1974-79 DISTRIBUTORS & IGNITION SYSTEMS
Motorcraft Duraspark II Electronic Ignition

Ford Motor Co.: 1979 Fiesta

DESCRIPTION

The Duraspark II ignition system is basically a solid state ignition system, using a larger rotor, distributor cap and adapter, secondary wires and wide gap spark plugs to take advantage of the higher energy produced.

OPERATION

The Duraspark II ignition system contains a distributor, electronic control module, and ignition coil. *See Fig. 1.* An armature (reluctor) with 4 teeth (one for each cylinder) rotates with the distributor shaft past a stator (pick-up coil). As the teeth pass the pick-up coil, a signal is sent to the electronic control module.

The module then determines when to turn current off and on in the primary windings of the ignition coil. This current collapse in the primary causes a high voltage surge in the secondary, firing the spark plugs.

ELECTRONIC CONTROL MODULE

Each Duraspark II module has 6 wires (a 2-wire connector and a 4-wire connector). *See Fig. 2.* The Red and White wires are the ignition feed wires. White wire is for cranking mode, Red wire for run mode. The Red wire circuit contains a 1.1 ohm wire resistor.

The current in the primary circuit of the ignition coil is turned off and on by the Green wire. The Orange and Purple wires transmit signals to the module from the armature and pick-up coil in the distributor. The Black wire is used to ground the distributor. The module is powered whenever the ignition switch is in the "RUN" or "START" position.

DISTRIBUTOR

A 4-tooth armature and stator (pick-up coil) combine to signal the control module when to turn ignition coil off and on. The distributor features an adapter between cap and housing, and has centrifugal and vacuum advance mechanisms. *See Fig. 3.*

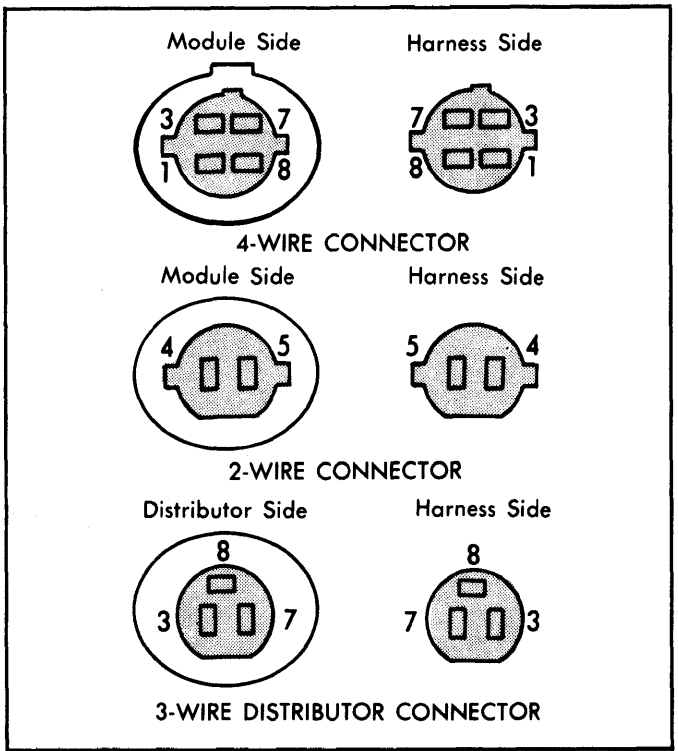

Fig. 2: Control Module & Distributor Connectors

IGNITION COIL

The coil is powered whenever ignition switch is in the "RUN" or "START" position. It contains a primary positive battery "BAT" and a negative Distributor Electronic Control ("DEC") terminal and a single secondary terminal. A connector attaches the Green wire from the control module to the coil negative terminal and the wire from the ignition switch to the positive terminal.

NOTE: The "DEC" terminal is also referred to as the "TACH TEST" terminal.

RESISTANCE WIRE

The ignition resistance wire between the ignition switch and "BAT" terminal of the coil must be of specified length and diameter to reduce operating voltage. Under no circumstances should it be replaced by

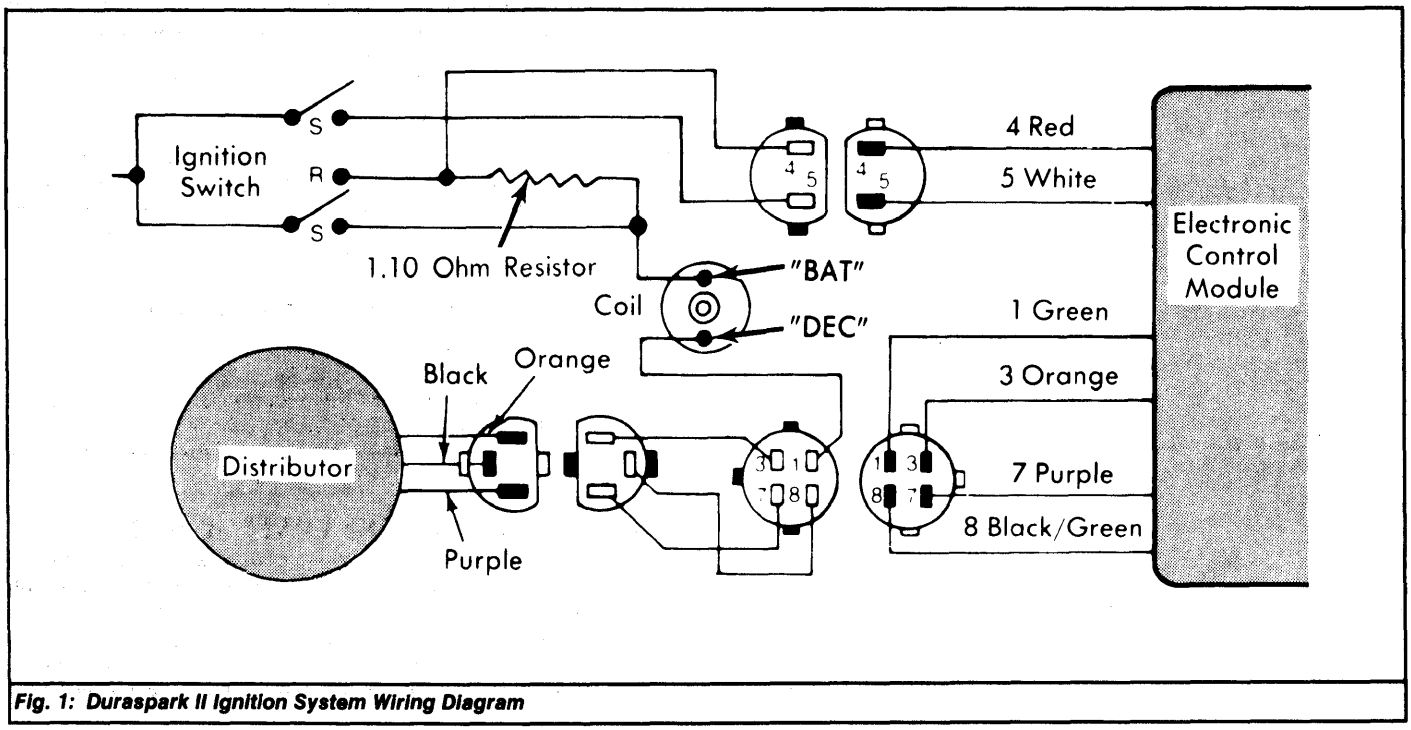

Fig. 1: Duraspark II Ignition System Wiring Diagram

Motorcraft Duraspark II Electronic Ignition (Cont.)

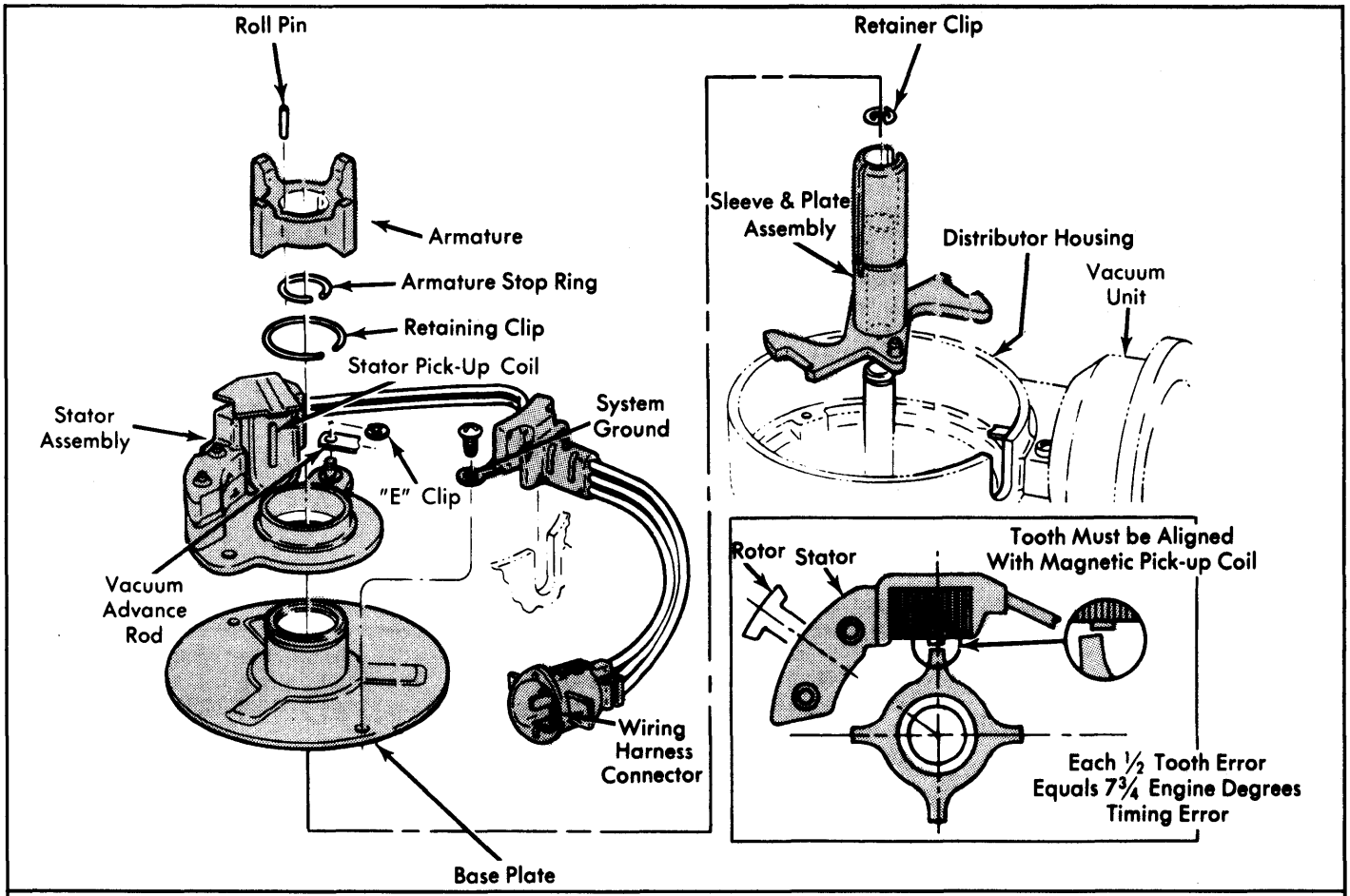

Fig. 3: Components of Duraspark II Distributor

any other wire than the correct service resistor wire. When a new wire is installed, the old wire should be isolated from the system. Resistance value of wire is 1.05-1.15 ohms.

SYSTEM PROTECTION

The Duraspark II system is protected against electrical currents produced or used by any other vehicle component during normal operation. However, damage to the system can occur if proper testing procedures are not followed.

PRECAUTIONS

Since the electronic control module and ignition coil are powered whenever the ignition switch is in the "RUN" or "START" position, the system will generate a spark whenever the ignition is turned off. This feature may be used as a diagnostic tool to check for continuity of circuit, coil and ignition switch.

A spark may occur if distributor cap is removed with ignition on, keep ignition off during under-the-hood operations, unless you plan to start the engine or perform a test requiring ignition to be on. This will prevent accidental engine rotation during service or test procedures.

Silicone dielectric grease must be applied to all insulating areas at distributor, coil and spark plug boots. To help prevent radio frequency interference, coat the entire brass rotor tip with silicone dielectric grease to a thickness of 1/32" (.75 mm). DO NOT remove this grease, even if discolored, as grease will maintain its insulating properties.

A 3/4" (18 mm) clearance must be maintained at distributor cap mounting edge, spark plug wire terminals and coil tower to prevent high voltage are to ground. When replacing spark plug wires, be sure to use the specified replacement wires. When removing distributor cap and adapter, always remove the cap first, then the adapter.

TESTING

NOTE: When checking the secondary voltage, do not remove the No. 1 or 3 spark plug wires while the engine is running. On vehicles with catalytic converters, do not run the engine for more than 30 seconds with a spark plug wire removed.

COIL RESERVE VOLTAGE TEST

Clamp secondary voltage pick-up over distributor-to-coil high voltage wire. Run engine at 2000 RPM and check overall operating condition and coil voltage reserve. Reserve should be 8000 volts minimum. Using an ohmmeter, check resistance of coil-to-distributor high voltage wire. Resistance should be 5000 ohms per foot.

ROTOR-TO-CAP VOLTAGE DROP TEST

Connect high voltage pick-up to coil-to-distributor secondary wire. Remove one spark plug wire momentarily and ground wire to the engine. Run engine at idle speed, without letting a spark gap appear between engine and spark plug wire. High voltage reading should be 8000 volts maximum. If voltage fails to meet specifications, check rotor, adapter and distributor cap.

REQUIRED SPARK PLUG VOLTAGE TEST

Make this test with engine running at approximately 2000 RPM and with secondary voltage pick-up connected over coil-to-distributor high voltage wire. Firing voltage should be relatively even and between 8000-20,000 volts. If firing voltage is not to specifications, check individual cylinder firing voltage. Each cylinder should receive a minimum of 6000 volts and all cylinders should be within 50 percent of each other.

1974-79 DISTRIBUTORS & IGNITION SYSTEMS
Motorcraft Duraspark II Electronic Ignition (Cont.)

SPARK PLUG WIRE RESISTANCE TEST

Check spark plug wire resistance using an ohmmeter. Resistance should not exceed 5000 ohms per foot with spark plug wire connected to distributor cap and resistance test made through internal distributor cap terminal.

IGNITION COIL RESISTANCE TEST

Primary Resistance - With ignition off, remove connector from coil's positive and negative primary terminals. Set ohmmeter on low scale and connect ohmmeter leads to primary terminals of ignition coil. 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 - With ignition off, remove coil secondary wire. Set ohmmeter to high scale (x1000) and connect one lead to coil negative terminal and other lead to coil tower. Ohmmeter reading should be 7700-9300 ohms at 75°F (24°C). With coil temperature at 200°F (93°C), a maximum reading of 12,000 ohms is acceptable.

BASIC SYSTEM TEST

1) Connect oscilloscope with clamp-on pick-ups to coil high voltage wire.rer's specifications. If scope is not available, remove coil wire from distributor and insert a modified spark plug into coil wire. *See Fig. 4.*

2) Turn ignition on and tap distributor base with a screwdriver handle. Check for sparks while tapping distributor (visible by checking scope trace or at modified spark plug gap).

3) If no spark occurs, turn ignition off. Crank engine to approximately align engine timing pointer with initial timing degree line on damper. Turn ignition on and repeat tapping of distributor, checking again for sparks.

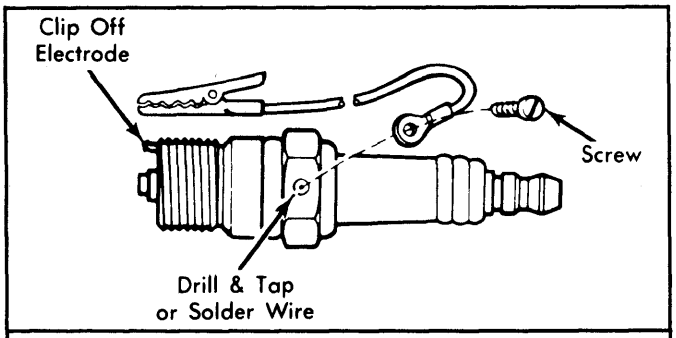

Fig. 4: Modified Spark Plug Tester

CONTROL MODULE FEED TEST

Red Wire Circuit - 1) If no spark occurred in step **3)** of BASIC SYSTEM TEST, measure battery voltage. Using a straight pin, puncture Red wire of control module's 2-wire harness (between module and connector). *See Fig. 5.*

2) Connect voltmeter positive lead to straight pin and negative lead to ground. Voltage on Red wire should be within 1 volt of battery voltage. If so, proceed to step **1)** of COIL PRIMARY CIRCUIT TEST.

3) If not, repair Red wire circuit and repeat previous tests. If spark occurs at modified plug, ignition system is okay.

White Wire Circuit - 1) If spark occurred at step **3)** of BASIC SYSTEM TEST, connect voltmeter positive lead to ignition coil's "BAT" terminal and negative lead to ground.

2) Check voltage while cranking engine. Voltage should be within 1 volt of battery voltage. If not, repair White wire circuit feeding positive terminal of coil.

3) If voltage is okay, crank engine and check for sparks at modified plug. If sparks occur, ignition system is okay. If none occurs, puncture White wire with a straight pin between control module and 2-wire connector. *See Fig. 5.*

4) Connect positive lead of voltmeter to straight pin and negative lead to ground. Crank engine. Voltage should be within 1 volt of battery voltage. If not, repair White wire circuit and repeat White wire circuit check.

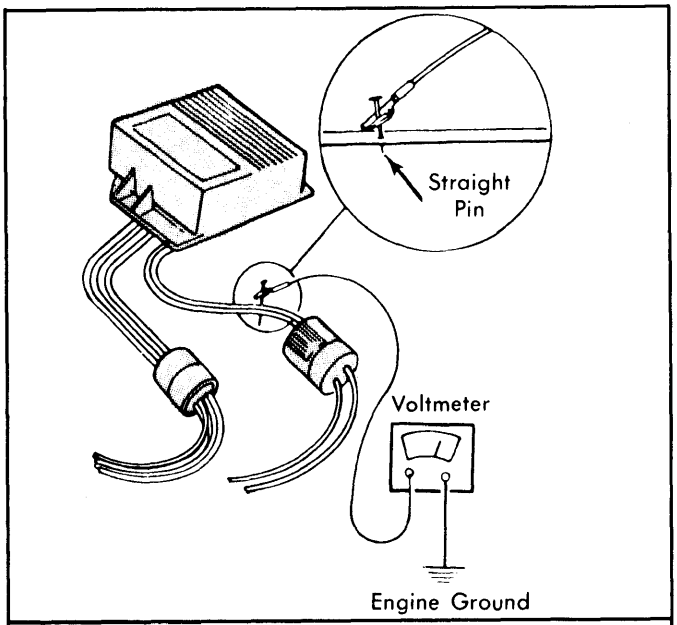

Fig. 5: Red Or White Wire Circuit Tests

5) If voltage is okay, substitute a known good control module (but do not install). Repeat test procedure from step **1)**. If sparks now occur, reconnect original module. If no spark occurs, replace defective module with a new one.

COIL PRIMARY CIRCUIT TEST

1) Perform step **1)** of CONTROL MODULE FEED TEST for Red wire circuit. If voltage was within 1 volt of battery voltage, turn ignition switch from "RUN" to "OFF". A spark should be seen each time ignition is turned off. Place ignition switch to "RUN" position. If sparks occur, go to CONTROL MODULE & STATOR TEST. If no sparks occur, go to next step.

2) Connect positive lead of voltmeter to ignition coil "BAT" terminal and negative lead to ground. Reading should be 5-8 volts. If so, go to step **11)**. If less than 6 volts, go to step **10)**.

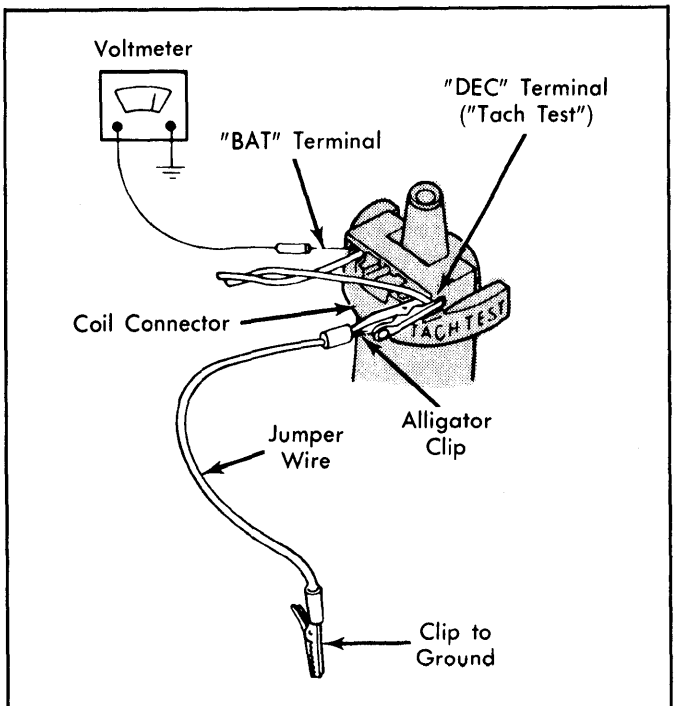

Fig. 6: Coil Primary Circuit Test

Motorcraft Duraspark II Electronic Ignition (Cont.)

3) If voltage in step **2)** is battery voltage, disconnect 4-wire connector at control module. Insert a jumper wire (paper clip) into the 4-wire harness connector's terminals that mate with the control module's Green and Black wires (terminals No. 1 and 8).
4) Connect voltmeter positive lead to ignition coil "BAT" terminal and negative lead to ground. Measure voltage. If battery voltage exists, go to step **6)**.
5) If voltage now reads 6-8 volts, substitute (but do not install) a known good control module. Repeat previous tests. If sparks occur, reconnect original control module and retest. If no spark now occurs, replace control module.
6) If voltage in step **4)** was battery voltage, make sure coil connector is fully engaged on primary terminals of ignition coil. Ground the "TACH TEST" terminal of coil. *See Fig. 6.* Connect voltmeter positive lead to coil "BAT" terminal and negative lead to ground.
7) If reading is now 6-8 volts, remove ground wire from "TACH TEST" terminal of coil connector. Ground jumper wire (paper clip) in 4-wire connector. Again measure voltage at coil "BAT" terminal. Reading should be approximately 6-8 volts. If so, go to step **9)**.
8) If not, repair wire from control module to coil (mates with Green wire). Remove jumper wire (paper clip) from 4-wire connector. Reconnect control module and retest system. If sparks occur, system is okay.
9) If voltage in step **7)** was 6-8 volts, repair the Black wire from control module to distributor. Remove jumper wire (paper clip) from 4-wire connector and retest system. If sparks occur, system is okay.
10) If voltage in step **2)** was less than 6 volts, repair wire feeding the ignition coil "BAT" terminal and retest system. If spark occurs at modified plug, system is okay.
11) If voltage in step **2)** was 6-8 volts but engine would not run, or if voltage in step **6)** was battery voltage, remove paper clip and reconnect control module. Substitute (but do not install) a known good ignition coil and repeat system test. If sparks occur, reconnect original coil and retest. If no sparks occur, replace ignition coil.
12) If no sparks occurred with substitute coil, connect original ignition coil and be sure connector is fully engaged over terminals. Substitute (but do not install) a known good control module and repeat tests. If sparks occur, reconnect original module and retest. If no sparks occur, replace control module.

CONTROL MODULE & STATOR TEST

1) Perform step **1)** of COIL PRIMARY CIRCUIT TEST. If modified plug sparked, but engine would not run, substitute any known good distributor. Ground distributor, but do not install. Spin gear and check for sparks. *See Fig. 7.*
2) If sparks occur, reconnect original distributor to check if it is damaged. Repeat tests and check for sparks. If no sparks occur, replace distributor stator assembly.
3) If no sparks occurred when gear of good distributor was spun, disconnect 3-wire distributor connector and 4-wire control module connector. Check harness wires as indicated in steps **4)** through **8)**.
4) Turn ignition off. Connect ohmmeter leads to ends of each wire, one at a time. Wire mating with control module Black wire (terminal No. 8) grounds distributor. Wires mating with control module Orange and Purple wire signal control module as to when coil primary circuit should be shut off and on. Continuity should exist at each wire.
5) Connect ohmmeter leads to harness wires mating with Orange wire (terminal No. 3) and Purple (terminal No. 7) wire of control module. There should be no continuity between these 2 wires.
6) Connect one ohmmeter lead to ground and touch other lead in turn to wires mating Orange wire (terminal No. 3) and Purple (terminal No. 7) control module wires. An open condition should exist.
7) If harness checks okay, reconnect distributor connector. Substitute a known good module and repeat system tests. If sparks occur, reconnect original control module and retest. If no sparks occur, replace original control module with a new one.
8) If harness proved defective in step **4)** through step **6)**, repair wires or connectors as necessary and retest for spark at modified plug.

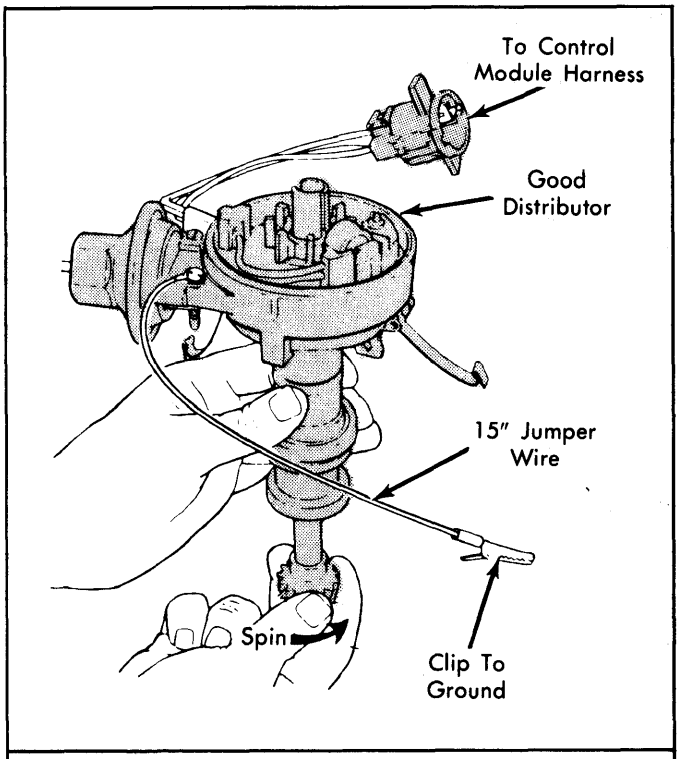

Fig. 7: Control Module & Stator Test

INTERMITTENT OPERATION TEST

1) If ignition system becomes operative during testing without a repair having been made, attempt to recreate original problem. With engine running, wiggle wires at coil, module, distributor and other harness connectors. Check connections that you have previously disconnected.
2) Check distributor ground connection. Turn engine off. Heat stator pick-up coil by placing a 250 watt heat lamp approximately 1-2 inches (25-50 mm) from its top surface. Apply heat for 5-10 minutes, while checking pick-up coil resistance at distributor Orange and Purple wires. Resistance should be 400-1000 ohms. Tapping with screwdriver may also be helpful.
3) With engine running, heat control module in the same manner. DO NOT let module temperature exceed 212°F (100°C). If ignition system malfunctions, substitute (but do not install) a new control module. If malfunction is corrected, recheck old control module before replacing it.

OVERHAUL

DISASSEMBLY & REASSEMBLY

1) Remove distributor cap, adapter, and rotor. Disconnect distributor wiring harness connector. Using a small gear puller or 2 screwdrivers, carefully pry armature from sleeve and plate assembly. Remove spring pin.
2) Remove snap ring, washer and wave washer. Remove ground screw and stator (pick-up coil) assembly. DO NOT pinch stator (pick-up coil) wires when removing armature.
3) Remove vacuum diaphragm by tilting unit downward to disengage link from advance plate. Reassemble distributor in reverse order of disassembly. Use new spring pin and install pin in groove 180 degrees from original location.