

ENGINE TUNE-UP

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In order to maintain the full performances originally built in the engine, a periodic engine tune-up is essential.

If any deficiency is encountered during operation of the car, it must be diagnosed immediately, and proper care should be taken by tuning up the engine.

The progress of modern engineering standard has been developed so quickly that it necessitates the use of proper instruments, and well trained mechanics. The compression has been increased, also incorporates numerous electrical equipment, and other components which can only be taken care with special knowledge, and proper care.

In order to accomplish the work correctly, and properly, a reliable tune-up equipment are necessary.

The procedures described in the following order should be carefully studied.

Inspection & Adjustment

Battery

The battery is mounted at the right side in the front fender.

For battery removal, refer to BATTERY Removal in ENGINE ELECTRICAL SYSTEM

1. Check the level of the electrolyte in the battery cells.

The electrolyte should be at the level line on the battery case. If necessary, replenish with distilled water only.

2. Check the charge of battery cells using a hydrometer.

The specific gravity should be 1.260 at 20°C (68°F).

If distilled water has been replenished, the specific gravity should not be measured until mixing is completed. To speed up the mixing, charge the battery for about half an hour.

When the battery specific gravity decreases less than 1.200, and the difference between each cell becomes more than 0.025 reading, the battery should be charged.

3. Check the battery terminals, and tighten if necessary.
4. Check the battery case for cracks or other damages.
5. Clean the battery terminals, and the top of the battery.

6. The battery hold-down clamp nuts should be kept tight enough to prevent the battery from shaking around in the battery holder.

Engine oil

1. Check the engine oil level, and replenish if necessary.

2. Check the engine oil for deterioration.

Check if the coolant or fuel is present in the oil.

If necessary, replace with proper grade engine oil.

Use SAE-40 when the average temperature is 30°C (86°F) or above.

Use SAE-30 when the average temperature is above 0°C (32°F).

Use SAE-20 during cold weather when the temperature is below 0°C (32°F).

Coolant

1. Check the coolant system for leaks, weak hoses, loose hose clamps, and correct coolant level.

If necessary, replenish with 30 to 50 percent of Long-life engine coolant (Permanent-type coolant) solution.

Every 20,000 kilos or 12,000 miles the cooling system should be serviced by flushing with plain water, then completely refill with a fresh solution of water, and Long-life

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engine coolant (permanent-type coolant).

"V" belt

1. Inspect the "V" belt for wear, cracks or other damages.
2. Check and adjust if necessary to correct tension.
The specified tension is 8 ~ 10 mm (0.3 ~ 0.4") when depressed at midway of the belt with 10 kg (22 lb) pressure.
To adjust the tension, loosen the alternator adjusting bar bolt, and adjust the alternator on its mounting bracket until the tension of the belt is sufficient.

Fuel filter

1. Check the fuel filter bowl for cracks and if necessary replace.
2. Check the element for damage or excessive dirt.
Replace the element if necessary.

Air cleaner

Clean the element with compressed air at low pressure.
Replace the element if damaged or excessively dirty.

Spark plug

1. Inspect each plug individually for badly worn electrodes, glazed, broken or blistered porcelain, and replace the plug/s as necessary.
2. Clean the spark plugs thoroughly using a sand blast cleaner.
When cleaning with a sand blast cleaner, do not operate too long to prevent porcelain damage.
3. Inspect each spark plug for make, and heat range.
All plugs must be of the same make, and number or heat range.
If excessive carbon deposits are

observed on the insulator tip, replace with a hot range type spark plugs.

If the spark plugs show burning white or rapid electrode wear, replace with a cold range type spark plugs.

Recommended spark plugs are BP-7E (NGK) or N9Y (Champion).

4. Adjust the spark plug gap by bending the ground electrode to obtain the specific gap of 0.7 ~ 0.8 mm (0.027 ~ 0.031") with a spark plug gap gauge.

Distributor

1. Clean the distributor cap, and inspect for cracks, carbon tracks, and burnt or corroded terminals.
Replace the cap if necessary.
2. Clean the rotor, and inspect for damage or deterioration.
Replace the rotor if necessary.
3. Check the distributor centrifugal advance mechanism by turning the rotor in the clockwise direction as far as possible, then release the rotor, and see if the rotor returns to its retarded position.
If the rotor does not return readily, the distributor must be disassembled, and the cause of the trouble should be corrected.
4. Check the vacuum advancer mechanism by pushing in the octane selector, then release the octane selector to see if the selector returns to its retarded position.
Any stiffness in the operation of the vacuum governor mechanism will affect the ignition timing.
Correct any interference or binding.
5. Clean the breaker points if necessary with a point file.
Never use emery cloth or sand

paper to clean the points since particles will embed, and cause arcing, and rapid burning of the points.

Replace the points that are burnt or badly pitted.

6. Check and adjust the point gap. The gap should be 0.45 mm (0.018").
7. Check the breaker arm tension with a spring tension tester, by pulling at right angle of the breaker arm point. Read the tester just when the point opens. The tension should be 510 ~ 690 grams (18 ~ 24 oz).
8. Lubricate the distributor as shown in the following illustration. Distributor grease indicated by "A". Motor oil indicated by "B".

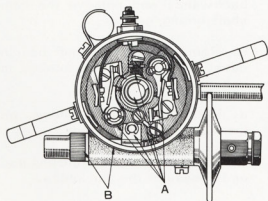


Fig. 2-1 Distributor G0339
Lubrication

9. Inspect the advance characteristics of the vacuum advancer, and the centrifugal advancer, cam dwell angle, and the condenser capacity. For detail inspection and procedures, refer to DISTRIBUTOR in ENGINE ELECTRICAL SYSTEM.

Ignition initial timing

1. Connect a timing light onto the No. 1 spark plug, using a suitable

adapter at the wire connection.

2. Attach a tachometer onto the ignition coil.
3. Start the engine, and run it at idle speed of 700 ~ 800 rpm.
4. Aim the timing light at the timing graduations on the crankshaft damper. Adjust the timing to B.T.D.C. 15° by loosening the distributor clamp, and rotate the distributor housing as required, then tighten the clamp securely. Next, plug the vacuum line on the distributor, and adjust the timing to B.T.D.C. 35°. To adjust the ignition timing, the octane selector should be set at normal position.

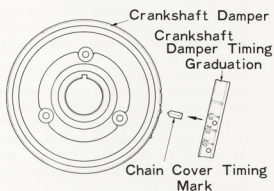


Fig. 2-2 Ignition Initial Timing G0308

Octane selector

1. Depending on the gasoline octane rating, the initial timing must be adjusted as required. The adjustment of the octane selector should be adjusted during the road test.
2. If the engine "pings" excessively, turn the adjuster towards the "R" mark. If the engine does not "ping" at all, turn the adjuster towards the "A" mark. Turning the adjuster towards the

"A" mark will advance the timing,, and towards the "R" mark will retard the timing.

Valve clearance

Proper adjustment of the intake, and exhaust valve clearances is very important to prevent burning of the valves, and poor engine performance.

1. Tighten the cylinder head bolt nuts for 12 mm bolts to 8.0 m-k_g or 58 ft-lb, and for 8 mm bolts to 1.5 ~ 2.2 m-k_g (11 ~ 16 ft-lb) torque.
2. Tighten the camshaft bearing cap nuts to 1.8 ~ 2.4 m-k_g (13 ~ 17 ft-lb) torque.
3. Remove the radiator lower shroud.
4. Rotate the crankshaft with a wrench and check the valve clearance with a feeler gauge with the engine cold.

Measure, and take note of the clearances recorded, together with the relative corrections needed to achieve the prescribed clearances. The specific clearance is 0.35 mm (0.0138") for the intake, and 0.45 mm (0.0177") for the exhaust.

If necessary, adjust the valve clearance with the valve adjusting pad.

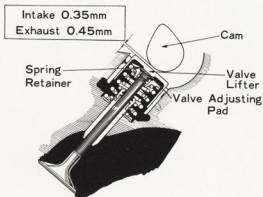


Fig.2-3 Valve Clearance C0318

5. Adjust the valve clearance in the

following manner.

- a. Set the No.1 piston at B.T.D.C. C. 35° with compression stroke by aligning the timing pointer on the timing chain cover with the graduation (B.T.D.C. 35°) on the crankshaft damper.

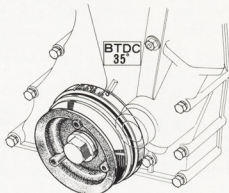


Fig.2-4 Aligning Timing Marks X6188

- b. Move the chain tensioner No.1 backward, and remove the camshaft timing gears.
- c. Remove the camshaft bearing caps, then remove the intake, and exhaust camshafts.
- d. Pull out the valve lifters, and the valve adjusting pads.
- e. Extract the valve adjusting pads, and measure the thickness.
- f. Select a new pad of correct thickness. The pads are supplied in a series of thicknesses ranging from 1.000 mm (0.0394") to 1.900 mm or 0.0748" in increments of 0.025 mm (0.001").

- g. Refit the corrected thickness valve adjusting pad, and the valve lifter.

Position the camshaft, and install the camshaft bearing caps.

Tighten the camshaft bearing cap nuts to 1.8 ~ 2.4 m-k_g (13 ~ 17 ft-lb) torque.

h. Rotate the camshaft using the Valve Timing Adjust Wrench 09225-43010, and recheck the valve clearance.

Rotate one of the camshaft if necessary, but the other camshaft must be removed.

i. After adjusting the valve clearance on each side, install the camshafts, and set the camshafts using the Valve Timing Adjust Gauge 09248-43010.

j. Rotate the crankshaft clockwise slightly, and align the timing marks ("V" groove and pointer) at T. D. C. of No.1 piston at compression stroke.

k. Position the camshaft timing gears onto the camshafts, and connect the chain No.2.

l. Install the chain tensioner No.1.

m. Find out the hole in the camshaft timing gear which will align with the hole in the camshaft flange, then insert the straight pin into the holes.

When the holes do not align, rotate the camshaft slightly to within $1^{\circ}20'$ with the Valve Timing Adjust Wrench 09225-43010, and then insert the straight pin into the holes.

n. Position the washers onto the camshaft, tighten the retaining bolts to 3.5 ~ 4.5 m-kg (25 ~ 33 ft-lb) torque.

Chain No.2

Inspect and adjust the chain No.2 looseness in the following manner. Loose chain No.2 will cause retarded valve timing.

1. Set the No.1 piston at T.D.C. at compression stroke by aligning the timing marks.
2. Before inspecting, check the chain

tensioner No.1 for looseness.

3. Inspect the camshaft valve timing with the Valve Timing Adjust Gauge 09248-43010.

The Valve Timing Adjust Gauge, and the slots on the camshaft flange should be aligned.

If these do not align, the chain No.2 indicates looseness.

4. To adjust the looseness of the chain No.2, remove the camshaft timing gear retaining bolt, washer, and the straight pin.

Next, install the Valve Timing Adjust Gauge 09248-43010 onto the camshaft.

Find out the aligned holes in the camshaft timing gear, and the camshaft flange, and then insert the straight pin.

Install the washer, and tighten the retaining bolt to 3.5 ~ 4.5 m-kg (25 ~ 33 ft-lb) torque.

Carburetor

For detail operation and procedures refer to CARBURETOR in FUEL SYSTEM.

1. Disconnect the air cleaner hose, and remove the intake air connector No.1.

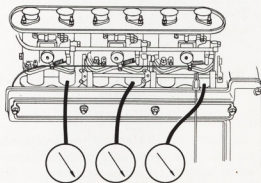


Fig.2-5 Vacuum Gauge Connection X6189

Unscrew the plugs on the intake manifolds (No.1, No.3, and No.5 cylinders), and install the vacuum

gauge hose connectors.

Connect the vacuum gauges to each hose connectors.

2. Warm up the engine to operating temperature more than 60°C (140°F) before the carburetor adjustment.
3. Accelerator linkage adjustment. Increase the engine revolution gradually, and set it at 1,750 ~ 1,850 rpm with the adjusting screw on the idle adjusting arm No.1. Read the vacuum gauge on the No.1 cylinder. The reading should be 290 ~ 340 mm Hg (11.42 to 13.39 in Hg).

At this time also with other vacuum gauges, the reading should be 290 ~ 340 mm Hg (11.42 to 13.39 in Hg), and the difference between each gauges should be ± 5 mm Hg (0.20 in Hg) reading. The adjusting screws on the idle adjusting arm No.2 should be adjusted.

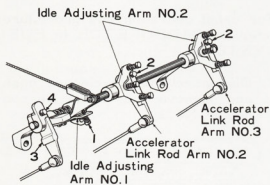


Fig.2-6 Accelerator Linkage G0326

Note:

Carburetor balancer is available to balance twin or more carburetors which is quite convenient for balancing the carburetors.

When using the carburetor balancer, the difference of the float level should be less than ± 5 mm (0.2") between each carburetor. If necessary, adjust the adjusting screws on the idle adjusting arm No.2.

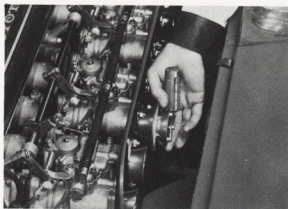


Fig.2-7 Using Carburetor V1296 Balancer

4. Idle speed adjustment

a. After adjusting the accelerator linkage, screw out the adjusting screw on the idle adjusting arm No.1.

Set the engine speed to 700 ~ 800 rpm with the throttle valve adjusting screws.

b. The vacuum gauge reading should be more than 250 mm Hg (9.84 in Hg), and the difference between each carburetor should be less than ± 5 mm Hg (0.2 in Hg).

When using the carburetor balancer the difference of the float level should be less than ± 7 mm (0.27") between each carburetor.

c. Disconnect the fuel hoses from each carburetor, and then connect a gasoline mileage tester onto each carburetor fuel line.

d. Confirm the arrow marks on the idle adjusting screws of all the carburetors.

The arrow mark should be positioned between the mark to mark on the carburetor body.

If necessary, adjust the idle adjusting screw/s.

To adjust, first, screw in the idle adjusting screw firmly finger tight, next, screw out the idle adjusting screw to 7/8 turn, and align the arrow mark with the center mark

on the carburetor body.

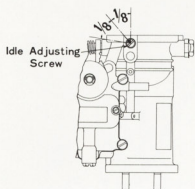


Fig.2-8 Position of Idle G0328
Adjusting Screw

e. Check the fuel consumption at engine speed of 700 ~ 800 rpm with a gasoline mileage tester.

The fuel consumption of each carburetor should be 0.43 ~ 0.36 liter (0.91 ~ 0.76 US pint, 0.76 to 0.63 Imp. pint) per hour, and if the difference between each carburetor indicates more than 0.04 liter (0.08 US pint, 0.07 Imp. pint) per hour, the idle adjusting screws should be adjusted.

Screw in the idle adjusting screw, to decrease the fuel consumption.

After completing all of the above adjustments, perform the following adjustments.

f. Set the engine speed at 700 to 800 rpm for 10 ~ 15 minutes, and check the alteration of the engine speed.

The engine speed should not alter. After idling the engine speed for 10 ~ 15 minutes, remove all spark plugs, and check the electrodes condition.

If the spark plugs show white or excessive carbon deposits, re-

adjust the idle adjusting screw/s for the abnormal conditioned spark plug/s.

If the spark plug shows burning white, the fuel mixture is lean. After completing all of the above carburetor adjustments, recheck the engine running condition for smooth engine operation.

For carburetor adjustment installed on the engine with Positive Crankcase Ventilation refer to the adjustment specification on the Carburetor Adjustment(W/PCV).

Compression test.

1. Warm up the engine to operating temperature before the test.
2. Disconnect the high tension wires from the spark plugs, and ignition coil.
3. Remove all spark plugs to test the compression with a compression gauge.
Always use a fully charged battery to obtain the starter revolution of more than 250 rpm.
The throttle valve must be fully opened during the compression test.
4. Crank the engine with the starter until the compression gauge reading is steady, and the reading is at the maximum.

The compression pressure should exceed 12.5 kg/cm² (177.7 psi) at 250 rpm.

The limit is 9 kg/cm² (128 psi) at 250 rpm.

Difference of pressure between the cylinders should be less than 0.7 kg/cm (10 psi).