CHRYSLER CORP. ELECTRONIC SPARK CONTROL SYSTEM

Chrysler Corp.
All Models

DESCRIPTION

The Electronic Spark Control system is governed by a Spark Control Computer, various engine sensors and a specially calibrated carburetor. The function of this system is to provide a method for the engine to burn a lean air/fuel mixture.

NOTE – *All Calif. vehicles and Federal vehicles with 318" 4-barrel engines have an Electronic Spark Combustion Computer. See below.*

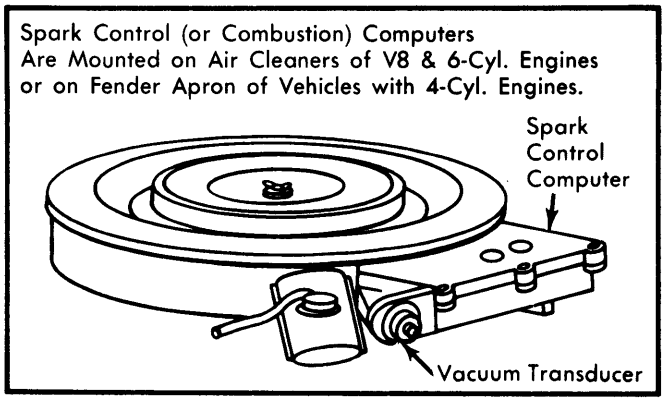

Fig. 1 Electronic Spark Control Computer

SPARK CONTROL COMPUTER

The Spark Control Computer (SCC) is the heart of the entire system. It gives the system the capability of igniting a lean fuel mixture according to different modes of engine operation by delivering an infinite amount of variable advance curves. The computer determines the exact instant when ignition is required, then feeds the ignition coil to produce electrical impulses which fire the spark plugs.

The computer consists of one electronic printed circuit board which receives signals from all the sensors and within milliseconds computes them so that proper advance or retard is immediately achieved.

SPARK COMBUSTION COMPUTER

On Calif. vehicles and Federal 318" 4-barrel V8 engines, a spark combustion computer is used. This computer not only has a 10 pin dual connector, but also a 6 pin single connector (3 pins blank on 4-cylinder, 2 pins blank on others). The combustion computer controls ignition system and air/fuel ratio of carburetor.

Electronic Spark Advance system is new in 1980, determining spark advance by speed and vacuum only. Start timer, vacuum transducer count-up clock and memory, throttle transducer, and ambient air temperature sensor features used on previous models are not used in 1980.

SENSORS

The Electronic Spark Control Computer uses engine sensors to determine when to fire the spark plugs. There are 4 sensors used on 4 and 6 cylinder engines, 5 used on V8 engines. The sensors are; pick-up assembly (Hall Effect pick-up on 4 cylinder engines), coolant temperature switch, carburetor switch, vacuum transducer, and a detonation sensor (Calif. V8 engines only). Their functions are as follows:

NOTE – *Vehicles with Electronic Spark Combustion Computers use 8 sensors. In addition to those discussed below, an oxygen sensor, speed sensor and charge temperature switch are also used. See pins 13, 14, 15, and 16 in wiring diagram shown in Fig. 4.*

Pick-Up Coil – The pick-up coil (called a Hall Effect pick-up on 4 cylinder models) is located in the distributor and supplies the basic timing signal to the computer. Some engines use 2 pick-ups, start and run, to provide the computer with the basic timing signal. These engines are; all California and high altitude 318" V8 and Federal 360" V8 with 4-Bbl. carburetor.

Coolant Temperature Sensor (Oxygen Feedback Only) – Located on intake manifold (all V8 engines) or on thermostat housing (all 4-Cyl. engines). Sensor signals computer when engine coolant temperature is below 150° F (66° C).

Detonation Sensor – Sensor is used on Calif. V8 engines only and is located on intake manifold. Sensor detects engine knock sounds and transmits a signal to the computer. The computer will then retard spark timing up to a maximum of 11°. Amount of retard is directly proportional to the strength and frequency of detonation condition.

Carburetor Switch – Located on right side of carburetor on all V8 engines. Switch is located on idle stop solenoid or air conditioning solenoid on Omni and Horizon models. Carburetor switch signal tells computer if engine is at idle or off idle.

Vacuum Transducer (On Computer) – Provides an intake manifold vacuum signal. The higher the vacuum, the more spark advance that is given. To obtain the greatest amount of advance for any inch of vacuum, the Carburetor Switch Sensor must be open for a specified time. The advance at this time happens slowly. If the carburetor switch closes, the advance is cancelled. When switch is reopened, the build-up of advance must start all over again on most models, as most systems do not have accumulators.

OPERATION

The Spark Control Computer has two functional modes, "Start" and "Run". The "Start" mode operates while cranking and starting only. The "Run" mode operates after engine has started and during normal engine operation. The two modes never operate at the same time. When cranking and starting the pick-up coil sends a signal to the computer which is in the "Start" mode, the "Run" mode is by-passed. During this time a fixed advance is used. Advance is determined by distributor position (basic timing). After engine starts, the pick-up coil continues to send a signal to the computer, but the computer is now in the "Run" mode and "Start" mode is by-passed. The amount of timing advance is now controlled by the computer, based upon information received from the engine sensors.

If there is a "Run" mode failure, the start mode will take over. The engine will keep running, but performance and fuel economy will be poor. "Start" mode timing will be fixed. The pick-up coil signal is a reference signal. When it is received by the computer, maximum amount of timing advance is made available. Based on data from all sensors, the computer determines how much of this

CHRYSLER CORP. ELECTRONIC SPARK CONTROL SYSTEM (Cont.)

maximum advance is needed at that instant. If for some reason the computer fails, the system will go into what is called the limp-in mode. The driver can continue to drive the vehicle, but performance will be poor. If there is a failure of the pick-up coil (or both pick-up coils on dual pick-up distributors) or "Start" mode of computer, the engine will not start or run.

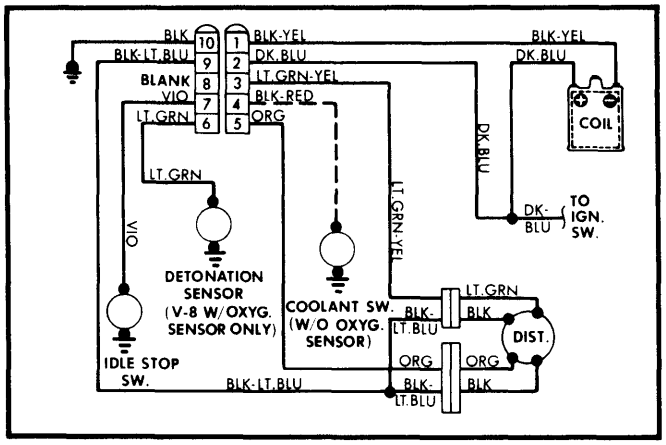

Fig. 2 Chrysler Corp. Electronic Spark Control Wiring Diagram (V8 & 6-Cyl. Engines)

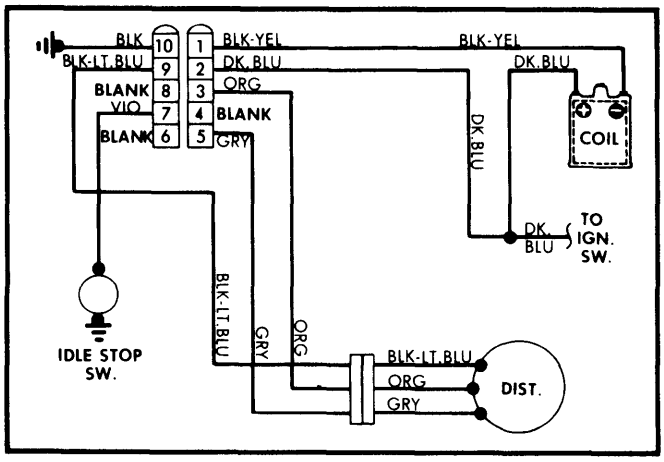

Fig. 3 Chrysler Corp. Electronic Spark Control Wiring Diagram (4-Cyl. Engines)

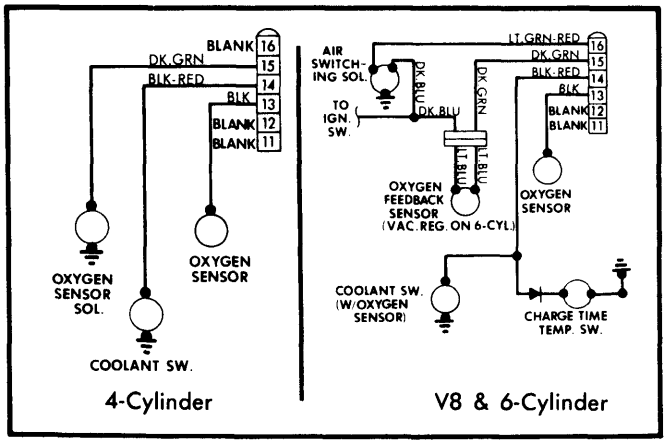

Fig. 4 Chrysler Corp. Additional Wiring Diagram When Equipped with Spark Combustion Computer (Additional 6 Pin Connector)

TROUBLE SHOOTING

IGNITION SYSTEM STARTING TEST

1) Remove coil wire from distributor cap. Hold end of wire about ¼" away from a good engine ground. Have an assistant crank engine while you look for a spark at the coil wire. If there is a spark, it must be constant and bright blue.

2) If the spark is good, continue engine cranking while moving coil wire away from ground and look for arcing at the coil tower (between coil terminals). If arcing occurs, replace coil.

3) If spark is weak or not constant, or if there is no spark, proceed to "Failure to Start Test."

4) If spark is good and there is no arcing at coil tower, ignition system is producing necessary high secondary voltage. Make sure this spark is getting to plugs by checking distributor rotor, cap, spark plugs, and plug wires.

5) If all this checks out okay, but engine still will not start, the ignition system is not the problem. It will be necessary to check fuel system and engine mechanical items.

FAILURE TO START TEST

NOTE – *Perform "Ignition System Starting Test" first. Failure to do so may result in lost diagnostic time or incorrect test results.*

All Models Except Omni and Horizon – 1) Measure and record battery voltage. Measure battery specific gravity, which must be at least 1.220 (temperature corrected) to deliver proper voltage to ignition system.

2) Insert a piece of paper between idle adjusting screw and carburetor sensor, or insure screw does not contact sensor. Connect a voltmeter negative lead to ground.

3) Turn ignition to "RUN" position and measure voltage at the carburetor switch terminal. If voltage is approximately 5 volts, proceed to step **7**).

4) If voltage is not at least 5 volts, turn ignition switch "OFF" and disconnect the 10 pin connector from computer. Turn ignition to "RUN" and measure the voltage at pin 2 of 10 pin connector. Voltage should be battery voltage. If voltage is correct, proceed to step **6**). If voltage is not correct, check and repair wiring and connections between pin 2 of 10 pin connector and ignition switch.

5) Turn ignition switch "OFF" and check continuity between pin 7 of 10 pin connector and carb switch terminal. Continuity should exist. If not, check wire between pin 7 and carburetor switch. If continuity exists, check for continuity between pin 10 of 10 pin connector and ground. If continuity exists, replace computer. If continuity does not exist, check wire from pin 10 ground.

6) Turn ignition switch to "RUN" position and connect positive lead of voltmeter to pin 1. Connect negative lead to ground. Reading should be battery voltage. If reading is correct, proceed to step **9**). If it is not correct, proceed as follows.

7) Turn ignition switch "OFF". With an ohmmeter, measure resistance between pins 5 and 9 of 10 pin connector for the

CHRYSLER CORP. ELECTRONIC SPARK CONTROL SYSTEM (Cont.)

pick-up assembly (if distributor is equipped with a start pick-up, also measure between pins 3 and 9 in the 10 pin connector). Pick-up resistance should be between 150 and 900 ohms. If resistance is correct, proceed with step **10**). If resistance is incorrect, proceed with next step.

8) Disconnect pick-up assembly connector at distributor and measure resistance across the pins of the connector (going to distributor). Resistance should be 150 to 900 ohms. If resistance is now correct, wires between 10 pin connector pins 3, 5, and 9 and pick-up assembly connector are shorted or broken. If resistance is not correct, pick-up assembly is bad and should be replaced.

9) Connect one lead of an ohmmeter to ground and the other lead to each of the pins of the pick-up assembly connector (going to distributor). No continuity should be indicated. If any continuity is indicated, pick-up assembly is shorted and should be replaced.

10) Remove distributor cap and check air gap of pick-up assembly (check both pick-up assemblies if equipped). If air gap is incorrect, adjust air gap to specifications (see *Pick-Up Coils — Air Gap in this article)* by loosening pick-up hold down screw and moving pick-up assembly.

11) Install distributor cap and reconnect all wiring. Start vehicle. If vehicle fails to start, install a new computer. If vehicle now starts, install old computer and try to start vehicle. If vehicle starts, system is okay. If not, replace computer. If vehicle would not start when new computer was originally installed, install old computer and repeat test procedures to find fault (probably with testing).

Omni and Horizon Models — **1**) Measure and record battery voltage. Measure battery specific gravity, which must be at least 1.220 (temperature corrected) to deliver proper voltage to ignition system.

2) Disconnect wire from negative terminal of coil. Disconnect high tension coil wire from distributor. Hold coil wire about ¼" from a good engine ground.

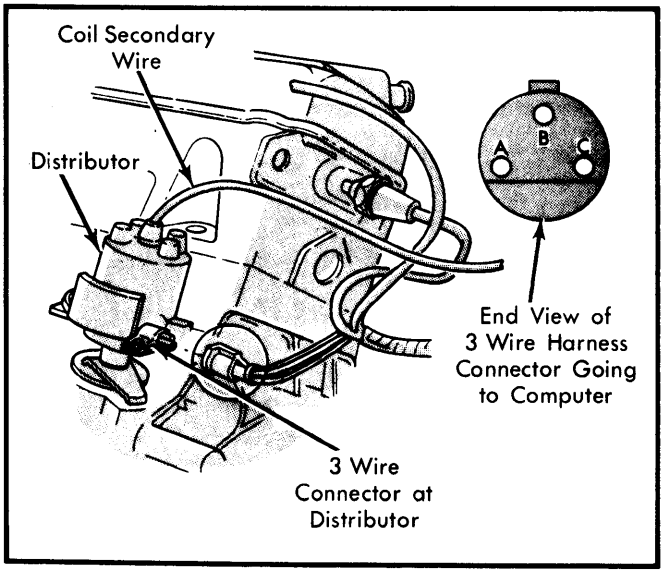

Fig. 5 Three Wire Connector from Computer to Distributor (Showing Pin Location)

3) Turn ignition on. While holding coil high tension wire ¼" from ground, momentarily touch jumper wire to negative terminal of coil and to ground. Coil high tension wire should spark. If not, make the following checks:

- No spark, check coil positive terminal voltage. Should be at least 9 volts.
- If voltage is good, coil is defective.
- If voltage is not to specifications, check and repair wires and connections as necessary.
- If car still will not start, proceed to step **4**).

4) If coil sparked in step **3**), turn ignition switch off and reconnect coil. Disconnect 3 wire connector from computer to distributor (at distributor). Turn ignition on and measure voltage from pin "B" of 3 wire connector to engine ground. Voltage should be battery voltage. *See Fig. 5.*

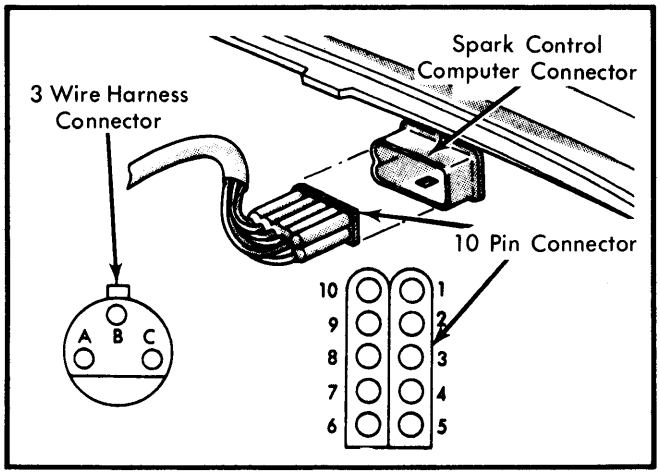

Fig. 6 Disconnecting 10 Pin Connector from Computer and Showing Locations of Pins on 10 Pin Connector and on 3 Wire Connector from Distributor

5) If voltage was correct, proceed to step **8**). If voltage was not correct, proceed as follows. Turn ignition off and disconnect 10 pin connector at computer. *See Fig. 6.*

6) With 10 pin connector and 3 wire connector disconnected, check continuity between pin 3 of 10 pin connector and pin "B" of 3 wire connector. If there is no continuity, repair wire and see if problem is fixed. If continuity exists, proceed to step **7**).

7) Turn ignition on and check for battery voltage between pins 2 and 10 (ground) of 10 pin connector of computer. If voltage is not same as battery voltage, check wire and connections. If battery voltage is measured at this point, spark control computer is defective and should be replaced.

8) Connect 10 pin connector to computer. Hold coil wire ¼" from ground and turn ignition on. On the 3 wire connector (disconnected at distributor), use a jumper wire to momentarily touch pins "A" and "C" together.

- If coil wire sparks, Hall Effect pick-up assembly is defective.
- If coil wire does not spark, proceed to step **9**).

9) Turn ignition off and disconnect 10 pin connector from computer. Using an ohmmeter, check the continuity between the following pins:

- Pin "C" of 3 wire connector to pin 9 on 10 pin connector.
- Pin "A" of 3 wire connector to pin 5 of 10 pin connector.

CHRYSLER CORP. ELECTRONIC SPARK CONTROL SYSTEM (Cont.)

- If continuity exists with these checks, spark control computer is defective.
- If continuity does not exist, wires or connectors are damaged. Repair as necessary.
- After repairs are made, go back and repeat step **8)**.

POOR PERFORMANCE TESTS

Start Advance Timing Test – 1) Connect an adjustable timing light to engine. Use a jumper wire to connect carburetor switch to a good ground. Make sure vacuum hose is connected to vacuum transducer on computer.

2) Look at timing mark on crankshaft (located on crankshaft damper on V8 and 6 cylinder engines or on clutch housing of 4 cylinder engines). Remove plastic plug on 4 cylinder manual transmission models for access to timing marks.

3) Start engine and adjust timing light so that crankshaft timing marks are set at basic timing. Meter on timing light should show start advance timing. *Refer to Distributor Specifications in this Section.*

4) If timing is not as specified, replace computer and retest. If timing is correct, proceed with next test.

Speed Advance Test – 1) Make sure basic timing and hot curb idle are set to specifications. Disconnect the jumper wire from carburetor switch to ground, if installed.

2) Start and run engine for two minutes. Raise RPM to specifications. Adjust timing light so that basic timing is seen at timing indicator. Additional advance seen on timing light meter should be as specified. If not, replace computer and repeat test. If within specifications, proceed to next test.

POOR FUEL ECONOMY AND UNUSUALLY HIGH IDLE SPEED TESTS

Coolant Sensor Test – Disconnect coolant sensor connector. Connect one ohmmeter lead to coolant sensor connector and the other lead to a good ground. With engine temperature below 150°F (66°C), continuity should be indicated. With engine temperature above 150°F (66°C), no continuity should be indicated. If coolant sensor fails this test, replace sensor.

Vacuum Advance Schedule Test – 1) *For Vacuum Advance Schedule specifications, refer to Distributor Specifications in this section.* If spark control computer fails to obtain any of the specified settings, replace the computer.

2) Start engine and allow it to reach normal operating temperature. If engine is at normal operating temperature, wait at least one minute for start-up advance to return to basic timing. Place transmission in neutral and apply parking brake. Perform following steps and check in order.

- Check and adjust basic timing if necessary.
- Remove and plug vacuum hose at vacuum transducer.
- Disconnect carburetor switch from ground.
- Increase engine speed to 1100 RPM.
- Check "Speed Advance Timing", timing should be as specified in Distributor Specifications.
- With engine RPM at 1100, connect vacuum hose to vacuum transducer.
- Allow accumulator in computer to clock up. Refer to Distributor Specifications for correct clock up time.
- With accumulator clocked up and engine at 1100 RPM, check "Vacuum Advance", should be as specified in Distributor Specifications.
- Disconnect and plug hose at vacuum transducer.
- Run engine at 1500 RPM (3000 RPM for 4 cyl. engines).
- Note "Speed Advance Timing".
- Connect vacuum hose to vacuum transducer.
- Check "Vacuum Advance", should be as specified in Distributor Specifications.
- Return engine to curb idle, connect carburetor switch wire.

DETONATION SENSOR TEST

NOTE – *Detonation sensor is used only on Calif. V8 engines.*

1) Connect a variable timing light to engine. Start engine and run it on second highest step of fast idle cam (at least 1200 RPM).

2) Tap lightly on intake manifold near the sensor with a small metal object. Using the timing light, look for a decrease in timing. The amount of decrease will be directly proportional to the strength and frequence of the tapping.

3) If sensor fails to perform as specified, replace sensor and repeat test. If new sensor still fails to perform properly, check wiring back to computer.

PICK-UP COILS – AIR GAPS

NOTE – *Air gap is non-adjustable on the Hall Effect pick-up assembly used on 4-cyl. engines.*

Loosen pick-up coil hold down screw and align one reluctor blade with pick-up pole being checked. Set air gap using a .006" non-magnetic feeler gauge. Tighten hold down screw. Check gap with a non-magnetic feeler gauge that is .002" larger than setting gauge. On models with two pick-ups, set the "Start" pick-up at .006" clearance and the "Run" pick-up at .012" clearance. Again check clearance with a non-magnetic feeler gauge that is .002" larger than gauge used to set air gap. Gauge should not fit between reluctor tooth and pick-up pole.

NOTE – *Do not force larger feeler gauge into air gap when checking.*

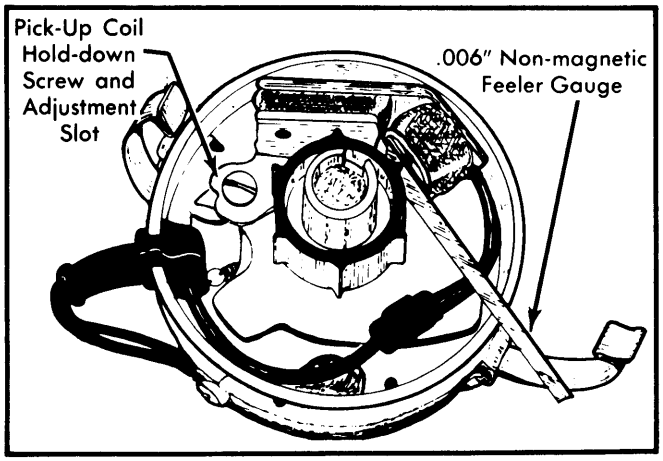

Fig. 7 Checking Air Gap of Reluctor-to-Pick-Up (Single Pick-Up Shown, Dual Pick-Up Similar 4-Cyl. Hall Effect Pick-Up Non-Adjustable)