2008 Accessories & Equipment

Displays & Gages - Ascender, Envoy & Trailblazer

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	Specification	
	Metric	English
Instrument Panel Cluster Assembly Screws	2 N.m	18 lb in

SCHEMATIC & ROUTING DIAGRAMS

INSTRUMENT CLUSTER SCHEMATICS

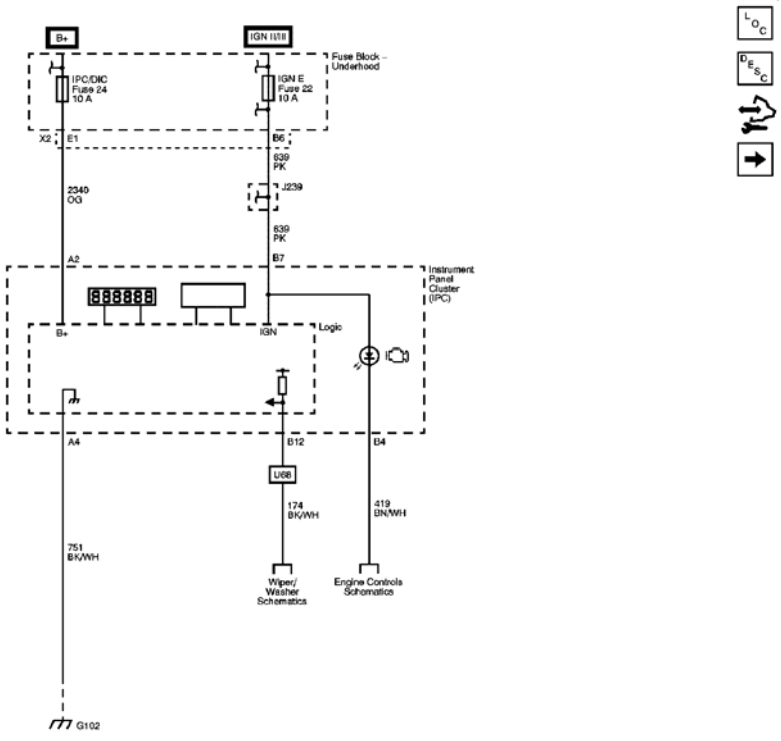


Fig. 1: Power, Ground, Serial Data & MIL Schematic
Courtesy of GENERAL MOTORS CORP.

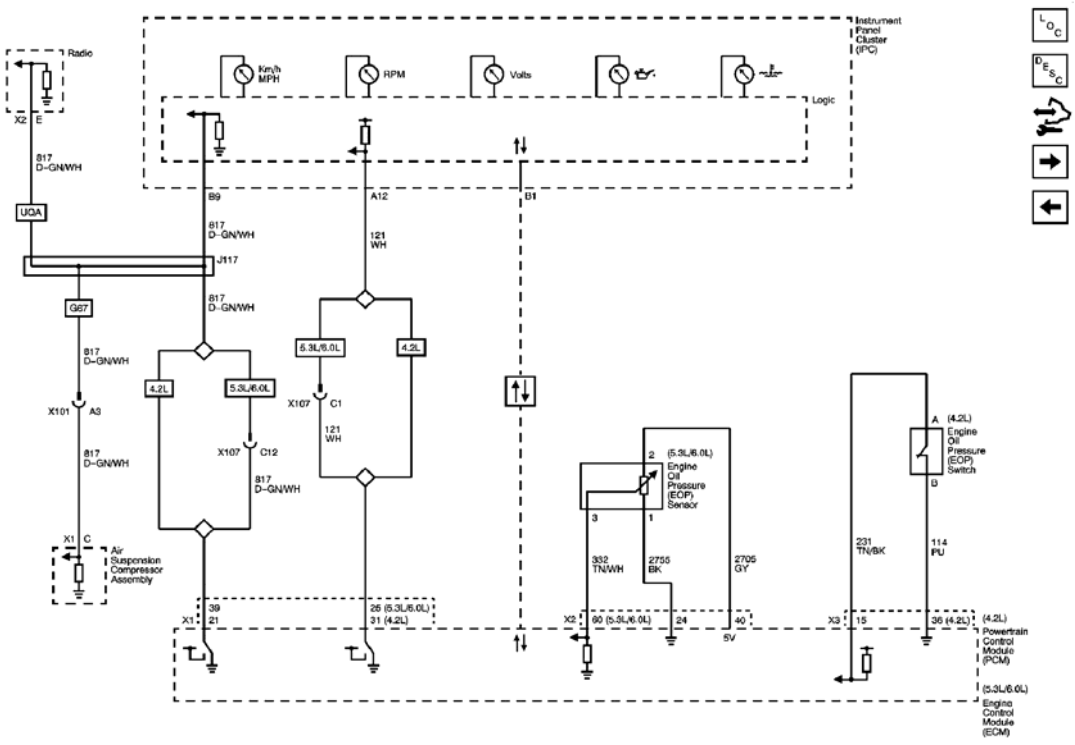


Fig. 2: Gages Schematic
Courtesy of GENERAL MOTORS CORP.

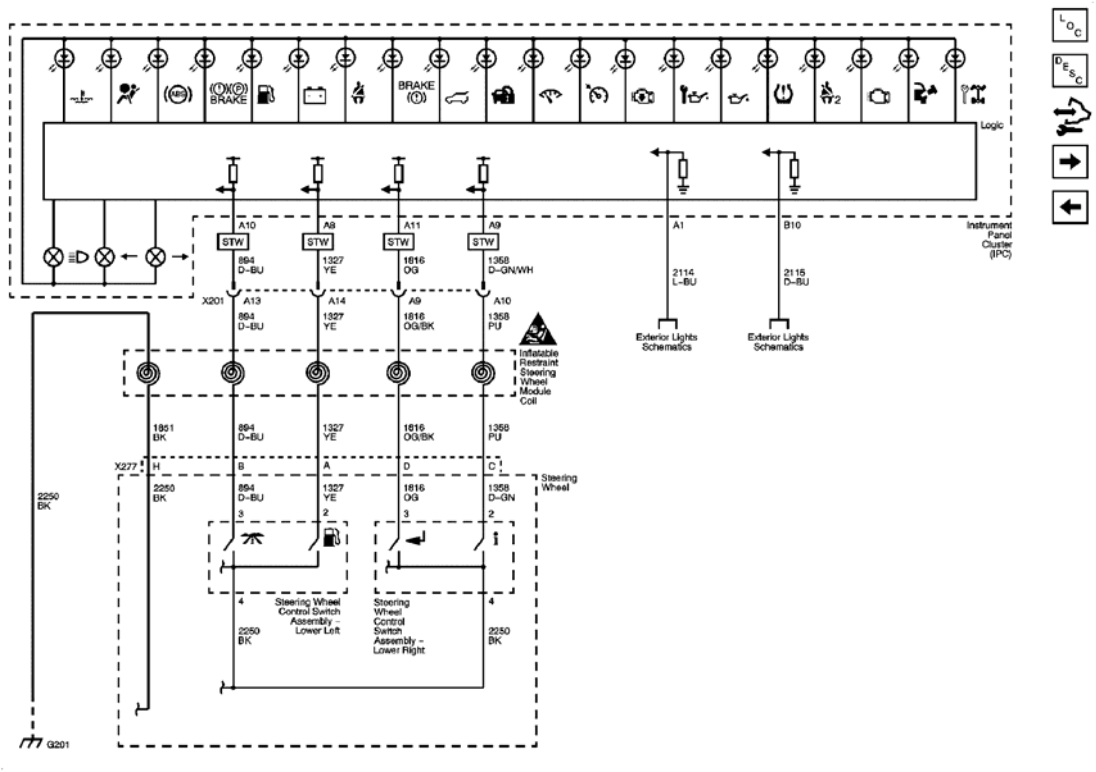


Fig. 3: Indicators & DIC Controls Schematic
Courtesy of GENERAL MOTORS CORP.

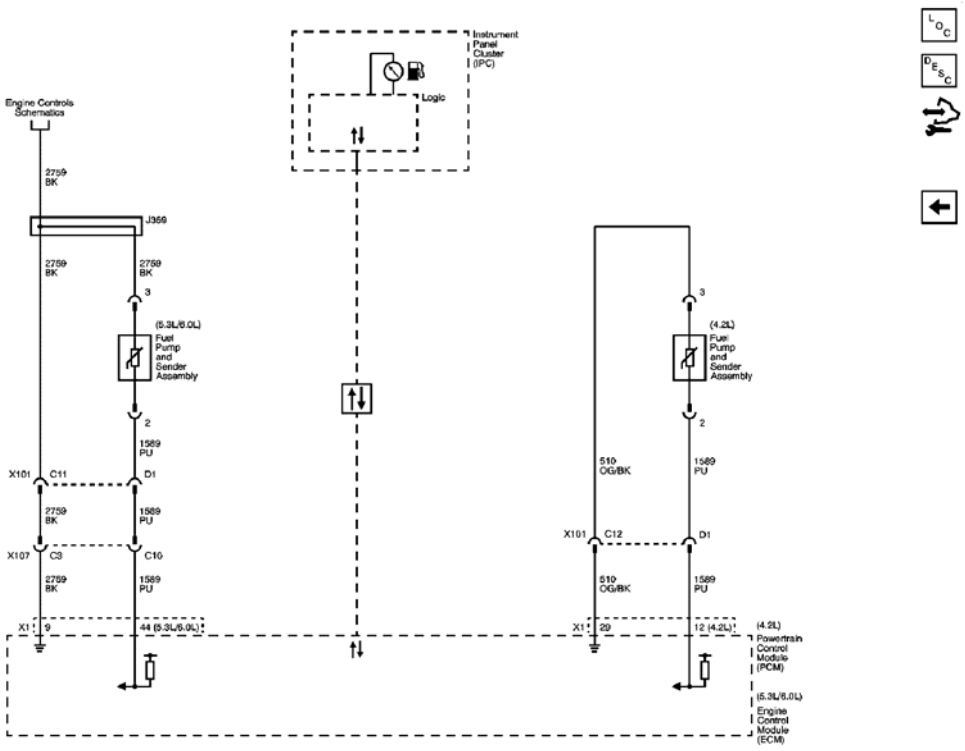


Fig. 4: Fuel Gage Schematic
Courtesy of GENERAL MOTORS CORP.

DRIVER INFORMATION SYSTEM SCHEMATICS

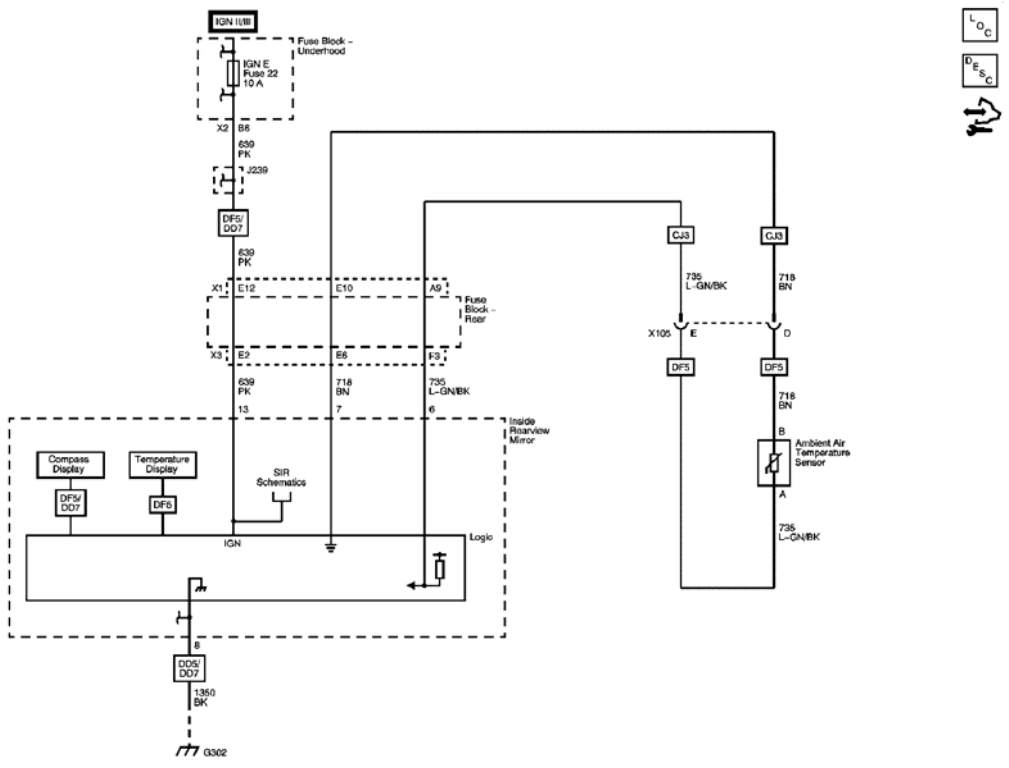


Fig. 5: Driver Information System Schematic
Courtesy of GENERAL MOTORS CORP.

AUDIBLE WARNINGS SCHEMATICS

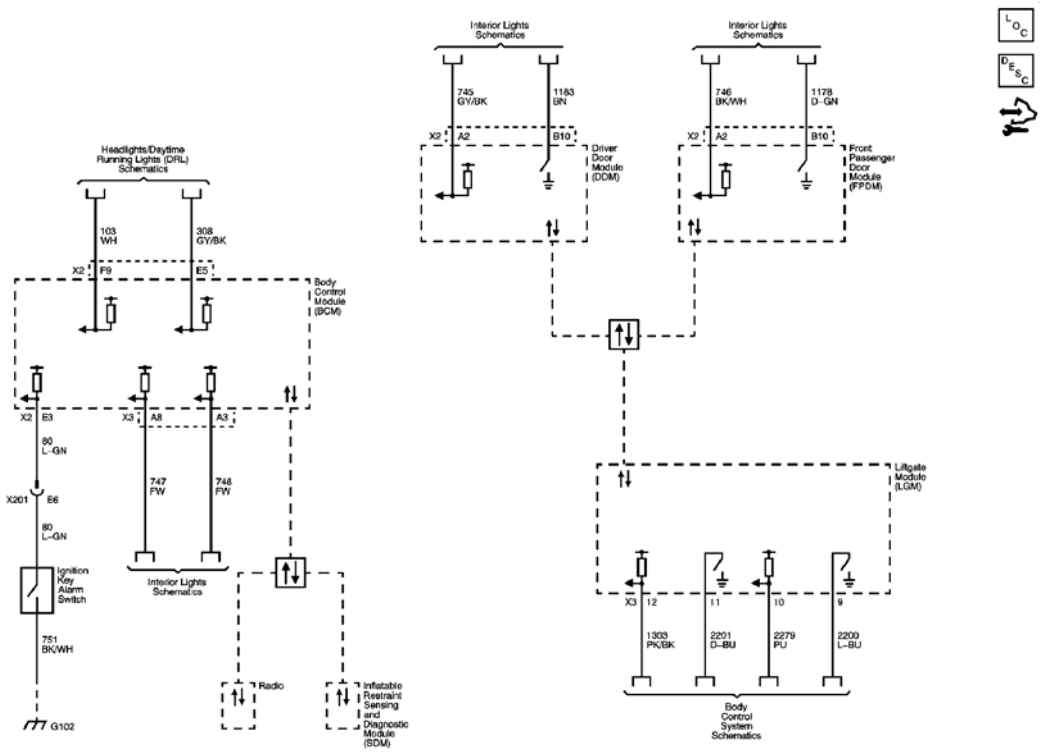


Fig. 6: Audible Warnings Schematic
Courtesy of GENERAL MOTORS CORP.

DIAGNOSTIC INFORMATION & PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
DTC B0540	B0540: Speedometer Circuit
DTC B0560	B0560: Tachometer Circuit
DTC B1372	B1372: Device Ignition 1 (ON and START) Circuit Low
DTC B2961	B2961: Key In Ignition Circuit
DTC P0461	P0461: Fuel Level Sensor Performance
DTC P0462	P0462: Fuel Level Sensor Circuit Low Voltage
DTC P0463	P0463: Fuel Level Sensor Circuit High Voltage
DTC P0464	P0464: Fuel Level Sensor Circuit Intermittent
DTC P0520	P0520: Engine Oil Pressure (EOP) Sensor Circuit
DTC P0521	P0521: Engine Oil Pressure (EOP) Sensor Performance
DTC P0522	P0522: Engine Oil Pressure (EOP) Sensor Circuit Low Voltage
DTC P0523	P0523: Engine Oil Pressure (EOP) Sensor Circuit High Voltage

DTC P0608	P0608: Vehicle Speed Output Circuit
DTC P0654	P0654: Engine Speed Output Circuit

DIAGNOSTIC STARTING POINT - DISPLAYS & GAGES

Begin the displays and gages system diagnosis with **Diagnostic System Check - Vehicle** or the audible warning system diagnosis with **Diagnostic System Check - Vehicle** . The Diagnostic System Check will provide the following information:

- The identification of the control modules which command the system
- The ability of the control modules to communicate through the serial data circuit
- The identification of any stored diagnostic trouble codes (DTCs) and their status

The use of the Diagnostic System Check will identify the correct procedure for diagnosing the system and where the procedure is located.

DTC B0540

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using the diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC B0540

Speedometer Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Vehicle Speed Signal Circuit	B0540	B0540	B0540	-

Circuit Description

The instrument panel cluster (IPC) receives the vehicle speed information from the engine control module (ECM)/powertrain control module (PCM) through the vehicle speed signal circuit. The ECM/PCM converts the data from the vehicle speed sensor to a 4000 pulses/mile signal. The ECM/PCM also sends a class 2 message to the IPC indicating the vehicle speed. If the IPC determines there is a loss of the vehicle speed signal from the ECM/PCM due to a vehicle speed signal circuit malfunction, a DTC sets.

Conditions for Running the DTC

- The vehicle speed is more than 10 km/h (6 mph).
- The ignition voltage is between 9-18 volts.

Conditions for Setting the DTC

- The IPC detects that the vehicle speed signal circuit does not match the vehicle speed from the class 2 serial data circuit.
- The condition above must be present for a minimum of 5 seconds.

Action Taken When the DTC Sets

- The IPC stores a DTC B0540 in memory.
- The speedometer defaults to 0 km/h (0 mph).
- No driver warning message will be displayed for this DTC.

Conditions for Clearing the DTC

- The history DTC clears after 100 malfunction-free warm-up cycles.
- The DTC becomes history when the conditions for setting the DTC are no longer present.
- The IPC receives the clear code command from the scan tool.

Reference Information

Schematic Reference

- **Instrument Cluster Schematics**
- **Engine Controls Schematics** for the 4.2L engine
- Engine Controls Schematics for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engines

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector X1 at the ECM/PCM. Install a signal generator and instrument panel tester between the following vehicle speed signal circuit and ground:
   - Terminal 21 (4.2L)
   - Terminal 39 (5.3L/6.0L)
2. Ignition ON, set the signal generator to generate a speedometer signal. Verify that the vehicle speedometer indicates a reading.
   - If no speedometer reading is present, test the signal circuit for an open/high resistance, a short to voltage, or a short to ground. If the circuit tests normal, replace the IPC.
3. If all circuits test normal, test or replace the ECM/PCM.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for the ECM/PCM and IPC replacement, setup, and programming

DTC B0560

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using the diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC B0560

Tachometer Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Engine Speed Signal Circuit	B0560	B0560	B0560	-

Circuit Description

The instrument panel cluster (IPC) receives the engine speed information from the engine control module (ECM)/powertrain control module (PCM) through the engine speed signal circuit. The ECM/PCM converts the data from the engine speed sensor to a 2 pulses/engine revolution signal. The ECM/PCM also sends a class 2 message to the IPC indicating the engine speed. If the IPC determines there is a loss of the engine speed signal from the ECM/PCM due to a engine speed signal circuit malfunction, a DTC sets.

Conditions for Running the DTC

- The engine speed is greater than 800 RPM.
- The ignition voltage is greater than 9 volts, but less than 18 volts.

Conditions for Setting the DTC

- The IPC detects that the engine speed signal circuit does not match the engine speed from the class 2 serial data circuit.
- The above condition is present for at least 5 seconds.

Action Taken When the DTC Sets

The IPC stores the DTC in memory.

Conditions for Clearing the DTC

- A last test failed (current DTC) clears when the diagnostic runs and does not fail.
- A history DTC clears after 100 consecutive malfunction-free warm-up cycles.
- The IPC receives the clear code command from the scan tool.

Reference Information

Schematic Reference

- **Instrument Cluster Schematics**
- **Engine Controls Schematics** for the 4.2L engine
- Engine Controls Schematics for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engines

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector X1 at the ECM/PCM. Install a signal generator and instrument panel tester between the following engine speed signal circuit and ground:
   - Terminal 31 (4.2L)
   - Terminal 25 (5.3L/6.0L)
2. Ignition ON, set the signal generator to generate a tachometer signal. Verify that the tachometer indicates a RPM reading.
   - If no RPM reading is present, test the signal circuit for an open/high resistance, a short to voltage, or a short to ground. If the circuit tests normal, replace the IPC.
3. If all circuits test normal, test or replace the ECM/PCM.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for the ECM/PCM and IPC replacement, setup, and programming

DTC B1372

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using the diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC B1372

Device Ignition 1 (ON and START) Circuit Low

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition 1 Voltage Circuit	B1372	B1372	B1372	-

Circuit Description

When the ignition switch is in the UNLOCK position, certain class 2 messages do not transmit. The instrument cluster suspends the operation of the indicators and the gages that are dependent on these messages until the ignition switch is no longer in the UNLOCK position.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

There is a difference of at least 75 percent between the ignition 1 voltage circuit and the instrument panel cluster (IPC) battery positive voltage circuit for 3 seconds.

Action Taken When the DTC Sets

- The odometer and the PRNDL displays do not illuminate.
- The fuel gage and the engine coolant temperature gage default to 0.
- The scan tool does not communicate with the instrument cluster.

Conditions for Clearing the DTC

- The DTC becomes history when the conditions for setting the DTC are no longer present.
- The history DTC clears after 100 malfunction-free warm-up cycles.
- The IPC receives the clear code command from the scan tool.

Diagnostic Aids

- When the instrument cluster detects low voltage at the ignition 1 voltage circuit, the instrument cluster will not communicate with the scan tool, and the odometer and PRNDL displays will not be illuminated. The season odometer will display if the trip reset switch is pressed, and the instrument cluster will communicate with the scan tool until the trip reset switch is released.
- An intermittent condition is likely to be caused by an open condition in the ignition 1 voltage circuit.
- DTC B1372 can only be read by the scan tool as a history code once the fault is removed. Refer to **Scan Tool Does Not Communicate with Class 2 Device** for diagnosis of a loss of communication with the instrument cluster.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the IPC.
2. Ignition ON, verify that a test lamp illuminates between the ignition 1 voltage circuit terminal B7 and ground.
    - If the test lamp does not illuminate, repair the ignition 1 voltage circuit for an open/high resistance. If the ignition 1 voltage circuit fuse is open, also test the voltage circuit for a short to ground.
3. If all circuits test normal, test or replace the IPC.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for IPC replacement, setup, and programming

DTC B2961

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using the diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC B2961

Key In Ignition Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Key In Ignition Alarm Switch Signal Circuit	-	B2961	-	-

Circuit Description

The body control module (BCM) monitors the ignition key alarm switch. When the key is in the ignition, the ignition key alarm switch is closed and the signal circuit is low. When the key is not in the ignition, the ignition key alarm switch is open and the signal circuit is high.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

- The ignition 1 input is active and the key in ignition switch signal circuit is inactive (signal circuit is high).
- The above conditions must be present for more than 5 seconds.

Action Taken When the DTC Sets

The BCM stores DTC B2961 in memory.

Conditions for Clearing the DTC

- The DTC becomes history when the fault is no longer present.
- A history DTC will clear after 100 consecutive ignition cycles if the condition for the malfunction is no longer present.
- The BCM receives the clear code command from the scan tool.

Reference Information

Schematic Reference

- **Audible Warnings Schematics**
- **Body Control System Schematics**

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector X2 at the BCM.

2. Ignition ON, engine OFF, install a 3-amp fused jumper between the signal circuit E3 at the BCM and ground. Verify the scan tool Key In Ignition parameter displays Yes.
    - If not Yes, replace the BCM.
3. Ignition ON, engine OFF, test for less than 1 ohm of resistance between the signal circuit E3 and ground at the harness.
    - If greater than 1 ohm test the signal circuit for an open/high resistance.
4. Ignition ON, engine OFF, verify the ignition 1 parameter displays Off.
    - If not Off, test the ignition 1 voltage circuit connector X3 terminal A19 at the BCM for a short to voltage.
5. If all circuits test normal, test or replace the ignition switch.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Ignition and Start Switch Replacement**
- **Control Module References** for BCM replacement, setup, and programming

DTC P0461

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P0461

Fuel Level Sensor Performance

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Fuel Level Sensor Reference Voltage Circuit	P0462	-	-	P0461
Fuel Level Sensor Signal Circuit	P0462	P0463, P0464, 1	P0463	P0461
Fuel Level Sensor Low Reference Circuit	-	P0463, P0464, 1	P0463	P0461
1. Fuel Gage Inaccurate or Inoperative				

Circuit Description

The engine control module (ECM)/powertrain control module (PCM) monitors the signal circuit of the fuel level sender in order to determine fuel level. The sender consists of a variable resistor that changes resistance based on the fuel level in the tank. The ECM/PCM monitors the voltage across the sender resistance in order to determine the fuel level. The ECM/PCM uses the signal circuit of the fuel level sender in order to calculate the total remaining fuel, in percent. The ECM/PCM sends the fuel level percent via the serial data circuit to the instrument cluster in order to control the fuel gage. The fuel level information is also used for misfire and evaporative emission (EVAP) diagnostics.

This diagnostic tests for a stuck fuel level sender signal. The ECM/PCM sets this DTC if the fuel level sender signal appears to be stuck based on a lack of signal variation expected during normal operation.

Conditions for Running the DTC

- The ignition is ON.
- The ECM/PCM has confirmed that the fuel tank is between 15-85 percent full.

Conditions for Setting the DTC

The ECM/PCM does not detect a change in fuel level of at least 3.0L (0.79 gal) over a distance of 320 km (200 mi).

Action Taken When the DTC Sets

- The fuel gage defaults to empty.
- The low fuel indicator illuminates.
- The ECM/PCM records the operating conditions at the time the diagnostic fails. The ECM/PCM stores the failure information in the Failure Records on the scan tool.

Conditions for Clearing the DTC

- The DTC becomes history when the conditions for setting the DTC are no longer present.
- The history DTC clears after 40 malfunction-free warm-up cycles.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, remove the fuel level sender and verify that there is no obstruction interfering with the fuel level sender.
    - If interference is present, remove the obstruction.
2. If no interference is present, replace the fuel level sender.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Fuel Level Sensor Replacement** for the 4.2L engine
- Fuel Level Sensor Replacement for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engines
- **Control Module References** for the ECM/PCM replacement, setup, and programming

DTC P0462

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P0462

Fuel Level Sensor Circuit Low Voltage

Diagnostic Fault Information

	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance

Circuit	Ground	Resistance	Voltage	Performance
Fuel Level Sensor Reference Voltage Circuit	P0462	-	-	P0461
Fuel Level Sensor Signal Circuit	P0462	P0463, P0464, 1	P0463	P0461
Fuel Level Sensor Low Reference Circuit	-	P0463, P0464, 1	P0463	P0461
1. Fuel Gage Inaccurate or Inoperative				

Circuit Description

The engine control module (ECM)/powertrain control module (PCM) monitors the signal circuit of the fuel level sender in order to determine fuel level. The sender consists of a variable resistor that changes resistance based on the fuel level in the tank. The PCM monitors the voltage across the sender resistance in order to determine the fuel level. The ECM/PCM uses the signal circuit of the fuel level sender in order to calculate the total remaining fuel, in percent. The ECM/PCM sends the fuel level percent via the serial data circuit to the instrument cluster in order to control the fuel gage. The fuel level information is also used for misfire and evaporative emission (EVAP) diagnostics.

Conditions for Running the DTC

The ignition is ON, with the engine ON.

Conditions for Setting the DTC

- The fuel level signal is less than 0.39 volt.
- The above condition is present for greater than 20 seconds.

Action Taken When the DTC Sets

- The fuel gage defaults to empty.
- The low fuel indicator illuminates.
- The ECM/PCM records the operating conditions at the time the diagnostic fails. The ECM/PCM displays the failure information in the Failure Records on the scan tool.

Conditions for Clearing the DTC

- The DTC becomes history when the conditions for setting the DTC are no longer present.
- The history DTC clears after 40 malfunction-free warm-up cycles.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

Ignition ON, verify the scan tool Fuel Tank Level Remaining or Fuel Level Sensor parameter is between 4-98 percent.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the fuel level sensor.
2. Ignition ON, verify that the scan tool Fuel Tank Level Remaining or Fuel Level Sensor parameter is less than 4 percent.
    - If greater than 4 percent, test the signal circuit for a short to ground. If the circuit tests normal, replace the ECM/PCM.
3. If all circuits test normal, test or replace the fuel level sensor.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Fuel Level Sensor Replacement** for the 4.2L engine
- Fuel Level Sensor Replacement for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engines
- **Control Module References** for the ECM/PCM replacement, setup, and programming

DTC P0463

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P0463

Fuel Level Sensor Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Fuel Level Sensor Reference Voltage Circuit	P0462	-	-	P0461
Fuel Level Sensor Signal Circuit	P0462	P0463, P0464, 1	P0463	P0461
Fuel Level Sensor Low Reference Circuit	-	P0463, P0464, 1	P0463	P0461
1. Fuel Gage Inaccurate or Inoperative				

Circuit Description

The engine control module (ECM)/powertrain control module (PCM) monitors the signal circuit of the fuel level sender in order to determine fuel level. The sender consists of a variable resistor that changes resistance based on the fuel level in the tank. The PCM monitors the voltage across the sender resistance in order to determine the fuel level. The ECM/PCM uses the signal circuit of the fuel level sender in order to calculate the total remaining fuel, in percent. The ECM/PCM sends the fuel level percent via the serial data circuit to the instrument cluster in order to control the fuel gage. The fuel level information is also used for misfire and evaporative emission (EVAP) diagnostics.

Conditions for Running the DTC

The ignition is ON, with the engine ON.

Conditions for Setting the DTC

- The fuel level signal is greater than 5 volts.
- The above condition is present for greater than 20 seconds.

Action Taken When the DTC Sets

- The fuel gage defaults to empty.
- The low fuel indicator illuminates.

- The ECM/PCM records the operating conditions at the time the diagnostic fails. The ECM/PCM displays the failure information in the Failure Records on the scan tool.

Conditions for Clearing the DTC

- The DTC becomes history when the conditions for setting the DTC are no longer present.
- The history DTC clears after 40 malfunction-free warm-up cycles.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

Ignition ON, verify the scan tool Fuel Tank Level Remaining or Fuel Level Sensor parameter is between 4-98 percent.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the fuel level sensor.
2. Ignition OFF, test for less than 1 ohm of resistance between the low reference circuit terminal 3 and ground.
    - If greater than 1 ohm, test the low reference circuit for a short to voltage or an open/high resistance. If the circuit tests normal, replace the ECM/PCM.

3. Ignition ON, install a 3-amp fused jumper between the signal circuit terminal 2 and the low reference circuit terminal 3. Verify the scan tool Fuel Tank Level Remaining or Fuel Level Sensor parameter is greater than 98 percent.
    - If less than 98 percent, test the signal circuit for a short to voltage or an open/high resistance. If the circuit tests normal, replace the ECM/PCM.
4. If all circuits test normal, test or replace the fuel level sensor.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Fuel Level Sensor Replacement** for the 4.2L engine
- Fuel Level Sensor Replacement for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engines
- **Control Module References** for the ECM/PCM replacement, setup, and programming

DTC P0464

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P0464

Fuel Level Sensor Circuit Intermittent

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Fuel Level Sensor Reference Voltage Circuit	P0462	-	-	P0461
Fuel Level Sensor Signal Circuit	P0462	P0463, P0464, 1	P0463	P0461
Fuel Level Sensor Low Reference Circuit	-	P0463, P0464, 1	P0463	P0461
1. Fuel Gage Inaccurate or Inoperative				

Circuit Description

The engine control module (ECM)/powertrain control module (PCM) monitors the signal circuit of the fuel level sender in order to determine fuel level. The sender consists of a variable resistor that changes resistance

based on the fuel level in the tank. The ECM/PCM monitors the voltage across the sender resistance in order to determine the fuel level. The ECM/PCM uses the signal circuit of the fuel level sender in order to calculate the total remaining fuel, in percent. The ECM/PCM sends the fuel level percent via the serial data circuit to the instrument cluster in order to control the fuel gage. The fuel level information is also used for misfire and evaporative emission (EVAP) diagnostics.

This diagnostic tests for an intermittent fuel level sender signal. If a change in fuel level is detected DTC P0442 is aborted due to a refueling event. A refueling event test is executed to confirm that a refueling event has occurred. If refueling is confirmed, the test is considered passing. Otherwise, the DTC will set indicating an intermittent signal problem.

Conditions for Running the DTC

- The ignition is OFF.
- DTC P0442 is running.

Conditions for Setting the DTC

- The fuel level change is greater than 10 percent.
- The above condition is present for greater than 30 seconds.

Action Taken When the DTC Sets

- DTC P0442 is aborted.
- The ECM/PCM records the operating conditions at the time the diagnostic fails. The ECM/PCM displays the failure information in the Failure Records on the scan tool.

Conditions for Clearing the DTC

- The DTC becomes history when the conditions for setting the DTC are no longer present.
- The history DTC clears after 40 malfunction-free warm-up cycles.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the fuel level sensor. Install a signal generator and instrument panel tester between the signal circuit terminal 2 and the low reference circuit terminal 3.
2. Ignition ON, vary the resistance on the signal generator from 40-250 ohms. Verify that the scan tool Fuel Tank Level Remaining or Fuel Level Sensor parameter displays the correct fuel level percent.
    - If the fuel level percent is incorrect, test the signal circuit and the low reference circuit for an open/high resistance. If the circuits test normal, replace the ECM/PCM.
3. Ignition ON, vary the resistance on the signal generator from 40-250 ohms and monitor the fuel gage.
    - If the gage is incorrect, replace the IPC.
4. If all circuits test normal, test or replace the fuel level sensor.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Fuel Level Sensor Replacement** for the 4.2L engine
- Fuel Level Sensor Replacement for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engines
- **Control Module References** for the ECM/PCM replacement, setup, and programming

DTC P0520

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using the diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P0520

Engine Oil Pressure (EOP) Sensor Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Oil Pressure Switch Signal	1	P0520	-	-
Low Reference Oil Pressure Switch Signal	-	P0520	-	-
1. Engine Oil Pressure Indicator Always On				

Circuit Description

With low oil pressure, the engine oil pressure (EOP) switch closes, and the signal circuit is low. With oil pressure above 4.5 psi, the EOP switch opens, and the signal circuit is high. The powertrain control module (PCM) monitors the oil pressure switch signal circuit, and sends a class 2 message to the instrument panel cluster (IPC), indicating the switch status.

Conditions for Running the DTC

- DTC P0117 is not set.
- DTC P0118 is not set.
- The ignition is ON, with the engine OFF.
- Engine temperature at the last shutdown was at least 80°C (176°F).

Conditions for Setting the DTC

- The PCM detects that the oil pressure switch signal circuit is high.
- The above condition is present for greater than 10 seconds.

Action Taken When the DTC Sets

The PCM stores the conditions that are present when the DTC sets. This information is stored as Failure Records data only. This information is not stored as Freeze Frame data.

Conditions for Clearing the DTC

- The DTC becomes history when the conditions for setting the DTC are no longer present.
- The history DTC clears after 40 malfunction-free warm-up cycles.
- The PCM receives the clear code command from the scan tool.

Reference Information

Schematic Reference

- **Instrument Cluster Schematics**
- **Engine Controls Schematics**

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the EOP switch.
2. Ignition OFF, test for less than 1 ohm of resistance between the low reference circuit terminal B and ground.
    - If greater than 1 ohm, test the low reference circuit for an open/high resistance. If the circuit tests normal, replace the PCM.
3. Ignition ON, install a 3-amp fused jumper wire between the signal circuit terminal A and the low reference circuit terminal B. Verify the scan tool Engine Oil Pressure Switch parameter is Low.
    - If not Low, test the signal circuit of the EOP switch for an open/high resistance. If the circuit tests normal replace the PCM.
4. If all circuits test normal, test or replace the EOP switch.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Engine Oil Pressure Sensor and/or Switch Replacement**
- **Control Module References** for the PCM replacement, setup, and programming

DTC P0521

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P0521

Engine Oil Pressure (EOP) Sensor Performance

Circuit Description

The engine oil pressure (EOP) sensor changes resistance based on engine oil pressure. The engine control module (ECM) monitors the signal circuit of the EOP sensor. When the oil pressure is high, the sensor resistance is high, and the ECM senses a high signal voltage. When the oil pressure is low, the sensor resistance is low, and the ECM senses a low signal voltage. The ECM sends the engine oil pressure information to the instrument panel cluster (IPC) via the class 2 serial data circuit.

Conditions for Running the DTC

- The engine is running with engine speed between 1,000 and 3500 RPM.
- Oil temperature is less than 140°C (284°F).

Conditions for Setting the DTC

The ECM does not detect a change in the engine oil pressure of at least 34.5 kPa (5 psi) over a predetermined variance of the engine speed.

Action Taken When the DTC Sets

- The ECM records the operating conditions at the time the diagnostic test fails. The ECM displays this information in the Failure Records on the scan tool.
- The IPC illuminates the EOP indicator.

Conditions for Clearing the DTC

- The DTC becomes history when the conditions for setting the DTC are no longer present.
- The history DTC clears after 40 malfunction-free warm-up cycles.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

Engine idling, verify the scan tool Engine Oil Pressure Sensor indicates a range of 0.7-2.8 volts.

Circuit/System Testing

Engine idling, verify the scan tool Engine Oil Pressure Sensor parameter is between 0.7-2.8 volts.

- If not in the specified range, replace the EOP sensor.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Engine Oil Pressure Sensor and/or Switch Replacement

DTC P0522

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P0522

Engine Oil Pressure (EOP) Sensor Circuit Low Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Engine Oil Pressure 5-Volt Reference				

Circuit	P0522	P0522	P0523	P0521
Engine Oil Pressure Sensor Signal Circuit	P0522	P0523	P0523	P0521
Low Reference	-	P0523	-	P0521

Circuit Description

The engine oil pressure (EOP) sensor changes resistance based on engine oil pressure. The engine control module (ECM) monitors the signal circuit of the EOP sensor. When the oil pressure is high, the sensor resistance is high, and the ECM senses a high signal voltage. When the oil pressure is low, the sensor resistance is low, and the ECM senses a low signal voltage. The ECM sends the engine oil pressure information to the instrument panel cluster (IPC) via the class 2 serial data circuit.

Conditions for Running the DTC

- The engine is running.
- DTC P0641 is not present.

Conditions for Setting the DTC

- The ECM detects that the EOP sensor signal circuit is less than 0.4 volt.
- The above condition is present for greater than 9 seconds.

Action Taken When the DTC Sets

- The ECM records the operating conditions at the time the diagnostic test fails. The ECM displays this information in the Failure Records on the scan tool.
- The IPC illuminates the EOP indicator.

Conditions for Clearing the DTC

- The DTC becomes history when the conditions for setting the DTC are no longer present.
- The history DTC clears after 40 malfunction-free warm-up cycles.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the EOP sensor.
2. Ignition ON, test for 4.8-5.2 volts between the 5-volt reference circuit terminal 2 and ground.
    - If less than 4.8 volts, test the 5-volt reference circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the ECM.
    - If greater than 5.2 volts, test the 5-volt reference circuit for a short to voltage. If the circuit tests normal, replace the ECM.
3. Install a 3-amp fused jumper wire between the signal circuit terminal 3 and the 5-volt reference circuit terminal 2. Verify the scan tool Engine Oil Pressure Sensor parameter is greater than 4.6 volts.
    - If less than specified, test the signal circuit for a short to ground. If the circuit tests normal, replace the ECM.
4. If all circuits test normal, test or replace the EOP sensor.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- Engine Oil Pressure Sensor and/or Switch Replacement
- **Control Module References** for the ECM replacement, setup, and programming

DTC P0523

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P0523

Engine Oil Pressure (EOP) Sensor Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Engine Oil Pressure 5-Volt Reference Circuit	P0522	P0522	P0523	P0521
Engine Oil Pressure Sensor Signal Circuit	P0522	P0523	P0523	P0521
Low Reference	-	P0523	-	P0521

Circuit Description

The engine oil pressure (EOP) sensor changes resistance based on engine oil pressure. The engine control module (ECM) monitors the signal circuit of the EOP sensor. When the oil pressure is high, the sensor resistance is high, and the ECM senses a high signal voltage. When the oil pressure is low, the sensor resistance is low, and the ECM senses a low signal voltage. The ECM sends the engine oil pressure information to the instrument panel cluster (IPC) via the class 2 serial data circuit.

Conditions for Running the DTC

- The engine is running.
- DTC P1635 is not present.

Conditions for Setting the DTC

- The ECM detects that the EOP sensor signal circuit is greater than 4.6 volts.
- The above condition is present for greater than 9 seconds.

Action Taken When the DTC Sets

The ECM records the operating conditions at the time that the diagnostic test fails. The ECM displays this information in the Failure Records on the scan tool.

Conditions for Clearing the DTC

- The DTC becomes history when the conditions for setting the DTC are no longer present.
- The history DTC is cleared after 40 malfunction-free warm-up cycles.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the EOP sensor.
2. Ignition OFF, test for less than 1 ohm of resistance between the low reference circuit terminal 1 and ground.
    - If greater than specified, test the low reference circuit for a short to voltage or an open/high resistance. If the circuit tests normal, replace the ECM.
3. Ignition ON, test for 4.8-5.2 volts between the 5-volt reference circuit terminal 2 and ground.
    - If less than 4.8 volts, test the 5-volt reference circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the ECM.
    - If greater than 5.2 volts, test the 5-volt reference circuit for a short to voltage. If the circuit tests normal, replace the ECM.
4. Install a 3-amp fused jumper wire between the signal circuit terminal 3 and the low reference circuit terminal 1. Verify the scan tool Engine Oil Pressure Sensor parameter is less than 0.4 volt.
    - If greater than specified, test the signal circuit for a short to voltage or an open/high resistance. If the circuit tests normal, replace the ECM.
5. If all circuits test normal, test or replace the EOP sensor.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- Engine Oil Pressure Sensor and/or Switch Replacement

- **Control Module References** for the ECM replacement, setup, and programming

DTC P0608

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using the diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P0608

Vehicle Speed Output Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Vehicle Speed Signal Circuit	P0608	P0608	P0608	-

Circuit Description

The engine control module (ECM)/powertrain control module (PCM) creates the vehicle speed output signal by pulsing the circuit to ground. The ECM/PCM monitors the voltage on the vehicle speed output circuit. If the ECM/PCM determines that the voltage is out of the normal operating range, a DTC sets.

Conditions for Running the DTC

- The engine speed is more than 400 RPM.
- The ignition voltage is between 6-18 volts.

Conditions for Setting the DTC

- The ECM/PCM detects that the commanded state of the driver and the actual state of the signal circuit do not match.
- The above condition must be present for a minimum of 5 seconds.

Action Taken When the DTC Sets

The ECM/PCM records the operating conditions at the time the diagnostic fails. The ECM/PCM displays the failure information in the Failure Records on the scan tool.

Conditions for Clearing the MIL/DTC

- The history DTC clears after 40 malfunction-free warm-up cycles.
- The DTC becomes history when the conditions for setting the DTC are no longer present.
- The ECM/PCM receives the clear code command from the scan tool.

Reference Information

Schematic Reference

- **Instrument Cluster Schematics**
- **Engine Controls Schematics** for the 4.2L engine
- Engine Controls Schematics for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engines

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector X1 at the ECM/PCM. Install a signal generator and instrument panel tester between the following vehicle speed signal circuit and ground:
    - Terminal 21 (4.2L)
    - Terminal 39 (5.3L/6.0L)
2. Ignition ON, set the signal generator to generate a speedometer signal. Verify that the vehicle speedometer indicates a reading.
    - If no speedometer reading is present, test the signal circuit for an open/high resistance, a short to voltage, or a short to ground. If the circuit tests normal, replace the instrument panel cluster (IPC).
3. If all circuits test normal, test or replace the ECM/PCM.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for the ECM/PCM and IPC replacement, setup, and programming

DTC P0654

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using the diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P0654

Engine Speed Output Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Engine Speed Signal Circuit	P0654	P0654	P0654	-

Circuit Description

The powertrain control module (PCM) creates the engine speed signal by pulsing the circuit to ground. The engine control module (ECM)/PCM monitors the voltage on the engine speed signal circuit. If the ECM/PCM determines that the voltage is not within the normal operating range, the ECM/PCM sets a DTC.

Conditions for Running the DTC

- The engine speed is greater than 400 RPM.
- The ignition voltage is greater than 6 volts, but less than 18 volts.

Conditions for Setting the DTC

- The ECM/PCM detects that the commanded state of the driver and the actual state of the signal circuit do not match.
- The above condition exists for a minimum of 5 seconds.

Action Taken When the DTC Sets

- The ECM/PCM stores the DTC information in memory when the diagnostic test runs and fails.
- The malfunction indicator lamp (MIL) will not illuminate.
- The ECM/PCM records the operating conditions at the time when the diagnostic test fails. The ECM/PCM stores this information in the Failure Records.

Conditions for Clearing the MIL/DTC

- The DTC becomes history when the conditions for setting the DTC are no longer present.
- A history DTC is cleared after 40 consecutive malfunction-free warm-up cycles.
- The ECM/PCM receives the clear code command from the scan tool.

Reference Information

Schematic Reference

- **Instrument Cluster Schematics**
- **Engine Controls Schematics** for the 4.2L engine
- Engine Controls Schematics for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engines

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector X1 at the ECM/PCM. Install a signal generator and instrument panel tester between the following engine speed signal circuit and ground:
    - Terminal 31 (4.2L)
    - Terminal 25 (5.3L/6.0L)
2. Ignition ON, set the signal generator to generate a tachometer signal. Verify that the tachometer indicates a RPM reading.
    - If no RPM reading is present, test the signal circuit for an open/high resistance, a short to voltage, or a short to ground. If the circuit tests normal, replace the instrument panel cluster (IPC).
3. If all circuits test normal, test or replace the ECM/PCM.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for the ECM/PCM and IPC replacement, setup, and programming

SYMPTOMS - DISPLAYS & GAGES

IMPORTANT: The following steps must be completed before using the symptom tables.

1. Perform the **Diagnostic System Check - Vehicle** , before using the Symptom Tables in order to verify that all of the following are true:
   - There are no DTCs set.
   - The control modules can communicate via the serial data link.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to the following:
   - **Audible Warnings Description and Operation**
   - **Driver Information Center (DIC) Description and Operation**
   - **Indicator/Warning Message Description and Operation**
   - **Instrument Cluster Description and Operation**

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the Instrument Cluster or Audible Warning Systems. Refer to **Checking Aftermarket Accessories** .
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Inspect the applicable reservoir for the proper fluid level related to the indicator or message.
- Verify that the indicators work properly during the displays test.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to **Testing for Intermittent Conditions and Poor Connections** .

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

Gages

- **Engine Coolant Temperature Gage Inaccurate or Inoperative**
- **Engine Oil Pressure Gage Inaccurate or Inoperative (4.2L)** or **Engine Oil Pressure Gage Inaccurate or Inoperative (4.8L, 5.3L, 6.0L, 6.2L, or 7.0L)**
- **Fuel Gage Inaccurate or Inoperative**
- **Speedometer and/or Odometer Inaccurate or Inoperative (4.2L Engine)** or **Speedometer and/or Odometer Inaccurate or Inoperative (4.8L, 5.3L, 6.0L, 6.2L, 7.0L Engines)**
- **Tachometer Inaccurate or Inoperative**
- **Volt Gage Inaccurate or Inoperative**

Indicators

- **Change Engine Oil Indicator Malfunction**
- **Door Ajar Indicator Malfunction**
- **Low Fuel Indicator Inoperative**
- **Mirror Compass Display Inoperative or Inaccurate**
- **Mirrors - Temperature Display Inaccurate**
- **Mirrors - Temperature Displays SC or OC**
- **Liftgate/Liftgate Window Ajar Indicator Malfunction**
- **Service Indicator Always On** for the NVG 226-NP8 transfer case
- **Service Indicator Inoperative** for the NVG 226-NP8 transfer case
- **Service Indicator Always On** for the NVG 126-NP4 transfer case
- **Service Indicator Inoperative** for the NVG 126-NP4 transfer case
- **Tow/Haul Switch/Indicator Always On or Inoperative**
- **Brake Warning Indicator Malfunction**
- **ABS Indicator Malfunction**
- **Traction Off Indicator Malfunction**
- **Low Tire Pressure Indicator Always On**
- **Low Tire Pressure Indicator Inoperative**
- **Charge Indicator Malfunction**
- **Cruise Control Indicator Malfunction (IPC Indicator Malfunction)**
- **Malfunction Indicator Lamp (MIL) Diagnosis** for the 4.2L engine
- Malfunction Indicator Lamp (MIL) Diagnosis for the 4.8L, 5.3L, 6.0L, 6.2L, or 7.0L engine
- **Headlamp Switch On Indicator Inoperative**
- **Turn Signal Lamps and/or Indicators Malfunction**
- **Air Bag Indicator Circuit Malfunction**
- **Passenger Presence System Indicator Circuit Malfunction**
- **Seat Belt Indicator Circuit Malfunction**
- **Security Indicator Malfunction**

Driver Information Center

Driver Information Center (DIC) Switch Inoperative

Instrument Cluster Dimming

Interior Backlighting Malfunction

Odometer

Odometer Trip/Reset Switch Inoperative

Audible Warning

Chime Malfunction

CHANGE ENGINE OIL INDICATOR MALFUNCTION

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using the diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit/System Description

The engine control module (ECM)/powertrain control module (PCM) determines when the engine oil should be changed and calculates the oil life in percent. The ECM/PCM sends this information via serial data to the instrument panel cluster (IPC) which illuminates the CHANGE ENGINE OIL indicator. The IPC will illuminate the CHANGE ENGINE OIL indicator when the oil needs to be changed.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the scan tool Engine Oil Life Remaining parameter is greater than 0 percent.
    - If equal to 0 percent, reset the engine oil life.
2. If the percent value is normal, replace the IPC.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **GM Oil Life System Resetting**
- **Control Module References** for IPC replacement, setup, and programming

CHARGE INDICATOR MALFUNCTION

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit/System Description

The engine control module (ECM)/powertrain control module (PCM) uses the generator turn ON signal circuit to control the load of the generator on the engine. A high side driver in the ECM/PCM applies a voltage to the voltage regulator. This signals the voltage regulator to turn the field circuit ON and OFF. The ECM/PCM monitors the state of the generator turn ON signal circuit. The ECM/PCM should detect low voltage on the generator turn on signal circuit when the ignition is ON and the engine is OFF, or when the charging system malfunctions. With the engine running, the ECM/PCM should detect high voltage on the generator turn on signal circuit. The ECM/PCM performs key ON and RUN tests to determine the status of the generator turn on signal circuit. If a malfunction is detected the ECM/PCM will illuminate the charge indicator in the instrument panel cluster (IPC).

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**

- **Wiring Repairs**

Scan Tool Reference

Control Module References

Circuit/System Testing

1. Ignition ON, verify that the charge indicator illuminates during the self test when the ignition is turned ON.
   - If the charge indicator does not illuminate, replace the IPC.
2. Ignition ON, verify that the scan tool Battery Voltage parameter for the IPC is between 10-15 volts.
   - If not within the specified voltage range, refer to **Charging System Test** .
3. If all circuits test normal, test or replace the IPC.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for the IPC replacement, setup, and programming

CHIME MALFUNCTION

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit/System Description

The radio generates the audible warning through the left front speaker. The radio receives audible warning requests via class 2 serial data from the body control module (BCM).

Reference Information

Schematic Reference

- **Instrument Cluster Schematics**
- **Audible Warnings Schematics**
- **Radio/Navigation System Schematics**

Connector End View Reference

Component Connector End Views

Description and Operation

- **Audible Warnings Description and Operation**
- **Indicator/Warning Message Description and Operation**

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References

Circuit/System Testing

Chime Always On

1. Ignition ON, headlamp switch OFF, verify the scan tool Headlamp Switch parameter is Inactive.
   - If not Inactive, test the headlamp input signal circuit for an open or short to voltage. If the circuit tests normal, replace the headlamp switch.
2. Ignition ON, park lamp switch OFF, verify the scan tool Park Lamp Switch parameter is Inactive.
   - If not Inactive, test the parklamp signal circuit for an open or short to voltage. If the circuit tests normal, replace the headlamp switch.
3. Ignition OFF, key out of the ignition, verify the scan tool Key In Ignition Status parameter is Key Out.
   - If not Key Out, test the key in ignition signal circuit for an open or short to voltage. If the circuit tests normal, replace the ignition switch.
4. Ignition ON, doors closed, verify the scan tool Door Ajar Switch parameters are Inactive.
   - If not Inactive, refer to **Courtesy Lamps Malfunction** .
5. Ignition ON, rear gate closed, verify the scan tool Liftgate Ajar Switch parameter and the Liftglass Ajar Switch parameter are Closed.
   - If not Closed, refer to **Courtesy Lamps Malfunction** .
6. If all circuits test normal, replace the BCM.

Chime Inoperative

1. Ignition OFF, key in the ignition, open the driver door. The courtesy lamps should illuminate.
   - If the courtesy lamps do not illuminate, refer to **Courtesy Lamps Malfunction** .
2. Ignition ON, radio ON, adjust the radio balance and fade to the left front speaker.
   - If the speaker does not operate properly, refer to **Speaker Malfunction** .

3. If the speaker operates properly, replace the radio.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Ignition and Start Switch Replacement**
- **Turn Signal Multifunction Switch Replacement**
- **Control Module References** for BCM replacement, setup, and programming

DRIVER INFORMATION CENTER (DIC) SWITCH INOPERATIVE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using the diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit/System Description

The driver information switches are normally open momentary switches. Power is provided to the driver information center (DIC) switches via the instrument panel cluster (IPC) ignition 1 voltage circuit. The IPC interfaces with the DIC switches via 4 discreet circuits. Each switch input to the cluster is pulled low or grounded when a switch is activated. The DIC switches include the PERSONALIZATION, SELECT, FUEL, and TRIP switches.

Reference Information

Schematic Reference

- **Instrument Cluster Schematics**
- **Steering Wheel Secondary/Configurable Control Schematics**

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the DIC switch assembly.
2. Ignition OFF, test for less than 1 ohm of resistance between both ground circuits terminal 4 and ground.
   - If greater than 1 ohm, test the ground circuits for an open/high resistance.
3. Ignition ON, verify all of the scan tool DIC Switch parameters are Off.
   - If any are not Off, test the appropriate signal circuit for a short to ground. If the circuit tests normal, replace the IPC.
4. Ignition ON, install a 3-amp fused jumper wire between all the signal circuits terminals 2 and 3 and ground. Verify all of the scan tool DIC Switch parameters are On.
   - If any are not On, test the appropriate signal circuit for a short to voltage or an open/high resistance. If the circuit tests normal, replace the IPC.
5. If all the circuits test normal, test or replace the DIC switch assembly.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Steering Wheel Control Switch Assembly Replacement**
- **Control Module References** for IPC replacement, setup, and programming

ENGINE COOLANT TEMPERATURE GAGE INACCURATE OR INOPERATIVE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using the diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit/System Description

The instrument panel cluster (IPC) displays the engine coolant temperature as determined by the engine control module (ECM)/powertrain control module (PCM). The PCM/ECM sends the temperature data via serial data to the IPC in order to display the engine temperature.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

Ignition ON, perform the engine coolant gage sweep test with the scan tool.

- If the engine coolant gage does not sweep from its low to high position, replace the IPC.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for IPC replacement, setup, and programming

ENGINE OIL PRESSURE GAGE INACCURATE OR INOPERATIVE (4.2L)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using the diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit Description

With low oil pressure, the engine oil pressure (EOP) switch closes, and the signal circuit is low. With oil pressure above 4.5 psi, the EOP switch opens, and the signal circuit is high. The powertrain control module (PCM) monitors the oil pressure switch signal circuit, and sends a class 2 message to the instrument panel cluster (IPC), indicating the switch status.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the EOP switch.
2. Ignition ON, verify the scan tool Engine Oil Pressure Switch parameter is OK.
    - If not OK, test the signal circuit of the EOP switch for a short to ground. If the circuit tests normal replace the PCM.
3. Ignition ON, with a scan tool perform the IPC Gauges test. The oil pressure gauge should sweep from high to low.
    - If the engine oil pressure gauge does not sweep from its low to high position, replace the IPC.
4. If all circuits test normal, test or replace the EOP switch.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Engine Oil Pressure Sensor and/or Switch Replacement**
- **Control Module References** for the IPC or PCM replacement, setup, and programming

ENGINE OIL PRESSURE GAGE INACCURATE OR INOPERATIVE (4.8L, 5.3L, 6.0L, 6.2L, OR 7.0L)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using the diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.

- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit Description

The engine oil pressure (EOP) sensor changes resistance based on engine oil pressure. The engine control module (ECM) monitors the signal circuit of the EOP sensor. When the oil pressure is high, the sensor resistance is high, and the ECM senses a high signal voltage. When the oil pressure is low, the sensor resistance is low, and the ECM senses a low signal voltage. The ECM sends the engine oil pressure information to the instrument panel cluster (IPC) via the class 2 serial data circuit.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the EOP sensor.
2. Ignition OFF, test for less than 1 ohm of resistance between the low reference circuit terminal 1 and ground.
    - If greater than specified, test the low reference circuit for a short to voltage or an open/high resistance. If the circuit tests normal, replace the ECM.
3. Ignition ON, test for 4.8-5.2 volts between the 5-volt reference circuit terminal 2 and ground.
    - If less than 4.8 volts, test the 5-volt reference circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the ECM.

   - If greater than 5.2 volts, test the 5-volt reference circuit for a short to voltage. If the circuit tests normal, replace the ECM.
4. Install a 3-amp fused jumper wire between the signal circuit terminal 3 and the low reference circuit terminal 1. Verify the scan tool Engine Oil Pressure Sensor parameter is less than 0.4 volt.
   - If greater than specified, test the signal circuit for a short to voltage or an open/high resistance. If the circuit tests normal, replace the ECM.
5. Install a 3-amp fused jumper wire between the signal circuit terminal 3 and the 5-volt reference circuit terminal 2. Verify the scan tool Engine Oil Pressure Sensor parameter is greater than 4.6 volts.
   - If less than specified, test the signal circuit for a short to ground. If the circuit tests normal, replace the ECM.
6. Ignition ON, with a scan tool perform the IPC Gauges test.
   - If the engine oil pressure gauge does not sweep from its low to high position, replace the IPC.
7. If all circuits test normal, test or replace the EOP sensor.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- Engine Oil Pressure Sensor and/or Switch Replacement
- **Control Module References** for the IPC and ECM replacement, setup, and programming

FUEL GAGE INACCURATE OR INOPERATIVE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit Description

The engine control module (ECM)/powertrain control module (PCM) monitors the signal circuit of the fuel level sender in order to determine fuel level. The sender consists of a variable resistor that changes resistance based on the fuel level in the tank. The ECM/PCM monitors the voltage across the sender resistance in order to determine the fuel level. The ECM/PCM uses the signal circuit of the fuel level sender in order to calculate the total remaining fuel, in percent. The ECM/PCM sends the fuel level percent via the serial data circuit to the instrument cluster in order to control the fuel gage. The fuel level information is also used for misfire and evaporative emission (EVAP) diagnostics.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

Ignition ON, verify DTC P0461, P0462, 0463 or P0464 is not set.

- If any of the DTCs are set, refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the fuel level sensor.
2. Ignition OFF, test for less than 1.0 ohm of resistance between the low reference circuit terminal 3 and ground.
    - If greater than the specified range, test the low reference circuit for an open/high resistance. If the circuit tests normal, replace the ECM/PCM.
3. Install a Signal Generator and Instrument Panel Tester between the signal circuit terminal 2 and ground.
4. Ignition ON, vary the signal generator resistance between 40 and 250 ohms. Verify that the scan tool Fuel Tank Level Remaining or Fuel Level Sensor parameter displays a range that varies between 5 and 95 percent as the signal generator resistance changes.
    - If not displaying as specified, test the signal circuit for an open/high resistance. If the circuits test normal, replace the ECM/PCM.
5. Vary the signal generator resistance between 40 and 250 ohms. Verify that the fuel gage displays a range that varies between empty and full as the signal generator resistance changes.
    - If not displaying as specified, replace the IPC.
6. If all circuits test normal, perform the fuel level sensor component test before replacing the fuel level sensor.

Component Testing

1. Ignition OFF, disconnect the harness connectors at the fuel level sensor.
2. While sweeping the fuel level sensor through its full range of motion, test for a minimum value less than 41 ohms and a maximum value greater than 119 ohms of resistance between the signal terminal 2 and the low reference terminal 3.
    - If not within the specified range, replace the fuel level sensor.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Fuel Level Sensor Replacement** for the 4.2L engine
- Fuel Level Sensor Replacement for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engines
- **Control Module References** for the ECM/PCM or IPC replacement, setup, and programming

LOW FUEL INDICATOR INOPERATIVE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using the diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit Description

The engine control module (ECM)/powertrain control module (PCM) monitors the signal circuit of the fuel level sender in order to determine fuel level. The sender consists of a variable resistor that changes resistance based on the fuel level in the tank. The ECM/PCM monitors the voltage across the sender resistance in order to determine the fuel level. The ECM/PCM uses the signal circuit of the fuel level sender in order to calculate the total remaining fuel, in percent. The ECM/PCM sends the fuel level percent via the serial data circuit to the instrument cluster in order to control the fuel gage. When the fuel level percent reaches a predetermined low level, the IPC will illuminate the low fuel indicator.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Verification

Ignition ON, perform the lamp test with the scan tool.

- If the low fuel indicator does not illuminate, replace the IPC.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for the IPC replacement, setup, and programming

MIRROR COMPASS DISPLAY INOPERATIVE OR INACCURATE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit/System Description

The inside rearview mirror (ISRVM) uses 2 magnetic field sensors for compass direction. One sensor is for north and south, the other is for east and west. The ISRVM supplies a signal and low reference to each sensor. As the vehicle travels with or against the earths magnetic pull, there will be a change in voltage on one or both sensors. As a result of the change in voltage, the ISRVM changes the heading on the compass display. The internal fault detection for the compass is handled by the ISRVM.

Reference Information

Schematic Reference

Driver Information System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Driver Information Center (DIC) Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition ON, compass ON, verify that there is a compass reading on the display.
   - If the display is blank, replace the ISRVM.
   - If the display shows the letter C or CAL, perform the compass calibration procedure. Refer to **Compass Calibration and Magnetic Variance**.
2. Verify that the compass reading on the display is correct.
   - If not correct, perform the compass magnetic variation adjustment procedure. Refer to **Compass Calibration and Magnetic Variance**.
3. If the display is still incorrect, replace the ISRVM.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for ISRVM replacement, setup, and programming

MIRRORS - TEMPERATURE DISPLAY INACCURATE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using the diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit/System Description

The inside rearview mirror (ISRVM) applies 5 volts to the ambient air temperature sensor. The ambient air temperature sensor is a thermistor which varies in resistance as the temperature changes. As the resistance of the ambient air temperature sensor increases, the ISRVM senses a larger voltage drop across the sensor, indicating a lower temperature. As the resistance of the ambient air temperature sensor decreases, the ISRVM senses a smaller voltage drop across the sensor, indicating a higher temperature.

Diagnostic Aids

The following table will be used to measure the resistance of the sensor and compare it with the actual ambient temperature. The mirror temperature accuracy should be within 5 degrees of the actual temperature. The actual temperature should not be taken from a radio station, a sign displaying the temperature, etc. A temperature measuring tool such as a thermometer should be used. Some temperature measuring tools may be within 5 degrees of the actual temperature. Make sure to consult the manufacturer for the accuracy of the tool. This comparison can make the mirror seem off by 5-10 degrees of the actual temperature when it is not.

Ambient Air Temperature Sensor Resistance

°C	°F	Minimum Resistance K Ohms	Maximum Resistance K Ohms
-35	-31	234.81	250.59
-30	-22	171.69	182.31
-25	-13	126.82	133.99
-20	-4	94.63	99.49
-15	5	71.30	74.58
-10	14	54.21	56.43
-5	23	41.48	43.17
0	32	32.00	33.31
5	41	24.96	25.83
10	50	19.61	20.19
15	59	15.49	15.94
20	68	12.31	12.67
25	77	9.85	10.12
30	86	7.96	8.15
35	95	6.45	6.61
40	104	5.27	5.39
45	113	4.32	4.42
50	122	3.56	3.64
55	131	2.95	3.02
60	140	2.46	2.52

Reference Information

Schematic Reference

Driver Information System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Driver Information Center (DIC) Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the ambient air temperature sensor. Install a signal generator and instrument panel tester between the signal circuit terminal A and the low reference circuit terminal B.
2. Ignition ON, vary the resistance on the signal generator from 2.5K to 230K. Verify that the temperature displayed on the ISRVM matches the ambient temperature resistance chart.
    - If the temperature displayed is incorrect, test the signal circuit and the low reference circuit for an open/high resistance. If the circuits test normal, replace the ISRVM.
3. If the temperature displayed is correct, replace the ambient air temperature sensor.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for ISRVM replacement, setup, and programming

MIRRORS - TEMPERATURE DISPLAYS SC OR OC

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit/System Description

The inside rearview mirror (ISRVM) applies 5 volts to the ambient air temperature sensor. The ambient air temperature sensor is a thermistor which varies in resistance as the temperature changes. As the resistance of the ambient air temperature sensor increases, the ISRVM senses a larger voltage drop across the sensor, indicating a lower temperature. As the resistance of the ambient air temperature sensor decreases, the ISRVM senses a smaller voltage drop across the sensor, indicating a higher temperature.

Diagnostic Aids

The following table will be used to measure the resistance of the sensor and compare it with the actual ambient temperature. The mirror temperature accuracy should be within 5 degrees of the actual temperature. The actual temperature should not be taken from a radio station, a sign displaying the temperature, etc. A temperature measuring tool such as a thermometer should be used. Some temperature measuring tools may be within 5 degrees of the actual temperature. Make sure to consult the manufacturer for the accuracy of the tool. This comparison can make the mirror seem off by 5-10 degrees of the actual temperature when it is not.

Ambient Air Temperature Sensor Resistance

°C	°F	Minimum Resistance K Ohms	Maximum Resistance K Ohms
-35	-31	234.81	250.59
-30	-22	171.69	182.31
-25	-13	126.82	133.99
-20	-4	94.63	99.49
-15	5	71.30	74.58
-10	14	54.21	56.43
-5	23	41.48	43.17
0	32	32.00	33.31
5	41	24.96	25.83
10	50	19.61	20.19
15	59	15.49	15.94
20	68	12.31	12.67
25	77	9.85	10.12
30	86	7.96	8.15
35	95	6.45	6.61
40	104	5.27	5.39
45	113	4.32	4.42
50	122	3.56	3.64
55	131	2.95	3.02
60	140	2.46	2.52

Reference Information

Schematic Reference

Driver Information System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Driver Information Center (DIC) Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the ambient air temperature sensor.
2. Ignition OFF, test for less than 1 ohm of resistance between the low reference circuit terminal B and ground.
    - If greater than 1 ohm, test the ground circuit for an open/high resistance.
3. Ignition ON, verify that OC is displayed on the ISRVM display.
    - If OC is not displayed, test the signal circuit for a short to ground.
4. Ignition ON, install a 3-amp fused jumper wire between the signal circuit terminal A and ground. Verify that SC is displayed on the ISRVM display.
    - If SC is not displayed, test the signal circuit for an open/high resistance. If the circuit tests normal replace the ISRVM.
5. If the display is correct, replace the ambient air temperature sensor.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for ISRVM replacement, setup, and programming

ODOMETER TRIP/RESET SWITCH INOPERATIVE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using the diagnostic procedure.

- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit/System Description

The instrument panel cluster (IPC) calculates the mileage based on the vehicle speed signal circuit from the engine control module (ECM)/powertrain control module (PCM). The ECM/PCM sends the vehicle speed information via serial data to the IPC. The odometer will display 'error' if an internal IPC memory failure is detected. The odometer displays either miles or kilometers as requested by the activation of the Personalization button on the steering wheel controls.

Reference Information

Scan Tool Reference

Instrument Cluster Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Verification

Ignition ON, press the trip reset button a few times to verify the odometer and trip odometer.

- If the odometer display does not switch between trip and odometer, replace the IPC.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for IPC replacement, setup, and programming

SPEEDOMETER AND/OR ODOMETER INACCURATE OR INOPERATIVE (4.2L ENGINE)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using the diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit Description

The instrument panel cluster (IPC) receives the vehicle speed information from the powertrain control module (PCM) through the vehicle speed signal circuit. The PCM converts the data from the vehicle speed sensor to a 4,000 pulses/mile signal. The PCM also sends a class 2 message to the IPC indicating the vehicle speed.

Reference Information

Schematic Reference

- **Instrument Cluster Schematics**
- **Engine Controls Schematics**

Connector End View Reference

Component Connector End Views

Description and Operation

- **Instrument Cluster Description and Operation**
- **Engine Control Module Description**

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Testing

1. Ignition ON, perform the segments test with the scan tool.
    - If not all of the segments illuminate, replace the IPC.
2. Raise the vehicle drive wheels. Refer to **Lifting and Jacking the Vehicle** .
3. Ignition ON, engine ON, transmission in Drive, verify the scan tool Vehicle Speed Sensor parameter in the IPC matches the speedometer display.
    - If the Vehicle Speed Sensor parameter does not match the speedometer display, test the vehicle speed signal circuit for a high resistance.
4. If the circuit tests normal, test or replace the IPC.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for the IPC replacement, setup, and programming

SPEEDOMETER AND/OR ODOMETER INACCURATE OR INOPERATIVE (4.8L, 5.3L, 6.0L, 6.2L, 7.0L ENGINES)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using the diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit Description

The instrument panel cluster (IPC) receives the vehicle speed information from the engine control module (ECM) through the vehicle speed signal circuit. The ECM converts the data from the vehicle speed sensor to a 4,000 pulses/mile signal. The ECM also sends a class 2 message to the IPC indicating the vehicle speed.

Reference Information

Schematic Reference

- **Instrument Cluster Schematics**
- **Diagnostic Starting Point - Engine Controls**
- **Automatic Transmission Controls Schematics (4.2L)** or **Automatic Transmission Controls Schematics (5.3L/6.0L)**

Connector End View Reference

Component Connector End Views

Description and Operation

- **Instrument Cluster Description and Operation**
- Engine Control Module Description
- **Electronic Component Description (TCM)** or **Electronic Component Description (PCM)**

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Testing

1. Ignition ON, perform the segments test with the scan tool.
    - If not all of the segments illuminate, replace the IPC.
2. Raise the vehicle drive wheels. Refer to **Lifting and Jacking the Vehicle** .
3. Ignition ON, engine ON, transmission in Drive, verify the scan tool Vehicle Speed Sensor parameter in the IPC matches the speedometer display.
    - If the Vehicle Speed Sensor parameter does not match the speedometer display, test both the vehicle speed signal circuit for a high resistance and the high-front signal circuit at the transmission control module (TCM) for an open/high resistance, short to voltage, or short to ground.
4. If the circuits test normal, test or replace the IPC.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for the IPC replacement, setup, and programming

TACHOMETER INACCURATE OR INOPERATIVE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using the diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit Description

The instrument panel cluster (IPC) receives the engine speed information from the engine control module

(ECM)/powertrain control module (PCM) through the engine speed signal circuit. The ECM/PCM converts the data from the engine speed sensor to a (2 pulses)/(engine revolution) signal. The ECM/PCM also sends a class 2 message to the IPC indicating the engine speed.

Reference Information

Schematic Reference

- **Instrument Cluster Schematics**
- **Engine Controls Schematics** for the 4.2L engine
- Engine Controls Schematics for the 4.8L, 5.3L, 6.0L, 6.2L and 7.0L engines

Connector End View Reference

Component Connector End Views

Description and Operation

- **Instrument Cluster Description and Operation**
- **Engine Control Module Description** for the 4.2L engine
- Engine Control Module Description for the 4.8L, 5.3L, 6.0L, 6.2L and 7.0L engines

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Testing

1. Ignition ON, engine ON, verify the scan tool engine speed parameter for the IPC matches the tachometer display.
    - If the engine speed parameter does not match the tachometer display, test the signal circuit for a high resistance.
2. If the circuit tests normal, replace the IPC.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for the IPC replacement, setup, and programming

VOLT GAGE INACCURATE OR INOPERATIVE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit/System Description

The instrument panel cluster (IPC) displays the vehicle voltage based on the information from the body control module (BCM). The BCM provides voltage information to the IPC via class 2 serial data.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Verification

Ignition ON, perform the volt gage sweep test with the scan tool.

- If the volt coolant gage does not sweep from its low to high position, replace the IPC.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for IPC replacement, setup, and programming

REPAIR INSTRUCTIONS

AMBIENT AIR TEMPERATURE SENSOR REPLACEMENT

Removal Procedure

1. Remove the front grille. Refer to **Grille Replacement (Envoy)** or **Grille Replacement (TrailBlazer)** .

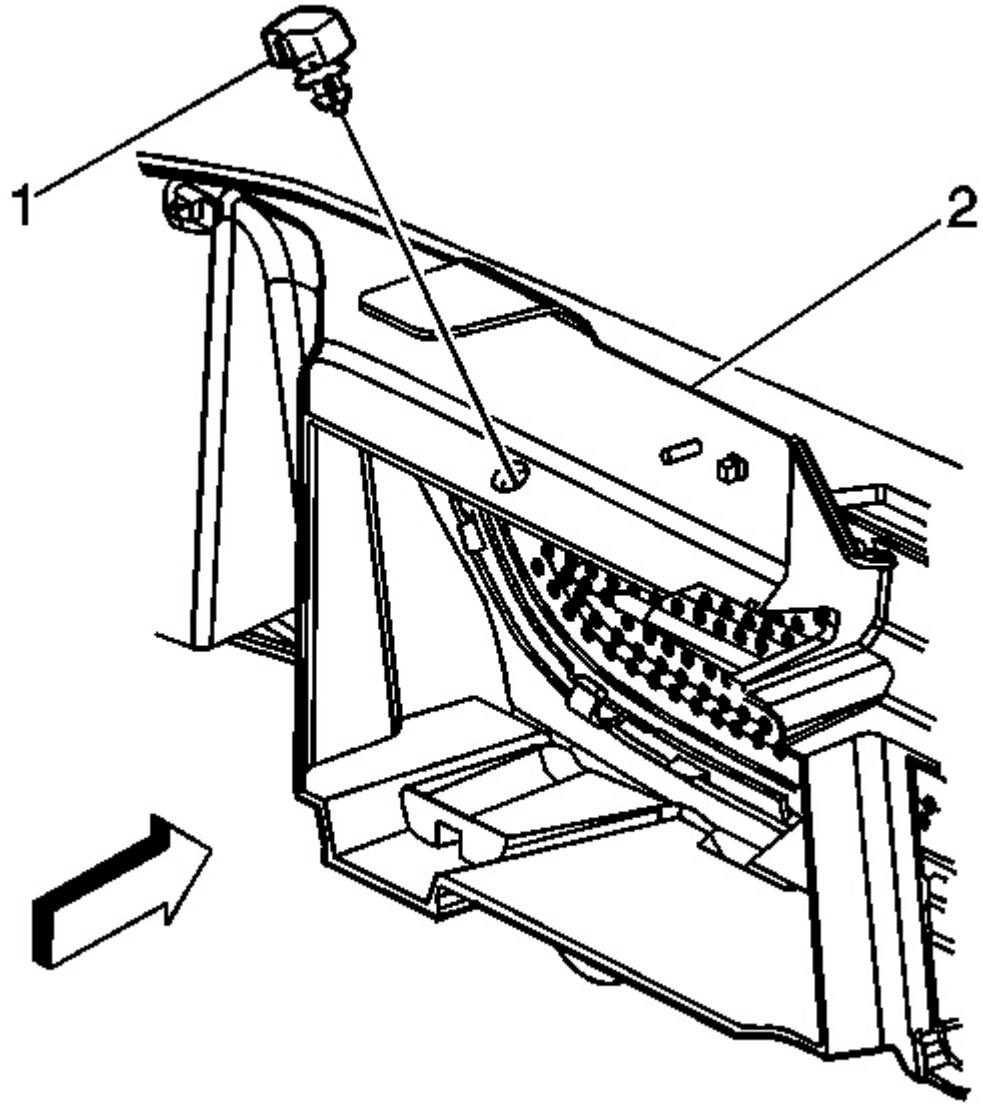


Fig. 7: Locating Ambient Air Temperature Sensor
Courtesy of GENERAL MOTORS CORP.

2. Remove the sensor (1) from the panel assembly (2).

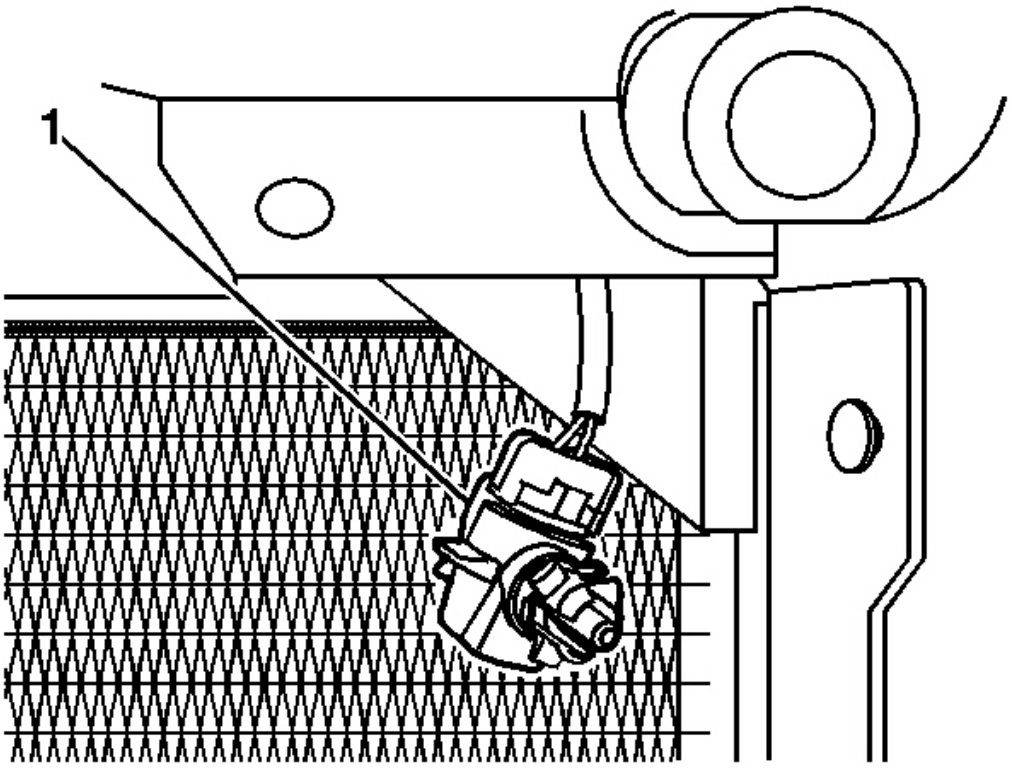


Fig. 8: Identifying Ambient Air Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

3. Disconnect the electrical connector from the sensor (1).

Installation Procedure

1. Position the sensor to the panel assembly.

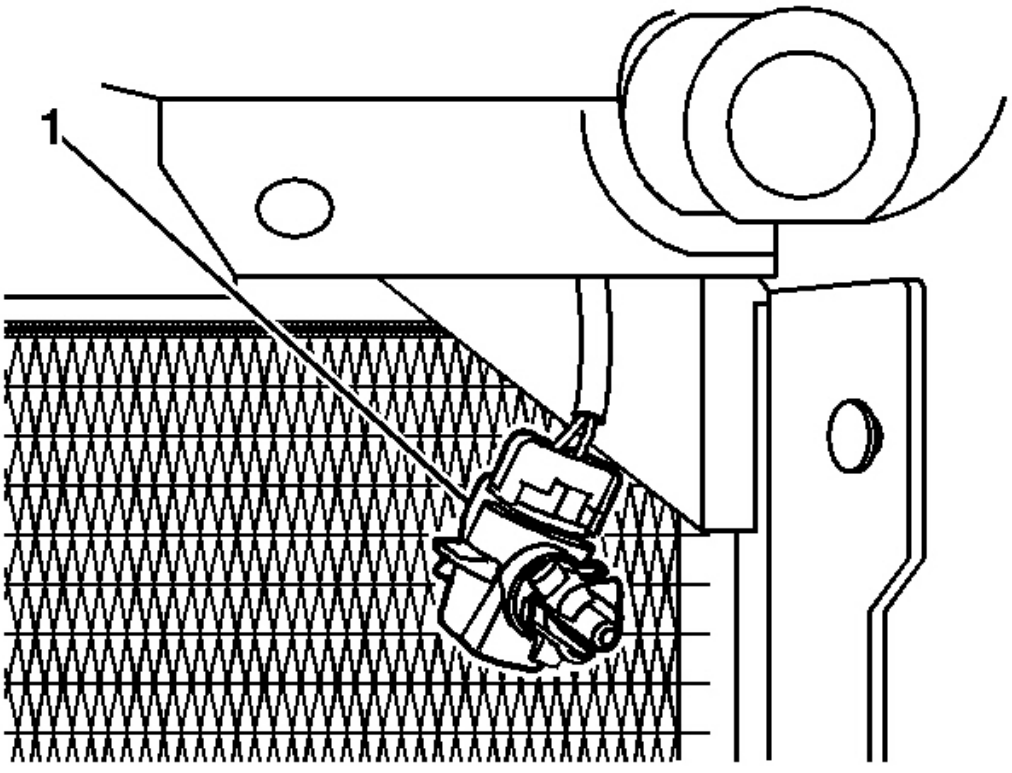


Fig. 9: Identifying Ambient Air Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

2. Connect the electrical connector to the sensor (1).

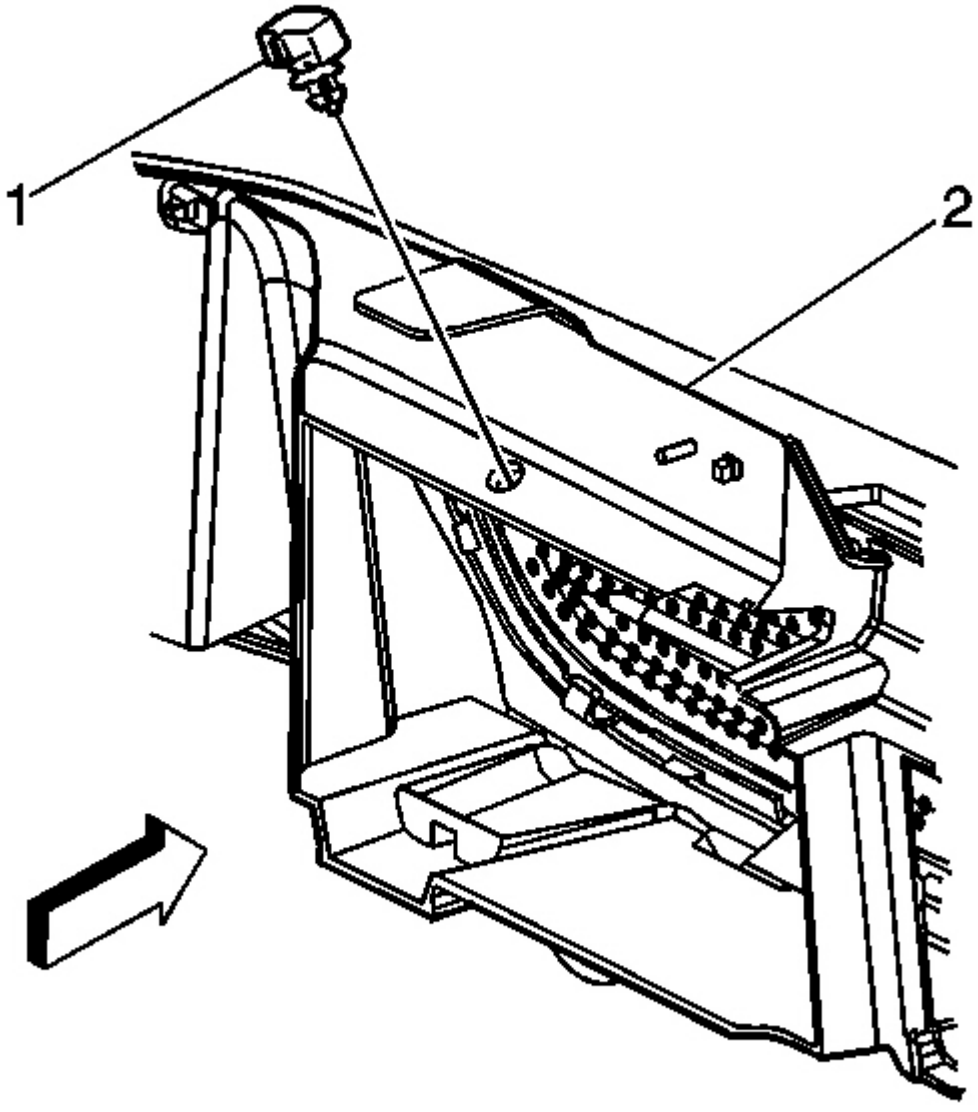


Fig. 10: Locating Ambient Air Temperature Sensor
Courtesy of GENERAL MOTORS CORP.

3. Install the sensor (1) to the panel assembly (2).
4. Install the front grille. Refer to **Grille Replacement (Envoy)** or **Grille Replacement (TrailBlazer)** .

INSTRUMENT CLUSTER REPLACEMENT

Removal Procedure

1. Remove the left closeout insulator panel. Refer to **Instrument Panel Insulator Panel Replacement - Left Side** .
2. Remove the knee bolster trim panel. Refer to **Driver Knee Bolster Panel Replacement** .
3. Remove the instrument panel cluster (IPC) bezel. Refer to **Instrument Panel Cluster Trim Plate Bezel Replacement (Chevrolet)** or **Instrument Panel Cluster Trim Plate Bezel Replacement (GMC, Buick)** .

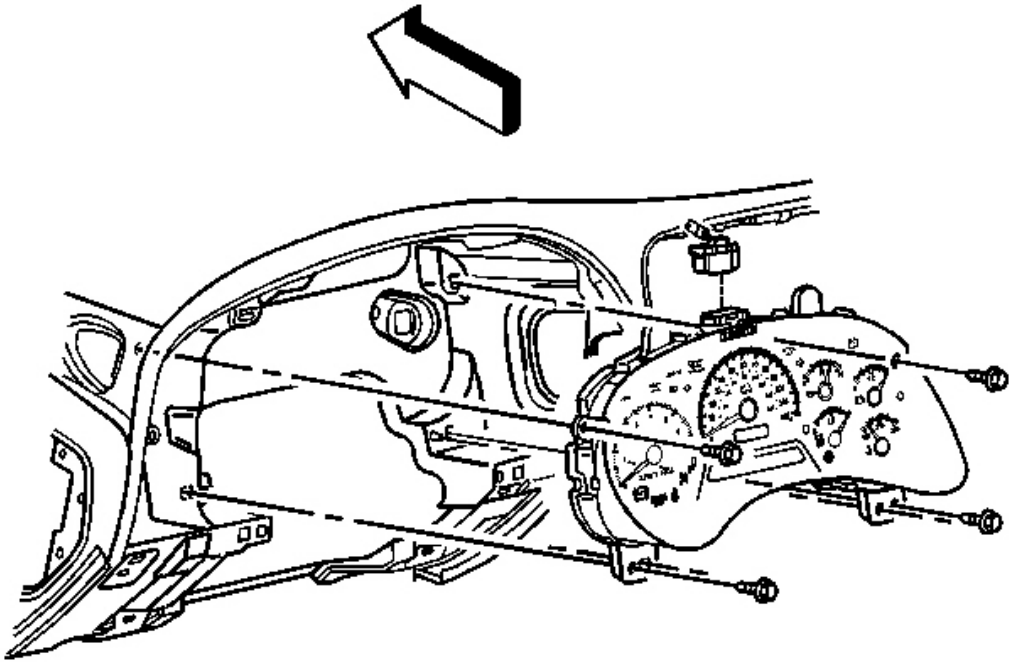


Fig. 11: View Of Instrument Panel Cluster (IPC)
Courtesy of GENERAL MOTORS CORP.

4. Remove the screws retaining the IPC to the I/P.
5. Partially remove the IPC from the I/P in order to gain access to the electrical connector.
6. Disconnect the electrical connector from the IPC.
7. Remove the IPC from the I/P.

Installation Procedure

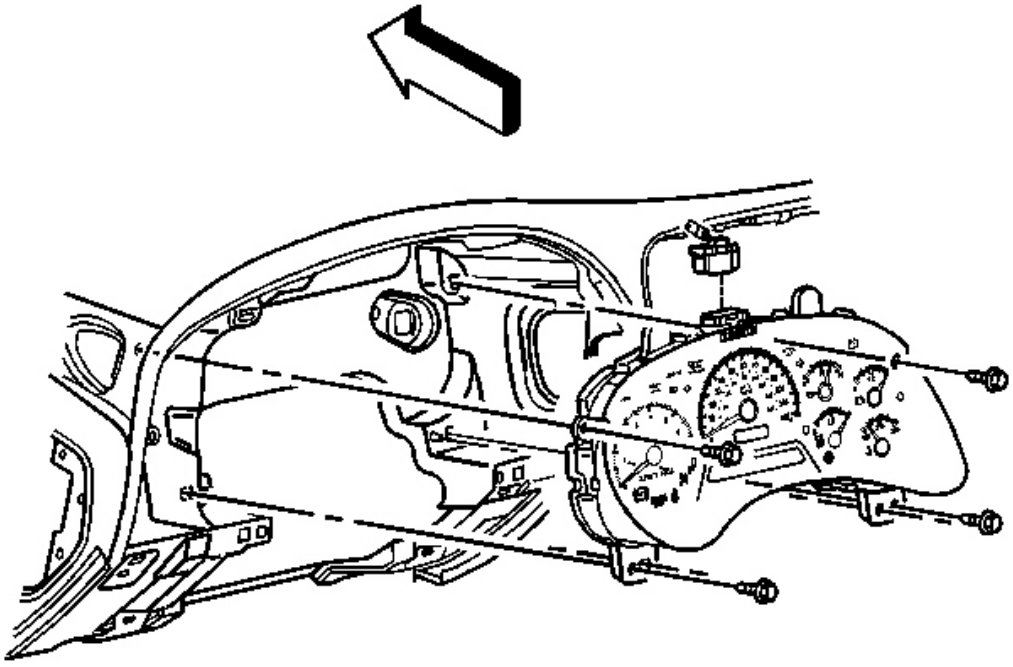


Fig. 12: View Of Instrument Panel Cluster (IPC)
Courtesy of GENERAL MOTORS CORP.

1. Position the IPC to the I/P.
2. Connect the electrical connector to the IPC.
3. Install the IPC to the I/P.

NOTE: Refer to Fastener Notice .

4. Install the screws to the instrument panel cluster.

   Tighten: Tighten the screws to 2.5 N.m (22 lb in).

5. Install the IPC bezel. Refer to **Instrument Panel Cluster Trim Plate Bezel Replacement (Chevrolet)** or **Instrument Panel Cluster Trim Plate Bezel Replacement (GMC, Buick)** .
6. Install the knee bolster trim panel. Refer to **Driver Knee Bolster Panel Replacement** .
7. Install the left closeout insulator panel. Refer to **Instrument Panel Insulator Panel Replacement - Left Side** .
8. If installing a new IPC, program the IPC. Refer to **Control Module References** .

DESCRIPTION & OPERATION

AUDIBLE WARNINGS DESCRIPTION & OPERATION

The audible warnings alert the driver of a system concern or a critical vehicle condition. The radio generates the audible warnings through the left front speaker. The radio receives audible warning requests via the class 2 serial data line. If the radio receives multiple audible warning requests, the warning with the highest priority sounds first. On vehicles with RPO UQA the audio amplifier, instead of the radio, generates the audible warnings and receives audible warnings requests via the class 2 serial data line. Either the radio or the audio amplifier is the chime producer. The following lists the audible warning priority and the pulse rate:

1. Fast rate chime (200 pulses per minute)
2. Medium rate chime (150 pulses per minute)
3. Slow rate chime (50 pulses per minute)
4. Single chime

Door Ajar Warning

The chime producer activates the door ajar audible warning as requested by the IPC. The IPC sends a class 2 message to the chime producer indicating the chime duration (4 pulses). The door ajar warning sounds and the appropriate DOOR AJAR indicator illuminates in the Driver Information Center when the following occurs:

- The body control module (BCM) determines that a door (driver door, passenger door, left rear door, right rear door) is open and the signal circuit is low. The IPC receives a class 2 message from the BCM indicating the door ajar status.
- The vehicle is not in park. The IPC receives a class 2 message from the PCM indicating the gear position.
- The vehicle speed is greater than 8.05 km/h (5 MPH). The IPC uses the vehicle speed signal circuit (4000 pulses/mile) from the PCM in order to calculate the vehicle speed.

Fasten Safety Belt Warning

The chime producer activates the fasten safety belt audible warning as requested by the IPC. The IPC sends a class 2 message to the chime producer indicating the duration (8 seconds). The fasten safety belt warning sounds and the fasten safety belt indicator illuminates when the following occurs:

- The ignition switch transitions to ON.
- The inflatable restraint sensing and diagnostic module (SDM) detects that the driver's seat belt is not buckled (signal is low). The IPC receives a class 2 message from the SDM indicating the driver's seat belt status.

If the seat belt is buckled when the ignition is turned on, the chime does not sound. If the seat belt is buckled while the chime is sounding, the chime stops. If the seat belt is unbuckled after the initial transition to ON, the chime does not sound.

Key-In-Ignition Warning

The chime producer activates the key-in-ignition audible warning as requested by the IPC. The IPC sends a class 2 message to the chime producer indicating the chime frequency and duration (continuous). The key-in-ignition warning sounds when the following occurs:

- The ignition switch is OFF.
- The body control module (BCM) determines that the driver's door is open and the signal circuit is low. The IPC receives a class 2 message from the BCM indicating the door ajar status.
- The BCM determines that the key-in-ignition switch is closed and the signal circuit is low. The IPC receives a class 2 message from the BCM indicating the key-in-ignition status.

Lights On Warning

The chime producer activates the lights on warning as requested by the body control module (BCM). The BCM sends a class 2 message to the chime producer indicating the chime frequency (fast rate) and duration (continuous). The lights on warning sounds when the following occurs:

- The ignition is OFF.
- The BCM determines that the driver's door is open and the signal circuit is low.
- The BCM determines that the headlamp switch is in the park or head position.

Additional Warnings

The following warnings have an associated IPC indicator or DIC indicator:

- Check Oil Level

  The chime producer activates the audible warning as requested by the IPC. The IPC sends a class 2 message to the chime producer indicating the chime frequency and duration.

- Liftgate Ajar/Rear Access Open

  The chime producer activates the audible warning as requested by the IPC. The IPC sends a class 2 message to the chime producer indicating the chime frequency and duration (4 pulses).

- Low Fuel

  The chime producer activates the audible warning as requested by the IPC. The IPC sends a class 2 message to the chime producer indicating the chime frequency (medium rate) and duration (4 pulses).

- Oil Pressure Low Stop Engine

  The chime producer activates the audible warning as requested by the IPC. The IPC sends a class 2 message to the chime producer indicating the chime frequency and duration.

- Overspeed/Vehicle Overspeed

The chime producer activates the audible warning as requested by the IPC. The IPC sends a class 2 message to the chime producer indicating the chime frequency and duration (continuous).

- Reduced Engine Power

  The chime producer activates the audible warning as requested by the IPC. The IPC sends a class 2 message to the chime producer indicating the chime frequency and duration.

- Trans Hot Idle Engine

  The chime producer activates the audible warning as requested by the IPC. The IPC sends a class 2 message to the chime producer indicating the chime frequency and duration (continuous)

- Turn Signal On

  The chime producer activates the audible warning as requested by the IPC. The IPC sends a class 2 message to the chime producer indicating the chime frequency and duration (1 pulse).

Refer to **Indicator/Warning Message Description and Operation**.

COMPASS CALIBRATION & MAGNETIC VARIANCE

Compass Calibration

Before calibrating the compass, drive the vehicle to an area that is magnetically clean or free of large metallic objects. Verify there are no magnetized objects on the inside or outside of the vehicle close to the mirror.

1. Start the engine.
2. Press and hold the switch for the compass, which may be depicted as COMP, COMPASS, or On/Off (w/UE1) depending on the type of mirror on the vehicle, until the letter "C" or "CAL" is displayed.
3. Drive the vehicle in circles at a speed of less than 8 km/h (5 mph) until the "C" or "CAL" is replaced by a proper vehicle heading. The calibration procedure is now complete.

Compass Magnetic Variation Adjustment

Magnetic variation adjustments are required when the compass displays a constant error in heading. Variation is the difference between magnetic north and true north due to geographical location.

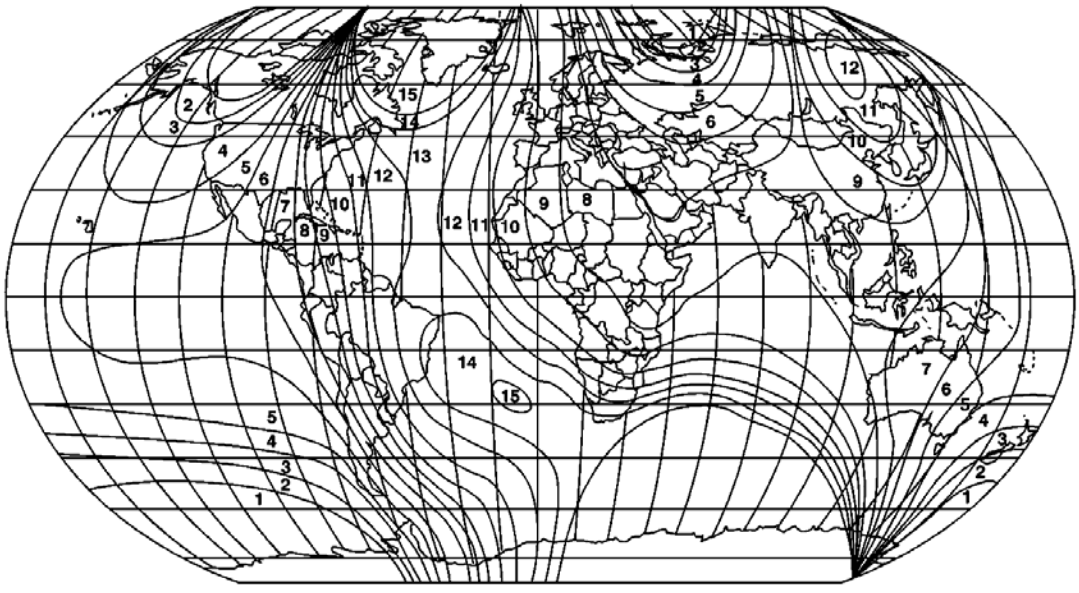


Fig. 13: World Magnetic Variation Map
Courtesy of GENERAL MOTORS CORP.

1. Locate your current geographic location on the World Magnetic Variation Map.
2. Turn ON the ignition, with the engine OFF.
3. Press and hold the switch for the compass, which may be depicted as COMP, COMPASS, or On/Off (w/UE1) depending on the type of mirror on the vehicle, until a zone number appears on the compass display.
4. Depress the switch for the compass to select the desired zone number.
5. Wait 5 seconds, the display will return to a compass heading. The variance procedure is now complete.

DRIVER INFORMATION CENTER (DIC) DESCRIPTION & OPERATION

Driver Information Center (DIC)

The driver information center (DIC) consists of a single line 22 character vacuum fluorescent (VF) display placed in the lower center area of the instrument panel cluster (IPC). The DIC will display vehicle information, configuration, and warning parameters to the driver.

The display parameters are cycled, changed, and acknowledged using four (4) DIC buttons.

- Trip Information

  Button representation icon appears as a road to the horizon.

- Fuel Information

Button representation icon appears as a gasoline pump.

- Personalization

  Button representation icon appears as a human next to vehicle.

- Select

  Button representation icon appears as an arrow.

DIC Displays

The DIC parameters are displayed by order of priority as follows (from highest to lowest) :

- Service Diagnostics
- Driver Identifier
- Feature Programming
- Driver Warnings
- Vehicle Information

Vehicle Information

Vehicle information provides feedback to the driver on vehicle performance, mileage, maintenance, or related information.

Vehicle information can only be displayed with the ignition switch in the RUN position.

When the English/Metric status changes, any applicable vehicle information data values will also change.

DIC Trip Information / Reset Capabilities

The available DIC Trip Information and reset capabilities are as follows:

- Odometer - Cannot be reset
- Trip Odometer A - Can be reset
- Trip Odometer B - Can be reset
- Timer - Can be reset
- Tire Pressures

Trip Reset Stem/Trip Information

The trip reset stem on the IPC operates in the following manner with the ignition switch in the RUN position:

1. Each time the reset stem or the DIC Trip Information button is pushed the display will cycle to the next trip parameter. The trip parameters are as follows:

- Odometer
- Trip A odometer
- Trip B odometer

2. Holding the reset stem for greater than 4 seconds or depressing the Trip Information button for greater than one second while either Trip A or Trip B odometer is displayed will reset the displayed trip odometer to 0.0 upon release of the stem. The trip odometer will remain displayed after being reset.
3. If a trip odometer parameter is being displayed, pressing the Trip Information button will display the next trip odometer parameter.
4. If the next Trip Information parameter to be displayed is Timer or blank, pressing the reset stem will return the display to the Odometer.

Odometer

The odometer is capable of displaying values from 0-999,999 MI or KM.

If the ignition is in the OFF or UNLOCK/ACC position, the odometer can be displayed by pressing the trip reset stem. The odometer will remain displayed for 5 seconds.

Trip Odometers

The DIC can display Trip A or Trip B odometers.

The trip odometers are capable of displaying values from 0-9999.9 MI or KM.

When the maximum value is reached, the trip odometer will roll over to 0.0.

Timer

The Timer is displayed as XX (hours) : XX (minutes) : XX (seconds).

The Timer is started and stopped using the DIC Select button.

Holding the Select button for longer than 3 seconds while the Timer parameter is displayed will reset the Timer to 00:00:00.

The Timer status and data value is retained in memory when the ignition is turned OFF. When the ignition is turned ON again, the Timer status and data value is resumed.

The Timer maximum value is 99:59:59. When the maximum is reached, the Timer rolls over to 00:00:00 and continues to operate.

Tire Pressures

Press the trip information button until TIRE PRESSURES appears on the display. This mode shows the tire pressure in pounds per square inch (psi) or kilopascals (kPa). Press the select button to scroll through the following information:

- LF TIRE XX PSI
- RF TIRE XX PSI
- RR TIRE XX PSI
- LR TIRE XX PSI

Fuel Information

DIC Fuel Information / Reset Capabilities

The available DIC Fuel Information and reset capabilities are as follows:

- Range - Can not be reset
- Avg. Fuel Economy - Can be reset
- Inst. Fuel Economy - Can not be reset
- Engine Oil Life - Can be reset

Range

The range display is the estimated distance that the vehicle can travel under current fuel economy and fuel level conditions.

This range is calculated from odometer information and class 2 messages.

Fuel Range is capable of displaying values from 0 - 999 MI or km.

Display appears as: RANGE: XXX MILES (English), RANGE: XXX km (Metric).

If the range is less than 40 miles, RANGE: LOW will be displayed.

Average Fuel Economy

The Average Fuel Economy (AFE) value is calculated by the cluster based on Trip Distance and Trip Fuel Used.

Pressing the Select button for longer than 3 seconds while the Average Fuel Economy is displayed in the DIC will reset both the Trip Distance and Trip Fuel Used to 0.0.

Average Fuel Economy is capable of displaying values from 0.0-99.9.

Display appears as: AVG MPG XX.X (English), AVG L/100km XX.X XX (Metric), AVG km/l XX.X (Japanese).

Trip Distance and Trip Fuel Used accumulated values are stored in memory when the ignition is turned OFF.

Instantaneous Fuel Economy

Instantaneous Fuel Economy values are calculated by the cluster from odometer information and class 2 messages.

The cluster calculates instantaneous fuel economy based on distance and fuel.

Instantaneous fuel economy is capable of displaying values from 0.0-99.9.

Display appears as INST MPG XX.X (English), INST L/100km XX.X (Metric), INST km/l XX.X (Japanese).

Values for the Instantaneous fuel economy are not stored when the ignition is turned OFF.

Engine Oil Life

Engine Oil Life percentage values are based on class 2 messages to the IPC. The IPC requests this value when Engine Oil Life is selected on the DIC.

Engine Oil Life is capable of displaying values from 0-100%.

Pressing the Select button for longer than 5 seconds while Engine Oil Life is displayed on the DIC the value will reset to 100%.

Display appears as ENGINE OIL LIFE: XXX%.

Feature Programming

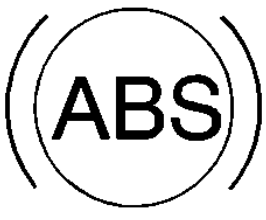
Refer to **Personalization Description and Operation** .

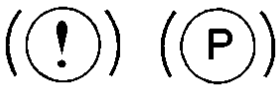
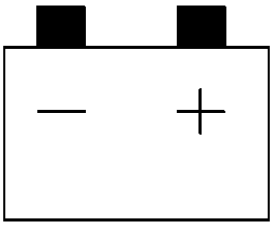
Driver Warnings

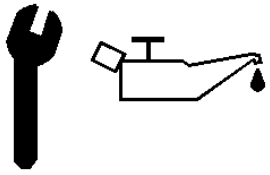
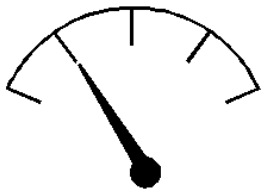
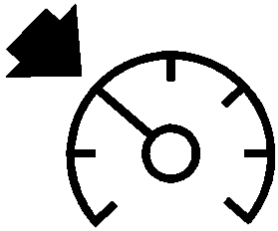
For the list of Driver Warnings, refer to **Indicator/Warning Message Description and Operation**.

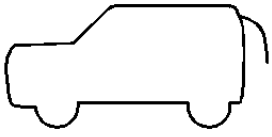
INDICATOR/WARNING MESSAGE DESCRIPTION & OPERATION

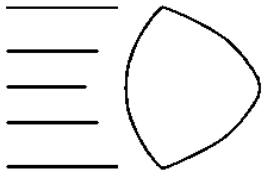
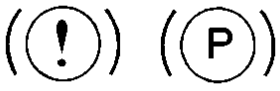
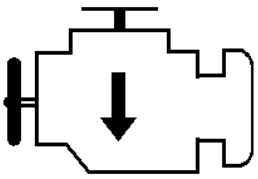
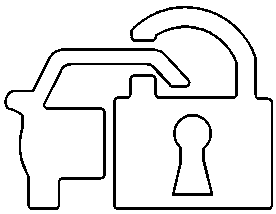
Indicators

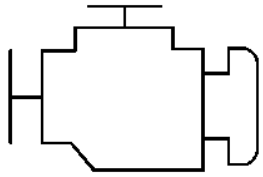
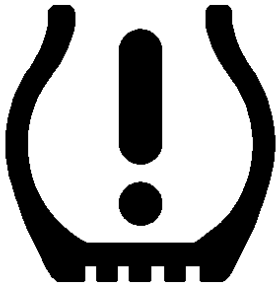
Symbol	Reference
	ABS: Refer to **ABS Description and Operation**

	Air Bag: Refer to **SIR System Description and Operation**
 (Canada)	Brake: Refer to **Brake Warning System Description and Operation**
 BRAKE (U.S.)	Brake: Refer to **Brake Warning System Description and Operation**
	Charge: Refer to **Charging System Description and Operation**
	CHANGE ENG OIL: Refer to **Indicator/Warning**

	Message Description and Operation
 (Canada) CHANGE ENG OIL (U.S.)	
 (Canada) CHECK GAGES (U.S.)	CHECK GAGES: Refer to **Indicator/Warning Message Description and Operation**
 CHECK GAS CAP	CHECK GAS CAP: Refer to **Indicator/Warning Message Description and Operation**
	CRUISE: Refer to **Cruise Control Description and Operation**

(Canada) CRUISE (U.S.)	
	Fasten Safety Belt: Refer to **Seat Belt System Description and Operation**
 FASTEN PASSENGER SAFETY BELT	FASTEN PASSENGER SAFETY BELT: Refer to **Seat Belt System Description and Operation**
 (Canada) GATE AJAR (U.S.)	GATE AJAR: Refer to **Liftgate/Liftgate Window Ajar Indicator Malfunction**
	High Beam: Refer to **Exterior Lighting Systems Description and Operation**

	
Low Fuel	Low Fuel: Refer to **Indicator/Warning Message Description and Operation**
OVERSPEED	OVERSPEED: Refer to **Indicator/Warning Message Description and Operation**
 PARK BRAKE	Park Brake: Refer to **Park Brake System Description and Operation**
 (Canada) REDUCED ENGINE POWER (U.S.)	REDUCED ENGINE POWER: Refer to **Engine Control Module Description** for the 4.2L engine or Engine Control Module Description for the 4.8L, 5.3L, 6.0L, 6.2L, or 7.0L engine
 (Canada) SECURITY (U.S.)	SECURITY: Refer to **Immobilizer Description and Operation**

 (Canada) SERVICE ENGINE SOON (U.S.)	Malfunction Indicator Lamp (MIL): Refer to **Engine Control Module Description** for the 4.2L engine or Engine Control Module Description for the 4.8L, 5.3L, 6.0L, 6.2L, or 7.0L engine
	Stability System Active: Refer to **ABS Description and Operation**
	Tire Pressure Monitor: Refer to **Tire Pressure Monitor Description and Operation**
	Turn Signals: Refer to **Exterior Lighting Systems Description and Operation**

DIC Warning Messages

Message	Reference
BATTERY NOT CHARGING	Refer to **Charging System Description and Operation**
CHANGE ENGINE OIL	Refer to **Indicator/Warning Message Description and Operation**
CHECK OIL LEVEL	Refer to **Indicator/Warning Message Description and Operation**
CHECK TIRE PRESSURE	Refer to **Tire Pressure Monitor Description and Operation**
CHECK WASHER FLUID	Refer to **Wiper/Washer System Description and Operation**
CURB VIEW ACTIVATED	Refer to **Outside Mirror Description and Operation (Heated Mirrors)**
DRIVER DOOR AJAR	Refer to **Door Ajar Indicator Description and Operation**
ENGINE COOLANT HOT IDLE ENGINE	Refer to **Cooling System Description and Operation**
ENGINE OVERHEATED STOP ENGINE	Refer to **Cooling System Description and Operation**
FUEL LEVEL LOW	Refer to **Indicator/Warning Message Description and Operation**
ICE POSSIBLE	Refer to **Indicator/Warning Message Description and Operation**
KEYFOB X BATTERY LOW	Refer to **Keyless Entry System Description and Operation**
LEFT REAR DOOR AJAR	Refer to **Door Ajar Indicator Description and Operation**
OIL LIFE RESET	Refer to **Indicator/Warning Message Description and Operation**
OIL PRESSURE LOW STOP ENGINE	Refer to **Indicator/Warning Message Description and Operation**
PASSENGER DOOR AJAR	Refer to **Door Ajar Indicator Description and Operation**
PROGRAM CLUSTER	Refer to **Indicator/Warning Message Description and Operation**
REAR ACCESS OPEN	Refer to **Liftgate/Liftgate Window Ajar Indicator Malfunction**
REAR WIPER OBSTRUCTION	Refer to **Rear Wiper/Washer System Description and Operation**
RIGHT REAR DOOR AJAR	Refer to **Door Ajar Indicator Description and Operation**
SEATBELT REMINDER	Refer to **Seat Belt System Description and Operation**
SERVICE AIR BAG	Refer to **SIR System Description and Operation**

SERVICE BRAKE SYSTEM	Refer to **Brake Warning System Description and Operation**
SERVICE STABILITY SYS	Refer to **ABS Description and Operation**
SERVICE TIRE MONITOR	Refer to **Tire Pressure Monitor Description and Operation**
STABILITY SYS ACTIVE	Refer to **ABS Description and Operation**
STABILITY SYS DISABLED	Refer to **ABS Description and Operation**
STABILITY SYS READY	Refer to **ABS Description and Operation**
TIGHTEN FUEL CAP	Refer to **Indicator/Warning Message Description and Operation**
TRACTION ACTIVE	Refer to **ABS Description and Operation**
TRACTION SYS LIMITED	Refer to **ABS Description and Operation**
TRANS HOT IDLE ENGINE	Refer to **Transmission Component and System Description**
TURN SIGNAL ON	Refer to **Exterior Lighting Systems Description and Operation**
VEHICLE OVERSPEED	Refer to **Indicator/Warning Message Description and Operation**

CHANGE ENGINE OIL

The instrument panel cluster (IPC) illuminates the CHANGE ENGINE OIL message when the engine control module (ECM) determines that the engine oil should be changed. The IPC receives a class 2 message from the ECM requesting illumination. Once the oil is changed, perform the engine oil monitor reset procedure in order to clear the Change Engine Oil indicator. Refer to **GM Oil Life System Resetting** .

CHECK GAGES

The instrument panel cluster (IPC) illuminates the CHECK GAGES indicator under the following conditions:

- The engine coolant temperature exceeds 125°C (257°F). The IPC receives a class 2 message from the powertrain control module (PCM) indicating the engine coolant temperature.
- The engine oil pressure is low. The IPC receives a class 2 message from the PCM indicating the engine oil pressure.
- The IPC has not been programmed after an IPC replacement. Refer to **Service Programming System (SPS)** .

CHECK GAS CAP

The instrument panel cluster (IPC) illuminates the CHECK GAS CAP indicator in the message center when the gas cap is not tightened properly. The IPC receives a class 2 message from the engine control module (ECM) or the powertrain control module (PCM) indicating fuel tank pressure.

CHECK OIL LEVEL

The instrument panel cluster (IPC) illuminates the CHECK OIL LEVEL message in the driver information center (DIC) when the powertrain control module (PCM) detects a low engine oil level condition. The PCM only monitors the oil level switch signal circuit for a brief period between key on and ignition crank. The IPC receives a class 2 message from the PCM requesting illumination.

FUEL LEVEL LOW

The instrument panel cluster (IPC) illuminates the FUEL LEVEL LOW message in the driver information center (DIC) when the IPC detects that the fuel level is less than a pre-determined value. The IPC receives a class 2 message from the powertrain control module (PCM) indicating fuel level percent.

ICE POSSIBLE

The instrument panel cluster (IPC) illuminates the ICE POSSIBLE message in the DIC when the outside air temperature drops below 4°C (39°F). The IPC receives a class 2 message from the body control module (BCM) indicating the outside air temperature.

OIL LIFE RESET

The instrument panel cluster (IPC) illuminates the OIL LIFE RESET message when the powertrain control module (PCM) determines that the engine oil should be changed. The IPC receives a class 2 message from the PCM indicating the remaining oil life percent. Once the oil is changed, perform the engine oil monitor reset procedure in order to clear the Change Engine Oil indicator. Refer to **GM Oil Life System Resetting** .

OIL PRESSURE LOW STOP ENGINE

The instrument panel cluster (IPC) illuminates the OIL PRESSURE LOW STOP ENGINE message in the driver information center (DIC) when the powertrain control module (PCM) detects a low oil pressure condition with the signal circuit low. The IPC receives a class 2 message from the PCM requesting illumination.

OVERSPEED

The instrument panel cluster (IPC) illuminates the OVERSPEED indicator when the IPC detects that the vehicle speed is more than 120 km/h (75 mph).

PROGRAM CLUSTER

The instrument panel cluster (IPC) illuminates the PROGRAM CLUSTER message in the driver information center (DIC) when the IPC has not been programmed after an IPC replacement. Refer to **Service Programming System (SPS)** .

TIGHTEN FUEL CAP

The instrument panel cluster (IPC) illuminates the TIGHTEN FUEL CAP message in the driver information center (DIC) when the power control module (PCM) detects a low fuel pressure condition. The IPC receives a class 2 message from the PCM requesting illumination.

INSTRUMENT CLUSTER DESCRIPTION & OPERATION

Displays Test

Certain instrument panel cluster (IPC) features are tested when the ignition is turned on in order to verify the features are working properly. The following indicators illuminate for 3 seconds:

- The Antilock Brake System (ABS) indicator
- The brake indicator
- The CHECK GAGES indicator
- The LOW FUEL indicator
- The park brake indicator
- The OVERSPEED indicator
- The REDUCED POWER indicator
- The SECURITY indicator
- The TAILGATE AJAR indicator
- All gages sweep to their minimum physical position and then to their actual physical position.

The following indicators illuminate for the specified times:

- The AIR BAG indicator flashes 7 times.
- The battery indicator stays illuminated with ignition on and engine off.
- The seatbelt indicator illuminates for 20 seconds followed by 55 seconds of flashing with the drivers seatbelt unfastened, or, the seatbelt indicator will illuminate for 8 seconds with the drivers seatbelt fastened.
- The SERVICE ENGINE SOON indicator (MIL) illuminates briefly.
- All message center segments illuminate briefly.

Indicators & Warning Messages

Refer to **Indicator/Warning Message Description and Operation**.

Engine Coolant Temperature Gage

The instrument panel cluster (IPC) displays the engine coolant temperature as determined by the powertrain control module (PCM). The IPC receives a class 2 message from the PCM indicating the engine coolant temperature. The engine coolant temperature gage defaults to 100°F (40°C) or below if:

- The PCM detects a malfunction in the engine coolant temperature sensor circuit.
- The IPC detects a loss of class 2 communications with the PCM.

Engine Oil Pressure Gage

The instrument panel cluster (IPC) displays the engine oil pressure as determined by the powertrain control module (PCM). The IPC receives a class 2 message from the PCM indicating the engine oil pressure. The engine oil pressure gage defaults to 0 psi (0 kPa) or below if:

- The PCM detects a malfunction in the engine oil pressure sensor circuit.
- The IPC detects a loss of class 2 communications with the PCM.

For the 4.2L LL8, the PCM uses an engine oil switch that is open when the oil pressure is normal and closed when the oil pressure is low. At normal pressure, the engine oil pressure gage will display 275 kPa (40 psi). At low pressure, the gage will go to 0 kPa and the low pressure warning will be displayed in the driver information center (DIC). At high pressure, the gage will display 551 kPa (80 psi). Any values between these three values are calculated values determined by the PCM.

Fuel Gage

The instrument panel cluster (IPC) displays the fuel level as determined by the powertrain control module (PCM). The IPC receives a class 2 message from the PCM indicating the fuel level percent. The fuel gage defaults to empty if:

- The PCM detects a malfunction in the fuel level sensor circuit.
- The IPC detects a loss of class 2 communications with the PCM.

When the fuel level is less than a pre-determined value, the IPC illuminates the low fuel indicator.

Odometer

The vehicle odometer is calculated and stored electronically in the instrument panel cluster (IPC). The base IPC contains a season odometer and a trip odometer. The uplevel IPC contains a season odometer and two trip odometers. Momentarily press the trip/reset switch on the IPC in order to toggle between the season odometer and the trip odometer. Press the trip/reset switch for greater than 2 seconds, while the trip odometer is displayed, in order to reset the trip odometer.

The IPC calculates the mileage based on the vehicle speed signal circuit from the powertrain control module (PCM). The odometer will display 'error' if an internal IPC memory failure is detected. The odometer displays either miles or kilometers as requested by the activation of the Personalization button on the steering wheel controls.

PRND321 Display

The instrument panel cluster (IPC) displays the selected gear position as determined by the powertrain control module (PCM). The IPC receives a class 2 message from the PCM indicating the gear position. The PRND321 display blanks if:

- The PCM detects a malfunction in the transmission range switch circuit.
- The IPC detects a loss of class 2 communications with the PCM.

Speedometer

The instrument panel cluster (IPC) displays the vehicle speed based on the information from the powertrain control module (PCM). The PCM converts the data from the vehicle speed sensor to a 4000 pulses/mile signal.

The IPC uses the vehicle speed signal circuit (4000 pulses/mile) from the PCM in order to calculate the vehicle speed. If the IPC detects a malfunction in the vehicle speed signal circuit, the IPC uses the class 2 message from the PCM indicating the vehicle speed.

Tachometer

The instrument panel cluster (IPC) displays the engine speed based on the information from the powertrain control module (PCM). The PCM converts the data from the engine speed sensor to a 2 pulses/engine revolution signal. The IPC uses the engine speed signal circuit (2 pulses/engine revolution) from the PCM in order to calculate the engine speed. If the IPC detects a malfunction in the engine speed signal circuit, the IPC uses the class 2 message from the PCM indicating the engine speed.

Voltmeter

The instrument panel cluster (IPC) displays the vehicle voltage based on the information from the body control module (BCM). The IPC uses class 2 serial data information from the BCM to provide a voltage level indication on the voltmeter.