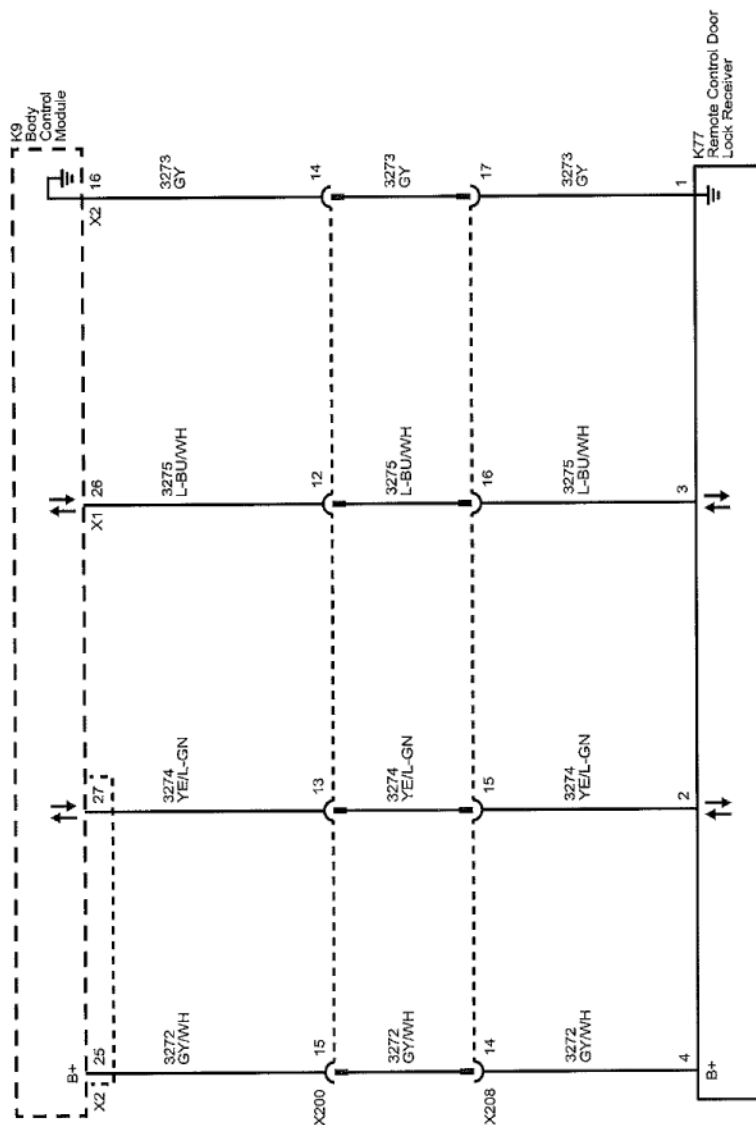


Remote Functions

Schematic and Routing Diagrams

Remote Function Schematics (Keyless Entry)



Diagnostic Information and Procedures

DTC B3101

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle* on page 6-66 prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis* on page 6-58 for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions* on page 6-59 provides an overview of each diagnostic category.

DTC Descriptor

DTC B3101: Keyless Entry Data Link Circuit

For symptom byte information, refer to *Symptom Byte List* on page 6-85.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	B3101 00	B3101 00	—	—
Serial Data – Enable Line	B3101 00	B3101 00	B3101 00	B3101 00
Serial Data – Receive	B3101 00	B3101 00	B3101 00	B3101 00
Low Reference	—	B3101 00	—	—

Circuit/System Description

The body control module communicates with the remote control door lock receiver through the keyless entry serial data circuits. When any button on the keyless entry transmitter is pressed, the transmitter sends a signal to the remote control door lock receiver. The remote control door lock receiver sends a function request to the body control module, depending on which button is pressed on the transmitter. The body control module receives the message and performs the appropriate function.

Conditions for Running the DTC

A button is pressed on the keyless entry transmitter.

Conditions for Setting the DTC

No response is received from the remote control door lock receiver after the body control module requests information from or sends configuration commands to the remote control door lock receiver.

Action Taken When the DTC Sets

In the case of power loss, the remote control door lock receiver is disabled for 65 s. Otherwise no action is taken.

Conditions for Clearing the DTC

- A current DTC will clear when the fault is no longer present.
- A history DTC will clear after 40 consecutive ignition cycles without a fault present.

Reference Information

Schematic Reference

Remote Function Schematics on page 13-34

Component Connector End Views

Component Connector End Views on page 11-269

Description and Operation

Keyless Entry System Description and Operation on page 13-44

Electrical Information Reference

- *Circuit Testing* on page 11-526
- *Connector Repairs* on page 11-548
- *Testing for Intermittent Conditions and Poor Connections* on page 11-531
- *Wiring Repairs* on page 11-537

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the K77 Remote Control Door Lock Receiver. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 30 Ω between the low reference circuit terminal 1 and ground.
 - ⇒ **If 30 Ω or greater**
 - 2.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
 - 2.2. 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 K9 Body Control Module.
 - ↓ **If less than 30 Ω**
3. Ignition ON.
4. Test for greater than 11.5 V between the B+ circuit terminal 4 and ground.
 - ⇒ **If 11.5 V or less**
 - 4.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
 - 4.2. 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.
 - 4.3. 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 , replace the K9 Body Control Module.
 - ↓ **If greater than 11.5 V**
5. Test for 1–6 V between the serial data circuit terminal 2 and ground.
 - ⇒ **If less than 1 V**
 - 5.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
 - 5.2. Test for infinite resistance between the serial data circuit and ground.
 - ⇒ If less than infinite resistance, repair the short to ground on the circuit.
 - ↓ If infinite resistance
 - 5.3. Test for less than 2 Ω in the serial data 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 greater than 6 V**
 - 5.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module, ignition ON.
 - 5.2. Test for less than 1 V between the serial data 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 between 3–6 V**
- 6. Ignition OFF, disconnect the X1 and X2 harness connectors at the K9 Body Control Module, ignition ON.
- 7. Test for less than 1 V between the K9 Body Control Module serial data circuit terminal 26 X1 and ground.
 - ⇒ **If 1 V or greater**
 - Repair the short to voltage on the circuit.
 - ↓ **If less than 1 V**
 - 8. Ignition OFF.
 - 9. Test for infinite resistance between the K9 Body Control Module serial data circuit terminal 26 X1 and ground.
 - ⇒ **If less than infinite resistance**
 - Repair the short to ground on the circuit.
 - ↓ **If infinite resistance**
- 10. Test for less than 2 Ω between the K9 Body Control Module serial data circuit terminal 26 X1 and the K77 Remote Control Door Lock Receiver serial data circuit terminal 3.
 - ⇒ **If 2 Ω or greater**
 - Repair the open/high resistance in the circuit.
 - ↓ **If less than 2 Ω**
 - 11. Replace the K77 Remote Control Door Lock Receiver.
 - 12. Verify DTC B3101 does not set while operating the vehicle under the conditions for running the DTC.
 - ⇒ **If the DTC sets**
 - Replace the K9 Body Control Module
 - ↓ **If the DTC does not set**
 - 13. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification* on page 6-92 after completing the repair.

Control Module References on page 6-3 for body control module or remote control door lock receiver replacement, programming, and setup.

DTC B3105

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle* on page 6-66 prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis* on page 6-58 for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions* on page 6-59 provides an overview of each diagnostic category.

DTC Descriptor

DTC B3105: Keyless Entry Transmitters

For symptom byte information, refer to *Symptom Byte List* on page 6-85.

Circuit/System Description

The body control module monitors the number of keyless entry transmitters programmed. Until at least one transmitter is programmed, the body control module determines a malfunction condition exists.

Conditions for Running the DTC

The body control module has been set up without transmitters being programmed.

Conditions for Setting the DTC

No keyless entry transmitter programmed to the body control module.

Action Taken When the DTC Sets

The keyless entry system is inoperative.

Conditions for Clearing the DTC

A current DTC is cleared when at least one transmitter has been programmed to the body control module.

Reference Information

Schematic Reference

Remote Function Schematics on page 13-34

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Keyless Entry System Description and Operation on page 13-44

Electrical Information Reference

- *Circuit Testing* on page 11-526
- *Connector Repairs* on page 11-548

- *Testing for Intermittent Conditions and Poor Connections* on page 11-531
- *Wiring Repairs* on page 11-537

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify that the transmitter is a correct transmitter for the vehicle. This can be accomplished by comparing the part number printed on the transmitter to the appropriate part number in the parts catalog.
 - ⇒ **If the transmitter is incorrect**
Replace the transmitter.
 - ⇓ **If the transmitter is correct**
2. Program the transmitter. Refer to *Key with Integrated Transmitter Programming* on page 13-30.
3. Verify the transmitter has successfully completed the programming procedure.
 - ⇒ **If the transmitter does not program successfully**
Replace the transmitter.
 - ⇓ **If the transmitter programs successfully**
4. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification* on page 6-92 after completing the repair.
Key with Integrated Transmitter Programming on page 13-30

DTC B3106

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle* on page 6-66 prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis* on page 6-58 for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions* on page 6-59 provides an overview of each diagnostic category.

DTC Descriptor

DTC B3106: Keyless Entry Data Link

For symptom byte information, refer to *Symptom Byte List* on page 6-85.

Circuit/System Description

The body control module communicates with the remote control door lock receiver through the keyless entry serial data circuits. When any button on the keyless entry transmitter is pressed, the transmitter sends a signal to the remote control door lock receiver. The remote control door lock receiver sends a function request to the body control module, depending on which button is pressed on the transmitter. The body control module receives the message and performs the appropriate function.

Conditions for Running the DTC

A keyless transmitter button is pressed.

Conditions for Setting the DTC

The transmitter that is sending a signal to the remote control door lock receiver is different from those transmitters stored in the body control module.

Action Taken When the DTC Sets

No action is taken.

Conditions for Clearing the DTC

- A current DTC will clear when the fault is no longer present and the ignition switch is cycled.
- A history DTC will clear after 40 consecutive ignition cycles without a fault present.

Reference Information

Schematic Reference

Remote Function Schematics on page 13-34

Component Connector End Views

Component Connector End Views on page 11-269

Description and Operation

Keyless Entry System Description and Operation on page 13-44

Electrical Information Reference

- *Circuit Testing* on page 11-526
- *Connector Repairs* on page 11-548
- *Testing for Intermittent Conditions and Poor Connections* on page 11-531
- *Wiring Repairs* on page 11-537

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. With a valid and learned transmitter, press and release a button on the transmitter.
2. Verify that DTC B3106 is not set.

⇒ If DTC B3106 is set

Replace the K77 Remote Control Door Lock Receiver.

↓ If DTC B3106 is not set

3. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification* on page 6-92 after completing the repair.

Control Module References on page 6-3 for remote control door lock receiver replacement, programming, and setup.

DTC B3109-B3113

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle* on page 6-66 prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis* on page 6-58 for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions* on page 6-59 provides an overview of each diagnostic category.

DTC Descriptors

DTC B3109: Keyless Entry Transmitter 1 Battery

DTC B3110: Keyless Entry Transmitter 2 Battery

DTC B3111: Keyless Entry Transmitter 3 Battery

DTC B3112: Keyless Entry Transmitter 4 Battery

DTC B3113: Keyless Entry Transmitter 5 Battery

For symptom byte information, refer to *Symptom Byte List* on page 6-85.

Circuit/System Description

With each press of a keyless entry transmitter button, a message containing the current battery state of the transmitter is sent to the remote control door lock receiver, along with the commanded keyless entry function. The remote control door lock receiver sends this to the body control module to perform the requested function.

Conditions for Running the DTC

A keyless transmitter button is pressed.

Conditions for Setting the DTC

Three consecutive low battery signals are received from the same transmitter.

Action Taken When the DTC Sets

The keyless entry system is inoperative.

Conditions for Clearing the DTC

The DTC is cleared when a normal transmitter voltage signal is received from the transmitter that set the DTC.

Reference Information

Schematic Reference

Remote Function Schematics on page 13-34

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Keyless Entry System Description and Operation on page 13-44

Electrical Information Reference

- *Circuit Testing* on page 11-526
- *Connector Repairs* on page 11-548
- *Testing for Intermittent Conditions and Poor Connections* on page 11-531
- *Wiring Repairs* on page 11-537

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify none of the DTCs listed below are set:

- DTC B3109
- DTC B3110
- DTC B3111
- DTC B3112
- DTC B3113

⇒ **If any of the DTCs are set**

- 1.1. Replace the battery in the appropriate keyless entry transmitter and operate the transmitter three consecutive times.

- 1.2. Verify the DTC does not set.

⇒ If the DTC sets, replace the keyless entry transmitter.

↓ If the DTC does not set

- 1.3. All OK.

↓ **If none of the DTCs are set**

2. All OK.

DTC B310D-B310F

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle* on page 6-66 prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis* on page 6-58 for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions* on page 6-59 provides an overview of each diagnostic category.

DTC Descriptors

DTC B310D: Keyless Entry Transmitter 6 Battery

DTC B310E: Keyless Entry Transmitter 7 Battery

DTC B310F: Keyless Entry Transmitter 8 Battery

For symptom byte information, refer to *Symptom Byte List* on page 6-85.

Circuit/System Description

With each press of a keyless entry transmitter button, a message containing the current battery state of the transmitter is sent to the remote control door lock receiver, along with the commanded keyless entry function. The remote control door lock receiver sends this to the body control module to perform the requested function.

Conditions for Running the DTC

A keyless transmitter button is pressed.

Conditions for Setting the DTC

Three consecutive low battery signals are received from the same transmitter.

Action Taken When the DTC Sets

The keyless entry system is inoperative.

Conditions for Clearing the DTC

The DTC is cleared when a normal transmitter voltage signal is received from the transmitter that set the DTC.

Reference Information

Schematic Reference

Remote Function Schematics on page 13-34

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Keyless Entry System Description and Operation on page 13-44

Electrical Information Reference

- *Circuit Testing* on page 11-526
- *Connector Repairs* on page 11-548
- *Testing for Intermittent Conditions and Poor Connections* on page 11-531
- *Wiring Repairs* on page 11-537

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify none of the DTCs listed below are set:
 - DTC B310D
 - DTC B310E
 - DTC B310F

⇒ **If any of the DTCs are set**

- 1.1. Replace the battery in the appropriate keyless entry transmitter and operate the transmitter three consecutive times.
- 1.2. Verify the DTC does not set.
 - ⇒ If the DTC sets, replace the keyless entry transmitter.
 - ⇓ If the DTC does not set
- 1.3. All OK.

⇓ **If none of the DTCs are set**

2. All OK.

Symptoms - Remote Functions

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

1. Perform *Diagnostic System Check - Vehicle* on page 6-66 before using the Symptom Tables in order to verify that all of the following are true:
 - There are no DTCs set.
 - The control modules can communicate via the serial data link.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to *Keyless Entry System Description and Operation* on page 13-44.

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the Keyless Entry System. Refer to *Checking Aftermarket Accessories* on page 11-525.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to *Testing for Intermittent Conditions and Poor Connections* on page 11-531.

Symptom List

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

- *Keyless Entry System Malfunction* on page 13-41
- *Remote Vehicle Start Malfunction* on page 13-42

Keyless Entry System Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle* on page 6-66 prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis* on page 6-58 for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions* on page 6-59 provides an overview of each diagnostic category.

Circuit/System Description

The keyless entry transmitter is part of the vehicle key. The keyless entry system will unlock the vehicle doors or open/unlock the rear compartment when a corresponding button on the keyless entry transmitter is pressed. This is accomplished by the keyless entry transmitter sending a radio frequency to the remote control door lock receiver, which then sends the signal to the body control module (BCM). The BCM interprets the signal and activates the requested function. A low transmitter battery or radio frequency (RF) interference from aftermarket devices such as 2-way radios, power inverters, cellular phone chargers, computers, etc. may cause a system malfunction. High RF traffic areas, such as gas stations which use pay-at-the-pump RF transponders, may also cause interference that could lead to a malfunction.

Diagnostic Aids

- Unwanted or inadvertent door lock/unlock activation may be requested by the OnStar® Remote Link app. It is possible that a customer may be unaware of account usage, result in an unwanted or phantom door lock/unlock. If normal system diagnosis does results in an inability to verify the customer's concern, contact Technical Assistance Center (TAC).

- If available, the EL 43241 Keyless Entry Tester may be used to diagnose a low transmitter battery or a malfunctioning transmitter. To test, place the transmitter on the test pad of the EL 43241 and press each transmitter button one at a time, holding each button for three seconds. If the green light on the tester does not illuminate and a tone does not sound, first replace the transmitter battery and retest. If the malfunction continues after replacing the transmitter battery, replace the transmitter.
- When using the EL 43241 Keyless Entry Tester, first inspect the keyless entry transmitter part number to determine that it is the correct model for the vehicle. An incorrect part number transmitter may pass the test, but it will not activate the keyless entry system.
- When the vehicle key is in the ignition, the keyless entry functions are disabled from all keyless entry transmitters.

Reference Information

Schematic Reference

Remote Function Schematics on page 13-34

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Keyless Entry System Description and Operation on page 13-44

Electrical Information Reference

- *Circuit Testing* on page 11-526
- *Connector Repairs* on page 11-548
- *Testing for Intermittent Conditions and Poor Connections* on page 11-531
- *Wiring Repairs* on page 11-537

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL 43241 Keyless Entry Tester

Circuit/System Verification

1. Verify that the vehicle key is correct for the vehicle. This can be accomplished by comparing the part number printed on the key to the appropriate part number in the parts catalog.
 - ⇒ **If the vehicle key is incorrect**
Replace the vehicle key.
 - ↓ **If the vehicle key is correct**
2. Operate the transmitter while observing the scan tool Key Fob Function parameter for the appropriate transmitter.

3. Verify the scan tool Key Fob Function parameter corresponds with the function selected on the transmitter.

⇒ **If the Key Fob Function parameter does not correspond with the transmitter selection**

Note: Before replacing the transmitter, inspect the transmitter battery contacts for any corrosion or damage. If no corrosion or damage is found, replace the transmitter battery and retest before replacing the transmitter.

- 3.1. Replace the vehicle key.
- 3.2. Operate the new transmitter while observing the scan tool Key Fob Function parameter for the transmitter.
- 3.3. Verify the scan tool Key Fob Function parameter correspond with the function selected on the transmitter.

⇒ If the Key Fob Function parameter does not correspond with the transmitter selection, replace the K9 Body Control Module

↓ If the Key Fob Function parameter corresponds with the transmitter selection

3.4. All OK.

↓ **If the Key Fob Function parameter corresponds with the transmitter selection**

4. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification* on page 6-92 after completing the repair.

- *Key with Integrated Transmitter Programming* on page 13-30
- *Control Module References* on page 6-3 for body control module replacement, programming, and setup

Remote Vehicle Start Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle* on page 6-66 prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis* on page 6-58 for an overview of each diagnostic approach.
- *Diagnostic Procedure Instructions* on page 6-59 provides an overview of each diagnostic category.

Circuit/System Description

Remote vehicle start begins as an radio frequency message received by the body control module (BCM) from a keyless entry transmitter. The BCM monitors system conditions such as content theft deterrent, hood ajar status, and body DTCs to determine if a remote vehicle start event will occur. If conditions are determined to be acceptable, the remote vehicle start message is sent to the Engine Control Module (ECM).

The ECM monitors system conditions such as engine control parameters and vehicle theft deterrent to determine if engine starting will be allowed.

If conditions are acceptable, the ECM will initiate engine starting. During the engine run time in a remote vehicle start attempt, before the operator enters the vehicle, the ECM may discontinue engine operation if system conditions require it or a message is received from the BCM requesting the engine be turned OFF.

Diagnostic Aids

- Unwanted or inadvertent door lock/unlock activation may be requested by the OnStar® Remote Link app. It is possible that a customer may be unaware of account usage, result in an unwanted or phantom door lock/unlock. If normal system diagnosis does results in an inability to verify the customer's concern, contact Technical Assistance Center (TAC).
- If the vehicle has a current DTC that illuminates the malfunction indicator lamp (MIL), the cause of the DTC must be diagnosed before proceeding with the Remote Vehicle Start Inoperative diagnostic.
- The remote vehicle start system will not operate if any of the following conditions are present:
 - A current vehicle DTC that illuminates the malfunction indicator lamp (MIL)
 - The vehicle is in valet mode.
 - More than 2 remote starts have been attempted.
 - The hazard switch is in the ON position.
 - A current hazard switch DTC is set.
 - The vehicle hood is ajar.
 - A current hood ajar DTC is set.
 - Incorrect BCM software is installed and vehicle start is not enabled.
 - The content theft deterrent system detects an alarm trigger.
 - Excessive engine RPM
 - Excessive coolant temperature
 - Accelerator pedal position greater than 0 percent
 - Vehicle not in park
 - Vehicle theft deterrent malfunction
 - A current automatic transmission shift lock control system DTC is set.
 - A vehicle speed sensor signal is detected by the ECM.

Reference Information

Schematic Reference

Remote Function Schematics on page 13-34

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Keyless Entry System Description and Operation on page 13-44

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify that the keyless entry functions operate with all available keyless entry transmitters.

⇒ **If any keyless entry functions do not operate properly**

Refer to *Keyless Entry System Malfunction on page 13-41*.

↓ **If all keyless entry functions operate properly**

2. Verify that no Diagnostic Status History or Start Disable items are present in the scan tool BCM Remote Start Diagnostic Status History and the ECM Remote Vehicle Start Disable History parameters.

⇒ **If remote vehicle start disable history items are present**

Refer to the appropriate subsection in which the malfunction occurred.

↓ **If remote vehicle start disable history items are not present**

3. Verify all scan tool BCM Content Theft Trigger History parameters display None.

⇒ **If any BCM Content Theft Trigger History parameter does not display None**

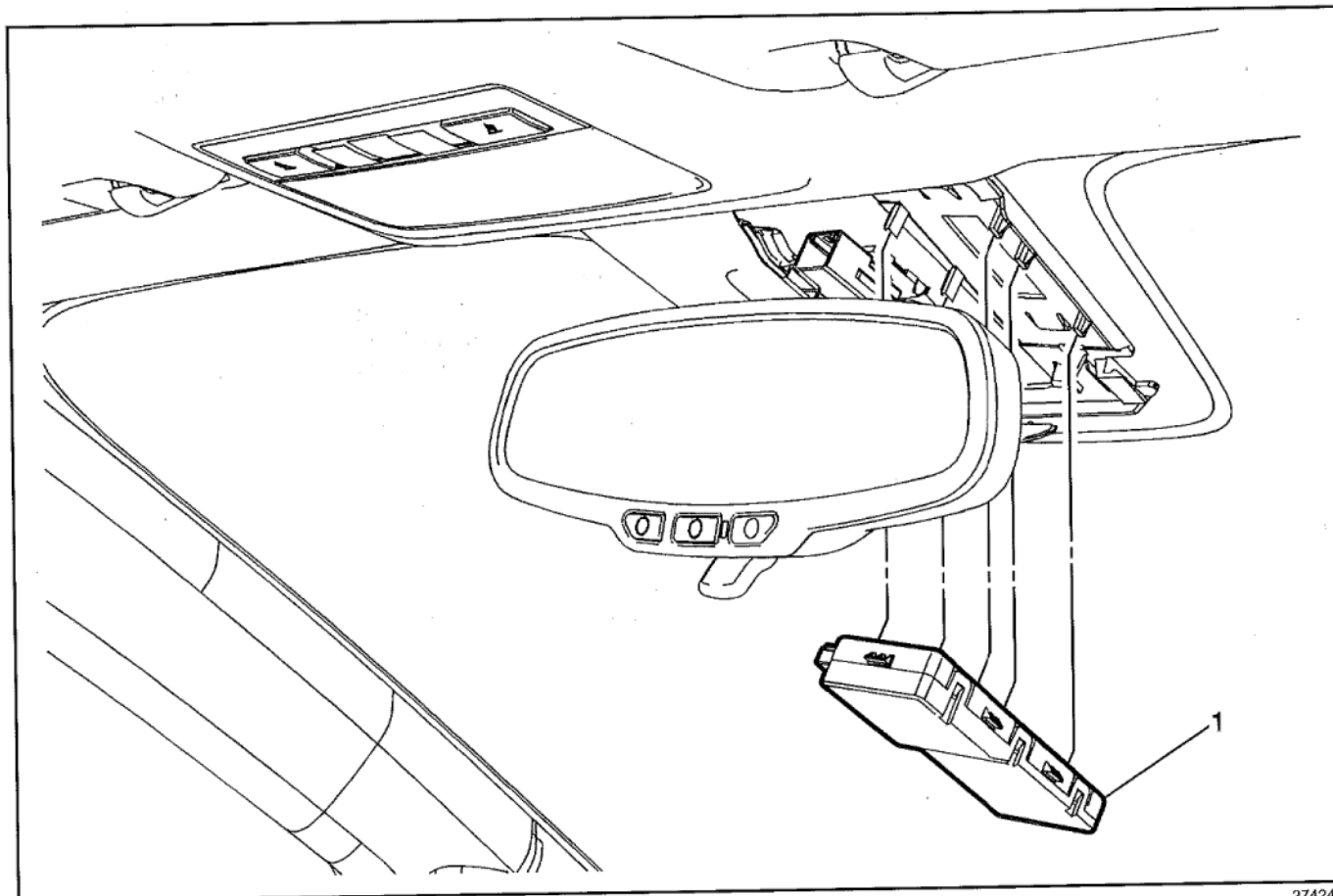
Refer to *Content Theft Deterrent Malfunction on page 13-150*.

↓ **If all BCM Content Theft Trigger History parameters display None**

4. All OK.

Repair Instructions

Remote Control Door Lock Receiver Replacement



2742466

Remote Control Door Lock Receiver Replacement

Callout	Component Name
Preliminary Procedure Remove the windshield outside moisture sensor cover. Refer to <i>Windshield Outside Moisture Sensor Cover Replacement</i> on page 4-383.	
1	Remote Control Door Lock Receiver Procedure 1. Disconnect the electrical connector. 2. Unsnap the receiver from the windshield bracket. 3. For programming and set up, refer to <i>Control Module References</i> on page 6-3.

Description and Operation

Keyless Entry System Description and Operation

The keyless entry system is a vehicle entry device. The keyless entry system is used in conjunction with the door locks to unlock the vehicle. Keyless entry will lock/unlock the vehicle doors or open the rear compartment lid when a corresponding button on the keyless entry transmitter is pressed. This is accomplished by the transmitter sending a radio frequency to the Remote Control Door Lock Receiver antenna that has a direct link to the Body Control Module (BCM). The BCM interprets the signal and activates the requested function or request the appropriate control module to activate the function via a serial data message. A low transmitter battery or radio frequency interference from aftermarket devices, such as 2-way radios, power inverters, computers, etc., may cause a system malfunction. High radio frequency traffic areas, such as gas stations that use pay-at-the-pump radio frequency transponders, may also cause interference that could lead to a malfunction. Keyless entry allows you to operate the following features:

- Door lock/unlock
- Liftgate lock/unlock, if equipped
- Trunk release, if equipped
- Power liftgate, if equipped
- Vehicle locator/Panic alarm
- Remote vehicle starting, if equipped

The keyless entry system has the following components:

- Keyless entry transmitters
- Body Control Module
- Remote Control Door Lock Receiver

Keyless Entry Transmitters

Note: When the vehicle key is in the ignition, keyless entry functions from all keyless entry transmitter are disabled.

The keyless entry transmitters are used to perform various entry functions while away from the immediate area of the vehicle. Keyless entry functions may work at up to 20 m (65 ft) away from the vehicle. Ambient conditions may affect the performance of the keyless entry transmitter and reduce the range at which keyless entry functions operate. Up to eight transmitters may be programmed to a single vehicle. The keyless entry transmitter is an integral part of the vehicle key.

OnStar® Remote Link (if equipped)

A vehicle operator may have the ability to perform some of the keyless entry functions using applications on personal devices such as a smart phone. Unwanted or inadvertent door lock/unlock activation may be requested by the OnStar® Remote Link app. It is possible that a customer may be unaware of account usage, result in an unwanted or phantom door lock/unlock. If normal system diagnosis does results in an inability to verify the customer's concern, contact Technical Assistance Center (TAC).

Body Control Module (BCM)

The BCM is a multifunction module that operates the keyless entry system. When a radio frequency message is received from a keyless entry transmitter, the BCM interprets this signal and performs the specific function, i.e. door lock, door unlock, or vehicle locate.

Remote Control Door Lock Receiver

The Remote Control Door Lock Receiver acts as an antenna for the keyless entry system and communicates with the BCM through a dedicated serial data link. When a button is pressed on a keyless entry transmitter, the Remote Control Door Lock Receiver receives this signal and sends the request to the BCM. The BCM interprets the signal and performs the specific function, i.e. door lock, door unlock, or vehicle locate.

Unlock Doors

Momentarily press the transmitter UNLOCK button in order to perform the following functions:

- Unlock only the driver door or all doors and liftgate (if equipped); this is customized through the DIC.
- Illuminate the interior lamps for a determined length of time or until the ignition is turned ON.
- Flash the exterior lights; this is customized through the DIC.
- Disarm the content theft deterrent system, if equipped.
- Deactivate the content theft deterrent system when in the alarm mode.

Lock All Doors

Press the transmitter LOCK button to perform the following functions:

- Lock all vehicle doors.
- Immediately turn OFF the interior lamps.
- Flash the exterior lights and/or sound the horn; this is customized through the DIC.
- Arm the content theft deterrent system.

Trunk Release, if equipped

Press the trunk release button on the transmitter to open the trunk.

Power Liftgate, if equipped

Press and hold the power liftgate button to perform the following functions:

- Open or close the liftgate using the power liftgate function.
- Flash the tail lamps.
- Sound the interior power liftgate chime.

Vehicle Locator/Panic Alarm

A single press of the panic button performs the following functions. Some functions may be dependent on personalization settings:

- Pulse the horn three times.
- Flash the exterior lamps three times.

A press and hold of the panic button performs the following functions:

- Illuminate the interior lamps.
- Pulse the horn and flash the exterior lamps for 30 seconds or until the following conditions occur:
 - The panic button is pressed.
 - The ignition switch is turned to the RUN position with a valid key.

Remote Vehicle Start, if equipped

The remote vehicle start function allows engine starting while not in the vehicle. It also allows the vehicle HVAC system and other vehicle systems to enable, providing a comfortable vehicle upon entry. The remote vehicle start sequence begins by pressing and releasing the lock button and then pressing and holding the remote vehicle start buttons on the keyless entry transmitter. The turn signal lamps will illuminate to indicate the vehicle has received the remote start request. Each time an remote vehicle start is performed, the vehicle doors are locked, however they may then be unlocked/locked with the transmitter or vehicle key at any time. Once activated, the engine is allowed to run for 10 minutes. The remote vehicle start time may be extended by an additional 10 minutes by again pressing and releasing the lock button and then pressing and holding the remote vehicle start buttons on the transmitter. This feature is called a remote vehicle start continue and allows a maximum of 20 minutes of engine running. If the remote vehicle start continue is performed at seven minutes into the initial 10 minute time-out, a total of 17 minutes of engine running would occur. The remote vehicle start event may be suspended at any time by pressing only the remote vehicle start button on the transmitter or by entering the vehicle and pressing the hazard lamp switch.

In between ignition cycles, only two remote vehicle start events may occur or be attempted. Once two events or attempts have been made, future remote vehicle start events will be suspended until the vehicle is started using the ignition.

Enable/Disable Remote Vehicle Start

Using the driver information center, remote vehicle start may be enabled or disabled as a part of vehicle personalization. Refer to the vehicle owners manual for more information.

Hood Ajar Switch

The hood switch provides status of the hood to the BCM for remote vehicle start purposes. The switch is integrated into the hood latch assembly.

Remote Vehicle Start Circuit Description

The BCM receives a signal from the keyless entry transmitter indicating a remote vehicle start request. A message is then sent to the BCM which determines if a crank request message will be sent to the ECM to allow engine starting. To determine if conditions are correct for an remote vehicle start event, the BCM will ensure the following conditions are met:

- A valid hood ajar switch closed signal is present.
- The doors are locked.
- The hazard switch is OFF.
- The vehicle power mode is correct.
- No content theft deterrent alarm triggers are present.

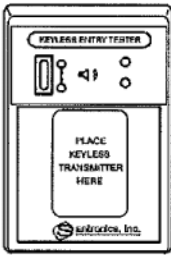
When the BCM determines all conditions meet those required for an remote vehicle start event, a message is sent via serial data to the ECM. The ECM relies on the remote vehicle start message from BCM to enable remote vehicle start when the crank request signal is received. If the ECM does not receive a valid remote vehicle start message, it will not attempt to start the engine. While the ECM is in remote vehicle start mode it will suspend engine operation if any of the following additional conditions occur:

- Vehicle speed is greater than 0.
- Transmission is not in PARK.
- Excessive engine coolant temperature
- Low oil pressure
- The malfunction indicator lamp (MIL) is commanded ON.
- Engine crank time is greater than 30 seconds.
- Excessive engine speed
- Accelerator pedal position too high
- Remote start timer equals 0.
- Immobilizer system indicates tamper

Keyless Entry Personalization

Vehicle lock/unlock functions and remote vehicle start remote vehicle start settings may be personalized. For functional descriptions and personalization instructions, refer to the vehicle owners manual.

Special Tools and Equipment

Illustration	Tool Number/ Description
	EL 43241 Keyless Entry Tester

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