

2017 ACCESSORIES AND EQUIPMENT

Immobilizer - Bolt EV

SCHEMATIC WIRING DIAGRAMS

IMMOBILIZER WIRING SCHEMATICS

Immobilizer

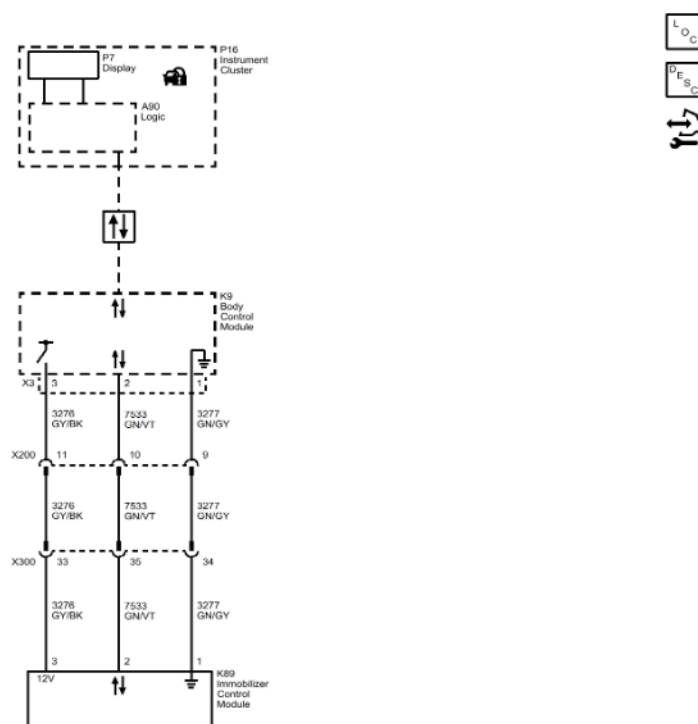


Fig. 1: Immobilizer

Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC B2955: SECURITY SENSOR DATA CIRCUIT 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 B2955 00

Security Sensor Data Circuit Malfunction

For symptom byte information, refer to [Symptom Byte List](#).

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	B2955 00	B2955 00	-	-
Serial Data	B2955 00	B2955 00	B2955 00	B2955 00
Low Reference	-	B2955 00	-	-

Circuit/System Description

When a keyless entry transmitter is inserted into the transmitter pocket/slot and the ignition mode switch is pressed, the transponder embedded in the transmitter is energized by the immobilizer antenna exciter coil. The transponder transmits a signal to the body control module (BCM). The BCM then compares this value to a value stored in memory. If the value is correct, the BCM will send the prerelease password via the serial data circuit to the engine control module (ECM). If the learned key code does not match or a transponder value is not received, the BCM will send the start disable password to the ECM.

Conditions for Running the DTC

Vehicle is ON or in Service Mode.

Conditions for Setting the DTC

The BCM detects a circuit fault on the immobilizer antenna circuits.

Action Taken When the DTC Sets

- Vehicle starting will be disabled.
- The security indicator in the instrument cluster will be illuminated. A service message will be displayed in the driver information center.

Conditions for Clearing the DTC

- A current DTC will be cleared when the condition for setting the DTC are no longer present.
- A history DTC will be cleared after 100 malfunction-free power mode cycles.

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Immobilizer Schematics

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

Scan Tool Reference

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

Circuit/System Testing

1. Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the K89 ^{cardiagn.com} Immobilizer Control Module. It may take up to 2 min for all vehicle systems to power down.

2. Verify a test lamp illuminates between the low reference circuit terminal 1 and B+.

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

1. Vehicle OFF, disconnect the harness connector at the K9 Body 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 K9 Body Control Module.

- **If the test lamp illuminates**

3. Vehicle in Service Mode.

NOTE: In some instances, the K9 Body Control Module may only apply voltage for 3 s immediately after the ignition mode switch is pressed. It may be necessary to monitor the DMM while pressing the ignition mode switch to observe the voltage.

4. Test for greater than 9 V between the ignition circuit terminal 3 and ground.

- **If 9 V or less**

1. Vehicle OFF, disconnect the harness connector at the K9 Body Control Module.

2. 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

3. 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 K9 Body Control Module.

- **If greater than 9 V**

5. Vehicle in Service Mode.

6. Test for 12 - 13 V between the serial data circuit terminal 2 and ground.

- **If less than 12 V**

1. Vehicle OFF, disconnect the harness connector at the K9 Body Control Module.

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

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 13 V**

1. Vehicle OFF, disconnect the harness connector at the K9 Body Control Module, vehicle 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 K9 Body Control Module.

- **If within 12 - 13 V**

7. Replace the K89 Immobilizer Control Module.

8. Verify DTC B2955 is not set.

- **If DTC B2955 is set**

Replace the K9 Body Control Module.

- **If DTC B2955 is not set or is set as history**

9. All OK.

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

[Control Module References](#) for body control module or immobilizer control module replacement, programming, and setup

DTC B302A: MOBILE TELEPHONE COMMUNICATIONS INTERFACE REQUESTED IMMOBILIZATION

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 B302A

Mobile Telephone Communications Interface Requested Immobilization

For symptom byte information, refer to [Symptom Byte List](#) .

Circuit/System Description

As part of the vehicle telematics enhanced services, a request may be sent to the body control module (BCM) to disable vehicle starting. If a valid message is received by the BCM requesting that starting be disabled, the start enable message will not be sent to the engine control module (ECM).

Conditions for Running the DTC

The BCM continuously monitors for this DTC.

Conditions for Setting the DTC

A start disable message has been received from the telematics module.

Action Taken When the DTC Sets

Vehicle starting will be suspended and the security indicator will be illuminated.

Conditions for Clearing the DTC

- A current DTC will clear when the telematics start disable request is no longer received.
- A history DTC will clear after 100 ignition cycles in which the telematic start disable request is not seen.

Diagnostic Aids

- DTC B302A is only an indicator that a start disable request has been received from the vehicle telematics system and does not indicate a fault in the immobilizer or telematics system.
- To remove the start disable request, the vehicle account must be updated with the OnStar stolen vehicle team. This will require that a law enforcement agency or the customer contact OnStar to indicate that the vehicle has been successfully and safely recovered.
- If the OnStar system has been disabled or damaged during a theft attempt, the system will not be able to communicate and the start disable request will not be removed. OnStar must be functioning properly for the start disable request to be removed.

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[Immobilizer Schematics](#)

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- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify the OnStar system is not damaged and is operating properly, with no DTCs set.
 - **If the OnStar system is damaged, inoperative, or any OnStar DTCs are set**

These concerns must be corrected before the start disable can be removed.
 - **If the OnStar system is not damaged and is operating properly**
2. Press the blue OnStar button and ask the advisor to be transferred to the stolen vehicle team to verify the vehicle account has been updated.
3. Verify that OnStar is aware the vehicle has been recovered and that the vehicle account has been updated.
 - **If OnStar has not been notified that the vehicle has been recovered**

Contact the customer and advise them that for security purposes, they must contact OnStar and the law enforcement agency to update the vehicle account.
 - **If the account has been properly updated**
4. Once the vehicle account has been updated and the start disable request has been removed, DTC B302A will transition to a history DTC. Clear the history DTC.

DTC B3031: SECURITY CONTROLLER IN LEARN MODE

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 B3031

Security Controller In Learn Mode

For symptom byte information, refer to **Symptom Byte List** .

Circuit/System Description

When learning a coded key, the body control module (BCM) is placed in learn mode. DTC B3031 will set automatically as an indicator that the system is in learn mode and not as a fault indicator. On some model year vehicles the instructions for adding keys includes the direction to always use two learned keys. This DTC will set if that direction is not followed. If only one learned key is available then Replacing Keys must be performed. Once the coded key is learned, learn mode will be exited and the DTC cleared. If the BCM does not exit learn mode, DTC B3031 will remain current and indicate a fault.

The instrument cluster security indicator will illuminate and the driver information center will display a message.

Conditions for Running the DTC

The immobilizer system is the learn coded keys state.

Conditions for Setting the DTC

The DTC will set any time the BCM enters the learn coded keys state.

Action Taken When the DTC Sets

The security indicator will illuminate. The driver information center will display a message.

Conditions for Clearing the DTC

- A current DTC B3031 will be cleared upon the successful exit of learn mode.
- A history DTC will be cleared after 100 malfunction-free ignition cycles.

Reference Information

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Connector End View Reference

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Scan Tool Reference

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

Circuit/System Verification

1. Verify all available keys are correct for the vehicle. This can be accomplished by comparing the part number that is laser etched on the key to the part number listed in the parts catalog.

NOTE: On some model year vehicles two learned keys are required to add additional keys. If only one learned key is used, this DTC will set. If only one learned key is available then Replacing Keys must be performed.

- **If a key is not correct**

Replace the key

- **If all keys are correct**

2. Verify the scan tool Immobilizer data displays two or more keys learned to the vehicle.

- **If not**

Add one additional key

- **If two or more keys are learned to the vehicle**
- 3. Perform the Replacing Keys procedure. Refer to [Key with Integrated Transmitter Programming](#).
- 4. Verify the K9 Body Control Module learns the vehicle key and exits the learn coded key state. The scan tool Master Keys Learned parameter should increment to 1.
 - **If the K9 Body Control Module does not exit the learn coded key state after the programming attempt**

Replace the K9 Body Control Module
 - **If the K9 Body Control Module exits the learn coded key state after the programming attempt**
- 5. All OK.

Repair Instructions

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

[Control Module References](#) for body control module replacement, programming, and setup.

DTC B3055: NO TRANSPONDER MODULATION OR NO TRANSPONDER

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 B3055

No Transponder Modulation or No Transponder

For symptom byte information, refer to [Symptom Byte List](#).

Circuit/System Description

When a vehicle key is inserted into the key slot and the vehicle on/off switch is pressed, the transponder embedded in the head of the key is energized by the exciter coils. The energized transponder transmits a signal that contains its unique value, which is received by the body control module (BCM). The BCM then compares this value to a value stored in memory. If the value is not correct, the BCM disables engine start.

Conditions for Running the DTC

Vehicle is ON or in Service Mode.

Conditions for Setting the DTC

The BCM is unable to measure the key transponder value.

Action Taken When the DTC Sets

- Vehicle starting will be disabled.
- The security indicator will illuminate. A service message will be displayed in the driver information center.

Conditions for Clearing the DTC

- A current DTC will be cleared when the BCM detects a valid transponder value from the key.

- A history DTC will be cleared after 100 malfunction-free power mode cycles.

Diagnostic Aids

- Because DTC B3055 may be caused by a malfunctioning vehicle key, it is necessary to have all available keys at the time of diagnosis. A possible scenario would be a customer leaving the vehicle with a spare key during the service visit, but the key which they use everyday, not the spare key, is the cause of the DTC. Not having all available keys in this instance would result in the customer concern not being duplicate or a misdiagnosis.
- Ensure that the immobilizer control module is properly installed and fully seated. An audible and/or tactile click will indicate that the immobilizer control module is fully seated. To ensure proper transponder communication, the key must be in a specific location in relation to the immobilizer control module. If the immobilizer control module is not fully seated, transponder communication may not occur and DTC B3055 will set.

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Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Vehicle in Service Mode.
2. Verify that DTC B1370, B1380, or B1441 is not set.

- **If any of the DTCs are set**

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

- **If none of the DTCs are set**

3. Verify all available keys are correct for the vehicle.

- **If a key is not correct**

Replace the key

- **If all keys are correct**

4. Remove the battery from each of the available vehicle keys.

5. Verify that DTC B3055 does not set while attempting to start the vehicle with each available key. To start the vehicle with the key battery removed, the key must be placed in the key slot.

- **If DTC B3055 sets when attempting to start the vehicle with only one of the available keys**

Replace the appropriate key.

- If DTC B3055 sets when attempting to start the vehicle with all of the available keys

Replace the K89 Immobilizer Control Module.

- If DTC B3055 does not set

6. All OK.

Repair Instructions

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

[Control Module References](#) for immobilizer control module replacement, programming, and setup

DTC B305C: IMMOBILIZER TRANSPONDER OF WRONG TYPE PROGRAMMED

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 B305C

Immobilizer Transponder of Wrong Type Programmed

For symptom byte information, refer to [Symptom Byte List](#).

Circuit/System Description

When a vehicle key/keyless entry transmitter is inserted into the key slot/transmitter pocket and the vehicle on/off switch is pressed, the transponder embedded in the key/transmitter is energized by the immobilizer antenna exciter coil. The transponder transmits a signal to the body control module (BCM). The BCM then compares this value to a value stored in memory. If the value is correct, the BCM will send the prerelease password via the serial data circuit to the engine control module (ECM). If the learned key code does not match or a transponder value is not received, the BCM will send the start disable password to the ECM.

Conditions for Running the DTC

- Battery voltage is greater than 9 volts
- Transponder authentication has occurred

Conditions for Setting the DTC

- The programmed transponder type does not match the equipped system on the vehicle.
- A transponder used for vehicles without BTM and/or ATH/ATS has been programmed to a vehicle with BTM and/or ATH/ATS.
- A transponder used for vehicles with BTM and/or ATH/ATS has been programmed to a vehicle without BTM and/or ATH/ATS.

Action Taken When the DTC Sets

No action is taken.

Conditions for Clearing the DTC

- A current DTC will be cleared when the BCM detects a programmed transponder type that matches the equipped system on the vehicle.
- A history DTC will be cleared after 100 malfunction-free power mode cycles.

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Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Using each vehicle key, attempt to put the vehicle in Service Mode.
2. Verify DTC B305C does not set after each attempt to put the vehicle in Service Mode.
 - **If the DTC sets**

Replace the appropriate key or keyless entry transmitter.
 - **If the DTC does not set**
3. All OK.

DTC B3060: UNPROGRAMMED TRANSPONDER IDENTIFICATION CODE RECEIVED

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 B3060

Unprogrammed Transponder Identification Code Received

For symptom byte information, refer to **Symptom Byte List** .

Circuit/System Description

When a vehicle key is inserted into the key slot and the vehicle on/off switch is pressed, the transponder embedded in the head of the key is energized by the exciter coils. The energized transponder transmits a signal that contains its unique value, which is received by the body control module (BCM). The BCM then compares this value to a value stored in memory. If the value is not correct, the BCM disables engine start.

Conditions for Running the DTC

Vehicle is ON or in Service Mode.

Conditions for Setting the DTC

The transponder value measured by the BCM is incorrect or not learned to the vehicle.

Action Taken When the DTC Sets

- Vehicle starting will be disabled.
- The security indicator in the instrument cluster will be illuminated. The driver information center will display a service message.

Conditions for Clearing the DTC

- A current DTC will be cleared when the BCM detects a valid transponder value from the key.
- A history DTC will be cleared after 100 malfunction-free power mode cycles or when a scan tool is used to clear DTCs.

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Scan Tool Reference

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

Circuit/System Verification

1. Perform the Vehicle Key Relearn procedure. Refer to [Key with Integrated Transmitter Programming](#).
2. Verify the scan tool Key Part Number parameter reads a Key Part Number when turning the vehicle ON with each key.
 - **If a Key Part Number is not read**
Replace the appropriate key.
 - **If a Key Part Number is read with each key**
3. All OK.

Repair Instructions

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

Key with Integrated Transmitter Programming

DTC B389A: ENVIRONMENT IDENTIFICATION

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 B389A

Environment Identification

For symptom byte information, refer to [Symptom Byte List](#) .

Circuit/System Description

When certain modules are programmed and configured during installation, the module learns a specific environment identifier which is unique to the vehicle. The environment identifier is used to prevent the swapping modules between vehicles. The body control module (BCM) is the keeper of the environment identifier. The Instrument Cluster, Electronic Brake Control Module, HVAC Control Module, Inflatable Restraint Sensing and Diagnostic Module, engine control module (ECM), and Steering Column Lock Module (if equipped) each learn the environment identifier during their configuration process. During vehicle operation, the BCM sends the immobilizer identifier as a challenge and each module responds to the challenge by sending the environment identifier back to the BCM. If the BCM sends an incorrect immobilizer identifier or a specific number of incorrect environment identifiers are received, vehicle starting is disabled.

Conditions for Running the DTC

Ignition is in the ACCESSORY or RUN position.

Conditions for Setting the DTC

An incorrect immobilizer identifier was broadcast by the BCM.

Action Taken When the DTC Sets

- The security indicator in the instrument cluster will illuminate.
- Vehicle starting will be disabled.

Conditions for Clearing the DTC

A current DTC will be cleared when the BCM broadcasts a correct immobilizer identifier.

Diagnostic Aids

If BCM programming is not completed after BCM replacement, the immobilizer identifier will not be learned. If DTC B389A sets immediately after the replacement and programming of a BCM, perform the programming procedure again.

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Scan Tool Reference

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

Circuit/System Verification

1. Verify DTC B389A did not set immediately following the replacement and programming of the K9 Body Control Module.
 - **If the DTC set immediately after the replacement and programming of the K9 Body Control Module**

The immobilizer learn procedure was not properly completed. Perform the BCM immobilizer learn using the body control module IMMO Function with Existing Transponder or Remote Key in SPS. Refer to [Immobilizer System Component Programming](#).
 - **If the DTC did not set immediately after the replacement and programming of the K9 Body Control Module**
2. Verify DTC B3902 is not set in any of the control modules listed below:
 - K20 Engine Control Module
 - K36 Inflatable Restraint Sensing and Diagnostic Module
 - K17 Electronic Brake Control Module
 - K33 HVAC Control Module
 - P16 Instrument Cluster
 - K60 Steering Column Lock Module (if equipped)
 - **If DTC B3902 is set in any of the modules**

Refer to [DTC B3902](#).
 - **If DTC B3902 is not set in any of the modules**
3. Perform the K9 Body Control Module immobilizer learn using body control module IMMO Function with Existing Transponder or Remote Key in SPS. Refer to [Immobilizer System Component Programming](#).
4. Verify DTC B389A does not set after programming.
 - **If the DTC sets after programming**

Replace the K9 Body Control Module.
 - **If the DTC does not set after programming**
5. All OK.

Repair Instructions

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

[Control Module References](#) for body control module replacement, programming, and setup.

DTC B3902: INCORRECT IMMOBILIZER IDENTIFIER RECEIVED

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. cardiagn.com

DTC Descriptor

DTC B3902

Incorrect Immobilizer Identifier Received

For symptom byte information, refer to [Symptom Byte List](#) .

Circuit/System Description

When certain modules are programmed and configured during installation, the module learns a specific environment identifier which is unique to the vehicle. The environment identifier is used to prevent the swapping modules between vehicles. The body control module (BCM) is the keeper of the environment identifier. The instrument cluster, electronic brake control module, HVAC control module, inflatable restraint sensing and diagnostic module, engine control module (ECM), and steering column lock module (if equipped) each learn the environment identifier during their configuration process. During vehicle operation, the BCM sends the immobilizer identifier as a challenge and each module responds to the challenge by sending the environment identifier back to the BCM. If the BCM sends an incorrect immobilizer identifier or a specific number of incorrect environment identifiers are received, vehicle starting is disabled.

Conditions for Running the DTC

Ignition is in the ACCESSORY or RUN position.

Conditions for Setting the DTC

The control module's environment identifier does not match the environment identifier stored by the BCM.

Action Taken When the DTC Sets

- The security indicator in the instrument cluster will illuminate.
- Vehicle starting will be disabled.

Conditions for Clearing the DTC

A current DTC will be cleared when the module learns a correct environment identifier.

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Scan Tool Reference

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

Circuit/System Verification

1. Perform the Programming and Setup procedure for the control module that set DTC B3902.

NOTE: When performing the following step, Immobilizer System Component Programming, the module may also need to be reset by using the SPS function Prepare For Removal.

2. Perform the Immobilizer System Component Programming [Immobilizer System Component Programming](#).
3. Verify DTC B3902 does not set after programming.
 - **If the DTC sets after programming**
Replace the control module that set the DTC.
 - **If the DTC does not set after programming**
4. All OK.

Repair Instructions

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

[Control Module References](#) for instrument cluster, electronic brake control module, HVAC control module, inflatable restraint sensing and diagnostic module, engine control module, or steering column lock module replacement, programming, and setup.

DTC B3924-B3928: INCORRECT ENVIRONMENTAL IDENTIFIER RECEIVED

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 B3924

Incorrect Environmental Identifier Received From Inflatable Restraint Sensing and Diagnostic Module

DTC B3925

Incorrect Environmental Identifier Received From HVAC Control Module

DTC B3926

Incorrect Environmental Identifier Received From Instrument Cluster

DTC B3927

Incorrect Environmental Identifier Received From Electronic Brake Control Module

DTC B3928

Incorrect Environmental Identifier Received From Telematics Communication Interface Control Module

For symptom byte information, refer to [Symptom Byte List](#).

Circuit/System Description

When certain modules are programmed and configured during installation, the module learns a specific environment identifier which is unique to the vehicle. The environment identifier is used to prevent the swapping of control modules between vehicles. The body control module (BCM) is the keeper of the

environment identifier. The instrument cluster, electronic brake control module, HVAC control module, inflatable restraint sensing and diagnostic module, and telematics communication interface control module each learn the environment identifier during their configuration process. During vehicle operation, the BCM sends the immobilizer identifier as a challenge and each module responds to the challenge by sending the environment identifier back to the BCM. If the BCM sends an incorrect immobilizer identifier or a specific number of incorrect environment identifiers are received, vehicle starting is disabled.

Conditions for Running the DTC

Ignition is in the ACCESSORY or RUN position.

Conditions for Setting the DTC

The control module's environment identifier does not match the environment identifier stored by the BCM.

Action Taken When the DTC Sets

- The security indicator in the instrument cluster will illuminate.
- Vehicle starting will be disabled.

Conditions for Clearing the DTC

A current DTC will be cleared when the module learns a correct environment identifier.

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Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Perform the Programming and Setup procedure for the control module that set the DTC.
2. Verify the DTC does not set after programming.

- **If the DTC sets after programming**

Replace the control module that set the DTC.

- **If the DTC does not set after programming**

3. All OK.

Repair Instructions

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

[Control Module References](#) for instrument cluster, electronic brake control module, HVAC control module, inflatable restraint sensing and diagnostic module, or telematics communication interface control module replacement, programming, and setup.

DTC B3935: TRANSPONDER AUTHENTICATION

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 B3935

Transponder Authentication

For symptom byte information, refer to [Symptom Byte List](#) .

Circuit/System Description

When a vehicle key is inserted into the key slot and the vehicle on/off switch is pressed, the transponder embedded in the head of the key is energized by the exciter coils surrounding the key slot. The energized transponder transmits a signal that contains its unique value, which is received by the body control module (BCM). The BCM then compares this value to a value stored in memory. If the value is not correct, the BCM disables engine start.

Conditions for Running the DTC

- Vehicle is ON or in Service Mode.
- A valid transponder value has been read.

Conditions for Setting the DTC

- The transponder value is valid and matches the value stored in the BCM memory.
- The transponder calculation of the challenge from the BCM does not match the BCM calculation.

Action Taken When the DTC Sets

- Vehicle starting will be disabled.
- The security indicator will illuminate. The driver information center will display a service message.

Conditions for Clearing the DTC

- A current DTC will be cleared when a valid transponder value has been read and authenticated.
- A history DTC will be cleared after 100 malfunction-free power mode cycles.

Reference Information

Schematic Reference

Immobilizer Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Immobilizer Description and Operation

- [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. Replace the suspected inoperative or malfunctioning key.
2. Verify DTC B3935 is not set as current.
 - **If the DTC is set as current**

Replace the K9 Body Control Module.
 - **If the DTC is set as history**
3. All OK.

Repair Instructions

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

[Control Module References](#) for body control module replacement, programming, and setup

DTC B3976: UNCONFIGURED TRANSPONDER

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 B3976

Unconfigured Transponder

For symptom byte information, refer to [Symptom Byte List](#) .

Circuit/System Description

When a vehicle key is inserted into the key slot and the vehicle on/off switch is pressed, the transponder embedded in the head of the key is energized by the exciter coils surrounding the key slot. The energized transponder transmits a signal that contains its unique value, which is received by the body control module (BCM). The BCM then compares this value to a value stored in memory. If the value is not correct, the BCM disables engine start.

Conditions for Running the DTC

- Vehicle is ON or in Service Mode.
- The BCM is in the learn coded key state.

Conditions for Setting the DTC

The BCM has determined the current key is not configured as a proper vehicle key.

Action Taken When the DTC Sets

- Vehicle starting will be disabled.
- The security indicator in the instrument cluster will be illuminated. A service message will be displayed in the driver information center.

Conditions for Clearing the DTC

- A current DTC will be cleared when the BCM detects a properly configured vehicle key.
- A history DTC will be cleared after 100 malfunction-free power mode cycles or when a scan tool is used to clear DTCs.

Reference Information

Schematic Reference

Immobilizer Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Immobilizer 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 the engine starts with each available key.
 - **If the engine does not start with a key**
Replace the key.
 - **If the engine starts with all keys**
2. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair.

DTC B3984: DEVICE 1 ENVIRONMENT IDENTIFIER NOT PROGRAMMABLE

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 B3984

Device 1 Environment Identifier Not Programmable

For symptom byte information, refer to [Symptom Byte List](#).

Circuit/System Description

When certain modules are programmed and configured during installation, the module learns a specific environment identifier which is unique to the vehicle. The environment identifier is used to prevent the swapping modules between vehicles. The body control module (BCM) is the keeper of the environment identifier. The instrument cluster, electronic brake control module, HVAC control module, inflatable restraint sensing and diagnostic module, engine control module (ECM), and steering column lock module (if equipped) each learn the environment identifier during their configuration process. During vehicle operation, the BCM sends the immobilizer identifier as a challenge and each module responds to the challenge by sending the environment identifier back to the BCM. If the BCM sends an incorrect immobilizer identifier or a specific number of incorrect environment identifiers are received, vehicle starting is disabled.

Conditions for Running the DTC

Ignition is in the ACCESSORY or RUN position.

Conditions for Setting the DTC

An incorrect environment identifier is programmed or no environment identifier is programmed.

Action Taken When the DTC Sets

- The security indicator in the instrument cluster will illuminate.
- Vehicle starting will be disabled.

Conditions for Clearing the DTC

A current DTC will be cleared when the module learns a correct environment identifier.

Reference Information

Schematic Reference

Immobilizer Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Immobilizer 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. Perform the Programming and Setup procedure for the control module that set DTC B3984.
2. Verify DTC B3984 does not set after programming.

- **If the DTC sets after programming**

Replace the control module that set the DTC.

- If the DTC does not set after programming

3. All OK.

Repair Instructions

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

[Control Module References](#) for instrument cluster, electronic brake control module, HVAC control module, inflatable restraint sensing and diagnostic module, engine control module, and steering column lock module replacement, programming, and setup.

DTC P0513: IMMOBILIZER KEY INCORRECT

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 P0513

Immobilizer Key Incorrect

Circuit/System Description

The body control module (BCM) sends the pre - release information to the hybrid/EV powertrain control module 1 via the serial data circuit. The hybrid/EV powertrain control module 1 then sends a challenge to the BCM. Both the hybrid/EV powertrain control module 1 and BCM perform a calculation on this challenge. The engine control module (ECM) also monitors this challenge and calculates it's own result. If the calculated response from the BCM equals the calculation performed by the hybrid/EV powertrain control module 1 and ECM, the hybrid/EV powertrain control module 1 and ECM will allow vehicle propulsion.

Conditions for Running the DTC

Vehicle is ON or in Service Mode.

Conditions for Setting the DTC

Hybrid/EV Powertrain Control Module 1

The calculated response from the BCM does not equal the calculation performed by the hybrid/EV powertrain control module 1.

Engine Control Module

The calculated response from the BCM does not equal the calculation performed by the ECM.

Action Taken When the DTC Sets

- The security indicator in the instrument cluster will illuminate.
- Vehicle propulsion will be disabled.

Conditions for Clearing the DTC

- A current DTC P0513 will be cleared when a valid calculation is received.
- A history DTC will be cleared after 40 malfunction-free power mode cycles or when a scan tool is used to clear DTCs.

Diagnostic Aids

The key referenced in the DTC descriptor does not refer to the vehicle key. In this case, key is referring to the challenge response.

Reference Information

Schematic Reference

Immobilizer Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Immobilizer 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 there are no immobilizer DTCs set in the K9 Body Control Module.
 - **If any immobilizer DTCs are set in the K9 Body Control Module**

Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .
 - **If no immobilizer DTCs are set in the K9 Body Control Module**
2. Perform the K9 Body Control Module immobilizer learn using the Body Control Module IMMO Function with Existing Transponder or Remote Key in SPS. Refer to **Immobilizer System Component Programming**.
3. Verify the K9 Body Control Module successfully completes the learn procedure and DTC P0513 is not set.
 - **If the K9 Body Control Module does not successfully learn or DTC P0513 is set**

Perform the appropriate immobilizer learn using the IMMO Learn in SPS. Refer to **Immobilizer System Component Programming**.
 - **If the K9 Body Control Module successfully completes the learn and DTC P0513 is not set**
4. All OK

DTC P0633: IMMOBILIZER KEY NOT PROGRAMMED

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 P0633

Circuit/System Description

When learning the immobilizer data, as well as the challenge and response sequence, the engine control module (ECM) is placed in learn mode. DTC P0633 will set automatically as an indicator that the system is in learn mode and not as a fault indicator. Once the immobilizer data and challenge/response are learned, learn mode will be exited when the engine is successfully started. If the ECM does not exit learn mode, DTC P0633 will remain current and indicate a fault.

Conditions for Running the DTC

The ECM is in learn mode.

Conditions for Setting the DTC

DTC P0633 will set any time the ECM enters learn mode.

Action Taken When the DTC Sets

The security indicator in the instrument cluster will illuminate.

Conditions for Clearing the DTC

- A current DTC will be cleared upon a successful engine start after exit of learn mode.
- A history DTC will be cleared after 100 malfunction-free ignition cycles.

Reference Information

Schematic Reference

Immobilizer Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Immobilizer 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: DTC P0633 will clear upon a successful engine start. Any malfunction that will cause a no-start condition will prevent DTC P0633 from clearing. Prior to diagnosing DTC P0633, ensure that all power moding and engine control systems are operating properly and all conditions that may cause a no-start have been corrected. Do not replace the K20 Engine Control Module. Replacing the K20 Engine Control Module will not correct the no-start condition.

1. Verify there are no immobilizer DTCs set in the K9 Body Control Module.

- **If any immobilizer DTCs are set in the K9 Body Control Module**

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

- **If no immobilizer DTCs are set in the K9 Body Control Module**
- 2. Perform the K20 Engine Control Module immobilizer learn using the engine control module IMMO Learn in SPS. Refer to [Immobilizer System Component Programming](#).
- 3. Verify the engine starts after the K20 Engine Control Module completes the learn procedure.
 - **If the engine does not start**

An undiagnosed no-start condition exists. Refer to the appropriate subsection and diagnostic to correct the no-start condition.

- **If the engine starts**
4. All OK.

DTC P162B: REMOTE VEHICLE SPEED LIMITING SIGNAL MESSAGE COUNTER INCORRECT

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 P162B

Remote Vehicle Speed Limiting Signal Message Counter Incorrect

Circuit/System Description

When a remote slow-down request is sent from OnStar, the vehicle communication interface control module sends a serial data message to the engine control module (ECM) indicating that reduced vehicle speed has been requested. Once the request is active, the ECM begins reducing engine torque to match the requested vehicle speed and the REDUCED ENGINE POWER message is displayed.

Conditions for Running the DTC

- The engine run time is greater than 5 s
- A remote slow-down request is sent from OnStar

Conditions for Setting the DTC

- The VIN embedded in the slow-down request does not match the VIN stored in the ECM.
- The rolling code counter embedded in the slow-down request does not increment for ten consecutive messages.

Action Taken When the DTC Sets

- ECM ignores all reduced vehicle speed request messages from the vehicle communication interface module.
- The ECM stores DTC P162B in history.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC will clear after 40 malfunction-free ignition cycles have occurred.

Reference Information

Schematic Reference

cardiagn.com

[OnStar/Telematics Schematics](#)

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Remote Vehicle Speed Limiting 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 the vehicle is equipped with OnStar (RPO UE1) and DTC P162B is set
 - **If the vehicle is not equipped with OnStar (RPO UE1) and DTC P162B is set**
Replace the ECM.
 - **If the vehicle is equipped with OnStar (RPO UE1) and DTC P162B is set**
2. Perform the Remote Vehicle Speed Limiting Reset procedure with the scan tool.
3. Verify DTC P162B is not set.
 - **If DTC P162B is set**
 1. Reprogram the ECM. Refer to **Control Module References** .
 2. Verify the DTC does not set while operating the vehicle within the Conditions for Running the DTC.
 - If the DTC sets, replace the ECM. If the DTC continues to set after ECM replacement, replace the vehicle communication interface module.
 - If the DTC does not set
 - 3. All OK.
 - **If DTC P162B is not set**
4. All OK.

Repair Instructions

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

Control Module References for telematics communication interface control module or engine control module replacement, programming, and setup

DTC P1631: IMMOBILIZER FUEL ENABLE SIGNAL NOT CORRECT

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 P1631

Immobilizer Fuel Enable Signal Not Correct

Circuit/System Description

The body control module (BCM) sends the pre - release information to the hybrid/EV powertrain control module 1 via the serial data circuit. The hybrid/EV powertrain control module 1 then sends a challenge to the BCM. Both the hybrid/EV powertrain control module 1 and BCM perform a calculation on this challenge. The engine control module (ECM) also monitors this challenge and calculates it's own result. If the calculated response from the BCM equals the calculation performed by the hybrid/EV powertrain control module 1 and ECM, the hybrid/EV powertrain control module 1 and ECM will allow vehicle propulsion.

Conditions for Running the DTC

Vehicle is ON or in Service Mode.

Conditions for Setting the DTC

Hybrid/EV Powertrain Control Module 1

The hybrid/EV powertrain control module 1 receives incorrect immobilizer data from the BCM.

Engine Control Module

The ECM receives incorrect immobilizer data from the BCM.

Action Taken When the DTC Sets

- The security indicator in the instrument cluster will illuminate.
- Vehicle starting will be disabled.

Conditions for Clearing the DTC

- A current DTC P1631 will be cleared when correct immobilizer data is received.
- A history DTC will be cleared after 40 malfunction-free power mode cycles or when a scan tool is used to clear DTCs.

Reference Information

Schematic Reference

Immobilizer Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Immobilizer 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 there are no immobilizer DTCs set in the K9 Body Control Module.
 - **If any immobilizer DTCs are set in the K9 Body Control Module**

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

- **If no immobilizer DTCs are set in the K9 Body Control Module**
- 2. Perform the K9 Body Control Module immobilizer learn using the Body Control Module IMMO Function with Existing Transponder or Remote Key in SPS. Refer to [Immobilizer System Component Programming](#).
- 3. Verify the K9 Body Control Module successfully completes the learn procedure and DTC P1631 is not set.

- **If the K9 Body Control Module does not successfully learn or DTC P1631 is set**

Perform the appropriate immobilizer learn using the IMMO Learn in SPS. Refer to [Immobilizer System Component Programming](#).

- **If the K9 Body Control Module successfully completes the learn and DTC P1631 is not set**

4. All OK

DTC P1649: IMMOBILIZER SECURITY CODE NOT PROGRAMMED

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 P1649

Immobilizer Security Code Not Programmed

Circuit/System Description

When learning the security code, as well as the challenge and response sequence, the engine control module (ECM) is placed in learn mode. Once the security code and challenge/response are learned, learn mode will be exited when the engine is successfully started.

Conditions for Running the DTC

The ECM is in learn mode.

Conditions for Setting the DTC

The ECM has not learned a security code.

Action Taken When the DTC Sets

The security indicator in the instrument cluster will illuminate.

Conditions for Clearing the DTC

- A current DTC will be cleared upon a successful engine start after exit of learn mode.
- A history DTC will be cleared after 100 malfunction-free ignition cycles.

Reference Information

Schematic Reference

Immobilizer Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Immobilizer Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify there are no immobilizer DTCs set in the K9 Body Control Module.
 - **If any immobilizer DTCs are set in the K9 Body Control Module**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .
 - **If no immobilizer DTCs are set in the K9 Body Control Module**
2. Perform the K20 Engine Control Module immobilizer learn using the engine control module IMMO Learn in SPS. Refer to [Immobilizer System Component Programming](#).
3. Verify the engine starts after the K20 Engine Control Module completes the learn procedure.
 - **If the engine does not start**

Replace the K20 Engine Control Module.
 - **If the engine starts**
4. All OK.

Repair Instructions

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

[Control Module References](#) for engine control module replacement, programming, and setup.

SYMPTOMS - IMMOBILIZER

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

1. Perform the [Diagnostic System Check - Vehicle](#) before using the symptom tables in order to verify that all of the following are true:
 - There are no DTCs set.
 - The control modules can communicate via the serial data links.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to [Immobilizer Description and Operation](#).

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the systems. Refer to [Checking Aftermarket Accessories](#) .
- 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](#) .

Refer to [OnStar Stolen Vehicle Slowdown Active](#) to diagnose the symptom.

ONSTAR STOLEN VEHICLE SLOWDOWN ACTIVE

Diagnostic Instructions

NOTE: This procedure is not used in Brazil.

- 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

When a remote slow-down request is sent from OnStar, the Telematics Communication Interface Control Module sends a serial data message to the engine control module (ECM) indicating that reduced vehicle speed has been requested. Once the request is active, the ECM begins reducing engine torque to match requested vehicle speed and the REDUCED ENGINE POWER message is displayed.

Reference Information

Schematic Reference

[OnStar/Telematics Schematics](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

Description and Operation

[Remote Vehicle Speed Limiting 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 the vehicle is not in the OnStar initiated Stolen Vehicle Slowdown mode. This can be accomplished by verifying the scan tool Telematics Enhanced Service Immobilization parameter is No.
 - **If the scan tool Telematics Enhanced Service Immobilization parameter is Yes**
 1. Perform the Remote Vehicle Speed Limiting Reset procedure with the scan tool.
 2. Press the blue OnStar button and inform the advisor that you need to be transferred to the stolen vehicle team to update the vehicle account.
 - **If the scan tool BCM Telematics Enhanced Service Immobilization parameter is No**
2. All OK.

REPAIR INSTRUCTIONS

IMMOBILIZER SYSTEM COMPONENT PROGRAMMING

This procedure will learn the immobilizer function and require greater than 15 minutes to complete. If the battery voltage is low, charge the battery before proceeding with the learn. If the body control module (BCM) or engine control module (ECM) have been replaced, they must be programmed before performing this learn procedure.

Depending on the immobilizer function being learned or the component replaced, different learn functions are required to be performed. These learn functions are as follows:

Function name on SPS tool:	Function description:	When the function should be used:	Notes:
Body Control Module IMMO Function with Existing Transponder or Remote Key	The BCM will relearn the immobilizer passwords and data while reusing the existing vehicle keys	The BCM has been replaced and the existing vehicle keys are being reused or a diagnostic has instructed to perform the learn	-
Body Control Module IMMO Function with New Transponder or Remote Key	The BCM will relearn the immobilizer passwords and data while using new vehicle keys	The BCM has been replaced and new vehicle keys are being reused	-
Engine Control Module IMMO Learn	The ECM will relearn the immobilizer passwords and data	The ECM has been replaced or a diagnostic has instructed to perform the learn	-
Engine Control Module and Body Control Module IMMO Learn	The ECM and BCM will learn new immobilizer passwords and data	Both the ECM and BCM have been replaced (this selection will REQUIRE new vehicle keys be used)	Because both the ECM and BCM have been replaced and are learning new immobilizer passwords and data, all vehicle keys must also be replaced
Program Transponder or Remote Key (Add)	A new vehicle key will learn the immobilizer passwords and data	A new vehicle key is being added (does not affect other vehicle keys)	This function may not be available in all sales regions
Program Transponder or Remote Key (Delete)	All existing vehicle keys will be invalidated and any desired keys are relearned	All vehicle keys are desired to be invalidated and certain keys relearned or a diagnostic has instructed to perform the learn	This procedure may be used if a customer has had their keys lost or stolen and wishes to invalidate the keys, making them unable to start the vehicle

1. Connect a scan tool to the vehicle and access SPS.
2. Vehicle in Service Mode, engine OFF.
3. Ensure that all power consuming devices are turned OFF on the vehicle.
4. Select SPS application and follow the on-screen instructions.
5. Select Reprogram ECU.
6. Select IMMO Immobilizer Learn - Setup.
7. Select the appropriate programming function based on the component that was replaced or is being programmed. Refer to the table at the top of this document for assistance in choosing the correct programming function.

NOTE:

- At multiple times during the learn procedure, SPS will instruct you to turn the vehicle to Service Mode. Make sure the vehicle

is actually in the Service Mode before continuing on the SPS terminal. If the vehicle is not in the Service Mode, the learn procedure will fail.

- The key pocket is located in the center console under the small tray. The key must be placed with the buttons facing down.

8. Follow the on-screen instructions.

NOTE: If the programming does not complete or hangs during the programming operation, refer to Unable to Complete Programming below.

9. After programming all keys "Programming Complete" is displayed.
10. Press and hold the vehicle ON/OFF switch for 15 seconds.
11. Press the lock and unlock button on each transmitter that was programmed. This will awaken each transmitter and allow passive and active keyless entry functions to be established.
12. With a scan tool, clear any DTCs.
13. Verify each key is operating properly. Operate each of the keyless entry functions using the buttons on the transmitter and then start the vehicle. When verifying operation, make sure that no other keys are near the vehicle.

Unable to Complete Programming

When attempting to program immobilizer components, various conditions may prevent the programming operation from completing. These conditions may be caused by normal system operation, a system malfunction, or an external influence. Common symptoms of a incomplete programming is receiving an error message during the attempt or having the SPS application become unresponsive.

- DTCs are set in the body control module (BCM)

The immobilizer system is a function of the BCM software. If immobilizer DTCs are set in the BCM, such as DTC B2955, a fault has been identified in the immobilizer system. If this is not corrected before attempting to program components, the programming may not complete. Correct all immobilizer DTCs before attempting to program any immobilizer components.

- The key has been programmed to another vehicle or is not the correct type for the vehicle

A key can only be programmed to a single vehicle. Once a key is programming to a vehicle, it is paired for the life of the key. The key can be learned to the same vehicle again and again, but it is not able to be programmed to a different vehicle.

Many vehicle are available with both a base keyless entry system and an optional passive entry system. These keys typically look identical but cannot be substituted for one another. To verify the key is correct, compare the part number that is etched on the key to the part number identified in the parts catalog. The key should be correct for the system installed in the vehicle.

- The theft deterrent module is not properly secured or the key is not properly positioned in the pocket/slot.

A theft deterrent module that is not fully seated or is otherwise not properly secured may prevent a coupling between the transponder located in the key and the theft deterrent module. Being out of place by as little as 1 mm may prevent programming from completing. Make sure the theft deterrent module is properly installed and fully seated in it's clip.

The key shank must be fully extended so that the entire key shank fits into the programming slot.

To determine if the theft deterrent module is properly secured, remove the battery from the key and place the key into the pocket/slot. Attempt to change the vehicle mode by pressing the vehicle ON/OFF switch. The vehicle should change modes. If the NO REMOTE DETECTED message is displayed on the DIC, the theft deterrent module may not be properly secured.

- External interference is interrupting the programming operation

External RF interference and EMI may interrupt the low frequency coupling between the key and theft deterrent module. This interference may come from many different locations. Devices plugged into the vehicle power outlets such as cell phone chargers, laptop computers, GPS devices, etc. may cause interference. Vehicle location may also cause interference. Locations near airports and military installations may cause interference. Remove all customer installed devices and, if necessary, move the vehicle if interference is suspected.

KEY WITH INTEGRATED TRANSMITTER PROGRAMMING

Keys can be programmed in various ways using the procedures outlined below. Using the Replacing Keys procedure will first erase all the known keys from the vehicle. Any existing keys and any new keys will then be programmed. This procedure should be used any time a key is required to be unlearned or erased from a vehicle. If a new key is being learned to a vehicle to replace a damaged, inoperative, or stolen key, the Replacing Keys procedure must be used. This ensures that the old key cannot be used to access or start the vehicle after programming.

The Adding Keys procedure does not erase any keys prior to programming. The procedure will simply program the key into the next available slot. The Adding Keys procedure should only be used when adding an additional key to the vehicle. The Adding Keys procedure should never be used to program a key to a vehicle that is having a key replaced, regardless of the cause for the replacement.

Replacing Keys (Without SPS)

NOTE:

- This procedure will unlearn all previously learned keys. All keys that are to be programmed must be with the vehicle.
- This procedure will take approximately 30 minutes to complete.
- A total of eight keys may be learned to a single vehicle.
- This procedure will only learn the vehicle key information. This procedure will not learn any immobilizer information between the body control module (BCM) and engine control module (ECM).
- This procedure may be used with or without existing learned keys being present. If existing keys are present, keep the keys away from the vicinity of the vehicle. Failure to keep learned keys away from the vehicle will result in the learn changing to the Adding Keys procedure.
- The keys to be learned must duplicate the mechanical cut of the current key.

1. Insert the mechanical key of the new key into the key lock cylinder located on the outside of the driver door and turn the key to the unlock position five times within ten seconds. The Driver Information Center (DIC) will display Remote Learn Pending, Please Wait.
2. After ten minutes, the DIC will display Press Engine Start Button To Learn. Press the vehicle ON/OFF switch. The DIC will again display Remote Learn Pending, Please Wait.
3. Repeat Step 2 two additional times, for a total of thirty minutes. All previously known keys have now been unlearned. Remaining keys can be relearned during the next steps. The DIC display will now display Ready For Remote # 1.

NOTE: The key pocket is located in the center console under the small tray. The key must be placed with the buttons facing down.

4. Place the new key into the key pocket.

NOTE: If the programming does not complete or hangs during the programming operation, refer to Unable to Complete Programming below.

5. Press the vehicle ON/OFF switch. When the key is learned the DIC will indicate that it is ready to program the next key.
6. Remove the key from the key pocket and press the unlock button. To program additional keys, repeat Steps 4 through 6.
7. When all additional keys are programmed, press and hold the vehicle ON/OFF switch for 5 seconds to exit programming mode.

Replacing Keys (With SPS)

NOTE:

- This procedure will unlearn all previously learned keys. All keys that are to be programmed must be with the vehicle.
- This procedure may be used with or without existing learned keys being present.
- This procedure will take more than 15 minutes to complete.
- A total of eight keys may be learned to a single vehicle.
- This procedure will only learn the vehicle key information. This procedure will not learn any immobilizer information between the body control module (BCM) and engine control module (ECM).
- If the battery voltage is low, charge the battery before continuing with the procedure.

1. Connect a scan tool to the vehicle and access SPS.
2. Ensure that all power consuming devices are turned OFF on the vehicle.
3. Select the SPS application and follow the on-screen instructions.
4. Select Reprogram ECU.
5. Select IMMO Immobilizer Learn - Setup.
6. Select the Program Transponder or Remote Key (Delete) function.

NOTE:

- At multiple times during the learn procedure, SPS will instruct you to turn the vehicle to Service Mode. Make sure the vehicle is actually in the Service Mode before continuing on the SPS terminal. If the vehicle is not in the Service Mode, the learn procedure will fail.
- The key pocket is located in the center console under the small tray. The key must be placed with the buttons facing down.

7. Follow the on-screen instructions.

NOTE:

If the programming does not complete or hangs during the programming operation, refer to Unable to Complete Programming below.

8. After programming all keys, Programming Complete, is displayed.
9. Press and hold the vehicle ON/OFF switch for 15 seconds.
10. Press the lock and unlock button on each key that was programmed. This will awaken each key and allow passive and active keyless entry functions to be established.
11. With a scan tool, clear any DTCs.
12. Verify each key is operating properly. Operate each of the keyless entry functions using the buttons on the key and then start the vehicle. When verifying operation, make sure that no other keys are near the vehicle.

Adding Keys (Without SPS)

NOTE:

- To initiate, this procedure requires that 2 learned keys be available.

- A total of eight keys maybe be learned to a single vehicle.
- This procedure adds keys only. The procedure does not erase previously learned keys.
- The keys to be learned must duplicate the mechanical cut of the current key.

1. Place the recognized keys in the vehicle cupholder.
2. Insert the mechanical key of the new key into the key lock cylinder located on the outside of the driver door and turn the key to the unlock position five times within ten seconds. The Driver Information Center (DIC) will display Ready For Remote #2, 3, 4 or 5.

NOTE: The key pocket is located in the center console under the small tray. The key must be placed with the buttons facing down.

3. Place the new key into the key pocket.

NOTE: If the programming does not complete or hangs during the programming operation, refer to Unable to Complete Programming below.

4. Press and hold the vehicle ON/OFF switch for two seconds. When the key is programmed, the DIC will show that it is ready to program the next key.
5. Remove the key from the key slot and press the unlock button. To program additional keys, repeat Steps 3 through 5.
6. When all additional keys are programmed, press and hold the vehicle ON/OFF switch for 10 seconds to exit programming mode.

Adding Keys (With SPS)

NOTE:

- This procedure may be used with or without existing learned keys being present.
- This procedure will take more than 15 minutes to complete.
- A total of eight keys maybe be learned to a single vehicle.
- This procedure will only learn the vehicle key information. This procedure will not learn any immobilizer information between the body control module (BCM) and engine control module (ECM).
- If the battery voltage is low, charge the battery before continuing with the procedure.

1. Connect a scan tool to the vehicle and access SPS.
2. Ensure that all power consuming devices are turned OFF on the vehicle.
3. Select the SPS application and follow the on-screen instructions.
4. Select Reprogram ECU.
5. Select IMMO Immobilizer Learn - Setup.
6. Select the Program Transponder or Remote Key (Add) function.

NOTE:

- At multiple times during the learn procedure, SPS will instruct you to turn the vehicle to Service Mode. Make sure the vehicle is actually in the Service Mode before continuing on the SPS terminal. If the vehicle is not in the Service Mode, the learn procedure will fail.
- The key pocket is located in the center console under the small tray. The key must be placed with the buttons facing down.

7. Follow the on-screen instructions.

NOTE: If the programming does not complete or hangs during the programming operation, refer to Unable to Complete Programming below.

8. After programming all keys, Programming Complete, is displayed.
9. Press and hold the vehicle ON/OFF switch for 15 seconds.
10. Press the lock and unlock button on each key that was programmed. This will awaken each key and allow passive and active keyless entry functions to be established.
11. With a scan tool, clear any DTCs.
12. Verify each key is operating properly. Operate each of the keyless entry functions using the buttons on the key and then start the vehicle. When verifying operation, make sure that no other keys are near the vehicle.

Unable to Complete Programming

When attempting to program immobilizer components, various conditions may prevent the programming operation from completing. These conditions may be caused by normal system operation, a system malfunction, or an external influence. Common symptoms of an incomplete programming is receiving an error message during the attempt or having the SPS application become unresponsive.

- DTCs are set in the body control module (BCM)

The immobilizer system is a function of the BCM software. If immobilizer DTCs are set in the BCM, such as DTC B2955, a fault has been identified in the immobilizer system. If this is not corrected before attempting to program components, the programming may not complete. Correct all immobilizer DTCs before attempting to program any immobilizer components.

- The key has been programmed to another vehicle or is not the correct type for the vehicle

A key can only be programmed to a single vehicle. Once a key is programmed to a vehicle, it is paired for the life of the key. The key can be learned to the same vehicle again and again, but it is not able to be programmed to a different vehicle.

Many vehicles are available with both a base keyless entry system and an optional passive entry system. These keys typically look identical but cannot be substituted for one another. To verify the key is correct, compare the part number that is etched on the key to the part number identified in the parts catalog. The key should be correct for the system installed in the vehicle.

- The theft deterrent module is not properly secured or the key is not properly positioned in the pocket/slot.

A theft deterrent module that is not fully seated or is otherwise not properly secured may prevent a coupling between the transponder located in the key and the theft deterrent module. Being out of place by as little as 1 mm may prevent programming from completing. Make sure the theft deterrent module is properly installed and fully seated in its clip.

The key shank must be fully extended so that the entire key shank fits into the programming slot.

To determine if the theft deterrent module is properly secured, remove the battery from the key and place the key into the pocket/slot. Attempt to change the vehicle mode by pressing the vehicle ON/OFF switch. The vehicle should change modes. If the NO REMOTE DETECTED message is displayed on the DIC, the theft deterrent module may not be properly secured.

- External interference is interrupting the programming operation

External RF interference and EMI may interrupt the low frequency coupling between the key and theft deterrent module. This interference may come from many different locations. Devices plugged into the vehicle power outlets such as cell phone chargers, laptop computers, GPS devices, etc. may cause interference. Vehicle location may also cause interference. Locations near

airports and military installations may cause interference. Remove all customer installed devices and, if necessary, move the vehicle if interference is suspected.

DESCRIPTION AND OPERATION

IMMOBILIZER DESCRIPTION AND OPERATION

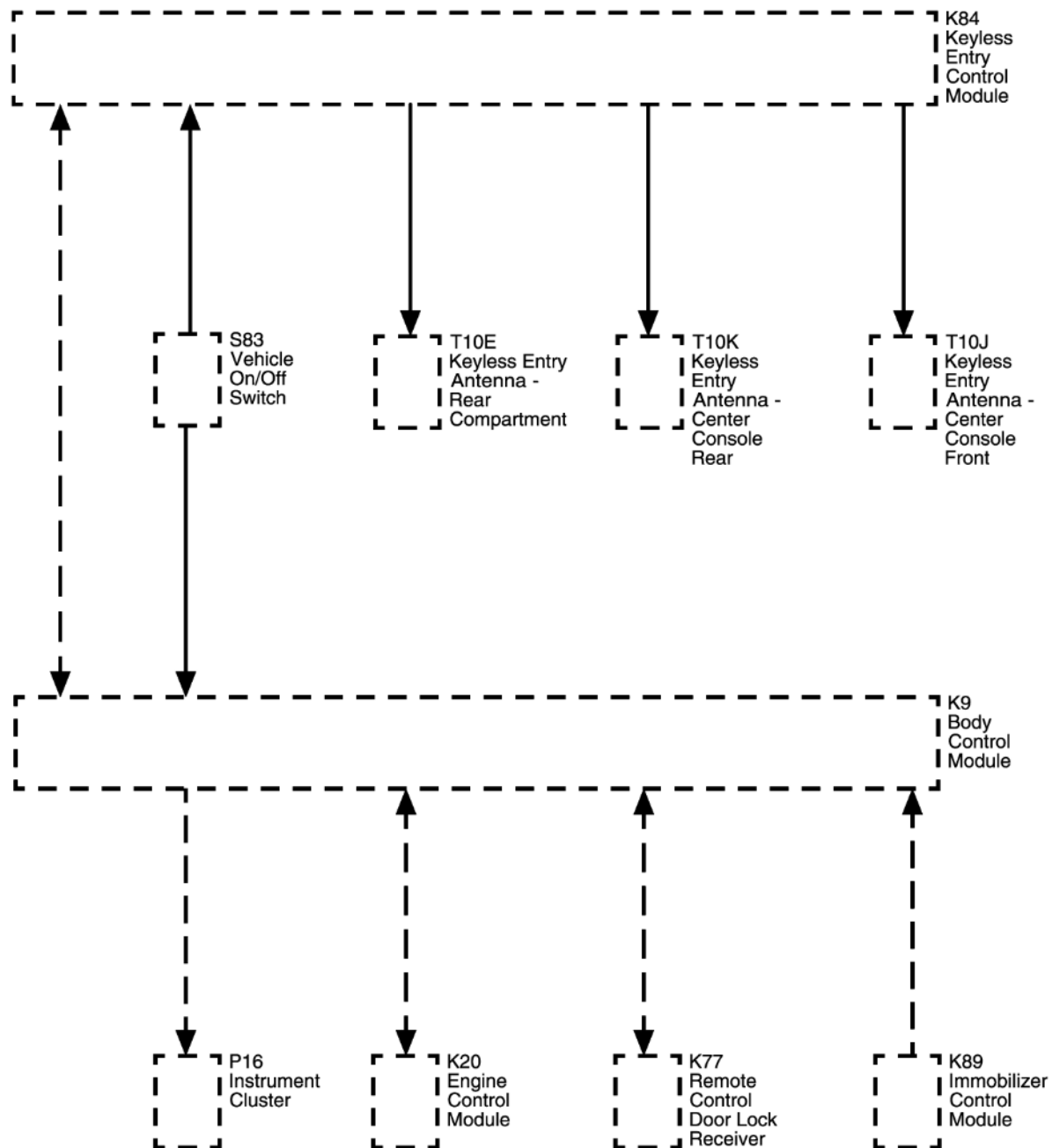


Fig. 2: Immobilizer System Diagram

Courtesy of GENERAL MOTORS COMPANY

The immobilizer system functions are provided by the keyless entry control module, remote control door lock receiver, body control module (BCM), hybrid/EV powertrain control module 1, and engine control module (ECM), as well as any modules which store and report the environment identifier. The keyless start system use low frequency antennas in three different locations on the vehicle to determine the location of the transmitter. Multiple antenna are used to ensure complete coverage of the vehicle interior and rear compartment.

When the vehicle ON/OFF switch is pressed, the low frequency antennas emit a challenge to the keyless entry transmitter. The transmitter receives this challenge and emits it's response as an RF message. The transmitter transmits a signal that contains its unique value, which is received by the BCM through the

remote control door lock receiver. The BCM then compares this value to a value stored in memory. The BCM also monitors various modules to determine if the stored environment identifiers match.

If both the environment identifier and the value received from the transponder match, the BCM will send the prerelease password via serial data to the hybrid/EV powertrain control module 1. If the encrypted code's unique value is incorrect or the environment identifier does not match, the BCM will send the fuel disable message to the hybrid/EV powertrain control module 1.

When the hybrid/EV powertrain control module 1 receives the BCM prerelease password, the hybrid/EV powertrain control module 1 will challenge the password. The hybrid/EV powertrain control module 1 sends this challenge to the BCM via serial data. Both the hybrid/EV powertrain control module 1 and BCM perform a calculation on this challenge. Additionally, the ECM will also monitor this challenge and calculate its own response. If the BCM calculated response to the challenge equals the calculation performed by the hybrid/EV powertrain control module 1 and ECM, the hybrid/EV powertrain control module 1 and ECM will allow vehicle propulsion.

If RF communication is interrupted, a "No Remote Detected" message will be displayed on the DIC. In these cases, the extended transmitter key blade can be placed in the transmitter slot located in the upper instrument panel storage compartment, under the rubber mat. The immobilizer antenna coil is located directly beneath the transmitter slot. Placing the transmitter in the pocket will create a low powered coupling between the transmitter and immobilizer antenna, allowing communications to occur and enabling vehicle starting.

The components of the theft system are as follows:

- BCM
- Hybrid/EV powertrain control module 1
- ECM
- Immobilizer antenna
- Ignition key or keyless entry transmitter
- Security indicator
- Various modules which store and report the environment identifier

Body Control Module (BCM)

The immobilizer system is an integral part of the BCM and is controlled internally within the BCM. The BCM can learn up to 8 keys (transponder values).

The BCM uses the following inputs:

- Environment identifier exchange with various modules
- Encrypted code from the vehicle key, received by the immobilizer antenna

The BCM uses the following outputs:

- Prerelease password communication with ECM
- Challenge/response with ECM

When the vehicle ON/OFF switch is pressed, the low frequency antennas emit a challenge to the keyless entry transmitter. The transmitter receives this challenge and emits its response as an RF message. The transmitter transmits a signal that contains its unique value, which is received by the BCM through the remote control door lock receiver. The BCM then compares this value to a value stored in memory. The BCM then performs one of the following functions:

- If the encrypted code value matches the values stored in the BCM memory, the BCM will send the prerelease password to the ECM via serial data.
- If the encrypted code unique value does not match the value stored in the BCM, the BCM will send the start disable message to the ECM via serial data.
- If the BCM is unable to measure the ignition key encrypted code value, the BCM will not send any messages to the ECM.

Hybrid/EV Powertrain Control Module 1

When the hybrid/EV powertrain control module 1 receives the BCM prerelease password, the hybrid/EV powertrain control module 1 will challenge the password. The hybrid/EV powertrain control module 1 sends this challenge to the BCM via the serial data circuit. Both the hybrid/EV powertrain control module 1 and BCM perform a calculation on this challenge. If the calculated response from the BCM equals the calculation performed by the hybrid/EV powertrain control module 1, the hybrid/EV powertrain control module 1 will allow vehicle propulsion.

The hybrid/EV powertrain control module 1 will disable vehicle propulsion if any of the following immobilization conditions occur:

- The prerelease password is invalid.
- The start disable password is sent by the BCM.
- No passwords are received. There is no communication with the BCM.
- The BCM calculated response to the challenge does not equal the calculation performed by the hybrid/EV powertrain control module 1.

Engine Control Module (ECM)

The ECM functions in the immobilizer system as a type of slave device. It does not generate the password challenge, but it does monitor the challenge and response messages between the BCM and hybrid/EV powertrain control module 1. The ECM will calculate its own result to the challenge. If the ECM response does not equal the BCM response, the ECM may also disable vehicle propulsion. To allow vehicle propulsion, the response from the BCM, ECM, and hybrid/EV powertrain control module 1 must all match.

The ECM will disable vehicle propulsion if any of the following immobilization conditions occur:

- The start disable password is sent by the BCM.
- No passwords are received. There is no communication with the BCM or hybrid/EV powertrain control module 1.
- The BCM calculated response to the challenge does not equal the calculation performed by the ECM.

Immobilizer Antenna

The immobilizer antenna contains an immobilizer coil. The coil passively powers the transponder located in the ignition key when the key is in the transmitter slot. When powered, the key transmits its unique value to the immobilizer antenna, which is then relayed to the BCM via a LIN serial data circuit. The immobilizer antenna also receives B+ and ground from the BCM.

The immobilizer antenna is used to:

1. Learn keys
2. To start vehicle with or without RF interference
3. To start vehicle when key battery is dead

Keyless Entry Transmitter

Each keyless entry transmitter contains a transponder with a unique encrypted value. The transponder's encrypted value is fixed and unable to be changed. The immobilizer system uses the transponder value to determine if a valid transmitter is being used to start the vehicle.

Environment Identifier

Various modules throughout the vehicle learn a specific environment identifier during the module programming process. The environment identifier is learned by each individual module and matches the environment identifier stored in the BCM. Prior to starting after a battery disconnect, each of the modules which store an environment identifier will compare their identifier to that of the identifier stored in the BCM. If all the identifiers match, the engine starting process will continue. If the environment identifiers do not match, engine starting will be disabled.

The BCM will command the instrument panel cluster to illuminate the security indicator when the vehicle is in Service Mode to indicate a fault has occurred within the immobilizer system and when the engine starting is disabled.

REMOTE VEHICLE SPEED LIMITING DESCRIPTION AND OPERATION

Certain vehicles equipped with OnStar[®] now have an additional feature that allows for remote limiting of the vehicle's speed. This OnStar[®] feature is called Stolen Vehicle Slow-Down and is now part of the OnStar[®] Stolen Vehicle Assistance service. This feature, when used in conjunction with local law enforcement and strict guidelines at the OnStar[®] Call Center, will slow the vehicle by interacting with the engine control system.

When the engine control system receives a valid request from the OnStar[®] telematics communications interface module, it will enter into a reduced engine power/vehicle speed limiting mode, which will decelerate the vehicle. Once the request is active the engine control module begins reducing engine torque to match requested vehicle speed and a REDUCED ENGINE POWER indication is displayed. No DTCs will be set during this process.
