

1992 Volvo 940

Submodel: | Engine Type: L4 | Liters: 2.3

Fuel Delivery: FI | Fuel: GAS

All adjustments in the ignition system are controlled by the Engine Control Module (ECM) for optimum performance. No adjustments are possible.

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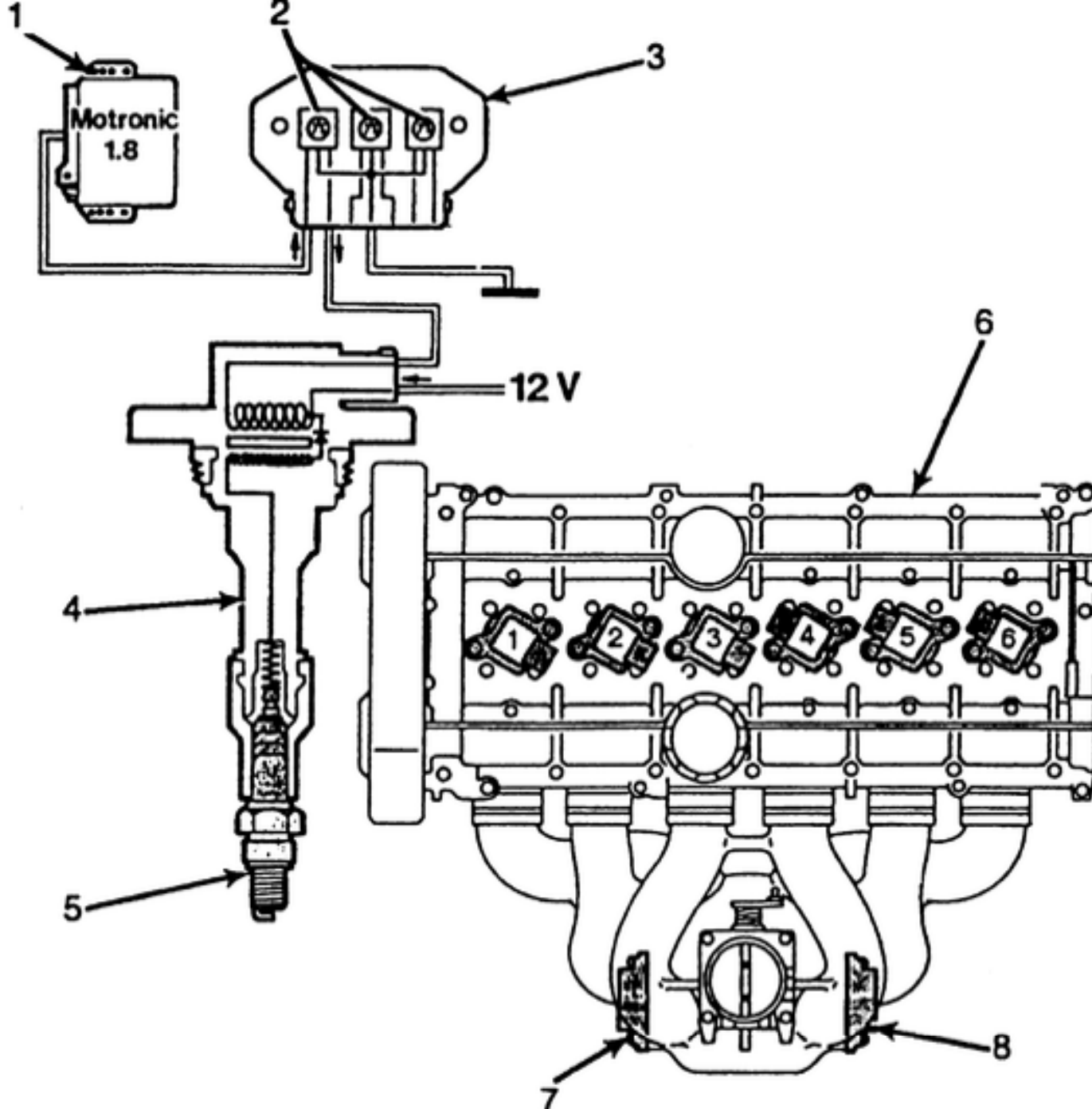
The Camshaft position sensor is covered in Section 4, under Electronic Engine Controls.

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The Crankshaft position sensor is covered in Section 4, under Electronic Engine Controls.



1. Motronic ECU
2. Power unit (amplifier)  
3 stages
3. Power unit (amplifier)
4. Individual ignition coil
5. Spark plug
6. B 6304 F engine  
showing coil  
locations
7. Front power unit  
controls 1, 3, 5
8. Rear power unit  
controls 2, 4, 6

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The best way to perform this procedure is to use a spark tester (available at most automotive parts stores). The Air Gap type must be adjusted to the individual spark plug gap specified for the engine. This type of tester allows the user to not only detect the presence of spark, but also the intensity (orange/yellow is weak, blue is strong).

1. Remove a coil from a cylinder.
2. Connect the coil to the spark tester and ground the tester to an appropriate location on the engine.

**NOTE: The coil must be connected to the harness during this test.**

3. Crank the engine and check for spark at the tester.
4. If spark exists at the tester, the ignition system is functioning properly.
5. If spark does not exist at the spark tester, there is a fault in the ignition system. Further testing of the ignition system is needed. refer to component testing procedures.

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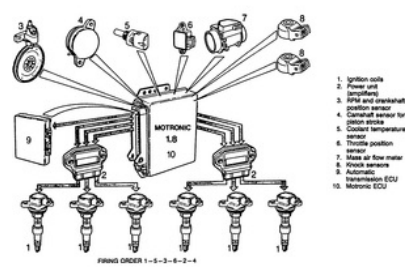
The B6304 engine is the only engine equipped with a distributorless ignition system. Each cylinder is equipped with an individual ignition coil. The coil is located over the spark plug, just like a spark plug boot; this style is referred to as "coil over plug". Using separate coils for each plug guarantees a very high voltage (approximately 49 kV) and rapid power build-up. This results in effective initiation of the combustion process and improves cold start performance.

The ignition coils are controlled by two power stages (ignition modules). One module is connected to cylinders 1, 3, and 5 and the other to 2, 4, and 6. The power stages each incorporate three separate drivers, one for each ignition coil. The power stages are controlled by the ECM, which receives inputs from various sensors and other components.

The ECM computes ignition timing and activates the power stage controlling current to the ignition coils. During start-up, the ECM ensures a fixed timing and ignition voltage, but, after start-up, the ECM continually computes optimum ignition requirements based on engine speed, engine load, engine temperature, and combustion timing. The engine speed is monitored by the crankshaft position (RPM) sensor and the Camshaft Position (CMP) sensor. The engine load is monitored by the Mass Air Flow (MAF) sensor, Throttle Position (TP) sensor, and by inputs from the Transmission Control Module (TCM), which sends a torque reduction signal to the ECM when a gear change is imminent. The engine temperature is determined by the Engine Coolant Temperature (ECT) sensor. The knock sensor determines if the ignition timing is correct by detecting engine knocks or "pre-ignition."

The system has a fail safe or "limp home mode" where it defaults to a predetermined timing and voltage level if an input device fails. The Malfunction Indicator Lamp (MIL) will illuminate and the vehicle may exhibit more driveability problems; it should be diagnosed as soon as possible.

Fig. 1: Motronic distributorless ignition system — B6304 engine



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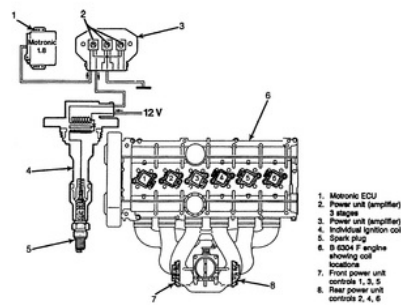
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1. Disconnect the negative battery cable.
2. Disconnect the harness from the ignition coil.
3. Remove the retaining bolt from the ignition coil-to-upper cylinder head.
4. Lift the coil off of the spark plug and from the cylinder.

### To install:

5. Place the ignition coil into the correct cylinder and onto the spark plug. Push gently downward until a click is either felt or heard; the coil is now attached to the spark plug.
6. Install and tighten the retaining bolt on the ignition coil-to-upper cylinder head.
7. Connect the harness to the ignition coil.
8. Connect the negative battery cable.

Fig. 1: Cutaway view of ignition coil-to-spark plug mounting



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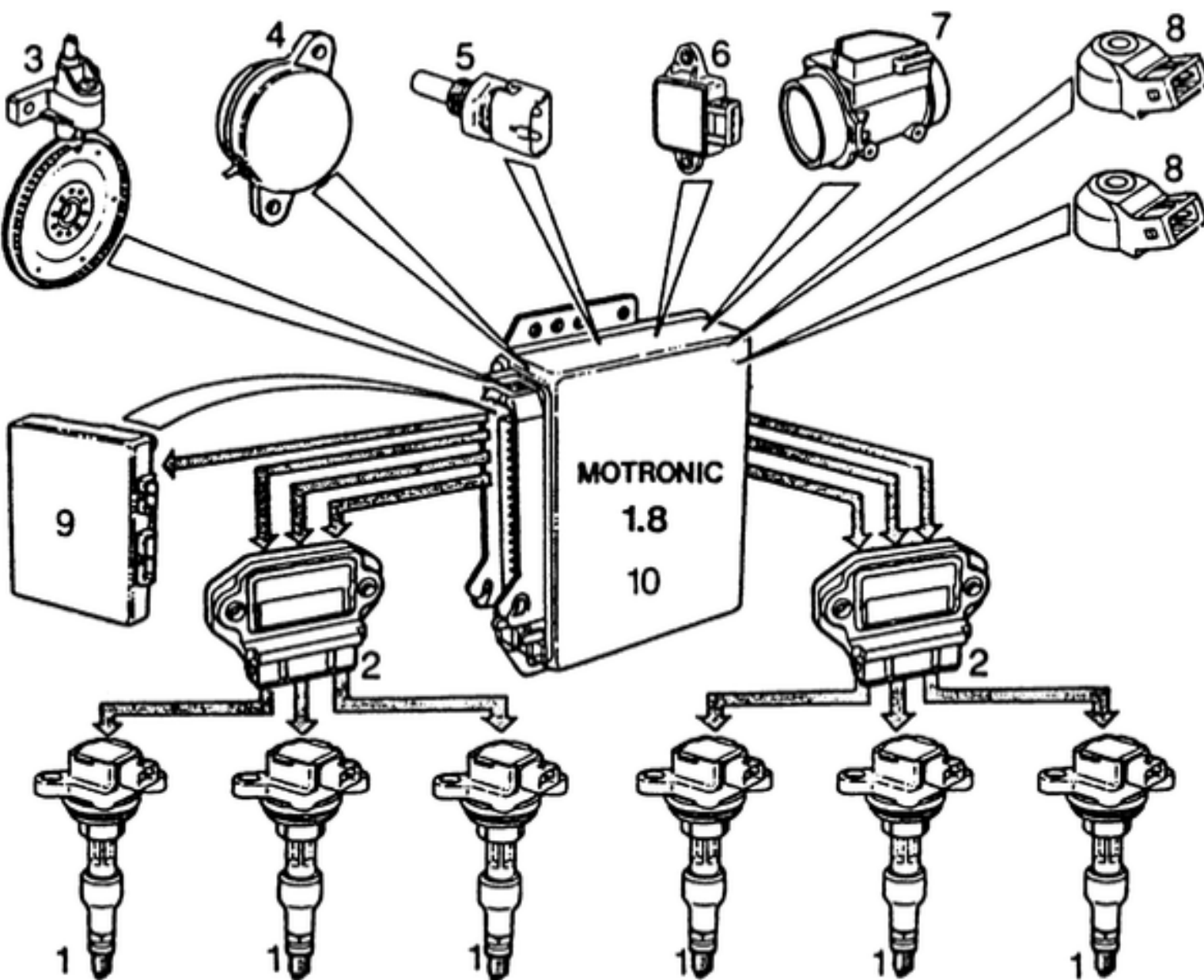
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With the ignition **OFF**, disconnect the harness from the ignition coil, then place the leads of an ohmmeter across terminals 1 and 2 of the ignition coil. Resistance should be approximately 1 ohm; if out of range, replace the ignition coil.

Fig. 1: Connect an ohmmeter across the two terminals of the ignition coil to test the coil







1. Ignition coils
2. Power unit (amplifiers)
3. RPM and crankshaft position sensor
4. Camshaft sensor for piston stroke
5. Coolant temperature sensor
6. Throttle position sensor
7. Mass air flow meter
8. Knock sensors
9. Automatic transmission ECU
10. Motronic ECU

FIRING ORDER 1-5-3-6-2-4

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The power stages are located on the intake manifold for increased cooling.

1. Disconnect the negative battery cable.
2. Disconnect the harness from the power stage(s).
3. For each power stage to be removed, unfasten the two bolts retaining the power stage to the intake manifold.
4. Remove the power stage(s).

**To install:**

5. Install the power stage(s) and tighten the retaining bolts.
6. Connect the harness to the power stage(s).
7. Connect the negative battery cable.