2007 ACCESSORIES & EQUIPMENT

Displays and Gages - Outlook

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

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

FUEL LEVEL SPECIFICATIONS

The information in this table is intended for use with the **J 33431-C** Signal Generator and Instrument Panel Tester. The fuel level sensor values represent the test values to be used on the Signal Generator to drive the fuel gage display to the indicated positions. Vehicles that require more than one fuel level sensor calculate gage position from many possible resistance combinations of fuel levels between the two tanks. Therefore, the values in the table may not correlate directly to readings taken from the vehicle primary or secondary sending units.

The values in the table are approximate values based on information obtained from properly operating vehicles. Actual results may vary slightly.

Fuel Level Specifications

Fuel Gage Display	Resistance (ohms)	Fuel Level (%)	Sender Voltage	Fuel Remaining
E	270-280 ohms	0-5%	2.6 V	0.4-3.7 L (0.1-1.0 gal)
1/4	212-222 ohms	25-30%	2.3 V	15.5 L (4.1 gal)
1/2	164-174 ohms	45-50%	1.9 V	33.3 L (8.8 gal)
3/4	117-127 ohms	68-73%	1.5 V	45.8 L (12.1 gal)
F	63-73 ohms	90-95%	0.9 V	58.7-62.8 L (15.5-16.6 gal)

SCHEMATIC AND ROUTING DIAGRAMS

INSTRUMENT CLUSTER SCHEMATICS

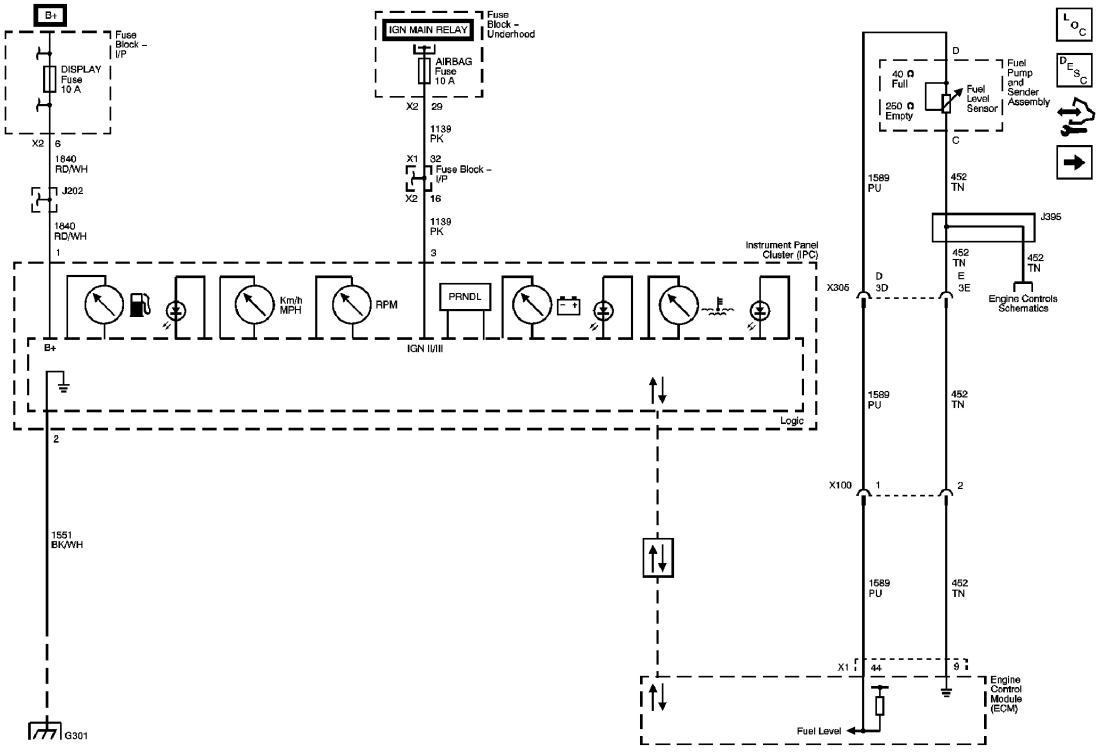


Fig. 1: Gages, Ground & Power Schematic
Courtesy of GENERAL MOTORS CORP.

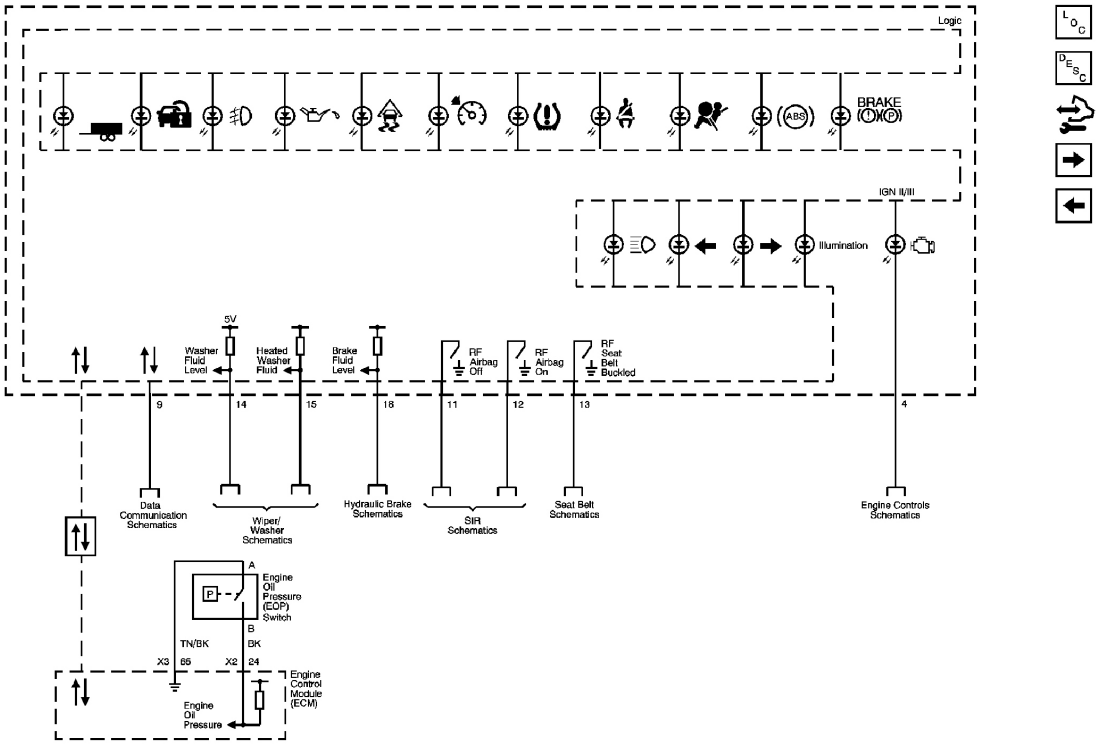


Fig. 2: Indicators & Lighting Schematic
Courtesy of GENERAL MOTORS CORP.

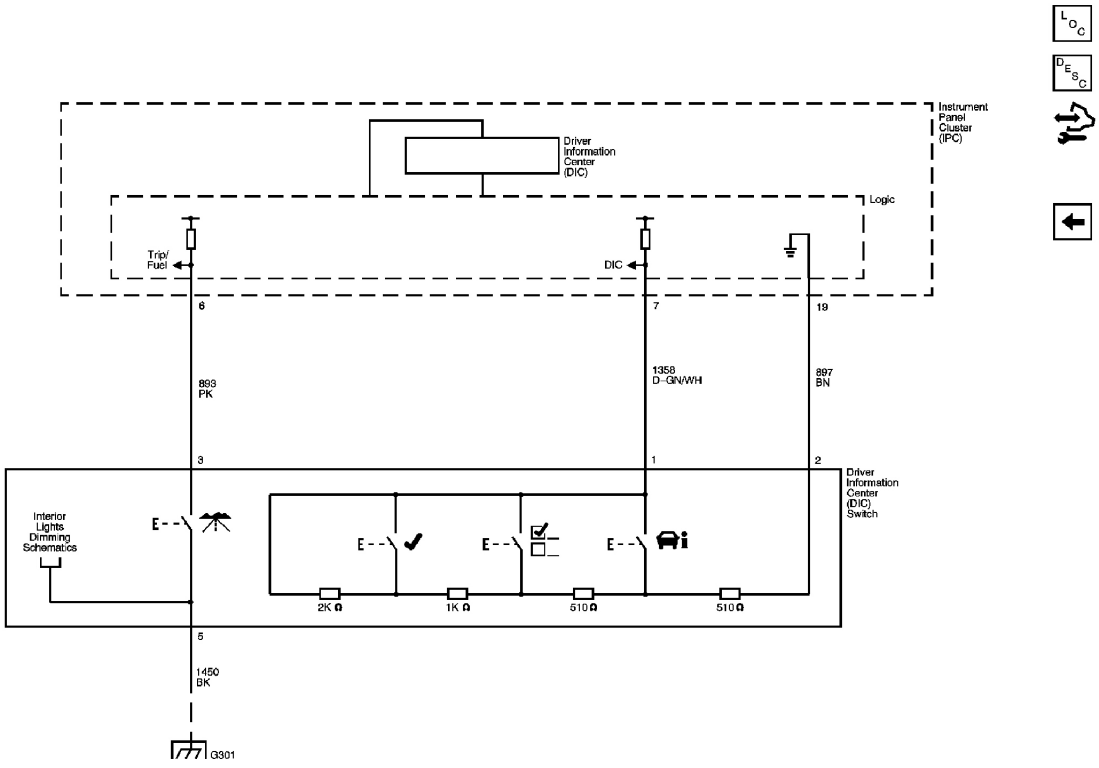


Fig. 3: DIC - UH9 Schematic

Courtesy of GENERAL MOTORS CORP.

DRIVER INFORMATION SYSTEM SCHEMATICS

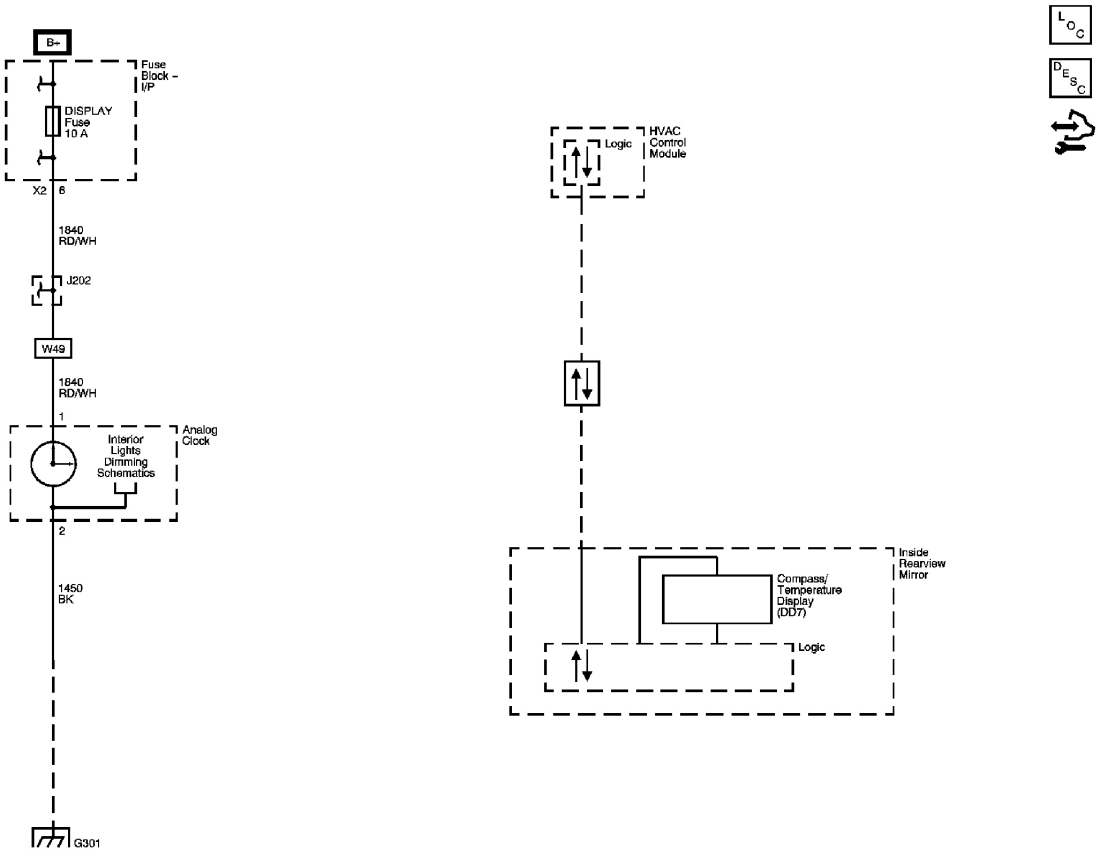


Fig. 4: DD7/W49 Schematic
Courtesy of GENERAL MOTORS CORP.

HEAD UP DISPLAY SCHEMATICS

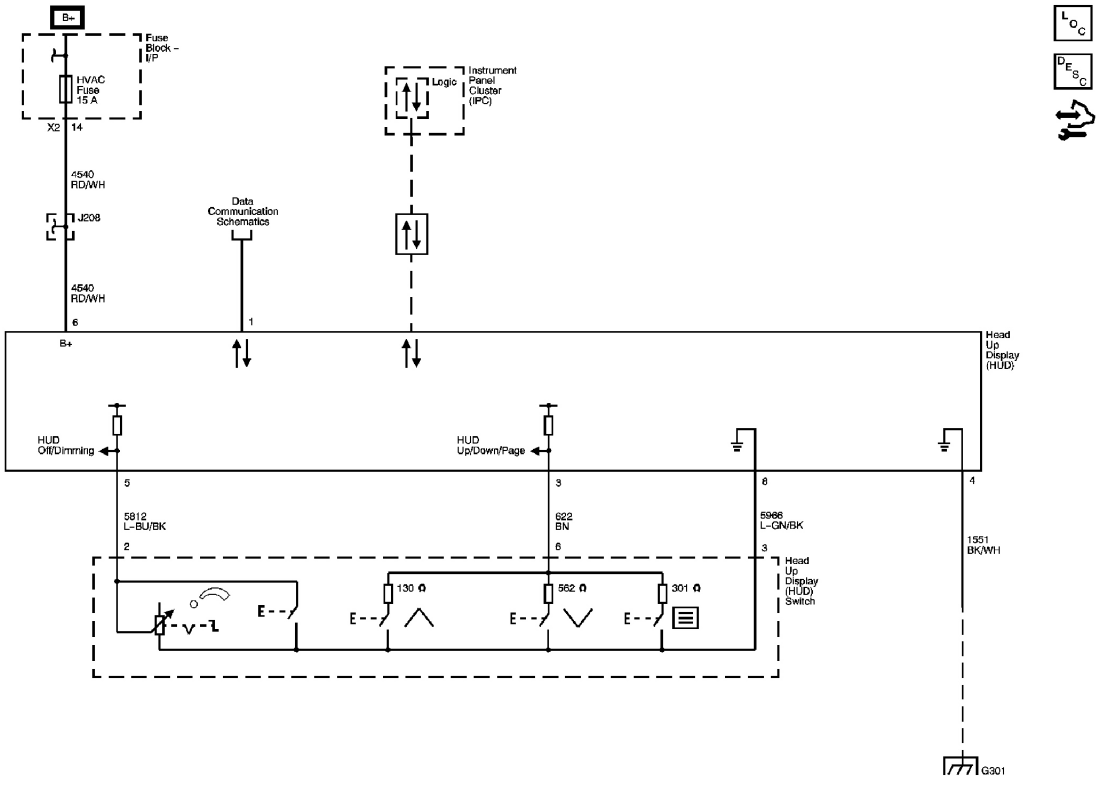


Fig. 5: Head Up Display Schematic - UV6
Courtesy of GENERAL MOTORS CORP.

AUDIBLE WARNINGS SCHEMATICS

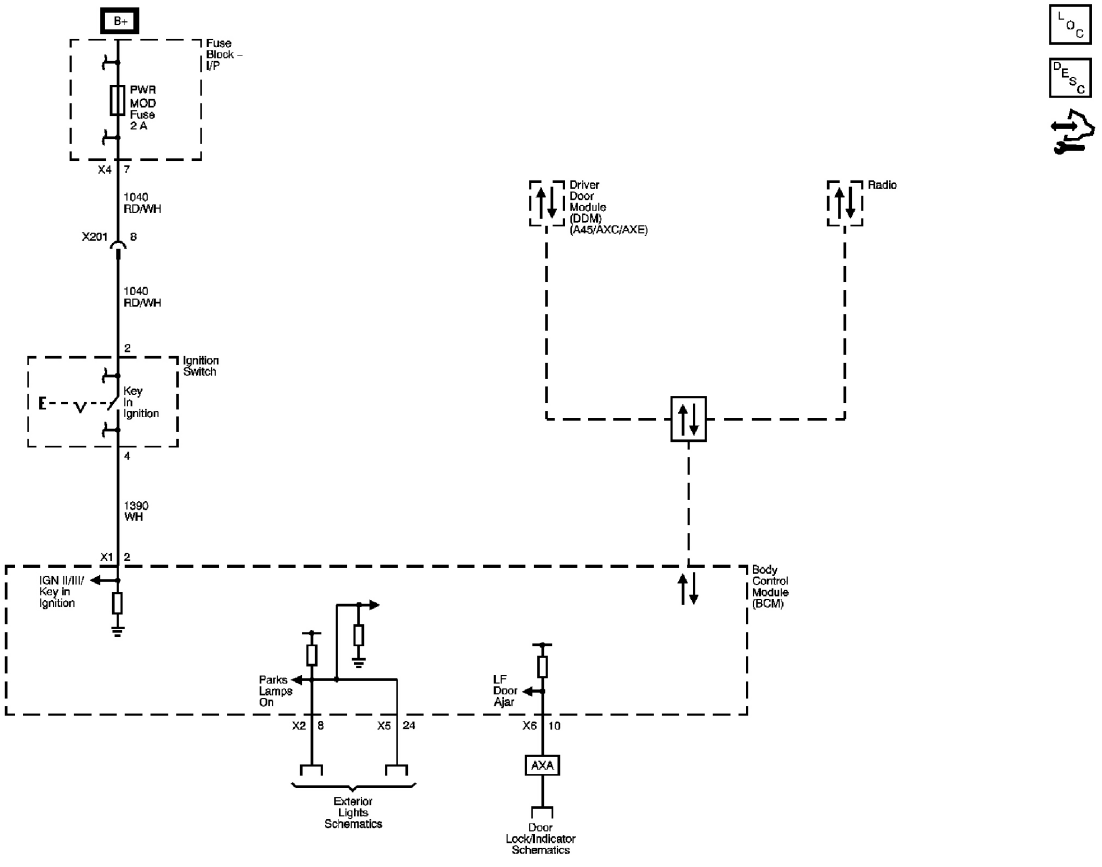


Fig. 6: Audible Warnings Schematic
Courtesy of GENERAL MOTORS CORP.

COMPONENT LOCATOR

DISPLAYS AND GAGES COMPONENT VIEWS

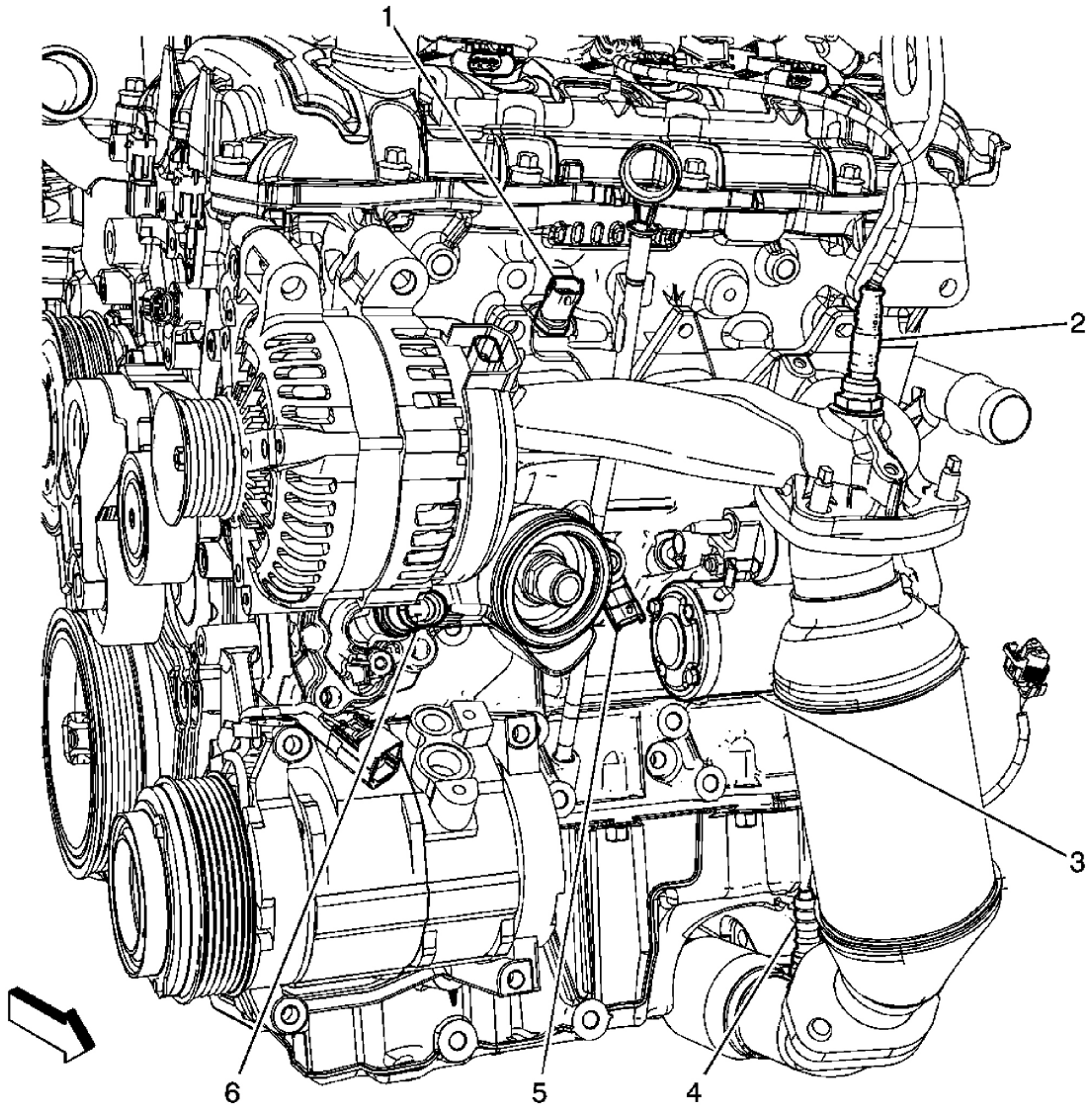


Fig. 7: View Of Engine Components - Front
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 7

Callout	Component Name
1	Engine Coolant Temperature (ECT) Sensor
2	Heated Oxygen Sensor (HO2S) Bank 2 Sensor 1
3	Starter Motor
4	Heated Oxygen Sensor (HO2S) Bank 2 Sensor 2
5	Knock Sensor (KS) 2
6	Engine Oil Pressure (EOP) Switch

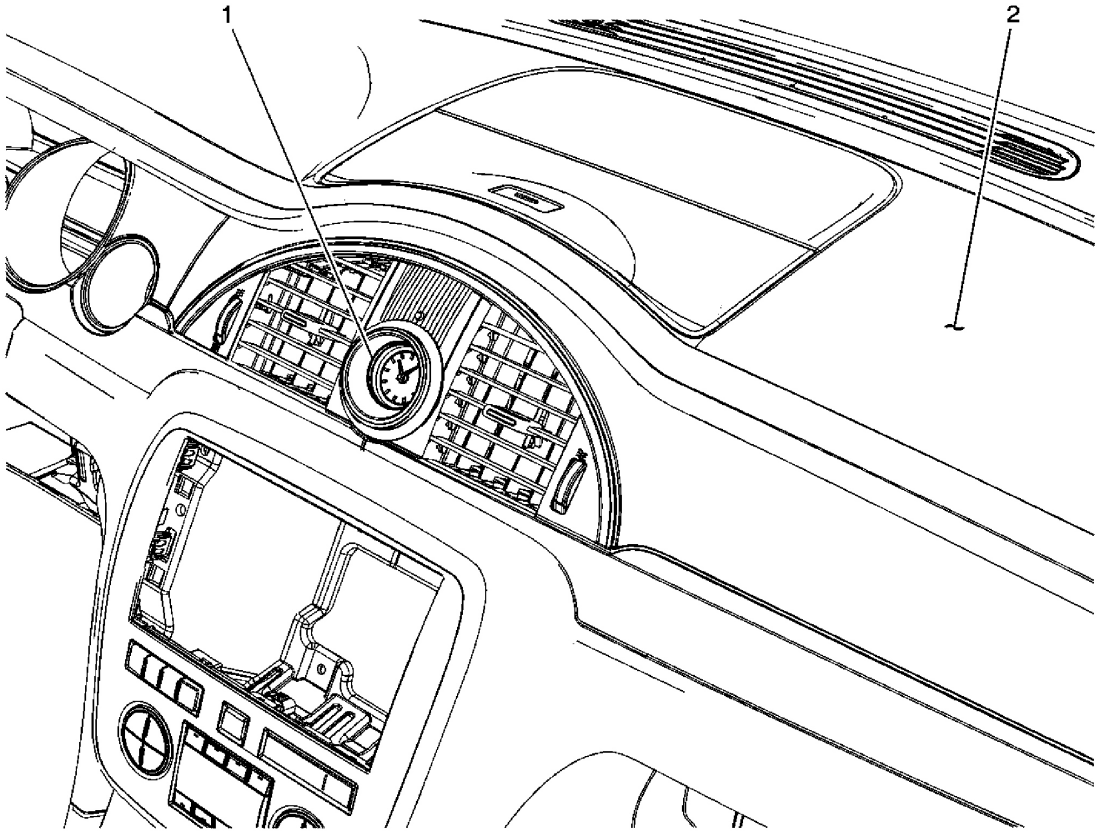


Fig. 8: View Of Analog Clock (W49)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 8

Callout	Component Name
1	Analog Clock
2	I/P Trim

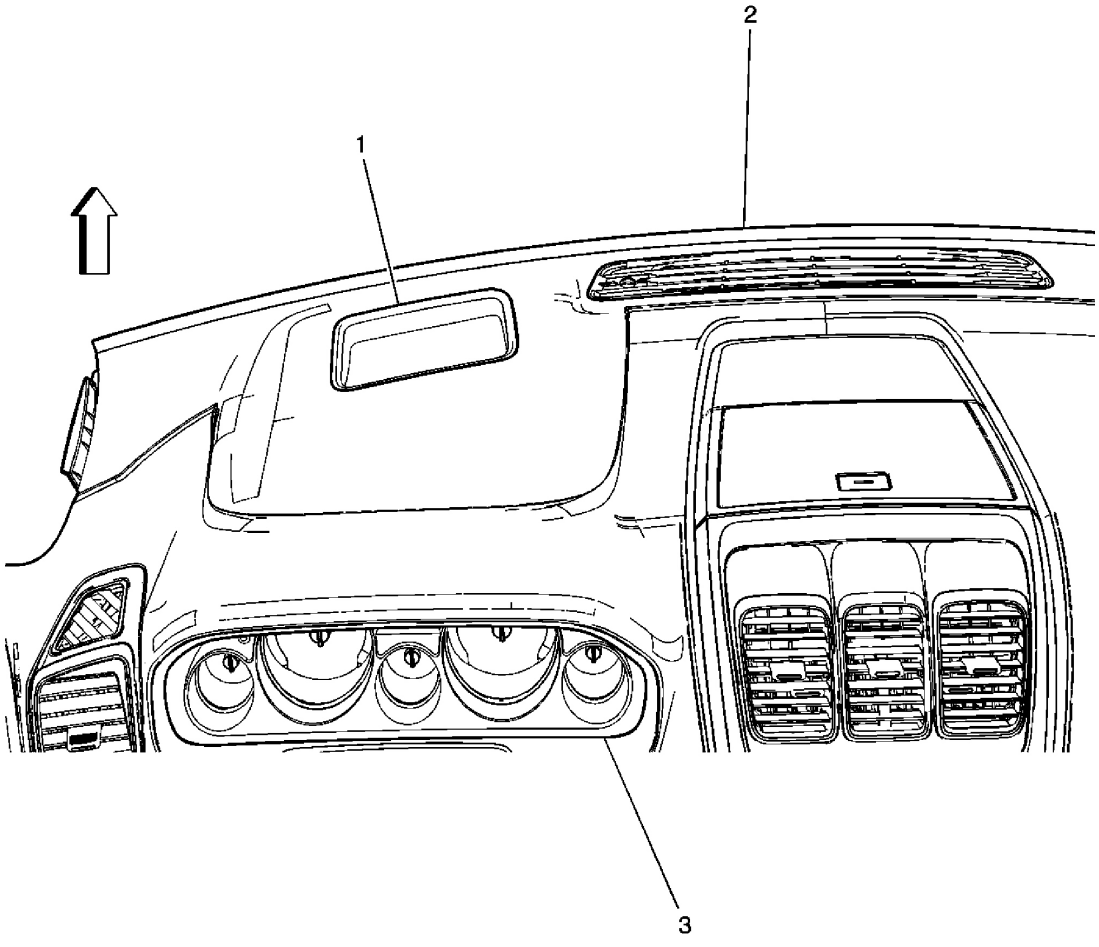


Fig. 9: View Above Instrument Cluster (UV6)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 9

Callout	Component Name
1	Head Up Display
2	I/P Trim
3	Instrument Panel Cluster (IPC)

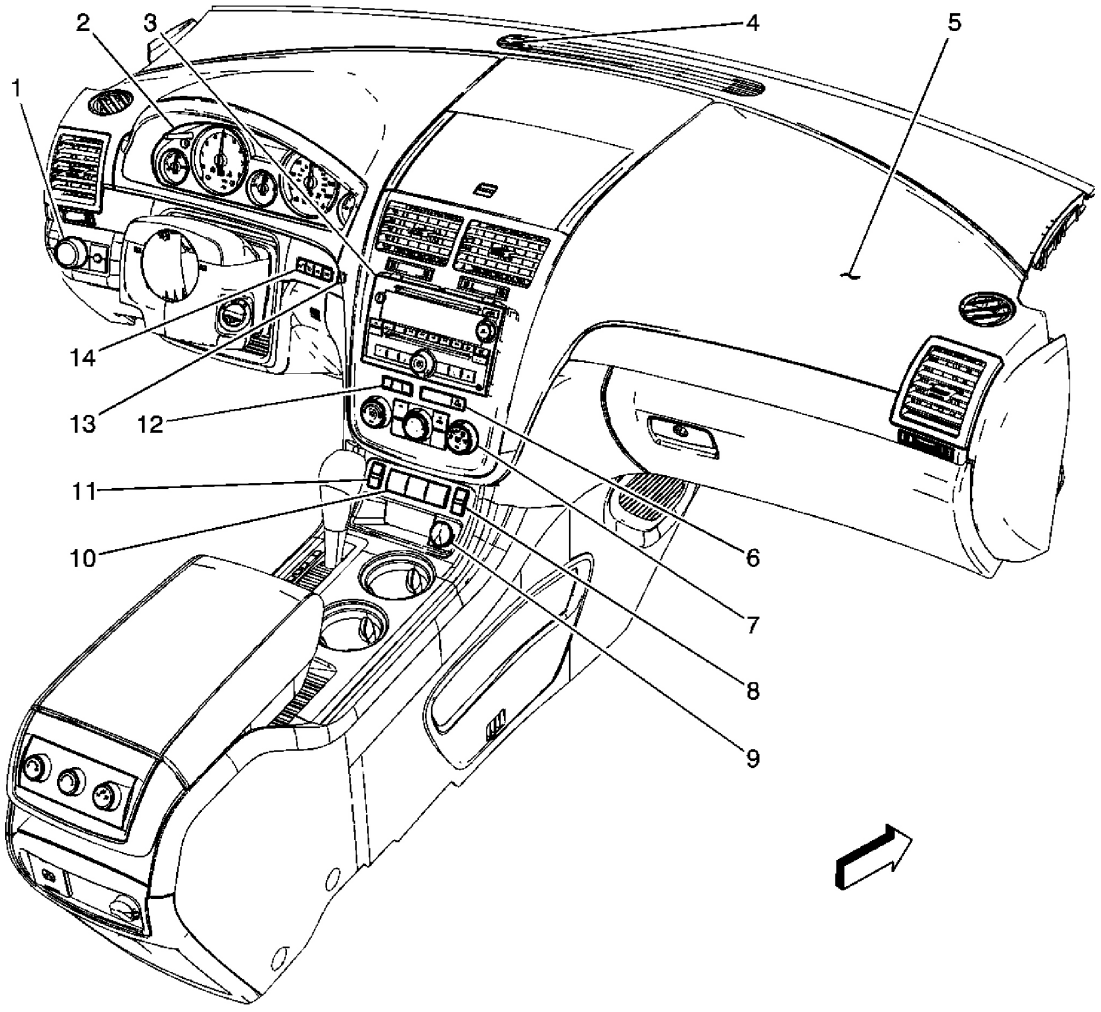


Fig. 10: Identifying I/P Components
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 10

Callout	Component Name
1	Headlamp Switch
2	Instrument Panel Cluster (IPC)
3	Radio
4	Sunload Sensor (CJ2)/Ambient Light Sensor (C67)
5	I/P Trim
6	Inflatable Restraint Passenger Air Bag ON/OFF Indicator
7	HVAC Control Module
8	Heated Seat Switch - Passenger (KA1)

9	Auxiliary Power Outlet - I/P
10	I/P Switch Assembly
11	Heated Seat Switch - Driver (KA1)
12	Hazard Switch
13	Driver Information Center (DIC) Switch (UH9)

DISPLAYS AND GAGES CONNECTOR END VIEWS

Analog Clock (W49)

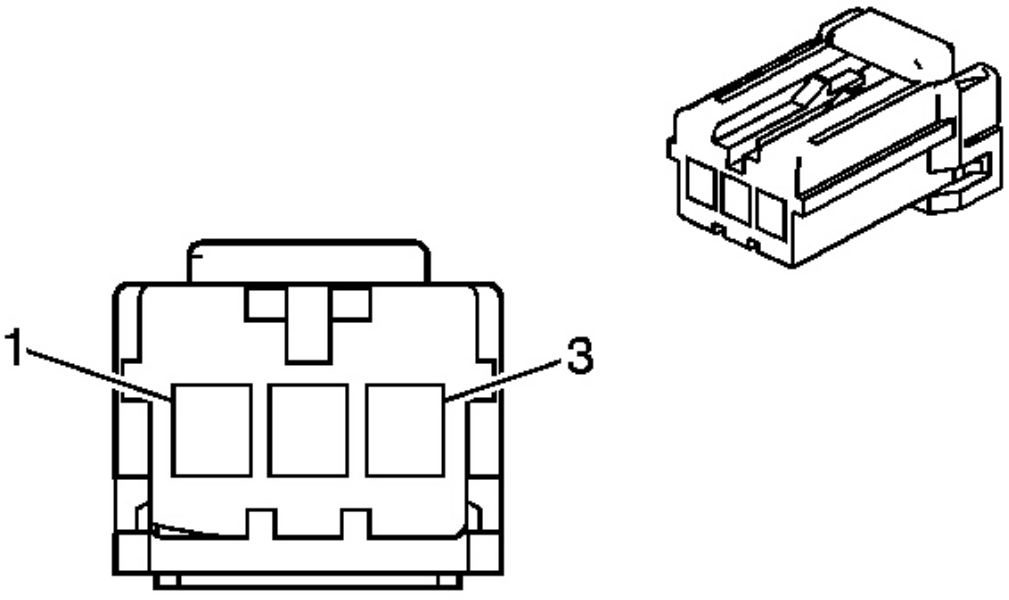


Fig. 11: Analog Clock (W49) Connector End View
Courtesy of GENERAL MOTORS CORP.

Analog Clock (W49) Connector Parts Information

Connector Part Information

- OEM: 15368694
- Service: 88953272
- Description: 3-Way F Multilock 070 Series (WH)

Terminal Part Information

- Terminal/Tray: 173630-7/7
- Core/Insulation Crimp: E/4
- Release Tool/Test Probe: 15315247/J-35616-33 (YE)

Analog Clock (W49) Connector Terminal Identification

Pin	Wire	Circuit No.	Function
1	0.35 RD/WH	1840	Battery Positive Voltage
2	0.35 BK	1450	Ground
3	0.35 PU/WH	1382	LED Dimming Signal

Driver Information Center (DIC) Switch (WDA+UH9)

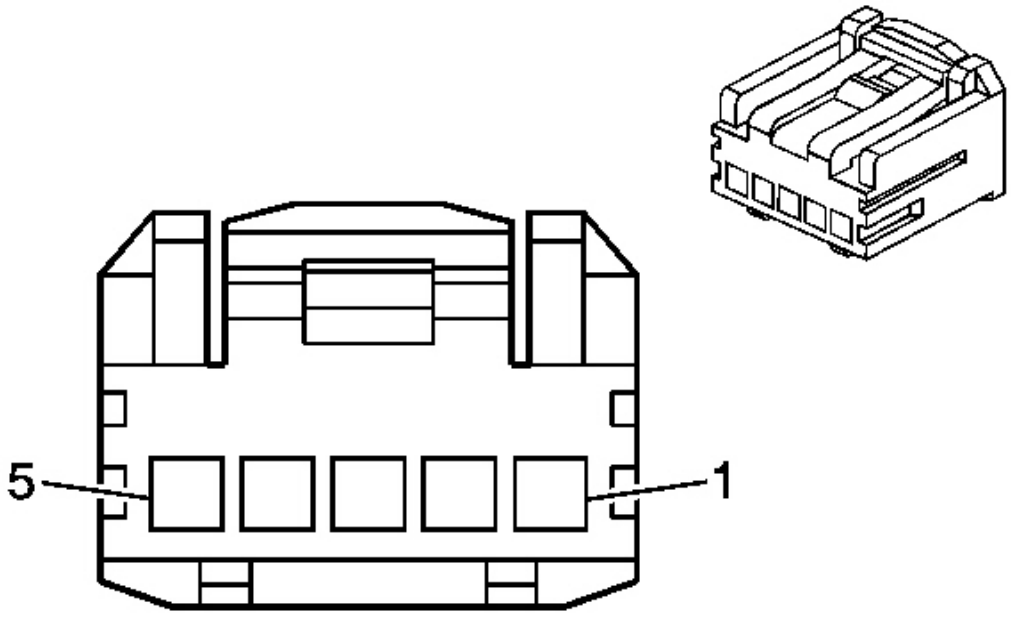


Fig. 12: Driver Information Center (DIC) Switch (WDA+UH9) Connector End View
Courtesy of GENERAL MOTORS CORP.

Driver Information Center (DIC) Switch (WDA+UH9) Connector Parts Information

Connector Part Information

- OEM: 15491277
- Service: 88988747
- Description: 5-Way F HCM 5PA Series (BK)

Terminal Part Information

- Terminal/Tray: SHCM-A03T-P025/20
- Core/Insulation Crimp: J/J
- Release Tool/Test Probe: 12094429/J-35616-64B (L-BU)

Driver Information Center (DIC) Switch (WDA+UH9) Connector Terminal Identification

Pin	Wire	Circuit No.	Function
1	0.35 D-GN/WH	1358	DIC Switch Signal
2	0.35 BN	897	DIC Switch Low Reference
3	0.35 PK	893	DIC Select Menu Switch Signal
4	0.35 PU/WH	1382	LED Dimming Signal
5	0.35 BK	1450	Ground

Driver Information Center (DIC) Switch (Z88+UH9)

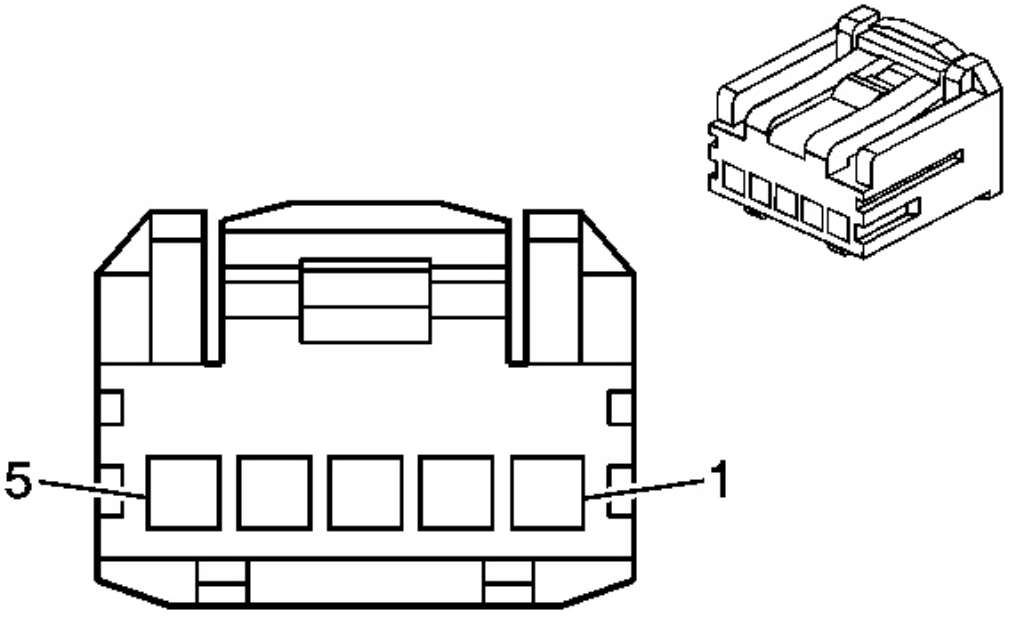


Fig. 13: Driver Information Center (DIC) Switch (Z88+UH9) Connector End View
Courtesy of GENERAL MOTORS CORP.

Driver Information Center (DIC) Switch (Z88+UH9) Connector Parts Information

Connector Part Information

- OEM: 15491277
- Service: 88988747
- Description: 5-Way F HCM 5PA Series (BK)

Terminal Part Information

- Terminal/Tray: SHCM-A03T-P025/20
- Core/Insulation Crimp: J/J
- Release Tool/Test Probe: 12094429/J-35616-64B (L-BU)

Driver Information Center (DIC) Switch (Z88+UH9) Connector Terminal Identification

Pin	Wire	Circuit No.	Function
1	0.35 D-GN/WH	1358	DIC Switch Signal

2	0.35 BN	897	DIC Switch Low Reference
3	0.35 PK	893	DIC Select Menu Switch Signal
4	0.35 PU/WH	1382	LED Dimming Signal
5	0.35 BK	1450	Ground

Driver Information Center (DIC) Switch (W49+UH9)

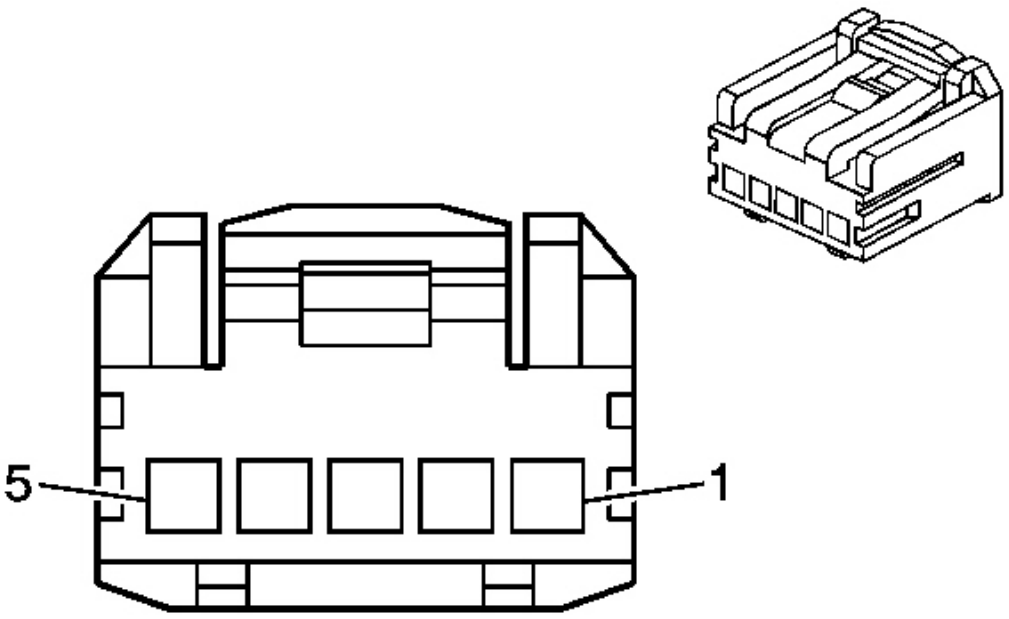


Fig. 14: Driver Information Center (DIC) Switch (W49+UH9) Connector End View
Courtesy of GENERAL MOTORS CORP.

Driver Information Center (DIC) Switch (W49+UH9) Connector Parts Information

Connector Part Information

- OEM: 15491277
- Service: 88988747
- Description: 5-Way F HCM 5PA Series (BK)

Terminal Part Information

- Terminal/Tray: SHCM-A03T-P025/20
- Core/Insulation Crimp: J/J
- Release Tool/Test Probe: 12094429/J-35616-64B (L-BU)

Driver Information Center (DIC) Switch (W49+UH9) Connector Terminal Identification

Pin	Wire	Circuit No.	Function
1	0.35 D-GN/WH	1358	DIC Switch Signal
2	0.35 BN	897	DIC Switch Low Reference
3	0.35 PK	893	DIC Select Menu Switch Signal
4	0.35 PU/WH	1382	LED Dimming Signal
5	0.35 BK	1450	Ground

Electronic Compass Module (Z88)

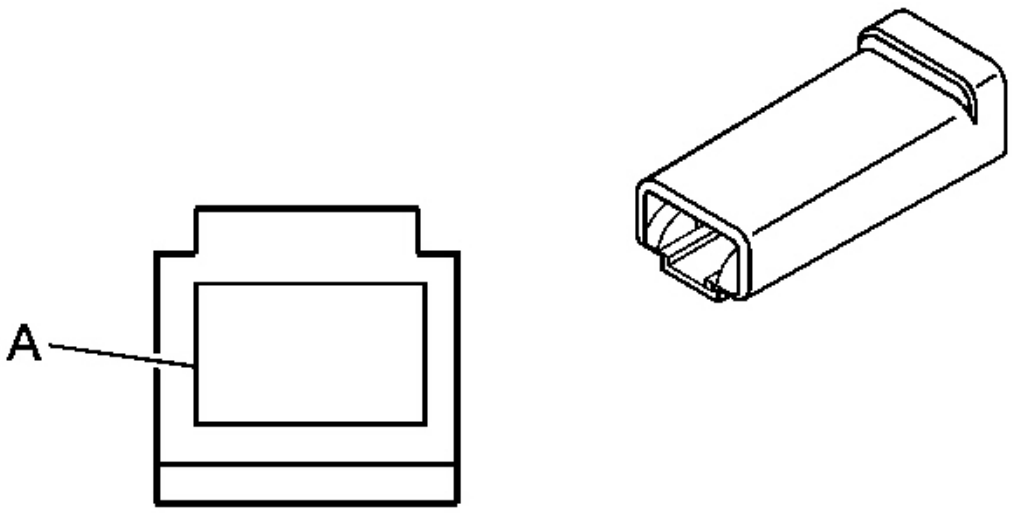


Fig. 15: Electronic Compass Module (Z88) Connector End View
Courtesy of GENERAL MOTORS CORP.

Electronic Compass Module (Z88) Connector Parts Information

Connector Part Information

- OEM: 88988900
- Service: See Catalog
- Description: 4-Way F

Terminal Part Information

- Terminal/Tray: 7116-4618-02/14
- Core/Insulation Crimp: P/P
- Release Tool/Test Probe: J-38125-215/J-35616-64B (L-BU)

Electronic Compass Module (Z88) Connector Terminal Identification

Pin	Wire	Circuit No.	Function
1	0.35 OG	300	Ignition 3 Voltage (COM)
2	0.35 BK	850	Ground (COM)
3	0.35 D-GN	6134	(COM)
4	-	-	Not Used

Engine Oil Pressure (EOP) Switch (LY7)

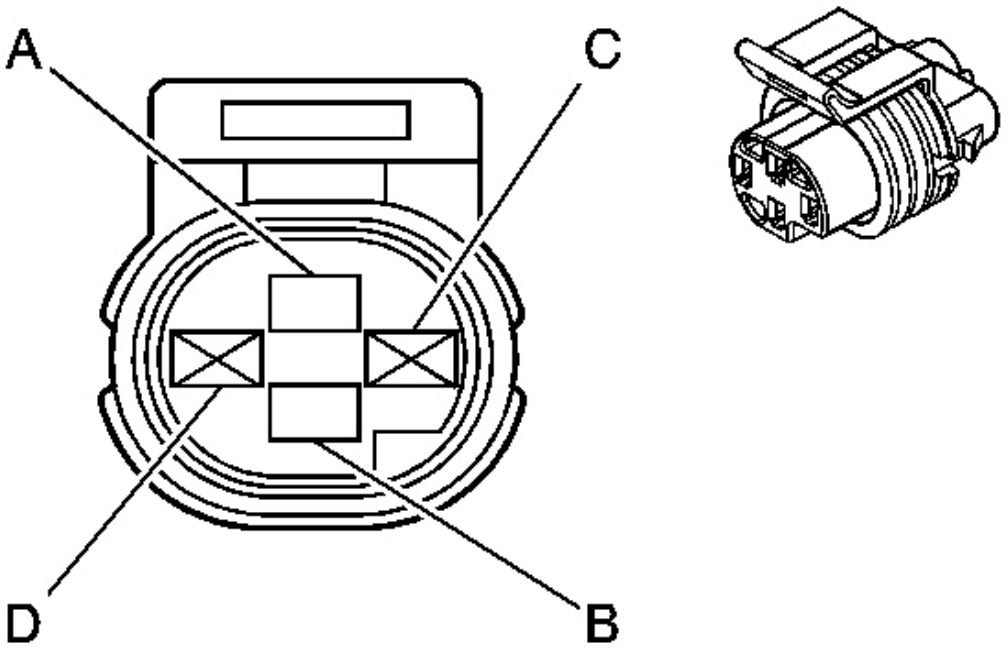


Fig. 16: Engine Oil Pressure (EOP) Switch (LY7) Connector End View
Courtesy of GENERAL MOTORS CORP.

Engine Oil Pressure (EOP) Switch (LY7) Connector Parts Information

Connector Part Information

- OEM: 12065400
- Service: 12126436
- Description: 4-Way F Metri-Pack 150 Series (GN)

Terminal Part Information

- Terminal/Tray: 12048074/2
- Core/Insulation Crimp: E/1
- Release Tool/Test Probe: 12094429/J-35616-14 (GN)

Engine Oil Pressure (EOP) Switch (LY7) Connector Terminal Identification

Pin	Wire	Circuit No.	Function

A	0.5 TN/BK	231	Oil Pressure Switch Signal
B	0.5 BK	2755	Low Reference
C-D	-	-	Not Used

Head Up Display (HUD) (UV6)

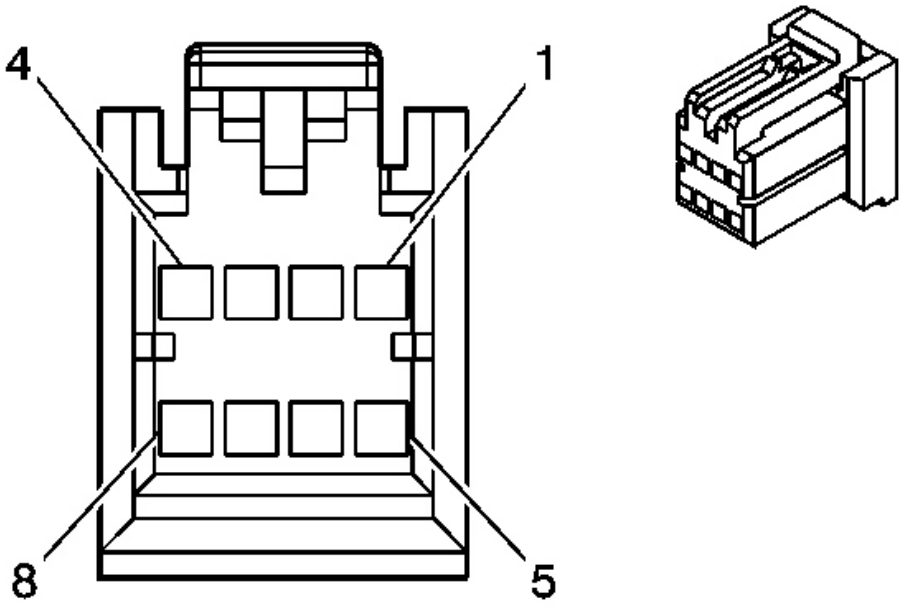


Fig. 17: Head Up Display (HUD) (UV6) Connector End View
Courtesy of GENERAL MOTORS CORP.

Head Up Display (HUD) (UV6) Connector Parts Information

Connector Part Information

- OEM: 175964-2
- Service: 15306185
- Description: 8-Way F AMP Multilock 040 MarkII (BK)

Terminal Part Information

- Terminal/Tray: 173681-2/17

- Core/Insulation Crimp: E/4
- Release Tool/Test Probe: 15315247/J-35616-16 (L-GN)

Head Up Display (HUD) (UV6) Connector Terminal Identification

Pin	Wire	Circuit No.	Function
1	0.35 D-GN	5060	Low Speed GMLAN Serial Data
2	-	-	Not Used
3	0.35 BN	622	HUD Switch Signal
4	0.35 BK/WH	1551	Ground
5	0.35 L-BU/BK	5812	-
6	0.5 RD/WH	4540	Liftgate Latch Sector Switch Signal
7	-	-	Not Used
8	0.35 L-GN/BK	5699	-

Head Up Display (HUD) Switch (UV6)

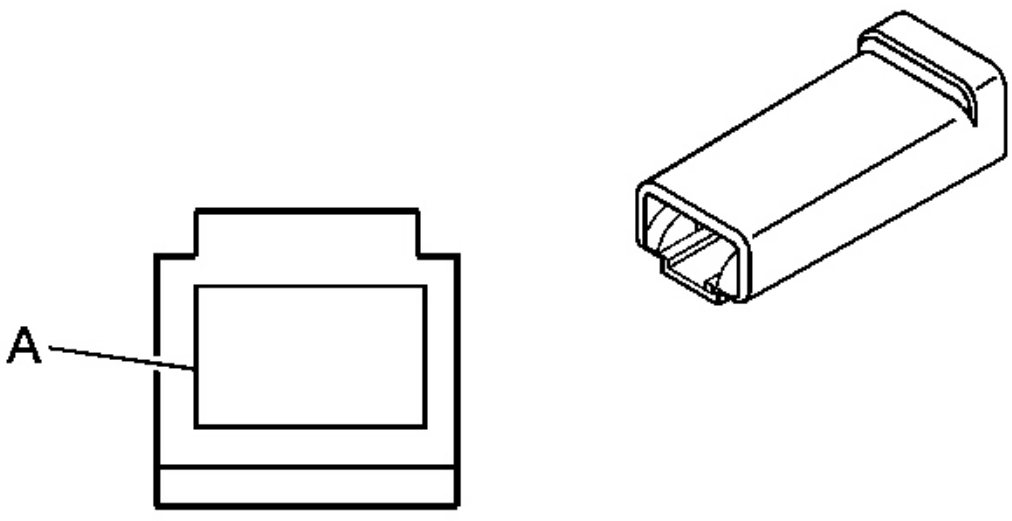


Fig. 18: Head Up Display (HUD) Switch (UV6) Connector End View
Courtesy of GENERAL MOTORS CORP.

Head Up Display (HUD) Switch (UV6) Connector Parts Information

Connector Part Information

- OEM: 15269798
- Service: See Catalog
- Description: 6-Way F AIT II Series (BK)

Terminal Part Information

- Terminal/Tray: 7116-4618-02/14
- Core/Insulation Crimp: P/P
- Release Tool/Test Probe: J-38125-215/J-35616-64B (L-BU)

Head Up Display (HUD) Switch (UV6) Connector Terminal Identification

Pin	Wire	Circuit No.	Function
1	-	-	Not Used
2	0.35 L-BU/BK	5812	-
3	0.35 L-GN/BK	5699	-
4	0.35 BK	1450	Ground
5	0.35 PU/WH	1382	LED Dimming Signal
6	0.35 BN	622	HUD Switch Signal

Instrument Panel Cluster (IPC) (WDA)

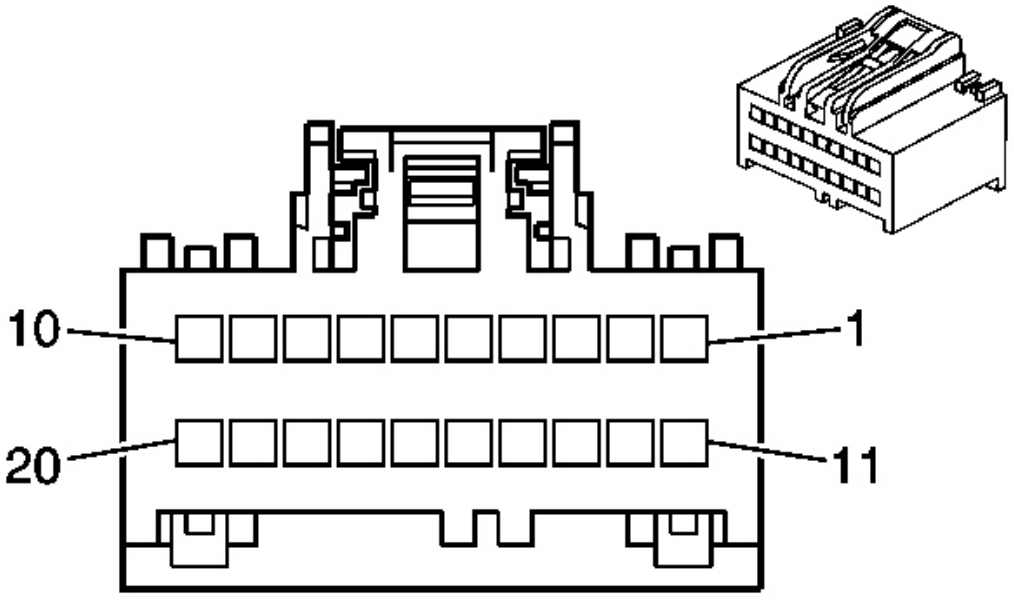


Fig. 19: Instrument Panel Cluster (IPC) (WDA) Connector End View
Courtesy of GENERAL MOTORS CORP.

Instrument Panel Cluster (IPC) (WDA) Connector Parts Information

Connector Part Information

- OEM: 15126711
- Service: See Catalog
- Description: 20-Way F 0.64 Series (BK)

Terminal Part Information

- Terminal/Tray: 7116-4618-02/14
- Core/Insulation Crimp: P/P
- Release Tool/Test Probe: J-38125-215/J-35616-64B (L-BU)

Instrument Panel Cluster (IPC) (WDA) Connector Terminal Identification

Pin	Wire	Circuit No.	Function
1	0.35 RD/WH	1840	Battery Positive Voltage

2	0.35 BK/WH	1551	Ground
3	0.35 PK	1139	Ignition 1 Voltage
4	0.35 BN/WH	419	MIL Control
6	0.35 PK	893	DIC Select Menu Switch Signal (UH9)
7	0.35 D-GN/WH	1358	DIC Switch Signal (UH9)
8	-	-	Not Used
9	0.35 D-GN	5060	Low Speed GMLAN Serial Data
10	-	-	Not Used
11	0.35 PU	5234	-
12	0.35 D-BU	2307	Passenger Air Bag On Indicator Control
13	0.35 D-GN	2308	Passenger Air Bag Off Indicator Control
14	0.35 TN	185	Low Washer Fluid Indicator Control
15	0.35 D-BU/WH	5970	(XA7)
16-17	-	-	Not Used
18	0.35 TN/WH	33	Brake Warning Indicator Control
19	0.35 BN	897	DIC Switch Low Reference (UH9)
20	-	-	Not Used

Instrument Panel Cluster (IPC) (Z88)

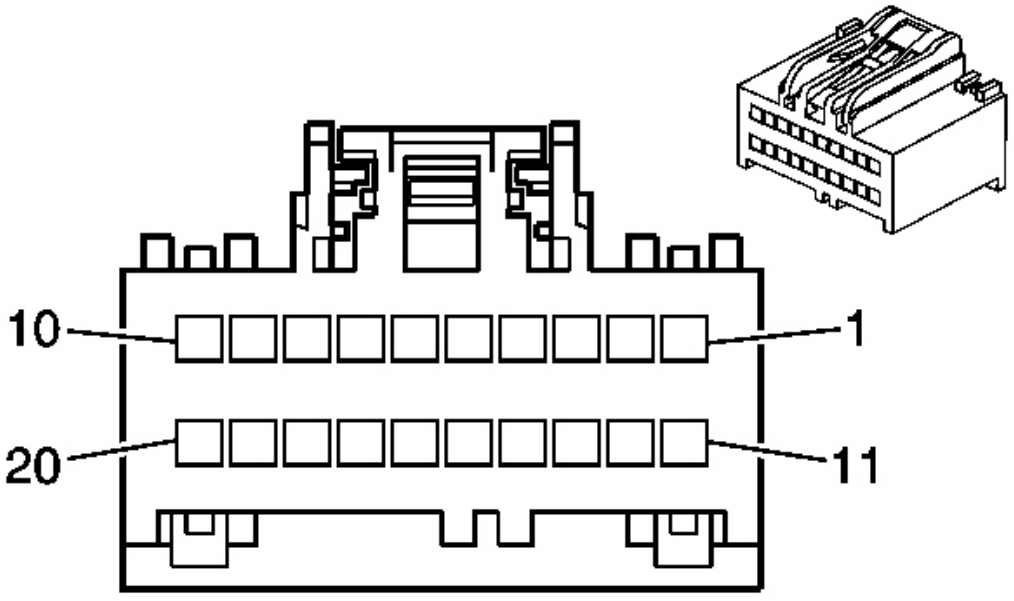


Fig. 20: Instrument Panel Cluster (IPC) (Z88) Connector End View
Courtesy of GENERAL MOTORS CORP.

Instrument Panel Cluster (IPC) (Z88) Connector Parts Information

Connector Part Information

- OEM: 15126711
- Service: See Catalog
- Description: 20-Way F 0.64 Series (BK)

Terminal Part Information

- Terminal/Tray: 7116-4618-02/14
- Core/Insulation Crimp: P/P
- Release Tool/Test Probe: J-38125-215/J-35616-64B (L-BU)

Instrument Panel Cluster (IPC) (Z88) Connector Terminal Identification

Pin	Wire	Circuit No.	Function
1	0.35 RD/WH	1840	Battery Positive Voltage

2	0.35 BK/WH	1551	Ground
3	0.35 PK	1139	Ignition 1 Voltage
4	0.35 BN/WH	419	MIL Control
5	-	-	Not Used
6	0.35 PK	893	DIC Select Menu Switch Signal (UH9+Z88/W49)
	0.35 PK	893	DIC Select Menu Switch Signal (UH9+WDA)
7	0.35 D-GN/WH	1358	DIC Switch Signal (UH9+Z88/W49)
	0.35 D-GN/WH	1358	DIC Switch Signal (UH9+WDA)
8	-	-	Not Used
9	0.35 D-GN	5060	Low Speed GMLAN Serial Data
10	-	-	Not Used
11	0.35 PU	5234	-
12	0.35 D-BU	2307	Passenger Air Bag On Indicator Control
13	0.35 D-GN	2308	Passenger Air Bag Off Indicator Control
14	0.35 TN	185	Low Washer Fluid Indicator Control
15	0.35 D-BU/WH	5970	(XA7)
16-17	-	-	Not Used
18	0.35 TN/WH	33	Brake Warning Indicator Control
19	0.35 BN	897	DIC Switch Low Reference (UH9+Z88/W49)
	0.35 BN	897	DIC Switch Low Reference (UH9+WDA)
20	-	-	Not Used

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
DTC B2976	Door Ajar Circuit
DTC B3567	Driver Information Center (DIC) Select Switch Circuit

DTC P0461	Fuel Level Sensor 1 Performance
DTC P0462	Fuel Level Sensor 1 Circuit Low Voltage
DTC P0463	Fuel Level Sensor 1 Circuit High Voltage
DTC P0464	Fuel Level Sensor 1 Circuit Intermittent
DTC P0520	Engine Oil Pressure (EOP) Switch Circuit

DIAGNOSTIC STARTING POINT - DISPLAYS AND GAGES

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

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

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

SCAN TOOL OUTPUT CONTROLS

Body Control Module (BCM)

Scan Tool Output Control	Additional Menu Selection(s)	Description
Interior Lamps	Output Control/Lamp Test	The body control module (BCM) turns the interior lamps ON when you select ON. The interior lamps should stay ON until commanded OFF.
I/P Illumination Lamps	Output Control/Lamp Test	The BCM turns the instrument panel illumination lamps on when you select ON. The illumination lamps should stay on until commanded OFF.
Transmission Range Indicator	Output Control/Lamp Test	The BCM turns the PRNDL indicators ON when you select ON. The PRNDL should stay ON until commanded OFF.

Instrument Panel Cluster (IPC)

Scan Tool Output Control	Additional Menu Selection(s)	Description
		The instrument panel cluster (IPC) illuminates the

Lamp and Gauge Check		following indicators when you select ON: • ABS • Air Bag • BRAKE • Charge • Fasten Safety Belt • High Beam • Liftgate Ajar • Low Fuel • Low Oil Pressure • Low Traction • Reduced Engine Power • Security • Tire Pressure Monitor • Traction OFF The IPC drives the following gages to maximum position when you select ON: • Engine Coolant Temperature Gage • Fuel Gage • Speedometer • Tachometer The indicators should stay illuminated and all gages remain at maximum until commanded OFF. When commanded OFF, the indicators should turn OFF and all gages should remain at the minimum position until the test is exited or commanded ON.

SCAN TOOL DATA LIST

The scan tool data lists contain all the instrument panel, gages and console related parameters that are available on the scan tool. The parameters in the list are arranged in alphabetical order. The

data list column indicates the location of the parameter within the scan tool menu selections.

Use the scan tool data lists as directed by a diagnostic table or in order to supplement the diagnostic procedures. Begin all of the diagnostic procedures with **Diagnostic System Check - Vehicle** .

Use the scan tool data lists only after the following is determined:

- There is no published DTC procedure nor published symptom procedure for the customer concern.
- The DTC or symptom procedure indicated by the diagnostic system check does not resolve the customer concern.

The typical data values are obtained from a properly operating vehicle under the conditions specified in the first row of the scan tool data list table. Comparison of the parameter values from the suspect vehicle with the typical data values may reveal the source of the customer concern.

Body Control Module (BCM)

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Operating Conditions: Ignition ON/Engine OFF/High Beams OFF/Doors Closed/Trunk Closed/Park Brake Unapplied/Seatbelt Buckled			
Accy/RAP Relay Command	Power Mode	On/Off	Off
Battery Voltage	Charging Info	Volts	0-18 V
Hazard Lamp Switch	Exterior Lighting	Active/Inactive	Inactive
Headlamp Switch	Exterior Lighting	Active/Inactive	Inactive
High Beam Relay Command	Exterior Lighting	On/Off	Off
High Beam Select Switch	Exterior Lighting	Active/Inactive	Inactive
Ign. Off/Run/Crank	Power Mode	Key Out/ACC/Key In/Off/Crank/Run	Key In/Off
Key In Ignition Status	Power Mode	Key In/Key Out	Key In
Left Rear Door Ajar Switch	Doors	Door Closed/Door Ajar	Door Closed
Low Beam Relay Command	Exterior Lighting	On/Off	Off
Park Brake Switch	Inputs	Applied/Released	Released
Park Lamp Relay Cmd.	Exterior Lighting	On/Off	Off
Parklamp Switch	Exterior Lighting	Active/Inactive	Inactive
		Door Closed/Door	

Right Rear Door Ajar Sw.	Doors	Ajar	Door Closed

Driver Door Switch

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Operating Conditions: Ignition ON/Engine OFF/High Beams OFF/Doors Closed/Trunk Closed/Park Brake Unapplied/Seat Belt Buckled			
Driver Door Ajar Sw.	Inputs	Active/Inactive	Inactive

Engine Control Module (ECM)

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Operating Conditions: Engine Idling/Normal Operating Temperature			
Ambient Temperature Sensor	Engine Data EVAP Data Fuel Trim Data	Celsius (Fahrenheit)	-35-60°C (-31-140°F) (Varies)
Cruise Control Active	Engine Data TAC Data Cruise/PTO/Traction Data IPC Data	Yes/No	No
Engine Speed	Engine Data CMP Actuator Data EVAP Data HO2S Data Ignition Data Induction Data Misfire Data Cooling/HVAC Data Cruise/PTO/Traction Data Electrical/Theft Data IPC Data Auto. Transmission Data	RPM	100 RPM from Desired Idle Speed
	Engine Data CMP Actuator Data EVAP Data Fuel Trim Data		

ECT Sensor	HO2S Data Ignition Data Induction Data Misfire Data TAC Data Cooling/HVAC Data Cruise/PTO/Traction Data Electrical/Theft Data IPC Data Auto. Transmission Data	Celsius (Fahrenheit)	85-105°C (185-220°F)
Engine Oil Life Remaining	IPC Data	%	Varies
Engine Oil Pressure Switch	Engine Data CMP Actuator Data Misfire Data Electrical/Theft Data IPC Data	OK/Low	OK
Fuel Level Sensor	EVAP Data Fuel Trim Data IPC Data	Volts	0-5 V (Varies)
Fuel Tank Level Remaining	Engine Data EVAP Data Fuel Trim Data Misfire Data IPC Data	%	Varies
Fuel Tank Level Remaining	Engine Data EVAP Data Fuel Trim Data	Gallons (Liters)	Varies
Fuel Tank Rated Capacity	EVAP Data Fuel Trim Data	Liters (Gallons)	62.8 L (16.6 gal)
Ignition 1 Signal	Engine Data CMP Actuator Data EVAP Data Fuel Trim Data HO2S Data Ignition Data Induction Data Misfire Data	Volts	9-16 V

	TAC Data Cooling/HVAC Data Cruise/PTO/Traction Data Electrical/Theft Data IPC Data Auto. Transmission Data		(Varies)
MIL Circuit Status	IPC Data	OK/Open/Short/Invalid State	OK
MIL Command	Engine Data IPC Data	On/Off	Off
Reduced Engine Power	TAC Data	Active/Inactive	Inactive
Vehicle Speed Sensor	Engine Data CMP Actuator Data EVAP Data Fuel Trim Data HO2S Data Ignition Data Induction Data Misfire Data TAC Data Cooling/HVAC Data Cruise/PTO/Traction Data Electrical/Theft Data IPC Data Auto. Transmission Data	km/h (mph)	0 km/h (0 mph)

Instrument Panel Cluster (IPC)

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Operating Conditions: Ignition ON/Engine OFF/Seat Belt Buckled/High Beams OFF/Park Brake Unapplied/Park Lamps ON			
Battery Voltage	Data Display	Volts	9-16 V (Varies)
Brake Fluid	Data Display	OK/Low	OK
Brake Fluid Switch	Data Display	Volts	Varies
DIC Fuel Info	Data Display	Active/Inactive	Inactive
DIC Information Switch	Data Display	Active/Inactive	Inactive

DIC Personalization	Data Display	Active/Inactive	Inactive
Ignition 1 Input	Data Display	Active/Inactive	Active
Ignition Cycle Counter	Data Display	Cycles	0-255
Odo/Trip Reset Switch	Data Display	Active/Inactive	Inactive
Passenger Seatbelt Indicator Commanded	Data Display	On/Off	Off
Passenger Seatbelt Indicator Status	Data Display	On/Off	Off
Set/Reset Switch	Data Display	Active/Inactive	Inactive
Washer Fluid Level	Data Display	OK/Low	OK

Passenger Door Switch

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Operating Conditions: Ignition ON/Engine OFF/High Beams OFF/Doors Closed/Trunk Closed/Park Brake Unapplied/Seatbelt Buckled			
Passenger Door Ajar Sw.	Inputs	Active/Inactive	Inactive

SCAN TOOL DATA DEFINITIONS

Accy/RAP Relay Command

The scan tool displays On or Off. This is the state of the Accy/RAP relay command as monitored by the body control module (BCM).

Ambient Temperature Sensor

The scan tool displays 0-100°C. The measured temperature from the ambient outside air temperature sensor to the body control module (BCM).

Battery Voltage

The scan tool displays 0-18 volts. This is the voltage at the battery positive voltage circuit of the BCM.

Battery Voltage

The scan tool displays 0-18 volts. The battery voltage as monitored by the instrument panel cluster (IPC).

Brake Fluid

The scan tool displays OK or Low. This is the state of the brake fluid level switch as monitored by the IPC.

Brake Fluid Switch

The scan tool displays 0-5 volts. The IPC monitors the brake fluid switch signal circuit where a low voltage indicates low brake fluid.

Cruise Control Active

The scan tool displays Yes or No. The state of the cruise control indicator as commanded by the ECM.

DIC Fuel Info

The scan tool displays Active or Inactive. The IPC monitors the fuel button of the DIC switch. A closed switch is displayed as Active.

DIC Information

The scan tool displays Active or Inactive. The IPC monitors the information button of the DIC switch. A closed switch is displayed as Active.

DIC Personalization

The scan tool displays Active or Inactive. The IPC monitors the personalization button of the DIC switch. A closed switch is displayed as Active.

Driver Door Ajar Sw.

The scan tool displays Active or Inactive. The driver door module monitors the signal circuit of the driver door ajar switch. An open switch is displayed as Active with the door open.

ECT Sensor

The scan tool displays -39 to +140°C (-38 to +284°F). This is the engine coolant temperature as monitored by the engine control module (ECM). The voltage is inversely proportional to the engine coolant temperature.

Engine Oil Life Remaining

The scan tool displays 0-100 percent. This is the engine oil life index that is calculated and maintained by the ECM.

Engine Oil Pressure Switch

The scan tool displays OK or Low. The ECM monitors the signal circuit of the engine oil pressure switch. A closed switch with low oil pressure is displayed as Low.

Engine Speed

The scan tool displays 0-9999 RPM. Engine speed is computed by the ECM from the 3X reference input. It should remain close to desired idle under various engine loads with the engine idling.

Fuel Level Sensor

The scan tool displays 0-5 volts. The ECM monitors the fuel level sensor signal circuit where 0 V is an empty tank.

Fuel Tank Level Remaining

The scan tool displays gallons (liters). This is the amount of fuel remaining in the fuel tank as determined by the ECM.

Fuel Tank Level Remaining

The scan tool displays 0-100%. The scan tool displays in percentage the amount of fuel remaining in the fuel tank as determined by the ECM.

Fuel Tank Rated Capacity

The scan tool displays gallons (liters). This is the fuel tank rated capacity as determined by the ECM.

Hazard Lamp Switch

The scan tool displays Active or Inactive. The BCM monitors the hazard switch signal circuit. When the hazard lamp is off the signal is displayed as Inactive.

Headlamp Switch

The scan tool displays Active or Inactive. The BCM monitors the signal circuit of the headlamp switch. A closed switch is displayed as Active.

High Beam Relay Command

The scan tool displays the commanded state of the high beam relay. The scan tool displays On when the BCM allows the high beam relay to go to ground to activate the high beam lamps.

High Beam Select Switch

The scan tool displays Active or Inactive. This is the position of the high beam select switch where an on switch is displayed as Active.

Ign. Off/Run/Crank

The scan tool displays Key Out/ACC/Key In/Off/Crank/Run. The power mode status as monitored by the BCM.

Ignition 1 Input

The scan tool displays Active or Inactive. The scan tool displays Active when the ignition switch is in the RUN or CRANK position

Ignition 1 Signal

The scan tool displays 0-16 V. The ignition 1 signal represents the system voltage detected by the ECM at the ignition voltage circuit.

Ignition Cycle Counter

The scan tool displays 0-255. The IPC counts the number of times the ignition is cycled.

Key In Ignition Status

The scan tool displays Key In or Key Out. The BCM monitors the signal circuit of the ignition key alarm switch. The scan tool displays Key In when the ignition key is fully inserted into the ignition switch cylinder.

Left Rear Door Ajar Switch

The scan tool displays Door Closed/Door Ajar. The BCM monitors the signal circuit of the

left rear door ajar switch. An open switch is displayed as Door Ajar with the door open.

Low Beam Relay Command

The scan tool displays On or Off. The BCM monitors the low beam relay output signal. When the low beam switch is turned Off the signal is displayed as Off.

MIL (Malfunction Indicator Lamp) Command

The scan tool displays On or Off. This is the commanded state of the malfunction indicator lamp (MIL) by the ECM.

MIL Circuit Status

The scan tool displays OK/Open/Short/Invalid State. The ECM monitors the status of the MIL signal circuit

Odo/Trip Reset Switch

The scan tool displays Active or Inactive. The IPC monitors the trip reset stem on the cluster. A closed switch is displayed as Active.

Park Brake Switch

The scan tool displays Applied or Released. The BCM monitors the park brake signal circuit, where a closed switch with the park brake applied is displayed as Applied.

Park Lamp Relay Cmd.

The scan tool displays the commanded state of the park lamp relay. The scan tool displays On when the BCM allows the park lamp relay to go to ground to activate the park lamps.

Parklamp Switch

The scan tool displays Active or Inactive. The BCM monitors the signal circuit of the parklamp switch. A closed switch is displayed as Active.

Passenger Door Ajar Switch

The scan tool displays Active or Inactive. The passenger door module monitors the signal circuit of the passenger door ajar switch. An open switch is displayed as On with the door open.

Passenger Seatbelt Indicator Commanded

The scan tool displays On or Off. This is the state of the passenger safety belt indicator as commanded by the IPC.

Passenger Seatbelt Indicator Status

The scan tool displays On or Off. This is the state of the passenger safety belt indicator as monitored by the IPC.

Reduced Engine Power

The scan tool displays Active or Inactive. This is the state of the Reduced Engine Power indicator as monitored by the ECM.

Right Rear Door Ajar Sw.

The scan tool displays Door Closed/Door Ajar. The BCM monitors the signal circuit of the right rear door ajar switch. An open switch is displayed as Door Ajar with the door open.

Set/Reset Switch

The scan tool displays Active/Inactive. The IPC monitors the set/reset button of the DIC switch. A closed switch is displayed as Active.

Vehicle Speed Sensor

The scan tool displays 0-255 km/h (0-159 mph). The ECM monitors the voltage at the signal circuit of the vehicle speed sensor. The voltage is proportional to the vehicle speed.

Washer Fluid Level

The scan tool displays OK/Low. The IPC monitors the windshield washer solvent level switch, where a closed switch with low washer fluid is displayed as Low.

DTC B2976

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 B2976 00

Door Ajar Circuit

Diagnostic Fault Information

DTC B2976 00

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Door Ajar Signal	B2976 00	2	-	B3567 59
Door Ajar Ground	-	2	2	-
1. Door Ajar Indicator Always On 2. Door Ajar Indicator Inoperative				

Circuit/System Description

For vehicles without RPO AXC/AXE, the body control module (BCM) receives a discrete input from each of the 4 jamb switches and for vehicles with RPO AXC/AXE the BCM will only receive discrete input from the rear door jamb switches to indicate the status for each door. The BCM then communicates this status to the instrument panel cluster (IPC) via a serial data message. The IPC, upon receipt of this serial data message, will illuminate the appropriate ajar message in the driver information center (DIC) and also send a serial data massage to the radio to activate the door ajar audible warming when the transmission is removed from PARK and the vehicle speed is greater then 8 km/h (5 mph).

The door ajar switches supply a ground to the BCM when the door is open. Once the door is closed the door ajar switch opens removing the ground to the BCM. The BCM sends a signal to the IPC to turn on the door ajar light when a door is open.

Conditions for Running the DTC

The system voltage is 9-18 volts.

Conditions for Setting the DTC

The BCM receives a voltage signal on the driver door ajar circuit.

Action Taken When the DTC Sets

The ajar indicator is on at all times.

Conditions for Clearing the DTC

- The DTC will be current for as long as the fault is present.
- When the fault is no longer present, the DTC will become a history DTC.
- A history DTC will clear after 50 ignition cycles.

Reference Information

Schematic Reference

Door Lock/Indicator Schematics (AXA) or **Door Lock/Indicator Schematics (AXC/AXE)**

Connector End View Reference

VEHICLE ACCESS CONNECTOR END VIEWS

Description and Operation

Door Ajar Indicator Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Circuit/System Verification

Ignition ON, with all doors closed, observe the scan tool Door Ajar Switch parameters while opening and closing all doors. The parameters should change between Closed and Ajar.

Circuit/System Testing

1. Ignition OFF, disconnect harness connector at the appropriate door latch assembly.
2. Ignition ON, verify the appropriate scan tool Door Ajar Sw. parameter is Door Closed.
    - If not the specified value, test the signal circuit listed below for a short to ground;

        - Driver door latch assembly signal circuit terminal 6.
        - Left rear door latch assembly signal circuit terminal 4.
        - Passenger door latch assembly signal circuit terminal 1.
        - Right rear door latch assembly signal circuit terminal 1.
    - If the circuit tests normal, replace the BCM.
3. If all circuits test normal, test or replace the door latch assembly.

Component Testing

1. Ignition OFF, disconnect the harness connector at the appropriate door latch assembly.
2. With the switch in the open position, test for infinite resistance between the signal terminal and the ground terminal listed below:
    - Driver door latch assembly signal terminal 6 and ground terminal 8.
    - Left rear door latch assembly signal terminal 4 and ground terminal 6.
    - Passenger and right rear door latch assembly signal terminal 1 and ground terminal 3.
        - If not the specified value, replace the door latch assembly.
3. With the switch in the closed position, test for less than 1.0 ohms between the signal and the ground terminals listed below:
    - Driver door latch assembly signal terminal 6 and ground terminal 8.
    - Left rear door latch assembly signal terminal 4 and ground terminal 6.
    - Passenger and right rear door latch assembly signal terminal 1 and ground terminal 3.
        - If not the specified value, replace the door latch assembly.

Repair Procedures

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

- **FRONT SIDE DOOR LATCH REPLACEMENT** for the IPC replacement, setup and programming
- **REAR SIDE DOOR LATCH REPLACEMENT**
- **Control Module References** for PCM replacement, setup and programming

DTC B3567

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 (DIC) Select Switch Circuit Short To Battery

DTC B3567 59

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

Diagnostic Fault Information

DTC B3567

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

Circuit/System Description

The driver information switches are normally open momentary switches. Power is provided to the driver information center (DIC) switches via the instrument panel cluster (IPC) ignition 1 voltage circuit. The IPC ignition 1 voltage circuit is fused in the body control module (BCM). The IPC interfaces with the DIC switches via 3 discreet circuits. The switch input to the cluster is pulled low or grounded when a switch is activated. The IPC reads the voltage at the analog input to determine which switch(es) is pressed. The switch input to the cluster is set up in a resistor ladder format. The DIC switches include the PERSONALIZATION, SET/RESET, TRIP/FUEL and VEHICLE INFO switches. A stuck switch or a short to battery sets a DTC.

Conditions for Running the DTC

The ignition is in ACCESSORY or RUN.

Conditions for Setting the DTC

- The IPC detects that the DIC switch is stuck.
- 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.
- The engine control module (ECM) receives a clear code command from the scan tool.

Diagnostic Aids

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

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

- **Door Lock/Indicator Schematics (AXA)** or **Door Lock/Indicator Schematics (AXC/AXE)**
- **Inline Harness Connector End Views**

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the DIC switch assembly.
2. Verify all of the scan tool DIC Switch parameters except the TRIP/FUEL parameter are Inactive.
   - If not Inactive, replace the IPC.
3. Ignition ON, install a 3-amp fused jumper wire between the signal circuit and ground. Verify all of the scan tool DIC Switch parameters except the TRIP/FUEL parameter are Active.
   - If not Active, test the signal circuit of the DIC switch assembly for a short to voltage. If the circuit tests normal, replace the IPC.
4. If all circuits test normal, test or replace the DIC switch assembly.

Repair Procedures

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

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

DTC P0461

Diagnostic Instructions

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

DTC Descriptor

DTC P0461

Fuel Level Sensor 1 Performance

Diagnostic Fault Information

DTC P0461

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Fuel Level Sensor				

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

Circuit/System Description

The fuel level sender changes resistance based on the fuel level. The powertrain control module (PCM) monitors the signal circuit of the fuel level sender in order to determine fuel level. When the fuel tank is full, the sender resistance is low and the PCM senses a low signal voltage. When the fuel tank is empty, the sender resistance is high and the PCM senses a high signal voltage. The PCM uses the signal circuit of the fuel level sender in order to calculate the total remaining fuel percent in the tank. The PCM sends the fuel level message via the CAN serial data circuit to the body control module (BCM). The BCM sends the fuel level percent to the instrument panel cluster (IPC) via the class 2 data circuit to display on the fuel gage. The fuel level information is also used for misfire and evaporative emission (EVAP) diagnostics.

This diagnostic tests for a lower than normal fuel level sender signal.

Conditions for Running the DTC

The engine is ON.

Conditions for Setting the DTC

The PCM detects a change is fuel level less than 10 liters (1.3 gallons) over a distance of 241.4 km (150 miles).

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

- The DTC becomes history when the conditions for setting the DTC are no longer present.

- The history DTC clears after 40 malfunction-free warm-up cycles.
- The PCM receives the clear code command from the scan tool.

Diagnostic Aids

Using the Failure Records data may help locate an intermittent condition. If you cannot duplicate the DTC, the information in the Failure Records can help determine how many miles since the DTC set. The Fail Counter and Pass Counter can help determine how many ignition cycles that the diagnostic test reported a pass and/or a fail.

Reference Information

Schematic Reference

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

Connector End View Reference

- **Displays and Gages Connector End Views**
- **Engine Control Module Connector End Views**

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Circuit/System Testing

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

Component Testing

Measure the resistance of the float arm of the fuel level sender while moving the float arm between 40-250 ohms.

- If the resistance does not move smoothly across the specified range, replace the fuel level sensor.

Repair Procedures

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

- **Fuel Level Sensor Replacement**
- **Control Module References** for PCM replacement, setup and programming

DTC P0462

Diagnostic Instructions

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

DTC Descriptor

DTC P0462

Fuel Level Sensor 1 Circuit Low Voltage

Diagnostic Fault Information

DTC P0462

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

Circuit/System Description

The fuel level sender changes resistance based on the fuel level. The powertrain control module (PCM) monitors the signal circuit of the fuel level sender in order to determine fuel level. When the fuel tank is full, the sender resistance is low and the PCM senses a low signal voltage. When the fuel tank is empty, the sender resistance is high and the PCM senses a high signal voltage. The PCM uses the signal circuit of the fuel level sender in order to calculate the total remaining fuel percent in the tank. The PCM sends the fuel level message via the CAN serial data circuit to the body control module (BCM). The BCM sends the fuel level percent to the instrument panel cluster (IPC) via the class 2 data circuit to display on the fuel gage. The fuel level information is also used for misfire and evaporative emission (EVAP) diagnostics.

This diagnostic tests for a lower than normal fuel level sender signal.

Conditions for Running the DTC

The ignition is ON, with the engine ON.

Conditions for Setting the DTC

- The fuel level signal is greater than 98 percent.
- The above condition is present for greater than 20 seconds.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Diagnostic Aids

Using the Failure Records data may help locate an intermittent condition. If you cannot duplicate the DTC, the information in the Failure Records can help determine how many miles since the DTC set. The Fail Counter and Pass Counter can help determine how many ignition cycles that the diagnostic test reported a pass and/or a fail.

Reference Information

Schematic Reference

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

Connector End View Reference

- **Displays and Gages Connector End Views**
- **Engine Control Module Connector End Views**

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the fuel level sensors.
2. Ignition ON, verify that the scan tool fuel tank level remaining parameter is less than 4 percent.
    - If greater than 4 percent, test the signal circuit for a short to ground. If the circuit tests normal, replace the PCM.
3. If all circuits test normal, test or replace the fuel level sensors.

Component Testing

Measure the resistance of the float arm of the fuel level sender while moving the float arm between 40-250 ohms.

- If the resistance does not move smoothly across the specified range, replace the fuel level sensor.

Repair Procedures

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

- **Fuel Level Sensor Replacement**
- **Control Module References** for PCM replacement, setup and programming

DTC P0463

Diagnostic Instructions

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

DTC Descriptor

DTC P0463

Fuel Level Sensor 1 Circuit High Voltage

Diagnostic Fault Information

DTC P0463

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

Circuit/System Description

The fuel level sender changes resistance based on the fuel level. The powertrain control module (PCM) monitors the signal circuit of the fuel level sender in order to determine fuel level. When the fuel tank is full, the sender resistance is low and the PCM senses a low signal voltage. When the fuel tank is empty, the sender resistance is high and the PCM senses a high signal voltage. The PCM uses the signal circuit of the fuel level sender in order to calculate the total remaining fuel percent in the tank. The PCM sends the fuel level message via the CAN serial data circuit to the

body control module (BCM). The BCM sends the fuel level percent to the instrument panel cluster (IPC) via the class 2 data circuit to display on the fuel gage. The fuel level information is also used for misfire and evaporative emission (EVAP) diagnostics.

This diagnostic tests for a lower than normal fuel level sender signal.

Conditions for Running the DTC

The ignition is ON, with the engine ON.

Conditions for Setting the DTC

- The fuel level signal is less than 3.5 percent.
- The above condition is present for greater than 20 seconds.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Diagnostic Aids

Using the Failure Records data may help locate an intermittent condition. If you cannot duplicate the DTC, the information in the Failure Records can help determine how many miles since the DTC set. The Fail Counter and Pass Counter can help determine how many ignition cycles that the diagnostic test reported a pass and/or a fail.

Reference Information

Schematic Reference

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

Connector End View Reference

- **Displays and Gages Connector End Views**
- **Engine Control Module Connector End Views**

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Circuit/System Testing

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

Component Testing

Measure the resistance of the float arm of the fuel level sender while moving the float arm between 40-250 ohms.

- If the resistance does not move smoothly across the specified range, replace the fuel level sensor.

Repair Procedures

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

- **Fuel Level Sensor Replacement**
- **Control Module References** for PCM replacement, setup and programming

DTC P0464

Diagnostic Instructions

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

DTC Descriptor

DTC P0464

Fuel Level Sensor 1 Circuit Intermittent

Diagnostic Fault Information

DTC P0464

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

Circuit/System Description

The fuel level sender changes resistance based on the fuel level. The powertrain control module (PCM) monitors the signal circuit of the fuel level sender in order to determine fuel level. When the fuel tank is full, the sender resistance is low and the PCM senses a low signal voltage. When the fuel tank is empty, the sender resistance is high and the PCM senses a high signal voltage. The PCM uses the signal circuit of the fuel level sender in order to calculate the total remaining fuel percent in the tank. The PCM sends the fuel level message via the CAN serial data circuit to the body control module (BCM). The BCM sends the fuel level percent to the instrument panel

cluster (IPC) via the class 2 data circuit to display on the fuel gage. The fuel level information is also used for misfire and evaporative emission (EVAP) diagnostics.

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Diagnostic Aids

Using the Failure Records data may help locate an intermittent condition. If you cannot duplicate the DTC, the information in the Failure Records can help determine how many miles since the DTC set. The Fail Counter and Pass Counter can help determine how many ignition cycles that the diagnostic test reported a pass and/or a fail.

Reference Information

Schematic Reference

- **Instrument Cluster Schematics**

- **Engine Controls Schematics**

Connector End View Reference

- **Displays and Gages Connector End Views**
- **Engine Control Module Connector End Views**

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Circuit/System Testing

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

Component Testing

Measure the resistance of the float arm of the fuel level sender while moving the float arm between 40-250 ohms.

- If the resistance does not move smoothly across the specified range, replace the fuel level sensor.

Repair Procedures

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

- **Fuel Level Sensor Replacement**
- **Control Module References** for PCM replacement, setup and programming

DTC P0520

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 P0520

Engine Oil Pressure (EOP) Switch Circuit

Diagnostic Fault Information

DTC P0520

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

Circuit/System Description

The engine control module (ECM) monitors the signal circuit of the engine oil pressure (EOP) sensor. When the oil pressure is high, the sensor is open and the ECM senses a high signal voltage. When the oil pressure is low, the sensor is closed and the ECM senses a low signal voltage.

Conditions for Running the DTC

The ignition is ON, with the engine ON.

Conditions for Setting the DTC

- The ECM detects that the EOP sensor signal circuit is pulled low.
- The above condition is present for greater than 5 seconds.

Action Taken When the DTC Sets

- The ECM records the operating conditions at the time the diagnostic test fails. The ECM displays this information in the Failure Records on the scan tool.
- The instrument panel cluster (IPC) illuminates the engine oil pressure 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.
- The ECM receives a clear code command from the scan tool.

Diagnostic Aids

Using the Failure Records data may help locate an intermittent condition. If you cannot duplicate the DTC, the information in the Failure Records can help determine how many miles since the DTC set. The Fail Counter and Pass Counter can help determine how many ignition cycles that the diagnostic test reported a pass and/or a fail.

Reference Information

Schematic Reference

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

Connector End View Reference

- **Displays and Gages Connector End Views**
- **Engine Control Module Connector End Views**

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the EOP.
2. Ignition ON, install a 3-amp fused jumper between the signal circuit and ground. Verify the scan tool Engine Oil Pressure Switch parameter is Low.
    - If not Low, test the signal circuit of the EOP switch for an open/high resistance. If the circuit tests normal, replace the ECM.
3. If all circuits test normal, test or replace the EOP switch.

Repair Procedures

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

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

SYMPTOMS - DISPLAYS AND GAGES

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

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

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the instrument panel

cluster or audible warnings system. Refer to **Checking Aftermarket Accessories** .

- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Inspect for 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:

Gages and Odometer

- **Engine Coolant Temperature Gage Inaccurate or Inoperative**
- **Fuel Gage Inaccurate or Inoperative**
- **Hourmeter Inaccurate or Inoperative**
- **Instrument Cluster Inoperative**
- **Odometer Trip/Reset Switch Inoperative**
- **Speedometer and/or Odometer Inaccurate or Inoperative**
- **Tachometer Inaccurate or Inoperative**

Indicators

- **ABS Indicator Always On**
- **ABS Indicator Inoperative**
- **Air Bag Indicator Circuit Malfunction**
- **Brake Warning Indicator Always On**
- **Change Engine Oil Indicator Always On**
- **Brake Warning Indicator Inoperative**
- **Charge Indicator Always On**
- **Charge Indicator Inoperative**
- **Door Ajar Indicator Malfunction**
- **Driver Information Center (DIC) Switch(es) Inoperative**

- **Engine Coolant Temperature Indicator Always On**
- **Engine Coolant Temperature Indicator Inoperative**
- **Engine Oil Pressure Indicator Always On**
- **Interior Backlighting Does Not Dim**
- **Interior Backlighting Inoperative**
- **Low Engine Oil Level Indicator Always On**
- **Low Tire Pressure Indicator Always On**
- **Low Tire Pressure Indicator Inoperative**
- **Malfunction Indicator Lamp (MIL) Diagnosis**
- **Mirror Compass Display Inoperative or Inaccurate**
- **Passenger Presence System Indicator Circuit Malfunction**
- **Seat Belt Indicator Circuit Malfunction - Driver**
- **Seat Belt Indicator Circuit Malfunction - Passenger**
- **Stability System Caution Indicator Always On**
- **Stability System Caution Indicator Inoperative**
- **Turn Signal Lamps and/or Indicators Inoperative**
- **Turn Signal Lamps and/or Indicators Always On or Flashing**

Audible Warnings

- **Chime Always On**
- **Chime Inoperative**

CHANGE ENGINE OIL INDICATOR ALWAYS ON

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) determines when the engine oil should be changed and calculates the oil life in percent. The ECM sends this information via high speed GMLAN to the body control module (BCM). The instrument panel cluster (IPC) receives this information from

the BCM through low speed GMLAN and illuminates the oil level percent in the driver information center (DIC). The IPC will illuminate the CHANGE ENGINE OIL message when the oil needs to be changed.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Displays and Gages Connector End Views

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Circuit/System Verification

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

Repair Procedures

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

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

CHIME ALWAYS ON

Diagnostic Instructions

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

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

Circuit/System Description

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

Reference Information

Schematic Reference

- **Instrument Cluster Schematics**
- **Body Control System Schematics**
- **Radio/Navigation System Schematics**

Connector End View Reference

- **Displays and Gages Connector End Views**
- **Data Communication Connector End Views**
- **Entertainment/Communication Connector End Views**

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Circuit/System Testing

1. Ignition ON, headlamp switch OFF, verify the scan tool Headlamp Switch parameter is Inactive.
    - If not Inactive, test the headlamps signal circuit for an open or short to voltage. If the circuit tests normal, replace the headlamp switch.
2. Ignition ON, park lamp switch OFF, verify the scan tool Park Lamp Switch parameter is

Inactive.

- If not Inactive, test the park lamp switch signal circuit for an open or short to voltage. If the circuit tests normal, replace the headlamp switch.

3. Ignition OFF, key out of the ignition, verify the scan tool Key In Ignition Status parameter is Key Out.
   - If not Key Out, test the key in ignition switch signal circuit for an open or short to voltage. If the circuit tests normal, replace the ignition switch.
4. Ignition ON, doors closed, verify the scan tool Door Ajar Switch parameters are Inactive.
   - If not Inactive, go to **Courtesy Lamps Always On** .
5. If all circuits test normal, replace the BCM.

Repair Procedures

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

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

CHIME INOPERATIVE

Diagnostic Instructions

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

Circuit/System Description

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

Reference Information

Schematic Reference

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

Connector End View Reference

- **Displays and Gages Connector End Views**
- **Entertainment/Communication Connector End Views**

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Circuit/System Testing

1. Ignition OFF, key in the ignition, open the driver door. The courtesy lamps should illuminate.
   - If the courtesy lamps do not illuminate, refer to **Courtesy Lamps Inoperative** .
2. Ignition ON, radio ON, adjust the radio balance and fade to the left front speaker.
   - If the speaker does not operate properly, refer to **Speakers Inoperative - One or More** .
3. If the speaker operates properly, replace the radio.

Repair Procedures

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

Control Module References for radio replacement, setup and programming

DOOR AJAR 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.

Diagnostic Fault Information

Door Ajar Indicator Malfunction

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Door Ajar Signal Circuit	1	2	-	-
Door Ajar Ground Circuit	-	2	2	-
1. Door Ajar Light Stays On 2. Door Ajar Light Will Not Come On				

Circuit/System Description

The body control module (BCM) receives a discrete input from the respective jamb switch to indicate the status of the door. The BCM then communicates this status to the instrument panel cluster (IPC) via a serial data message. The IPC, upon receipt of this serial data message, will illuminate the appropriate ajar message in the driver information center (DIC) and also send a serial data massage to the radio to activate the door ajar audible warming when the transmission is removed from PARK and the vehicle speed is greater then 8.05 km/h (5 mph).

Diagnostic Aids

The door ajar switches supply a ground to the BCM when the door is open. Once the door is closed the door ajar switch opens canceling the ground to the BCM. The BCM sends a signal to the IPC to turn on the door ajar light when a door is open.

Reference Information

Schematic Reference

Door Lock/Indicator Schematics (AXA) or **Door Lock/Indicator Schematics (AXC/AXE)**

Connector End View Reference

- **Vehicle Access Connector End Views**
- **Data Communication Connector End Views**

Electrical Information Reference

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

Scan Tool Reference

- **Scan Tool Data List**
- **Scan Tool Data Definitions**

Circuit/System Verification

Ignition ON, observe the Scan Tool Door Ajar Switch parameter while opening and closing all of the doors. The reading should change between low and high.

Circuit/System Testing

Ignition ON, while observing the door ajar indicators and the dome lamps, open and close each door. The door ajar indicator and the dome lamp should turn on with each door that opens.

- If the dome lamps operate properly and the door ajar indicator does not illuminate, replace the IPC.

Repair Procedures

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

- **Front Side Door Latch Replacement**
- **Rear Side Door Latch Replacement**
- **Control Module References** for IPC and BCM replacement, setup and programming

DRIVER INFORMATION CENTER (DIC) SWITCH(ES) INOPERATIVE

Diagnostic Instructions

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

Circuit/System Description

The driver information switches are normally open momentary switches. Power is provided to the driver information center (DIC) switches via the instrument panel cluster (IPC) ignition 1 voltage circuit. The IPC ignition 1 voltage circuit is fused in the body control module (BCM). The IPC interfaces with the DIC switches via 3 discreet circuits. The switch input to the cluster is pulled low or grounded when a switch is activated. The IPC reads the voltage at the analog input to determine which switch(es) is pressed. The switch input to the cluster is set up in a resistor ladder

format. The DIC switches include the PERSONALIZATION, SET/RESET, TRIP/FUEL and VEHICLE INFO switches.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Displays and Gages Connector End Views

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Circuit/System Testing

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

Repair Procedures

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

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

ENGINE COOLANT TEMPERATURE GAGE INACCURATE OR INOPERATIVE

Diagnostic Instructions

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

Circuit/System Description

The instrument panel cluster (IPC) displays the engine coolant temperature as determined by the engine control module (ECM). The IPC receives a serial data message from the ECM indicating the engine coolant temperature.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Displays and Gages Connector End Views

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

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

Scan Tool Reference

- **Scan Tool Output Controls**
- **Scan Tool Data List**

- **Scan Tool Data Definitions**

Circuit/System Testing

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

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

Repair Procedures

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

Control Module References for the IPC replacement, setup and programming

ENGINE OIL PRESSURE INDICATOR ALWAYS ON

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 oil pressure (EOP) switch is a normally closed switch that opens with the proper oil pressure. With the ignition switch turned ON and the engine not running, the engine control module (ECM) should detect a low signal voltage input. With the engine running, the pressure switch opens and the ECM should detect a high signal voltage input.

Reference Information

Schematic Reference

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

Connector End View Reference

- **Displays and Gages Connector End Views**
- **Engine Control Module Connector End Views**

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Circuit/System Testing

1. Ignition ON, engine ON, verify the scan tool Engine Oil Pressure Switch parameter is Low.
   - If not Low, replace the instrument panel cluster (IPC).
2. Ignition OFF, disconnect the harness connector at the EOP switch.
3. Ignition ON, verify the scan tool Engine Oil Pressure Switch parameter is OK.
   - If not OK, test the signal circuit of the EOP switch for a short to ground. If the circuit tests normal, replace the ECM.
4. If all circuits test normal, test or replace the EOP sensor.

Repair Procedures

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

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

FUEL GAGE INACCURATE OR INOPERATIVE

Diagnostic Instructions

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

Circuit/System Description

The fuel level sender changes resistance based on the fuel level. The powertrain control module (PCM) monitors the signal circuit of the fuel level sender in order to determine fuel level. When the fuel tank is full, the sender resistance is low and the PCM senses a low signal voltage. When the fuel tank is empty, the sender resistance is high and the PCM senses a high signal voltage. The

PCM uses the signal circuit of the fuel level sender in order to calculate the total remaining fuel percent in the tank. The PCM sends the fuel level message via the CAN serial data circuit to the body control module (BCM). The BCM sends the fuel level percent to the instrument panel cluster (IPC) via the class 2 data circuit to display on the fuel gage. The fuel level information is also used for misfire and evaporative emission (EVAP) diagnostics.

Reference Information

Schematic Reference

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

Connector End View Reference

- **Displays and Gages Connector End Views**
- **Engine Control Module Connector End Views**

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Circuit/System Testing

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

4. If all circuits test normal, test or replace the fuel level sensors.

Component Testing

Measure the resistance of the float arm of the fuel level sender while moving the float arm between 40-250 ohms.

- If the resistance does not move smoothly across the specified range, replace the fuel level sensor.

Repair Procedures

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

- **Fuel Level Sensor Replacement**
- **Control Module References** for PCM or IPC replacement, setup and programming

HOURMETER INACCURATE OR INOPERATIVE

Diagnostic Instructions

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

Circuit/System Description

The instrument panel cluster (IPC) can display the accumulated engine run time hours when the cluster is in the OFF AWAKE or ACC, RAP and in the RUN positions. The IPC stores the accumulated engine run time hours in a non-volatile format. The hourmeter will update every 6 minutes and will not change if the battery is disconnected or removed.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Displays and Gages Connector End Views

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Circuit/System Testing

Verify the hourmeter operation.

- If the hourmeter does not operate properly, replace the IPC.

Repair Procedures

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

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

INSTRUMENT CLUSTER 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

Voltage is supplied to the instrument panel cluster (IPC) through the battery voltage circuit and the ignition 1 voltage circuit. The IPC will operate when the ignition 1 voltage circuit is in the RUN/START position.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Displays and Gages Connector End Views

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Schematic Reference

Connector End View Reference

Electrical Information Reference

Scan Tool Reference

Circuit/System Testing

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

Repair Procedures

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

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

LIFTGATE/LIFTGATE WINDOW AJAR 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 body control module (BCM) receives an input from both the liftgate and liftglass ajar switches. The ajar switches are normally open when the liftgate and the liftglass are fully closed. When either the liftgate or liftglass is opened, the appropriate ajar switch contacts close providing a path to ground. The driver information center (DIC) located at the bottom of the instrument panel cluster (IPC), illuminates the rear access open message when either the glass or the gate is open. The IPC receives a GMLAN serial data message from the BCM indicating the liftgate or liftglass ajar status. If this message is displayed and the vehicle speed is greater than 8.1 km/h (5 mph), a chime will sound.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Displays and Gages Connector End Views

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Circuit/System Testing

1. Ignition OFF, disconnect both the liftgate and liftglass ajar switches.

2. Ignition OFF, test for less than 1 ohm of resistance between the low reference circuit and ground.
    - If greater than 1 ohm, test the ground circuit for an open/high resistance.
3. Ignition ON, verify the scan tool Liftgate Ajar Switch parameter is Inactive.
    - If not Inactive, test the signal circuit for a short to ground. If the circuit tests normal, replace the BCM.
4. Ignition ON, check to see that the rear access open message is not displayed.
    - If the message is displayed in the DIC, replace the IPC.
5. Ignition ON, install a 3-amp fused jumper wire between the signal circuit and ground. Verify the scan tool Liftgate Ajar Switch parameter is Active.
    - If not Active, test the signal circuit for a short to voltage or an open/high resistance. If the circuit tests normal replace the BCM.
6. Ignition ON, check to see that the rear access open message is displayed.
    - If the message is not displayed in the DIC, replace the IPC.
7. If all circuits test normal, test or replace the liftgate ajar switch or the liftglass ajar switch.

Repair Procedures

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

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

LOW ENGINE OIL LEVEL INDICATOR ALWAYS ON

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 oil level switch is a normally closed switch that opens when there is a low engine oil condition. When the switch is open the engine control module (ECM) will detect a high signal voltage input. During a low engine oil condition the ECM sends a high speed GMLAN message to the body control module (BCM). The BCM then sends a message via low speed GMLAN to the instrument panel cluster (IPC) requesting illumination of the ENGINE OIL LOW ADD OIL message in the driver information center (DIC).

Reference Information

Schematic Reference

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

Connector End View Reference

- **Displays and Gages Connector End Views**
- **Engine Control Module Connector End Views**
- **Inline Harness Connector End Views**

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector of the engine oil level switch.
2. Ignition OFF, test for less than 1 ohm of resistance between the ground circuit and ground.
    - If greater than 1 ohm, test the ground circuit for an open/high resistance.
3. Install a 3-amp fused jumper wire between the signal circuit and ground. Verify the scan tool Engine Oil Level Switch parameter is OK.
    - If not OK, test the signal circuit for an open/high resistance. If the circuit tests normal, replace the ECM.
4. If all circuits test normal, test or replace the engine oil level switch.

Repair Procedures

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

- **Engine Oil Pressure Sensor and/or Switch Replacement**

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

MIRROR COMPASS DISPLAY INOPERATIVE OR INACCURATE

Diagnostic Instructions

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

Circuit/System Description

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

Reference Information

Schematic Reference

Inside Rearview Mirror Schematics

Connector End View Reference

Mirror Connector End Views

Electrical Information Reference

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

Circuit/System Testing

1. Ignition ON, compass ON, verify that there is a compass reading on the display.
    - If the display is blank, replace the ISRVM.
    - If the display shows the letter C or CAL, perform the compass calibration procedure.

Refer to **Compass Calibration and Magnetic Variance**.

2. Verify that the compass reading on the display is correct.
    - If not correct, perform the compass magnetic variation adjustment procedure. Refer to **Compass Calibration and Magnetic Variance**.
3. If the display is still incorrect, replace the ISRVM.

Repair Procedures

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

- **Rearview Mirror Replacement**
- **Control Module References** for ISRVM replacement, setup and programming

ODOMETER TRIP/RESET SWITCH INOPERATIVE

Diagnostic Instructions

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

Circuit/System Description

The instrument panel cluster (IPC) calculates the mileage based on the vehicle speed signal circuit from the powertrain control module (PCM). The PCM sends the vehicle speed information via high speed GMLAN serial data to the body control module (BCM). The BCM then sends the information via low speed GMLAN to the IPC indicating the value of the odometer. The odometer will display error if an internal memory failure is detected. The odometer displays either miles or kilometers and the desired units can be accessed by pressing the trip/reset switch.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Displays and Gages Connector End Views

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Circuit/System Testing

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

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

Repair Procedures

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

Control Module References for IPC replacement, setup and programming

SPEEDOMETER AND/OR ODOMETER INACCURATE OR INOPERATIVE

Diagnostic Instructions

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

Circuit/System Description

The instrument panel cluster (IPC) displays the vehicle speed based on the information from the engine control module (ECM). The ECM converts the data from the vehicle speed sensor to a 4000 pulses/mile signal. The ECM sends the vehicle speed information via high speed GMLAN serial data circuit to the body control module (BCM). The BCM then sends the information via low speed GMLAN to the IPC to order to display the vehicle speed and miles traveled.

Diagnostic Aids

Check for the following DTCs:

- **DTC B1000**

- **DTC U2100**
- **DTC U2105-U2199**

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Displays and Gages Connector End Views

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Circuit/System Testing

1. Ignition OFF, raise the vehicles drive wheels.
2. Engine ON, transmission in drive, verify the scan tool Vehicle Speed Sensor parameter matches the speedometer display.
    - If the Vehicle Speed Sensor parameter does not match the speedometer display, replace the IPC.
3. Verify that the odometer is operating properly.
    - If the odometer is not operating properly, replace the IPC.

Repair Procedures

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

Control Module References for IPC replacement, setup and programming

TACHOMETER INACCURATE OR INOPERATIVE

Diagnostic Instructions

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

Circuit/System Description

The instrument panel cluster (IPC) displays the engine speed based on the information from the engine control module (ECM). The ECM converts the data from the engine speed sensor to a 2 pulses/engine revolution signal. The ECM sends the engine speed information via high speed GMLAN serial data circuit to the body control module (BCM). The BCM then sends the information via low speed GMLAN to the IPC to order to display the engine speed.

Reference Information

Schematic Reference

Instrument Cluster Schematics

Connector End View Reference

Displays and Gages Connector End Views

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

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

Scan Tool Reference

- **Scan Tool Output Controls**
- **Scan Tool Data List**
- **Scan Tool Data Definitions**

Circuit/System Testing

Ignition ON, engine ON, verify the scan tool Engine Speed parameter matches the tachometer display.

- If the Engine Speed parameter does not match the tachometer display, replace the IPC.

Repair Procedures

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

Control Module References for IPC replacement, setup and programming

REPAIR INSTRUCTIONS

AMBIENT AIR TEMPERATURE GAGE SENSOR REPLACEMENT

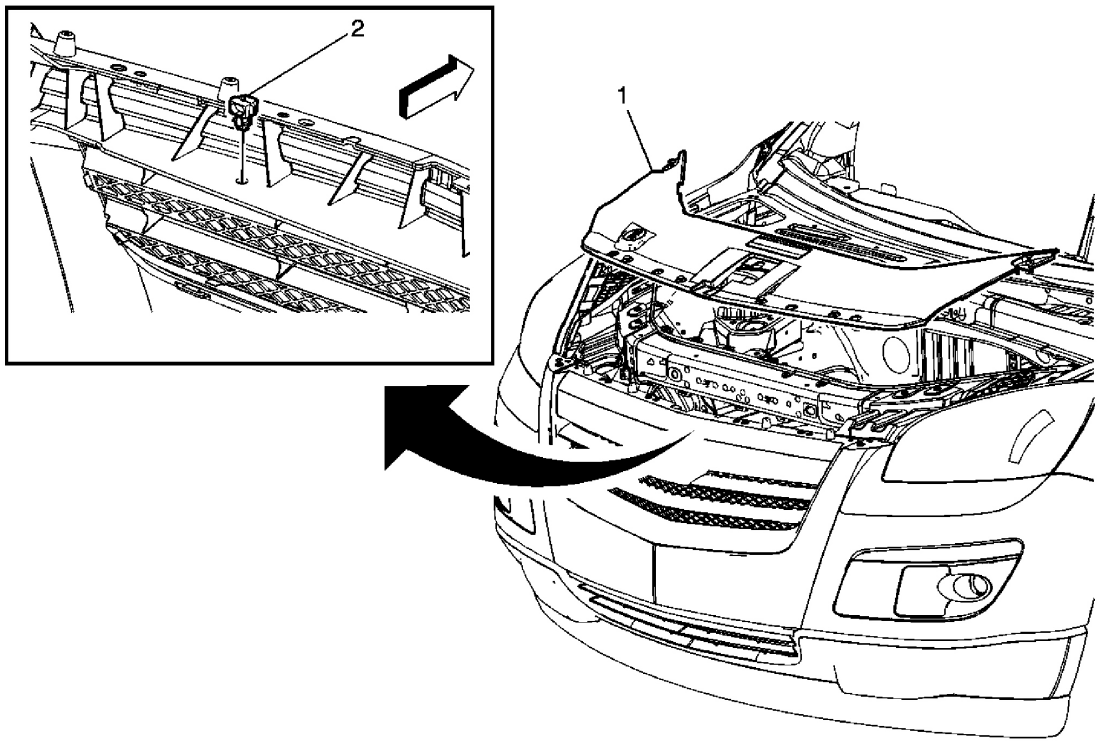


Fig. 21: Identifying Ambient Air Temperature Gage Sensor
Courtesy of GENERAL MOTORS CORP.

Ambient Air Temperature Gage Sensor Replacement

Callout	Component Name
1	Front Compartment Sight Shield

	Refer to **Front Compartment Sight Shields Replacement** .
2	Ambient Air Temperature Sensor **Procedure** 1. Disconnect the electrical connector from the sensor. 2. Unsnap the sensor from the front fascia.

DRIVER INFORMATION DISPLAY SWITCH REPLACEMENT

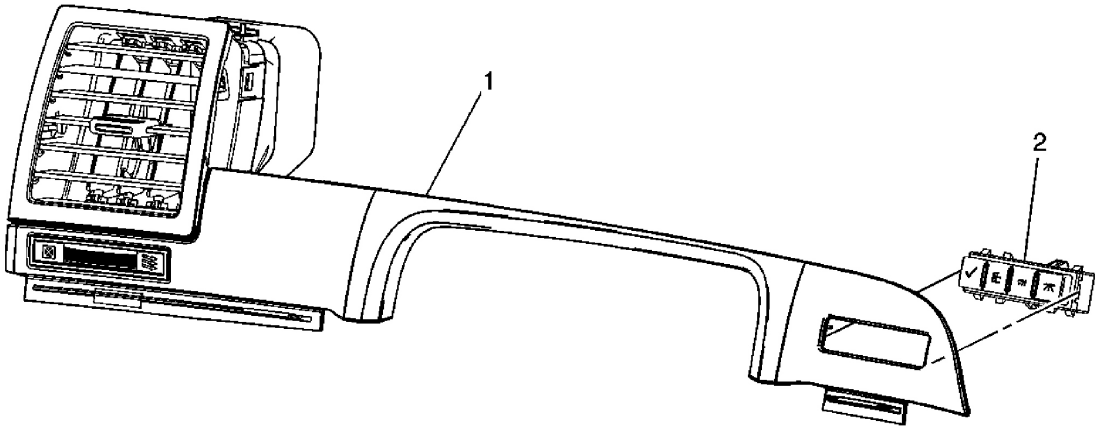


Fig. 22: Locating Driver Information Display Switch
Courtesy of GENERAL MOTORS CORP.

Driver Information Display Switch Replacement

Callout	Component Name
1	Instrument Panel Trim Panel Refer to **Instrument Panel Trim Panel Replacement - Left Side**
2	Drivers Information Center Switch Assembly **Procedure:** Unsnap the switch assembly from the trim panel.

INSTRUMENT CLUSTER REPLACEMENT

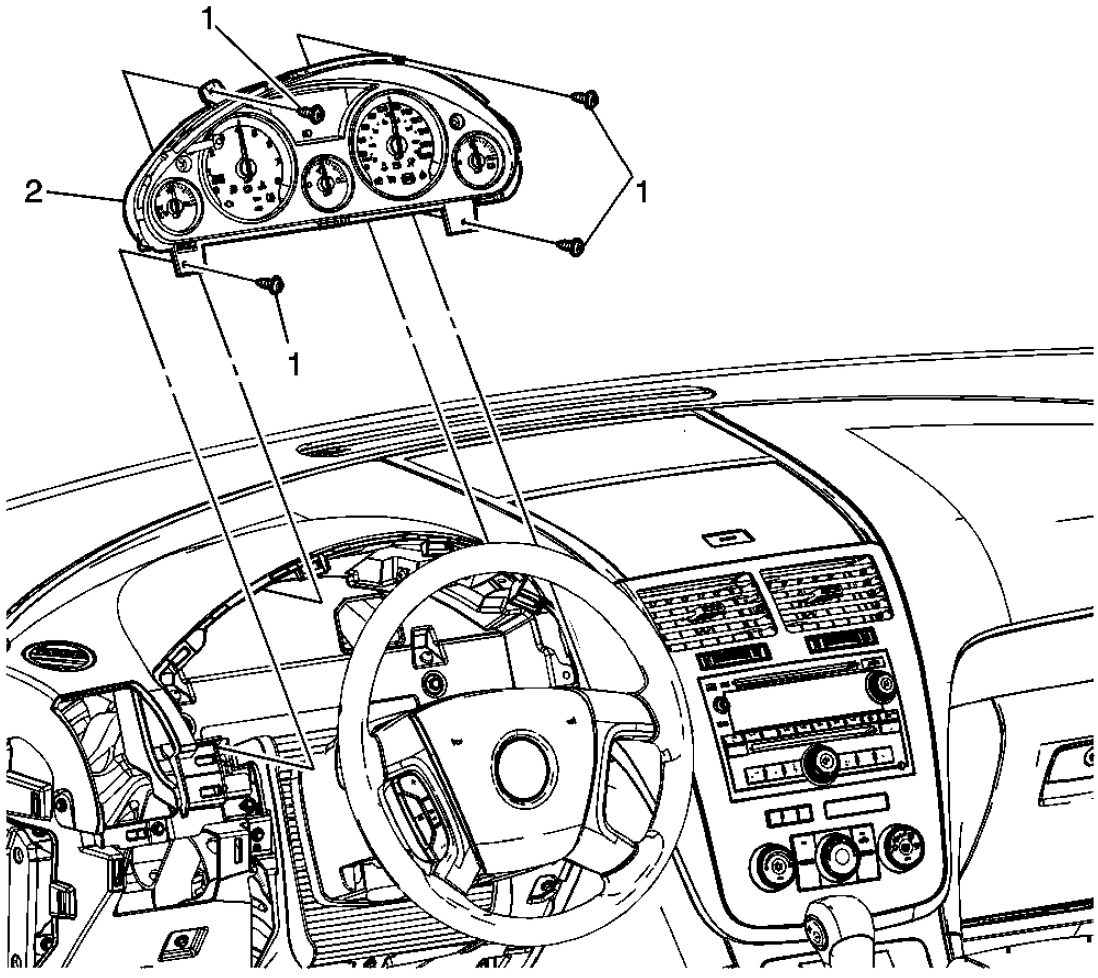


Fig. 23: View Of Instrument Cluster
Courtesy of GENERAL MOTORS CORP.

Instrument Cluster Replacement

Callout	Component Name
Preliminary Procedure: Remove the instrument panel cluster trim plate bezel. Refer to **Instrument Panel Cluster Trim Plate Bezel Replacement** .	
1	Instrument Panel Cluster Screw (Qty: 4) **NOTE:** **Refer to Fastener Notice .** **Tighten:** 2 N.m (18 lb in)
	Instrument Panel Cluster Assembly

2	**Tip:** 1. Disconnect the electrical connector. 2. Refer to **Control Module References** for programming and setup information.

DESCRIPTION AND OPERATION

AUDIBLE WARNINGS DESCRIPTION AND OPERATION

The audible warnings alert the driver of a system concern or a critical vehicle condition. The radio generates the audible warnings through the left front speaker. The radio receives audible warning requests via the GMLAN serial data circuit. If the radio receives multiple audible warning requests, the warning with the highest priority sounds first. On vehicles without a radio, a chime module generates the audible warnings and receives audible warning requests via GMLAN. Either the radio or the chime module is the chime procedure. The following lists the audible warning priority and the pulse rate:

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

Fasten Safety Belt Warning

The chime producer activates the fasten safety belt audible warning as requested by the body control module (BCM). The BCM sends a GMLAN message to the audio amplifier indicating the chime frequency at a slow rate and a duration of 8 seconds. The fasten safety belt warning sounds and the fasten safety belt indicator illuminates when the following occurs:

- The ignition switch transitions to ON.
- The inflatable restraint sensing and diagnostic module (SDM) detects that the drivers seat belt is not buckled and the signal is low. The SDM sends a GMLAN message to the BCM indicating the seat belt status. The instrument panel cluster (IPC) receives a GMLAN message from the BCM indicating the driver seat belt status.

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

Lights On Warning

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

- The ignition is OFF.
- The 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 chime producer activates the brake audible warning as requested by the instrument panel cluster (IPC). The IPC sends a GMLAN message to the chime producer indicating the chime frequency of a fast rate and at a continuous 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 GMLAN 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 Traction Control System (TCS) and the Vehicle Stability Enhancement System (VSES) have failed.

Key-In-Ignition Warning

The chime producer activates the key-in-ignition audible warning as requested by the body control module (BCM). The BCM sends a GMLAN message to the chime producer indicating the chime frequency of a medium rate and continuous 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 GMLAN message from the BCM indicating the door ajar status
- The BCM determines that the key-in-ignition switch is open and the signal circuit is high. The IPC receives a GMLAN message from the BCM indicating the key-in-ignition status.

Door Ajar Warning

The chime producer activates the door ajar audible warning as requested by the body control module (BCM). The BCM sends a GMLAN message to the chime producer indicating the chime frequency of a medium rate and continuous duration. The door ajar warning sounds and the appropriate door ajar indicator illuminates in the drivers information center (DIC) when the following occurs:

- The BCM determines that a door (driver door, passenger door, left rear door, right rear door) is open and the signal circuit is low. The IPC also receives a GMLAN message from the BCM indicating the door ajar status.
- The vehicle is not in PARK. The BCM receives a GMLAN message from the engine control module (ECM)/BCM indicating the gear position.

Additional Warnings

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

- Engine Overheated Stop Engine Message-The chime producer activates the audible warning as requested by the BCM. The BCM sends a GMLAN message to the chime producer indicating the chime frequency of a fast rate and at a continuous duration.
- Engine Power Is Reduced Message-The chime producer activates the audible warning as requested by the BCM. The BCM sends a GMLAN message to the chime producer indicating the chime frequency of a medium rate and at a continuous duration.
- Fuel Level Low Message-The chime producer activates the audible warning as requested by the BCM. The BCM sends a GMLAN message to the chime producer indicating the chime frequency of a fast rate and at a continuous duration.
- Hood Open Message-The chime producer activates the audible warning as requested by the BCM. The BCM sends a GMLAN message to the chime producer indicating the chime frequency of a medium rate and at a finite duration.
- Oil Pressure Indicator-The chime producer activates the audible warning as requested by the BCM. The BCM sends a GMLAN message to the chime producer indicating the chime frequency of a fast rate and at a continuous duration.
- Park Assist Fault Clean Rear Bumper Message-The chime producer activates the audible warning as requested by the BCM. The BCM sends a GMLAN message to the chime producer indicating the chime frequency of a medium rate and at a finite duration.
- Rear Access Open Message-The chime producer activates the audible warning as requested by the BCM. The BCM sends a GMLAN message to the chime producer indicating the chime frequency of a medium rate and at a finite duration.
- Tire Pressure Low Indicator-The chime producer activates the audible warning as requested

by the BCM. The BCM sends a GMLAN message to the chime producer indicating the chime frequency of a fast rate and at a continuous duration.

- Turn Signal Indicators-The chime producer activates the audible warning as requested by the IPC. The chime produces two different chimes, one when the turn signal turns off and another when the turn signal turns on.
- Vehicle Overspeed Message-The chime producer activates the audible warning as requested by the BCM. The BCM sends a GMLAN message to the chime producer indicating the chime frequency of a medium rate and at a finite duration.
- Transmission Hot Idle Engine Message-The chime producer activates the audible warning as requested by the BCM. The BCM sends a GMLAN message to the chime producer indicating the chime frequency of a fast rate and at a continuous duration.

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

COMPASS CALIBRATION AND MAGNETIC VARIANCE

Compass Calibration

Before calibrating the compass, drive the vehicle to an open area that is magnetically clean or free of large metallic objects such as high tension power lines or large steel buildings. Verify there are no magnetized roof antennas, magnets on or hanging from the mirror or any other magnetized objects on the inside or outside of the vehicle close to the mirror.

1. Start the engine.

IMPORTANT: Before calibrating the compass, make sure the mirror has the correct zone number. Refer to Compass Magnetic Variation Adjustment.

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

Compass Magnetic Variation Adjustment

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

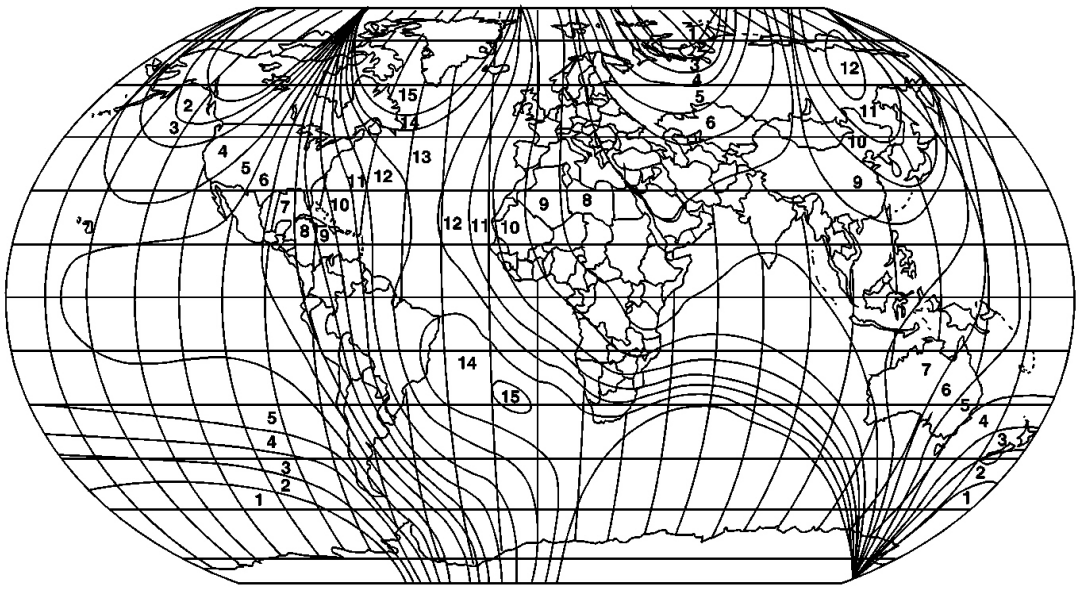


Fig. 24: View Of World Magnetic Variation Map
Courtesy of GENERAL MOTORS CORP.

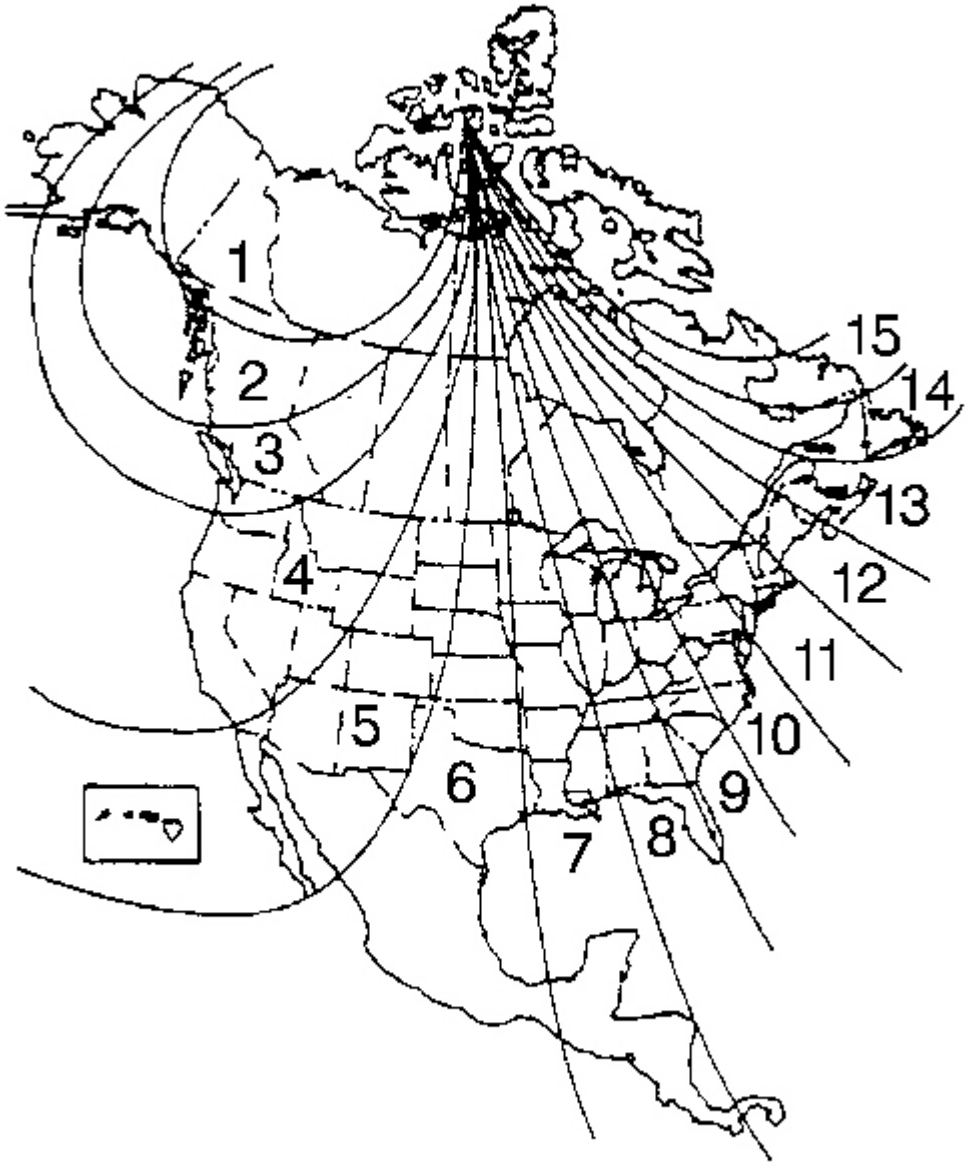


Fig. 25: Identifying Magnetic Variation Zones
Courtesy of GENERAL MOTORS CORP.

1. Locate your current geographic location on the World Magnetic Variation Map.
2. Turn ON the ignition, with the engine OFF.

3. Press and hold the switch for the compass, which may be depicted as COMP, COMPASS or on/off (w/UE1) depending on the type of mirror on the vehicle, until a zone number appears on the compass display.
4. Depress the switch for the compass to select the desired zone number.
5. Wait 5 seconds. The display will return to a compass heading. The variance procedure is now complete.
6. Calibrate the compass. Refer to **Compass Calibration** mentioned above.

DOOR AJAR INDICATOR DESCRIPTION AND OPERATION

Door Ajar Indicator System Components

The door ajar indicator system consists of the following components:

- The driver door switch (DDS)
- The passenger door switch (PDS)
- The body control module (BCM)
- The instrument panel cluster (IPC)
- The driver information center (DIC)
- The driver door ajar switch
- The passenger door ajar switch
- The left rear door ajar switch
- The right rear door ajar switch
- The liftgate ajar switch

Driver Door Ajar And Passenger Door Ajar

The driver door switch (DDS) and passenger door switch (PDS) receive a discrete input from the respective door ajar switch to indicate the status of the door. The DDS or PDS then communicates this status to the instrument panel cluster (IPC) via LAN message. The IPC, upon receipt of this LAN message, will illuminate the appropriate door ajar message in the driver information center (DIC) and also send a LAN message to the radio to activate the door ajar audible warning when the following conditions are met:

- The transmission is removed from PARK
- The vehicle speed is greater then 8.05 km/h (5 mph)

Left Rear Door Ajar And Right Rear Door Ajar

The body control module (BCM) receives a discrete inputs from both the left and right rear door and liftgate ajar switches to indicate the status of the doors and liftgate. The BCM then communicates this status to the instrument panel cluster (IPC) via LAN message. The IPC, upon receipt of this LAN message, will illuminate the appropriate door ajar message in the driver information center (DIC) and also send a LAN message to the radio to activate the door ajar audible warning when the following conditions are met:

- The transmission is removed from PARK
- The vehicle speed is greater then 8.05 km/h (5 mph)

DRIVER INFORMATION CENTER (DIC) DESCRIPTION AND OPERATION

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

There are 4 switch functions for the DIC.

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

Trip/Fuel

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

- Average Fuel Economy (AFE)
- Average Vehicle Speed (AVE)
- Blank Display
- Fuel Range
- Fuel Used
- Odometer
- Trip A
- Trip B
- Trip Time

Vehicle Info

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

- Blank Display
- English/Metric Units
- Front Tire Pressure
- Key Fob Programming Menu
- Left Front Tire Pressure
- Left Rear Tire Pressure
- Oil Life Index (OLI)
- Park Assist Menu
- Rear Tire Pressure
- Right Front Tire Pressure
- Right Rear Tire Pressure
- Tire Programming Menu

Personalization

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

- Approach Lighting
- Automatic Door Lock
- Automatic Door Unlock
- Chime Volume
- Delayed Door Lock
- Display Language
- Easy Exit Seat
- Exit Lighting
- Memory Seat Recall
- Remote Door Lock
- Remote Door Unlock
- Remote Start

- Park Tilt Mirrors

Average Fuel Economy

Average fuel economy is calculated using the equation: AFE = Distance/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 engine control module (ECM) sends the average fuel economy GMLAN message to the instrument panel cluster (IPC). The value of this mode is retained during ignition OFF and can be changed between English units and metric units by selecting from the driver information center (DIC) options menu.

Average Speed

Average speed is calculated using the equation: Average Speed = AVS Distance/AVS Time

- Distance = The accumulated distance travelled since the last reset of this value
- Ignition On = The accumulated ignition on time since the last reset of this value

Oil Life Remaining

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

Fuel Range

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

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

The ECM sends the fuel range value to the IPC. The IPC receives a GMLAN message with fuel information. The fuel range value is retained during ignition OFF and can be changed between English and Metric units by accessing the DIC English/Metric menu. The Fuel Range display

cannot be reset. LOW is displayed when fuel range is below a predetermined value.

Fuel Used

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

Tire Pressure Monitor

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

Trip Time

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

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

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

Park Assist Menu

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

Fuel Display

Parameter	Update Rate	Range	Reset Value	Units
Average Fuel Economy	1 second	0.0-99.9	99.9	MPG or L/100 KM
Fuel Range	1 second	0-999	N/A	MI/KM
Fuel Used	1 second	0-999.9	0.0	Gal/L

English/Metric

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

Trip A/B

The trip odometer A or B can be accessed through the DIC Trip/Fuel switch function.

Trip Display

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

Language

The driver information center (DIC) is capable of displaying in 8 languages

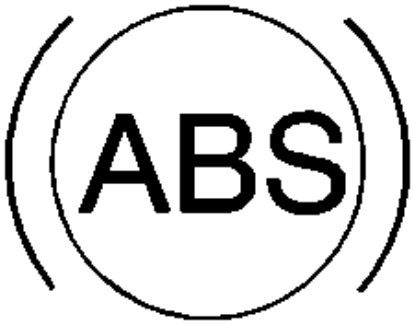
- English
- French
- Spanish

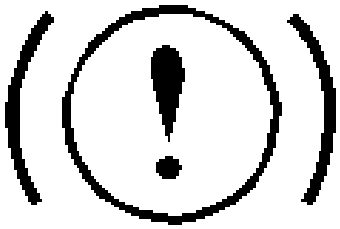
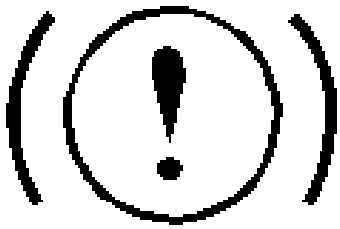
INDICATOR/WARNING MESSAGE DESCRIPTION AND OPERATION

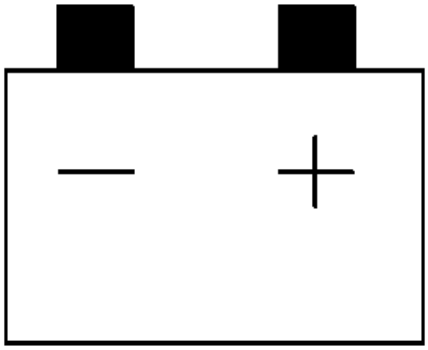
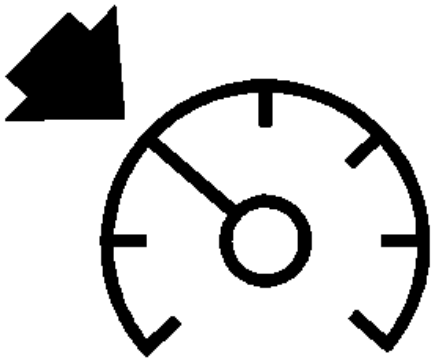
Indicators

Indicator/Warning Message Description and Operation

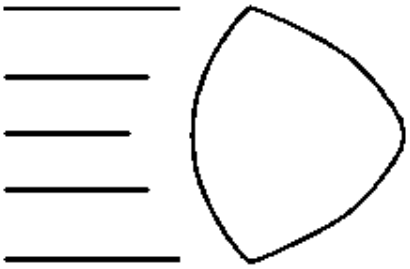
Symbol	Description
	ABS: Refer to **ABS Description and Operation**

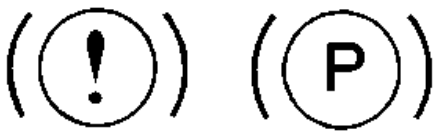
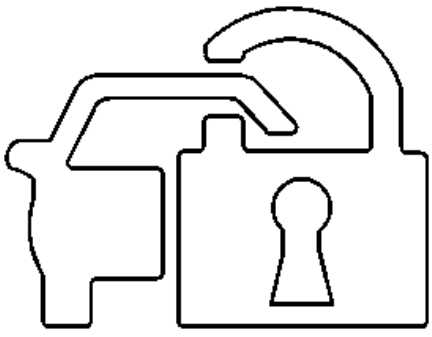
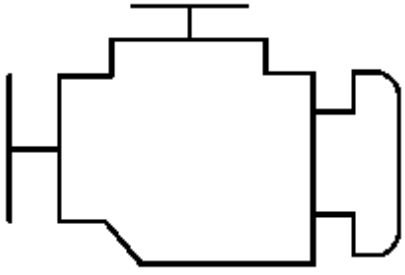
	
	Air Bag: Refer to **SIR System Description and Operation**

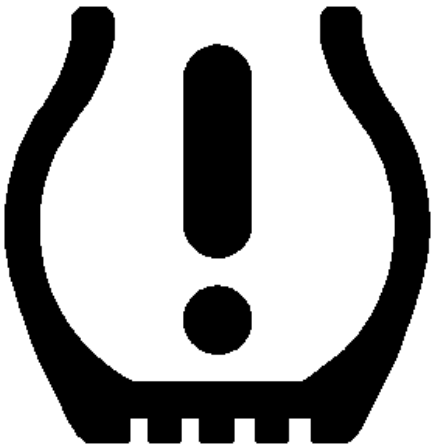
  (Canada) BRAKE (U.S.)	Brake: Refer to **Brake Warning System Description and Operation**
	Charge: Refer to **Charging System Description and Operation**

	
 (Canada) CRUISE (U.S.)	CRUISE: Refer to **Cruise Control Description and Operation**
	Engine Coolant Temperature: Refer to **Cooling System Description and Operation**

	
	Fasten Safety Belt: Refer to **Seat Belt System Description and Operation**

	Front Fog Lamps: Refer to **Exterior Lighting Systems Description and Operation**
	High Beam: Refer to **Exterior Lighting Systems Description and Operation**
	Low Engine Oil Pressure: Refer to **Indicator/Warning Message Description and Operation**

 PARK BRAKE	Park Brake: Refer to **Park Brake System Description and Operation**
 (Canada) SECURITY (U.S.)	SECURITY: Refer to **Content Theft Deterrent (CTD) Description and Operation**
 (Canada) SERVICE ENGINE SOON (U.S.)	Malfunction Indicator Lamp (MIL): Refer to **Engine Control Module Description**

	Tire Pressure Monitor: Refer to **Tire Pressure Monitor Description and Operation**
	TOW/HAUL: Refer to **Transmission Indicators and Messages**
	Turn Signals: Refer to **Exterior Lighting Systems Description and Operation**

	VDC: Refer to **ABS Description and Operation**

DIC Warning Messages

Indicator/Warning Message Description and Operation

Symbol	Description
ALL WHEEL DRIVE OFF	Refer to **Transfer Case Description and Operation**
AUTOMATIC LIGHT CONTROL OFF	Refer to **Exterior Lighting Systems Description and Operation**
AUTOMATIC LIGHT CONTROL ON	Refer to **Exterior Lighting Systems Description and Operation**
BATTERY SAVER ACTIVE	Refer to **Charging System Description and Operation**
BUCKLE PASSENGER SEATBELT	Refer to **Seat Belt System Description and Operation**
BUCKLE SEATBELT	Refer to **Seat Belt System Description and Operation**
CHANGE ENGINE OIL SOON	Refer to **Indicator/Warning Message Description and Operation**

CHANGE TRANSMISSION FLUID	Refer to **Transmission Indicators and Messages**
CHECK LEFT FRONT TIRE PRESSURE	Refer to **Tire Pressure Monitor Description and Operation**
CHECK LEFT REAR TIRE PRESSURE	Refer to **Tire Pressure Monitor Description and Operation**
CHECK RIGHT FRONT TIRE PRESSURE	Refer to **Tire Pressure Monitor Description and Operation**
CHECK RIGHT REAR TIRE PRESSURE	Refer to **Tire Pressure Monitor Description and Operation**
CHECK SPARE TIRE PRESSURE	Refer to **Tire Pressure Monitor Description and Operation**
CHECK TIRE PRESSURE	Refer to **Tire Pressure Monitor Description and Operation**
COOLANT LEVEL LOW ADD COOLANT	Refer to **Cooling System Description and Operation**
CRUISE SET TO XXX	Refer to **Cruise Control Description and Operation**
DRIVER DOOR OPEN	Refer to **Door Ajar Indicator Description and Operation**
ENGINE HOT TURN A/C OFF	Refer to **Cooling System Description and Operation**
ENGINE OVERHEATED IDLE ENGINE	Refer to **Cooling System Description and Operation**
ENGINE POWER IS REDUCED	Refer to **Engine Control Module Description**
ENGINE OIL LOW ADD OIL	Refer to **Indicator/Warning Message Description and Operation**
ENGINE OVERHEATED STOP ENGINE	Refer to **Cooling System Description and Operation**
FUEL LEVEL LOW	Refer to **Indicator/Warning Message Description and Operation**
HEATED WASH FLUID SYSTEM OFF	Refer to **Wiper/Washer System Description and Operation**
HEATED WASH FLUID WASH WIPES PENDING	Refer to **Wiper/Washer System Description and Operation**

HOOD OPEN	Refer to **Content Theft Deterrent (CTD) Description and Operation**
ICE POSSIBLE	Refer to **Indicator/Warning Message Description and Operation**
LEFT REAR DOOR OPEN	Refer to **Door Ajar Indicator Description and Operation**
LIFTGATE OPEN	Refer to **Liftgate/Liftgate Window Ajar Indicator Description and Operation**
OIL PRESSURE LOW STOP ENGINE	Refer to **Indicator/Warning Message Description and Operation**
OIL STARVATION MODE ACTIVE	Refer to **Indicator/Warning Message Description and Operation**
PARK ASSIST FAULT CLEAN REAR BUMPER	Refer to **Object Detection Description and Operation**
PARK ASSIST OFF	Refer to **Object Detection Description and Operation**
PASSENGER DOOR OPEN	Refer to **Door Ajar Indicator Description and Operation**
PROGRAM CLUSTER	Refer to **Indicator/Warning Message Description and Operation**
REMOTE KEY LEARNING ACTIVE	Refer to **Keyless Entry System Description and Operation**
REMOTE KEY LEARNING COMPLETE	Refer to **Keyless Entry System Description and Operation**
REPLACE BATTERY IN REMOTE KEY	Refer to **Keyless Entry System Description and Operation**
RIGHT REAR DOOR OPEN	Refer to **Door Ajar Indicator Description and Operation**
SERVICE A/C SYSTEM	Refer to **Air Temperature Description and Operation**
SERVICE ALL WHEEL DRIVE	Refer to **Transfer Case Description and Operation**
SERVICE AIR BAG	Refer to **SIR System Description and Operation**
SERVICE BATTERY CHARGING SYSTEM	Refer to **Charging System Description and Operation**

SERVICE BRAKE ASSIST	Refer to **Brake Assist System Description and Operation**
SERVICE BRAKE BOOSTER	Refer to **ABS Description and Operation**
SERVICE BRAKE SYSTEM	Refer to **Brake Warning System Description and Operation**
SERVICE BRAKES BRAKE PADS WORN	Refer to **Brake Warning System Description and Operation**
SERVICE COLUMN LOCK	Refer to **Steering Wheel and Column Description and Operation**
SERVICE PARK ASSIST	Refer to **Object Detection Description and Operation**
SERVICE PARKING BRAKE	Refer to **Park Brake System Description and Operation**
SERVICE POWER STEERING	Refer to **Power Steering System Description and Operation**
SERVICE STABILITRAK	Refer to **ABS Description and Operation**
SERVICE THEFT DETERRENT SYSTEM	Refer to **Immobilizer Description and Operation**
SERVICE TIRE MONITOR SYSTEM	Refer to **Tire Pressure Monitor Description and Operation**
SERVICE TRACTION CONTROL	Refer to **ABS Description and Operation**
SERVICE TRANSMISSION	Refer to **Transmission Indicators and Messages**
SERVICE VEHICLE SOON	Refer to **Indicator/Warning Message Description and Operation**
SHIFT DENIED	Refer to **Transmission Indicators and Messages**
SPEED LIMITED TO XXX	Refer to **Indicator/Warning Message Description and Operation**
STABILITRAK OFF	Refer to **ABS Description and Operation**
STABILITRAK NOT READY	Refer to **ABS Description and Operation**
STARTING DISABLED SERVICE THROTTLE	Refer to **Throttle Actuator Control (TAC) System Description**
THEFT ATTEMPTED	Refer to **Content Theft Deterrent (CTD) Description and Operation**
	Refer to **Indicator/Warning Message**

TIGHTEN GAS CAP	**Description and Operation**
TIRE LEARNING ACTIVE	Refer to **Tire Pressure Monitor Description and Operation**
TIRE PRESSURE SYSTEM RESET	Refer to **Tire Pressure Monitor Description and Operation**
TRACTION CONTROL OFF	Refer to **ABS Description and Operation**
TRACTION CONTROL ON	Refer to **ABS Description and Operation**
TRANSMISSION HOT IDLE ENGINE	Refer to **Transmission Indicators and Messages**
TURN SIGNAL ON	Refer to **Exterior Lighting Systems Description and Operation**
VEHICLE OVERSPEED	Refer to **Indicator/Warning Message Description and Operation**
WASHER FLUID LOW ADD FLUID	Refer to **Wiper/Washer System Description and Operation**
WAIT TO START	Refer to **Content Theft Deterrent (CTD) Description and Operation**

CHANGE ENGINE OIL SOON

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

FUEL LEVEL LOW

The instrument panel cluster (IPC) illuminates the FUEL LEVEL LOW message in the driver information center (DIC) and the LOW FUEL indicator when the IPC detects that the fuel level is less than a pre-determined value. The IPC receives a serial data message from the engine control module (ECM) indicating fuel level percent.

ICE POSSIBLE

The instrument panel cluster (IPC) illuminates the ICE POSSIBLE message in the driver information center (DIC) when the outside air temperature drops below 2.5°C (36.5°F). The IPC receives a serial data message from the HVAC control module indicating the outside air temperature.

OIL PRESSURE LOW

The instrument panel cluster (IPC) illuminates the OIL PRESSURE LOW message in the driver information center (DIC) when the engine control module (ECM) detects a low oil pressure condition with the signal circuit low. The IPC receives a serial data message from the ECM requesting illumination.

OIL STARVATION MODE ACTIVE

The instrument panel cluster (IPC) illuminates the OIL STARVATION MODE ACTIVE message in the driver information center (DIC) when the engine control module (ECM) detects a low engine oil level condition. The IPC receives a serial data message from the ECM requesting illumination.

PROGRAM CLUSTER

The instrument panel cluster (IPC) illuminates the PROGRAM CLUSTER message in the driver information center (DIC) when the IPC needs to be programmed. Refer to **Instrument Cluster Programming and Setup** for setup and programming.

SPEED LIMITED TO XXX

The instrument panel cluster (IPC) illuminates the SPEED LIMITED TO XXX in the driver information (DIC). The limited speed value is determined by the engine control module (ECM).

VEHICLE OVERSPEED

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

SERVICE VEHICLE SOON

The driver information center (DIC) illuminates the SERVICE VEHICLE SOON indicator when the engine control module (ECM) detects certain malfunctions that are not related to the emissions system. The DIC receives a serial data message requesting warning message illumination from the ECM.

TIGHTEN GAS CAP

The instrument panel cluster (IPC) illuminates the TIGHTEN GAS CAP message in the driver information center (DIC) when the engine control module (ECM) detects a low fuel pressure condition. The IPC receives a serial data message from the ECM requesting illumination.

INSTRUMENT CLUSTER DESCRIPTION AND OPERATION

Displays Test

Certain instrument panel cluster (IPC) features are tested when the ignition is turned on in order to verify the features are working properly. The following occurs at key up:

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

Indicators and Warning Messages

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

Engine Coolant Temperature Gage

The instrument panel cluster (IPC) displays the engine coolant temperature as determined by the engine control module (ECM). The IPC receives a GMLAN message from the ECM indicating the engine coolant temperature. The engine coolant temperature gage defaults to 60°C (140°F) or below if:

- The ECM detects a malfunction in the engine coolant temperature sensor circuit.

- The IPC detects a loss of GMLAN communications with the ECM.
- The BCM detects a loss of GMLAN communications with the ECM.

Fuel Gage

The instrument panel cluster (IPC) displays the fuel level as determined by the ECM. The IPC receives a GMLAN message from the ECM indicating the fuel level percent. The fuel gage defaults to empty if:

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

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

Odometer

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

PRNDL Display

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

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

Speedometer

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

Tachometer

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

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

LIFTGATE/LIFTGATE WINDOW AJAR INDICATOR DESCRIPTION AND OPERATION

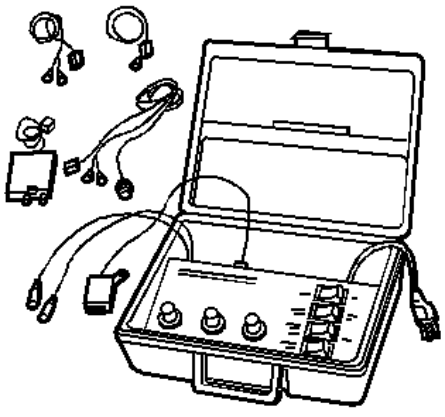
GATE AJAR Indicator

The instrument panel cluster (IPC) illuminates the GATE AJAR indicator when the body control module (BCM) detects that the liftgate or liftglass is ajar or open. The IPC receives a LAN message from the BCM requesting illumination. If the vehicle is in the forward or reverse gear position, the BCM activates an audible warning.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Special Tools

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