

MOTORCRAFT SOLID STATE IGNITION (SSI) (Cont.)

The collapse of the magnetic field in the ignition coil primary circuit induces a high voltage surge in secondary, causing current to flow from the coil to the distributor, rotor, cap and spark plug wires.

SOLID STATE IGNITION (SSI) SYSTEM NOTES

NOTE: 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.

NOTE: When disconnecting control unit connectors, pull with firm, straight pull. Do not attempt to pry apart with screwdriver. When connecting, press together firmly to overcome hydraulic pressure of grease. If connector locking tabs weaken or break off, it is unnecessary to replace connector. Just press together firmly and bind with electrical tape or a harness tie strap to assure good connection.

TESTING

SECONDARY CIRCUIT CHECK

CAUTION: When checking the secondary voltage, do not remove spark plug wires from spark plugs No. 1 or 5 on 6-cylinder engines nor from spark plugs No. 3 or 4 on V8 Engines.

1) Disconnect coil wire from distributor cap. Use insulated pliers to hold wire approximately 1/2" from engine block or intake manifold.

2) Crank engine and check for spark at gap. If no spark occurs, turn off ignition switch, and check resistance of secondary coil windings. See *Ignition Coil Resistance Check, Secondary Resistance*. Replace ignition coil if outside specifications.

3) If spark occurred in step 2), connect coil wire to distributor cap. Remove wire from 1 spark plug. Using insulated pliers, hold wire 1/2" from engine head while cranking engine. Check for spark.

4) If spark occurs, check for fuel problems or incorrect timing. If no sparks occur, check for defective rotor or distributor cap or for defective spark plug wires.

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.

4) If less than 3.5 amps., check for poor connections in 4-wire and 3-wire connectors or for poor ground at distributor ground screw.

5) 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.

COIL OUTPUT CHECK

1) Connect oscilloscope to engine. Start engine and observe secondary winding spark voltage. Remove 1 spark plug wire (not wire No. 1 or 5 on 6-cylinder engine nor wire No. 3 or 4 on V8 engines) from distributor cap. Run engine at 1000 RPM.

2) Observe voltage on oscilloscope. This voltage, referred to as open circuit voltage, should be 24,000 volts minimum.

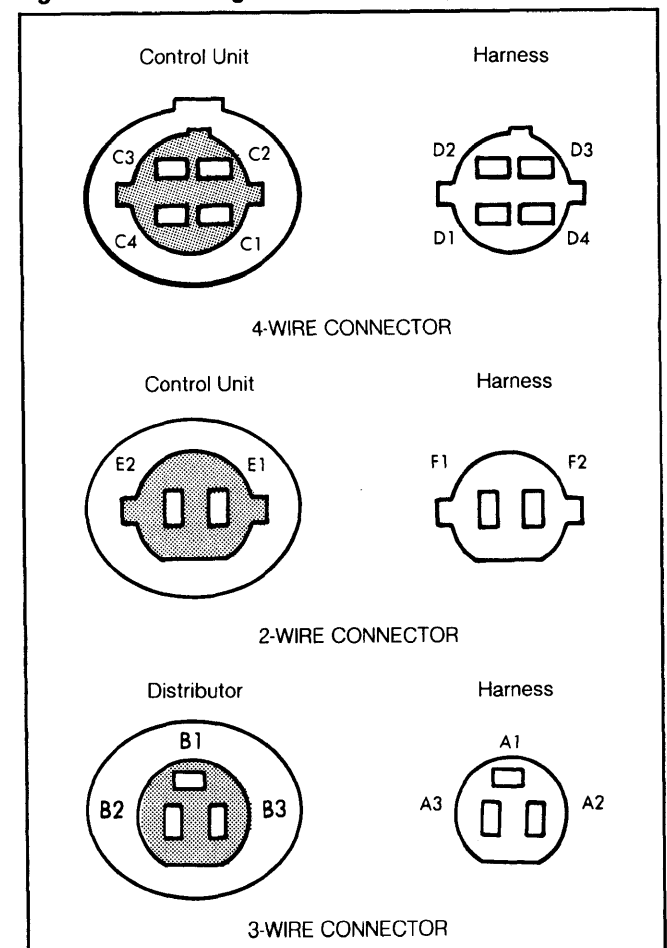
NOTE: Do not operate engine with spark plug disconnected for more than 30 seconds or damage may result to catalytic converter.

SPARK PLUG REQUIRED VOLTAGE

1) Attach secondary voltage pick-up over coil high tension wire. Run engine at approximately 1000 RPM. Firing voltage should be relatively even and between 5,000-16,000 volts.

2) If firing voltage is bad, check each cylinder. Maximum variation between cylinders is 3,000 to 5,000 volts.

Fig. 2: Solid State Ignition Connectors



Terminals are identified for testing purposes.

Distributors & Ignition Systems

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IGNITION COIL RESISTANCE CHECK

Primary Resistance

1) 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.

2) Ohmmeter reading should be 1.13-1.23 ohms at 75°F (24°C). With coil temperature at 200°F (93°C), a 1.5 ohm reading is acceptable.

Secondary Resistance

1) Turn ignition switch "OFF". Set ohmmeter to high scale (x1000 scale). Connect one lead to coil negative terminal and other lead to coil tower (remove coil secondary wire).

2) Ohmmeter reading should be 7,700-9,300 ohms with coil temperature at 75°F (24°C). With coil temperature at 200°F (93°C) or above, a maximum reading of 12,000 ohms is acceptable.

COIL PRIMARY CIRCUIT CHECK

1) Connect voltmeter positive lead to coil positive terminal and negative lead to 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.

4) With ignition switch in "ON" position and 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 "AV" (Red 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 "AV" (Red 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 & SENSOR CHECK

1) Disconnect high tension coil wire from distributor cap. Attach a modified spark plug to coil wire (side electrode of plug cut off and ground wire attached to side of plug casing). If plug is not available, hold coil wire ½" from engine block, using insulated pliers.

2) Turn ignition switch "ON" and disconnect 4-wire connector from control unit. Watch for spark at modified spark plug, 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 the 3-wire connector at the 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 out of specifications, replace sensor 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 zero (less than .022 ohms).

7) If ohmmeter reading is OK, recheck system starting at step 3). If reading is above specifications, check for the source of the 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 terminals "D2" and "D3", crank engine. Voltmeter reading should fluctuate.

9) 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 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 battery voltage (within 0.2 volts). If reading is correct, replace control unit. If not, proceed to next step.

2) 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) Connect voltmeter negative lead to ground and positive lead to Light Blue wire at harness connector terminal "F1" in 2-wire connector. Crank engine. Voltmeter

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reading should be within 1 volt of battery cranking voltage. If not, check for bad connections, ignition switch or starter solenoid.

4) Turn ignition switch "OFF", connect 2-wire connector and disconnect 4-wire connector. Connect an ammeter to ground and to Black wire terminal "C1" of control unit (not harness) connector. Turn ignition switch "ON". Reading should be 0.9-1.1 amps. If reading is higher or lower than specified, replace control unit.

OVERHAUL

DISTRIBUTOR

Disassembly

1) Remove distributor cap and rotor. Using suitable gear puller (J-28509), remove trigger wheel (2 screwdrivers can be used to pry trigger wheel upward). Remove pin.

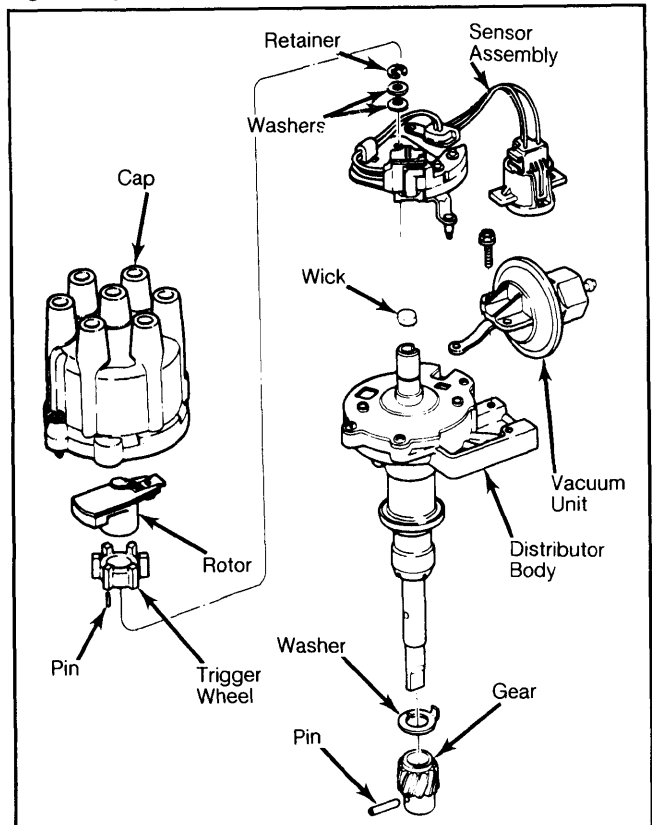
2) On 6-cylinder engines, remove sensor retainer and washers from pivot pin on base plate. On V8 engines, remove sensor snap ring from shaft. Remove retainer from vacuum unit-to-sensor drive pin and move vacuum lever aside.

3) Remove ground screw from harness tab. Lift sensor assembly from distributor housing. Only remove vacuum unit if it is to be replaced.

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.

Fig. 4: Exploded View of Jeep SSI Distributor



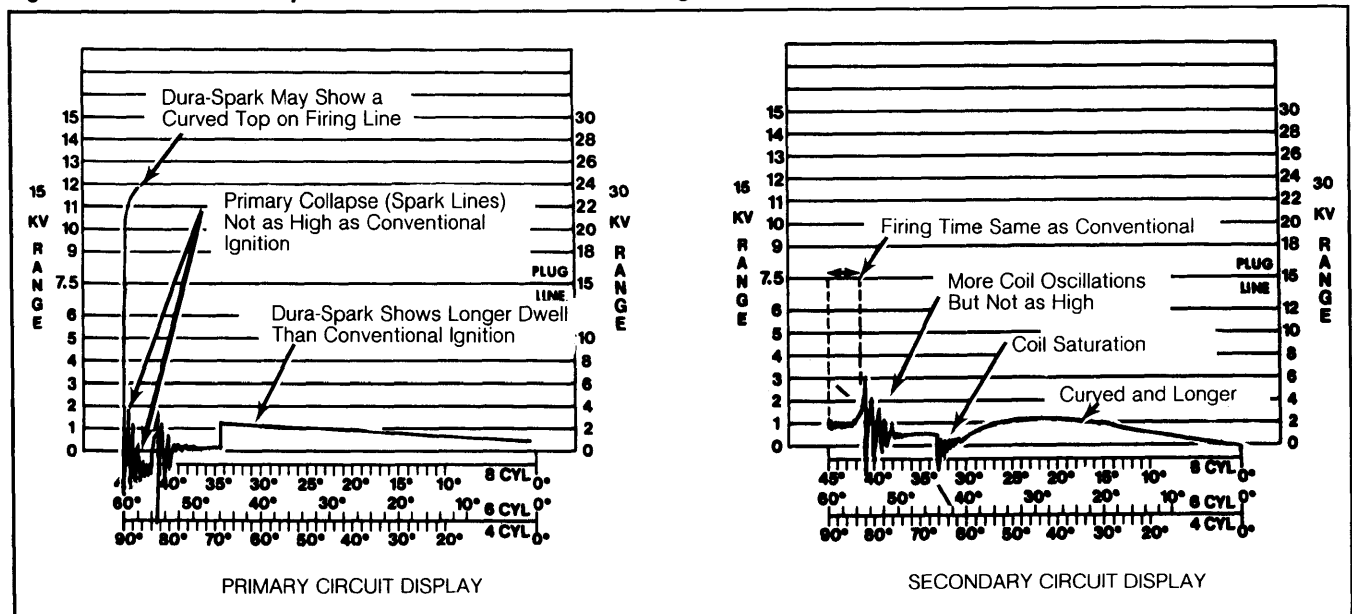
Reluctors have 1 tooth for each cylinder.

TYPICAL MOTORCRAFT IGNITION OSCILLOSCOPE PATTERNS

To analyze the Solid State (SSI) and Dura-Spark Ignition Systems using an oscilloscope, follow the procedures recommended by manufacturer of scope.

The electrical display patterns will appear similar to patterns of conventional breaker type ignition systems except as shown in Fig. 3.

Fig. 3: Normal Oscilloscope Patterns Shown for Solid State Ignition (SSI) Systems



These patterns also apply to Motorcraft Dura-Spark II systems.