Computerized Engine Controls

VOLVO COMPUTERIZED ENGINE CONTROL

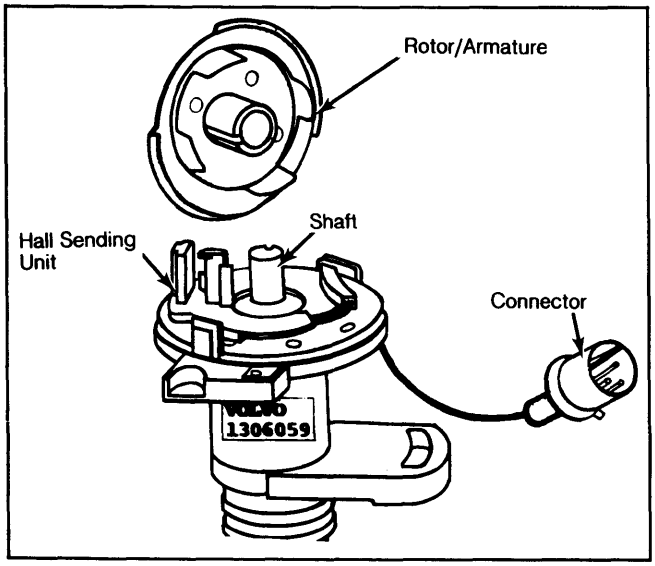
DL, GL, GLE, GLT

DESCRIPTION

The Volvo Computerized Engine Control System is used on all Volvo 4-cylinder engines except for GLT Turbo. It consists of a Computer Controlled Electronic Ignition System and Constant Idle Speed System.

The computer controlled ignition consists of Volvo breakerless distributor, an electronic control unit, ignition coil, ignition switch, and a vacuum signal microswitch. The distributor contains no vacuum or centrifugal advance mechanisms. The rotor and armature are a single unit. *See Fig. 1.*

Fig. 1: Disassembled View of Volvo Electronic Distributor



Distributor contains Hall sending unit.

A Hall Effect sending unit in the distributor provides engine speed signals to the electronic control unit. The distributor also consists of necessary connecting wiring and a distributor cap. The Constant Idle Speed System includes an electronic control unit, air control valve, throttle switch, coolant sensor and connecting wiring and hoses.

OPERATION

COMPUTER CONTROLLED IGNITION

As the engine turns the distributor shaft, the shutter blades of the rotor/armature assembly pass through the Hall Effect sending unit's pick-up coil. A signal is then sent to the electronic control unit.

In addition to receiving engine speed information from the distributor, the electronic control unit receives engine load information from the intake manifold. Speed and vacuum signals are processed in the electronic control unit to control spark advance and dwell.

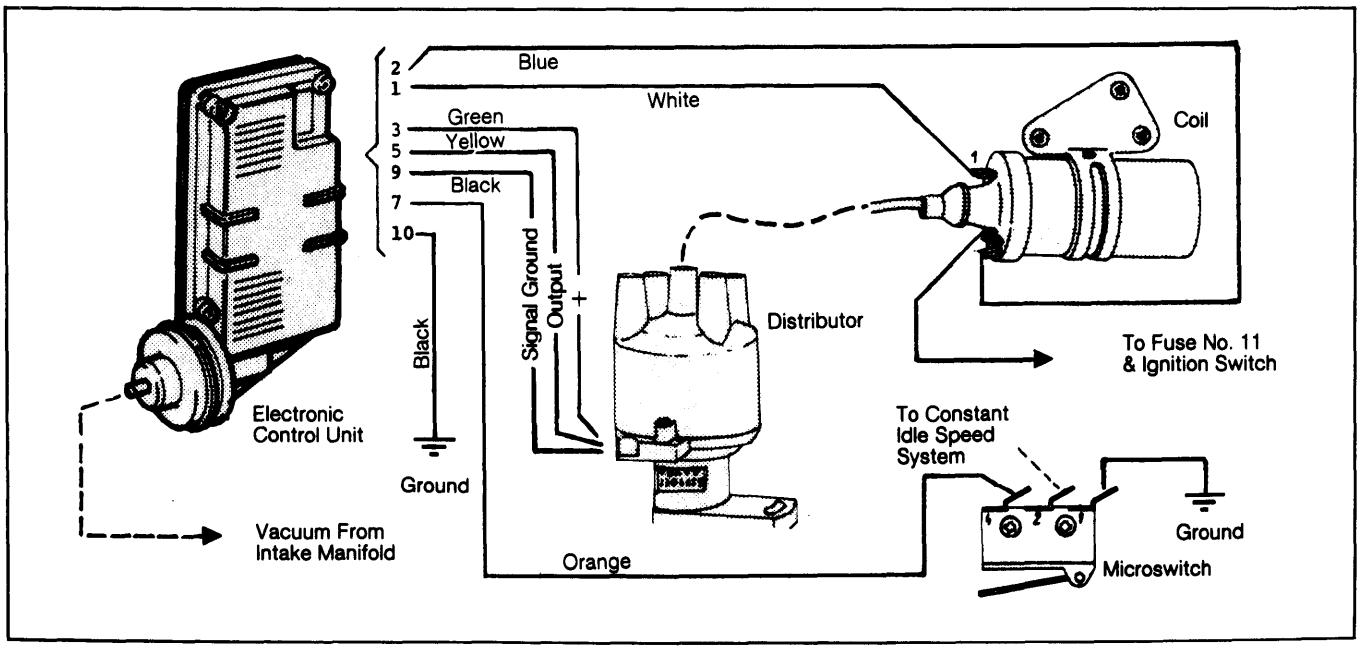
A throttle position microswitch (located on the airflow meter) provides throttle information. Under normal conditions, the throttle position signal is sent to the electronic control unit.

The manifold vacuum signal is also processed by the control unit to control ignition timing. When the throttle is closed, (during deceleration and idle) the circuit is closed, and no signal is sent to the control unit.

The electronic control unit analyzes all information, and interrupts the signal to the ignition coil primary circuit. This causes a high voltage surge in the secondary circuit, firing the spark plugs at the proper time.

When the engine is first started, the electronic control unit operates in the "CRANK" mode until engine speed reaches 1500 RPM. At this point the micro-processor takes over, controlling all engine speeds down to 250 RPM.

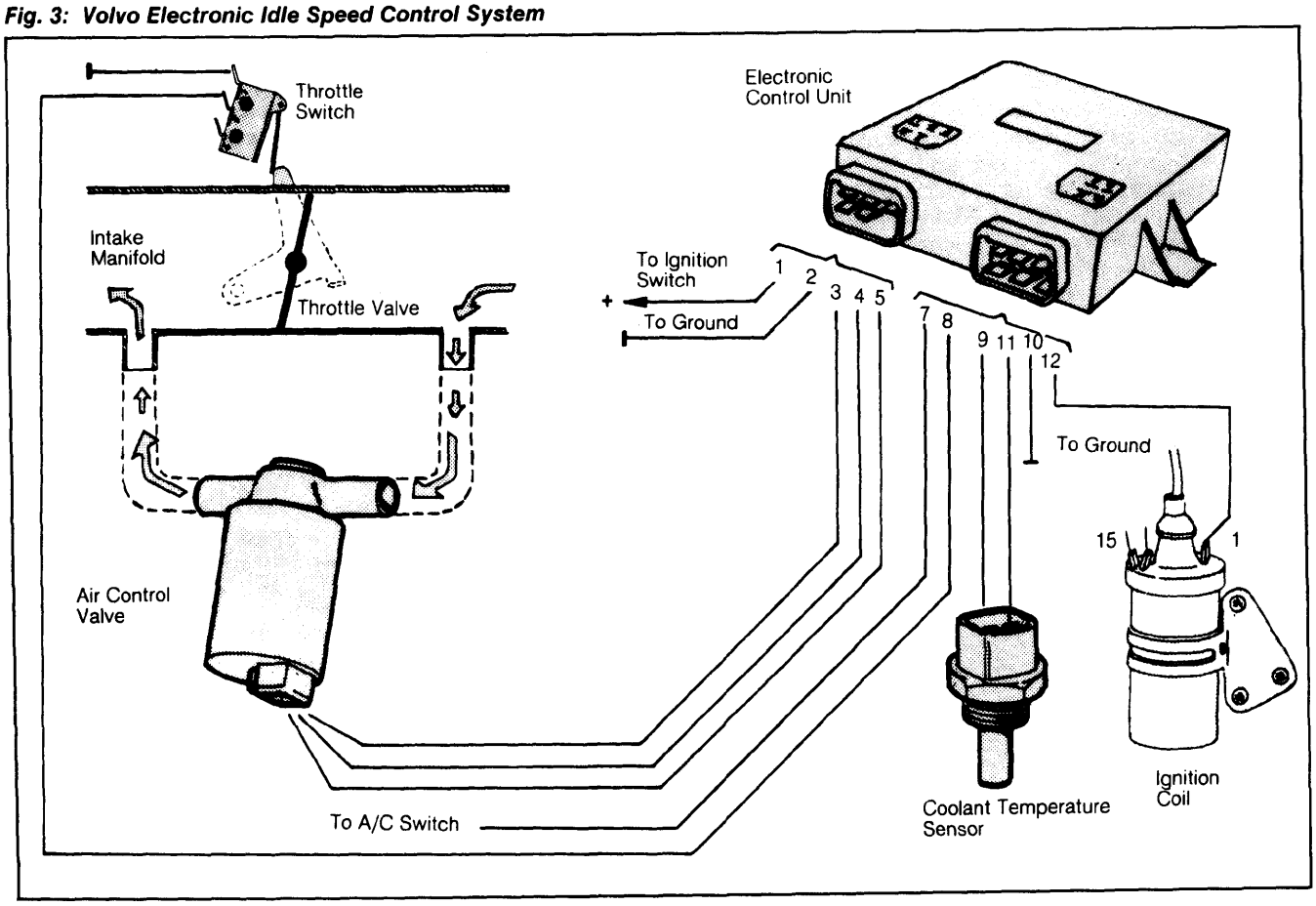
Fig. 2: Schematic of Volvo Computer-Controlled Ignition System



Computerized Engine Controls

VOLVO COMPUTERIZED ENGINE CONTROL (Cont.)

Fig. 3: Volvo Electronic Idle Speed Control System



The electronic control unit can operate without the micro-processor in the "LIMP HOME" or "CRANK" mode. If a problem in the system occurs, the electronic control unit will enter the "LIMP HOME" mode. In the "LIMP HOME" mode, the engine will operate at a fixed ignition timing to allow the vehicle to be driven to a service facility.

CONSTANT IDLE SPEED SYSTEM

Electronic Control Unit

The electronic control unit for the constant idle system processes information it receives from the engine coolant temperature sensor, throttle switch and distributor. After receiving information on coolant temperature, throttle position and engine speed, the control unit sends electrical impulses to air control valve to regulate idle speed.

Air Control Valve

The air control valve consists of a small electrical motor mounted between connecting hoses at the air flow throttle valve. The motor rotates clockwise or counterclockwise to increase or decrease the amount of air which is injected into intake manifold.

Throttle Switch

Throttle switch is a small electrical switch activated by the throttle lever to provide the control unit with a signal when throttle valve is at the idle position. The ground circuit is interrupted at idle position.

Coolant Temperature Sensor

Coolant temperature sensor provides an electrical impulse to the electronic control unit at low coolant temperatures. At low temperatures, the control unit activates the air control valve to provide more air to increase engine speed.

DIAGNOSIS & TESTING

NOTE: Before testing components, be sure that the battery is properly charged, and that all wires are sound and connections are secure. Inspect the distributor cap and rotor for cracks and carbon tracking. When connecting test equipment or when replacing parts, turn the ignition switch to the "OFF" position.

ENGINE STARTS BUT WILL NOT RUN PROPERLY

1) Check ignition timing with the vacuum hose at the ignition system electronic control unit disconnected. When setting timing, set at 12° BTDC. When checking, ignition timing of 10-14° BTDC is acceptable. Check advance by increasing engine speed and observing whether timing advances.

2) If necessary, try a new electronic control unit and re-test. Check vacuum advance. Run the engine at approximately 1500 RPM with the vacuum hose disconnected. Reconnect the vacuum hose, and ensure that timing changes. If timing does not change, check the vacuum line for cracks or poor connections. If the vacuum line is okay, try a known good electronic control unit.

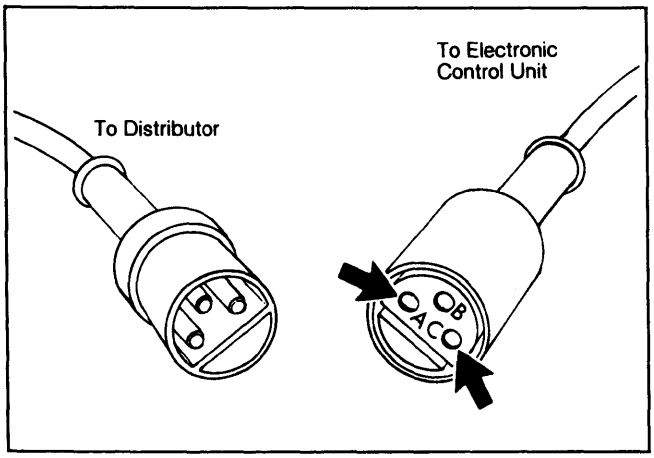
VOLVO COMPUTERIZED ENGINE CONTROL (Cont.)

TESTING IGNITION SYSTEM WHEN ENGINE WILL NOT START

1) Disconnect the high tension wire at the distributor cap, and hold it approximately 1/2" from the engine block. Crank the engine. If spark occurs at the wire end, check the rotor and distributor cap. Ensure spark is reaching spark plugs.

2) If no spark occurs, disconnect the connector at the distributor. Connect a jumper wire to pin "A" in the female connector leading to the electronic control unit. *See Fig. 4.* With the ignition "ON", touch pin "C" with the other end of the jumper wire, and check for spark.

Fig. 4: Distributor Connector Showing Pin Locations



3) If no spark, go to next step. If spark, touch jumper wire between pins "A" and "C". Check for live condition at pin "B". If present, replace Hall sending unit in distributor. If no voltage, ensure wiring harness is good. If so, replace electronic control unit.

4) If no spark occurred at pin "C" in step **2)**, check all wires and connectors carefully. If no fault is found, substitute a new electronic control unit. If there is still no spark, substitute a new ignition coil.

THROTTLE SWITCH

1) To test throttle switch circuitry, connect voltmeter across terminals "1" and "2". *See Fig. 5.* With ignition on and engine stopped, voltmeter reading at idle should be 2-8 volts. Above idle position, voltmeter reading should be 0 volts. If throttle switch does not respond as outlined, test switch position as follows:

2) With voltmeter still connected, ignition on and engine stopped, insert a feeler gauge as shown in *Fig. 5.* Feeler gauge should produce voltages indicated in chart. If not, replace throttle switch and adjust as follows:

3) After replacing throttle switch, connect voltmeter and turn ignition on with engine stopped. Insert .016" (.40 mm) feeler gauge. Loosen throttle switch retaining screws until reading is indicated on voltmeter. Tighten retaining screws.

THROTTLE SWITCH VOLTAGE READINGS

Feeler Gauge In. (mm)	Voltmeter Reading
.008 (.20)	Any
.035 (.90)	0 Volts

Fig. 5: Testing Throttle Switch Operation