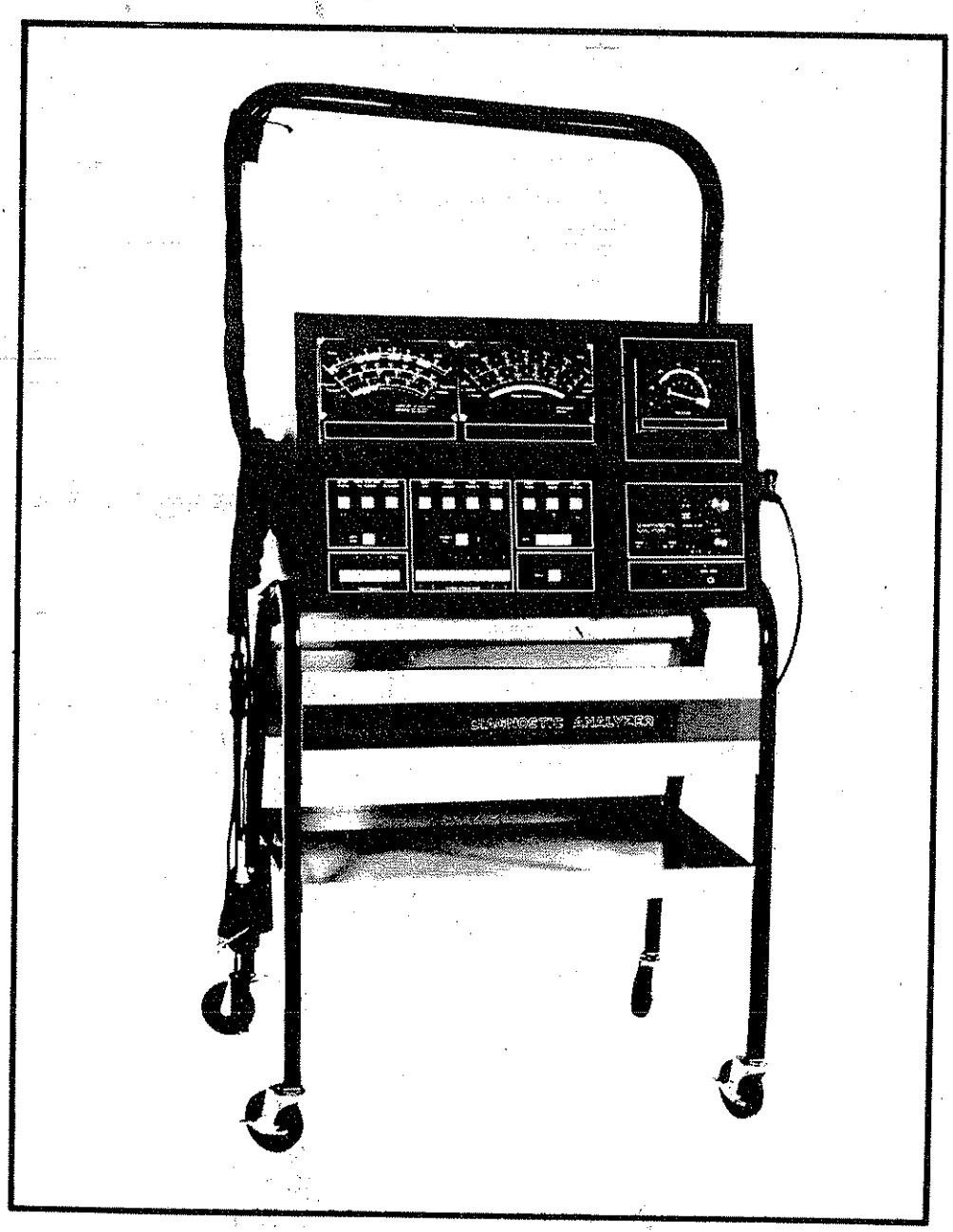
I

OPERATOR'S SECTION

DIAGNOSTIC ENGINE ANALYZER



98-5260

WARNING!

IMPORTANT OPERATING & SAFETY NOTES ... READ BEFORE PROCEEDING WITH TESTS

1. **Always** work in a well ventilated area ... **Never** start a vehicle's engine in an enclosed area.
2. **Never** smoke or allow any other open flame to come within 25 feet of the vehicle being tested.
3. **Always** insure that **everyone** within close proximity of the vehicle being tested is **correctly** wearing approved safety/protective glasses before proceeding with any testing or adjustments.
4. **Always** insure that the vehicle's engine is turned **OFF** when connecting or disconnecting any and all test equipment.
5. **Never** stand in front of the vehicle while testing.
6. **Always** insure that the tester's black grounding clip is connected **first** during hook-up and that it is disconnected **last** when testing is completed.
7. **Always** exercise **extreme** caution to insure that hands, arms, clothing and tester leads are kept well away from **ALL** moving engine parts.
8. Because the battery may produce highly explosive gases, it is extremely important that you carefully observe the following precautions:
   A. **DO NOT** smoke or allow any other open flame or spark within 25 feet of the battery.
   B. **NEVER DIRECTLY CONNECT THE POSITIVE AND NEGATIVE** battery post together with any single conductive material (such as a screwdriver, jumper lead, etc.), as this will cause a short circuit and spark which could result in an explosion.
9. Battery acid and corrosion can be extremely dangerous and **MUST BE DEALT WITH VERY CAREFULLY.**
   A. **DO NOT** allow battery acid or corrosion to come in direct contact with skin or eyes ... If it does, thoroughly wash skin with warm, soapy water **IMMEDIATELY** and/or rinse eyes with clear water for 15-20 minutes ... **CONTACT PHYSICIAN IMMEDIATELY.**
   B. Extreme caution must be exercised to avoid ingestion of battery acid or corrosion ... If ingestion does occur, drink large quantities of milk **(DO NOT INDUCE VOMITING). CONTACT PHYSICIAN IMMEDIATELY.**
10. Tremendous back pressure can be developed in the radiator, and taking the radiator cap off improperly can result in a sudden release of scalding hot water, and subsequent serious burns. You **MUST** refer to proper vehicle manufacturer's service manual for correct procedure.

Due to the inherent dangers associated with even the simplest automotive maintenance procedures, the manufacturer and all parties involved in the distribution and/or sale of this automotive test product will NOT be held liable or responsible, wholly OR partially, for ANY injuries, damages or claims resulting from the performance of testing or adjustment procedures included in this instruction guide and/or the use of this automotive test product.

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CONTENTS I

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2

FEATURES AND BENEFITS

The diagnostic analyzer is a complete diagnostic engine analyzer using sequential pushbuttons to step through battery/starter, points resistance/primary resistor, charging volts-amps, dwell/RPM fine adjustment plus you will be able to key in magnetic timing offset and a cylinder kill button will short individual or multiple cylinders. Including a digital high impedence volt-ohm-component section.

- Works on all 1 through 15 cylinder engines including 2 and 4 cycle
- Inductive hook-ups eliminate wire disconnects
- Magnetic probe enables you to quickly test timing & diesel RPM
- Individual or multiple cylinder testing by the touch of a button
- Designed to prevent damage if improperly hooked up
- Swivel overhead boom allows you to make most tests without getting out of the car
- Boom sock eliminates the lead set tangle
- Larger caster wheels allow for total mobility
- LED light indicators specify which meter scale to read
- LED light indicator for alternator diode test
- Microprocessor circuitry for years of trouble-free service
- Complete with a fully illustrated instruction manual
- Works on all the latest electronic ignition systems
- Many others

PRELIMINARY INSPECTION AND SET-UP

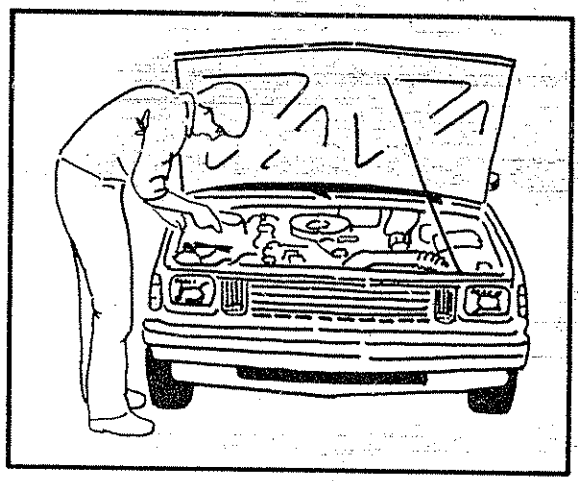

Figure 1

Whenever any vehicle comes in for service the first thing is to understand the customer complaint. Then check the vehicle. Look for a loose drive belt, check wiring and electrical connections and repair the obvious. If problem remains, clean and chalk mark the timing index. Then adjust the analyzer as follows:

1. If necessary, mechanically "zero" both meters by turning the adjustment screws at the base of the two large meter faces.

2. Check both 9 volt batteries in the Components Analyzer before use. This is done by simply turning on the Components Analyzer and checking for a Low Battery indication on the Digital Display.

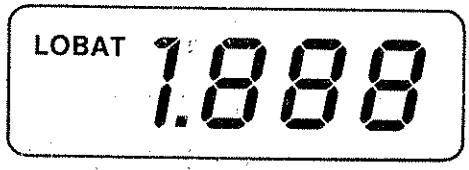

Figure 2

Both batteries are checked if the test selector knob is placed in the DC Volts position and also the Low Ohms position. See Maintenance Section of Manual for replacement of batteries.

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EQUIPMENT DESCRIPTION

METER ADJUSTMENT SCREWS

Both the left and right meters have a "zero" adjusting screw at the bottom center of the meter face. If either meter appears to be off "zero" use these screws to adjust "zero" before connecting the analyzer to the vehicle.

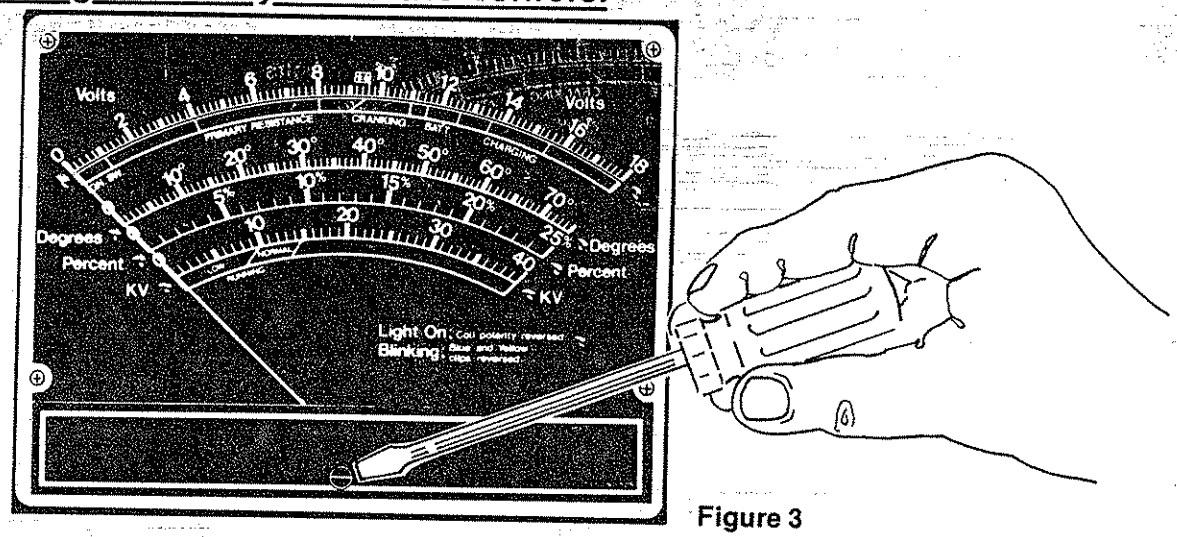

Figure 3

METER SCALE CODING AND IDENTIFICATION

Easy-to-read, fan type dials are featured. The analyzer meter scales have green and red color coding. Green means O.K., Red means NOT O.K. Lights on each side of the meter scales will illuminate to show the test scale selected. If these scale lights are blinking during a test this means that the meter is reading a measurement that is other than would normally be expected. For example, during Charging Volts-Amps Test, if lights are blinking on Amps Scale either the Amp clamp is reversed or the battery is discharging.

EQUIPMENT DESCRIPTION

LEFT METER SCALES

The left meter indicates Volts, Degrees, Percent, and Kilovolts. An error light on the left meter, in Dwell mode, will blink at a uniform rate to indicate analyzer leads to the coil (Blue and Yellow clips) are reversed. An error light on the left meter, in either KV mode, will indicate KV less than 2 Kilovolts or possible reversed coil.

NOTE: IN THIS MODE LIGHT MAY BLINK ERRATIC IF KV IS LOW.

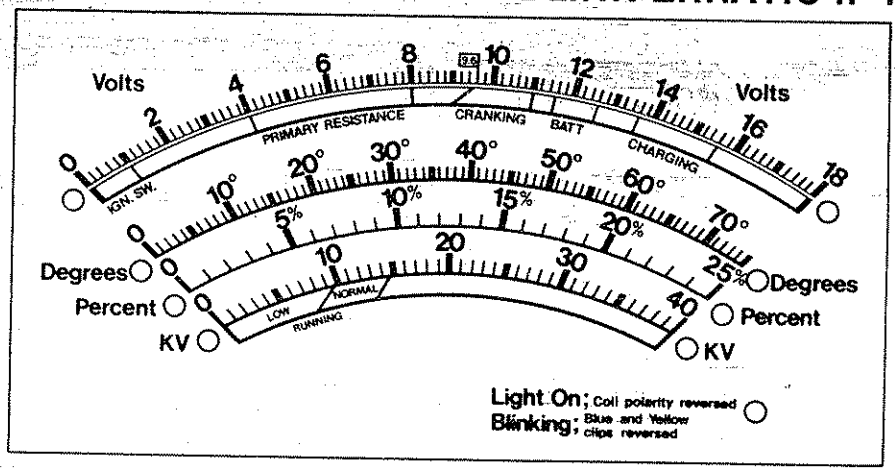

Figure 4

RIGHT METER SCALES

The right meter indicates High RPM, Low RPM, Low Amps, High Amps, and Points Resistance. A light on the right meter indicates that an alternator diode may be defective.

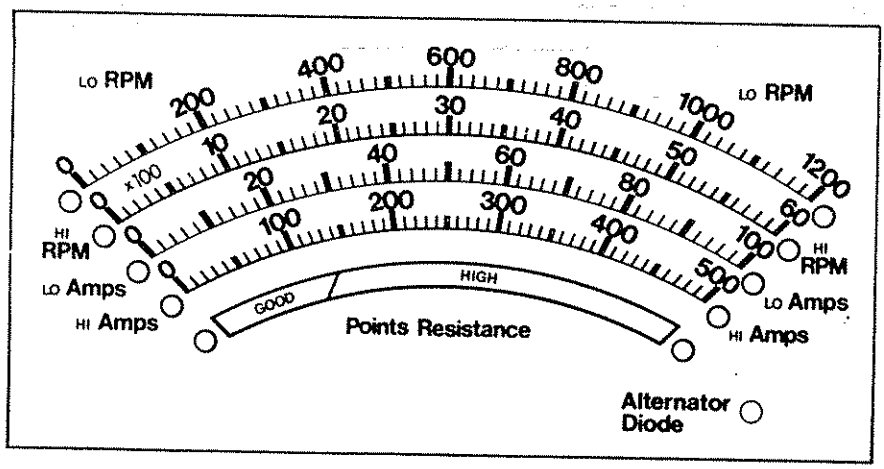

Figure 5

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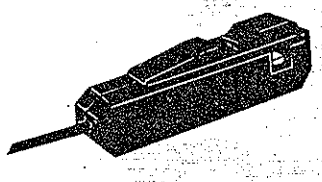
EQUIPMENT DESCRIPTION

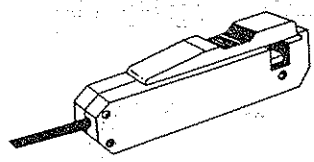
"HALL-EFFECT" CLAMP-AMP

The Hall-Effect Clamp Amp is an inductive type pick-up. It is used to measure current (amps) without disconnecting any wires or cables.



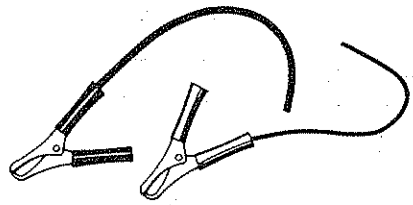
NO. 1 PLUG INDUCTIVE PICKUP

The #1 Plug inductive pickup clamps over the #1 spark plug wire and relays the signal (impulse) whenever the #1 spark plug fires.



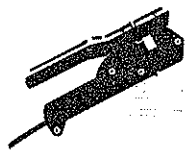
BATTERY LEADS

These leads are used to supply the analyzer with power from the battery.



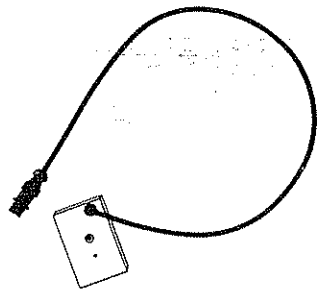
SECONDARY PICKUP (TRADITIONAL)

Secondary Pickup is used on traditional ignition systems. It is clamped over the coil tower high tension wire.



HEI SECONDARY PICKUP

The HEI Secondary Pickup adapter is used in place of the Traditional secondary pickup. The HEI Adapter attaches to the top of the distributor with internal coil.



COIL(+) AND COIL(-) CLIPS

The blue alligator clip (-) attaches to the coil negative terminal, the yellow alligator clip (+) attaches to the coil positive terminal. For HEI systems the yellow clip is left unattached and out of the engine compartment to avoid damage.

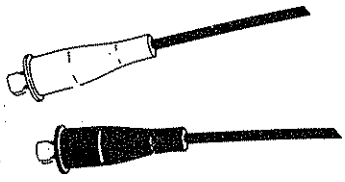
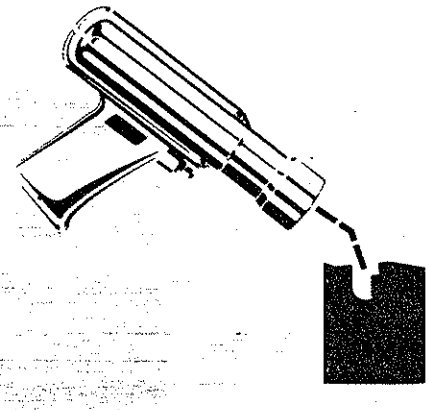


Figure 6

EQUIPMENT DESCRIPTION

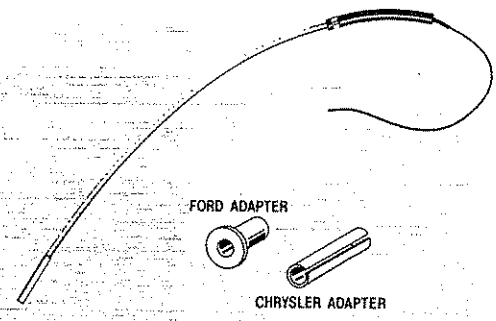
TIMING LIGHT

The timing light is included with a "holster" mounted on the side of the analyzer.



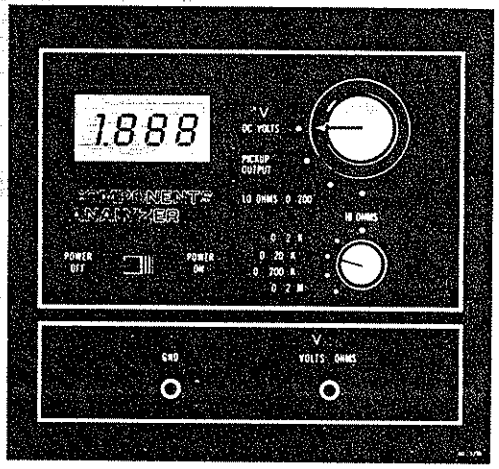
MAGNETIC TIMING PROBE

The magnetic probe (placed into the probe holder) senses each time the crank shaft turns one complete revolution. This information is then relayed through the probe lead into the solid state circuit. The analyzer probe is designed to fit engines (gas and diesel) equipped with a probe holder having a hole size .310" in diameter. This includes all GM diesel cars. Special magnetic timing probe adapters (2) are furnished for Ford and Chrysler engines.



COMPONENTS ANALYZER

The components analyzer is a very accurate high impedance digital Volt-Ohm meter. It can measure DC Volts (0-20 VDC), pickup coil output, and five ranges of resistance. The Low Ohms scale can be used for checking diodes.



VACUUM GAUGE

The vacuum gauge is operational at any time the vacuum hose is connected to a vacuum source on the engine under test.

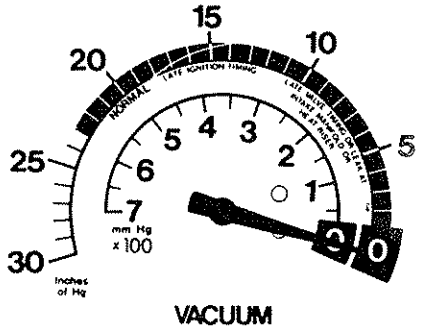


Figure 7

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BUTTON FUNCTIONS

The analyzer functions are controlled by the 29 buttons on the front panel. Symbols are used to indicate the function of each button or group of buttons and should be found easy to use with a little experience.

To simplify the explanation of functions in this manual, each button (or group of buttons) has been identified by a letter as illustrated below.

Buttons A thru J are sequential tests and have been organized according to the Programmed Test Sequence. This sequence of testing has been determined to be the most efficient method of finding an engine fault.

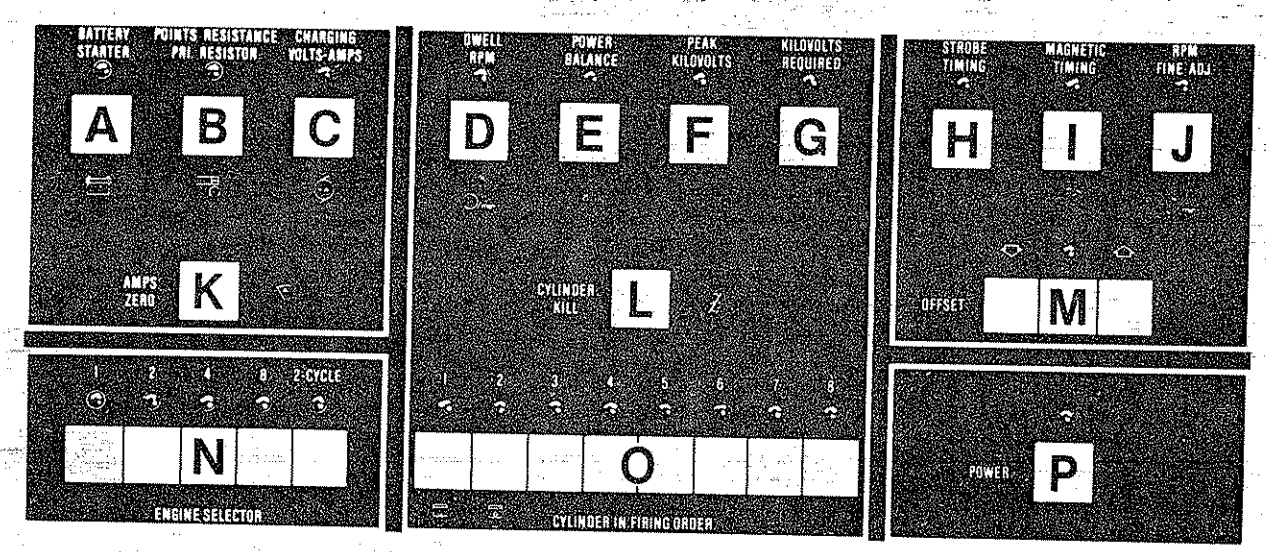

Figure 8

To select the correct number of cylinders according to buttons "N", button numbers are added.

Example: For 6 cylinder engine push 2 and 4

To identify the individual cylinder under test according to buttons "O" use the engine firing order and count the buttons from left to right starting with No. 1.

Example: Button Number: 1 2 3 4 5 6 7 8
Firing order of engine: 1 5 3 6 2 4

Buttons higher than number of cylinders in engine under test are not used.

BUTTON FUNCTIONS

BUTTON	NAME	FUNCTION
A	Battery/Starter	Push to read battery volts, cranking volts, and cranking amps.
B	Points Resistance Primary Resistor	Push to check ignition switch circuit, primary resistor, primary leakage, and point resistance.
C	Charging Volts-Amps	Push to read charging volts and charging amps.
D	Dwell/RPM	Push to read RPM, to check dwell and individual cylinder dwell.
E	Power Balance	Push to check the power output of each individual cylinder.
F	Peak KV	Push to check peak secondary output. Coil and plug wires are checked along with coil itself.
G	KV Required	Push to check average secondary output. Individual plugs and cylinders are checked.
H	Strobe Timing	Push to engage strobe timing light to check initial timing. Also checks mechanical + vacuum advance.
I	Magnetic Timing	Push to check magnetic timing using magnetic probe. Can be used to check initial, mechanical, and vacuum timing.
J	RPM fine adjust	Push to check carburetor adjustment. When button is pushed percent is zeroed. RPM and percent change is displayed.
K	Amps Zero	Push to zero amps scale before amp clamp is placed on battery cable.
L	Cylinder Kill	Push to short individual or multiple cylinders. Works along with Power Balance test and cylinder buttons 'O'.
M	Magnetic timing offset	If offset is different than 9.5° required push to key in different magnetic timing offset. Offset will be displayed on degrees scale. Stays set until analyzer is turned off.
N	Engine Selector	Push button(s) to correspond with number of cylinders in engine being tested.
O	Cylinder in firing order	Push to select individual cylinders. Used along with Dwell, Power Balance, Peak KV, and KV Required.
P	Power	Push to turn on analyzer

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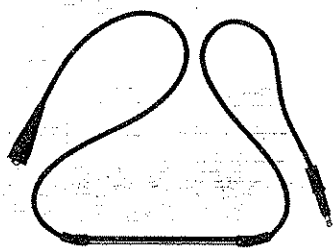
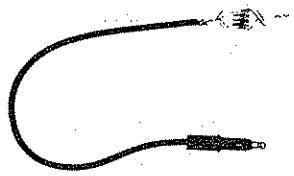
ACCESSORIES

Accessories furnished with the analyzer adapt it for hook-up to the engine and for specific tests. These accessores include:



HEI LOAD ADAPTER RESISTANCE LEAD

The HEI load adapter is used when performing the coil reserve test. Adapter connects into the boot of a disconnected spark plug wire and to an engine ground.

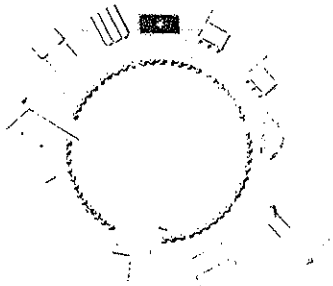


IGNITION WIRE GROUNDING ADAPTER

This adapter is used to ground ignition wires to determine if a problem exists in an ignition, wire, or spark plug.

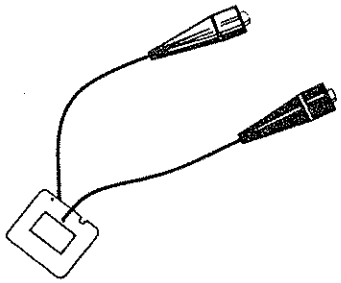
VACUUM HOSE

The vacuum hose is connected to the back of the analyzer and onto a vacuum source on the engine under test. This enables the vacuum gauge on the analyzer.



FIELD JUMPER ADAPTERS

This set of various adapters is used to separate the alternator (generator) from the charging circuit in various charging systems, for the purpose of full fielding the alternator.

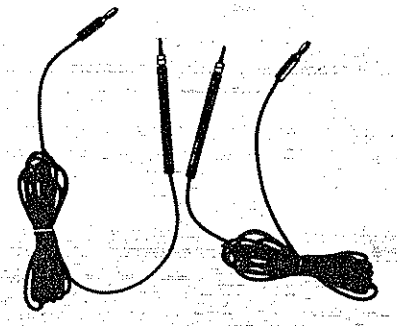


CURRENT MULTIPLIER

This adapter is used in conjunction with the CLAMP AMP in circuits to determine low current flow. Adapter multiplies current by Ten (x10).

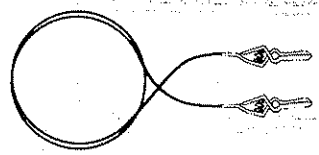
Figure 9

ACCESSORIES



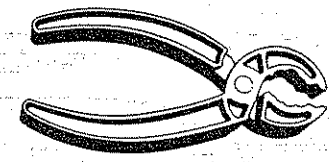
COMPONENTS TEST LEADS AND CLIPS

Leads are used for electrical tests and component tests in electrical systems. Lead ends are color coded. Clip adapters are included for easy hook-up.



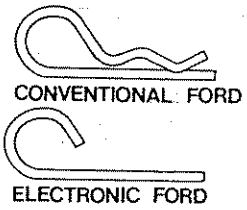
JUMPER LEAD

Lead is provided for electrical connections at hard-to-reach parts, alternators, and as a jumper for components testing.



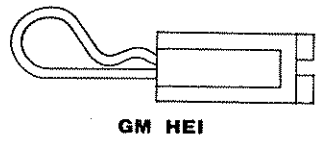
INSULATED PLIERS

Pliers are designed to prevent electrical shock when disconnecting or holding high tension ignition wiring.



FORD ADAPTERS

Ford adapters are used at the coil to permit connection of coil (+) and coil (-) yellow and blue alligator clips.



HEI ADAPTER

HEI adapter is used at the coil to permit connection of coil (-) blue alligator clip.

Figure 10

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HARNESS HOOK-UP

Start the procedural steps to connect the analyzer to the engine as follows:

Step 1.

Push the power button "P" to turn power off (button out).

Step 2.

Connect the battery leads to the battery. The black lead is negative (-) and connects to the negative terminal of the battery. The red positive (+) lead connects to the positive battery terminal.

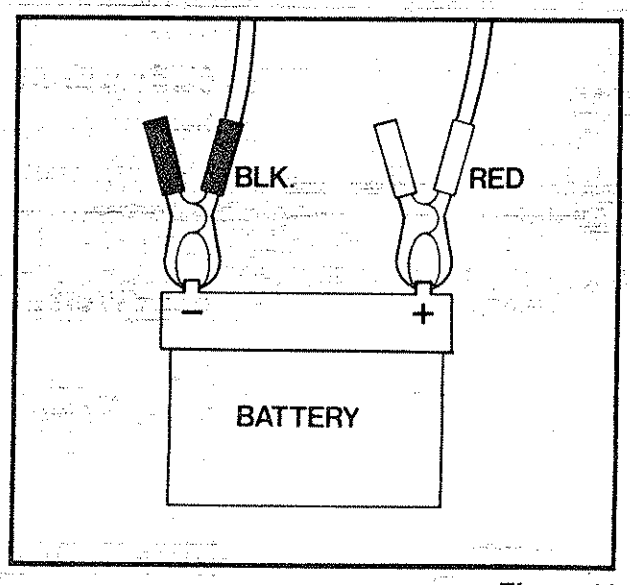


Figure 11

NOTE: The analyzer incorporates advance circuitry that automatically protects both the analyzer and the vehicle being tested from damage that could be caused by incorrect hook-up or overloaded circuits. For protection, always be sure that the battery negative is the first "on-the-car" connection made in the hook-up, and that it's disconnected last when testing is completed.

Step 3.

Push the power button to turn power on). Note: Light will turn on to indicate that button is engaged.

Step 4.

Push Engine Selecter button(s) (Button Function N) to match the number of cylinders on the engine to be tested. Lights will light to indicate buttons pushed. (Example: For 6 cylinder engine push 4 and 2.)

HARNESS HOOK-UP

Step 5.

While holding the "Clamp Amp" away from any electromagnetic source (alternator, etc.) with thumb slide closed, push Battery Starter button "A" or charging Volts-Amps button "C". Then push Amps Zero button "K". This automatically zeroes the Clamp Amp.

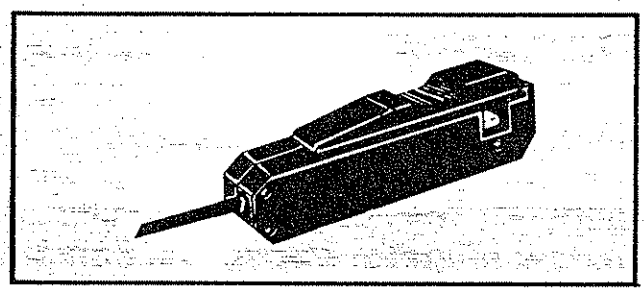


Figure 12

Step 6.

Clip the Clamp-Amp onto the negative battery cable of the vehicle to be tested. It is important that the arrow on the Clamp-Amp points toward the battery. If the clamp will not fit over the negative cable, use the positive cable, but in this case, the arrow on the Clamp-Amp must point away from the battery.

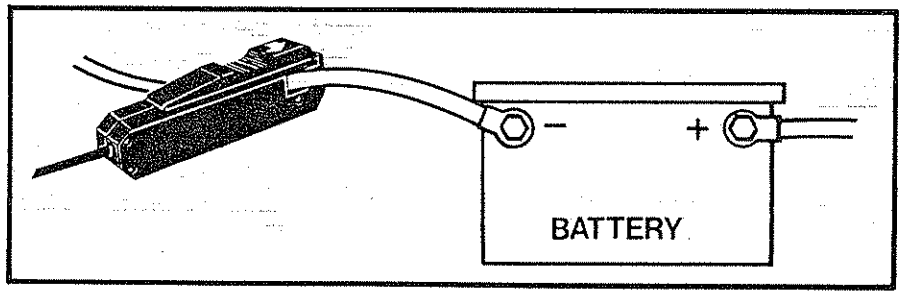


Figure 13

Step 7.

Clip the #1 Plug Inductive Pickup over the number one spark plug wire. That's the number one cylinder in the firing order. The arrow on the #1 Pickup must point towards the spark plug.

Note: On most engines, the cylinder nearest the front of the engine is the number one cylinder. See manufacturer's specifications for specific number one cylinder location.

Figure 14

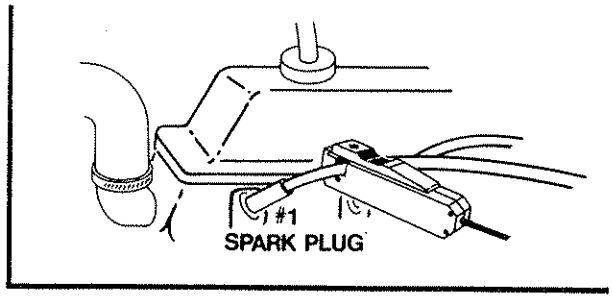
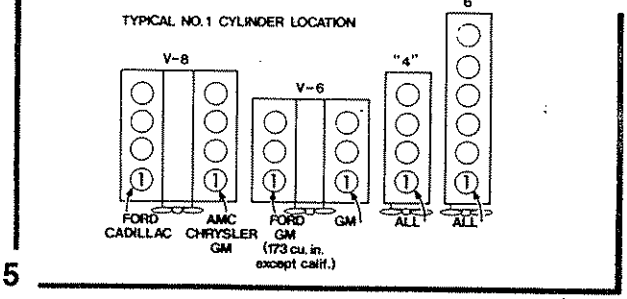


Figure 15



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S

HARNESS HOOK-UP

Step 8.

Traditional and HEI engine coil harness hookups differ. See following:

TRADITIONAL: Connect the traditional secondary pickup lead to the analyzer. Clip the secondary pickup onto the coil tower high tension wire.

Connect the blue alligator clip to the coil negative terminal, and the yellow alligator clip to the coil positive terminal.

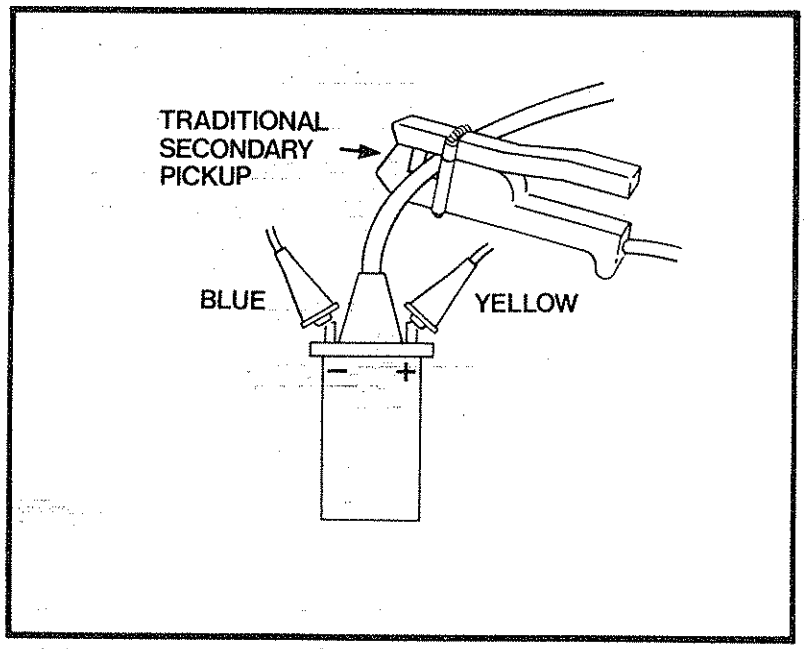

Figure 16

HARNESS HOOK-UP

Step 8. continued

HEI: Connect the HEI secondary pickup lead to the analyzer in place of the traditional secondary pickup. Clip the secondary pickup to the top of the HEI distributor.

Connect the HEI adapter (see accessories) to the tach terminal of the distributor. Clip the blue alligator clip to the wire end of the HEI adapter. The yellow alligator clip is unused for HEI engines.

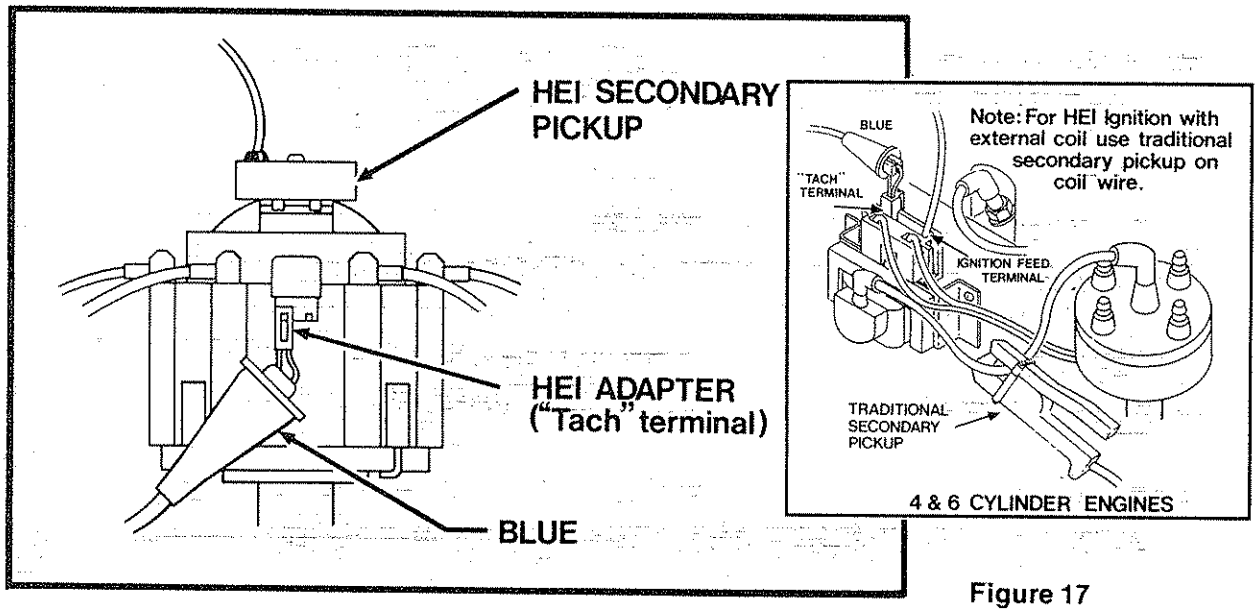

Figure 17

Step 9.

Connect the vacuum hose from the analyzer to a good intake manifold vacuum source.

Step 10.

If the magnetic probe is to be used for RPM or timing tests, insert the probe into the probe holder, normally located near the timing index.

HARNESS HOOK-UP

CONNECTIONS TO THE VEHICLE (QUICK LIST)

1. Black clip to battery (-) terminal
2. Red clip to battery (+) terminal
3. Large Black Clamp-Amp onto battery (-) cable
4. Large Gray #1 Pickup Clamp onto #1 spark plug wire

TRADITIONAL

5. Blue clip to coil (-) negative terminal
6. Yellow clip to coil (+) positive terminal
7. Small Black clamp (secondary pickup) onto coil tower high tension wire.

HEI

5. Blue clip to coil (-) terminal
6. HEI secondary pickup onto HEI distributor
7. Yellow clip not used.

NOTE: Care must be taken to ensure that test leads are clear of fan and other rotating equipment.

NOTE: Always be sure that the transmission is in neutral or park (automatic) before starting or cranking the engine.

HEI CCC SYSTEM See test 9a.

BASIC HOOK-UP

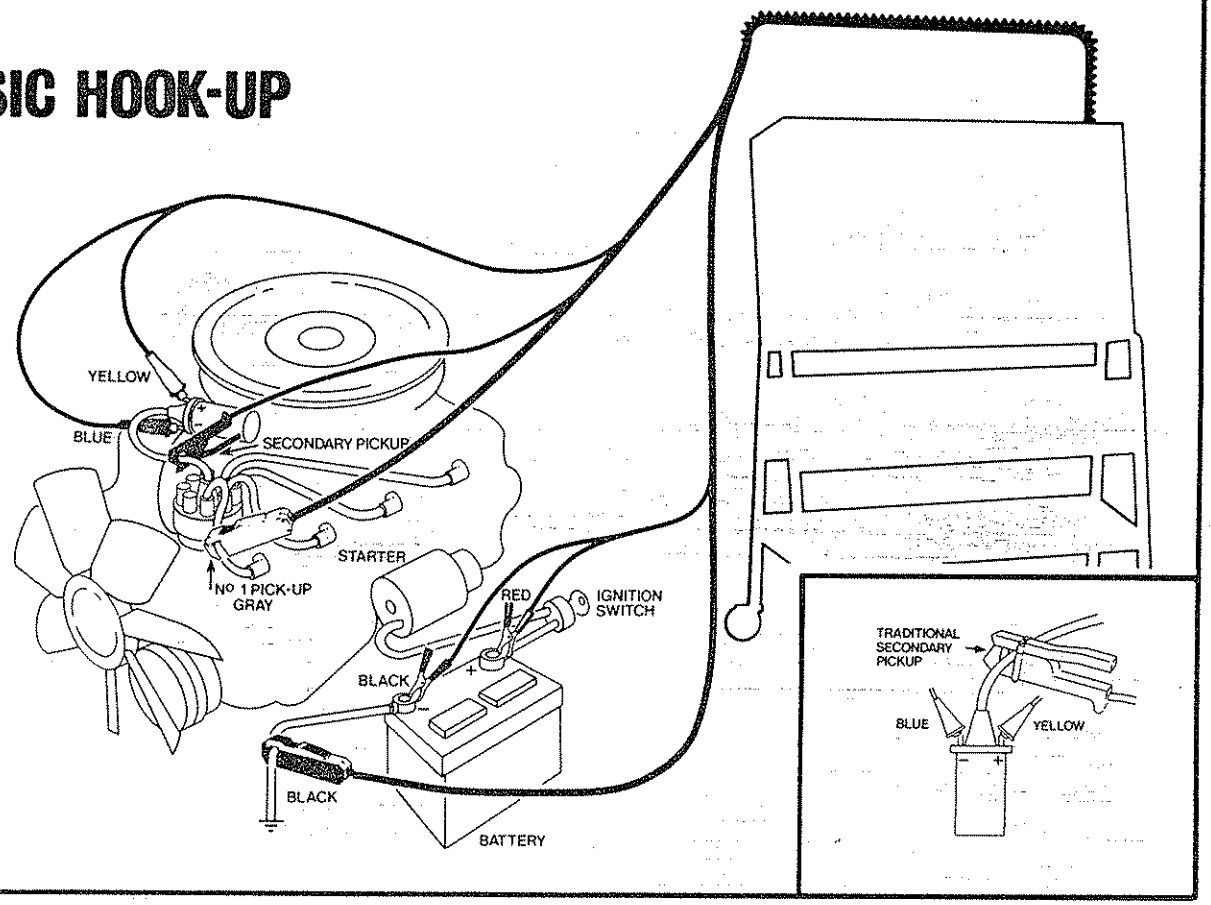

Figure 18

HEI HOOK-UP

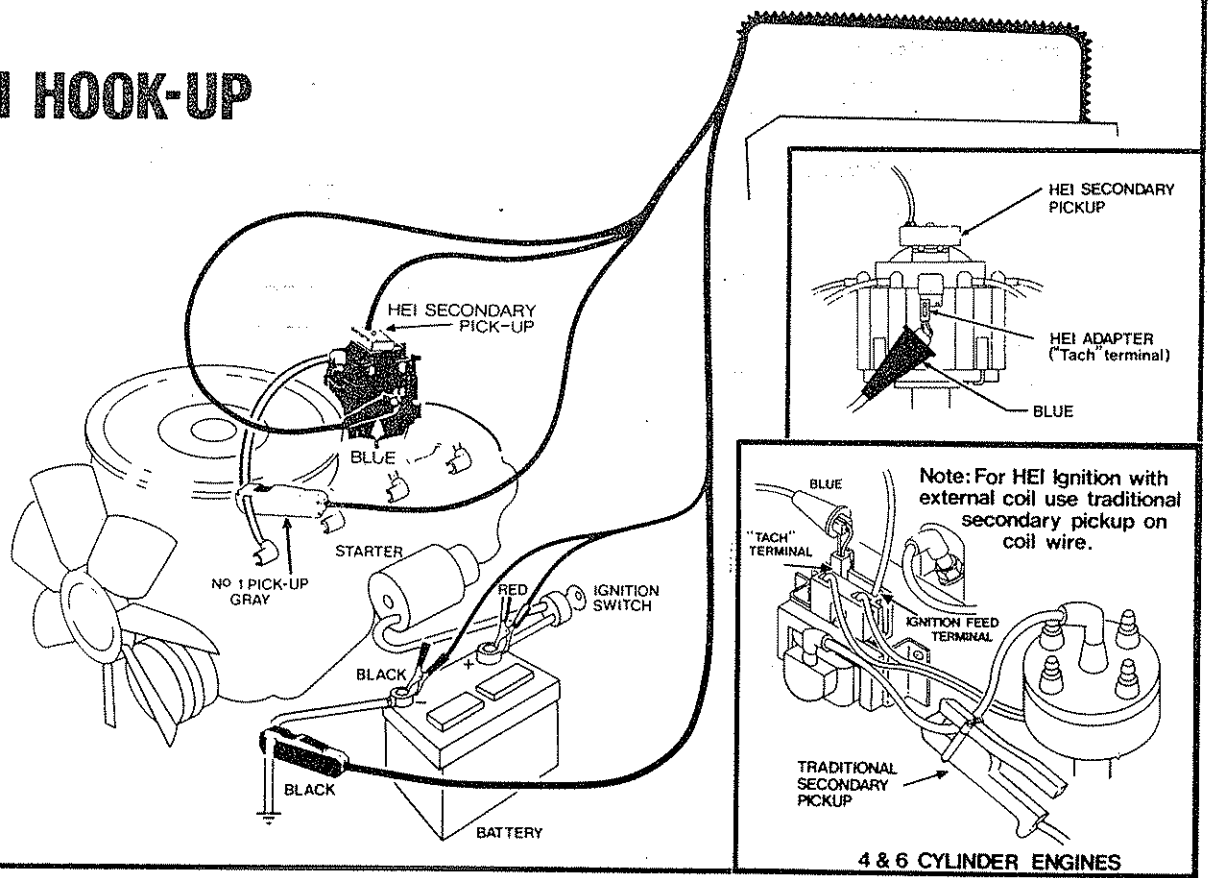

Figure 19

FOR GM CCC HOOK-UP SEE TEST 9A.

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TUNE-UP/DIAGNOSIS JOB SHEET

DATE _____

NAME _____ PHONE _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

CAR MAKE _____ YEAR _____ LICENSE _____

MILEAGE _____ No. of CYLINDERS _____ CUBIC INCH _____

CARBUREATION _____ TRANSMISSION: ☐ AUTO ☐ MAN ACCESS. ☐ A/C ☐ P/S ☐ P/B

IGNITION TYPE: ☐ STANDARD, ☐ OEM ELECTRONIC, ☐ AFTERMARKET ELECTRONIC

1 VISUAL INSPECTION

INSPECT	GOOD	BAD
AIR FILTER		
GAS FILTER		
OIL FILTER		
FUEL VAPOR FILTER		
CRANKCASE BREATHER FILTER		
CHECK BELTS		
RADIATOR PRESSURE CAP		
RADIATOR & HEATER HOSES		
ENGINE OIL ELVEL		
TRANSMISSION OIL LEVEL		
POWER STEERING OIL LEVEL		
DIFFERENTIAL OIL LEVEL		
BRAKE FLUID LEVEL		
BATTERY WATER LEVEL & HOLD DOWNS		
CARBURETOR CHOKE LINKAGE		
AIR CONDITIONER		
WINDSHIELD WIPERS-WASHER		
PCV VALVE		
EGR VALVE		
ENGINE MOUNTS		
HEAT RISER		
EXHAUST SYSTEM		

2 BATTERY STARTER

TEST	SPECIFICATION	GOOD	BAD	AFFECTS
BATTERY VOLTS (LIGHT LOAD)	11.5 V or ABOVE			ENGINE STARTING
CRANKING VOLTS	9.6 V or TABLE 1*			
CRANKING AMPS	TABLE 2*			

TABLE 1.

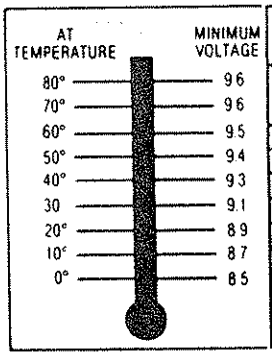


TABLE 2.

ENGINE SIZE			AVERAGE STARTER DRAW
CUBIC INCH	CUBIC CM	LITER	10-SEC CRANKING AMPERAGE*
90	1469	1.5	95
120	1959	2.0	110
150	2450	2.5	125
200	3270	3.3	150
250	4100	4.1	175
300	4900	5.0	200
350	5740	5.7	225
400	6550	6.6	250
450	7380	7.4	275

3 POINTS RESISTANCE (DYNAMIC)

LEFT METER	RIGHT METER		AFFECTS
VOLTS _____	GOOD ☐	BAD ☐	STARTING ACCELERATION, CRUISE PERFORMANCE

4 PRIMARY RESISTOR (STATIC)

SPECIFICATION	LEFT METER	RIGHT METER		AFFECTS
4 to 8 VOLTS*	VOLTS _____	GOOD ☐	BAD ☐	FLOW OF CURRENT THRU POINTS

5 CHARGING

Charging Volts				
SPECIFICATION	RESULT	GOOD	BAD	AFFECTS
13.5 TO 15.5 VOLTS*				starting characteristics as related to battery state of charge, operating efficiency of accessories, and battery life.
Charging Amps				
Specifications	**Results**	**Good**	**Bad**	
WITHOUT A/C 30 TO 42 AMPS* WITH A/C 50 to 65 AMPS				

6 DWELL RMP

LEFT METER		RIGHT METER		
DEGREES		RPM		
TEST	SPECIFICATION	GOOD	BAD	AFFECTS
Dwell	Engine Decal			Overall Engine performance
Dwell Variation	4 Max at 2000 RPM*			
PCV Valve				Gas mileage exhaust emissions, idle characteristics
Engine Vacuum				
Engine Idle Speed	Engine Decal			

7 POWER BALANCE

	PERCENT	HIGH IDLE RPM
1		
2		
3		
4		
5		
6		
7		
8		
LEFT BANK		
RIGHT BANK		

8 KILOVOLTS

KILOVOLTS		RPM
PEAK		
REQUIRED		
1		
2		
3		
4		
5		
6		
7		
8		

9 STROBE TIMING

	INITIAL	VACUUM	MECHANICAL	TOTAL
DEGREES				
RPM				

10 MAGNETIC TIMING

	INITIAL	VACUUM	MECHANICAL	TOTAL
DEGREES				
RPM				

11 FINE RPM ADJUST

IF FINE RPM ADJUST IS NECESSARY
SEE SECTION IN OPERATORS MANUAL

12 COMPONENT TESTING

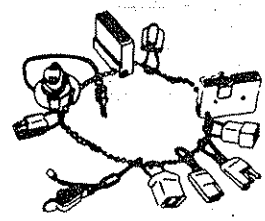
ELECTRONIC IGNITION COMPONENTS ANALYSIS	If vehicle equipped with electronic or solid-state ignition won't start, starts hard, or runs rough, and cause was not determined in preceeding tests, refer to instruction manual for components test procedures.
EXTERNAL VOLTS, AMPS, OHMS TESTING	Use for all automotive external Volts, Amps, and Ohms tests within the following test ranges: 1. Volts .....0-1.8 & 0-18 Volts 2. Amps .....0-3 & 0-10 Amps 3. Ohms .....0-500 & 0-5000,000 Ohms

VOLTAGE TESTS	TEST RESULTS
Battery Voltage	
System Ground	
Ignition Switch Volts	
Ballast Resistor	
Collant Switch	
Coil Input Voltage	
Harness Voltage	
Negative Battery Cable	
Positive Battery Cable	
Solenoid	
AMP TESTS	**TEST RESULTS**
Module Draw	
Primary System Draw	
Static Draw	

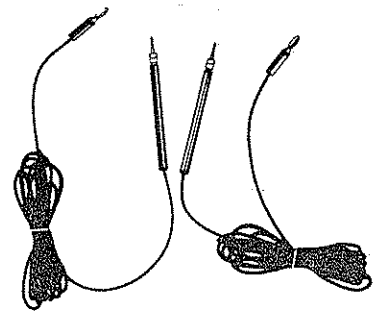
*Refer to manufacturer's specification. Values shown are typical.

MAGNETIC TIMING REFERENCE TABLE

MANUFACTURER	PROBE HOLDER OFFSET
General Motors	9.5°
American Motors	9.5°
Ford	45°
	52° 2.3 Liter 4 Cylinder
Chrysler	10°



Field Jumper Adapter Set



Components Test Leads

RESISTANCE (OHMS) TEST	TEST RESULTS
Coil Primary	
Coil Secondary	
Pick-Up Coil continuity	
Sensor Unit Ground	
Ballast Resistor	
Aux. Ballast Resistor	
Coolant Switch	
Throttle Position Sensor	
Harness Continuity	

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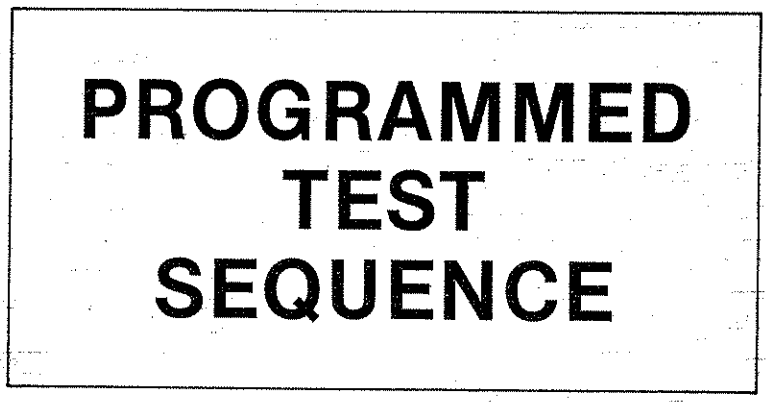
INTRODUCTION TO PROGRAMMED TEST SEQUENCE

Buttons "A" thru "J" on the analyzer (top row of buttons) are sequential tests and have been organized in order of a Programmed Test Sequence. This sequence of testing has been determined to be the most efficient method of finding an engine fault.



Before beginning tests on each vehicle hook up the analyzer to the vehicle as described in General Information, Harness Hook-up. With power button "P" on, select the button(s) in group "N" to suit the particular vehicle. You are ready to begin the PROGRAMMED TEST SEQUENCE.

BATTERY VOLTS

PURPOSE: To check general condition of battery.

PROCEDURE:

1. Push Battery Starter button "A".
2. Turn on ignition switch, heater blower, and headlights for about 30 seconds.

OBSERVE: Battery voltage on left meter scale 0-18. Voltage should be in Battery green zone.

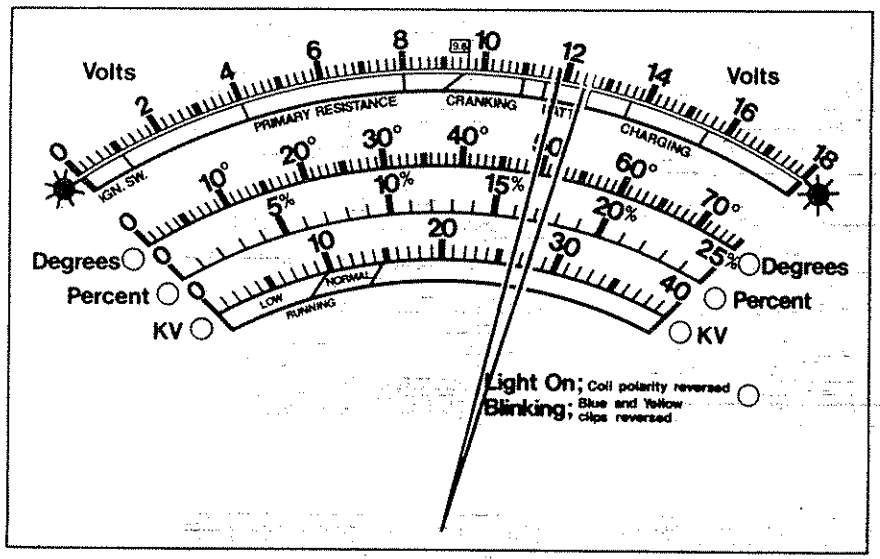


Figure 20

RESULT	→	REMEDY
Battery reading below green Battery zone.	→	Charge battery, or replace it if battery has failed

CRANKING VOLTS AND AMPS

PURPOSE: To check condition of battery and starting system.

PROCEDURE:

1. Push Battery Starter button "A".
2. Crank engine for about 15 seconds.

   Note: Engine should not start while in Battery Starter position. If engine does start, the analyzer yellow and blue clips are reversed on the coil.

OBSERVE:

1. Volts on left meter during cranking.
2. Amps on right meter during cranking.

Battery voltage is effected by temperature, and cranking amps is effected by engine size. A 9.6 volt or higher reading is good for 70 degrees F. and a 300 cu. in. engine will have a typical starter draw of 100-200 Amps. See tables below.

TABLE 1.

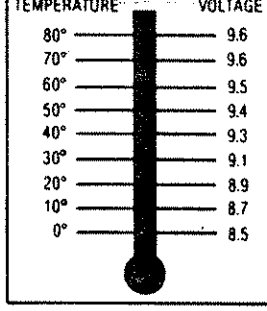


TABLE 2.

ENGINE SIZE			AVERAGE STARTER DRAW
CUBIC INCH	CUBIC CM	LITER	10-SEC CRANKING AMPERAGE*
90	1469	1.5	95
120	1959	2.0	110
150	2450	2.5	125
200	3270	3.3	150
250	4100	4.1	175
300	4900	5.0	200
350	5740	5.7	225
400	6550	6.6	250
450	7380	7.4	275

TEST 2

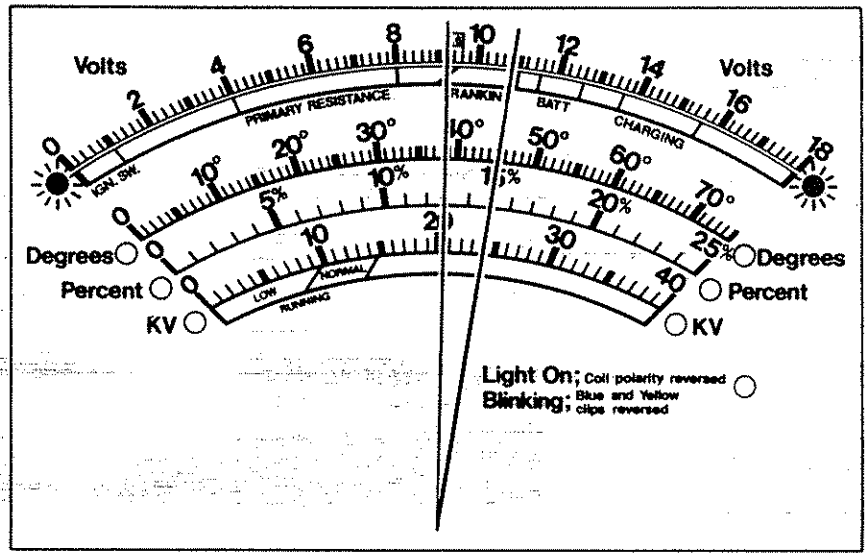


Figure 21

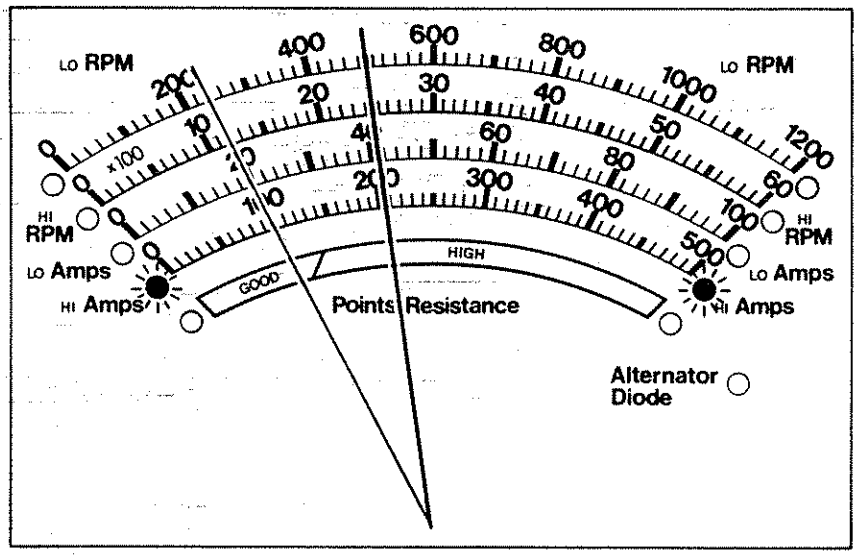


Figure 22

RESULT	→	CAUSE, REMEDY
Cranking volts below green zone, Cranking amps is within limits or low.	→	Charge battery, or replace it if battery has failed.
Cranking volts below green zone, Cranking amps is high.	→	Starter motor is suspect (or) engine is "tight".
Cranking volts above green zone, Cranking amps is below limits.	→	Excessive resistance. - Go to Cranking System Voltage Drop Test #2A.

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CRANKING SYSTEM VOLTAGE DROP TEST

Note: Perform this test only if excessive resistance was indicated in TEST 2.

PURPOSE: To find area of high resistance in cranking system.

PROCEDURE:

1. Turn Components Analyzer power on and test selector to DC Volts.
2. Connect components red lead to positive side and black lead to negative side of parts to be checked. See Figure, next page.
3. With leads connected as described, crank engine.

OBSERVE: Digital output volts for each area checked. Readings should not exceed .2 volts, except for solenoid which should not exceed .5 volts.

TEST 2A

EXAMPLES OF VARIOUS TEST POINTS
A TO B, C to D, D to E, E to F, F to G, G to A, ETC.

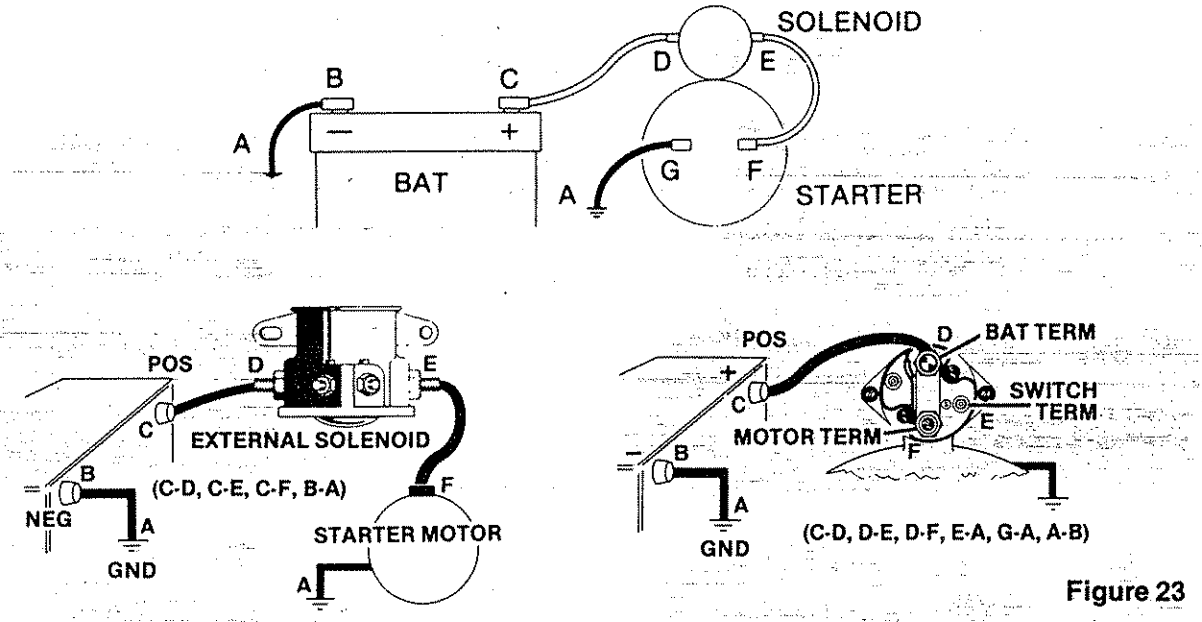

Figure 23

TEST PARTS	CONNECT RED CLIP	CONNECT BLACK CLIP
Negative Battery Cable	Engine Block	Negative Battery Post
Positive Battery Cable	Positive Battery Terminal	Battery Side of Solenoid
Solenoid	Battery Side of Solenoid	Starter Side of Solenoid
Solenoid/ Starter Cable	Starter Side of Solenoid	Solenoid Side of Starter

RESULT	→	CAUSE, REMEDY
Voltage reading above acceptable limits in one or more area.	→	Part is bad, or connection is poor - replace or repair part or connection.

Note: Voltage drop test will work on engine that will not crank as long as battery is charged and ignition switch provides voltage to solenoid.

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IGNITION SWITCH

NOTE: This test applies only to systems with an external primary resistor. Standard Ford electronic and Chrysler electronic systems use external primary ignition [ballast] resistors. Other electronic systems and some AMC ignition systems do not use external primary resistors.

PURPOSE: To check condition of ignition switch circuit and starter by-pass circuit.

PROCEDURE:

1. Push Points Resistance-Primary Resistor button "B".
2. Crank engine.

OBSERVE: Ignition switch voltage on left meter. Voltage should read in Ignition Switch green zone. [Less than 1 volt on 0-18 volt scale.]

TEST 3

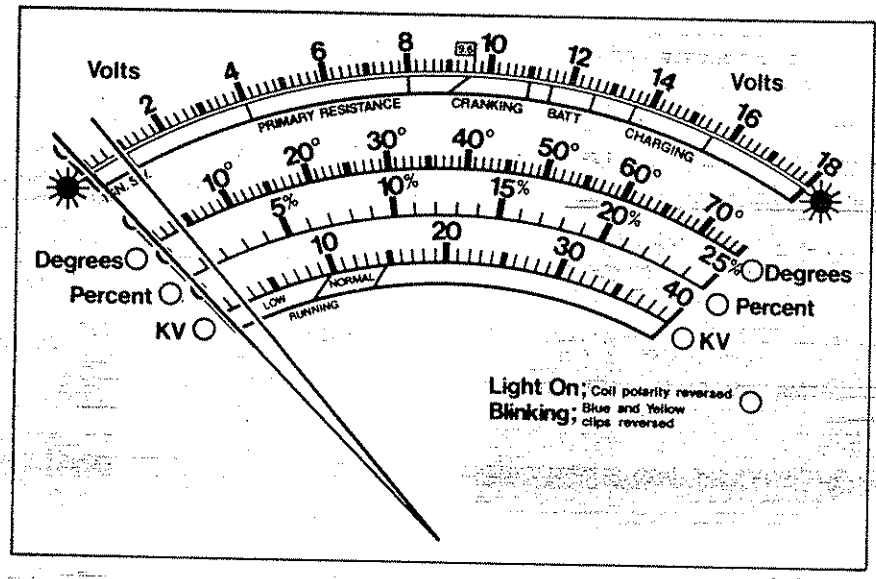

Figure 24

RESULT	→	CAUSE, REMEDY
Voltage reading greater than 1 volt during cranking.	→	Excessive resistance in by-pass circuit [or] Solenoid "tap" not operating [or] The ignition switch or wiring connections have failed.

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PRIMARY RESISTOR

NOTE: This test applies only to systems with an external primary resistor. Standard Ford electronic and Chrysler electronic systems use external primary ignition (ballast) resistors. Other electronic systems and some AMC ignition systems do not use external primary resistors.

PURPOSE:

To check the effectiveness of the primary resistor in limiting current flow across the distributor contact points.

PROCEDURE:

1. Push Points Resistance—Primary Resistor button "B".
2. Turn ignition switch to RUN position.
3. On points systems "bump" the starter until the points close. This is when Left Meter moves below Battery Volts.

OBSERVE:

Primary resistor volts reading on left meter. Voltage should be in Primary Resistance green zone (4 to 8 volts).

RESULT	→	CAUSE, REMEDY
Above 8 volts	→	Resistor value too high or poor connections.
Below 4 volts		Wiring or ignition switch problem.
Zero or near zero (points closed!!)	→	Resistor or ignition switch shorted or, Resistor is in coil and must be checked with ohmmeter.

Primary circuit resistance generally consists of the following values:

- Coils used with external primary resistance-1 to 2.5 Ohms.
- Coils with internal primary resistance-3 to 5 Ohms.
- Primary resistor-(both wire wound and resistance wire) - .7 to 1.5 Ohms. (nominal).

NOTES:

1. Most cars, by means of the ignition switch and/or starting motor solenoid, by-pass the primary resistor during cranking.

2. Some electrical systems are so designed that the primary resistor is used both during cranking and running. In these cases, the Primary Resistor reading is low initially, but as the resistor heats up, its resistance increases to the point where the meter pointer will climb to the primary resistance green zone. On these systems the Ignition Switch test will read the same. (In these installations the primary resistor is often referred to as a ballast resistor.)

PRIMARY LEAKAGE

Primary leakage test does not apply to electronic ignition systems.
PURPOSE: To check for leakage in primary circuit when points are open.

PROCEDURE:

1. Push points resistance-primary resistor button "B".
2. Turn ignition switch to "RUN" position.
3. On points systems "bump" starter until points open.

OBSERVE: Left meter should read zero volts indicating no leakage.

READING	ACTION	RESULT	CAUSE, REMEDY
A. Greater than zero volts	● Check and tighten all primary connections. ● Remove distributor cap and rotor. ● Inspect points to see if opened-fix if not opened.	Meter still reads more than zero volts	● Distributor wire short or primary wire failure or condenser bad Go to A1.
		(or)	
		Meter reads zero volts.	● Readjust point opening if necessary.
A1	● Switch components module on. ● Turn components test selector to volts D.C. ● Disconnect primary wire from distributor. ● Connect components black lead to primary wire (removed from distributor).	Components meter reads battery voltage	● Leakage is in distributor. Go to A2.
		(or)	
		Components meter reads lower than battery voltage.	● Coil or primary wire is bad. Check wire and coil -replace if necessary.
A 2	● Reconnect primary wire to distributor with components red lead attached. ● Disconnect condenser wire.	Comp. meter reads batt. voltage (or) Comp. meter still lower than Batt.	● Condenser shorted -replace. ● Wires in distributor shorting or carbon path causing leakage - wiggle and pull on wires.

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TEST 6

POINT RESISTANCE

The Point Resistance test does not apply to electronic ignition systems.

PURPOSE:

To check for high resistance between the negative coil terminal and ground.

PROCEDURE:

1. Push Points Resistance Primary Resistor button "B".
2. Crank engine.

OBSERVE:

Points resistance scale on right meter. A reading in the green zone is good.

RESULT	→	CAUSE, REMEDY
Any reading above the green zone.	→	● Bad points-replace. ● High resistance in wire from negative terminal of coil to distributor. ● Poor breaker point plate ground. ● Excessive corrossion between distributor and engine.

To identify components which may have failed, perform a Static Resistance Test #6.a.

STATIC RESISTANCE-
PRIMARY RESISTANCE

PERFORM THE FOLLOWING TESTS ONLY IF POINT RESISTANCE WAS IN THE "RED" ZONE.

THIS TEST DOES NOT APPLY TO electronic ignition systems.

PURPOSE:

To locate unwanted primary resistance or a primary short.

PROCEDURE:

1. Switch components to Power On.
2. Turn components Test Selector to Volts D.C.
3. Remove distributor cap and rotor.
4. Connect components lead assembly red lead to coil negative (-) terminal, and black lead to battery negative (-).
5. Turn ignition switch to "RUN" position.
6. "Bump" starter until points are closed, as indicated by digital meter moving towards zero.

OBSERVE:

Digital meter should change from battery voltage to less than .25 volts as starter is bumped. If not, continue testing as shown on next page.

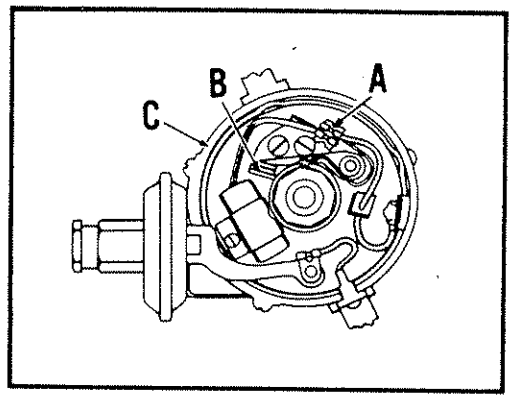

Figure 25

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METER READING	ACTION	RESULT	CAUSE, REMEDY
A..25 volts or less.	Move breaker plate with non-metallic object.	● Meter still reads .25 volts or less	→ ● Condenser is bad-replace
		——(or)——	
		● Meter now reads above .25 volts.	→ ● Ground in distributor is bad (braided ground strap or breaker plate ground).
B. Greater than .25 volts.	Move red lead from coil neg. to point "A" (see fig. 25).	● Meter still reads greater than .25 volts	→ ● Go to B1.
		——(or)——	
		● Meter drops to below .25 volts	→ ● Pigtail wire is bad.
B1	Move red lead from point "A" to point "B" (see fig. 25).	● Meter still reads greater than .25 volts	→ ● Go to B2.
		——(or)——	
		● Meter drops to below .25 volts.	→ ● Contact points bad. Replace *
B2	Move red lead from point "B" to point "C" (see fig. 25).	● Meter still reads greater than .25 volts	→ ● Corrosion exists between distributor and engine block.
		——(or)——	
		● Meter drops to below .25 volts	→ ● Distributor internal ground bad.

*New breaker points may show up as bad becuase of oxide coating from manufacturing process.

CHARGING VOLTS - AMPS

PURPOSE:

To check charging system.

PROCEDURE:

1. Push Charging Volts-Amps button "C".
2. Turn all accessories off.
3. Run engine at fast idle (1800-2000RPM) for about 2 minutes.

OBSERVE:

Charging volts-left meter, charging amps-right meter. Voltage reading in green charging zone with alternator diode light off, means charging system should be O.K. See note below.

NOTE:

If 15 second cranking test was done prior to this test Low Amps scale (right meter) should indicate full alternator charging output. See manufacturers' specifications for correct output.

ALTERNATOR DIODE LIGHT

The alternator diode light will light when ripple is found in the battery charging system. Ripple can be caused by any of the following conditions:

A. Defective diode in alternator
B. Charging current in excess of 10 amps
C. Battery with low state of charge
D. Sulphated battery
E. Poor battery terminal connections

If the alternator diode light comes on during testing, we must determine which of the above problems has caused it. If the light comes on during the first time through the test sequence, note the charge rate; if it is above 10 amps, return to this test after the battery has returned to full charge. If the light is still on, check the battery terminals and battery.

After the above tests have been completed, if the alternator diode light is still on, it is time to test the alternator diodes and replace if required.

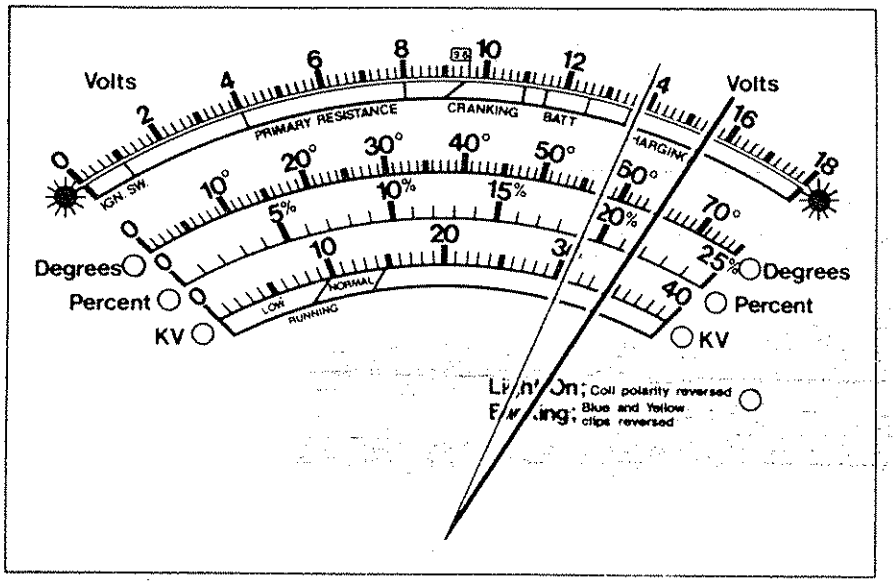

Figure 26

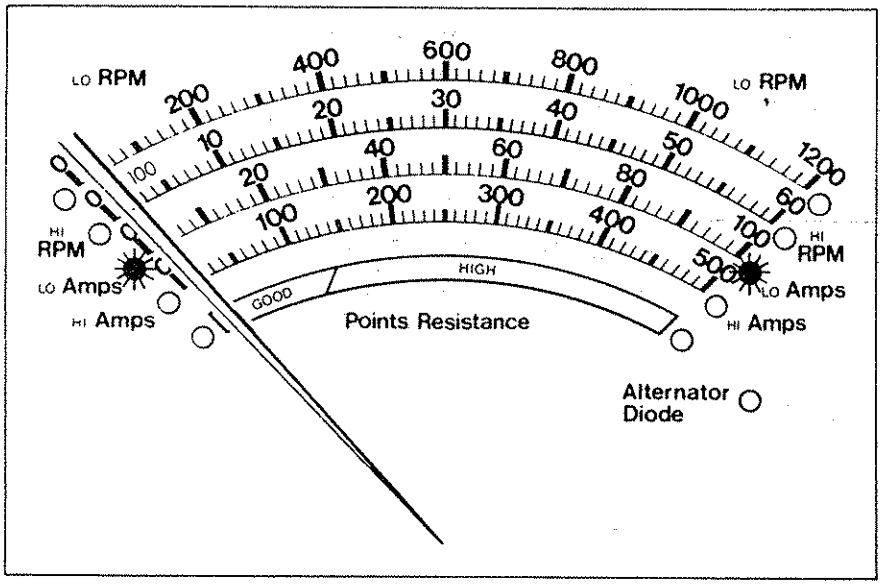

Figure 27

RESULT	→	CAUSE, REMEDY
Low current reading and low voltage reading.	→	Check for possibility of loose alternator belt, defective regulator, poor connections, or defective alternator. Go to Full Field Test #7A.
Voltage high.	→	Regulator not controlling voltage level-replace or adjust.
High current and low or normal voltage.	→	Defective or undercharged battery-charge or replace if defective.

FULL FIELD TEST

NOTE:
Perform following test only if failed charging TEST #7 with low current reading and low or normal voltage reading.

PURPOSE:
To isolate alternator or regulator which has failed.

PROCEDURE:
1. Push power button off.
2. Turn on headlights, heater blower, etc. for about 2 minutes. Then make sure all accessories are turned off.
3. "Remove" regulator from the charging system (using field jumper adapter set) by one of the methods to follow. (See page 1-40)

NOTE:
In all cases the ignition switch should be off before installing or removing an adapter to bypass the regulator.

4. Push Power button on.
5. Push Charging Volts-Amps button "C".
6. Start engine-slowly increase engine RPM to reach rated output.

NOTE:
Do not exceed rating of alternator. Do not run test for more than 20 seconds, or allow battery volts to exceed 17 volts.

FULL FIELD TEST (continued)

OBSERVE:

Charging Amps on right meter. Current output for a 12 volt system should be 30-42 amps for a non-air conditioned car.

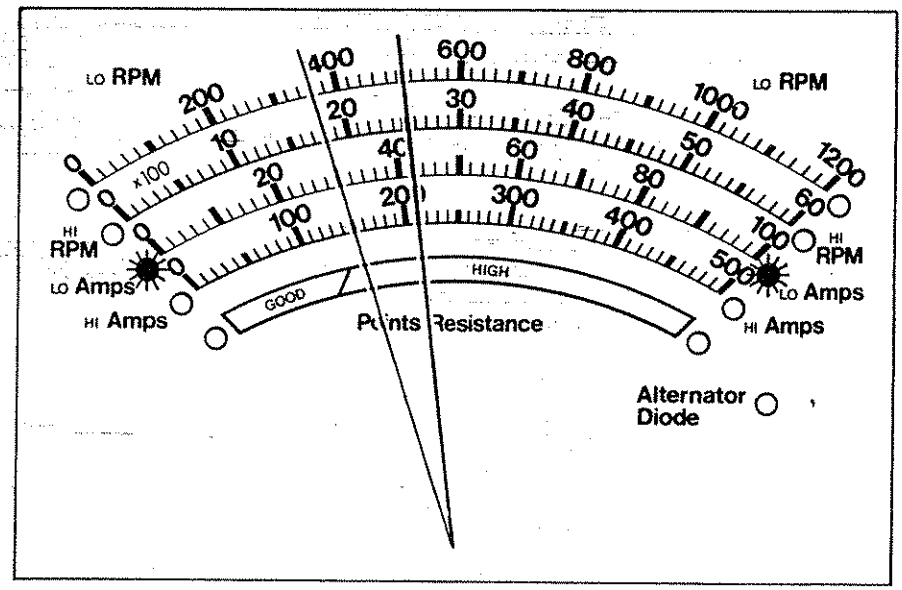

Figure 28

RESULT	→	CAUSE, REMEDY
Charging amps low or doesn't approach rated output.	→	First check for a loose or bad fan belt. Alternator defective-replace or repair alternator.
Voltage is not within specified limits.	→	Regulator is suspect-replace or adjust.

NOTE:

Remember to place regulator back into charging system.

FULL FIELD JUMPERS

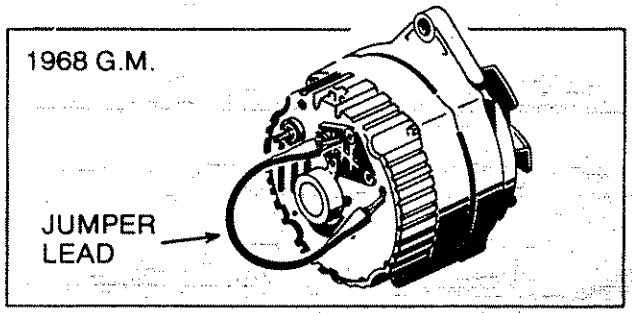

Figure 29

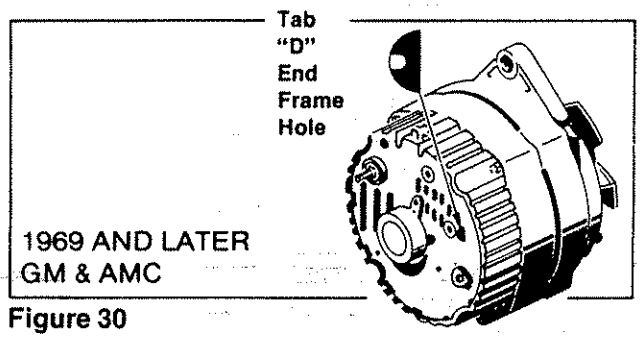

Figure 30

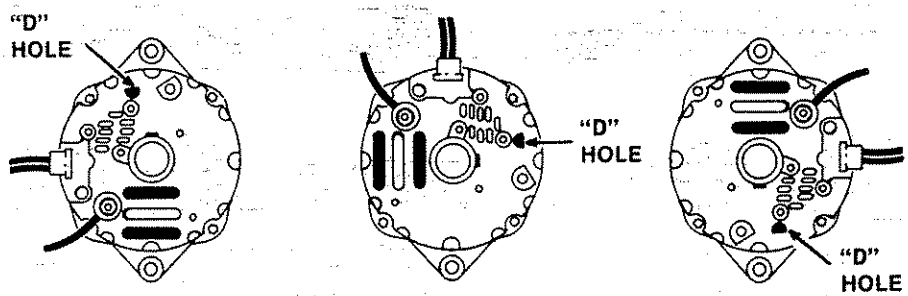

Figure 31

1. 1969 and later AMC and GM vehicles have a regulator that is built-in the alternator. Insert a screwdriver in the end frame hole and ground the tab to the end frame. On 1968 and earlier GM alternators, connect a jumper between the regulator heat sink and alternator frame.

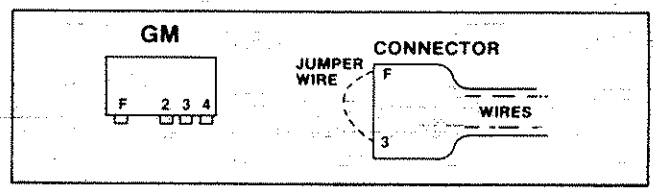

Figure 32

A. For an external GM regulator, disconnect the wires from terminal "F" and "3" connect these two wires together. Use a jumper if necessary. MAKE THE CONNECTION BEFORE STARTING THE ENGINE.

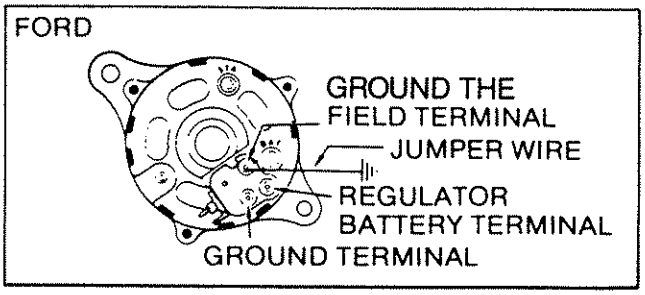

Figure 33

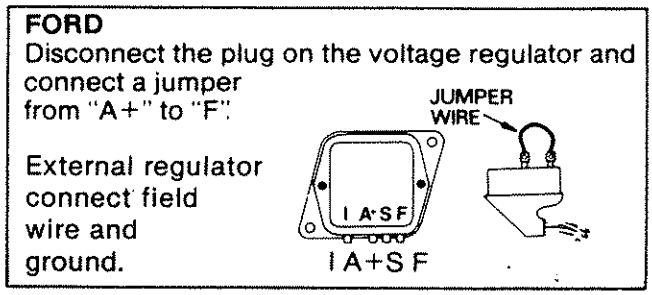

Figure 34

2. Ford alternators with regulator built into alternator: Connect jumper wire between regulator field terminal and ground. No additional adapter is needed.

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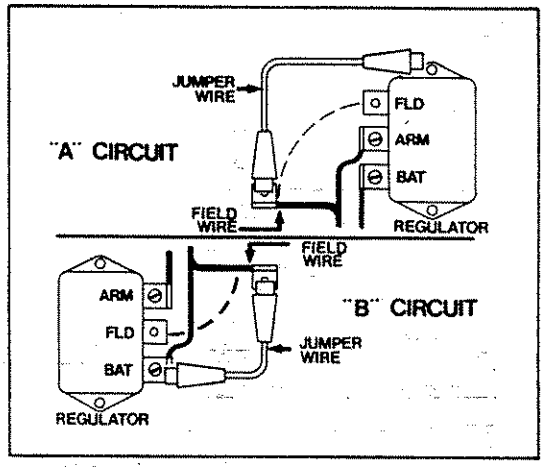

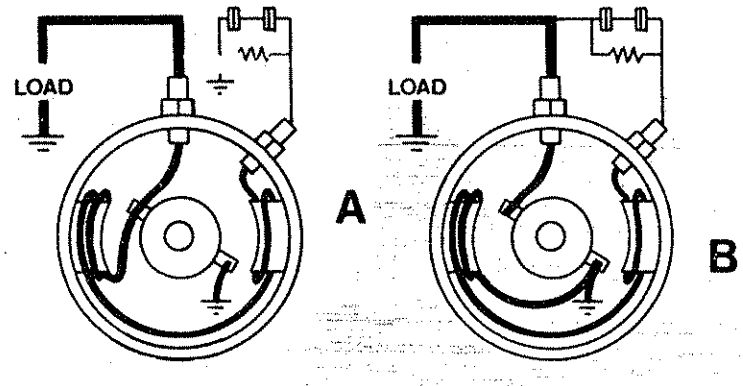

Figure 35

3. There are two types of circuits that supply the current to the generator fields. One is called the "A" circuit and the other the "B" circuit. Most General Motors cars are "A" circuit and Fords are usually "B" circuits. In an "A" circuit, ground the field terminal. If it is a "B" circuit, connect jumper wire from armature terminal to the field terminal. If you don't know which circuit the generator has, try grounding the field first and then try it with the jumper between armature and field. With the correct field connector, run the engine to see if the generator will put out. Because of an uncontrolled generator, do not run engine too fast or the generator will put out excessive current.

4. For General Motors, Chrysler and American Motors vehicles with "A" circuit generator systems (open terminal type regulators): Remove field wire from regulator and connect to ground or to ground terminal with jumper lead supplied. Ford open terminal regulator with "B" Circuit generator system: Remove field wire from regulator and connect to armature or battery terminal at regulator.

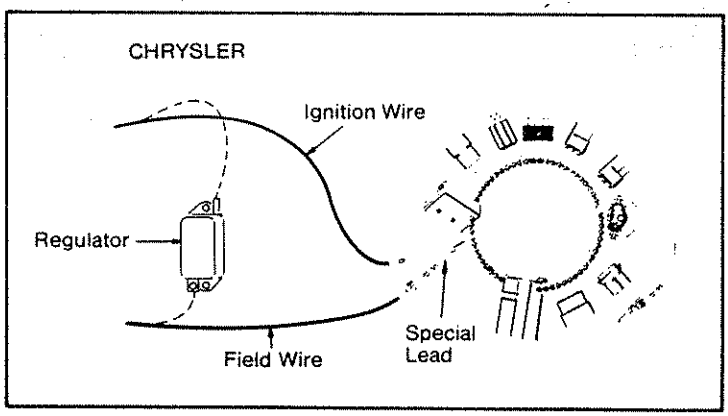

Figure 36

5. For Chrysler alternator systems with open terminal regulators, disconnect both field and ignition wires at regulator and hook them together with special lead supplied.

STANDARD DWELL

PURPOSE:

To ensure that contact breaker points are correctly adjusted. Dwell indicates the number of degrees the distributor cam rotates from the time the points close until they open again.

PROCEDURE:

1. Push Dwell RPM button "D".
2. Disconnect and plug vacuum advance hose at the distributor-or-if engine has an advance retard solenoid, disconnect wire at carburetor.
3. Run engine at slow idle.

OBSERVE:

Degrees of dwell on left meter. See manufacturers specification for correct dwell angle.

RESULT	→	CAUSE, REMEDY
Low dwell angle.	→	Wide point gap, adjust.
High dwell angle. Dwell changing over 3°	→	Point spacing too close, adjust. Warn bushing—bent shaft worn lobes.

NOTE: If coil leads blue and yellow are reversed, the left meter error light will blink in this switch position.

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INDIVIDUAL DWELL

PURPOSE:

To check the difference in ignition timing of each cylinder caused by distributor cam and drive faults.

PROCEDURE:

1. Push Dwell RPM button "D".
2. Run engine at slow idle.
3. Push cylinder 1 button in group "O". This corresponds to the first cylinder in the firing order (where the No. 1 pickup clamp is located). After noting the dwell reading, disengage cylinder 1 by pushing button again, then push cylinder 2 button. After noting the dwell reading, disengage cylinder 2 and go on to 3, etc.

OBSERVE:

Dwell readings. Readings should be very close to one another.

RESULT	→	CAUSE, REMEDY
Dwell readings vary.	→	1. Worn distributor shaft bearings. 2. Distributor drive gear or camshaft worn. 3. Distributor shaft bent. 4. Worn distributor lobes.

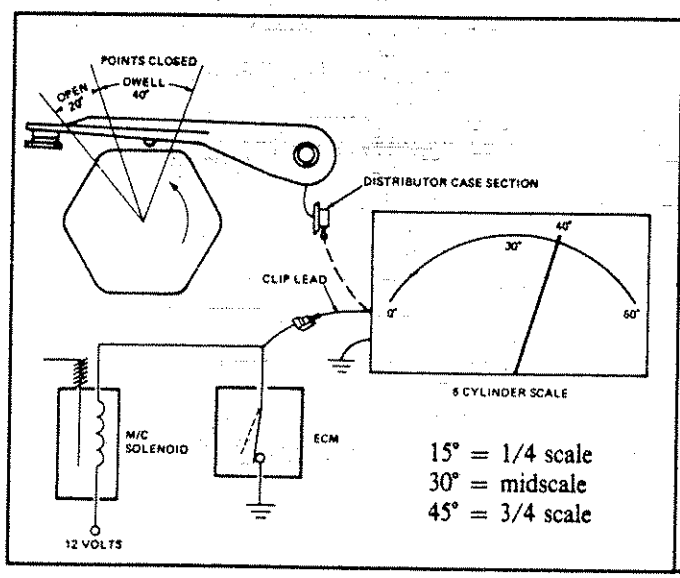
NOTE: If more than one cylinder is pushed, the dwell reading is the average of the cylinders.

NOTE: GM odd-fire V-6 engine will have 3 cylinders with similar dwell. The other 3 cylinders should also have similar dwell.

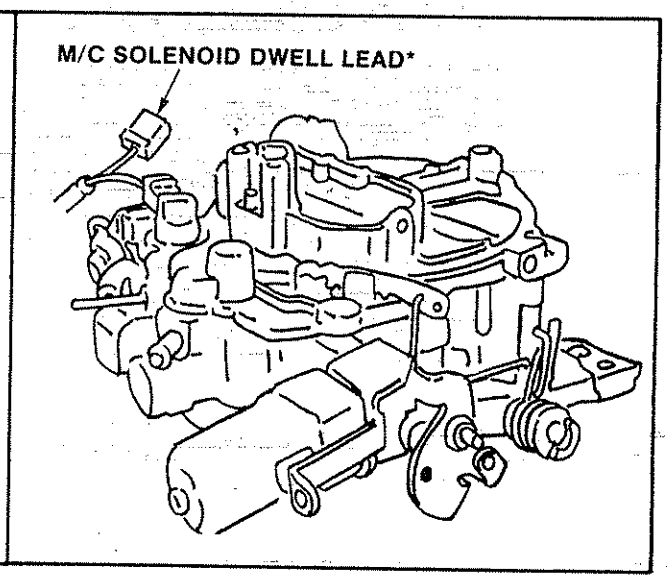
GM CCC SYSTEM

First set the engine selector on the 6 cylinder position, then connect the blue lead to the M/C solenoid dwell lead (green terminal) to measure the output of the ECM. Do not allow the terminal to touch ground, including hoses. You must use the 6 cylinder position when diagnosing all engines, whether the engine you're working on is a 4, 6, or 8 cylinder engine.

NOTE: When checking the dwell on the GM C-3 or C-4 system, disconnect the #1 pickup for this test.



DWELL THEORY



CCC SYSTEM
PERFORMANCE CHECK
USING DWELL METER

Figure 37

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GENERAL DESCRIPTION OF POWER BALANCE

The following three test modes are used to help separate ignition problems from mechanical problems or vacuum leaks. The first test to be performed is the Power Balance Test which determines the amount of power being produced by each cylinder. The important consideration isn't the percent of power being produced by each cylinder but that all readings are close to each other. This will tell us that the engine is operating as an efficient, effective power source. If we find one or more cylinders with a much lower reading we have found a problem which must be isolated by further testing. The most likely cause of an incorrect Power Balance Test on today's cars would be a vacuum leak which would cause turbulances in the manifold and disturb the cylinder's ability to receive the fuel mixture. A vacuum leak would be the most likely cause , **but** since we have the engine analyzer connected the most efficient test to make would be the Ignition Test.

POWER BALANCE

PURPOSE:

To check the power output of each cylinder by disabling the selected cylinder. Test results can indicate worn rings, defective valves or lifters, a vacuum leak or carburetor problems.

NOTE: If the engine is equipped with an EGR, exhaust gas recirculation system, the EGR must be disabled **before** performing Power Balance Test. Also, if the vehicle has a catalytic converter limit the length of time the cylinder is shorted and never short more than half the cylinders.

PROCEDURE:

1. Push Power Balance button "E".
2. Test can be performed at any RPM.
3. Push cylinder #1 button in group "O", then push cylinder kill button "L". After noting the percent drop in RPM disengage cylinder #1. Then push cylinder #2 button, etc. . .

NOTE: Cylinders will not be disabled unless the cylinder kill button is pushed and held.

OBSERVE:

Percent scale reading. All deflections should be about the same. If percent scale indicators blink when cylinder kill is pushed it indicates the engine speed increased when that cylinder was disabled. Look for a vacuum leak or EGR valve stuck open.

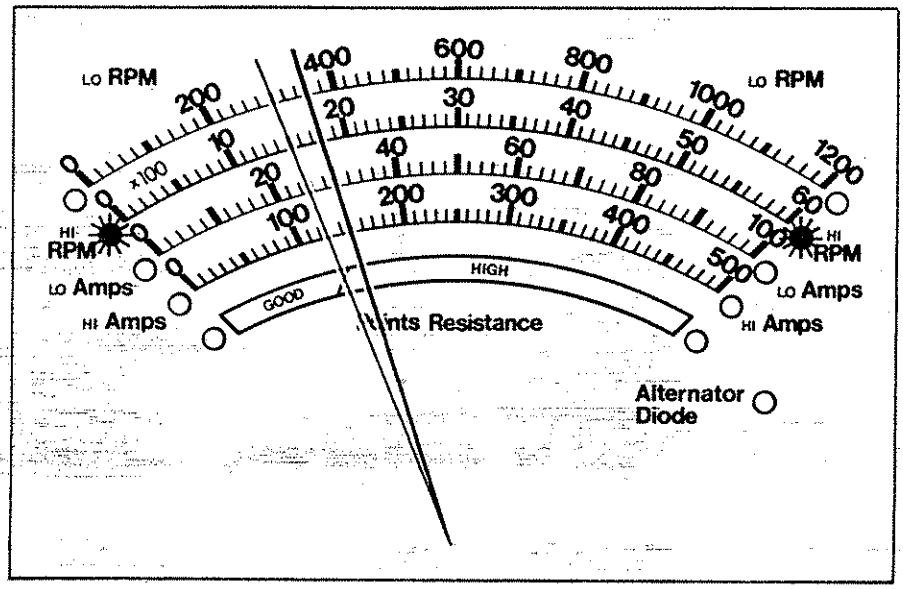


Figure 38

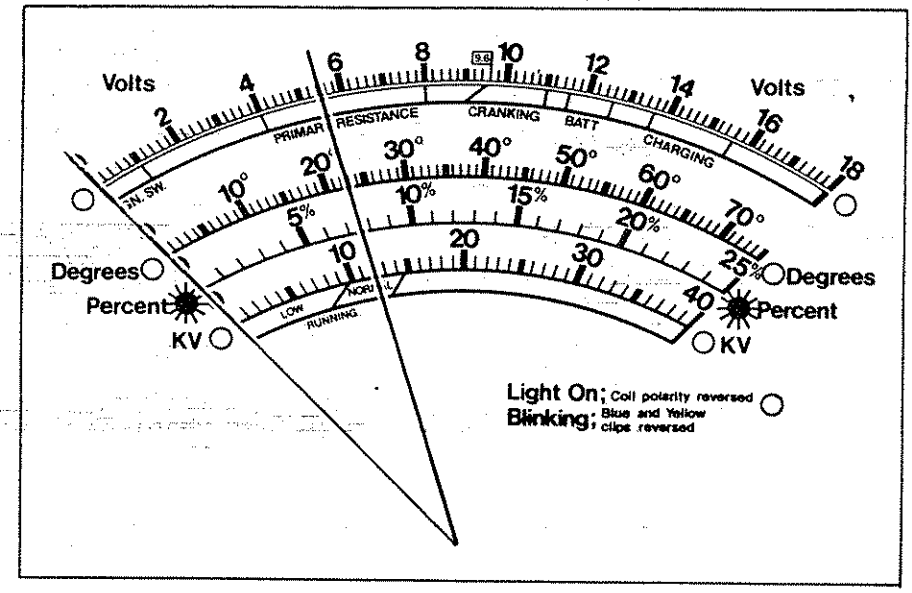


Figure 39

RESULT	→	CAUSE, RESULT
One or more cylinders shows little or no deflection.	→	See ignition tests.

CARBURETOR BALANCE

PURPOSE:

To confirm test results of the power balance test, compare the efficiency of one carburetor barrel against another, and to detect vacuum leaks.

NOTES:

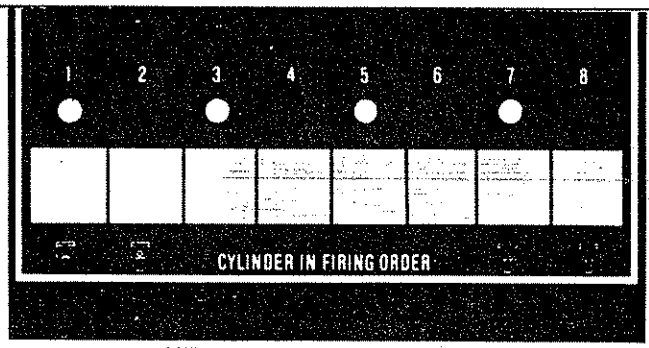
1. To perform carburetor balance test properly any problem cylinder found in the power balance test must be corrected.
2. Test can be performed on "V" and opposed type engines.
3. Test is not recommended for catalytic converter automobiles.
4. If engine is equipped with an EGR (exhaust gas recirculation system), the EGR must be disabled before performing test.

PROCEDURE:

1. Push Power Balance button "E".
2. Push every other cylinder button in group "O", so that every other cylinder in the firing order is selected, then push and hold cylinder kill button "L".
3. Repeat above procedure for remaining cylinders.

OBSERVE:

This test will normally cause percent meter to go to full scale, therefore results must be checked on the RPM scale. The RPM drop should be very close on each bank.



For example, if firing order of a V-8 is 1-8-4-3-6-5-7-2, push buttons 1-3-5-7 and Cylinder Kill. This shorts out cylinders 1-4-6 and 7. Repeat procedure for cylinders 8-3-5 and 2.

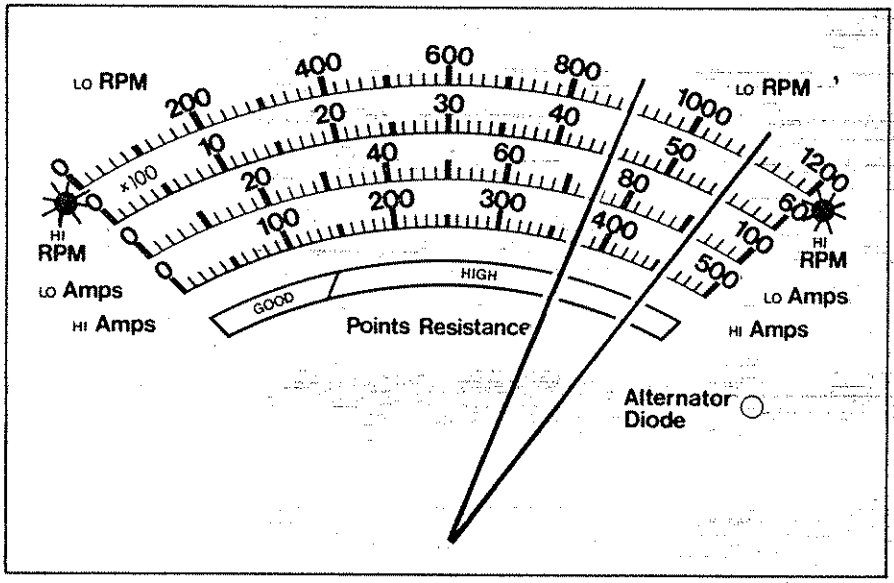


Figure 40

RESULT	→	CAUSE, REMEDY
More than 100 RPM difference between cylinder banks.	→	Carburetor out of adjustment-adjust carburetor. If problem persists-possible vacuum leak, dirty carburetor, intake manifold leak or restriction, or defective vacuum operated accessories.

GENERAL DESCRIPTION OF IGNITION

Before we start on the ignition test we have some basic questions to answer:

What is KILOVOLTS?
What is PEAK KILOVOLTS?
What is KILOVOLTS REQUIRED?

"KILO" is a prefix which stands for "THOUSAND" and when connected to volts as in KILOVOLTS we have a thousand volts. Our Ignition scale is the bottom scale on the left meter and goes from 0 to 40 KILOVOLTS or 0 to 40,000 VOLTS.

The Secondary System must be capable of producing enough voltage to jump the Rotor Gap and the Spark Plug Gap for current to flow and ignite the air fuel mixture. The wider the gap the more voltage will be required to jump this gap.

One very large automotive problem is keeping this Secondary Voltage directed to the Spark Plug Gap, since by nature it would rather take an easier path such as a carbon track in the Distributor Cap or through stiff, old, brittle ignition wires to the engine block.

The Secondary Pickup Probe acts as a high voltage probe when connected around the Secondary Wires, the meter reads the voltage across the Rotor Gap or the Spark Plug Gap which ever is larger.

PEAK KILOVOLTS

When the engine analyzer is in the PEAK KILOVOLT mode it looks at the Secondary Voltage of each cylinder and displays the largest one.

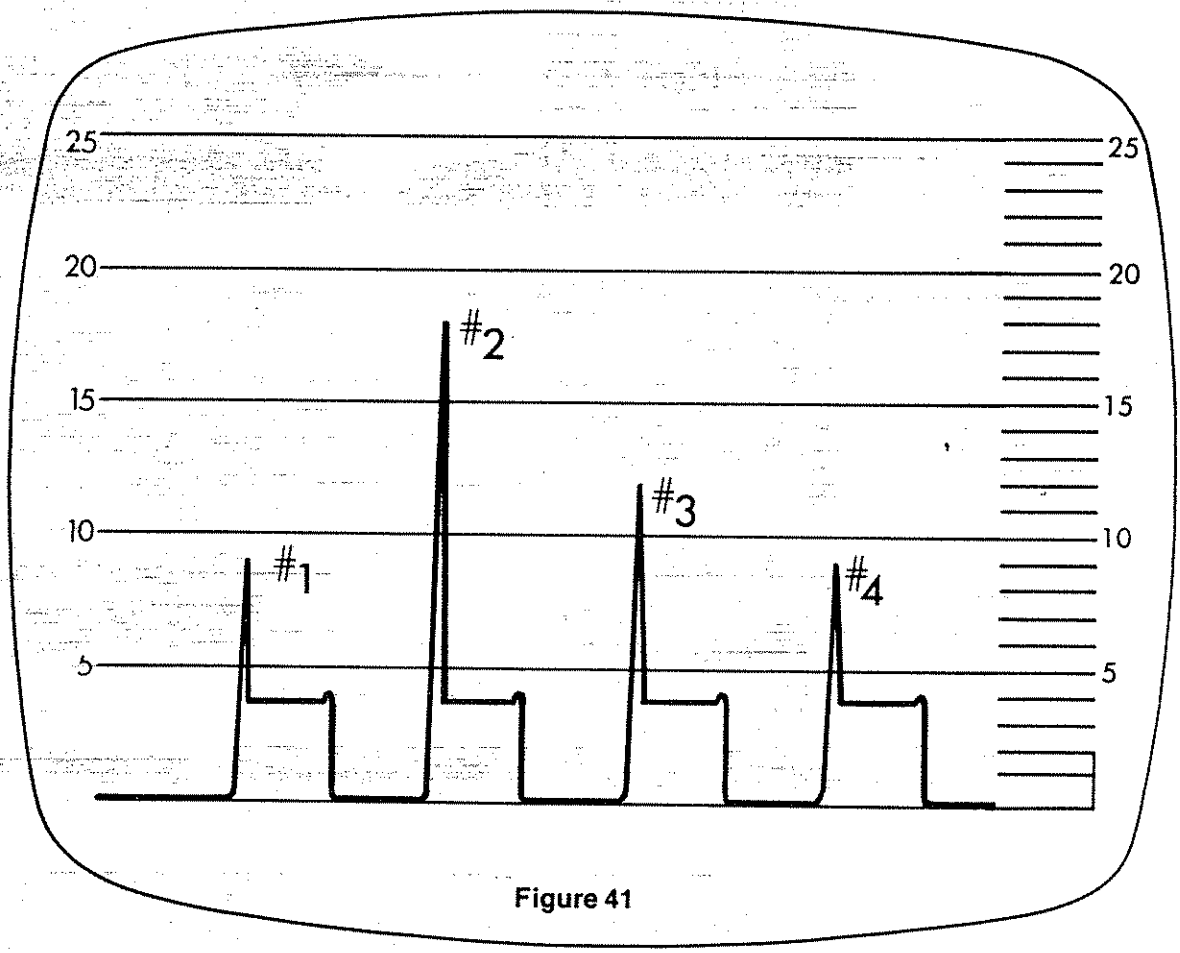


Figure 41

Using figure 41 as an example in PEAK KILOVOLTS the left meter would read 18 KV or the largest Secondary Voltage which is the Secondary Voltage of cylinder #2, this is PEAK KILOVOLTS.

When you are in PEAK KILOVOLTS you may also select individual cylinders. Using figure 41 as an example the meter would display the following readings:

Cylinder #1 = 9kv
Cylinder #2 = 18kv
Cylinder #3 = 12kv
Cylinder #4 = 9kv

NOTE: IF ERROR LIGHT IS INDICATED REFER TO PAGE 1-7.

KILOVOLTS REQUIRED

When the engine analyzer is in the KILOVOLTS REQUIRED mode it looks at the secondary voltage of each cylinder and displays an average of all the readings. Using figure 41 as an example in KILOVOLTS REQUIRED the left meter would read 12 kv.

When you are in KILOVOLTS REQUIRED you may also select individual cylinders. Using figure #41 as an example the meter would display the following readings.

Cylinder #1 = 9kv
Cylinder #2 = 18kv
Cylinder #3 = 12kv
Cylinder #4 = 9kv

NOTE: IF ERROR LIGHT IS INDICATED REFER TO PAGE 1-7.

NOTE: The GREEN ZONE on the KILOVOLTS meter scale should be used only as a diagnostic aid, readings above and below this GREEN ZONE can be OK, but it should tell you that more testing should be performed. The most important indication that more testing will be required is incorrect POWER BALANCE readings. The following specific tests will help determine where the problem is.

MAY BE PERFORMED IN PEAK KV OR KV REQUIRED

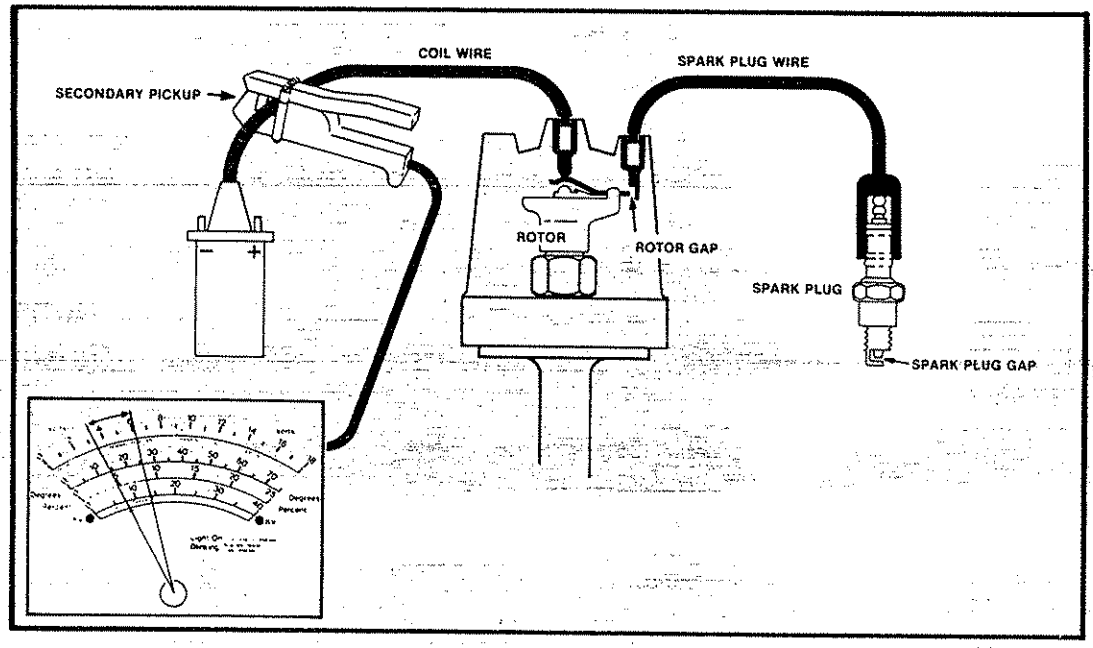


Figure 42

With Secondary Pickup connected around the coil wire we are reading the Kilovolts across the Rotor Gaps or the Spark Plug Gaps which ever is largest.

PERFORMED IN PEAK KV ONLY

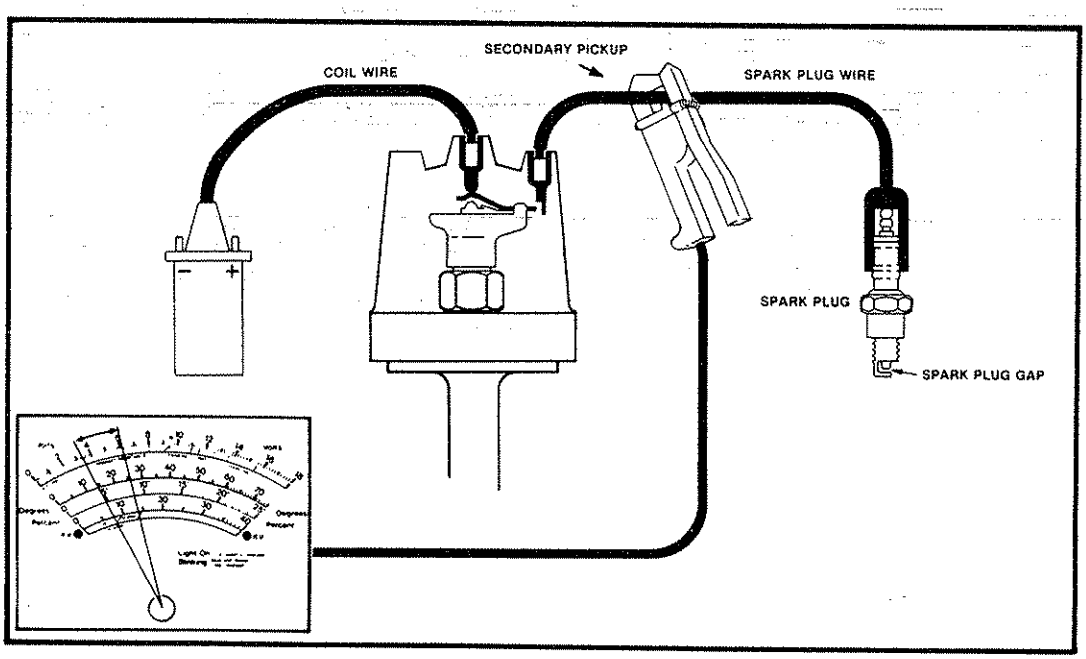


Figure 43

With Secondary Pickup connected around a Spark Plug Wire we are reading the Kilovolts across that Spark Plug Gap.

MAY BE PERFORMED IN PEAK KV OR KV REQUIRED

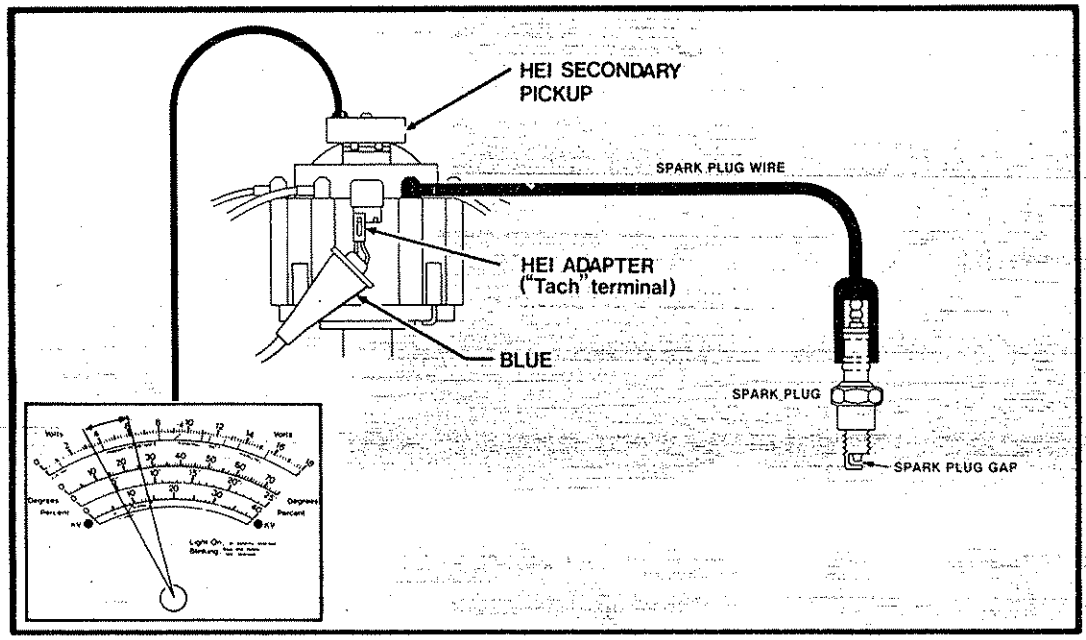


Figure 44

With HEI Pickup connected as shown we are reading the Kilovolts across the Rotor Gaps or the Spark Plug Gaps whichever is largest.

PERFORMED IN PEAK KV ONLY

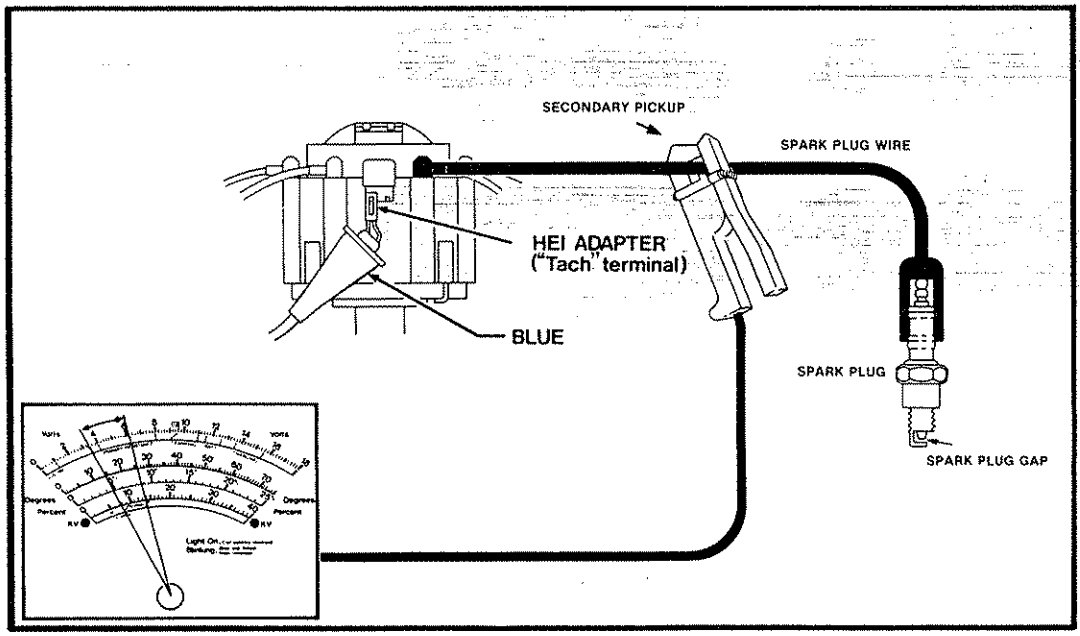


Figure 45

With Secondary Pickup connected around a HEI Spark Plug Wire we are reading the Kilovolts across that Spark Plug.

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COIL RESERVE

PURPOSE:

To check full output capability of Ignition Coil

PROCEDURE:

1. Turn ignition off.
2. Remove one Spark Plug Wire from Spark Plug.
3. Connect HEI Load Adapter Wire between Spark Plug Wire and good engine ground.
4. For Standard Ignition System connect as shown in figure 42, for HEI connect as shown in figure 44.
5. Select Peak Kilovolt mode.
6. Run engine.
7. Note Kilovolt reading on KV scale.
8. Select Kilovolt Required mode.
9. Note Kilovolt reading on KV scale.

OBSERVE:

When using HEI Load Adapter as described above the Coil Reserve is the difference between the Peak Kilovolts reading and the Kilovolts Required reading.

(PEAK KILOVOLTS READING)–(KILOVOLTS REQUIRED READING) = (COIL RESERVE)

The Peak KV should be a minimum of 10 KV higher than Kilovolts Required.

RESULTS		CAUSE, REMEDY
Both readings high, small difference	→	Go to High Resistance Coil Wire Test #14
Kilovolts Required normal, small difference	→	● Check for proper Dwell Test #8. ● Test for carbon track in Distributor Cap Test #15. ● Check for brittle Spark Plug Wire arcing to engine ground on wire with HEI Load Adapter Test #15. ● If above tests are positive repeat Coil Reserve Test on another cylinder. If results are the same suspect a faulty coil.

HIGH RESISTANCE SPARK PLUG WIRE

PURPOSE:

To find Spark Plug Wire with high resistance.

PROCEDURE:

1. For Standard Ignition System connect as shown in figure 42, for HEI connect as shown in figure 44.
2. Select Peak Kilovolts mode. Note reading on KV meter.
3. Select Kilovolts Required mode. Note reading on KV meter.

OBSERVE:

Readings should be very close.

RESULTS		CAUSE; REMEDY
Readings not close	→	Select Kilovolts Required mode and select one cylinder at a time until the high reading is found.

TEST 14

HIGH RESISTANCE COIL WIRE

PURPOSE:

To find a coil wire with very high resistance.

PROCEDURE:

1. Connect the engine analyzer as shown in figure 42.
2. Select Peak Kilovolts mode. Note reading on KV meter.
3. Select Kilovolts Required mode. Note reading on KV meter.

OBSERVE:

Readings should be very close and within normal range.

RESULTS		CAUSE, REMEDY
Readings are close but appear high.	→	Place Secondary Pickup on one or more Spark Plug Wires. If readings seem closer to the normal range perform the following checks. A. Remove Coil Wire. Test with an Ohm Meter and do a close visual inspection. B. Remove Distributor Cap and inspect floating carbon wiper. Inspect rotor. Replace any of the above components which are found incorrect.

CARBON TRACK IN DISTRIBUTOR CAP. SPARK PLUG WIRE ARCING TO ENGINE. FOULED SPARK PLUG.

PURPOSE:

To find Carbon Track in Distributor Cap, shorted Distributor Cap, Spark Plug Wire arcing to engine and fouled Spark Plugs.

PROCEDURE:

Perform Power Balance Test as described in Test 10.

OBSERVE:

All selected cylinders read the same % drop.If one or more cylinders are low follow the test sequence below.

1. Select Peak Kilovolt mode.
2. Connect Secondary Pickup around Spark Plug Wire of low cylinder as shown in figure 43 or 45. Note reading.
3. Connect Secondary Pickup around Spark Plug Wire of normal cylinder. Note reading.

OBSERVE:

Both readings should be close to the same. If the low cylinder KV reading is much lower or seems very erratic follow the Test Sequence next page.

1. Shut off engine.
2. Connect HEI Adapter to low cylinder Spark Plug Wire.
3. Select Peak Kilovolt and start engine.
4. Connect Secondary Pickup around low cylinder Spark Plug Wire.

Note reading.

RESULT		CAUSE, REMEDY
Reading very low or erratic	→	Inspect Spark Plug Wire for short to engine or replace Spark Plug Wire and repeat test. Continue with next step.
Reading still very low or erratic	→	Inspect Distributor Cap for Carbon Track.
Steady high reading	→	Suspect shorted or fouled Spark Plug.

STROBE TIMING INITIAL

PURPOSE:

To check initial timing and to check for worn distributor parts.

NOTE:

On traditional engines, timing should be checked whenever the dwell is adjusted. On engines with electronic ignition, timing should be checked whenever any electronic component is replaced.

PROCEDURE:

1. Disconnect and plug vacuum hoses at distributor. (Before disconnecting the vacuum lines on dual-action vacuum advance systems, mark the advance and retard hose for identification purposes).
2. Push strobe timing button "H".
3. For initial timing turn the advance thumb control knob on the timing light all the way counter clockwise. (Left meter should be reading zero).
4. Point timing light at the timing index near the harmonic balance wheel.
5. Run engine at slow idle-the timing mark on the harmonic balance wheel in relation to the timing pointer indicates initial timing. See manufacturer's specifications.
6. After timing #1 cylinder, move the #1 plug pickup from the #1 cylinder to the alternate firing plug.

NOTE: Follow the engine decal procedure.

NOTE:

Locate alternate plugs by placing the first half of firing order over remaining half. Alternate plug is under No. 1.

1-8-4-3
6-5-7-2

In this case, alternate cylinder is No. 6.

OBSERVE:

Initial Timing should be at manufacturer's specifications for rated RPM. Timing for the alternate cylinder should be within 3° variation of initial timing.

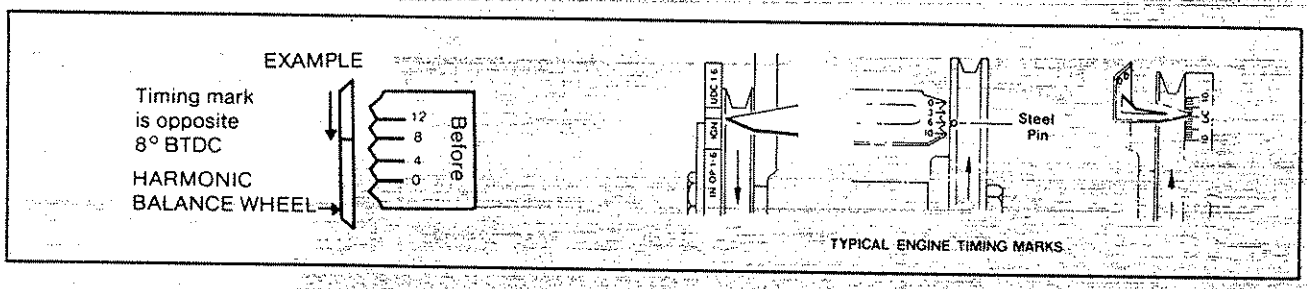

Figure 46

RESULT	→	CAUSE, REMEDY
Initial timing not at manufacturer's specifications.	→	Timing off-loosen and turn distributor while checking timing with light. (Remember to tighten distributor).
Alternate plug not within 3° of initial timing.	→	Distributor cam worn or eccentric-replace or repair.
Timing mark appears to "fanout" or "wander".	→	Possible pitted points, mis-aligned points, improper point spring tension, loose or worn breaker plate, worn distributor shaft or bushing, or worn distributor drive.

STROBE TIMING ADVANCE

PURPOSE:

To check timing mechanical and vacuum advance.

PROCEDURES:

1. Run engine at fast idle.
2. Turn the advance thumb control knob on the timing light all the way counter clockwise.
3. Point the timing light at the timing index.
4. Turn the thumb control knob clockwise until the timing mark returns to the initial timing position. Note degrees of Mechanical Advance on Left Meter degrees scale.
5. Reconnect vacuum lines at the distributor and adjust RPM to fast idle.
6. Point the timing light at the timing index.
7. Turn the thumb control knob clockwise until the timing mark returns to the initial timing position. Note degrees of total advance.
8. To determine Vacuum Advance, subtract Mechanical Advance from Total Advance.

OBSERVE:

Mechanical, and total timing advance on Left Meter degrees scale. Vacuum Advance can be easily calculated from the readings. Use manufacturer's specifications for advance at rated RPM to determine if timing should be corrected.

MECHANICAL TIMING ADVANCE

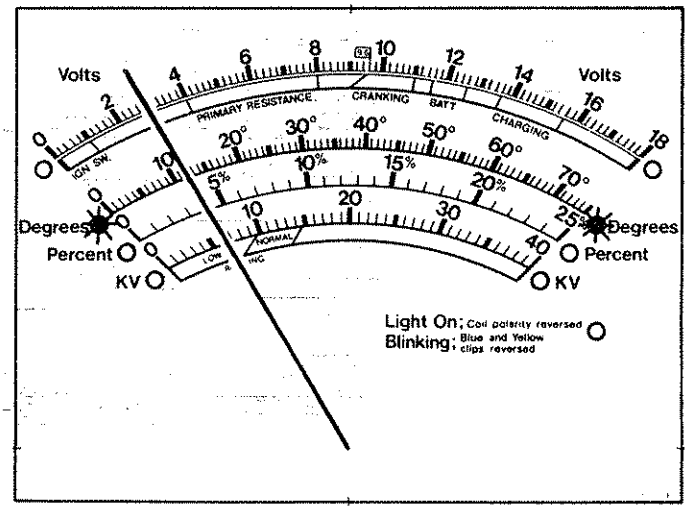

Figure 47

12° = MECHANICAL TIMING ADVANCE

TEST 17

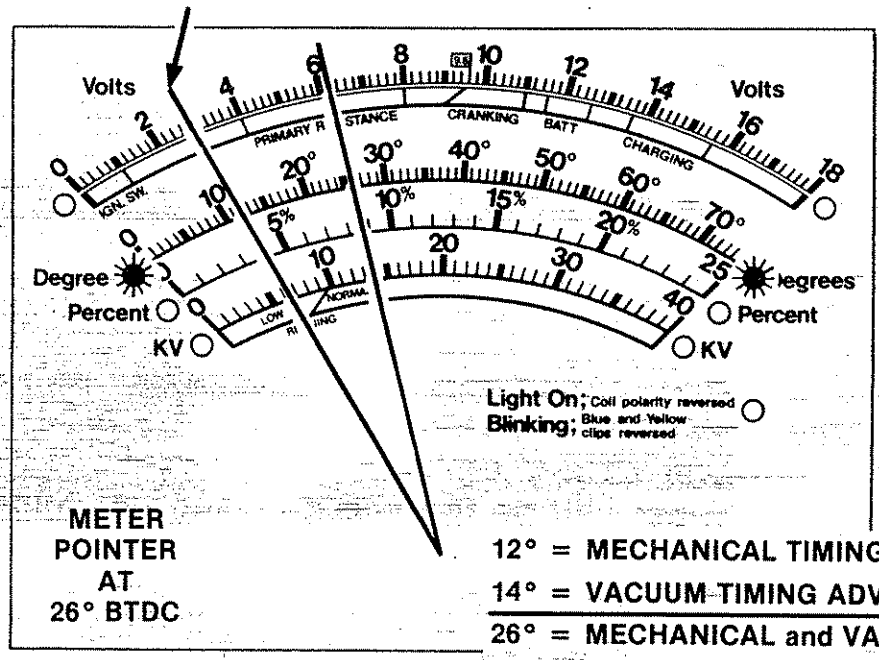

Figure 48

RESULT	→	CAUSE, REMEDY
Mechanical Advance incorrect for manufacturer's specifications at rated RPM.	→	Centrifugal mechanism faulty-check for weak control springs, over-strong springs, seized spindle, or broken parts.
Vacuum Advance incorrect for manufacturer's spec. at rated RPM.	→	Check for kinked, pinched, blocked or leaking vacuum hose. Check for manifold vacuum at carburetor. Check for defective distributor vacuum unit by providing unit with good vacuum source.

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MAGNETIC TIMING

PURPOSE:

To check the engine timing by using the magnetic timing probe.

PROCEDURE:

1. Push center button in offset button group "M" (button functions chart). The analyzer is automatically preset with a 9.5° offset.
2. If offset other than 9.5° is desired change the offset using the offset ▲ and ▼ buttons, according to the Magnetic Timing Reference Table. The degrees offset will be indicated on the left meter degrees scale. The magnetic timing offset is now set and will not change until tester is turned off.

MAGNETIC TIMING REFERENCE TABLE

MANUFACTURER	PROBE HOLDER OFFSET
General Motors	9.5°
American Motors	9.5°
Ford	45° 8 Cylinder
	52° 2.3 Liter 4 Cylinder
Chrysler	10°

3. Make sure magnetic probe is placed in probe holder on engine. On Ford engines, slip the flanged bushing over the magnetic probe. On Chrysler engines, use the split sleeve.

MAGNETIC TIMING ADAPTERS

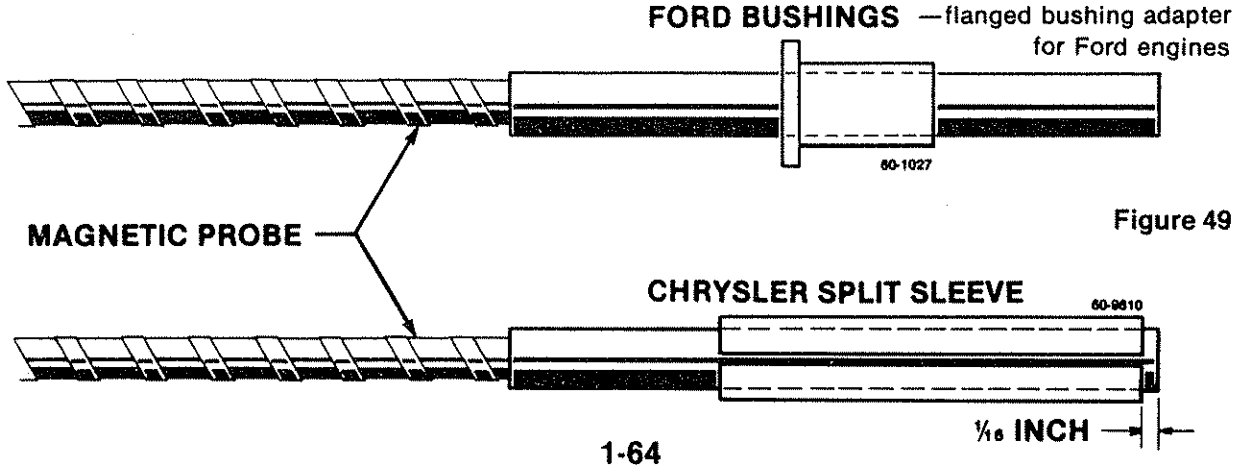


Figure 49

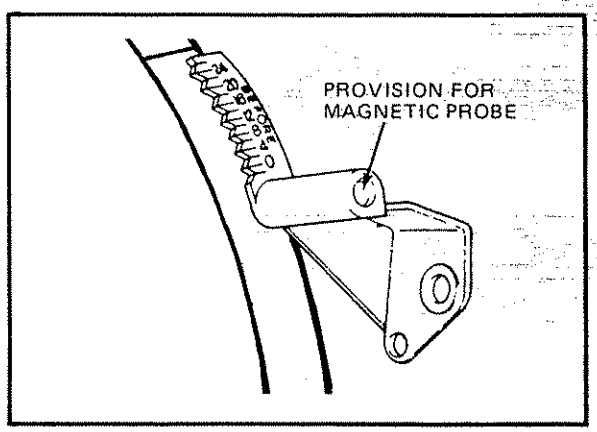
MAGNETIC TIMING

PROCEDURE: (continued)

4. Disconnect and plug the vacuum hoses at the distributor.
5. Push Magnetic Timing button "I".
6. Run engine at slow idle-Left meter degrees scale will indicate initial timing.
7. Increase engine RPM to fast idle-Left meter will now indicate initial plus mechanical.
8. Reconnect vacuum hoses to distributor and adjust engine RPM to fast idle-Left meter will now indicate total degrees timing advance.

OBSERVE:

Initial, initial plus mechanical, and total timing advance on left meter degrees scale. Mechanical and vacuum timing can be easily calculated from the readings. Use manufacturer's specifications for advance at rated RPM to determine if timing should be corrected.



EACH MANUFACTURER USES A DIFFERENT PLACEMENT FOR THIS TIMING PLATE AND DIFFERENT OFFSET DEGREES.

AMC/CHY	10°	NOTCH
GM	9.5°	NOTCH
FORD*	26.2°	4 CYL. NOTCH
	69.5°	V8'S & 6'S NOTCH
	55.5°	PEG
	135.0°	200 & 250 & SOME V8'S NOTCH
	52.5°	2300CC NOTCH

*EACH FORD ENGINE PLANT SETS THEIR OWN OFFSET FIGURES.

Example of magnetic initial, mechanical, and vacuum advance timing.

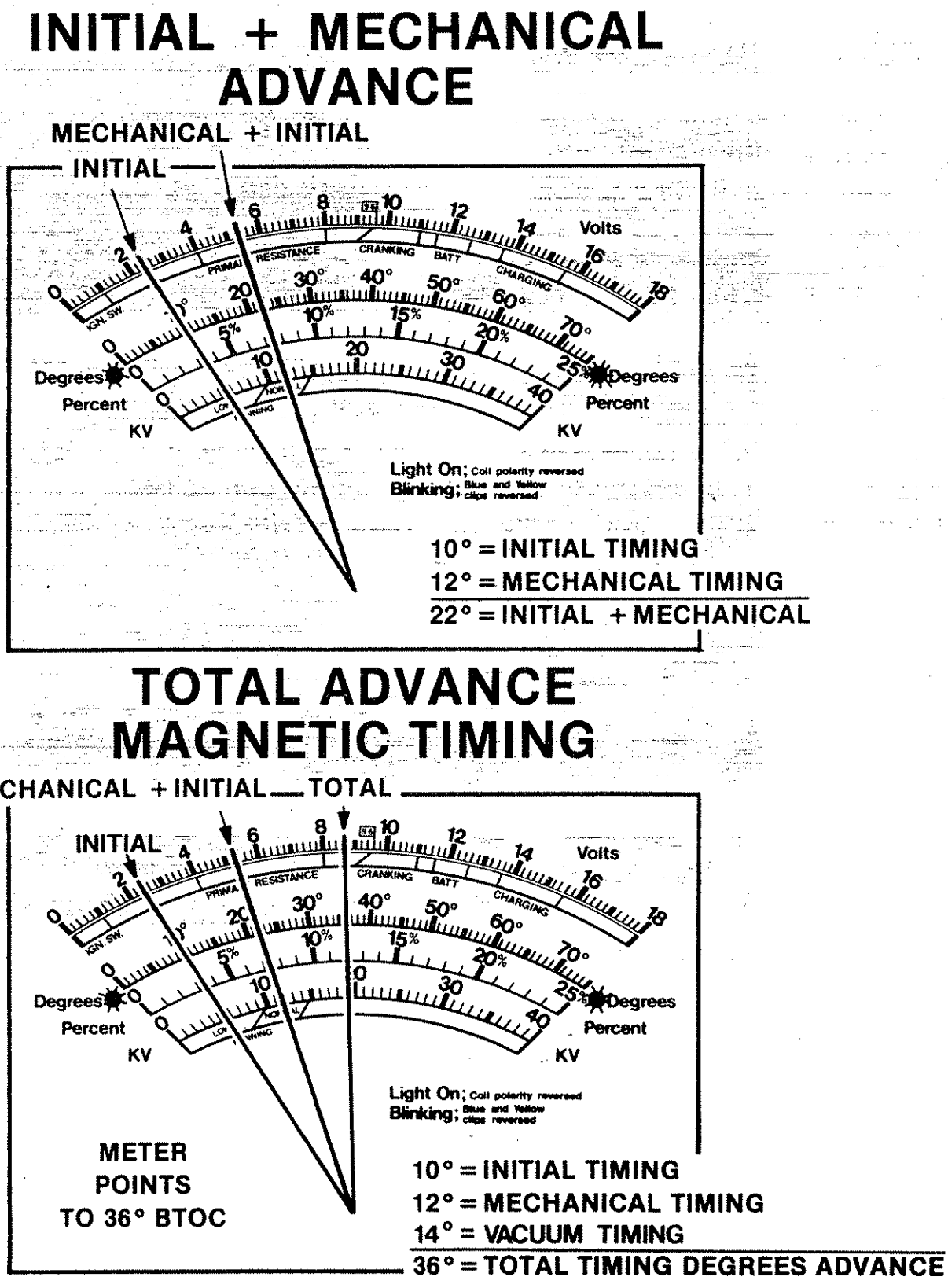


Figure 50

RPM
FINE ADJUST

PURPOSE:

To indicate fine adjustment of RPM during carburetor balance and carburetor adjustment.

PROCEDURE:

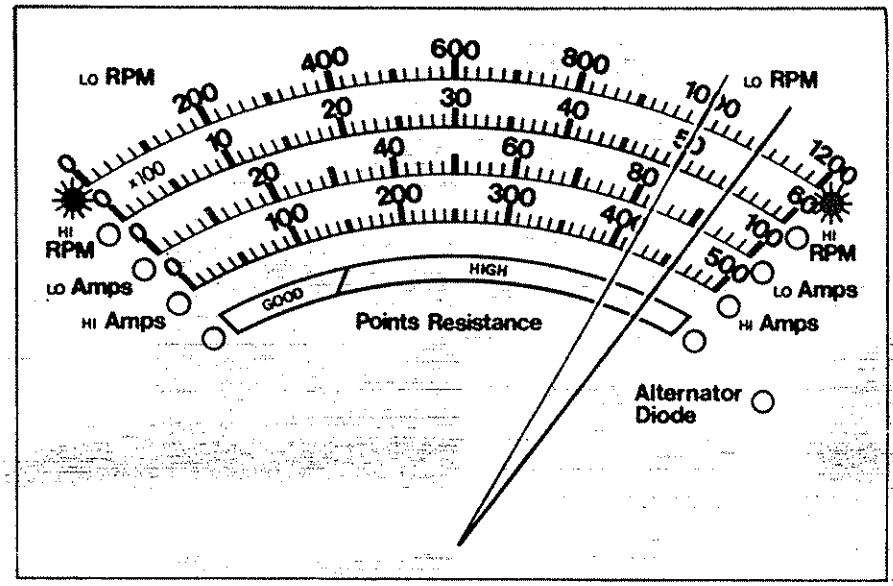
1. Run engine at desired RPM range for carburetor adjustment, etc.
2. Push RPM Fine Adjust button "J".
3. Adjust carburetor to peak RPM.

OBSERVE:

RPM on right meter. Left meter indicates percentage change in RPM from time button was pushed. To reset percentage to zero, push button again.

NOTE:

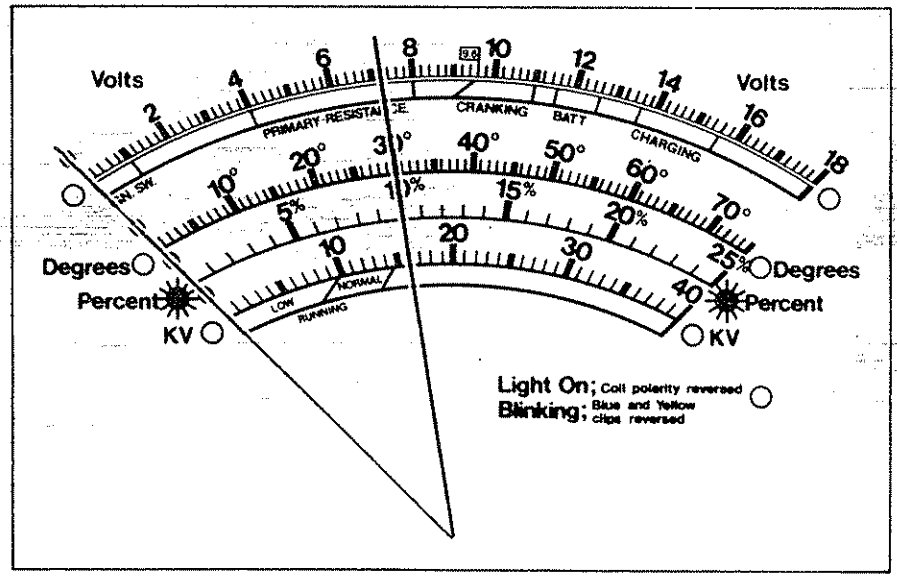
Blinking lights on percentage scale means the engine RPM decreased from the time the fine RPM adjust was pushed. Solid lights mean positive (+) percentage change.



100 RPM INCREASE

Right Meter

Figure 51



10% INCREASE IN RPM

Left Meter

Figure 52

VACUUM GAUGE TESTS

Properly used, the analyzer **vacuum gauge can provide much information about the internal condition of an engine.** But its easy to misread. To avoid mistakes remember that **it is more important to note the action of the gauge needle than reading the number on the dial.** In all cases, engine vacuum must be at least 18 to 20 inches... if not, there's a vacuum problem requiring correction.

NORMAL ENGINE

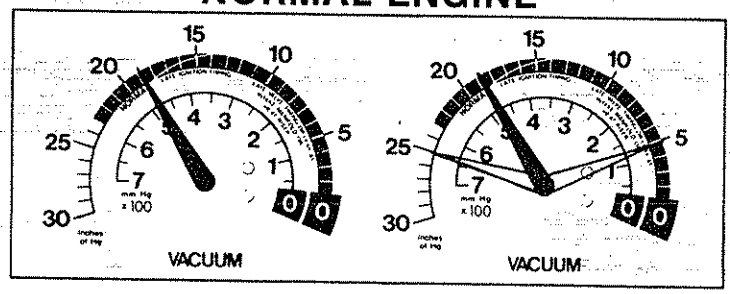


Figure 53

NORMAL ENGINE ...

Normal engine vacuum at idle is 18 to 20 inches. Suddenly opening and closing the throttle should show a drop below 5 inches then up to 25 inches.

LEAKING PISTON RINGS

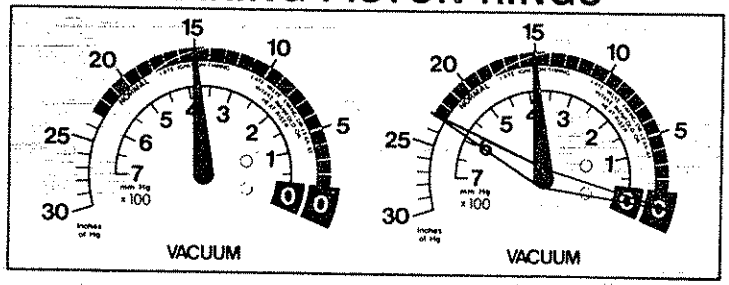


Figure 54

LEAKING PISTON RINGS...

If the piston rings are leaking, the vacuum gauge will behave like a normal engine except that at idle the vacuum will be 3 or 4 inches lower and when the throttle is suddenly opened and closed the needle may drop to zero and bounce back to around 22 inches. A compression test will verify that a piston ring is leaking.

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CARBURETOR ADJUSTMENT

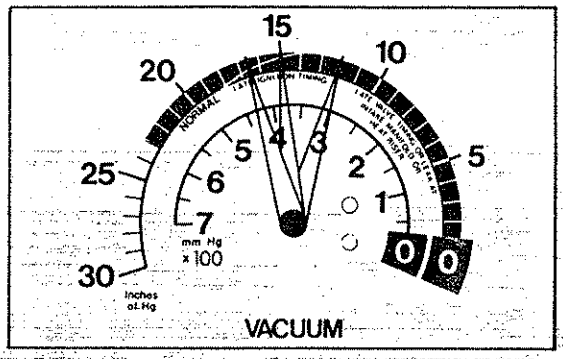

Figure 55

CARBURETOR ADUSTMENT...

A faulty carburetor adjustment will cause the needle to slowly float or fluctuate over a range of 4 to 5 points.

SPARK PLUG GAPS

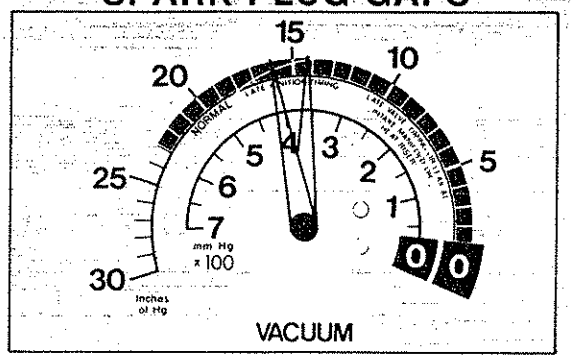

Figure 56

SPARK PLUGS...

A needle fluctuation over a narrower range, about 2 points, indicates that the spark plug gaps are too close.

VALVE ACTION

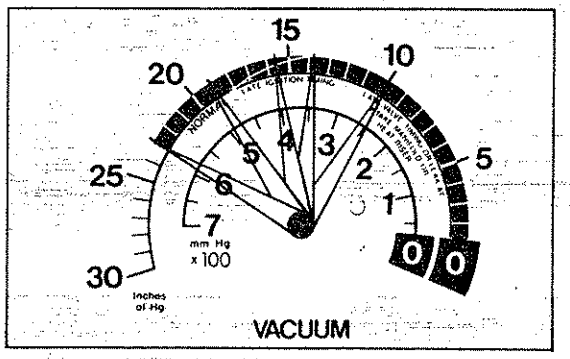

Figure 57

VALVE ACTION...

If the needle vibrates rapidly at idle speed, the intake valve guides are probably worn. If the needle vibrates rapidly when the engine is accelerated, one or more of the valve springs are weak. A regular vacuum drop is an indication of a burned or leaking valve. An occasional drop of 3 to 4 points indicates that the valves may be sticking.

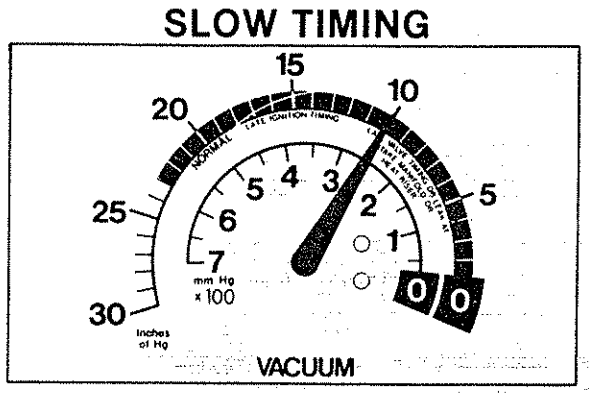

Figure 58

SLOW TIMING...

Slow timing could be the problem if engine compression is good and yet the needle indicates low. Slow valve timing or a carburetion problem could also be the cause.

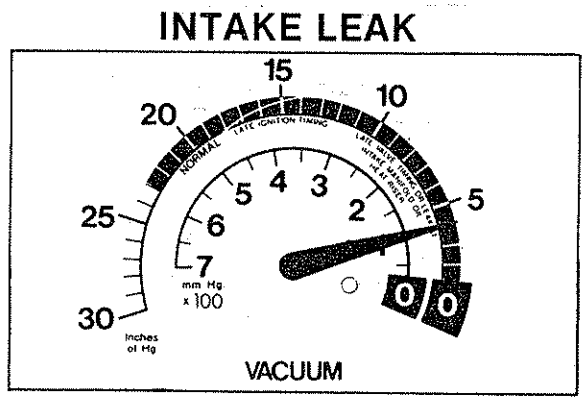

Figure 59

INTAKE LEAK...

An extremely low but steady reading is an indication of a possible air leak in the carburetor, intake manifold or gaskets ...check the manifold heat valve, bolts, carburetor bolts, fuel and vacuum connections. **The PCV, a clogged fuel filter or a plugged exhaust pipe could be at fault.**

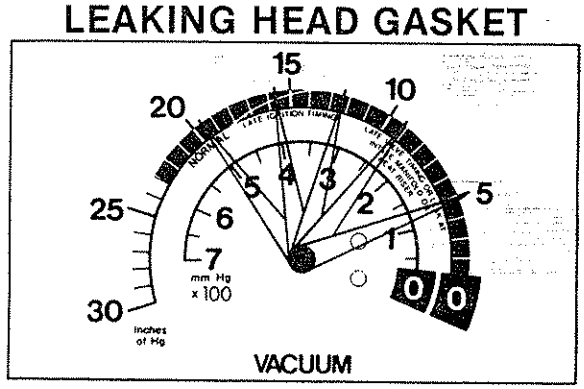

Figure 60

LEAKING HEAD GASKET...

If the needle fluctuates regularly between a high and low reading, the cylinder head gasket has blown-out between two adjacent cylinders. **Confirm this with a compression test.**

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INTRODUCTION TO MAINTENANCE

The Diagnostic Analyzer represents the finest in workmanship and materials available. It has been designed to provide many years of trouble-free, highest quality tune-up and testing service.

Just as the Programmed Test Sequence is designed to quickly and effectively "zero in" on an engine fault, the Analyzer's MODULE DESIGN is engineered to make troubleshooting, maintenance, and repair a quick and easy process. Each module can easily be removed to check electrical connections, replace batteries, or (if needed) troubleshoot the analyzer to determine which area is causing a problem.

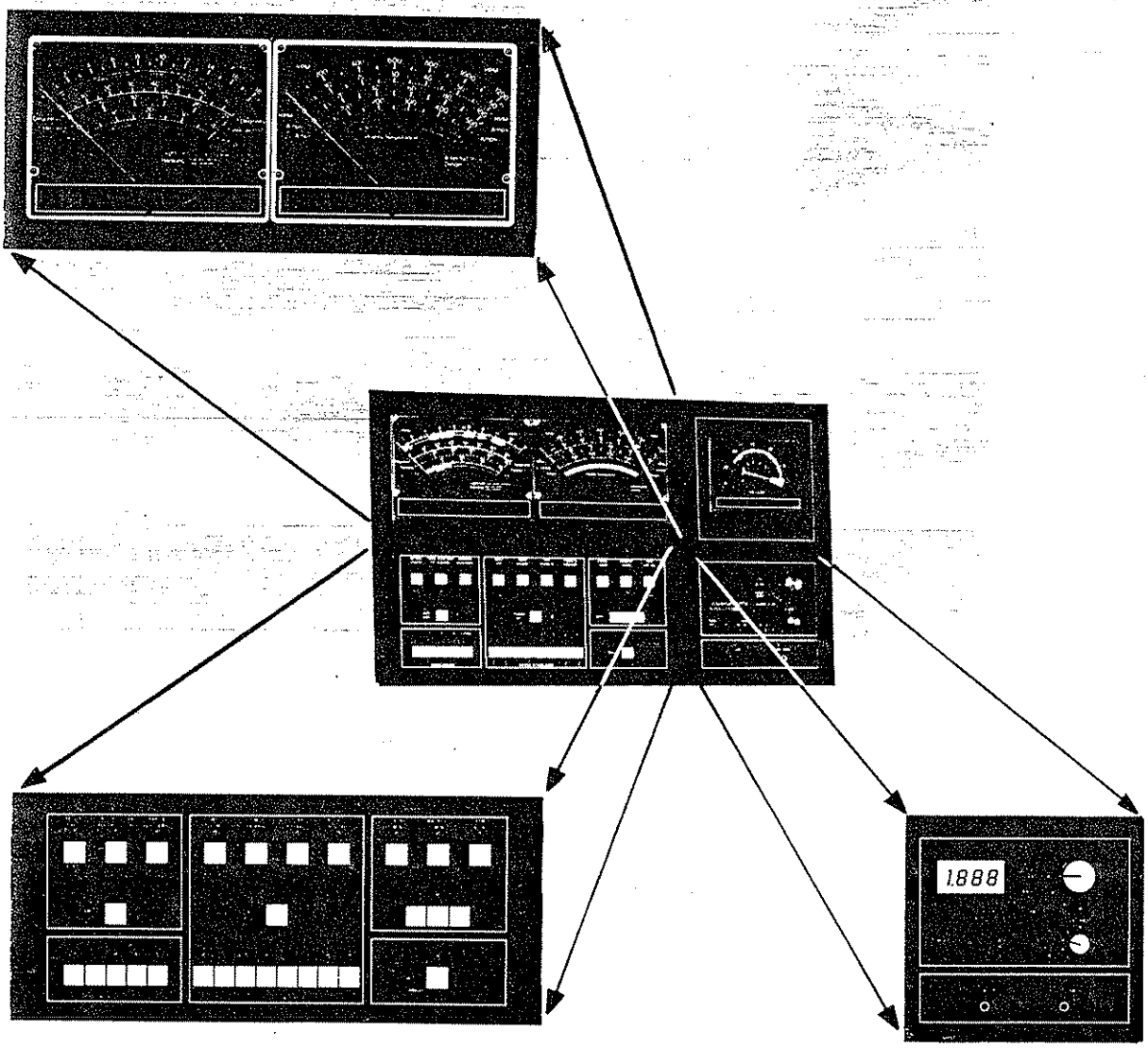


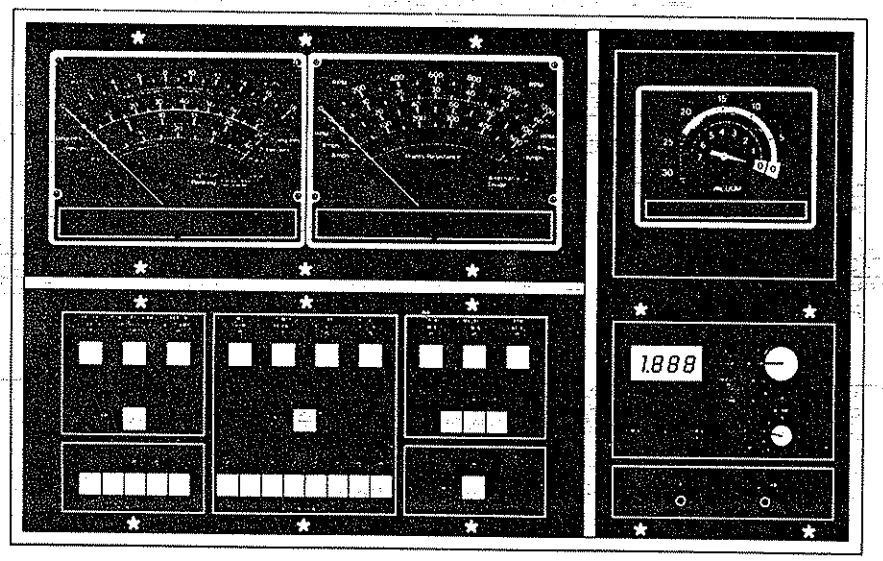
Figure 61

MODULE REMOVAL

If batteries need replacement, or a harness connector or module problem is suspected, it will be necessary to remove a module from the console as follows:

Release the module latches by pulling on the small black plunger knobs. The plunger knobs will "pop out" about 1/4". When all the knobs for the module are "popped out" the latches are released and the module can simply be lifted out of the console.

Meter Module has 6 latches
Switch Module has 6 latches
Components Module has 4 latches



★ (16) Latches

Figure 62

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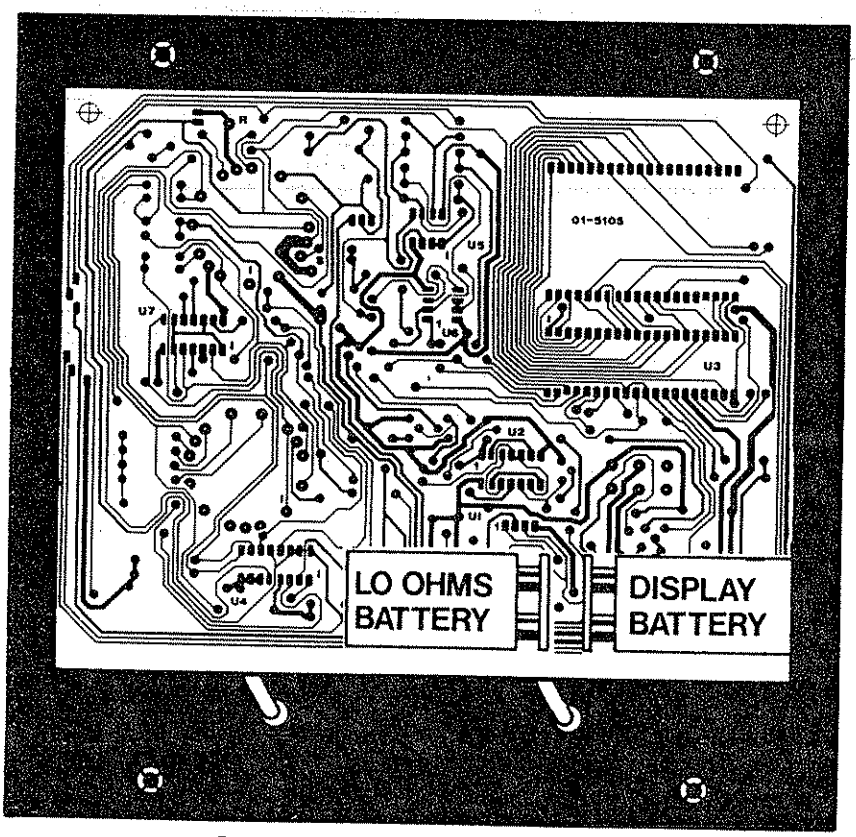
BATTERY REPLACEMENT

The Components Analyzer is powered by two 9V batteries. If either of the batteries runs down a LO BAT indication will be displayed on the digital display.

To check for a bad Display Battery, turn on the Components Analyzer and place the test selector in the D.C. Volts, Pickup Output, or HI Ohms position. If LO BAT appears, replace the Display Battery.

To check for a bad LO Ohms Battery, turn on the Components Analyzer and place the test selector in the LO Ohms position. If LO BAT appears, replace the LO Ohms Battery.

Replace batteries by removing the Components Analyzer Module (4 latches). The batteries are found on the back of the circuit board.



Components Module (Rear View) Figure 63

TROUBLESHOOTING (Preliminary Checks)

Should you have a problem with your Diagnostic Engine Analyzer at any time in the future, always perform the following preliminary checks before continuing with troubleshooting.

1. Make sure that the hook-up is complete and correct.
2. Make sure switch panel and meter lights are operating.
   A). If no lights will come on including the power light, 12 volt power is not reaching the Analyzer. Check the battery, cables, and all connections. Remove corrosion, etc.

   B). If the power light will light, but all others will not, inadaquate power is reaching the Analyzer. Undercharged battery or poor connections are likely causes.

TROUBLESHOOTING

If the preliminary checks do not solve the problem with your Analyzer it will be necessary to take a step-by-step approach to troubleshooting. The troubleshooting procedure should proceed as follows:

1. Determine which test(s) are not operating properly.
2. Determine which button(s) are common to the test(s) not operating properly.
3. Determine which leads are in use when these button(s) are pushed.
4. Go to the Leads Troubleshooting section of MAINTENANCE, and follow the step-by-step procedure for checking every lead used in test(s) determined above.
5. If any certain lead fails to be operating properly, remove the Switch Module from the analyzer and check that lead's connector contact to the processor board. (See Processor Board Connector Identification).
6. If no lead seems to be malfunctioning, the Switch Module is suspect of failing.
7. If only one of the analyzer meters is operating (Voltmeter-Left, Ampmeter-Right), determine whether the meter or the Switch Module has failed by the following:
   A). Remove the Meter Module from the console and disconnect the white and black connectors.
   B). To determine if the Meter or the Switch Module is at fault, connect the black and white connectors in reverse.
   C). If the problem meter now operates (lights and scales will be incorrect, of course) and the other does not, the fault is in the Switch Module.
   D). If the problem meter still fails to operate, the Meter Module is at fault.
   E). If both Meters now operate, the fault is in the connectors. Check connectors for corrosion.

For help in Analyzer Troubleshooting or hook-up, use the Hotline for free answers. This free service is offered to all customers.

Call Toll Free - Dial 800-252-9880.

Ask for the Technical Service Manager and tell him the problem.

*Michigan call 800-632-5090

TROUBLESHOOTING
(LEADS)

BATTERY LEADS

To check battery leads, connect leads to a known good 12V battery. Push power button on tester. If the power light comes on the battery leads are OK. If the power light will not light, the battery leads are suspect.

NO. 1 PICKUP LEAD (SYNC. PROBE)

With the analyzer properly hooked up to an engine, remove the Coil (-) Lead and the Magnetic Timing probe from the engine. Push RPM button "D" and run engine. If RPM is indicated and steady on the meter, the Sync. Probe Lead is O.K. If RPM is not indicated or steady on the meter, the Sync. Probe Lead is suspect of failure.

MAGNETIC TIMING PROBE LEAD

With the analyzer properly hooked up to an engine, remove the Coil (-) Lead and the No. 1 pickup (Sync. Probe) from the engine. Push RPM button "D" and run engine. If RPM is indicated and steady on the meter, the Mag. Timing Lead is OK. If not, the Mag. Timing Lead is suspect of failure.

COIL (-) LEAD

With the analyzer properly hooked up to an engine, remove the Magnetic Timing Probe and No. 1 pickup lead from the engine. Push RPM button "D" and run the engine. If RPM is indicated and steady on the meter, the Coil (-) Lead is OK. If not, the Coil (-) Lead is suspect of failure.

COIL (+) LEAD

With the analyzer properly hooked up to an engine, push Points Resistance button "B". Disconnect the Coil (+) Lead from the Coil (+) Terminal and connect it to the Battery (+) Terminal. Meter should read 0 volts on 0-18 volt scale indicating that Coil (+) Lead is OK. If meter does not read 0 volts the Coil (+) Lead is suspect of failure.

SECONDARY PICKUP LEAD

With the analyzer properly hooked up to an engine, if improper or erratic readings are observed in Kilovolt test, the secondary pickup is suspect of failure. If either the Traditional Pickup Adapter or the HEI Pickup Adapter cause improper readings, only that adapter is suspect. However, if both adapters cause improper readings, the main Secondary Pickup Lead is probably causing the problem.

TIMING LIGHT LEAD

With the analyzer properly hooked up to an engine, push the Strobe Timing button "H". If RPM is indicated and stable (engine running) and yet the timing light will not flash (trigger pulled), the Timing Light Lead is suspect of failure. If RPM is not indicated or not stable, the Coil (-) or #1 Pickup (Sync. Probe) Leads may be the problem.

CURRENT PROBE LEAD (Clamp Amp)

With the analyzer properly hooked up to an engine, push the Battery Starter button "A". Always make sure the Clamp Amp is zeroed with thumb slide closed, and away from battery cables, alternator, etc. When engine is cranked on a known good cranking system, and the amps indication is improper, the Current Probe Lead is suspect.

PROCESSOR BOARD CONNECTOR IDENTIFICATION

LEAD IDENTIFICATION LIST

PART NO.	DESCRIPTION	CONNECTOR	PART NO.	DESCRIPTION	CONNECTOR
01-5115	TIMING LIGHT	6 PIN WHITE	01-5120	SYNC. PROBE	4 PIN WHITE
01-5116	BATTERY	6 PIN BLUE	01-5121	CURRENT PROBE	6 PIN BLACK
01-5117	COIL NEGATIVE	4 PIN BLUE	01-5122	MAG. TIMING	6 PIN RED
01-5118	COIL POSITIVE	4 PIN RED		VOLT METER	9 PIN WHITE
01-5119	SECONDARY	4 PIN BLACK		AMP METER	9 PIN BLACK

60-5262

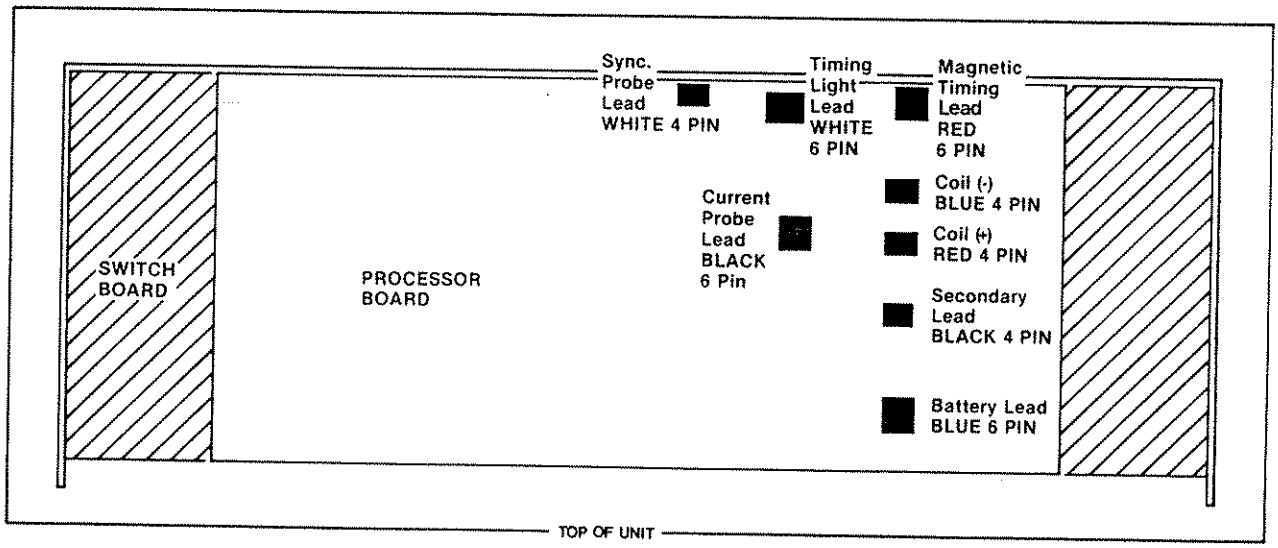


Figure 64

SWITCH MODULE

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METER MODULE CONNECTOR IDENTIFICATION

Volt Meter (Left) - 9 PIN WHITE Connector
Amp Meter (Right) - 9 PIN BLACK Connector

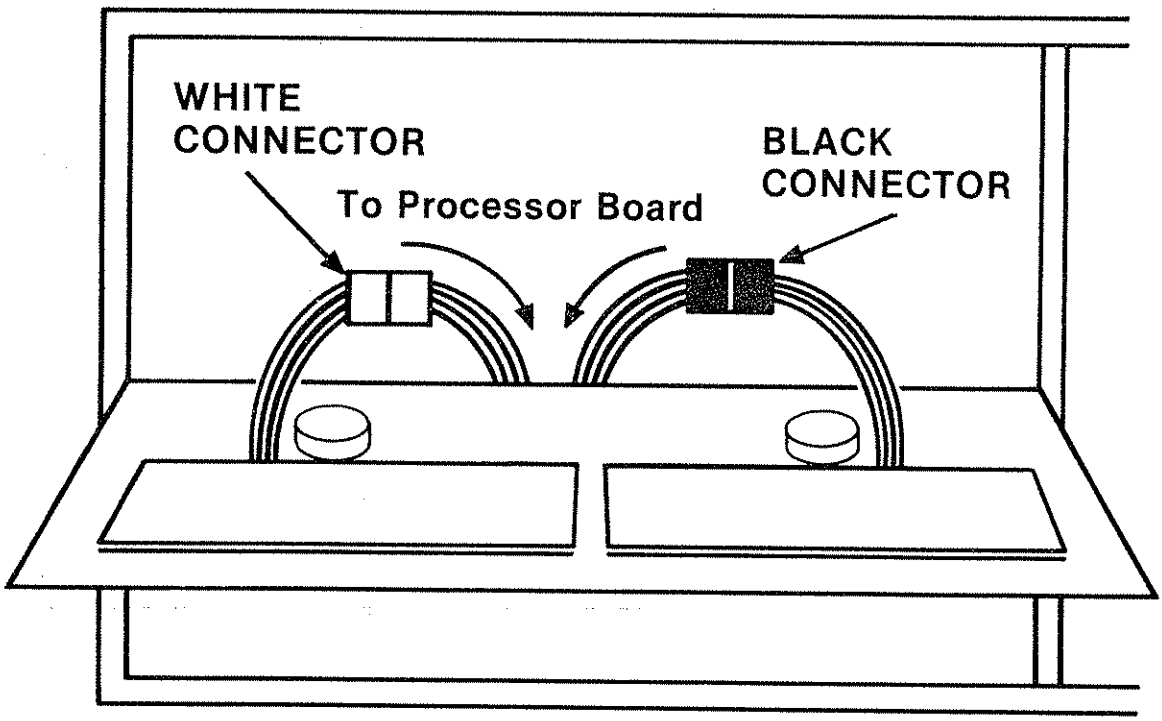


Figure 65

CLEANING THE DIAGNOSTIC ANALYZER

The Diagnostic Analyzer can keep its new appearance if it is cleaned regularly with a soft cloth and warm soapy water. CAUTION: Do not use degreasers or strong solvents.

TECHNICAL SERVICE INFORMATION

Call Toll Free for instant answers to:

1. Factory Specifications for approved Tune-Up.
2. Technical help for trouble-shooting Tune-Up problems.
3. Proper use and hook-up of Kal instruments.
4. Latest data on Emission Control maintenance and service.
5. A personal contact with the factory should a Kal tester need repair or calibration.

Just dial **800-253-9880*** Toll Free anytime between 7:30 A.M. and 5:00 P.M. Eastern Time Monday thru Friday. Ask for the Technical Service Manager and tell him the problem.

*Michigan - call 800-632-5090

FACTORY SERVICE ...

If the occasion arises whereby the analyzer requires service, the following details are listed with the intention they will be used as a guide to help expedite service.

1. Always list the Model and Serial number. Attach a note to the unit with a brief message listing the problem(s).

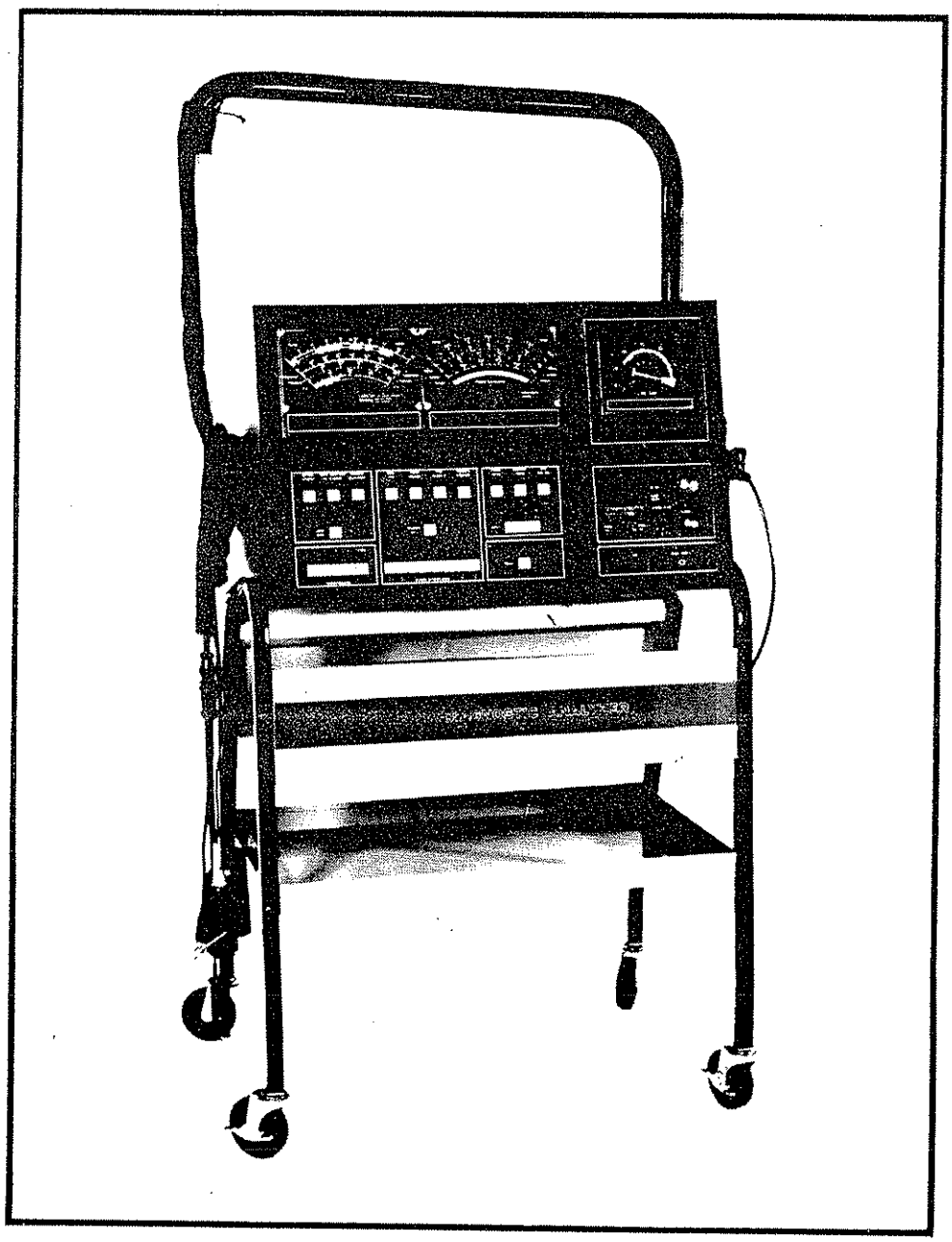
2. PACKING FOR SHIPMENT - Packing any analyzer so it will arrive at its desitnation without shipping damage is important.
   A. Shipping damage may cause a delay in the return of the unit as well as the added expense.
   B. Shipping damage is claimed in two categories:
      1. **Visual Carton Damage:** This type of claim is made with the carrier.
      2. **Concealed Damage:** This type must be referred to the sender.

GOOD PACKING WILL AVOID SHIPPING DAMAGE AND ADDED EXPENSE.

II

DIAGNOSTIC SECTION

DIAGNOSTIC ENGINE ANALYZER



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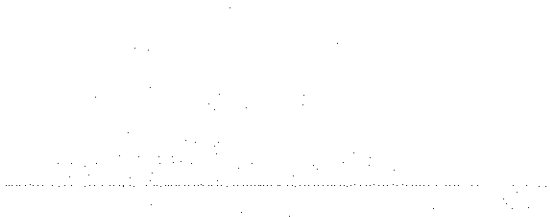

WARNING!

IMPORTANT OPERATING & SAFETY NOTES ... READ BEFORE PROCEEDING WITH TESTS

1. **Always** work in a well ventilated area ... **Never** start a vehicle's engine in an enclosed area.
2. **Never** smoke or allow any other open flame to come within 25 feet of the vehicle being tested.
3. **Always** insure that **everyone** within close proximity of the vehicle being tested is **correctly** wearing approved safety/protective glasses before proceeding with any testing or adjustments.
4. **Always** insure that the vehicle's engine is turned **OFF** when connecting or disconnecting any and all test equipment.
5. **Never** stand in front of the vehicle while testing.
6. **Always** insure that the tester's black grounding clip is connected **first** during hook-up and that it is disconnected **last** when testing is completed.
7. **Always** exercise **extreme** caution to insure that hands, arms, clothing and tester leads are kept well away from **ALL** moving engine parts.
8. Because the battery may produce highly explosive gases, it is extremely important that you carefully observe the following precautions:
   A. **DO NOT** smoke or allow any other open flame or spark within 25 feet of the battery.
   B. **NEVER DIRECTLY CONNECT THE POSITIVE AND NEGATIVE** battery post together with any single conductive material (such as a screwdriver, jumper lead, etc.), as this will cause a short circuit and spark which could result in an explosion.
9. Battery acid and corrosion can be extremely dangerous and **MUST BE DEALT WITH VERY CAREFULLY.**
   A. **DO NOT** allow battery acid or corrosion to come in direct contact with skin or eyes ... If it does, thoroughly wash skin with warm, soapy water **IMMEDIATELY** and/or rinse eyes with clear water for 15-20 minutes ... **CONTACT PHYSICIAN IMMEDIATELY.**
   B. Extreme caution must be exercised to avoid ingestion of battery acid or corrosion ... If ingestion does occur, drink large quantities of milk **(DO NOT INDUCE VOMITING). CONTACT PHYSICIAN IMMEDIATELY.**
10. Tremendous back pressure can be developed in the radiator, and taking the radiator cap off improperly can result in a sudden release of scalding hot water, and subsequent serious burns. You **MUST** refer to proper vehicle manufacturer's service manual for correct procedure.

Due to the inherent dangers associated with even the simplest automotive maintenance procedures, the manufacturer and all parties involved in the distribution and/or sale of this automotive test product will NOT be held liable or responsible, wholly OR partially, for ANY injuries, damages or claims resulting from the performance of testing or adjustment procedures included in this instruction guide and/or the use of this automotive test product.

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CONTENTS II

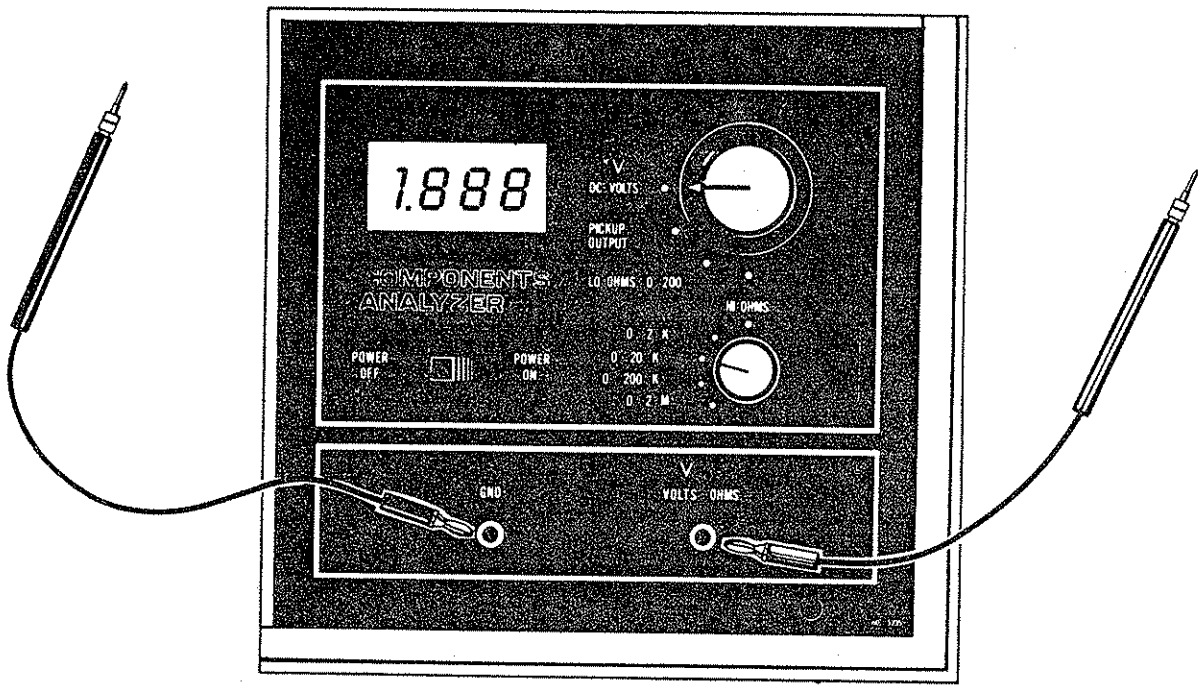
COMPONENTS TESTING - GENERAL

Late model cars equipped with electronic ignition that won't start, start hard, or run rough, should be tested using the specific components tests procedures listed for that system. If is not necessary to perform these components tests as a part of every regular tune-up... but when an electronic component problem is suspected, they will prove to be valuable in pinpointing the problem.

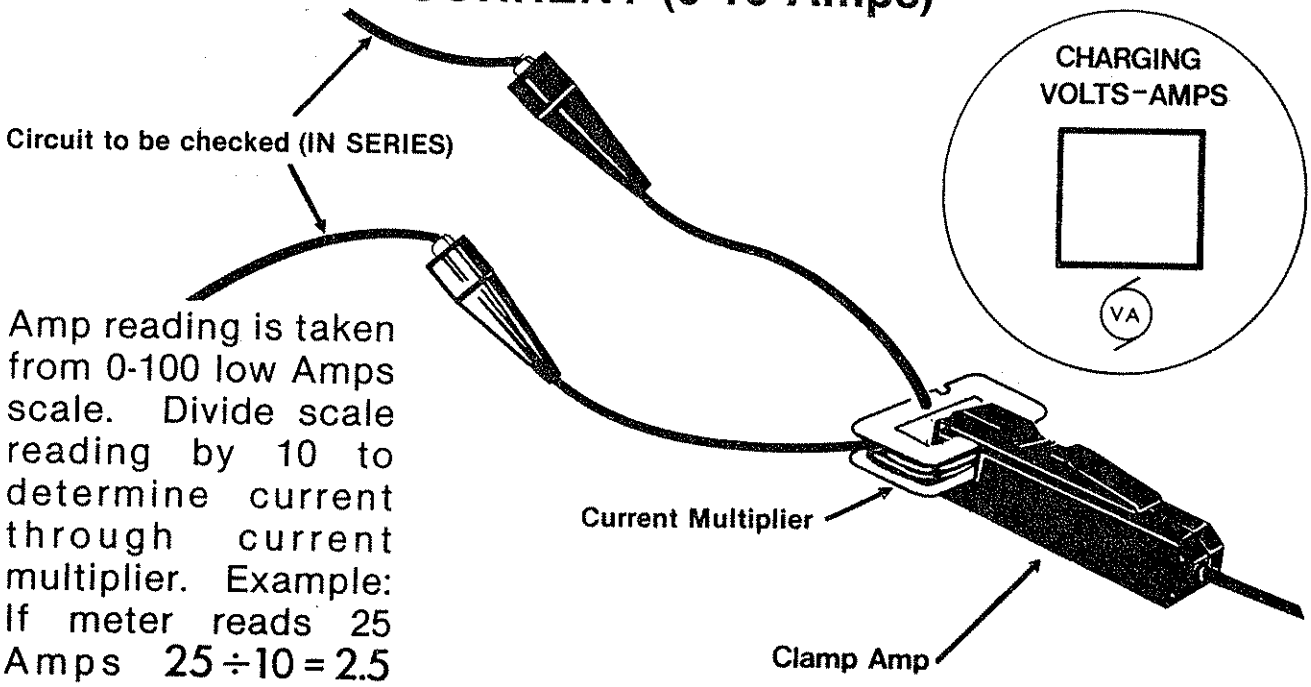
Step-by-step test procedures have been included in this operators section for most O.E.M. electronic ignition systems, and analyzer selector positions and test points have been specified for each. In addition, the analyzer can also be used for components testing on "add-on" retrofit electronic ignition systems (using the manufacturer service manual). For all regular-external volts-amps-ohms testing, utilize the analyzer as follows:

TEST	SELECTOR POSITION	SCALE(S)	LEADS	APPLICATION
D.C. Voltage	D.C. Volts	0-20VDC	Components Red (+) Black (-)	D.C. Voltage measurement
Pickup Coil	Pickup Output	0-20 V P-P	Components Red and Black	P-P Voltage output of pickup coil
Resistance	Lo Ohms	0-200	Components Red and Black	Low resistance, Diode check
	Hi Ohms	0-2K 0-20K 0-200K 0-2M	Components Red and Black	High resistance measurements
Lo Amps	Charging Volts-AMPS (Engine Analyzer)	0-10 Amps (0-100 Amp) (Scale ÷10)	Current Multiplier with clamp Amp attached	Low current measurement

TESTING: D.C. VOLTS, PICKUP COIL, RESISTANCE, and DIODE CHECK



TESTING: LOW CURRENT (0-10 Amps)



Amp reading is taken from 0-100 low Amps scale. Divide scale reading by 10 to determine current through current multiplier. Example: If meter reads 25 Amps $25 \div 10 = 2.5$ Amps through circuit under test.

ELECTRONIC IGNITION — GENERAL OPERATIONAL CONCEPT

In order to thoroughly understand how electronic, solid-state and transistorized ignition systems function, it's important to first understand how "conventional" breaker point ignition systems function.

While the engine is running, primary low voltage travels from the battery through the solenoid and ignition bypass circuit to the coil positive terminal. While the points are closed, it continues through the coil primary and points, to point ground, causing an electronic field to "build up" in the coil primary. When the rotating distributor shaft cam forces the points open, the circuit is interrupted, the coil field collapses, and firing voltage is induced in the coil secondary. This firing voltage is then transmitted through the coil high tension wire, distributor cap center tower, rotor, spark plug wire, and spark plug where ignition occurs.

An almost identical process occurs with electronic ignition. The basic difference is the way that the primary circuit is interrupted ... **Mechanically** with "conventional" system contact points, and **electrically** in electronic ignition **without** contact points.

In general terms, electronic ignition systems incorporate a gear-shaped **reluctor** (or trigger wheel, armature, etc.) mounted on and rotating with the distributor shaft; a stationary **pick-up coil** assembly (or electronic sensor, etc.); and an **electronic control module.**

As each reluctor "tooth" rotates **away** from direct alignment with the pick-up coil, voltage travels through the primary circuit (as when the contact points **close** in conventional ignition). When each "tooth" **aligns** with the pick-up coil, a voltage pulse is created and transmitted to the control module switching transistor. The switching transistor then "turns-off" and interrupts the primary circuit (as when contact points are open in conventional ignition), firing voltage is induced in the coil secondary, and ignition occurs. Since dwell time, or the length of time the switching transistor is "on" and "off," is electronically predetermined in the control module circuitry, **dwell is not adjustable.** (On certain AMC/IHC models equipped with BID ignition, dwell can be adjusted by changing pick-up coil air gap.)

IMPORTANT NOTE: The various vehicle manufacturers incorporate unique electronic ignition components and testing sequences. These manufacturers testing sequences must be followed to accurately trouble shoot the system. Refer to the appropriate vehicles manufacturers service manuals for these testing sequences. See samples on next page.

ENGINE CRANKS, BUT WILL NOT RUN WITH REMOTE COIL

2-15-81

NOTE: PERFORM DIAGNOSTIC CIRCUIT CHECK BEFORE PROCEEDING WITH THIS TEST.

NOTE: IF A TACHOMETER IS CONNECTED TO THE TACHOMETER TERMINAL, DISCONNECT IT BEFORE PROCEEDING WITH THE TEST.

1. CHECK SPARK AT PLUG WITH ST-125 WHILE CRANKING (IF NO SPARK ON ONE WIRE, CHECK A SECOND WIRE.)

- SPARK → CHECK FUEL, SPARK PLUGS ETC.
- NO SPARK → 2. CHECK FOR SPARK AT COIL WIRE WITH ST-125 WHILE CRANKING. LEAVE ST-125 CONNECTED TO COIL WIRE FOR STEPS 3-7.

2.
- SPARK → • INSPECT CAP FOR WATER, CRACKS, ETC. IF OK, REPLACE ROTOR.
- NO SPARK → 3. REMOVE DIST. CAP WITH IGNITION ON. CHECK VOLTAGE AT "+" TERM. ON DIST. MODULE. SEE FIGURE 1.

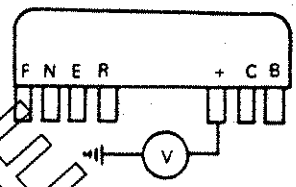


FIG. 1

3.
- 10 VOLTS OR MORE → 4. WITH IGN. ON, CHECK "C" TERM. VOLTAGE ON HEI MODULE. SEE FIGURE 2.
- UNDER 10 VOLTS → REPAIR WIRE FROM "+" TERM. ON MODULE TO IGN. COIL "+" CONNECTION AT IGN. COIL AND PRIMARY CIRCUIT TO IGN. SWITCH.

4.
- UNDER 1 VOLT → IT IS OPEN OR GROUNDED LEAD FROM COIL TO DIS. "C" TERM., CONNECTION OR IGN. COIL OR OPEN PRIMARY CIRCUIT IN COIL.
- 10 VOLTS OR MORE → 5. REMOVE PICK-UP COIL CONNECTOR FROM MODULE. CHECK "C" TERM. VOLTAGE WITH "IGN" "ON". WATCH VOLTMETER AS TEST LIGHT IS MOMENTARILY CONNECTED FROM BAT. + TO MODULE TERM. "P", NOT MORE THAN 5 SEC. SEE FIGURE 3.
- 1 TO 10 VOLTS → REPLACE MODULE AND CHECK FOR SPARK FROM COIL AS IN STEP 6.
  - SPARK → SYSTEM OK
  - NO SPARK → REPLACE IGN. COIL, IT TOO IS FAULTY.

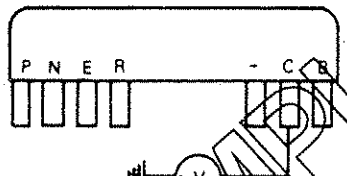


FIG. 2

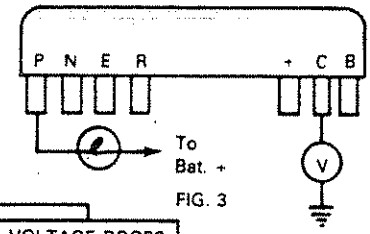
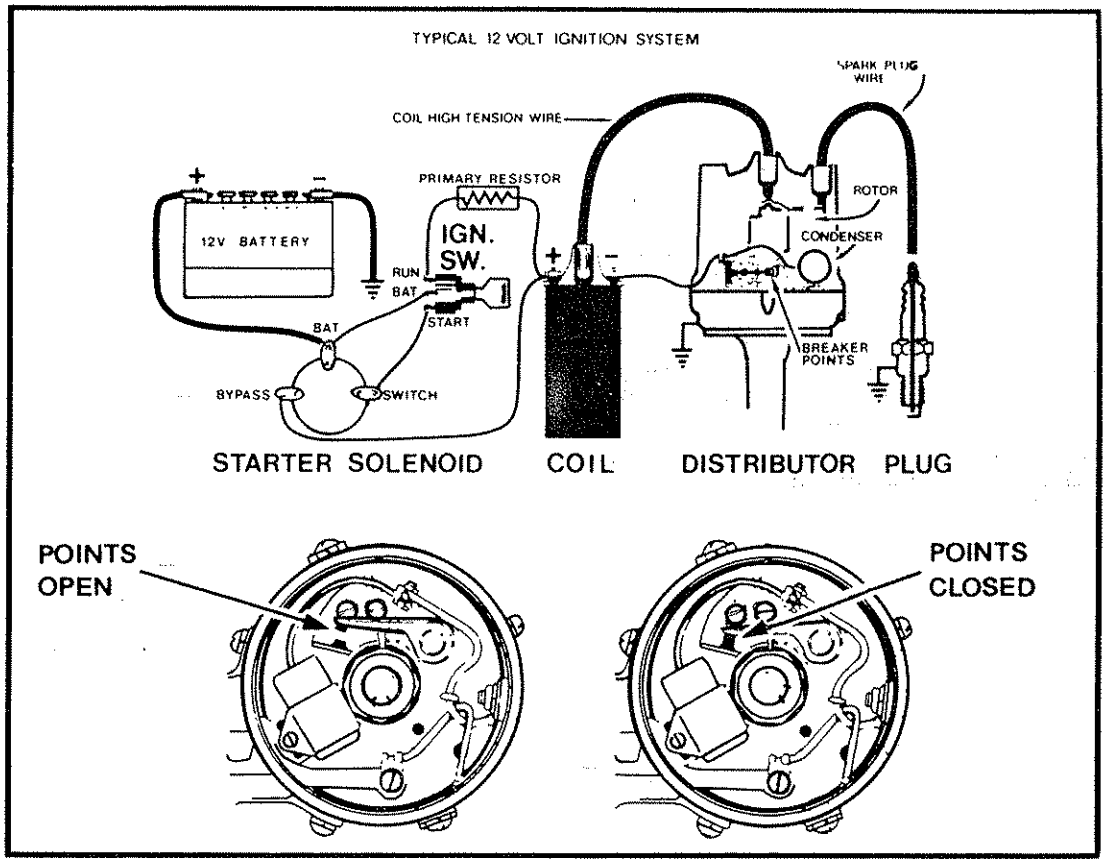
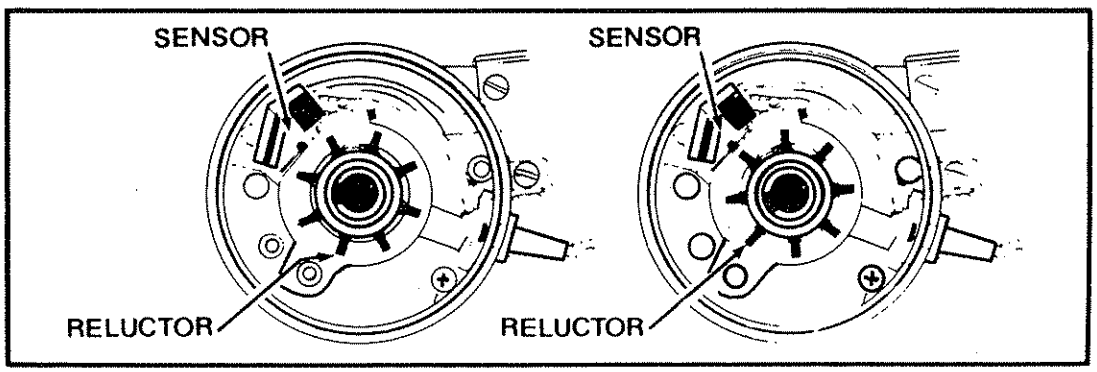


FIG. 3

5.
- NO DROP IN VOLTAGE → CHECK MODULE GROUND. IF OK, REPLACE MODULE.
- VOLTAGE DROPS → 6. CHECK FOR SPARK FROM COIL WIRE WITH ST-125 AS TEST LIGHT IS REMOVED FROM MODULE TERM.
  - NO SPARK
    - IF MODULE TESTER IS AVAILABLE, TEST MOD.
      - OK → CHECK COIL WIRE FROM CAP TO COIL. IF OK, REPLACE COIL.
      - BAD → REPLACE MOD.
    - IF NO MODULE TESTER IS AVAILABLE → 7. REPLACE HEI MODULE AND REPEAT STEP 6.
      - SPARK → SYSTEM OK
      - NO SPARK → MODULE REMOVED IS OK, REINSTALL MODULE. CHECK COIL WIRE FROM CAP TO COIL. IF OK, REPLACE COIL.
  - SPARK → IT IS PICK-UP COIL OR CONNECTIONS. COIL RESISTANCE SHOULD BE 500-1500 OHMS AND NOT GROUNDED.



Electronic Ignition System



98-5260

AMERICAN MOTORS/INTERNATIONAL HARVESTER BID IGNITION

The American Motors and International Harvester BID (Breakerless Inductive Discharge) electronic ignition system utilizes a stationary **distributor sensor unit** mounted in the distributor housing; a rotating gear-shaped **trigger wheel** mounted on the distributor shaft, and an **electronic ignition control unit.** The BID system is **not** a "high energy" secondary voltage system, and all components except those noted above are the same as AMC conventional ignition.

Basic system operation is as follows ... An oscillating signal is transmitted through the distributor sensor unit from the control unit, and as each "tooth" of the trigger wheel rotates to direct alignment with the sensor, the signal's amplitude is modulated, or changed. This causes the control unit's switching transistor to turn "off," with the primary circuit being interrupted and firing voltage induced in the coil secondary.

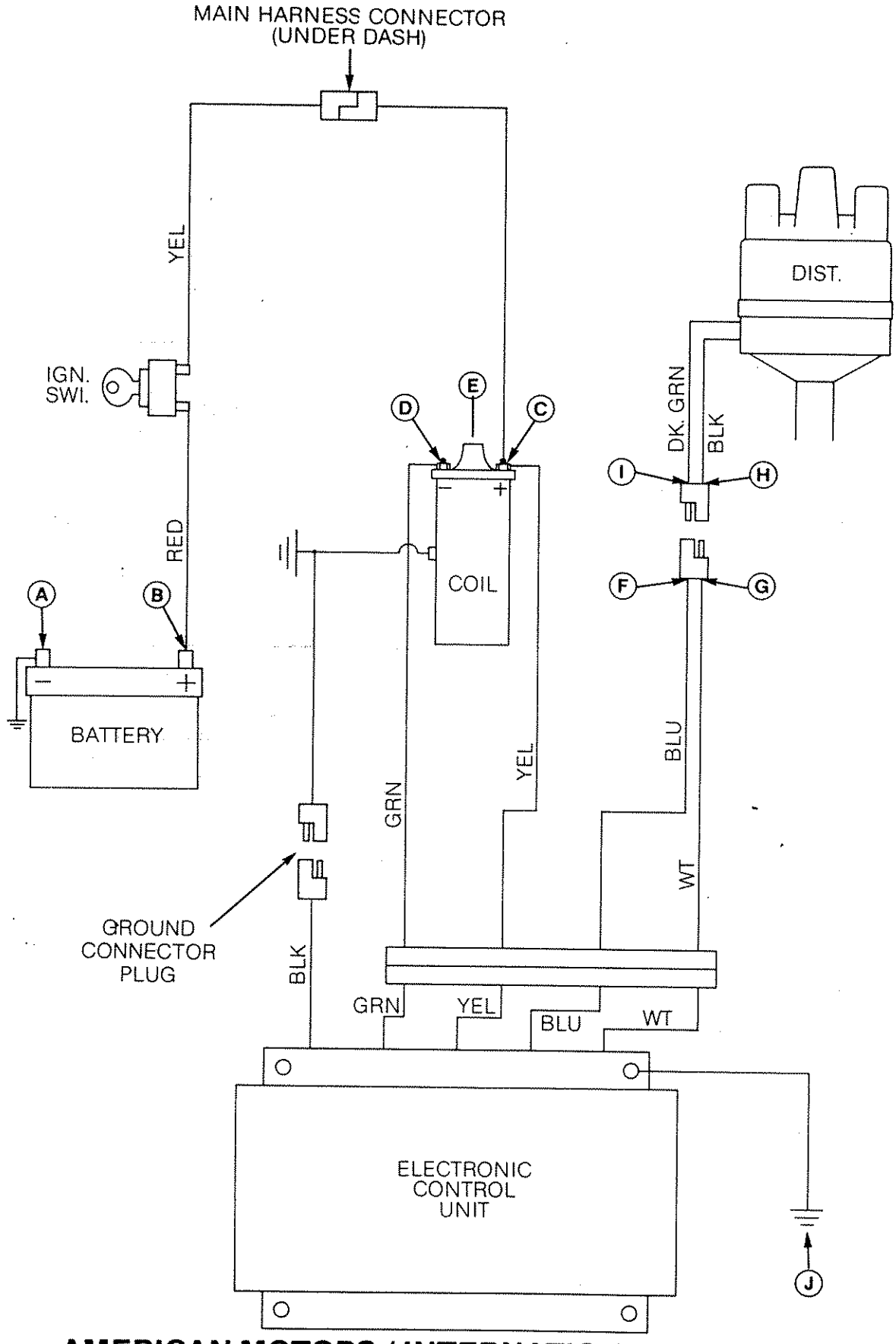
NOTE: Before performing these trouble-shooting tests to isolate the cause of a no-start, hard-start, or rough-running condition, CHECK DISTRIBUTOR SENSOR UNIT AIR GAP and adjust to manufacturer's specification.

COMPONENTS TEST	SELECTOR POSITION	ANALYZER CONNECTIONS RED CLIP	ANALYZER CONNECTIONS BLACK CLIP	RESULTS
1. Battery State of Charge	D.C. Volts	B Battery Pos. (+) Post	A Battery Neg. (-) Post	Remove and ground coil high tension wire and crank engine for 10 seconds. Meter should read at least 9 volts while cranking. If not, charge battery and proceed.
2. Electronic System Ground	D.C. Volts	B Battery Pos. (+) Post	J Module Ground	With ignition switch on (do not crank) and coil high tension wire reconnected at coil, meter should read between 11 and 13 volts. If not, check continuity and connections of connector lead from module to ground (point J) and retest. If still not OK, system ground is faulty and **MUST** BE CORRECTED **BEFORE** PROCEEDING WITH TESTS.
3. Ignition Switch	D.C. Volts	C Coil Pos. (+) Terminal	A Battery Neg. (-) Post	With ignition switch on (do not crank), meter should read between 11 and 13 volts. Now crank engine. Meter should read at least 9 volts while cranking. If **both** readings are OK, proceed with test 4. But if either or both readings are **not** OK, replace Ignition Switch.
4. Static Power Check of Module	Charging Volts-Amps (Engine Analyzer)	Connect Current Multiplier between coil end of coil Neg. (-) lead and coil neg. (-) terminal (D). Attach clamp amp.		With distributor harness connector and coil negative lead disconnected, and ignition switch on (do not crank), meter should read between 3 and 5 amps. If OK, proceed with test 5. If **not** OK, proceed with test 4-A.
4-A. Continuity of Coil Primary	LO Ohms 0-200	C Coil Pos. (+) Terminal	D Coil Neg. (-) Terminal	With ignition switch off and coil negative lead disconnected from coil, meter should read between .7 and 2.5 ohms. If OK, replace Electronic Ignition Control Unit* (module). If **not** OK, replace Ignition Coil.
5. Continuity of Coil Secondary	HI Ohms 0-20K	C Coil Pos. (+) Terminal	E Coil High Tension Tower	With ignition switch off and coil negative lead disconnected from coil, meter should read between 8,000 and 16,000 ohms. If not, replace Ignition Coil.
6. Continuity of Distributor Sensor Unit	Lo Ohms	H Distributor Connector Lead Cavity	I Distributor Connector Lead Pin	With ignition switch off, meter should read between 1.5 and 2.5 ohms. If not, replace Distributor Sensor Unit.
7. Short in Distributor Sensor Unit	Ohms 0-20K	I Distributor Connector Lead Pin	A Battery Neg. (-) Post	With ignition switch off, meter should not move. If there is **any** ohms reading, replace Distributor Sensor Unit.
8. Distributor Sensor Unit or Module	None	Not Used	Not Used	With **all** leads and harnesses reconnected for normal operating and ignition switch on (do not crank), remove coil high tension wire **from distributor cap** and place approximately 1/2 inch from a good engine ground. Using a jumper wire, momentarily make contact between module connector lead pin (G) and module connector lead cavity (F). If a spark occurs from the distributor end of the coil high tension wire, replace the Distributor Sensor Unit. If **no** spark occurs, replace the Electronic Ignition Control Unit* (module).

NOTE: Perform this test **only** if tests 1-7 have not isolated the problem, and is **not** faulty plug wires, distributor cap, etc.

*__IMPORTANT NOTE:__ Before condemning **any** parts, check the continuity of **all** connecting wires, and insure that **all** connections are clean, solid and properly seated. Additional information concerning testing of wiring may be obtained from the appropriate American Motors or International Harvester Service Manual.

If the above tests do not isolate the specific **electronic** component problem, the Electronic Ignition Control Unit (Module) is at fault. But **before** replacing it, insure that the engine performance problem is **not** due to faulty plug wires, distributor cap, etc.



AMERICAN MOTORS / INTERNATIONAL HARVESTER
BID IGNITION

93-5260

AMERICAN MOTORS HEI
4-CYLINDER ENGINE

The American Motors HEI (High Energy Ignition) system was adopted for use on all 4-cylinder engines in 1980. The system is the General Motors HEI system. It produces spark plug firing voltages of up to 35,000 volts and "burn time" is almost twice as long as conventional and other electronic ignition systems. All electronic components, including the module, are located in the distributor assembly (except an external ignition coil on inline 4- and 6-cylinder engines). Because of HEI's high firing voltages, secondary ignition system testing requires specialized equipment and procedures.

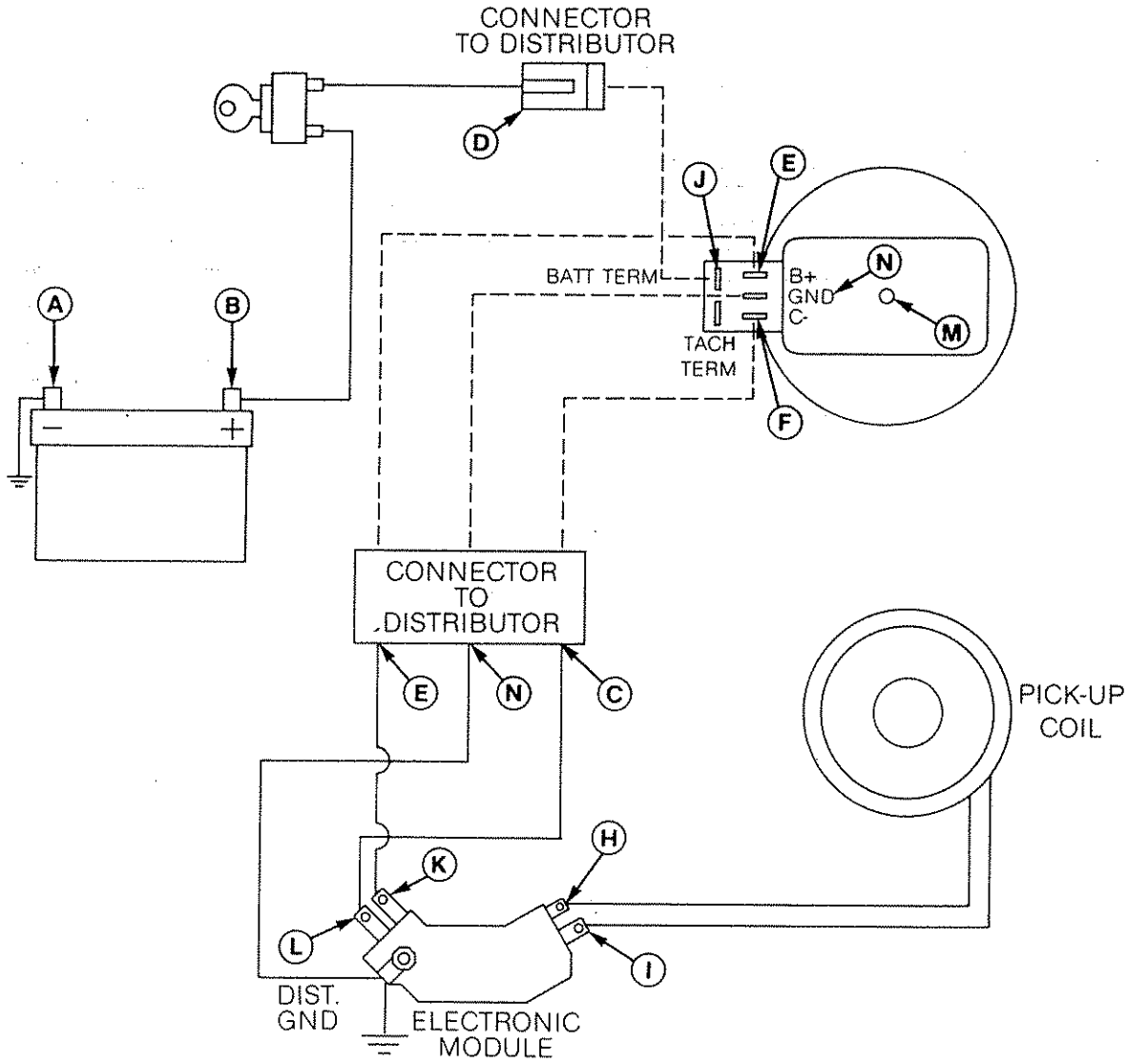
Electronic components include a **pick-up coil** mounted over the distributor shaft: a rotating **timer core** with outward-pointing "teeth" mounted on the distributor shaft; a stationary **pole piece** with inward-pointing "teeth"; and an **electronic module.** A condenser is included strictly for suppression of radio noise interference. In addition, because there is no external primary resistor in the ignition switch circuit, the distributor primary receives direct battery voltage.

HEI operates as follows ... As the timer core "teeth" approach direct alignment with the pole piece "teeth," voltage builds in the coil primary (similar to a points-closed cycle in conventional ignition). When the "teeth" are directly aligned, the pick-up coil signals the module switching transistor to turn "off" and the primary circuit is interrupted (similar to points-open). The coil field then collapses, firing voltage is induced in the coil secondary, and ignition occurs. Dwell, or the length of time the module switching transistor is "on," varies with engine speed, and because it's controlled electronically it is not adjustable.

COMPONENTS TEST	SELECTOR POSITION	ANALYZER CONNECTIONS RED CLIP	BLACK CLIP	RESULTS
1. Battery State of Charge	D.C. Volts	B Battery Pos. (+) Post	A Battery Neg. (-) Post	Disconnect ignition switch feed wire from distributor (do **not** ground) and crank engine for 10 seconds. Meter should read at least 9 volts. If not, charge battery and proceed.
2. Electronic System Ground	D.C. Volts	B Battery Pos. (+) Post	N Lower Harness Gnd. Terminal	Disconnect the Distributor 3-wire connector, use wire adapter, meter should read battery voltage — if not, move black clip and touch Dist. metal housing. If it now reads battery voltage, the ground wire or ground connection inside of the Distributor is at fault and must be corrected before proceeding.
3. Ignition Switch	D.C. Volts	D End of Ignition Switch Feed Wire	A Battery Neg. (-) Post	Disconnect switch wire from Distributor battery terminal. With the switch "off" meter should read zero "0" volts, turn switch "on" meter should read battery volts, crank engine, meter should read at least 9 volts. Reconnect Dis. 3-wire harness.
4. Static Power Check of Module	Charging Volts-Amps (Engine Analyzer)	Connect Current Multiplier between Distributor "Batt" terminal (J) and end of ignition switch feed wire (D). Attach clamp amp.		With ignition switch on (do not crank), meter should read between .1 and .7 amps. If higher, replace Electronic Module. If lower or zero, proceed with test 5. Use adapter at battery terminal.
5. Continuity of Coil Primary	LO Ohms 0-200	F Distributor "C"-Terminal	J Distributor "BAT"-Terminal	With ignition switch off, remove distributor cap and rotor, and disconnect lower housing harness. Meter should read between 0 to 1 ohms. If above 1 ohm, replace Ignition Coil (located in distributor cap).
6. Continuity of Coil Secondary	HI Ohms 0-20k	M High Tension Terminal	F-N Distributor "C-" & GRD Terminal	With ignition switch off, meter should read between 6000 and 30,000 ohms. If meter reads higher than 30,000 ohms, replace Ignition Coil (located in distributor cap). Also, inspect rotor, coil and distributor cap for carbon tracking, etc., and replace as indicated.
7. Lower Housing Harness	D.C. Volts	K Module B Terminal	A Battery Neg. (-) Post	Connect switch wire & Dist. 3-wire harness. With ignition switch on (do not crank), place analyzer red clip in contact with module B terminal (test point K). Meter should read at least 10 volts. If not, replace Lower Housing Harness at distributor.
8. Lower Housing Harness	D.C. Volts	L Module C Terminal	A Battery Neg. (-) Post	With ignition switch on (do not crank), place analyzer red clip in contact with module C terminal (test point L). Meter should read at least 10 volts. If not, replace Lower Housing Harness at distributor.
9. Pick-up Coil Assembly Output	Pick-up Output	I Pick-up Lead	H Pick-up Lead	Disconnect ignition switch feed wire from distributor (do **not** ground). With pick-up leads **connected** to module, crank engine for 10 seconds. Meter should read 1.5 volts or more while cranking. If not, proceed with test 9-A.
9-A. Pick-up Coil Assembly Output	Pick-up Output	I Pick-up Lead	H Pick-up Lead	With ignition switch off, disconnect pick-up leads from module. Now crank engine for 10 seconds. If meter **now** reads 1.5 volts or more Normal zone while cranking, replace the Electronic Module*. But if reading is still **not** OK, replace Pick-up Coil Assem.

***IMPORTANT NOTE:** Before condemning **any** parts, check the continuity of **all** connecting wires, and insure that **all** connections are clean, solid and properly seated. Additional information concerning testing of wiring may be obtained from the appropriate AMC Service Manual.

If the above tests do not isolate the specific **electronic** component problem, the Electronic Module is at fault. But **before** replacing it, insure that the engine performance problem is **not** due to faulty plug wires, distributor cap, etc.



AMERICAN MOTORS H E I

98-5260

BOSCH ELECTRONIC IGNITION
1979 TYPE 2 VOLKSWAGEN (CALIFORNIA)

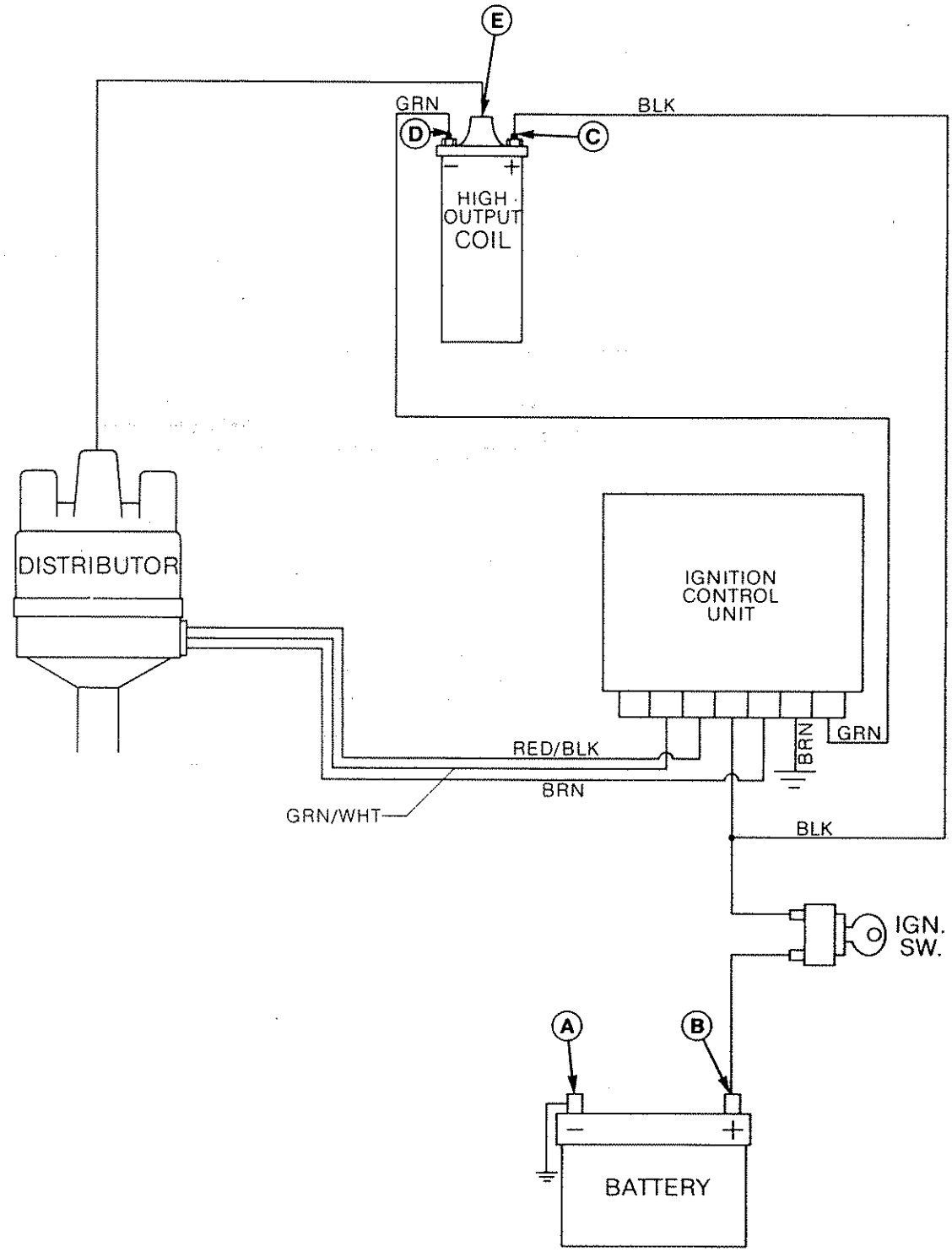
The Bosch electronic ignition system is found on California Type 2 (Bus) Volkswagens. The system consists of a distributor with a Hall Effect pick-up, an electronic ignition control unit, and a conventional high output ignition coil. Centrifugal and vacuum advance mechanisms are standard.

A Hall-effect sender unit is located within the distributor which is used to signal the ignition control unit to make or break the primary circuit through the coil. The Hall-effect sender is not adjustable.

COMPONENTS TEST	SELECTOR POSITION	ANALYZER CONNECTIONS RED CLIP	ANALYZER CONNECTIONS BLACK CLIP	RESULTS
1. Battery State of Charge	D.C. Volts	B Battery Pos. (+) Post	A Battery Neg. (-) Post	Remove and ground coil high tension wire. Crank engine 10 seconds. Meter should read 9 volts while cranking. If not, charge battery.
2. Ignition Switch	D.C. Volts	C Coil Positive (+) Terminal	A Battery Neg. (-) Post	With ignition switch on (do not crank), meter should read between 11 and 13 volts. Now crank engine. Meter should read at least 9 volts while cranking. If **both** readings are OK, proceed with test 3. But if either or both readings are **not** OK, replace Ignition Switch.
3. Continuity of Coil Primary	LO Ohms 0-200	C Coil Positive (+) Terminal	D Coil Neg. (-) Terminal	With ignition switch off and coil negatiave lead disconnected from coil, meter should read between .6-.8 ohms. If OK, replace Electronic Ignition Control Unit* (module). If not, replace Ignition Coil.
4. Continuity of Coil Secondary	HI Ohms 0-20k	C Coil Positive (+) Terminal	E Coil High Tension Tower	With ignition switch off and coil negative lead disconnected from coil, meter should read between 3,000-5,000 ohms. If not, replace Ignition Coil.
5. Ignition Control Unit Check	D.C. Volts	D Coil Negative (-) Terminal	A Battery Neg. (-) Terminal	Turn ignition switch on. If voltage is considerably lower than 12 volts, **immediately** turn ignition off. 1. Disconnect green/white wire of connector on distributor (center terminal) and connect to ground. Voltage at coil negative (-) terminal should now be at least 12 volts. 2. Disconnect green/white wire from ground. Voltage at coil negative (-) terminal should drop briefly to approximately 6 volts. 3. If voltages are not within limits of steps 1 and 2, replace Ignition Control Unit.

*__IMPORTANT NOTE:__ Before condemning **any** parts, check the continuity of **all** connecting wires and insure that **all** connections are clean, solid and properly seated. Additional information concerning testing of wiring may be obtained from the appropriate Volkswagen Service Manual.

If the above tests do not isolate the specific **electronic** component problem, the Electronic Control Unit is at fault. But **before** replacing, insure that the engine performance problem is **not** due to faulty plug wires, distributor cap, etc.



BOSCH ELECTRIC IGNITION SYSTEM

98-5260
LG

CHRYSLER ELECTRONIC IGNITION, 1980

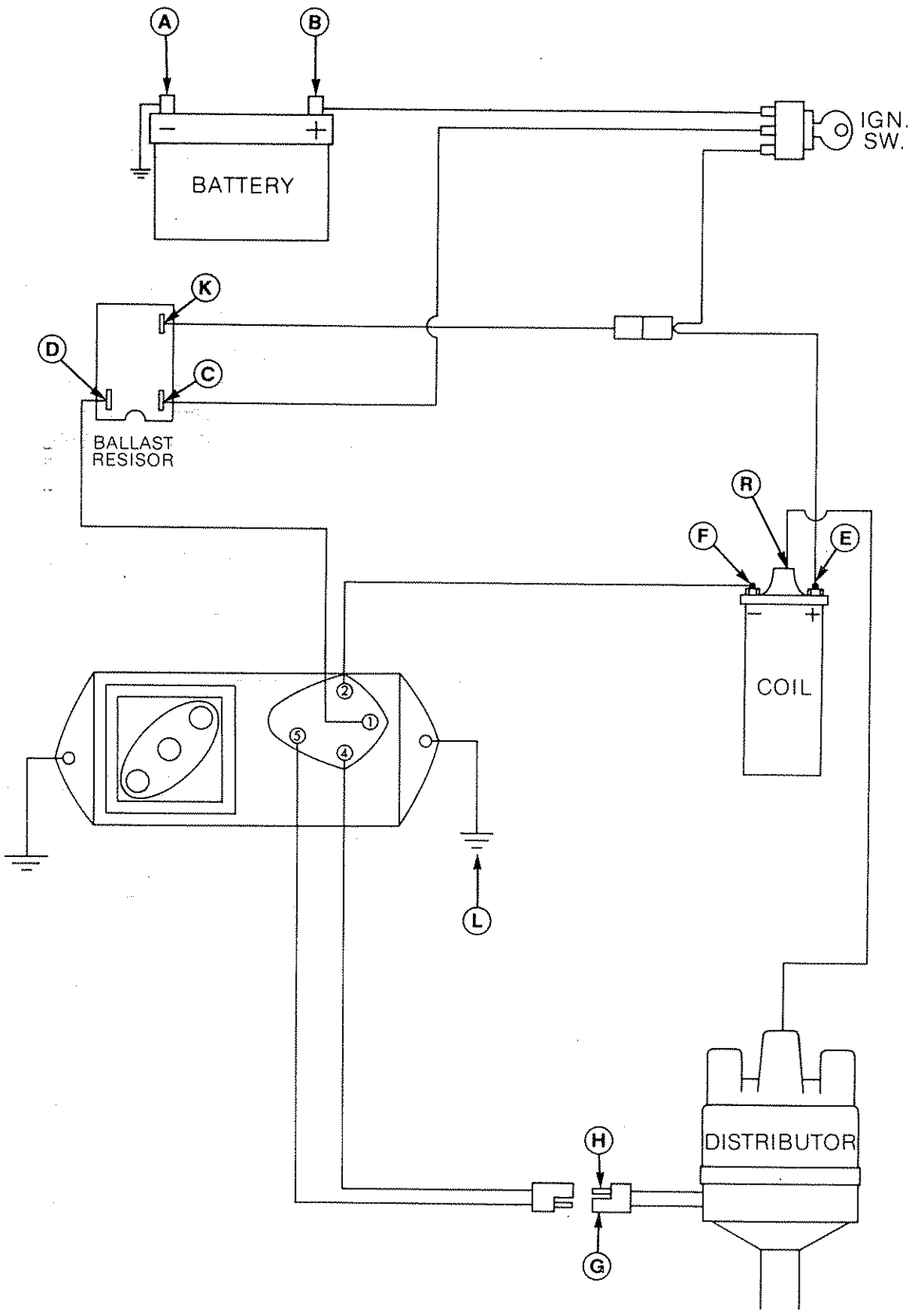
Chrysler electronic ignition utilizes a rotating "gear-shaped" **reluctor** mounted on the distributor shaft; a single magnetic **pick-up coil** assembly; an **electronic control unit** (module), and five major circuits; a **primary ignition circuit** and a **secondary ignition circuit;** the **auxiliary ballast circuit** and the **control unit feed circuit** which are used to operate the electronic control unit; and the **pick-up circuit** which controls the switching transistor in the electronic control unit. This system is **not** a "high energy" secondary voltage system.

Basic system operation is as follows ... As each reluctor "tooth" lines up with the pick-up coil, it creates a voltage pulse which is transmitted to the control module switching transistor. The switching transistor then interrupts the primary circuit (similar to open contact points), firing voltage is induced in the coil secondary and ignition occurs. Since dwell time, or the length of time the switching transistor is "on" and "off" is electronically predetermined, dwell is not adjustable.

COMPONENTS TEST	SELECTOR POSITION	ANALYZER CONNECTIONS RED CLIP	ANALYZER CONNECTIONS BLACK CLIP	RESULTS
1. Battery State of Charge	D.C. Volts	B Battery Pos. (+)	A Battery Neg. (-)	Remove and ground coil high tension wire, and crank engine for 10 seconds. Meter should read at least 9 volts while cranking. If not, charge battery and proceed.
2. Module Ground	D.C. Volts	L Module Case	A Battery Neg. (-) Post	Scrape paint off a small section of the module case, and with ignition switch on (do not crank), touch analyzer red clip to bare module surface. Meter should read less than .25 volt. If not, turn ignition switch off, remove module from mounting, thoroughly clean all mounting surfaces, re-mount module and re-test. MODULE GROUND **MUST** BE OK **BEFORE** PROCEEDING WITH TESTS.
3. Compensating Side of Primary Ignition — QUICK TEST	D.C. Volts	E Coil Pos. (+) Terminal	A Battery Neg. (-) Post	With ignition switch on (do not crank), meter should read between 3.5 and 7.5 volts. Now crank engine for 10 seconds. Meter should read at least 9 volts while cranking. If **both** readings are OK, proceed with test 4. But if either or both readings are **not** OK, proceed with test 3-A.
3-A. Coil Primary and Electronic Package	D.C. Volts	F Coil Neg. (-) Terminal	A Battery Neg. (-) Post	With ignition switch on (do not crank), meter should read between .3 and 1.8 volts. If reading is **higher** than 1.8 volts, and if module connector leads and connections are OK, replace Module and re-test.* If reading is OK or lower than .3 volt, proceed with test 3-B.
3-B. Continuity of Coil Primary	LO Ohms 0-200	E Coil Pos. (+) Terminal	F Coil Neg. (-) Terminal	With ignition switch off, meter should read between 1 and 3 ohms. If not, replace Ignition Coil. If reading is OK **and** if test 3-A checked OK, replace Ignition Switch.
4. Continuity of Coil Secondary	HI Ohms 0-200k	E Coil Pos. (+) Terminal	R Coil High Tower	With ignition switch off, meter should read between 5,000 and 25,000 ohms. If not, replace Ignition Coil. Also, check for coil carbon tracking, cracks, etc., and replace if indicated.
5. Ballast Jumper	D.C. Volts	C Ballast Resistor	A Battery Neg. (-) Post	Leaving ballast connector lead **connected** at point C, insert clip adapter at point C and connect analyzer red clip to adapter. With ignition switch on (do not crank), meter should read between 11 and 13 volts. If not, repair or replace connector lead from point C to point K.
6. Auxiliary Side of Ballast Resistor	LO Ohms 0-200	M Module Connector Harness Terminal	O Module Connector Harness Terminal	With ignition switch off, module connector harness disconnected from module and analyzer connected as indicated, meter should read between 3 and 7 ohms. If OK, proceed with test 6. If **not** OK, proceed with test 5-A. RECONNECT MODULE CONNECTOR HARNESS AT MODULE.
6-A. Auxiliary Side of Ballast Resistor	LO Ohms 0-200	D Ballast Resistor	C Ballast Resistor	With ignition switch off, ballast connector leads disconnected at points C and D and analyzer connected as indicated, meter should read between 3 and 7 ohms. If not, replace Ballast Resistor. If reading is OK, repair or replace Module Connector Harness.
7. Pick-up Coil Output	Pickup Output	G Distributor Connector Cavity	H Distributor Connector Pin	Crank engine for 10 seconds. If meter reads 3 volts or more while cranking, repair or replace Module Connector Harness. But if reading is not 3 volts or more replace Pick-up Coil Assembly.

***IMPORTANT NOTE:** Before condemning **any** parts, check the continuity of **all** connecting wires and insure that **all** connections are clean, solid and properly seated. Additional information concerning testing of wiring may be obtained from the appropriate Chrysler Service Manual.

If the above tests do not isolate the specific **electronic** component problem, the Electronic Control Unit is at fault. But **before** replacing, insure that the engine performance problem is **not** due to faulty plug wires, distributor cap, etc.



1980 CHRYSLER ELECTRONIC IGNITION

98-5260

CHRYSLER ELECTRONIC IGNITION, 1971-79

Chrysler electronic ignition utilizes a rotating "gear-shaped" **reluctor** mounted on the distributor shaft; a single magnetic **pick-up coil** assembly; an **electronic control unit** (module), and five major circuits; a **primary ignition circuit** and a **secondary ignition circuit;** the **auxiliary ballast circuit** and the **control unit feed circuit** which are used to operate the electronic control unit; and the **pick-up circuit** which controls the switching transistor in the electronic control unit. This system is **not** a "high energy" secondary voltage system.

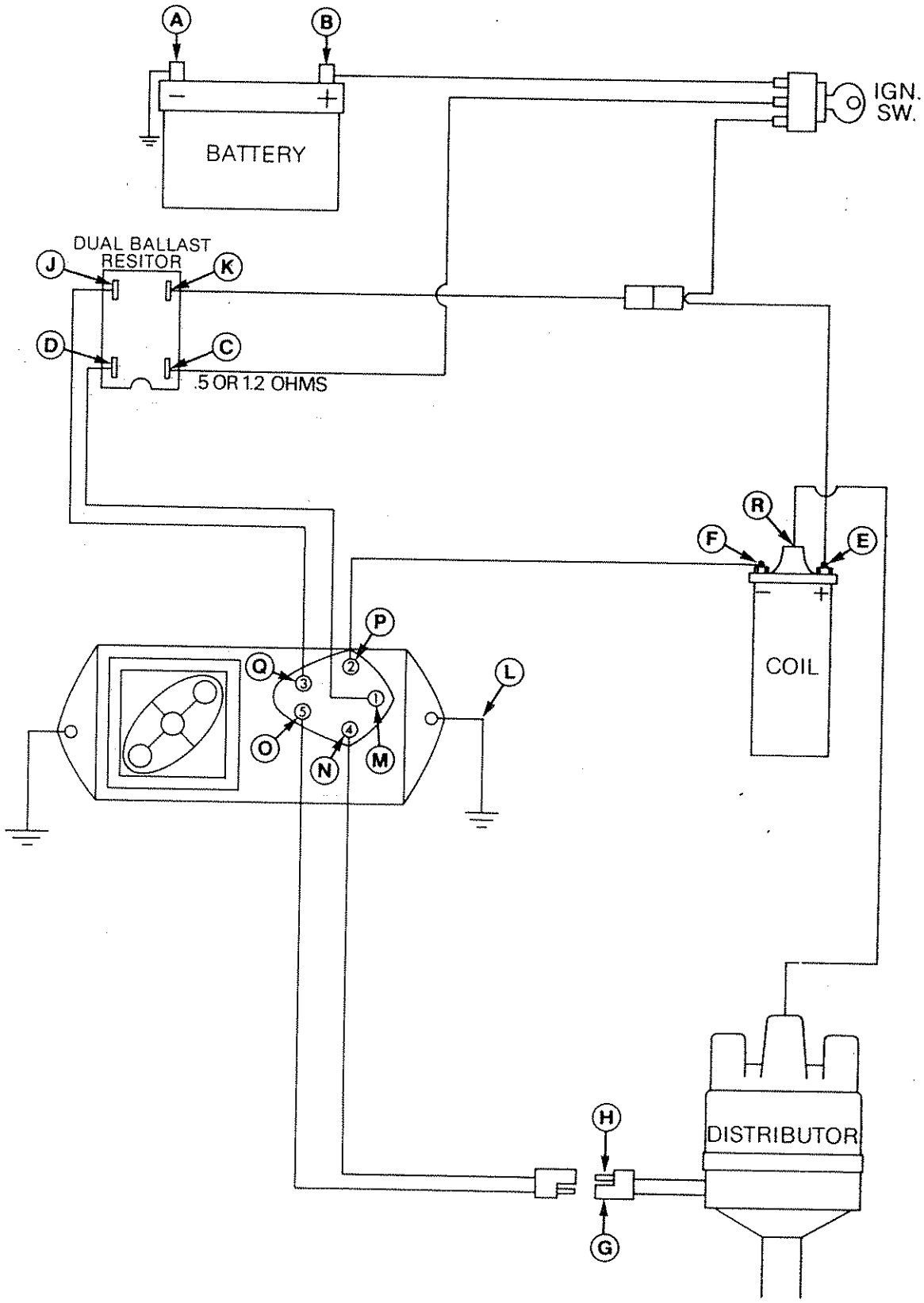
Basic system operation is as follows . . . As each reluctor "tooth" lines up with the pick-up coil, it creates a voltage pulse which is transmitted to the control module switching transistor. The switching transistor then interrupts the primary circuit (similar to open contact points), firing voltage is induced in the coil secondary and ignition occurs. Since dwell time, or the length of time the switching transistor is "on" and "off" is electronically predetermined, dwell is not adjustable.

A dual ballast resistor was used on all 1979 and earlier Chrysler models. 1980 models are equipped with a single ballast resistor mounted on the firewall. The resistor assembly dissipates heat and may be hot to the touch after normal operation. A radio noise suppression capacitor (used since 1973) is mounted near the ballast resistor.

COMPONENTS TEST	SELECTOR POSITION	ANALYZER CONNECTIONS RED CLIP	BLACK CLIP	RESULTS
1. Battery State of Charge	D.C. Volts	B Battery Pos. (+)	A Battery Neg. (-)	Remove and ground coil high tension wire, and crank engine for 10 seconds. Meter should read at least 9 volts while cranking. If not, charge battery and proceed.
2. Module Ground	D.C. Volts	L Module Case	A Battery Neg. (-) Post	Scrape paint off a small section of the module case, and with ignition switch on (do not crank), touch analyzer red clip to bare module surface. Meter should read **less** than .25 volt. If not, turn ignition switch off, remove module from mounting, thoroughly clean all mounting surfaces, re-mount module and re-test. MODULE GROUND **MUST** BE OK **BEFORE** PROCEEDING WITH TESTS.
3. Compensating Side of Primary Ignition — QUICK TEST	D.C. Volts	E Coil Pos. (+) Terminal	A Battery Neg. (-) Post	With ignition switch on (do not crank), meter should read between 3.5 and 7.5 volts. Now crank engine for 10 seconds. Meter should read at least 9 volts while cranking. If **both** readings are OK, proceed with test 4. But if either or both readings are **not** OK, proceed with test 3-A.
3-A. Coil Primary and Electronic Package	D.C. Volts	F Coil Neg. (-) Terminal	A Battery Neg. (-) Post	With ignition switch on (do not crank), meter should read between .3 and 1.8 volts. If reading is **higher** than 1.8 volts, and if module connector leads and connections are OK, replace Module and re-test.* If reading is OK or lower than .3 volt, proceed with test 3-B.
3-B. Value of Ballast Resistor	LO Ohms 0-200	J Ballast Resistor	K Ballast Resistor	With ignition switch off, ballast connector leads disconnected at points J and K and analyzer connected as indicated, meter should read between .2 and 1.0 ohm. If OK, proceed with test 3-C. If not OK, replace Ballast Resistor.
3-C. Continuity of Coil Primary	LO Ohms 0-200	E Coil Pos. (+) Terminal	F Coil Neg. (-) Terminal	With ignition switch off, meter should read between 1 and 3 ohms. If not, replace Ignition Coil. If reading is OK **and** if tests 3-A and 3-B also checked OK, replace Ignition Switch.
4. Continuity of Coil Secondary	HI Ohms 0-200k	E Coil Pos. (+) Terminal	R Coil High Tower	With ignition switch off, meter should read between 5,000 and 25,000 ohms. If not, replace Ignition Coil. Also, check for coil carbon tracking, cracks, etc., and replace if indicated.
5. Ballast Jumper	D.C. Volts	C Ballast Resistor	A Battery Neg. (-) Post	Leaving ballast connector lead **connected** at point C, insert clip adapter at point C and connect analyzer red clip to adapter. With ignition switch on (do not crank), meter should read between 11 and 13 volts. If not, repair or replace connector lead from point C to point K.
6. Auxiliary Side of Ballast Resistor	LO Ohms 0-200	M Module Connector Harness Terminal	O Module Connector Harness Terminal	With ignition switch off, module connector harness disconnected from module and analyzer connected as indicated, meter should read between 3 and 7 ohms. If OK, proceed with test 6. If **not** OK, proceed with test 5-A. RECONNECT MODULE CONNECTOR HARNESS AT MODULE.
6-A. Auxiliary Side of Ballast Resistor	LO Ohms 0-200	D Ballast Resistor	C Ballast Resistor	With ignition switch off, ballast connector leads disconnected at points C and D and analyzer connected as indicated, meter should read between 3 and 7 ohms. If not, replace Ballast Resistor. If reading is OK, repair or replace Module Connector Harness.
7. Pick-up Coil Output	Pickup Output	P Module Lead Cavity	Q Module Lead Cavity	With module connector harness disconnected from module and analyzer connected as indicated, crank engine for 10 seconds. Meter should read 3 volts or more while cranking. If not, check pick-up coil air gap, adjust as indicated and re-test. If reading is **still not OK,** proceed with test 7-A.
7-A. Pick-up Coil Output	Pickup Output	G Distributor Connector Cavity	H Distributor Connector Pin	Crank engine for 10 seconds. If meter now reads 3 volts or more while cranking, repair or replace Module Connector Harness. But if reading is still not OK, replace Pick-up Coil Assembly.

***IMPORTANT NOTE:** Before condemning **any** parts, check the continuity of **all** connecting wires and insure that **all** connections are clean, solid and properly seated. Additional information concerning testing of wiring may be obtained from the appropriate Chrysler Service Manual.

If the above tests do not isolate the specific **electronic** component problem, the Electronic Control Unit is at fault. But **before** replacing, insure that the engine performance problem is **not** due to faulty plug wires, distributor cap, etc.



1971-79 CHRYSLER ELECTRONIC IGNITION

98-5260
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CHRYSLER LEAN BURN, 1976-77 MODELS (EXCEPT LE BARON AND DIPLOMAT)

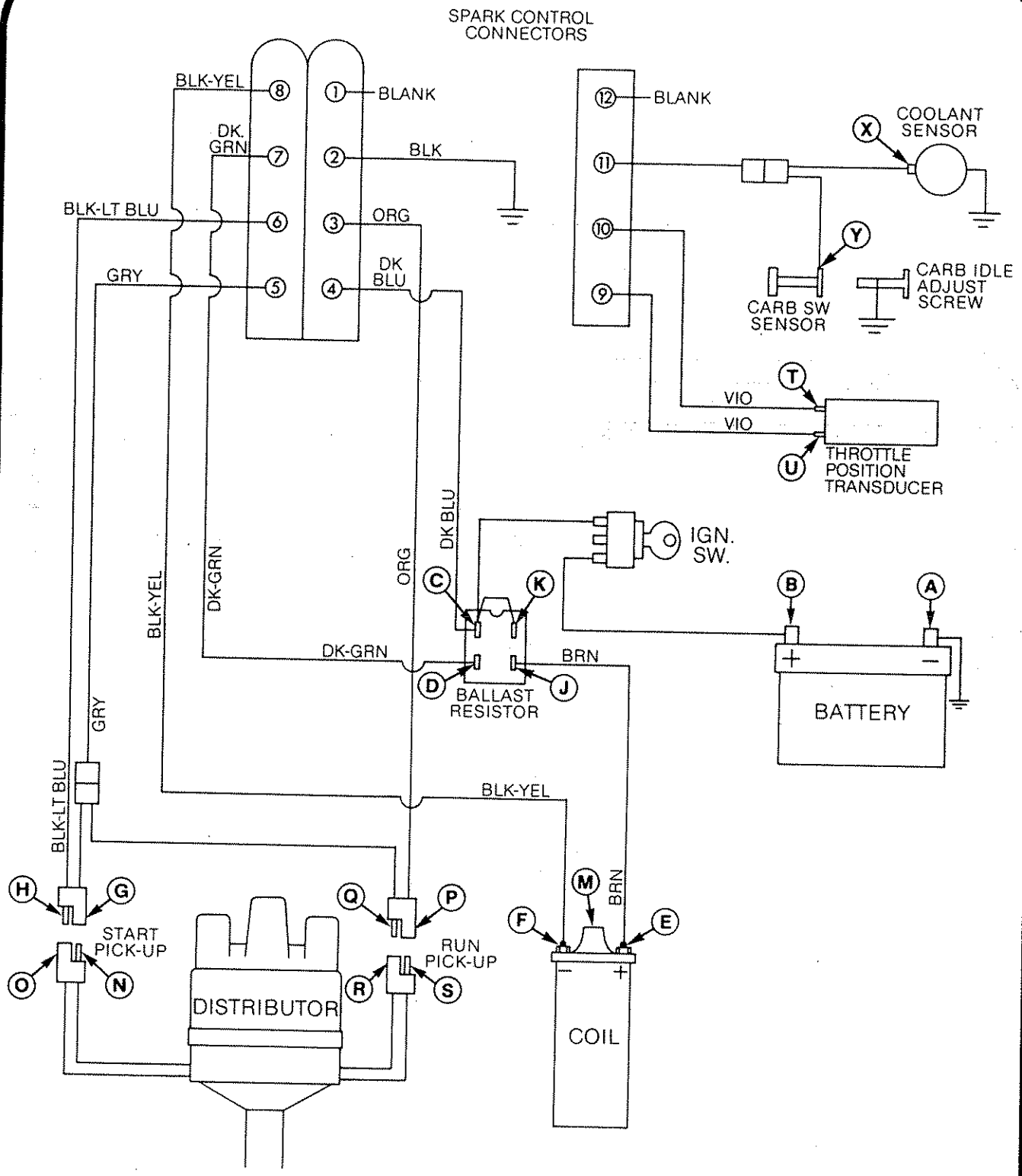
Chrysler's Electronic Lean Burn (ELB) system produces the same spark plug firing voltage and incorporates the same "regular-construction" external ignition coil, distributor cap, spark plug wires, reluctor, dual ballast resistor and ignition switch as Chrysler electronic ignition. But **in place of** an electronic module, the ELB system utilizes a "Spark Control Computer" located on the air cleaner.

In addition, the ELB system incorporates seven sensors that provide the Spark Control computer with constant measurements of engine operating conditions and requirements. "Start" Pick-Up Coil, "Run" Pick-Up Coil, Coolant Sensor, Air Temperature Sensor, Throttle Position Transducer, Carburetor Switch, and Vacuum Transducer.

COMPONENTS TEST	SELECTOR POSITION	ANALYZER CONNECTIONS RED CLIP	BLACK CLIP	RESULTS
1. Battery State of Charge	D.C. Volts	B Battery Positive (+) Post	A Battery Negative (-) Post	Remove and ground Coil High Tension wire, and crank engine for 10 seconds. Meter should read at least 9 volts while cranking. If not, charge battery and proceed.
2. S.C. Computer Circuit Ground	LO Ohms 0-200	Cavity #2, Dual Connector Harness	A Battery Negative (-) Post	With Ignition Switch off, meter should read zero ohms. If there is **any** ohms reading, the ground is faulty and must be corrected before proceeding with tests.
3. Coil Primary Circuit, Auxiliary Side	D.C. Volts	E Coil Positive (+) Terminal	A Battery Negative (-) Post	With Ignition Switch on (do not crank), meter should read between 3.5 and 7.5 volts. If OK, proceed with test 4. If not, proceed with test 3-A. (Note: Harnesses at Spark Control computer **must be connected to Computer**).
3-A. Circuit thru Auxiliary Side of Ballast	D.C. Volts	Cavity #7, Dual Connector Harness	A Battery Negative (-) Post	Disconnect both single **and** dual harness connectors from Spark Control Computer, and with ignition switch on (do not crank), meter should read between 11 and 13 volts. If OK, proceed with test 4. If not OK, proceed with test 3-B.
3-B. Value of Ballast Resistor Auxiliary Side	LO Ohms 0-200	J Ballast Terminal, Auxiliary Side	K Ballast Terminal, Auxiliary Side	Remove connector leads from Ballast Resistor at points J and K and connect analyzer red and black clips to J and K terminals. Meter should read between 4.5 and 5.8 ohms. If OK, check continuity of connector leads, replacing as indicated. If not OK, replace Ballast Resistor.
4. Coil Primary Circuit, Compensating Side	D.C. Volts	Cavity #8, Dual Connector Harness	A Battery Negative (-) Post	With both single **and** dual harness connectors disconnected from Spark Control Computer and Ignition Switch on (do not crank), meter should read between 11 and 13 volts. If OK, proceed with test 5. If not OK, proceed with test 4-A.
4-A. Valve of Ballast Resistor, Compensating Side	LO Ohms 0-200	D Ballast Terminal, Compen. Side	C Ballast Terminal, Compen. Side	Remove connector leads from Ballast Resistor at points C and D, and connect analyzer red and black clips to C and D terminals. Meter should read between .5 and .6 ohms. If OK, proceed with test 5. If not OK, replace Ballast Resistor.
5. Ignition Switch	D.C. Volts	Cavity #4, Dual Connector Harness	A Battery Negative (-) Post	With Ignition Switch on (do not crank), meter should read between 11 and 13 volts. If OK, proceed with test 6. If not OK, check continuity of connector lead from point D to cavity 4, replacing as indicated. Re-test. If reading is still not OK, replace Ignition Switch.
6. Continuity of Coil Primary	LO Ohms 0-200	E Coil Positive (+) Terminal	F Coil Negative (-) Terminal	With Ignition Switch off, meter should read between 1.4 and 1.6 ohms (Chrysler Essex coil), or between 1.6 and 1.8 ohms (Prestolite coil). If not OK, replace Ignition Coil.*
7. Continuity of Coil Secondary	HI Ohms 0-20k	E Coil Positive (+) Terminal	M Coil High Tension Tower	With Ignition Switch off, meter should read between 8,000 and 12,000 ohms. If not not OK, replace Ignition Coil.*
8. Start Pick-up Coil Output	Pickup Output	Cavity #5, Dual Harness Connector	Cavity #6, Dual Harness Connector	Crank engine for 10 seconds. Meter should read 3 volts or more. If OK, proceed with test 9. If not OK, check Start Pick-up Coil air gap. Adjust as necessary and re-test. If reading is still not OK, proceed with test 8-A.
8-A. Start Pick-up Coil Output	Pickup Output	H Distributor Connector Pin	G Distributor Connector Cavity	Crank engine for 10 seconds. If meter **now** reads 3 volts or more, replace distributor connector lead from points N & O to cavities 5 & 6. But if reading is still not OK, replace Run Pick-up Coil Assembly.
9. Run Pick-up Coil Output	Pick-up Out-put	Cavity #3, Dual Connector Harness	Cavity #5, Dual Connector Harness	Crank engine for 10 seconds. Meter should read 3 volts or more. If OK, proceed with test 10. If not OK, check Run Pick-up Coil air gap. Adjust as necessary and re-test. If reading is still not OK, proceed with test 9-A.
9-A. Run Pick-up Coil Output	Pick-up Out-put	O Distributor Connector Pin	P Distributor Connector Cavity	Crank engine for 10 seconds. If meter **now** reads 3 volts or more, replace distributor connector lead from points S & R to cavities 3 & 5. But if reading is still not OK, replace Run Pick-up Coil Assembly.
10. Coolant Switch Circuit	D.C. Volts	Cavity #11, Single Connector Harness	A Battery Negative (-) Post	With single connector harness disconnected from Spark Control Computer and Ignition Switch on (do not crank), meter should read at **least** 5 volts. If OK, proceed with test 11. If not OK, check connections and continuity of connector lead from cavity 11 to the end of harness at point X, replacing as indicated. If harness, etc., is OK, proceed with test 10-A.
10-A. Continuity of Coolant Switch Circuit	LO Ohms 0-200	X Coolant Switch Terminal	A Battery Negative (-) Post	With single connector lead disconnected from Spark Control Computer and Ignition Switch off, meter should be zero ohms **when engine temperature is below 125° and above 225° F.** If not, replace Coolant Switch. (NOTE: On Coolant Switches that incorporate 2 terminals, there **should** be an ohms reading on black wire terminal, zero ohms reading on orange wire terminal.)
11. Throttle Position Transducer	LO Ohms 0-200	Cavity #9 Single Connector Harness	Cavity #10 Single Connector Harness	With Ignition Switch off, meter should read between 50 and 90 ohms. If not, check harness connections and continuity from point T to cavity 9 and from point U to cavity 10. If OK, proceed with test 11-A. If not OK, replace connector harness and proceed with test 11-A.
11-A. Throttle Position Transducer	LO Ohms 0-200	T Transducer Terminal	U Transducer Terminal	With connector leads disconnected at points T and U and Ignition Switch off, meter should read between 50 and 90 ohms. If not, replace Throttle Position Transducer.*

***IMPORTANT NOTE:** Before condemning **any** parts, check the continuity of **all** connecting wires, and insure that **all** connections are solid, clean and properly seated. Additional information concerning testing of wiring may be obtained from the appropriate Chrysler Service Manual.

If the above tests do not isolate the specific **electronic** component problem, the Spark Control Computer is at fault. But before replacing, insure that the engine performance problem is **not** due to faulty plug wires, distributor cap, etc.



CHRYSLER LEAN BURN 1976-1977
(EXCEPT LE BARON AND DIPLOMAT)

98-5260

DATSUN IGNITION (HITACHI)
1977-78 MODELS

The Datsun Transistor Ignition system is not universally incorporated in U.S. production models (as late as the 1977 U.S. model year). It utilizes an external ignition coil, a reluctor and pick-up coil assembly, and a "Transistor Ignition Unit" (module) that incorporates 4 major circuits; Spark Timing Signal Monitoring circuit; Power Switching circuit; Lock Preventing circuit; and Duty Control circuit.

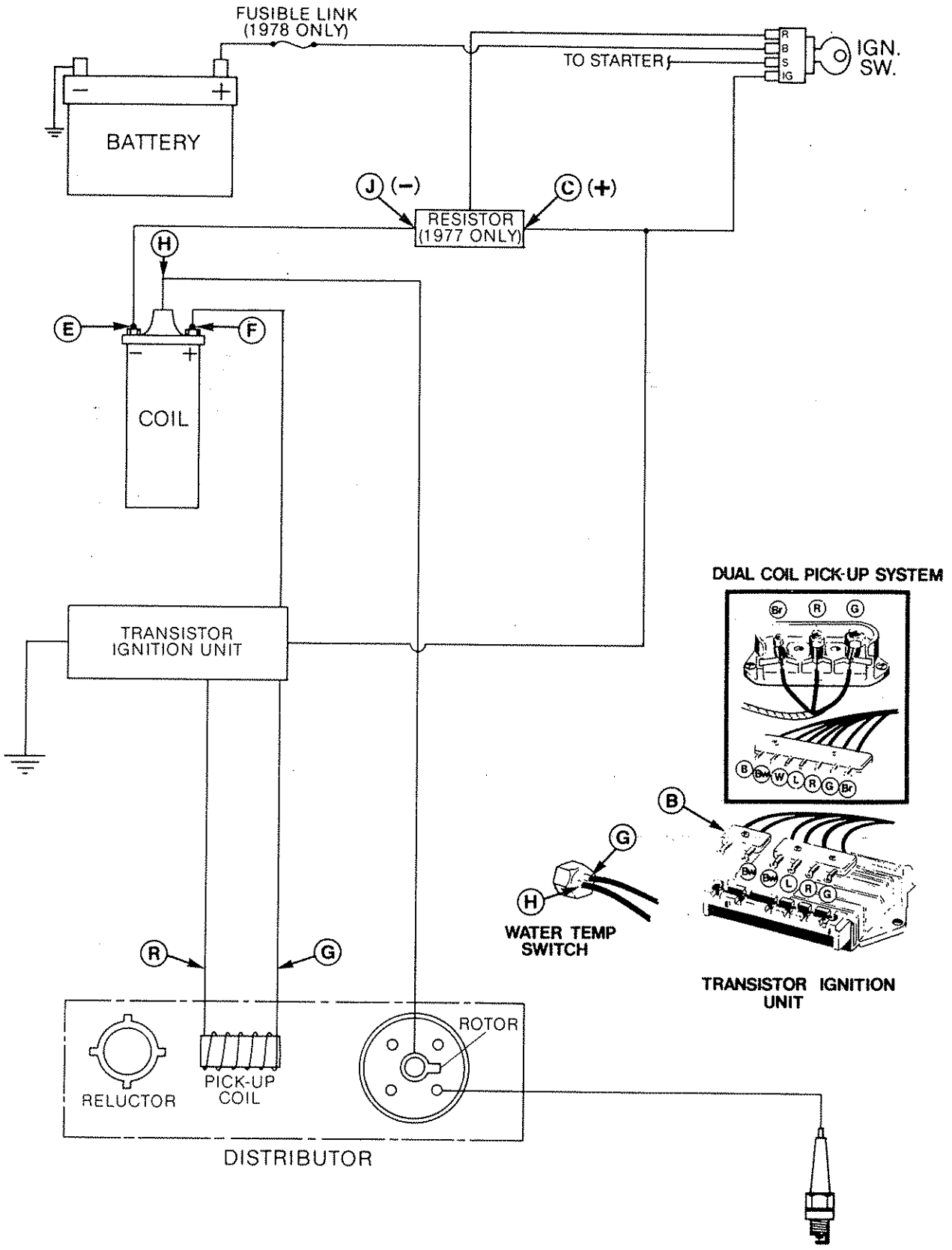
Certain non-California U.S. production models utilize dual pick-up coil assemblies. A "start" pick-up coil, and a "run" pick-up coil. With the exception of a fifth module circuit (Advanced Retarded Control circuit) utilized in the dual pick-up coil systems, operation is basically the same for both systems.

Datsun transistor ignition is **not** a "high energy" system, and all components, except those noted above, are the same as those incorporated in Datsun breaker point systems. Primary circuit interruption occurs when each reluctor "tooth" becomes aligned with the pick-up coil, and because dwell is electronically predetermined it is not adjustable.

COMPONENTS TEST	SELECTOR POSITION	ANALYZER CONNECTIONS RED CLIP	ANALYZER CONNECTIONS BLACK CLIP	RESULTS
1. Battery State of Charge	D.C. Volts	Battery Pos. (+) Post	Battery Neg. (-) Post	Remove and ground coil high tension wire, and crank engine for 10 seconds. Meter should read at least 9 volts while cranking. If not, charge battery and proceed
2. Transistor Control Module Circuit Ground	D.C. Volts	B Module Terminal	Battery Neg. (-) Post	With ignition switch on, meter should read less than .25 volt. If reading is not OK, the system ground is faulty and MUST BE CORRECTED BEFORE PROCEEDING WITH TESTS.
3. Ignition Switch and Primary Circuit	D.C. Volts	BW Module Terminal	B Module Terminal	With ignition switch on (do not crank), meter should read between 11 and 13 volts. Now crank engine for 10 seconds. Meter should read at least 9 volts while cranking. If "Ignition Switch On" **and** "Cranking" readings were **both** OK, proceed with test 4. But if readings for **either** were **not** OK, proceed with test 3-A.
3-A. Ignition Switch and Primary Circuit	D.C. Volts	C Ballast Resistor Pos. (+) Terminal	Battery Negative (-) Post	With ignition switch on (do not crank), meter should read between 11 and 13 volts. Now crank engine for 10 seconds. Meter should read at least 9 volts while cranking. If "Ignition Switch On" **and** "Cranking" readings are **both** OK, the connector lead from ignition switch to Module terminal BW and/or connections are faulty and must be corrected. But if readings for **either** were **not** OK, replace ignition switch.
4 Lock Preventive Circuit	D.C. Volts	L Module Terminal	Battery Neg. (-) Post	With ignition switch on (do not crank) and all leads, harnesses, etc., connected for normal operating, meter should read between 11 and 13 volts **within 10 seconds.** If not, replace Transistor Control Unit.*
5 Primary Circuit	D.C. Volts	L Module End of Disconnected Connector Lead	B Module Terminal	With ignition switch off, disconnect the module connector lead from point L and connect the analyzer red clip to the module end of the connector lead. Now turn ignition switch on (do not crank). Meter should read between 11 and 13 volts. Now crank engine for 10 seconds. Meter should read at least 9 volts while cranking. If **both** readings were OK, proceed with test 6. But if **either** reading was **not** OK proceed with test 5-A. Reconnect leads.
5-A. Primary Circuit	LO Ohms 0-200	C Ballast Res. Pos. (+) Terminal	J Ballast Res. Neg. (-) Terminal	With ignition switch off, meter should read between 1.6 and 2.0 ohms. If OK replace ignition switch. If not OK, replace Ballast Resistor and Ignition Coil *
6 Continuity of Coil Secondary	HI Ohms 0-20k	E Coil. Pos. (+) Terminal	M Coil High Tension Tower	With ignition switch off, meter should read between 5,000 and 12,000 ohms. If not, replace Ignition Coil.*
7. Pick-up Coil Output	Pickup Output	R Module Terminal	G Module Terminal	With ignition switch off, disconnect connector leads from **module** terminals R & G and connect analyzer as indicated. Crank engine for 10 seconds. Meter should read 1.5 volts or more while cranking. If OK, proceed with test 8. If **not** OK, check pick-up coil air gap, adjust as indicated and re-test. If reading is still not OK, proceed with test 7-A. (NOTE: On non-California vehicles equipped with dual pick-up coils, repeat 7 & 7-A test procedures with red clip moved to test point BR to test advance pick-up coil.)
7-A Pick-up Coil Output	Pickup Output	R Terminal Block	G Terminal Block	With connector leads disconnected (ignition switch off) at TERMINAL BLOCK points R and G, crank engine for 10 seconds. If meter **now** reads 1.5 volts or **more,** replace distributor connector leads from module terminals R & G to terminal block points R & G. But if reading is still not OK, replace Pick-up Coil Assembly.
8. Water Temperature Switch	LO Ohms 0-200	H Temperature Switch	G Temperature Switch	(NOTE: This test applies **only** to non-California vehicles equipped with dual pick-up coils.) With connector leads disconnected from Temperature Switch at points H and G, meter should read **less than** 1.0 ohm **when engine is cold.** If reading is not OK, replace Water Temperature Switch.*

***IMPORTANT NOTE:** Before condemning **any** parts, check the continuity of **all** connecting wires, and insure that **all** connections are clean, solid **and properly** seated. Additional information concerning testing of wiring may be obtained from the appropriate Datsun Service Manual.

If the above tests do not isolate the specific **electronic** component problem, the Transistor Control Module is at fault and must be replaced. But **before replacing, insure** that the engine performance problem is NOT due to faulty spark plug wires, distributor cap, etc.



1977-78 DATSUN IGNITION CIRCUIT
HITACHI

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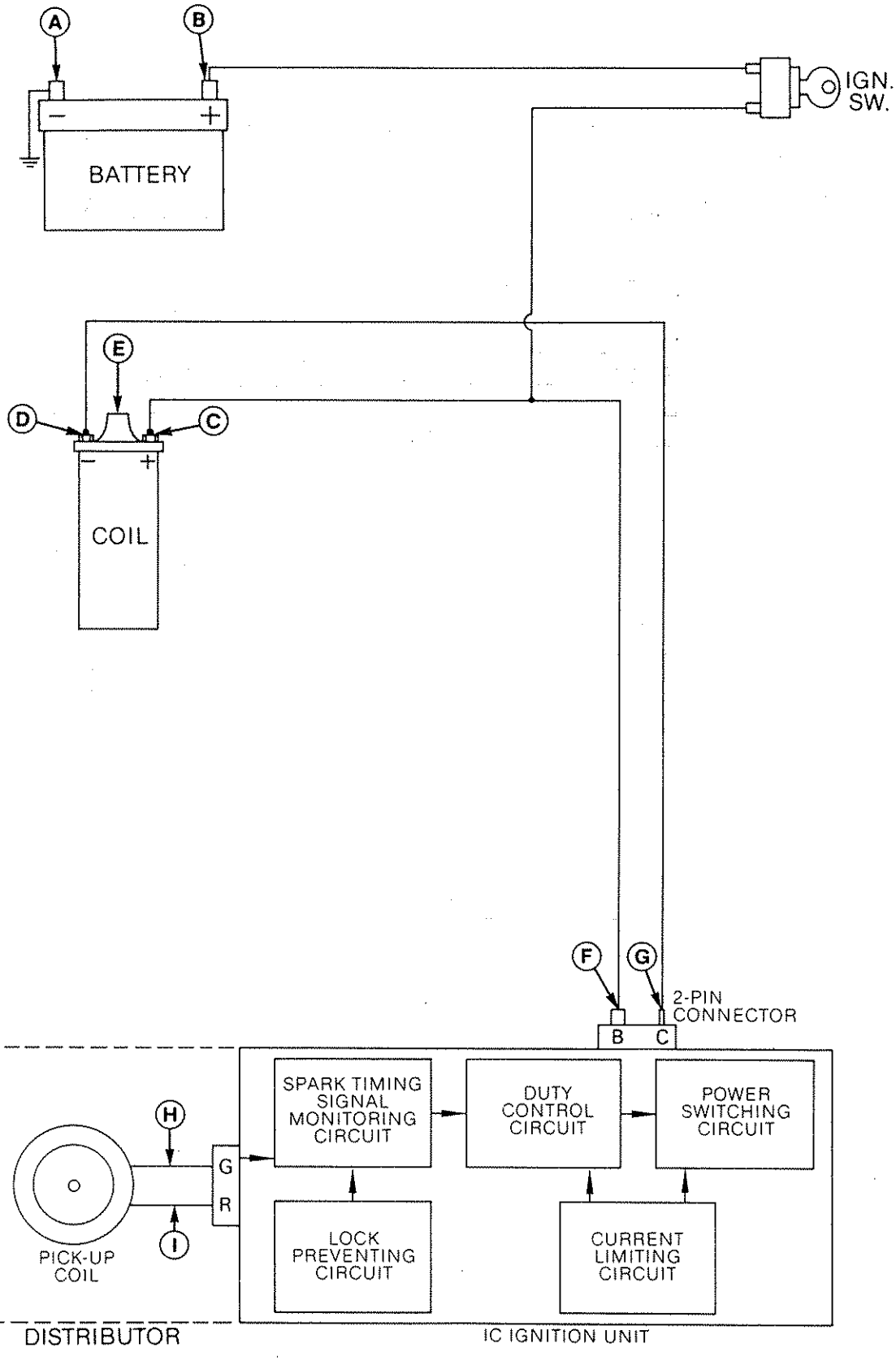
DATSUN IGNITION (HITACHI)
ALL 1979 MODELS

All 1979 Datsun models use the Hitachi Electronic Ignition System. The system consists of a conventional ignition coil, distributor cap and rotor. An IC Ignition Unit is mounted on the distributor housing. The distributor has vacuum and centrifugal advance mechanisms. Inside the distributor, a reluctor and stator work together to provide electrical signals to the IC Ignition Unit. The IC Ignition Unit transmits signals to the coil to make and break the primary circuit.

COMPONENTS TEST	SELECTOR POSITION	ANALYZER CONNECTIONS RED CLIP	ANALYZER CONNECTIONS BLACK CLIP	RESULTS
1. Battery State of Charge	D.C. Volts	B Battery Pos. (+) Post	A Battery Neg. (-) Post	Remove and ground coil high tension wire. Crank engine 10 seconds. Meter should read 9 volts while cranking. If not, charge battery.
2. Ignition Switch	D.C. Volts	C Coil Positive (+) Terminal	A Battery Neg. (-) Post	With ignition switch on (do not crank), meter should read between 11 and 13 volts. Now crank engine. Meter should read at least 9 volts while cranking. If **both** readings are OK, proceed with test 3. But if either or both readings are **not** OK, replace Ignition Switch.
3. Continuity of Coil Primary	LO Ohms 0-200	C Coil Positive (+) Terminal	D Coil Neg. (-) Terminal	With ignition switch off and coil negative lead disconnected from coil, meter should read between .7 and 2.5 ohms. If OK, replace Electronic Ignition Control Unit* (module). If **not** OK, replace Ignition Coil.
4. Continuity of Coil Secondary	HI Ohms 0-20k	C Coil Positive (+) Terminal	E Coil High Tension Tower	With ignition switch off and coil negative lead disconnected from coil, meter should read between 8,200-12,800 ohms. If not, replace Ignition Coil.
5. Power Supply Circuit Check	D.C. Volts	F Black/White Wire Terminal 2-Pin Connector	A Battery Neg. (-) Terminal	Ignition off. Disconnect 2-pin connector from IC Unit. Turn ignition on. If battery voltage is indicated, but engine won't start, go to step 6. If not battery voltage, check battery, wiring, and connectors for continuity.
6. Primary Circuit Check	D.C. Volts	G Blue Wire Terminal, 2-Pin Connector	A Battery Neg. (-) Terminal	Ignition switch off. Disconnect 2-pin connector from IC Unit. Ignition on. Battery voltage should be indicated. If no voltage, check primary circuit wiring and connectors. If OK, go to step 7.
7. IC Ignition Unit and Pick-up Coil Check	HI Ohms 0-2k	H Pick-up Coil Terminal	I Pick-up Coil Terminal	Ignition off. Reverse Ohmmeter leads H and I. Meter should indicate about 400 ohms. If not, suspect IC Ignition Unit Problem. Go to step 8.
8. IC Ignition Unit Check	D.C. Volts	D Coil Negative (-) Terminal	A Battery Neg. (-) Terminal	Ignition on. If not voltage is indicated, IC Ignition Unit is defective. Ignition off. If voltage is indicated, go to step 8-A.
8-A. IC Ignition Unit Check	HI Ohms 0-2k	H Pick-up Coil Terminal	I Pick-up Coil Terminal	Ignition off. Remove IC Unit from distributor. If reading is about 400 ohms, pick-up coil is OK; IC Unit is bad. If reading is not 400 ohms, pick-up coil is defective. Go to step 8-B.
8-B. Pick-up Coil Check	HI Ohms 0-2k	H Pick-up Coil Terminal	I Pick-up Coil Terminal	Ignition off. Remove IC Ignition Unit from distributor. Measure resistance between pick-up coil terminals. Meter should indicate about 400 ohms. If not, replace faulty Pick-up Coil.

***IMPORTANT NOTE:** Before condemning **any** parts, check the continuity of **all** connecting wires, and insure that **all** connections are clean, solid and properly seated. Additional information concerning testing of wiring may be obtained from the appropriate Datsun Service Manual.

If the above tests do not isolate the specific **electronic** component problem, the Transistor Control Module is at fault and must be replaced. But **before** replacing, **insure** that the engine performance problem is NOT due to faulty spark plug wires, distributor cap, etc.



1979 DATSUN IC IGNITION UNIT CIRCUIT DIAGRAM

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FORD ELECTRONIC ENGINE CONTROL (EEC) IGNITION SYSTEM

Ford's Electronic Engine Control (EEC) ignition systems precisely control vital engine functions. The EEC I engine timing, EGR flow rates and Thermactor air flow. The EEC II and EEC III systems control these and air/fuel ratios.

All Ford systems contain an Electronic Control Assembly (ECA), a variety of engine sensors, an ignition module, unique distributor (no magnetic pick-up or vacuum advance mechanism, because timing is controlled by the ECA), ignition coil and high energy plugs and wiring.

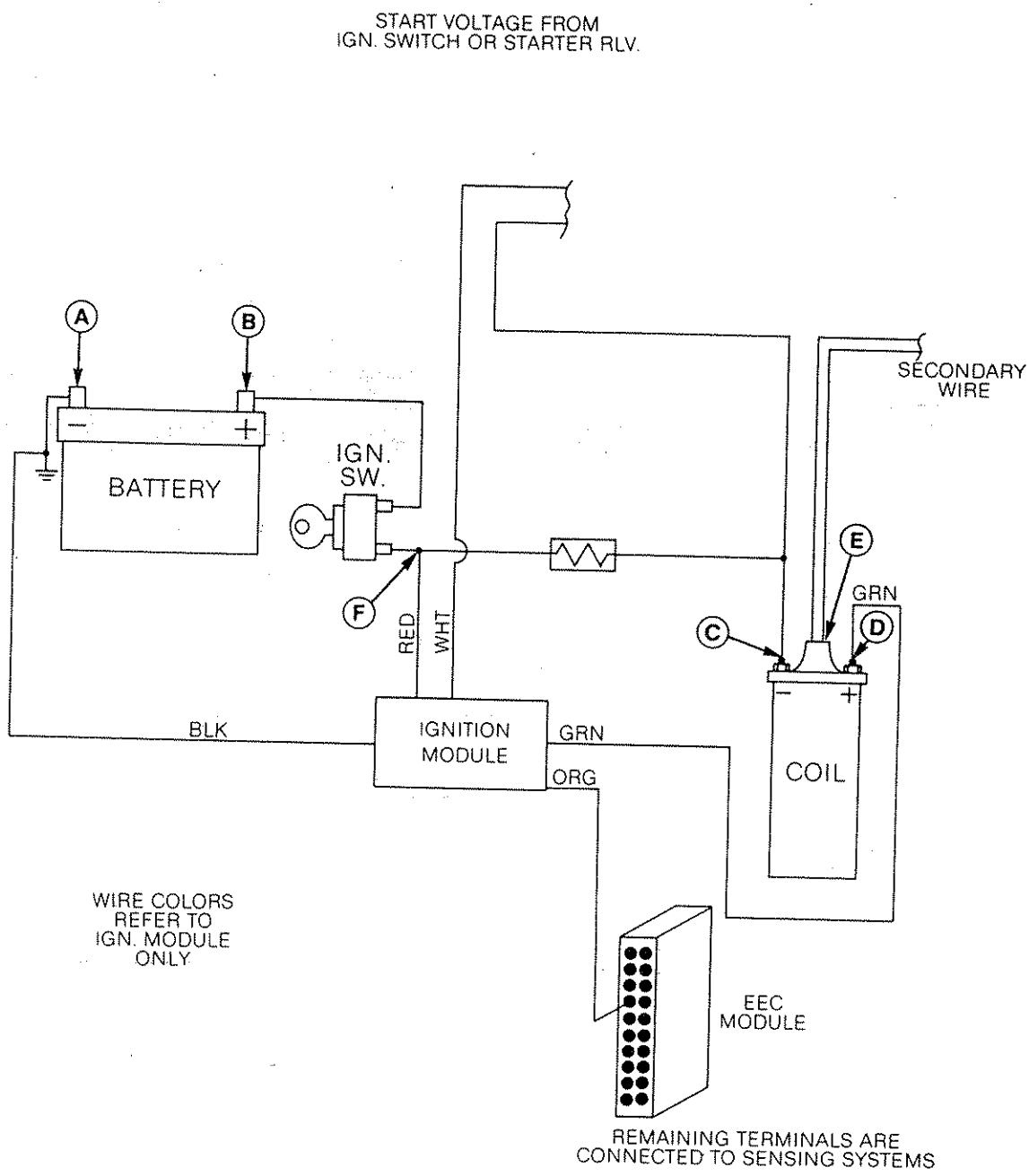
EEC II was used on 1979 and some 1980 model 351" W V8 engines in full size Ford and Mercury models. EEC III was introduced in 1980 and was available on all V8 engines except the Versailles model. A single 32-pin connector links the EEC III ECA to the sensors and engine controls.

With the exception of the tests described, EEC systems require special test modules. Procedures are detailed in applicable Ford Motor Co. Service Manuals.

COMPONENTS TEST	SELECTOR POSITION	ANALYZER CONNECTIONS RED CLIP	BLACK CLIP	RESULTS
1. Battery State of Charge	D.C. Volts	B Battery Pos. (+) Post	A Battery Neg. (-) Post	Remove and ground coil high tension wire. Crank engine 10 seconds. Meter should read 9 volts while cranking. If not, charge battery.
2. Ignition Switch	D.C. Volts	C Coil Positive (+) Terminal	A Battery Neg. (-) Post	With ignition switch on (do not crank), meter should read between 11 and 13 volts. Now crank engine. Meter should read at least 9 volts while cranking. If **both** readings are OK, proceed with test 3. But if either or both readings are **not** OK, replace Ignition Switch.
3. Continuity of Coil Primary	LO Ohms 0-200	C Coil Positive (+) Terminal	C Coil Neg. (-) Terminal	With ignition switch off and coil negative lead disconnected from coil, meter should read between 1.13-1.23 ohms. If OK, replace Electronic Ignition Control Unit* (module). If **not** OK, replace Ignition Coil.
4. Continuity of Coil Secondary	HI Ohms 0-20k	C Coil Positive (+) Terminal	E Coil High Tension Tower	With ignition switch off and coil negative lead disconnected from coil, meter should read between 7,000-9,300 ohms. If not, replace Ignition Coil.
5. Ballast Resistor	LO Ohms 0-200	C Coil Positive (+) Terminal	F Red Wire at Ignition Module	With ignition switch off, meter should read 1.05 to 1.15 ohms. If out of limits, replace Ballast Resistor.

***IMPORTANT NOTE:** Before condemning **any** parts, check the continuity of **all** connecting wires and insure that **all** connections are clean, solid and properly seated. Additional information concerning testing of wiring may be obtained from the appropriate Ford Service Manual.

If the above tests do not isolate the specific **electronic** component problem, the Distributor Electronic Control Module is at fault. But before replacing, insure that the engine performance problem is NOT due to faulty spark plug wires, distributor cap, etc.



FORD ELECTRONIC ENGINE CONTROL
IGNITION SYSTEM

98-5260
55

FORD SOLID-STATE (SSI), DURA SPARK I & DURA SPARK II IGNITION SYSTEMS

Ford electronic ignition systems ... SSI, Dura Spark I and Dura Spark II ... all incorporate similar components and operate in basically the same manner. With the exception of the Dura Spark I system (initially designed only for California applications), the Ford electronic systems are **not** "high energy" secondary voltage systems. In addition, the **primary circuit** from the battery to the "BAT" coil terminal (except Dura Spark I with no ballast resistor), the **secondary circuit** (except for larger plug wires, distributor caps & rotors on Dura Spark I & II), and **mechanical & vacuum advance** are exactly the same as Ford conventional ignition, and can be tested using the same procedures.

The major difference from conventional ignition lies in the method of primary circuit interruption ... As each cylinder's armature pole, or "tooth," rotates **away** from direct alignment with the magnetic pick-up assembly, the module switching transistor (Dura Spark I has 2) is turned "on," producing a condition similar to a points-closed condition in conventional ignition. As each pole becomes **aligned** with the pick-up assembly, the switching transistor(s) is turned "off," the primary circuit is interrupted, and firing voltage is induced in the coil secondary.

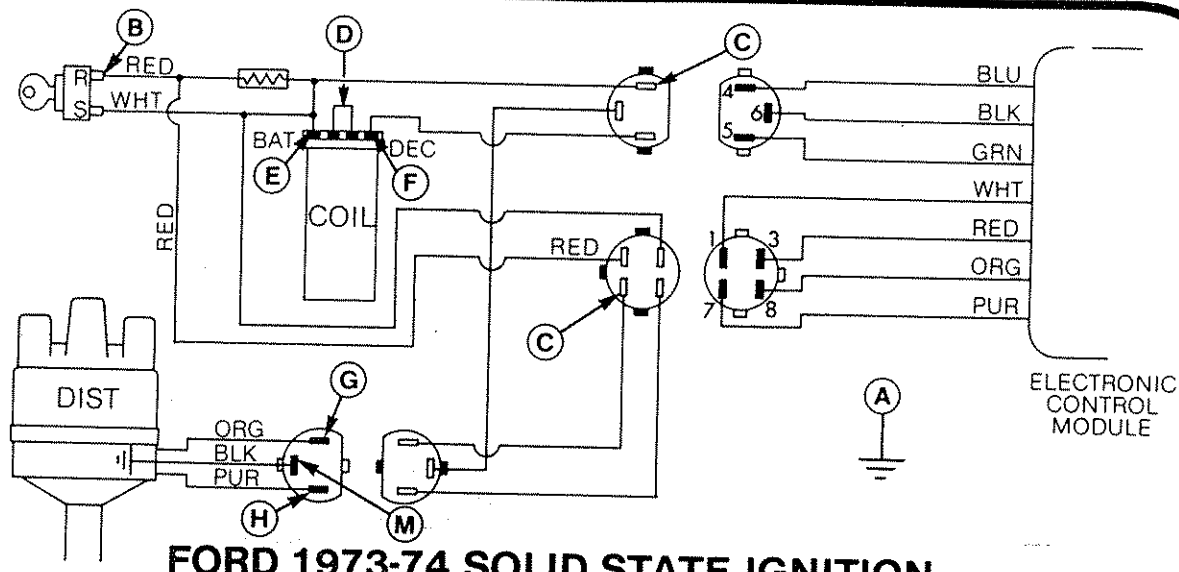
In addition to the components differences noted above, the same oil-filled coil is used on both the SSI and Dura Spark II systems ... The Dura Spark I coil is similar in construction, but incorporates a lower primary resistance and is not interchangeable with any other Ford system. Also, Dura Spark I has **no** ballast resistor, and **different value** ballast resistors are used with SSI and Dura Spark II.

- ***When installing a new distributor cap or rotor, coat the brass rotor electrode surfaces on all sides with silicone grease to approximately 1/32" thickness.***
- ***On the 1975-76 Solid State systems and on Dura-Spark I and II systems, because of the high secondary voltages that could arc to stator and damage it, DO NOT remove the following spark plug wires while engine is running.***
  No. 1 or No. 8 wire on V8 engines.
  No. 3 or No. 5 wire on inline 6-cyl. engines.
  No. 1 or No. 4 wire on V6 engines.
  No. 1 or No. 3 wire on inline 4-cyl. engines.
- ***Disconnect battery before disconnecting control module connectors.***
- ***1973-75 modules have a 3-wire and 4-wire connector. 1976-80 have a 2-wire and a 4-wire connector. SSI modules cannot be interchanged with Dura-Spark modules. Dura-Spark I modules cannot be interchanged with Dura-Spark II modules. All replacement modules have 2-wire and 4-wire connectors.***
- ***When a spark plug wire is removed from spark plug, coil or the distributor terminal housing, silicone grease must be applied to the boot before it is reconnected.***

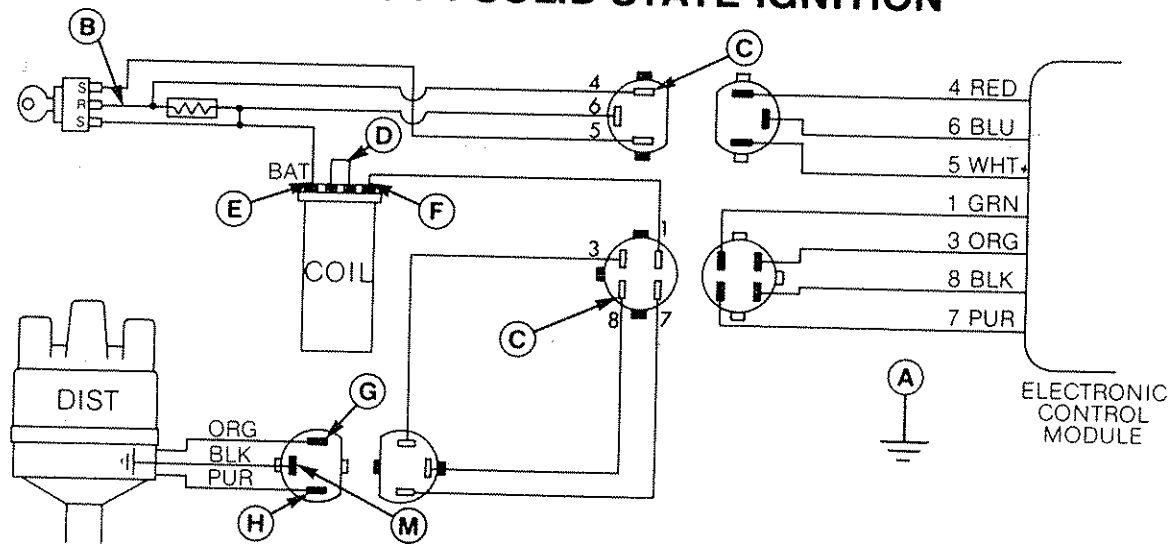
COMPONENTS TEST	SELECTOR POSITION	ANALYZER CONNECTORS RED CLIP	ANALYZER CONNECTORS BLACK CLIP	RESULTS
1. Battery State of Charge	D.C. Volts	B Battery Pos. (+) Post	A Ground	Remove and ground coil high tension wire, and crank engine for 10 seconds. Meter should read at least 9 volts while cranking. If not, charge battery and proceed.
2. Electronic System Ground	LO Ohms 0-200r	M Distributor Connector Lead Terminal	A Battery Neg. (-) Post	With ignition switch off, meter should read zero ohms. If there is **any** ohms reading, the system ground is faulty and must be corrected before proceeding.
3. Primary System QUICK TEST	Charging Volts-Amps (Engine Analyzer)	Connect Current Multiplier between coil end of DEC connector lead and coil DEC connector (F). Attach Clamp Amp to Current Multiplier.		With ignition switch off, remove coil cap and connect jumper lead from coil BAT terminal to coil end of BAT connector lead. Turn ignition switch on (do not crank). Meter should read between 2.0 and 5.5 amps. Now crank engine for 10 seconds. Meter should read between 3.0 and 6.0 amps while cranking. If **both readings are OK proceed with test 4. But if either** reading is **not** OK, proceed with test 3-A.
3-A. Ignition Switch	D.C. Volts	E Coil BAT Terminal	A Ground	With ignition switch on (do not crank), meter should read between 4.9 and 7.9 volts (between 11 and 14 on Dura Spark I). Now crank the engine for 10 seconds. Meter should read (all Ford systems) at least 9 volts. If **both** readings are OK, proceed with test 3-B. If both readings are **not** OK, or if "Ignition On" reading is OK and "Cranking" reading is **not** OK, replace Ignition Switch and proceed with test 4. If "Cranking" reading is OK and "Ignition On" reading is **not** OK, proceed with test 3-C.
3-B. Power To DEC Module	D.C. Volts	C Connector Lead Terminal	A Ground	With ignition switch on (do not crank), meter should read between 10 and 13 volts. If not, replace Ignition Switch.
3-C. Continuity of Coil Primary	LO Ohms 0-200	F Coil DEC Terminal	E Coil BAT Terminal	With ignition switch off, meter should read between 1.0 and 2.0 ohms (between .71 and .77 ohms on Dura Spark I; 1.13 and 1.23 ohms on Dura Spark II).
3-D. Continuity of Ballast Resistor Wire	LO Ohms 0-200*	C Connector Lead Terminal	E Coil BAT Terminal	With ignition switch off, meter should read between 1.0 and 2.0 ohms (between .7 and 1.7 ohms on Dura Spark II). If not, replace Ballast Resistor Wire assembly. (NOTE: This test does not apply to Dura Spark I. On these vehicles, simply check continuity and connections of connector lead from coil BAT terminal to ignition switch and correct as indicated.)
4. Continuity of Coil Secondary	HI Ohms 0-20k	D Coil High Tension Tower	E Coil BAT Terminal	With ignition switch off, meter should read between 7,000 and 13,000 ohms, SSI; 7,700 to 9,000 ohms, Dura Spark I and II.
5. Pick-up Coil	Pick-up	H Distributor Connector Lead Terminal	G Distributor Connector Lead Terminal	With distributor connector lead disconnected at points G and H and analyzer connected as indicated, crank engine for 10 seconds. Meter should read 3 volts or more. If not, check for coil misalignment caused by loose distributor breaker plate. Correct as indicated and re-test. If reading is still not OK, replace Pick-up Coil assembly.

*__IMPORTANT NOTE:__ Before condemning **any** parts check the continuity of **all** connecting wires and insure that **all** connections are clean, solid and properly seated. Additional information concerning testing of wiring may be obtained from the appropriate Ford Service Manual.

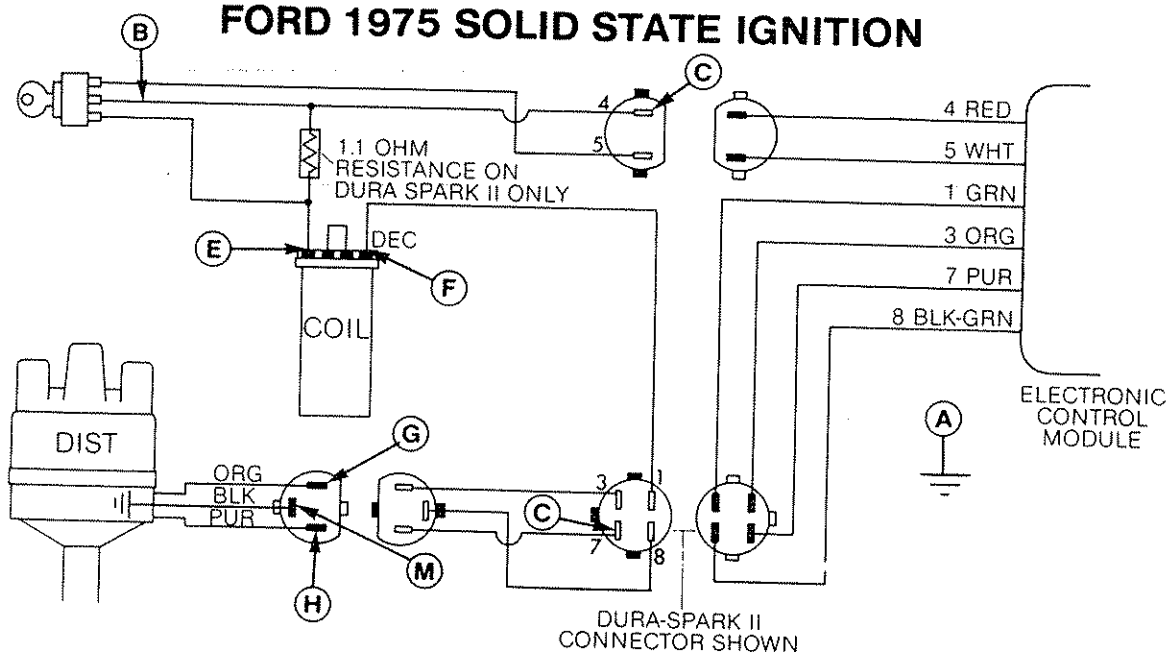
If the above tests do not isolate the specific **electronic** component problem, the Distributor Electronic Control Module is at fault. But before replacing, insure that the engine performance problem is **not** due to faulty plug wires, distributor cap, etc.



FORD 1973-74 SOLID STATE IGNITION



FORD 1975 SOLID STATE IGNITION



FORD 1976 SOLID STATE
AND 1977-80 DURA-SPARK I & II IGNITION

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FORD, 1977-78 CAPRI & 1978-79 FIESTA MODELS
DURA SPARK II WIRING

The Ford Dura Spark II electronic ignition system does not have a "high energy" secondary voltage system. In addition, the primary circuit from the battery to the coil BAT terminal, the secondary circuit, and mechanical and vacuum advance are identical to that used on Ford conventional ignition systems.

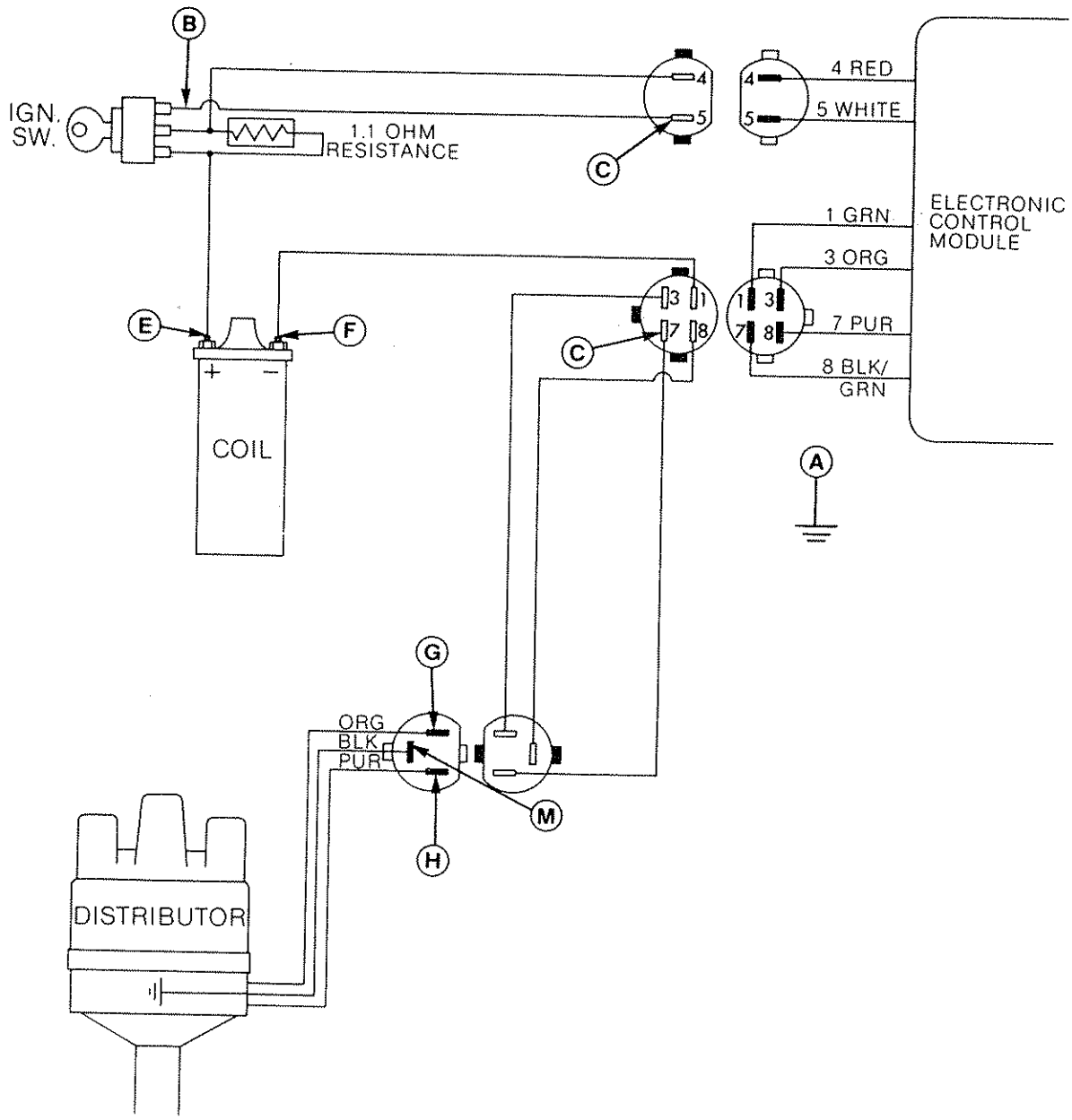
The major difference from conventional ignition lies in the method of primary circuit interruption ... As each cylinder's armature pole, or "tooth," rotates **away** from direct alignment with the magnetic pick-up assembly, the module switching transistor is turned "on," producing a condition similar to a points-closed condition in conventional ignition. As each pole becomes **aligned** with the pick-up assembly, the switching transistor(s) is turned "off," the primary circuit is interrupted, and firing voltage is induced in the coil secondary.

- ***Dura-Spark I modules cannot be interchanged with Dura-Spark II modules. All replacement modules will have 2-wire and 4-wire connectors.***
- ***When a spark plug wire is removed from spark plug, coil or the distributor terminal housing, silicone grease must be applied to the boot before it is reconnected.***
- ***When installing a new distributor cap or rotor, coat the brass rotor electrode surfaces on all sides with silicone grease to approximately 1/32" thickness.***
- ***On Dura-Spark II systems, because of the high secondary voltages that could arc to stator and damage it, DO NOT remove the following spark plug wires while engine is running.***
  No. 3 or No. 5 wire on inline 6-cyl. engines.
  No. 1 or No. 4 wire on V6 engines.
  No. 1 or No. 3 wire on inline 4-cyl. engines.

COMPONENTS TEST	SELECTOR POSITION	ANALYZER CONNECTIONS RED CLIP	ANALYZER CONNECTIONS BLACK CLIP	RESULTS
1. Battery State of Charge	D.C. Volts	B Battery Pos. (+) Post	A Ground	Remove and ground coil high tension wire, and crank engine for 10 seconds. Meter should read at least 9 volts while cranking. If not, charge battery and proceed.
2. Electronic System Ground	LO Ohms 0-200*	M Distributor Connector Lead Terminal	A Ground	With ignition switch off, meter should read zero ohms. If there is **any** ohms reading, the system ground is faulty and must be corrected before proceeding.
3. Primary System QUICK TEST	Charging Volts-Amps (Engine Analyzer)	Connect Current Multiplier between coil end of negative connector LEAD and coil negatiave (-) terminal (F). Attach clamp Amp to Current Multiplier.		With ignition switch off, remove coil cap and connect jumper lead from coil BAT terminal to coil end of BAT connector lead. Turn ignition switch on (do not crank). Meter should read between 2.0 and 5.5 amps. Now crank engine for 10 seconds. Meter should read between 3.0 and 6.0 amps while cranking. If **both readings are OK, proceed with test 4. But if either** reading is **not** OK, proceed with test 3-A.
3-A. Ignition Switch	D.C. Volts	E Coil BAT (+) Terminal	A Ground	With ignition switch on (do not crank), meter should read between 4.9 and 7.9 volts. Now crank the engine for 10 seconds. Meter should read (all Ford systems) at least 9 volts. If **both** readings are OK, proceed with test 3-B: If both readings are **not** OK, or if "Ignition On" reading is OK and "Cranking" reading is **not** OK, replace Ignition Switch and proceed with test 4. If "Cranking" reading is OK and "Ignition On" reading is **not** OK, proceed with test 3-C.
3-B. Power To DEC Module	D.C. Volts	C Connector Lead Terminal	A Ground	With ignition switch on (do not crank), meter should read between 10 and 13 volts. If not, replace Ignition Switch.
3-C. Continuity of Coil Primary	LO Ohms 0-200	F Coil Neg. (-) Terminal	E Coil BAT (+) Terminal	With ignition switch off, meter should read between 1.0 and 2.0 ohms. If not, replace Ignition Coil.*
3-D. Continuity of Ballast Resistor Wire	LO Ohms 0-200	C Connector Lead Terminal	E Coil BAT (+) Terminal	With ignition switch off, meter should read 1.1 ohms. If not, replace Ballast Resistor Wire assembly.
4. Continuity of Coil Secondary	HI Ohms 0-20k	D Coil High Tension Tower	E Coil BAT (+) Terminal	With ignition switch off, meter should read between 7,000 and 13,000 ohms. If not, replace Ignition Coil.*
5. Pick-up Coil	Pick-up Output	H Distributor Connector Lead Terminal	G Distributor Connector Lead Terminal	With distributor connector lead disconnected at points G and H and analyzer connected as indicated, crank engine for 10 seconds. Meter should read 3 volts or more. If not, check for coil misalignment caused by loose distributor breaker plate, correct as indicated and re-test. If reading is sitll not OK, replace Pick-Up Coil assembly.

***IMPORTANT NOTE:** Before condemning **any** parts, check the continuity of **all** connecting wires and insure that **all** connections are clean, solid and properly seated. Additional information concerning testing of wiring may be obtained from the appropriate Ford Service Manual.

If the above tests do not isolate the specific **electronic** component problem, the Distributor Electronic Control Module is at fault. But before replacing, insure that any engine performance problem is **not** due to faulty plug wires, distributor cap, etc.



ALL 1977-78 CAPRI & 1978-79 FIESTA MODELS
DURA-SPARK II WIRING

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GENERAL MOTORS HEI
INLINE 4 & 6 CYLINDER ENGINES

General Motors HEI (High Energy Ignition) produces spark plug firing voltages of up to 35,000 volts and "burn time" is almost twice as long as conventional and other electronic ignition systems. All electronic components, including the module, are located in the distributor assembly (except an external ignition coil on inline 4 & 6 cylinder engines). Because of HEI's high firing voltages, secondary ignition system testing requires specialized equipment and procedures.

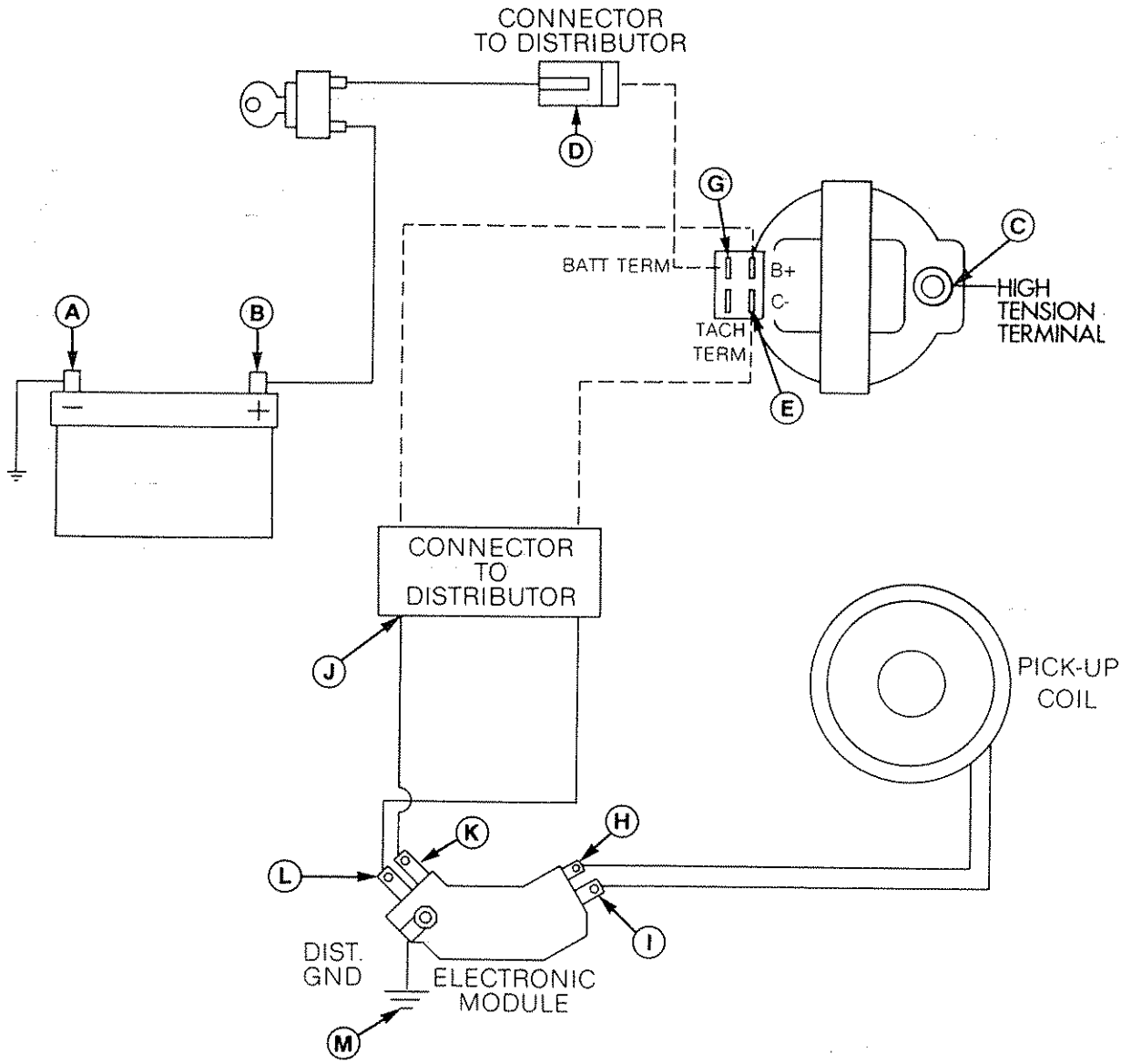
Electronic components include a **pick-up coil** mounted over the distributor shaft; a rotating **timer core** with outward-pointing "teeth" mounted on the distributor shaft; a stationary **pole piece** with inward-pointing "teeth"; and an **electronic module.** A condenser is included strictly for suppression of radio noise interference. In addition, because there is no external primary resistor in the ignition switch circuit, the distributor primary receives direct battery voltage.

HEI operates as follows ... As the timer core "teeth" approach direct alignment with the pole piece "teeth," voltage builds in the coil primary (similar to a points-closed cycle in conventional ignition). When the "teeth" are directly aligned, the pick-up coil signals the module switching transistor to turn "off" and the primary circuit is interrupted (similar to points-open). The coil field then collapses, firing voltage is induced in the coil secondary, and ignition occurs. Dwell, or the length of time the module switching transistor is "on," varies with engine speed, and because it's controlled electronically it is not adjustable.

COMPONENTS TEST	SELECTOR POSITION	ANALYZER CONNECTIONS RED CLIP	ANALYZER CONNECTIONS BLACK CLIP	RESULTS
1. Battery State of Charge	D.C. Volts	B Battery Pos. (+) Post	A Battery Neg. (-) Post	Disconnect ignition switch feed wire from coil (do **not** ground) and crank engine for 10 seconds. Meter should read at least 9 volts while cranking. If not, charge battery and proceed.
2. Electronic System Ground	D.C. Volts	B Battery Pos. (+) Post	M Distributor Ground	With ignition switch on (do not crank) and ignition switch feed wire reconnected at coil, meter should read between 11 and 13 volts. If not, the system ground is faulty and **MUST** BE CORRECTED **BEFORE** PROCEEDING WITH TESTS.
3. Ignition Switch	D.C. Volts	D Ignition Switch Feed Terminal	A Battery Neg. (-) Post	With ignition switch on (do not crank), meter should read between 11 and 13 volts. Now crank engine. Meter should read at least 9 volts while cranking. If **both readings are OK, proceed with test 4. But if either or** both readings are **not** OK, replace Ignition Switch.
4. Static Power Check of Module	Charging Volts-Amps (Engine Analyzer)	Connect current multiplier between Distributor "Batt" terminal (G) and end of ignition switch feed wire (D). Attach clamp amp to current mult.		With ignition switch on (do not crank), meter should read between .1 and .7 amp. If higher, replace Electronic Module.* If lower or OK, proceed with test 5.
5. Continuity of Coil Primary	LO Ohms 0-200	E Coil Terminal	G Coil Terminal	Disconnect coil connectors from coil and connect analyzer as indicated. With ignition switch off, meter should read .2-1.5 ohms. If not, replace Ignition Coil.
6. Continuity of Coil Secondary	HI Ohms 0–200k	C Coil High Tension Terminal	E Coil Terminal	Disconnect coil high tension and coil connectors from coil, and connect analyzer as indicated. With ignition switch off, meter should read between 6,000 and 30,000 ohms. If not, replace Ignition Coil.*
7. Lower Harness Assembly	D.C. Volts	K Module Terminal	A Battery Neg. (-) Post	Reconnect coil connector, high tension wire and ignition switch feed wire. With ignition switch on (do not crank), meter should read at least 10 volts. If OK, proceed with test 8. If not, replace Lower Harness Assembly.
8. Lower Harness Assembly	D.C. Volts	L Module Terminal	A Battery Neg. (-) Post	With ignition switch on (do not crank), meter should read at least 10 volts. If OK, proceed with test 9. If not OK, replace Lower Harness Assembly.
9. Pick-up Coil Output	Pickup Output	I Pick-up Lead	H Pick-up Lead	Disconnect ignition switch feed wire at coil and crank engine for 10 seconds. With pick-up leads connected at module, meter should read 1.5 volts or more while cranking. If not, proceed with test 9-A.
9-A. Pick-up Coil Output	Pickup Output	I Pick-up Lead	H Pick-up Lead	Disconnect pick-up leads from module and crank engine for 10 seconds. If meter **now** reads 1.5 volts or more while cranking, replace Electronic Module.* But if reading is still **not** OK, replace Pick-up Coil assembly.

*IMPORTANT NOTE: Before condemning **any** parts, check the continuity of **all** connecting wires, and insure that **all** connections are clean, solid and properly seated. Additional information concerning testing may be obtained from the appropriate General Motors Service Manual

If the above tests do not isolate the specific **electronic** component problem, the Distributor Electronic Control Module is at fault. But before replacing, insure that the engine performance problem is **not** due to faulty plug wires, distributor cap, etc.



GM HEI IN-LINE 4 & 6-CYL.

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GENERAL MOTORS HEI
V-6 & V-8 ENGINES

General Motors HEI (High Energy Ignition) produces spark plug firing voltages of up to 35,000 volts and "burn time" is almost twice as long as conventional and other electronic ignition systems. All electronic components, including the module, are located in the distributor assembly (except an external ignition coil on inline 4 & 6 cylinder engines). Because of HEI's high firing voltages, secondary ignition system testing requires specialized equipment and procedures.

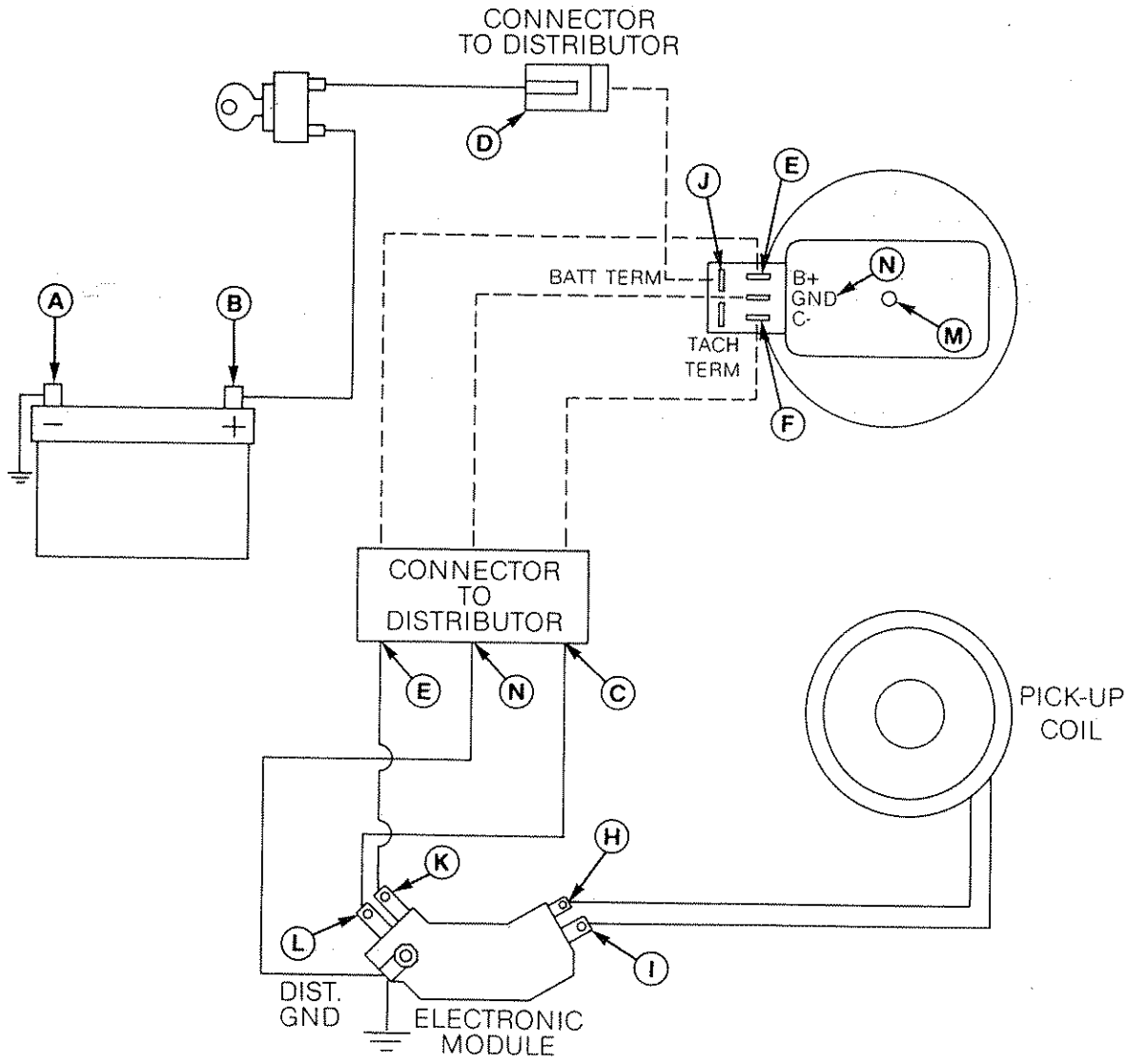
Electronic components include a **pick-up coil** mounted over the distributor shaft; a rotating **timer core** with outward-pointing "teeth" mounted on the distributor shaft; a stationary **pole piece** with inward-pointing "teeth"; and an **electronic module.** A condenser is included strictly for suppression of radio noise interference. In addition, because there is no external primary resistor in the ignition switch circuit, the distributor primary receives direct battery voltage.

HEI operates as follows ... As the timer core "teeth" approach direct alignment with the pole piece "teeth," voltage builds in the coil primary (similar to a points-closed cycle in conventional ignition). When the "teeth" are directly aligned, the pick-up coil signals the module switching transistor to turn "off" and the primary circuit is interrupted (similar to points-open). The coil field then collapses, firing voltage is induced in the coil secondary, and ignition occurs. Dwell, or the length of time the module switching transistor is "on," varies with engine speed, and because it's controlled electronically it is not adjustable.

COMPONENTS TEST	SELECTOR POSITION	ANALYZER CONNECTIONS RED CLIP	ANALYZER CONNECTIONS BLACK CLIP	RESULTS
1. Battery State of Charge	D.C. Volts	B Battery Pos. (+) Post	A Battery Neg. (-) Post	Disconnect ignition switch feed wire from distributor (do **not** ground) and crank engine for 10 seconds. Meter should read at least 9 volts. If not, charge battery and proceed.
2. Electronic System Ground	D.C. Volts	**B Battery Pos. (+) Post**	**N Distributor Gnd. Terminal**	**Disconnect the Distributor 3-wire connector, use wire adapter, meter should read battery voltage — if not, move black clip and touch Dist. metal housing. If it now reads battery voltage, the ground wire or ground connection inside of the Distributor is at fault and must be corrected before proceeding.**
3. Ignition Switch	D.C. Volts	D End of Ignition Switch Feed Wire	A Battery Neg. (-) Post	Disconnect switch wire from Distributor battery terminal. With the switch "off" meter should read zero "0" volts, turn switch "on" meter should read battery volts, crank engine, meter should read at least 9 volts. Reconnect Dis. 3-wire harness.
4. Static Power Check of Module	Charging Volts-Amps (Engine Analyzer)	Connect Current Multiplier between Distributor "Batt" terminal (J) and end of ignition switch feed wire (D). Attach clamp amp.		With ignition switch on (do not crank), meter should read between .1 and .7 amps. If higher, replace Electronic Module. If lower or zero, proceed with test 5. Use adapter at battery terminal.
5. Continuity of Coil Primary	LO Ohms 0-200	F Distributor "C"-Terminal	J Distributor "BAT" Terminal	With ignition switch off, remove distributor cap and rotor, and disconnect lower housing harness. Meter should read between 0 to 1 ohm. If above 1 ohm, replace Ignition Coil (located in distributor cap).
6. Continuity of Coil Secondary	HI Ohms 0-200k	M High Tension Terminal	**F & N Distributor "C-" GRD Terminal**	With ignition switch off, either meter should read between 6000 and 30,000 ohms. If meter reads higher than 30,000 ohms replace Ignition Coil (located in distributor cap). Also inspect rotor, coil and distributor cap for carbon tracking, etc., and replace as indicated.
7. Lower Housing Harness	D.C. Volts	K Module B Terminal	A Battery Neg. (-) Post	Connect switch wire & Dist. 3-wire harness. With ignition switch on (do not crank), place analyzer red clip in contact with module B terminal (test point K). Meter should read at least 10 volts. If not, replace Lower Housing Harness at distributor.
8. Lower Housing Harness	D.C. Volts	L Module C Terminal	A Battery Neg. (-) Post	With ignition switch on (do not crank), place analyzer red clip in contact with module C terminal (test point L). Meter should read at least 10 volts. If not, replace Lower Housing Harness at distributor.
9. Pick-up Coil Assembly Output	Pick-up Output	I Pick-up Lead	H Pick-up Lead	Disconnect ignition switch feed wire from distributor (do **not** ground). With pick-up leads **connected** to module, crank engine for 10 seconds. Meter should read 1.5 volts or more while cranking. If not, proceed with test 9-A.
9-A. Pick-up Coil Assembly Output	Pick-up Output	I Pick-up Lead	H Pick-up Lead	With ignition switch off, disconnect pick-up leads from module. Now crank engine for 10 seconds. If meter **now** reads 1.5 volts or more while cranking, replace the Electronic Module.* But if reading is still **not** OK, replace Pick-up Coil Assembly.

***IMPORTANT NOTE:** Before condemning **any** parts, check the continuity of **all** connecting wires, and insure that **all** connections are clean, solid and properly seated. Additional information concerning testing of wiring may be obtained from the appropriate General Motors Service Manual.

If the above tests do not isolate the specific **electronic** component problem, the Electronic Module is at fault. But **before** replacing it, insure that the engine performance problem is **not** due to faulty plug wires, distributor cap, etc.



GENERAL MOTORS HEI
V8 AND V6 ENGINES

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GENERAL MOTORS HEI IGNITION WITH C-4 EMISSION SYSTEM

Beginning in 1979 some models, General Motors vehicles, were equipped with the C-4 Emissions System (computer controlled catalytic converter). C-4 is a computer-controlled fuel management system that controls exhaust emissions by regulating the air/fuel ratio. It uses a special catalytic converter.

Although C-4 is basically an emission system, vehicles with C-4 or Digital Electronic Fuel Injection (DEFI) have a self-diagnosis system which affects and will often assist in specifically identifying problems with the vehicle's ignition system.

Components include a 3-way dual-bed catalytic converter, an exhaust gas oxygen sensor, an electronic control module, an electronically-controlled air/fuel ratio carburetor, and various optional sensor-type components which supply information to the electronic control module.

TEST PROCEDURES USING THE DIAGNOSTIC ENGINE ANALYZER

1. Harness connection is identical to that for any GM HEI system.

2. DWELL - To measure dwell, remove the blue coil (-) clip from the distributor TACH terminal and reconnect to the Dwell Meter Connector (figure 3-1). The pig tail has a green connector sticking out of the wiring harness for connection of the HEI lead.

A. Remove the No. 1 plug inductive pickup from the No. 1 spark plug wire.

B. Depress engine selector buttons "N" for 6 cylinders, regardless of the number of cylinders in the engine to be tested.

C. On the C-4 system, Dwell is the period of time that the circuit is closed and allows voltage to flow. In this "closed loop" mode, the electronic computer has command of the circuit and changes the engine operation as needed. Dwell will change continuously between 5 and 50 in closed loop operation.

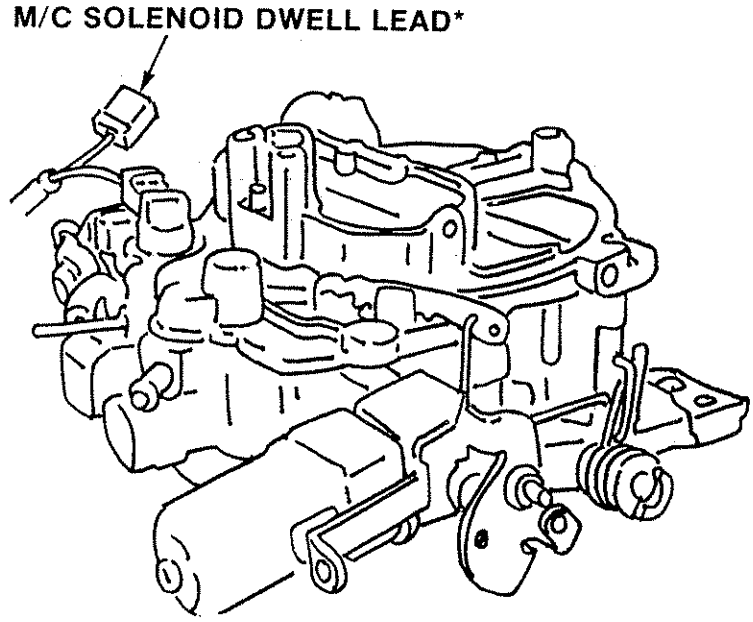
D. There are three ways of distinguishing "Open" from "Closed" loop operation:

1. A variation in dwell will occur only in closed loop.

2. If you place your hand over the carburetor to choke the engine and dwell moves up scale, this indicates closed loop operation.

3. If you pull a vacuum hose off and the dwell drops down, that also indicates closed loop.

DWELL METER CONNECTOR LOCATION

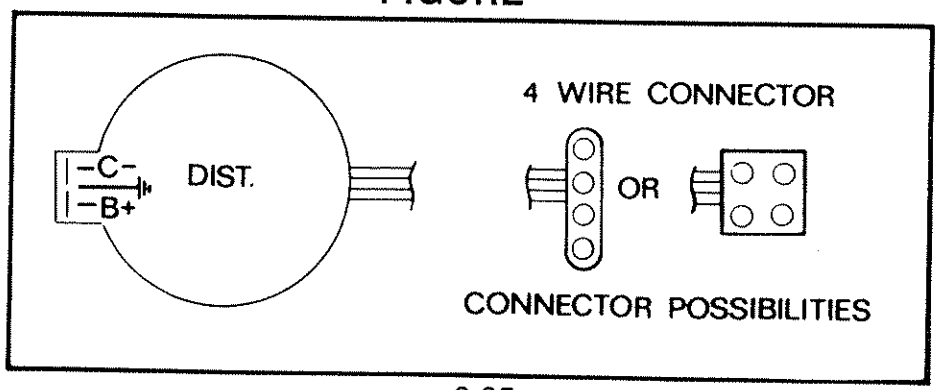


*M/C solenoid dwell lead connector may be found in various locations on the wiring harness depending on the engine wiring configuration.

3. RPM - To obtain an RPM reading, remove the blue clip from the Dwell Meter connector and replace the No. 1 pickup on the No. 1 spark plug wire.

4. INITIAL TIMING - To set or measure initial timing, it will be necessary to disconnect the (4) wire connector wires which come from the bottom of the Distributor - Reconnect when finished (see figure). There is no vacuum or mechanical timing advance to measure since the computer controls the distributor spark advance.

DISTRIBUTOR 4-WIRE CONNECTOR FIGURE



98-5260

5. DISTRIBUTOR PICK-UP COIL — The new distributor modules look different because they have (7) terminals.

   The Distributor pick-up coil is connected to the module terminals labeled "P" and "N."

   Testing the Distributor Pick-up Coil remains the same as with the (4) terminal module. The examples of late style modules are shown, one with circuit connections (see figure 3-3).

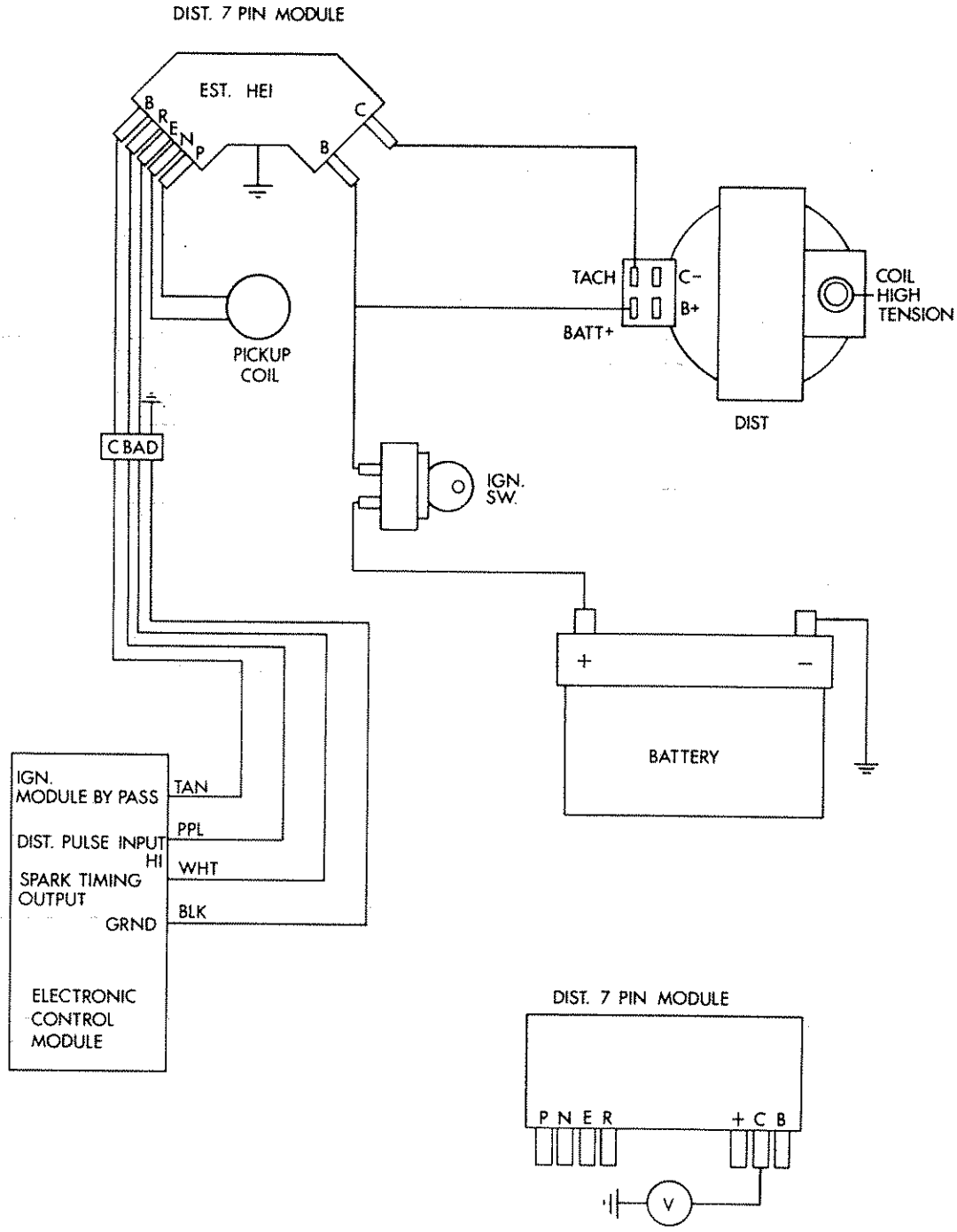
6. CHARGING CIRCUIT — To by-pass the Regulator (to perform full alternator output) or (full fielding) on 1981 systems, ground through the "D" shaped hole in the alternator (positioned at the lower end of the regulator) except it is necessary to enter about 1/4-inch further to reach the "TAB."

   NOTE: The earlier type (through 1979) had the TAB positioned 5/8-inch from the outside of the case and the new alternators have this tab positioned 7/8-inch inside the case.

   A coat hanger bent on one end with a 7/8-inch end, and about 12 inches long works well for all series.

7. COMPONENTS TESTING — Use the GM HEI procedures described in this section for 4- and 6-cylinder or V-6 and V-8 engines as applicable.

GM Electronic Spark Timing Schematic, 1980
FIGURE 3-3



1980 GENERAL MOTORS EST

98-5260

GENERAL MOTORS MISAR (EARLY BURN)

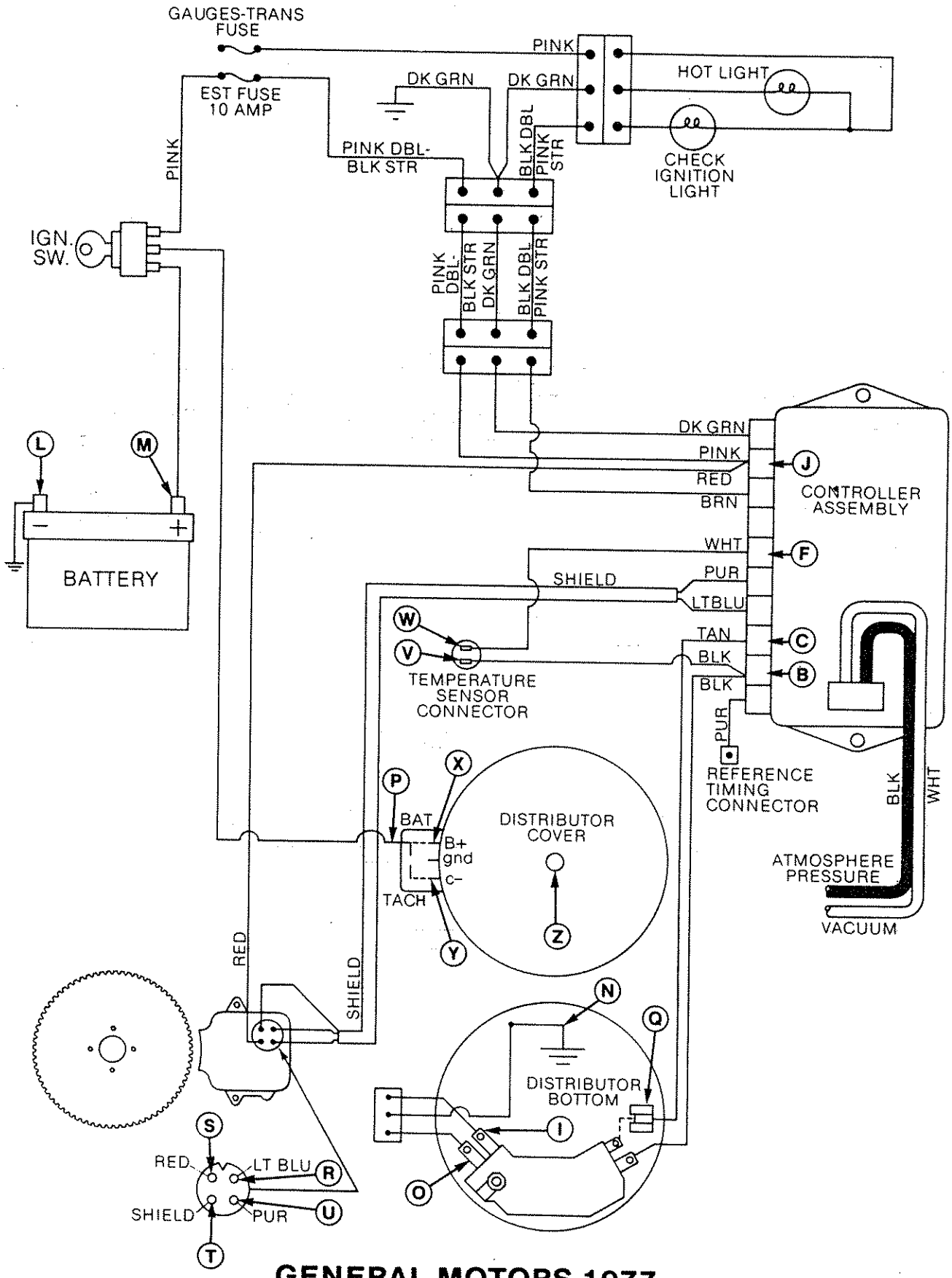
GM's MISAR (microprocessed Sensing and Automatic Regulation) electronic spark timing system incorporates engine sensors that constantly measure crankshaft position, atmospheric pressure, engine speed & temperature, and manifold vacuum, and a controller assembly (on-board digital computer/microprocessor) capable of performing thousands of operations per second that analyzes total sensor input and instantaneously adapts distributor firing advance for maximum engine efficiencies.

The MISAR system's firing voltages are the same as HEI, and both systems utilize the same spark plug wires, distributor caps, ignition coils, electronic modules and rotors. The MISAR system does not, however, incorporate a timer core, pole piece, or pick-up coil, or mechanical and vacuum advance mechanisms, because firing results strictly from controller assembly directives to the distributor electronic module. In addition, the MISAR rotor cannot be adjusted by turning the distributor, so engine timing adjustments require a very specialized procedure. Also, because this system produces the same "high energy" firing voltages as HEI, **secondary ignition system testing** (spark plugs, plug wires, etc.) requires specialized equipment and test procedures.

COMPONENTS TEST	SELECTOR POSITION	ANALYZER CONNECTIONS RED CLIP	ANALYZER CONNECTIONS BLACK CLIP	RESULTS
1. Battery State of Charge	D.C. Volts	M Battery Pos. (+) Post	L Battery Neg. (-) Post	With ignition switch lead wire disconnected from distributor (do not ground), crank engine for 10 seconds. Meter should read at least 9 volts while cranking. If not, charge battery and proceed.
2. Electronic System Ground	D.C. Volts	B Controller Assy. Ground Terminal	L Battery Neg. (-) Post	With ignition switch on, meter should read less than .25 volt. If not, remove the distributor cap, move analyzer red clip to the distributor ground screw at point N and retest. If the reading is now less than .25 volt, the ground fault is located between the distributor and the controller assembly. But if the reading is still higher than .25 volt, remove any corrosion, etc., from the ground screw, tighten firmly, and retest. THE SYSTEM GROUND **MUST** BE OK **BEFORE** PROCEEDING WITH TESTS.
3. Ignition Switch	D.C. Volts	P End of Ignition Sw. Feed Wire	L Battery Neg. (-) Post	With ignition switch feed wire disconnected from the distributor and ignition switch on (do not crank), meter should read at least 11 volts. Now crank engine for 10 seconds. Meter should read at least 9 volts while cranking. If either reading is not OK, replace Ignition Switch. Proceed with test 4.
4. Ignition Switch	D.C. Volts	J Controller Assy. Terminal	L Battery Neg. (-) Post	With ignition switch on (do not crank), meter should read at least 11 volts. If not, check 10 amp E.S.T. fuse in fuse panel. If fuse is OK, replace Ignition Switch.
5. Static Module Power Check	Charging volts-amps (Engine Analyzer)	Connect Current Multiplier between distributor "Batt" terminal (X) and end of ignition switch feed wire (P). Attach clamp Amp.		With ignition switch on (do not crank), meter should read between .1 and .7 amp. If OK or lower, proceed with test 6. If higher, replace Electronic Module.*
6. Continuity of Coil Primary	LO Ohms 0-200	Y Distributor "C-" Terminal	X Distributor "BAT" Terminal	With ignition switch off, disconnect lower housing harness from distributor cap and remove distributor cap and rotor. With analyzer connected as indicated, meter should read between .2-1.5 ohms. If not, replace Ignition Coil (located in distributor cap).
7. Continuity of Coil Secondary	HI Ohms 0-200k	Z Coil High Tension Terminal	N Distributor Ground	With ignition switch off, meter should read between 5,000 and 25,000 ohms. If reading is higher than 25,000 ohms, replace Ignition Coil (located in distributor cap).
8. Lower Housing Harness	D.C. Volts	I Module "B" Terminal	L Battery Neg. (-) Post	With lower housing harness **and** ignition switch feed wire reconnected at distributor cap and ignition switch on (do not crank), place analyzer red clip in contact with module terminal B (test point I). Meter should read at least 10 volts. If not, replace Lower Housing Harness.
9. Lower Housing Harness	D.C. Volts	O Module "C-" Terminal	L Battery Neg. (-) Post	With ignition switch on (do not crank), place analyzer red clip in contact with module terminal C (test point O). Meter should read at least 10 volts. If not, replace Lower Housing Harness.
10. Circuit thru Distributor to Controller Assy.	D.C. Volts	Q Distributor Connector Terminal	L Battery Neg. (-) Post	With ignition switch feed wire disconnected from distributor (do **not** ground), crank engine for 10 seconds. Meter should read between .5 and 2 volts while cranking. If OK, proceed with test 11. If not OK, proceed with test 10-A.
10-A. Circuit thru Distributor to Controller Assy.	D.C. Volts	C Controller Assy. Terminal	L Battery Neg. (-) Post	Crank engine for 10 seconds. Meter should read between .5 and 2 volts while cranking. If OK, replace connector lead from distributor at test point Q to controller assembly at test points B and C-1 and proceed with test 11. If **not** OK, proceed with test 10-B.
10-B. Controller Assembly	D.C. Volts	J Controller Assy. Terminal	L Battery Neg. (-) Post	Crank engine for 10 seconds and note meter reading while cranking. Now disconnect crankshaft sensor connector harness from crankshaft sensor, crank engine for additional 10 seconds and again note meter reading while cranking. Both readings should be the same, and if there is more than 2 volts difference, replace the Controller Assy.*
11. Crankshaft Sensor Connector Harness	D.C. Volts	S Connector Harness Cavity	L Battery Neg. (-) Post	With ignition switch on (do not crank), meter should read at least 11 volts. If OK, proceed with test 12. If **not** OK, replace Crankshaft Sensor Connector Harness and proceed with test 15.*
12. Crankshaft Sensor Connector Harness	D.C. Volts	T Connector Harness Cavity	L Battery Neg. (-) Post	With ignition switch on (do not crank), meter should read zero volts. If there is **any** reading, replace Crankshaft Sensor Connector Harness and proceed with test 15. If there is **no** volts reading, proceed with test 13.
13. Crankshaft Sensor Connector Harness	D.C. Volts	U Connector Harness Cavity	L Battery Neg. (-) Post	With ignition switch on (do not crank), meter should read between 8 and 10 volts. If OK, proceed with test 14. If **not** OK, replace Crankshaft Sensor Connector Harness and proceed with test 15.*
14. Crankshaft Sensor Connector Harness	D.C. Volts	R Connector Harness Cavity	L Battery Neg. (-) Post	With ignition switch on (do not crank), meter should read between 8 and 10 volts. If not, replace Crankshaft Sensor Connector Harness. Proceed with test 15.*
15. Temperature Sensor	HI Ohms 0-2k 0-200k	V Temperature Sensor Terminal	W Temperature Sensor Terminal	NOTE: Engine must **either** be at operating **or** room temperature. Test is not valid if temperature is in between. With temperature sensor connector leads disconnected from sensor at test points V and W, meter should read between 1,500 and 2,000 ohms when engine is at **normal OPERATING** temperature (between 25,000 and 55,000 ohms when engine is at "room" temperature of 70° F or 21° C). If not, replace Temperature Sensor. Proceed with test 16.
16. Temperature Sensor Connector Lead	LO Ohms 0-200	V End of Connector Lead	B Controller Assy. Terminal	With temperature sensor lead disconnected at points V and B and analyzer connected as indicated, meter should read less than 1 ohm. If not, replace connector lead.
17. Temperature Sensor Connector Lead	LO Ohms 0-200	W End of Connector Lead	F Controller Assy. Terminal	With temperature sensor lead disconnected at points W and F and analyzer connected as indicated, meter should read less than 1 ohm. If not, replace connector lead.

*__IMPORTANT NOTE:__ Before condemning **any** parts, check the continuity of **all** connecting wires, and insure that **all** connections are clean, solid and properly seated. Additional information concerning testing of wiring may be obtained from the appropriate General Motors Service Manual.

If the above tests do not isolate the specific **electronic** component problem, either the Electronic Module, Controller Assembly or Crankshaft Sensor is at fault. Refer to the appropriate General Motors Service Manual **before** making any replacements, and insure that the engine performance problem is **not** due to faulty plug wires, distributor cap, etc.



GENERAL MOTORS 1977
ELECTRONIC SPARK TIMING SYSTEM (MISAR)

98-5260
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GENERAL MOTORS
1980 ELECTRONIC SPARK CONTROL IGNITION SYSTEM

The Electronic Spark control (ESC) ignition system is used on 1980 General Motors 231" (VIN 3) V6 and 301" (VIN T and W) V8 engines. ESC is a closed loop system that controls detonation by adjusting spark timing.

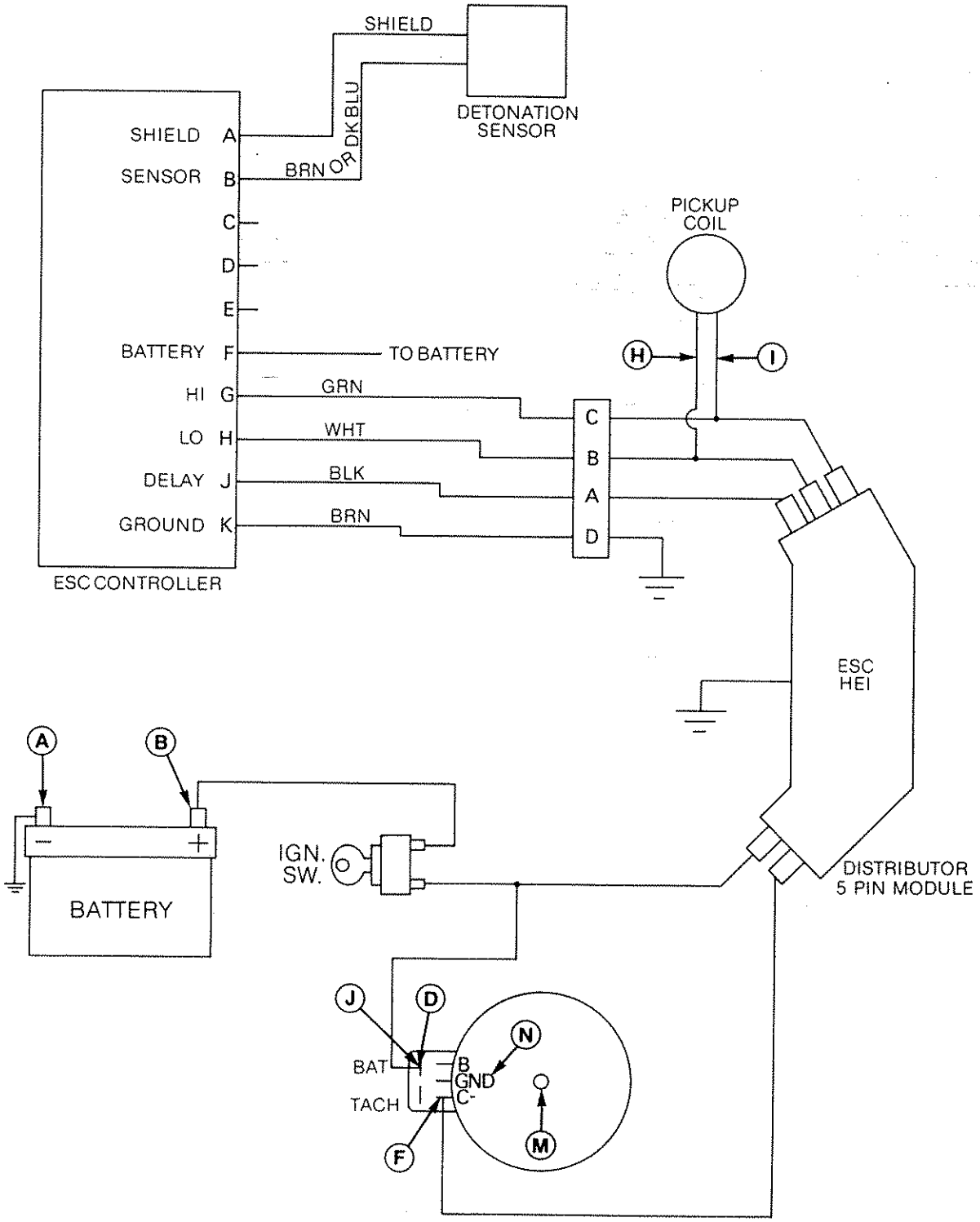
There are three basic components to the ESC system; an ESC controller, detonation sensor and the distributor. The distributor is an HEI unit containing a 5-pin ESC HEI electronic module. It must not be interchanged with other HEI modules.

The ESC controller has no memory storage. Failure of the controller results in no ignition, no retard, or full retard. The detonation sensor is located in the intake manifold. Failure of the sensor results in no retard.

COMPONENTS TEST	SELECTOR POSITION	ANALYZER CONNECTIONS RED CLIP	ANALYZER CONNECTIONS BLACK CLIP	RESULTS
1. Battery State of Charge	D.C. Volts	B Battery Pos. (+) Post	A Battery Neg. (-) Post	With ignition switch feed wire disconnected from distributor (do **not** ground), crank engine for 10 seconds. Meter should read at least 9 volts while cranking. If not, charge battery and proceed.
2. Electronic System Ground	D.C. Volts	B Battery Pos. (+) Post	N Distributor Ground Terminal	Disconnect the Distributor 3-wire connector, use wire adapter, meter should read battery voltage — if not, move black clip and touch Dist. metal housing. If it now reads battery voltage, the ground wire or ground connection inside of the Distributor is at fault and must be corrected before proceeding.
3. Ignition Switch	D.C. Volts	D End of Ignition Sw. Feed Wire	A Battery Neg. (-) Post	Disconnect switch wire from Distributor battery terminal. With the switch "off" meter should read zero "0" volts, turn switch "on" meter should read battery volts, crank engine, meter should read at least 9 volts. Reconnect Dis. 3-wire harness.
4. Continuity of Coil Primary	LO Ohms 0-200	F Distributor "C"-Terminal	J Distributor "BAT" Terminal	With ignition switch off, remove distributor cap and rotor, and disconnect lower housing harness. Meter should read between 0 to 1 ohm. If above 1 ohm, replace Ignition Coil (located in distributor cap).
5. Continuity of Coil Secondary	HI Ohms 0-200k	M High Tension Terminal	F & N Distributor "C-" GRD Terminal	With ignition switch off, meter should read between 6,000 and 30,000 ohms. If meter reads higher than 30,000 ohms, replace Ignition Coil (located in distributor cap). Also inspect rotor, coil and distributor cap for carbon tracking, etc., and replace as indicated.
6. Pick-up Coil Resistance	HI Ohms 0-2k	H Pick-up Lead	I Pick-up Lead	Unplug wire connectors from module. Ignition off. Meter should read 500-1,500 ohms. If not in limits, replace pick-up coil.
7. Pick-up Coil Assembly Output	Pick-up Output	I Pick-up Lead	H Pick-up Lead	Disconnect ignition switch feed wire from distributor (do **not** ground). With pick-up leads **connected** to module, crank engine for 10 seconds. Meter should read 1.5 volts or more while cranking. If not, proceed with test 7-A.
7-A. Pick-up Coil Assembly Output	Pick-up Output	I Pick-up Lead	H Pick-up Lead	With ignition switch off, disconnect pick-up leads from module. Now crank engine for 10 seconds. If meter **now** reads 1.5 volts or more while cranking, replace the Electronic Module.* But if reading is still **not** OK, replace Pick-up Coil Assembly.

***IMPORTANT NOTE:** Before condemning **any** parts, check the continuity of **all** connecting wires, and insure that **all** connections are clean, solid and properly seated. Additional information concerning testing of wiring may be obtained from the appropriate General Motors Service Manual.

If the above tests do not isolate the specific **electronic** component problem, the Electronic Module is at fault. But **before** replacing it, insure that the engine performance problem is **not** due to faulty plug wires, distributor cap, etc.



GENERAL MOTORS 1980 ELECTRONIC SPARK CONTROL, 229 CU. IN. ENGINE

98-5260
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GENERAL MOTORS 1980 ELECTRONIC SPARK TIMING

Electronic Spark Timing (EST) is used on 1980 California (and some low altitude) Buick, Chevrolet, Oldsmobile and Pontiac models with 3.8L (VIN A) V6 engines. It is also used on Oldsmobile 4.3L (VIN F) V8 engines that use the C-4 emission system, as well as Federal Cadillac Eldorado and Sevilles with 6.0 V8 engines that use the Digital Electronic Fuel Injection (DEFI) system.

The distributor used with 1980 EST does not have a vacuum advance unit or mechanical advance weights. It makes use of a 7-pin electronic control module (EST HEI) inside the distributor. Previous EST systems (1977 and 1978) used 4-pin or 3-pin modules.

The EST HEI module and harness are not interchangeable with other HEI modules. The 1980 harness is equipped with an external pigtail for connection to the C-4 or DEFI system's electronic control module, located in the passenger compartment.

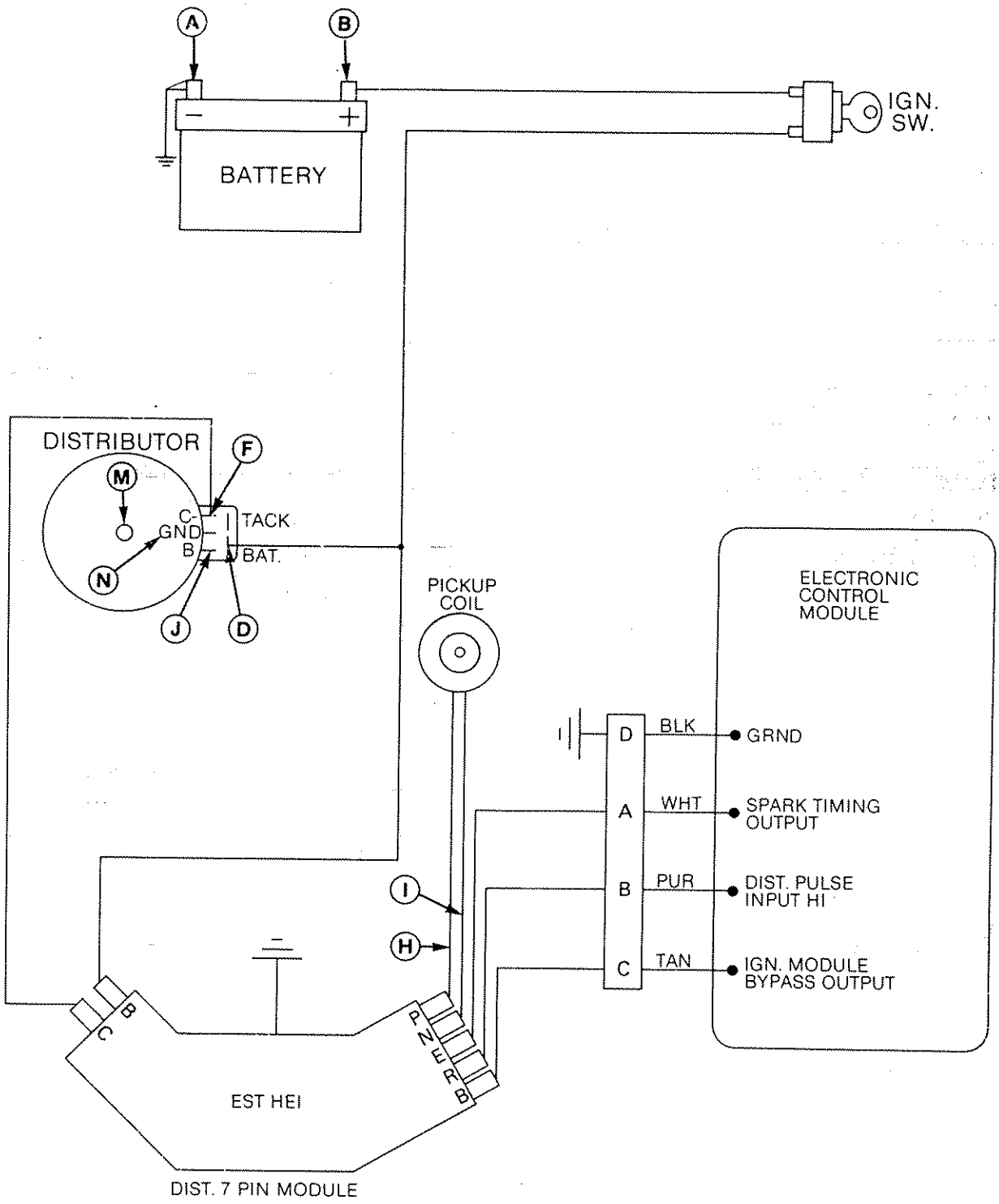
A magnetic decoupler or shield is located below the rotor to protect the electronic circuits from false impulses from the magnetic field of the ignition coil.

Other components of the EST system for 1980 include engine sensors, supplying such input to the ECM as system power, ignition on signal, engine crank signal, throttle switch, distributor reference pulses, manifold absolute pressure, ambient pressure and engine coolant temperature.

COMPONENTS TEST	SELECTOR POSITION	ANALYZER CONNECTIONS RED CLIP	BLACK CLIP	RESULTS
1. Battery State of Charge	D.C. Volts	B Battery Pos. (+) Post	A Battery Neg. (-) Post	Disconnect ignition switch feed wire from distributor (do **not** ground) and crank engine for 10 seconds. Meter should read at least 9 volts. If not, charge battery and proceed.
2. Electronic System Ground	D.C. Volts	B Battery Pos. (+) Post	N Distributor Gnd. Terminal	Disconnect the Distributor 3-wire connector, use wire adapter, meter should read battery voltage — if not, move black clip and touch Dist. metal housing. If it now reads battery voltage, the ground wire or ground connection inside of the Distributor is at fault and must be corrected before proceeding.
3. Ignition Switch	D.C. Volts	D End of Ignition Switch Feed Wire	A Battery Neg. (-) Post	Disconnect switch wire from Distributor battery terminal. With the switch "off" meter should read zero "0" volts, turn switch "on" meter should read battery volts, crank engine, meter should read at least 9 volts. Reconnect Dis. 3-wire harness.
4. Continuity of Coil Primary	LO Ohms 0-200	F Distributor "C"-Terminal	J Distributor "BAT" Terminal	With ignition switch off, remove distributor cap and rotor, and disconnect lower housing harness. Meter should read between 0 to 1 ohm. If above 1 ohm, replace Ignition Coil (located in distributor cap).
5. Continuity of Coil Secondary	HI Ohms 0-200k	M High Tension Terminal	F & N Distributor "C-" GRD Terminal	With ignition switch off, meter should read between 6000 and 30,000 ohms. If meter reads higher than 30,000 ohms, replace Ignition Coil (located in distributor cap). Also inspect rotor, coil and distributor cap for carbon tracking, etc., and replace as indicated.
6. Pick-up Coil Resistance	HI Ohms 0-2k	H Pick-up Lead	I Pick-up Lead	Unplug wire connector from module. Ignition off. Meter should read 500-1,500 ohms. If not in limits, replace pick-up coil.
7. Pick-up Coil Assembly Output	Pick-up Output	I Pick-up Lead	H Pick-up Lead	Disconnect ignition switch feed wire from distributor (do **not** ground). With pick-up leads **connected** to module, crank engine for 10 seconds. Meter should read 1.5 volts or more while cranking. If not, proceed with test 7A.
7-A. Pick-up Coil Assembly Output	Pick-up Output	I Pick-up Lead	H Pick-up Lead	With ignition switch off, disconnect pick-up leads from module. Now crank engine for 10 seconds. If meter **now** reads 1.5 volts or more while cranking, replace the Electronic Module.* But if reading is still **not** OK, replace Pick-up Coil Assembly.

***IMPORTANT NOTE:** Before condemning **any** parts, check the continuity of **all** connecting wires, and insure that **all** connections are clean, solid and properly seated. Additional information concerning testing of wiring may be obtained from the appropriate General Motors Service Manual.

If the above tests do not isolate the specific **electronic** component problem, the Electronic Module is at fault. But **before** replacing it, insure that the engine performance problem is **not** due to faulty plug wires, distributor cap, etc.



GENERAL MOTORS 1980

ELECTRONIC SPARK TIMING

98-5260

INTERNATIONAL HARVESTER IHC
HOLLEY BREAKERLESS IGNITION SYSTEM

The International Harvester Holley Breakerless electronic ignition system utilizes a stationary **distributor sensor unit** mounted in the distributor housing; a rotating gear-shaped **trigger wheel** mounted on the distributor shaft, and an **electronic ignition control unit**. The BID system is **not** a "high energy" secondary voltage system.

Basic system operation is as follows ... An oscillating signal is transmitted through the distributor sensor unit from the control unit, and as each "tooth" of the trigger wheel rotates to direct alignment with the sensor, the signal's amplitude is modulated, or changed. This causes the control unit's switching transistor to turn "off," with the primary circuit being interrupted and firing voltage induced in the coil secondary.

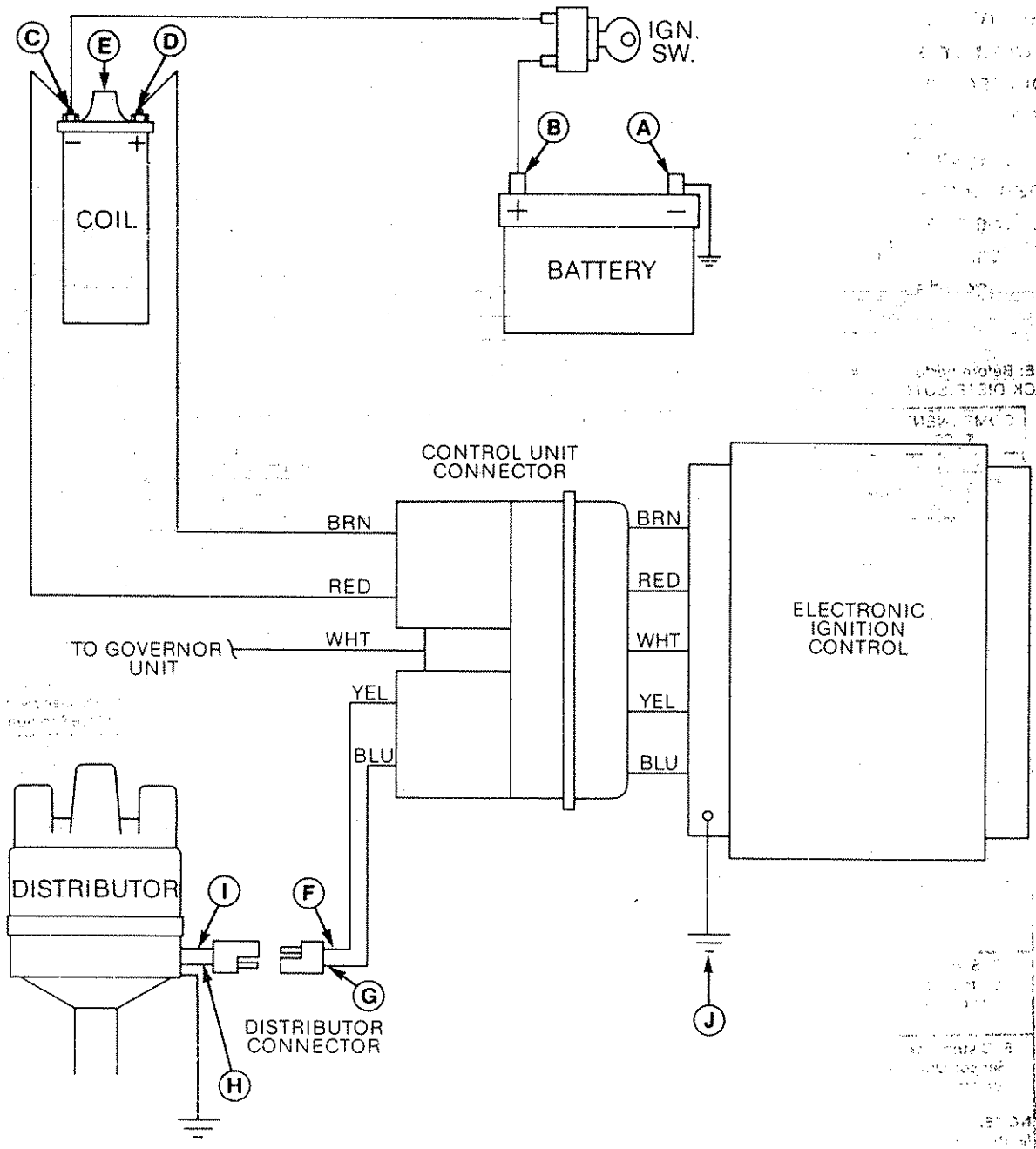
NOTE: Before performing these trouble-shooting tests to isolate the cause of a no-start, hard-start or rough-running condition, CHECK DISTRIBUTOR SENSOR UNIT AIR GAP and adjust to manufacturer's specification.

COMPONENTS TEST ...	SELECTOR POSITION	ANALYZER CONNECTIONS RED CLIP	ANALYZER CONNECTIONS BLACK CLIP	RESULTS
1. Battery State of Charge	D.C. Volts	B Battery Pos. (+) Post	A Battery Neg. (-) Post	Remove and ground coil high tension wire and crank engine for 10 seconds. Meter should read at least 9 volts while cranking. If not, charge battery and proceed.
2. Electronic System Ground	D.C. Volts	B Battery Pos. (+) Post	J Module Ground	With ignition switch on (do not crank) and coil high tension wire reconnected at coil, meter should read between 11 and 13 volts. If not, check continuity and connections of connector lead from module to ground (point J) and retest. If still not OK, system ground is faulty and **MUST** BE CORRECTED **BEFORE** PROCEEDING WITH TESTS.
3. Ignition Switch	D.C. Volts	C Coil Pos. (+) Terminal	A Battery Neg. (-) Post	With ignition switch on (do not crank), meter should read between 11 and 13 volts. Now crank engine. Meter should read at least 9 volts while cranking. If **both** readings are OK, proceed with test 4. But if either or both readings are **not** OK, replace Ignition Switch.
4. Continuity of Coil Primary	LO Ohms 0-200	C Coil Pos. (+) Terminal	D Coil Neg. (-) Terminal	With ignition switch off and coil negative lead disconnected from coil, meter should read between 1.25 and 1.40 ohms. If OK, replace Electronic Ignition Control Unit* (module). If **not** OK, replace Ignition Coil.
5. Continuity of Coil Secondary	Hi Ohms 0-20k	C Coil Pos. (+) Terminal	E Coil High Tension Tower	With ignition switch off and coil negative lead disconnected from coil, meter should read between 9,400 and 11,700 ohms. If not, replace Ignition Coil.
6. Continuity of Distributor Sensor Unit	LO Ohms 0-200	H Distributor Connector Lead Cavity	I Distributor Connector Lead Pin	With ignition switch off, meter should read between 1 and 4 ohms. If not, replace Distributor Sensor Unit.
7. Short in Distributor Sensor Unit	HI Ohms 0-20k	I Distributor Connector Lead Pin	A Battery Neg. (-) Post	With ignition switch off, meter should not move. If there is **any** ohms reading, replace Distributor Sensor Unit.
8. Distributor Sensor Unit or Module	Not Used			With **all** leads and harnesses reconnected for normal operating and ignition switch on (do not crank), remove coil high tension wire **from distributor cap** and place approximately 1/2-inch from a good engine ground. Using a jumper wire, momentarily make contact between module connector lead pin (G) and module connector lead cavity (F). If a spark occurs from the distributor end of the coil high tension wire, replace the Distributor Sensor Unit. If **no** spark occurs, replace the Electronic Ignition Control Unit* (module).

NOTE: Perform this test **only** if tests 1-7 have not isolated the problem, faulty plug wires, distributor cap, etc.

***IMPORTANT NOTE:** Before condemning **any** parts, check the continuity of **all** connecting wires, and insure that **all** connections are clean, solid and properly seated. Additional information concerning testing of wiring may be obtained from the appropriate International Harvester Service Manual.

If the above tests do not isolate the specific **electronic** component problem, the Electronic Ignition Control Unit (Module) is at fault. But **before** replacing it, insure that the engine performance problem is **not** due to faulty plug wires, distributor cap, etc.



INTERNATIONAL HARVESTER IHC
HOLLEY BREAKERLESS INGITION SYSTEM

98-5260

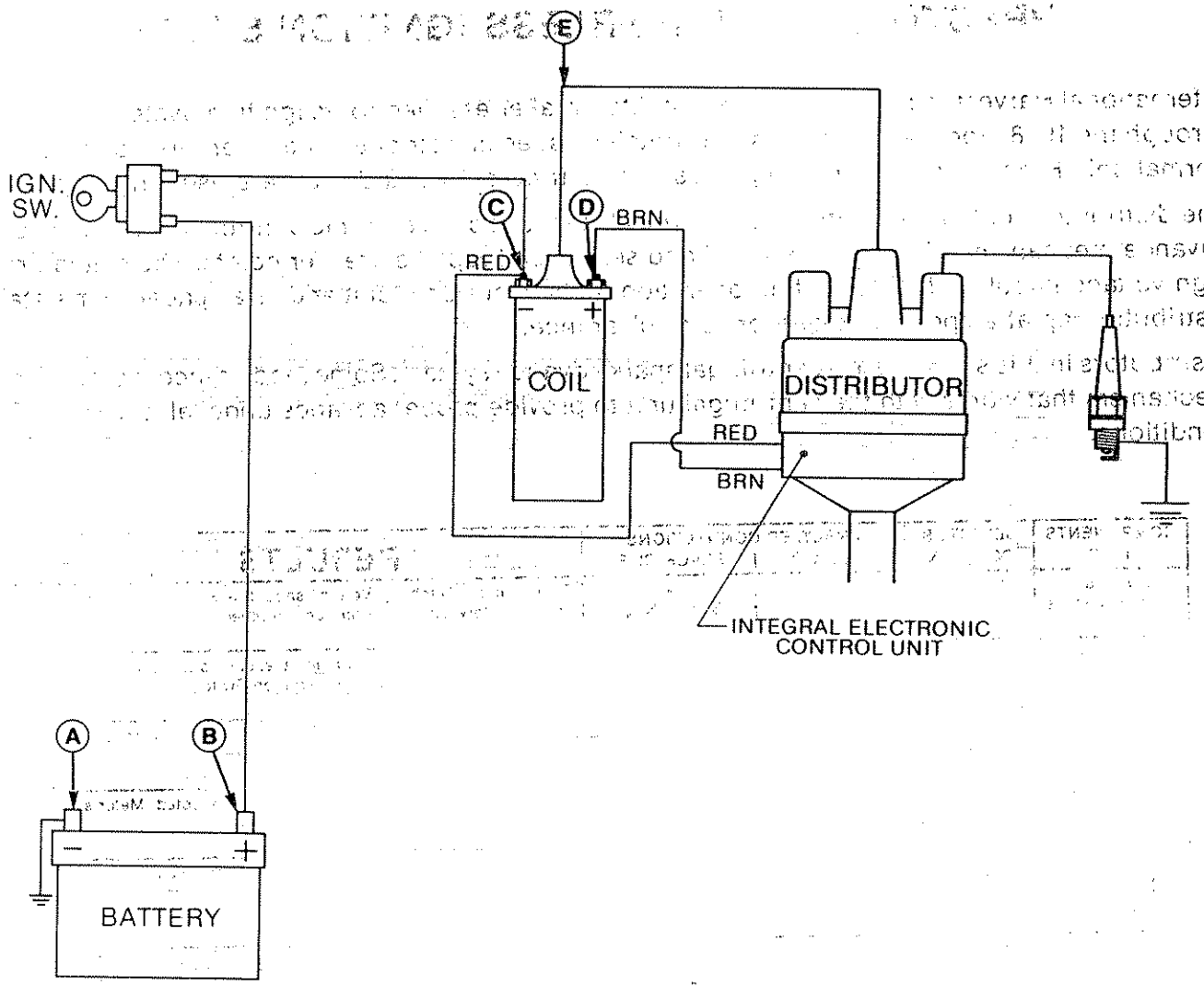
INTERNATIONAL HARVESTER
PRESTOLITE BREAKERLESS IGNITION SYSTEM

International Harvester introduced the Prestolite Breakerless Electronic Ignition System Load midway through the 1978 model year. The system contains a special distributor with internal electronic unit and normal coil. High voltage spark plug wires and distributor cap and rotor are used in this system.

The distributor contains a rotating trigger wheel, sensor coil, electronic control unit, rotor, shield and advance mechanisms. The trigger wheel and sensor coil replace breaker points. The shield prevents high voltage impulses from affecting operation of the electronic unit and as a spacer to maintain the distributor cap at a specific height for rotor clearance.

Distributors in this system use a centrifugal spark advance system. Some models incorporate a vacuum mechanism that works with the centrifugal unit to provide proper advance under all engine operating conditions.

COMPONENTS TEST	SELECTOR POSITION	ANALYZER CONNECTIONS RED CLIP	ANALYZER CONNECTIONS BLACK CLIP	RESULTS
1. Primary Ignition Voltage	D C Volts	C Coil Positive (+) Terminal	A Battery Neg. (-) Terminal	Turn ignition switch on. Voltage should be ±1 volt of battery voltage. If low, charge battery and proceed.
2. Ignition Switch	D C Volts	C Coil Positive (+) Terminal	A Battery Neg. (-) Terminal	Crank engine. Meter should read at least 9 volts. Low reading with charged battery means replace Ignition Switch.
3. Continuity of Coil Primary	LO Ohms 0-200	C Coil Positive (+) Terminal	D Coil Negative (-) Terminal	Ignition switch off. Disconnect coil negative lead. Meter should read 1.2 to 1.4 ohms. If not, replace coil.
4. Continuity of Coil Secondary	HI Ohms 0-20k	C Coil Positive (+) Terminal	E Coil High Tension Tower	Ignition switch off. Coil negative lead disconnected. Meter should read 9,000 to 12,000 ohms. If not, replace coil.
5. Electronic Control Unit Operation (ECU)	D C Volts	D Coil Negative (-) Terminal	A Battery Neg. (-) Terminal	Ignition switch on. Touch face of sensor with small screwdriver. Voltage should increase to 12-13 volts. Remove screwdriver, voltage should drop to 5-8 volts. If meter reading is not within limits, replace ECU.



INTERNATIONAL HARVESTER PRESTOLITE BREAKERLESS IGNITION SYSTEM

98-5260