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SECTION 0

GENERAL, SPECIAL TOOLS AND SERVICE MATERIALS

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0-1. IDENTIFICATION NUMBER

VEHICLE IDENTIFICATION NUMBER

The vehicle identification number is on the instrument panel left side.
Refer to below figure for detailed VIN cord information and its location.

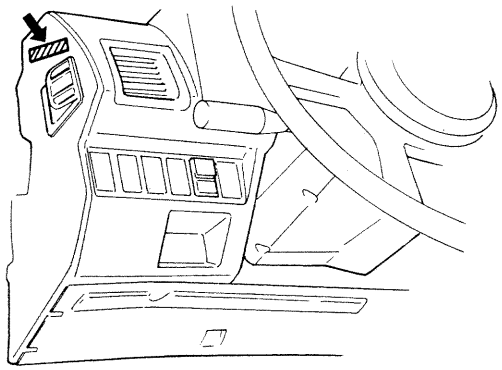
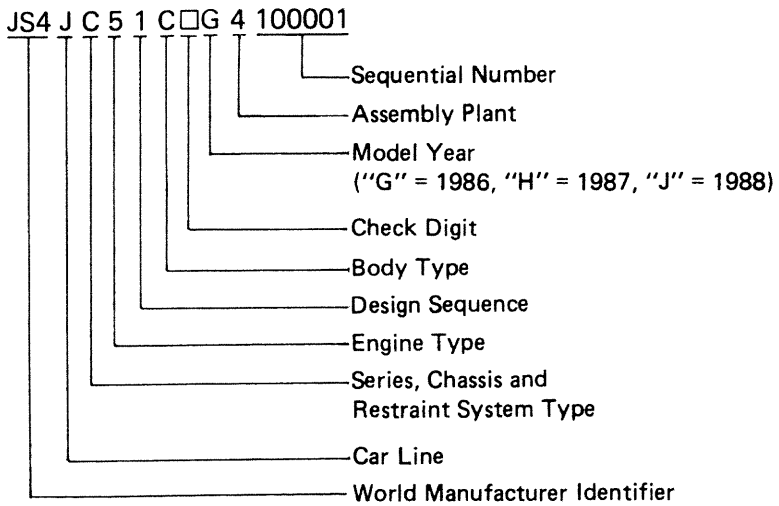


Fig. 0-1



ENGINE IDENTIFICATION NUMBER

The engine number is punched on the rear portion of the left-hand skirt part of cylinder block.

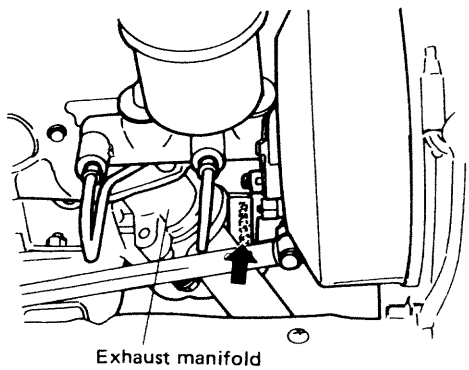


Fig. 0-2 Location of Engine No.

0-2. STANDARD SHOP PRACTICES

1. Protect painted surfaces of the body, and avoid staining or tearing seats. When working on fenders and seats, be sure to cover them up with sheets.
2. Disconnect negative terminal connection of the battery when working on any electrical part or component. This is necessary for avoiding electrical shocks and short-circuiting, and is very simple to accomplish: merely loosen wing nut on negative terminal and separate cable from terminal post.
3. In raising front or rear car end off the floor by jacking, be sure to put the jack against differential portion of axle housing.

NOTE:
Don't get on the car, get under it or service it in this state.

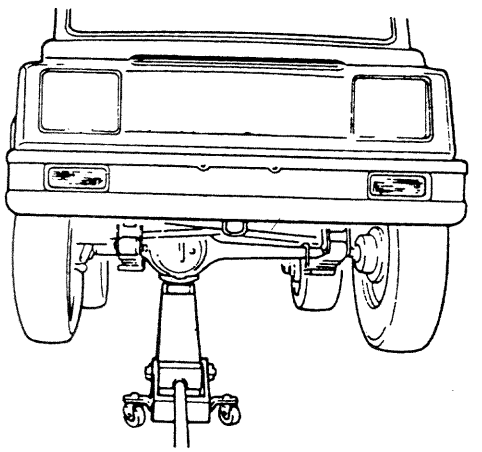


Fig. 0-3 Front Side

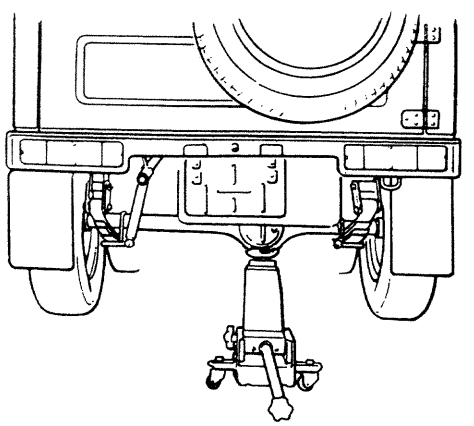


Fig. 0-4 Rear Side

4. To perform service with either front or rear car end jacked up, be sure to place safety stands under chassis frame so that body is securely supported. Refer to below figures for where to place safety stands. And then check to ensure that chassis frame does not slide on safety stands and the car is held stable for safety's sake.

WARNING:
Place chocks against both right and left wheels on the ground from both front and rear.

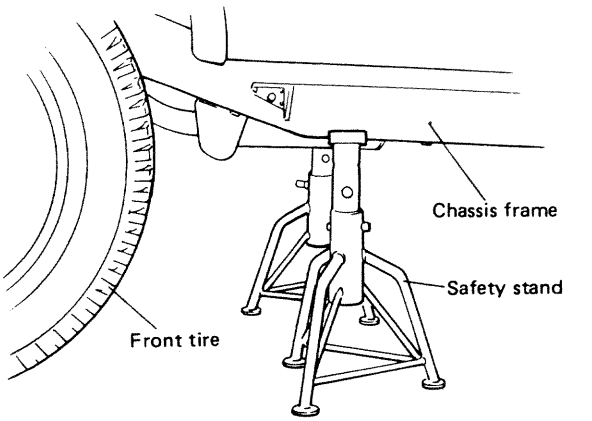


Fig. 0-5 Front Side

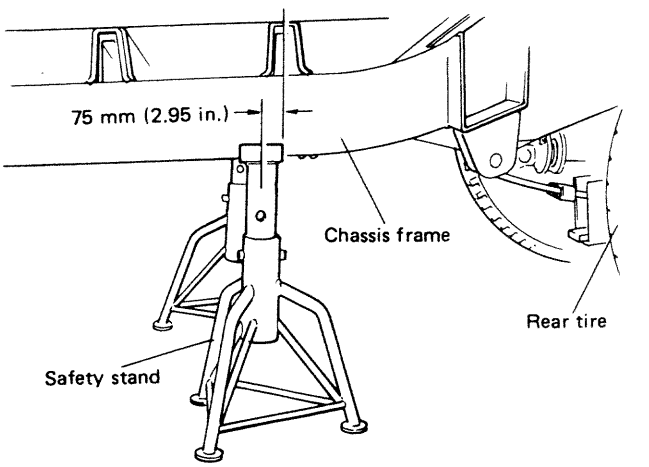


Fig. 0-6 Rear Side

5. Fig. 0-7 and 0-8 show how to lift the car by using a hoist.

WARNING:

- **When using frame contact hoist, apply hoist as shown below (right and left at the same position). Lift up the car till 4 tires are a little off the ground and make sure that the car will not fall off by trying to move car body in both ways. Work can be started only after this confirmation.**
- **Before applying hoist to underbody, always take car balance throughout service into consideration. Car balance on hoist may change depending of what part to be removed.**
- **For suspention parts removal, follow previous steps 3 and 4.**
- **Make absolutely sure to lock hoist after car is hoisted up.**

When using frame contact hoist:

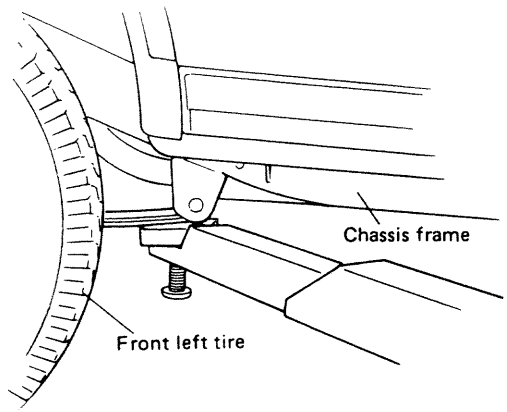


Fig. 0-7 Front Support Location

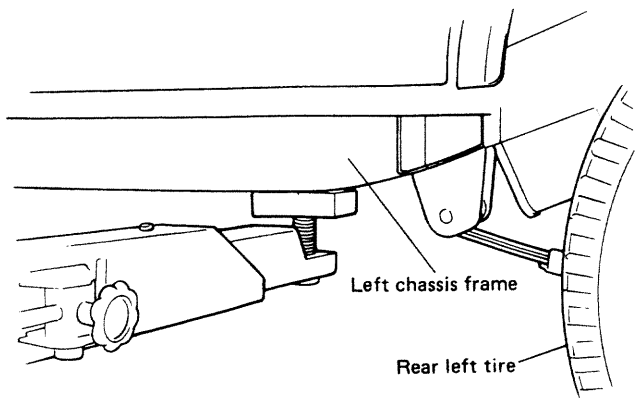


Fig. 0-8 Rear Support Location

6. Orderliness is a key to successful overhauling. Trays, pans and shelves are needed to set aside disassembled parts in groups or sets in order to avoid confusion and misplacement. This is particularly important for engine overhauling.
7. Have on hand liquid packing—SUZUKI BOND No. 1215 (99000-31110) – for ready use. This packing dope is an essential item to assure leak-free (water and oil) workmanship.
8. Each bolt must be put back to where it was taken from or for which it is intended. Do not depend on your hunch in tightening bolts for which tightening torque values are specified: be sure to use torque wrenches on those bolts.
9. It is advisable to discard and scrap gaskets and "O" rings removed in disassembly. Use new ones in reassembly, and try not to economize gaskets and "O" rings.
10. Use of genuine SUZUKI parts is imperative. Use of imitation parts is a big gamble on safety and performance. Use genuine SUZUKI parts and live up to the trust your customer places on you.
11. Special tools save time and ensure good workmanship: They are available from SUZUKI. Use them where their use is specified. Moreover, your own safety is assured by the use of special tools in many of the disassembly and reassembly steps.

12. Refer to the contents of this MANUAL as often as practical, and do each job properly as prescribed.

NOTE:

Engine cylinders are identified by numbers. See Fig. 0-9. Counting from the front end, the cylinders are referred to as No. 1, No. 2, No. 3 and No. 4 cylinders.

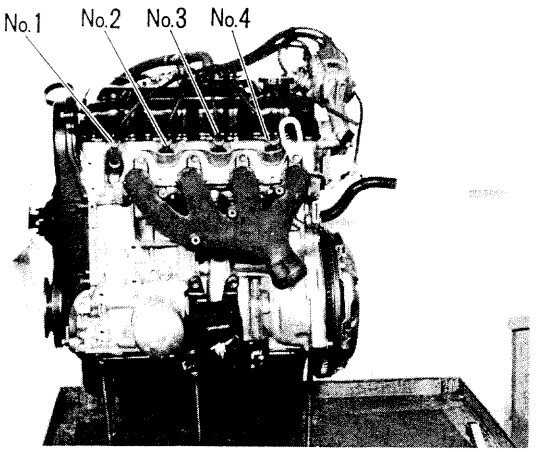
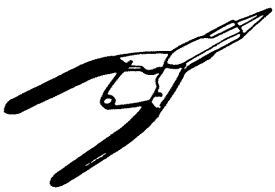
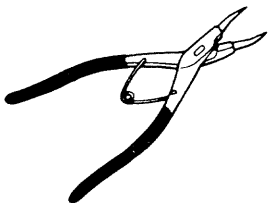
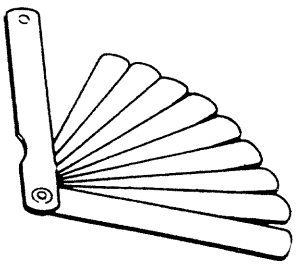
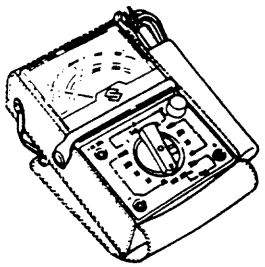
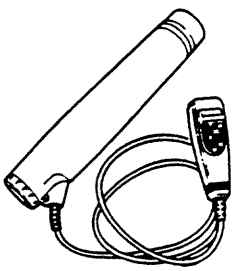
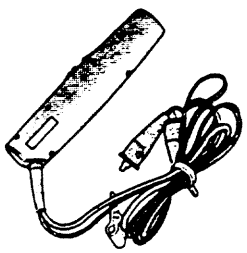
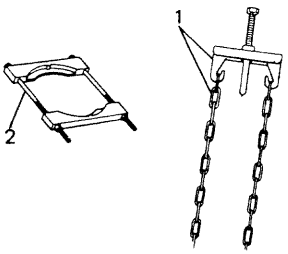
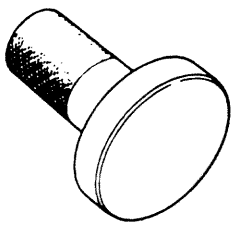
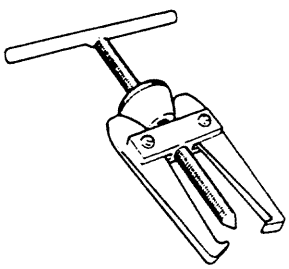
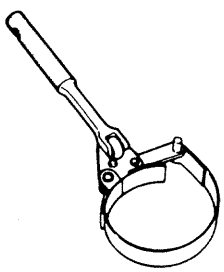
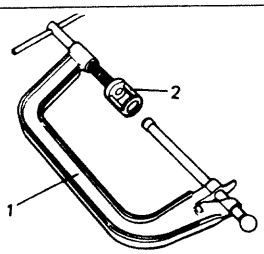
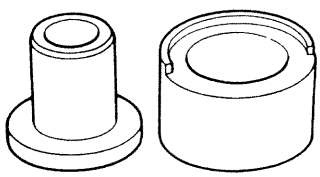
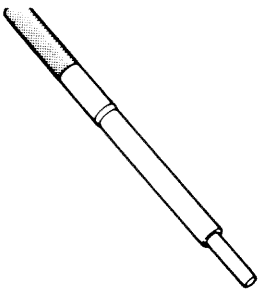


Fig. 0-9 Engine Cylinder Numbers

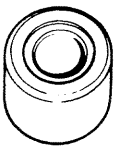
0-3. SPECIAL TOOLS

Special tools assure three things: 1) improved workmanship; 2) speedy execution of jobs for which they are meant; and 3) protection of parts and components against damage. Here are the special tools prescribed for this Model:

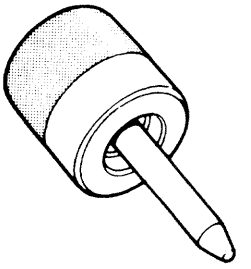
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09900-06107
Snap ring plier (opening type)</td>
<td> 
09900-06108
Snap ring plier (closing type)</td>
<td> 
09900-20803
Thickness gauge</td>
<td> 
09900-25002
Pocket tester</td>
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09900-27311
Timing light (Dry cell type)</td>
<td> 
09900-27301
Timing light (D.C. 12V)</td>
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1. 09927-18410
Universal puller
2. 09921-57810
Bearing remover</td>
<td> 
09913-75510
Bearing installer</td>
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09913-60910
Bearing puller</td>
<td> 
09915-47310
Oil filter wrench</td>
<td> 
1. 09916-14510
Valve lifter
2. 09916-48210
Valve lifter attachment</td>
<td> 
09926-48010
Universal joint
assembler</td>
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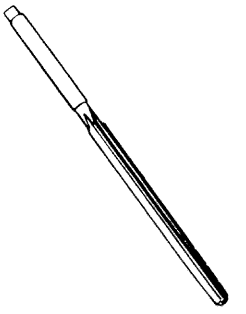
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Valve guide remover



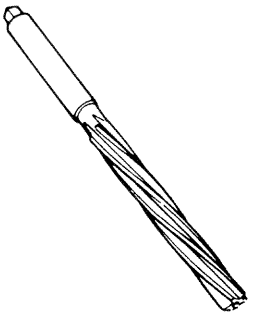
09917-88210
Valve guide installer



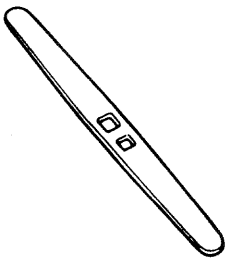
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Valve stem seal installer



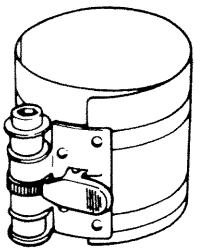
09916-34520
Reamer (7 mm)



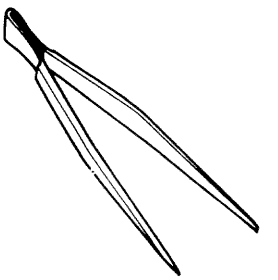
09916-37310
Reamer (12 mm)



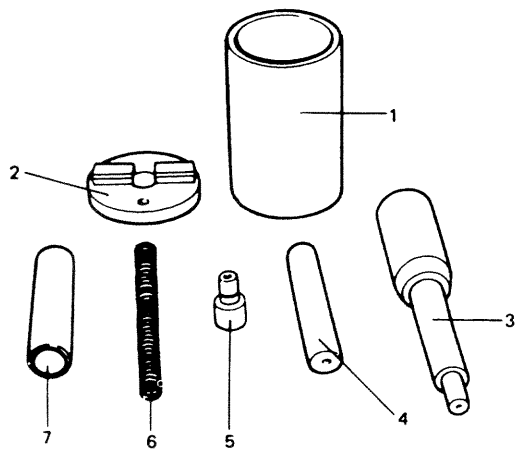
09916-34541
Reamer handle



09916-77310
Piston ring compressor

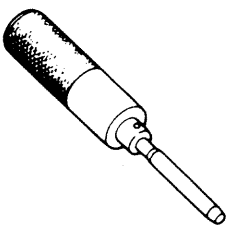


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Forceps

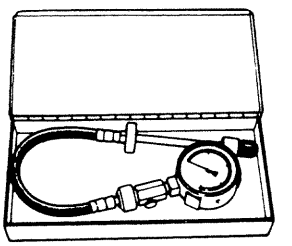


09910-38210
Piston pin remover and installer

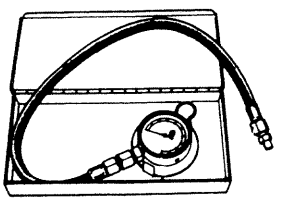
1. Base
2. Base cap
3. Driver handle
4. Piston pin guide for installation
5. Piston pin guide for removal
6. Spring
7. Spring guide



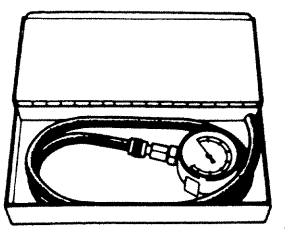
09916-57321
Valve guide installer handle



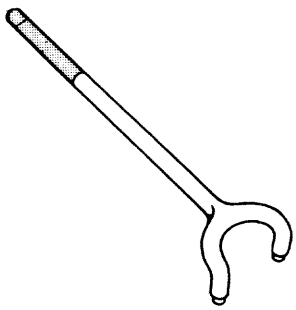
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Compression gauge



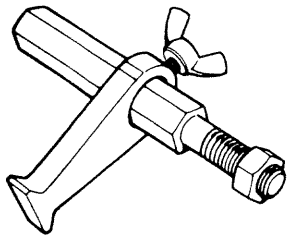
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Oil pressure gauge



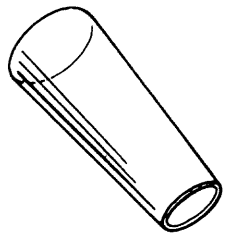
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Vacuum gauge



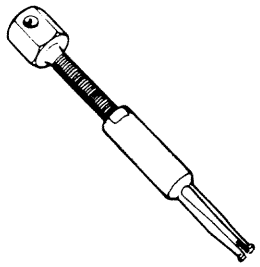
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Camshaft lock holder



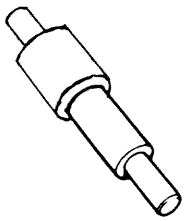
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Flywheel holder



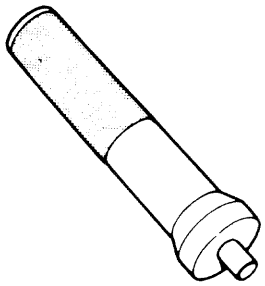
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Oil seal guide (Vinyl resin)



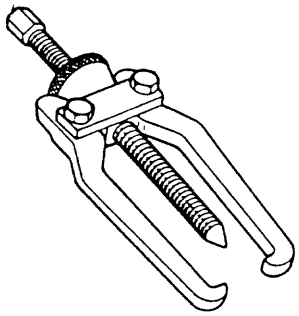
09917-58010
Bearing remover
(for input shaft bearing)



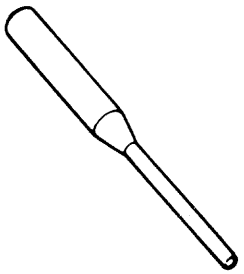
09923-38220
Clutch center guide



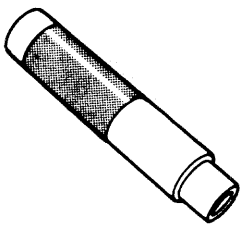
09925-98210
Input shaft bearing
installer



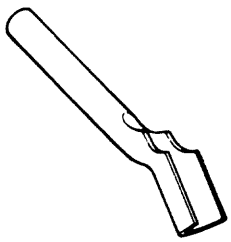
09913-65135
Transmission and transfer
bearing and gear remover



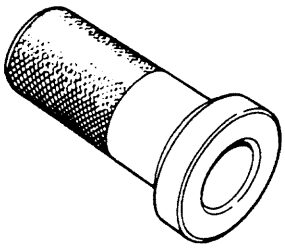
09922-85811
Spring pin remover
(4.5 mm)



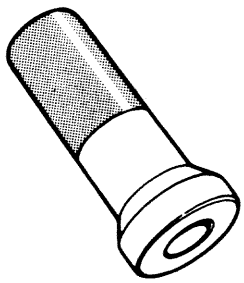
09925-18010
Transmission gear, bush
and bearing installer



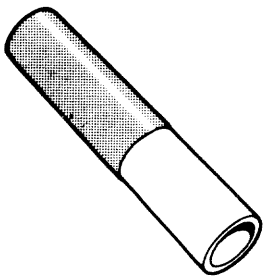
09925-48210
Clutch release bush
remover



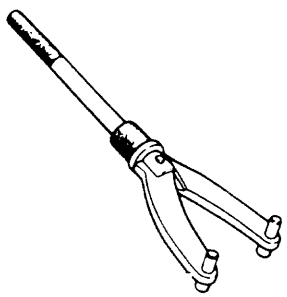
09913-75810
Transfer bearing installer



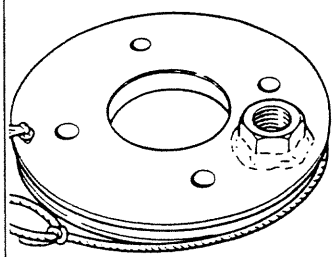
09913-76010
Transfer bearing installer



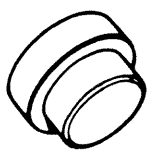
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Transfer bearing installer



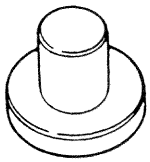
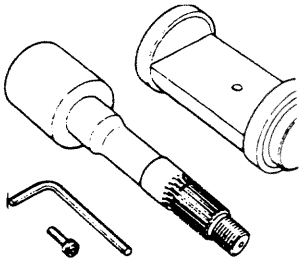
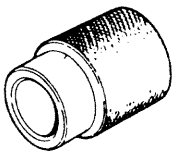
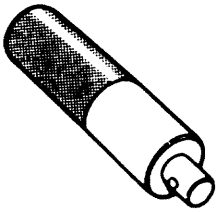
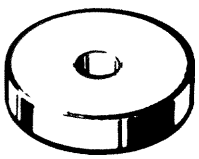
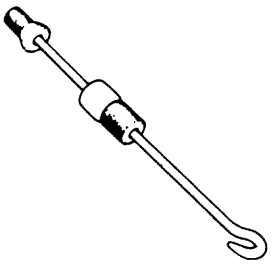
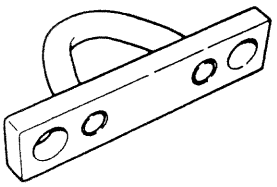
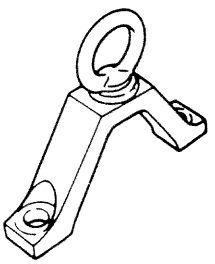
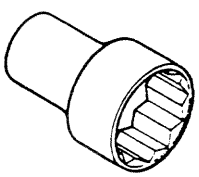
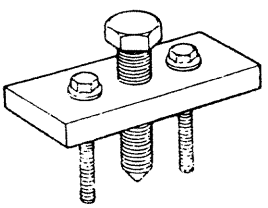
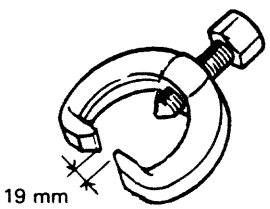
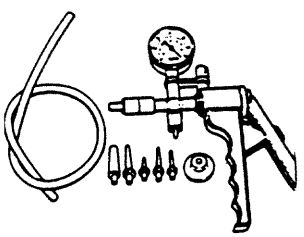
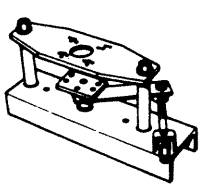
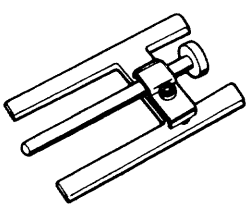
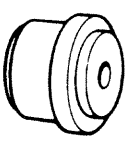
09930-40113
- Transfer flange lock holder
- Differential side bearing adjuster



09922-75221
- Differential bearing preload checking tool

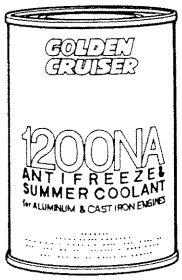
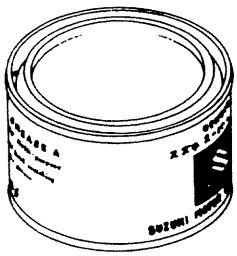
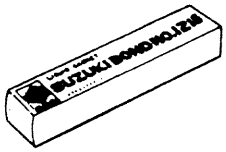


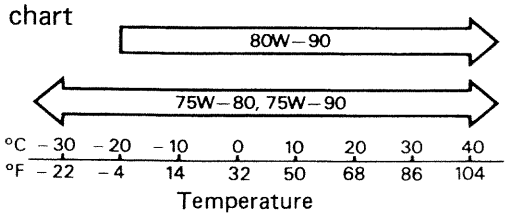
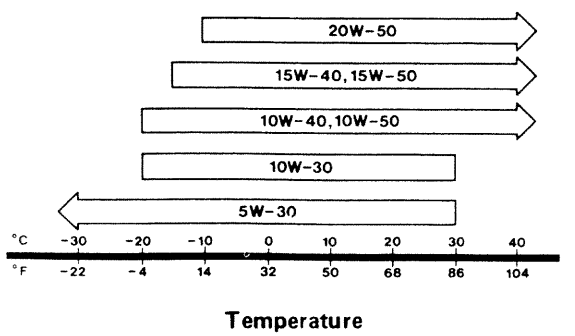
09926-58010
Bearing puller attachment (transfer)

 09913-85230 Differential side bearing remover jig	 09926-78310 Differential bevel pinion mounting dummy	 09940-53111 Differential side bearing installer	 09924-74510 Bearing installer attachment
 09926-68310 Differential pinion bearing installer	 09942-15510 Sliding hammer	 09922-66010 Rear axle shaft remover	 09943-35511 Brake drum remover
 09941-58010 50 mm socket wrench	 09944-36010 Steering wheel remover	 09913-65210 Tie-rod end remover	 09917-47910 Vacuum pump gauge
 09950-78210 Flare nut wrench (10 mm)	 09950-88210 Booster overhaul tool set	 09950-98210 Booster piston rod gauge	 No. 1 09951-08210  No. 2 09951-18210 Booster No. 2 body Oil seal remover & Installer No. 1, No. 2

0-4. REQUIRED SERVICE MATERIALS

The materials listed below are needed for maintenance work on these cars, and should be kept on hand for ready use. In addition, such standard materials as cleaning fluids, lubricants, etc., should also be available. Methods and time of use are discussed in the text of this manual on later pages.

Ref. No.	Material		Use
1.	SUZUKI GOLDEN CRUISER 1200NA (Non-Amine type) "Anti-freeze and Summer Coolant" (99000-99032-10X)		Additive to engine cooling system for improving cooling efficiency and for protection of wet walls against rusting.
2.	SUZUKI SUPER GREASE A (99000-25010)		• For locations indicated in the section dealing with the starter motor. • Clutch release bearing retainer. • Clutch release shaft bushing. • Transmission oil seal. • Differential oil seal. • Wheel bearings. • Gear shifting control lever bushing & seat. • Door window regulators. • For other locations specifically indicated in the text of this manual.
3.	SUZUKI GREASE SUPER H (99000-25120)		Special grease intended for use on constant velocity joints.
4.	SUZUKI BOND NO. 1215 (99000-31110)		• For top and bottom mating faces of transmission case. • For other locations specifically indicated in the text of this manual.

5.	CHASSIS GREASE	• For grease nipples on propeller shafts. • For propeller shaft splines.
6.	GEAR OIL Oil Grade <table><tr><td colspan="2"></td><td>API GRADE</td></tr><tr><td colspan="2">Transmission</td><td rowspan="2">GL-4 or 5</td></tr><tr><td colspan="2">Transfer</td></tr><tr><td rowspan="2">Differential</td><td>Front</td><td rowspan="2">GL-5</td></tr><tr><td>Rear</td></tr></table> Viscosity chart SAE 	• Transmission case 1.3 ltr. (2.7/2.3 US/Imp. pt.) • Transmission gear and bearing • Transfer case 0.8 ltr. (1.7/1.4 US/Imp. pt.) • Steering gear box • Differential gear box (Hypoid gear oil) Rear 1.5 ltr. (3.2/2.6 US/Imp. pt.) Front 2.0 ltr. (4.2/3.5 US/Imp. pt.)
7.	SEALANT (99000-31150)	• For mating surfaces of engine oil pan and cylinder block.
8.	4-STROKE ENGINE OIL It is recommended to use engine oil of SE, or SF class. **Proper Engine Oil Viscosity Chart** 	• For engine oil pan: (For periodical oil change) • Crank journal bearings and thrust plate. • Connecting-rod big-end and small-end bearings. • Camshaft journals. • Rocker shafts. • Oil pump gears. • Pistons and piston rings. • Engine oil seals. • Valve stems. • Accelerator and clutch cables. • Parking brake cable. • Accelerator, brake and clutch pedal shafts. • Door locks and hinges. • Distributor gear.

9.	SEALING COMPOUND "CEMEDINE" 366E (Water tight sealant) (99000-31090) 180 mℓ		• King pin shim face. • For steering knuckle (rear axle housing) and brake packing plate mating surface. • For other locations specifically indicated in the text of this manual.
10.	THREAD LOCK CEMENT SUPER 1333B (99000-32020)		• Transmission reverse gear shift rim bolt. • Gear shift lever locating bolt. • Differential drive bevel gear bolt.
11.	BRAKE FLUID "DOT3"		• To fill master cylinder reservoir. • To clean and apply to inner parts of master cylinder, caliper and wheel cylinder when they are disassembled.
12.	SILICONE GREASE (Furnished in repair kit)		• To apply to brake booster inner parts where application is instructed in this manual.
13.	THREAD LOCK CEMENT "1342" (99000-32050)		• King pin bolt
14.	SUZUKI SUPER GREASE I (99000-25210)		• Transmission input shaft

0-5. METRIC INFORMATION

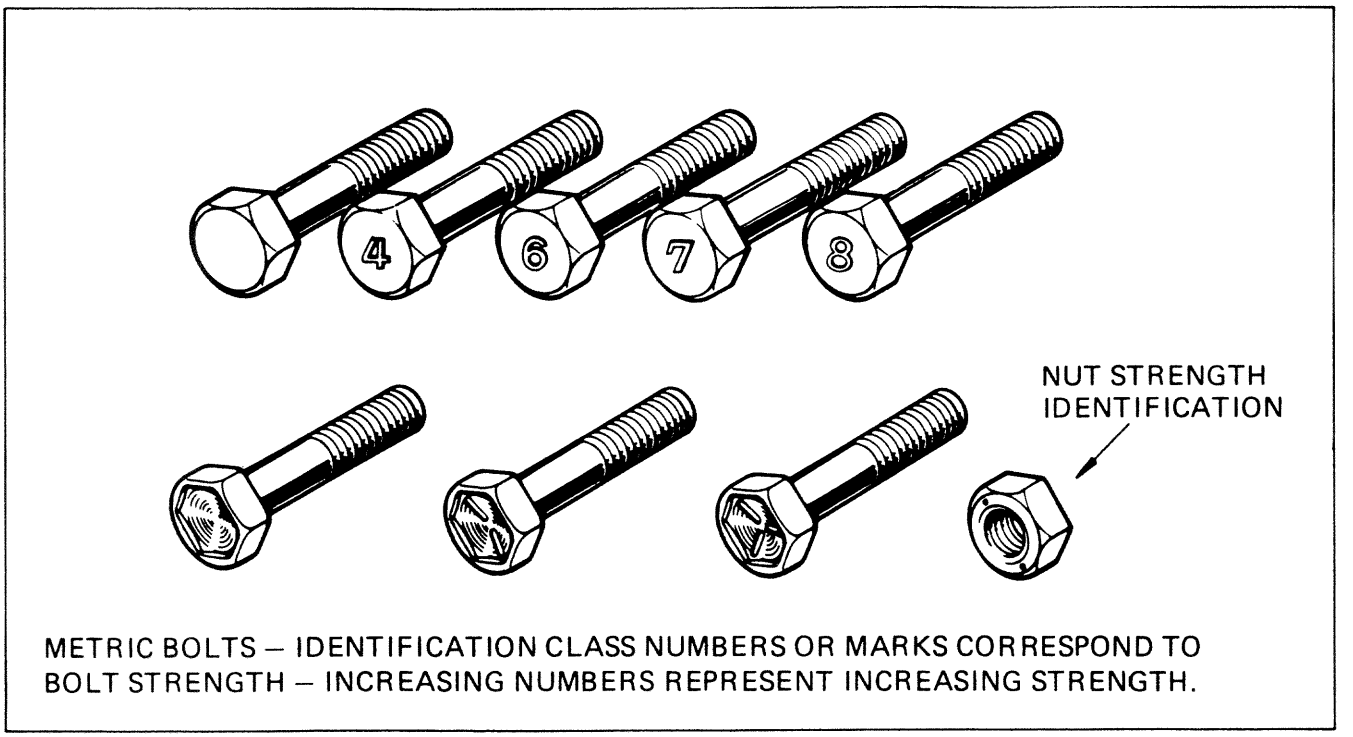
METRIC FASTENERS

Most of the fasteners used for this vehicle are metric. When replacing any fasteners, it is most important that replacement fasteners be the correct diameter, thread pitch and strength.

FASTENER STRENGTH IDENTIFICATION

Most commonly used metric fastener strength property classes are 4T, 7T and radial line with the class identification embossed on the head of each bolt. Some metric nuts will be marked with punch mark strength identification on the nut face. Fig. 0-10 shows the different strength markings.

When replacing metric fasteners, be careful to use bolts and nuts of the same strength or greater than the original fasteners (the same number marking or higher). It is likewise important to select replacement fasteners of the correct size. Correct replacement bolts and nuts are available through the parts department.



METRIC BOLTS – IDENTIFICATION CLASS NUMBERS OR MARKS CORRESPOND TO BOLT STRENGTH – INCREASING NUMBERS REPRESENT INCREASING STRENGTH.

Fig. 0-10 Bolt Strength Markings

STANDARD TIGHTENING TORQUE

Each fastener should be tightened to the torque specified in each section of this manual. If no description or specification is provided, refer to the following tightening torque chart for the applicable torque for each fastener. When a fastener of greater strength than the original one is used, however, use the torque specified for the original fastener.

NOTE:

- **For the flanged bolt and nut, add 10% to the tightening torque given in the below chart.**
- **The below chart is applicable only where the fastened parts are made of steel or light alloy.**

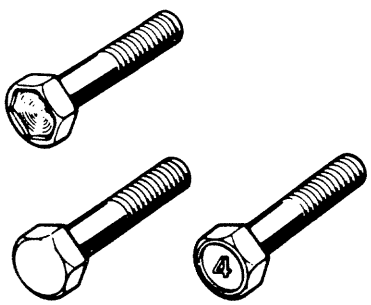
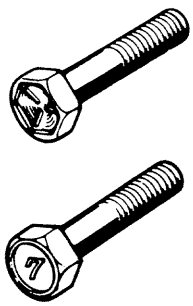
STRENGTH / THREAD DIAMETER (mm)	 Conventional bolt "4T" bolt			 "7T" bolt		
	N·m	kg-m	lb-ft	N·m	kg-m	lb-ft
4	1 – 2	0.1 – 0.2	0.7 – 1.0	1.5 – 3.0	0.15 – 0.30	1.5 – 2.0
5	2 – 4	0.2 – 0.4	1.5 – 3.0	3 – 6	0.3 – 0.6	2.5 – 4.0
6	4 – 7	0.4 – 0.7	3.0 – 5.0	8 – 12	0.8 – 1.2	6.0 – 8.5
8	10 – 16	1.0 – 1.6	7.5 – 11.5	18 – 28	1.8 – 2.8	13.5 – 20.0
10	22 – 35	2.2 – 3.5	16.0 – 25.0	40 – 60	4.0 – 6.0	29.0 – 43.0
12	35 – 55	3.5 – 5.5	25.5 – 39.5	70 – 100	7.0 – 10.0	51.0 – 72.0
14	50 – 80	5.0 – 8.0	36.5 – 57.5	110 – 160	11.0 – 16.0	80.0 – 115.5
16	80 – 130	8.0 – 13.0	58.0 – 94.0	170 – 250	17.0 – 25.0	123.0 – 180.5
18	130 – 190	13.0 – 19.0	94.5 – 137.0	200 – 280	20.0 – 28.0	145.0 – 202.5

Fig. 0-11 Tightening Torque Chart

SECTION 1

PERIODIC MAINTENANCE SERVICE

1

CONTENTS

1-1. MAINTENANCE SCHEDULE 1-2

1-2. ENGINE AND EMISSION CONTROL 1-5

1-3. CHASSIS AND BODY 1-17

1-1. MAINTENANCE SCHEDULE

NOTE: (For U.S.A. specification vehicle)
The "CHECK ENGINE" light in the combination meter flashes or lights at the mileage of 50,000, 80,000 and 100,000 miles each of which is detected by the mileage sensor. Upon completion of maintenance service of the following items required for each mileage, be sure to turn off the "CHECK ENGINE" light cancel switch, referring to SECTION 5 of this manual. Then the mileage sensor will be reset.

Interval: This interval should be judged by odometer reading or months, whichever comes first.																	
	miles (x 1,000)	7.5	15	22.5	30	37.5	45	52.5	60	67.5	75	82.5	90	97.5	105	112.5	120
	km (x 1,000)	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192
	months	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96
ENGINE & EMISSION CONTROL																	
1. Fan (Water pump) drive belt		–	–	–	I	–	–	–	R	–	–	–	I	–	–	–	R
2. Camshaft timing belt		–	–	–	–	–	–	–	I	–	–	–	I	–	–	–	I
3. Valve lash (clearance)		–	I	–	I	–	I	–	I	–	I	–	I	–	I	–	I
4. Engine oil and oil filter		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
5. Cooling system hoses and connections		–	–	–	**I[I]	–	–	–	I	–	–	–	I	–	–	–	I
6. Engine coolant		–	–	–	**R[R]	–	–	–	R	–	–	–	R	–	–	–	R
7. Exhaust pipes and mountings		–	–	–	**I[I]	–	–	–	I&(R)	–	–	–	I	–	–	–	I&(R)
8. PCV valve		Replace at 50,000 miles (80,000 km) and 100,000 miles (160,000 km)															
9. Oxygen sensor		Replace at 80,000 miles (128,000 km) [Replace every 50,000 miles (80,000 km)]															
10. Catalytic converter		Inspect at 100,000 miles (160,000 km)															
11. Charcoal canister		Replace at 100,000 miles (160,000 km)															
12. Emission-related hoses & tubes		–	–	–	–	–	–	–	I	–	–	–	–	–	–	–	I
13. EGR system		Inspect at 50,000 miles (80,000 km) and 100,000 miles (160,000 km)															
14. ECM & associated sensors		Inspect at 100,000 miles (160,000 km)															
15. Wiring harness and connections		–	–	–	–	–	–	–	I	–	–	–	–	–	–	–	I
16. Spark plugs		–	–	–	R	–	–	–	R	–	–	–	R	–	–	–	R
17. Distributor cap and rotor		–	–	–	–	–	–	–	I	–	–	–	–	–	–	–	I
18. Ignition wiring		–	–	–	–	–	–	–	R	–	–	–	–	–	–	–	R
19. Ignition timing		–	–	–	–	–	–	–	I	–	–	–	–	–	–	–	I
20. Distributor advance		–	–	–	–	–	–	–	I	–	–	–	–	–	–	–	I

NOTES:
"R": Replace or change
"I" : Inspect and correct or replace if necessary
"T": Tighten to the specified torque
"L": Lubricate

- [ ]: *Applicable to Canadian specification vehicle.*
- *Item 7 (R) is applicable to the exhaust mounting rubber only.*
- *(For U.S.A. specification vehicle) Item 5 **I, Item 6 **R and Item 7 **I are recommended maintenance items.*
- *(For Canadian specification vehicle) Item 13 is recommended item.*

Interval: This interval should be judged by odometer reading or months, whichever comes first.																	
	miles (x 1,000)	7.5	15	22.5	30	37.5	45	52.5	60	67.5	75	82.5	90	97.5	105	112.5	120
	km (x 1,000)	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192
	months	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96
21. Fuel tank cap		–	–	–	**I[I]	–	–	–	R	–	–	–	I	–	–	–	R
22. Air cleaner filter element		–	–	–	R	–	–	–	R	–	–	–	R	–	–	–	R
23. Thermostatically controlled air cleaner system		–	–	–	I	–	–	–	I	–	–	–	I	–	–	–	I
24. Choke system		–	–	–	I&L	–	–	–	I&L	–	–	–	I&L	–	–	–	I&L
25. Fuel filter		–	–	–	**R[R]	–	–	–	R	–	–	–	R	–	–	–	R
26. Fuel lines and connections		–	–	–	**I[I]	–	–	–	R	–	–	–	I	–	–	–	R
*27. Idle speed		–	I	–	I	–	I	–	I	–	I	–	I	–	I	–	I
28. Idle mixture		–	–	–	–	–	–	–	I	–	–	–	–	–	–	–	I
29. Carburetor		Inspect at 100,000 miles (160,000 km)															
CHASSIS AND BODY																	
30. Clutch		–	I	–	I	–	I	–	I	–	I	–	I	–	I	–	I
31. Brake discs and pads (front) Brake drums and shoes (rear)		–	I	–	I	–	I	–	I	–	I	–	I	–	I	–	I
32. Brake hoses and pipes		–	I	–	I	–	I	–	I	–	I	–	I	–	I	–	I
33. Brake fluid		–	I	–	I	–	I	–	R	–	I	–	I	–	I	–	R
34. Brake pedal		–	I	–	I	–	I	–	I	–	I	–	I	–	I	–	I
35. Brake lever and cable		–	I	–	I	–	I	–	I	–	I	–	I	–	I	–	I
36. Tires		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
37. Wheel discs and free wheeling hubs (if equipped)		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
38. Steering knuckle oil seals		–	–	R	–	–	R	–	–	R	–	–	R	–	–	R	–
39. Wheel bearings		–	I	–	*I	–	I	–	*I	–	I	–	*I	–	I	–	*I
40. Shock absorbers		I	I	–	I	–	I	–	I	–	I	–	I	–	I	–	I
41. Propeller shafts		–	I&L	–	I&L	–	I&L	–	I&L	–	I&L	–	I&L	–	I&L	–	I&L
42. Transmission, transfer and differential oil		R	I	I	R	I	I	I	R	I	I	I	R	I	I	I	R
43. Leaf springs		–	–	–	I	–	–	–	I	–	–	–	I	–	–	–	I
44. Bolts and nuts		T	T	–	T	–	T	–	T	–	T	–	T	–	T	–	T
45. Steering system		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
46. Door hinges		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L

NOTES:
"R": Replace or change
"I" : Inspect and correct or replace if necessary
"T": Tighten to the specified torque
"L": Lubricate

- [ ]: *Applicable to Canadian specification vehicle.*
- *(For U.S.A. specification vehicle) Item 21 **I, Item 25 **R and Item 26 **I are recommended maintenance items.*
- *Item 26 R is applicable to the fuel hose and clamp only.*
- *Item *27 is recommended maintenance item.*
- *Item 39 *I is applicable to not only rattled wear but also their grease.*

MAINTENANCE RECOMMENDED UNDER SEVERE DRIVING CONDITIONS

If the car is usually used under the conditions corresponding to any severe condition code given below, it is recommended that applicable maintenance operation be performed at the particular interval as given in the below chart.

Severe condition code

A – Towing a trailer
B – Repeated short trips
C – Driving on rough and/or muddy roads
D – Driving on dusty roads
E – Driving in extremely cold weather and/or salted roads
F – Repeated short trips in extremely cold weather

Severe Condition Code	Maintenance	Maintenance Operation	Maintenance Interval
A – – D E F	Engine oil and oil filter	R	Every 3 750 miles (6 000 km) or 3 months
A B C – E –	Exhaust pipes and mountings	I	Every 7 500 miles (12 000 km) or 6 months
– – – D – –	Air cleaner filter element *1	I	Every 3 750 miles (6 000 km) or 3 months
		R	Every 15 000 miles (24 000 km) or 12 months
– – – – E –	Choke system (Carburetor shafts)	I & L	Every 7 500 miles (12 000 km) or 6 months
– – – – E –	Distributor cap and Ignition wiring *2	I	Every 15 000 miles (24 000 km) or 12 months
A B C D – –	Brake discs and pads (Front) Brake drums and shoes (Rear)	I	Every 7 500 miles (12 000 km) or 6 months
A B C – – –	Propeller shafts	I & L	Every 7 500 miles (12 000 km) or 6 months
A – C – – –	Transmission, transfer and differential oil	R	Every 15 000 miles (24 000 km) or 12 months After first replacement at 7 500 miles (12 000 km)
– – C – – –	Leaf springs	I	Every 15 000 miles (24 000 km) or 12 months
– – C – – –	Bolts and nuts on chassis	T	Every 7 500 miles (12 000 km) or 6 months
– – C – – –	Steering wheel free play, gear box oil and linkage	I	Every 3 750 miles (6 000 km) or 3 months
– – C – E –	Steering knuckle oil seals	R	Every 15 000 miles (24 000 km) or 12 months

NOTES:

I – Inspect and correct or replace if necessary
R – Replace or change
T – Tighten to the specified torque
L – Lubricate

**1 Inspect more frequently if the vehicle is used under dusty conditions.*
**2 In areas where road salt is used, inspect and clean the distributor cap and ignition wiring more frequently.*

1-2. ENGINE AND EMISSION CONTROL

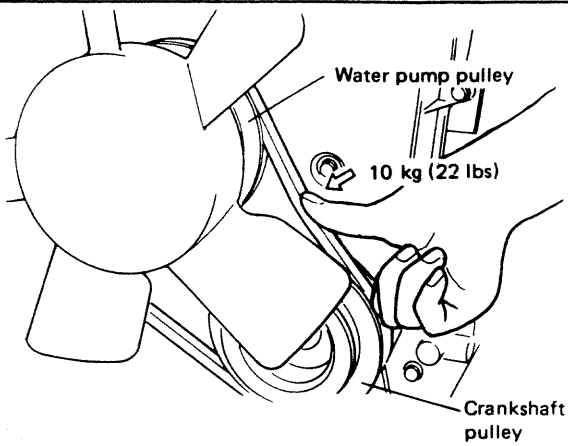
1. WATER PUMP BELT INSPECTION AND REPLACEMENT

WARNING:
All inspection and replacement are to be performed with ENGINE NOT RUNNING.

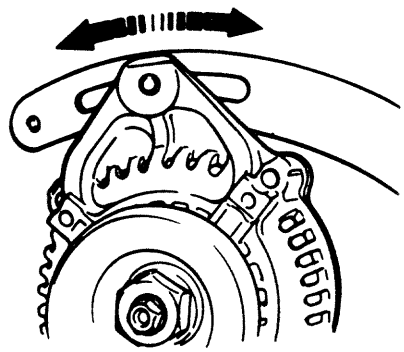
[INSPECTION]

1) Disconnect negative battery lead at battery.
2) Inspect belt for cracks, cuts, deformation, wear and cleanliness. If any defect, replace. Check belt for tension. The belt is in proper tension if it deflects 6 to 9 mm (0.24 – 0.35 in.) under thumb pressure (about 10 kg or 22 lb.).

Belt tension specification	6 – 9 mm (0.24 – 0.35 in.) as deflection



3) If the belt is too tight or too loose, adjust it to specification by adjusting alternator position.



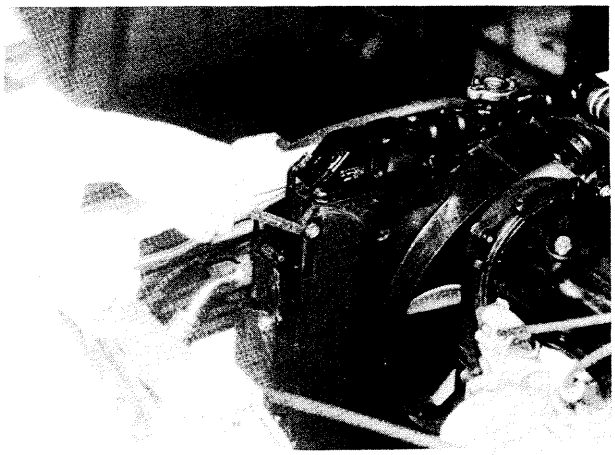
4) Tighten alternator adjusting bolt and pivot bolts.
5) Connect negative battery lead to battery.

[REPLACEMENT]

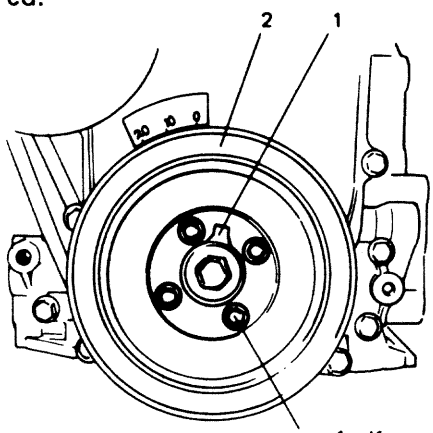
1) Disconnect negative battery lead at battery.
2) Loosen alternator adjusting bolt and pivot bolts.
3) Replace water pump belt.
4) Adjust belt tension to specification and tighten alternator adjusting bolt and pivot bolts.
5) Connect negative battery lead to battery.

2. CAMSHAFT TIMING BELT INSPECTION

1) Disconnect negative battery lead at battery.
2) Loosen fan drive belt, and remove 4 bolts securing radiator shroud panel and 4 nuts securing engine cooling fan & clutch. Then remove radiator shroud and cooling fan & clutch at the same time.

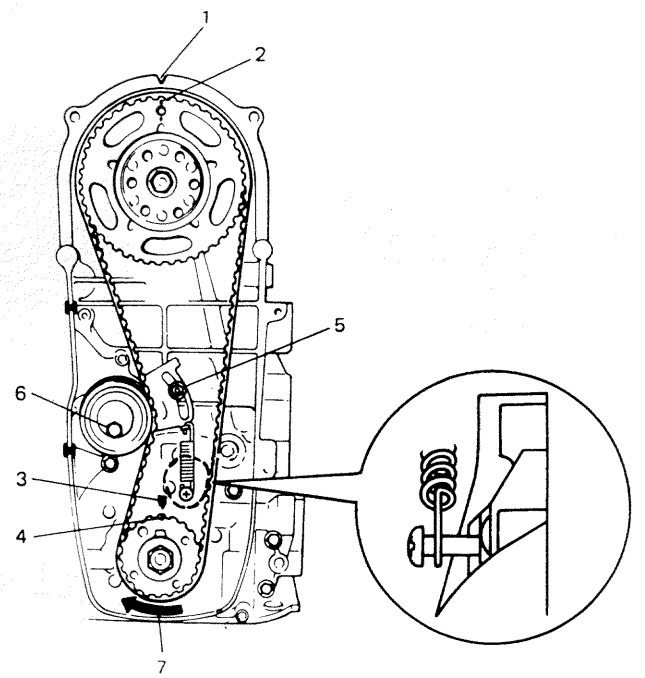


3) Remove water pump belt and pump pulley.
4) Remove crankshaft pulley by removing 4 pulley bolts. The crankshaft timing belt pulley bolt at the center need not be loosened.



1. Key
2. Crankshaft pulley
3. Pulley bolt

5) Remove timing belt outside cover. Inspect the belt for damage or wear. When any damage or wear is found on the belt, replace it.
   If belt replacement is necessary, be sure to install the belt properly.
6) Remove cylinder head cover and loosen all valve adjusting screws all the way to permit free rotation of camshaft.
7) Turn crankshaft clockwise and align 4 marks as shown.
   Loosen tensioner bolt and nut but do not remove.



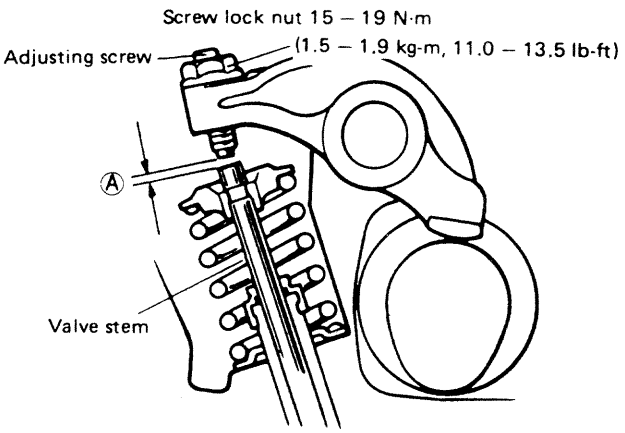
1. "V" mark
2. Timing mark
3. Arrow mark
4. Punch mark
5. Tensioner nut
6. Tensioner bolt
7. Turning direction

8) To allow belt to be free of any slack, turn crankshaft clockwise fully twice. After removing belt slack, tighten tensioner nut to 9 – 12 N·m (0.9 – 1.2 kg-m, 7.0 – 8.5 lb-ft) first and then tensioner bolt to 24 – 30 N·m (2.4 – 3.0 kg-m, 17.5 – 21.5 lb-ft).
   Then confirm again that 4 marks are matched.
9) Adjust valve lash to specification.
10) Install cylinder head cover and torque bolt to specification.
11) Install timing belt outside cover and torque bolts and nut to specification.
12) Install crankshaft pulley and torque bolts to specification.
13) Install water pump pulley and belt.
14) Install radiator shroud and cooling fan & clutch.
15) Adjust water pump belt tension to specification.
16) Connect negative battery lead to battery.

3. VALVE LASH INSPECTION

1) Remove cylinder head cover.
2) Inspect intake and exhaust valve lash and adjust as necessary.

		When cold (Coolant temperature is 15 – 25°C or 59 – 77°F)	When hot (Coolant temperature is 60 – 68°C or 140 – 154°F)
Valve lash (gap A) specification	Intake	0.13 - 0.17 mm (0.0051 - 0.0067 in)	0.23 - 0.27 mm (0.009 - 0.011 in)
	Exhaust	0.16 - 0.20 mm (0.0063 - 0.0079 in)	0.26 - 0.30 mm (0.0102 - 0.0118 in)

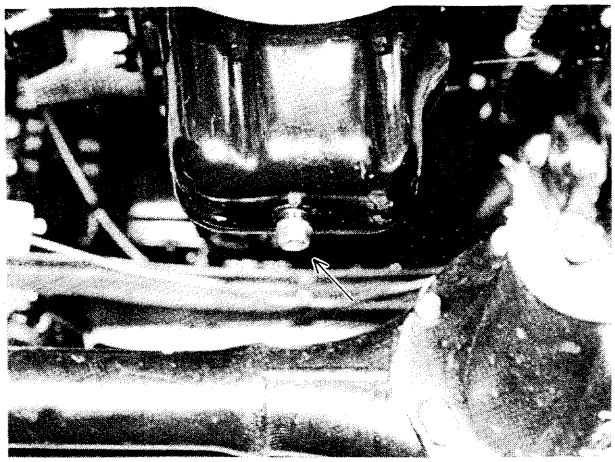


3) Install cylinder head cover and tighten bolts to specification.

4. ENGINE OIL AND FILTER CHANGE

Before draining engine oil, check engine for oil leakage. If any evidence of leakage is found, make sure to correct defective part before proceeding to the following work.

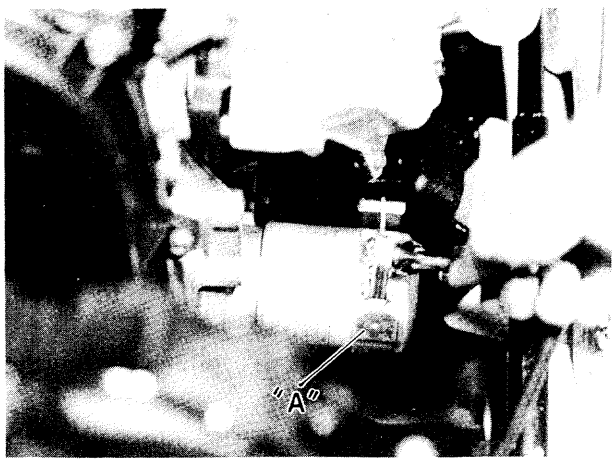
1) Drain engine oil by removing drain plug.



2) After draining oil, wipe drain plug clean. Reinstall drain plug, and tighten it securely.

Tightening torque for oil drain plug	N·m	kg-m	lb-ft
	30–40	3.0–4.0	22.0–28.5

3) Loosen oil filter by using oil filter wrench "A" (special tool 09915-47310).



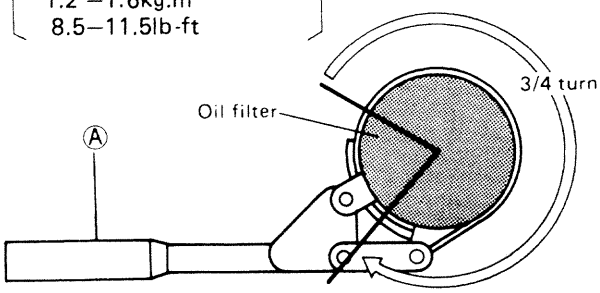
NOTE:
Before fitting new oil filter, be sure to oil its "O" ring. Use engine oil for this purpose.

4) Screw new filter on oil filter stand by hand until the filter "O" ring contacts the mounting surface.

CAUTION:
To tighten the oil filter properly, it is important to accurately identify the position at which the filter "O" ring first contacts the mounting surface.

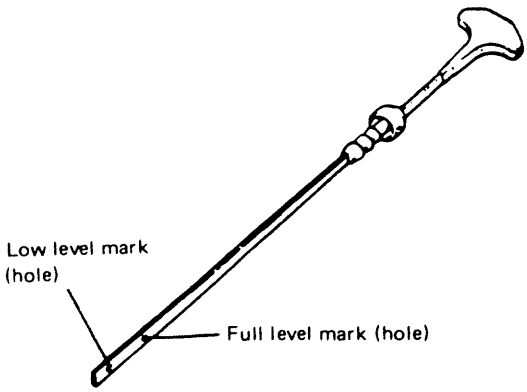
5) Tighten the filter 3/4 turn from the point of contact with the mounting surface using an oil filter wrench Ⓐ.

Oil filter tightening torque
12–16N.m
1.2 –1.6kg.m
8.5–11.5lb-ft



6) Replenish oil until oil level is brought to FULL level mark on dipstick. (about 3.7 liters or 7.8/6.5 US/Imp pt.). The filler inlet is atop the cylinder head cover.

7) Start engine and run it for three minutes. Stop engine and wait another three minutes before checking oil level. Add oil, as necessary, to bring oil level to FULL level mark on dip stick.

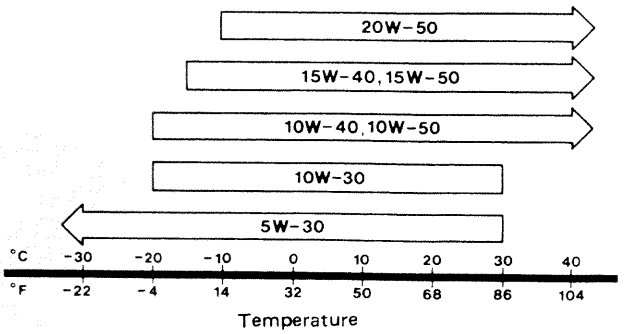


NOTE:
Steps 1) – 6) outlined above must be performed with ENGINE NOT RUNNING. For step 7), be sure to have adequate ventilation while engine is running.

It is recommended to use engine oil of SE or SF class.

NOTE:
For temperatures below 32° F(0°C), it is highly recommended to use SAE 5W–30 oil.

Proper Engine Oil Viscosity Chart



Engine Oil Viscosity Chart

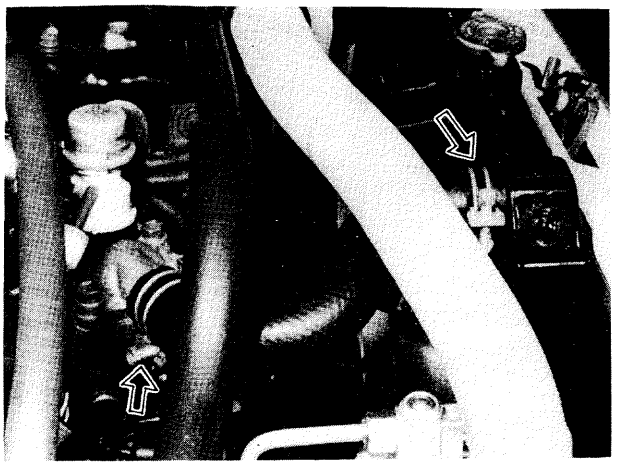
Engine oil capacity

Oil pan capacity	3.5 liters (7.4/6.2 US/Imp pt.)
Oil filter capacity	0.2 liters (0.4/0.3 US/Imp pt.)
Others	0.3 liters (0.6/0.5 US/Imp pt.)
Total	4.0 liters (8.4/7.0 US/Imp pt.)

8) Check oil filter and drain plug for oil leakage.

5. COOLING SYSTEM HOSES AND CONNECTIONS INSPECTION

1) Visually inspect cooling system hoses for any evidence of leakage and cracks. Examine them for damage, and check connection clamps for tightness.

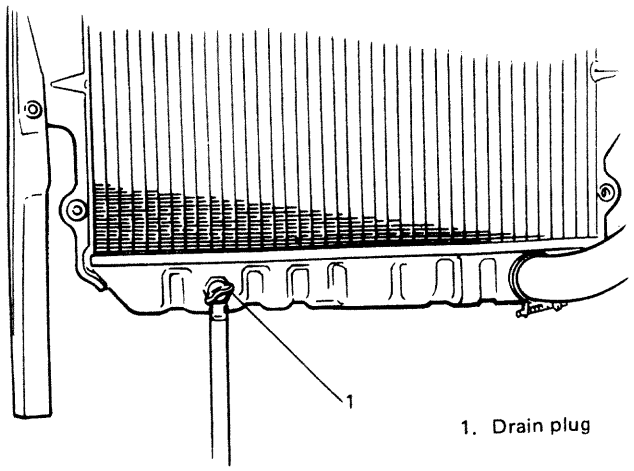


2) Replace all hoses which show evidence of leakage, cracks or other damage. Replace all clamps which cannot maintain proper tightness.

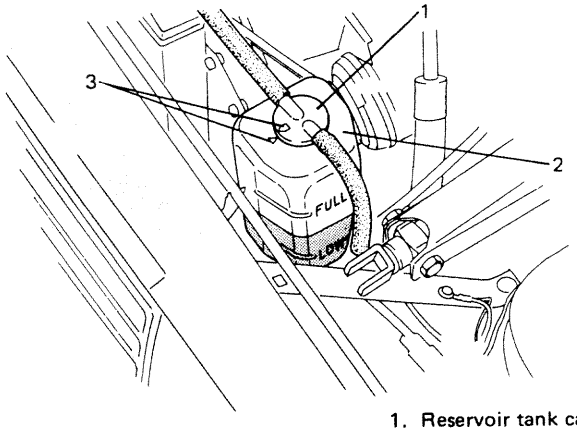
6. ENGINE COOLANT CHANGE

WARNING:
To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if the cap is taken off too soon.

1) Remove radiator cap when engine is cool.
2) Loosen radiator drain plug ① to drain coolant.
3) Remove reservoir tank ②, which is on the side of radiator, and drain.
4) Tighten plug ① securely. Also reinstall reservoir tank.



1. Drain plug



1. Reservoir tank cap
2. Reservoir tank
3. Arrow marks

5) Fill radiator with specified amount of coolant, and run engine for 2 or 3 minutes at idle. This drives out any air which may still be trapped within cooling system. STOP ENGINE. Add coolant as necessary until coolant level reaches the filler throat of radiator. Reinstall radiator cap.
6) Add coolant to reservoir tank so that the level aligns with Full mark. Then, reinstall cap aligning the arrow marks on the tank and cap.

COOLANT CAPACITY	
Engine, radiator and heater	4.2 liters (8.9/7.4 US/Imp pt.)
Reservoir tank	0.6 liters (1.3/1.1 US/Imp pt.)
Total	4.8 liters (10.1/8.4 US/Imp pt.)

CAUTION:
When changing engine coolant, use mixture of 50% water and 50% GOLDEN CRUISER 1200NA for the market where ambient temperature falls lower than −16°C (3°F) in winter and mixture of 70% water and 30% GOLDEN CRUISER 1200NA for the market where ambient temperature doesn't fall lower than −16°C (3°F).
Even in a market where no freezing temperature is anticipated, mixture of 70% water and 30% GOLDEN CRUISER 1200NA should be used for the purpose of corrosion protection and lubrication.

7. EXHAUST PIPES AND MOUNTINGS INSPECTION

WARNING:
To avoid danger of being burned, do not touch exhaust system when system is hot. Any service on exhaust system should be performed when system is cool.

When carrying out periodic maintenance, or the car is raised for other service, check exhaust system as follows:

- Check rubber mountings for damage, deterioration, and out of position.
- Check exhaust system for leakage, loose connections, dents, and damages.
  If bolts or nuts are loose, tighten them to specification. Refer to below chart for torque specification.
- Check nearby body areas for damaged, missing, or mispositioned parts, open seams, holes, loose connections or other defects which could permit exhaust fumes to seep into the car.
- Make sure that exhaust system components have enough clearance from the underbody to avoid overheating and possible damage to the floor carpet.
- Any defects should be fixed at once.

Bolts and nut	Tightening torque
Exhaust pipe bolts	40 – 60 N·m 4.0 – 6.0 kg-m 29.0 – 43.0 lb-ft
Muffler nuts	18 – 28 N·m 1.8 – 2.8 kg-m 13.5 – 20.0 lb-ft

Replace center pipe rubber mounting and muffler rubber mountings with new ones periodically.

8. PCV VALVE REPLACEMENT

1) Disconnect crankcase ventilation hose from PCV valve.
2) Remove PCV valve from intake manifold.
3) Wind sealing tape on thread of the new valve and install it securely.

Tightening torque for PCV valve	15 – 25 N·m 1.5 – 2.5 kg-m 11.0 – 18.0 lb-ft

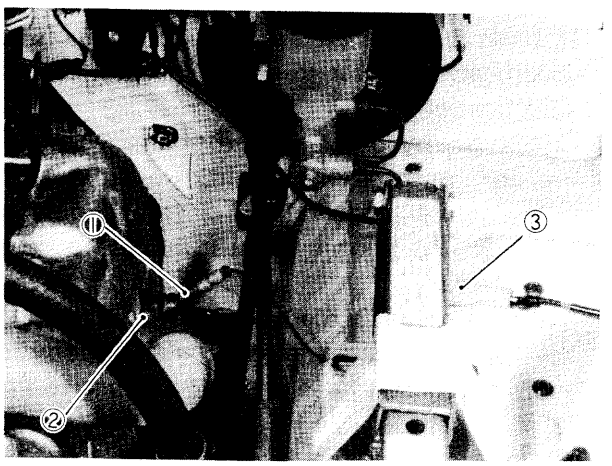
4) Install hose and clamp it securely.

9. OXYGEN SENSOR REPLACEMENT

[Canadian specification vehicle]
When the odometer indicates 50,000 and 100,000 miles, replace oxygen sensor as follows.

CAUTION:
To avoid the danger of being burned, do not touch the exhaust system when the system is hot. This work should be performed when the system is cool.

1) Disconnect battery negative cable from battery and disconnect oxygen sensor wire at the coupler.

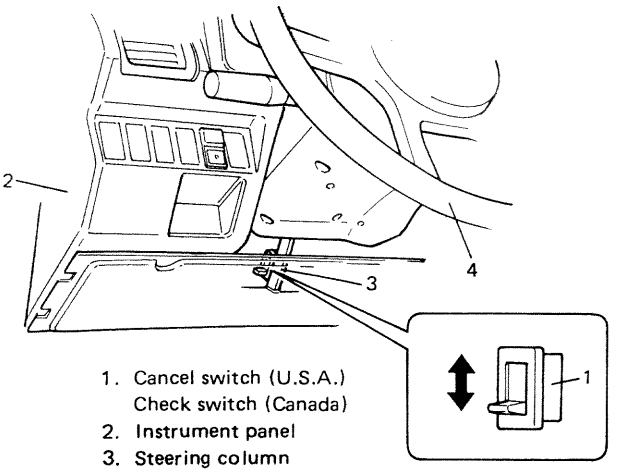


1. Oxygen sensor
2. Exhaust manifold
3. Coupler

2) Remove oxygen sensor from exhaust manifold.
3) Install new gasket and oxygen sensor, and tighten it to specification.

Tightening torque for oxygen sensor	45 – 55 N·m 4.5 – 5.5 kg-m 33.0 – 39.5 lb-ft

4) Connect oxygen sensor wire at the coupler securely and clamp its wire.
5) Connect negative cable to battery.
6) Start engine and check for gas leak.
For Canadian specification vehicle, turn on check switch.
7) Run engine at 1,500 ~ 2,000 r/min for 30 sec. after warming up engine. Check to be sure that "CHECK ENGINE" light flashes, and turn off "CHECK ENGINE" light cancel/check switch on steering column holder bracket.



1. Cancel switch (U.S.A.)
Check switch (Canada)
2. Instrument panel
3. Steering column holder bracket
4. Steering wheel

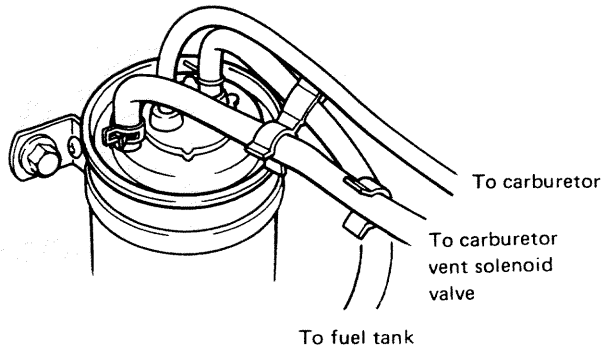
10. CATALYTIC CONVERTER INSPECTION

1) All accessories (wipers, heater, lights, etc.) are out of service.
2) Warm up engine to normal operating temperature.
3) Connect CO tester to mufler tail pipe.
4) With the engine warmed up, keep the engine speed at 1,500 to 2,000 r/min. (rpm). If the CO concentration is 0.4% or less in this state, the catalytic converter is in good condition.
If it exceeds the specification, refer to DIAGNOSIS (p. 5-15).

11. CHARCOAL CANISTER REPLACEMENT

WARNING:
The following cautions should be always observed.
- **Disconnect negative cable at battery.**
- **DO NOT smoke and place "NO SMOKING" signs near work area.**
- **Be sure to have CO_2 fire extinguisher handy.**
- **Wear safety glasses.**
- **To release the fuel vapor pressure in fuel tank, remove the fuel tank cap and then reinstall it.**

1) Disconnect 3 hoses from canister.
2) Remove canister from car body.
3) Install new canister.
4) Connect 3 hoses to canister securely.
5) Clamp them securely.



12. EMISSION-RELATED HOSES AND TUBES INSPECTION

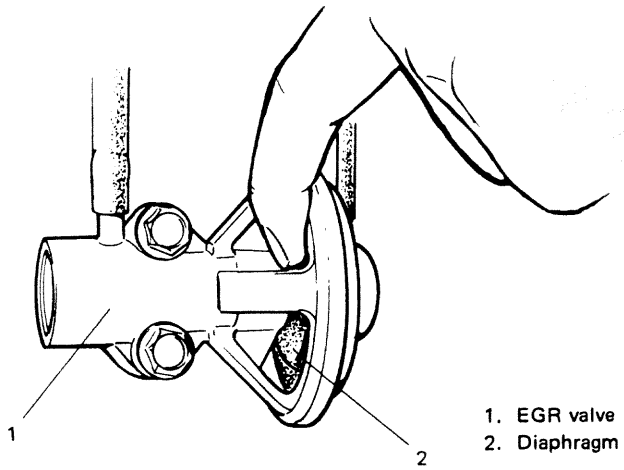
Check each vacuum hose and tube for secure connection. Also, check that it is free from any bend or damage.
Correct faulty condition, if any.

13. EXHAUST GAS RECIRCULATION (EGR) SYSTEM INSPECTION

NOTE:
- **Before checking, confirm that altitude is not higher than 1,220 m (4,000 ft) (atmospheric pressure is below 680mmHg) and gear shift lever is at neutral position.**
- **When performing this check at higher than 1,220 m (4,000 ft) altitude, be sure to disconnect HAC coupler.**

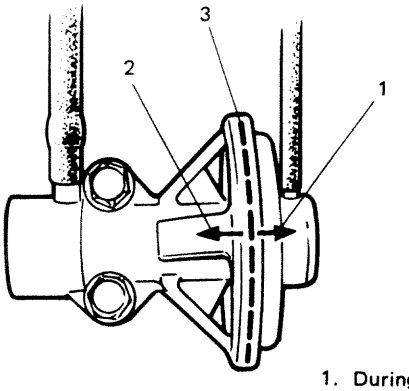
1) Run engine when it is cool (coolant temperature is below 55°C (131°F)) and check that EGR valve diaphragm is not operating in this state, by touching diaphragm with finger.

WARNING:
If EGR valve is hot, it may be necessary to wear gloves to avoid burning finger.



Checking EGR valve diaphragm

2) Warm up engine to normal operating temperature and race it after warming up. Then check to be sure that diaphragm moves toward ① in below figure during acceleration and toward ② during deceleration.

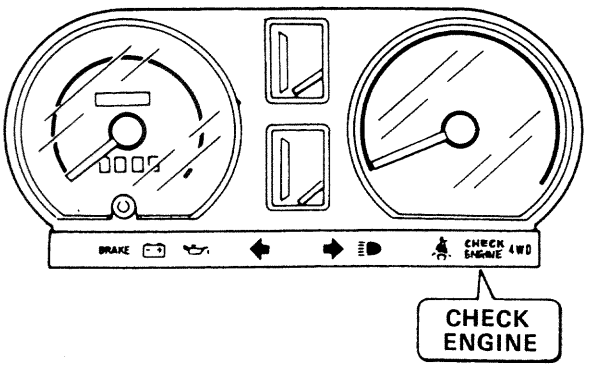


1. During acceleration
2. During deceleration
3. Diaphragm

Movement of EGR valve diaphragm

14. ECM AND ASSOCIATED SENSORS INSPECTION

1) Start engine and warm it up to normal operating temperature.
   For Canadian specification vehicle, turn on check switch.
2) Run engine at 1500 – 2000 r/min (rpm). In this state, make sure that "CHECK ENGINE" light flashes.
   Flashing of light proves that ECM and associated sensors are in good condition.
   If the light does not flash, check them and replace or adjust as necessary. Refer to SECTION 5 for checking procedure.



"CHECK ENGINE" light

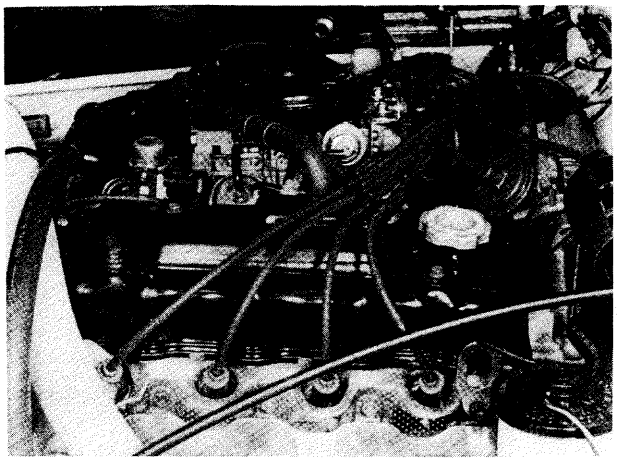
3) Turn off "CHECK ENGINE" light cancel or check switch on steering holder bracket.
4) Stop engine.

15. WIRING HARNESS AND CONNECTIONS INSPECTION

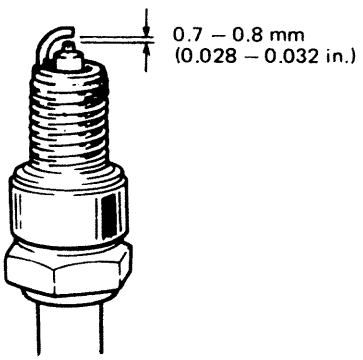
1) Visually inspect all wires located in engine compartment for evidence of breakage.
   Inspect the condition of the insulation (cracks). All clips and clamps should have solid connections to wires.
2) Replace any wires in a deteriorated or otherwise defective condition.

16. SPARK PLUGS REPLACEMENT

1) Disconnect high-tension cords from spark plugs. Make sure to pull only on spark plug caps.



2) Using a spark plug wrench, loosen and remove plugs.



NOTE:
When replacing plugs, make sure to use new plugs of specified heat range and size.

PLUG SPECIFICATION

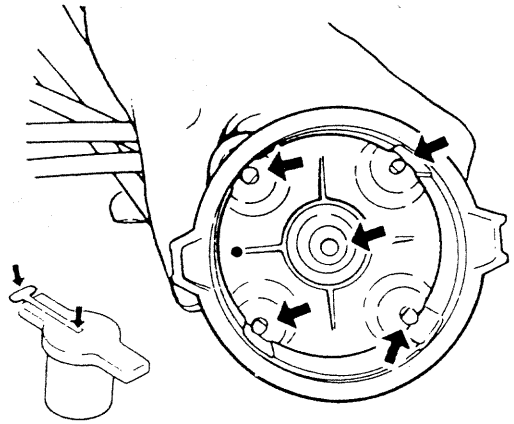
Maker	Heat range Standard type
NGK	BPR5ES
Nippon Denso	W16EXR-U

3) Install new spark plugs. Tighten plugs to specification.
4) Connect high tension cords to spark plugs. DO NOT push cords for connection. Push boots.

Spark plug tightening torque	20 – 30 N·m 2.0 – 3.0 kg-m 14.5 – 21.5 lb-ft

17. DISTRIBUTOR CAP AND ROTOR INSPECTION

1) Inspect distributor cap and rubber caps for cracks.
2) Inspect center electrode and terminals for wear.

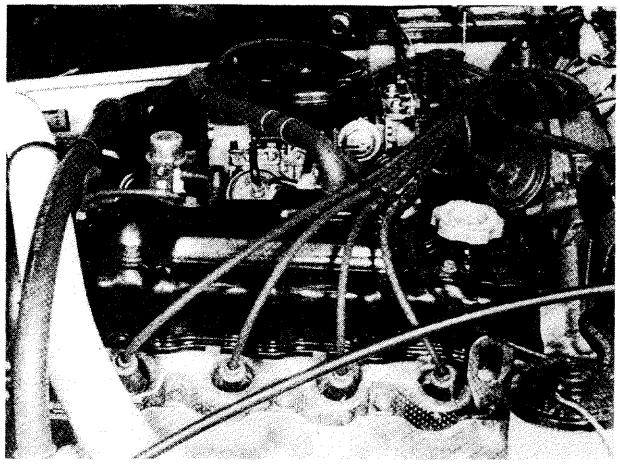


3) Inspect rotor for cracks, and its electrode for wear.
4) Check to see that there are no excessive closes in ventilation plug hole.
5) Repair or replace as necessary any component which is found to be in malcondition as described above.

NOTE:
Dust and stains found within distributor can be cleaned by using a dry, soft cloth.

18. IGNITION WIRING REPLACEMENT

1) Disconnect high tension cords from spark plugs, ignition coil and distributor.
2) Connect new high tension cords as shown and clamp them securely. DO NOT push cords for connection. Push boots.



19. IGNITION TIMING INSPECTION

Check to make sure that ignition timing is set properly. If out of specification, adjust it.
Refer to p. 8-9 for inspection and adjustment procedure.

20. DISTRIBUTOR ADVANCER INSPECTION

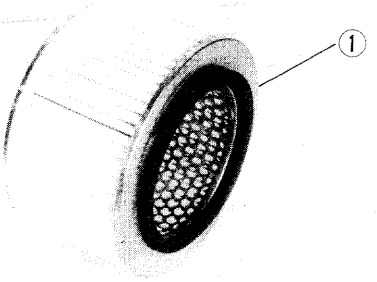
Check advancer for proper operation. Refer to p. 8-9 for checking procedure.
Check vacuum hose for pinhole, crack or break. Correct or replace if necessary.

21. FUEL TANK CAP GASKET INSPECTION AND REPLACEMENT

Visually inspect gasket of fuel tank cap. If it is damaged or deteriorated, replace it with new one.

22. AIR CLEANER ELEMENT REPLACEMENT

1) Remove air cleaner cap.
2) Take cleaner element ① out of air cleaner case.
3) Install new cleaner element ① into cleaner case.



4) Install air cleaner cap securely.

23. THERMOSTATICALLY CONTROLLED AIR CLEANER SYSTEM INSPECTION

Check thermostatically controlled air cleaner system for proper operation. Refer to p. 5-19 for checking procedure.

24. CARBURETOR CHOKE SYSTEM LUBRICATION AND INSPECTION

1) Remove air intake case, and lubricate rotating parts.
2) Check choke for proper operation.
   Refer to p. 4-22 for checking procedure.

25. FUEL FILTER REPLACEMENT

WARNING:
This work must be performed in a well ventilated area and away from any open flames (such as gas hot water heaters).

1) Disconnect negative cable from battery.
2) Remove fuel tank cap to release fuel vapor pressure in fuel tank. After releasing, reinstall the cap.
3) Disconnect inlet and outlet hoses from fuel filter located at the front part of fuel tank, inside the right-hand side of chassis.
4) Remove fuel filter with clamp.
5) Install new filter with clamp, and connect inlet and outlet hoses to fuel filter.

NOTE:
The top connection is for the outlet hose, the lower one for the inlet hose.

6) Connect negative cable to battery.
7) After installation, start engine and check it for leaks.

26. FUEL LINES AND CONNECTIONS INSPECTION AND REPLACEMENT

[INSPECTION]

Visually inspect fuel lines and connections for evidence of fuel leakage, hose cracking, and damage. Make sure all clamps are secure.
Repair leaky joints, if any.
Replace hoses that are suspected of being cracked.

[REPLACEMENT]

WARNING:
The following cautions should be always observed.

- **Disconnect negative cable at battery.**
- **DO NOT smoke and place "NO SMOKING" signs near work area.**
- **Be sure to have CO_2 fire extinguisher handy.**
- **Wear safety glasses.**
- **To release the fuel vapor pressure in fuel tank, remove the fuel tank cap and then reinstall it.**

1) Replace fuel hoses (pipe to fuel pump, pipe to fuel filter and breather hose) in fuel feed and return lines with new ones.
2) Remove fuel tank.
3) Replace return hose (tank to return pipe) with new one.
4) Clamp hoses securely.
5) Install fuel tank referring to p. 4-35.
6) After installation, start engine and check it for leaks.

27. IDLE SPEED INSPECTION

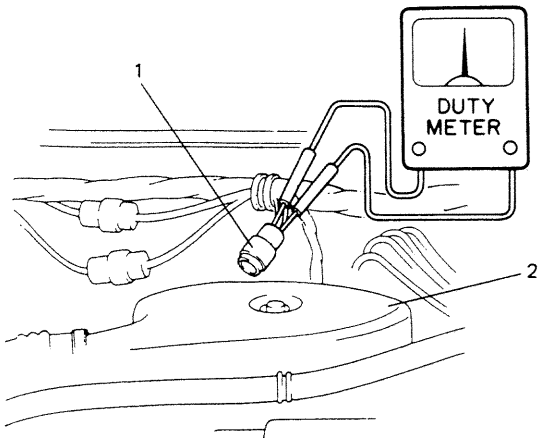
NOTE:
Before starting engine, place transmission gear shift lever in "Neutral", and set parking brake and block drive wheels.

> **WARNING:**
> **Keep hands, tools, and clothing away from engine cooling fan to help prevent personal injury.**

1) Warm up engine to normal operating temperature.
2) Check to ensure that idle speed is within 750 – 850 r/min (rpm).
3) If idle speed is not within specified range, adjust idle speed. Refer to MAINTENANCE SERVICE (p. 4-26) for procedures to check and adjust idle speed.

28. IDLE MIXTURE INSPECTION

1) Warm up engine to normal operating temperature.
2) Remove seal rubber of duty check coupler and connect positive terminal of duty meter to "Blue/Red" wire and negative terminal to "Black/Green" wire.



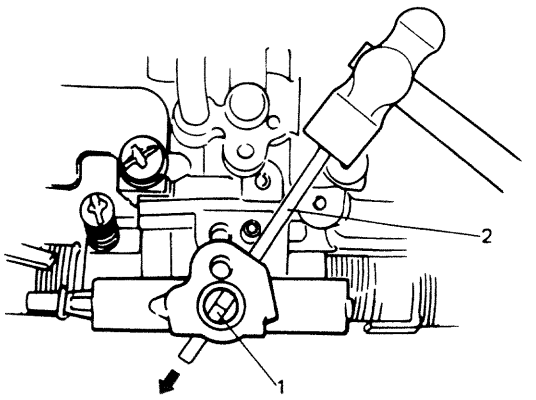
1. Duty check coupler
2. Air intake case

3) Set tachometer.
4) Run engine at 1,500 – 2,000 r/min for 30 seconds and bring it to idle speed.
5) Check duty at specified idle speed. If it is out of specification, adjust it to specification according to following adjustment procedure.

Specified Duty	10 – 50 at 750 – 850 r/min.

After inspection, install seal rubber to duty check coupler.

Idle mixture adjustment procedure is as follows:
1) Remove carburetor from intake manifold following normal service procedure to gain access to mixture adjusting screw pin covering mixture adjusting screw.
2) Drive out mixture adjusting screw pin using about 4.5 mm (0.18 in) thick iron rod as shown below.



1. Mixture adjusting screw pin
2. Rod

Mixture adjusting screw pin

3) Reinstall carburetor following normal service procedures.
   Connect emission control system hoses and lead wires. Make specified play on accelerator cable and refill cooling system.
4) Place transaxle gear shift lever in "Neutral", set parking brake and block drive wheels.
5) Start engine, and warm it up to normal operating temperature, stop engine.
6) Be sure to check the following before idle mixutre adjustment.
   - Fuel level is within round mark at the center of level gauge.
   - Valve lash is checked and adjusted according to the maintenance schedule.
   - Air cleaner has been properly installed and is in good condition.
   - All accessories (wipers, heater, lights etc) are out of service.
   - Ignition timing is within specification.
   - Choke valve opens fully.
   - Idle-up actuator does not operate.
7) Check and adjust idle speed to specification if necessary.
8) Remove seal rubber of duty check coupler and connect positive terminal of duty meter to "Blue/Red" wire and negative terminal to "Black/Green" wire.
9) Run engine at 1,500 – 2,000 r/min for 30 seconds and bring it to idle speed.
10) With engine running at idle speed, adjust idle mixture adjusting screw slowly in small increment allowing time for duty to stabilize after turning screw to obtain duty of 10 – 50. If duty is too low, back screw out; if too high, screw it in. After obtaining duty of 10 – 50, recheck idle speed, and adjust if necessary.

NOTE:
If adjustment can't be made because duty meter indicator does not deflect, check feed back system according to the checking procedure of system described in section of Emission Control System.

11) After adjustment, install seal rubber to duty check coupler and drive in idle mixture adjusting screw pin.

29. CARBURETOR INSPECTION

Check each carburetor mounting nut for tightness.
If it is found loose, tighten it securely.
Also, check where the carburetor and intake manifold are mated and other parts of the carburetor body for leakage. Be sure to correct the cause for leakage, if any.

1-3. CHASSIS AND BODY

30. CLUTCH PEDAL INSPECTION

1) Check clutch pedal height. It should be the same as brake pedal height.
2) Check clutch pedal free travel.

Clutch pedal free travel	20 – 30 mm (0.8 – 1.1 in.)

For the details of the above steps 1) and 2), refer to MAINTENANCE SERVICE (p. 11-8) of SECTION 11.

31. BRAKE DISCS, PADS, BRAKE DRUMS AND SHOES INSPECTION

Brake Discs and Pads

1) Remove wheel and caliper but don't disconnect brake hose from caliper.
2) Check front disc brake pads and discs for excessive wear, damage and deflection. Replace parts as necessary. For the details, refer to p. 19-16 and 19-17 of SECTION 19.
   Be sure to torque caliper guide pins to specification for reinstallation.

Brake Drums and Shoes

1) Remove wheel and brake drum.
2) Check rear brake drums and brake linings for excessive wear and damage, while wheels and drums are removed. Also check wheel cylinders for leaks, at the same time. Replace these parts as necessary.
   For the details, refer to p. 19-21 and p. 19-22 of SECTION 19.

32. BRAKE HOSES AND PIPES INSPECTION

Check brake hoses and pipes for proper hook-up, leaks, cracks, chafing and other damage. Replace any of these parts as necessary.

> CAUTION:
> **After replacing any brake pipe or hose, be sure to carry out air purge operation.**

33. BRAKE FLUID INSPECTION AND CHANGE

[INSPECTION]

1) Check around master cylinder and reservoir for fluid leakage.
   If found leaky, correct.
2) Check fluid level
   If fluid level is lower than the minimum level of reservoir, refilling is necessary. Fill reservoir with specified brake fluids.

Brake fluid	Specifications
	DOT 3

For the details, refer to MAINTENANCE SERVICE (p. 19-42) of SECTION 19.

> CAUTION:
> **Since the brake system of this car is factory-filled with glycol-base brake fluid, do not use or mix different type of fluid when refilling the system; otherwise serious damage will occur. Do not use old or used brake fluid, or one taken from unsealed container.**

[CHANGE]

1) Change brake fluid. As fluid change procedure, drain existing fluid from brake system completely, fill the system with above recommended fluid and carry out air purge operation.
   For description of air purge, refer to p. 19-46 and 19-47 of SECTION 19.

34. BRAKE PEDAL INSPECTION

Check brake pedal travel.
For checking procedure, refer to PEDAL TRAVEL CHECK (p. 19-43) of SECTION 19.

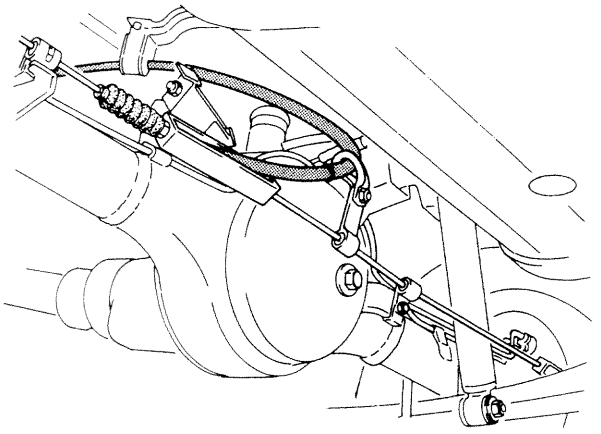
35. BRAKE LEVER AND CABLE INSPECTION

Parking Brake Lever

1) Check tooth tip of each notch for damage or wear. If any damage or wear is found, replace parking lever.
2) Check parking brake lever for proper operation and stroke, and adjust it if necessary.
   For checking and adjusting procedures, refer to PARKING BRAKE INSPECTION AND ADJUSTMENT (p. 19-44) of SECTION 19.

Parking Brake Cable

Inspect brake cable for damage and smooth movement. Replace cable if it is in deteriorated condition.



36. TIRE INSPECTION AND ROTATION

1) Check tires for uneven or excessive wear, or damage. If defective, replace.
2) Check inflating pressure of each tire and adjust pressure to specification as necessary.

NOTE:

- **Tire inflation pressure should be checked when tires are cool.**
- **Specified tire inflation pressure should be found on tire placard or in owners' manual which came with the car.**

3) Rotate tires.

For the details of above steps 1) to 3), refer to MAINTENANCE SERVICE (p. 18-19 and 18-20) of SECTION 18.

37. WHEEL DISCS AND FREE WHEELING HUBS (if equipped) INSPECTION

Wheel Discs

Inspect each wheel disc for dents, distortion and cracks. A disc in badly damaged condition must be replaced.

Free Wheeling Hub

This is applicable to the car equipped with free wheeling hubs.

Check free wheeling hub for proper operation by moving free wheeling hub knob to LOCK and FREE positions. (The same check on both right and left wheels)

For checking procedure, refer to MAINTENANCE SERVICE (p. 17-29) of SECTION 17.

38. STEERING KNUCKLE OIL SEAL REPLACEMENT

For replacement procedure, refer to MAINTENANCE SERVICE (p. 17-23) of SECTION 17.

39. WHEEL BEARING INSPECTION

[Inspection of wheel bearing]

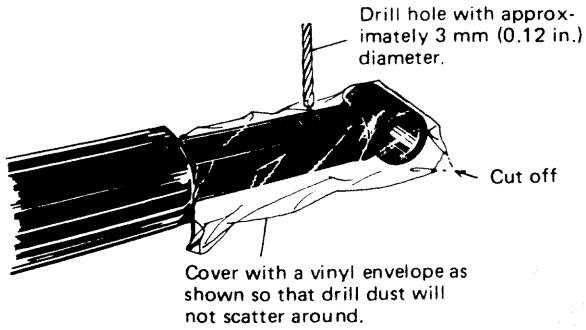
1) Check front wheel bearing for wear, damage, abnormal noise or rattles. For the details, refer to MAINTENANCE (p. 17-20 and 17-21) of SECTION 17.
2) Check rear wheel bearing for wear, damage abnormal noise or rattles. For the details, refer to MAINTENANCE SERVICE (p. 17-24) of SECTION 17.

[Inspection of front wheel bearing grease]

1) Remove wheel hub and spindle referring to FRONT WHEEL HUB REMOVAL of SECTION 17.
2) Check grease around front wheel bearing rollars and between front axle shaft surface and wheel spindle bush for deterioration and capacity.

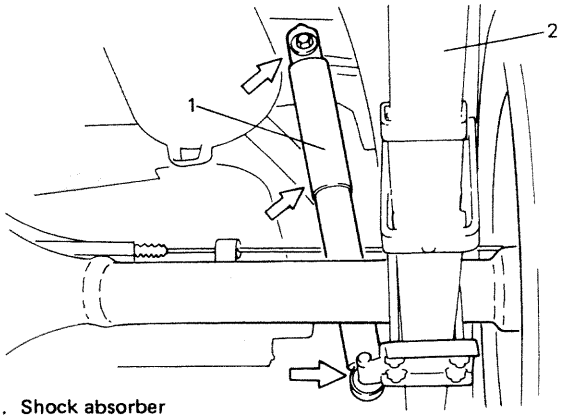
If grease is deteriorated, remove grease thoroughly and apply enough amount of new SUZUKI SUPER GREASE A or wheel bearing grease. If grease is found insufficient, add some more.

3) Install spindle, bearings, wheel hub, bearing nut and brake disc referring to INSTALLATION (p. 17-12) of SECTION 17.
4) Adjust bearing preload and then tighten bearing lock nut to specification. Refer to MAINTENANCE (p. 17-21) of SECTION 17.
5) Install drive flange or free wheeling hub (if equipped), brake caliper with mounting and wheel referring to INSTALLATION (p. 17-12) of SECTION 17.
For tightening torque of each bolt and nut, refer to torque table (p. 17-26) of SECTION 17.



40. SHOCK ABSORBERS INSPECTION

1) Inspect absorbers for evidence of oil leakage, dents or any other damage on sleeves; and inspect anchor ends for deterioration.
2) Depending on the results of the above inspection, replace absorbers.

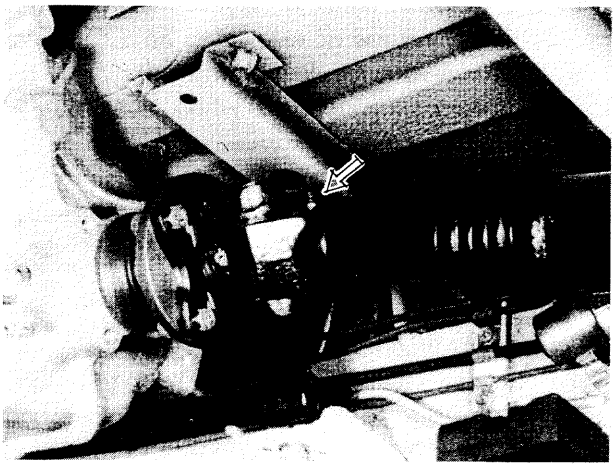


1. Shock absorber
2. Leaf spring

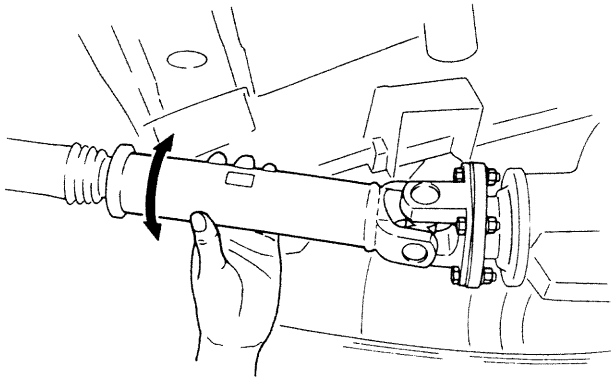
WARNING:
When handling rear shock absorber in which high-pressure gas is sealed, make sure to observe the following precautions.
1. Don't disassemble it.
2. Don't put it into fire.
3. Don't store it where it gets hot.
4. Before disposing it, be sure to drill a hole in it where shown in the illustration below and let gas and oil out. Lay it down sideways for this work.

41. PROPELLER SHAFTS INSPECTION AND LUBRICATION

1) Lubricate propeller shaft.
The nipple for lubrication is located on each sliding yoke. Be sure to use chassis grease.



2) Check universal joint and spline of propeller shaft for rattle. If rattle is found, replace defective part with a new one.



3) Check propeller shaft (No. 1, No. 2, No. 3) flange yoke bolts for tightness, and retighten them as necessary:

	N·m	kg-m	lb-ft
Tightening torque	23 – 30	2.3 – 3.0	17.0 – 21.5

42. TRANSMISSION, TRANSFER, DIFFERENTIAL OIL INSPECTION AND CHANGE

[Inspection]

1) Inspect transmission case, transfer case and differential housing for evidence of oil leakage. Repair leaky point if any.
2) Make sure that the car is placed level for oil level check.
3) Remove each level plug of transmission, transfer and differential (front and rear). In any of these cases, oil level can be checked roughly by means of level plug hole. That is, if oil flows out of level plug hole or if oil level is found up to hole when level plug is removed, oil is properly filled.
   If oil is found insufficient, pour specified amount of specified oil as given in the below table.

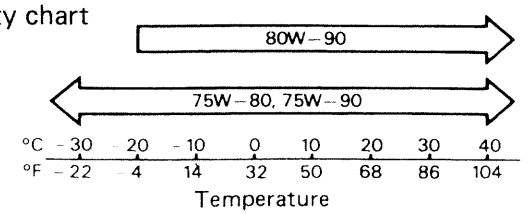
[Change]

Oil change procedure is as follows.

Place the car level and drain oil by removing drain plug. Pour specified amount of specified oil as in the below table and tighten drain plug and filler plug to specified torque.

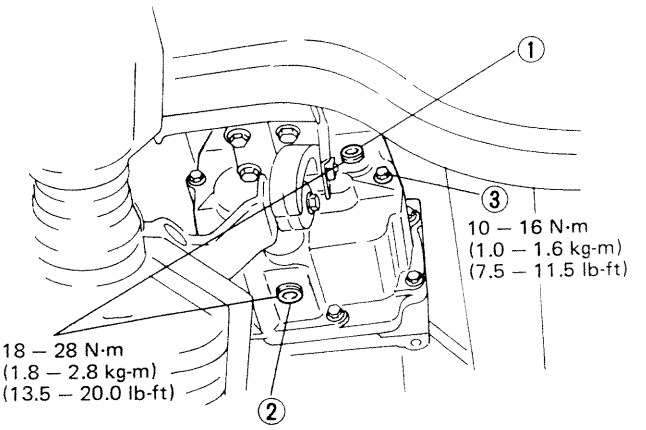
It is highly recommended to use SAE 75W–90 gear oil.

Viscosity chart



Transmission oil change

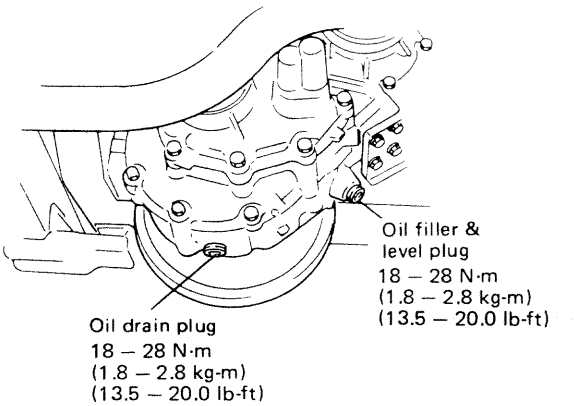
Oil capacity	1.3 liters (2.7/2.3 US/Imp pt.)
Type of oil	Gear oil, SAE 80W–90, 75W–80 or 75W–90



1. Oil filler plug
2. Oil drain plug
3. Oil level plug

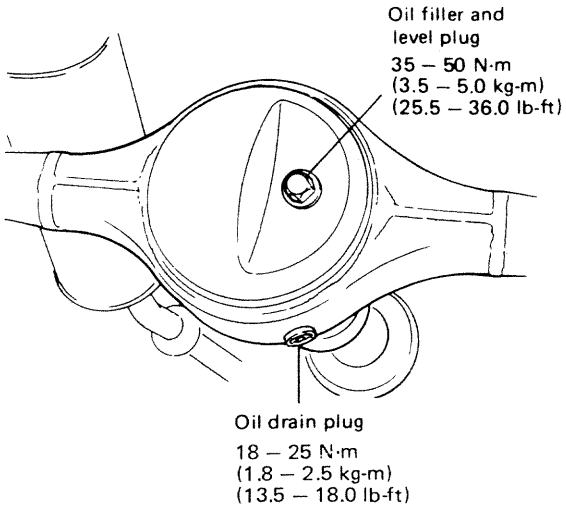
Transfer oil change

Oil capacity	0.8 liters (1.7/1.4 US/Imp. pt.)
Type of oil	Gear oil SAE 80W–90, 75W–80 or 75W–90



Differential oil change (Front and rear)

	Front	Rear
Oil capacity	2.0 liters (4.2/3.5 US/Imp pt.)	1.5 liters (3.2/2.6 US/Imp pt.)
Type of oil	Hypoid gear oil, SAE 80W–90, 75W–80 or 75W–90	



43. LEAF SPRING INSPECTION

Check leaf spring for wear, crack and damage. (Where each end of the shorter leaf contacts.) If excessive wear of cracking is noted, replace the spring with a new one.

44. BOLTS AND NUTS TIGHTENING

Check suspension bolts and nuts for tightness and retighten them as necessary.
Repair or replace defective parts, if any.

NOTE:
For the details of check points, refer to the table of MAINTENANCE SERVICE (p. 17-24) of SECTION 17.

45. STEERING SYSTEM INSPECTION

1) Check steering wheel for play and rattle, holding car in straight forward condition on the ground.

Steering wheel play	10 – 30 mm (0.4 – 1.2 in.)

2) Check universal joint and rubber joint of steering shaft for rattle and damage. If rattle or damage is found, replace defective part with a new one.
3) Check bolts and nuts for tightness and retighten them as necessary. Repair or replace defective parts, if any.
Refer to MAINTENANCE SERVICE on p. 18-18 for particular check points.
4) Inspect steering gear box for evidence of oil leakage. If leakage is found, check oil level in gear box.

NOTE:
For the details of the above steps 1) to 4), refer to MAINTENANCE SERVICE (p. 18-18) of SECTION 18.

5) Check boots of tie rod ends for damage. If damage is found, replace it with a new one.
6) Check wheel alignment.

Alignment service data

Side slip	OUT 0 – IN 3 m/km
Toe-in	2 – 6 mm (0.079 – 0.236 in.)
Camber	1 degree (1°) ± 45′
Kingpin inclination	9 degrees (9°) ± 2°
Caster	3 degrees 30 minutes (3° 30′) ± 1°

NOTE:
For the details of wheel alignment, refer to WHEEL ALIGNMENT (p. 18-16) of SECTION 18.

46. DOOR HINGES LUBRICATION

Lubricate door hinges for smooth operation.

FINAL INSPECTION

Carry out road test in safe place.

> **WARNING:**
> **When carrying out the following road tests, select a safe place where no man or no running car is seen so as to prevent any accident.**

1) Engine start

Check engine start for readiness.

2) Clutch

Check the following:

- that clutch is completely released when depressing clutch pedal,
- that no slipping clutch occurs when releasing pedal and accelerating,
- and that clutch itself is free from any abnormal condition.

3) Gearshift Lever (Transmission and Transfer)

Check gearshift lever for smooth shifting to all positions and for good performance of transmission and transfer in any position.

4) Brake

[Foot brake]

Check the following when depressing brake pedal while driving;

- that brake works properly,
- that it is free from noise,
- and that braking force applies equally on all wheels.

[Parking brake]

Check to ensure that parking brake is fully effective when the car is stopped on the slop and brake lever is pulled all the way.

5) Steering

Check to ensure that steering wheel is free from instability, or abnormally heavy feeling while driving.

SECTION 2

TROUBLE SHOOTING

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2-13. FUEL METER 2-18

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2-1. ENGINE

Condition	Possible cause	Correction
Poor starting (Hard starting)	**Starter will not run**	
	1. Main fuse blown off	Replace
	2. Contact not closing in main switch, or this switch open-circuited	Repair or replace
	3. Run-down battery	Recharge
	4. Defective magnetic switch of starter	Replace
	5. Loose battery terminal connection	Clean and retighten
	6. Defective brushes in starter	Replace
	7. Loose battery cord connection	Retighten
	8. Open in field or armature circuit of starter	Repair or replace
	No sparking	
	1. Defective spark plug	Adjust gap, or replace
	2. High tension cord short-circuited (grounded)	Repair or replace
	3. Cracked rotor or cap in distributor	Replace
	4. Defective signal generator or ignitor	Replace
	5. Maladjusted signal rotor air gap.	Adjust
	6. Contact not closing positively in main switch, or this switch open-circuited	Replace
	7. Loose or blown fuse	Set right or replace
	8. Improper ignition timing	Adjust
	9. Defective ignition coil.	Replace
	Faulty intake and exhaust systems	
	1. Carburetor out of adjustment	Adjust
	2. Fuel pump not discharging adequately	Replace
	3. Clogged fuel filter	Clean, or replace
	4. Defective choke mechanism	Repair or replace
	5. Loose intake manifold	Retighten
	6. Dirty and clogged carburetor	Disassemble and clean
	7. Float level out of adjustment	Adjust
	8. Clogged fuel hose or pipe	Clean or replace
	9. Not enough fuel in the tank	Refill
	10. Malfunctioning fuel cut solenoid valve	Check solenoid valve for proper operation and replace if necessary
	Abnormal engine internal condition	
	1. Ruptured cylinder head gasket	Replace
	2. Improper valve clearance	Adjust
	3. Weakened or broken valve spring	Replace
	4. Loose manifold, permitting air to be drawn in	Retighten and, as necessary, replace gasket
	5. Worn pistons, rings or cylinders	Replace worn rings and pistons and rebore as necessary

Condition	Possible cause	Correction
Poor starting (Hard starting)	6. Broken valve timing belt	Replace
	7. Poor valve seating	Repair or replace
	8. Wrong kind of engine oil	Replace
	9. Burnt valves	Replace
	10. Sticky valve stem	Correct or replace valve and guide
	Emission control	
	1. Malfunctioning PCV valve	Replace.
	2. Loose connection or disconnection of vacuum hoses	Connect securely.
	3. ECM is poorly grounded	Ground ECM securely
Not enough power	**Inadequate compression**	
	1. Improper valve clearance	Adjust
	2. Valves not seating tight	Repair
	3. Valve stems tending to seize	Replace
	4. Broken or weakened valve spring	Replace
	5. Piston rings seized in grooves, or broken	Replace
	6. Worn pistons, rings or cylinders	Replace worn parts and rebore as necessary
	7. Leaky cylinder head gasket	Replace
	Improperly timed ignition	
	1. Improper ignition timing	Adjust
	2. Defective spark plug	Adjust gap or replace
	3. Worn distributor terminals	Dress or replace
	4. Leaks, loose connection or disconnection of high tension cord	Connect or replace as necessary
	5. Malfunctioning ignition timing advancers	Replace
	Fuel system out of order	
	1. Clogged carburetor jets	Disassemble and clean
	2. Defective fuel pump	Repair or replace
	3. Clogged fuel filter	Replace
	4. Malfunctioning choke system	Adjust or replace
	5. Float level out of adjustment	Adjust
	6. Clogged fuel pipe	Clean or replace
	7. Clogged fuel tank outlet	Clean
	8. Loose joint in fuel system	Retighten
	Abnormal condition in air intake system	
	1. Air cleaner dirty and clogged	Clean or replace
	2. Poor returning motion of choke valve	Repair, adjust or replace
	Overheating tendency of engine	
	1. (Refer to the section entitled "over-heating.")	

Condition	Possible cause	Correction
Not enough power	**Emission control** 1. Malfunctioning EGR valve 2. Malfunctioning bowl vent solenoid valve. 3. Malfunctioning high altitude switch. 4. Malfunctioning throttle position switch (wide open switch) **Others** 1. Dragging brakes 2. Slipping clutch	Check and replace as necessary. Check and replace as necessary. Check and replace as necessary Check nad replace as necessary Repair or replace Adjust or replace
Engine hesitates (Momentary lack of response as the accelerator is depressed. Can occur at all car speeds. Usually most severe when first trying to make the car move, as from a stop sign.)	**Abnormal condition in electrical systems** 1. Defective spark plug or plug gap out of adjustment 2. Cracked rotor or cap in distributor, resulting in leakage 3. Deteriorated ignition coil, or crack resulting in leakage 4. Leaky high-tension cords 5. Ignition timing out of adjustment **Abnormal condition in fuel system** 1. Improper adjustment of float level 2. Clogged carburetor jets 3. Malfunctioning accelerator pump 4. Inadequately discharging fuel pump **Abnormal condition in engine** 1. Loss of compression pressure due to leaky cylinder head gasket 2. Compression pressure too low because of worn pistons, rings, cylinders or burnt valves **Emission control** 1. Malfunctioning bowl vent solenoid valve 2. Malfunctioning throttle position switch (wide open switch) 3. Malfunctionnig high altitude switch 4. Malfunctioning EGR valve 5. Malfunctioning thermostatically controlled air cleaner	 Replace or adjust gap Replace Replace Replace Adjust as prescribed Adjust Clean Check and replace as necessary Replace Replace Replace and rebore as necessary Check and replace as necessary Check and replace as necessary Check and replace as necessary Check and replace as necessary Check and replace as necessary

Condition	Possible cause	Correction
Surges (Engine power variation under steady throttle or cruise. Feels like the car speeds up and down with no change in the accelerator pedal.)	**Fuel system out of order** 1. Clogged fuel filter 2. Kinky, leaky or damaged fuel hoses and lines 3. Malfunctioning fuel pump 4. Leaky manifold and carburetor gaskets 5. Improper float level **Ignition system out of order** 1. Improper ignition timing 2. Malfunctioning ignition timing advancers (mechanical and vacuum) 3. Leaky or loosely connected high tension cord 4. Defective spark plug (excess carbon deposits, improper gap, burned electrodes, etc..) 5. Cracked rotor or cap in distributor **Emission control** 1. Malfunctioning bowl vent solenoid valve 2. Malfunctioning throttle position switch (wide open switch) 3. Malfunctioning high altitude switch 4. Malfunctioning EGR valve 5. Malfunctioning thermostatically controlled air cleaner	 Replace Check and replace as necessary Check and replace as necessary Replace Adjust Adjust Check or replace Check and repair or replace Check and clean, adjust or replace Replace Check and replace as necessary Check and replace as necessary Check and replace as necessary Check and replace as necessary Check and replace as necessary.
Dieseling (Engine continues to run after ignition switch is turned off. it runs unevenly and may make knocking noise.)	Malfunctioning fuel cut solenoid valve in carburetor	Check solenoid valve for proper operation and replace as necessary
Erratic idling (Improper engine idling)	**Abnormal condition in ignition system** 1. Defective spark plug 2. Leaky or disconnected high tension cord 3. Worn distributor terminals 4. Improper ignition timing 5. Cracked cap in distributor, leakage inside	 Adjust or replace Connect or replace Replace Adjust Replace

Condition	Possible cause	Correction
Erratic idling (Improper engine idling)	**Abnormal condition in fuel system**	
	1. Clogged carburetor jets	Clean
	2. Incorrect idle adjustment	Adjust
	3. Clogged air cleaner element	Clean or replace
	4. Leaky manifold, carburetor or cylinder head gaskets	Replace
	5. Improper float level	Adjust
	6. Malfunctioning choke system	Adjust or replace
	7. Malfunctioning fuel cut solenoid valve	Replace
	Others	
	1. Loose connection or disconnection of vacuum hoses	Connect
	2. Malfunctioning PCV valve	Check and replace as necessary
	3. Low compression	Previously outlined
	4. Loose carburetor and intake manifold bolts and nuts	Tighten bolts and nuts
	5. Leaky carburetor and intake manifold gaskets	Replace
Abnormal detonation	**Abnormal condition in ignition system**	
	1. Spark plugs tending to overheat	Change plug heat value
	2. Improper ignition timing	Adjust
	3. Loose connection in high-tension or low-tension circuit.	Retighten
	Abnormal condition in fuel system	
	1. Clogged fuel filter and fuel lines	Replace or clean
	2. Clogged carburetor jets	Clean
	3. Improper adjustment of float level	Adjust
	4. Malfunctioning fuel pump	Replace
	5. Air inhaling from intake manifold and carburetor gaskets	Replace
	Abnormal condition in engine	
	1. Excessive carbon deposit on piston crowns or cylinder head	Clean
	2. Blown cylinder head gasket, resulting in low compression pressure	Replace
	3. Improper valve clearance	Adjust
	4. Valves tending to seize	Replace
	5. Weakened valve springs	Replace
	Others	
	1. Malfunctioning EGR valve	Replace

Condition	Possible cause	Correction
Overheating	**Abnormal condition in ignition system**	
	1. Improper ignition timing	Adjust
	2. Wrong heat value of spark plugs	Change heat value
	Abnormal condition in fuel systems	
	1. Float level set too low	Adjust
	2. Clogged jets in carburetor	Clean
	3. Loose inlet manifold	Retighten
	Abnormal condition in cooling system	
	1. Not enough coolant	Refill
	2. Loose or broken fan belt	Adjust or replace
	3. Erratically working thermostat	Replace
	4. Poor water pump performance	Replace
	5. Leaky radiator cores	Repair or replace
	Abnormal condition in lubrication system	
	1. Clogged oil filter	Replace
	2. Clogged oil strainer	Clean
	3. Deteriorated oil pump performance	Replace
	4. Oil leakage from oil pan or pump	Repair
	5. Improper engine oil grade	Replace with proper grade oil
	6. Not enough oil in oil pan	Replenish
	Others	
	1. Dragging brakes	Repair or replace
	2. Slipping clutch	Adjust or replace
	3. Blown cylinder head gasket	Replace
Engine noise **Note: Before checking the mechanical noise, make sure that:** **• Ignition timing is properly adjusted.** **• Specified spark plug is used.** **• Specified fuel is used.**	**Crankshaft noise**	
	1. Worn-down bearings, resulting in excessively large running clearances	Replace
	2. Worn connecting-rod bearings	Replace
	3. Distorted connecting rods	Repair or replace
	4. Worn crankshaft journals	Repair by grinding, or replace crankshaft
	5. Worn crankpins.	Repair by grinding, or replace crankshaft
	Noise due to pistons, rings, pins or cylinders	
	1. Abnormally worn cylinder bores	Rebore to next oversize or replace
	2. Worn pistons, rings or pins	Replace
	3. Pistons tending to seize	Replace
	4. Broken piston rings	Replace
	Others	
	1. Excessively large camshaft thrust play	Replace
	2. Excessively large crankshaft thrust clearance	Adjust as prescribed
	3. Valve clearance too large	Adjust as prescribed
	4. Not enough engine oil	Replenish

Condition	Possible cause	Correction
High fuel consumption	**Abnormal condition ignition system**	
	1. Improper ignition timing	Adjust
	2. Leak or loose connection of high tension cord	Repair or replace
	3. Defective spark plug (improper gap, heavy deposits, and burned electrodes, etc..)	Clean, adjust or replace
	4. Cracked distributor cap or rotor	Replace
	5. Malfunctioning mechanical and vacuum advancers in distributor	Check and repair or replace
	Abnormal condition in fuel system	
	1. Improper float level	Adjust
	2. Fuel leakage from tank, pipe or carburetor	Repair or replace
	3. Malfunctioning carburetor choke system	Repair or replace
	4. Dirty or clogged carburetor jets	Clean
	5. Clogged air cleaner element	Clean or replace
	6. Malfunctioning thermostatically controlled air cleaner	Check and repair or replace
	Abnormal condition in engine	
	1. Low compression	Previously outlined
	2. Poor valve seating	Repair or replace
	3. Improper valve clearance	Adjust
	Emission control	
	1. Air leaks at exhaust manifold	Tighten manifold bolts and nuts. Replace gasket.
	2. Oxygen sensor out of order	Replace.
	3. Water temperature switch out of order	Replace.
	4. Malfunctioning throttle position switch	Replace
	5. Malfunctioning MCS (mixture control solenoid) valve in carburetor	Replace
	6. Malfunctioning EGR valve	Replace
	Others	
	1. Dragging brakes	Repair or replace
	2. Slipping clutch	Adjust or replace
	3. Improper tire pressure	Adjust
Excessive engine oil consumption	**Oil leakage**	
	1. Loose oil drain plug	Tighten
	2. Loose oil pan securing bolts	Tighten
	3. Deteriorated or broken oil pan sealant	Replace sealant
	4. Leaky oil seals	Replace
	5. Blown cylinder head gasket	Replace
	6. Improper tightening of oil filter	Tighten
	7. Loose oil pressure switch	Tighten

Condition	Possible cause	Correction
Excessive engine oil consumption	**"Oil pumping" (Oil finding its way into combustion chambers.)**	
	1. Sticky piston ring	Remove carbon and replace rings
	2. Worn piston ring groove and ring	Replace piston and ring
	3. Worn pistons or cylinders	Replace pistons and rebore as necessary
	Oil leakage along valve stems	
	1. Defective valve stem oil seals	Replace
	2. Badly worn valve stem	Replace

2-2. CARBURETOR

Condition	Possible cause	Correction
Fuel overflow from carburetor	1. Float valve worn or dirty with foreign matter	Clean or replace
	2. Float level set too high	Adjust as prescribed
	3. Float ruptured and containing some fuel	Replace
	4. Broken or otherwise defective gasket	Replace
	5. Loose float chamber securing screws	Retighten

2-3. EXHAUST AND MUFFLER

Condition	Possible cause	Correction
Poor muffling performance	1. Loose exhaust pipe connection	Retighten
	2. Broken muffler gasket	Replace
	3. Broken manifold, pipe or muffler	Repair or replace
	4. Exhaust manifold loose in place	Retighten
	5. Interference between body and muffler	Repair, eliminating any contact

2-4. CLUTCH

Condition	Possible cause	Correction
Slipping clutch	1. Loss of clearance at the tip of release fork	Adjust as prescribed
	2. Clutch facings dirty with oil	Replace
	3. Clutch facings excessively worn	Replace
	4. Weakened diaphragm spring	Replace
	5. Distorted pressure plate or flywheel surface	Replace
	6. Improper clutch pedal free travel	Adjust and, as necessary, replace clutch facings

Condition	Possible cause	Correction
Dragging clutch	1. Improper clutch pedal free travel	Adjust free travel
	2. Weakened diaphragm spring, or worn spring tip	Replace
	3. Damaged or worn splines of transmission input shaft	Replace
	4. Front input shaft bearing worn or broken	Replace
	5. Excessively wobbly clutch disc	Replace
	6. Clutch facings broken or dirty with oil	Replace
Clutch vibration	1. Glazed (glass-like) clutch facings	Repair or replace
	2. Clutch facings dirty with oil	Replace
	3. Wobbly clutch disc, or poor facing contact	Replace
	4. Weakened torsion springs (in clutch disc)	Replace
	5. Clutch disc rivets loose	Replace the disc
	6. Distorted pressure plate or flywheel surface	Replace
	7. Weakened engine mounting or loosened mounting bolt or nut	Retighten or replace
Noisy clutch	1. Worn or broken release bearing	Replace
	2. Front input shaft bearing worn down	Replace
	3. Excessive rattle of clutch disc hub	Replace the disc
	4. Cracked clutch disc	Replace
	5. Pressure plate and diaphragm spring rattling	Replace
Grabbing clutch	1. Clutch facings soaked with oil	Replace
	2. Excessively worn clutch facings	Replace
	3. Rivet heads showing out of the facing	Replace
	4. Weakened torsion springs	Replace

2-5. TRANSMISSION

Condition	Possible cause	Correction
Gears slipping out of mesh	1. Worn shift fork shaft	Replace
	2. Worn locating steel balls	Replace
	3. Weakened springs for locating steel balls	Replace
	4. Worn shift fork	Replace
	5. Excessive rattle in thrust direction of gears	Replace
	6. Worn ring or hub in synchronizers	Replace
	7. Worn bearings of input shaft, main shaft or countershaft	Replace
Gears refusing to disengage	1. Weakened or broken synchronizer springs	Replace
	2. Worn inner groove of synchronizer ring	Replace
	3. Synchronizer ring seized on the cone	Replace the ring
	4. Distorted shift fork shaft or shift fork	Replace.

Condition	Possible cause	Correction
Excessive gear noise	1. Not enough oil in transmission 2. Defective synchronizer 3. Gears rattling in thrust direction 4. Broken or worn bearings 5. Damaged or worn gears	Replenish Replace Replace Replace Replace
Hard shifting	1. Clutch pedal play too large, resulting in a "dragging clutch" 2. Worn clutch disc facings 3. Clutch disc facings dirty with oil. 4. Distorted or unevenly worn shift fork shaft 5. Broken locating balls 6. Worn synchornizer sleeve or ring 7. Worn synchronizer hub	Adjust as prescribed Replace. Replace. Replace Replace Replace Replace

2-6. DIFFERENTIALS

Condition	Possible cause	Correction
Gear noise	1. Maladjusted backlash between drive pinion and ring gear 2. Damaged gear teeth or improper mesh of drive pinion and ring gear 3. Improper tooth contact in the mesh between drive pinion and ring gear 4. Insufficient or wrong kind of gear oil 5. Ring gear wobbling when turning, or ring gear securing bolts loose 6. Broken or otherwise damaged teeth of side gears or differential pinion gears	Adjust as prescribed Replace or adjust Adjust as prescribed Replenish or replace Replace, or retighten Replace
Bearing noise	1. (Constant noise) Insufficient or wrong kind of gear oil 2. (Constant noise) Damaged or worn bearings or borne parts 3. (Noise during coasting) Damaged bearings of rear drive pinion 4. (Noise during turning) Broken bearings on axle shafts	Replenish or change Replace. Replace Replace

2-7. PROPELLER SHAFTS

Condition	Possible cause	Correction
Vibration and noise	1. Broken or worn bearings of universal joint spider	Replace
	2. Distorted propeller shaft	Replace
	3. Unbalanced propeller shaft	Replace
	4. Loose propeller shaft	Retighten
Noise occurring at standing start or during coasting	1. Worn or damaged universal joint	Replace
	2. Worn propeller shaft splines, due to lack of lubrication	Replace
	3. Loose propeller shaft	Retighten
	4. Loose flanged yoke of universal joint	Retighten

2-8. BRAKES

Condition	Possible cause	Correction
Not enough braking force	1. Brake oil leakage from brake lines	Locate leak point and repair
	2. Brake disc or pads stained with oil	Clean or replace
	3. Overheated brakes	Determine cause and repair
	4. Poor contact of shoes on brake drum	Repair for proper contact
	5. Brake shoes linings stained with oil or wet with water	Replace
	6. Badly worn brake shoe linings	Replace
	7. Defective wheel cylinders	Repair or replace
	8. Malfunctioning caliper assembly	Repair or replace
Brake Pull (Brakes not working in unison)	1. Shoe linings wet with water or stained with oil in some brakes	Replace
	2. Drum-to-shoe clearance out of adjustment in some brakes (Malfunctioning auto adjusting mechanism)	Check for inoperative auto adjusting mechanism
	3. Drum out of round in some brakes	Replace
	4. Wheel tires inflated unequally	Inflate equally
	5. Malfunctioning wheel cylinders	Repair or replace
	6. Disturbed front end alignment	Adjust as prescribed
	7. Unmatched tires on same axle	Use tires with approximately the same amount of tread on the same axle
	8. Restricted brake tubes or hoses	Check for soft hoses and damaged lines. Replace with new hoses and new double-walled steel brake tubing.
	9. Malfunctioning caliper assembly	Check for stuck or sluggish pistons and proper lubrication of caliper slide bush. Caliper should slide.
	10. Loose suspension parts	Check all suspension mountings
	11. Loose calipers	Check and torque bolts to specifications

Condition	Possible cause	Correction
Excessive pedal travel (Pedal stroke too large)	1. Partial brake system failure	Check diagonal brake systems and repair as necessary
	2. Insufficient fluid in master cylinder reservoirs	Fill reservoirs with approved brake fluid. Check for leaks and air in brake systems. Check warning light. Bleed system if necessary.
	3. Air in system (Pedal soft/spongy)	Bleed system
	4. Rear brake system not adjusted (malfunctioning auto adjusting mechanism)	Adjust rear brakes (Repair auto adjusting mechanism)
	5. Bent brake shoes	Replace brake shoes
	6. Worn rear brake shoes	Replace brake shoes
Dragging brakes (A very light drag is present in all disc brakes immediately after pedal is released)	1. Master cylinder pistons not returning correctly	Repair master cylinder
	2. Clogged return port in master cylinder	Clean
	3. Restricted brake tubes or hoses	Check for soft hoses or damaged tubes and replace with new hoses and/or new double-walled steel brake tubing
	4. Incorrect parking brake adjustment	Check and adjust to correct specifications
	5. Weakened or broken return springs in the brake	Replace
	6. Sluggish parking-brake cables or linkage	Repair or replace
	7. Wheel cylinder or caliper piston sticking	Repair as necessary
Pedal pulsation (Pedal pulsates when depressed for braking)	1. Damaged or loose wheel bearings	Replace wheel bearings
	2. Excessive disc lateral runout	Check per instructions. If not within specifications, replace or machine the disc.
	3. Parallelism not within specifications	Check per instructions. If not within specifications, replace or machine the disc.
	4. Rear drums out of round	Check runout.
Braking noise	1. Glazed shoe linings, or foreign matters stuck to linings	Repair or replace shoe lining
	2. Worn or distorted shoe linings	Replace shoe lining (or pad)
	3. Loose front wheel bearings	Replace wheel bearings
	4. Distorted backing plates or loose mounting bolts	Replace or retighten securing bolts

2-9. SUSPENSION, STEERING SYSTEM AND TIRES

Condition	Possible cause	Correction
Hard steering	1. Wheel tires not adequately inflated 2. Bind in tie rod end ball stud 3. Linkage connections tending to seize 4. Steering gearbox out of adjustment 5. Unevenly worn steering shaft bush 6. Disturbed front wheel alignment	Adjust the pressure Replace Repair or replace Adjust as prescribed Replace Adjust as prescribed
Wobbly steering wheel (Shimmy, shake or vibration)	1. Wheel tires inflated unequally 2. Wobbly wheels 3. Large difference in tire diameter between right and left wheels 4. Loose hub nuts 5. Damaged or worn wheel bearings 6. Worn or loose tie rod ends 7. Steering gearbox out of adjustment 8. Steering gearbox mounted loose 9. Worn steering knuckle oil seal 10. Tire or wheel out of balance 11. Blister or bump on tire 12. Disturbed front wheel alignment	Adjust tire pressure Repair or replace Replace Retighten Replace Replace or retighten Adjust as prescribed Retighten Replace Balance wheel or replace tire and/or wheel Replace tire Check front wheel alignment
Steering wheel pulling to one side (car pulls)	1. Unevenly worn wheel tires 2. Brake dragging in one road wheel 3. Wheel tires unequally inflated 4. Worn or distorted link rods 5. Disturbed front wheel alignment 6. Loose, bent or broken front or rear suspension parts	Replace Repair Adjust tire pressure Replace Adjust as prescribed Tighten or replace suspension parts
Shocks coming to steering wheel (or wheel tramp)	1. Tire inflating pressure too high 2. Poor shock absorber performance 3. Differences in tire diameter among four road wheels 4. Worn steering linkage connections 5. Worn or broken front wheel bearings 6. Loose front wheel 7. Steering wheel loose in place 8. Blister or bump on tire	Reduce to the specification Replace Adjust Replace Replace Retighten Retighten the nut Replace tire
Rapid wear or uneven wear of wheel tires (Abnormal or excessive tire wear)	1. Wheel tires imporperly inflated 2. Differences in diameter among four tires 3. Worn or loose road wheel bearings 4. Wobbly wheel tires	Adjust tire pressure Adjust or replace Replace Repair or replace

Condition	Possible cause	Correction
Rapid wear or uneven wear of wheel tires (Abnormal or excessive tire wear)	5. Wheel tires improperly "rotated" to result in unbalance 6. Disturbed front wheel alignment 7. Hard driving	Adjust Adjust as prescribed Replace tire
Steering noise	1. Loose bolts and nuts 2. Loose leaf spring seats 3. Broken or otherwise damaged wheel bearings 4. Worn or sticky tie rod ends 5. Linkage joints needling grease	Retighten Retighten Replace Replace Lubricate or replace
Too much play in steering	1. Worn wheel bearings 2. Steering gear box attachments loose 3. Steering gear box adjustments 4. Worn steering shaft joints 5. Worn tie rod ends or drug rod ball joints	Replace wheel bearing Tighten or repair Check and adjust Replace joint Replace tie rod end or tie rod
Poor returnability	1. Bind in tie rod end ball studs 2. Bind in steering column 3. Lack of lubricant steering gear box 4. Disturbed front end alignment 5. Steering gear box adjustment 6. Tires not adequatley inflated	Replace tie rod end Repair or replace Check, lubricate or replace Check and adjust front end alignment Check and adjust gear box torque Adjust pressure
Abnormal noise, front end	1. Worn, sticky or loose tie rod ends, drug rod ball joints or axle shaft joints 2. Damaged shock absorbers or mountings 3. Loose stabilizer bar 4. Loose wheel nuts 5. Loose suspension bolts or nuts 6. Broken or otherwise damaged wheel bearings 7. Broken suspension springs	Replace tie rod ends, drug rod or axle shaft joints Replace or repair Tighten bolts or replace bushes Tighten Tighten suspension bolts or nuts Replace Replace
Wander or poor steering stability	1. Mismatched or uneven tires 2. Loose tie rod ends or drug rod 3. Faulty shock absorber or mounting	Replace tire or inflate tires to proper pressure Replace tie rod end or drug rod Replace absorber or repair mounting

Condition	Possible cause	Correction
Wander or poor steering stability	4. Loose stabilizer bar 5. Broken or sagging springs 6. Steering gear box adjustment 7. Front wheel alignment	Tighten or replace stabilizer bar or bushs Replace spring Check or adjust steering gear box torque Check front wheel alignment
Low or uneven trim height	1. Broken or sagging springs 2. Overloaded 3. Incorrect springs	Replace Check loading Replace
Ride too soft	1. Faulty shock absorbers	Replace
Suspension bottoms	1. Overloaded 2. Faulty shock absorbers 3. Incorrect, broken or sagging springs	Checking loading. Replace Replace
Body leans or sways in corners	1. Loose stabilizer bar 2. Faulty shock absorbers or mounting 3. Broken or sagging springs 4. Overloaded	Tighten stabilizer bar bolts or replace bushes Replace shock absorbers or tighten mounting Replace Check loading

2-10. STARTING MOTOR

Condition	Possible cause	Correction
Starter runs but pinion will not mesh into ring gear.	1. Worn pinion of starter clutch. 2. Defective splines, resulting in sticky pinion plunging motion. 3. Worn bush. 4. Wrong pinion plunging position. 5. Worn teeth of ring gear.	Replace. Repair or replace. Replace. Adjust Replace.
Starter will not run at all, or runs but runs too slow to crank with full force.	**Battery trouble** 1. Poor contact in battery terminal connection 2. Loose ground cable connection 3. Battery run down 4. Battery voltage too low due to battery deterioration **Ignition switch trouble** 1. Poor contacting action 2. Lead wire socket loose in place 3. Opne-circuit between ignition switch and magnet switch	 Repair or retighten Retighten Recharge Replace Replace Retighten Repair

Condition	Possible cause	Correction
Starter will not run at all, or runs but runs too slow to crank with full force	**Magnet switch trouble** 1. Lead wire socket loose in place 2. Burnt contact plate, or poor contacting action 3. Open-circuit in pull-in coil 4. Open-circuit in holding coil **Starter proper trouble** 1. Brushes seating poorly or worn down 2. Burnt commutator 3. Open-circuit in armature winding 4. Worn-down starter	 Retighten Replace, or repair Replace Replace Repair or replace Repair or replace Replace Replace
Starter does not stop running.	1. Fused contact points of magnet-switch contact plate 2. Short-circuit between turns of magnet-switch coil (layer short-circuit) 3. Failure of returning action in ignition switch	Repair or replace Replace Replace

2-11. ALTERNATOR

Condition	Possible cause	Correction
Battery quickly becomes over-discharged.	1. Loose or broken "V" belt 2. Battery cables loose, corroded or worn 3. Low level of battery electrolyte 4. Defective battery cell plates 5. Insufficient contact in battery terminal connection. 6. Excessive electrical load 7. IC regulator or alternator faulty 8. Defective idle up system	Adjust or replace Repair or replcae Replace Replace the battery Clean and retighten Check charging system Replace Repair or replace
Charge light does not light with ignition ON and engine off	1. Fuse blown 2. Light burned out 3. Loose wiring connection 4. IC regulator faulty	Check fuse Replace light Tighten loose connections Replace
Alternator noise	1. Worn, loose or otherwise defective bearings	Replace

2-12. WIPER MOTOR

Condition	Possible cause	Correction
Wiper will not run	1. Fuse set loose or blown off	Tighten or replace
	2. Incomplete metal-to-metal contact in connector	Repair
	3. Worn or floating brushes	Replace or repair
	4. Dirty or burnt commutator	Repair or replace
	5. Short-circuited or fused field coil	Replace
	6. Loose terminal connection on wiper switch	Repair
Wiper will not stop running	1. Defective wiper switch	Repair or replace
Wiper stops at wrong position	1. Improper wiper arm setting	Repair
	2. Cover plate incorrectly positioned in plcae	Repair
Poor wiping action	1. Insufficient pressure of wiper arm	Replace
	2. Deteriorated or hardened blade	Replace
	3. Blade improperly set	Repair or replace
	4. Windshield dirty with oil	Clean

2-13. FUEL METER

Condition	Possible cause	Correction
Faulty meter indication	1. Incomplete metal-to-metal contact in terminal connections	Retighten
	2. Defective receiver gauge due to burnt point or deformed bimetal element	Replace
	3. Erratic float movement	Repair or replace
	4. Defective grounding (for float and gauge)	Repair
No indication	1. Open-circuit	Repair
	2. Open-circuited heat wire	Replace
	3. Burnt point	Replace
	4. Deformed bimetal element	Replace
	5. Open-circuited resistor	Replace

2-14. SPEEDOMETER

Condition	Possible cause	Correction
Faulty indication	1. Damaged speedometer drive or driven gear 2. Defective drive cable 3. Drive cable incompletely or imporperly tied into the meter 4. Defective speedometer	Replace Replace Set right Replace
Speedometer noise	1. Inadequately lubricated or defective cable 2. Not enough oil in transfer	Lubricate or replace Replenish

2-15. WATER TEMPERATURE METER

Condition	Possible cause	Correction
Faulty indication	1. Incomplete metal-to-metal contact in terminal connections 2. Receiver gauge defective (due to burnt point or deformed bimetal element) 3. Defective temperature gauge	Repair and tighten Replace Replace
No indication	1. Open-circuit 2. Defective receiver gauge (open-circuited heat wire, deformed bimetal element or pointer) 3. Defective temperature gauge	Repair Replace Replace

SECTION 3

ENGINE

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3-1. GENERAL DESCRIPTION

1) Engine

The engine is water-cooled, in line 4 cylinders, 4 stroke cycle gasoline unit with its S.O.H.C. (Single overhead camshaft) valve mechanism arranged for "V"-type valve configuration.
This single overhead camshaft is mounted over the cylinder head; it is driven from crankshaft through timing belt, and no push rods are provided in the valve train system.

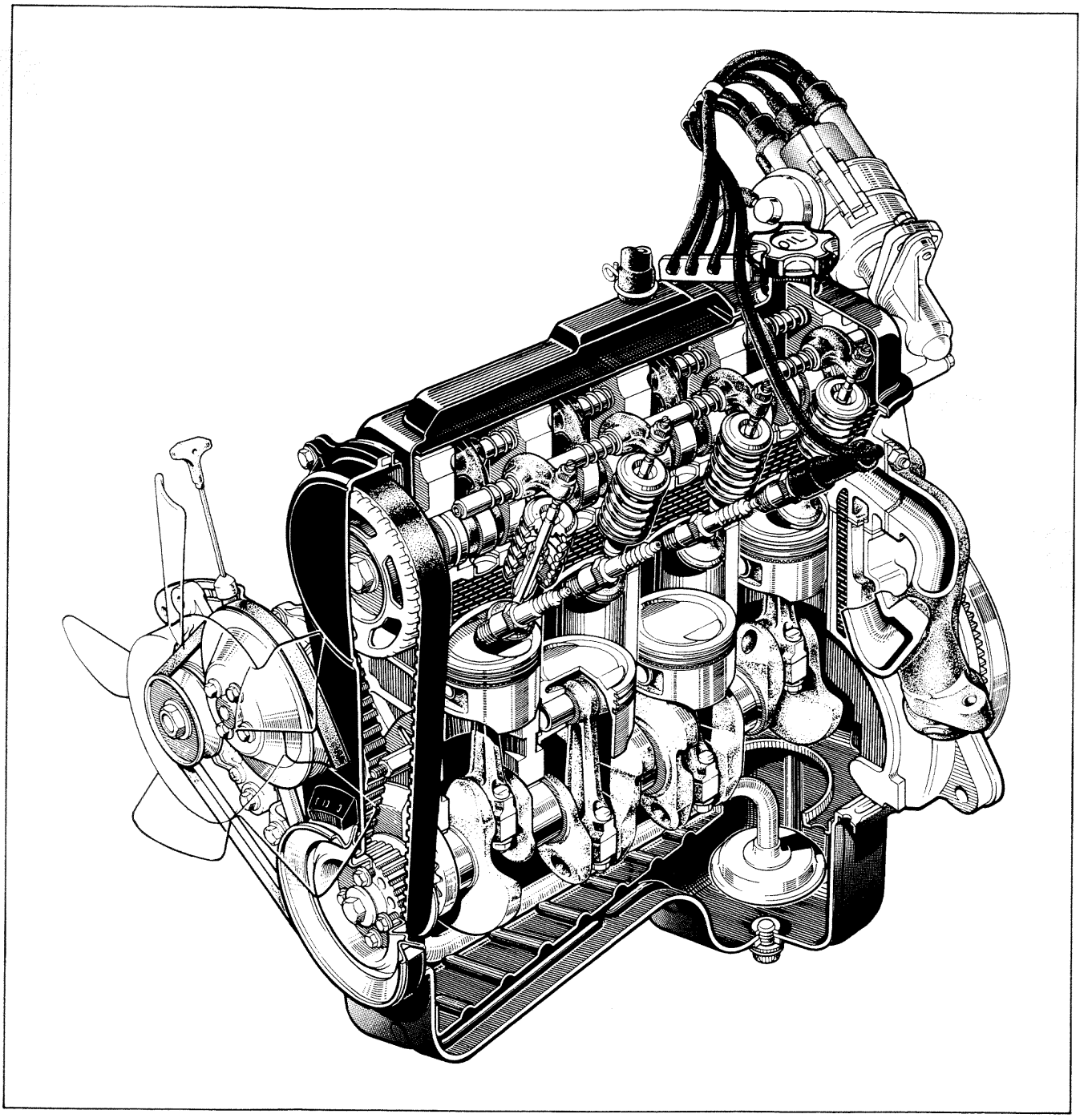


Fig. 3-1-1

2) Engine Lubrication

The oil pump is of a trochoid type, and mounted on the crankshaft at the crankshaft pulley side.
Oil is drawn up through the oil pump strainer and passed through the pump to the oil filter.
The filtered oil flows into two paths in cylinder block.
In one path, oil reaches the crankshaft journal bearings.
Oil from the crankshaft journal bearings is supplied to the connecting rod bearings by means of intersecting passages drilled in the crankshaft, and then injected from a small hole provided on the big end of connecting rod to lubricate piston, rings, and cylinder wall.
In another path, oil goes up to the cylinder head and lubricates rocker arms, valves and camshaft, etc., after passing through the internal oilway of rocker arm shafts.

An oil relief valve is provided on the oil pump. This valve starts relieving oil pressure when the pressure comes over about 3.0 kg/cm^2 (42.7 psi, 300 kPa). Relieved oil drains back to the oil pan.

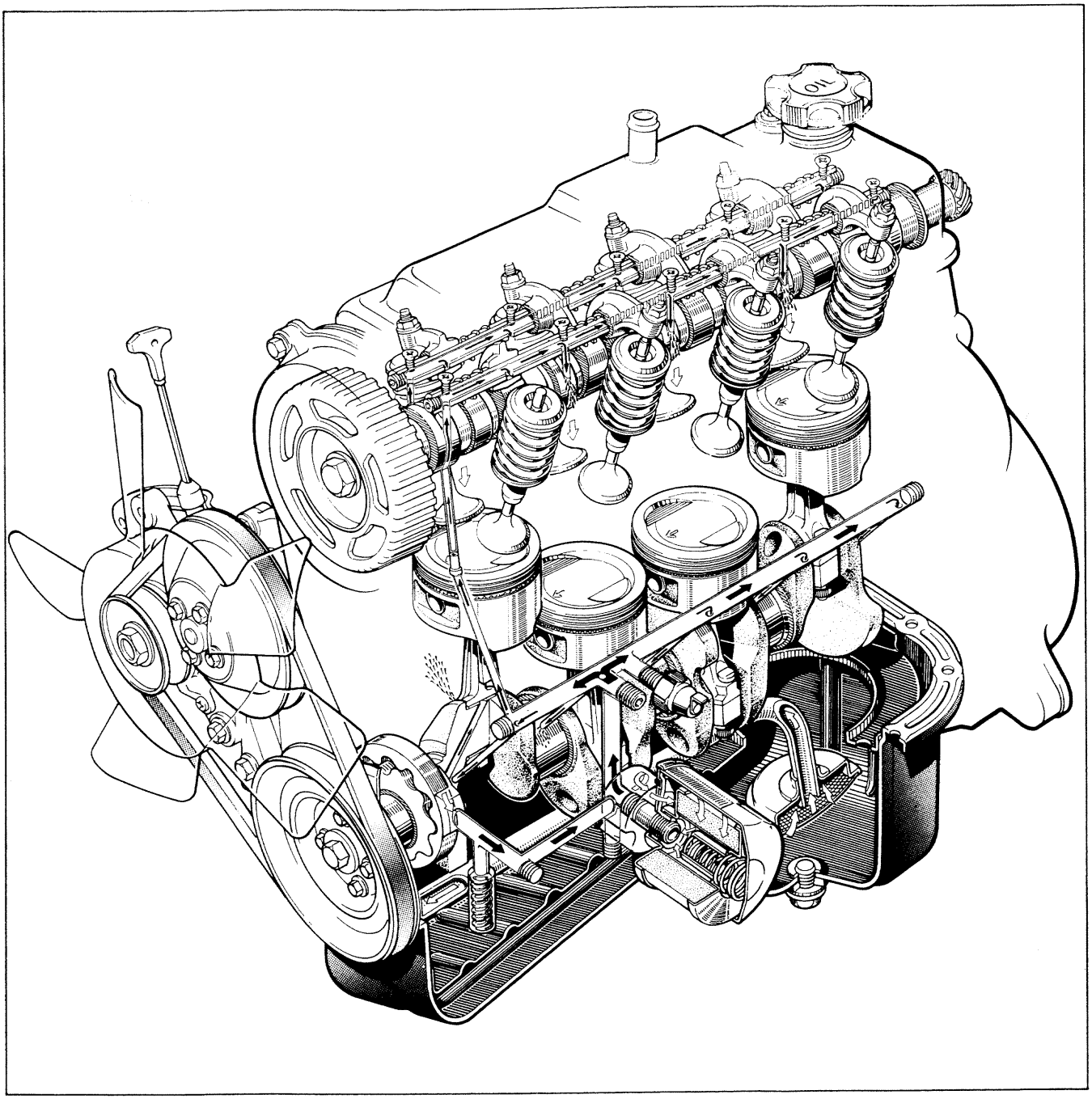


Fig. 3-1-2

3) Cylinder Head and Valve Train

The cylinder head is made of cast aluminum alloy and has four combustion chambers arranged in-line. Each combustion chamber has an intake and an exhaust ports.

Moreover, as shown in Figure 3-1-3, the air induction nozzle is provided near each intake valve. During intake stroke of the engine, air/fuel mixture enters into the combustion chamber from carburetor through intake manifold and intake valve. At the same time, air flows to the air induction nozzle through carburetor and air induction passage in the intake manifold, and jets into the combustion chamber.

The air jetted into the combustion chamber accelerates the mixture swirl to improve the combustion efficiency.

A single overhead camshaft driven by the crankshaft through the timing belt is mounted on the cylinder head. The camshaft has eight cams, and each cam operates the intake or exhaust valve through rocker arm. The valve lash can be adjusted by turning the adjusting screw on the rocker arm after loosening the lock nut.

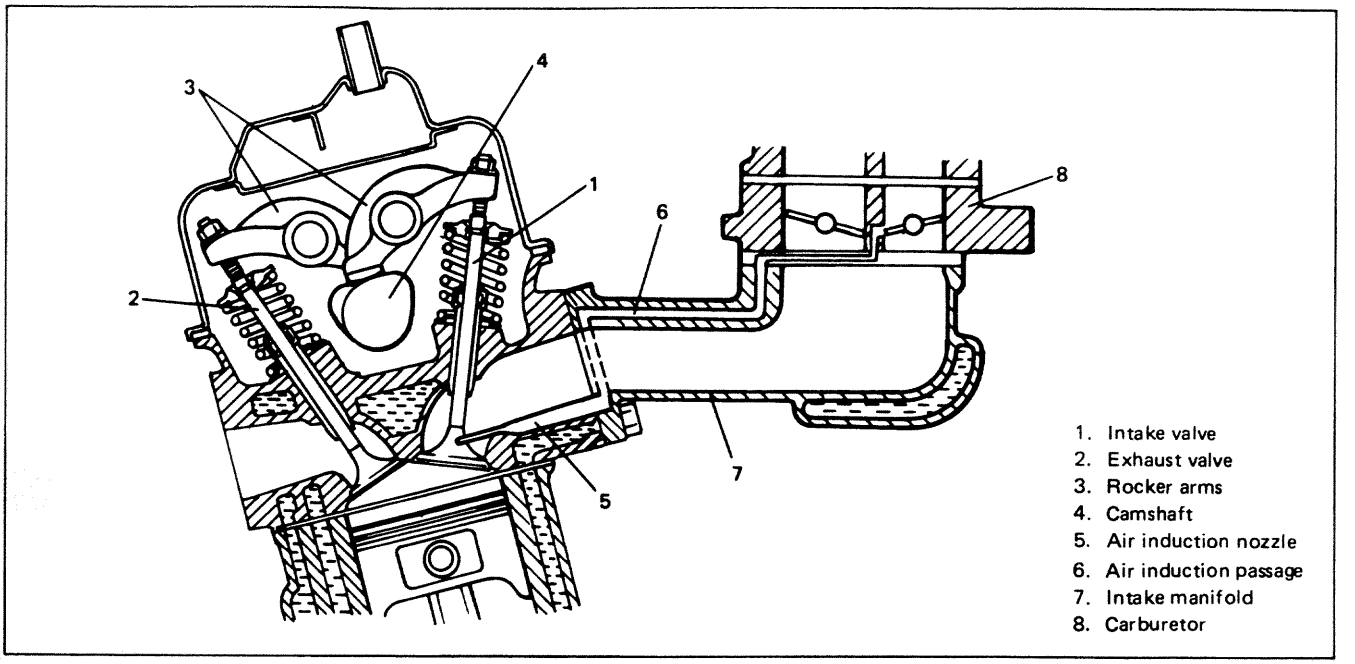


Fig. 3-1-3 Cylinder head and valve train

4) Cylinder Block

The cylinder block is made of cast aluminum alloy and has 4 cylinders arranged "In-Line". A cylindrical cast iron sleeve is installed in each cylinder.

5) Crankshaft and Main Bearings

A monoblock casting crankshaft is supported by 5 main bearings which are of precision insert type. Four crank pins on the crankshaft are positioned 180° apart.

6) Pistons, Rings, Piston Pins and Connecting Rods

The piston is cast aluminum alloy, and has two compression rings and one oil ring.

Among two compression rings (top and 2nd rings), the top ring is plated with hard chromium for improvement in abrasion resistance.

The oil ring consists of two rails and one spacer.

The piston pin is offset 0.5 mm towards the major thrust side. This allows a gradual change in thrust pressure against the cylinder wall as the piston travels its path. Pins are chromium steel and have a floating fit in the pistons. They are retained in the connecting rods by a press fit. The connecting rods are made of forged steel, and the rod bearings are of precision insert type.

3-2. ENGINE SERVICES NOT REQUIRING ENGINE REMOVAL

The following parts of components do not require engine removal to receive services (replacement, inspection or adjustment):

Part or Component	Nature of Service
1. Spark plug	Replacement or inspection
2. Distributor	Replacement, inspection or adjustment
3. Exhaust manifold	Replacement or inspection
4. Oil filter	Replacement
5. Oil pressure unit	Replacement
6. Cylinder head cover	Replacement
7. Rocker shaft	Replacement or inspection
8. Rocker-arm	Replacement or inspection
9. Rocker-arm spring	Replacement or inspection
10. Cam shaft	Replacement or inspection (Cylinder head removal required)
11 Cylinder head	Replacement or inspection
12. Radiator	Replacement or inspection (Cooling fan and fan shroud removal required)
13. Cooling fan	Replacement
14. Camshaft timing belt pulley	Replacement or inspection
15. Crankshaft timing belt pulley	Replacement or inspection
16. Timing belt	Replacement or inspection (Cooling fan and fan shroud removal required)
17. Fuel pump	Replacement
18. Carburetor	Replacement, inspection or adjustment
19. Intake manifold	Replacement
20. Alternator	Replacement or inspection
21. Starter motor	Replacement or inspection
22. Fan belt	Replacement, inspection or tension adjustment
23. Water pump	Replacement (Cooling fan and fan shroud removal required)
24. Pulleys (crank, generator, fan)	Replacement
25. Timing belt cover	Replacement (Cooling fan and fan shroud removal required)
26. Water hose	Replacement or inspection
27. Oil pan, oil strainer, and oil pump	Replacement or inspection
28. Piston and connecting rod	Replacement or inspection (Cylinder head and oil pan removal required)

3-3. ENGINE REMOVAL

1) Disconnect negative (−) and positive (+) cords from battery terminals.
2) From starter motor terminals, disconnect black/yellow lead wire and positive (+) battery cord.
3) Disconnect coupler and white lead wire from alternator terminals.
4) Disconnect lead wires from water temperature gauge and thermal switch. The gauge and switch are on intake manifold.
   Disconnect earth lead wire from intake manifold.
5) Disconnect couplers of carburetor fuel cut solenoid valve, vent solenoid valve and mixture control solenoid valve, and disconnect couplers from TWSVS and VSV.
6) Remove warm air hose.
7) Disconnect breather hose from air cleaner case.
8) Remove air intake case from carburetor body and air inlet hose.
9) Disconnect accelerator cable from carburetor.
10) Disconnect vacuum hoses of TCAC and canister from intake manifold.
11) Remove fuel tank filler cap to release fuel vapor pressure in fuel tank. After releasing, reinstall it. Disconnect fuel feed and return hoses from fuel pump.
12) Disconnect lead wire from oil pressure unit terminal and oxygen sensor lead wire at the coupler.
13) Disconnect lead wires of back-up light switch and fifth switch at their couplers.
14) Disconnect distributor lead wire at the coupler.
15) Pull off high-tension cord from ignition coil.
16) Loosen radiator drain plug to drain cooling water.
17) Disconnect water hoses from thermostat cap and water inlet pipe. After removing cooling fan & clutch and fan shroud, remove radiator.

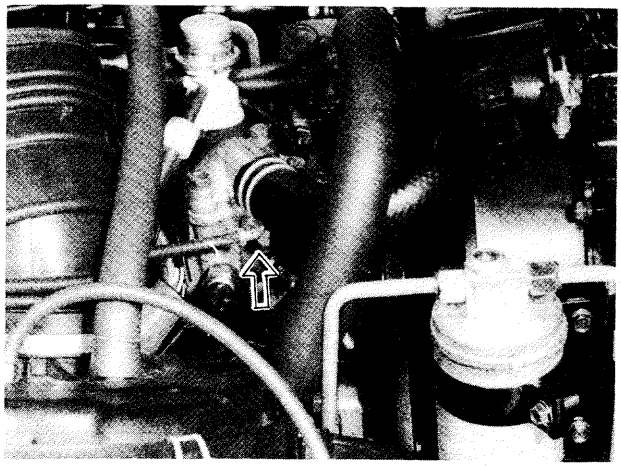


Fig. 3-3-1

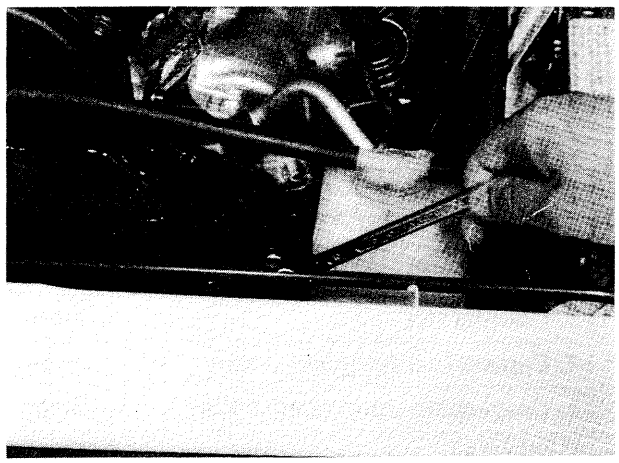


Fig. 3-3-2

18) Disconnect heater hoses from heater unit outlet pipe and intake manifold.

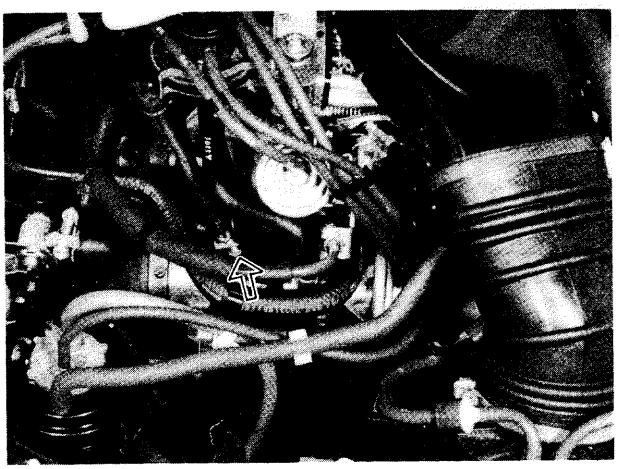


Fig. 3-3-3

19) Disconnect brake booster vacuum hose from pipe.
20) Disconnect coupler of lead wire (black) from distributor gear case.
21) Remove 4 bolts fastening gear shift lever boot No. 2 and move the boot upward.

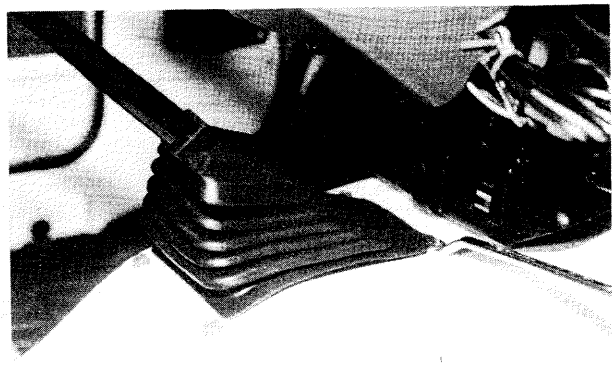


Fig. 3-3-4

22) Move gear shift lever boot No. 1 to upper side of shift lever.
23) Loosen 3 bolts tightening gear shift lever case cover and take shift lever out of lever case.

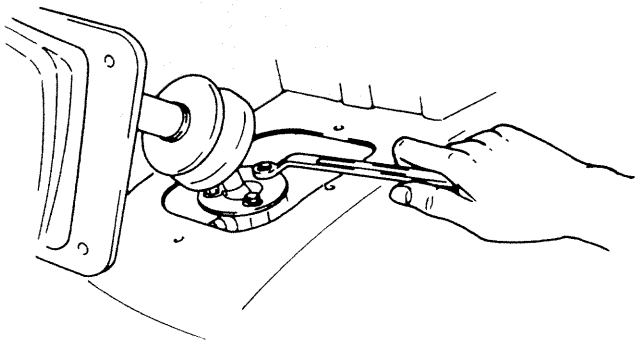


Fig. 3-3-5

24) Raise vehicle.
25) Sever exhaust manifold from muffler by undoing joint.
26) Disconnect clutch cable from engine mounting bracket and clutch release lever.
27) Loosen drain plug to drain transmission oil.
28) Remove propeller shaft interconnecting transmission case and transfer case.
29) By using a chain block, hold engine so that the engine is kept from falling.

NOTE:
To use a chain block for hoist, take hitch on engine at two hooks provided, one on inlet-manifold side and the other on exhaust-manifold side.

30) Remove exhaust center pipe mounting bracket and 4 transmission mounting bolts.

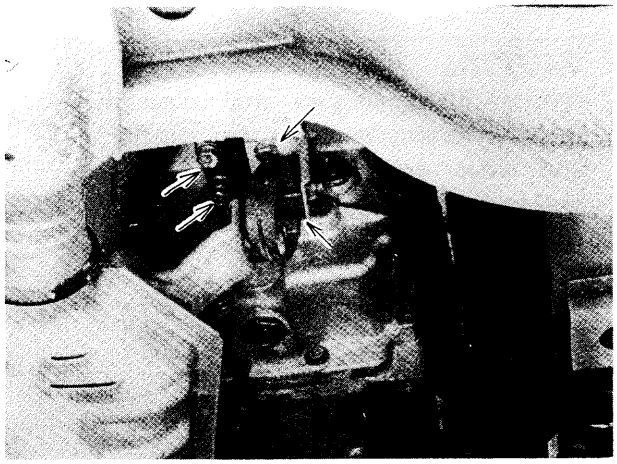


Fig. 3-3-6

31) Remove the pipe connected to chassis under the transmission case.

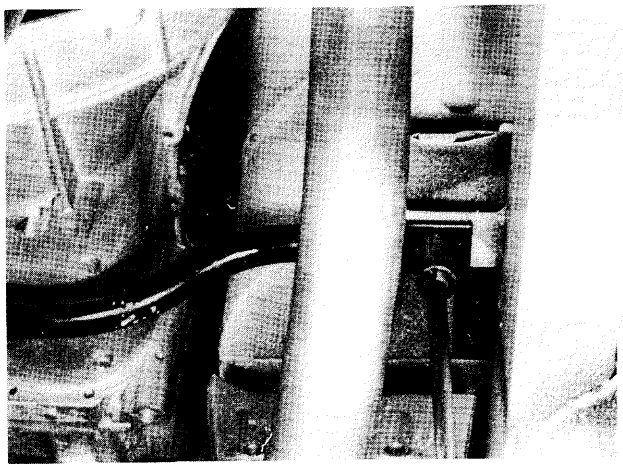


Fig. 3-3-7

32) Lower vehicle and remove 4 bolts securing right and left engine mounting brackets (body side).

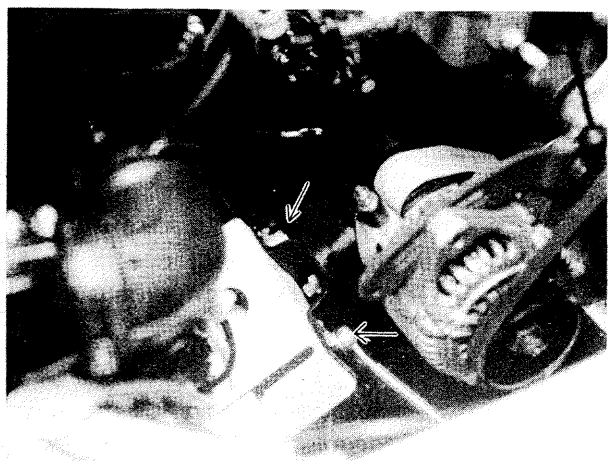


Fig. 3-3-8

CAUTION:
Before lifting engine and transmission, recheck to ascertain all hoses, electric wires and cables are disconnected from engine and transmission.

33) Take down engine by operating a hoisting means.

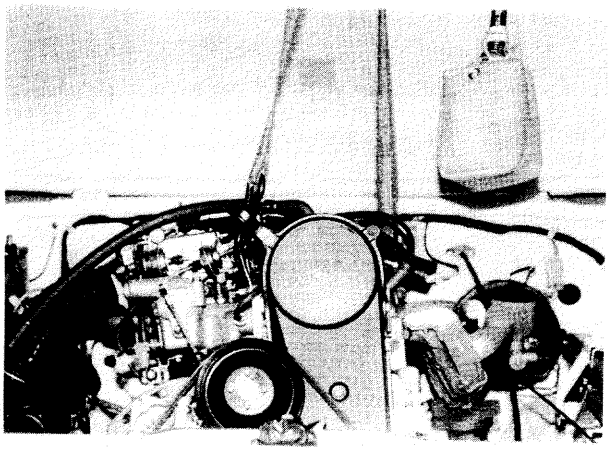


Fig. 3-3-9

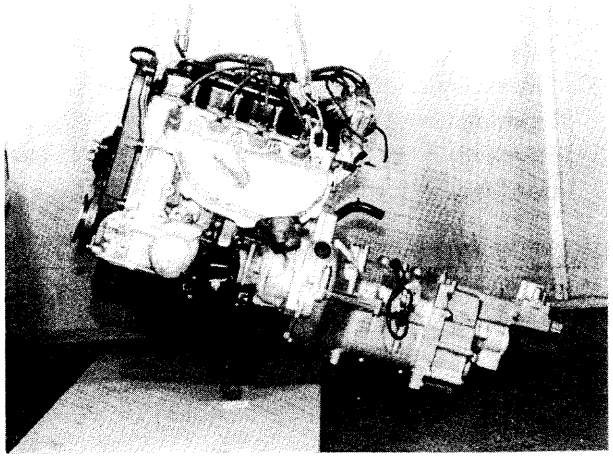


Fig. 3-3-10

34) Remove clutch lower plate.
35) Separate transmission from engine.

Throughout this MANUAL, 4 cylinders of engine are identified by numbers: No. 1, No. 2, No. 3 and No. 4 as counted from front end.

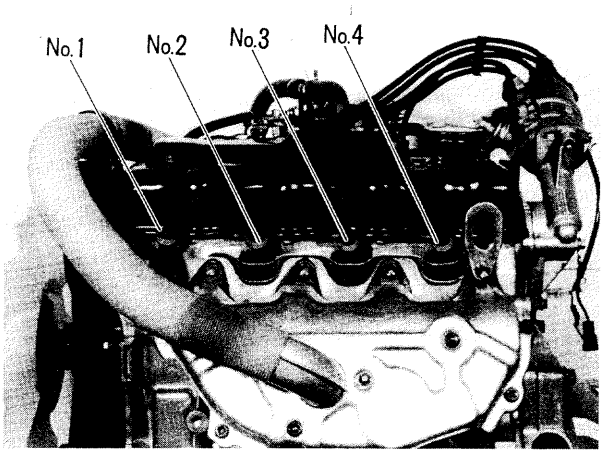


Fig. 3-3-11

3-4. ENGINE DISASSEMBLY

NOTE:

- **Observe critically before starting to remove a component or part by loosening bolts, nuts and the like. What you may find before and during disassembly is valuable information necessary for sucessful reassembly.**
- **Be careful in handling aluminum-alloy parts. They are softer than steel or cast-iron parts and their finished surfaces more easily take scratch marks.**
- **Have trays and pans ready for setting aside disassembled parts in an orderly manner. Place parts in trays and pans in such a way that they can be readily identified. Put match marks or tags on them, as necessary, so that they will go back to where they came from.**

Carry out engine disassembly in the following sequence:

1) Loosen drain plug and drain out engine oil.

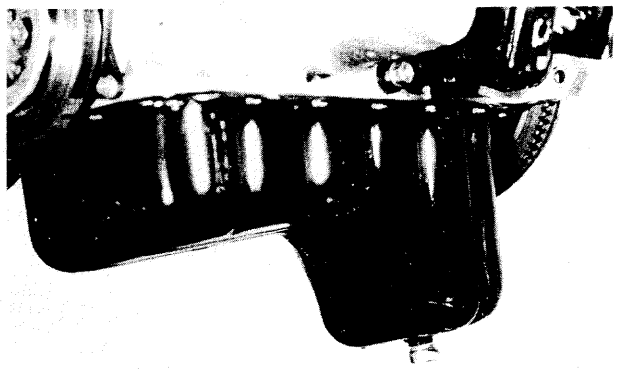


Fig. 3-4-1

2) Remove clutch cover and clutch disc.

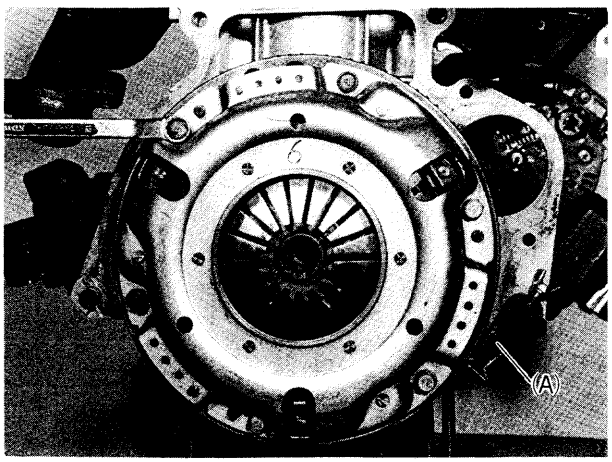


Fig. 3-4-2 (A) Flywheel holder (Special tool 09924-17810)

3) Remove distributor assembly.

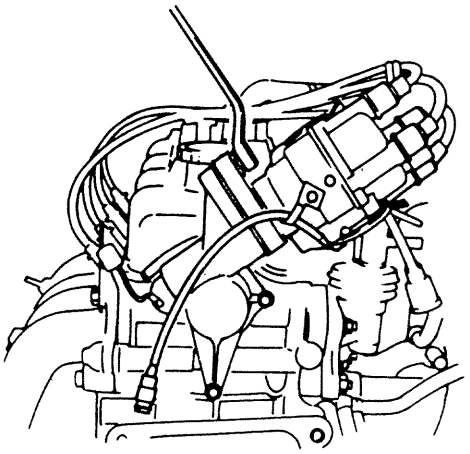


Fig. 3-4-3

4) Remove the fuel pump and rod.

NOTE:

When removing pump and distributor gear case, place waste or receiver under gear case.

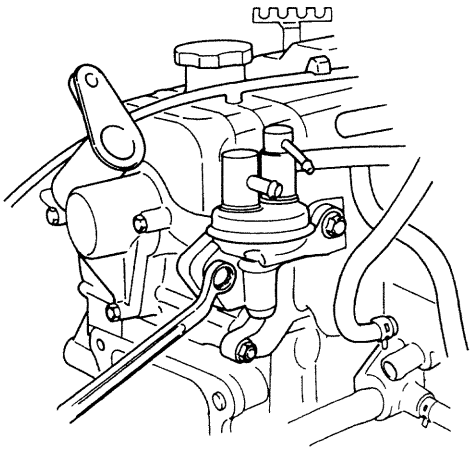


Fig. 3-4-4

5) Take down distributor case.

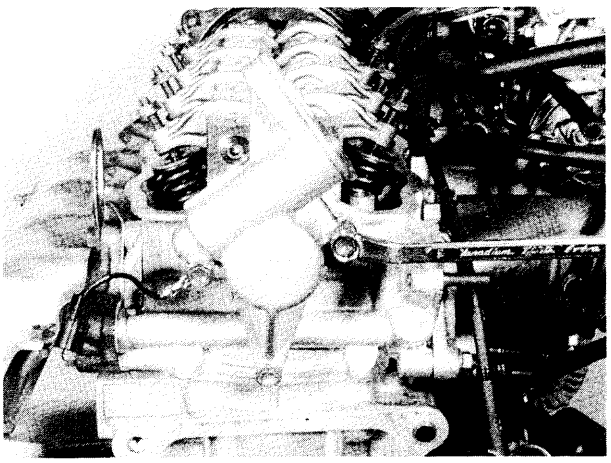


Fig. 3-4-5

6) Take down alternator and water pump pulley.

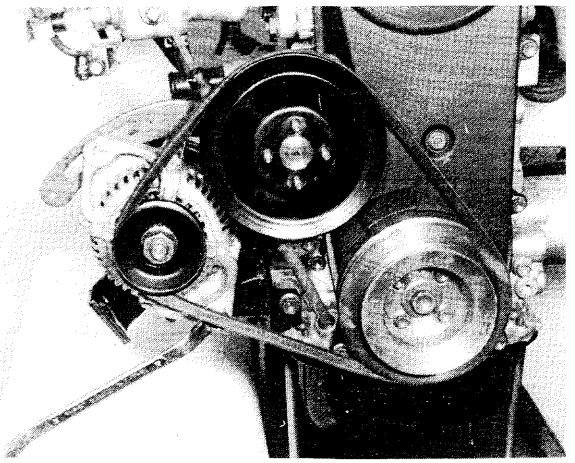


Fig. 3-4-6

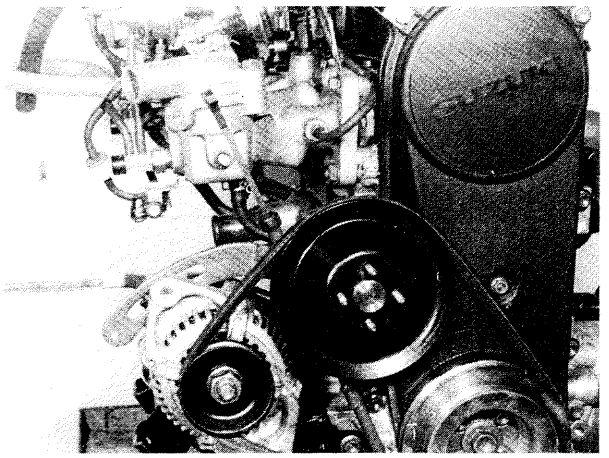
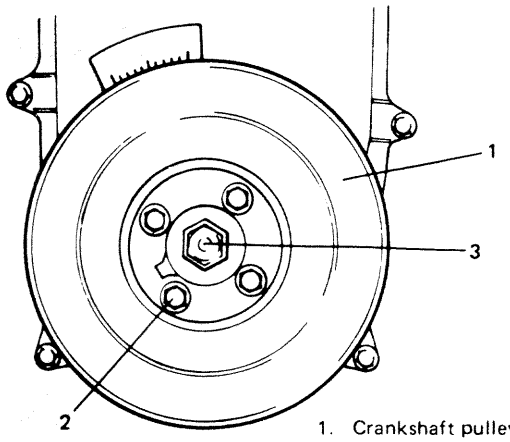


Fig. 3-4-7

7) Remove crankshaft pulley by removing 4 pulley bolts, with special tool (A) hitched to flywheel so that crankshaft will not turn.
The crank timing belt pulley bolt at the center needs not to be loosened.



1. Crankshaft pulley
2. Crankshaft pulley bolt
3. Crank timing belt pulley bolt

Fig. 3-4-8

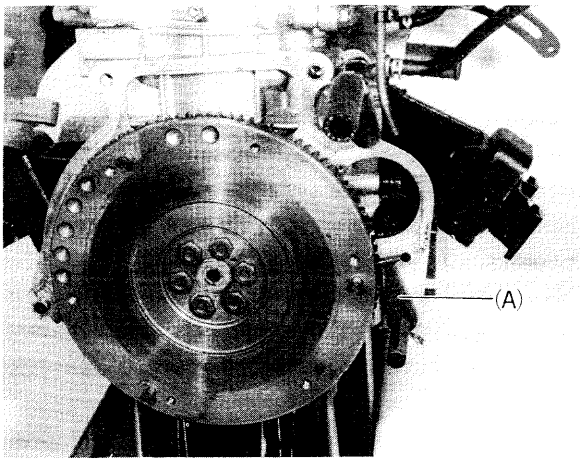


Fig. 3-4-9 (A) Flywheel holder (Special tool 09924-17810)

8) Remove outside cover on timing belt.

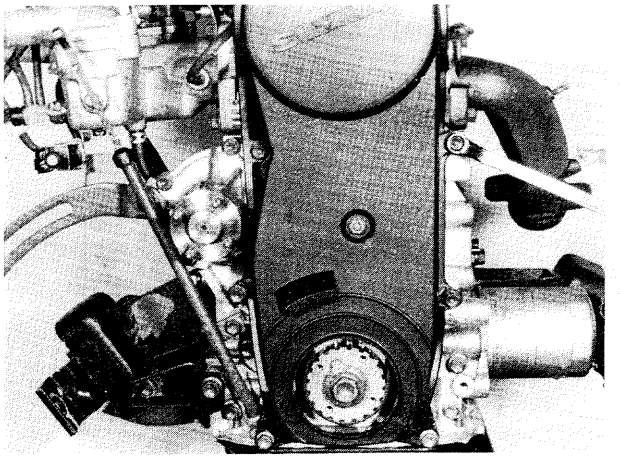
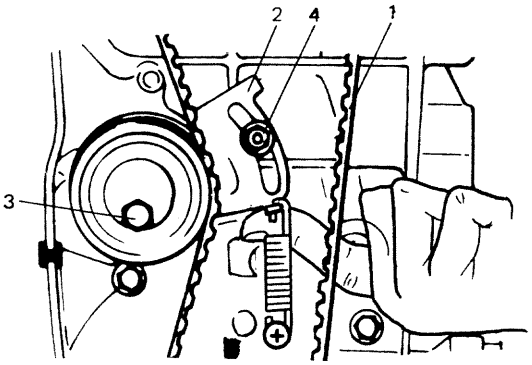


Fig. 3-4-10

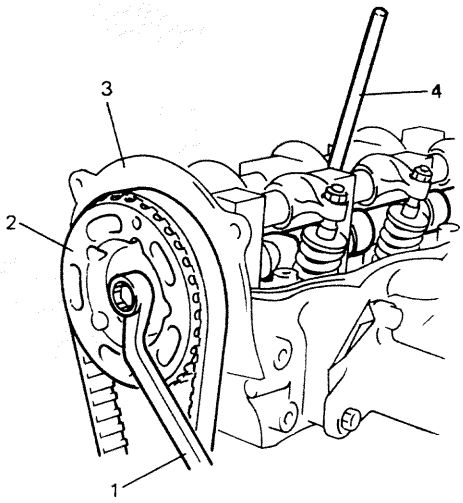
9) Loosen tensioner bolt and stud, and remove belt from crank timing belt pulley and camshaft pulley after pushing up tensioner plate fully by finger as shown in Figure 3-4-11.



1. Timing belt
2. Tensioner plate
3. Tensioner bolt
4. Tensioner stud

Fig. 3-4-11

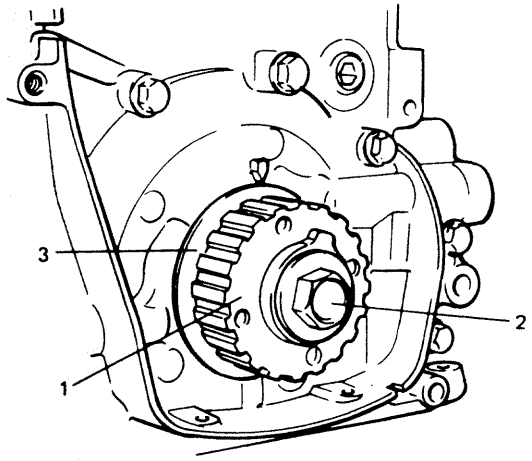
10) Remove timing belt tensioner, tensioner plate, and tensioner spring.
11) Remove camshaft timing belt pulley by locking camshaft (insert general rod into the camshaft hole) as shown below.



1. Wrench
2. Camshaft timing belt pulley
3. Timing belt inside cover
4. General rod

Fig. 3-4-12

12) Using flywheel holder (A) (Special tool), remove crankshaft timing belt pulley bolt, pulley and timing belt guide with crankshaft locked.



1. Crankshaft timing belt pulley
2. Pulley bolt
3. Timing belt guide

Fig. 3-4-13

13) Remove crankshaft timing belt pulley key.
14) Remove timing belt inside cover.

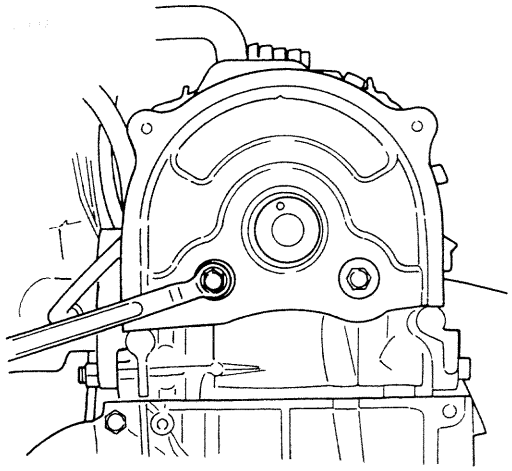


Fig. 3-4-14

15) Remove water pump.

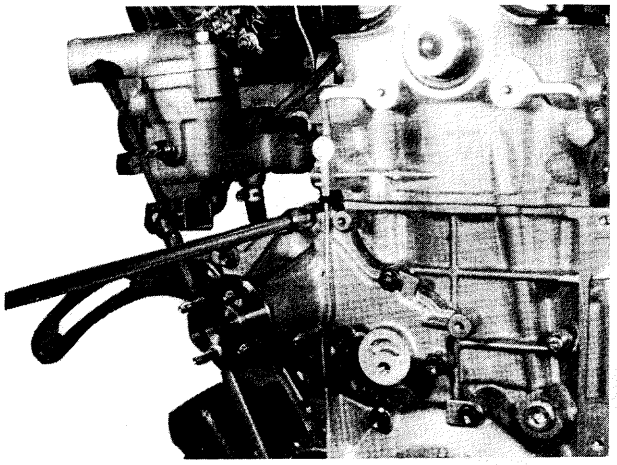


Fig. 3-4-15

16) Remove exhaust manifold cover.
17) Take off exhaust manifold and its gasket.

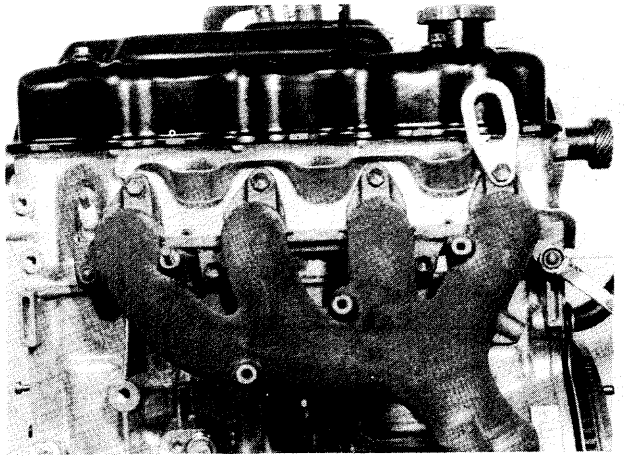


Fig. 3-4-16

18) Using special tool (C), remove oil filter.

NOTE:
Be careful not to spill oil when removing filter.

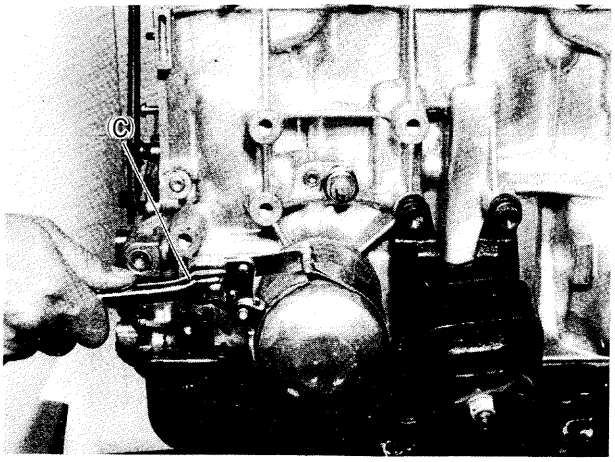


Fig. 3-4-17 (C) Oil filter wrench (09915-47310)

19) Draw water hoses off water pump inlet pipe.

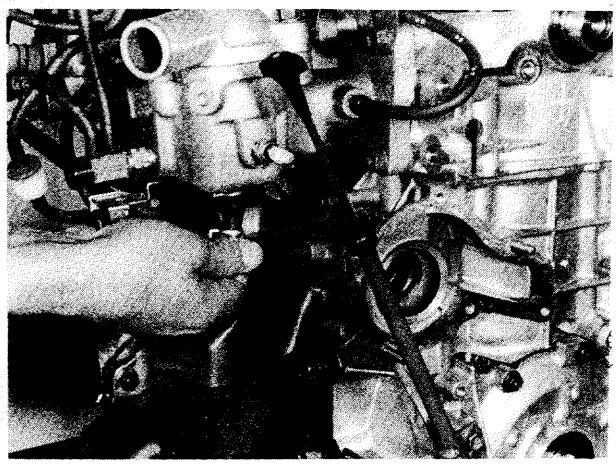


Fig. 3-4-18

20) Disconnect PCV (Positive crankcase ventilation valve) hose from cylinder head cover.
21) Take down intake manifold with carburetor.

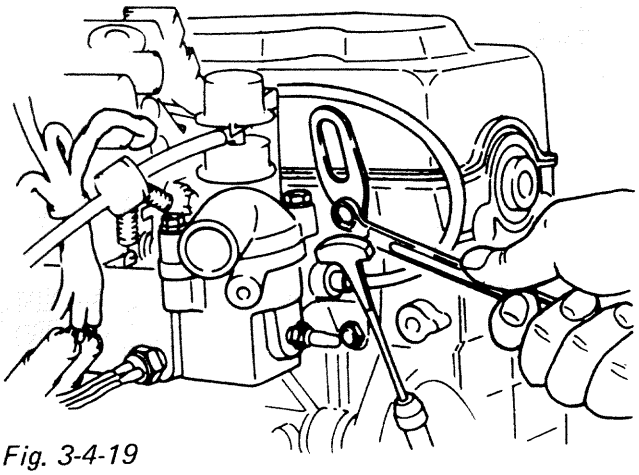


Fig. 3-4-19

22) Remove water inlet pipe.

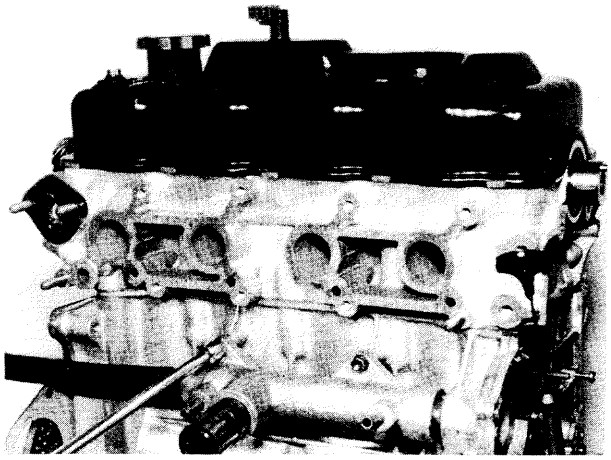


Fig. 3-4-20

23) Take off cylinder head cover.

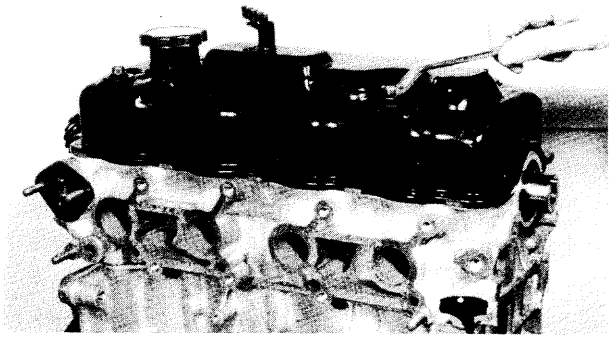


Fig. 3-4-21

24) Loosen 8 valve adjusting screws fully. Leave screws in place.

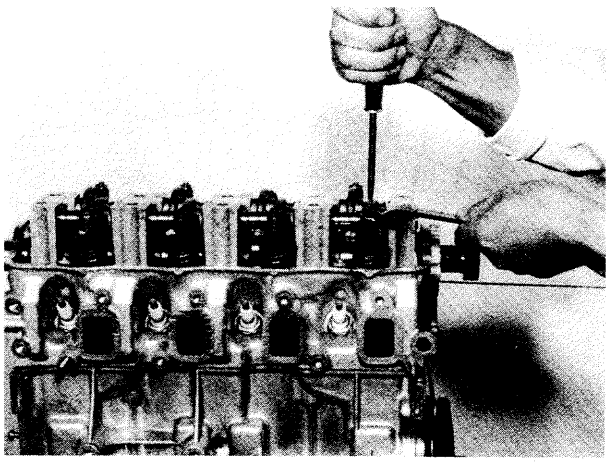


Fig. 3-4-22

25) Loosen rocker arm shaft securing screws (10 pcs).

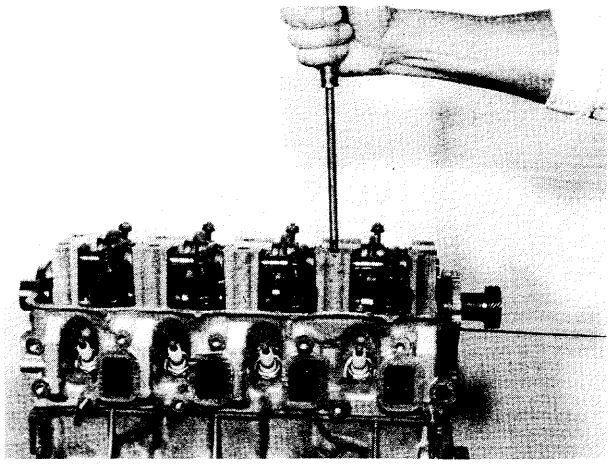


Fig. 3-4-23

26) While drawing out rocker arm shaft, separate valve rocker arms and rocker arm springs.

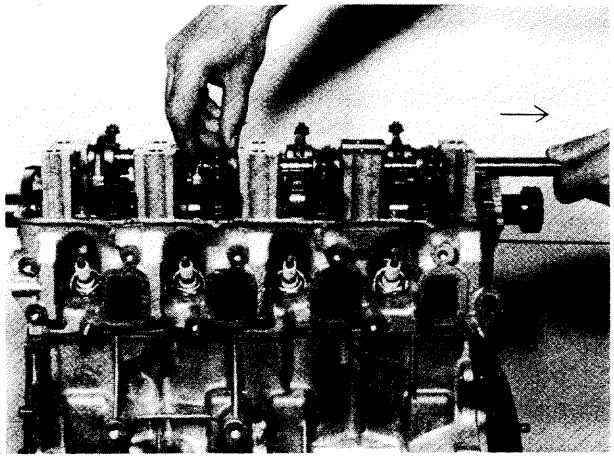


Fig. 3-4-24

27) Draw camshaft out toward rear end (transmission case side).

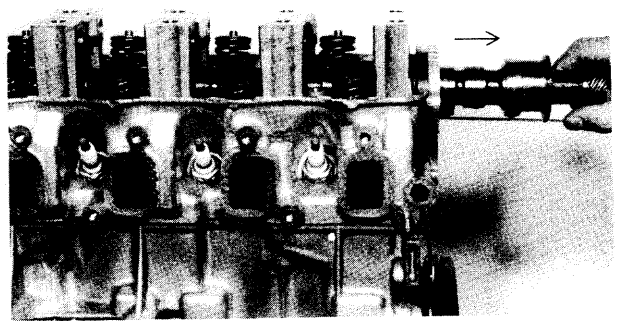


Fig. 3-4-25

28) Remove cylinder head.

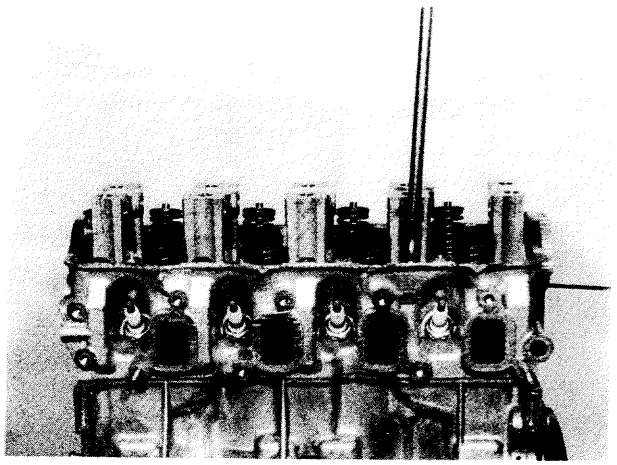
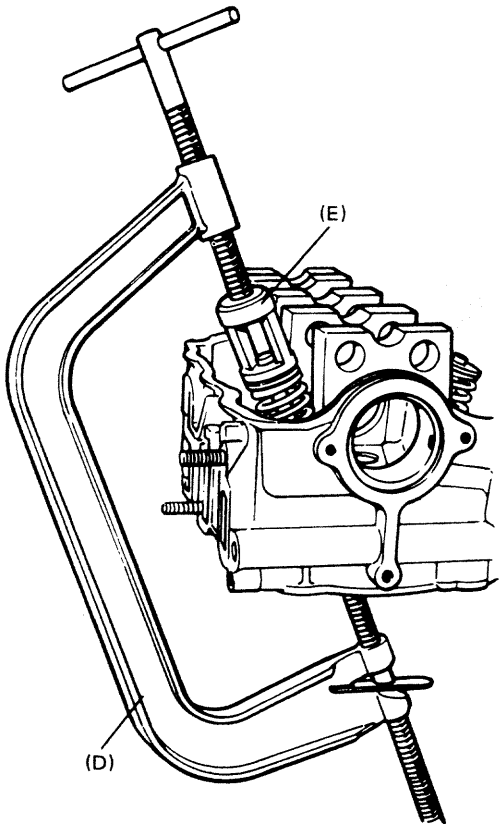


Fig. 3-4-26

a) Use valve lifter (D), (E) to compress valve spring in order to free valve cotter pieces for removal. In this way, remove valve spring and valves.



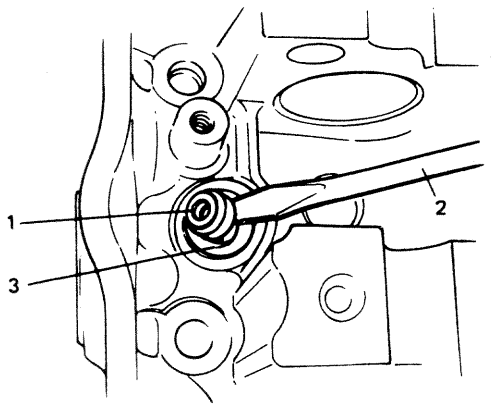
(D) Valve lifter
(Special tool 09916-14510)

(E) Valve lifter attachment
(Special tool 09916-48210)

Fig. 3-4-27

b) Remove valve stem oil seal from valve guide, and then valve spring seat.

NOTE:
Do not reuse oil seal once disassembled. Be sure to use new oil seal when assembling.

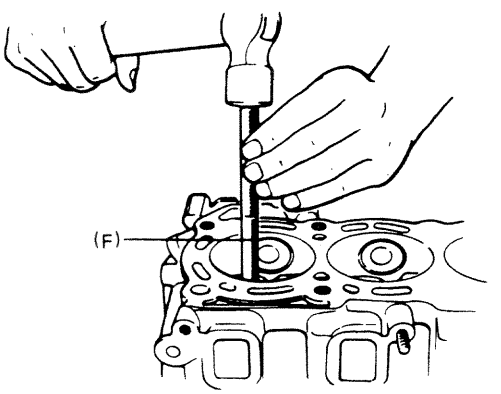


1. Valve stem oil seal
2. Blade screw driver
3. Valve spring seat

Fig. 3-4-28

c) Using special tool (F), drive valve guide out from combustion chamber side to valve spring side (Figure 3-4-29).

NOTE:
Do not reuse valve guide once disassembled. Be sure to use new valve guide (Oversize) when assembling.



(F) Valve guide remover (Special tool 09916-44511)

Fig. 3-4-29

NOTE:
Place disassembled parts except valve stem seal and valve guide in order, so that they can be installed in their original positions.

29) Remove flywheel, using special tool (A) as shown.

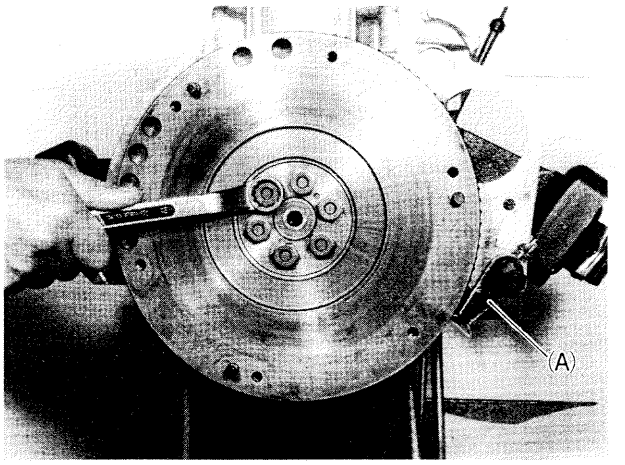


Fig. 3-4-30 (A) Flywheel holder (Special tool 09924-17810)

30) Remove oil level gauge guide from oil pump.

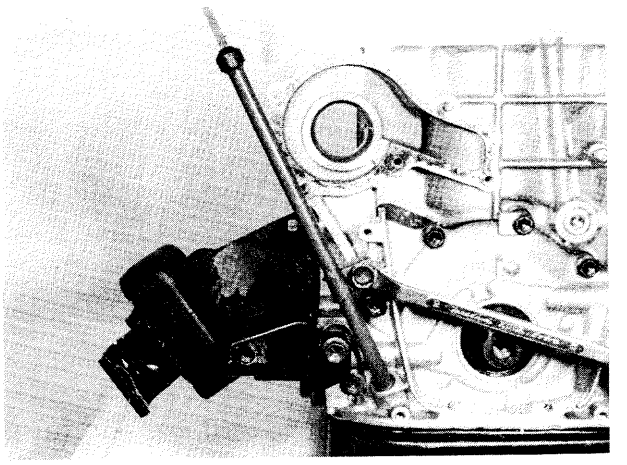


Fig. 3-4-31

31) Take down oil pan.

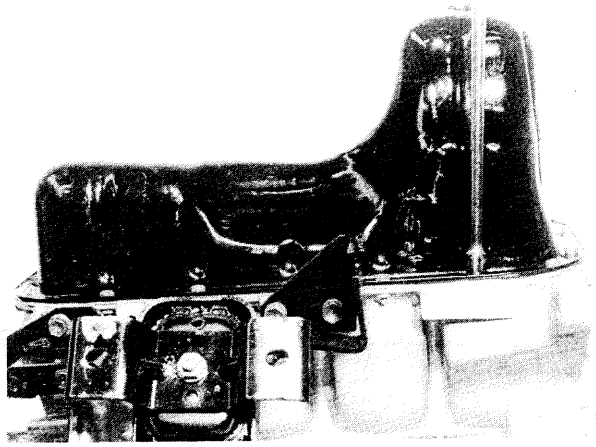


Fig. 3-4-32

32) Remove oil pump strainer.

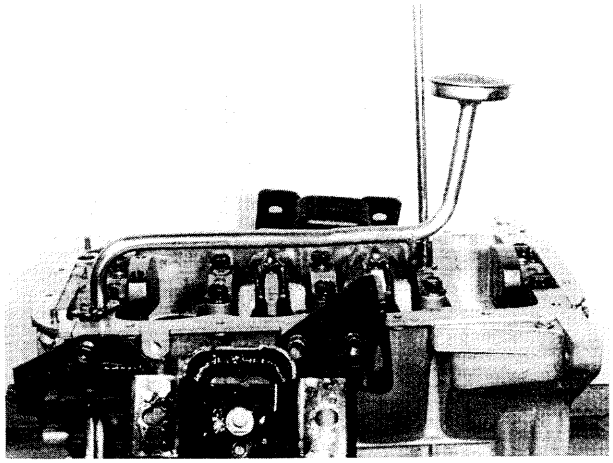


Fig. 3-4-33

33) Remove connecting rod bearing caps.

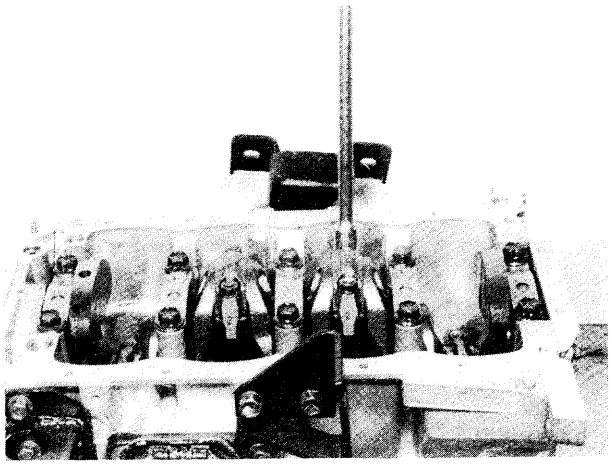
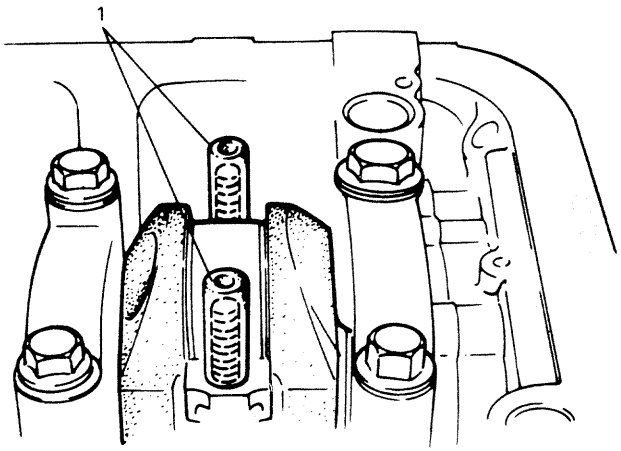


Fig. 3-4-34

34) Install guide hose over threads of rod bolts. This is to prevent damage to bearing journal and cylinder wall when removing connecting rod.



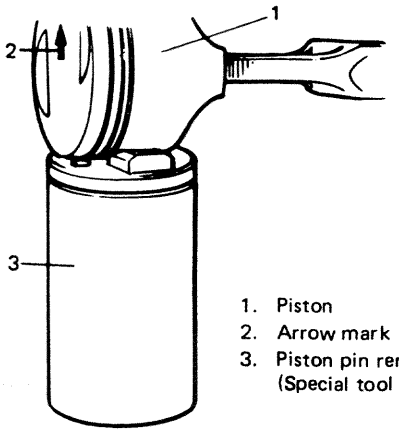
1. Guide hoses

Fig. 3-4-35

35) Decarbon top of cylinder bore, before removing piston from cylinder.
36) Push piston and connecting rod assembly out through the top of cylinder bore.

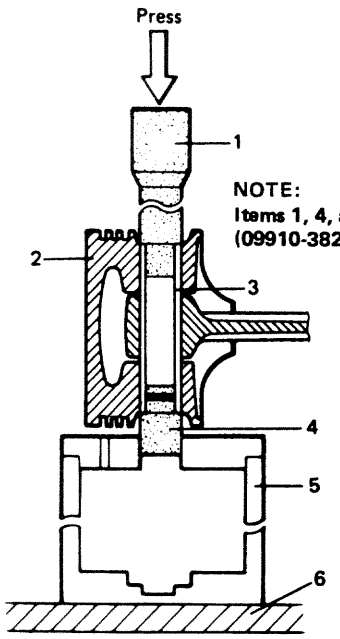
CAUTION:
- **Before pulling piston out, scribe cylinder number on its crown.**
- **Be sure to identify each bearing cap for its connecting rod by using cylinder number. Set cap and rod aside in combination.**

a) Using piston ring expander, remove two compression rings (Top and 2nd) and oil ring from piston.
b) Remove piston pin from connecting rod.
Fit piston and connecting rod assembly to special tool (Fig. 3-4-36), and then press piston pin out of connecting rod by using arbor press (Fig. 3-4-37).



1. Piston
2. Arrow mark
3. Piston pin remover and installer (Special tool 09910-38210)

Fig. 3-4-36



1. Driver handle
2. Piston
3. Piston pin
4. Piston pin guide
5. Base
6. Support

NOTE:
Items 1, 4, and 5 are in Special tool (09910-38210).

Fig. 3-4-37

37) Remove oil pump assembly.

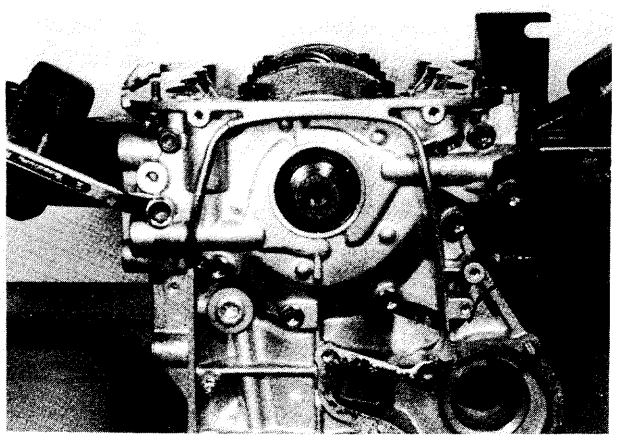
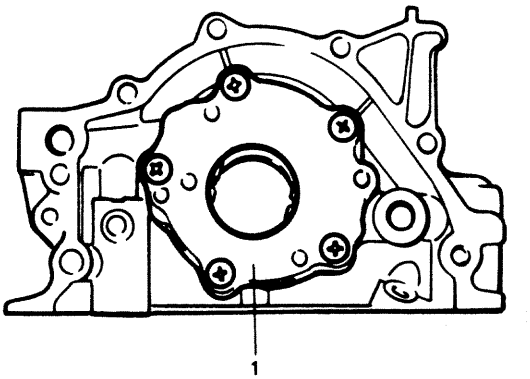


Fig. 3-4-38

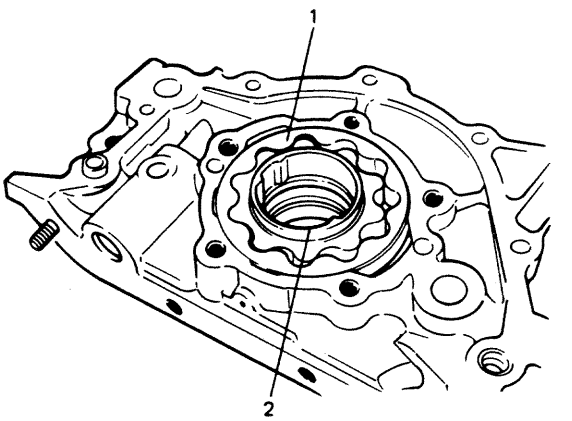
a) Remove oil pump rotor plate.



1. Rotor plate

Fig. 3-4-39

b) Remove outer rotor and inner rotor.



1. Outer rotor
2. Inner rotor

Fig. 3-4-40

38) Remove oil seal housing.

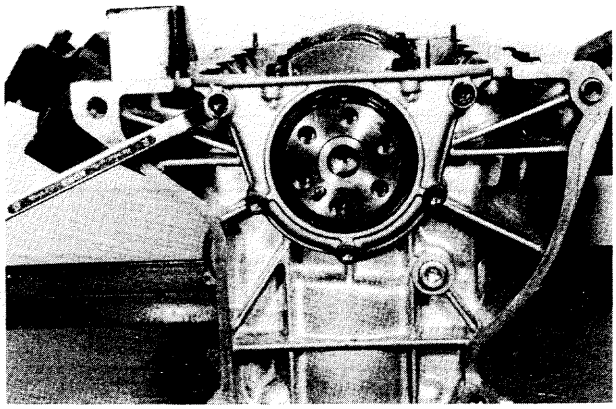


Fig. 3-4-41

39) Remove crankshaft bearing caps, and take out crankshaft.

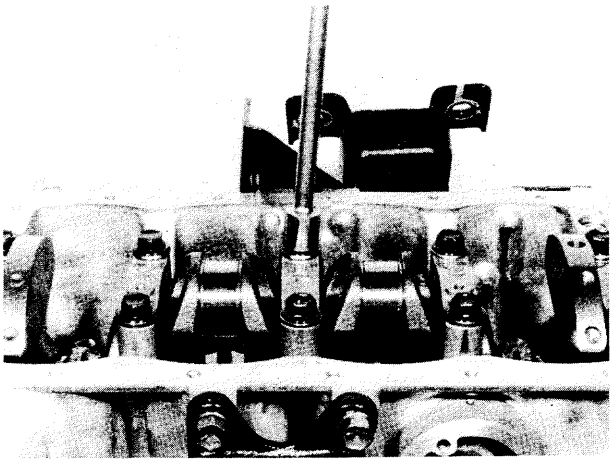


Fig. 3-4-42

3-5. INSPECTION OF ENGINE COMPONENTS

NOTE:

- **During and immediately after disassembly, inspect cylinder block and head for evidence of water leakage or damage and, after washing them clean, inspect more closely.**
- **Wash all disassembled parts clean, removing grease, slime, carbon and scales, before inspecting them to determine whether repair is necessary or not. Be sure to de-scale water jackets.**
- **Use compressed air to clear internal oil holes and passages.**
- **Do not disturb set combinations of valves, bearings and bearing caps, etc. Have the sets segregated and identified.**

Cylinder Head

- Remove all carbon from combustion chambers.

NOTE:

Do not use any sharp-edged tool to scrape off the carbon. Be careful not to scuff or nick metal surfaces when de-carboning. This applies to valves and valve seats, too.

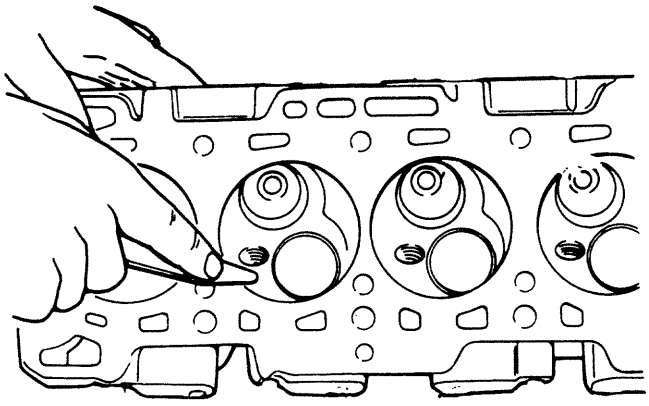


Fig. 3-5-1

- Check cylinder head for cracks in intake and exhaust ports, combustion chambers, and head surface.

- Flatness of gasketed surface:
  Using a straightedge and thickness gauge, check surface at a total of 6 locations. If the limit stated below, is exceeded, correct gasketed surface with a surface plate and abrasive paper of about # 400 (Waterproof silicon carbide abrasive paper): place paper on and over surface plate, and rub gasketed surface against paper to grind off high spots. Should this fail to reduce thickness gauge readings to within the limit, replace cylinder head.
  Leakage of combustion gases from this gasketed joint is often due to a warped gasketed surface; such leakage results in reduced power output.

Limit of distortion	0.05 mm (0.002 in.)

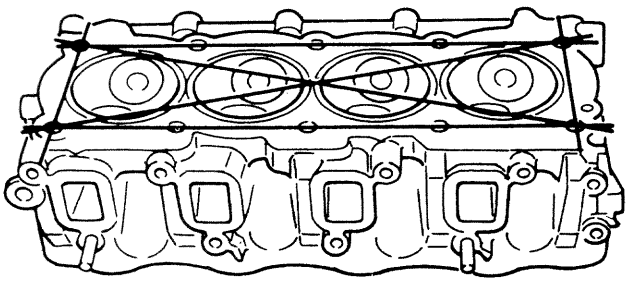


Fig. 3-5-2

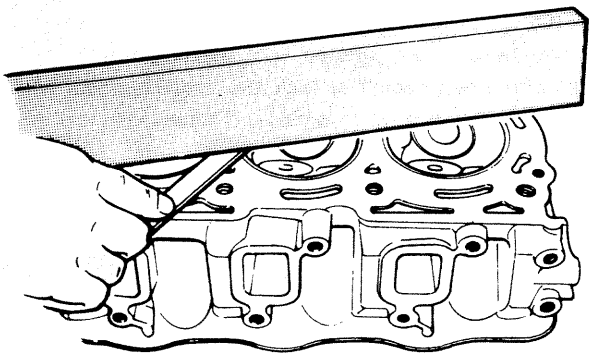


Fig. 3-5-3

- Distortion of manifold seating faces:
  Check seating faces of cylinder head for manifolds, using a straightedge and thickness gauge, in order to determine whether these faces should be corrected or cylinder head replaced.

Limit of distortion	0.10 mm (0.004 in.)

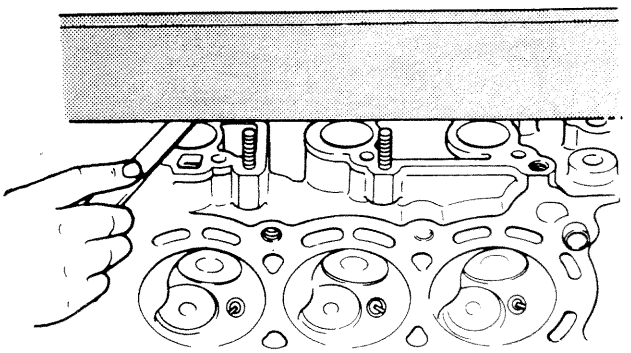


Fig. 3-5-4 Intake manifold seating face

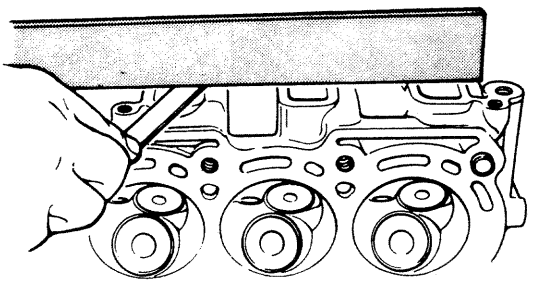


Fig. 3-5-5 Exhaust manifold seating face

Rocker-Arm Shaft and Rocker Arms

- Shaft-to-arm clearance (IN & EX):
  Using a micrometer and a bore gauge, measure rocker shaft dia. and rocker arm I.D..
  The difference between two readings is the arm-to-shaft clearance on which limit is specified.
  If the limit is exceeded, replace shaft or arm, or both.

Item	Standard	Limit
Rocker arm I.D.	16.000 – 16.018 mm (0.629 – 0.630 in.)	—
Rocker arm Shaft dia.	15.973 – 15.988 mm (0.628 – 0.629 in.)	—
Arm-to-Shaft clearance	0.012 – 0.045 mm (0.0005 – 0.0017 in.)	0.09 mm (0.0035 in.)

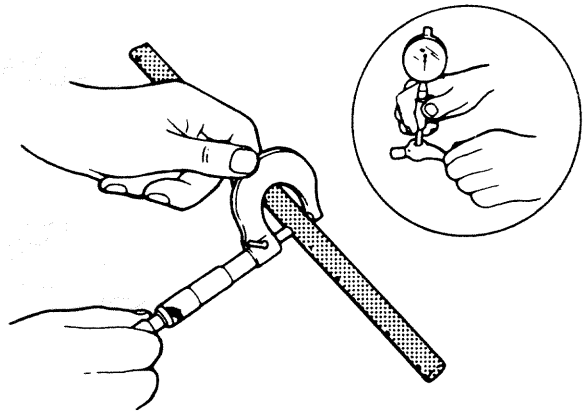


Fig. 3-5-6

- Runout of rocker-arm shaft:
  Using "V" blocks and dial gauge, check runout. If runout exceeds the limit, replace rocker arm shaft.

Runout limit	0.12 mm (0.004 in.)

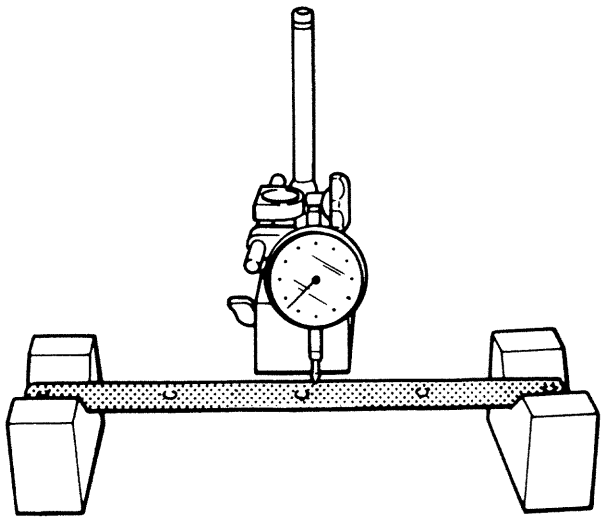
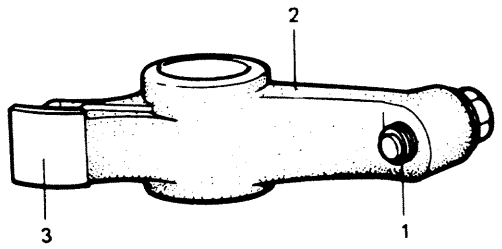


Fig. 3-5-7

- Wear of rocker-arm and adjusting screw:
  If the tip ① of adjusting screw is badly worn, replace screw. Arm must be replaced if its cam-riding face ③ is badly worn.



1. Adjusting screw
2. Rocker arm
3. Cam-riding face

Fig. 3-5-8

Valve Guides

Using a micrometer and bore gauge, take diameter readings on valve stems and guides to determine stem clearance in guide. Be sure to take a reading at more than one place along the length of each stem and guide.

Item		Standard	Limit
Valve stem diameter	In	6.965 – 6.980 mm (0.2742 – 0.2748 in.)	———
	Ex	6.950 – 6.965 mm (0.2737 – 0.2742 in.)	———
Valve guide I.D.	In	7.000 – 7.015 mm (0.2756 – 0.2761 in.)	———
	Ex.	7.000 – 7.015 mm (0.2756 – 0.2761 in.)	———
Stem-to-guide clearance	In	0.020 – 0.050 mm (0.0008 – 0.0019 in.)	0.07 mm (0.0027 in.)
	Ex	0.035 – 0.065 mm (0.0014 – 0.0025 in.)	0.09 mm (0.0035 in.)

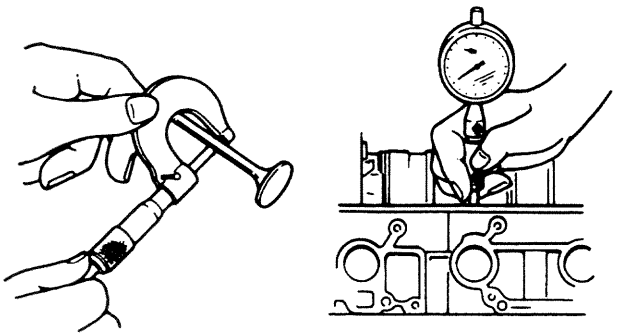


Fig. 3-5-9

If bore gauge is not available, check end deflection of the valve stem in place with a dial gauge rigged.
Move stem end in the directions ① and ② to measure end deflection.
If deflection exceeds its limit, replace valve stem and valve guide.

Valve stem end deflection limit	In	0.14 mm (0.005 in.)
	Ex	0.18 mm (0.007 in.)

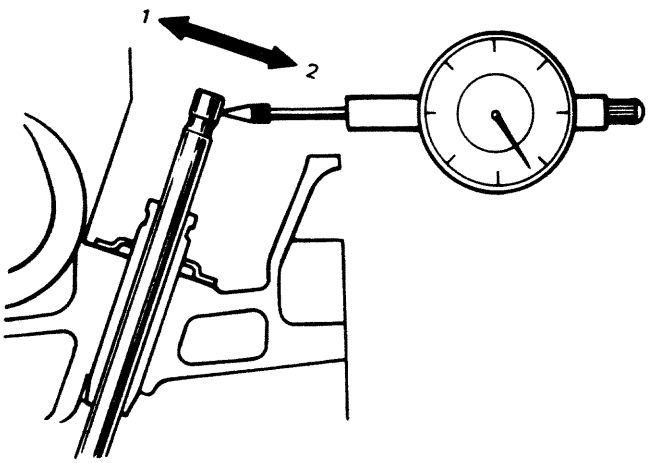
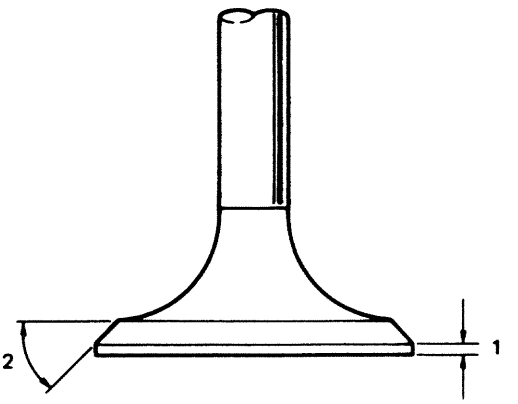


Fig. 3-5-10

Valves

- Remove all carbon from valves.
- Inspect each valve for wear, burn or distortion at its face and stem and replace as necessary.
- Measure thickness of valve head. If measured thickness exceeds its limit specified below, replace valve.

Valve head thickness		
Standard	Limit	
1.0 mm (0.039 in.)	In	0.6 mm (0.023 in.)
	Ex	0.7 mm (0.027 in.)



1. Valve head thickness
2. 45°

Fig. 3-5-11

- Check end face of each valve stem for wear. This face meets rocker arm intermittently in operation, and might become concaved or otherwise irregular. As necessary, smoothen the end face with an oil stone and, if this grinding removes the end stock by as much as 0.5 mm (0.0196 in.) (as measured from the original face), replace the valve.

Limit on stock allowance of valve stem end face	0.5 mm (0.0196 in.)

- Check each valve for radial runout with a dial gauge and "V" block. To check runout, rotate valve slowly. If runout exceeds limit, replace valve.

Limit on valve head radial runout	0.08 mm (0.003 in.)

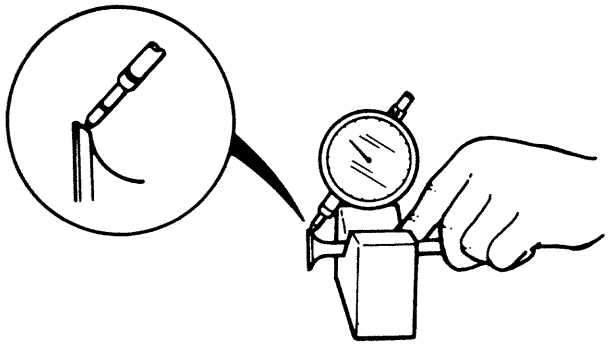


Fig. 3-5-12

Valve Seats

CAUTION:
Valves to be checked and serviced for seating width and contact pattern must be those found satisfactory in regard to stem clearance in the guide and also requirements stated on preceding page under valves.

- Seating contact width:
  Produce contact pattern on each valve in the usual manner, namely, by giving uniform coat of marking compound to valve seat and by rotatingly tapping seat with valve head. Valve lapper (tool used in valve lapping) must be used.

The pattern produced on seating face of valve must be a continuous ring without any break, and width Ⓦ of pattern must be within stated range as follows.

Ⓦ Standard seating width revealed by contact pattern on valve face	Intake	1.3 – 1.5 mm (0.0512 – 0.0590 in.)
	Exhaust	

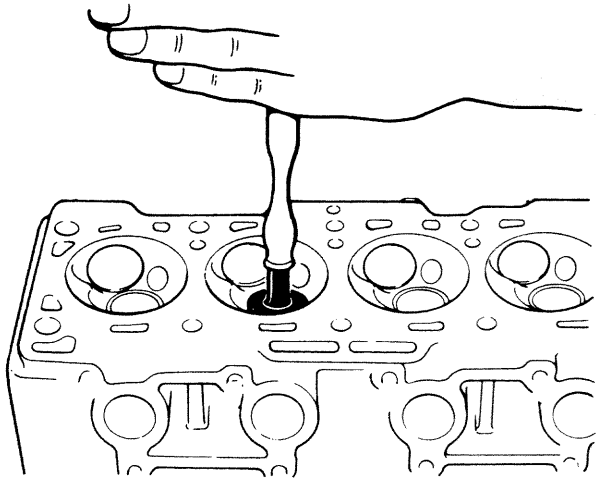
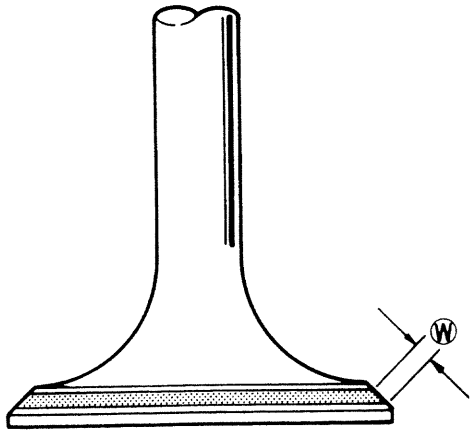


Fig. 3-5-13



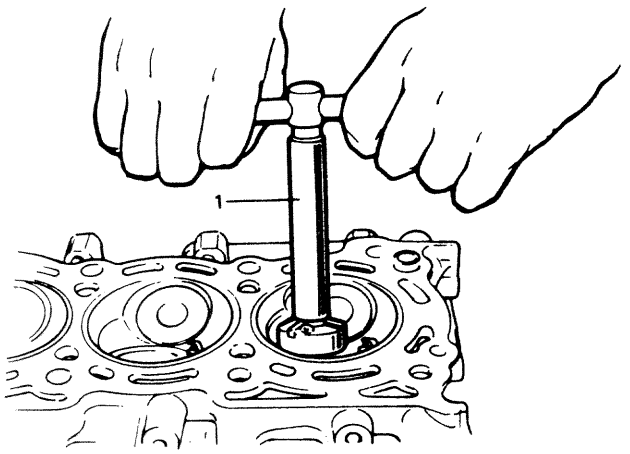
Ⓦ Valve seat contact width

Fig. 3-5-14

- Valve seat repair:
  Valve seat not producing uniform contact with its valve or showing width Ⓦ of seating contact that is off the specified range must be repaired by regrinding or by cutting and regrinding and finished by lapping.

1) EXHAUST VALVE SEAT: Use a valve seat cutter to make three cuts as illustrated in Fig. 3-5-16. Three cutters must be used: the first for making 15° angle, the second for making 75° angle and the last for making 45° seat angle. The third cut must be made to produce desired seat width Ⓦ.

Seat width Ⓦ for exhaust valve seat	1.3 – 1.5 mm (0.0512 – 0.0590 in.)



1. Valve seat cutter

Fig. 3-5-15 Valve seat cutting

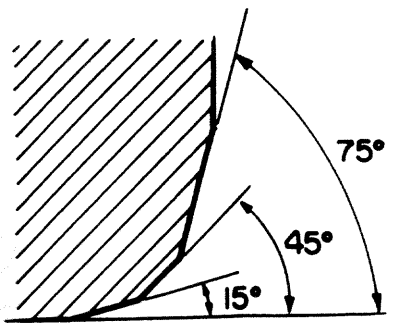


Fig. 3-5-16 Valve seat angles for exhaust valve

2) INLET VALVE SEAT: Cutting sequence is the same as for exhaust valve seats but the second angle is (60°).

Seat width Ⓦ for inlet valve seat	1.3 – 1.5 mm (0.0512 – 0.0590 in.)

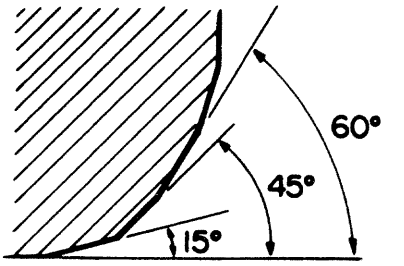


Fig. 3-5-17 Valve seat angles for intake valve

3) VALVE LAPPING. Lap valve on seat in two steps, first with coarse-size lapping compound applied to its face and the second with a fine-size compound, each time using a valve lapper according to usual lapping method.

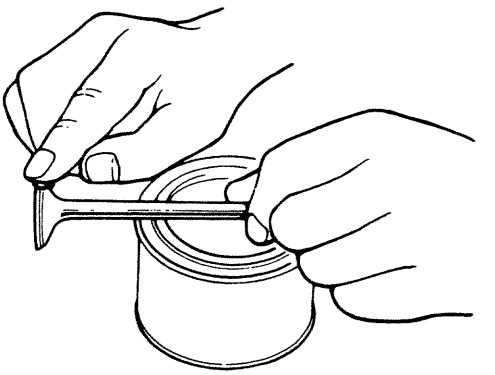


Fig. 3-5-18 Applying lapping compound to valve face

NOTE:

- **After lapping, wipe compound off valve face and seat, and produce contact pattern with marking compound. Check to be sure that contact is centered widthwise on valve seat and that there is no break in contact pattern ring.**
- **Be sure to check and, as necessary, adjust valve clearance after re-installing cylinder head and valve mechanism.**

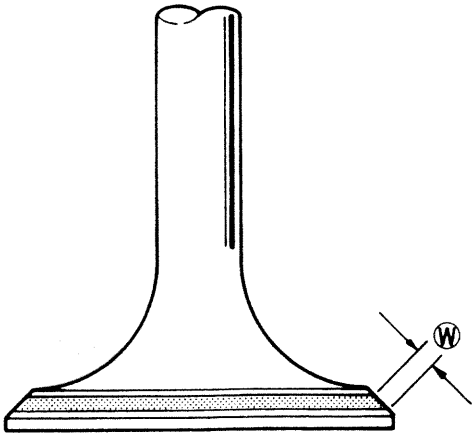


Fig. 3-5-19 Contact pattern Ⓦ uniform in width

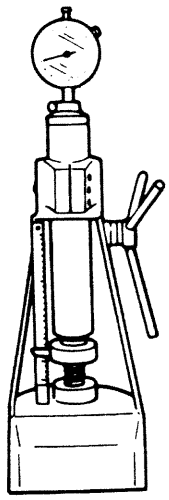


Fig. 3-5-21 Measuring spring preload

Valve Springs

- Referring to the criterion-data given below, check to be sure that each spring is in sound condition, free of any evidence of breakage or weakening. Remember, weakened valve springs can be the cause of chatter, not to mention the possibility of reducing power output due to gas leakage caused by decreased seating pressure.

Item	Standard	Limit
Valve spring free length	49.3 mm (1.9409 in.)	48.1 mm (1.8937 in.)
Valve spring preload	24.8 – 29.2 kg for 41.5 mm (54.7 – 64.3 lb/ 1.63 in.)	22.8 kg for 41.5 mm (50.2 lb/ 1.63 in.)

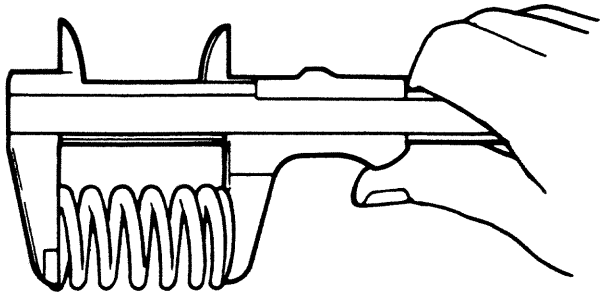


Fig. 3-5-20 Measuring free length of spring

- Spring squareness:
  Use a square and surface plate to check each spring for squareness in terms of clearance between the end of valve spring and square. Valve springs found to exhibit a larger clearance than specified limit must be replaced.

Valve springs squareness limit	2.0 mm (0.079 in.)

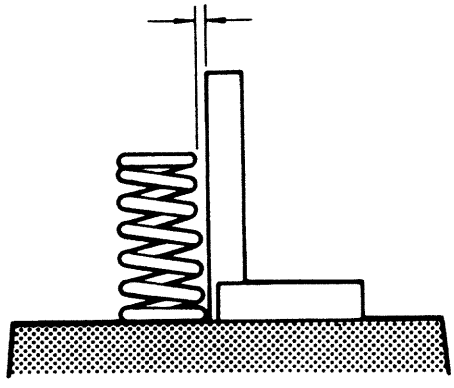


Fig. 3-5-22 Measuring spring squareness

Camshaft

- Runout of camshaft:
  Hold camshaft between two "V" blocks, and measure runout by using a dial gauge.
  If runout exceeds its limit, replace camshaft.

Runout limit	0.10 mm (0.0039 in.)

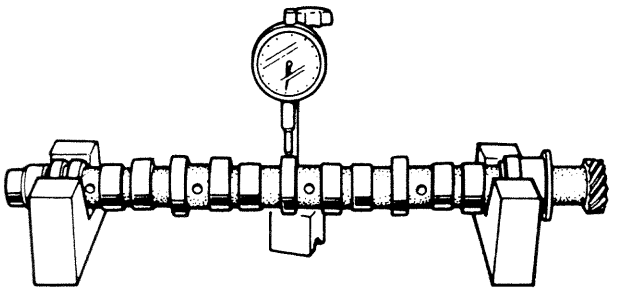


Fig. 3-5-23

- Cam wear:
  Using a micrometer, measure height (H) of cam (lobe). If measured height is less than respective limits, replace camshaft.

Cam height	Standard	Limit
Intake cam	37.500 mm (1.4763 in.)	37.400 mm (1.4724 in.)
Exhaust cam	37.500 mm (1.4763 in.)	37.400 mm (1.4724 in.)
Fuel pump drive cam	40.000 mm (1.5748 in.)	39.600 mm (1.5590 in.)

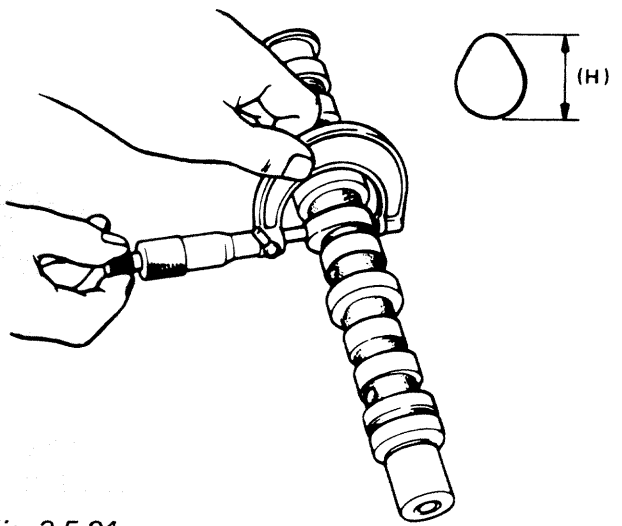


Fig. 3-5-24

- Journal wear:
  Measure journal diameter in two directions at two places (total of 4 readings) on each journal as shown in Fig. 3-5-25, and also by using bore gauge, measure journal bore in cylinder head as shown in Fig. 3-5-26 (i.e. 4 readings on each journal).
  Subtract journal diameter measurement from journal bore measurement to determine journal clearance.
  If journal clearance exceeds its limit, replace camshaft, and as necessary, cylinder head, too.

	Standard	Limit
Journal clearance limit	0.050 – 0.091 mm (0.0020 – 0.0036 in.)	0.15 mm (0.0059 in.)

Camshaft journal dia.	Journal bore dia.
Ⓐ 44.125 – 44.150 mm (1.7372 – 1.7381 in.)	44.200 – 44.216 mm (1.7402 – 1.7407 in.)
Ⓑ 44.325 – 44.350 mm (1.7451 – 1.7460 in.)	44.400 – 44.416 mm (1.7480 – 1.7486 in.)
Ⓒ 44.525 – 44.550 mm (1.7530 – 1.7539 in.)	44.600 – 44.616 mm (1.7560 – 1.7565 in.)
Ⓓ 44.725 – 44.750 mm (1.7609 – 1.7618 in.)	44.800 – 44.816 mm (1.7638 – 1.7644 in.)
Ⓔ 44.925 – 44.950 mm (1.7687 – 1.7697 in.)	45.000 – 45.016 mm (1.7716 – 1.7723 in.)

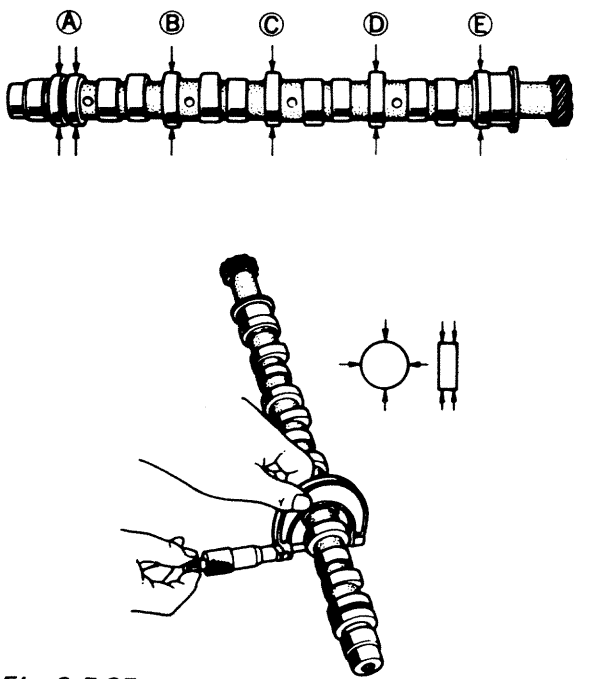


Fig. 3-5-25

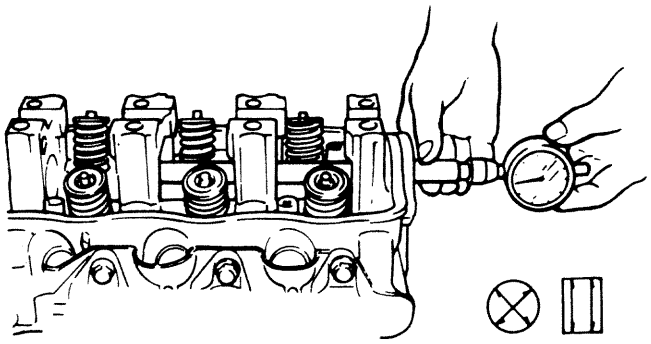


Fig. 3-5-26

Cylinder Block

- Distortion of gasketed surface:
  Using a straightedge and a thickness gauge, check gasketed surface for distortion and, if result exceeds specified limit, correct it.

	Standard	Limit
Flatness	0.03 mm (0.0012 in.)	0.06 mm (0.0024 in.)

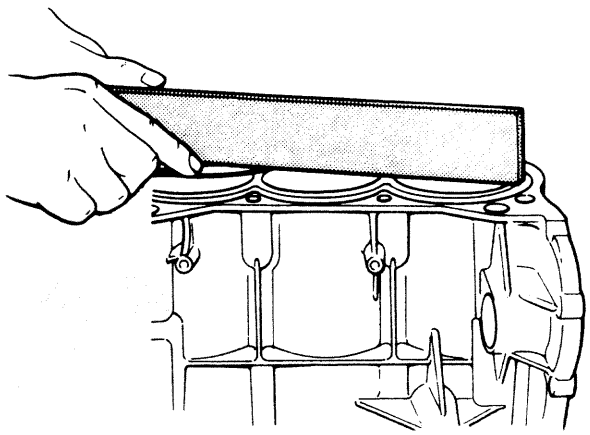


Fig. 3-5-27

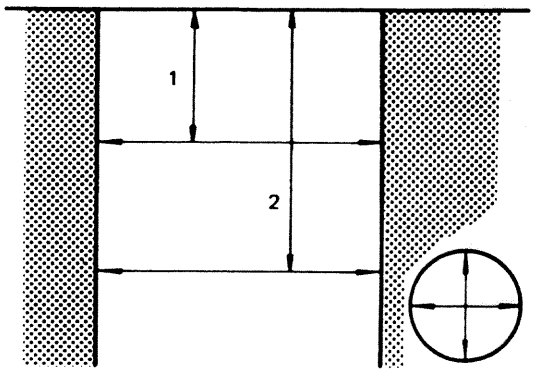
- Cylinder bore:

1) Inspect cylinder walls for scratches, roughness, or ridges which indicate excessive wear. If cylinder bore is very rough or deeply scratched, or ridged, rebore cylinder and use oversize piston.
2) Using a cylinder gauge, measure cylinder bore in thrust and axial directions at two positions as shown in Fig. 3-5-28.
   If any of the following conditions exists, rebore cylinder.

- Cylinder bore dia. exceeds its limit.
- Difference of measurements at two positions exceeds taper limit.
- Difference between thrust and axial measurements exceeds out-of-round limit.

Cylinder bore dia. limit	74.15 mm (2.9193 in.)
Taper and out-of-round limit	0.10 mm (0.0039 in.)

NOTE:
If any one of four cylinders has to be rebored, rebore all four to the same next oversize. This is necessary for the sake of uniformity and balance.



1. 50 mm (1.96 in.)
2. 95 mm (3.74 in.)

Fig. 3-5-28 Positions to be measured

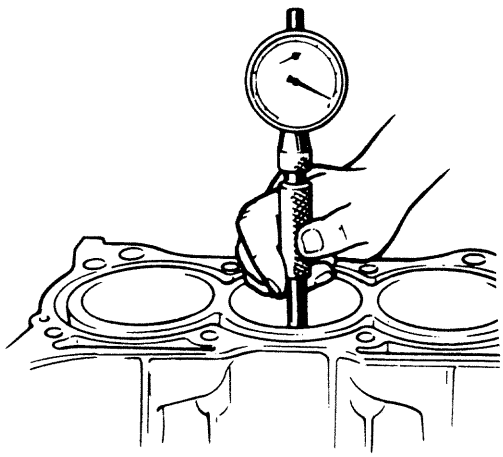


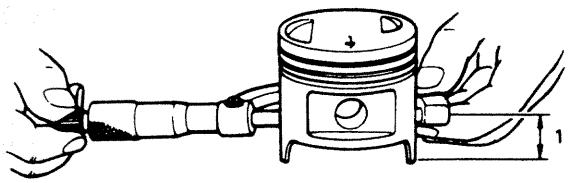
Fig. 3-5-29 Measuring cylinder bore with cylinder gauge

- Honing or reboring cylinders:

1) When any cylinder needs reboring, all other cylinders must also be rebored at same time.
2) Select oversized piston according to amount of cylinder wear.

Size	Piston diameter
O/S 0.25	74.220 – 74.230 mm (2.9220 – 2.9224 in.)
O/S 0.50	74.470 – 74.480 mm (2.9318 – 2.9322 in.)

3) Using micrometer, measure piston diameter.



1. 15 mm (0.59 in.)

Fig. 3-5-30 Measuring piston diameter

4) Calculate cylinder bore diameter to be rebored.

D = A + B – C

D : Cylinder bore diameter to be rebored.
A : Piston diameter as measured.
B : Piston clearance = 0.02 – 0.04 mm (0.0008 – 0.0015 in)
C : Allowance for horning = 0.02 mm (0.0008 in)

5) Rebore and hone cylinder to calculated dimension.

NOTE:
Before reboring, install all main bearing caps in place and tighten to specification to avoid distortion of bearing bores.

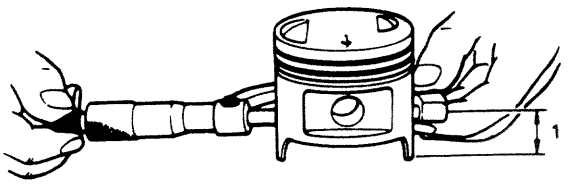
6) Measure piston clearance after honing.

Piston and Piston Rings

Clean carbon from piston head and ring grooves, using a suitable tool.
Inspect piston for faults, cracks or other damage. Damaged or faulty piston should be replaced.

- Piston diameter:
  As indicated in Fig. 3-5-31, piston diameter should be measured at the height of 15 mm (0.59 in) from piston skirt end in the direction perpendicular to piston pin.

Piston diameter	Standard	73.970 – 73.990 mm (2.9122 – 2.9129 in.)
	Oversize: 0.25 mm (0.0098 in.)	74.220 – 74.230 mm (2.9220 – 2.9224 in.)
	0.50 mm (0.0196 in.)	74.47 – 74.48 mm (2.9319 – 2.9322 in.)



1. 15 mm (0.59 in)

Fig. 3-5-31 Measuring piston diameter with micrometer

- Piston clearance:
  To calculate piston clearance, measure cylinder bore diameter and piston diameter. The piston clearance is difference between cylinder bore diameter and piston diameter. Piston clearance should be within specification as follows.

If it is out of specification, rebore cylinder and use oversize piston.

Piston clearance	0.02 – 0.04 mm (0.0008 – 0.0015 in.)

NOTE:
Cylinder bore diameters measured in thrust direction at two positions as shown in Fig. 3-5-28 should be used for calculation of piston clearance.

- Ring groove clearance:
  Before checking, piston grooves must be clean, dry and free from carbon.
  Fit new piston ring into piston groove, and measure clearance between ring and ring land by using thickness gauge.
  If the clearance is out of specification, replace piston.

Ring groove clearance	Top	0.03 – 0.07 mm (0.0012 – 0.0027 in.)
	2nd	0.02 – 0.06 mm (0.0008 – 0.0023 in.)

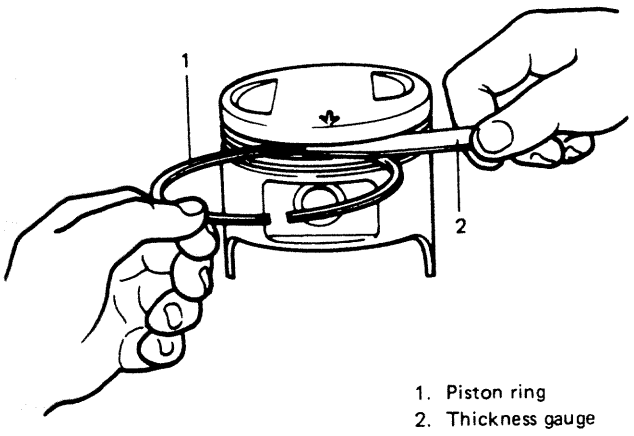


Fig. 3-5-32 Measuring ring groove clearance

- Piston ring end gap:
  To measure end gap, insert piston ring into cylinder bore, locating it at the lowest part of bore and holding it true and square; then use a feeler gauge to measure gap. If the gap exceeds its limit, replace ring.

NOTE:
Decarbon and clean top of cylinder bore, before inserting piston ring.

Item		Standard	Limit
Piston ring end gap	Top ring	0.20 – 0.33 mm (0.0079 – 0.0129 in.)	0.7 mm (0.0275 in.)
	2nd ring	0.20 – 0.35 mm (0.0079 – 0.0137 in.)	0.7 mm (0.0275 in.)
	Oil ring	0.20 – 0.70 mm (0.0079 – 0.0275 in.)	1.8 mm (0.0708 in.)

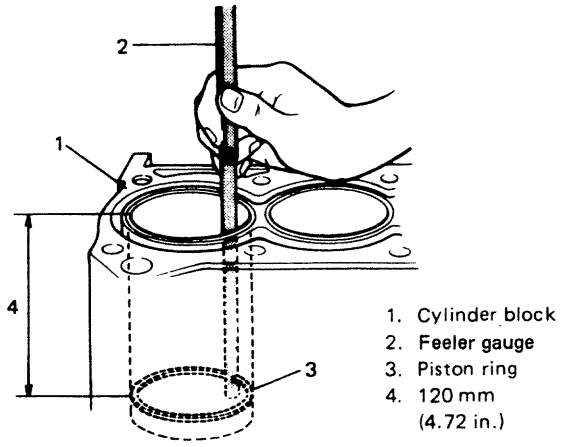


Fig. 3-5-33 Measuring piston ring end gap

Piston Pins

- Piston pin must be fitted into piston bore with an easy finger push at normal room temperature.
- Check piston pin and piston bore for wear or damage. If pin or piston bore is badly worn or damaged, replace pin or piston, or both.

Connecting Rods

- Big-end side clearance:
  Check big end of connecting rod for side clearance, with rod fitted and connected to its crank pin in the normal manner. If clearance measured is found to exceed its limit, replace connecting rod.

Item	Standard	Limit
Big-end side clearance	0.10 – 0.20 mm (0.0039 – 0.0078 in.)	0.35 mm (0.0137 in.)

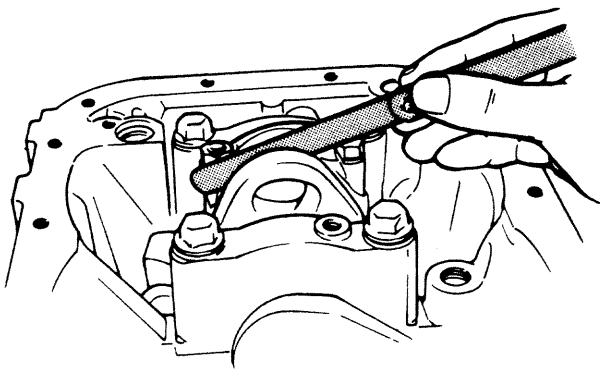


Fig. 3-5-34 Measuring side clearance

- Connecting rod alignment:
  Mount connecting rod on aligner to check it for bow and twist and, if either limit is exceeded, replace it.

Limit on bow	0.05 mm (0.0020 in.)
Limit on twist	0.10 mm (0.0039 in.)

Crank Pin and Connecting Rod Bearings

- Inspect crank pin for uneven wear or damage. Measure crank pin for out-of-round or taper with a micrometer. If crank pin is damaged, or out-of-round or taper is out of limit, replace crankshaft or regrind crank pin to undersize and use undersize bearing.

Connecting rod bearing size	Crank pin diameter
Standard	41.982 – 42.000 mm (1.6529 – 1.6535 in.)
0.25 mm (0.0098 in.) undersize	41.732 – 41.750 mm (1.6430 – 1.6437 in.)

Out-of-round and taper limit	0.01 mm (0.0004 in.)

- Rod bearing:
  Inspect bearing shells for signs of fusion, pitting, burn or flaking and observe contact pattern. Bearing shells found in defective condition must be replaced.
  Two kinds of rod bearing are available; standard size bearing and 0.25 mm undersize bearing. To distinguish them, 0.25 mm undersize bearing has stamped number (US025) on its backside as indicated in Fig. 3-5-35, but standard size one has no such number.

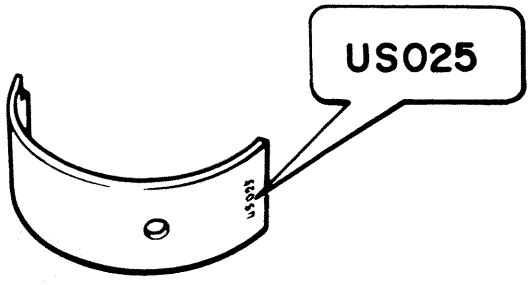
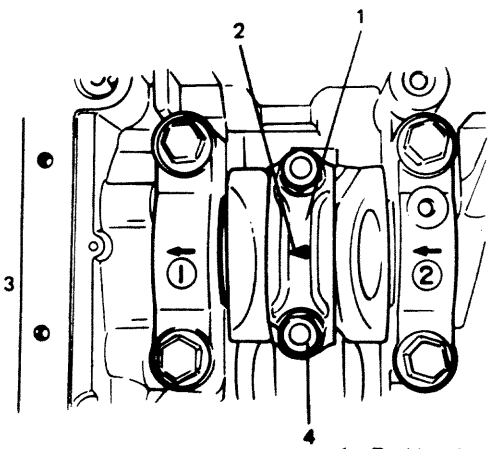


Fig. 3-5-35 0.25 mm undersize bearing

- Rod bearing clearance:

1) Before checking bearing clearance, clean bearing and crank pin.
2) Install bearing in connecting rod and bearing cap.
3) Place a piece of gaging plastic the full width of the crankpin as contacted by bearing (parallel to the crankshaft), avoiding the oil hole.
4) Install rod bearing cap to connecting rod. When installing cap, be sure to point arrow mark on cap to crankshaft pulley side, as indicated in Fig. 3-5-36. Tighten the cap nuts to the specified torque. DO NOT turn crankshaft with gaging plastic installed.

Tightening torque for rod bearing cap nuts	33 – 37 N·m 3.3 – 3.7 kg-m 24.0 – 26.5 lb-ft

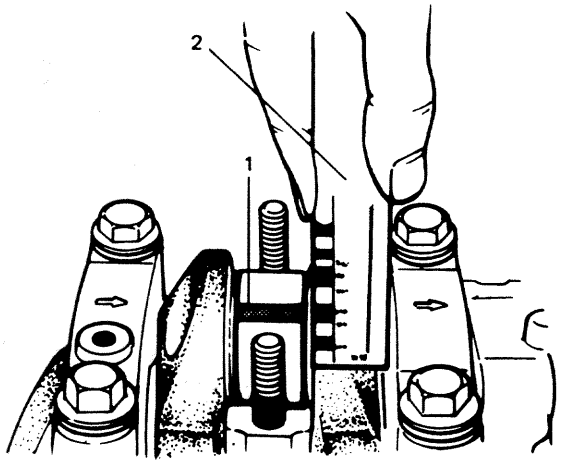


1. Rod bearing cap
2. Arrow mark
3. Crankshaft pulley side
4. Cap nut

Fig. 3-5-36 Installing bearing cap

5) Remove cap and using scale on gaging plastic envelope, measure gaging plastic width at the widest point.
If the clearance exceeds its limit, use a new standard size bearing and remeasure clearance.

	Standard	Limit
Bearing clearance	0.030 – 0.050 mm (0.0012 – 0.0019 in.)	0.080 mm (0.0031 in.)



1. Gaging plastic
2. Scale

Fig. 3-5-37 Measuring rod bearing clearance

6) If clearance can not be brought to within limit even by using a new standard size bearing, regrind crankpin to the undersize and use 0.25 mm undersize bearing.

Crankshaft

- Crankshaft runout:
  Using a dial gauge, measure runout at center journal. Rotate crankshaft slowly. If runout exceeds limit, replace crankshaft.

Limit on runout	0.06 mm (0.0023 in.)

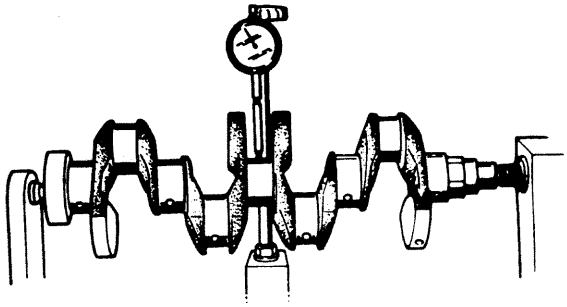


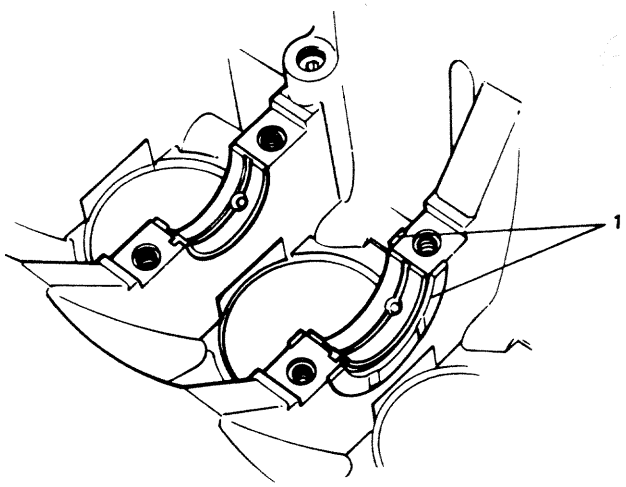
Fig. 3-5-38 Measuring runout

- Crankshaft thrust play:
  Measure this play with crankshaft set in cylinder block in the normal manner, that is, with thrust bearing fitted and journal bearing caps installed. Tighten bearing cap bolts to specified torque.
  Use a dial gauge to read displacement in axial (thrust) direction of crankshaft.
  If the limit is exceeded, replace thrust bearing with new standard one or oversize one to obtain standard thrust play.

Tightening torque for main bearing cap bolts	50 – 57 N·m 5.0 – 5.7 kg-m 36.5 – 41.0 lb-ft

Item	Standard	Limit
Crankshaft thrust play	0.11 – 0.31 mm (0.0044 – 0.0122 in.)	0.38 mm (0.0149 in.)

Thickness of crankshaft thrust bearing	Standard	2.50 mm (0.0984 in.)
	Oversize 0.125 mm (0.0049 in.)	2.563 mm (0.1009 in.)



1. Thrust bearing

Fig. 3-5-39 Thrust bearings

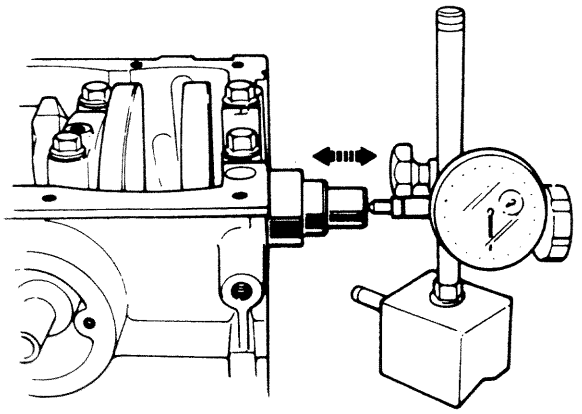


Fig. 3-5-40 Measuring thrust play of crankshaft

- Out-of-round and taper (uneven wear):
  An unevenly worn crankshaft journal shows up as a difference in diameter at a cross section or along its length (or both). This difference, if any, is to be determined from micrometer readings.
  If any of journals is badly damaged or if the amount of uneven wear in the sense explained above exceeds its limit, regrind or replace the crankshaft.

Limit on out-of-round and taper	0.01 mm (0.0004 in.)

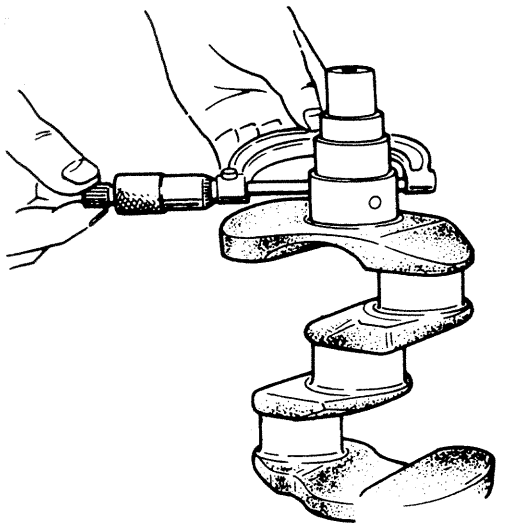
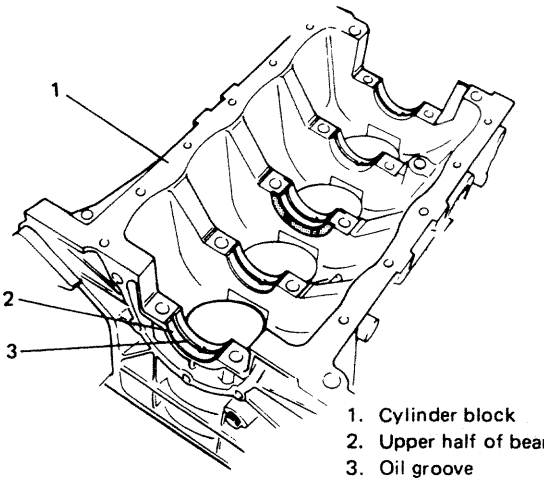


Fig. 3-5-41 Checking uneven wear

Crankshaft Main (Journal) Bearings

General informations:

- Service main bearings are available in standard-size and 0.25 mm (0.0098 in) undersize, and each of them has 5 kinds of bearings differing in tolerance.
- The upper half of bearing has oil groove as indicated in Fig. 3-5-42. Install this half with oil groove to cylinder block.

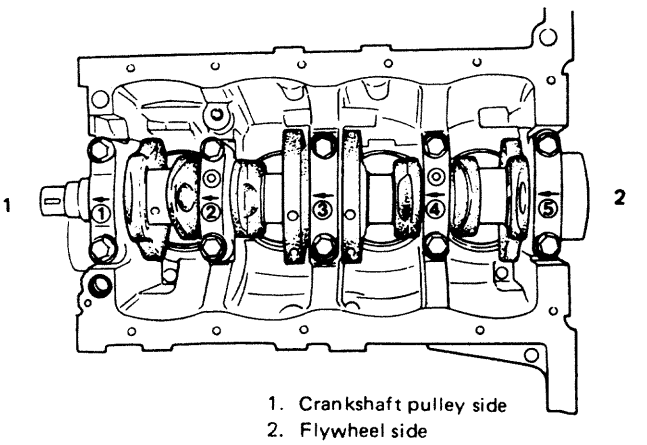


1. Cylinder block
2. Upper half of bearing
3. Oil groove

Fig. 3-5-42 Upper half of bearing installation

- On each main bearing cap, arrow mark and number are embossed as indicated in Fig. 3-5-43.
  When installing each bearing cap to cylinder block, point arrow mark toward crankshaft pulley side and install each cap from crankshaft pulley side to flywheel side in ascending order of numbers ①, ②, ③, ④ and ⑤. Tighten cap bolts to specified torque.

Tightening torque for main bearing cap bolt	50 – 57 N·m 5.0 – 5.7 kg-m 36.5 – 41.0 lb-ft



1. Crankshaft pulley side
2. Flywheel side

Fig. 3-5-43 Bearing caps installation

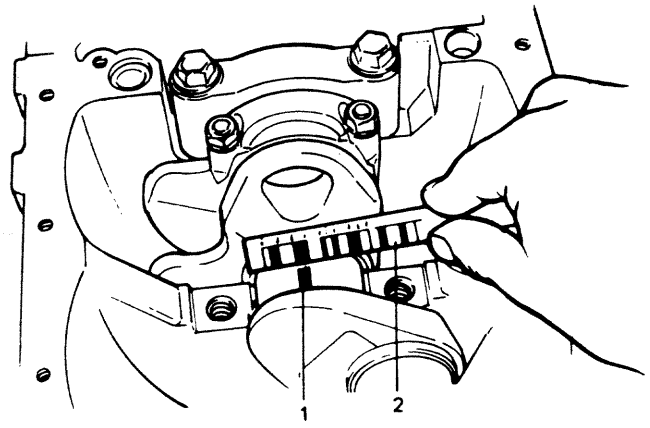
Inspect:
Check bearings for pitting, scratches, wear or damage. If any malcondition is found, replace both upper and lower halves. Never replace one half without replacing the other half.

Main bearing clearance:
Check clearance by using gaging plastic according to following procedure.
1) Remove bearing caps.
2) Clean bearings and main journals.
3) Place a piece of gaging plastic the full width of the bearing (parallel to the crankshaft) on journal, avoiding oil hole.
4) Install bearing cap as previously outlined and evenly torque cap bolts to specified torque. Bearing cap MUST be torqued to specification in order to assure proper reading.

NOTE:
Do not rotate crankshaft while gaging plastic is installed.

5) Remove cap, and using scale on gaging plastic envelop, measure gaging plastic width at its Widest point. If clearance exceeds its limit, replace bearing. Always replace both upper and lower inserts as a unit.
A new standard bearing may produce proper clearance. If not, it will be necessary to regrind crankshaft journal for use of 0.25 mm undersize bearing.
After selecting new bearing, recheck clearance.

	Standard	Limit
Bearing clearance	0.020 – 0.040 mm (0.0008 – 0.0016 in.)	0.060 mm (0.0023 in.)



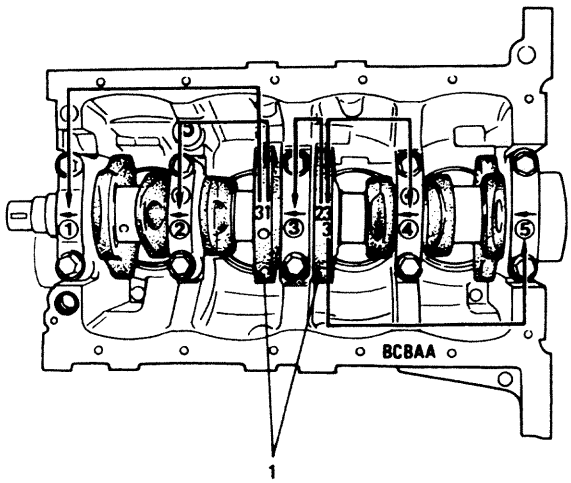
1. Gaging plastic
2. Scale

Fig. 3-5-44 Measuring main bearing clearance

Selection of main bearings:
STANDARD BEARING:
If bearing is in malcondition, or bearing clearance is out of specification, select a new standard bearing according to the following procedure and install it.
1) First check journal diameter as follows.
As shown in Fig. 3-5-45, crank webs of No. 2 and No. 3 cylinders have five stamped numerals.
Three kinds of numerals (1, 2 and 3) represent following journal diameters respectively.

Numeral stamped	Journal diameter
1	44.994 – 45.000 mm (1.7714 – 1.7716 in.)
2	44.988 – 44.994 mm (1.7712 – 1.7714 in.)
3	44.982 – 44.988 mm (1.7710 – 1.7712 in.)

The first, second, third, fourth and fifth (left to right) stamped numerals indicate the journal diameters at bearing caps "1", "2", "3" "4" and "5" respectively.
For example, in Fig. 3-5-45, the first (leftmost) numeral "3" indicates that journal dia. at bearing cap ① is within 44.982 – 44.988 mm, and second one "1" indicates that journal dia. at cap ② is within 44.994 – 45.000 mm.



1. Crank webs of No. 2 and 3 cylinder

Fig. 3-5-45 Stamped numerals on crank webs of No. 2 and No. 3 cylinders

2) Next, check bearing cap bore diameter without bearing.
On mating surface of cylinder block, five alphabets are stamped as shown in Fig. 3-5-46.
Three kinds of alphabets ("A", "B" and "C") represent following cap bore diameters.

Alphabet stamped	Bearing cap bore diameter (without bearing)
A	49.000 – 49.006 mm (1.9292 – 1.9294 in.)
B	49.006 – 49.012 mm (1.9294 – 1.9296 in.)
C	49.012 – 49.018 mm (1.9296 – 1.9298 in.)

The first, second, third, fourth and fifth (left to right) stamped alphabets indicate the cap bore diameter of bearing caps "1", "2", "3", "4" and "5" respectively.
For example, in Fig. 3-5-46, the first (leftmost) alphabet "B" indicates that the cap bore dia. of bearing cap ① is within 49.006 – 49.012 mm, and the fifth (rightmost) alphabet "A" indicates that the cap bore dia. of cap ⑤ is within 49.000 – 49.006 mm.

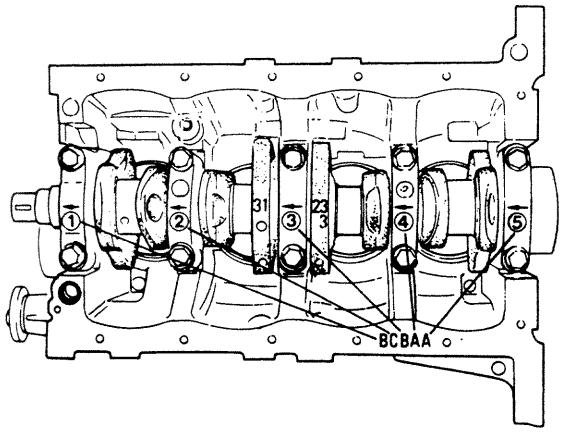
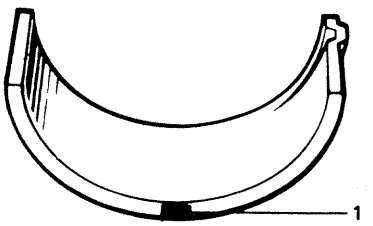


Fig. 3-5-46 Stamped alphabets on cylinder block

3) There are five kinds of standard bearings differing in thickness. To distinguish them, they are painted in following colors at the position indicated in Fig. 3-5-47.
Each color indicates the following thicknesses at center of bearing.

Color painted	Bearing thickness
Green	1.996 – 2.000 mm (0.0786 – 0.0787 in.)
Black	1.999 – 2.003 mm (0.0787 – 0.0788 in.)
Colorless (no paint)	2.002 – 2.006 mm (0.0788 – 0.0789 in.)
Yellow	2.005 – 2.009 mm (0.0789 – 0.0790 in.)
Blue	2.008 – 2.012 mm (0.0790 – 0.0791 in.)



1. Paint

Fig. 3-5-47 Paint on standard bearing

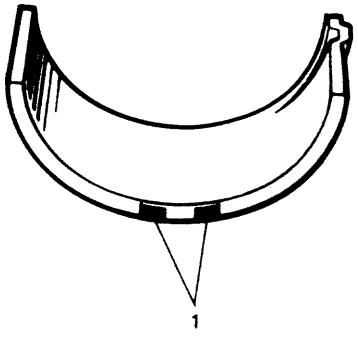
4) From the numeral stamped on crank webs of No. 2 and No. 3 cylinders and the alphabets stamped on mating surface of cylinder block, determine new standard bearing to be installed to the journal, by referring to the table shown below.
For example, if numeral stamped on crank web is "1" and alphabet stamped on mating surface is "B", install new standard bearing painted in "Black" to its journal.

		Numerals stamped on crank webs (Journals diameter)		
		1	2	3
Alphabets stamped on mating surface	A	Green	Black	Colorless
	B	Black	Colorless	Yellow
	C	Colorless	Yellow	Blue
	New standard bearing to be installed.			

5) Using gaging plastic, check bearing clearance with new standard bearing selected.
If clearance still exceeds its limit, use next thicker bearing and recheck clearance.
6) When replacing crankshaft or cylinder block due to any reason, select new standard bearings to be installed by referring to the numerals stamped on new crankshaft or the alphabets stamped on the mating surface of new cylinder block.

UNDERSIZE BEARING (0.25 mm):
- 0.25 mm undersize bearing is available in 5 kinds differing in thickness.
To distinguish them, each bearing is painted in following colors at position indicated in Fig. 3-5-48.
Each color indicates following thickness at center of bearing.

Color painted	Bearing thickness
Green & Red	2.121 – 2.125 mm (0.0835 – 0.0836 in.)
Black & Red	2.124 – 2.128 mm (0.0836 – 0.0837 in.)
Red only	2.127 – 2.131 mm (0.0837 – 0.0838 in.)
Yellow & Red	2.130 – 2.134 mm (0.0838 – 0.0839 in.)
Blue & Red	2.133 – 2.137 mm (0.0839 – 0.0840 in.)



1. Paint

Fig. 3-5-48 Paints on undersize bearing

- If crankshaft journal is necessary to be reground to undersize, regrind the journal and select undersize bearing to be used as follows.

1) Regrind journal to following finished diameter.

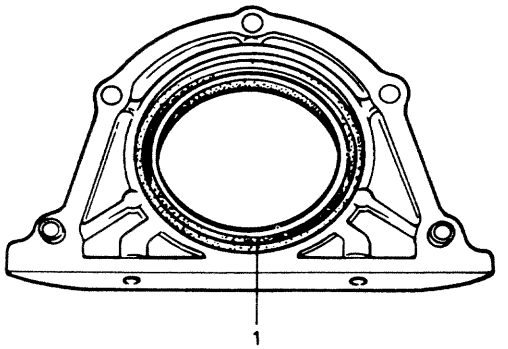
Finished diameter	44.732 –44.750 mm (1.7612 – 1.7618 in.)

2) Using micrometer, measure reground journal diameter. Measurement should be carried out in two directions perpendicular to each other in order to check for out-of-round.
3) From the journal diameter measured above and the alphabets stamped on mating surface of cylinder block, select the undersize bearing to be installed by referring to the table shown below.
Check bearing clearance with undersize bearing selected.

		Measured journal diameter		
		44.744 – 44.750 mm (1.7616 – 1.7618 in.)	44.738 – 44.744 mm (1.7614 – 1.7616 in.)	44.732 – 44.738 mm (1.7612 – 1.7614 in.)
Alphabets stamped on mating surface of cylinder block	A	Green & Red	Black & Red	Red only
	B	Black & Red	Red only	Yellow & Red
	C	Red only	Yellow & Red	Blue & Red
		Undersize bearing to be installed.		

Rear Oil Seal

Carefully inspect oil seal for wear or damage. If its lip is worn or damaged, replace oil seal.



1. Rear oil seal

Fig. 3-5-49 Rear oil seal

Flywheel

- If ring gear is damaged, cracked or worn, replace flywheel.
- If surface contacting clutch disc is damaged, or excessibly worn, replace flywheel.
- Check flywheel for face runout with a dial gauge.
  If runout is out of limit, replace flywheel.

Limit on runout	0.2 mm (0.0078 in.)

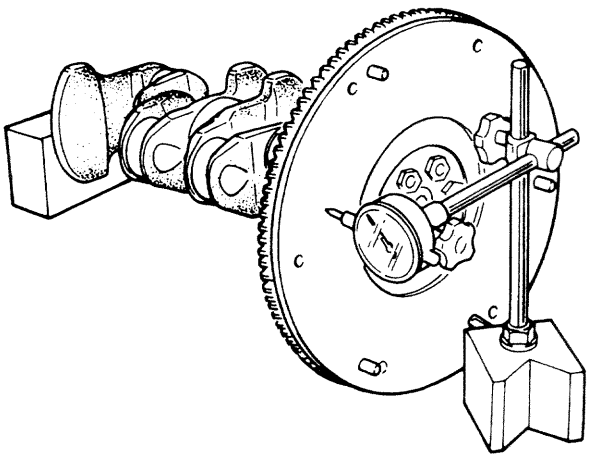


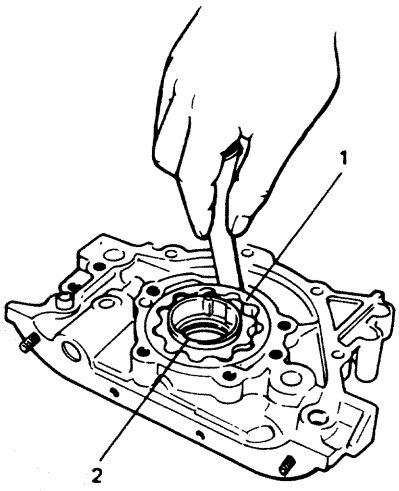
Fig. 3-5-50 Measuring runout

Oil Pump

1) Inspect oil seal lip for fault or other damage. Replace as necessary.
2) Inspect outer and inner rotors, rotor plate, and oil pump case for excessive wear or damage.

- Radial clearance:
  Check radial clearance between outer rotor and case, using thickness gauge.
  If clearance exceeds its limit, replace outer rotor or case.

Radial clearance between:	Limit on radial clearance
Outer rotor and case	0.310 mm (0.0122 in.)



1. Outer rotor
2. Inner rotor

Fig. 3-5-51 Radial clearances

- Side clearance:
  Using straight edge and thickness gauge, measure side clearance.

Limit on side clearance	0.15 mm (0.0059 in.)

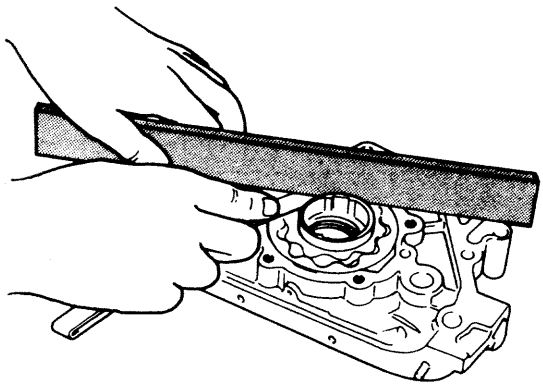


Fig. 3-5-52 Side clearance measurement

Timing Belt and Tensioner
- Inspect timing belt for wear or crack. Replace it as necessary.
- Inspect tensioner for smooth rotation.

3-6. ENGINE REASSEMBLY

NOTE:
- **All parts to be used in reassembly must be perfectly clean.**
- **Oil sliding and rubbing surfaces of engine parts just before using them in reassembly. Use engine oil (Refer to page 1-8).**
- **Have liquid packing ready for use. SUZUKI BOND NO. 1215 is specified for it. Use it wherever its use is specified in order to ensure leak-free (oil and water) workmanship of reassembly.**
- **There are many running clearances. During the course of engine reassembly, be sure to check these clearances, one after another, as they form.**
- **Gaskets, "O" rings and similar sealing members must be in perfect condition. For these members, use replacement parts in stock.**
- **Tightening torque is specified for important fasteners — mainly bolts and nuts —of the engine and other components. Use torque wrenches and constantly refer to the specified values given on p. 3-58.**
- **Do not disregard match marks provided on parts. Some of them are those given at the time of disassembly.**
- **There are many sets of parts. Crankshaft bearings, connecting rods, pistons, etc., are in combination sets. Do not disturb such combinations and make sure that each part goes back to where it came from.**

Engine reassembly is the reverse of engine disassembly as far as sequence is concerned, but there are many reassembling steps that involve measures necessary for restoring engine as close to factory-assembled condition as possible. Only those steps will be dealt with here.

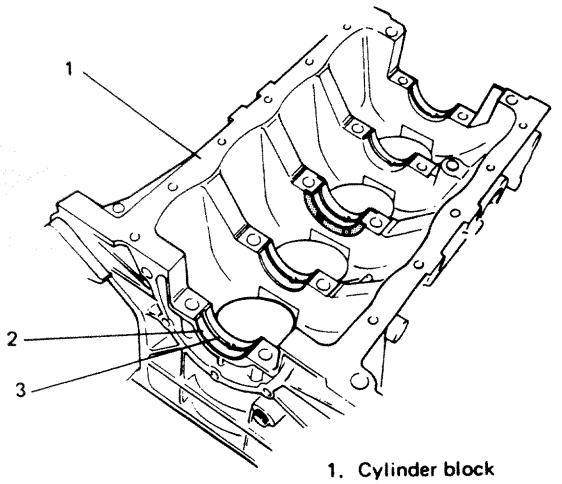
Crankshaft

1) Install main bearings to cylinder block.

NOTE:

If main bearing replacement is necessary, select such bearing as to allow proper clearance as described on p. 3-30 and install it in place.

Between two halves of main bearing, one side has oil groove. Install this half with oil groove to cylinder block, and another half without oil groove to bearing cap.
Make sure that two halves are painted with same color.



1. Cylinder block
2. Upper half of bearing
3. Oil groove

Fig. 3-6-1 Installing bearing half with oil groove

2) Be sure to oil crankshaft journal bearings as shown.

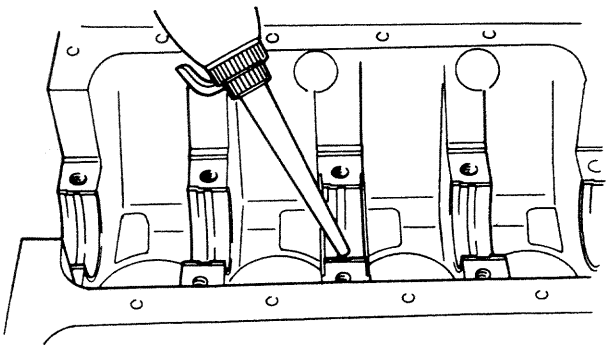
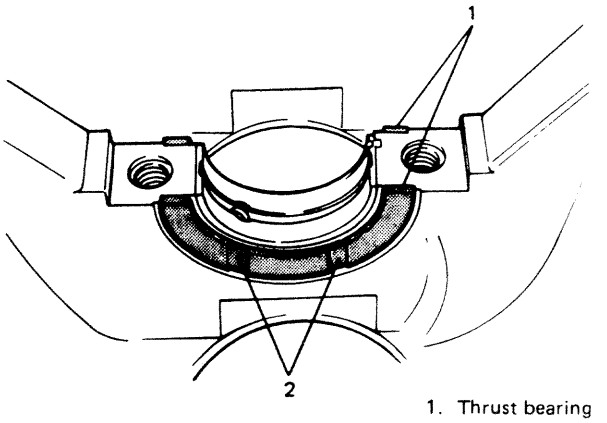


Fig. 3-6-2

3) Install thrust bearings to cylinder block between No. 2 and No. 3 cylinders. Face oil groove sides to crank webs.



1. Thrust bearing
2. Oil groove

Fig. 3-6-3 Installing thrust bearing

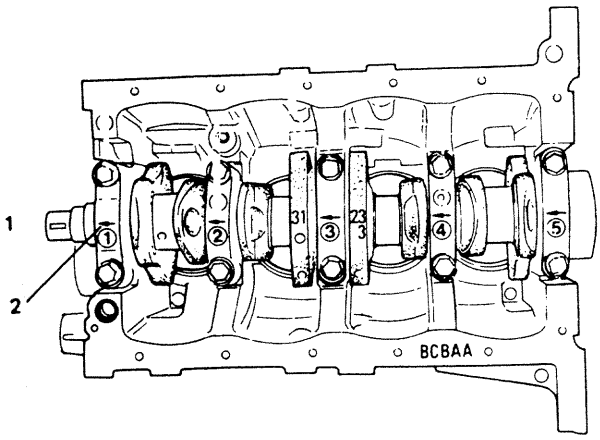
4) Install crankshaft to cylinder block.
5) Oil crankshaft journals.
6) When fitting bearing caps to journals after setting crankshaft in place, be sure to point arrow mark (on each cap) to crankshaft pulley side. Fit them sequentially in ascending order, 1, 2, 3, 4 and 5, starting from pulley side.

Tightening torque for main bearing cap bolts	50 – 57 N·m 5.0 – 5.7 kg-m 36.5 – 41.0 lb-ft

Gradual and uniform tightening is important for bearing cap bolts. Make sure that five caps become tight equally and uniformly specified torque.

NOTE:

After tightening cap bolts, check to be sure that crankshaft rotates smoothly when turned by hand.



1. Crankshaft pulley side
2. Arrow mark

Fig. 3-6-4 Installing main bearing caps

Oil Seal Housing

Install oil seal housing and its gasket.

Install new gasket. Do not reuse gasket removed in disassembly. Apply oil to oil seal lip before installing. Tighten housing bolts to specification.

After installing oil seal housing, gasket edges might bulge out; if so, cut off edges to flush with cylinder block and oil seal housing.

Tightening torque for housing bolts	10 – 13 N·m 1.0 – 1.3 kg-m 7.5 – 9.0 lb-ft

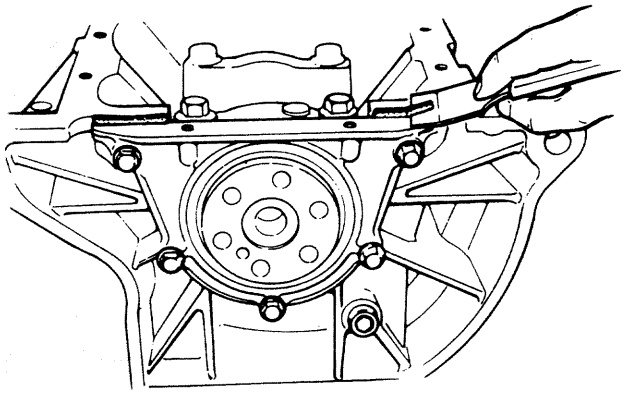


Fig. 3-6-5 Cutting off edges of gasket

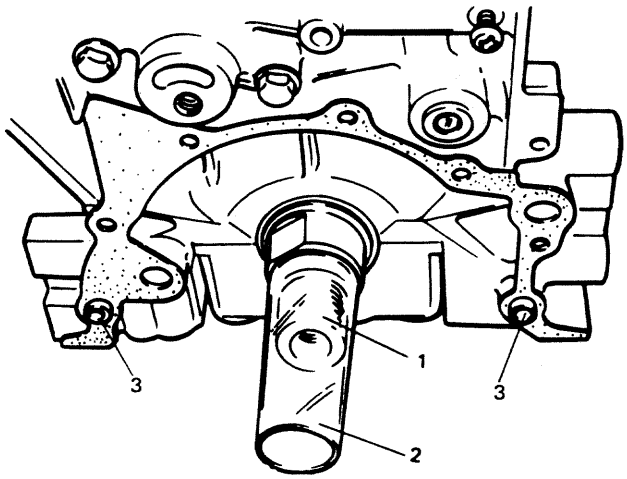
Oil Pump

NOTE:

Reassemble components of oil pump assembly according to following procedure, if disassembled.

a) Wash, clean and then dry all disassembled parts.
b) Apply thin coat of engine oil to inner and outer rotors, oil seal lip portion, and inside surfaces of oil pump case and plate.
c) Install outer and inner rotors to pump case.
d) Install gear plate. Tighten 5 screws securely.
e) After installing plate, check to be sure that gears turn smoothly by hand.

1) Install two oil pump pins and oil pump gasket to cylinder block. Use new gasket.
2) To prevent oil seal lip from being damaged or upturned when installing oil pump to crankshaft, fit oil seal guide (special tool) to crankshaft, and apply engine oil to it.

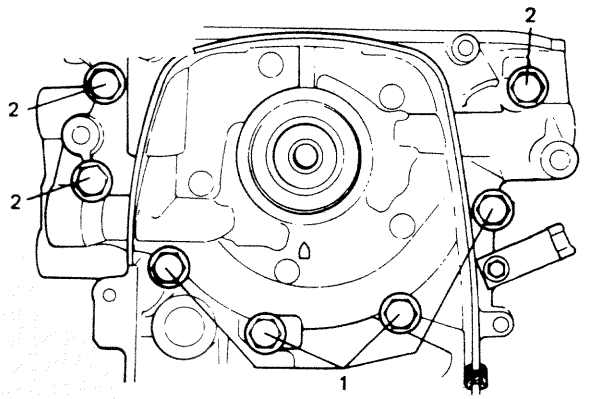


1. Crankshaft
2. Oil seal guide (Vinyl resin) (Special tool 09926-18210)
3. Oil pump pin

Fig. 3-6-6 Special tool (Oil seal guide) installation

3) Install oil pump to crankshaft and cylinder block. Install No. 1 and No. 2 bolts as shown in Fig. 3-6-7, and tighten them to specified torque.
After installing oil pump, check to be sure that oil seal lip is not upturned, and then remove special tool.

Tightening torque for No. 1 and No. 2 bolts	9 – 12 N·m 0.9 – 1.2 kg-m 7.0 – 8.5 lb-ft



1. No. 1 bolts (short)
2. No. 2 bolts (long)

Fig. 3-6-7

4) Edge of oil pump gasket might bulge out: if it does, cut bulge off with a sharp knife, making edge smooth and flush with end faces of the pump case and cylinder block.

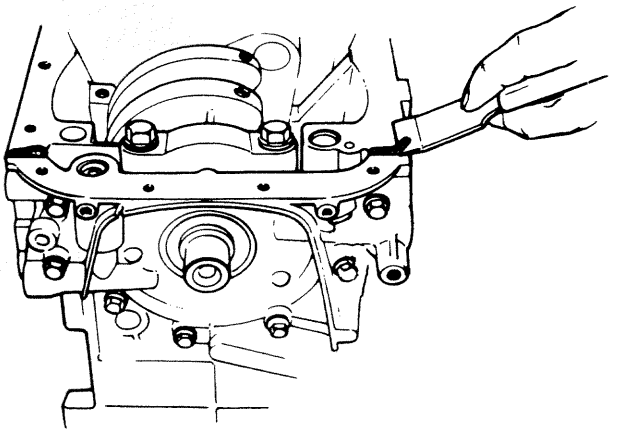


Fig. 3-6-8 Cutting the edge of gasket

Piston, Connecting Rod and Piston Rings

NOTE:
Two sizes of piston are available as standard size spare part so as to ensure proper piston-to-cylinder clearance. When installing a standard size piston, make sure to match piston with cylinder as follows.

a) Each piston has a stamped number 1 or 2 as shown depending on its outer diameter.

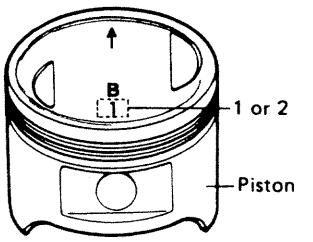


Fig. 3-6-9

b) There are also stamped numbers of 1 and 2 on cylinder block as shown below. First number indicates inner diameter of No. 1 cylinder, second number of No. 2 cylinder, third number of No. 3 cylinder and fourth number of No. 4 cylinder.

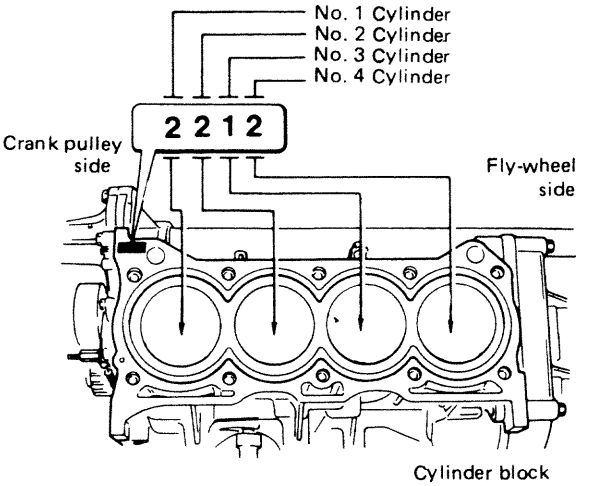


Fig. 3-6-10

c) Use a number 2 stamped piston for installation if cylinder is identified with number 2 and a number 1 piston for cylinder with number 1.

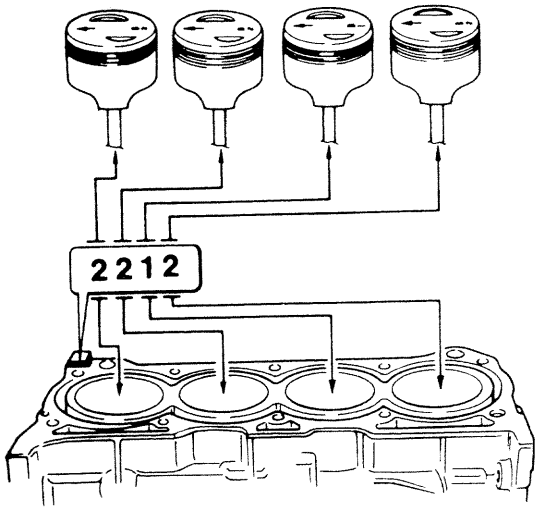


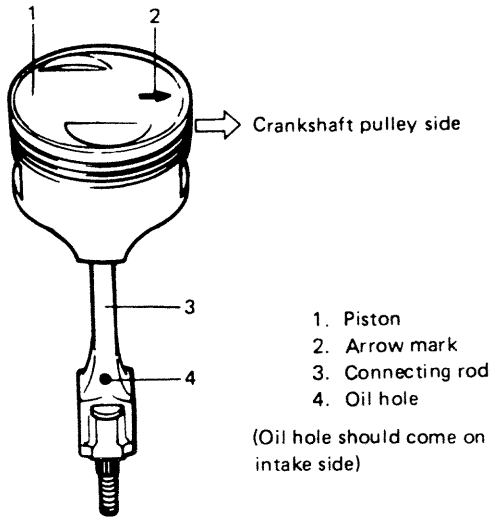
Fig. 3-6-11

Piston		Cylinder		Piston-to-cylinder clearance
Number at the top (mark)	Outside diameter	Number (mark)	Bore diameter	
1	73.98 - 73.99mm (2.9126 - 2.9130in.)	1	74.01 - 74.02mm (2.9138 - 2.9142in.)	0.02 - 0.04mm (0.0008 - 0.0015in.)
2	73.97 - 73.98mm (2.9122 - 2.9126in.)	2	74.00 - 74.01 mm (2.9134 - 2.9138in.)	0.02 - 0.04mm (0.0008 - 0.0015in.)

Also, a letter A, B, C etc., is stamped on piston head but ordinarily it is not necessary to discriminate each piston by this number.

1) Install connecting rod to piston.

① After applying engine oil to piston pin holes in piston and connecting rod, fit connecting rod to piston as prescribed in Fig. 3-6-12.

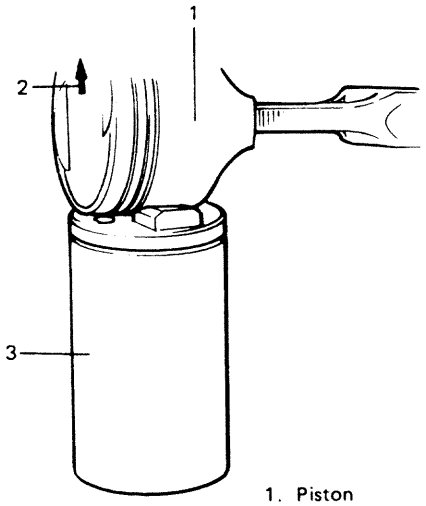


1. Piston
2. Arrow mark
3. Connecting rod
4. Oil hole

(Oil hole should come on intake side)

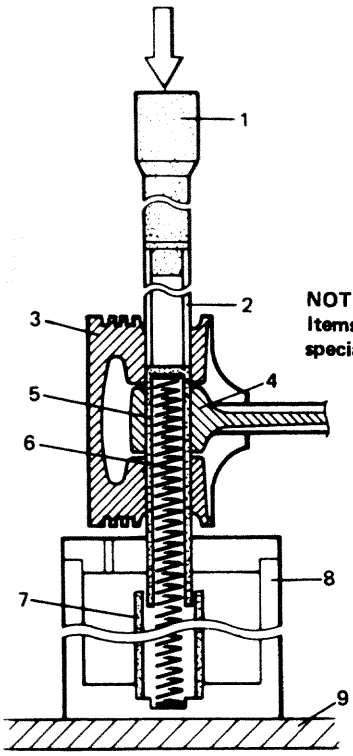
Fig. 3-6-12 Fitting connecting rod to piston

② Place piston on piston pin remover and installer (special tool) as indicated in Fig. 3-6-13, and press piston pin into piston and connecting rod (Fig. 3-6-14).



1. Piston
2. Arrow mark
3. Piston pin remover and installer (Special tool 09910-38210)

Fig. 3-6-13 Fitting piston to special tool

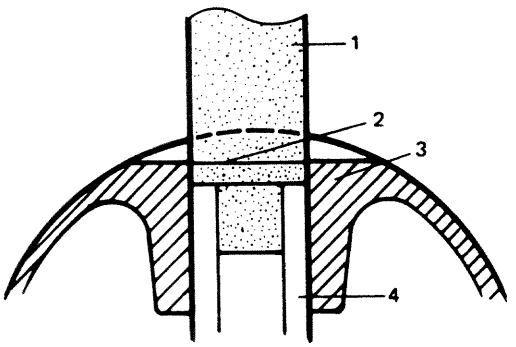


NOTE:
Items 1, 5, 6, 7 and 8 are in special tool (09910-38210).

1. Driver handle
2. Piston pin
3. Piston
4. Connecting rod
5. Piston pin guide
6. Guide spring
7. Spring retainer
8. Base
9. Support

Fig. 3-6-14 Installing piston pin

③ Press piston pin until line marked on driver handle is flush with flat surface of piston (Fig. 3-6-15).

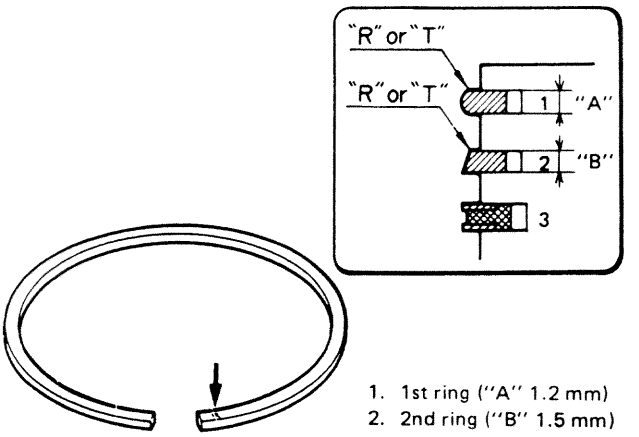


1. Driver handle
2. Line
3. Piston
4. Piston pin

Fig. 3-6-15 Line marked on driver handle

2) Install piston rings to piston.

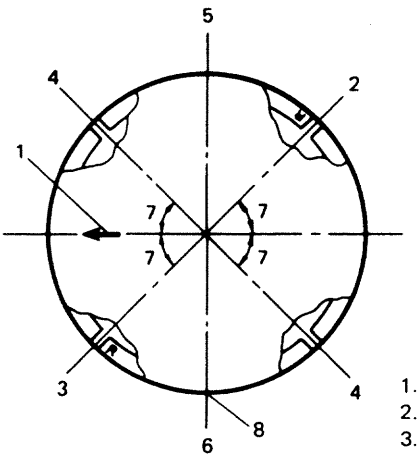
- As indicated in Fig. 3-6-16, 1st and 2nd rings have "R" or "T" mark. Installing these piston rings to piston with marked side of each ring faced foward top of piston.
- 1st ring differs from 2nd ring in thickness, shape and color of the surface contacting cylinder wall.
  Distinguish 1st ring from 2nd ring by referring to Fig. 3-6-16.
- When installing oil ring, install spacer first and then two rails.



1. 1st ring ("A" 1.2 mm)
2. 2nd ring ("B" 1.5 mm)
3. Oil ring

Fig. 3-6-16 Piston rings installation

- After installing 3 rings (1st, 2nd and oil rings), distribute their end gaps as shown in Fig. 3-6-17.



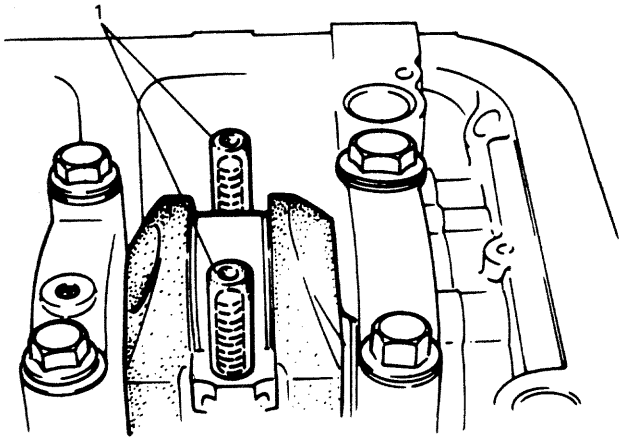
1. Arrow mark
2. 1st ring end gap
3. 2nd ring end gap
4. Oil ring rail gaps
5. Intake side
6. Exhaust side
7. 45°
8. Oil ring spacer gap

Fig. 3-6-17 Piston ring end gaps positions

3) Install piston and connecting rod assembly into cylinder bore.

① Apply engine oil to pistons, rings, cylinder walls, connecting rod bearings and crankpins.

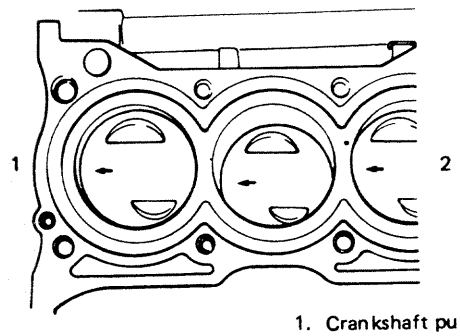
② Put guide hoses over connecting rod bolts as shown in Fig. 3-6-18. These guide hoses protect crankpin and thread of rod bolt from damage during installation of connecting rod and piston assembly.



1. Guide hoses

Fig. 3-6-18 Guide hoses installation

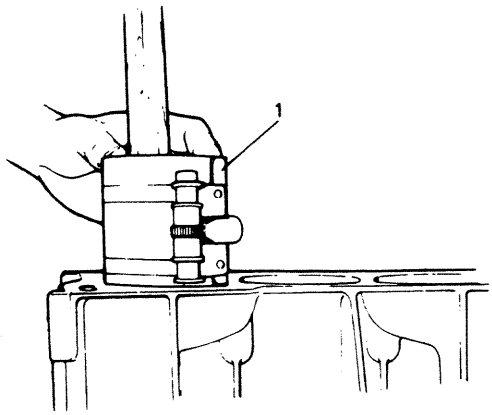
③ When installing piston and connecting rod assembly into cylinder bore, point arrow mark on each piston head to crankshaft pulley side.



1. Crankshaft pulley side
2. Flywheel side

Fig. 3-6-19 Direction of arrow mark on piston head

④ Use piston ring compressor (Special tool) to compress rings. Guide connecting rod into place on the crankshaft.
Using a hammer handle, tap piston head to install piston into bore. Hold ring compressor firmly against cylinder block until all piston rings have entered cylinder bore.

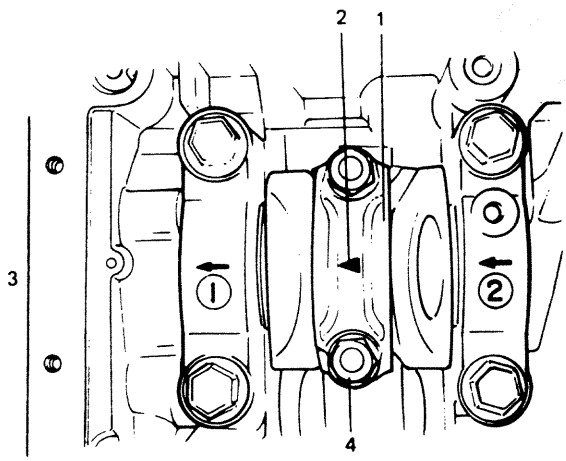


1. Piston ring compressor (Special tool 09916-77310)

Fig. 3-6-20 Installing piston to cylinder

4) Install connecting rod bearing cap.
When installing cap to rod, point arrow mark on cap to crankshaft pulley side.
Tighten cap nuts to specification.

Tightening torque for rod bearing cap nuts	33 – 37 N·m 3.3 – 3.7 kg-m 24.0 – 26.5 lb-ft



1. Bearing cap
2. Arrow mark
3. Crankshaft pulley side
4. Cap nut

Fig. 3-6-21 Installing bearing cap

Oil Pump Strainer

Install seal in the position shown in Fig. 3-6-22. Tighten strainer bolt first and bracket bolt to specified torque.

Tightening torque for bolts	9 – 12 N·m 0.9 – 1.2 kg-m 6.5 – 8.5 lb-ft

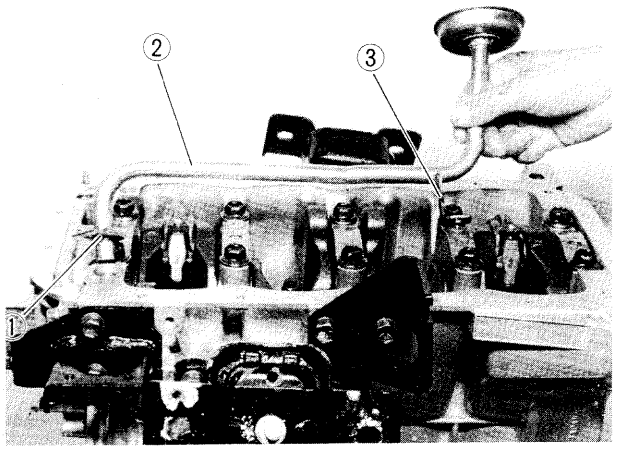
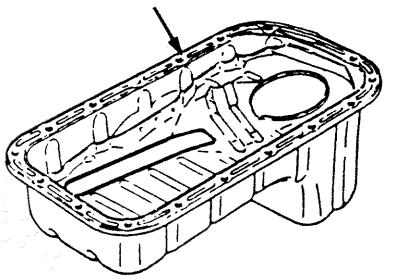


Fig. 3-6-22 Installing seal

1. Seal
2. Strainer
3. Bracket

Oil Pan

1) Clean mating surfaces of oil pan and cylinder block. Remove oil, old sealant, and dusts from mating surfaces.
After cleaning, apply silicon type sealant to oil pan mating surface continuously as shown in Fig. 3-6-23.



Sealant (99000-31150)

Fig. 3-6-23 Applying sealant to oil pan

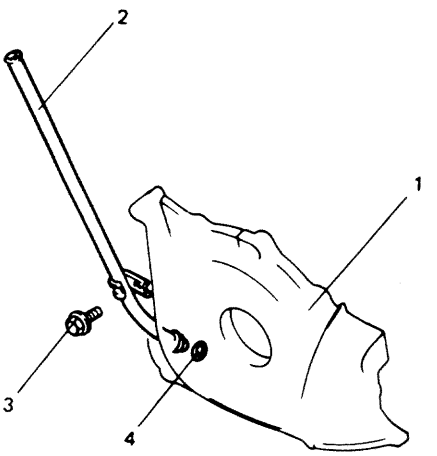
2) Install oil pan to cylinder block.
After fitting oil pan to block, run in securing bolts and start tightening at the center: move wrench outward, tightening one bolt at a time.
Tighten bolts to specified torque.

Tightening torque for oil pan bolts	9 – 12 N·m 0.9 – 1.2 kg-m 7.0 – 8.5 lb-ft

3) Install gasket and drain plug to oil pan.
Tighten drain plug to specified torque.

Tightening torque for drain plug	30 – 40 N·m 3.0 – 4.0 kg-m 22.0 – 28.5 lb-ft

4) Install guide seal to pump case and then oil level gauge guide.



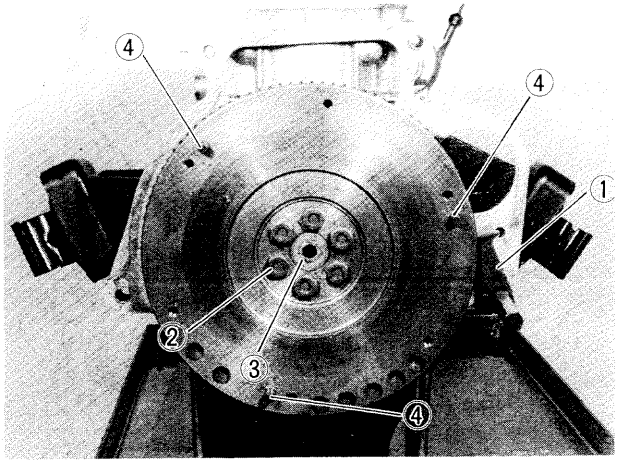
1. Oil pump
2. Oil level gauge guide
3. Guide bolt
4. Guide seal

Fig. 3-6-24 Oil level gauge guide

Flywheel

Install flywheel to crankshaft.
Using special tool, lock flywheel, and tighten flywheel bolts to specification.

Tightening torque for flywheel bolts	57 – 65 N·m 5.7 – 6.5 kg-m 41.5 – 47 lb-ft



1. Flywheel holder (Special tool 09924-17810)
2. Flywheel bolts
3. Input shaft end bearing
4. Locating pin

Fig. 3-6-25

Cylinder Head

NOTE:

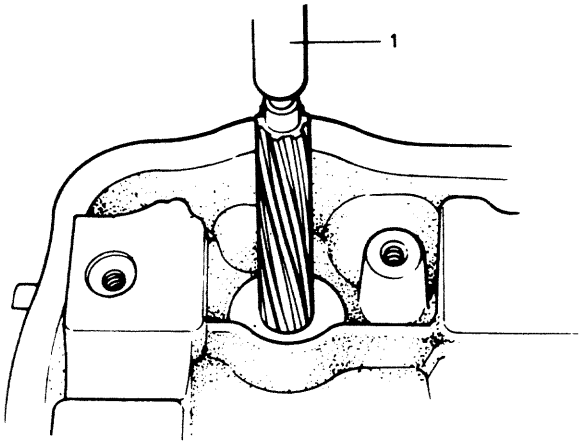
- **Do not reuse valve guide once disassembled. Install new valve guide (Oversize).**
- **Intake and exhaust valve guides are identical.**

Valve guide oversize	0.03 mm (0.0012 in.)
Valve guide protrusion (In and Ex)	14 mm (0.55 in.)

1) Install new valve guide into cylinder head.

a) Before installing new valve guide into cylinder head, ream guide hole with 12 mm reamer (Special tool) to remove burrs, making sure that guide hole diameter after reaming comes within specified range.

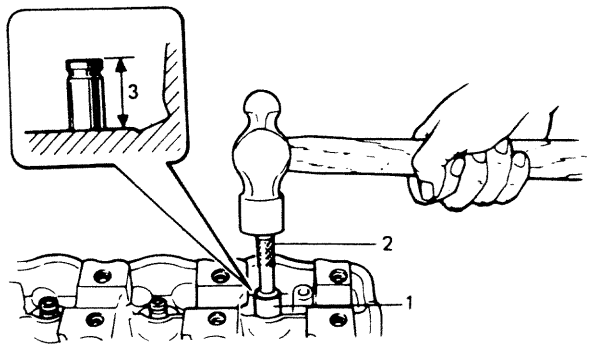
Valve guide hole Dia. (In & Ex)	12.030 – 12.048 mm (0.4736 – 0.4743 in.)



1. 12 mm reamer (Special tool 09916-37310)

Fig. 3-6-26 Reaming guide hole

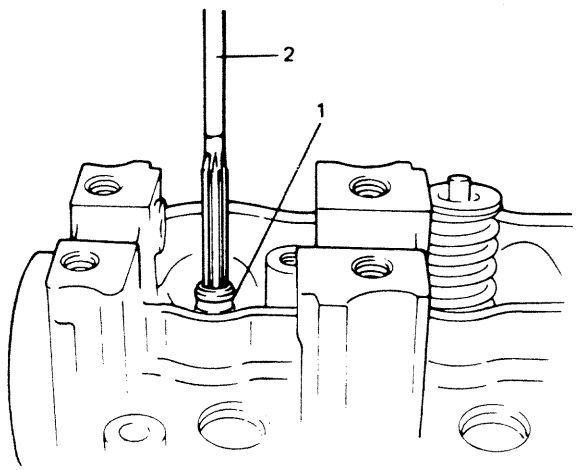
b) Install valve guide to cylinder head.
Heat cylinder head uniformly at a temperature of 80 to 100°C (176 to 212°F), using care not to distort head, and drive new valve guide into hole with special tools. Refer to Fig. 3-6-27.
Drive in new valve guide until valve guide installer(Special tool) contacts cylinder head. After installation, make sure that valve guide protrudes by 14 mm from cylinder head (Fig. 3-6-27).



1. Valve guide installer attachment (Special tool 09917-88210)
2. Valve guide installer handle (Special tool 09916-57321)
3. Valve guide protrusion (14 mm)

Fig. 3-6-27 Valve guide installation

c) Ream valve guide bore with 7 mm reamer (Special tool).
After reaming, clean bore.



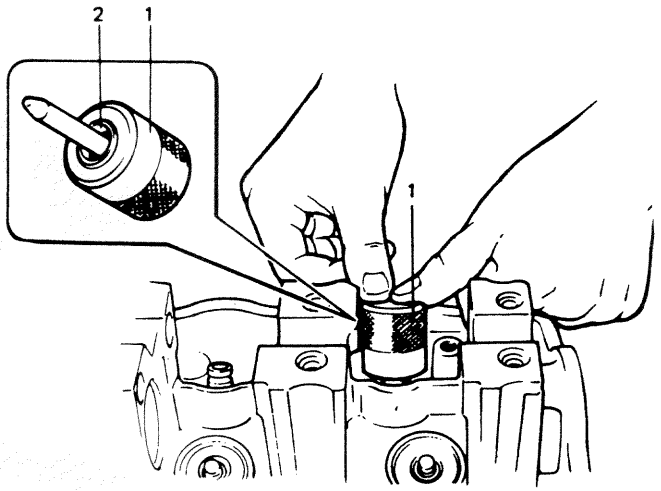
1. Valve guide
2. 7 mm reamer (Special tool 09916-34520)

Fig. 3-6-28 Reaming valve guide bore

2) Install valve spring seat to cylinder head.
3) Install new valve stem seal to valve guide.
After applying engine oil to seal and spindle of valve stem seal installer (special tool), fit oil seal to spindle, and then install seal to valve guide by pushing special tool by hand.
After installation, check to be sure that seal is properly fixed to valve guide.

NOTE:

- **Do not reuse oil seal disassembled. Be sure to install new oil seal.**
- **When installing, never tap or hit special tool with a hammer or else. Install seal to guide only by pushing special tool with hand. Tapping or hitting special tool may cause damage on seal.**



1. Valve stem seal installer (Special tool 09917-98210)
2. Valve stem seal

Fig. 3-6-29 Valve stem seal installation

4) Install valve to valve guide.
Before installing valve to valve guide, apply engine oil to stem seal, valve guide bore, and valve stem.

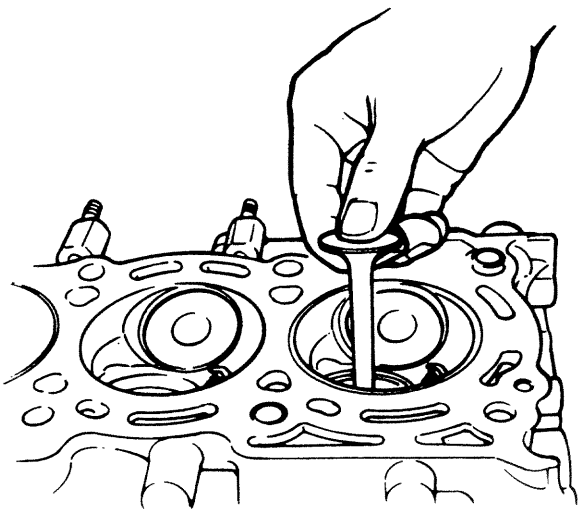
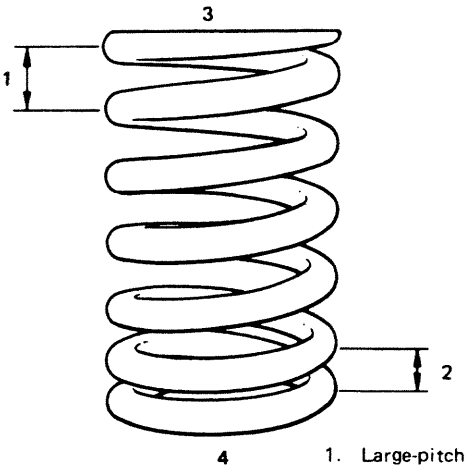


Fig. 3-6-30 Valve installation

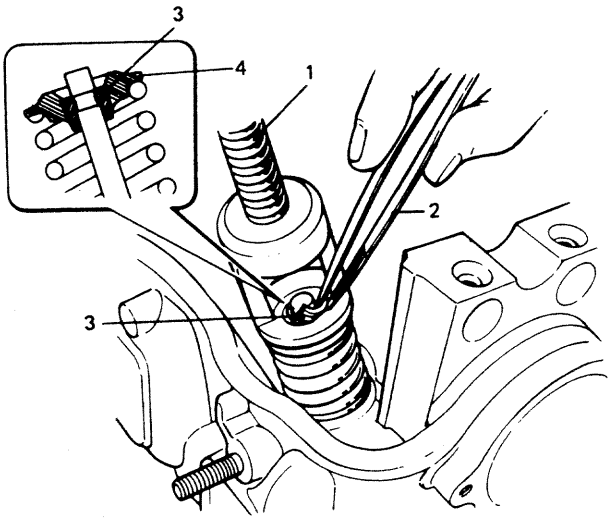
5) Install valve spring and spring retainer.
Each valve spring has top end (large-pitch end) and bottom end (small-pitch end). Be sure to position spring in place with its bottom end (small-pitch end) down to valve spring seat side.



1. Large-pitch
2. Small-pitch
3. Valve spring retainer side
4. Valve spring seat side

Fig. 3-6-31 Valve spring installation

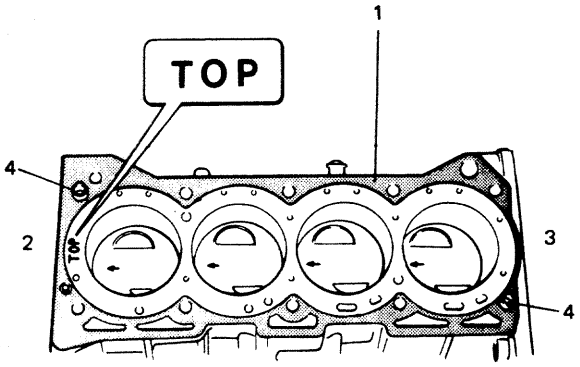
6) Using special tool (Valve lifter), compress valve spring and fit two valve cotters to groove provided in valve stem.



1. Valve lifter (Special tool)
2. Forceps (Special tool)
3. Valve cotters
4. Valve spring retainer

Fig. 3-6-32 Valve cotters installation

7) Be sure that locating pins ④ are in place and then install new head gasket as shown in Fig. 3-6-33, namely in such a way that "TOP" mark provided on the gasket comes on top side (toward cylinder head side) and on crankshaft pulley side.



1. Cylinder head gasket
2. Crankshaft pulley side
3. Flywheel side
4. Locating pin

Fig. 3-6-33 Cylinder head gasket installation

8) Install cylinder head onto cylinder block. Tighten cylinder head bolts gradually with a torque wrench, following sequence in Fig. 3-6-34. Finally tighten bolts to specified torque.

Tightening torque for cylinder head bolts	63 – 70 N·m 6.3 – 7.0 kg-m 46.0 – 50.5 lb-ft

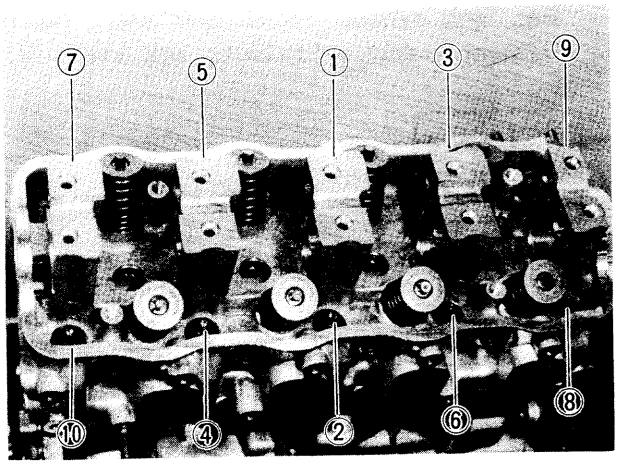


Fig. 3-6-34 Tightening sequence of cylinder head bolts

Camshaft

1) Apply engine oil to cams and journals on camshaft, and oil seal on cylinder head.
2) Install to cylinder head from transmission case side.

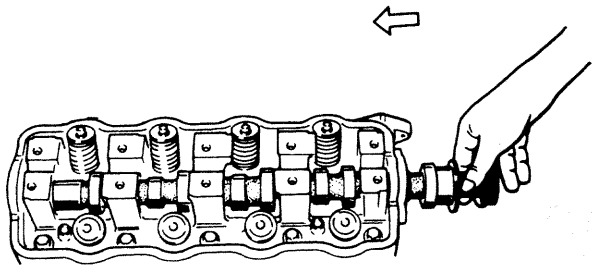
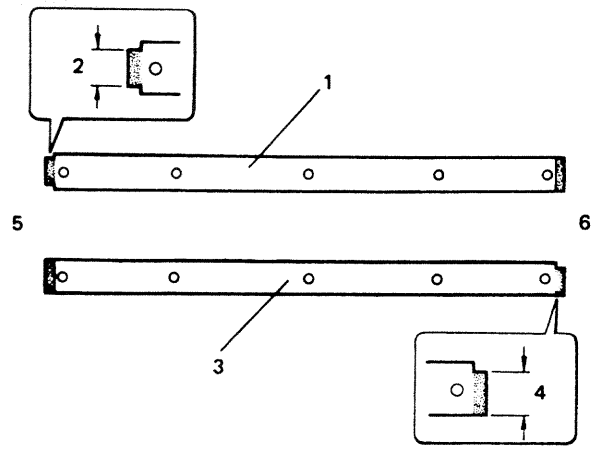


Fig. 3-6-35 Camshaft installation

Rocker-Arm Shafts

1) Apply engine oil to rocker arms and rocker arm shafts.
2) Install rocker arms, springs and rocker arm shafts.
   The two rocker arm shafts are not identical. To distinguish between the two, dimensions of their stepped ends differ as shown in Fig. 3-6-36. Install intake rocker arm shaft, facing its stepped end to camshaft pulley side, and exhaust rocker arm shaft, facing its stepped end to distributor side (rear side).



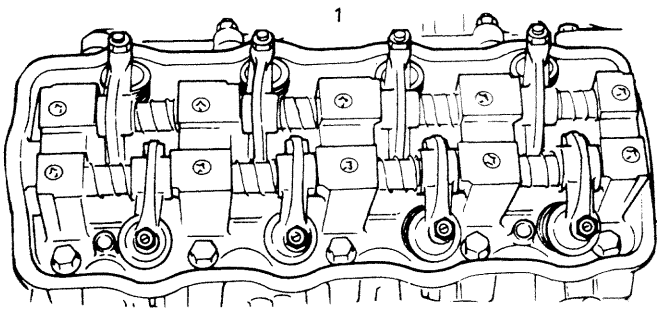
1. Intake rocker arm shaft
2. 14 mm (0.55 in)
3. Exhaust rocker arm shaft
4. 15 mm (0.59 in)
5. Camshaft pulley side
6. Distributor side

Fig. 3-6-36 Rocker arm shafts installation

3) After installing rocker arms, springs, and rocker arm shafts as shown in Fig. 3-6-37, tighten rocker arm shaft screws to specified torque.

Tightening torque for rocker arm shaft screws	9 – 12 N·m 0.9 – 1.2 kg-m 7.0 – 8.5 lb-ft

NOTE:
Valve clearance is adjusted after all parts are assembled. So it is not adjusted at this point. Leave rocker arm adjusting screw as loose as can be.



1. Intake side
2. Exhaust side

Fig. 3-6-37

Water Inlet Pipe

Install water inlet pipe to cylinder block.

Make sure to fit seal ring ①(O-ring) to inlet pipe before installation.

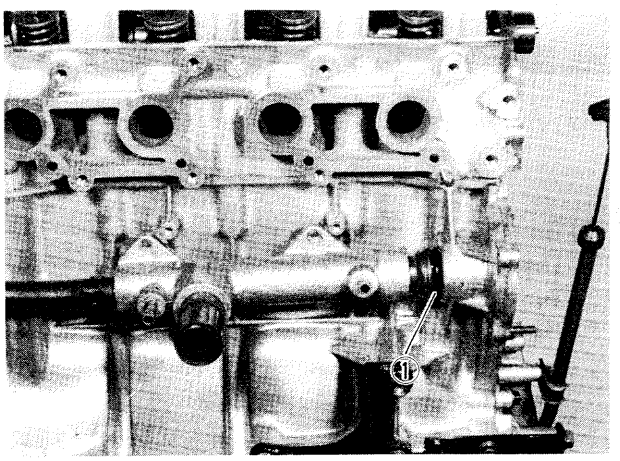


Fig. 3-6-38

Intake Manifold and Carburetor

1) Install intake manifold gasket to cylinder head. Use new gasket.

NOTE:
Clean cylinder head mating surface with gasket before installation.

2) Install intake manifold with carburetor to cylinder head.
3) Tighten manifold bolts and nuts to specified torque.

Tightening torque for manifold bolts and nuts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5–20.0

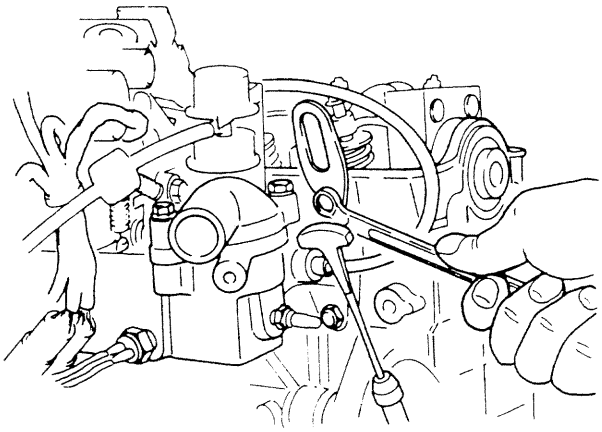


Fig. 3-6-39

4) Connect water hoses to water inlet pipe and clamp each hose.

Oil Filter

Install oil filter.

> **CAUTION:**
> **For oil filter installation, refer to P. 1-7 of this manual.**

Exhaust Manifold and Cover

1) Install exhaust manifold gasket to cylinder head.
   Use new gasket.

NOTE:
Clean cylinder head mating surface with gasket before installation.

2) Install exhaust manifold to cylinder head.
3) Tighten bolts and nuts to specified torque.

Tightening torque for bolts and nuts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

4) Install exhaust manifold cover.

Water pump

1) Install water pump gasket to cylinder block.
   Use new gasket.

NOTE:
Clean cylinder block mating surface with gasket before installation.

2) Install water pump to cylinder block.
3) Tighten bolts and nuts to specified torque.

Tightening torque for water pump bolts and nuts	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

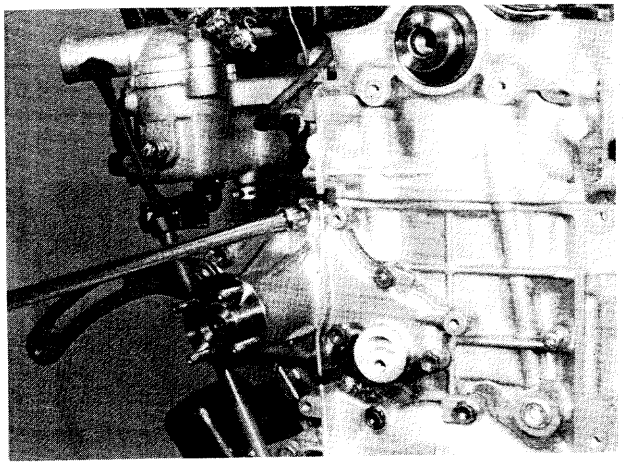


Fig. 3-6-40

4) Install rubber seats ①; one between oil pump and water pump and the other between water pump and cylinder head.

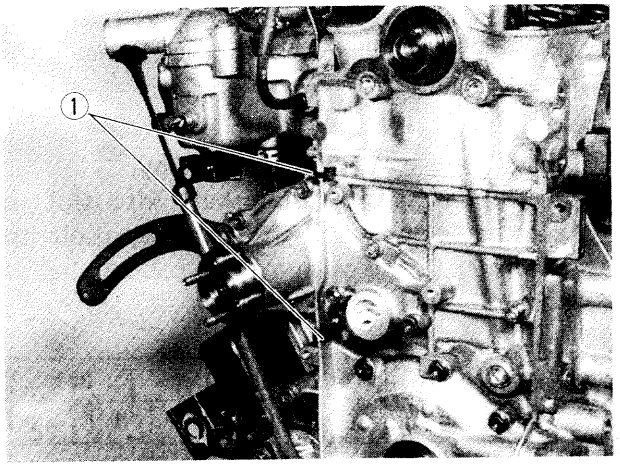
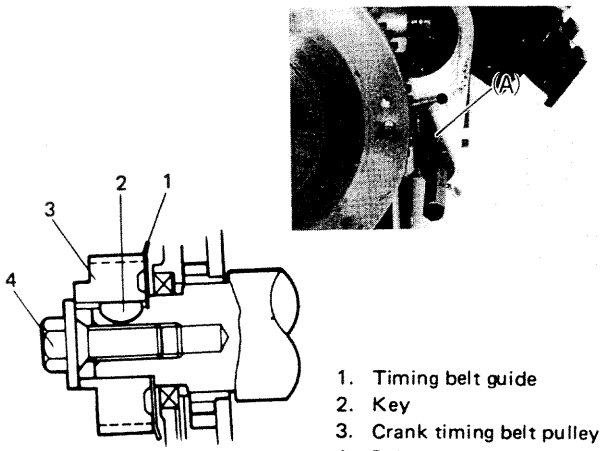


Fig. 3-6-41

Timing Belt Inside Cover, Belt Pulleys, Tensioner, Timing Belt and Outside Cover

1) Install timing belt inside cover to cylinder head.
2) Install crankshaft timing belt guide, key and pulley.
   Refer to Fig. 3-6-42 for proper installation of these parts.
   Install timing belt guide in such a way that its concave side faces oil pump.
   Tighten crankshaft timing belt pulley bolt to specified torque by using flywheel holder A (Special tool).

Tightening torque for timing belt pulley bolt	N·m	kg-m	lb-ft
	65 – 75	6.5 – 7.5	47.5–54.0



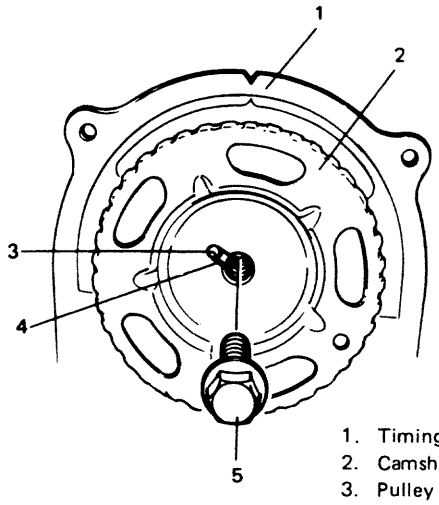
1. Timing belt guide
2. Key
3. Crank timing belt pulley
4. Pulley bolt

(A) Flywheel holder (09924-17810)

Fig. 3-6-42 Installing guide, key and pulley

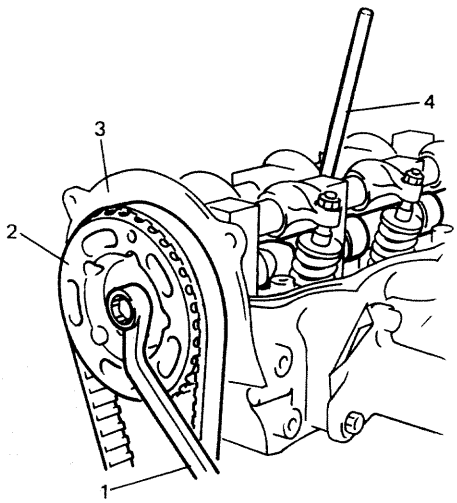
3) Install camshaft timing belt pulley.
   Fit pulley pin on camshaft into slot in camshaft pulley. Tighten pulley bolt to specified torque with general rod applied as shown in Fig. 3-6-44.

Tightening torque for pulley bolt	N·m	kg-m	lb-ft
	56 – 64	5.6 – 6.4	41.0–46.0



1. Timing belt inside cover
2. Camshaft pulley
3. Pulley pin
4. Slot
5. Pulley bolt

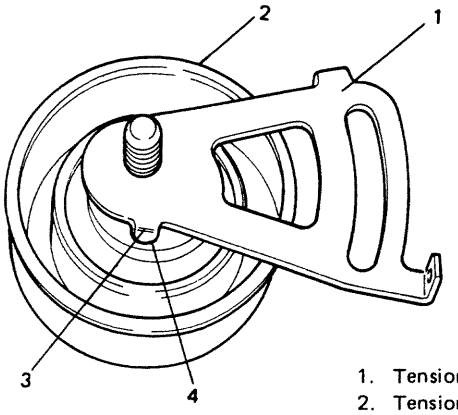
Fig. 3-6-43 Pulley pin, slot and pulley bolt



1. Wrench
2. Camshaft timing belt pulley
3. Timing belt inside cover
4. General rod

Fig. 3-6-44

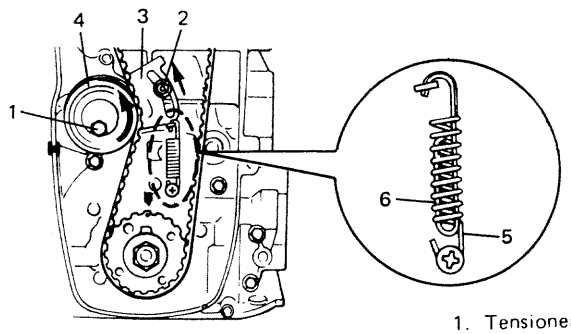
4) Install timing belt tensioner plate to tensioner.
Insert lug of tensioner plate into hole of tensioner.



1. Tensioner plate
2. Tensioner
3. Lug
4. Hole

Fig. 3-6-45 Lug and hole

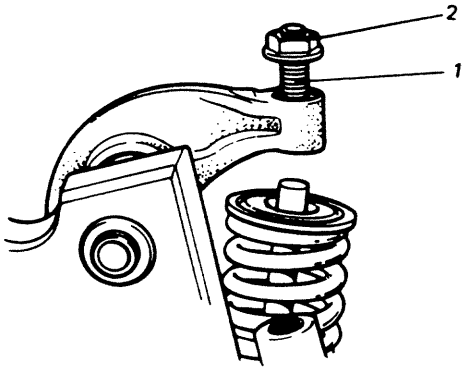
5) Install timing belt tensioner, tensioner plate and spring.
Do not tighten tensioner bolt and stud with wrench yet.
Hand tighten only at this time.
Be sure that plate movement in arrow direction as shown in Fig. 3-6-46 causes the same directional movement of tensioner. If no associated movement between plate and tensioner occurs, remove tensioner and plate again and reinsert plate lug into tensioner hole.



1. Tensioner bolt
2. Tensioner stud
3. Tensioner plate
4. Tensioner
5. Spring
6. Spring damper

Fig. 3-6-46 Tensioner installation

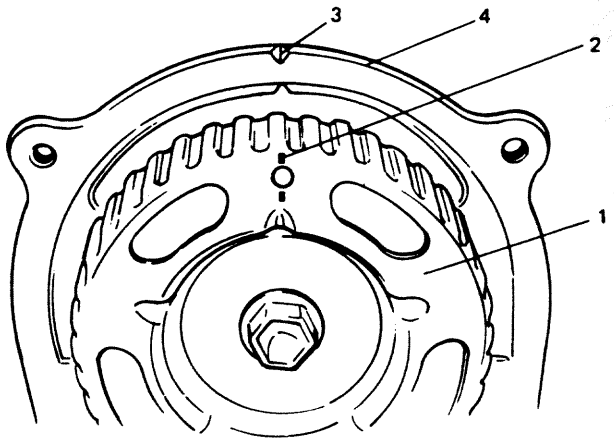
6) Before installing timing belt to camshaft pulley and crankshaft timing belt pulley, loosen all valve adjusting screws of intake and exhaust rocker arms fully, or check to ensure they are loose.
This is to permit free rotation of camshaft for the following reason; when installing timing belt to both pulleys, belt should be correctly tensed by tensioner spring force. If camshaft does not rotate freely, belt will not be correctly tensed by tensioner.



1. Valve adjusting screw
2. Lock nut

Fig. 3-6-47 Valve adjusting screw and lock nut

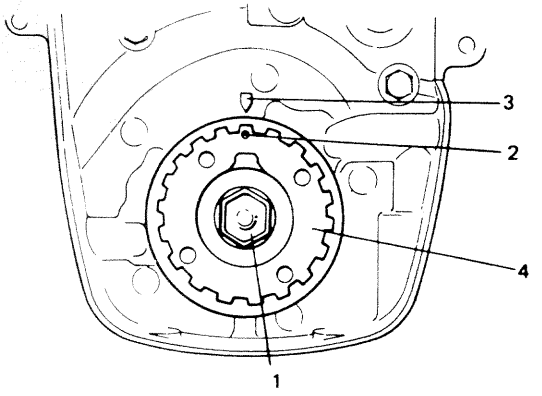
7) After loosening all valve adjusting screws all the way, turn camshaft pulley clockwise and align timing mark on camshaft pulley with "V" mark on belt inside cover as shown in Fig. 3-6-48.



1. Camshaft timing pulley
2. Timing mark
3. "V" mark
4. Belt inside cover

Fig. 3-6-48 Timing marks

8) Turn crankshaft clockwise, fitting 17 mm wrench to crankshaft timing belt pulley bolt, and align punch mark on timing belt pulley with arrow mark on oil pump as shown in Fig. 3-6-49.

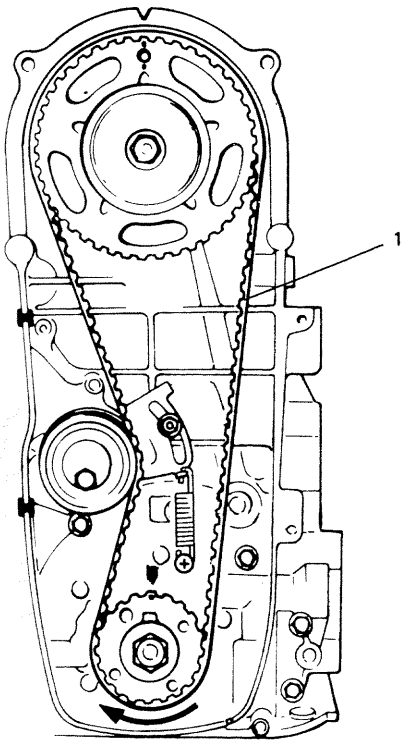


1. Crankshaft timing belt pulley bolt
2. Punch mark
3. Arrow mark
4. Crankshaft timing belt pulley

Fig. 3-6-49 Timing marks

9) With 4 marks aligned, install timing belt on two pulleys in such a way that drive side of belt is free from any slack, and with tensioner plate pushed up by finger.

NOTE:
In this state, No.4 piston is at top dead center of compression stroke.



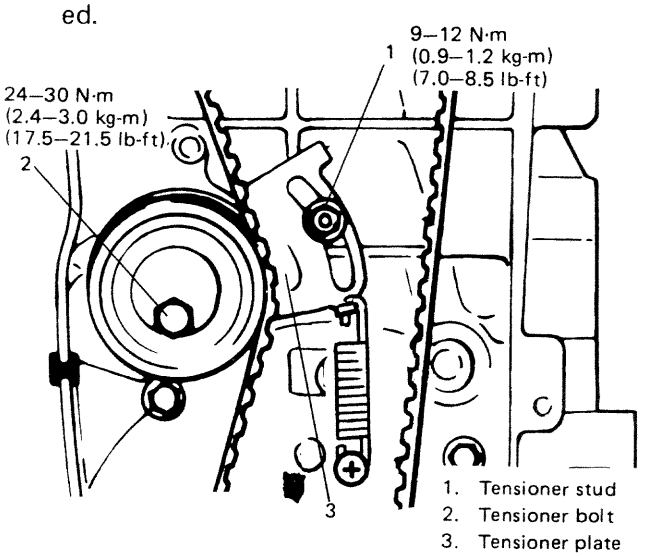
Direction of crankshaft

1. Drive side of belt

Fig. 3-6-50 Installing timing belt

NOTE:
When installing timing belt, match arrow mark (⇨) on timing belt with rotating direction of crankshaft.

10) To allow belt to be free of any slack, turn crankshaft clockwise fully twice after installing belt. After removing belt slack, tighten tensioner stud first and then tensioner bolt to 24 – 30 N·m (2.4 – 3.0 kg-m, 17,5 – 21.5 lb-ft).
Then confirm again that 4 marks are matched.



1. Tensioner stud
2. Tensioner bolt
3. Tensioner plate

Fig. 3-6-51 Tensioner bolt and nut

11) Install timing belt outside cover.

Tightening torque for outside cover bolts and nuts	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

Crankshaft Pulley, Water Pump Pulley and Alternator

1) Install crankshaft pulley.
Fit keyway on pulley to key of crankshaft timing belt pulley, and tighten 4 bolts to specification, with flywheel holder (special tool 09924-17810) hitched to flywheel so that crankshaft will not turn.

Tightening torque for pulley bolts	N·m	kg-m	lb-ft
	10 – 13	1.0 – 1.3	7.5 – 9.0

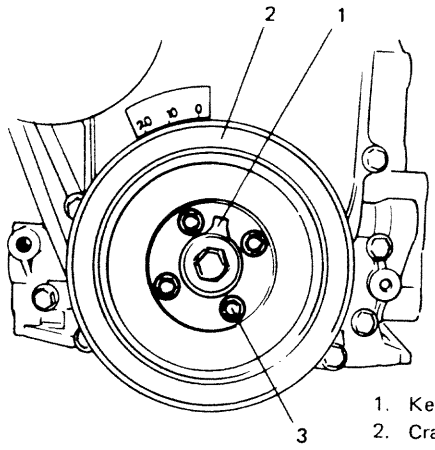


Fig. 3-6-52 Installing crankshaft pulley

2) Install alternator assembly.
   Tighten alternator ass'y securing bolts (3pcs) only to the extent to allow alternator to be moved by hand. Don't torque them tight.

NOTE:
Adjust water pump belt tension to specification upon completion of installing engine ass'y to body and then cooling fan and water pump pulley. Make sure to refer to p. 1-5 of this manual for adjusting procedure.

Distributor Case

1) Install distributor case O-ring to cylinder head.
2) Install distributor case.
3) Tighten bolts to specified torque.

Tightening torque for case bolts	N·m	kg-m	lb-ft
	8 – 12	0.8 – 1.2	6.0 – 8.5

CAUTION:
After tightening case bolts, fill distributor case with about 30cc (1.02/1.06 US/Imp oz) engine oil.

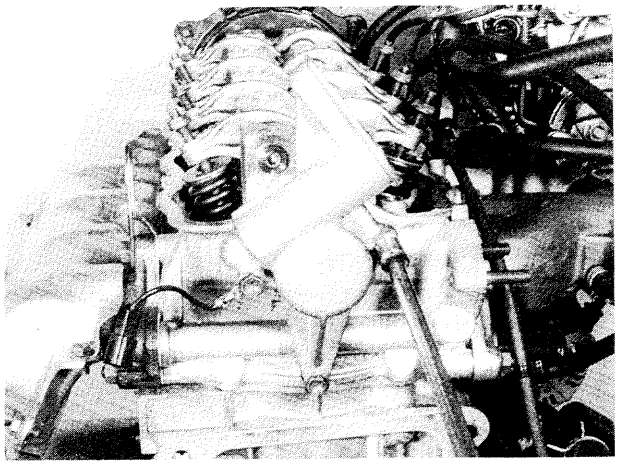


Fig. 3-6-53

Fuel Pump

Install fuel pump rod, gasket and fuel pump to cylinder head.
Apply engine oil to rod ① before installation.
Use new gasket.

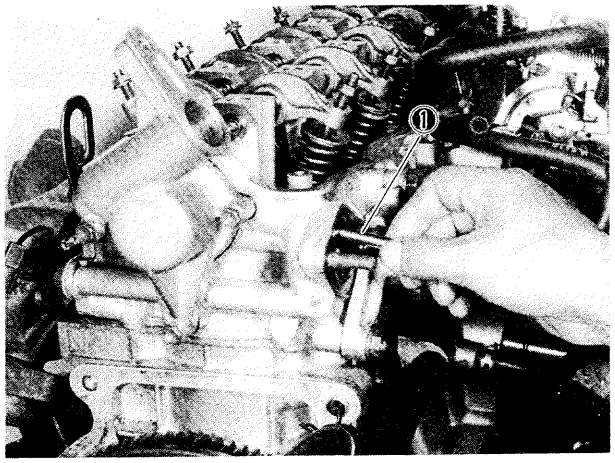


Fig. 3-6-54 Fuel pump rod installation

Clutch Disc and Cover

Install clutch disc and cover.

For installation, refer to p. 11-7 of SECTION 11 CLUTCH in this manual and torque each bolt to specification.

Transmission Assembly

1) Check to make sure that 2 pins ① are fitted to cylinder block.

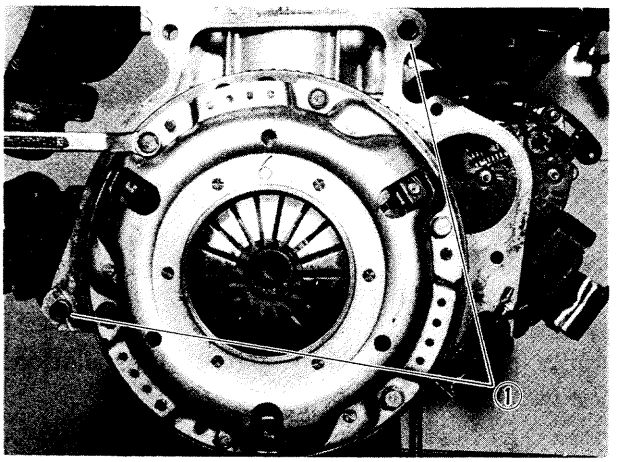


Fig. 3-6-55

2) Attach transmission assembly to engine cylinder block and tighten bolts and nuts to specified torque.

Tightening torque for transmission case bolts and nuts	N·m	kg-m	lb-ft
	22 – 35	2.2 – 3.5	16.0–25.0

Distributor

1) Install distributor to case.

For installation, be sure to refer to SECTION 8 IGNITION SYSTEM in this manual.

NOTE:

Check and adjust ignition timing with engine installed to car body and after installing and connecting all necessary parts. For procedure, refer to p. 8-9 of SECTION 8 IGNITION SYSTEM in this manual.

Valve Lash (Clearance) Adjustment

Adjust valve lash of all intake and exhaust valves to specification, referring to description on valve lash on p. 3-53 of this manual.

Cylinder Head Cover

Install cover to cylinder head and tighten bolts to specified torque.

Tightening torque for cylinder head cover bolts	N·m	kg-m	lb-ft
	4 – 5	0.4 – 0.5	3.0 – 3.5

3-7. ENGINE INSTALLATION

1) Lower engine with transmission into vehicle, but do not remove lifting device.
2) Tighten engine mounting bracket bolts (right and left) and transmission mounting bolts to specification. Refer to p. 3-58.
3) Remove lifting device.
4) Reverse removal procedures for installation of remainder.
5) Adjust accelerator cable play and clutch cable play.
6) Connect vacuum hoses securely. Refer to section 5 "EMISSION CONTROL SYSTEM" for correct connection.
7) Connect wire harnesses and couplers securely.
8) Tighten bolts and nuts to specified torque. For individual specification, refer to each section.
9) Fill specified amount of specified transmission oil and engine oil. For the detail, refer to SECTION 1 PERIODIC MAINTENANCE SERVICE of this manual.
10) After adjusting water pump belt tension to specification, fill specified amount of engine cooling water.
11) Before starting engine, check again to ensure that all parts once disassembled or disconnected are back in place securely.
12) Start engine and check ignition timing. If it is not to specified timing, adjust it, referring to SECTION 8 of this manual.
13) After engine is started, check for oil leak, abnormal noise and other malcondition. Also, check each part for operation.

3-8. ENGINE MAINTENANCE SERVICE

Fan Belt

Adjust belt tension as outlined in SECTION 6 ENGINE COOLING SYSTEM (p. 6-10).

Ignition Timing

Refer to IGNITION TIMING, Page 8-9.

Carburetor

Adjustments to be made are detailed in SECTION 4 (p. 4-19).

Valve Lash (Clearance)

Valve lash specifications:

Valve lash refers to gap between rocker arm adjusting screw and valve stem. Use a thickness gauge to measure this gap Ⓐ.

		When cold (Coolant temperature is 15 – 25°C or 59 – 77°F)	When hot (Coolant temperature is 60 – 68°C or 140 – 154°F)
Valve lash (gap A) specification	Intake	0.13 - 0.17 mm (0.0051 - 0.0067 in)	0.23 - 0.27 mm (0.009 - 0.011 in)
	Exhaust	0.16 - 0.20 mm (0.0063 - 0.0079 in)	0.26 - 0.30 mm (0.0102 - 0.0118 in)

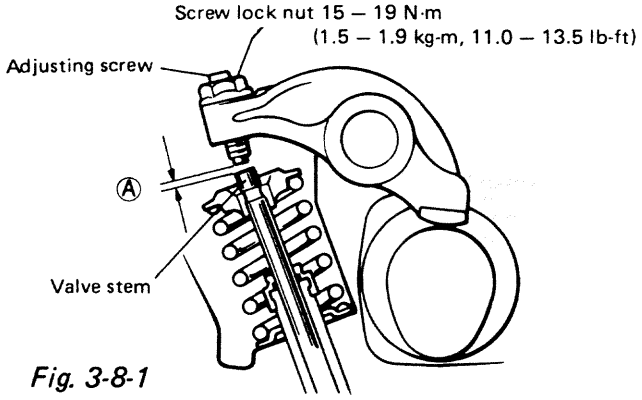


Fig. 3-8-1

Checking and adjusting procedures:

NOTE:

- **Refer to Fig. 3-3-11 of SECTION 3 for cylinder numbers (No. 1, No. 2, No. 3 and No. 4) mentioned in this section.**
- **When adjustment becomes necessary in step 4), loosen adjusting screw lock nut and then make adjustment by turning adjusting screw. After adjustment, tighten lock nut to specified torque while holding adjusting screw stationary with straight headed screwdriver, and then make sure again that gap Ⓐ is within specification.**

1) Remove cylinder head cover.
2) Remove ignition timing check window rubber plug from clutch housing of transmission case.
3) Turn crankshaft clockwise (viewing from crankshaft pulley side) to the extent that line ② above "T" mark punched on flywheel is aligned with match mark ① on transmission case as shown below, i.e. No. 1 cylinder piston reaches TDC position.

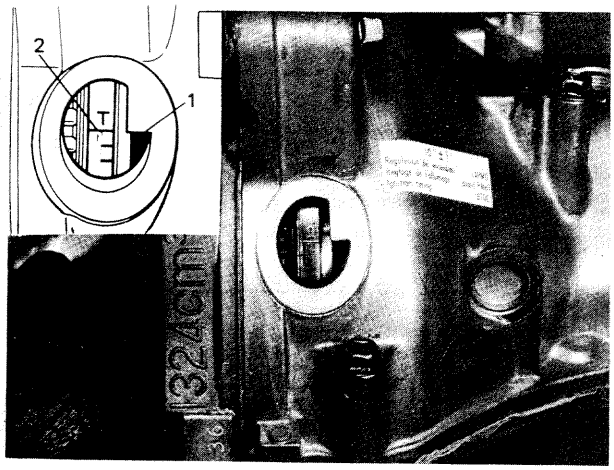


Fig. 3-8-2 1. Match mark 2. "T" (TDC) mark

4) Remove distributor cap and check that rotor is positioned as shown in figure. If rotor is out of place, turn crankshaft clockwise once (360°). In this state, check valve lashes at valves ①, ②, ⑤ and ⑦. Rotate crankshaft exactly one turn, and check the same at valves ③, ④, ⑥ and ⑧.

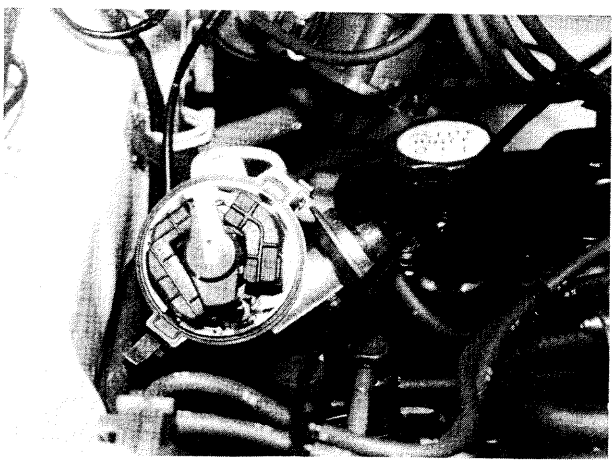


Fig. 3-8-3

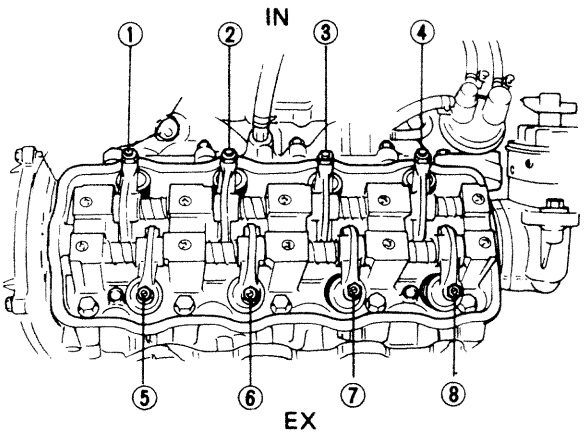


Fig. 3-8-4

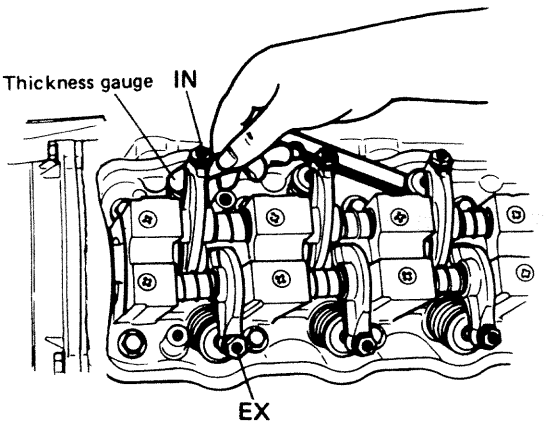


Fig. 3-8-5 Measuring valve lashes

5) Upon completion of check and adjustment, install cylinder head cover and torque bolts to specification.

Tightening torque for cylinder head cover bolts	N·m	kg-m	lb-ft
	4 – 5	0.4 – 0.5	3.0 – 3.5

6) Install distributor cap and connect blow-by gas hose to cylinder head cover.

Camshaft Timing Belt
For checking procedures of damage, wear and tension of camshaft timing belt, refer to SECTION 1 (p. 1-5) of this manual.

Engine Oil
Refer to SECTION 1 (p. 1-7) of this manual.

Engine Oil Filter
For removal and installation of filter, refer to SECTION 1 (p. 1-7) of this manual.

Engine Coolant

This subject is covered in SECTION 6 ENGINE COOLING SYSTEM.

Exhaust Line and Muffler

Inspect each exhaust line connection for tightness, and examine muffler and other parts for evidence of breakage and leakage of gases. Repair or replace defective parts, if any.

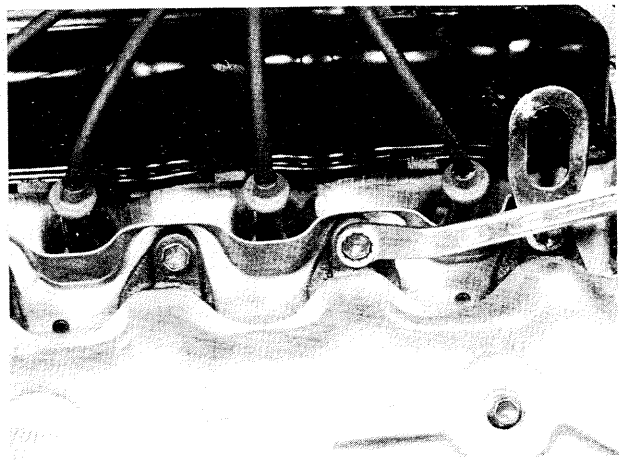
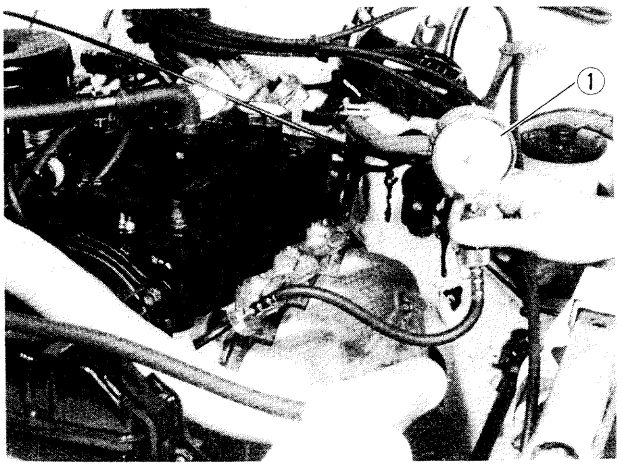


Fig. 3-8-6

Compression Pressure Measurement

Check compression pressure on all four cylinders as follows:

1) Warm up engine.
2) Stop engine after warming up.
3) Remove all spark plugs and disconnect high tension cord from ignition coil.
4) Install compression gauge (special tool) into spark plug hole.



1. Compression gauge (Special tool 09915-64510)

Fig. 3-8-7 Installing compression gauge

5) Disengage clutch (to lighten starting load on engine), and depress accelerator pedal all the way to make throttle full-open.
6) Crank engine with fully charged battery, and read the highest pressure on compression gauge.

	Compression pressure
Standard	14.0 kg/cm² (199.0 psi) 400 r/min
Limit	12.0 kg/cm² (170.0 psi) 400 r/min
Max. difference between any two cylinders	1.0 kg/cm² (14.2 psi), 400 r/min

7) Carry out steps 4) through 6) on each cylinder to obtain four readings.

NOTE:
Compression pressure value is measured by using compression gauge (Special tool 09915-64510).

Oil Pump Discharge Pressure Measurement

NOTE:
Prior to checking oil pressure, check the following.

- **Oil level in oil pan.**
  If level is low, add oil up to Full level hole on oil level gauge.
- **Oil quality.**
  If oil is discolored, or deteriorated, change oil. For particular oil to be used, refer to table on p 1-8 of SECTION 1.
- **Oil leak.**
  If leak is found, repair it.

1) Disconnect lead wire from oil pressure switch.
2) Remove oil pressure switch from cylinder block.

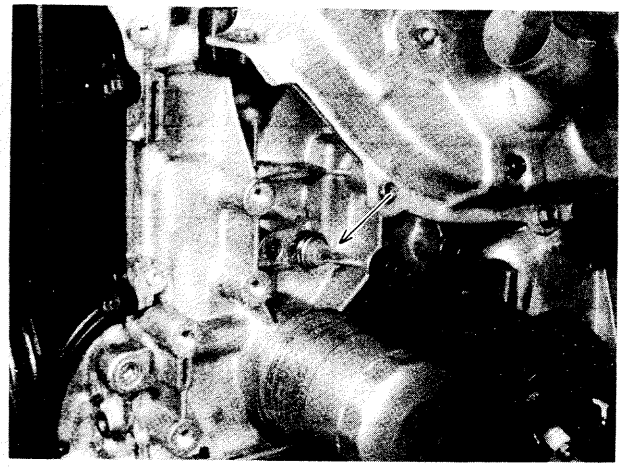
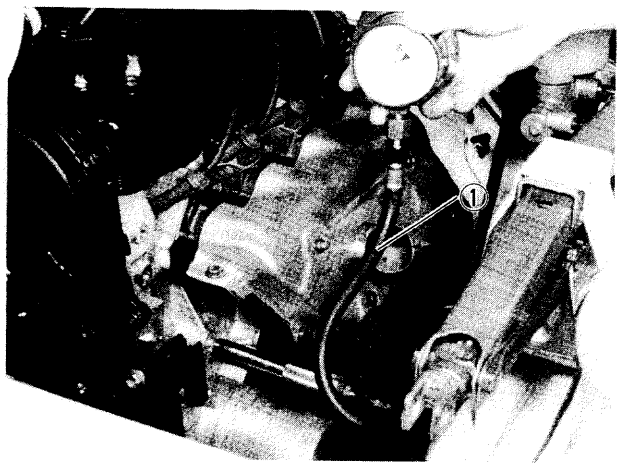


Fig. 3-8-8 Oil pressure switch

3) Install oil pressure gauge (special tool) to vacated threaded hole.



1. Oil pressure gauge (Special tool 09915-77310)

Fig. 3-8-9 Oil pressure gauge installation

4) Start engine and warm it up to normal operating temperature.
5) After warming up, raise engine speed to 3,000 r/min and measure oil pressure.

Oil pressure specification	3.0 – 4.2 kg/cm² 42.7 – 59.7 psi at 3,000 r/min (rpm)

6) After checking oil pressure, stop engine and remove oil pressure gauge.
7) Before reinstalling oil pressure switch, be sure to wrap its screw threads with sealing tape and tighten switch to specified torque.

Tightening torque for oil pressure switch	12 – 15 N·m 1.2 – 1.5 kg-m 9.0 – 10.5 lb-ft

NOTE:
- **If sealing tape edge is bulged out from screw threads of switch, cut off edge.**

8) After installing oil pressure switch, start engine and check switch for oil leakage.

Vacuum Measurement

Engine vacuum that develops in intake line is a good indicator of engine condition. Vacuum checking procedure is as follows:

1) Warm up engine to normal operating temperature.
2) Install vacuum gauge Ⓐ (09915-67310), as shown in Fig. 3-8-10. Install engine tachometer.

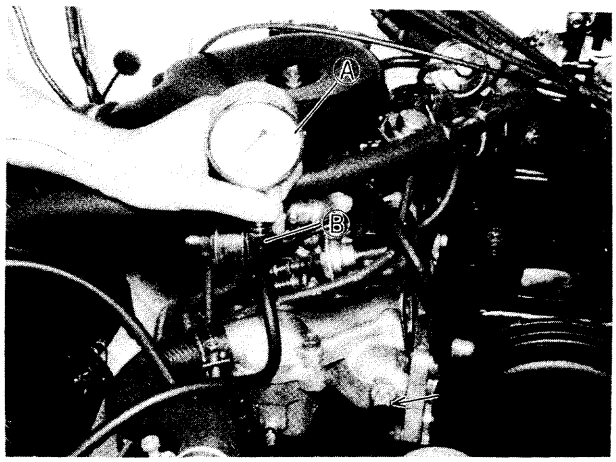


Fig. 3-8-10

3) Run engine at specified idling speed and, under this running condition, read vacuum gauge. Vacuum should not be lower than 45 cm Hg (17.7 in. Hg).

A low vacuum reading means that any combination of following malconditions is the cause, which must be corrected before releasing machine to customer:

(a) Leaky cylinder head gasket
(b) Leaky inlet manifold gasket
(c) Leaky valves
(d) Weakened valve springs
(e) Maladjusted valve clearance
(f) Valve timing out of adjustment
(g) Ignition mistimed
(h) Carburetor improperly adjusted

NOTE:
Should indicating hand of the vacuum gauge oscillate violently, turn adjusting nut Ⓑ to steady it.

Standard vacuum (sea level)	45 – 55 cm Hg (17.7 – 21.6 in. Hg)
Idling speed specification	800 ± 50 r/min (rpm) (Take vacuum reading at this speed.)

4) After checking, remove vacuum gauge.
5) Before reinstalling vacuum checking plug, be sure to wrap its screw threads with sealing tape and tighten plug.

Oil Filler Cap

The cap has a packing. Be sure that packing is in good condition, free of any damage and signs of deterioration, and is tight in place: it is replaceable.

3-9. RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Cylinder head bolt	63 – 70	6.3 – 7.0	46.0 – 50.5
2. Cylinder head cover bolt	4 – 5	0.4 – 0.5	3.0 – 3.5
3. Spark plug	20 – 30	2.0 – 3.0	14.5 – 21.5
4. Distributor gear case	8 – 12	0.8 – 1.2	6.0 – 8.5
5. Rocker arm shaft screw	9 – 12	0.9 – 1.2	7.0 – 8.5
6. Valve adjusting screw lock nut	15 – 19	1.5 – 1.9	11.0 – 13.5
7. Crankshaft main bearing cap bolt	50 – 57	5.0 – 5.7	36.5 – 41.0
8. Oil filter stand	20 – 25	2.0 – 2.5	14.5 – 18.0
9. Oil filter Ass'y	12 – 16	1.2 – 1.6	9.0 – 11.5
10. Oil pressure switch	12 – 15	1.2 – 1.5	9.0 – 10.5
11. Oil drain plug	30 – 40	3.0 – 4.0	22.0 – 28.5
12. Oil pan bolt and nut	9 – 12	0.9 – 1.2	7.0 – 8.5
13. Oil pump strainer bolt	9 – 12	0.9 – 1.2	7.0 – 8.5
14. Water pump bolt and nut	9 – 12	0.9 – 1.2	7.0 – 8.5
15. Cooling fan nut	8 – 12	0.8 – 1.2	6.0 – 8.5
16. Flywheel bolt	57 – 65	5.7 – 6.5	41.5 – 47.0
17. Oil seal housing bolt	9 – 12	0.9 – 1.2	7.0 – 8.5
18. Connecting rod bearing cap nut	33 – 37	3.3 – 3.7	24.0 – 26.5
19. Crankshaft pully bolt	10 – 13	1.0 – 1.3	7.5 – 9.0
20. Crankshaft timing belt pulley bolt	65 – 75	6.5 – 7.5	47.5 – 54.0
21. Timing belt cover bolt and nut	9 – 12	0.9 – 1.2	7.0 – 8.5
22. Camshaft timing pully bolt	56 – 64	5.6 – 6.4	41.0 – 46.0
23. Timing belt tension bolt	24 – 30	2.4 – 3.0	17.5 – 21.5
24. Timing belt tensioner stud	9 – 12	0.9 – 1.2	7.0 – 8.5
25. Oil pump case bolt	9 – 12	0.9 – 1.2	7.0 – 8.5
26. Oil pump rotor plate screw	9 – 12	0.9 – 1.2	7.0 – 8.5
27. Inlet & exhaust manifold nut	18 – 28	1.8 – 2.8	13.5 – 20.0
28. Fuel pump nut	10 – 16	1.0 – 1.6	7.0 – 11.5
29. Engine mounting bracket frame side bolt	40 – 60	4.0 – 6.0	29.0 – 43.0
30. Engine mounting bracket engine side bolt	50 – 60	5.0 – 6.0	36.5 – 43.0
31. Engine mounting nut	40 – 50	4.0 – 5.0	29.0 – 36.0
32. Transmission mounting bracket bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
33. Transmission mounting bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
34. Transmission mounting and frame bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
35. Propeller shaft flange bolt and nut	23 – 30	2.3 – 3.0	17.0 – 21.5

NOTE: **If specified tightening torque for particular bolt or nut is not included here, refer to p 0-12 of this manual.**

SECTION 4

FUEL SYSTEM

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CAUTION:
THE ENGINE OF THIS VEHICLE REQUIRED THE USE OF UNLEADED FUEL ONLY.
USE OF LEADED AND/OR LOW LEAD FUEL CAN RESULT IN ENGINE DAMAGE AND REDUCE THE EFFECTIVENESS OF THE EMISSION CONTROL SYSTEMS.

4-1. CARBURETOR

GENERAL DESCRIPTION

General

This 2-barrel, downdraft type carburetor has primary and secondary systems.

The primary system operates under normal driving condition, and the secondary system operates under high speed-high load driving condition. The choke valve is provided in the primary system.

The main components and their functions are as follows.

- The primary system has; (1) a mixture control solenoid valve which is operated by the electrical signals from the Electronic Control Module (ECM) so as to maintain the optimum air fuel ratio of the primary slow and the primary main systems at all times, (2) a fuel cut solenoid valve which is for the fuel cut under deceleration and prevention of the dieseling, and (3) an acceleration pump system.
- The secondary system has a secondary diaphragm which is operated by the vacuum from the primary side and actuates the secondary throttle valve.
- The choke system is a full automatic type using a thermo-wax.
- The switch vent solenoid valve provided on top of the float chamber is to reduce the evaporative emissions.

1. Air horn
2. Float chamber
3. Throttle chamber
4. Pump boot
5. Pump lever
6. Pump rod
7. Bracket
8. Screw
9. Thermo element holder
10. Seal
11. Thermo element
12. Choke piston
13. Delay valve
14. Switch vent solenoid
15. Vacuum switching valve
16. 3 way joint
17. Vacuum transmitting valve
18. Primary slow air No. 1 bleeder
19. Secondary slow air bleeder
20. Mixture control solenoid valve
21. Solenoid valve seal
22. Needle valve filter
23. Needle valve gasket
24. Needle valve
25. Float
26. Air horn gasket
27. Connector (5 terminal)
28. Connector (4 terminal)
29. Connector (1 terminal)
30. Injector weight
31. Injector spring
32. Injector weight
33. Ball
34. Primary slow air No. 2 bleeder
35. Primary slow jet
36. Primary main air bleeder
37. Secondary main air bleeder
38. Spring
39. Secondary slow jet
40. Idle micro switch
41. Wide open micro switch
42. Idle up actuator
43. Solenoid valve (Fuel cut)
44. Washer
45. Level gauge seal
46. Level gauge
47. Level gauge gasket
48. Micro switch bracket
49. Primary main jet
50. Secondary main jet
51. Drain plug gasket
52. Drain plug
53. Float pin
54. Insulator
55. Secondary actuator (diaphragm)

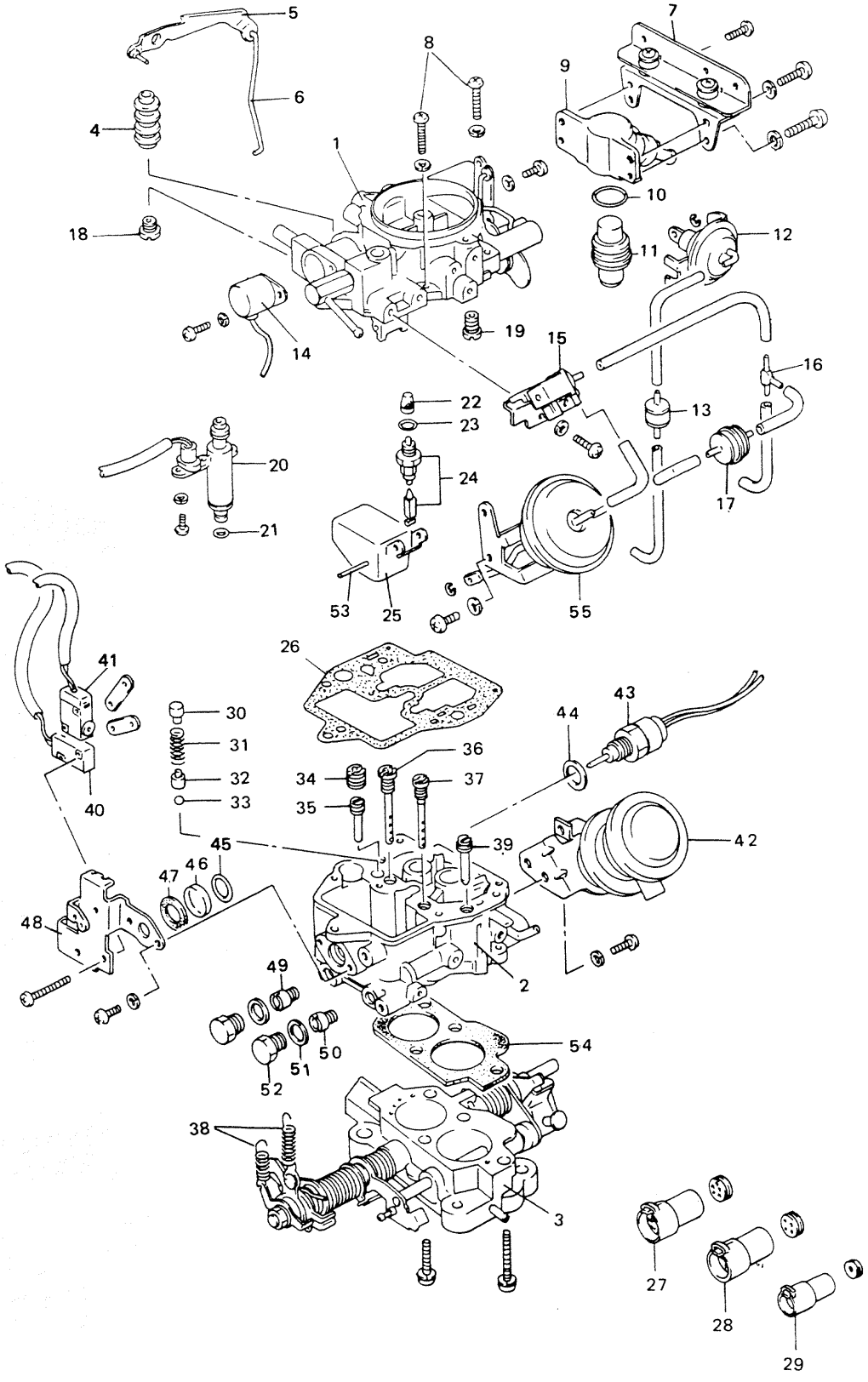


Fig. 4-1-1 Carburetor exploded view

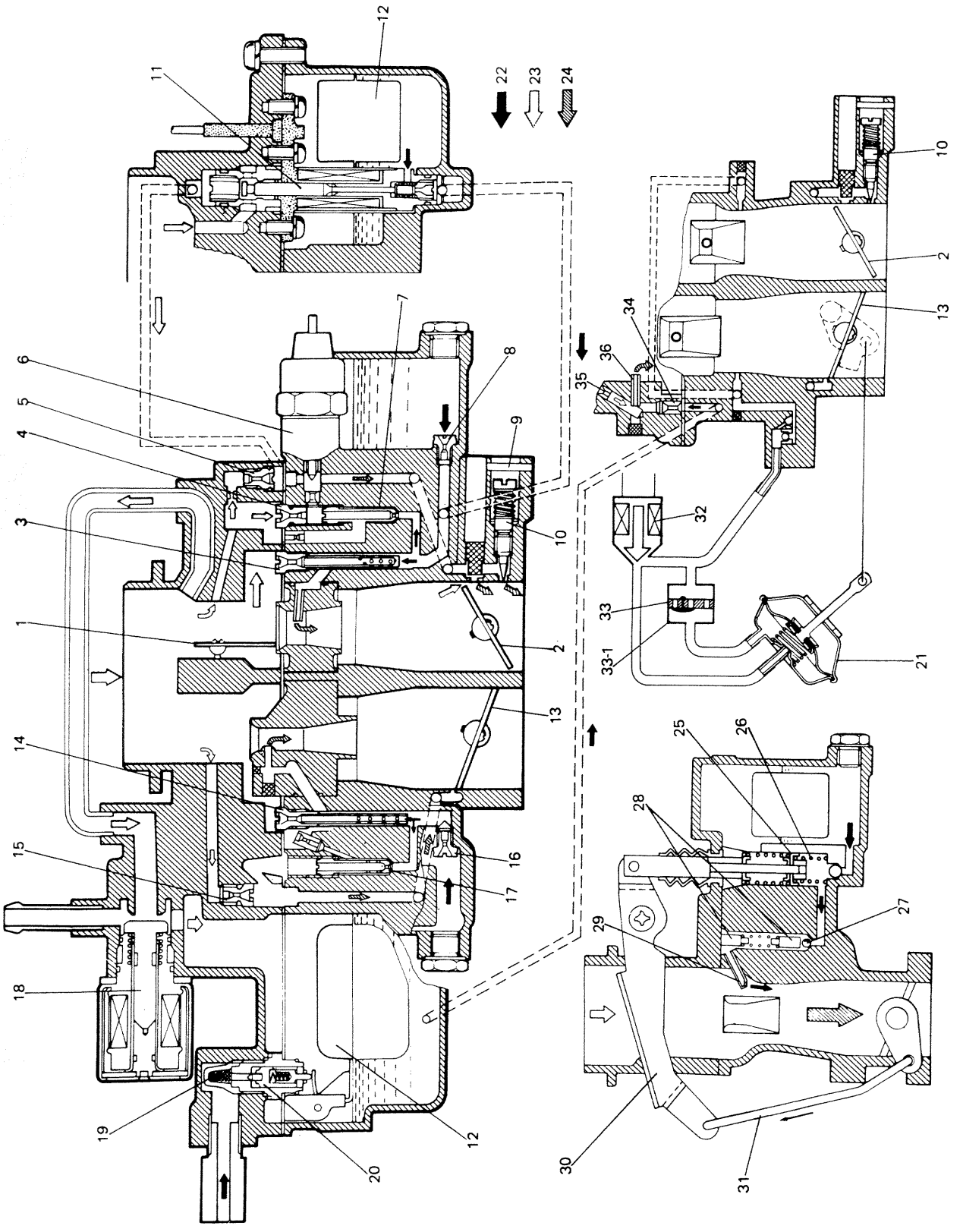


Fig. 4-1-2 Carburetor cross-section

1. Choke valve
2. Primary throttle valve
3. Primary main air bleeder
4. Primary slow air No. 2 bleeder
5. Primary slow air No. 1 bleeder
6. Solenoid valve (Fuel cut)
7. Primary slow jet
8. Primary main jet
9. Mixture adjusting screw pin
10. Mixture adjusting screw
11. Mixture control solenoid valve
12. Float
13. Secondary throttle valve
14. Secondary main air bleeder
15. Secondary slow air bleeder
16. Secondary main jet
17. Secondary slow jet
18. Switch vent solenoid
19. Needle valve filter
20. Needle valve
21. Secondary (actuator) diaphragm
22. Fuel
23. Air
24. Air/Fuel mixture
25. Pump piston
26. Return spring
27. Ball
28. Injector weight
29. Discharge nozzle
30. Pump lever
31. Pump rod
32. VSV (Vacuum switching valve)
33. VTV (Vacuum transmitting valve)
33-1 Brown side
34. Richer jet
35. Richer air bleeder
36. Richer nozzle

Float System

The float system consists of a float chamber, a float, a float needle valve and seat, and needle valve filter. Fuel from the fuel pump enters the float chamber, passing through the needle valve filter and the needle valve.

The float's function is to maintain a constant level in the chamber.

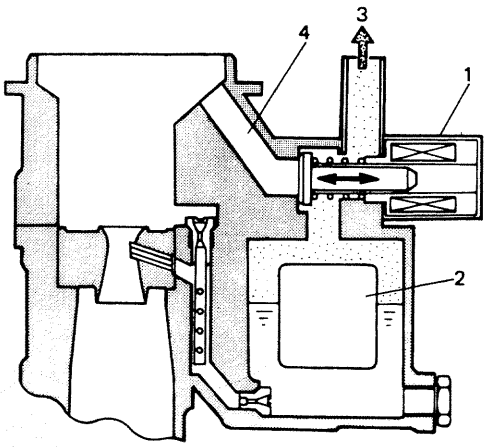
As the fuel level in the chamber drops, the float and the needle valve drops down allowing the fuel to enter the chamber. As the fuel enters the chamber, the float and the needle valve again rise to close the fuel inlet.

A constant fuel level in the chamber is maintained through the repetition of this cycle.

1. Float
2. From fuel pump
3. Needle valve filter
4. Needle valve seat
5. Needle valve

Fig. 4-1-3 Float system

[Switch vent solenoid]
Provided on top of the float chamber is a switch vent solenoid which is connected to the ignition switch through ECM. As the ignition switch is operated, the solenoid opens and closes its valve so as not to release the fuel vapor in the float chamber out into the atmosphere.
When the ignition switch is turned to "OFF" position, the passage connecting the inner vent passage and the float chamber will close, and the passage connecting the float chamber and the canister will open, then the fuel vapor will flow into the canister.
When the ignition switch is turned to "ON" position, and engine speed is above 400 r/min, the passage connecting the float chamber and the canister will close, and the passage connecting the float chamber and the inner vent passage will open, then the fuel vapor will flow into the carburetor bore.



1. Switch vent solenoid
2. Float
3. To canister
4. Inner vent passage

Fig. 4-1-4 Switch vent solenoid

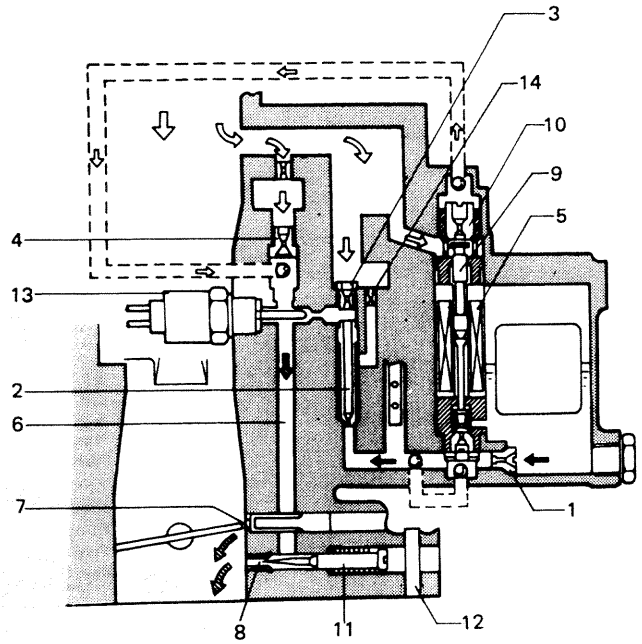
Primary System

[Primary slow system]
The fuel, after passing through the main jet, is metered by the primary slow jet, then mixed with the air from the primary slow air No. 2 bleeder. This air/fuel mixture is further blended with the air from the primary slow air No. 1 bleeder and air supplied through the mixture control solenoid. Then the air/fuel mixture passes through the idle down channel and enters the carburetor bore through the off idle discharge port and the idle discharge hole.

[Mixture control solenoid valve]
The primary system has the Mixture Control Solenoid (MCS) Valve. In the MCS, there is a plunger which makes 16 up and down movements per second by the electrical signals from the Electronic Control Module (ECM). That is, when an electrical signal is received by the solenoid, the plunger will move down and when no signal is received, the plunger will move up by the spring force.
When the plunger moves down, the air jet located on the upper side of the mixture control solenoid valve will open as shown in below figure, allowing the air to flow into the idle down channel. In this condition, the mixture will become lean.
On the other hand, when the plunger is pushed up by the spring, the air jet will close, shutting off the air flow into the idle down channel. In this condition, the mixture will become rich.
The up and down movement of the plunger at the rate of 16 times per second to the signals from the ECM controls the air/fuel mixture to the optimum ratio at all times and as a result helps to improve the emission and engine performances, and fuel economy.
The ECM receives the electrical information from the oxygen sensor installed to the exhaust manifold and the engine operating condition signals from other devices and sends out and stops the electrical signal to the mixture control solenoid valve to actuate the plunger up and down 16 times every second. The ECM is located under the glove box of the instrument panel.

- Since the mixture control solenoid valve is factory adjusted, it must not be overhauled or its jets must not be removed.
- Since the mixture adjust screw is also factory adjusted, it must not be adjusted at the field except the following.
  a. When the carburetor assembly has been replaced.
  b. When the carburetor has been overhauled.
  c. When the idle mixture adjustment is necessary due to the emission test failures.

  To adjust the mixture adjust screw in one of the above conditions, drive out the pin in front of the screw. After the adjustment, a new pin should be installed.

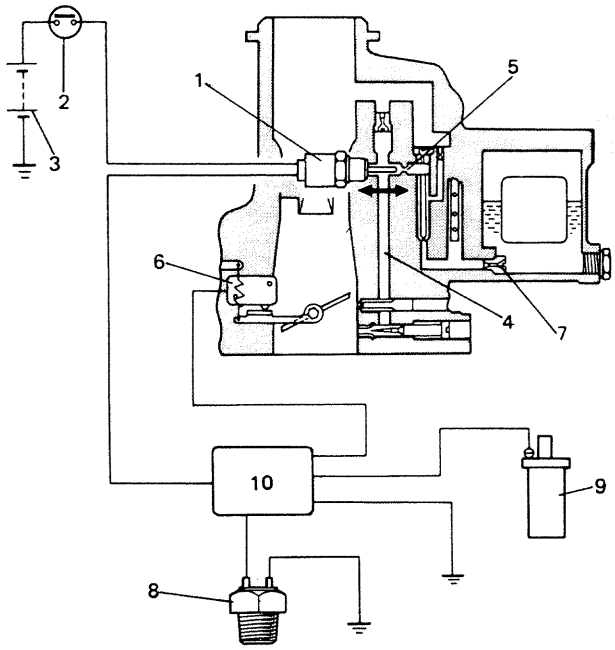


1. Primary main jet
2. Primary slow jet
3. Primary slow air No. 2 bleeder
4. Primary slow air No. 1 bleeder
5. Mixture control solenoid valve
6. Idle down channel
7. Off idle discharge port
8. Idle discharge hole
9. Plunger
10. Air jet
11. Mixture adjusting screw
12. Pin
13. Solenoid valve (Fuel cut)
14. Economizer air bleeder

Fig. 4-1-5 Primary slow system

[**Fuel cut system**]

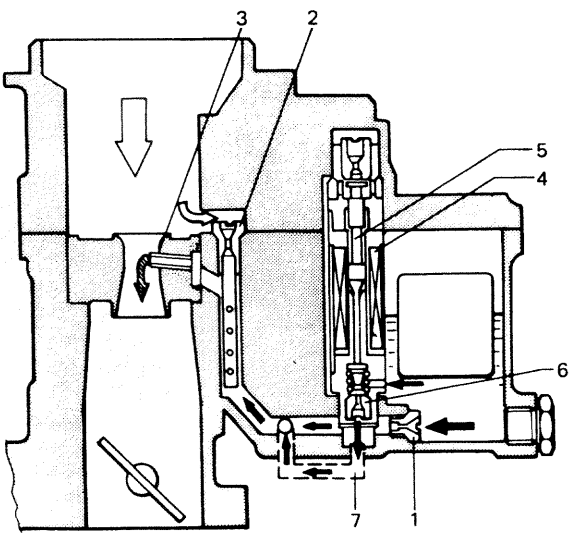
The primary slow system incorporates the fuel cut system with the fuel cut solenoid valve which is operated by the ignition switch and the ECM. When the ignition switch is at "OFF" position or during deceleration, the fuel cut solenoid valve stops the fuel flow into the idle down channel by closing the fuel passage. Thus the fuel cut system helps to prevent the dieseling and improve the emission performance and fuel economy. For details, refer to SECTION 5 "EMISSION CONTROL SYSTEM".



1. Fuel cut solenoid valve
2. Ignition switch
3. Battery
4. Idle down channel
5. Fuel passage
6. Idle micro switch
7. Primary main jet
8. Thermal switch
9. Ignition coil
10. ECM

Fig. 4-1-6 Fuel cut system

[Primary main system]
The fuel metered by the primary main jet is mixed with the air from the primary main air bleeder and then is discharged into the carburetor bore through the main discharge nozzle. When the plunger of the MCS is at the up position (i.e. the ECM electrical signal is not received by the MCS), the fuel orifice of the MCS is open. In this state, the fuel is allowed to flow into the fuel passage through this orifice in addition to the main jet and the mixture becomes rich.
On the other hand, when the plunger is at the down position (i.e. the ECM signal is received by the MCS), the fuel orifice is closed. In this state, the fuel flows into the fuel passage only through the main jet and therefore the mixture becomes lean. In this way, the mixture is maintained to the optimum air/fuel ratio at all times by the plunger which moves up and down at a frequency of 16 times per second according to the electrical signals from the ECM.

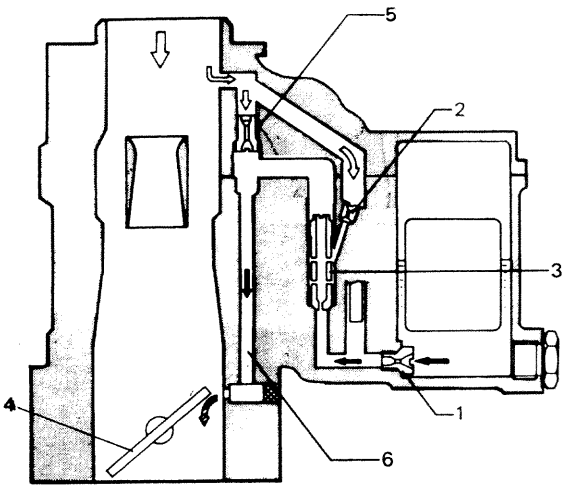


1. Primary main jet
2. Primary main air bleeder
3. Main discharge nozzle
4. Mixture control solenoid valve
5. Plunger
6. Fuel orifice
7. Fuel passage

Fig. 4-1-7 Primary main system

Secondary System

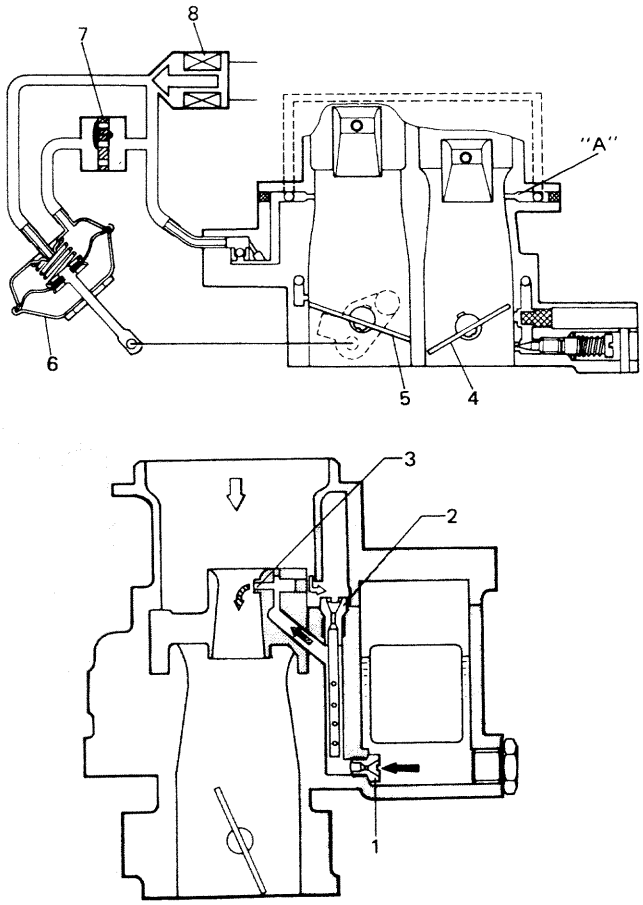
[Secondary slow system]
This system operates during the transition period from the primary main system to the secondary main system. When the primary throttle valve is open nearly 54° and the vacuum in "A" as shown in the below figure exceeds specification, the diaphragm pulls up the rod.
In this state, the secondary throttle valve is ready to open at any time when the primary throttle valve opens further. When the secondary throttle valve opens, the fuel discharged through the secondary main jet is mixed with the air from the economizer air bleeder at the secondary slow jet. Then it is further blended with the air from the secondary slow air bleeder and enters into the carburetor bore through the idle down channel.



1. Secondary main jet
2. Economizer air bleeder
3. Secondary slow jet
4. Secondary throttle valve
5. Secondary slow air bleeder
6. Idle down channel

Fig. 4-1-8 Secondary slow system

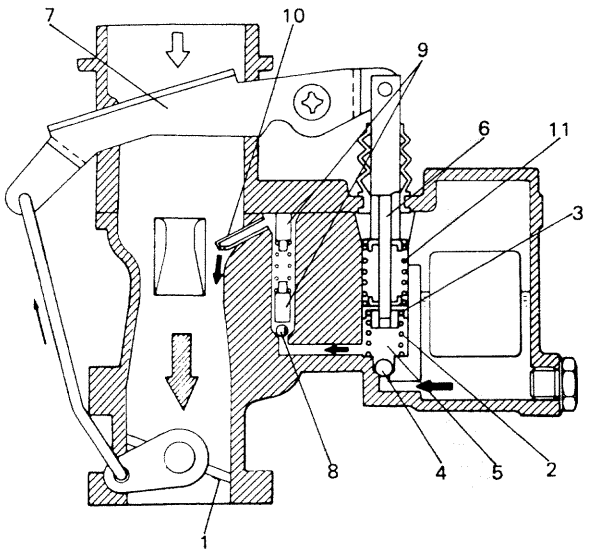
[Secondary main system]
Operation of the secondary throttle valve is also controlled by the VTV and VSV. When the VSV is closed, the vacuum to be applied to the secondary diaphragm passes the VTV side and the secondary throttle valve opens gradually.
When the primary throttle valve opens almost fully, the VSV opens according to the signal from the ECM. Then the vacuum is applied directly to the secondary diaphragm and the secondary throttle valve responds to intensity of vacuum. When the secondary throttle valve opening is wider than when secondary slow system operates, the fuel is discharged through the secondary main jet and mixed with the air from the secondary main air bleeder. The air/fuel mixture is discharged into the carburetor bore through the main discharge hole.



1. Secondary main jet
2. Secondary main air bleeder
3. Main discharge hole
4. Primary throttle valve
5. Secondary throttle valve
6. Secondary diaphragm
7. VTV
8. VSV

Fig. 4-1-9 Secondary main system

Acceleration Pump System
This system operates to supply extra fuel to the primary side only during the acceleration.
When the primary throttle valve closes, the return spring pushes up the pump piston. Then the fuel pushes up the check ball and enters into the pump cylinder. When the throttle valve opens during the acceleration, simultaneously the pump piston is pushed down by means of the pump lever. Then the fuel in the pump cylinder pushes up the discharge ball and the lower injector weight and discharges into the carburetor bore from the pump discharge nozzle.
In this way, a higher acceleration performance is provided by this system.

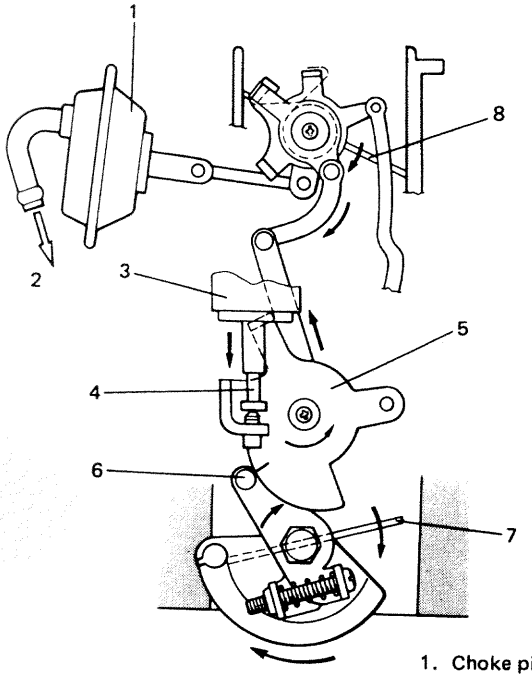


1. Primary throttle valve
2. Return spring
3. Pump piston
4. Check ball
5. Pump cylinder
6. Plunger
7. Pump lever
8. Discharge ball
9. Injector weight
10. Pump discharge nozzle
11. Pump damper spring

Fig. 4-1-10 Acceleration pump system

Choke System

This choke system is provided with a thermo-wax which operates according to the heat from the engine coolant, causing the choke valve to open and close as well as the fast idle system to operate automatically.



1. Choke piston
2. Vacuum
3. Thermo wax
4. Plunger
5. Fast idle cam
6. Cam follower
7. Throttle valve
8. Choke valve

Fig. 4-1-11 Choke system

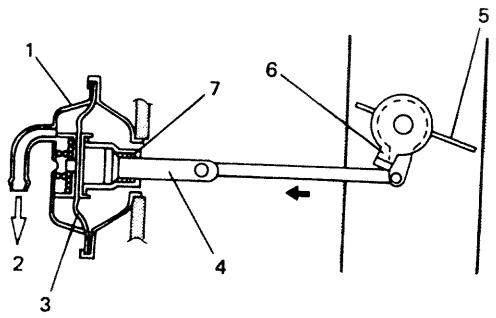
[Operation of choke system]

As the thermo-wax is contracted at the low coolant temperature, the plunger of the thermo-wax is retracted (at the up position) and the fast idle cam rotates clockwise by the spring force. As a result, the cam follower pushed down by the cam causes the primary throttle valve to open and brings about the fast idle state.

The thermo-wax expands as the coolant temperature rises and the plunger position lowers, causing the fast idle cam to rotate counterclockwise. As a result, the throttle valve starts moving to close. In this way, the throttle valve closes gradually as the coolant temperature rises until it reaches the idling position at the normal temperature. Refer to Fig. 4-1-11.

1) When coolant temperature is low:

As the thermo-wax is contracted and the plunger is retracted, the choke valve linked with the fast idle cam is closed. When the engine is started in this state, the intake manifold vacuum pulls the diaphragm of the choke piston to the left (below figure). The choke piston rod also moves to the left and acts on the choke valve to open. However, the choke valve is restricted by the plunger of the thermo-wax through the choke lever. Therefore, the rod cannot move to the left far enough to open the choke valve wide and has to stop at a position where the choke valve opening is small as shown in the figure. In this state, the diaphragm contracts the bucking spring.



1. Choke piston
2. Intake manifold vacuum
3. Diaphragm
4. Choke piston rod
5. Choke valve
6. Choke lever
7. Bucking spring

Fig. 4-1-12 When coolant temp. is low

2) When the coolant temperature rises:

The plunger lowers due to the expansion of the thermo-wax. Then the fast idle cam rotates counterclockwise and consequently the choke lever clockwise. This allow the rod to move further to the left by the bucking spring force (below figure). Thus a wide opening of the choke valve is obtained.

Hereafter, the plunger of the thermo-wax moves futher down in accordance with the coolant temperature rise. The lower the plunger moves, the wider the choke valve opening becomes, and it becomes fully open at the normal coolant temperature.

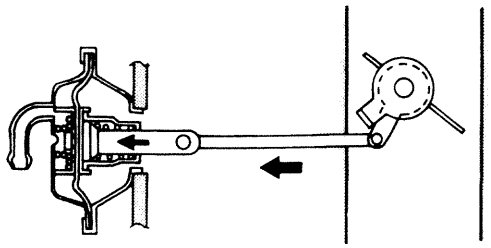
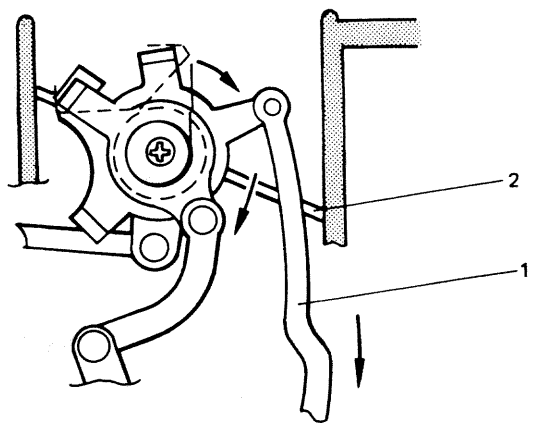


Fig. 4-1-13 When coolant temp. rises

[**Unloader system**]
If accelerator pedal is depressed for acceleration while the opening of the choke valve is small, the throttle lever pulls down the unloader lever and the choke valve opens up temporarily for smooth acceleration.

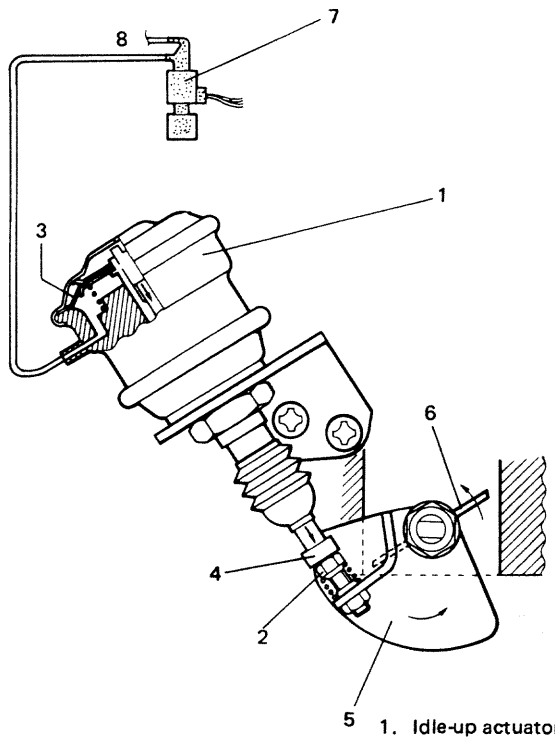


1. Unloader lever
2. Choke valve

Fig. 4-1-14 Unloader system

Idle Up System
This system operates at idling and compensates the idle speed;
1) When any one of following electric loads is operating.
   - Small light, tail light, side marker light & license light
   - Rear defogger (if equipped)
   - Heater fan
2) When car is at a high altitude (higher than 1,220 m (4,000 ft) and HAC is ON).
3) When temperature in engine room is cold (below 7°C (44°F) and thermal switch is ON).
4) When engine speed after engine start is lower than 1,500 r/min.

The ECM sends an electric signal to the Three Way Solenoid Valve (TWSV). Receiving the signal, the TWSV opens its inner valve and transmits the manifold vacuum to the idle-up diaphragm. As the diaphragm moves down by the vacuum, the rod move down and push the throttle lever to open the throttle valve a little for the idle-up state.
In this way, the idle-up system helps to stabilize the idle speed even when electric loads operate. When electric loads stop operating, the TWSV closes. Then the idle-up diaphragm as well as rod moves back up, thus the idle-up state is released.



1. Idle-up actuator
2. Adjusting screw
3. Diaphragm
4. Rod
5. Throttle lever
6. Throttle valve
7. TWSV
8. To intake manifold

Fig. 4-1-15 Idle-up system operation

REMOVAL AND INSTALLATION

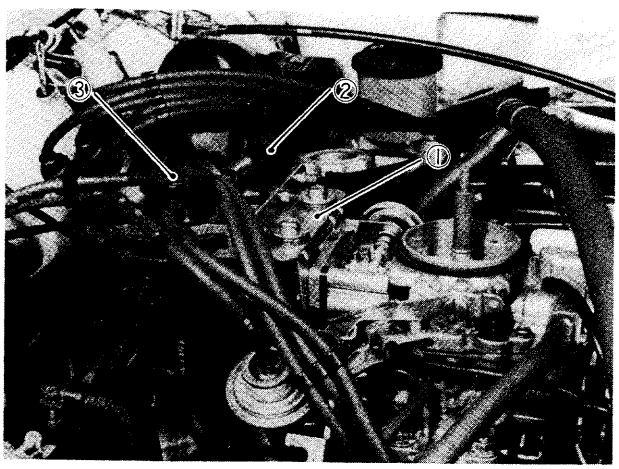
WARNING:
Removal and installation of carburetor must be carried out in a well-ventilated place where no fire is used around.

Removal

1) Disconnect negative battery cord from battery.
2) Drain coolant.

WARNING:
To help avoid the danger of being burned, do not remove the drain plug and the radiator cap while the engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if the plug and cap are taken off too soon.

3) Remove air intake case from carburetor.
4) Disconnect micro switches, switch vent solenoid valve, fuel cut solenoid valve and MCSV lead wires at their couplers.
5) Disconnect VSV coupler from VSV.
6) Detach bracket with EGR modulator and TWSV from carburetor.



1. Bracket
2. TWSV
3. EGR modulator

Fig. 4-1-16

7) Disconnect water inlet and outlet hoses from carburetor.
8) Disconnect accelerator cable from carburetor.
9) Disconnect vacuum hoses from idle up actuator and carburetor.
10) To release the pressure in fuel tank, remove fuel tank filler cap and then, reinstall it.
11) Disconnect fuel inlet hose from carburetor.
12) Check all around carburetor for any other parts required to be removed or disconnected for removal of carburetor and remove or disconnect whatever necessary.
13) Remove carburetor from intake manifold.

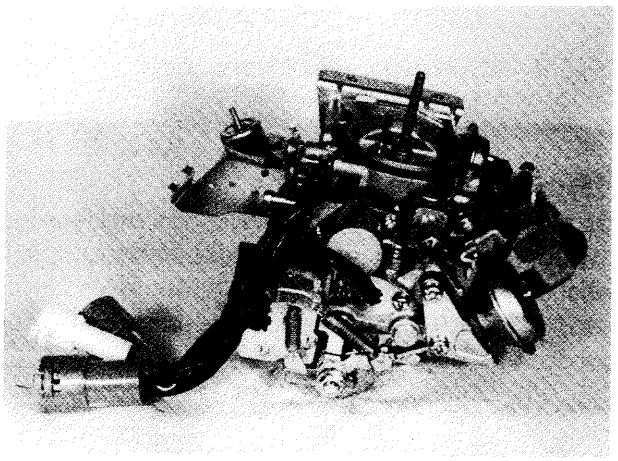


Fig. 4-1-17

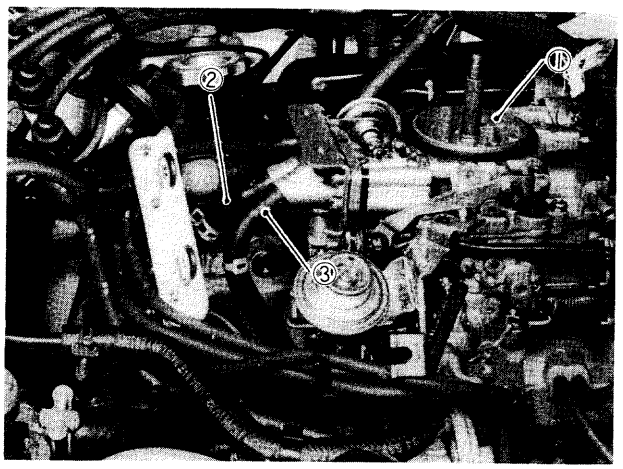
Installation

Install in the reverse order of removal using care for the following.

- Install carburetor to intake manifold.
  Tighten 4 carburetor nuts to the specified torque.

Tightening torque for nuts	18 – 28 N·m 1.8 – 2.8 kg-m 13.5 – 20.0 lb-ft

- Connect water hoses to carburetor.



1. Carburetor
2. Inlet hose
3. Outlet hose

Fig. 4-1-18

- Connect electric couplers securely.
- Connect accelerator cable to carburetor. With the accelerator pedal released, adjust the cable play to specification. This adjustment can be made by turning the adjusting nut. After adjustment, tighten the lock nut. Refer to p. 4-19.
- Connect vacuum hoses securely.
- Refill cooling system.
- Connect negative cable at battery.

NOTE:
Upon completion of installation, be sure to check each part for evidence of fuel leakage and for proper operation. If defective, correct.

UNIT REPAIR OVERHAUL

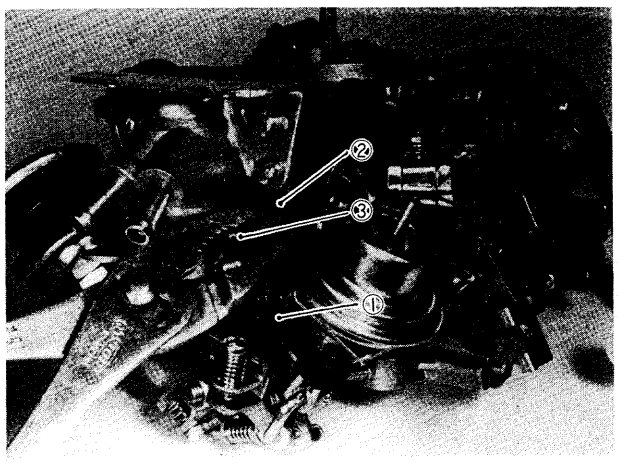
This section outlines procedure to be used for overhauling carburetor as removed from engine. For removal and installation of carburetor from and to engine, refer to the previous page.

NOTE:
- **Be sure to replace gaskets as well as worn or damaged parts.**
- **While disassembling and assembling carburetor, use special care not to deform levers on throttle valve shaft or cause damage to any other parts.**
- **Don't disassemble mixture control solenoid valve and accelerator pump piston.**
- **Don't remove idle and wide open micro switches from the bracket where they are installed.**

WARNING:
Keep lighted cigarette and any other fire off near carburetor as it contains gasoline, when servicing carburetor.

Disassembly

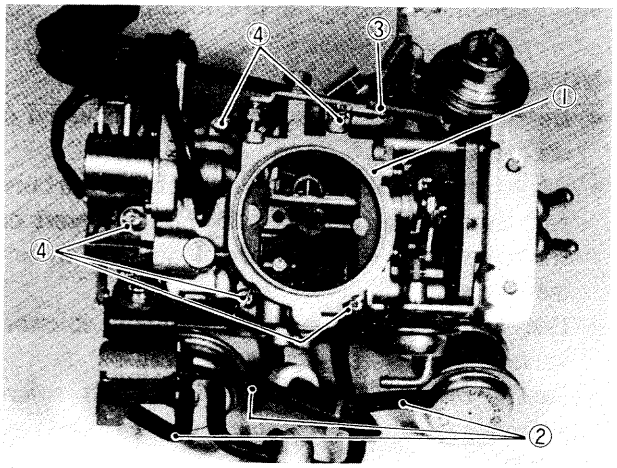
1) Turn fast idle cam counterclockwise and insert a pin avialable into holes on cam and bracket to lock the cam.



1. Fast idle cam
2. Bracket
3. Pin

Fig. 4-1-19

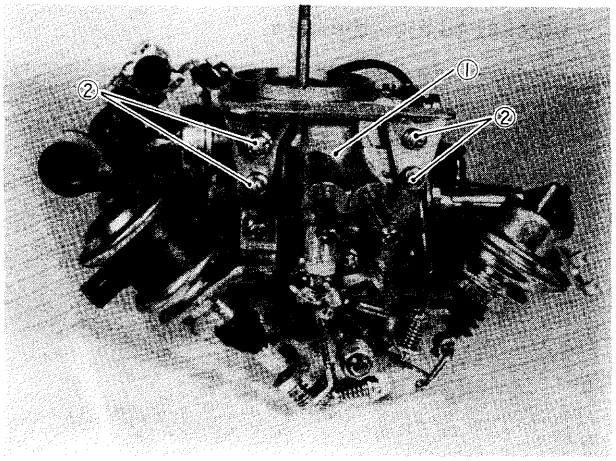
2) Remove air horn from float chamber after disconnecting three hoses and pump lever and removing five screws of air horn. Loosen idle up bracket screw.



1. Air horn
2. Hose
3. Pump lever
4. Screw

Fig. 4-1-20 Air horn and hoses, etc.

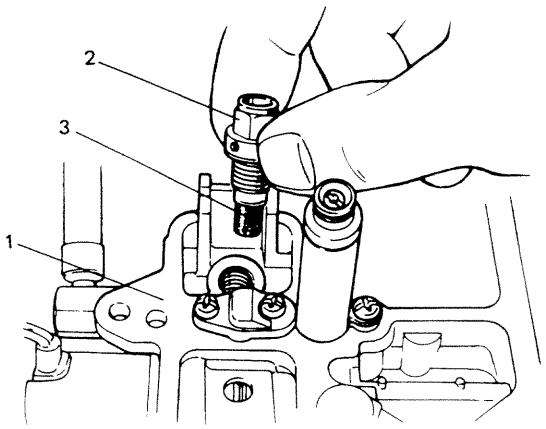
NOTE:
Never loosen 4 screws fixing element holder at this point.



1. Thermo element holder
2. Screw

Fig. 4-1-21

3) Remove float and needle valve from air horn and then needle valve seat and filter.

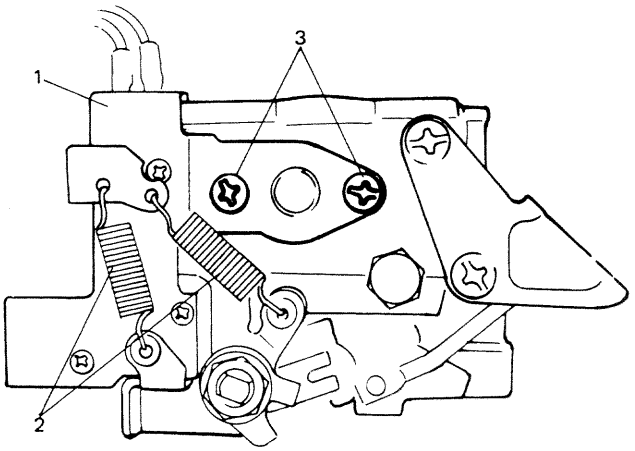


1. Air horn
2. Needle valve seat
3. Needle valve filter

Fig. 4-1-22 Needle valve seat and filter

4) Remove micro switch bracket after removing 2 springs and 2 screws indicated in below figure.

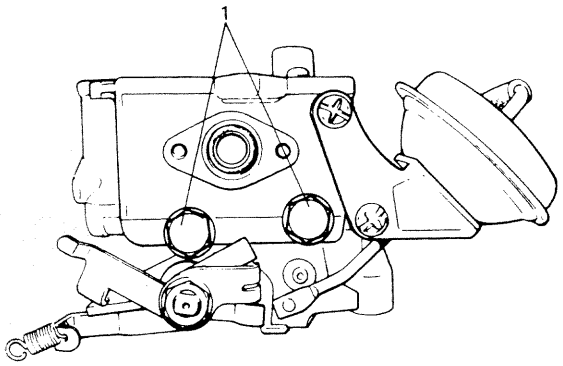
NOTE:
Don't remove micro switches from bracket.



1. Micro switch bracket
2. Spring
3. Screw

Fig. 4-1-23 Idle and wide open micro switches and bracket

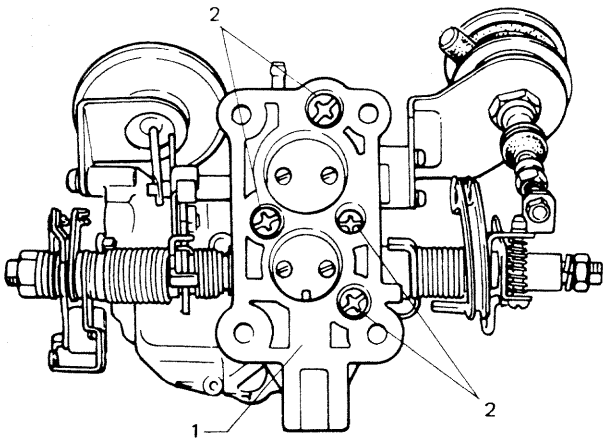
5) Remove two drain plugs and then primary and secondary main jets in float chamber through plug's holes, using a negative screw driver.



1. Drain plug

Fig. 4-1-24 Drain plugs

6) Remove throttle chamber from float chamber after removing four screws shown in below figure.



1. Throttle chamber
2. Screw

Fig. 4-1-25 Throttle chamber

Cleaning

1) Wash below listed items in carburetor cleaner and then clean them by blowing compressed air.
- All removable air jets and fuel jets, except mixture control solenoid valve jet.
- Needle valve, valve seat and filter.

2) Blow compressed air into all passages to clean.
3) Clean bottom of float chamber.

NOTE:

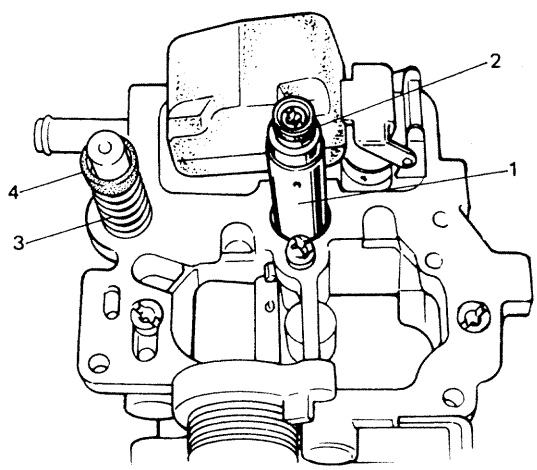
1) Don't immerse following parts in carburetor cleaner.
- **Micro switches (wide open switch and idle switch)**
- **Switch vent solenoid**
- **Fuel cut solenoid valve**
- **Mixture control solenoid valve**
- **Secondary diaphragm, choke piston and idle-up actuator**
- **Parts made of rubber or resin and gasket**
- **Thermo-wax (thermo element)**

2) Don't put drills or wires into fuel passages and metering jets for cleaning. It causes damages in passages and jets.

3) If cleaning solvent contacts rubber or resin parts, be sure to blow off cleaning solvent by compressed air immediately.

Inspection

1) Check choke valve and throttle valves for smooth operation.
2) Check rubber cup of pump piston and seal of mixture control solenoid valve for deterioration and damage. Refer to below figure.
3) Check needle valve and valve seat for wear.

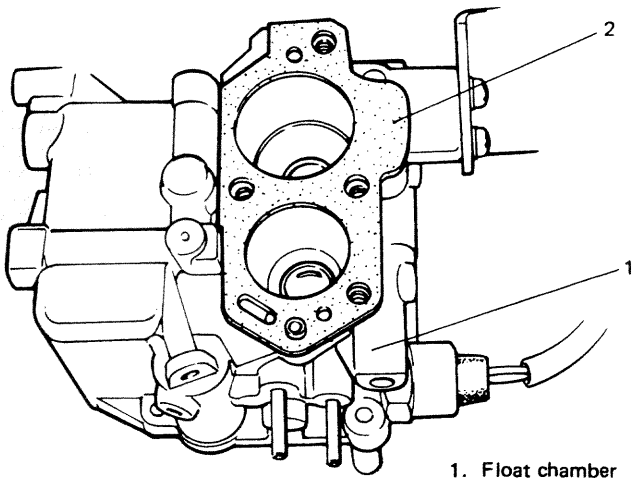


1. Mixture control solenoid valve
2. Seal
3. Spring
4. Rubber cup

Fig. 4-1-26 Accelerator pump piston and mixture control solenoid valve

Assembly

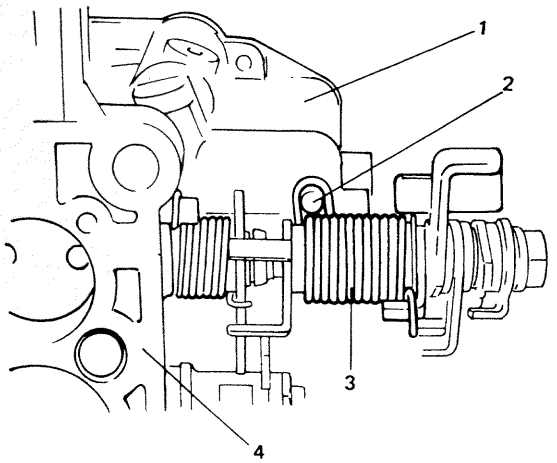
1) Install insulator to float chamber as shown in below figure.



1. Float chamber
2. Insulator

Fig. 4-1-27 Insulator installation

2) After attaching both ends of throttle lever return spring as shown in figure, install throttle chamber to float chamber. Hook throttle valve side end of return spring over the boss on float chamber as shown in below figure.

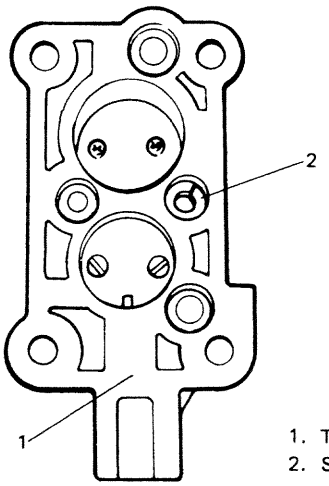


1. Float chamber
2. Boss
3. Throttle lever return spring
4. Throttle chamber

Fig. 4-1-28 Hooking throttle lever return spring

3) Install spring washer as below figure, and torque four screws to specification.

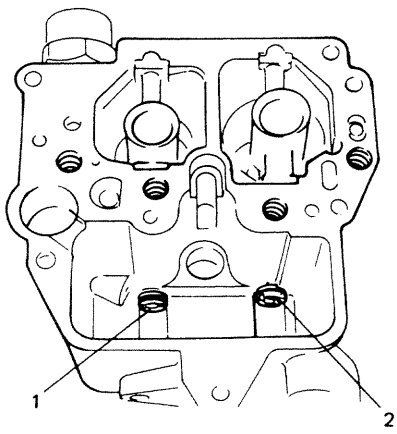
Tightening torque for screws	4 – 7 N·m 0.4 – 0.7 kg-m 3 – 5 lb-ft



1. Throttle chamber
2. Spring washer

Fig. 4-1-29 Installing washer

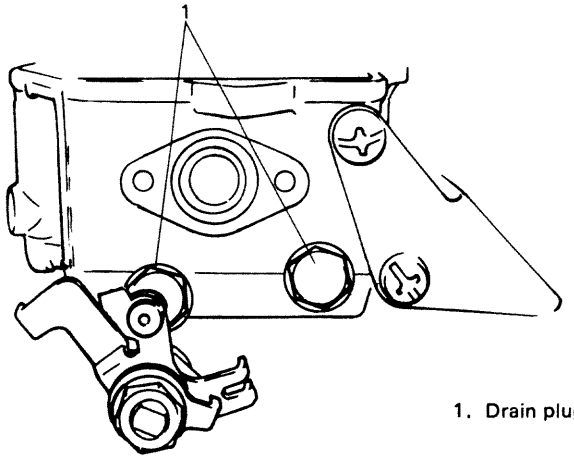
4) Install primary and secondary main jets.



1. Primary main jet
2. Secondary main jet

Fig. 4-1-30 Primary and secondary main jets

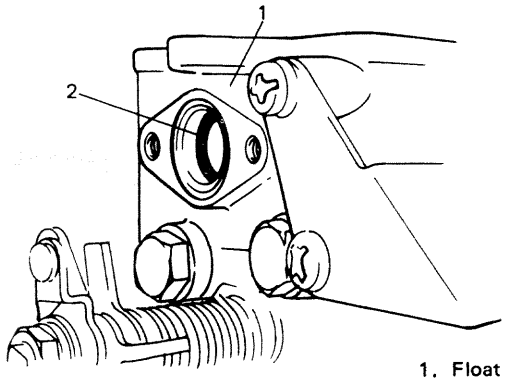
5) Install gaskets and drain plugs, after installing main jets.



1. Drain plug

Fig. 4-1-31 Installing drain plugs

6) Install level gauge seal.



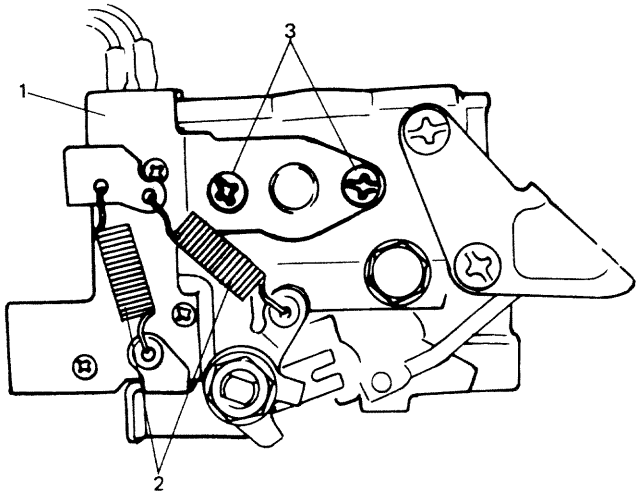
1. Float chamber
2. Level gauge seal

Fig. 4-1-32 Installing level gauge seal

7) Install micro switch bracket with micro switches and level gauge, and two springs as shown in below figure.

NOTE:

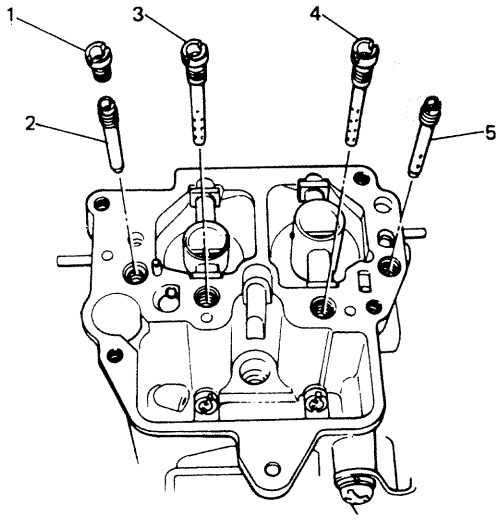
- **Don't remove micro switches (idle switch & wide open switch) from bracket.**
- **When bracket with micro switches has been removed from float chamber for any service and reinstalled after service work, make sure to check switches for operation and adjust if necessary. Check and adjustment for micro switches should be carried out with carburetor removed from intake manifold.**
  Refer to SECTION 5 "EMISSION CONTROL SYSTEM" for procedure to check and adjust micro switches.



1. Micro switch bracket
2. Spring
3. Screw

Fig. 4-1-33 Installing bracket and springs

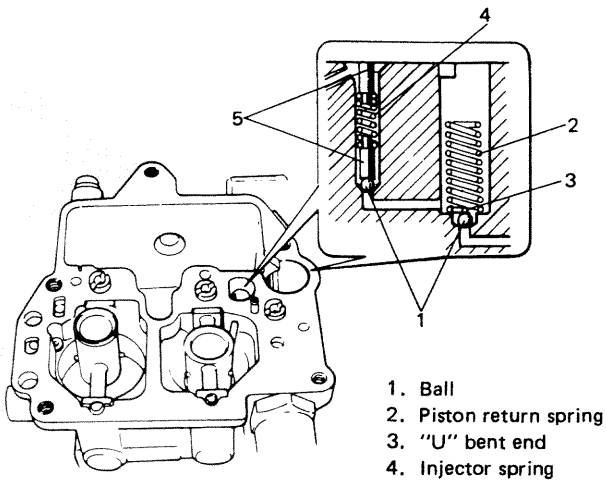
8) Install jets and air bleeders to float chamber. Refer to Fig. 4-1-34 for their installation.



1. Primary slow air No. 2 bleeder
2. Primary slow jet
3. Primary main air bleeder
4. Secondary main air bleeder
5. Secondary slow jet

Fig. 4-1-34 Installing jets and air bleeders

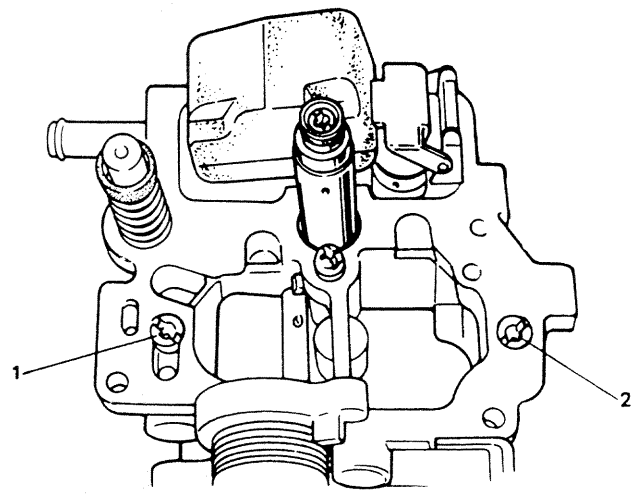
9) Install balls, injector spring and weights to accelerator pump. Direct "U" bent end side of piston return spring downward as shown in below figure.



1. Ball
2. Piston return spring
3. "U" bent end
4. Injector spring
5. Injector weight

Fig. 4-1-35 Installing balls, injector spring and weights, and piston return spring

10) Install needle valve filter, valve seat, gasket, needle valve and float to air horn. After installing float, check for float level and adjust if necessary.
11) Install primary and secondary slow air bleeders to air horn.

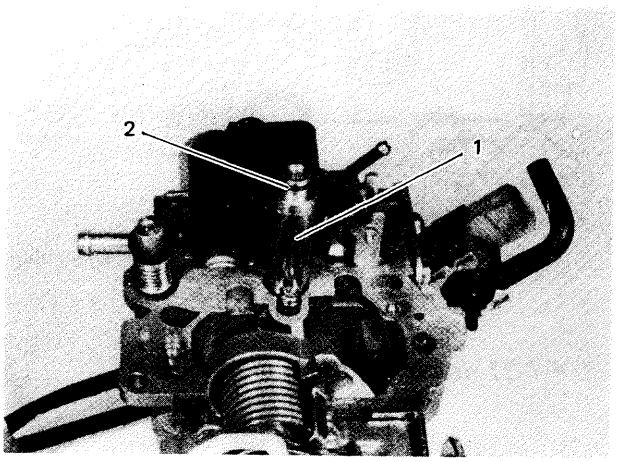


1. Primary slow air No. 1 bleeder
2. Secondary slow air bleeder

Fig. 4-1-36 Installing slow air bleeders

12) Be sure to apply silicone oil to mixture control solenoid valve seal before installing air horn to float chamber.

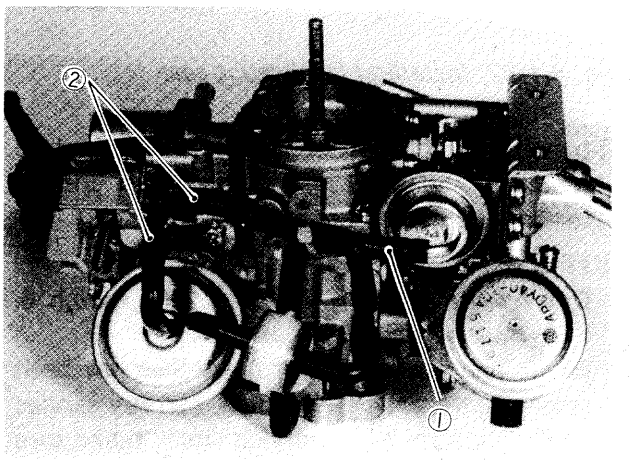
NOTE:
Be sure to use silicone oil that will not affect rubber.



1. Mixture control soelnoid valve
2. Seal

Fig. 4-1-37 Mixture control solenoid valve seal

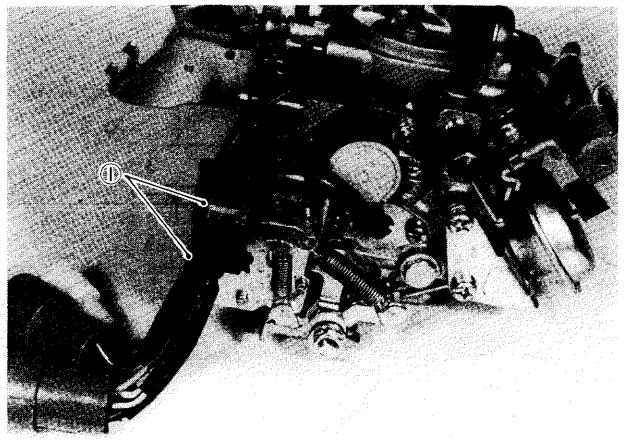
13) Install air horn gasket to float chamber. Use new gasket.
14) Install air horn to float chamber. After installing acceleration pump lever to air horn, check lever for smooth operation.
15) Connect 3 hoses as shown below figure.



1. Choke piston hose
2. Secondary diaphragm hose

Fig. 4-1-38 Installing hoses

16) Clamp wire harness securely.



1. Clamp

Fig. 4-1-39

17) Remove the pin installed before disassembly (to lock fast idle cam).

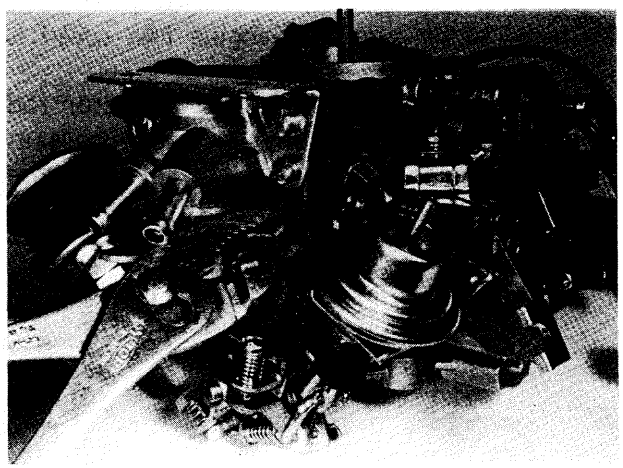


Fig. 4-1-40

MAINTENANCE SERVICES

Before checking or adjusting the carburetor as the cause of poor engine performance or rough idle, check the followings for malconditions.

- Ignition system including distributor, timing, spark plugs and wires.
- Air cleaner including thermostatically controlled air cleaner system.
- Evaporative emission control system.
- PCV system.
- EGR valve.
- Engine compression.

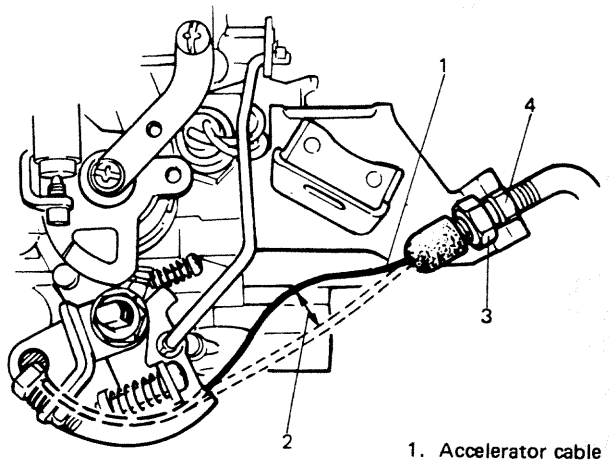
Also, check the intake manifold, carburetor and vacuum hoses for leakage.

Accelerator Cable Adjustment

Check accelerator cable for play and adjust if necessary.

Cable play should be within the specifications. If out of specification, loosen lock nut and adjust by turning adjusting nut. Be sure to tighten lock nut securely after adjustment.

Condition	Cable play
When carburetor and coolant are cold;	10 – 15 mm (0.4 – 0.6 in.)
When carburetor and coolant are warm;	3 – 5 mm (0.12 – 0.20 in.)

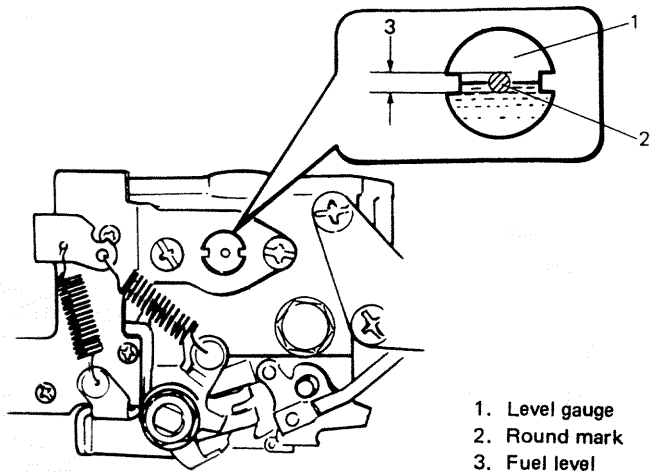


1. Accelerator cable
2. Cable play
3. Lock nut
4. Adjusting nut

Fig. 4-1-41 Accelerator cable play

Float Adjustment

1) The fuel level in float chamber should be within round mark at the center of level gauge.



1. Level gauge
2. Round mark
3. Fuel level

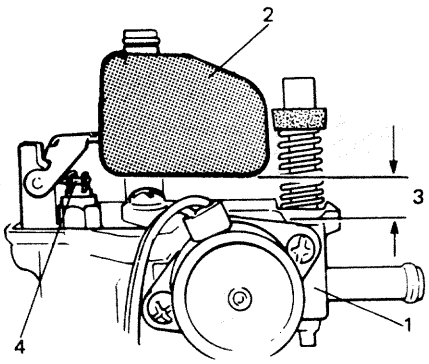
Fig. 4-1-42 Fuel level

2) If the fuel level is not found within the round mark, check the float level and adjust it as follows:
   a) Remove the air horn, and invert it.
   b) Measure the distance between the float and the gasketed surface of air horn. The measured distance is float level, and it should be the specification.
   If the float level is out of specification, adjust it by bending the tongue up or down.

NOTE:

- **This measurement should be made without a gasket on the air horn.**
- **Check float height with float weight applied to needle valve.**
- **As a gauge for checking float level, use something whose thickness measurement is the same as specified level measurement (such as a drill or M8 bolt) after confirming thickness with vernier calipers.**

Float level specification	8 mm (0.31 in.)

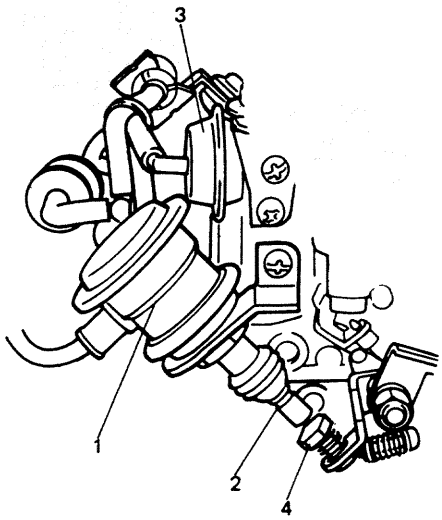


1. Air horn
2. Float
3. Float level
4. Tongue

Fig. 4-1-43 Float level

Idle Up Adjustment

1) Warm up engine to normal operating temperature.
2) Check to be sure that engine idle speed is specification.
3) Check to ensure that idle-up actuator rod moves down (indicating that idle-up is at work) when small light, tail light, license light and side marker light are turned "ON".



1. Idle-up actuator
2. Idle-up actuator rod
3. Choke piston
4. Idle up adjusting screw

Fig. 4-1-44 Idle-up adjusting screw

4) With lights (head light) turned "ON", check engine rpm (idle-up speed). Be sure that heater fan, rear defogger (if equipped), and air conditioner (if equipped) are all turned "OFF".

Idle-up speed	900 – 1,000 r/min.

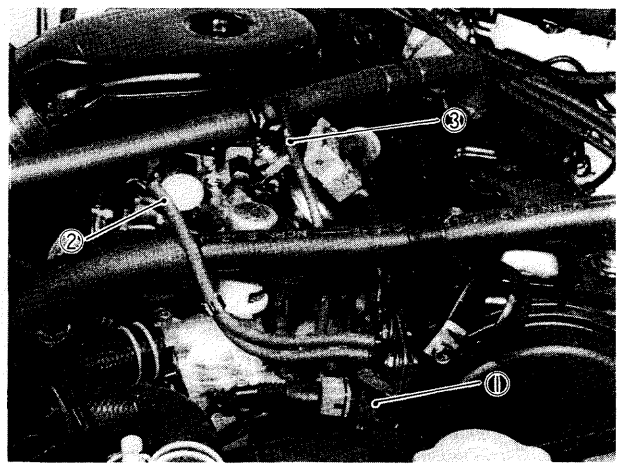
If idle-up speed is not within specification, adjust by turning adjusting screw.

5) After idle-up adjustment, check to ensure that idle-up adjusting screw moves as in step 3) when only heater fan is operated and then only rear defogger is operated (small light, tail light, side marker light and license light should be "OFF" in this cases).

If found faulty in step 3), check following parts individually according to each procedure.

[Checking TWSV]

1) Make sure that lighting switch, heater fan switch, rear defogger switch (if equipped) and air conditioner switch (if equipped) are all turned OFF.
2) Disconnect TWSV vacuum hoses from intake manifold and actuator.
3) With ignition switch at "OFF" position, by blowing air into hose disconnected from actuator, make sure there is no continuity between these hoses.
4) Turn lighting switch to ON position and by blowing air into the hose disconnected from actuator, make sure that there is continuity between hoses.



1. TWSV (Black)
2. To intake manifold
3. To actuator

Fig. 4-1-45

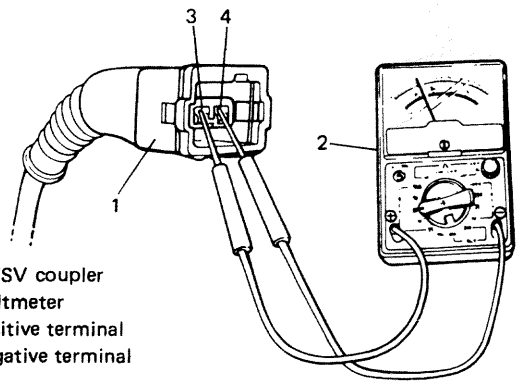
If defective in steps 3) and 4), replace TWSV or checking TWSV circuit.

[Checking TWSV circuit]

1) Warm up engine to normal operating temperature.
2) Stop engine and disconnect TWSV coupler.
3) Run engine at idle speed and connect voltmeter to coupler terminals disconnected. Check that voltmeter indicates 0V.
4) Check that voltmeter indicates about 12V under either of the following conditions.

- When engine speed exceeds 2,000 r/min.
- When lighting switch, heater fan switch or rear defogger switch (if equipped) is turned ON.

If defective in steps 3) and 4), the particular circuit is disconnected or in poor contact. Check the circuit for such condition. For detail, refer to item "CHECKING IDLE UP SIGNAL" in SECTION 5 "EMISSION CONTROL SYSTEM".



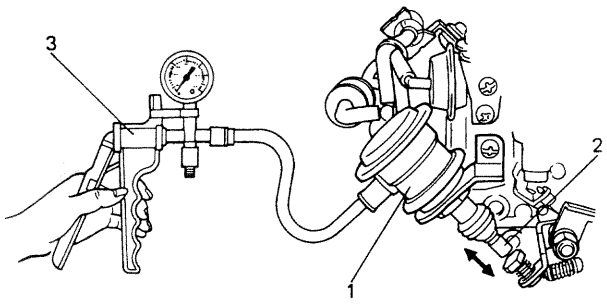
1. TWSV coupler
2. Voltmeter
3. Positive terminal
4. Negative terminal

Fig. 4-1-46

[Checking actuator]

1) Disconnect hose from TWSV.
2) Connect special tool (vacuum pump gauge) to its hose.
3) Check that actuator rod moves smoothly and that it is held at the same position when about 40 cmHg vacuum is applied to actuator.

If rod doesn't move smoothly, or it isn't held at the same position, replace actuator.



1. Idle up actuator
2. Rod
3. Special tool (Vacuum pump gauge 09917-47910)

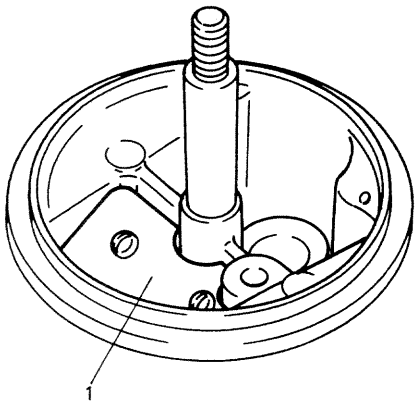
Fig. 4-1-47

Choke Adjustment

Perform following check and adjustments with air intake case removed when engine is cold.

[Choke valve]

1) Check choke valve for smooth movement by pushing it with a finger.



1. Choke valve

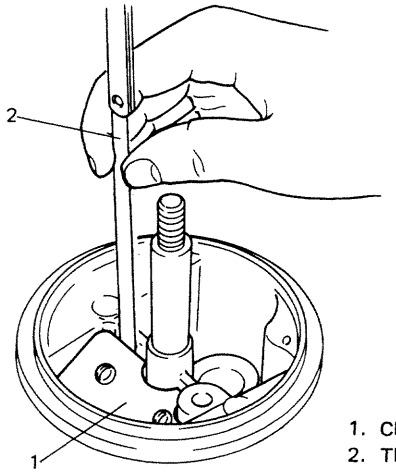
Fig. 4-1-48 Choke valve

2) Make sure that choke valve is closed almost completely when ambient temperature is below 25° C (77° F) and engine is cold.
3) Check to ensure that choke valve to carburetor bore clearance is within following specifications when engine is cool.

Ambient temperature	Clearance
25° C (77° F)	0.1 – 0.6 mm (0.004 – 0.023 in.)
40° C (104° F)	1.3 – 2.8 mm (0.05 – 0.11 in.)

NOTE:

As ambient temperature or engine coolant temperature rises high, clearance increases.



1. Choke valve
2. Thickness gauge

Fig. 4-1-49 Choke valve to carburetor bore clearance

4) If clearance is found excessively large or small in the above check, check strangler spring, choke piston and each link in choke system for smooth operation. Lubricate choke valve shaft and each link with spray lubricant if necessary.

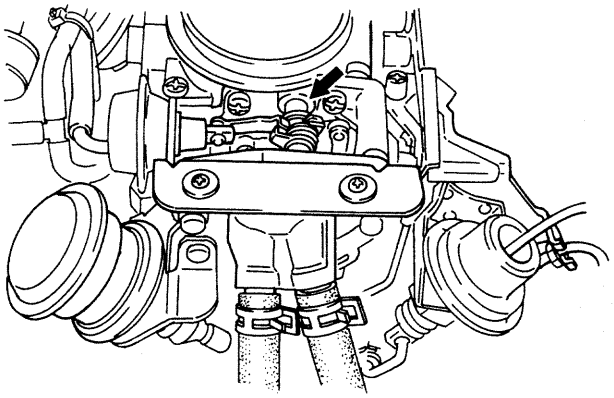
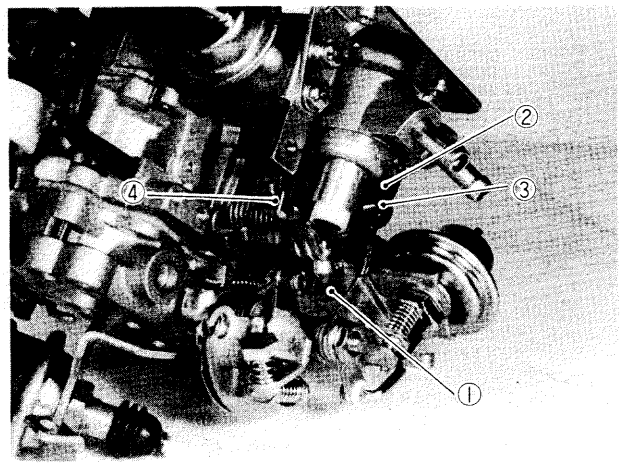


Fig. 4-1-50

5) If clearance is still out of specification even after lubrication in step 4), remove carburetor from intake manifold and remove idle-up actuator from carburetor.
Then, turn fast idle cam counterclockwise and insert a pin available into holes in cam and bracket to lock the cam.
In this state, bend choke lever shown in below figure up or down, with plier. Bending up causes choke valve to close, and down to open.



1. Fast idle cam
2. Bracket
3. Pin
4. Choke lever

Fig. 4-1-51 Choke lever

6) After installing air intake case, start engine again and warm it up fully.
7) Stop the engine when it is warmed up and remove air intake case again, and then check to ensure that choke valve is fully open.

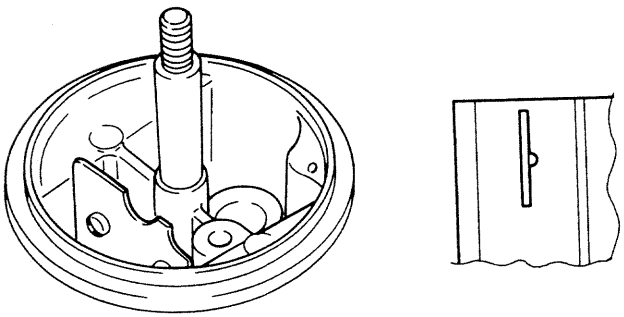
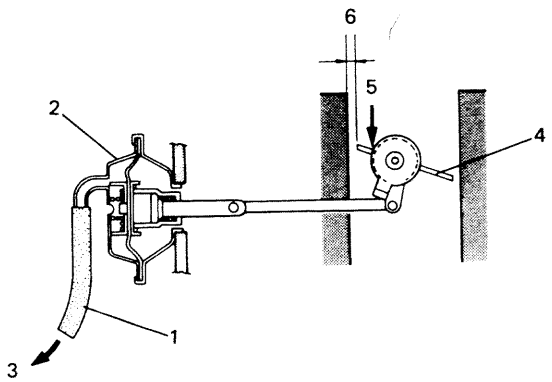


Fig. 4-1-52

If choke valve doesn't open fully, defect lies in wax-element or its link system.
Repair or replace defective parts(s).

[**Choke piston**]
Check choke piston as follows.
1) Disconnect choke piston hose at throttle chamber.
2) With choke valve pushed down to its closing side lightly by finger, apply vacuum to choke piston hose with vacuum pump gauge, and check to ensure that choke valve to carburetor bore clearance is within the specification.

Choke valve to carburetor bore clearance	1.1 – 1.3 mm (0.04 – 0.05 in.)

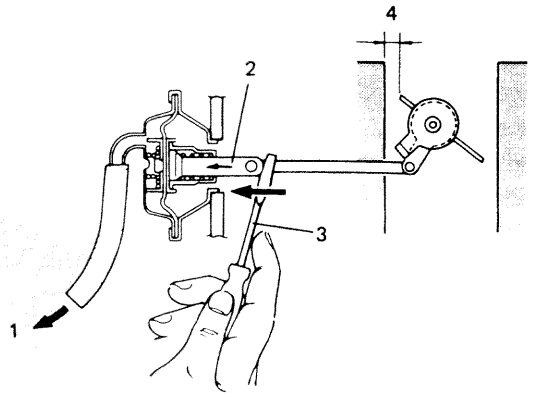


1. Choke piston hose
2. Choke piston
3. Vacuum (Apply −30 ~ −50 cm Hg vacuum)
4. Choke valve
5. Push here lightly
6. Choke valve to carburetor bore clearance

Fig. 4-1-53 Checking choke piston

3) With vacuum applied as in step 2), move choke piston rod with small screw driver as shown and check to ensure that choke valve to carburetor bore clearance is within following specification.

Choke valve to carburetor bore clearance	3.2 – 3.7 mm (0.13 – 0.14 in.)



1. Vacuum (Apply −30 ~ −50 cm Hg vacuum)
2. Choke piston rod
3. Screw driver
4. Choke valve to carburetor bore clearance

Fig. 4-1-54 Moving choke piston rod

Fast Idle Adjustment

NOTE:

Fast idle check and adjustment should be performed after making sure of the following.

- **Ambient temperature is between 22°C and 28°C (71°F and 82°F).**
- **Idle up system (idle up speed) is normal.**

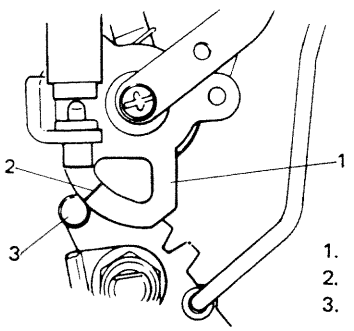
Check and adjustment procedure is as follows.

1) Leave car at a place where ambient temperature is between 22°C and 28°C (71°F and 82°F), for over 4 hours.

NOTE:

When carburetor is removed, leave carburetor at the place mentioned above for an hour and check as follows.

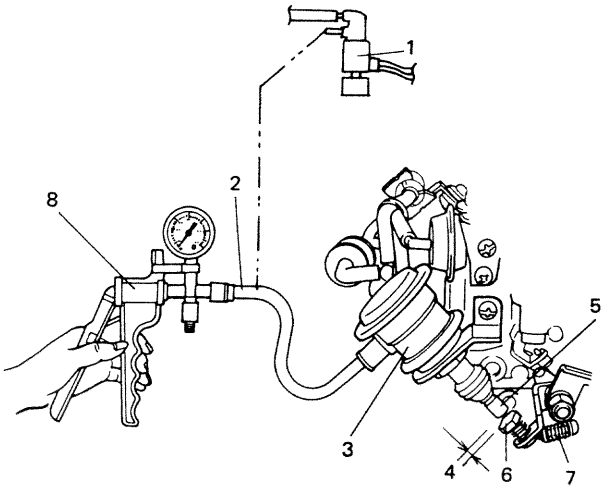
2) After leaving, make sure that the mark on cam and the center of cam follower are in alignment as shown in below figure.



1. Fast idle cam
2. Mark on cam
3. Cam follower

Fig. 4-1-55 Mark on cam and cam follower

3) Disconnect vacuum hose from TWSV and connect special tool (vacuum pump gauge) to its hose.



1. TWSV
2. Vacuum hose
3. Idle up actuator
4. Clearance
5. Actuator rod
6. Idle up adjusting screw
7. Fast idle adjusting screw
8. Special tool (Vacuum pump gauge)

With applying about 40 cmHg vacuum to actuator.

4) Check clearance between actuator rod and idle up adjusting screw.

Clearance "4" for fast idle	2.5 ~ 3.0 mm (0.10 ~ 0.12 in.)

If clearance is out of specification, adjust it to specification with tast idle adjusting screw.

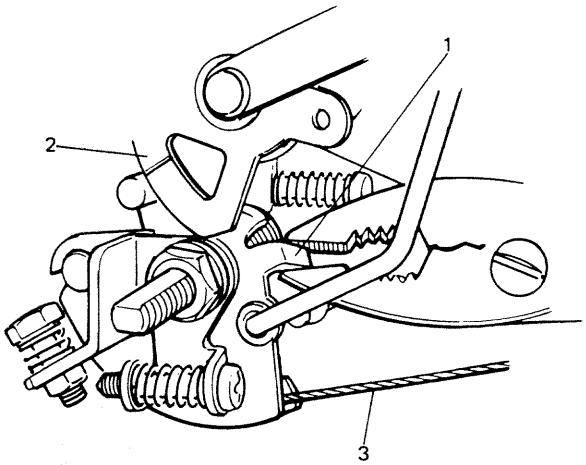
Unloader Adjustment

Perform this check and adjustment when engine is cool.

1) Remove air intake case.
2) Make sure that choke valve is fully closed.
3) Fully open throttle valve and check choke valve to carburetor bore clearance to ensure it is within following specification.

4) If clearance is out of specification, adjust by bending the unloader arm indicated in below figure.

Choke valve to carburetor bore clearance	2.5 – 3.2 mm (0.10 – 0.12 in.)

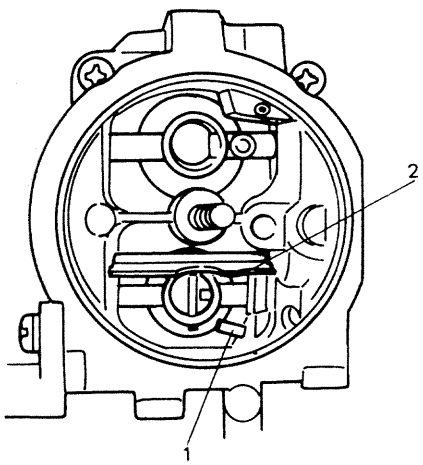


1. Unloader arm
2. Fast idle cam
3. Accelerator cable

Fig. 4-1-57 Unloader lever arm

Checking Acceleration Pump

1) Remove air intake case.
2) Make sure that fuel comes out of pump discharge nozzle when accelerator pedal is depressed.

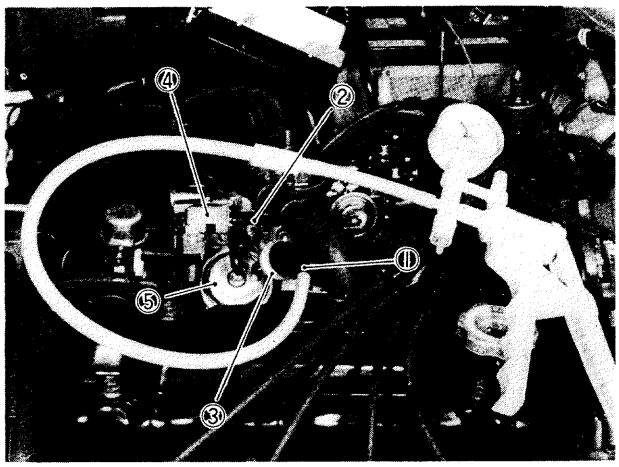


1. Pump discharge nozzle
2. Choke valve

Fig. 4-1-58 Pump discharge nozzle

Checking Secondary System

1) Remove air intake case.
2) Disconnect hose ① from 3 way joint, and connect vacuum pump gauge.
3) Open primary throttly valve fully.
4) Check if secondary throttle valve opens smoothly and is held there when vacuum (10 cmHg) is applied to actuator.
5) Disconnect hose ② from 3 way joint and connect vacuum pump gauge to its hose. Plug hose ① with finger.
6) Turn ignition switch to "ON" position and open primary throttle valve fully. 5 or 6 seconds later, make the same check as in above step 4).



1. Hose
2. Hose
3. VTV
4. VSV
5. Actuator

Fig. 4-1-59

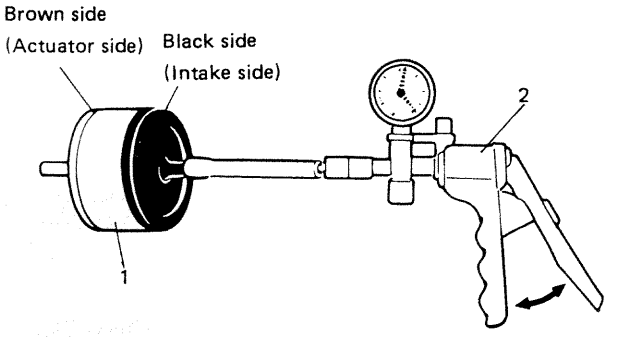
If check result in step 4) is not satisfactory, check VTV, and if that in step 6) is not satisfactory, check VSV.
If not satisfactory in either step 4) or 6) and both VTV and VSV are in good condition, replace actuator.

[VTV (Vacuum Transmitting Valve)]

Remove VTV. Use a vacuum pump gauge for VTV check. If pointer of vacuum pump gauge reacts as described below in each condition, VTV is in good condition.

With vacuum pump gauge set at Brown side of VTV, when pump is operated, pointer doesn't move (remains at zero position).

With vacuum pump gauge set at Black side of VTV, when pump is operated, pointer moves considerably but moves back to zero position as soon as pump operation is stopped.



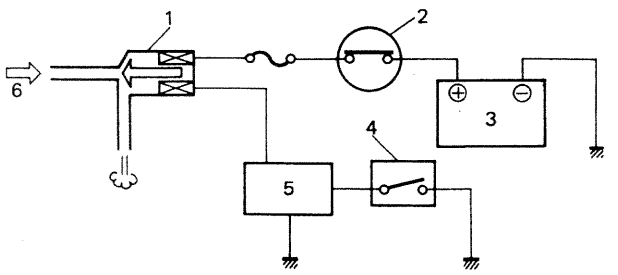
1. VTV
2. Vacuum pump gauge

Fig. 4-1-60

Install VTV. Refer to Fig. 4-1-2 for installation.

[VSV (Vacuum Switching Valve)]

1) Disconnect VSV vacuum hoses from 3 way joint and secondary actuator and while blowing either hose, check that air doesn't come out of the other hose.
2) Turn on ignition switch and depress accelerator pedal fully. 5 or 6 seconds later, while blowing either vacuum hose, check that air comes out of the other hose.



1. VSV
2. Ignition switch
3. Battery
4. WOTS
5. ECM
6. Blow air

Fig. 4-1-61

If check results in steps 1) and 2)are not satisfactory, either replace VSV or check WOTS and its circuit referring to SECTION5 "EMISSION CONTROL SYSTEM".

Idle Speed Adjustment

NOTE:

Before starting engine, place transmission gear shift lever in "Neutral", and set parking brake and block drive wheels.

Before idle speed check and adjustment, make sure of the following.

- Lead wires and hoses of engine emission control systems are connected securely.
- Accelerator cable has some play, that is, it is not tight.
- All vacuum hoses are connected securely.
- Fuel level should be within round mark at the center of level gauge.
- Valve lash is checked and adjusted according to the maintenance schedule.
- Air cleaner has been properly installed and is in good condition.
- All accessories (wipers, heater, lights, etc) are out of service.
- Ignition timing is within specification.
- Idle up actuator is not operating when engine is running at idle speed.

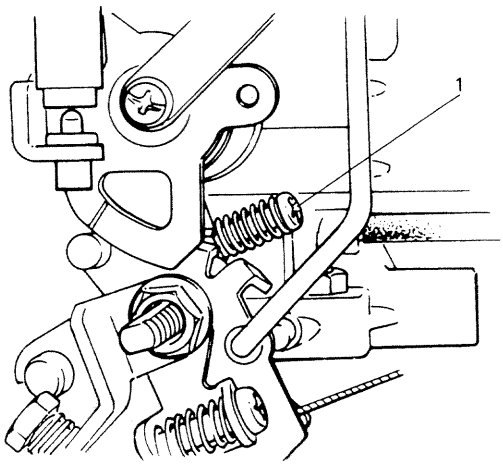
NOTE:

In areas above 4,000feet(1,220m) elevation (high altitude), idle up system will be normally in operation. Do not attempt to adjust the idle speed.

After above items are all confirmed, adjust idle speed as follows.

> **WARNING:**
> **Keep hands, tools, and clothing alway from engine cooling fan to help prevent personal injury.**

1) Warm up engine to normal operating temperature.
2) Check to ensure that idle speed is within 750 – 850 r/min (rpm).
3) If idle speed is not within specified range, adjust by turning idle speed adjusting screw.
   If idle speed can not be adjusted to the specification by turning the adjusting screw, it can be due to faulty return of throttle valve or some other reason. Determine cause and repair, and then adjust idle speed to specification.



1. Idle speed adjusting screw

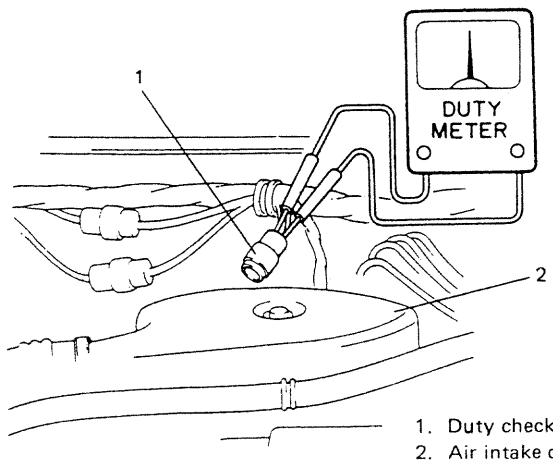
Fig. 4-1-62 Idle speed adjusting screw

4) After idle speed adjustment, check idle-up for operation with lights (small light, tail light, side marker light and license light), heater fan and rear defogger (if equipped) turned "ON", only one at a time. Refer to item "Idle Up Adjustment". (p. 4-20).
5) Stop engine and check to ensure that accelerator cable play is within the specification as previously outlined. If play is out of specification, adjust it.

Idle Mixture Inspection and Adjustment

[Inspection]

1) Warm up engine to normal operating temperature.
2) Remove seal rubber of duty check coupler and connect positive terminal of duty meter to "Blue/Red" wire and negative terminal to "Black/Green" wire.



1. Duty check coupler
2. Air intake case

Fig. 4-1-63

3) Set tachometer.
4) Run engine at 1,500 – 2,000 r/min for 30 seconds and bring it to idle speed.
5) Check duty at specified idle speed. If it is out of specification, adjust it to specification according to following adjustment procedure.

Specified Duty	10 – 50 at 750 – 850 r/min.

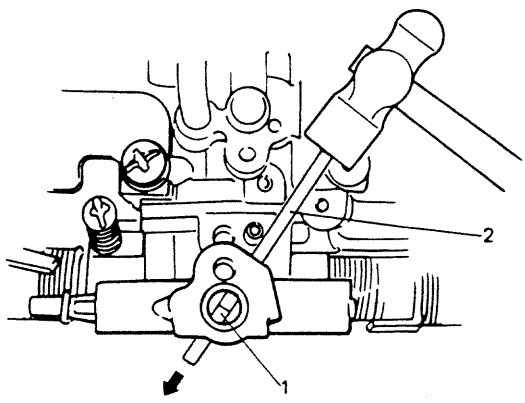
After inspection, install seal rubber to duty check coupler.

[Idle Mixture Adjustment]

The carburetor has been calibrated at the factory and should not normally need adjustment in the field. For this reason, the mixture adjustment should never be changed from the original factory setting. However, if during diagnosis, the check indicates the carburetor to be the cause of a driver performance complaint or emission failure, or the carburetor is overhauled or replaced, the idle mixture can be adjusted using the following procedure.
After adjustment, mixture adjusting screw pin must be installed.

Idle mixture adjustment procedure is as follows:

1) Remove carburetor from intake manifold following normal service procedure to gain access to mixture adjusting screw pin covering mixture adjusting screw.
2) Drive out mixture adjusting screw pin using about 4.5 mm (0.18 in) thick iron rod as shown below.



1. Mixture adjusting screw pin
2. Rod

Fig. 4-1-64 Mixture adjusting screw pin

3) Reinstall carburetor following normal service procedures.
   Connect emission control system hoses and lead wires. Make specified play on accelerator cable and refill cooling system.
4) Place transaxle gear shift lever in "Neutral", set parking brake and block drive wheels.
5) Start engine, and warm it up to normal operating temperature, stop engine.
6) Be sure to check the following before idle mixture adjustment.
   - Fuel level is within round mark at the center of level gauge.
   - Valve lash is checked and adjusted according to the maintenance schedule.
   - Air cleaner has been properly installed and is in good condition.
   - All accessories (wipers, heater, lights etc) are out of service.
   - Ignition timing is within specification.
   - Choke valve opens fully.
   - Idle-up actuator does not operate.
7) Check and adjust idle speed to specification if necessary.
8) Remove seal rubber of duty check coupler and connect positive terminal of duty meter to "Blue/Red" wire and negative terminal to "Black/Green" wire.
9) Run engine at 1,500 – 2,000 r/min for 30 seconds and bring it to idle speed.
10) With engine running at idle speed, adjust idle mixture adjusting screw slowly in small increment allowing time for duty to stabilize after turning screw to obtain duty of 10 – 50. If duty is too low, back screw out; if too high, screw it in. After obtaining duty of 10 – 50, recheck idle speed, and adjust if necessary.

NOTE:
If adjustment can't be made because duty meter indicator does not deflect, check feed back system according to the checking procedure of system described in section of Emission Control System.

11) After adjustment, install seal rubber to duty check coupler and drive in idle mixture adjusting screw pin.

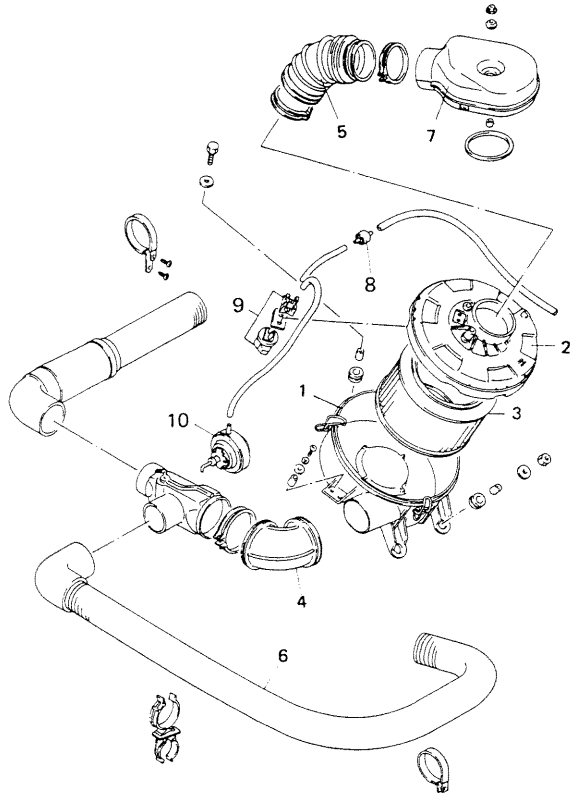
4-2. AIR CLEANER

GENERAL DESCRIPTION

In the air cleaner case, a dry-type air cleaner element is provided for filtering out dirt and dust from air being drawn into the engine for combustion.

A damaged element must be replaced with a new one, since it allows dust particles to enter the engine if used as it is. Such dust particles could cause wear to the engine inner parts and this further results in decreased output.

Also, the element must be cleaned periodically. Dusty and dirty element causes decrease in output and increase in fuel consumption. The dusty element even after cleaning should be replaced with a new one.



1. Air cleaner case
2. Air cleaner case cap
3. Air cleaner element
4. Air cleaner inlet hose
5. Air cleaner outlet hose
6. Warm air hose
7. Carburetor air intake case
8. Check valve
9. Thermo sensor (valve)
10. Air control actuator

Fig. 4-2-1

MAINTENANCE SERVICES

Air Cleaner Element

[Cleaning]

1) Remove air cleaner outlet hose and case cap.

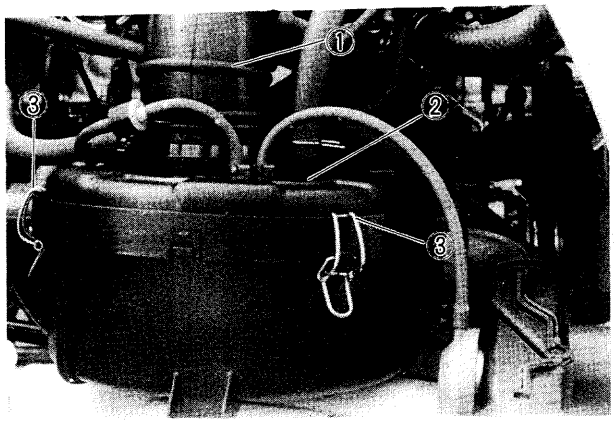


Fig. 4-2-2

1. Air cleaner outlet hose
2. Air cleaner case cap
3. Clamp

2) Take out air cleaner element from air cleaner case and blow off dust with compressed air from inside of element.

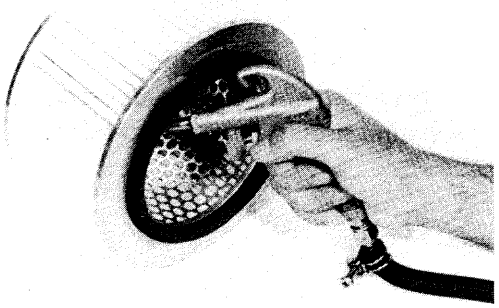


Fig. 4-2-3

3) Install element and cap by fitting cap groove to case securely, and be sure to clamp cap.
4) Install air cleaner outlet hose.

[Replacement]
1) Remove air cleaner outlet hose and case cap.
2) Remove air cleaner element.

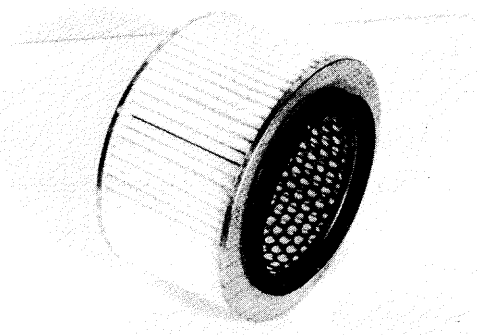


Fig. 4-2-4

3) Install new element and cap by fitting cap groove to case securely, and be sure to clamp cap.
4) Install air cleaner outlet hose.

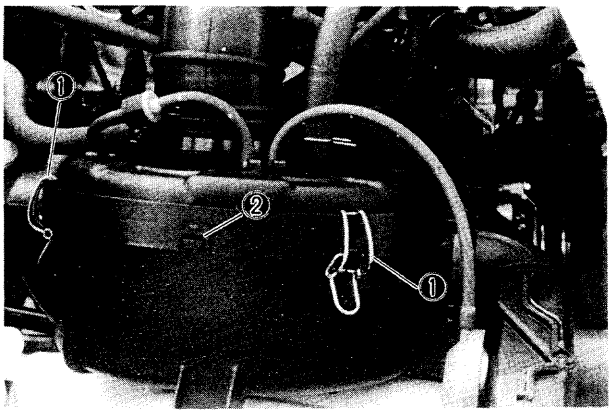


Fig. 4-2-4-1

1. Clamp
2. Groove

4-3. FUEL PUMP, FILTER AND LINES

GENERAL DESCRIPTION

The main components of the fuel system are fuel tank, fuel pump and fuel filter and it includes three lines; fuel feed line, fuel return line and fuel vapor line.

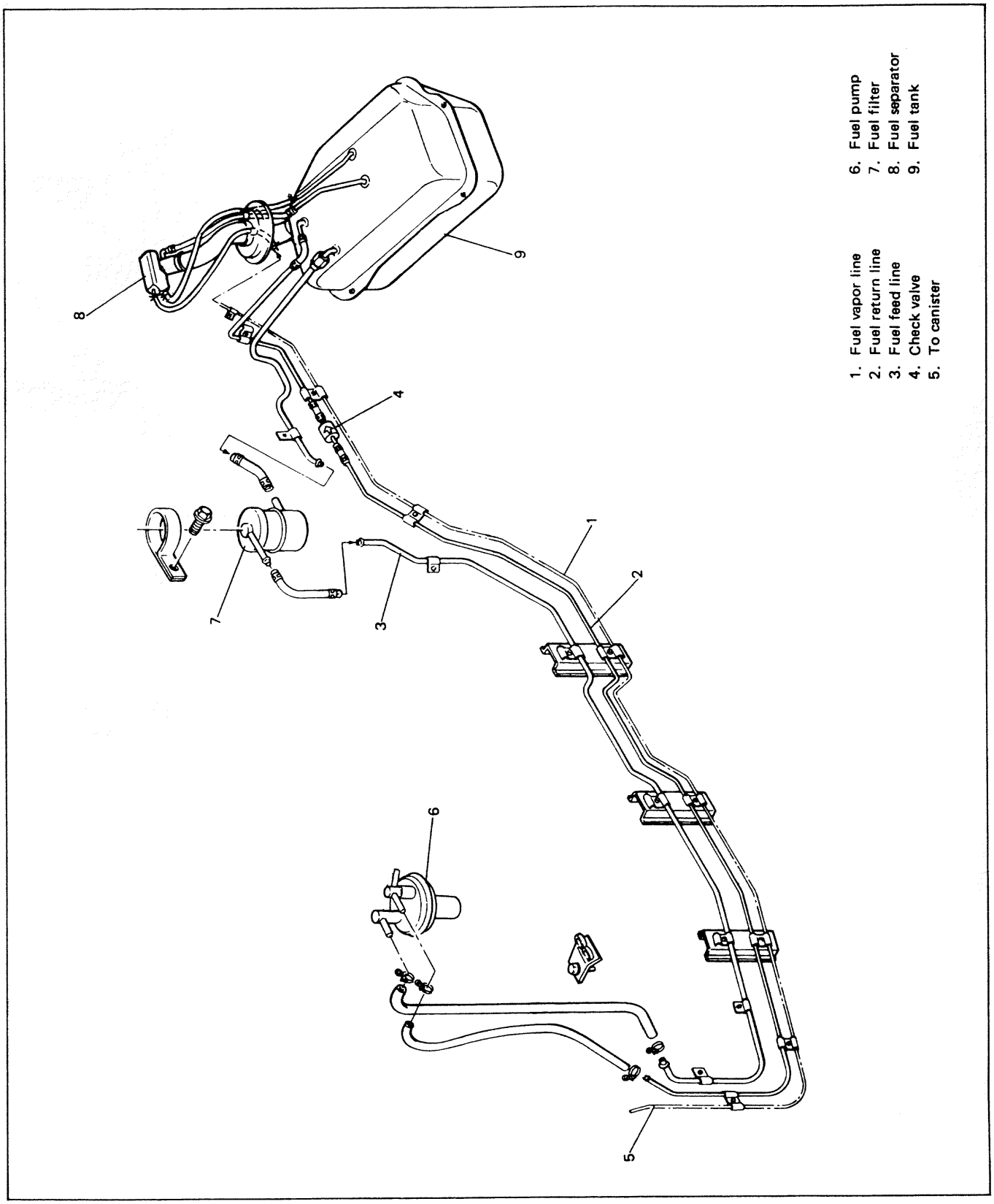


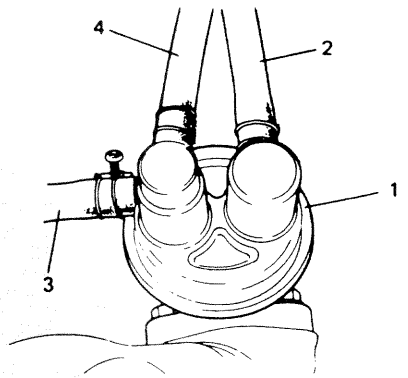
Fig. 4-2-5

Fuel Pump

A mechanical fuel pump is mounted on the cylinder head.

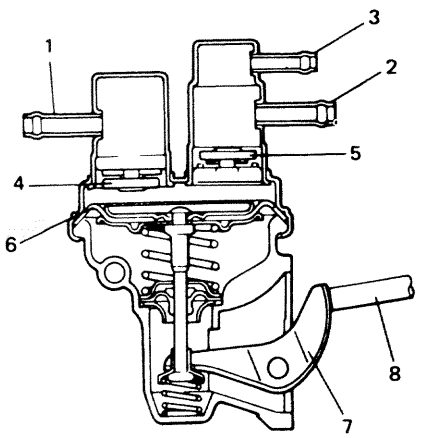
The diaphragm in fuel pump is actuated from the cam on the engine camshaft, through a fuel pump rod and a rocker arm of fuel pump. A rocker arm rides on the cam through the fuel pump rod and moves the pump diaphragm up and the fuel pump feeds the fuel into carburetor.

A fuel return circuit is provided in this pump in order to avoid "vapor lock". When the float chamber refuses to admit fuel, a slight pressure buildup occurs on the discharge side of the pump and this buildup causes the fuel to flow through the return circuit to the fuel tank. In other words, the fuel pump is kept in action as long as the engine is running, so that the constant flow of fuel through the pump keeps it cool.



1. Fuel pump
2. Inlet hose
3. Outlet hose
4. Return hose

Fig. 4-2-6



1. Inlet
2. Outlet
3. Return tube
4. Inlet valve
5. Outlet valve
6. Diaphragm
7. Rocker arm
8. Fuel pump rod

Fig. 4-2-7

Fuel Filter

Fuel filter is located at the front part of fuel tank, inside the right-hand side of chassis.

Fuel enters the filter through its inlet hose and, after passing through filtering element, comes out of its outlet hose communicated to the fuel pump. This filter is not meant to be disassembled. It is of cartridge type, consisting of a filtering element in a plastic case.

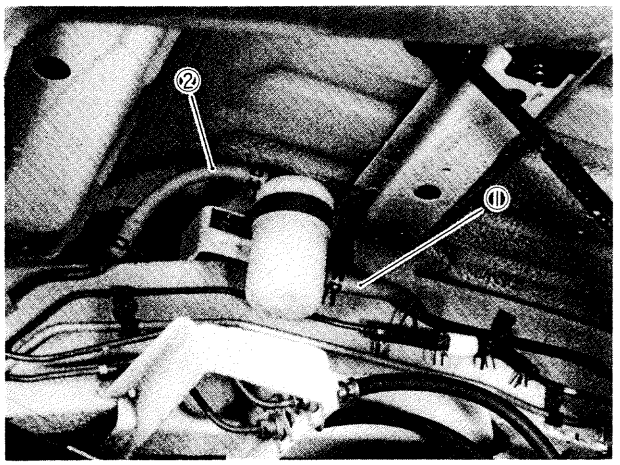
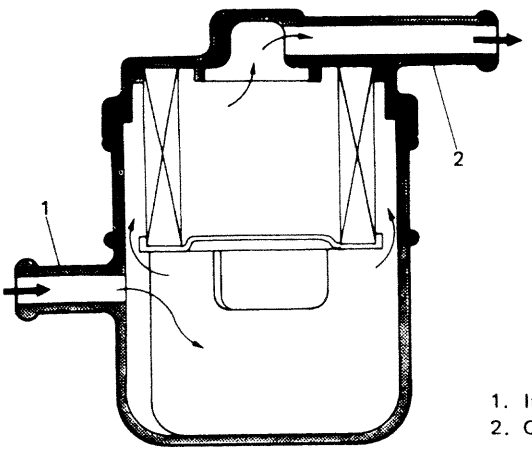


Fig. 4-2-8



1. Inlet
2. Outlet

Fig. 4-2-9

Fuel Filler Cap

The fuel tank filler neck has a pressure-vacuum cap.

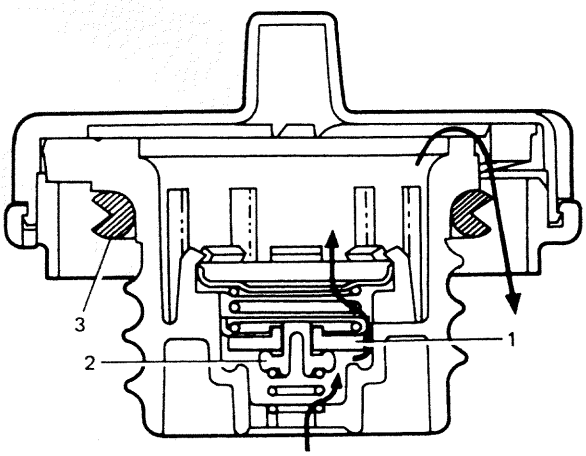
A ratchet tightening device on the threaded fuel filler cap reduces the chances of incorrect installation, which would prevent sealing fuel vapors.

After the gasket on fuel filler cap and the filler neck flange contact, the ratchet produces a loud clicking noise, indicating the seal has been set.

This cap has pressure relief valve and vacuum relief valve inside.

If the pressure of fuel vapor in fuel tank should exceed that for which fuel system is designed, the pressure relief valve opens to relieve the pressure.

The vacuum relief valve opens to relieve the vacuum created in fuel tank.



1. Pressure relief valve
2. Vacuum relief valve
3. Gasket

Fig. 4-2-10 Fuel filler cap cross-section

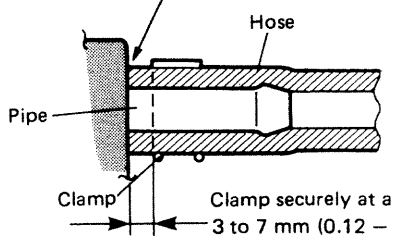
REMOVAL AND INSTALLATION

CAUTION:

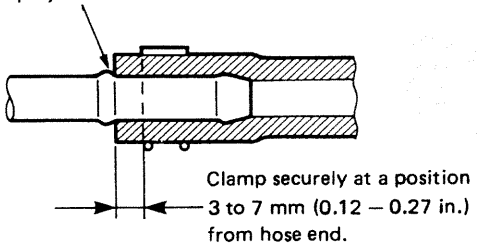
Before attempting service of any type on fuel system, the following cautions should be always observed.

- **Disconnect negative cable at battery.**
- **DO NOT smoke, and place "NO SMOKING" signs near work area.**
- **Be sure to have CO_2 fire extinguisher handy.**
- **Wear safety glasses.**
- **To release fuel vapor pressure in fuel tank, remove fuel filler cap from fuel filler neck and then reinstall it. If pressure in fuel tank is not released beforehand, fuel in fuel tank may come out of fuel hoses due to the pressure when they are disconnected.**
- **Note that fuel hose connection varies with each type of pipe. Be sure to connect and clamp each hose correctly referring to the following.**

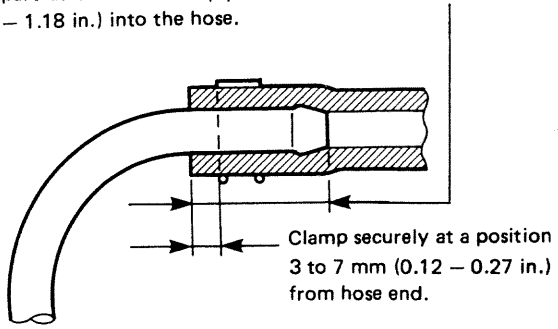
With following type pipe, fit hose as far as it reaches pipe joint as shown.



With following type pipe, fit hose as far as its peripheral projection as shown.



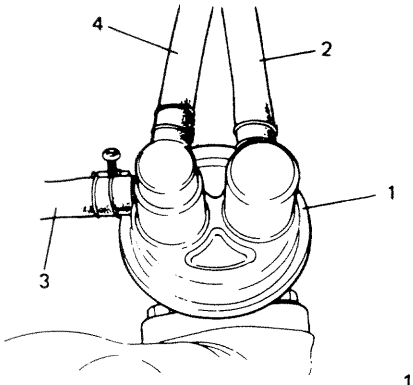
With following type pipe, fit hose as far as its bent part as shown or till pipe is about 20 to 30 mm (0.79 – 1.18 in.) into the hose.



Fuel Pump

[Removal]

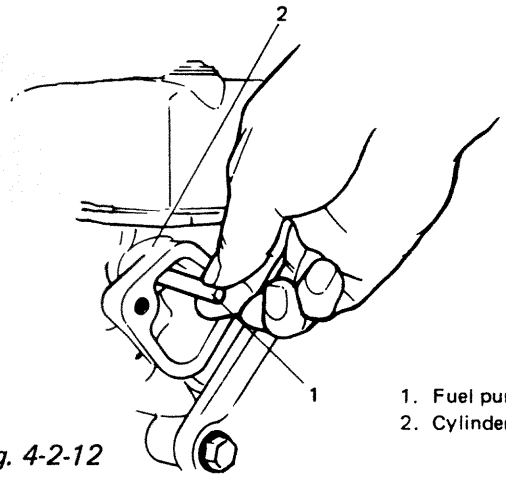
1) Disconnect negative cable from battery.
2) Remove fuel filler cap from fuel filler neck to release fuel vapor pressure in fuel tank. After releasing, reinstall the cap.
3) Disconnect fuel inlet, outlet and return hoses from fuel pump.



1. Fuel pump
2. Inlet hose
3. Outlet hose
4. Return hose

Fig. 4-2-11

4) Remove fuel pump from cylinder head.
5) Remove fuel pump rod from cylinder head.



1. Fuel pump rod
2. Cylinder head

Fig. 4-2-12

[Installation]

Reverse removal procedure for installation using care for the following.

- After oiling it, install fuel pump rod to cylinder head.
- Use new fuel pump gasket.
- Make sure for proper hose connection.
- Upon completion of installation, start engine and check fuel hose or its joints for leaks.

Fuel Filter

[Removal]

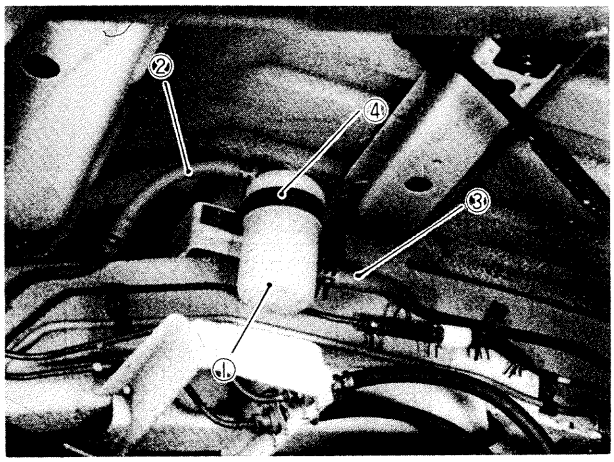
1) Disconnect negative cable from battery.
2) Remove fuel filler cap to release fuel vapor pressure in fuel tank. After releasing, reinstall the cap.
3) Disconnect inlet and outlet hoses from fuel filter.
4) Remove fuel filter with clamp.

[Installation]

1) Install filter and clamp, and connect inlet and outlet hoses to fuel filter.

NOTE:

The top connection is for outlet hose, the lower one for inlet hose.



1. Fuel filter
2. To fuel pump
3. From fuel tank
4. Clamp

Fig. 4-2-13

2) Connect negative cable to battery.
3) After installation, start engine and check it for leaks.

Fuel Tank

[Removal]

1) Disconnect negative cable from battery.
2) Disconnect fuel level gauge lead wire.
3) To release the pressure in fuel tank, remove fuel filler cap and then, reinstall it.
4) Raise car on hoist.
5) Drain fuel by removing drain plug.
6) Remove filler hose protector.
7) Disconnect filler hose from fuel tank.
8) Disconnect fuel hoses and pipe from fuel tank.
9) Remove fuel tank.