

2017 ACCESSORIES & EQUIPMENT

Displays and Gauges - Encore, Trax

SPECIFICATIONS

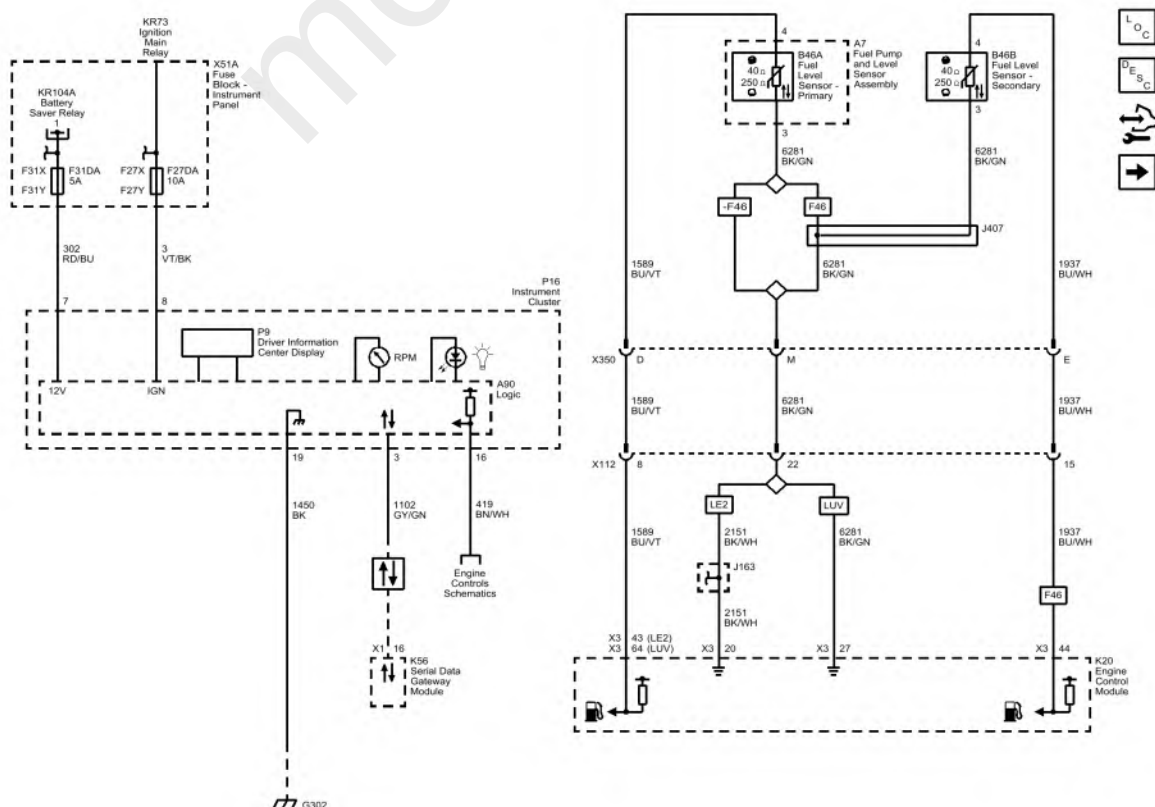
AMBIENT AIR TEMPERATURE SENSOR RESISTANCE

Temperature		Ambient Air Temp Sensor	Ambient Air Temp Sensor (Min)	Ambient Air Temp Sensor (Max)
°C	°F	(kΩ)	(kΩ)	(kΩ)
-40	-40	333.5	313.7	353.4
-30	-22	176.1	167.2	184.9
-20	-4	96.8	92.8	100.8
-10	14	55.3	53.4	57.1
0	32	32.6	31.7	33.5
10	50	19.9	19.6	20.2
20	68	12.5	12.3	12.7
25	77	10.0	9.9	10.1
30	86	8.06	7.96	8.15
40	104	5.32	5.25	5.40
50	122	3.60	3.54	3.66
60	140	2.49	2.44	2.54

SCHEMATIC WIRING DIAGRAMS

INSTRUMENT CLUSTER WIRING SCHEMATICS (BUICK)

Power, Ground, Serial Data, and Gauges (Buick)



Indicators (Buick)

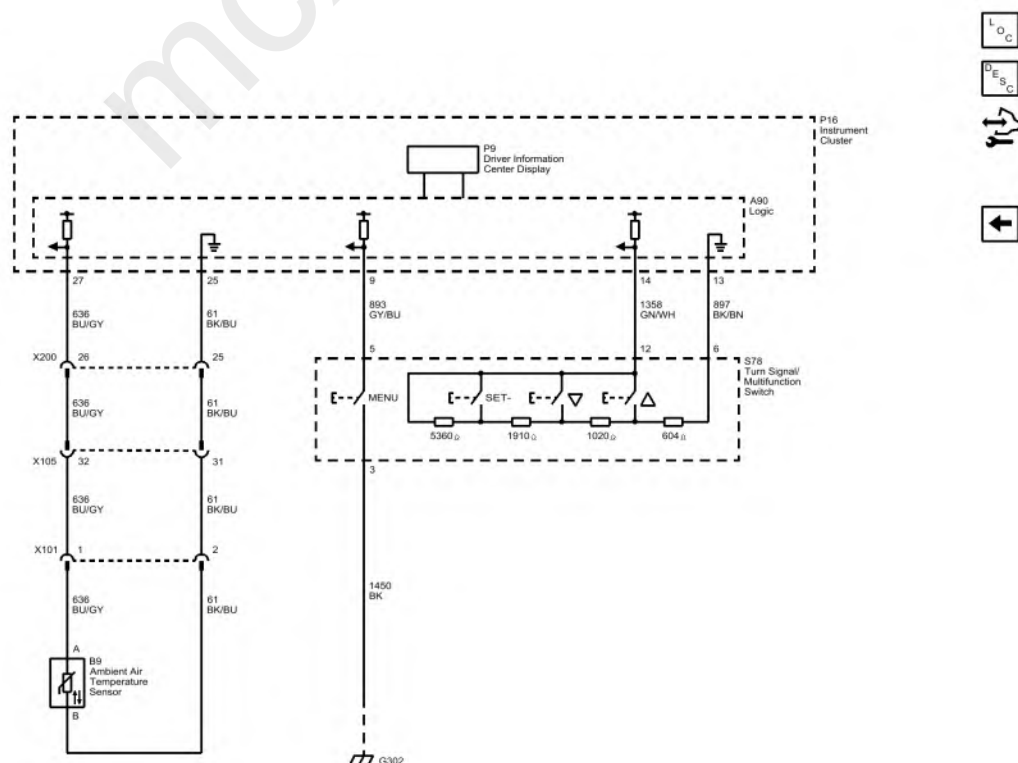


Fig. 3: Air Temperature and Driver Information Center (Buick).
Courtesy of GENERAL MOTORS COMPANY

INSTRUMENT CLUSTER WIRING SCHEMATICS (CHEVROLET)

Power, Ground, Serial Data, and Gauges (Chevrolet)

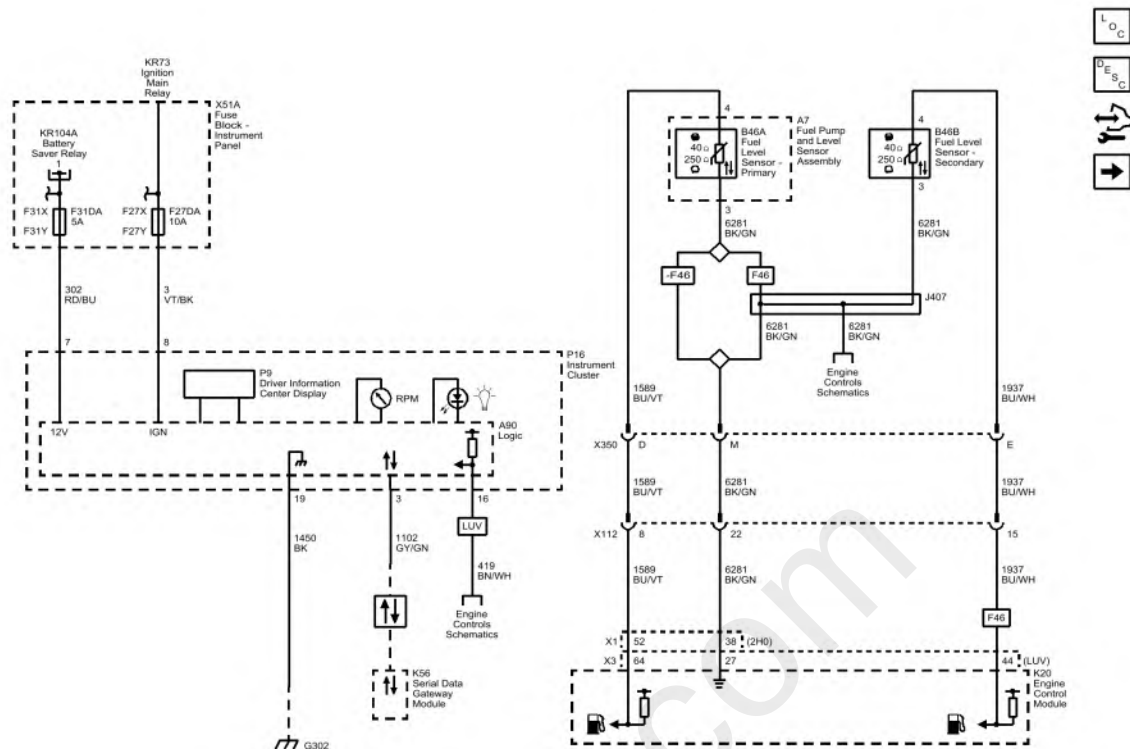


Fig. 4: Power, Ground, Serial Data, and Gauges (Chevrolet).
Courtesy of GENERAL MOTORS COMPANY

Indicators (Chevrolet)

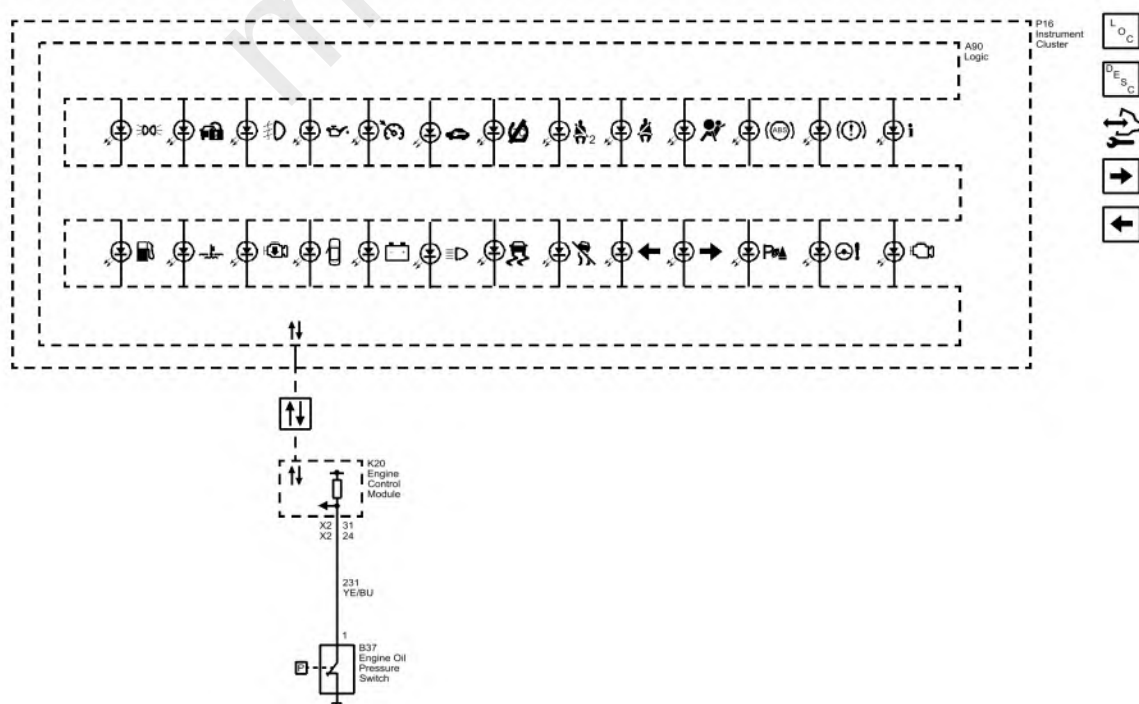


Fig. 5: Indicators (Chevrolet)
Courtesy of GENERAL MOTORS COMPANY

Indicators (Chevrolet)

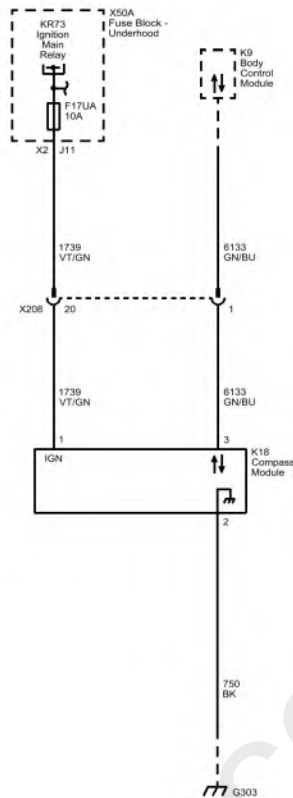


Fig. 6: Indicators (Chevrolet)
Courtesy of GENERAL MOTORS COMPANY

Air Temperature, Turn Signal, and Driver Information Center (Chevrolet)

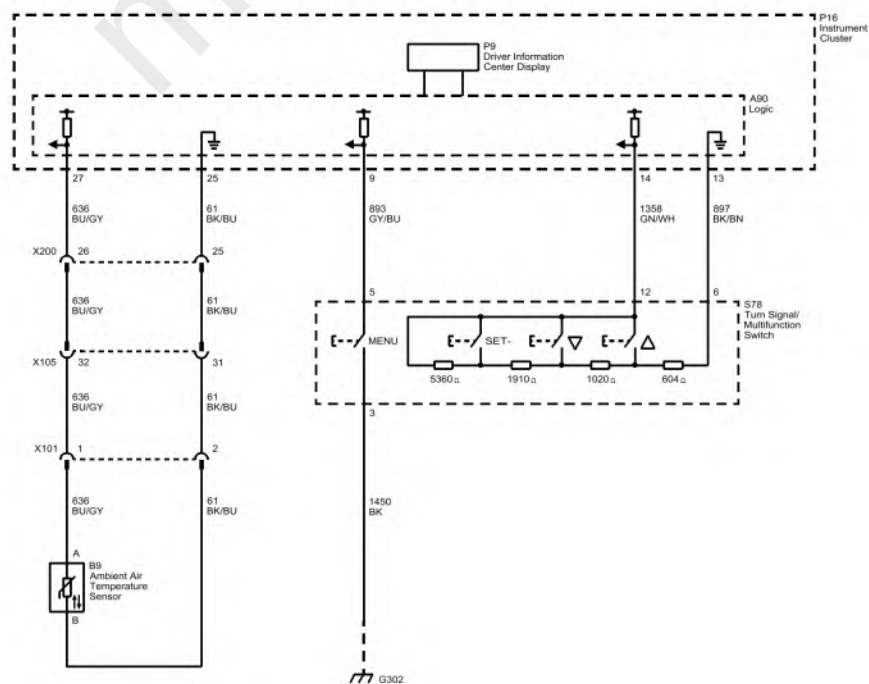


Fig. 7: Air Temperature, Turn Signal, and Driver Information Center (Chevrolet).
Courtesy of GENERAL MOTORS COMPANY

AUDIBLE WARNINGS WIRING SCHEMATICS (BUICK)

Audible Warnings (Buick)

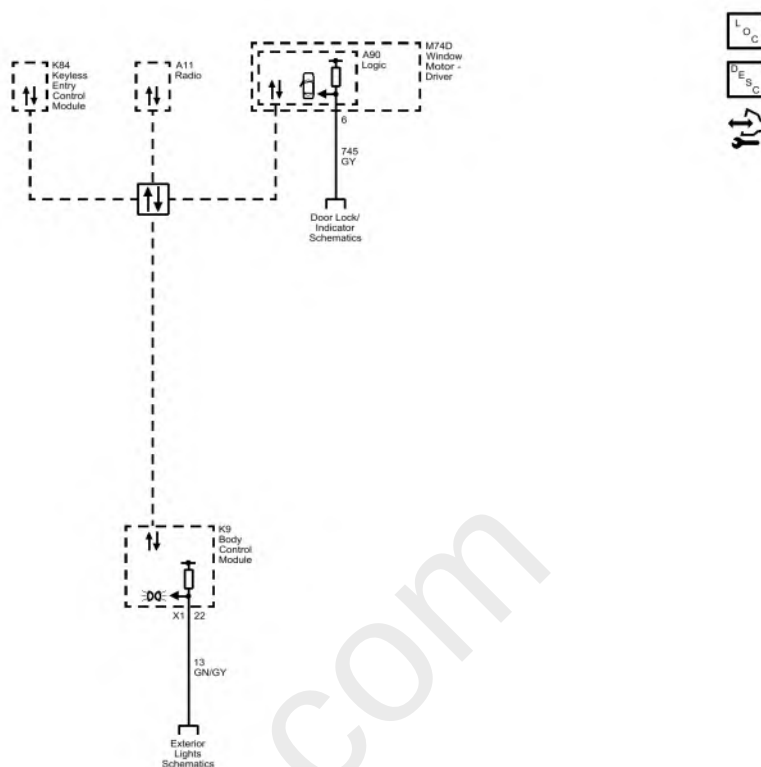


Fig. 8: Audible Warnings (Buick).
Courtesy of GENERAL MOTORS COMPANY

AUDIBLE WARNINGS WIRING SCHEMATICS (CHEVROLET)

Audible Warnings (Chevrolet without BTM)

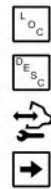
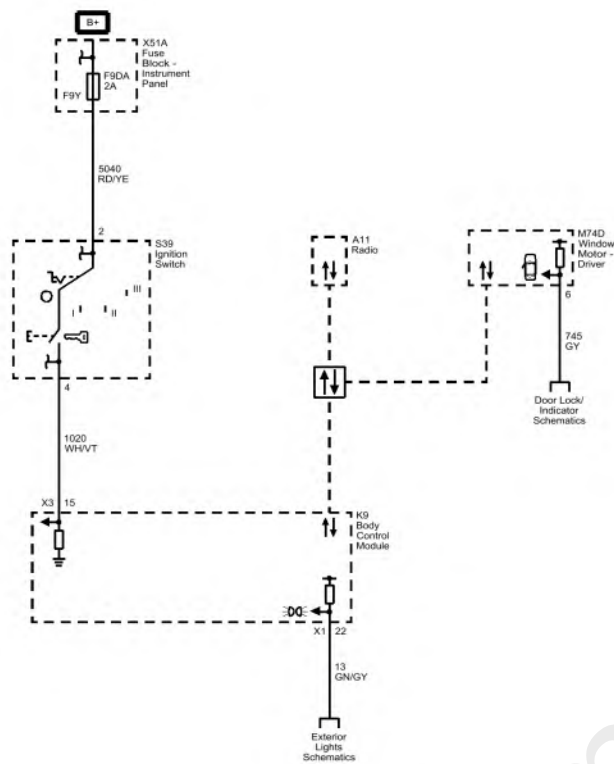


Fig. 9: Audible Warnings (Chevrolet without BTM).
Courtesy of GENERAL MOTORS COMPANY

Audible Warnings (Chevrolet with BTM)

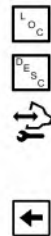
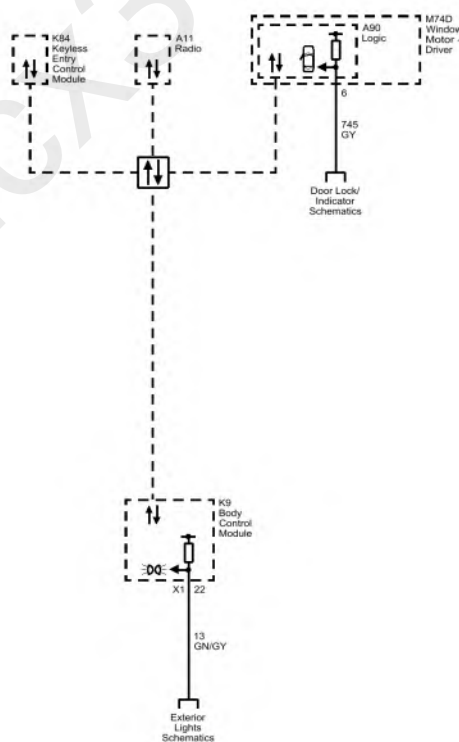


Fig. 10: Audible Warnings (Chevrolet with BTM).
Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC B0158: AMBIENT AIR TEMPERATURE SENSOR

Diagnostic Instructions

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

DTC Descriptors

DTC B0158 02

Ambient Air Temperature Sensor Circuit Short to Ground

DTC B0158 05

Ambient Air Temperature Sensor Circuit High Voltage/Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	B0158 02	B0158 05	B0158 05	-
Low Reference	-	B0158 05	-	-

Circuit/System Description

The instrument cluster monitors the ambient air temperature sensor with a low reference circuit and signal circuit. The instrument cluster monitors the voltage drop across the sensor, which is inversely proportional to temperature. When the ambient air temperature is cold, the resistance of the sensor is high. When the ambient air temperature is warm, the resistance of the sensors is low. The instrument cluster converts the voltage value to a temperature value. Based on application, the Instrument Cluster either displays the temperature or sends the value via serial data to the Info Display Module for display.

Conditions for Running the DTC

The system voltage is between 9-16 V.

Conditions for Setting the DTC

B0158 02

The instrument cluster detects the sensor signal is more than 88Â°C (190Â°F).

B0158 05

The instrument cluster detects the sensor signal is less than -40Â°C (-40Â°F).

Action Taken When the DTC Sets

The instrument cluster uses a default air temperature value for further calculations. The instrument cluster will display -Â°C (-Â°F). A/C compressor engagement may be disabled.

Conditions for Clearing the DTC

The DTC will become history if the instrument cluster no longer detects a malfunction.

Diagnostic Aids

The outside air temperature display on the Info Display Module is a buffered value. It is not a live value when the vehicle is parked, it periodically updates while driving the vehicle. For more information on how the display is updated, refer to [Instrument Cluster Description and Operation](#).

Reference Information

[Instrument Cluster Schematics \(Buick\)](#)[Instrument Cluster Schematics \(Chevrolet\)](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX \(ENCORE\)](#) [COMPONENT CONNECTOR END VIEWS - INDEX \(TRAX\)](#)

Description and Operation

[Instrument Cluster Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

[Circuit/System Verification](#)

1. Ignition ON.
2. Verify the scan tool Ambient Air Temperature parameter is between -40°C (-40°F) and $+88^{\circ}\text{C}$ ($+190^{\circ}\text{F}$) and changes with air temperature changes.
 - **If not between -40°C (-40°F) and $+88^{\circ}\text{C}$ ($+190^{\circ}\text{F}$) or changes with air temperature changes**
Refer to Circuit/System Testing.
 - **If between -40°C (-40°F) and $+88^{\circ}\text{C}$ ($+190^{\circ}\text{F}$) and changes with air temperature changes**
3. Perform the Instrument Cluster Ambient Air Temperature Instant Update special function with the scan tool
4. Verify the scan tool Ambient Air Temperature parameter is within five degrees of actual ambient air temperature.
 - **If not within five degrees of actual ambient air temperature**
Refer to Circuit/System Testing.
 - **If within five degrees of actual ambient air temperature**
5. All OK.

[Circuit/System Testing](#)

NOTE: **Circuit/System Verification must be performed before proceeding with Circuit/System Testing.**

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B9 Ambient Air Temperature Sensor. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than $10\ \Omega$ between the low reference circuit terminal A (or 1) and ground.
 - **If $10\ \Omega$ or greater**
 1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster.
 2. Test for less than $2\ \Omega$ in the low reference circuit end to end.
 - If $2\ \Omega$ or greater, repair the open/high resistance in the circuit.
 - If less than $2\ \Omega$, replace the P16 Instrument Cluster.

- **If less than 10 Ω**

3. Ignition ON.

4. Verify the scan tool Ambient Air Temperature parameter is greater than 98%.

- **If 98% or less**

1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster.

2. Test for infinite resistance between the signal circuit terminal B (or 2) and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the P16 Instrument Cluster.

- **If greater than 98%**

5. Install a 3 A fused jumper wire between the signal circuit terminal B (or 2) and the low reference circuit terminal A (or 1).

6. Verify the scan tool Ambient Air Temperature parameter is less than 8%.

- **If 8% or greater**

1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster, ignition ON.

2. Test for less than 1 V between the signal circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V

3. Ignition OFF

4. Test for less than 2 Ω in the signal circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the P16 Instrument Cluster.

- **If less than 8%**

7. Test or replace the B9 Ambient Air Temperature Sensor.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Displays and Gauges Component Replacement Reference](#)
- [Control Module References](#) for instrument cluster replacement, programming and setup

DTC B0550: ODOMETER CIRCUIT GENERAL MEMORY 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.

DTC Descriptor

DTC B0550 32

Odometer Circuit General Memory Malfunction

Circuit/System Description

The Instrument Cluster is equipped with odometers that indicate the distance traveled by the vehicle. One type of odometer is the season odometer where the traveled distance can not be reset by the driver. This information is also stored in the Body Control Module (BCM). In addition to storing the season odometer value for the vehicle, the Instrument Cluster and the BCM store the VIN. Software checks are performed to ensure these modules, and their stored season odometer information, can not be moved or transferred between different vehicles.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

The BCM has detected an internal memory malfunction.

Action Taken When the DTC Sets

DTC B0550 32 is stored in the BCM memory.

Conditions for Clearing the DTC

The BCM no longer detects a malfunction.

Reference Information

Schematic Reference

Instrument Cluster Schematics (Buick)Instrument Cluster Schematics (Chevrolet)

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE) COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)

Description and Operation

Driver Information Center (DIC) Description and Operation (uplevel Instrument Cluster)Driver Information Center (DIC) Description and Operation (base Instrument Cluster)

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify DTC B0550 32 is not set.
 - **If DTC B0550 32 is set**
 1. Program the K9 Body Control Module.
 2. Verify the DTC does not set.
 - If the DTC sets, replace the K9 Body Control Module.
 - If the DTC does not set
 - 3. All OK.
 - **If DTC B0550 32 is not set**
3. All OK

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair.

Control Module References for BCM replacement, programming and setup

DTC B071F: TRANSMISSION RANGE INDICATOR

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

DTC Descriptor

Transmission Range Indicator

- Symptom Byte: 32 - Internal Malfunction

Circuit/System Description

The indicator has a series of LEDs that show in which range the transmission is. The device is controlled over a serial data bus by the body control module.

For an overview of the component/system, refer to: [Instrument Cluster Description and Operation](#)

Conditions for Running the DTC

Ignition ⌘ On / Vehicle ⌘ In Service Mode

Conditions for Setting the DTC

K9 Body Control Module Detected Transmission Range Indicator=Internal Malfunction

Actions Taken When the DTC Sets

No additional actions taken

Conditions for Clearing the DTC

The conditions for setting the DTC no longer exist.

Reference Information

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX \(ENCORE\)](#), [COMPONENT CONNECTOR END VIEWS - INDEX \(TRAX\)](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#)

Circuit/System Verification

1. Ignition ⌘ On / Vehicle ⌘ In Service Mode
2. Verify DTC B071F is not set.

- **If the DTC is set**

Replace the component: P2 Transmission Shift Lever Position Indicator

- **If the DTC is not set**

3. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

[Displays and Gauges Component Replacement Reference](#)

DTC B1370: CONTROL MODULE IGNITION 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.

DTC Descriptors

DTC B1370 01

Control Module Ignition On and Start Circuit Short to Battery

DTC B1370 06

Control Module Ignition On and Start Circuit Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition Main Relay Control Terminal 2	B1370 06	B1370 06	B1370 01	-
Ignition Main Relay Ignition terminal 5/ Instrument Cluster ignition voltage terminal 31	B1370 06	B1370 06	B1370 01	-
Ignition Main Relay Ground terminal 1	-	B1370 06	-	-
Ignition Main Relay B+ terminal 3	-	B1370 06	-	-

Circuit/System Description

The vehicle power mode master is the body control module (BCM). The ignition switch is a low current switch with multiple discrete circuits to the BCM.

The power mode master will activate relays and other direct outputs of the power mode master as needed according to the calculated power mode. Some relays controlled by the BCM are switched ignition voltage outputs that are pass through circuits within the BCM directly from the ignition switch. If these circuits short to ground, the B+ circuit fuse to the ignition switch will open.

Conditions for Running the DTC

B1370 01

Ignition switch is in the Accessory position.

B1370 06

Ignition switch is in the Accessory, Run, or Crank positions.

Conditions for Setting the DTC

B1370 01

Ignition circuit is shorted to voltage.

B1370 06

- Ignition circuit is open.
- Ignition or run/crank relay circuit is shorted to ground.
- B+ circuit of the ignition run/crank relay is open or shorted to ground.
- Ignition run/crank relay control circuit open, including relay coil and ground.

Action Taken When the DTC Sets

The Instrument Cluster still functions except check engine light is always off.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC will clear once 50 consecutive malfunction-free ignition cycles have occurred.

Reference Information

Schematic Reference

- [Instrument Cluster Schematics \(Buick\)](#) [Instrument Cluster Schematics \(Chevrolet\)](#)
- [Power Distribution Schematics \(Buick\)](#) [Power Distribution Schematics \(Chevrolet\)](#)
- [Power Moding Schematics \(Buick\)](#) [Power Moding Schematics \(Chevrolet\)](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX \(ENCORE\)](#) [COMPONENT CONNECTOR END VIEWS - INDEX \(TRAX\)](#)

Description and Operation

- [Instrument Cluster Description and Operation](#)
- [Power Mode Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

1. Verify that DTC B144B or B1380 is not set.

- **If DTC B144B or B1380 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .

- **If DTC B144B or B1380 is not set**

Refer to Circuit/System Testing.

Circuit/System Testing

NOTE: **Circuit/System Verification must be performed before proceeding with Circuit/System Testing.**

1. Ignition OFF, disconnect the KR73 Ignition Main Relay.
2. Test for less than 10 Ω between the ground circuit terminal 1 and ground.

- **If 10 Ω or greater**

Test the ground circuit for an open/high resistance.

- **If less than 10 Ω**

3. Verify that a test lamp illuminates between the B+ circuit terminal 3 and ground.

- **If the test lamp does not illuminate**

Repair the open/high resistance in the circuit.

- **If the test lamp illuminates**

4. Verify that a test lamp does not illuminate between the control circuit terminal 2 and ground.

- **If the test lamp illuminates**

1. Disconnect the harness connector at the K9 Body Control Module.

2. Test for less than 1 V between the control circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the K9 Body Control Module.

- **If the test lamp does not illuminate**

5. Ignition ON, verify that a test lamp illuminates between the control circuit terminal 2 and ground.

- **If the test lamp does not illuminate**

1. Test for less than 2 Ω in the control circuit end to end.

- If less than 2 Ω , replace the K9 Body Control Module.
- If 2 Ω or greater, repair the open/high resistance in the circuit.

- **If the test lamp illuminates**

6. Ignition OFF, reconnect the KR73 Ignition Main Relay.

7. Disconnect the harness connector at the P16 Instrument Cluster.

8. Verify that a test lamp does not illuminate between the ignition circuit terminal 31 and ground.

- **If the test lamp illuminates**

1. Test for less than 1 V between the ignition circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the KR73 Ignition Main Relay.

- **If the test lamp does not illuminate**

9. Ignition ON, verify that a test lamp illuminates between the ignition terminal 31 and ground.

- **If the test lamp does not illuminate and the Ignition fuse is good**

1. Test for less than 2 Ω in the ignition circuit end to end

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the KR73 Ignition Main Relay.

- **If the test lamp does not illuminate and the Ignition fuse is open**

1. Test for infinite resistance between the ignition circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the P16 instrument cluster.

- **If the test lamp illuminates**

10. Replace the P16 instrument cluster.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Instrument Cluster Replacement \(Buick\)](#) [Instrument Cluster Replacement \(Chevrolet\)](#)
- [Relay Replacement \(Attached to Wire Harness\)](#) [Relay Replacement \(Within an Electrical Center\)](#)
- [Control Module References](#) for BCM replacement, programming and setup

DTC B3567: INFO DISPLAY SELECT SWITCH

Diagnostic Instructions

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

DTC Descriptors

DTC B3567 01

Info Display Select Switch Circuit Short to Battery

DTC B3567 02

Info Display Select Switch Circuit Short to Ground

DTC B3567 04

Info Display Select Switch Circuit Open

DTC B3567 59

Info Display Select Switch Circuit Protection Time-Out

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
DIC Menu Switch Signal	P3567 59	1	1 or P3567 01	1
DIC Selt/Clear Switch Signal	P3567 02	1 or P3567 04	1 or P3567 04	1
DIC Switch Low Reference	-	1 or P3567 04	-	-
DIC Switch Ground	-	1	-	-
1. Driver Information Center (DIC) Switch Malfunction				

Circuit/System Description

The driver information center switches are multiplexed switches that are part of the Turn Signal/Multifunction Switch.

The Instrument Cluster provides 5 volts to the MENU switch. The MENU switch is a momentary contact switch that is provided ground through the Turn Signal/Multifunction Switch ground circuit.

The Instrument Cluster provides battery voltage to the UP, DOWN, SET switches. The UP, DOWN, SET switch signal circuits are pulled up to battery voltage in the Instrument Cluster. The Instrument Cluster also provides the UP, DOWN, SET switches with a low reference circuit. The UP, DOWN, SET switch signal circuit is pulled low when a switch is activated. The driver information center UP, DOWN, SET switches are momentary contact switches that connect a series of resistors in a resistor ladder format. The instrument cluster monitors the driver information center UP, DOWN, SET switch signal circuit to determine the switch position. Each switch state - UP, DOWN, SET- corresponds to a certain resistance value. The instrument cluster determines the switch pressed by the voltage drop across the resistors.

Conditions for Running the DTC

- The ignition is in OFF, ACCESSORY or RUN position.
- The system voltage is between 9-16 V.

Conditions for Setting the DTC

B3567 01

The instrument cluster detects that the driver information center switch signal circuit is shorted to battery.

B3567 02

The instrument cluster detects that the driver information center switch signal circuit is shorted to ground.

B3567 04

The instrument cluster detects that the driver information center switch signal circuit is open.

B3567 59

The instrument cluster detects that the driver information center switch is stuck.

Action Taken When the DTC Sets

The instrument cluster ignores the driver information center switch inputs.

Conditions for Clearing the DTC

The DTC will become history if the instrument cluster no longer detects a malfunction.

Reference Information

Schematic Reference

Instrument Cluster Schematics (Buick)**Instrument Cluster Schematics (Chevrolet)**

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE) **COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)**

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify DTC B0158 is not set
 - **If DTC B0158 is set**

Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .

- **DTC B0158 is not set**
3. Verify the driver information center set, up and down function changes when pressing the set, up or down switch.

- **If the driver information center does not change**

Refer to Set, Up and Down Switch Malfunction

- **If the driver information center changes**

4. Verify the driver information center menu function changes when pressing the menu switch.

- **If the driver information center does not change**

Refer to Menu Switch Malfunction

- **If the driver information center changes**

5. All OK.

Circuit/System Testing

NOTE: **Circuit/System Verification must be performed before proceeding with Circuit/System Testing.**

Menu Switch Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the X1 harness connector at the S78 Turn Signal/Multifunction Switch, ignition ON.

2. Test for 4.8-5.2 V between the signal circuit terminal 5 and ground.

- **If less than 4.8 V**

1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster.

2. Test for infinite resistance between the signal circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance

3. Test for less than 2 Ω in the signal circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the P16 Instrument Cluster.

- **If greater than 5.2 V**

1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster, ignition ON.

2. Test for less than 1 V between the signal circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the P16 Instrument Cluster.

- **If between 4.8-5.2 V**

3. Test for less than 10 Ω between the ground circuit terminal 3 and ground.

- **If 10 Ω or greater**

Repair the open/high resistance in the circuit

- **If less than 10 Ω**

4. Test or replace the S78 Turn Signal/Multifunction Switch.

Set, Up and Down Switch Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the X1 harness connector at the S78 Turn Signal/Multifunction Switch, ignition ON.

2. Test for less than 10 Ω between the low reference circuit terminal 6 and ground.

- **If 10 Ω or greater**

1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster.

2. Test for less than 2 Ω in the low reference circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the P16 Instrument Cluster.

- **If less than 10 Ω**

3. Test for 9.8-12.2 V between the signal circuit terminal 12 and ground.

- **If less than 9.8 V**

1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster.

2. Test for infinite resistance between the signal circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance

3. Test for less than 2 Ω in the signal circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the P16 Instrument Cluster.

- **If greater than 12.2 V**

1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster, ignition ON.

2. Test for less than 1 V between the signal circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the P16 Instrument Cluster.

- **If between 9.8-12.2 V**

4. Test or replace the S78 Turn Signal/Multifunction Switch.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Displays and Gauges Component Replacement Reference](#)
- [Control Module References](#) for instrument cluster replacement, programming and setup

DTC P0070: AMBIENT AIR TEMPERATURE SENSOR CIRCUIT

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

DTC Descriptor

DTC P0070

Ambient Air Temperature Sensor Circuit

Symptom Byte Information: [Symptom Byte List](#)

Circuit/System Description

Circuit	Description
Signal circuit	The sensor resistance varies with temperature.
Components • B9 Ambient Air Temperature Sensor • P16 Instrument Cluster	
The input voltage varies depending on the temperature of the sensor.	

Conditions for Running the DTC

Ignition On

Conditions for Setting the DTC

The internal fault detection is handled inside the control module. No external circuit diagnosis is involved.

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category=Type B DTC

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category=Type B DTC

Diagnostic Aids

DTC P0070 is set in case the battery was disconnected or the control module was re-programmed.

Reference Information

Schematic Reference

Instrument Cluster Schematics (Buick) Instrument Cluster Schematics (Chevrolet)

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE) COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition $\hat{A}$ » On / Vehicle $\hat{A}$ » In Service Mode
2. Verify DTC B0158 is not set.

- **If DTC B0158 is set**

Refer to: **Diagnostic Trouble Code (DTC) List - Vehicle**

- **If the DTC is not set**

3. Verify DTC B0158 is not set.

- **If the DTC is not set**

All OK.

- **If DTC P0070 is set**

4. Clear DTC P0070
5. Verify the DTC does not set.

- **If the DTC is not set**

All OK.

- **If DTC P0070 is set**

6. Ignition/Vehicle $\hat{\text{A}}$ Off - For greater than 3 h

Verify the following parameters are within 15 $\hat{\text{A}}$ °C (59 $\hat{\text{A}}$ °F) of each other:

- IAT Sensor 1
- Ambient Air Temperature
- **If not in the specified range**

Replace the component: B9 Ambient Air Temperature Sensor

- **If in the specified range**

7. Verify DTC P0070 is not set.

- **If the DTC is not set**

All OK.

- **If DTC P0070 is set**

8. Perform all necessary programming and setup procedures for the control module: P16 Instrument Cluster

9. Verify DTC P0070 is not set.

- **If the DTC is not set**

All OK.

- **If DTC P0070 is set**

10. Perform all necessary programming and setup procedures for the control module: K9 Body Control Module

11. Verify DTC P0070 is not set.

- **If the DTC is not set**

All OK.

- **If DTC P0070 is set**

12. Perform all necessary programming and setup procedures for the control module: K20 Engine Control Module

13. Verify DTC P0070 is not set.

- **If the DTC is not set**

All OK.

- **If DTC P0070 is set**

14. Replace the control module: K20 Engine Control Module

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- For control module replacement, programming, and setup refer to: [Control Module References](#)

DTC P0071-P0074: AMBIENT AIR TEMPERATURE SENSOR

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)

- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

DTC Descriptors

DTC P0071

Ambient Air Temperature Sensor Performance

DTC P0072

Ambient Air Temperature Sensor Circuit Low Voltage

DTC P0073

Ambient Air Temperature Sensor Circuit High Voltage

DTC P0074

Ambient Air Temperature Sensor Circuit Intermittent

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	P0072	P0073	P0073	P0071/P0074
Low Reference	-	P0073	-	P0071

Circuit/System Description

For an overview of the component/system, refer to: [Instrument Cluster Description and Operation](#)

Circuit	Description
Signal	The control module input circuit has an internal resistance connected to 5 V.
Low Reference	Grounded through the control module.

Component	Description
B9 Ambient Air Temperature Sensor	The temperature sensor is a negative temperature coefficient thermistor, a resistor which changes based on temperature.
K20 Engine Control Module	The K20 control module monitors the B9 ambient air temperature sensor. The control module converts the analog voltage signal input to a temperature value.

Conditions for Running the DTC

Ignition $\hat{\gg}$ On / Vehicle $\hat{\gg}$ In Service Mode

Conditions for Setting the DTC

P0071

The difference between the following parameters is greater than a predefined value: Outside Ambient Air Temperature Sensor Signal & Intake Air Temperature Sensor Signal

P0072

Outside Ambient Air Temperature Sensor Signal=Greater than 88 $\hat{\circ}$ C (190 $\hat{\circ}$ F)

P0073

Outside Ambient Air Temperature Sensor Signal=Less than - 40 $\hat{\circ}$ C (- 40 $\hat{\circ}$ F)

Outside Ambient Air Temperature Sensor Signal=Not Plausible

Action Taken When the DTC Sets

- DTCs listed in the DTC Descriptor Category=Type B DTC
- The DIC will display SERVICE A/C SYSTEM.

Air Conditioning Compressor Clutch=Disabled

- The control module uses default replacement values.

Conditions for Clearing the DTC

The conditions for setting the DTC no longer exist.

Diagnostic Aids

The displayed temperature is a filtered value that updates periodically while driving. The value rarely changes when the vehicle is parked.

For an overview of the component/system, refer to: [Instrument Cluster Description and Operation](#)

Reference Information

Schematic Reference

[Instrument Cluster Schematics \(Buick\)](#)[Instrument Cluster Schematics \(Chevrolet\)](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX \(ENCORE\)](#) [COMPONENT CONNECTOR END VIEWS - INDEX \(TRAX\)](#)

Description and Operation

[Instrument Cluster Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

DTC Type Reference

[Powertrain Diagnostic Trouble Code \(DTC\) Type Definitions](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

1. Ignition $\hat{A}$ » On / Vehicle $\hat{A}$ » In Service Mode
2. Verify the scan tool parameter: Ambient Air Temperature = -40 to 88 $\hat{A}$ °C (-40 to 190 $\hat{A}$ °F) and changes
 - **If not between -40 to 88 $\hat{A}$ °C (-40 to 190 $\hat{A}$ °F) or does not change**
Refer to: Circuit/System Testing
 - **If between -40 to 88 $\hat{A}$ °C (-40 to 190 $\hat{A}$ °F) and changes**

3. All OK.

Circuit/System Testing

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

1. Ignition/Vehicle & All vehicle systems $\hat{\gg}$ Off
2. Disconnect the electrical connector:B9 Ambient Air Temperature Sensor
3. Test for less than $10\ \Omega$ between the test points:Low Reference circuit terminal B or 2 & Ground
 - **If $10\ \Omega$ or greater**
 1. Disconnect the electrical connector:K20 Engine Control Module
 2. Test for less than $2\ \Omega$ between the test points:Low Reference circuit terminal B or 2 @Component harness & The other end of the circuit
 - If $2\ \Omega$ or greater $\hat{\gg}$ Repair the open/high resistance in the circuit.
 - If less than $2\ \Omega$ $\hat{\gg}$ Replace the component:K20 Engine Control Module
 - **If less than $10\ \Omega$**
4. Ignition $\hat{\gg}$ On / Vehicle $\hat{\gg}$ In Service Mode
5. Verify the scan tool parameter:Ambient Air Temperature=Less than $-34\ ^\circ\text{C}$ ($-30\ ^\circ\text{F}$)
 - **If $-34\ ^\circ\text{C}$ ($-30\ ^\circ\text{F}$) or warmer**
 1. Ignition/Vehicle $\hat{\gg}$ Off
 2. Disconnect the electrical connector:K20 Engine Control Module
 3. Test for infinite resistance between the test points:Signal circuit terminal A or 1 @Component harness & Ground
 - If less than infinite resistance $\hat{\gg}$ Repair the short to ground on the circuit.
 - If infinite resistance $\hat{\gg}$ Replace the component:K20 Engine Control Module
 - **If $143\ ^\circ\text{C}$ ($290\ ^\circ\text{F}$) or colder**
6. Connect a 3 A fused jumper wire between the test points:Signal circuit terminal A or 1 & Low Reference circuit terminal B or 2
7. Verify the scan tool parameter:Ambient Air Temperature=Greater than $143\ ^\circ\text{C}$ ($290\ ^\circ\text{F}$)
 - **If $143\ ^\circ\text{C}$ ($290\ ^\circ\text{F}$) or colder**
 1. Ignition/Vehicle $\hat{\gg}$ Off & Remove $\hat{\gg}$ Jumper wire(s)
 2. Disconnect the electrical connector:K20 Engine Control Module
 3. Ignition $\hat{\gg}$ On / Vehicle $\hat{\gg}$ In Service Mode
 4. Test for less than 1 V between the test points:Signal circuit@Component harness & Ground
 - If 1 V or greater $\hat{\gg}$ Repair the short to voltage on the circuit.
 - If less than 1 V
 5. Ignition/Vehicle $\hat{\gg}$ Off
 6. Test for less than $2\ \Omega$ between the test points:Signal circuit@Component harness & The other end of the circuit
 - If $2\ \Omega$ or greater $\hat{\gg}$ Repair the open/high resistance in the circuit.
 - If less than $2\ \Omega$ $\hat{\gg}$ Replace the component:K20 Engine Control Module
 - **If $144\ ^\circ\text{C}$ ($291\ ^\circ\text{F}$) or warmer**
8. Test or replace the component:B9 Ambient Air Temperature Sensor

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Displays and Gauges Component Replacement Reference](#)
- [Control Module References](#) for control module replacement, programming and setup

DTC P0461-P0464: FUEL LEVEL SENSOR (FWD)

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 P0461

Fuel Level Sensor Performance

DTC P0462

Fuel Level Sensor Circuit Low Voltage

DTC P0463

Fuel Level Sensor Circuit High Voltage

DTC P0464

Fuel Level Sensor Circuit Intermittent

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

- Ignition ON
- Battery voltage is between 11-32 V

Conditions for Setting the DTC

P0461 00

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

P0462

- The signal voltage is less than 0.25 V.
- The above conditions must be met for 5 seconds.

P0463

- The signal voltage is greater than 4.7 V.
- The above conditions must be met for 5 seconds.

P0464

- The fuel level change is greater than 10% for a duration lasting less than 30 seconds.
- DTC P0464 runs and fails 2 out of 3 test cycles.

Action Taken When the DTC Sets

P0461, P0462, and P0463

- P0461, P0462, and P0463 are Type B DTCs
- The fuel gauge defaults to empty
- The low fuel indicator illuminates

P0464

- P0464 is a Type A DTC

Conditions for Clearing the DTC

- P0461, P0462, and P0463 are Type B DTCs
- P0464 is a Type A DTC

Reference Information

Schematic Reference

Instrument Cluster Schematics (Buick) **Instrument Cluster Schematics (Chevrolet)**

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE) **COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)**

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool Fuel Remaining in Tank parameter is between 5-95% and varies with fuel level.
 - **If not between 5-95% or does not vary with fuel level**

Refer to Circuit/System Testing.

- **If between 5-95% and varies with fuel level**

3. Verify that all fuel level gauge segments illuminate when performing the scan tool Driver Information Center Segments control function.

- **If any fuel level gauge segments do not illuminate**

Replace the P16 Instrument Cluster.

- **If all fuel level gauge segments illuminate**

4. All OK.

Circuit/System Testing

NOTE: **Circuit/System Verification must be performed before proceeding with Circuit/System Testing.**

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the A7 Fuel Pump and Level Sensor Assembly. It may take up to 2 minutes for all vehicle systems to power down.

2. Test for less than 10 Ω between the low reference circuit terminal 3 and ground.

- **If 10 Ω or greater**

1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.

2. Test for less than 2 Ω in the low reference circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K20 Engine Control Module.

- **If less than 10 Ω**

3. Ignition ON.

4. Test for less than 1 V between the low reference circuit and ground.

- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **If less than 1 V**

5. Verify the scan tool Remaining Fuel In Tank parameter is greater than 95%.

- **If 95% or less**

1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, ignition ON.

2. Test for less than 1 V between the signal circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the K20 Engine Control Module.

- **If greater than 95%**

6. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, ignition ON.

7. Test for infinite resistance between the signal circuit terminal 4 and ground.

- **If less than infinite resistance**

Repair the short to ground on the circuit.

- **If infinite resistance**

8. Ignition OFF

9. Test for less than 2 Ω in the signal circuit end to end.

- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

10. Test or replace the B46 Fuel Level Sensor.

Component Testing

1. Ignition OFF, remove the A7 Fuel Pump and Level Sensor Assembly.
2. Sweep the Fuel Level Sensor through its full range of motion while measuring resistance between the signal terminal 4 and the low reference terminal 3.
3. Test for a minimum resistance value of 37-43 Ω and a maximum value of 245-255 Ω without any spikes or dropouts.

- **If minimum resistance is not 37-43 Ω , maximum resistance is not 245-255 Ω , or if there are any spikes or dropouts**

Replace the B46 Fuel Level Sensor.

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

4. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Displays and Gauges Component Replacement Reference](#)
- [Control Module References](#) for the Engine Control Module replacement, programming and setup

DTC P0461-P0464, P2066, P2067, OR P2068: FUEL LEVEL SENSOR (AWD)

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 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 P2066

Fuel Level Sensor 2 Performance

DTC P2067

Fuel Level Sensor 2 Circuit Low Voltage

DTC P2068

Fuel Level Sensor 2 Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Fuel Level Sensor 1/Primary/Right Signal	P0462	P0463	P0463	P0461
Fuel Level Sensor 2/Secondary/Left Signal	P2067	P2068	P2068	P2066
Low Reference	-	P0463, P2068	-	P0461, P2066

Circuit/System Description

The primary fuel level sensor and the secondary fuel level sensor change resistance based on fuel level. The engine control module (ECM) monitors the signal circuits of both sensor to determine the fuel level. When the fuel tank is full, the resistances of both fuel level sensors are low. When the fuel tank is empty, the resistances of the fuel level sensors are high. The ECM uses the signal voltages of the primary fuel level sensor and the secondary fuel level sensor to calculate the percentage of remaining fuel in the tank. The ECM sends the fuel level percentage via serial data to the body control module (BCM). The BCM then sends the fuel level percentage via serial data to the instrument cluster to control the fuel gauge.

Conditions for Running the DTC

- Ignition ON
- Battery voltage is between 11-32 V

Conditions for Setting the DTC

P0461 or P2066

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

P0462 or P2067

- The signal voltage is less than 0.25 V.
- The above conditions must be met for 5 seconds.

P0463 or P2068

- The signal voltage is greater than 4.7 V.
- The above conditions must be met for 5 seconds.

P0464

- The fuel level change is greater than 10% for a duration lasting less than 30 seconds.
- DTC P0464 runs and fails 2 out of 3 test cycles.

Action Taken When the DTC Sets

- P0461, P0462, P0463, P2066, P2067 and P2068 are Type B DTCs
- The fuel gauge defaults to empty
- The low fuel indicator illuminates

P0464

- P0464 is a Type A DTC

Conditions for Clearing the DTC

- P0461, P0462, P0463, P2066, P2067 and P2068 are Type B DTCs
- P0464 is a Type A DTC

Reference Information

Schematic Reference

Instrument Cluster Schematics (Buick) Instrument Cluster Schematics (Chevrolet)

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE) COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool Fuel Level Sensor Right Tank parameter is between 0.5-3.5 V and varies with fuel level.
 - **If not between 0.5-3.5 V or does not vary with fuel level**
Refer to Primary Fuel Level Sensor Malfunction in Circuit/System Testing
 - **If between 0.5-3.5 V and varies with fuel level**
3. Verify the scan tool Fuel Level Sensor Left Tank parameter is between 0.5-3.5 V and varies with fuel level.
 - **If not between 0.5-3.5 V or does not vary with fuel level**
Refer to Secondary Fuel Level Sensor Malfunction in Circuit/System Testing
 - **If between 0.5-3.5 V and varies with fuel level**
4. All OK.

Circuit/System Testing

NOTE: **Circuit/System Verification must be performed before proceeding with Circuit/System Testing.**

Primary Fuel Level Sensor Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the A7 Fuel Pump and Level Sensor Assembly. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 3 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.

2. Test for less than 2 Ω in the low reference circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K20 Engine Control Module.
- **If less than 10 Ω**
3. Ignition ON.
4. Verify the scan tool Fuel Level Sensor Left Tank parameter is greater than 4.8 V.
 - **If 4.8 V or less**
 1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.
 2. Test for infinite resistance between the signal circuit terminal 4 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K20 Engine Control Module.
 - **If greater than 4.8 V**
5. Install a 3 A fused jumper wire between the signal circuit terminal 4 and the low reference circuit terminal 3.
6. Verify the scan tool Fuel Level Sensor Left Tank parameter is less than 0.2 V.
 - **If 0.2 V or greater**
 1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, ignition ON.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 - 3. Ignition OFF
 - 4. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K20 Engine Control Module.
 - **If less than 0.2 V**
7. Test or replace the B46 Fuel Level Sensor.

Secondary Fuel Level Sensor Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B46B Fuel Level Sensor - Secondary. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 3 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.
 2. Test for less than 2 Ω in the low reference circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K20 Engine Control Module.
 - **If less than 10 Ω**
3. Ignition ON.
4. Verify the scan tool Fuel Level Sensor Right Tank parameter is greater than 4.8 V.
 - **If 4.8 V or less**
 1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.
 2. Test for infinite resistance between the signal circuit terminal 4 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K20 Engine Control Module.
 - **If greater than 4.8 V**
5. Install a 3 A fused jumper wire between the signal circuit terminal 4 and the low reference circuit terminal 3.
6. Verify the scan tool Fuel Level Sensor Right Tank parameter is less than 0.2 V.

- If 0.2 V or greater

1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, ignition ON.
2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
3. Ignition OFF
4. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K20 Engine Control Module.
- **If less than 0.2 V**
7. Test or replace the B46B Fuel Level Sensor - Secondary.

Component Testing

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

Replace the appropriate Fuel Level Sensor.
 - **If minimum resistance is 37-43 Ω , maximum resistance is 245-255 Ω , and if there are no spikes or dropouts**
4. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Displays and Gauges Component Replacement Reference](#)
- [Control Module References](#) for engine control module or instrument cluster replacement, programming, and setup

DTC P0520: ENGINE OIL PRESSURE SWITCH CIRCUIT

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 Switch Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Signal	1	P0520	P0520
1. Engine Oil Pressure Indicator Malfunction			

Typical Scan Tool Data

ECM - Engine Oil Pressure Switch

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine Running Parameter Normal Range: OK			
Signal	Low	OK	OK

Circuit/System Description

The engine oil pressure 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 engine oil pressure switch opens and the ECM should detect a high signal voltage input. When the oil pressure is low, the ECM sends a message via serial data to the body control module (BCM). The BCM then sends a message via serial data to the instrument cluster requesting the engine oil pressure indicator turned ON.

Conditions for Running the DTC

- Engine coolant temperature at last engine stop was greater than 80°C (176°F).
- Engine coolant temperature reduced more than 10°C (16°F) since engine off.
- Engine was off more than 60s.
- Ignition on, engine off

Conditions for Setting the DTC

- The ECM detects a high signal voltage of the engine oil pressure switch signal circuit.
- The above condition is present for greater than 5 seconds.

Action Taken When the DTC Sets

The instrument cluster illuminates the service vehicle soon indicator and the oil pressure low indicator.

Conditions for Clearing the DTC

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

Diagnostic Aids

DTC P0520 can set due to inadequate engine oil pressure. This can be an indication of mechanical engine issues causing lower than expected engine oil pressure.

Reference Information

Schematic Reference

[Instrument Cluster Schematics \(Buick\)](#)[Instrument Cluster Schematics \(Chevrolet\)](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX \(ENCORE\)](#) [COMPONENT CONNECTOR END VIEWS - INDEX \(TRAX\)](#)

Description and Operation

- [Instrument Cluster Description and Operation](#)
- [Indicator/Warning Message Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Command the All Indicators test ON and OFF with the scan tool, verify that the engine oil pressure indicator turns ON and OFF.
 - **If the engine oil pressure indicator does not turn ON or OFF as commanded**

Replace the P16 Instrument Cluster.
 - **If the engine oil pressure indicator turns ON and OFF as commanded**
3. Verify the scan tool Engine Oil Pressure parameter is Low.
 - **If not Low**

Refer to Circuit/System Testing.
 - **If Low**
4. Engine running.
5. Verify actual engine oil pressure is within specified range. Refer to Oil Pressure Diagnosis and Testing in Displays and Gauges Component Replacement Reference.
6. Verify the scan tool Engine Oil Pressure parameter is OK.
 - **If not OK**

Refer to Circuit/System Testing.
 - **If OK**
7. All OK.

Circuit/System Testing

NOTE: **Circuit/System Verification must be performed before proceeding with Circuit/System Testing.**

1. Ignition OFF, disconnect the harness connector at the B37 Engine Oil Pressure Switch, ignition ON.
2. Verify the scan tool Engine Oil Pressure Switch parameter is OK.
 - **If not OK**
 1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.
 2. Test for infinite resistance between the signal circuit terminal 1 (or A) and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K20 Engine Control Module.
 - **If OK**
3. Install a 3 A fused jumper wire between the signal circuit terminal 1 (or A) and ground.
4. Verify the scan tool Engine Oil Pressure Switch parameter is Low.
 - **If not Low**
 1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, ignition ON.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V

3. Test for less than 2 Ω in the signal circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K20 Engine Control Module.

- **If Low**

5. Test or replace the B37 Engine Oil Pressure Switch.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Displays and Gauges Component Replacement Reference](#)
- [Control Module References](#) for ECM replacement, programming and setup

DTC P0521: ENGINE OIL PRESSURE SENSOR PERFORMANCE MALFUNCTION (WITHOUT LE2)

Diagnostic Instructions

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

DTC Descriptor

DTC P0521

Engine Oil Pressure Sensor Performance Malfunction

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	1	P0521	1	P0521
1. Engine Oil Pressure Indicator Malfunction				

Typical Scan Tool Data

ECM - Engine Oil Pressure Switch

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine Running Parameter Normal Range: OK			
Signal	Low	OK	OK

Circuit/System Description

The engine oil pressure 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 Engine Oil Pressure Switch opens and the ECM should detect a high signal voltage input. When the oil pressure is low, the ECM sends a message via serial data to the body control module (BCM). The BCM then sends a message via serial data to the Instrument Cluster requesting the engine oil pressure indicator turned ON.

Conditions for Running the DTC

The engine is running.

Conditions for Setting the DTC

- The ECM detects that the engine oil pressure switch signal circuit is pulled low.
- The engine oil pressure is outside of a calculated working range determined by engine speed and temperature.

- The above condition is present for greater than 10 seconds.

Action Taken When the DTC Sets

The Instrument Cluster illuminates the service vehicle soon indicator and the oil pressure low indicator.

Conditions for Clearing the DTC

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

Diagnostic Aids

DTC P0521 can set if engine oil pressure is outside the calculated engine oil pressure model stored in the engine control module. This can be an indication of mechanical engine issues causing lower than expected engine oil pressure.

Reference Information

Schematic Reference

Instrument Cluster Schematics (Buick) Instrument Cluster Schematics (Chevrolet)

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE) COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)

Description and Operation

- Instrument Cluster Description and Operation
- Indicator/Warning Message Description and Operation
- Driver Information Center (DIC) Description and Operation (uplevel Instrument Cluster) Driver Information Center (DIC) Description and Operation (base Instrument Cluster)

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool Engine Oil Pressure parameter is Low.
 - **If not Low**
Refer to Circuit/System Testing.
 - **If Low**
3. Engine running.
4. Verify the scan tool Engine Oil Pressure parameter is OK.
 - **If not OK**

Refer to Circuit/System Testing.

- **If OK**

5. All OK.

Circuit/System Testing

NOTE: **Circuit/System Verification must be performed before proceeding with Circuit/System Testing.**

1. Ignition OFF, disconnect the harness connector at the B37 Engine Oil Pressure Switch, ignition ON.
2. Verify the scan tool Engine Oil Pressure Switch parameter is OK.
 - **If not OK**
 1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.
 2. Test for infinite resistance between the signal circuit terminal 1 (or A) and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K20 Engine Control Module.
 - **If OK**
3. Install a 3 A fused jumper wire between the signal circuit terminal 1 (or A) and ground.
4. Verify the scan tool Engine Oil Pressure Switch parameter is Low.
 - **If not Low**
 1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, ignition ON.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K20 Engine Control Module.
 - **If Low**
5. Test or replace the B37 Engine Oil Pressure Switch.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Displays and Gauges Component Replacement Reference](#)
- [Control Module References](#) for control module replacement, programming and setup

DTC P0521, P0522, OR P0523: ENGINE OIL PRESSURE SENSOR (WITH LE2)

Diagnostic Instructions

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

DTC Descriptors

DTC P0521

Engine Oil Pressure Sensor Performance

DTC P0522

Engine Oil Pressure Sensor Circuit Low Voltage.

Engine Oil Pressure Sensor Circuit High Voltage**Diagnostic Fault Information**

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

Circuit/System Description

The engine oil pressure sensor changes voltage based on the engine oil pressure. The engine oil pressure sensor is a 3-wire sensor comprising of the signal circuit, the low reference circuit and the 5 V reference circuit. The engine control module (ECM) supplies 5 V to the engine oil pressure sensor via the 5 V reference circuit and provides ground via the low reference circuit. The ECM monitors the signal circuit of the engine oil pressure sensor to determine if the engine oil pressure sensor voltage is within the normal operating range of approximately 1-4 V. When the engine oil pressure is high, the engine oil pressure sensor voltage is high and the ECM senses a high signal voltage. When the engine oil pressure is low, the engine oil pressure sensor voltage is low and the ECM senses a low signal voltage. The ECM sends the engine oil pressure information to the instrument cluster via serial data. The instrument cluster will illuminate or display the engine oil pressure indicator when the engine oil pressure is low.

Conditions for Running the DTC

The engine is running.

Conditions for Setting the DTC**P0521**

- The ECM detects that measured oil pressure is at least 47 kPa (6.8 psi) less than or 50 kPa (7.3 psi) higher than the predicted oil pressure.
- The engine oil pressure is outside of a calculated working range determined by engine speed and temperature.
- The above condition is present for greater than 10 s.

P0522

- The ECM detects that the engine oil pressure sensor signal circuit is less than 0.2 V.
- The above condition is present for greater than 10 s.

P0523

- The ECM detects that the engine oil pressure sensor signal circuit is greater than 4.8 V.
- The above condition is present for greater than 10 s.

Action Taken When the DTC Sets

- The ECM records the operating conditions at the time the diagnostics test fails. The ECM displays this information in the Failure Records on the scan tool.
- The instrument cluster 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.

Diagnostic Aids

DTC P0521 can set if engine oil pressure is outside the calculated engine oil pressure model stored in the engine control module. This can be an indication of mechanical engine issues causing lower than expected engine oil pressure.

Reference Information

Schematic Reference

Instrument Cluster Schematics (Buick)Instrument Cluster Schematics (Chevrolet)

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE)

Description and Operation

- Indicator/Warning Message Description and Operation
- Instrument Cluster Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

With UDD

1. Ignition ON.
2. Verify the engine oil pressure indicator turns on and off when commanding the All Indicators ON and OFF with a scan tool.
 - **If the engine oil pressure indicator does not turn on and off.**
Replace the P16 Instrument Cluster.
 - **If the engine oil pressure indicator turns on and off**
3. Verify the scan tool Engine Oil Pressure Sensor parameter is 0 psi (0 kPa).
 - **If not 0 psi (0 kPa)**
Refer to Circuit/System Testing.
 - **If 0 psi (0 kPa)**
4. Engine running.
5. Verify actual engine oil pressure is within specified range. Refer to *Oil Pressure Diagnosis and Testing* in Displays and Gauges Component Replacement Reference.
6. Verify the scan tool Engine Oil Pressure parameter is within specified range.
 - **If not within specified range**
Refer to Circuit/System Testing.
 - **If within specified range**
7. Verify the engine oil pressure displayed on Instrument Cluster is within specified range.
 - **If not within specified range**

Test or replace the P16 Instrument Cluster.

- **If within specified range**

8. All OK.

With UDV or UHS

1. Ignition ON.

2. Verify the scan tool Engine Oil Pressure Sensor parameter is 0 psi (0 kPa).

- **If not 0 psi (0 kPa)**

Refer to Circuit/System Testing.

- **If 0 psi (0 kPa)**

3. Engine running.

4. Verify actual engine oil pressure is within specified range. Refer to *Oil Pressure Diagnosis and Testing* in **Displays and Gauges Component Replacement Reference**.

5. Verify the scan tool Engine Oil Pressure parameter is within specified range.

- **If not within specified range**

Refer to Circuit/System Testing.

- **If within specified range**

6. Verify the engine oil pressure displayed on Instrument Cluster is within specified range.

- **If not within specified range**

Test or replace the P16 Instrument Cluster.

- **If within specified range**

7. All OK.

Circuit/System Testing

NOTE: **Circuit/System Verification must be performed before proceeding with Circuit/System Testing.**

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B37B Engine Oil Pressure Sensor. It may take up to 2 min for all vehicle systems to power down.

2. Test for less than 10 Ω between the low reference circuit terminal 2 and ground.

- **If 10 Ω or greater**

1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.

2. Test for less than 2 Ω in the low reference circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K20 Engine Control Module.

- **If less than 10 Ω**

3. Ignition ON.

4. Test for 4.8-5.2 V between the 5 V reference circuit terminal 3 and ground.

- **If less than 4.8 V**

1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.

2. Test for infinite resistance between the 5 V reference circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance

3. Test for less than 2 Ω in the 5 V reference circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K20 Engine Control Module.

- **If greater than 5.2 V**
 1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, ignition ON.
 2. Test for less than 1 V between the 5 V reference circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K20 Engine Control Module.
 - **If between 4.8-5.2 V**
- 5. Verify the scan tool Engine Oil Pressure parameter is less than 35kPa (5psi).
 - **If 35kPa (5psi) or above**
 1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, ignition ON.
 2. Test for less than 1 V between the signal circuit terminal 1 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K20 Engine Control Module.
 - **If below 35kPa (5psi)**
- 6. Install a 3 A fused jumper wire between the signal circuit terminal 1 and the 5 V reference circuit terminal 3.
- 7. Engine running.
- 8. Verify the scan tool Engine Oil Pressure parameter is greater than 800kPa (116psi).
 - **If 800kPa (116psi) or less**
 1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.
 2. Test for infinite resistance between the signal circuit terminal 1 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K20 Engine Control Module.
 - **If greater than 800kPa (116psi)**
- 9. Test or replace the B37B Engine Oil Pressure Sensor.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Displays and Gauges Component Replacement Reference](#)
- [Control Module References](#) for control module replacement, programming and setup

DISPLAYS AND GAUGES COMPONENT REPLACEMENT REFERENCE

Component	Repair Instruction
B9 Ambient Air Temperature Sensor	Ambient Air Temperature Sensor Replacement
B37 Engine Oil Pressure Sensor	{1.4L LUJ engine} Engine Oil Pressure Indicator Switch Replacement {1.8L 2HO or LFH engine} Engine Oil Pressure Indicator Switch Replacement
B46 Fuel Level Sensor	{1.4L LUJ engine} Fuel Level Sensor Replacement {1.8L 2HO or LFH engine} Fuel Level Sensor Replacement
P2 Transmission Shift Lever Position Indicator	{6T40 MHH or 6T45 MH7} Transmission Control Lever Knob Replacement (Chevrolet or Holden) Transmission Control Lever Knob Replacement (Except Chevrolet or Holden)

Component	Repair Instruction
S39 Ignition Switch	Ignition and Start Switch Replacement (Buick, With BTM) Ignition and Start Switch Replacement (Chevrolet, Without BTM) Ignition and Start Switch Replacement (Chevrolet, With BTM)
Oil Pressure Diagnosis and Testing	{1.4L LUJ engine} Engine Oil Pressure Indicator Switch Replacement {1.8L 2HO or LFH engine} Oil Pressure Diagnosis and Testing

SYMPTOMS - DISPLAYS AND GAUGES

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

- Before using the symptom diagnostic tables, perform the [Diagnostic System Check - Vehicle](#)
- Review the system operation in order to understand the system functions. Refer to the following description and operations:
 - [Instrument Cluster Description and Operation](#)
 - [Indicator/Warning Message Description and Operation](#)
 - [Driver Information Center \(DIC\) Description and Operation \(uplevel Instrument Cluster\)](#) [Driver Information Center \(DIC\) Description and Operation \(base Instrument Cluster\)](#)
 - [Audible Warnings Description and Operation](#)

Visual/Physical Inspection

- Inspect for aftermarket devices which can affect the operation of the instrument panel cluster or the audible warning systems. Refer to [Checking Aftermarket Accessories](#)
- Inspect the accessible system components or the visible system components for obvious damage or for obvious conditions which can cause the symptom.
- Inspect for the proper fluid levels.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to [Testing for Intermittent Conditions and Poor Connections](#)

Symptom List

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

Gauges and Odometer

- [Instrument Cluster Gauges Malfunction \(Encore only\)](#)
- [Fuel Gauge Malfunction](#)
- [Speedometer and/or Odometer Malfunction \(Encore only\)](#)

Indicators

- [Charge Indicator Malfunction](#)
- [Engine Oil Pressure Indicator Malfunction](#)

Driver Information Center

- [Driver Information Center Switch Malfunction](#)
- [Outside Air Temperature Display Malfunction \(with LE2\)](#) [Outside Air Temperature Display Malfunction \(without LE2\)](#)

Audible Warnings

Chime Malfunction

CHARGE INDICATOR MALFUNCTION

Diagnostic Instructions

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

Circuit/System Description

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

Reference Information

Schematic Reference

Instrument Cluster Schematics (Buick) Instrument Cluster Schematics (Chevrolet)

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE) COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)

Description and Operation

Indicator/Warning Message Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON, engine running.
2. Verify the scan tool Battery Voltage parameter is between 12.5-15.5 V.
 - **If not 12.5-15.5 V**
Refer to [Charging System Test](#) .
 - **If 12.5-15.5 V**
3. Verify the charge indicator turns on and off when commanding the All Indicators test ON and OFF with the scan tool.
 - **If the charge indicator always stays on or always stays off**

Replace the P16 Instrument Cluster.

- If the charge indicator turns on and off as commanded

4. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

[Control Module References](#) for Instrument Cluster replacement, programming, and setup

CHIME MALFUNCTION

Diagnostic Instructions

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

Circuit/System Description

The radio generates the audible warnings. The instrument cluster, the body control module (BCM), the inflatable restraint sensing and diagnostic module (SDM) or the object alarm module request audible warnings via serial data.

Reference Information

Schematic Reference

[Instrument Cluster Schematics \(Buick\)](#) [Instrument Cluster Schematics \(Chevrolet\)](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX \(ENCORE\)](#) [COMPONENT CONNECTOR END VIEWS - INDEX \(TRAX\)](#)

Description and Operation

[Audible Warnings Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

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

1. Ignition ON.
2. Verify all the radio speakers operate by adjust the radio balance and fade to each speaker.
 - If any speaker does not operate properly

Refer to [Speaker Malfunction \(without Amplifier\)](#), [Speaker Malfunction \(Audio Amplifier Buick\)](#), [Speaker Malfunction \(Audio Amplifier Chevrolet\)](#) .

- **If the speakers operate properly**

3. Verify the scan tool Driver Seat Belt Status and Passenger Seat Belt Status parameters are Buckled when both front seat belts are buckled.

- **If not Buckled**

Refer to [Seat Belt Indicator Malfunction - Driver](#) .

- **If buckled**

4. Verify the scan tool Headlamp On Switch parameter is Inactive when the headlamps are OFF.

- **If not Inactive**

Refer to [Headlamps Malfunction](#) .

- **If Inactive**

5. Verify the scan tool Park Lamps Switch parameter is Inactive when the park lamp switch is OFF.

- **If not Inactive**

Refer to [Park, License, and/or Tail Lamps Malfunction](#) .

- **If Inactive**

6. Verify the scan tool Left Turn Signal Switch and Right Turn Signal Switch parameters are Inactive while the turn signal switch is OFF.

- **If not Inactive**

Refer to [Turn Signal Lamps and/or Indicators Malfunction](#) .

- **If Inactive**

7. Verify the scan tool Park Brake Switch parameter is Inactive when the park brake is OFF.

- **If not Inactive**

Refer to [Park Brake System Diagnosis \(Disc Brake\)](#), [Park Brake System Diagnosis \(Drum Brake\)](#) .

- **If Inactive**

8. Verify that all scan tool parameters listed below are Inactive when all the doors are closed.

- Driver Door Ajar Switch
- Passenger Door Ajar Switch
- Left Rear Door Ajar Switch
- Right Rear Door Ajar Switch
- **If not Inactive**

Refer to [Door Ajar Indicator Malfunction](#) .

- **If Inactive**

9. Verify the scan tool Key in Ignition Status parameter is Inactive when the key is out of the ignition.

- **If not Inactive**

Refer to Circuit/System Testing.

- **If Active**

10. All OK

NOTE:

Circuit/System Verification must be performed before proceeding with Circuit/System Testing.

1. Ignition ON, disconnect the harness connector at the S39 Ignition Switch while the ignition is ON.
2. Verify a test lamp illuminates between the B+ circuit terminal 2 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
Test for less than 2 Ω in the B+ circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Test for infinite resistance between the B+ circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 2. Test for infinite resistance between the signal circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K9 Body Control Module.
 - **If the test lamp illuminates**
3. Verify the scan tool Key in Ignition Status parameter is Inactive.
 - **If not Inactive**
 1. Disconnect the X3 harness connector at the K9 Body Control Module.
 2. Test for less than 1 V between the signal circuit terminal 4 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **If Inactive**
4. Install a 3 A fused jumper wire between the signal circuit terminal 4 and the B+ circuit terminal 2.
5. Verify the scan tool Key in Ignition Status parameter is Active.
 - **If not Active**
 1. Ignition OFF, disconnect the X3 harness connector at the K9 Body Control Module.
 2. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If Active**
6. Test or replace the S39 Ignition Switch.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

[Control Module References](#) for BCM or Radio replacement, programming and setup

DRIVER INFORMATION CENTER SWITCH MALFUNCTION

Diagnostic Instructions

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

DTC Descriptors

DTC B3567 01

Info Display Select Switch Circuit Short to Battery

DTC B3567 02

Info Display Select Switch Circuit Short to Ground

DTC B3567 04

Info Display Select Switch Circuit Open

DTC B3567 59

Info Display Select Switch Circuit Protection Time-Out

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
DIC Menu Switch Signal	P3567 59	1	1 or P3567 01	1
DIC Selt/Clear Switch Signal	P3567 02	1 or P3567 04	1 or P3567 04	1
DIC Switch Low Reference	-	1 or P3567 04	-	-
DIC Switch Ground	-	1	-	-
1. Driver Information Center (DIC) Switch Malfunction				

Circuit/System Description

The driver information center switches are multiplexed switches that are part of the Turn Signal/Multifunction Switch.

The Instrument Cluster provides 5 volts to the MENU switch. The MENU switch is a momentary contact switch that is provided ground through the Turn Signal/Multifunction Switch ground circuit.

The Instrument Cluster provides battery voltage to the UP, DOWN, SET switches. The UP, DOWN, SET switch signal circuits are pulled up to battery voltage in the Instrument Cluster. The Instrument Cluster also provides the UP, DOWN, SET switches with a low reference circuit. The UP, DOWN, SET switch signal circuit is pulled low when a switch is activated. The driver information center UP, DOWN, SET switches are momentary contact switches that connect a series of resistors in a resistor ladder format. The instrument cluster monitors the driver information center UP, DOWN, SET switch signal circuit to determine the switch position. Each switch state - UP, DOWN, SET- corresponds to a certain resistance value. The instrument cluster determines the switch pressed by the voltage drop across the resistors.

Conditions for Running the DTC

- The ignition is in OFF, ACCESSORY or RUN position.
- The system voltage is between 9-16 V.

Conditions for Setting the DTC

B3567 01

The instrument cluster detects that the driver information center switch signal circuit is shorted to battery.

B3567 02

The instrument cluster detects that the driver information center switch signal circuit is shorted to ground.

B3567 04

The instrument cluster detects that the driver information center switch signal circuit is open.

The instrument cluster detects that the driver information center switch is stuck.

Action Taken When the DTC Sets

The instrument cluster ignores the driver information center switch inputs.

Conditions for Clearing the DTC

The DTC will become history if the instrument cluster no longer detects a malfunction.

Reference Information

Schematic Reference

Instrument Cluster Schematics (Buick)**Instrument Cluster Schematics (Chevrolet)**

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE) **COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)**

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify DTC B0158 is not set
 - **If DTC B0158 is set**

Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .
 - **DTC B0158 is not set**
3. Verify the driver information center set, up and down function changes when pressing the set, up or down switch.
 - **If the driver information center does not change**

Refer to Set, Up and Down Switch Malfunction
 - **If the driver information center changes**
4. Verify the driver information center menu function changes when pressing the menu switch.
 - **If the driver information center does not change**

Refer to Menu Switch Malfunction
 - **If the driver information center changes**
5. All OK.

NOTE: Circuit/System Verification must be performed before proceeding with Circuit/System Testing.

Menu Switch Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the X1 harness connector at the S78 Turn Signal/Multifunction Switch, ignition ON.
2. Test for 4.8-5.2 V between the signal circuit terminal 5 and ground.
 - **If less than 4.8 V**
 1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster.
 2. Test for infinite resistance between the signal circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the P16 Instrument Cluster.
 - **If greater than 5.2 V**
 1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster, ignition ON.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the P16 Instrument Cluster.
 - **If between 4.8-5.2 V**
3. Test for less than 10 Ω between the ground circuit terminal 3 and ground.
 - **If 10 Ω or greater**

Repair the open/high resistance in the circuit
 - **If less than 10 Ω**
4. Test or replace the S78 Turn Signal/Multifunction Switch.

Set, Up and Down Switch Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the X1 harness connector at the S78 Turn Signal/Multifunction Switch, ignition ON.
2. Test for less than 10 Ω between the low reference circuit terminal 6 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster.
 2. Test for less than 2 Ω in the low reference circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the P16 Instrument Cluster.
 - **If less than 10 Ω**
3. Test for 9.8-12.2 V between the signal circuit terminal 12 and ground.
 - **If less than 9.8 V**
 1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster.
 2. Test for infinite resistance between the signal circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the P16 Instrument Cluster.
 - **If greater than 12.2 V**

1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster, ignition ON.
2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the P16 Instrument Cluster.
- **If between 9.8-12.2 V**
4. Test or replace the S78 Turn Signal/Multifunction Switch.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Displays and Gauges Component Replacement Reference](#)
- [Control Module References](#) for instrument cluster replacement, programming and setup

DRIVER INFORMATION CENTER DISPLAY 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 Instrument Cluster contains a Driver Information Center which displays vehicle information such as the engine coolant temperature, fuel level, vehicle speed, and other information based on the information received from various modules on the vehicle's serial data bus. The Driver Information Center illuminates a combination of indicators and messages to display the status of various vehicle systems.

Reference Information

Schematic Reference

[Instrument Cluster Schematics \(Buick\)](#) [Instrument Cluster Schematics \(Chevrolet\)](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX \(ENCORE\)](#) [COMPONENT CONNECTOR END VIEWS - INDEX \(TRAX\)](#)

Description and Operation

[Instrument Cluster Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify no DTC is set.
 - **If any DTC is set,**

Diagnose any DTCs first. Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#).

- **If no DTCs are set**

3. Verify all indicators except the engine malfunction indicator illuminate and turn off as commanded when performing the All Indicators test with the scan tool.

- **If any indicators do not illuminate and turn off as commanded**

Replace the P16 Instrument Cluster.

- **If all indicators respond properly**

4. Verify all segments illuminate when performing the Driver Information Center Segments test with the scan tool.

- **If any segments do not illuminate**

Replace the P16 Instrument Cluster.

- **If all segments illuminate properly**

5. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

[Control Module References](#) for instrument cluster or ECM replacement, programming, and setup.

ENGINE OIL PRESSURE GAUGE INACCURATE OR INOPERATIVE

Diagnostic Instructions

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

DTC Descriptors

DTC P0521

Engine Oil Pressure Sensor Performance

DTC P0522

Engine Oil Pressure Sensor Circuit Low Voltage.

DTC P0523

Engine Oil Pressure Sensor Circuit High Voltage

Diagnostic Fault Information

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

Circuit/System Description

The engine oil pressure sensor changes voltage based on the engine oil pressure. The engine oil pressure sensor is a 3-wire sensor comprising of the signal circuit, the low reference circuit and the 5 V reference

circuit. The engine control module (ECM) supplies 5 V to the engine oil pressure sensor via the 5 V reference circuit and provides ground via the low reference circuit. The ECM monitors the signal circuit of the engine oil pressure sensor to determine if the engine oil pressure sensor voltage is within the normal operating range of approximately 1-4 V. When the engine oil pressure is high, the engine oil pressure sensor voltage is high and the ECM senses a high signal voltage. When the engine oil pressure is low, the engine oil pressure sensor voltage is low and the ECM senses a low signal voltage. The ECM sends the engine oil pressure information to the instrument cluster via serial data. The instrument cluster will illuminate or display the engine oil pressure indicator when the engine oil pressure is low.

Conditions for Running the DTC

The engine is running.

Conditions for Setting the DTC

P0521

- The ECM detects that measured oil pressure is at least 47 kPa (6.8 psi) less than or 50 kPa (7.3 psi) higher than the predicted oil pressure.
- The engine oil pressure is outside of a calculated working range determined by engine speed and temperature.
- The above condition is present for greater than 10 s.

P0522

- The ECM detects that the engine oil pressure sensor signal circuit is less than 0.2 V.
- The above condition is present for greater than 10 s.

P0523

- The ECM detects that the engine oil pressure sensor signal circuit is greater than 4.8 V.
- The above condition is present for greater than 10 s.

Action Taken When the DTC Sets

- The ECM records the operating conditions at the time the diagnostics test fails. The ECM displays this information in the Failure Records on the scan tool.
- The instrument cluster 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.

Diagnostic Aids

DTC P0521 can set if engine oil pressure is outside the calculated engine oil pressure model stored in the engine control module. This can be an indication of mechanical engine issues causing lower than expected engine oil pressure.

Reference Information

Schematic Reference

Instrument Cluster Schematics (Buick)Instrument Cluster Schematics (Chevrolet)

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE) COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)

Description and Operation

- [Indicator/Warning Message Description and Operation](#)
- [Instrument Cluster Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

With UDD

1. Ignition ON.
2. Verify the engine oil pressure indicator turns on and off when commanding the All Indicators ON and OFF with a scan tool.
 - **If the engine oil pressure indicator does not turn on and off.**
Replace the P16 Instrument Cluster.
 - **If the engine oil pressure indicator turns on and off**
3. Verify the scan tool Engine Oil Pressure Sensor parameter is 0 psi (0 kPa).
 - **If not 0 psi (0 kPa)**
Refer to Circuit/System Testing.
 - **If 0 psi (0 kPa)**
4. Engine running.
5. Verify actual engine oil pressure is within specified range. Refer to *Oil Pressure Diagnosis and Testing* in [Displays and Gauges Component Replacement Reference](#).
6. Verify the scan tool Engine Oil Pressure parameter is within specified range.
 - **If not within specified range**
Refer to Circuit/System Testing.
 - **If within specified range**
7. Verify the engine oil pressure displayed on Instrument Cluster is within specified range.
 - **If not within specified range**
Test or replace the P16 Instrument Cluster.
 - **If within specified range**
8. All OK.

With UDV or UHS

1. Ignition ON.
2. Verify the scan tool Engine Oil Pressure Sensor parameter is 0 psi (0 kPa).
 - **If not 0 psi (0 kPa)**
Refer to Circuit/System Testing.
 - **If 0 psi (0 kPa)**
3. Engine running.

4. Verify actual engine oil pressure is within specified range. Refer to *Oil Pressure Diagnosis and Testing* in [Displays and Gauges Component Replacement Reference](#).

5. Verify the scan tool Engine Oil Pressure parameter is within specified range.

- **If not within specified range**

Refer to Circuit/System Testing.

- **If within specified range**

6. Verify the engine oil pressure displayed on Instrument Cluster is within specified range.

- **If not within specified range**

Test or replace the P16 Instrument Cluster.

- **If within specified range**

7. All OK.

Circuit/System Testing

NOTE: **Circuit/System Verification must be performed before proceeding with Circuit/System Testing.**

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B37B Engine Oil Pressure Sensor. It may take up to 2 min for all vehicle systems to power down.

2. Test for less than 10 Ω between the low reference circuit terminal 2 and ground.

- **If 10 Ω or greater**

1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.

2. Test for less than 2 Ω in the low reference circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K20 Engine Control Module.

- **If less than 10 Ω**

3. Ignition ON.

4. Test for 4.8-5.2 V between the 5 V reference circuit terminal 3 and ground.

- **If less than 4.8 V**

1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.

2. Test for infinite resistance between the 5 V reference circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance

3. Test for less than 2 Ω in the 5 V reference circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K20 Engine Control Module.

- **If greater than 5.2 V**

1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, ignition ON.

2. Test for less than 1 V between the 5 V reference circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the K20 Engine Control Module.

- **If between 4.8-5.2 V**

5. Verify the scan tool Engine Oil Pressure parameter is less than 35kPa (5psi).

- **If 35kPa (5psi) or above**

1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, ignition ON.

2. Test for less than 1 V between the signal circuit terminal 1 and ground.

- If 1 V or greater, repair the short to voltage on the circuit.

- If less than 1 V, replace the K20 Engine Control Module.
 - **If below 35kPa (5psi)**
6. Install a 3 A fused jumper wire between the signal circuit terminal 1 and the 5 V reference circuit terminal 3.
 7. Engine running.
 8. Verify the scan tool Engine Oil Pressure parameter is greater than 800kPa (116psi).
 - **If 800kPa (116psi) or less**
 1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.
 2. Test for infinite resistance between the signal circuit terminal 1 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K20 Engine Control Module.
 - **If greater than 800kPa (116psi)**
 9. Test or replace the B37B Engine Oil Pressure Sensor.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Displays and Gauges Component Replacement Reference](#)
- [Control Module References](#) for control module replacement, programming and setup

ENGINE OIL PRESSURE 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.

DTC Descriptor

DTC P0520

Engine Oil Pressure Switch Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Signal	1	P0520	P0520
1. Engine Oil Pressure Indicator Malfunction			

Typical Scan Tool Data

ECM - Engine Oil Pressure Switch

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine Running Parameter Normal Range: OK			
Signal	Low	OK	OK

Circuit/System Description

The engine oil pressure 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 engine oil pressure switch opens and the

ECM should detect a high signal voltage input. When the oil pressure is low, the ECM sends a message via serial data to the body control module (BCM). The BCM then sends a message via serial data to the instrument cluster requesting the engine oil pressure indicator turned ON.

Conditions for Running the DTC

- Engine coolant temperature at last engine stop was greater than 80°C (176°F).
- Engine coolant temperature reduced more than 10°C (16°F) since engine off.
- Engine was off more than 60s.
- Ignition on, engine off

Conditions for Setting the DTC

- The ECM detects a high signal voltage of the engine oil pressure switch signal circuit.
- The above condition is present for greater than 5 seconds.

Action Taken When the DTC Sets

The instrument cluster illuminates the service vehicle soon indicator and the oil pressure low indicator.

Conditions for Clearing the DTC

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

Diagnostic Aids

DTC P0520 can set due to inadequate engine oil pressure. This can be an indication of mechanical engine issues causing lower than expected engine oil pressure.

Reference Information

Schematic Reference

Instrument Cluster Schematics (Buick) Instrument Cluster Schematics (Chevrolet)

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE) COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)

Description and Operation

- Instrument Cluster Description and Operation
- Indicator/Warning Message Description and Operation

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.

2. Command the All Indicators test ON and OFF with the scan tool, verify that the engine oil pressure indicator turns ON and OFF.

- **If the engine oil pressure indicator does not turn ON or OFF as commanded**

Replace the P16 Instrument Cluster.

- **If the engine oil pressure indicator turns ON and OFF as commanded**

3. Verify the scan tool Engine Oil Pressure parameter is Low.

- **If not Low**

Refer to Circuit/System Testing.

- **If Low**

4. Engine running.

5. Verify actual engine oil pressure is within specified range. Refer to Oil Pressure Diagnosis and Testing in [Displays and Gauges Component Replacement Reference](#).

6. Verify the scan tool Engine Oil Pressure parameter is OK.

- **If not OK**

Refer to Circuit/System Testing.

- **If OK**

7. All OK.

Circuit/System Testing

NOTE: Circuit/System Verification must be performed before proceeding with Circuit/System Testing.

1. Ignition OFF, disconnect the harness connector at the B37 Engine Oil Pressure Switch, ignition ON.

2. Verify the scan tool Engine Oil Pressure Switch parameter is OK.

- **If not OK**

1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.

2. Test for infinite resistance between the signal circuit terminal 1 (or A) and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the K20 Engine Control Module.

- **If OK**

3. Install a 3 A fused jumper wire between the signal circuit terminal 1 (or A) and ground.

4. Verify the scan tool Engine Oil Pressure Switch parameter is Low.

- **If not Low**

1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, ignition ON.

2. Test for less than 1 V between the signal circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V

3. Test for less than 2 Ω in the signal circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K20 Engine Control Module.

- **If Low**

5. Test or replace the B37 Engine Oil Pressure Switch.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Displays and Gauges Component Replacement Reference](#)
- [Control Module References](#) for ECM replacement, programming and setup

FUEL GAUGE 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 instrument cluster displays the fuel level based on the information from the engine control module (ECM). The ECM converts the data from the fuel level sensors to a fuel level signal. The ECM sends the fuel level signal via a High Speed CAN-Bus signal to the body control module (BCM). The BCM then sends the information via a Low Speed CAN-Bus signal to the instrument cluster to display the fuel level. When the fuel level falls below 11% the instrument cluster illuminates the low fuel level indicator.

Reference Information

Schematic Reference

[Instrument Cluster Schematics \(Buick\)](#) [Instrument Cluster Schematics \(Chevrolet\)](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX \(ENCORE\)](#) [COMPONENT CONNECTOR END VIEWS - INDEX \(TRAX\)](#)

Description and Operation

[Instrument Cluster Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

1. Ignition ON, perform the Instrument Cluster Gauge Sweep test with the scan tool, verify that the fuel level gauge sweeps from its low to high position.
 - **If the fuel level gauge does not sweep**

Replace the P16 Instrument Cluster.
 - **If the fuel level gauge sweeps**
2. Command the All Indicators test ON and OFF with the scan tool, verify that the low fuel level indicator turns ON and OFF.
 - **If the low fuel level indicator does not turn ON or OFF as commanded**

Replace the P16 Instrument Cluster.
 - **If the low fuel level indicator turns ON and OFF as commanded**

3. Observe the scan tool ECM Fuel Level Sensor parameter. The reading should be 0.5-3.5 V and vary with fuel level.

- **If the reading does not vary with fuel level**

Refer to [DTC P0461-P0464 \(FWD\)](#) for FWD or [DTC P0461-P0464, P2066, P2067, or P2068 \(AWD\)](#) for AWD.

- **If the reading varies with fuel level**

4. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

[Control Module References](#) for instrument cluster or ECM replacement, programming and setup

INSTRUMENT CLUSTER GAUGES MALFUNCTION (ENCORE ONLY)

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 cluster displays the engine coolant temperature, fuel level, vehicle speed and the engine speed based on the information from the engine control module (ECM). The ECM sends information via a serial data to the body control module (BCM). The BCM then sends the information via serial data to the instrument cluster to display the engine coolant temperature, fuel level, the engine speed, the vehicle speed and the distance travelled, either in kilometers or miles, based on the vehicle requirements.

Reference Information

Schematic Reference

[Instrument Cluster Schematics \(Buick\)](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX \(ENCORE\)](#)

Description and Operation

[Instrument Cluster Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

1. Verify no DTC is set.

- **If any DTC is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .

- **If no DTCs are set**

2. Ignition ON, perform the Instrument Cluster Gauge Sweep test with the scan tool, verify that all gauges sweep from their low to high position.

- **If any gauge does not sweep**

Replace the P16 Instrument Cluster.

- **If all gauges sweep**

3. Drive the vehicle, verify the gauge values matches the values on the scan tool.

- **If the values do not match**

Replace the P16 Instrument Cluster.

- **If the values match the scan tool**

4. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

[Control Module References](#) for Instrument Cluster or ECM replacement, programming, and setup.

INSTRUMENT CLUSTER PROGRAMMING MALFUNCTION (WITH UDD)

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 X92 USB Receptacle is located behind the instrument panel compartment and is connected to the Instrument Cluster via a USB cable. The X92 USB Receptacle is only used for programming the Instrument Cluster via SPS programming.

Reference Information

Schematic Reference

[Instrument Cluster Schematics \(Buick\)](#)[Instrument Cluster Schematics \(Chevrolet\)](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX \(ENCORE\)](#) [COMPONENT CONNECTOR END VIEWS - INDEX \(TRAX\)](#)

Description and Operation

[Instrument Cluster Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Testing

NOTE: This procedure should only be completed when the Instrument Cluster fails to read the USB thumb drive during a USB programming event.

1. Verify the USB cable is properly connected and there is no damage to the cable or connections.
 - **If connection problems or cable damage is noted.**
Perform the appropriate repair or replacement to correct any issues.
 - **If no connection problems or cable damage is noted.**
2. Connect the EL-50334-50 to the X92 USB Receptacle connector and the Instrument Cluster connector X2.
3. Ignition ON.
4. Verify the Instrument Cluster completes USB Programming properly following SPS instructions..
 - **If Instrument Cluster does not program properly**
 1. Replace the X92 USB Receptacle.
 2. Verify the Instrument Cluster completes USB Programming properly following SPS instructions.
 - **If Instrument Cluster does not operate properly**
Replace the P16 Instrument Cluster.
 - **If Instrument Cluster programs properly**
All OK
 - **If Instrument Cluster programs properly**
5. Replace the USB harness.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Displays and Gauges Component Replacement Reference](#)
- [Control Module References](#) for control module replacement, programming, and setup.

ODOMETER TRIP/RESET SWITCH MALFUNCTION (TRAX ONLY)

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 cluster displays the travelled distance based on the information from the engine control module (ECM). The ECM converts the data from the vehicle speed sensor to a distance signal. The ECM sends the distance information via serial data to the body control module (BCM). The BCM then sends the information via serial data to the instrument cluster to display the vehicle odometer and trip odometer. When the instrument cluster detects the activation of the trip stem and a press and hold of the stem, it resets the trip odometer information to zero.

Reference Information

[Instrument Cluster Schematics \(Chevrolet\)](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX \(TRAX\)](#)

Description and Operation

[Instrument Cluster Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

[Circuit/System Verification](#)

1. Ignition ON.
2. Verify the instrument cluster changes from odometer to trip when the odometer trip reset stem on the instrument cluster is pressed.
 - **If the instrument cluster does not change from odometer to trip**
Replace the P16 Instrument Cluster.
 - **If the instrument cluster changes from odometer to trip**
3. Verify the instrument cluster resets the trip odometer display when the odometer trip reset stem on the cluster is pressed for approximately 2 seconds.
 - **If the instrument cluster does not reset the trip odometer display**
Replace the P16 Instrument Cluster.
 - **If the instrument cluster resets the trip odometer display**
4. All OK.

[Repair Instructions](#)

Perform the [Diagnostic Repair Verification](#) after completing the repair.

[Control Module References](#) for instrument cluster replacement, programming, and setup.

[OUTSIDE AIR TEMPERATURE DISPLAY MALFUNCTION \(WITH LE2\)](#)

[Diagnostic Instructions](#)

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

[DTC Descriptors](#)

[DTC P0071](#)

Ambient Air Temperature Sensor Performance

DTC P0072

Ambient Air Temperature Sensor Circuit Low Voltage

DTC P0073

Ambient Air Temperature Sensor Circuit High Voltage

DTC P0074

Ambient Air Temperature Sensor Circuit Intermittent

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	P0072	P0073	P0073	P0071/P0074
Low Reference	-	P0073	-	P0071

Circuit/System Description

For an overview of the component/system, refer to: [Instrument Cluster Description and Operation](#)

Circuit	Description
Signal	The control module input circuit has an internal resistance connected to 5 V.
Low Reference	Grounded through the control module.

Component	Description
B9 Ambient Air Temperature Sensor	The temperature sensor is a negative temperature coefficient thermistor, a resistor which changes based on temperature.
K20 Engine Control Module	The K20 control module monitors the B9 ambient air temperature sensor. The control module converts the analog voltage signal input to a temperature value.

Conditions for Running the DTC

Ignition $\hat{\mathbf{A}}$ On / Vehicle $\hat{\mathbf{A}}$ In Service Mode

Conditions for Setting the DTC

P0071

The difference between the following parameters is greater than a predefined value: Outside Ambient Air Temperature Sensor Signal & Intake Air Temperature Sensor Signal

P0072

Outside Ambient Air Temperature Sensor Signal=Greater than 88 $\hat{\mathbf{A}}$ °C (190 $\hat{\mathbf{A}}$ °F)

P0073

Outside Ambient Air Temperature Sensor Signal=Less than -40 $\hat{\mathbf{A}}$ °C (-40 $\hat{\mathbf{A}}$ °F)

P0074

Outside Ambient Air Temperature Sensor Signal=Not Plausible

Action Taken When the DTC Sets

- DTCs listed in the DTC Descriptor Category=Type B DTC
- The DIC will display SERVICE A/C SYSTEM.

- The control module uses default replacement values.

Conditions for Clearing the DTC

The conditions for setting the DTC no longer exist.

Diagnostic Aids

The displayed temperature is a filtered value that updates periodically while driving. The value rarely changes when the vehicle is parked.

For an overview of the component/system, refer to: [Instrument Cluster Description and Operation](#)

Reference Information

Schematic Reference

[Instrument Cluster Schematics \(Buick\)](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX \(ENCORE\)](#)

Description and Operation

[Instrument Cluster Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

DTC Type Reference

[Powertrain Diagnostic Trouble Code \(DTC\) Type Definitions](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

1. Ignition $\hat{\gg}$ On / Vehicle $\hat{\gg}$ In Service Mode
2. Verify the scan tool parameter: Ambient Air Temperature = -40 to 88°C (-40 to 190°F) and changes
 - If not between -40 to 88°C (-40 to 190°F) or does not change
Refer to: Circuit/System Testing
 - If between -40 to 88°C (-40 to 190°F) and changes
3. All OK.

Circuit/System Testing

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

1. Ignition/Vehicle & All vehicle systems $\hat{\gg}$ Off

2. Disconnect the electrical connector: B9 Ambient Air Temperature Sensor
3. Test for less than 10 Ω between the test points: Low Reference circuit terminal B or 2 & Ground
 - **If 10 Ω or greater**
 1. Disconnect the electrical connector: K20 Engine Control Module
 2. Test for less than 2 Ω between the test points: Low Reference circuit terminal B or 2 @ Component harness & The other end of the circuit
 - If 2 Ω or greater $\hat{\text{A}} \gg$ Repair the open/high resistance in the circuit.
 - If less than 2 Ω $\hat{\text{A}} \gg$ Replace the component: K20 Engine Control Module
 - **If less than 10 Ω**
4. Ignition $\hat{\text{A}} \gg$ On / Vehicle $\hat{\text{A}} \gg$ In Service Mode
5. Verify the scan tool parameter: Ambient Air Temperature = Less than -34 $^{\circ}\text{C}$ (-30 $^{\circ}\text{F}$)
 - **If -34 $^{\circ}\text{C}$ (-30 $^{\circ}\text{F}$) or warmer**
 1. Ignition/Vehicle $\hat{\text{A}} \gg$ Off
 2. Disconnect the electrical connector: K20 Engine Control Module
 3. Test for infinite resistance between the test points: Signal circuit terminal A or 1 @ Component harness & Ground
 - If less than infinite resistance $\hat{\text{A}} \gg$ Repair the short to ground on the circuit.
 - If infinite resistance $\hat{\text{A}} \gg$ Replace the component: K20 Engine Control Module
 - **If -35 $^{\circ}\text{C}$ (-31 $^{\circ}\text{F}$) or colder**
6. Connect a 3 A fused jumper wire between the test points: Signal circuit terminal A or 2 & Low Reference circuit terminal B or 2
7. Verify the scan tool parameter: Ambient Air Temperature = Greater than 143 $^{\circ}\text{C}$ (290 $^{\circ}\text{F}$)
 - **If 143 $^{\circ}\text{C}$ (290 $^{\circ}\text{F}$) or colder**
 1. Ignition/Vehicle $\hat{\text{A}} \gg$ Off & Remove $\hat{\text{A}} \gg$ Jumper wire(s)
 2. Disconnect the electrical connector: K20 Engine Control Module
 3. Ignition $\hat{\text{A}} \gg$ On / Vehicle $\hat{\text{A}} \gg$ In Service Mode
 4. Test for less than 1 V between the test points: Signal circuit @ Component harness & Ground
 - If 1 V or greater $\hat{\text{A}} \gg$ Repair the short to voltage on the circuit.
 - If less than 1 V
 5. Ignition/Vehicle $\hat{\text{A}} \gg$ Off
 6. Test for less than 2 Ω between the test points: Signal circuit @ Component harness & The other end of the circuit
 - If 2 Ω or greater $\hat{\text{A}} \gg$ Repair the open/high resistance in the circuit.
 - If less than 2 Ω $\hat{\text{A}} \gg$ Replace the component: K20 Engine Control Module
 - **If 144 $^{\circ}\text{C}$ (291 $^{\circ}\text{F}$) or warmer**
8. Test or replace the component: B9 Ambient Air Temperature Sensor

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Displays and Gauges Component Replacement Reference](#)
- [Control Module References](#) for control module replacement, programming and setup

OUTSIDE AIR TEMPERATURE DISPLAY MALFUNCTION (WITHOUT LE2)

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 B0158 02

Ambient Air Temperature Sensor Circuit Short to Ground

DTC B0158 05

Ambient Air Temperature Sensor Circuit High Voltage/Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	B0158 02	B0158 05	B0158 05	-
Low Reference	-	B0158 05	-	-

Circuit/System Description

The instrument cluster monitors the ambient air temperature sensor with a low reference circuit and signal circuit. The instrument cluster monitors the voltage drop across the sensor, which is inversely proportional to temperature. When the ambient air temperature is cold, the resistance of the sensor is high. When the ambient air temperature is warm, the resistance of the sensors is low. The instrument cluster converts the voltage value to a temperature value. Based on application, the Instrument Cluster either displays the temperature or sends the value via serial data to the Info Display Module for display.

Conditions for Running the DTC

The system voltage is between 9-16 V.

Conditions for Setting the DTC

B0158 02

The instrument cluster detects the sensor signal is more than 88Â°C (190Â°F).

B0158 05

The instrument cluster detects the sensor signal is less than -40Â°C (-40Â°F).

Action Taken When the DTC Sets

The instrument cluster uses a default air temperature value for further calculations. The instrument cluster will display -Â°C (-Â°F). A/C compressor engagement may be disabled.

Conditions for Clearing the DTC

The DTC will become history if the instrument cluster no longer detects a malfunction.

Diagnostic Aids

The outside air temperature display on the Info Display Module is a buffered value. It is not a live value when the vehicle is parked, it periodically updates while driving the vehicle. For more information on how the display is updated, refer to [Instrument Cluster Description and Operation](#).

Reference Information

Schematic Reference

[Instrument Cluster Schematics \(Buick\)](#)[Instrument Cluster Schematics \(Chevrolet\)](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX \(ENCORE\)](#), [COMPONENT CONNECTOR END VIEWS - INDEX \(TRAX\)](#)

Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool Ambient Air Temperature parameter is between -40°C (-40°F) and $+88^{\circ}\text{C}$ ($+190^{\circ}\text{F}$) and changes with air temperature changes.
 - **If not between -40°C (-40°F) and $+88^{\circ}\text{C}$ ($+190^{\circ}\text{F}$) or changes with air temperature changes**

Refer to Circuit/System Testing.
 - **If between -40°C (-40°F) and $+88^{\circ}\text{C}$ ($+190^{\circ}\text{F}$) and changes with air temperature changes**
3. Perform the Instrument Cluster Ambient Air Temperature Instant Update special function with the scan tool
4. Verify the scan tool Ambient Air Temperature parameter is within five degrees of actual ambient air temperature.
 - **If not within five degrees of actual ambient air temperature**

Refer to Circuit/System Testing.
 - **If within five degrees of actual ambient air temperature**
5. All OK.

Circuit/System Testing

NOTE: **Circuit/System Verification must be performed before proceeding with Circuit/System Testing.**

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B9 Ambient Air Temperature Sensor. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than $10\ \Omega$ between the low reference circuit terminal A (or 1) and ground.
 - **If $10\ \Omega$ or greater**
 1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster.
 2. Test for less than $2\ \Omega$ in the low reference circuit end to end.
 - If $2\ \Omega$ or greater, repair the open/high resistance in the circuit.
 - If less than $2\ \Omega$, replace the P16 Instrument Cluster.
 - **If less than $10\ \Omega$**
3. Ignition ON.
4. Verify the scan tool Ambient Air Temperature parameter is greater than 98%.
 - **If 98% or less**
 1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster.
 2. Test for infinite resistance between the signal circuit terminal B (or 2) and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the P16 Instrument Cluster.

- **If greater than 98%**

5. Install a 3 A fused jumper wire between the signal circuit terminal B (or 2) and the low reference circuit terminal A (or 1).

6. Verify the scan tool Ambient Air Temperature parameter is less than 8%.

- **If 8% or greater**

1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster, ignition ON.

2. Test for less than 1 V between the signal circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V

3. Ignition OFF

4. Test for less than 2 Ω in the signal circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the P16 Instrument Cluster.

- **If less than 8%**

7. Test or replace the B9 Ambient Air Temperature Sensor.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Displays and Gauges Component Replacement Reference](#)
- [Control Module References](#) for instrument cluster replacement, programming and setup

SPEEDOMETER AND/OR ODOMETER MALFUNCTION (ENCORE ONLY)

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 cluster displays the engine coolant temperature, fuel level, vehicle speed and the engine speed based on the information from the engine control module (ECM). The ECM sends information via a High Speed CAN-Bus signal to the body control module (BCM). The BCM then sends the information via a Low Speed CAN-Bus signal to the instrument cluster to display the engine coolant temperature, fuel level, the engine speed, the vehicle speed and the distance travelled, either in kilometers or miles, based on the vehicle requirements. The instrument cluster will display dashes when its VIN does not match the VIN received from the BCM.

Diagnostic Aids

If the VIN mismatch is corrected the odometer will once again be displayed in the instrument cluster. If the vehicle is driven for a calibrated distance with a VIN mismatch, it will cause the instrument cluster odometer to enter into an error mode and lock itself. When this occurs the dashes will remain on the display even after correcting the VIN mismatch. The vehicle odometer status data display on the scan tool can be used to identify a locked odometer. The only way to unlock the instrument cluster (clear the dashes from the display) is to perform an SPS programming event. Failure to follow the diagnostic and programming procedures may result in either an improper odometer value or a module replacement.

Reference Information

Schematic Reference

[Instrument Cluster Schematics \(Buick\)](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX \(ENCORE\)](#)

Instrument Cluster Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

1. Verify no DTC is set.
 - **If any DTC is set**

Diagnose DTCs first. Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .
 - **If no DTCs are set**
2. Ignition ON, perform the Speedometer Sweep Test with the scan tool, verify the speedometer sweeps from low to high position.
 - **If speedometer does not sweep**

Replace the P16 Instrument Cluster.
 - **If speedometer sweeps properly**
3. Drive the vehicle, verify the speedometer gauge value matches the Vehicle Speed parameter on the scan tool.
 - **If the values do not match**

Replace the P16 Instrument Cluster.
 - **If the speedometer value matches the scan tool parameter**
4. Drive the vehicle, verify the odometer display and the displayed distance counts up while driving.
 - **If the odometer displays only "----" (dashes)**

Refer to Circuit/System Testing.
 - **If the odometer display does not count up**

Replace the P16 Instrument Cluster.
 - **If speedometer sweeps and displays the correct value, and the odometer display counts up**
5. All OK.

Circuit/System Testing

NOTE:

- **Circuit/System Verification must be performed before proceeding with Circuit/System Testing.**
- **If there are multiple modules not original to the vehicle and are not new correctly configured service parts, SPS may not be able to proper read or recover the vehicle odometer value. Follow government rules and documentation (including vehicle identification) regarding inaccurate/unknown odometer values.**

Instrument Cluster is Showing "----" (Dashes)

Correcting VIN mismatch - odometer is still Inactive.

1. Verify the vehicle odometer status with a scan tool. The reading should be Inactive.
 - **If the reading is Active**
Refer to correcting VIN mismatch - odometer Active.
 - **If the reading is Inactive**
2. Using the scan tool, verify the BCM VIN matches the vehicle VIN placard.
 - **If the VIN does not match**
Reprogram the BCM, then proceed to Step 3.
 - **If the VIN matches**
3. Using the scan tool, verify the instrument cluster VIN matches the vehicle VIN placard.
 - **If the VIN does not match**
Reprogram the instrument cluster. Then proceed with step 4.
 - **If the VIN matches**
4. Ignition ON, verify the instrument cluster is displaying the correct value.
 - **If the instrument cluster is still displaying "----" (dashes)**
Replace the P16 Instrument Cluster.

Instrument Cluster is Showing "----" (Dashes)

Correcting VIN mismatch - odometer is Active.

1. Verify the vehicle odometer status with a scan tool. The reading should be Inactive.
 - **If the reading is Inactive**
Refer to Correcting VIN mismatch - odometer Inactive.
 - **If the reading is Active**
2. Using the scan tool, verify the instrument cluster VIN matches the vehicle's VIN placard.
 - **If the VIN does not match**
Reprogram the Instrument Cluster. Then proceed with step 3.
 - **If the VIN matches**
3. Perform the BCM setup procedure in SPS.
4. Ignition ON, verify the instrument cluster is displaying the correct value.
 - **If the instrument cluster is still displaying "----" (dashes)**
Replace the P16 Instrument Cluster.
 - **If instrument cluster is displaying the correct value**
5. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

[Control Module References](#) for instrument cluster, BCM or ECM replacement, programming, and setup

TACHOMETER INACCURATE OR INOPERATIVE (TRAX ONLY)

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 cluster displays the engine coolant temperature, fuel level, vehicle speed and the engine speed based on the information from the engine control module (ECM). The ECM sends information via a High Speed CAN-Bus signal to the body control module (BCM). The BCM then sends the information via a Low Speed CAN-Bus signal to the instrument cluster to display the engine coolant temperature, fuel level, the engine speed, the vehicle speed and the distance travelled, either in kilometers or miles, based on the vehicle requirements.

Reference Information

Schematic Reference

Instrument Cluster Schematics (Buick)**Instrument Cluster Schematics (Chevrolet)**

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)

Description and Operation

Instrument Cluster Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify no DTC is set.
 - **If any DTC is set**
diagnose DTCs first.
 - **If no DTCs are set**
2. Ignition ON, perform the Tachometer Gauge Sweep test with the scan tool, verify tachometer sweeps from low to high position.
 - **If tachometer does not sweep**
replace the P16 Instrument Cluster.
 - **If tachometer sweeps properly**
3. Engine running, verify the tachometer value matches the Engine Speed parameter on the scan tool.
 - **If the value does not match**
replace the P16 Instrument Cluster.
 - **If the tachometer value matches the value displayed on the scan tool**
4. Replace the K20 Engine Control Module.

Perform the [Diagnostic Repair Verification](#) after completing the repair.

[Control Module References](#) for instrument cluster or ECM replacement, programming, and setup.

REPAIR INSTRUCTIONS

AMBIENT AIR TEMPERATURE SENSOR REPLACEMENT

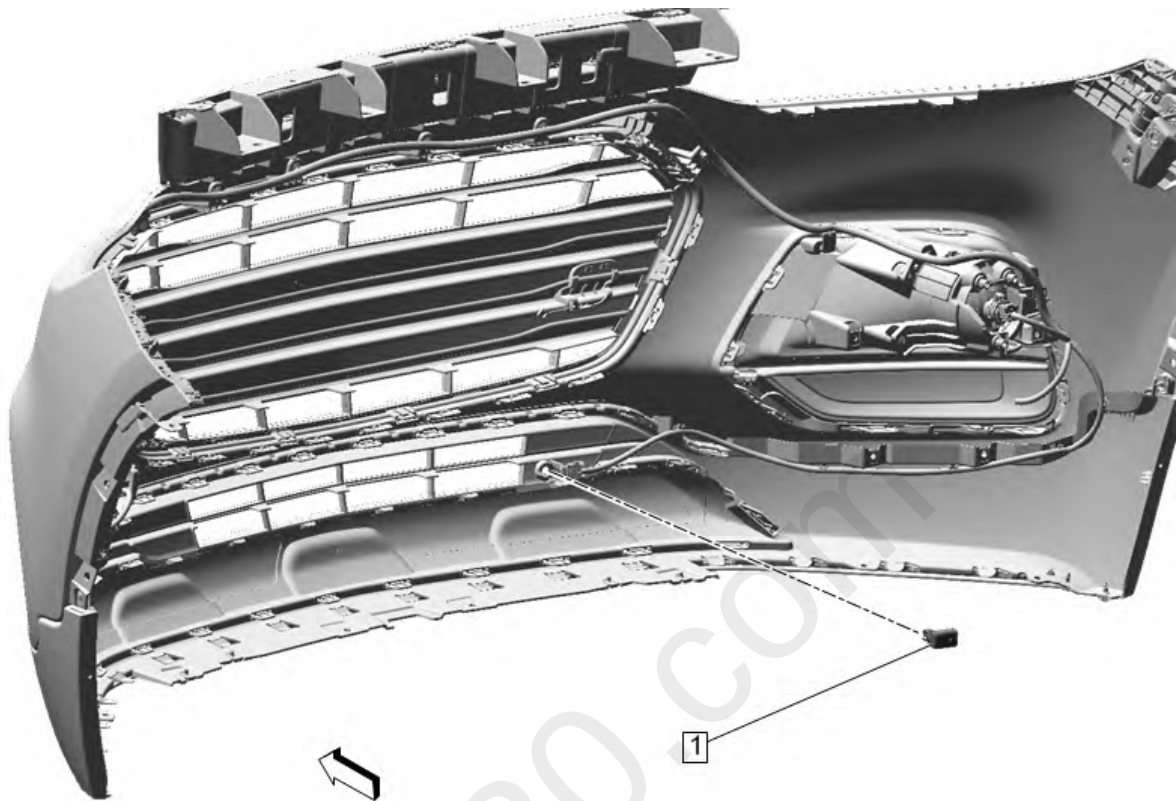


Fig. 11: Ambient Air Temperature Sensor
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Front Bumper Fascia Replacement (Chevrolet)</u> <u>Front Bumper Fascia Replacement (Buick)</u>	
1	Ambient Air Temperature Sensor Procedure 1. Squeeze the tabs on the ambient air temperature sensor, and push ambient air temperature sensor back out of the fascia. 2. Disconnect the electrical connector.

INSTRUMENT CLUSTER REPLACEMENT (BUICK)

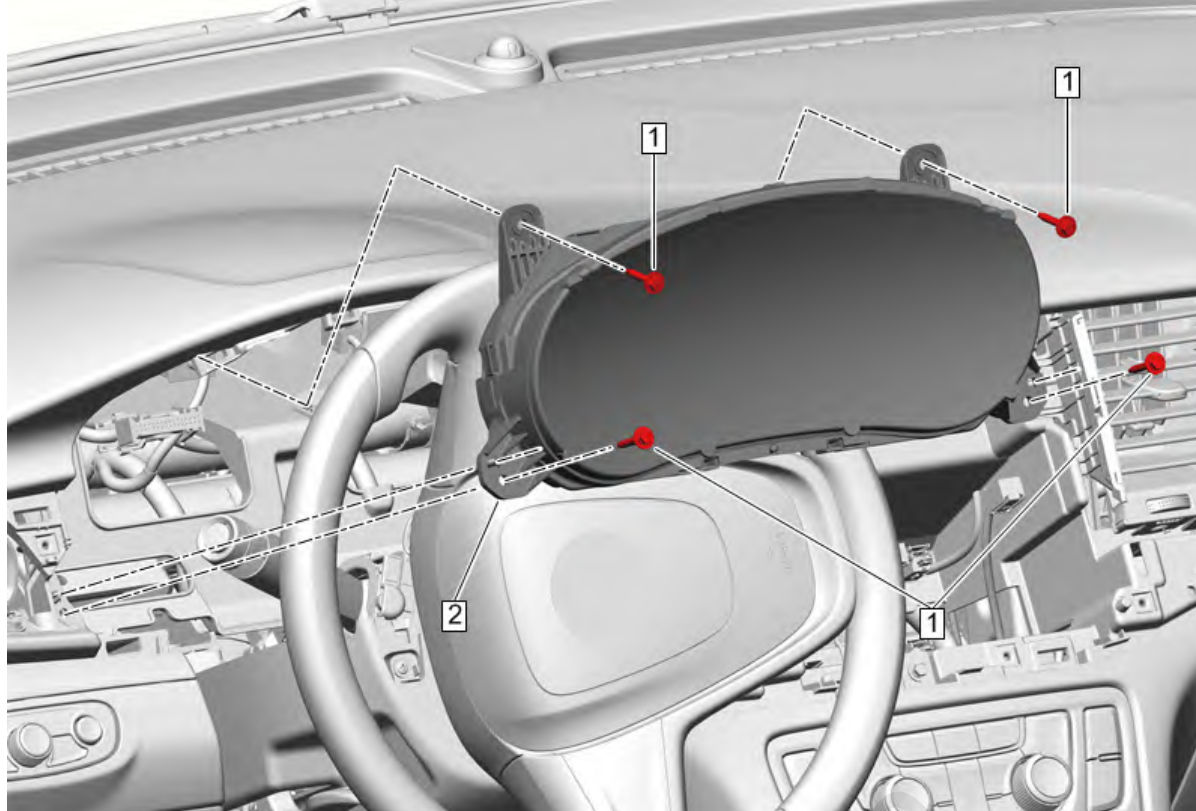


Fig. 12: Instrument Cluster (Encore)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Instrument Panel Outer Air Outlet Replacement - Left Side (Buick). 2. Steering Column Upper Trim Cover Replacement (Buick, With BTM).	
1	Instrument Cluster Bolt (Qty: 4) CAUTION: Refer to Fastener Caution . Tighten 2.5 N.m (22 lb in)
2	Instrument Cluster Procedure 1. Disconnect the electrical connector. 2. Perform the necessary programming and setup procedure: Control Module References

INSTRUMENT CLUSTER REPLACEMENT (CHEVROLET)

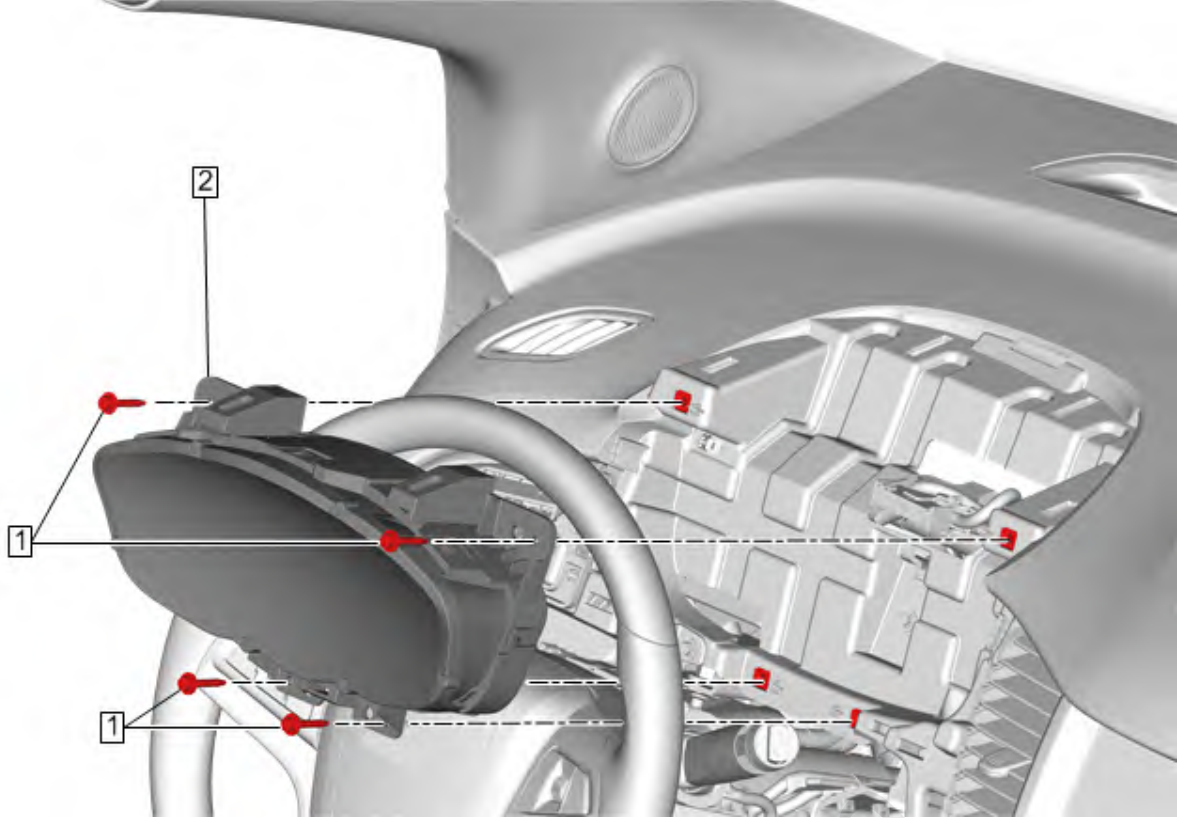


Fig. 13: Instrument Cluster (Trax)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Instrument Panel Instrument Cluster Hood Replacement (Chevrolet)</u>	
1	Instrument Cluster Bolt (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 2.5 N.m (22 lb in)
2	Instrument Cluster Procedure 1. Disconnect the electrical connector. 2. Perform the necessary programming and setup procedure: <u>Control Module References</u>

FUEL ECONOMY SWITCH REPLACEMENT (BUICK)



Fig. 14: Fuel Economy Switch (Encore)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Instrument Panel Accessory Bezel Replacement (Buick)</u>	
1	Fuel Economy Switch Procedure Release the retaining tabs.

FUEL ECONOMY SWITCH REPLACEMENT (CHEVROLET)

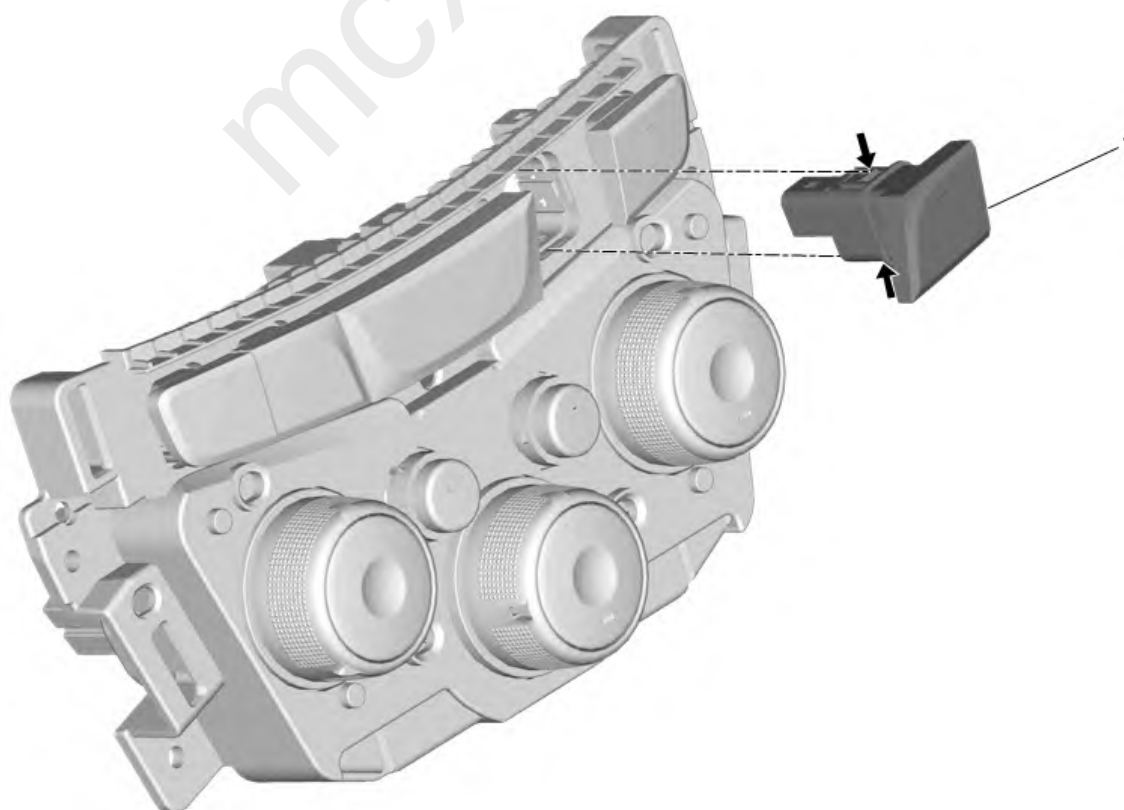


Fig. 15: Fuel Economy Switch (Trax)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Heater and Air Conditioning Control with Cable Control Replacement (C60).</u>	
1	Fuel Economy Switch Procedure Release the retaining tabs.

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 speakers. The radio receives audible warning requests via the serial data circuit. If the radio receives multiple audible warning requests, the warning with the highest priority sounds first. The radio is the chime producer. The following lists the audible warning sounds:

1. Single pulse gong
2. Multiple pulse gong
3. Single pulse beep
4. Multiple pulse beep
5. Click
6. Clack

Fasten Safety Belt Warning

The chime producer activates the fasten safety belt audible warning as requested by the body control module (BCM). The BCM sends a serial data message to the chime producer indicating the chime as a multiple gong. 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 serial data message to the BCM indicating the seat belt status. The instrument cluster receives a serial data message from the BCM indicating the driver seat belt status.

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

Lights On Warning

The chime producer activates the lights on warning as requested by the BCM. The BCM sends a serial data message to the chime producer indicating the chime as a multiple gong. 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 multiple control modules. The BCM, electronic brake control module or the parking brake control module sends a serial data message to the chime producer indicating the chime as a multiple gong. 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 instrument cluster receives a serial data message from the engine control module (ECM) indicating the vehicle speed.

- The BCM determines that the parking brake is engaged and the signal circuit is low.
- The brake fluid is low.

Key-In-Ignition Warning

The chime producer activates the key-in-ignition audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer indicating the chime as a multiple gong. 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.

Door Ajar Warning

The chime producer activates the door ajar audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer indicating the chime frequency of a medium rate and continuous duration. The door ajar warning sounds and the appropriate door ajar indicator illuminates in the driver information center when 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 instrument cluster also receives a serial data message from the BCM indicating the door ajar status.

Object Detection

The chime producer activates the object detection audible warning as requested by the object alarm module. When an object is within the measuring range of the sensor, the ultrasonic pulse is reflected and is received by the sending or a neighboring sensor. The sensor converts this signal into a voltage signal and sends this signal to the object alarm module. The object alarm module evaluates the received sensor signals. As soon as an object is within the measuring range, the object alarm module sends a message via CAN-Bus to the chime producer in order to give out the acoustic distance signal. The measuring range is between 30-120 cm (11.81-47.24 in). From a distance of 120 cm (47.24 in), the acoustic signal is active. The frequency of the beep sound increases with decreasing distance. From a distance less than 30 cm (11.81 in), the sound becomes continuous.

Additional Warnings

The following warnings have an associated instrument cluster indicator or driver information center message:

- Turn Signal Indicators-The chime producer activates the audible warning as requested by the BCM. The chime produces two different chimes, one when the turn signal turns off and another when the turn signal turns on.
- Vehicle Overspeed Message-The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer.
- Fuel Level Low Message-The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer.
- Oil Pressure Indicator-The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer.
- Park Assist Fault Clean Rear Bumper Message-The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer.
- Tire Pressure Low Indicator-The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer.

Refer to [Indicator/Warning Message Description and Operation](#).

COMPASS CALIBRATION AND MAGNETIC VARIANCE (DRIVER INFORMATION CENTER (DIC))

Compass Calibration

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

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

Compass Magnetic Variation Adjustment

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

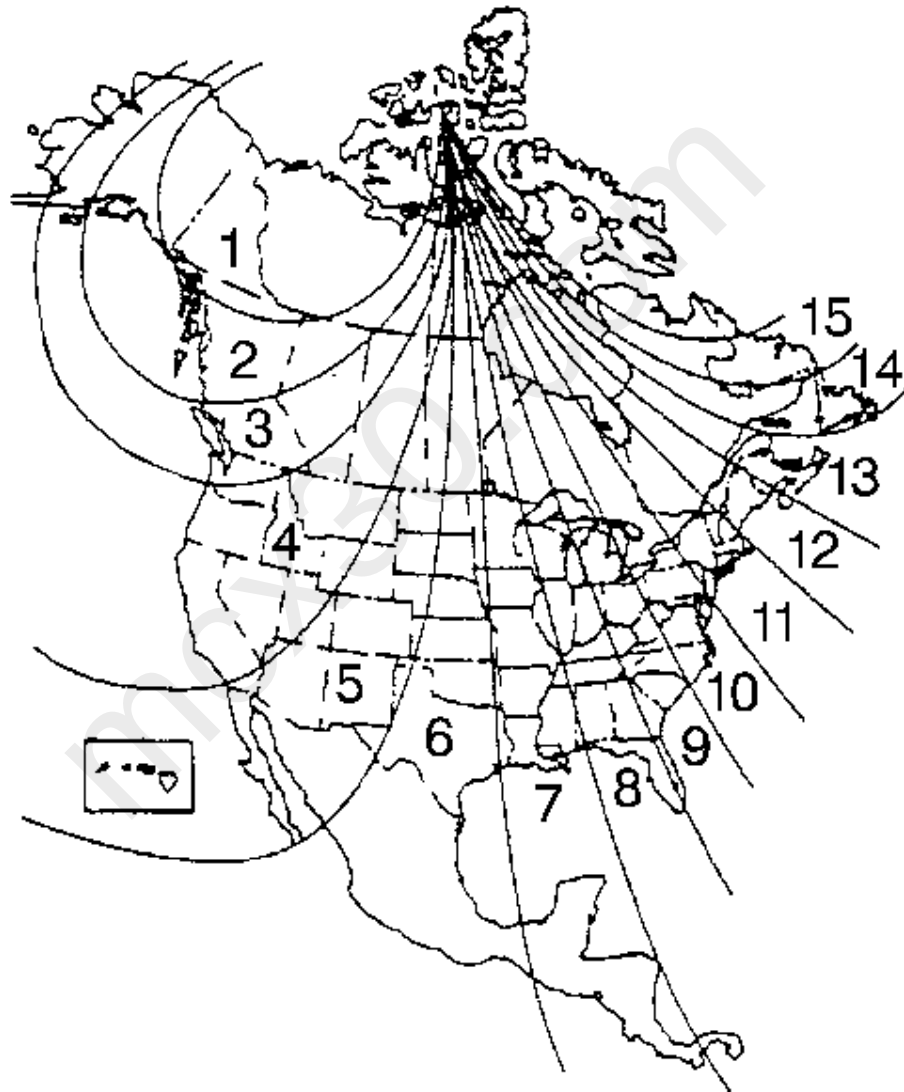


Fig. 16: Illustrating Magnetic Variation Zones
Courtesy of GENERAL MOTORS COMPANY

1. Locate your geographic location. Refer to the variation zone map.
2. Turn ON the ignition with the engine OFF.
3. Press the vehicle information button until PRESS TO CHANGE COMPASS ZONE displays on the DIC.
4. Press the set/reset button to scroll through and select the appropriate variance zone.

5. Navigate to one of the trip/fuel menu screens to view the direction the vehicle is moving. This will be shown in the top right corner of the DIC display.

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

DRIVER INFORMATION CENTER (DIC) DESCRIPTION AND OPERATION (UPLEVEL INSTRUMENT CLUSTER)

In the lower middle of the instrument cluster, an additional display is installed. Its task is to give additional information, such as an odometer or error codes/warning messages. Refer to

[Indicator/Warning Message Description and Operation](#).

There are 4 or 5 switch functions for the driver information center:

- Menu
- Set/Clear
- Up
- Down
- Odometer Trip Reset Stem (if equipped)

Menu

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

Up and Down

The Up and the Down switches are used to navigate within the menus. Cycle through the following menu parameters by successive pressing of the Down switch.

Vehicle Information Menu

- Units Menu
- Speed Warning

Trip/Fuel Information Menu

- Trip A
- Fuel Range
- Average Fuel Economy
- Instantaneous Fuel Economy
- Average Vehicle Speed

Set/Clear

The Set/Clear switch is used to reset or enter various displays such as the oil life percentage, fuel economy, etc.

Odometer Trip Reset Stem (if equipped)

The Odometer Trip Reset Stem switch is used to reset the trip odometer and to change the display from odometer to trip odometer.

Trip A

The trip odometer can be accessed through the driver information center switch Up/Down function.

Trip Display

Driver Information Center Trip Display	Range		
	Europe-SI	USA	GB

Driver Information Center Trip Display	Range		
	Europe-SI	USA	GB
TRIP A	#####.##km	#####.## miles	#####.## miles

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

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

The engine control module (ECM) sends the fuel range value to the instrument cluster. The instrument cluster receives a serial data message with fuel information. The fuel range value is retained during ignition OFF and can be changed between Europe-SI, USA and GB units by accessing the driver information center Units menu. The Fuel Range display cannot be reset. LOW is displayed when fuel range is below a predetermined value.

Average Fuel Economy

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

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

The ECM sends the average fuel economy serial data message to the instrument cluster. 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 options menu.

Instantaneous Fuel Economy

The ECM sends the instantaneous fuel economy serial data message to the instrument cluster. The value of this mode can be changed between English units and metric units by selecting from the driver information center options menu.

Average Vehicle Speed

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

- 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

Outside Air Temperature

On vehicles with radio delete, the outside air temperature is displayed on the driver information center. On vehicles with a radio, the outside air temperature is displayed on the center stack display screen. The outside air temperature sensor is wired directly to the instrument cluster. The sensor varies its resistance with temperature. The instrument cluster reads the resistance value to determine temperature. The time of and rate of the temperature update is based on an algorithm in the cluster software. Factors such as, last reading, current reading, length of time vehicle is been off/on, power mode, vehicle speed, driven distance, and sensor location are all considered by the cluster to know when to update the displayed temperature. For example, if the sensor is located near the engine compartment, and the vehicle has been turned off for only 10 minutes then restarted, the cluster will wait until the vehicle is driven to get more accurate air flow across the sensor before it updates the display.

Units Menu

The unit mode is used to toggle between Europe-SI, USA and GB units and can be accessed through the driver information center Menu switch and the driver information center Set/Reset switch.

Compass (w/ UE1)

The vehicle may have a compass display on the Driver Information Center. The compass receives its heading and other information from the Global Positioning System (GPS) antenna. If applicable, the GPS antenna is located with the telematics communication interface control module.

Odometer

The instrument cluster displays the vehicle odometer in the driver information center. The ECM send a distance rolling count message on GMLAN to the body control module (BCM). The BCM uses this information to calculate the vehicle odometer. This odometer value is then sent to the instrument cluster on GMLAN. The instrument cluster does not calculate the odometer. The odometer displays miles or kilometers as selected in the Units menu.

The odometer value is stored in multiple modules. The instrument cluster is a secondary storage module for the odometer, while the BCM is the primary storage and accumulator.

In addition to storing the odometer value for the vehicle, the instrument cluster and the BCM store the VIN. Software checks are performed to ensure these modules, and their stored odometer information, can not be move or transferred between different vehicles.

If the VINs do not match, the instrument cluster will go into an error mode and display "----" (dashes). If the VIN mismatch exists over a calibrated distance, the instrument cluster will "lock" the odometer display and only show dashes, even if the VIN mismatch is subsequently correct. The only way to clear or "unlock" the instrument cluster is to perform a BCM programming event using SPS.

Language

The driver information center is capable of displaying in different languages, corresponding to the radio language settings. The instrument cluster receives a serial data message with language information from the radio. This message is only sent one time, after a new language is selected. To set the language, see the owners manual.

DRIVER INFORMATION CENTER (DIC) DESCRIPTION AND OPERATION (BASE INSTRUMENT CLUSTER)

In the lower middle of the instrument cluster, an additional display is installed. Its task is to give additional information, such as an odometer, trip odometer, oil life percentage, or error codes/warning messages. Refer to [Indicator/Warning Message Description and Operation](#).

The driver information center is controlled by the stem switch on the face of the Instrument Cluster. The DIC display changes between odometer, trip odometer, oil life percentage, and Unit modes when the odometer trip reset stem on the instrument cluster is pressed. The trip odometer, oil life percentage, and Unit values are reset when the odometer trip reset stem on the instrument cluster is pressed and held.

Odometer

The instrument cluster displays the vehicle odometer in the driver information center. The ECM send a distance rolling count message on GMLAN to the body control module (BCM). The BCM uses this information to calculate the vehicle odometer. This odometer value is then sent to the instrument cluster on GMLAN. The instrument cluster does not calculate the odometer. The odometer displays miles or kilometers as selected in the Units menu.

The odometer value is stored in multiple modules. The instrument cluster is a secondary storage module for the odometer, while the BCM is the primary storage and accumulator.

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INDICATOR/WARNING MESSAGE DESCRIPTION AND OPERATION

INDICATOR LIGHT ON

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

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

MESSAGE DISPLAYED

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

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

CHANGE TIMING BELT MESSAGE

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

BRAKES OVERHEATED

The Electronic Brake Control Module monitors brake usage and compares it to an internal thermal model to determine if the brakes could become overheated. If the Electronic Brake Control Module determines the brakes pads have exceeded a desirable temperature based on the thermal model, it sends a serial data message to the Instrument Cluster to display the BRAKES OVERHEATED message. The message remains displayed until the estimated temperature returns to a desirable range.

Transmission Shift Lever Position Indicator

The Transmission Shift Lever Position Indicator (if equipped) is located on the center console and indicates the current transmission shift lever position. The Transmission Shift Lever Position Indicator receives power and ground and is controlled by the Body Control Module (BCM) via serial data. The Transmission Control Module determines transmission shift lever position based on signals from the Transmission Internal Mode Switch and sends the shift lever position information to the BCM via serial data.

INSTRUMENT CLUSTER DESCRIPTION AND OPERATION

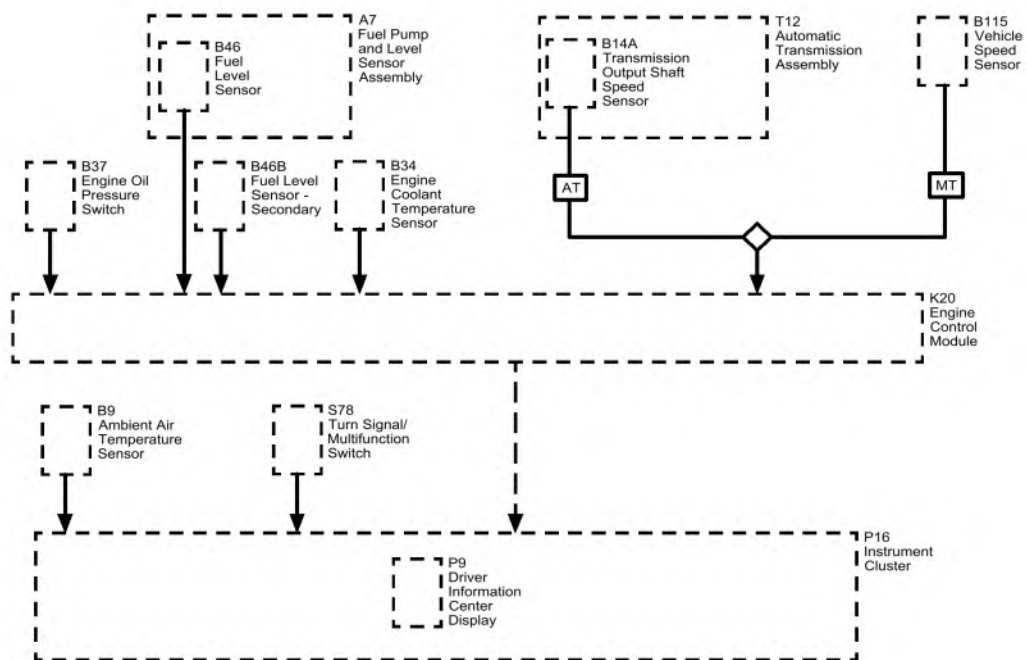


Fig. 17: Displays and Gauges Block Diagram
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
AT	Automatic Transmission
MT	Manual Transmission
P16	P16 Instrument Cluster
P9	P9 Driver Information Center Display
S78	S78 Turn Signal/Multifunction Switch
B9	B9 Ambient Air Temperature Sensor
B14A	B14A Transmission Output Shaft Speed Sensor
T12	T12 Automatic Transmission Assembly
B115	B115 Vehicle Speed Sensor
K20	K20 Engine Control Module
B46	B46 Fuel Level Sensor
A7	A7 Fuel Pump and Level Sensor Assembly
B37	B37 Engine Oil Pressure Switch
B46B	B46B Fuel Level Sensor - Secondary
B34	B34 Engine Coolant Temperature Sensor

Displays Test

Certain instrument cluster features are tested when the ignition is turned on in order to verify the features are working properly. The following occurs when the ignition is turned on:

- The ABS indicator illuminates briefly.
- The airbag indicator illuminates briefly.
- The battery indicator illuminates briefly.
- The brake indicator illuminates briefly.
- The door ajar indicator illuminates briefly.
- The fuel level low indicator illuminates briefly.
- The oil pressure low indicator illuminates briefly.
- The park assist service indicator illuminates briefly.

- The press clutch indicator illuminates briefly.
- The security indicator illuminates briefly.
- The service vehicle soon indicator illuminates briefly.
- The vehicle dynamic caution service indicator illuminates briefly.
- The vehicle dynamics caution off indicator illuminates briefly.

Indicators and Warning Messages

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

Engine Coolant Temperature Gauge (if equipped)

The instrument cluster displays the engine coolant temperature as determined by the engine control module (ECM). The ECM sends the engine coolant temperature information via a High Speed CAN-Bus signal to the body control module (BCM). The BCM then sends the information via a Low Speed CAN-Bus signal to the instrument cluster to display the engine coolant temperature. The engine coolant temperature gauge defaults to 40°C (104°F) or below if:

- The ECM detects a malfunction in the engine coolant temperature sensor circuit.
- The BCM detects a loss of serial data communications with the ECM.
- The instrument cluster detects a loss of serial data communications with the BCM.

Engine Oil Pressure Gauge (if equipped)

The IPC displays the engine oil pressure as determined by the ECM. The ECM monitors the engine oil pressure sensor. The IPC receives a serial data message from the ECM indicating the engine oil pressure. The engine oil pressure gauge defaults to 0 kPa (0 psi) or below if:

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

Fuel Level Gauge

The instrument cluster displays the fuel level based on the information from the ECM. The ECM converts the data from the fuel level sensors to a fuel level signal. The ECM sends the fuel level signal via a High Speed CAN-Bus signal to the BCM. The BCM then sends the information via a Low Speed CAN-Bus signal to the instrument cluster to display the fuel level. If the fuel level falls under 11% the instrument cluster switches on the low fuel level indicator. The fuel gauge defaults to empty if:

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

Speedometer

The instrument cluster displays the vehicle speed based on the information from the ECM. The ECM sends the vehicle speed information via a High Speed CAN-Bus signal to the BCM. The BCM then sends the vehicle speed information via a Low Speed CAN-Bus signal to the instrument cluster in order to display the vehicle speed, either in kilometers or miles, based on the vehicle requirements. The speedometer defaults to 0 km/h (0 MPH) if:

- The BCM detects a loss of serial data communications with the ECM.
- The instrument cluster detects a loss of serial data communications with the BCM.

Tachometer (if equipped)

The instrument cluster displays the engine speed based on the information from the ECM. The ECM converts the data from the engine speed sensor to an engine revolution signal. The ECM sends the engine speed information via a High Speed CAN-Bus signal to the BCM. The BCM then sends the information via a Low Speed CAN-Bus signal to the instrument cluster to display the engine speed. The tachometer defaults to 0 RPM if:

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

Outside Air Temperature

The outside air temperature shows the outside air temperature as a damped value. The time and rate of the temperature update is based on an algorithm in the instrument cluster. Factors such as last temperature reading, current temperature reading, length of time the vehicle was off, current vehicle speed, and the distance driven effect when the displayed temperature is updated. To get the vehicle to display the most accurate temperature faster, drive the vehicle. Constant moving traffic will update the display to the correct temperature more quickly than stop and go traffic.

Driver Information Center Display

In the lower middle of the instrument cluster, an additional display is installed. Its task is to give additional information, such as an odometer or error codes. This part of the instrument cluster is available in 4 different variants, mostly depending on the assembled engine. For further information refer to [Driver Information Center \(DIC\) Description and Operation \(uplevel Instrument Cluster\)](#)[Driver Information Center \(DIC\) Description and Operation \(base Instrument Cluster\)](#).

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