18R-G ENGINE TUNE-UP

18R-G ENGINE TUNE-UP ITEM

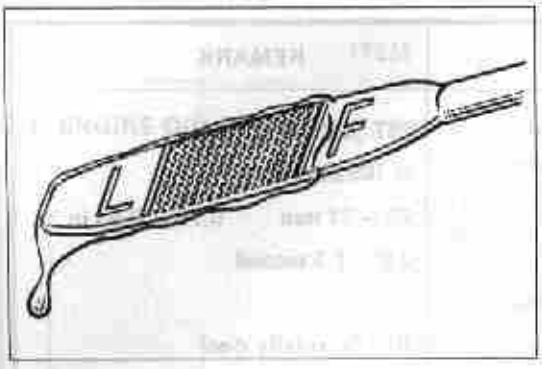
	ITEM		REMARK
1	ENGINE OIL	Oil level check	"Full" line
		Oil replenishment	API service SE classification
		Oil capacity	
		Dry refill w/Oil filter	3.9 liter 4.1 US qt. 3.4 Imp.qt.
		Drain & refill w/Oil filter	3.3 liter 3.5 US qt. 2.9 Imp.qt.
		w/o Oil filter	2.9 liter 3.1 US qt. 2.6 Imp.qt.
		Quality check	
		Oil filter replacement	SST [09228-44010]
2	COOLING SYSTEM	Coolant level check	"Full" line
		Quality check	
		Coolant capacity (w/Heater)	8.4 liter 8.9 US qt. 7.4 Imp.qt.
3	DRIVE BELT	Tension Fan — Alternator	
		New	5 — 6 mm 0.20 — 0.24 in.
		Used	6 — 9 mm 0.24 — 0.35 in
		A/C — Crankshaft	16 — 19 mm 0.63 — 0.75 in
4	AIR CLEANER	Element cleaning	
5	BATTERY	Specific gravity	1.25 — 1.27 at 20°C 68°F
		Electrolyte level	
6	SPARK PLUG	Visual check	
		Cleaning	
		Plug gap	0.7 — 0.8 mm 0.028 — 0.031 in
7	HIGH TENSION CORD	Resistance	10 — 50 kΩ/Meter
8	DISTRIBUTOR	Distributor cap	
		Point gap	0.45 mm
		Dwell angle	50 — 54°
		Dwell angle variation	within 3°
		Ignition timing	
		at Idle speed	12° BTDC
		Governor operational	
		Vacuum operational	
9	NO.2 CHAIN TENSIONER	Back stroke	0.5 — 1.0 mm at 3 — 5 kg
10	VALVE TIMING		SST [09248-27010]
11	VALVE CLEARANCE (COLD)	Intake	0.24 — 0.34 mm 0.009 — 0.013 in
		Exhaust	0.29 — 0.39 mm 0.011 — 0.015 in

	ITEM		REMARK
12	CARBURETOR	Float level	SST [09240-27010] or [09240-27020] 20 – 21 mm 0.79 – 0.83 in
	ACCELERATION PUMP	Fuel discharging time	0.9 – 1.3 second
		Fuel injection direction	
		Starter wire	70° (at totally disc)
		Throttle valve full open	
	WARM UP ENGINE		
13	THROTTLE LINK	Idle speed	1000 ± 50 rpm
	(INITIAL IDLE SPEED)	Manifold vacuum	380 mm Hg 14.96 in Hg
		Vacuum difference	below 10 mm Hg 0.39 in Hg
14	BEST IDLE ADJUSTMENT	Idle mixture adjusting screw preset position	Screw out 2 turn
		Best idle speed	1000 ± 50 rpm
		Manifold vacuum	above 380 mm Hg 14.96 in Hg
15	CO CONCENTRATION		1.0 – 1.5%
16	ENGINE CONDITION		
17	COMPRESSION PRESSURE	Standard	12.7 kg/cm^2 152.0 psi
		Limit	10.0 kg/cm^2 142.0 psi
		Difference of pressure between cylinders	Less than 1.0 kg/cm^2 14.2 psi

ENGINE OIL

CHECK OIL LEVEL

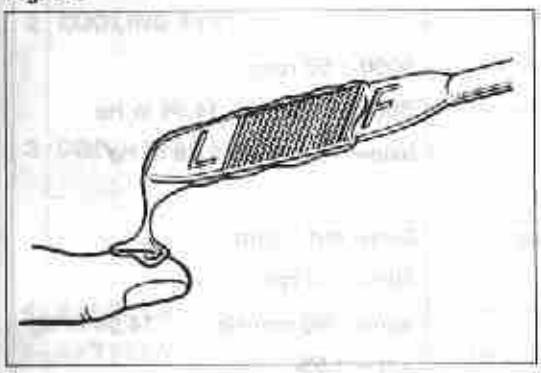
Fig. 3-1



The oil level should be between the L and F marks. If low, check for leakage and add oil to the F mark. Use API service SE classification oil.

CHECK OIL QUALITY

Fig. 3-2



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

REPLACE OIL FILTER

Fig. 3-3

1. Remove the oil filter with SST.
   SST [09228-34010]
2. To install new filter, tighten firmly by hand.

– Note –

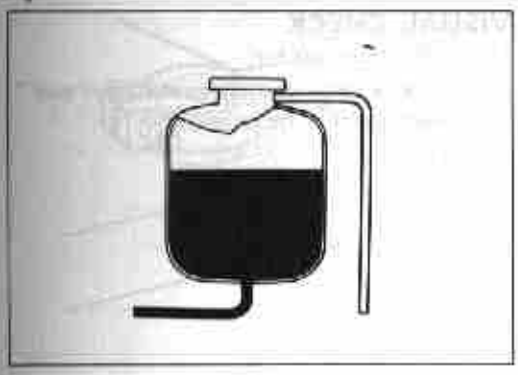
Do not tighten with SST or wrench.

Fig. 3-4

3. Start the engine and check for oil leakage.
4. Stop the engine and recheck the oil level.

COOLING SYSTEM

Fig. 3-5



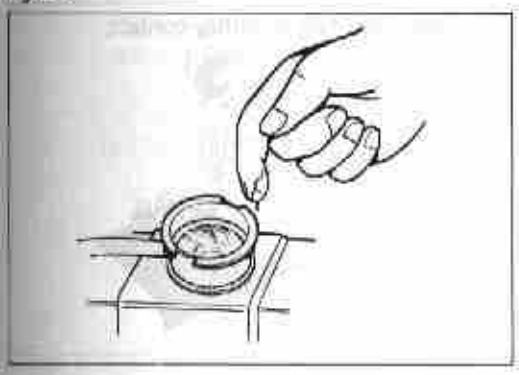
CHECK COOLANT LEVEL

If low, fill reservior to FULL line.

– Note –

To maintain freeze protection, use a recommended anti-freeze.

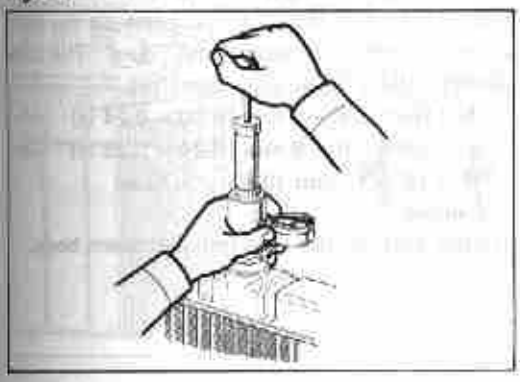
Fig. 3-6



CHECK COOLANT QUALITY

1. Check coolant cleanliness.
2. Check for rust or scale deposits around radiator cap and filler neck.
3. Check to see that there is no oil in the coolant.

Fig. 3-7

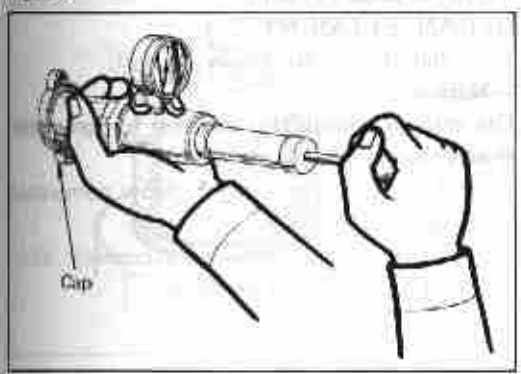


CHECK COOLING SYSTEM

Check for:

1. Damaged or deteriorated radiator and water hoses.
2. Loose hose clamps.
3. Damage or corrosion in the radiator core.
4. Leakage from the water pump, radiator core or a loose water drain cock.

Fig. 3-8



INSPECT RADIATOR CAP OPERATION

Inspect the spring tension and seating condition of the radiator cap vacuum valves. Replace the cap if the valve opens at a pressure below the specified or is otherwise defective.

Valve opening pressure limit

0.6 kg/cm² (8.5 psi)

Standard	**0.9 kg/cm² (12.8 psi)**

Fig. 3-9

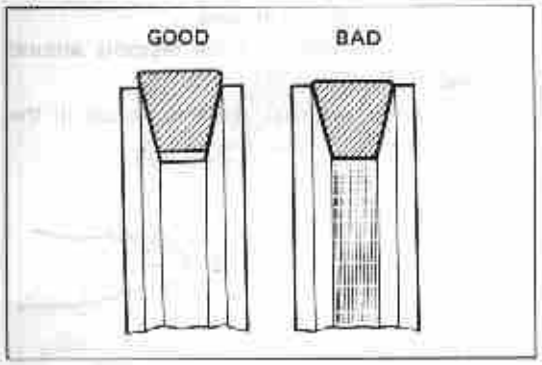
DRIVE BELT

VISUAL CHECK

Check the drive belt for:

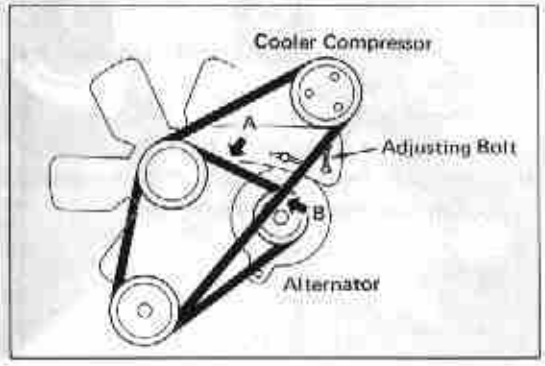
1. Cracks, deterioration, stretching or wear.
2. Adherence of oil or grease.

Fig. 3-10



3. Improper belt-to-pulley contact.

Fig. 3-11



CHECK & ADJUST BELT TENSION

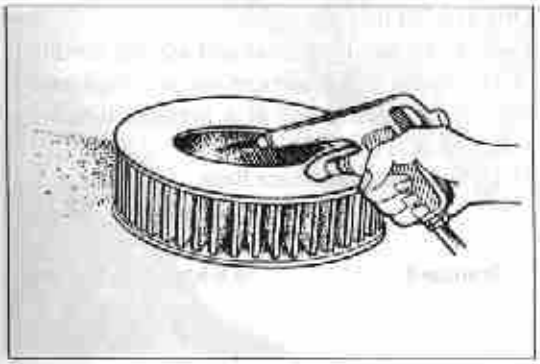
With 10 kg (22 lb) of force, press on the belt at the points indicated in the figure. The belt should deflect the amount specified.

A : New 5 – 6 mm (0.20 – 0.24 in)
Used 6 – 9 mm (0.24 – 0.35 in)
B : 16 – 19 mm (0.63 – 0.75 in)

– Caution –

Do not press on the air pump aluminum body.

Fig. 3-12



AIR CLEANER

CLEAN ELEMENT

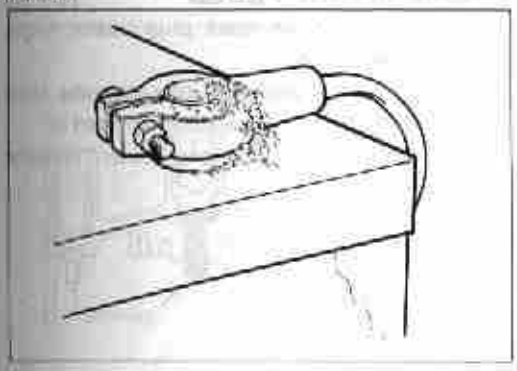
1. Remove the air cleaner element.

– Note –

Use care to prevent dirt or other foreign matter from entering into the carburetor.

2. To clean the element, blow compressed air from inside.
3. If element is torn or excessively dirty, replace it with a new one.

Fig. 3-13



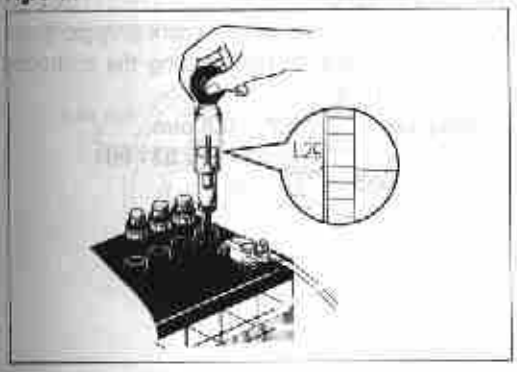
BATTERY

VISUAL CHECK

Check the battery for the following:

1. Rusted battery support.
2. Loose terminal connections.
3. Rusted or deteriorated terminals.
4. Damaged or leaking battery.

Fig. 3-14

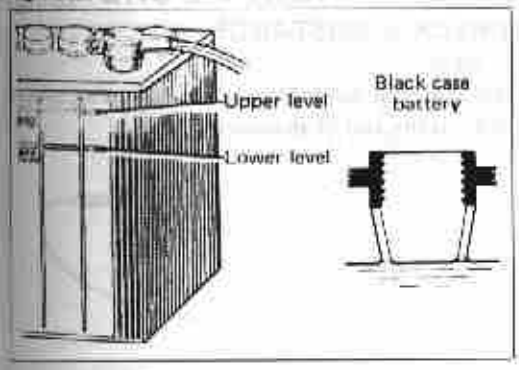


MEASURE SPECIFIC GRAVITY

1. Insert the hydrometer into the cell and hold it so that the float does not the cylinder wall.
2. Draw in sufficient water so that the float is suspended free from both the top and bottom of the cylinder.
3. Read the graduation.

Specific gravity 1.25 – 1.27 at 20°C (68°F)

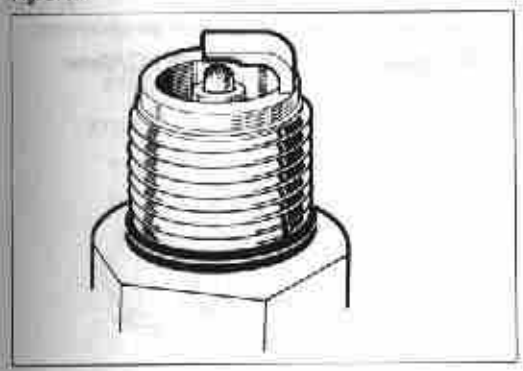
Fig. 3-15



CHECK ELECTROLYTE LEVEL

The water should be up to the upper electrolyte level. If low, add distilled or purified water.

Fig. 3-16



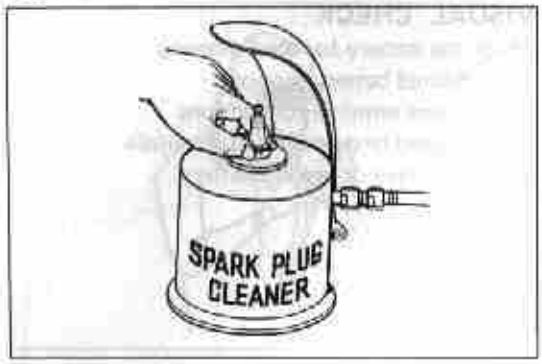
SPARK PLUG

VISUAL CHECK

The spark plugs for the following:

1. Cracks or other damage on the threads and insulator.
2. Electrode wear.
3. Damaged or deteriorated gaskets.
4. Burnt electrode or excess carbon deposits.

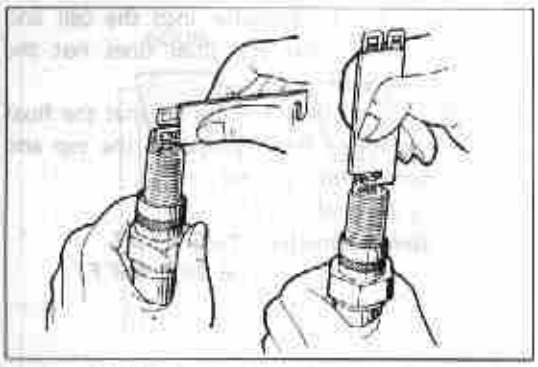
Fig. 3-17



CLEAN SPARK PLUGS

1. Do not use the spark plug cleaner longer than necessary.
2. Thoroughly blow off the cleaning compound and carbon with compressed air.
3. Clean the threads and outer insulator surface.

Fig. 3-18

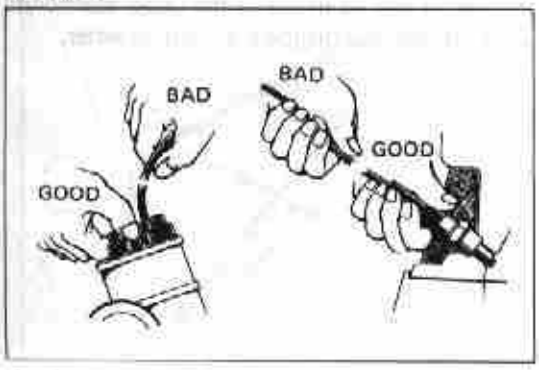


ADJUST GAP

Check each plug gap with a spark plug gap gauge. If necessary, adjust by bending the protruding (outer) electrode.

Plug gap **0.7 – 0.8 mm (0.028 – 0.031 in)**

Fig. 3-19



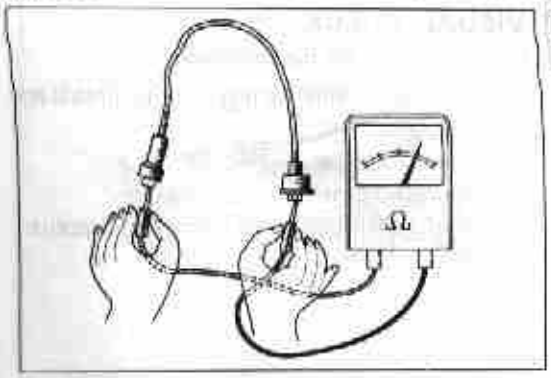
HIGH TENSION CORD

CHECK RESISTANCE

– Note –

To pull the cord from the spark plug, always pull on the end of the cord.

Fig. 3-20



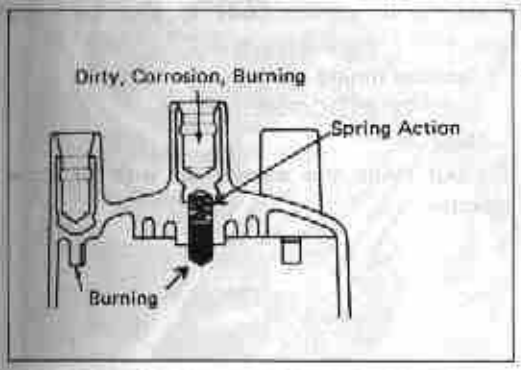
Check the cord resistance with an ohmmeter.

Resistance **Less than 25 kΩ/Meter**

DISTRIBUTOR

CHECK DISTRIBUTOR CAP

Fig. 3-21

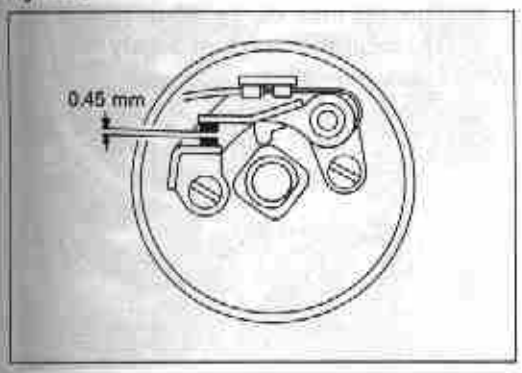


Check the cap and rotor for:

1. Cracks, damage, corrosion, burning and dirty cord hole.
2. Burnt electrode terminal.
3. Weak center piece spring action.

ADJUST POINT GAP

Fig. 3-22

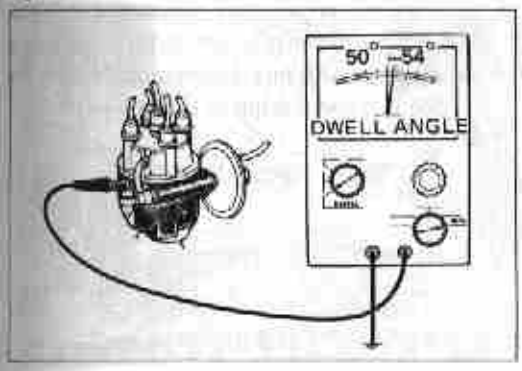


1. Replace the breaker points if excessively burnt or pitted.
2. Adjust the point gap and damping spring.

Point gap 0.45 mm (0.018 in)

INSPECT DWELL ANGLE

Fig. 3-23



Inspect the dwell angle with a dwell angle tester.

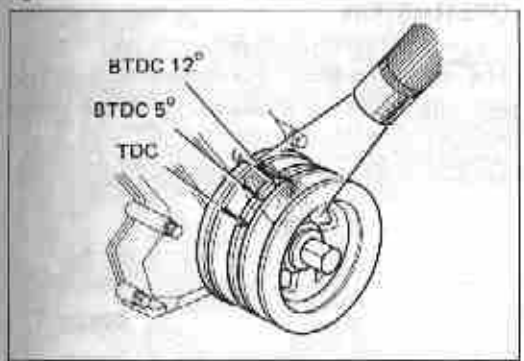
Dwell angle 50 – 54°

Variation

within 3° (at idling to 2000 rpm)

INSPECT IGNITION TIMING

Fig. 3-24

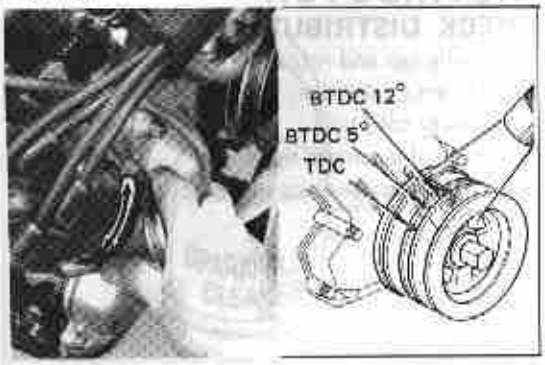


1. To inspect the ignition timing, the engine should be running at idle.
2. The octane selector must be set at the standard position.

Ignition timing

at Idle speed 12°BTDC

Fig. 3-25



ADJUSTMENT

Turn the distributor body to align the timing marks.

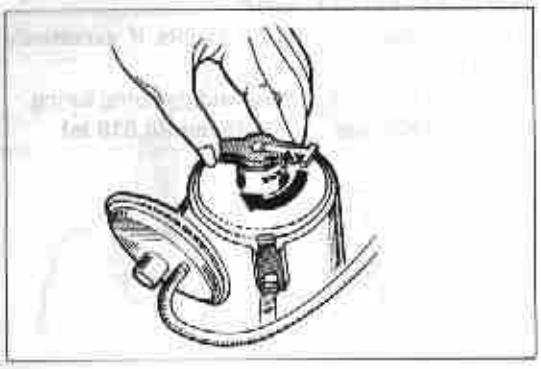
Ignition timing

12°BTDC/1000 rpm

— Note —

Do not make this adjustment with the octane selector.

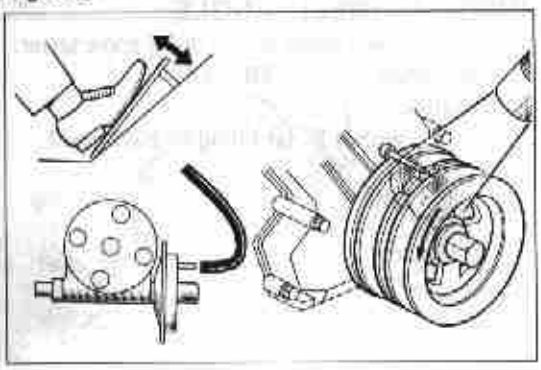
Fig. 3-26



GOVERNOR CHECK OPERATION

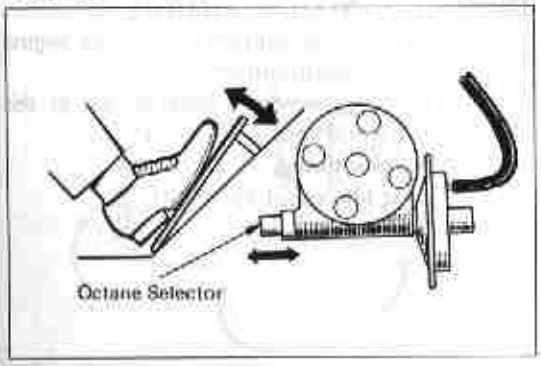
1. Turn the rotor clockwise and release. The rotor should return quickly.
2. Check the rotor for looseness.

Fig. 3-27



3. Start the engine and disconnect the vacuum hose from the distributor. The timing mark should vary in accordance with the opening and closing of throttle valve.

Fig. 3-28

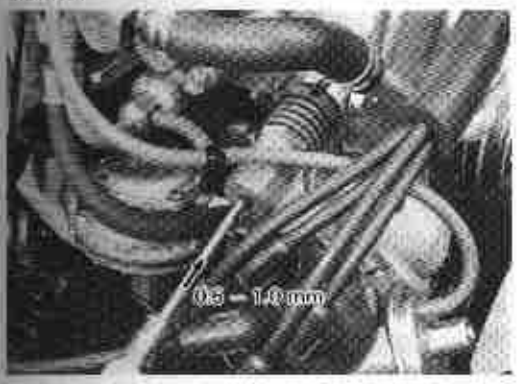


VACUUM ADVANCE CHECK OPERATION

Connect the distributor vacuum hose.

The octane selector should vary in accordance with the opening and closing of the throttle valve.

Fig. 3-29



NO.2 CHAIN TENSIONER

CHECK BACK STROKE

With a screwdriver, press in the plunger with 3 – 5 kg (6.6 – 11 lb) of force and measure the stroke length.

Stroke 0.5 – 1.0 mm (0.02 – 0.04 in)

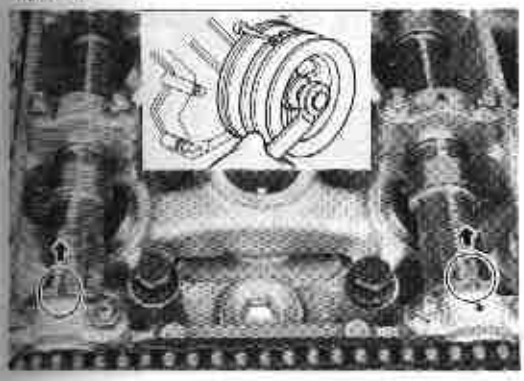
Fig. 3-30

ADJUSTMENT

Adjust the back stroke by the following procedure:

1. Loosen the lock nut.
2. Press in the plunger with 3 – 5 kg (6.6 – 11 lb) of force, and screw in the adjust nut until it rests on the plunger.
3. Unscrew the adjust nut 1/3 – 2/3 turns and secure it with the lock nut.
4. Check the stroke again to see that it is within the specified value.

Fig. 3-31

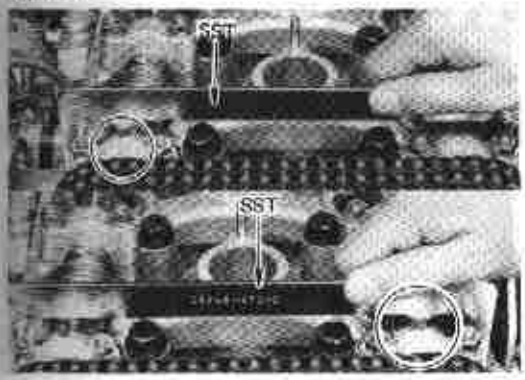


VALVE TIMING

INSPECTION

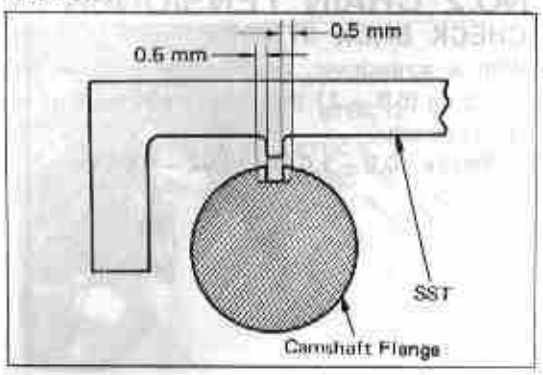
1. Remove the engine cylinder head cover.
2. Set the No. 1 cylinder to TDC/compression. In this position, the timing slits in the flange of the camshaft are positioned upward.

Fig. 3-32



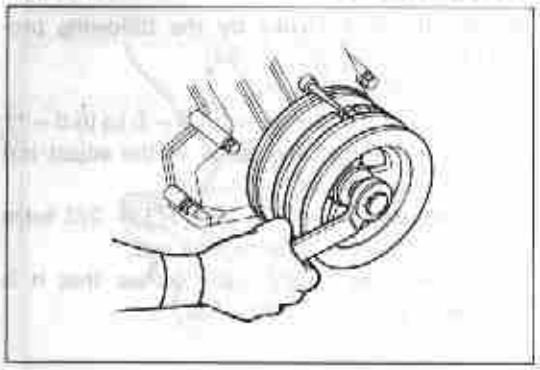
3. Check the positions of camshaft No. 1 and No. 2 with SST.
   SST [09248-27010]

Fig. 3-33



4. Valve timing permissible error: (on the camshaft outer flange):
   ± 2° Camshaft rotation angle.
   ± 0.5 mm (0.020 in)
   Camshaft flange outer perimeter.

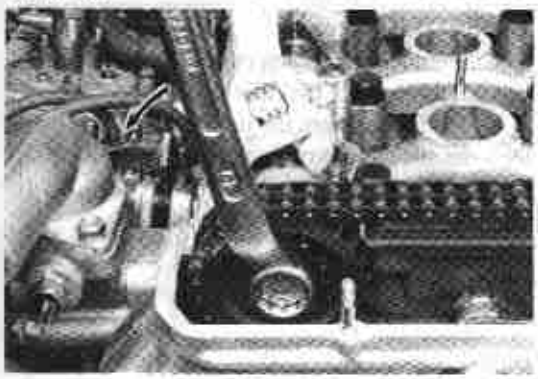
Fig. 3-34



ADJUSTMENT

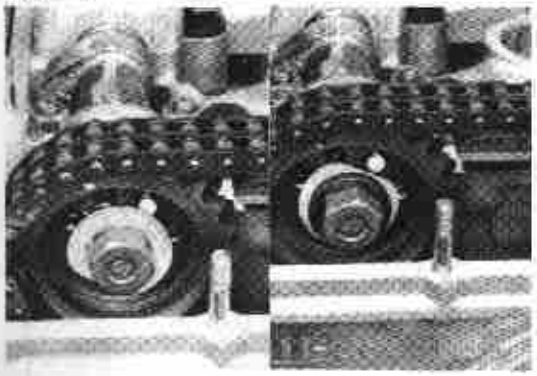
1. Reset No. 1 cylinder TDC/compression.

Fig. 3-35



2. Loosen the camshaft mounting bolt.

Fig. 3-36



3. Rotate the washer until the pin head is completely exposed.

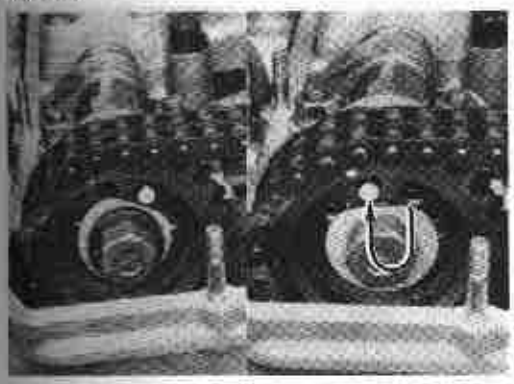
Fig. 3-37

4. Pull out the pin.

– Note –

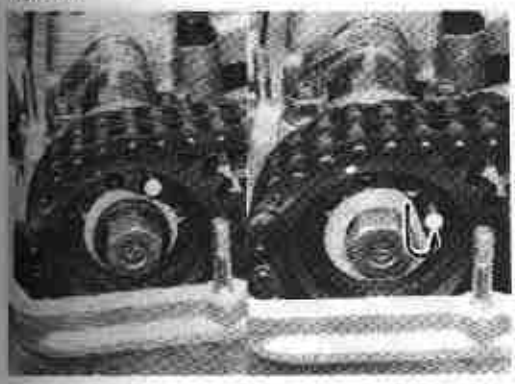
This will be easier if the camshaft is turned slightly forward to provide some play.

Fig. 3-38



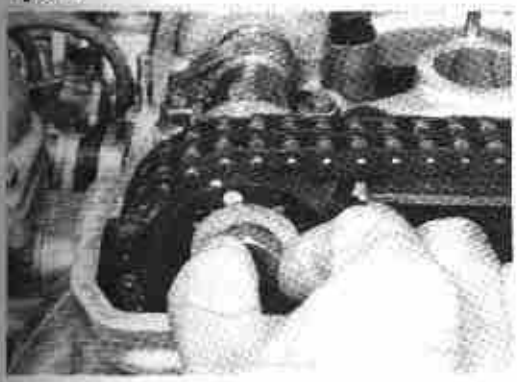
5. Valve timing advanced.
   (1) Align the pin hole in the counter-clockwise direction.
   (2) Turn the camshaft so that the slit is aligned with the adjust gauge and insert the pin.

Fig. 3-39



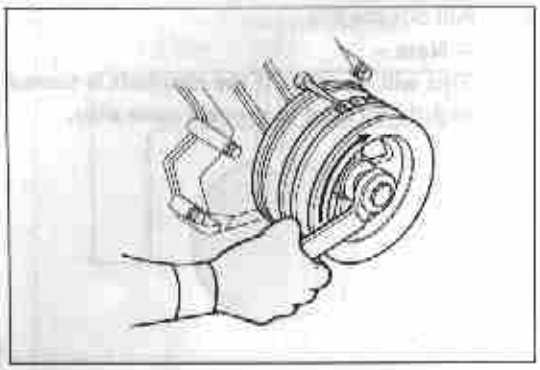
6. Retarded valve timing.
   (1) Align the pin hole in the clockwise direction.
   (2) Turn the camshaft so that the slit is aligned with the adjust gauge and insert the pin.

Fig. 3-40



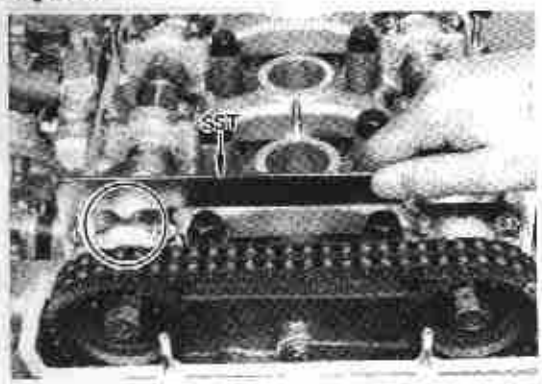
7. Support the pin with the washer and tighten the bolt.

Fig. 3-41



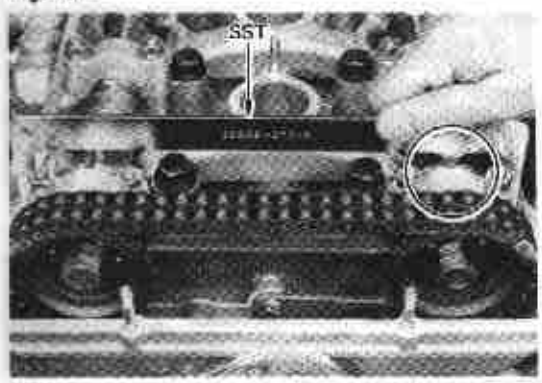
8. Rotate the crankshaft in the clockwise direction until No.1 cylinder is at TDC/ compression.

Fig. 3-42



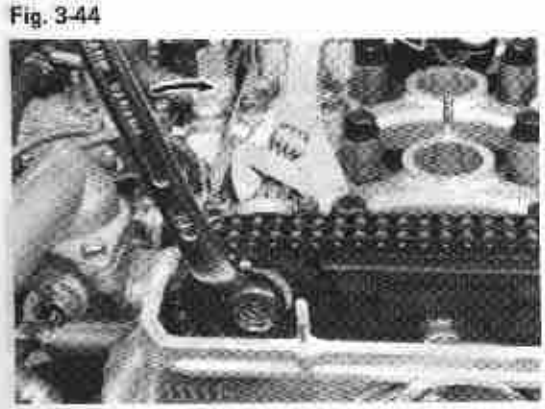
9. Recheck the No. 1 camshaft valve timing. Use SST [09248-27010]. The camshaft and SST protrusion should line up.

Fig. 3-43



10. Recheck the No. 2 camshaft valve timing. Use SST [09248-27010]. The camshaft slit and SST protrusion should line up.

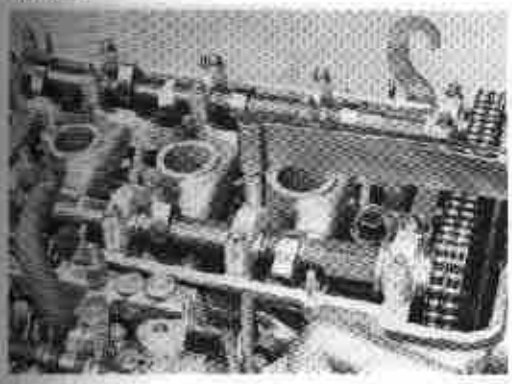
Fig. 3-44



11. Hold the camshaft with a wrench and tighten the camshaft mounting bolt.

Torque 7.0 – 8.0 kg-m (50.6 – 57.9 ft-lb)

Fig. 3-45

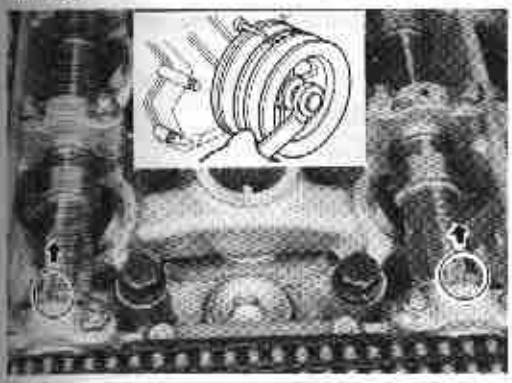


VALVE CLEARANCE

INSPECTION
(Cold Condition)

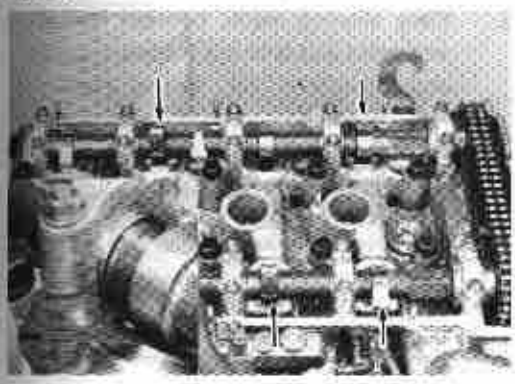
1. Before inspection, insure the following:
   (1) Camshaft bearing cap torque.
   Torque 1.6 – 2.2 kg-m (12 – 15 ft-lb)
   (2) Valve time is correct.
   SST [09248-27010]

Fig. 3-46



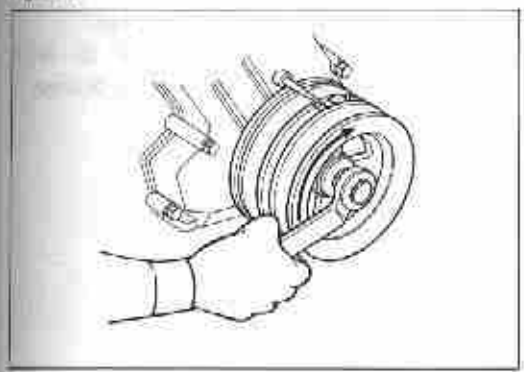
2. Set the No. 1 cylinder to TDC/compression. In this position, the timing check slits in the camshaft flange are facing upward.

Fig. 3-47



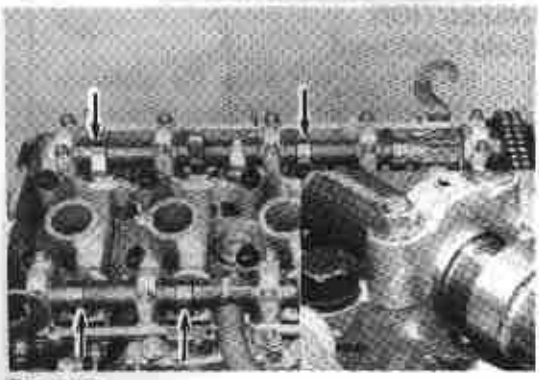
3. Measure and keep a record of the clearances of only the valves indicated by arrows in the figure.
   Clearance
   Intake 0.24 – 0.34 mm (0.009 – 0.013 in)
   Exhaust 0.29 – 0.39 mm (0.011 – 0.015 in)

Fig. 3-48



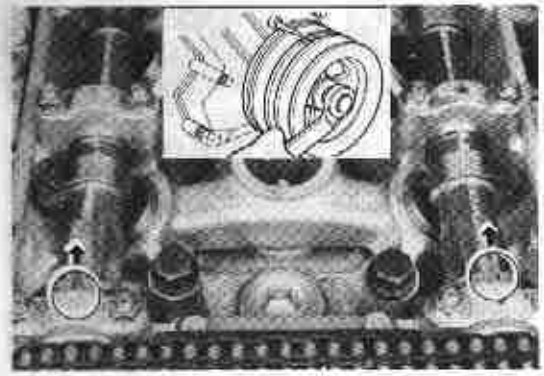
4. Turn the crankshaft 360° forward to No. 4 cylinder is TDC/compression.

Fig. 3-49



5. Check the remaining valve clearances of the remaining valves (indicated by arrows in the figure).

Fig. 3-50

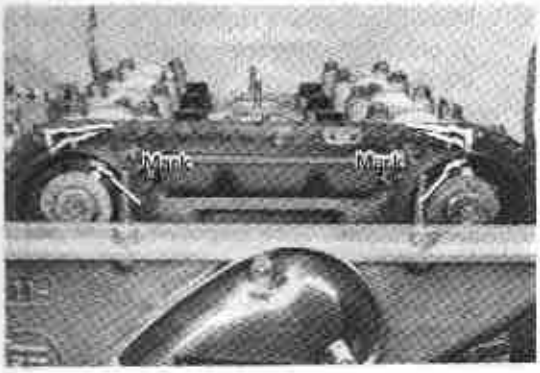


ADJUSTMENT

Adjust the clearance of any valve not within specification.

1. Set the No. 1 cylinder to TDC/compression.

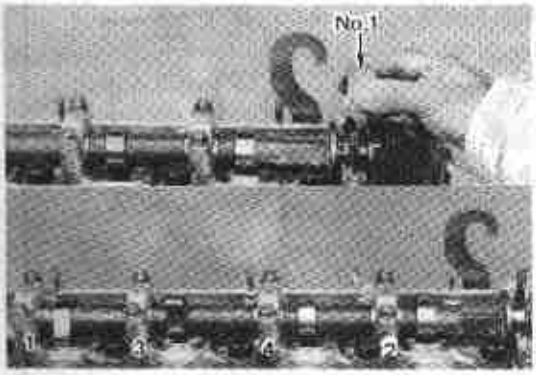
Fig. 3-51



2. Place aligning marks between No.2 chain and gears and between the respective gear and pin holes for correct reassembly.

3. Remove parts as follows.
   (1) No. 2 chain damper.
   (2) No. 2 chain tensioner.
   (3) Camshaft timing gear.

Fig. 3-52

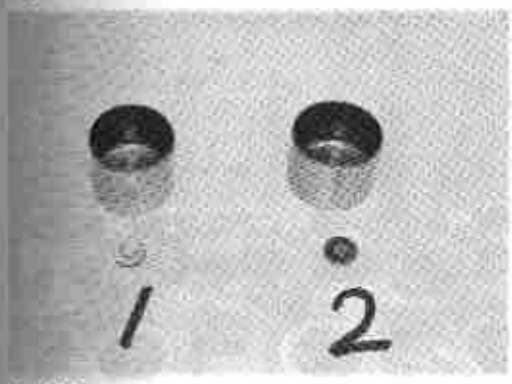


   (4) Camshaft No. 1 bearing cap.
   (5) Gradually loosen No. 2 to No. 5 bearing cap nuts in 2 to 3 stages in the sequence as shown.
   (6) Camshaft.

Fig. 3-53

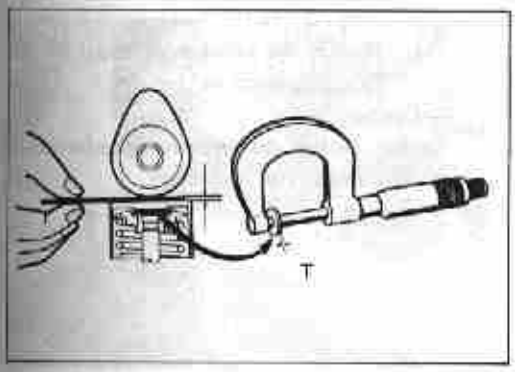
4. Remove valve lifter when valve clearance is not within specified valve.

Fig. 3-54



5. Keep valves and adjusting pads in order.

Fig. 3-55



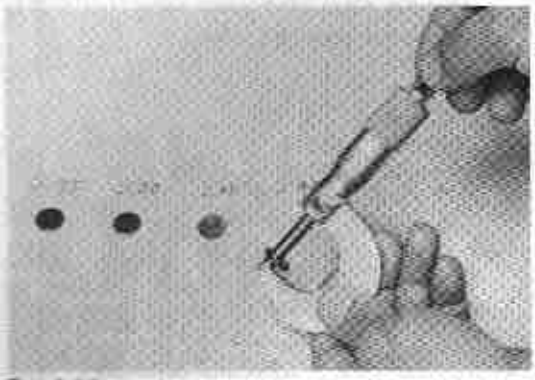
6. Select a new pad that will give the specified valve clearance as follows.
   (1) Measure the pad that was off with a micrometer.

   (2) Calculate thickness of new pad so valve clearance comes within specified valve.
   T ..... Thickness of pad used
   A ..... Valve clearance measured

   Intake Side
   New Pad Thickness
   = T + (A–0.29mm)

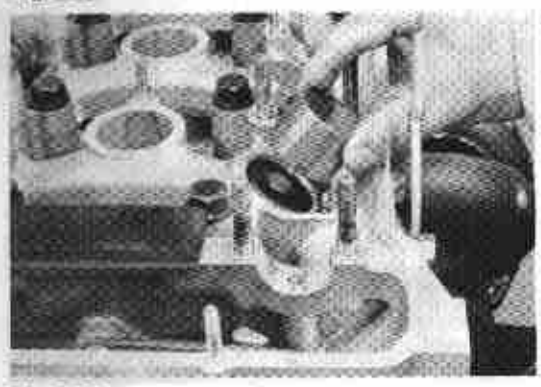
   Exhaust Side
   New Pad Thickness
   = T + (A–0.34mm)

Fig. 3-56



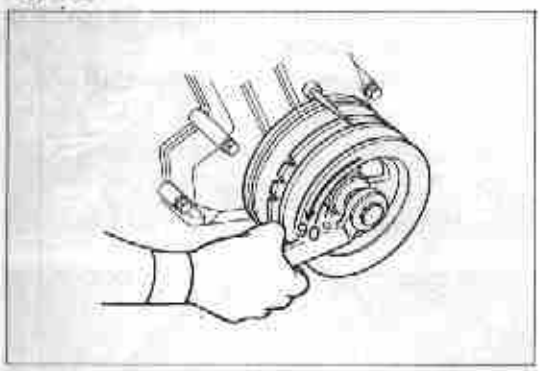
(3) Select a pad with a thickness as close as possible to the valve calculated. Pads are available in 41 sizes, in increments of 0.05 mm (0.002 in) from 1.00 mm (0.039 in) to 3.00 mm (0.118 in).

Fig. 3-57



7. Install pad and valve lifter

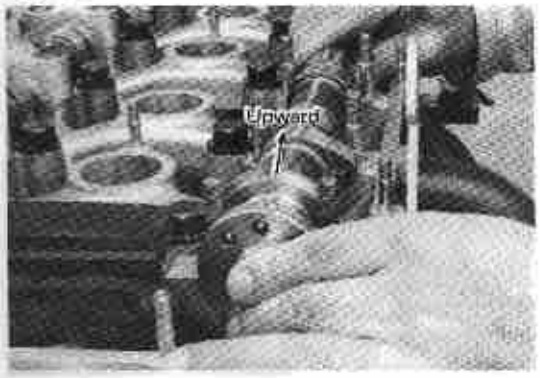
Fig. 3-58



8. Install the camshaft
(1) Rotate the crankshaft about 90° the reverse direction.

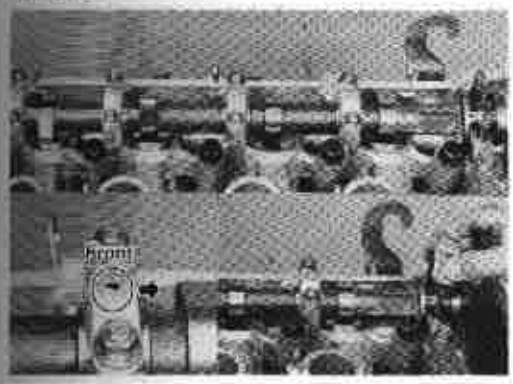
– Caution –
Lower piston to prevent interference a piston head and valve.

Fig. 3-59



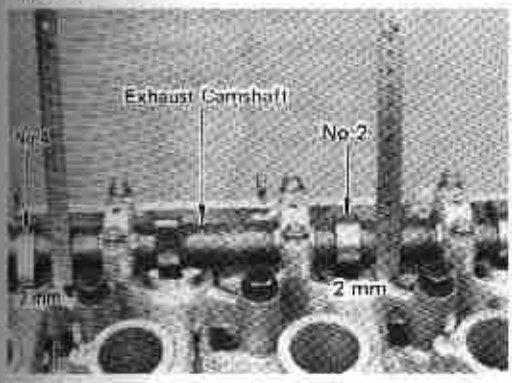
(2) Position slit of camshaft upward a shown.

Fig. 3-60



(3) Install the No. 2 to No. 5 camshaft bearing caps.
Face the arrow mark toward front.
(4) Gradually tighten bearing cap nuts in 3 to 4 stages in the sequence as shown.
Torque 1.6 – 2.2 kg-m (12 – 15 ft-lb)
(5) Then tighten No. 1 bearing cap to 1.6 – 2.2 kg-m (12 – 15 ft-lb).

Fig. 3-61

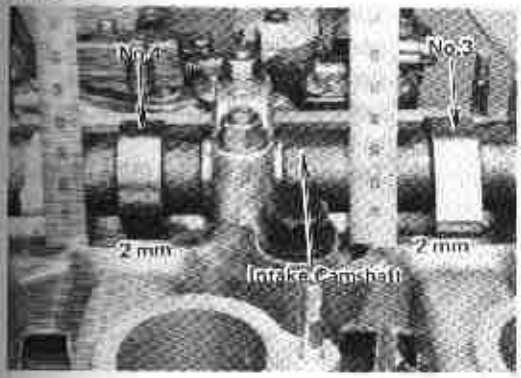


9. Recheck intake side valve clearance.
(1) Exhaust side valve lifter No. 2 and No. 4 shoud protrude the same amount (approx. 2 mm)

Fig. 3-62

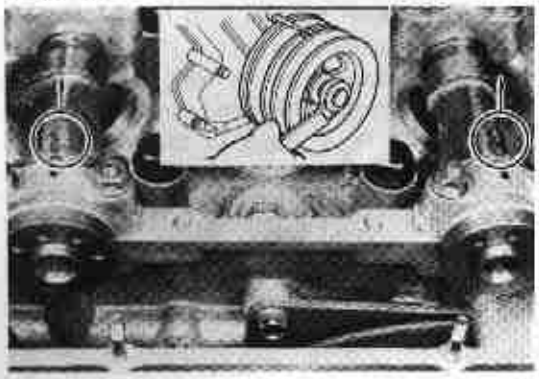
(2) Measure intake side valve clearance. If outside the specified valve, choose another pad.

Fig. 3-63



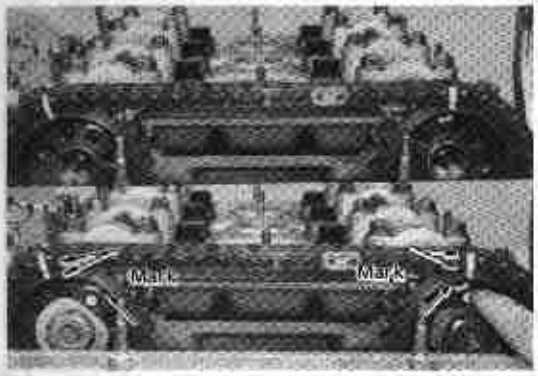
10. Recheck exhaust side valve clearance.
(1) Intake side valve lifter No. 3 and No. 4 should protrude the same amount.
(2) Measure exhaust side clearance.
If outside the specified value, choose another pad.

Fig. 3-64



11. Install the No. 2 chain and camshaft gears.
    (1) Position the No.1 and No. 2 camshaft slit vertically upward.
    (2) Set the No.1 cylinder to TDC/compression.

Fig. 3-65



    (3) Align chain and gear with marking made before disassembly.
    (4) Align camshaft and gear pin hole to position before disassembly and insert pin.

Fig. 3-66

    (5) Hold the pin with the washer.

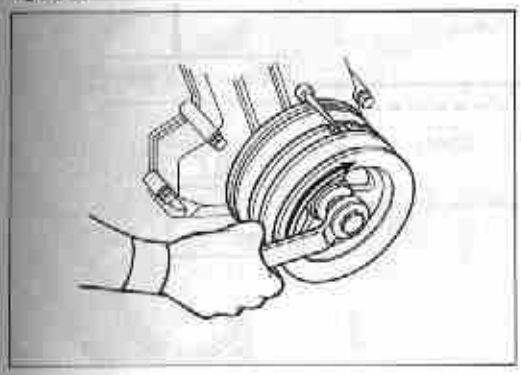
Fig. 3-67

    (6) Turn the crankshaft slightly in normal direction, until there is no slack in the pins, gears, and camshafts, and then tighten the bolts to specified torques.
    Torque 7.0-8.0kg-m (50.6-57.8ft-lb)

Fig. 3-68

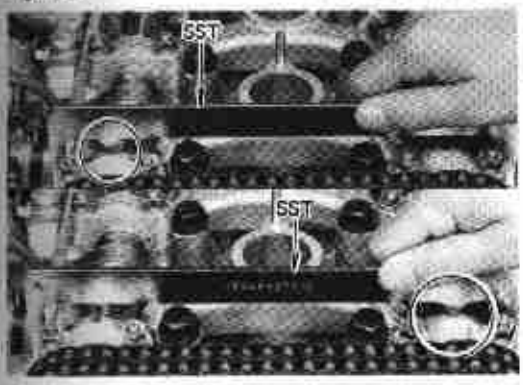
(7) Adjust the No. 2 chain tensioner.
Back stroke 0.5-1.0mm (0.02-0.04in)
at 3-5kg (6.6-11lb)

Fig. 3-69



12. Recheck valve timing.
(1) Rotate the crankshaft two turn in normal direction until No. 1 cylinder TDC/compression.

Fig. 3-70



(3) Recheck valve timing with SST [09248-27010].

CARBURATOR

CARBURATOR ADJUSTMENT PROCEDURES

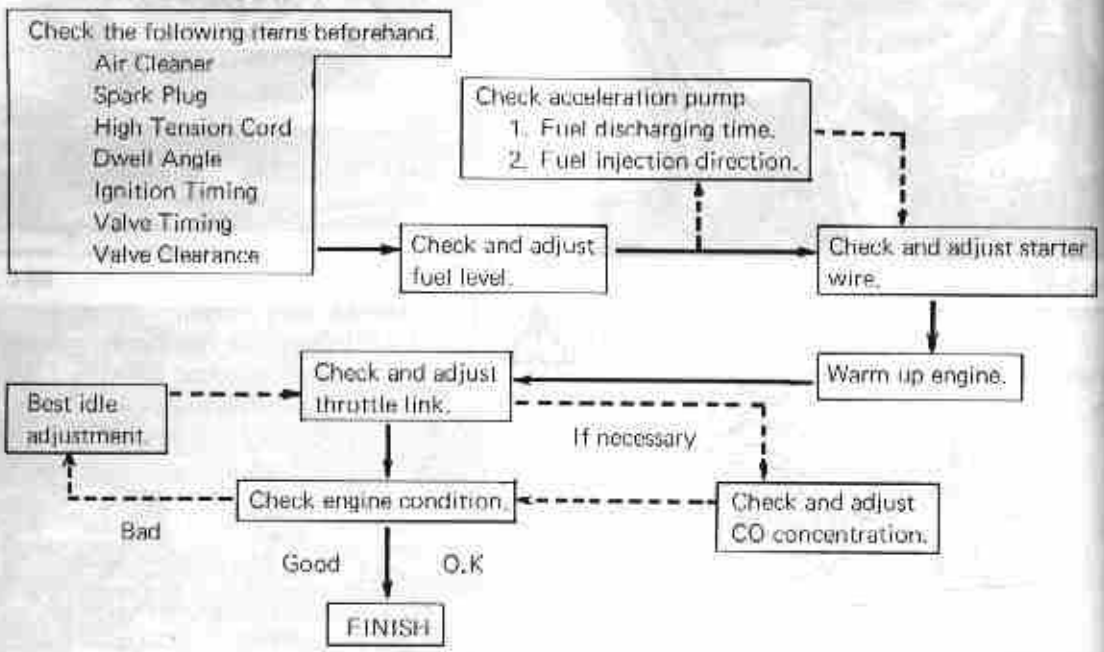


Fig. 3-71

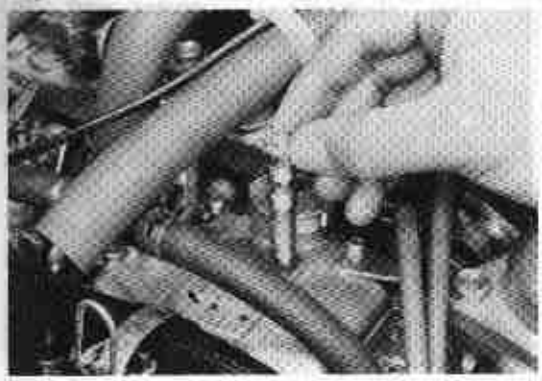
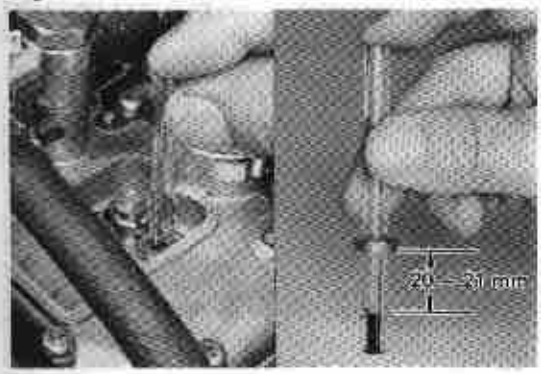


Fig. 3-72

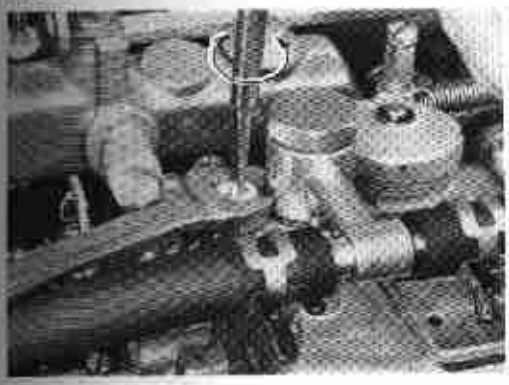


FLOAT LEVEL

Inspection

1. Start the engine and idle.
   About 1000rpm
2. Take out one of the main jet holders in assembled form.
3. Insert SST [09240-27010] or [09240-27020] in the hole from which the main jet holder was removed.
4. Check the gasoline level inside the gauge to see if within the limit.
   Standard level 20 – 21 mm (0.79 – 0.83 in)

Fig. 3-73



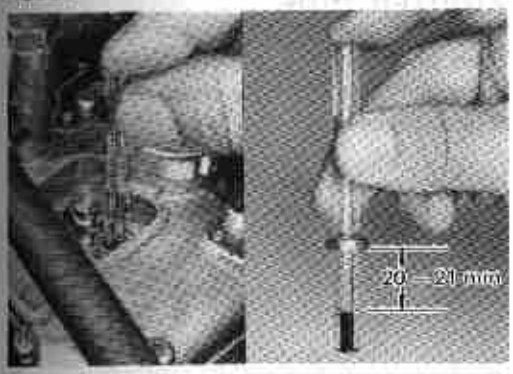
ADJUSTMENT

1. Adjust by turning the float level adjusting screw.

   One turn

   Float level change to 1.8mm (0.07in)

Fig. 3-74



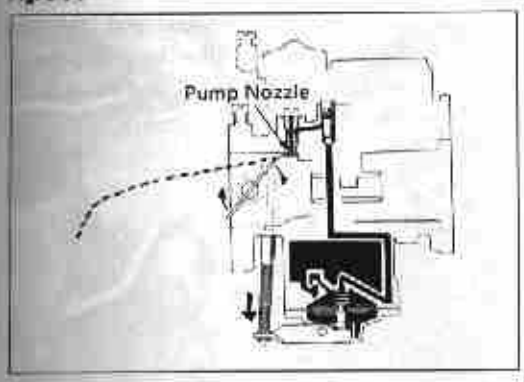
2. Recheck the float level.
   Condition where the fuel pump is operating and applying fuel pressure.

Fig. 3-75

ACCELERATION PUMP INSPECTION

1. Remove the carburetor.
2. Check the fuel in the float chamber.

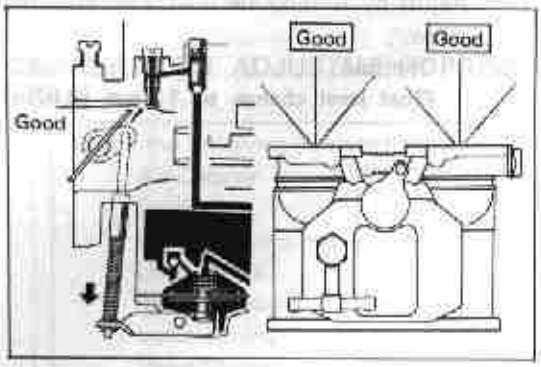
Fig. 3-76



3. Check the fuel discharging time.

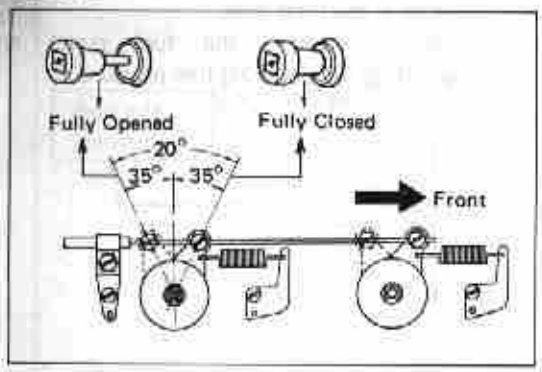
   0.9 – 1.3 second

Fig. 3-77



4. Check the fuel injection direction.

Fig. 3-78



STARTER WIRE

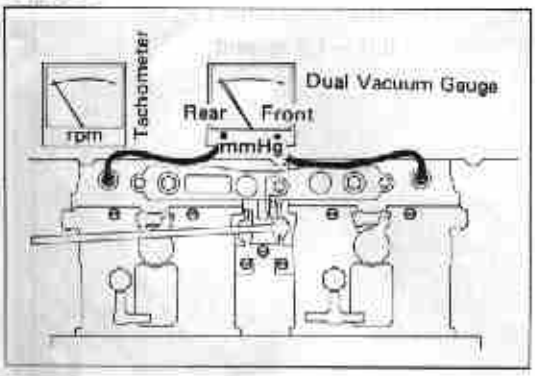
Insure that the carburetor discs are in the fully open position when the starter knob is pulled completely out and fully closed position when it is returned.

THROTTLE LINK (INITIAL IDLE SPEED) INSPECTION

Check the following items beforehand.

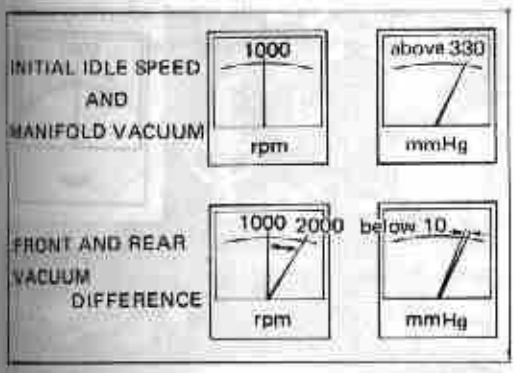
1. Coolant temperature 80°C (180°F)
2. Accessory parts All switched off.

Fig. 3-79



3. Mount the tachometer and the dual vacuum gauge to the vacuum take-off connection on the No. 1 and No. 4 intake manifolds.

Fig. 3-80



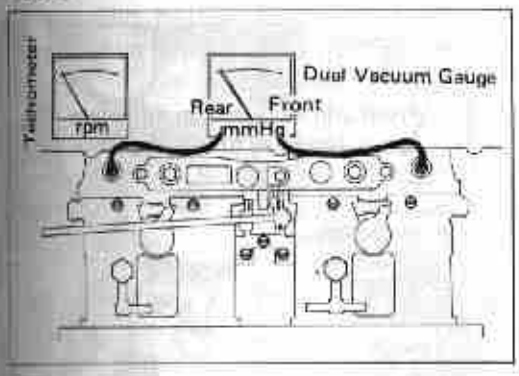
4. Check the idle speed and the difference between front and rear manifold vacuum.

Idle speed **1000 ± 50rpm**
Manifold Vacuum **380 mmHg (14.96inHg)**
Front and Rear Vacuum Difference (idle to 2000 rpm) below 10mmHg (0.39inHg)

ADJUSTMENT

Check the following items beforehand.
1. Coolant temperature 80°C (180°F)
2. Accessory parts All switched off.

Fig. 3-81

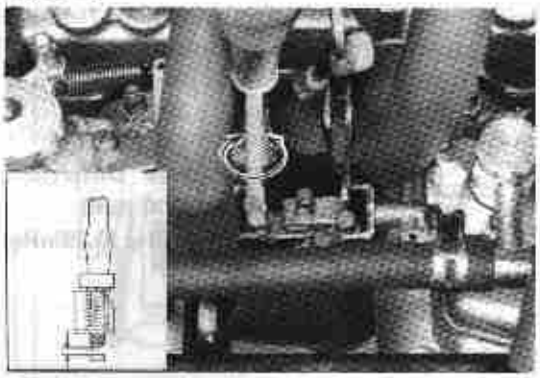


3. Mount the tachometer and the dual vacuum gauge to the vacuum take-off connection on the No. 1 and No. 4 intake manifolds.

Fig. 3-82

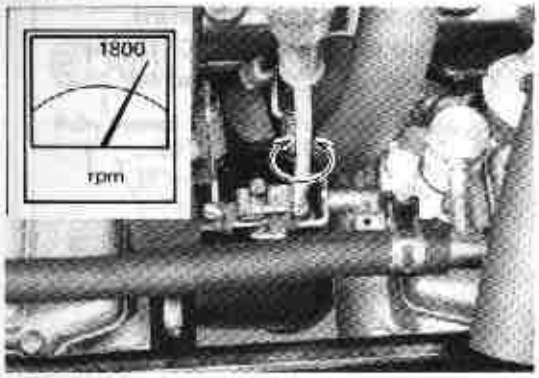
4. Disconnect the connecting rod at the body.

Fig. 3-83



5. Loosen the rear idle speed adjusting screw until it is free from the lever.

Fig. 3-84

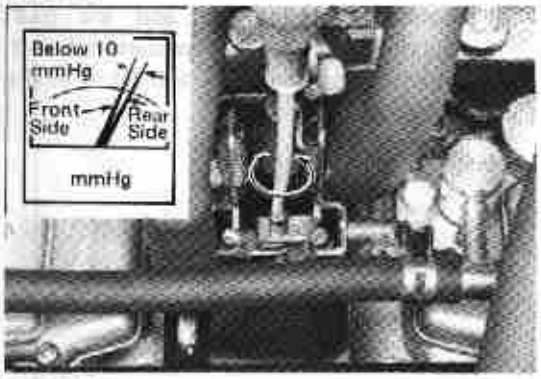


6. Set to 1800rpm by turning the front idle speed adjusting screw.

Engine speed 1800 rpm

Check the engine speed after raising the engine speed.

Fig. 3-85

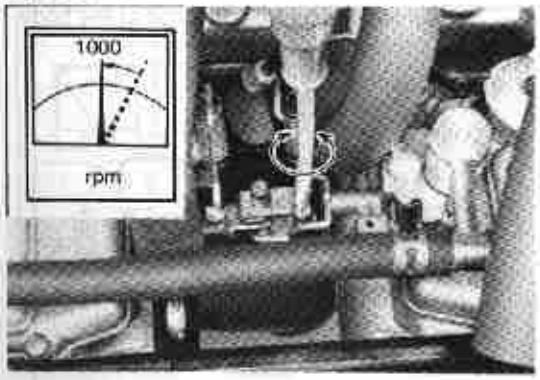


7. Set to front-rear vacuum difference to within 10mmHg (0.39inHg) by turning the synchronizing screw.

Front and rear vacuum difference below 10mmHg (0.39inHg)

Check the vacuum difference after raising the engine speed.

Fig. 3-86

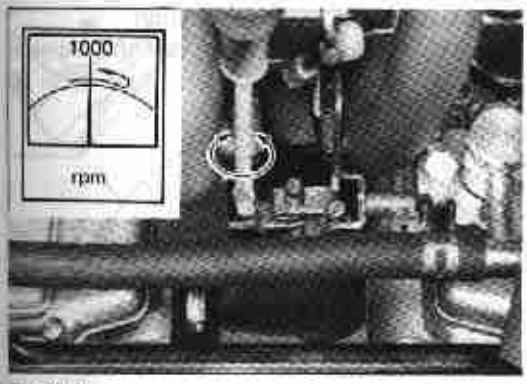


8. Loosen the front idle speed adjusting screw and lower the engine speed to 950 — 1,050 rpm.

Engine speed 1000 ± 50 rpm

Check the engine speed after raising the engine speed.

Fig. 3-87



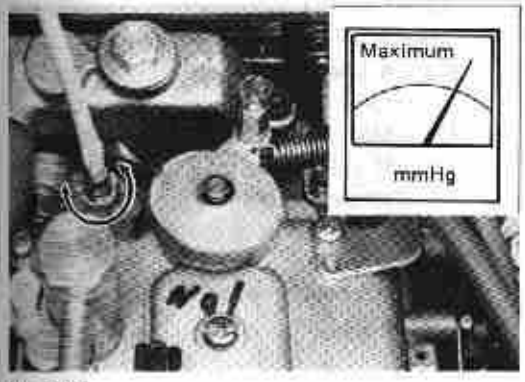
9. Screw in the slightly the rear idle speed adjusting screw and raise the engine speed, then adjust the engine speed to 950 ~ 1050 rpm.
   Engine speed 1000 ± 50rpm
   Check the engine speed after raising the engine speed.
10. Readjust front rear vacuum difference.
    Below 10mmHg (0.39inHg)

BEST IDLE ADJUSTMENT

1. Screw out all of the idle mixture adjusting screws 1 turn from fully closed position.
   – Note –
   Screw in gently until fully closed, taking care not to injure the carburetor idle port or the screw tapered point.

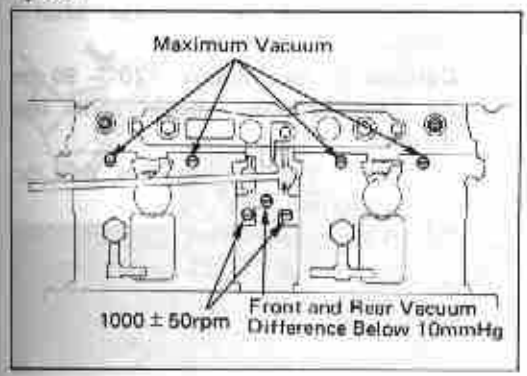
Fig. 3-88

Fig. 3-89



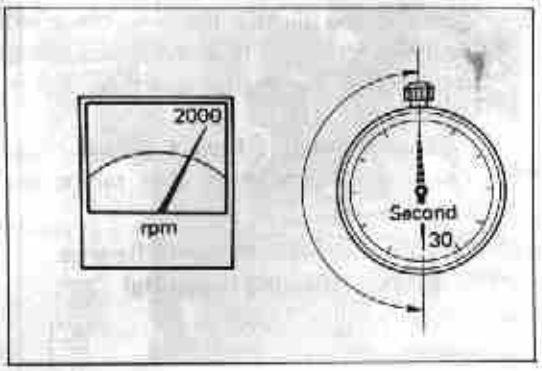
2. Set to the maximum vacuum reading by turning each idle mixture adjusting screw.
   – Caution –
   Repeat adjustment 2 or 3 times to obtain maximum vacuum setting.
   Best idle speed 1000 rpm
   Manifold vacuum Above 330mmHg (13.00inHg)

Fig. 3-90



3. Readjust the following 2 or 3 times.
   (1) Idle speed adjusting screw
   Idle speed 1000 ± 50rpm
   (2) Synchronizing screw (Idle to 2000rpm)
   Front and rear vacuum difference Below 10mmHg (0.39inHg)
   (3) Idle mixture adjusting screw
   Manifold vacuum Above 380mmHg (14.96inHg)

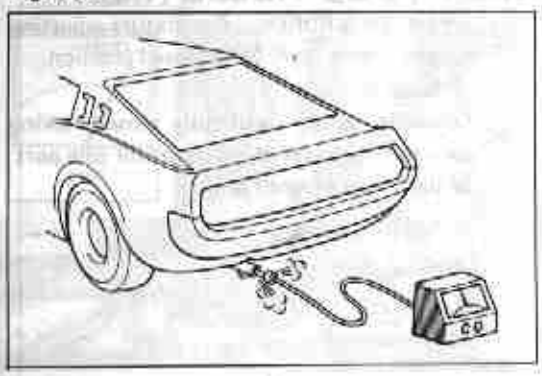
Fig. 3-91



CO CONCENTRATION

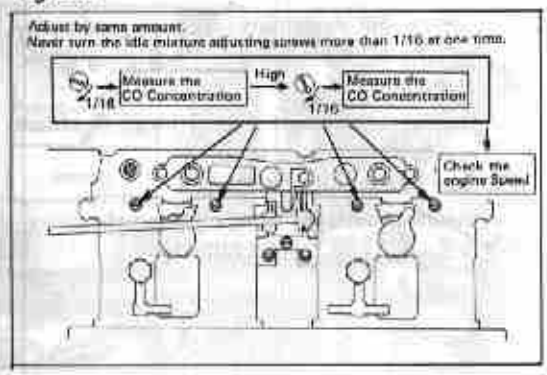
1. Measure the CO concentration
   (1) Before measuring, race the engine at about 2,000 rpm for 30 – 60 seconds.

Fig. 3-92



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

Fig. 3-93

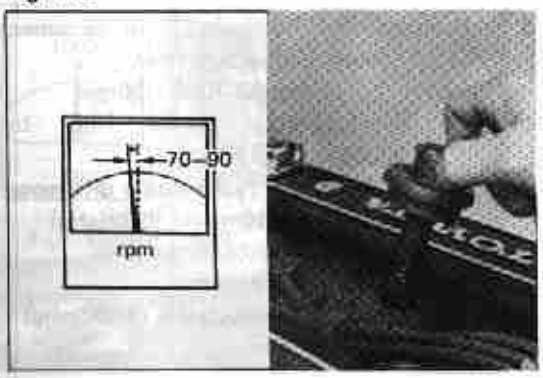


2. Adjust the CO concentration.
   When the concentration is high:
   (1) 4 idle mixture adjusting screws 1/16 turn.
   (2) Measure the CO concentration again.
   (3) If still high, 4 idle mixture adjusting screws another 1/16 turn.
   (4) Check the engine speed.

   – Note –

   Do not allow rpm to be below best idle speed.

Fig. 3-94



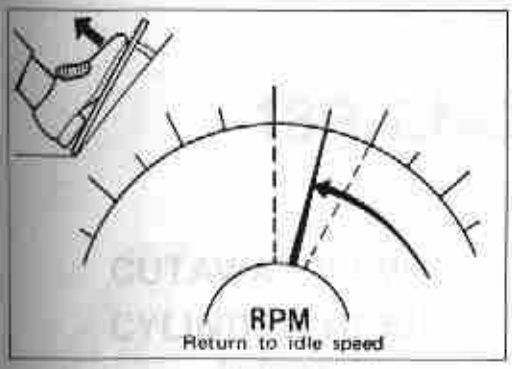
3. Check rpm of each cylinder when misfires.

   Decrease in rpm approx. 70 – 90 rpm
   All four cylinders should show same decrease.

   (1) When one plug misfires, raise rpm and clean.
   (2) When decrease in rpm is not uniform, adjust with the idle mixture adjusting screw.

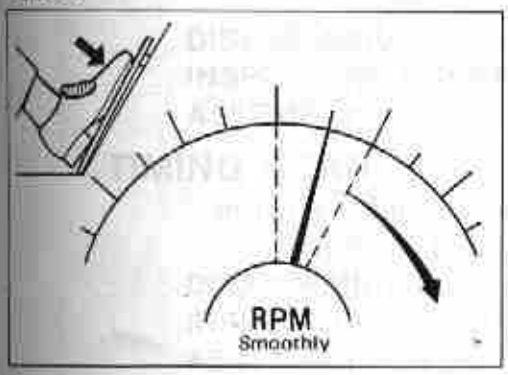
ENGINE CONDITION

Fig. 3-95



1. Check if the engine returns to idle speed when both suddenly and slowly accelerated.

Fig. 3-96



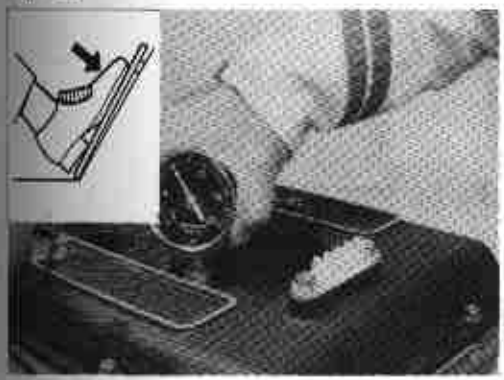
2. Opening throttle valve gradually should cause engine to speed up smoothly in relation to amount of valve opening.

COMPRESSION PRESSURE

Fig. 3-97

1. Warm up the engine.
2. Remove all spark plugs.
3. Disconnect the high tension cord from ignition coil to cut-off the secondary circuit.

Fig. 3-98



4. Insert a compression gauge into the spark plug hole, open the throttle valve fully, and measure the compression pressure while cranking the engine with starter motor.

Compression Pressure (at 200 rpm)
STD 12.7kg/cm² (180.3psi)
Limit 10.0kg/cm² (142.0psi)
Difference of pressure between cylinders Less than 1.0kg/cm² (14.2psi)