$4.95

SURE YOU CAN®

Work on Electronic Ignition

A Simplified Guide to Finding and Fixing Problems

WELLS

Original Equipment Quality for
Original Equipment Performance

WELLS

Original Equipment Quality Since 1903

Since 1903, Wells Mfg. Corp. has been producing original-equipment quality ignition and engine performance components in Fond du Lac, Wisconsin. We got our start making parts for the original Model T Ford, and as cars and trucks have changed over the years, so have we.

Today, your vehicle has some pretty complicated electronic ignition components on it. We're building those parts in our own electronics plant that's as high-tech as they come. We've got all the state-of-the-art computer-operated robots that the automakers have, and then some. Maybe that's why they buy a fair number of their ignition components from us.

So, whether you need a point set for your '57 Chevy or an electronic ignition module for your brand-new vehicle, you can rest assured that each and every Wells component is an exact match to the original. We guarantee it.

SURE YOU CAN®

Work on Electronic Ignition

A Simplified Guide To Finding and Fixing Problems

This guide from Wells Manufacturing Corp. is designed to help you get over the technology shock of working on your late-model car. While new cars have become more sophisticated, there are still a lot of things you CAN do yourself, when you know how. No matter how complex modern computer-controlled electronics become, a few troubleshooting techniques and some basic equipment will allow you to diagnose and repair most common problems.

Since the early eighties, every new car and light truck is equipped with one or more on-board computers. The computers, called Electronic Control Modules, are used for a variety of purposes. Over the years, the operation of the engine ignition system has been turned over to complete computer control, mainly for emission control reasons. All new cars use some form of electronic ignition, but some systems are more comprehensive than others in what they control and how they do it.

The most modern of these computerized electronic ignition systems use a variety of engine sensors to allow the computer to constantly adjust the spark timing under all driving conditions. If one of these sensors fails, it could cause a loss of performance or a drop in fuel mileage. It could also cause more harmful emissions from the tailpipe and could result in catalytic converter damage.

These modern electronic components (with no moving parts) should theoretically last the life of the vehicle, but components do sometimes fail due to the harsh operating environment under the hood. Most automotive electrical systems have built-in aids to help you find the problem. They're designed to be easy to trouble-shoot. In fact, finding a failed electronic component is often easier than finding a fouled spark plug or a bad ignition wire.

⚠ **CAUTION:** All computer-based systems are extremely sensitive to electrical voltages and cannot tolerate careless or haphazard testing or service procedures. Be careful not to connect or disconnect test leads or connectors with the ignition switch ON. Make sure the manufacturer's instructions for the test equipment you use states that the tester will work with the type of electronic ignition you're troubleshooting. Read all operating instructions carefully before making any test connections.

There are only a few diagnostic techniques you need to know when dealing with any computerized automotive control system. Read the basic information before attempting any testing to provide the background of information necessary to avoid the most common and obvious mistakes which can cost you both time and money. Most replacement and testing procedures are simple. A basic understanding of the typical electronic ignition components and their function is all you need.

Although the test procedures in this booklet have been written for domestic GM, Ford, and Chrysler vehicles, many imported vehicles can also be tested using similar procedures. Be sure to consult the service manual for the vehicle on which you are working.

Minor component malfunctions can make a big difference in performance, so it helps to know how each component affects the operation of the overall electronic ignition system. Once you understand how everything works together, it's easier to find the ultimate cause of a problem without replacing good components unnecessarily. A wise old mechanic once said, "It's not enough to use the proper test equipment; you must use the test equipment properly!"

Following is a list of equipment you will need to perform all of the testing and troubleshooting procedures and "Two-Minute Tests" listed in this guide. Although test equipment and manuals cost money, you will find that the price of test equipment required to solve a problem will generally be much less than you would pay to have someone do the work for you. Therefore, the purchase of test equipment for the do-it-yourselfer is most often a good value; and the value continues to increase each time you use the equipment in the future.

- Digital voltmeter, any high-impedance (10 megohm) type—for testing Oxygen Sensors and General Motors and Chrysler Manifold Absolute Pressure (MAP) Sensors.

- Engine tachometer—for testing Ford MAP Sensors and Mass Air Flow (MAF) Sensors.

- Ohmmeter—for testing Ignition Coils, Spark Plug Wires, magnetic-type Pick-up Coils, Ignition Resistors, Temperature Sensors, etc.

  NOTE: Multimeters are also available. This type of tester contains a voltmeter, ohmmeter, and tachometer. Some meters may even have other functions. The multimeter is usually less expensive and more convenient to use than separate pieces of test equipment.

- Pair of jumper wires with alligator clips for testing MAP Sensors.
- Vacuum gauge or hand vacuum pump for testing MAP Sensors.
- Small propane torch for testing Oxygen Sensors.
- Hall Effect Tester kit with the necessary adapters and feeler gauge for testing Hall Effect Sensors.
- Magnetic Sensor (variable reluctance) Tester for testing Knock Sensors and Crankshaft Position Sensors.
- Manifold Absolute Pressure (MAP) Sensor Tester.
- Mass Air Flow (MAF) Sensor Tester.
- "No-start" type Electronic Ignition Module Tester.
- "Indicator light" type Sensor Tester for testing Throttle Position Sensors (TPS) and Idle Speed Control (ISC) Motors.
- Nine-volt battery (the type used in transistor radios) for testing Idle Speed Control (ISC) Motors.
- A service manual that will supply specifications and guidelines for the vehicle on which you are working. This manual contains the electrical wiring diagrams and service information needed for some of the tests. This manual also includes the trouble code charts that are necessary when working on late model computer-controlled vehicles. These types of manuals are available from publishers such as Chilton, Haynes, Mitchell, Motor, etc.

Be sure to check with your auto parts supplier if you are not certain of the type of equipment to buy for the vehicle on which you are working.

Safety Guidelines

TO PREVENT ACCIDENTS THAT COULD RESULT IN SERIOUS INJURY AND/OR DAMAGE TO YOUR VEHICLE OR TEST EQUIPMENT, CAREFULLY FOLLOW THESE SAFETY RULES AND TEST PROCEDURES:

SAFETY EQUIPMENT

- Fire Extinguisher

  Never work on your car without having a suitable extinguisher handy. A 5-lb. or larger CO^2 or dry chemical unit specified for gasoline/chemical/electrical fires is recommended.

- Fireproof Container

  Rags and flammable liquids should be stored only in fireproof, closed metal containers. A gasoline-soaked rag should be allowed to dry thoroughly outdoors before being discarded.

- Safety Goggles

  We recommend wearing safety goggles when working on your car to protect your eyes from battery acid, gasoline, and dust and dirt flying off moving engine parts.

  NOTE: Never look directly into the carburetor throat while the engine is cranking or running, as sudden backfire can cause burns.

LOOSE CLOTHING AND LONG HAIR

Be very careful not to get your hands, hair, or clothes near any moving parts such as fan blades, belts and pulleys, or throttle and transmission linkages. Never wear neckties or loose clothing when working on your car.

JEWELRY

Never wear wrist watches, rings, or other jewelry when working on your car. You'll avoid the possibility of catching on moving parts or causing an electrical short circuit which could shock or burn you.

VENTILATION

The carbon monoxide in exhaust gas is highly toxic. To avoid asphyxiation, always operate your vehicle in a well-ventilated area. If the vehicle is in an enclosed area, exhaust should be routed directly to the outside via leakproof exhaust hose.

SETTING THE BRAKE

Make sure that your car is in **park** or **neutral** and that the **parking brake is firmly set**.

HOT SURFACES

Avoid contact with hot surfaces such as exhaust manifolds and pipes, mufflers (catalytic convertors), the radiator, and hoses. Never remove the radiator cap while the engine is hot, as escaping coolant under pressure may cause serious burns.

SMOKING AND OPEN FLAMES

Never smoke while working on your car. Gasoline vapor is highly flammable, and the gas formed in a charging battery is explosive.

BATTERY

Do not lay tools or equipment on the battery. Accidentally grounding the "HOT" battery terminal can cause shock or burn and may damage the wiring, battery, or your tools and testers. The battery might even explode! Be careful of contact with battery acid. It can burn holes in your clothing and burn your skin or eyes.

When operating any test instrument from an auxiliary battery, connect a jumper wire between the negative terminal of the auxiliary battery and ground on the vehicle under test. When working in a garage or other enclosed area, an auxiliary battery should be located at least 18 inches above the floor to minimize the possibility of igniting gasoline vapors.

HIGH VOLTAGE

High voltage—30,000-50,000 volts—is present in the Ignition Coil, Distributor Cap, ignition wires, and spark plugs. When handling ignition wires while the engine is running, use insulated pliers to avoid shock. While not lethal, a shock may cause you to jerk involuntarily and hurt yourself.

JACK

The jack supplied with the vehicle should be used only for changing wheels. Never crawl under the car or run the engine while your vehicle is on a jack. Be sure to use an approved jack stand or hoist when working under a vehicle.

TOOLS

Don't use loose fitting wrenches or other tools which may slip and cause injury.

Don't push on wrenches when loosening or tightening nuts or bolts. Always try to pull the wrench toward you. If the situation calls for pushing the wrench away, push with an open hand to avoid scraped knuckles if the wrench should slip.

Don't attempt to lift a heavy component alone—get someone to help you.

OTHER

Don't rush or take unsafe shortcuts to finish a job.

Don't allow children or animals in or around the vehicle while you are working on it.

Get someone to check on you periodically when working alone on a vehicle.

Remember that your vehicle's safety affects that of yourself and others. If in doubt on any point, get professional advice.

OWNER'S MANUAL

Consult the vehicle owner's manual and an up-to-date service manual for any additional safety guidelines that you may be required to follow.

Organized Troubleshooting Procedures

It is often said that when working on a 15-20 year old car, it takes 15 minutes to find the problem and 2 hours to fix it. But when working on late model cars, it takes 2 hours to find the problem and only 15 minutes to fix it!

An organized troubleshooting routine is a must to correctly identify the problem. Approach any ignition system problem in a logical, organized manner. Following are some standard trouble-shooting techniques:

1. **Find out exactly when the problem occurs.** Does it appear only under certain conditions? Were there any obvious symptoms, such as a cold or hot engine, wet or dry conditions, high or low RPM, heavy or light engine load, etc.?

2. **Pull diagnostic codes.** Vehicles with self-diagnosing computer systems can provide trouble codes that can be used to locate the system or electrical circuit that has the problem.

3. **Test for problems systematically.** Are all the components functioning properly? Is power going to electrical components? Is there vacuum at the vacuum switches and/or actuators? Doing careful, systematic checks will often turn up most causes on the first inspection without wasting time checking unrelated components.

4. **Isolate the problem area within the ignition system.** Make some simple tests and observations, then eliminate things which are working properly. Check for broken wires, dirty connections, or split or disconnected vacuum hoses. *Always check for the obvious before assuming something complicated is the cause.*

5. **Test all repairs after the work is done to make sure that the problem is fixed.** Some ignition system problems can be traced to more than one component, so a careful verification of repair work is important to pick up additional malfunctions.

Electronic ignition parts can be easily tested using the procedures outlined in this guide. If you are not familiar with the proper use of any of the tools used to do these tests, refer to the COMMON TROUBLESHOOTING TOOLS section in the Appendix of this guide.

Safety Precautions

Computerized control systems, such as modern electronic ignition, require some special precautions to prevent the possibility of personal injury or damage to electronic components during service or test procedures. These include the following:

⚠ **CAUTION:** Make sure the ignition is switched OFF before connecting or disconnecting battery cables, component connectors, or test leads.

⚠ **CAUTION:** Exercise care when inserting test probes into connectors to insure good connections without damaging the connector or spreading the pins. Whenever possible, probe connectors from the rear (wire) side, NOT the pin side, to avoid accidentally shorting terminals together. Straight pins can make handy probes for terminals, but don't pierce any wires in the process.

⚠ **CAUTION:** Don't remove or attach wiring harness connectors with the ignition switch ON. The correct procedure is to turn the switch OFF, disconnect or connect the coupling, then turn the switch back ON if the test calls for it.

⚠ **CAUTION:** Be careful not to drop any components during service procedures and don't apply 12 volts directly to any component (such as a solenoid or relay) unless instructed specifically to do so in the test procedures. Most computerized components have electrical windings which are designed to only safely handle 4 or 5 volts and can be damaged if direct battery voltage is applied to the connector.

⚠ **CAUTION:** Accidents and serious injury could result if basic safety rules and test procedures are not carefully followed.

For a general list of guidelines that should be followed when working on and around automobiles, refer to the SAFETY GUIDELINES section of this guide.

Distributor Caps and Rotors

Distributor Caps and Rotors distribute high-voltage energy from the Ignition Coil to each of the individual spark plugs by way of the Spark Plug Wires. Damaged or worn out Distributor Caps and Rotors can cause hard starting (especially in cold or wet weather), lack of power, rough idle, hesitation, high exhaust emissions, poor fuel economy, and generally poor performance.

Distributor Caps and Rotors can be damaged in several ways. The terminals where electrical arcing occurs may erode over time, and the high-voltage resistance can be significantly reduced by contamination from grease, oil, or dirt.

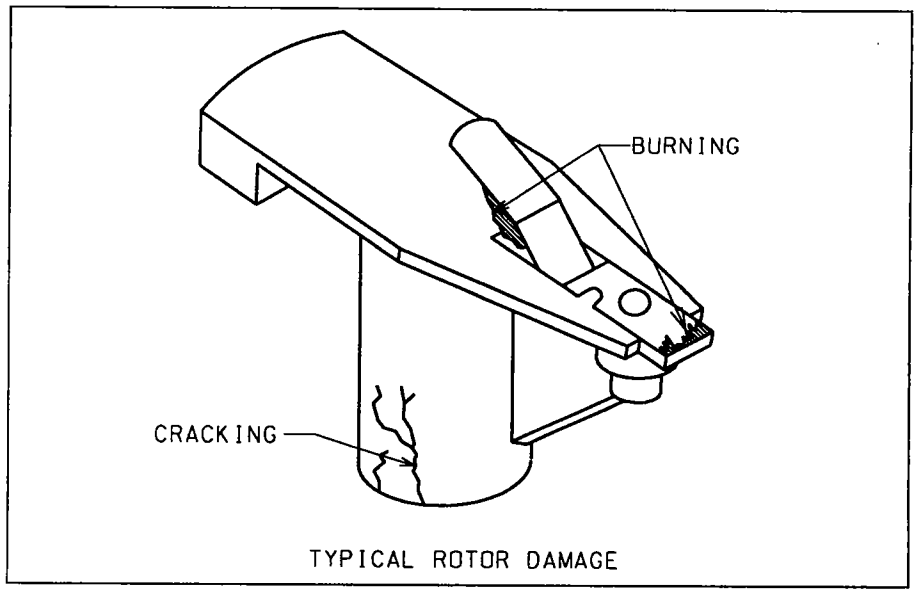

Fig. 1

When high voltage arcs across the surface of a Distributor Cap or Rotor, it burns the material (Fig. 1 and Fig. 2), leaving a powdery black trail called carbon tracking. Replace any component that shows this type of damage. Look for any fine cracks in the Distributor Cap or Rotor (Fig. 1 and Fig. 2). Cracks may allow moisture to enter and may cause a crossfire situation where the voltage arcs uncontrollably around the inside of the Distributor Cap. Again, replace any cracked Distributor Cap. Finally, check the carbon button in the top center of the Distributor Cap. Replace any Distributor Cap with a worn or damaged carbon button.

The same rules for damage apply to the Rotor, with one addition. If the Rotor electrode is burned or pitted, or if carbon tracking is evident, replace the Rotor.

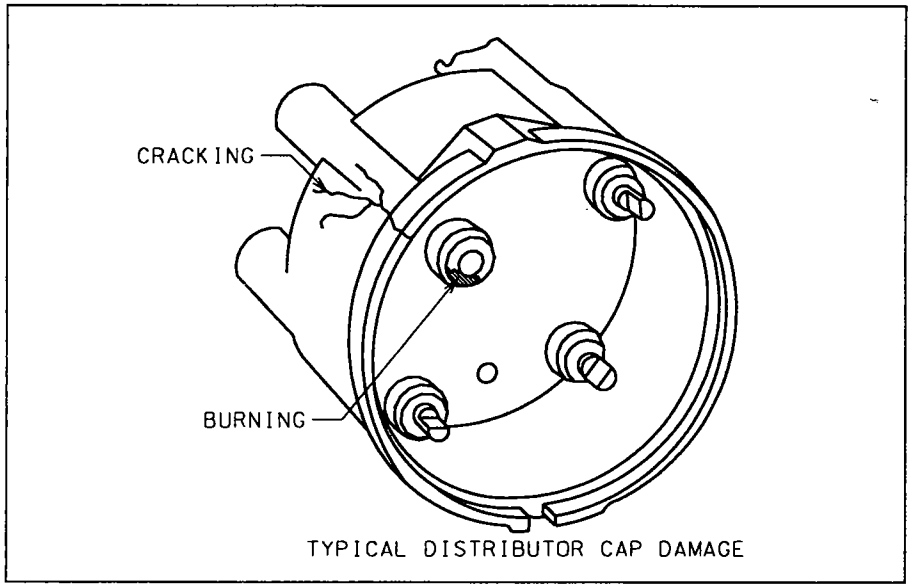

Fig. 2

Spark Plug Wires

Spark Plug Wires carry the high-voltage energy that fires the spark plugs, and have become as high tech as today's ignition systems. Most are constructed of alternating layers of insulation and silicone, with the center core generally made of conductive latex around a non-conductive fiberglass and Kevlar cord.

Damaged or worn out Spark Plug Wires can cause hard starting, hesitation, loss of power, high exhaust emissions, poor fuel economy, and generally poor performance. Too much resistance in the Spark Plug Wires can also cause early failures in other ignition components such as Ignition Coils, Electronic Ignition Modules, and Engine Control Computers.

Because of the high voltages the Spark Plug Wires must carry, it is important that you not pierce the Spark Plug Wire insulator for any reason. Putting a hole in the Spark Plug Wire with a sharp probe will allow the current to arc from the wire. Testing a Spark Plug Wire is largely a matter of visual inspection.

Look for burned or blackened marks on the insulator or wire connector ends (Fig. 3). Check the Spark Plug Wire with an ohmmeter for continuity to make sure there aren't any breaks inside the insulation. Finally, use your ohmmeter to check the resistance of the wire. The maximum resistance is 8000 ohms per foot. If your ohmmeter indicates a higher resistance than this, replace the Spark Plug Wires.

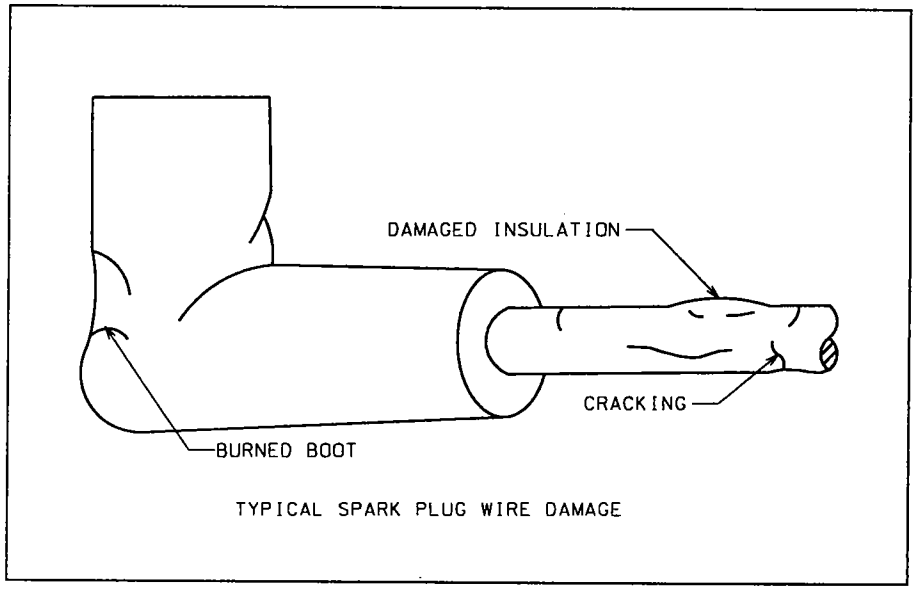

Fig. 3

Pick-up Coils and Sensors

Pick-up Coils and Sensors provide the Electronic Ignition Module with a timing signal that tells when to fire each spark plug. A failed Pick-up Coil or Sensor can cause hard starting, hesitation, no starting, rough idle, stalling, and misfires. Depending upon the manufacturer, these Magnetic Pick-up Coils and Sensors have different names. American Motors Corporation (AMC) uses the terms "Stator" or "Sensor Assembly", Chrysler uses the term "Electronic Pick-up", Ford uses the term "Stator", and General Motors uses the term "Pick-up Coil." For simplicity, we will use the term "Pick-up Coil."

MAGNETIC PICK-UP COILS

The Magnetic Pick-up Coils located in the distributor can be easily checked by first inspecting for physical damage such as cracks in the plastic housing, broken magnets, or deformed metal parts. The Pick-up Coil itself can be tested with an ohmmeter.

Connect the leads of your ohmmeter to each of the Pick-up Coil leads and take a reading (Fig. 4). The reading should be within the specifications listed in your service manual. For example, many early General Motors Electronic Ignition Systems have Pick-up Coils that should register 500 to 1500 ohms of resistance. If it registers less than 500 ohms, the Pick-up Coil has some sort of short circuit condition. A reading that registers over 1500 ohms indicates a loose connection, corrosion, or similar condition. Wiggle the Pick-up Coil's wires while taking the reading. This will help find those broken and frayed wires which can cause intermittent problems.

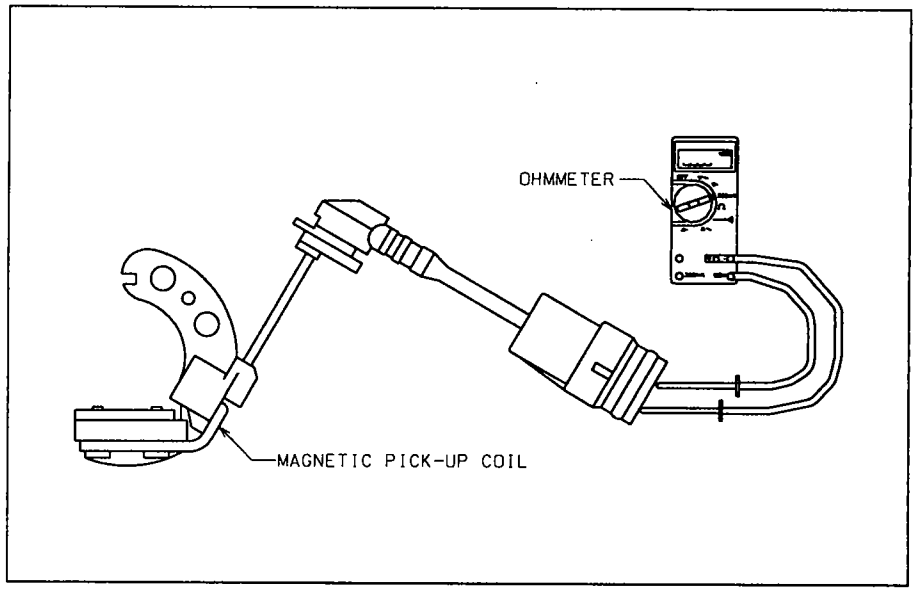

Fig. 4 (Typical example: Wells #JA107)

HALL EFFECT SENSORS

Many manufacturers are using Hall Effect Sensors in the distributors. Many distributorless ignition systems use Hall Effect Camshaft and Crankshaft Position Sensors, too. This type of sensor should be tested with an "indicator light" type Hall Effect Tester.

Hall Effect Sensors can be tested both on and off the vehicle. If you are testing the component on the vehicle, simply plug the Hall Effect Tester into the sensor (Fig. 5), then crank the engine and observe the indicator light. It should wink on and off while the engine is cranking.

⚠ **CAUTION:** Be sure to refer to the SAFETY GUIDELINES section of this guide before performing an on-vehicle test.

If testing the sensor off the vehicle, plug the Hall Effect Tester into the sensor connector and observe the indicator light; it should remain on steadily. Using the metal blade that comes with the tester, pass the blade through the sensor air gap. The indicator light should go off while the blade is in the air gap, then come back on when the blade is removed. The important thing to look for is the indicator light going on and off as the blade passes through the air gap.

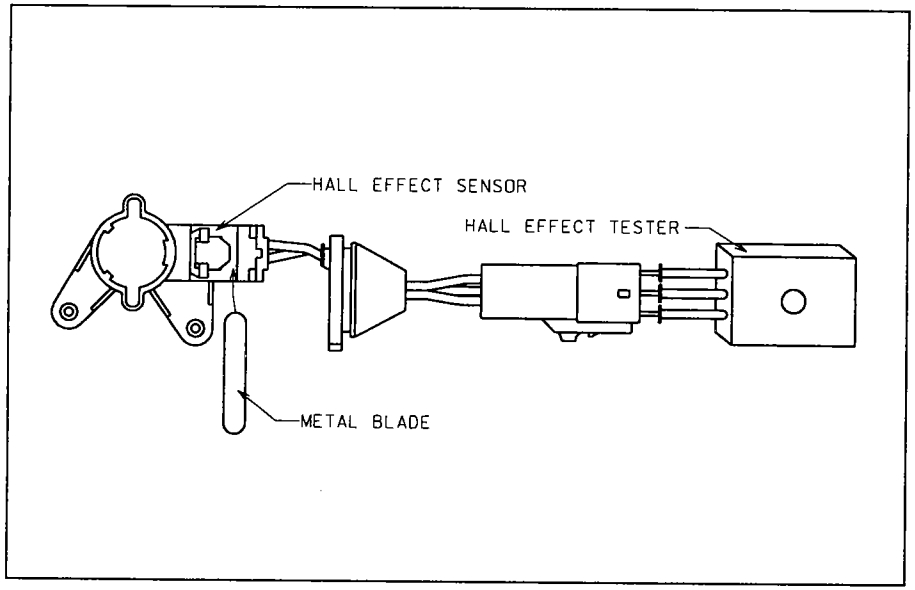

Fig. 5 (Typical example: Wells #F123)

General Motors and Chrysler sensors are checked by connecting the tester directly to the sensor leads or connector. Ford sensors are easier to test through the Electronic Ignition Module. Follow the tester manufacturer's instructions to determine the proper connections for the vehicle on which you are working.

Ignition Coils

The Ignition Coil produces the high-voltage energy needed to fire the spark plugs. When the Ignition Coil wears out or becomes damaged, hard starting, stalling, rough idle, no power under load, hesitation, poor fuel economy, and generally poor performance can result. Most cylindrical-type Ignition Coils are mounted on the engine, fender well, or fire wall. Square-type Ignition Coils can be mounted either on the engine, fire wall, or fender well, but may also be installed as part of the Distributor Cap assembly.

Oil-Filled (Cylindrical-Type) Ignition Coils

To test the primary winding (Fig. 6), isolate the Ignition Coil by disconnecting all leads from the Coil. Next, calibrate your ohmmeter in the low range, and connect it across the primary terminals of the Coil. Take a reading, and refer to a service manual for the proper specifications.

To test the secondary winding (Fig. 6), switch the ohmmeter into the high range, and recalibrate if necessary. Connect one lead to either primary terminal and one to the secondary discharge port. Again, take a reading and refer to a service manual for the proper specifications.

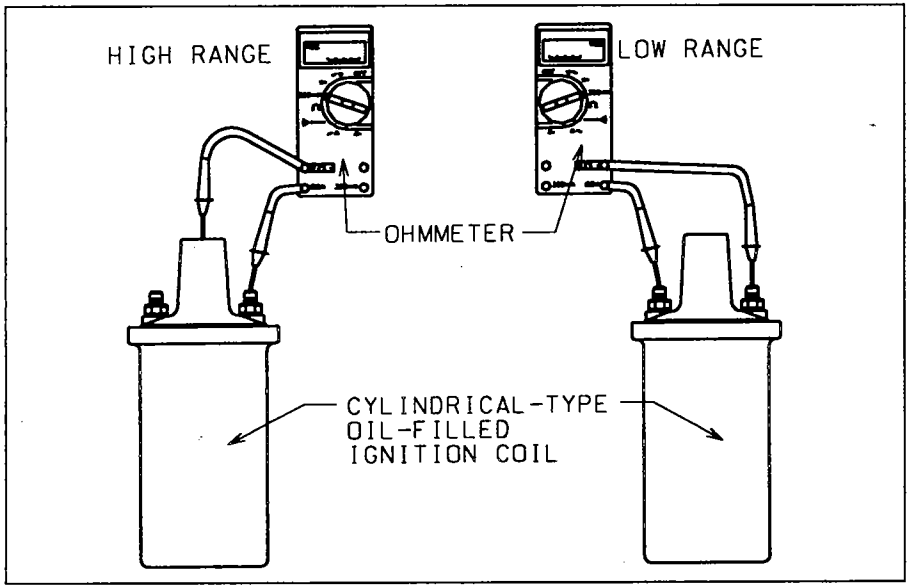

Fig. 6 (Typical example: Wells #C836)

EPOXY-FILLED (SQUARE-TYPE) IGNITION COILS

To test the primary winding (Fig. 7, 8, and 9), isolate the Ignition Coil by disconnecting all the leads. Set the ohmmeter in the low range, and recalibrate if necessary. Connect the ohmmeter leads across the primary terminals as illustrated (Fig. 7, 8, and 9). Take a reading and refer to a service manual for proper specifications.

To test the secondary winding (Fig. 7, 8, and 9), switch the ohmmeter to high range and recalibrate if necessary. Connect the ohmmeter leads across the secondary terminals as illustrated (Fig. 7, 8, and 9). Again, take a reading and refer to a service manual for proper specifications.

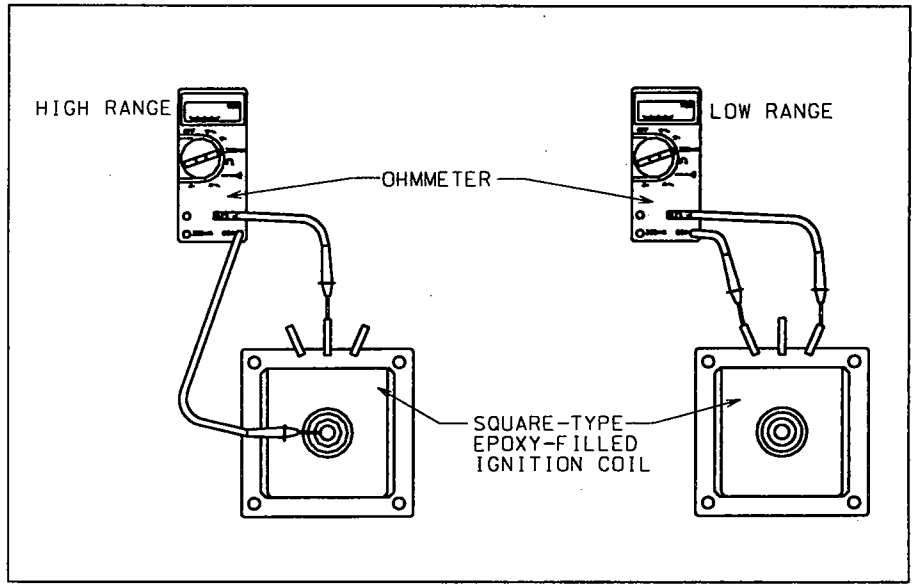

Fig. 7 (Typical example: Wells #C833)

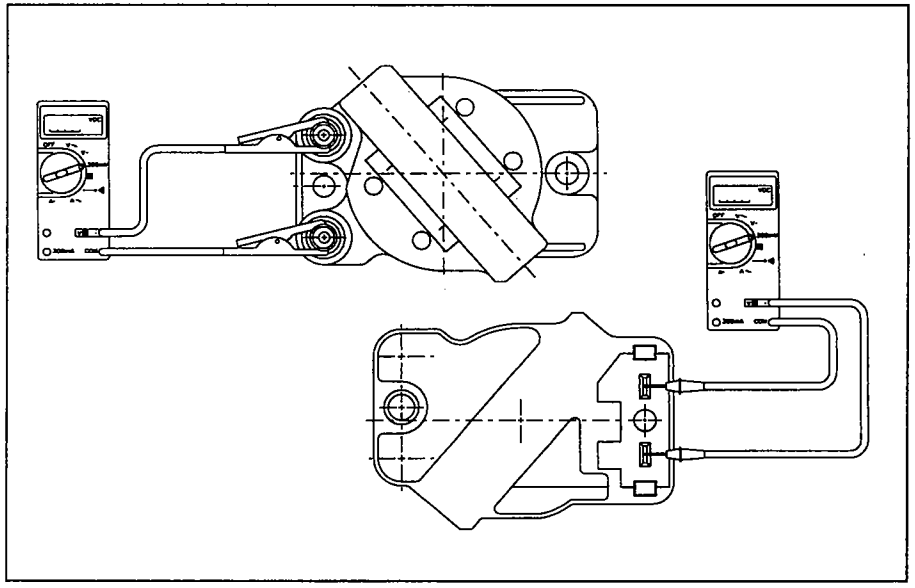

Fig. 8 (Typical example: Wells #C849)

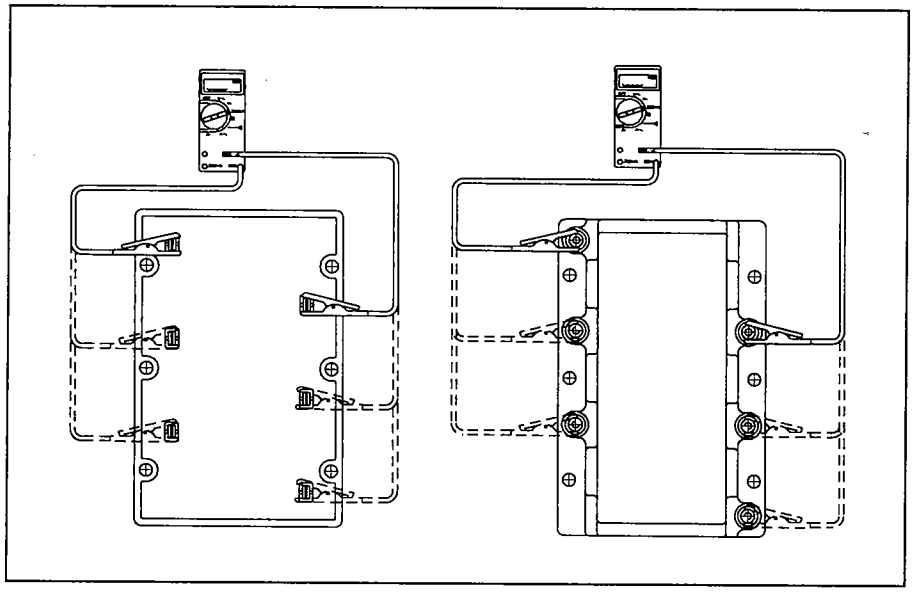

Fig. 9 (Typical example: Wells #C860)

Electronic Ignition Modules

The Electronic Ignition Module is a solid-state device containing an electronic circuit that turns the Ignition Coil primary winding on and off, which creates the high-voltage energy needed by the spark plugs. Electronic Ignition Modules also regulate the dwell and electrical current that flows in the ignition system. Some modules work in conjunction with the vehicle's on-board computer to regulate engine timing. In some vehicles this is called Electronic Spark Timing or EST. A failed or damaged Electronic Ignition Module can cause no starts, hard starting, stalling, rough idle, poor fuel economy, and generally poor performance.

The best way to easily test Electronic Ignition Modules is with a "no-start" type Electronic Ignition Module Tester. This universal type of tool can provide you with a quick and easy way to tell whether the module is causing a no-start problem. This type of tester can determine whether an Electronic Ignition Module can start and run a vehicle. Further testing would require a full function tester that your auto parts supplier may have available. Be sure to consult the tester manufacturer's instruction sheet for all connections and testing information for the make and model of your car. Here are some typical procedures for "no-start" type Electronic Ignition Module testing. (Remember, these test procedures do not test all of the functions of an Electronic Ignition Module, but will provide a quick indication of whether the module should be able to start and run the vehicle.)

GENERAL MOTORS

MODELS WITHOUT COMPUTERS (1974-1980)

The basic General Motors Electronic Ignition Module fits into the distributor. It has four terminals, marked "W", "G", "B", and "C" (Fig. 10).

1. Connect the black tester lead (ground) to one of the mounting holes in the bottom of the module or to the tester's ground clamp.

2. Then attach the red tester lead to the "B" terminal.

3. Attach the green tester lead, which is connected to the tester's indicator light, to the "C" terminal.

4. The leftover white tester lead acts as the trigger. Touch the white trigger lead to the "G" terminal. If the module is in proper working order, the indicator light will flash each time the white lead touches the "G" terminal. If there is dirt, oil, or corrosion on the module's terminals, be sure to press hard to scrape the terminal and get a good connection.

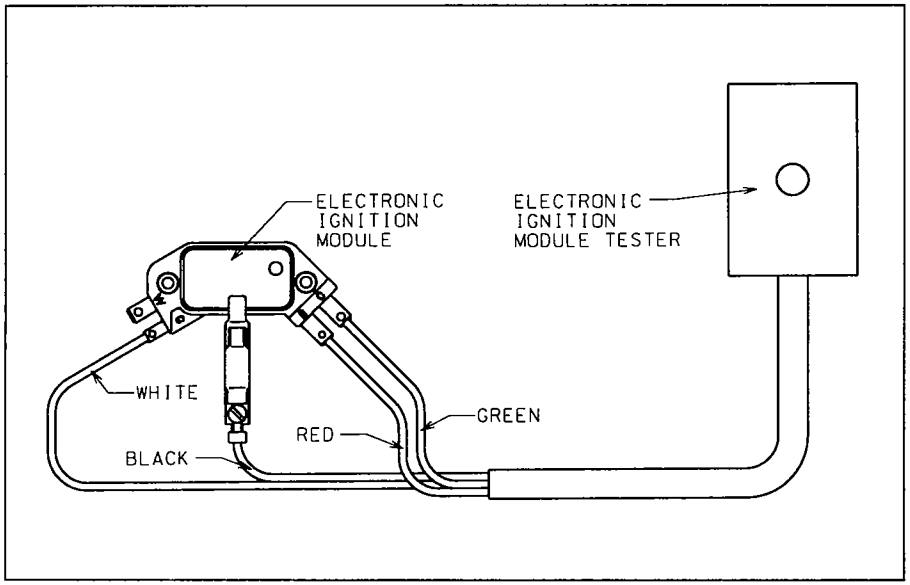

Fig. 10 (Typical example: Wells #DR100)

MODELS WITH COMPUTERS (1981-PRESENT)

1. Connect the black tester lead to ground on the bottom of the module.

2. Attach the red tester lead to the positive (+) terminal and the green lead to the "C" terminal.

3. Touch the white trigger lead to the terminal marked "P" to trigger the module. The indicator light should flash on if the module is triggering properly (Fig. 11).

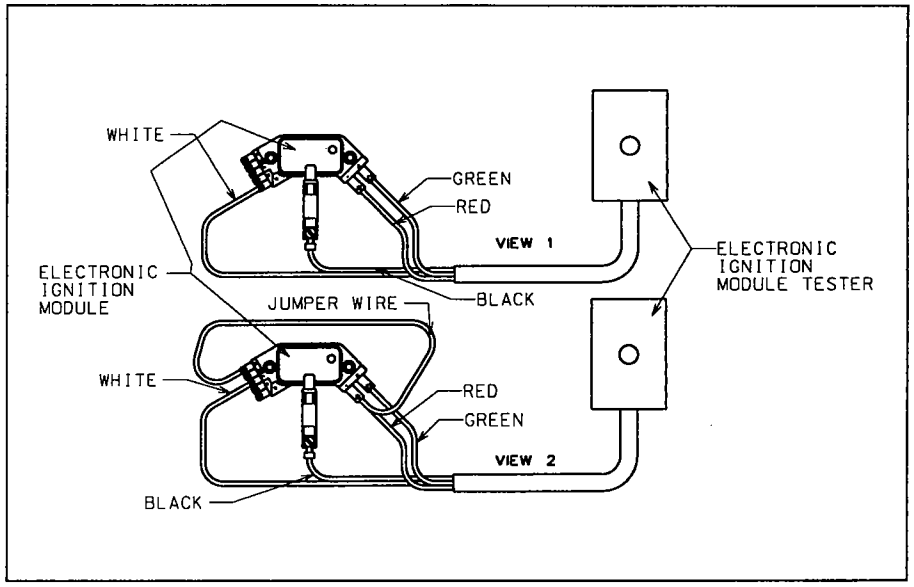

Fig. 11 (Typical example: Wells #DR124)

To test the EST function, connect one end of the jumper wire that comes with the tester to the positive (+) terminal and the other end to the bypass (B) terminal. This should put the module into EST mode. Touch the white trigger lead to the EST (E) terminal. If the EST switch inside the module is working properly, the indicator light will flash on when touched.

DISTRIBUTORLESS IGNITION SYSTEM (DIS) MODULES

1. To line the pins properly, hold the module in the same position as shown in Fig. 12.

2. Connect one end of the jumper wire to pin "P" (crankshaft sensor positive) and connect the other end to the Wells code key.

3. Connect the module tester black lead to pin "B" (ground). Connect the red lead to pin "J" (coil positive). Connect the green lead to pin "K" (coil negative). The module is now powered and ready to be triggered. However, the LED indicator light **should not** be on at this time.

4. To begin triggering the module, with one hand hold the Wells code key on a flat surface and with the other hand slide the white lead (of the module tester) across the open area of the Wells code key. This should be done in a back and forth motion approximately 10 times, about two times per second. While doing this, the LED light on the module tester should randomly flash.

5. Move the green module tester lead to pin "L" and repeat step 4.

6. **Both of the coil negative pins must be tested.** If either one of these pins does not test properly, the module should be replaced.

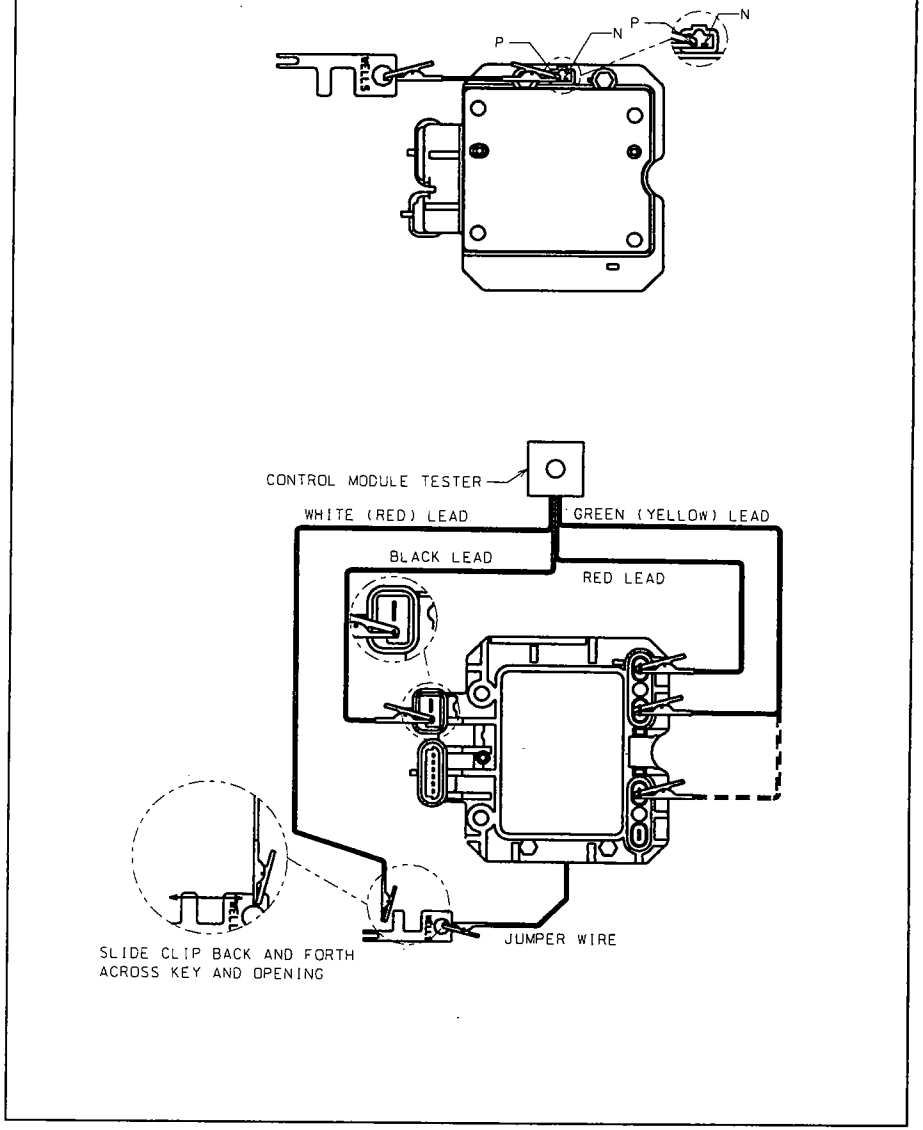

Fig. 12 (Typical example: Wells #DR144)

FORD

There are two types of Ford Electronic Ignition Modules. One type is housed in a large metal "case" (Fig. 13) that has a colored plastic grommet where the wires exit the module. It is mounted on the fender well or fire wall. The other smaller plastic module is called a "TFI" or "Thick Film Integrated" design (Fig. 14) which may be mounted on the distributor itself or in various other remote locations.

The following is a typical test procedure:

1. To test the grommet type, connect the tester leads to the module leads in the sequence red-to-red, green-to-green, white-to-white, and black-to-black (Fig. 13).

2. At this point, the tester's indicator light should light up.

3. To trigger the module, connect one end of the jumper wire to the alligator clip on the red lead (which is already attached to the module).

4. Now, touch the other end of the jumper wire to the module's orange wire terminal. If the module is working properly, the indicator light will flicker briefly each time the connection is made.

Some modules will actually turn the indicator light off and on and not flicker. Make sure you check with the tester manufacturer's instruction sheet for any differences.

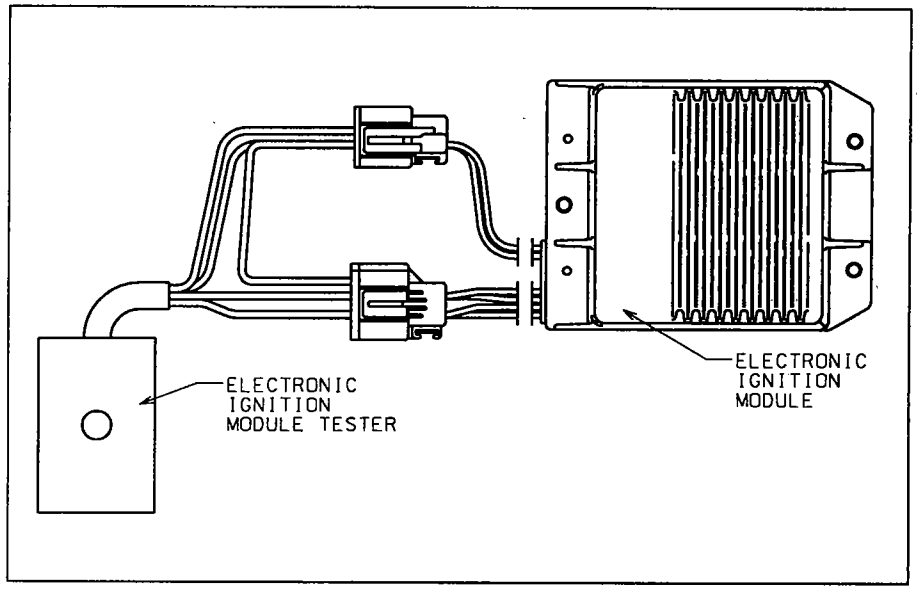

Fig. 13 (Typical example: Wells #F102)

When testing the TFI type, simply plug the custom tester connector into the module (Fig. 14). The indicator light should be either off or just lit. Touch the tester's single lead clip to the appropriate test connection for the module you are testing. Refer to the tester manufacturer's instructions for the correct connection. Not all test connections are the same, depending on the year, make, and model on which you're working. A properly functioning module will cause the indicator light to flash each time the connection is made.

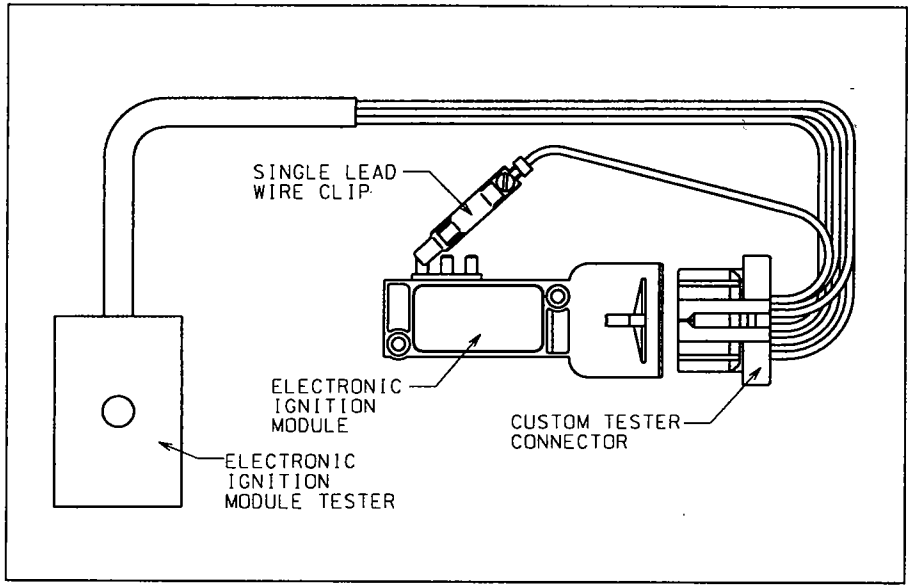

Fig. 14

CHRYSLER

Chrysler Electronic Ignition Modules are located on the fender well or fire wall and, in some cases, inside of the distributor. Consult a service manual for the location if you are not sure.

The following is a typical test for the metal housing modules (Fig. 15) that are mounted on the fire wall or fender wall:

1. Connect the red tester lead to the top center terminal and the green lead to the top left terminal just above it.

2. Connect the black tester's lead to the module housing for ground.

3. This connection should make the indicator light turn on.

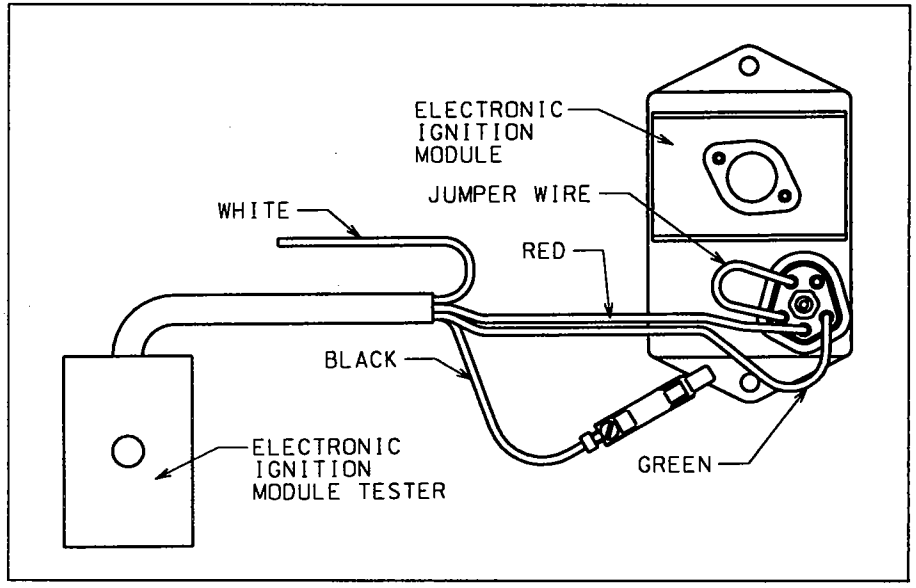

Fig. 15 (Typical example: Wells #CR100)

4. Touch the ends of a jumper wire across the right most terminals as illustrated. If the module is triggering properly, the indicator light will flicker very briefly each time the terminals are jumpered.

This is a typical Chrysler module test. Some module pin configuration and connectors vary. Refer to the tester manufacturer's instructions for the year, make, and model on which you are working.

A typical test procedure for the distributor-mounted type module (Fig. 16) is as follows:

1. Connect the red tester lead to the terminal marked “B” and the green tester lead to the terminal marked “C.”

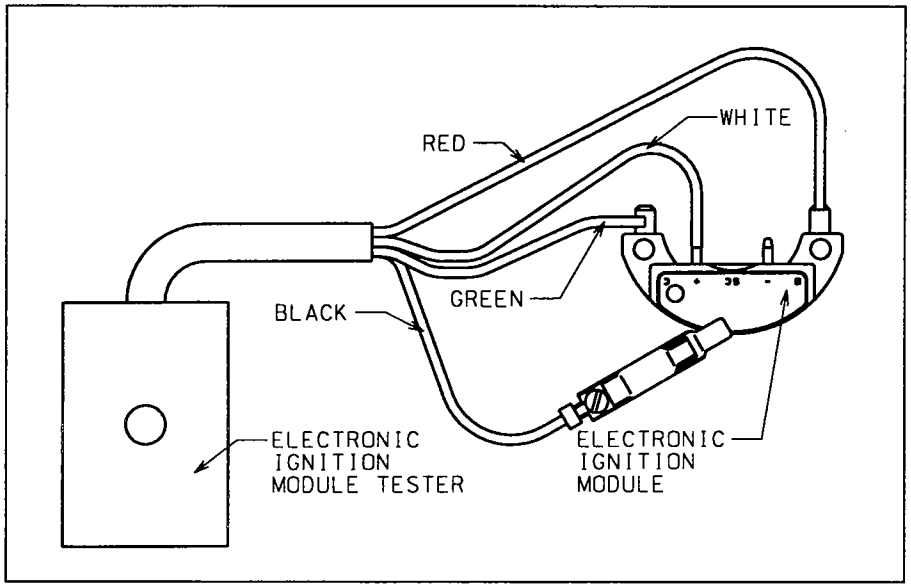

Fig. 16 (Typical example: Wells #CR125)

2. Connect the black tester lead to the module housing for ground.

3. The leftover white tester lead acts as the trigger. Touch the white lead to the "+" terminal. If the module is in proper working order, the indicator light will flash each time the white lead touches the module's "+" terminal.

In order to help quickly identify a problem in the computer-controlled ignition system, many car manufacturers have designed in a self-diagnostic system. You can take advantage of this capability by putting the vehicle's engine control computer into the diagnostic mode and reading the stored trouble codes. The following procedures will guide you through the process, but **keep in mind that the trouble codes stored in the computer's memory do not necessarily mean that a specific component is defective**. The trouble code means there is a problem in an electrical circuit. This means the trouble could be in the component itself, the electrical connections, or in the wiring harness. Be sure to perform the appropriate "Two-Minute Tests" outlined in this guide before replacing any component part indicated by a trouble code.

General Motors

Entering Diagnostic Mode

Most General Motors engine control systems have the capability to store trouble codes indicating problems detected within the last 50 engine starts. Reading these trouble codes is simply accomplished by grounding a test terminal which is part of a connector located under the dash panel. To help do this, Wells Manufacturing Corp. offers a simple tool called the code key (Part #KEY1). The two narrow prongs on the end of the code key are designed to plug directly into the diagnostic connector and activate the on-board diagnosis system.

To put your computer into the diagnosis mode, first locate the connector under the dash panel. Look for this connector just under the dash panel near the steering column (Fig. 17). Use the code key to connect terminals "A" and "B" together. Turn the ignition to the ON position. Any stored trouble codes will be indicated by the flashing CHECK ENGINE or SERVICE ENGINE SOON light on the dash.

NOTE: Some GM vehicles (i.e., certain Cadillac models) do not use a diagnostic connector and dash-mounted light to access service codes. Instead, diagnostic information is obtained by pressing various buttons on the vehicle's climate control panel. Refer to a service manual to obtain diagnostic codes on these vehicles.

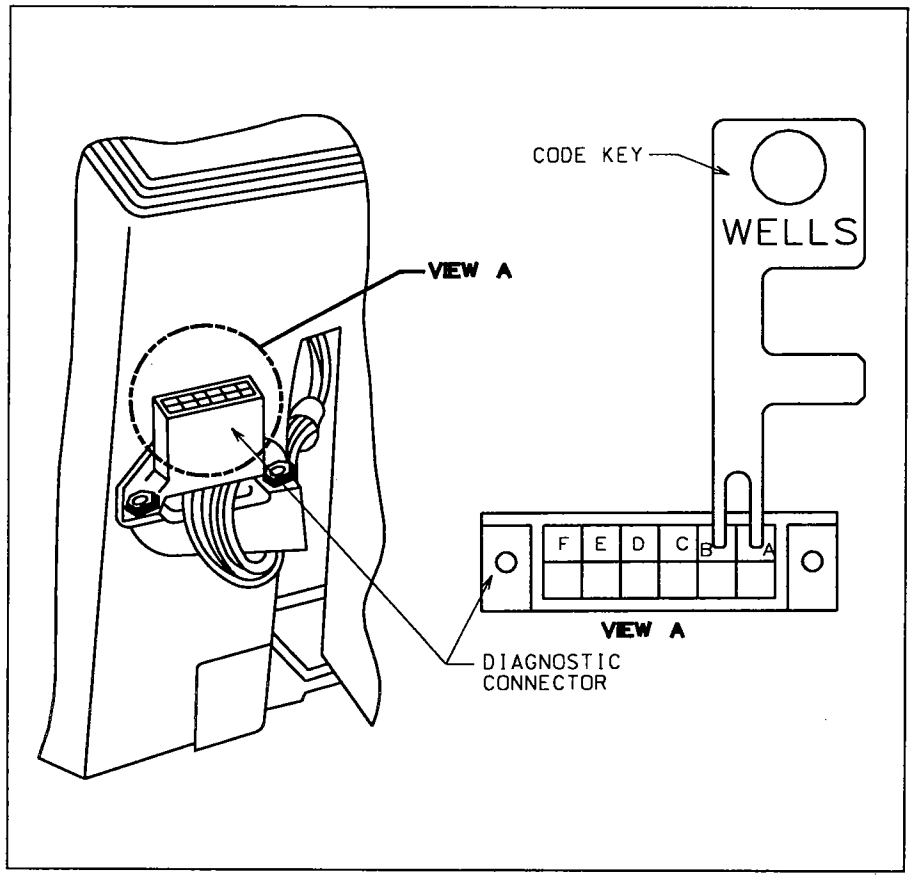

Fig. 17

READING TROUBLE CODES

Trouble codes are indicated as a two-digit number. The first digit will flash, followed by a brief pause, then the second digit will flash.

For example, a code 12 will be indicated by one flash, a pause, then two more flashes. A code 42 will be indicated by four flashes, a pause, then two more flashes. All General Motors code readouts begin with code 12, which is the system test code. Each code will be repeated three times.

Different trouble codes indicate different circuit problems for different years, makes, and models. To interpret the codes, refer to the TYPICAL CODE CHARTS section of this guide. Trouble codes are also listed in a service manual. Locate the section of the service manual covering computer trouble codes and read the chart to find out what the computer is trying to tell you. **Remember, the codes only indicate which circuit the problem is in; they don't necessarily tell you a component in the circuit has failed. The problem could be caused by a loose connection or broken wire.**

CLEARING TROUBLE CODES

Once you've found and repaired the problem, you'll want to clear the trouble codes from the computer memory. To do so, make sure the ignition switch is OFF, and disconnect the positive battery cable for at least 10 seconds. This will also erase things like stations you may have set on the radio, clock time, etc., so you'll have to reprogram them. You'll also have to drive the vehicle for a while until the computer resets the engine operating parameters which are programmed in the read-only memory chip. You may notice reduced performance or unusual idle characteristics until the computer resets itself. Normal performance should return quickly.