

2009 ACCESSORIES & EQUIPMENT

Displays and Gages - Avalanche, Escalade, Suburban, Tahoe & Yukon

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

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

SCHEMATIC AND ROUTING DIAGRAMS

INSTRUMENT CLUSTER SCHEMATICS

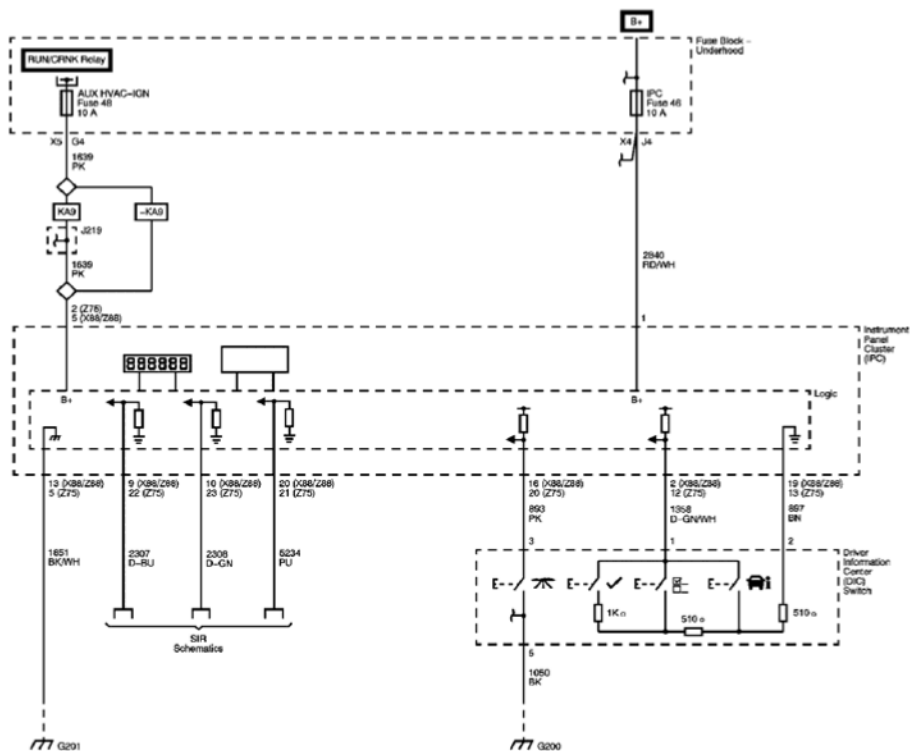


Fig. 1: Power, Ground, and Driver Information Center Switch
Courtesy of GENERAL MOTORS CORP.

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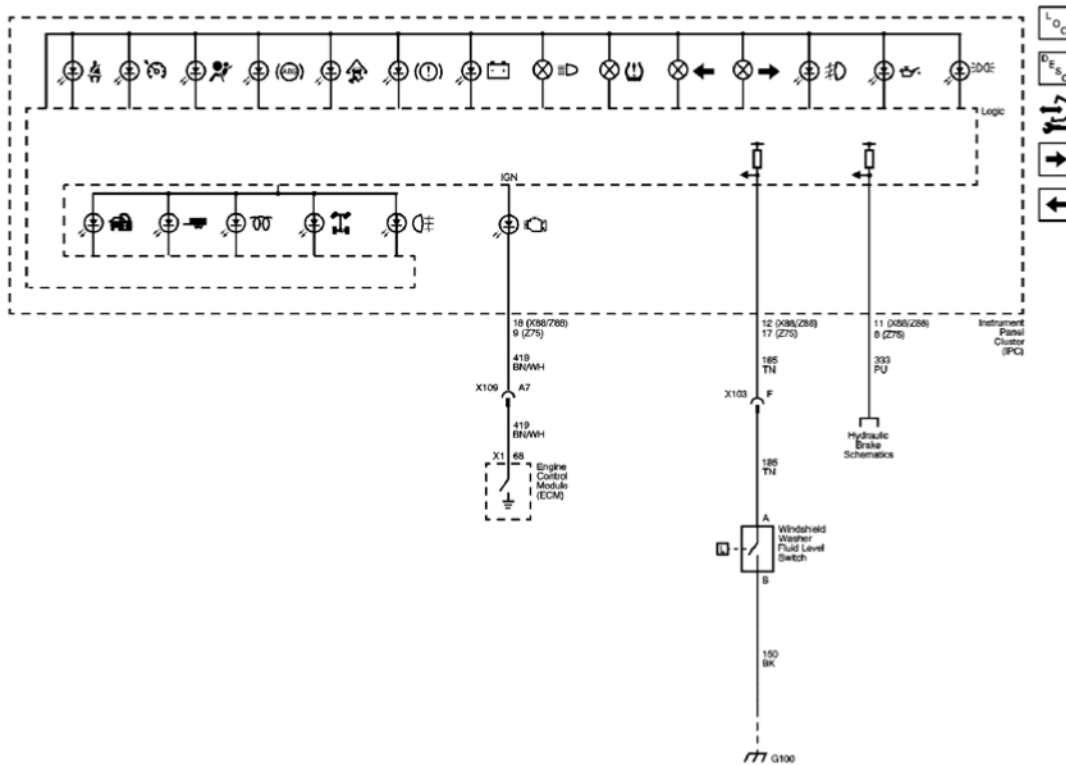


Fig. 2: Indicators

Courtesy of GENERAL MOTORS CORP.

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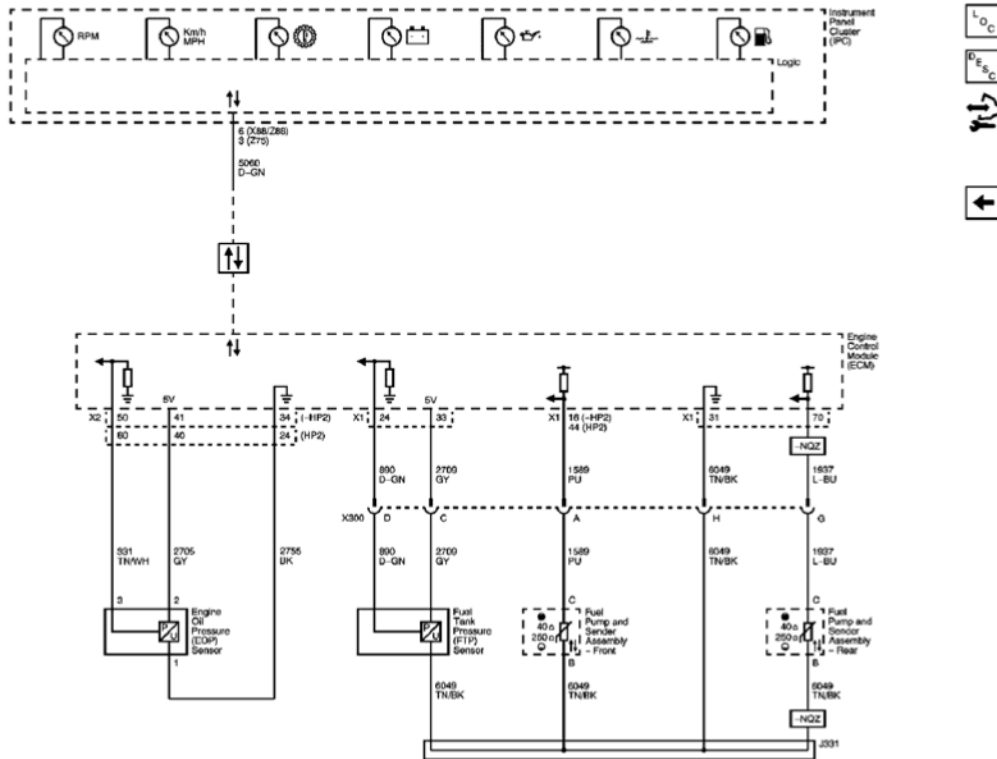


Fig. 3: Gages

Courtesy of GENERAL MOTORS CORP.

DRIVER INFORMATION SYSTEM SCHEMATICS

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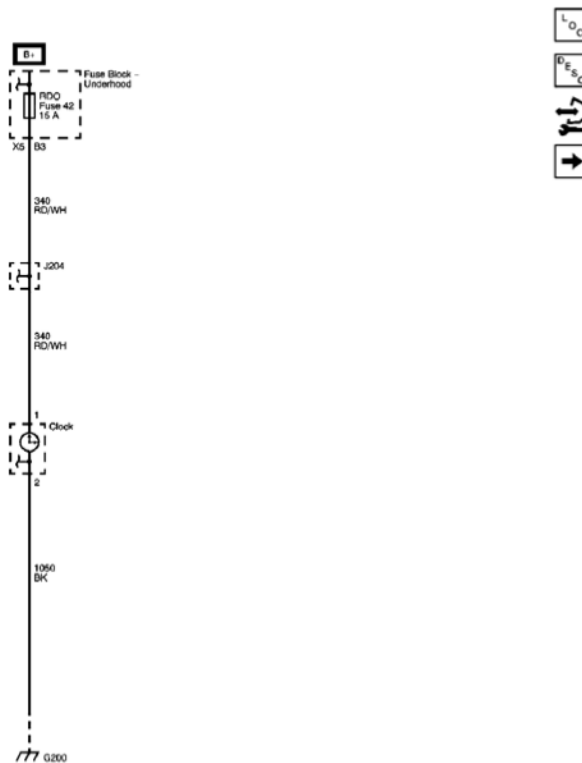


Fig. 4: Analog Clock (Z75)

Courtesy of GENERAL MOTORS CORP.

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AUDIBLE WARNINGS SCHEMATICS

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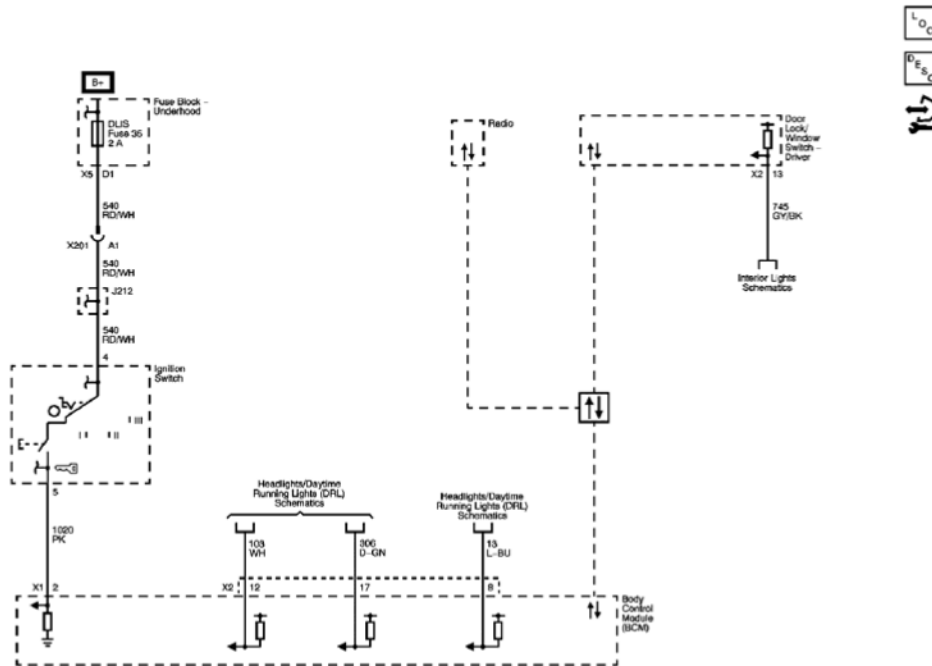


Fig. 6: Audible Warnings Schematic
Courtesy of GENERAL MOTORS CORP.

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>DTC B3567</u>	B3567 01: Driver Information Center (DIC) Select Switch Circuit Short To Battery B3567 59: Driver Information Center (DIC) Select Switch Circuit/Component Protection Time-Out
<u>DTC P0461</u>	P0461: Fuel Level Sensor 1 Performance
<u>DTC P0462</u>	P0462: Fuel Level Sensor 1 Low Voltage
<u>DTC P0463</u>	P0463: Fuel Level Sensor 1 High Voltage
<u>DTC P0464</u>	P0464: Fuel Level Sensor 1 Circuit Intermittent
<u>DTC P0521 (5.3L Engine)</u>	P0521: Engine Oil Pressure (EOP) Sensor Performance
<u>DTC P0521, P0522, or P0523</u>	P0521: Engine Oil Pressure (EOP) Sensor Performance P0522: Engine Oil Pressure (EOP) Sensor Circuit Low Voltage. P0523: Engine Oil Pressure (EOP) Sensor Circuit High Voltage
<u>DTC P2066</u>	P2066: Fuel Level Sensor 2 Performance

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DTC P2067	P2067: Fuel Level Sensor 2 Low Voltage
DTC P2068	P2068: Fuel Level Sensor 2 High Voltage

DIAGNOSTIC STARTING POINT - DISPLAYS AND GAGES

Begin the displays and gages system diagnosis with **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** or the audible warning system diagnosis with **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** . 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 B3567

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** 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 Descriptors

DTC B3567 01

Driver Information Center (DIC) Select Switch Circuit Short To Battery

DTC B3567 59

Driver Information Center (DIC) Select Switch Circuit/Component Protection Time-Out

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
DIC Switch Signal	1	1	B3567 01	B3567 59
DIC Select Switch Signal	1	1	1	B3567 59
DIC Switch Low Reference	-	1	-	-
DIC Switch Ground	-	1	-	-

1. Driver Information Center (DIC) Switch Inoperative

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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). The IPC interfaces with the DIC switches via 3 discreet circuits. The switch input to the cluster is pulled low or grounded when a switch is activated. The IPC reads the voltage at the analog input to determine which switches is pressed. The switch input to the cluster is set up in a resistor ladder format for three of the four switches. The DIC switches include the PERSONALIZATION, SET/RESET, TRIP/FUEL, AND VEHICLE INFO switches. A stuck switch or a short to battery sets a DTC.

Conditions for Running the DTC

The ignition is in ACCESSORY or RUN.

Conditions for Setting the DTC

B3567 59

The IPC detects that the DIC switch is stuck.

B3567 01

The IPC detects that the DIC switch signal circuit is shorted to battery.

Action Taken When the DTC Sets

The IPC ignores the DIC switch inputs.

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.

Diagnostic Aids

- When the DIC switches are stuck, only the TRIP/FUEL switch functions correctly. When the TRIP/FUEL switch is stuck, all other DIC switches function correctly.
- Only the DIC signal circuit can be diagnosed as shorted to battery.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

- **Driver Information Center (DIC) 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 that when the DIC switches are pressed and released the DIC scan tool parameters toggle between Active and Inactive.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the DIC switch assembly.
2. Ignition OFF, test for less than 1 ohm between the low reference terminal 2 and ground.
 - If greater than the specified range, test the low reference circuit for an open/high resistance.
3. Ignition OFF, test for less than 5 ohms between the ground circuit terminal 5 and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance.
4. Ignition ON, verify that all of the scan tool DIC Switch parameters are Inactive.
 - If any are not Inactive, test the signal circuit terminal listed below for a short to ground. If the circuit tests normal, replace the IPC.
 - DIC Switch Signal Terminal 1
 - DIC Select Switch Signal Terminal 3
5. Ignition ON, install a 3A fused jumper wire between the signal circuit terminal 1 and the low reference circuit terminal 2. Verify the scan tool DIC Switch parameters, except the DIC Fuel Info. parameter, are Active.
 - If any are not Active, test the signal circuit for a short to voltage or an open/high resistance. If the circuit tests normal, replace the IPC.
6. Ignition ON, install a 3A fused jumper wire between the signal circuit terminal 3 and ground. Verify the scan tool DIC Fuel Info. parameter is Active.
 - If not Active, test the signal circuit for a short to voltage or and open/high resistance. If the circuit

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tests normal, replace the IPC.

7. 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.

- **Driver Information Display Switch Replacement (Cadillac)** or **Driver Information Display Switch Replacement (Except Cadillac)**
- **Control Module References** for the IPC replacement, setup, and programming

DTC P0461

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** 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 1 Performance

Diagnostic Fault Information

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

Circuit/System Description

The fuel level sensor changes resistance in response to the fuel level. The engine control module (ECM) monitors the signal circuit of the fuel level sensor in order to determine the fuel level. When the fuel tank is full, the sensor resistance is low and the ECM senses a low signal voltage. When the fuel tank is empty, the sensor resistance is high and the ECM senses a high signal voltage. The ECM uses the signal circuit of the fuel level sensor in order to calculate the percentage of remaining fuel in the tank. The ECM sends the fuel level percentage via the serial data circuit to the instrument cluster in order to control the fuel gage.

This diagnostic tests for a stuck fuel level sensor signal. The ECM sets this DTC if the fuel level sensor signal

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appears to be stuck based on a lack of signal variation expected during normal operation.

Conditions for Running the DTC

The engine is running.

Conditions for Setting the DTC

The ECM detects a change in fuel level less than 10 liters (2.64 gallons) over a distance of 241.4 km (150 miles).

Action Taken When the DTC Sets

- The fuel gage defaults to empty.
- The low fuel indicator illuminates.
- The ECM records the operating conditions at the time that the diagnostic test fails. The ECM 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

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Control Module References for Scan Tool Information

Component Testing

1. Ignition OFF, remove the fuel level sender and verify there are no obstructions interfering with the fuel level sender.
 - o If any interference is present, repair the fuel sender interference.
2. Ignition OFF, disconnect the harness connector at the fuel level sensor.
3. While sweeping the fuel level sensor through its full range of motion, test for a minimum resistance value of less than 41 ohms and a maximum value greater than 119 ohms between the signal terminal C and the low reference terminal B.
 - o 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 6.0L (LFA) engine
- Fuel Level Sensor Replacement (1500 Series w/E85) or Fuel Level Sensor Replacement (2500 - 43.5L (11.5 gal) Tank - Rear) or Fuel Level Sensor Replacement (2500 - 98.4L (26 gal) Tank - Front) or Fuel Level Sensor Replacement (1500 Series) for the 4.8L, 5.3L, 6.0L, 6.2L, or 7.0L engine
- Control Module References for ECM replacement, setup, and programming

DTC P0462

Diagnostic Instructions

- Perform the Diagnostic System Check - Vehicle (with HP2) or Diagnostic System Check - Vehicle (without HP2) 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 1 Low Voltage

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Fuel Level Sensor Signal	P0462	1	P0463, P0464	P0463	P0461
			P0463,		

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Fuel Level Sensor Low Reference	-	1	P0464	P0463	P0461
1. Fuel Gage Inaccurate or Inoperative					

Circuit/System Description

The fuel level sensor changes resistance in response to the fuel level. The engine control module (ECM) monitors the signal circuit of the fuel level sensor in order to determine the fuel level. When the fuel tank is full, the sensor resistance is low and the ECM senses a low signal voltage. When the fuel tank is empty, the sensor resistance is high and the ECM senses a high signal voltage. The ECM uses the signal circuit of the fuel level sensor in order to calculate the percentage of remaining fuel in the tank. The ECM sends the fuel level percentage via the serial data circuit to the instrument cluster in order to control the fuel gage.

Conditions for Running the DTC

- The ignition is ON, with the engine running.
- The system voltage is between 11-18 volts.

Conditions for Setting the DTC

- The sender output is less than 0.5 volt.
- The above condition is present for greater than 30 seconds.

Action Taken When the DTC Sets

- The fuel gage defaults to empty.
- The low fuel indicator illuminates.
- The ECM records the operating conditions at the time that the diagnostic test fails. The ECM 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.

Diagnostic Aids

A defective fuel level sensor most likely will not set DTC P0462. The sensor has a 500 ohm default resistor that will prevent it from meeting the code setting criteria of this DTC. Look for problems in the wiring and in the inline and harness connectors at the sensor and ECM.

Reference Information

Schematic Reference

Instrument Cluster Schematics

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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 parameter is between 4 and 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 parameter is less than 4 percent.
 - If greater than the specified range, test the signal circuit terminal C for a short to ground. If the circuit tests normal, replace the ECM.
3. If all circuits test normal, test or replace the fuel level sensor.

Component Testing

1. Ignition OFF, remove the fuel level sender.
2. While sweeping the fuel level sensor through its full range of motion, test for a minimum resistance value of less than 41 ohms and a maximum value greater than 119 ohms between the signal terminal C and the low reference terminal B.
 - 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 6.0L (LFA) engine
- Fuel Level Sensor Replacement (1500 Series w/E85) or Fuel Level Sensor Replacement (2500 -

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43.5L (11.5 gal) Tank - Rear or **Fuel Level Sensor Replacement (2500 - 98.4L (26 gal) Tank - Front)** or **Fuel Level Sensor Replacement (1500 Series)** for the 4.8L, 5.3L, 6.0L, 6.2L, or 7.0L engine

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

DTC P0463

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** 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 1 High Voltage

Diagnostic Fault Information

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

Circuit/System Description

The fuel level sensor changes resistance in response to the fuel level. The engine control module (ECM) monitors the signal circuit of the fuel level sensor in order to determine the fuel level. When the fuel tank is full, the sensor resistance is low and the ECM senses a low signal voltage. When the fuel tank is empty, the sensor resistance is high and the ECM senses a high signal voltage. The ECM uses the signal circuit of the fuel level sensor in order to calculate the percentage of remaining fuel in the tank. The ECM sends the fuel level percentage via the serial data circuit to the instrument cluster in order to control the fuel gage.

Conditions for Running the DTC

- The ignition is ON, with the engine running.
- The system voltage is between 11-18 volts.

Conditions for Setting the DTC

- The sensor output is greater than 3.5 volts.

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- The above condition is present for greater than 30 seconds.

Action Taken When the DTC Sets

- The fuel gage defaults to empty.
- The low fuel indicator illuminates.
- The ECM records the operating conditions at the time that the diagnostic test fails. The ECM 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.

Diagnostic Aids

A defective fuel level sensor most likely will not set DTC P0463. The sensor has a 500 ohm default resistor that will prevent it from meeting the code setting criteria of this DTC. Look for problems in the wiring and in the inline and harness connectors at the sensor and ECM.

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

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Circuit/System Verification

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

Component Testing

1. Ignition OFF, remove the fuel level sender.
2. While sweeping the fuel level sensor through its full range of motion, test for a minimum resistance value of less than 41 ohms and a maximum value greater than 119 ohms between the signal terminal C and the low reference terminal B.
 - o 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 6.0L (LFA) engine
- **Fuel Level Sensor Replacement (1500 Series w/E85)** or **Fuel Level Sensor Replacement (2500 - 43.5L (11.5 gal) Tank - Rear)** or **Fuel Level Sensor Replacement (2500 - 98.4L (26 gal) Tank - Front)** or **Fuel Level Sensor Replacement (1500 Series)** for the 4.8L, 5.3L, 6.0L, 6.2L, or 7.0L engine
- **Control Module References** for the ECM replacement, setup, and programming

DTC P0464

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** 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

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DTC P0464

Fuel Level Sensor 1 Circuit Intermittent

Diagnostic Fault Information

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

Circuit/System Description

The fuel level sensor changes resistance in response to the fuel level. The engine control module (ECM) monitors the signal circuit of the fuel level sensor in order to determine the fuel level. When the fuel tank is full, the sensor resistance is low and the ECM senses a low signal voltage. When the fuel tank is empty, the sensor resistance is high and the ECM senses a high signal voltage. The ECM uses the signal circuit of the fuel level sensor in order to calculate the percentage of remaining fuel in the tank. The ECM sends the fuel level percentage via the serial data circuit to the instrument cluster in order to control the fuel gage.

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 possible refueling event. A refueling event test is executed to confirm that a refueling event has occurred. If refueling is confirmed, the test for DTC P0464 is considered passing. The refueling event test must pass 2 out of 3 times, 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 less than 30 seconds.
- Both conditions above occur 2 out of 3 times as part of a refueling event test.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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- 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

Special Tools

J 33431-C Instrument Panel Tester. See Special Tools.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the fuel level sensor.
2. Ignition OFF, test for less than 1 ohm between the low reference circuit terminal B 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.
3. Install a Signal Generator and Instrument Panel Tester between the signal circuit terminal C and the low reference circuit terminal B.
4. Ignition ON, vary the signal generator resistance between 40 and 250 ohms. Verify that the scan tool Fuel Tank Level Remaining parameter displays a range that varies between 5 and 95 percent as the signal generator resistance changes.
 - If not within the specified range, test the signal circuit for an open/high resistance. If the circuit

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tests normal, replace the ECM.

5. 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 between the signal terminal C and the low reference terminal B.
 - o 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 6.0L (LFA) engine
- **Fuel Level Sensor Replacement (1500 Series w/E85)** or **Fuel Level Sensor Replacement (2500 - 43.5L (11.5 gal) Tank - Rear)** or **Fuel Level Sensor Replacement (2500 - 98.4L (26 gal) Tank - Front)** or **Fuel Level Sensor Replacement (1500 Series)** for the 4.8L, 5.3L, 6.0L, 6.2L, or 7.0L engine
- **Control Module References** for ECM replacement, setup, and programming

DTC P0521 (5.3L ENGINE)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** 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

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Engine Oil Pressure 5-Volts Reference	P0522	1	P0522	-	P0521
Engine Oil Pressure Sensor Signal	P0522	1	P0522	P0523	P0521
Low Reference	-	1	P0523	-	P0521

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1. Engine Oil Pressure Indicator Malfunction.

Circuit/System Description

The engine oil pressure (EOP) sensor changes voltage based on the engine oil pressure. The EOP sensor is a 3-wire sensor comprising of the signal circuit, the low reference circuit and the 5-volt reference circuit. The engine control module (ECM) supplies 5 volts to the EOP sensor via the 5-volt reference circuit and provides ground via the EOP low reference circuit. The ECM monitors the signal circuit of the EOP sensor to determine if the EOP sensor voltage is within the normal operating range of approximately 1-4 volts. When the engine oil pressure is high, the EOP sensor voltage is high and the ECM senses a high signal voltage. When the engine oil pressure is low, the EOP sensor voltage is low and the ECM senses a low signal voltage. The ECM sends the EOP information to the instrument panel cluster (IPC) via a serial data message. The ECM can also predict oil pressure as a function of engine speed and engine temperature.

Conditions for Running the DTC

- The engine is running with engine speed between 700-3,500 RPM.
- Oil temperature is less than 150°C (302°F).
- Engine load stability is less than 250 kPa (36.2 psi).
- Engine predicted pressure is between 50 kPa (7.3 psi) and 400 kPa (58 psi).
- No crank sensor DTCs set.
- No coolant sensor DTCs set.
- No intake air temperature sensor DTCs set.
- No MAF DTCs set.
- No oil pressure sensor circuit DTCs set.

Conditions for Setting the DTC

The ECM detects that the difference between the predicted oil pressure and the actual oil pressure is either less than 47 kPa (6.8 psi) or greater than 50 kPa (7.3 psi).

Action Taken When the DTC Sets

- The ECM records the operating conditions at the time the diagnostics 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

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Instrument Cluster Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

- Instrument Cluster 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 for scan tool information.

Circuit/System Verification

Engine ON, observe the Engine Oil Pressure Sensor parameter. The reading should be between 41-448 kPa (6-65 psi).

Circuit/System Testing

1. Engine ON, transmission in park, vary the engine speed by 500 RPM.
2. Verify the scan tool Engine Oil Pressure Sensor parameter changes by more than 34.5 kPa (5 psi).
 - If less than 34.5 kPa (5 psi), refer to Oil Pressure Diagnosis and Testing .
3. If the pressure tests normal, 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 P0521, P0522, OR P0523

Diagnostic Instructions

- Perform the Diagnostic System Check - Vehicle (with HP2) or Diagnostic System Check - Vehicle

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(without HP2) 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 Descriptors

DTC P0521

Engine Oil Pressure (EOP) Sensor Performance

DTC P0522

Engine Oil Pressure (EOP) Sensor Circuit Low Voltage.

DTC P0523

Engine Oil Pressure (EOP) Sensor Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Engine Oil Pressure 5-Volt Reference	P0522	1	P0522	P0523	P0521
Engine Oil Pressure Sensor Signal	P0522	1	P0522	P0523	P0521
Low Reference	-	1	P0523	-	P0521
1. Engine Oil Pressure Indicator Malfunction					

Circuit/System Description

The engine oil pressure (EOP) sensor changes voltage based on the engine oil pressure. The EOP sensor is a 3-wire sensor comprising of the signal circuit, the low reference circuit and the 5-volt reference circuit. The engine control module (ECM) supplies 5 volts to the EOP sensor via the 5-volt reference circuit and provides ground via the EOP low reference circuit. The ECM monitors the signal circuit of the EOP sensor to determine the EOP sensor voltage is within the normal operating range of approximately 1-4 volts. When the engine oil pressure is high, the EOP sensor voltage is high and the ECM senses a high signal voltage. When the engine oil pressure is low, the EOP sensor voltage is low and the ECM senses a low signal voltage. The ECM sends the EOP information to the instrument panel cluster (IPC) via GMLAN serial data message.

Conditions for Running the DTC

The engine is running.

Conditions for Setting the DTC

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P0521

The ECM detects that the difference between the predicted oil pressure and the actual oil pressure is either less than 47 kPa (6.8 psi) or greater than 50 kPa (7.3 psi).

P0522

- The ECM detects that the EOP sensor signal circuit is less than 0.1 volt.
- The above condition is present for greater than 10 seconds.

P0523

- The ECM detects that the EOP sensor signal circuit is greater than 4.4 volts.
- The above condition is present for greater than 10 seconds.

Action Taken When the DTC Sets

- The ECM records the operating conditions at the time the diagnostics 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

1. Engine running, observe the scan tool Engine Oil Pressure Sensor parameter. The reading should be between 41-448 kPa (6-65 psi).
2. Verify the engine oil pressure, refer to:
 - **Oil Pressure Diagnosis and Testing** for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engines
 - **Oil Pressure Diagnosis and Testing** for the 6.0L (LFA) engine.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the engine oil pressure (EOP) sensor.
2. Ignition OFF, test for less than 1.0 ohm between the low reference circuit terminal 1 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.
3. Ignition ON, test for 4.8-5.2 volts between the 5-volt reference circuit terminal 2 and ground.
 - If less than the specified range, 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 the specified range, test the 5-volt reference circuit for a short to voltage. If the circuit tests normal, replace the ECM.
4. Verify the scan tool Engine Oil Pressure Sensor parameter is less than 8 kPa (1.2 psi).
 - If greater than the specified range, test the signal circuit terminal 3 for a short to voltage or an open/high resistance. If the circuit tests normal, replace the ECM.
5. Install a 3A 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 550 kPa (80 psi).
 - If less than the specified range, test the signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the ECM.
6. 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** for the 6.0L (LFA) engine
- **Engine Oil Pressure Sensor and/or Switch Replacement** for the 4.8L, 5.3L, 6.0L, 6.2L, or 7.0L engine.
- **Control Module References** for ECM replacement, setup and programming

DTC P2066

Diagnostic Instructions

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- Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** 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 P2066

Fuel Level Sensor 2 Performance

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Fuel Level Sensor Signal Secondary	P2067	1	P2068	P2068	P2066
Fuel Level Sensor Low Reference	-	1	P2068	P2068	P2066
1. Fuel Gage Inaccurate or Inoperative					

Circuit/System Description

The primary fuel level sender and the secondary fuel level sender changes resistance based on fuel level. The engine control module (ECM) monitors the signal circuits of the primary fuel level sender and the secondary fuel level sender in order to determine the fuel level. When the fuel tank is full, the resistances of both fuel level senders are low and the ECM senses a low signal voltage on both the signal circuits of the primary fuel level sender and the secondary fuel level sender. When the fuel tanks are empty, the resistances of the fuel level senders are high and the ECM senses a high signal voltage. The ECM uses the signal circuits of the primary fuel level sender and the secondary fuel level sender in order to calculate the percentage of remaining fuel in the tank. The ECM sends the fuel level percentage via the serial data circuit to the instrument cluster in order to control the fuel gage.

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

Conditions for Running the DTC

- The engine is running.
- Fuel level is greater than 32 liters (8.5 gallons).

Conditions for Setting the DTC

- The ECM detects a change in fuel level less than 3 liters (0.8 gallon) over a distance greater than 282 km (175 miles).
- The vehicle is at rest and the primary fuel tank increases by 3 liters (0.8 gallon) and the secondary fuel tank does not decrease by 3 liters (0.8 gallon) when the transfer pump is on greater than 500 seconds.

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Action Taken When the DTC Sets

- The fuel gage defaults to empty.
- The low fuel indicator illuminates.
- The ECM records the operating conditions at the time that the diagnostic test fails. The ECM 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

Component Testing

1. Ignition OFF, remove the secondary fuel level sender and verify there are no obstructions interfering with the fuel level sender.
 - If any interference is present, repair the fuel sender interference.
2. Ignition OFF, disconnect the harness connector at the secondary fuel level sensor.
3. While sweeping the fuel level sensor through its full range of motion, test for a minimum resistance value of less than 41 ohms and a maximum value greater than 119 ohms between the signal terminal C and the

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low reference terminal B.

- If not within the specified range, replace the secondary fuel level sensor.

Repair Procedures

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

- **Fuel Level Sensor Replacement** for the 6.0L (LFA) engine
- **Fuel Level Sensor Replacement (1500 Series w/E85)** or **Fuel Level Sensor Replacement (2500 - 43.5L (11.5 gal) Tank - Rear)** or **Fuel Level Sensor Replacement (2500 - 98.4L (26 gal) Tank - Front)** or **Fuel Level Sensor Replacement (1500 Series)** for the 4.8L, 5.3L, 6.0L, 6.2L, or 7.0L engine
- **Control Module References** for the ECM replacement, setup, and programming

DTC P2067

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** 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 P2067

Fuel Level Sensor 2 Low Voltage

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Fuel Level Sensor Signal Secondary	P2067	1	P2068	P2068	P2066
Fuel Level Sensor Low Reference	-	1	P2068	P2068	P2066

1. Fuel Gage Inaccurate or Inoperative

Circuit/System Description

The primary fuel level sender and the secondary fuel level sender changes resistance based on fuel level. The engine control module (ECM) monitors the signal circuits of the primary fuel level sender and the secondary fuel level sender in order to determine the fuel level. When the fuel tank is full, the resistances of both fuel level senders are low and the ECM senses a low signal voltage on both the signal circuits of the primary fuel level sender and the secondary fuel level sender. When the fuel tanks are empty, the resistances of the fuel level senders are high and the ECM senses a high signal voltage. The ECM uses the signal circuits of the primary fuel level sender and the secondary fuel level sender in order to calculate the percentage of remaining fuel in the

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tank. The ECM sends the fuel level percentage via the serial data circuit to the instrument cluster in order to control the fuel gage.

Conditions for Running the DTC

- The ignition is ON, with the engine running.
- The system voltage is between 11-18 volts.

Conditions for Setting the DTC

- The secondary sender output is less than 0.5 volt.
- The above condition is present for greater than 30 seconds.

Action Taken When the DTC Sets

- The fuel gage defaults to empty.
- The low fuel indicator illuminates.
- The ECM records the operating conditions at the time that the diagnostic test fails. The ECM 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

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Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Verification

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

Circuit/System Testing

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

Component Testing

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

Repair Procedures

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

- **Fuel Level Sensor Replacement** for the 6.0L (LFA) engine
- **Fuel Level Sensor Replacement (1500 Series w/E85)** or **Fuel Level Sensor Replacement (2500 - 43.5L (11.5 gal) Tank - Rear)** or **Fuel Level Sensor Replacement (2500 - 98.4L (26 gal) Tank - Front)** or **Fuel Level Sensor Replacement (1500 Series)** for the 4.8L, 5.3L, 6.0L, 6.2L, or 7.0L engine
- **Control Module References** for the ECM replacement, setup, and programming

DTC P2068

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** 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

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DTC P2068

Fuel Level Sensor 2 High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Fuel Level Sensor Signal Secondary	P2067	1	P2068	P2068	P2066
Fuel Level Sensor Low Reference	-	1	P2068	P2068	P2066
1. Fuel Gage Inaccurate or Inoperative					

Circuit/System Description

The primary fuel level sender and the secondary fuel level sender changes resistance based on fuel level. The engine control module (ECM) monitors the signal circuits of the primary fuel level sender and the secondary fuel level sender in order to determine the fuel level. When the fuel tank is full, the resistances of both fuel level senders are low and the ECM senses a low signal voltage on both the signal circuits of the primary fuel level sender and the secondary fuel level sender. When the fuel tanks are empty, the resistances of the fuel level senders are high and the ECM senses a high signal voltage. The ECM uses the signal circuits of the primary fuel level sender and the secondary fuel level sender in order to calculate the percentage of remaining fuel in the tank. The ECM sends the fuel level percentage via the serial data circuit to the instrument cluster in order to control the fuel gage.

Conditions for Running the DTC

- The ignition is ON, with the engine running.
- The system voltage is between 9-16 volts.

Conditions for Setting the DTC

- The secondary sensor output is greater than 3.5 volts.
- The above condition is present for greater than 30 seconds.

Action Taken When the DTC Sets

- The fuel gage defaults to empty.
- The low fuel indicator illuminates.
- The ECM records the operating conditions at the time that the diagnostic test fails. The ECM 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.

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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 parameter is between 4-98 percent.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the secondary fuel level sensor.
2. Ignition OFF, test for less than 1 ohm between the low reference circuit terminal B and ground.
 - If greater than the specified range, 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, install a 3-amp fused jumper wire between the secondary signal circuit terminal C and the low reference circuit terminal B. Verify the scan tool Fuel Tank Level Remaining parameter display is greater than 98 percent.
 - If less than the specified range, test the secondary signal circuit for a short to voltage or an open/high resistance. If the circuit tests normal, replace the ECM.
4. If all circuits test normal, test or replace the secondary fuel level sensor.

Component Testing

1. Ignition OFF, remove the secondary fuel level sender.

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2. While sweeping the fuel level sensor through its full range of motion, test for a minimum resistance value of less than 41 ohms and a maximum value greater than 119 ohms between the secondary signal terminal B and the low reference terminal C.
 - o If not within the specified range, replace the secondary fuel level sensor.

Repair Procedures

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

- **Fuel Level Sensor Replacement** for the 6.0L (LFA) engine
- **Fuel Level Sensor Replacement (1500 Series w/E85)** or **Fuel Level Sensor Replacement (2500 - 43.5L (11.5 gal) Tank - Rear)** or **Fuel Level Sensor Replacement (2500 - 98.4L (26 gal) Tank - Front)** or **Fuel Level Sensor Replacement (1500 Series)** for the 4.8L, 5.3L, 6.0L, 6.2L, or 7.0L engine
- **Control Module References** for the ECM replacement, setup, and programming

SYMPTOMS - DISPLAYS AND GAGES

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

1. Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)**, 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:
 - **Instrument Cluster Description and Operation**
 - **Indicator/Warning Message Description and Operation**
 - **Driver Information Center (DIC) Description and Operation**
 - **Audible Warnings 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 for proper fluid level.

Intermittent

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

Symptom List

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

Gages and Odometer

- Driver Efficiency Gage Inaccurate or Inoperative
- Fuel Gage Inaccurate or Inoperative (Single Tank) or Fuel Gage Inaccurate or Inoperative (Dual Tank)
- Instrument Cluster Gages Inoperative

Indicators

- Compass Malfunction
- Engine Oil Pressure Indicator Malfunction
- Door Ajar Indicator Malfunction
- Service Indicator Always On for the MP 3023/3024-NQH transfer case
- Brake Warning Indicator Malfunction
- ABS Indicator Malfunction for the ABS - Hybrid
- ABS Indicator Malfunction for the ABS - Non-Hybrid Greater than Equal to 3900
- ABS Indicator Malfunction for the ABS - Non-Hybrid Less than 3900 kg (8600 lb)
- StabiliTrak Indicator Malfunction for the ABS - Hybrid
- StabiliTrak Indicator Malfunction for the ABS - Non-Hybrid Greater than Equal to 3900
- StabiliTrak Indicator Malfunction for the ABS - Non-Hybrid Less than 3900 kg (8600 lb)
- Low Tire Pressure Indicator Malfunction
- Charge Indicator Malfunction
- Hourmeter Inaccurate or Inoperative
- Malfunction Indicator Lamp (MIL) Diagnosis for the 4.8L, 5.3L, 6.0L, 6.2L, or 7.0L engine
- Tow/Haul Switch/Indicator Always On or Inoperative for the 4L60-E/4L65-E/4L70-E automatic transmission
- Tow/Haul Switch/Indicator Always On or Inoperative for the 6L50/6L80/6L90 automatic transmission
- Low Washer Fluid Indicator Malfunction
- Turn Signal Lamps and/or Indicators Malfunction
- Door Ajar Indicator Malfunction
- Liftgate/Liftgate Window Ajar Indicator Malfunction (Manual Liftgate) or Liftgate/Liftgate Window Ajar Indicator Malfunction (Power Liftgate)
- Air Bag Indicator Circuit Malfunction
- Passenger Presence System Indicator Circuit Malfunction
- Seat Belt Indicator Circuit Malfunction - Driver
- Seat Belt Indicator Circuit Malfunction - Passenger
- Security Indicator Malfunction

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- **Outside Air Temperature Display Inaccurate or Inoperative**

Driver Information Center (DIC)

Driver Information Center (DIC) Switch Malfunction

Audible Warnings

Chime Malfunction

CHARGE INDICATOR MALFUNCTION

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** 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) uses the generator turn ON signal circuit to control the load of the generator on the engine. A high side driver in the ECM applies a voltage to the voltage regulator. This signals the voltage regulator to turn the field circuit ON and OFF. The ECM monitors the state of the generator turn ON signal circuit. The ECM 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 should detect high voltage on the generator turn on signal circuit. The ECM performs key ON and RUN tests to determine the status of the generator turn on signal circuit. If a malfunction is detected the ECM will illuminate the charge indicator in the instrument panel cluster (IPC).

Reference Information

Schematic Reference

- **Instrument Cluster Schematics**
- **Starting and Charging Schematics**
- **Starting and Charging Schematics** - Hybrid

Connector End View Reference

Component Connector End Views

Description and Operation

- **Instrument Cluster Description and Operation**
- **Charging System Description and Operation**

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- **Charging System Description and Operation** - Hybrid

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

1. Ignition ON, engine running, verify the scan tool Battery Voltage parameter is between 12.5 and 15.5 volts.
 - If not within the specified range, refer to **Charging System Test** . If a hybrid vehicle, refer to **Charging System Test** .
2. Ignition ON, perform the display test with the scan tool. The charge indicator should turn ON and OFF when changing between the commanded states.
 - If the indicator does not turn ON and OFF between commanded states, 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

CLOCK MALFUNCTION

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** 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.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Clock B+	1	1	-	-
Clock Ground	-	1	1	-

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1. Clock Malfunction

Circuit/System Description

The instrument panel is equipped with an analog clock. The analog clock utilizes the clock B+ circuit and the clock ground circuit to operate.

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 clock.
2. Ignition OFF, test for less than 5 ohms between the ground circuit terminal 2 and ground.
 - If greater than the specified value, test the ground circuit for a short to voltage or an open/high resistance.
3. Verify that a test lamp illuminates between the B+ circuit terminal 1 and the ground circuit terminal 2.
 - If the test lamp does not illuminate, test the B+ circuit for a short to ground or an open/high resistance.
4. If all circuits test normal, test or replace the clock.

Repair Procedures

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

Clock Replacement

CHIME MALFUNCTION

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** 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.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Key In Ignition B+	1	1	-	-
Key In Ignition Signal	1	1	1	-
1. Chime Malfunction				

Circuit/System Description

The radio generates the audible warning through the left speaker. The radio receives audible warning requests via the serial data circuit from the instrument panel cluster (IPC) or the body control module (BCM).

Reference Information

Schematic Reference

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

Connector End View Reference

Component Connector End Views

Description and Operation

Audible Warnings Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

IMPORTANT: Before performing this diagnostics, make sure no indicator(s) are illuminated after the IPC performs the displays test. If any indicators are illuminated after the bulb test, perform the indicator diagnostics before this diagnostic.

1. Ignition ON, headlamp switch OFF, verify the scan tool Headlamp Switch ON parameter is Inactive.
 - If not Inactive, refer to **Headlamps Malfunction (With X88, Z75, and Z88)** or **Headlamps Malfunction (With T4Q)** .
2. Ignition ON, park lamp switch OFF, verify the scan tool Park Lamp Switch parameter is Inactive.
 - If not Inactive, refer to **Park, License, and/or Tail Lamps Malfunction (With X88, Z75, and Z88)** or **Park, License, and/or Tail Lamps Malfunction (Front LED Park/Marker Lamps with T4Q)** .
3. Ignition ON, doors closed, verify the scan tool Door Ajar Switch parameters are Inactive.
 - If not Inactive, refer to **Courtesy Lamps Malfunction** .
4. 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** .
5. Verify that the Key In Ignition Status parameter is Key In when the key is in the ignition and Key Out when the key is out of the ignition.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the ignition switch.
2. Ignition ON, verify that a test lamp illuminates between the B+ circuit terminal 4 and ground.
 - If the test lamp does not illuminate, test the B+ circuit for a short to ground or an open/high resistance. If the circuit tests normal and the DLIS circuit fuse is open, test the signal circuit terminal 5 for a short to ground.
3. Verify the scan tool Key In Ignition Status parameter is Key Out.
 - If not the specified value, test the signal circuit terminal 5 for a short to voltage. If the circuit tests normal, replace the BCM.
4. Install a 3A fused jumper wire between the signal circuit terminal 5 and the B+ circuit terminal 4. Verify the scan tool Key In Ignition Status parameter is Key In.
 - If not the specified value, test the signal circuit for an open/high resistance. If the circuit tests normal, replace the BCM.
5. If all circuits test normal, test or replace the ignition switch.

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Repair Procedures

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

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

COMPASS MALFUNCTION

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** 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.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Compass Voltage	1	1	-	-
Compass LIN 3	1	1	1	-
Compass Ground	-	1	1	-
1. Compass Malfunction				

Circuit/System Description

The compass module communicates with the body control module (BCM) through the local interconnect network 3 (LIN) data circuit. The instrument panel cluster (IPC) receives compass information from the BCM via the serial data circuit. The IPC displays compass information in the driver information center (DIC).

Diagnostic Aids

- Check for aftermarket equipment installed or personal items that could create a magnetic field that could affect the performance of the compass.
- Cycle the ignition before performing the compass magnetic variation adjustment procedure.
- Check that the compass module is properly installed in the vehicle. The embossed arrow on the module should be parallel with the centerline of the vehicle.

Reference Information

Schematic Reference

Instrument Cluster Schematics

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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 Verification

Ignition ON, compass ON, verify that there is a correct compass reading on the DIC.

- If the compass is incorrect, refer to Compass Display Is Incorrect BELOW.
- If the compass shows CAL, refer to Compass Displays CAL BELOW.
- If the compass displays "- -" (dashes) or is blank, refer to Compass Displays No Heading BELOW.

Circuit/System Testing

Compass Display Is Incorrect

1. Adjust or change the compass zone using the world magnetic variation map. Refer to Compass Calibration and Magnetic Variance.
 - If the compass is still incorrect, perform the compass magnetic variation adjustment procedure. Refer to Compass Calibration and Magnetic Variance.
2. If the compass is still incorrect, replace the compass module.

Compass Displays CAL

1. Perform the compass magnetic variation adjustment procedure. Refer to Compass Calibration and Magnetic Variance.
2. If the compass still displays CAL, replace the compass module.

Compass Displays No Heading

1. Ignition OFF, disconnect the harness connector at the compass module.
2. Test for less than 5 ohm between the low reference circuit terminal 2 and ground.
 - If greater than the specified range, test the circuit for a short to voltage or an open/high resistance.
3. Ignition ON, verify that a test lamp illuminates between the voltage circuit terminal 1 and ground.
 - If the test lamp does not illuminate, repair the circuit for a short to ground or an open/high resistance.
4. Ignition OFF, test for greater than 1 ohm between the compass LIN 3 data circuit terminal 3 and ground.
 - If less than the specified range, test the LIN 3 data circuit for a short to ground.
5. Ignition ON, verify that a test lamp does not illuminate between the compass LIN 3 data circuit terminal 3 and ground
 - If the test lamp illuminates, test the LIN 3 data circuit for a short to voltage.
6. Ignition OFF, disconnect the X4 harness connector at the BCM.
7. Test for less than 1 ohm between the compass LIN 3 data circuit terminal 3 to the BCM terminal 6.
 - If greater than the specified range, repair the LIN 3 data circuit for an open/high resistance.
8. If all circuits test normal, replace the compass module.

Repair Procedures

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

Control Module References for compass module replacement, setup, and programming

DRIVER EFFICIENCY GAGE INACCURATE OR INOPERATIVE**Diagnostic Instructions**

- Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** 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 driver efficiency gage shows when the vehicle is operating at a fuel efficient point. There are several zones on the gage indicating different levels of efficiency. The gage shall indicate fuel efficiency when the engine is running and will be set at the minimum scale position when the ignition transitions to a mode other than when the engine is running. The gage will set at its half scale position when there is a loss of communication. The engine control module (ECM) provides information to the instrument panel cluster (IPC) for the driver efficiency gage via the serial data circuit.

Reference Information

2009 Cadillac Escalade

2009 ACCESSORIES & EQUIPMENT Displays and Gages - Avalanche, Escalade, Suburban, Tahoe & Yukon

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 driver efficiency gage sweep test with the scan tool. Verify that the driver efficiency gage sweeps from its low to high position.

- If the driver efficiency 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

DRIVER INFORMATION CENTER (DIC) SWITCH MALFUNCTION

Diagnostic Instructions

- Perform the Diagnostic System Check - Vehicle (with HP2) or Diagnostic System Check - Vehicle (without HP2) 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.

Diagnostic Fault Information

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Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
DIC Switch Signal	1	1	B3567 01	B3567 59
DIC Select Switch Signal	1	1	1	B3567 59
DIC Switch Low Reference	-	1	-	-
DIC Switch Ground	-	1	-	-
1. Driver Information Center (DIC) Switch Inoperative				

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). The IPC interfaces with the DIC switches via 3 discreet circuits. The switch input to the cluster is pulled low or grounded when a switch is activated. The IPC reads the voltage at the analog input to determine which switch(es) is pressed. The switch input to the cluster is set up in a resistor ladder format for three of the four switches. The DIC switches include the PERSONALIZATION, SET/RESET, TRIP/FUEL, AND VEHICLE INFO switches. A stuck switch or a short to battery sets a DTC.

Reference Information

Schematic Reference

Instrument Cluster 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 Verification

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Ignition ON, verify that when the DIC switches are pressed and released the DIC scan tool parameters toggle between Active and Inactive.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the DIC switch assembly.
2. Ignition OFF, test for less than 1 ohm between the low reference terminal 2 and ground.
 - If greater than the specified range, test the low reference circuit for an open/high resistance.
3. Ignition OFF, test for less than 5 ohms between the ground circuit terminal 5 and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance.
4. Ignition ON, verify that all of the scan tool DIC Switch parameters are Inactive.
 - If any are not Inactive, test the signal circuit terminal listed below for a short to ground. If the circuit tests normal, replace the IPC.
 - DIC Switch Signal Terminal 1
 - DIC Select Switch Signal Terminal 3
5. Ignition ON, install a 3A fused jumper wire between the signal circuit terminal 1 and the low reference circuit terminal 2. Verify the scan tool DIC Switch parameters, except the DIC Fuel Info. parameter, are Active.
 - If any are not Active, test the signal circuit for a short to voltage or an open/high resistance. If the circuit tests normal, replace the IPC.
6. Ignition ON, install a 3A fused jumper wire between the signal circuit terminal 3 and ground. Verify the scan tool DIC Fuel Info. parameter is Active.
 - If not Active, test the signal circuit for a short to voltage or an open/high resistance. If the circuit tests normal, replace the IPC.
7. 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.

- **Driver Information Display Switch Replacement (Cadillac)** or **Driver Information Display Switch Replacement (Except Cadillac)**
- **Control Module References** for IPC replacement, setup, and programming

ENGINE OIL PRESSURE GAGE INACCURATE OR INOPERATIVE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** 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.

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Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Engine Oil Pressure 5-Volt Reference	P0522	1	P0522	P0523	P0521
Engine Oil Pressure Sensor Signal	P0522	1	P0522	P0523	P0521
Low Reference	-	1	P0523	-	P0521
1. Engine Oil Pressure Indicator Malfunction					

Circuit/System Description

The engine oil pressure (EOP) sensor changes voltage based on the engine oil pressure. The EOP sensor is a 3-wire sensor comprising of the signal circuit, the low reference circuit and the 5-volt reference circuit. The engine control module (ECM) supplies 5 volts to the EOP sensor via the 5-volt reference circuit and provides ground via the EOP low reference circuit. The ECM monitors the signal circuit of the EOP sensor to determine the EOP sensor voltage is within the normal operating range of approximately 1-4 volts. When the engine oil pressure is high, the EOP sensor voltage is high and the ECM senses a high signal voltage. When the engine oil pressure is low, the EOP sensor voltage is low and the ECM senses a low signal voltage. The ECM sends the EOP information via the serial data circuit to the body control module (BCM). The BCM then sends the EOP information to the instrument panel cluster (IPC) via the 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
- 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 for scan tool information

Circuit/System Verification

1. Engine running, observe the scan tool Engine Oil Pressure Sensor parameter. The reading should be between 41-448 kPa (6-65 psi).
2. Verify the engine oil pressure, refer to:
 - **Oil Pressure Diagnosis and Testing** for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engines
 - **Oil Pressure Diagnosis and Testing** for the 6.0L (LFA) engine.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the engine oil pressure (EOP) sensor.
2. Ignition OFF, test for less than 1.0 ohm between the low reference circuit terminal 1 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.
3. Ignition ON, test for 4.8-5.2 volts between the 5-volt reference circuit terminal 2 and ground.
 - If less than the specified range, 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 the specified range, test the 5-volt reference circuit for a short to voltage. If the circuit tests normal, replace the ECM.
4. Verify the scan tool Engine Oil Pressure Sensor parameter is less than 8 kPa (1.2 psi).
 - If greater than the specified range, test the signal circuit terminal 3 for a short to voltage or an open/high resistance. If the circuit tests normal, replace the ECM.
5. Install a 3A 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 550 kPa (80 psi).
 - If less than the specified range, test the signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the ECM.
6. Ignition ON, with a scan tool perform the IPC Gages sweep test.
 - If the engine oil pressure gage 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** for the 6.0L (LFA) engine
- **Engine Oil Pressure Sensor and/or Switch Replacement** for the 4.8L, 5.3L, 6.0L, 6.2L, or 7.0L engine.
- **Control Module References** for the PCM or IPC replacement, setup, and programming

ENGINE OIL PRESSURE INDICATOR MALFUNCTION

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Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** 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.

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Engine Oil Pressure 5-Volt Reference	P0522	1	P0522	P0523	P0521
Engine Oil Pressure Sensor Signal	P0522	1	P0522	P0523	P0521
Low Reference	-	1	P0523	-	P0521
1. Engine Oil Pressure Indicator Malfunction					

Circuit/System Description

The engine oil pressure (EOP) sensor changes voltage based on the engine oil pressure. The EOP sensor is a 3-wire sensor comprising of the signal circuit, the low reference circuit and the 5-volt reference circuit. The engine control module (ECM) supplies 5 volts to the EOP sensor via the 5-volt reference circuit and provides ground via the EOP low reference circuit. The ECM monitors the signal circuit of the EOP sensor to determine the EOP sensor voltage is within the normal operating range of approximately 1-4 volts. When the engine oil pressure is high, the EOP sensor voltage is high and the ECM senses a high signal voltage. When the engine oil pressure is low, the EOP sensor voltage is low and the ECM senses a low signal voltage. The ECM sends the EOP information via the serial data circuit to the body control module (BCM). The BCM then sends the EOP information to the instrument panel cluster (IPC) via the 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**
- **Indicator/Warning Message Description and Operation**

Electrical Information Reference

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- **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

1. Engine running, observe the scan tool Engine Oil Pressure Sensor parameter. The reading should be between 41-448 kPa (6-65 psi).
2. Verify the engine oil pressure, refer to:
 - **Oil Pressure Diagnosis and Testing** for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engines
 - **Oil Pressure Diagnosis and Testing** for the 6.0L (LFA) engine.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the engine oil pressure (EOP) sensor.
2. Ignition OFF, test for less than 1.0 ohm between the low reference circuit terminal 1 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.
3. Ignition ON, test for 4.8-5.2 volts between the 5-volt reference circuit terminal 2 and ground.
 - If less than the specified range, 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 the specified range, test the 5-volt reference circuit for a short to voltage. If the circuit tests normal, replace the ECM.
4. Verify the scan tool Engine Oil Pressure Sensor parameter is less than 8 kPa (1.2 psi).
 - If greater than the specified range, test the signal circuit terminal 3 for a short to voltage or an open/high resistance. If the circuit tests normal, replace the ECM.
5. Install a 3A 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 550 kPa (80 psi).
 - If less than the specified range, test the signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the ECM.
6. Ignition ON, command the indicators OFF with the scan tool.
 - If the EOP indicator does not turn OFF, 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.

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- **Engine Oil Pressure Sensor and/or Switch Replacement** for the 6.0L (LFA) engine
- **Engine Oil Pressure Sensor and/or Switch Replacement** for the 4.8L, 5.3L, 6.0L, 6.2L, or 7.0L engine.
- **Control Module References** for the PCM or IPC replacement, setup, and programming

FUEL GAGE INACCURATE OR INOPERATIVE (SINGLE TANK)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** 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.

Diagnostic Fault Information

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

Circuit/System Description

The fuel level sensor changes resistance in response to the fuel level. The engine control module (ECM) monitors the signal circuit of the fuel level sensor in order to determine the fuel level. When the fuel tank is full, the sensor resistance is low and the ECM senses a low signal voltage. When the fuel tank is empty, the sensor resistance is high and the ECM senses a high signal voltage. The ECM uses the signal circuit of the fuel level sensor in order to calculate the percentage of remaining fuel in the tank. The ECM sends the fuel level percentage via the serial data circuit to the body control module (BCM). The BCM then sends the fuel information to the instrument panel cluster (IPC) via the serial data circuit in order to display the fuel gage.

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

Special Tools

J 33431-C Instrument Panel Tester. See **Special Tools**.

Circuit/System Verification

Ignition ON, verify DTC P0461, P0462, or P0463 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 between the fuel level sensor low reference circuit terminal B 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.
3. Install a Signal Generator and Instrument Panel Tester between the signal circuit terminal C and ground.
4. Ignition ON, vary the signal generator resistance between 40-250 ohms. Verify that the scan tool Fuel Tank Level Remaining parameter displays a range that varies between 5-95 percent as the signal generator resistance changes.
 - If not within the specified range, test the signal circuit for an open/high resistance. If the circuits test normal, replace the ECM.
5. Vary the signal generator resistance between 40-250 ohms. Verify that the fuel gage displays a range that varies between empty and full as the signal generator resistance changes.
 - If the gage is incorrect, replace the IPC.
6. If all circuits test normal, perform the fuel level sensor component test before replacing the fuel level sensor.

Component Testing

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1. Ignition OFF, remove the fuel level sender.
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 between the signal terminal C and the low reference terminal B.
 - o 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 6.0L (LFA) engine
- **Fuel Level Sensor Replacement (1500 Series w/E85)** or **Fuel Level Sensor Replacement (2500 - 43.5L (11.5 gal) Tank - Rear)** or **Fuel Level Sensor Replacement (2500 - 98.4L (26 gal) Tank - Front)** or **Fuel Level Sensor Replacement (1500 Series)** for the 4.8L, 5.3L, 6.0L, 6.2L, or 7.0L engine
- **Control Module References** for the ECM or IPC replacement, setup, and programming

FUEL GAGE INACCURATE OR INOPERATIVE (DUAL TANK)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** 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.

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Fuel Level Sensor Signal	P0462, P2067	1	P0463, P0464, P2068	P0463, P2068	P0461, P2066
Fuel Level Sensor Low Reference	-	1	P0463, P0464, P2068	P0463, P2068	P0461, P2066

1. Fuel Gage Inaccurate or Inoperative

Circuit/System Description

The fuel level sensor changes resistance in response to the fuel level. The engine control module (ECM) monitors the signal circuits of the primary and secondary fuel level sensors in order to determine the fuel level. When the fuel tanks are full, the sensor resistances are low and the ECM senses a low signal voltage. When the fuel tanks are empty, the sensor resistances are high and the ECM senses a high signal voltage. The ECM uses the signal circuits of the primary and secondary fuel level sensors in order to calculate the percentage of remaining fuel in the tanks. The ECM sends the fuel level percentage via the serial data circuit to the body

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control module (BCM). The BCM then sends the fuel level information to the instrument panel cluster (IPC) via the serial data circuit in order to display the fuel level.

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

Special Tools

J 33431-C Instrument Panel Tester. See Special Tools.

Circuit/System Verification

Ignition ON, verify DTC P0461, P0462, P0463, P0464, P2066, P2067, or P2068 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 primary and secondary fuel level sensors.
2. Ignition OFF, test for less than 1.0 ohm between the primary fuel level sensor low reference circuit terminal B 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.

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3. Ignition OFF, test for less than 1.0 ohm between the secondary fuel level sensor low reference circuit terminal B 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.
4. Jumper the primary fuel level sensor signal circuit terminal C to secondary fuel level sensor signal circuit terminal C. Install a signal generator and instrument panel tester between the jumped signal circuits and ground.
5. Ignition ON, vary the signal generator resistance between 40-250 ohms. Verify that the scan tool Fuel Tank Level Remaining parameter displays a range that varies between 5 and 95 percent as the signal generator resistance changes.
 - If not within the specified range, test both signal circuits for an open/high resistance. If the circuits test normal, replace the ECM.
6. Vary the signal generator resistance between 40-250 ohms. Verify that the fuel gage displays a range that varies between empty and full as the signal generator resistance changes.
 - If the gage is incorrect, replace the IPC.
7. If all circuits test normal, perform the fuel level sensor component test before replacing either the primary or secondary fuel level sensor.

Component Testing

1. Ignition OFF, remove the primary and secondary fuel level senders.
2. While sweeping the primary 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 between the signal terminal C and the low reference terminal B.
 - If not within the specified range, replace the primary fuel level sensor.
3. While sweeping the secondary 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 between the signal terminal C and the low reference terminal B.
 - If not within the specified range, replace the secondary fuel level sensor.

Repair Procedures

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

- **Fuel Level Sensor Replacement** for the 6.0L (LFA) engine
- **Fuel Level Sensor Replacement (1500 Series w/E85)** or **Fuel Level Sensor Replacement (2500 - 43.5L (11.5 gal) Tank - Rear)** or **Fuel Level Sensor Replacement (2500 - 98.4L (26 gal) Tank - Front)** or **Fuel Level Sensor Replacement (1500 Series)** for the 4.8L, 5.3L, 6.0L, 6.2L, or 7.0L engine
- **Control Module References** for the ECM or IPC replacement, setup, and programming

HOURLY METER INACCURATE OR INOPERATIVE

Diagnostic Instructions

2009 Cadillac Escalade

2009 ACCESSORIES & EQUIPMENT Displays and Gages - Avalanche, Escalade, Suburban, Tahoe & Yukon

- Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** 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) can display the accumulated engine run time hours when the cluster is in the OFF AWAKE or ACC, RAP and in the RUN positions. The IPC stores the accumulated engine run time hours in a non-volatile format. The hourmeter will update every 6 minutes and will not change if the battery is disconnected or removed.

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

With the engine running, verify that the time on the hourmeter increments properly.

- If the time does not increment properly, replace the IPC.

Repair Procedures

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

2009 Cadillac Escalade

2009 ACCESSORIES & EQUIPMENT Displays and Gages - Avalanche, Escalade, Suburban, Tahoe & Yukon

- **Instrument Cluster Description and Operation**
- **Control Module References** for IPC replacement, setup, and programming

INSTRUMENT CLUSTER GAGES INOPERATIVE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle (with HP2)** or **Diagnostic System Check - Vehicle (without HP2)** 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

This diagnostic procedure applies to serial data gages located in the instrument panel cluster (IPC) which includes the speedometer, tachometer, engine coolant temperature gage, volt gage and engine oil pressure gage if equipped.

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

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IMPORTANT: If the suspect gage is the speedometer, the drive wheels of the vehicle must be raised and the transmission must be placed in drive or first gear. Refer to Lifting and Jacking the Vehicle .

1. Ignition ON and the scan tool installed, perform the IPC Gage Sweep Test in the IPC Output Controls. Verify that all gage dials move from minimum to the maximum value and back to the gage minimum value.
 - o If the gages do not perform the IPC Gage Sweep Test, replace the IPC.
2. Start the engine with the vehicle drive wheels raised and place the transmission in drive or first gear. Verify that the speedometer value matches the scan tool Vehicle Speed parameter in the ECM Engine Data List.
 - o If the speedometer is incorrect, 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

OUTSIDE AIR TEMPERATURE DISPLAY INACCURATE OR INOPERATIVE

Diagnostic Instructions

- Perform the Diagnostic System Check - Vehicle (with HP2) or Diagnostic System Check - Vehicle (without HP2) 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.

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage
Ambient Air Temperature Sensor Signal	1	1	1	1
Ambient Air Temperature Sensor Low Reference	-	1	1	-
1. Outside Air Temperature Display Inaccurate or Inoperative				

Circuit/System Description

The inside rearview mirror (ISRV) 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 ISRV senses a larger voltage drop across the sensor, indicating a lower temperature. As the resistance of the ambient air temperature sensor decreases, the ISRV senses a smaller voltage drop across the sensor, indicating a higher temperature.

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2009 ACCESSORIES & EQUIPMENT Displays and Gages - Avalanche, Escalade, Suburban, Tahoe & Yukon

Reference Information

Schematic Reference

Inside Rearview Mirror Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Automatic Day-Night Mirror 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

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's 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

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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

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the ambient air temperature sensor.
2. Ignition OFF, test for less than 1 ohm between the low reference circuit terminal B 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 ISRVM.
3. Ignition ON, verify that OC is displayed on the ISRVM display.
 - If not the specified value, test the signal circuit terminal A for a short to ground. If the circuit tests normal replace the ISRVM.
4. Ignition ON, install a 3-amp fused jumper wire between the signal circuit terminal A and the low reference circuit terminal B. Verify that SC is displayed on the ISRVM display.
 - If not the specified value, test the signal circuit for an open/high resistance. If the circuit tests normal replace the ISRVM.
5. If all circuits test normal, 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
- **Ambient Air Temperature Sensor Replacement (DF5)** or **Ambient Air Temperature Sensor Replacement (CJ2)**

REPAIR INSTRUCTIONS

AMBIENT AIR TEMPERATURE SENSOR REPLACEMENT (DF5)

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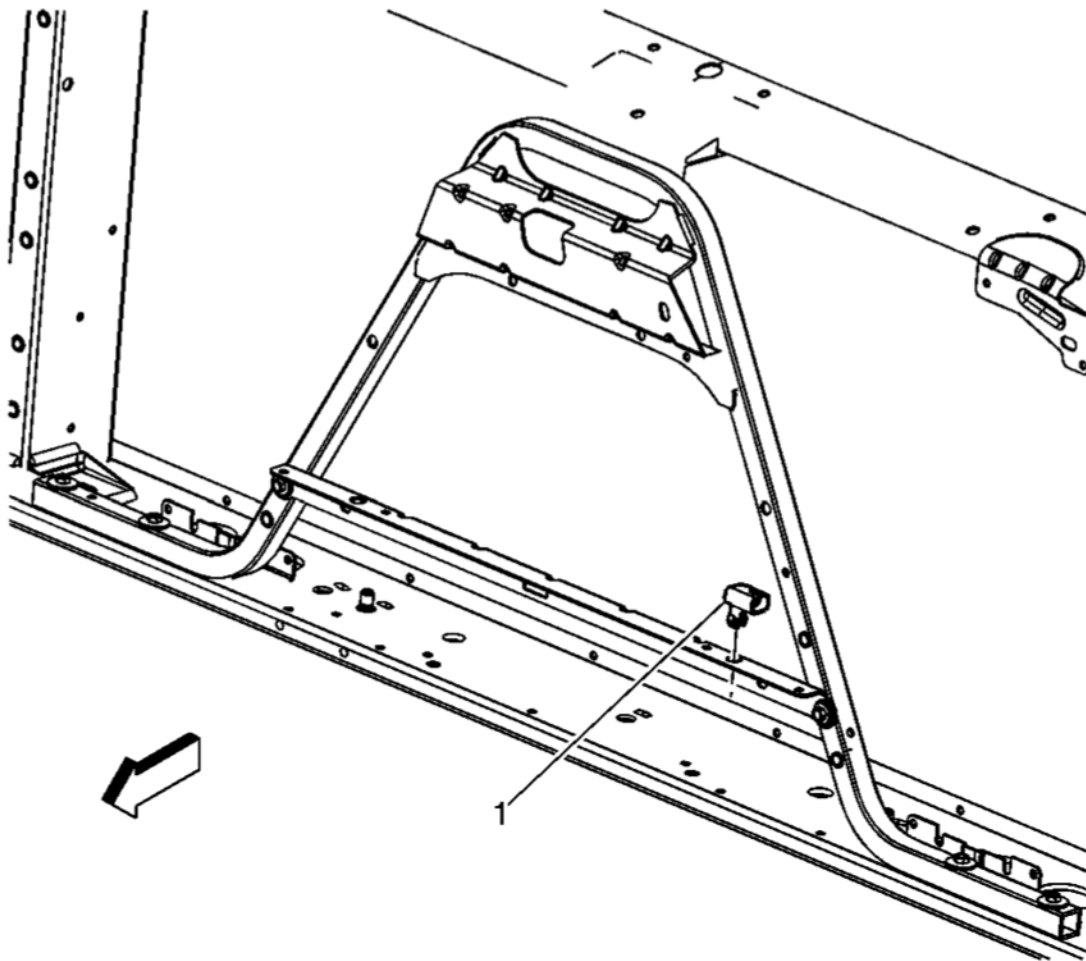


Fig. 7: Locating Ambient Air Temperature Sensor
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the top portion of the grille and gently pull forward. Refer to <u>Fascia Grille Replacement (Escalade)</u> or <u>Fascia Grille Replacement (Z71)</u> or <u>Fascia Grille Replacement (GMC Denali XL)</u> or <u>Fascia Grille Replacement (Suburban, Tahoe)</u> or <u>Fascia Grille Replacement (Yukon)</u> or <u>Fascia Grille Replacement (GMC Yukon Hybrid 2 Mode)</u> .	
1	Ambient Air Temperature Sensor Tip: 1. Disconnect the electrical connector. 2. Snap the new sensor into the steel support gently or the new sensor could break.

AMBIENT AIR TEMPERATURE SENSOR REPLACEMENT (CJ2)

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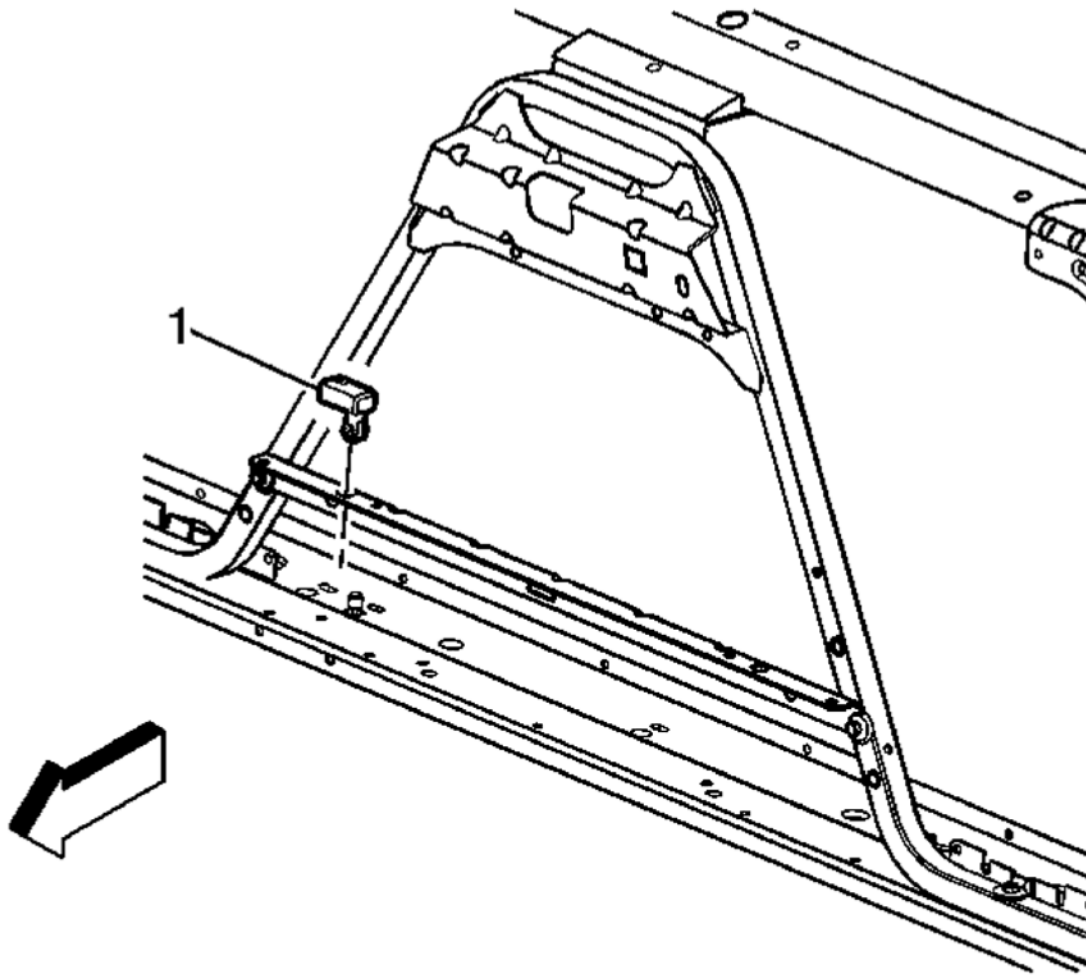


Fig. 8: Locating Ambient Air Temperature Sensor

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the top portion of the grille and gently pull forward. Refer to <u>Fascia Grille Replacement (Escalade)</u> or <u>Fascia Grille Replacement (Z71)</u> or <u>Fascia Grille Replacement (GMC Denali XL)</u> or <u>Fascia Grille Replacement (Suburban, Tahoe)</u> or <u>Fascia Grille Replacement (Yukon)</u> or <u>Fascia Grille Replacement (GMC Yukon Hybrid 2 Mode)</u> .	
1	Ambient Air Temperature Sensor Tip: 1. Disconnect the electrical connector. 2. Snap the new sensor into the steel support gently or the new sensor could break.

ELECTRONIC COMPASS MODULE REPLACEMENT

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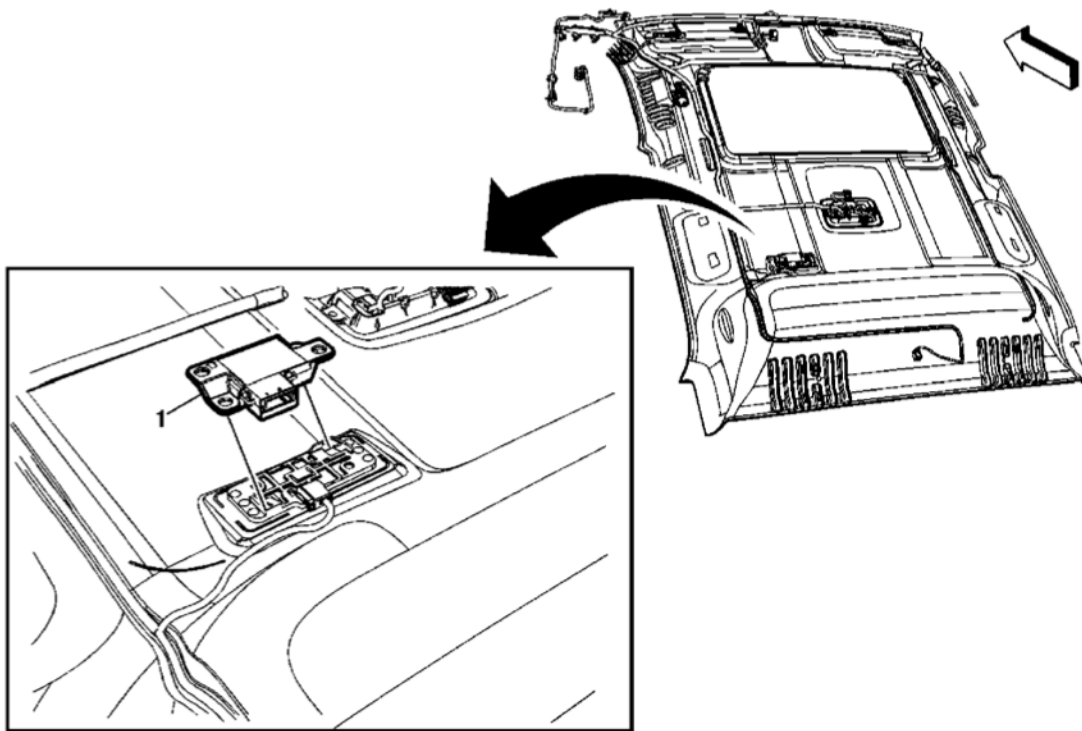


Fig. 9: Electronic Compass Module Replacement
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Lower only rear end portion of the headliner. Refer to <u>Headlining Trim Panel Replacement (Avalanche/Escalade EXT w/CF5 and U42)</u> or <u>Headlining Trim Panel Replacement (Avalanche/Escalade EXT w/CF5 w/o U42)</u> or <u>Headlining Trim Panel Replacement (Avalanche w/CJ2 w/o CF5 and U42)</u> or <u>Headlining Trim Panel Replacement (Avalanche/Escalade EXT w/CJ3)</u> or <u>Headlining Trim Panel Replacement (Avalanche/Escalade EXT w/U24 w/o CF5)</u> or <u>Headlining Trim Panel Replacement (LWB w/CF5 and U42)</u> or <u>Headlining Trim Panel Replacement (LWB w/CF5 w/o U42)</u> or <u>Headlining Trim Panel Replacement (LWB w/CJ2)</u> or <u>Headlining Trim Panel Replacement (LWB w/CJ3)</u> or <u>Headlining Trim Panel Replacement (LWB w/U42 w/o CF5)</u> or <u>Headlining Trim Panel Replacement (SWB w/CF5 and U42)</u> or <u>Headlining Trim Panel Replacement (SWB w/CF5 w/o U42)</u> or <u>Headlining Trim Panel Replacement (SWB w/CJ3)</u> or <u>Headlining Trim Panel Replacement (SWB w/o CF5 and U42)</u> or <u>Headlining Trim Panel Replacement (SWB w/U42 w/o CF5)</u> .	
1	Electronic Compass Module Procedure 1. Disconnect the electrical connectors. 2. For programming and set up information, refer to Control Module References .

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3. Unsnap the electronic compass module from the bracket.

DRIVER INFORMATION DISPLAY SWITCH REPLACEMENT (CADILLAC)

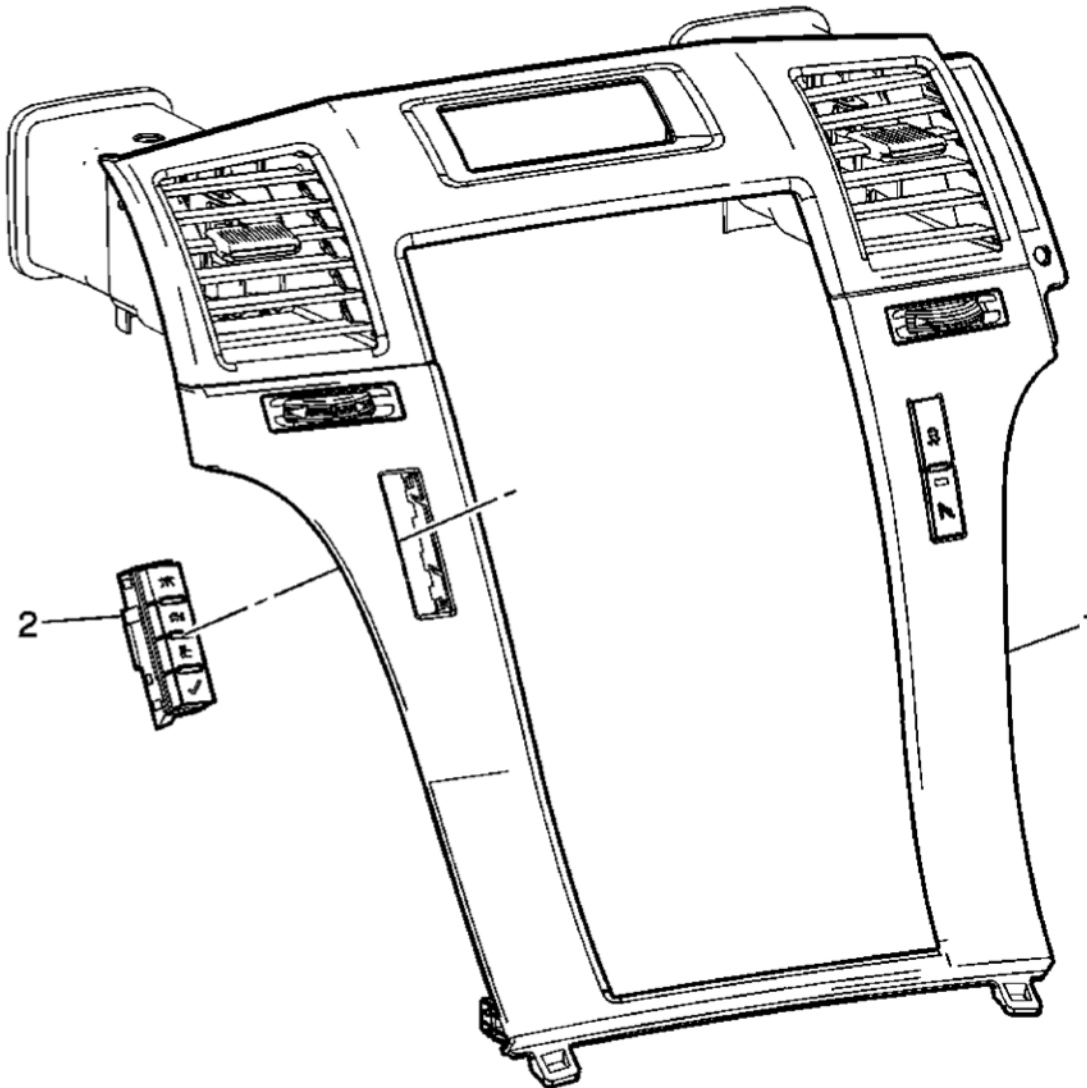


Fig. 10: View Of Driver Information Center Switch Assembly & Accessory Trim Plate
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Instrument Panel Accessory Trim Plate Tip: Refer to <u>Instrument Panel Accessory Trim Plate Replacement (Cadillac)</u> or <u>Instrument Panel Accessory Trim Plate Replacement (Except Cadillac)</u> .
2	Driver Information Center Switch Assembly Tip: Release the tabs securing the switch assembly to the accessory trim plate.

DRIVER INFORMATION DISPLAY SWITCH REPLACEMENT (EXCEPT CADILLAC)

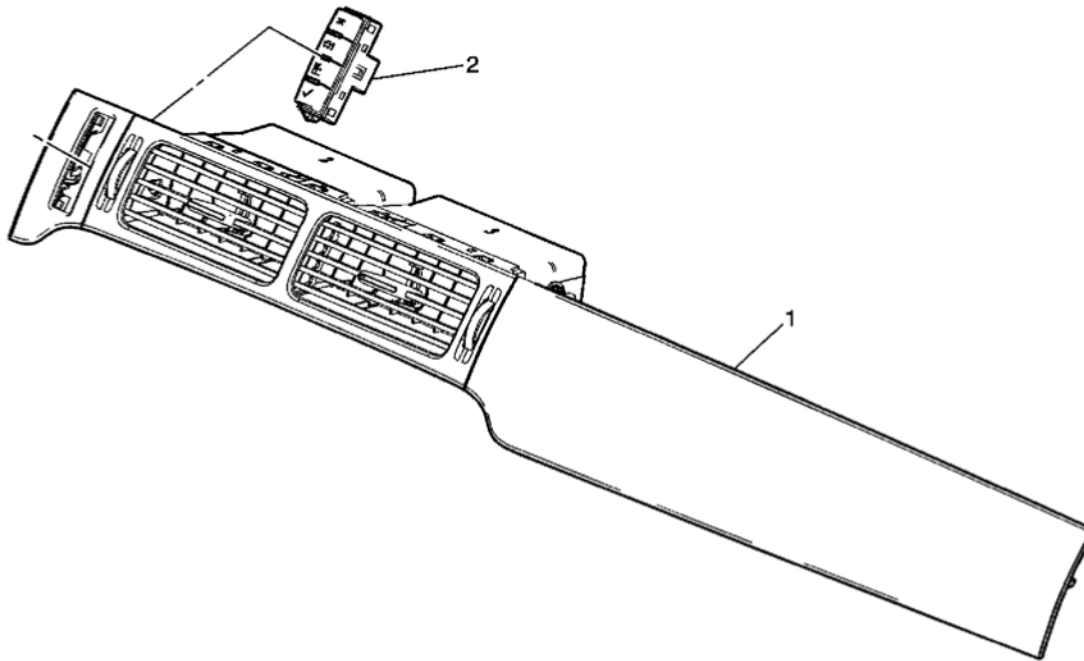


Fig. 11: View Of Driver Information Center Switch Assembly & Accessory Trim Plate
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Instrument Panel Center Trim Plate Tip: Refer to <u>Instrument Panel Center Trim Panel Replacement (Cadillac)</u> or <u>Instrument Panel Center Trim Panel Replacement (Except Cadillac)</u> .
2	Driver Information Switch Assembly

INSTRUMENT CLUSTER REPLACEMENT (EXCEPT CADILLAC)

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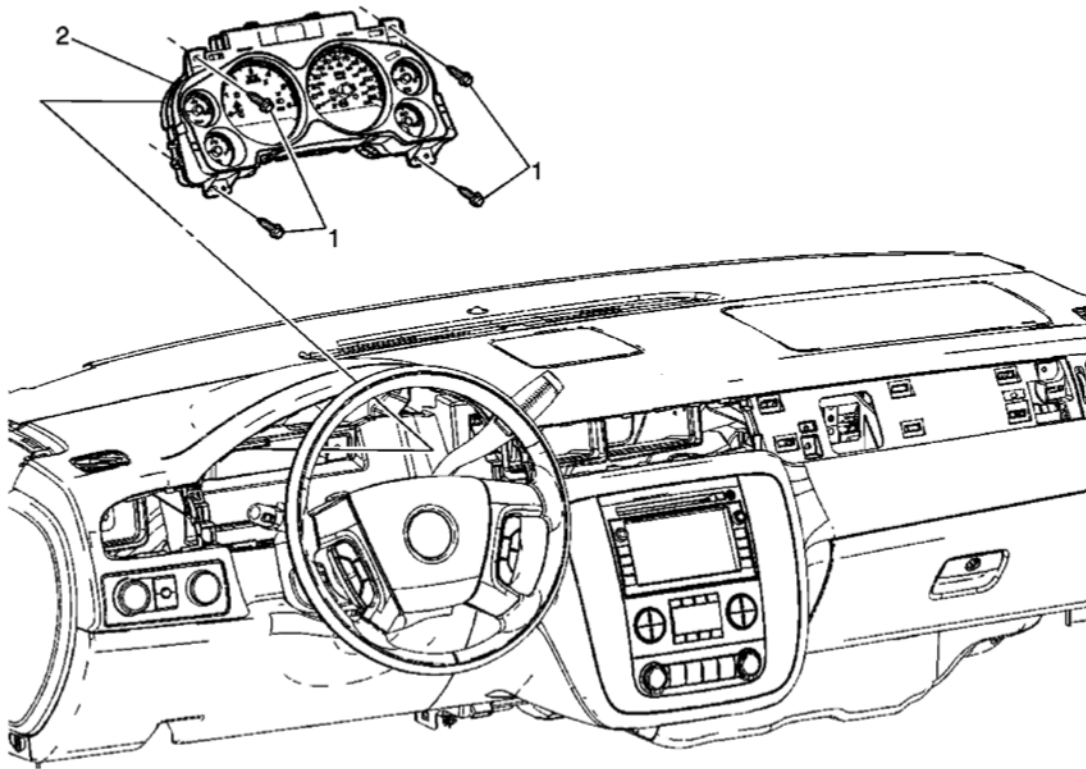


Fig. 12: View Of Instrument Panel Cluster Assembly & Screws
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the instrument panel cluster trim plate. Refer to <u>Instrument Cluster Trim Panel Replacement (Except Cadillac)</u> or <u>Instrument Cluster Trim Panel Replacement (Cadillac)</u> .	
1	Instrument Panel Cluster Screw (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 2 N.m (18 lb in)
2	Instrument Panel Cluster Assembly Tip: A replacement cluster must be programmed. Refer to <u>Control Module References</u> .

INSTRUMENT CLUSTER REPLACEMENT (CADILLAC)

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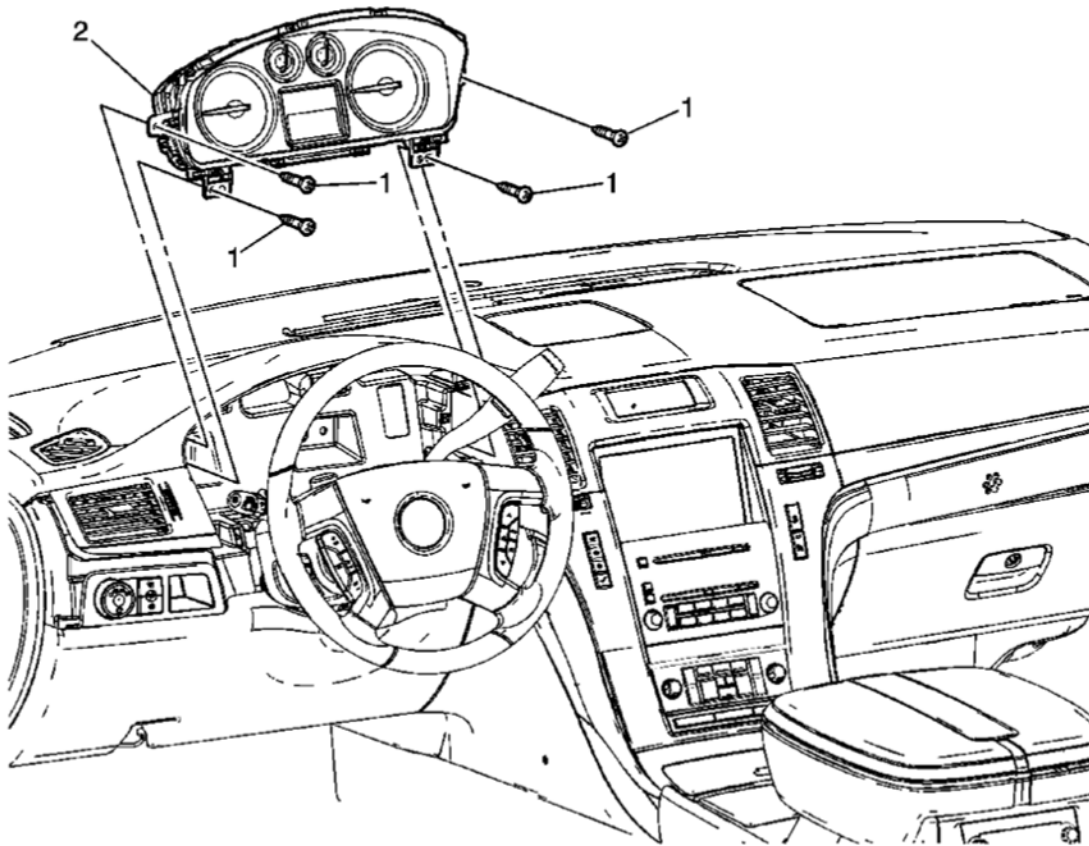


Fig. 13: View Of Instrument Panel Cluster Assembly, Bolts & Screws
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the instrument panel cluster trim plate bezel. Refer to <u>Instrument Cluster Trim Panel Replacement (Except Cadillac)</u> or <u>Instrument Cluster Trim Panel Replacement (Cadillac)</u> .	
1	Instrument Panel Cluster Assembly Bolts/Screw (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 2 N.m (18 lb in)
2	Instrument Panel Cluster Assembly Tip: • Disconnect electrical connections. • A replacement cluster must be programmed. Refer to <u>Control Module References</u> .

CLOCK REPLACEMENT

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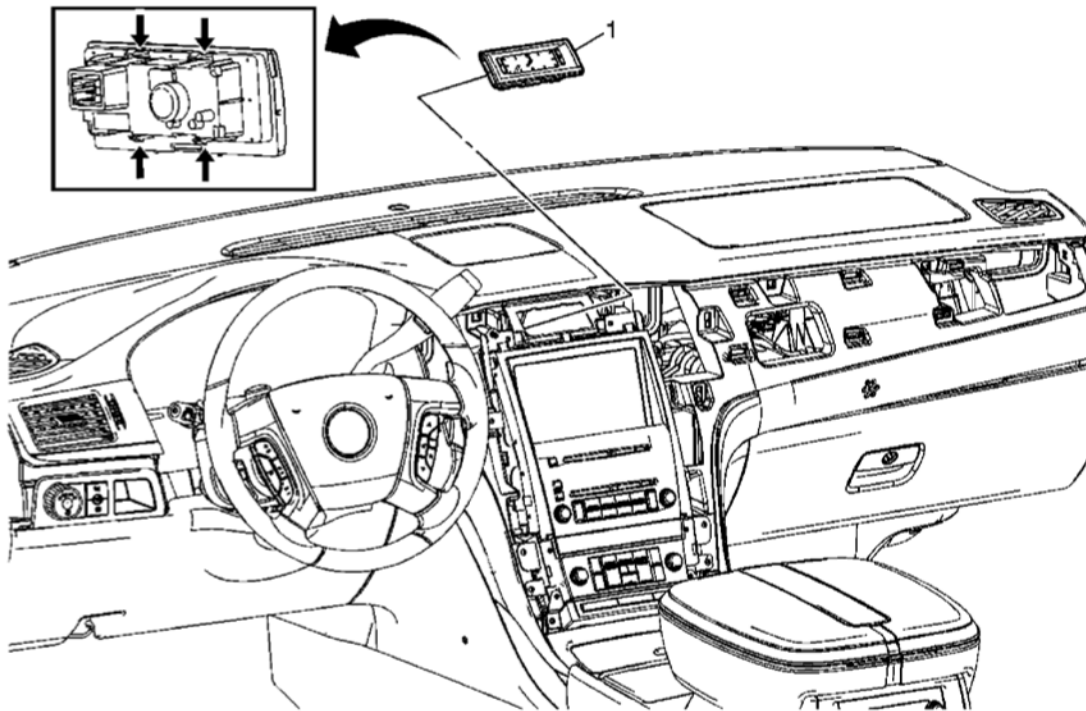


Fig. 14: View Of Clock Assembly

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the instrument panel accessory trim plate. Refer to <u>Instrument Panel Accessory Trim Plate Replacement (Cadillac)</u> or <u>Instrument Panel Accessory Trim Plate Replacement (Except Cadillac)</u> .	
1	Clock Assembly Tip: 1. Disconnect the electrical connection. 2. Squeeze the tabs to release the clock from the instrument panel accessory trim plate.

ACCESSORY SWITCH REPLACEMENT (EXCEPT CADILLAC)

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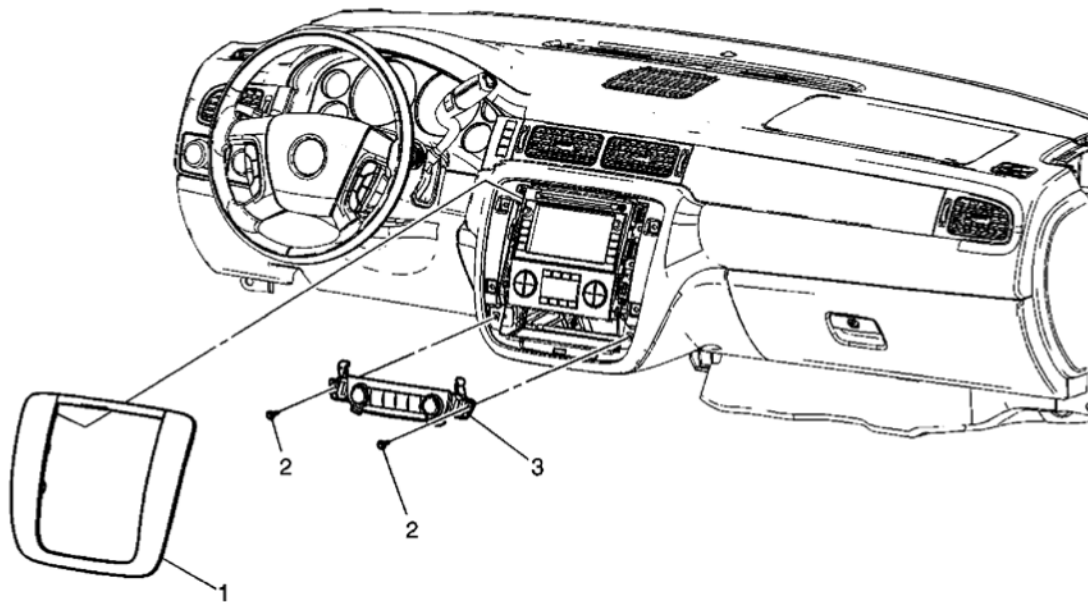


Fig. 15: View Of Instrument Panel Accessory Switch Assembly & Components
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Instrument Panel Accessory Trim Plate Refer to <u>Instrument Panel Accessory Trim Plate Replacement (Cadillac)</u> or <u>Instrument Panel Accessory Trim Plate Replacement (Except Cadillac)</u> .
2	Instrument Panel Accessory Switch Screw (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 2 N.m (18 lb in)
3	Instrument Panel Accessory Switch Assembly Tip: Disconnect the electrical connections.

ACCESSORY SWITCH REPLACEMENT (CADILLAC)

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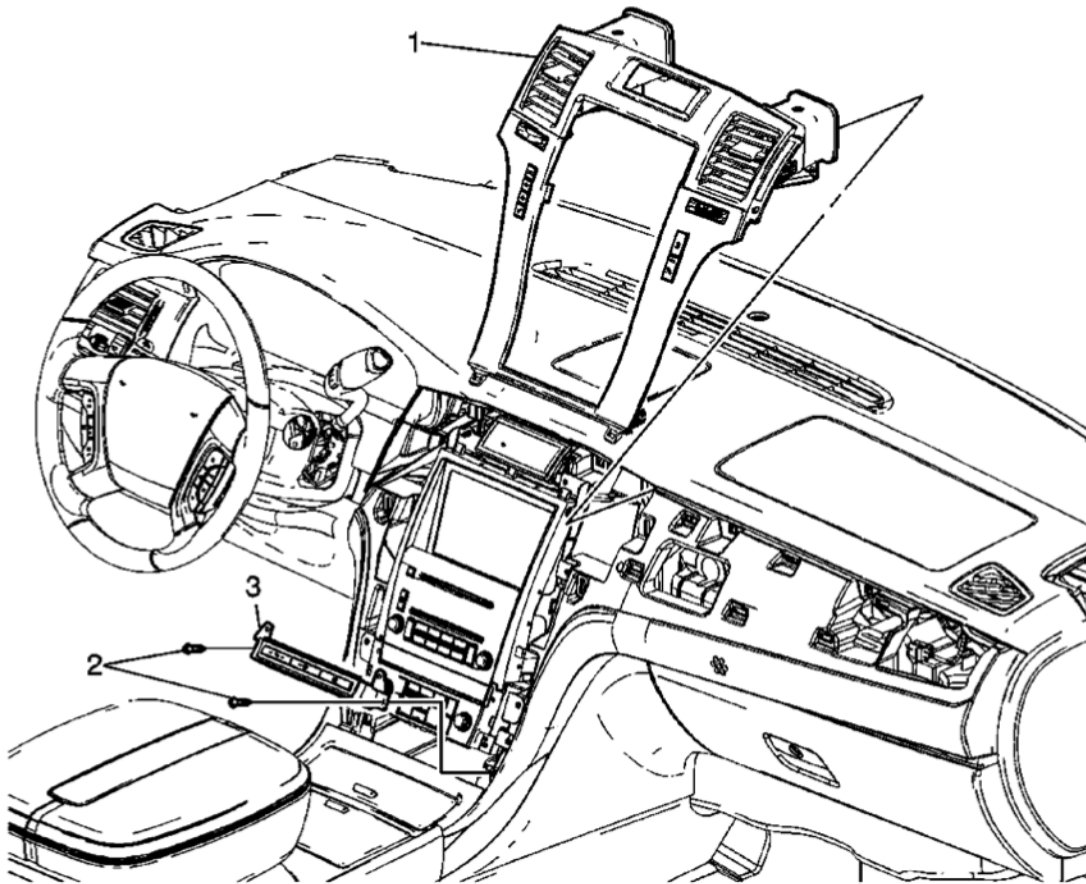


Fig. 16: View Of Instrument Panel Accessory Switch Assembly, Trim Plates & Screws
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Instrument Panel Accessory Trim Plate Refer to <u>Instrument Panel Accessory Trim Plate Replacement (Cadillac)</u> or <u>Instrument Panel Accessory Trim Plate Replacement (Except Cadillac)</u> .
2	Instrument Panel Accessory Switch Screw (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 2 N.m (18 lb in)
3	Instrument Panel Accessory Switch Assembly Tip: Disconnect the electrical connection.

DESCRIPTION AND OPERATION

AUDIBLE WARNINGS DESCRIPTION AND OPERATION

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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 serial data circuit. If the radio receives multiple audible warning requests, the warning with the highest priority sounds first. On vehicles without a radio, a chime module generates the audible warnings and receives audible warning requests via the serial data circuit. Either the radio or the chime module is the chime procedure. 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

Fasten Safety Belt Warning

The chime producer activates the fasten safety belt audible warning as requested by the body control module (BCM). The BCM sends a serial data message to the audio amplifier indicating the chime frequency and duration. 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 drivers seat belt is not buckled. The SDM sends a serial data message to the BCM indicating the seat belt status. The instrument panel cluster (IPC) receives a serial data message from the BCM indicating the driver 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.

Lights On Warning

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

- The ignition is OFF.
- The BCM determines that the driver door is open.
- The BCM determines that the headlamp switch is in the park or head position.

Brake Warning

The chime producer activates the brake audible warning as requested by the instrument panel cluster (IPC). The IPC sends a serial data message to the chime producer indicating the chime frequency and duration. The brake warning sounds and the BRAKE indicator illuminates when the following occurs:

- The ignition is ON.
- The vehicle speed is greater than 8 km/h (4.9 mph). The IPC receives a serial data message from the

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engine control module (ECM) indicating the vehicle speed.

- The IPC determines that the park brake is engaged.
- The brake fluid is low.
- The Traction Control System (TCS) and the Vehicle Stability Enhancement System (VSES) have failed.

Key-In-Ignition Warning

The chime producer activates the key-in-ignition audible warning as requested by the body control module (BCM). The BCM sends a serial data message to the chime producer indicating the chime frequency and duration. The key-in-ignition warning sounds when the following occurs:

- The ignition switch is turned OFF. (The chime will not come on until the key is turned on and the OFF.)
- The BCM determines that the driver door is open. The IPC also receives a serial data message from the BCM indicating the door ajar status
- The BCM determines that the key-in-ignition switch is open and the signal circuit is high. The IPC receives a serial data message from the BCM indicating the key-in-ignition status.

Door Ajar Warning

The chime producer activates the door ajar audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer indicating the chime frequency and duration. The door ajar warning sounds and the door ajar indicator displays in the driver information center (DIC) when the following occurs:

- The BCM determines that a door (driver door, passenger door, left rear door, right rear door) is open. The IPC receives a serial data message from the BCM indicating the door ajar status.
- The vehicle is not in PARK. The BCM receives a serial data message from the ECM/BCM indicating the gear position.

Additional Warnings

The following warnings have an associated instrument panel cluster (IPC) indicator or driver information center (DIC) message:

- Engine Overheated Stop Engine Message-The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer indicating the chime frequency and duration.
- Engine Power Is Reduced Message-The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer indicating the chime frequency and duration.
- Fuel Level Low Message-The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer indicating the chime frequency and duration.
- Hood Open Message-The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer indicating the chime frequency and duration.
- Oil Pressure Indicator-The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer indicating the chime frequency of a fast rate and

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at a continuous duration.

- Park Assist Fault Clean Rear Bumper Message-The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer indicating the chime frequency and duration.
- Rear Access Open Message-The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer indicating the chime frequency and duration.
- Tire Pressure Low Indicator-The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer indicating the chime frequency and duration.
- Turn Signal Indicators-The chime producer activates the audible warning as requested by the IPC. The chime produces two different chimes, one when the turn signal turns off and another when the turn signal turns on.
- Vehicle Overspeed Message-The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer indicating the chime frequency and duration.
- Transmission Hot Idle Engine Message-The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer indicating the chime frequency and duration.

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

COMPASS CALIBRATION AND MAGNETIC VARIANCE

Compass Calibration

The compass direction will show CAL if it needs to be calibrated. Before calibrating the compass, drive the vehicle to an area that is magnetically clean (free of large metallic objects).

1. Turn ON the ignition.
2. Before calibrating the compass, make sure the compass is set to the variance zone in which the vehicle is travelling. See Compass Magnetic Variation Adjustment below.
3. Press the vehicle information button until the PRESS TO CALIBRATE COMPASS screen is displayed.
4. Press the set/reset button to start the compass calibration.
5. The DIC will display CALIBRATING: DRIVE IN CIRCLES. Drive the vehicle in circles at less than 8 km/h (5 mph) to complete the calibration. The DIC will display CALIBRATION COMPLETE when the calibration is complete.

Compass Magnetic Variation Adjustment

Compass variance is the difference between the earth's magnetic north and true geographic north. If not adjusted to account for compass variance, the compass in the vehicle could give false readings. Under certain circumstances, such as during a long distance cross-country trip, it will be necessary to compensate for compass variance and reset the zone through the DIC.

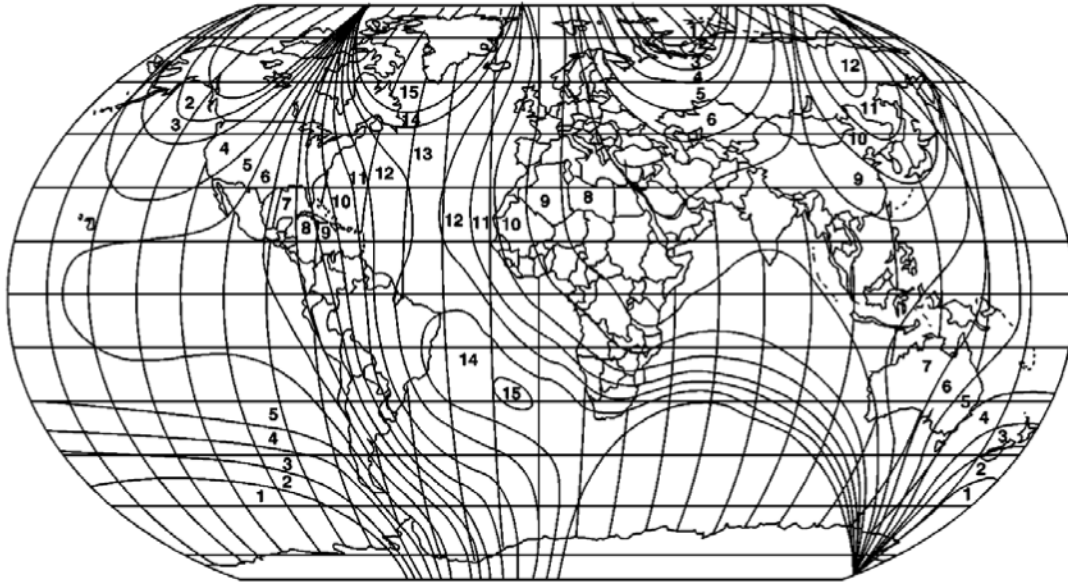


Fig. 17: View Of World Magnetic Variation Map
Courtesy of GENERAL MOTORS CORP.

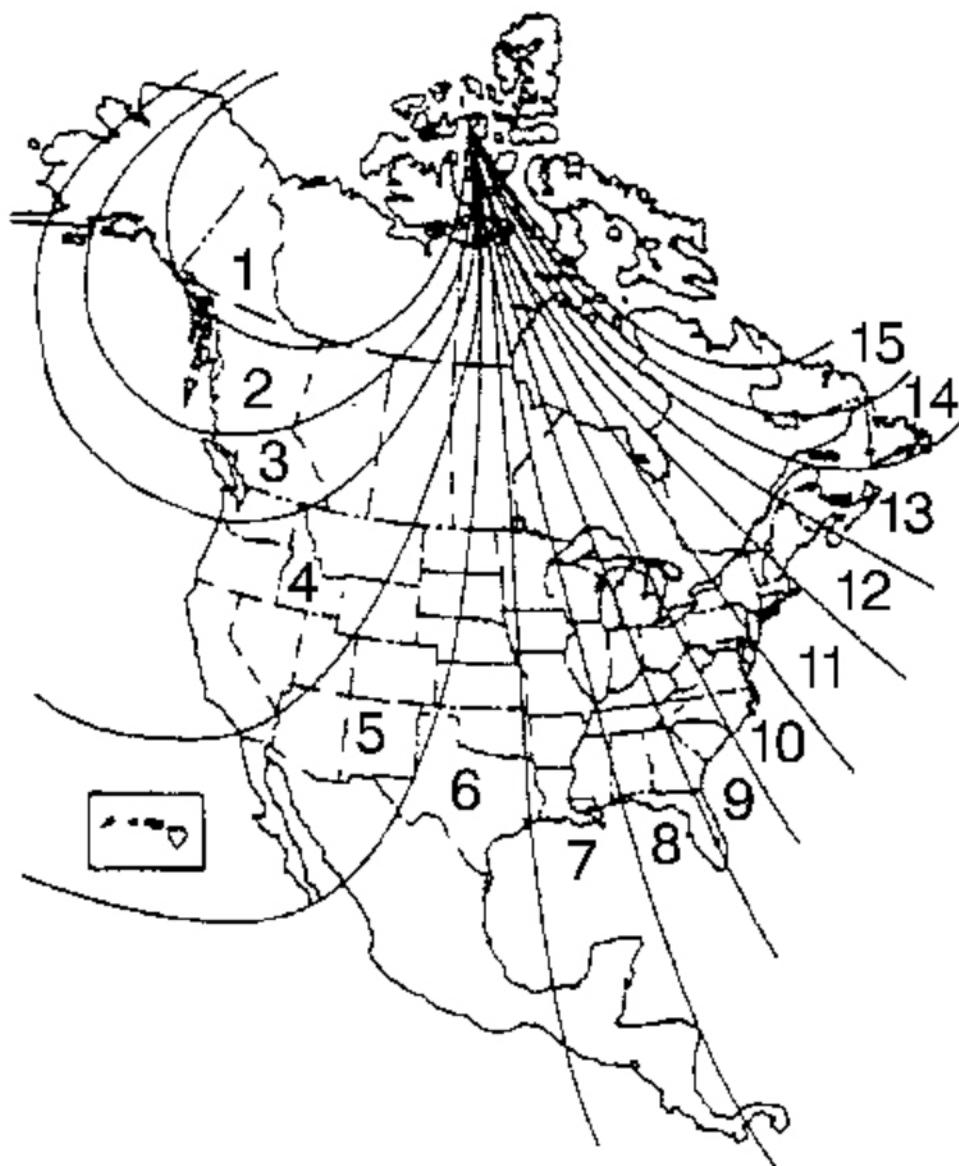


Fig. 18: Illustrating Magnetic Variation Zones
Courtesy of GENERAL MOTORS CORP.

1. Locate your geographic location. Refer to the variation zone map.
2. Turn ON the ignition with the engine OFF.
3. Press the vehicle information button until PRESS TO CHANGE COMPASS ZONE displays on the DIC.

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4. Press the set/reset button to scroll through and select the appropriate variance zone.
5. Navigate to one of the trip/fuel menu screens to view the direction the vehicle is moving. This will be shown in the top right corner of the DIC display.

If the compass needs to be calibrated, use the compass calibration procedure above.

DRIVER INFORMATION CENTER (DIC) DESCRIPTION AND OPERATION

The driver information center (DIC) displays DIC WOW for 5 seconds when it first powers up. If enabled through Personalization, the DIC then returns to the last display status before no power condition.

There are 4 switch functions for the DIC.

- Personalization
- Set/Reset
- Trip/Fuel
- Vehicle Info

Trip/Fuel

The Trip/Fuel switch is used to navigate between vehicle information parameters. Cycle through the following vehicle parameters by successive pressing of the Trip/Fuel switch

- Average Fuel Economy (AFE)
- Average Speed (AVS)
- Fuel Range
- Fuel Used
- Instantaneous Fuel Economy (IFE)/Active Fuel Management (Displacement on Demand (DOD))
- Odometer
- Trans Temp
- Trip Odometer
- Trip Time
- Total Fuel Saved (Hybrid)
- Fuel Saved Since Reset
- Compass
- Outside Air Temperature
- Blank

Vehicle Info

The Vehicle Info switch is used to navigate between vehicle information parameters. Cycle through the following vehicle parameters by successive pressing of the Vehicle Info switch.

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- Blank Display
- English/Metric Units
- Key Fob Programming Menu
- Left Front Tire Pressure
- Left Rear Tire Pressure
- Oil Life Index (OLI)
- Right Front Tire Pressure
- Right Rear Tire Pressure
- Tire Programming Menu
- Engine Hours
- Compass
- Outside Air Temperature
- Side Obstacle Detection

Personalization

The Personalization switch is used to set personalization features for both the vehicle and the driver. Many of the parameters in the Trip/Fuel menu and the Vehicle Info menu can be programmed through the Personalization switch. In addition to the parameters in the Trip/Fuel and Vehicle Info menus, the following features can also be programmed.

- Approach Lighting
- Automatic Door Lock
- Automatic Door Unlock
- Chime Volume
- Delayed Door Lock
- Display Language
- Easy Exit Recall
- Exit Lighting
- Memory Seat Recall
- Remote Door Lock
- Remote Door Unlock
- Remote Start
- Park Tilt Mirrors
- Smart High Beams

Average Fuel Economy

Average fuel economy is calculated using the equation: $AFE = \text{Distance} / \text{Fuel}$

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- Distance = The accumulated distance travelled since the last reset of this value
- Fuel = The accumulated fuel consumption since the last reset of this value

The engine control module (ECM) sends the average fuel economy serial data message to the instrument panel cluster (IPC). The value of this mode is retained during ignition OFF and can be changed between English units and metric units by selecting from the driver information center (DIC) options menu.

Oil Life Remaining

The ECM sends the oil life remaining percentage to the IPC via a serial data message. The instrument panel cluster receives a serial data message indicating the engine oil life remaining. The DIC displays the current percentage of the GM Oil Life System as determined by the ECM. When the oil life remaining percentage drops below 5 percent, the DIC displays CHANGE ENGINE OIL SOON. When the engine oil is changed, reset the GM Oil Life System. Refer to **GM Oil Life System Resetting**.

Fuel Range

This message indicates the estimated distance that the vehicle can travel under the current fuel economy and fuel level conditions since the last battery connection to the IPC. Fuel Range is calculated using the equation: $\text{Fuel Range} = \text{Range Distance} / \text{Range Fuel Used}$.

- Range Distance = The accumulated distance travelled since the last reset of this value.
- Fuel Used = The accumulated fuel delivered since the last reset of this value

The ECM sends the fuel range value to the IPC. The IPC receives a serial data message with the fuel information. The fuel range value is retained during ignition OFF and can be changed between English and Metric units by accessing the DIC English/Metric menu. The Fuel Range display cannot be reset. LOW is displayed when fuel range is below a predetermined value.

Fuel Used

The DIC calculates and displays the total amount of fuel used since the last reset operation. You can reset the fuel used mode by depressing and holding the Set/Reset button for more than 3 seconds. The value of this mode is retained during ignition OFF.

Instantaneous Fuel Economy (IFE)

Instantaneous fuel economy (IFE) is calculated using the equation: $\text{IFE} = \text{Distance} / \text{Fuel Used}$.

- Distance = The accumulated distance travelled for the last 2 seconds
- Fuel = The accumulated fuel delivered for the last 2 seconds

The IPC receives a serial data message from the ECM. The distance information is calculated by the IPC using the vehicle speed information from the ECM. These values are retained during ignition OFF and can be changed between English and Metric units accessing the DIC English/Metric menu. The IFE display cannot be reset.

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Tire Pressure Monitor

The IPC receives a serial data message from the tire pressure monitoring (TPM) system for front and rear tire pressure data. The DIC will display the pressure for each of the front and rear tires. When a tire with low air pressure is present, the DIC displays XXXX XXXX TIRE PRESSURE LOW.

Trip Time

The timer records elapsed time starting from activation. When the DIC displays the timer, pressing the Set/Reset switch for 1 second on the DIC resets the timer. Pressing the Set/Reset button on the DIC switch for approximately 1 second starts and stops the timer. The DIC displays the timer in one of the following formats:

The DIC displays the timer in the following format: XX: XX:XX:

The first XX represents hours elapsed, the second XX represents minutes elapsed, and the third XX represents seconds elapsed. The maximum range of the timer is 99 hours, 59 minutes, and 59 seconds. After the maximum range is reached, the timer displays all zeros (00:00:00).

Park Assist Menu

The park assist menu is displayed in the DIC. The DIC displays the current state of the park assist until the IPC receives a message indicating otherwise. The DIC displays (- - -) when communication with park assist is lost.

Total Fuel Saved (Hybrid)

Fuel Saved Over Lifetime shows how much fuel (by volume) was save by driving the Hybrid versus the non-Hybrid (if equipped). This value constantly accumulates over the life of the vehicle and is not re-settable.

Fuel Saved Since Reset

The Fuel Saved Since Reset is similar to the Fuel Saved Over Lifetime but is re-settable by the driver.

English/Metric

The English/Metric mode is used to toggle between English and Metric units and can be accessed through the DIC Vehicle Info switch.

Trip Odometer

The trip odometer can be accessed through the DIC Trip/Fuel switch function. The trip odometer shows the current distance traveled in either miles or kilometers since the last reset of the trip odometer. The trip odometer can be reset to zero by pressing the set/reset button while the trip odometer is displayed.

The trip odometer has a feature called the retro-active reset. This can be used to set the trip odometer to the number of miles (kilometers) driven since the ignition was last turned on. This can be used if the trip odometer is not reset at the beginning of the trip.

To use the retro-active reset feature, press and hold the set/reset button for at least four seconds. The trip

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odometer will display the number of miles (mi) or kilometers (km) driven since the ignition was last turned on and the vehicle was moving. Once the vehicle begins moving, the trip odometer will accumulate mileage.

Language

The DIC is capable of displaying in 8 languages

- English
- German
- Italian
- French
- Spanish
- Arabic
- Chinese
- Korean

Compass

The driver information center (DIC) displays the compass based on serial data message from the BCM. The compass module communicates with the body control module (BCM) through a bi-directional data circuit. The instrument panel cluster (IPC) receives compass information from the BCM via the serial data circuit. The compass is displayed in the DIC with other vehicle information and is at the bottom line of the DIC. The compass display shows "- -" when a malfunction is present with the compass module or a compass serial data communication fault exists. The compass displays 'CAL' or 'C' when the compass needs to be calibrated. Cycle the ignition before performing the compass magnetic variation adjustment procedure.

Check that the compass module is properly installed in the vehicle since this may cause the compass to malfunction. The embossed arrow on the top of the compass module should be parallel to the centerline of the vehicle.

Outside Air Temperature

The Outside Air Temperature is sent via the serial data circuit from the BCM to the IPC. It is displayed in the lower left corner of the DIC. It is displayed in the English and Metric units

INDICATOR/WARNING MESSAGE DESCRIPTION AND OPERATION

Indicators

Symbol	Reference
	ABS: • ABS Description and Operation Hybrid

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- **ABS Description and Operation** Less than 8600
- **ABS Description and Operation** Greater than 8600



Air Bag: **SIR System Description and Operation**



Brake: **Brake Warning System Description and Operation**

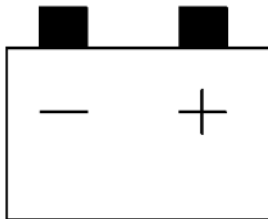


(Canada)

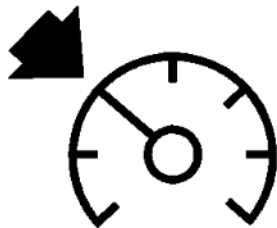
BRAKE (U.S.)

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Charge: Charging System Description and Operation
or
Charging System Description and Operation
Hybrid



(Canada)
CRUISE (U.S.)

Cruise: Cruise Control Description and Operation



Fasten Safety Belt: Seat Belt System Description and Operation

Front Fog Lamps: Exterior Lighting Systems Description and Operation

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High Beam: **Exterior Lighting Systems Description and Operation**



Lights On: **Exterior Lighting Systems Description and Operation**



The IPC displays this indicator when the ECM detects a low oil pressure condition.

MPH/KMH

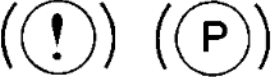
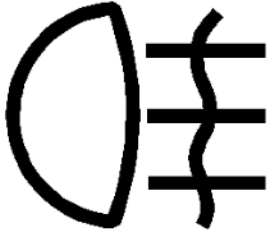
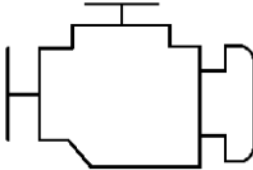
The instrument panel cluster (IPC) displays the MPH indicator when the cluster detects that English units have been requested.

The instrument panel cluster (IPC) displays the km/h indicator when the cluster detects that Metric units have been requested.

Park Brake: **Park Brake System Description and**

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	<u>Operation</u>
 PARK BRAKE	
	Rear Fog Lamps: <u>Exterior Lighting Systems</u> <u>Description and Operation</u>
 (Canada) SECURITY (U.S.)	Security: <u>Content Theft Deterrent (CTD)</u> <u>Description and Operation</u>
 (Canada) SERVICE ENGINE SOON (U.S.)	Malfunction Indicator Lamp (MIL): <u>Engine</u> <u>Control Module Description</u> for the 4.8L, 5.3L, 6.0L, 6.2L, or 7.0L engine

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	Tire Pressure Monitor: <u>Tire Pressure Monitor Description and Operation</u>
	Tow/Haul: <u>Transmission Indicators and Messages (TCM)</u> for the 6L80-E transmission or <u>Transmission Indicators and Messages</u> for the 4L60-E/4L65-E/4L70-E transmission
	Turn Signals: <u>Exterior Lighting Systems Description and Operation</u>
	VDC: • <u>ABS Description and Operation</u> Hybrid • <u>ABS Description and Operation</u> Less than 8600 • <u>ABS Description and Operation</u> Greater than 8600

DIC Warning Messages

Message	Reference
	<u>Transfer Case Description and Operation</u> for the MP 3023/3024-NQH transfer case

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ALL WHEEL DRIVE DISABLED	or <u>Transfer Case Description and Operation</u> for the BW 4485-NR3 transfer case
AUTOMATIC LIGHT CONTROL OFF	<u>Exterior Lighting Systems Description and Operation</u>
AUTOMATIC LIGHT CONTROL ON	<u>Exterior Lighting Systems Description and Operation</u>
BATTERY SAVER ACTIVE	<u>Charging System Description and Operation</u>
BRAKE FLUID LOW ADD BRAKE FLUID	<u>Brake Warning System Description and Operation</u>
BUCKLE PASSENGER SEATBELT	<u>Seat Belt System Description and Operation</u>
BUCKLE SEATBELT	<u>Seat Belt System Description and Operation</u>
CALIBRATING: DRIVE IN CIRCLES	<u>Compass Calibration and Magnetic Variance</u>
CALIBRATION COMPLETE	<u>Compass Calibration and Magnetic Variance</u>
CHANGE ENGINE OIL SOON	The IPC displays this message in the DIC when the ECM determines that the engine oil should be changed. Once the oil is changed, perform the engine oil monitor reset procedure in order to clear the Change Engine Oil indicator. Refer to <u>GM Oil Life System Resetting</u> .
CHECK LEFT FRONT TIRE PRESSURE	<u>Tire Pressure Monitor Description and Operation</u>
CHECK LEFT REAR TIRE PRESSURE	<u>Tire Pressure Monitor Description and Operation</u>
CHECK RIGHT FRONT TIRE PRESSURE	<u>Tire Pressure Monitor Description and Operation</u>
CHECK RIGHT REAR TIRE PRESSURE	<u>Tire Pressure Monitor Description and Operation</u>
CHECK SPARE TIRE PRESSURE	<u>Tire Pressure Monitor Description and Operation</u>
COOLANT LEVEL LOW ADD COOLANT	<u>Cooling System Description and Operation</u>
DRIVER DOOR OPEN	<u>Door Ajar Indicator Description and Operation</u>
ENGINE HOT TURN A/C OFF	<u>Cooling System Description and Operation</u>
ENGINE POWER IS REDUCED	<u>Engine Control Module Description</u> for the 4.8L, 5.3L, 6.0L, 6.2L, or 7.0L engine
ENGINE OIL LOW ADD OIL	The IPC displays this message in the DIC when the ECM detects a low engine oil level condition. Refer to <u>Engine Oil Level Sensor Diagnosis</u> 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engine.
ENGINE OIL HOT IDLE ENGINE	The IPC displays this message in the DIC when the ECM detects a very hot engine oil condition and the engine need to idle.
ENGINE OVERHEATED STOP ENGINE	<u>Cooling System Description and Operation</u>
	The IPC displays this message in the DIC when the

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FUEL LEVEL LOW	ECM detects that the fuel level is less than a pre-determined value. This message is displayed only in the RUN power mode
HEATED WASH FLUID SYSTEM OFF	<u>Wiper/Washer System Description and Operation</u>
HEATING WASH FLUID WASH WIPES PENDING	<u>Wiper/Washer System Description and Operation</u>
HOOD OPEN	<u>Keyless Entry System Description and Operation (Without Accessory 2 Way Remote) or Keyless Entry System Description and Operation (With Accessory 2 Way Remote)</u>
ICE POSSIBLE DRIVE WITH CARE	The IPC displays this message in the DIC when the outside air temperature drops below 4°C (39°F).
JUMP ASSIST COMPLETE	<u>Jump Assist Description and Operation</u>
JUMP ASSIST ABORTED	<u>Jump Assist Description and Operation</u>
JUMP ASSIST ACTIVE BATTERY CHARGING	<u>Jump Assist Description and Operation</u>
JUMP ASSIST NEEDS SEE OWNER'S MANUAL	<u>Jump Assist Description and Operation</u>
JUMP ASSIST READY TURN KEY TO OFF	<u>Jump Assist Description and Operation</u>
LEFT REAR DOOR OPEN	<u>Door Ajar Indicator Description and Operation</u>
OIL PRESSURE LOW STOP ENGINE	The IPC displays this message in the DIC when the ECM detects a low oil pressure condition.
PARK ASSIST FAULT CLEAN REAR BUMPER	<u>Object Detection Description and Operation (UD7) or Object Detection Description and Operation (UVC) or Object Detection Description and Operation (UFT)</u>
PARK ASSIST OFF	<u>Object Detection Description and Operation (UD7) or Object Detection Description and Operation (UVC) or Object Detection Description and Operation (UFT)</u>
PASSENGER DOOR OPEN	<u>Door Ajar Indicator Description and Operation</u>
PROGRAM CLUSTER	The IPC displays this message in the DIC when the IPC is replaced and needs to be programmed. Refer to <u>Instrument Cluster Programming and Setup</u> for setup and programming.
REAR ACCESS OPEN	<u>Door Ajar Indicator Description and Operation</u>
REMOTE KEY LEARNING ACTIVE	<u>Keyless Entry System Description and Operation (Without Accessory 2 Way Remote) or Keyless Entry System Description and Operation (With Accessory 2 Way Remote)</u>
REMOTE KEY LEARNING COMPLETE	<u>Keyless Entry System Description and Operation (Without Accessory 2 Way Remote) or Keyless Entry System Description and Operation (With Accessory 2 Way Remote)</u>
	Refer to <u>Keyless Entry System Description and</u>

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REPLACE BATTERY IN REMOTE KEY	<u>Operation (Without Accessory 2 Way Remote) or Keyless Entry System Description and Operation (With Accessory 2 Way Remote)</u>
RIGHT REAR DOOR OPEN	<u>Door Ajar Indicator Description and Operation</u>
SERVICE ALL WHEEL DRIVE	<u>Transfer Case Description and Operation</u> for the MP 3023/3024-NQH transfer case or <u>Transfer Case Description and Operation</u> for the BW 4485-NR3 transfer case
SERVICE AIR BAG	<u>SIR System Description and Operation</u>
SERVICE BATTERY CHARGING SYSTEM	<u>Charging System Description and Operation</u> or <u>Charging System Description and Operation</u> Hybrid
SERVICE BRAKE BOOSTER	<u>Brake Warning System Description and Operation</u>
SERVICE BRAKES SOON	<u>Brake Warning System Description and Operation</u>
SERVICE HYBRID SYSTEM	<u>High Voltage Monitoring Systems Description</u>
SERVICE PARK ASSIST	<u>Object Detection Description and Operation (UD7)</u> or <u>Object Detection Description and Operation (UVC)</u> or <u>Object Detection Description and Operation (UFT)</u>
SERVICE STABILITRAK	• <u>ABS Description and Operation</u> Hybrid • <u>ABS Description and Operation</u> Less than 8600 • <u>ABS Description and Operation</u> Greater than 8600
SERVICE SUSPENSION SYSTEM	<u>Electronic Suspension Control Description and Operation</u> .
SERVICE THEFT DETERRENT SYSTEM	<u>Immobilizer Description and Operation</u>
SERVICE TIRE MONITOR SYSTEM	<u>Tire Pressure Monitor Description and Operation</u>
SERVICE TRACTION CONTROL	Refer to • <u>ABS Description and Operation</u> Hybrid • <u>ABS Description and Operation</u> Less than 8600 • <u>ABS Description and Operation</u> Greater than 8600
SERVICE SIDE BLIND ZONE	<u>Object Detection Description and Operation (UD7)</u> or <u>Object Detection Description and Operation (UVC)</u> or <u>Object Detection Description and Operation (UFT)</u>

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SIDE BLIND ZONE OFF	<u>Object Detection Description and Operation (UD7)</u> or <u>Object Detection Description and Operation (UVC)</u> or <u>Object Detection Description and Operation (UFT)</u>
SIDE BLIND ZONE SYS UNAVAILABLE	<u>Object Detection Description and Operation (UD7)</u> or <u>Object Detection Description and Operation (UVC)</u> or <u>Object Detection Description and Operation (UFT)</u>
STABILITRAK OFF	• <u>ABS Description and Operation</u> Hybrid • <u>ABS Description and Operation</u> Less than 8600 • <u>ABS Description and Operation</u> Greater than 8600
STARTING DISABLED SERVICE THROTTLE	<u>Throttle Actuator Control (TAC) System Description</u>
THEFT ATTEMPTED	<u>Content Theft Deterrent (CTD) Description and Operation</u>
TIGHTEN GAS CAP	• <u>Fuel System Description</u> for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engine • <u>Fuel System Description</u> for the 6.0L (LFA) engine
TIRE LEARNING ACTIVE	<u>Tire Pressure Monitor Description and Operation</u>
TRACTION CONTROL OFF	• <u>ABS Description and Operation</u> Hybrid • <u>ABS Description and Operation</u> Less than 8600 • <u>ABS Description and Operation</u> Greater than 8600
TRANSMISSION HOT IDLE ENGINE	<u>Transmission Indicators and Messages (TCM)</u> for the 4L60-E transmission or <u>Transmission Indicators and Messages</u> for the 4L60-E/4L65-E/4L70-E transmission
TURN SIGNAL ON	<u>Exterior Lighting Systems Description and Operation</u>
VEHICLE OVERSPEED	The IPC displays this message in the DIC when the IPC detects that the vehicle speed is more than 120 km/h (75 mph).
WASHER FLUID LOW ADD FLUID	<u>Wiper/Washer System Description and Operation</u>

INSTRUMENT CLUSTER DESCRIPTION AND 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 occurs at key up:

- The air bag indicator flashes 7 times (not IPC controlled).
- The ABS indicator illuminates briefly.
- The battery indicator illuminates briefly.
- The brake indicator illuminates briefly.
- The coolant temperature indicator illuminates briefly.
- The cruise engage indicator illuminates briefly.
- The engine oil pressure indicator illuminates briefly.
- The malfunction indicator lamp (MIL) illuminates briefly (not IPC controlled).
- The seat belt indicator illuminates for 70 seconds or until the driver seat belt is latched (not IPC controlled).
- The security indicator illuminates briefly.
- The tire pressure low indicator illuminates briefly.
- The vehicle dynamics caution (VDC) indicator illuminates briefly.
- All segments of the driver information center (DIC) illuminate briefly.
- All odometer segments illuminate briefly.
- The PRNDL segment illuminates briefly.

Indicators and Warning Messages

Refer to **Indicator/Warning Message Description and Operation**, **Data Link Communications Description and Operation**, and **Body Control System Description and Operation**.

Driver Efficiency Gage (Hybrid)

The IPC displays the driver efficiency as determined by the engine control module (ECM). The IPC receives a serial data message from the ECM indicating the fuel efficiency of the vehicle. There are several zones on the gage indicating different levels of efficiency. The gage shall indicate fuel efficiency when the engine is running and will be set at the minimum scale position when the ignition transitions to a mode other than when the engine is running. The gage will default to its half scale position when there is a loss of serial data communication with the ECM.

The driver efficiency gage gives feedback to the driver of the hybrid vehicle as to how efficient they are driving. When driving in a way to optimize the fuel economy (e.g. gradually increasing the speed, slow braking, etc.), the pointer or indicator moves into a high efficiency band. When driving in an inefficient manner (e.g. starts, hard braking, constantly changing speeds, etc.), the pointer or indicator moves into a less efficient band. The gage spans several zones, corresponding to different levels of efficiency for acceleration and deceleration. As the indicator moves across the band, the driver receives directional feedback as to whether their driving style is moving towards or away from the desired efficiency.

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Engine Coolant Temperature Gage

The IPC displays the engine coolant temperature as determined by the ECM. The IPC receives a serial data message from the ECM indicating the engine coolant temperature. The engine coolant temperature gage defaults to 60°C (140°F) or below if:

- The ECM detects a malfunction in the engine coolant temperature sensor circuit.
- The IPC detects a loss of serial data communications with the ECM.
- The body control module (BCM) detects a loss of serial data communications with the ECM.

Fuel Gage

The IPC displays the fuel level as determined by the ECM. The IPC receives a serial data message from the ECM indicating the fuel level percent. The fuel gage defaults to empty if:

- The ECM detects a malfunction in the fuel level sensor circuit.
- The IPC detects a loss of serial data communications with the ECM

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

Odometer

The vehicle odometer is calculated and stored electronically in the IPC. The IPC contains a season odometer and trip odometer A or B. Momentarily press the DIC trip/fuel button on the IPC in order to toggle between the season odometer and the trip odometer. Press the DIC set/reset button for greater than 0.25 seconds, while the trip odometer is displayed, in order to reset the trip odometer. The IPC displays the vehicle mileage and trip mileage as determined by the IPC. The IPC calculates the mileage based on the serial data vehicle speed information from the ECM. The odometer will display "error" if an internal IPC memory failure is detected. The odometer displays either miles or kilometers and can be set through the personalization programming menu in the DIC.

PRNDL Display

The IPC displays the selected gear position as determined by the ECM. The IPC receives a serial data message from the ECM indicating the gear position. The PRNDL display blanks if:

- The ECM detects a malfunction in the transmission range switch circuit.
- The IPC detects a loss of serial data communications with the ECM.

Speedometer

The IPC displays the vehicle speed as determined by the ECM. The IPC calculates the mileage based on the serial data vehicle speed information from the ECM. The speedometer defaults to 0 km/h (0 mph) if the IPC detects a loss of serial data communications with the ECM.

Tachometer

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The IPC displays the engine speed as determined by the ECM. The IPC receives a serial data message from the ECM indicating the engine speed. The tachometer will default to 0 RPM if:

- The ECM detects a malfunction in the engine speed sensor circuit.
- The IPC detects a loss of serial data communications with the ECM.

Tachometer (Hybrid)

The hybrid tachometer is a single gage that displays the engine speed and indicates whether the vehicle is in the AUTO STOP or OFF mode of operation. The AUTO STOP mode indicates that the vehicle is still motion capable and the engine could restart by auto start at any time. OFF mode indicates that either the vehicle is turned OFF or the engine has stalled. The instrument panel cluster (IPC) displays the engine speed as determined by the engine control module (ECM). The engine control module (ECM) calculates the engine speed and sends the engine speed serial data message to the BCM. The BCM sends the engine speed via the serial data circuit to the IPC. The tachometer defaults to 0 RPM if:

- The ECM detects a malfunction in the engine speed sensor.
- The BCM detects a loss of serial data communication with the ECM.
- The IPC detects a loss of serial data communication with the BCM.

Battery Gage

The IPC displays the voltage as determined by the regulated voltage control (RVC). The IPC receives a serial data message from the body control module (BCM) indicating the battery voltage. When the engine is ON, the gage should be between 10-16 volts. The gage will default to 0 volts if the IPC detects a loss of communication with the BCM.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/ Description
	J 33431-C Signal Generator and Instrument Panel Tester