

## IGNITION TIMING

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### Introduction

Ignition timing is the measurement, in degrees of crankshaft rotation, of the point at which the spark plugs fire in each of the cylinders. It is measured in degrees before or after Top Dead Center (TDC) of the compression stroke.

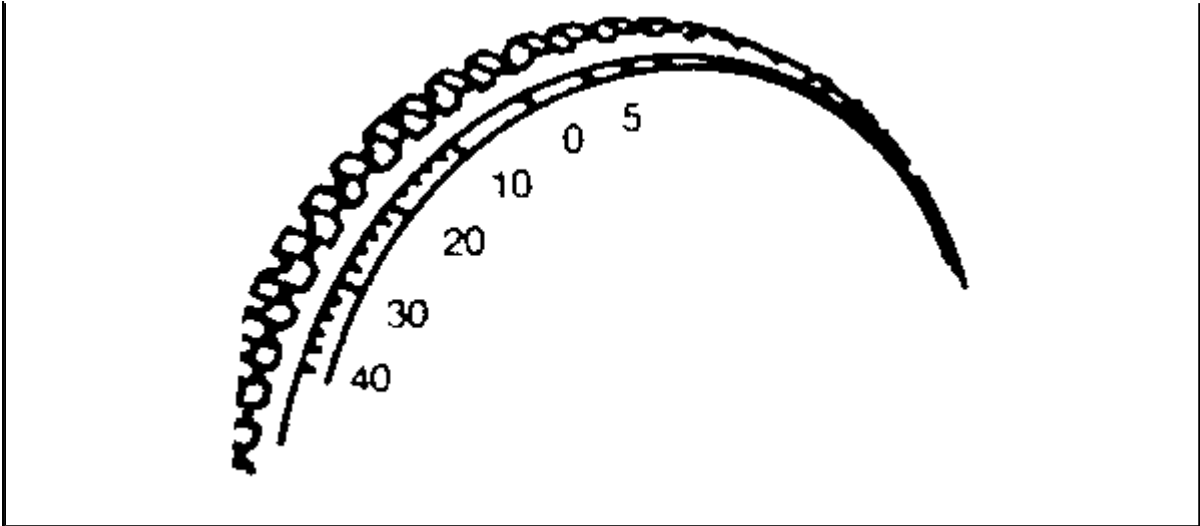
Because it takes a fraction of a second for the spark plug to ignite the mixture in the cylinder, the spark plug must fire a little before the piston reaches TDC. Otherwise, the mixture will not be completely ignited as the piston passes TDC and the full power of the explosion will not be used by the engine.

The timing measurement is given in degrees of crankshaft rotation BEFORE the piston reaches TDC (BTDC). If the setting for the ignition timing is 10° BTDC, the spark plug must fire 10° before each piston reaches TDC. This only holds true, however, when the engine is at idle speed.

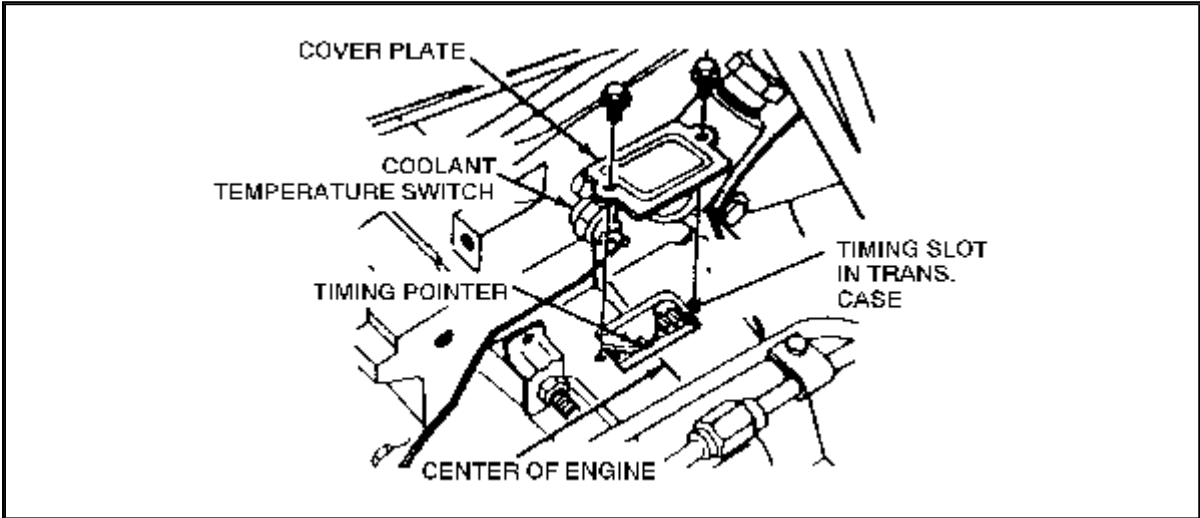
As the engine speed increases, the pistons go faster. The spark plugs have to ignite the fuel even sooner if it is to be completely ignited when the piston reaches TDC. To do this, distributors have various means of advancing the spark timing as the engine speed increases. On some earlier model vehicles, this is accomplished by centrifugal weights within the distributor along with a vacuum diaphragm mounted on the side of the distributor. Models covered by this manual use signals from various sensors, making all timing changes electronically, and no vacuum or mechanical advance is used. The 3.0L and 3.2L SHO engines and the 3.0L Flexible Fuel engines use a distributorless electronic ignition system. Operation of this system allows for full electronic control of the timing.

If the ignition is set too far advanced (BTDC), the ignition and expansion of the fuel in the cylinder will occur too soon and tend to force the piston down while it is still traveling up. This causes engine ping. If the ignition spark is set too far retarded, After TDC (ATDC), the piston will have already passed TDC and started on its way down when the fuel is ignited. This will cause the piston to be forced down for only a portion of its travel, and will result in poor engine performance as well as a lack of power.

The timing marks on the 2.5L engine are visible through a hole in the top of the transaxle case. The 3.0L and 3.8L engines have the timing marks on the crankshaft pulley and a timing marker near the pulley. A stroboscopic (dynamic) timing light is used, which is hooked into the circuit of the No. 1 cylinder spark plug. Every time the spark plug fires, the timing light flashes. By aiming the timing light at the timing marks while the engine is running, the exact position of the piston within the cylinder can be easily read since the stroboscopic flash makes the mark on the pulley appear to be standing still. Proper timing is indicated when the notch is aligned with the correct number on the scale.

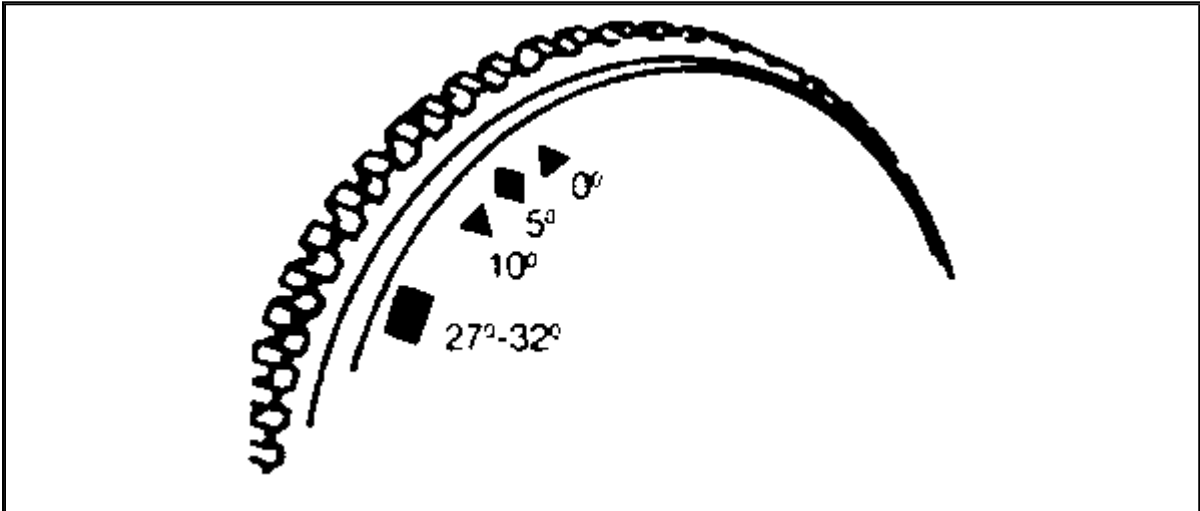


Timing mark on flywheel-2.5L engine with manual transaxle

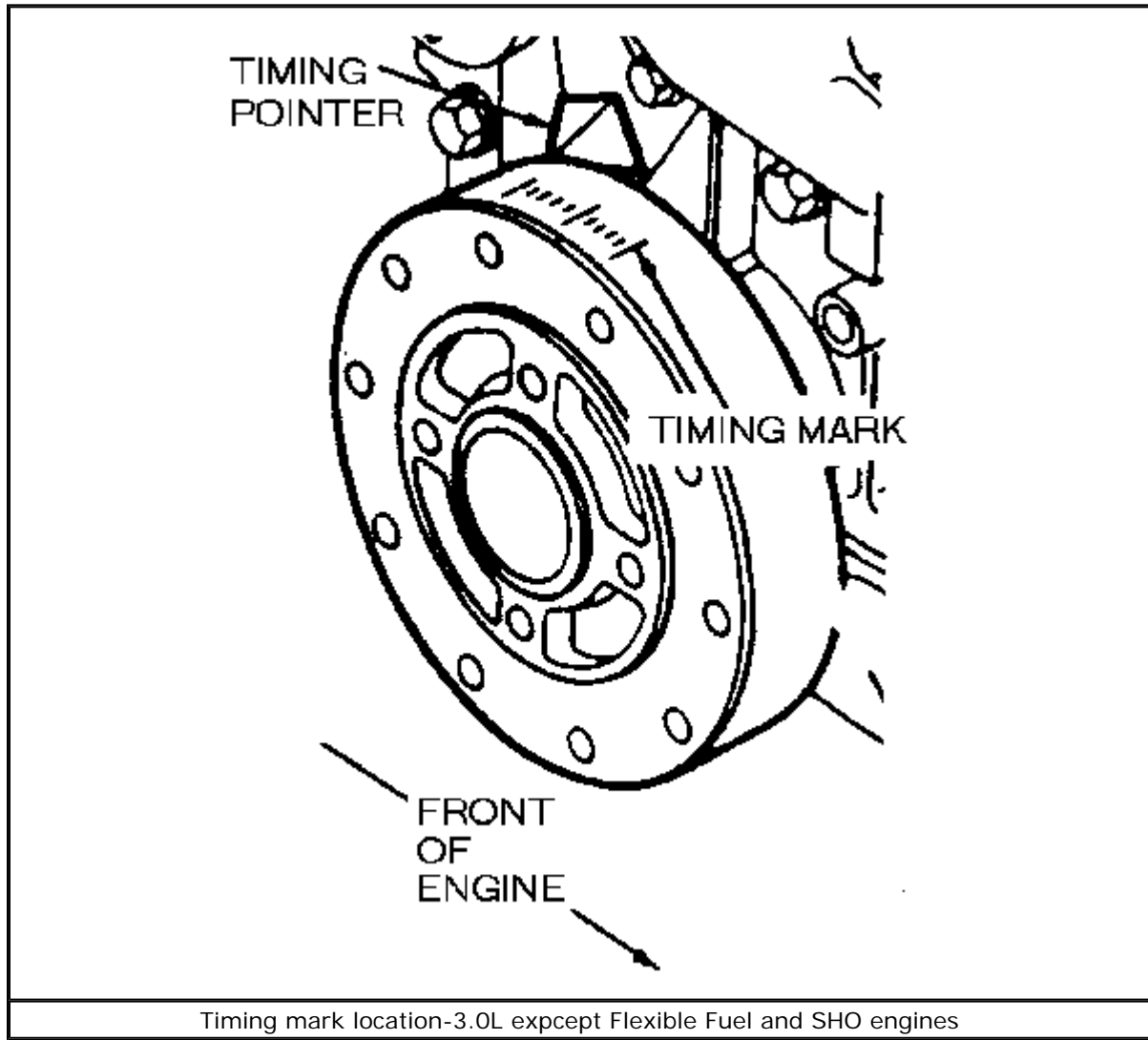
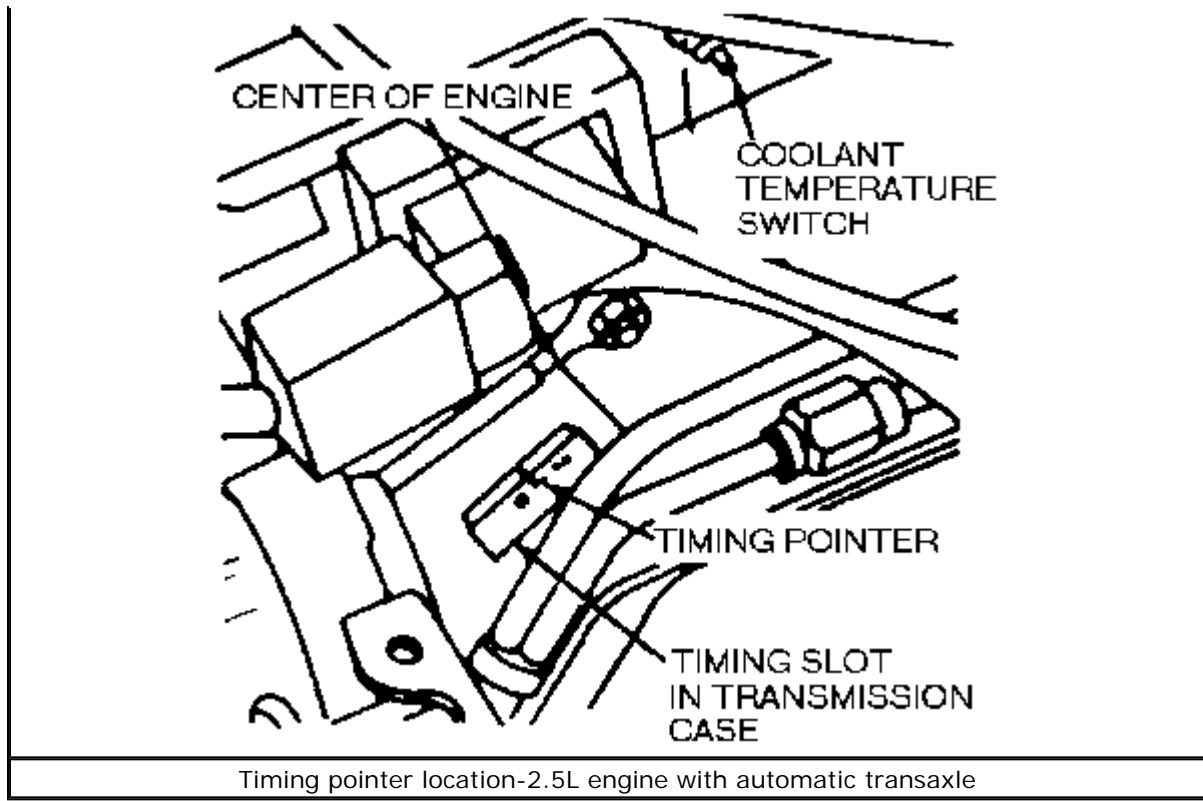


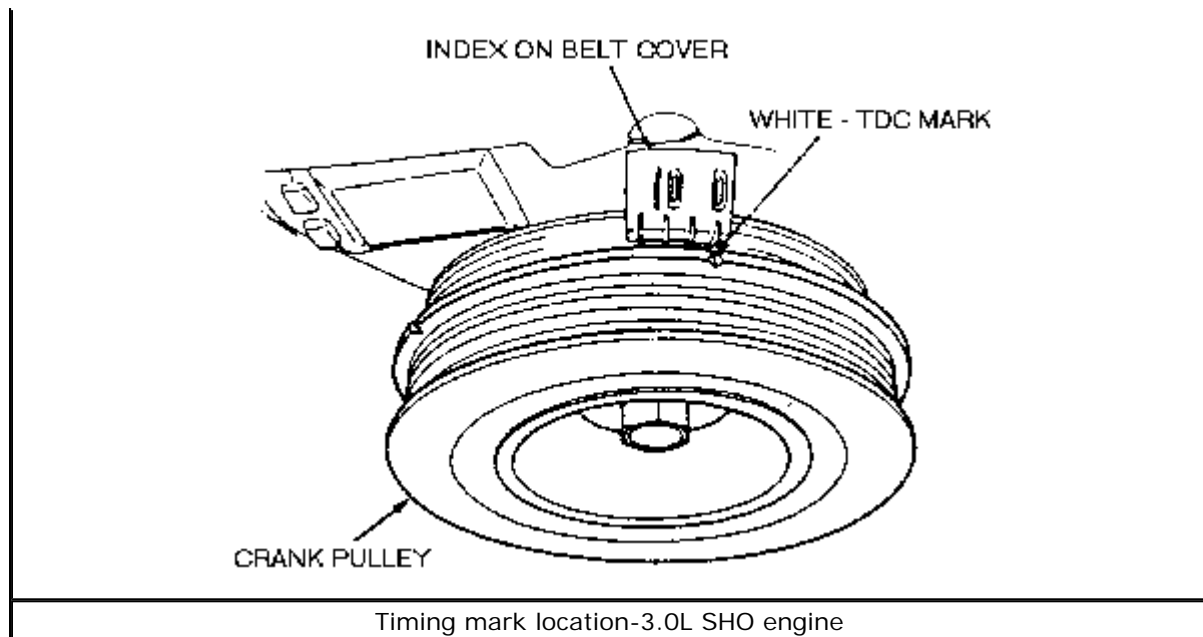
Timing pointer location-2.5L engine with manual transaxle

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Timing mark on flywheel-2.5L engine with automatic transaxle





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There are three basic types of timing lights available. The first is a simple neon bulb with two wire connections (one for the spark plug and one for the plug wire, to connect the light in series). This type of light is quite dim, and must be held closely to the marks to be seen, but it is quite inexpensive. The second type of light is powered by the car's battery. Two alligator clips connect to the battery terminals, while a third wire connects to the spark plug with an adapter. This type of light is more expensive, but the xenon bulb provides a nice bright flash which can even be seen in sunlight. The third type replaces the battery source with 110 volt house current, but still attaches to the No. 1 spark plug wire in order to determine when the plug is fired. Some timing lights have other functions built into them, such as dwell meters, tachometers, or remote starting switches. These are convenient, in that they reduce the tangle of wires under the hood, but may duplicate the functions of tools you already have.

**Never pierce a spark plug wire in order to attach a timing light or perform tests. The pierced insulation will eventually lead to an electrical arc and related ignition troubles.**

Since your car has electronic ignition, you should use a timing light with an inductive pickup. This pickup simply clamps onto the No. 1 spark plug wire, eliminating the adapter. It is not susceptible to cross-firing or false triggering, which may occur with a conventional light, due to the greater voltages produced by electronic ignition.

## Timing

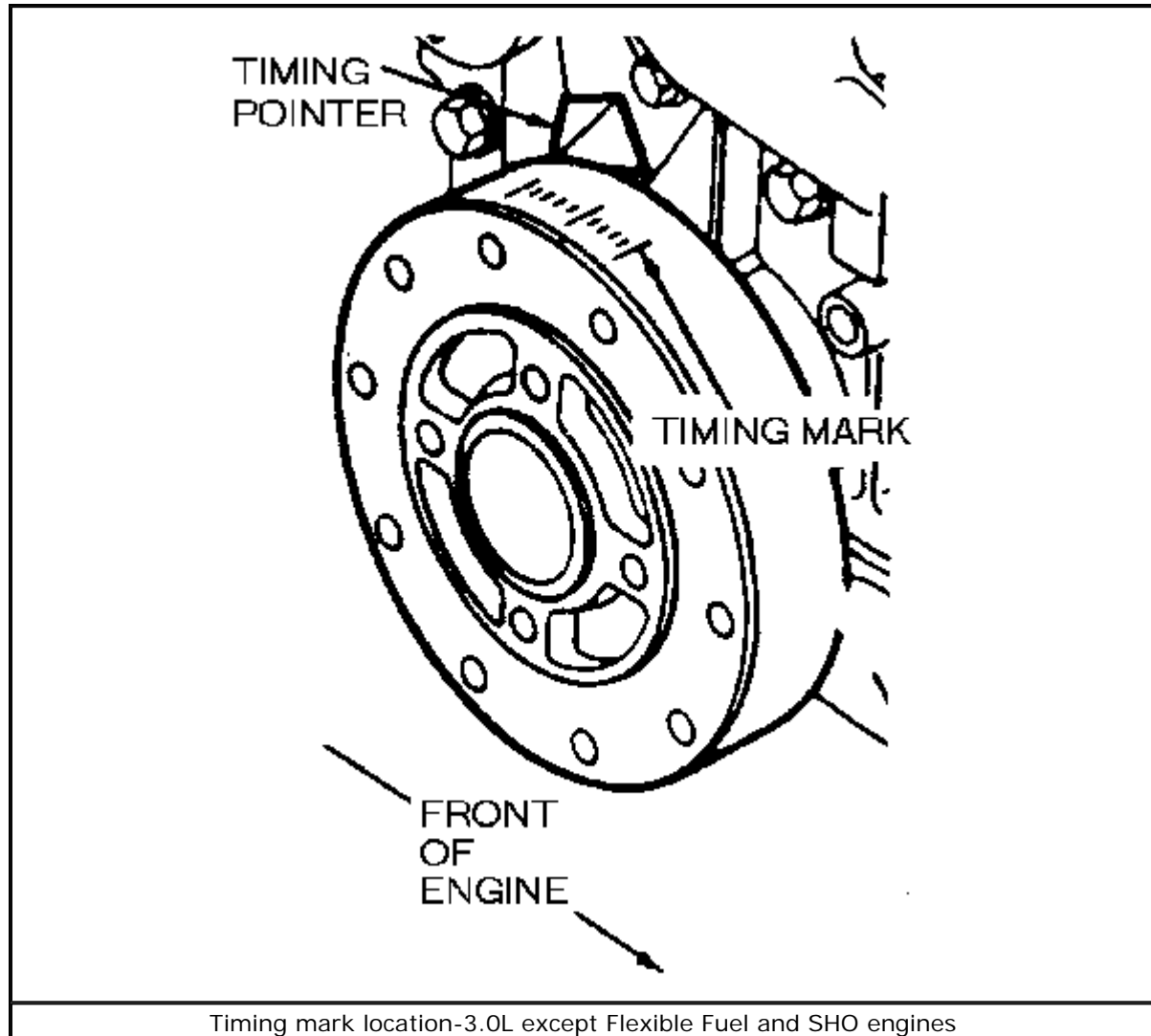
### INSPECTION & ADJUSTMENT

#### Except 3.0L Flexible Fuel (FF), 3.0L and 3.2L SHO Engines

The timing marks on the 2.5L engine are located on the flywheel and are visible through a hole in the transaxle case for manual transaxles. To view the timing marks, a cover plate on top of the transaxle must be removed. For 2.5L engines equipped with automatic transaxles, the timing marks are visible through a hole

in the transaxle case.

The 3.0L and 3.8L engines have the timing marks on the crankshaft pulley and a timing pointer near the pulley. To check and adjust the ignition timing:



1. Place the transaxle in the P (AT) or N (MT) position. The air conditioner and heater must be in the OFF position.
2. Open the hood, locate the timing marks and clean them with a stiff brush or solvent. On vehicles equipped with a manual transaxle, it will be necessary to remove the transaxle cover plate which allows access to the timing marks.
3. Using a white chalk or paint, highlight the specified timing mark and pointer.
4. Near the distributor, detach the inline Spark Output (SPOUT) connector or remove the shorting bar from the double wire SPOUT connector. The spout connector is the center wire between the Electronic Control Assembly (ECA) connector and the Thick Film Integrated (TFI) or Ignition Control (ICM) module.
5. Connect an inductive-type timing light, Rotunda tool No. 059-00006 or equivalent, to the No. 1 spark plug wire. DO NOT puncture the ignition wire with any type of probing device.

The high ignition coil voltage generated in the EEC-IV ignition system may falsely trigger the timing lights with capacitive or direct connect pick-ups. It is necessary that an inductive type timing light be used in

this procedure.

6. Connect a suitable tachometer, Rotunda tool No. 099-00003 or equivalent, to the engine. The ignition coil connector allows a test lead with an alligator clip to be connected to the Distributor Electronic Control (DEC) terminal without removing the connector.

The ignition coil electrical connector allows a test lead with an alligator clip to be connected to its dark green/yellow dotted wire terminal without removing the connector. Be careful not to ground the alligator clip, for permanent damage to the ignition coil will result.

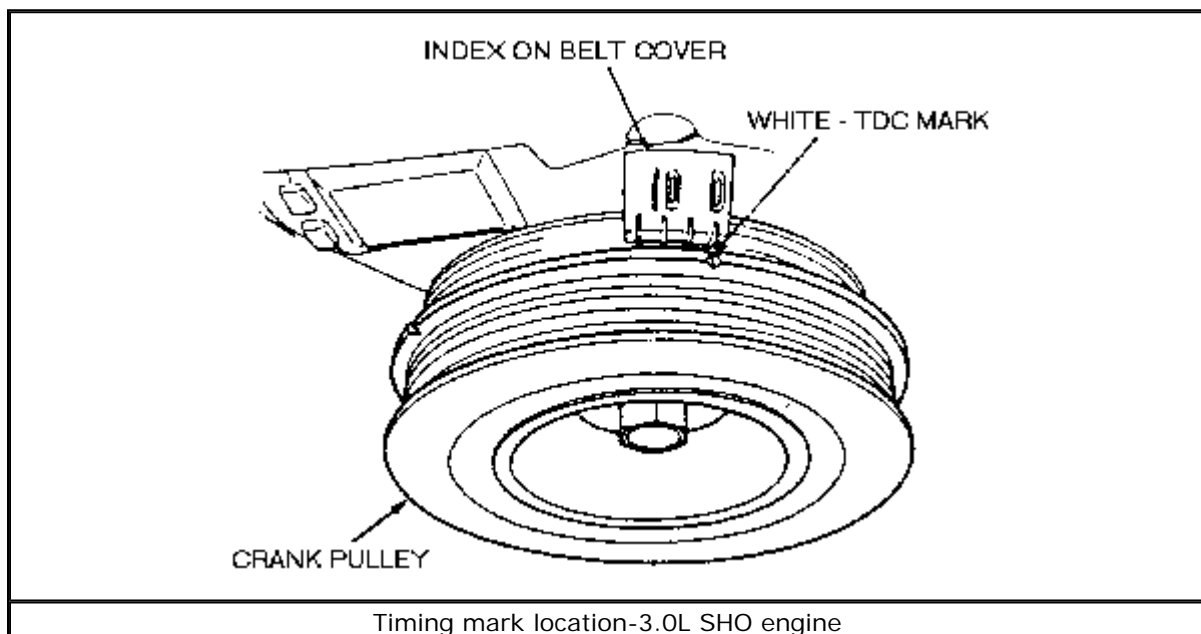
7. Start the engine, using the ignition key, and allow it to run until it reaches normal operating temperature.

Only use the ignition key to start the vehicle. Do NOT use a remote starter, as disconnecting the start wire at the starter relay will cause the TFI or ICM to revert back to the start mode timing, after the vehicle is started. Reconnecting the start wire after the vehicle is running will not correct the timing.

8. Check the engine idle rpm; if it is not within specifications, adjust as necessary. Idle speed is not adjustable on 1991-95 vehicles. After the rpm has been adjusted or checked, aim the timing light at the timing marks. If they are not aligned, loosen the distributor clamp bolts slightly and rotate the distributor body until the marks are aligned under the timing light illumination.
9. Tighten the distributor clamp bolts and recheck the ignition timing. Readjust the idle speed, if necessary or possible.
10. Turn the engine OFF, remove all test equipment, reconnect the inline SPOUT connector to the distributor and, if necessary, reinstall the cover plate on manual transaxle vehicles.

### 3.0L Flexible Fuel (FF), 3.0L and 3.2L SHO Engines

The base ignition timing is set at 10° Before Top Dead Center (BTDC) and is not adjustable.



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## TACHOMETER HOOKUP

On distributor-equipped models with an "E" type ignition coil, the tachometer connection is made at the back of the wire harness connector. A cut-out is provided and the tachometer lead wire alligator clip can be connected to the dark green/yellow dotted wire of the electrical harness plug.

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