

# Tune-Up and Troubleshooting



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## Tune-Up Procedures

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*NOTE: The procedures found in this section are specific and pertain only to the Land Cruiser. General procedures are outlined in the "Tune-Up" section following this chapter.*

### SPARK PLUGS

Spark plugs ignite the air and fuel mixture in the cylinder as the piston reaches the top of the compression stroke. The controlled explosion that results forces the piston down, turning the crankshaft and the rest of the drive train.

The average life of a spark plug is 12,000 miles. This is, however, dependent on a number of factors: the mechanical condition of the engine; the type of fuel; driving conditions; and the driver.

When you remove the spark plugs, check their condition. They are a good indicator of the condition of the engine. It is a good idea to remove the spark plugs at regular intervals, such as every 3,000 or 4,000 miles, just so you can keep an eye on the mechanical state of your engine.

A small deposit of light tan or gray material on a spark plug that has been used for any period of time is to be considered normal. Any other color, or abnor-

mal amounts of deposit, indicate that there is something amiss in the engine.

The gap between the center electrode and the side or ground electrode can be expected to increase not more than 0.001 in. every 1,000 miles under normal conditions.

When a spark plug is functioning normally or, more accurately, when the plug is installed in an engine that is functioning properly, the plugs can be taken out, cleaned, regapped, and reinstalled in the engine without doing the engine any harm.

When, and if, a plug fouls and begins to misfire, you will have to investigate, correct the cause of the fouling, and either clean or replace the plug.

There are several reasons why a spark plug will foul and you can learn which is at fault by just looking at the plug. A few of the most common reasons for plug fouling, and a description of the fouled plug's appearance, is listed in the "Troubleshooting" section, which also offers solutions to the problems.

### Removal

1. Number the wires so you won't cross them when you replace them.
2. Remove the wire from the end of the spark plug by grasping the wire by the rubber boot. If the boot sticks to the plug, remove it by twisting and pulling

## Tune-Up Specifications

Year	Engine No. Cyl Displacement Cu in. (cc)	Spark Plugs		Distributor		Ignition Timing (deg)		Intake Valve Opens (deg)	Fuel Pump Pressure (psi)	Compression Pressure (psi)	Idle Speed (rpm)		Valve Clearance (in.)	
		Type	Gap (in.)	Point Dwell (deg)	Point Gap (in.)	MT	AT				MT	AT	In	Ex
All	F Series 6-236.7 (3878)	NGK B5ES <sup>①</sup>	0.030	41	0.018	7B	—	17B	3.4-4.8	150 <sup>②</sup>	650	—	0.008	0.014

<sup>①</sup> Or Bosch W175T2

<sup>②</sup> Minimum 100 psi in 1966-68; 114 psi in 1969-71; 128 psi in 1972-75. Difference between cylinders should not exceed 14.2 psi

— Not applicable

at the same time. Do not pull the wire itself or you will most certainly damage the delicate carbon core.

3. Use a  $\frac{13}{16}$  in. spark plug socket to loosen all of the plugs about two turns.

4. If compressed air is available, blow off the area around the spark plug holes. Otherwise, use a rag or a brush to clean the area. Be careful not to allow any foreign material to drop into the spark plug holes.

5. Remove the plugs by unscrewing them the rest of the way from the engine.

### Inspection

Check the plugs for deposits and wear. If they are not going to be replaced, clean the plugs thoroughly. Remember that any kind of deposit will decrease the efficiency of the plug. Plugs can be cleaned on a spark plug cleaning machine, which can sometimes be found in service stations, or you can do an acceptable job of cleaning with a stiff brush.

Check spark plug gap before installation. The ground electrode must be parallel to the center electrode and the specified size wire gauge should pass through the gap with a slight drag. If the electrodes are worn, it is possible to file them level.

### Installation

1. Insert the plugs in the spark plug hole and tighten them hand-tight. Take care not to cross-thread them.

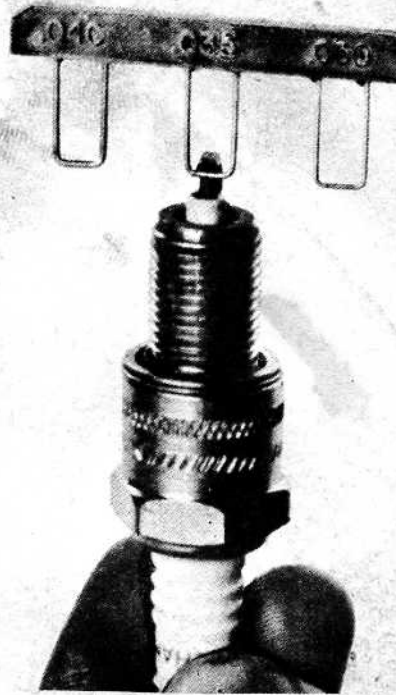
2. Tighten the plugs to the torque figure specified in the "Tune-Up" section at the end of this chapter.

3. Install the spark plug wires on their plugs. Make sure that each wire is firmly connected to each plug.

### BREAKER POINTS

The points function as a circuit breaker for the primary circuit of the ignition system. The ignition coil must boost the 12 volts of electrical pressure supplied by the battery to as much as 25,000 volts in order to fire the plugs. To do this, the coil depends on the points and the condenser to make a clean break in the primary circuit.

The coil has both primary and secondary circuits. When the ignition is turned on, the battery supplies voltage



Measuring the spark plug electrode gap

through the coil and onto the points. The points are connected to ground, completing the primary circuit. As the current passes through the coil, a magnetic field is created in the iron center core of the coil. As the cam in the distributor turns, the points open and the primary circuit collapses. The magnetic field in the primary circuit of the coil also collapses and cuts through the secondary circuit windings around the iron core. Because of the scientific phenomenon called "electromagnetic induction," the battery voltage is increased to a level sufficient to fire the spark plugs.

When the points open, the electrical charge in the primary circuit jumps the gap created between the two open contacts of the points. If this electrical charge were not transferred elsewhere, the metal contacts of the points would melt and the gap between the points would start to change rapidly. If this gap is not maintained, the points will not break the primary circuit. If the primary circuit is not broken, the secondary circuit will not have enough voltage to fire the spark plugs.

It is interesting to note that the above cycle must be completed by the ignition system every time a spark plug fires. In a 4 cycle engine such as the Land Cruiser 6 cylinder engine, all of the spark plugs fire once for every two revo-

