

## MOTORCRAFT SOLID STATE IGNITION SYSTEM

**American Motors  
6-Cylinder Engines**

### DESCRIPTION

The Solid State Ignition system, often called SSI, features a solid state distributor, electronic control unit, an ignition coil, and conventional distributor cap, rotor, spark plug wires and spark plugs. Other components include the battery, ignition switch, starter solenoid, primary resistance wires and a by-pass wire.

**Electronic Control Unit** — There are 8 wires leading from the control unit, 2 to one connector, 2 to another and 4 to another. The White wire and Red wire leading from one 2 wire connector are for ignition feed circuits (White wire for cranking and Red wire for after engine is running). The control unit uses the Green wire to turn power to the ignition coil off and on. The Orange and Violet wires are used to transmit signals from the distributor's pick-up coil (sensor) to control unit. The Black wire supplies the distributor ground circuit. The Yellow wire from the MCU to the control unit transmits signals from the Micro Computer Unit (MCU) to the control unit for ignition retard.

**Distributor** — Components are divided into 3 groups, the pick-up coil (sensor) and trigger wheel, the spark advance and the cap and rotor. The trigger wheel, which has 6 teeth (one for each cylinder), rotates with the distributor shaft. The pick-up coil is a coil of fine wire mounted around a permanent magnet. There are no contacting surfaces between the trigger wheel and pick-up coil. Dwell is not adjustable and is controlled electronically. Centrifugal advance is controlled by engine speed, vacuum spark advance by carburetor ported vacuum supplied to the distributor's vacuum unit. Distributor cap and rotor are of conventional design.

**Ignition Coil** — Coils are oil-filled and, sealed and contain a primary and secondary circuit. As in any system, the coil's basic function is to convert battery voltage applied to the primary circuit into high secondary voltage for firing the spark plugs. The coil has positive and negative primary terminals and a single secondary terminal. A special coil connector slides over the primary terminals.

**Resistance Wire** — A wire with 1.3-1.4 ohms resistance is provided in the Red wire (engine running) circuit to supply less than battery voltage to the coil. This resistance wire is bypassed during starting so that full battery voltage may be applied to the coil. The by-pass is accomplished through the "I" terminal of the starter solenoid.

**System Protection** — The electronic control unit has built-in reverse polarity and transient voltage protection. However, damage to the system can occur if proper testing procedures are not followed.

### OPERATION

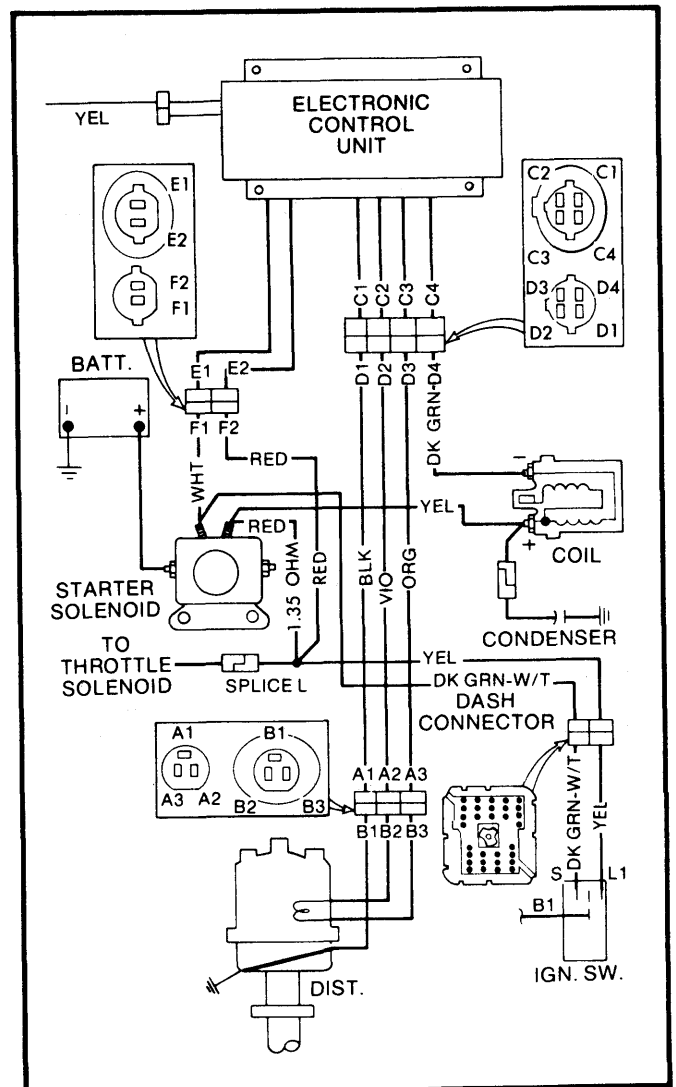
The electronic control unit and ignition coil are turned on whenever the ignition switch is in the "START" or "ON" position. When the engine begins turning the distributor shaft, the trigger wheel rotates with it. As each tooth passes the pick-up coil, it interrupts the magnetic field around the pick-up coil. This continual build-up and collapse of the magnetic field provides a signal to the control unit. The control unit receives this signal and turns the power to the ignition coil's primary circuit off and on as each tooth passes the pick-up coil.

The collapse of the magnetic field in the ignition coil primary circuit induces a high voltage surge in the secondary. This causes current to flow from the coil to the distributor, rotor, cap and spark plug wires. Ignition timing is constantly changed by the control unit, the Micro Computer Unit (MCU), and vacuum and centrifugal advance mechanisms according to engine operation.

### SOLID STATE IGNITION SYSTEM NOTES

*When disconnecting wire from spark plug or distributor cap, twist rubber boot slightly to loosen. Grasp boot (not wire) and pull off with steady, even force.*

*When disconnecting control unit connectors, pull apart with firm, straight pull. Do not attempt to pry apart with screwdriver. When connecting, press together firmly to overcome hydraulic pressure caused by the silicone dielectric compound. If connector locking tabs weaken or break off, it is unnecessary to replace connector. Just press firmly together and bind with electrical tape or a harness tie strap. This should assure a good connection.*



**Fig. 1 American Motors Solid State Ignition System Wiring Diagram**

## MOTORCRAFT SOLID STATE IGNITION SYSTEM (Cont.)

### TESTING

#### SECONDARY SPARK VOLTAGE CHECK

**CAUTION** — When checking secondary voltage, do not remove spark plug wires from No. 1 or No. 5 spark plugs, as this could damage pick-up coil.

**NOTE** — On vehicles with catalytic converter, do not run engine for more than 30 seconds with a spark plug wire removed.

1) Disconnect ignition coil high tension wire from center tower of distributor cap. Using insulated pliers, hold wire terminal approximately  $\frac{1}{2}$ " from engine block or intake manifold.

2) Rotate engine with starter motor and check for spark at gap to ground. If no spark occurs, check coil primary and secondary resistance and tests that follow. If spark occurs, reconnect coil wire to distributor center tower. Remove wire from one spark plug.

3) Hold spark plug wire approximately  $\frac{1}{2}$ " from cylinder head while cranking engine. Observe spark at gap. If spark occurs, ignition system is not at fault. Check other systems such as fuel and ignition timing. If no spark occurs, check for defective rotor, distributor cap or spark plug wires.

#### HIGH TENSION WIRE RESISTANCE CHECKS

**Coil-to-Distributor Wire Resistance** — Using an ohmmeter, check resistance of coil-to-distributor wire. Resistance should be 10,000 ohms maximum.

**Spark Plug Wire Resistance** — Check spark plug wire resistance, using an ohmmeter. For USED wires, resistance should not exceed 5,000 ohms per INCH with spark plug wire connected to distributor cap and check made through internal cap terminal. For NEW wires, resistance reading should be less than 7,000 ohms per FOOT.

#### IGNITION COIL RESISTANCE CHECK

**Primary Resistance** — Remove connector from positive and negative coil terminals. Be sure ignition switch is "OFF." Set an ohmmeter on low scale and connect ohmmeter leads to positive and negative terminals. Ohmmeter reading should be 1.13-1.23 ohms at 75°F. With coil temperature at 200°F, a 1.5 ohm reading is acceptable.

**Secondary Resistance** — Turn ignition switch "OFF". Set ohmmeter to high scale (x 1000 scale) and connect one lead to coil negative terminal and other lead to coil tower (remove coil secondary wire). Ohmmeter reading should be 7,700-9,300 ohms with coil temperature at 75° F. With coil temperature at 200° F or above, a maximum reading of 12,000 ohms is acceptable.

#### CURRENT FLOW CHECK

1) Remove connector from ignition coil. Remove positive wire from connector, then negative wire. Connect ammeter between positive terminal of coil and disconnected positive wire. Connect jumper wire from negative terminal to good ground.

2) Turn ignition switch "ON". Current flow should be approximately 7 amps., but should not exceed 7.6 amps. If more than 7.6 amps., replace ignition coil.

3) With ammeter still connected to coil positive terminal, remove jumper wire from negative terminal. Connect coil Green wire to negative terminal. Current flow should be approximately 4 amps. If less than 3.5 amps, check for poor connection in 4-wire and 3-wire connectors or for poor ground at distributor ground screw.

4) If current flow is greater than 5 amps., the control unit is defective and must be replaced. Start engine. Normal current flow with engine running is 2.0-2.4 amps. If outside of specifications, replace control unit.

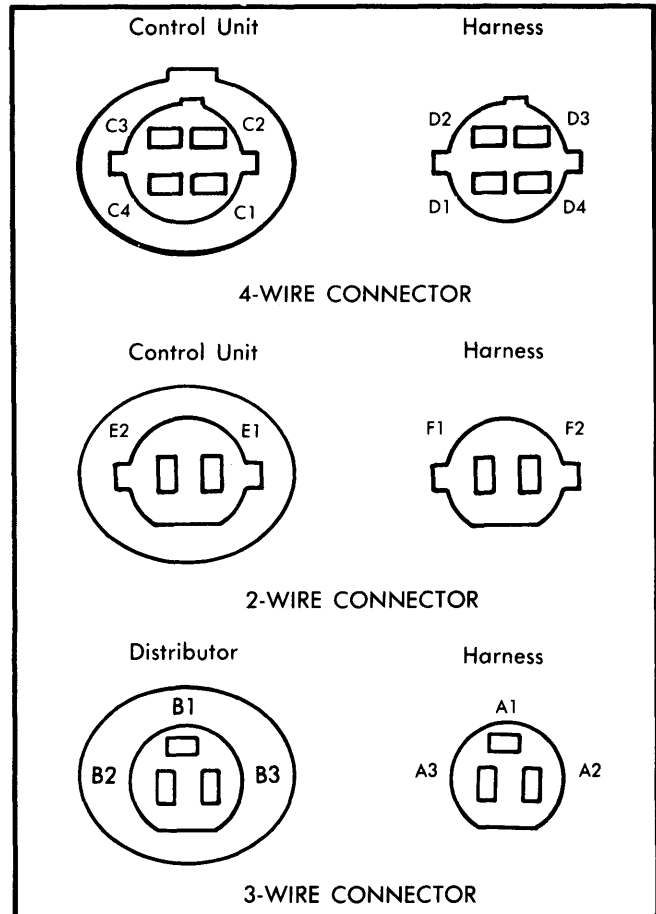


Fig. 2 Solid State Ignition Connectors

#### COIL PRIMARY CIRCUIT CHECK

1) Connect a voltmeter to coil positive terminal and ground. Turn ignition switch to "ON" position. Reading should be 5.5-6.5 volts. If voltage is too high (battery voltage), proceed to step 4). If voltage is too low (below 5.5 volts), disconnect condenser lead. If voltage is now correct, replace condenser. If voltage is still low, proceed to step 7).

2) If voltage was 5.5-6.5 volts in step 1), turn ignition switch to "START" position. Voltage should be the same as battery cranking voltage. If correct, check other systems (fuel, mechanical, etc.) for problems. If voltage is not correct, proceed to next step.

3) Check wire connected to starter solenoid "I" terminal for shorts or opens. If wire is OK, check for defective starter solenoid. Replace solenoid if necessary.

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4) With ignition switch in "ON" position, voltmeter still connected to coil positive terminal, disconnect wire connected to starter solenoid "I" terminal. If voltage drops to 5.5-6.5 volts, replace starter solenoid.

5) If voltage remains high, connect a jumper wire from coil negative terminal to ground. If voltage drops to 5.5-6.5 volt range, proceed to step 6). If voltage does not drop, resistance wire is defective. Replace resistance wire and retest, beginning with step 2).

6) With ignition switch "OFF", connect an ohmmeter lead to the coil negative terminal and the other lead to the Green wire terminal "D4" of the 4-wire harness connector. Also check from Black wire terminal "D1" to ground. If continuity is OK, replace the control unit. If no continuity is present, repair wire in harness and retest beginning at step 2).

7) With ignition switch "OFF", connect ohmmeter leads between coil positive terminal and dash connector terminal "FW" (Yellow wire). If resistance is not 1.3-1.4 ohms, replace resistance wire. If ohmmeter reading is to specifications, proceed to next step.

8) With ignition switch still "OFF", connect ohmmeter leads between dash connector terminal "FW" (Yellow wire) and ignition switch terminal "L1". Resistance should be less than 0.1 ohm. If reading is to specifications, repair feed wire or replace ignition switch.

9) If resistance is more than 0.1 ohm, check for opens in wire or for poor connections at connectors. Repair or replace as necessary.

### CONTROL UNIT & PICK-UP COIL CHECK

1) Disconnect high tension coil wire from distributor cap. Hold end of coil wire 1/2" away from engine block, using insulated pliers.

2) Turn the ignition switch "ON", then disconnect 4-wire connector from control unit. Watch for spark as connector is disconnected. If sparking occurs, proceed with next step. If no sparking occurs, proceed to step 6).

3) Turn ignition switch "OFF" and disconnect 4-wire connector at control unit. Connect an ohmmeter between the Orange and Violet wire terminals "D2" and "D3" of harness connector. Ohmmeter reading should be 400-800 ohms. If reading is correct, proceed to step 8). If reading is not correct, proceed to next step.

4) Disconnect and reconnect 3-wire connector at distributor. If ohmmeter reading is now correct, proceed to step 8). If reading is still not correct, proceed to next step.

5) Disconnect 3-wire connector at the distributor and connect ohmmeter leads between the Orange and Violet wire terminals "B2" and "B3" of distributor connector. If reading is now 400-800 ohms, repair harness between 3-wire and 4-wire connectors. If reading is still not to specifications, replace pick-up coil assembly in distributor.

6) With ignition switch "OFF" and 4-wire connector disconnected, connect ohmmeter leads to battery negative terminal (ground) and Black wire terminal "D1" in harness connector. Ohmmeter reading should be nearly 0 (less than .002 ohms).

7) If ohmmeter reading is OK, proceed to step 3). If reading is above specification, check for source of bad ground (ground cable resistance, distributor-to-engine block resistance or ground screw in distributor to Black wire terminal "D1").

8) With ignition switch "ON" and voltmeter connected to harness side of 4-wire connector Orange and Violet wire ter-

minals "D2" and "D3", crank engine. Voltmeter reading should fluctuate. If no voltage fluctuation occurs, check for defective trigger wheel, distributor shaft not turning, or missing trigger wheel retaining pin (shaft turning but not trigger wheel).

### CONTROL UNIT POWER FEED CHECK

**NOTE** — Before making this check, always check ignition coil primary circuit first.

1) Disconnect 2-wire connector (Red and White wires) at control unit. Connect voltmeter negative lead to ground and positive lead to Red wire harness connector terminal "F2". Turn ignition switch "ON". Voltage reading should be within 0.2 volts of battery voltage. If reading is correct, replace control unit and proceed to step 3).

2) If reading is not correct, locate and repair cause of voltage reduction (corroded connectors, defective ignition switch, etc.). If connectors are repaired and there is spark at coil wire, start engine. If connectors are repaired and there is no spark at coil wire, replace control unit.

3) Turn ignition switch "OFF", connect 2-wire connector and disconnect 4-wire connector. Connect an ammeter to Black wire terminal "C1" of control unit connector and to ground. Turn ignition switch "ON". Reading should be 0.9-1.1 amps. If reading is higher or lower than specified, replace the control unit.

### CENTRIFUGAL ADVANCE TEST

Disconnect and plug hose at vacuum advance unit. Connect timing light to No. 1 spark plug wire and connect tachometer to coil negative terminal. Start engine and note timing with engine idling. Slowly increase engine speed to 2000 RPM. Timing should advance smoothly as engine speed increases. See appropriate DISTRIBUTOR SPECIFICATIONS article in this section.

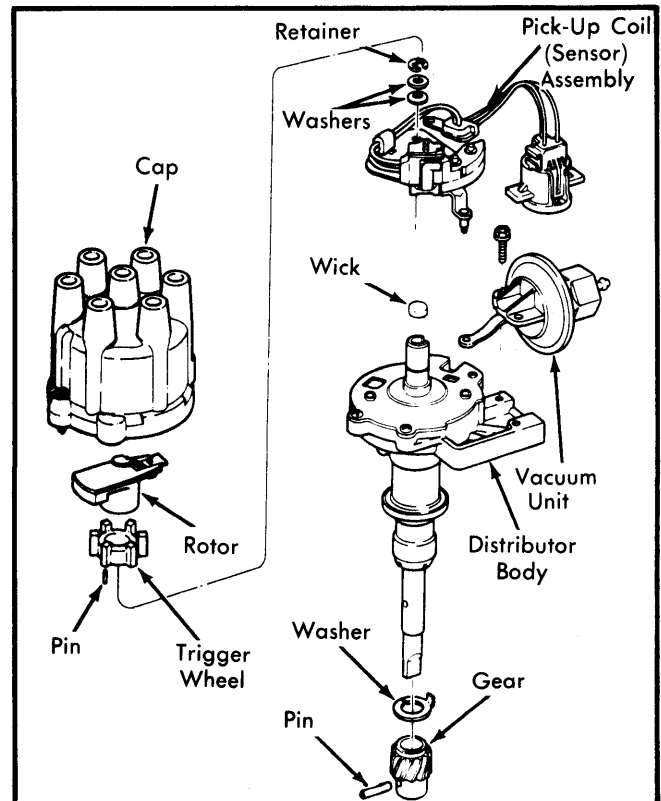


Fig. 3 Exploded View of AMC Solid State Distributor

# Distributors & Ignition Systems

## MOTORCRAFT SOLID STATE IGNITION SYSTEM (Cont.)

### VACUUM ADVANCE TEST

Disconnect and plug vacuum hose at vacuum advance unit. Connect an auxiliary vacuum supply to vacuum advance unit. Connect a timing light and tachometer to engine. With engine at idle, check and note timing. Slowly increase engine speed to 2000 RPM. With vacuum applied, ignition timing should advance sooner than with centrifugal advance alone. See appropriate *DISTRIBUTOR SPECIFICATIONS* article in this section.

### ELECTRONIC IGNITION RETARD TEST

The electronic ignition retard function is tested as part of the Computerized Emission Control (CEC) system. See appropriate article in *COMPUTERIZED ENGINE CONTROLS* section.

### OVERHAUL

#### DISTRIBUTOR

**Disassembly** – 1) Remove distributor cap and rotor. Using suitable gear puller (J-28509), remove trigger wheel (two screwdrivers can be used to pry trigger wheel upward). Remove pin.

2) Remove pick-up coil retainer and washers from pivot pin on base plate. Remove pick-up coil plate screws. Lift pick-up coil assembly from distributor. Vacuum unit need not be removed unless replacement is necessary.

**Reassembly** – Reverse disassembly procedure, being sure to coat brass surface of rotor with silicone grease. If sensor or vacuum unit was replaced, check ignition timing.