

IGNITION SYSTEM - 4.0L W/SOLID STATE IGNITION (SSI)

1988 Jeep Cherokee

DISTRIBUTORS & IGNITION SYSTEMS
Jeep Solid State Ignition

4.0L 6-Cylinder

DESCRIPTION

IGNITION SYSTEM GENERAL DESCRIPTION

The Solid State Ignition (SSI) system features a solid state Ignition Control Module (ICM)/ignition coil assembly, Electronic Control Unit (ECU), distributor and engine speed sensor. Other components include the battery, ignition switch, starter solenoid, spark plugs and wires, cap and rotor, resistance wire, by-pass wire and a knock sensor. A sync pulse signal generator (stator) inputs the firing order to the ECU.

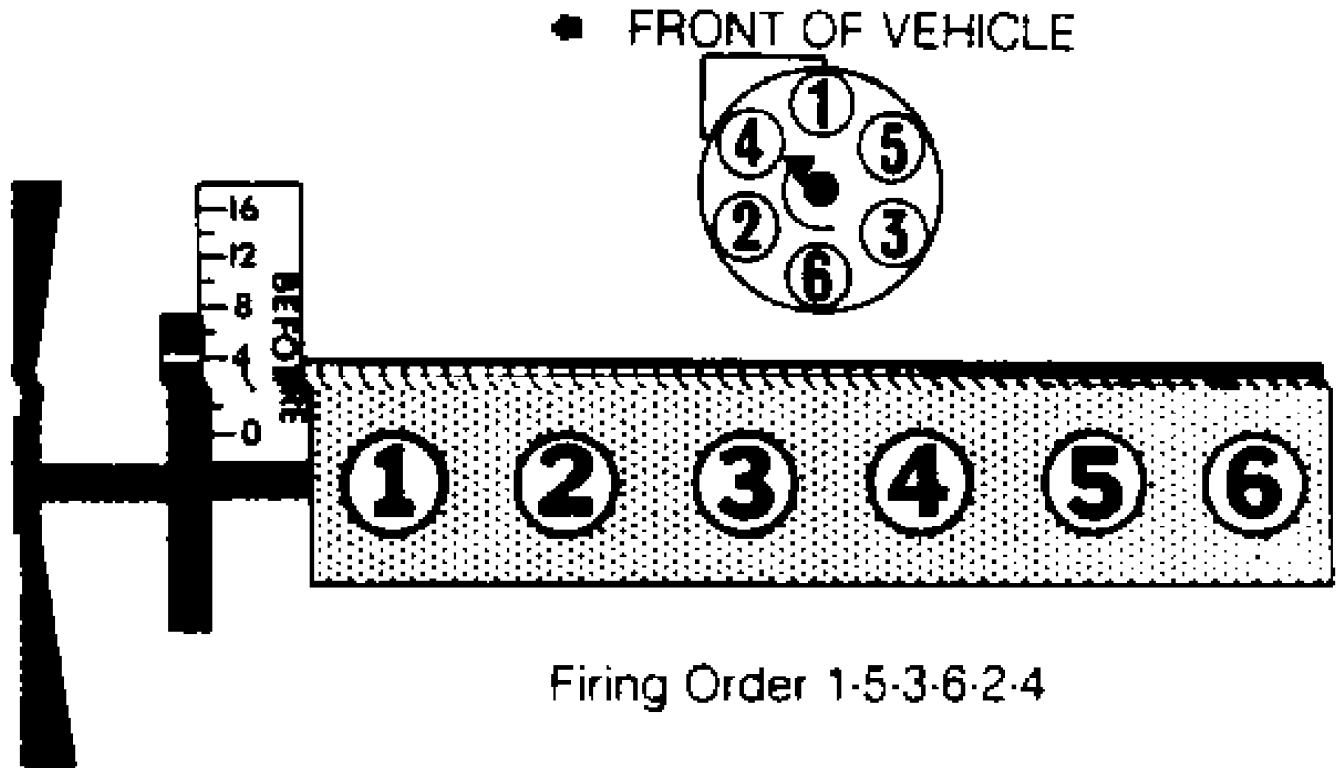


Fig. 1: 4.0L 6-Cylinder Firing Order

IGNITION CONTROL MODULE (ICM)

The ignition control module is mounted to the ignition coil. See Fig. 2. Based on control system inputs, the ECU triggers the ignition coil via the ignition control module. The ECU is able to advance or retard ignition timing by controlling the ignition coil through the ignition control module.

The ICM consists of a solid state ignition circuit, an integrated ignition circuit and an integrated ignition coil that can be removed and serviced separately if necessary.

The ECU provides an input signal to the ICM. The ICM has only two outputs:

- * Tach signal to the tachometer and diagnostic connector
- * High voltage from the coil to the distributor cap

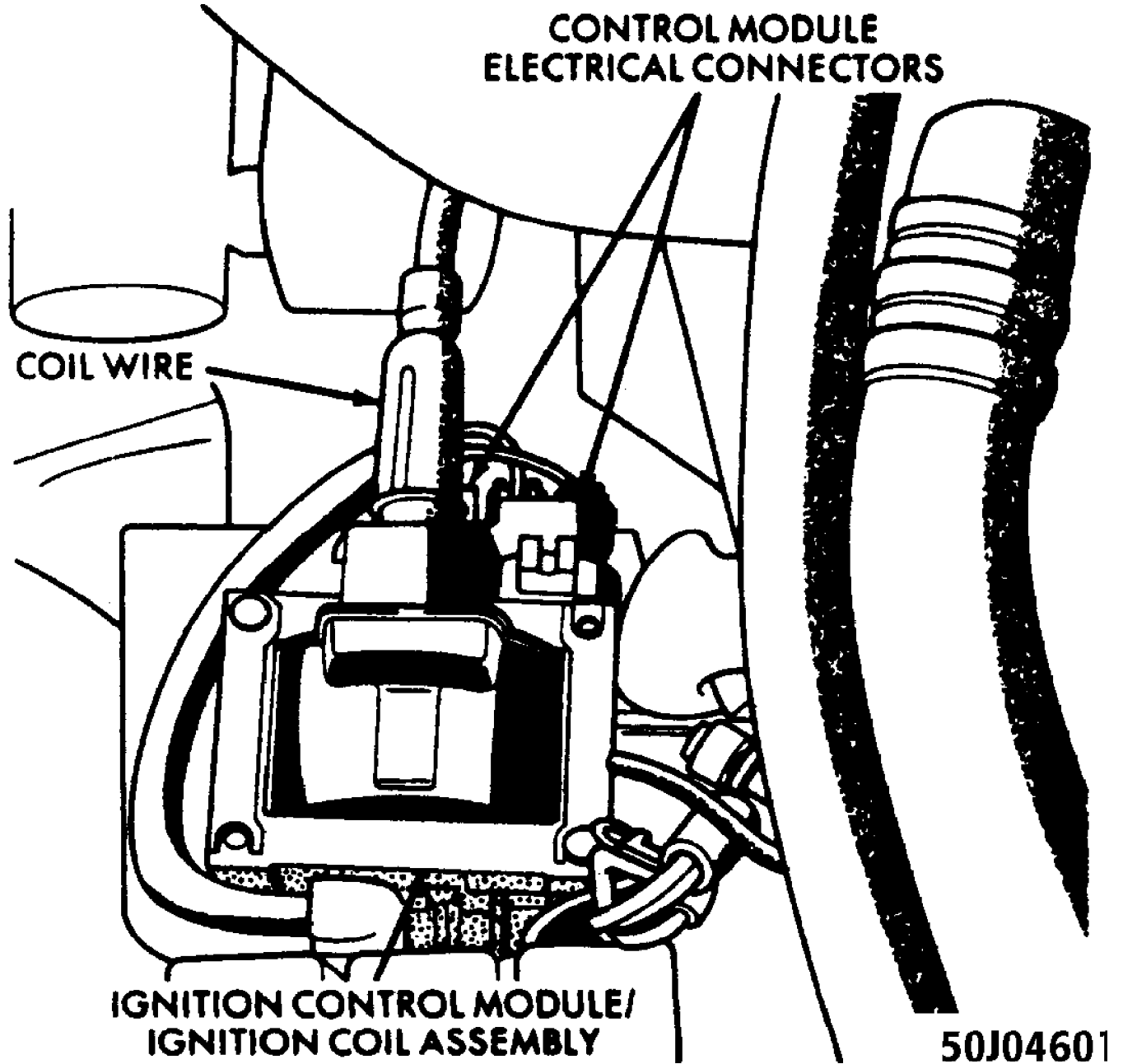
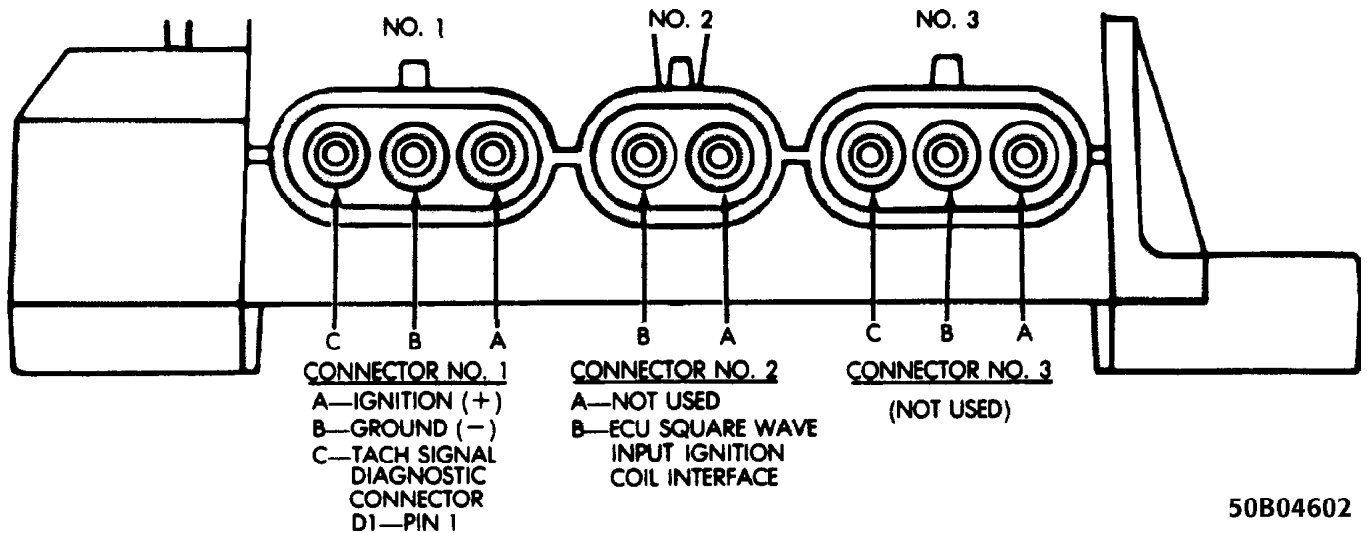


Fig. 2: View of Ignition Control Module/Ignition Coil Assembly

IGNITION CONTROL MODULE (ICM) ELECTRICAL FEED CONNECTIONS

Electrical feed to the ICM is through terminal "A" of Connector No. 1 on the module. See Fig. 3.

NOTE: Electrical supply only occurs with the ignition switch in the START and RUN position.



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Fig. 3: Ignition Control Module Connector Identification
 Courtesy of Chrysler Motors.

Terminal "B" of Connector No. 1 is grounded at the engine oil dipstick bracket along with the ECU ground wire and Oxygen (O2) sensor ground.

The tachometer output signal wire of the ICM is connected to Pin No. 1 of the "D1" Diagnostic connector. The wire is routed to the diagnostic connector through a short section of the ECU harness, the engine, and the instrument panel harness. This type of routing eliminates any potential electrical interference from occurring in the various ECU circuitry.

Ignition firing signals from ECU terminal "27" are transmitted through terminal "B" of Connector No. 2 on the ICM. The ignition signal from the ECU is received by the ICM in the form of a 5 volt square wave. As the leading edge of the wave contacts the ignition circuitry in the ICM, the ICM charges the coil primary windings.

When coil saturation occurs, the module circuitry opens the primary windings to collapse the magnetic field in the windings. This induces the coil secondary windings which is then transmitted to the spark plug via the coil wire, distributor cap, and rotor.

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

The MAP sensor reacts to absolute pressure in the intake manifold and provides an input signal to the ECU. As the engine load changes, manifold pressure varies, which causes the MAP sensor resistance to change, resulting in a different input voltage to the ECU. The input voltage level supplies the ECU with information relating to ambient barometric pressure during engine start-up or regarding engine load while the engine is running. The ECU calculates this information and adjusts the air-fuel mixture accordingly.

The MAP sensor is mounted under the hood on the firewall and is connected to the throttle body with a vacuum hose. See Fig. 4.

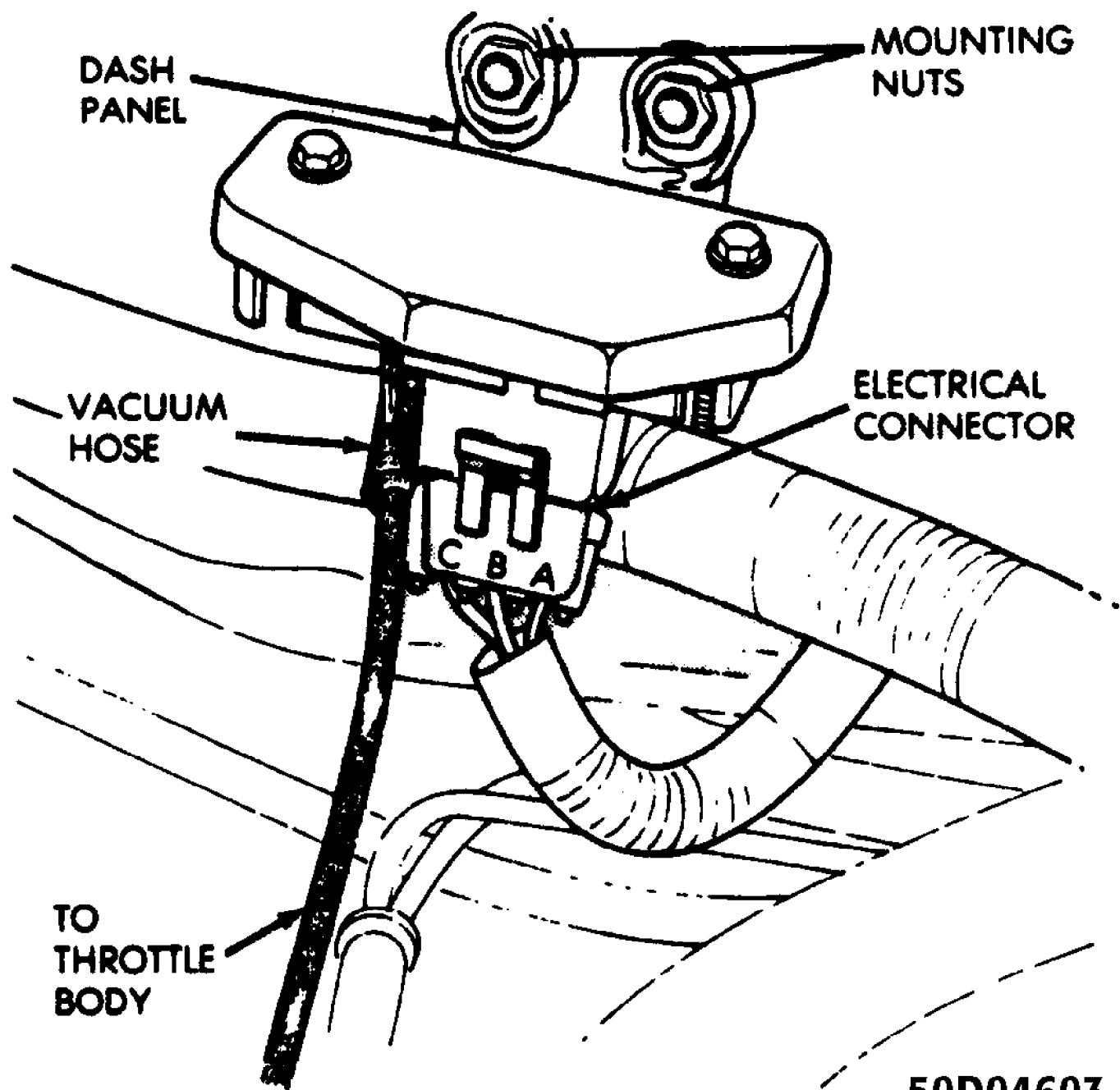


Fig. 4: View of Manifold Absolute Pressure (MAP) Sensor
 Courtesy of Chrysler Motors.

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COOLANT TEMPERATURE SENSOR (CTS)

The coolant temperature sensor is installed in the engine water jacket on the left side of the engine. See Fig. 5. It provides an input voltage to the ECU. As coolant temperatures vary, the Coolant Temperature Sensor resistance changes, resulting in a different input voltage to the ECU. The ECU calculates this information and adjusts the following:

- * Adjust fuel injector pulse width. Colder coolant

temperatures will result in longer injector pulse width and richer air-fuel mixtures.

- * Compensate for fuel condensation in the intake manifold.
- * Control engine warm-up idle speed.
- * Increase ignition advance when the coolant is cold.
- * Energize the EGR valve solenoid, thus preventing the flow of vacuum to the EGR valve.

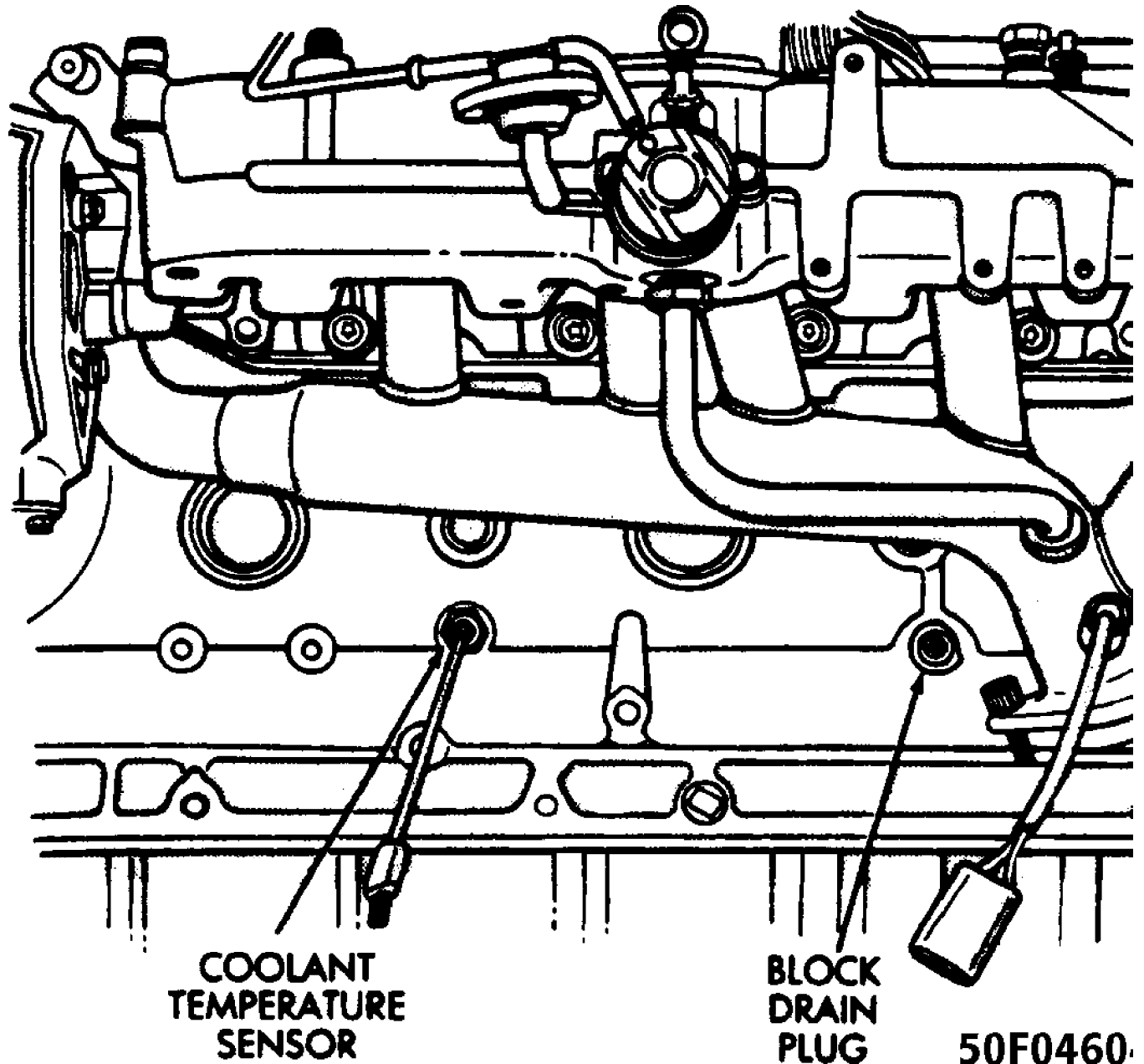
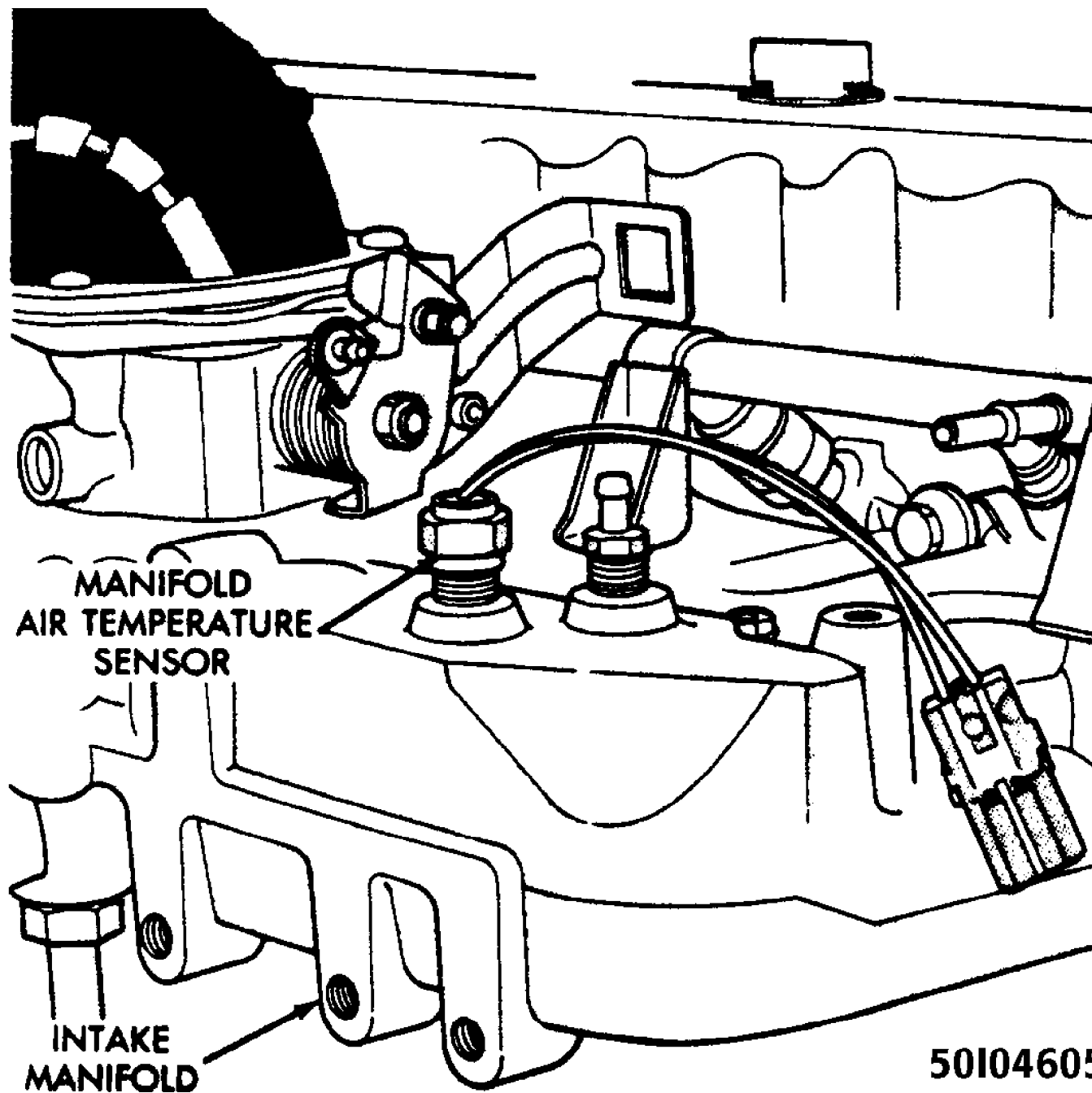


Fig. 5: Location of Coolant Temperature Sensor (CTS)
Courtesy of Chrysler Motors.

MANIFOLD AIR TEMPERATURE (MAT) SENSOR

The Manifold Air Temperature (MAT) sensor is installed in the intake manifold with the sensor element extending into the air-fuel

stream See Fig. 6. The MAT sensor provides an input voltage to the ECU. As the temperature of the air-fuel stream in the manifold varies, resistance changes, resulting in a different input voltage to the ECU.



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Fig. 6: Location of Manifold Air Temperature (MAT) Sensor
Courtesy of Chrysler Motors.

ENGINE SPEED SENSOR (CRANKSHAFT POSITION SENSOR - CPS)

The engine speed sensor is attached to the flywheel cover housing and provides an input signal to the ECU relating to crankshaft speed, angle, and position. See Fig. 7. The ECU converts crankshaft speed input into engine RPM and converts crankshaft angle to piston

position. The engine speed sensor senses TDC, BDC, and engine speed by detecting the flywheel teeth as they pass by the sensor during engine operation. The engine speed sensor is non-adjustable.

The flywheel has three trigger notches, 120° apart. See Fig. 7. There are 20 small teeth between each trigger notch. Each large trigger notch is located 12 small teeth before each Top Dead Center (TDC) position of the corresponding pistons.

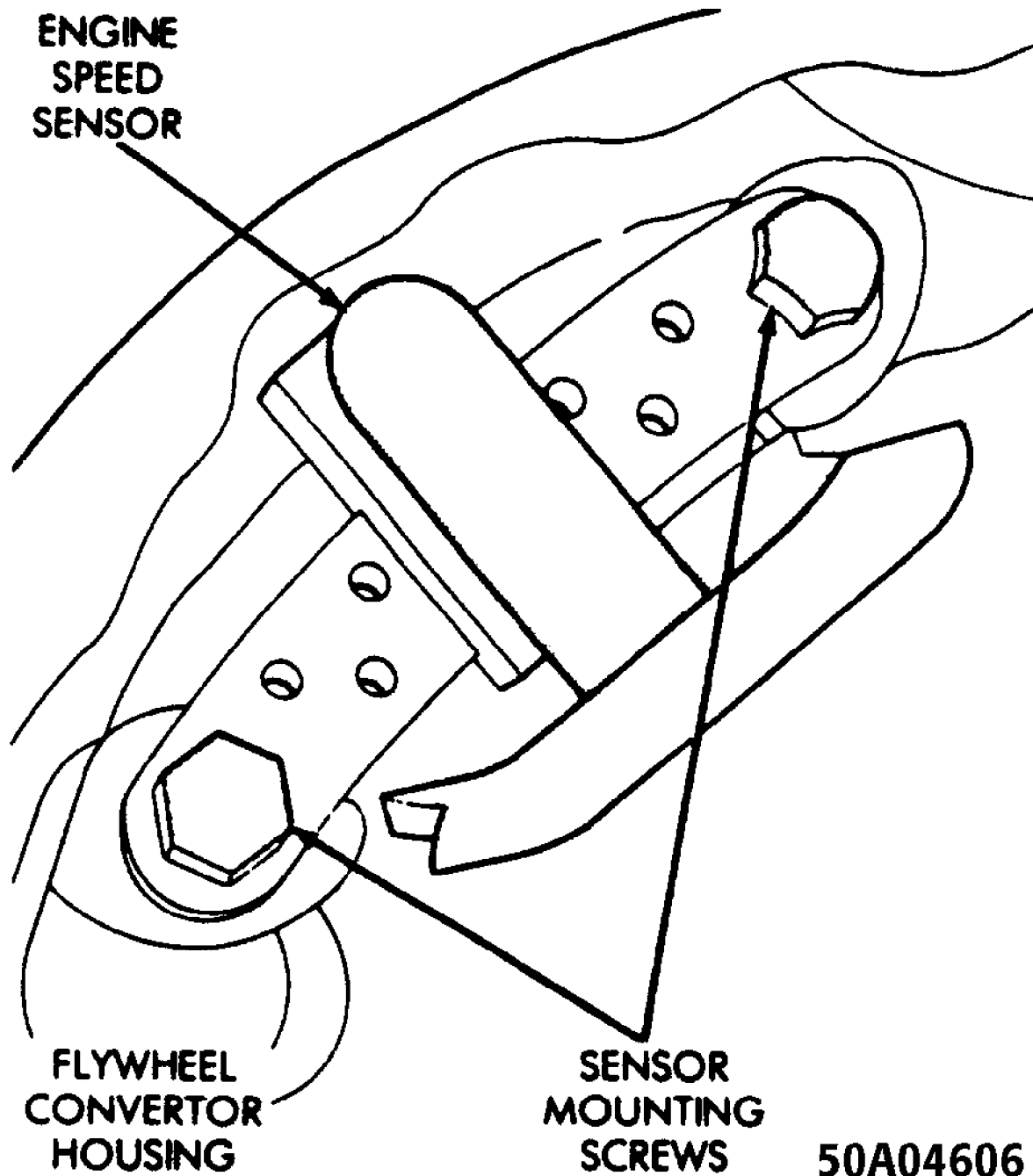


Fig. 7: Location of Engine Speed Sensor
Courtesy of Chrysler Motors.

When a small tooth and notch pass the magnet core in the sensor, the concentration, followed by the collapse of the magnetic

flux induces a small voltage spike to the sensor pickup coil winding. These small voltage spikes enable the ECU to count the teeth as they pass the sensor. When a large trigger tooth and notch pass the magnetic core in the sensor, the increased concentration, and then collapse of the magnetic flux induces a higher voltage spike into the sensor pickup coil winding. See Fig. 8.

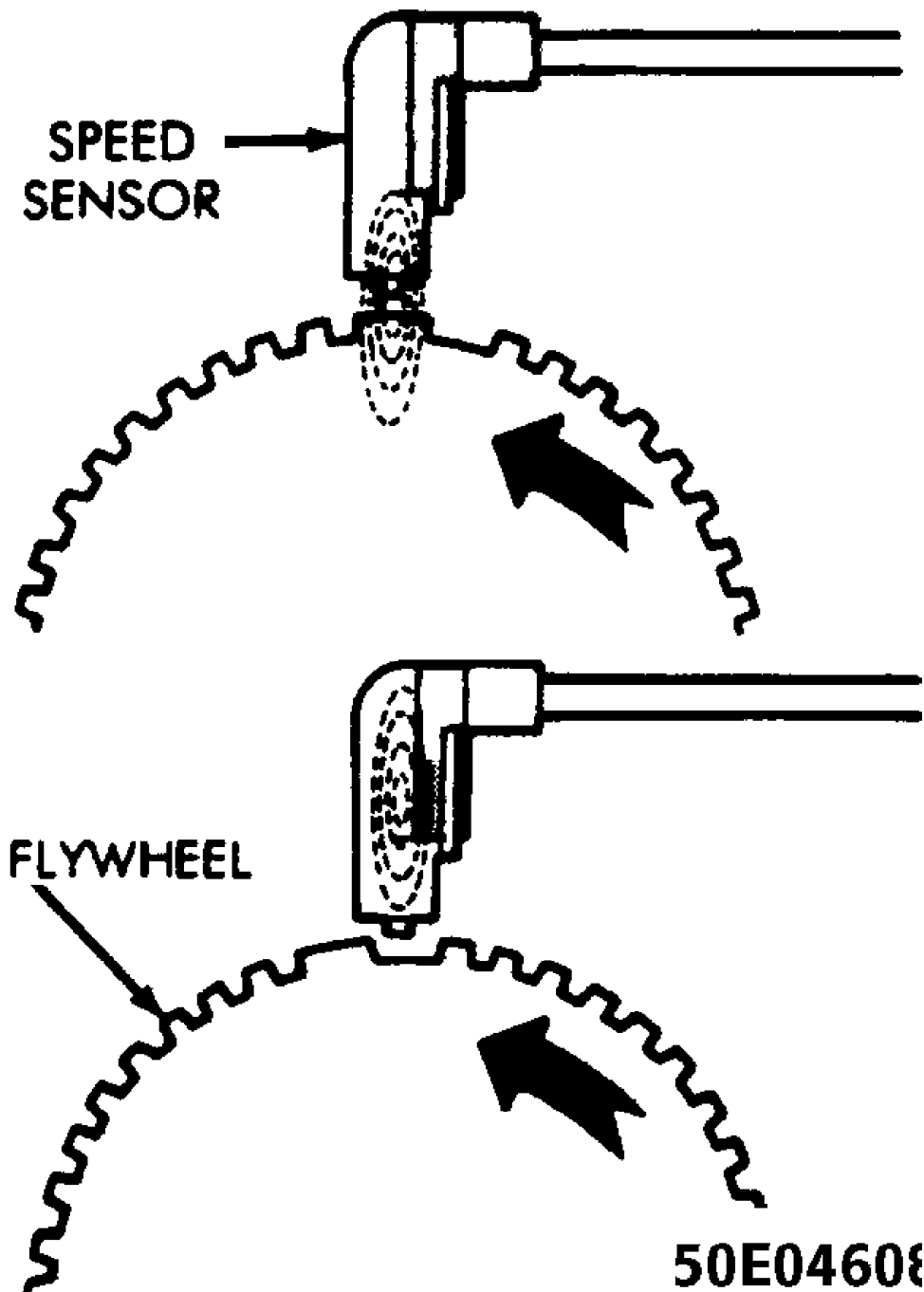


Fig. 8: Engine Speed Sensor Operation
Courtesy of Chrysler Motors.

The higher voltage spike is an indication to the ECU that a piston will reach its TDC position, 12 teeth later. See Fig. 9. The

ignition timing for the particular cylinder is either advanced or retarded as necessary by the ECU according to sensor inputs.

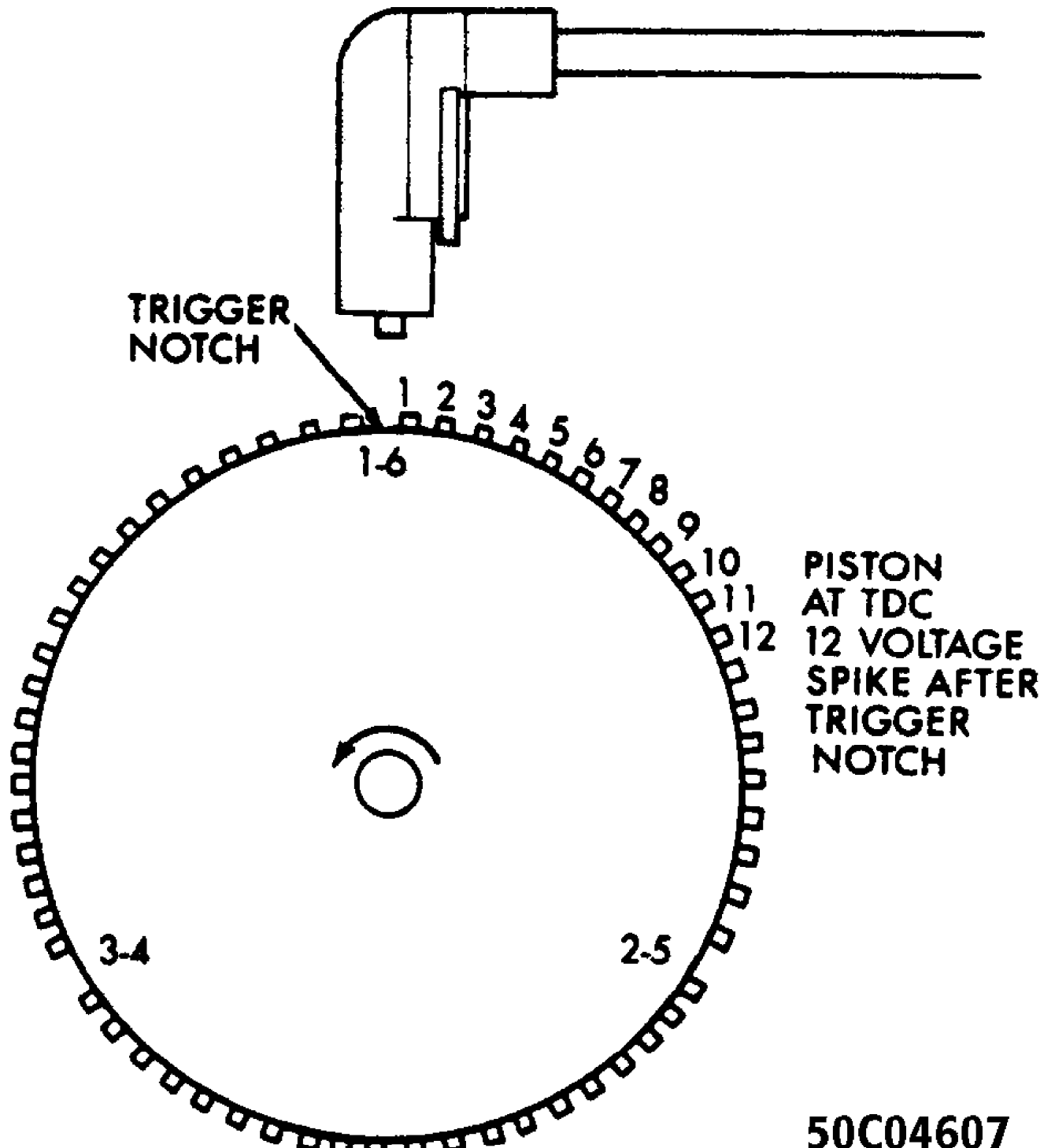


Fig. 9: View of Engine Speed Sensor, Showing Trigger Notches & TDC Position
Courtesy of Chrysler Motors.

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SYNC PULSE SIGNAL GENERATOR (STATOR)

The sync pulse signal generator is located in the distributor and works in conjunction with the engine speed sensor to provide the ECU with input to establish and maintain correct injector firing order. See Fig. 10. A pulse ring mounted to the distributor shaft references the position of pistons one and six as it rotates through the sync pulse signal generator's magnetic field.

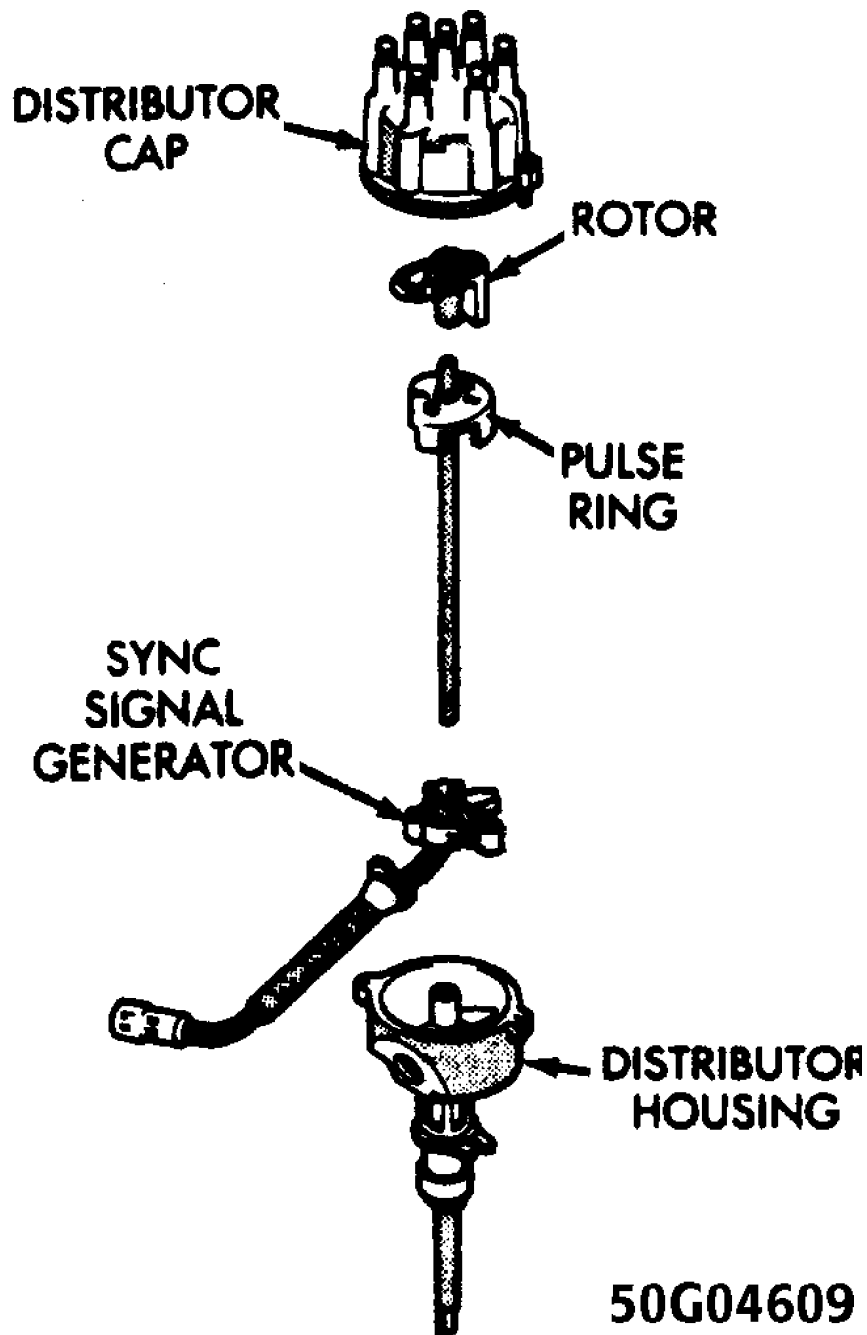
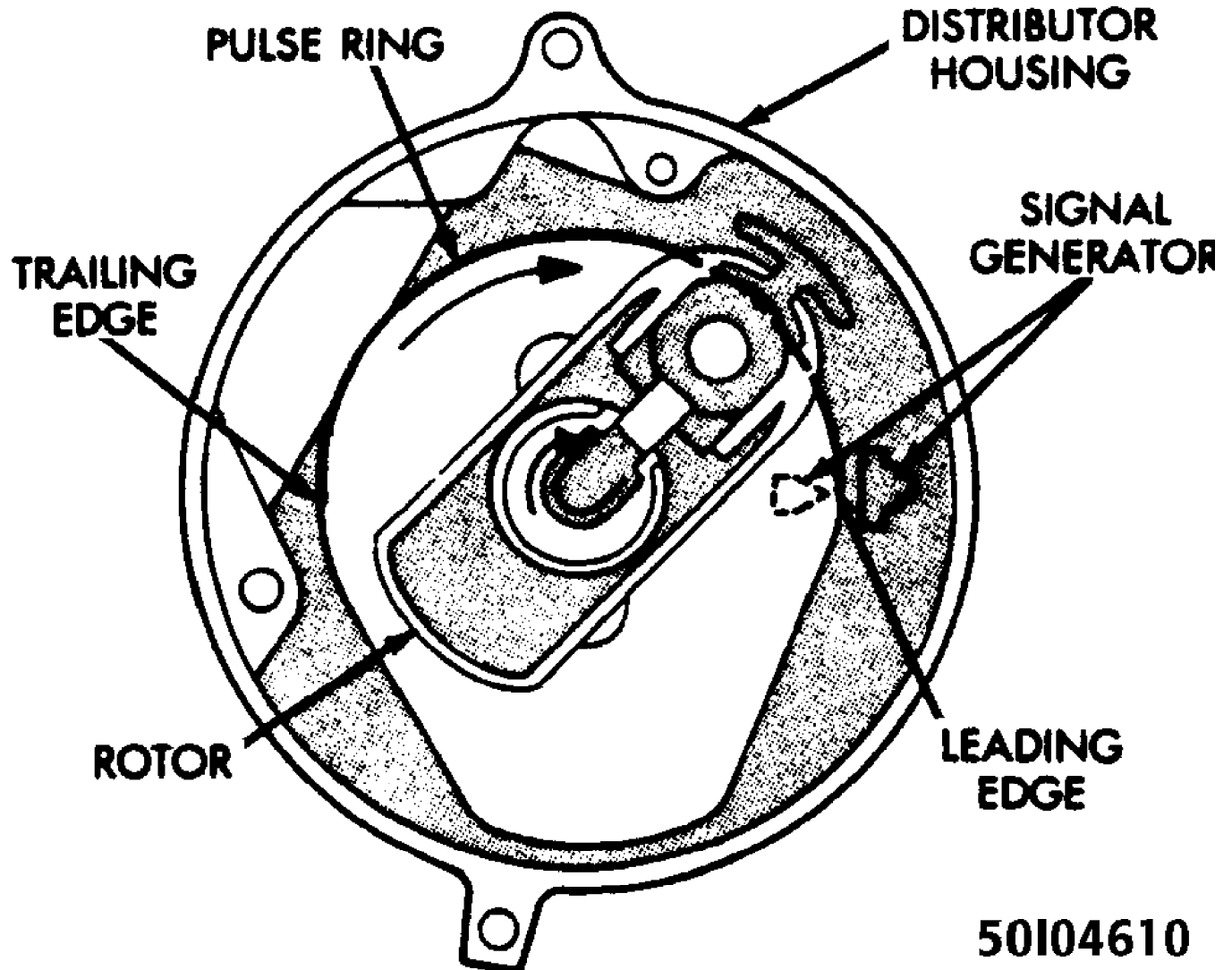


Fig. 10: Location of Sync Pulse Signal Generator & Pulse Ring
Courtesy of Chrysler Motors.

The pulse ring rotates through the sync pulse signal generator for 180°. When the leading edge of the pulse enters the sync

pulse signal generator, the magnetic field becomes weaker. This indicates the position of piston number one to the ECU. When the trailing edge of the pulse ring leaves the sync pulse signal generator, the magnetic field becomes stronger. This indicates the position of piston number six.

The sync pulse signal input and engine speed sensor input allow the ECU to establish the necessary reference point to synchronize the fuel injection.



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Fig. 11: Sync Pulse Signal Generator Operation
Courtesy of Chrysler Motors.

KNOCK SENSOR

The knock sensor is located on the lower left side of the engine block just above the oil pan. See Fig. 12. The knock sensor provides an input to the ECU, indicating detonation (knock) during engine operation. When knock occurs, the ECU retards the ignition advance to eliminate the knock at the appropriate cylinder(s).

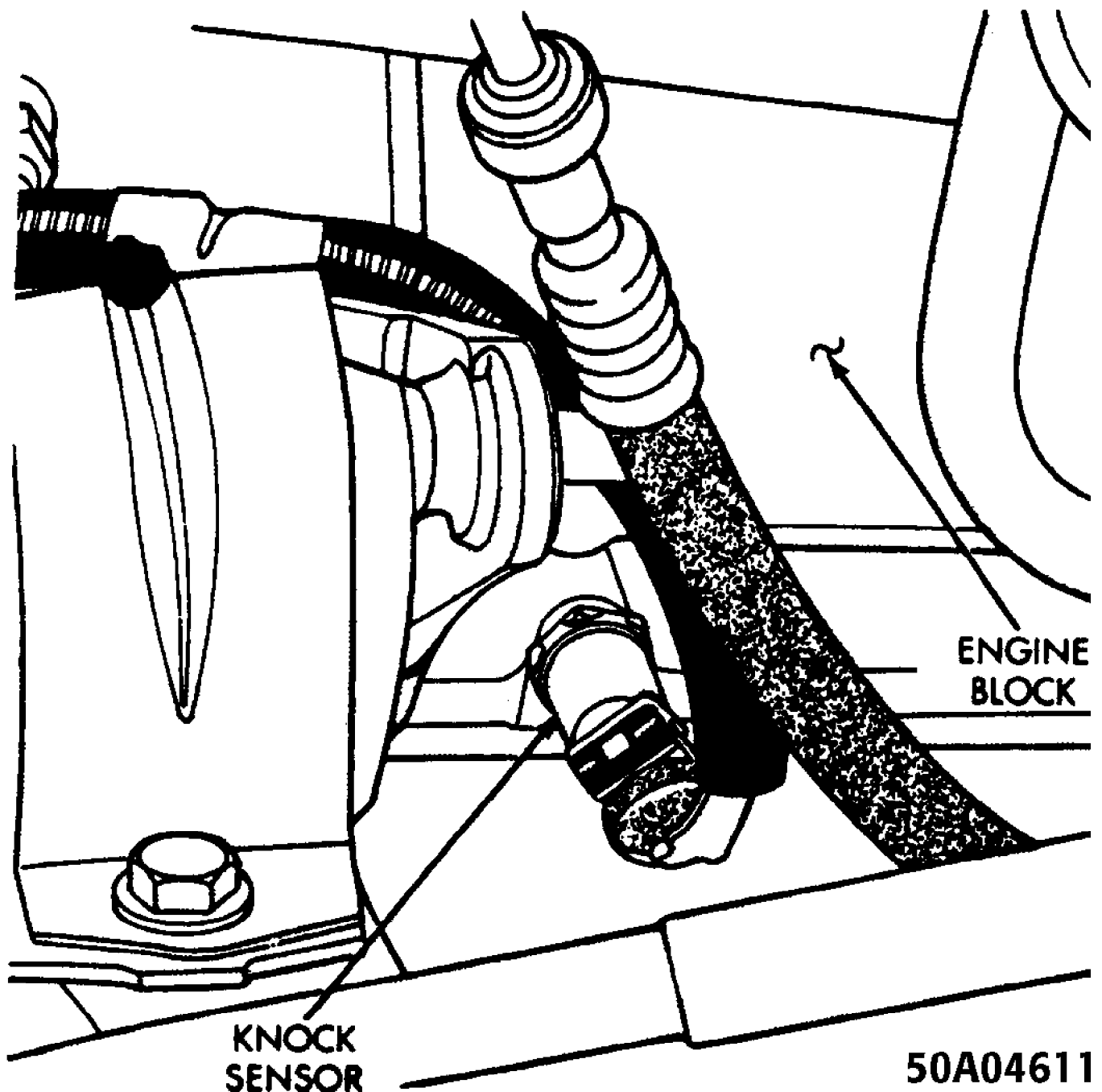


Fig. 12: Location of Knock Sensor
Courtesy of Chrysler Motors.

IGNITION SYSTEM PRECAUTIONS

When disconnecting wire from spark plug or distributor cap, twist rubber boot slightly to loosen. Grasp boot (not wire) and pull with steady, even force.

When separating control unit connectors, pull with firm, straight force. Do not pry apart with screwdriver. When connecting, press together firmly to overcome hydraulic pressure of silicone grease.

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If connector locking tabs weaken or break, press together firmly and bind with electrical tape or a harness tie strap to assure good connection.

COMPONENT LOCATIONS

COMPONENT LOCATIONS

Component	Location
Coolant Temperature Sensor (CTS)	On left side of engine
Engine Speed Sensor	Attached to flywheel cover housing
Ignition Control Module	Mounted to ignition coil
Knock Sensor	On lower left side of engine
Manifold Absolute Pressure (MAP) Sensor	Under the hood, on firewall
Manifold Air Temperature (MAT) sensor	On intake manifold
Sync Pulse Signal Generator	Inside distributor

TESTING

BASIC DIAGNOSTIC PROCEDURES

This section contains information for determining individual system component performance. Diagnosis of ECU/Engine Control System is performed using the DRB-II Diagnostic Tester. See the appropriate Computerized Engine Control System article in this section.

COOLANT TEMPERATURE SENSOR (CTS) TEST

1) Disconnect the CTS wire harness connector from the CTS. See Fig. 13.

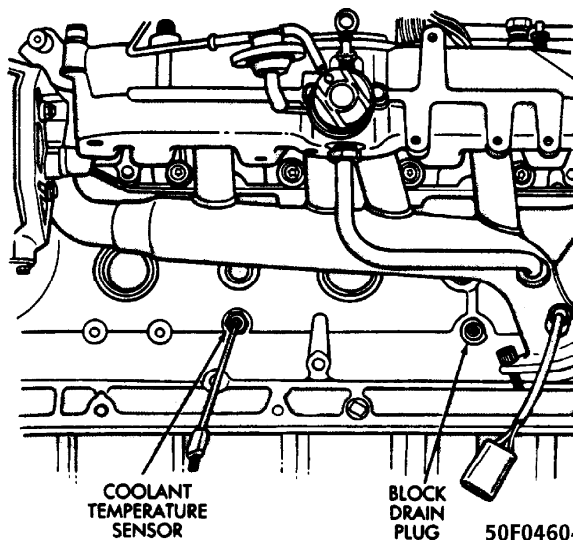


Fig. 13: Location of Coolant Temperature Sensor (CTS)
Courtesy of Chrysler Motors.

2) Using a high input impedance (digital) volt-ohmmeter, test the resistance of the sensor. Resistance should be less than 1000 ohms

with a warm engine. See the COOLANT TEMPERATURE SENSOR (CTS) RESISTANCE VALUES table below.

COOLANT TEMPERATURE SENSOR (CTS) RESISTANCE VALUES

Degrees °F	Degrees °C	Resistance (Ohms)
-40	-40	100,700
0	-18	25,000
20	-7	13,500
40	4	7,500
70	20	3,400
100	38	1,600
160	70	450
212	100	185

3) If any resistance is not within the range as specified in the table, replace the coolant temperature sensor.

4) Test the resistance of the wire harness between the ECU wire harness connector terminal "D-3" and the sensor connector terminal "C-10".

5) Repair any open circuits.

MANIFOLD AIR TEMPERATURE (MAT) SENSOR TEST

1) Disconnect the MAT wire harness connector from the MAT sensor. See Fig. 14*.

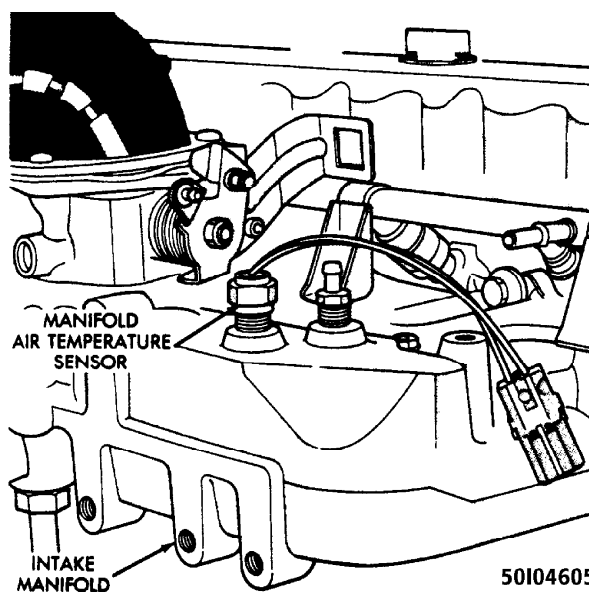


Fig. 14: Location of Manifold Air Temperature (MAT) Sensor
Courtesy of Chrysler Motors.

2) Using a high input impedance (digital) volt-ohmmeter, test the resistance of the sensor. Resistance should be less than 1000 ohms

with a warm engine. See the MANIFOLD AIR/FUEL TEMPERATURE (MAT) SENSOR RESISTANCE VALUES table below.

MANIFOLD AIR/FUEL TEMPERATURE (MAT)
SENSOR RESISTANCE VALUES

Degrees °F	Degrees °C	Resistance (Ohms)
-40	-40	100,700
0	-18	25,000
20	-7	13,500
40	4	7,500
70	20	3,400
100	38	1,600
160	70	450
212	100	185

3) If any resistance is not within the range as specified in the table, replace the MAT sensor.

4) Test the resistance of the wire harness between the ECU wire harness connector terminal "D-3" and the sensor connector terminal "C-8".

5) Repair as necessary any circuits displaying a value greater than one ohm.

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR TEST

1) Inspect the MAP sensor vacuum hose connections at the throttle body and the MAP sensor. See Fig. 15. Repair vacuum hose or connections as necessary.

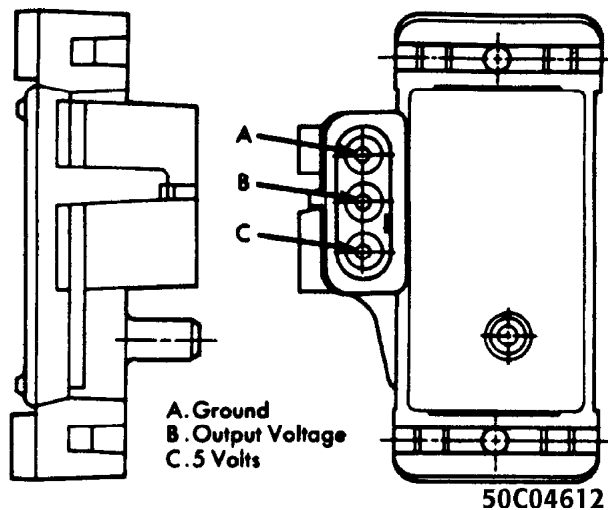


Fig. 15: Manifold Absolute Pressure (MAP) Sensor Connectors
Courtesy of Chrysler Motors.

2) With the ignition switch ON and engine OFF, test the MAP sensor output voltage at the MAP sensor connector terminal "B". See

Fig. 15. With a hot idle condition, the voltage reading should drop to between 0.5-1.5 volts.

3) Test ECU terminal "C-6" for the same voltage as described in step 2) to verify the wiring harness. Repair as necessary.

4) Test the MAP sensor supply voltage at the sensor connector terminal "C" with the ignition ON. Voltage reading should be between 4.5-5.5 volts. Check that the voltage reading at terminal "C-14" is also 4.5-5.5 volts.

5) Repair or replace the wire harness as necessary.

6) Test the MAP sensor ground circuit at the sensor connector terminal "A" and ECU connector terminal "D-3". Repair the wire harness as necessary.

7) Using an ohmmeter, test the MAP sensor ground circuit at the ECU connector between terminal "D-3" and terminal "B-11". If an open circuit is indicated, check for a defective sensor ground connection. The MAP sensor ground is located on the right side of the engine block.

8) If, after performing step 7), the ground connection is verified to be good, check for a short to 12 volts at terminal "D-3". If a short is found, repair the short and then replace the ECU.

KNOCK SENSOR TEST

1) Connect Diagnostic Tester M.S. 1700 to the vehicle.

2) Go to "State Display" mode.

3) Start the engine and let idle.

4) Observe knock sensor value.

5) Using the tip of a screwdriver, lightly tap the cylinder block near the sensor while observing the knock sensor value.

6) The knock sensor value should increase when the cylinder block is tapped.

7) If the knock sensor value does not increase while tapping on the cylinder block near the knock sensor, check for proper connections to the knock sensor. If connections are good, replace the knock sensor. Refer to REMOVAL & INSTALLATION in this article.

ENGINE SPEED SENSOR TEST

1) Disconnect the engine speed sensor connector from the ignition control module.

2) place an ohmmeter between terminals "A" and "B" (marked on the connector). On a hot engine, the resistance reading should be between 125-275 ohms.

3) Replace sensor if readings are not within specification.

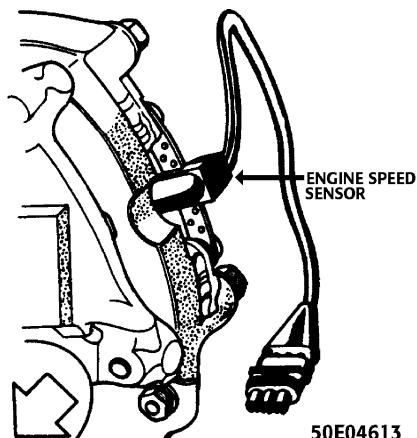


Fig. 16: View of Engine Speed Sensor Connectors (At Sensor)
Courtesy of Chrysler Motors.

SPARK PLUG CHECK

Faulty or fouled plugs may perform well at idle speed, but at higher engine speeds, they frequently fail. Faulty plug can exhibit the following symptoms:

- * Poor fuel economy.
- * Power loss.
- * Decreased engine speed.
- * Hard starting.
- * Generally poor performance.

Spark plugs also malfunction due to carbon fouling, excessive electrode air gap, or broken insulators.

SYNC PULSE SIGNAL GENERATOR (STATOR) TEST

NOTE: For this test, an analog voltmeter MUST be used.

- 1) Insert the positive (+) lead of the voltmeter into the Blue wire at the distributor connector.
- 2) Insert the negative (-) voltmeter lead into the Gray/White wire at the distributor connector.

CAUTION: DO NOT remove the distributor connector from distributor. Insert the voltmeter leads into the backside of the distributor connector to make contact with the terminals.

- 3) Set the voltmeter to the 15-Volt D/C scale. Turn ignition key to "ON".
- 4) The voltmeter should display approximately 5.0 volts.
- 5) If no voltage displays, check that the voltmeter leads are making good contact. If there is still no voltage, go to next step.
- 6) Remove the ECU and check for voltage at pin "C-16" and ground with harness connected. If there is still no voltage, proceed to the next step.
- 7) Connect Diagnostic Tester M.S. 1700 to the vehicle. Using the diagnostic tester, perform vehicle test. If voltage is present, go to the next step.
- 8) Check for continuity between the Blue wire at the distributor connector and pin C-16 at the ECU.
- 9) If there is no continuity, repair harness as necessary.
- 10) Check for continuity between the Gray/White wire at the distributor connector and pin C-5 at the ECU.
- 11) If there is no continuity, repair harness as necessary.
- 12) Check for continuity between the Black wire at the distributor connector and ground.
- 13) If there is no continuity, repair harness as necessary.
- 14) While observing the voltmeter, crank the engine; the voltmeter needle should fluctuate back and forth while the engine is cranking. A fluctuation verifies that the stator in the distributor is operating properly.
- 15) If there is no pulse sync, replace the stator. Refer to REMOVAL & INSTALLATION below in this article.

REMOVAL & INSTALLATION

COOLANT TEMPERATURE SENSOR (CTS)

Removal

- 1) Drain the cooling system.

- 2) Remove air cleaner assembly.
- 3) Disconnect the CTS wire connector. See Fig. 17.
- 4) Remove the CTS from the left side of the engine block.

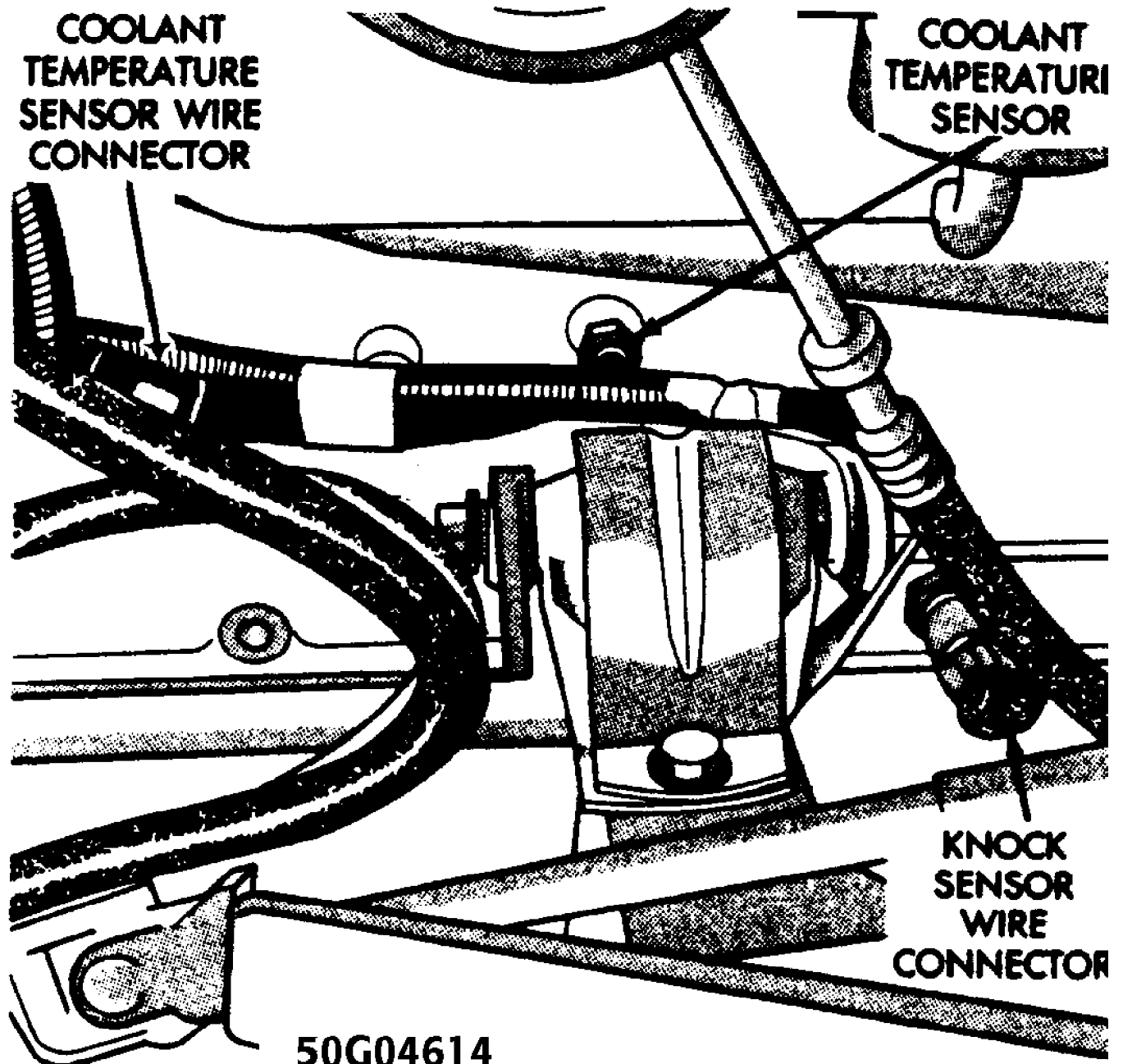


Fig. 17: Coolant Temperature Sensor (CTS) Connector
Courtesy of Chrysler Motors.

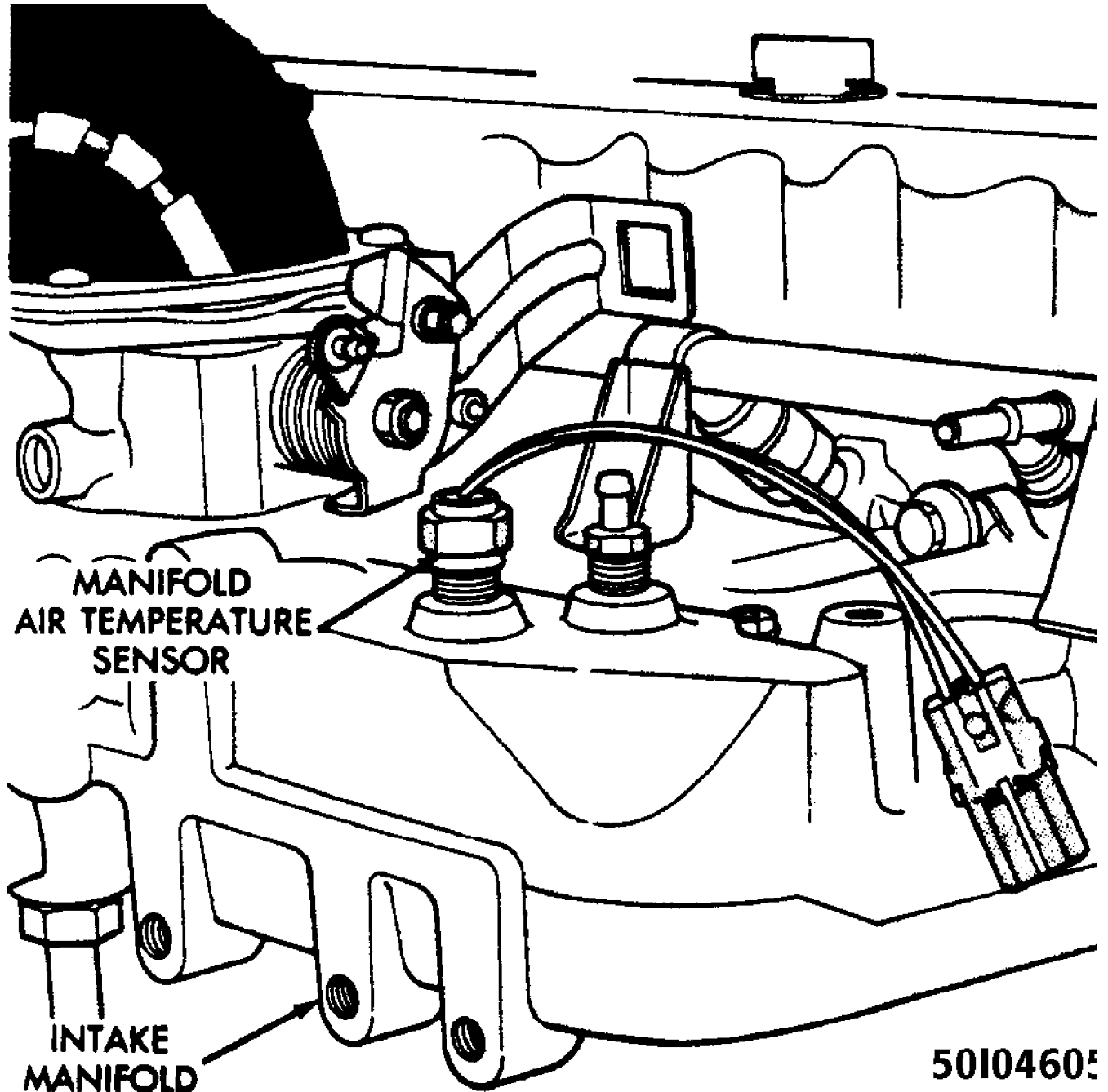
Installation

- 1) Install the CTS to the cylinder block. Tighten the CTS to 21 Ft. Lbs. (28 Nm).
- 2) Connect the CTS wire connector.
- 3) Install air cleaner assembly.
- 4) Fill the cooling system.

MANIFOLD AIR TEMPERATURE (MAT) SENSOR

Removal

- 1) Disconnect the MAT sensor wire connector. See Fig. 18.
- 2) Remove the MAT from the intake manifold.



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Fig. 18: Manifold Air Temperature (MAT) Sensor Connectors
Courtesy of Chrysler Motors.

Installation

- 1) Install the MAT sensor to the cylinder block. Tighten the MAT sensor to 21 Ft. Lbs. (28 Nm).
- 2) Connect the MAT sensor wire connector.

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

Removal

- 1) Disconnect the MAP sensor wire connector. See Fig. 19.
- 2) Disconnect MAP sensor vacuum supply hose from MAP sensor.
- 3) Remove the MAP sensor attaching nuts. Remove MAP sensor from the firewall.

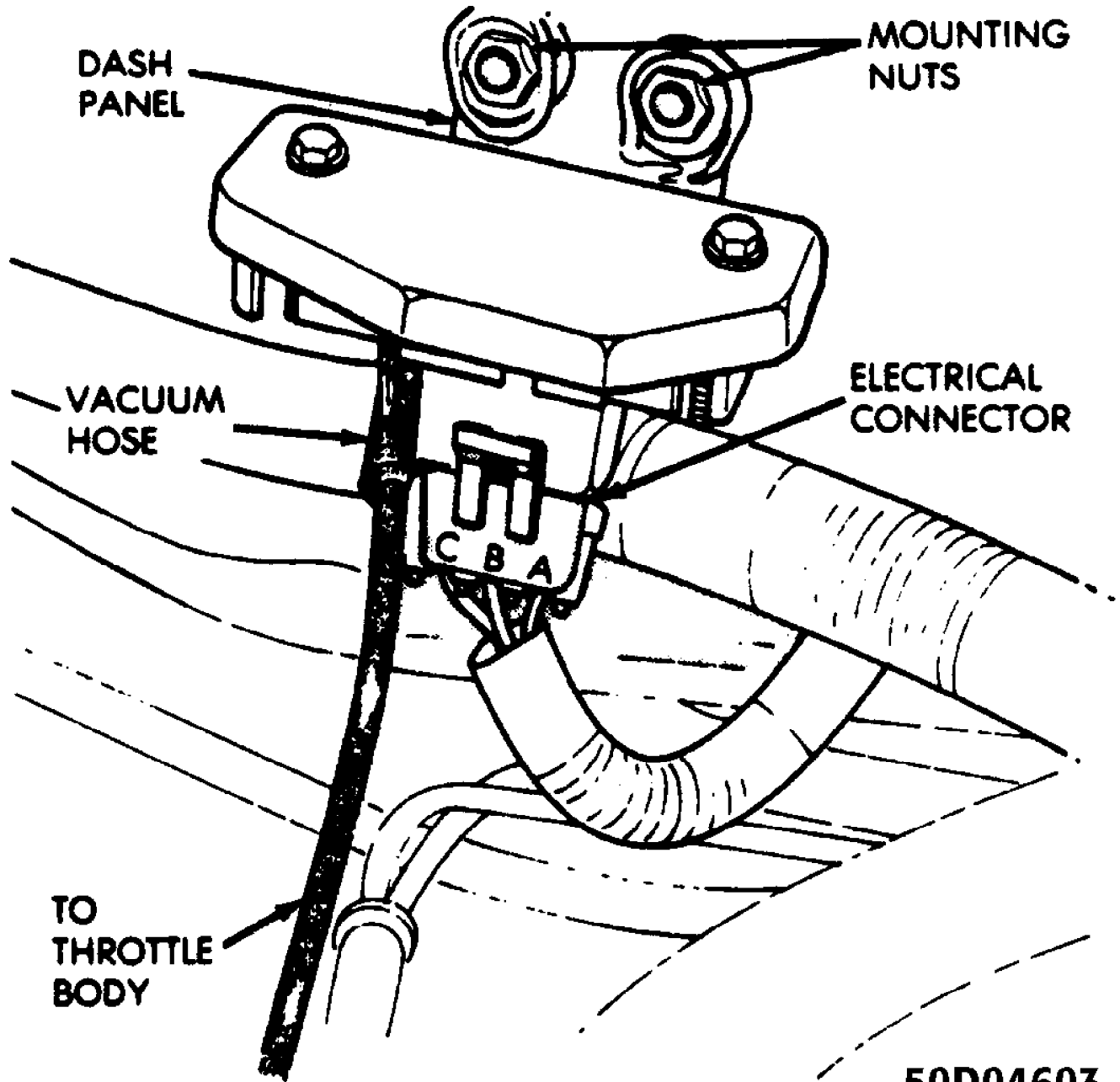


Fig. 19: View of Manifold Absolute Pressure (MAP) Sensor Mounting Nuts & Vacuum Supply Hose
Courtesy of Chrysler Motors.

Installation

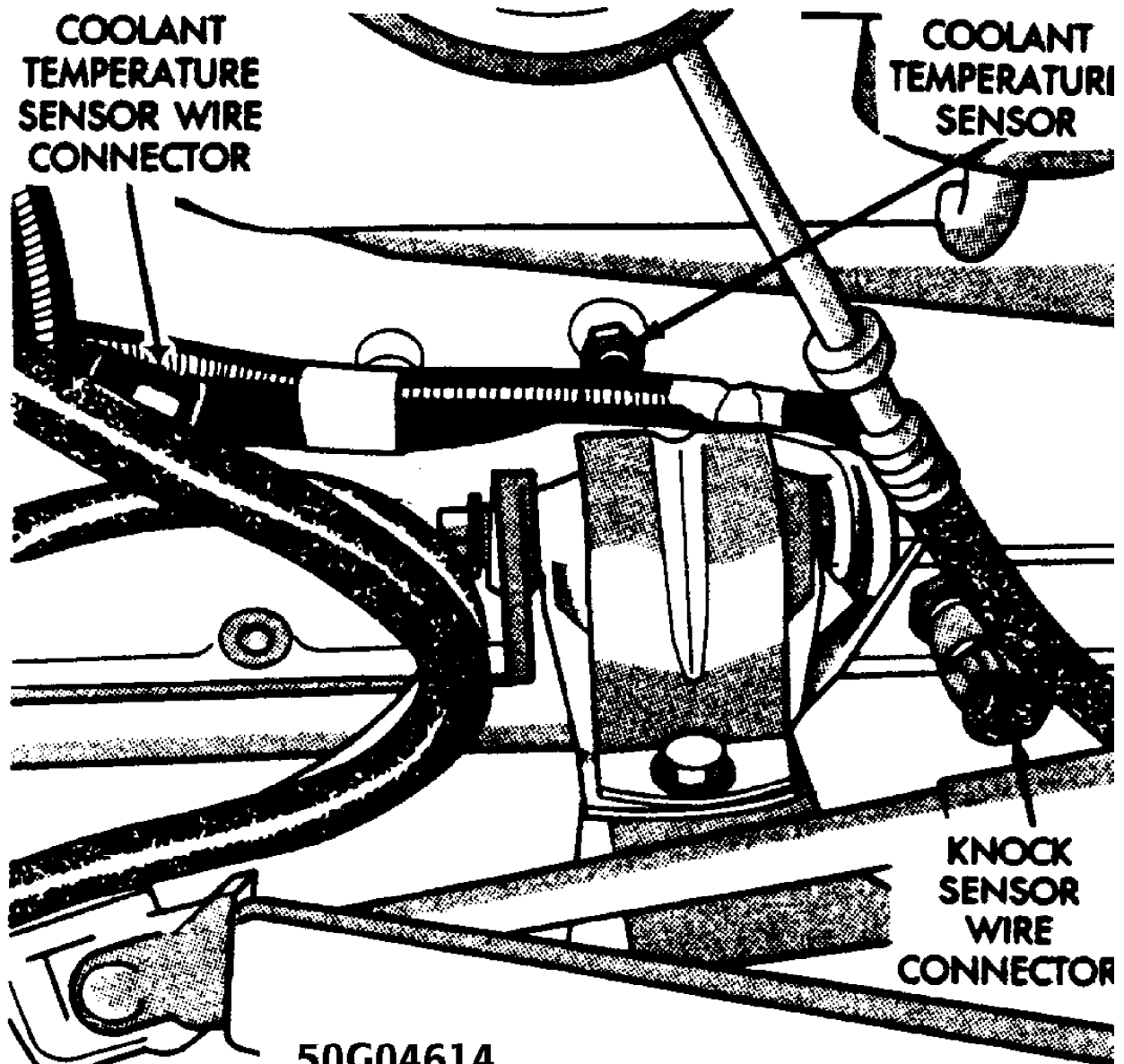
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- 1) Install the MAP sensor to the firewall. Tighten the MAP sensor attaching nuts.
- 2) Connect the MAP sensor vacuum supply hose.
- 3) Connect the MAP sensor wire connector.

KNOCK SENSOR

Removal

- 1) Raise and support the vehicle.
- 2) Disconnect the knock sensor wire connector located below and to the rear of the Coolant Temperature Sensor. See Fig. 20.
- 3) Remove knock sensor from left side of the engine block.



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Fig. 20: Knock Sensor Connector
Courtesy of Chrysler Motors.

Installation

WARNING: The knock sensor **MUST** be tightened to the **EXACT** torque specified in order to ensure proper operation.

- 1) Install the knock sensor to the cylinder block. Tighten the knock sensor to 89 INCH Lbs. (10 Nm).
- 2) Connect the knock sensor wire connector.
- 3) Lower vehicle.

ENGINE SPEED SENSOR

Removal

- 1) Remove engine speed sensor wire connector. See Fig. 21.
- 2) Remove the engine speed sensor-to-transmission housing attaching bolts. Remove engine speed sensor from transmission housing.

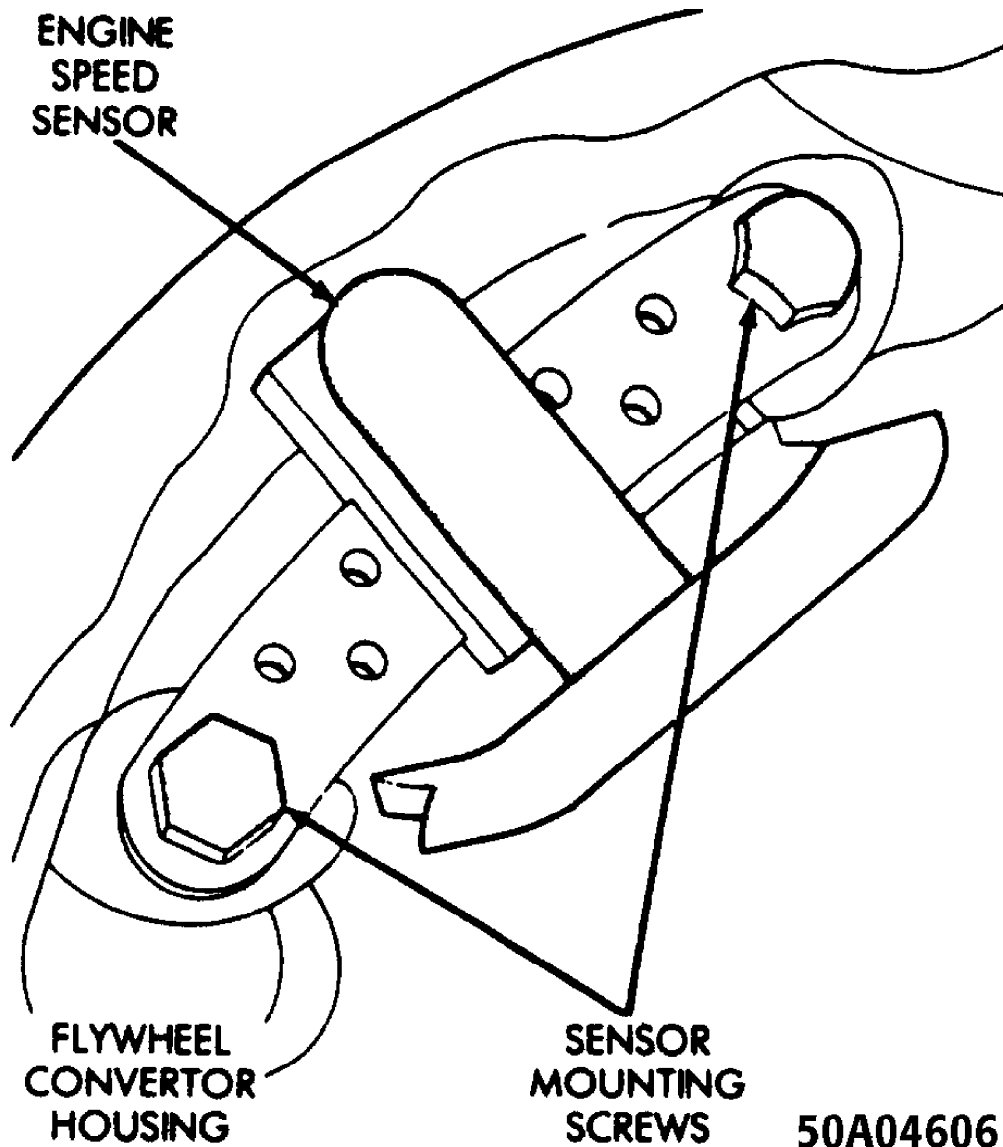


Fig. 21: Engine Speed Sensor Mounting Bolts
Courtesy of Chrysler Motors.

Installation

- 1) Install the engine speed sensor to the transmission

housing with 2 shoulder bolts. Tighten the engine speed sensor shoulder bolts.

2) Connect the engine speed sensor wire connector.

ELECTRONIC CONTROL UNIT (ECU)

Removal

NOTE: The ECU is located below the instrument panel, between the steering column and the A/C-Heater housing. See Fig. 22. Three screws mount the ECU to a bracket.

- 1) Disconnect the negative battery cable.
- 2) Remove the 3 ECU attaching screws. See Fig. 23.
- 3) Disconnect the ECU wiring harness connector.
- 4) Remove the ECU.

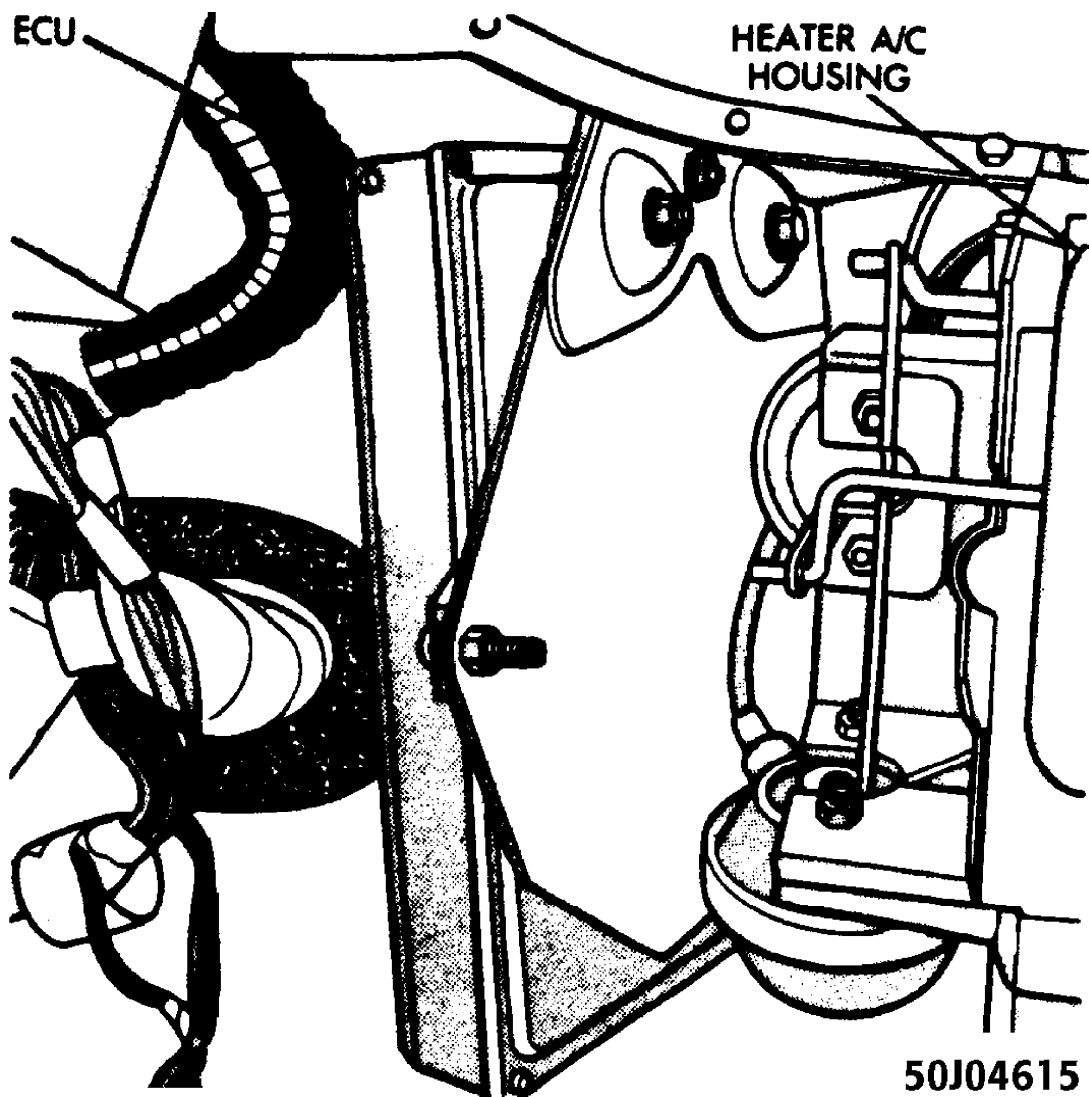


Fig. 22: Location of ECU
Courtesy of Chrysler Motors.

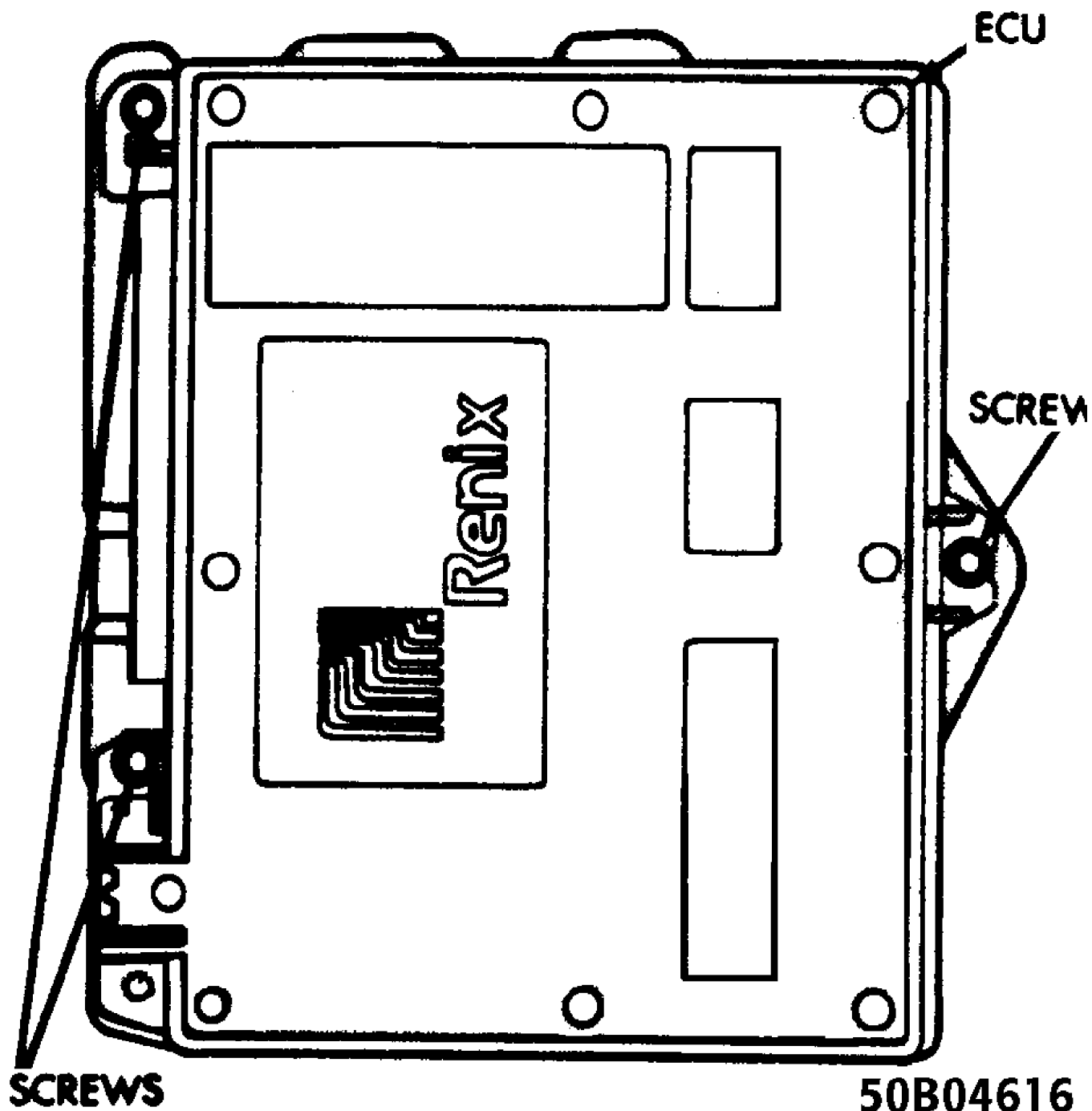


Fig. 23: Location of ECU Mounting Screws
Courtesy of Chrysler Motors.

Installation

- 1) Connect the ECU wiring harness connector.
- 2) While holding the ECU in position, attach the 3 ECU attaching screws. See Fig. 23.
- 3) Connect the negative battery cable.

DISTRIBUTOR

Removal

1) Disconnect the battery negative cable.

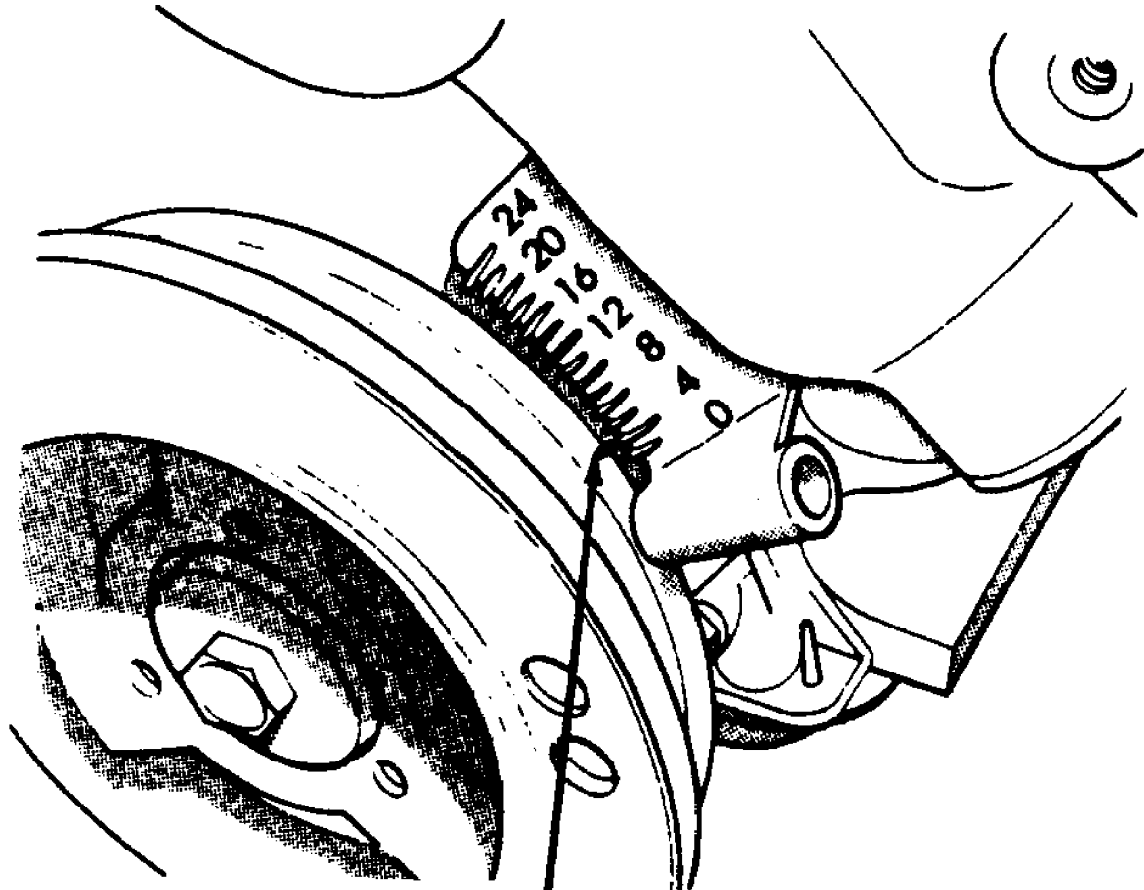
2) On vehicles equipped with A/C, remove the electrical cooling fan and shroud assembly from the radiator to allow room to rotate the engine with a socket and ratchet using the vibration damper bolt.

3) Scribe a mark on the distributor housing below the left side (past) the number one spark plug wire post of the distributor cap for reassembly reference for No 1 cylinder firing position.

4) Remove the distributor cap.

5) Turn the engine in a clockwise direction until the rotor is approaching the scribed mark on the distributor housing. Then slowly turn the engine until the timing mark on the crankshaft vibration damper lines up with zero on the front cover timing scale. See Fig. 24.

NOTE: The timing mark is located on the edge of the vibration damper closest to the front cover.

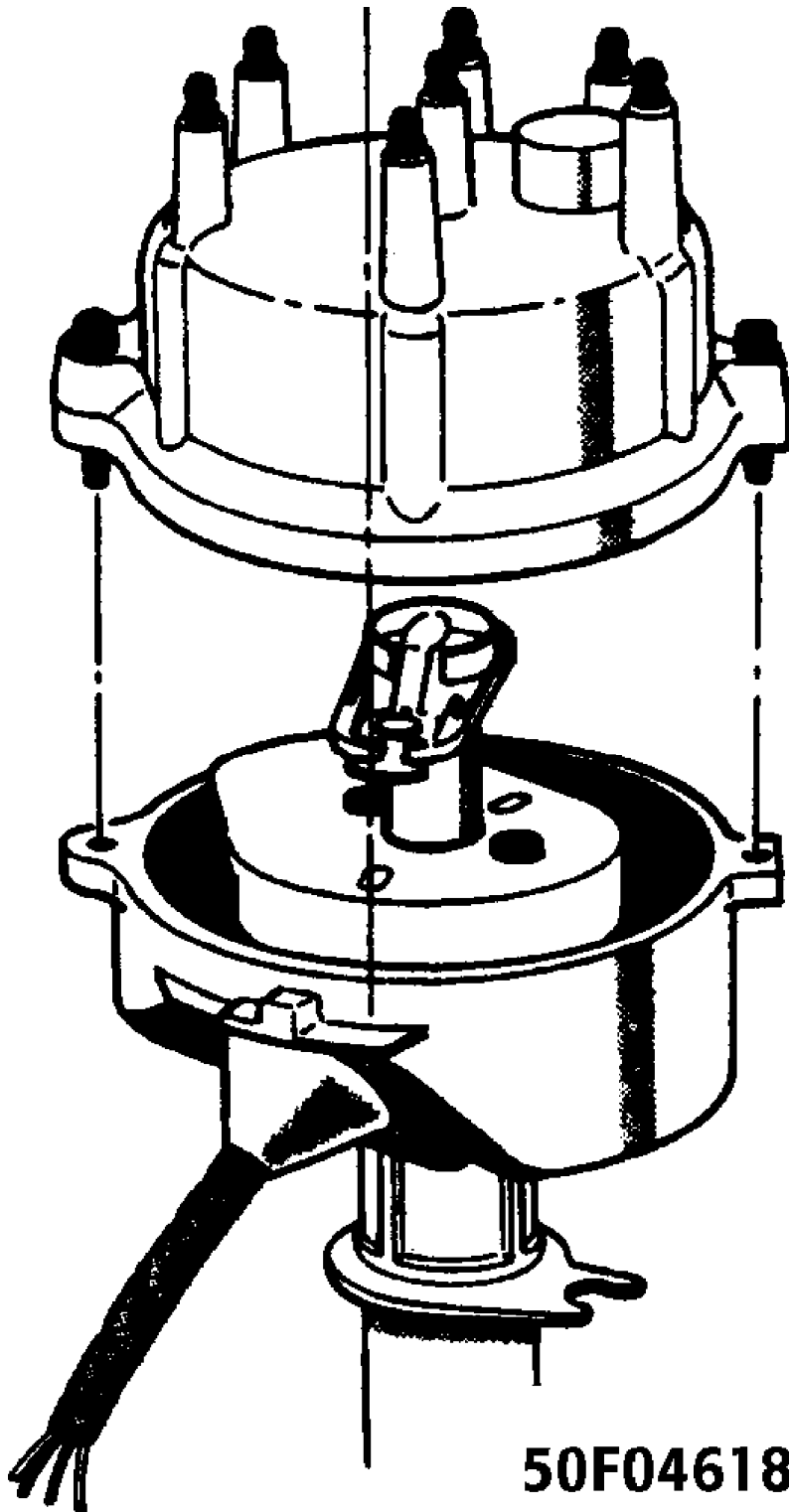


**CRANKSHAFT
VIBRATION DAMPER
TIMING MARK**

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Fig. 24: View of Crankshaft Vibration Damper Timing Marks
Courtesy of Chrysler Motors.

6) Align the trailing edge of the rotor blade with the mark previously scribed on the distributor housing. See Fig. 25.



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Fig. 25: Aligning Rotor & Distributor Cap for Removal
Courtesy of Chrysler Motors.

- 7) Remove the distributor hold-down bolt and clamp.
- 8) Remove the distributor from the engine.

Installation

1) If needed, use a flat blade screwdriver to turn the oil pump gear shaft until the slot is slightly past the 11 o'clock position. See Fig. 26. The oil pump shaft is located down in the distributor hole.

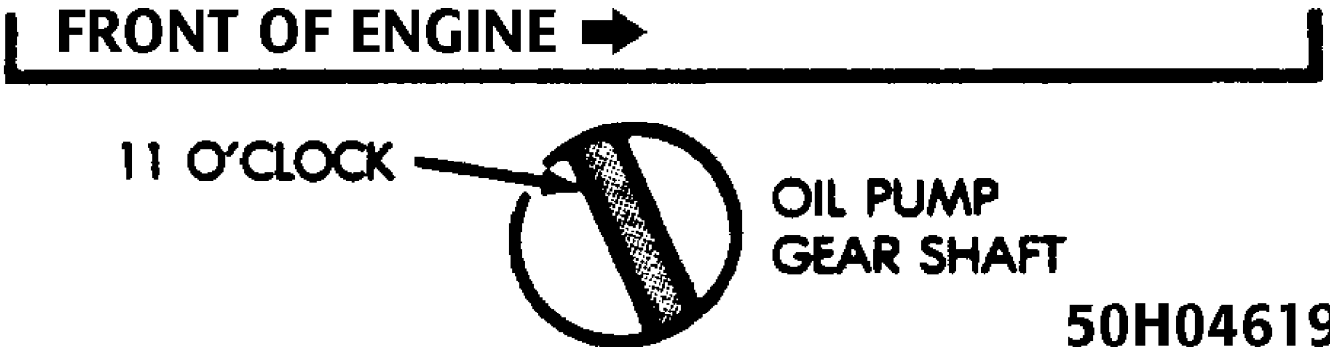


Fig. 26: Aligning Oil Pump Gear Shaft
Courtesy of Chrysler Motors.

2) Install the rotor.

3) Without engaging the distributor gear into the cam gear and ensuring the distributor gasket is installed, position the distributor into the hole in the engine block.

4) Visually line up the hold down ear of the distributor housing with the hold down clamp hole. See Fig. 27.

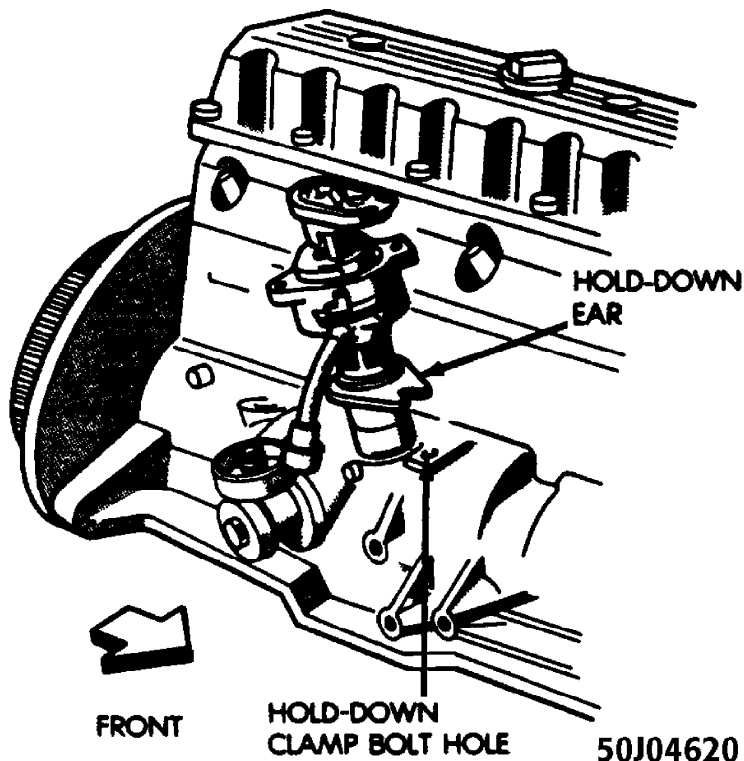


Fig. 27: Installing Distributor
Courtesy of Chrysler Motors.

5) Turn the rotor to the 4 o'clock position. See Fig. 28.

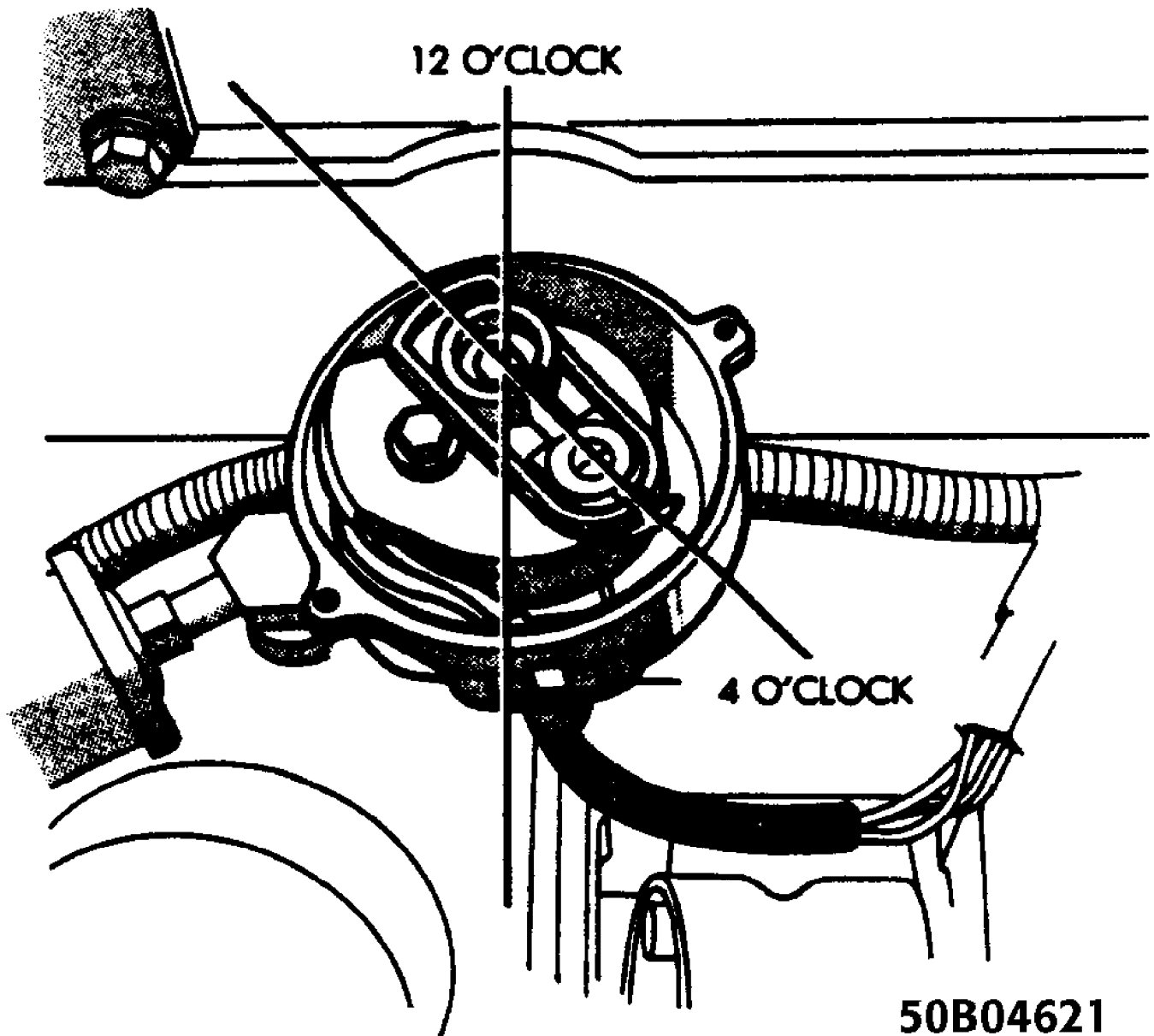


Fig. 28: Installing & Aligning Rotor
 Courtesy of Chrysler Motors.

6) Carefully slide the distributor into the block until it seats, keeping the hold down ear aligned to the hole in the block.

7) The rotor should be in the 5 o'clock position with the trailing edge of the rotor blade lined up with the mark previously scribed on the distributor housing (number one spark plug wire post location).

8) install the distributor hold-down clamp bolt and tighten to 9.5-14 Ft. Lbs. (13-19 N.m).

9) Install the distributor cap. Connect the distributor electrical connector.

10) Install the electric cooling fan and shroud if applicable.

11) Connect the negative battery cable.

IGNITION/COIL WIRE REPLACEMENT PRECAUTIONS

Removal & Installation

Using care, disconnect the spark plug and coil wire boots and wires. Twist the boot one half turn and pull on the boot to disconnect the wire.

When replacing the spark plug and coil wires, carefully route the wires correctly and secure them in their proper channels retainers.

Failure to route the wires properly can cause the radio to reproduce ignition noise, cross ignition of the plugs, or can short circuit the wires to ground.

OVERHAUL

STATOR REPLACEMENT

Disassembly

- REMOVAL & INSTALLATION
- 1) Remove the distributor as specified in DISTRIBUTOR under REMOVAL & INSTALLATION above in this article.
 - 2) Remove the distributor rotor.
 - 3) Position the distributor in a vise.
 - 4) Remove the distributor gear from the shaft using a small punch and a hammer to drive out the retaining roll pin. See Fig. 29.
 - 5) Remove the distributor shaft from the distributor housing.
 - 6) Remove the stator retaining screw.

NOTE: Mark the location of the stator position for reassembly reference.

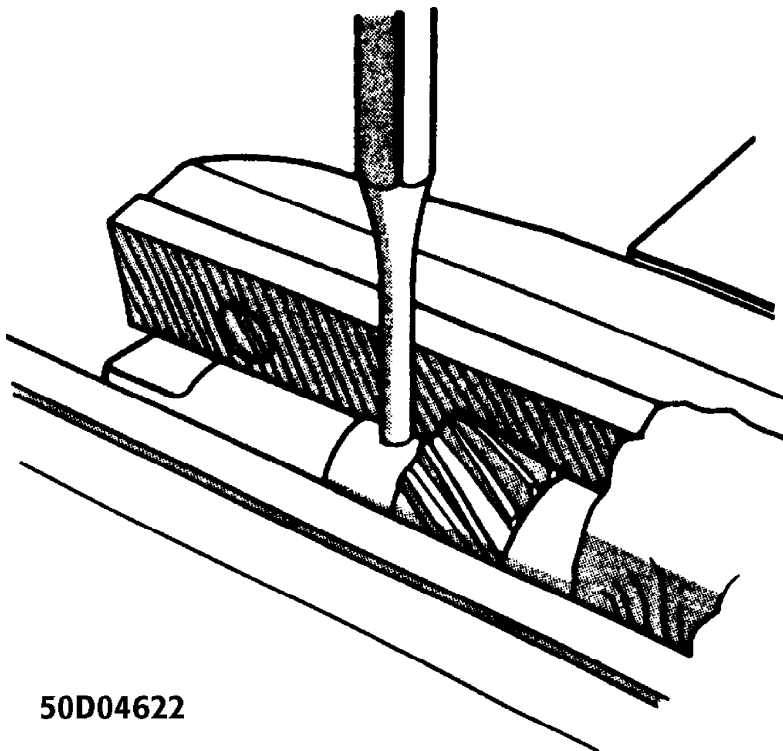


Fig. 29: Removing Distributor Gear Retaining Roll Pin
Courtesy of Chrysler Motors.

7) Remove stator harness by pushing the grommet through the distributor housing. Remove stator assembly. See Fig. 30.

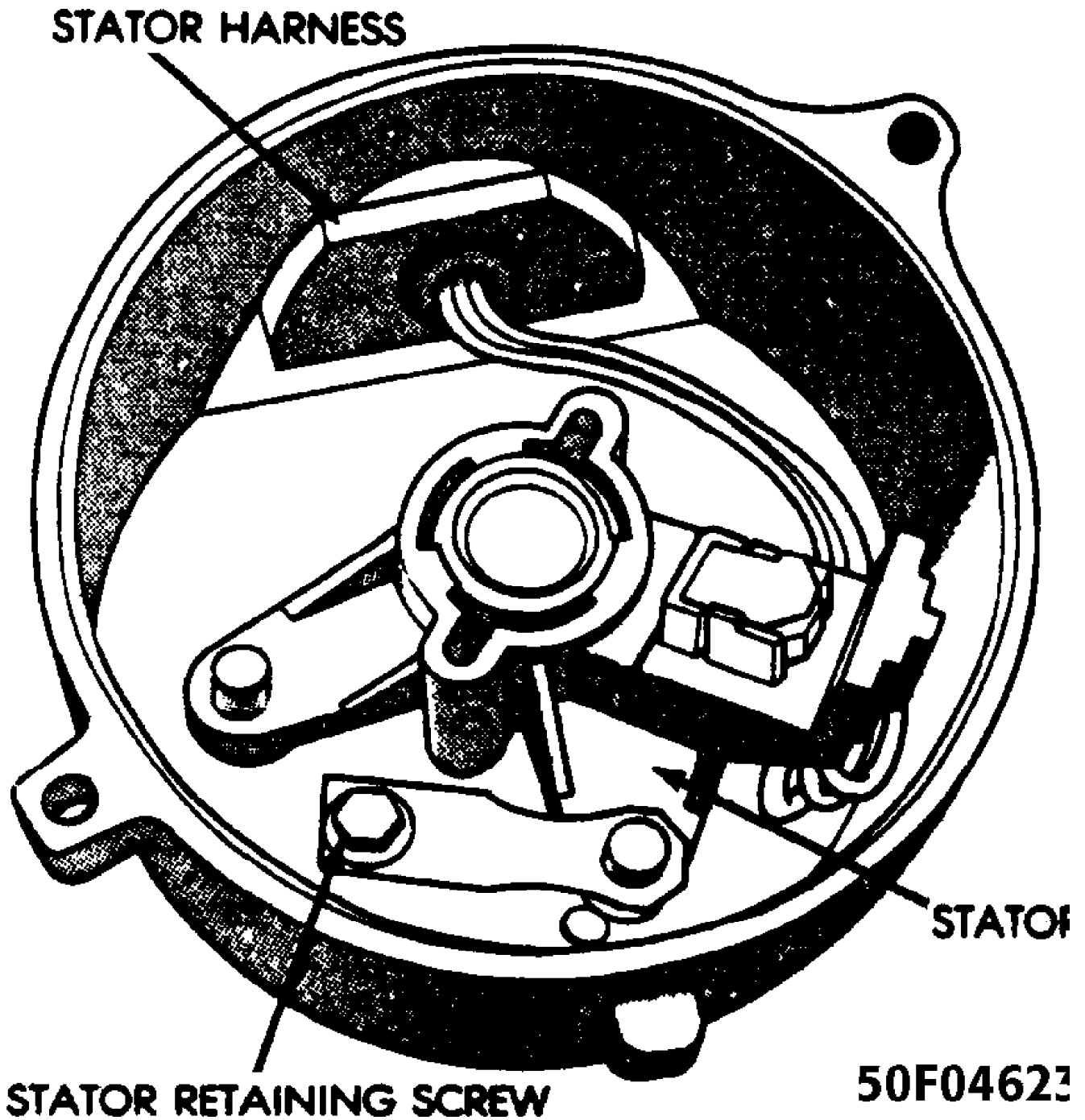


Fig. 30: Location of Stator Retaining Screw
 Courtesy of Chrysler Motors.

Reassembly

- 1) Install stator assembly and the stator retaining screw.
- 2) Position the stator assembly harness through the distributor housing and push the grommet into position.
- 3) Install distributor shaft into the distributor housing. If the shaft is equipped with seals, ensure that they are in place and not damaged.

- 4) Install the distributor gear washer and distributor gear onto the shaft.
- 5) Install the distributor gear retaining pin.
- 6) Install the distributor rotor.
- 7) Install the distributor as specified in DISTRIBUTOR under REMOVAL & INSTALLATION above in this article.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Coolant Temperature Sensor	21 (28)
Distributor Hold-Down Clamp Bolt	9.5-14 (13-19)
Manifold Air Temperature Sensor	21 (28)
	INCH Lbs. (N.m)
Knock Sensor	89 (10)