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TOYOTA

Repair Manual

4Y ENGINE

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TOYOTA
INDUSTRIAL EQUIPMENT

TOYOTA Material Handling Company
A Division of TOYOTA INDUSTRIES CORPORATION
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FOREWORD

This repair manual describes the description, construction, trouble shooting, removal, disassembly, inspection and repair, assembly and installation of the various components of the 4Y model engine equipped on the Toyota Forklift Trucks.

You are encouraged to become thoroughly familiar with this manual so as to make the most of the outstanding performance and durability features of these vehicles mounted with the 4Y engine and to perform the proper servicing to maintain them in tip-top running condition.

This repair manual contains the latest information available as of August 1986.
For any changes thereafter, you are asked to consult the Parts & Service News.
Toyota reserves the right to make changes in specifications and descriptions without incurring any obligation and without previous notice.

TOYOTA Material Handling Company
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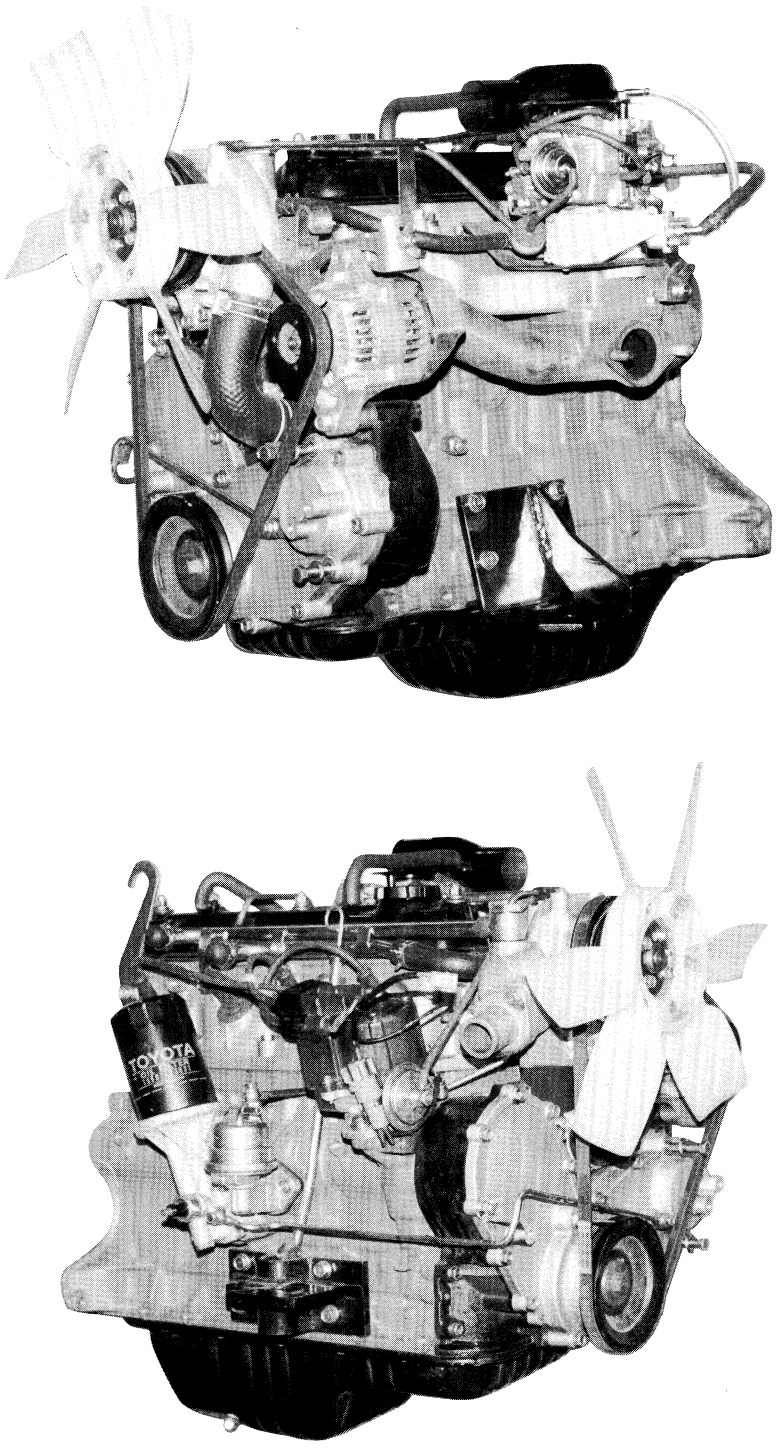
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GENERAL

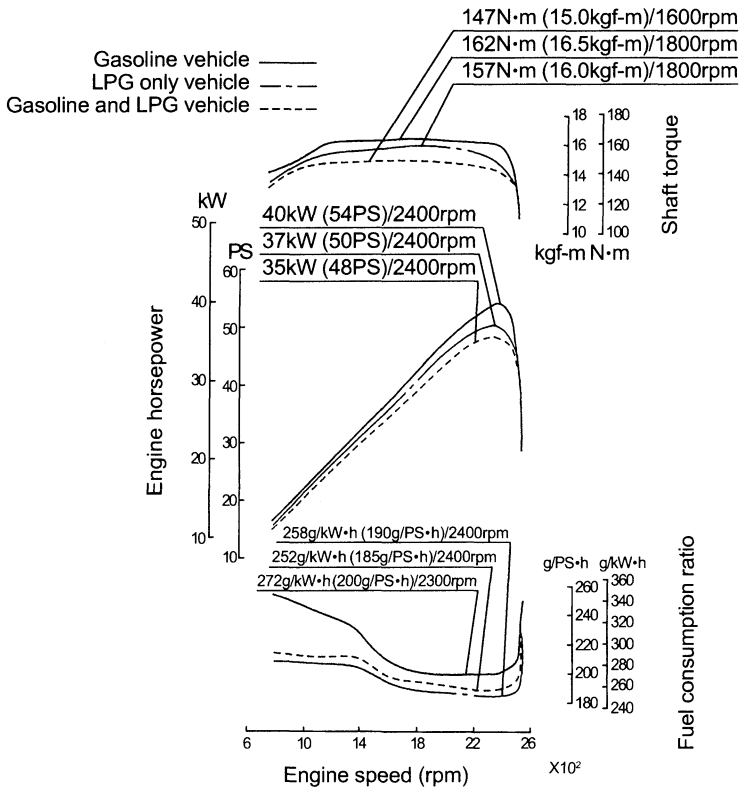
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ENGINE VIEWS

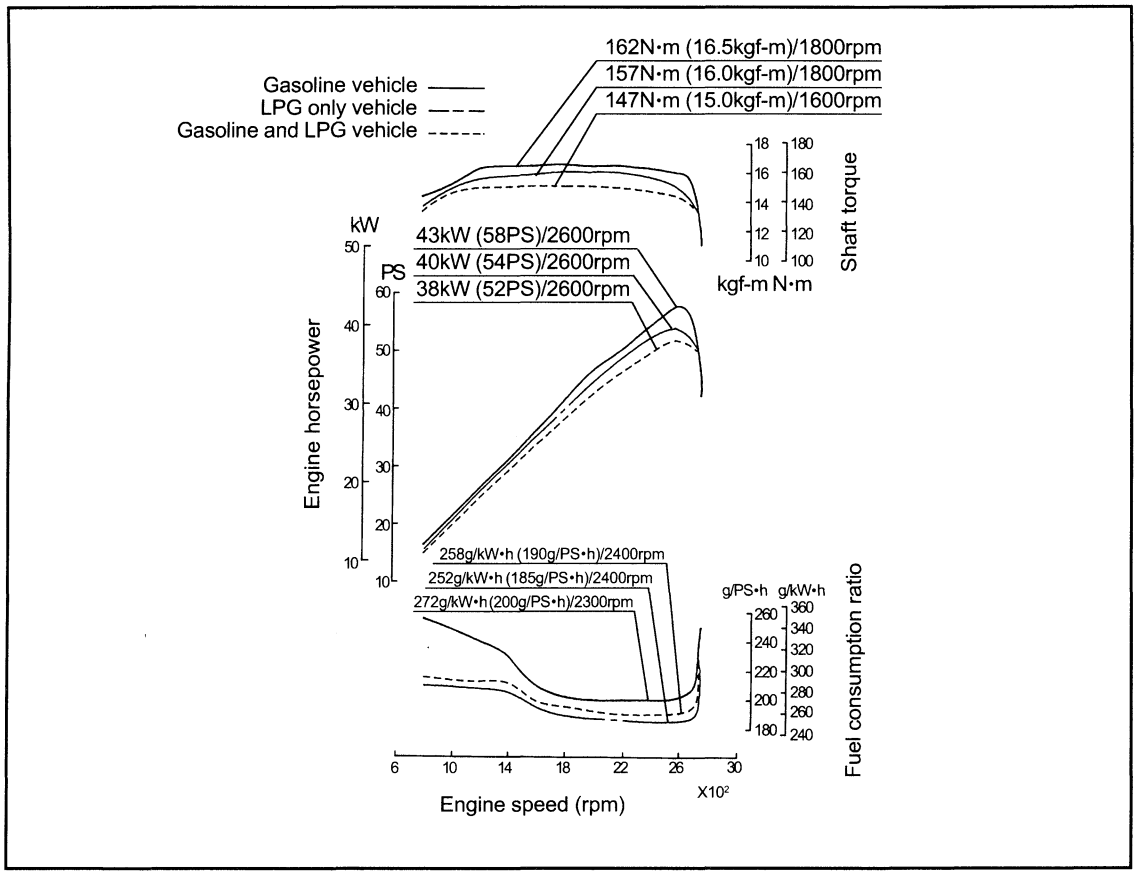


4Y Engine Exterior Views KAJ14-2,6

ENGINE PERFORMANCE CURVES



4Y Engine Performance Curves (7FG15-25)



4Y Engine Performance Curves (7FG30)

SPECIFICATIONS

		Toyota 4Y
Engine model		4Y
Type		Gasoline
Cycle		4
No. of cylinders and arrangement		In-line 4 cylinders, longitudinal arrangement
Starting method		Self-starting
Combustion chamber type		Wedge type
Valve mechanism		OHV, Chain drive
Bore x Stroke mm (in.)		91.0 x 86.0 (3.58 x 3.39)
Total displacement cc (cu-in)		2237 (136)
Compression ratio		8.8
Compression pressure kg/cm^2 (psi)/rpm		12.5 (178)/250
Rated horsepower		See repair manual for model
Maximum torque		See repair manual for model
Minimum fuel consumption at full load		See repair manual for model
Engine dimensions (length x width x height) mm (in)		~1998.7 : 676×512×707 (26.6×20.2×27.8) 1998.8~ : 710×525×705 (28.0×20.7×27.8)
Service weight kg (lb)		134 (295)
Number of piston rings		2 compression rings and 1 oil ring
Intake valve timing	Open	12° BTDC
	Close	~1998.7 : 40° ABDC, 1998.8~ : 48° ABDC
Exhaust valve timing	Open	54° BBDC
	Close	~1998.7 : 6° ATDC, 1998.8~ : 10° ATDC
Valve clearance	Intake	0 (Self adjusting)
	Exhaust	〃
Idle speed		See repair manual for model
No-load maximum governed speed		See repair manual for model
PCV system type		Closed type

ABBREVIATIONS

Abbreviation (code)	Meaning	Abbreviation (code)	Meaning
ASSY	Assembly	O/S	Oversize
ABDC	After bottom dead center	OPT	Option
ATDC	After top dead center	RH	Right hand
BBDC	Before bottom dead center	rpm	Revolutions per minute
BTDC	Before top dead center	SST	Special service tool
BDC	Bottom dead center	STD	Standard
EX	Exhaust	SUB-ASSY	Sub-assembly
IIA	Integrated ignition assembly	T =	Tightening torque
IN	Intake	U/S	Undersize
LH	Left hand		

GENERAL RULES OF SERVICING WORK

PREPARATION BEFORE DISASSEMBLY

1. Prepare mechanic tools, necessary measuring instruments and SST before starting operation.
2. When disassembling a complicated assembly, put punch or matching marks at places not affecting function to facilitate reassembly operation. When repairing an electrical system, start operation after disconnecting the cable from the battery negative terminal.

INSPECTION DURING DISASSEMBLY

1. Each time a part is removed, check the part installed state, deformation, damage, roughening state and scratching.

ORDERLY ARRANGEMENT OF DISASSEMBLED PARTS

1. Disassembled parts shall be arranged orderly. Distinguish the parts to be replaced from the parts to be reused.

CLEANING OF DISASSEMBLED PARTS

1. Parts to be reused shall be cleaned and washed thoroughly.

INSPECTION AND MEASUREMENT

1. Detailed inspection and measurement shall be carried out as required for parts to be reused.

INSTALLATION

1. Install good parts according to the correct procedure and observing the determined standards (tightening torques, adjustment values, etc.).
2. Always use genuine parts for replacement of existing parts.
3. Always use new packings, gaskets and cotter pins because they are not meant for reuse.
4. Coat seal packing on gaskets depending on the places, coat oil on the sliding contact places, coat oil or grease at specified places, and coat MP grease on oil seal lips before reassembly.

ADJUSTMENTS AND OPERATION CHECK

1. Adjust to the service standard values by using gages, a multimeter, etc.

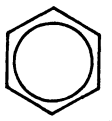
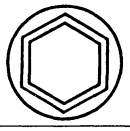
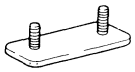
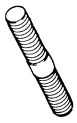
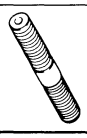
STANDARD BOLT AND NUT TIGHTENING TORQUE JUDGEMENT

Standard bolt and nut tightening torques are not indicated; therefore tightening torque must be judged as below:

1. Find out the type of the bolt from the list below.
   Then, find the bolt tightening torque from the table.
2. The nut tightening torque can be judged from the bolt type. (See the table.)

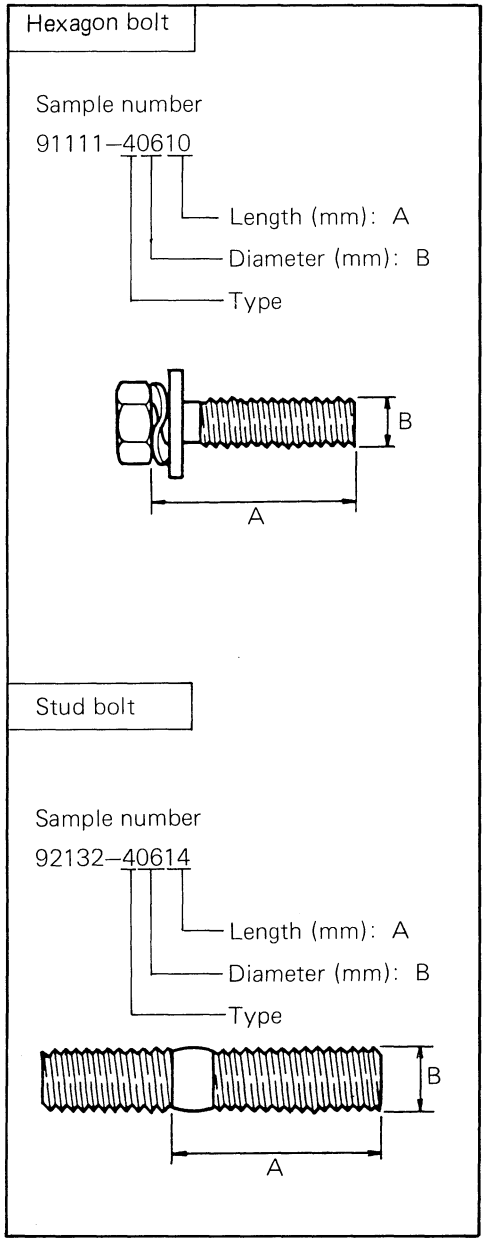
LIST OF BOLT TYPES AND STRENGTH

1. Judging by part

Shape and description			Type
Hexagon bolt		Number in relief or hallmark on the head	4 = 4T 5 = 5T 6 = 6T 7 = 7T
Standard bottom surface		No mark	4T
Hexagon bolt (Collared bottom)		No mark	4T
Hexagon bolt (Standard bottom surface)		Two relief lines on the head	5T
Hexagon bolt (Collared bottom)		Two relief lines on the head	6T
Hexagon bolt		Three relief lines on the head	7T
Welded bolt			4T
Welding bolt		No mark	4T
Stud bolt		Approximately 2mm (0.08 in.) hollow on either or both ends	6T

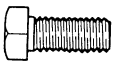
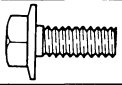
BAHS28

2. Judging by part No.



BAHS25

STANDARD BOLT TIGHTENING TORQUE

Type	Diameter mm	Pitch mm	Standard tightening torque kg-cm (ft-lb)	
			Standard seat 	Seat with flange 
4 T	6	1.0	55 (4.0)	60 (4.3)
	8	1.25	130 (9.4)	145 (10.5)
	10	1.25	260 (18.8)	290 (20.9)
	12	1.25	480 (34.7)	540 (39.0)
	14	1.5	760 (54.9)	850 (61.4)
	16	1.5	1,150 (83.0)	—
5 T	6	1.0	65 (4.7)	—
	8	1.25	160 (11.6)	—
	10	1.25	330 (23.8)	—
	12	1.25	600 (43.3)	—
	14	1.5	930 (67.1)	—
	16	1.5	1,400 (101.1)	—
6 T	6	1.0	80 (5.8)	90 (6.5)
	8	1.25	195 (14.1)	210 (15.2)
	10	1.25	400 (28.9)	440 (31.8)
	12	1.25	730 (52.7)	810 (58.5)
	14	1.5	1,100 (79.4)	1,250 (90.3)
7 T	6	1.0	110 (7.9)	120 (8.7)
	8	1.25	260 (18.8)	290 (20.9)
	10	1.25	530 (38.3)	590 (42.6)
	12	1.25	970 (70.0)	1,050 (75.8)
	14	1.5	1,500 (108.3)	1,700 (122.7)
	16	1.5	2,300 (166.1)	—

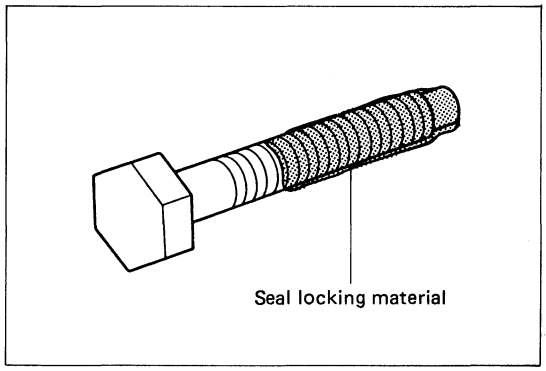
BAHS26

Precoated bolts (bolts and nuts coated with seal lock agent on threaded parts)

1. Do not use precoated bolts in any of the following cases:
   (1) When a precoated bolts is removed.
   (2) When a precoated bolts is removed as a result of tightening check, etc. (When it is loosened or tightened).

   Note:
   Check the torque with the lower limit of the tightening torque. If it moves, retighten it according to the following procedure:

2. Method for reuse of precoated bolts
   (1) Clean the bolt and threaded hole.
   Clean the threaded hole when the bolt is to be replaced.
   (2) Dry the cleaned parts thoroughly by air blowing.
   (3) Coat the specified seal lock agent on the threaded part of the bolt.



B4460

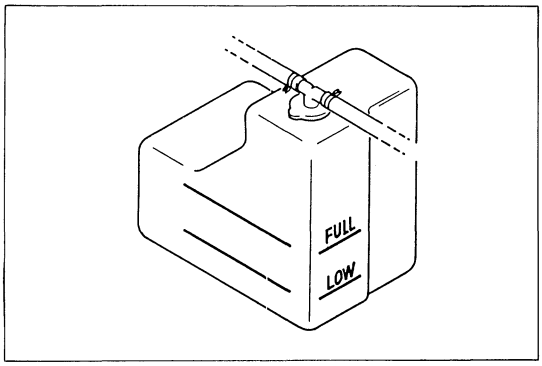
ENGINE TUNE-UP

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COOLANT INSPECTION

1. Coolant Inspection
   (See Section 5.)

   Standard:
   The coolant level in the radiator reservoir tank shall be between the FULL and LOW lines.
   The LLC concentration shall be 30% (50% in frigid zone) or more, and the coolant shall not be contaminated with oil, etc.

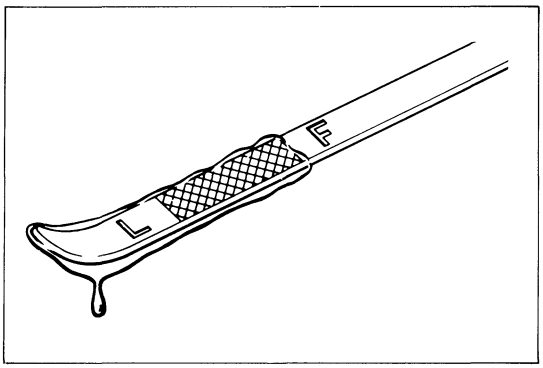


Inspecting the Coolant KAHS109

ENGINE OIL INSPECTION

1. Engine Oil Inspection

   Standard:
   The oil level shall be between F and L on the dip-stick.
   The oil shall not be heavily contaminated, and the viscosity shall be proper.
   Neither coolant nor light oil shall exist in the engine oil.



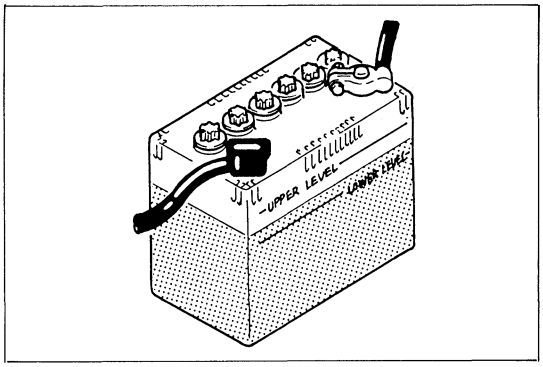
Inspecting the Engine Oil LU0309

BATTERY ELECTROLYTE LEVEL AND SPECIFIC GRAVITY INSPECTION

1. Battery Electrolyte Level Inspection

   Standard:
   The electrolyte level shall be between UPPER LEVEL and LOWER LEVEL.
   The specific gravity shall be 1.28 (at 20°C).

   Caution:
   If the battery electrolyte is insufficient, add distilled water.

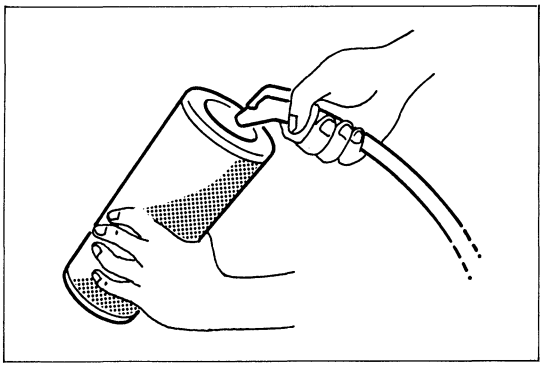


Inspecting the Battery Electrolyte Level KAJS94

AIR CLEANER INSPECTION AND CLEANING

1. Air Cleaner Element Inspection and Cleaning
   (1) Check the air cleaner element for damage, dirt and clogging.
   (2) Use compressed air to clean the air cleaner element.

   Caution:
   The air pressure shall be 7 kg/cm^2 (99 psi) or less.



Cleaning the Air Cleaner Element KAHS111

1. Air Cleaner Case Cleaning
   (1) Clean the inner and outer surfaces of the case with cloth.

CLOGGING WARNING SYSTEM INSPECTION

1. Inspection on vehicle
   (1) Check that the air cleaner warning lamp on the instrument panel comes on when the key switch is set to ON, and that it goes off when the engine starts.

2. Individual inspection
   (1) Check current conduction when a negative pressure is applied to the vacuum switch.

   Standard:
   Approx. 50 mmHg or above:
   Conduction
   Approx. 35 mmHg or less:
   No conduction

   Caution:
   Do not apply a negative pressure exceeding 75 mmHg to the vacuum switch.

V-BELT INSPECTION AND ADJUSTMENT

1. V-belt Inspection
   (1) Check that the belt is correctly installed.
   (2) If squealing or slipping exists, check the belt surface in contact with the pulley for wear, damage and scratches, and the pulley for surface defects.
   (3) Push the center of the belt between the alternator and water pump with a force of 10 kg (22 lb) and measure the flexure.

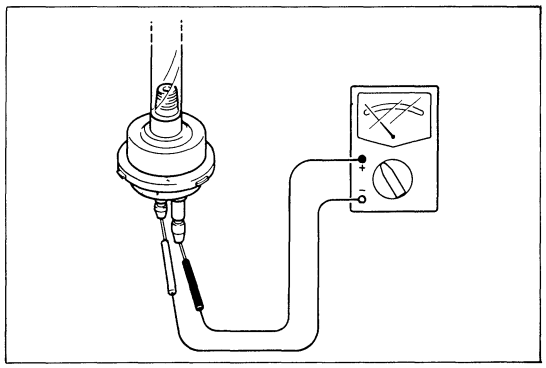
   Standard V belt flexure:

New belt mm (in)	7–9 (0.28–0.35)
For general inspection mm (in)	8–13 (0.31–0.51)

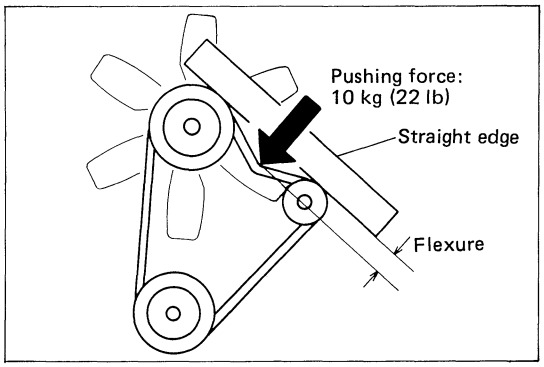
   Caution:
   - **Always measure the belt flexure at between the specified pulleys.**



Warning Lamp KAJS2



Inspecting the Vacuum Switch KAHS125



Inspecting the V-belt Flexure KAJS1

- When replaced with a new belt, adjust the flexure to the central value of the standard range for the new belt.
- When inspecting a belt used for 5 minutes or more, apply the standard for general inspection.
- When reinstalling a belt used for 5 minutes or more, adjust the flexure to the central value of the standard range for general inspection.

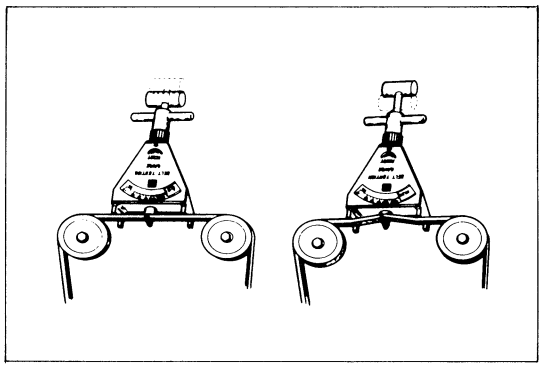
(4) When the belt tension gauge is available, apply the gauge at the center between the alternator and water pump to measure the tension of the V-belt.

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(SST 09216-00020)

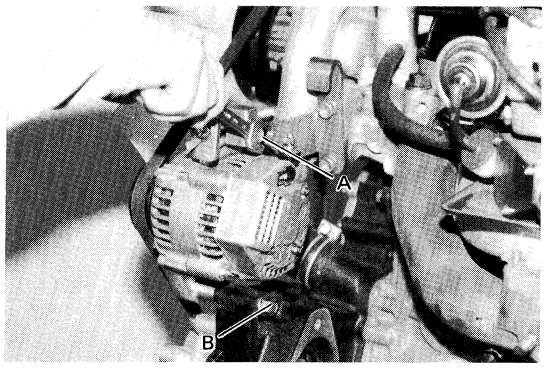
V-belt tension standard:

For new belt kg (lb)	38–62 (84–137)
For general inspection kg (lb)	30–50 (66–110)

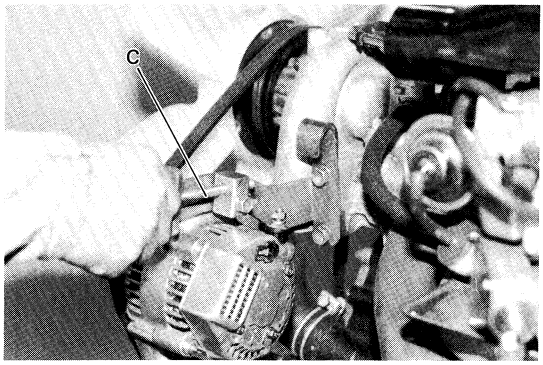
2. V-belt Flexure Adjustment
   (1) Loosen fixing bolts A and B.
   (2) Turn adjusting bolt C to adjust the flexure.
   (3) Tighten fixing bolts B and A in this order.
   (4) Check the belt tension (flexure or tension)



Tension gauge B1669



Adjusting the V-belt (1) KAJ11-6



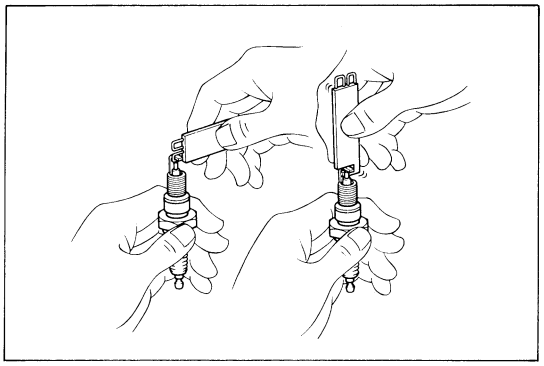
Adjusting the V-belt (2) KAJ11-7

IGNITION PLUG CLEANING, AND GAP INSPECTION & ADJUSTMENT

1. Gap Inspection and Adjustment
   (1) Inspect the gap and adjust it if the standard is not satisfied.

   Standard: 0.7 – 0.8 mm (0.028 – 0.031 in.)

(See page 7-3)



Inspecting the Ignition Plug IG0089

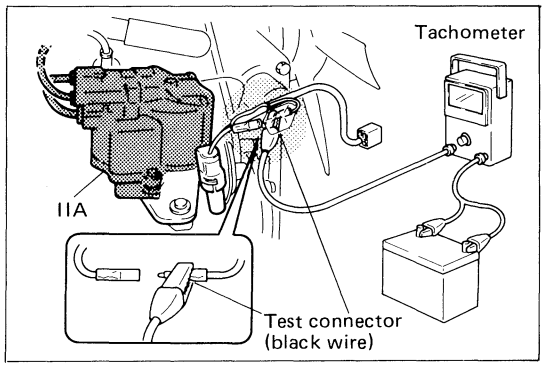
IGNITION TIMING INSPECTION AND ADJUSTMENT

1. Engine warm up
   Standard:
   Coolant temperature: 80°C or more
   Engine oil temperature: 70°C or more
   Hydraulic oil temperature: 50°C or more
2. Tachometer and timing light installation
   (1) Disconnect the test connector and connect the tachometer measuring lead to the black wire.
3. Idle speed inspection
   Standard: See repair manual for model
4. Ignition timing inspection and adjustment
   (1) Disconnect the vacuum hose from the Distributor (IIA).
   (2) Use the timing light and inspect the ignition timing.
   Standard: 7° BTDC/idle speed
   (3) If the standard is not satisfied, loosen the distributor set bolt and turn the distributor for adjustment to the standard value.
   (4) Tighten the set bolt and recheck the ignition timing.
   T = 1.85 kg-m (13.4 ft-lb)
   (5) After ignition timing adjustment, seal the distributor set bolt by using the sealing tape.

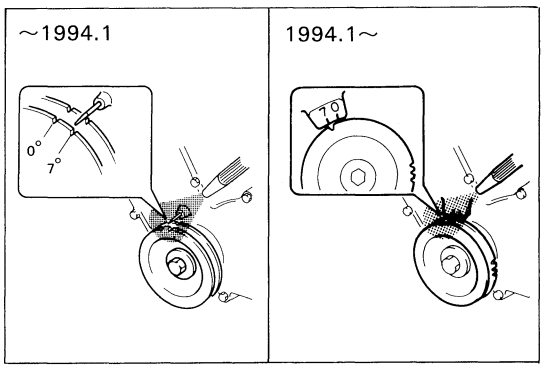
IDLE-UP INSPECTION AND ADJUSTMENT

1. Engine warm up
   Standard:
   Coolant temperature: 80°C or more
   Engine oil temperature: 70°C or more
   Hydraulic oil temperature: 50°C or more
2. Tachometer installation (See above.)
3. Idle-up speed inspection and adjustment
   (1) Start the engine. Disconnect the vacuum hose ② from the idle-up actuator ① , and measure the engine speed.
   Standard: See repair manual for model
   If the standard is not satisfied, turn the adjusting screw ③ for adjustment.

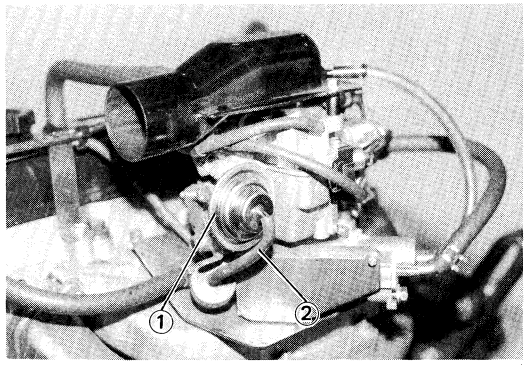
   Caution:
   Clockwise turn of the adjusting screw increases the engine speed.



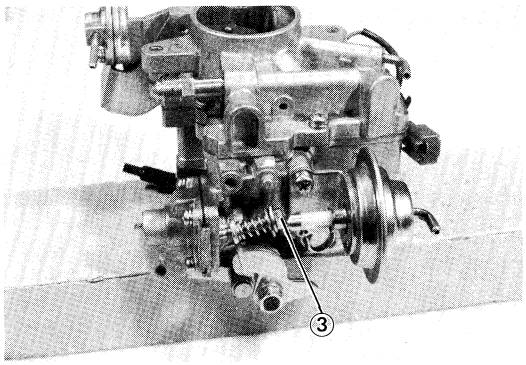
Installing the Tachometer KAJS5



Inspecting the Ignition Timing KAJS4



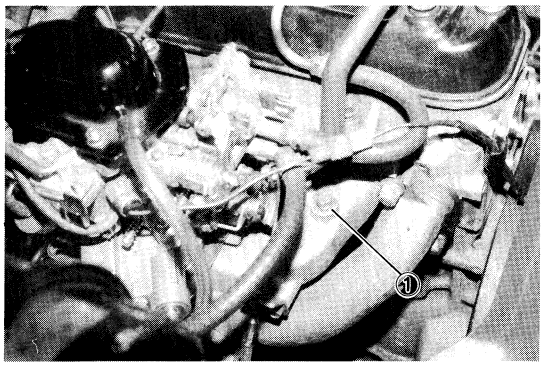
Idle-up Actuator KAJ14-12



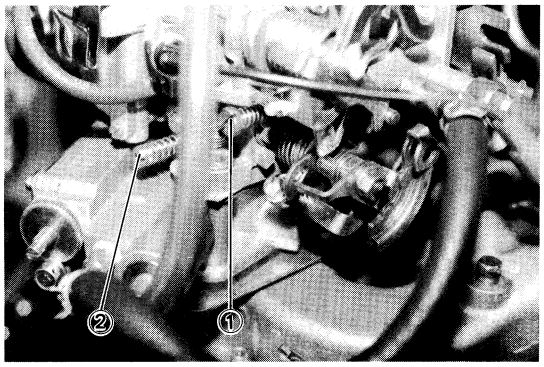
Adjusting the Idle-up Speed KAJ20-9

IDLING SPEED INSPECTION AND ADJUSTMENT

1. Engine warm up
   Standard:
   Coolant temperature: 80°C or more
   Engine oil temperature: 70°C or more
   Hydraulic oil temperature: 50°C or more
2. Tachometer and vacuum gauge installation
   (1) Install the tachometer. (See page 1-5.)
   (2) Remove the intake manifold plug ① and connect the vacuum gauge.
3. Idle speed inspection and adjustment
   (1) Start the engine. Alternately turn the throttle adjusting screw ① and idle adjusting screw ② to maximize and stabilize the vacuum while maintaining the specified idle speed.
   (2) When engine idle speed does not return to the normal (preset) speed due to the interference or contact between the idle-up adjusting screw and the idle-up actuator rod, loosen the idle-up adjusting screw. (See page 1-5)
   Standard: See repair manual for model



Vacuum Gauge Installing Position KAJ21-8



Adjusting the Idling Speed KAJ14-25

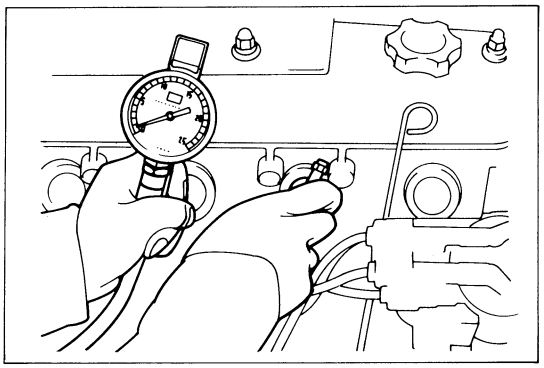
NO LOAD MAXIMUM GOVERNED SPEED INSPECTION AND ADJUSTMENT

(See page 3-34)

COMPRESSION PRESSURE INSPECTION

Note:
If output reduction, excessive oil consumption or extremely bad fuel consumption ratio is observed, measure the cylinder compression pressure.

1. Engine warm up
   Standard:
   Coolant temperature: 80°C or more
2. Remove of all ignition plugs
3. Distributor connector disconnection



Measuring the Compression Pressure EM2418

4. Compression pressure measurement

Caution:
Run the starting motor to discharge foreign matters from cylinders before the compression pressure measurement.

(1) Insert the compression gauge to the ignition plug hole.
(2) Fully open the throttle.
(3) Crank the engine by the starting motor and measure the compression pressure.

Standard: 12.5 kg/cm² (178 psi)
Limit: 9.0 kg/cm² (128 psi)

Caution:
Always use a fully charged battery to keep the engine speed at 250 rpm or above.

(4) Repeat steps (1) to (3) above for all cylinders and inspect the pressure difference.
Pressure difference limit:
1.0 kg/cm² (14 psi)

(5) If the compression pressure is below the limit or if the compression pressure in any cylinder is deviated beyond the pressure difference limit, add engine oil slightly through the ignition plug hole, and repeat steps (1) to (3).
① If the pressure rises after the oil addition, the piston rings and/or cylinder bore may be worn or damaged.
② If the pressure is still low after the oil addition, valve seizure, valve contact defect or pressure leak from the gasket may be the reason.

5. Distributor connector reconnection

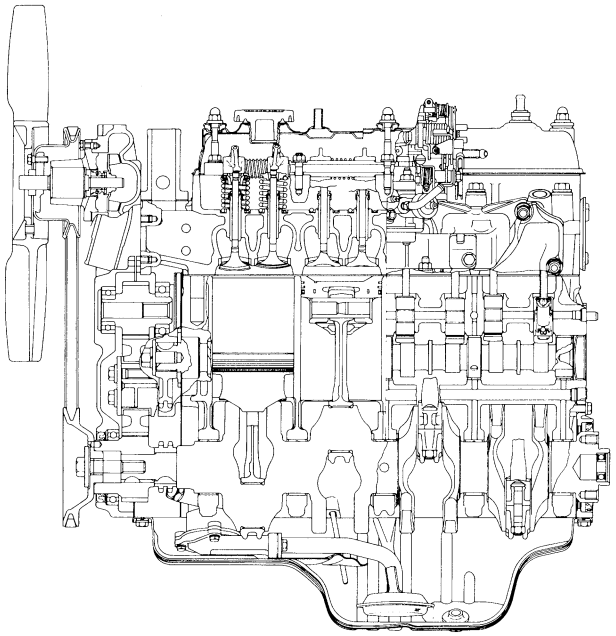
6. Ignition plug installation
T = 1.8 kg-m (13.0 ft-lb)

ENGINE OVERHAUL

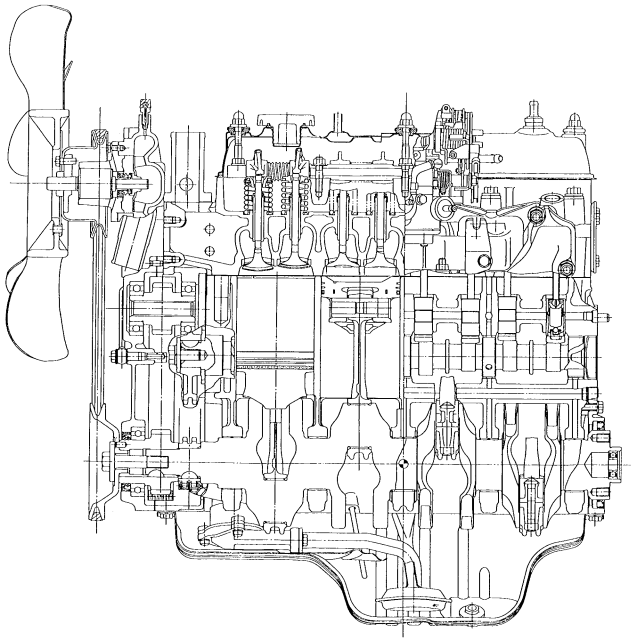
	Page
ENGINE SECTIONAL VIEWS	2-2
CYLINDER HEAD	2-4
TIMING GEAR & CAMSHAFT	2-25
CYLINDER BLOCK	2-41

2

ENGINE SECTIONAL VIEWS

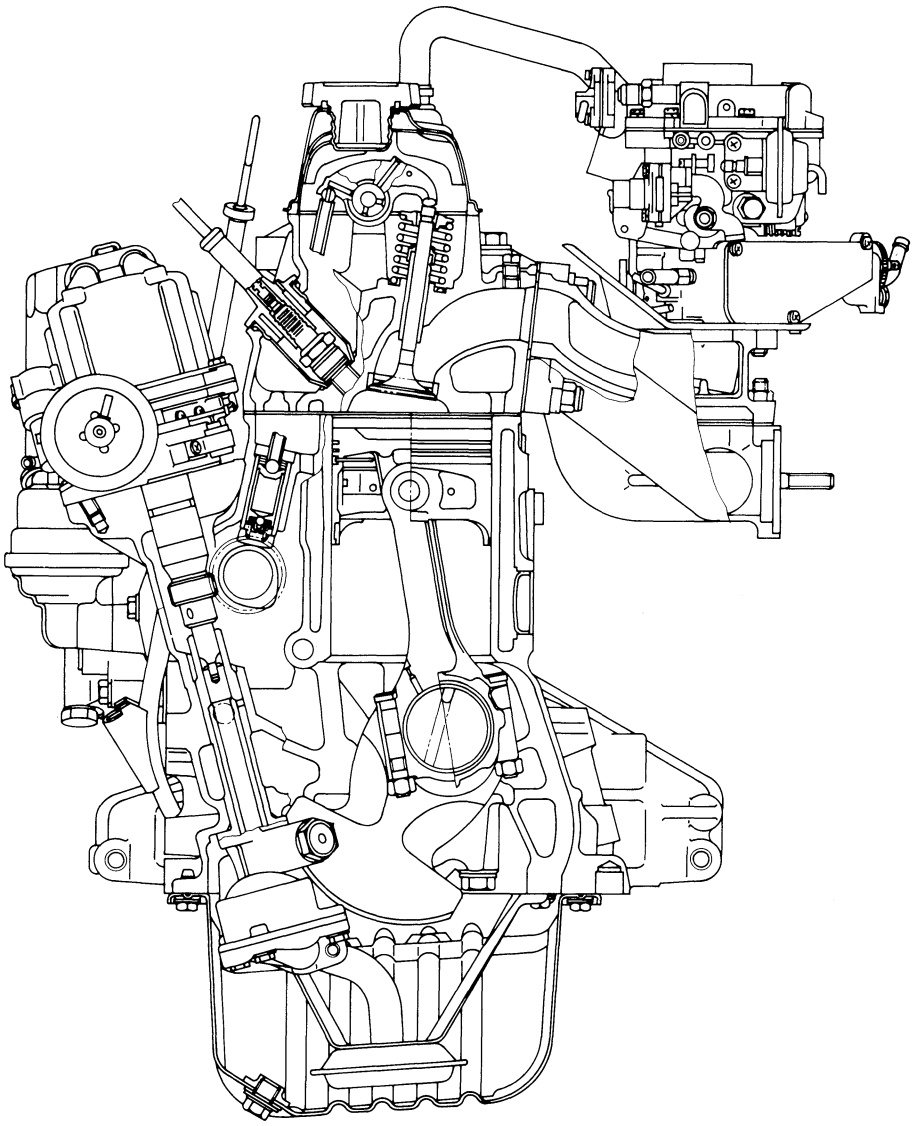


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1994.1~

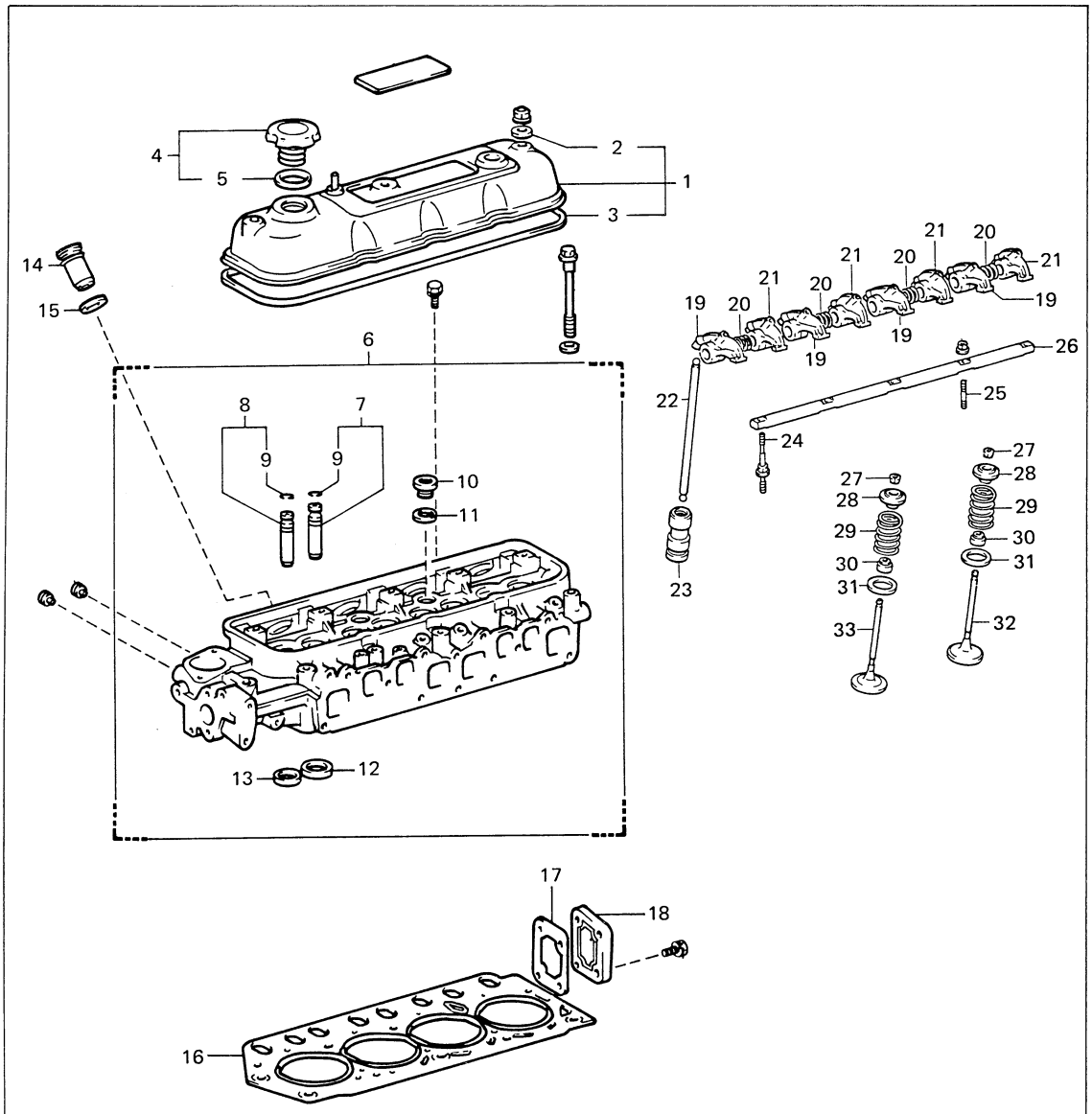
4Y Engine Longitudinal Sectional View LAOL3



4Y Engine Transverse Sectional View LAOL4

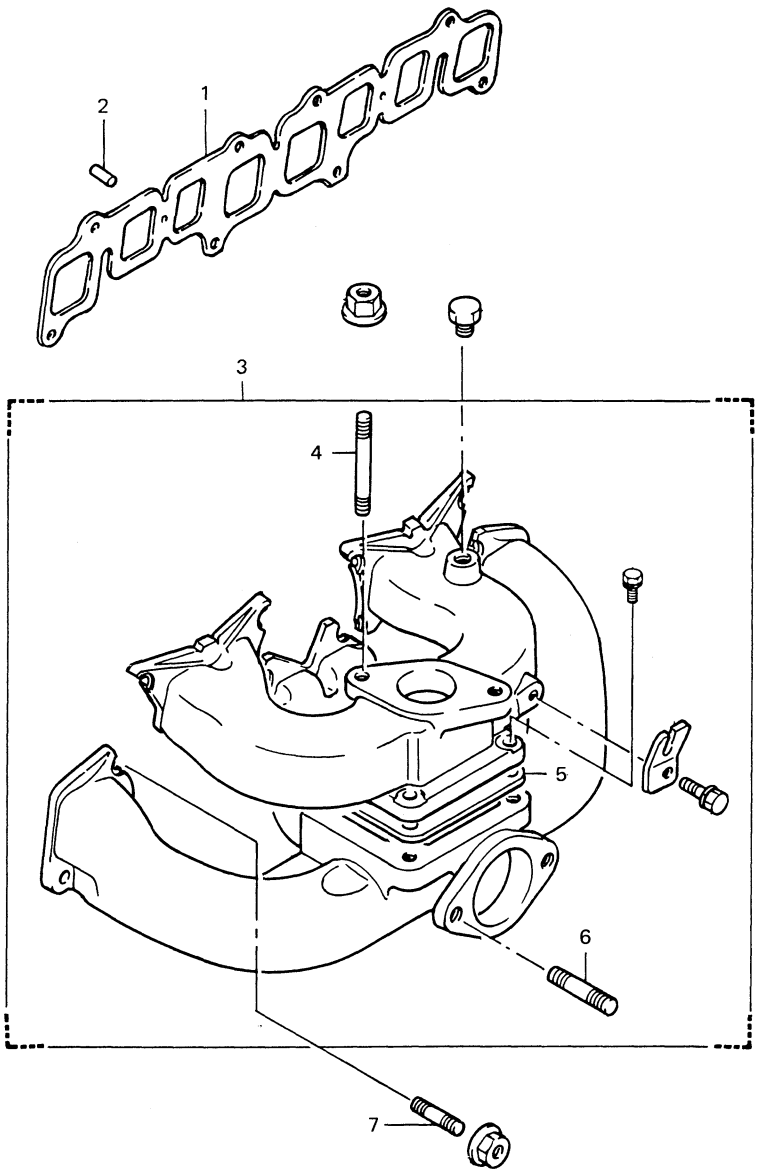
CYLINDER HEAD

COMPONENTS



1. Cylinder head cover SUB-ASSY
2. Seal washer
3. Cylinder head cover gasket
4. Oil filler cap SUB-ASSY
5. Gasket
6. Cylinder head SUB-ASSY
7. Intake valve guide bush
8. Exhaust valve guide bush
9. Shaft snap ring
10. Plug
11. Gasket
12. Intake valve seat
13. Exhaust valve seat
14. Ignition plug hole
15. Gasket
16. Cylinder head gasket
17. Gasket
18. Head rear plate
19. Valve rocker arm, No. 2
20. Spring
21. Valve rocker arm, No. 1
22. Valve push rod
23. Valve lifter
24. Stud bolt
25. Stud bolt
26. Valve rocker shaft No. 1
27. Valve spring retainer lock
28. Valve spring retainer
29. Valve spring
30. Valve stem oil seal
31. Spring seat
32. Intake valve
33. Exhaust valve

Cylinder Head Components KAJM3

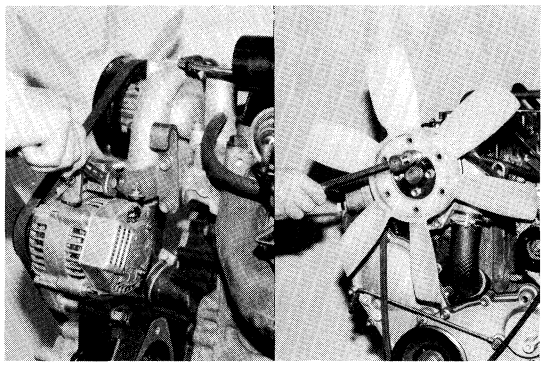


1. Manifold to cylinder head gasket
2. Straight pin
3. Manifold ASSY
4. Stud bolt
5. Intake to exhaust manifold gasket
6. Stud bolt
7. Stud bolt

Manifold Components KAJM4

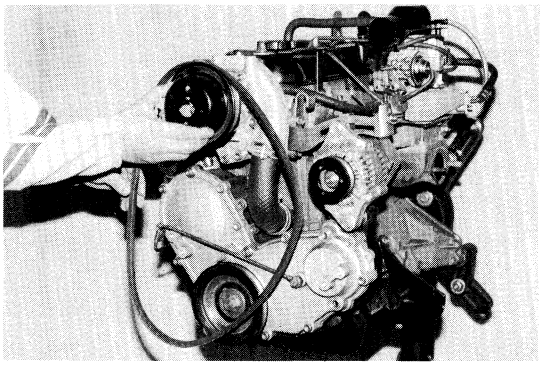
CYLINDER HEAD REMOVAL

1. Fan, fan pulley and V-belt removal
   (1) Loosen alternator fixing bolts (2 pcs.) and the adjusting bolt.
   (2) Fan



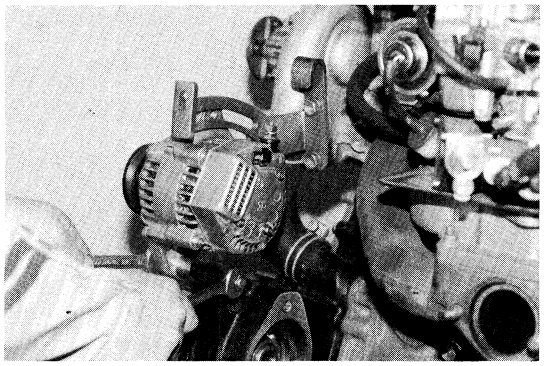
Removing the Fan KAJ11-6,8

   (3) Fan pulley
   (4) V-belt



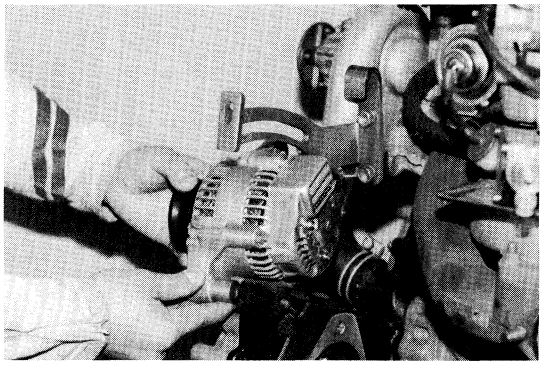
Removing the Fan Pulley and V-belt KAJ11-10

2. Alternator removal
   (1) Fixing bolts (2 pcs.)
   (2) Adjusting bolt



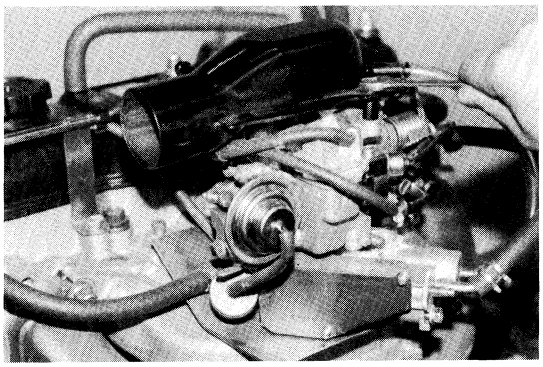
Removing the Alternator (1) KAJ11-12

   (3) Alternator



Removing the Alternator (2) KAJ11-14

3. Air cleaner connector disconnection
   (1) Disconnect ventilation hose No. 3.
   (2) Disconnect the connector to governor hose.
   (3) Remove set bolts (2 pcs.), and remove the air cleaner connector.

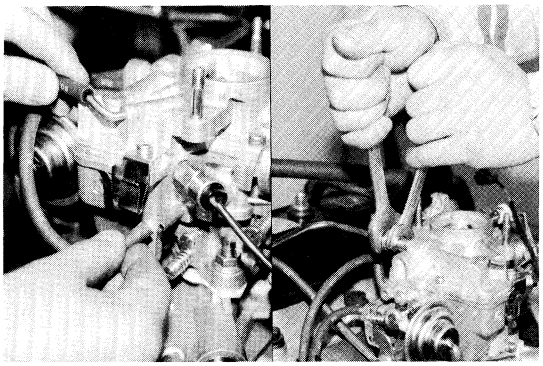


Disconnecting the Air Cleaner Connector KAJ11-23

4. Carburetor removal
   (1) Disconnect vacuum hoses (4 pcs.).

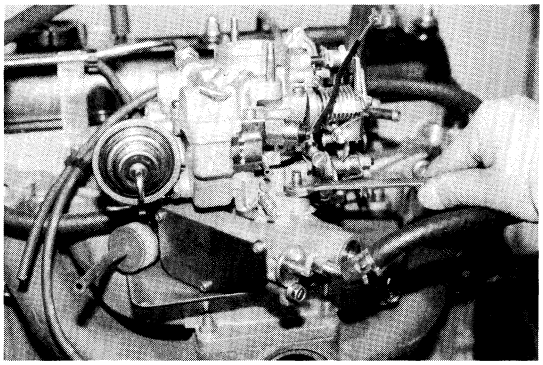
   Note:
   Attach identification tags to the vacuum hoses before disconnection.

   (2) Disconnect the water hose.
   (3) Disconnect the fuel piping.



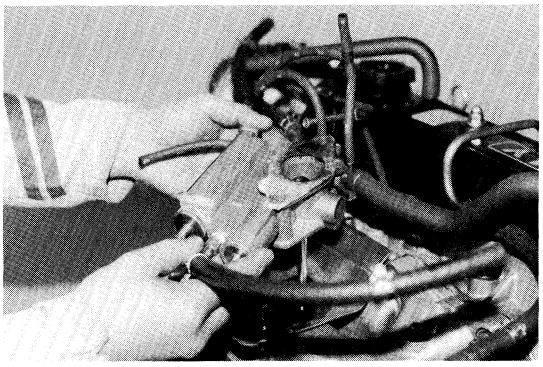
Disconnecting the Piping KAJ11-27,29

   (4) Remove set nuts (2 pcs.), and remove the carburetor.



Removing the Carburetor KAJ11-30

5. Governor removal
   (1) Disconnect ventilation hose No. 1.
   (2) Disconnect the water hose.
   (3) Remove the air governor.
   (4) Remove the heat insulator and fuel insulator plate.



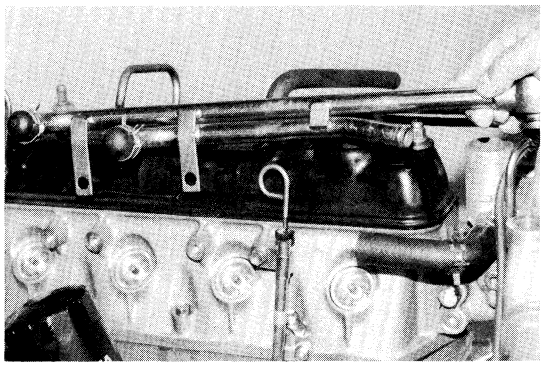
Removing the Air Governor KAJ11-36

~1998.7

6. Water outlet pipe removal
   (1) Union bolt
   (2) Set bolts (2 pcs.)
   (3) Water bypass hose disconnection
   (4) Water outlet pipe

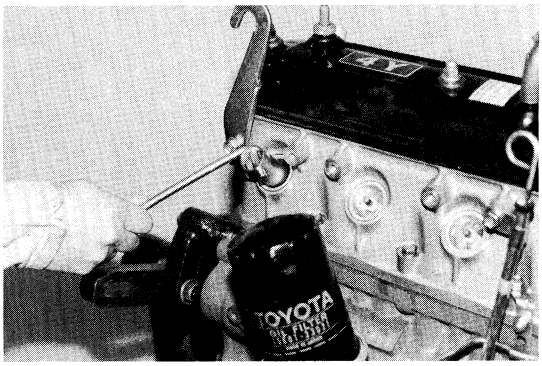
1998.8~

6. Water bypass hose removal
   (1) Water bypass hose and clamp



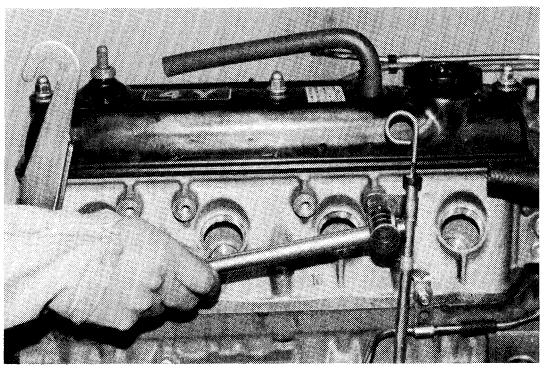
Removing the Water Outlet Pipe KAJ13-8

7. Ignition plug and tube removal
   (1) Use an ignition plug wrench and remove ignition plugs (4 pcs.) and ignition plug tubes (4 pcs.).



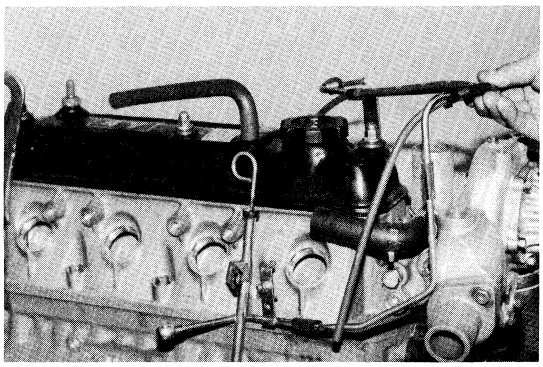
Removing the Ignition Plugs and Tubes KAJ13-9

8. Oil level gauge set bolt removal



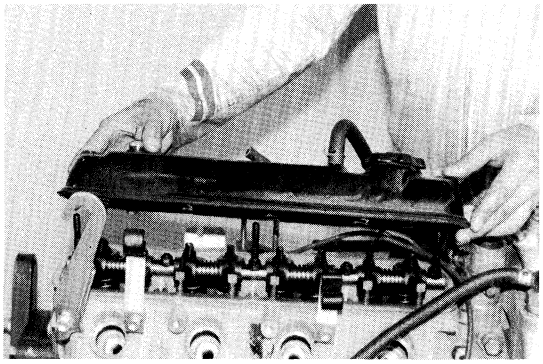
Removing the Oil Level Gauge Set Bolt KAJ13-17

9. Fuel pipe and hose removal
   (1) Disconnect the fuel pipe from the fuel pump.
   (2) Fuel pipe clamp set bolts (2 pcs.)
   (3) Fuel pipe and hose



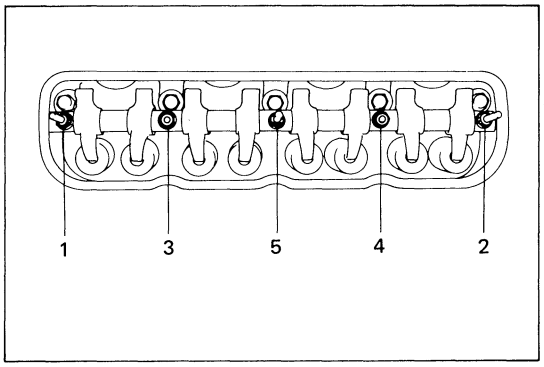
Disconnecting the Fuel Pipe and Hose KAJ13-20

10. Cylinder head cover removal
    (1) Cap nuts (3 pcs.)
    (2) Seal washers (3 pcs.)
    (3) Cylinder head cover
    (4) Gasket



Removing the Cylinder Head Cover KAJ3-27

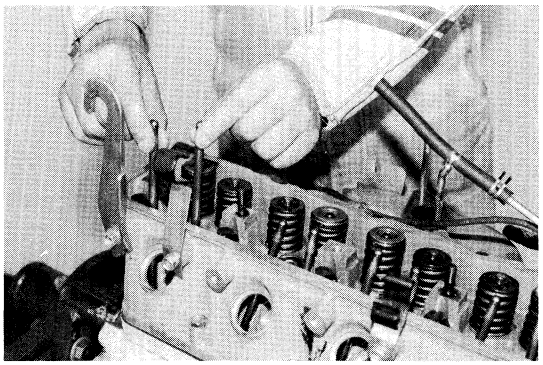
11. Valve rocker shaft ASSY removal
    (1) Evenly loosen three valve rocker shaft set bolts and two nuts in the illustrated order in several steps, and remove them.
    (2) Remove the valve rocker shaft ASSY.



Removing the Valve Rocker Shaft ASSY EM2417

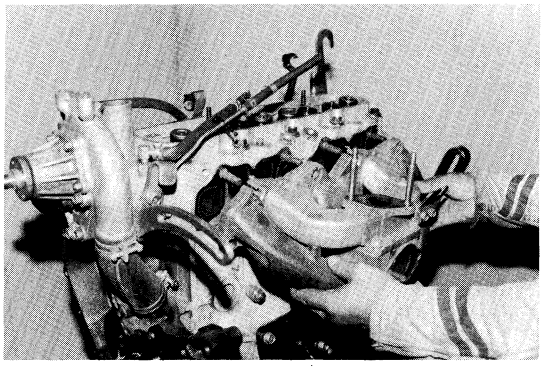
12. Valve push rod removal

    Caution:
    Extracted push rods shall be arranged in the order of cylinders.



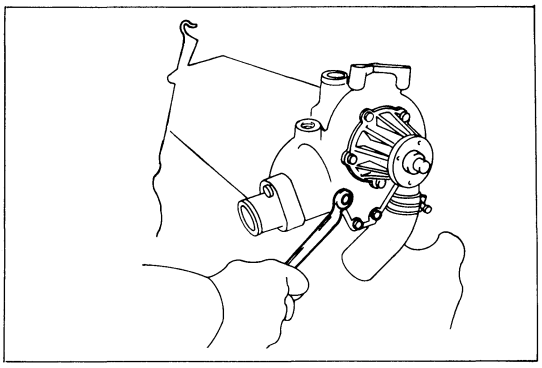
Removing the Valve Push Rods KAJ3-35

13. Manifold removal
    (1) Set nuts (8 pcs.)
    (2) Manifold
    (3) Gasket



Removing the Manifold KAJ4-27

14. Water pump ASSY removal
    (1) Water inlet hose disconnection
    (2) Set bolts (4 pcs.)
    (3) Water pump ASSY



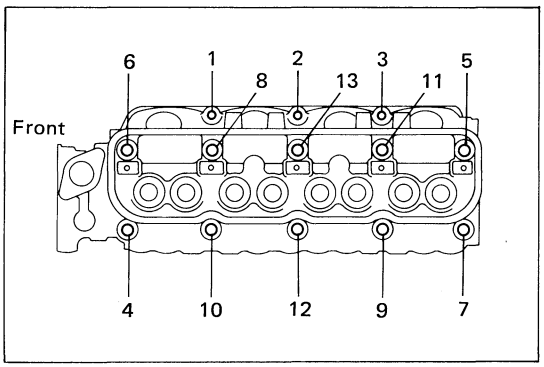
Removing the Water Pump ASSY KAJS6

15. Cylinder head removal
    (1) Evenly loosen 13 cylinder head bolts in the illustrated order in several steps.

    (2) Remove the set bolts and remove the rear engine hanger.

    (3) Remove the cylinder head from the cylinder block.

    Caution:
    Carefully prevent the cylinder head installation surface from any damage.



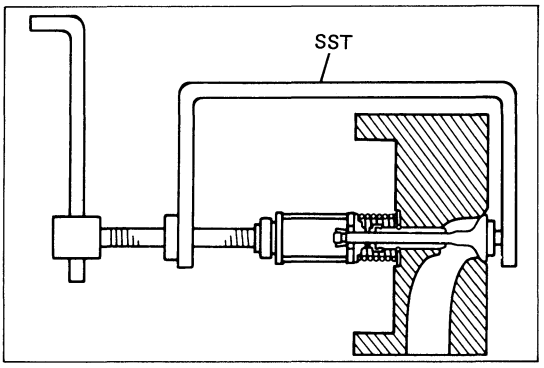
Removing the Cylinder Head EM2416

CYLINDER HEAD DISASSEMBLY

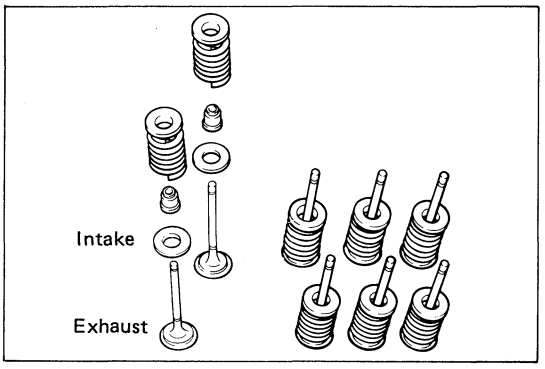
1. Valve removal
    (1) Set the SST to the valve to compress the valve spring, and remove two retainer locks.
    SST 09202-76001-71
    (SST 09202-43013)

    (2) Remove spring retainers, springs, seats, valves and oil seals.

    Caution:
    Removed parts shall be arranged orderly for each cylinders.



Removing the Valve EM2413



Valve Components EM0025

CYLINDER HEAD INSPECTION AND CLEANING

1. Piston and cylinder block top surface cleaning
   (1) Rotate the crankshaft to bring each piston to the top dead center. Use a gasket scraper and remove the carbon deposit on top of the piston.
   (2) Use the scraper and remove the gasket adhering on the cylinder block top surface.
   (3) Use an air gun to blow off oil and foreign matters from bolt holes.

   Caution:
   Use cloth to prevent splashing of oil.

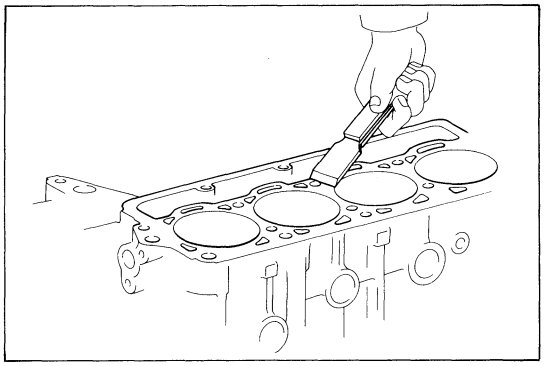
2. Cylinder head gasket removal
   (1) Use the scraper and clean the cylinder head bottom surface and manifold installation surface.

   Caution:
   Do not damage the cylinder head during cleaning.

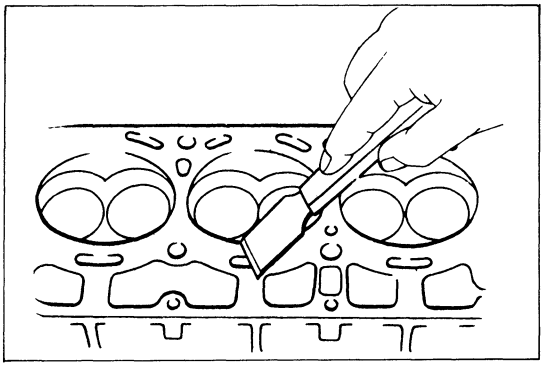
3. Cylinder head combustion chamber cleaning
   (1) Use a wire brush to remove the carbon from the combustion chambers.

   Caution:
   Do not damage the surface to be in contact with the head gasket.

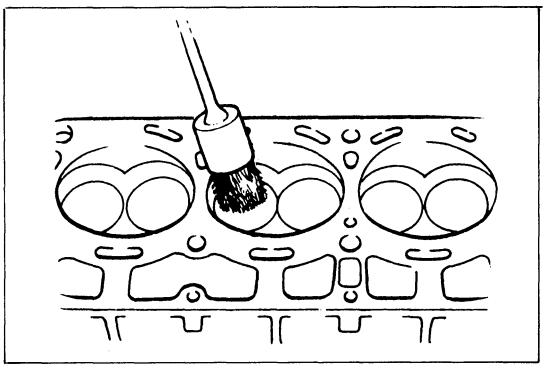
4. Valve guide bush cleaning
   (1) Use a solvent and clean the inner surface of the valve guide bush.



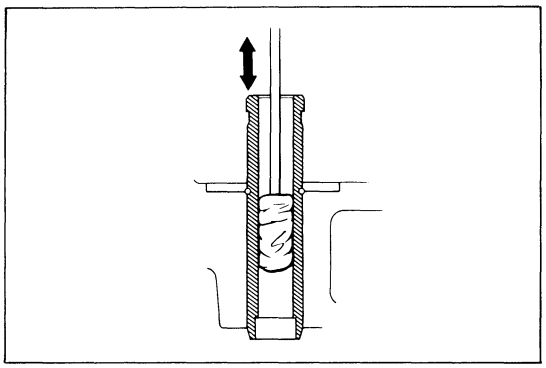
Cleaning the Cylinder Block EM2532



Cleaning the Cylinder Head EM2412

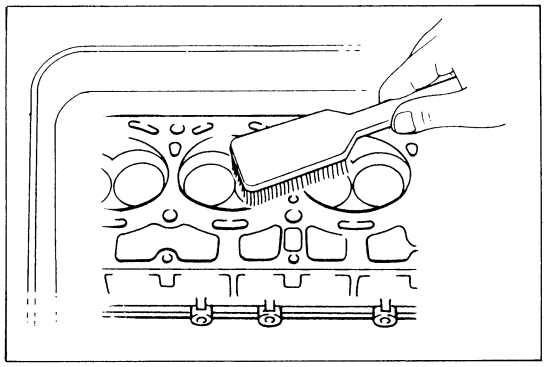


Cleaning the Cylinder Head Combustion Chambers EM2411



Cleaning the Valve Guide Bush EM0028

5. Cylinder head washing
   (1) Wash the cylinder head with a solvent.

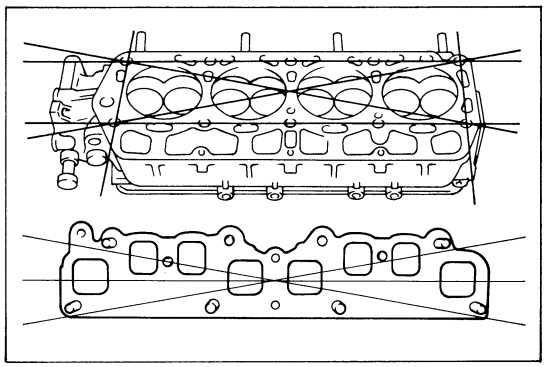


Washing the Cylinder Head EM2409

6. Cylinder head distortion inspection
   (1) Use a straight edge and thickness gauge, and measure at the illustrated places.

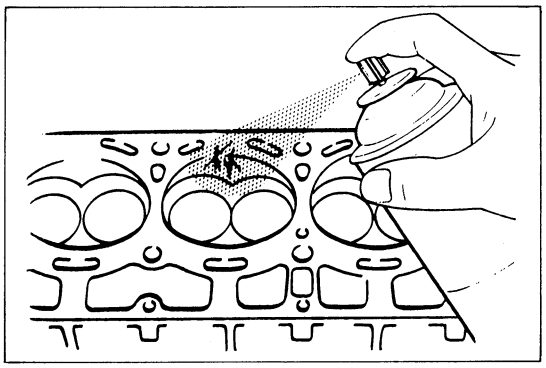
   Limits:
   Cylinder head bottom surface:
   0.15 mm (0.0059 in.)
   Manifold installation surface:
   0.10 mm (0.0039 in.)

   Regrind or replace the cylinder head if the limit is exceeded.



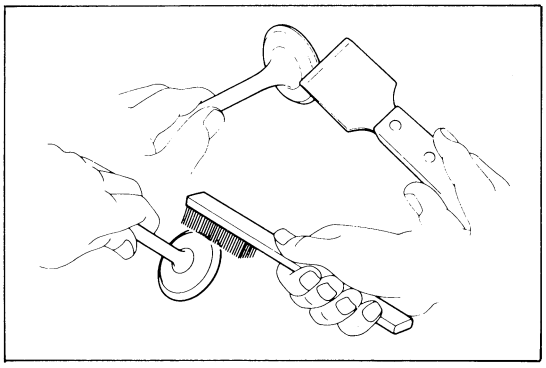
Inspecting the Cylinder Head Distortion KAJS95, EM2533

7. Cylinder head crack inspection
   (1) Inspect the combustion chambers, intake ports, exhaust ports, head bottom surface and head top surface by color check.



Inspecting the Cylinder Head for Cracks EM2408

8. Valve cleaning
   (1) Use a scraper to remove the carbon, and then use a wire brush for thorough removal.



Cleaning the Valve EM0580

9. Inspect the oil clearance between each valve guide bush and valve stem.
   (1) Use a caliper gauge and measure the inside diameter of the valve guide bush.

   Standard: 8.010 – 8.030 mm (0.3154 – 0.3161 in.)

   (2) Use a micrometer and measure the outside diameter of the valve stem.

   Standard:
   IN 7.970 – 7.985 mm (0.3138 – 0.3144 in.)
   EX 7.965 – 7.980 mm (0.3136 – 0.3142 in.)

   (3) Calculate the difference between the valve guide bush inside diameter and valve stem outside diameter.

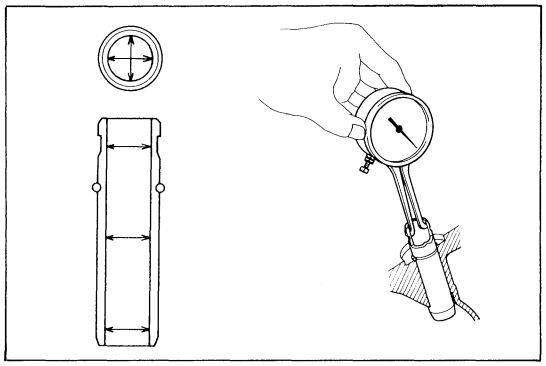
   Standard:
   IN 0.025 – 0.060 mm (0.0010 – 0.0024 in.)
   EX 0.030 – 0.065 mm (0.0012 – 0.0026 in.)

   Limit:
   IN 0.10 (0.0039 in.)
   EX 0.12 (0.0047 in.)

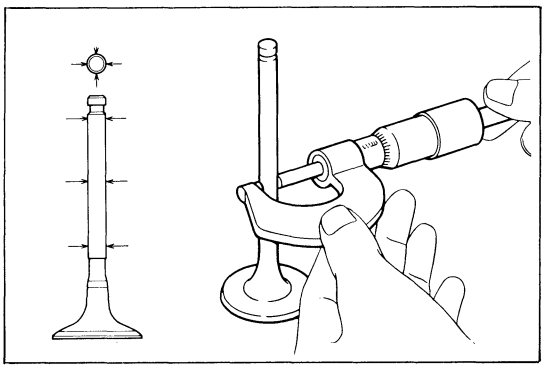
   If the limit is exceeded, replace the valve and valve guide bush as a pair.

10. Valve guide bush replacement
   (1) Use a brass bar and hammer to break the valve guide bush.
   (2) Remove the snap ring.

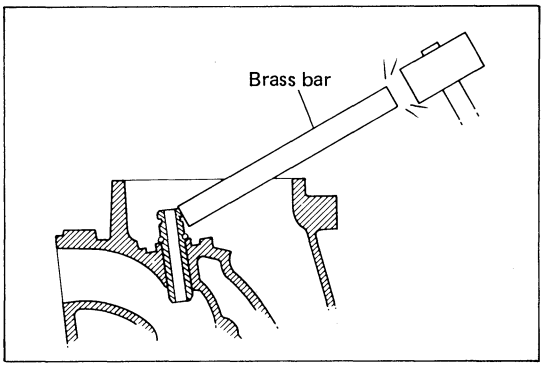
   (3) Gradually warm the cylinder head to 80–100°C (176–212°F).



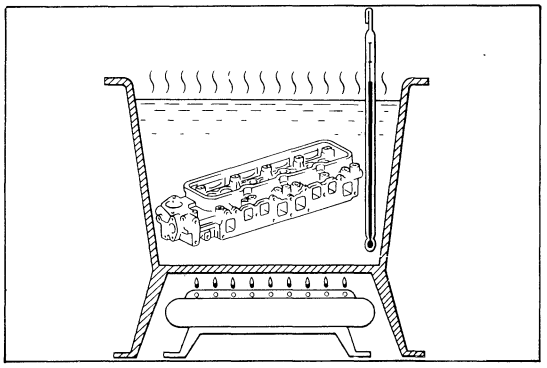
Inspecting the Valve Guide Bush Inside Diameter EM2407,2105



Inspecting the Valve Stem Outside Diameter EM0963,0964

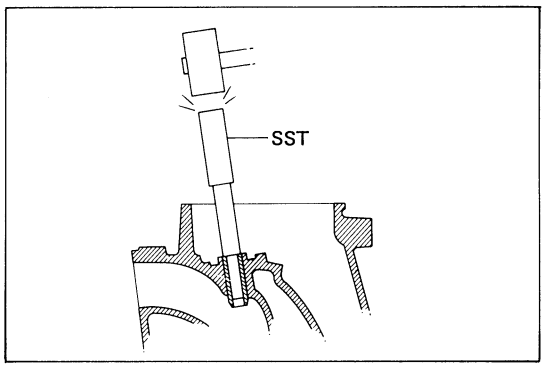


Removing the Valve Guide Bush EM2406



Heating the Cylinder Head EM2405

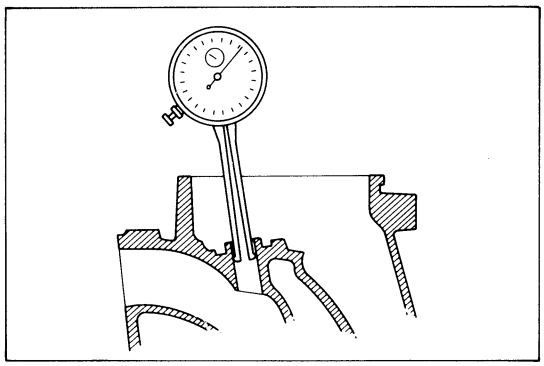
(4) Use the SST and hammer to drive out the valve guide bush.
SST 09201-76006-71
(SST 09201-60011)



Removing the Valve Guide Bush EM2404

(5) Use a caliper gauge and measure the valve guide bush holes in the cylinder head.
(6) Select the bush to be used. (STD size or O/S 0.05)

Bush hole diameter	Bush size
13.000 – 13.027 (0.5118 – 0.5129)	Use a STD bush
13.027 (0.5129) or more	Use an O/S 0.05 bush

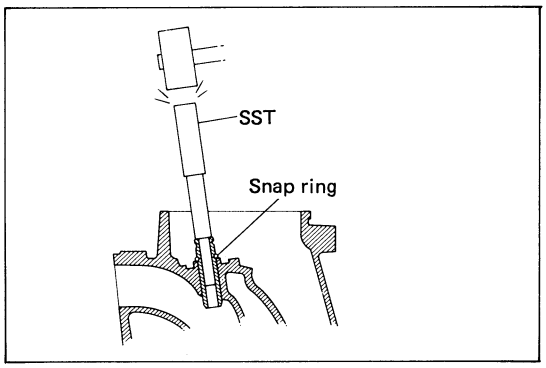


Measuring the Valve Guide Bush Hole Diameter EM2403

○ If the bush hole diameter exceeds 13.027 mm (0.5129 in.) or more, use a reamer and correct the bush hole to the following size.
Bush hole diameter:
13.050 – 13.077 mm
(0.5138 – 0.5148 in.)

○ If the bush hole diameter exceeds 13.077 mm (0.5148 in.), replace the cylinder head.

(7) Gradually warm the cylinder head to 80–100°C (176–212°F).
(8) Use the SST and hammer, and drive in the new valve guide bush until the snap ring comes into light contact with the cylinder head.
SST 09201-76006-71
(SST 09201-60011)



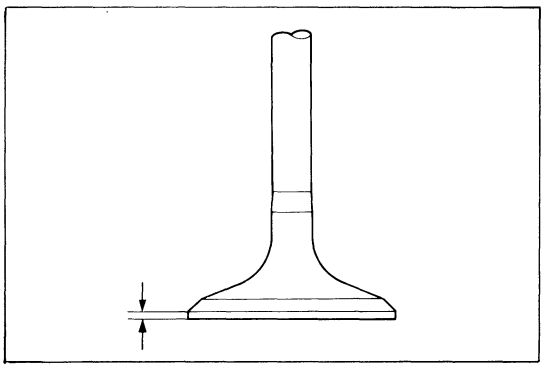
Driving in the Valve Guide Bush EM2402

11. Valve inspection
    (1) Measure the valve head margin thickness.

    Standard: IN 1.0 – 1.4 mm (0.039 – 0.055 in.)
    EX 1.3 – 1.7 mm (0.051 – 0.067 in.)

    Limit: IN 0.5 mm (0.020 in.)
    EX 0.8 mm (0.031 in.)

    If the thickness is less than the limit, replace the valve.



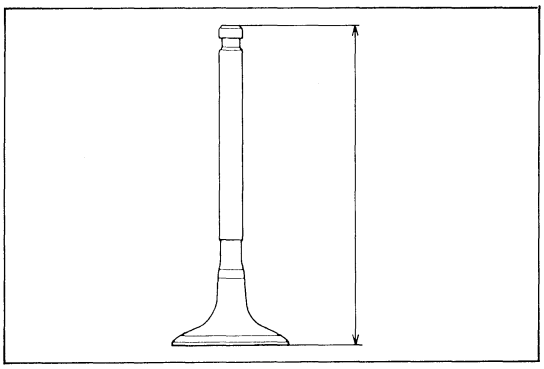
Measuring the Valve Head Margin Thickness EM0181

    (2) Measure the valve overall length.

    Standard: IN 108.2 mm (4.260 in.)
    EX 108.5 mm (4.272 in.)

    Limit: IN 107.7 mm (4.240 in.)
    EX 108.0 mm (4.252 in.)

    If the length is less than the limit, replace the valve.



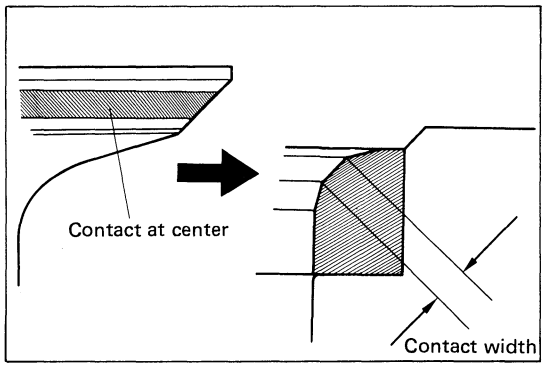
Measuring the Valve Overall Length EM2534

12. Valve and valve seat contact inspection
    (1) Thinly coat red lead on the valve face.
    (2) Insert the valve into the valve guide bush. Push the valve lightly against the valve seat, and inspect the contact position and width.

    Standard:
    Contact position:
    Center on whole valve circumference
    Contact width:
    1.2 – 1.6 mm (0.047 – 0.063 in.)

    Caution:
    Do not rotate the valve when it is in contact with the seat.

    If the standard is not satisfied, replace the valve or correct the valve seat.

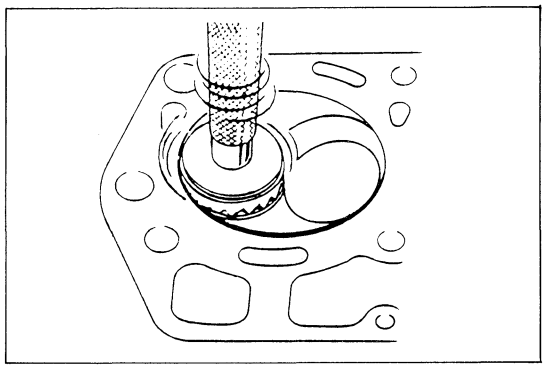


Inspecting the Valve Contact Position and Width Z9850

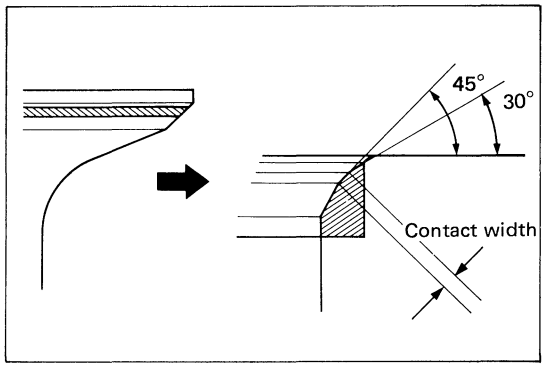
13. Valve seat correction

Caution:
- Use a cutter with cement carbide tip for the EX valve seats.
- Always inspect the valve contact position and width during the correction.
- Gradually release the force near the end of cutting to prevent stepping on the cut surface.
- Start the correcting operation after inspecting the valve guide bush.

(1) Use a 45° cutter and cut the minimum contact width to become wider than the standard.
(2) Cut so that the contact position comes to the center of the valve face.
   ① If the contact position is deviated to the outside, cut with a 30° cutter.

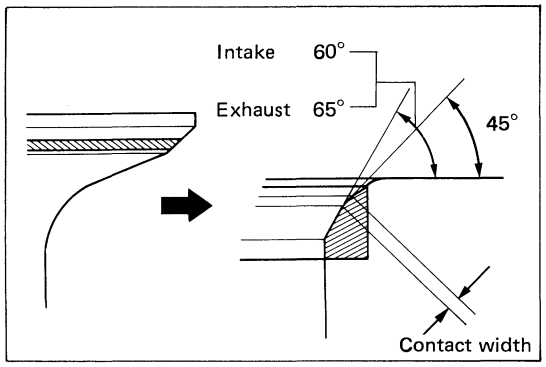


Correcting the Valve Seat (1) EM2535



Correcting the Valve Seat (2) EM0185

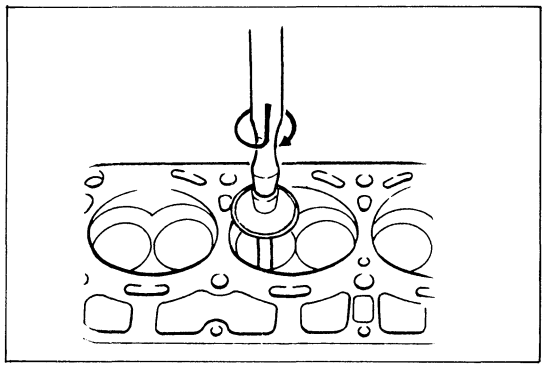
   ② If the contact position is deviated to the inside, cut with a 60° cutter (for IN) or 65° cutter (for EX).



Correcting the Valve Seat (3) EM0186

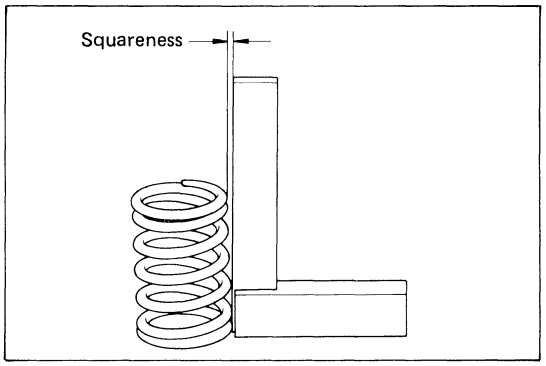
(3) Use a compound and lap the valve.
(4) After lapping, use red lead and check that the valve contact is uniform on the whole circumference.

Caution:
Thoroughly remove the compound after valve lapping.



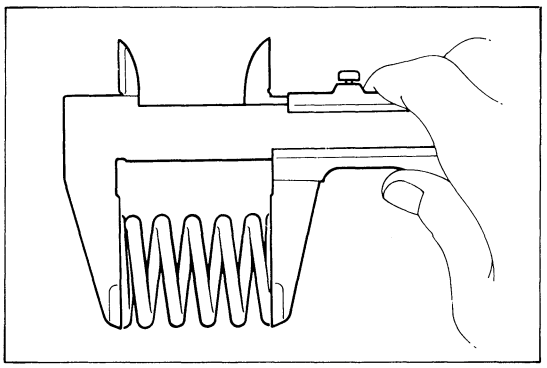
Lapping the Valve EM2400

14. Valve spring inspection
    (1) Use a straight edge and thickness gauge, and measure the squareness at the top end of the valve spring.
    Limit: 2.0 mm (0.079 in.)
    Replace the valve spring if the limit is exceeded.

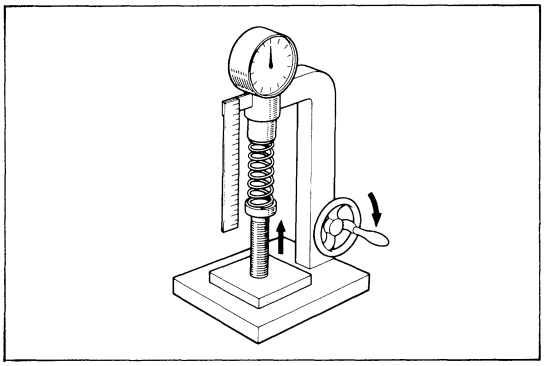


Measuring the Valve Spring Squareness EM0988

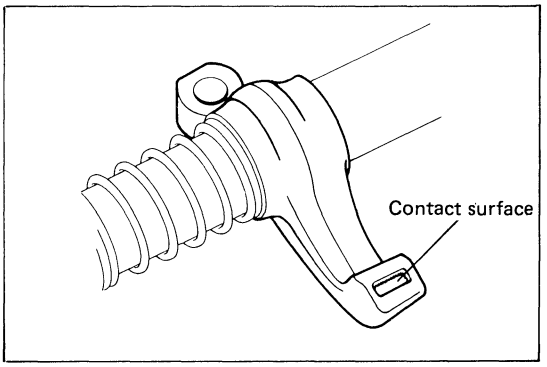
    (2) Use a vernier caliper and measure the free length of the valve spring.
    Standard: 47.0 mm (1.85 in.)


Measuring the Valve Spring Free Length EM0801

    (3) Use a spring tester and measure the installed tension of the valve spring.
    Standard:
    ~1995.12, 2000.11~:
    28.8 – 35.2 kg (63.5 – 77.6 lb)
    [When the installed length is 40.6 mm (1.598 in.)]
    1996.1~2000.11:
    20.6 – 22.8 kg (45.4 – 50.3 lb)
    [When the installed length is 40.6 mm (1.598 in.)]
    If the standard is not satisfied, replace the valve spring.


Measuring the Valve Spring Installed Tension EM0281

15. Valve rocker arm inspection
    (1) Inspect the rocker arm for the wear and damage of the surface in contact with the valve stem.
    (2) If slight surface defect is found, correct with an oil stone. If heavily worn or damaged, replace the rocker arm.

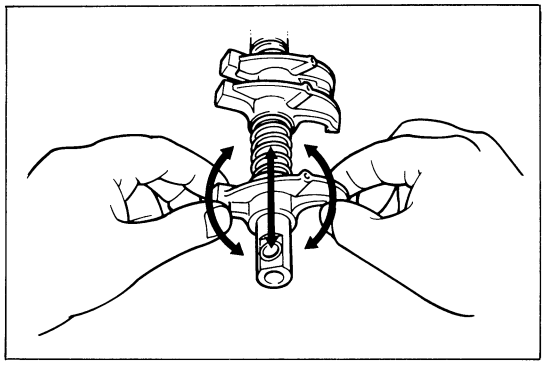


Inspecting the Valve Rocker Arm (1) EM2399

(3) Move the rocker arm as illustrated, and inspect the clearance with the rocker arm shaft.

Standard: **Almost no looseness shall be felt.**

If any looseness is felt, disassemble the rocker arm ASSY and inspect the oil clearance.

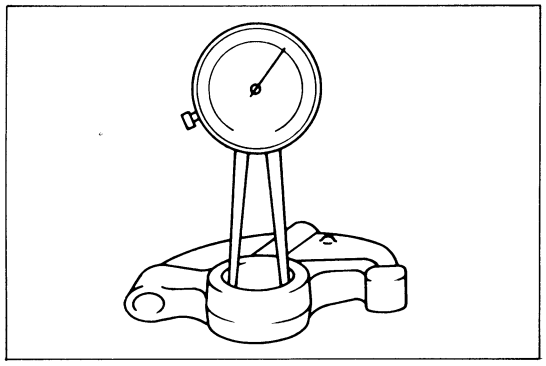


Inspecting the Valve Rocker Arm EM2398

16. Rocker arm to rocker shaft oil clearance

(1) Use a caliper gauge and measure the rocker arm inside diameter.

Standard: **18.500 – 18.515 mm (0.7283 – 0.7289 in.)**



Measuring the Rocker Arm Inside Diameter EM2397

(2) Use a micrometer and measure the rocker shaft outside diameter.

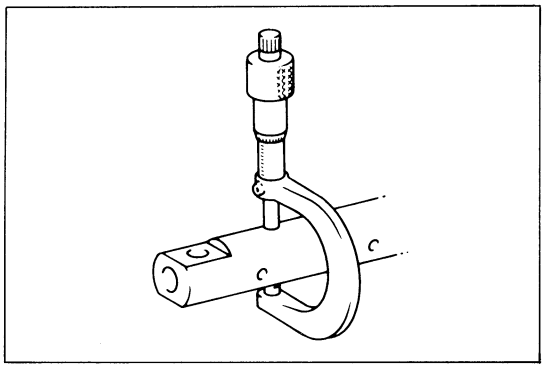
Standard: **18.474 – 18.487 mm (0.7273 – 0.7278 in.)**

(3) Calculate the difference between the rocker arm inside diameter and rocker shaft outside diameter.

Standard: **0.013 – 0.041 mm (0.0005 – 0.0016 in.)**

Limit: **0.08 mm (0.0031 in.)**

If the limit is exceeded, replace the rocker arm and rocker shaft.

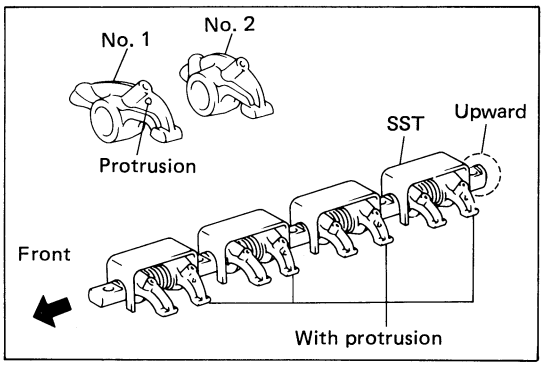


Measuring the Rocker Shaft Outside Diameter EM2396

(4) Assemble the valve rocker shaft ASSY.

1 Check the direction of the rocker arm shaft rear end, assemble the rocker arms and springs as illustrated, and position them by using SSTs.

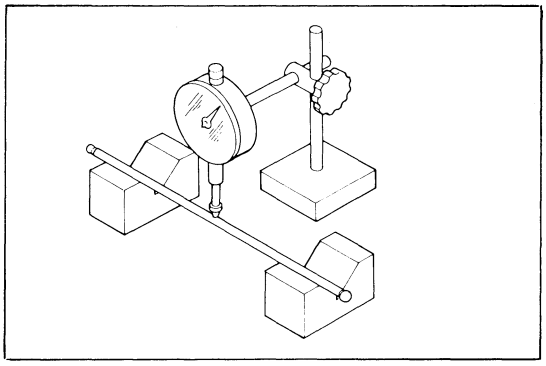
SST 09270-76001-71 (SST 09270-71010)



Positioning the Rocker Arms EM2395

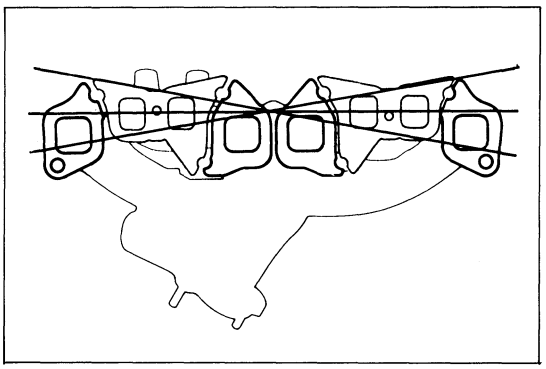
17. Push rod inspection
    (1) Inspect the push rod runout
    Runout limit: 0.30 mm (0.0118 in.)
    If the limit is exceeded, replace the push rod.

    (2) Inspect the push rod and oil hole clogging.
    If clogged, clean with an air gun.



Inspecting the Push Rod EM2536

18. Intake and exhaust manifold distortion inspection
    (1) Use a straight edge and thickness gauge, and measure the distortion of the installation surface to the cylinder head.
    Limit: 0.40 mm (0.0157 in.)
    If the limit is exceeded, regrind or replace the manifold ASSY.



Inspecting the Manifold for Distortion EM2394

CYLINDER HEAD ASSEMBLY

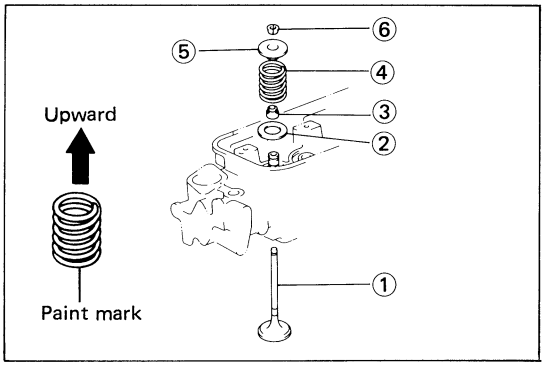
Notes:
- Thoroughly clean the parts to be assembled.
- Coat engine oil on the sliding contact and rotating surfaces.
- Replace the gaskets and oil seals with new parts.

1. Valve assembly
   (1) Insert valve ① into the valve guide bush.
   (2) Install valve spring seat ② and oil seal ③ Coat engine oil on the valve stem and oil seal lip.
   (3) Install valve spring ④ and spring retainer ⑤.

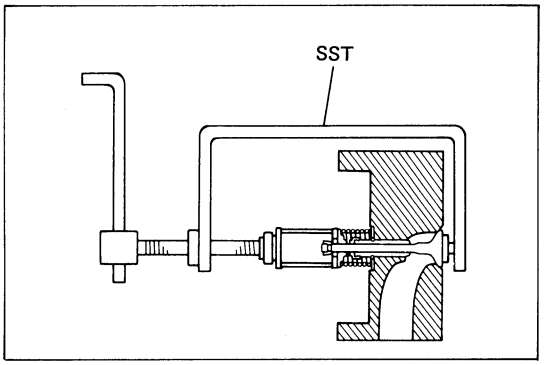
Note:
~1995.12:
The paint mark on the spring shall face the head.
1996.1~:
No upside-down direction for the spring. It is reversible.

   (4) Use the SST to compress the valve spring, and install spring retainer lock ⑥.
   SST 09202-76001-71
   (SST 09202-43013)

   (5) Tap the valve stem top lightly with a plastic hammer to settle the spring.



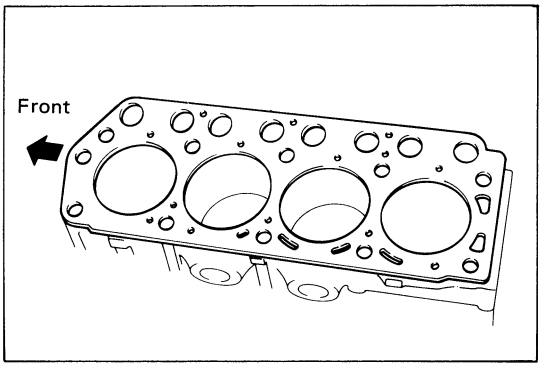
Assembling the Valve (1) EM0415,0416



Assembling the Valve (2) EM2413

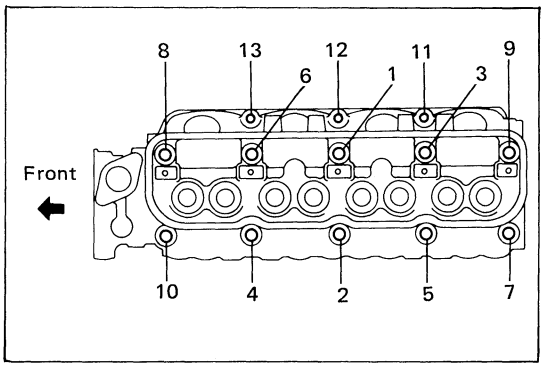
CYLINDER HEAD INSTALLATION

1. Cylinder head installation
   (1) Install a new gasket to the cylinder block, paying attention to its direction.
   (2) Install the cylinder head.
   (3) Coat engine oil on cylinder head bolts.



Installing the Cylinder Head Gasket EM2393

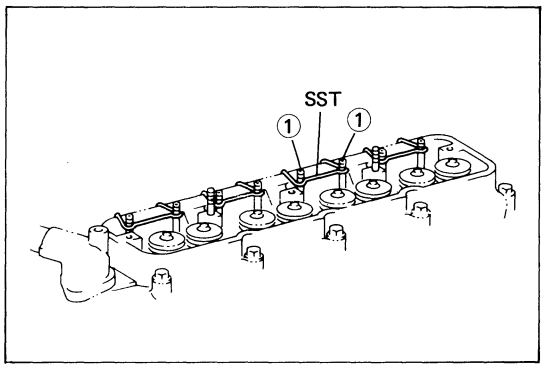
(4) Evenly tighten 13 cylinder head bolts in the illustrated order in several steps.
T = 9.0 kg-m (65 ft-lb)
(M12)
T = 1.95 kg-m (14 ft-lb)
(M8)



Tightening the Cylinder Head Bolts EM2416

2. Push rod and valve rocker shaft ASSY installation
(1) Install each push rod ① at its original position before removal.
(2) Use the SST and position the push rods as illustrated.
SST 09270-76001-71
(SST 09270-71010)

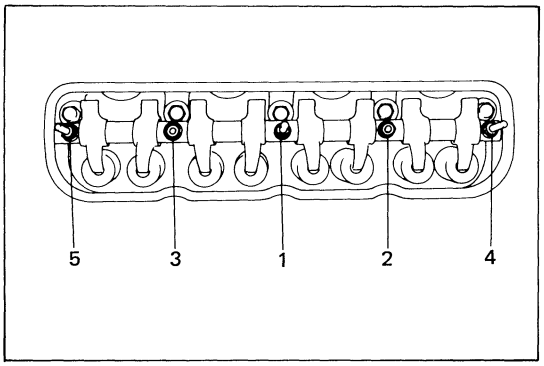
Caution:
Check that the push rod is surely in the lifter push rod seat portion.



Installing the Push Rods EM2392

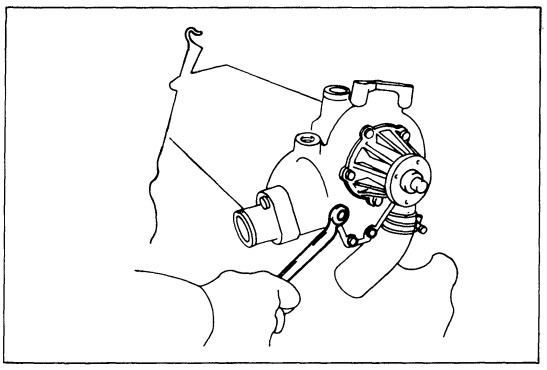
(3) Install the valve rocker shaft ASSY to the cylinder head.
(4) Evenly tighten 3 bolts and 2 nuts in the illustrated order in several steps.
T = 2.40 kg-m (17 ft-lb)

Caution:
Keep the push rods from leaving the rocker arm, and tighten the bolts and nuts.



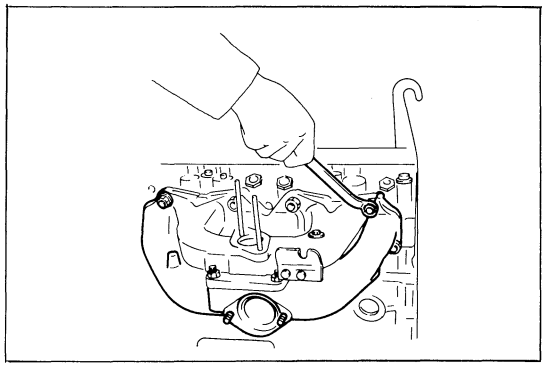
Installing the Valve Rocker Shaft ASSY EM2417

3. Water pump ASSY installation
(1) Install a new gasket.
(2) Install the water pump ASSY.
(3) Tighten 4 set bolts.
T = 1.85 kg-m (13 ft-lb)
(4) Install the water inlet hose.



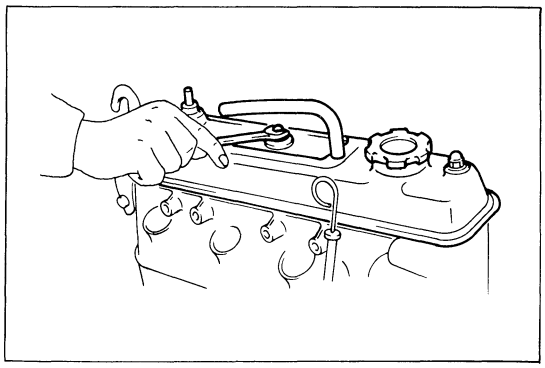
Installing the Water Pump ASSY KAJS6

4. Manifold ASSY installation
   (1) Install a new gasket.
   (2) Install the manifold ASSY.
   T = 5.0 kg-m (36 ft-lb)



Installing the Manifold ASSY KAJS8

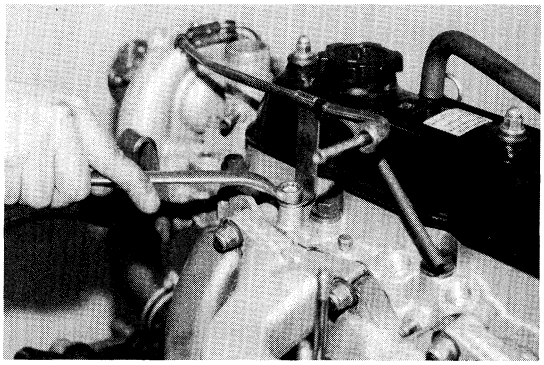
5. Cylinder head cover and gasket installation
   (1) Install the gasket and cylinder head cover SUB-ASSY.
   (2) Install 3 seal washers and 3 cap nuts.
   T = 0.5 kg-m (3.6 ft-lb)



Installing the Cylinder Head Cover KAJS7

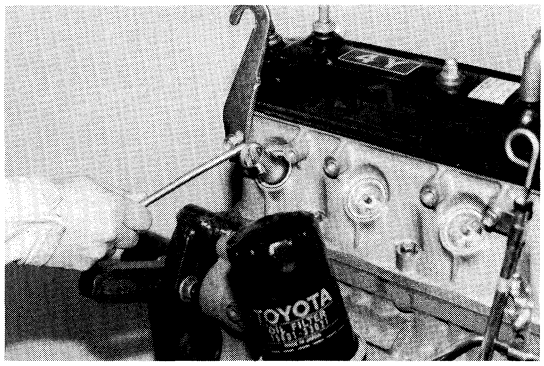
6. Fuel pipe and hose installation
   (1) Install the fuel pipe and hose, and tighten the clamp set bolt.
   (2) Connect the fuel pipe to the fuel pump.

7. Oil level gauge set bolt installation



Installing the Fuel Pipe KAJ13-19

8. Tube and ignition plug installation
   T = 1.8 kg-m (13 ft-lb)



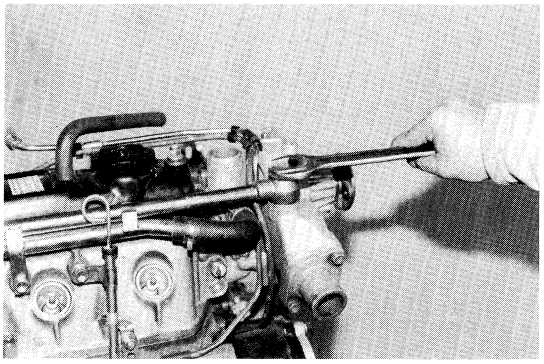
Installing the Tubes and Ignition Plugs KAJ13-9

~1998.7

9. Water outlet pipe installation
   (1) Install the water outlet pipe.
   (2) Install the water bypass hose.
   (3) Install 2 set bolts and the union bolt.
   Union bolt T = 3.5 kg-m (25 ft-lb)

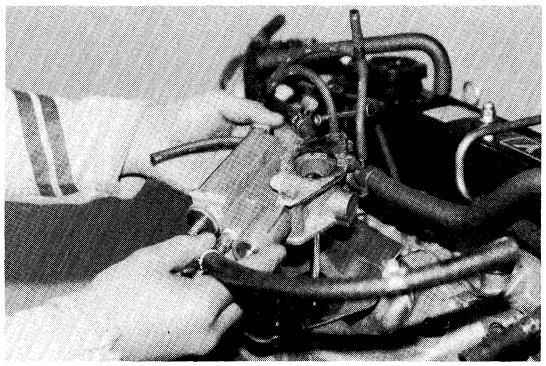
1998.8~

9. Water bypass hose installation
   (1) Install the water bypass hose and clamp.



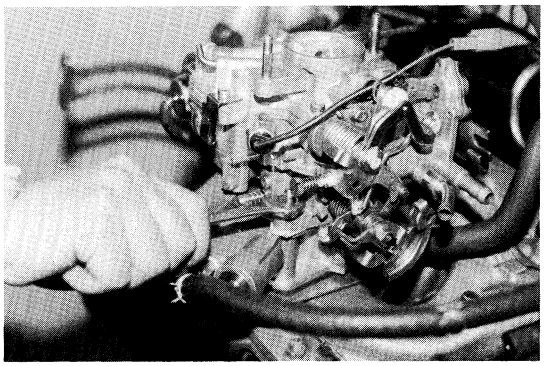
Installing the Water Outlet Pipe KAJ13-5

10. Air governor installation
   (1) Install the fuel insulator plate and heat insulator.
   (2) Install the air governor.
   (3) Install the water hose and ventilation hose.



Installing the Air Governor KAJ11-36

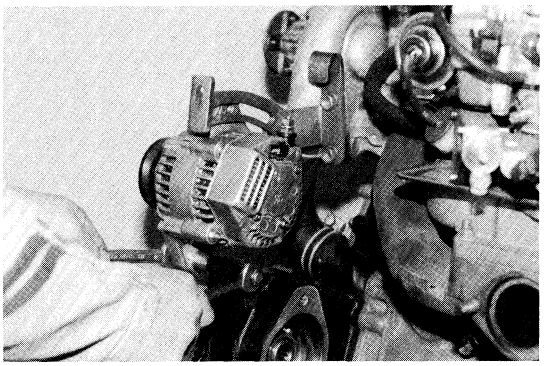
11. Carburetor installation
   (1) Install the carburetor and tighten 2 set nuts.
   T = 1.15 kg-m (8 ft-lb)
   (2) Install the fuel pipe.
   (3) Install the water hose.
   (4) Install the vacuum hose.



Installing the Carburetor KAJ11-28

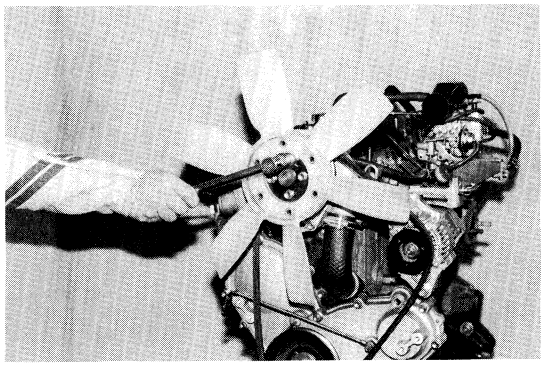
12. Air cleaner connector installation
   (1) Install the air cleaner connector and tighten two set bolts.
   (2) Install the ventilation hose.

13. Alternator installation
   (1) Install the alternator and temporarily tighten the fixing and adjusting bolts.
   (2) Install the V-belt and fan pulley.
   (3) Adjust the V-belt tension.
   See page 1-3 for the belt tension adjustment procedure.



Installing the Alternator KAJ11-12

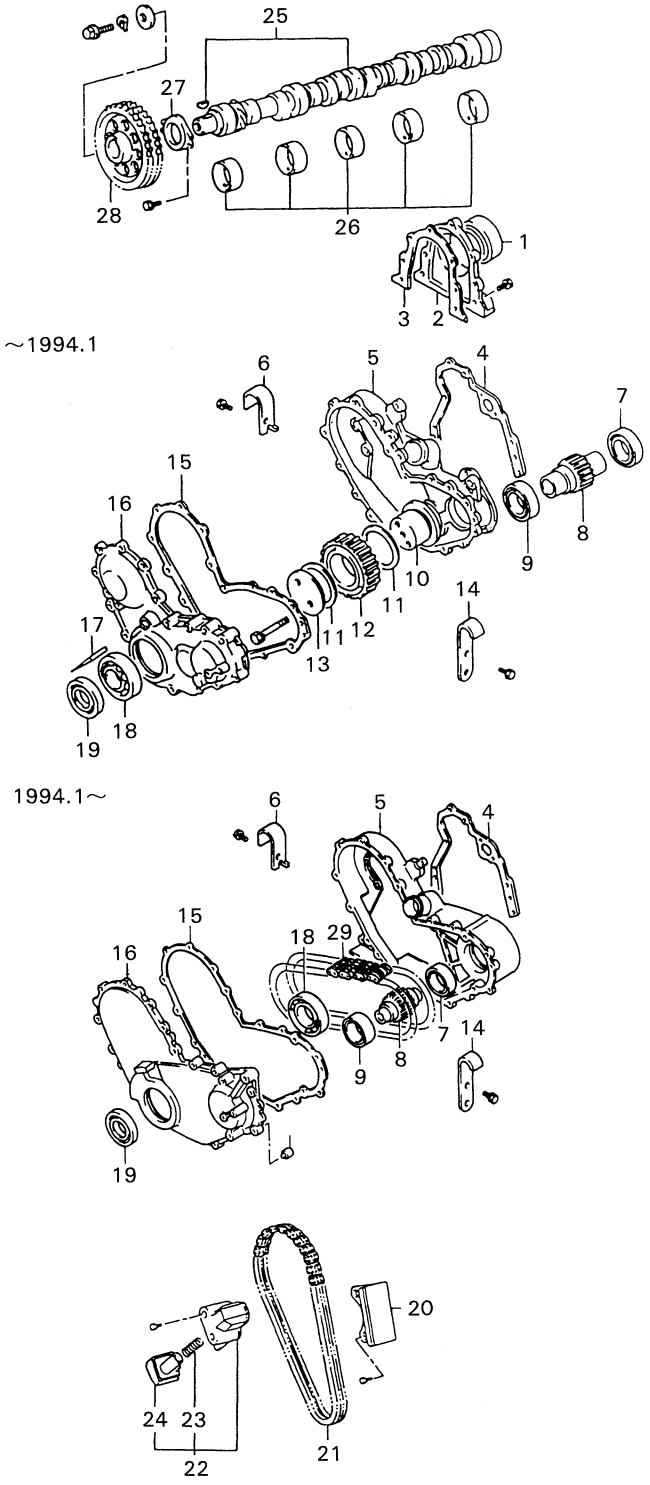
14. Fan installation
    (1) Fan
    (2) Set bolts (4 pcs.)
        T = 1.85 kg-m (13 ft-lb)



Installing the Fan KAJ11-8

TIMING GEAR & CAMSHAFT

COMPONENTS

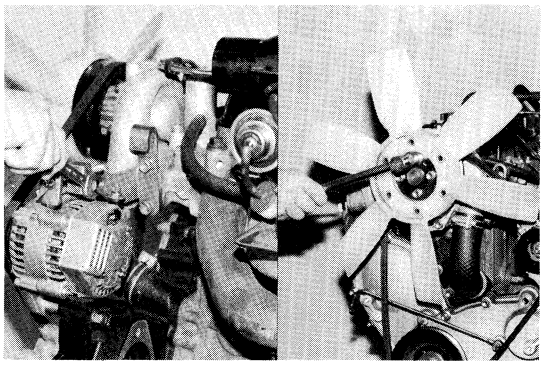


1. Engine rear oil seal
2. Rear oil seal retainer
3. Rear oil seal retainer gasket
4. Front end plate gasket
5. Timing gear case
6. Engine hanger No. 2
7. Bearing
8. Hydraulic pump drive sprocket
9. Bearing
10. Idle gear shaft
11. Plate washer
12. Idle gear
13. Thrust plate
14. Engine hanger
15. Timing gear cover gasket
16. Timing gear cover
17. Timing pointer
18. Bearing
19. Oil seal
20. Chain vibration damper No. 1
21. Timing chain SUB-ASSY
22. Chain tensioner ASSY
23. Spring
24. Chain tensioner plunger
25. Camshaft
26. Camshaft bearing set
27. Camshaft thrust plate
28. Camshaft timing gear
29. Chain

Timing Gear Cover and Chain Components KAJM5

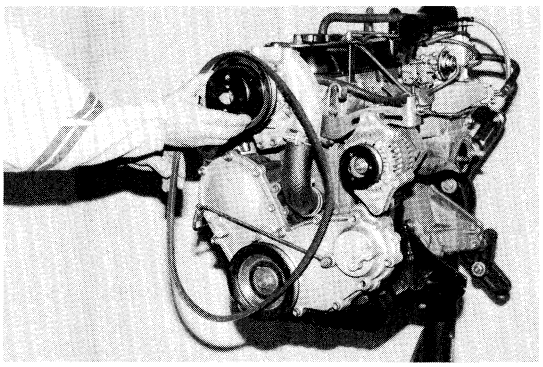
TIMING GEAR & CAMSHAFT REMOVAL

1. Fan, fan pulley and V-belt removal
   (1) Loosen the alternator fixing bolts and adjusting bolt.
   (2) Fan



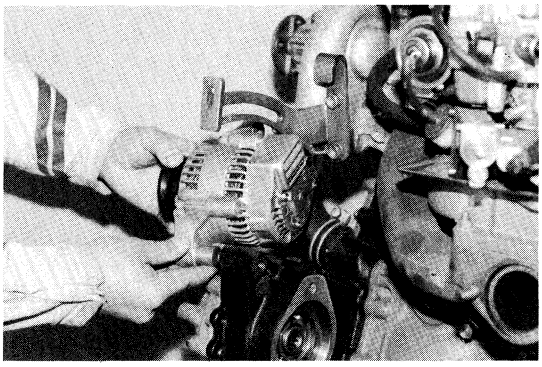
Removing the Fan KAJ11-6,8

   (3) Fan pulley
   (4) V-belt



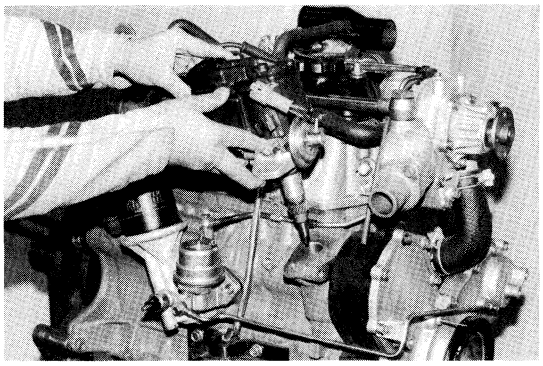
Removing the Fan Pulley and V-belt KAJ11-10

2. Alternator removal
   (1) Fixing bolts
   (2) Adjusting bolt
   (3) Alternator



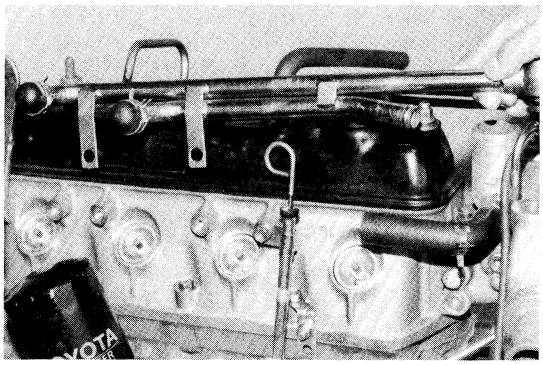
Removing the Alternator KAJ11-14

3. Distributor removal
   (1) Disconnect the plug cord from the ignition plug.
   (2) Disconnect the vacuum hose (1 pc.).
   (3) Remove the set bolt (1 pcs.), and remove the distributor.



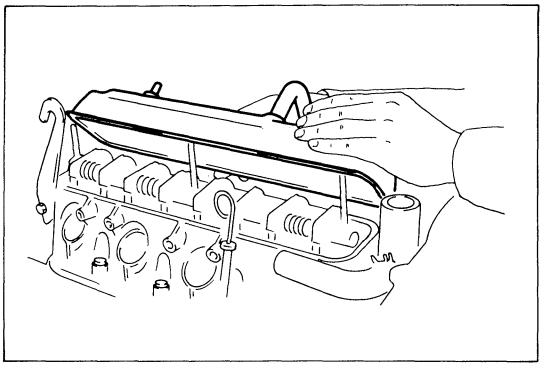
Removing the Distributor KAJ11-19

4. Water outlet pipe removal
   (1) Water hose disconnection.
   (2) Union bolt
   (3) Set bolts (2 pcs.).
   (4) Water bypass hose disconnection.
   (5) Water outlet pipe



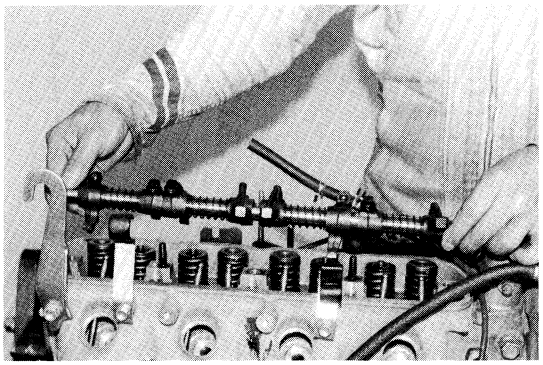
Removing the Water Outlet Pipe KAJ13-8

5. Cylinder head cover removal
   (1) Cap nuts (3 pcs.)
   (2) Seal washers (3 pcs.)
   (3) Cylinder head cover
   (4) Gasket



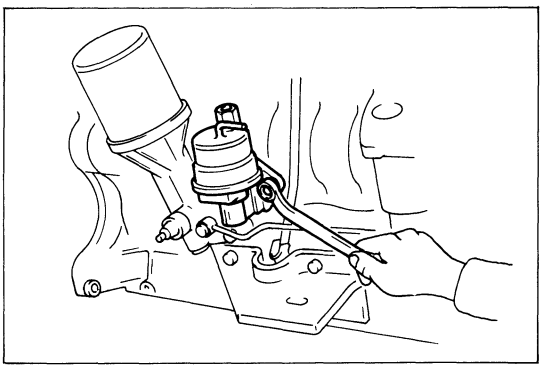
Removing the Cylinder Head Cover KAJS9

6. Valve rocker shaft ASSY and push rod removal
   (See page 2-9 in the cylinder head removal section for the removal procedure for the valve rocker shaft ASSY and push rod.)



Removing the Valve Rocker Shaft ASSY KAJ3-30

7. Fuel pump removal
   (1) Disconnect the fuel pipe and fuel hose.
   (2) Remove 2 set bolts, and remove the fuel pump.
   (3) Remove the fuel pump insulator and 2 gaskets.

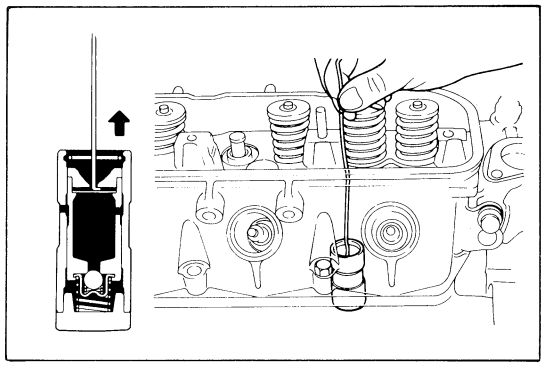


Removing the Fuel Pump KAJS25

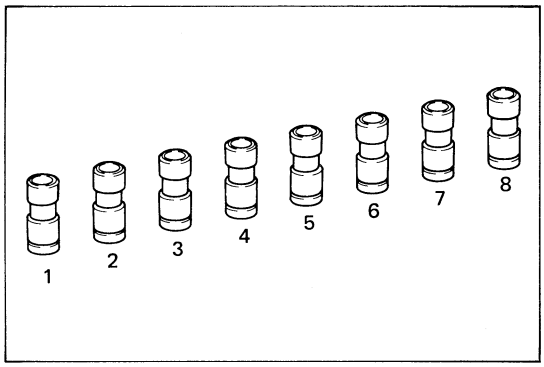
8. Valve lifter removal
   (1) Use a wire with its tip end bent to L shape to remove 8 valve lifters.

   Note:
   Bend about 1 mm of the wire end. Insert it to the hole at the center of the valve lifter to pick up the lifter.

   Caution:
   - Clean the wire carefully.
   - Removed lifters shall be arranged in the order of the numbers and kept in vertical state.
   - Do not disassemble the valve lifter.

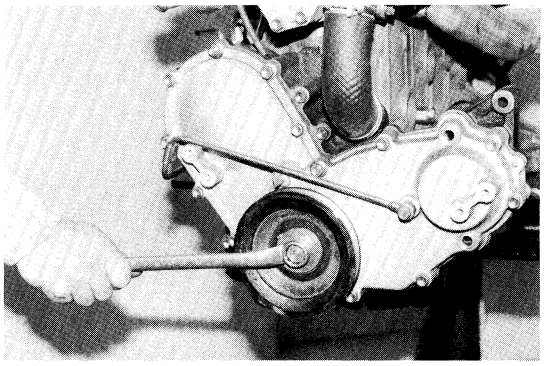


Removing the Valve Lifter EM2342,2341



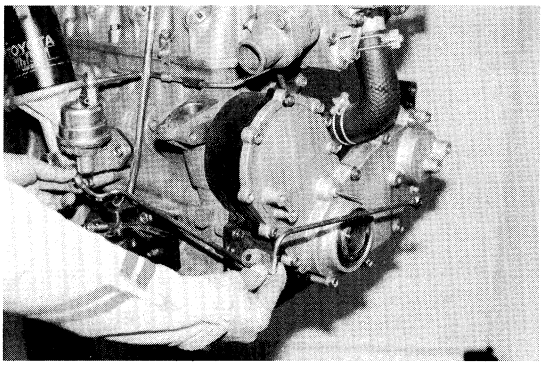
Keeping the Valve Lifters EM1142

9. Crankshaft pulley removal
   (1) Install two bolts (M10) to the rear end of the crankshaft to prevent rotation.
   (2) Remove the pulley bolt, and remove the crankshaft pulley.



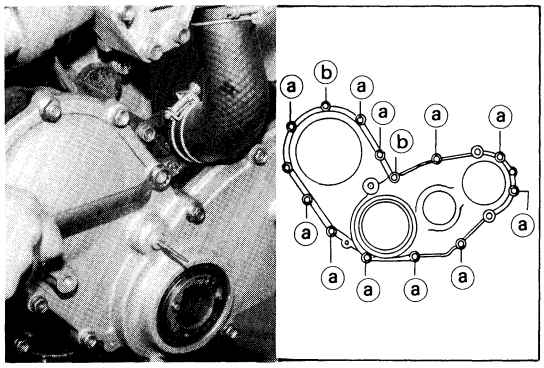
Removing the Crankshaft Pulley KAJ12-3

10. Oil pipe disconnection
    (1) Disconnect the oil pipe from the timing gear cover.



Disconnecting the Oil Pipe JAK13-2

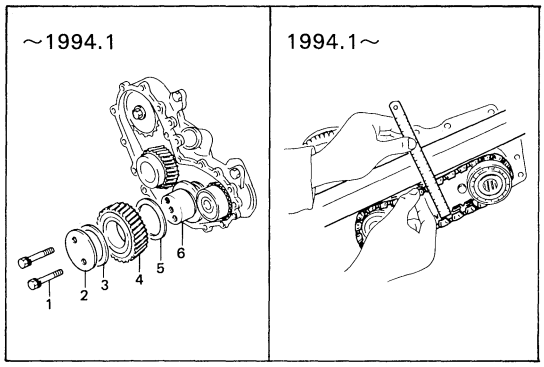
11. Timing gear cover removal
    (1) Remove 11 bolts ⓐ and 2 nuts ⓑ and remove the timing gear cover.
    (2) Gasket



Removing the Timing Gear Cover KAJ13-3, KAJS10

12. Idle gear removal (~1994.1)
    (1) Set bolts (2 pcs.)
    (2) Thrust plate
    (3) Plate washer
    (4) Idle gear
    (5) Plate washer
    (6) Idle gear shaft

    Pump drive chain flexure inspection (1994.1~)
    (1) Measure the pump drive chain flexure before disassembly.
        Limit: 25 mm (0.98 in.)
        If the limit is exceeded, replace the chain.

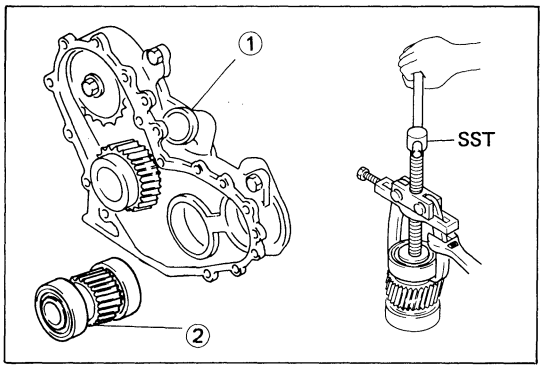


Removing the Idle Gear KAJS11

13. Pump drive gear and bearing removal
    (1) Remove the pump drive gear with bearing from the timing gear case ① .

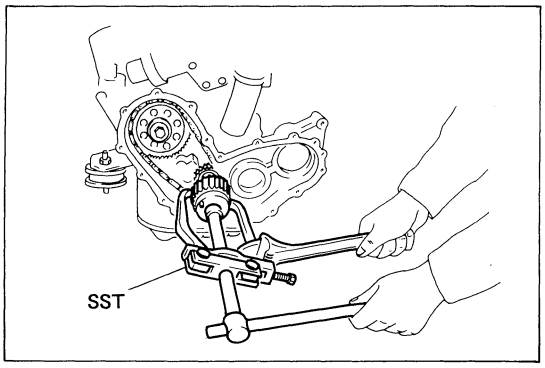
    Note:
    If the bearing fitting is tight, lightly tap with a soft hammer from the pump installation side.

    (2) Use the SST, and remove the bearing from the pump drive gear ② .
        SST 09950-76014-71
        (SST 09950-20017)



Removing the Oil Pump Drive Gear KAJS12,21

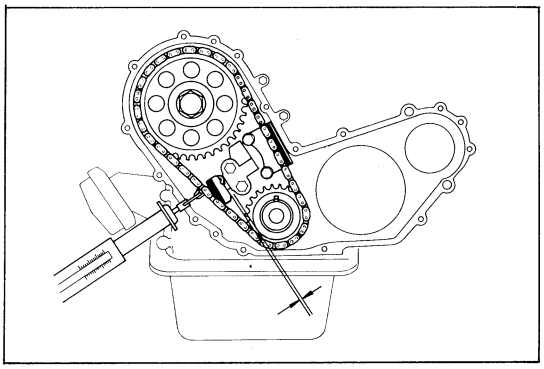
14. Crankshaft timing sprocket removal
    (1) Screw in the service bolt (M14 x 80 mm (3.1 in.) or more) to the crankshaft, and use the SST to remove the sprocket.
        SST 09950-76014-71
        (SST 09950-20017)



Removing the Timing Sprocket KAJS15

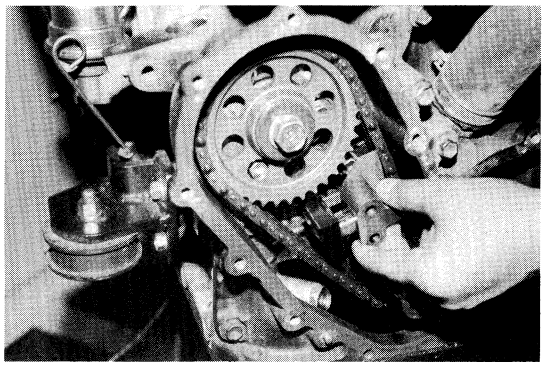
15. Timing chain flexure inspection
    (1) Use a tension gauge and measure the timing chain flexure.
    Flexure limit:
    13.5 mm (0.531 in.) at 10 kg (22.0 lb)

    If the limit is exceeded, replace the timing chain or timing gear.



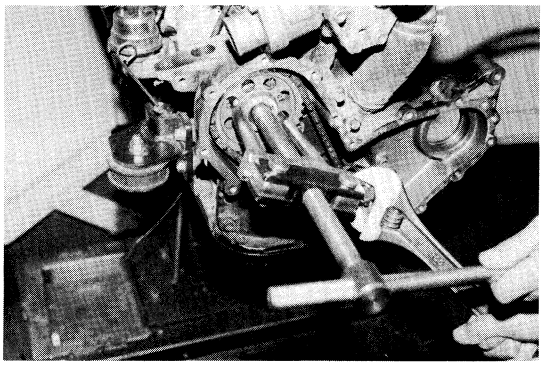
Measuring the Timing Chain Flexure **KAJS14**

16. Chain tensioner removal
    (1) Remove two bolts, and remove the chain tensioner.



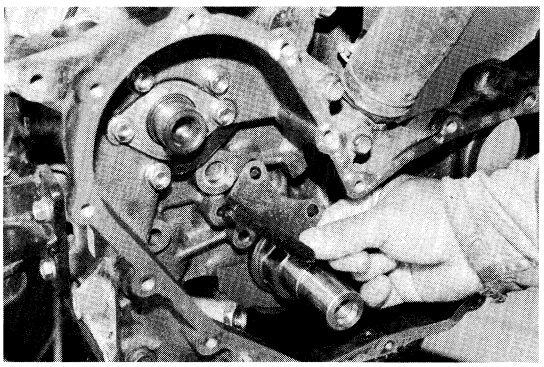
Removing the Chain Tensioner **KAJ3-11**

17. Timing chain and timing gear removal
    (1) Install two bolts (M10) to the rear end of the crankshaft to prevent rotation.
    (2) Remove the set bolts.
    (3) Use the SST and remove the camshaft timing gear, timing chain and crankshaft timing gear.
    SST 09950-76014-71
    (SST 09950-20017)



Removing the Timing Chain and Timing Gear **KAJ3-13**

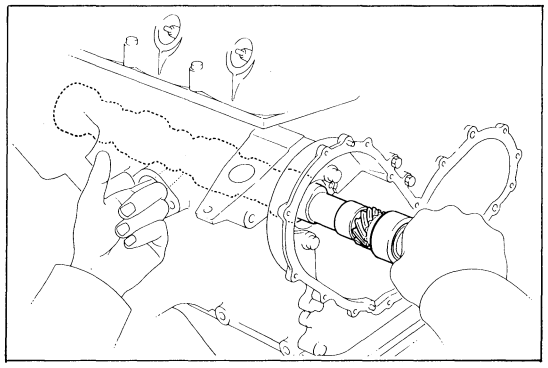
18. Chain vibration damper removal
    (1) Remove two bolts, and remove the chain vibration damper.



Removing the Chain Vibration Damper **KAJ3-23**

19. Thrust plate and camshaft removal
    (1) Remove two bolts, and remove the thrust plate.
    (2) Extract the cam shaft.

    Caution:
    Do not damage the camshaft bearing.



Removing the Camshaft KAJS13

TIMING CHAIN AND CHAMSHAFT COMPONENTS INSPECTION

1. Camshaft inspection
   (1) Support the camshaft by V blocks and measure the runout at the center journal.
   Limit: 0.06 mm (0.0024 in.)
   If the limit is exceeded, replace the camshaft.

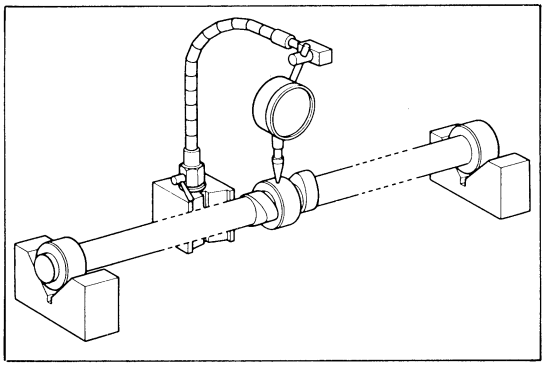
   (2) Use a micrometer and measure the cam heights.
   ~1998.7
   Standard: IN 38.620 – 38.720 mm (1.5205 – 1.5244 in.)
   EX 38.629 – 38.729 mm (1.5208 – 1.5248 in.)
   Limit: IN 38.26 mm (1.5063 in.)
   EX 38.27 mm (1.5067 in.)
   1998.8~
   Standard: IN 38.185 – 38.285 mm (1.5033 – 1.5073 in.)
   EX 38.443 – 38.543 mm (1.5135 – 1.5174 in.)
   Limit: IN 37.7 mm (1.4842 in.)
   EX 38.0 mm (1.4961 in.)
   If the limit is exceeded, replace the camshaft.

   (3) Use a micrometer and measure the journal outside diameter.

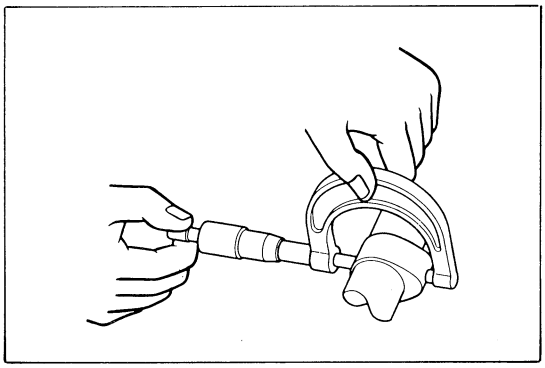
   Standard (from the front side)
   No. 1 46.459 – 46.475 mm (1.8291 – 1.8297 in.)
   No. 2 46.209 – 46.225 mm (1.8192 – 1.8199 in.)
   No. 3 45.959 – 45.975 mm (1.8094 – 1.8100 in.)
   No. 4 45.709 – 45.725 mm (1.7996 – 1.8002 in.)
   No. 5 45.459 – 45.475 mm (1.7897 – 1.7904 in.)

   If the standard is not satisfied, measure the oil clearance with the camshaft bearing. (See page 2-55)

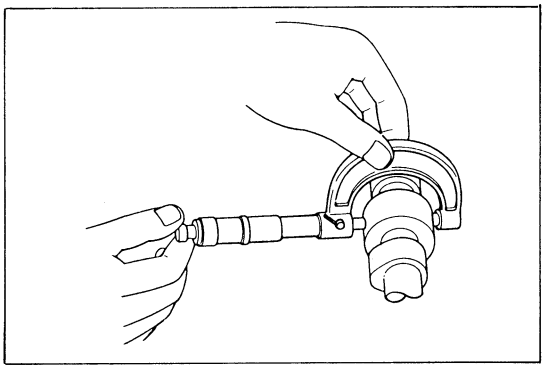
   (4) Install the thrust plate and camshaft timing gear camshaft.
   (5) Tighten the camshaft timing gear set bolt.
   T = 9.20 kg-m (67 ft-lb)



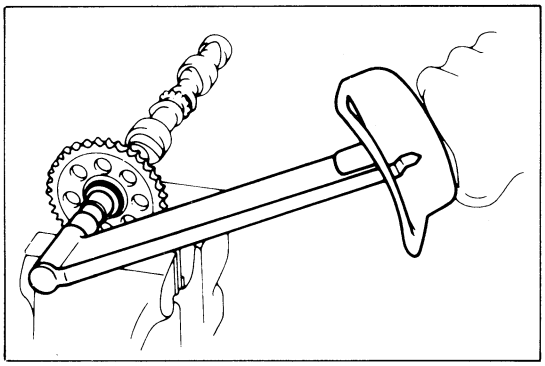
Inspecting the Camshaft Runout EM0035



Measuring the Camshaft Cam Height EM2011



Measuring the Camshaft Journal Outside Diameter EM2538



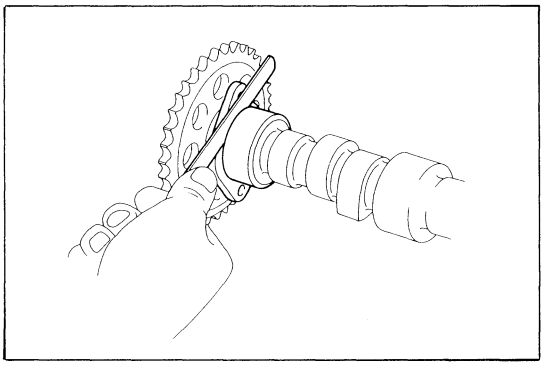
Tightening the Timing Gear Set Bolt EM2423

(6) Use a thickness gauge and measure the thrust clearance between the thrust plate and camshaft.

Standard: 0.07 – 0.22 mm (0.0028 – 0.0087 in.)

Limit: 0.3 mm (0.012 in.)

If the limit is exceeded, replace the thrust plate. If necessary, replace the camshaft.



Measuring the Camshaft Thrust Clearance EM2349

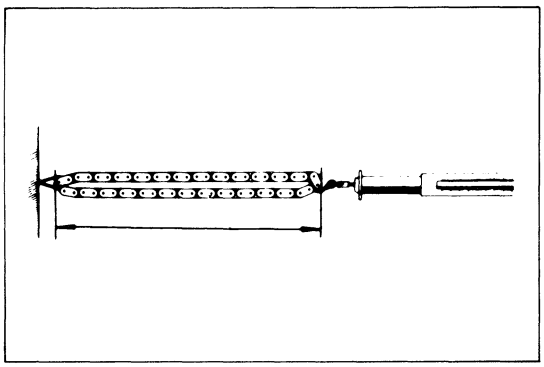
2. Timing chain and timing gear inspection

(1) Pull the chain by a tension of 5 kg (11.0 lb), and measure the chain length to inspect the chain elongation.

(2) Repeat the same measurement by selecting three positions as desired.

Limit: 291.4 mm (11.472 in.) [tension = 5 kg (11.0 lb)]

If the limit is exceeded, replace the chain.



Measuring the Timing Chain Elongation EM2422

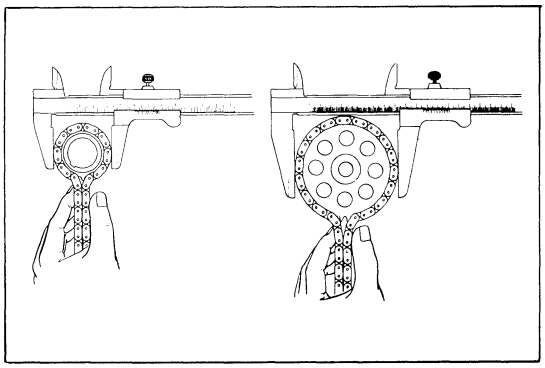
(3) Use a vernier caliper, and measure the outside diameter of the timing gear with chain.

Limit: (with chain)

Crankshaft 59 mm (2.32 in.)

Camshaft 114 mm (4.49 in.)

If less than the limit, replace the chain and timing gear.



Measuring the Timing Gear Outside Diameter EM2347,2348

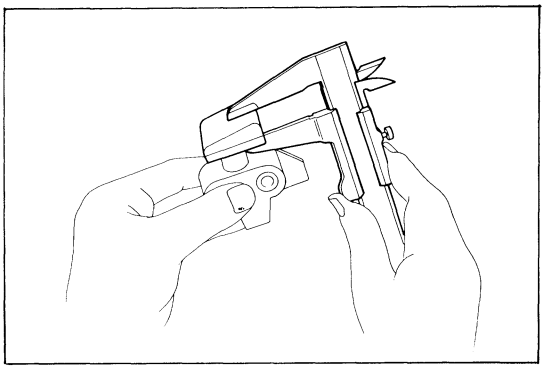
3. Chain tensioner inspection

(1) Use a vernier caliper and measure the tensioner head thickness.

Standard: 15.0 mm (0.591 in.)

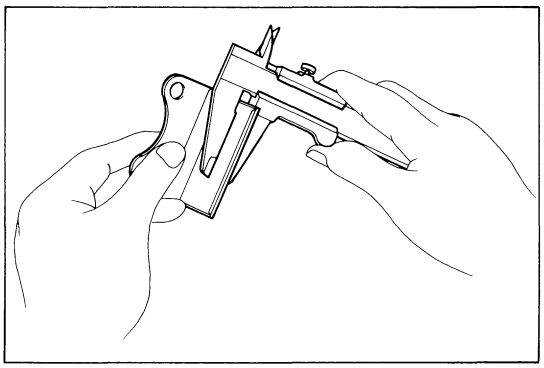
Limit: 12.5 mm (0.492 in.)

If less than the limit, replace the tensioner.



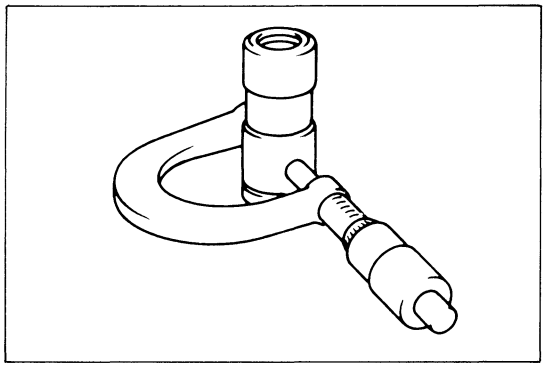
Measuring the Tensioner Head Thickness EM1395

4. Chain vibration damper inspection
   (1) Use a vernier caliper, and measure the damper thickness.
   Standard: 6.6 mm (0.260 in.)
   Limit: 5.0 mm (0.197 in.)
   If less than the standard, replace the damper.



Measuring the Damper Thickness EM1399

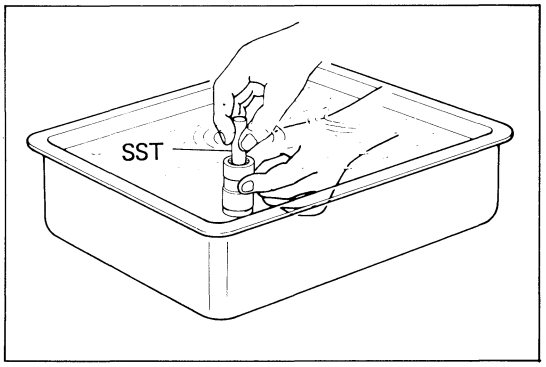
5. Valve lifter inspection
   (1) Use a micrometer, and measure the valve lifter outside diameter.
   Standard: 21.387 – 21.404 mm (0.8420 – 0.8427 in.)
   If the standard is not specified, inspect the oil clearance. (See page 2-57)



Measuring the Valve Lifter Outside Diameter EM2389

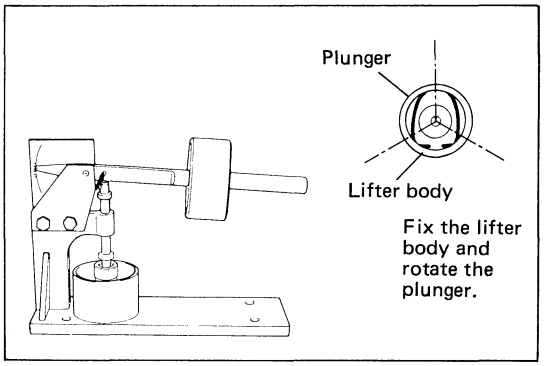
6. Valve lifter air bleeding
   (1) Put the valve lifter in a container filled with clean light oil.
   (2) Use the SST and move the plunger up and down several times to bleed the air.
   SST 09276-76001-71
   (SST 09276-71010)

   Note:
   The air bleeding has to be done in a container filled with clean light oil, and this is for the valve leak down test. Therefore, when installing valve filters to the engine, it is necessary to do the air bleeding of them again in a container filled with clean engine oil.



Bleeding the Air from Valve Lifter EM2391

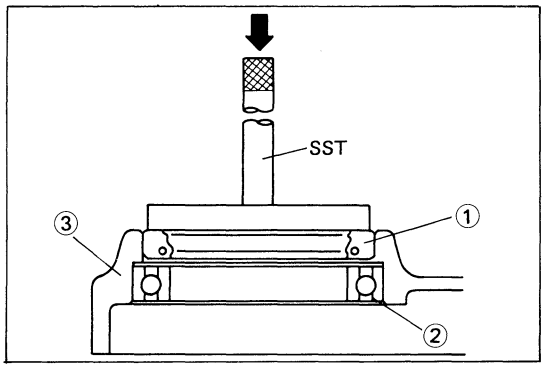
7. Valve lifter leak down test
   (1) Use the leak down tester and apply 20 kg (44.1 lb) force to the plunger of the lifter often air bleeding.
   Measure the time required for the plunger to fall by 1 mm (0.04 in.) after it falls by 2 mm (0.08 in.).
   (2) Measure three times by changing the plunger position relative to the lifter body by 120° at a time, and obtain the average.
   Standard: 7–28 seconds/1 mm (0.04 in.) [oil temperature at 20°C (68°F)]



Leak Down Test A4074

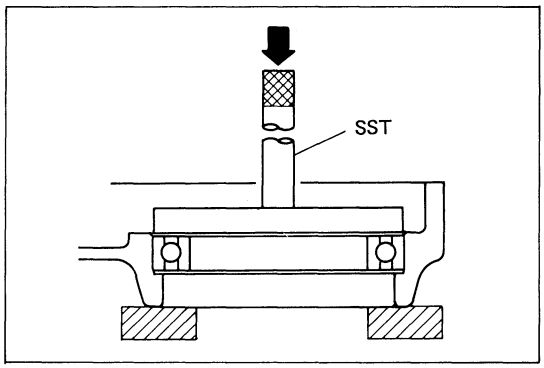
CRANKSHAFT FRONT OIL SEAL AND BEARING REPLACEMENT

1. Oil seal with bearing removal
   (1) Use the SST to drive out the oil seal ① with bearing ② from the timing gear cover ③
   SST 09608-76009-71
   (SST 09608-35014)



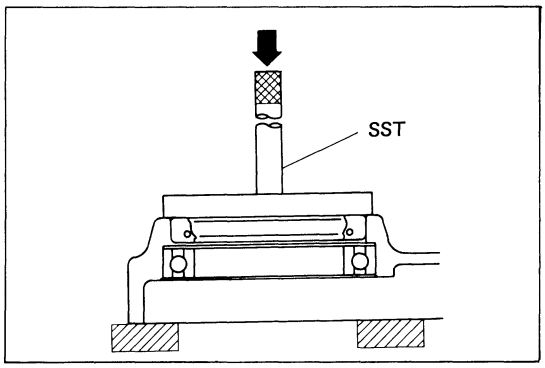
Removing the Oil Seal with Bearing KAJS16

2. Bearing installation
   (1) Use the SST and install the bearing to the timing gear cover. The bearing shall be flush with the cover end surface.
   SST 09608-76009-71
   (SST 09608-35014)



Installing the Bearing KAJS17

3. Oil seal installation
   (1) Use the SST and install the oil seal from the front side of the timing gear cover. The oil seal shall be flush with the cover and surface.
   SST 09608-76009-71
   (SST 09608-35014)



Installing the Oil seal KAJS18

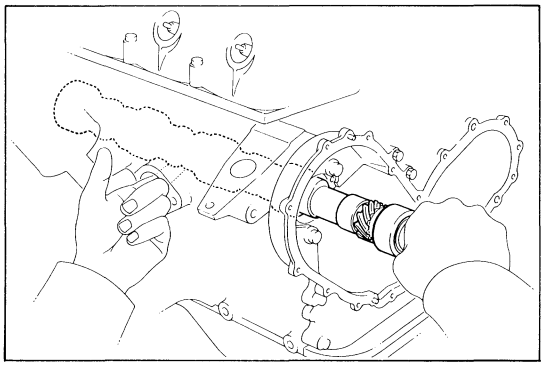
TIMING GEAR AND CAMSHAFT INSTALLATION

1. Camshaft installation
   (1) Insert the camshaft to the cylinder block.

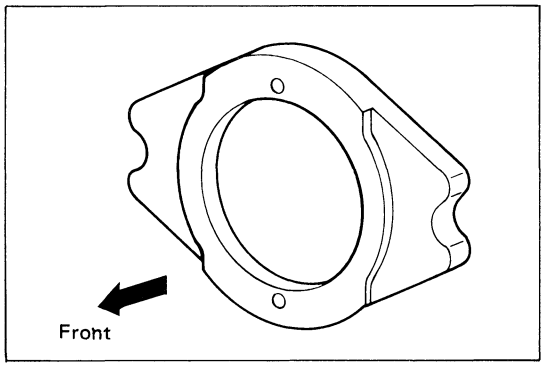
   Caution:
   Do not damage the camshaft and bearing.

   (2) Use two bolts and install the thrust plate.
   T = 1.85 kg-m (13 ft-lb)

   Caution:
   Pay attention to the installing direction.

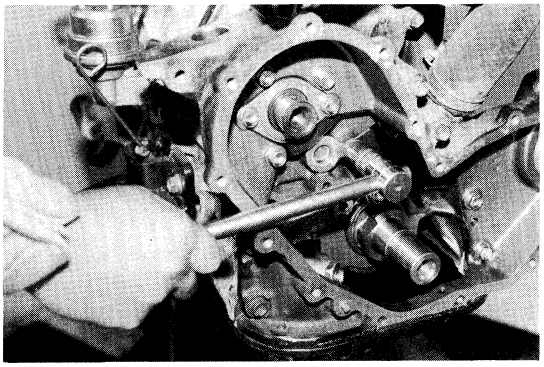


Installing the Camshaft KAJS13



Thrust plate installing Direction EM2352

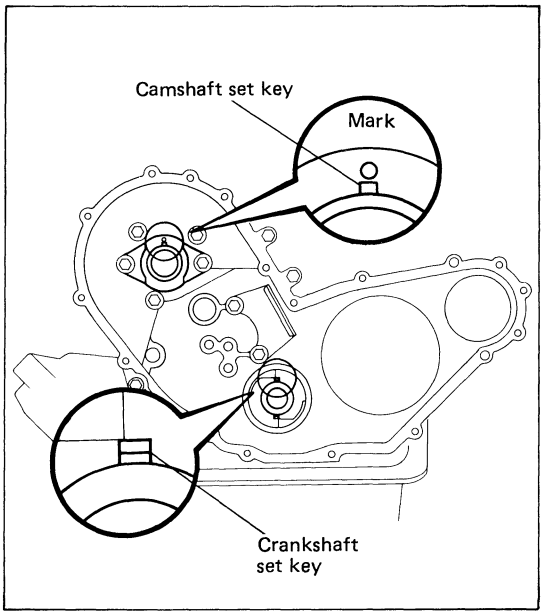
2. Chain vibration damper installation
   (1) Use two bolts and install the chain vibration damper.
   T = 1.85 kg-m (13 ft-lb)



Installing the Vibration Damper KAJ3-22

3. Timing chain, camshaft timing gear and crankshaft timing gear installation.
   (1) Rotate the crankshaft to bring the crankshaft key to the top position.

   (2) Rotate the camshaft to align the camshaft key with the timing mark in the upper part of the thrust plate.

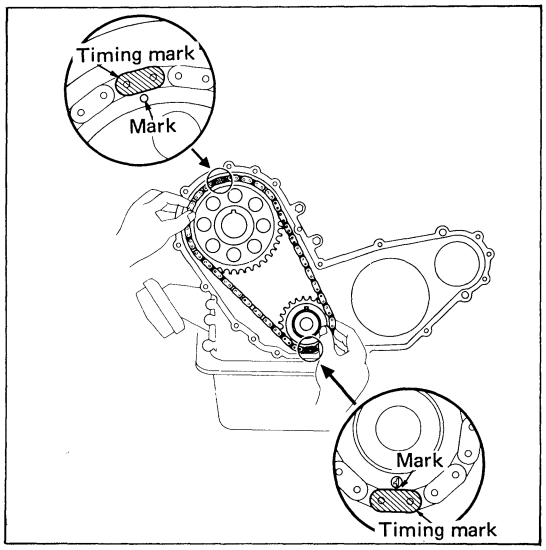


Installing the Chain and Timing Gear (1) KAJS19

   (3) Assemble the crankshaft timing gear, camshaft timing gear and timing chain.

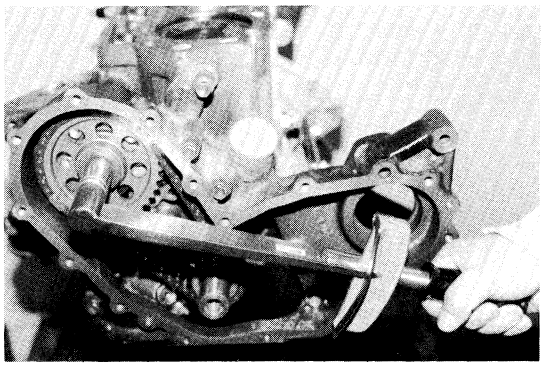
Note:
Match the mark on each timing gear with the corresponding timing mark on the timing chain.

   (4) Install the timing chain and timing gear at the same time.



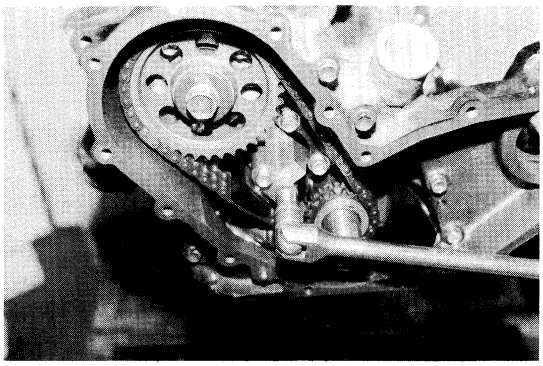
Installing the Chain and Timing Gear (2) KAJS20

   (5) Coat engine oil on the thread and seat surface of the camshaft timing gear bolt.
   (6) Install two bolts (M10) to the crankshaft rear end to stop rotation.
   (7) Install and tighten the camshaft timing gear bolt.
   T = 9.20 kg-m (67 ft-lb)



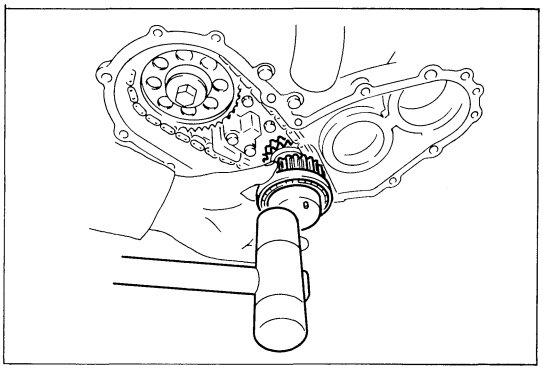
Tightening the Camshaft Timing Gear Bolt KAJ9-12

4. Chain tensioner installation
   (1) Use two bolts and install the chain tensioner.
   T = 1.85 kg-m (13 ft-lb)



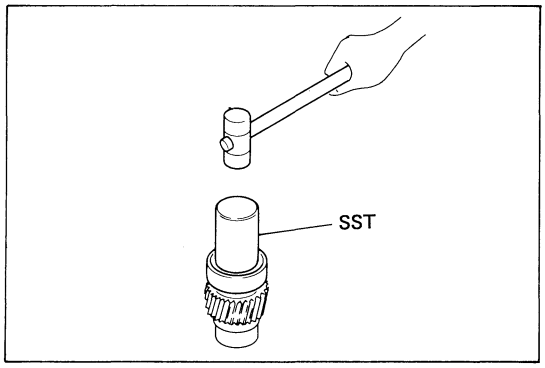
Installing the Chain Tensioner KAJ9-14

5. Crankshaft timing sprocket installation
   (1) Drive in the straight pin to the crankshaft timing sprocket.
   (2) Drive the crankshaft timing sprocket onto the crankshaft. (~1994.1)
   (2) Drive the crankshaft timing sprocket with pump drive chain onto the crankshaft. (1994.1~)



Installing the Crankshaft Timing Sprocket KAJS22

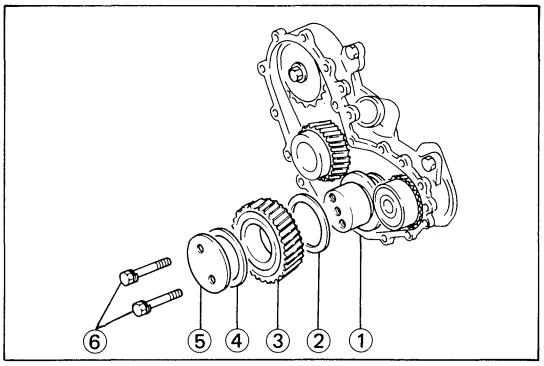
6. Pump drive gear and bearing installation
   (1) Drive in the bearing to the pump drive gear.
   SST 09410-40120-71 (large bearing)
   09381-41950-71 (small bearing)
   (2) Install the pump drive gear with bearing to the timing gear case. (~ 1994.1)
   (2) Install the pump drive sprocket with bearing to timing gear case. (1994.1 ~)



Installing the Pump Drive Gear Bearing KAJS23

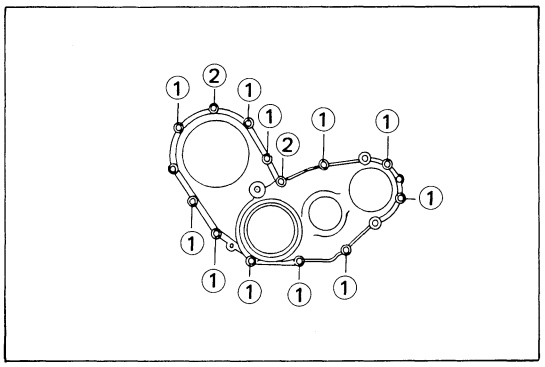
7. Idle gear installation (~1994.1)
   (1) Install the idle gear shaft ① to the timing gear case by aligning the bolt holes.
   (2) Install the plate washer ②, idle gear ③, plate washer ④ and thrust washer ⑤ in this order, and tighten them by using two bolts ⑥.
   T = 3.80 kg-m (27 ft-lb)
   Idle gear thrust clearance
   Standard
   0.1 ~ 0.26 mm (0.0039 ~ 0.0102 in)

   Notes:
   - **Coat engine oil on the tooth surface, plate washer, idle shaft sliding contact surface.**
   - **Check rotation of the plate washer.**



Installing the Idle Gear KAJS11

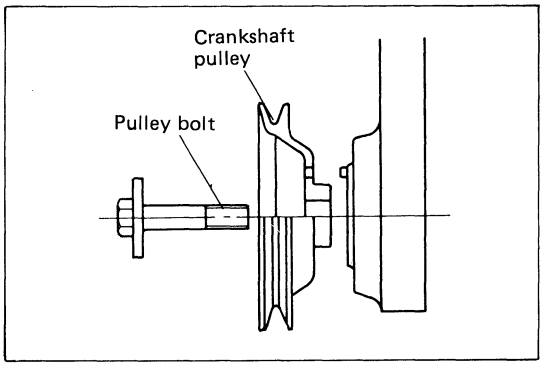
8. Timing gear cover installation
   (1) Gasket
   (2) Timing gear cover
   (3) Set bolts ① (11 pcs.) and set nuts ② (2 pcs.)
   T = 1.85 kg-m (13 ft-lb) (bolts)
   T = 1.15 kg-m (8 ft-lb) (bolts)



Installing the Timing Gear Cover KAJS10

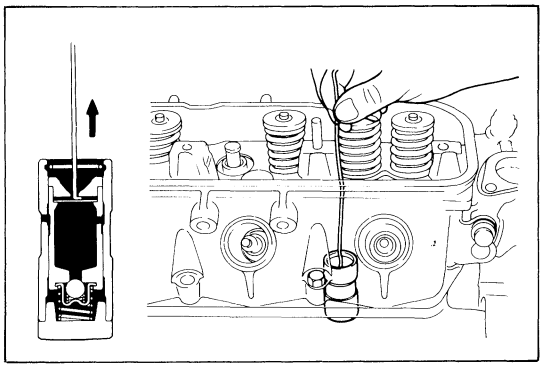
9. Oil pipe installation

10. Crankshaft pulley installation
   (1) Install two bolts (M10) to the crankshaft rear end to stop rotation.
   (2) Insert the crankshaft pulley into the crankshaft sprocket.
   (3) Coat engine oil on the pulley bolt thread and seat surface, and tighten the bolt.
   T = 16.0 kg-m (115.7 ft-lb) (~ 1990.11)
   T = 23.0 kg-m (166.4 ft-lb) (1990.12 ~)



Installing the Crankshaft Pulley KAJS24

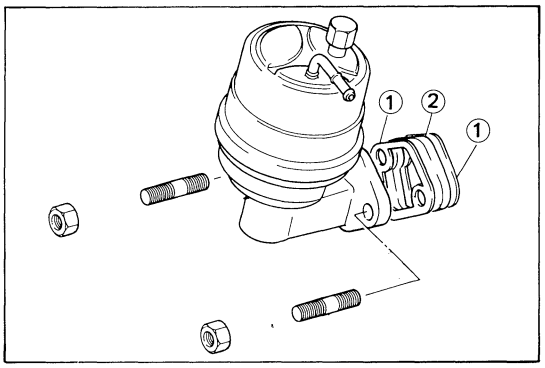
11. Valve lifter installation
   (1) Bleed the air from valve lifters in a container filled with clean engine oil (refer to page 2-34 for the air bleeding work).
   (2) Use a wire with its tip end bent to L shale, and carefully insert the valve lifter into the valve lifter hole.



Installing the Valve Lifter EM2342,2341

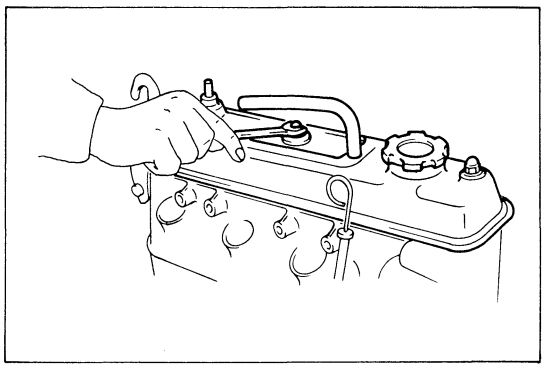
12. Fuel pump installation
   (1) Install two gaskets ①, the insulator ② and fuel pump by using two nuts.
   T = 1.85 kg-m (13 ft-lb)

13. Push rod and rocker arm ASSY installation (See page 2-21)



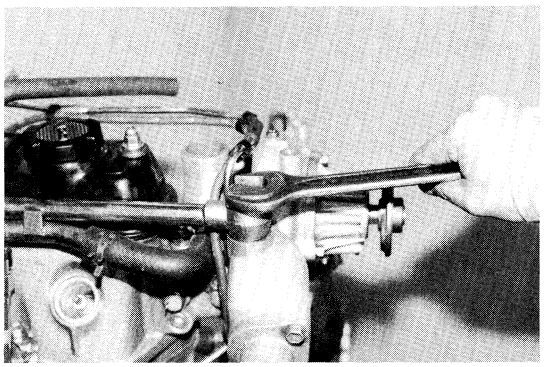
Installing the Fuel Pump KAJS26

14. Cylinder head cover installation
    (1) Install the gasket and cylinder head cover SUB-ASSY.
    (2) Install three seal washer and three cap nuts.
        T = 0.5 kg-m (3.6 ft-lb)



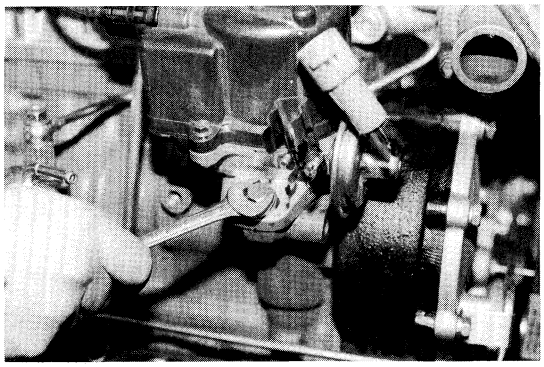
Installing the Cylinder Head Cover KAJS7

15. Water outlet pipe installation
    (1) Water outlet pipe
    (2) Water bypass hose connection
    (3) Clamp set bolts (2 pcs.)
    (4) Union bolt
        T = 3.5 kg-m (25 ft-lb)
    (5) Water hose connection



Installing the Water Outlet Pipe KAJ13-7

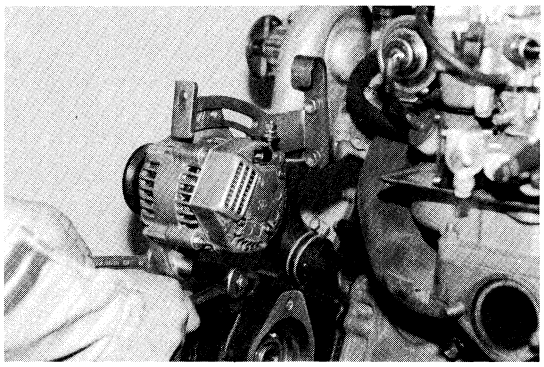
16. Distributor installation (See page 7-18)



Installing the Distributor KAJ14-33

17. Alternator installation
    (1) Install the alternator and temporarily tighten two fixing bolts and the adjusting bolt.
    (2) Install the V-belt and fan pulley.
    (3) Adjust the V-belt tension.
        See page 1-3 for the V-bolt tension adjustment procedure.

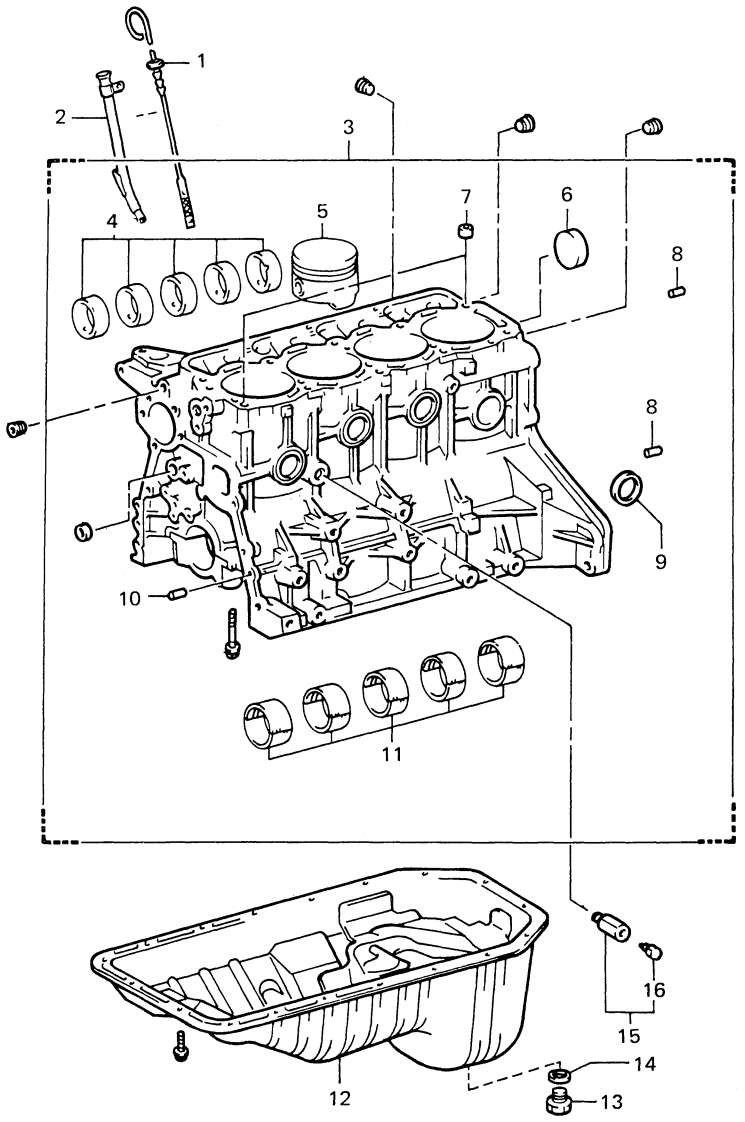
18. Fan installation
    (1) Fan
    (2) Set bolts (4 pcs.)
        T = 1.85 kg-m (13 ft-lb)



Installing the Alternator KAJ11-12

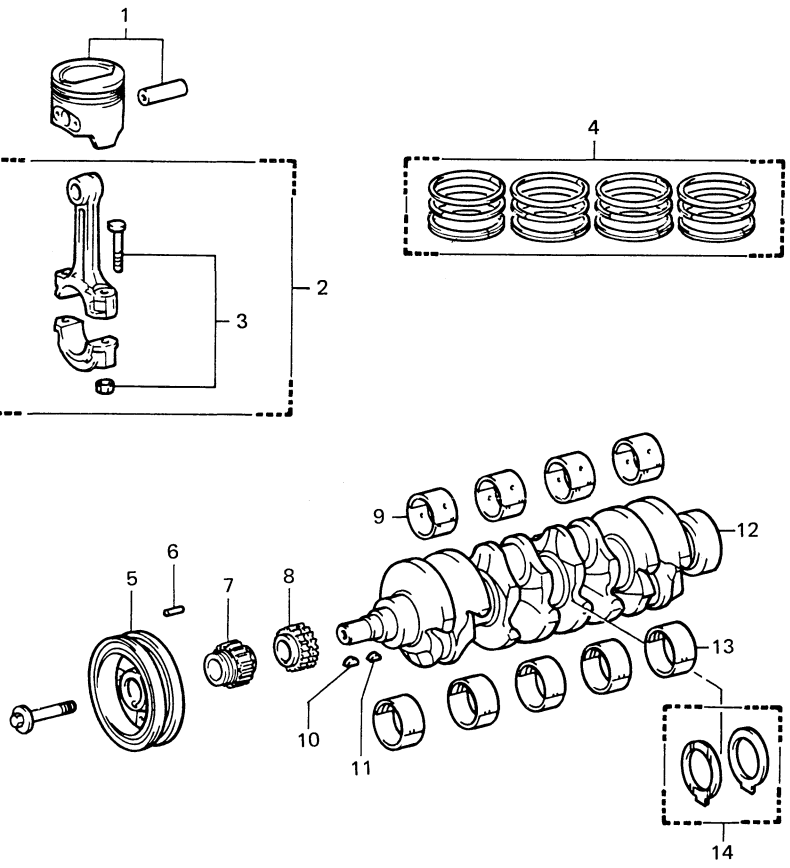
CYLINDER BLOCK

COMPONENTS



1. Oil level gauge SUB-ASSY
2. Oil level gauge guide
3. Cylinder block SUB-ASSY
4. Camshaft bearing set
5. Piston SUB-ASSY
6. Tight plug No. 1
7. Ring pin
8. Straight pin
9. Tight plug No. 2
10. Straight pin
11. Crankshaft bearing
12. Oil pan SUB-ASSY
13. Plug
14. Gasket
15. Drain cock SUB-ASSY
16. Drain cock plug

Cylinder Block Components KAJM7



1. Piston SUB-ASSY with pin
2. Connecting rod SUB-ASSY
3. Connecting rod bolt
4. Piston ring set
5. Crankshaft pulley
6. Straight pin
7. Crankshaft timing sprocket
8. Crankshaft timing gear
9. Connecting rod bearing
10. Crankshaft key
11. Crankshaft key
12. Crankshaft
13. Crankshaft bearing
14. Crankshaft thrust washer set

Crankshaft & Piston Components

KAJM13

CYLINDER BLOCK REMOVAL

1. Engine installation to engine stand

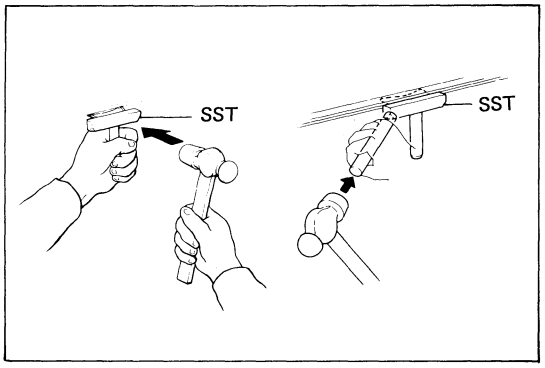
2. Oil filter bracket with oil filter removal

3. Cylinder head removal (See pages 2-6 to 2-10)

4. Timing gear and camshaft removal (See pages 2-26 to 2-31)

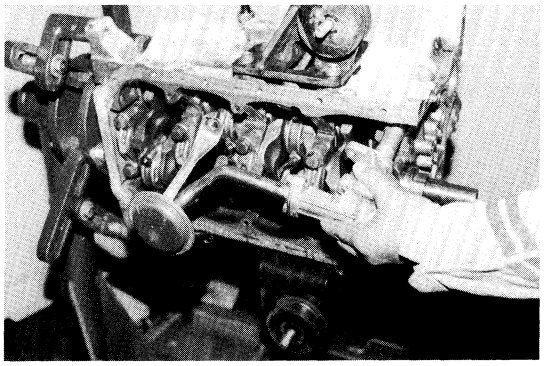
5. Oil pan removal
   (1) Remove 18 set bolts.
   (2) Insert the blade of the SST between the cylinder block and oil pan, and cut the sealant to remove the oil pan.
   SST 09032-76001-71
   (SST 09032-00100)

   Caution:
   - **Do not use the SST on the timing gear cover side. Use a screwdriver if necessary.**
   - **Slowly operate so as not to deform the oil pan flange.**



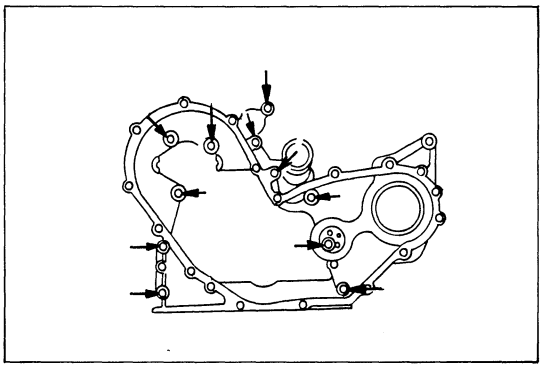
Removing the Oil Pan **LU0272,0271**

6. Oil pump ASSY with strainer removal
   (1) Remove two strainer set bolts and the oil pump set bolt, and remove the oil pump with strainer.



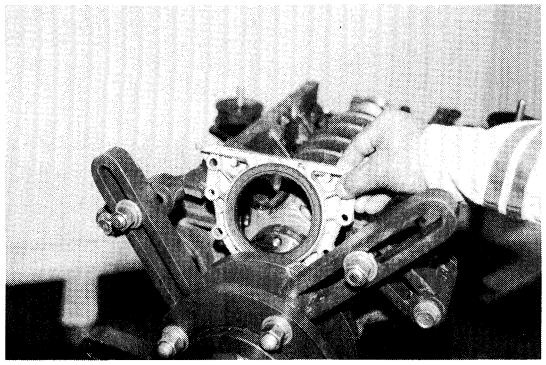
Removing the Oil Pump with Strainer **KAJ5-18**

7. Timing gear case removal
   (1) Remove 11 set bolts.
   (2) Remove the timing gear case and gasket.



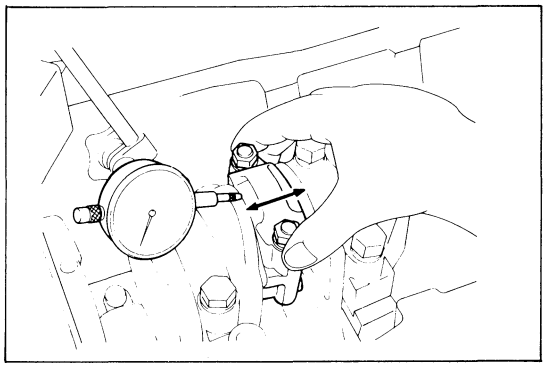
Removing the Timing Gear Case **KAJS27**

8. Rear oil seal retainer removal
   (1) Remove five set bolts.
   (2) Remove the rear oil seal retainer with dust seal and gasket.



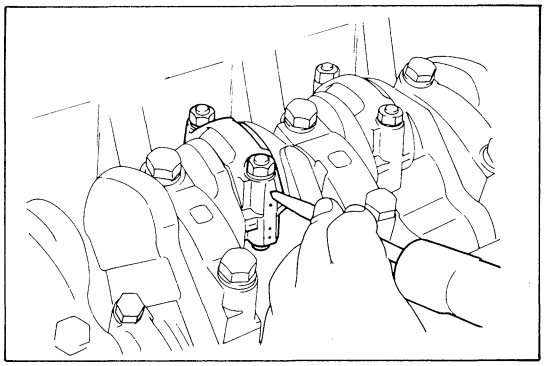
Removing the Rear Oil Seal Retainer KAJ5-29

9. Connecting rod thrust clearance inspection
   (1) Use a dial gauge and measure the thrust clearance by moving the connecting rod back and forth.
   Standard: 0.160 – 0.312 mm (0.0063 – 0.00123 in.)
   Limit: 0.35 mm (0.0138 in.)
   If the limit is exceeded, replace the connecting rod ASSY.



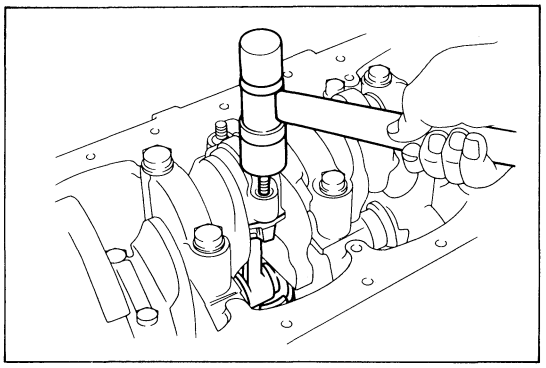
Inspecting the Connecting Rod Thrust Clearance EM0065

10. Connecting rod oil clearance inspection
    (1) Punch matching mark on the connecting rod and cap.



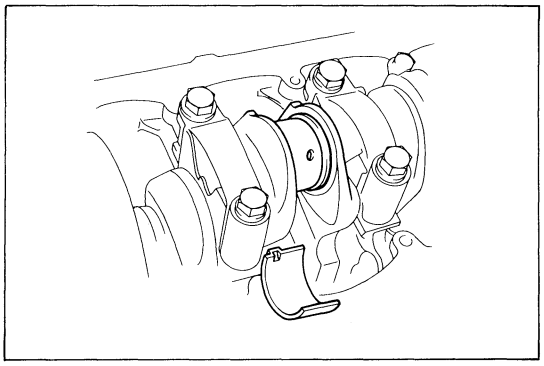
Punching the Matching Mark EM2539

   (2) Remove the connecting rod cap nuts.
   (3) Use a plastic hammer and tap the bolt lightly to remove the connecting rod cap and bearing.



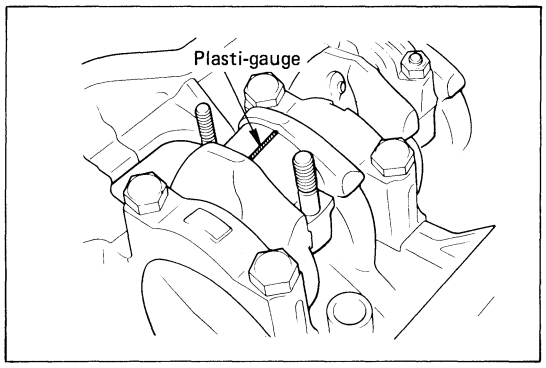
Removing the Connecting Rod Cap EM0209

(4) Clean the connecting rod and the connecting rod cap surface in contact with the bearing.
(5) Clean the bearing and crankpin.
(6) Check the bearing for flaking and damage. If damaged, replace the bearing.



Cleaning and Inspecting the Connecting Rod and Bearing EM0210

(7) Place a plasti-gauge on the crankpin.

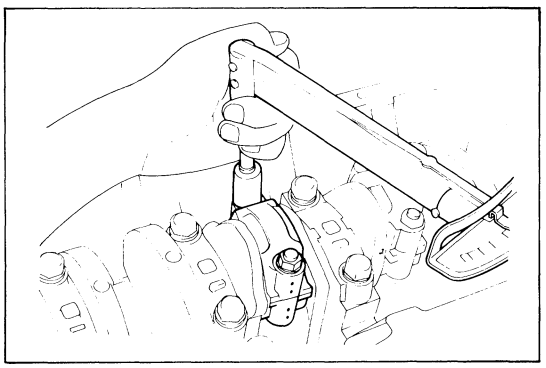


Plasti-gauge EM1794

(8) Align the matching marks, install the cap and tighten the nuts. (See page 2-63)
T = 5.0 kg-m (36 ft-lb)

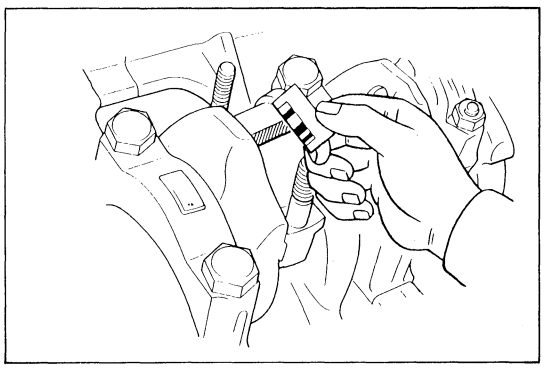
Caution:
Never rotate the crankshaft.

(9) Remove the connecting rod cap.



Installing the Connecting Rod Cap EM2560

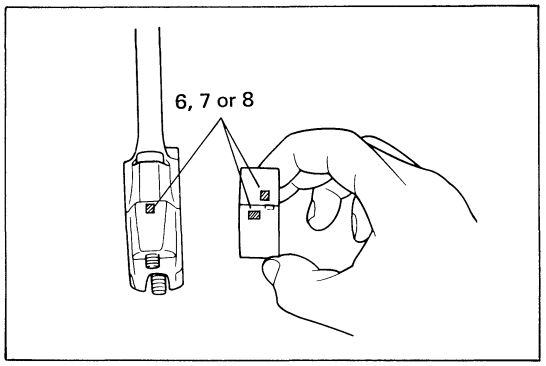
(10) Measure the widest portion of the plasti-gauge.
Standard: 0.020 – 0.051 mm (0.0008 – 0.0020 in.)
Limit: 0.10 mm (0.0039 in.)
If the limit is exceeded, replace the bearing. Replace the crankshaft if required.



Measuring the Oil Clearance EM2541

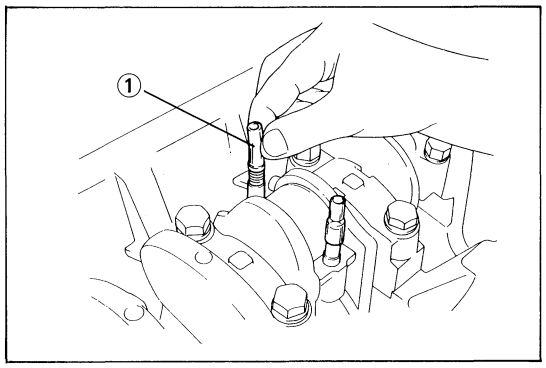
Note:
When using the STD bearing, select the one whose code (6, 7 or 8) is the same as that punched on the connecting rod cap.

(11) Thoroughly remove the plasti-gauge.



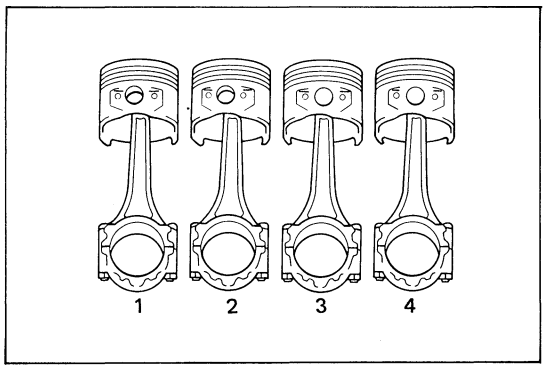
Punched Code Position EM0066

11. Piston and connecting rod removal
(1) Cover the connecting rod bolts with vinyl hoses ① and take it out toward the cylinder head side so as not to damage the crankpin.



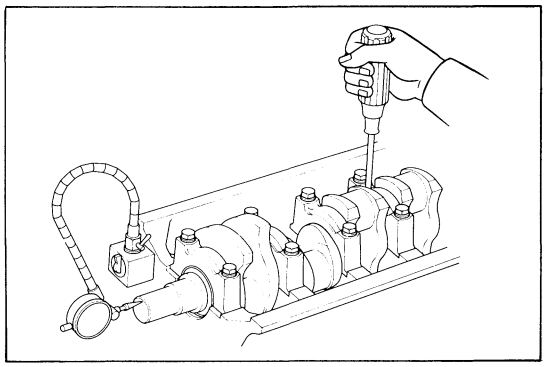
Removing the Piston and Connecting Rod (1) EM2540

Note:
The removed pistons, connecting rod caps and bearings shall be arranged in the order of corresponding cylinders.



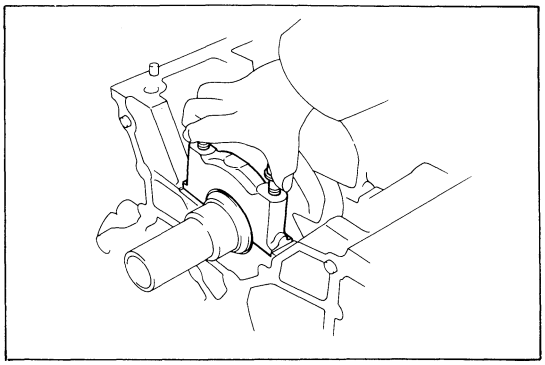
Removing the Piston and Connecting Rod (2) EM2340

12. Crankshaft thrust clearance inspection
(1) Use a dial gauge and measure the thrust clearance by moving the crankshaft back and forth with a screwdriver.
Standard: 0.020 – 0.220 mm
(0.0008 – 0.0087 in.)
Limit: 0.3 mm (0.0118 in.)
If the limit is exceeded, replace the thrust washer.
Oversize thrust washer: O/S 0.250



Measuring the Thrust Clearance EM2543

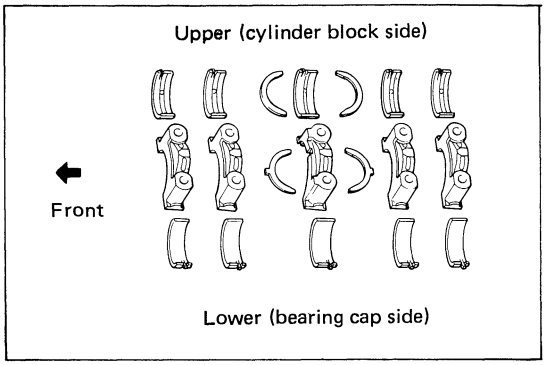
13. Crankshaft removal
    (1) Remove the crankshaft bearing cap bolts.
    (2) Use the two removed bolts and remove the crankshaft bearing cap.



Removing the Crankshaft EM2022

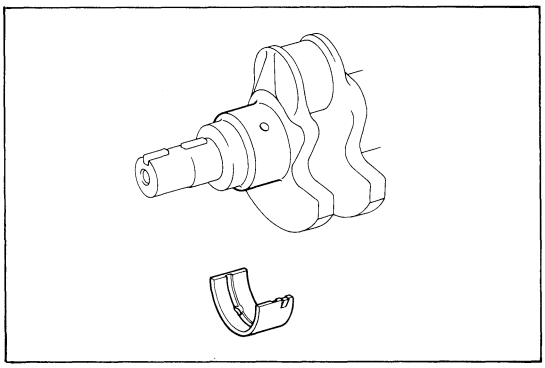
    (3) Remove the crankshaft, crankshaft bearing and crankshaft thrust washer from the cylinder block.

Note:
Arrange the removed bearing caps, bearings and thrust washers in the order of cylinder Nos.



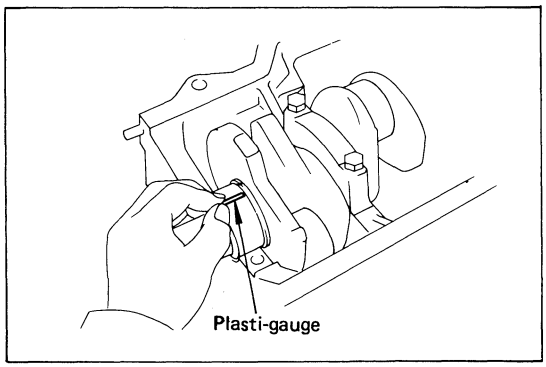
Arranging the Bearing Caps, Bearings and Thrust Washers EM2323

14. Crankshaft oil clearance inspection
    (1) Clean the cylinder block and bearing cap surfaces in contact with the bearings.
    (2) Clean the bearings and crankshaft journals.
    (3) Check the bearings for flaking and damage, and replace any damaged bearing.
    (4) Install the bearings and crankshaft to the cylinder block.



Inspecting the Bearing and Crankshaft Journal EM1498

    (5) Install the thrust washer to the No. 3 journal.
    (6) Place a plasti-gauge on the crankshaft journal.

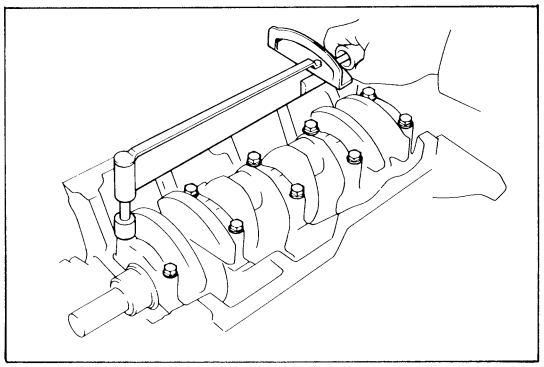


Plasti-gauge EM1793

(7) Install the bearing cap, with its arrow makr on the front side, to the original position, and tighten the bolts.
(See page 2.62)
T = 8.0 kg-m (58 ft-lb)

Caution:
Never rotate the crankshaft.

(8) Remove the bearing cap.



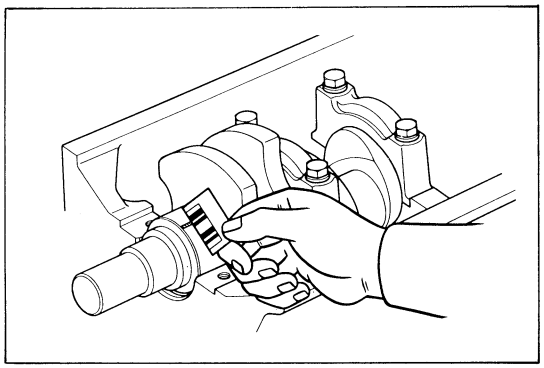
Installing the Bearing Cap EM2033

(9) Measure the widest portion of the plasti-gauge.

Standard: 0.020 – 0.051 mm
(0.0008 – 0.0020 in.)
Limit: 0.10 mm (0.0039 in.)

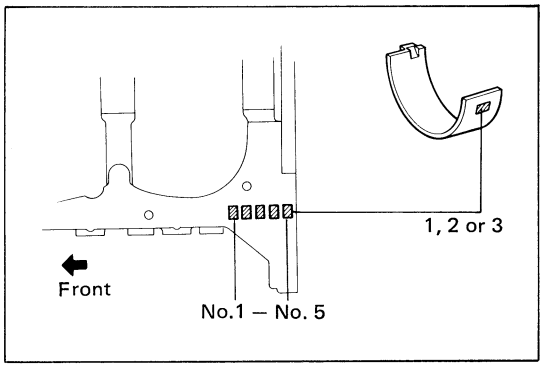
If the limit is exceeded, replace the bearing. If necessary, replace the crankshaft.

Note:
When using the STD bearing, select the one whose code (1, 2 or 3) is the same as that punched on the cylinder block.



EM1737

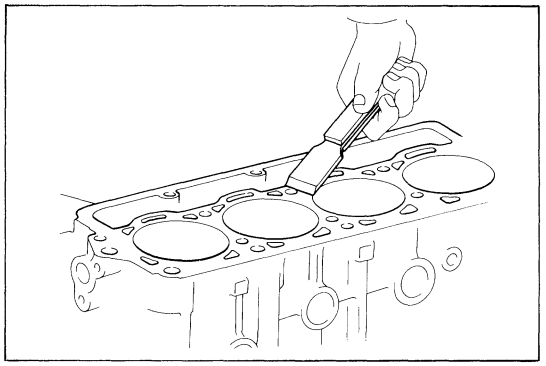
(10) Thoroughly remove the plasti-gauge.



Punched Code Position EM2544

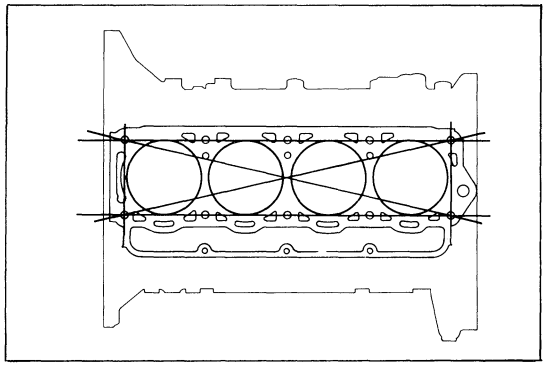
CYLINDER BLOCK INSPECTION

1. Cylinder block cleaning
   (1) Use a scraper and remove the gasket remaining on the cylinder block.
   (2) Clean each part of the cylinder block with a solvent.



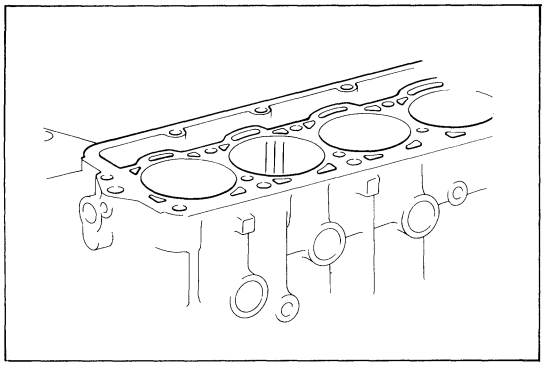
Cleaning the Cylinder Block EM2532

2. Cylinder block top surface distortion inspection
   (1) Use a straight edge and thickness gauge, and measure the six illustrated places.
   Limit: 0.05 mm (0.0020 in.)
   If the limit is exceeded, regrind the top surface of the cylinder block or replace the cylinder block.



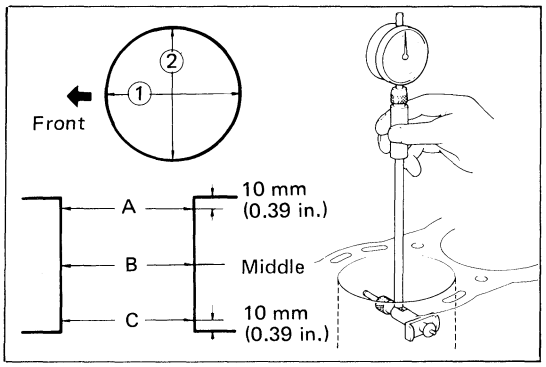
Inspecting the Cylinder Blcok Top Surface for Distortion EM2546

3. Cylinder bore inspection
   (1) Check the cylinder bore for surface defects. If any excessive damage if found, rebore the cylinder.



Inspecting the Cylinder Bore EM2547

4. Cylinder wear inspection
   (1) Use a cylinder gauge and measure the bore in the axial ① and thrust directions ② at three places, A, B and C, and obtain the difference between the maximum and minimum values.
   Limit: 0.2 mm (0.008 in.)
   If the limit is exceeded, rebore the cylinder or replace the cylinder block.



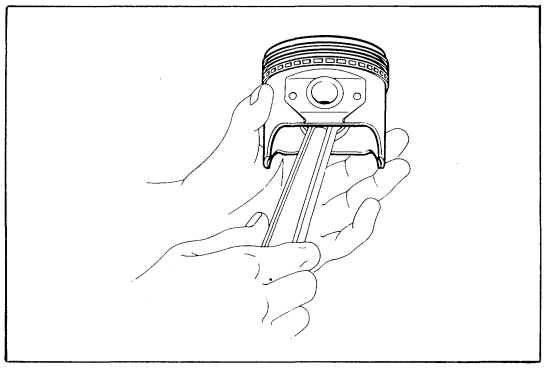
Inspecting the Cylinder Wear EM2548,0086

Reference:
Standard cylinder bore:
91.000 – 91.030 mm
(3.5827 – 3.5839 in.)

PISTON AND CONNECTING ROD DISASSEMBLY

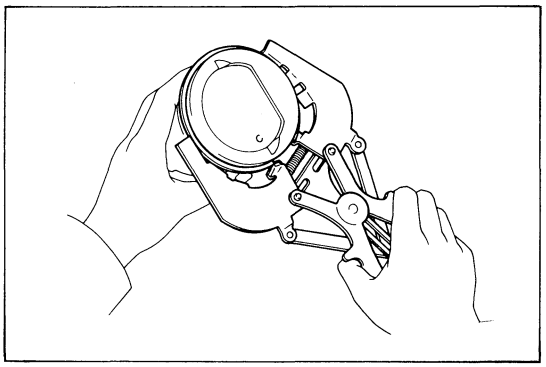
Caution:
Removed pistons and piston rings and piston pins shall be used in original combinations before removal.

1. Piston movement inspection
   (1) Move the piston to check smooth movement.
   (2) If obstruction, looseness or heavy movement is observed, replace the piston SUB-ASSY.



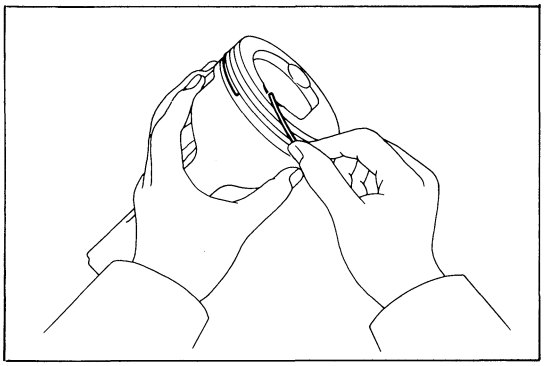
Piston Movement Inspection EM2339

2. Piston ring removal
   (1) Use the piston ring tool and remove two compression rings.



Removing the Compression Rings EM2549

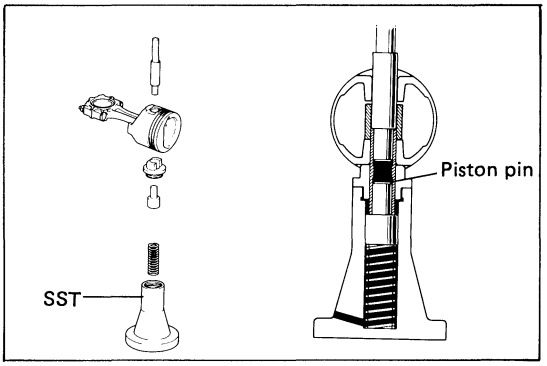
   (2) Manually remove two side rails and the oil ring expander.
   (3) Arrange the removed piston rings in the order of the corresponding cylinders.



Removing the Side Rail and Expander EM1497

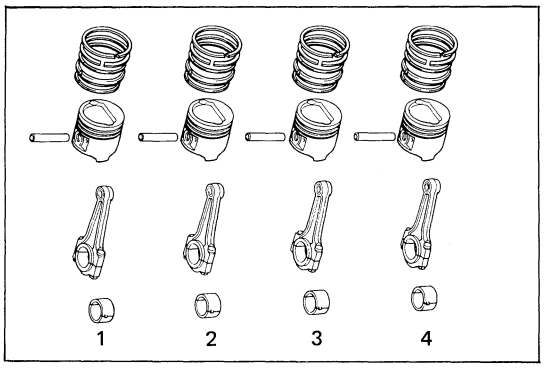
3. Piston pin removal
   (1) Use the SST and push out the piston pin.
   SST 09221-76002-71
   (SST: 09221-25018)
   (09221-00020, 09221-00030,
   09221-00040, 09221-00070,
   09221-00080)

   Remove the piston pin at the room temperature.



Removing the Piston Pin EM2338,2324

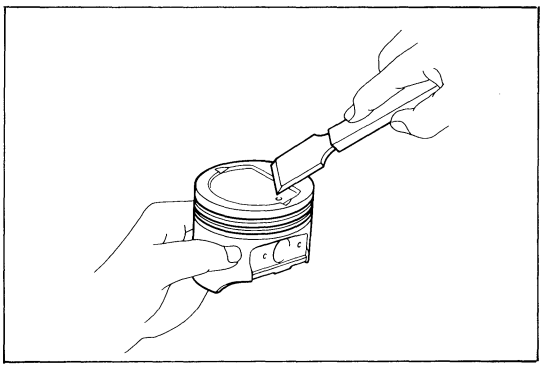
(2) Arrange the removed pistons, piston pins, piston rings and connecting rodes in the order of the corresponding cylinders.



Arranging the Pistons, Piston Pins, Rings and Rods EM1403

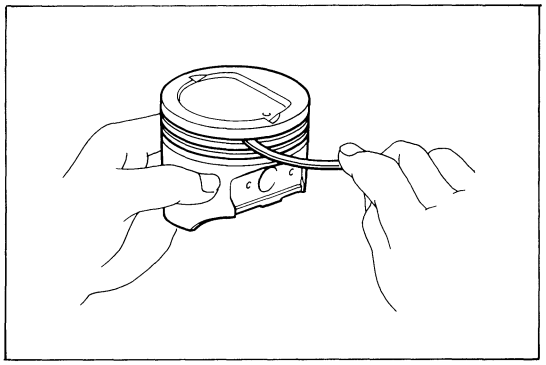
PISTON AND CONNECTING ROD INSPECTION

1. Piston cleaning
   (1) Use a scraper and remove the carbon from the top surface of each piston.



Cleaning the Piston (1) EM2550

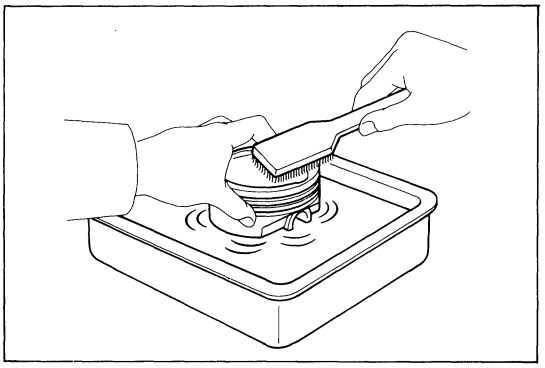
(2) Remove the carbon from each ring groove with an unnecessary piston ring.



Cleaning the Piston EM2336

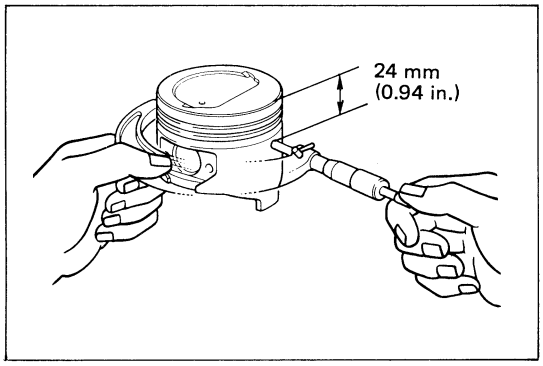
(3) Wash each piston with a solvent.

Caution:
Do not use a hard wire brush.



Washing the Piston EM2551

2. Piston outside diameter inspection
   (1) Use a micrometer and measure the diameter in the direction vertical to the piston pin hole at 24 mm (0.94 in.) from the top of the piston.
   Standard:
   ~1998.7:
   STD size: 90.925 – 90.955 mm (3.5797 – 3.5809 in.)
   O/S 0.50: 91.425 – 91.455 mm (3.599 – 3.601 in.)
   1998.8~:
   STD size: 90.938 – 90.968 mm (3.5802 – 3.5814 in.)
   O/S 0.50: 91.438 – 91.468 mm (3.6000 – 3.6011 in.)

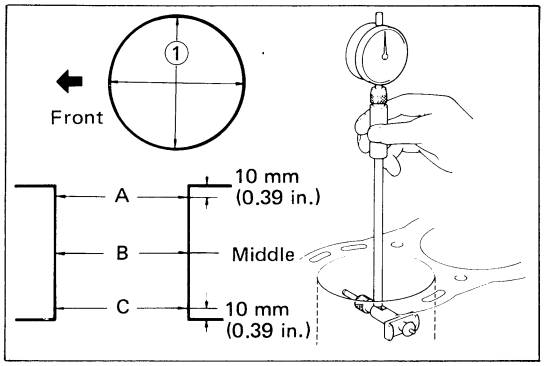


Measuring the Piston Outside Diameter EM2335

3. Piston clearance inspection
   (1) Use a cylinder gauge and measure the minimum cylinder bore in the thrust direction ①.
   (2) Use a micrometer and measure the piston diameter in the direction vertical to the piston pin at 24 mm (0.94 in.) from the top of the piston.
   (3) Calculate the difference between the minimum cylinder bore in the thrust direction and the measured piston outside diameter.

   Standard:
   ~1998.7: 0.065 – 0.085 mm (0.0026 – 0.0033 in.)
   1998.8~: 0.032 – 0.092 mm (0.0013 – 0.0036 in.)

   If the standard is not satisfied, either replace the piston or rebore the cylinder and use an O/S piston.

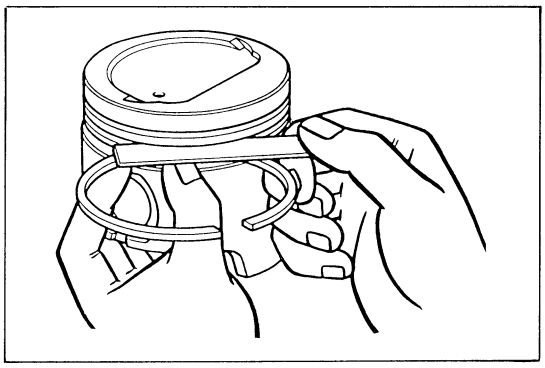


Measuring the Cylinder Bore EM2548,0086

   Note:
   Honing finishing dimension = P + C – H
   P = Piston outside diameter
   C = Piston clearance
   H = Honing margin: 0.02 mm (0.0008 in.) or less

4. Piston ring to piston groove clearance inspection
   (1) Use a thickness gauge and measure the clearance between the new piston ring an ring groove for the whole circumference.
   Standard:
   No. 1·No. 2: 0.03 – 0.07 mm (0.0012 – 0.0028 in.)
   Oil expander: 0.025 – 0.165 mm (0.0010 – 0.0065 in.)

   If the standard is not satisfied, replace the piston.


Measuring the Piston Ring to Ring Groove Clearance EM2334

5. Piston ring joint clearance inspection
   (1) Manually put the piston ring slightly in the cylinder.
   (2) Use the piston and push the piston ring to a depth of approx. 110 mm (4.33 in.) from the top of the cylinder block.

   Note:
   Measure the piston ring joint clearance at a position lower that the cylinder sliding contact surface with the piston ring.

   (3) Use a thickness gauge and measure the joint clearance.

Standard: Unit:mm (in.)

	~1998.7	1998.8~
No. 1	0.23 – 0.48 (0.0091 – 0.0189)	0.27 – 0.39 (0.0106 – 0.0154)
No. 2	0.16 – 0.44 (0.0063 – 0.0173)	0.40 – 0.55 (0.0157 – 0.0217)
Oil	0.13 – 0.47 (0.0051 – 0.0185)	0.13 – 0.38 (0.0051 – 0.0150)

Limit: Unit:mm (in.)

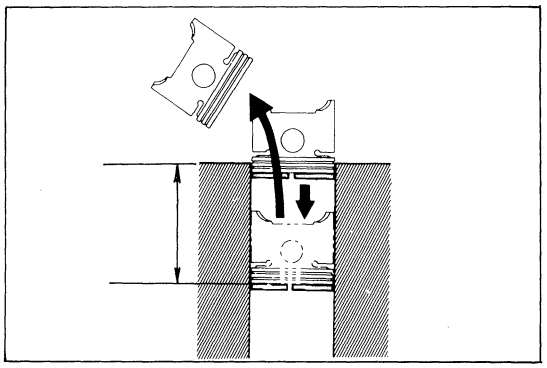
No. 1	1.08 (0.0425)	←
No. 2	1.04 (0.0409)	←
Oil	1.07 (0.0421)	←

If the limit is exceeded, replace the piston ring.
If the limit is exceeded as a result of measurement of a new piston ring, rebore the cylinder and use O/S piston rings.

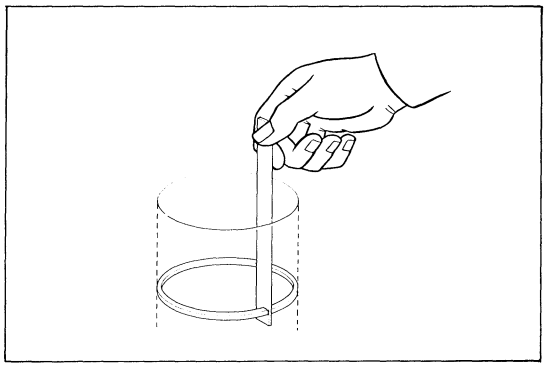
6. Connection rod inspection
   (1) Use a rod aligner and inspect the connecting rod alignment.

   Bend inspection
   Limit: 0.05 mm (0.0020 in.) per 100 mm (3.94 in.)
   If the limit is exceeded, replace the connecting rod ASSY.

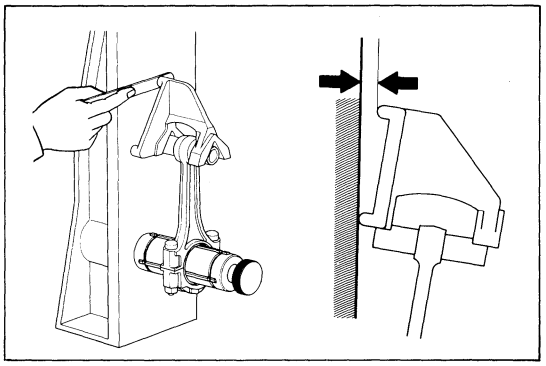
   Torsion inspection
   Limit: 0.05 mm (0.0020 in.) per 100 mm (3.94 in.)
   If the limit is exceeded, replace the connecting rod ASSY.



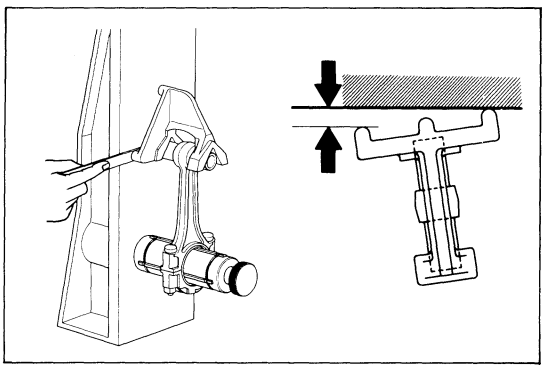
Inspecting the Piston Ring Joint Clearance EM0224



Inspecting the Piston Ring Joint Clearance EM2552



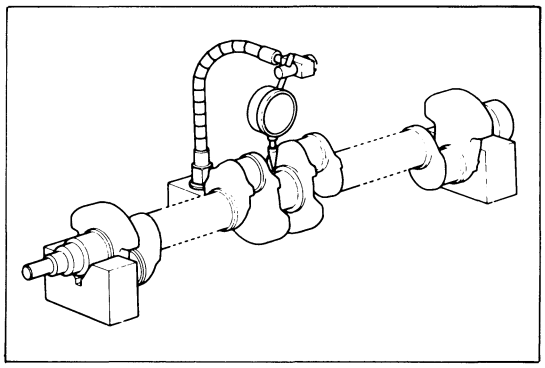
Inspecting the Connecting Rod EM0287,0288



Inspecting the Connecting Rod EM0289,0290

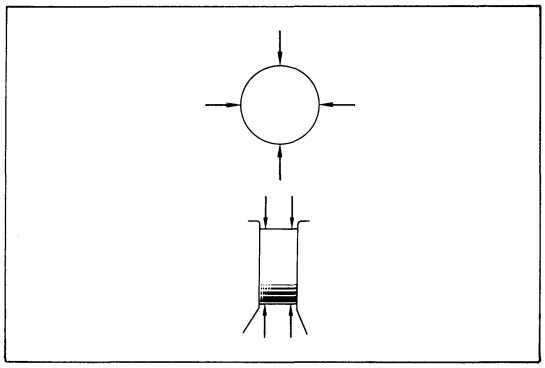
CRANKSHAFT INSPECTION

1. Crankshaft run-out inspection
   (1) Support the crankshaft with two V blocks.
   (2) Use a dial gauge and measure the center journal run-out while the crankshaft is rotated by one turn.
   Limit: 0.06 mm (0.0024 in.)
   If the limit is exceeded, replace the crankshaft.



Inspecting the Crankshaft Run-out EM2553

2. Crankshaft wear inspection
   (1) Use a micrometer and measure the outside diameter of each journal and pin of the crankshaft.
   Standard:
   Journal outside diameter:
   57.985 – 58.000 mm
   (2.2829 – 2.2835 in.)
   Crankpin outside diameter:
   47.985 – 48.000 mm
   (1.8892 – 1.8898 in.)
   If the standard is not specified, measure the oil clearance. (See page 2-47)



Journal and Crankpin Outside Diameter Measuring Places EM0315

   (2) Calculate the taper and eclipticity of each journal and crankpin.
   Limit: Taper/eclipticity:
   0.02 mm (0.0008 in.)
   If the limit is exceeded, replace the crankshaft.

CAMSHAFT BEARING INSPECTION

1. Camshaft oil clearance inspection
   (1) Use a cylinder gauge, and measure the inside diameter of the camshaft bearing.

   Standard (from the front side):

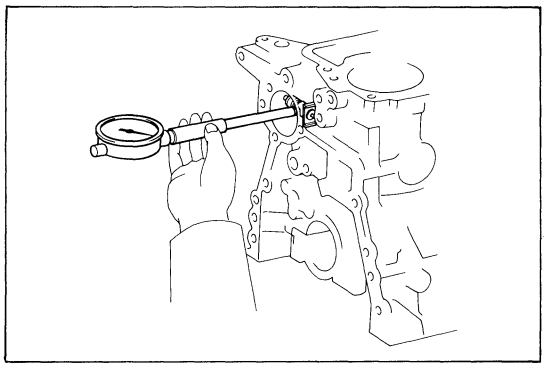
No. 1	46.500 – 46.540 mm (1.8307 – 1.8323 in.)
No. 2	46.250 – 46.290 mm (1.8209 – 1.8224 in.)
No. 3	46.000 – 46.040 mm (1.8110 – 1.8126 in.)
No. 4	45.750 – 45.790 mm (1.8012 – 1.8028 in.)
No. 5	45.500 – 45.540 mm (1.7913 – 1.7929 in.)

   (2) Calculate the difference between the measured bearing inside diameter and journal outside diameter (see page 2-32).

   Standard: 0.025 – 0.081 mm (0.0010 – 0.0032 in.)

   Limit: 0.10 mm (0.0039 in.)

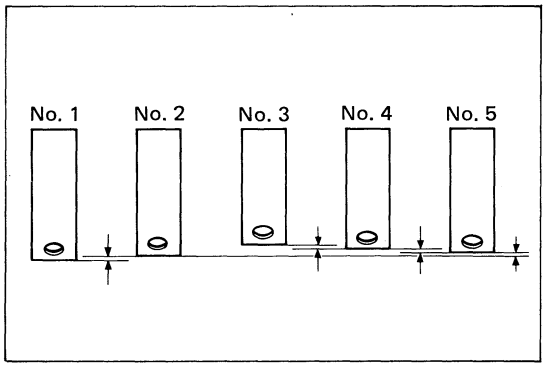
   If the limit is exceeded, replace the camshaft bearing. If necessary, regrind or replace the camshaft.



Measuring the Camshaft Bearing Inside Diameter EM2554

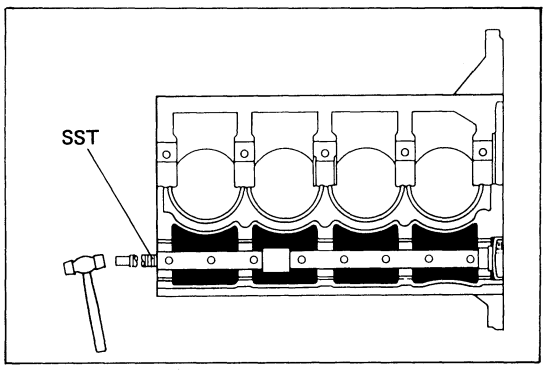
CAMSHAFT BEARING REPLACEMENT

Note:
All camshaft bearings have different outside diameters.



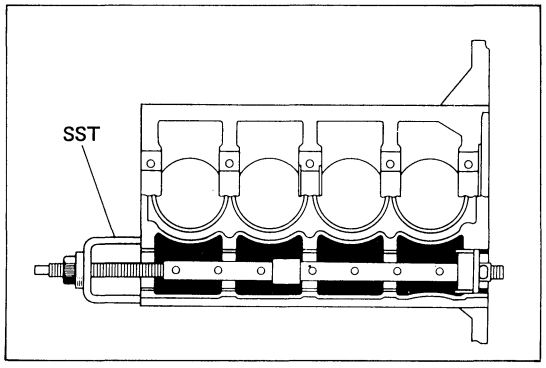
Camshaft Bearings EM2555

1, Rear tight plug removal
   (1) Use the SST and hammer to remove the rear tight plug.
   SST 09215-76003-71
   (SST 09215-00100)
   (09215-00130, 09215-00150, 09215-00210)



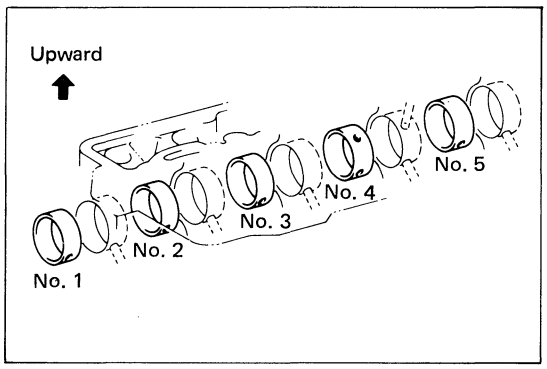
Removing the Rear Tight Plug EM1051

2. Camshaft bearing removal
   (1) Use the SST to remove camshaft bearings.
   SST 09215-76003-71
   (SST 09215-00100)
   (09215-00120, 09215-00130,
   09215-00140, 09215-00150,
   09215-00160, 09215-00250)



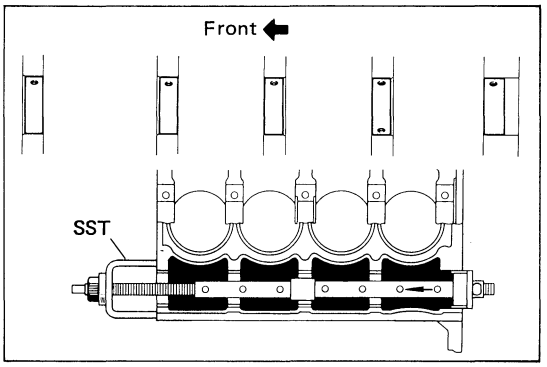
Removing the Camshaft Bearing EM1094

3. Camshaft bearing installation
   (1) Align oil holes of the cylinder block and bearing.



Installing the Camshaft Bearing (1) EM2325

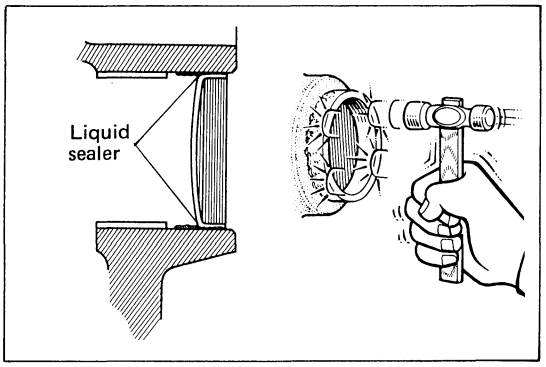
   (2) Use the SST to install the bearings.
   SST 09215-76003-71
   (SST 09215-00100)
   (09215-00120, 09215-00130,
   09215-00140, 09215-00150,
   09215-00160, 09215-00250)



Installing the Camshaft Bearing (2) EM2556,1093

4. Camshaft oil clearance inspection (See page 2-55)

5. Rear tight plug installation
   (1) Coat sealant on the tight plug installation surface of the cylinder block.
   (2) Use a hammer and drive in the tight plug until it is flush with the cylinder block end surface.



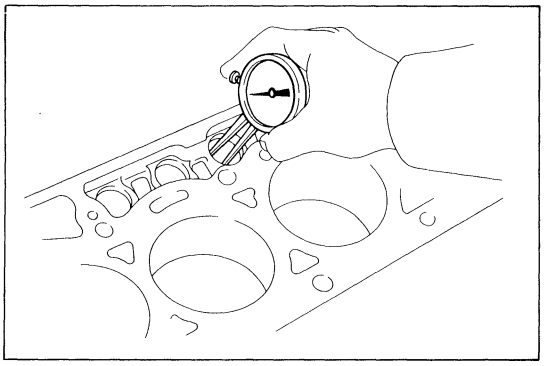
Installing the Rear Tight Plug EM2326,2327

VALVE LIFTER HOLE INSPECTION

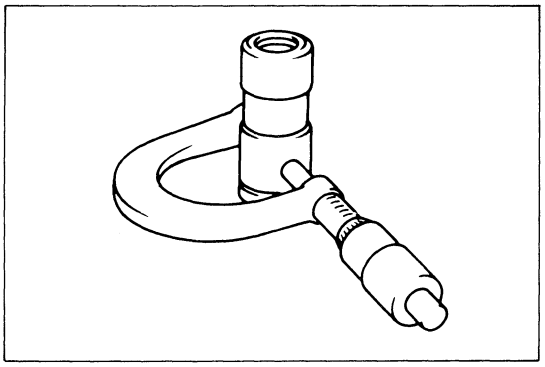
1. Valve lifter oil clearance inspection
   (1) Use a caliper gauge, and measure the inside diameter of the valve lifter hole.
   Standard: 21.417 – 21.443 mm (0.8432 – 0.8442 in.)

   (2) Use a micrometer an measure the valve lifter outside diameter. (See page 2-34)

   (3) Calculate the difference between the valve lifter hole inside diameter and valve lifter outside diameter.
   Standard: 0.012 – 0.056 mm (0.0005 – 0.0022 in.)
   Limit: 0.10 mm (0.0039 in.)
   If the limit is exceeded, replace the valve lifter.



Measuring the Valve Lifter Hole Inside Diameter EM2333

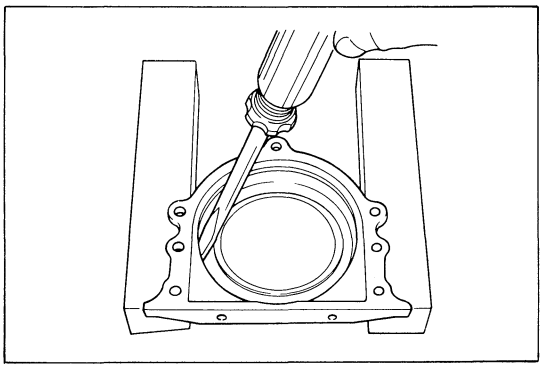


Measuring the Valve Lifter Outside Diameter EM2389

CRANKSHAFT REAR OIL SEAL; REPLACEMENT;

Note:
The oil seal can be replaced in two ways.

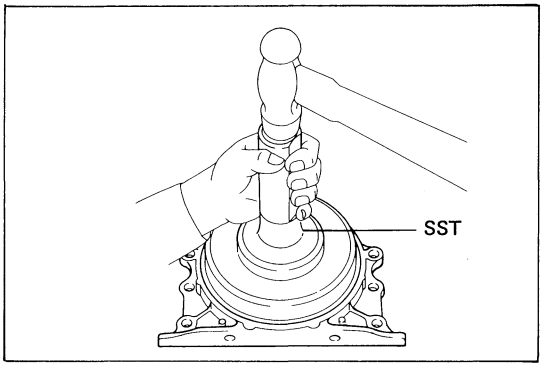
1. When the rear oil seal is removed from the cylinder block.
   (1) Use a screwdriver and hammer, and drive out the oil seal.



Removing the Crankshaft Rear Oil Seal EM1163

   (2) Use the SST and hammer, and drive in the oil seal until it becomes flush with the end surface of the rear oil seal retainer.
   SST 09223-76008-71
   (SST 09223-63010)

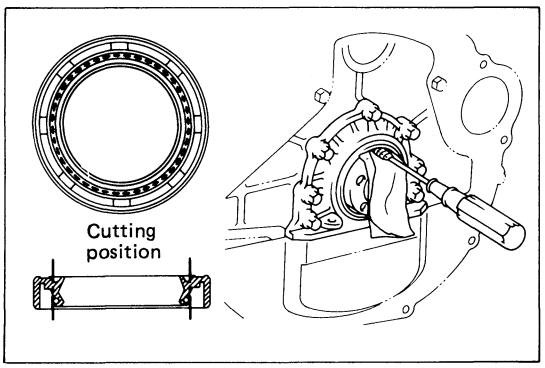
   (3) Coat MP grease on the oil seal lip.



Installing the Crankshaft Rear Oil Seal EM1164

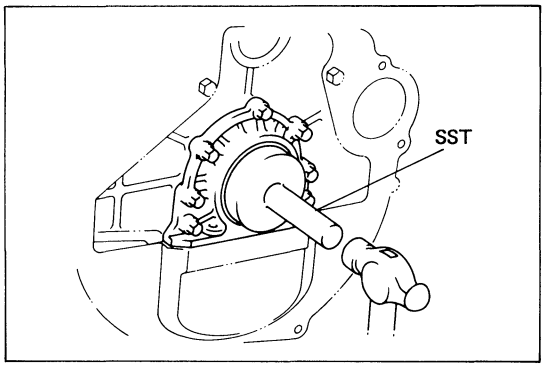
2. When the rear oil seal retainer is installed to the cylinder block.
   (1) Use a knife and cut the oil seal lip.
   (2) Wrap vinyl tape around a screwdriver and pry the oil seal with cloth on the crankshaft.

   Caution:
   After removing the oil seal, check the crankshaft chamfered portion for surface defect. Any defect shall be corrected with sandpaper (#400).



Removing the Crankshaft Rear Oil Seal EM0282,1165

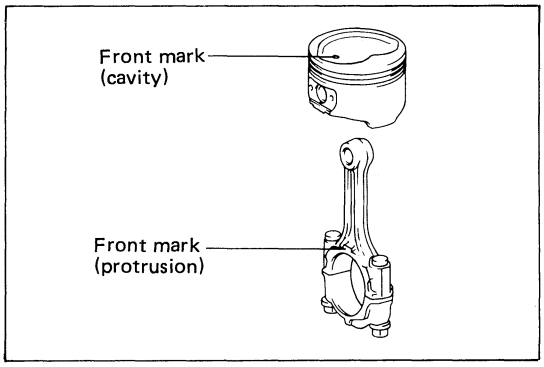
   (3) Before installation, coat MP grease on the oil seal lip.
   (4) Use the SST and hammer to drive in the oil seal until it is flush with the rear oil seal retainer end surface.
   SST 09223-76008-71
   (SST 09223-63010)



Installing the Crankshaft Rear Oil Seal EM1166

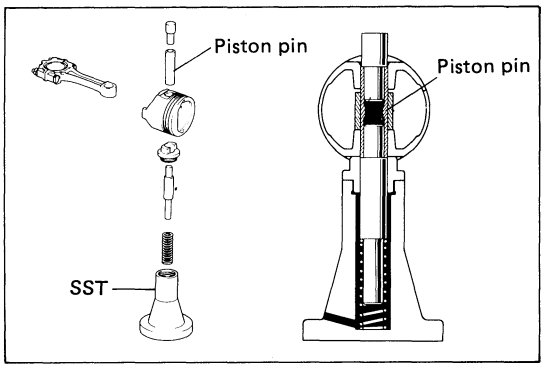
PISTON AND CONNECTING ROD ASSEMBLY

1. Piston and connecting rod assembly
   (1) Match the front marks on the piston and connecting rod.



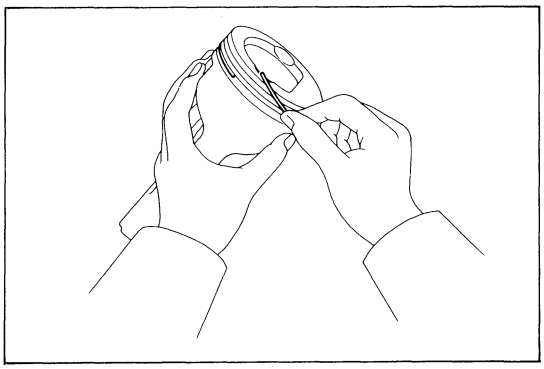
Front Marks EM2557

   (2) Coat engine oil on the piston pin and piston hole in piston.
   (3) Use the SST to press the piston pin. Assemble the parts at the room temperature.
   SST 09221-76002-71
   (SST 09221-25018)
   (09221-00020, 09221-00030, 09221-00040, 09221-00070, 09221-00080)



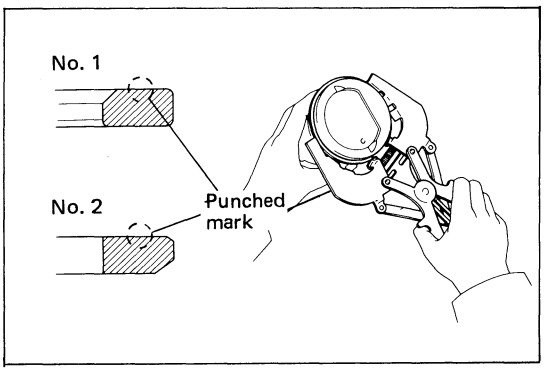
Installing the Piston Pin EM2337,2328

2. Piston ring installation
   (1) Manually install the oil ring expander and two side rails.



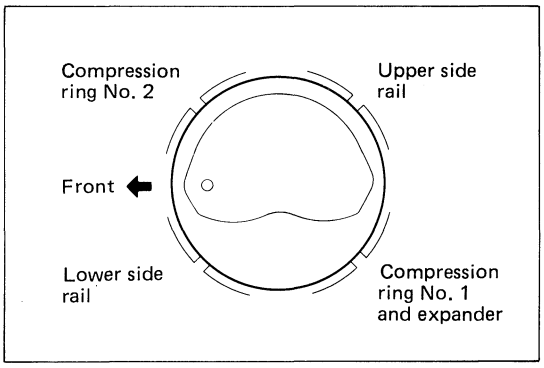
Installing the Oil Ring and Side Rails EM1497

   (2) Use the piston ring tool and install two compression rings, with the punched marks facing upward.



Installing the Compression Rings EM2545,2549

(3) Position the piston ring joints as illustrated.

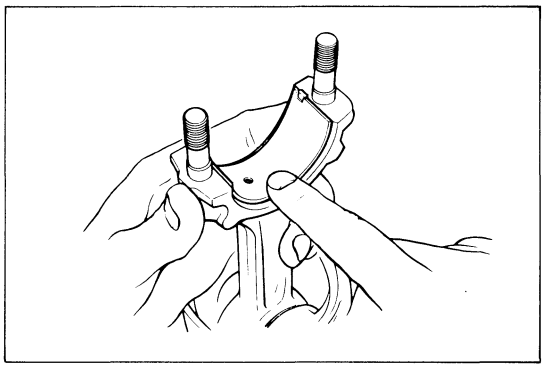


Positioning the Piston Ring Joints EM2558

3. Connection rod bearing installation

Caution:
Keep the bearing outer surfaces (in contact with the connecting rod or bearing caps) free from oil.

(1) Install the upper bearing, with the connecting rod oil hole and lock groove as the guide.
(2) Install the lower bearing by fitting with the bearing cap lock groove.



Installing the connecting Rod Bearing EM0095

CYLINDER BLOCK ASSEMBLY

Caution:
- Thoroughly clean the parts to be assembled.
- Coat engine oil on the sliding contact and rotating surfaces before assembly.
- Replace gaskets, oil seal and other non-reusable parts with new ones.

1. Crankshaft bearing installation

Caution:
Keep the bearing outer surfaces (in contact with the cylinder block or bearing caps) free from oil.

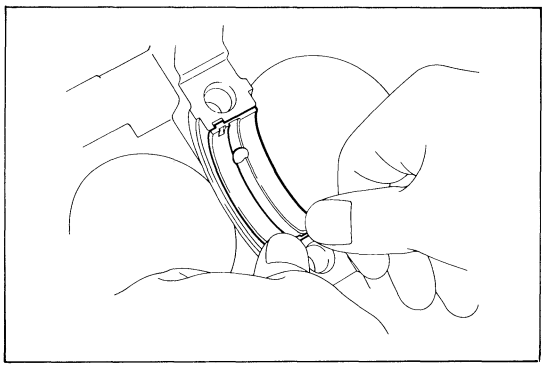
(1) Install the upper bearing having an oil groove on the whole periphery, with the cylinder block oil hole and lock groove as the guide.

(2) Install the lower bearing by fitting with the bearing cap lock groove.

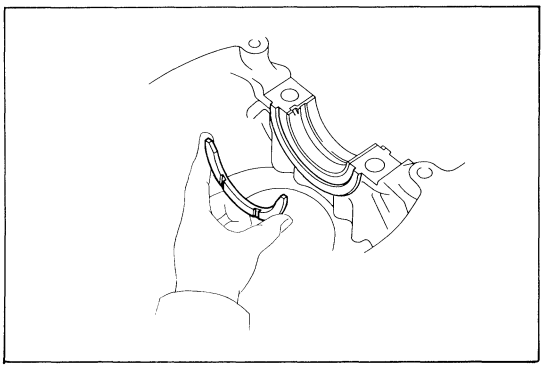
(3) Install the upper thrust washer to the No. 3 journal supporting portion, with the oil grooves facing outward.

(4) Install the lower thrust washer to the No. 3 bearing cap, with the oil grooves facing outward.

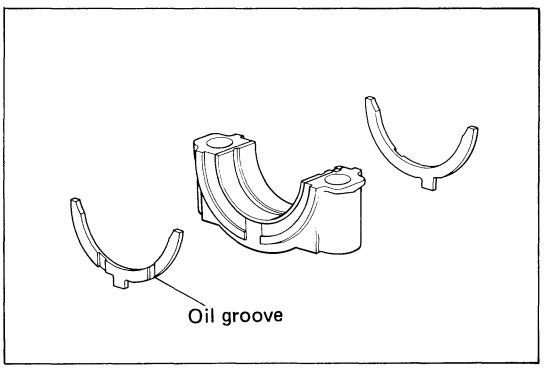
Reference:
Coat engine oil on the rear face of the thrust washer to prevent falling.



Crankshaft Bearing Installation EM0388

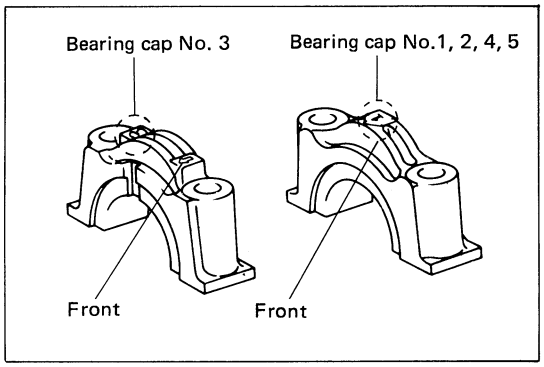


Installing the Upper Thrust Washer EM0247



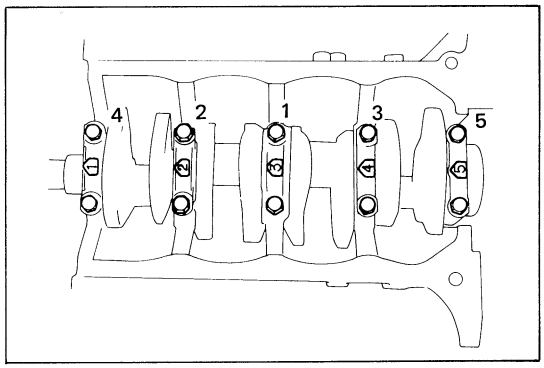
Installing the Lower Thrust Washer EM1703

2. Crankshaft installation
   (1) Coat engine oil on the upper bearings and install the crankshaft.
   (2) Coat engine oil on the lower bearing surfaces. Install the bearing caps to the corresponding code positions, with the front marks on the front side.



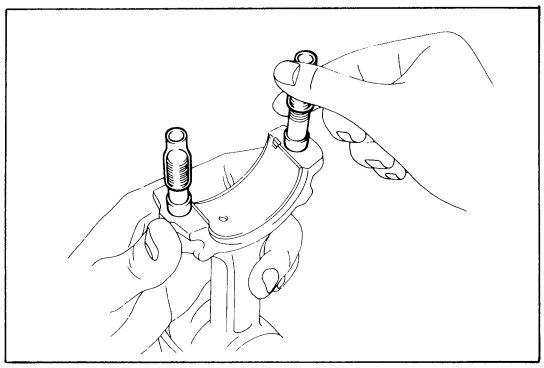
Installing the Bearing Caps EM2329

   (3) Coat engine oil thinly on the bearing cap bolt threads and seat surfaces.
   (4) Evenly tighten ten bearing cap bolts on the left and right sides in the illustrated order little by little in several steps.
   T = 8.00 kg-m (58 ft-lb)
   (5) After tightening the bearing caps, check that the crankshaft rotates smoothly.
   (6) Inspect the crankshaft thrust clearance. (See page 2-46)



Tightening the Bearing Cap Bolts EM2330

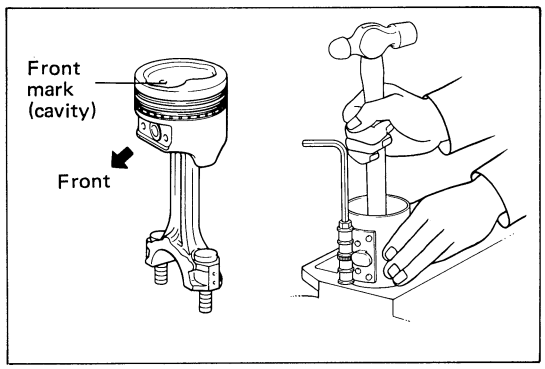
3. Piston with connecting rod installation
   (1) Coat engine oil on the cylinder bores, piston outer circumferences and bearing surfaces.
   (2) Cover connecting rod bolts with vinyl tubes to prevent damages of the cylinders and the crankshaft.



Covering with Vinyl Tubes EM2082

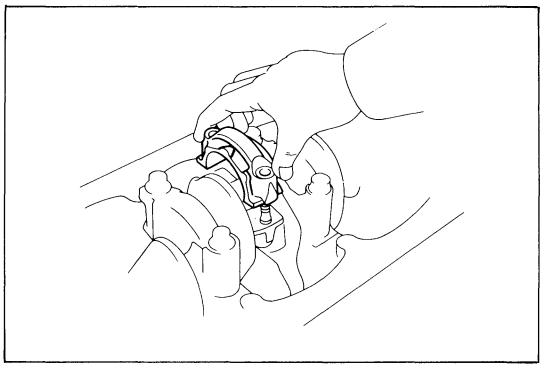
   (3) Check the piston ring joint positions. (See page 2-60)
   (4) Use a piston ring compressor. With the front marks placed on the front side, insert each piston with connecting rod into the cylinder block.

Caution:
The piston and block combination shall be the same as before disassembly.



Installing the Piston with Connecting Rod EM2652,0414

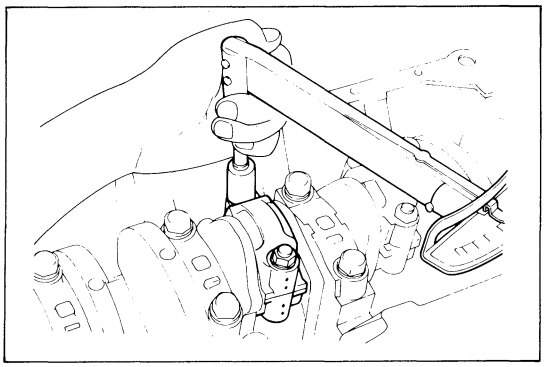
4. Connecting rod bearing cap installation
   (1) Check the matching marks punched at the time of removal.
   (2) Place the bearing cap front mark on the front side, and install the bearing cap to the connecting rod.



Installing the Bearing Caps EM0253

   (3) Slightly coat engine oil on the connecting rod threaded portion and nut bottom surface.
   (4) Alternately tighten the left and right nuts equally in several steps.
   T = 5.00 kg-m (36 ft-lb)

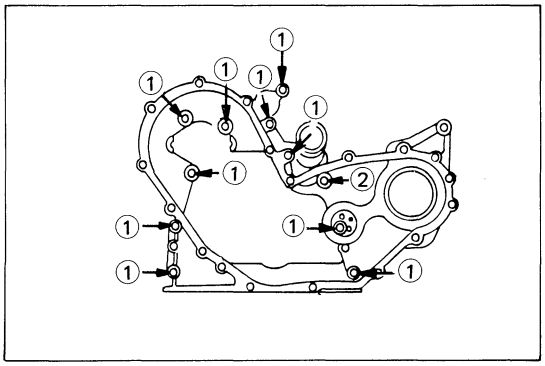
   (5) Check that the crankshaft rotate smoothly.
   (6) Check the connecting rod thrust clearance. (See page 2-44)



Tightening the Bearing Cap Bolts EM2560

5. Rear oil seal retainer installation
   (1) Install the oil seal retainer by using five bolts with a new gasket in-between.
   ~1998.7:
   T = 5.00 kg-m (36 ft-lb)
   1998.8~:
   T = 1.85 kg-m (13 ft-lb)

6. Timing gear case installation
   (1) Use 11 bolts and install the timing gear case with a new gasket in-between.
   T = 1.85 kg-m (13 ft-lb) (① M8)
   T = 3.80 kg-m (27 ft-lb) (② M10)



Installing the Timing Gear Case KAJS27

7. Oil pump with strainer installation (See page 6-11)

8. Oil pan installation (See page 6-12)

9. Camshaft and timing gear installation. (See pages 2-36 to 2-40)

10. Cylinder head installation. (See pages 2-20 to 2-24)

11. Oil filter bracket with oil filter installation
    T = 1.85 kg-m (13 ft-lb)

12. Engine removal from engine stand

FUEL SYSTEM

	Page
INSPECTION ON VEHICLE	3-2
FUEL PUMP	3-3
CARBURETOR	3-6
AIR GOVERNOR	3-28

3

Caution:
- Disconnect the battery negative terminal before handling the fuel system.
- Keep fire sources away.
- Do not stain rubber with gasoline.
- Group components to prevent confusion of similar components.
- Clean each part.

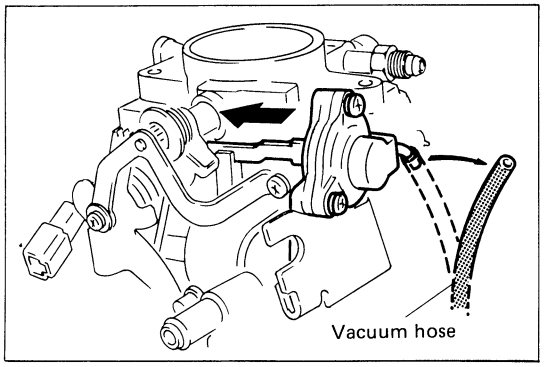
INSPECTION ON VEHICLE

1. Air cleaner connector disconnection

2. Carburetor and link inspection
   (1) Check tightening of the set screw, plug and union.
   (2) Inspect wear of the link and loss of the snap ring.
   (3) Fully depress the accelerator pedal, and check that the throttle valve is fully opened.

INSPECTION IN COLD STATE

3. Choke breaker system inspection
   (1) Start the engine.
   (2) Check that the rod returns when the choke breaker vacuum hose in disconnected.



Inspecting the Choke Breaker System KAJS50

INSPECTION IN HOT STATE

4. Choke valve full opening inspection
   (1) Check that the choke valve is fully opened.

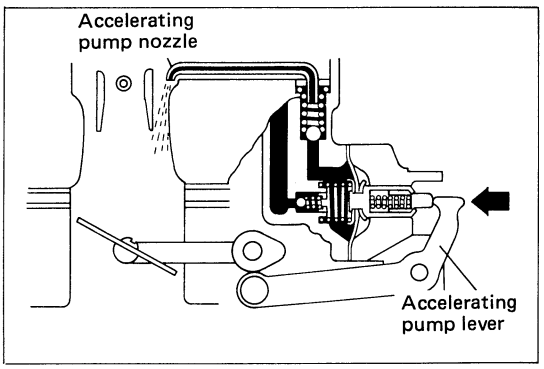
5. Accelerating pump inspection
   (1) Operate the accelerating pump and check that the fuel is injected from the accelerating pump nozzle.

6. Air cleaner connector installation

7. Idle-up inspection and adjustment
   (See page 1-5)

8. Idle speed inspection and adjustment
   (See page 1-6)

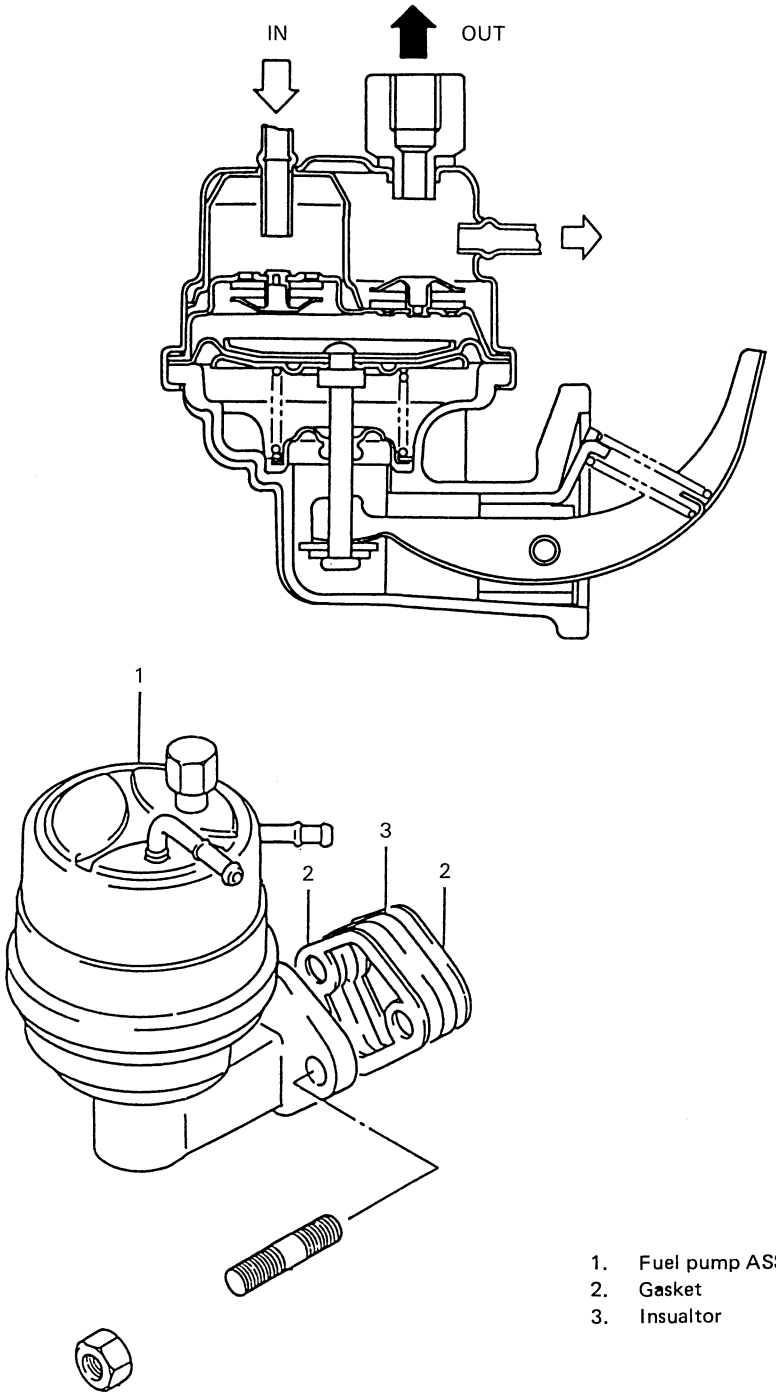
9. No-load maximum governed speed and loaded maximum speed inspection and adjustment
   (See page 3-34)



Inspecting the Accelerating Pump KAJS51

FUEL PUMP

CONTENTS

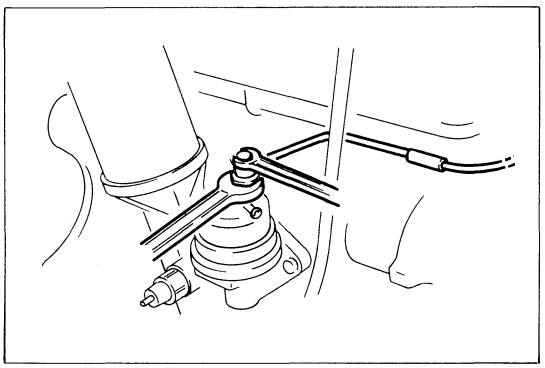


1. Fuel pump ASSY
2. Gasket
3. Insualtor

Fuel Pump Sectional View and Components KAJM15

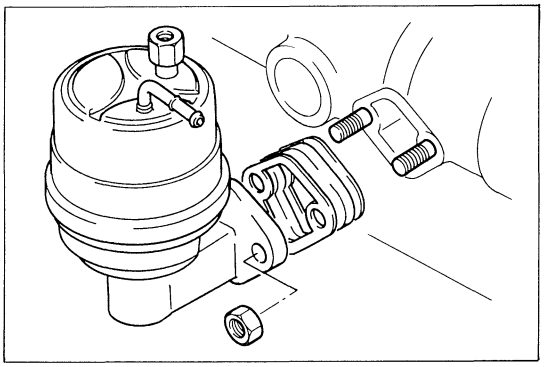
REMOVAL

1. Fuel pump piping disconnection
   (1) Disconnect the fuel pump outlet and inlet pipes.



Disconnecting the Piping KAJS81

2. Fuel pump ASSY removal
   (1) Remove two fuel pump set nuts and the fuel pump ASSY.
   (2) Remove the insulator.

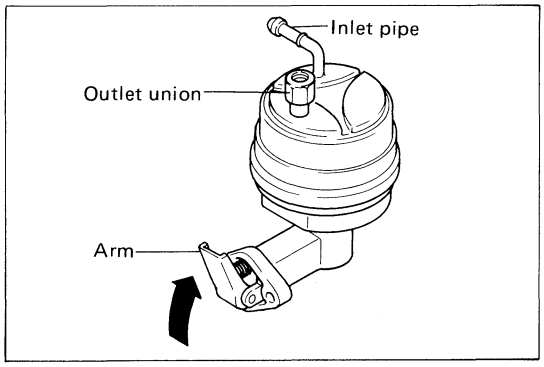


Removing the Fuel Pump ASSY KAJ556

INSPECTION (AIRTIGHTNESS CHECK)

1. Preparation for inspection
   (1) Supply a small volume of gasoline to the fuel pump to keep the airtightness of the check valve.
   (2) Operate the arm without blocking the pipe, and check the arm travel and play.

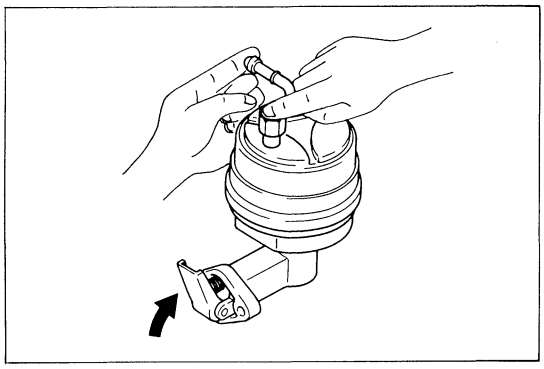
   Reference:
   The arm travel and play checked in the preparation shall be used as the basis for later inspections.



Preparing for Inspection KAJS57

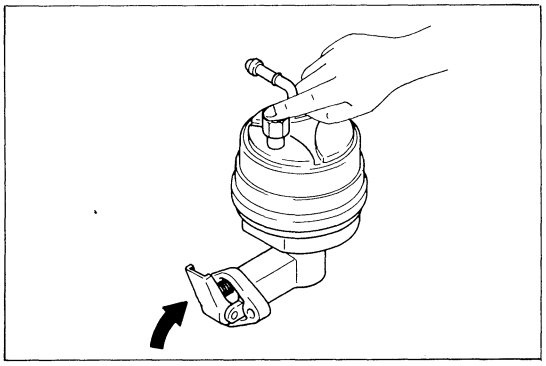
2. Diaphragm inspection
   (1) Block the inlet pipe and outlet union with fingers, and operate the arm to check that the arm movement becomes heavy.

   Caution:
   Do not operate the arm forcibly.



Inspecting the Diaphragm KAJS58

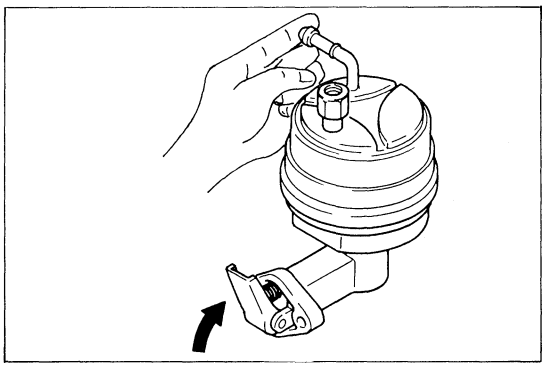
3. Inlet valve inspection
   (1) Block the outlet union with a finger and operate the arm to check that it moves freely without reaction force and that the play increases.



Inspecting the Inlet Valve KAJS59

4. Outlet valve inspection
   (1) Block the inlet pipe with a finger and operate the arm to check that the operating force becomes heavy.

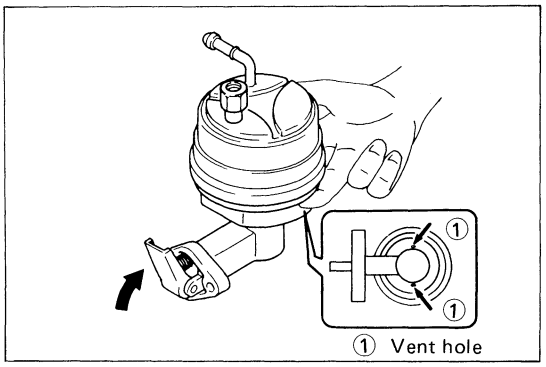
   Caution:
   Do not operate the arm forcibly.



Inspecting the Outlet Valve KAJS60

5. Oil seal inspection
   (1) Block the vent hole with a finger and operate the arm to check that the operating force becomes heavy.

   Caution:
   Do not operate the arm forcibly.

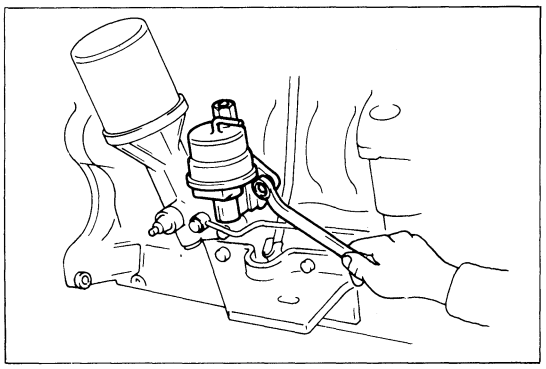


Inspecting the Oil Seal KAJS61

INSTALLATION

1. Fuel pump ASSY installation
   (1) Install the fuel pump ASSY, insulator and two gaskets to the cylinder block by using two set nuts.
   T = 1.85 kg-m (13 ft-lb)

   Caution:
   Surely bring the rocker arm into contact with the camshaft.

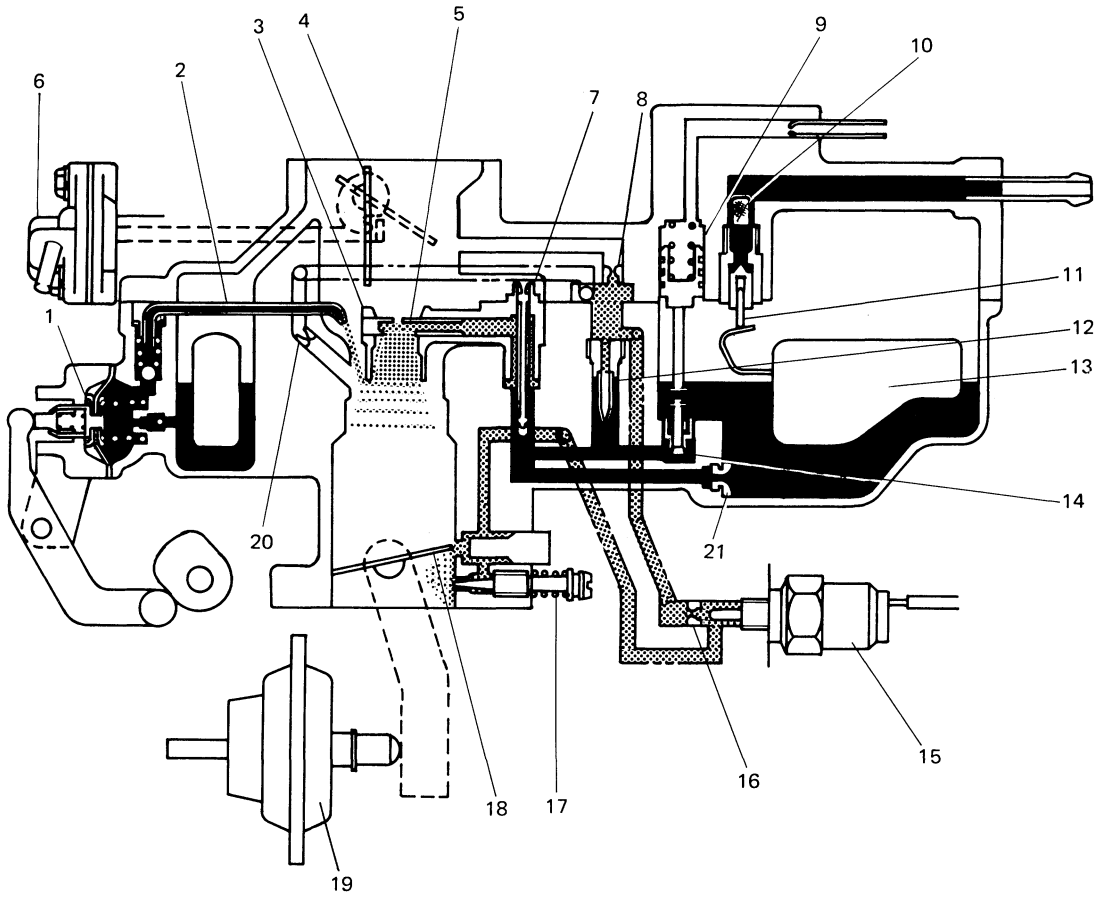


Installing the Fuel Pump ASSY KAJS25

2. Fuel pump piping connection

CARBURETOR

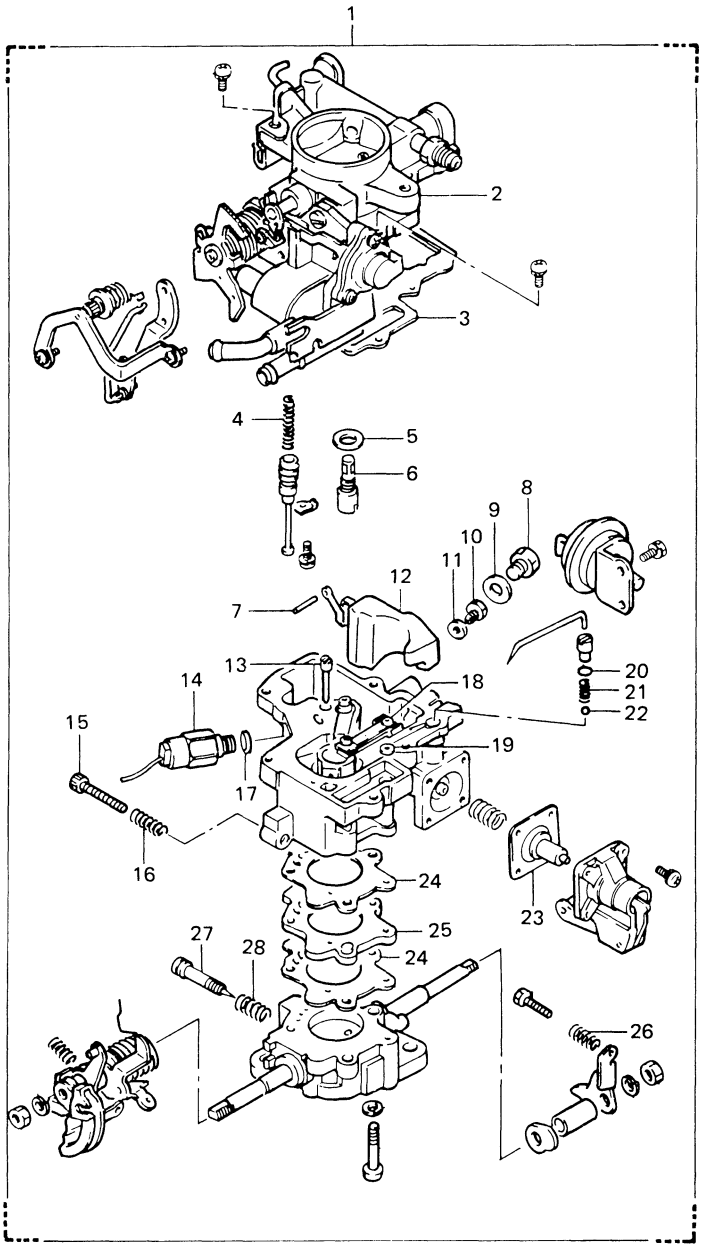
SYSTEM DIAGRAM



1. Accelerating pump diaphragm
2. Accelerating pump nozzle
3. Small Venturi tube
4. Choke valve
5. Main nozzle
6. Chock breaker
7. Main air bleed
8. Slow air bleed No. 2
9. Power piston
10. Strainer
11. Needle valve
12. Slow jet
13. Float
14. Power valve
15. Solenoid valve
16. Economizer jet
17. Idle adjusting screw
18. Throttle valve
19. Idle-up actuator
20. Slow air bleed No. 1
21. Main jet

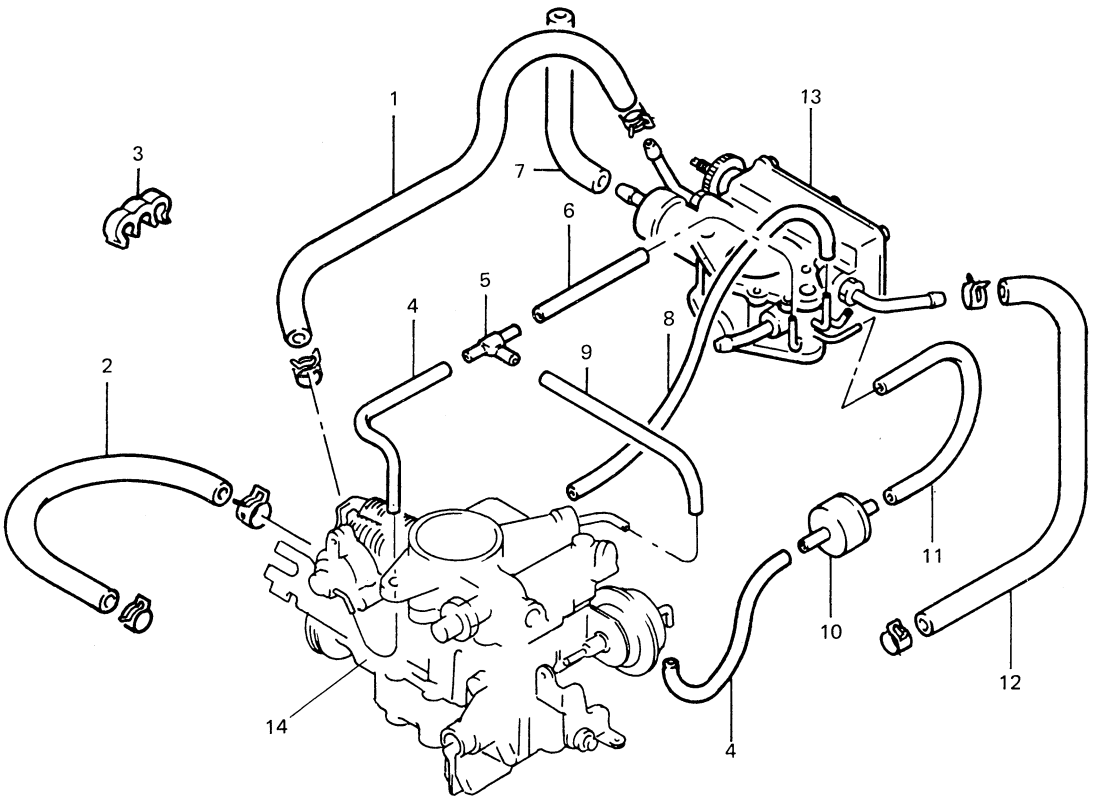
Carburetor System Diagram KAJM8

COMPONENTS



1. Carburetor ASSY
2. Air horn
3. Air horn gasket
4. Spring
5. Needle valve seat gasket
6. Needle valve
7. Float lever pin
8. Main passage plug
9. Gasket
10. Main jet
11. Gasket
12. Float
13. Slow jet
14. Solenoid valve
15. Throttle adjusting screw
16. Spring
17. Gasket
18. Hot idle compensator
19. Gasket
20. O-ring
21. Spring
22. Steel ball
23. Accelerating pump diaphragm
24. Gasket
25. Insulator
26. Spring
27. Idle adjusting screw
28. Spring

Carburetor Components KAJM9

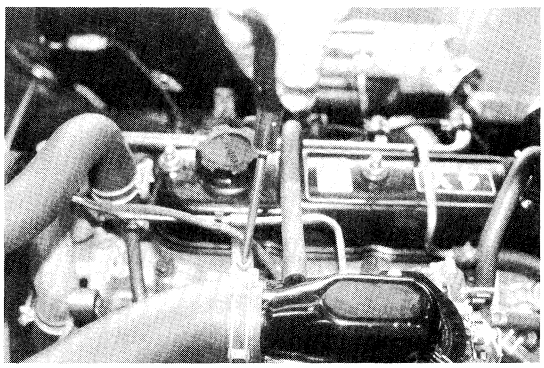


1. Water hose
2. Water hose
3. Hose clamp
4. Vacuum hose (L=30)
5. 3-way tube
6. Vacuum hose (L=80)
7. Air cleaner to air governor hose
8. Vacuum hose (L=300)
9. Vacuum hose (L=220)
10. Vacuum transmitting valve
11. Vacuum hose (L=100)
12. Water hose
13. Air governor
14. Carburetor

Vacuum Hose and Water Hose Components KAJM10

REMOVAL

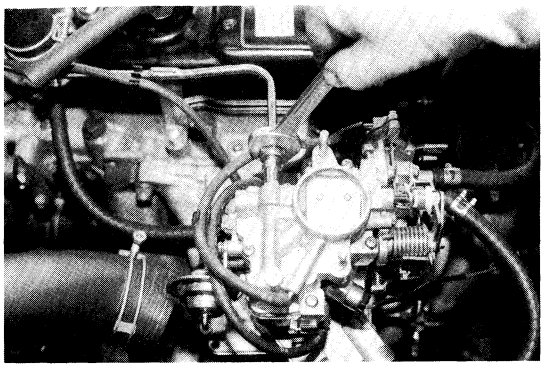
1. Air cleaner connector removal
   (1) Disconnect the air cleaner hose.
   (2) Disconnect ventilation hose No. 3.
   (3) Disconnect the connector to governor hose.
   (4) Remove two set bolts, and remove the air cleaner connector.



Disconnecting the Air Cleaner Hose LAO77-1

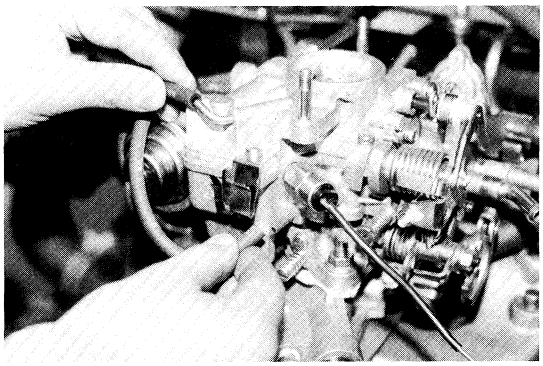
2. Accelerator wire disconnection

3. Carburetor removal
   (1) Disconnect the fuel pipe.
   (2) Disconnect two water hoses.



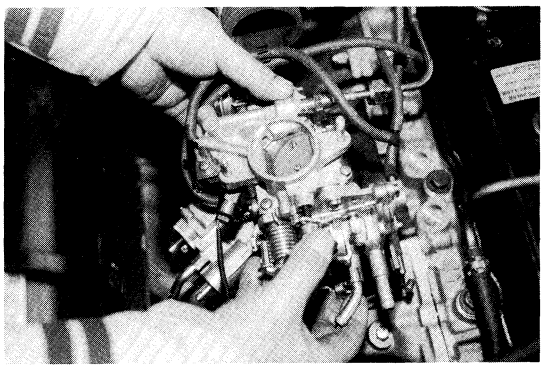
Disconnecting the Fuel Pipe LAO77-3

   (3) Disconnect four vacuum hoses.
   (4) Disconnect the solenoid valve connector.



Disconnecting the Vacuum Hose KAJ11-27

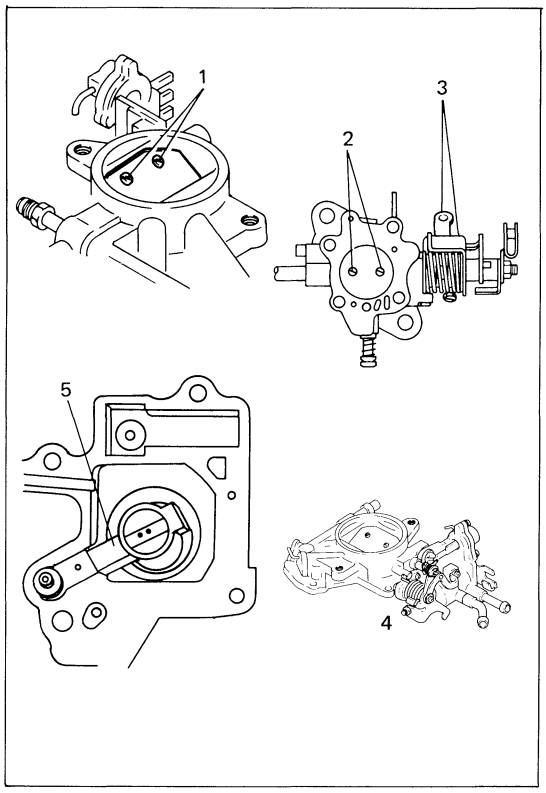
   (5) Remove two set nuts and remove the carburetor ASSY.



Removing the Carburetor LAO76-3

DISASSEMBLY

Caution:
- Since there are many similar components, arrange the disassembled components orderly.
- Use the SST (carburetor driver set).
  SST 09860-76001-71
  (SST 09860-11011)
- Do not disassemble the following parts:
  1. Choke valve set screws
  2. Throttle valve set screws
  3. Throttle arm
  4. Automatic choke mechanism
  5. Small venturi tube
  6. Power valve

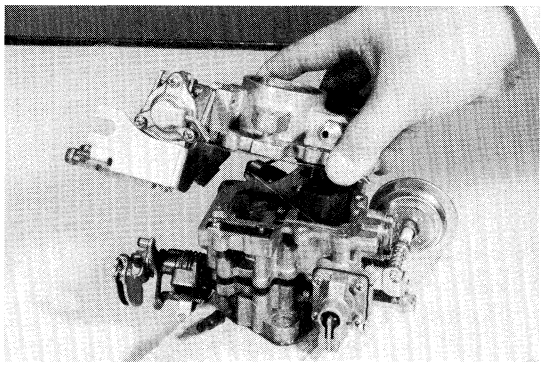


Parts Not Allowing Disassembly KAJS28,29,30,31

Air Horn Disassembly

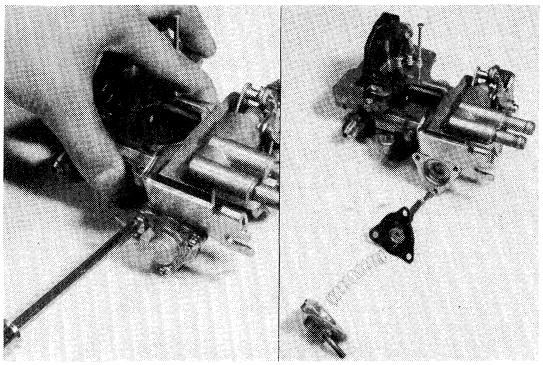
Caution:
Do not separate the wax body from the air horn.

1. Air horn ASSY removal
   (1) Remove 5 set screws, and remove the air horn and gasket from the body.



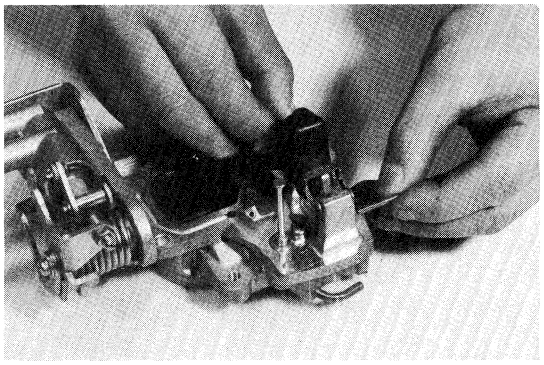
Removing the Air Horn KAJ17-17

2. Choke breaker disassembly
   (1) Set screw (3 pcs.)
   (2) Cover
   (3) Spring
   (4) Diaphragm with lever
   (5) Gasket



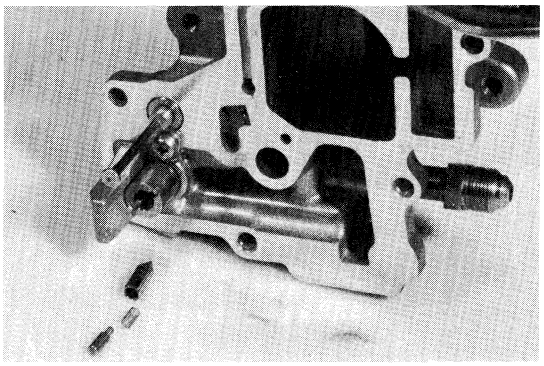
Disassembling the Choke Breaker KAJ17-20,22

3. Float removal
   (1) Remove the float lever pin, and remove the float.



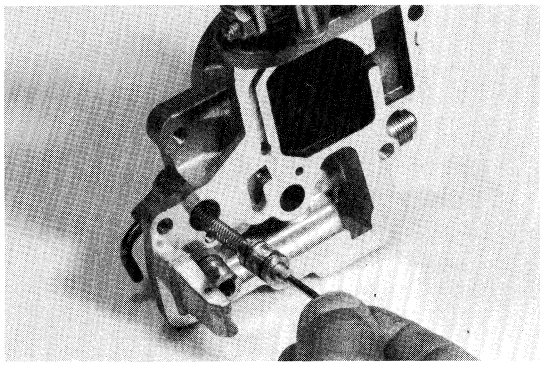
Removing the Float KAJ17-24

4. Needle valve removal
   (1) Needle valve bush pin
   (2) Spring
   (3) Needle valve



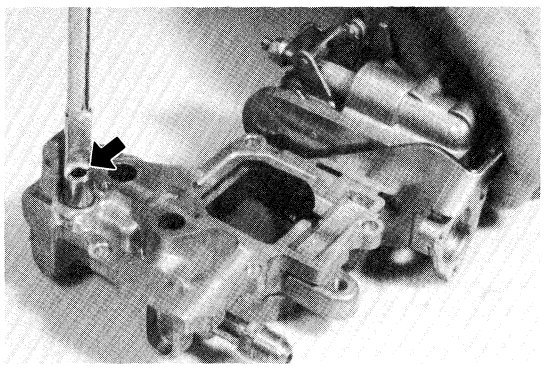
Removing the Needle Valve KAJ17-29

5. Power piston removal
   (1) Remove the power piston stopper screw, and remove the power piston stopper, power piston and spring.



Removing the Power Piston KAJ17-28

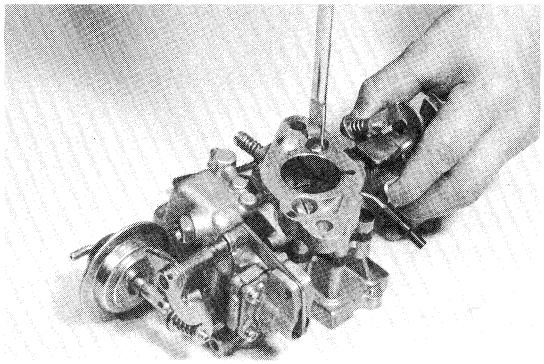
6. Needle valve seat removal
   (1) Needle valve seat
   (2) Gasket



Removing the Needle Valve Seat KAJ17-31

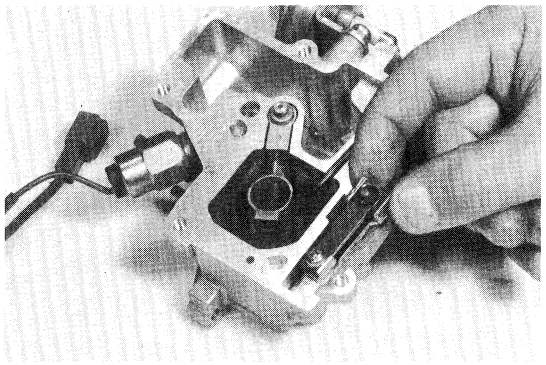
Carbretor Body Disassembly

1. Carburetor body removal
   (1) Remove two screws, and disconnect the carburetor body and the flange.
   (2) Remove the gasket and insulator.



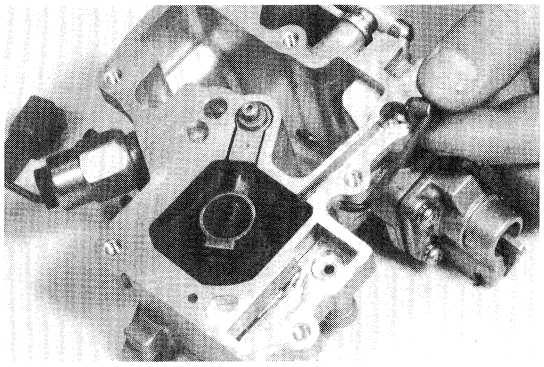
Disconnecting the Carburetor Body and Flange KAJ18-16

2. Hot idle compensator removal
   (1) Hot idle compensator
   (2) Gasket



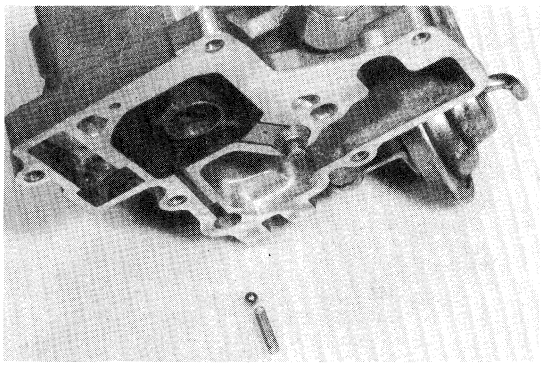
Removing the Hot Idle Compensator KAJ18-19

3. Accelerating pump nozzle and outlet check valve removal
   (1) Accelerating pump nozzle
   (2) O-ring



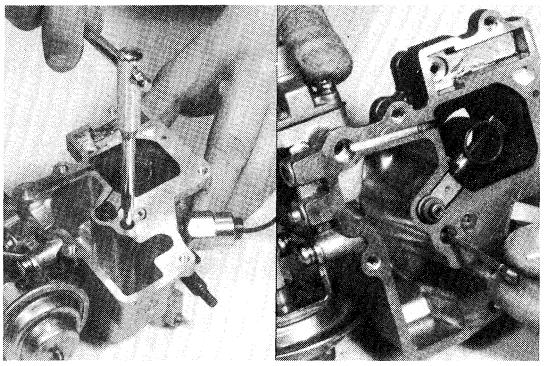
Removing the Accelerating Pump Nozzle KAJ18-20

   (3) Spring
   (4) Steel ball



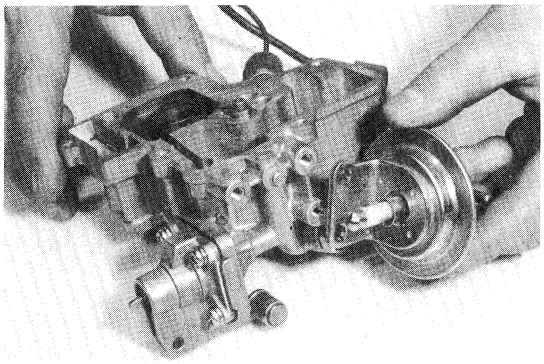
Removing the Outlet Check Valve KAJ18-21

4. Slow jet removal



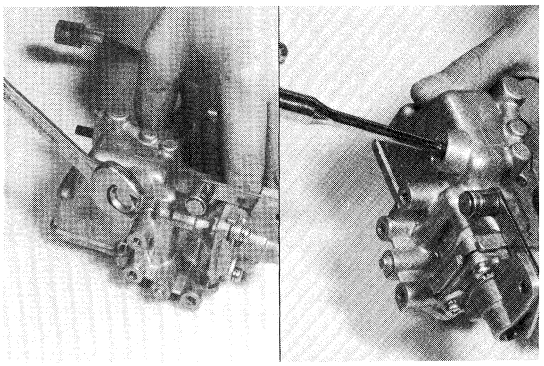
Removing the Slow Jet KAJ18-22,23

5. Idle-up actuator removal
   (1) Remove two set screws and remove the idle-up actuator.



Removing the Idle-up Actuator KAJ18-25

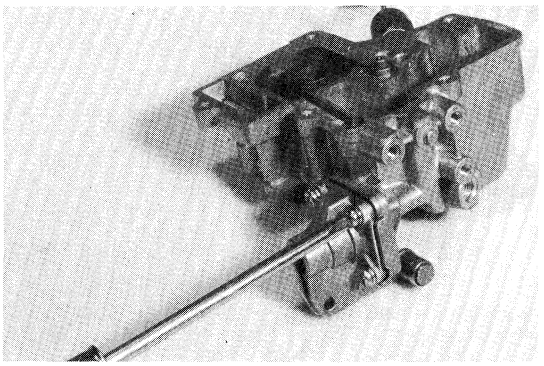
6. Main jet removal
   (1) Remove the main passage plug and gasket.
   (2) Remove the main jet and gasket from the main passage plug hole.



Removing the Main Jet KAJ18-26,28

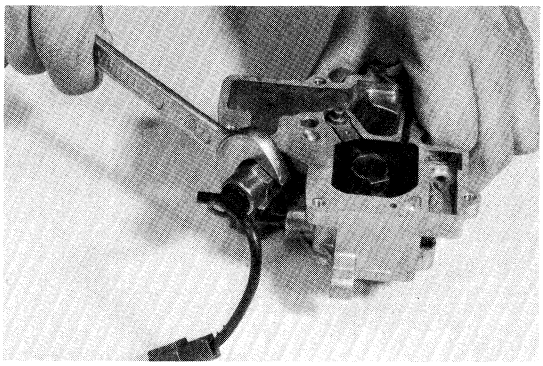
7. Accelerating pump diaphragm removal
   (1) Remove four set screws, and remove the accelerating pump cover.
   (2) Remove the diaphragm and spring.

8. Throttle adjusting screw removal
   (1) Throttle adjusting screw
   (2) Spring



Removing the Throttle Adjusting Screw KAJ18-30

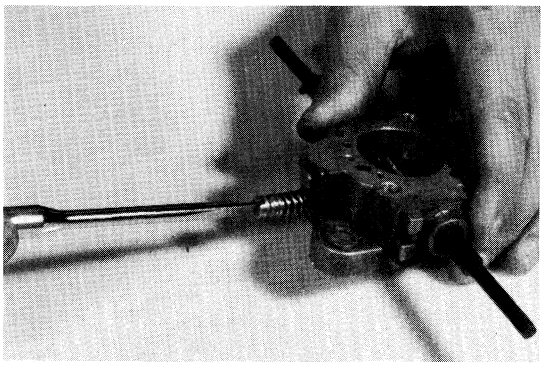
9. Solenoid valve removal



Removing the Solenoid Valve KAJ18-32

Flange Disassembly

1. Idle adjusting screw removal
   (1) Idle adjusting screw
   (2) Spring

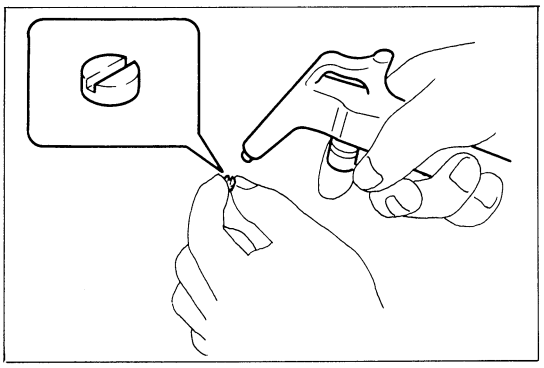


Removing the Idle Adjusting Screw KAJ19-28

DISASSEMBLED COMPONENTS CLEANING

1. Cleaning of disassembled components before inspection
   (1) Use a soft brush, and wash and clean casted components.
   (2) Clean the carbon around the throttle valve.
   (3) Wash other components.
   (4) Blow off all dirt and foreign matters from the jets, fuel passage and body sliding contact surface.

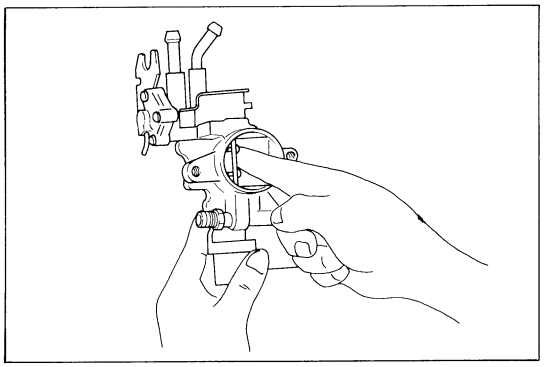
   Caution:
   Do not clean the jets with a wire since the holes may be deformed.



Cleaning the Jet KAJS34

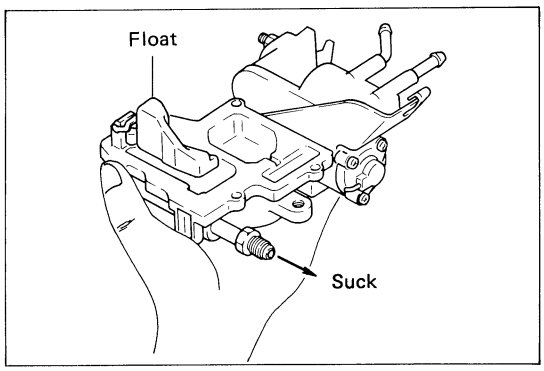
INSPECTION

1. Choke valve and choke shaft inspection
   (1) Push the choke valve with a finger and check that it is fully opened smoothly.



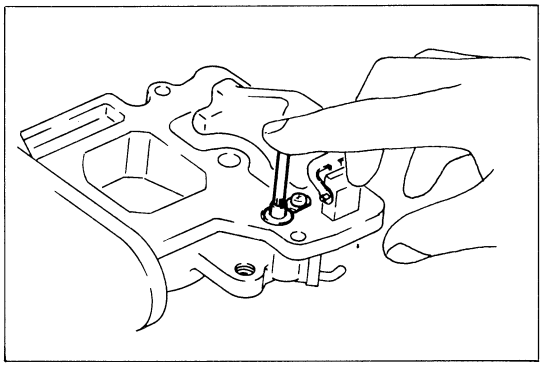
Inspecting the Choke Valve and Choke Shaft KAJS32

2. Needle valve inspection
   (1) Check the sliding motion of the needle valve.
   (2) Install the float and reverse the air horn, check if air is leaking when sucked from the fuel inlet pipe side.



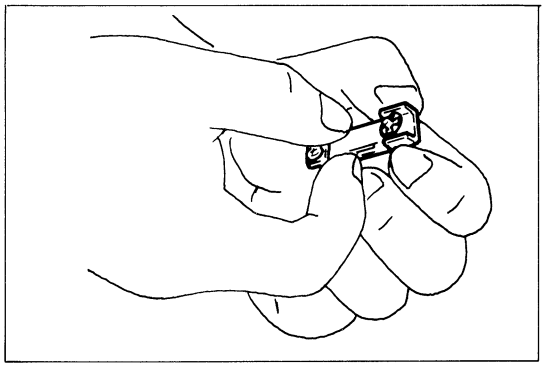
Inspecting the Needle Valve KAJS33

3. Power piston sliding status inspection
   (1) Install the power piston to the carburetor body with the spring in-between. Check that the pushed with a finger slides smoothly without looseness.



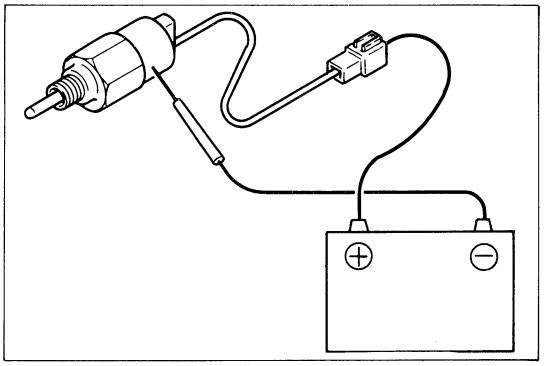
Inspecting the Power Piston Sliding Status KAJS35

4. Hot idle componsator inspection
   (1) Use fingers to move the valve of the hot idle compensator, and check that it moves lightly.



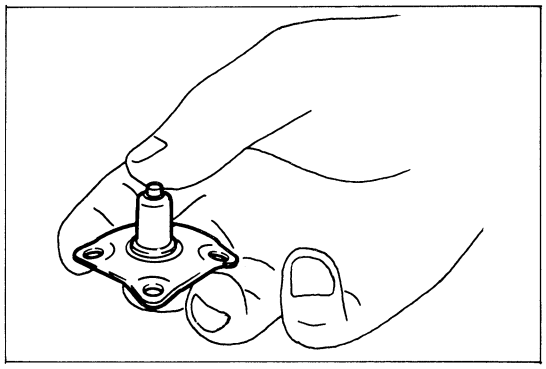
Inspecting the Hot Idle Compensator KAJS36

5. Solenoid valve function check
   (1) Connect the solenoid valve to the battery and set it to ON of OFF. Check that clicking sound is heard.
   (2) Replace the valve if it does not function correctly.



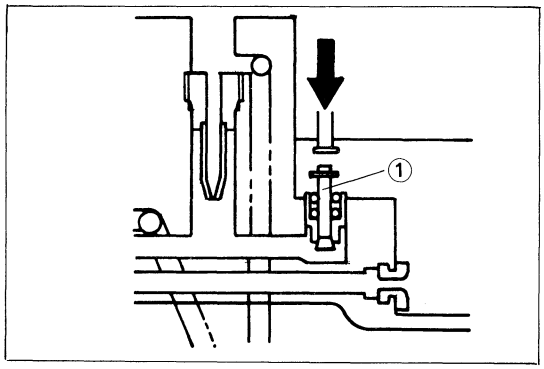
Inspecting the Solenoid Valve Function KAJS37

6. Accelerating pump diaphragm inspection
   (1) Check the diaphragm for any damage.
   (2) Push the plunger rod with a finger. Check that it moves smoothly.



Inspecting the Plunger Rod KAJS38

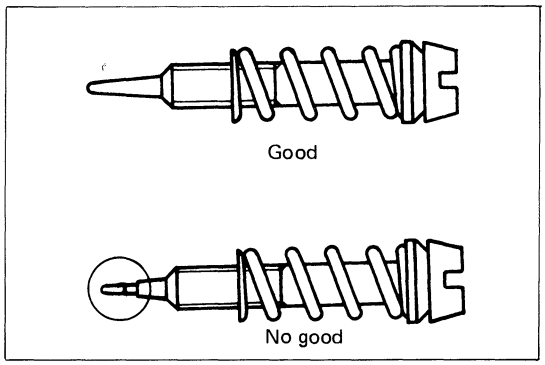
7. Power valve sliding inspection
   (1) Push the power valve rod ① lightly with a finger, and check that it slides smoothly.



Inspecting the Power Valve Sliding Status KAJS39

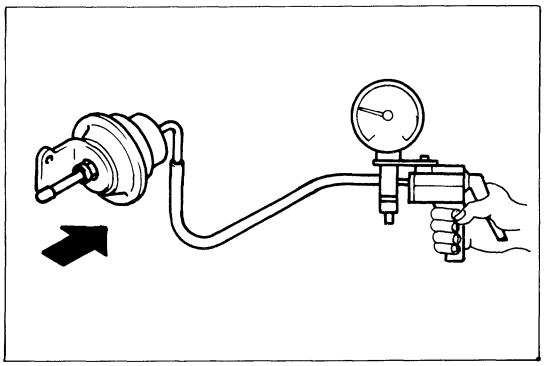
8. Idle adjusting screw inspection
   (1) Check that the tapered portion of the idle adjusting screw is not stepped and that the threaded portion is not damaged.

9. Throttle valve and shaft inspection
   (1) Operate the throttle lever, and check that the throttle shaft slides smoothly.



Inspecting the Idle Adjusting Screw KAJS40

10. Idle-up actuator inspection
    (1) Check that the rod moves when a negative pressure is applied to the diaphram chamber.
    (2) Check that the rod quickly returns to the original position when the negative pressure is set from the state in (1) to zero.



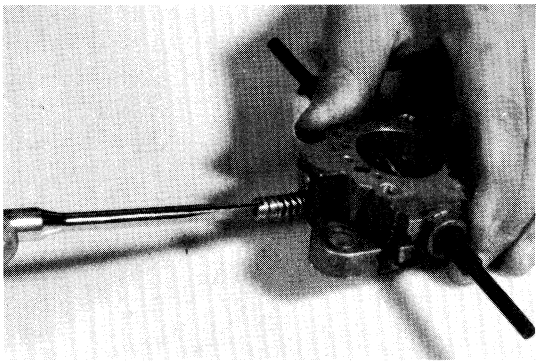
Inspecting the Idle-up Actuator KAJS41

ASSEMBLY

Caution:
Replace all gaskets and O-rings with new ones.

Flange Assembly

1. Idle adjusting screw installation
   (1) Install the idle adjusting screw and spring.

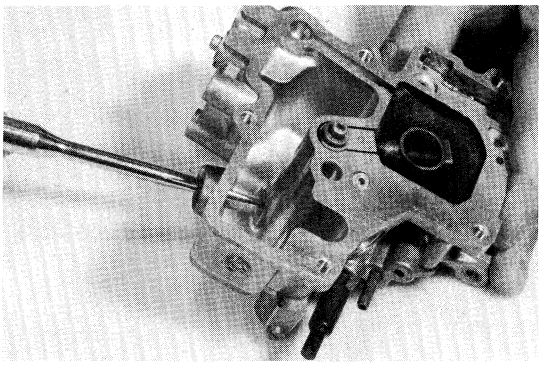


Removing the Idle Adjusting Screw KAJ19-28

Carburetor Body Assembly

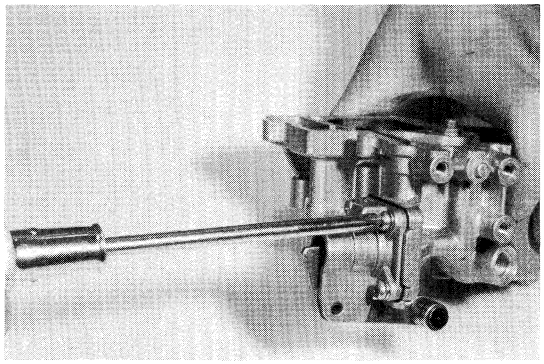
1. Solenoid valve installation
   (1) Install the solenoid valve to the carburetor body with a new gasket in-between.

2. Main jet installation
   (1) Install the main jet through the main passage plug hole with a new gasket in-between.
   (2) Install the main passage plug with a new gasket in-between.



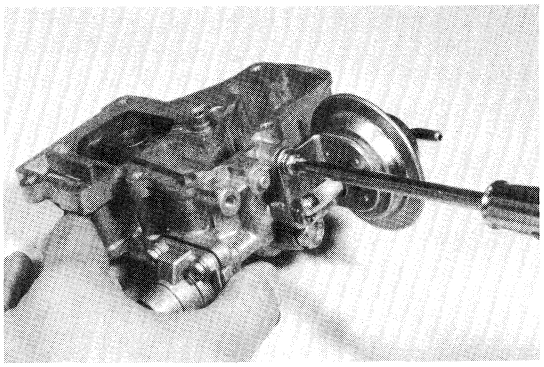
Installing the Main Jet KAJ19-13

3. Accelerating pump diaphragm installation
   (1) Install the spring, diaphragm and accelerating pump, and tighten four set screws.



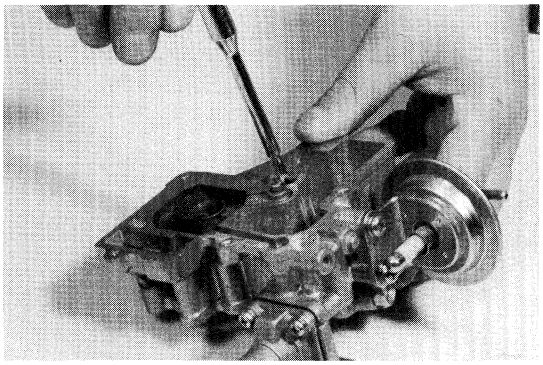
Installing the Accelerating Pump Diaphragm KAJ19-14

4. Idle-up actuator installation
   (1) Use two screws and install the idle-up actuator to the carburetor body.



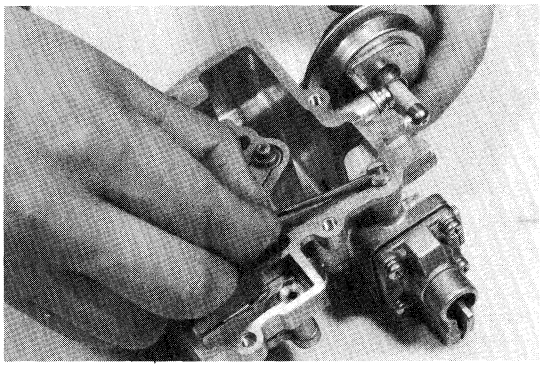
Installing the Idle-up Actuator KAJ19-16

5. Slow jet installation



Installing the Slow Jet KAJ19-17

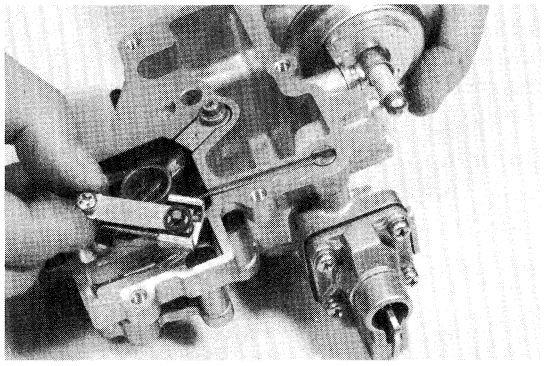
6. Accelerating pump nozzle and outlet check valve installation
   (1) Install the steel ball and spring.
   (2) Install the accelerating pump nozzle with a new O-ring in-between.



Installing the Accelerating Pump Nozzle KAJ19-18

7. Hot idle compensator installation
   (1) Install the gasket.
   (2) Install the hot idle compensator.

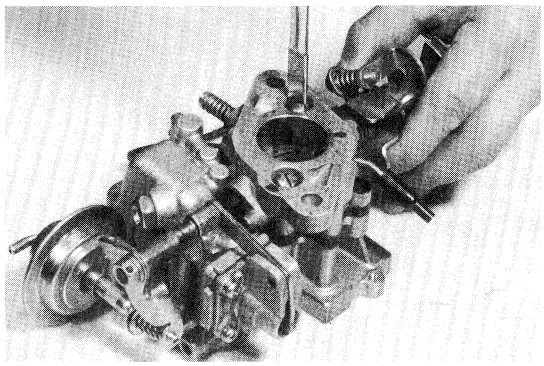
8. Throttle adjusting screw installation
   (1) Install the throttle adjusting screw and spring.



Installing the Hot Idle Compensator KAJ19-19

Carburetor Body Installation

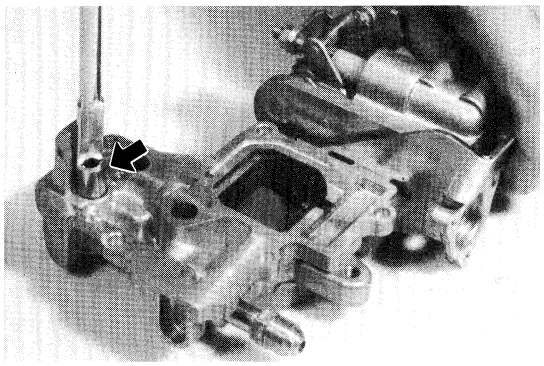
1. Carburetor body installation
   (1) Install the carburetor body to the flange with the insulator and new gasket in-between, and tighten two screws.



Installing the Carburetor Body KAJ18-16

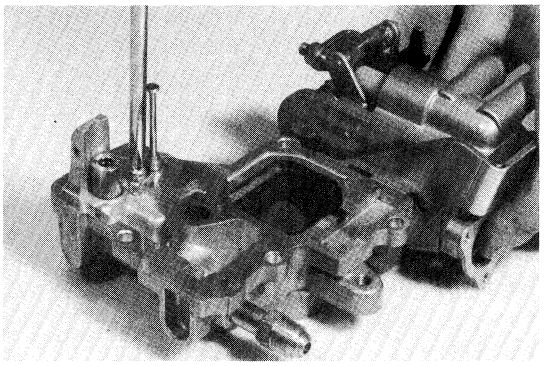
Air Horn Assembly

1. Needle valve seat installation
   (1) Install the needle valve seat with a new gasket in-between.



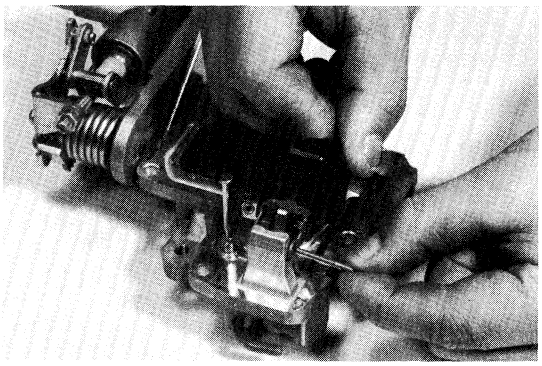
Installing the Needle Valve Seat KAJ17-31

2. Power piston installation
   (1) Install the spring and power piston, and tighten the stopper screw to fix the power piston stopper.



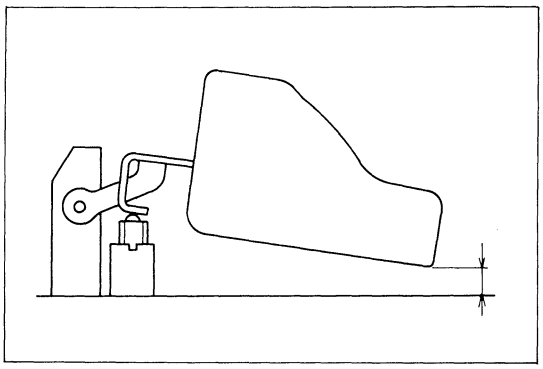
KAJ17-26

3. Float level inspection and adjustment
   (1) Install the needle valve, spring and needle valve bush pin in this order to the valve seat.
   (2) Install the float and float lever pin.



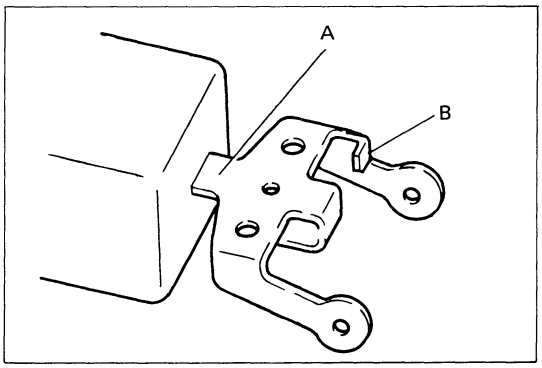
Installing the Float KAJ17-23

   (3) Reverse the air horn. When the float falls by it own weight, use the SST and measure the clearance between the float tip end and air horn.
   SST 09240-76002-71
   (SST 09240-00014)
   Standard: 5.5 mm (0.217 in.)



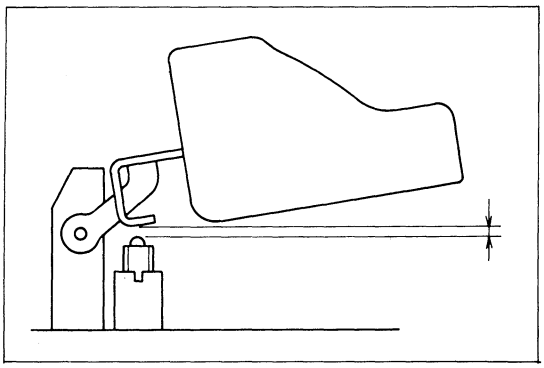
Measuring the Float Level
(Float Raised Position) KAJS42

   If the standard is not satisfied, bend the A portion of the float lever for adjustment.



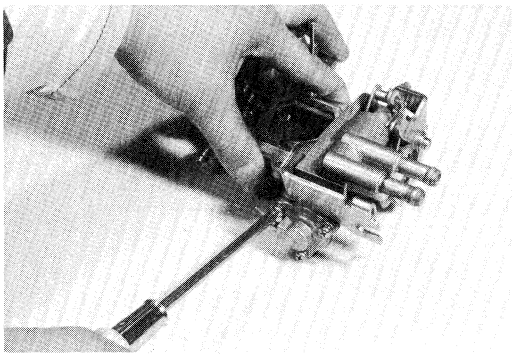
Float Level Adjusting Position KAJS43

   (4) Raise the float and measure the clearance between the float lip portion and valve bush pin with the SST.
   SST 09240-76003-71
   (SST 09240-00020)
   Standard: 1.1 – 1.3 mm
   (0.043 – 0.051 in.)
   If the standard is not satisfied, bend the B portion of the float lever for adjustment. (See the illustration above.)



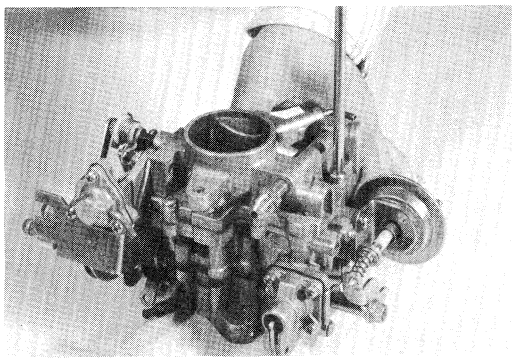
Measuring the Float Level
(Float Lowered Position) KAJS44

4. Choke breaker installation
   (1) Install a new gasket, diaphragm with lever, spring and cover, and tighten three screws.



Installing the Choke Breaker KAJ17-20

5. Air horn installation
   (1) Install the air horn to the carburetor body by tightening five air horn set screws which also hold the solenoid wire clamp and number plate.



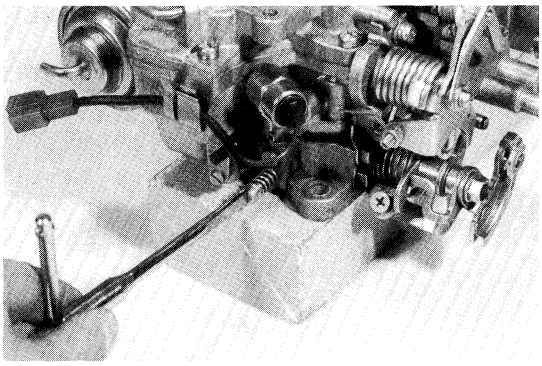
Installing the Air Horn KAJ17-15

CARBURETOR ADJUSTMENT

SST 09240-00014, 09240-00020

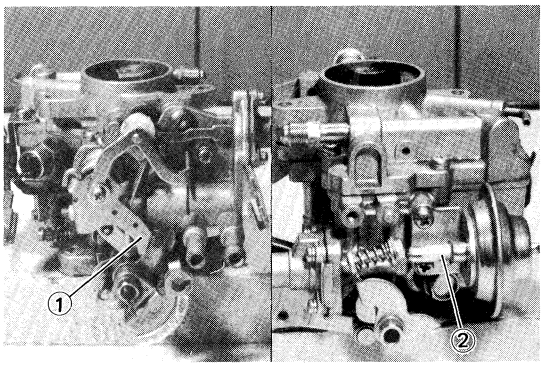
1. Idle adjusting screw adjustment
   (1) Fully tighten the idle adjusting screw, and then loosen it by about three turns.

   Caution:
   Do not tighten too tightly.



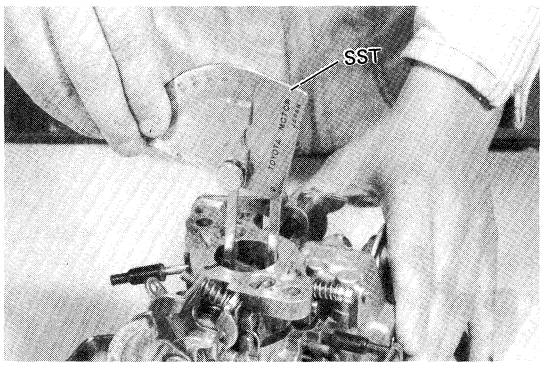
Adjusting the Idle Adjusting Screw KAJ19-25

2. Throttle valve adjustment
   (1) Forcibly turn the fast idle cam ① clockwise. To bring the cam into released state.
   (2) Retract the idle-up actuator rod ②.



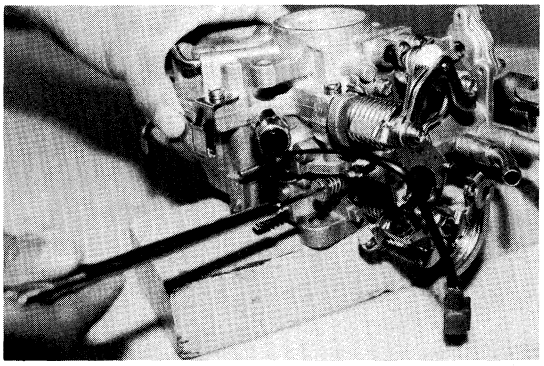
Fast Idle Cam, Idle Up Actuator Rod KAJ17-6,10

   (3) Measure throttle valve idle opening angle.
   SST 09240-76002-71
   (SST 09240-00014)
   Standard (from horizontal level): 13.5°



Measuring the Idle Opening KAJ19-36

   (4) Adjust the throttle adjusting screw.



Adjusting the Idle Opening KAJ22-1

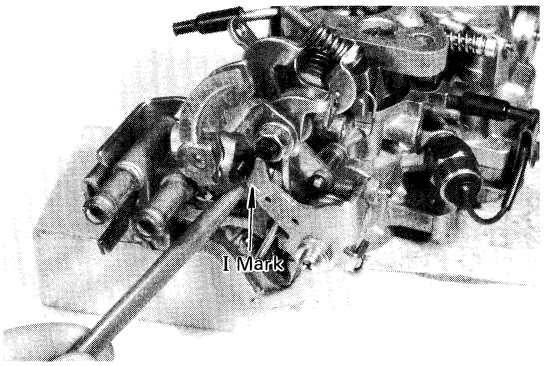
3. Fast idle inspection and adjustment

Caution:
- **First remove the carburetor assembly. Inspect and adjust it when the ambient temperature is 25 ± 2°C.**
- **Do not adjust unless necessary.**

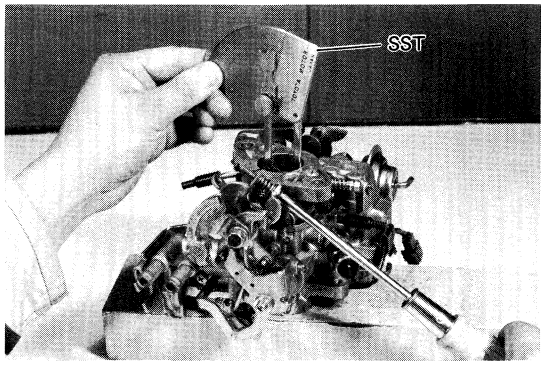
(1) Measure the throttle valve opening angle when the fast idle adjusting lever roller center matches the I mark on the fast idle cam.
SST 09240-76002-71
(SST 09240-00014)

Standard (from horizontal level):
23 – 25°

(2) Turn the fast idle adjusting screw for adjustment.
(3) If the I mark on the fast idle cam does not match the roller center when the ambient temperature is at 25 ± 2°C, measure the throttle valve opening angle after adjusting the fast idle cam.
(See page 3-27.)



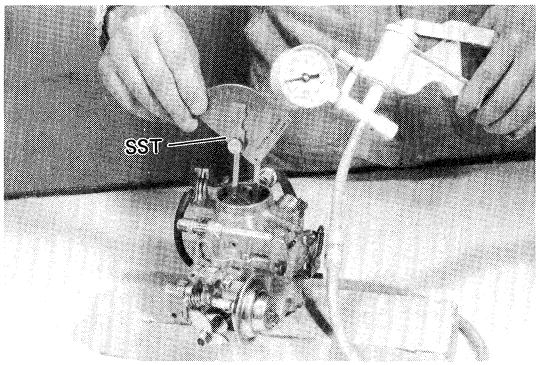
Fast Idle Cam (I Mark) **KAJ20-5**



Adjusting the Fast Idle Opening Angle **KAJ20-6**

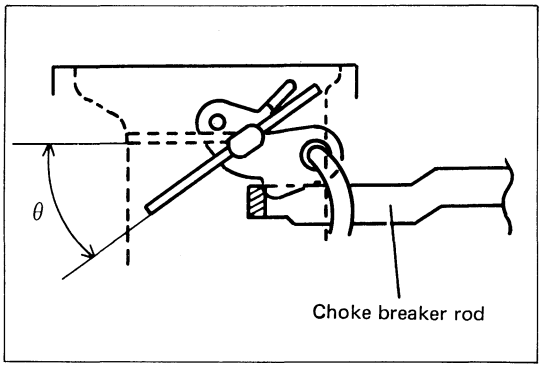
4. Choke breaker inspection and adjustment
(1) Apply a pressure of 400 mmHg or more to the choke breaker diaphragm chamber, and measure the choke valve opening angle (θ).
SST 09240-76002-71
(SST 09240-00014)

Standard (from horizontal level):
39 – 41°



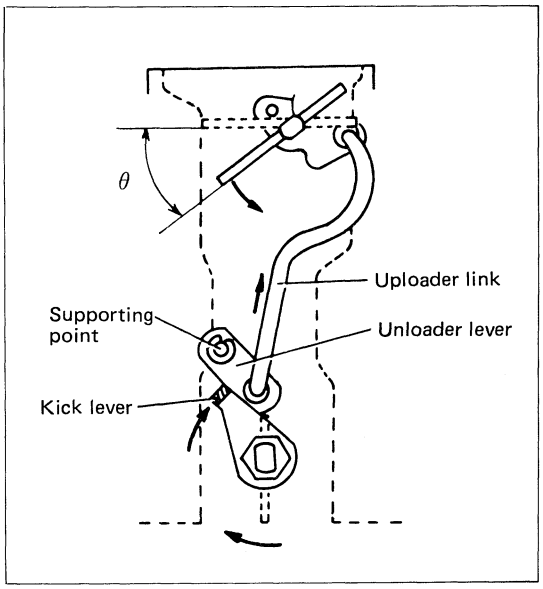
Measuring the Choke Valve Opening Angle **KAJ20-1**

For adjustment, bend the choke breaker rod end.
(2) Check if the choke valve opens and the reading does not drop when a negative pressure is applied.



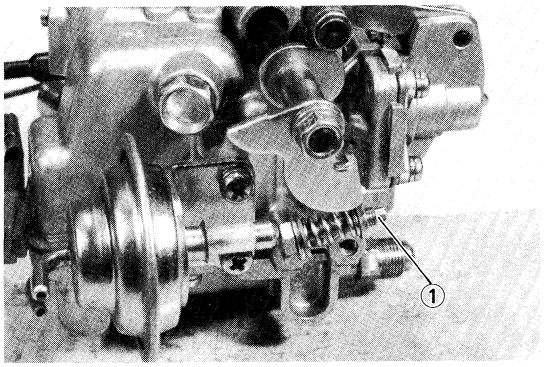
Adjusting the Choke Valve Opening Angle **KAJS45**

5. Unloader inspection and adjustment
   (1) Measure the choke valve angle (θ) when the throttle valve is fully open.
   Standard (from horizontal level):
   38 – 42°
   To adjust, bend the kick lever.



Inspecting and Adjusting the Unloader KAJS46

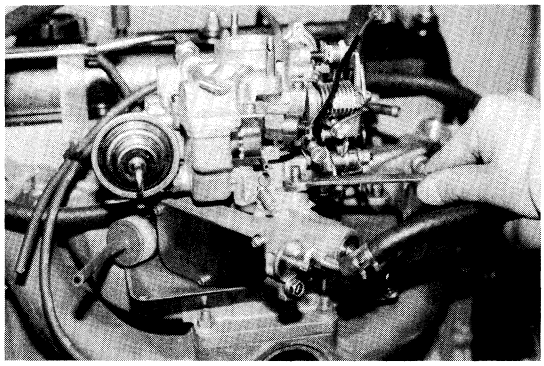
6. Idle-up actuator inspection and adjustment
   (1) Forcibly turn the fast idle cam clockwise to release the cam.
   (2) Measure the throttle valve angle (touch angle) when the idle-up actuator rod is in contact with the adjusting rod.
   Standard (from horizontal level): 17.5°
   For adjustment, turn the adjusting screw ①.



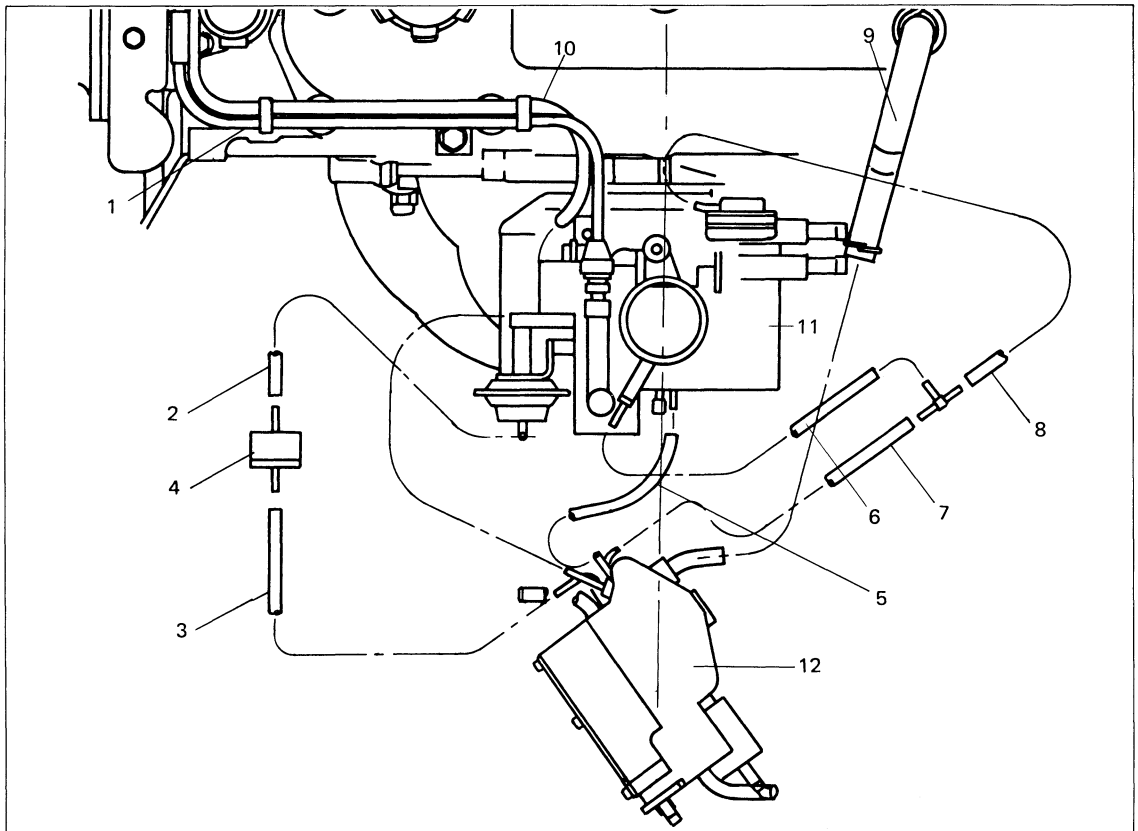
Adjusting Touch Angle **KAJ20-8**

INSTALLATION

1. Carburetor installation
   (1) Install the carburetor. Tighten two set nuts.
   T = 2.04 kg-m (14.8 ft-lb)
   (2) Connect the solenoid valve connector.
   (3) Connect four vacuum hoses.
   (4) Connect two water hoses.
   (5) Connect the fuel pipe.
2. Accelerator wire connection
3. Air cleaner connector connection
4. Engine adjustment
   (See 1. Engine Adjustment section.)



Carburetor Installation KAJ11-30



1. Fuel pipe
2. Vacuum hose (ℓ = 30)
3. Vacuum hose (ℓ = 100)
4. Vacuum transmitting valve
5. Vacuum hose (ℓ = 300)
6. Vacuum hose (ℓ = 220)
7. Vacuum hose (ℓ = 80)
8. Vacuum hose (ℓ = 30)
9. Ventilation hose
10. Vacuum hose
11. Carburetor
12. Air governor

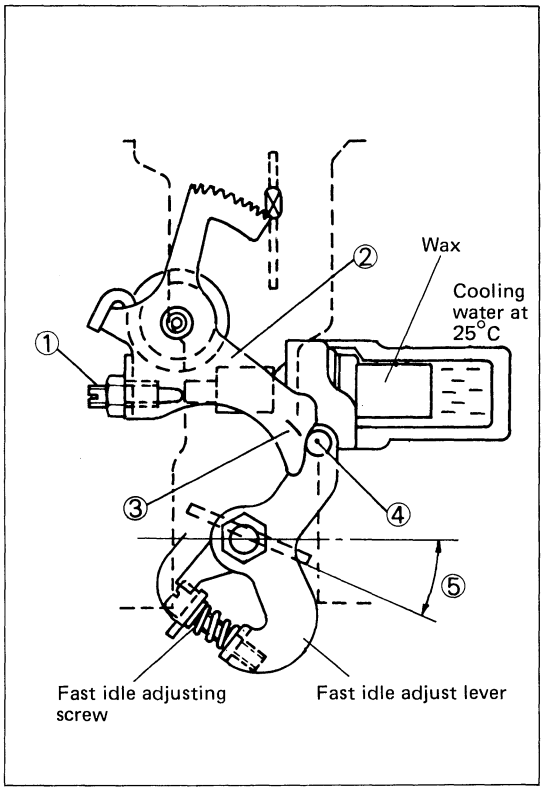
Vacuum Hoses and Fuel Piping KAJS47

FAST IDLE CAM ADJUSTMENT

Caution:
- Adjust the fast idle cam when the ambient temperature is 25 ± 2°.
- Do not make adjustment unless it is absolutely necessary.

1. Turn the adjust screw ① to bring the I mark ③ on the fast idle cam ② to the center of the fast adjust lever roller pin ④. Tighten the lock nut.

2. After I mark alignment, adjust the fast idle opening angle ⑤ (See to 3-24)



Adjusting the Fast Idle Cam KAJS48

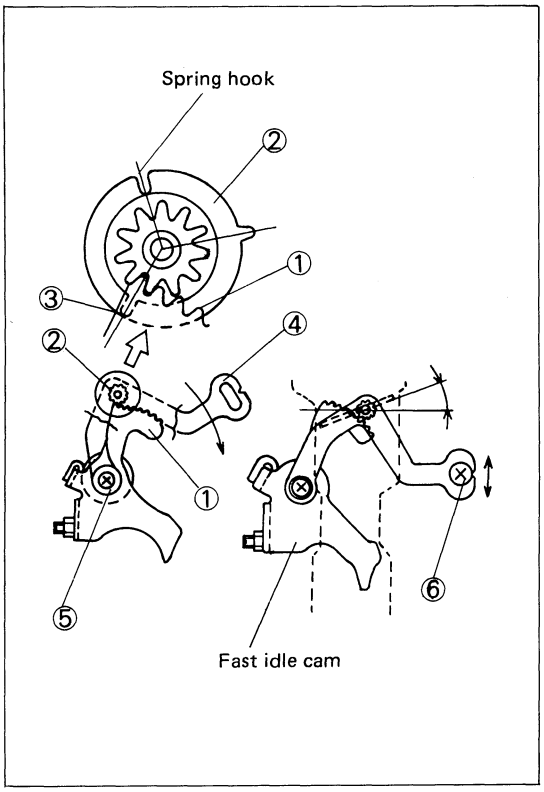
CHOKE VALVE ADJUSTMENT

Caution:
Do not make adjustment unless it is absolutely necessary.

1. After I mark alignment, match the rack ① and pinion ② positions when the ambient temperature is 25 ± 2°C.

2. Turn the pinion until the leftmost tooth of the rack matches the pinion teeth on both sides of the matching mark ③.

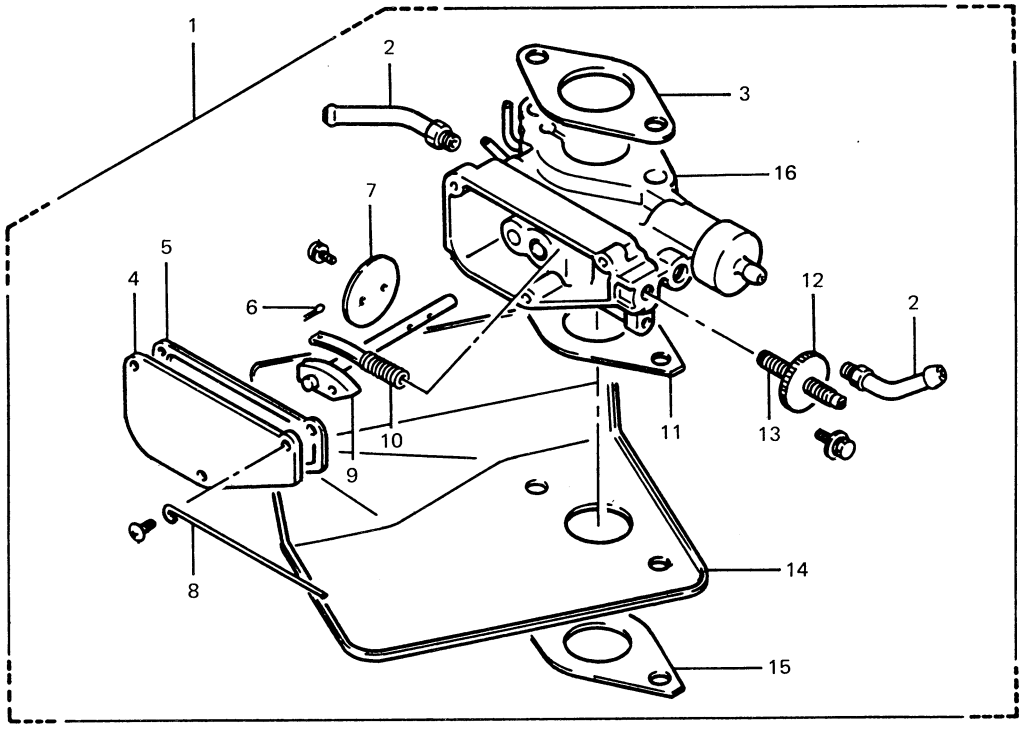
3. Turn the pinion lever ④ clockwise until the choke lever is at 16 to 21° degrees from the horizontal level. Tighten set screws ⑤ and ⑥.



Adjusting the Choke Valve KAJS49

AIR GOVERNOR

COMPONENTS



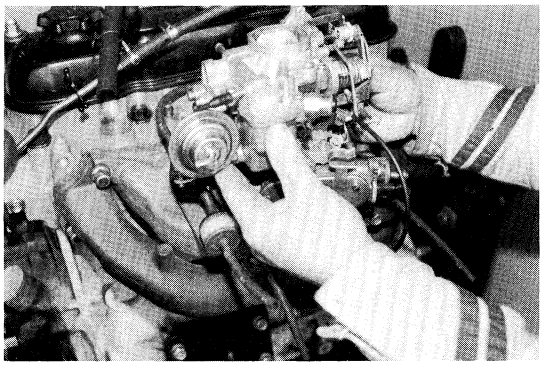
1. Air governor assy
2. Union
3. Gasket
4. Cover
5. Gasket
6. Snap ring
7. Throttle valve
8. Wire
9. Throttle valve shaft sub-assy
10. Spring sub-assy
11. Heat insulator
12. Bush
13. Adjusting screw
14. Insulator plate
15. Gasket
16. Governor body

Air Governor Components KAJM16

REMOVAL

1. Carburetor assy removal

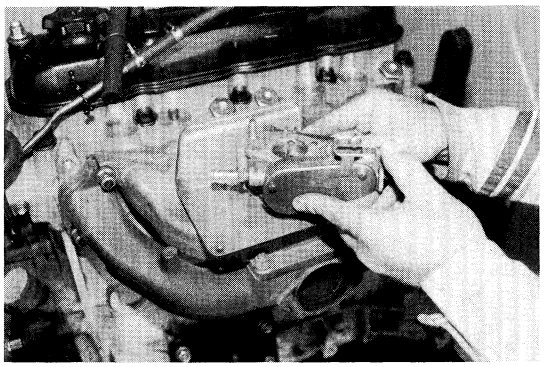
   Note:
   See the CARBURETOR REMOVAL section.



Removing the Carburetor Assy KAJ10-15

2. Air governor ASSY removal
   (1) Remove the carburetor gasket.
   (2) Remove the air governor ASSY.

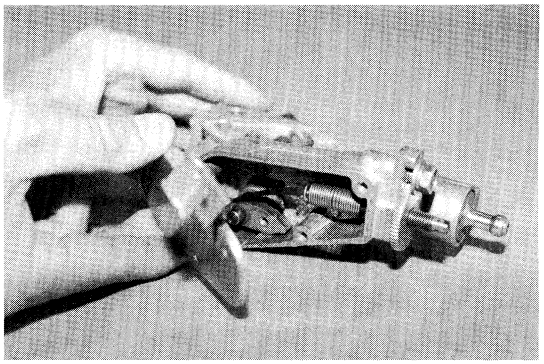
   Caution:
   After removing the air governor, cover the intake manifold opening to prevent dust entrance.



Removing the Air Governor Assy KAJ10-12

DISASSEMBLY

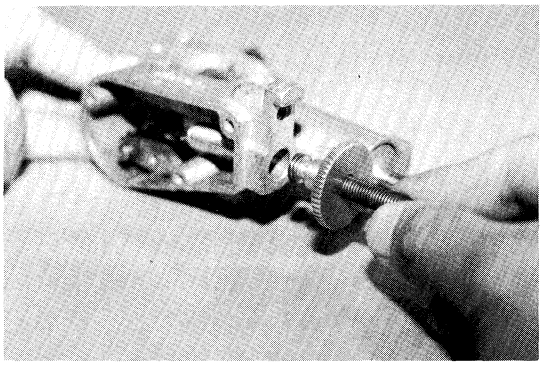
1. Governor cover removal
   (1) Untie the lock wire.
   (2) Remove three set screws. Remove the governor cover.



Removing the Governor Cover KAF22-18

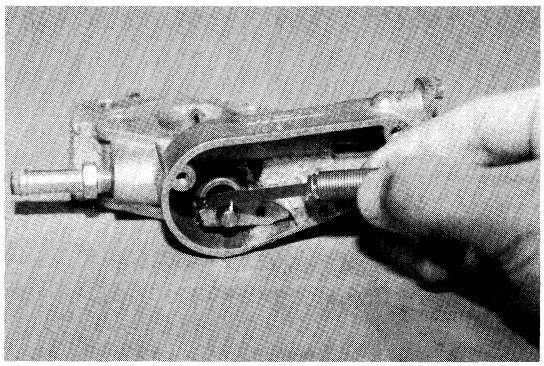
2. Bush w/ adjusting screw removal
   (1) Remove the lock bolt.
   (2) Turn the adjusting screw counterclockwise. Remove the bush w/ adjusting screw.

   Caution:
   Note the screwed in depths of the screw and bush.



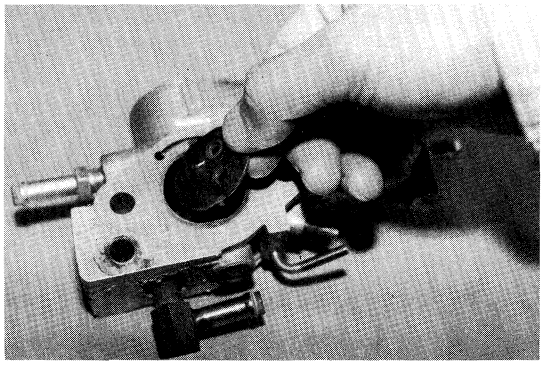
Removing the Bush w/ Adjusting Screw KAF22-22

3. Spring SUB-ASSY removal
   (1) Remove the snap ring. Remove the spring SUB-ASSY.



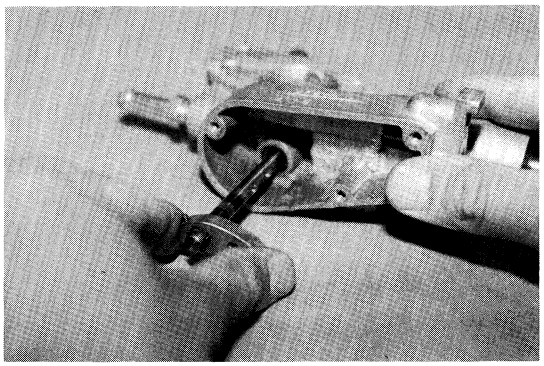
Removing the Spring Sub-assy KAF22-26

4. Throttle valve and valve shaft
   (1) Remove valve set screws (2 pcs.). Remove the throttle valve.



Removing the Throttle Valve KAF22-28

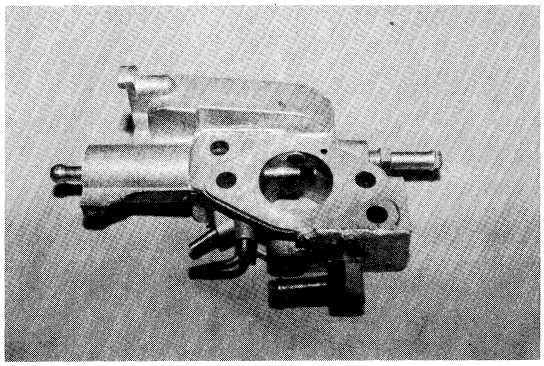
   (2) Remove the throttle valve shaft.



Removing the Throttle Valve Shaft KAF22-29

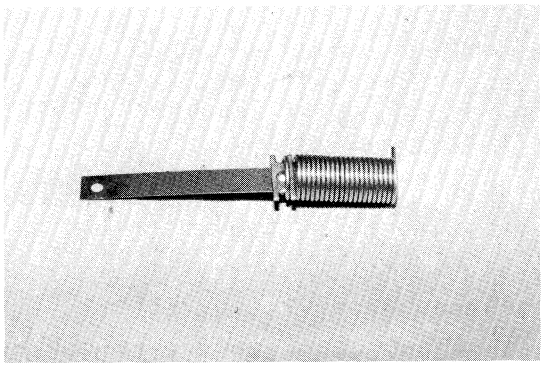
INSPECTION

1. Governor body inspection
   (1) Inspect the governor body for any corrosion. Remove any or rusting with fine grained sandpaper.
   (2) Manually move the stabilizer piston. Check smooth sliding without sticking.
   (3) Inspect the body for distortion. Replace the body if distorted.



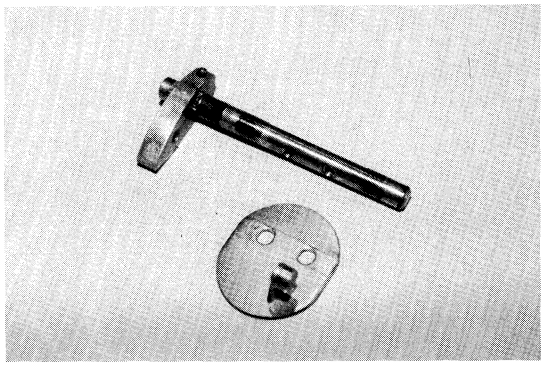
Inspecting the Governor Body KAF22-31

2. Governor spring and ribbon inspection
   (1) Replace the governor spring if any fatigue, deformation or other abnormality is found.
   (2) Replace the governor ribbon if any bending, deformation, crack, or other abnormality is found.



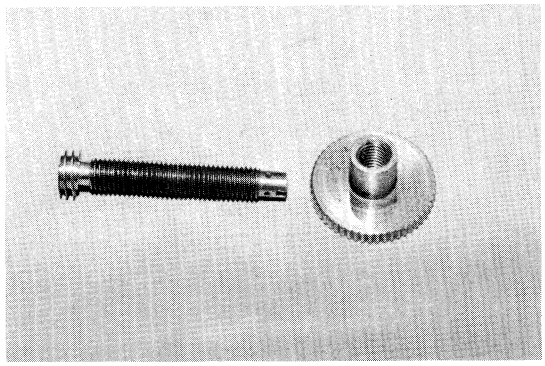
Inspecting the Governor Spring and Ribbon KAF22-33

3. Throttle valve and the valve shaft inspection
   (1) Damage and deformation of the throttle valve.
   (2) Assemble the throttle valve shaft to the governor body. Turn the cam manually and check any sticking or looseness caused by wear.
   (3) Wear (looseness during shaft insertion) or rusting of the governor body needle bearing.



Inspecting the Throttle Valve and Valve Shaft KAF22-32

4. Adjusting screw and bush inspection
   (1) Bending of the adjusting screw, and damage of the thread.
   (2) Damage of the bush thread.



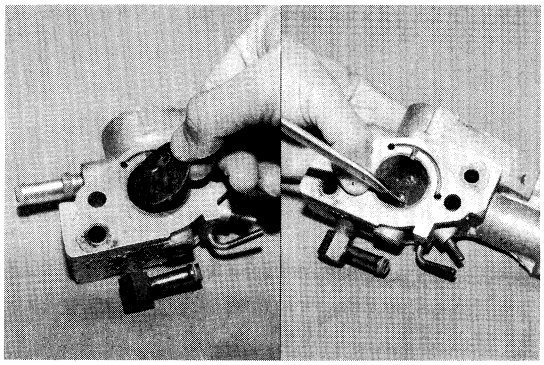
Inspecting the Adjust Screw and the Bush KAF22-34

ASSEMBLY

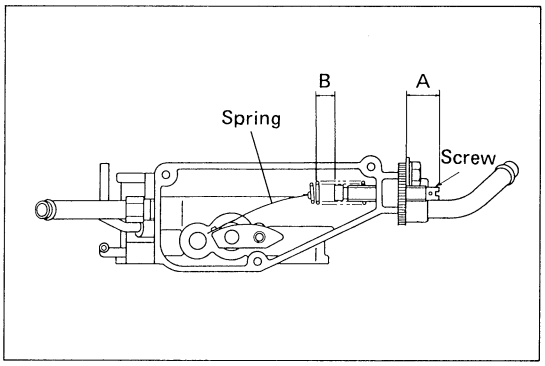
The assembly procedure is the reverse of the disassembly procedure.

Caution:
- Clean the governor body with compressed air prior to assembling.
- When assembling the throttle valve shaft, apply MP grease thinly to the governor body needle bearing.
- After completing the throttle valve shaft and valve assembly, check for smooth operation.
- Temporarily install the air governor spring to the following dimension.

	1 ton vehicle	2-3 ton vehicle
Adjust screw protrusion A	16.8 mm (0.661 in.)	21.9 mm (0.862 in.)
Effective spring turns B	11 turns	13 turns



Assembling the Throttle Valve KAF22-28,27



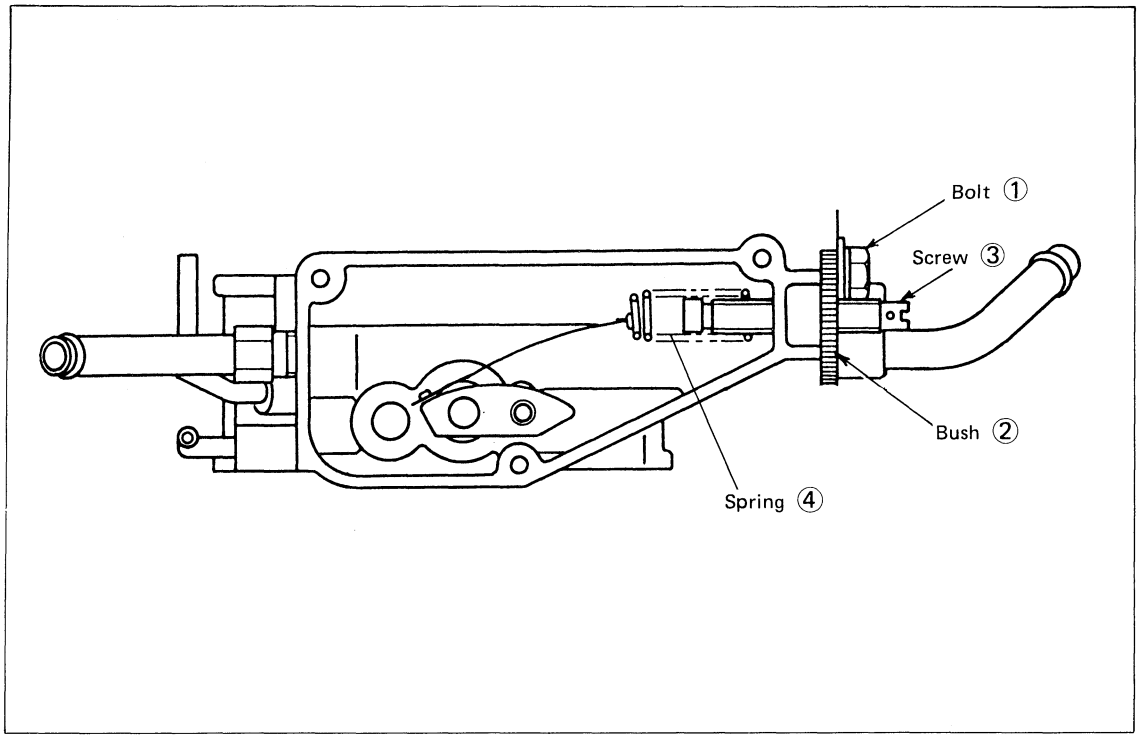
Assembling the Air Govenor Spring KAJS119

INSTALLATION

The installation procedure is the reverse of the removal procedure.

Caution:
See the carburetor section for correct installation of the carburetor and air governor piping.

AIR GOVERNER ADJUSTMENT



Air Governor KAJS62

Adjustment Procedure of Each Part

Bolt ① :

Counterclockwise turn	Releases locking of bush ②
Clockwise turn	Locks bush ②

Bush ② :

Counterclockwise turn	Lowers no-loaded static stability maximum revolution number
Clockwise turn	Raises no-loaded static stability maximum revolution number

Caution:
Be sure to lock screw ③ with plain screwdriver before turning bush ②.

Screw ③ :

Counterclockwise turn	Decreases relief down when the oil control valve tilt lever is operated (to backward tilt.) When relief down is within the reference value, turn the screw 1/10 clockwise to mend twist of the spring ④.
Clockwise turn	Decreases hunting at unloaded or loaded static stability maximum revolution. Keep turning the adjust screw clockwise until hunting stops. Turn 1/4 anticlockwise. Turn 1/10 clockwise to mend twist of the spring ④ .

Air Governor Standard

No-load static maximum speed
Standard: See repair manual for model

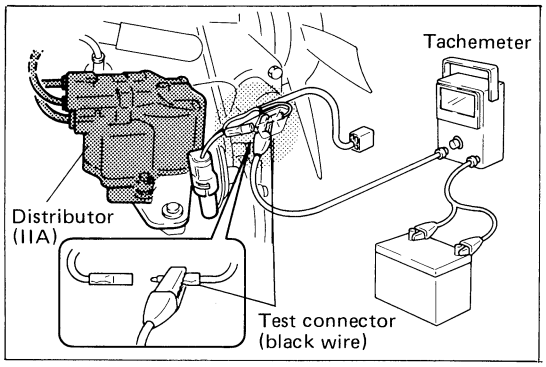
Air Governor Adjustment Procedures

Caution:
Be sure to complete the carburetor adjustment before adjusting the air governor.

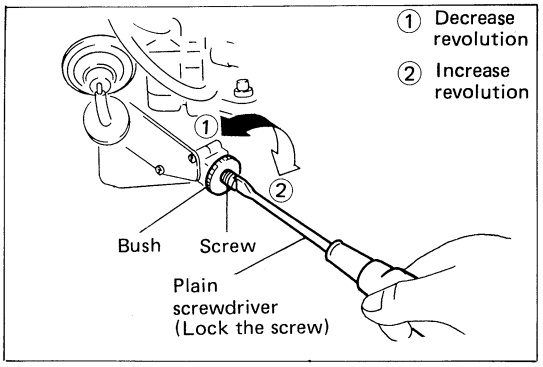
1. Engine warming up
   Standard:
   Coolant temperature: 80°C or more
   Engine oil temperature: 70°C or more
   Hydraulic oil temperature: 50°C or more
2. Install the tachometer
3. No-load static maximum speed
   (1) Remove the sealing.
   (2) Loosen the bush lock bolt.
   (3) Fully depress the accelerator pedal to open the throttle valve fully. Measure the engine speed.
   If the standard is exceeded, turn the bush counterclockwise.
   If less than the standard, turn the bush clockwise.

   Note:
   Refer to adjustment procedures of each section. (See page 3-33)

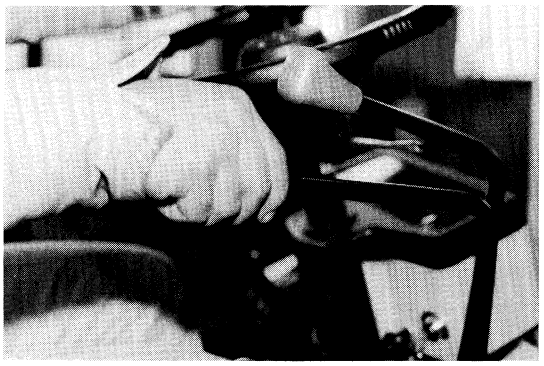
4. Loaded static maximum speed
   (1) Fully depress the accelerator pedal and the speed at the no-load static maximum speed.
   (2) Operate the oil control valve tilt lever to backward tilt direction and measure the relief down.
   Relief down: 250 rpm or less



Setting the Engine Tachometer KAJS5



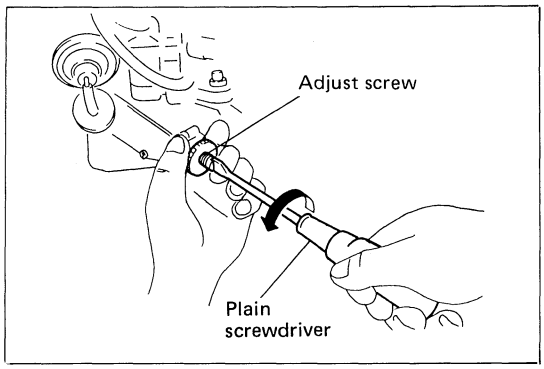
No-load Static Maximum Speed Adjustment KAJS63



Measuring the Loaded Static Maximum Speed LAO49-34

(3) If the relief down exceeds 250 rpm, turn the adjusting screw counterclockwise for adjustment.

Note:
See the adjustment procedure in each section. (See page 3-33)

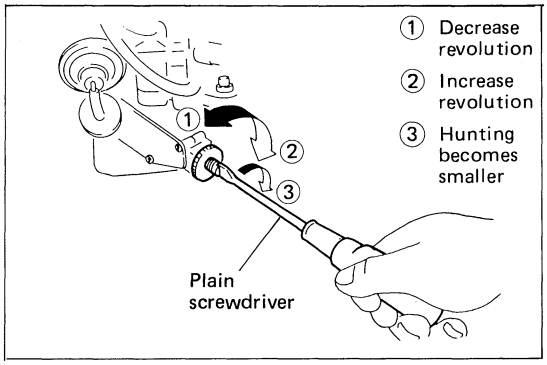


Adjusting the Relief Down KAJS64

5. Hunting adjustment
(1) If hunting occurs at either the no-load or loaded maximum speed after the end of the adjustments in steps 3 and 4, adjust by the bush and adjusting screw.

Adjusting screw . . . Hunting adjustment
Bush . . . . . Maximum speed adjustment

Caution:
If hunting disappears after several times, it should be judged no hunting.



Hunting Adjustment KAJS65

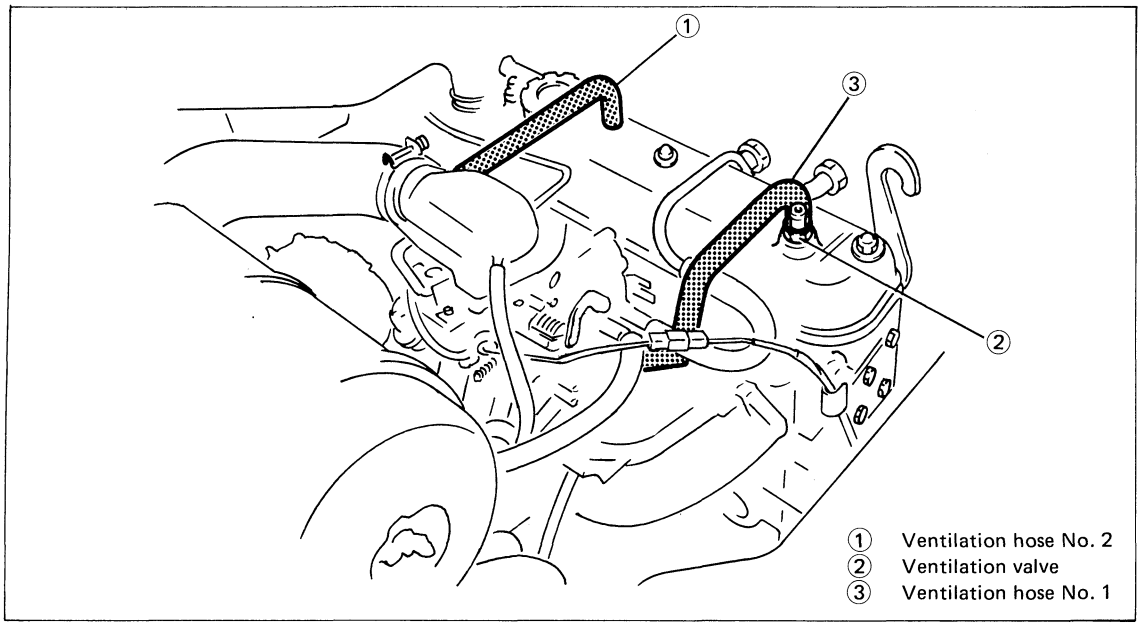
Repeat above steps 3 to 5 for setting to the standard values.

PCV SYSTEM

	Page
GENERAL	4-2
VENTILATION VALVE	4-2

4

GENERAL

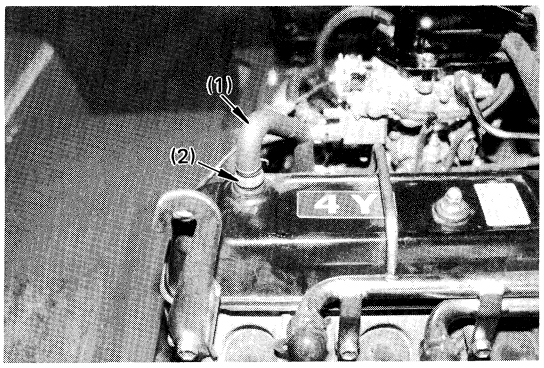


PCV Equipment KAJS66

VENTILATION VALVE

REMOVAL

1. Ventilation valve removal
   (1) Remove rubber hose connecting between the ventilation vlave and the air governor.
   (2) Remove the ventilation valve from the cylinder head cover.



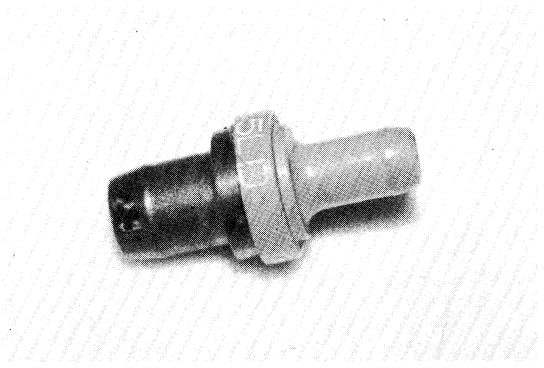
Removing the Ventilation Valve KAJ21-15

INSPECTION

1. Ventilation valve inspection
   (1) Shake the ventilation valve by hand for clicking sound.
   Clicking sound is a sign of normality.

2. PCV system rubber hose inspection
   (1) Inspect the PCV system rubber hose for damage, and deterioration. Replace the hose if any abnormality is found.

3. Ventilation valve inspection
   Inspection and washing timing . . . . . Every 6 weeks (every 250 hours)



Inspecting the Ventilation Valve KAJ21-17

INSTALLATION

The installation procedure is reverse of the removal procedure.

COOLING SYSTEM

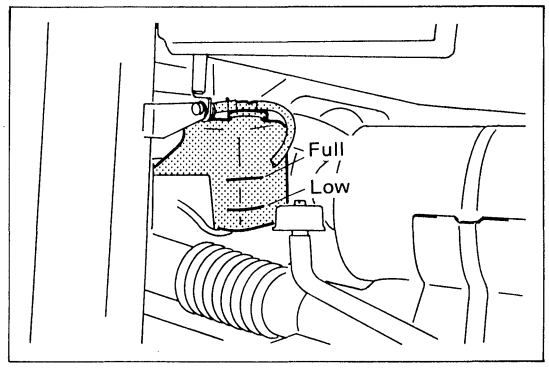
	Page
COOLANT INSPECTION AND REPLACEMENT	5-2
RADIATOR INSPECTION	5-3
THERMOSTAT	5-4
WATER PUMP ASSY	5-6

5

COOLANT INSPECTION AND REPLACEMENT

COOLANT INSPECTION

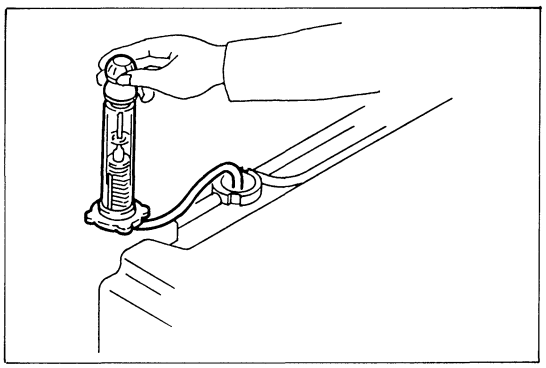
1. Coolant level inspection
   (1) Check that the coolant level is between the FULL and LOW marks on the radiator reservoir tank.



Inspecting the Coolant Level KAHS109

2. Coolant concentration measurement (LLC)
   (1) Measure the coolant temperature and specific gravity, and obtain the concentration according to the conversion graph below.

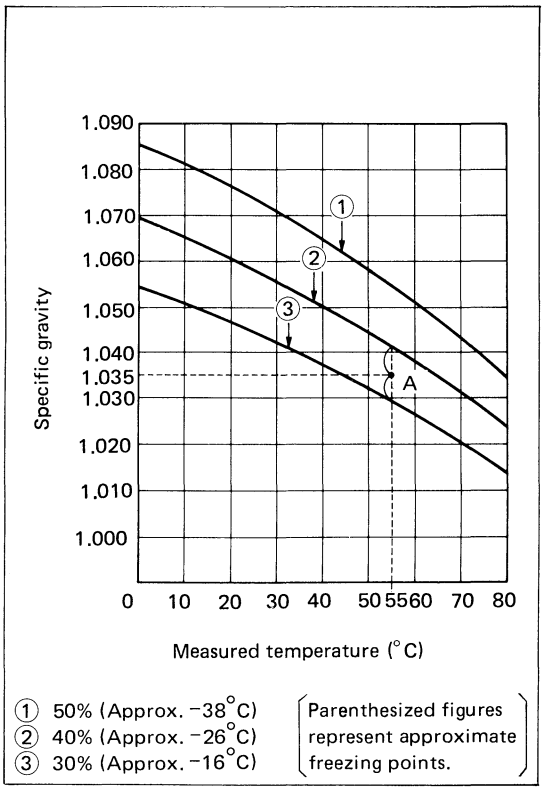
   Caution:
   The coolant concentration shall be 30% (50% in frigid zone) or more.



Measuring the Coolant Concentration KAGS48

   Note:
   This graph shows the relationship between the specific gravity and temperature of the coolant at concentrations of 30, 40 and 50%. Assume the coolant temperature and specific gravity to be 55°C and 1.035. Then, the coolant concentration can be obtained as follows:
   Intersection A of the lines representing 55°C and 1.035 is halfway between the curves representing 30% and 40%. Therefore, the concentration of the coolant is approximately 35%.

3. Inspecting the coolant quality
   (1) Make sure that the coolant is not contaminated by oil, etc.



Coolant Concentration Conversion Graph M6370

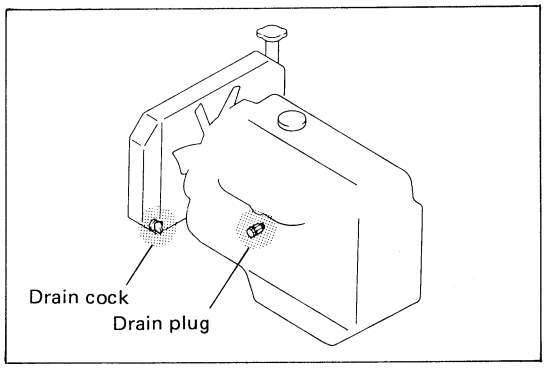
COOLANT REPLACEMENT

1. Coolant draining
   (1) Open the radiator drain cock and the engine drain plug on the left side of the cylinder block to drain the coolant.
   (2) Drain the coolant in the reservoir tank.

2. Coolant filling
   (1) Close the radiator drain cock and engine drain plug and fill coolant.
   (2) Perform the air bleeding by unscrewing the bleeder plug located at the upper part of water pump. (See page 5-5)
   (3) After warming up the engine, inspect the coolant level.

   Caution:
   When removing the radiator cap, carefully operate to avoid scalding by spouting steam or hot water.

   (4) Replenish coolant.

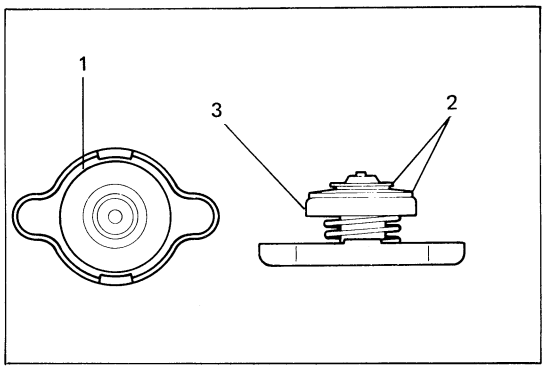


Drain Cock and Plug Positions KAJS84

RADIATOR INSPECTION

INSPECTION ON VEHICLE

1. Visual inspection of radiator cap
   (1) Check the packing for cracking or deformation.
   (2) Check the valve seat for deformation or dent.
   (3) Check there is no scale between the valve and valve seat.

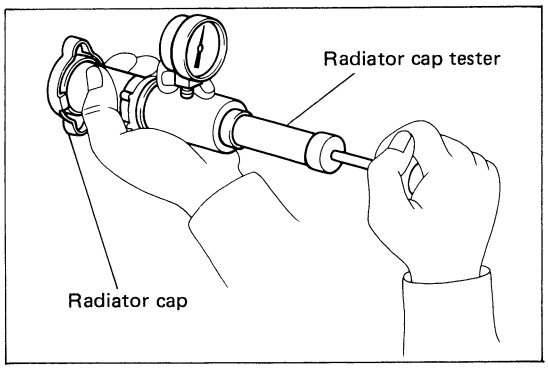


Inspecting the Radiator Cap (1) B5443

2. Radiator cap valve opening pressure inspection
   (1) Install the cap tester to the radiator cap, and check the valve opening pressure.

   Standard: 0.75 – 1.05 kg/cm^2 (10.7 – 14.9 psi)
   Limit: 0.60 kg/cm^2 (8.5 psi)

3. Neck filler (water filler) inspection
   (1) Check the sealing face for deformation or dent.
   (2) Check the edge portion for deformation.



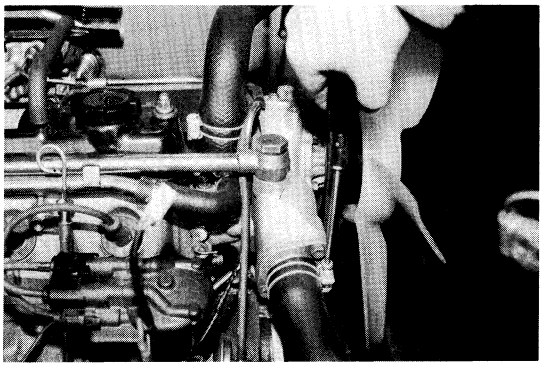
Inspecting the Radiator Cap (2) CO0034

THERMOSTAT

REMOVAL

1. Draining about half of coolant (See page 5-3)

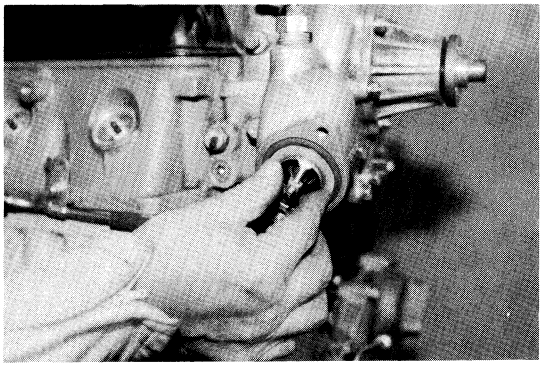
2. Radiator outlet hose disconnection
   (1) Disconnect the radiator outlet hose from the engine.



Disconnecting the Radiator Hose LAO57-24

3. Water inlet removal
   (1) Remove two set bolts, and remove the water inlet.

4. Thermostat removal

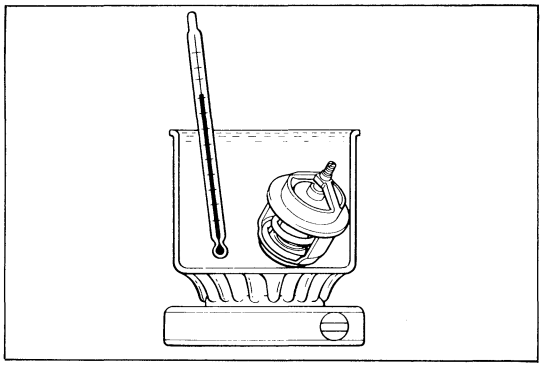


Removing the Thermostat KAJ10-20

INSPECTION

1. Thermostat inspection
   (1) Immerse the thermostat in a water bath and heat the bath gradually.

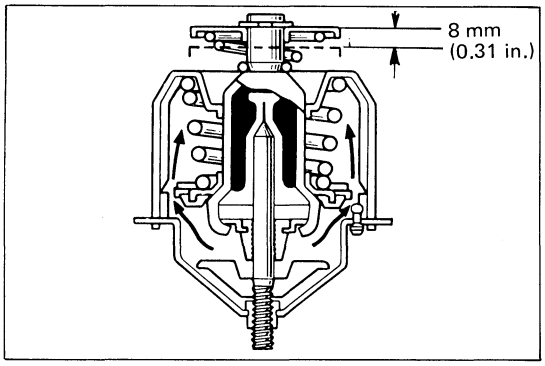
   Caution:
   Heat the thermostat up to the valve opening temperature.



Inspecting the Thermostat (1) CO0081

   (2) Pick up the thermostat and promptly measure the fully opened dimension.

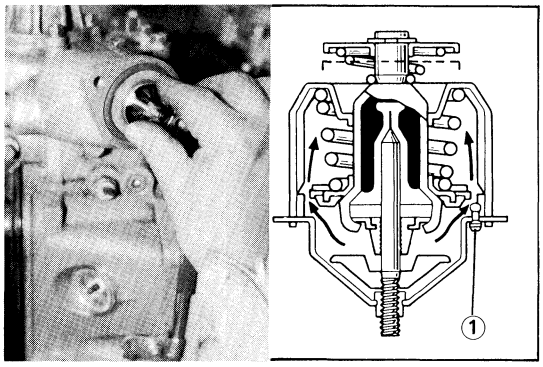
   Standard
   Opening start temperature:
   74.5 – 78.5°C (166 – 173°F)
   Opening end temperature: 90°C (194°F)
   Fully opened dimension: 8 mm (0.31 in.) or more
   (full lift)



Inspecting the Thermostat (2) CO0032

INSTALLATION

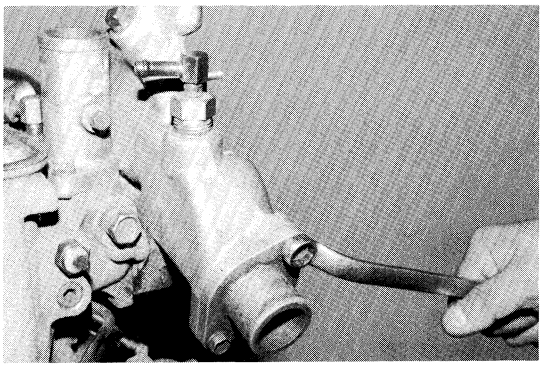
1. Thermostat installation
   (1) Install a new gasket to the thermostat, and insert them to the inlet. The jiggle valve ① of the thermostat shall be on the upper side.



Installing the Thermostat KAJ10-20, KAJS85

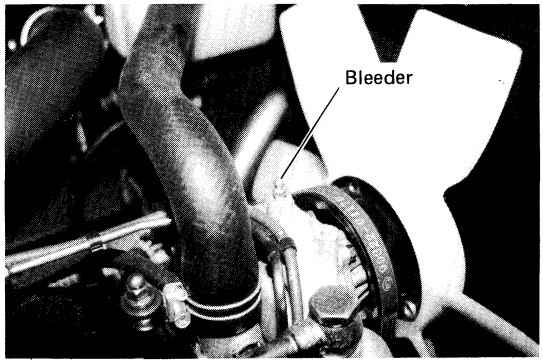
2. Water inlet installation
   (1) Install the water inlet by using two bolts. T = 1.85 kg-m (13 ft-lb)

3. Radiator outlet hose connection
   (1) Connect the radiator outlet hose to the water inlet.



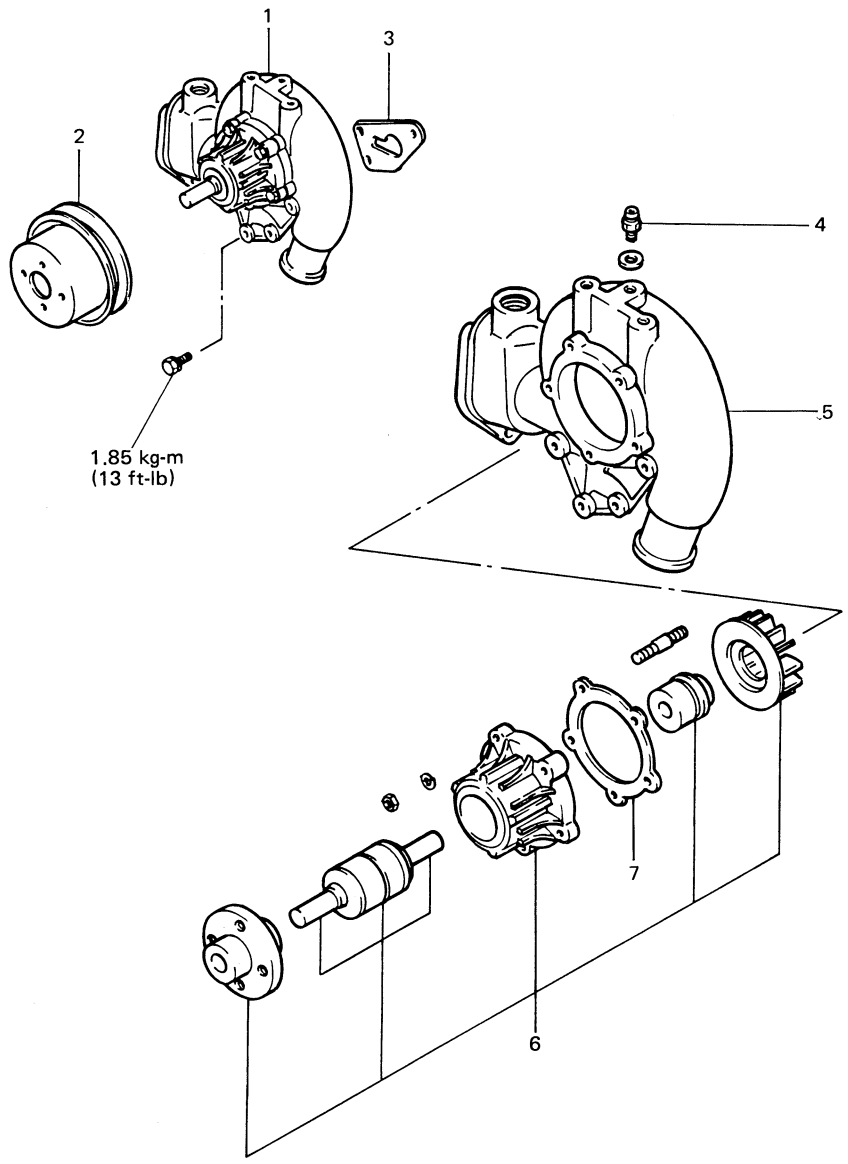
Installing the Water Inlet KAJ4-35

4. Coolant filling
   (1) After checking closing of the radiator drain cock and engine drain plug, fill coolant.
   (2) Start the engine and check that no leakage from the mounting place occurs.
   (3) Shut off the engine and perform bleeding of the air from the cooling system by unscrewing the bleeder plug located at the upper part of water pump.



Bleeding the Air from Water Pump LAO198-8

WATER PUMP ASSY



1. Water pump ASSY
2. Fan pulley
3. Gasket
4. Bleeder
5. Water pump body
6. Water pump cover ASSY
7. Gasket

Water Pump ASSY Components KAJM17

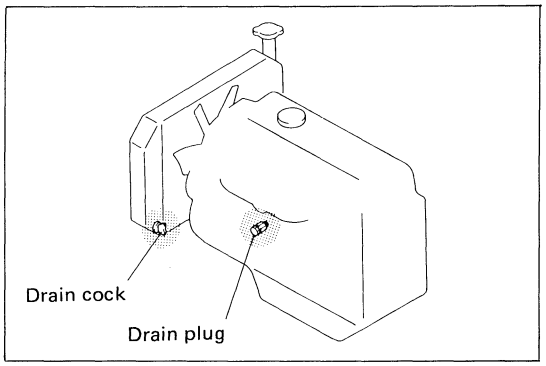
REMOVAL

1. Coolant draining
   (1) Open the engine hood.
   (2) Loosen the radiator and engine drain plugs to drain the coolant.

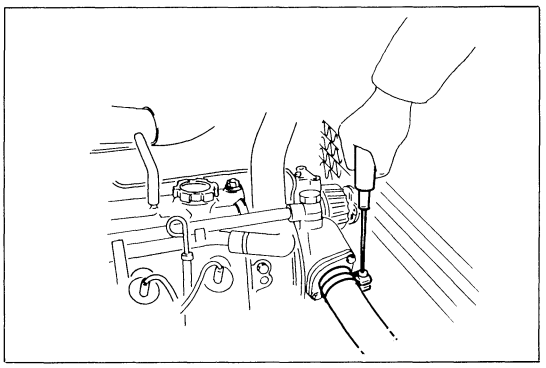
2. Fan shround removal (in torque converter model)

3. Fan, fan pulley and V-belt removal
   (1) Loosen the alternator adjusting bolt.
   (2) Remove four set bolts, and remove the fan, fan pulley and V-belt.

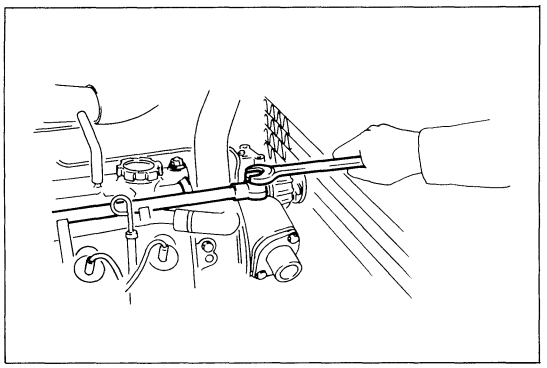
4. Radiator outlet hose disconnection
   (1) Disconnect the radiator outlet hose from the engine.



Drain Cock and Plug Positions KAJS84

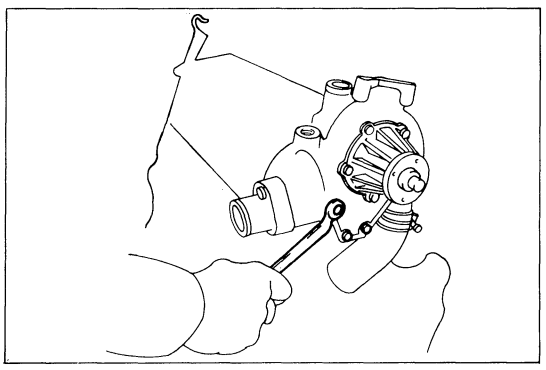

Disconnecting the Radiator Outlet Hose KAJS89

5. Water pump w/ thermostat removal
   (1) Remove the union bolt for the water outlet hose.
   (2) Disconnect the water inlet hose from the water pump.

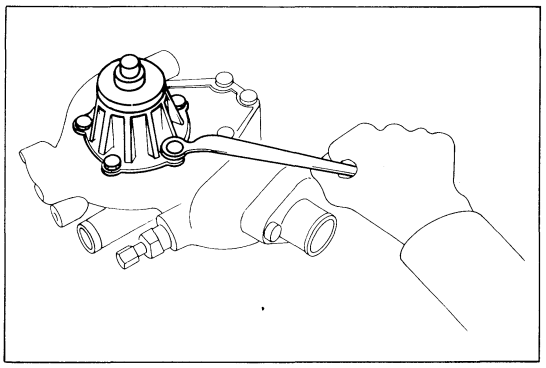

Removing the Union Bolt KAJS90

   (3) Remove four water pump set bolts, and then remove the water pump and gasket.

6. Thermostat removal
   (1) Remove two set bolts, and disconnect the water inlet from the water pump body.
   (2) Remove the thermostat.
   (3) Remove the water bypass flange.


Removing the Water Pump w/ Thermostat KAJS67

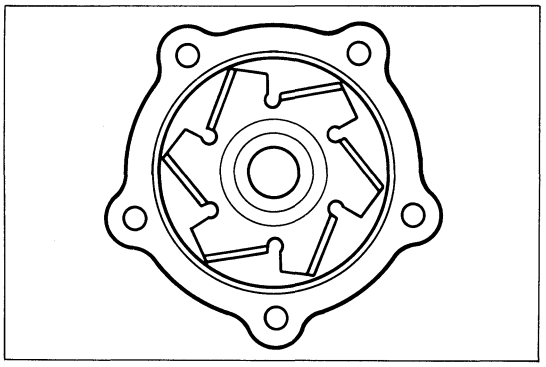
7. Water pump cover ASSY removal
   (1) Remove five nuts, and remove the water pump cover ASSY and gasket.



Removing the Pump Cover ASSY KAJS68

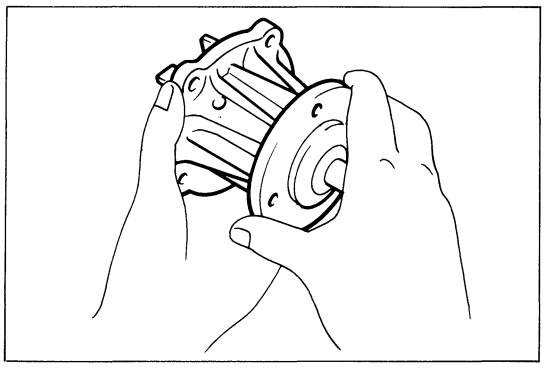
INSPECTION

1. Water pump inspection
   (1) Make sure that each part is not cracked or damaged.



Inspecting the Water Pump C5175

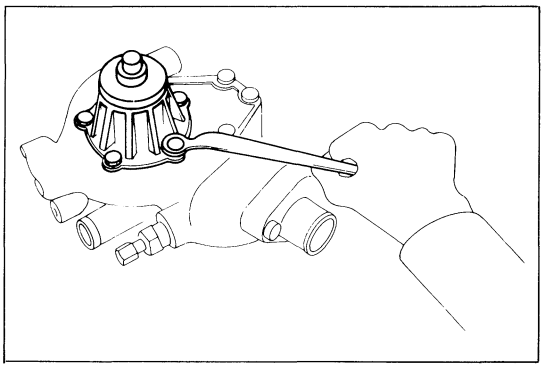
2. Water pump bearing inspection
   (1) Make sure that the bearing rotates smoothly without abnormal sound.



Inspecting the Water Pump Bearing KAJS87

INSTALLATION

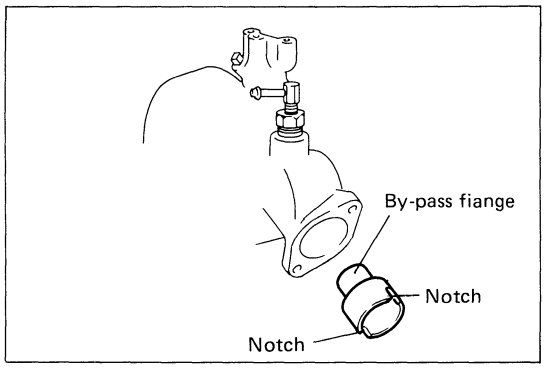
1. Water pump cover ASSY installation
   (1) Position the water pump cover ASSY so that the drain holes are placed up and down.
   (2) Fix the cover to the pump body with a new gasket in-between by tightening five set nuts.



Installing the Water Pump Cover KAJS68

2. Water bypass flange installation
   (1) Drive in the bypass flange to the water pump inlet portion. The notch on the flange shall face the inlet mounting bolt hole direction.

3. Thermostat installation
   (See page 5-5.)



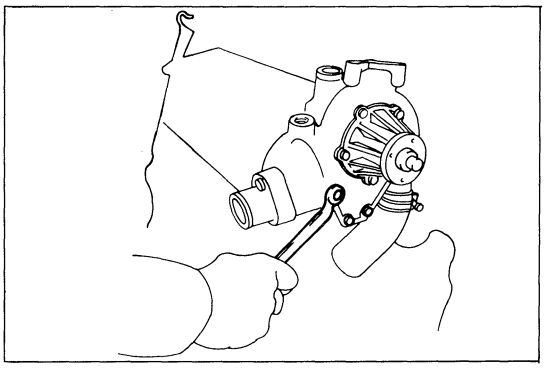
Installing the Water Bypass Flange KAJS92

4. Water pump installation
   (1) Remove the old gasket adhered on the water pump and cylinder block.
   (2) Install the water pump with a new gasket in-between, and tighten four set bolts.
   T = 1.85 kg-m
   (3) Connect the water inlet hose to the water pump.
   (4) Install the water outlet pipe union bolt.

5. Radiator outlet hose installation
   Fan pulley, V-belt and fan installation.
   See page 1-3 for V-belt adjustment.

6. Coolant filling
   (See page 5-5.)

7. Water leak check



Installing the Water Pump Cover KAJS66

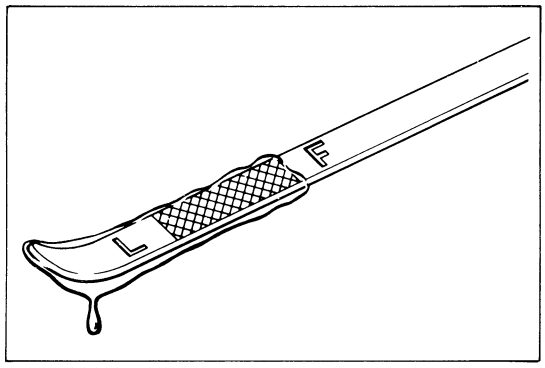
LUBRICATION SYSTEM

	Page
OIL PRESSURE INSPECTION	6-2
OIL FILTER	6-3
OIL PUMP	6-6

6

OIL PRESSURE INSPECTION

1. Oil inspection
   (1) Make sure that the engine oil does not contain with coolant or gasoline.
   (2) Check proper viscosity without excessive contamination.
   (3) Check that the oil level is between F and L lines on the oil level gauge.

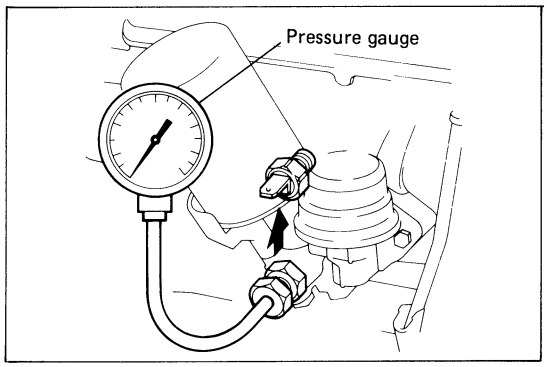


Inspecting the Engine Oil LU0309

2. Oil pressure switch removal

3. Oil pressure gauge installation

4. Engine warm-up
   Standard:
   Coolant temperature
   75 – 85°C (167 – 185°F)
   Hydraulic temperature
   50°C or more



Inspecting the Oil Pressure LU0296

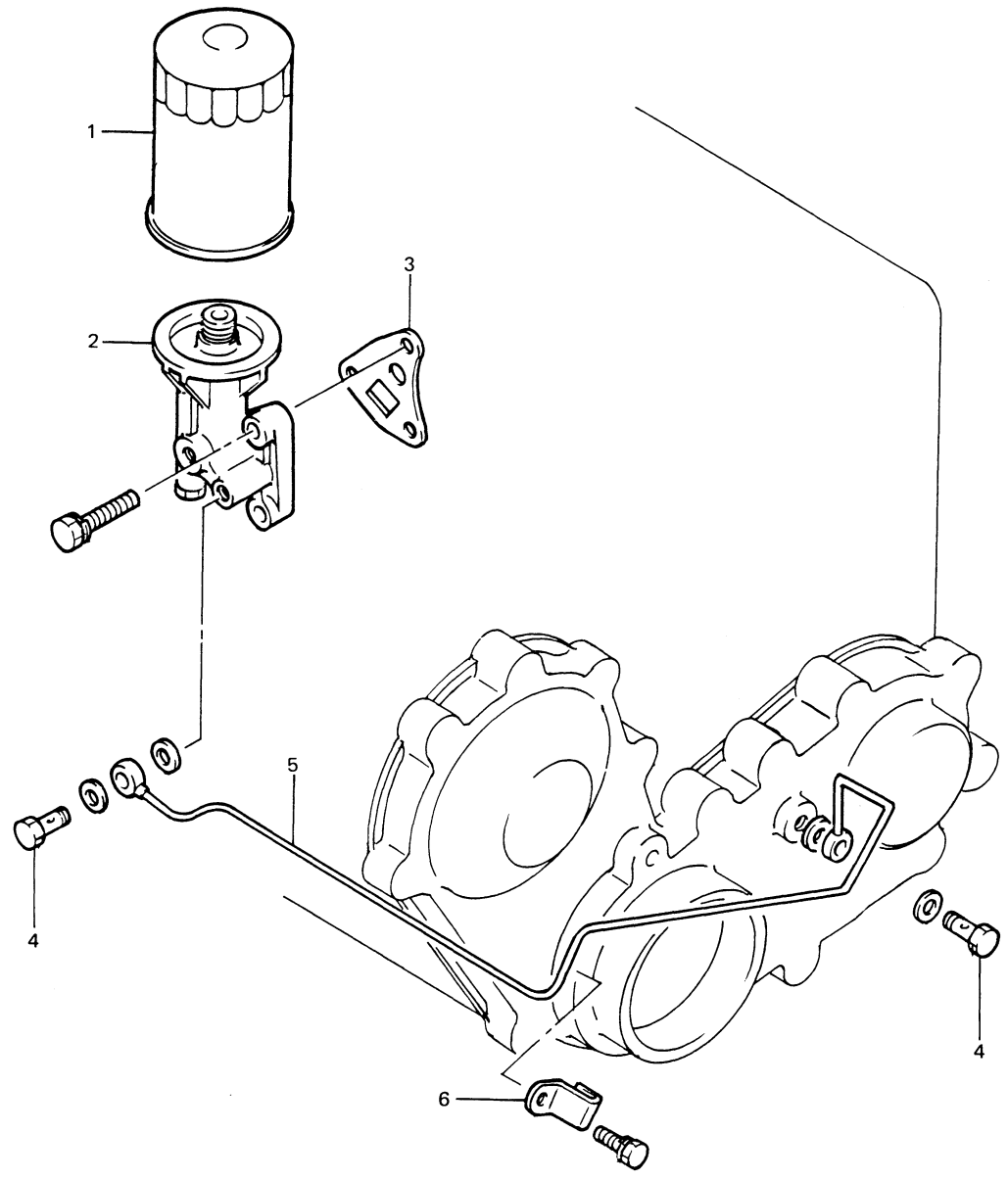
5. Oil pressure measurement
   Standard:

At idle speed	0.3 kg/cm^2 or more (4.3 psi)
At 2000 rpm	2.0 ~ 4.5 kg/cm^2 (28.4 ~ 64.0 psi)

6. Oil pressure switch installation
   T = 1.0 kg-m (7 ft-lb)

OIL FILTER

COMPONENTS

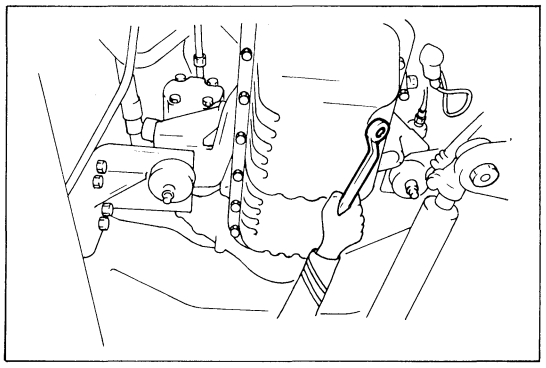


1. Oil filter ASSY
2. Oil filter bracket
3. Gasket
4. Union bolt
5. Oil pipe
6. Clamp

Oil Filter Components KAJM19

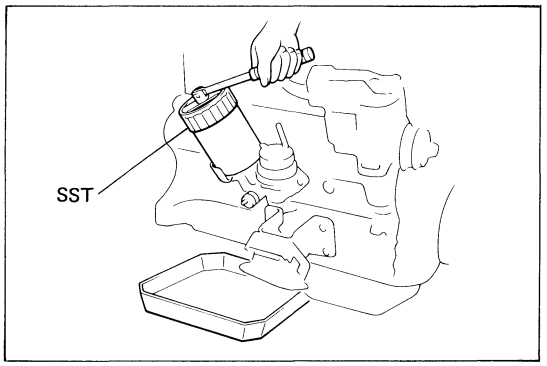
ENGINE OIL FILTER REPLACEMENT

1. Engine oil draining
   (1) Remove the oil filler cap.
   (2) Prepare a container for drained oil.
   (3) Remove the oil pan drain plug to drain the engine oil.



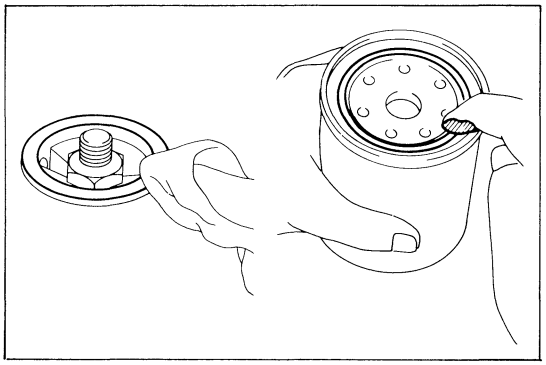
Draining the Engine Oil KAJS76

2. Oil filter removal
   (1) Use the SST to remove the oil filter.
   SST 09228-76005-71
   (SST 09228-22020)



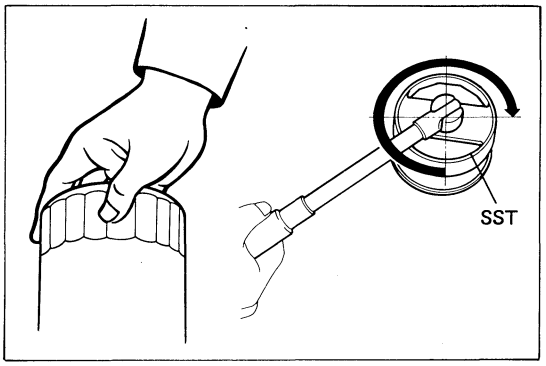
Removing the Oil Filter LU0297

3. Oil filter installation
   (1) Clean the oil filter mounting surface.
   (2) Coat clean engine oil on the gasket of the new oil filter.



Installing the Oil Filter (1) LU0004,0005

   (3) Lightly screw in the oil filter by hand until the gasket is brought into contact with the filter bracket.
   (4) Use the SST for further tightening by 3/4 turn.
   SST 09228-76005-71
   (SST 09228-22020)



Installing the Oil Filter (2) LU0006,0007

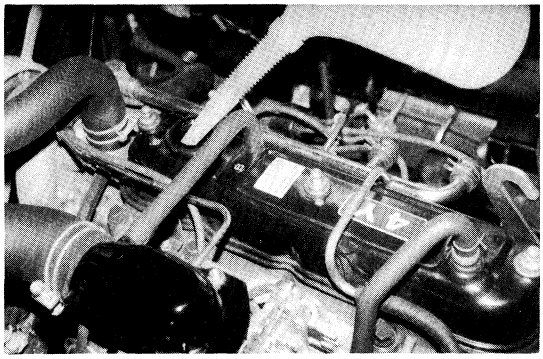
4. Engine oil filling
   (1) Install the oil drain plug with the new gasket in between.

   Caution:
   Clean the mounting surface.

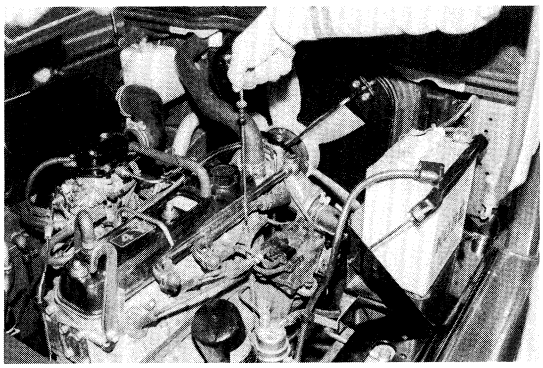
   (2) Fill oil
   Total capacity (when oil and filter are replaced): 4.0ℓ (1.1 US gal)
   Oil pan capacity (when only oil is replaced): 3.2ℓ (0.8 US gal)

   (3) Install the oil filler cap.

5. Oil level and leak inspection
   (1) Pull out the dipstick and check the oil level.
   (2) Start the engine and check that no oil is leaking.
   (3) Check that the oil level is between F and L marks on the oil level gauge.



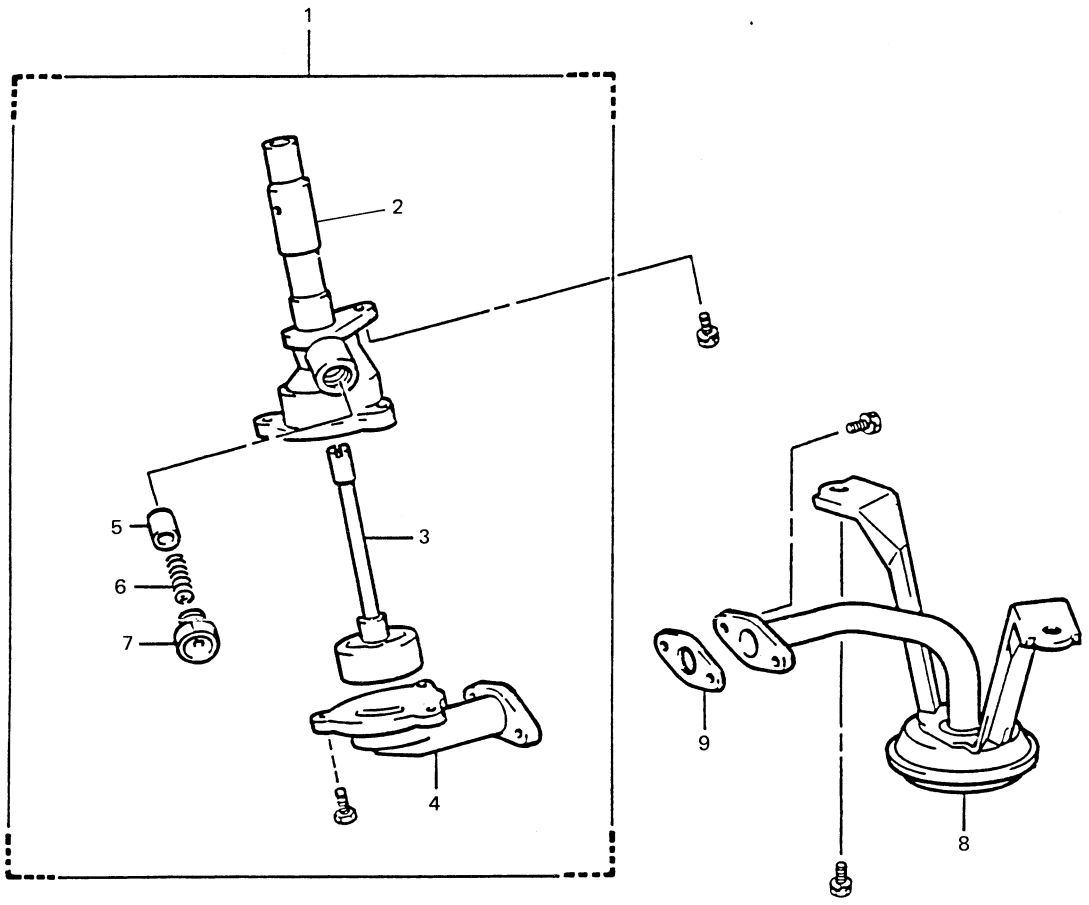
Filling Engine Oil LAO192-14



Inspecting the Engine Oil Level KAJ21-4

OIL PUMP

COMPONENTS

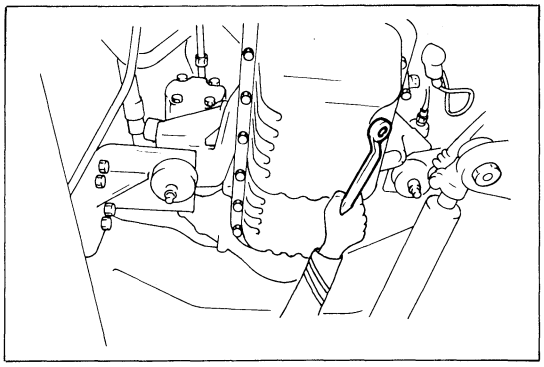


1. Oil pump ASSY
2. Oil pump body
3. Rotor set
4. Pump cover
5. Relief valve
6. Relief valve spring
7. Plug
8. Oil strainer SUB-ASSY
9. Gasket

Oil Pump Components KAJM18

REMOVAL

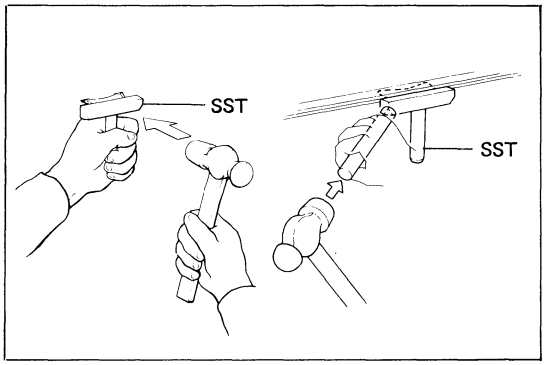
1. Engine oil draining
   (1) Remove the drain plug to drain the engine oil.



Draining the Engine Oil KAJS76

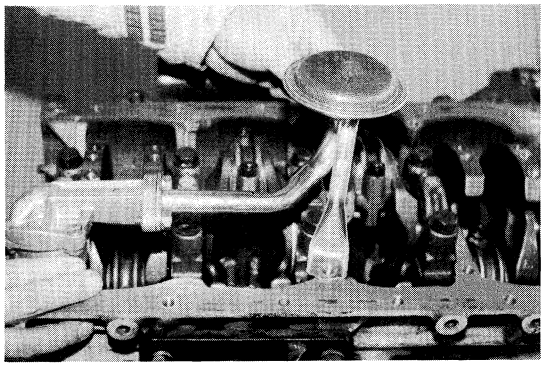
2. Oil pan removal
   (1) Remove 18 set bolts.
   (2) Insert the blade of the SST between the cylinder block and oil pan to cut the sealant and remove the oil pan.
   SST 09032-76001-71
   (SST 09032-00100)

   Caution:
   - Do not use the SST on the timing gear side. If necessary, use a screwdriver.
   - Operate slowly and carefully to prevent the oil pan flange from deformation.



Removing the Oil Pan LU0272,0271

3. Oil pump ASSY w/ strainer removal
   (1) Remove the oil pump set bolt and oil strainer set bolts (2 pcs.).
   (2) Remove the oil pump w/ strainer.

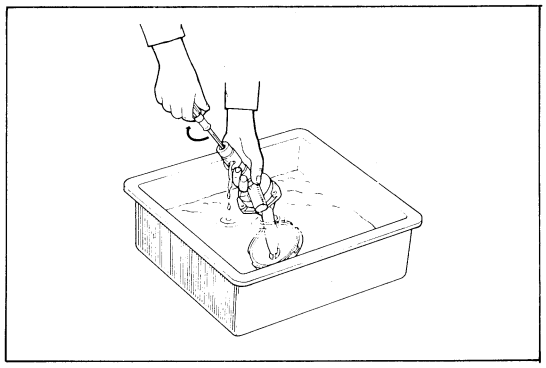


Removing the Oil Pump ASSY KAJ8-21

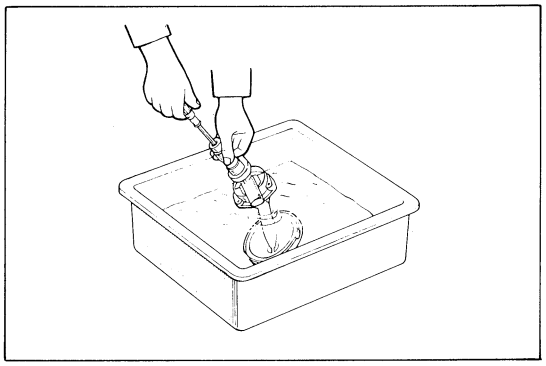
DIASSEMBLY

Note:
Check the following points before starting disassembly.

1. . Check pump operation
   (1) Using a screwdriver, immerse the suction end (oil strainer) in oil and turn the shaft clockwise. Oil should come out of the discharge hole.
   (2) Using a screwdriver, close the discharge hole with your thumb and turn the shaft as before. The shaft should be difficult to turn.

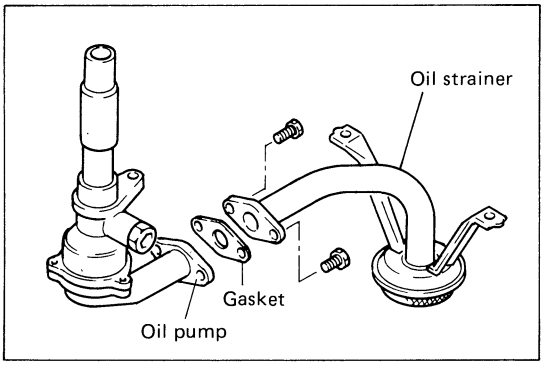


Oil Pump Function Check (1) LU0305



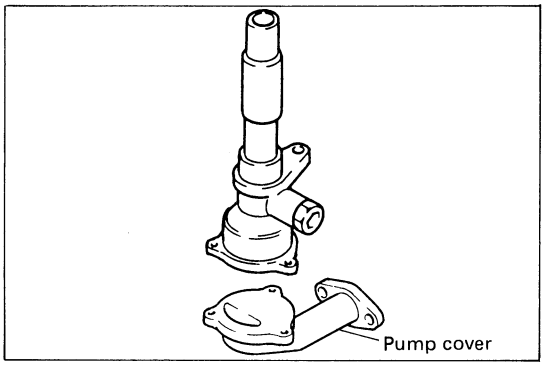
Oil Pump Function Check (2) LU0306

2. Oil strainer removal
   (1) Remove set bolts (2 pcs.), and remove the oil strainer from the oil pump body.



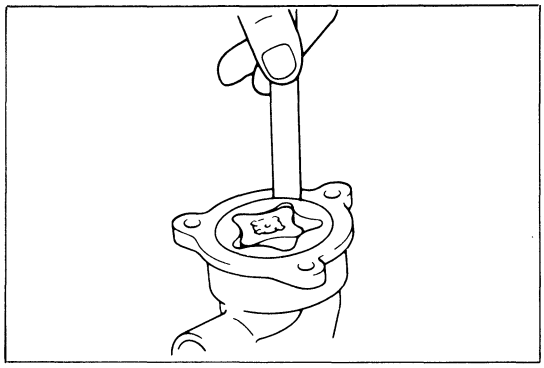
Removing the Oil Strainer KAJS69

3. Oil pump cover removal
   (1) Remove cover set bolts (3 pcs.) to remove the oil pump cover.



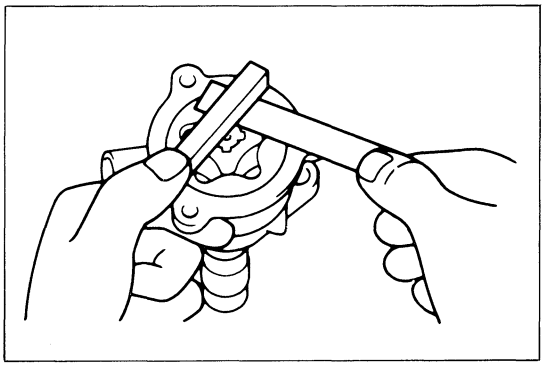
Removing the Oil Pump Cover KAJS70

4. Drive and driven rotor inspection
   (1) Use a thickness gauge, and measure the clearance between the driven rotor and pump body.
   Standard:
   0.1 – 0.15 mm (0.0039 – 0.0059 in.)
   Limit: 0.2 mm (0.008 in.)
   If the clearance exceeds the limit, replace the rotors as a set.
   If necessary, replace the whole oil pump ASSY.



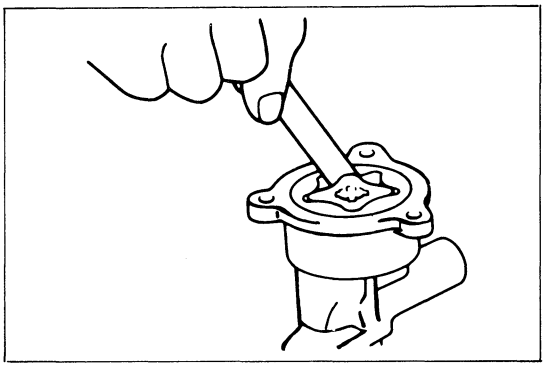
Measuring the Clearance between Driven Rotor and Body LU0300

   (2) Use a straight edge and thickness gauge, and measure the rotor side clearance.
   Standard:
   0.03 – 0.07 mm (0.0012 – 0.0028 in.)
   Limit: 0.15 mm (0.0059 in.)
   If the clearance exceeds the limit, replace the rotors as a set.
   If necessary, replace the whole oil pump ASSY.



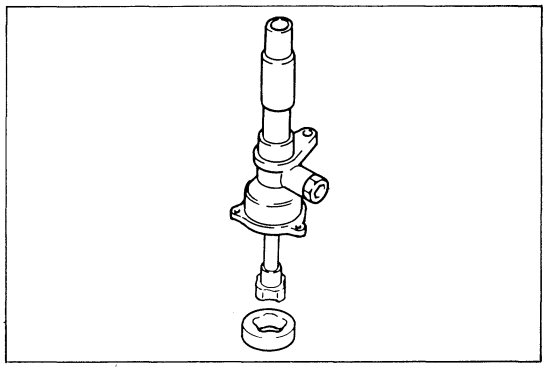
Measuring the Rotor Side Clearance LU0302

   (3) Use the thickness gauge and measure the tip clearance between the drive and driven rotors.
   Standard:
   0.07 – 0.12 mm (0.0028 – 0.0047 in.)
   Limit: 0.2 mm (0.008 in.)
   If the clearance exceeds the limit, replace the rotors as a set.
   If necessary, replace the whole oil pump ASSY.



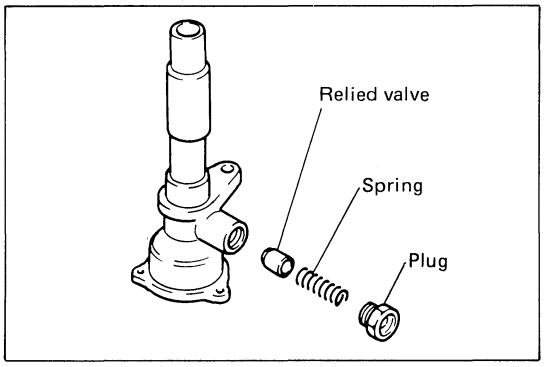
Measuring the Rotor Tip Clearance LU0301

5. Drive and driven rotor removal
   (1) Remove the drive and driven rotors from the pump body.



Removing the Rotors KAJS71

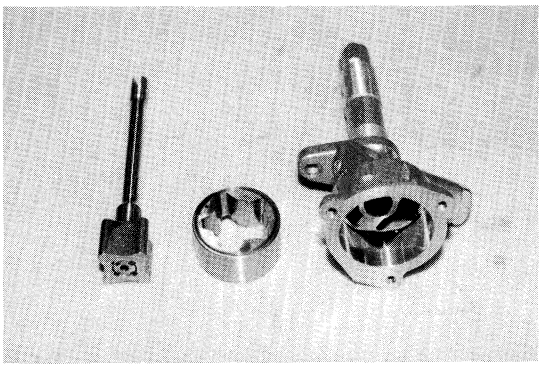
6. Relief valve removal
   (1) Remove the plug, spring and relief valve.



Removing the Relief Valve KAJS72

INSPECTION

1. Inspection of drive and driven rotors
   (1) Surface damage of drive and driven rotors.
   (2) Damage on pump body inside surface.
   (3) Assemble the rotors and the pump body, and inspect contact and movement of rotors.

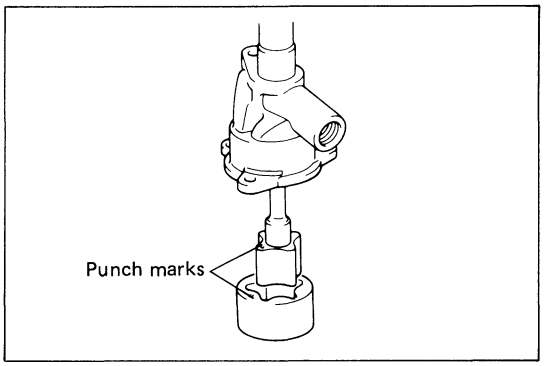


Inspecting the Components KAJ8-17

ASSEMBLY

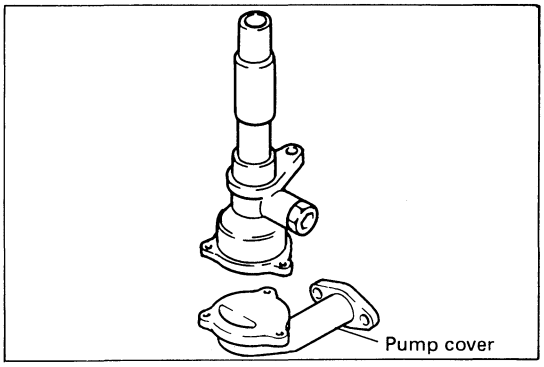
Caution:
- Wash each component with clean washing fluid, and blow compressed air.
- Coat new engine oil at the time of assembly.

1. Rotor assembly
   (1) Align punch marks on the drive and driven gears.
   (2) The punch marks shall face the pump body inner side at the time of assembly.



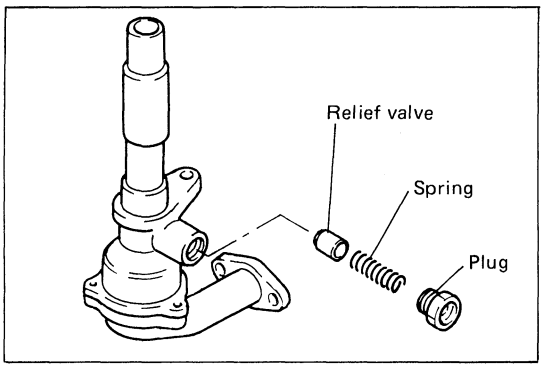
Assembling the Rotors LU0303

2. Pump cover installation
   (1) Install the pump cover by using set bolts (3 pcs.) to the pump body.
   T = 0.8 kg-m (5.8 ft-lb)



Installing the Pump Cover KAJS68

3. Relief valve assembly
   (1) Assemble the relief valve and spring with the pump body.
   (2) Tighten the plug to the specified torque.
   T = 3.75 kg-m (27 ft-lb)

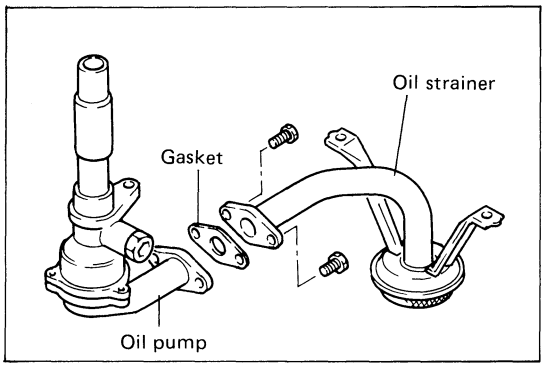


Assembling the Relief Valve KAJS73

4. Oil strainer installation
   (1) Install the oil strainer by using set bolts (2 pcs.).
   T = 1.20 kg-m (9 ft-lbs)

5. Oil pump function check

   Reference:
   See step 1 (on page 6-4) for the function check.



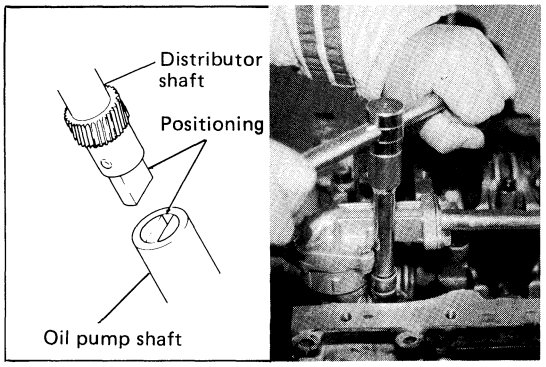
Installing the Oil Strainer KAJS69

INSTALLATION

1. Oil pump ASSY with strainer installation
   (1) Install the oil pump ASSY with strainer to the cylinder block.

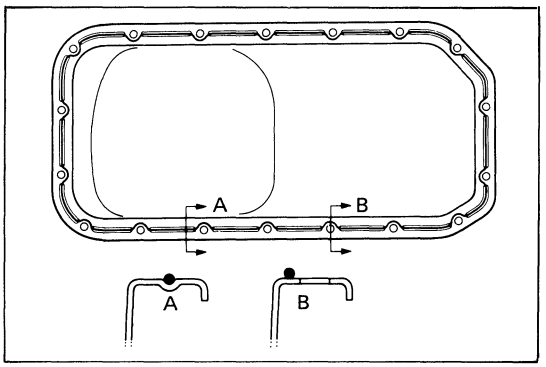
   Caution:
   Turn the pump shaft to match the protrusion at the end of the distributor shaft with the slit at the end of the oil pump shaft.

   (2) Tighten set bolts (3 pcs.) to the specified torque.
   Oil pump T = 1.85 kg-m (13 ft-lb)
   Oil strainer T = 1.2 kg-m (9 ft-lb)



Installing the Oil Pump with Strainer KAJS74, KAJ8-22

2. Oil pan installation
   (1) Remove the sealant (FIPG) adhered to the oil pan and cylinder block mating surface with a screwdriver, wire brush and gasket scraper.
   (2) Degrease the sealant coating area and mating surface.
   (3) Coat the sealant on the oil pan as illustrated.
   Sealant = Part No. 08826-00080 or equivalent



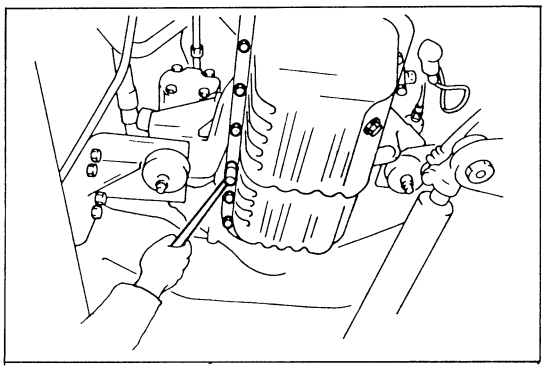
Sealant Coating Area LU0307

Caution:

- The sealant coating width shall be about 3 mm (0.12 in.).
- Coat the sealant on the inner sides of bolt holes and on the center groove at other places.
- The sealant shall be coated without discontinuity, and always overlap the coating starting point and end point.
- Install the oil pan within 3 minutes after coating the sealant.
- Do not fill coolant and engine oil and do not start the engine within 2 hours after installation.

(3) Install the oil pan to the cylinder block and tighten 18 set bolts to the specified torque.
T = 1.30 kg-m (9 ft-lb)

3. Engline oil filling
(See page 6-5)
4. Oil level and leak inspection
(See page 605)



Installing the Oil Pan KAJS75

IGNITION SYSTEM

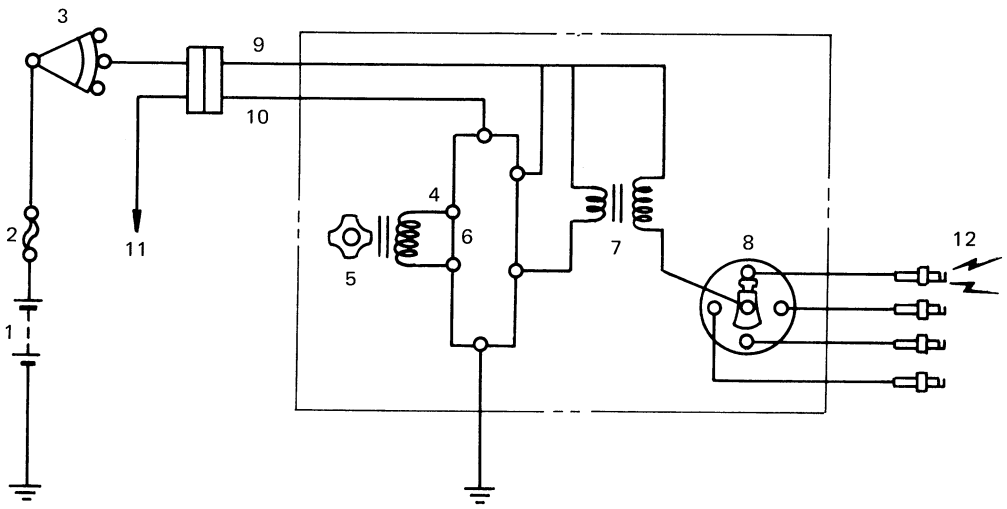
	Page
CIRCUIT DIAGRAM	7-2
INSPECTION ON VEHICLE	7-3
DISTRIBUTOR (IIA)	7-6

7

Caution:

- For 12V negative grounded vehicle only.
- Do not mistake the positive terminal for the negative terminal or vice versa.
- Do not disconnect the battery cable while the engine is running.
- When washing vehicle, always protect the Integrated Ignition Assembly (IIA) from being splashed with water.
- Do not generate harmful pulse.
  Example: Disconnecting the alternator B terminal causing sparking for battery charge confirmation.
- Do not make wiring mistake. Make correct connections.

CIRCUIT DIAGRAM



1. Battery
2. Fusible link
3. Ignition switch
4. Pickup coil
5. Signal rotor
6. Igniter
7. Ignition coil
8. Cap, rotor
9. Black with two orange stripes
10. Black
11. To rotary signal detector
12. Spark plug

Circuit Diagram KAJS12

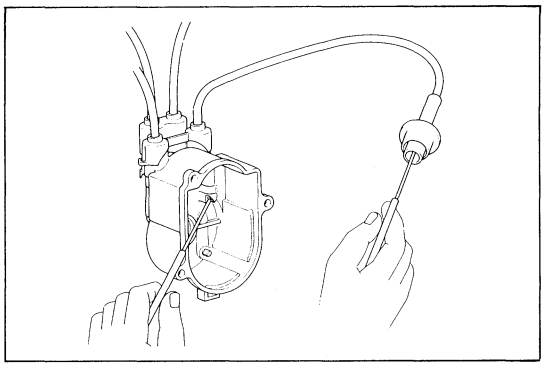
INSPECTION ON VEHICLE

RESISTIVE CORD INSPECTION

1. Distributor cap removal

   Caution:
   When disconnecting the resistive cord, do not pull the cord.

2. Resistance measurement
   (1) Use a circuit tester to measure the resistive cord resistance.
   Limit: 25 kΩ piece or less

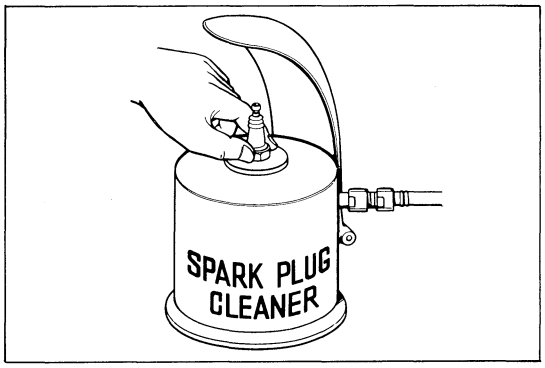


Measuring the Resistive Cord Resistance IG0494

SPARK PLUG INSPECTION AND ADJUSTMENT

1. Spark plug removal

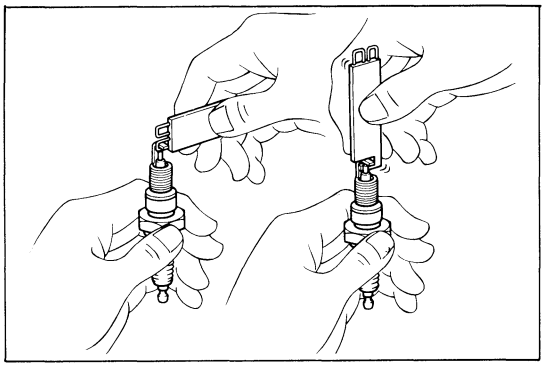
2. Spark plug cleaning and inspection
   (1) To clean the spark plug, use spark plug cleaner.
   (2) Inspect the spark plug. Replace it if any abnormality is found.



Cleaning the Spark PLug IG0152

3. Plug gap inspection and adjustment
   Standard: 0.7 – 0.8 mm (0.028 – 0.031 in.)

4. Spark plug installation
   T = 1.8 kg-m (13 ft-lb)

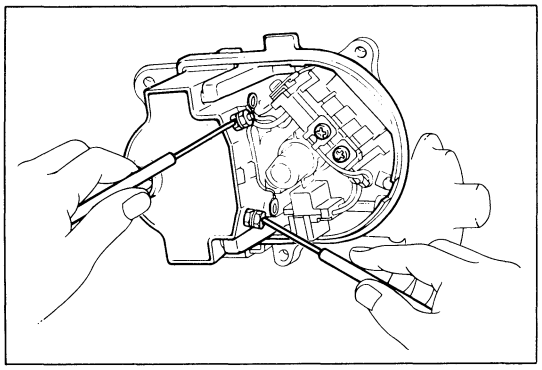


Inspecting and Adjusting the Spark Plug Gap IG0089

IGNITION COIL INSPECTION

1. Distributor cap, rotor and dust cover removal

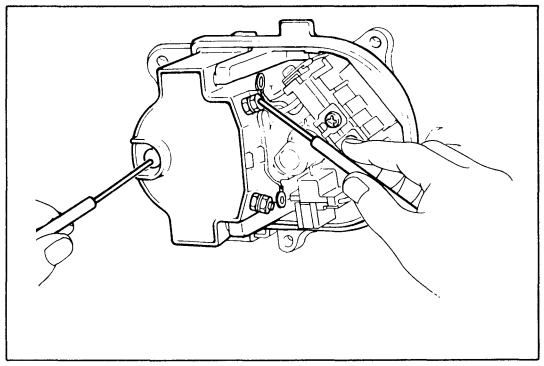
2. Primary coil resistance measurement
   (1) Turn off the ignition switch.
   (2) Remove the wiring from the ignition coil terminal.
   (3) Measure the resistance between the ignition coil positive and negative terminals with a circuit tester.
   Standard: 1.2 – 1.5 Ω
   If the standard is not satisfied, replace the ignition coil.



Measuring the Primary Coil Resistance IG0495

3. Secondary coil resistance measurement
   (1) Turn off the ignition switch.
   (2) Remove wiring from the ignition coil terminal.
   (3) Measure the resistance between the ignition coil positive terminal and high voltage terminal with the circuit tester.
   Standard: 10.3 – 14.1 kΩ

   If the standard is not satisfied, replace the ignition coil.

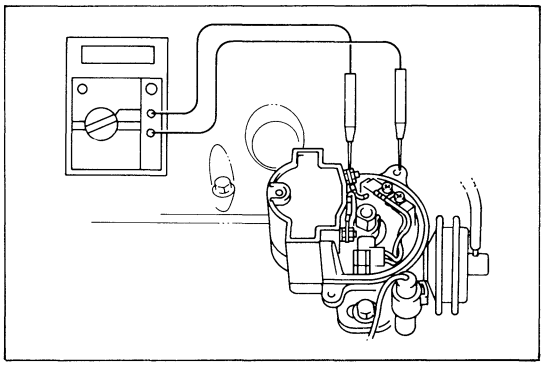


Measuring the Secondary Coil Resistance IG0505

IGNITER INSPECTION

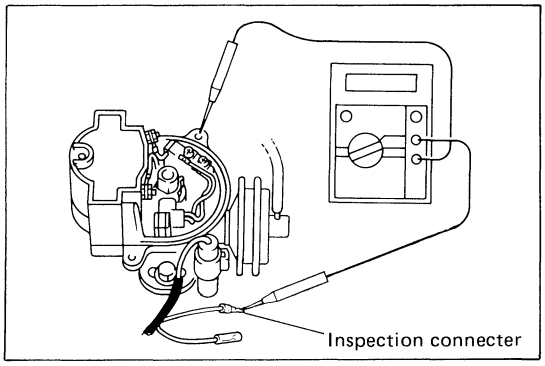
1. Distributor cap, rotor and dust cover removal

2. Input voltage inspection
   (1) Turn on the ignition switch.
   (2) Measure the resistance between the ignition coil positive terminal and the earth.
   Standard: about 12V



Inspecting the Input Voltage KAJS52

3. Transistor OFF inspection
   (1) Turn on the ignition switch.
   (2) Disconnect the inspection connector.
   (3) Measure the voltage between the inspection connector black lead and the earth.
   Standard: about 12V



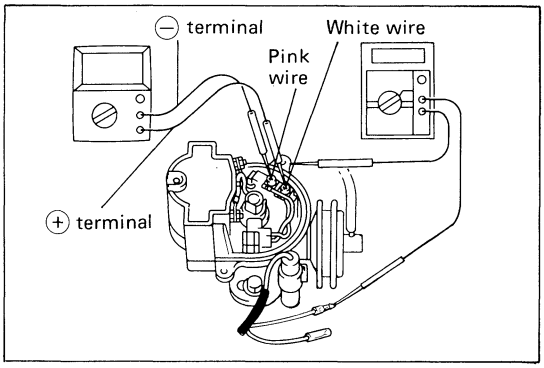
Transistor OFF inspection KAJS53

4. Transistor ON inspection
   (1) Turn on the ignition switch.
   (2) Set the circuit tester at x1 Ω or x10 Ω range.
   (3) Bring the tester probes into contact with both terminals of the igniter as illustrated.

   Caution:
   Do not mistake polarities.

   (4) Measure the voltage between the inspection connector and the earth.
   Standard: about 0 – 3 V

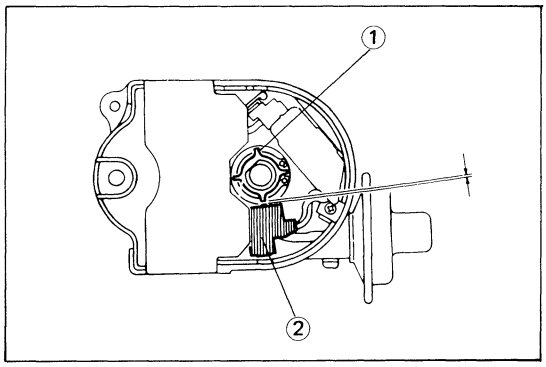
   Caution:
   Complete the inspection within 10 seconds.



Transistor ON Inspection KAJS54

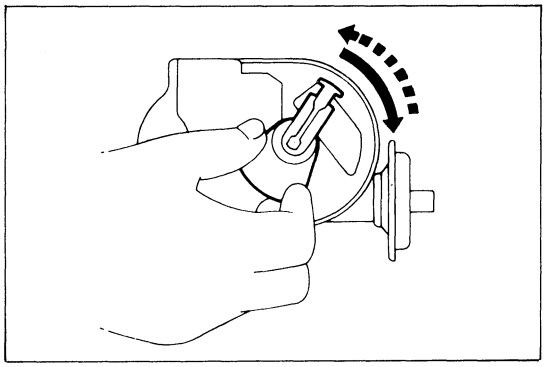
DISTRIBUTOR INSPECTION

1. Air gap inspection
   (1) Measure the gap between the signal rotor ① and the pickup coil ② with a thickness gauge.
   Standard:
   0.2 – 0.4 mm (0.008 – 0.016 in.)
   If the standard is not satisfied, replace the signal generator. (See page 7-10)

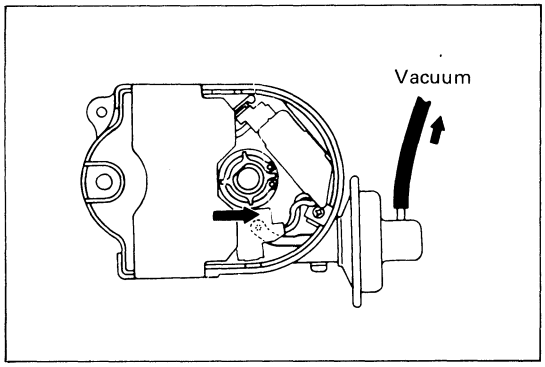


Inspecting the Air Gap IG0500

2. Governor function inspection
   (1) Turn the rotor clockwise and inspect if it returns smoothly.

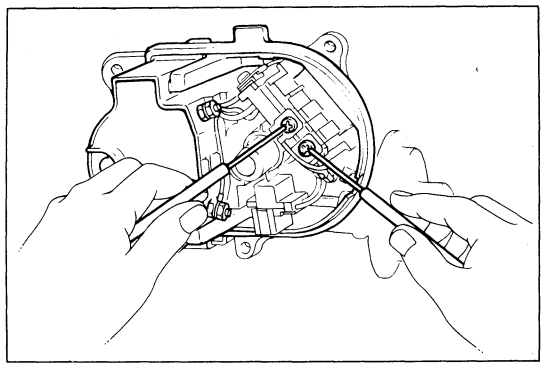

Inspecting the Governor Function IG0503

3. Vacuum advancer inspection
   (1) Disconnect the vacuum hose. Apply a negative pressure of about 400 mmHg to the diaphragm. Check if the advancer moves.
   If the advancer does not move, replace the vacuum advancer.

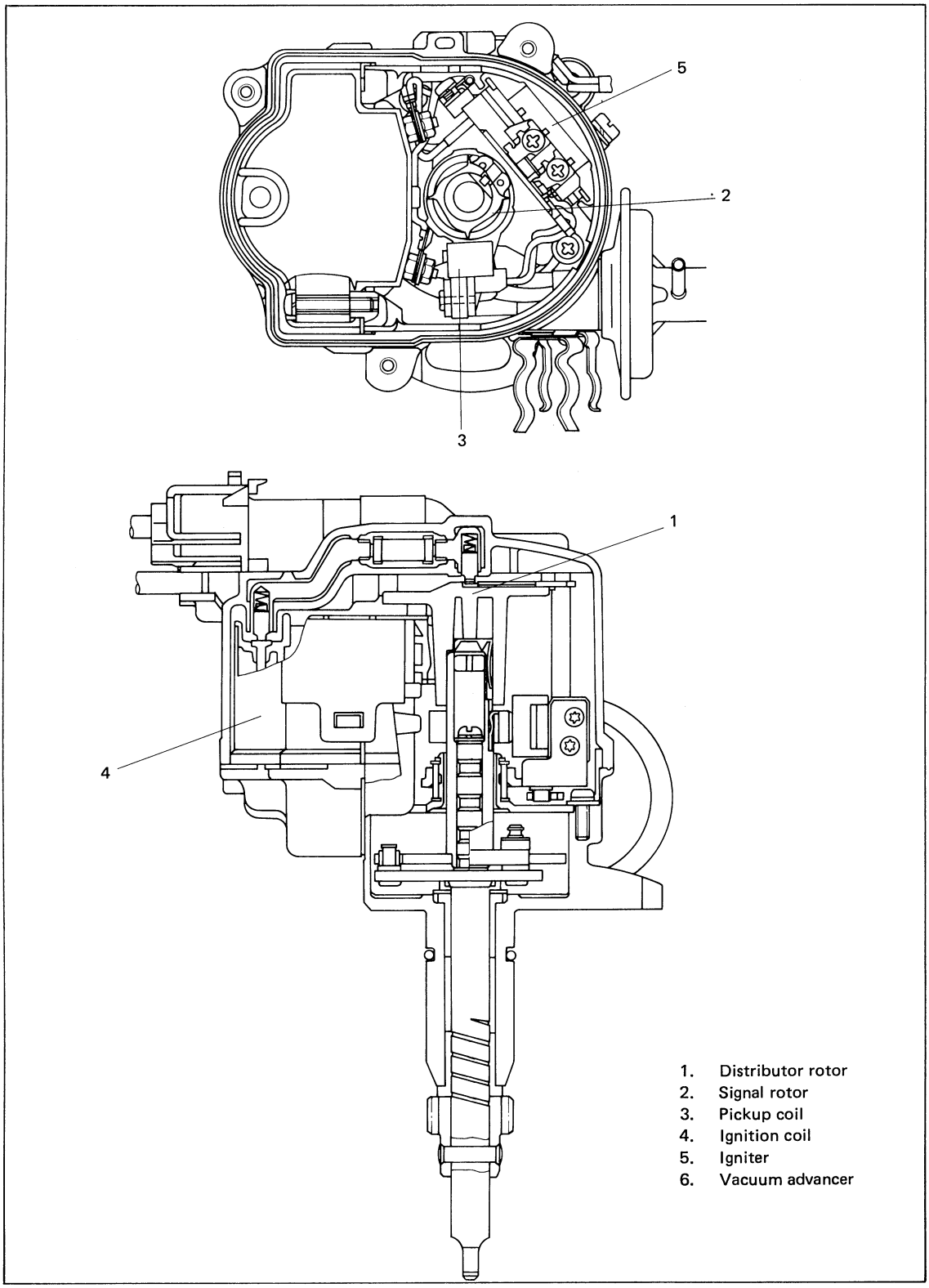


Inspecting the Vacuum Advancer IG0501

4. Pickup coil inspection
   (1) Turn off the ignition coil.
   (2) Measure the pickup coil resistance with the circuit tester.
   Standard: 140 – 180 Ω
   If the standard is not satisfied, replace the signal generator ASSY.

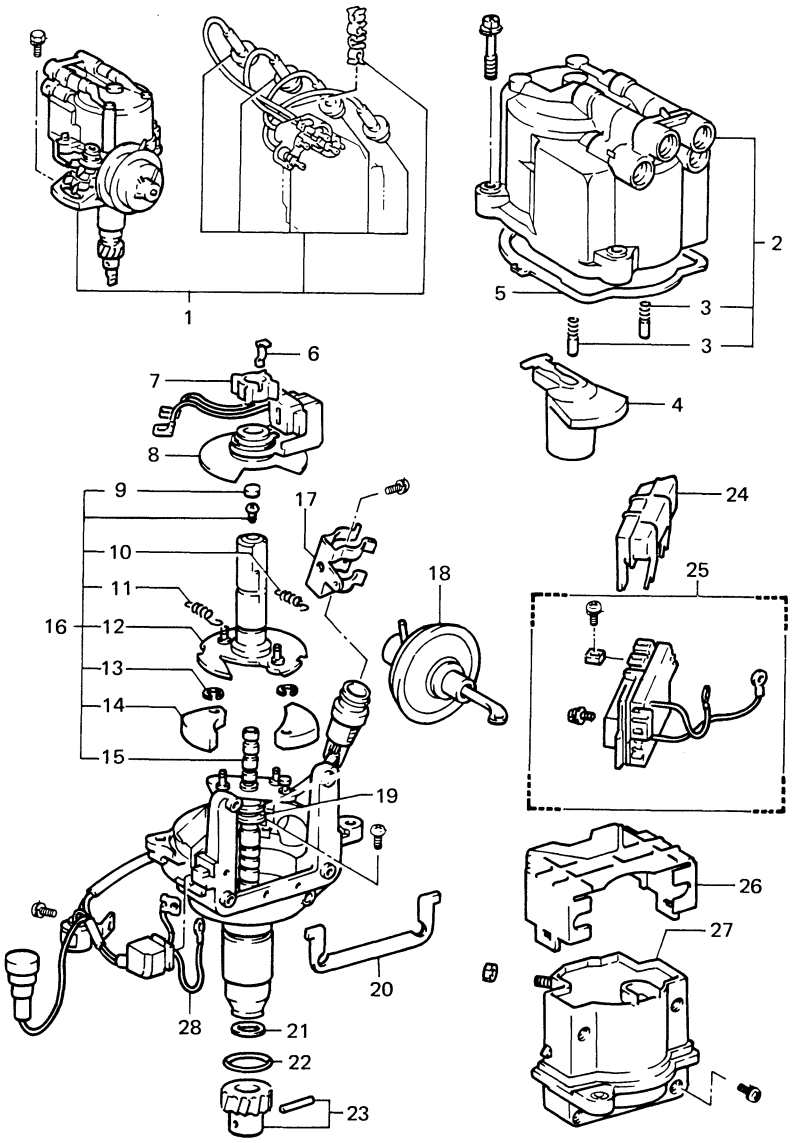

Inspecting the Pickup Coil IG0504

DISTRIBUTOR (IIA)



IIA Sectional View KAJM11

COMPONENTS



1. Distributor ASSY
2. Distributor cap
3. Cap center piece
4. Distributor rotor
5. Packing
6. Rotor set spring
7. Signal rotor
8. Signal generator ASSY
9. Cap
10. Governor spring A
11. Governor spring B
12. Signal rotor shaft
13. Snap ring
14. Governor weight
15. Governor shaft
16. Governor ASSY
17. Cord clamp
18. Vacuum advancer
19. Washer
20. Packing
21. Washer
22. O-ring
23. Spiral gear
24. Igniter dust cover
25. Igniter
26. Ignition coil dust cover
27. Ignition coil
28. Distributor wire

Distributor Components KAJM14

REMOVAL

1. Disconnect the battery negative terminal.

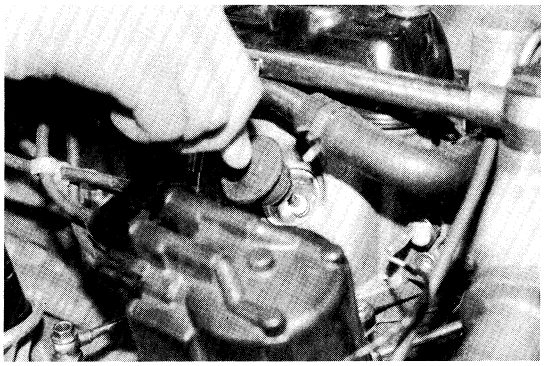
2. Disconnect the resistive cords.

   Caution:
   When disconnecting the resistive cords, do not pull by the cord.

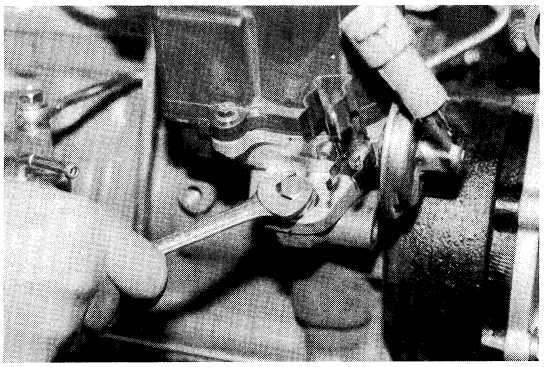
3. Disconnect the connector.

4. Disconnect the vacuum advancer hose.

5. Remove the set bolts. Remove the distributor.



Disconnecting the Resistive Cords KAJ14-29



Removing the Distributor KAJ14-33

DISASSEMBLY

1. Distributor cap w/ resistive cords removal
   (1) Remove 3 set screws. Remove the distributor cap w/ resistive cords.

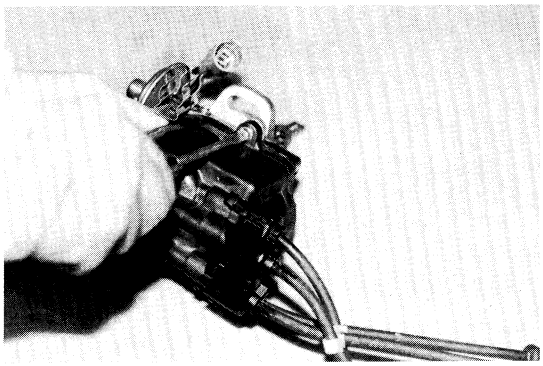
2. Distributor rotor removal

3. Ignition coil dust cover removal

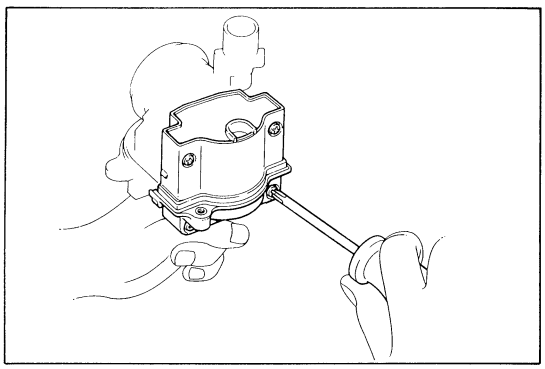
4. Igniter dust cover removal

5. Ignition coil removal
   (1) Remove 2 nuts. Disconnect 3 wires from the ignition coil terminals.

   (2) Remove 4 screws. Remove the ignition coil and gasket.

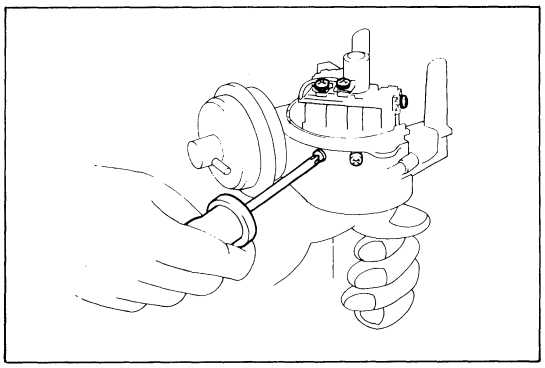


Removing the Distributor Cap KAJ16-1



Removing the Ignition Coil IG0524

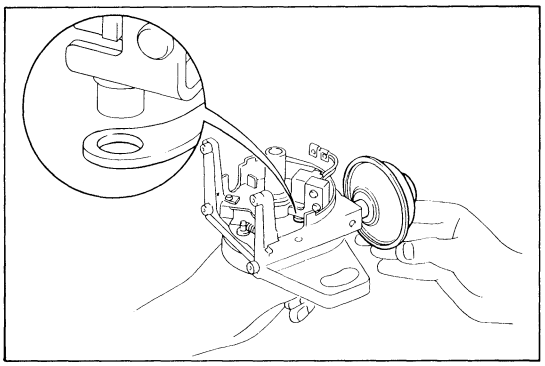
6. Igniter removal
   (1) Remove 3 screws and nuts, and disconnect 3 wires from the igniter terminal.
   (2) Remove 2 screws, and remove the igniter.



Removing the Igniter IG0525

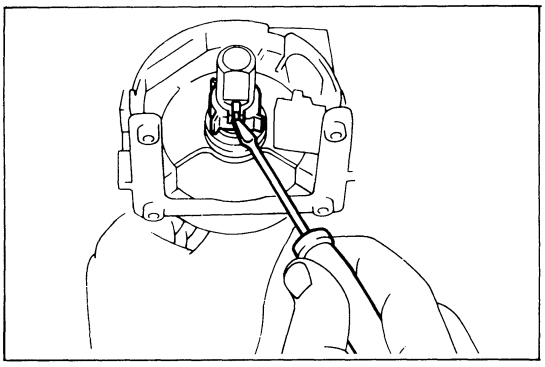
7. Vacuum advancer removal
   (1) Remove 2 screws, and remove the wire clamp.
   (2) Disconnect the advancer link from the signal generator ASSY breaker plate pin, and remove the advancer.

8. Distributor wiring removal



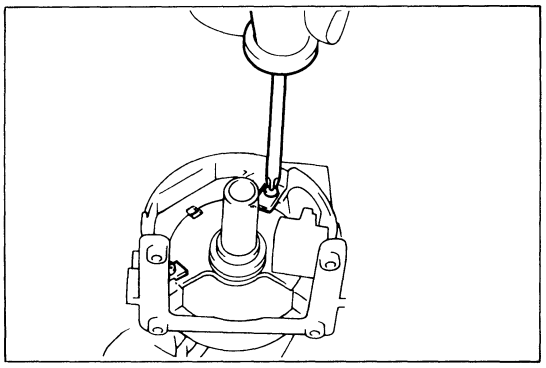
Removing the Vacuum Advancer IG0526

9. Signal rotor removal
   (1) Pull out the rotor set spring with a small screwdriver.
   (2) Remove the signal rotor.



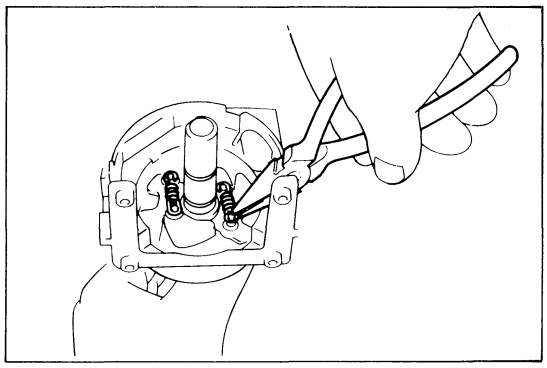
Removing the Signal Rotor IG0527

10. Signal generator ASSY removal
    (1) Remove two screws and plate washers.
    (2) Remove the signal generator ASSY.



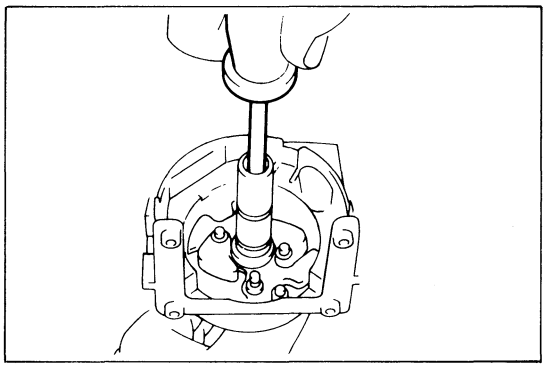
Removing the Signal Generator IG0528

11. Governor spring removal



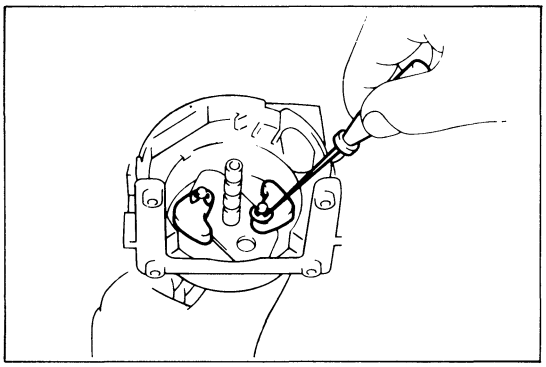
Removing the Governor Spring IG0529

12. Signal rotor shaft removal
    (1) Remove the cam cap.
    (2) Remove the screws and remove the signal rotor shaft.



Removing the Signal Rotor Shaft IG0530

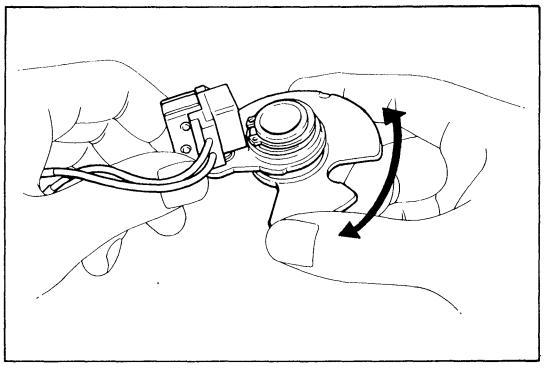
13. Governor weight removal
    (1) Remove the snap ring with the small screwdriver, and remove two governor weights.



Removing the Governor Weight IG0531

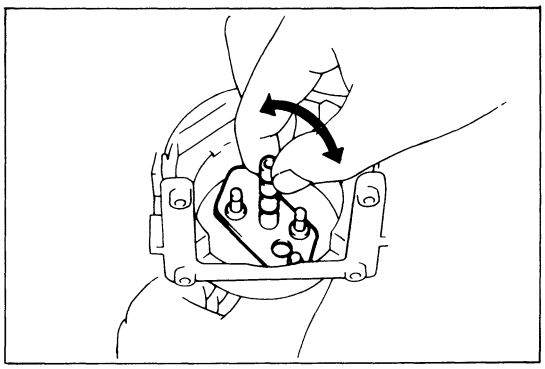
INSPECTION

1. Breaker plate inspection
   (1) Rotate the breaker plate. Check for any dragging or scratching.
   If any dragging or scratching is found, replace the signal generator ASSY.



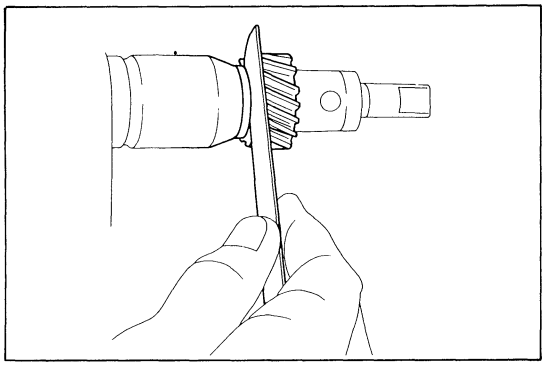
Inspecting the Breaker Plate IG0532

2. Governor shaft inspection
   (1) Rotate the governor shaft. Check rotating condition.



Inspecting the Governor Shaft IG0533

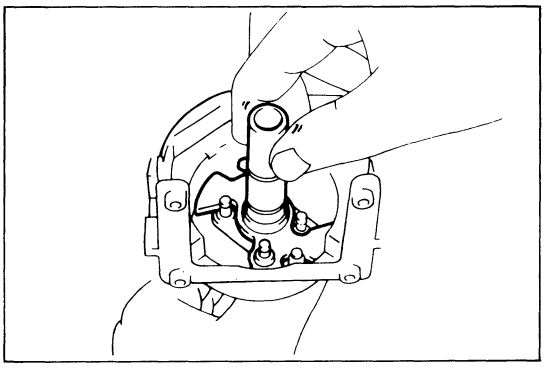
   (2) Measure the governor shaft thrust clearance with a thickness gauge.
   Standard:
   0.15 – 0.50 mm (0.0059 – 0.0197 in.)
   If the standard is not satisfied, adjust with the thrust washer. (See Page 7-14.)



Inspecting the Governor Shaft Thrust Clearance IG0514

3. Signal rotor shaft inspection
   (1) Install the signal rotor shaft to the governor shaft. Check for any looseness.
   If any looseness is found, remove the signal rotor or governor shaft.

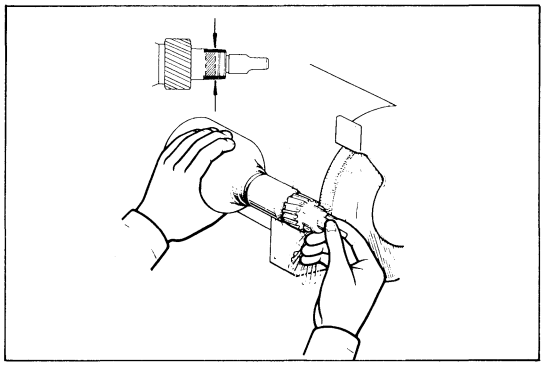
4. Distributor cap inspection
   (1) Inspect the function of the spring at the piece section.
   (2) Check for crack, damage or burning.



Inspecting the Signal Rotor Shaft IG0534

GOVERNOR SHAFT (OR SPIRAL GEAR) REPLACEMENT

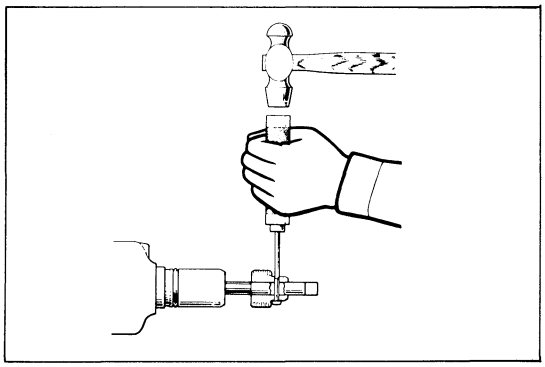
1. Spiral gear removal
   (1) Use a grinder and grind off the caulked portion of the pin.



Removing the Governor Shaft (1) IG0156,0154

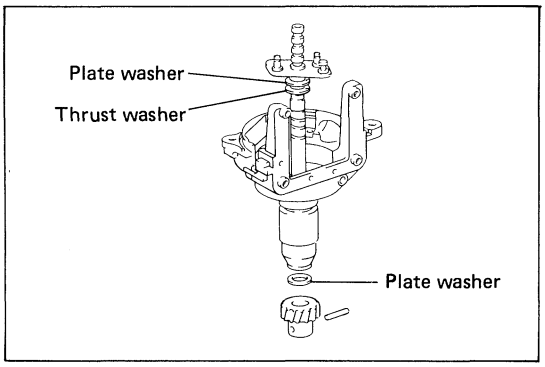
   (2) Drive out the straight pin with a pin punch.
   (3) Remove the spiral gear and thrust washer.

2. Governor shaft removal
   (1) Remove the governor shaft and thrust washer.



Removing the Governor Shaft (2) IG0155

3. Governor shaft installation
   (1) Apply high temperature grease thinly on the governor shaft.
   (2) Install the thrust washer to the governor shaft.
   (3) Assemble the governor shaft to the housing.

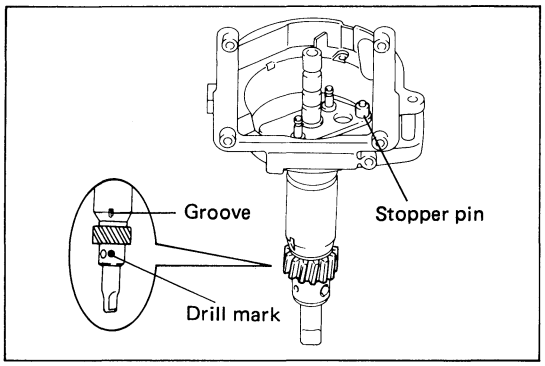


Installing the Governor Shaft (1) IG0535

4. Spiral gear installation
   (1) Install the plate washer, and spiral gear to the governor shaft.
   (2) Align the spiral gear drill mark with the groove on housing.

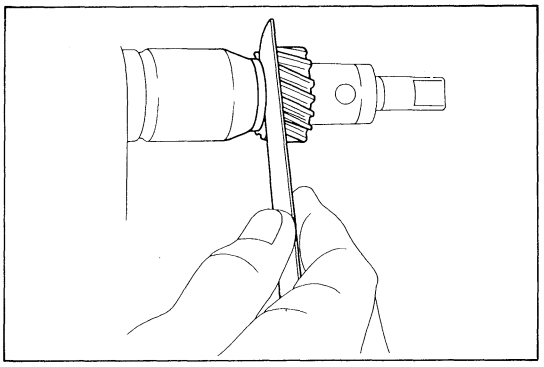
   Caution:
   Make sure that the stopper pin is at the illustrated position.

   (3) Install the straight pin.



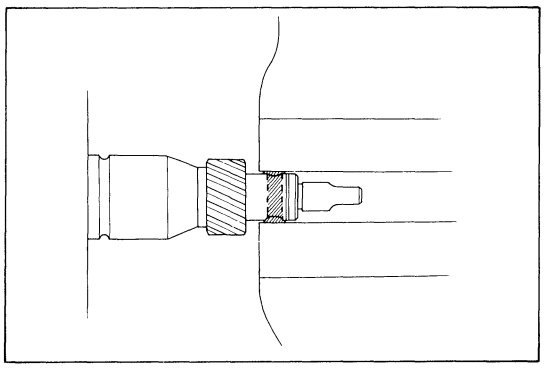
Installing the Governor Shaft (2) IG0536

(4) Measure the governor shaft thrust clearance with a thickness gauge.
Standard:
0.15 – 0.50 mm (0.0059 – 0.0197 in.)
If the standard is not satisfied, use the thrust washer for adjustment.
Thrust washer thickness:
0.3 mm (0.012 in.)
0.4 mm (0.016 in.)
0.5 mm (0.020 in.)
0.6 mm (0.024 in.)



Measuring the Thickness Gauge Thrust Clearance IG0514

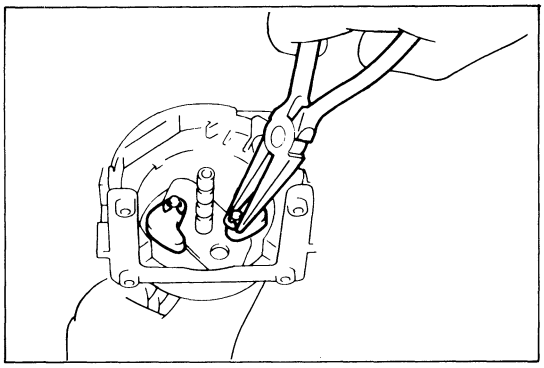
(5) Caulk both ends of the straight pin by pinching with a vise.



Caulking the Straight Pin IG0517

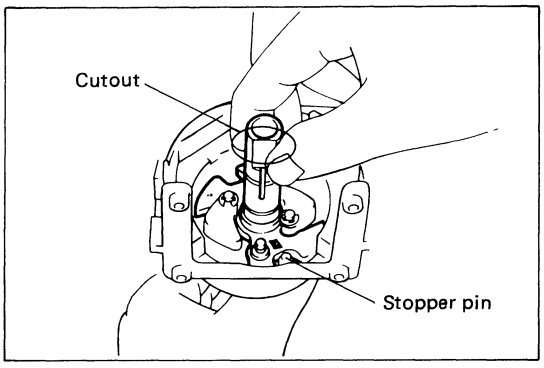
INSTALLATION

1. Governor weight installation
   (1) Coat high temperature grease thinly on the governor shaft.
   (2) Install two governor weights.
   (3) Install two snap rings.



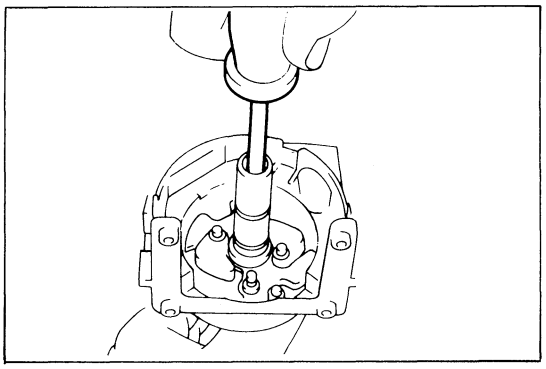
Installing the Governor Weight IG0537

2. Signal rotor shaft installation
   (1) Match the stopper pin and the shaft cut-out directions as illustrated, and assemble the signal rotor shaft.



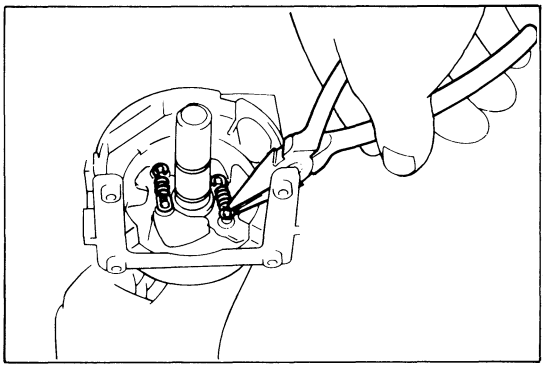
Installing the Signal Rotor Shaft IG0077

(2) Install the screw.
(3) Apply high temperature grease inside the shaft.
(4) Install the cam cap.



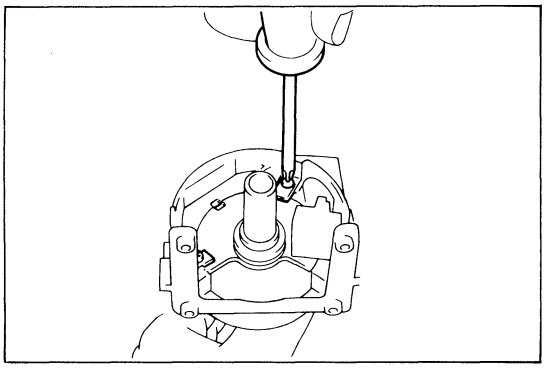
Installing the Screw IG0530

3. Governor spring installation



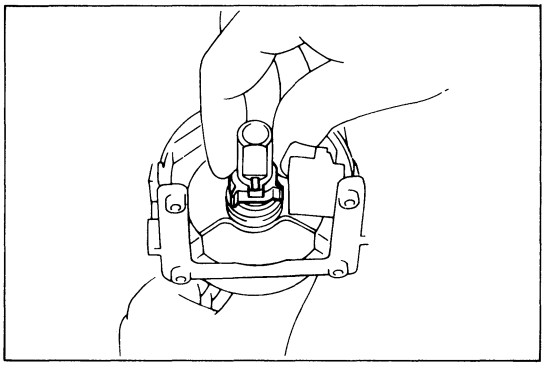
Installing the Governor Spring IG0529

4. Signal generator ASSY installation
(1) Match the signal generator ASSY and the housing cutout.
(2) Fix the signal generator ASSY using 2 plate washers and 2 screws.



Installing the Signal Generator ASSY IG0528

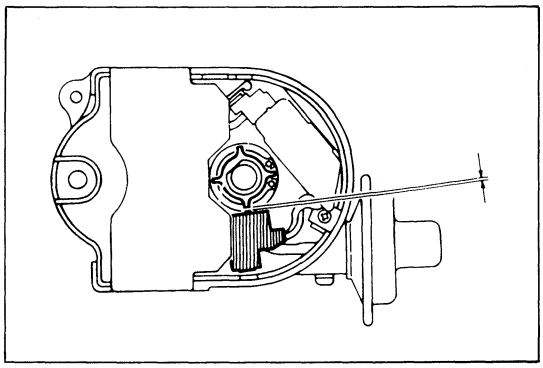
5. Signal rotor installation
(1) Insert the signal rotor into the rotor shaft. Match the cutout.



Installing the Signal Rotor IG0539

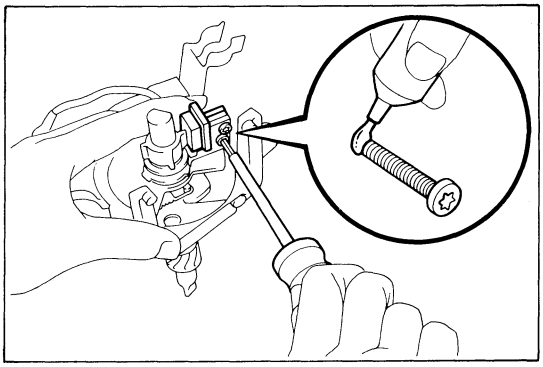
6. Air gap inspection
   (1) Measure the air gap with a thickness gauge.
   Standard:
   0.2 – 0.4 mm (0.008 – 0.016 in.)

   (2) If the standard is not satisfied as the result of inspection, replace the signal generator ASSY.



Measuring the Air Gap IG0500

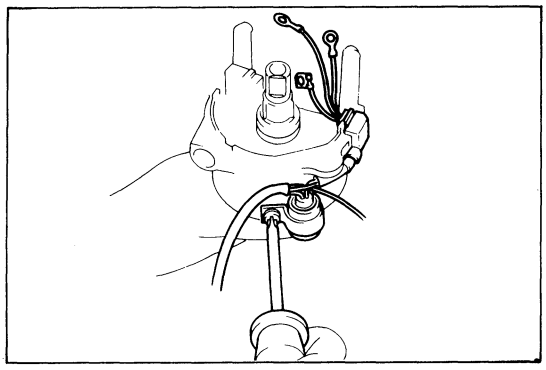
   (3) When replacing, wash the magnet holding screw and coil thread of new parts in trichloroethylene.
   Apply 08833-00070 or equivalent to the screw end for 3 – 5 mm (0.12 – 0.20 in.).
   (4) Temporarily fasten to the coil SUB-ASSY threaded hole through the breaker plate and magnet mounting holes.
   (5) Use a thickness gauge, adjust the air gap to 0.2 – 0.4 mm (0.008 – 0.016 in.) and finelly tighten the screw.



Replacing the Signal Generator ASSY IG0172

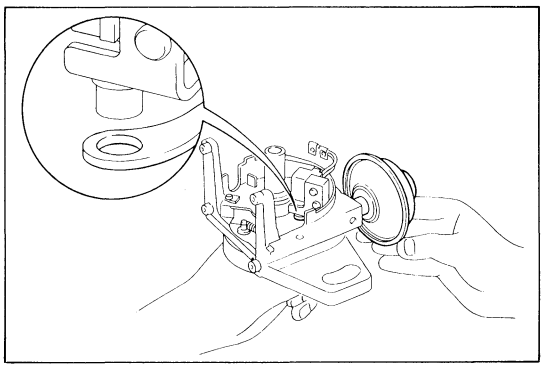
Caution:
- **Be sure to replace the rotor set spring with new part each time the signal generator ASSY is replaced.**
- **Keep the screw and coil threads free of grease or oil.**
- **Wipe off excessive 08833-00070.**
- **Do not start the engine until 08833-00070 hardens.**

7. Distributor wiring installation
   (1) Install the wire grommet to the housing.
   (2) Install the capacitor by using a screw.



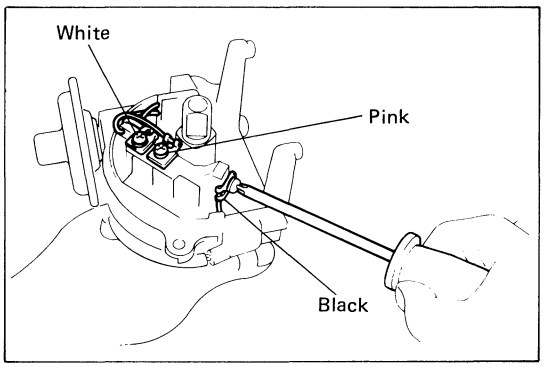
Installing the Distributor Wiring IG0540

8. Vacuum advancer installation
   (1) Insert the breaker plate pin to the advancer link hole.
   (2) Install the advancer and wire clamp by using 2 screws.



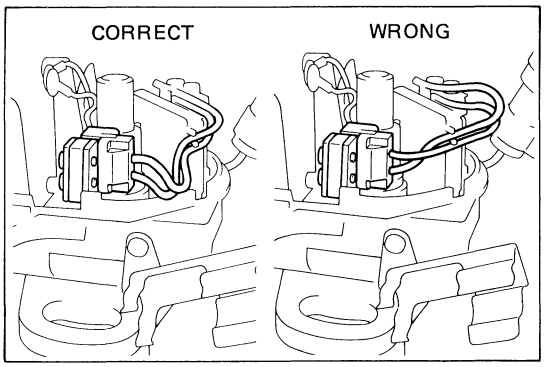
Installing the Vacuum Advancer IG0526

9. Igniter installation
   (1) Install the igniter and tighten 2 screws.
   (2) Install 3 wires to the igniter terminals.



Installing the Igniter IG0541

   (3) Give ample slack to the pickup coil wire as illustrated and fix them by the clip.



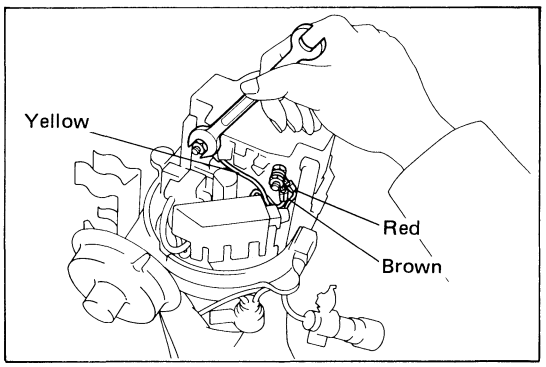
Fixing the Pickup Coil Wires IG0080,0081

10. Ignition coil installation
    (1) Install the ignition coil and gasket, and tighten 4 screws.
    (2) Install 3 wires to the ignition coil terminals.

11. Igniter dust cover installation

12. Ignition coil dust cover installation

13. Rotor installation

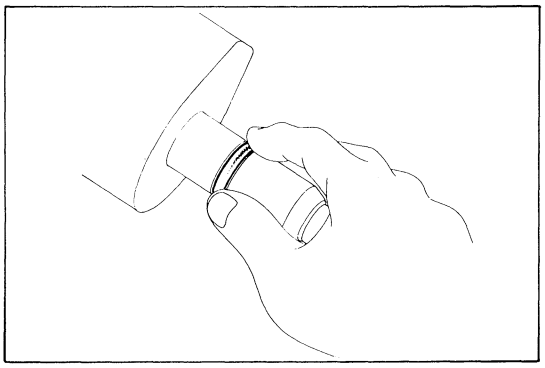


Installing the Ignition Coil KAJS55

14. Distributor cap with resistive cord installation
    (1) Install the gasket to the distributor housing.
    (2) Install the distributor cap and tighten 3 screws.

15. Install new O-ring to the housing.

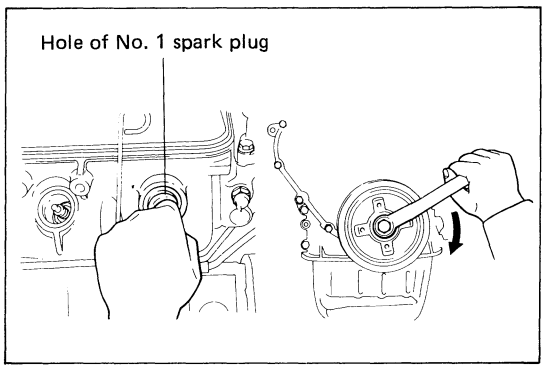
    Note:
    Coat engine oil thinly on the O-ring.



Installing the O-ring IG0522

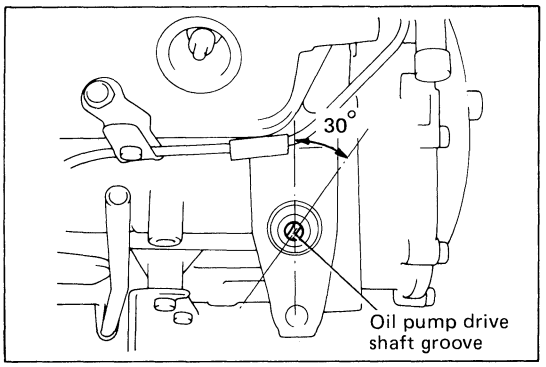
DISTRIBUTOR INSTALLATION

1. Set No. 1 cylinder compression TDC as follows:
    (1) Remove No. 1 spark plug.
    (2) Cover the hole of No. 1 spark plug with a finger tip. Turn the crankshaft clockwise. When pressure is felt, No. 1 cylinder is at the compression TDC.
    (3) Install No. 1 spark plug.



Setting No.1 Cylinder Compression Top Dead Center IG0082, KAJS86

2. Oil pump drive shaft groove setting
    (1) Set the shaft groove to point about 1 o'clock (30°) direction as viewed from above.

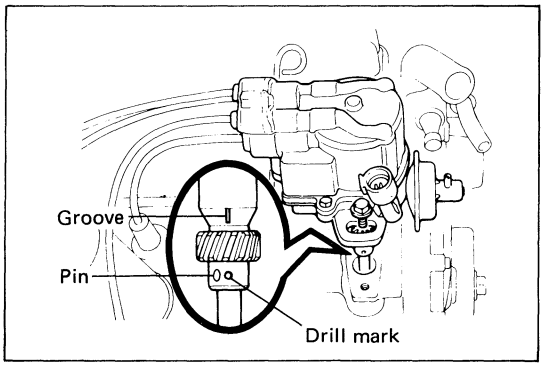


Oil Pump Drive Shaft Groove Position IG0084

3. Distributor installation
    (1) Align the housing groove with the spiral gear drill mark. (Do not align with the spiral gear straight pin.)
    (2) Insert the distributor parallel with the engine.

    Caution:
    Insert the distributor by nearly aligning the block installation screw hole with the center of installation flange groove.

    (3) Temporarily tighten the set bolts.



Installing the Distributor IG0087

4. Resistive cord installation
   Firing order: 1–3–4–2

   Caution:
   Insert the resistive cords until they click to the positions.

5. Connect the distributor connector.

6. Connect the vacuum hose.

7. Connect the battery negative terminal.

8. Ignition timing adjustment
   (See Page 1-5.)

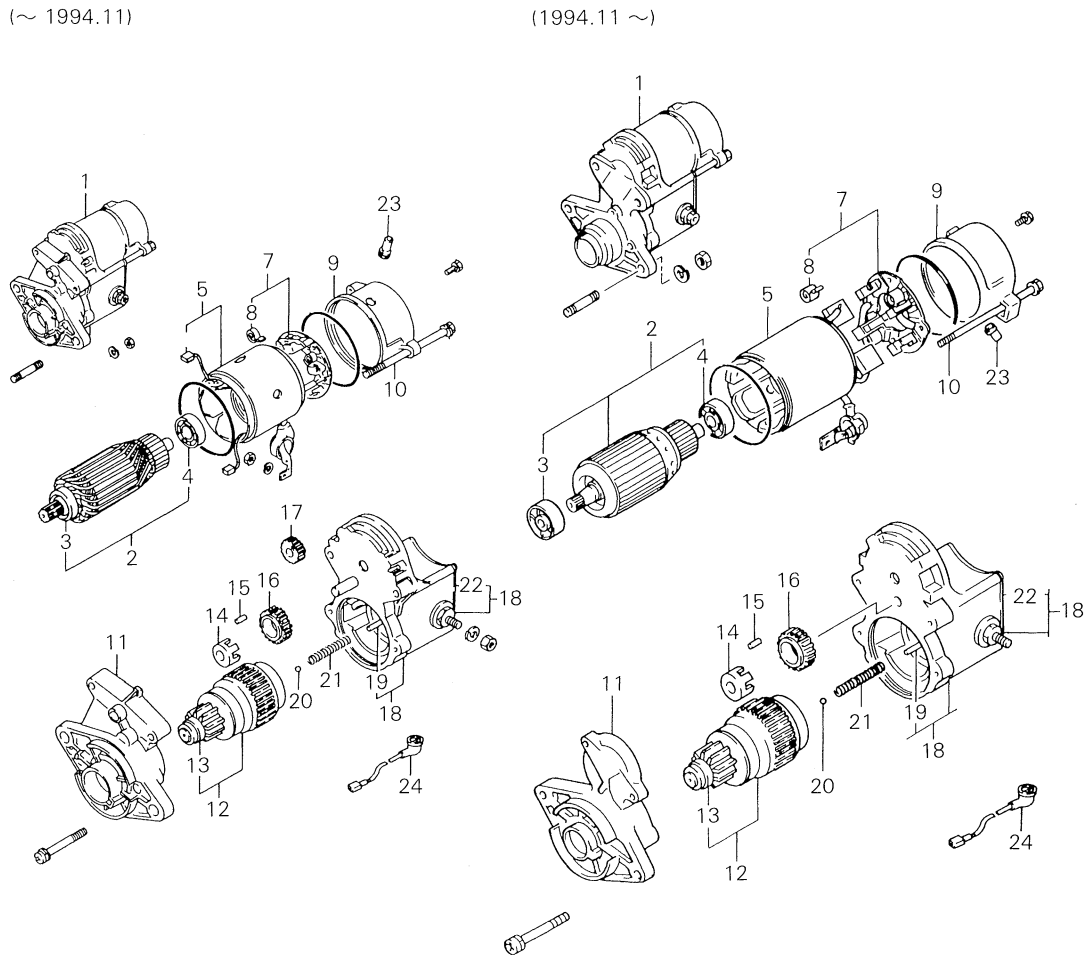
STARTING SYSTEM

Page

STARTING MOTOR 8-2

8

STARTING MOTOR



1. Starting motor ASSY
2. Armature ASSY
3. Bearing No. 1
4. Bearing No. 2
5. Yoke ASSY
6. Brush
7. Brush holder ASSY
8. Brush spring
9. End frame ASSY
10. Through bolt
11. Drive housing
12. Clutch SUB-ASSY
13. Pinion SUB-ASSY
14. Idle gear retainer
15. Roller
16. Idle gear
17. Pinion gear
18. Magnet ASSY
19. Contactor plunger
20. Steel ball
21. Magnet switch return spring
22. Packing
23. End frame cover
24. Lead wire

Starting Motor Components

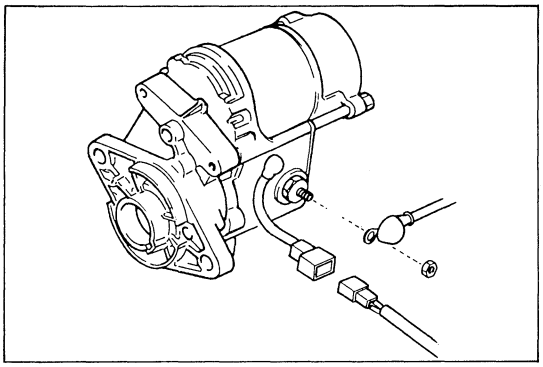
KAJM20

REMOVAL

Caution:
The following description explains the starting motor ASSY removal and installation procedures on the vehicle.

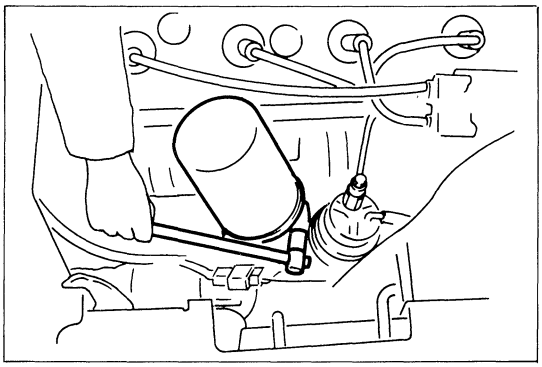
1. Battery negative terminal disconnection.

2. Wire harness removal
   (1) Remove the nut and remove the wire harness from terminal 30.
   (2) Disconnect the connector from terminal 50.



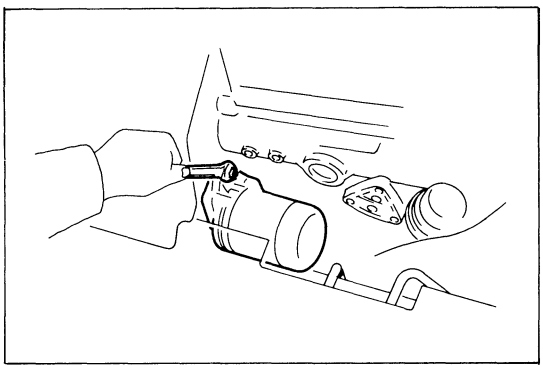
Disconnecting the Wire Harness KAJS78

3. Oil filter ASSY w/ bracket removal
   (1) Place an oil receiving container under the filter.
   (2) Remove 3 set bolts and remove the oil filter ASSY w/ bracket.



Removing the Oil Filter ASSY w/ Bracket KAJS104

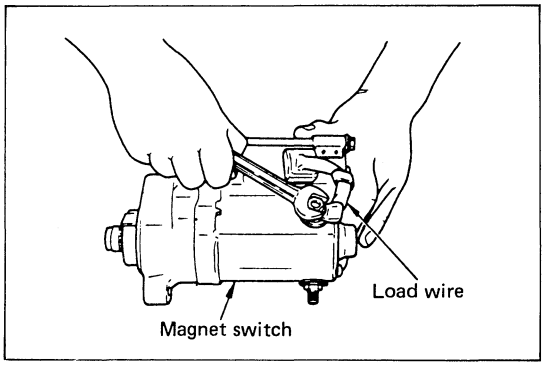
4. Starting motor ASSY removal
   (1) Remove 2 set nuts and disconnect the bond strap.
   (2) Remove the starting motor ASSY.



Removing the Starting Motor ASSY KAJS79

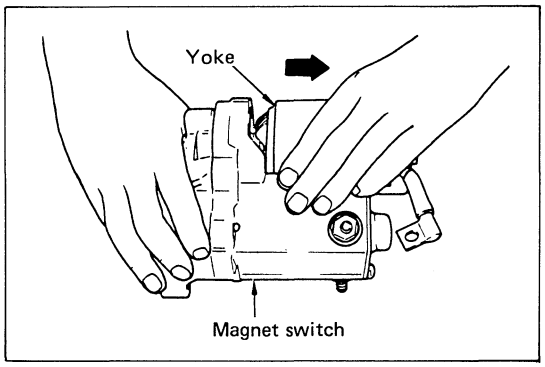
DISASSEMBLY

1. Lead wire disconnection
   (1) Disconnect the lead wire from the magnet switch.



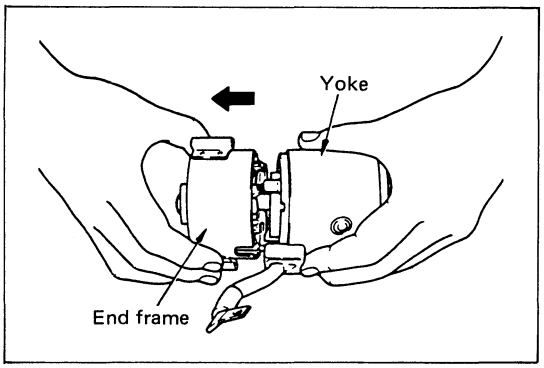
Disconnecting the Lead Wire KAJS80

2. Yoke ASSY removal
   (1) Remove 2 through bolts, and remove the yoke ASSY.



Removing the Yoke ASSY KAHS92

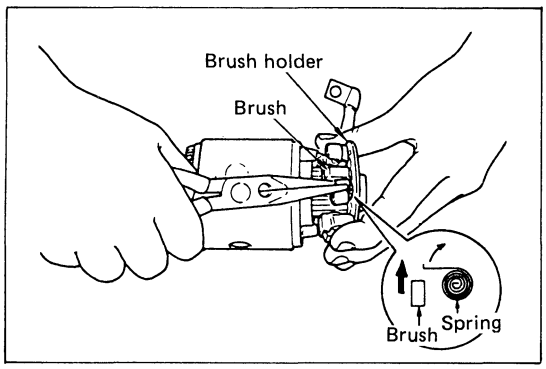
3. End frame removal
   (1) Remove 2 screws, and remove the end frame.



Removing the End Frame KAHS93

4. Brush removal
   (1) Use long-nosed pliers to lift up the positive side brush spring, and remove the brush from the brush holder.

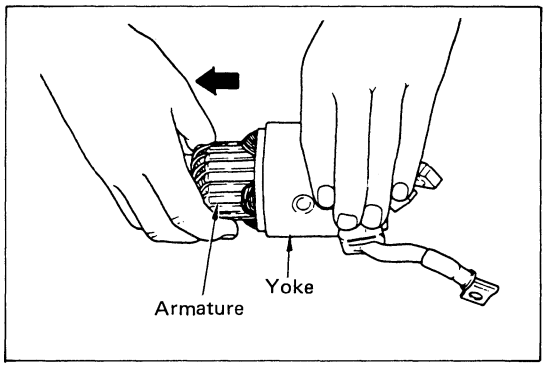
   Caution:
   Be careful not to inflict damage to the brush and commutator.



Removing the Brush KAHS94

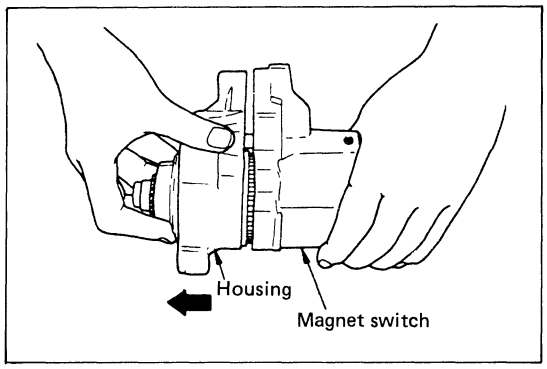
5. Armature ASSY removal
   (1) Remove the armature ASSY from the yoke.

   Caution:
   Be careful not to drop the armature.



Removing the Armature ASSY KAHS95

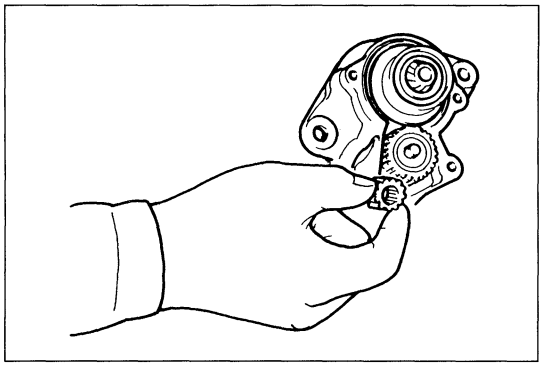
6. Housing ASSY removal
   (1) Remove 2 screws. Separate the housing ASSY and the magnet switch ASSY.



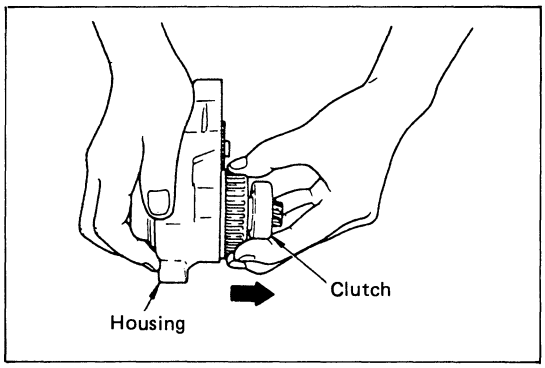
Removing the Housing ASSY KAHS96

7. Starting motor pinion removal
   (1) Remove the starting motor pinion from the clutch housing. (~ 1994.11)

   (1) Starting motor pinion has been discontinued. (1994.11 ~)



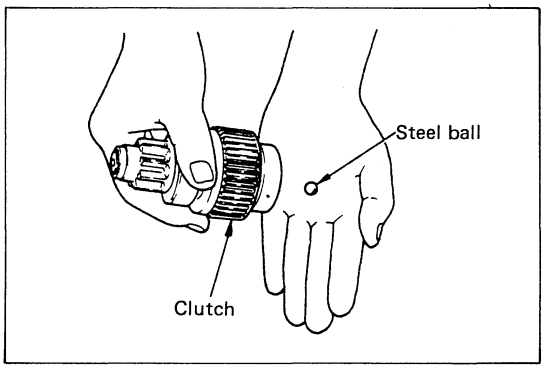
8. Clutch ASSY removal
   (1) Remove the clutch ASSY from the housing.



Removing the Clutch ASSY KAHS97

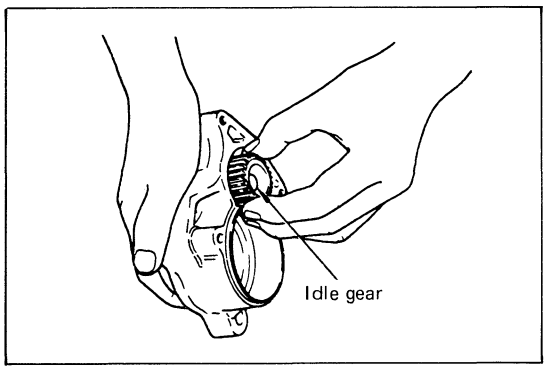
9. Steel ball removal
   (1) Remove the steel ball from the clutch ASSY.

   Caution:
   Do not lose the steel ball.



Removing the Steel Ball KAHS98

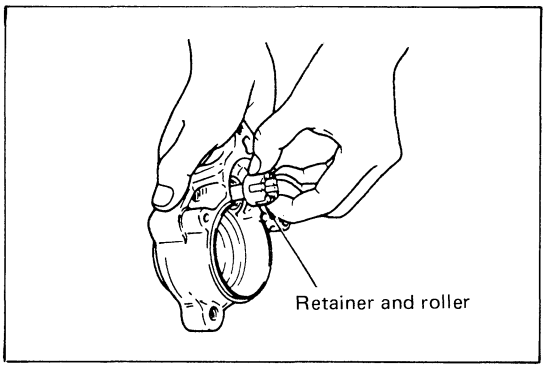
10. Idle gear removal
    (1) Remove the idle gear from the housing.



Removing the Idle Gear KAHS99

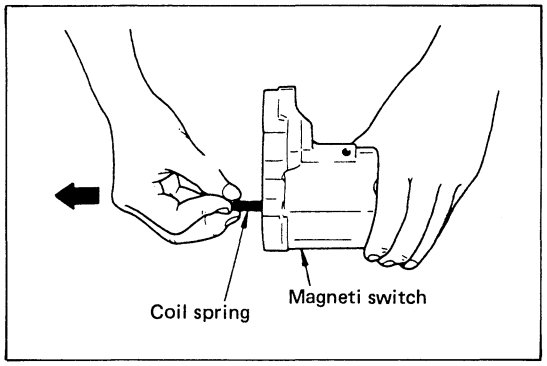
11. Retainer and roller removal
    (1) Remove the retainer and rollers from the housing.

    Caution:
    Do not drop the retainer and rollers.



Removing the Retainer and Roller KAHS100

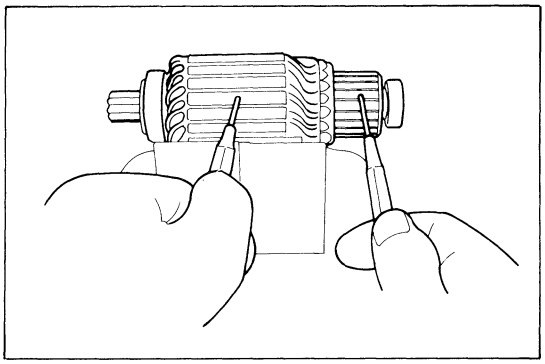
12. Coil spring removal
    (1) Remove the coil spring from the magnet switch.



Removing the Coil Spring KAHS101

INSPECTION

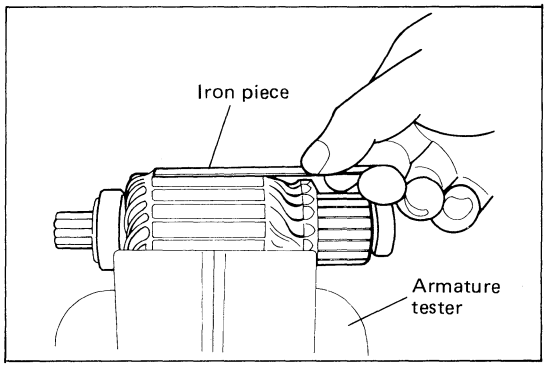
1. Armature coil grounding test
   (1) Inspect the insulation between the commutator and armature coil.
   Standard: No conduction



Inspecting the Armature Coil (1) Z5260

2. Armature coil short-circuit test
   (1) Use an armature tester, and turn the armature while holding an iron piece parallel to the armature.
   Standard: The iron piece shall neither be attracted nor vibrate.

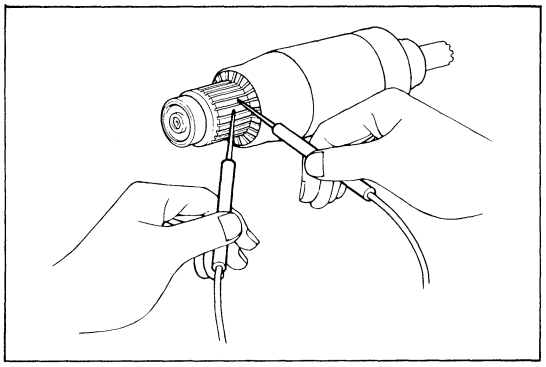
   Caution:
   Wipe the armature surface clean of any foreign matters before the test.



Inspecting the Armature Coil (2) Z5261

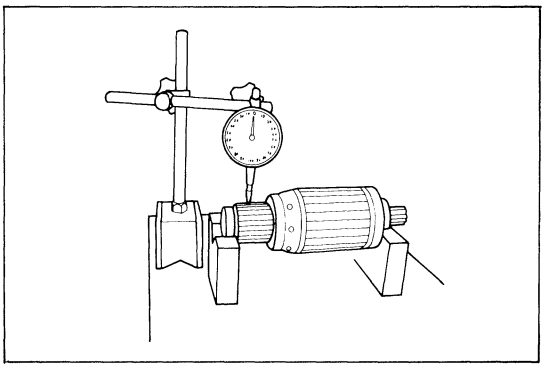
3. Armature coil open-circuit test
   (1) Inspect conduction between segments.

   Reference:
   Conduction between all segments.



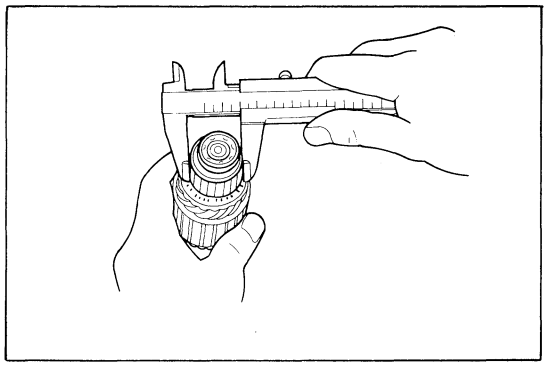
Inspecting the Armature Coil (3) B1416

4. Commutator inspection
   (1) Inspect the radial runout.
   Standard: 0.05 mm (0.0020 in.) or less



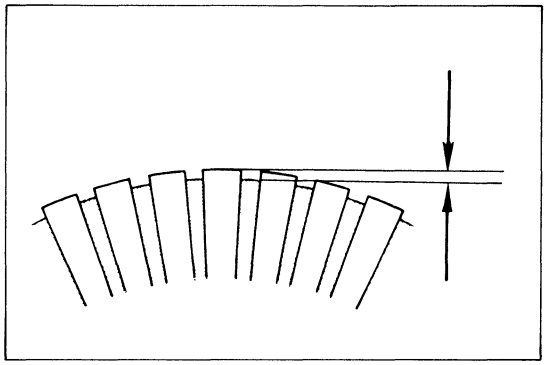
Inspecting the Commutator (1) Z5256

(2) Inspect the outside diameter.
Standard: 30 mm (1.18 in.)
Limit: 29 mm (1.14 in.)



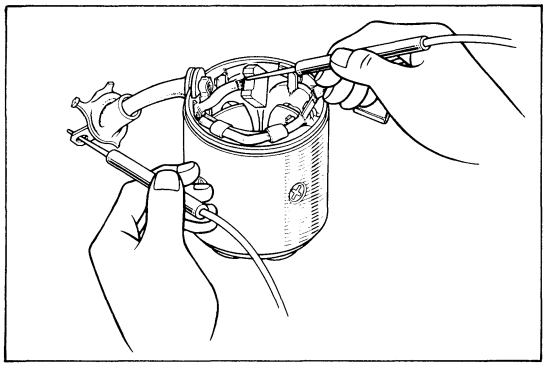
Measuring the Outside Diameter Z5257

(3) Inspect the undercut depth between segments.
(~ 1994.11)
Standard: 0.5 – 0.8 mm (0.020 – 0.031 in.)
Limit: 0.2 mm (0.008 in.)
(1994.11 ~)
Standard: 0.45 – 0.75 mm (0.0177 – 0.0295 in.)
Limit: 0.2 mm (0.008 in.)



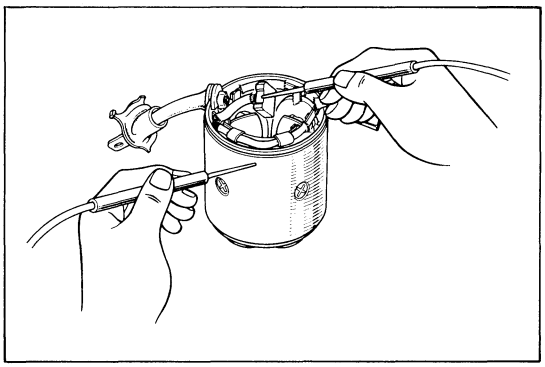
Inspecting the Undercut M5044

5. Field coil open-circuit test
(1) Inspect conduction between the field coil brush and C terminal.
Standard: Conduction



Testing the Field Coil Open-circuit M5047

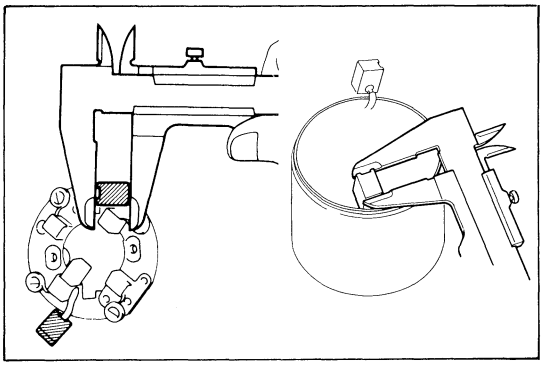
6. Field coil grounding test
(1) Inspect insulation between the field coil brush and field.
Standard: No conduction



Testing the Field Coil Grounding M5048

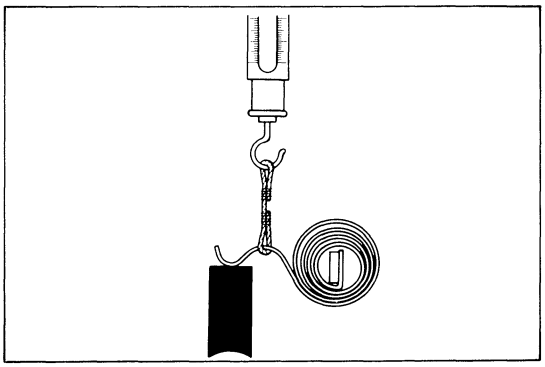
7. Brush test
   (1) Inspect roughening of the contact surface and the brush length.
   (~ 1994.11)
   Standard: 15 mm (0.59 in.)
   Limit: 10 mm (0.394 in.)
   (1994.11 ~)
   Standard: 15 mm (0.59 in.)
   Limit: 11 mm (0.433 in.)

   (2) For contact surface repair or brush replacement, wrap sand paper around the commutator to correct the brush surface.



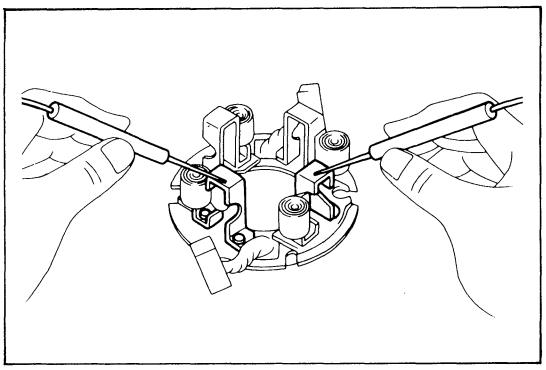
Inspecting the Brush ST0017,0018

8. Brush spring inspection
   (1) Check the brush spring for smooth movement. Measure the installed load.
   Standard: 1785 – 2415 g
   (3.93 – 5.32 lb)



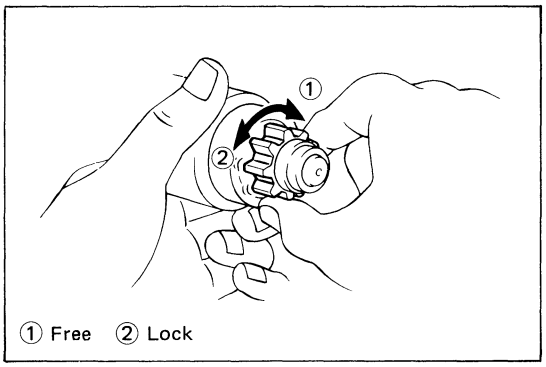
Inspecting the Brush Spring ST0019

9. Brush holder inspection
   (1) Inspect the insulation between the positive and negative brushes.
   Standard: No conduction



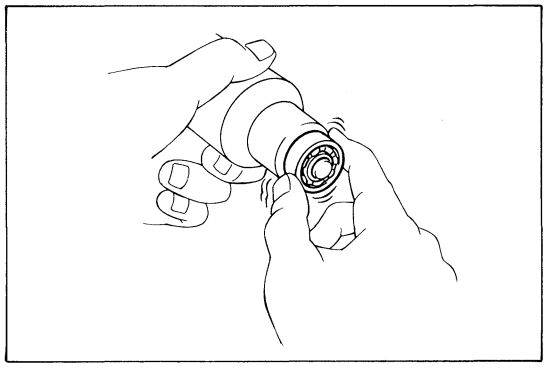
Inspecting the Brush Holder ST0062

10. Clutch and gear inspection
   (1) Inspect wear and damages of the gear.
   (2) Check that the gear is locked when rotated in the driving direction (counterclockwise). Check that the gear movement is smooth when turned in the opposite (clockwise) direction.



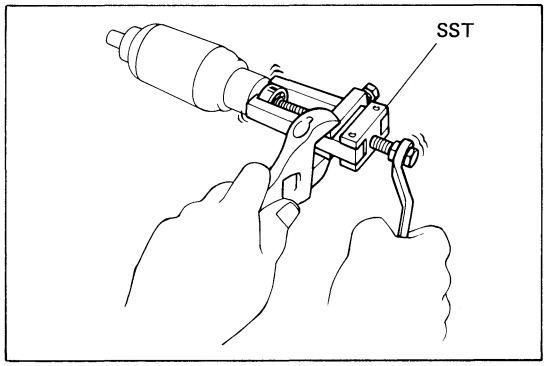
Inspecting the Clutch & Gear ST0020

11. Bearing inspection and replacement
    (1) Turn the bearing by applying a force with finger tips. No abnormality or sticking shall occur.
    (2) Turn the bearing rapidly. No abnormal sound shall be heard.
    (3) Replace the bearing if any abnormality is found.



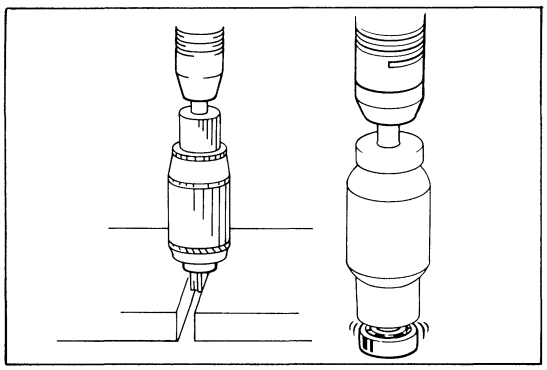
Inspecting the Bearing ST0041

    (4) Use the SST and remove the front and rear bearings.
    SST 09286-76001-71
    (SST 09286-46011)



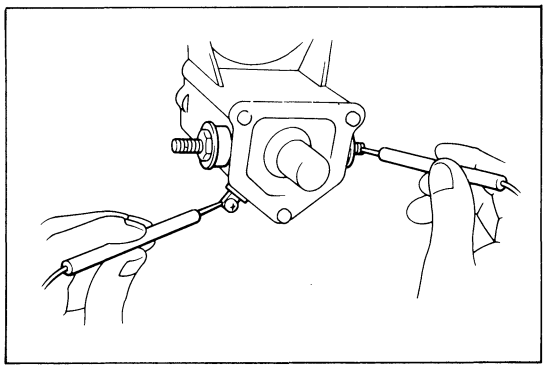
Replacing the Bearing ST0042

    (5) Use a press and install the new front bearing.
    (6) Use the press and install the new rear bearing.



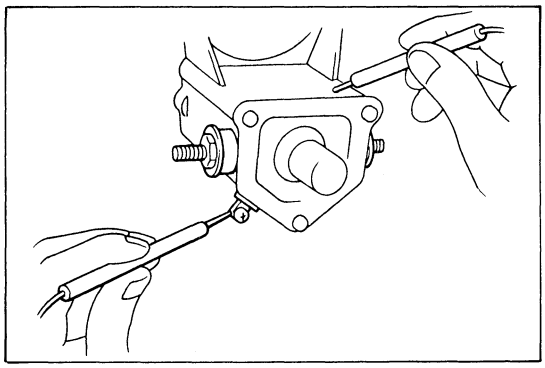
Replacing the Bearing F5076, ST0043

12. Magnet and switch inspection
    (1) Inspect the conduction between terminals 50 and C.
    Standard: Conduction



Inspecting the Magnet Switch ASSY ST0110

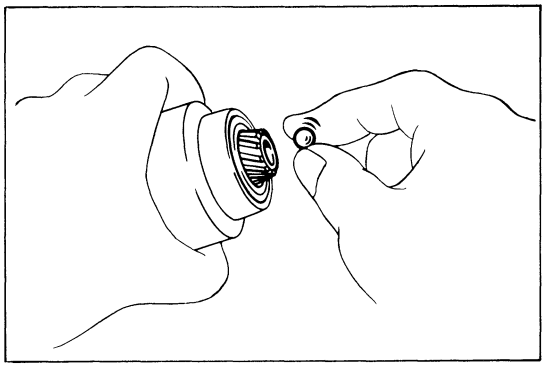
(2) Inspect the conduction between terminal 50 and switch body.
Standard: Conduction



Inspecting the Magnet Switch ASSY ST0111

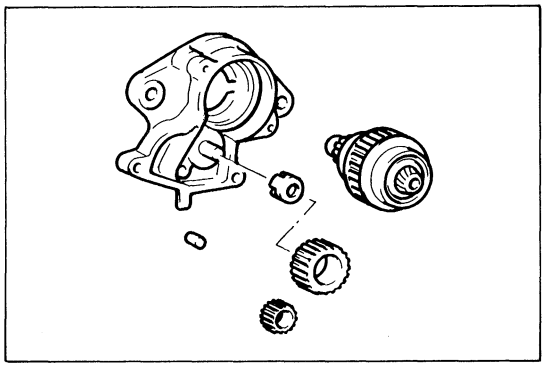
INSTALLATION

1. Steel ball installation
   (1) Coat grease on the steel ball and put it into the clutch shaft hole.



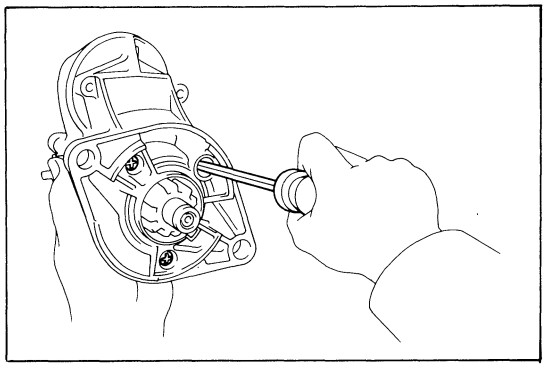
Installing the Steel Ball ST0044

2. Starting motor housing ASSY installation
   (1) Coat grease on the idler gear, starting pinion, starting motor clutch and return spring.
   (2) Install the starting motor clutch, return spring, idler gear, idler gear retainer, five idler gear rollers, and plate washer to the magnet switch.



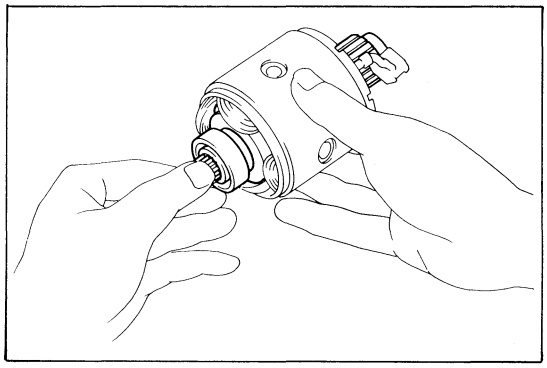
Installing the Housing ASSY (1) ST0357

   (3) Install the starting motor housing to the magnet switch ASSY by using 2 screws.



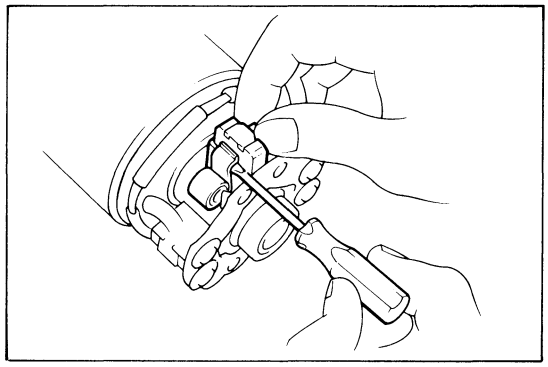
Installing the Housing ASSY (2) ST0355

3. Armature ASSY installation
   (1) Coat grease on the armature bearing. Install the armature to the starting motor yoke.



Installing the Armature ASSY ST0237

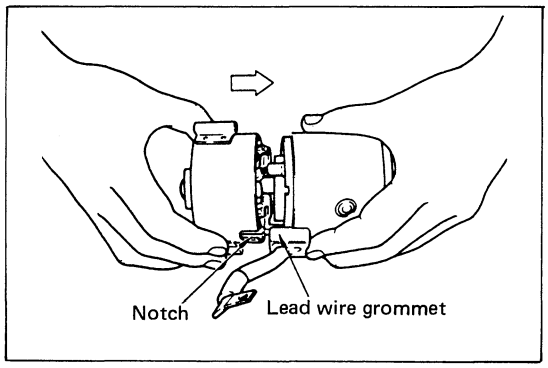
4. Brush holder installation
   (1) Lift the brush spring with a screwdriver and install the brush holder to the starting motor yoke.
   (2) Lift the brush spring, and install the brush to the brush holder.



Installing the Brush Holder ST0039

5. End frame installation
   (1) Install the end frame to the yoke by using 2 screws.

   Caution:
   Match the end frame cutout with the lead wire grommet.

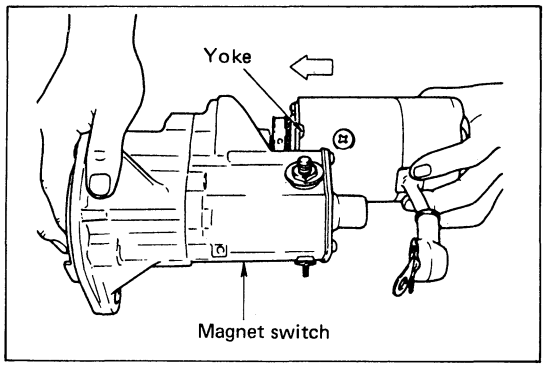


Installing the End Frame KAHS102

6. Yoke ASSY w/ armature ASSY installation
   (1) Install the yoke ASSY w/ armature ASSY to the magnet switch.

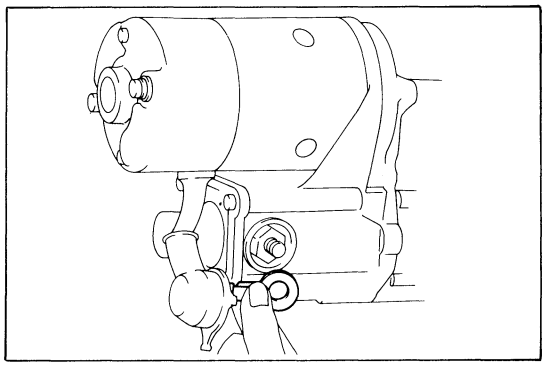
   Caution:
   Match the yoke cutout with the convex portion of the magnet switch.
   Coat grease thinly on the armature shaft.

   (2) Tighten 2 through bolts.



Installing the Yoke ASSY KAJS81

7. Terminal C lead wire connection
   (1) Connect the lead wire to terminal C by using a nut.

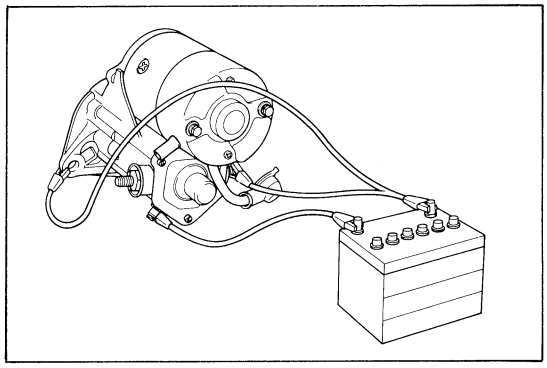


Connecting the Lead Wire to Terminal C ST0347

INDIVIDUAL STARTING MOTOR INSPECTION

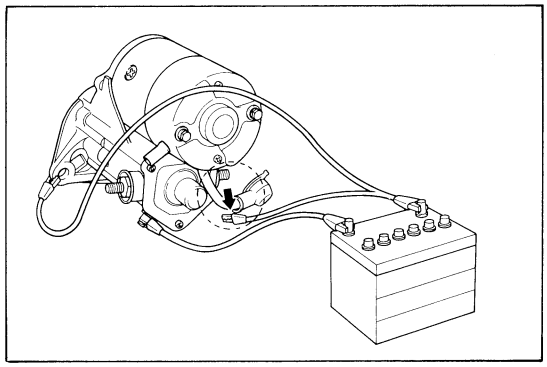
Caution:
Test each item in a short time (3 to 5 seconds).

1. Pull-in test
   (1) Make sure that the pinion gear comes out when the wiring is connected as illustrated.



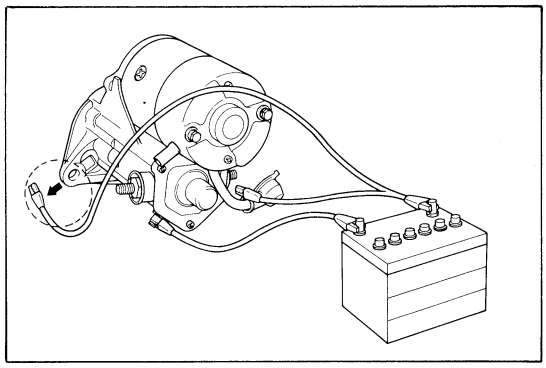
Pull-in Test ST0349

2. Holding coil holding test
   (1) Disconnect terminal C lead from the pull-in test state. Check that the pinion gear remains protruded.



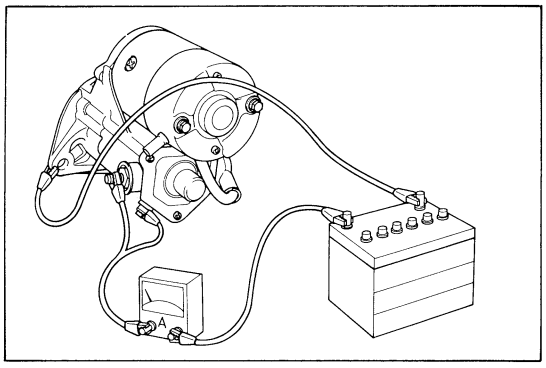
Holding Coil Holding Test ST0350

3. Plunger return test
   (1) Disconnect the wiring as illustrated from the holding coil holding test state. Check that the pinion gear retracts.



Plunger Return Test ST0351

4. No-load test
   (1) Clamp the starting motor firmly in a vise.
   (2) Use heavy lead wires for the no-load test because a big current flows during the test.
   (3) Read the ammeter indication after it is stablized.
   Standard: 90A or less



No-load Test ST0352

INSTALLATION

The installation procedure is the reverse of the removal procedure.

Caution:
Make sure that all wiring is correctly made without omission before connecting the battery negative terminal.

CHARING SYSTEM

	Page
INSPECTION ON VEHICLE	9-2
ALTERNATOR ASSY	9-3

9

INSPECTION ON VEHICLE

1. Inspect the specific gravity of the battery electrolyte.
   Standard: 1.28 (at electrolyte temperature of 20°C)
2. Inspect the battery terminals.
3. Inspect the V-belt.
4. Inspect the fuse.
5. Inspect the wiring.
6. Inspect abnormal sound.
   (1) Inspect the abnormal sound from the alternator while engine is running.
7. Measuring no-load (regulated voltage and current inspection)
   (1) Connect a volt meter and an ammeter as illustrated.

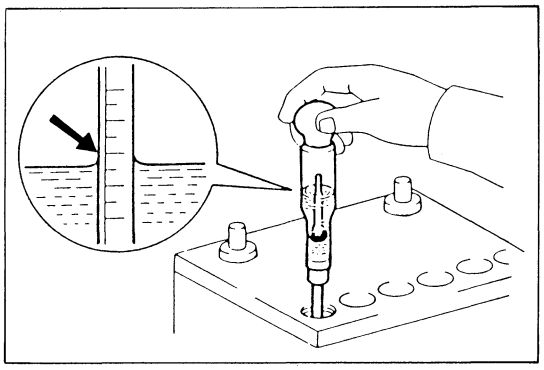
   ~1998.7:

   (2) Increase the engine speed gradually to 2000 rpm and measure the voltage.
   Standard: 14.2 – 14.8V

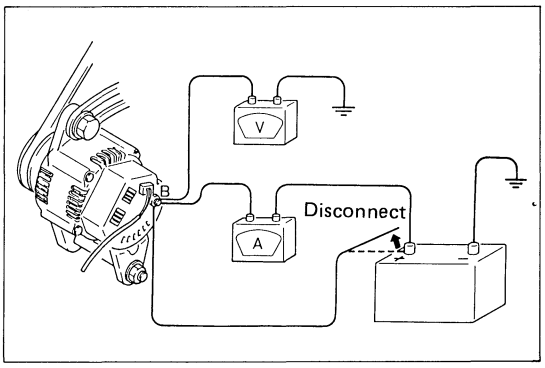
   1998.8~:

   (2) Increase the engine speed gradually to 2600 rpm and measure the voltage.
   Standard: 13.5 – 14.3 V
   (3) Measure the current when the engine speed reaches 2000 rpm.
   Standard: 10A or less

   Caution:
   Immediately after the start of engine, current temporarily surges to over 10A. This is not abnormal.



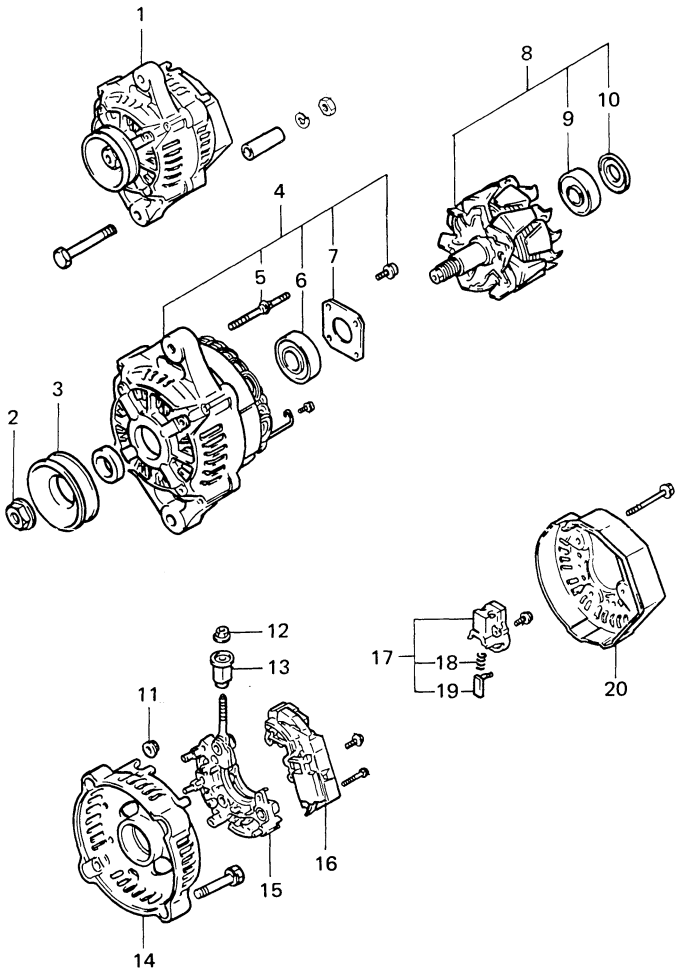
Inspecting the Specific Gravity of the Battery Electrolyte KAHS106



Measuring the No-load Regulated Voltage KAHS104

ALTERNATOR ASSY

COMPONENTS

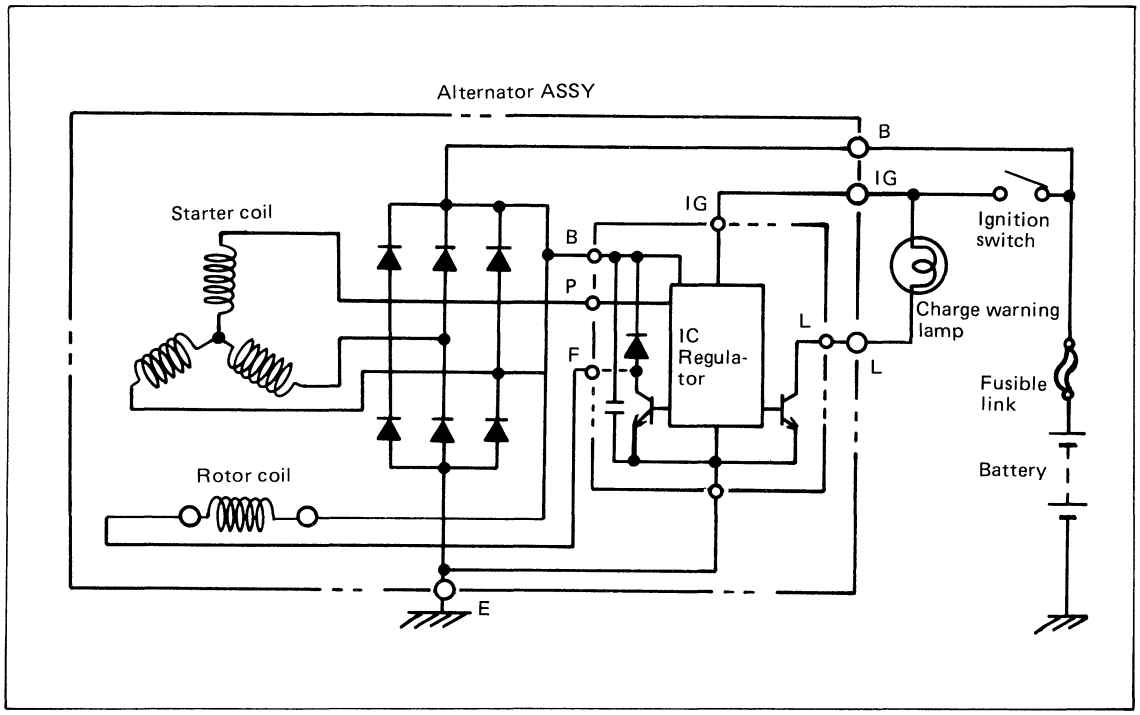


1. Alternator ASSY
2. Nut, pulley lock
3. Pulley, alternator
4. Frame ASSY, drive end
5. Bolt, stud
6. Bearing
7. Plate, bearing retainer
8. Rotor ASSY, alternator
9. Bearing
10. Cover, bearing
11. Nut
12. Nut
13. Insulator
14. Frame, rectifier end
15. Holder, with rectifier
16. Regulator
17. Holder ASSY, alternator brush
18. Spring, brush
19. Brush, alternator
20. Cover, rear end

Alternator ASSY Components KAJM21

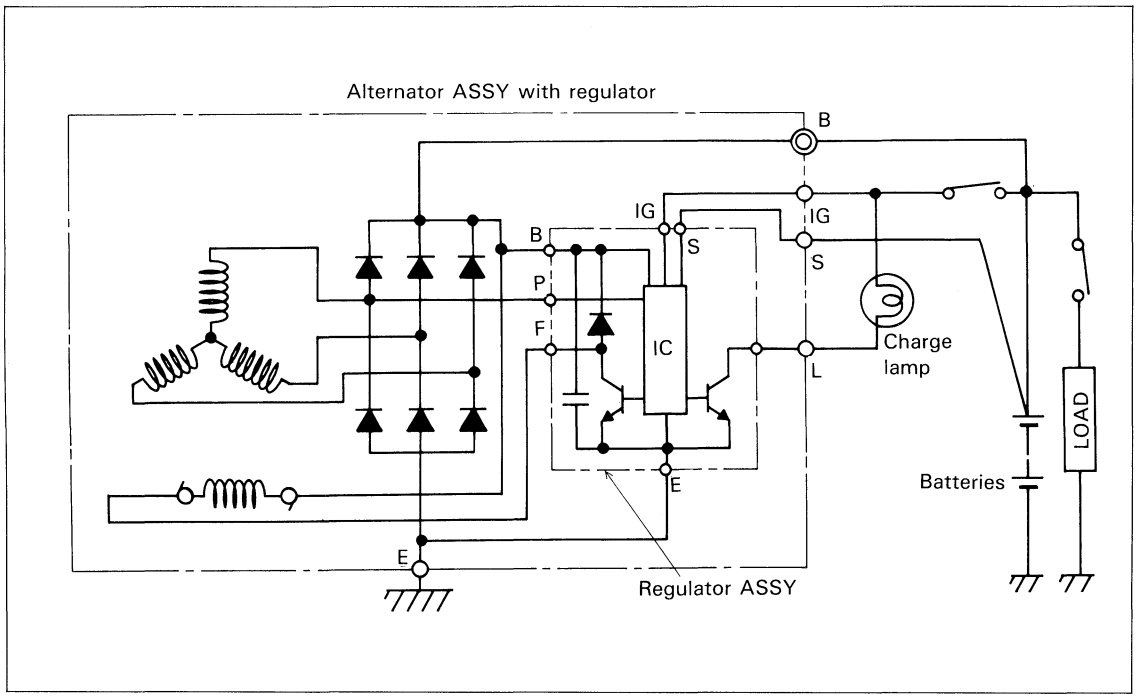
CIRCUIT DIAGRAM

Until March, 1989



Alternator Circuit Diagram KAJM22

Since March, 1989



Alternator Circuit Diagram KANM27

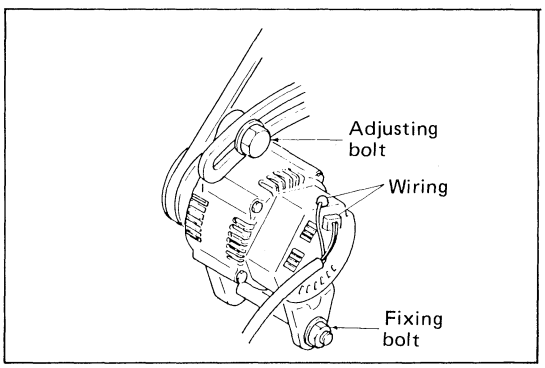
Caution:
The following description explains removal and installation procedures of the alternator ASSY on the vehicle.

REMOVAL

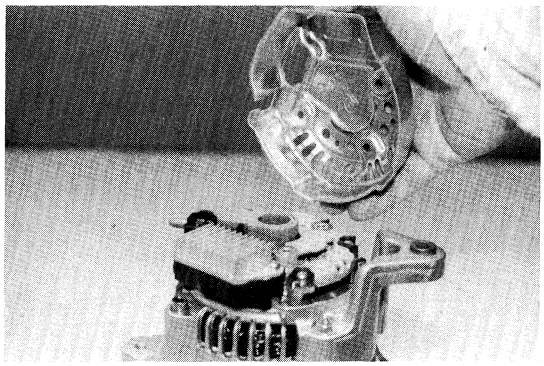
1. Battery negative terminal removal
2. Alternator wiring disconnection.
3. V belt loosening
4. Alternator ASSY removal

DISASSEMBLY

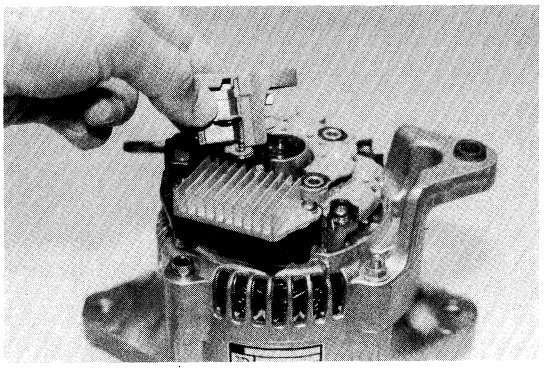
1. Terminal insulator removal
2. Rear end cover removal
   (1) Screws (3 pcs.)
   (2) Rear end cover
3. Brush holder SUB-ASSY removal
   (1) Screws (2 pcs.)
   (2) Brush holder SUB-ASSY
4. IC regulator ASSY removal
   (1) Screw (3 pcs.)
   (2) IC regulator ASSY



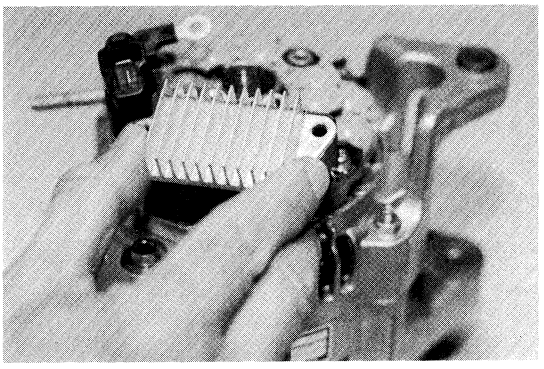
Alternator ASSY KAJS83



Removing the Rear End Cover KAH21-7

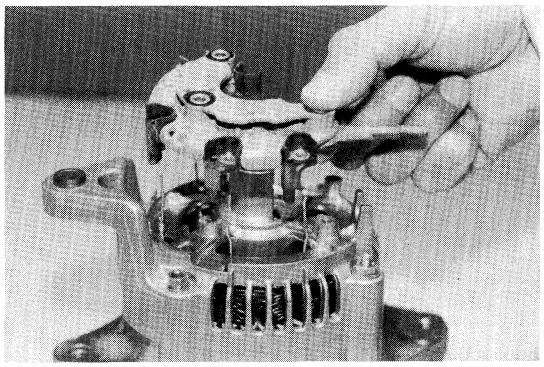


Removing the Brush Holder SUB-ASSY KAH21-12



Removing the IC Regulator KAH21-16

5. Rectifier SUB-ASSY removal
   (1) Stator coil terminal screws at four places (4 pcs.).
   (2) Straighten the terminal.
   (3) Rectifier SUB-ASSY

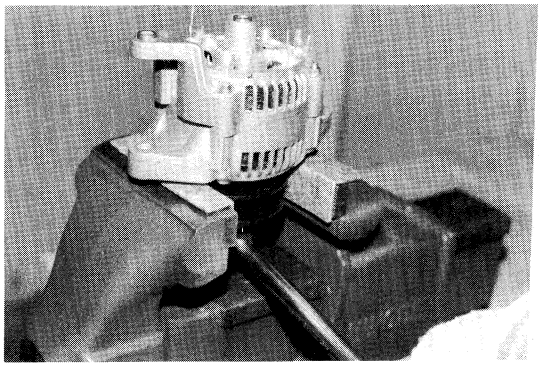


Removing the Rectifier SUB-ASSY KAH21-21

6. Pulley removal
   (1) Fix the alternator pulley in a vise.

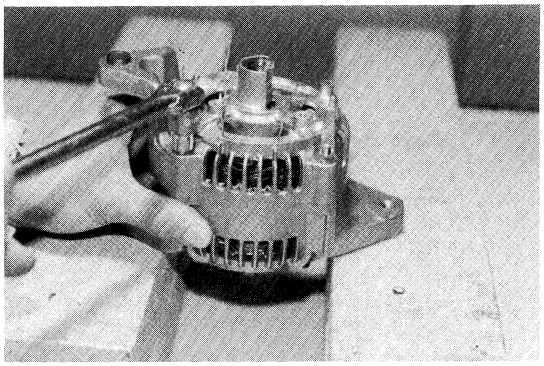
   Caution:
   Always use pads for the vise.

   (2) Set nut (The width across flats of the socket wrench is 22 mm.)
   (3) Pulley



Removing the Pulley KAH22-2

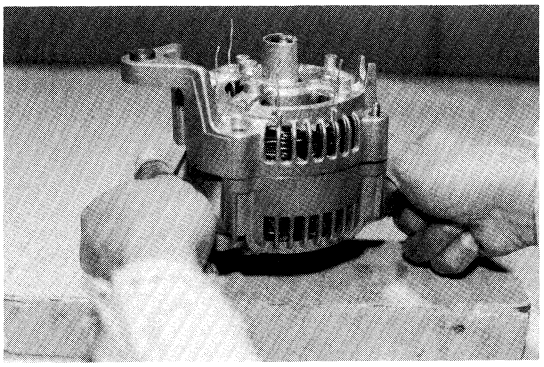
7. Rear end frame removal
   (1) Set nuts (2 pcs.)
   (2) Set bolts (2 pcs.)



Removing the Rear End Frame (1) KAH22-5

   (3) Hold the rear end frame. Give shock to the end of the rotor shaft and disconnect the drive end frame from the rear end frame.

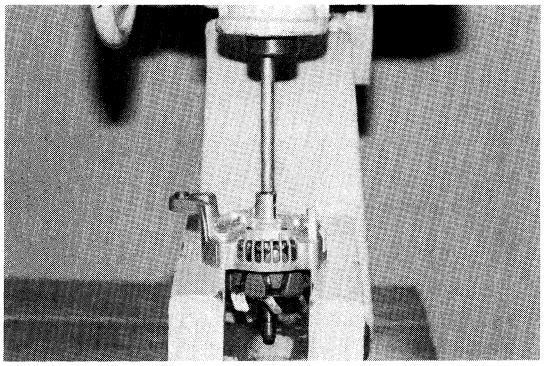
   Caution:
   When giving shock, use a wooden block at the end of the rotor shaft for protection.



Removing the Rear End Frame (2) KAH22-8

8. Disconnect the drive end frame from the rotor ASSY.
   (1) Use a press and remove the rotor ASSY from the end frame.

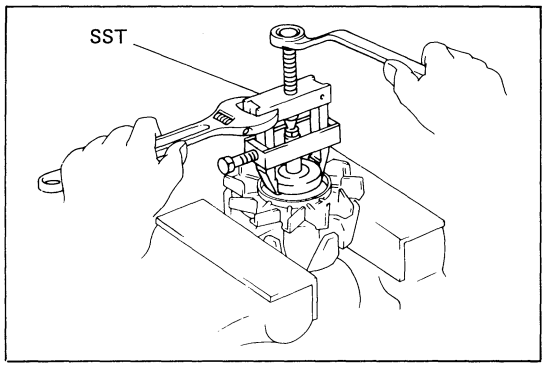
   Caution:
   Be careful not to inflict damage to bakelite at the tip end on the rear side of the rotor ASSY.



Removing the Rotor ASSY KAH22-14

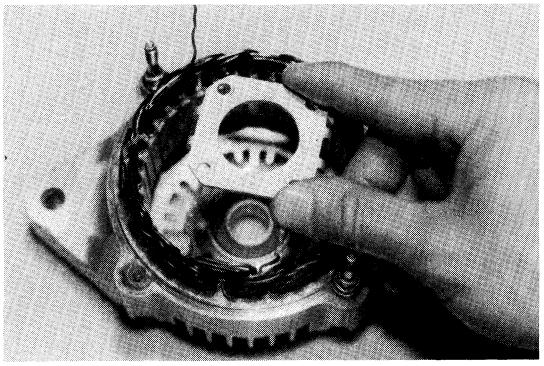
9. Rear bearing removal
   (1) Use the SST and remove the rear bearing.
   SST 09820-76002-71
   (SST 09820-00021)

   Caution:
   Do not remove unless there is abnormality.



Removing the Rear Bearing B1565

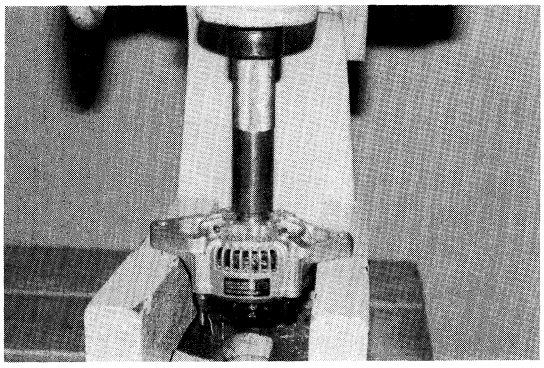
10. Front bearing removal
    (1) Screws (4 pcs.)
    (2) Retainer plate



Removing the Retainer Plate KAH22-26

    (3) Front bearing

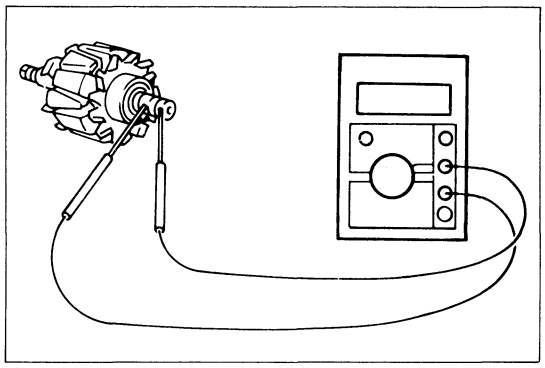
    Caution:
    Use an appropriate round bar (ϕ25 – 28) and a press.



Removing the Front Bearing KAH22-27

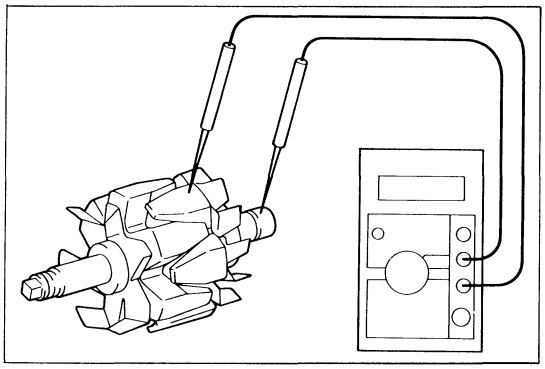
INSPECTION

1. Rotor ASSY inspection No. 1 (Coil open-circuit test).
   (1) Measure the resistance between two slip rings.
   Standard: 2.9Ω or less



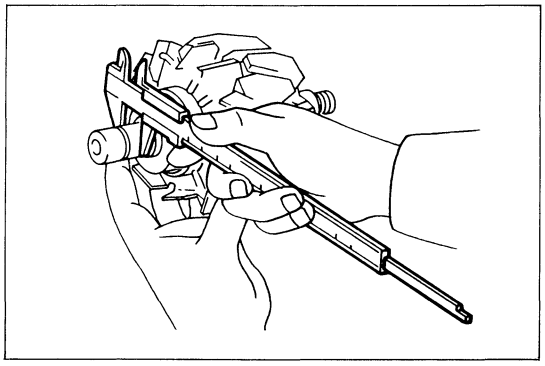
Inspecting the Rotor ASSY (Coil open-circuit test) F1698

2. Rotor ASSY inspection No. 2 (Coil grounding test).
   (1) Measure the insulation resistance between the slip ring and rotor core.
   Standard: 0.1 MΩ or more



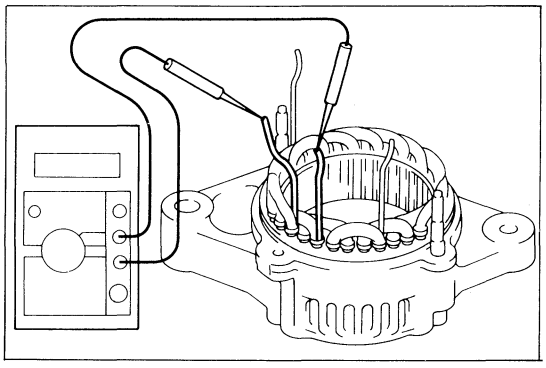
Inspecting the Rotor ASSY (Coil grounding test) F3507

3. Slip ring inspection
   (1) Inspect the slip ring for any damage.
      1 Repair damage on the slip ring surface, if any, with sandpaper (#400).
   (2) Measure the slip ring outside diameter.
   Standard: 14.4 mm (0.567 in.)
   Limit: 14.0 mm (0.551 in.)



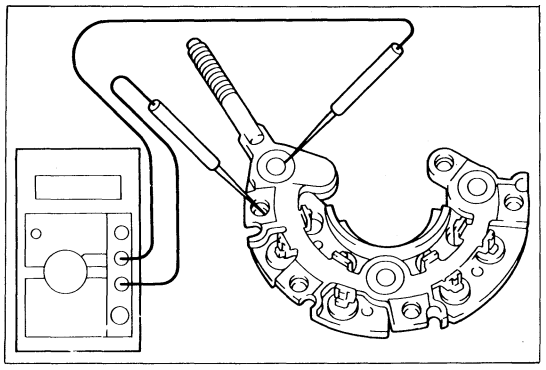
Inspecting the Slip Ring B5722

4. Stator coil inspection
   (1) Measure the resistance between phases.
   Standard: 1 Ω



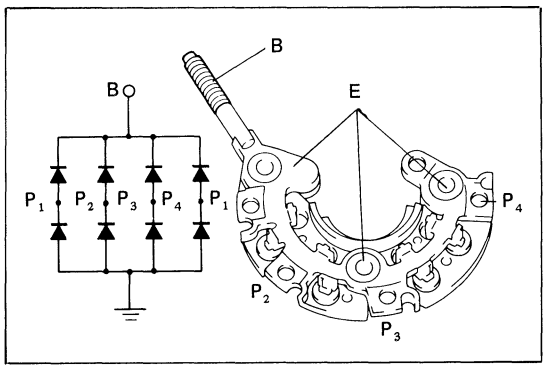
Inspecting the Stator Coil F3511

5. Rectifier SUB-ASSY inspection
   (1) Test continuity of the rectifier SUB-ASSY using kΩ range of the tester.
   Standard: Conduction in one direction and no conduction in the reverse direction.



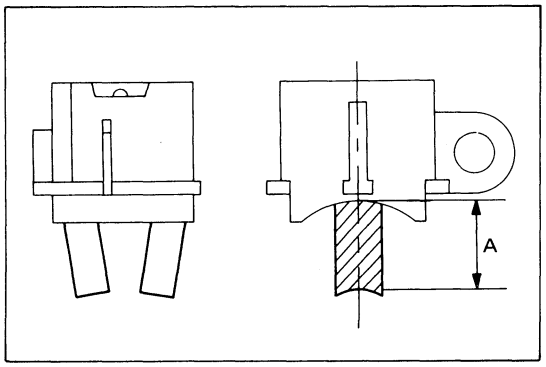
Inspecting the Rectifier SUB-ASSY F3508

Caution:
- For the rectifier circuit, see the illustration.
- The quality of the rectifier cannot be determined only on the basis of the forward resistance because the forward current varies greatly with the supply voltage due to the diode characteristic.
- The circuit tester indication varies with the tester type and the resistance range. Therefore, the rectifier shall be judged acceptable if the difference between the forward and reverse resistances is great.
- Never use a 500V megger because it may destroy the rectifier.



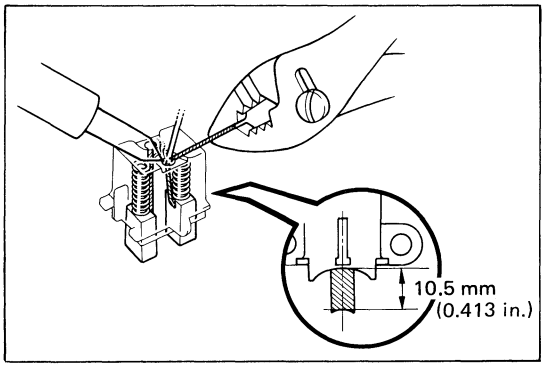
Inspecting the Rectifier SUB-ASSY F3509

6. Brush inspection
   (1) Measure brush protrusion length A.
   Standard: 10.5 mm (0.413 in.)
   Limit: 1.5 mm (0.059 in.)



Measuning the Brush Protrusion Length F3510

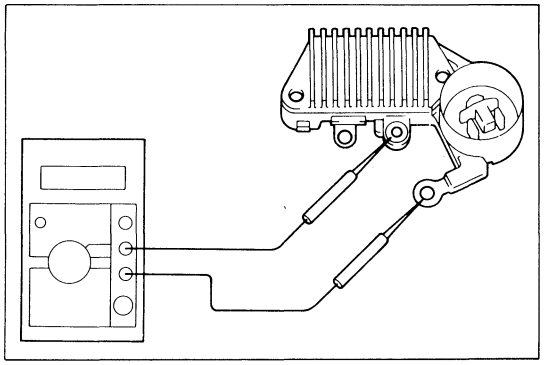
   (2) When the brush length is less than the limit, melt soldering of the brush holder and remove the brush.
   (3) Fix the spring to the brush holder. Solder brush to the holder to make brush length 10.5 mm (0.413 in.).
   (4) Cut off excess length of the lead wire.
   (5) Coat insulation paint on the soldered part.



Adjusting the Brush Length B5004

Caution:
- Replace the brushes on both sides at the same time.
- Solder thickness shall not exceed 1.0 mm (0.039 in.).

7. IC regulator diode inspection
   (1) Test continuity of the diode between terminals B and F using the kΩ range of a circuit tester.
   Standard: Conduction in one direction and no conduction in the reverse direction when tested with polarity change between terminals B and F.



Inspecting the IC Regulator F3512

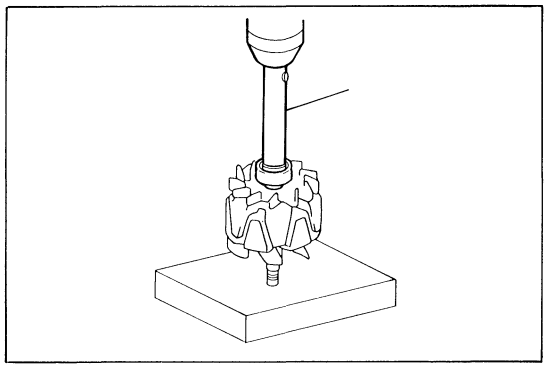
ASSEMBLY

1. Rear bearing installation

   Caution:
   Carry out this work only when the bearing was removed.

   (1) Press-fit the rear bearing with the SST and a press.

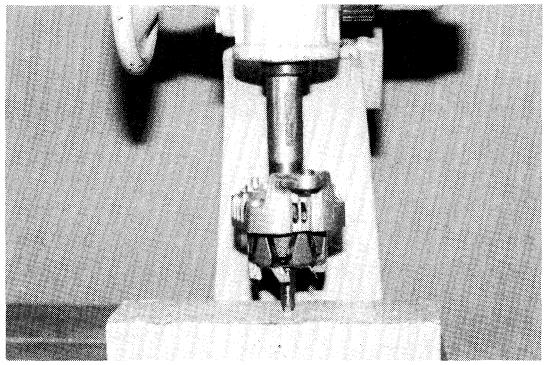
   Caution:
   Press-fit the bearing from the inner race side.



Installing Rear Bearing C5024

2. Assemble the rear end frame and the rotor
   (1) Press-fit the rear end frame to the rotor using the SST and press.
   SST 09381-41950-71

   Caution:
   Pressure should be evenly distributed over the rear end frame. To achieve this, place plate washers to fill up the clearance between the SST and rear end frame.

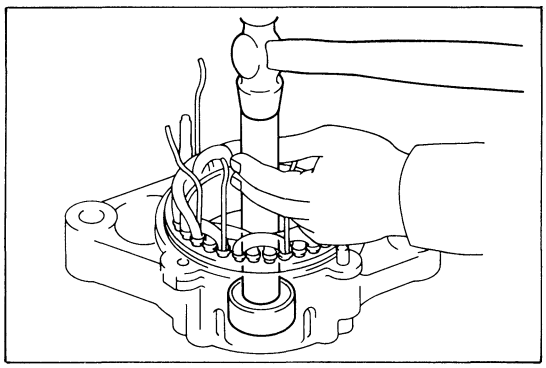


Assembling the Rear End Frame KAH22-33

3. Install the bearing to the drive end frame.

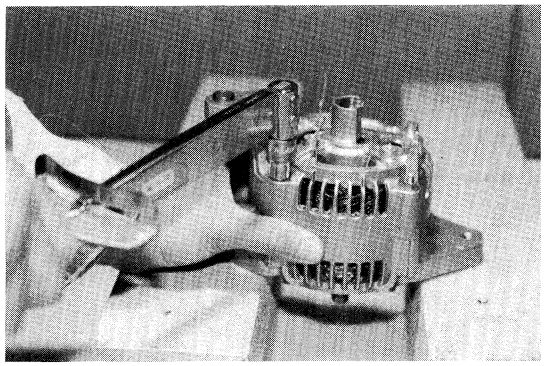
   Caution:
   Carry out this work only when the bearing was removed.

   (1) Use a brass bar and install the bearing to the front end frame.
   (2) Retainer plate



Installing the Front Bearing F3514

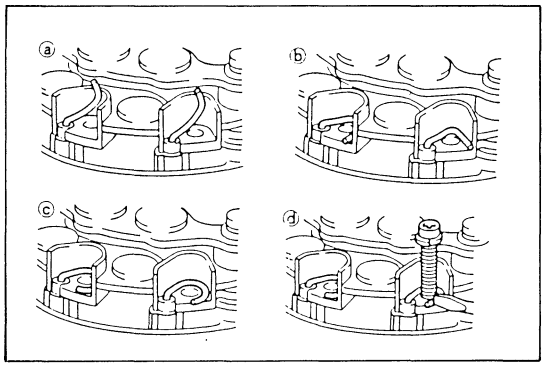
4. Assemble the drive end frame SUB-ASSY and the rear end frame SUB-ASSY.
   (1) Straighten the stator coil terminal.
   (2) Rear end frame SUB-ASSY
   (3) Set bolts (2 pcs.)
   (4) Set nuts (2 pcs.)
   T = 55 kg-cm (4 ft-lb)



Assembling the Rear End Frame SUB-ASSY KAH22-7

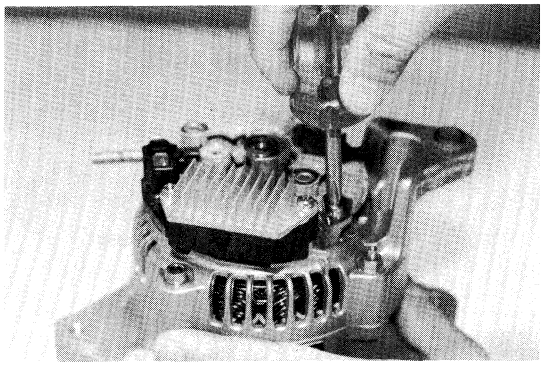
5. Install the pulley to the rotor shaft.

6. Assemble the rectifier holder USB-ASSY
   (1) Four the wire end illustrated in the order of ⓐ to ⓒ to fix it to the terminal with a screw.
   (2) Tighten each terminal with a screw (4 screws in total) as illustrated in ⓓ.



Assembling the Rectifier Holder SUB-ASSY KAHS105

7. IC regulator installation
   (1) IC regulator
   (2) Screws (3 pcs.)

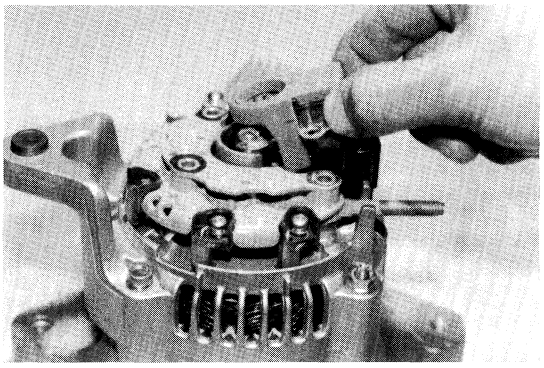


Installing the IC Regulator KAH21-14

8. Brush holder installation
   (1) Brush holders

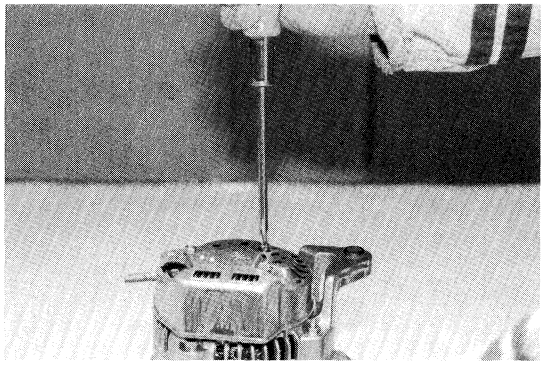
   Caution:
   Make sure that the brush holder boots are correctly installed.

   (2) Screws (2 pcs.)



Installing the Brush Holder KAH22-36

9. Rear end cover installation
   (1) Rear end cover
   (2) Screws (3 pcs.)



Installing the Rear End Cover KAH21-4

INSTALLATION

The installation procedure is the reverse of the removal procedure.

Caution:
Be sure to adjust the flexure of the V belt after installing the alternator.
(See page 1-3 and 1-4)

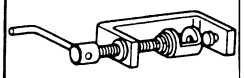
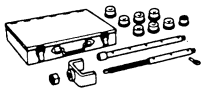
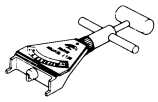
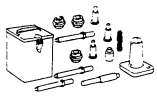
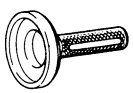
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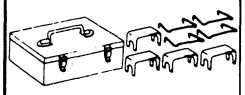
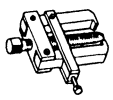
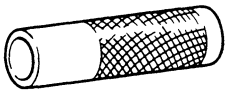
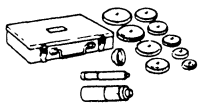
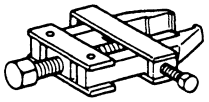
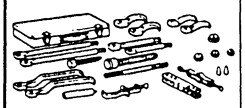
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SST LIST

SST Description Section / SST Part Name / SST Part Number / SST			1	2	3	5	6	8	9
	09032-76001-71 (09032-00100)	Oil pan seal cutter		○			○		
	09201-76006-71 (09201-60011)	Remover & replacer, valve guide bush		○					
	09202-76001-71 (09202-43013)	Compressor, valve spring		○					
	09215-76003-71 (09215-00100)	Remover & replacer set A, camshaft bearing		○					
	09216-76001-71 (09216-00020)	Belt tension gauge	○						
	09221-76002-71 (09221-25018)	Piston pin remover & placer		○					
	09223-76008-71 (09223-63010)	Replacer, crankshaft rear oil seal		○					
	09228-76005-71 (09228-22020)	Wrench, oil filter					○		
	09240-76002-71 (09240-00014)	Gauge set, carburetor adjusting			○				
	09240-76003-71 (09240-00020)	Gauge set, wire			○				

SST Description Section / SST Part Name / SST Part Nunber / SST			1	2	3	5	6	8	9
	09270-76001-71 (09270-71010)	Tool set, rocker arm support		○					
	09276-76001-71 (09276-71010)	Tool, valve lifter		○					
	09286-76001-71 (09286-46011)	Puller, injection pump spline shaft						○	
	09381-41950-71	Replacer, H.S.T. pump bearing		○					○
	09410-40120-71	Replacer, steering worm bearing		○					
	09608-76009-71 (09608-35014)	Tool set, axle hub and drive pinion bearing		○					
	09820-76002-71 (09820-00021)	Puller, alternator rear bearing							○
	09860-76001-71 (09860-11011)	Carburetor driver set			○				
	09950-76014-71 (09950-20017)	Puller, universal		○					

SERVICE STANDARDS

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ENGINE TUNE-UP

Lubricating oil capacity ℓ (US gal)	Total capacity	4.0 (1.1)
	Oil pan capacity	3.2 (0.8)
Specific gravity of battery electrolyte (Fluid temperature at 20°C (68°F))		1.28
V belt flexure (Pressure 10 kg (22 lb) mm (in)	New part	7 – 9 (0.28 – 0.35)
	At inspection	8 – 13 (0.31 – 0.51)
V belt tension (Use tension gauge) kg (lb)	New part	38 – 62 (84 – 137)
	At inspection	30 – 50 (66 – 110)
Spark plug gap mm (in)	Standard	0.7 – 0.8 (0.028 – 0.031)
Ignition timing		BTDC 7°
Idle-up speed		See repair manual for model
Idle speed		See repair manual for model
No-load static maximum speed		See repair manual for model
Firing order		1–3–4–2
Intake manifold vacuum (at idle speed) mmHg		400 or more
Compression pressure kg/cm² (psi)	Standard	12.5 (178)
	Limit	9.0 (128)
	Difference between cylinder	1.0 (14)

ENGINE BODY

CYLINDER HEAD

Bottom surface distortion limit mm (in)			0.15 (0.0059)
Manifold installing surface distortion limit mm (in)			0.10 (0.0039)
Valve seat	Correction angle	IN	30°, 45°, 60°
		EX	30°, 45°, 60°
	Contact angle		45°
	Contact width mm (in)		1.2 – 1.6 (0.047 – 0.063)

VALVE GUIDE BUSH

Inside diameter mm (in)		Standard	8.010–8.030 (0.3154–0.3161)
Outside diameter mm (in)		Standard	13.040–13.051 (0.5134–0.5138)
		O/S 0.05	13.090–13.101 (0.5154–0.5158)

VALVE

Total length mm (in)	Standard	IN	108.2 (4.260)
		EX	108.5 (4.272)
	Limit	IN	107.7 (4.240)
		EX	108.0 (4.252)
Contact face angle	IN & EX		44.5°
Outside diameter, stem mm (in)	Standard	IN	7.970–7.985 (0.3138–0.3144)
		EX	7.965–7.980 (0.3136–0.3142)
Oil cearance with valve guide bush mm (in)	Standard	IN	0.025–0.060 (0.0010–0.0024)
		EX	0.030–0.065 (0.0012–0.0026)
	Limit	IN	0.10 (0.0039)
		EX	0.12 (0.0047)
Valve head margin mm (in)	Standard	IN	1.0–1.4 (0.039–0.055)
		EX	1.3–1.7 (0.051–0.067)
	Limit	IN	0.5 (0.020)
		EX	0.8 (0.031)

VALVE SPRING

Free length	mm (in)	47.0 (1.85)
Installed tension [At installed length 40.6 mm (1.598 in.)]	kg (lb)	28.8–35.2 (63.5–77.6) (~1995.12, 2000.11~) 20.6–22.8 (45.4–50.3) (1996.1~2000.11)
Squareness	mm (in)	2.0 (0.079)

ROCKER ARM & SHAFT

Rocker arm inside diameter	mm (in)	Standard	18.500–18.515 (0.7283–0.7289)
Rocker shaft outside diameter	mm (in)	Standard	18.474–18.487 (0.7273–0.7278)
Rocker shaft & rocker arm oil clearance	mm (in)	Standard	0.013–0.041 (0.0005–0.0016)
		Limit	0.08 (0.0031)

PUSH ROD

Runout limit	mm (in)	0.30 (0.0118)

INTAKE & EXHAUST MANIFOLD

Cylinder head installing surface distortion limit IN & EX mm (in)	0.4 (0.016)

CAMSHAFT

Runout limit		mm (in)	0.06 (0.0024)
Cam height mm (in)	Standard	IN	38.620–38.720 (1.5205–1.5244) (~1998.7) 38.185–38.285 (1.5033–1.5073) (1998.8~)
		EX	38.629–38.729 (1.5208–1.5248) (~1998.7) 38.443–38.543 (1.5135–1.5174) (1998.8~)
	Limit	IN	38.26 (1.5063) (~1998.7) 37.70 (1.4842) (1998.8~)
		EX	38.27 (1.5067) (~1998.7) 38.00 (1.4961) (1998.8~)
Journal outside diameter mm (in)	Standard	No. 1	46.459–46.475 (1.8291–1.8297)
		No. 2	46.209–46.225 (1.8192–1.8199)
		No. 3	45.959–45.975 (1.8094–1.8100)
		No. 4	45.709–45.725 (1.7996–1.8002)
		No. 5	45.459–45.475 (1.7897–1.7904)
Camshaft bearing inside diameter mm (in)	Standard	No. 1	46.500–46.540 (1.8307–1.8323)
		No. 2	46.250–46.290 (1.8209–1.8224)
		No. 3	46.000–46.040 (1.8110–1.8126)
		No. 4	45.750–45.790 (1.8012–1.8028)
		No. 5	45.500–45.540 (1.7913–1.7929)
Camshaft journal oil clearance mm (in)		Standard	0.025–0.081 (0.0010–0.0032)
		Limit	0.10 (0.0039)
Thrust clearance mm (in)		Standard	0.07–0.22 (0.0028–0.0087)
		Limit	0.3 (0.012)

TIMING CHAIN & TIMING GEAR

Timing chain flexure limit [Tension 10 kg (22.0 lb)]	mm (in)	13.5 (0.531)
Timing chain elongation limit [Tension 5 kg (11.0 lb)]	mm (in)	291.4 (11.472)
Crankshaft timing gear outside diameter limit (with chain)	mm (in)	59 (2.32)
Camshaft timing gear outside diameter limit (with chain)	mm (in)	114 (4.49)

TENSIONER & DAMPER

Tensioner head thickness mm (in)	Standard	15 (0.591)
	Limit	12.5 (0.492)
Damper thickness mm (in)	Standard	6.6 (0.260)
	Limit	5.0 (0.197)

VALVE LIFTER

Lifter outside diameter mm (in)	Standard	21.387–21.404 (0.8420–0.8427)
Cylinder block lifter hole diameter mm (in)	Standard	21.417–21.443 (0.8432–0.8442)
Valve lifter oil clearance mm (in)	Standard	0.012–0.056 (0.0005–0.0022)
	Limit	0.10 (0.0039)
Leak down test [At oil temperature of 20°C (68°F) and 20 kg (44.1 lb)]	Standard	~1998.7: 7 to 28 seconds/1 mm (0.04 in) 1998.8~: 8.5 to 51 seconds/1 mm (0.04 in)

CYLINDER BLOCK

Top surface distortion limit mm (in)		0.05 (0.0020)
Cylinder bore mm (in)	Standard	91.000–91.030 (3.5827–3.5839)
	Wear limit	0.20 (0.008)
	Honing margin	0.02 (0.0008) or less

PISTON, PISTON RING

Piston outside diameter mm (in)	Standard size	90.925–90.955 (3.5797–3.5809) (~1998.7) 90.938–90.968 (3.5802–3.5814) (1998.8~)
	O/S 0.50	91.425–91.455 (3.5994–3.6006) (~1998.7) 91.438–91.468 (3.6000–3.6011) (1998.8~)
Clearance with cylinder mm (in)		0.065–0.085 (0.0026–0.0033) (~1998.7) 0.032–0.092 (0.0013–0.0036) (1998.8~)
Clearance between piston ring and ring groove mm (in)		No.1·No.2: 0.03–0.07 (0.0012–0.0028) Oil: 0.025–0.165 (0.0010–0.0065)

Piston ring joint clearance mm (in)	Standard	No. 1	0.23–0.48 (0.0091–0.0189) (~1998.7) 0.27–0.39 (0.0106–0.0154) (1998.8~)
		No. 2	0.16–0.44 (0.0063–0.0173) (~1998.7) 0.40–0.55 (0.0157–0.0217) (1998.8~)
		Oil	0.13–0.47 (0.0051–0.0185) (~1998.7) 0.13–0.38 (0.0051–0.0150) (1998.8~)
	Limit	No. 1	1.08 (0.0425)
		No. 2	1.04 (0.0409)
		Oil	1.07 (0.0421)

CONNECTING ROD

Thrust clearance mm (in)	Standard	0.160–0.312 (0.0063–0.0123)
	Limit	0.35 (0.0138)
Rod bending limit per 100 mm (3.94 in) mm (in)		0.05 (0.0020)
Rod twisting limit per 100 mm (3.94 in) mm (in)		0.05 (0.0020)

CRANKSHAFT

Thrust clearance mm (in)	Standard	0.020–0.220 (0.0008–0.0087)
	Limit	0.30 (0.0118)
Thrust washer thickness mm (in)	Standard size	2.440–2.490 (0.0961–0.0980)
	O/S 0.250	2.565–2.615 (0.1010–0.1030)
Journal outside diameter mm (in)	Standard	57.985–58.000 (2.2829–2.2835)
Journal oil clearance mm (in)	Standard	0.020–0.051 (0.0008–0.0020)
	Limit	0.10 (0.0039)
Crank pin outside diameter mm (in)	Standard	47.985–48.000 (1.8892–1.8898)
Crank pin oil clearance mm (in)	Standard	0.020–0.051 (0.0008–0.0020)
	Limit	0.10 (0.0039)
Runout limit mm (in.)		0.06 (0.0024)
Journal and crank pin taper and ellipticity mm (in.)	Limit	0.02 (0.0008)

FUEL SYSTEM

CARBURETOR

Float level mm (in)	Float top position	5.5 (0.217)
	Float bottom position	1.1–1.3 (0.043–0.051)
Throttle valve full close angle		7° (from horizontal level)
Throttle valve idle opening angle		13.5° (from horizontal level)
Throttle valve full open angle		90° (from horizontal level)
Fast idle opening angle (at 25°C)		23–25° (from horizontal level)
Choke valve full close angle		15° (from horizontal level)
Unloader opening angle (with throttle valve fully opened)		38–42° (from horizontal level)
Choke breaker pulling angle (at –400 mmHg)		39–41° (from horizontal level)
Idle up setting opening angle		19.5° (from horizontal level)

COOLING SYSTEM

RADIATOR

Radiator cap valve opening pressure kg/cm^2 (psi)	Standard	0.75–1.05 (10.7–14.9)
	Limit	0.60 (8.5)

THERMOSTAT

Opening start temperature	°C (°F)	74.5–78.5 (166–173)
Fully opening temperature	°C (°F)	90 (194)
Full lift	mm (in)	8 (0.31) or more

LUBRICATION SYSTEM

OIL PUMP

Rotor side clearance mm (in)	Standard	0.03–0.07 (0.0012–0.0028)
	Limit	0.15 (0.0059)
Clearance between driven rotor and pump body mm (in)	Standard	0.1–0.15 (0.0039–0.0059)
	Limit	0.2 (0.008)
Rotor tip clearance mm (in)	Standard	0.07–0.12 (0.0028–0.0047)
	Limit	0.2 (0.008)
Relief valve opening pressure	kg/cm^2 (psi)	3.6–4.4 (51–63)

IGNITION SYSTEM

DISTRIBUTOR (IIA)

Air gap		mm (in)	0.2–0.4 (0.008–0.016)
Pickup coil resistance		Ω	140–180 (~1998.7), 205~255 (1998.8~)
Governor shaft thrust clearance		mm (in)	0.15–0.50 (0.0059–0.0197)
Governor shaft thrust washer thickness		mm (in)	0.3 (0.012)
			0.4 (0.016)
			0.5 (0.020)
			0.6 (0.024)
Resistive cord resistance	Limit		25 kΩ/cord
Ignition coil, primary coil resistance	Standard		1.2–1.5 Ω
Ignition coil, secondary coil resistance	Standard		10.3–14.1 kΩ

Governor advance angle (on crankshaft)	Speed rpm	~1998.7	1998.8~
		650–1250 : 0°	650–1300 : 0°
		1500 : 2°	1600 : 0.6–5.0°
		2000 : 7.6°	2000 : 6.1–9.6°
		2500 : 13.5°	2700 : 14.0–17.4°
Vacuum advance angle (on crankshaft)	Negative pressure mmHg	~1998.7	1998.8~
		–100 : 0°	–100 : 0°
		–120 : 0.4–5.0°	–120 : 0.2–4.4°
		–240 : 14–18°	–240 : 13.2–17.2°
		–320 or more : 18–22°	–370 : 18.0–22.0°

STARTING SYSTEM

STARTING MOTOR

Motor type			DC series reduction type
Nominal voltage		V	12
Nominal output		kW	1.4
No-load characteristics	Voltage	V	11.5
	Current	A	90 or less
	Speed	rpm	3,500 or more (~ 1994.11) 3,000 or more (1994.11 ~)

Commutator	Ellipticity mm (in.)	Standard	0.02 (0.0008) (~ 1994.11) 0.05 (0.0020) (1994.11 ~)
		Limit	0.05 (0.0020) (~ 1994.11) 0.4 (0.015) (1994.11 ~)
	Outside diameter mm (in.)	Standard	30 (1.18)
		Limit	29 (1.14)
	Undercut mm (in.)	Standard	0.5 – 0.8 (0.020 – 0.031) 0.45 – 0.75 (0.0177 – 0.0295)
		Limit	0.2 (0.008)
Brush	lenght mm (in.)	Standard	15 (0.591)
		Limit	10 (0.394) (~ 1994.11) 11 (0.433) (1994.11 ~)
	Spring installed load g (lb)	Standard	1785 – 2415 (3.93 – 5.32)

CHARGING SYSTEM

ALTERNATOR

Nominal voltage V			12
Maximum output A			~1998.7: 35, 1998.8~:50
Unloaded characteristics	Adjusted voltage V	Standard	~1998.7: 14.2 – 14.8, 1998.8~:13.5 – 14.3
	Adjusted current A	Standard	10 or less
Brush length mm (in.)		Standard	10.5 (0.413)
		Limit	1.5 (0.059)
Slip ring outside diameter mm (in.)		Standard	14.4 (0.567)
		Limit	14.0 (0.551)
Rotor coil resistance Ω			2.9 Ω or less
Resistance between slip ring and rotor core		Standard	0.1 MΩ or more
Resistance between stator coil and each phase		Standard	1 Ω

TIGHTENING TORQUE

Place to be tightened		Tightening torque kg-m (ft-lb)
Cylinder block x Cylinder head	: M12	9.00 (65)
	: M8	1.95 (14)
Cylinder block x Timing gear case	: M10	3.80 (27)
	: M8	1.85 (13)
Cylinder block x Chain vibration damper		1.85 (13)
Cylinder block x Chain tensioner		1.85 (13)
Cylinder block x Camshaft thrust plate		1.85 (13)
Cylinder block x Idle gear shaft		3.80 (27)
Cylinder block x Distributor		1.85 (13)
Cylinder block x Oil filter		1.85 (13)
Cylinder block x Fuel pump		1.85 (13)
Cylinder block x Drain plug		4.50 (32) (~1998.7), 3.80 (27) (1998.8~)
Cylinder block x Oil pan		1.30 (9)
Cylinder block x Oil strainer		1.20 (9) (~1998.7), 1.95 (14) (1998.8~)
Cylinder block x Oil pump		1.85 (13)
Cylinder block x Crankshaft bearing cap		8.00 (58)
Cylinder head x Cylinder head cover		0.50 (3.6)
Cylinder head x Rocker shaft		2.40 (17)
Cylinder head x Spark plug		1.80 (13)
Cylinder head x Manifold		5.00 (36)
Cylinder head x Water pump		1.85 (13) (~1998.7), 2.10 (15) (1998.8~)
Crankshaft x Crankshaft pulley		16.00 (115.7) (~ 1990.11) 23.00 (166.4) (1990.12 ~)
Timing gear case x Timing gear cover	: bolt	1.85 (13) (~1998.7), 2.10 (15) (1998.8~)
	: nut	1.15 (8) (~1998.7), 2.10 (15) (1998.8~)
Camshaft x Camshaft timing gear		9.20 (67)
Connecting rod x Connecting rod cap		5.00 (36)
Oil strainer x Oil pump		1.20 (9) (~1998.7), 1.95 (14) (1998.8~)
Water inlet x Water pump		1.85 (13) (~1998.7), 2.10 (15) (1998.8~)
Water pump cover x Water pump		1.85 (13)
Water pump x Fan, fan pulley		1.85 (13)
Water pump x Water outlet pipe		3.50 (25)
Carburetor x Manifold		2.04 (14.8)
Alternator x Timing gear case		1.15 (8) (~1998.7), 2.60 (19) (1998.8~)
Alternator x Adjusting bar		1.85 (13)

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