

ACCESSORIES & EQUIPMENT Displays

And Gauges - Coupe And Wagon

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Drivers Information Display Switch Screws	1 N.m	9 lb in
Instrument Panel Cluster Assembly	2.5 N.m	22 lb in

SCHEMATIC WIRING DIAGRAMS

INSTRUMENT CLUSTER WIRING SCHEMATICS

Power, Ground, and Odometer

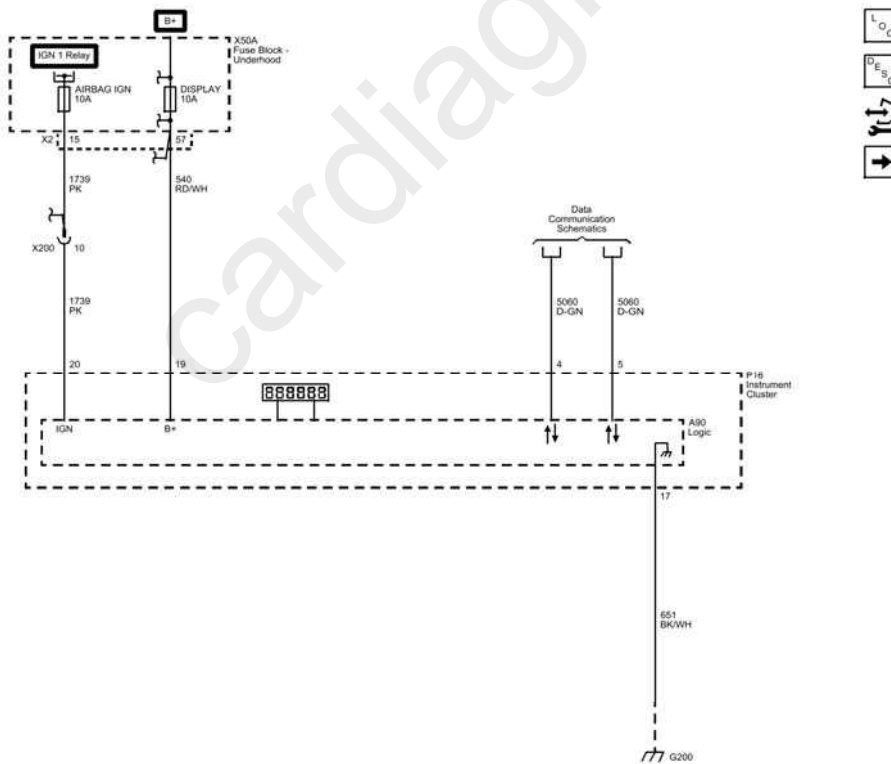


Fig. 1: Power, Ground, and Odometer
Courtesy of GENERAL MOTORS COMPANY

Indicators

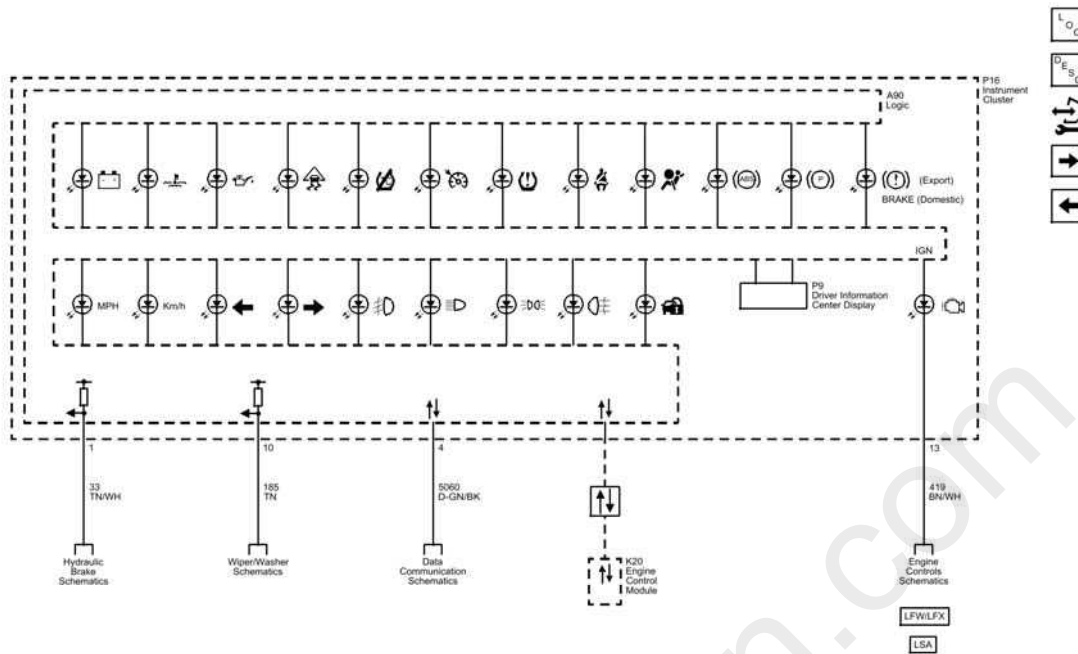


Fig. 2: Indicators

Courtesy of GENERAL MOTORS COMPANY

Gauges (LFW or LFX)

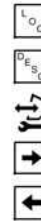
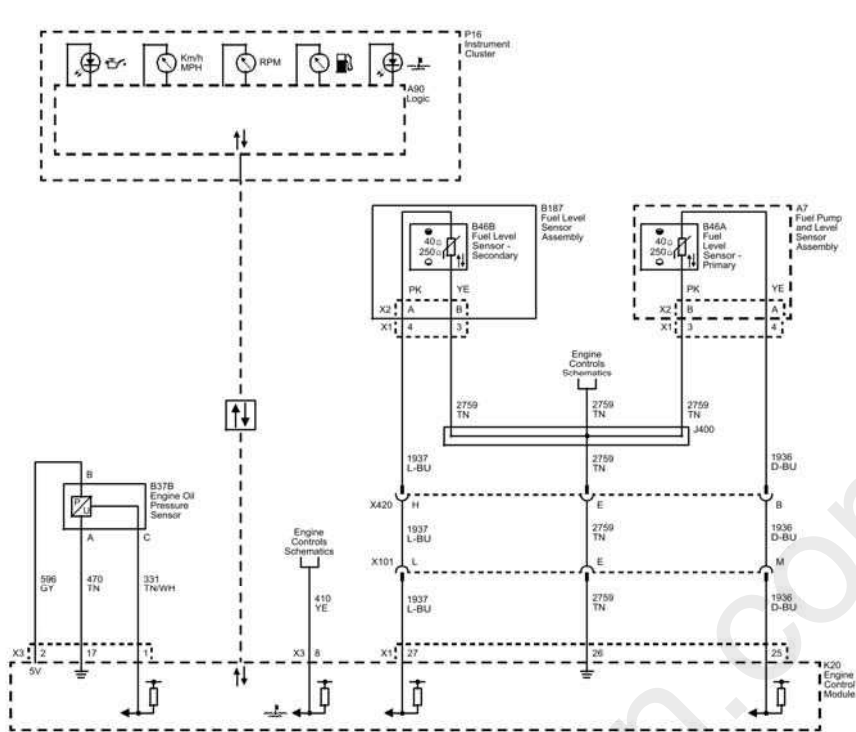


Fig. 3: Gauges (LFW or LFX)
Courtesy of GENERAL MOTORS COMPANY

Gauges (LSA)

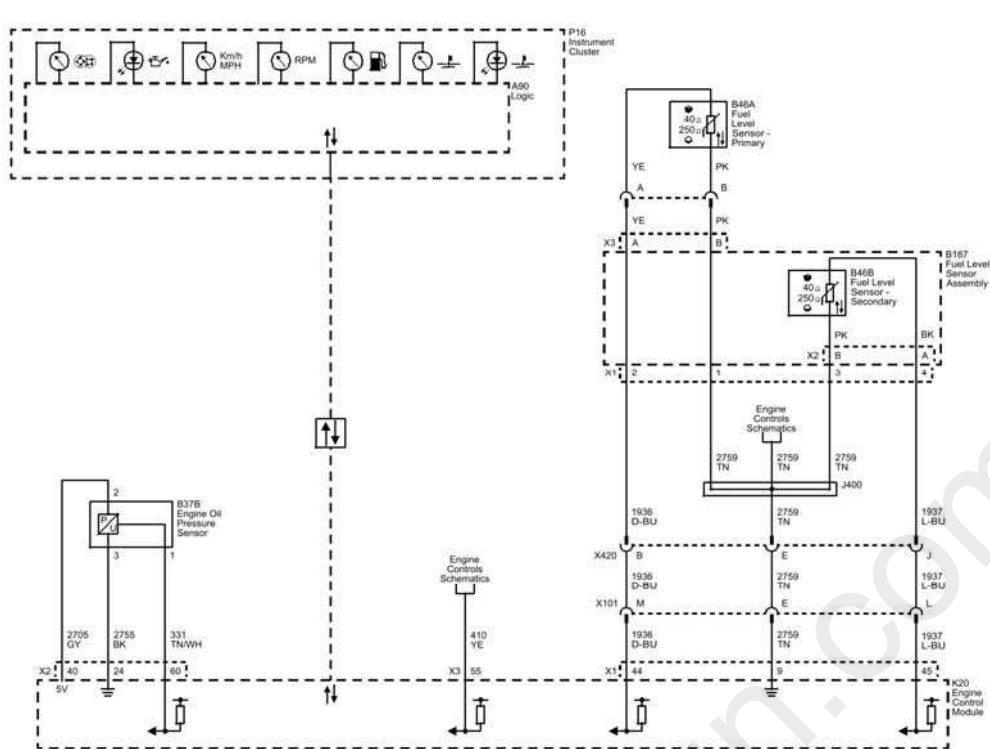


Fig. 4: Gauges (LSA)
Courtesy of GENERAL MOTORS COMPANY

Driver Information Center

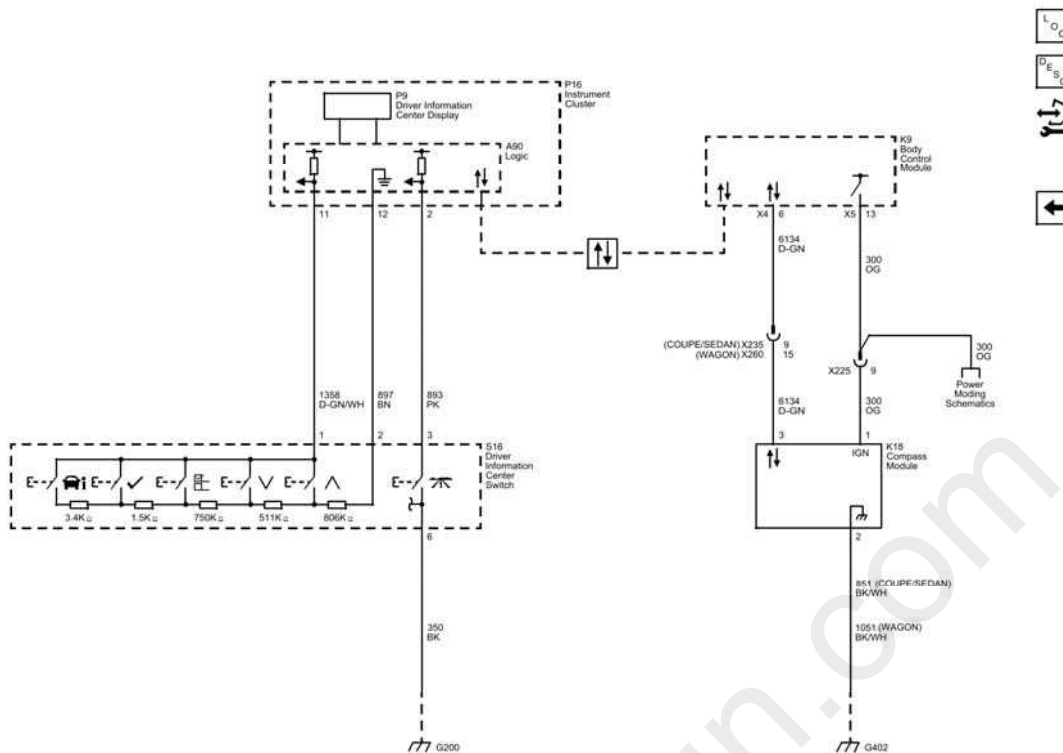


Fig. 5: Driver Information Center

Courtesy of GENERAL MOTORS COMPANY

DRIVER INFORMATION SYSTEM WIRING SCHEMATICS

Clock

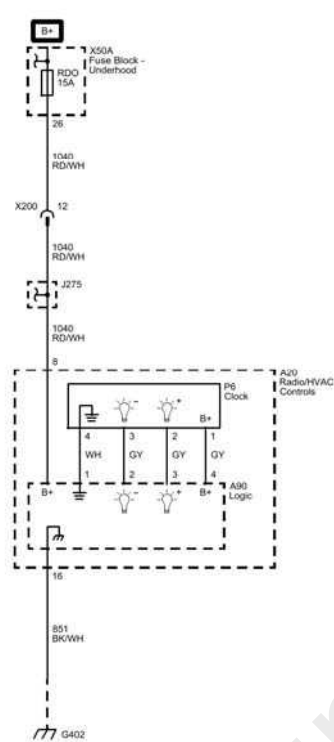


Fig. 6: Clock

Courtesy of GENERAL MOTORS COMPANY

AUDIBLE WARNINGS WIRING SCHEMATICS

Audible Warning System

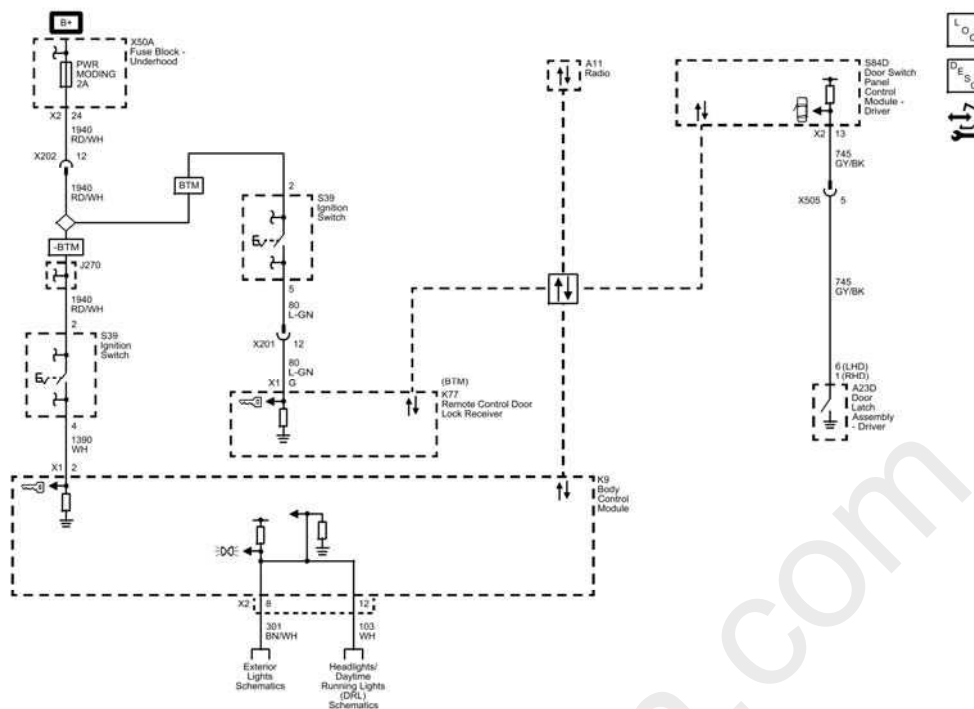


Fig. 7: Audible Warning System

Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>DTC B3567</u>	DTC B3567 01 Driver Information Center Select Switch Circuit Short to Battery DTC B3567 59 Driver Information Center Select Switch Circuit/Component Protection Time-Out
<u>DTC P0461</u>	DTC P0461 Fuel Level Sensor 1 Performance
<u>DTC P0462</u>	DTC P0462 Fuel Level Sensor 1 Circuit Low Voltage
<u>DTC P0463</u>	DTC P0463 Fuel Level Sensor 1 High Voltage
<u>DTC P0464</u>	DTC P0464 00 Fuel Level Sensor 1 Circuit Intermittent (LSA)
<u>DTC P0521, P0522, or P0523</u>	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
<u>DTC P2066</u>	DTC P2066 Fuel Level Sensor 2 Performance
<u>DTC P2067</u>	DTC P2067 Fuel Level Sensor 2 Low Voltage

DTC B3567: DRIVER INFORMATION CENTER SELECT SWITCH**Diagnostic Instructions**

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

DTC Descriptors**DTC B3567 01**

Driver Information Center Select Switch Circuit Short to Battery

DTC B3567 59

Driver Information Center 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	P3567	P3567
DIC Select Switch Signal	1	1	1	P3567
DIC Switch Low Reference	-	1	-	-
DIC Switch Ground	-	1	-	-
1. Driver Information Center (DIC) Switch Malfunction				

Circuit/System Description

The driver information center (DIC) switch is a multiplexed switch. Battery power is provided to the DIC switch via the instrument panel cluster (IPC). The DIC switch signal circuit is pulled up to battery voltage in the IPC. The IPC also provides the DIC switch with a low reference. The switch input to the IPC is pulled low when a switch is activated. The DIC switch is a momentary contact switch that connects a series of resistors in a resistor ladder format. The IPC monitors the DIC switch signal circuit to determine the DIC switch inputs. Each switch state - Set/Reset, Trip/Fuel, Vehicle Information, Personalization, INFO UP, INFO DOWN - corresponds to a certain resistance value. The IPC determines the switch pressed by the voltage drop across the resistors.

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

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - COUPE AND WAGON

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, 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 driver information center (DIC) switch.
2. Ignition OFF, test for less than 1 ohm between the low reference circuit 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 ohm between the ground circuit terminal 6 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 circuits terminal 1 or terminal 3 for a short to ground. If the circuit tests normal, replace the IPC.
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 tests normal, replace the IPC.
7. If all the circuits test normal, test or replace the DIC switch.

Repair Instructions

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

- **Driver Information Display Switch Replacement**
- **Control Module References** for the IPC replacement, setup, and programming

DTC P0461: FUEL LEVEL SENSOR 1 PERFORMANCE

Diagnostic Instructions

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

DTC Descriptor

DTC P0461

Fuel Level Sensor 1 Performance

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Fuel Level Sensor 1 Signal	P0462	1	P0463	P0463	P0461
Fuel Level Sensor 2 Signal	P2067	1	P2068	P2068	P2066
Fuel Level Sensor Low Reference	-	1	P0463 P2068	P0463 P2068	P0461 P2066
1. Fuel Gauge 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 serial data circuit to the instrument cluster in order to control the fuel gauge.

Conditions for Running the DTC

- The engine is running.
- No fuel level sensor signal failure present.
- The fuel level state is stable.

Conditions for Setting the DTC

The ECM detects a change in fuel level of less than a specified amount (typically 3-10 L or 0.8-2.6 gal) over a specified driving distance (typically 240-320 km or 150-200 miles).

Action Taken When the DTC Sets

- The fuel gauge 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 partially filled fuel tank and filling the fuel tank with the ignition ON or engine RUNNING may cause an inaccurate or erratic fuel gauge. This condition may cause a fuel system DTC to set and the fuel gauge to default to empty. Refer to **Fuel Gauge Description and Operation**.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - COUPE AND WAGON

Description and Operation

Fuel Gauge Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, remove the primary fuel level sender from fuel tank.
2. Verify there are no obstructions interfering with the fuel level sender.
 - **If any interference is present**

Repair the fuel level sender interference.
 - **If no interference is present**
3. Test or replace the fuel level sensor.

Component Testing

1. Ignition OFF, remove the fuel level sender.
2. Sweep the fuel level sensor through its full range of motion while measuring resistance between the signal terminal A and the low reference terminal B.
3. Test for a minimum resistance value of 37-43 ohms and a maximum value of 245-255 ohms without any spikes or dropouts.
 - **If minimum resistance is not 37-43 ohms, maximum resistance is not 245-255 ohms, or if there are any spikes or dropouts**

Replace the fuel level sensor.

- **If minimum resistance is 37-43 ohms, maximum resistance is 245-255 ohms, and if there are no spikes or dropouts**
4. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Fuel Level Sensor Replacement - Right Side** for the 3.6L engine
- **Fuel Level Sensor Replacement - Right Side** 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 P0462: FUEL LEVEL SENSOR 1 CIRCUIT LOW VOLTAGE

Diagnostic Instructions

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

DTC Descriptor

DTC P0462

Fuel Level Sensor 1 Circuit Low Voltage

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Fuel Level Sensor 1 Signal	P0462	1	P0463	P0463	P0461
Fuel Level Sensor 2 Signal	P2067	1	P2068	P2068	P2066
Fuel Level Sensor Low Reference	-	1	P0463, P2068	P0463, P2068	P0461, P2066
1. Fuel Gauge 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 serial data circuit to the instrument cluster in order to control the fuel gauge.

Conditions for Running the DTC

- The ignition is ON, with the engine running.
- The system voltage is between 10-18 V.

Conditions for Setting the DTC

- The primary fuel level signal is about 0.35 V.
- The above condition is present for about 60 seconds.

Action Taken When the DTC Sets

- The fuel gauge 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 - INDEX - COUPE AND WAGON

Description and Operation

Fuel Gauge 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, observe the scan tool Fuel Level Sensor parameter. The reading should be between 0.9-2.5 V.

Circuit/System Testing

NOTE: If equipped, the following tests can be performed at an inline connector. See schematics for the corresponding terminals to test at.

1. Ignition OFF, disconnect the harness connector at the primary fuel level sensor.
2. Ignition ON, verify that the scan tool Fuel Level Sensor Left Tank parameter is greater than 4.5 V.
 - If less than the specified range, test the primary signal circuit terminal 1 for a short to ground. If the circuit tests normal, replace the ECM.
3. If all circuits test normal, perform the fuel level sensor component test before replacing the primary fuel level sensor.

Component Testing

1. Ignition OFF, remove the fuel level sender.
2. Sweep the fuel level sensor through its full range of motion while measuring resistance between the signal terminal A and the low reference terminal B.
3. Test for a minimum resistance value of 37-43 ohms and a maximum value of 245-255 ohms without any spikes or dropouts.
 - **If minimum resistance is not 37-43 ohms, maximum resistance is not 245-255 ohms, or if there are any spikes or dropouts**

Replace the fuel level sensor.

- **If minimum resistance is 37-43 ohms, maximum resistance is 245-255 ohms, and if there are no spikes or dropouts**
4. All OK.

Repair Instructions

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

- **Fuel Level Sensor Replacement - Right Side** for the 3.6L engine
- **Fuel Level Sensor Replacement - Right Side** for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engines
- **Control Module References** for the ECM replacement, setup, and programming

DTC P0463: FUEL LEVEL SENSOR 1 HIGH VOLTAGE

Diagnostic Instructions

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

DTC Descriptor

DTC P0463

Fuel Level Sensor 1 High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Fuel Level Sensor 1 Signal	P0462	1	P0463	P0463	P0461
Fuel Level Sensor 2 Signal	P2067	1	P2068	P2068	P2066
Fuel Level Sensor Low Reference	-	1	P0463, P2068	P0463, P2068	P0461, P2066
1. Fuel Gauge 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 serial data circuit to the instrument cluster in order to control the fuel gauge.

Conditions for Running the DTC

- The engine is running.
- The system voltage is between 10-18 V.

- Fuel level state is stable.

Conditions for Setting the DTC

- The primary fuel level signal is about 3.2 V.
- The above condition is present for about 60 seconds.

Action Taken When the DTC Sets

- The fuel gauge 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 - INDEX - COUPE AND WAGON

Description and Operation

Fuel Gauge 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, observe the scan tool Fuel Level Sensor parameter. The reading should be between 0.9-2.5 V.

Circuit/System Testing

NOTE: If equipped, the following tests can be performed at an inline connector. See schematics for the corresponding terminals to test at.

1. Ignition OFF, disconnect the harness connector at the primary fuel level sensor.
2. Ignition OFF, test for less than 1 ohms between the low reference circuit terminal 4 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 A fused jumper between the primary signal circuit terminal 1 and the low reference circuit terminal 4. Verify the scan tool Fuel Level Sensor Left Tank parameter is less than 0.4 V.
 - If greater 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, perform the fuel level sensor component test before replacing the primary fuel level sensor.

Component Testing

1. Ignition OFF, remove the fuel level sender.
2. Sweep the fuel level sensor through its full range of motion while measuring resistance between the signal terminal A and the low reference terminal B.
3. Test for a minimum resistance value of 37-43 ohms and a maximum value of 245-255 ohms without any spikes or dropouts.
 - **If minimum resistance is not 37-43 ohms, maximum resistance is not 245-255 ohms, or if there are any spikes or dropouts**

Replace the fuel level sensor.
 - **If minimum resistance is 37-43 ohms, maximum resistance is 245-255 ohms, and if there are no spikes or dropouts**
4. All OK.

Repair Instructions

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

- **Fuel Level Sensor Replacement - Right Side** for the 3.6L engine
- **Fuel Level Sensor Replacement - Right Side** for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engines
- **Control Module References** for the ECM replacement, setup, and programming

DTC P0464: FUEL LEVEL SENSOR 1 CIRCUIT INTERMITTENT (LSA)

Diagnostic Instructions

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

DTC Descriptor

DTC P0464 00

Fuel Level Sensor 1 Circuit Intermittent (LSA)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Fuel Level Sensor 1 Signal	P0462 00	1	P0463 00	P0463 00
Fuel Level Sensor 2 Signal	P2067 00	1	P2068 00	P2068 00
Fuel Level Sensor Low Reference	-	1	P0463 00, P2068 00	P0463 00, P2068 00
1. Fuel Gauge 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 serial data circuit to the instrument cluster in order to control the fuel gauge.

Conditions for Running the DTC

- The engine is running.
- The system voltage is between 10-16 V.
- Fuel level state is stable.

Conditions for Setting the DTC

The ECM detects an erratic signal from the fuel pump and sender assembly for greater than 60 seconds.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

- The DTC clears when the fault is no longer detected.
- The history DTC will clear after 50 consecutive fault-free ignition cycles have occurred

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - COUPE AND WAGON

Description and Operation

Fuel Gauge Description and Operation

Electrical Information Reference

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

Circuit/System Verification

Ignition ON, observe the scan tool ECM Secondary Fuel Level Sensor parameter. The reading should be between 0.9-4.98 V.

Circuit/System Testing

NOTE: **If equipped, the following tests can be performed at an inline connector. See schematics for the appropriate circuit terminals.**

1. Ignition OFF, disconnect the harness connectors at the fuel pump and sender assembly.
2. Test for less than 1.0 ohms between the low reference circuit terminal 4 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, verify the scan tool ECM Secondary Fuel Level Sensor parameter is greater than 4.75 V.
 - If less than the specified value, test the signal circuit for a short to ground. If the circuit tests

normal, replace the ECM.

4. Connect a 3 A fused jumper wire between the signal circuit terminal 1 and ground, verify the scan tool ECM Secondary Fuel Level Sensor parameter is less than 1 V.
 - If greater 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.
5. If all circuits test normal, test or replace the fuel pump and sender assembly.

Component Testing

NOTE: This DTC only sets when test parameters indicate that an intermittent condition has occurred on multiple occasions. If the fault is not present do not replace components. Test again, as you perform action to induce the intermittent fault (moving harnesses, terminals and connectors, etc.) while observing the test readings.

1. Ignition OFF, remove the fuel level sender.
2. Sweep the fuel level sensor through its full range of motion while measuring resistance between the signal terminal A and the low reference terminal B.
3. Test for a minimum resistance value of 37-43 ohms and a maximum value of 245-255 ohms without any spikes or dropouts.
 - If minimum resistance is not 37-43 ohms, maximum resistance is not 245-255 ohms, or if there are any spikes or dropouts

Replace the fuel level sensor.
 - If minimum resistance is 37-43 ohms, maximum resistance is 245-255 ohms, and if there are no spikes or dropouts
4. All OK.

Repair Instructions

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

- **Fuel Tank Fuel Pump Module Replacement - Right Side**
- **Control Module References** for ECM replacement, setup and programming

DTC P0521, P0522, OR P0523: ENGINE OIL PRESSURE (EOP) SENSOR

Diagnostic Instructions

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

DTC 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 Gauge Inaccurate or Inoperative.					

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 engine oil pressure 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 the serial data circuit.

Conditions for Running the DTC

The engine is running.

Conditions for Setting the DTC

P0521

- The engine oil pressure is greater than 880 kPa (127.6 psi).
- The engine oil pressure is less than 8 kPa (1.16 psi).
- The ECM does not detect a change in the engine oil pressure of at least 34.5 kPa (5.0 psi).
- The above condition is present over a predetermined variance of engine speed.

P0522

- The ECM detects that the EOP sensor signal circuit is less than 0.2 volt.
- The above condition is present for greater than 10 seconds.

P0523

- The ECM detects that the EOP sensor signal circuit is greater than 4.8 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 EOP gauge defaults to zero.
- 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 - INDEX - COUPE AND WAGON

Description and Operation

- **Indicator/Warning Message 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 0.2-4.8 volts.
2. Verify the engine oil pressure, refer to:
 - **Oil Pressure Diagnosis and Testing** for the 3.6L engine
 - **Oil Pressure Diagnosis and Testing** for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L 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 C (or 1) and ground.
 - If greater than the specified range, test the 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 B (or 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 0.2 volt.
 - If greater than the specified range, test the signal circuit terminal A (or 3) for a short to voltage. If the circuit tests normal, replace the ECM.
5. Install a 3A fused jumper wire between the signal circuit terminal A (or 3) and the 5-volt reference circuit terminal B (or 2). Verify the scan tool Engine Oil Pressure Sensor parameter is greater than 4.8 volts.
 - 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 Instructions

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

- **Engine Oil Pressure Sensor and/or Switch Replacement** for 3.6L engine
- **Engine Oil Pressure Sensor and/or Switch Replacement** for 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engine
- **Control Module References** for ECM replacement, programming, and setup

DTC P2066: FUEL LEVEL SENSOR 2 PERFORMANCE

Diagnostic Instructions

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

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

DTC Descriptor

DTC P2066

Fuel Level Sensor 2 Performance

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Fuel Level Sensor 1 Signal	P0462	1	P0463	P0463	P0461
Fuel Level Sensor 2 Signal	P2067	1	P2068	P2068	P2066
Fuel Level Sensor Low Reference	-	1	P0463 P2068	P0463 P2068	P0461 P2066
1. Fuel Gauge 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 serial data circuit to the instrument cluster in order to control the fuel gauge.

Conditions for Running the DTC

- The engine is running.
- No fuel level sensor signal failure present.
- The fuel level state is stable.

Conditions for Setting the DTC

- The ECM detects a difference between the engine consumed fuel and change of the fuel level signal of less than 1 L (0.26 gallons) over a range of 30 L (7.92 gallons) or 45.6 percent of the secondary fuel tank.
- The above condition is present for about 300 seconds.

Action Taken When the DTC Sets

- The fuel gauge 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 partially filled fuel tank and filling the fuel tank with the ignition ON or engine RUNNING may cause an inaccurate or erratic fuel gauge. This condition may cause a fuel system DTC to set and the fuel gauge to default to empty. Refer to **Fuel Gauge Description and Operation**.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - COUPE AND WAGON

Description and Operation

Fuel Gauge Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, remove the secondary fuel level sender from fuel tank.
2. Verify there are no obstructions interfering with the fuel level sender.
 - **If any interference is present**

Repair the fuel level sender interference.

- **If no interference is present**
- 3. Test or replace the fuel level sensor.

Component Testing

1. Ignition OFF, remove the fuel level sender.
2. Sweep the fuel level sensor through its full range of motion while measuring resistance between the signal terminal A and the low reference terminal B.
3. Test for a minimum resistance value of 37-43 ohms and a maximum value of 245-255 ohms without any spikes or dropouts.
 - **If minimum resistance is not 37-43 ohms, maximum resistance is not 245-255 ohms, or if there are any spikes or dropouts**

Replace the fuel level sensor.

 - **If minimum resistance is 37-43 ohms, maximum resistance is 245-255 ohms, and if there are no spikes or dropouts**
4. All OK.

Repair Instructions

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

- **Fuel Level Sensor Replacement - Left Side** for the 3.6L engine
- **Fuel Level Sensor Replacement - Left Side** 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: FUEL LEVEL SENSOR 2 LOW VOLTAGE

Diagnostic Instructions

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

DTC Descriptor

DTC 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 1 Signal	P0462	1	P0463	P0463	P0461
Fuel Level Sensor 2 Signal	P2067	1	P2068	P2068	P2066
Fuel Level Sensor Low Reference	-	1	P0463, P2068	P0463, P2068	P0461, P2066
1. Fuel Gauge 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 serial data circuit to the instrument cluster in order to control the fuel gauge.

Conditions for Running the DTC

- The engine is running.
- The system voltage is between 10-18 V.

Conditions for Setting the DTC

- The secondary fuel level sensor signal is less than 0.35 V.
- The above condition is present for about 60 seconds.

Action Taken When the DTC Sets

- The fuel gauge 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 - INDEX - COUPE AND WAGON

Description and Operation

Fuel Gauge 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, observe the scan tool Fuel Level Sensor parameter. The reading should be between 0.9-2.5 V.

Circuit/System Testing

NOTE: If equipped, the following tests can be performed at an in-line connector. See schematics for the corresponding terminals to test at.

1. Ignition OFF, disconnect the harness connector at the secondary fuel level sensor.
2. Ignition ON, scan tool installed, verify that the scan tool Fuel Level Sensor Left Tank parameter is greater than 4.5 V.
 - If less than the specified range, test the secondary signal circuit terminal A for a short to ground. If the circuit tests normal, replace the ECM.
3. If all circuits test normal, perform the fuel level sensor component test before replacing the secondary fuel level sensor.

Component Testing

1. Ignition OFF, remove the fuel level sender.
2. Sweep the fuel level sensor through its full range of motion while measuring resistance between the signal terminal A and the low reference terminal B.
3. Test for a minimum resistance value of 37-43 ohms and a maximum value of 245-255 ohms without any spikes or dropouts.
 - **If minimum resistance is not 37-43 ohms, maximum resistance is not 245-255 ohms, or if there are any spikes or dropouts**

Replace the fuel level sensor.

- If minimum resistance is 37-43 ohms, maximum resistance is 245-255 ohms, and if there are no spikes or dropouts

4. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Fuel Level Sensor Replacement - Left Side** for the 3.6L engine
- **Fuel Level Sensor Replacement - Left Side** for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engines
- **Control Module References** for the ECM replacement, programming, and setup

DTC P2068: FUEL LEVEL SENSOR 2 HIGH VOLTAGE

Diagnostic Instructions

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

DTC Descriptor

DTC 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 1 Signal	P0462	1	P0463	P0463	P0461
Fuel Level Sensor 2 Signal	P2067	1	P2068	P2068	P2066
Fuel Level Sensor Low Reference	-	1	P0463, P2068	P0463, P2068	P0461, P2066
1. Fuel Gauge 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 serial data circuit to the instrument cluster in order to control the fuel gauge.

Conditions for Running the DTC

- The engine is running.
- The system voltage is between 10-18 V.

Conditions for Setting the DTC

- The secondary fuel level signal is about 3.5 V.
- The above condition is present for about 60 seconds.

Action Taken When the DTC Sets

- The fuel gauge 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 - INDEX - COUPE AND WAGON

Description and Operation

Fuel Gauge Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References

Circuit/System Verification

Ignition ON, observe the scan tool Fuel Level Sensor parameter. The reading should be between 0.9-2.5 V.

Circuit/System Testing

NOTE: If equipped, the following tests can be performed at an inline connector. See schematics for the corresponding terminals to test at.

1. Ignition OFF, disconnect the harness connector at the secondary fuel level sensor.
2. Ignition OFF, test for less than 1 ohms between the low reference circuit terminal D 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 A fused jumper between the secondary signal circuit terminal A and the low reference circuit terminal D. Verify the scan tool Fuel Level Sensor Right Tank parameter is less than 0.4 V.
 - If greater 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, perform the fuel level sensor component test before replacing the secondary fuel level sensor.

Component Testing

1. Ignition OFF, remove the fuel level sender.
2. Sweep the fuel level sensor through its full range of motion while measuring resistance between the signal terminal A and the low reference terminal B.
3. Test for a minimum resistance value of 37-43 ohms and a maximum value of 245-255 ohms without any spikes or dropouts.
 - **If minimum resistance is not 37-43 ohms, maximum resistance is not 245-255 ohms, or if there are any spikes or dropouts**

Replace the fuel level sensor.
 - **If minimum resistance is 37-43 ohms, maximum resistance is 245-255 ohms, and if there are no spikes or dropouts**
4. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Fuel Level Sensor Replacement - Left Side** for the 3.6L engine
- **Fuel Level Sensor Replacement - Left Side** for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engines
- **Control Module References** for the ECM replacement, programming, and setup

SYMPTOMS - DISPLAYS AND GAUGES

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

1. Before using the symptom diagnostic tables, perform the **Diagnostic System Check - Vehicle** in order to determine that there are no DTCs set, and that the control modules can communicate via the serial data link:
2. Review the system operation in order to understand the system functions. Refer to the following description and operations:
 - **Instrument Cluster Description and Operation**
 - **Indicator/Warning Message Description and Operation**
 - **Driver Information Center (DIC) Description and Operation**
 - **Audible Warnings Description and Operation**
 - **Fuel Gauge Description and Operation**

Visual/Physical Inspection

- Inspect for aftermarket devices which can affect the operation of the instrument panel cluster or the audible warnings system. Refer to **Checking Aftermarket Accessories** .
- Inspect the accessible system components or the visible system components for obvious damage or for obvious conditions which can cause the symptom.
- Inspect for the proper fluid levels.

Intermittent

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

Symptom List

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

Gauges and Odometer

- **Instrument Cluster Gauges Inoperative**
- **Fuel Gauge Inaccurate or Inoperative**
- **Engine Oil Pressure Gauge Inaccurate or Inoperative**

Indicators

- ABS Indicator Malfunction
- Air Bag Indicator Malfunction (Passenger) , Air Bag Indicator Malfunction (Driver)
- Brake Warning Indicator Malfunction
- Chime Malfunction
- Charge Indicator Malfunction
- Clock Malfunction
- Compass Malfunction (DIC)
- Door Ajar Indicator Malfunction
- Daytime Running Lamps Malfunction
- Front Fog Lamps Malfunction
- Headlamps Malfunction
- Low Tire Pressure Indicator Malfunction
- Low Washer Fluid Indicator Malfunction
- Rear Fog Lamps Malfunction
- Seat Belt Indicator Malfunction - Driver
- Seat Belt Indicator Malfunction - Passenger
- Security Indicator Malfunction
- Traction Control/Stability Control Indicator Malfunction (With LSA) , Traction Control/Stability Control Indicator Malfunction (Without LSA)
- Trunk Ajar Indicator Malfunction
- Turn Signal Lamps and/or Indicators Malfunction

Driver Information Center

Driver Information Center Switch Malfunction

Audible Warnings

Chime Malfunction

CHARGE INDICATOR MALFUNCTION

Diagnostic Instructions

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

Circuit/System Description

The engine control module (ECM) 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 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**

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - COUPE AND WAGON

Description and Operation

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

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

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

CLOCK MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

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

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 1 ohm between the ground circuit terminal 2 and ground.
 - If greater than the specified value, test the ground circuit for an open/high resistance.
3. Verify that a test lamp illuminates between the B+ circuit terminal 3 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 Instructions

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

Instrument Panel Center Trim Plate Applique Replacement (Left Hand Drive) , Instrument Panel Center Trim Plate Applique Replacement (Right Hand Drive)

CHIME MALFUNCTION

Diagnostic Instructions

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

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), the body control module (BCM) or the remote control door lock receiver (RCDLR).

Reference Information

Schematic Reference

Audible Warnings Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - COUPE AND WAGON

Description and Operation

Audible Warnings 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

IMPORTANT: Before performing this diagnostics, make sure no indicators are illuminated after the IPC performs a lamp test. If any indicators are illuminated after the bulb test, perform the indicator diagnostics before this diagnostics.

1. Ignition ON, headlamp switch OFF, verify the scan tool Headlamp Switch parameter is Inactive.
 - If not Inactive, refer to **Headlamps Malfunction** .
2. Ignition ON, park lamp switch OFF, verify the scan tool Park Lamps Switch parameter is Inactive.
 - If not Inactive refer to **Park, License, and/or Tail Lamps Malfunction (North America)** , **Park, License, and/or Tail Lamps Malfunction (European)** .
3. Ignition ON, doors closed, verify the scan tool All Door Lock Command is On.
 - If not On, 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 key in ignition switch.
2. Ignition ON, verify that a test lamp illuminates between the B+ circuit terminal 2 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 power mode circuit fuse is open, test the signal circuit terminal listed below for a short to ground:

- Terminal 4 without UHA/UHF
- Terminal 5 with UHA/UHF

3. Verify the scan tool Key In Ignition Status parameter is Key Out.

- If not the specified value, test the signal circuit terminal listed below for a short to voltage. If the circuit tests normal, replace the BCM or the RCDLR.

- Terminal 4 without UHA/UHF
- Terminal 5 with UHA/UHF

4. Install a 3A fused jumper wire between the signal circuit terminal listed below and the B+ circuit terminal

2. Verify the scan tool Key in Ignition Status parameter is Key In.

- Terminal 4 without UHA/UHF
- Terminal 5 with UHA/UHF

- If not the specified value, test the signal circuit for an open/high resistance. If the circuit tests normal, replace the BCM or the RCDLR.

5. If all circuits test normal, test or replace the ignition switch.

Repair Instructions

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

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

COMPASS MALFUNCTION (DIC)

Diagnostic Instructions

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

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 top of the module should be parallel with the centerline of the vehicle.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - COUPE AND WAGON

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.
- If the compass shows CAL or C, refer to Compass Displays CAL.
- If the compass displays "- -" (dashes), refer to Compass Display Is Blank.

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 (DIC)**.
 - If the compass is still incorrect, perform the compass magnetic variation zone adjustment procedure. Refer to **Compass Calibration and Magnetic Variance (DIC)**.
2. If the compass is still incorrect, replace the compass module.

Compass Displays CAL

1. Perform the compass calibration procedure. Refer to **Compass Calibration and Magnetic Variance (DIC)**.
2. If the compass still displays CAL or C, replace the compass module.

Compass Display Is Blank

1. Ignition OFF, disconnect the harness connector at the compass module.
2. Test for less than 5 ohm between the ground circuit terminal 2 and ground.
 - If greater than the specified range, test the ground 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 Instructions

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

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

DRIVER INFORMATION CENTER SWITCH MALFUNCTION

Diagnostic Instructions

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

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
DIC Switch Signal	1	1	P3567	P3567
DIC Select Switch Signal	1	1	1	P3567
DIC Switch Low Reference	-	1	-	-
DIC Switch Ground	-	1	-	-
1. Driver Information Center (DIC) Switch Malfunction				

Circuit/System Description

The driver information center (DIC) switch is a multiplexed switch. Battery power is provided to the DIC switch via the instrument panel cluster (IPC) with the DIC switch signal circuit pulled up to battery voltage in the IPC. The IPC also provides the DIC switch with a ground reference. The switch input to the IPC is pulled low or grounded when a switch is activated. The DIC switch is a momentary contact switch that connects a series of resistors in a resistor ladder format. The IPC monitors the DIC switch signal circuit to determine the DIC switch inputs. Each switch state - Set/Reset, Trip/Fuel, Vehicle Information, Personalization, INFO UP, INFO DOWN - corresponds to a certain resistance value. The IPC determines the switch pressed by the voltage drop across the resistors. A stuck switch or a short to battery sets a DTC.

The Trip/Fuel switch is monitored on a separate circuit provided by the IPC. The Trip/Fuel switch signal circuit is monitored for a stuck switch but not a short to battery.

Diagnostic Aids

When the Trip/Fuel switch is stuck, all other DIC switches will function correctly. When any of the DIC switches are stuck, only the Trip/Fuel switch functions correctly.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - COUPE AND WAGON

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, 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 driver information center (DIC) switch.
2. Ignition OFF, test for less than 1 ohm between the low reference circuit 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 ohm between the ground circuit terminal 6 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 circuits terminal 1 or terminal 3 for a short to ground. If the circuit tests normal, replace the IPC.
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 tests normal, replace the IPC.
7. If all the circuits test normal, test or replace the DIC switch.

Repair Instructions

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

- **Driver Information Display Switch Replacement**
- **Control Module References** for the IPC replacement, setup and programming

ENGINE OIL PRESSURE GAUGE INACCURATE OR INOPERATIVE

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Engine Oil Pressure 5 V 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 Gauge Inaccurate or Inoperative.					

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 V reference circuit. The engine control module (ECM) supplies 5 V to the EOP sensor via the 5 V reference circuit and provides ground via the EOP low reference circuit. The ECM monitors the signal circuit of the EOP sensor to determine the engine oil pressure sensor voltage is within the normal operating range of approximately 1-4 V. 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 the serial data circuit.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - COUPE AND WAGON

Description and Operation

- **Indicator/Warning Message 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 0.2-4.8 V.
2. Ignition ON, with a scan tool perform the IPC Gauges sweep test.
 - If the engine oil pressure gauge does not sweep from its low to high position, replace the IPC.

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 ohms between the low reference circuit terminal listed below and ground:
 - Terminal A, LFW or LFX engine
 - Terminal 3, LSA engine
 - 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 V between the 5 V reference circuit terminal listed below and ground:
 - Terminal B, LFW or LFX engine
 - Terminal 2, LSA engine
 - If less than the specified range, test the 5 V 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 V 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 0.2 V.
 - If greater than the specified range, test the signal circuit terminal listed below for a short to voltage. If the circuit tests normal, replace the ECM.
 - Terminal C, LFW or LFX engine
 - Terminal 1, LSA engine
5. Install a 3 A fused jumper wire between the signal circuit terminal listed below and the 5 V reference circuit terminal listed below. Verify the scan tool Engine Oil Pressure Sensor parameter is greater than 4.8 V.
 - Terminal A and low reference terminal C, LFW or LFX engine
 - Terminal 1 and low reference terminal 3, LSA engine

- 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 engine oil pressure sensor.

Repair Instructions

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

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

FUEL GAUGE INACCURATE OR INOPERATIVE

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Fuel Level Sensor 1 Signal Circuit	P0462	1	P0463	P0463	P0461
Fuel Level Sensor 2 Signal Circuit	P2067	1	P2068	P2068	P2066
Fuel Level Sensor Low Reference Circuit	-	1	P0463, P2068	P0463, P2068	P0461, P2066
1. Fuel Gauge 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 serial data circuit to the instrument cluster in order to control the fuel gauge.

Diagnostic Aids

A partially filled fuel tank and filling the fuel tank with the ignition ON or engine RUNNING may cause an inaccurate or erratic fuel gauge. This condition may cause a fuel system DTC to set and the fuel gauge to default to empty. Refer to **Fuel Gauge Description and Operation**.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - COUPE AND WAGON

Description and Operation

Fuel Gauge 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

Circuit/System Verification

1. Ignition ON, observe the scan tool Fuel Level Sensor parameter. The reading should be between 4-98 percent and vary with fuel level.
2. Ignition ON, perform the Instrument Cluster Gauge Sweep test with the scan tool, verify that the fuel level gauge sweeps from its low to high position
 - If the fuel level gauge does not sweep, replace the P16 Instrument Cluster
3. Command the All Indicators test ON and OFF with the scan tool, verify that the low fuel level indicator turns ON and OFF.
 - If the low fuel level indicator always stays on or always off, replace the P16 Instrument Cluster.

Circuit/System Testing

NOTE: If equipped, the following tests can be performed at an inline connector. See schematics for the corresponding terminals to test at.

1. Ignition OFF, disconnect the harness connector at the B46A primary and B46B secondary fuel level sensor.
2. Ignition OFF for 60 seconds, test for less than 5 ohms between the low reference circuit terminals listed below and ground.
 - Primary terminal 1
 - Secondary terminal A
 - If greater than the specified range, test the low reference circuit for an open/high resistance. If the circuit tests normal, replace the K20 ECM.
3. Ignition ON, test for 4.8-5.2 V between the signal circuit terminals listed below and ground.
 - Primary terminal 1
 - Secondary terminal A
 - 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 K20 ECM.
 - If greater than the specified range, test the signal circuit for a short to voltage. If the circuit tests normal, replace the K20 ECM.
4. Install a jumper wire between the signal circuit terminal 1 and A.
5. Install the Instrument Panel Tester between the jumped signal circuits and the low reference circuit. Verify the Instrument Panel Tester resistance is set at 40-250 ohms before turning the ignition ON.
 - If not displaying the specified range, test both signal circuits for an open/high resistance. If the circuits test normal, replace the ECM.
6. Ignition ON, verify that the scan tool Fuel Tank Level Remaining parameter varies between 5 and 95 percent as the Instrument Panel Tester resistance is varied between 40 and 250 ohms.
 - If not within the specified range, replace the K20 ECM.
7. While varying the Instrument Panel Tester resistance between 40 and 250 ohms verify the fuel gauge moves between empty and full.
 - If not within the specified range, replace the fuel gauge.
8. If all circuits test normal, perform the fuel level sensor component test before replacing the appropriate fuel level sensor.

Component Testing

1. Ignition OFF, remove the fuel level senders.
2. Sweep B46A fuel level sensor through its full range of motion while measuring resistance between the signal terminal 1 and the low reference terminal 4.
3. Test for a minimum resistance value of 37-43 ohms and a maximum value of 245-255 ohms without any spikes or dropouts.
 - **If minimum resistance is not 37-43 ohms, maximum resistance is not 245-255 ohms, or if there are any spikes or dropouts**

Replace the B46A fuel level sensor.

- **If minimum resistance is 37-43 ohms, maximum resistance is 245-255 ohms, and if there are no spikes or dropouts**

4. Sweep B46B fuel level sensor through its full range of motion while measuring resistance between the signal terminal A and the low reference terminal D.
5. Test for a minimum resistance value of 37-43 ohms and a maximum value of 245-255 ohms without any spikes or dropouts.
 - **If minimum resistance is not 37-43 ohms, maximum resistance is not 245-255 ohms, or if there are any spikes or dropouts**

Replace the B46B fuel level sensor.

- **If minimum resistance is 37-43 ohms, maximum resistance is 245-255 ohms, and if there are no spikes or dropouts**

6. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Fuel Level Sensor Replacement - Right Side** for the 3.6L engine
- **Fuel Level Sensor Replacement - Left Side** for the 3.6L engine
- **Fuel Level Sensor Replacement - Right Side** for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engines
- **Fuel Level Sensor Replacement - Left Side** for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engines
- **Control Module References** for ECM and IPC replacement, programming, and setup

INSTRUMENT CLUSTER GAUGES INOPERATIVE

Diagnostic Instructions

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

Circuit/System Description

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

Diagnostic Aids

For the CTS-V, the tachometer gauge sweep test does not go to the maximum value, only approximately 7000 RPM.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - COUPE AND WAGON

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

IMPORTANT: If the suspect gauge 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 Gauge Sweep Test in the IPC Output Controls. Verify that all gauge dials move from minimum to the maximum value and back to the gauge minimum value.
 - If the gauges do not perform the IPC Gauge 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.
 - If the speedometer is incorrect, test or replace the IPC.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

Control Module References for the IPC replacement, setup and programming

REPAIR INSTRUCTIONS

AMBIENT AIR TEMPERATURE SENSOR REPLACEMENT

Removal Procedure

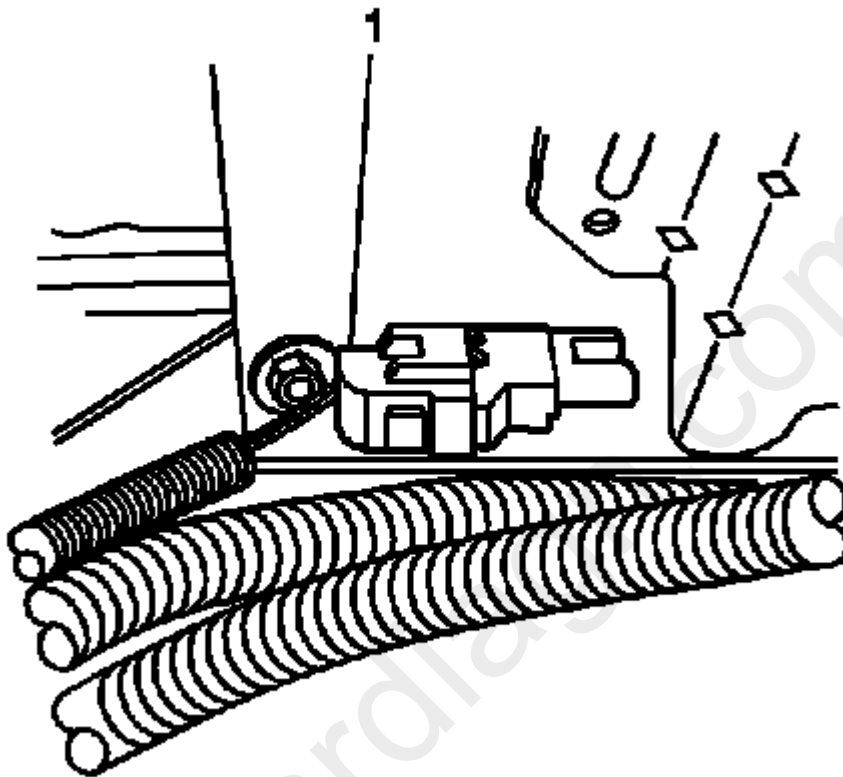


Fig. 8: View Of Ambient Air Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

1. Disconnect the ambient air temperature sensor electrical connector (1).
2. Release the ambient air temperature sensor from the clip.
3. Remove the ambient air temperature sensor from the vehicle.

Installation Procedure

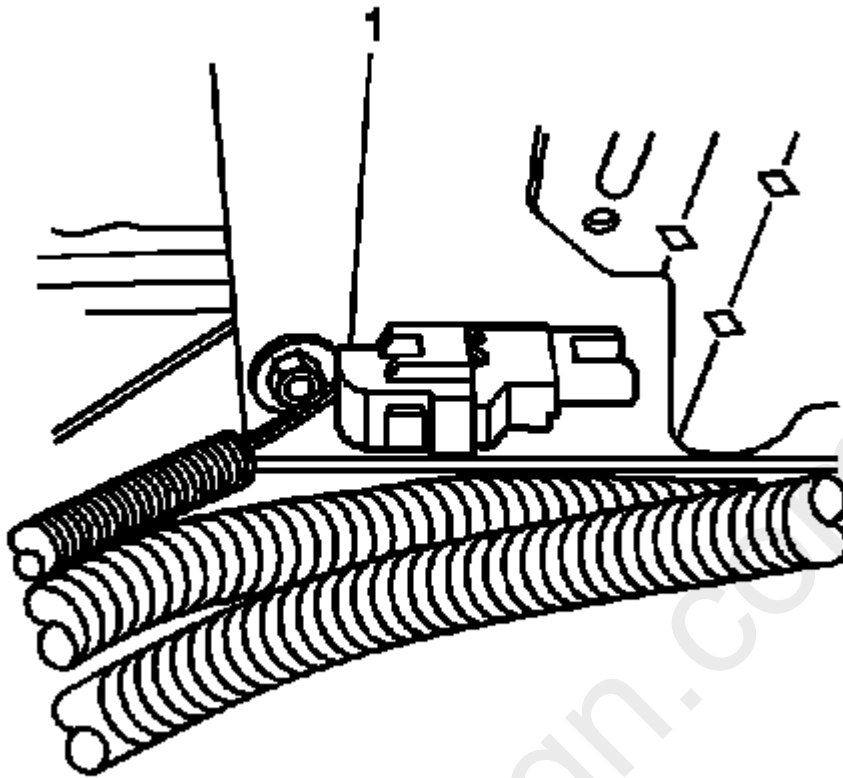


Fig. 9: View Of Ambient Air Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

1. Place the ambient air temperature sensor in position.
2. Engage the ambient air temperature sensor into the clip.
3. Connect the ambient air temperature electrical connector (1).

ELECTRONIC COMPASS MODULE REPLACEMENT (WAGON)

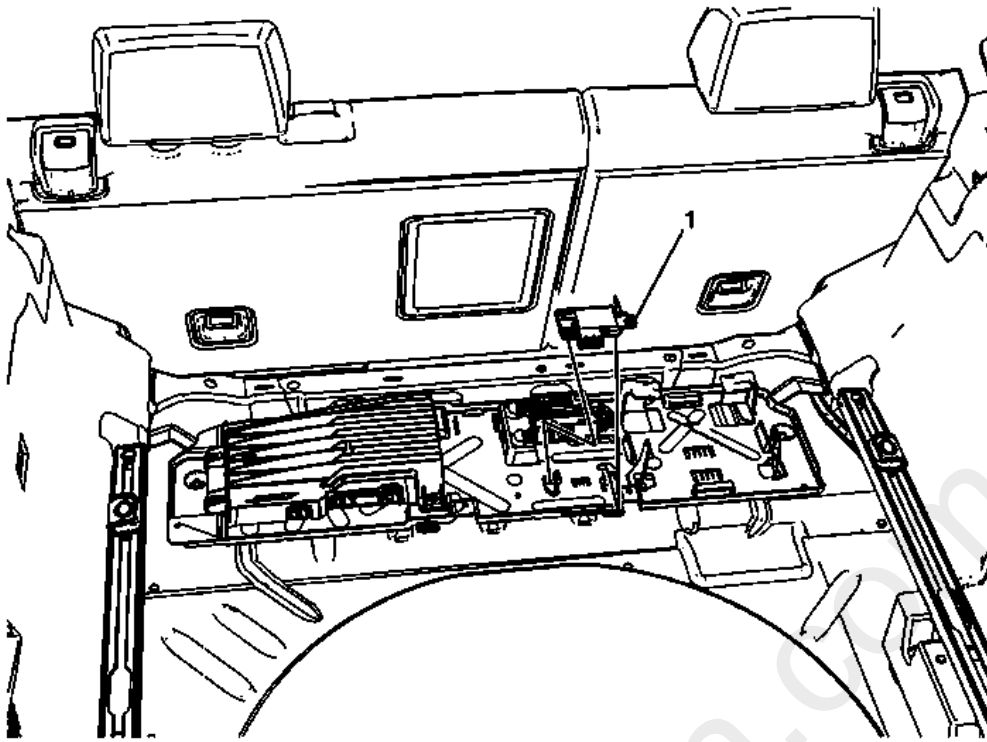


Fig. 10: Electronic Compass Module (Wagon)
 Courtesy of GENERAL MOTORS COMPANY

Electronic Compass Module Replacement (Wagon)

Callout	Component Name
Preliminary Procedure Remove the rear compartment floor stowage compartment cover. Refer to <u>Rear Compartment Floor Stowage Compartment Cover Replacement (Wagon)</u> .	
1	Electronic Compass Module Procedure 1. Disconnect the electrical connectors. 2. For programming and set up, refer to <u>Control Module References</u> 3. Unsnap the electronic compass module from the panel.

ELECTRONIC COMPASS MODULE REPLACEMENT (COUPE)

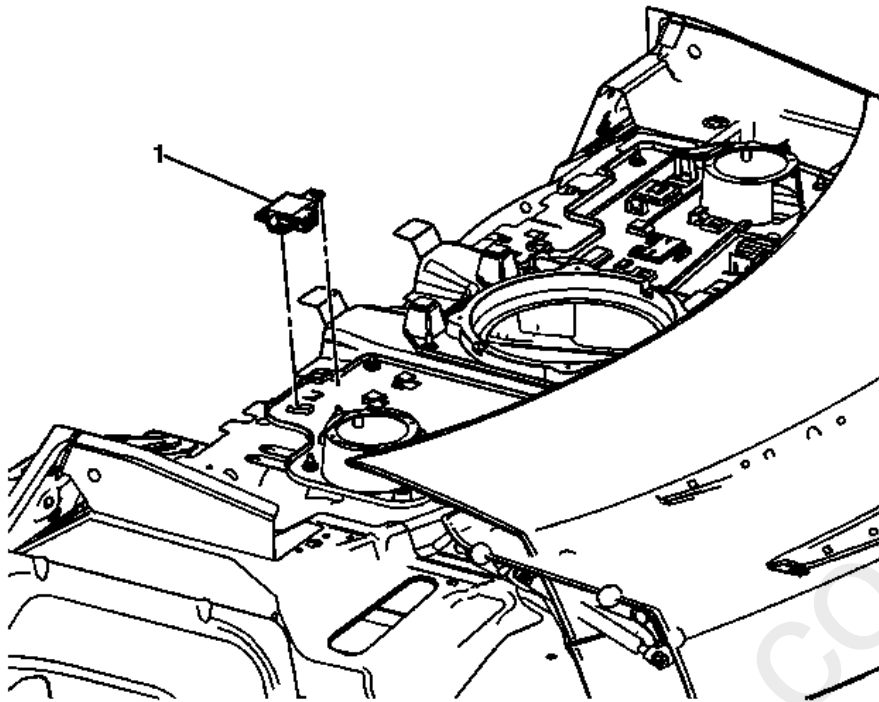


Fig. 11: Electronic Compass Module
 Courtesy of GENERAL MOTORS COMPANY

Electronic Compass Module Replacement (Coupe)

Callout	Component Name
Preliminary Procedure	
Remove the rear window shelf trim panel. Refer to <u>Rear Window Panel Trim Replacement (Coupe)</u> .	
1	Electronic Compass Module Procedure 1. Disconnect the electrical connectors. 2. For programming and set up information, refer to <u>Control Module References</u> . 3. Unsnap the electronic compass module from the panel.

DRIVER INFORMATION DISPLAY SWITCH REPLACEMENT

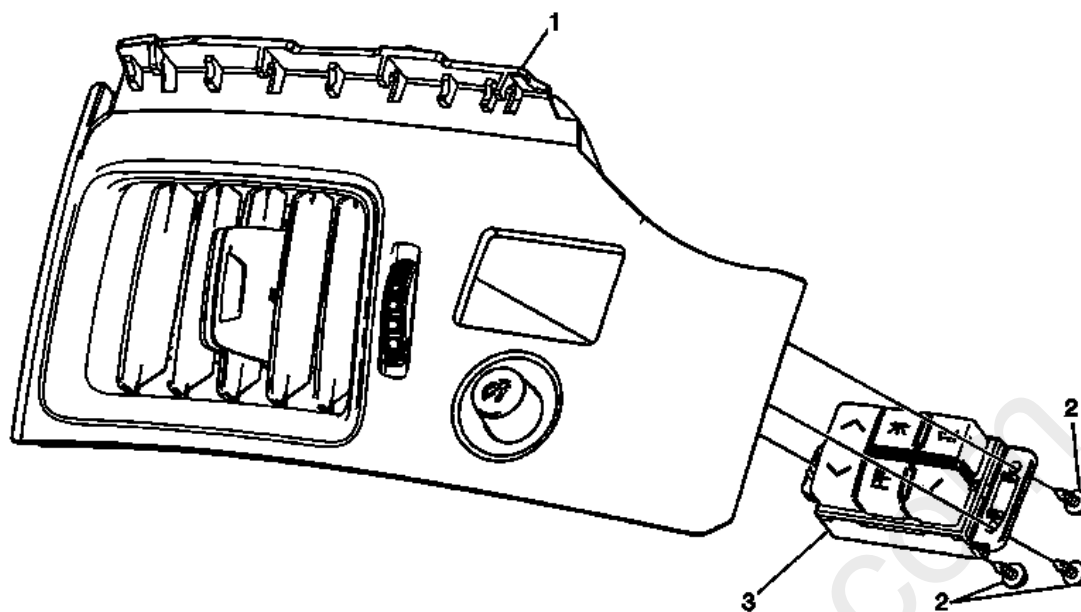


Fig. 12: Driver Information Display Switch
 Courtesy of GENERAL MOTORS COMPANY

Driver Information Display Switch Replacement

Callout	Component Name
1	Instrument Panel Outer Air Outlet Deflector Assembly Refer to <u>Instrument Panel Outer Air Outlet Deflector Replacement - Left Side</u> .
2	Drivers Information Display Switch Screw (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 1 N.m (9 lb in)
3	Drivers Information Display Switch Assembly

INSTRUMENT CLUSTER REPLACEMENT (LEFT HAND DRIVE)

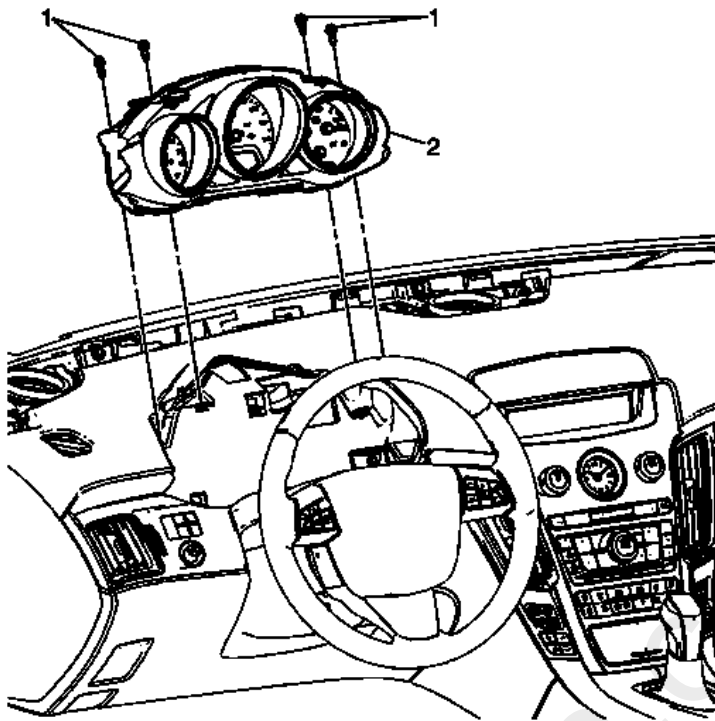


Fig. 13: Instrument Cluster
 Courtesy of GENERAL MOTORS COMPANY

Instrument Cluster Replacement (Left Hand Drive)

Callout	Component Name
Preliminary Procedure 1. Remove the instrument panel trim plate applique - left. Refer to <u>Instrument Panel Trim Plate Applique Replacement - Left Side (Left Hand Drive)</u> . 2. Remove the instrument panel cluster trim plate cover. Refer to <u>Instrument Panel Cluster Trim Plate Cover Replacement (Left Hand Drive)</u> .	
1	Instrument Panel Cluster Screw (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 2.5 N.m (22 lb in)
2	Instrument Panel Cluster Assembly Procedure 1. Disconnect the electrical connections.

2. Refer to **Control Module References** for programming and set up of the cluster assembly.

INSTRUMENT CLUSTER REPLACEMENT (RIGHT HAND DRIVE)

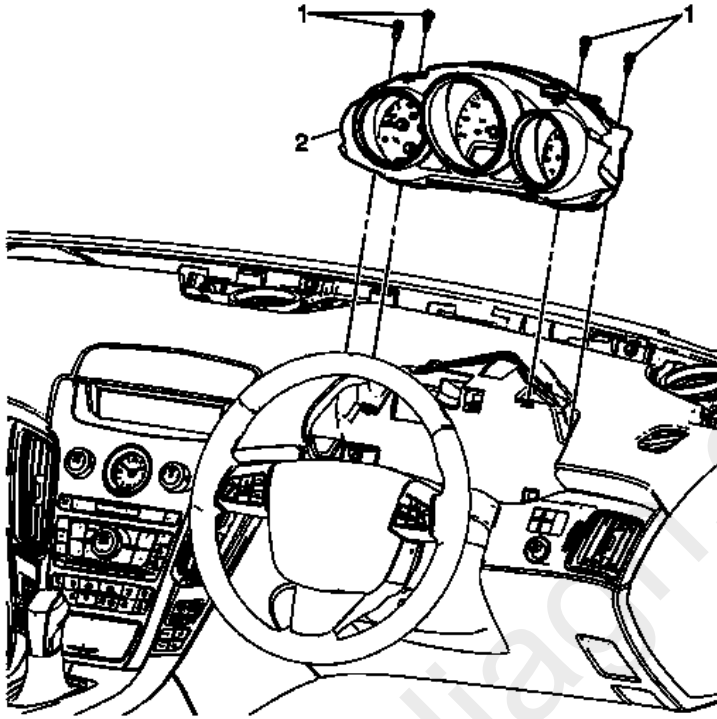


Fig. 14: Identifying Instrument Cluster (Right Hand Drive)

Courtesy of GENERAL MOTORS COMPANY

Instrument Cluster Replacement (Right Hand Drive)

Callout	Component Name
Preliminary Procedure	
1. Remove the instrument panel trim plate applique - left. Refer to Instrument Panel Trim Plate Applique Replacement - Left Side (Right Hand Drive) . 2. Remove the instrument panel cluster trim plate cover. Refer to Instrument Panel Cluster Trim Plate Cover Replacement (Right Hand Drive) .	
1	Instrument Panel Cluster Screw (Qty: 4) CAUTION: Refer to Fastener Caution . Tighten 2.5 N.m (22 lb in)

2	Instrument Panel Cluster Assembly Procedure 1. Disconnect the electrical connections. 2. Refer to <u>Control Module References</u> for programming and set up of the cluster assembly.
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DESCRIPTION AND OPERATION

AUDIBLE WARNINGS DESCRIPTION AND OPERATION

The audible warnings alert the driver of a system concern or a critical vehicle condition. The audio amplifier generates the audible warnings through the speaker. The audio amplifier receives audible warning request via the serial data circuit from the instrument panel cluster (IPC). If the audio amplifier receives multiple audible warning requests, the warning with the highest priority sounds first. 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 audio amplifier activates the fasten safety belt audible warning as requested by the instrument panel cluster (IPC). The IPC 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 driver's seat belt is not buckled and the signal is low. The SDM sends a serial data message to the IPC indicating the 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 audio amplifier activates the lights on warning as requested by the instrument panel cluster (IPC). The IPC sends a serial data message to the audio amplifier indicating the chime frequency and duration. The lights on warning sounds when the following occurs:

- The ignition is OFF.
- The body control module (BCM) determines that the driver door is open and the signal circuit is low.

- The BCM determines that the headlamp switch is in the park or head position.

Brake Warning

The audio amplifier activates the brake audible warning as requested by the instrument panel cluster (IPC). The IPC sends a serial data message to the audio amplifier 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 engine control module (ECM) indicating the vehicle speed.
- The IPC determines that the park brake is engaged and the signal circuit is low.
- The brake fluid is low.
- The dynamic rear proportioning (DRP) failed
- On vehicles equipped with electronic park brake, the indicator will flash to indicate a fault with the system. This will occur with the ignition key in the ON or OFF position.

Key-In-Ignition Warning

The audio amplifier activates the key-in-ignition audible warning as requested by the BCM. The BCM sends a serial data message to the radio indicating the chime frequency and duration. The key-in-ignition warning sounds when the following occurs:

- The ignition switch is OFF.
- The BCM determines that the driver door is open and the signal circuit is low. 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.

Door Ajar Warning

The audio amplifier activates the door ajar audible warning as requested by the body control module (BCM). The BCM sends a serial data message to the radio indicating the chime frequency and duration. The door ajar warning sounds and the door ajar indicator illuminates when the following occurs:

- The BCM determines that a door is open and the signal circuit is low. The instrument panel cluster (IPC) also receives a serial data message from the BCM requesting illumination of the door ajar indicator.
- The vehicle is not in PARK. The BCM receives a serial data message from the ECM/BCM indicating the gear position.

Additional Warnings

Many other vehicle systems activate audible warnings to signal to alert the driver that the system is currently operating or has been deactivated. The audio amplifier activates the audible warning as requested via serial data for systems including:

- Onstar

- Turn Signals
- Park Assist
- Door Locks
- Tire Pressure Warning System

The following warnings have an associated instrument panel cluster (IPC) indicator:

- Hot coolant temperature-The audio amplifier activates the audible warning as requested by the body control module (BCM) or the ECM. The IPC sends a serial data message to the audio amplifier indicating the chime frequency and duration.
- Low fuel-The audio amplifier activates the audible warning as requested by the IPC. The IPC sends a serial data message to the audio amplifier indicating the chime frequency and duration.
- Low engine oil pressure-The audio amplifier activates the audible warning as requested by the IPC. The IPC sends a serial data message to the audio amplifier indicating the chime frequency and duration. The low engine oil pressure indicator will be ON in the IPC.

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

COMPASS CALIBRATION AND MAGNETIC VARIANCE (DIC)

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.

World Magnetic Variation Map

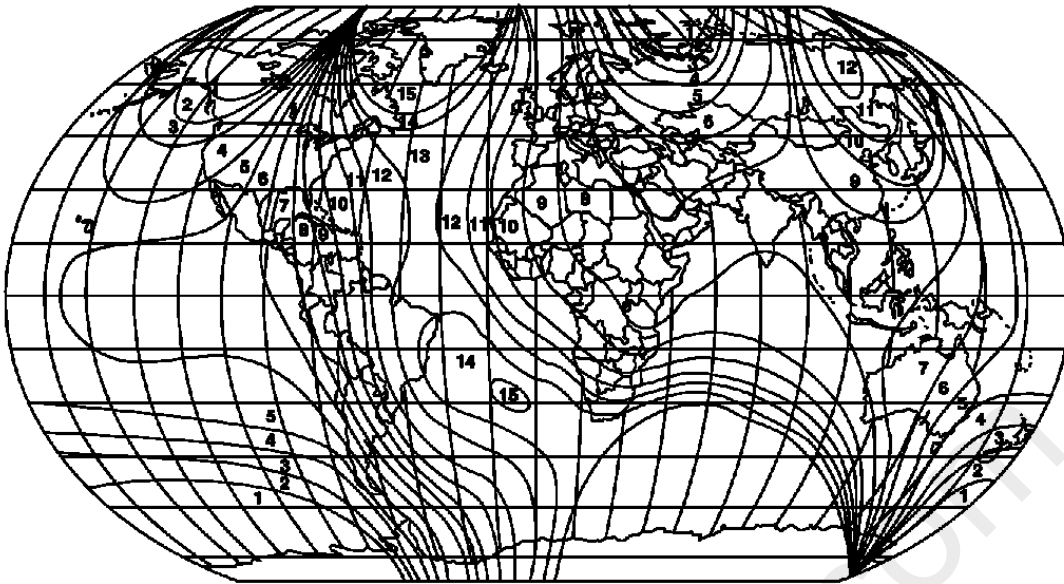


Fig. 15: View Of World Magnetic Variation Map
Courtesy of GENERAL MOTORS COMPANY

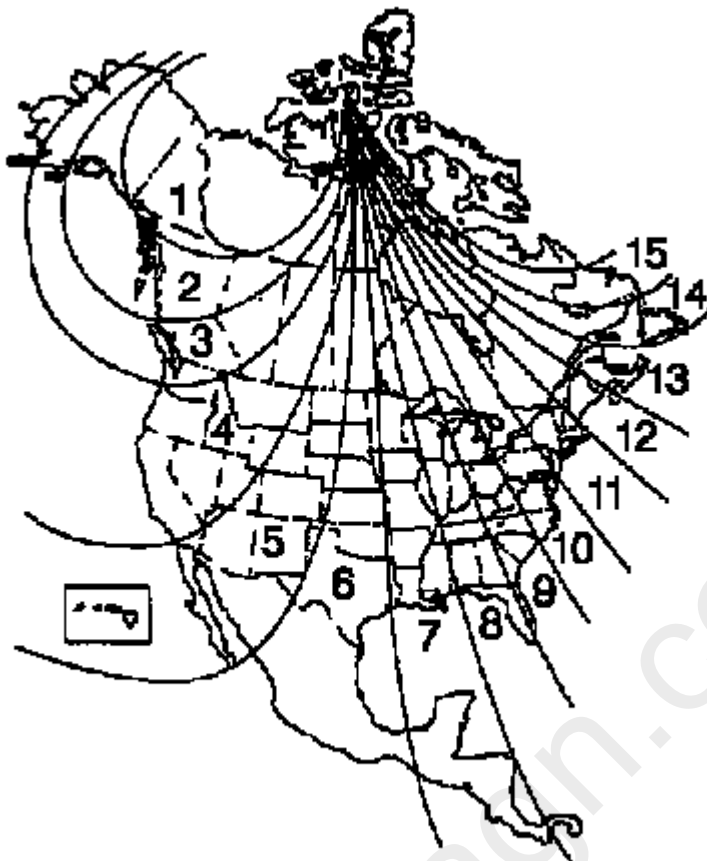


Fig. 16: Illustrating Magnetic Variation Zones
 Courtesy of GENERAL MOTORS COMPANY

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 [CHECK] TO CHANGE COMPASS ZONE displays on the DIC.
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 of the vehicle. This will be shown in the bottom line.

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

Compass Calibration

The compass direction will show CAL or C 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 above.

3. Press the vehicle information button until the PRESS [CHECK] 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 compass calibration is complete.

DRIVER INFORMATION CENTER (DIC) DESCRIPTION AND OPERATION

The DIC returns to the last display status before no power condition.

There are 6 switch functions for the DIC.

- Trip/Fuel Switch
- Vehicle Information Switch
- Personalization Switch
- Set/Reset Switch
- INFO UP
- INFO DOWN

Trip/Fuel Information Switch

The trip/fuel button is used to navigate between fuel information and trip options. Cycle through the following trip/fuel menus by successive pressing of the driver information center (DIC) trip/fuel button or use the Info Up/Info Down button to scroll through the DIC trip/fuel.

- Average Fuel Economy (AFE)
- Average Vehicle Speed (AVS)
- Fuel Range
- Instantaneous Fuel Economy (IFE)
- Odometer
- Trip Time
- Trip Odometer A
- Trip Odometer B
- Speedometer (Digital)
- Off

Vehicle Information Switch

The driver information center (DIC) vehicle information switch is used to navigate between vehicle information menus. Cycle through the following vehicle information by successive pressing of the vehicle information button or use the Info Up/Info Down button to scroll through the vehicle information switch.

NOTE: The engine coolant temperature values displayed in the DIC may not match the engine coolant temperature values displayed in the analog gauge. The difference in the values of the engine coolant temperature displayed in the DIC and the analog gauge is due to scaling and calibration reasons and does not indicate a system malfunction.

- Off
- Battery Voltage
- Engine Oil Life Remaining
- English/Metric Units
- Relearn Remote Key (Key Fob Programming Menu)
- Front Tire Pressures
- Rear Tire Pressures
- Park Assist On/Off
- Relearn Tire Positions (Tire Programming Menu)
- Calibrate Compass
- Change Compass Zone (Compass Zone Selection)
- Speedometer (Vehicle Speed)
- Transmission Temperature (CTS-V only)
- Engine Oil Temperature (CTS-V only)
- Lateral Acceleration (CTS-V only)
- Engine Coolant Temperature (CTS-V only)

Personalization Switch

The personalization switch is used to navigate between vehicle personalization options. Cycle through the following vehicle personalization options by successive pressing of the personalization button or use the Info Up/Info Down button to scroll through the personalization information.

- Advanced Feature Menu (if equipped)
- Approach Lighting
- Auto Door Lock
- Auto Door Unlock
- Chime Volume
- Delay Door Lock (if equipped)
- Display Language
- Easy Exit Recall
- Easy Exit Setup
- Exit Lighting
- Gauge Tracers (if equipped)

- Factory Settings
- Feature Settings
- Keyless Locking
- Keyless Unlock
- Memory Seat Recall (if equipped)
- Park Tilt Mirrors (if equipped)
- Remote Door Lock
- Remote Door Unlock
- Remote Start (if equipped)

For more information on vehicle personalization features, refer to the Owner's Manual.

Set/Reset Switch

Press the set/reset button in order to set or acknowledge any switch menu options.

Info Up/Info Down Switch

Scroll through any selected driver information center (DIC) switch function by pressing Info Up/Info Down.

Average Fuel Economy

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

- 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 IPC calculates AFE based on fuel and distance data sent on serial data circuit from the ECM. The value of this mode is retained during ignition OFF and can be changed between English and Metric units by selecting from the DIC trip/fuel information switch.

Average Vehicle Speed

Average vehicle speed is calculated using the equation: $\text{Average Speed} = \text{AVS Distance} / \text{AVS Time}$.

- Distance = The accumulated distance travelled since the last reset of this value.
- Time = The accumulated time since the last reset of this value.

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.

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

IPC receives a serial data message with fuel information and calculates fuel range. The fuel range value is retained during ignition OFF and can be changed between English and Metric units by accessing the DIC trip/fuel information switch. The Fuel Range display cannot be reset. LOW is displayed when fuel range is below a predetermined value. The fuel used value is retained as long as battery power is available to the DIC. The fuel used value can be changed between English and Metric units by accessing the DIC trip/fuel information switch.

- Fuel Used = The accumulated fuel used since the last reset of this value.
- Fuel Sum = The accumulated fuel sum since the last reset of this value.

Instantaneous Fuel Economy (IFE)

IFE is calculated using the equation: $IFE = \text{Distance} / \text{Fuel Used}$.

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

The IPC calculates IFE based on fuel information 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 by accessing the DIC trip/fuel information switch. The IFE display cannot be reset.

Trip Time

The timer records elapsed time starting from activation. When the DIC displays the timer, pressing the SET/RESET switch for 1.5 second on the DIC resets the timer. Pressing the SET/RESET button on the DIC switch 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).

Battery Voltage

Battery voltage data is not determined by the DIC and is not a resettable parameter. The DIC displays (- - -) when an invalid battery data is received or when the IPC experiences a loss serial data communication.

Engine Oil Life Remaining

The Engine Oil Life Remaining displays the estimated percentage of oil life remaining. The engine control module (ECM) sends the oil life remaining data to the instrument panel cluster (IPC) via serial data message. The driver information center (DIC) displays the current percentage of the GM Oil Life System as determined by the ECM. When the engine oil life remaining percentage drops below a pre-determined value, the DIC

displays CHANGE ENGINE OIL SOON message. When the engine oil is changed, reset the GM Oil Life System.

Tire Pressure Monitor

The instrument panel cluster (IPC) receives serial data message from the tire pressure monitoring (TPM) system indicating the front and rear tire pressure. The driver information center (DIC) will display the pressure for each of the front and rear tires. Tire pressure values are not resettable through the DIC. The tire programming menu can only be achieved with the vehicle transmission in PARK.

Park Assist Menu

The park assist menu is displayed in the driver information center (DIC) to indicate the ON/OFF status. The DIC displays the current state of the park assist until the instrument panel cluster (IPC) receives a serial data message from the BCM indicating a status change. The DIC displays (- -) when communication with park assist is lost.

Key FOB Programming Menu

The key fob programming menu is used to initiate programming of the key fobs. The key fob programming menu can only be achieved with the vehicle transmission in PARK.

English/Metric Button

The English/Metric button is used to toggle between English and Metric unit and can be accessed through the DIC trip/fuel switch.

Trip Odometer A/B

The trip odometer A or B can be accessed through the DIC trip/fuel switch.

Trip Display

DIC Trip Display	Range	
	Metric	English
TRIP A	#####.km	#####.MI
TRIP B	#####.km	#####.MI

Odometer

The instrument panel cluster (IPC) displays the vehicle odometer in the driver information center (DIC). The IPC calculates the vehicle odometer based on serial data vehicle speed information from the engine control module (ECM). The IPC stores the odometer information in non volatile memory and displays 'error' in the DIC if an internal IPC memory failure is detected. When the ignition is in RUN, the vehicle odometer is accessed through the trip/fuel DIC switch. When the ignition is OFF or ACCY and the trip/fuel switch is pressed, the DIC displays the odometer. The odometer displays miles or kilometers as selected from the DIC vehicle information switch.

Language

The driver information center (DIC) is capable of displaying in the languages listed below. The Language settings is accessed through the DIC personalization switch.

- English
- French
- Spanish
- Japanese
- German
- Italian
- Portuguese
- Chinese
- Arabic

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 displayed at the bottom line of the DIC. The compass displays "- -" (dashes) 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 zone adjustment procedure. The DIC vehicle information switch allows the compass zone to be changed or the compass recalibrated.

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.

Vehicle Speed

The driver information center displays the vehicle speed based on vehicle speed serial data information from the ECM. The vehicle speed can be displayed in English or Metric Units. English or Metric Units can be selected from the DIC vehicle information menu. The DIC displays vehicle speed as ####.km/h or ####.mph.

FUEL GAUGE DESCRIPTION AND OPERATION

The ECM uses the signal circuits of the primary and secondary fuel level senders to calculate the percentage of fuel remaining in the fuel tank. The ECM supplies 5 volts via the 5 volt reference circuit and also provides a low reference to the primary and secondary fuel level senders. When the fuel tank is full, the resistance 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 tank is empty, the resistance of both fuel level senders are high and the ECM senses a high signal voltage on both the signal circuits of the primary fuel level sender and the secondary fuel level sender. The engine control module (ECM) sends fuel level information to the instrument panel cluster (IPC) via the serial data circuit. The instrument panel cluster (IPC) displays the fuel level information in the fuel gauge. When the fuel level is less than a predetermined value, the low fuel message displays in the driver information center (DIC). Refer to:

- **Evaporative Emission Control System Description** for the 3.6L engine
- **Fuel System Description** for the 3.6L engine
- **Evaporative Emission Control System Description** for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engine
- **Fuel System Description** for the 4.8L, 5.3L, 6.0L, 6.2L or 7.0L engine

The fuel gauge 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.

NOTE: Partially filling the fuel tank or filling the fuel tank with the ignition ON or engine RUNNING may cause any of the following conditions:

- Inaccurate and erratic fuel gauge
- Fuel gauge slow to update after fuel fill
- A fuel system diagnostic trouble code (DTC) set in the ECM causing the fuel gauge to default to empty.

NOTE: When any of the above stated conditions exists, it is necessary to perform the following actions before undertaking any repairs.

- An erratic or inaccurate fuel gauge may be as a result of filling the tank with the ignition ON or engine RUNNING. Refueling with the ignition ON or engine RUNNING may also result in the fuel gauge being slow to update after a partial fill. Always refuel with the key OFF. If the ignition is ON when refueling, it is necessary to cycle the ignition after the fuel fill. Powering the ignition OFF for approximately 1-2 minutes gives the ECM the chance to update the current fuel level information to be displayed in the fuel gauge.
- Fuel system DTCs may set because of a refueling activity with the ignition ON or engine RUNNING. If the ECM does not detect a change in fuel level in the primary and secondary fuel tank of at least 3.0 L (0.79 gal) over a distance of 320 km (200 miles) or the ECM detects a difference between the engine consumed fuel and change of the fuel level signal of less than 1 L (0.264 gal) over a range of 30 L (7.92 gal), DTCs P0461 or P2066 sets in the ECM and the fuel gauge defaults to empty. If any DTC is set, determine that the DTC is current and repeatable before undertaking any repairs. If the DTC is history or not repeatable, it may have set due to a refueling activity with the ignition ON or engine RUNNING and the ECM did not update the fuel level information. Cycling the ignition after a fuel fill with the ignition ON or engine RUNNING is necessary. Powering the ignition OFF for approximately 1-2 minutes gives the ECM the chance to update the current fuel level information to be displayed in the fuel gauge. Always refuel with the key OFF.
- A partial fill of the fuel tank can cause the fuel gauge to not read accurately. This condition would likely occur when the fuel tank level is low and only enough fuel is added to the fuel tank to bring the fuel tank level near the half tank level. The resistor levels between the primary and the secondary fuel tanks creates an unreadable amount of fuel in the fuel tank system.
- Driving your vehicle on a hill or a hard cornering may affect the fuel gauge leading to an inaccurate or erratic fuel gauge. No corrective measures are required in this instance and symptoms should go away momentarily.

INDICATOR/WARNING MESSAGE DESCRIPTION AND OPERATION

INDICATOR LIGHT ON

Refer to the OWNER'S MANUAL for the descriptions and explanations of all indicator lights.

For diagnosis and repair information related to an indicator light refer to the System Diagnosis and the Description of Operation that the message relates to.

MESSAGE DISPLAYED

Refer to the OWNER'S MANUAL for descriptions and explanations of all messages displayed.

For diagnosis and repair information related to a displayed message refer to the System Diagnosis and the Description of Operation that the message relates to.

CHANGE TIMING BELT MESSAGE

The Instrument Cluster monitors the odometer mileage to determine when timing belt (if equipped) replacement may be necessary. After the vehicle has accumulated approximately 100,000 miles (160,000 kilometers), the Instrument Cluster may display the CHANGE TIMING BELT message. After the engine timing belt has been replaced, reset the CHANGE TIMING BELT message by locating and removing the fuses that supply power to the Instrument Cluster for two minutes.

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 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 message center segments illuminate briefly.
- All odometer segments illuminate briefly.

Indicators and Warning Messages

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

Engine Coolant Temperature Gauge

The instrument panel cluster (IPC) displays the engine coolant temperature as determined by the engine control module (ECM). The IPC receive serial data messages from the ECM indicating the engine coolant temperature. The engine coolant temperature gauge 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.

NOTE: The IPC also displays the engine coolant temperature in the driver information center (DIC) in a digital format (if equipped). The engine coolant temperature values displayed in the DIC may not match the engine coolant temperature values displayed in the analog gauge. The difference in the values of the engine coolant temperature displayed in the DIC and the analog gauge is due to scaling and calibration reasons and does not indicate a system malfunction.

Engine Oil Pressure Gauge

The instrument panel cluster (IPC) displays the engine oil pressure as determined by the engine control module (ECM). The IPC receive serial data messages from the ECM indicating the engine oil pressure. The engine oil pressure gauge defaults to 0 kPa (0 psi) or below if:

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

Rear Axle Temperature Sensor

The rear axle temperature sensor is a two wire sensor that is a variable resistor type. It is used by the Instrument Panel Cluster to monitor the temperature of the rear axle. The instrument cluster (IPC) provides a 5 V reference and signal. The temperature sensor is a variable resistive type mounted on the rear differential.

The IPC displays the following messages.

- Differential Hot Reduce Speed is displayed and the chime sounds if the differential fluid temperature exceeds 150°C (300°F).
- Service Differential Sensor is displayed when a DTC code is set.

Odometer

The instrument panel cluster (IPC) contains a season odometer and trip odometer A or B. Momentarily press the trip/fuel switch on the IPC in order to toggle between the season odometer and the trip odometer. Press the set/reset switch for greater than 2 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 ECM. The IPC calculates the mileage based on the serial data vehicle speed information from the engine control module (ECM). The

odometer will display 'error' if an internal IPC memory failure is detected. The odometer displays either miles or kilometers as requested by the activation of the English/Metric button on the IPC.

PRNDM Display

The instrument panel cluster (IPC) displays the selected gear position in the instrument panel cluster (IPC) as determined by the transmission control module (TCM). The IPC receives serial data messages from the TCM indicating the gear position. The PRNDM displays blank if:

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

The manual shift mode gear position is also displayed in the IPC. The PRNDM will be in the M position and tap up - tap down display will show as 1, 2, 3, 4, 5 or 6. Also, when the transmission sport mode is selected, the DIC displays the sport mode indicator.

Speedometer

The instrument panel cluster (IPC) displays the vehicle speed as determined by the engine control module (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 both the ECM.

Tachometer

The instrument panel cluster (IPC) displays the engine speed as determined by the engine control module (ECM). The IPC receive serial data messages 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.