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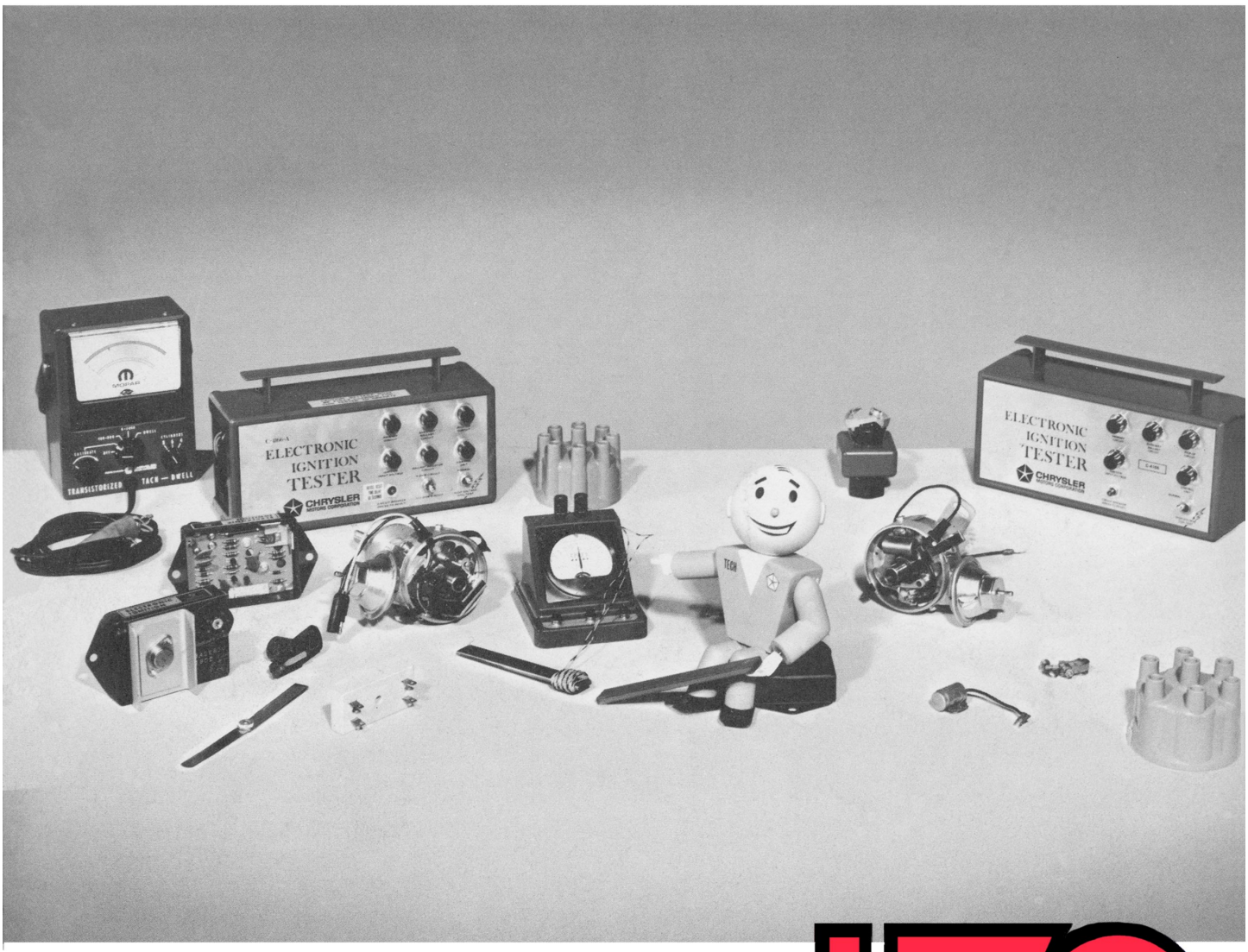


REFERENCE BOOK 11

# ELECTRONIC IGNITION DIAGNOSIS '73

PLYMOUTH · DODGE · CHRYSLER · IMPERIAL · DODGE TRUCK

CHRYSLER MOTORS CORPORATION

# electronic ignition diagnosis

As you've probably noticed, Chrysler Corporation has been making ever increasing use of electronics in automobiles and trucks. The effectiveness of these innovations is clearly shown by the wide acceptance from owners. Which means, electronic components will be an integral part of Chrysler vehicles for many years to come. There are many good reasons for using electronic components . . . primarily, they perform well, have excellent service life, and occasional malfunctions are relatively easy to diagnose and service.

As a Service Technician, you will appreciate the ease of servicing. You see, some of the components are designed to be replaced rather than repaired if they are faulty. In fact, items like electronic control units are sealed with epoxy resin after they are assembled and cannot be repaired economically. So if you run across a faulty control unit, the only choice you have is to unbolt it and install a new one.

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# INTRODUCTION

## *A QUICK LOOK AT THE OLD WAY*

The breaker point ignition system served its purpose satisfactorily for many years. One of the disadvantages, however, was the frequency of periodic service required to maintain satisfactory ignition performance.

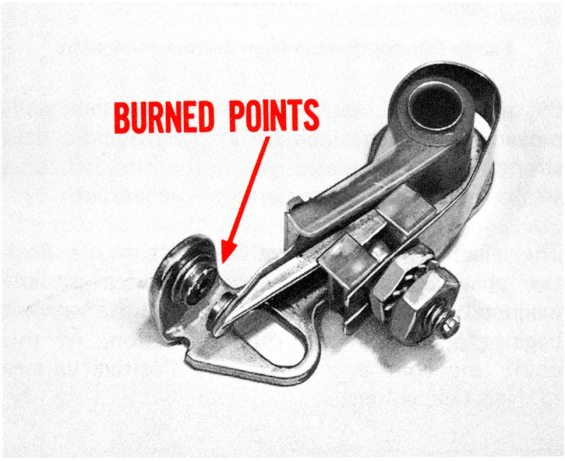


**Fig. 1—Breaker points burn and deteriorate**

The weak link in the breaker point ignition system is the points themselves. Breaker point wear begins as soon as they are installed and put into service. The rubbing block wears down from rubbing on the distributor cam lobes, and the contacts deteriorate because of metal transfer caused by arcing across the points, oxidation and erosion. This constant deterioration eventually leads to engine misfiring, and the points must be replaced.

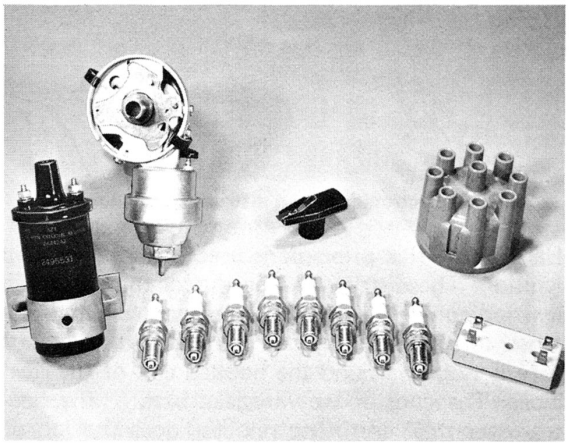

**Fig. 2—Ignition components have been improved**

With the exception of the spark plugs, which eventually wear out, the rest of the ignition system components — the coil, condenser, and ballast resistor have improved to the point where they should last the life of the car.

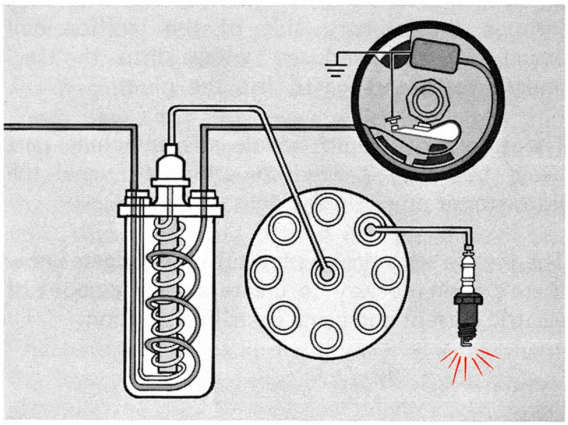

**Fig. 3—Breaker point circuit**

## *DUPLICATE THE FUNCTION OF THE BREAKER POINTS*

Breaker points are simply an electromechanical switch. When they open, the current flowing through the primary side of the ignition coil is interrupted and high voltage is induced in the ignition coil secondary winding to fire the spark plugs.

The Chrysler engineers came up with a way to stop current flow in the primary side of the ignition coil electronically instead of depending upon a mechanical method of switching.

From past experience, they knew a transistor could be excited by a small amount of electric current and made to act as a switch to open or close a path to larger amounts of electric current.

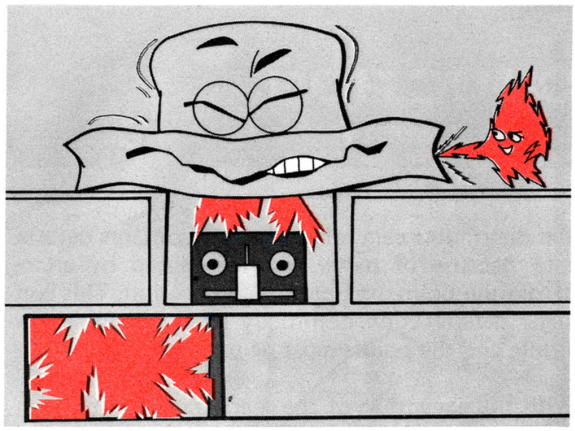

Fig. 4—A transistor is a switch

They built a transistorized electronic control unit to use as a switching station. When the unit receives a signal, it interrupts the current through the primary side of the ignition coil which, in turn, induces voltage into the secondary coil windings to fire the plugs.

The transistor would handle the switching part okay, but they needed something to signal the transistor at precisely the right instant.

The people who deal with electronic gadgets know there's a simple way to create a small amount of electric current and came up with a solution.

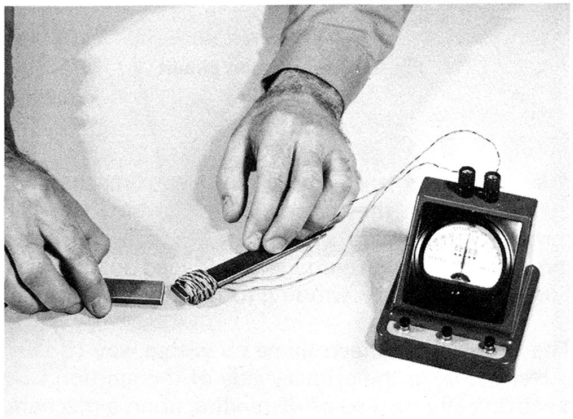

Fig. 5—A simple generator

When you wrap a coil of wire around the end of a magnet, and then move a piece of unmagnetized iron near the end of the magnet, the magnetic attraction between the magnet and the iron causes

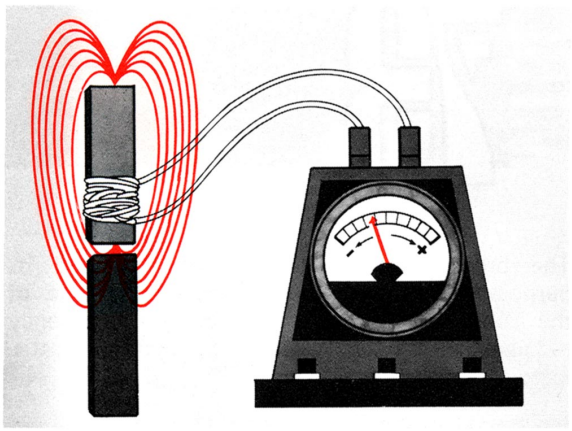

Fig. 6—Current changes from positive to negative

the magnetic field strength to increase as the iron is moved closer. The increase in the magnetic field strength excites the electrons in the wire coil and a small amount of electric current is generated.

The electric current at this point has a Positive charge. When the iron is moved away, the magnetic field begins to fade, and the current begins to flow in the other direction. At this point, the voltage changes from Positive voltage to Negative voltage.

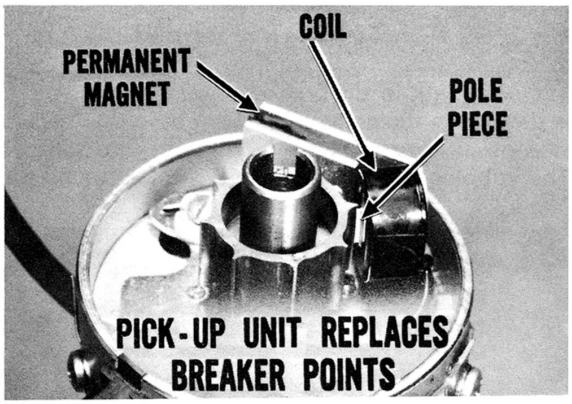


Fig. 7—Electronic ignition distributor components

Here's how this principle is used in the electronic ignition: The distributor housing for the electronic ignition contains a permanent magnet which is fastened to a fishhook-shaped piece of steel. A coil of wire is wound around the hooked end of the steel piece. The ends of the wire lead back to the electronic control unit. The reluctor does the job of the piece of unmagnetized iron.

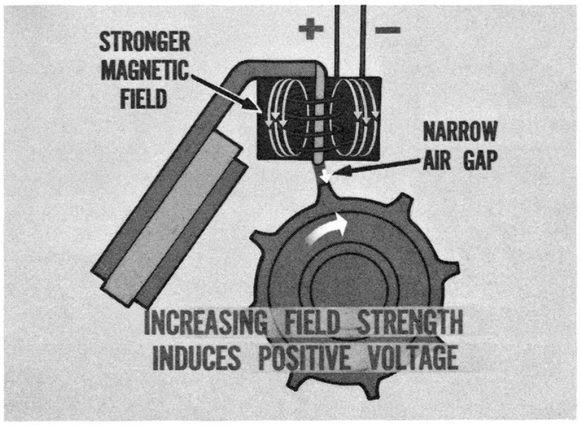


**Fig. 8—Magnetic attraction excites electrons**

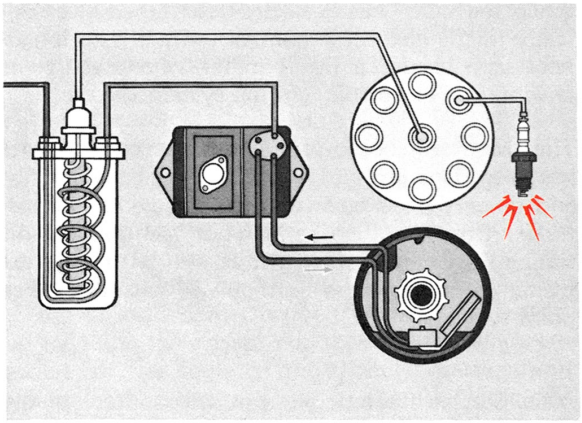

**Fig. 10—Electronic ignition circuit**

You'll notice the reluctor looks like a gear with teeth, one tooth for each cylinder. As each tooth approaches the pole piece with the coil around it, the magnetic attraction between the pole piece and the reluctor tooth begins to increase. The increase in the magnetic field excites the electrons in the coil of wire and a small amount of Positive current begins flowing towards the electronic control unit.

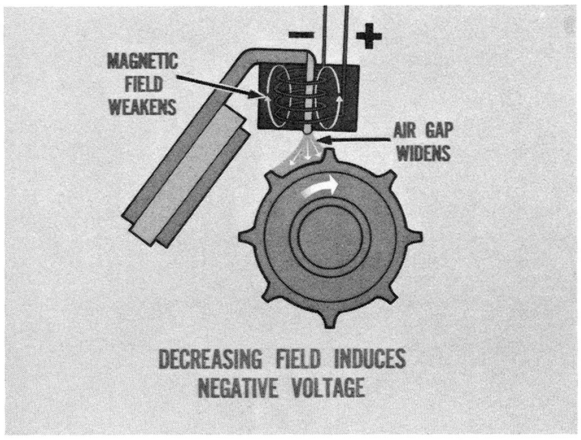


**Fig. 9—Magnetic field decreases, polarity changes**

When the reluctor tooth moves past the pole piece, the magnetic attraction between the magnet and the reluctor tooth begins to decrease. As the magnetic field decreases, the polarity in the coil of wire changes from Positive voltage to Negative voltage.

Okay, let's get back to the electronic control unit for a moment. Earlier we said the electronic control unit is a switching station. The battery current flows through the primary winding of the ignition coil and then through the electronic control unit to ground. The control unit remains "on" until the switching transistor receives the signal to turn "off" from the pickup unit in the distributor. It is the Negative voltage generated when the reluctor tooth passes the pole piece which actually signals the transistor to turn "off" the battery current flowing through the electronic control unit. When the battery current is interrupted in the ignition coil primary winding, voltage is induced in the secondary windings of the ignition coil to fire the spark plug.

The reluctor and pickup coil work as a team with the electronic control unit to fire the spark plugs at precisely the right instant. The reluctor and pickup unit determine the ignition timing. The electronic control unit determines the dwell.


**Fig. 11—Dwell meter not needed**

Since the dwell has been pre-determined electronically in the electronic control unit, it is no longer necessary to use a dwell meter when testing or checking an electronic ignition system.

The dwell will be correct unless the control unit has been damaged and this possibility can be easily and quickly checked with your electronic ignition tester. On the other hand, your tachometer and timing light will operate just as well with the electronic ignition system as they will with a breaker point system.

## *AIR GAP*

As a Service Technician, you will appreciate the limited number of adjustments required to keep the electronic ignition performing at peak efficiency. Really, the only things which can be adjusted are the spark plugs and the air gap between the reluctor and the pickup unit. Actually, the timing will have to be re-set if you remove the distributor from the engine, but we're not concerned with that adjustment at this time.

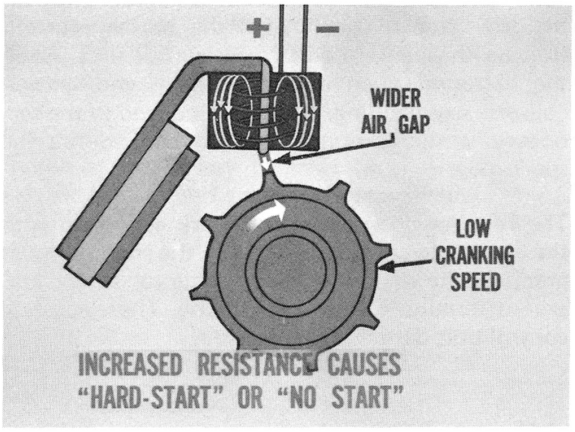


**Fig. 12—Wide air gap causes problems**

The air gap between the pick-up and the reluctor should be set to .008". If the gap is too wide, it can cause starting problems. You see, as the air gap between the reluctor and the pole piece is increased, the field strength between the magnet and the reluctor tooth decreases. Also, if the engine cranking speed is slow, it means there will be a slow change in field strength and the signal voltage in the pick-up unit will not be very strong. This "weak signal" condition could cause a hard starting problem, in fact, there may even be a "no start" condition if the gap is too wide.

If you do run across a "hard start" condition, check out the fuel system and the rest of the ignition system before you start changing the air gap. Remember, the gap does not change during normal service, so there should never be a reason to inspect it for periodic adjustments. Of course, if you install a new pick-up unit, you'll have to set the gap initially, but once it has been set that should be it for the life of the unit.

## *ADJUSTING THE AIR GAP*

If it is necessary to adjust the air gap, there is one piece of "special equipment" you will need to do the job — a non-magnetic feeler gauge. If you use a steel feeler gauge, the magnetic attraction of the pole piece will give you a false "feel", or drag when you place it between the reluctor tooth and the pole piece.

Some of the tool manufacturers are now making brass feeler gauges, so check your tool supplier. If you can't find brass feeler gauges, you can use brass shim stock. You will need two thicknesses to do the job — .010" and .008".

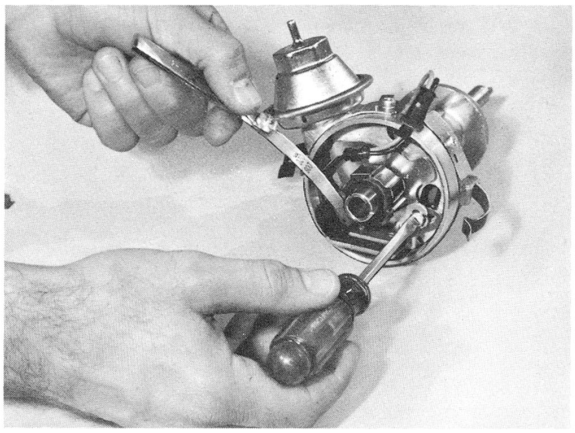

**Fig. 13—Adjust air gap**

When you first check the gap between the reluctor tooth and the pole piece, a .010" feeler gauge should not slip between the end of the pick-up coil core and an aligned reluctor tooth. Of course, you could *force* the .010" feeler gauge between the tooth and the pole piece . . . but don't do it. If the .010" feeler slips into the space easily, loosen the pick-up adjusting screw, align a reluctor tooth with the pick-up pole piece, and insert the .008" brass feeler between the two. Use the adjusting slot on the distributor plate to move the pick-up unit

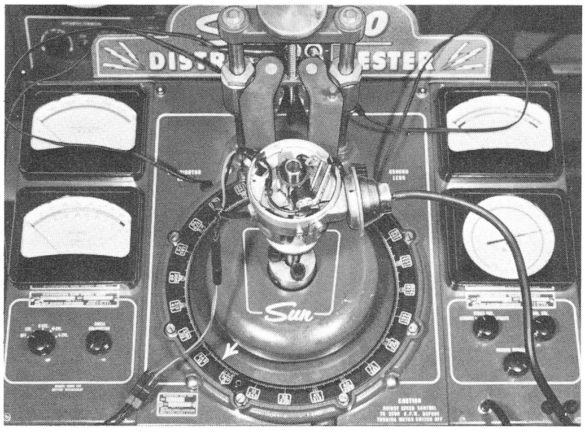


Fig. 14—Run distributor on a test stand

closer to or farther away from the reluctor tooth until the feeler gauge contacts the tooth and the pole piece. Tighten the hold-down screw.

After you set the air gap, run the distributor on a test stand and apply vacuum to the vacuum advance unit to make sure the reluctor teeth don't hit the pick-up unit during vacuum advance.

Incidentally, notice that the pick-up unit has a hole which fits over a pin in the distributor plate. The pin acts as a pivot point for moving the pick-up unit closer or farther away from the reluctor when you use a screwdriver in the adjusting slot. The hole should be large enough to fit over the pin and allow the pick-up unit to rest flat against the distributor plate. If the hole is too small, the pick-up unit will not rest flat and the reluctor tooth surface will not be parallel to the pick-up unit pole piece.

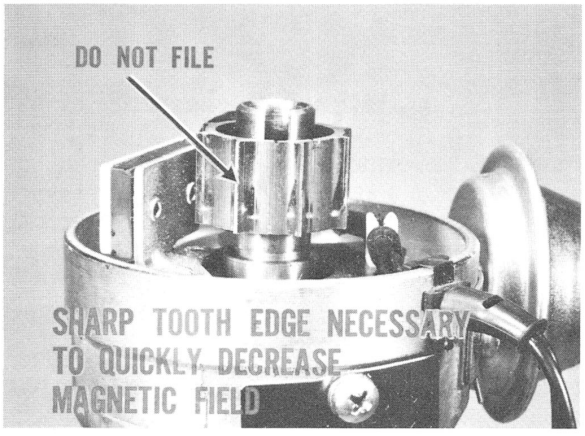


Fig. 15—Reluctor teeth are sharp

This would mean you would not get an accurate reading when you slip the feeler gauge between the reluctor tooth and the pick-up unit.

If the hole is too small, use a reamer to open it up enough to slip over the pin.

The reluctor teeth will probably appear to be a little rough at the edges. They're supposed to be rough. A sharp edge is needed to decrease the magnetic field quickly and induce the negative voltage in the pick-up coil. Do not try to clean the teeth up by filing the edges. You may file too much and round off the edges of the teeth. If the teeth are rounded, the voltage signal to the electronic control unit will be erratic.

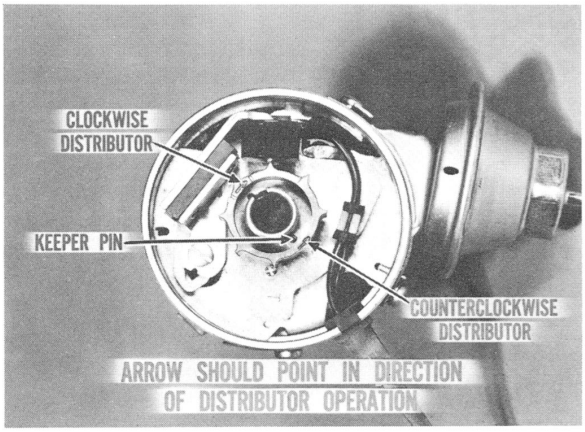


Fig. 16—Distributor rotation

## *DISTRIBUTOR ROTATION*

As you look straight into the distributor, you

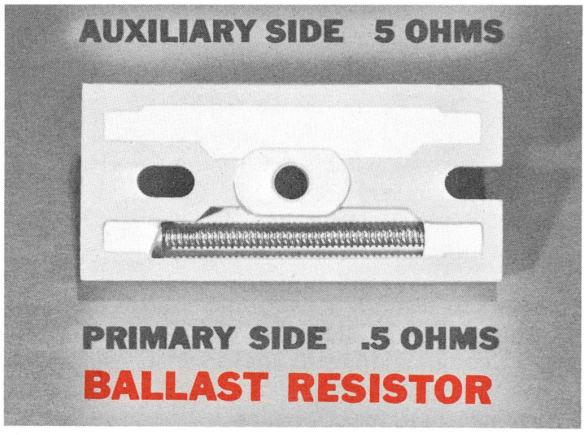


Fig. 17—Ballast resistor

will see two small arrows on the reluctor which point in opposite directions. You will also notice a keeper pin holds the reluctor in position on the distributor shaft. In a distributor which rotates in a clockwise direction, the arrow opposite the keeper pin should point in a clockwise direction. If the arrow at the keeper does not point in the direction, remove the reluctor, turn it one-hundred and eighty degrees, and reinstall it. Be careful not to lose the keeper pin.

*BALLAST RESISTOR*

The ballast resistor for the electronic ignition plays a dual role. One side has a half-ohm ballast resistor. It maintains constant primary current when there are variations in engine speed. This protects the ignition coil against high current flow at low engine speed. The half-ohm side of the ballast resistor is bypassed during engine cranking so full battery voltage is applied to the coil.

The other side of the dual ballast resistor has a five-ohm resistor. The function of the five-ohm resistor is to protect the control unit by limiting current flow in the electronic part of the circuit.

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# TESTING THE ELECTRONIC IGNITION


**Fig. 18—C-4166 Tester**

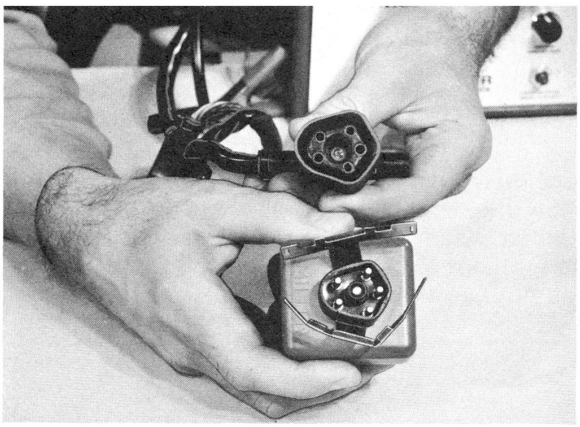


**Fig. 19—C-4166-1 Adapter**

The first tester available for testing the electronic ignition system was the C-4166 unit. As it stands, this model can be used to test 1971 and 1972 electronic ignitions.

However, to test 1973 electronic control units, an electronic adapter, Number C-4166-1, must be used in conjunction with the original tester. This adapter must be permanently installed to the electronic ignition tester wiring harness with the locking collar.

The C-4166-1 adapter is mounted permanently because the 1971 and 1972 electronic control units can also be tested with this adapter. Using the 1973 adaptor does not alter the test procedure instructions which appear on the back of the C-4166 electronic ignition tester.

A second generation tester, C-4166-A, has been released recently. This unit is the same as the C-4166 tester in all respects, except the adapter circuitry has been built into the unit. Also, an additional red


Fig. 20—C-4166-A Tester

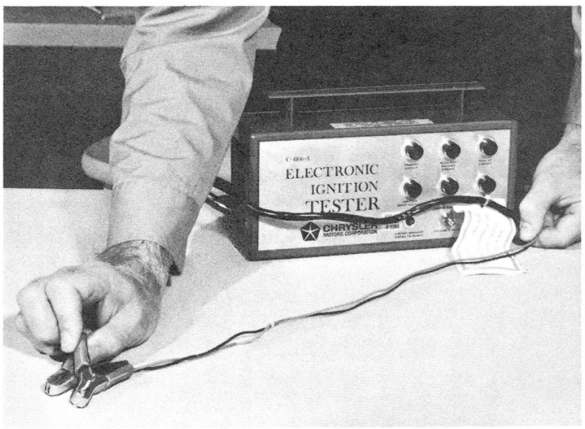


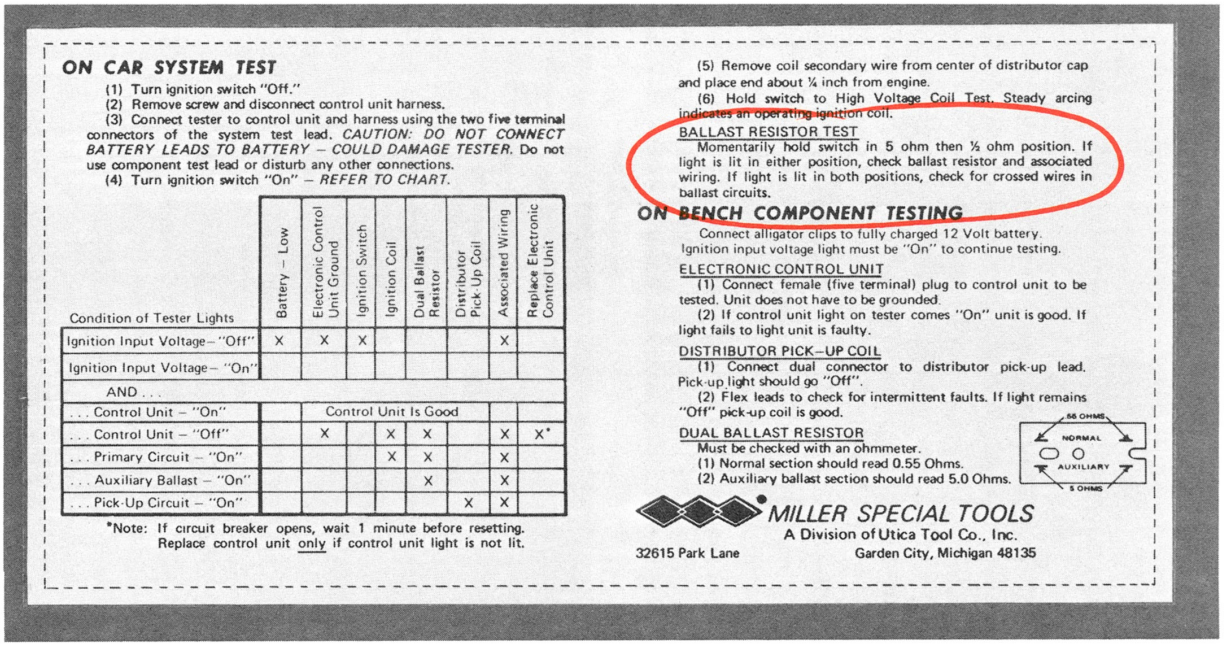

Fig. 21—Test leads for bench testing

light — and a toggle switch used in checking both the five-ohm and the one-half ohm circuit in the ballast resistor has been added.

The electronic ignition tester is a valuable diagnostic tool and a delicate test instrument, therefore, it should not be exposed to excessive dirt and dust for long periods of time.

Also, the test leads were designed to be a specified length. The two leads with the alligator-type battery clips and the dual male and female connector leads are used only for BENCH testing. These leads are not to be used for ON THE CAR testing.

Incidentally, if the circuit breaker on the tester should pop during testing, wait a minute or two before pushing it in to reset. This will allow the electronic circuitry to cool. The tester is not intended to be left hooked up for long periods of time . . . this may cause the testing unit to overheat.



**ON CAR SYSTEM TEST**

(1) Turn ignition switch "Off."
(2) Remove screw and disconnect control unit harness.
(3) Connect tester to control unit and harness using the two five terminal connectors of the system test lead. *CAUTION: DO NOT CONNECT BATTERY LEADS TO BATTERY — COULD DAMAGE TESTER.* Do not use component test lead or disturb any other connections.
(4) Turn ignition switch "On" — *REFER TO CHART.*

| Condition of Tester Lights | Battery — Low | Electronic Control Unit Ground | Ignition Switch | Ignition Coil | Dual Ballast Resistor | Distributor Pick-Up Coil | Associated Wiring | Replace Electronic Control Unit |
|---|---|---|---|---|---|---|---|---|
| Ignition Input Voltage— "Off" | X | X | X | | | | X | |
| Ignition Input Voltage— "On" | | | | | | | | |
| AND . . . | | | | | | | | |
| . . . Control Unit — "On" | | Control Unit Is Good | | | | | | |
| . . . Control Unit — "Off" | | X | | X | X | | X | X* |
| . . . Primary Circuit — "On" | | | | X | X | | X | |
| . . . Auxiliary Ballast — "On" | | | | | X | | X | |
| . . . Pick-Up Circuit — "On" | | | | | | X | X | |

*Note: If circuit breaker opens, wait 1 minute before resetting. Replace control unit only if control unit light is not lit.

(5) Remove coil secondary wire from center of distributor cap and place end about ¼ inch from engine.
(6) Hold switch to High Voltage Coil Test. Steady arcing indicates an operating ignition coil.

BALLAST RESISTOR TEST
Momentarily hold switch in 5 ohm then ½ ohm position. If light is lit in either position, check ballast resistor and associated wiring. If light is lit in both positions, check for crossed wires in ballast circuits.

**ON BENCH COMPONENT TESTING**

Connect alligator clips to fully charged 12 Volt battery. Ignition input voltage light must be "On" to continue testing.

ELECTRONIC CONTROL UNIT
(1) Connect female (five terminal) plug to control unit to be tested. Unit does not have to be grounded.
(2) If control unit light on tester comes "On" unit is good. If light fails to light unit is faulty.

DISTRIBUTOR PICK-UP COIL
(1) Connect dual connector to distributor pick-up lead. Pick-up light should go "Off".
(2) Flex leads to check for intermittent faults. If light remains "Off" pick-up coil is good.

DUAL BALLAST RESISTOR
Must be checked with an ohmmeter.
(1) Normal section should read 0.55 Ohms.
(2) Auxiliary ballast section should read 5.0 Ohms.



MILLER SPECIAL TOOLS
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Fig. 22—Tester decal

As you probably already know, the instructions for using the tester appear on the back panel of the instrument. Also, a decal was included as part of Chrysler/Plymouth Technical Service Bulletin No. 08-14-73C and Dodge Technical Service Bulletin No. 08-13-73D (Fig. 22).

The decal included in these Bulletins is to be placed on the back side of the electronic ignition tester. However, if you have a C-4166 tester, the BALLAST RESISTOR TEST shown for ON-CAR SYSTEM TEST on the decal cannot be performed. You see, the instructions read: Momentarily hold switch in 5-ohm then 1/2-ohm position. If light is lit in either position, check ballast resistor and associated wiring. If light is lit in both positions, check for crossed wires in ballast circuits.

Well, the switch mentioned in the instructions is not part of the C-4166 tester . . . the switch and light are on the C-4166-A tester which has been released recently.

The C-4166 tester has a red light labeled: "Auxiliary Ballast Circuit" which will light if the five-ohm side of the dual ballast resistor is bad. If the red light comes on, the dual ballast resistor must be replaced. The half-ohm (.5) side of the dual ballast resistor is checked with the rest of the primary circuit by the tester.

If one of the test lights in the electronic ignition tester needs replacing, use the same type and number. The unit uses a 313 lamp. DO NOT USE A SUBSTITUTE NUMBER — SUBSTITUTE LAMPS WILL NOT GIVE ACCURATE TEST RESULTS.



# ON-THE-CAR TESTING

The two leads, with the five-prong connectors, are used to connect the Electronic Ignition Tester into the car's ignition circuit for "on-the-car" testing. The test leads with the two alligator-type battery clips are *not* used for "on-the-car" testing — they are used only when you're "bench testing" electronic ignition components. The harness for the battery clip leads also includes a dual (male-female) connector used for "bench testing" the pick-up unit. Do not use the dual connector for "on-the-car" testing.

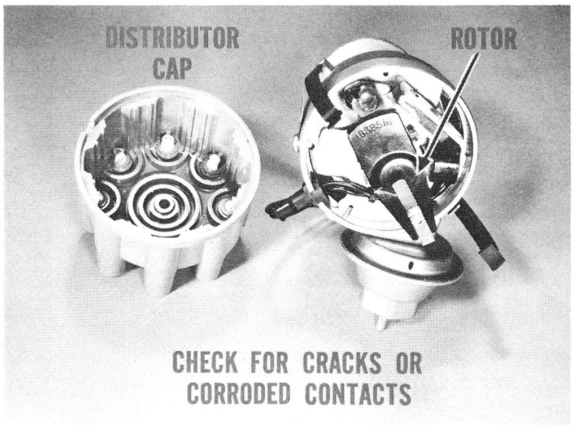


Fig. 23—Inspect distributor cap and rotor

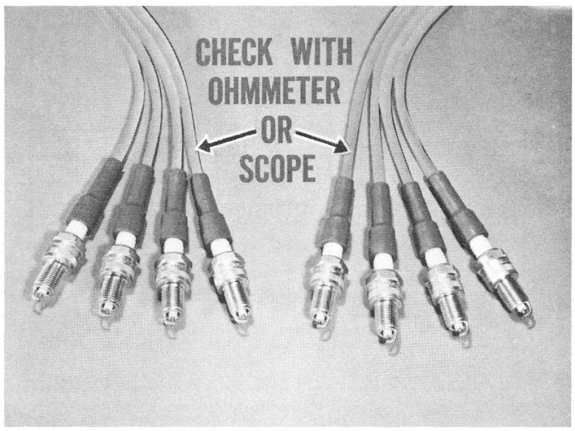


Fig. 24—Check spark plug cables

Before you connect the tester, make a quick check for other component problems which could cause the ignition to perform unsatisfactorily.

Remove the distributor cap and check it for hairline cracks or corroded terminals. Check the condition of the rotor while you're at it. If it shows signs of electrical corrosion, pitch it and install a new one.

Give the spark plug cables a thorough going over . . . if you suspect they are not performing at peak efficiency, test them out as outlined in the Service Manual.

Check the spark plugs. Clean and regap, or replace them if necessary.

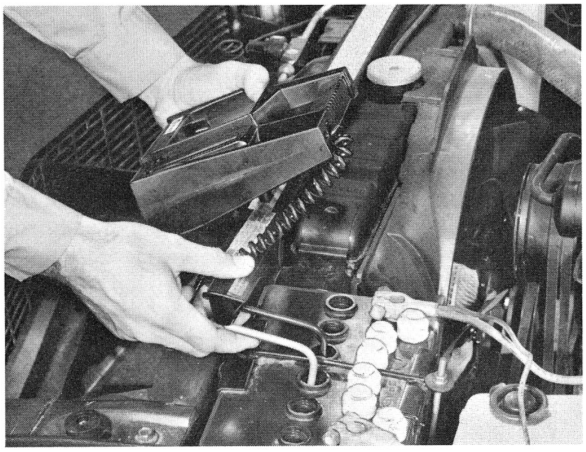

**Fig. 25—Check battery**

## *FULLY CHARGED BATTERY*

One of the requirements of accurate electronic ignition analysis with the Electronic Ignition Tester is a fully charged battery in good condition. Check the battery before you begin work — otherwise you'll be wasting your time if you attempt to check out the system with a weak battery.

## *CONNECTING THE TESTER*

Before you remove or install the wiring harness connector at the control unit, MAKE SURE THE IGNITION SWITCH IS TURNED OFF. This is very important — if the ignition switch is "ON" when you make any connections or disconnections, there's a good chance you'll damage the control unit.

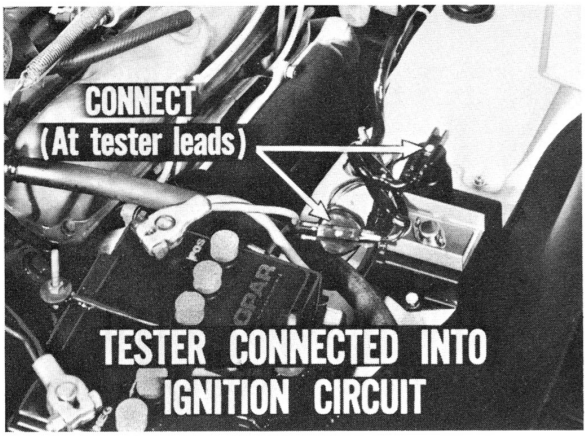


**Fig. 26—Connecting the tester**

Remove the hold-down screw from the electronic control unit and remove the wiring harness. Connect the female tester lead to the control unit. Next, connect the male tester lead to the system control lead. The tester is now wired into the car's ignition system circuit.

## *DON'T CONNECT ANY OTHER LEADS ON THE CAR*

Turn the ignition switch "ON", but be careful not to crank or start the engine.

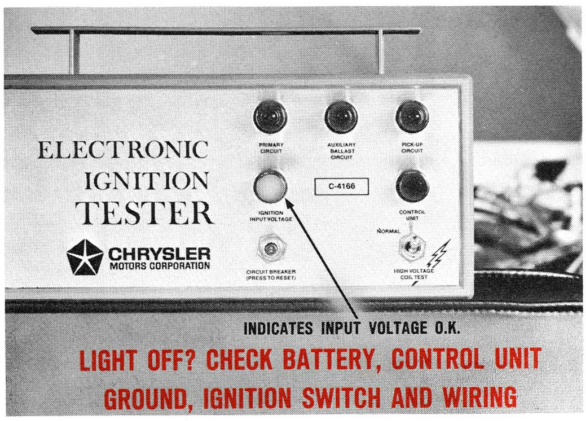


**Fig. 27—Ignition Input Voltage Light**

The Ignition Input Voltage Light must come "ON" and remain "ON" throughout all the tests. If it goes "OFF" at any time while you're making your tests, it means there is not enough input voltage from the battery to the tester to complete the tests.

If the Ignition Input Voltage Light didn't come "ON" at all . . . check the battery terminal connections and make sure the control unit is properly grounded. Also, check the ignition switch and its wiring for an open circuit.

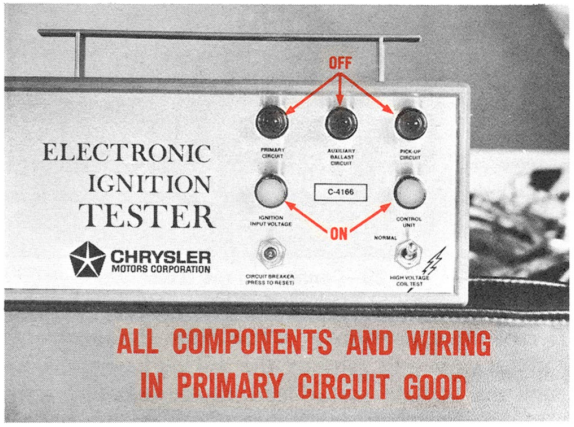


**Fig. 28—Both green lights ON**

If both of the green lights come "ON" and all the red lights remain "OFF", you're in good shape — this means all the components and wiring in the primary circuit are good.

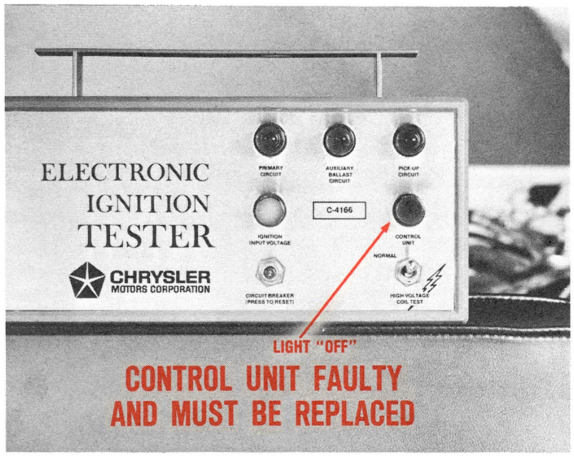


**Fig. 29—Control unit green light**

Okay, let's say the Ignition Input Voltage light is "ON" but the other one — the Control Unit green light is "OFF". You've found a problem right off the bat . . . the electronic control unit is bad and must be replaced.

Incidentally, each of the test lights in the Electronic Ignition Tester is completely independent of the others. If the electronic control unit is okay, the Control Unit green light will be on even if there is something wrong with the pick-up unit, ballast resistor, or the rest of the ignition primary circuit.

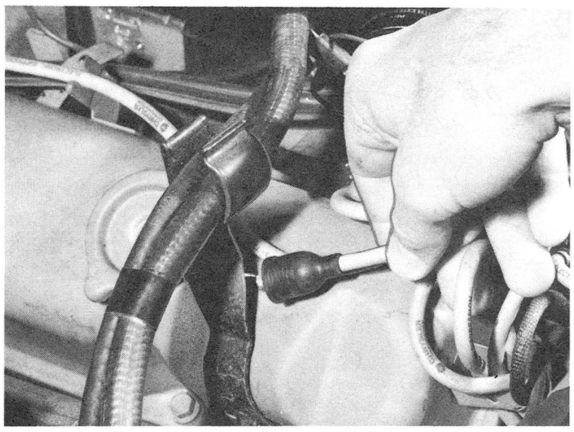

**Fig. 30—Actuate high voltage coil test switch**

To complete checking the system, disconnect the ignition coil secondary wire from the distributor cap tower and hold it about a quarter of an inch away from the engine. Actuate the High Voltage Coil Test Switch on the tester and watch for a good spark between the wire and the engine. A long, hot spark indicates the coil output is okay.

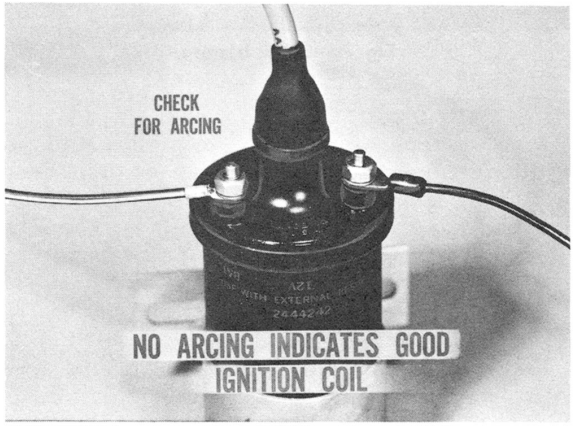


**Fig. 31—Watch coil tower for arcing**

While you're still holding the coil test switch, move the wire away from the engine until the spark

stops. Watch the coil tower to make sure arcing doesn't occur. If it does not, the coil is okay. This completes the checking of a good system.

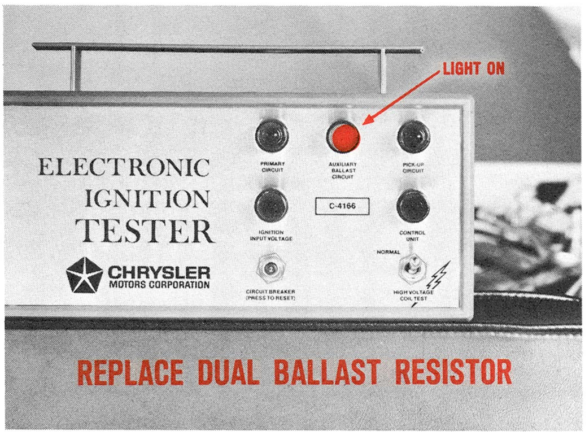


**Fig. 32—Auxiliary ballast circuit**

## *AUXILIARY BALLAST CIRCUIT LIGHT*

The red light labeled "Auxiliary Ballast Circuit" on the C-4166 Electronic Ignition Tester will light if the five-ohm side of the dual ballast resistor is bad. If the red light comes "ON", the dual ballast resistor must be replaced. The half-ohm is checked with the rest of the primary circuit by the C-4166 tester. Incidentally, when you're installing a new ballast resistor, make sure the connectors are installed correctly.

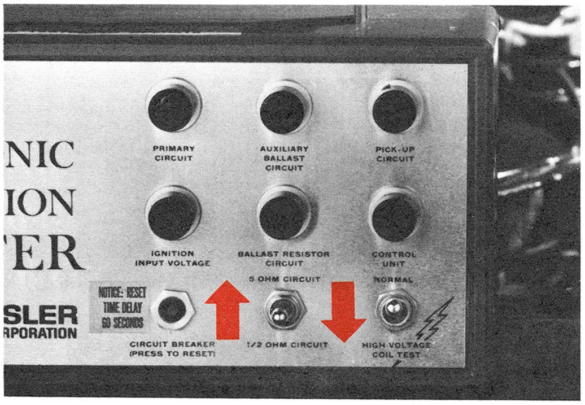


**Fig. 33—Use toggle switch to check ballast resistor**

If you have the new Electronic Ignition Tester, C-4166-A, use the toggle switch to check the ballast resistor. Momentarily hold the switch in the five-ohm, then the half-ohm position. If the light is lit in either position, check the ballast resistor and its associated wiring. Incidentally, the toggle switch is basically designed to check for improperly installed ballast resistor connectors. Therefore, if the light is lit in *both* positions, check for crossed wires in the ballast circuits.

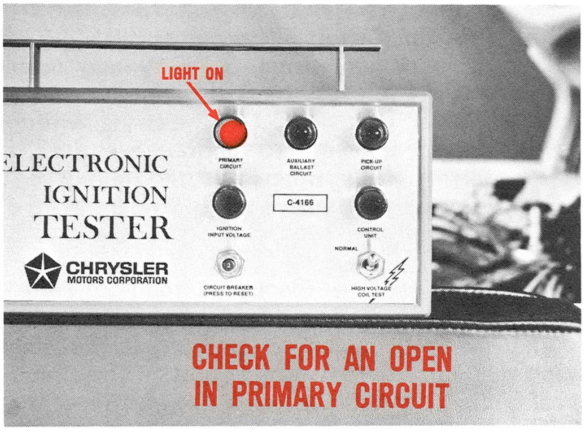


**Fig. 34—Primary circuit**

## *PRIMARY CIRCUIT*

If the red light labeled "Primary Circuit" comes on, check the ignition coil primary, the half-ohm side of the dual ballast resistor, and the wiring harness for an open in the circuit. Replace any faulty parts.

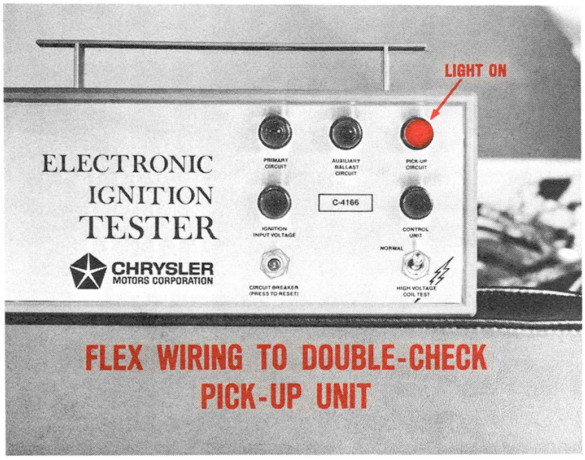


**Fig. 35—Pick-up circuit**

### *PICK-UP CIRCUIT*

If the Pick-Up Circuit light comes "ON", the pick-up unit or its wiring is faulty and must be replaced. Even if the light doesn't come "ON", it's a good idea to flex the wiring from the pick-up unit to double-check it. If the red light blinks when you flex the wires, replace the pick-up unit.

### *CIRCUIT BREAKER PROTECTION*

Both versions of the Electronic Ignition Tester (C-4166 and C-4166-A) are equipped with a circuit breaker to protect the tester from overloading when testing a shorted control unit. If the circuit breaker opens, the red button at the bottom of the panel will pop out. If it does, wait at least one full minute before resetting the circuit breaker by pushing the button in.

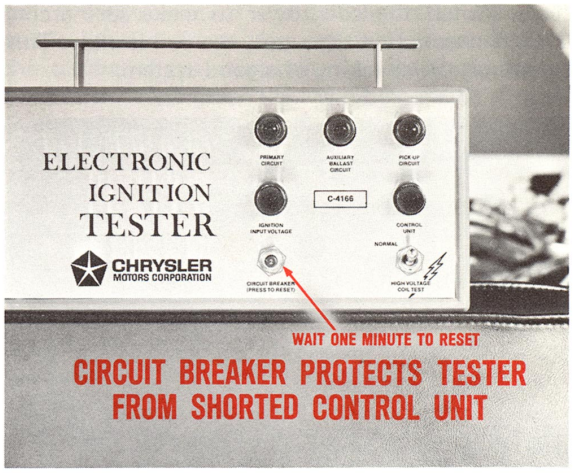


**Fig. 36—Circuit breaker**

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# BENCH TESTING

Once again, a fully charged twelve-volt battery is absolutely necessary for the Electronic Ignition Tester to analyze the components.

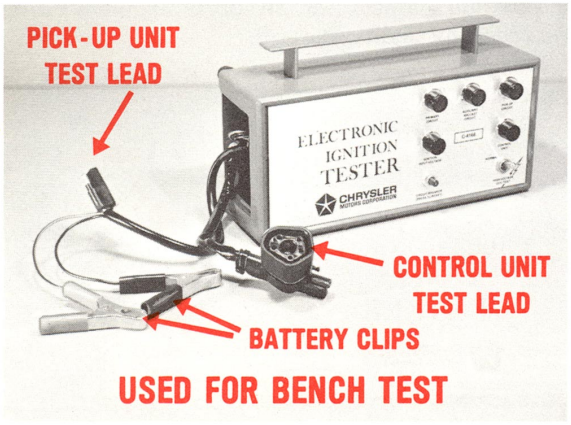


**Fig. 37—Bench test requires fully charged battery**

Hook the two battery clips to the fully charged battery . . . the red clip goes on the positive post and the black clip goes to the negative post. The green Ignition Input Voltage light should come on and remain on throughout the tests.

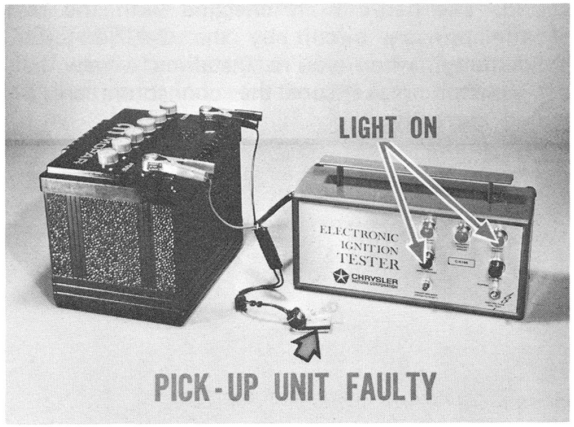


**Fig. 38—Flex wiring to double-check pick-up unit**

### *PICK-UP CIRCUIT*

Connect the pick-up connector to the tester. If the Pick-Up Circuit light comes "ON", the unit is faulty. Flex the wires to see if the light will blink.


**Fig. 39—No need to ground components**

Incidentally, the components do not have to be grounded when they are bench tested. You'll notice while you're testing the Pick-Up Unit, the green Control Unit light will be "OFF" and the red Primary Circuit and Auxiliary Ballast lights are "ON". This is normal because there is no input for these circuits when you're bench testing the Pick-Up Unit.

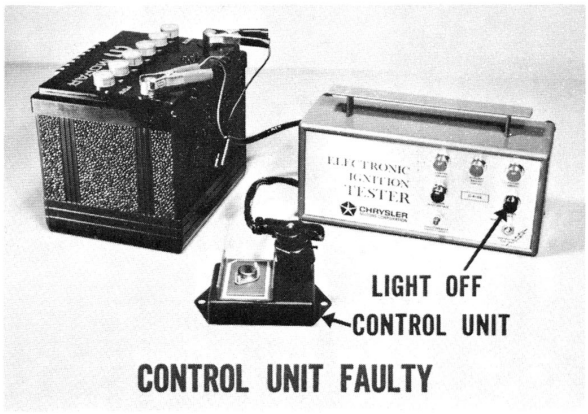


**Fig. 40—Bench test control unit**

## *CONTROL UNIT BENCH TEST*

When you bench-test the control unit, you need only be concerned with the green Input Voltage light and the green Control Unit light being "ON" after you plug the five-prong female tester lead into the control unit. The red lights will also be "ON", but you can ignore those — the ballast resistor, pick-up unit, and coil primary circuits are not connected into the tester circuit.

If the green Control Unit light does not come "ON", replace the control unit.

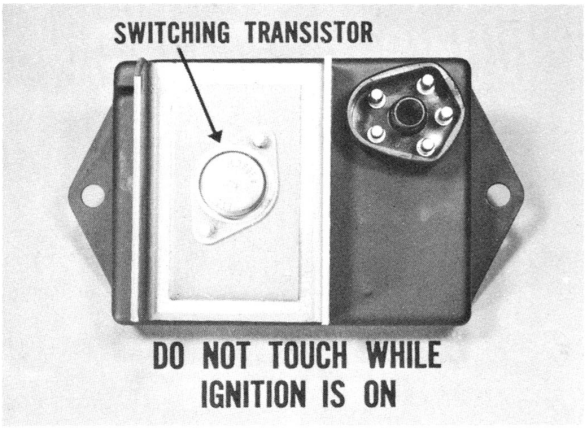


**Fig. 41—Transistor gives jolt when ignition is on**

## *CAREFUL . . . OR YOU'LL GET ZAPPED*

When you're working on or near the control unit with the ignition on, be careful of the little round unit located on the front of the control unit in the center of the heat sink . . . it's the switching transistor. The switching transistor is connected to ground and interrupts the current in the primary circuit when it gets the signal from the pick-up unit. If you touch the switching transistor when the ignition is on, there's a good chance you'll get zapped with a pretty good jolt of electricity.

## TEST QUESTIONS

1. The reluctor and pickup coil work as a team with the electronic control unit to fire the spark plugs at precisely the right instant.
   - *A. The reluctor and pickup unit determine the dwell; the electronic control unit determines the timing.*
   - *B. The reluctor and pickup unit determine the timing; the electronic control unit determines the dwell.*
   - *C. The reluctor and pickup coil are connected directly to the ignition coil.*

2. If it is necessary to adjust the air gap, there is one piece of "special equipment" you will need to do the job.
   - *A. You will need a good dwell meter.*
   - *B. You will need non-magnetic feeler gauges.*
   - *C. You will need a bar magnet.*

3. The reluctor teeth will probably appear to be a little rough at the edges.
   - *A. They're supposed to be rough because a sharp edge is needed to decrease the magnetic field quickly and induce the negative voltage in the pickup coil.*
   - *B. Clean them up with a file.*
   - *C. The roughness is caused by electrical discharge.*

4. The half-ohm side of the ballast resistor maintains constant primary current when there are variations in engine speed.
   *True*_____ *False*_____

5. The 1973 electronic ignition system cannot be checked with the C-4166 tester without the C-4166-1 adapter.
   *True*_____ *False*_____

6. Each of the test lights in the Electronic Ignition Tester is completely independent of the others.
   *True*_____ *False*_____

7. The ignition switch must be OFF when you make any connections or disconnections at the control unit or you'll damage the control unit.
   *True*_____ *False*_____

8. If the pick-up circuit light comes "ON" when you flex the pick-up unit wiring, it means the pick-up unit is working properly.
   *True*_____ *False*_____

9. All components must be grounded when they are bench tested.
   *True*_____ *False*_____

10. If you touch the switching transistor when the ignition is on there's a good chance you'll get zapped with a pretty good jolt of electricity.
    *True*_____ *False*_____

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