Workshop Manual

Volkswagen Taro 1989 ▶

Engine Code letters	2Y	4Y						

Booklet 1.8 and 2.2 ltr. Carburetor engines

Edition 02.89

V.A.G Service.

Repair Group Index to Workshop Manual

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When filing a technical instruction sheet, please enter the sheet number after the title of the instruction. This will enable you to see immediately which of the service bulletin topics have been published as technical instruction sheets.

Repair Group	Workshop Bulletins					
ENGINE MECHANICAL						
REMOVE AND FIT ENGINE						
TROUBLESHOOTING • ENGINE TUNE-UP						
COMPRESSION CHECK • CYLINDER HEAD						
TIMING CHAIN AND CAMSHAFT • CYLINDER BLOCK						
FUEL SYSTEM						
TROUBLESHOOTING • ON-VEHICLE INSPECTION						
CARBURETOR • FUEL PUMP						
DECELERATION FUEL CUT SYSTEM						
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COOLING SYSTEM						
TROUBLESHOOTING						
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WATER PUMP • THERMOSTAT • RADIATOR						
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REPLACEMENT OF ENGINE OIL AND OIL FILTER • OIL PUMP						
IGNITION SYSTEM						
TROUBLESHOOTING • IGNITION SYSTEM CIRCUIT						
ON-VEHICLE INSPECTION • DISTRIBUTOR						
EMISSION CONTROL SYSTEM						
PVC-, TP-, SD- and AS-System						
AUXILIARY SYSTEMS						
EVAP-, HAI-, CB- and AAP-System						

Technical Information should always be available to all foremen and mechanics, because compliance with the instructions given is essential to ensure vehicle roadworthiness and safety. In addition, the normal safety precautions to be observed when working on motor vehicles are also applicable.

Printed in Germany
000.5046.59.20

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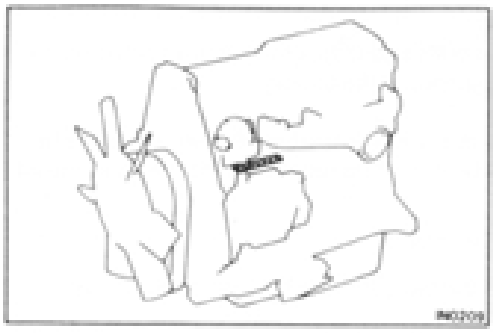


IDENTIFICATION INFORMATION

ENGINE SERIAL NUMBER

The engine serial number is stamped on the right side of the cylinder block.

GENERAL REPAIR INSTRUCTIONS

1. Use fender, seat and floor covers to keep the vehicle clean and prevent damage.

2. During disassembly, keep parts in order to facilitate reassembly.

3. Observe the following:

   (a) Before performing electrical work, disconnect the negative (-) cable from the battery terminal.

   (b) If it is necessary to disconnect the battery for inspection or repair, always disconnect the cable from the negative (-) terminal which is grounded to the vehicle body.

   (c) To prevent damage to the battery terminal post, loosen the terminal nut and raise the cable straight up without twisting or prying it.

   (d) Clean the battery terminal posts and cable terminals with a shop rag. Do not scrape them with a file or other abrasive object.

   (e) Install the cable terminal to the battery post with the nut loose, and tighten the nut after installation. Do not use a hammer to tap the terminal onto the post.

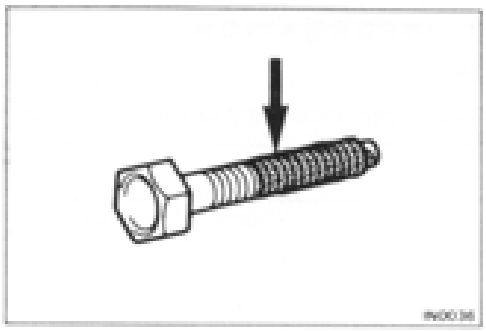
   (f) Be sure the cover for the positive (+) terminal is properly in place.

4. Check hose and wiring connectors to make sure that they are secure and correct.

5. Non-reusable parts

   (a) Always replace cotter pins gaskets, O-rings, oil seals, etc. with new ones.

   (b) Non-reusable parts are indicated in the component illustrations by the " ◆ " symbol.



6. Precoated parts

   Precoated parts are bolts and nuts, etc. that are coated with a seal lock adhesive (arrow) at the factory.

   (a) If a precoated part is retightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.

   (b) Recoating of Precoated Parts

      (1) Clean off the old adhesive from the part's threads.

      (2) Dry with compressed air.

      (3) Apply the specified seal lock adhesive to the part's threads.

   (c) Precoated parts are indicated in the component illustrations by the "★" symbol.

7. When necessary, use a sealer on gaskets to prevent leaks.

8. Carefully observe all specifications for bolt torques. Always use a torque wrench.

9. Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. For a list of SST see SST catalogue. A list of SSM can be found at page IX.

10. When replacing fuses, be sure the new fuse is the correct amperage. DO NOT exceed the rating or use one of a lower rating.

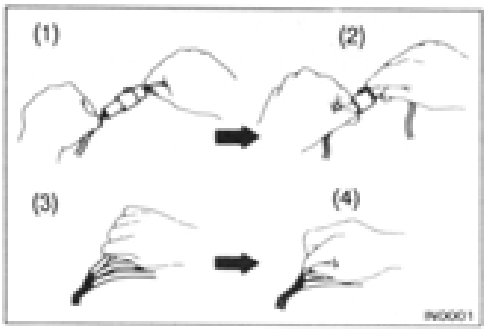
11. Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations.

   (a) If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels in order to ensure safety.

   (b) After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on the vehicle raised on a jack alone, even for a small job that can be finished quickly.

12. Observe the following precautions to avoid damaging the parts:

   (a) Be careful not to drop electrical components, such as sensors or relays. If they are dropped on a hard floor, they should be replaced and not reused.



(b) When separating electrical connectors, pull on the connector itself (2), not the wires (1).

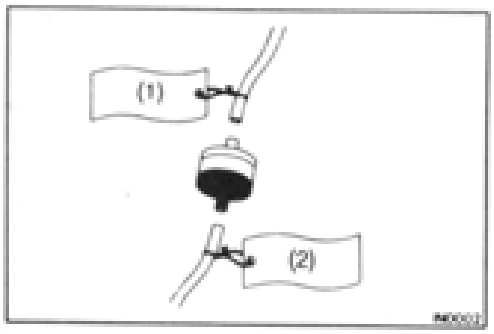
(c) When disconnecting vacuum hoses, pull on the end of the hose (4), not the middle (3).

(d) When steam cleaning an engine, protect the distributor, coil, air filter, and carburetor from water.

(e) Never use an impact wrench to remove or install temperature switches or temperature sensors.

(f) When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending.

(g) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step-down adaptor instead. Once the hose has been stretched, it may leak.



13. Tag hoses before disconnecting them:

(a) When disconnecting vacuum hoses, use tags to identify how they should be reconnected.

(1) VTV for TP, white side

(2) VTV for TP, black side

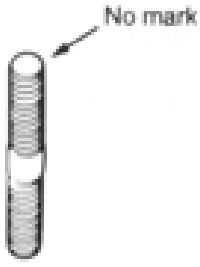
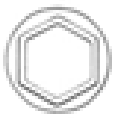
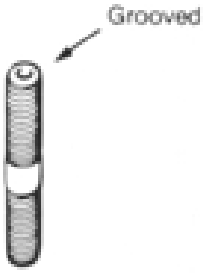
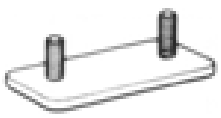
(b) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.

REMOVE AND FIT ENGINE

In the workshop the engine can be removed with an overhead crane. When replacing the engine, tighten the bolts securing the engine mountings, observing the torque values listed in the table on page VII. The torque values for the bolts between engine and drive line are listed in the sector on "Clutch and Gear Box". No other special proceedures need to be observed. For that reason, no special instructions for removing and fitting the engine are included.

STANDARD BOLT TORQUE SPECIFICATIONS

HOW TO DETERMINE BOLT STRENGTH

	Mark	Class		Mark	Class
Hexagon head bolt	 Bolt head No. 4- 5- 6- 7-	4T 5T 6T 7T	Stud bolt	 No mark	4T
	 No mark	4T			
Hexagon flange bolt w/washer hexagon bolt	 No mark	4T		 Grooved	6T
Hexagon head bolt	 Two protruding lines	5T			
Hexagon flange bolt w/washer hexagon bolt	 Two protruding lines	6T	Welded bolt		4T
Hexagon head bolt	 Three protruding lines	7T			

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque	
			Hexagon head bolt Nm	Hexagon flange bolt Nm
4T	6	1	5.4	5.9
	8	1.25	13	14
	10	1.25	25	28
	12	1.25	47	53
	14	1.5	75	83
	16	1.5	113	
5T	6	1	6.4	
	8	1.25	16	
	10	1.25	32	
	12	1.25	59	
	14	1.5	91	
	16	1.5	137	
6T	6	1	7.8	8.8
	8	1.25	19	21
	10	1.25	39	43
	12	1.25	72	79
	14	1.5		123
7T	6	1	11	12
	8	1.25	25	28
	10	1.25	52	58
	12	1.25	95	103
	14	1.5	147	167
	16	1.5	226	

SSM (SPECIAL SERVICE MATERIALS)

Part Name	Part No.	Sec.	Use etc.
Seal packing	AMV 188 200 03	Engine Mechanical	Camshaft expansion plug
Sealant	D 000 600	Fuel System	Choke valve mount screw
Seal packing	AMV 188 200 03	Lubrication System	Engine oil pan

ENGINE MECHANICAL

SPECIFICATIONS

Engine tune-up	Drive belt		
	Deflection	New belt	5 - 7 mm
		Used belt	7 - 8 mm
	Tension (Reference)	New belt	53 - 73 kg
		Used belt	26 - 46 kg
	Engine coolant capacity (with Heater)		
	2Y		7.0 liters
	4Y		7.4 liters
	Engine oil capacity		
	Drain and refill		
	without Oil filter change	Two-wheel drive	3.0 liters
		Four-wheel drive	3.5 liters
	with Oil filter change	Two-wheel drive	3.5 liters
		Four-wheel drive	4.0 liters
	Dry fill	Two-wheel drive	4.2 liters
		Four-wheel drive	4.6 liters
	Battery specific gravity		1.25 - 1.27 (when fully charged at 20 °C)
	High-tension cord resistance Limit		25 kΩ per cord
	Sparg plug		
	Type Conventional tipped type		
	ND		W16EXR-U
	Air gap Conventional tipped type		0.8 mm
	Ignition timing (with Vacuum advance OFF)		
	4Y		4 °BTDC @ idle
	2Y		8 °BTDC @ idle
	Firing order		1 - 3 - 4 - 2
	Idle speed		
		without Power Steering	700 rpm
		with Power Steering	800 rpm
	Idle mixture speed		
		without Power Steering	750 rpm
		with Power Steering	850 rpm
	Fast idle speed		2.600 rpm
	Idle CO concentration		1.5 ± 0.5 %
	Throttle Positioner setting speed		1.200 rpm

SPECIFICATION (CONT'D)

Intake manifold vacuum	at idle speed			400 mm Quicksilver (Hg)
Compression pressure	at 250 rpm Standard			12.5 bar
			Limit	9.0 bar
	Difference of pressure between each cylinder			1.0 bar
Cylinder head	Warpage	Cylinder block side	Limit	0.15 mm
		Manifold side	Limit	0.10 mm
	Valve seat	Refacing angle	Intake	30°, 45°, 60°
			Exhaust	30°, 45°, 65°
		Contacting angle		45°
		Contacting width		1.2 - 1.6 mm
Valve guide bush	Inside diameter			8.010 - 8.030 mm
	Outside diameter		Standard	13.040 - 13.051 mm
			Oversize 0.05	13.090 - 13.101 mm
Valve	Valve overall length	Standard	Intake	108.02 mm
			Exhaust	108.5 mm
		Limit	Intake	107.7 mm
			Exhaust	108.0 mm
	Valve face angle			44.5°
	Stem diameter		Intake	7.970 - 7.985 mm
			Exhaust	7.965 - 7.980 mm
	Stem oil clearance	Standard	Intake	0.025 - 0.060 mm
			Exhaust	0.030 - 0.065 mm
		Limit	Intake	0.10 mm
			Exhaust	0.12 mm
	Margin thickness	Standard	Intake	1.0 - 1.4 mm
			Exhaust	1.3 - 1.7 mm
		Limit	Intake	0.5 mm
			Exhaust	0.8 mm
Valve spring	Free length			47.0 mm
	Installed tension at 40.6 mm			282-345 N
	Squareness		Limit	2.0 mm
Rocker arm and shaft	Rocker arm inside diameter			18.500 - 18.515 mm
	Rocker shaft diameter			18.474 - 18.487 mm
	Rocker arm to shaft oil clearance		Standard	0.013 - 0.041 mm
			Limit	0.08 mm
Push rod	Circle runout		Limit	0.30 mm
Manifold	Warp		Limit	0.40 mm
Chain and sprocket	Chain slack at 98 N		Limit	13.5 mm
	Chain elongation		Limit	291.4 mm
	Crankshaft sprocket wear		Limit	59 mm
	Camshaft sprocket wear		Limit	114 mm

Tensioner and damper	Tensioner head thickness		Standard	15.0 mm
			Limit	12.5 mm
	Damper thickness		Standard	6.6 mm
			Limit	5.0 mm
Valve lifter	Lift diameter			21.387 - 21.404 mm
	Cylinder block lifter bore diameter			21.417 - 21.443 mm
	Oil clearanc		Standard	0.013 - 0.056 mm
			Limit	0.10 mm
	Leak down test at 196 N			7 - 50 seconds/1 mm
Camshaft	Thrust clearance		Standard	0.07 - 0.22 mm
			Limit	0.30 mm
	Journal oil clearance		Standard	0.025 - 0.111 mm
			Limit	0.14 mm
	Journal diameter	Standard	No. 1	46.459 - 46.475 mm
			No. 2	46.209 - 46.225 mm
			No. 3	46.959 - 45.975 mm
			No. 4	45.709 - 45.725 mm
			No. 5	45.459 - 45.475 mm
	Bearing inside diameter	Standard	No. 1	46.500 - 46.570 mm
			No. 2	46.250 - 46.320 mm
			No. 3	46.000 - 45.820 mm
			No. 4	45.750 - 45.820 mm
			No. 5	45.500 - 45.570 mm
	Circle runout	Limit		0.06 mm
	Cam lobe height			
		Standard	Intake	38.620 - 38.720 mm
			Exhaust	38.629 - 38.729 mm
		Limit	Intake	38.26 mm
			Exhaust	38.27 mm
Cylinder block	Cylinder head surface warpage		Limit	0.05 mm
	Cylinder, bore diameter			
	2Y	Standard	Mark 1	86.000 - 86.010 mm
			Mark 2	86.011 - 86.020 mm
			Mark 3	86.021 - 86.030 mm
		Limit	Standard	86.23 mm
			Oversize 0.50	86.73 mm
			Oversize 0.75	86.98 mm
			Oversize 1.00	87.23 mm
	4Y	Standard	Mark 1	91.000 - 91.010 mm
			Mark 2	91.011 - 91.020 mm
			Mark 3	91.021 - 91.030 mm
		Limit	Standard	91.23 mm
			Oversize 0.50	91.73 mm

Piston and piston ring	Piston diameter			
	2Y	Standard	Mark 1	85.915 - 85.925 mm
			Mark 2	85.926 - 85.935 mm
			Mark 3	85.936 - 85.945 mm
			Oversize 0.50	86.415 - 86.445 mm
			Oversize 0.75	86.665 - 86.695 mm
			Oversize 1.00	86.915 - 86.945 mm
	4Y	Standard	Mark 1	90.938 - 90.948 mm
			Mark 2	90.949 - 90.958 mm
			Mark 3	90.959 - 90.968 mm
			Oversize 0.50	91.438 - 91.468 mm
	Piston oil clearance			
	4Y			0.052 - 0.072 mm
	2Y			0.075 - 0.095 mm
	Piston ring groove clearance			0.030 - 0.070 mm
	Piston ring end gap			
	4Y	Standard	No. 1	0.23 - 0.51 mm
			No. 2	0.40 - 0.67 mm
			Oil	0.13 - 0.50 mm
		Limit	No. 1	1.11 mm
			No. 2	1.27 mm
			Oil	1.10 mm
	2Y	Standard	No. 1	0.22 - 0.51 mm
			No. 2	0.35 - 0.67 mm
			Oil	0.13 - 0.50 mm
		Limit	No. 1	1.11 mm
			No. 2	1.27 mm
			Oil	1.10 mm
Connecting rod	Thrust clearance	Standard		0.160 - 0.312 mm
		Limit		0.35 mm
	Connecting rod bearing center wall thickness			
		Standard	Mark 6	1.486 - 1.496 mm
			Mark 7	1.490 - 1.494 mm
			Mark 8	1.494 - 1.498 mm

SPECIFICATIONS (CONT'D)

Connecting rod (cont'd)	Connecting rod oil clearance		
	Standard	Standard	0.020 - 0.051 mm
		Undersize 0.25	0.021 - 0.067 mm
	Limit		0.10 mm
	Bent Limit	per 100 mm	0.05 mm
	Twist Limit	per 100 mm	0.15 mm
Crankshaft	Thrust clearance	Standard	0.020 - 0.220 mm
		Limit	0.30 mm
	Thrust washer thickness	Standard	2.440 - 2.490 mm
	Main journal oil clearance		
	Standard	Standard	0.020 - 0.051 mm
		Undersize 0.25	0.021 - 0.067 mm
	Limit		0.10 mm
	Main journal diameter	Standard	57.985 - 58.000 mm
		Undersize 0.25	57.745 - 57.755 mm
	Main bearing center wall thickness		
	Standard	Mark 1	1.986 - 1.990 mm
		Mark 2	1.990 - 1.994 mm
		Mark 3	1.994 - 1.998 mm
	Crank pin diameter	Standard	47.985- 48.000 mm
		Undersize 0.25	47.745 - 47.755 mm
	Circle runout	Limit	0.06 mm
	Main journal taper and out-of-round	Limit	0.02 mm
	Crank pin taper and out-of-round	Limit	0.02 mm

TORQUE SPECIFICATIONS

Part tightened		Nm
Manifold - Cylinder head		49
Cylinder head - Cylinder block	12 mm bolt head	19
	14 mm bolt head	88
Valve rocker shaft - Cylinder head		24
Spark plug - Cylinder head		18
Camshaft rocker shaft - Camshaft		90
Vibration damper - Cylinder block		18
Chain tensioner - Cylinder block		18
Timing chain cover - Chain case		5.9
Crankshaft pulley - Crankshaft		157
Main bearing - Cylinder block		78
Connecting rod cap - Connecting rod		49
Rear oil seal retainer - Cylinder block		12
Timing chain case - Cylinder block		18
Flywheel - Crankshaft		83

TROUBLESHOOTING

ENGINE OVERHEATING

Problem	Possible cause	Remedy	Page
Engine overheats	Cooling system faulty	Trouble shooting procedure cooling system	113
	Incorrect ignition timing	Reset timing	13, 14

HARD STARTING

Problem	Possible cause	Remedy	Page
Engine will not crank or cranks slowly	Starting system faulty	Trouble shooting procedure starting system	see manual Electrical System
Engine will not start/ Hard to start (cranks OK)	No fuel supply to carburetor	Check fuel line	
	Carburetor problems • Choke operation • Flooding • Needle valve sticking or clogged • Vacuum hose disconnected or damaged • Fuel cut solenoid valve not open	Repair as necessary	
	Ignition problems • Ignition coil • Distributor	Perform spark test	132
	Spark plug faulty	Inspect plugs	12
	High-tension cords disconnected or broken	Inspect cords	12
	Vacuum leaks • Positive Crankcase Ventilation • Intake manifold • Brake booster line	Repair as necessary	
	Compression low	Check compression	20

ROUGH IDLING

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses	Spark plug faulty	Inspect plugs	12
	High-tension cord faulty	Inspect leads	12
	Ignition problems		
	• Ignition coil	Inspect coil	133
	• Distributor	Inspect distributor	134
	Incorrect ignition timing	Reset timing	13, 14
	Vacuum leaks	Repair as necessary	
	• Positive Crankcase Ventilation		
	• Intake manifold		
	• Brake booster line		
	Incorrect idle speed	Adjust idle speed	15 - 18
	Carburetor problems	Repair as necessary	
	• Idle speed incorrect		
	• Slow jet clogged		
	• Idle mixture incorrect		
	• Fuel cut-out solenoid valve not open		
	• Fast idle speed setting incorrect (cold engine)		
	• Choke system faulty	Repair as necessary	
	Hot Air Intake system faulty	Check Hot Air Intake system	
	Engine overheats	Troubleshoot cooling system	113
	Compression low	Check compression	20

ENGINE MISFIRES/POOR ACCELERATION

Problem	Possible cause	Remedy	Page
Engine misfires/ poor acceleration	Spark plug faulty	Inspect plugs	12
	High-tension lead faulty	Inspect leads	12
	Vacuum leaks	Repair as necessary	
	• Positive Crankcase Ventilation		
	• Intake manifold		
	• Brake booster line		

ENGINE HESITATES/POOR ACCELERATION (CONT'D)

Problem	Possible cause	Remedy	Page
Engine misfires/ Poor acceleration (Cont'd)	Incorrect ignition timing	Reset timing	13,14
	Fuel system clogged	Check fuel system	
	Air cleaner clogged	Check air filter	11
	Carburetor problems • Float level too low • Accelerator pump faulty • Power valve faulty • Choke system faulty	Repair as necessary	
	Emission control system problem • Hot Air Intake system always on (hot engine)	Check Hot Air Intake system	
	• Auxiliary Acceleration Pump system faulty (cold engine)	Check Auxiliary Acceleration Pump system	
	Engine overheats	Check cooling system	
	Low compression	Check compression	20

ENGINE DIESELING

Problem	Possible cause	Remedy	Page
Engine diesels (runs after ignition switch is turned off)	Carburetor problems • Linkage sticking • Idle speed or fast idle speed out of adjustment • Fuel cut-out solenoid faulty	Repair as necessary	
	Incorrect ignition timing	Reset timing	13, 14

BACKFIRE

Problem	Possible cause	Remedy	Page
Muffler explosion (backfire) on deceleration only	Air Suction system faulty	Check Air Suction system	
	Throttle Positioner	Check Throttle Positioner system	
Muffler explosion (backfire) all the time	Air cleaner clogged	Check air filter	11
	Choke system faulty	Check choke system	
	Incorrect ignition timing	Reset timing	13,14

BACKFIRE (CONT'D)

Problem	Possible cause	Remedy	Page
Engine backfires	Choke valve open (cold engine)	Check choke system	
	Carburetor vacuum leak	Check hoses and repair as necessary	
	Vacuum leak • Positive Crankcase Ventilation hoses • Intake manifold • Brake booster line	Check hoses and repair as necessary	
	Pulling in air between air flow meter and throttle body	Repair as necessary	
	Insufficient fuel flow	Troubleshoot fuel system	
	Incorrect ignition timing	Reset timing	13, 14
	Carbon deposits in combustion chambers	Inspect cylinder head	

EXCESSIVE OIL CONSUMPTION

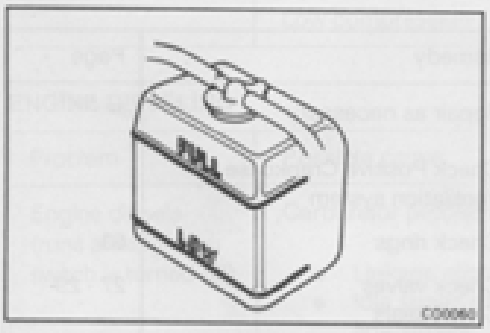
Problem	Possible cause	Remedy	Page
Excessive oil consumption	Oil leak	Repair as necessary	
	Positive Crankcase Ventilation line clogged	Check Positive Crankcase Ventilation system	
	Piston ring worn or damaged	Check rings	63
	Valve stem and guide worn Valve stem seal worn	Check valves Check seals	27 - 29

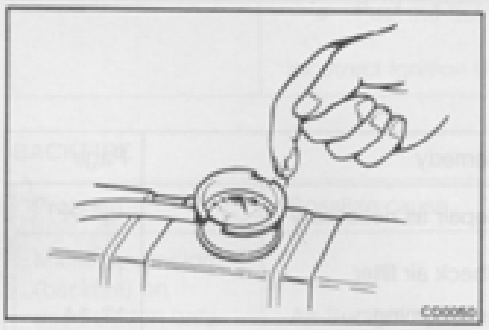
EXCESSIVE FUEL CONSUMPTION

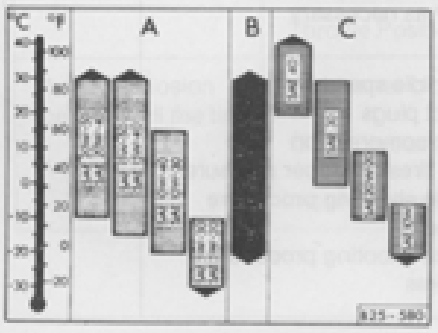
Problem	Possible cause	Remedy	Page
Excessive fuel consumption	Fuel leak	Repair as necessary	
	Air cleaner clogged	Check air filter	11
	Incorrect ignition timing	Reset timing	13, 14
	Carburetor problems • Choke faulty	Repair as necessary	
	Idle speed too high	Adjust idle speed	15-18
	Spark plugs faulty	Inspect plugs	12
	Compression low	Check compression	20
	Tires improperly inflated	Inflate tires to proper pressure	
	Clutch slips	Trouble shooting procedure of clutch	
	Brakes drag	Trouble shooting procedure of brakes	

UNPLEASANT ODOR

Problem	Possible cause	Remedy	Page
Umpleasant odor	Incorrect idle speed	Adjust idle speed	15 - 18
	Incorrect ignition timing	Reset timing	13, 14
	Vacuum leaks ● Positive Crankcase Ventilation hoses ● Intake manifold ● Air intake chamber ● Throttle body ● Brake booster line	Repair as necessary	
	Air Suction system faulty	Check Air Suction system	







ENGINE TUNE-UP

INSPECTION OF ENGINE COOLANT

1. **Check engine coolant level at reserve tank**

   The coolant level should be between the "LOW" and "FULL" lines.

   If low, check for leaks and add coolant up to the "FULL" line.

2. **Check engine coolant quality**

   There should not be any excessive deposits of rust or scales around the radiator cap or radiator filler hole, and the coolant should be free from oil.

   If excessively dirty, replace the coolant.

INSPECTION OF ENGINE OIL

1. **Check engine oil quality**

   Check the oil for deterioration, entry of water discoloring or timing.

   If the quality is poor, replace the oil.

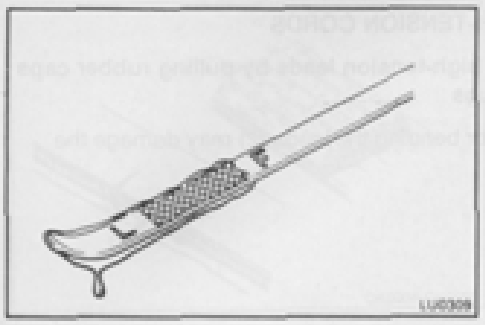
   Only use motor oils to API Specification.
   Make sure the viscosity class is correct.

   A - Multigrade oils, Specification VW 501 01
   - Multigrade branded oils, Specification API - SE or SG

   B - Light running oils, Specification VW 500 00

   C - Single grade branded oils, Specification API - SE or SG

   Allow for anticipated outside temperature in period up to next oil change.



2. **Check engine oil level**

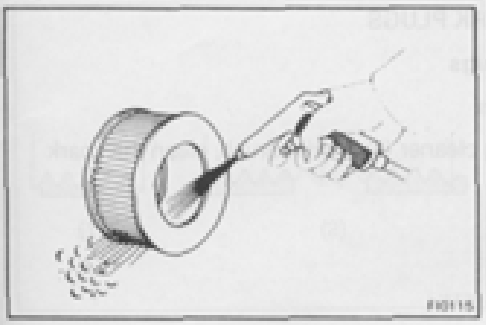
The oil level should be between the "L" and "F" marks on the dispstick.

If low, check for leakage and add oil up to the "F" mark.

INSPECTION OF BATTERY

(See manual ELECTRICAL SYSTEM)

Normal density,
1.25 - 1.27 at 20 °C when fully loaded.



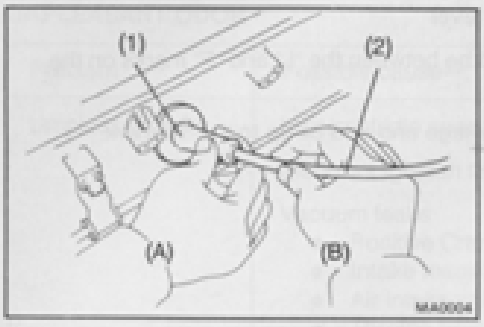
CLEANING OF AIR FILTER

(a) Visually check that the air filter element is not excessively dirty, damaged or oily.

If necessary, replace the air filter element.

(b) Clean the element with compressed air.

First aim airflow on the inside throughly. Then aim airflow on the outside of the element.

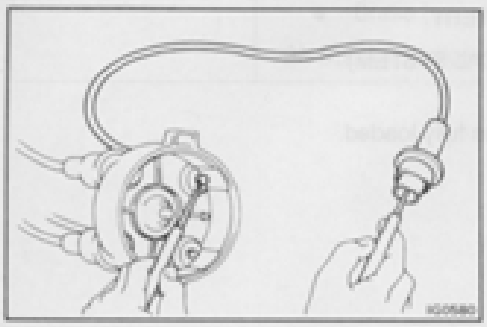


INSPECTION OF HIGH-TENSION CORDS

1. **Carefully remove high-tension leads by pulling rubber caps (1) from spark plugs**

   Notice: Pulling on or bending the leads (2) may damage the conductor inside.

   (A) Correct
   (B) Wrong

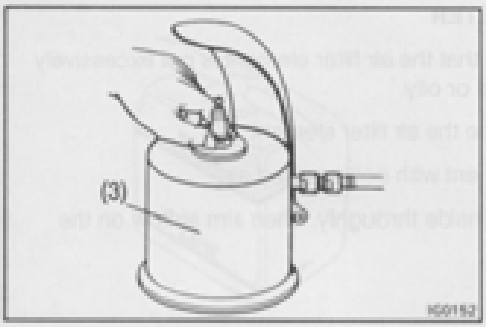


2. **Inspect high-tension lead resistance**

   Using an ohmmeter, measure the resistance without disconnecting the cap.

   Maximum resistance: 25 kΩ per cord

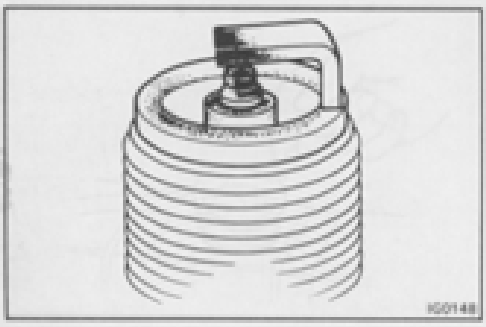
   If resistance is greater than maximum, check the terminals. If necessary, replace the high-tension lead and/or distributor cap.



INSPECTION OF SPARK PLUGS

1. **Remove spark plugs**
2. **Clean spark plugs**

   Using a spark plug cleaner (3) or wire brush, clean the spark plug.

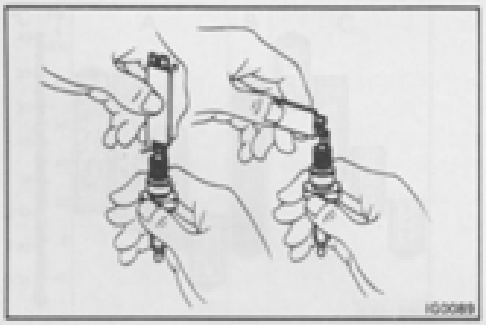


3. **Visually inspect spark plugs**

   Check the spark plug for electrode wear, thread damage and insulator damage.

   If abnormal, replace the plugs.

   Recommended spark plugs: W 16 EXR-U
   Original Part.No.: J 90 919 010 64



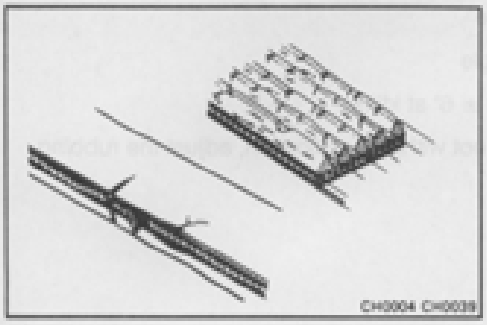
4. **Adjust electrode cap**

   Carefully bend the outer electrode to obtain the correct electrode gap.

   Correct electrode gap: 0.8 mm

5. **Install spark plugs**

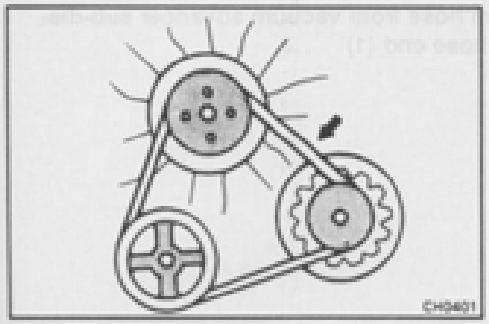
   Torque: 18 Nm



INSPECTION OF ALTERNATOR DRIVE BELT

(a) Visually check the belt for separation of the adhesive rubber above and below the core, core separating from the belt side, severed core, separation of the rib from the adhesive rubber, cracking or separation of the ribs, torn or worn ribs or cracks in the inner ridges of the ribs.

If necessary, replace the drive belt.

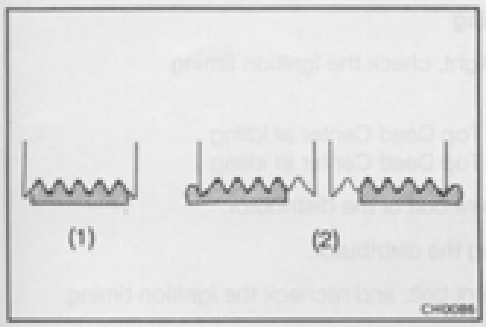


(b) Check the drive belt deflection by pressing on the belt at the points indicated in the figure with 10 kg of pressure.

Drive belt deflection:

New belt	5 - 7 mm
Used belt	7 - 8 mm

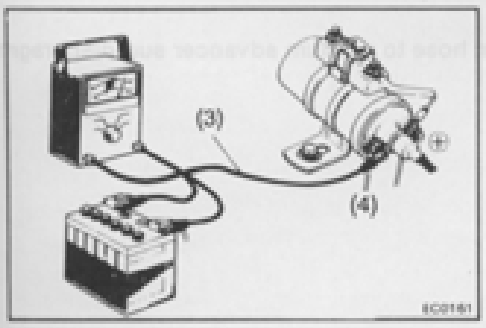
If necessary, adjust the drive belt deflection.



Hint:

- "New belt" refers to a belt which has been used less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.
- After installating the drive belt, check that it fits properly in the ribbed grooves.

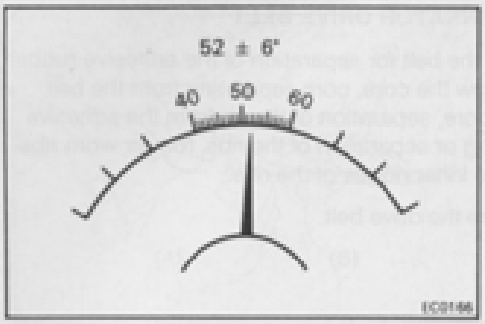
(1) Correct
(2) Wrong



ADJUSTMENT OF IGNITION TIMING

1. **Connect tachometer and timing light**

Connect the test probe (3) of a tachometer to the ignition coil negative (-) terminal (4).

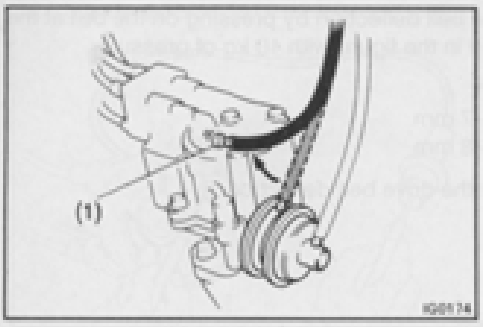


2. **Inspect dwell angle**

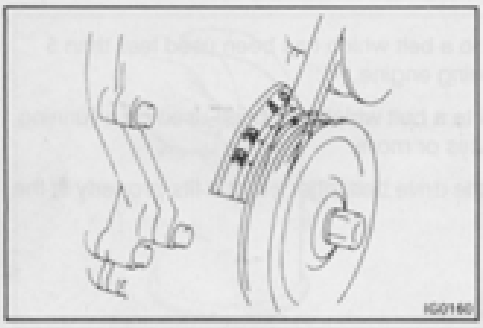
Check the dwell angle

Dwell angle: 52 ± 6° at idling

If the dwell angle is not within specification, adjust the rubbing block gap.



3. **Disconnect vacuum hose from vacuum advancer sub-diaphragm, and plug hose end (1)**



4. **Adjust ignition timing**

(a) Using a timing light, check the ignition timing.

Ignition timing:

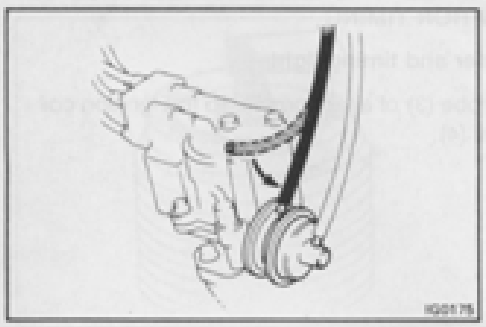
4Y 4° Before Top Dead Center at idling
2Y 8° Before Top Dead Center at idling

(b) Loosen the mount bolt of the distributor.

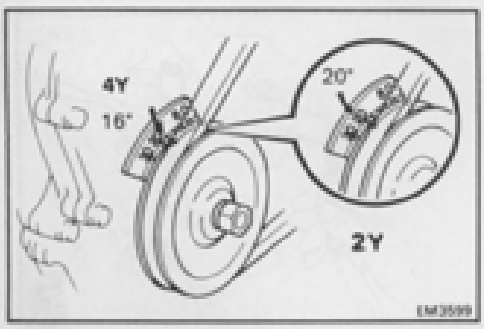
(c) Adjust by turning the distributor.

(d) Tighten the mount bolt, and recheck the ignition timing.

Torque: 18 Nm



5. **Reconnect vacuum hose to vacuum advancer sup-diaphragm**



6. **Further check ignition timing**

Ignition timing: 2Y Approx. 20° Before Top Dead Center at idling
4Y Approx. 16° Before Top Dead Center at idling

ADJUSTMENT OF IDLE SPEED AND IDLE MIXTURE

1. **Connect tachometer** (See page 13)

2. **Warm up engine**

   Allow the engine to reach normal operating temperature.

3. **Check idle speed**

Idle speed:	without Power Steering	2Y 700	± 50 rpm
		4Y 700	± 50 rpm
	with Power Steering	2Y 800	± 50 rpm
		4Y 800	± 50 rpm

If not as specified, adjust according to the following procedure.

Notice:

- Always use a CO-meter when adjusting the idle mixture. It is not necessary to adjust with the idle mixture adjusting screw in most vehicles if they are in good condition.
- If a CO-meter is not available and it is absolutely necessary to adjust with the idle mixture adjusting screw, use the alternative method.

(See page 17, 18)

A. METHOD WITH CO-METER

1. **Visually check carburetor**

   (a) Check for loose screws or loose mounting to the manifold.

   (b) Check for wear in the linkage, missing snap rings or excessive looseness in the throttle shaft. Correct any problems found.

2. **Initial conditions**

   (a) Air cleaner installed

   (b) Normal operating coolant temperature

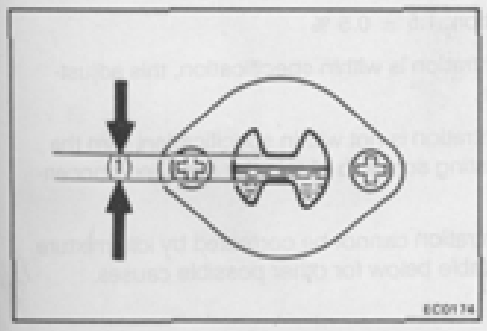
   (c) Choke fully open

   (d) All accessories switched off

   (e) All vacuum lines connected

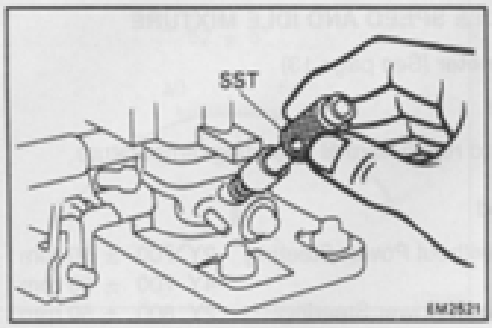
   (f) Ignition timing set correctly

   (g) Transmission in neutral



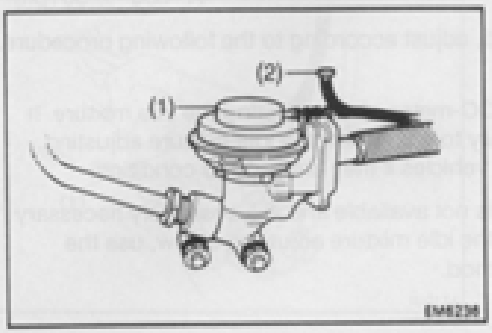
   (h) Fuel level (1) should be about even with the correct level in the sight glass

   (i) CO-meter operates normally



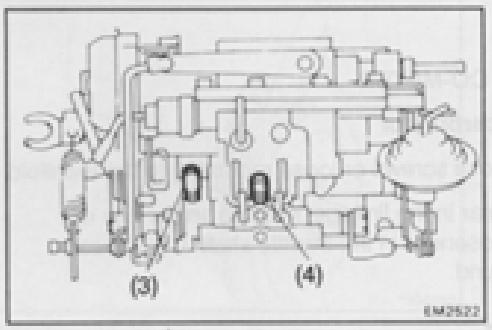
(j) Use SST if necessary.

SST 09243-00020



3. Shuts off air suction (AS) System

Disconnect the vacuum hose from the AS reed valve (1) and plug the hose end (2). This shuts off the AS system.



4. Adjust idle speed and idle mixture

(a) Start the engine.

(b) Using a CO-meter to measure the CO-concentration into the exhaust, turn the idle speed (3) and idle mixture (4) adjusting screws to obtain the specified concentration valve at idle speed.

Idle speed:

without Power Steering	700 rpm
with Power Steering	800 rpm

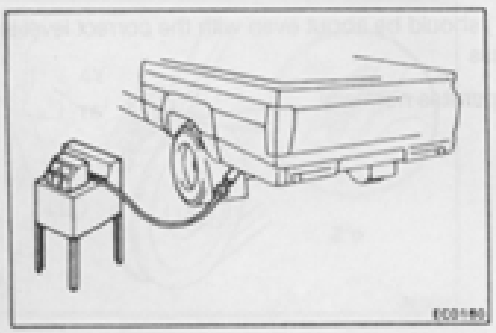
5. Inspect CO-concentration

(a) Check that the CO-meter is properly calibrated.

(b) Race the engine at 2.500 rpm about 3 minutes.

(c) Insert a testing probe at least 40 cm into the tailpipe.

(d) Measure the concentration within 1 - 3 minutes after racing the engine to allow the concentration to stabilize.



Idle CO-concentration: 1.5 ± 0.5 %

- If the CO-concentration is within specification, this adjustment is complete.
- If the CO-concentration is not within specification, turn the idle mixture adjusting screw to obtain the specified concentration valve.
- If the CO-concentration cannot be corrected by idle mixture adjustment, see table below for other possible causes.

CO	Problems	Causes
Normal	Rough idle	1. Faulty ignition: • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed ignition wires • Cracked distributor cap 2. Leaky exhaust valves 3. Leaky cylinder
Low	Rough idle	1. Vacuum leak: • Vacuum hose • Intake manifold • Positive Crankcase Ventilation line • Carburetor base
Low	Rough idle Black smoke from exhaust	1. Restricted air filter: 2. Plugged Positive Crankcase Ventilation 3. Faulty carburetion: • Faulty choke action • Incorrect float setting • Leaking needle or seat • Leaking power valve

6. **Reconnect vacuum hose to air suction (AS) reed valve.**

B. **ALTERNATIVE METHOD**

To be used only if CO-meter is not available.

1. **Visually inspect carburetor**

   (a) Check for loose screws of loose mounting to the manifold.

   (b) Check for wear in the linkage, missing snap rings or excessive looseness in the throttle shaft. Correct any problems found.

2. **Initial conditions**

   (a) Air cleaner installed

   (b) Normal operating coolant temperature

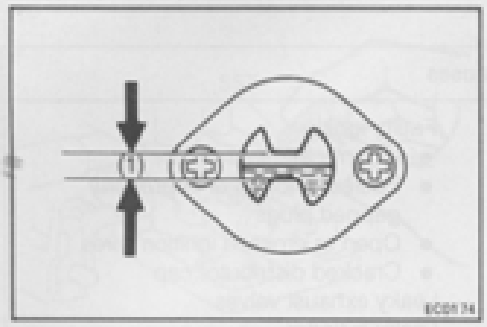
   (c) Choke fully open

   (d) All accessories switched off

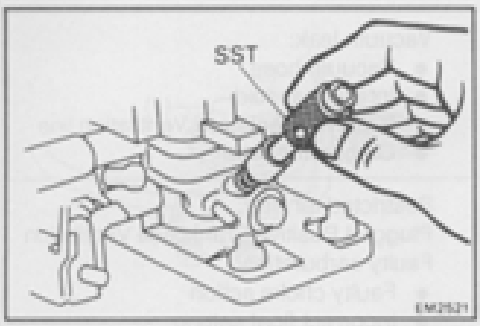
   (e) All vacuum lines connected

   (f) Ignition timing set correctly

   (g) Transmission in N range

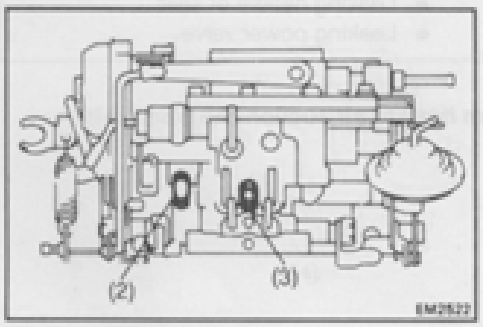


(h) Fuel level (1) should be about even with the correct level in the sight glass.



(i) Use SST if necessary.

SST 09243-00020



3. Adjust idle speed and idle mixture

(a) Start the engine.

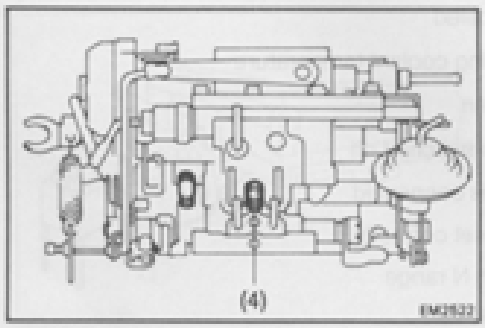
(b) Set to the maximum idle speed by turning the IDLE MIXTURE ADJUSTING SCREW (3).

(c) Set to the idle mixture speed by turning the IDLE SPEED ADJUSTING SCREW (2).

Idle mixture speed:

without Power Steering	750 rpm
with Power Steering	850 rpm

(d) Before moving to the next step, continue adjustments (b) and (c) until the maximum speed will not rise any further no matter how much the IDLE MIXTURE ADJUSTING SCREW is adjusted.



(e) Set to the idle speed by screwing in the IDLE MIXTURE ADJUSTING SCREW (4).

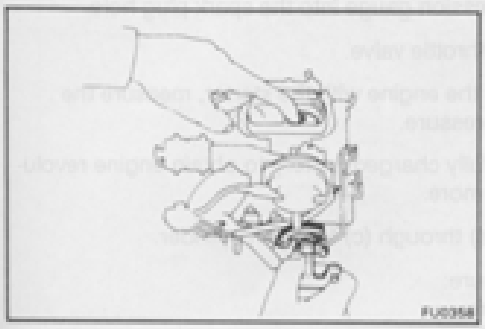
Idle speed:

without Power Steering	700 rpm
with Power Steering	800 rpm

This is the Lean Drop Method for setting idle speed and mixture.

ADJUSTMENT OF FAST IDLE SPEED

1. **Warm up and stop engine**
2. **Remove air cleaner or air intake connector from carburetor**
3. **Connect tachometer** (See page 13)

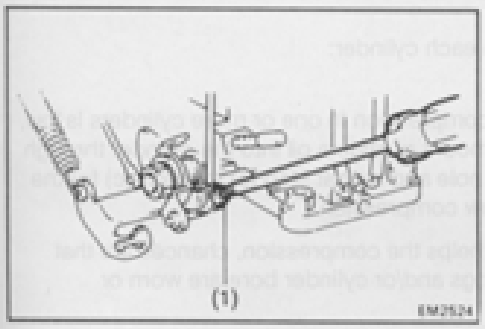


4. **Set fast idle cam**

   While holding the throttle valve slightly open, push the choke valve closed and hold it closed as you release the throttle valve.

   Hint: Check that the fast idle camp is set at the 1st step.

5. **Start engine, but do not depress accelerator pedal**



6. **Adjust fast idle speed**

   (a) Check the fast idle speed
   Fast idle speed: 2.600 rpm

   (b) Adjust the fast idle speed by turning the FAST IDLE ADJUSTING SCREW (1).

7. **Install air cleaner or air intake connector**

ADJUSTMENT OF THROTTLE POSITIONER SETTING SPEED

1. **Warm up and stop engine**
2. **Connect tachometer** (See page 13)
3. **Start engine**
4. **Adjust throttle positioner (TP) setting speed**

   (a) Disconnect the vacuum hoses from the filter (2) and TP diaphragm.

   (b) Using another hose, connect the filter (2) and TP diaphragm.

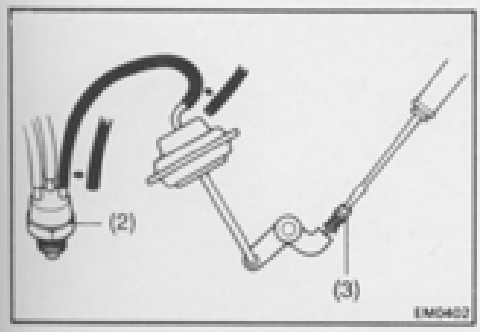
   (c) Race the engine to 2.500 rpm a few seconds, release the throttle and check the throttle opener setting speed.

   TP setting speed: 1.200 rpm

   (d) Adjust the throttle positioner setting speed by turning the THROTTLE POSITIONER ADJUSTING SCREW (3).

   (e) Race the engine to 2.500 rpm for a few seconds, release the throttle and recheck the throttle opener setting speed.

   (f) Reconnect the vacuum hoses to the TP and the filter.



COMPRESSION CHECK

Hint: If there is lack of power, excessive oil consumption or poor fuel economy, measure the cylinder compression pressure.

1. **Warm up and stop engine**
2. **Remove spark plugs**
3. **Disconnect distributor connector**
4. **Check cylinder compression pressure**

(a) Insert a compression gauge into the spark plug hole.

(b) Fully open the throttle valve.

(c) While cranking the engine with the starter, measure the compression pressure.

Hint: Always use a fully charged battery to obtain engine revolutions of 250 rpm or more.

(d) Repeat steps (a) through (c) for each cylinder.

Compression pressure:
12.5 bar or more
Minimum pressure:
9.0 bar
Difference between each cylinder:
1.0 bar or less

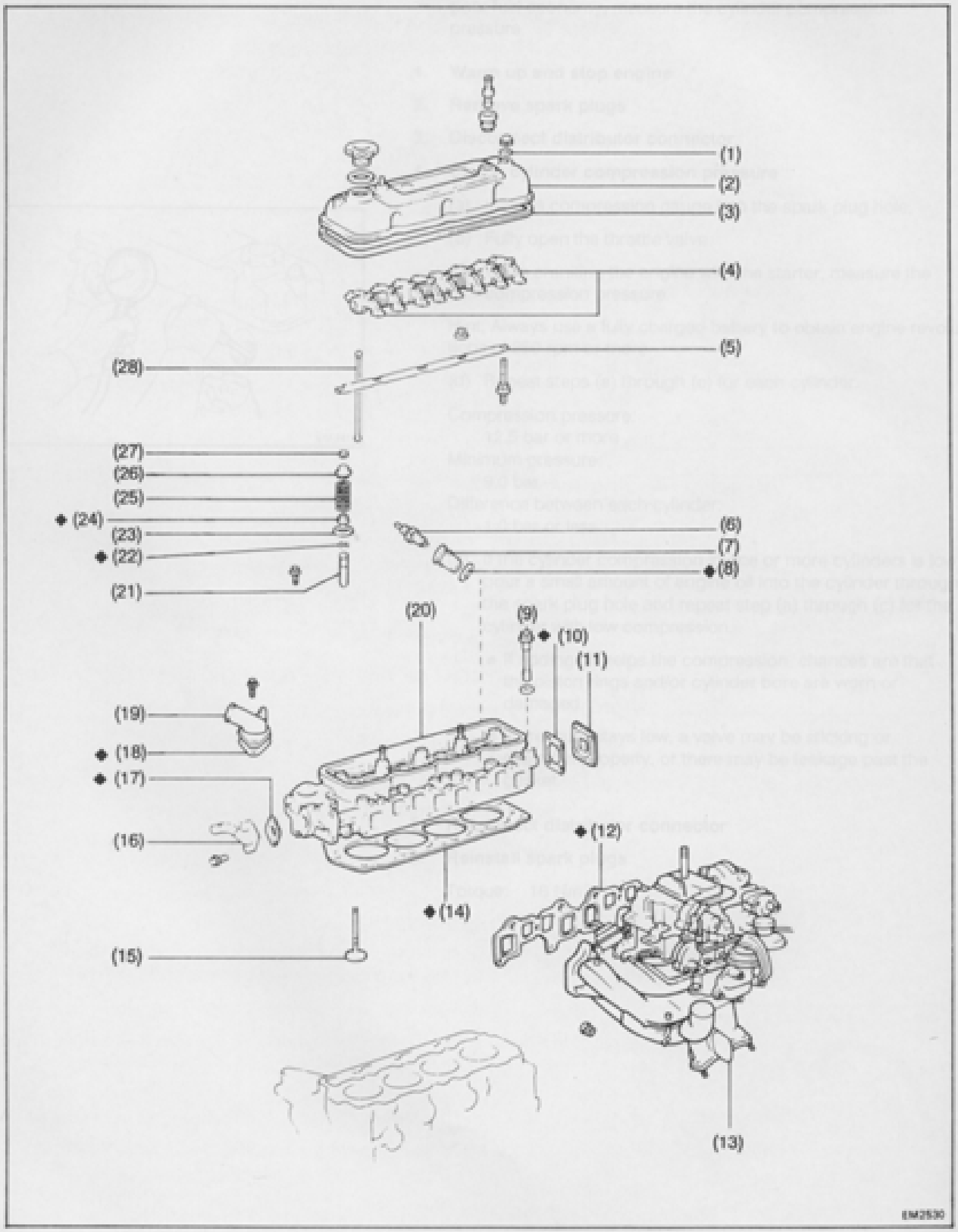
(e) If the cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat step (a) through (c) for the cylinder with low compression.

- If adding oil helps the compression, chances are that the piston rings and/or cylinder bore are worn or damaged.
- If pressure stays low, a valve may be sticking or seated improperly, or there may be leakage past the gasket.

5. **Reconnect distributor connector**
6. **Reinstall spark plugs**

Torque: 18 Nm

COMPONENTS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EM2530

(1) Seal Washer
(2) Cylinder Head Cover
(3) Gasket
(4) Rocker Arm and Spring
(5) Rocker Shaft
(6) Spark Plug
(7) Spark Plug Tube
(8) Gasket
(9) Bolt, 14 mm head: torque 88 Nm
12 mm head: torque 19 Nm
(10) Gasket
(11) Engine Rear Plate
(12) Gasket
(13) Intake and Exhaust Manifold
(14) Cylinder Head Gasket
(15) Valve
(16) Heater Outlet
(17) Gasket
(18) Gasket
(19) Water Outlet
(20) Cylinder Head
(21) Valve Lifter
(22) Snap Ring
(23) Spring Seat
(24) Oil Seat
(25) Valve Spring
(26) Spring Retainer
(27) Valve Keeper
(28) Push Rod

♦ Non-reusable part

PREPARATION FOR REMOVAL

1. **Drain engine coolant** (See page 114)
2. **Remove air suction (AS) reed valve with air injection manifold from cylinder head**
3. **Disconnect fuel hoses from fuel pump and carburetor**
4. **Remove heater pipe bracket from exhaust manifold**
5. **Remove vacuum pipe from cylinder head and carburetor**

   (a) Disconnect the vacuum hoses from the cylinder head and carburetor.

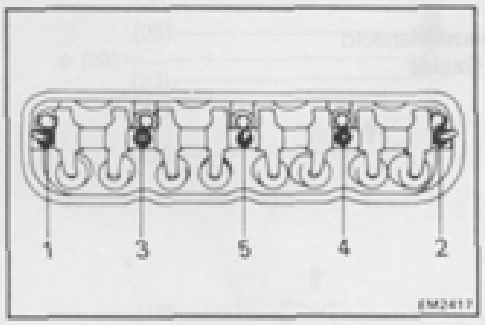
   Note: Before disconnecting the vacuum hoses, use tags to identify how they should be reconnected.

   (b) Remove the three bolts and vacuum pipe.

REMOVAL OF CYLINDER HEAD

(See page 22)

1. **Remove spark plugs and tubes**



2. **Remove cylinder head cover**

   Remove the cap nuts, seal washers, cylinder head cover and gasket.

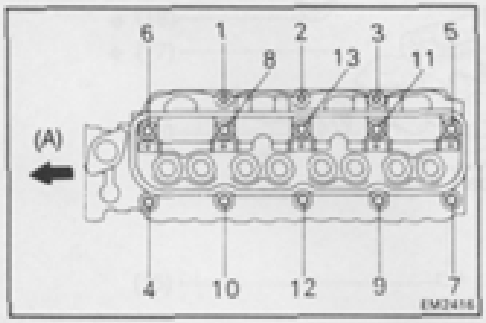
3. **Remove rocker shaft assembly**

   (a) Uniformly loosen and remove the three bolts and two nuts in several stages, in sequence shown.

   (b) Remove the rocker shaft assembly.

4. **Remove push rods**

   Note: Keep the push rods in correct order.

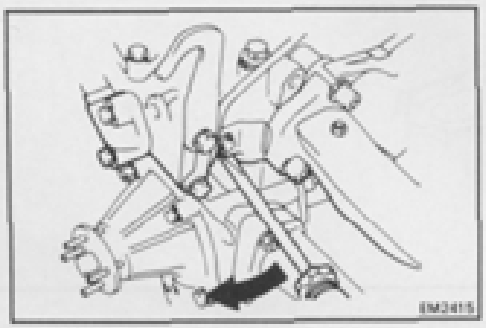


5. **Remove cylinder head**

   (a) Uniformly loosen and remove the thirteen head bolts in several stages, in the sequence shown.

   CAUTION: Head warp or cracking could result from bolts being removed in incorrect order.

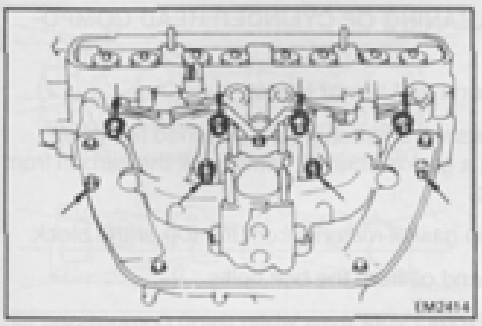
   (A) = Front



   (b) Lift the cylinder head from the dowels on the cylinder block and place the head on wooden blocks on a bench.

   If the cylinder head is difficult to lift off, pry with a screwdriver between the cylinder head and block projection.

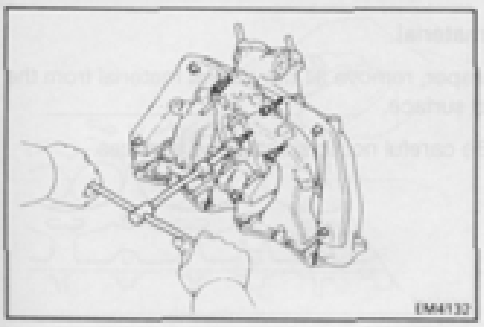
   CAUTION: Be careful not to damage the cylinder head and block surface of the cylinder and head gasket.



DISASSEMBLY OF CYLINDER HEAD

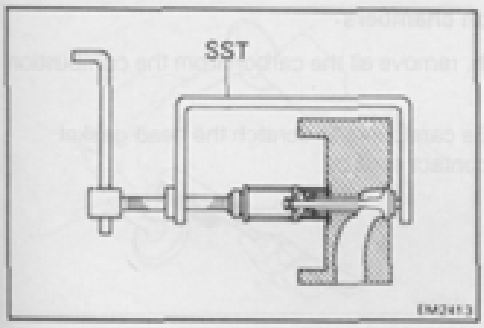
(See page 22)

1. **Remove carburetor**
2. **Remove intake and exhaust manifolds**



3. **If necessary, separate intake manifold and exhaust manifolds**

   Remove the four bolts, and separate the intake and exhaust manifolds.

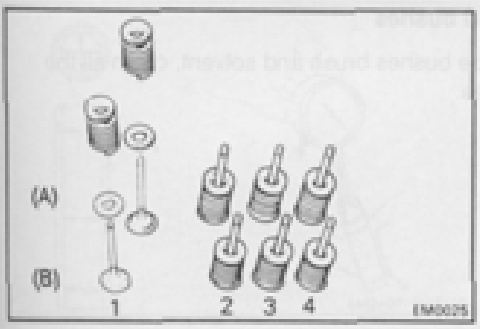


4. **Remove valves**

   (a) Using SST, press the valve spring and remove the two retainers.

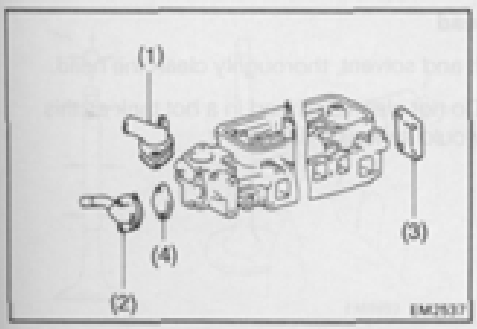
   SST 09202-43013

   (b) Remove the spring retainer (or valve rotator), spring, seat, valve and oil seal.



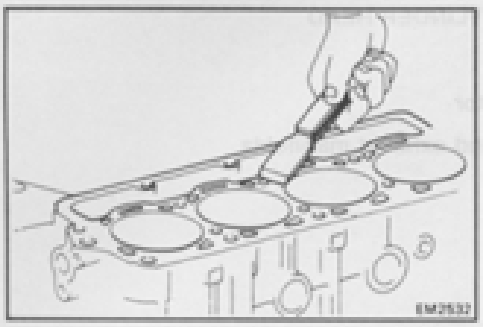
Note: Arrange the disassembled parts in correct order.

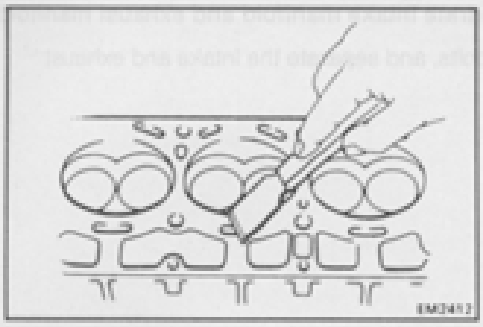
(A) = Intake
(B) = Exhaust

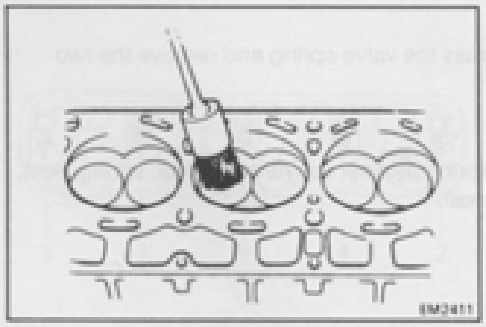


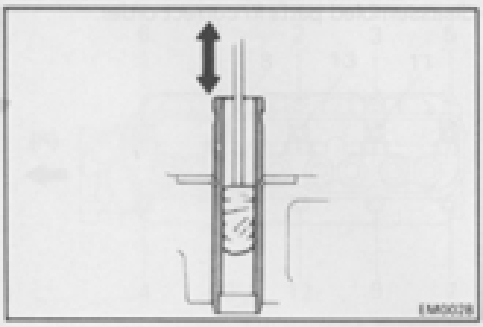
5. **If necessary, remove parts**

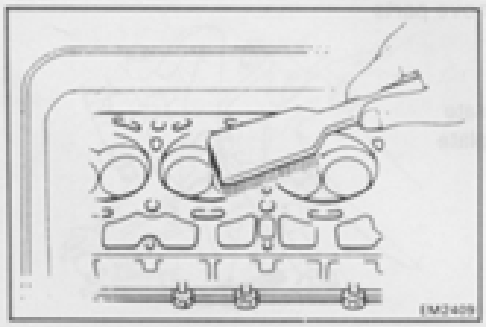
   (1) Water outlet
   (2) Heater outlet
   (3) Engine rear plate
   (4) Engine front plate











INSPECTION AND CLEANING OF CYLINDER HEAD COMPONENTS

1. **Clean top of pistons and top of block**

   (a) Turn the crankshaft and bring each piston to top dead center. Using a gasket scraper, remove all the carbon from the piston top.

   (b) Remove all the gasket material from the top of the block.

   (c) Blow carbon and oil from the bolt holes.

   WARNING: Protect your eyes when using compressed air.

2. **Remove gasket material**

   Using a gasket scraper, remove all the gasket material from the manifold and head surface.

   CAUTION: Be careful not to scratch the surfaces.

3. **Clean combustion chambers**

   Using a wire brush, remove all the carbon from the combustion chambers.

   CAUTION: Be careful not to scratch the head gasket contact surface.

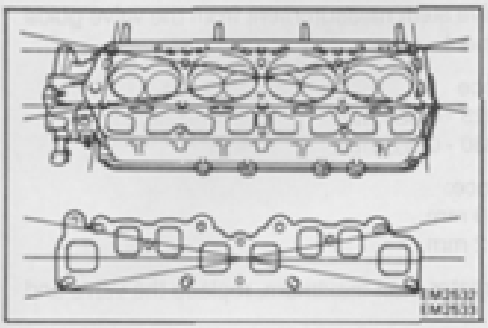
4. **Clean valve guide bushes**

   Using a valve guide bushes brush and solvent, clean all the valve guide bushes.

5. **Clean cylinder head**

   Using a soft brush and solvent, thoroughly clean the head.

   CAUTION: Do not clean the head in a hot tank as this would seriously damage it.



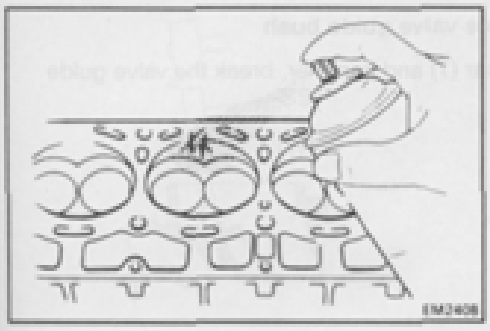
6. Inspect head for flatness

Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder block and manifolds for warp.

Maximum warp:

Cylinder block side	0.15 mm
Manifold side	0.10 mm

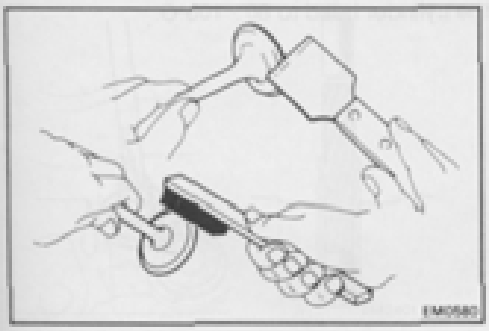
If warp is greater than maximum, replace the head.



7. Inspect cylinder head for cracks

Using a dye penetrant, check the combustion chamber, intake and exhaust ports, head surface and the top of the head for cracks.

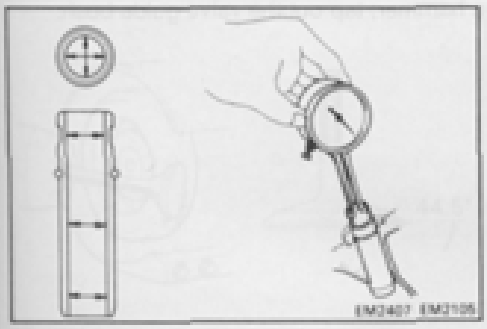
If cracked, replace the head.



8. Clean valves

(a) Using a gasket scraper, chip any carbon from the valve head.

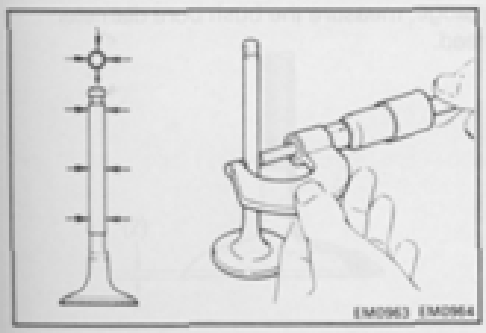
(b) Using a wire brush, thoroughly clean the valve.



9. Inspect valve stems and valve guide bushes

(a) Using a caliper gauge or telescoping gauge, measure the inside diameter of the valve guide bush.

Bush inside diameter:
8.010 - 8.030 mm



(b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:

Intake	7.970 - 7.985 mm
Exhaust	7.965 - 7.980 mm

(c) Subtract the valve stem measurement from the valve guide bush measurement.

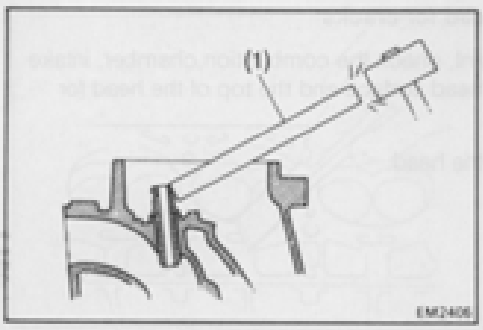
Standard oil clearance

Intake	0.025 - 0.060 mm
Exhaust	0.030 - 0.065 mm

Maximum oil clearance:

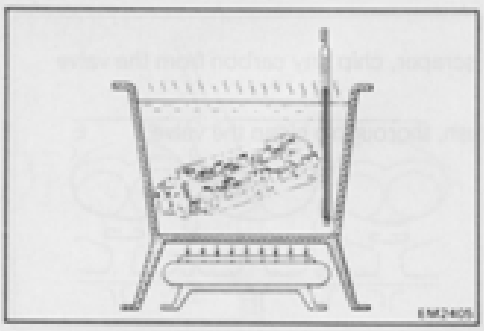
Intake	0.10 mm
Exhaust	0.12 mm

If the clearance is greater than maximum, replace the valve and valve guide bush.

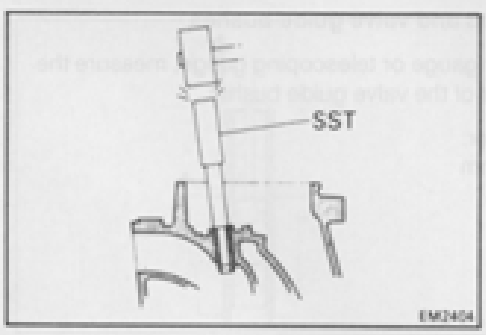


10. **If necessary, replace valve guide bush**

(a) Using a brass bar (1) and hammer, break the valve guide bush.

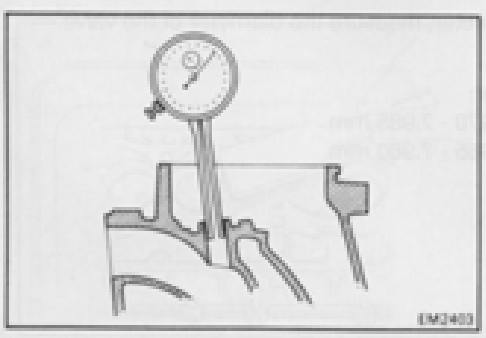


(b) Gradually heat the cylinder head to 80 - 100°C.



(c) Using SST and a hammer, tap out the valve guide bush.

SST 09201-60011



(d) Using a caliper gauge, measure the bush bore diameter of the cylinder head.

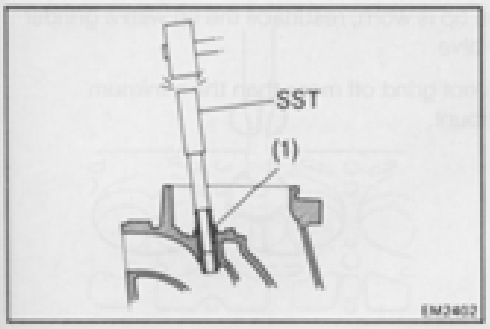
(e) Select a new valve guide bushing.

Bushing bore diameter	13.000 - 13.027:	Standardsize
Bushing bore diameter	> 13.027:	0.05 Oversize

If the bushing bore diameter of the cylinder head is more than 13.027 mm, machine the bore to the following dimensions.

Rebored cylinder head bushing bore dimension:
13.050 - 13.077 mm

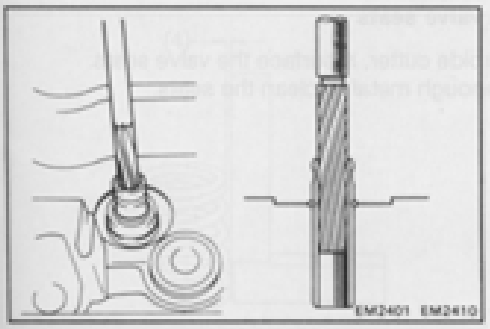
If the bush bore diameter of the cylinder head exceeds 13.077 mm, replace the cylinder head.



(f) Gradually heat the cylinder head to 80 - 100°C.

(g) Using SST and a hammer, tap in a new valve guide bush until the snap ring (1) makes contact with the cylinder head.

SST 09201-60011



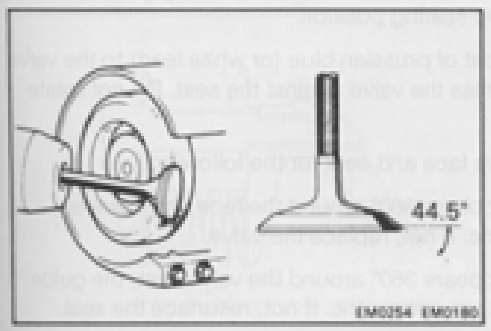
(h) Using a sharp 8 mm reamer, ream the valve guide bush to obtain the standard specified clearance (See page 28) between the valve guide bush and new valve stem.

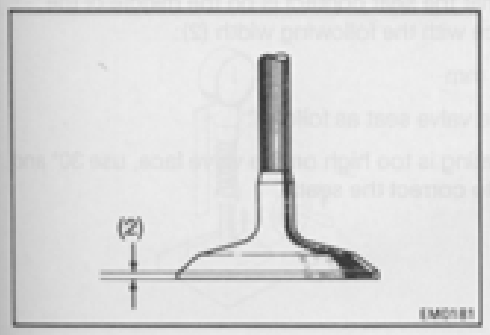
11. Inspect and grind valves

(a) Grind the valve only enough to remove pits and carbon.

(b) Check that the valve is ground to the correct valve face angle.

Valve face angle: 44.5°





(c) Check the valve head margin thickness (2).

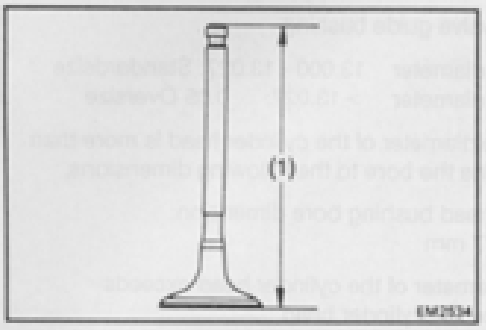
Standard margin thickness

Intake	1.0 - 1.4 mm
Exhaust	1.3 - 1.7 mm

Minimum margin thickness

Intake	0.5 mm
Exhaust	0.8 mm

If the valve head margin thickness is less than minimum, replace the valve.

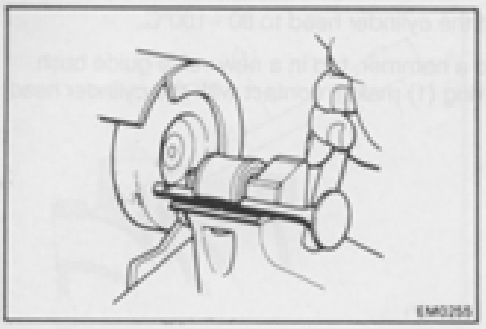


(d) Check the valve overall length (1).

Standard overall length:
- Intake 108.2 mm
- Exhaust 108.5 mm

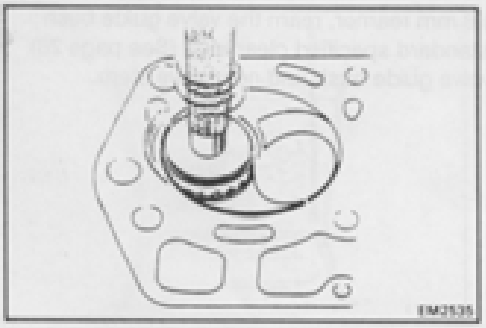
Minimum overall length:
- Intake 107.7 mm
- Exhaust 108.0 mm

If the overall length is less than minimum, replace the valve.



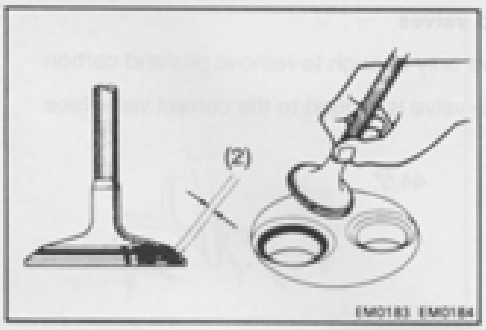
(e) If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

CAUTION: Do not grind off more than the minimum amount.



12. Inspect and clean valve seats

(a) Using a 45° carbide cutter, resurface the valve seats. Remove only enough metal to clean the seats.



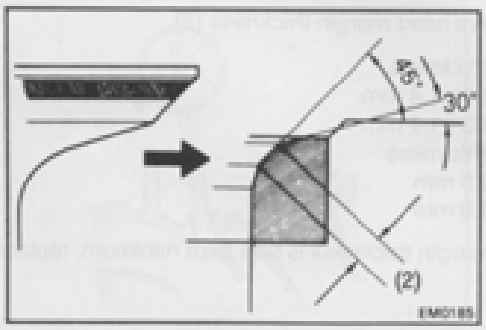
(b) Check the valve seating position.

Apply a thin coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate the valve.

(c) Check the valve face and seat for the following:

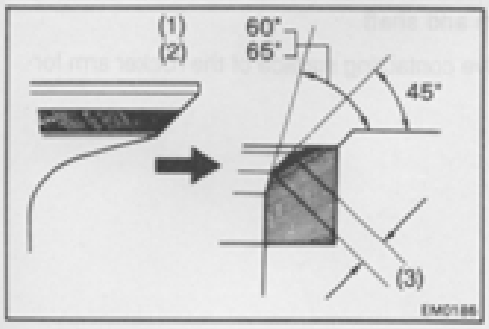
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and seat are concentric. If not, resurface the seat.
- Check that the seat contact is on the middle of the valve face with the following width (2):

  1.2 - 1.6 mm



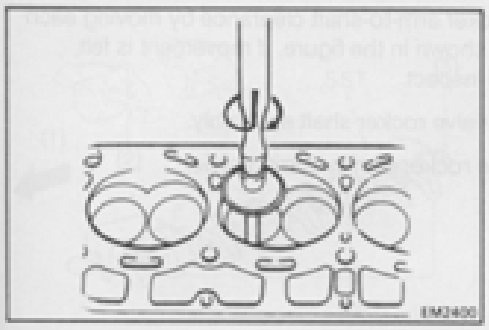
If not, correct the valve seat as follows:

(1) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.



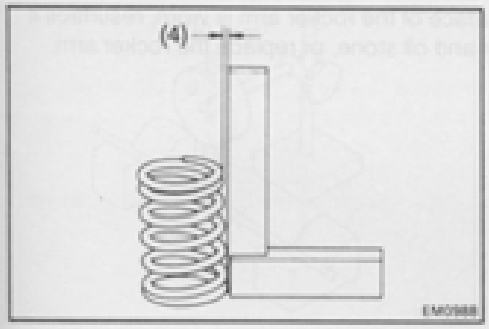
(2) (Intake) (1)
If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.
(Exhaust) (2)
If the seating is too low on the valve face, use 65° and 45° cutters to correct the seat.

(3) Width



(d) Hand-lap the valve and valve seat together with an abrasive compound.

(e) After hand-lapping clean the valve and valve seat.

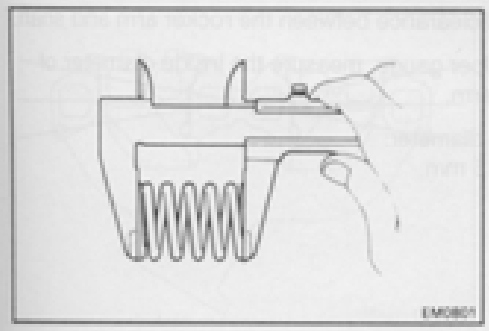


13. Inspect valve springs

(a) Using a steel square, check the squareness (4) of the valve springs.

Maximum deviation: 2.0 mm

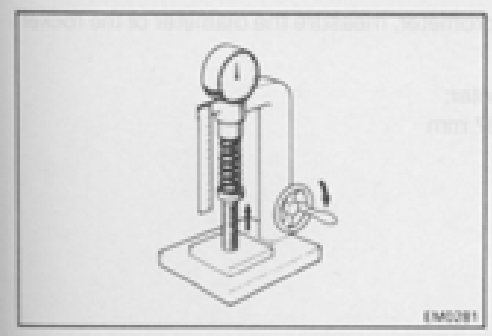
If squareness is greater than maximum, replace the valve spring.



(b) Using calipers, measure the free length of the valve spring.

Free length: 47.0 mm

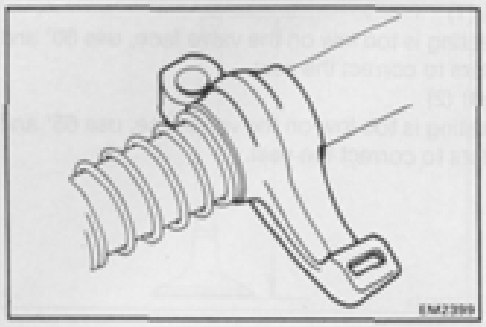
If the free length is not as specified, replace the valve spring.



(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

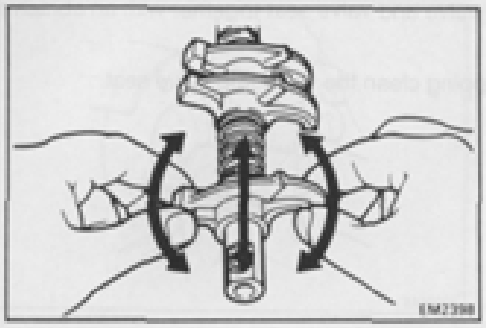
Installed tension: 282 - 345 N at 40.6 mm

If the installed tension is not within specification, replace the valve spring.



14. Inspect rocker arm and shaft

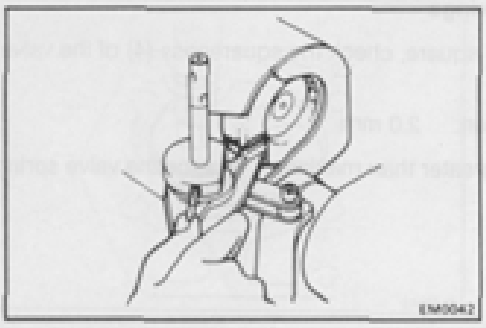
(a) Inspect the valve contacting surface of the rocker arm for wear.



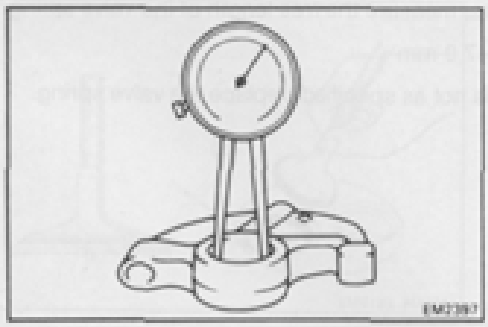
(b) Inspect the rocker arm-to-shaft clearance by moving each rocker arm as shown in the figure. If movement is felt, dismantle and inspect.

(c) Dismantle the valve rocker shaft assembly.

NOTE: Arrange the rocker arm in correct order.



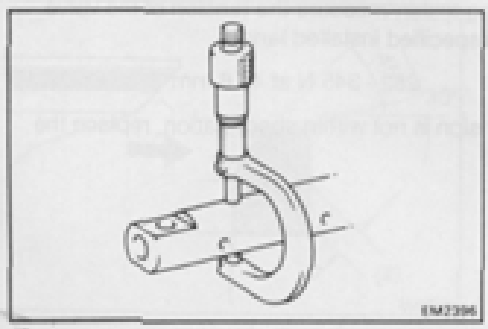
If the contacting surface of the rocker arm is worn, resurface it with a valve refacer and oil stone, or replace the rocker arm.



(d) Inspect the oil clearance between the rocker arm and shaft.

- Using a caliper gauge, measure the inside diameter of the rocker arm.

Rocker arm inside diameter:
18.500 - 18.515 mm



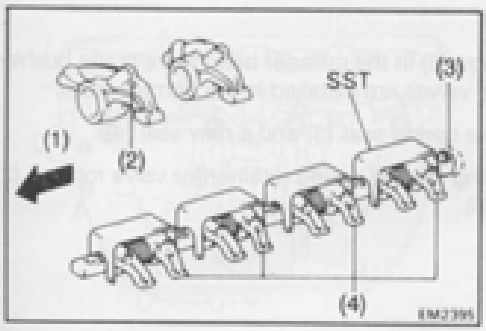
- Using a micrometer, measure the diameter of the rocker shaft.

Rocker shaft diameter:
18.474 - 18.487 mm

- Subtract the rocker shaft diameter measurement from the inside diameter measurement of the rocker arm.

Standard oil clearance: 0.013 - 0.041 mm
Maximum oil clearance: 0.08 mm

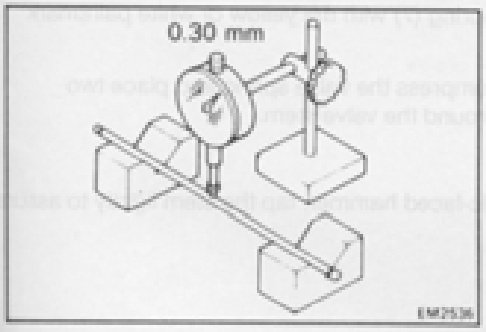
If the clearance is greater than maximum, replace the rocker arm and shaft.



(e) Assemble the valve rocker shaft assembly.
Confirm the correct direction of the rocker arm shaft rear end, assemble the rocker arms and springs as shown and hold them with SST.

SST 09270-71010

(1) Front
(2) Protrusion
(3) Upward
(4) With Protrusion



15. Inspect push rods

(a) Place the push rod on V-blocks.

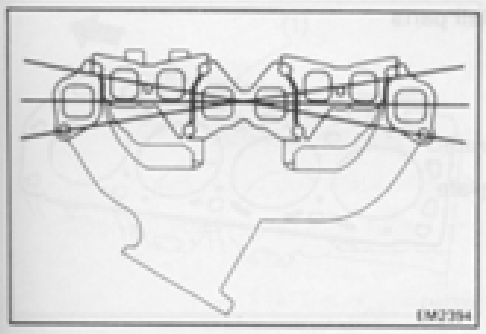
(b) Using a dial indicator, measure the circle runout at the center of the push rod.

Maximum circle runout: 0.30 mm

If the circle runout is greater than maximum, replace the push rod.

(c) Check that the push rod oil hole is not clogged.

If clogged, clear it with compressed air.



16. Inspect intake and exhaust manifolds

Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder head for warp.

Maximum warp: 0.40 mm

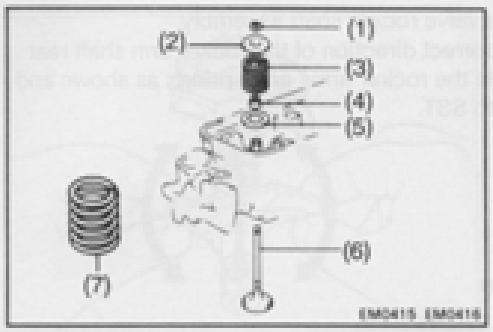
If warp is greater than maximum, replace the manifold.

ASSEMBLY OF CYLINDER HEAD

(See page 22)

Note:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.

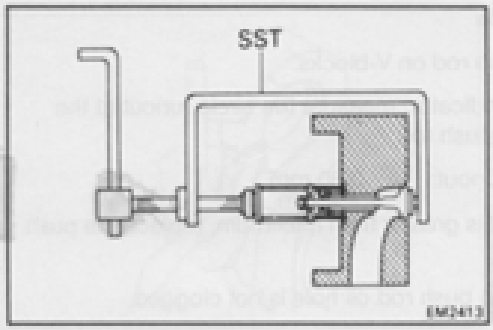


1. Install valves

(a) Insert the valves (6) in the cylinder head valve guide bushing. Make sure the valves are installed in the correct order.

(b) Install the valve spring seat (5) and a new seal (4).

(c) Install the spring (3) and spring retainer (or valve rotator) (2) on the valve (6).

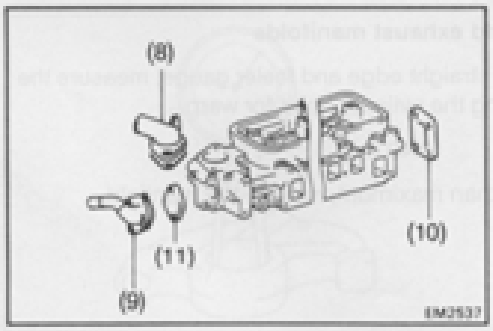


Note: Install the spring (7) with the yellow or white paintmark facing down.

(d) Using SST, compress the valve spring and place two keepers (1) around the valve stem.

SST 09202-43013

(e) Using a plastic-faced hammer, tap the stem lightly to assure proper fit.



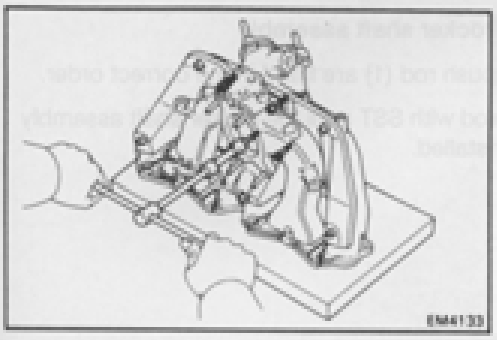
2. If necessary, install parts

(8) Water outlet

(9) Heater outlet

(10) Engine rear plate

(11) Engine front plate



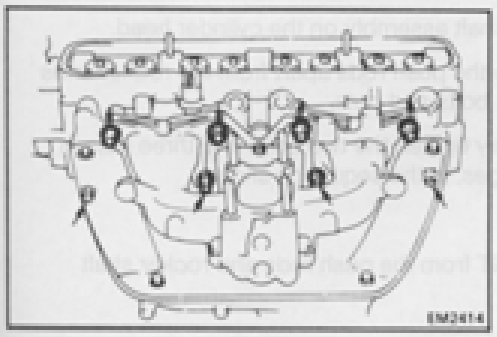
3. **Assemble intake and exhaust manifolds**

(a) Attach the cylinder head installation surfaces of the intake and exhaust manifolds to a precision surface plate.

(b) Assemble the intake manifold, insulator and exhaust manifold with the four bolts.

Torque: 20 Nm

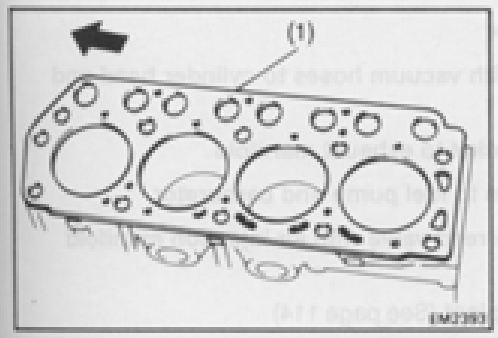
(c) Check the manifolds for flatness.
(See page 33)



4. **Install intake and exhaust manifolds**

Torque: 49 Nm

5. **Install carburetor**



INSTALLATION OF CYLINDER HEAD
(See page 22)

1. **Fit cylinder head**

(a) Fit a new cylinder head gasket (1) on the cylinder block.

NOTE: Observe the installation direction.

Arrow indicates front

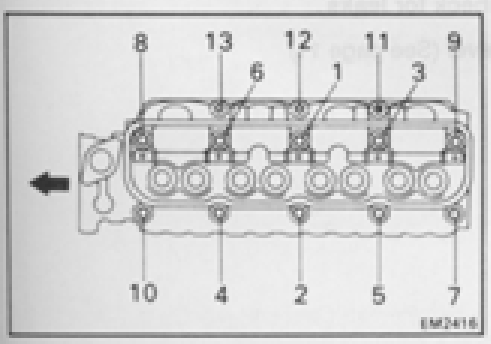
(b) Place the cylinder head on the cylinder head gasket.

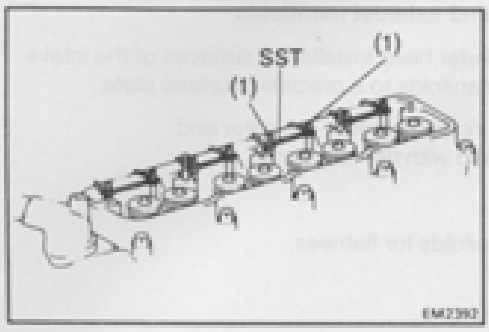
(c) Apply a light coat of engine oil on the threads and under the cylinder head bolts.

(d) Install and uniformly tighten the thirteen cylinder head bolts in several passes, in the sequence shown.

Torque:
14 mm bolt head 88 Nm
12 mm bolt head 19 Nm

Arrow indicates front



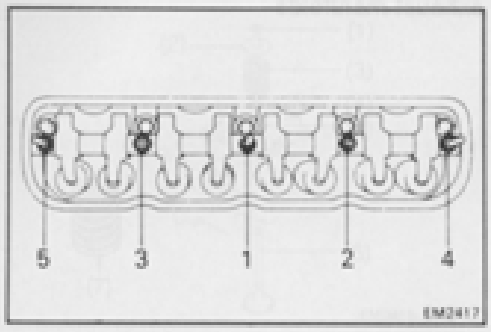


2. **Fit push rods and rocker shaft assembly**

   (a) Make sure the push rod (1) are fitted in the correct order.

   (b) Hold the push rod with SST until the rocker shaft assembly is completely installed.

   SST 09270-71010



   (c) Fit the rocker shaft assembly on the cylinder head.

   NOTE: Do not keep the push rods apart from the rocker arms while tightening the bolts and nuts.

   (d) Fit and uniformly tighten the two bolts and three nuts in the several stages, in the sequence shown.

   Torque: 24 Nm

   (e) Remove the SST from the push rods and rocker shaft assembly.

3. **Fit cylinder head cover**

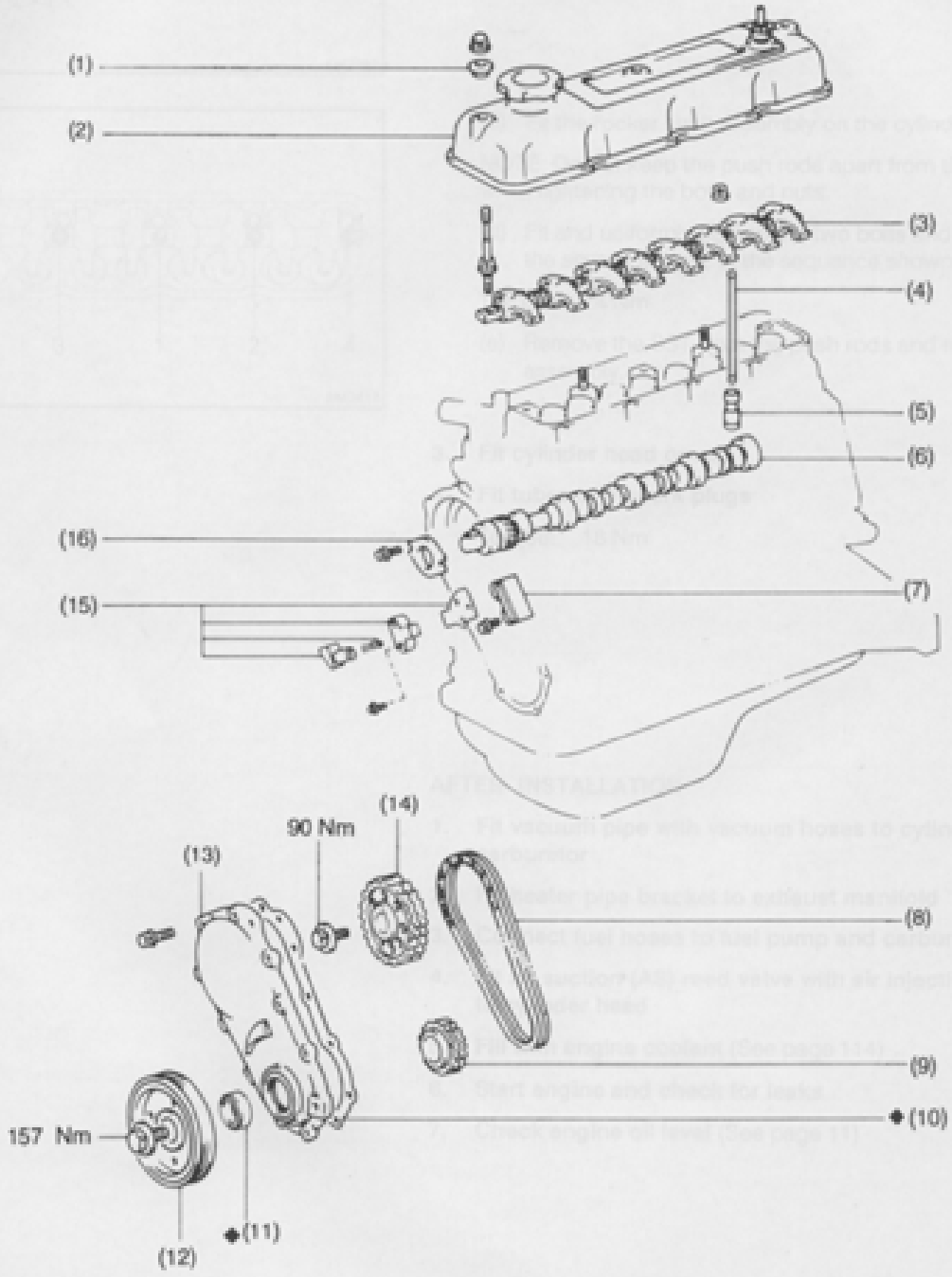
4. **Fit tubes and spark plugs**

   Torque: 18 Nm

AFTER INSTALLATION

1. **Fit vacuum pipe with vacuum hoses to cylinder head and carburetor**
2. **Fit heater pipe bracket to exhaust manifold**
3. **Connect fuel hoses to fuel pump and carburetor**
4. **Fit air suction (AS) reed valve with air injection manifold to cylinder head**
5. **Fill with engine coolant** (See page 114)
6. **Start engine and check for leaks**
7. **Check engine oil level** (See page 11)

COMPONENTS

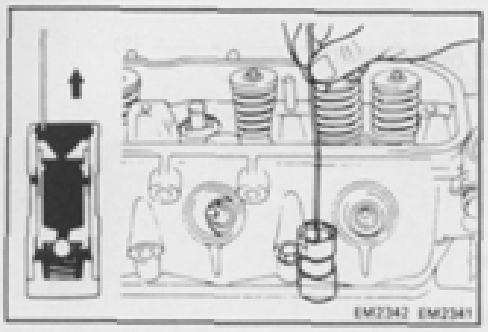


(1) Seal Washer
(2) Cylinder Head Cover (with Gasket)
(3) Rocker Shaft Assembly
(4) Push Rod
(5) Valve Lifter
(6) Camshaft
(7) Vibration Damper
(8) Timing Chain
(9) Crankshaft sprocket
(10) Gasket
(11) Crankshaft Front Oil Seal
(12) Crankshaft Pulley
(13) Timing Chain Cover
(14) Camshaft Sprocket
(15) Chain Tensioner
(16) Thrust Plate

♦ Non-reusable Part

PREPARATION FOR REMOVAL

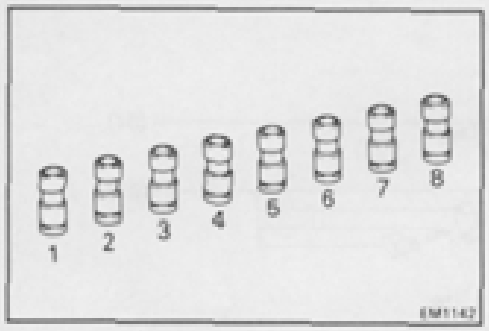
1. **Remove drive belt**
2. **Remove fan and water pump pulley**
   (See page 115)
3. **Remove fuel Pump**
4. **Remove distributor**
5. **Remove rocker shaft assembly and push rods (See steps 2 to 4 on page 24)**



REMOVAL OF TIMING CHAIN AND CAMSHAFT
(See page 38)

1. **Remove valve lifters**

   Remove the eight valve lifters with a piece of wire or magnetic finger.

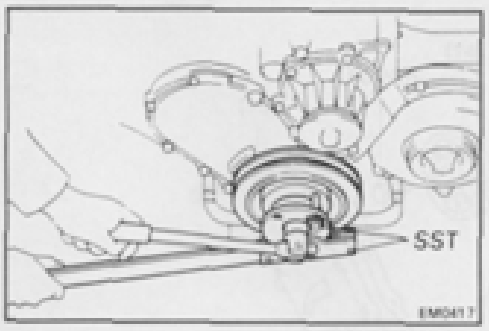


CAUTION: Always keep the valve lifter upright, and in correct order.

2. **Remove crankshaft pulley**

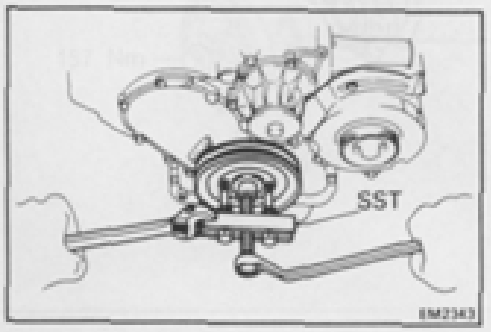
   (a) Using SST, remove the pulley bolt.

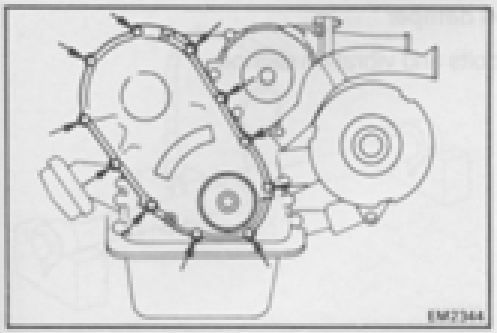
   SST 09213-70010 and 09330-00021



   (b) Using SST, remove the crankshaft pulley.

   SST 09213-31021

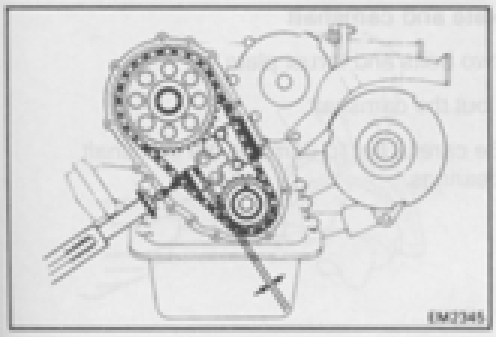




3. **Remove timing chain cover**

(a) Remove the eleven bolts as shown in the figure.

(b) Using a screwdriver, pry out the chain cover.

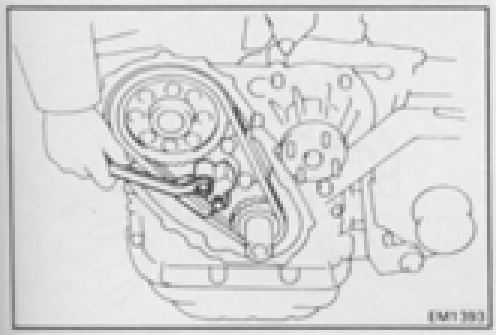


4. **Check timing chain slack**

Using an tension gauge, measure the slack of the timing chain.

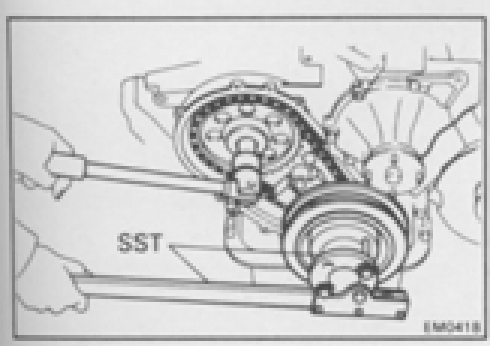
Maximum slack:
13.5 mm at 98 N

If the slack is greater than maximum, replace the timing chain and sprockets.



5. **Remove chain tensioner**

Remove the two bolts and chain tensioner.



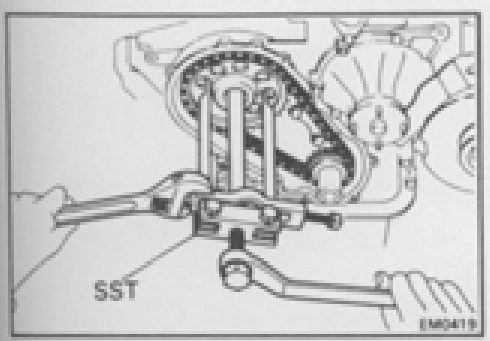
6. **Remove timing chain and sprockets**

(a) Install the crankshaft pulley to the crankshaft.

(b) Using SST, remove the camshaft sprocket bolt.

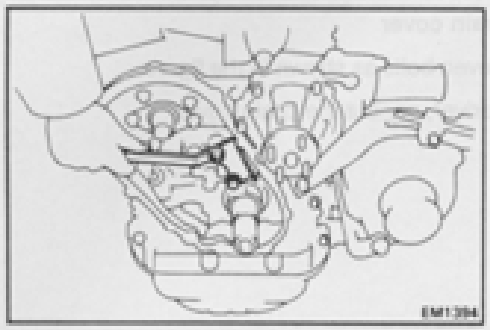
SST 09213-70010 and 09330-00021

(c) Remove the crankshaft pulley.



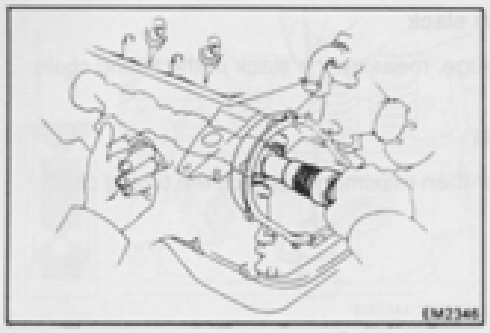
(d) Using SST, uniformly remove the camshaft sprocket together with the crankshaft sprocket and chain.

SST 09950-20017



7. Remove vibration damper

Remove the two bolts and vibration damper.

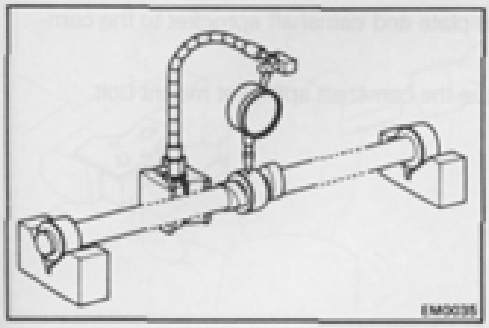


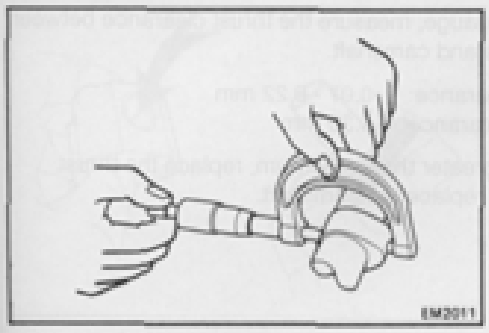
8. Remove thrust plate and camshaft

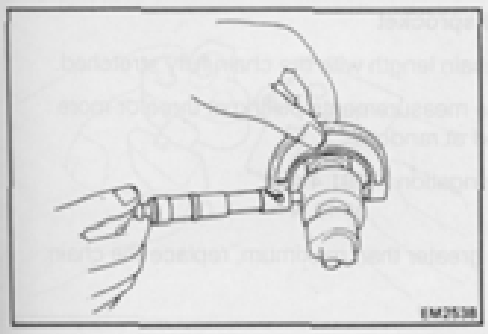
(a) Remove the two bolts and thrust plate.

(b) Carefully pull out the camshaft.

CAUTION: Be careful not to damage the camshaft bearings.







INSPECTION AND REPAIR OF TIMING CHAIN AND CAMSHAFT COMPONENTS

1. **Inspect camshaft**

(a) Place the camshaft on V-blocks and measure the runout at the center journal.

Maximum circle runout: 0.06 mm

If the circle runout is greater than maximum, replace the camshaft.

(b) Using a micrometer, measure the cam lobe height.

Standard lobe height:

Intake	38.620 - 38.720 mm
Exhaust	38.629 - 38.729 mm

Minimum lobe height:

Intake	38.26 mm
Exhaust	38.27 mm

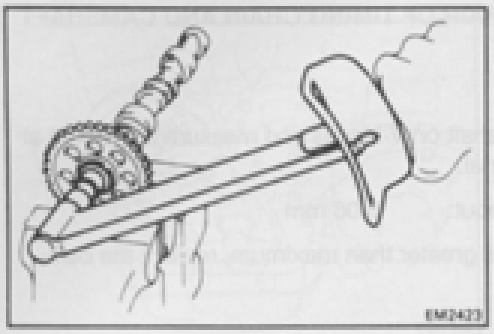
If the lobe height is less than minimum, replace the camshaft.

(c) Using a micrometer, measure the journal diameter.

Standard diameter (from front):

No. 1	46.459 - 46.475 mm
No. 2	46.209 - 46.225 mm
No. 3	45.959 - 45.975 mm
No. 4	45.709 - 45.725 mm
No. 5	45.459 - 45.475 mm

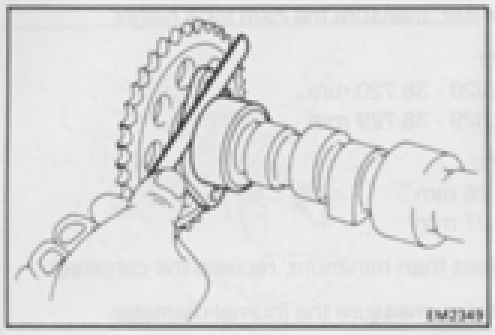
If the journal diameter is not within specification, check the oil clearance. (See page 66)



(d) Install the thrust plate and camshaft sprocket to the camshaft.

(e) Install and torque the camshaft sprocket mount bolt.

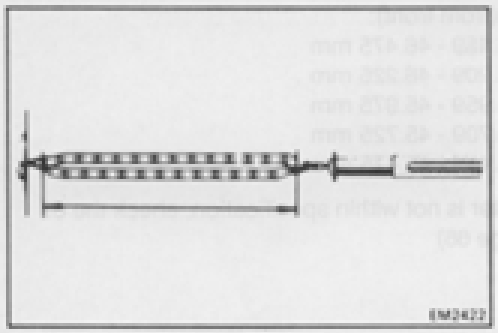
Torque: 90 Nm



(f) Using a feeler gauge, measure the thrust clearance between the thrust plate and camshaft.

Standard thrust clearance: 0.07 - 0.22 mm
Maximum thrust clearance: 0.30 mm

If the clearance is greater than maximum, replace the thrust plate. If necessary, replace the camshaft.



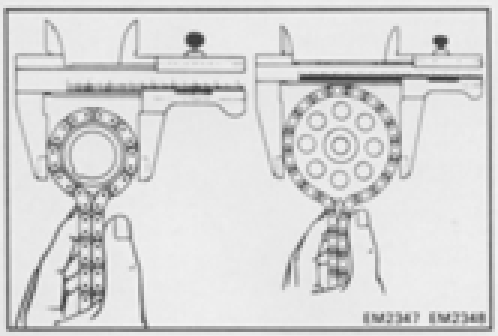
2. Inspect chain and sprocket

(a) Measure the chain length with the chain fully stretched.

(b) Make the same measurements pulling at three or more places selected at random.

Maximum chain elongation: 291.4 mm
at 49 N

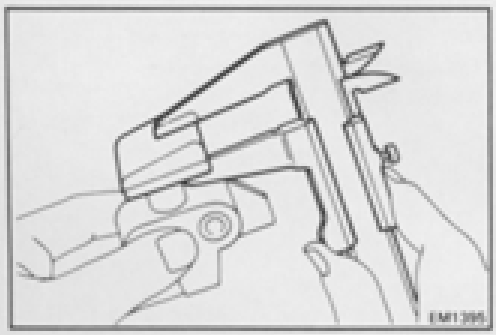
If the elongation is greater than maximum, replace the chain.



(c) Using calipers, measure the sprocket diameter with the chain.

Minimum sprocket diameter (with chain):
Crankshaft 59 mm
Camshaft 114 mm

If the diameter is less than minimum, replace the chain and two sprockets.

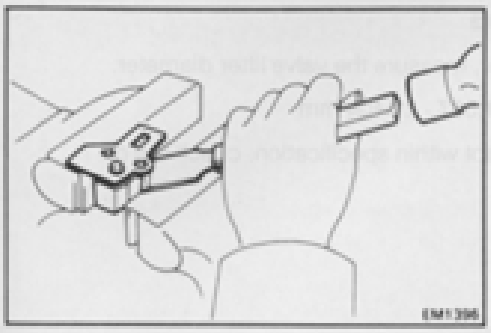


3. Inspect chain tensioner

Using calipers, measure the tensioner thickness.

Standard thickness: 15.0 mm
Minimum thickness: 12.5 mm

If the thickness is less than minimum, replace the tensioner.

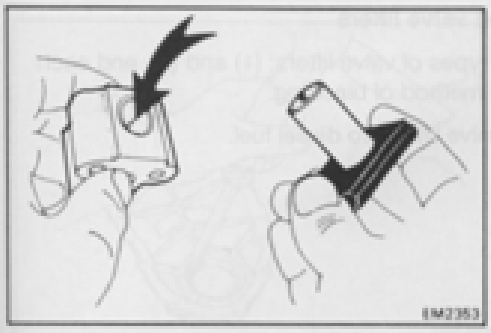


4. If necessary, replace chain tensioner plunger

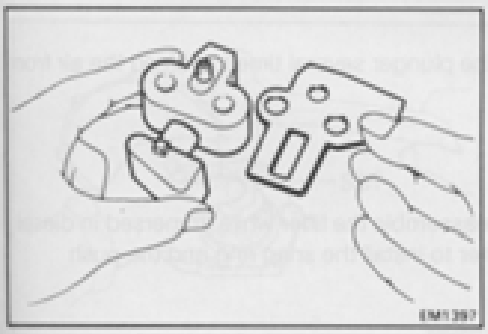
(a) Using a gasket scraper and hammer, remove the plate.

CAUTION: Do not bend the plate.

(b) Remove the chain tensioner plunger and spring.



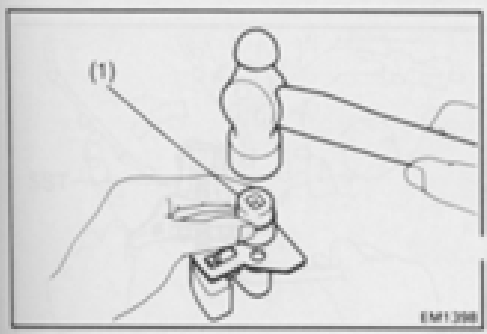
(c) Apply engine oil to the chain tensioner body and plunger sliding surface.



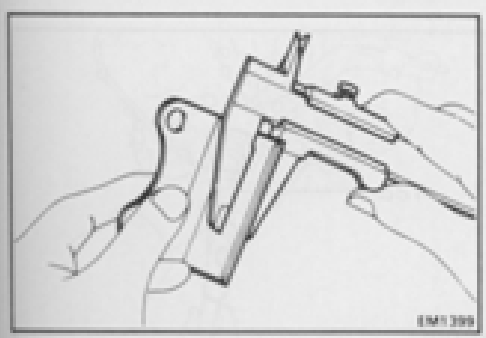
(d) Fit the spring and a new chain tensioner plunger to the chain tensioner body.

(e) Place the plate in position.

NOTE: Observe the installation instructions.



(f) Using a socket wrench (1) and hammer, tap in the plate.

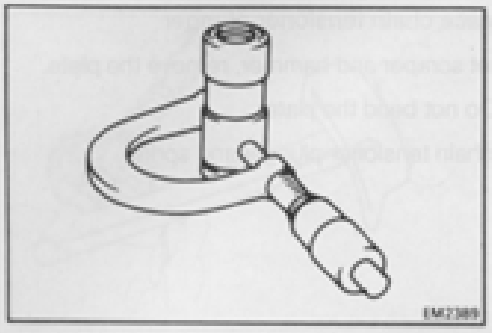


5. Inspect chain vibration damper

Using calipers, measure the damper thickness.

Standard thickness: 6.6 mm
Minimum thickness: 5 mm

If the thickness is less than minimum, replace the damper.



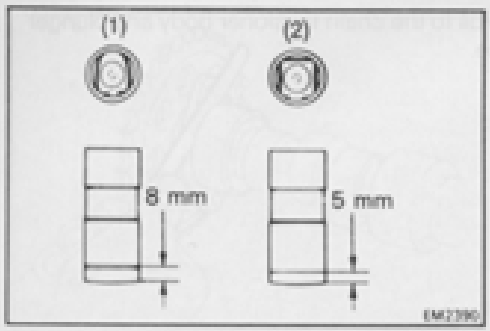
6. **Inspect valve lifters**

Using a micrometer, measure the valve lifter diameter.

Lifter diameter: 21.387 - 21.404 mm

If the diameter ist not within specification, check the oil clearance.

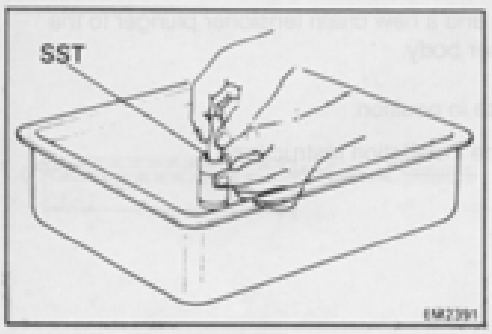
(See page 67)



7. **If necessary, bleed valve lifters**

(a) There are two types of valve lifters; (1) and (2), end each has a different method of bleeding.

(b) Immerse the valve lifter into diesel fuel.



Type (1)

Using SST, pump the plunger several times to bleed the air from the lifter.

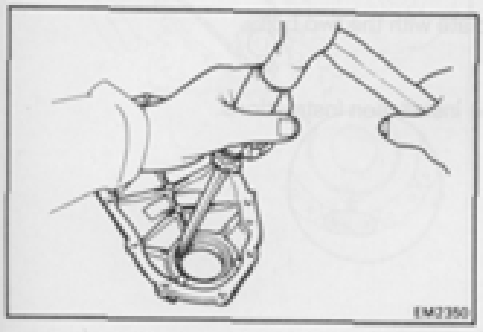
SST 09276-71010

Type (2)

Disassemble and reassemble the lifter while immersed in diesel fuel. Use a leak tester to install the snap ring and the push rod seat.

REPLACEMENT OF CRANKSHAFT FRONT OIL SEAL

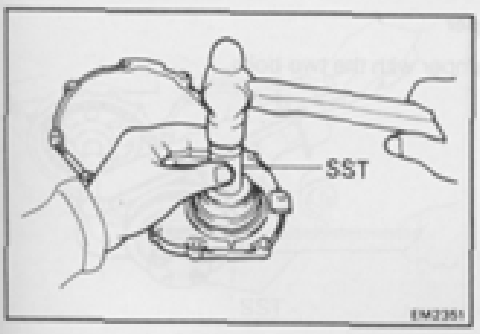
NOTE: There are two methods (A and B) of replacintg the oil seal.



Replace crankshaft front oil seal

A. If timing chain cover is removed from timing chain case:

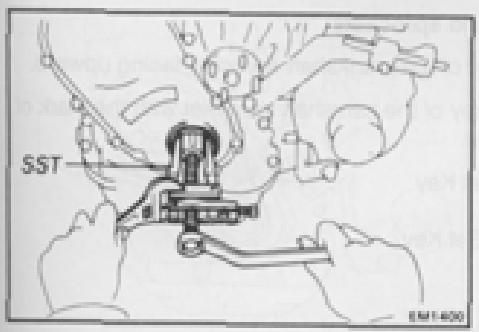
(a) Using a screwdriver and hammer, tap out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing chain cover edge.

SST 09223-22010

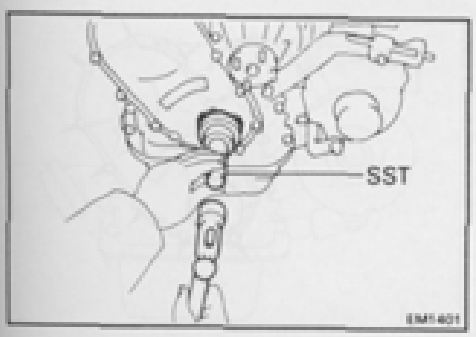
(c) Apply MP grease to the oil seal lip.



B. If timing chain cover is installed to timing chain case:

(a) Using SST, remove the oil seal.

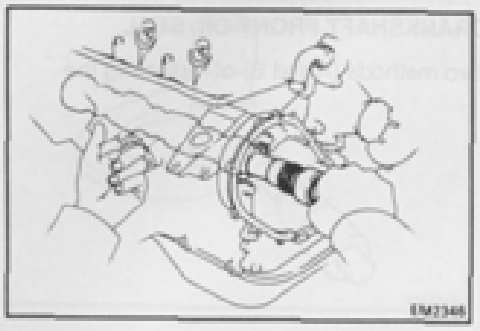
SST 09308-10010



(b) Apply MP grease to a new oil seal lip.

(c) Using SST and a hammer, tap in the oil seal until its surface is flush with the timing chain case edge.

SST 09223-22010



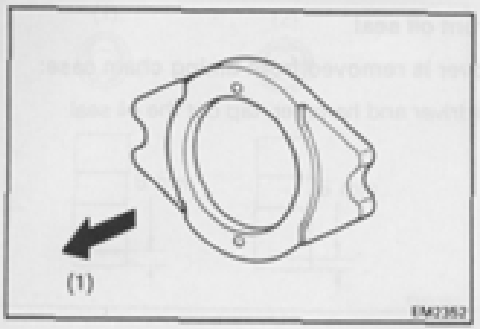
INSTALLATION OF TIMING CHAIN AND CAMSHAFT

(See page 38)

1. **Fit camshaft**

   (a) Carefully insert the camshaft into the cylinder block.

   CAUTION: Be careful not to damage the camshaft bearings.

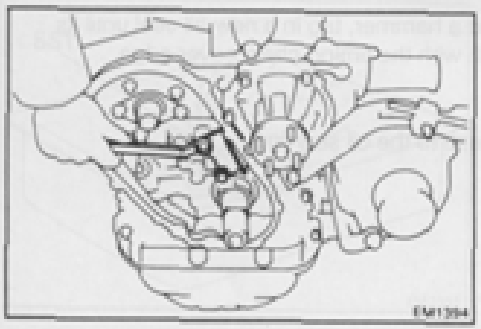


   (b) Fit the thrust plate with the two bolts.

   Torque: 18 Nm

   NOTE: Observe the installation instructions.

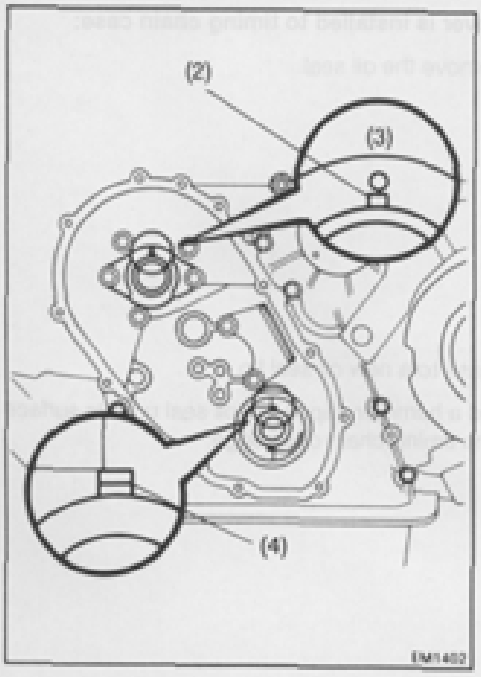
   (1) = Front



2. **Fit vibration damper**

   Fit the vibration damper with the two bolts.

   Torque: 18 Nm

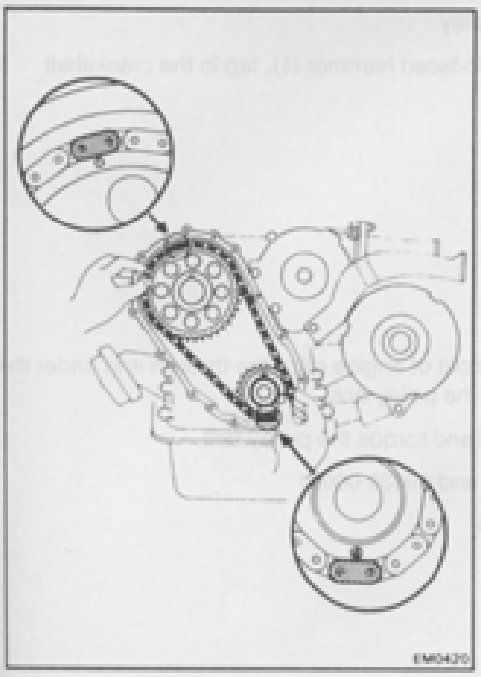


3. **Fit timing chain and sprockets**

   (a) Set the set key of the crankshaft sprocket facing upward.

   (b) Align the set key of the camshaft sprocket with the mark of the thrust plate.

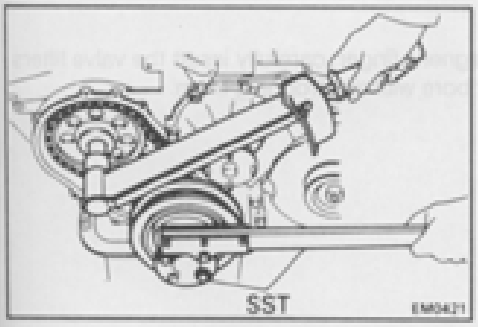
   (2) = Camshaft Set Key
   (3) = Mark
   (4) = Crankshaft Set Key



(c) Fit the sprockets to the timing chain.

NOTE: Align the timing marks of the timing chain and sprocket.

(d) Uniformly fit the chain together with the sprockets.



(e) Fit the crankshaft pulley to the crankshaft.

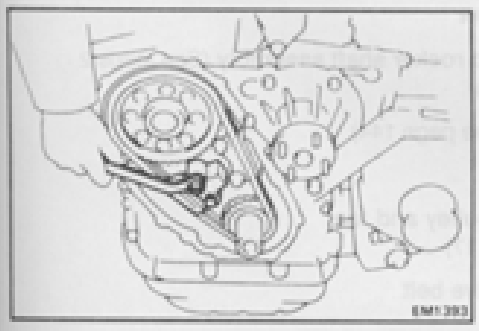
(f) Apply a light of engine oil to the threads and under the bolt head of the camshaft sprocket bolt.

(g) Using SST, fit and torque the camshaft sprocket bolt.

SST 09213-70010 and 09330-00021

Torque: 90 Nm

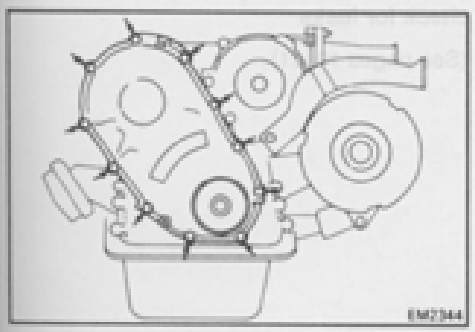
(h) Remove the crankshaft pulley.



4. Fit chain tensioner

Fit the chain tensioner with the two bolts.

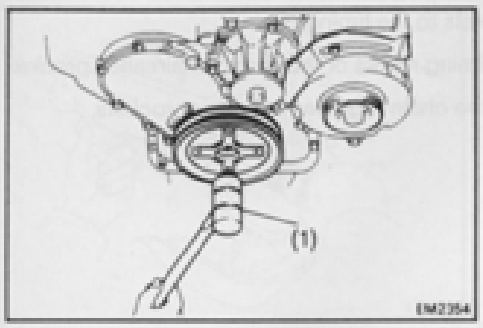
Torque: 18 Nm



5. Fit timing chain cover

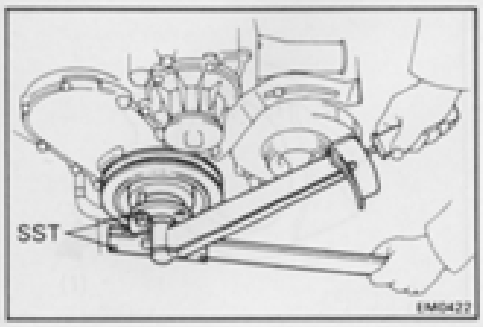
Fit a new gasket and the timing chain cover with the eleven bolts.

Torque: 5.9 Nm



6. **Fit crankshaft pulley**

(a) Using a plastic-faced hammer (1), tap in the crankshaft pulley.

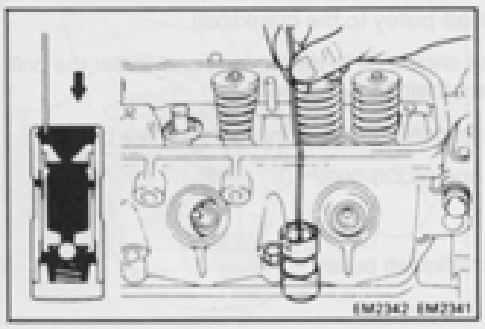


(b) Apply a light coat of engine oil to the threads and under the bolt heads of the pulley bolt.

(c) Using SST, fit and torque the pulley bolt.

SST 09213-70010 and 09330-00021

Torque: 157 Nm



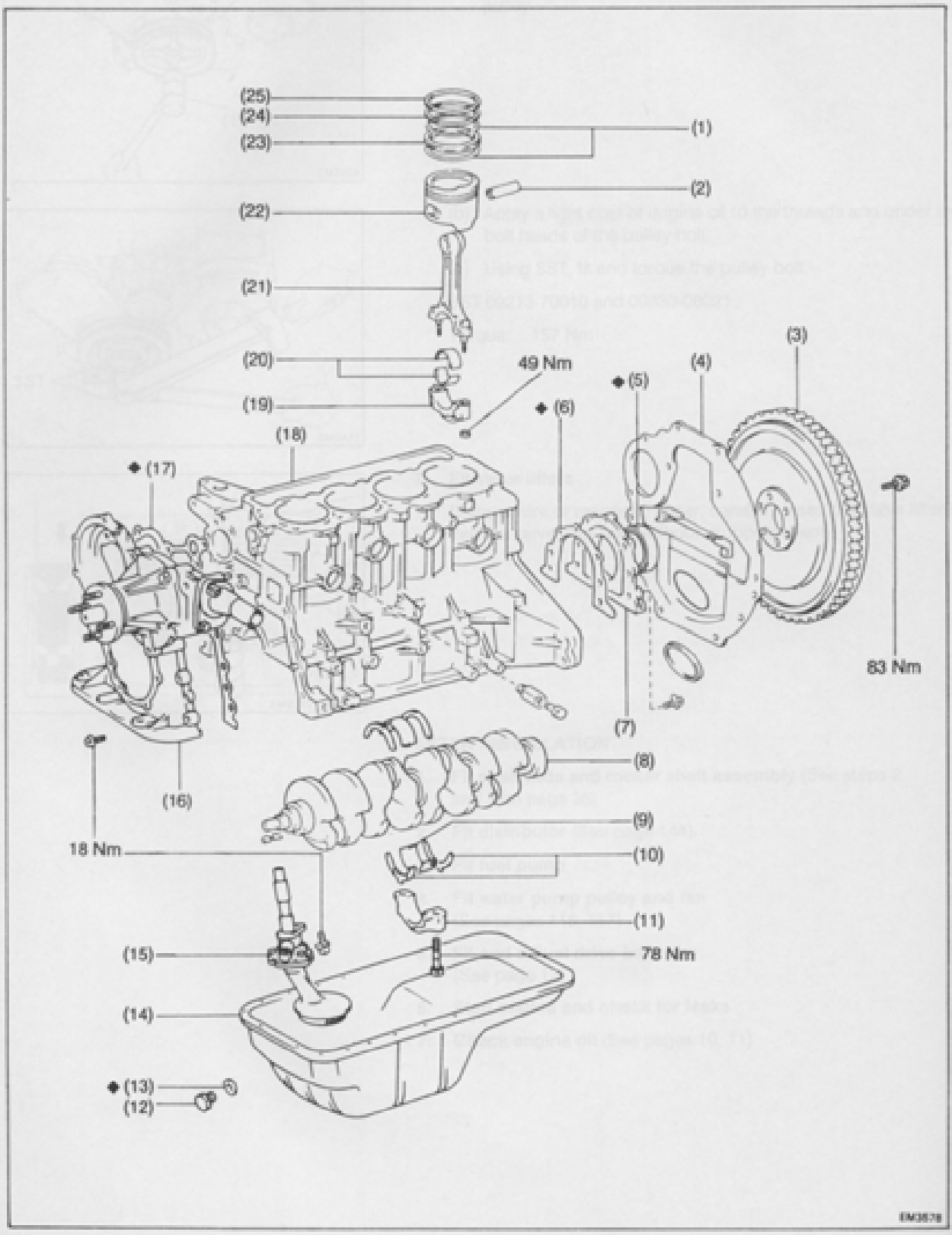
7. **Fit valve lifters**

Using a wire or magnetic finger, carefully insert the valve lifters into the valve lifter bore without dropping them.

AFTER INSTALLATION

1. **Fit push rods and rocker shaft assembly** (See steps 2 and 3 on page 36)
2. **Fit distributor** (See page 144)
3. **Fit fuel pump**
4. **Fit water pump pulley and fan** (See pages 116, 117)
5. **Fit and adjust drive belt** (See page 13)
6. **Start engine and check for leaks**
7. **Check engine oil** (See pages 10, 11)

COMPONENTS

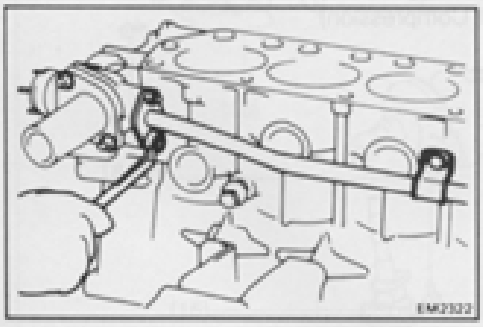

(25)
(24)
(23)
(1)
(2)
(22)
(21)
(20)
49 Nm
(19)
(6)
(5)
(4)
(3)
(18)
(17)
83 Nm
(7)
(8)
(16)
(9)
18 Nm
(10)
(11)
(15)
78 Nm
(14)
(13)
(12)
EM3578

(1) Piston Ring (Side Rail)
(2) Piston Pin
(3) Flywheel
(4) Rear End Plate
(5) Crankshaft Rear Oil Seal
(6) Gasket
(7) Rear Oil Seal Retainer
(8) Crankshaft
(9) Main Bearing
(10) Crankshaft Thrust Washer
(11) Main Bearing Cap
(12) Drain Plug
(13) Gasket
(14) Oil Pan
(15) Oil Pump
(16) Timing Chain Case
(17) Gasket
(18) Cylinder Block
(19) Connecting Rod Cap
(20) Connecting Rod Bearing
(21) Connecting Rod
(22) Piston
(23) Piston Ring (Expander)
(24) Piston Ring (No.2 Compression)
(25) Piston Ring (No.1 Compression)

♦ Non-reusable part

PREPARATION FOR DISASSEMBLY

1. **Remove clutch cover and disc**
2. **Remove flywheel**
3. **Remove rear end plate**
4. **Fit engine to engine stand for disassembly**
5. **Remove alternator and bracket**
6. **Remove oil filter bracket and oil filter**
7. **Remove cylinder head assembly**
   (See page 24)
8. **Remove timing chain and camshaft**
   (See pages 40 to 42)
9. **Remove engine oil pan and oil pump**
   (See pages 123, 124)

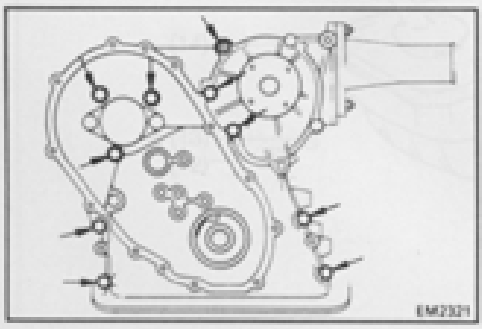


DISASSEMBLY OF CYLINDER BLOCK

(See page 52)

1. **Remove water by-pass pipe**

   Remove the two nuts and holding bolt, and remove the water by-pass pipe with the gasket.

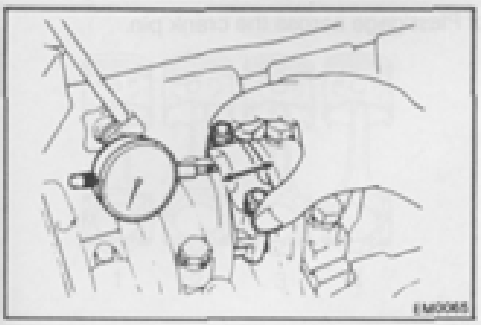


2. **Remove timing chain case**

   Remove the nine bolts and one nut, and remove the timing chain case and gasket.

3. **Remove rear oil seal retainer**

   Remove the five bolts, rear oil seal retainer, dust seal and gasket.

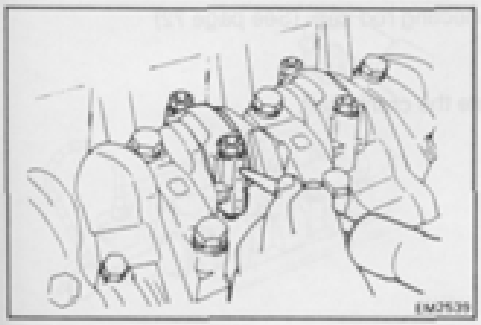


4. **Check connecting rod thrust clearance**

Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

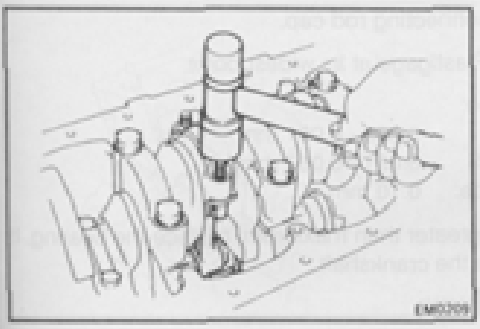
Standard thrust clearance: 0.160 - 0.312 mm
Maximum thrust clearance: 0.35 mm

If the clearance is greater than maximum, replace the connecting rod assembly.



5. **Remove connecting rod caps and check oil clearance**

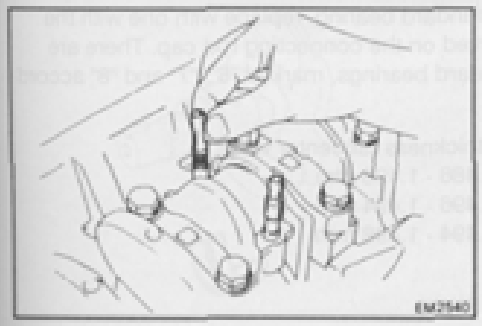
(a) Using a punch or numbering stamp, place the matchmarks on the connecting rods and caps to ensure correct reassembly.



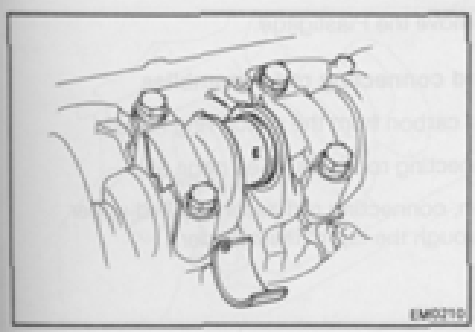
(b) Remove the connecting rod cap nuts.

(c) Using a plastic-faced hammer, lightly tap the connecting rod bolts and lift off the rod connecting cap.

NOTE: Keep the lower bearing insert with the connecting rod cap.



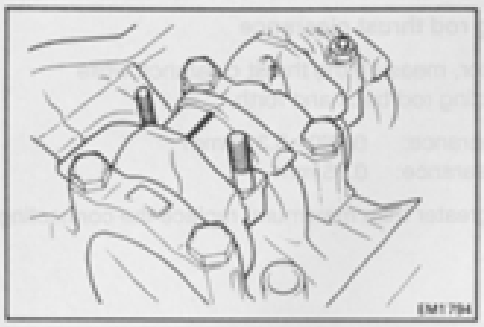
(d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



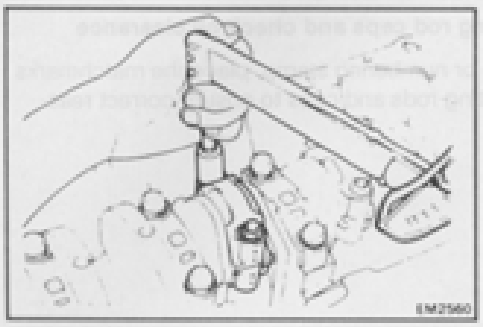
(e) Clean each crank pin and bearing.

(f) Check each crank pin and bearing for pitting and scratches.

If the crank pins or bearings are damaged, replace the bearings. If necessary, replace the crankshaft.



(g) Place a strip of Plastigage across the crank pin.



(h) Install the connecting rod cap. (See page 72)

Torque: 49 Nm

NOTE: Do not rotate the crankshaft.

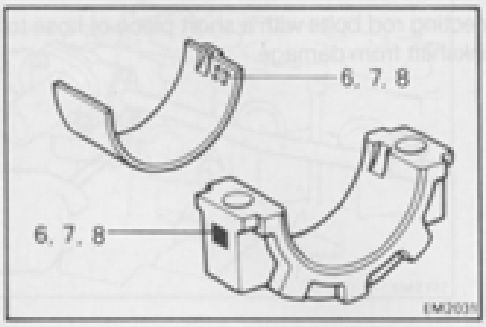
(i) Remove the connecting rod cap.

(j) Measure the Plastigage at its widest point.

Standard clearance:

Standard	0.020 - 0.051 mm
Undersize 0.25	0.021 - 0.067 mm
Maximum clearance:	0.10 mm

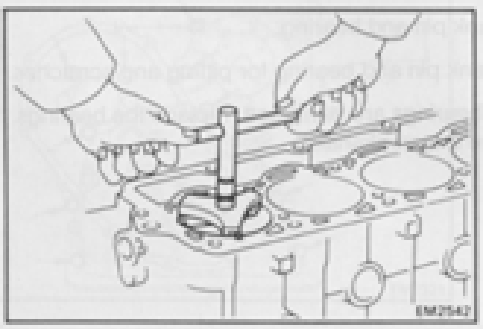
If the clearance is greater than maximum, replace the bearing. If necessary, replace the crankshaft.



NOTE: If using a standard bearing, replace with one with the same number marked on the connecting rod cap. There are three sizes of standard bearings, marked "6", "7" and "8" accordingly.

Standard bearing thickness (at center wall):

Mark "6"	1.486 - 1.496 mm
Mark "7"	1.496 - 1.494 mm
Mark "8"	1.494 - 1.498 mm



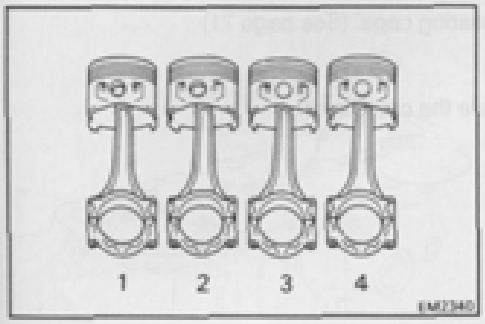
(k) Completely remove the Plastigage.

6. Remove piston and connecting rod assemblies

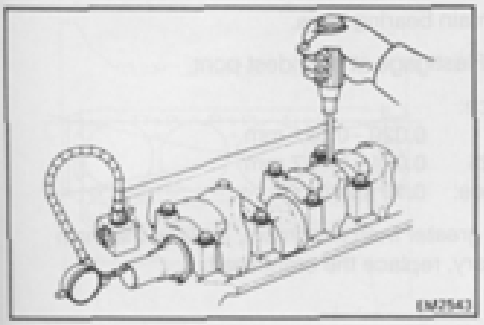
(a) Remove all the carbon from the piston ring ridge.

(b) Cover the connecting rod bolts. (See page 55)

(c) Push the piston, connecting rod assembly and upper bearing out through the tap of the cylinder.



NOTE:
- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in correct order.



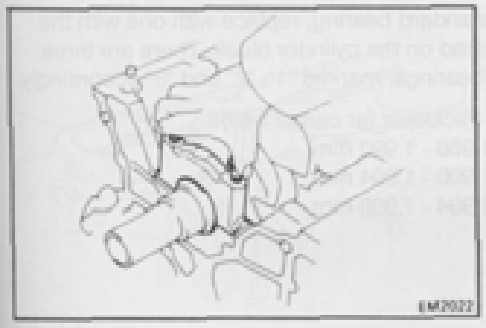
7. Check crankshaft thrust clearance

Using a dial indicator, measure the thrust clearance while moving the crankshaft back and forth with a screwdriver.

Standard thrust clearance: 0.020 - 0.220 mm
Maximum thrust clearance: 0.30 mm

If the clearance is greater than maximum, replace the thrust washers as a set.

Thrust washer thickness (Standard size):
2.440 - 2.490 mm

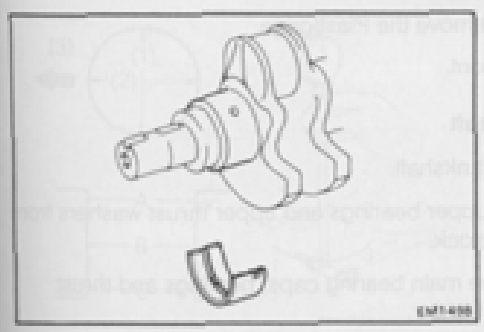


8. Remove main bearing caps and check oil clearance

(a) Remove the main bearing cap bolts.

(b) Using the removed main bearing cap bolts, move the cap back and forth, and remove the main bearing caps lower bearings and lower thrust washers (No.3 main bearing cap only.

NOTE.
- The lower bearing and main bearing cap not dismantle.
- Arrange the main bearing caps and lower thrust washers in correct order



(c) Lift out the crankshaft.

NOTE: Keep the upper bearing and upper thrust washers together with the cylinder block.

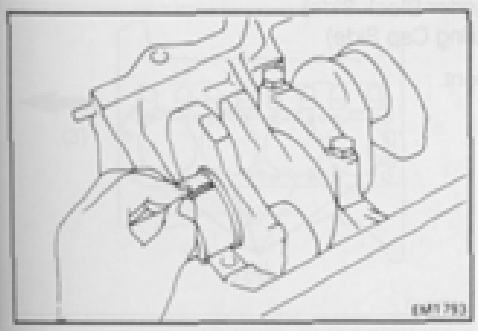
(d) Clean each main journal and bearing.

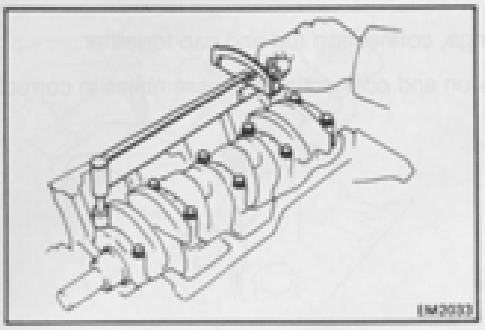
(e) Check each main journal and bearing for pitting and scratches.

If the journal or bearing are damaged, replace the bearing.
If necessary, replace the crankshaft.

(f) Place the crankshaft on the cylinder block.

(g) Place a strip of Plastigage across each main journals.

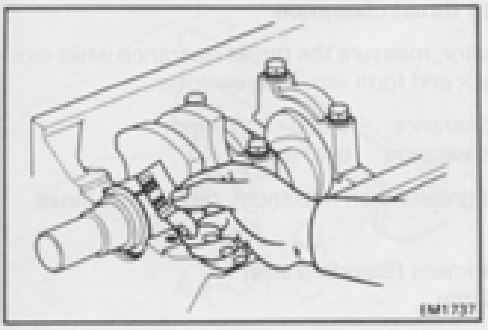




(h) Fit the main bearing caps. (See page 71)

Torque: 78 Nm

NOTE: Do not rotate the crankshaft.



(i) Remove the main bearing caps.

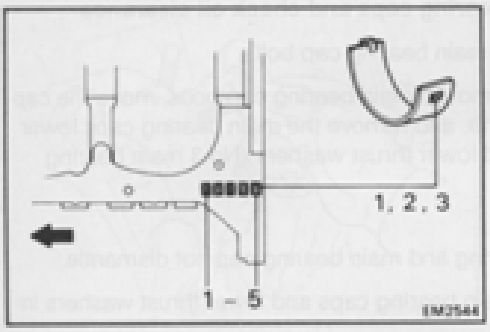
(j) Measure the Plastigage at its widest pont.

Standard clearance:

Standard	0.020 - 0.051 mm
Undersize 0.25	0.021 - 0.067 mm

Maximum clearance: 0.10 mm

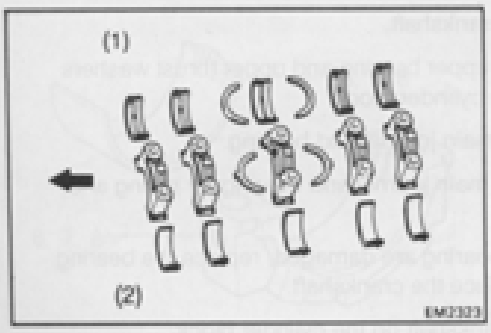
If the clearance is greater than maximum, replace the main bearing. If necessary, replace the crankshaft.



NOTE: If using a standard bearing, replace with one with the same number marked on the cylinder block. There are three sizes of standard bearings, marked "1", "2" and "3" accordingly.

Standard bearing thickness (at center wall):

Mark "1"	1.986 - 1.990 mm
Mark "2"	1.990 - 1.994 mm
Mark "3"	1.994 - 1.998 mm



(k) Completely remove the Plastigage.

Arrow indicates front.

9. Remove crankshaft

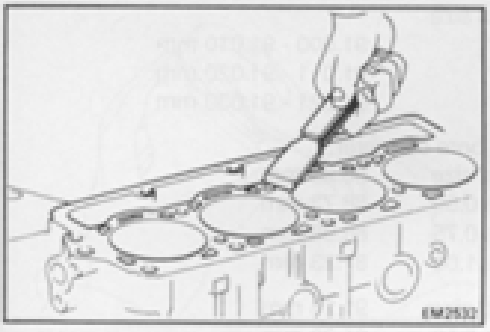
(a) Lift out the crankshaft.

(b) Remove the upper bearings and upper thrust washers from the cylinder block.

NOTE: Arrange the main bearing caps, bearings and thrust washers in correct order.

(1) = Upper (Cylinder Block Side)
(2) = Lower (Bearing Cap Side)

Arrow indicates front.



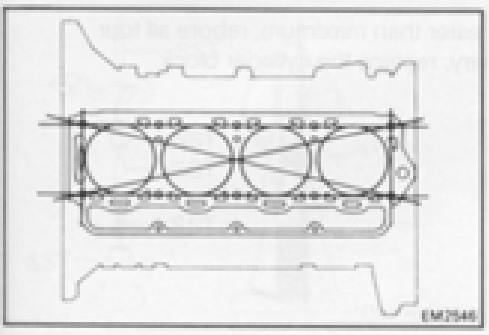
INSPECTION OF CYLINDER BLOCK

1. **Remove gasket material**

   Using a gasket scraper, remove all the gasket material from the cylinder block surface.

2. **Clean cylinder block**

   Using a soft brush and solvent, clean the block.

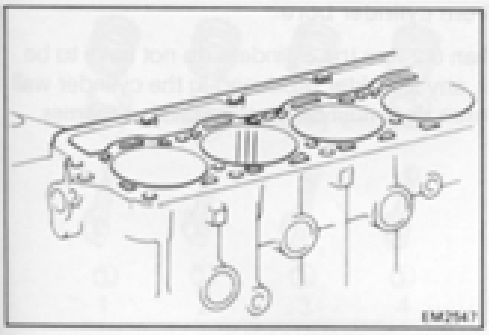


3. **Inspect top of cylinder block for flatness**

   Using a precision straight edge and feeler gauge, check the surface contacting the cylinder head gasket for warp.

   Maximum warp: 0.05 mm

   If warp is greater than maximum, replace the cylinder block.

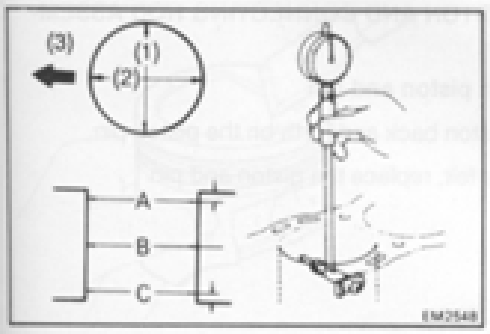


4. **Inspect cylinders for vertical scratches**

   Visually check the cylinders for vertical scratches.

   If deep scratches are present, rebore all four cylinders.

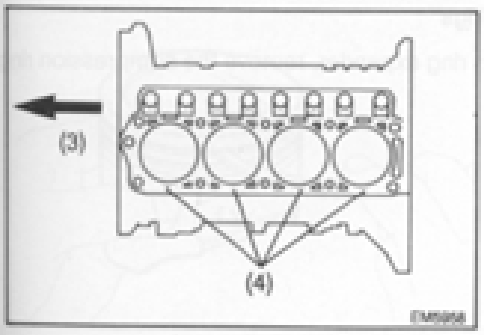
(See page 64)



5. **Inspect cylinder bores**

   Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.

   (1) Thrust Direction
   (2) Axial Direction
   (3) Front



NOTE: There are three sizes of standard cylinder bore diameter, marked "1", "2" and "3" accordingly. The mark (4) is stamped on the cylinder block as shown in the illustration.

Standard cylinder bore diameter:

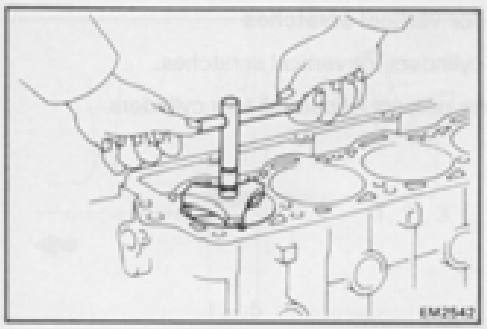
2Y:	Standard size	
	Mark "1"	86.000 - 86.010 mm
	Mark "2"	86.011 - 86.020 mm
	Mark "3"	86.021 - 86.030 mm

4Y:	Standard size	
	Mark "1"	91.000 - 91.010 mm
	Mark "2"	91.011 - 91.020 mm
	Mark "3"	91.021 - 91.030 mm

Maximum cylinder bore diameter:

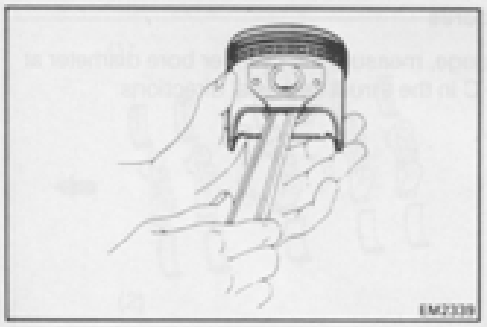
2Y:	Standard size	86.23 mm
	Oversize 0.50	86.73 mm
	Oversize 0.75	86.98 mm
	Oversize 1.00	87.23 mm
4Y:	Standard size	91.23 mm
	Oversize 0.50	91.73 mm

If the diameter is greater than maximum, rebore all four cylinders, if necessary, replace the cylinder block.



6. Remove scoring from cylinder bore

If the wear is less than 0.2 mm the cylinders do not have to be reground. However, any shoulder produced in the cylinder wall above the upper piston ring must be removed with a reamer.

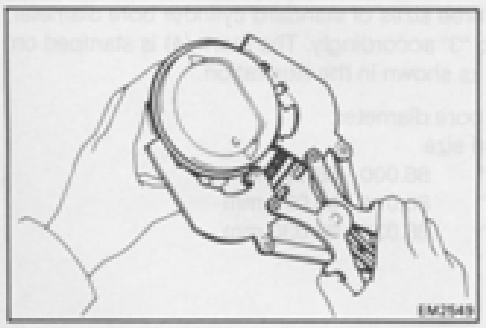


DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

1. Check fit between piston and pin

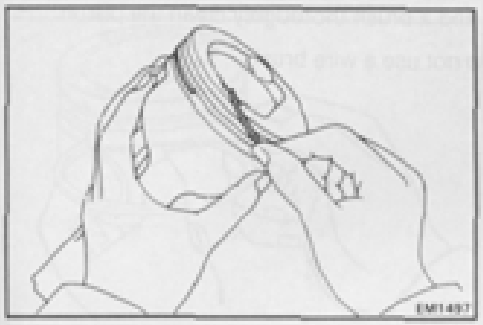
Try to move the piston back and forth on the piston pin.

If any movement is felt, replace the piston and pin.



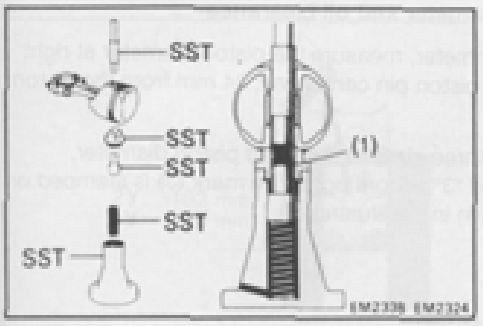
2. Remove piston rings

(a) Using a piston ring expander, remove the compression ring.



(b) Remove the two scraper rings of the oil control ring and the expander spring by hand.

NOTE: Arrange the rings in correct order.

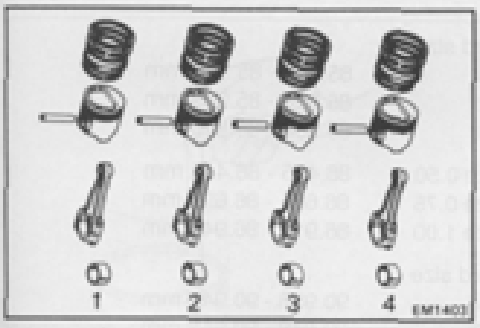


3. Disconnect connecting rod from piston

Using SST, press the pin out of the piston.

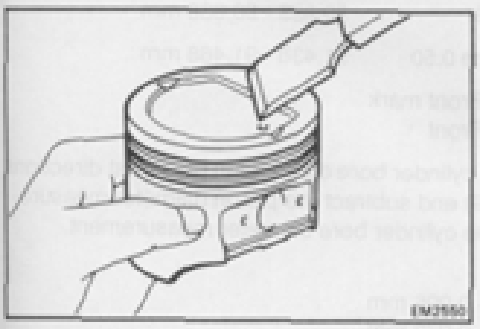
SST 09221-25022 (09221-00020, 09221-00030, 09221-00040, 09221-00071, 09221-00081)

(1) = Piston Pin



NOTE:

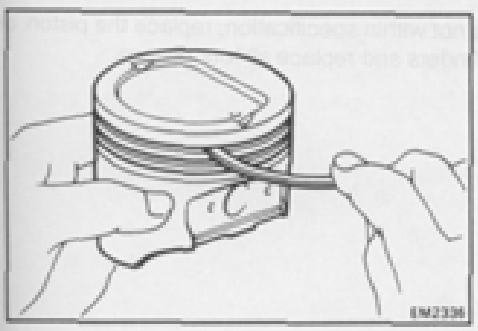
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in correct order.



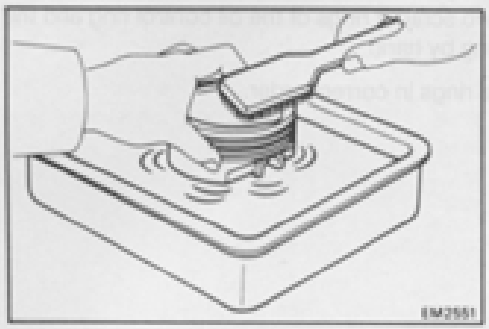
INSPECTION OF PISTON AND CONNECTING ROD ASSEMBLIES

1. Clean piston

(a) Using a gasket scraper, remove the carbon from the piston top.

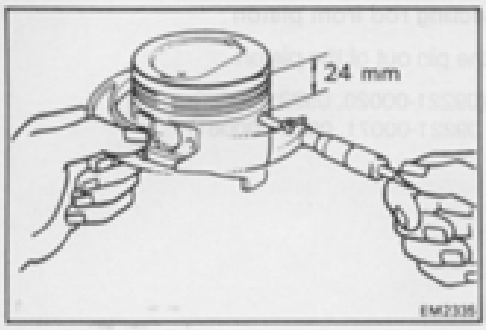


(b) Using a groove cleaning tool or broken ring, clean the ring grooves.



(c) Using solvent and a brush thoroughly clean the piston.

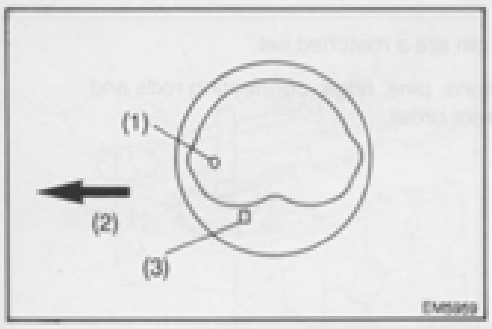
CAUTION: Do not use a wire brush.



2. Inspect piston diameter and oil clearance

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 24 mm from the piston head.

NOTE: There are three sizes of standard piston diameter, marked "1", "2" and "3" accordingly. The mark (3) is stamped on the piston as shown in the illustration.



Standard diameter:

2Y:	Standard size	
	Mark "1"	85.915 - 85.925 mm
	Mark "2"	85.926 - 85.935 mm
	Mark "3"	85.936 - 85.945 mm
	Oversize 0.50	86.415 - 86.445 mm
	Oversize 0.75	86.665 - 86.695 mm
	Oversize 1.00	86.915 - 86.945 mm
4Y:	Standard size	
	Mark "1"	90.938 - 90.948 mm
	Mark "2"	90.949 - 90.958 mm
	Mark "3"	90.959 - 90.968 mm
	Oversize 0.50	91.438 - 91.468 mm

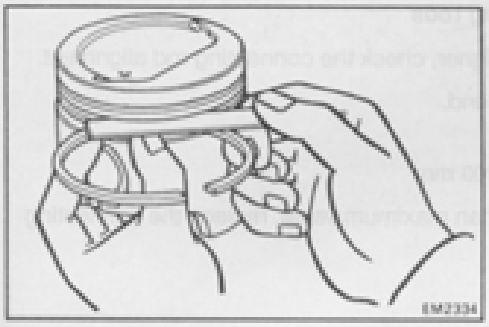
(1) Front mark
(2) Front

(b) Measure the cylinder bore diameter in the thrust directions (See page 59) and subtract the piston diameter measurement from the cylinder bore diameter measurement.

Oil clearance:

2Y:	0.075 - 0.095 mm
4Y:	0.052 - 0.072 mm

If the clearance is not within specification, replace the piston, or rebore all four cylinders and replace all four pistons.

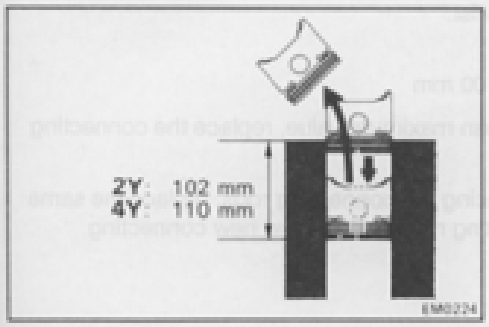


3. Inspect clearance between wall of piston ring groove and new piston ring

Using a feeler gauge, measure the clearance between the ring surface and wall of new piston ring groove.

Ring groove clearance:0.030 - 0.070 mm

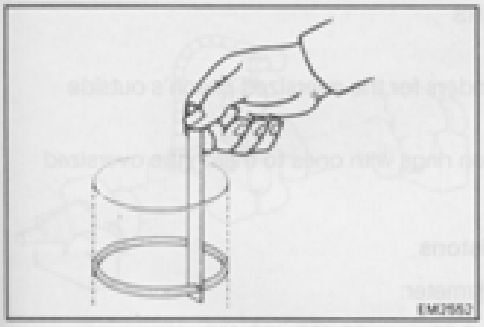
If the clearance is not within specification, replace the piston.



4. Inspect piston ring end gap

(a) Insert the piston ring into the cylinder bore.

(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 102 mm or 110 mm from the top of the cylinder block.



(c) Using a feeler gauge, measure the end gap.

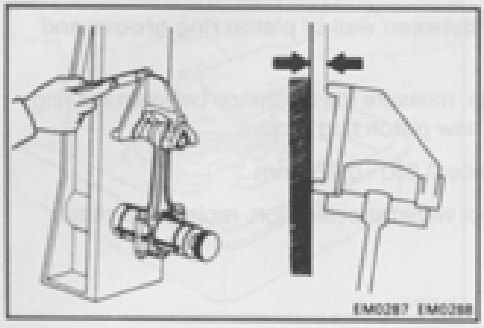
Standard end gap:

2Y:	No. 1	0.22 - 0.51 mm
	No. 2	0.35 - 0.67 mm
	Oil (Side rail)	0.13 - 0.50 mm
4Y:	No.1	0.23 - 0.51 mm
	No. 2	0.40 - 0.67 mm
	Oil (Side rail)	0.13 - 0.50 mm

Maximum end gap:

2Y and 4Y:		
	No. 1	1.11 mm
	No. 2	1.27 mm
	Oil (Side rail)	1.10 mm

If the gap is greater than maximum, replace the piston ring.
If the gap is greater than maximum even with a new piston ring, rebore all four cylinders and use Oversize piston rings.



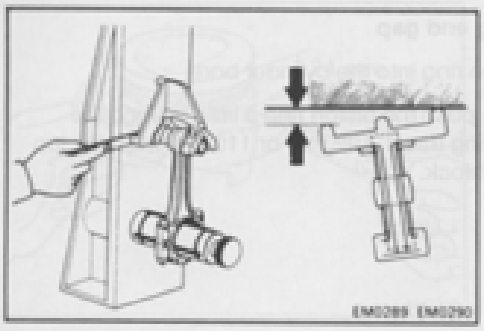
5. Inspect connecting rods

(a) Using a rod aligner, check the connecting rod alignment.

- Check for bend.

Maximum bend:
0.05 mm per 100 mm

If bend is greater than maximum value, replace the connecting rod assembly.



- Check for twist.

Maximum twist:
0.15 mm per 100 mm

If twist is greater than maximum value, replace the connecting rod assembly.

NOTE: When replacing the connecting rods, replace the same number of connecting rod bearings and new connecting rod caps.

BORING OF CYLINDERS

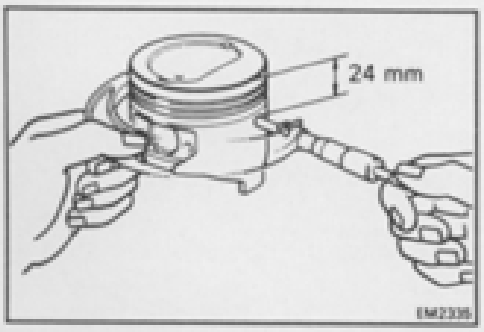
NOTE:

- Bore all four cylinders for the oversized piston's outside diameter.
- Replace the piston rings with ones to match the oversized pistons.

1. Keep oversized pistons

Oversized piston diameter:

2Y:	Oversize 0.50	86.415 - 86.445 mm
	Oversize 0.75	86.665 - 86.695 mm
	Oversize 1.00	86.915 - 86.945 mm
4Y:	Oversize 0.50	91.438 - 91.468 mm



2. Calculate dimension for boring cylinders

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 24 mm from the piston head.

(b) Calculate the size each cylinder is to be rebored as follows:
Size to be rebored = P + C - H
P = piston diameter
C = piston clearance

2Y: 0.075 - 0.095 mm

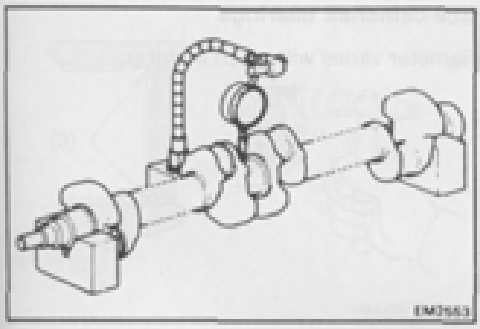
4Y: 0.057 - 0.072 mm

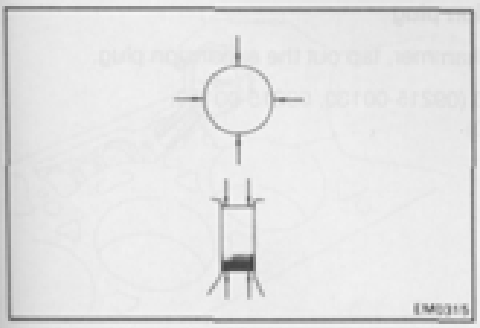
H = allowance for honing
0.02 mm or less

3. **Bore and hone cylinders to calculated dimensions**

Amount of honing:
0.02 mm maximum

CAUTION: Excessive honing will destroy the finished roundness.





INSPECTION AND REPAIR OF CRANKSHAFT

1. **Inspect crankshaft for runout**

(a) Place the crankshaft on V-blocks.

(b) Using a dial indicator, measure the circle runout at the centre journal.

Maximum circle runout: 0.06 mm

If the circle runout is greater than maximum, replace the crankshaft.

2. **Inspect main journals and crank pins**

(a) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:
Standard size 57.985 - 58.000 mm
Undersize 0.25 57.745 - 57.755 mm

Crank pin diameter:
Standard size 47.985 - 48.000 mm
Undersize 0.25 47.745 - 47.755 mm

If the diameter is not within specification, check the oil clearance.

(b) Check each main journal and crank pin for taper and out-of-round as shown.

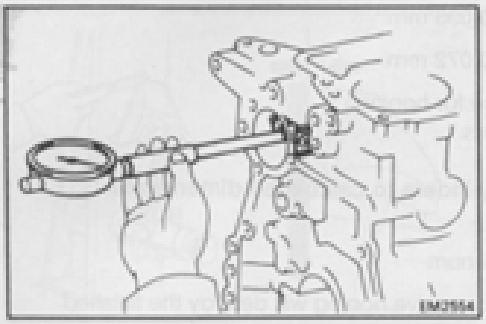
Maximum taper and out-of-round:
0.02 mm

If taper and out-of-round is greater than maximum, replace the crankshaft.

3. **If necessary, grind and hone main journals and/or crank pins**

Grind and hone the main journals and/or crank pins to the undersized finished diameter.

Fit new main journal and/or crank pin undersize bearings.



INSPECTION AND REPAIR OF CAMSHAFT BEARINGS

1. Inspect camshaft oil clearance

(a) Using a cylinder gauge, measure the inside diameter of the camshaft bearing.

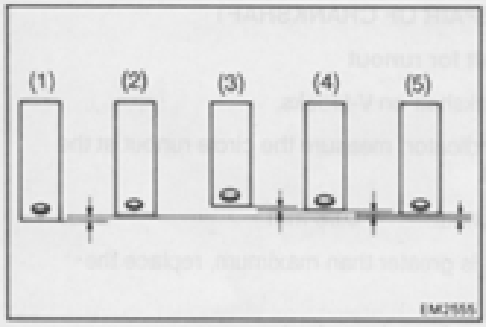
Bearing inside diameter (Arrow indicates front side):

(1) 46.500 - 46.570 mm
(2) 46.250 - 46.320 mm
(3) 46.000 - 46.070 mm
(4) 45.750 - 45.820 mm
(5) 45.500 - 45.570 mm

(b) Subtract the journal diameter measurement (See page 43) from the bearing inside diameter measurement.

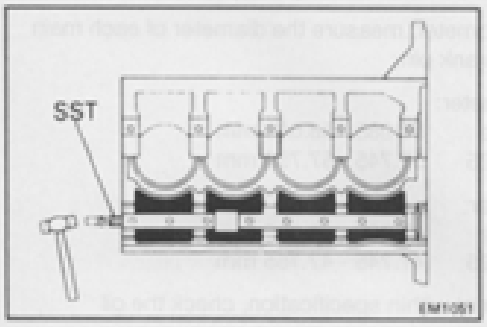
Standard oil clearance: 0.025 - 0.111 mm
Maximum oil clearance: 0.14 mm

If the clearance is greater than maximum, replace the camshaft bearings. If necessary, grind or replace the camshaft.



2. If necessary, replace camshaft bearings

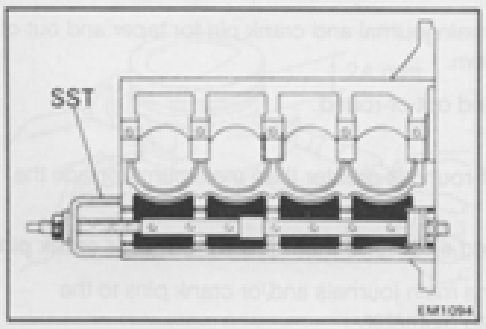
NOTE: The outer diameter varies with each bearing.



A. Remove expansion plug

Using SST and a hammer, tap out the expansion plug.

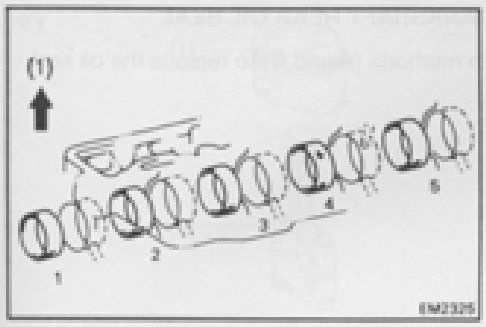
SST 09215-00100 (09215-00130, 09215-00150, 09215-00210)



B. Remove the camshaft bearings

Using SST, remove the bearings.

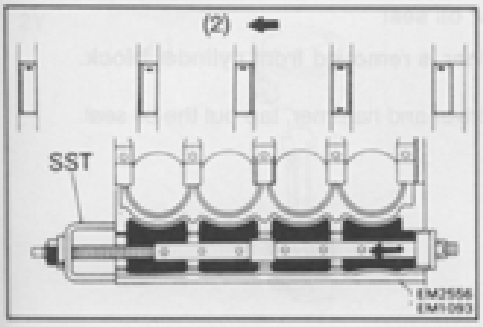
SST 09215-00100 (09215-00120, 09215-00130, 09215-00140, 09215-00150, 09215-00160, 09215-00250)



C. **Install new camshaft bearing**

(a) Align the oil holes of the bearing and cylinder block.

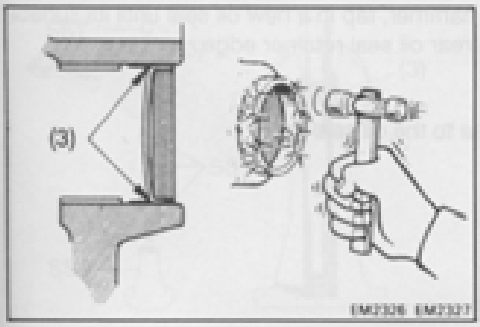
(1) = Upward



(b) Using SST, install the bearings.

SST 09215-00100 (09215-00120, 09215-00130, 09215-00140, 09215-00150, 09215-00160, 09215-00250)

(2) = Front



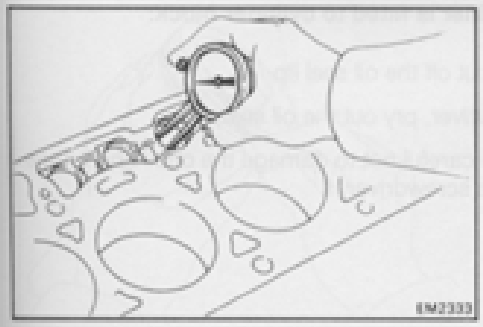
D. **Check camshaft oil clearance** (See page 66)

E. **Install expansion plug**

(a) Apply seal packing (3) to the expansion plug surface of the cylinder block.

Seal packing:
Part No. AMV 188 200 03 or equivalent

(b) Using a hammer, tap in a new expansion plug until its surface is flush with the cylinder block edge.



INSPECTION OF VALVE LIFTER BORES

Inspect valve lifter oil clearance

(a) Using calipers, measure the valve lifter bore diameter.

Bore diameter: 21.417 - 21.443 mm

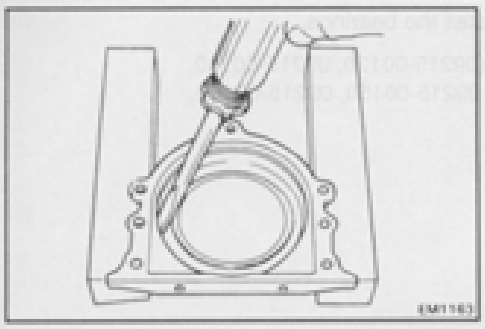
(b) Subtract the valve lifter diameter measurement (See page 46) from the valve lifter bore diameter measurement.

Standard oil clearance:	0.013 - 0.056 mm
Maximum oil clearance:	0.10 mm

If the clearance is greater than maximum, replace the valve lifters.

REPLACEMENT OF CRANKSHAFT REAR OIL SEAL

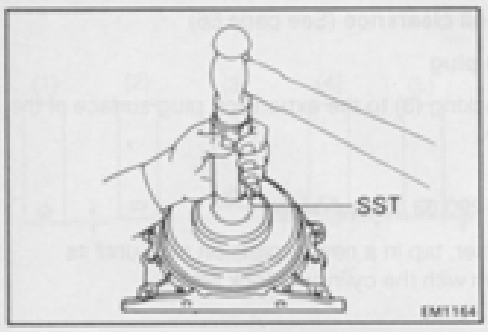
NOTE: There are two methods (A and B) to replace the oil seal.



Replace crankshaft rear oil seal

A. If rear oil seal retainer is removed from cylinder block.

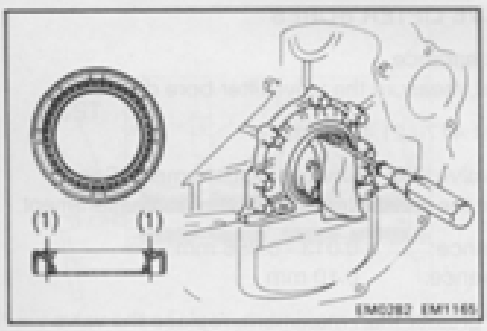
(a) Using a screwdriver and hammer, tap out the oil seal.



(b) Using SST and hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge.

SST 09223-63010

(c) Apply MP grease to the oil seal lip.



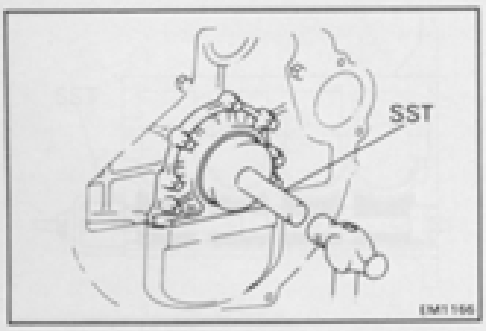
B. If rear oil seal retainer is fitted to cylinder block:

(a) Using a knife, cut off the oil seal lip.

(b) Using a screwdriver, pry out the oil seal.

CAUTION: Be careful not to damage the crankshaft. Tape the screwdriver.

(1) = Cut Position



(c) Apply MP grease to a new oil seal.

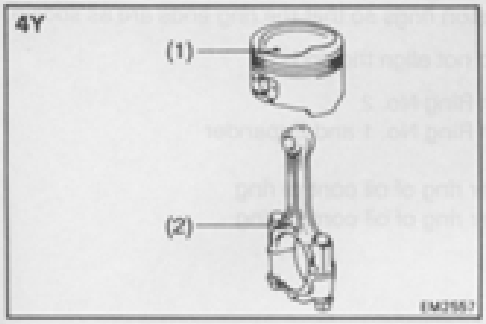
(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.

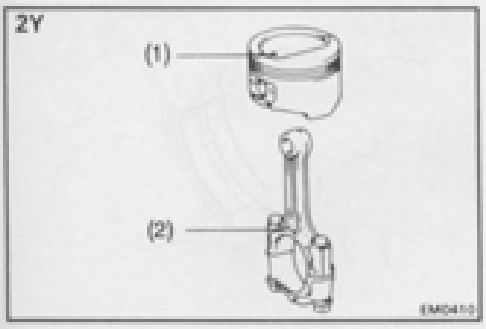
SST 09223-63010

ASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

1. **Assemble piston and connecting rod**

   (a) Align the front marks of the piston (1) and connecting rod (2).

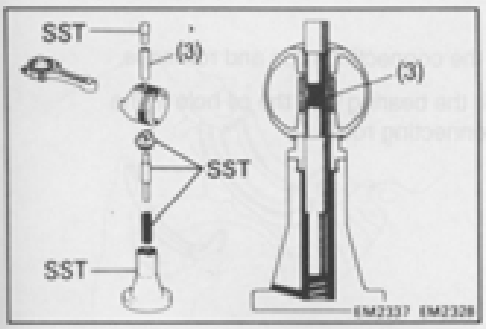




   (b) Coat the piston pin (3) and the piston pin hole of the piston with engine oil.

   (c) Using SST, press in the piston pin (3).

   SST 09221-25022 (09221-00020, 09221-00030, 09221-00040, 09221-00071, 09221-00081)

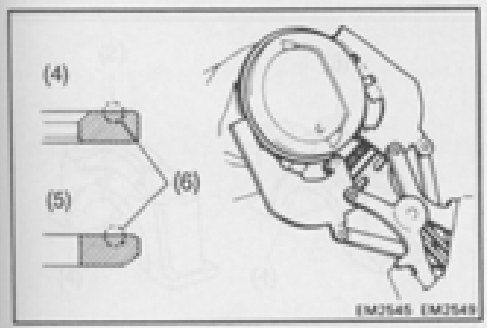


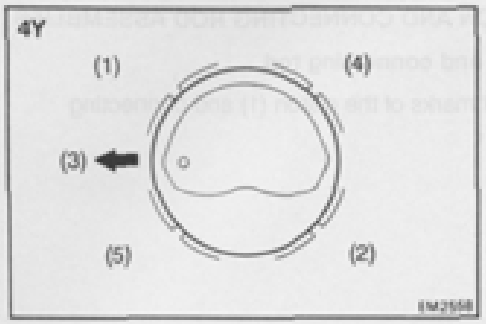
2. **Fit piston rings**

   (a) Fit the expander spring and the two scraper rings of the oil control ring by hand.

   (b) Using a piston ring expander, fit the two compression rings with the corde mark (6) facing upward.

   (4) = No. 1 Piston ring
   (5) = No. 2 Piston ring

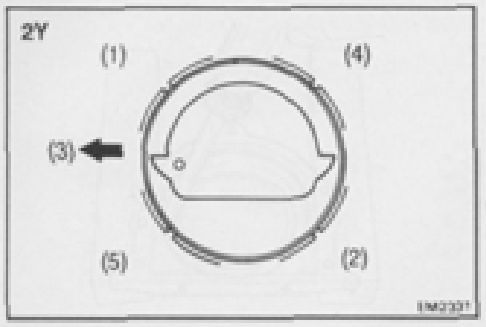


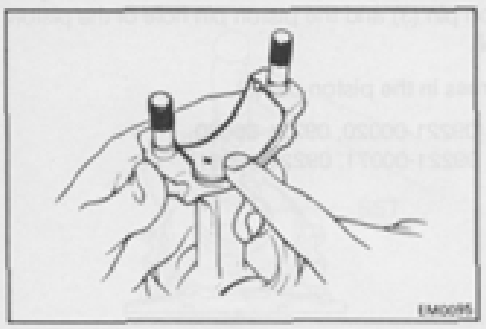


(c) Position the piston rings so that the ring ends are as shown.

CAUTION: Do not align the ends.

(1) = Compression Ring No. 2
(2) = Compression Ring No. 1 and Expander
(3) = Front
(4) = Upper scraper ring of oil control ring
(5) = Lower scraper ring of oil control ring





3. **Fit bearings**

Fit the bearings in the connecting rods and rod caps.

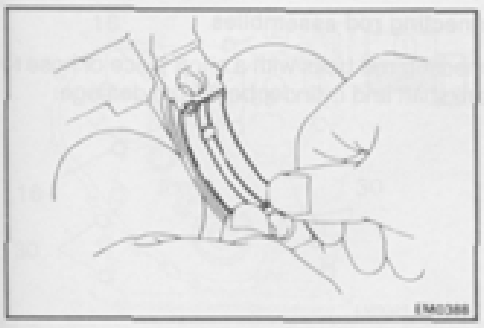
CAUTION: Fit the bearing with the oil hole in the connecting rod.

ASSEMBLY OF CYLINDER BLOCK

(See page 52)

NOTE:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, and oil seals with new parts.

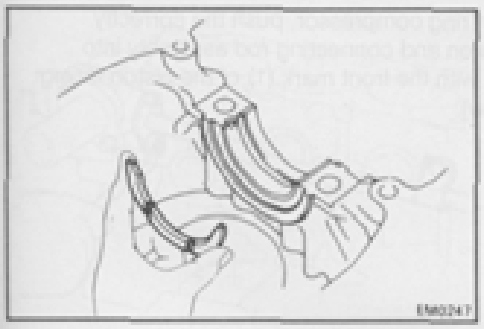


1. Fit main bearings in cylinder block and bearing caps

(a) Place the upper bearings in the cylinder block.

(b) Place the lower bearings in the main bearing caps.

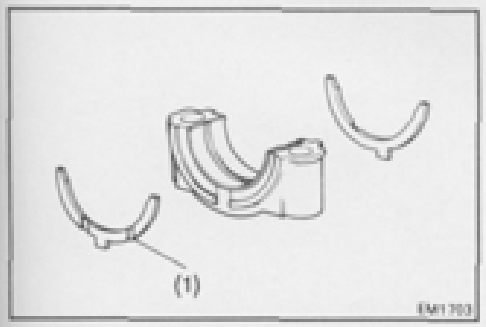
CAUTION: Fit the bearing with the oil hole in the block.



2. Fit upper thrust washers

Insert the thrust washers of the crankshaft bearing 3 into the cylinder block; the oil grooves (1) must face outwards.

3. Place crankshaft on cylinder block

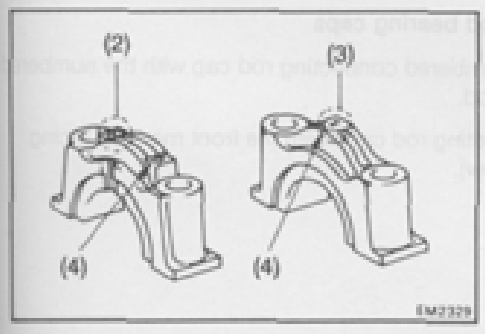


4. Fit main bearing caps and lower thrust washers

NOTE: Each bearing cap is numbered.

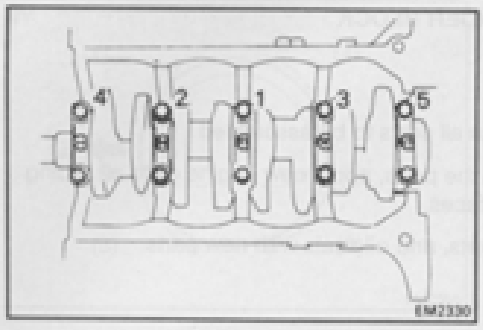
(a) Fit the thrust washers on the No. 3 bearing cap with the grooves facing outward.

(1) = Oil Groove



(b) Fit the bearing caps in their proper location.

(2) = Bearing Cap No. 3
(3) = Bearing Cap No. 1, 2, 4 and 5
(4) = Front



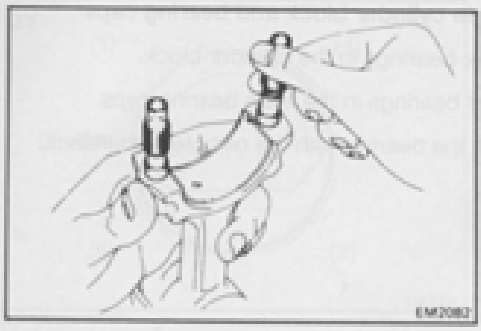
(c) Apply a light coat of engine oil to the threads and under the bolt heads of the main bearing caps.

(d) Fit and uniformly tighten the ten bolts of the main bearing caps in several stages, in the sequence shown.

Torque: 78 Nm

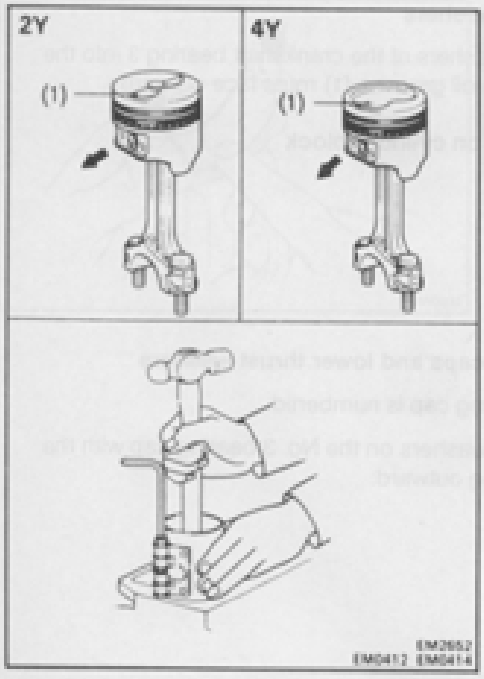
(e) Check that the crankshaft turns.

(f) Check the crankshaft thrust clearance.
(See page 57)

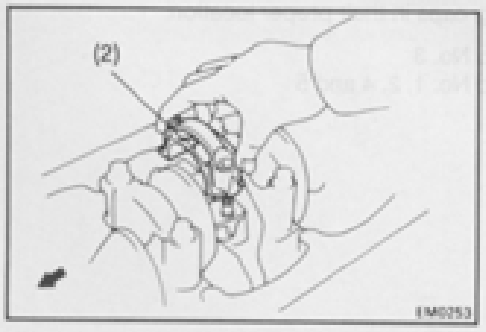


5. Fit piston and connecting rod assemblies

(a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft and cylinder bore from damage.



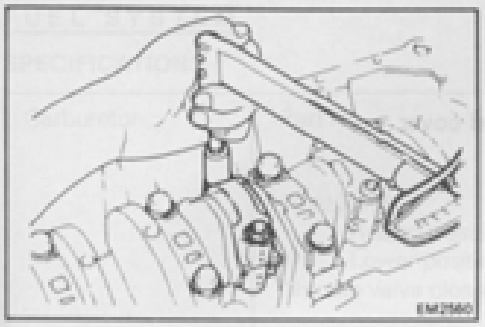
(b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assembly into each cylinder with the front mark (1) of the piston facing forward (Arrow).



6. Fit connecting rod bearing caps

(a) Match the numbered connecting rod cap with the numbered connecting rod.

(b) Fit the connecting rod caps with the front mark (2) facing forward (Arrow).



(c) Apply a light coat of engine oil to the threads and under the connecting rod nuts.

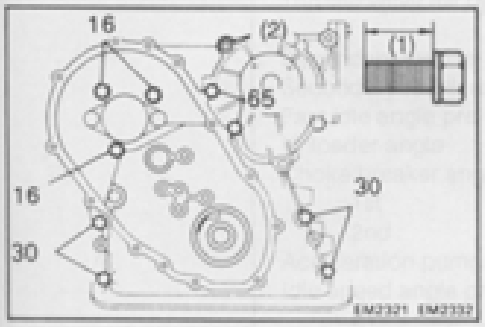
(d) Fit and alternately tighten the connecting rod nuts and in several stages.

Torque: 49 Nm

(e) Check that the crankshaft turns smoothly.

(f) Check the connecting rod thrust clearance.

(See page 55)



7. **Fit rear oil seal retainer**

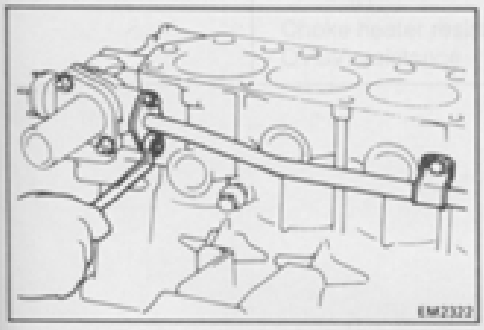
Torque: 12 Nm

8. **Fit timing chain case**

Fit a new gasket and the timing chain case with the nine bolts and one nut (2).

Numbers indicate bolt length (mm) (1)

Torque: 18 Nm



9. **Fit water by-pass pipe**

Fit a new gasket and the water by-pass pipe.

POST ASSEMBLY

1. **Fit oil pump and engine oil pan**
(See page 126)

2. **Fit timing chain and camshaft**
(See pages 48 to 50)

3. **Fit cylinder head**
(See pages 35, 36)

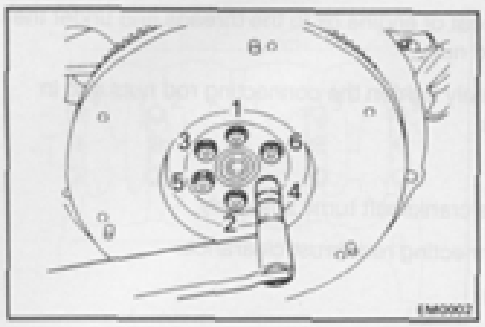
4. **Fit oil filter bracket and oil filter**

Torque: 18 Nm

5. **Fit alternator and bracket**

6. **Remove engine from engine stand**

7. **Fit rear end plate**



8. **Fit flywheel**

   Torque: 83 Nm

9. **Fit clutch disc and cover**

SPECIFICATIONS

Carburetor	Part No.	2Y	J 21 100 722 70
		4Y	J 21 100 733 40
	Float level		
	Raised position		11.0 mm
	Lower position		1.2 mm
	Throttle valve closed angle	Primary	7° from horizontal
		Secondary	20° from horizontal
	Throttle valve full opening angle	Primary	90° from horizontal
		Secondary	83° from horizontal
	Secondary throttle valve kickup angle		21° from horizontal
	Secondary touch angle		52° from horizontal
	Fast idle angle pre-setting		15.5° from horizontal
	Unloader angle		50°from horizontal
	Choke breaker angle (Double diaphragm type)		
	1st		40° from horizontal
	2nd		50° from horizontal
	Acceleration pump stroke		3.2 mm
	Idle speed angle pre-setting		12° from horizontal
	2Y		Screw out approx. 2 3/8 turns
	4Y		Screw out approx. 3 2/3 turns
	Choke heater resistance		17-29 Ω
	OVCV resistance		35-43 Ω

PRECAUTIONS

1. **Before working on the fuel system, disconnect the cable from the negative battery terminal.**
2. **When working on the fuel system, keep away from possible fire hazards and do not smoke.**
3. **Keep gasoline off rubber and leather parts.**
4. **Work on only one component group at a time to help avoid confusion between similar locking parts.**
5. **Keep work area clean to avoid contamination of the carburetor and components.**
6. **Be careful not to mix up or lose clips and springs.**

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not start/hard to start (cranks ok)	Carburetor problems		
	• Choke operation	Check choke system	
	• Needle valve sticking or clogged	Check float and needle valve	92
	• Vacuum hose disconnected or damaged		
	• Fuel cut-out solenoid valve not open	Check fuel cut-out colenoid valve	92
Rough idle or stalls	Carburetor problems		
	• Idle speed incorrect	Adjust idle speed	15
	• Slow jet clogged		
	• Idle mixture incorrect	Adjust idle mixture	15
	• Fuel cut-out solenoid valve not open	Check fuel cut solenoid valve	92
	• Fast idle speed setting incorrect (cold engine)	Adjust fast idle speed	19
	• Choke valve open (cold engine)	Check choke system	
Engine misfires/ poor acceleration	Carburetor problems		
	• Float level too low	Adjust float level	98
	• Accelerator pump faulty		
	• Power valve faulty	Check power piston and valve	92
	• Choke valve closed (hot engine)	Check choke system	
	• Choke valve stuck open (cold engine)	Check choke system	
	Fuel line clogged	Check fuel line	
Engine dieseling (runs after ignition) switch is turned off)	Carburetor problems		
	• Linkage sticking		
	• Idle speed or fast idle speed out of adjustment	Adjust idle speed or fast idle speed	15, 19
	• Fuel cut-out solenoid faulty	Check fuel cut-out solenoid valve	92
Poor gasoline mileage	Carburetor problems		
	• Choke faulty	Check choke system	
	• Idle speed too high	Adjust idle speed	15
	Deceleration fuel cut-out system faulty	Check deceleration system	
	• Power valve always open		
	Fuel leak	Repair as necessary	
Insufficient fuel supply to carburetor	Fuel filter clogged	Replace fuel filter	
	Fuel pump faulty	Replace fuel pump	106
	Fuel line clogged	Check fuel line	
	Fuel line bent or kinked	Replace fuel line	

ON-VEHICLE INSPECTION

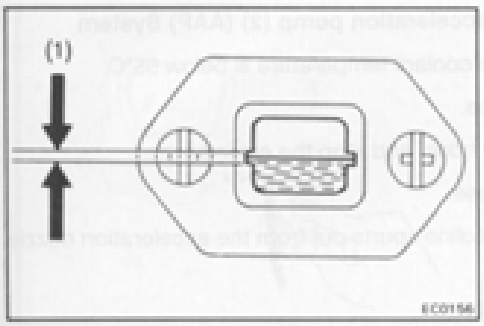
1. **Remove air cleaner assembly or air intake connector from carburetor**

2. **Inspect carburetor and linkage**

   (a) Check that the various set screws, plugs and union bolts are tight and correctly installed.

   (b) Check the linkage for excessive wear and missing snap rings.

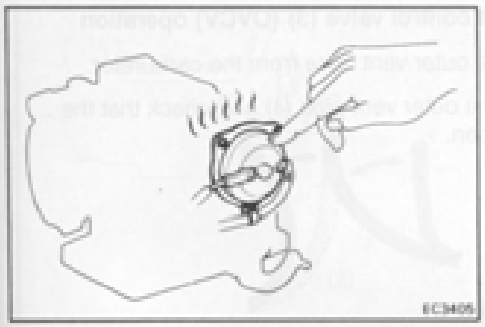
   (c) Check that the throttle valves open fully when the accelerator pedal is fully depressed.



3. **Inspect float level**

   Check that the float level (1) is about even with the correct level in the sight glass.

   If not, check the carburetor needle valve and float level, and adjust or repair, as necessary.



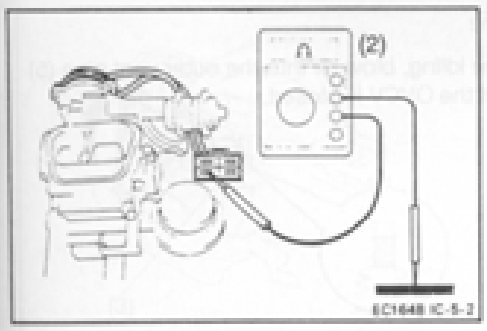
COLD ENGINE

4. **Inspect automatic choke system**

   (a) Start the engine.

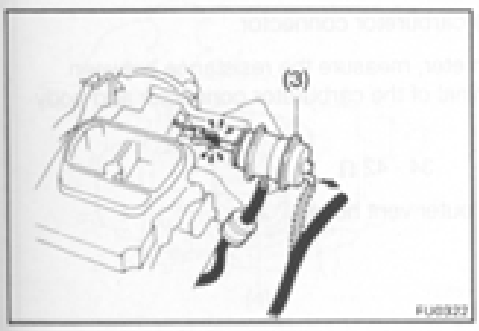
   (b) Shortly after, check that the choke valve begins to open and that the choke heater (coil housing) is heated.

   (c) Stop the engine.



   (d) Disconnect the carburetor connector.

   (e) Using an ohmmeter (2), measure the resistance between the choke heater (coil housing) terminal of the carburetor connector and body ground.
   Resistance (Cold): 17 - 19 Ω

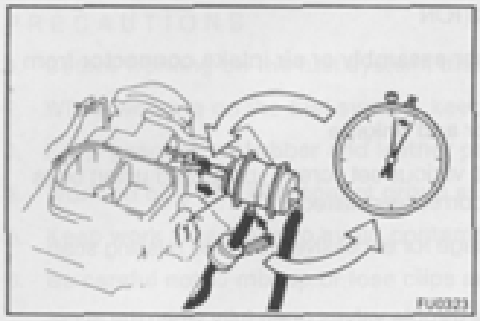


5. **Inspect choke breaker (CB) System**

   (a) Start the engine.

   (b) With the coolant temperature below 10°C disconnect the vacuum hose from choke breaker diaphragm B (3) and check that the choke linkage does not move.

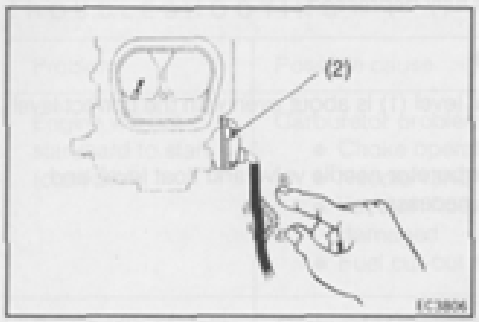
   (c) Reconnect the vacuum hose to diaphragm B (3).



(d) Disconnect the vacuum hose from the choke breaker diaphragm (1) and check that the choke linkage moves.

(e) Reconnect the vacuum hose to diaphragm A and check that the choke linkage moves within the specified time after reconnecting the hose.

Time: 1 - 5 seconds



6. Inspect auxiliary acceleration pump (2) (AAP) System

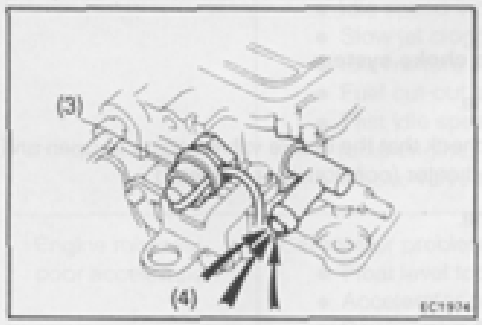
(a) Check that the coolant temperature is below 55°C.

(b) Start the engine.

(c) Pinch the AAP hose, and stop the engine.

(d) Release the hose.

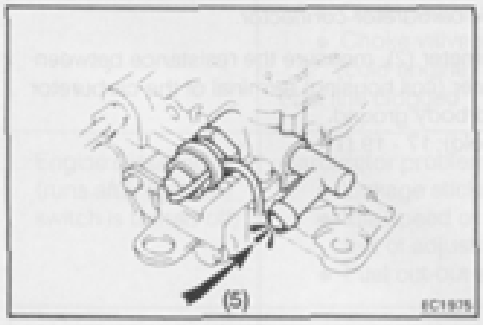
(e) Check that gasoline spurts out from the acceleration nozzle.



7. Inspect outer vent control valve (3) (OVCV) operation

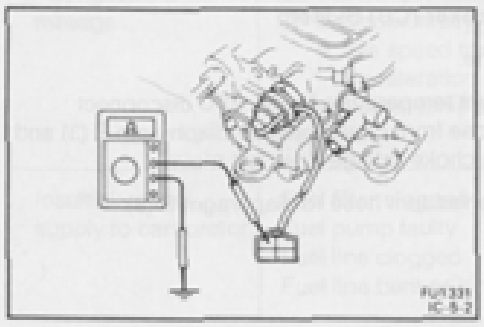
(a) Disconnect the outer vent hose from the carburetor.

(b) Blow air into the outer vent pipe (4) and check that the OVCV (3) is open.



(c) Start the engine

(d) With the engine idling, blow air into the outer vent pipe (5) and check that the OVCV is closed.

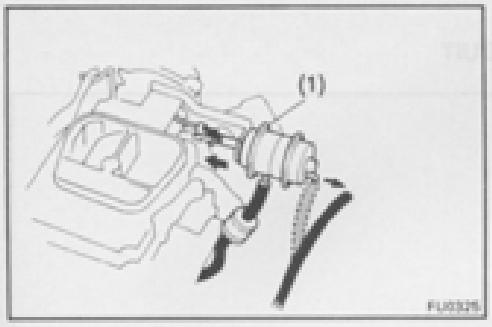


(e) Disconnect the carburetor connector.

(f) Using an ohmmeter, measure the resistance between the OVCV terminal of the carburetor connector and body ground.

Resistance (Cold): 34 - 42 Ω

(g) Reconnect the outer vent hose.

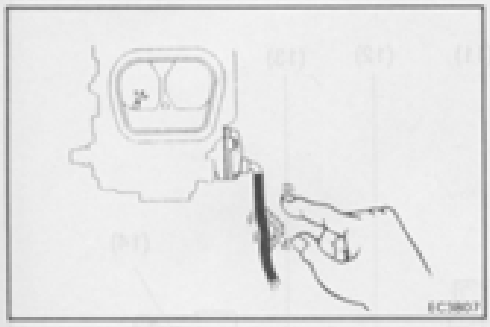


HOT ENGINE

8. **Inspect choke braker (CB) system**

   (a) After warming up the engine, disconnect the vacuum hose from diaphragm B (1) and check the choke linkage returns.

   (b) Reconnect the vacuum hose to diaphragm B.



9. **Inspect auxiliary acceleration pump (AAP) system**

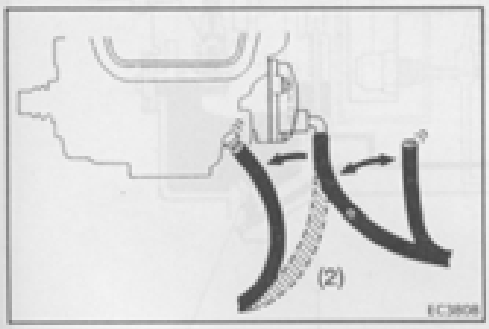
   (a) Start the engine.

   (b) Warm up the engine to normal operating temperature.

   (c) Pinch the AAP hose, and stop the engine.

   (d) Release the hose.

   (e) Check that gasoline does not spurt out from the acceleration nozzle.



10. **Inspect auxiliary acceleration pump (AAP) diaphragm**

    (a) Start the engine.

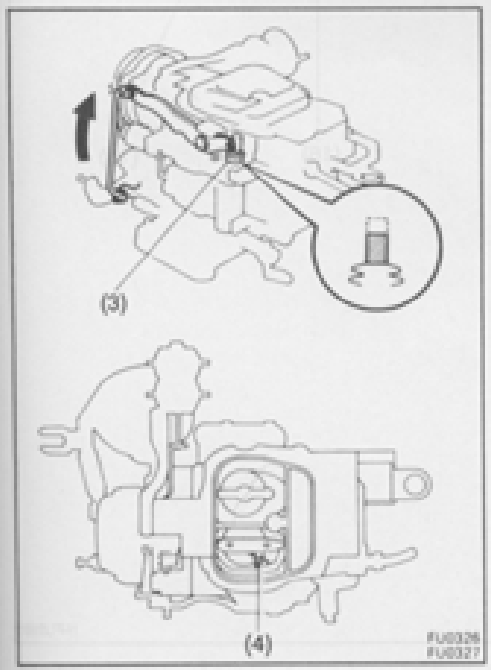
    (b) Disconnect the hose from the AAP.

    (c) Apply and release the vacuum (2) directly to the AAP at idle.

    (d) Check that the engine rpm changes by releasing vacuum.

    (e) Reconnect the AAP hose.

    If a problem is found, replace the AAP diaphragm.



11. **Inspect acceleration Pump (3)**

    Open the throttle valve, and check that gasoline spurts out from the acceleration nozzle (4).

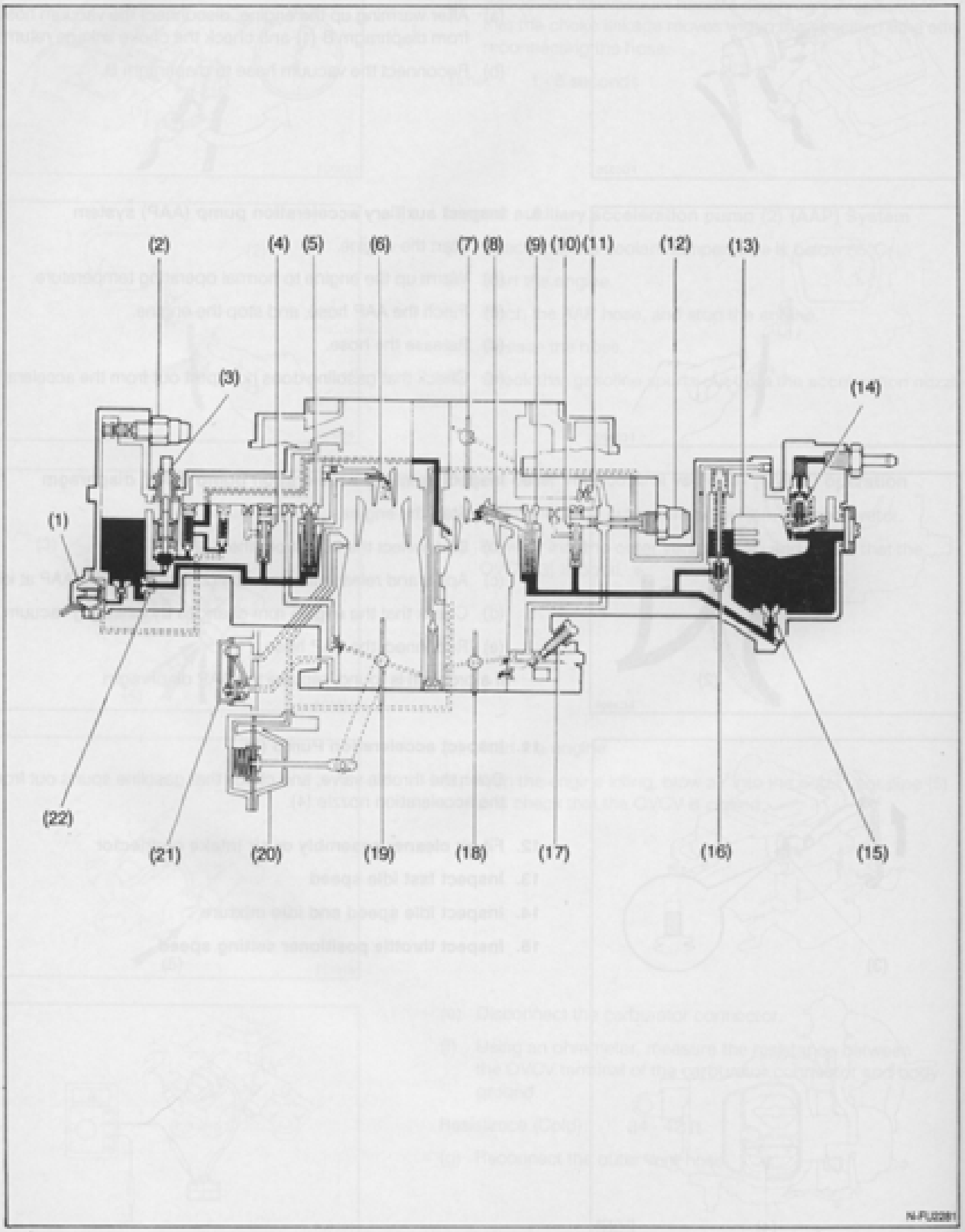
12. **Fit air cleaner assembly or air intake connector**

13. **Inspect fast idle speed**

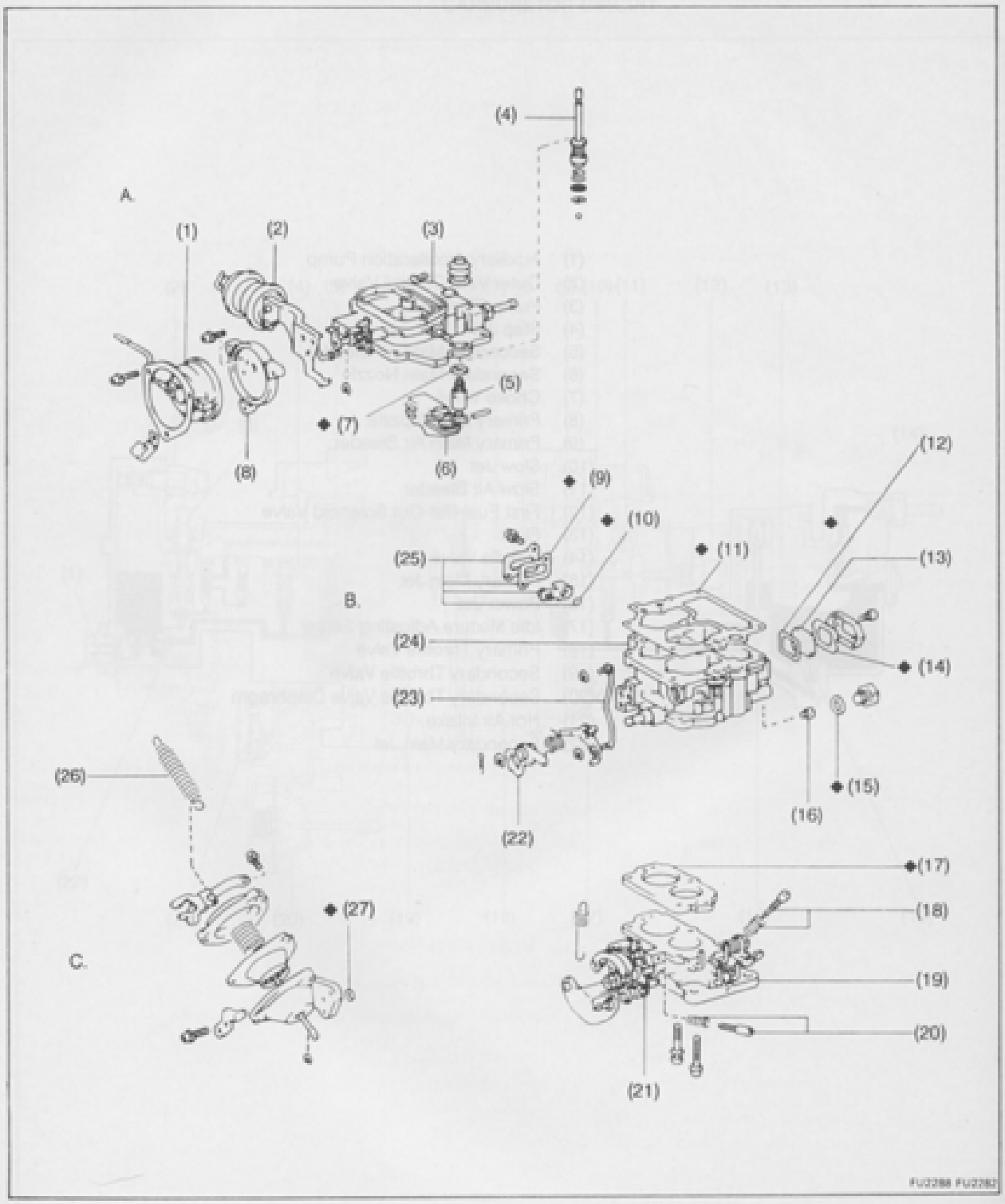
14. **Inspect idle speed and idle mixture**

15. **Inspect throttle positioner setting speed**

CARBURETOR CIRCUIT



(1) Auxiliary Acceleration Pump
(2) Outer Vent Control Valve
(3) Pump Plunger
(4) Step Jet
(5) Secondary Main Air Bleeder
(6) Secondary Main Nozzle
(7) Choke Valve
(8) Primary Main Nozzle
(9) Primary Main Air Bleeder
(10) Slow Jet
(11) Slow Air Bleeder
(12) First Fuel Cut-Out Solenoid Valve
(13) Float
(14) Needle Valve
(15) Primary Main Jet
(16) Power Jet
(17) Idle Mixture Adjusting Screw
(18) Primary Throttle Valve
(19) Secondary Throttle Valve
(20) Secondary Throttle Valve Diaphragm
(21) Hot Air Intake
(22) Secondary Main Jet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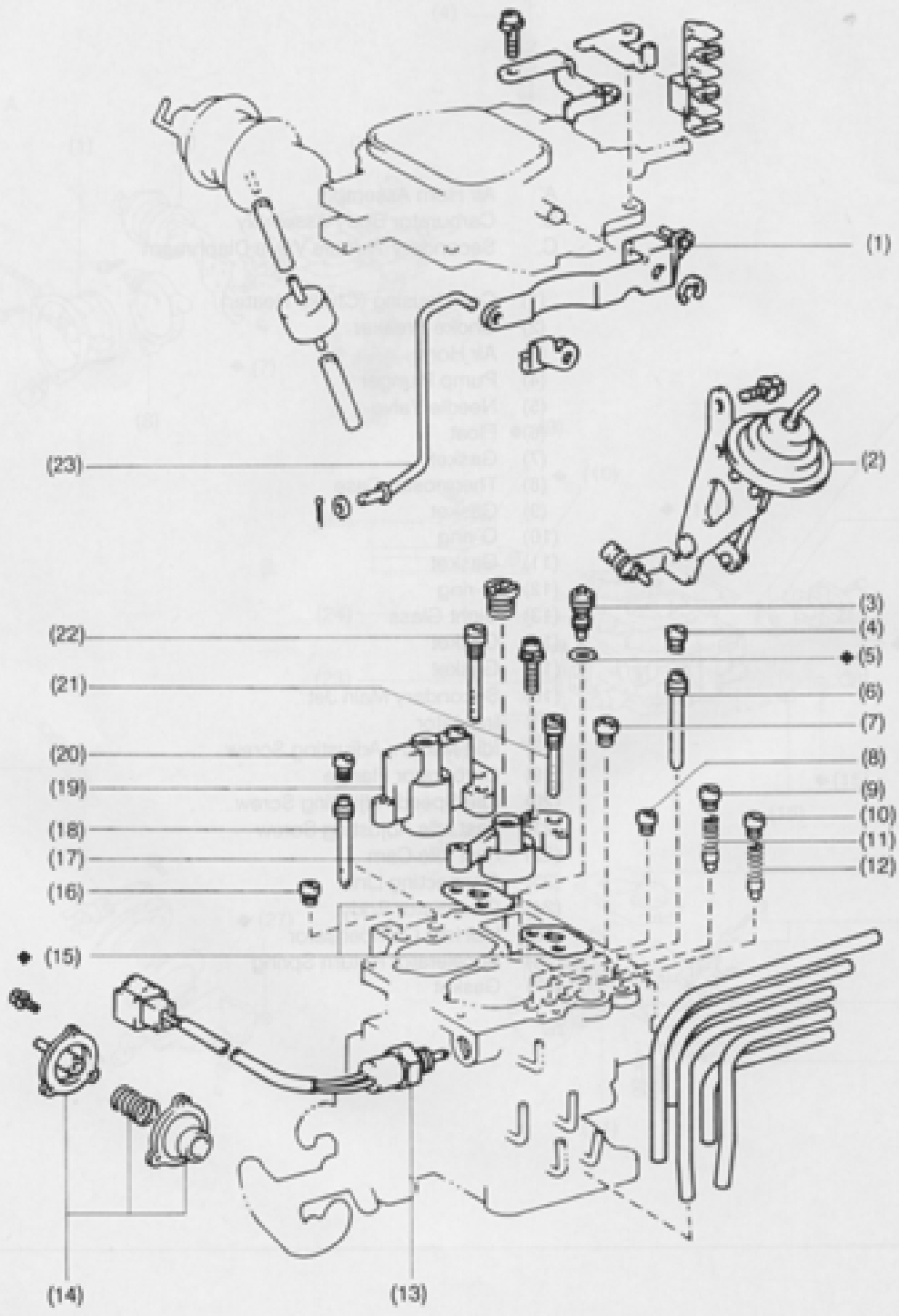
FU2288 FU2282

A. Air Horn Assembly
B. Carburator Body Assembly
C. Secondary Throttle Valve Diaphragm

(1) Coil Housing (Choke Heater)
(2) Choke Breaker
(3) Air Horn
(4) Pump Plunger
(5) Needle Valve
(6) Float
(7) Gasket
(8) Thermostat Case
(9) Gasket
(10) O-ring
(11) Gasket
(12) O-ring
(13) Sight Glass
(14) Gasket
(15) Gasket
(16) Secondary Main Jet
(17) Insulator
(18) Idle Mixture Adjusting Screw
(19) Carburator Flange
(20) Idle Speed Adjusting Screw
(21) Fast Idle Adjusting Screw
(22) Fast Idle Cam
(23) Connecting Link
(24) Carburator Body
(25) Hot Idle Compensator
(26) Accelerator Return Spring
(27) Gasket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FU2289

(1) Plunger Arm
(2) Throttle Positioner
(3) Power Jet
(4) Plug
(5) Gasket
(6) Slow Jet
(7) Primary Main Jet
(8) Slow Air Bleeder
(9) Plug
(10) Plug
(11) Pump Discharge Weight
(12) Auxiliary Acceleration Pump Outlet Spring
(13) First Fuel Cut-Out Solenoid Valve
(14) Auxiliary Acceleration Pump
(15) Gasket
(16) Passage Plug
(17) Primary Small Venturi
(18) Step Jet
(19) Secondary Small Venturi
(20) Plug
(21) Primary Main Air Bleeder
(22) Secondary Main Air Bleeder
(23) Connecting Link

♦ Non-reusable part

REMOVAL OF CARBURETOR

1. **Remove air cleaner assembly or air intake connector from carburetor**

2. **Disconnect carburetor connector**

   Disconnect the connector from the main wire.

3. **Disconnect linkages**

   Accelerator connecting rod

4. **Disconnect hoses from carburetor**

   (a) Fuel inlet hose
   (b) Emission control hose

   NOTE: Before disconnecting the vacuum hoses, use tags to identify how they should be reconnected.

5. **Remove carburetor**

   (a) Remove the carburetor mount nuts.

   (b) Lift out the carburetor.

   (c) Cover the inlet hole of the intake manifold with a cloth.

DISASSEMBLY OF CARBURETOR

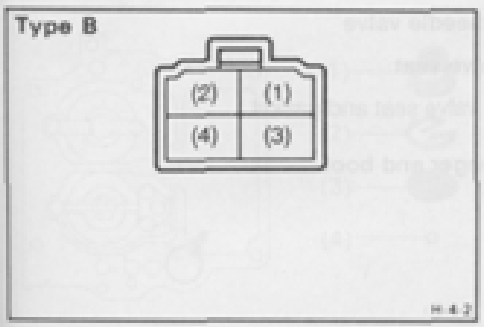
The following instructions are organized so that you work on only one component group at a time. This will help avoid confusion arising from similar parts from different sub-assemblies being on your workbench at the same time.

(a) To facilitate reassembly, arrange parts in order.

(b) Be careful not to mix up or lose clips or springs.

(c) Use SST (carburetor driver set).

SST 09860-11011



DISASSEMBLY OF AIR HORN

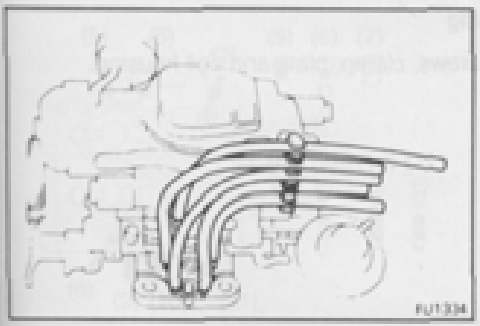
(See pages 82 to 85)

1. Disconnect wires from connector

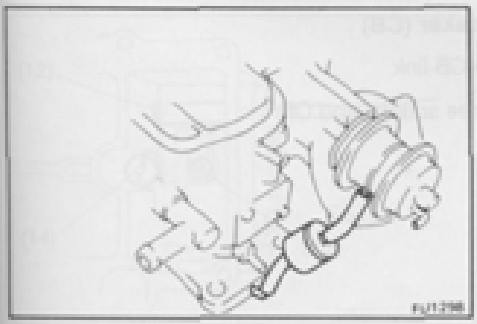
(a) Wire of coil housing

(b) Wire of outer vent control valve (OVCV)

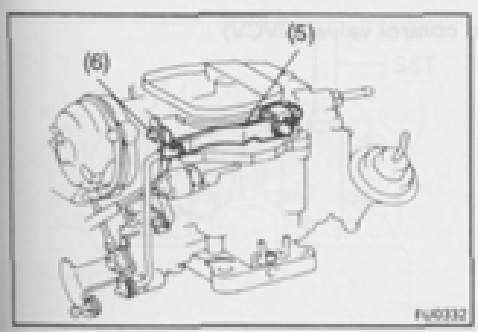
(1) Fuel cut solenoid valve (red)
(2) Outer vent control valve
(3) Fuel cut solenoid valve (black)
(4) Coil housing



2. Remove vacuum hoses



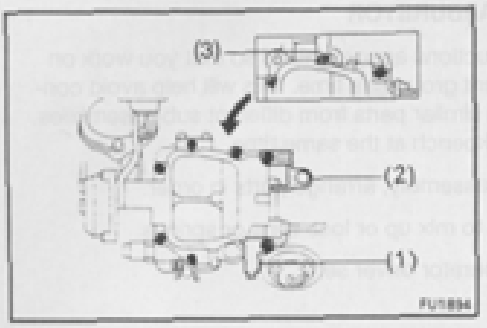
3. Remove vacuum hose of choke breaker (CB)



4. Remove air horn assembly

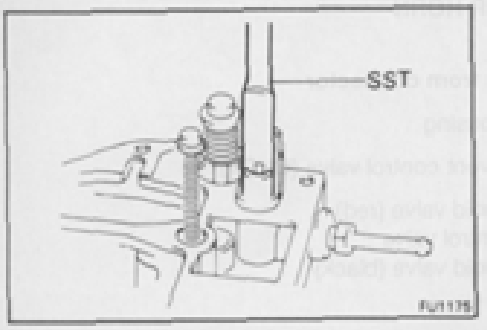
(a) Disconnect the plunger arm (5).

(b) Disconnect the fast idle link (6).



(c) Remove the seven or six screws and following parts

(1) Vacuum hose lamp holder
(2) Air pipe bracket
(3) Wire clamp

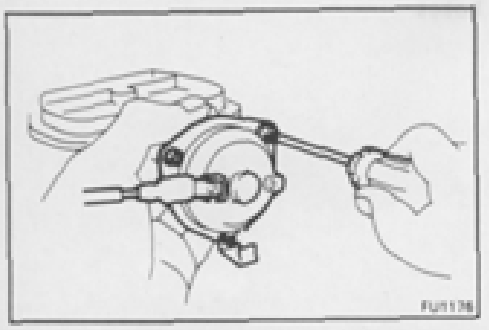


5. Remove float end needle valve

6. Remove needle valve seat

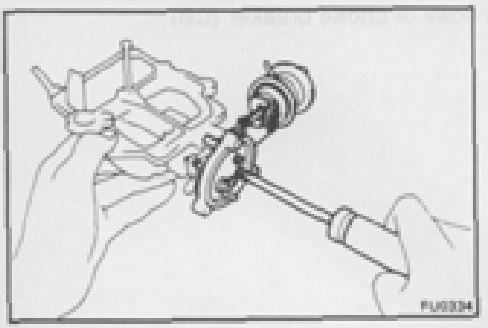
Remove the needle valve seat and gasket.

7. Remove pump plunger and boot



8. Remove coil housing

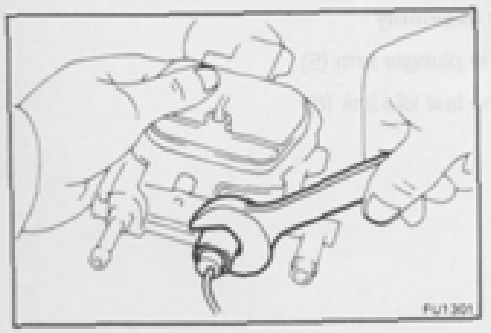
Remove the three screws, clamp, plate and coil housing.



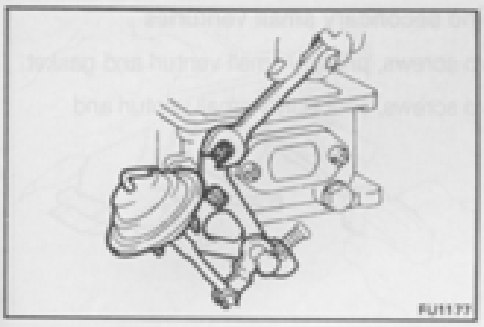
9. Remove choke breaker (CB)

(a) Disconnect the CB link.

(b) Remove the three screws and CB.



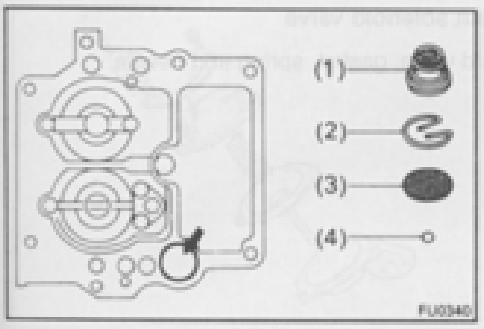
10. Remove outer vent control valve (OVCV)



DISASSEMBLY OF CARBURETOR BODY

(See pages 82 to 85)

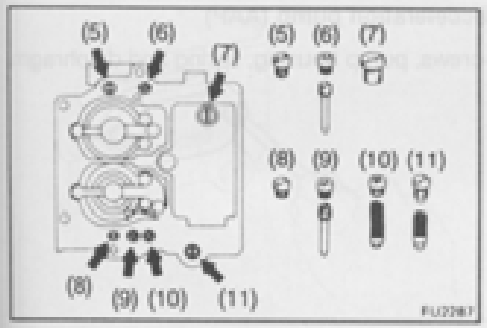
1. **Remove throttle positioner**



2. **Remove pump filter**

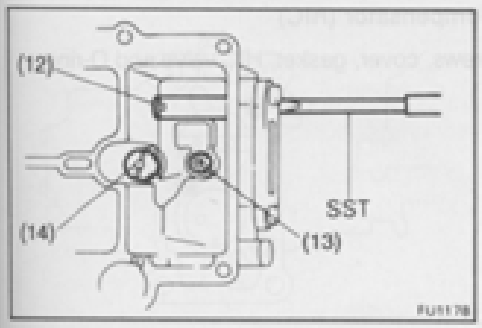
Remove the following parts:

(1) Plunger spring
(2) Clip
(3) Filter
(4) Steel ball



3. **Remove check ball and jets**

(5) Step air bleeder
(6) Plug and step jet
(7) Auxiliary acceleration pump
(8) Slow air bleeder
(9) Plug and slow jet
(10) Plug and discharge weight spring
(11) Plug and Auxiliary acceleration pump

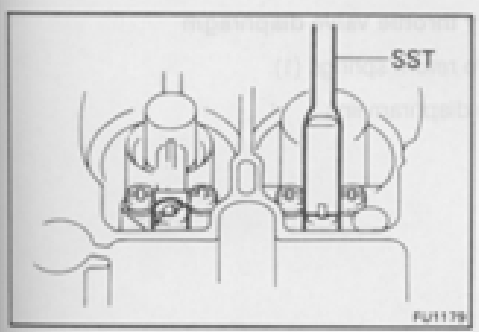


4. **Remove main and power jets**

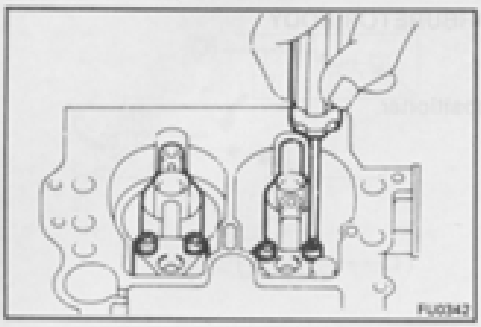
(a) Secondary main jet (12).
Remove the passage plug and gasket and remove the main jet.

(b) Primary main jet (13).

(c) Power jet (14) and gasket.



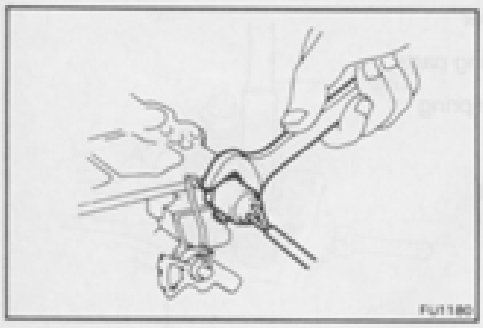
5. **Remove primary and secondary main air bleeders**



6. Remove primary and secondary small venturies

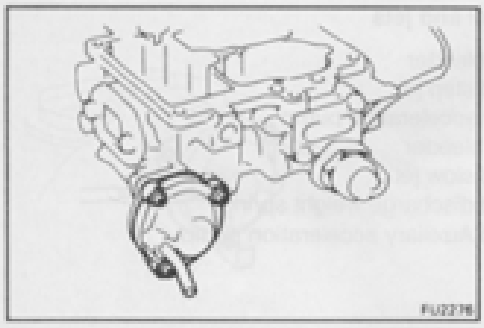
(a) Remove the two screws, primary small venturi and gasket.

(b) Remove the two screws, secondary small venturi and gasket.



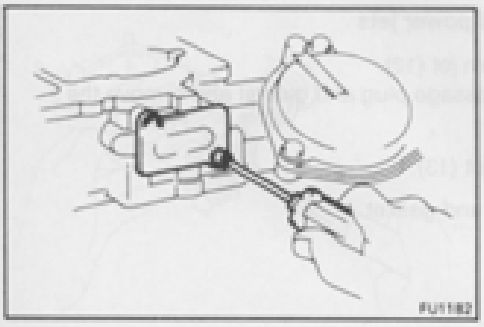
7. Remove fuel cut-out solenoid valve

Remove the solenoid valve, gasket, spring and needle.



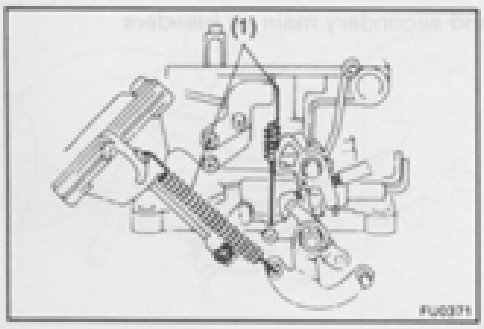
8. Remove auxiliary acceleration pump (AAP)

Remove the three screws, pump housing, spring and diaphragm.



9. Remove hot idle compensator (HIC)

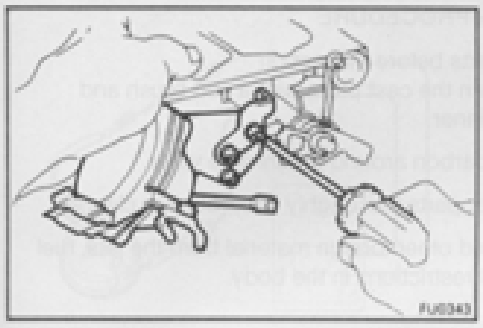
Remove the two screws, cover, gasket, HIC valve and O-ring.



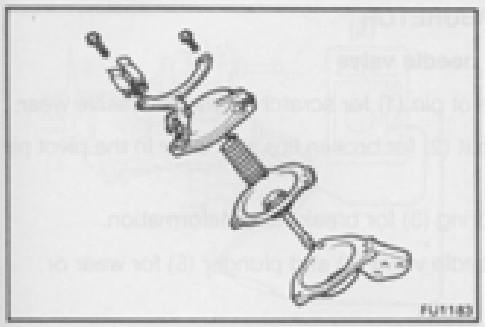
10. Remove secondary throttle valve diaphragm

(a) Remove the two return springs (1).

(b) Disconnect the diaphram link.

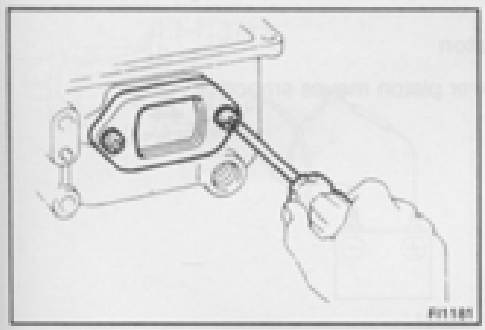


(c) Remove the three screws, retainer, secondary throttle valve diaphragm and gasket.



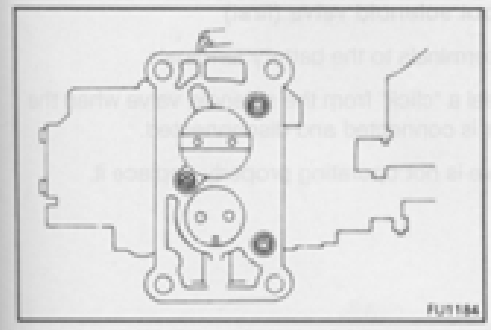
11. Disassemble secondary throttle valve diaphragm

Remove the three screws, and disassemble the secondary throttle valve diaphragm.



12. Remove sight glass

Remove the two screws, retainer, gasket, glass and O-ring.



13. Separate body and flange

Remove the three screws, and separate the body and flange.

GENERAL CLEANING PROCEDURE

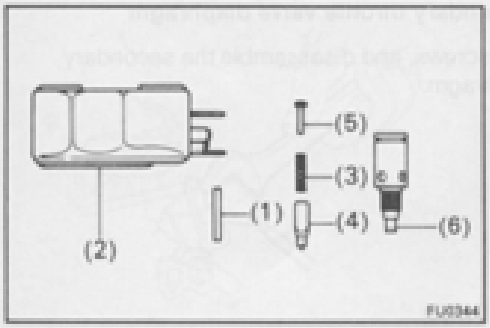
Clean disassembled parts before inspection

(a) Wash and clean the cast parts with a soft brush and carburetor cleaner.

(b) Clean off the carbon around the throttle valve.

(c) Wash the other parts thoroughly in carburetor cleaner.

(d) Blow all dirt and other foreign material from the jets, fuel passages and restrictions in the body.



INSPECTION OF CARBURETOR

1. **Inspect float and needle valve**

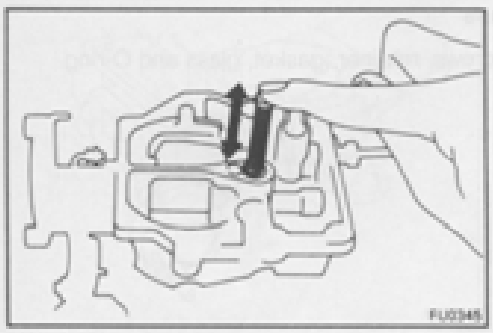
(a) Inspect the pivot pin (1) for scratches and excessive wear.

(b) Inspect the float (2) for broken lips and wear in the pivot pin holes.

(c) Inspect the spring (3) for breaks and deformation.

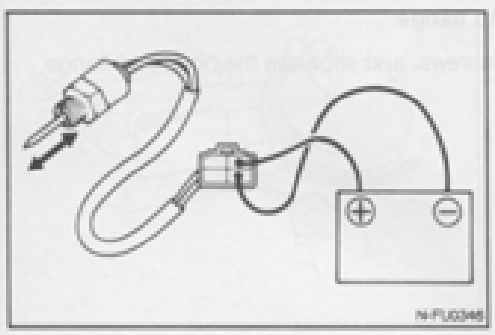
(d) Inspect the needle valve (4) and plunger (5) for wear or damage.

(e) Inspect the strainer (6) for wear or damage.



2. **Inspect power piston**

Check that the power piston moves smoothly.

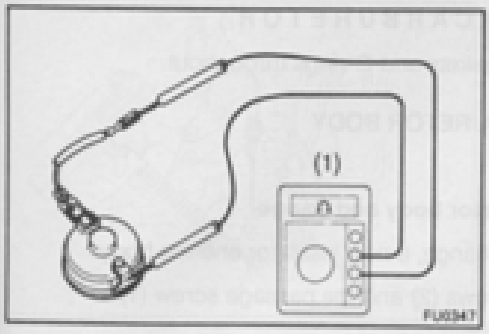


3. **Inspect fuel cut-out solenoid valve (first)**

(a) Connect the terminals to the battery terminals.

(b) You should feel a "click" from the solenoid valve when the battery power is connected and disconnected.

If the solenoid valve is not operating properly, replace it.

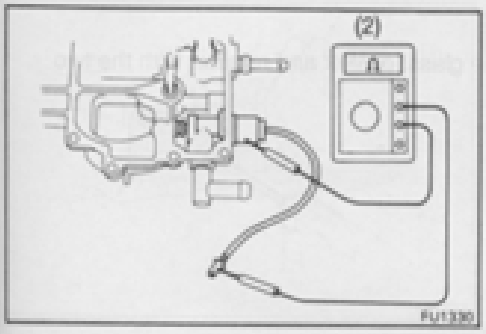


4. **Inspect choke heater (coil housing)**

Using an ohmmeter (1), measure the resistance between the terminals.

Resistance (cold): 17 - 19 Ω

If the resistance is not within specification, replace the choke heater.

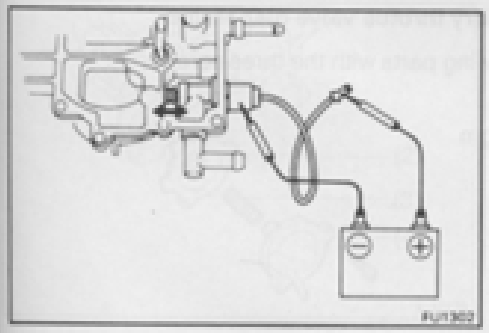


5. **Inspect outer vent control valve (OVCV)**

(a) Using an ohmmeter (2), measure the resistance between the wire terminal and body.

Resistance (cold): 34 - 42 Ω

If the resistance is not within specification, replace the OVCV.

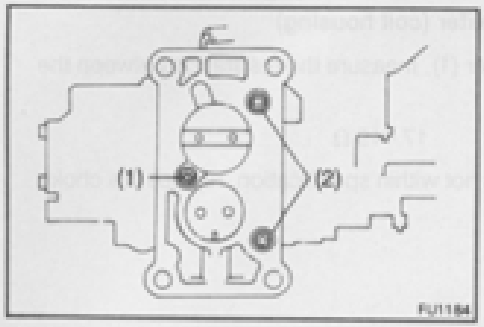


(b) Install the OVCV to the air horn.

(c) Connect the OVCV body and wire terminal to battery terminals.

(d) You should feel a "click" from the OVCV when battery power is connected and disconnected.

If the OVCV is not operating properly, replace it.



ASSEMBLY OF CARBURETOR

NOTE: Use new gaskets and O-rings throughout.

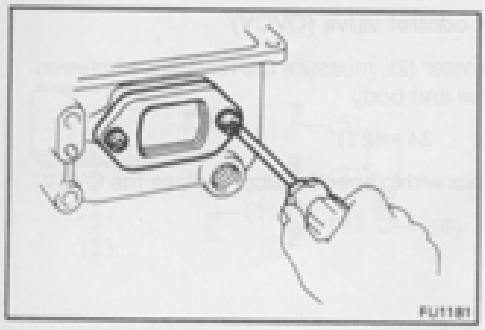
ASSEMBLY OF CARBURETOR BODY

(See pages 82 to 85)

1. Assemble carburetor body and flange

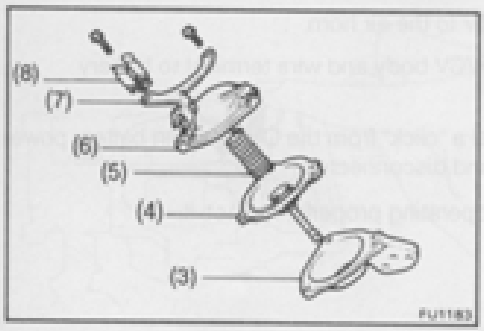
(a) Assemble the flange, a new insulator and the body.

(b) Fit the two screws (2) and the passage screw (1).



2. Fit sight glass

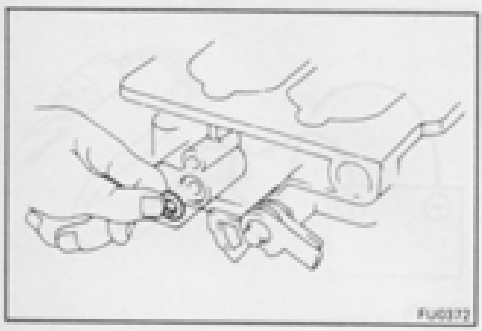
Fit a new O-ring, the glass, gasket and retainer with the two screws.



3. Assemble secondary throttle valve diaphragm

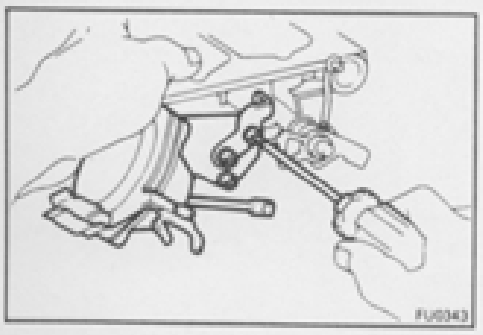
Assemble the following parts with the three screws.

(3) Housing
(4) Diaphragm
(5) Spring
(6) Cover
(7) Retainer
(8) Clamp

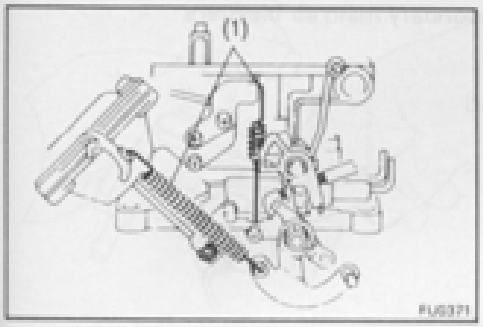


4. Fit secondary throttle valve diaphragm

(a) Place a new gasket in the carburetor body.

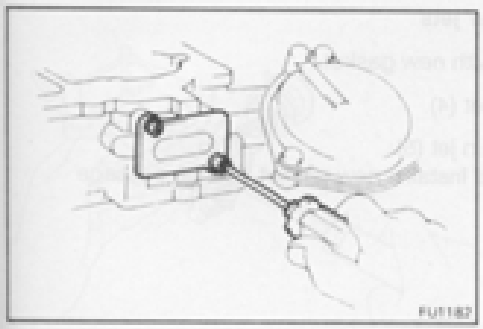


(b) Fit the secondary throttle valve diaphragm and retainer with the three screws.



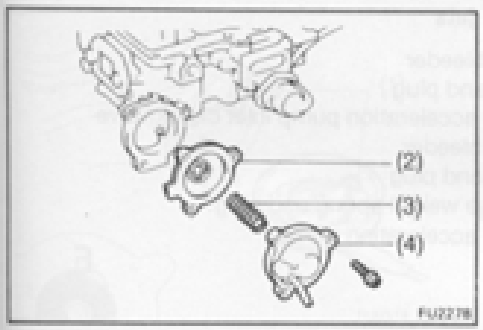
(c) Connect the diaphragm link.

(d) Fit the two return springs (1).



5. Fit hot idle compensator (HIC)

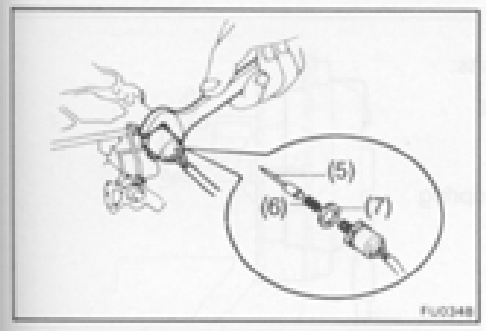
Fit a new O-ring, the HIC valve, gasket, cover with the two screws.



6. Fit auxiliary acceleration pump (AAP)

Fit the following parts with the three screws:

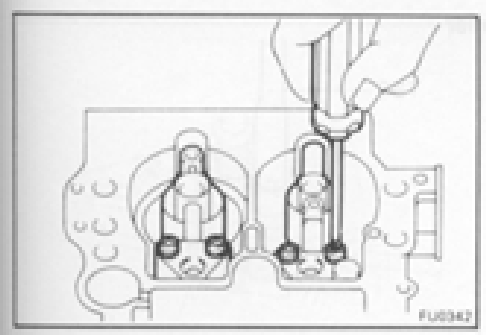
(2) Diaphragm
(3) Spring
(4) Cover



7. Fit fuel cut solenoid valve

(a) Assemble the solenoid valve, spring (6) and needle (5).

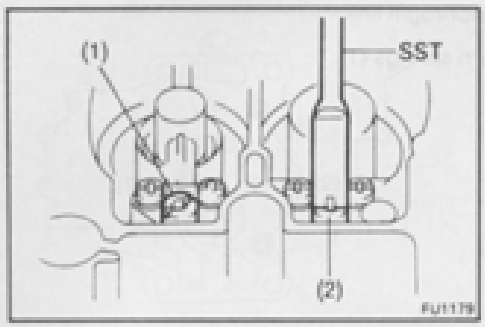
(b) Fit a new gasket (7) and the solenoid valve assembly.



8. Fit primary and secondary small venturies

(a) Fit a new gasket and the primary venturi with the two screws.

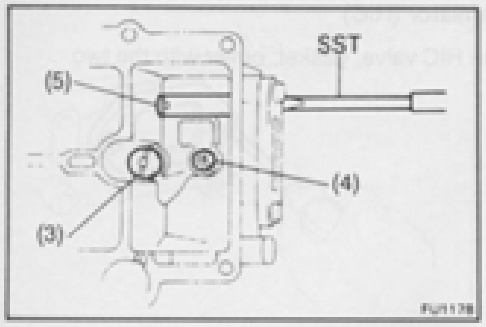
(b) Fit a new gasket and the secondary venturi with the two screws.



9. Fit primary and secondary main air bleeders

(1) Brass colored

(2) Chrome colored

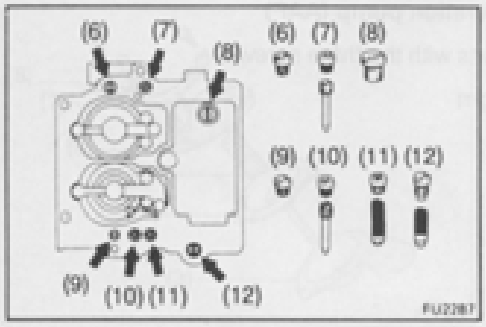


10. Fit main and power jets

(a) Power jet (3) with new gasket.

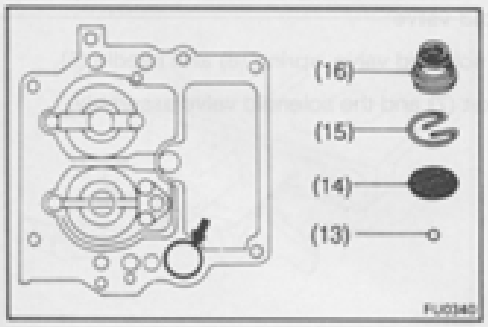
(b) Primary main jet (4).

(c) Secondary main jet (5).
Fit the main jet, install a new gasket and the passage plug.



11. Fit check ball and jets

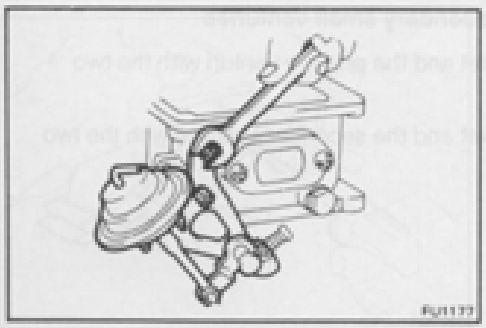
(6) Step air bleeder
(7) Step jet and plug
(8) Auxiliary acceleration pump inlet check valve
(9) Slow air bleeder
(10) Slow jet and plug
(11) Discharge weight spring and plug
(12) Auxiliary acceleration pump



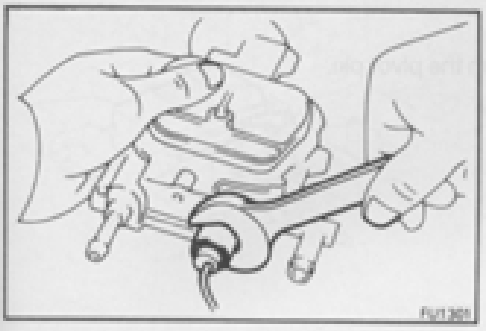
12. Fit pump filter

Fit the following parts:

(13) Steel ball
(14) Filter
(15) Clip
(16) Plunger spring



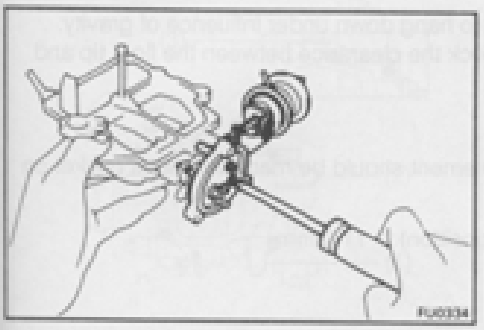
13. Fit throttle positioner



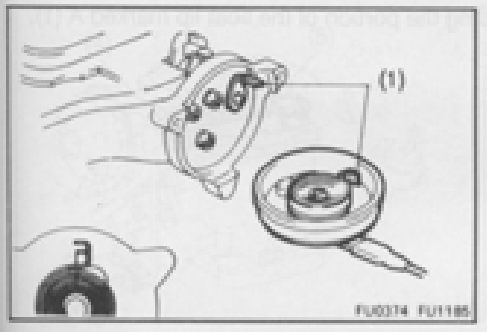
ASSEMBLY OF AIR HORN

(See pages 82 to 85)

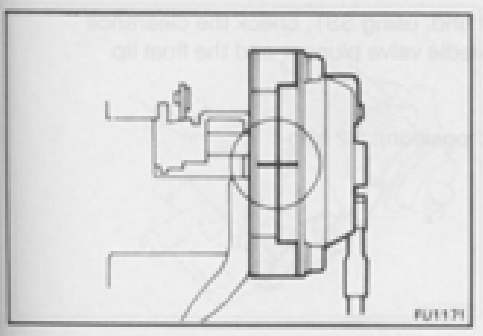
1. **Fit outer vent control valve (OVCV)**



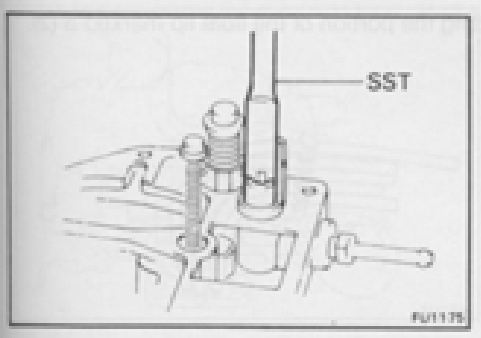
2. **Fit choke breaker (CB)**
   (a) Fit the CB with the three screws.
   (b) Connect the CB link.



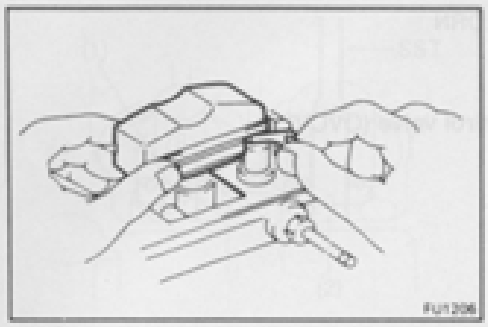
3. **Fit coil housing**
   (a) Align the bi-metal spring and the choke lever (1), and fit the coil housing.



   (b) Align the thermostat case line with the coil housing line, and fit the plate and clamp with the three screws.
   (c) Check the choke valve action.

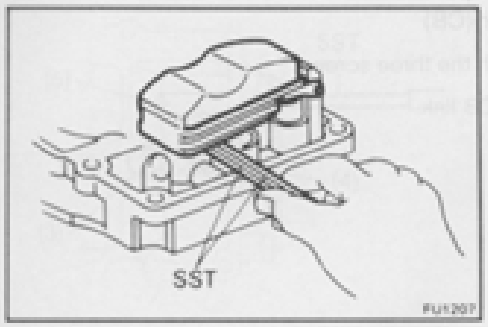


4. **Fit boot and pump plunger**
5. **Fit needle valve seat**
   Fit a new gasket and the needle valve seat to the fuel inlet.
6. **Fit needle valve**
   Fit the valve, spring and plunger.



7. Adjust float level

(a) Fit the float with the pivot pin.

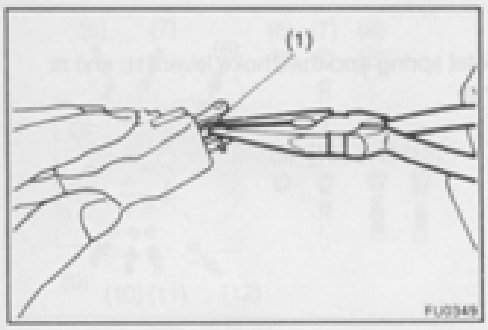


(b) Allow the float to hang down under influence of gravity. Using SST, check the clearance between the float tip and air horn.

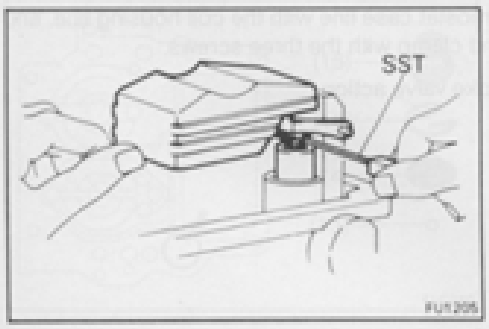
SST 09240-00014

NOTE: This measurement should be made without a gasket on the air horn.

Float level (raised position): 11.0 mm



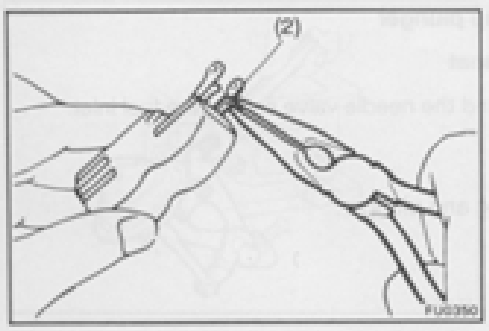
(c) Adjust by bending the portion of the float lip marked A (1).



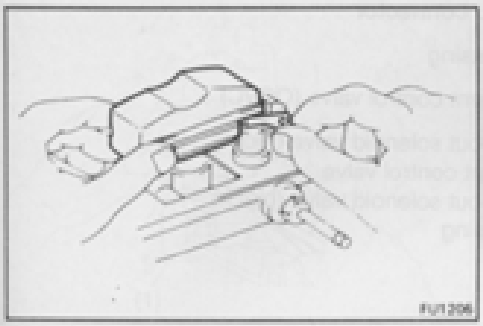
(d) Lift up the float and, using SST, check the clearance between the needle valve plunger and the float lip.

SST 09240-00020

Float level (lowered position): 1.2 mm



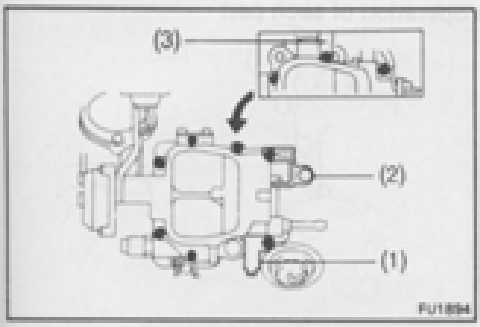
(e) Adjust by bending the portion of the float lip marked B (2).



8. Fit float

(a) Place a new gasket in position on the air horn.

(b) Fit the float with the pivot pin.



9. Fit air horn assembly

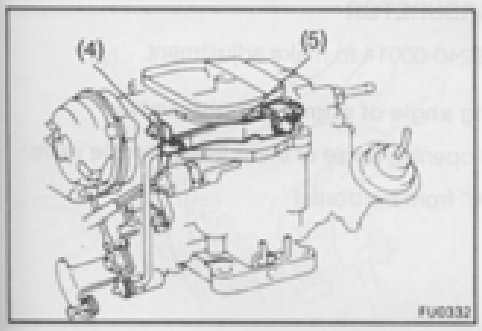
(a) Place the air horn in position on the body.

(b) Fit the following parts with the seven or six screws:

(1) Vacuum hose clamp holder

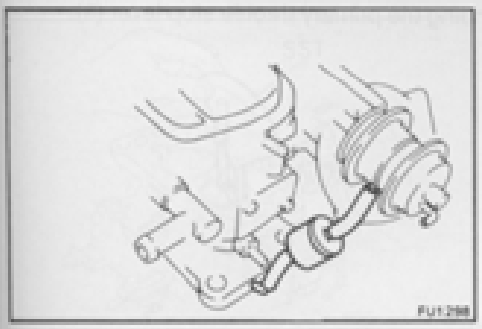
(2) Air pipe bracket

(3) Wire clamp

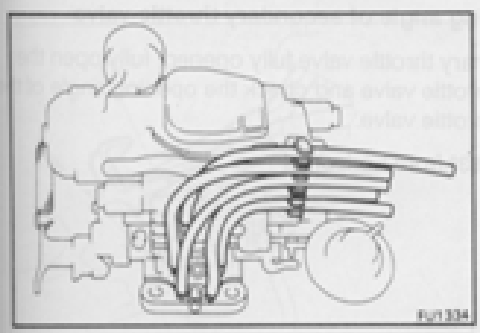


(c) Connect the fast idle link (4).

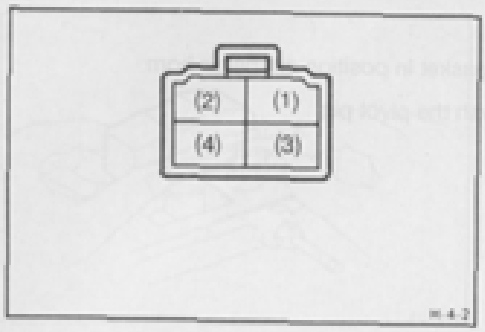
(d) Connect the plunger arm (5).



10. Fit vacuum hose of choke breaker (CB)



11. Fit vacuum hoses



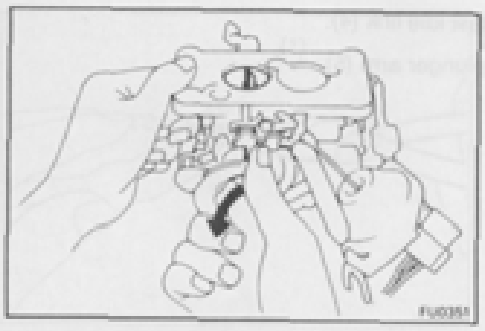
12. Connect wire(s) to connector

(a) Wire of coil housing

(b) Wire of outer vent control valve (OCVC)

(1) Fuel cut-out solenoid valve (red)
(2) Outer vent control valve
(3) Fuel cut-out solenoid valve (black)
(4) Coil housing

13. Check for smooth operation of each part



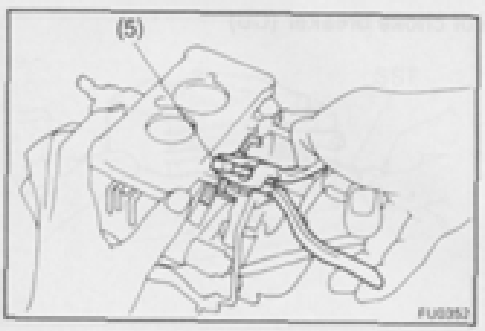
ADJUSTMENT OF CARBURETOR

NOTE: Use SST 09240-00014 to make adjustment.

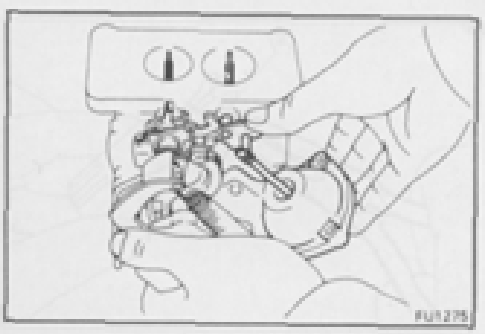
1. Adjust full opening angle of primary throttle valve

(a) Check the full opening angle of the primary throttle valve.

Standard angle: 90° from horizontal



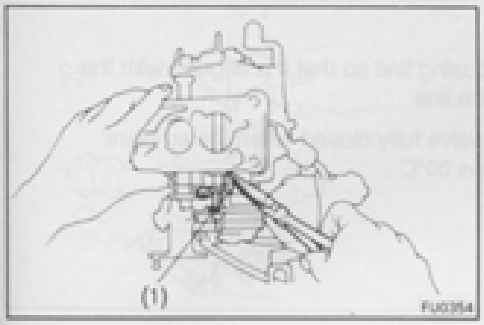
(b) Adjust by bending the primary throttle stop lever (5).



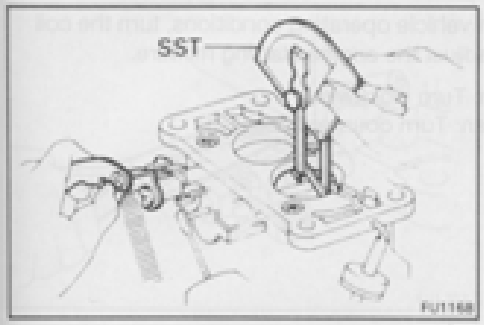
2. Adjust full opening angle of secondary throttle valve

(a) With the primary throttle valve fully opened, fully open the secondary throttle valve and check the opening angle of the secondary throttle valve.

Standard angle: 83° from horizontal



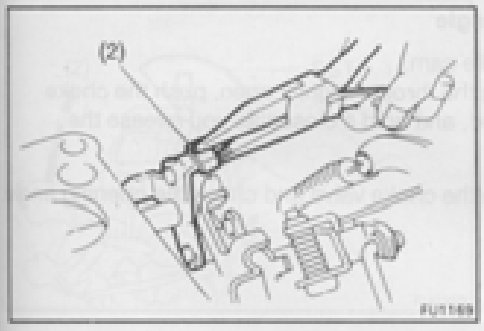
(b) Adjust by bending the secondary throttle stop lever (1).



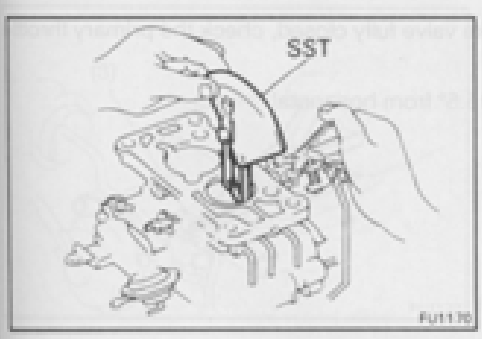
3. **Adjust kickup angle**

(a) With the primary throttle valve fully opened, check the opening angle of the secondary throttle valve.

Standard angle: 21° from horizontal



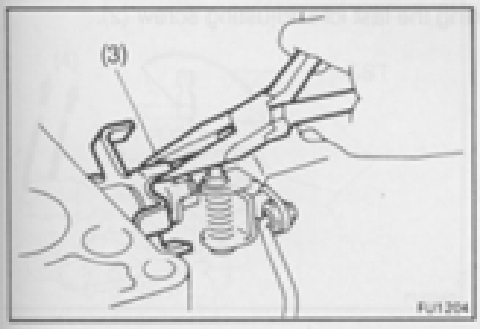
(b) Adjust by bending the secondary throttle kickup lever (2).



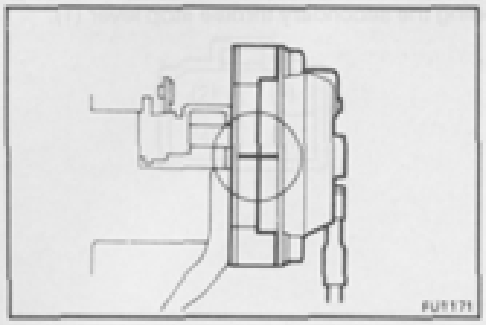
4. **Adjust secondary touch angle**

(a) Check the primary throttle valve opening angle at the same time the 1st kick lever just touches the 2nd kick lever.

Standard angle: 52° from horizontal



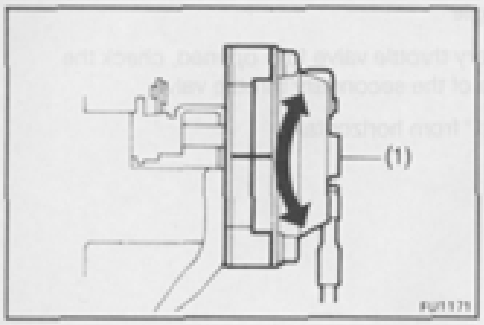
(b) Adjust by bending the secondary throttle touch angle lever (3).



5. **Automatik choke**

(a) Set the coil housing line so that it is aligned with the thermostat case line.

NOTE: The choke valve fully closed when the ambient temperature reaches 30°C.



(b) Depending on vehicle operating conditions, turn the coil housing and adjust the engine starting mixture.

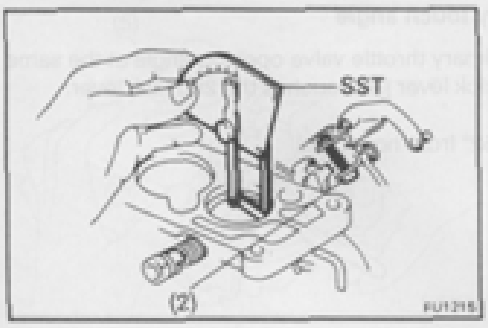
If to rich: Turn clockwise
If too lean: Turn counterclockwise

(1) Choke heater

6. **Adjust fast idle angle**

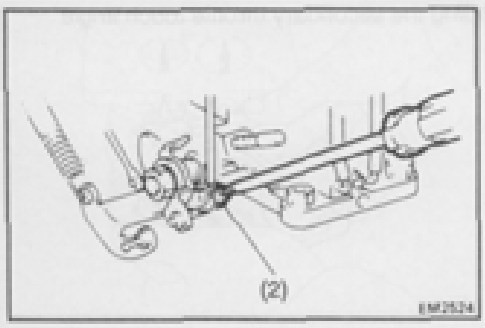
(a) Set the fast idle cam.
While holding the throttle slightly open, push the choke valve closened, and hold it closed as you release the throttle valve.

NOTE: Fully close the choke valve and check the opening angle.

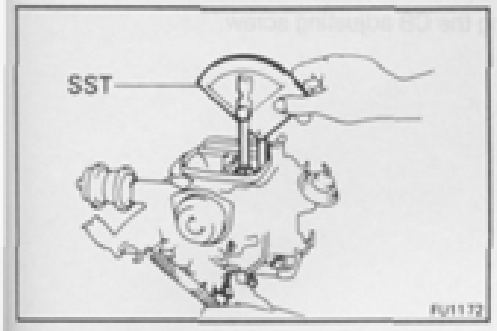


(b) With the choke valve fully closed, check the primary throttle valve angle.

Standard angle: 15.5° from horizontal



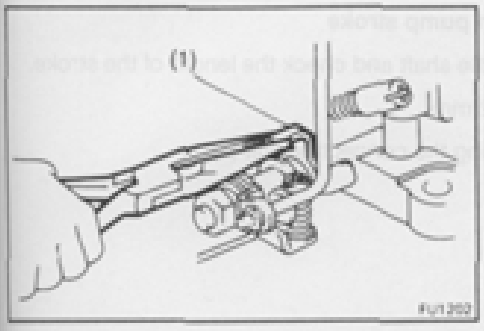
(c) Adjust by turning the fast idle adjusting screw (2).



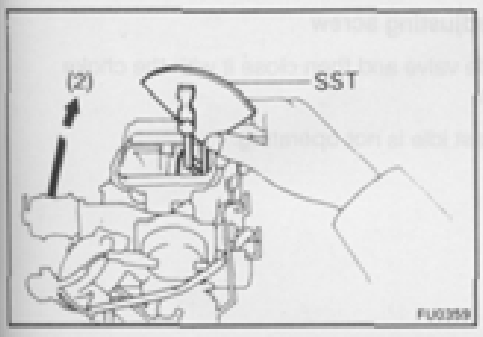
7. Adjust unloader angle

(a) *With the primary throttle valve fully opened, check the choke valve angle.*

Standard angle: 50° from horizontal



(b) Adjust by bending the unloader lever (1).



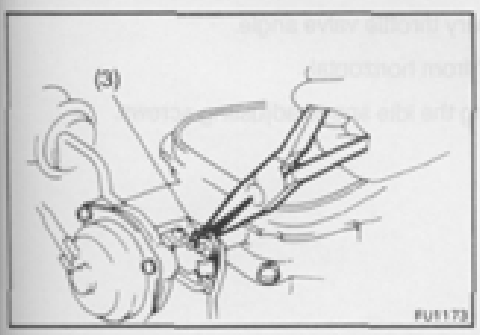
8. Adjust choke breaker (CB)

(a) Set the fast idle cam. (See page 102)

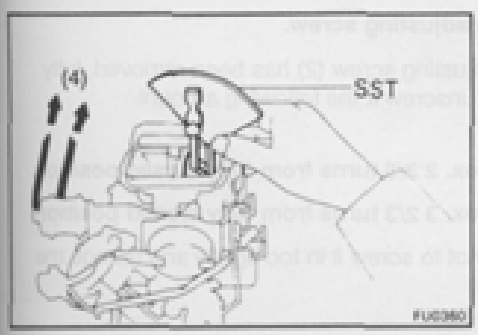
(b) Apply vacuum (2) to CB diaphragm A.

(c) Check the choke valve angle.

Standard angle (1st): 40° from horizontal



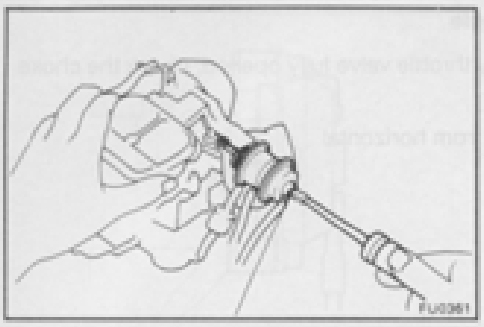
(d) Adjust by bending the relief lever (3).



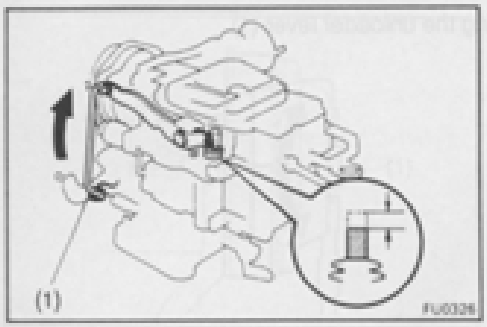
(e) Apply vacuum (4) to CB diaphragms A and B.

(f) Check the choke valve angle.

Standard angle (2nd): 53° from horizontal



(g) Adjust by turning the CB adjusting screw.

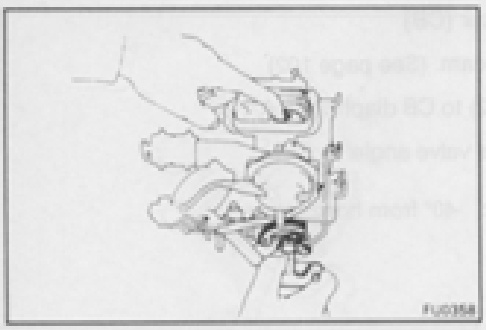


9. **Adjust acceleration pump stroke**

(a) Rotate the throttle shaft and check the length of the stroke.

Standard stroke: 3.2 mm

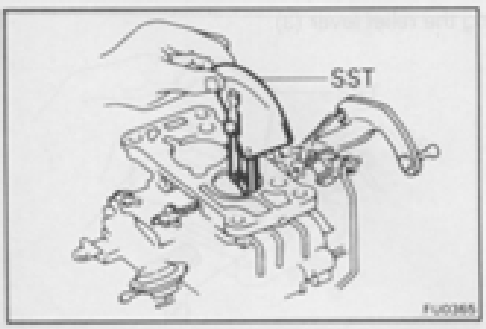
(b) Adjust by bending the connecting link (1).



10. **Preset idle speed adjusting screw**

(a) Open the throttle valve and then close it with the choke valve fully open.

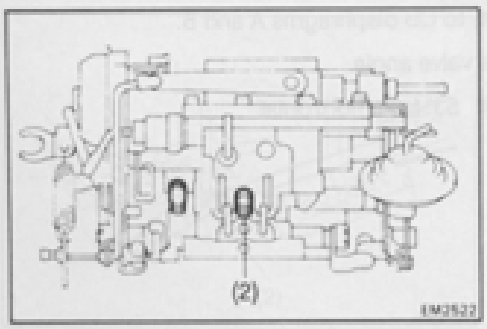
NOTE: Check that fast idle is not operating.



(b) Check the primary throttle valve angle.

Standard angle: 12° from horizontal

(c) Adjust by turning the idle speed adjusting screws.



11. **Preset idle mixture adjusting screw.**

If the idle mixture adjusting screw (2) has been removed, fully screw it in and then unscrew it the following amount.

Standard:

2Y: Return approx. 2 3/8 turns from fully closed position.

4Y: Return approx. 3 2/3 turns from fully closed position.

CAUTION: Use are not to screw it in too tightly and damge the screw tip.

SST 09243-00020

12. **Check for smooth operation of each part**

INSTALLATION OF CARBURETOR

1. **Fit carburetor**
   (a) Place the insulator on the intake manifold.
   (b) Place the carburetor on the insulator.
   (c) Fit the four carburetor mount nuts.
2. **Connect hoses to carburetor**
   (a) Fuel inlet hose.
   (b) Emission control hoses.
3. **Fit accelerator connecting rod**
4. **Connect carburetor connector**
5. **Fit air cleaner assembly or air intake connector to carburetor**
6. **Adjust idle speed and idle mixture**
   (See pages 15 to 18)
7. **Adjust fast idle speed**
   (See page 19)
8. **Adjust throttle positioner setting speed**
   (See page 19)

FUEL PUMP

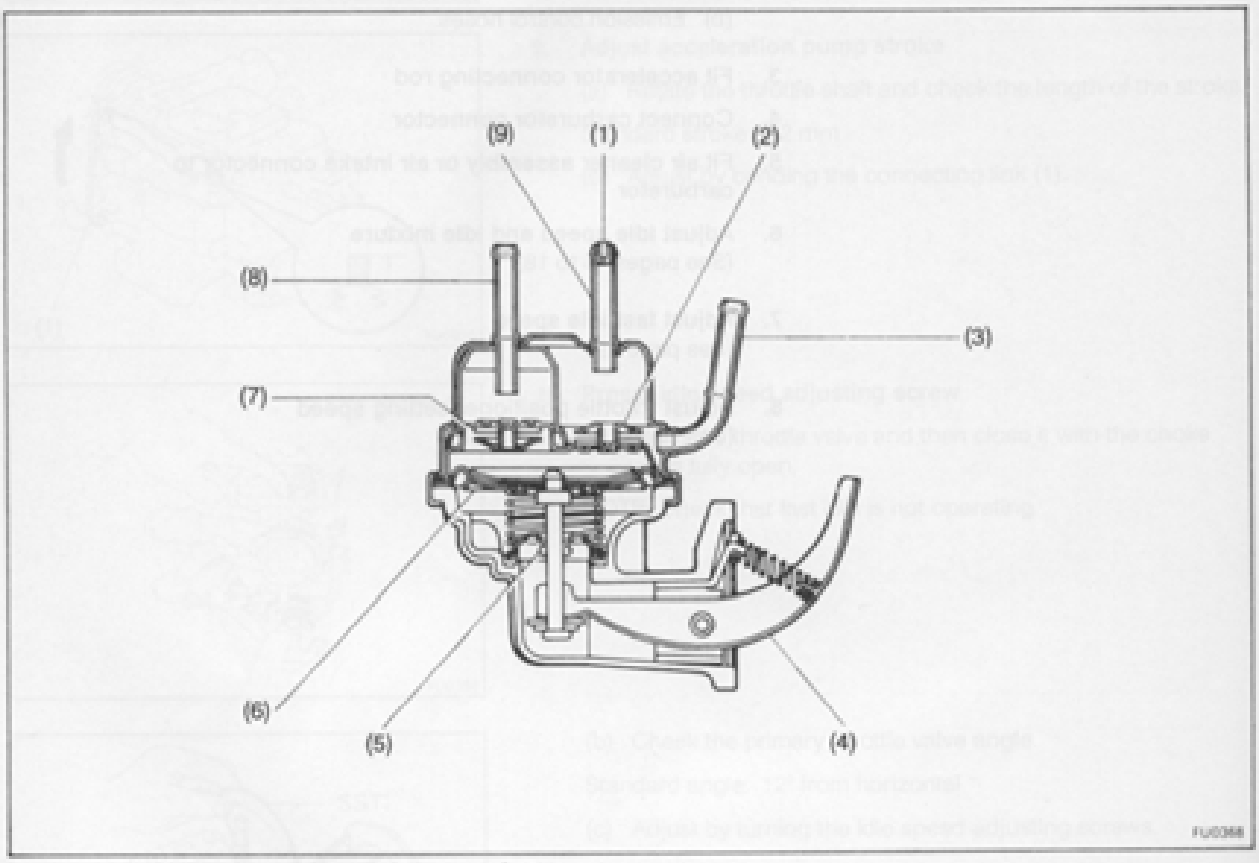
REMOVAL OF FUEL PUMP

1. **Disconnect fuel hoses from fuel pump**
2. **Remove fuel pumpe**

   Remove the two bolts, fuel pump and gasket.

INSPECTION OF FUEL PUMP (Airtight Test)

Cutaway View



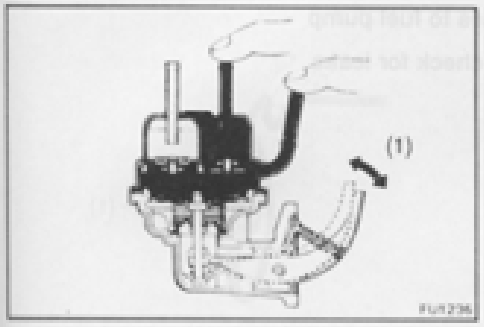
(1) Return Nozzle
(2) Outlet Valve
(3) Outlet Pipe
(4) Pump Arm
(5) Oil Seal
(6) Diaphragm
(7) Inlet Valve
(8) Inlet Pipe
(9) Return Pipe

Prechecks

Before performing the following checks on the fuel pump:

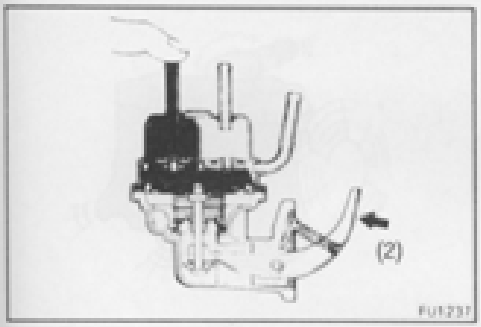
(a) Run some fuel through the pump to ensure that the check valves seal tightly (a dry check valve may not seal properly).

(b) Without blocking off any pipes, operate the pump lever and check the amount of force necessary for operation and the amount of arm play. This same amount of force should be used in the checks.



1. Check inlet valve

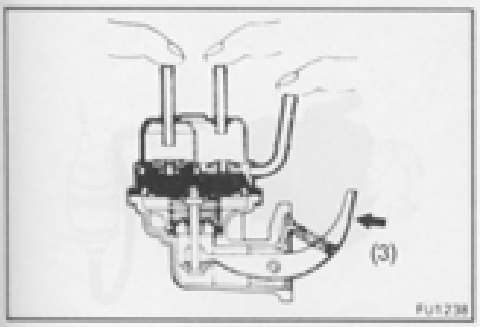
Block the outlet and return pipes with your finger and check that there is an increase in lever arm play and that the lever arm moves freely (1) (no reaction force).



2. Check outlet valve

Block the inlet pipe with your finger and check that the arm locks (2) do not operate with same amount of force used in the precheck above.

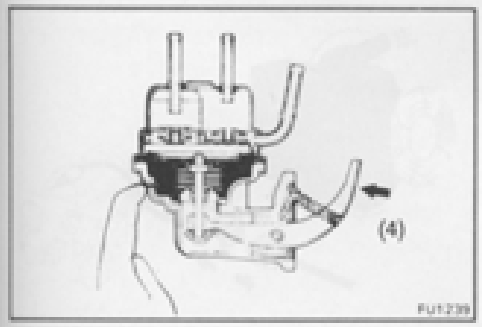
NOTE: Never use more force than that used in the precheck. This also applies to checks 3 and 4.



3. Check diaphragm

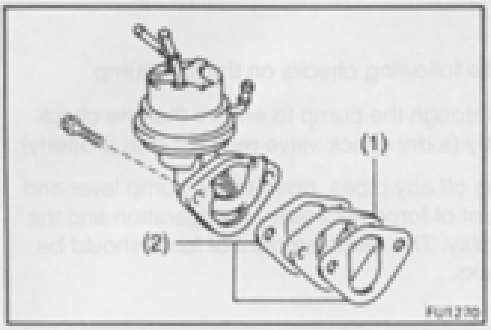
Block the inlet, outlet and return pipes and check that the pump arm locks (3).

NOTE: If all three of these checks are not as specified, the sealing of the body and upper casing is defective.



4. Check oil seal

Block the vent hole with your finger and check that the pump arm locks (4).



INSTALLATION OF FUEL PUMP

1. **Fit fuel pump**

   Fit new gaskets (2), the insulator (1) and fuel pump with the two bolts.

   Torque: 18 Nm

2. **Connect fuel hoses to fuel pump**
3. **Start engine and check for leaks**

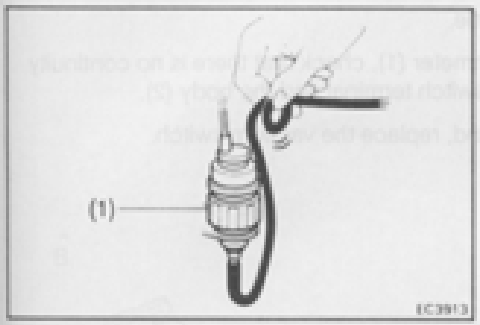
INSPECTION OF DECELERATION FUEL CUT-OUT SYSTEM

1. **Inspect system operation**

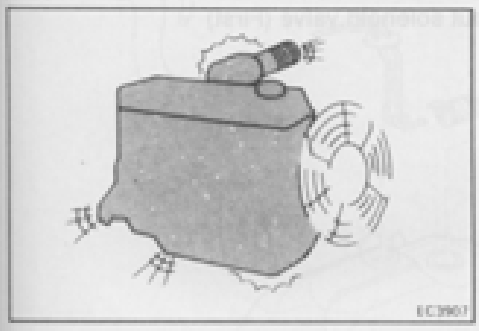
   (a) Connect a tachometer to the engine.

   (b) Start the engine.

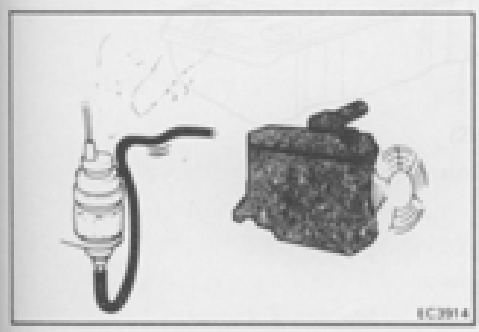
   (c) Check that the engine runs normally.



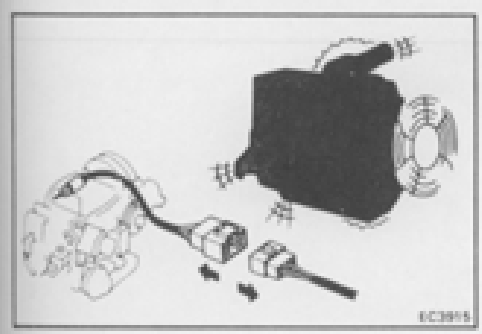
   (d) Pinch off the vacuum hose to the vacuum switch (1).



   (e) Gradually increase the engine speed. Check that the engine misfires slightly.

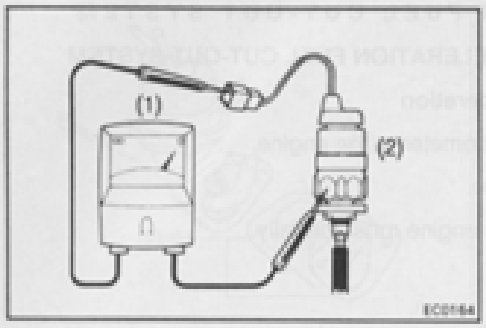


   (f) Release the pinched hose. Again gradually increase the engine speed and check that the engine operation returns to normal.



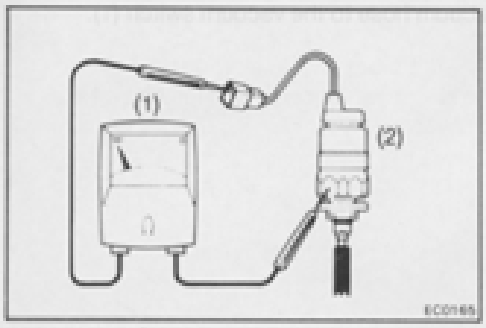
   (g) With the engine idling, unplug the wiring connector to the solenoid valve. Check that the engine dies.

   (h) Stop the engine, and reconnect the wiring. Remove the tachometer.



2. **Inspect vacuum switch**

(a) Using an ohmmeter (1), check for continuity between the switch terminal and switch body (2).



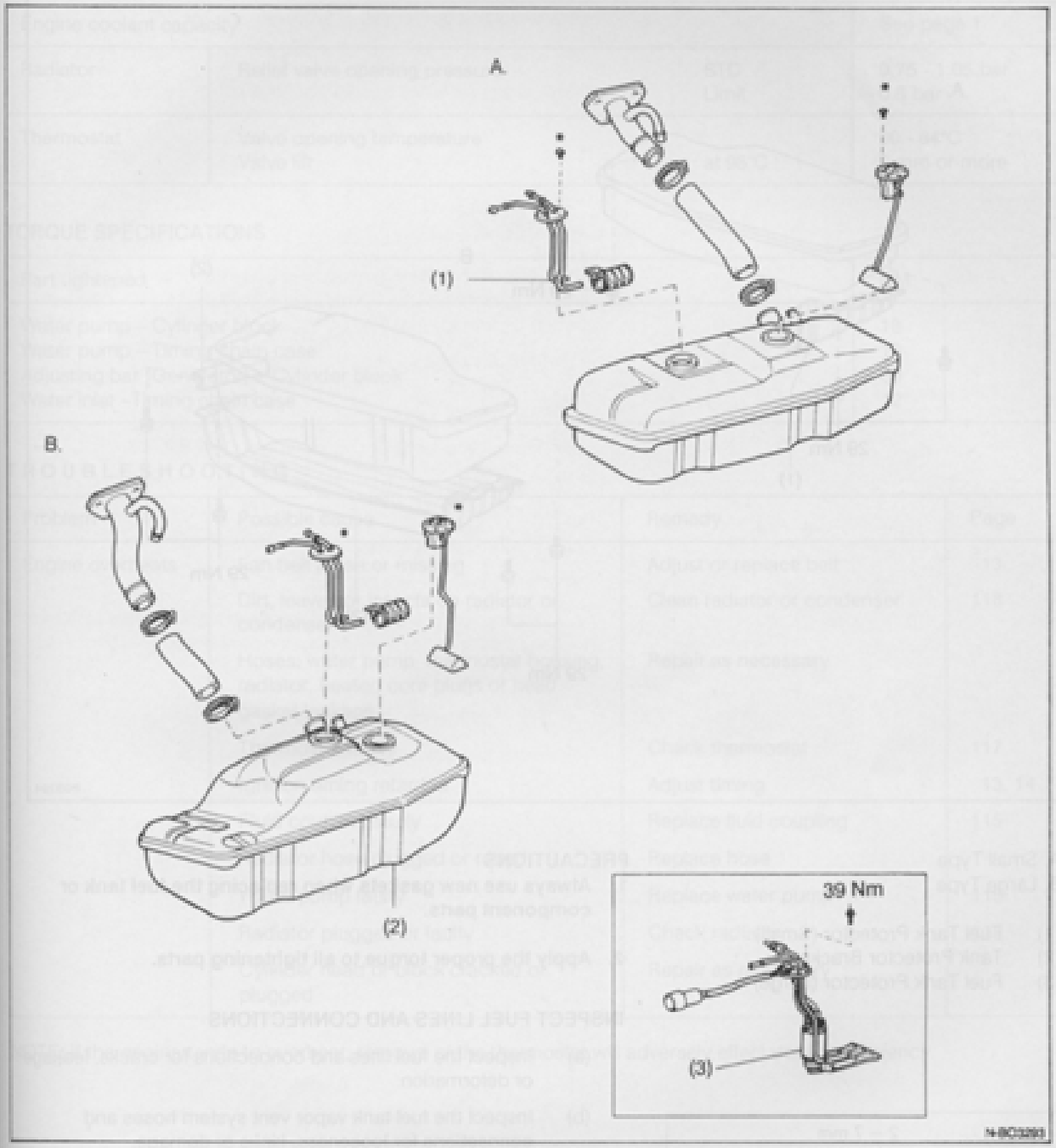
(b) Start the engine.

(c) Using an ohmmeter (1), check that there is no continuity between the switch terminal and the body (2).

If a problem is found, replace the vacuum switch.

3. **Inspect fuel cut-out solenoid valve (First)**
(See page 92)

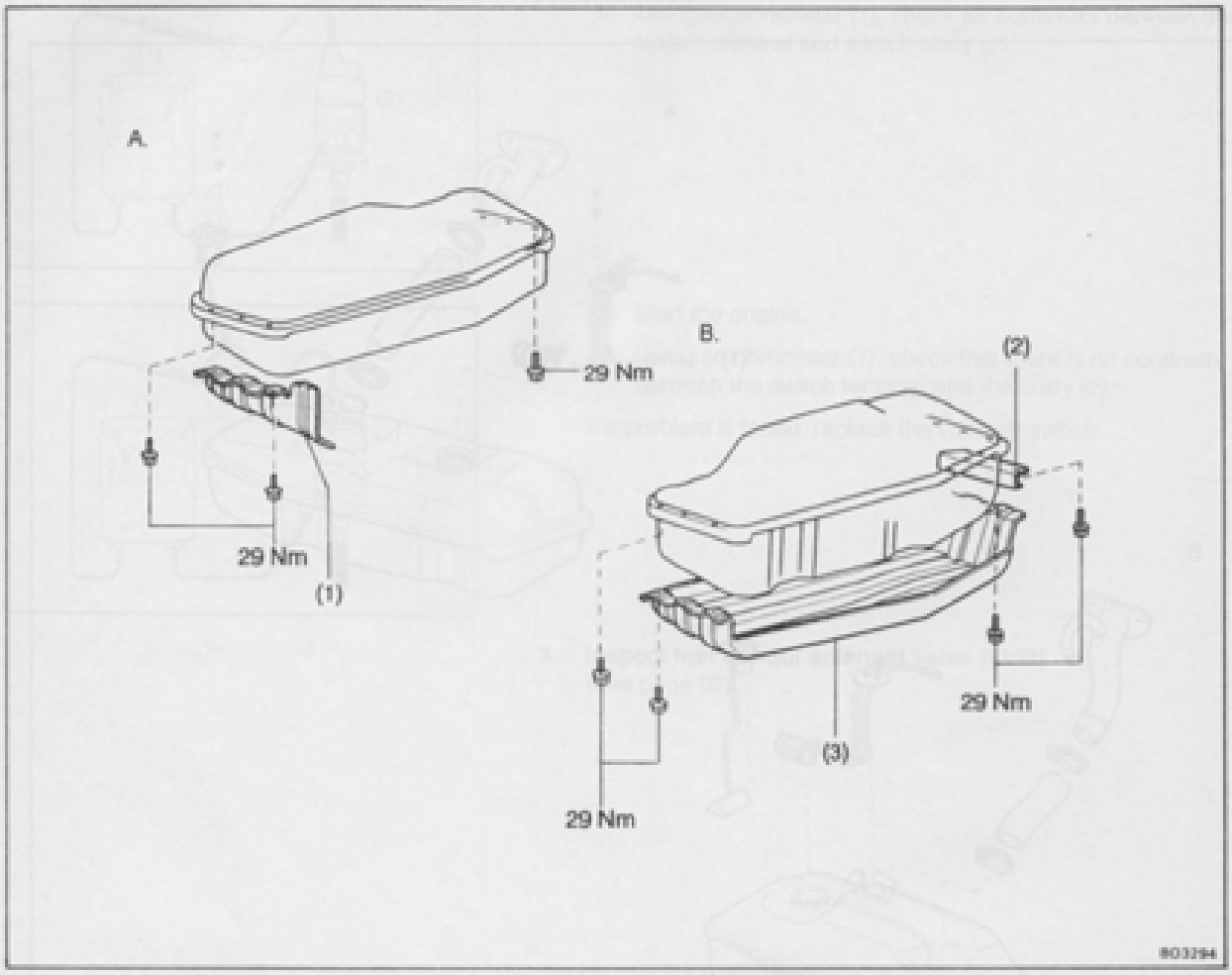
COMPONENTS



A. 56 Liter
B. 65 Liter

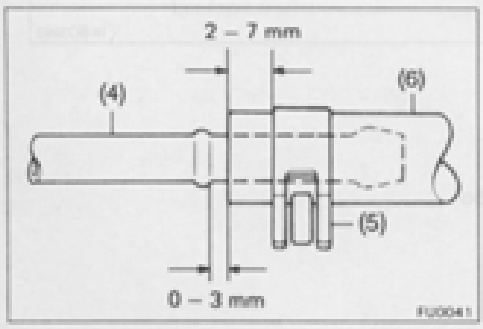
(1) Fuel Suction Tube
(2) Fuel Tank
(3) Fuel Pump

* Bolt, 5 pieces



A. Small Type
B. Large Type

(1) Fuel Tank Protector (Small)
(2) Tank Protector Bracket
(3) Fuel Tank Protector (Large)



PRECAUTIONS

1. **Always use new gaskets when replacing the fuel tank or component parts.**
2. **Apply the proper torque to all tightening parts.**

INSPECT FUEL LINES AND CONNECTIONS

(a) Inspect the fuel lines and connections for cracks, leakage or deformation.

(b) Inspect the fuel tank vapor vent system hoses and connections for looseness, kinks or damage.

(c) Inspect the fuel tank for deformation, cracks, fuel leakage or tank mount bolts looseness.

(d) Inspect the filler neck for damage or fuel leakage.

(e) Hose and tube connections are as shown in the illustration.

(4) Pipe
(5) Clip
(6) Hose

If problem is found, repair or replace the parts as necessary.

COOLING SYSTEM

SPECIFICATIONS

Engine coolant capacity			See page 1
Radiator	Relief valve opening pressure	STD Limit	0.75 - 1.05 bar 0.6 bar
Thermostat	Valve opening temperature Valve lift	 at 95°C	80 - 84°C 8 mm or more

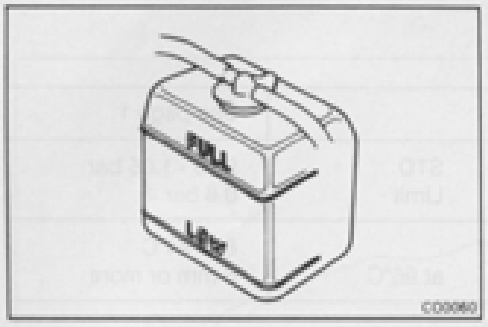
TORQUE SPECIFICATIONS

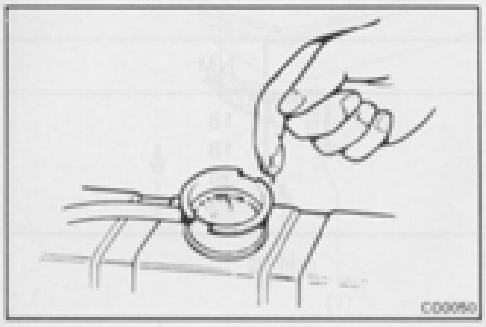
Part tightened	NM
Water pump – Cylinder block	18
Water pump – Timing chain case	18
Adjusting bar (Generator) – Cylinder block	39
Water inlet –Timing chain case	12

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine overheats	Fan belt loose or missing	Adjust or replace belt	13
	Dirt, leaves or insects on radiator or condenser	Clean radiator or condenser	118
	Hoses, water pump, thermostat housing, radiator, heater, core plugs or head gasket leakage	Repair as necessary	
	Thermostat faulty	Check thermostat	117
	Ignition timing retarded	Adjust timing	13, 14
	Fluid coupling faulty	Replace fluid coupling	115
	Radiator hose plugged or rotted	Replace hose	
	Water pump faulty	Replace water pump	115
	Radiator plugged or faulty	Check radiator	118
	Cylinder head or block cracked or plugged	Repair as necessary	

NOTE: If the engine tends to overheat, removal of the thermostat will adversely effect cooling efficiency.





CHECK AND REPLACEMENT OF ENGINE COOLANT

1. **Check engine coolant level at reserve tank**

   The coolant level should be between the "LOW" and "FULL" lines.

   If low, check for leaks and add coolant up to the "FULL" line.

2. **Check engine coolant quality**

   There should not be any excessive deposits of rust or scales around the radiator cap or radiator filler hole, and the coolant should be free from oil.

   If excessively dirty, replace the coolant.

3. **Replace engine coolant**

   (a) Remove the radiator cap or water outlet cap.

   (b) Drain the coolant from the radiator and engine drain cocks. (Engine drain cock is at left front of engine block.)

   (c) Close the drain cocks.

   (d) Fill the system with coolant.

   Use a good brand of ethylene-glycol base coolant, mixed according to the manufacturer's directions.

   Capacity (with Heater):

   2Y: 7.0 liters 4Y: 7.4 liters

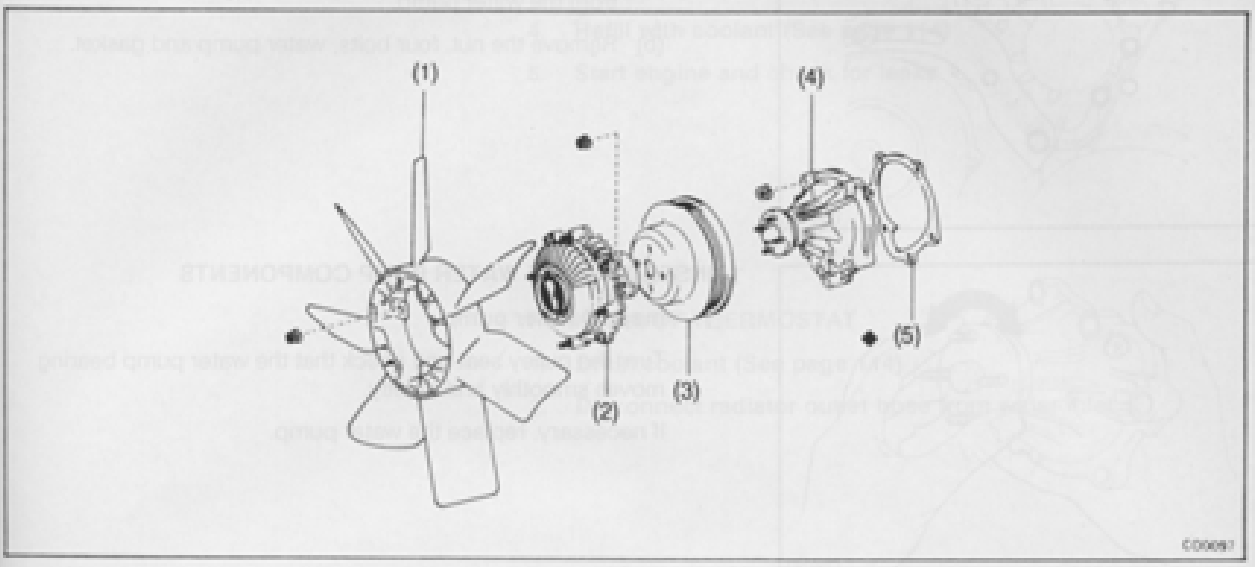
   (e) Install the radiator cap or water outlet cap.

   (f) Start the engine and check for leaks.

   (g) Recheck the coolant level and refill as necessary.

WATER PUMP

COMPONENTS

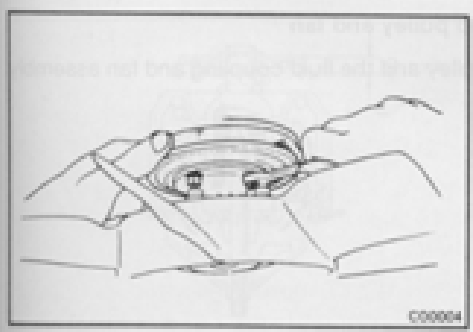


(1) Fan
(2) Fluid Coupling
(3) Water Pump Pulley
(4) Water Pump
(5) Gasket

◆ Non-reusable part

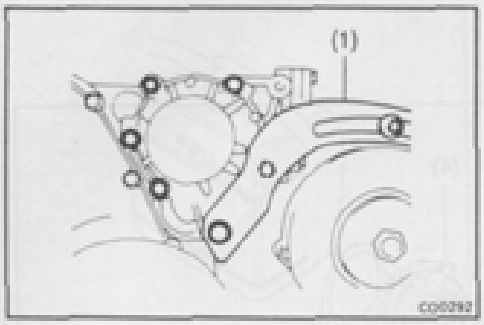
REMOVAL OF WATER PUMP

1. **Drain coolant (See page 114)**
2. **Remove drive belt**



3. **Remove fan and water pump pulley**

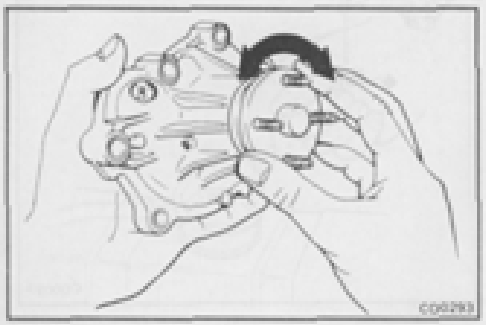
   Remove the four nuts holding the fluid coupling to the pulley seat, and remove the fan and fluid coupling assembly and the pump pulley.



4. **Remove water pump**

(a) Loosen screw and separate the generator adjustment plate from the water pump.

(b) Remove the nut, four bolts, water pump and gasket.

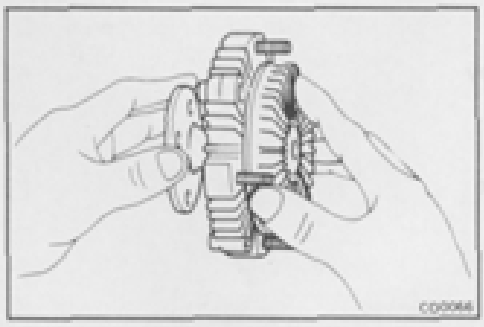


INSPECTION OF WATER PUMP COMPONENTS

1. **Inspect water pump**

Turn the pulley seat and check that the water pump bearing moves smoothly and quietly.

If necessary, replace the water pump.



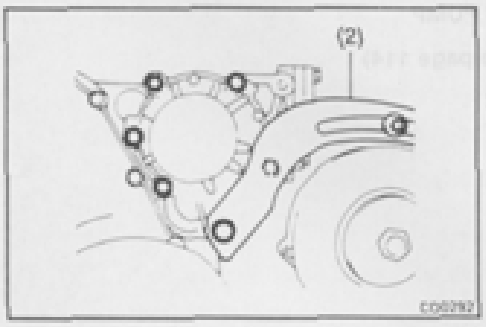
2. **Inspect fluid coupling**

Check the fluid coupling for damage and silicon oil leakage.

If necessary, replace the fluid coupling.

INSTALLATION OF WATER PUMP

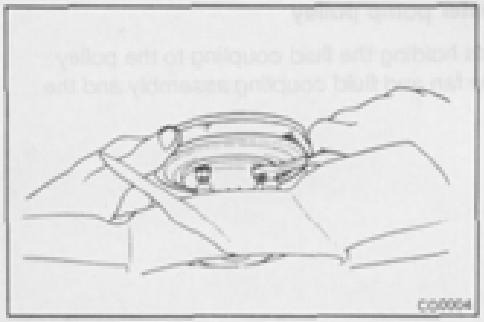
(See page 115)



1. **Install water pump**

Fit a new water pump gasket on to the timing chain housing and reassemble the water pump and the generator adjustment plate (2) using the nut and five screws.

Torque:	Water pump	16 Nm
	Adjusting bar	39 Nm



2. **Install water pump pulley and fan**

Install the pump pulley and the fluid coupling and fan assembly with the four nuts.

3. **Install and adjust drive belt**

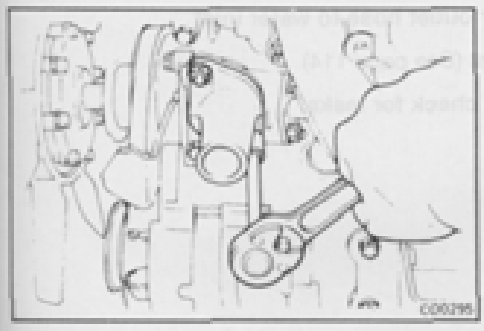
(See page 13)

4. **Refill with coolant (See page 114)**
5. **Start engine and check for leaks**

THERMOSTAT

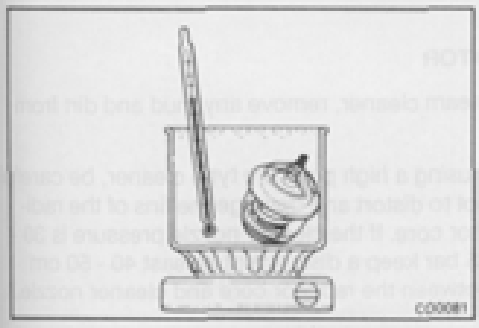
REMOVAL OF THERMOSTAT

1. **Drain coolant (See page 114)**
2. **Disconnect radiator outlet hose from water inlet**



3. **Remove water inlet and thermostat**

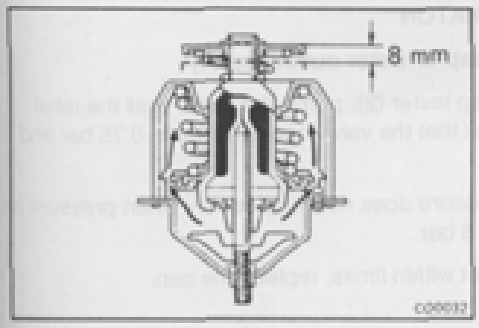
Remove the two nuts, water inlet, gasket and thermostat from the timing chain case.



INSPECTION OF THERMOSTAT

NOTE: The thermostat is numbered according to the valve opening temperature.

(a) Immerse the thermostat in water and heat the water gradually.

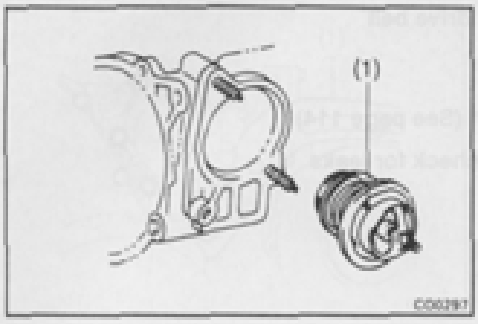


(b) Check the valve opening temperature and valve lift.

If the valve opening temperature and valve lift are not within the following specifications, replace the thermostat.

Valve opening temperature:
80 - 84°C
Valve lift:
8 mm or more at 95°C

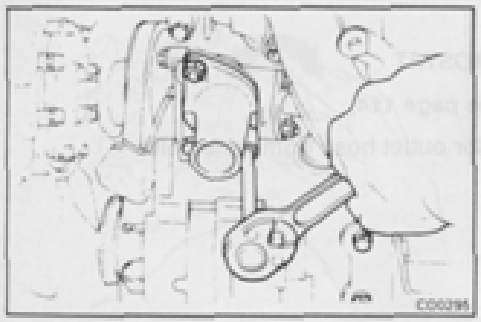
(c) Check that the valve spring is tight when the thermostat is fully closed. Replace as necessary.



INSTALLATION OF THERMOSTAT

1. **Install thermostat and water inlet**

   (a) Install a new gasket to the thermostat and place the thermostat with the valve (1) at the upper left as shown.



   (b) Install the water inlet with the two nuts.

   Torque: 12 Nm

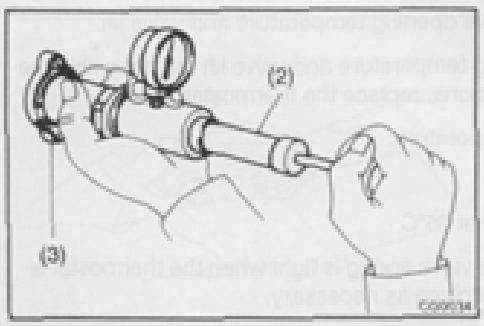
2. **Connect radiator outlet hose to water inlet**
3. **Refill with coolant** (See page 114)
4. **Start engine and check for leaks**

RADIATOR

CLEANING OF RADIATOR

Using water or a steam cleaner, remove any mud and dirt from the radiator core.

CAUTION: If using a high pressure type cleaner, be careful not to distort and damage the fins of the radiator core. If the cleaner nozzle pressure is 30 - 35 bar keep a distance of at least 40 - 50 cm between the radiator core and cleaner nozzle.



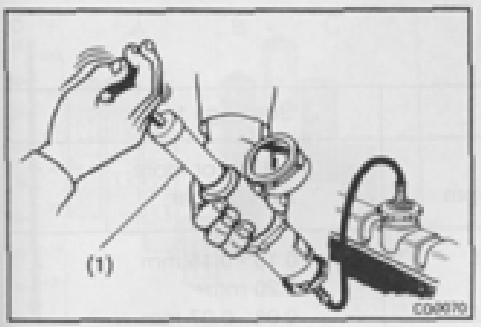
INSPECTION OF RADIATOR

1. **Inspect radiator cap or water outlet cap (3)**

   Using a radiator cap tester (2), pump the tester until the relief valve opens. Check that the valve opens between 0.75 bar and 1.05 bar.

   Check that the pressure does not drop rapidly when pressure on the cap is below 0.6 bar.

   If either check is not within limits, replace the cap.



2. Inspect cooling system for leaks

(a) Fill the radiator with coolant and attach a pressure tester (1).

(b) Warm up the engine.

(c) Pump it to 1.2 bar, check that pressure does not drop.

If the pressure drops, check for leaks from the hoses, radiator or water pump. If no external leaks are found, check the heater core, cylinder block and head.

LUBRICATION SYSTEM

SPECIFICATIONS

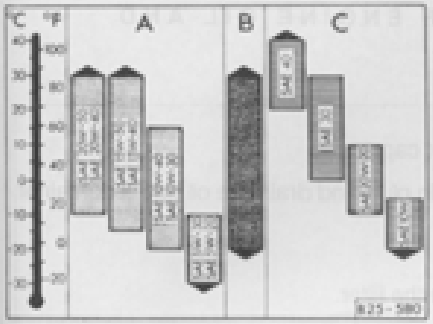
Engine oil capacity			See page 1
Oil pressure		at idle at 3000 rpm	0.3 bar or more 2.5 - 5.0 bar
Oil pump	Body clearance	Standard Limit	0.10 - 0.15 mm 0.20 mm
	Side clearance	Standard Limit	0.03 - 0.07 mm 0.15 mm
	Tip clearance	Standard Limit	0.07 - 0.12 mm 0.20 mm

TORQUE SPECIFICATIONS

Part tightened	Nm
Oil pump relief valve spring plug - Oil pump body	37
Oil pump cover - Oil pump body	8
Oil pump - Cylinder block	18
Oil pan - Cylinder block	13
Oil pan - Timing chain case	13
Oil pan - Rear oil seal retainer	13
Oil strainer - Oil pump cover	17
Oil strainer - Cylinder block	12

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Oil leakage	Cylinder head, cylinder block or oil pump body damaged or cracked	Repair as necessary	
	Oil seal faulty	Replace oil seal	47, 68
	Gasket faulty	Replace gasket	
Low oil pressure	Oil leakage	Repair as necessary	
	Relief valve faulty	Repair relief valve	123
	Oil pump faulty	Repair oil pump	123
	Engine oil poor quality	Replace engine oil	122
	Crankshaft bearing faulty	Replace bearing	53
	Connecting rod bearing faulty	Replace bearing	53
	Oil filter clogged	Replace oil filter	122
High oil pressure	Relief valve faulty	Repair relief valve	123



OIL PRESSURE CHECK

1. **Check engine oil quality**

   Check the oil for deterioration, entry of water, discoloring or thinning.

   If the quality is poor, replace the oil.

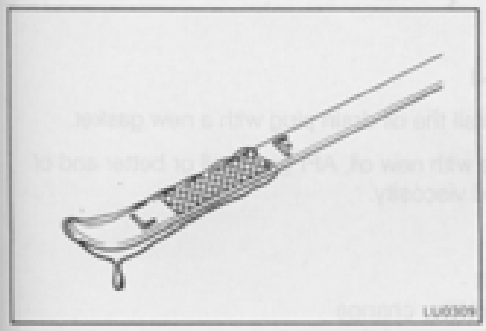
   Only use motor oils to API Specification.
   Make sure the viscosity class is correct.

   A - Multigrade oils, Specification VW 501 01
   A - Multigrade branded oils, Specification API - SE or SG

   B - Light running oils, Specification VW 500 00

   C - Single grade branded oils, Specification API - SE or SG

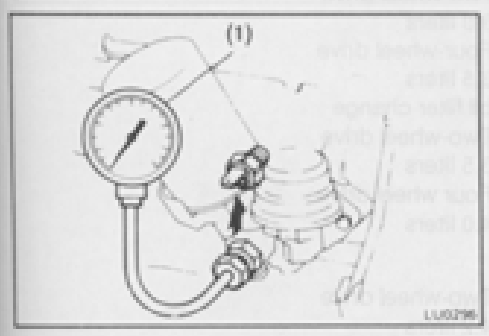
   Allow for anticipated outside temperature in period up to next oil change.



2. **Check engine oil level**

   The oil level should be between the "L" and "F" marks on the dipstick.

   If low, check for leakage and add oil up to the "F" mark.



3. **Remove oil pressure switch or sender gauge**
4. **Fit oil pressure gauge (1)**
5. **Start engine**

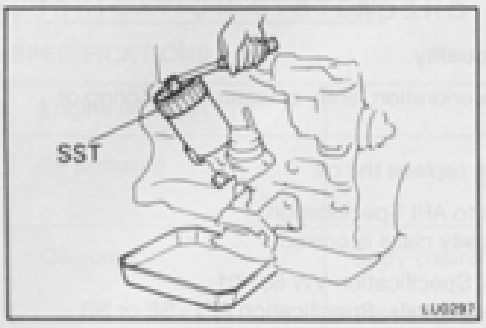
   Start engine and let it run until normal operating temperature is reached.

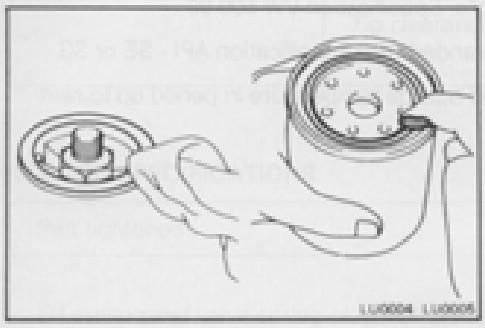
6. **Check oil pressure**

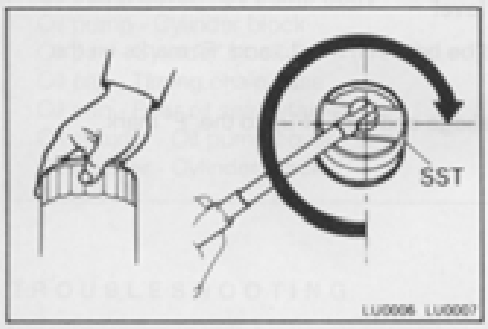
   Oil pressure:

At idle	0.3 bar or more .
At 3.000 rpm	2.5 - 5.0 bar

   NOTE: Check for oil leakage after reinstalling the oil pressure switch or sender gauge.







REPLACEMENT OF ENGINE OIL AND OIL FILTER

1. **Drain engine oil**

   (a) Remove the oil filter cap.

   (b) Remove the oil drain plug and drain the oil into a container.

2. **Replace oil filter**

   (a) Using SST, remove the filter.

   SST 09228-22020

   (b) Check and clean the oil filter installation surface.

   (c) Apply clean engine oil to the gasket of a new oil filter.

   (d) Lightly screw in the oil filter by hand until you feel resistance.

   (e) Then, using SST, tighten it another 3/4 turn.

   SST 09228-22020

3. **Fill with engine oil**

   (a) Clean and install the oil drain plug with a new gasket.

   (b) Fill the engine with new oil, API grade oil or better and of recommended viscosity.

   Capacity:

   Drain and refill -

without	oil filter change	
	Two-wheel drive	
	3.0 liters	
	Four-wheel drive	
	3.5 liters	
with	oil filter change	
	Two-wheel drive	
	3.5 liters	
	Four wheel drive	
	4.0 liters	

   Dry fill -

Two-wheel drive	
4.2 liters	
Four wheel drive	
4.6 liters	

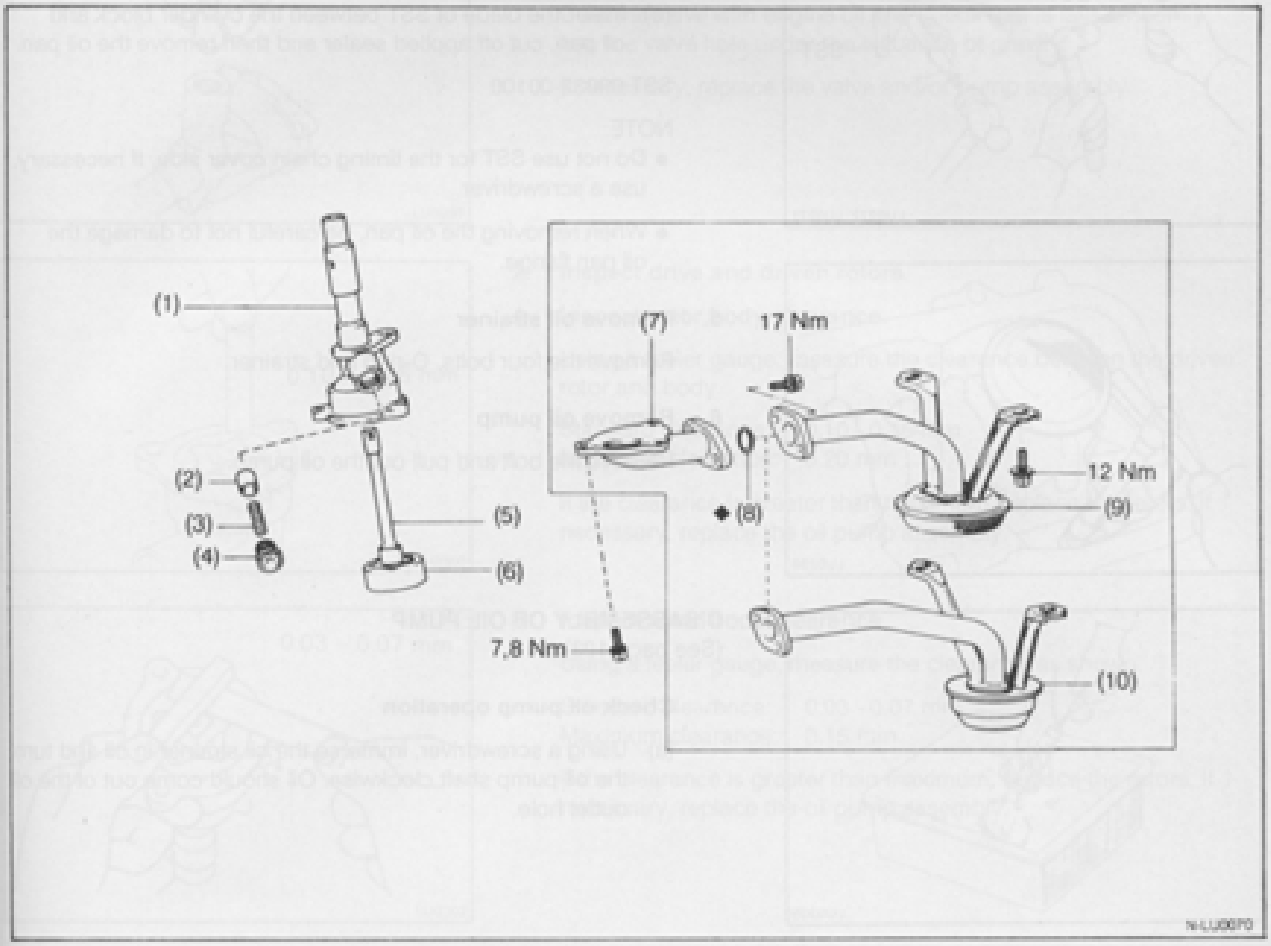
   (c) Install the oil filter cap with the gasket.

4. **Start engine and check for leaks**

5. **Recheck engine oil level (See page 10, 11)**

OIL PUMP

COMPONENTS



(1) Oil Pump Body
(2) Relief Valve
(3) Spring
(4) Plug
(5) Drive Rotor
(6) Driven Rotor
(7) Oil Pump Cover
(8) O-ring
(9) Oil Retainer, 2WD type
(10) Oil Retainer, 4WD type

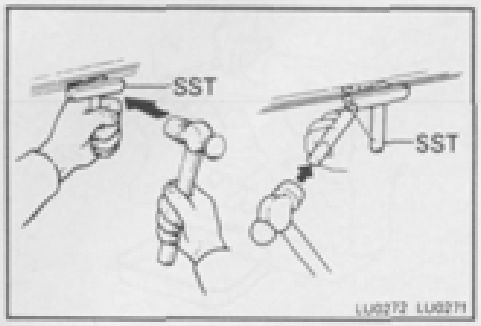
◆ Non-reusable part

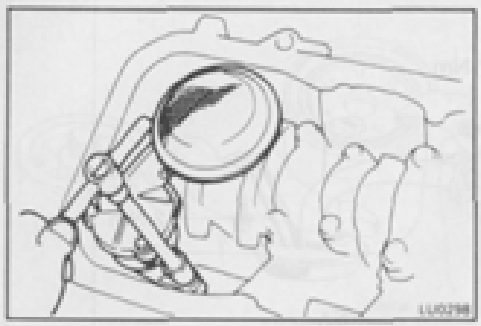
REMOVAL OF OIL PUMP

1. **Raise vehicle**

   CAUTION: Be sure the vehicle is securely supported.

2. **Drain engine oil** (See step 1 on page 122)
3. **Remove right and left stiffener plates**





4. **Remove oil pan**

   (a) Remove the eighteen bolts.

   (b) Insert the blade of SST between the cylinder block and oil pan, cut off applied sealer and then remove the oil pan.

   SST 09032-00100

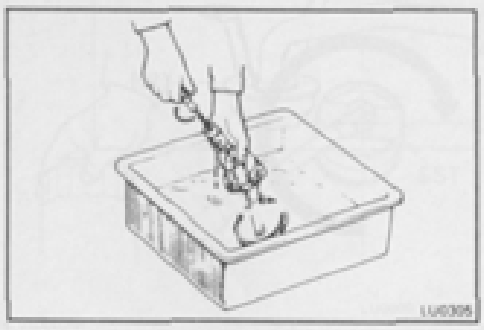
   NOTE:
   - Do not use SST for the timing chain cover side. If necessary, use a screwdriver.
   - When removing the oil pan, be careful not to damage the oil pan flange.

5. **Remove oil strainer**

   Remove the four bolts, O-ring and strainer.

6. **Remove oil pump**

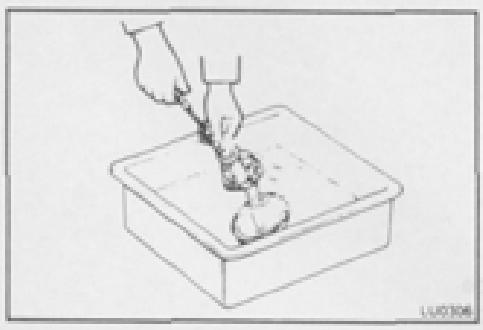
   Remove the bolt and pull out the oil pump.



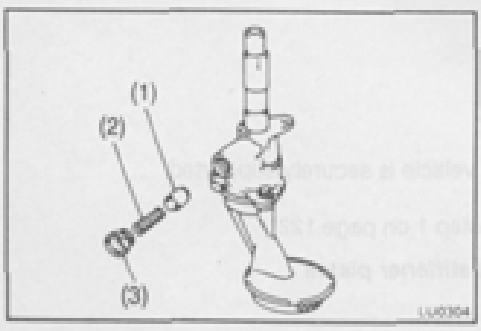
DISASSEMBLY OF OIL PUMP
(See page 123)

1. **Check oil pump operation**

   (a) Using a screwdriver, immerse the oil strainer in oil and turn the oil pump shaft clockwise. Oil should come out of the oil outlet hole.



   (b) Close the oil outlet hole with your thumb and turn the oil pump shaft as before. The oil pump shaft should be difficult to turn.



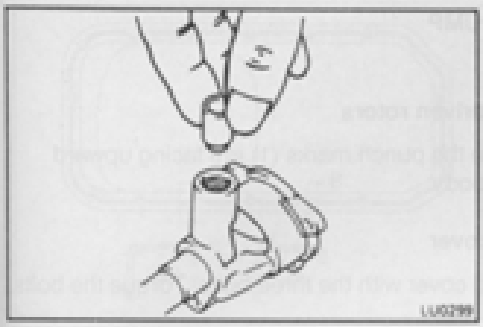
2. **Remove relief valve**

   Remove the relief valve plug (3), spring (2) and valve (1).

3. **Remove oil pump cover**

   Remove the three bolts and oil pump cover.

4. **Remove drive and driven rotors**

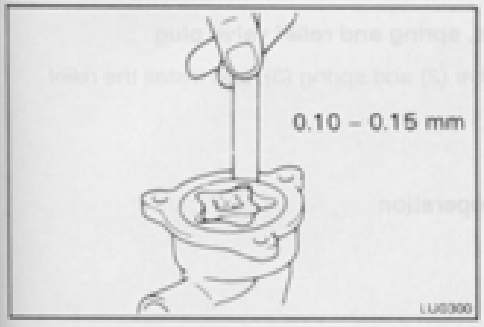


INSPECTION OF OIL PUMP

1. Inspect relief valve operation

Coat the valve with engine oil and check that is falls smoothly into the valve hole under the influence of gravity.

If necessary, replace the valve and/or pump assembly.



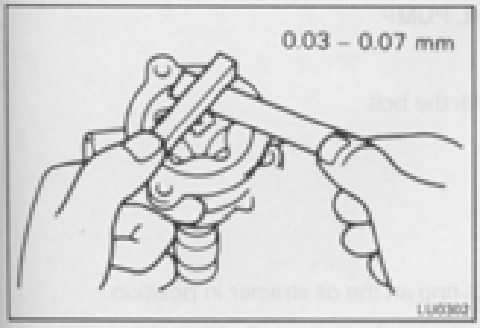
2. Inspect drive and driven rotors

A. Inspect rotor body clearance

Using a feeler gauge, measure the clearance between the driven rotor and body.

Standard clearance: 0.10 - 0.15 mm
Maximum clearance: 0.20 mm

If the clearance is greater than maximum, replace the rotors. If necessary, replace the oil pump assembly.

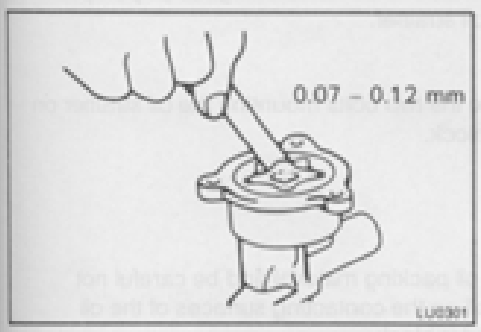


B. Inspect rotor body clearance

Using a feeler gauge, measure the clearance as shown.

Standard clearance: 0.03 - 0.07 mm
Maximum clearance: 0.15 mm

If the clearance is greater than maximum, replace the rotors. If necessary, replace the oil pump assembly.

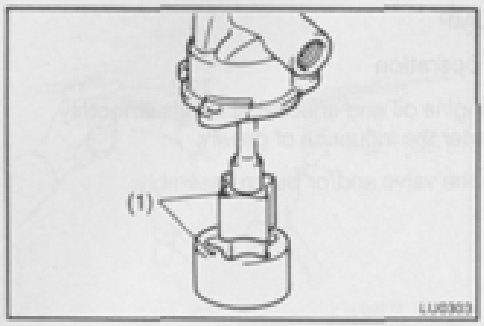


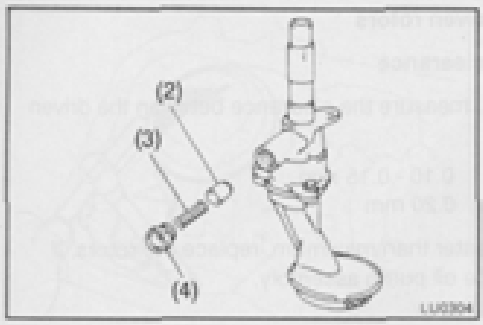
C. Inspect rotor tip clearance

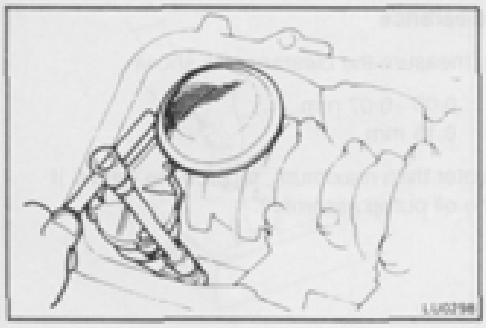
Using a feeler gauge, measure the clearance between the drive rotor and driven rotor.

Standard clearance: 0.07 - 0.12 mm
Maximum clearance: 0.20 mm

If the clearance is greater than maximum, replace the rotors. If necessary, replace the oil pump assembly.







ASSEMBLY OF OIL PUMP

(See page 123)

1. **Install drive and driven rotors**

   Install the rotors so the punch marks (1) are facing upward toward the pump body.

2. **Install oil pump cover**

   Install the oil pump cover with the three bolts. Torque the bolts.

   Torque: 7.8 Nm

3. **Install relief valve, spring and relief valve plug**

   Insert the relief valve (2) and spring (3), and install the relief valve plug (4).

   Torque: 37 Nm

4. **Check oil pump operation**
   (See page 124)

INSTALLATION OF OIL PUMP

1. **Fit oil pump**

   Fit the oil pump with the bolt.

   Torque the bolt.

   Torque: 18 Nm

2. **Fit oil strainer**

   (a) Place a new O-ring an the oil strainer in position.

   (b) Fit and torque the two bolts mounting the oil pump cover to the oil strainer.

   Torque: 17 Nm

   (c) Fit and torque the two bolts mounting the oil strainer on the cylinder block.

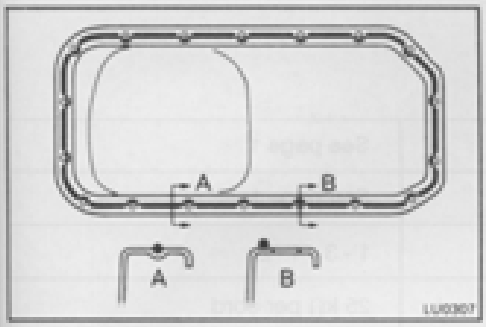
   Torque: 12 Nm

3. **Fit oil pan**

   (a) Remove any oil packing material and be careful not to drop any oil on the contacting surfaces of the oil pan and cylinder block.

   - Using a razor blade and gasket scraper, remove all the old packing material from the gasket surfaces and sealing groove.
   - Thoroughly clean all components to remove all the loose material.
   - Clean both sealing surfaces with a non-residue solvent.

   CAUTION: Do not use a solvent which will affect the painted surfaces.



(b) Apply seal packing to the oil pan as shown in the figure.

Seal packing:

Part No. AMV 188 200 03 or equivalent

- Fit a nozzle that has been cut to fit the 3 mm opening.

NOTE: Avoid applying an excess amount to the surface. Be exspecially careful near oil passages.

- Part must be assembled within 15 minutes of application. Otherwise, the material must be removed and reapplied.
- Immediately remove nozzle from tube and reinstall cap.

(c) Fit the oil pan with the eighteen bolts.

Torque: 13 Nm

IGNITION SYSTEM

SPECIFICATIONS

Ignition timing		See page 1
Spark plug		See page 1
Firing order		1 - 3 - 4 - 2
High-tension cord	Resistance	25 kΩ per cord
Ignition coil	Primary coil resistance Conventional type Secondary coil resistance	 1.3 - 1.6 Ω 10.7 - 14.5 kΩ
Distributor	Rubbing block gap Damping spring gap Dwell angle Governor shaft thrust clearance Governor shaft thrust washer thickness Conventional type	0.45 mm 0.05 - 0.45 mm 52 ±6° 0.15 - 0.50 mm 2.3 mm 2.5 mm 2.7 mm 2.9 mm

Distributor advance angle (Part No.)	Governor		Vacuum	
	Dis. rpm	Advance angle	mm Quicksilver (HG)	Advance angle
Conventional type (19100-73050)	700 1.113 1.950 3.000	Advance begins 2.8° 9.5° 9.2°	Main	
			80 158 247	Advance begins 5.3° 9.5°
			Sub	
			180 224 280	Advance begins 3.1° 6.0°
Conventional type (19100-73060)	700 1.200 2.400 3.000	Advance begins 5.0° 11.0° 10.8°	Main	
			120 208 310	Advance begins 5.2° 9.5°
			Sub	
			180 224 280	Advance begins 3.1° 6.0°

PRECAUTIONS

1. Do not keep the ignition switched on for more than 10 minutes if the engine does not start.

2. When a tachometer is connected to the system, connect the test probe of the tachometer to the ignition coil negative (-) terminal.

3. As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before using.

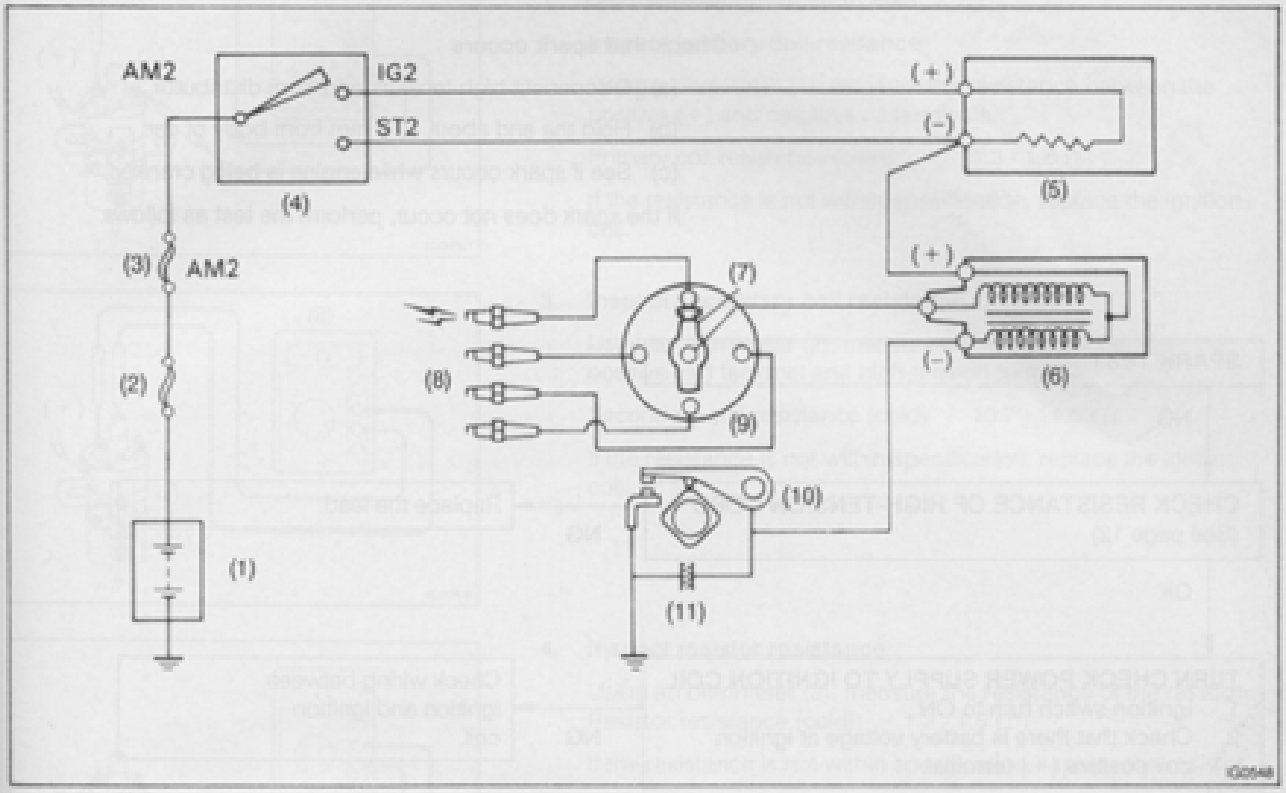
4. NEVER allow the tachometer terminal to contact on earth as it could result in damage to the igniter and/or ignition coil.

5. Do not disconnect the battery while the engine is running.

6. Make sure that the igniter is properly earthed to the body.

Problem	Possible cause	Remedy	Page
Engine will not start/ hard to start (cranks ok)	Incorrect ignition timing	Reset timing	13,14
	Ignition coil faulty	Inspect coil	133
	Distributor faulty	Inspect distributor	134
	High-tension cord faulty	Inspect high-tension cords	12
	Spark plug faulty	Inspect plugs	12
	Ignition wiring disconnected or broken	Inspect wiring	
Rough idle or stalls	Spark plug faulty	Inspect plugs	12
	Ignition wiring faulty	Inspect wiring	12
	Incorrect ignition timing	Reset timing	13-14
	Ignition coil faulty	Inspect coil	133
	Distributor faulty	Inspect distributor	134
	High-tension lead faulty	Inspect high-tension cords	12
Engine misfires/ poor acceleration	Spark plug faulty	Inspect plugs	12
	Ignition wiring faulty	Inspect wiring	12
	Incorrect ignition timing	Reset timing	13-14
Engine dieseling (runs after ignition switch is turned off)	Incorrect ignition timing	Reset timing	13-14
Continous muffler explosion (after fire)	Incorrect ignition timing	Reset timing	13-14
Engine backfires	Incorrect ignition timing	Reset timing	13-14
Poor fuel consumption	Spark plug faulty	Inspect plugs	12
	Incorrect ignition timing	Reset timing	13-14
Engine overheats	Incorrect ignition timing	Reset timing	13-14

IGNITION SYSTEM CIRCUIT



(1) Battery
(2) MAIN (2.0L)
(3) Fusible Link
(4) Ignition Switch
(5) Ignition Coil Resistor
(6) Ignition Coil
(7) Cap and Rotor
(8) Spark Plug, Firing Order 1-3-4-2
(9) Distributor
(10) Breaker Point
(11) Condenser

ON-VEHICLE INSPECTION

SPARK TEST

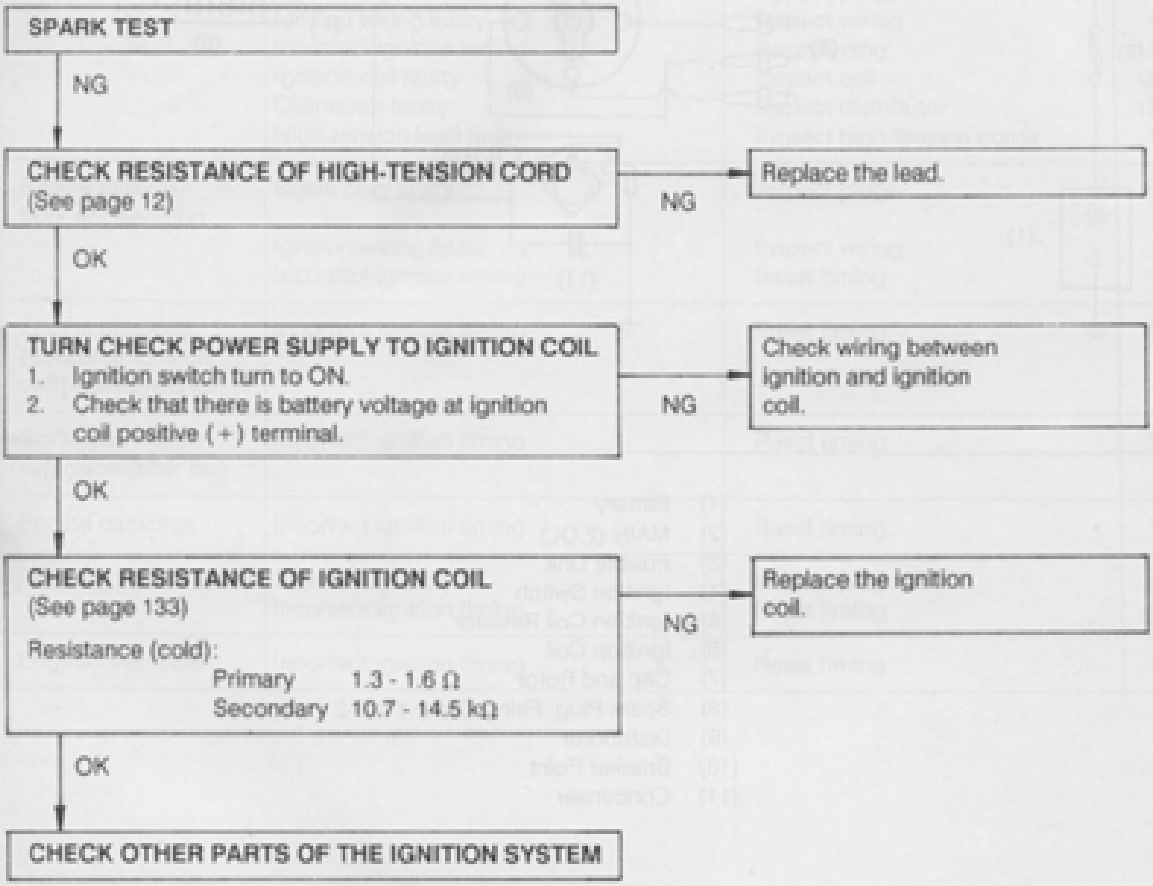
Check that spark occurs

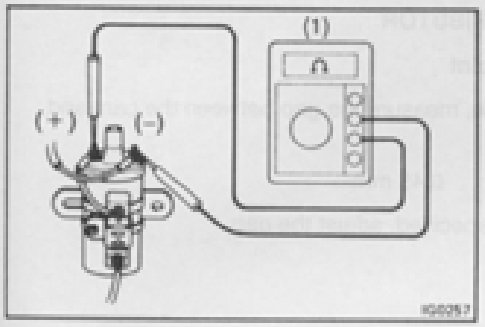
(a) Disconnect high-tension lead from distributor.

(b) Hold the end about 12.5 mm from body of car.

(c) See if spark occurs while engine is being cranked.

If the spark does not occur, perform the test as follows.





INSPECTION OF IGNITION COIL

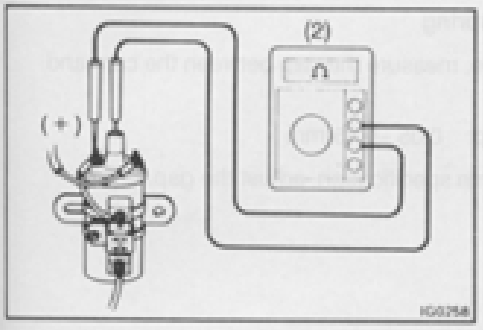
1. **Disconnect high-tension lead**

2. **Inspect primary coil resitance**

   Using a ohmmeter (1), measure the resistance between the positive (+) and negative (-) terminals.

   Primary coil resistance (cold): 1.3 - 1.6 Ω

   If the resistance is not within specification, replace the ignition coil.

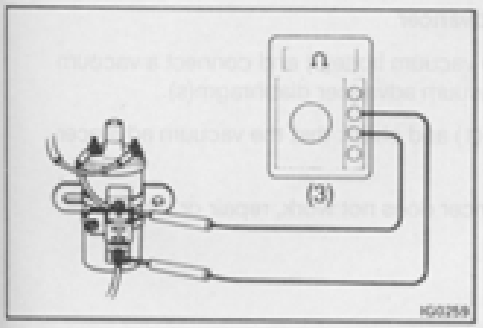


3. **Inspect secondary coil resistance**

   Using an ohmmeter (2), measure the resistance between the positive (+) terminal and high-tension terminal.

   Secondary coil resistance (cold): 10.7 - 14.5 kΩ

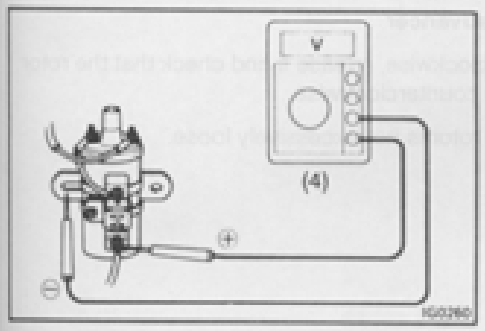
   If the resistance is not within specification, replace the ignition coil.



4. **Inspect resistor resistance**

   Using an ohmmeter (3), measure the resistance of the resistor.
   Resistor resistance (cold): 1.3 - 1.5 Ω

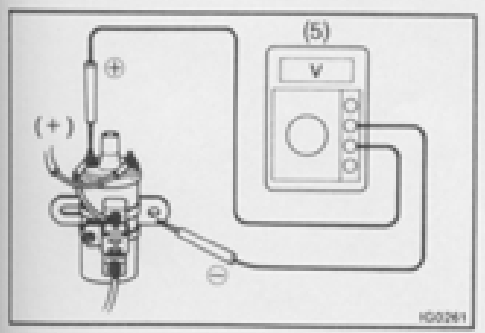
   If the resistance is not within specification, replace the resistor.



5. **Inspect power source line**

   (a) With the ignition switch at ON and using a voltmeter (4), connect the positive (+) probe to the terminal of resistor (black and red wire) and the negative (-) probe to body ground.

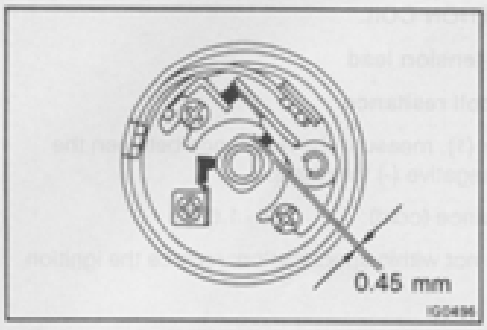
   Voltage: Approx. 12V



   (b) With the ignition switch at START and using a voltmeter (5), connect the positive (+) probe to the ignition coil (+) terminal and the negative (-) probe to body earth.

   Voltage: Approx. 12V

   If a problem is found, check the ignition switch and wire harness.



INSPECTION OF DISTRIBUTOR

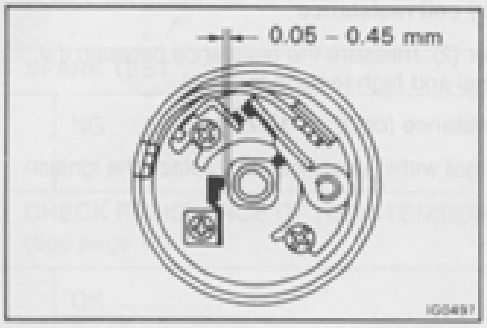
1. Inspect breaker point

Using a feeler gauge, measure the gap between the cam and rubbing block.

Rubbing block gap: 0.45 mm

If the gap is not as specified, adjust the gap.

(See page 142)



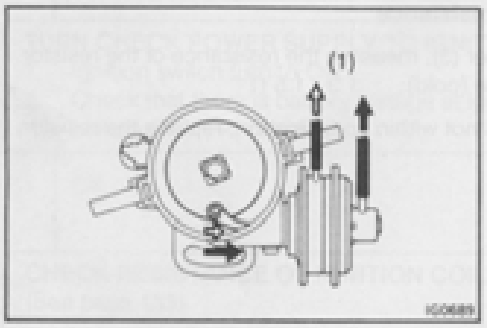
2. Inspect damping spring

Using a feeler gauge, measure the gap between the cam and damping spring.

Damping spring gap: 0.05 - 0.45 mm

If the gap is not within specification, adjust the gap.

(See page 143)

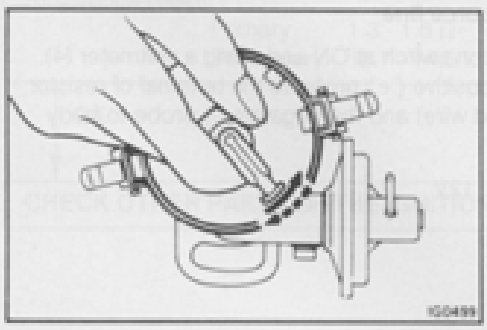


3. Inspect vacuum advancer

(a) Disconnect the vacuum hose(s) and connect a vacuum pump to the vacuum advancer diaphragm(s).

(b) Apply vacuum (1) and check that the vacuum advancer moves.

If the vacuum advancer does not work, repair or replace as necessary.



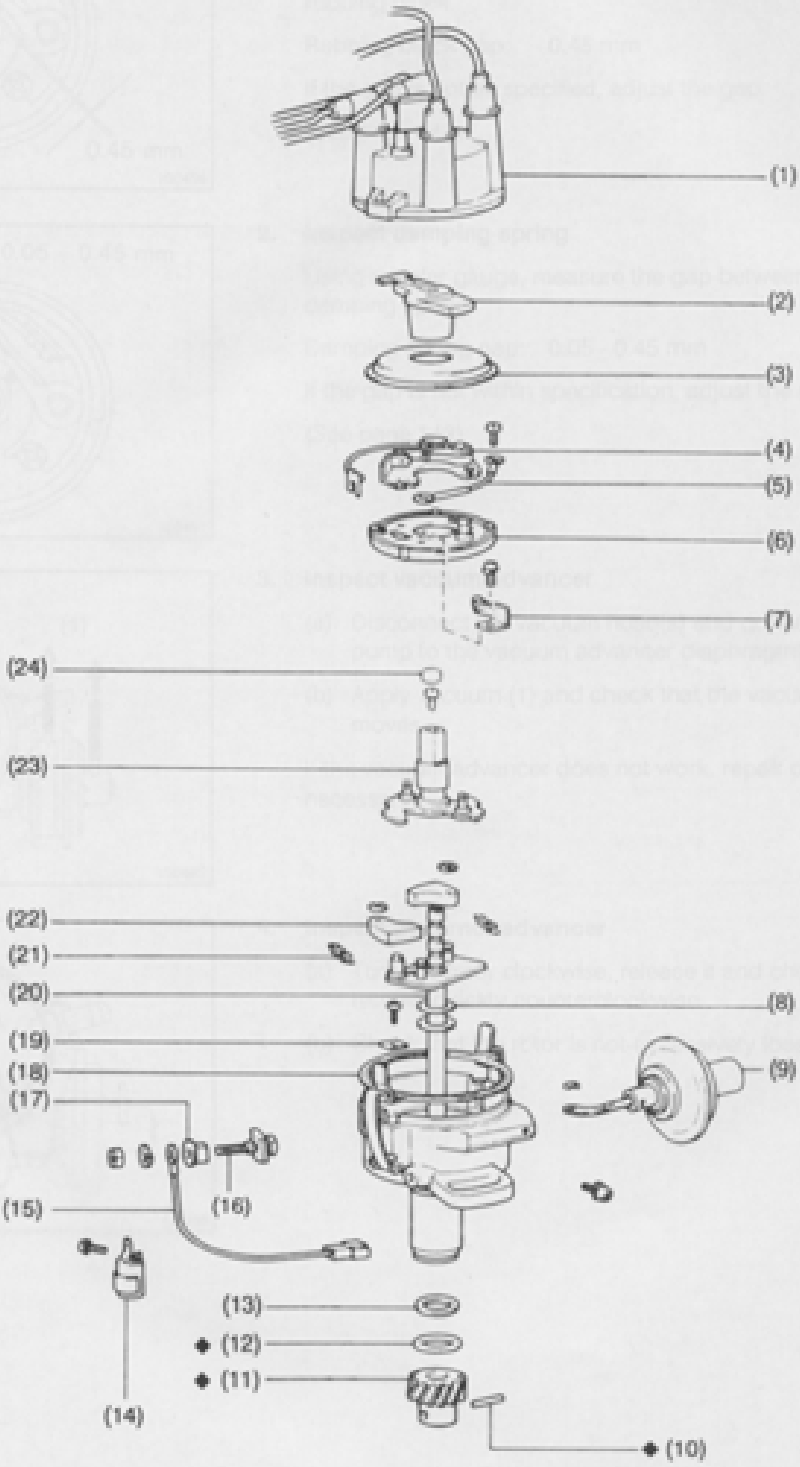
4. Inspect governor advancer

(a) Turn the rotor clockwise, release it and check that the rotor returns quickly counterclockwise.

(b) Check that the rotor is not excessively loose.

DISTRIBUTOR

COMPONENTS



(1) Distributor Cap (with High Tension Cord)
(2) Rotor
(3) Dust Cover
(4) Breaker Point
(5) Lead Wire
(6) Breaker Plate
(7) Damping Spring
(8) Thrust Washer
(9) Vacuum Advancer
(10) Straight Pin
(11) Driven Gear
(12) O-ring
(13) Plate Washer
(14) Condenser
(15) Distributor Wire
(16) Terminal
(17) Insulator
(18) Gasket
(19) Plate Washer
(20) Governor Shaft
(21) Governor Spring
(22) Governor Weight
(23) Cam
(24) Grease Stopper

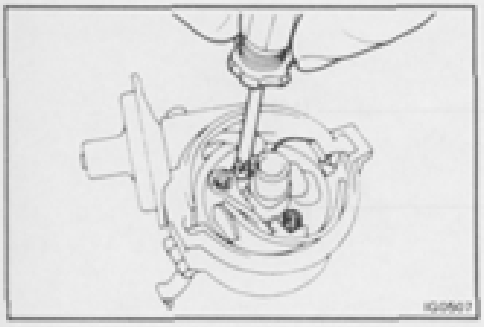
♦ Non-reusable part

DISASSEMBLY OF DISTRIBUTOR

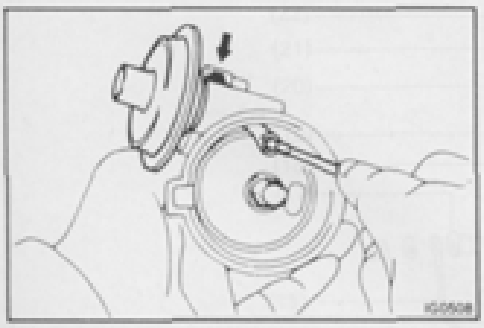
(See page 136)

1. **Remove distributor cap without disconnecting high-tension cords**
2. **Remove rotor and dust cover**

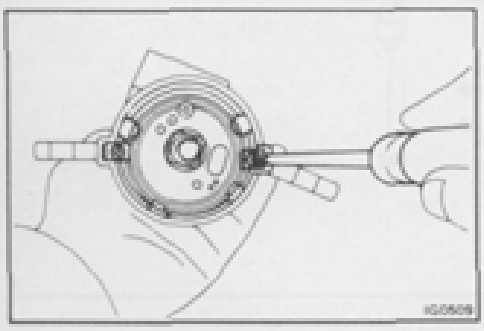
3. **Remove distributor wire and terminal**
   (a) Remove the nut and spring washer.
   (b) Remove the distributor wire and condenser.
   (c) Remove the insulator and terminal.



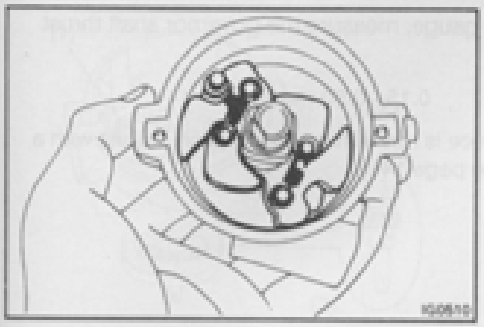
4. **Remove breaker point**
   Remove the two screws and breaker point.
5. **Remove damping spring**



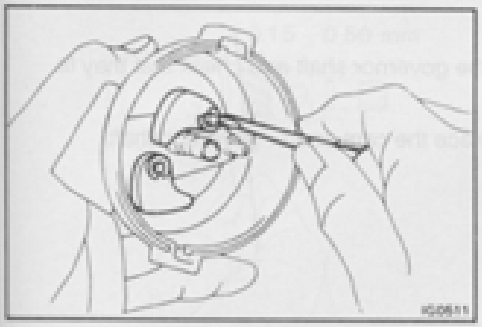
6. **Remove vacuum advancer**
   (a) Remove the screw from the distributor housing.
   (b) Remove the E-ring, turn and pull out the vacuum advancer.



7. **Remove breaker plate**
   Remove the two screws, plate washers and lead wire.
   Pull out the breaker plate.

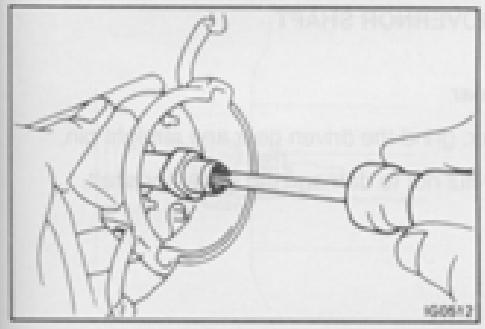


8. **Remove governor springs**



9. **Remove governor weights**

Using a small screwdriver, remove the E-ring and pull out the weight. Remove the two weights.



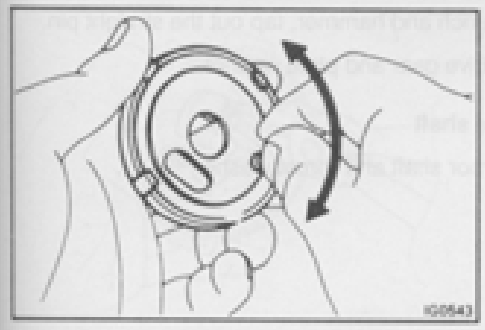
10. **Remove cam**

(a) Pry out the grease stopper.

(b) Remove the screw at the top of the governor shaft.

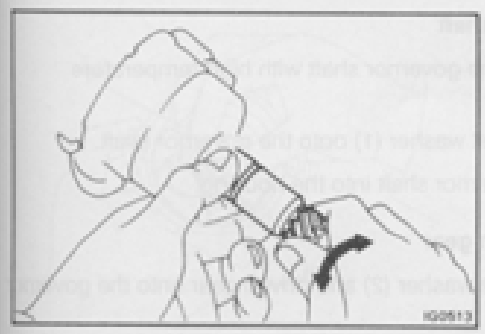
(c) Pull out the cam.

INSPECTION OF DISTRIBUTOR



1. **Inspect breaker plate**

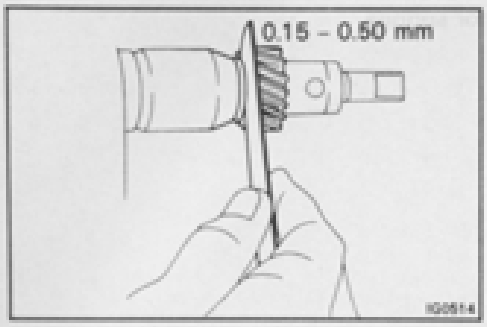
Turn the breaker plate and check that it has a slight drag. If it sticks or strongly resists, replace the breaker plate.



2. **Inspect governor shaft**

(a) Turn the governor shaft and check that it is not rough or worn.

If it feels rough or worn, replace the governor shaft.



(b) Using a feeler gauge, measure the governor shaft thrust clearance.

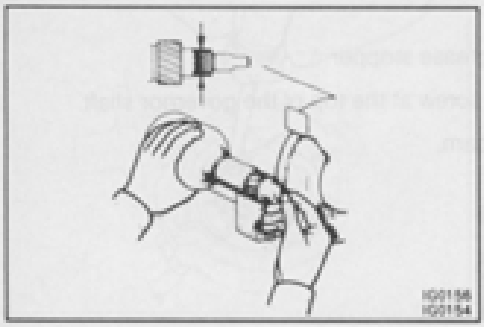
Thrust clearance: 0.15 - 0.50 mm

If the thrust clearance is not within specification, adjust with a thrust washer. (See page 141)

3. Inspect cam

Install the cam to the governor shaft and check that they fit correctly.

If they don't fit, replace the cam and/or governor shaft.

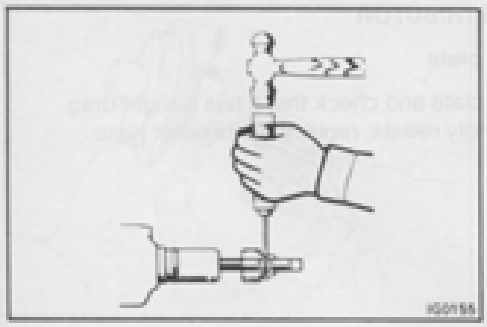


REPLACEMENT OF GOVERNOR SHAFT (OR DRIVEN GEAR)

1. Remove driven gear

(a) Using a grinder, grind the driven gear and straight pin.

CAUTION: Be careful not to damage the governor shaft.

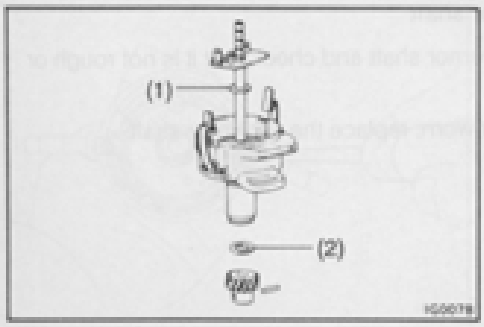


(b) Using a pin punch and hammer, tap out the straight pin.

(c) Remove the drive gear and plate washer.

2. Remove governor shaft

Remove the governor shaft and thrust washer.



3. Install governor shaft

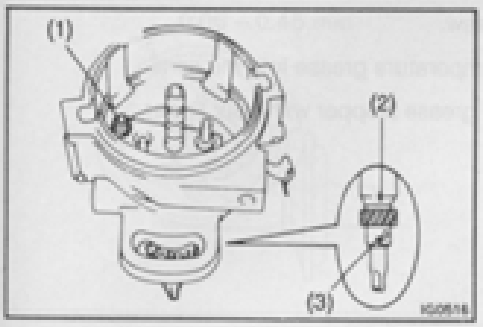
(a) Lightly coat the governor shaft with high-temperature grease.

(b) Slide the thrust washer (1) onto the governor shaft.

(c) Push the governor shaft into the housing.

4. Install new driven gear

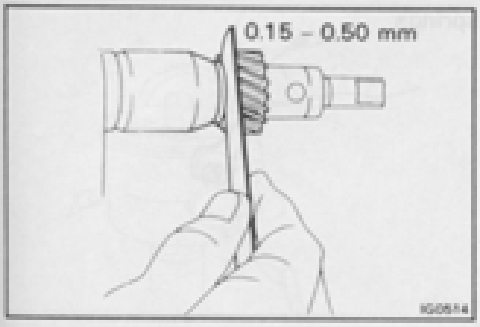
(a) Slide the plate washer (2) and driven gear onto the governor shaft.



(b) Align the drill mark (3) on the driven gear (not driven gear straight pin hole) with the groove (2) of the housing.

CAUTION: Be sure to check the stopper pin (1) is positioned as shown.

(c) Install a new straight pin.

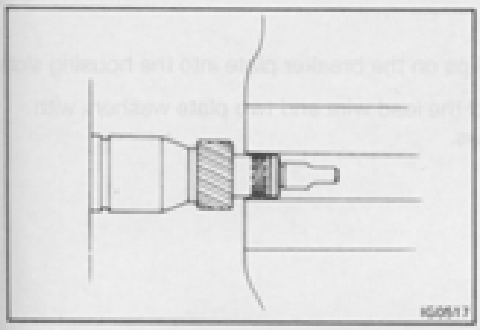


(d) Using a feeler gauge, measure the governor shaft thrust clearance.

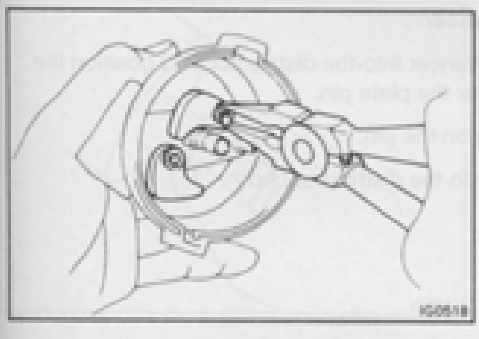
Thrust clearance: 0.15 - 0.50 mm

If the clearance is not within specification, adjust with a thrust washer.

Thrust washer thickness:
2.3 mm
2.5 mm
2.7 mm
2.9 mm



(e) Secure the ends of the straight pin in a vice.

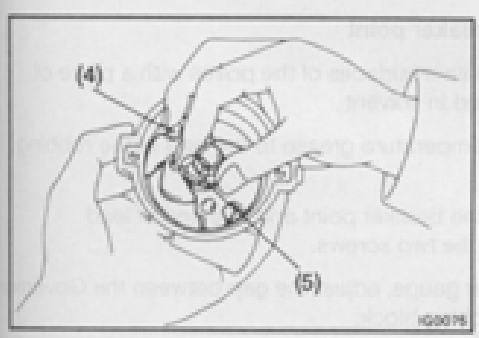


ASSEMBLY OF DISTRIBUTOR
(See page 136)

1. **Install governor weights**

Using needle-nose pliers, install the weight with the E-ring. Install the two weights.

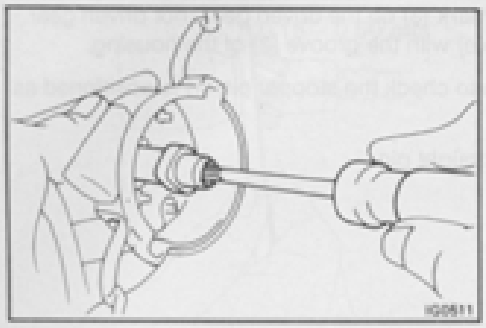
2. **Lightly coat governor shaft with high-temperature grease**



3. **Install cam**

(a) Install the cam on the governor shaft as shown.

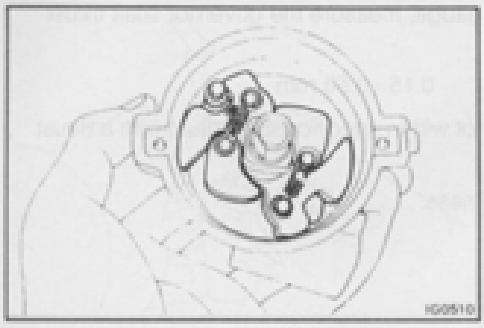
(4) Stopper Pin
(5) Cut-out



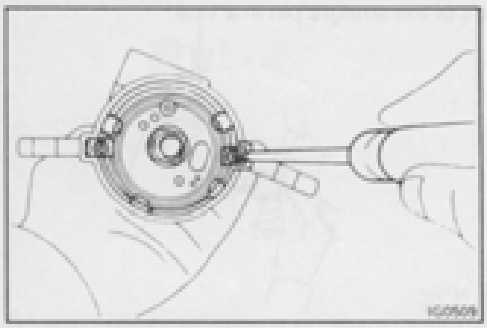
(b) Install the screw.

(c) Pack high-temperature grease into the cam.

(d) Press on the grease stopper with your finger.



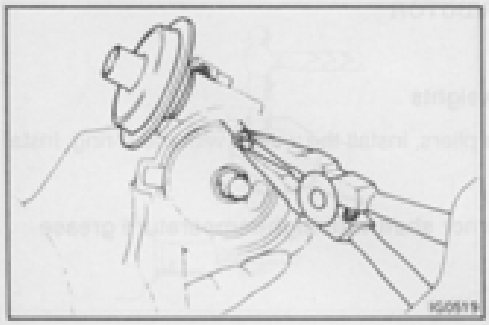
4. Install governor springs



5. Fit breaker plate

(a) Fit the four clips on the breaker plate into the housing slots.

(b) Fit one end of the lead wire and two plate washers with the two screws.

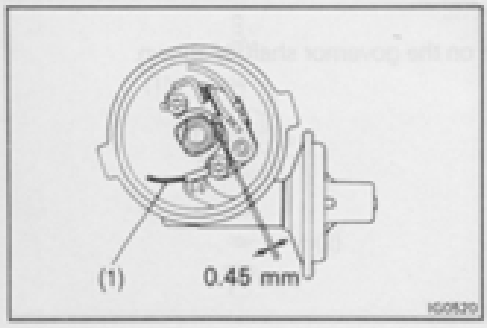


6. Fit vacuum advancer

(a) Insert the advancer into the distributor and position the lever hole over the plate pin.

(b) Fit the E-ring on the pin.

(c) Fit the screw to the distributor body.



7. Fit and adjust breaker point

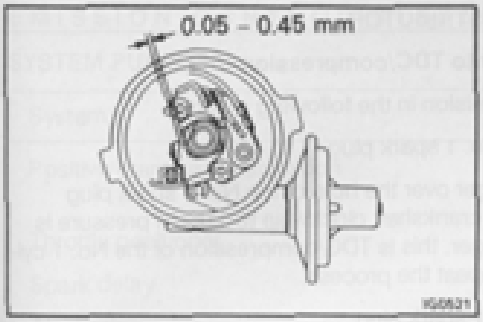
(a) Clean the contact surfaces of the points with a piece of cloth saturated in solvent.

(b) Apply high-temperature grease to the heel of the rubbing block.

(c) Loosenly fit the breaker point and one end of lead wire (1) with the two screws.

(d) Using a feeler gauge, adjust the gap between the Governor shaft and rubbing block.

Rubbing block/Governor shaft gap: 0.45 mm



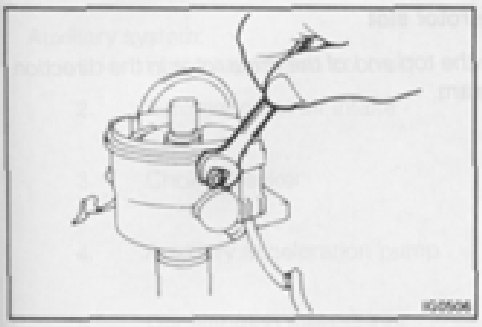
8. **Fit and adjust damping spring**

   (a) Apply high-temperature grease to the heel of the damping spring.

   (b) Loosenly fit the damping spring with the screw.

   (c) Using a feeler gauge, adjust the gap between the Governor shaft and damping spring.

   Damping spring gap: 0.05 - 0.45 mm



9. **Fit lead wire and terminal**

   (a) Fit the terminal and insulator.

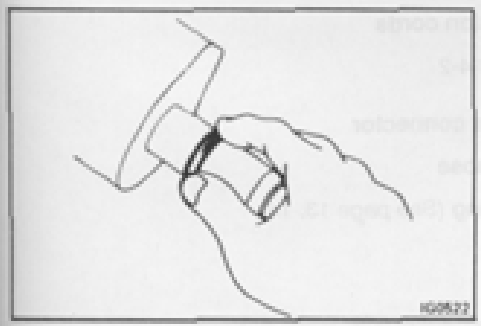
   (b) Fit the condenser and distributor wire.

   (c) Fit the spring washer and nut.

10. **Fit rotor and dust cover**

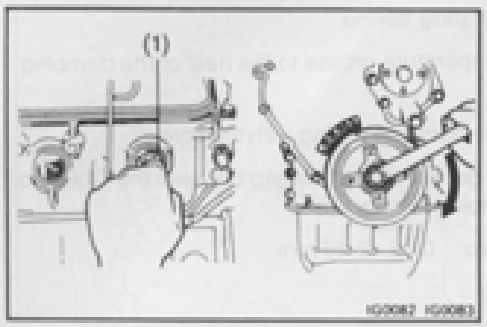
11. **Fit distributor cap and high-tension cords assembly**

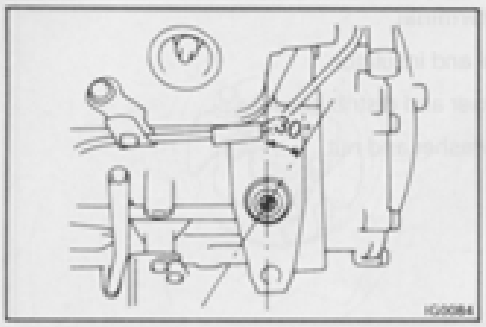
    Fit the gasket and gap with the two cap springs.

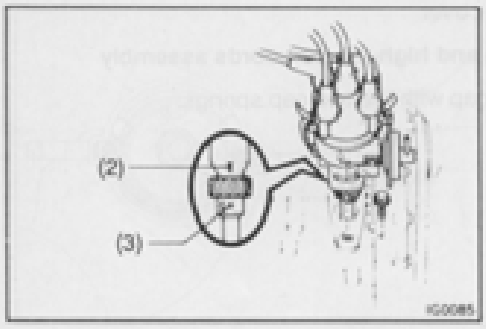


12. **Fit new O-ring to distributor housing**

    NOTE: Lightly coat the O-ring with engine oil.







INSTALLATION OF DISTRIBUTOR

1. **Set No. 1 cylinder to TDC/compression**

   Set to TDC/compression in the following manner.

   (a) Remove the No. 1 spark plug.

   (b) Place your finger over the hole of the No. 1 spark plug and rotate the crankshaft clockwise to TDC. If pressure is felt on your finger, this is TDC/compression of the No. 1 cylinder. If not, repeat the process.

   (c) Install the No. 1 spark plug.

2. **Set oil pump drive rotor slot**

   Position the slot on the top end of the drive rotor in the direction, as show in the diagram.

3. **Fit distributor**

   (a) Align the groove (2) of the housing with the drill mark (3) of the driven gear (not driven gear straight pin).

   (b) Insert the distributor, aligning the center of the flange with that of the bolt hole on the cylinder block.

   (c) Lightly tighten the hold-down bolt.

4. **Connect high-tension cords**

   Firing order: 1-3-4-2

5. **Connect distributor connector**

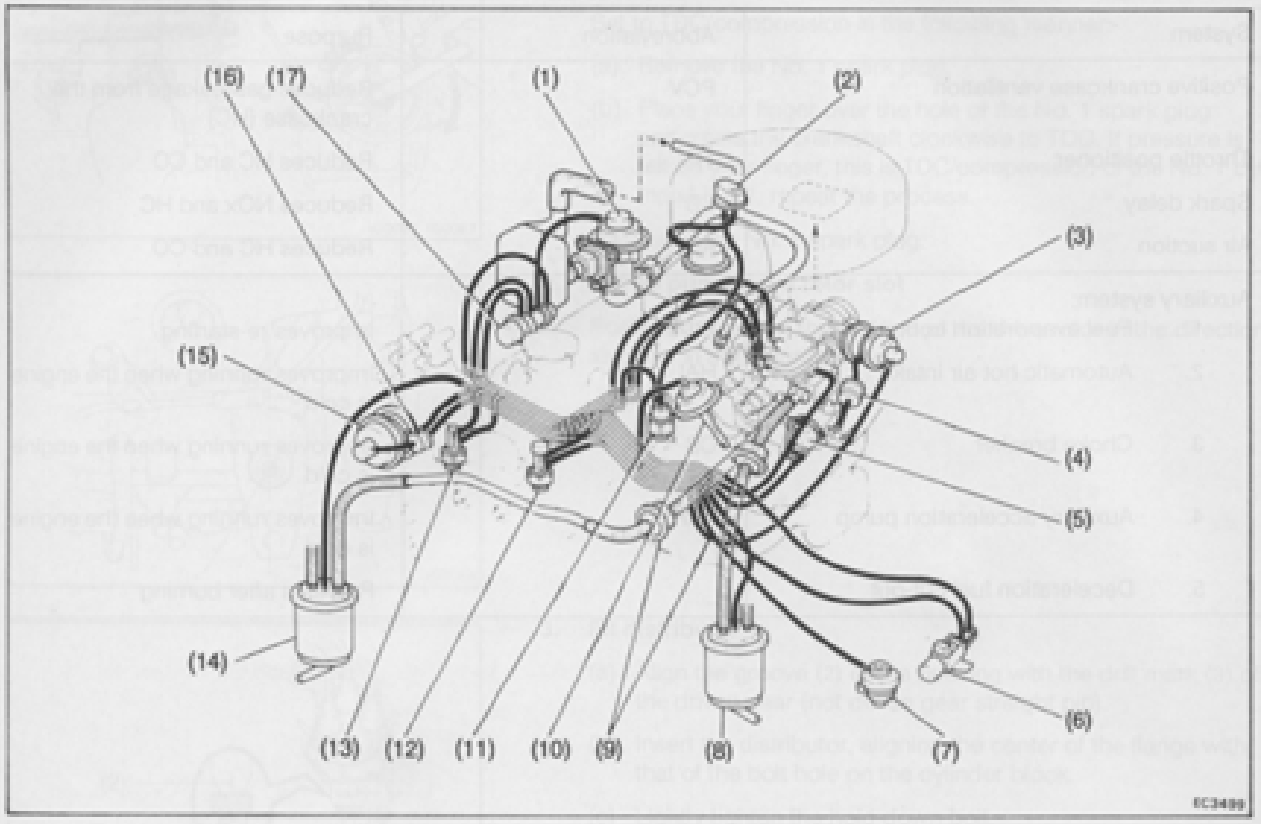
6. **Connect vacuum hose**

7. **Adjust ignition timing** (See page 13, 14)

EMISSION CONTROL SYSTEM

SYSTEM PURPOSE

System	Abbreviation	Purpose
Positive crankcase ventilation	PCV	Reduces gas leakage from the crankcase (HC)
Throttle positioner	TP	Reduces HC and CO
Spark delay	SD	Reduces NOx and HC
Air suction	AS	Reduces HC and CO
Auxiliary system:		
1. Fuel evaporation control	EVAP	Improves re-starting
2. Automatic hot air intake	HAI	Improves running when the engine is cold
3. Choke breaker	CB	Improves running when the engine is cold
4. Auxiliary acceleration pump	AAP	Improves running when the engine is cold
5. Deceleration fuel cut-out	–	Prevents after burning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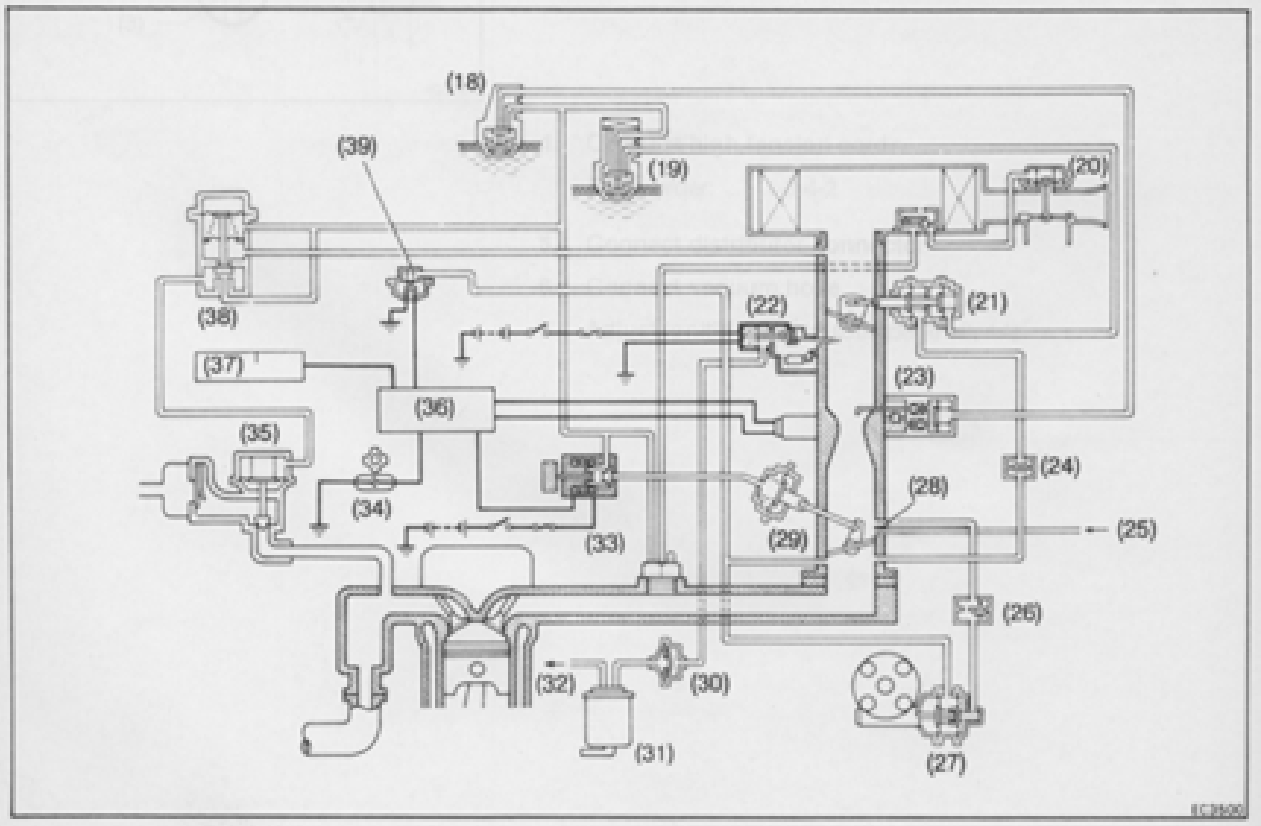
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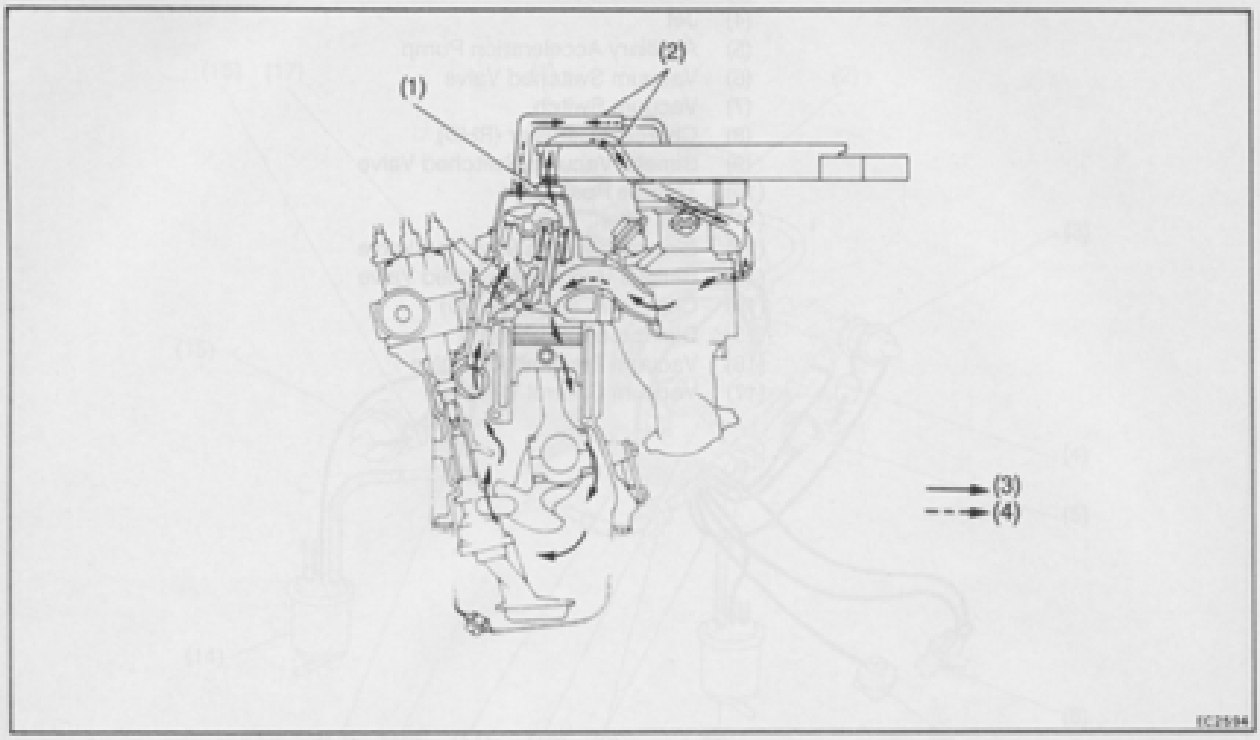
EC3500

(1) Reed Valve
(2) Thermo Valve
(3) Choke Breaker
(4) Jet
(5) Auxiliary Acceleration Pump
(6) Vacuum Switched Valve
(7) Vacuum Switch
(8) Charcoal Canister (RHD)
(9) Bimetal Vacuum Switched Valve
(10) Throttle Positioner
(11) Gas Filler
(12) Bimetal Vacuum Switched Valve
(13) Bimetal Vacuum Switched Valve
(14) Charcoal Canister (LHD)
(15) Distributor Diaphragm
(16) Vacuum Transmitting Valve
(17) Vacuum Control Valve

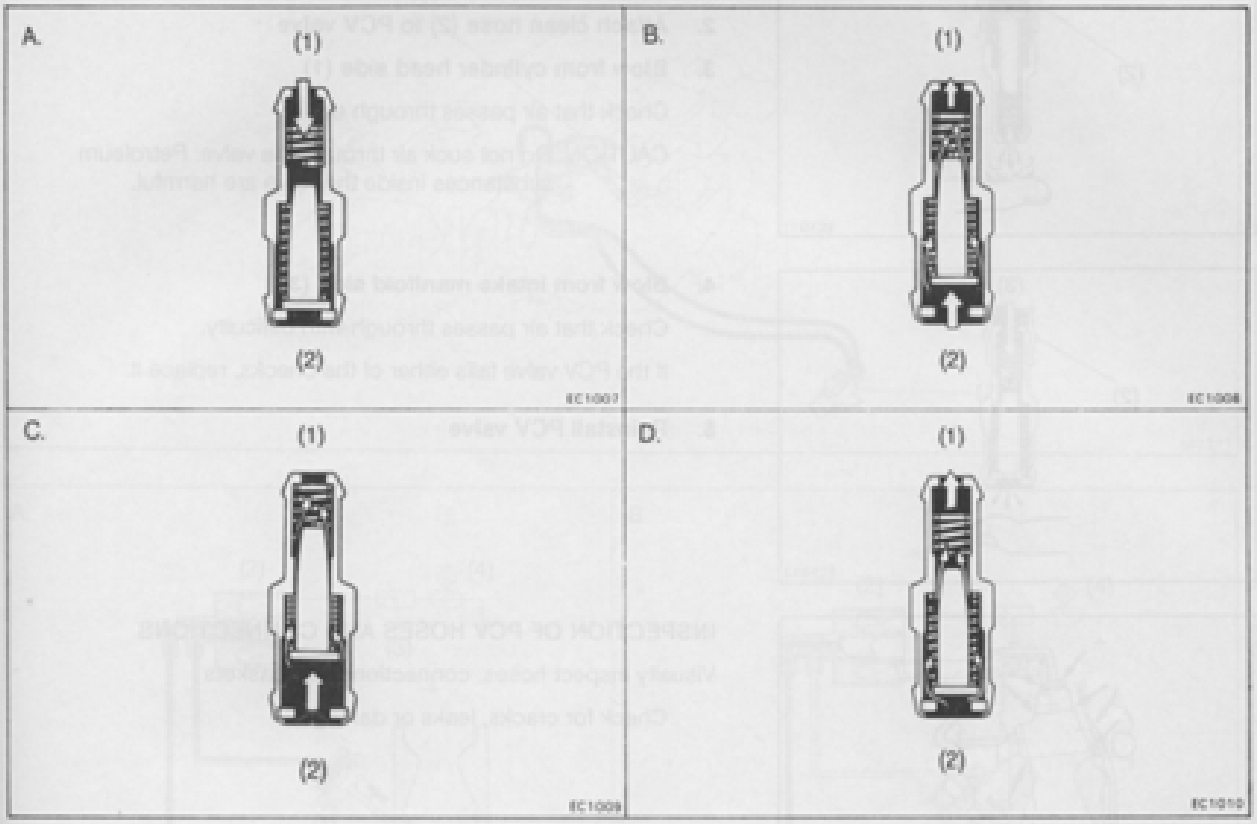
(18) Bimetal Vacuum Switched Valve
(19) Bimetal Vacuum Switched Valve
(20) Hot Air Intake
(21) Choke Breaker
(22) Outer Vent Control Valve
(23) Auxiliary Acceleration Pump
(24) Jet
(25) From Charcoal Canister
(26) Vacuum Transmitting Valve
(27) Distributor
(28) Purge Port
(29) Throttle Positioner
(30) Bimetal Vacuum Switched Valve
(31) Charcoal Canister
(32) To Purge Port
(33) Vacuum Switched Valve
(34) Speed Sensor
(35) Read Valve
(36) Computer
(37) Engine RPM
(38) Vacuum Control Valve
(39) Vacuum Switch

POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM



(1) Positive Crankcase Ventilation Valve
(2) Ventilation Hose
(3) Gas Blow-by
(4) Fresh Air

To reduce HC emission, crankcase gas blow-by (HC) is routed through the PCV valve to the intake manifold for combustion in the cylinders.



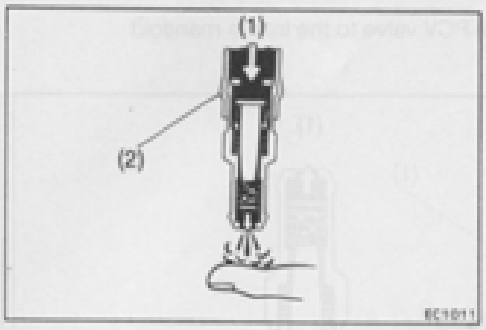
A. Engine not Running or Backfiring
- PCV-valve is Closed

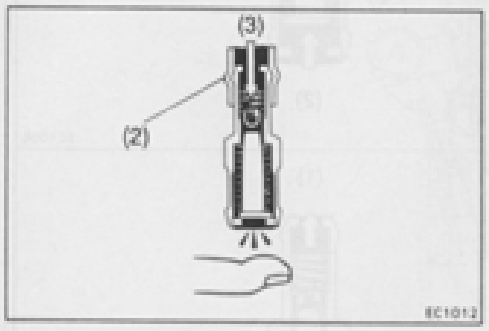
B. Normal Operation
- PCV-valve is Open
- Vacuum Passage is Large

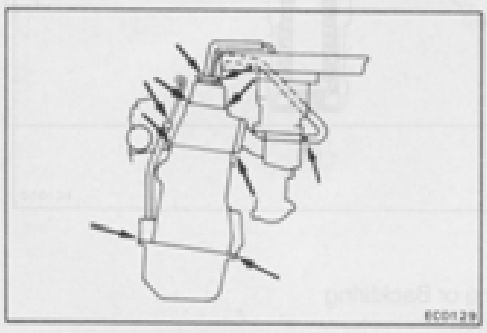
C. Idling or Decelerating
- PCV-valve is Open
- Vacuum Passage is Small

D. Acceleration or High Load
- PCV-valve is Fully Open

(1) Intake Manifold Side
(2) Cylinder Head Side







INSPECTION OF PCV VALVE

1. **Remove PCV valve**
2. **Attach clean hose (2) to PCV valve**
3. **Blow from cylinder head side (1)**

   Check that air passes through easily.

   CAUTION: Do not suck air through the valve. Petroleum substances inside the valve are harmful.

4. **Blow from intake manifold side (3)**

   Check that air passes through with difficulty.

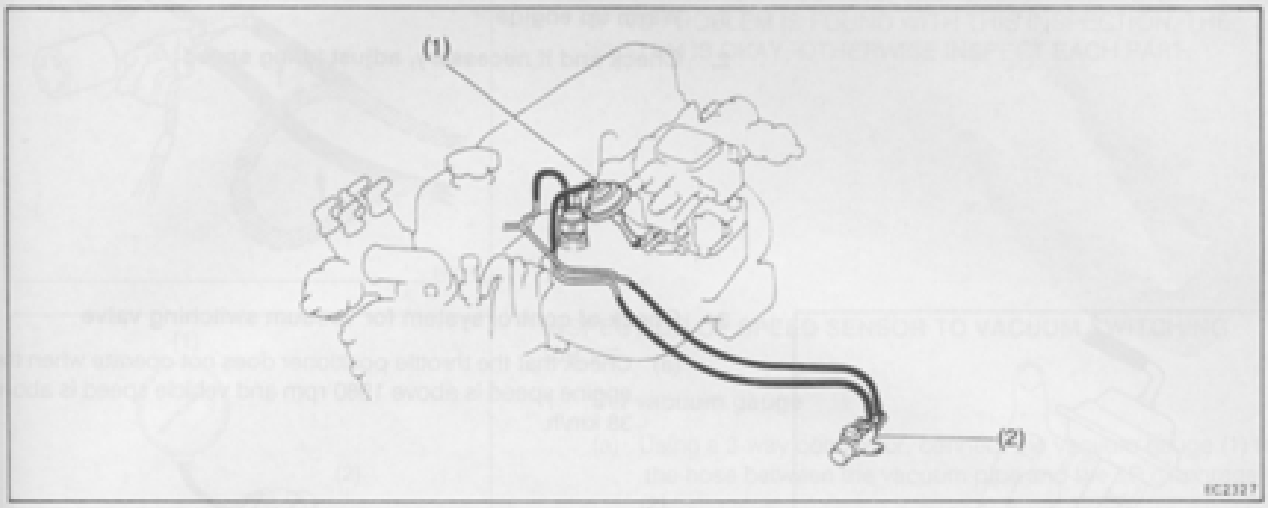
   If the PCV valve fails either of the checks, replace it.

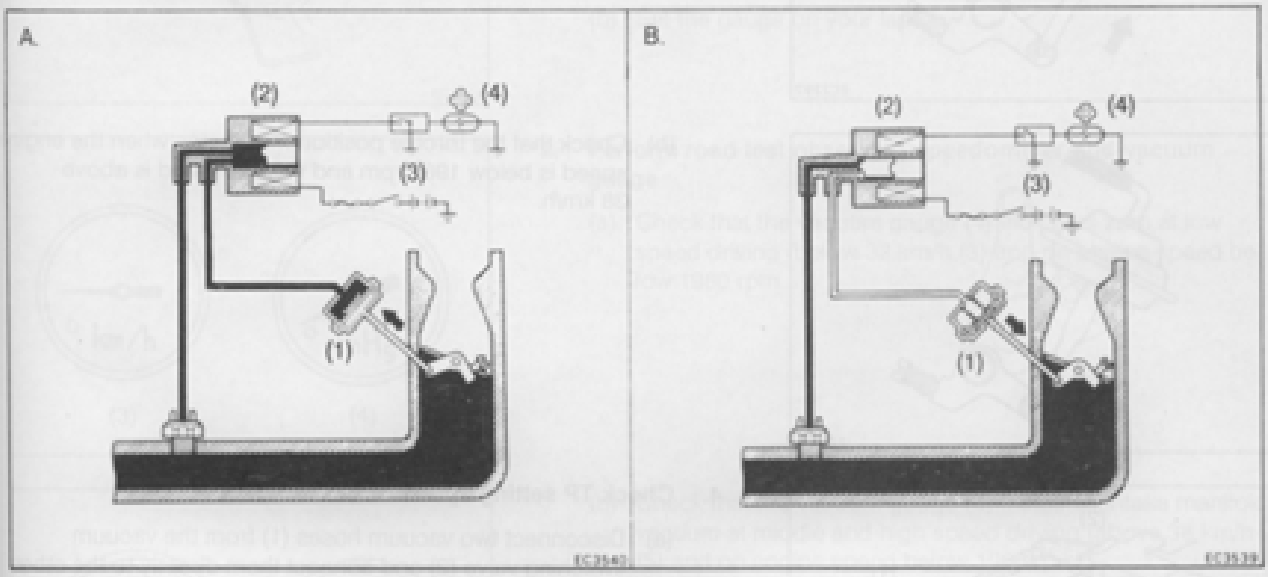
5. **Reinstall PCV valve**

INSPECTION OF PCV HOSES AND CONNECTIONS

Visually inspect hoses, connections and gaskets

Check for cracks, leaks or damage.





A. Deceleration ①
B. Deceleration ②

(1) Throttle Positioner (TP)
(2) Vacuum Switched Valve

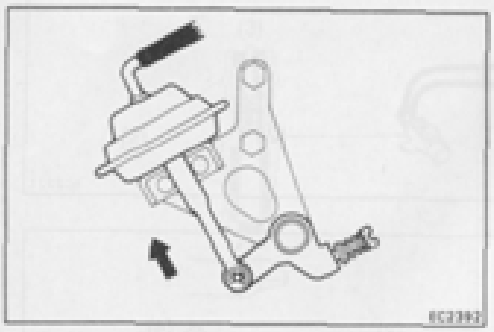
(3) Computer
(4) Engine RPM Speed Sensor

To reduce HC and CO emissions, the TP opens the throttle valve slightly more than at idle positions when decelerating. This causes the air-fuel mixture to burn completely.

Vehicle Speed	Engine Speed	Computer	VSV	Throttle Positioner	Throttle Valve
Medium or high speed above 38 km/h	Below 1980 rpm	ON	ON	TP IS SET Intake manifold Vacuum acts on TP diaphragm	Setting for medium and high speed
Deceleration from the above conditions					Throttle valve is held in a position that is slightly more opened that at idle
Except in the above conditions		OFF	OFF	TP IS RELEASED	Throttle valve is returned to the idle position

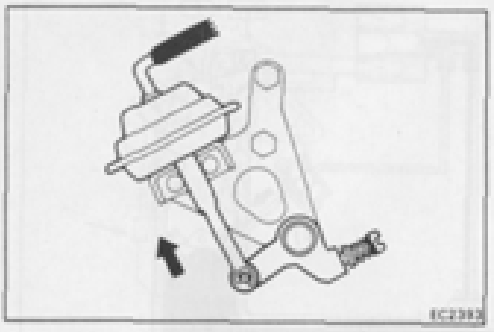
INSPECTION OF TP SYSTEM

1. **Warm up engine**
2. **Check and if necessary, adjust idling speed**

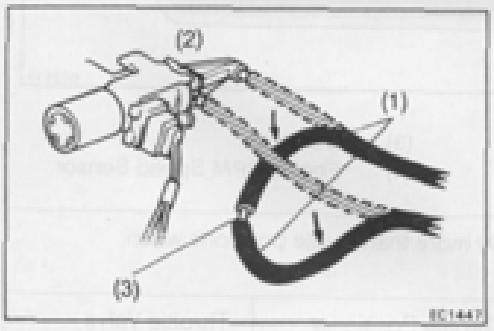


3. **Check of control system for vacuum switching valve**

   (a) Check that the throttle positioner does not operate when the engine speed is above 1980 rpm and vehicle speed is above 38 km/h.

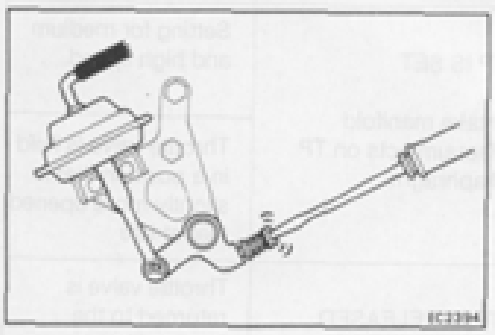


   (b) Check that the throttle positioner operates when the engine speed is below 1980 rpm and vehicle speed is above 38 km/h.



4. **Check TP setting speed**

   (a) Disconnect two vacuum hoses (1) from the vacuum switching valve (2) and connect them directly to the other connector (3).

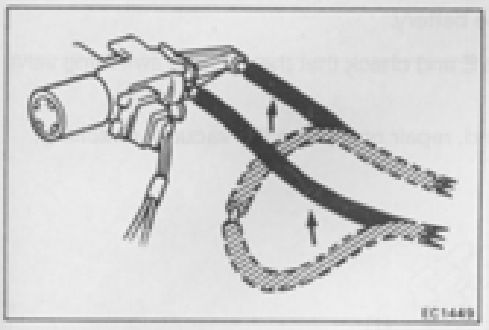


   (b) After the TP is set, check that engine speed is correct.

   TP setting speed: 1.200 + 100 rpm

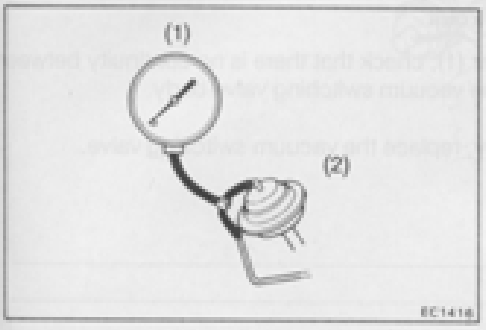
   If not at specified speed, adjust with the TP adjusting screw.

   HINT: Make adjustment with the engine cooling fan off.



(c) Reconnect the vacuum hoses to vacuum switching valve

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART

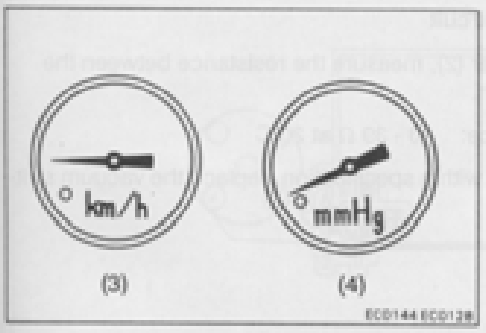


INSPECTION OF SPEED SENSOR TO VACUUM SWITCHING VALVE

1. **Set vacuum gauge**

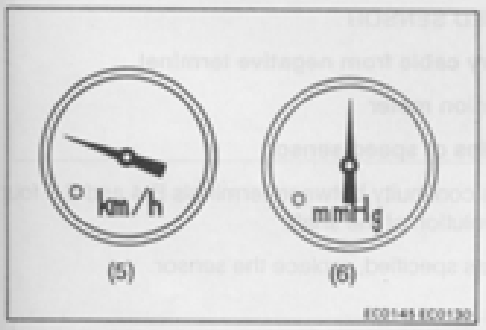
   (a) Using a 3-way connector, connect the vacuum gauge (1) to the hose between the vacuum pipe and the TP diaphragm (2).

   (b) Set the gauge on your lap.



2. **Perform road test observing speedometer and vacuum gauge**

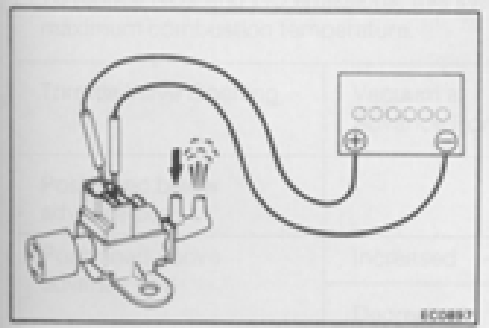
   (a) Check that the vacuum gauge (4) indicates zero at low speed driving (below 32 km/h (3) and on engine speed below 1980 rpm.



(b) Check that the vacuum gauge (6) indicates intake manifold vacuum at middle and high speed driving (above 38 km/h (5) and on engine speed below 1980 rpm.

If problem is found, inspect the vacuum switching valve and speed sensor.

3. **Disconnect vacuum gauge and reconnect vacuum hose to proper location**

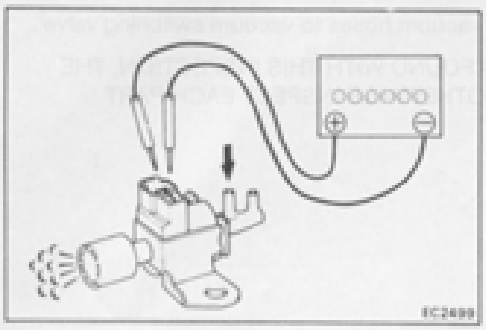


INSPECTION OF VACUUM SWITCHING VALVE

1. **Check vacuum circuit continuity in vacuum switching valve by blowing air into pipe**

   (a) Connect the vacuum switching valve terminals to the battery terminals as illustrated.

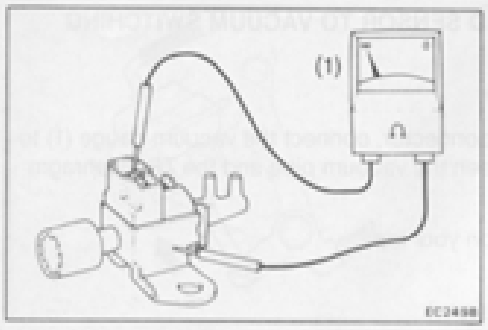
   (b) Blow into pipe E and check that air comes out of pipe F.



(c) Disconnect the battery.

(d) Blow into pipe E and check that the vacuum switching valve is closed.

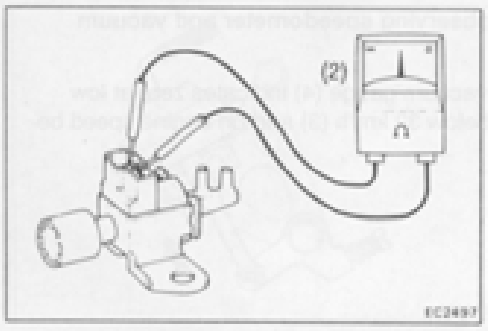
If a problem is found, repair or replace the vacuum switching valve.



2. Check for short circuit

Using an ohmmeter (1), check that there is no continuity between the terminal and the vacuum switching valve body.

If there is continuity, replace the vacuum switching valve.

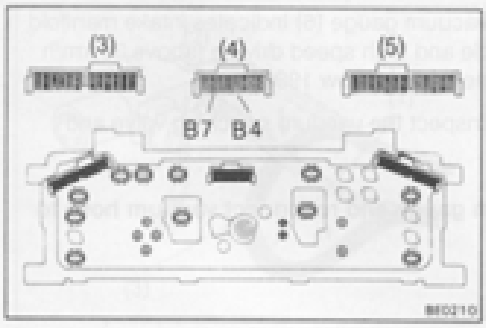


3. Check for open circuit

Using an ohmmeter (2), measure the resistance between the terminals as shown.

Specified resistance: 33 - 39 Ω at 20°C

If resistance is not within specification, replace the vacuum switching valve.



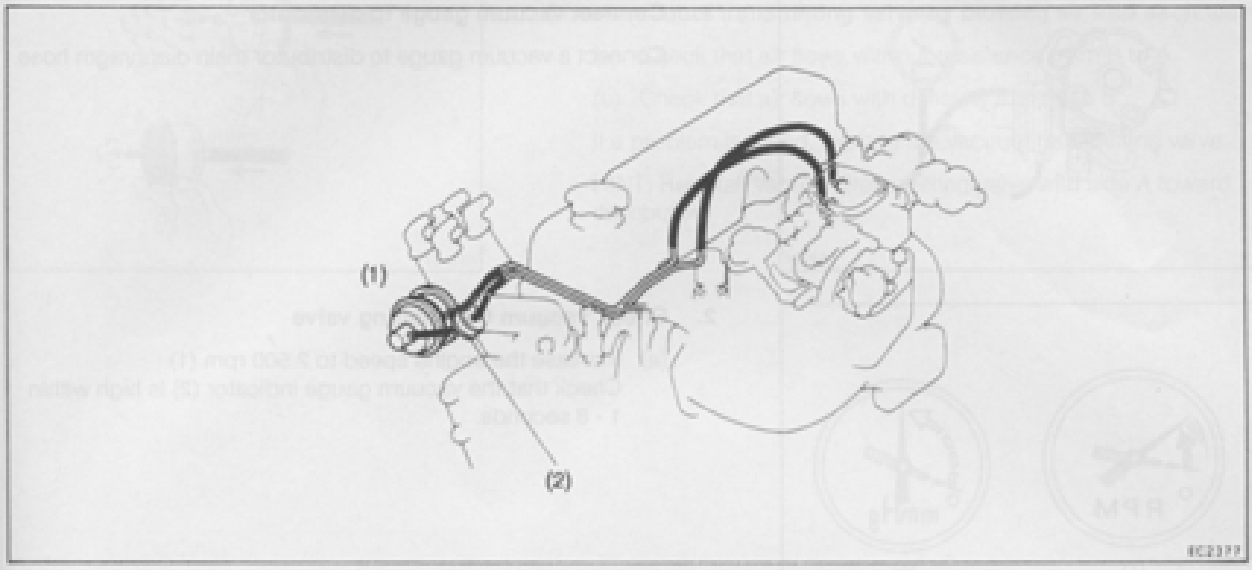
INSPECTION OF SPEED SENSOR

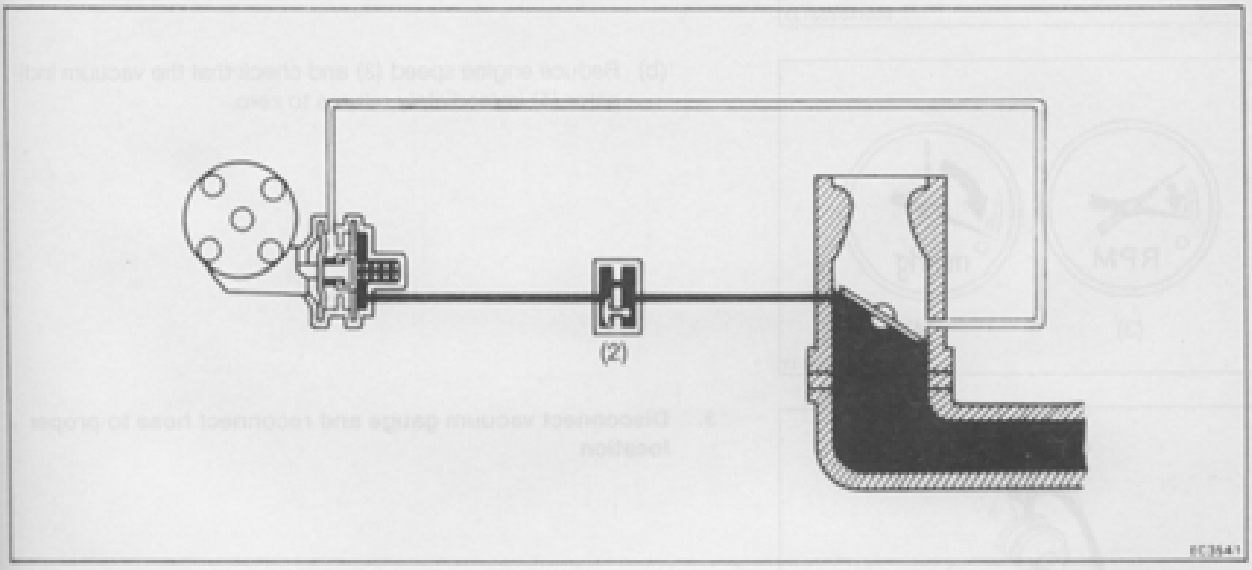
1. **Disconnect battery cable from negative terminal**
2. **Remove combination meter**
3. **Check on-off cycles of speed sensor**

Check that there is continuity between terminals B-4 and B-7 four times per each revolution of the shaft.

If operation is not as specified, replace the sensor.

(3) Connector "C"
(4) Connector "B"
(5) Connector "A"

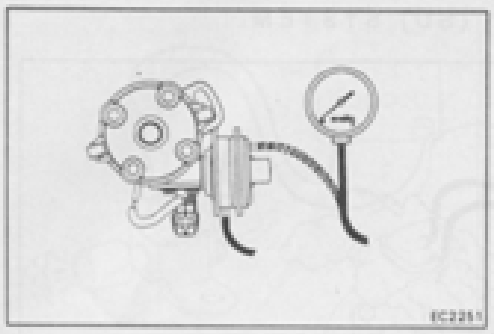




(1) Distributor Diaphragm
(2) Vacuum Transmitting Valve

To reduce NOx and HC emissions, this system delays the vacuum advance for a given time and lowers the maximum combustion temperature.

Throttle Valve Opening	Vacuum at Advance Port	Check Vacuum Transmitting Valve	Vacuum Ignition Timing
Positioned below advance port	-	-	Not advanced
Positioned above advance port	Increased	CLOSED	Delayed
	Decreased	OPEN	Normal

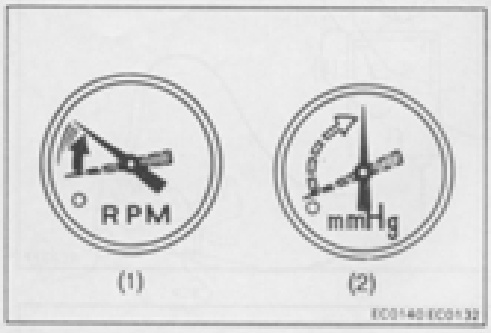


EC2251

INSPECTION OF SD SYSTEM

1. Connect vacuum gauge to distributor

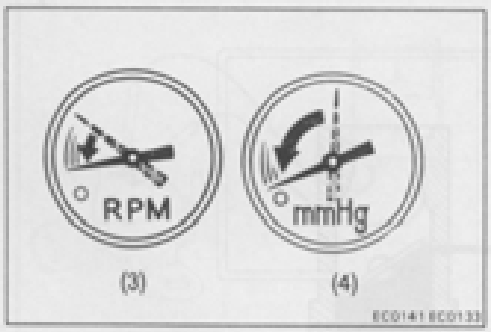
Connect a vacuum gauge to distributor main diaphragm hose.



EC0140 EC0132

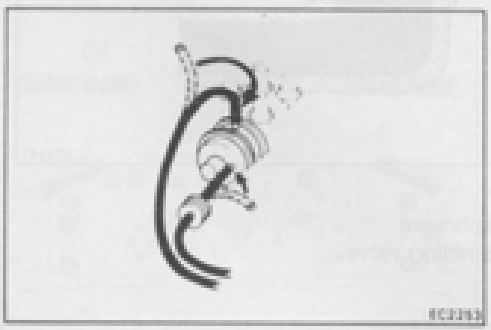
2. Check vacuum transmitting valve

(a) Increase the engine speed to 2.500 rpm (1).
Check that the vacuum gauge indicator (2) is high within 1 - 8 seconds.



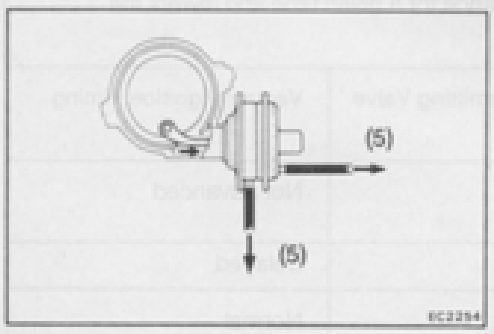
EC0141 EC0133

(b) Reduce engine speed (3) and check that the vacuum indicator (4) immediately returns to zero.



EC2253

3. Disconnect vacuum gauge and reconnect hose to proper location



EC2254

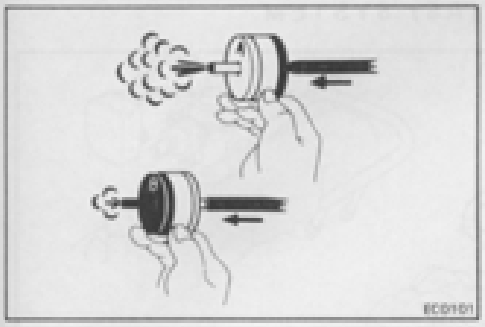
4. Check operation of distributor vacuum advancer

(a) Remove the distributor cap and rotor.

(b) Apply vacuum (5) to the Main and Sub-diaphragm, and check that the vacuum advancer moves in accordance with the vacuum.

(c) Reinstall the rotor and distributor cap.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT VACUUM TRANSMITTING VALVE



INSPECTION OF VACUUM TRANSMITTING VALVE (VTV)

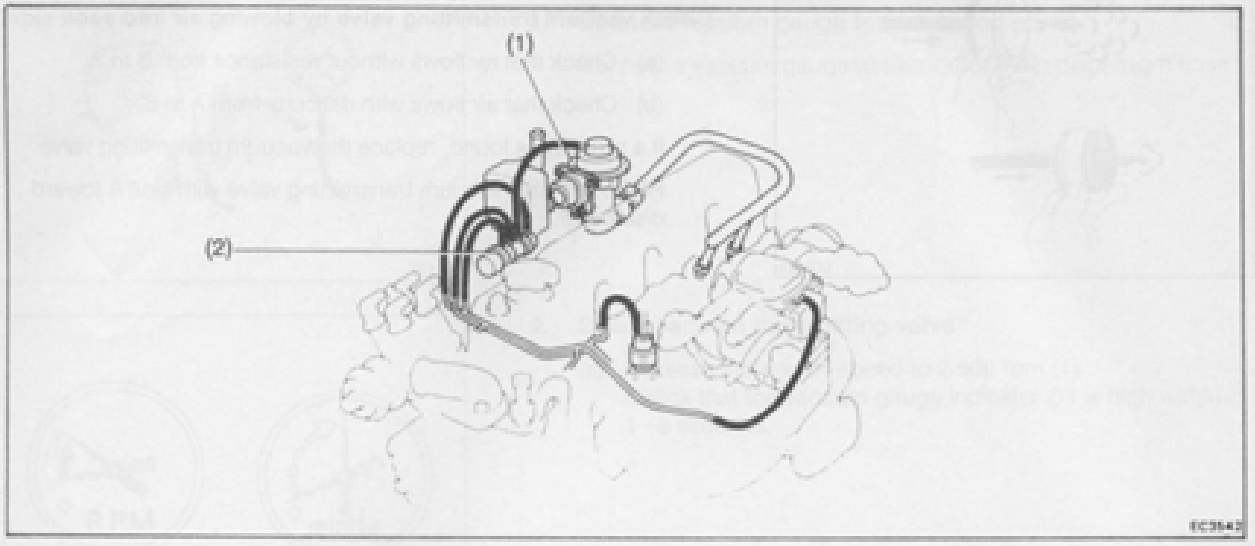
Check vacuum transmitting valve by blowing air into each side

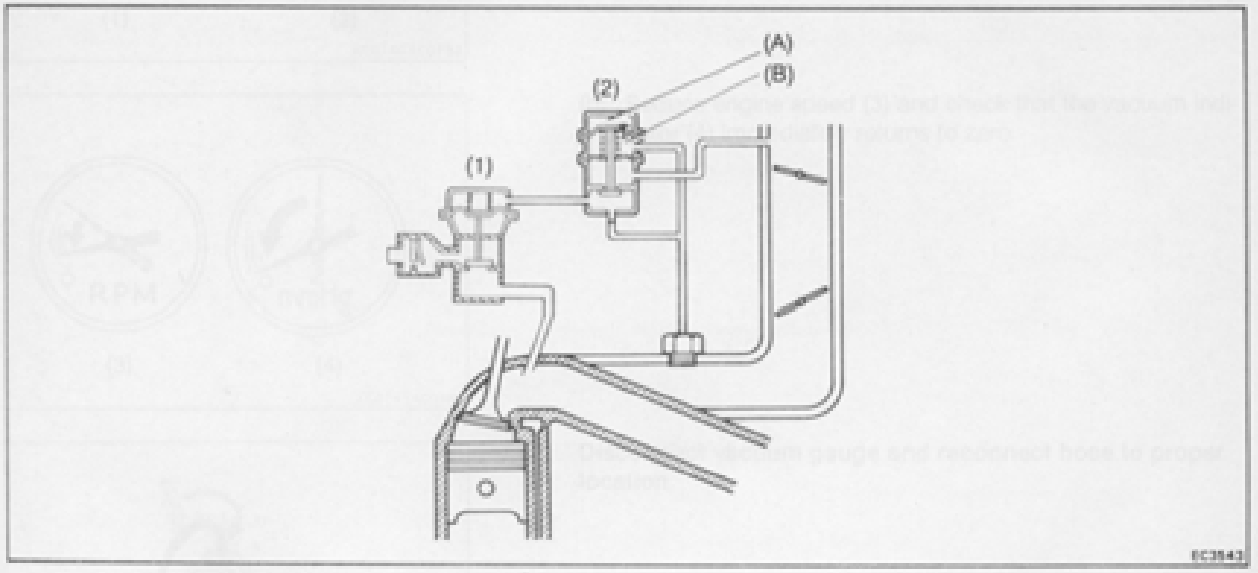
(a) Check that air flows without resistance from B to A.

(b) Check that air flows with difficulty from A to B.

If a problem is found, replace the vacuum transmitting valve.

HINT: Reinstall vacuum transmitting valve with side A toward distributor.



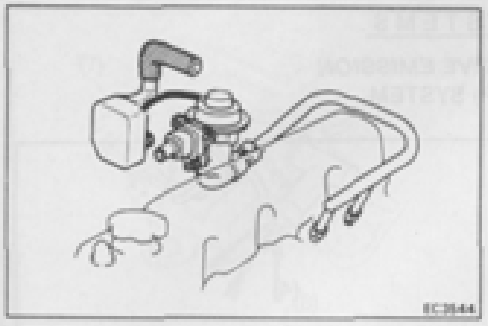


(1) Read Valve
(2) Vacuum Control Valve (VCV)
(A) Chamber A
(B) Chamber B

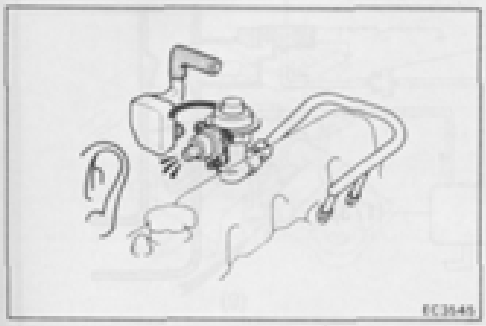
To reduce HC and CO emissions, this system draws air into exhaust ports to accelerate oxidation, using vacuum generated by the exhaust pulsation in the exhaust manifold.

Condition	Intake Manifold Vacuum	Vacuum in Vacuum Control Valve Chamber A and B	Read Valve	AS
Normal driving	Above -160 mmHg	Same	OPEN	ON
Full load driving	Below -120 mmHg	Same	CLOSED	OFF
Sudden Deceleration	High vacuum	*High vacuum acts on chamber B	CLOSED	Momentarily OFF

Remarks: After a few seconds, vacuum in both chambers of the VCV equalize through the orifice.



EC3544



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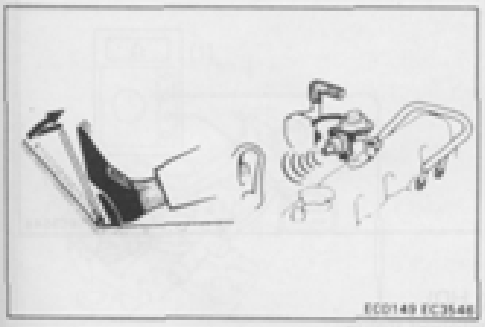

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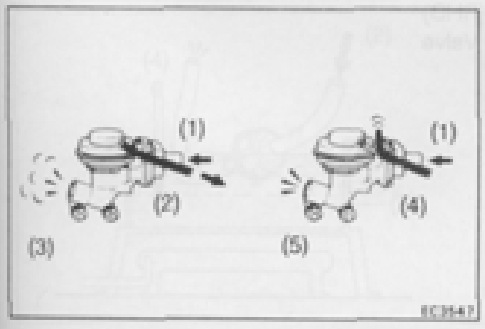

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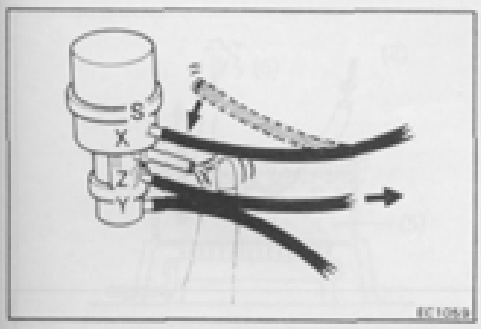


EC1058

INSPECTION OF AS SYSTEM

1. **Visually check hoses and tubes for cracks, kinks, damage or loose connections**
2. **Disconnect air suction hose from AS reed vavle**
3. **Check reed valve**
   (a) Start the engine and check that a bubbling noise is heard from the reed valve at idle.
   (b) Disconnect the vacuum hose from the AS reed valve.
   (c) Check that a bubbling noise is not heard.
   (d) Reconnect the vacuum hose.
4. **Check vacuum control valve (VCV)**

   Race the engine and quickly close the throttle valve.
   Check that there is not bubbling noise from the AS reed valve immediately after releasing the pedal.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART

INSPECTION OF REED VALVE

Check reed valve by blowing air into pipe

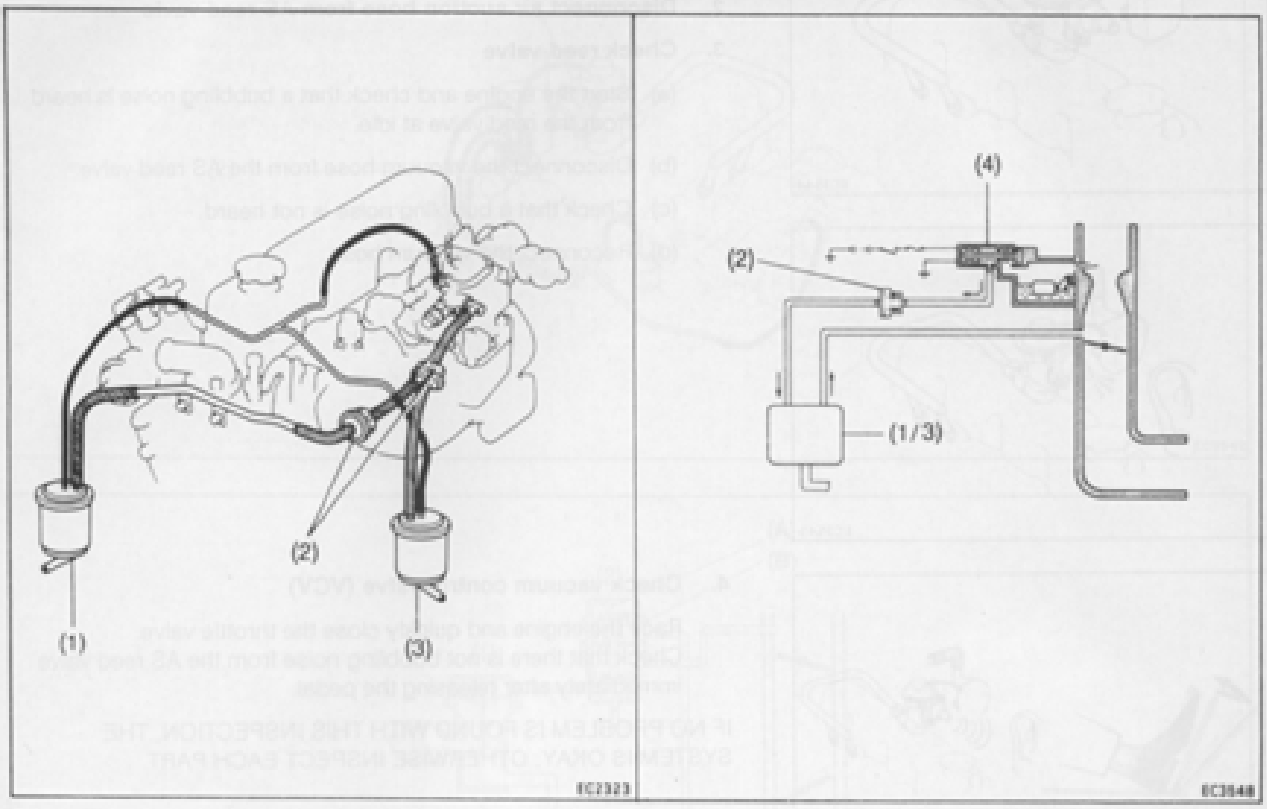
(a) Apply vacuum (2) to the reed valve diaphragm.
(b) Blow air (1) into a pipe and check that the reed valve is open (3).
(c) Release the vacuum (4) and check that the reed valve is closed (5).

INSPECTION OF VACUUM CONTROL VALVE (VCV)

Check VCV operation

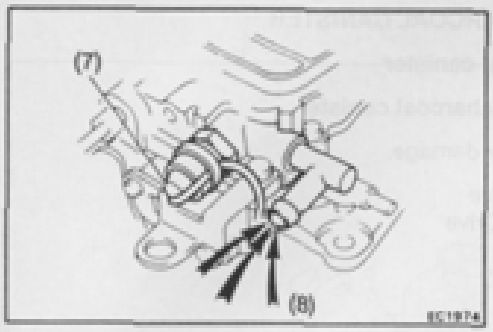
(a) Disconnect the vacuum hose from port Z of the VCV.
(b) Connect port Z directly to the intake manifold with another hose, and disconnect the vacuum hoses from ports S and X of the VCV.
(c) With the engine idling, place your finger over port X and check that vacuum is not felt.
(d) Check that vacuum is felt momentarily as the vacuum hose is reconnected to port S.

1. FUEL EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM



(1) Charcoal Canister (LHD)
(2) Bimetal Vacuum Switched Valve
(3) Charcoal Canister (RHD)
(4) Outer Vent Control Valve

This system improves re-starting after warm-up.



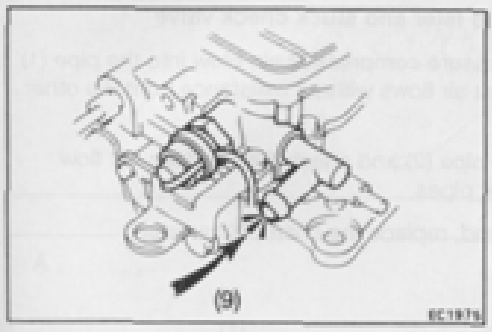
INSPECTION OF OUTER VENT CONTROL VALVE

1. **Check outer vent control valve operation**

   (a) Disconnect the outer vent control hose (7) between the carburetor and BVSV at the carburetor side.

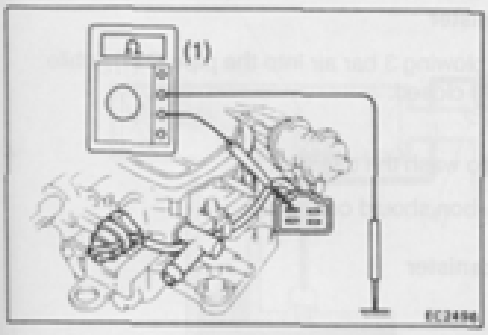
   - with engine stopped

   (b) Lightly blow air into the carburetor and check that air flows through (8). (The outer vent control valve is open.)



   (c) Start the engine.

   (d) With the engine idling lightly blow air into the carburetor and check that air does not flow through (9). (The outer vent control valve is closed.)

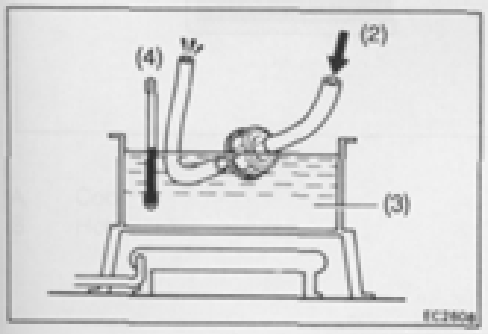


1. **Check solenoid**

   (a) Using the wiring connector.

   (b) Using an ohmmeter (1), measure the resistance between the positive (+) terminal and the solenoid body.

   Specified resistance: 34 - 42 Ω at 25°C

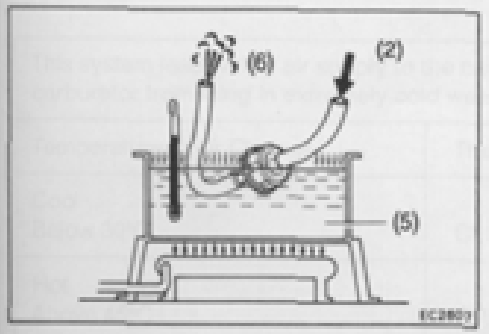


INSPECTION OF BIMETAL VACUUM SWITCHING VALVE (BVSV)

Check BVSV by blowing air (2) into in

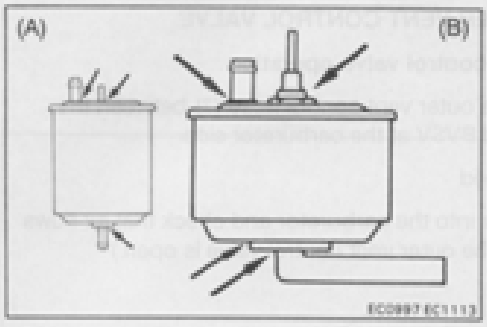
   (a) Cool the BVSV to below 31C with cool water (3).

   (b) Check that the BVSV is closed (4).



   (c) Heat the BVSV to above 45C with hot water (5).

   (d) Check that the BVSV is open (6).

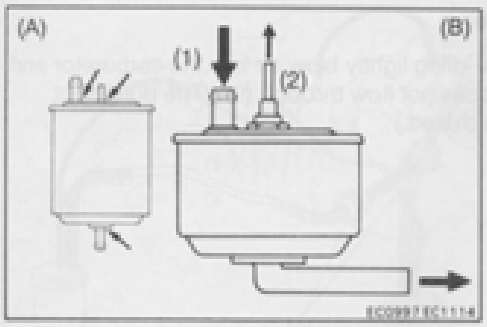


INSPECTION OF CHARCOAL CANISTER

1. **Remove charcoal canister**
2. **Visually inspect charcoal canister**

   Look for cracks or damage.

   (A) Left-hand Drive
   (B) Right -hand Drive

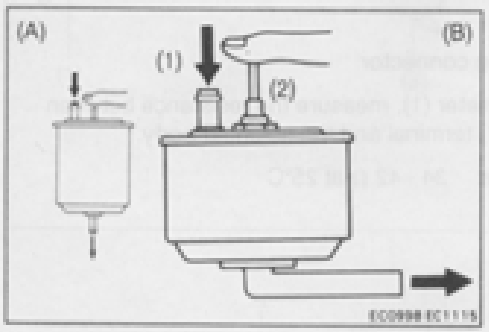


3. **Check for clogged filter and stuck check valve**

   (a) Using low pressure compressed air, blow into the pipe (1) and check that air flows without resistance from the other pipes.

   (b) Blow into the pipe (2) and check that air does not flow from the other pipes.

   If a problem is found, replace the charcoal canister.



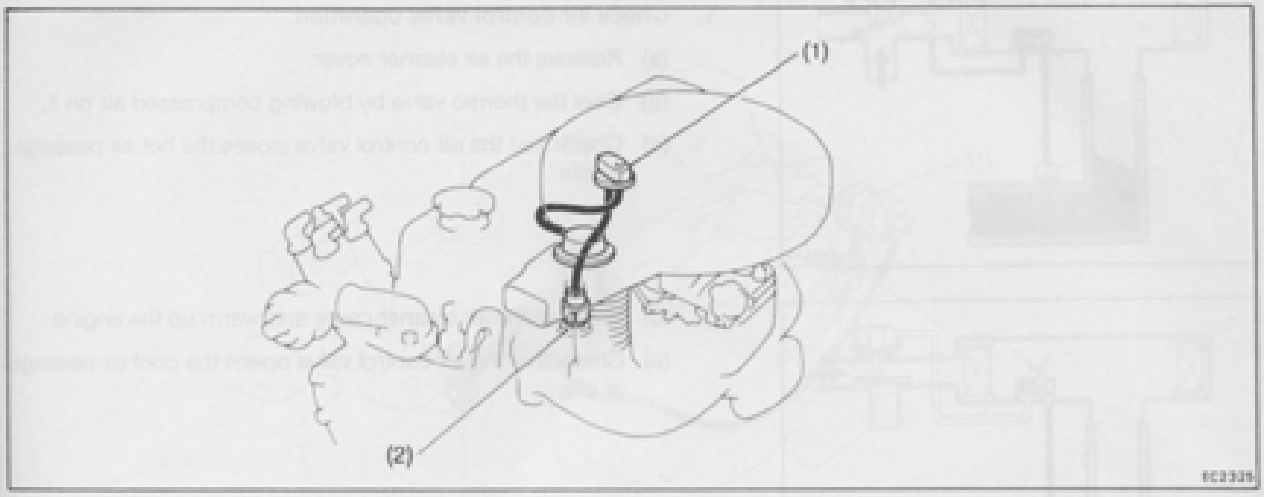
4. **Clean filter in canister**

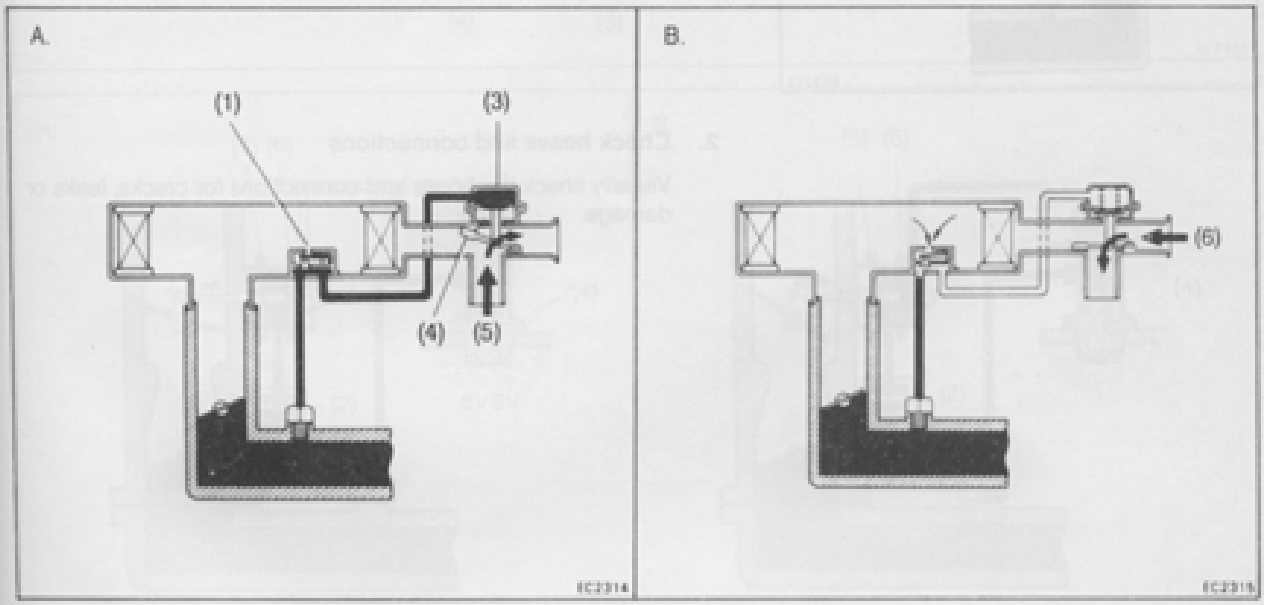
   Clean the filter by blowing 3 bar air into the pipe C (1), while holding the pipe (2) closed.

   HINT:
   - Do not attempt to wash the canister.
   - No activated carbon should come out.

5. **Install charcoal canister**

2. AUTOMATIC HOT AIR INTAKE (HAI) SYSTEM



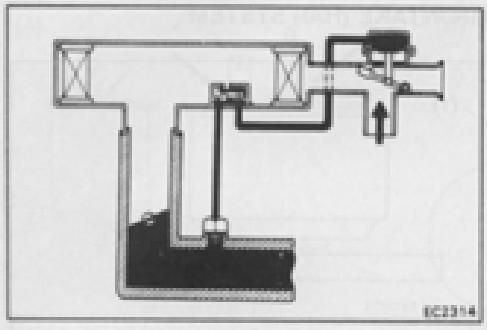


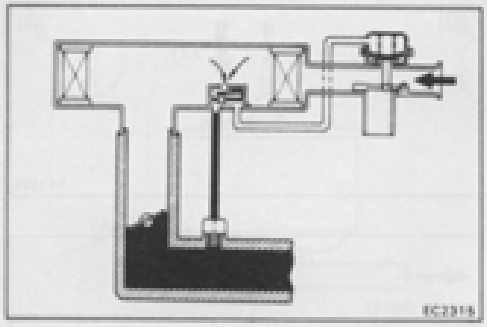
A. Cool
B. Hot

(1) Thermo Valve
(2) Gas Filter
(3) Hot Air Intake Diaphragm
(4) Air Control Valve
(5) Hot Air
(6) Cool Air

This system leads a hot air supply to the carburetor in cold weather to improve driveability and to prevent the carburetor from icing in extremely cold weather.

Temperature in Air Cleaner	Thermo Valve	Air Control Valve	Intake Air
Cool Below 30°C	CLOSED	Hot air passage OPEN	HOT
Hot Above 45°C	OPEN	Cool air passage OPEN	COOL





INSPECTION OF HOT AIR INTAKE SYSTEM

1. **Check air control valve operation**

   (a) Remove the air cleaner cover.

   (b) Cool the thermo valve by blowing compressed air on it.

   (c) Check that the air control valve closes the hot air passage at idle.

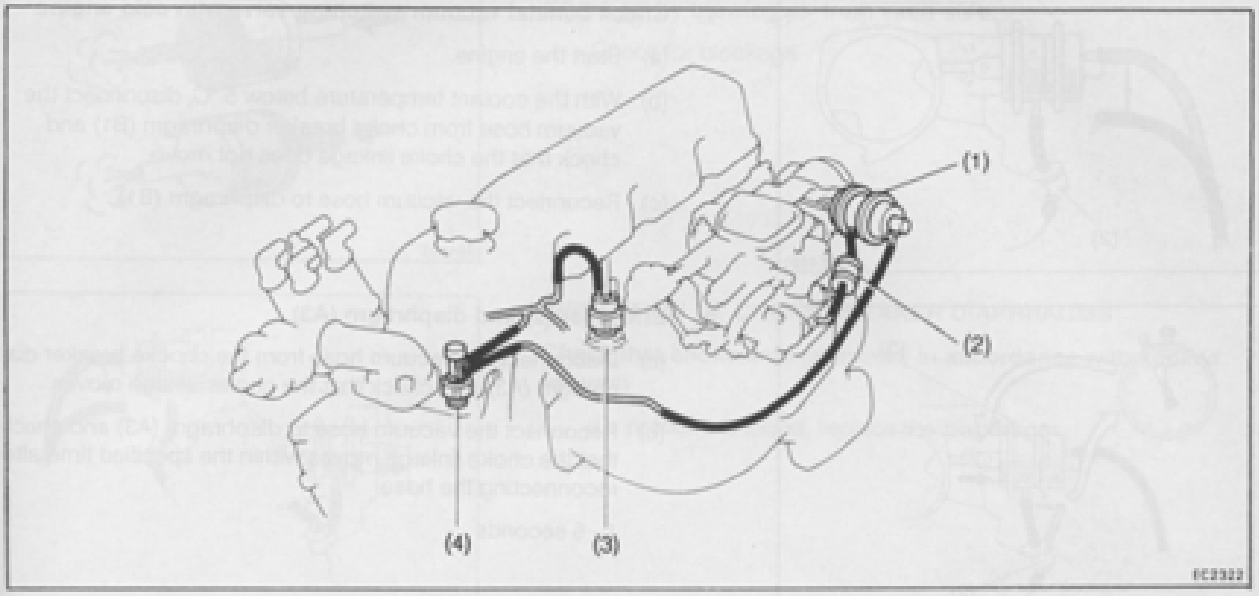
   (d) Reinstall the air cleaner cover and warm up the engine.

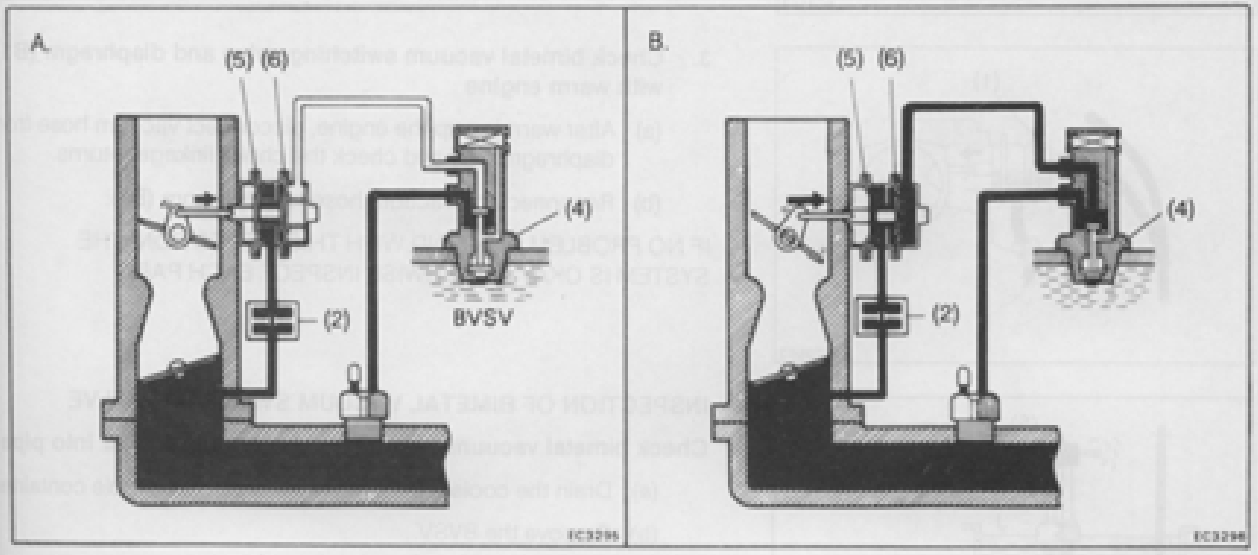
   (e) Check that the air control valve opens the cool air passage at idle.

2. **Check hoses and connections**

   Visually check the hoses and connections for cracks, leaks or damage.

3. CHOKE BREAKER (CB) SYSTEM





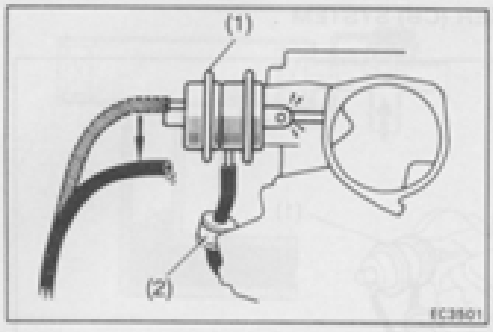
A. Cold
B. Hot

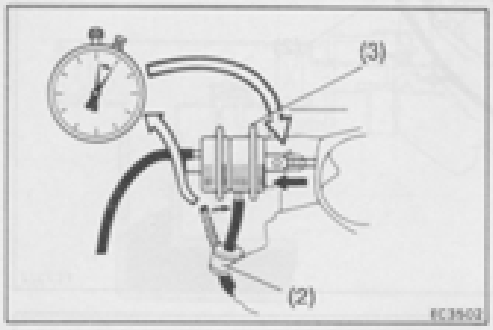
(1) Choke Breaker Diaphragm
(2) Jet
(3) Gas Filter
(4) Bimetal Vacuum Switched Valve
(5) Diaphragm A
(6) Diaphragm B

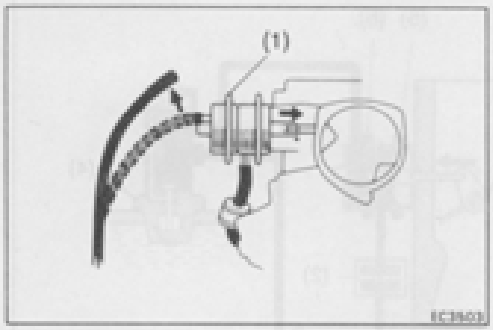
When the choke is closed, this system opens the choke valve slightly to prevent too rich a mixture. Then, when the engine is warmed up, the choke valve is forcibly opened further.

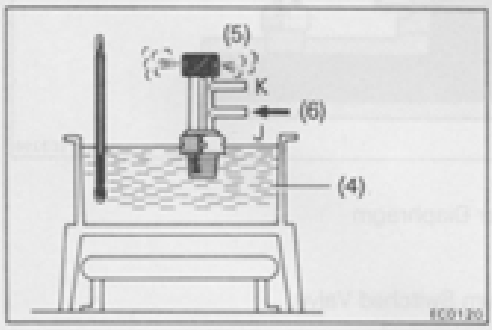
Coolant Temp.	BVSV	Diaphragm A	Diaphragm B	Choke Link Pull
*Below 5C	CLOSED	*PULLED	NOT PULLED	SLIGHT
Above 21C	OPEN	PULLED	PULLED	MUTCH

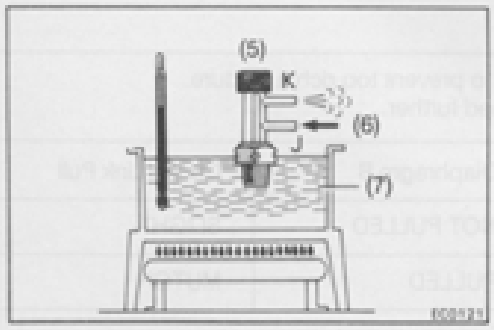
Remarks: *This action is delayed by the jet.











INSPECTION OF CHOKE BREAKER SYSTEM

1. **Check bimetal vacuum switching valve with cold engine**

   (a) Start the engine.

   (b) With the coolant temperature below 5 °C, disconnect the vacuum hose from choke breaker diaphragm (B1) and check that the choke linkage does not move.

   (c) Reconnect the vacuum hose to diaphragm (B1).

2. **Check jet (2) and diaphragm (A3)**

   (a) Disconnect the vacuum hose from the chocke breaker diaphragm (A3) and check that the choke linkage moves.

   (b) Reconnect the vacuum hose to diaphragm (A3) and check that the choke linkage moves within the specified time after reconnecting the hose.

   1 - 5 seconds

3. **Check bimetal vacuum switching valve and diaphragm (B1) with warm engine**

   (a) After warming up the engine, disconnect vacuum hose from diaphragm (B1) and check the choke linkage returns.

   (b) Reconnect the vacuum hose to diaphragm (B1).

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART

INSPECTION OF BIMETAL VACUUM SWITCHING VALVE

Check bimetal vacuum switching valve by blowing air into pipe

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the BVSV.

(c) Cool the BVSV to below 5 °C (4) with cool water.

(d) Check that air (6) flows from pipe J to the air filter (5).

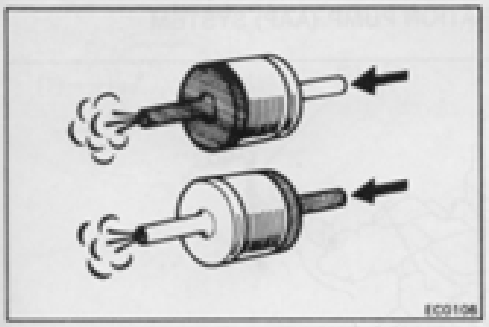
(e) Heat the BVSV to above 21°C (7) with hot water.

(f) Check that air (6) flows from pipe J to pipe K.

(g) Apply liquid sealer to the threads of the BVSV and reinstall.

(h) Fill the radiator with coolant.

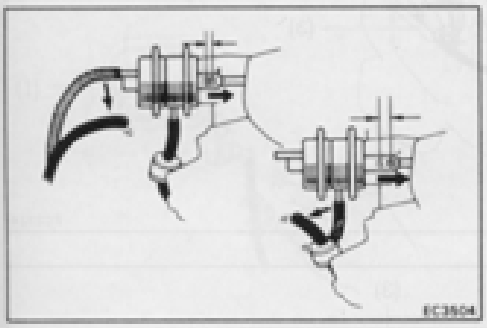
If a problem is found, replace the BVSV.



INSPECTION OF JET

Check jet by blowing air from each side

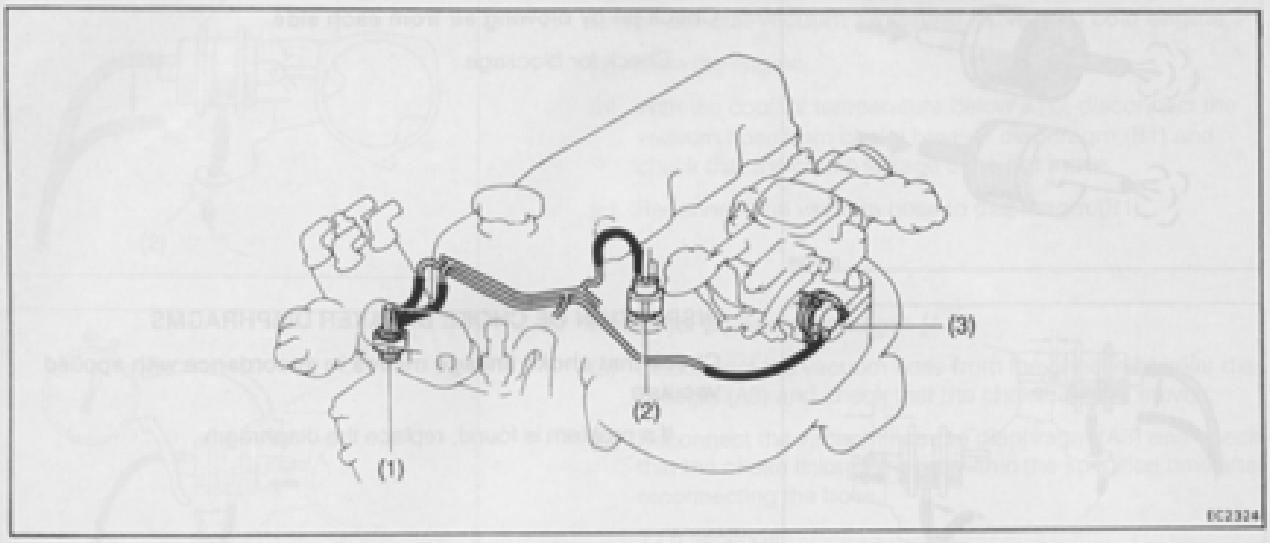
Check for blockage.

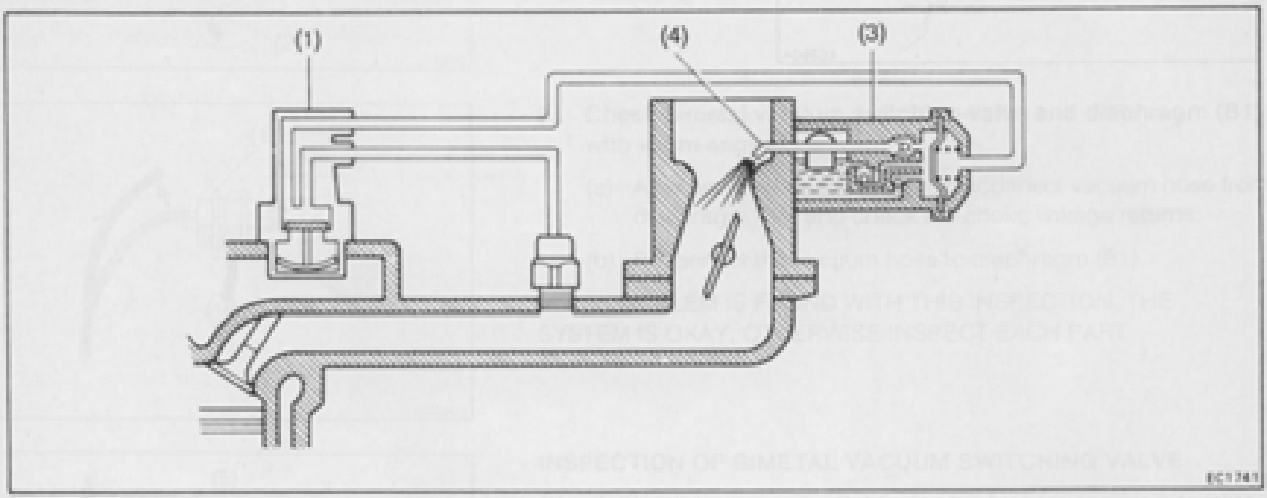


INSPECTION OF CHOKE BREAKER DIAPHRAGMS

Check that choke linkage moves in accordance with applied vacuum

If a problem is found, replace the diaphragm.

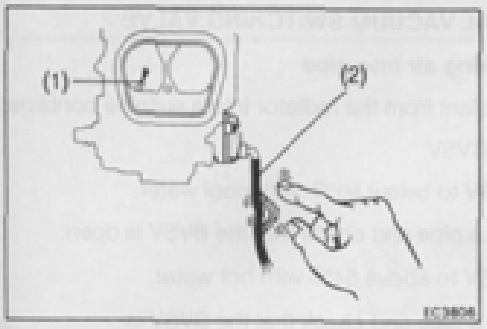


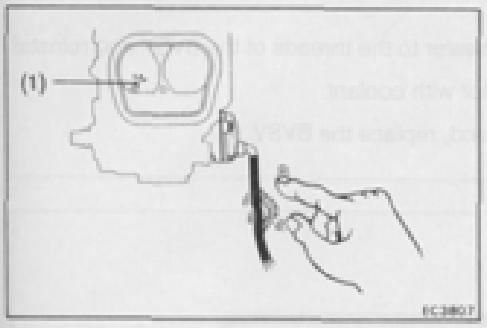


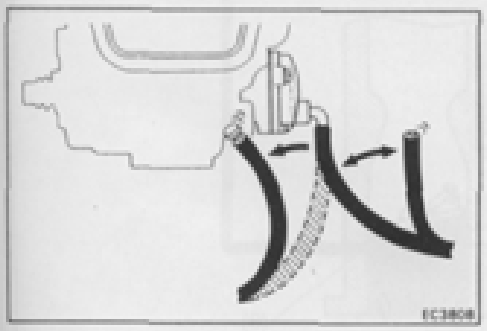
(1) Bimetal Vacuum Switched Valve
(2) Gas Filter
(3) Auxiliary Acceleration Pump
(4) Acceleration Nozzle

The carburetor air fuel mixture is very lean. When accelerating with a cold engine, the main acceleration pump capacity is insufficient to provide good acceleration. The AAP system compensates for this by forcing more fuel into the acceleration nozzle to obtain better cold engine performance.

Coolant Temp.	BVSV	Engine	Intake Vacuum	Diaphragm is AAP	Fuel
Below 50°C	OPEN	Constant RPM	HIGH	Pulled by vacuum	Drawn into AAP chamber
		Acceleration tension	LOW	Returned by spring	Forced into acceleration nozzle
Above 64°C	CLOSED	-	-	No operation	-







INSPECTION OF AUXILIARY ACCELERATION PUMP SYSTEM

1. Check system with cold engine

(a) Check that the coolant temperature is below 45 °C.

(b) Remove the air cleaner.

(c) Start the engine.

(d) Pinch the AAP hose (2), and stop the engine.

(e) Release the hose.

(f) Check that gasoline spurts out from the acceleration nozzle (1).

2. Repeat (c), (d) and (e) above after warm-up

(a) Check that gasoline does not spurt out from the acceleration nozzle (1).

(b) Reinstall the air cleaner.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART

INSPECTION OF AUXILIARY ACCELERATION PUMP DIAPHRAGM

Check diaphragm operation at idle

(a) Start the engine.

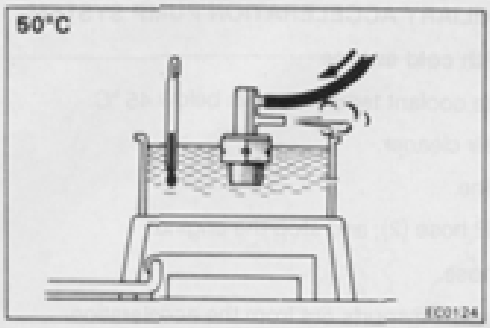
(b) Disconnect the hose from the AAP diaphragm.

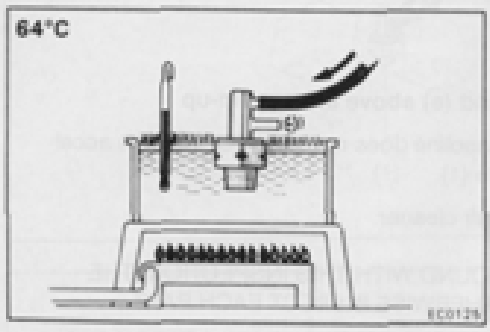
(c) Apply and release the vacuum directly to the AAP diaphragm at idle.

(d) Check that the engine rpm changes by releasing vacuum.

(e) Reconnect the AAP hose.

If a problem is found, replace the diaphragm.





INSPECT OF BIMETAL VACUUM SWITCHING VALVE

Check BVSV by blowing air into pipe

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the BVSV.

(c) Cool the BVSV to below 50°C with cool water.

(d) Blow air into a pipe and check that the BVSV is open.

(e) Heat the BVSV to above 64°C with hot water.

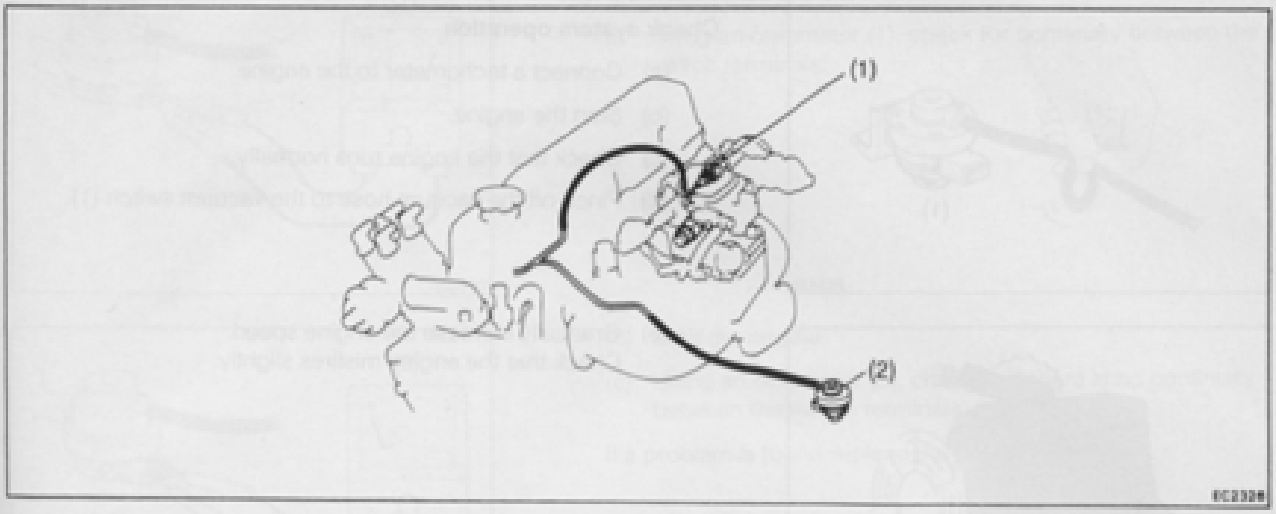
(f) Blow air into a pipe and check that the BVSV is closed .

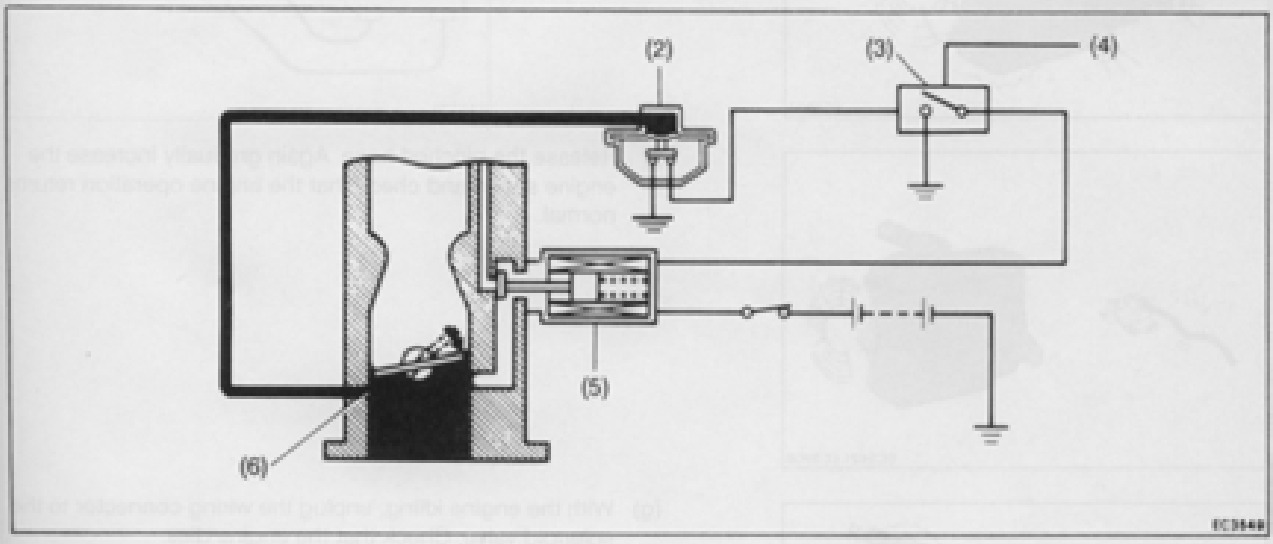
(g) Apply liquid sealer to the threads of the BVSV and reinstall.

(h) Fill the radiator with coolant.

If a problem is found, replace the BVSV.

5. DECELERATION FUEL CUT SYSTEM

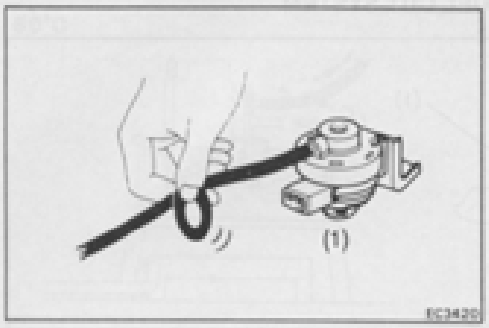


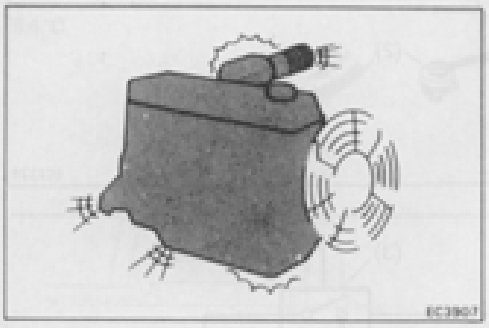


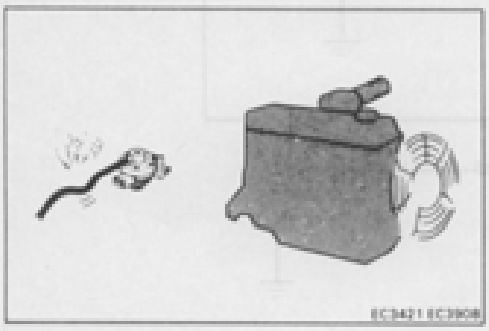
(1) Solenoid Valve
(2) Vacuum Switch
(3) Computer
(4) Engine RPM
(5) Fuel Cut-out Solenoid Valve
(6) Throttle Positioning Port

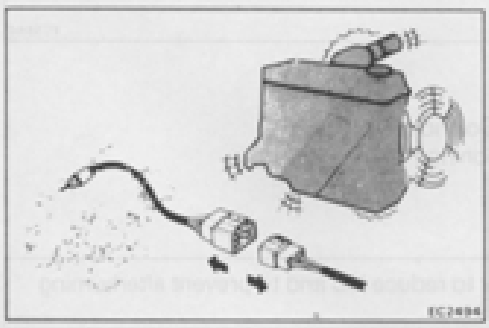
This system cuts out part of the fuel in the slow circuit of the carburetor to reduce HC and to prevent afterburning in the exhaust system.

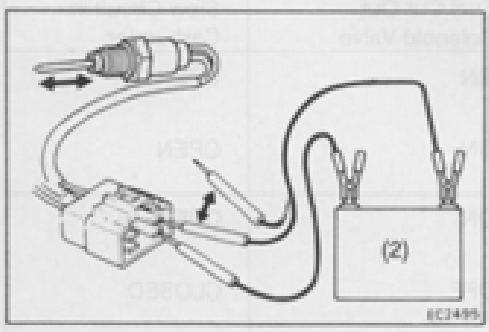
Engine RPM	Vacuum in the Vacuum SW	Vacuum SW	Computer	Fuel Cut-Out Solenoid Valve	Slow Circuit in Carburetor
Below 1,980 rpm	Below 295 mm Quicksilver (HG)	ON	ON	ON	OPEN
	Above 345 mm Quicksilver (HG)	OFF	ON	ON	OPEN
Above 2,410 rpm	Below 295 mm Quicksilver (HG)	ON	ON	ON	OPEN
	Above 345 mm Quicksilver (HG)	OFF	OFF	OFF	CLOSED











INSPECTION OF DECELERATION FUEL CUT-OUT SYSTEM

Check system operation

(a) Connect a tachometer to the engine.

(b) Start the engine.

(c) Check that the engine runs normally.

(d) Pinch off the vacuum hose to the vacuum switch (1).

(e) Gradually increase the engine speed.
Check that the engine misfires slightly.

(f) Release the pinched hose. Again gradually increase the engine speed and check that the engine operation returns to normal.

(g) With the engine idling, unplug the wiring connector to the solenoid valve. Check that the engine dies.

(h) Stop the engine, and reconnect the wiring. Remove the tachometer.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART

INSPECTION OF FUEL CUT-OUT SOLENOID VALVE

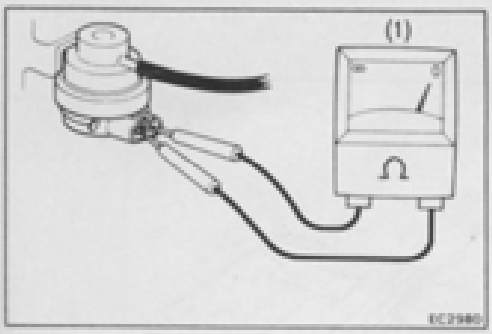
(a) Remove the solenoid valve.

(b) Connect the two terminals and the battery terminals as shown.

(c) Check that you can feel a "click" from the solenoid valve when the battery (2) is connected and disconnected.

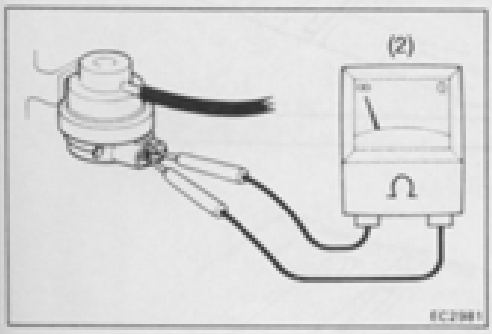
(d) Reinstall the valve and reconnect the wiring connector.

If a problem is found, replace the solenoid valve or O-ring.



INSPECTION VACUUM SWITCH

(a) Using an ohmmeter (1), check for continuity between the switch terminals.



(b) Start the engine.

(c) Using an ohmmeter (2), check that there is no continuity between the switch terminals.

If a problem is found replace the vacuum switch.