

# IGNITION CONTROL

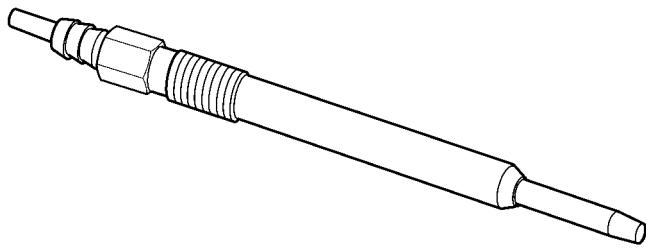
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## GLOW PLUG

### DESCRIPTION

Glow plugs are used to help start a cold or cool engine (Fig. 1). The glow plugs will heat up and glow to heat the combustion chamber of each cylinder. An individual glow plug is used for each cylinder. Each glow plug is threaded into the left side of the cylinder head below the cylinder head cover/intake manifold.



*Fig. 1 GLOW PLUG*

### OPERATION

Each glow plug will momentarily draw approximately 25 amps of electrical current during the initial key "ON" cycle. This is on a cold or cool engine. After heating the current draw will drop to approximately 9-12 amps per plug.

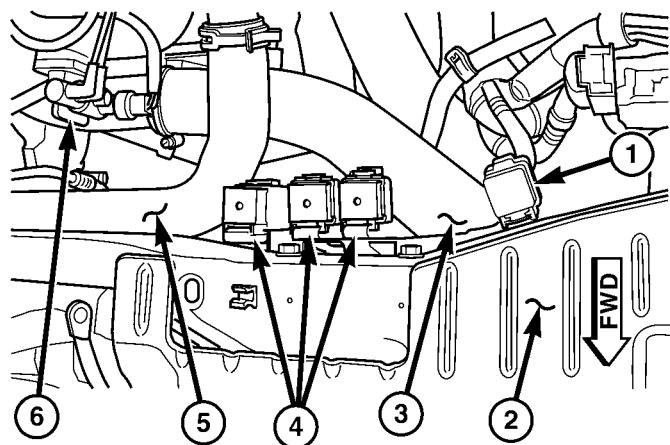
Total momentary current draw for all four glow plugs is approximately 100 amps on a cold engine dropping to a total of approximately 40 amps after the plugs are heated.

Electrical operation of the glow plugs is controlled by two glow plug relays. Each glow plug relay controls two glow plugs. Refer to glow plug relays for more information.

## GLOW PLUG RELAY

### DESCRIPTION

There are two glow plug relays. These relays are located in the Power Distribution Center (PDC) in the engine compartment (Fig. 2).



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*Fig. 2 RELAY LOCATIONS*

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- 1 - GLOW PLUG RELAY
- 2 - RADIATOR SUPPORT
- 3 - CHARGE AIR COOLER OUTLET HOSE
- 4 - COOLING FAN RELAY
- 5 - UPPER RADIATOR HOSE
- 6 - EGR SOLENOID

### OPERATION

When the ignition (key) switch is placed in the ON position, a signal is sent to the ECM relating current engine coolant temperature. This signal is sent from the engine coolant temperature sensor.

After receiving this signal, the ECM will determine if, when and for how long of a period the glow plug relays should be activated. This is done before, during and after the engine is started. Whenever the glow plug relays are activated, it will control the 12 volt 100 amp circuit for the operation of the four glow plugs. Each relay controls two glow plugs.

## GLOW PLUG RELAY (Continued)

The Glow Plug lamp is tied to this circuit. Lamp operation is also controlled by the ECM.

With a cold engine, the glow plug relays and glow plugs may be activated for a maximum time of 200 seconds. Refer to the following Glow Plug Control chart for a temperature/time comparison of the glow plug relay operation.

In this chart, Pre-Heat and Post-Heat times are mentioned. Pre-Heat is the amount of time the glow plug relay control circuit is activated when the ignition (key) is switched ON, without the engine running. Post-Heat is the amount of time the glow plug relay control circuit is activated after the engine is operated. The Glow Plug lamp will not be activated during the post-heat cycle.

Engine Coolant Temperature "Key ON"	Wait-To Start Lamp "ON" (Seconds)	Pre-Heat Cycle (Glow Plugs On Seconds)	Post-Heat Cycle (Seconds)
-30C	20 SEC.	35 SEC.	200 SEC.
-10C	8 SEC.	23 SEC.	180 SEC.
+10C	6 SEC.	21 SEC.	160 SEC.
+30C	5 SEC.	20 SEC.	140 SEC.
+40C	4 SEC.	19 SEC.	70 SEC.
+70C	1 SEC.	16 SEC.	20 SEC.

## CAMSHAFT POSITION SENSOR

## DESCRIPTION

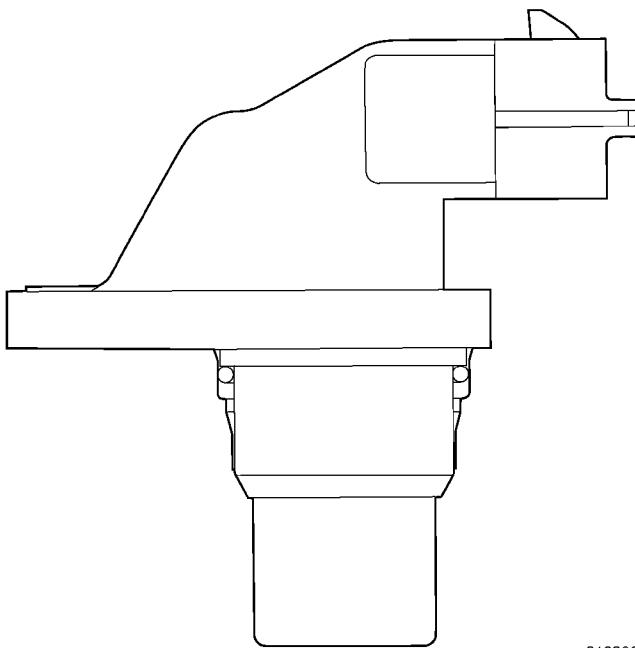
The camshaft position (CMP) sensor is mounted in the top of cylinder head cover/intake manifold at the rear of the engine. The CMP sensor is a hall effect device (Fig. 3).

## OPERATION

The CMP sensor is a hall effect switch. A tooth made of a ferromagnetic material is attached to the camshaft. When this tooth passes the CMP sensor an electronic signal is created. This signal is then sent to the engine control module (ECM). This signal is used by the ECM to determine which cylinder has just entered its compression phase.

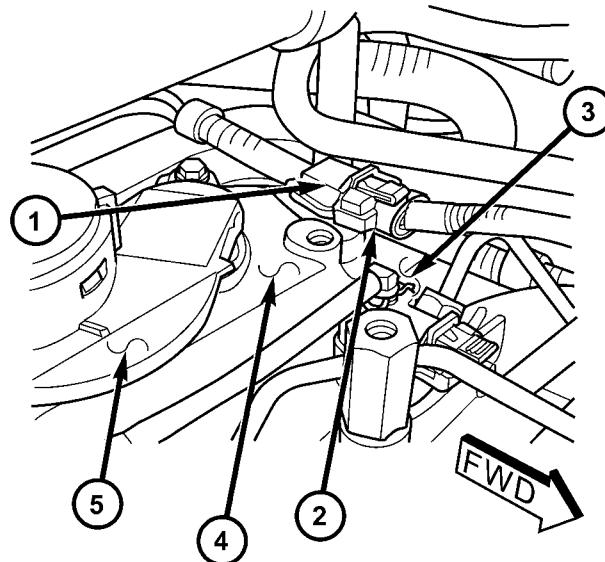
## REMOVAL

- (1) Disconnect negative battery cable.
- (2) Remove engine cover (Refer to 9 - ENGINE COVER - REMOVAL).
- (3) Disconnect camshaft position sensor electrical connector (Fig. 4).



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Fig. 3 CAMSHAFT POSITION SENSOR



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Fig. 4 CAMSHAFT POSITION SENSOR LOCATION

- 1 - CAMSHAFT POSITION SENSOR
- 2 - CAMSHAFT POSITION SENSOR ELECTRICAL SENSOR
- 3 - FUEL INJECTOR
- 4 - CYLINDER HEAD COVER
- 5 - OIL SEPARATOR

- (4) Remove sensor retaining bolt and remove sensor from cylinder head cover.

## CAMSHAFT POSITION SENSOR (Continued)

**INSTALLATION**

(1) Lubricate O-ring and install sensor in cylinder head cover. Torque retaining bolt to 5.4 N·m.

(2) Connect camshaft position sensor electrical connector.

(3) Install engine cover (Refer to 9 - ENGINE COVER - INSTALLATION).

(4) Connect negative battery cable.

