

Immobilizer - Equinox & Terrain

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	Specification	
	Metric	English
Theft Deterrent Module Bolt/Screw	2 N.m	18 lb in

SCHEMATIC AND ROUTING DIAGRAMS

IMMOBILIZER SCHEMATICS

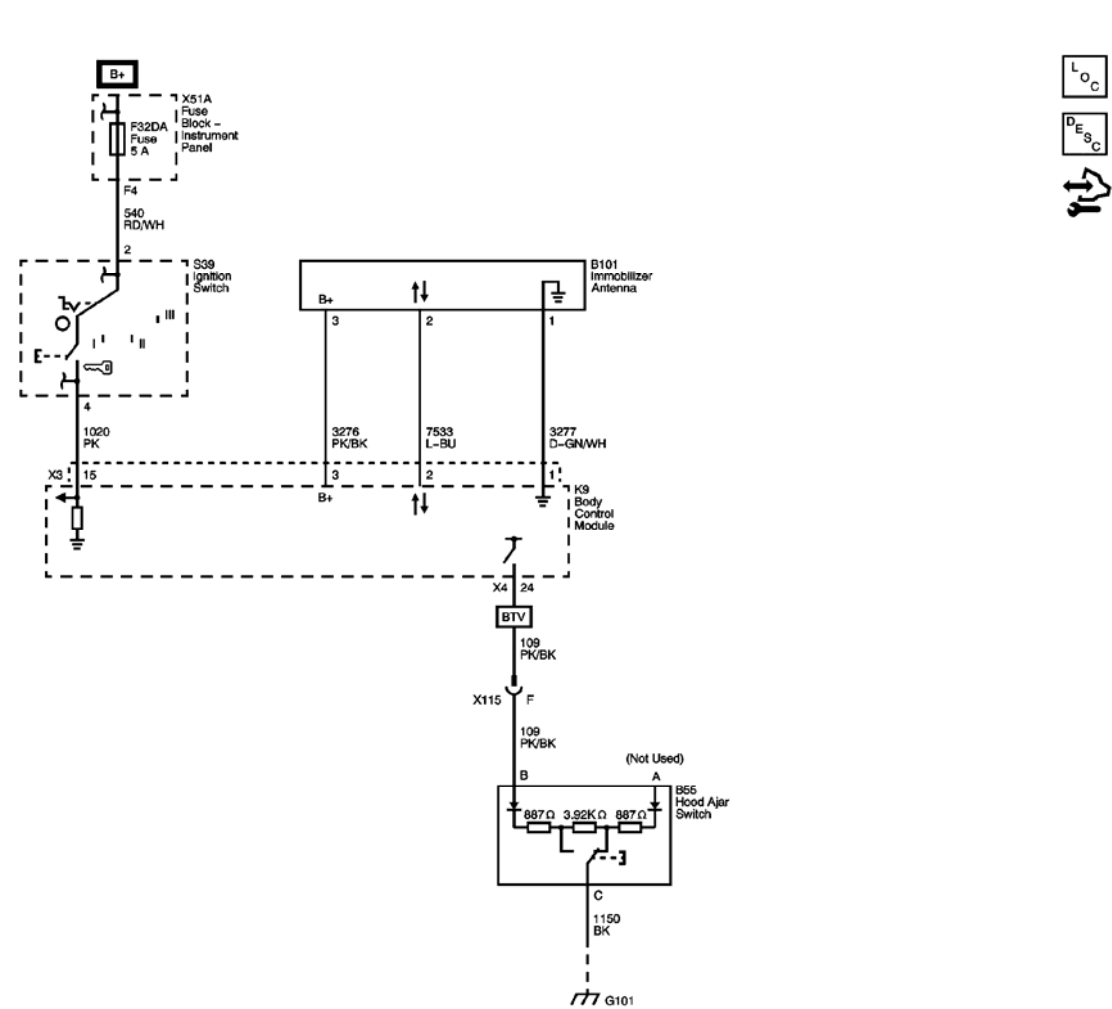


Fig. 1: Immobilizer Schematic

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
DTC B2955	B2955: Security Sensor Data Circuit Malfunction
DTC B3006	B3006 01: Hood Ajar Circuit Short to Battery B3006 02: Hood Ajar Circuit Short to Ground B3006 04: Hood Ajar Circuit Open
DTC B302A	B302A 00: Mobile Telephone Communications Interface Requested Immobilization Malfunction
DTC B3031	B3031 00: Security Controller In Learn Mode Malfunction
DTC B3055	B3055 00: No Transponder Modulation or No Transponder Malfunction
DTC B3060	B3060 00: Unprogrammed Transponder Identification Code Received Malfunction
DTC B389A	B389A: Environment Identification (Received by BCM)
DTC B3902	B3902: Incorrect Immobilizer Identifier Received
DTC B3935	B3935 00: Transponder Authentication Malfunction
DTC B3976	B3976 00: Unconfigured Transponder
DTC B3984	B3984: Device 1 Environment Identifier Not Programmable
DTC P0513	P0513: Immobilizer Key Incorrect
DTC P0633	P0633: Immobilizer Key Not Programmed
DTC P162B	P162B: Remote Vehicle Speed Limiting Signal Message Counter Incorrect
DTC P1631	P1631: Immobilizer Fuel Enable Signal Not Correct
DTC P1649	P1649: Immobilizer Security Code Not Programmed

DTC B2955

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

Security Sensor Data Circuit Malfunction

Diagnostic Fault Information

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

Circuit/System Description

When an ignition key is inserted into the ignition lock cylinder and the ignition is switched ON, the transponder embedded in the key is energized by the exciter coils surrounding the ignition lock cylinder. 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

Ignition is in the Accessory or Run position.

Conditions for Setting the DTC

The BCM is unable to measure the ignition key transponder value.

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 valid transponder value from the ignition key.
- A history DTC will be cleared after 100 malfunction-free ignition 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

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 Testing

1. Inspect all available vehicle keys that they are correct vehicle keys.
 - If not a correct vehicle key, replace the key.
2. Ignition OFF, disconnect the harness connector at the K64 Content Theft Deterrent Control Module and disconnect the harness connector X3 at the K9 Body Control Module, test for infinitive resistance between the signal circuit listed below and ground.
 - K9 Body Control Module terminal 1 X3
 - K9 Body Control Module terminal 2 X3
 - K9 Body Control Module terminal 3 X3
 - If less than the specified range, test the appropriate signal circuit for a short to ground.
3. Test for less than 0.3 V between the signal circuit listed below and ground:
 - K9 Body Control Module terminal 1 X3
 - K9 Body Control Module terminal 2 X3
 - K9 Body Control Module terminal 3 X3
 - If greater than the specified range, test the appropriate signal circuit for a short to voltage.
4. Test for less than 5 ohms between the signal circuit terminal listed below at the K9 Body Control Module and the signal circuit terminal listed below at the K64 Content Theft Deterrent Control Module.
 - K9 Body Control Module terminal 1 X3 and K64 Content Theft Deterrent Control Module terminal 1
 - K9 Body Control Module terminal 2 X3 and K64 Content Theft Deterrent Control Module terminal 2
 - K9 Body Control Module terminal 3 X3 and K64 Content Theft Deterrent Control Module terminal 3
 - If greater than the specified range, test the appropriate signal circuit for an open/high resistance.
5. If all circuits test normal, replace the K64 Content Theft Deterrent Control Module and verify that the customer concern is not still present.

- If the customer concern is still present, replace the K9 Body Control Module.

Repair Procedures

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

- **Replacing Keys (Erases All Existing Keys)**
- **Control Module References** for control module replacement, setup and programming

DTC B3006

Diagnostic Instructions

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

DTC Descriptors

DTC B3006 01

Hood Ajar Circuit Short to Battery

DTC B3006 02

Hood Ajar Circuit Short to Ground

DTC B3006 04

Hood Ajar Circuit Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Hood Ajar Switch Signal	B3006 02	B3006 04	B3006 01	-
Ground	-	B3006 04	-	-

Circuit/System Description

The body control module (BCM) monitors the voltage input of the hood ajar switch signal circuit.

Conditions for Running the DTC

The BCM continuously monitors for this DTC

Conditions for Setting the DTC

B3006 01

The BCM detects that the Hood Ajar Switch signal circuit is shorted to battery.

B3006 02

The BCM detects that the Hood Ajar Switch signal circuit is shorted to ground.

B3006 04

The BCM detects that the Hood Ajar Switch signal circuit is open.

Action Taken When the DTC Sets

Prevent an engine start.

Conditions for Clearing the DTC

- A current DTC will clear when the conditions for setting are no longer present.
- A history DTC will clear after 40 malfunction free ignition cycles.

Reference Information

Schematic Reference

- Immobilizer Schematics
- Remote Function Schematics
- Theft Deterrent System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Keyless Entry System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

Ignition ON, observe the scan tool BCM Hood Position parameter. With the hood open, the Hood Position parameter should read open. With the hood closed, the Hood Position parameter should read closed.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the B55 Hood Ajar Switch.
2. Ignition OFF, test for less than 8 ohms between the ground circuit terminal C and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance.
3. Ignition ON, test for greater 11 V between the signal circuit terminal B and ground.
 - If less than the specified range, test the signal circuit for a short to ground or open/high resistance.
If the circuit tests normal, replace the B55 Hood Ajar Switch.
4. If all circuits test normal, test or replace the K9 Body Control Module.

Repair Procedures

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

- **Hood Primary and Secondary Latch Replacement**
- **Control Module References** for BCM replacement, programming and setup

DTC B302A

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 00

Mobile Telephone Communications Interface Requested Immobilization Malfunction

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 valid start disable from telematics will set DTC B302A only as a history DTC.

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 telematic start disable request is no longer seen.
- 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 system. DTC will only set as a history.

Reference Information

Schematic Reference

Immobilizer Schematics

Connector End View Reference

Component Connector End Views

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. With a master vehicle key, turn the ignition ON.
2. Observe the security indicator. After approximately 10 minutes, the indicator will turn off.
3. Turn the ignition OFF and wait 5 s.
4. Repeat steps 2-4 two more times for a total of 3 cycles or 30 minutes.
5. With a master vehicle key, turn the ignition ON. The start disable will now be cleared.
6. Using the Red Emergency Button, notify the advisor that the Ignition Block on the vehicle has been cleared and to update the account status.

DTC B3031

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 00

Security Controller In Learn Mode Malfunction

Circuit/System Description

When learning a coded key, the body control module 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. Once the coded key is learned, learn mode will be exited and the DTC cleared. If the BCM does not exit learn mode, B3031 will remain current and indicate a fault. The instrument cluster security indicator will turn ON 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

DTC B3031 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 or when a scan tool is used to

clear DTCs.

Reference Information

Schematic Reference

Immobilizer Schematics

Connector End View Reference

Component Connector End Views

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 scan tool body control module Total Keys Learned parameter displays a learned key.
 - If not the specified value, perform the Vehicle Key Relearn procedure. Refer to **Replacing Keys (Erases All Existing Keys)**.
2. Perform the Vehicle Key Relearn procedure. Refer to **Replacing Keys (Erases All Existing Keys)**.
 - If the Body Control Modules does not exit the learn coded key state after the programming attempt, replace the K9 Body Control Module.

Repair Procedures

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

Control Module References for BCM replacement, setup and programming

DTC B3055

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 00

No Transponder Modulation or No Transponder Malfunction

Circuit/System Description

When an ignition key is inserted into the ignition lock cylinder and the ignition is switched ON, the transponder embedded in the key is energized by the exciter coils surrounding the ignition lock cylinder. 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

Ignition is in the Accessory or Run position.

Conditions for Setting the DTC

The BCM is unable to measure the ignition key transponder value.

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

Diagnostic Aids

The immobilizer system is not designed to have the key folded 90 degrees when attempting to start the engine. This may cause an intermittent no start condition. If you receive a customer complaint of an intermittent no start condition, verify that the customer is not folding the key while attempting to start the engine. The fob must be parallel to the key to function properly.

Reference Information

Schematic Reference

Immobilizer Schematics

Connector End View Reference

Component Connector End Views

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 Testing

1. Inspect all available vehicle keys that they are correct vehicle keys.
 - If not a correct vehicle key, replace the key.
2. While viewing the scan tool BCM Key Part Number, turn ON the ignition with each of the available vehicle keys. The parameter should read a Key Part Number with all available keys.
 - If only one key results in the parameter reading no Part Number, replace the appropriate key.
3. Ignition OFF, disconnect the harness connector at the K64 Content Theft Deterrent Control Module and disconnect the harness connector X3 at the K9 BCM, test for infinitive resistance between the signal circuit listed below and ground.
 - K9 BCM terminal 1 X3
 - K9 BCM terminal 2 X3
 - K9 BCM terminal 3 X3
 - If less than the specified range, test the appropriate signal circuit for a short to ground.
4. Test for less than 0.3 V between the signal circuit listed below and ground:
 - K9 BCM terminal 1 X3
 - K9 BCM terminal 2 X3
 - K9 BCM terminal 3 X3
 - If greater than the specified range, test the appropriate signal circuit for a short to voltage.
5. Test for less than 5 ohms between the signal circuit terminal listed below at the K9 BCM and the signal

circuit terminal listed below at the K64 Content Theft Deterrent Control Module.

- K9 BCM terminal 1 X3 and K64 Content Theft Deterrent Control Module terminal 1
 - K9 BCM terminal 2 X3 and K64 Content Theft Deterrent Control Module terminal 2
 - K9 BCM terminal 3 X3 and K64 Content Theft Deterrent Control Module terminal 3
 - If greater than the specified range, test the appropriate signal circuit for an open/high resistance.
6. If all circuits test normal, replace the K64 Content Theft Deterrent Control Module and verify that the customer concern is not still present.
- If the customer concern is still present, replace the K9 BCM.

Repair Procedures

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

- **Replacing Keys (Erases All Existing Keys)**
- **Control Module References** for BCM and remote function receiver module replacement, setup and programming

DTC B3060

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 00

Unprogrammed Transponder Identification Code Received Malfunction

Circuit/System Description

When an ignition key is inserted into the ignition lock cylinder and the ignition is switched ON, the transponder embedded in the head of the key is energized by the exciter coils surrounding the ignition lock cylinder. 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 an engine start.

Conditions for Running the DTC

Ignition is in the Accessory or Run position.

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 ignition key.
- A history DTC will be cleared after 100 malfunction-free ignition 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

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 Vehicle Key Relearn procedure. Refer to **Replacing Keys (Erases All Existing Keys)**.
2. While viewing the scan tool BCM Key Part Number parameter, turn ON the ignition with each of the available vehicle keys. The parameter should read a Key Part Number with all available keys.
 - If not the specified value, replace the appropriate key.

Repair Procedures

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

- **Replacing Keys (Erases All Existing Keys)**
- **Control Module References** for BCM replacement, setup, and programming

DTC B389A

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 (Received by BCM)

Circuit/System Description

When certain modules are programmed and configured during installation, the module learns a specific immobilizer identifier which is unique to the vehicle. The immobilizer identifier is used to prevent swapping modules between vehicles. The body control module (BCM) is the keeper of the environment identifier. The instrument cluster (IPC), electronic brake control module (EBCM), HVAC control module, sensing diagnostic module (SDM), engine control module (ECM) and steering column lock control module (SCLM, if equipped) each learn the immobilizer identifier during their configuration process. During vehicle operation, each of these modules compare their immobilizer identifier to the BCM. If the identifiers match, vehicle starting is allowed. If an immobilizer identifier does not match, 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 received 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 an environment identifier.

Reference Information

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: Make sure to fix DTC B3902 first that has set in the following modules, IPC, SDM, ECM, HVAC, EBCM and SCLM (if equipped) before proceeding to the following diagnosis regarding the BCM.

Perform the Programming and Setup procedure for the BCM. Verify the DTC does not reset after programming.

- If the DTC resets, replace the BCM.

Repair Procedures

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

Control Module References for instrument cluster, body control module and electronic brake control module replacement, programming and setup

DTC B3902

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 B3902

Incorrect Immobilizer Identifier Received

Circuit/System Description

When certain modules are programmed and configured during installation, the module learns a specific immobilizer identifier which is unique to the vehicle. The immobilizer identifier is used to prevent swapping modules between vehicles. The body control module (BCM) is the keeper of the immobilizer identifier. The instrument cluster, electronic brake control module (EBCM), and HVAC control module each learn the immobilizer identifier during their configuration process. During vehicle operation, each of these modules compare their immobilizer identifier to the BCM. If the identifiers match, vehicle starting is allowed. If an immobilizer identifier does not match, 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 is received by the control module.

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 an environment identifier.

Reference Information

Schematic Reference

Immobilizer Schematics

Connector End View Reference

Component Connector End Views

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

Perform the Programming and Setup procedure for the concerned control module. Verify the DTC does not reset after programming.

- If the DTC resets, replace the concerned control module.

Repair Procedures

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

Control Module References for Instrument Cluster, body control module and electronic brake control module replacement, setup, and programming

DTC B3935

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 00

Transponder Authentication Malfunction

Circuit/System Description

When an ignition key is inserted into the ignition lock cylinder and the ignition is switched ON, the transponder embedded in the head of the key is energized by the exciter coils surrounding the ignition lock cylinder. 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 an engine start.

Conditions for Running the DTC

- Ignition is in the Accessory or Run position.
- 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 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 a valid transponder value has been read and authenticated.
- A history DTC will be cleared after 100 malfunction-free ignition 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

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

Replace the suspected inoperative or malfunctioning key. DTC B3935 should not reset and the vehicle should start.

- If the replacement key results in the resetting of DTC B3935, replace the K9 Body Control Module.

Repair Procedures

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

- **Replacing Keys (Erases All Existing Keys)**
- **Control Module References** for BCM replacement, setup, and programming

DTC B3976

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 00

Unconfigured Transponder

Circuit/System Description

When the body control module (BCM) is in the learn coded key state, the BCM checks the current key to ensure it has been configured as a proper vehicle key.

Conditions for Running the DTC

- Ignition is in the Accessory or Run position.
- 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 ignition 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

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

While viewing DTCs with a scan tool, attempt to start the vehicle using all of the available keys. The vehicle should start with all available keys.

- If any key results in inoperative starting and DTC B3976 is set as current, replace the appropriate key.

Repair Procedures

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

Replacing Keys (Erases All Existing Keys)

DTC B3984

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

Circuit/System Description

When certain modules are programmed and configured during installation, the module learns a specific immobilizer identifier which is unique to the vehicle. The immobilizer identifier is used to prevent swapping modules between vehicles. The body control module (BCM) is the keeper of the immobilizer identifier. The instrument cluster, electronic brake control module (EBCM), and HVAC control module each learn the immobilizer identifier during their configuration process. During vehicle operation, each of these modules compare their immobilizer identifier to the BCM. If the identifiers match, vehicle starting is allowed. If an immobilizer identifier does not match, 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 is not programmable.

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 an environment identifier.

Reference Information

Schematic Reference

Immobilizer Schematics

Connector End View Reference

Component Connector End Views

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

Perform the Programming and Setup procedure for the concerned control module. Verify the DTC does not reset after programming.

- If the DTC resets, replace the concerned control module.

Repair Procedures

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

Control Module References for Instrument Cluster, body control module and electronic brake control module replacement, setup, and programming

DTC P0513

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 security code to the engine control module (ECM) via the serial data circuit. The ECM then sends a challenge to the BCM. Both the ECM and BCM perform a calculation on this challenge. If the calculated response from the BCM equals the calculation performed by the ECM, the ECM will allow vehicle starting.

Conditions for Running the DTC

Ignition is in the ACCESSORY or RUN position.

Conditions for Setting the DTC

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 starting 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 ignition 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

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: Because of normal system communications between the BCM and ECM, any immobilizer B-codes must be diagnosed prior to the diagnosis of P-codes.

Perform the Immobilizer Relearn procedure. Refer to **Immobilizer System Component Programming**. The ECM should successfully complete the password learn and the vehicle should start.

- If the ECM does not complete the learn or vehicle starting remains disabled, replace the K20 Engine Control Module.

Repair Procedures

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

- **Control Module References** for ECM replacement, setup, and programming
- For P-codes refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .

DTC P0633

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

Immobilizer Key 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. DTC P0633 will set automatically as an indicator that the system is in learn mode and not as a fault indicator. Once the security code and challenge/response are learned, learn mode will be exited when the engine is successfully started. If the ECM does not exit learn mode, 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 P0633 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 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

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: Because of normal system communications between the BCM and ECM, any immobilizer B-codes must be diagnosed prior to the diagnosis of P-codes.

Perform the Immobilizer Relearn procedure. Refer to **Immobilizer System Component Programming**. The ECM should successfully complete the password learn and the vehicle should start.

- If the ECM does not complete the learn or vehicle starting remains disabled, replace the K20 Engine Control Module.

Repair Procedures

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

Control Module References for ECM replacement, setup, and programming

For P-codes refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .

DTC P162B

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 Slow-Down request is sent from OnStar® the vehicle communication interface module (VCIM) 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 a REDUCED ENGINE POWER indications is displayed. No DTCs will be set during this process.

The ECM monitoring the serial data message for specific validity traits. If the ECM determines that the validity of the message is in error DTC P162B will be set.

Conditions for Running the DTC

- The engine run time is greater than 5 seconds.
- No other serial data errors are present.

Conditions for Setting the DTC

- The VIN embedded in the Slow-Down serial data request does not match the VIN stored in the ECM.
- The rolling code counter embedded in the Slow-Down serial data request does not increment for 10

consecutive messages.

Action Taken When the DTC Sets

- ECM disregards all reduced vehicle speed request messages from the VCIM.
- The ECM stores DTC P162B in ECM 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.
- A scan tool clear DTC request is performed.

Reference Information

Description and Operation

Remote Vehicle Speed Limiting Description and Operation (Stolen Vehicle Slow-Down)

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

If the DTC is set, perform the Stolen Vehicle Slow-Down Clear with a scan tool. If the DTC resets, replace the VCIM. If the DTC resets again, replace the ECM.

Repair Procedures

Perform the Diagnostic Repair Verification after completing the repair.

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

DTC P1631

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 security code to the engine control module (ECM) via the serial data circuit. The ECM then sends a challenge to the BCM. Both the ECM and BCM perform a calculation on this challenge. If the calculated response from the BCM equals the calculation performed by the ECM, the ECM will allow vehicle starting.

Conditions for Running the DTC

Ignition is in the ACCESSORY or RUN position.

Conditions for Setting the DTC

The ECM receives an incorrect security code 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 a correct security code is received.
- A history DTC will be cleared after 40 malfunction-free ignition 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

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

Circuit/System Verification

NOTE: Because of normal system communications between the BCM and ECM, any immobilizer B-codes must be diagnosed prior to the diagnosis of P-codes.

Perform the Immobilizer Relearn procedure. Refer to Immobilizer System Component Programming.

- If the ECM does not complete the learn or vehicle starting remains disabled, replace the K20 Engine Control Module.

Repair Procedures

Perform the Diagnostic Repair Verification .

- Control Module References
- For P-codes refer to Diagnostic Trouble Code (DTC) List - Vehicle .

DTC P1649

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 is not programmed.

Action Taken When the DTC Sets

The security indicator in the instrument cluster will illuminate.

Conditions for Clearing the DTC

- A current DTC P1649 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 or when a scan tool is used to clear DTCs.

Reference Information

Schematic Reference

Immobilizer Schematics

Connector End View Reference

Component Connector End Views

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

Circuit/System Verification

NOTE: Because of normal system communications between the BCM and ECM, any immobilizer B-codes must be diagnosed prior to the diagnosis of P-codes.

Perform the Immobilizer Relearn procedure. Refer to **Immobilizer System Component Programming**.

- If the ECM does not complete the learn or vehicle starting remains disabled, replace the K20 Engine Control Module.

Repair Procedures

Perform the **Diagnostic Repair Verification** .

Control Module References

For P-codes refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .

SYMPTOMS - IMMOBILIZER

NOTE: **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 **Keyless Entry System Description and Operation** .

Visual/Physical Inspection

- Inspect for aftermarket devices which may 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 may cause the symptom.

Intermittent

Refer to **Hood Ajar Indicator/Message Malfunction** in order to diagnose the symptom.

SYMPTOMS - REDUCED ENGINE POWER MESSAGE

Verification

Verify the vehicle is not in an OnStar initiated Stolen Vehicle Slow-Down mode. Look for a Reduced Engine Power message.

- If in the Stolen Vehicle Slow-Down mode, perform the OnStar vehicle interface communication module (VCIM) Stolen Vehicle Slow-Down Clear with a scan tool. After performing the clear event procedure, press the Blue OnStar® button to inform the advisor that you need to be transferred to the Stolen Vehicle team to have the vehicle account updated.

HOOD AJAR INDICATOR/MESSAGE MALFUNCTION

Diagnostic Instructions

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

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Hood Ajar Switch Signal	B3006 02	B3006 04	B3006 01	-
Ground	-	B3006 04	-	-

Circuit/System Description

The body control module (BCM) monitors the voltage input of the hood ajar switch signal circuit.

Reference Information

Schematic Reference

- **Immobilizer Schematics**
- **Remote Function Schematics**
- **Theft Deterrent System Schematics**

Connector End View Reference

Component Connector End Views

Description and Operation

Keyless Entry System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

Ignition ON, observe the scan tool BCM Hood Position parameter. With the hood open, the Hood Position parameter should read open. With the hood closed, the Hood Position parameter should read closed.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the B55 Hood Ajar Switch.
2. Ignition OFF, test for less than 8 ohms between the ground circuit terminal C and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance.
3. Ignition ON, test for greater 11 V between the signal circuit terminal B and ground.
 - If less than the specified range, test the signal circuit for a short to ground or open/high resistance.
If the circuit tests normal, replace the B55 Hood Ajar Switch.
4. If all circuits test normal, test or replace the K9 Body Control Module.

Repair Procedures

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

- **Hood Primary and Secondary Latch Replacement**
- **Control Module References** for BCM replacement, setup and programming

REPAIR INSTRUCTIONS

THEFT DETERRENT MODULE REPLACEMENT

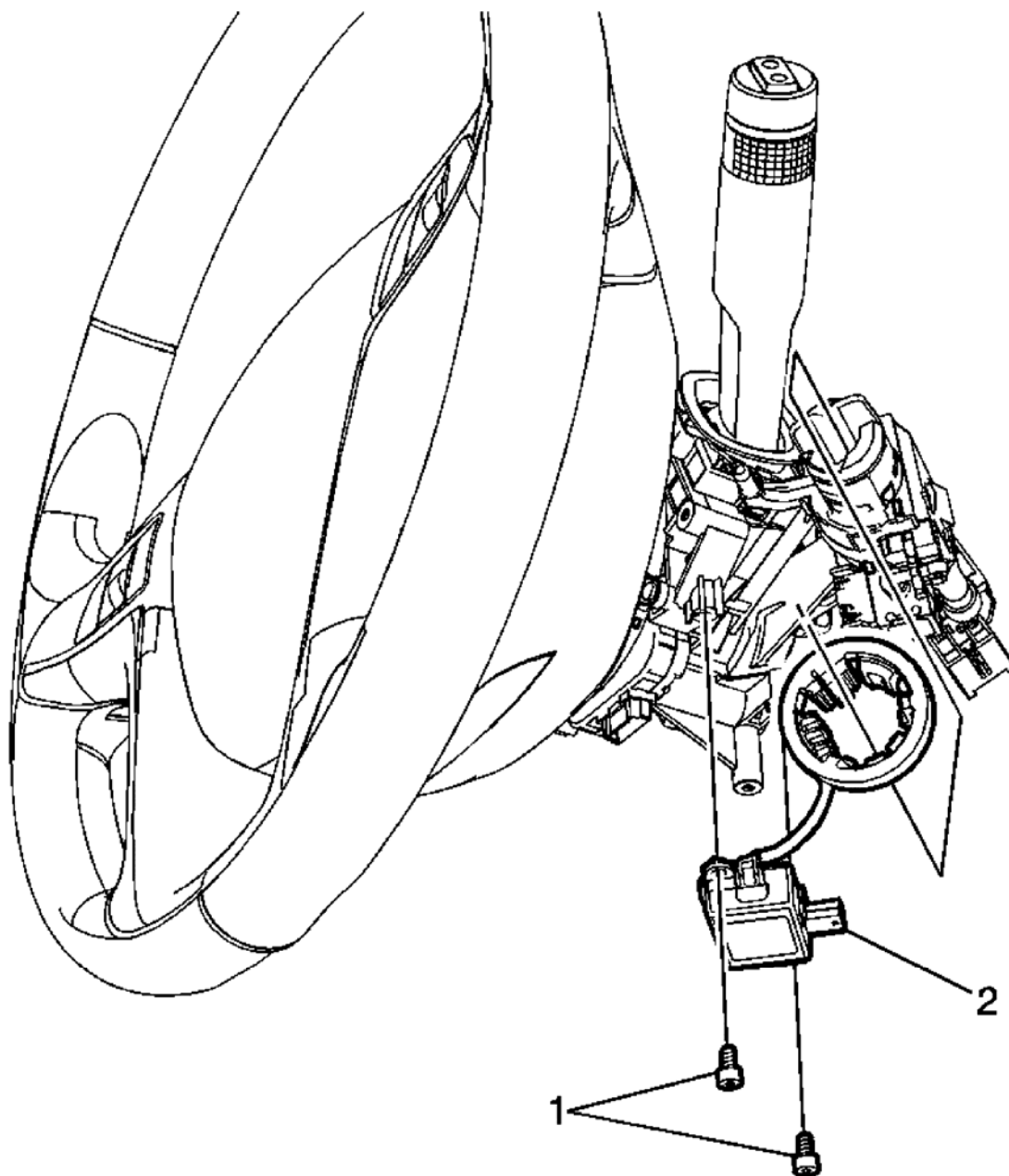


Fig. 2: Theft Deterrent Module

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the steering column shrouds. Refer to <u>Steering Column Shroud Replacement</u> .	
1	Theft Deterrent Module Bolt/Screw (Qty: 2) CAUTION:

	Refer to <u>Fastener Caution</u> . Tighten: 2 N.m (18 lb in)
2	Theft Deterrent Module Procedure 1. Disconnect the electrical connector. 2. Refer to <u>Control Module References</u> for programming and set up procedures.

IMMOBILIZER SYSTEM COMPONENT PROGRAMMING

This procedure will learn the immobilizer function. Following program function will take more than 15 minutes. If the battery voltage is low, charge the battery before programming the control module.

NOTE: **Before programming the Immobilizer Function, the body control module (BCM) and/or the engine control module (ECM) must be programmed.**

1. Connect a scan tool to the vehicle and access SPS. Refer to **Service Programming System (SPS)** .
2. Turn ON the ignition, with the 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 the IMMO Immobilizer Learn function.
7. Select the Program Immobilizer Function.

NOTE: **If both control modules were replaced, new virgin keys are needed.**

8. On the next screen select the appropriate control module or modules if both are replaced. If only one control module was replaced select Use Existing Transponder Keys. If both control modules were replaced select Use New Transponder Keys.
9. Follow the on-screen instructions.
10. With Use Existing Transponder Keys: After approximately 11 min. and after turn OFF the ignition for 1 min. the screen will display "Programming Complete".
11. With Use New Transponder Keys: After approximately 11 min. and after turn OFF the ignition for 1 min. the first key is learned. The screen will display "Learn Additional key". Select YES until all existing vehicle keys are learned.
12. After programming all keys "Programming Complete" is displayed.
13. With a scan tool, clear any DTCs.

ADDING KEYS (CANADA)

With Push Button Start (ATH and BTM)

To perform the adding key procedure for vehicles with ATH please observe Remote Keyless Entry System Operation (Keyless Access) in the owners manual.

Without Push Button Start With Two Learned Keys

NOTE:

- To initiate, this procedure requires that 2 learned keys be available.
- Depending on the vehicle, a total of 5 or 8 keys may be learned/programmed 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. With 2 previously learned keys, turn ON the ignition, with the engine OFF.
2. Turn OFF the ignition and remove the key.
3. Within 10 seconds of turning OFF the ignition, insert the key to be learned and turn ON the ignition. The vehicle has now learned the new key and transmitter.

Adding Keys using Service Programming System (SPS) With No Learned Key

NOTE:

- This procedure can also be used if you have a learned key.
- This procedure only learns the vehicle keys. This procedure will not learn the immobilizer function.
- Before proceeding with this procedure, the immobilizer function must have been learned for the body control module and engine control module. If not learned, refer to Immobilizer System Component Programming.
- This program function will take more than 15 minutes.
- If the battery voltage is low, charge the battery before programming the control module.
- A total of 8 keys may be programmed to a single vehicle.

This procedure should be used when a new vehicle key needs to be added/programmed to the vehicle.

1. Connect a scan tool to the vehicle and access SPS. Refer to Service Programming System (SPS).
2. Turn ON the ignition, with the engine OFF.
3. Ensure that all power consuming devices are turned OFF on the vehicle.
4. Select the SPS application and follow the on-screen instructions.
5. Select Reprogram ECU.
6. Select the IMMO Immobilizer Learn Setup.
7. Select the Program Transponder & Remote Keys (Add) function.
8. Follow the on-screen instructions.
9. After approximately 11 min. and after turn OFF the ignition for 1 min. the first key is learned. The screen

will display, Learn Additional key?. Select YES until all existing vehicle keys are learned.

10. After programming all keys, Programming Complete, is displayed.
11. With a scan tool, clear any DTCs.

ADDING KEYS (NORTH AMERICA, EXCEPT CANADA)

With Push Button Start (ATH and BTM)

To perform the adding key procedure for vehicles with ATH please observe Remote Keyless Entry System Operation (Keyless Access) in the owners manual.

Without Push Button Start With One Learned Key

NOTE:

- To initiate, this procedures requires that 1 learned key be available.
- Depending on the vehicle, a total of 5 or 8 keys may be learned/programmed 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. With a previously learned key, turn ON the ignition, with the engine OFF.
2. Turn OFF the ignition and remove the key.
3. Within 10 seconds of turning OFF the ignition, insert the key to be learned and turn ON the ignition. The vehicle has now learned the new key and transmitter.

Adding Keys using Service Programming System (SPS) With No Learned Key

NOTE:

- This procedure can also be used if you have a learned key.
- This procedure only learns the vehicle keys. This procedure will not learn the immobilizer function.
- Before proceeding with this procedure, the immobilizer function must have been learned for the body control module and engine control module. If not learned, refer to Immobilizer System Component Programming.
- This program function will take more than 15 minutes.
- If the battery voltage is low, charge the battery before programming the control module.
- A total of 8 keys may be programmed to a single vehicle.

This procedure should be used when a new vehicle key needs to be added/programmed to the vehicle.

1. Connect a scan tool to the vehicle and access SPS. Refer to Service Programming System (SPS) .
2. Turn ON the ignition, with the engine OFF.

3. Ensure that all power consuming devices are turned OFF on the vehicle.
4. Select the SPS application and follow the on-screen instructions.
5. Select Reprogram ECU.
6. Select the IMMO Immobilizer Learn Setup.
7. Select the Program Transponder & Remote Keys (Add) function.
8. Follow the on-screen instructions.
9. After approximately 11 min. and after turn OFF the ignition for 1 min. the first key is learned. The screen will display, Learn Additional key?. Select YES until all existing vehicle keys are learned.
10. After programming all keys, Programming Complete, is displayed.
11. With a scan tool, clear any DTCs.

REPLACING KEYS (ERASES ALL EXISTING KEYS)

NOTE:

- **The vehicle key contains a transponder, which is recognized by the vehicles security system when inserted into the ignition switch.**
- **This procedure only learns the vehicle keys. This procedure will not learn the immobilizer function.**

If not learned, refer to **Immobilizer System Component Programming**.

Replacing Keys

NOTE:

- **The procedure will first erase all vehicle keys when adding one or more keys. Even when only one key is added all vehicles are erased before learning the new key. The existing keys are relearned again during the program procedure. Be sure that all existing vehicle keys are available during the program procedure.**
- **This program function will take more than 15 minutes.**
- **If the battery voltage is low, charge the battery before programming the control module.**
- **A total of 8 keys may be programmed to a single vehicle.**

This procedure should be used when a new vehicle key needs to be programmed or when all vehicle keys need to be replaced/reprogrammed.

1. Connect a scan tool to the vehicle and access SPS. Refer to **Service Programming System (SPS)** .
2. Turn ON the ignition, with the engine OFF.
3. Ensure that all power consuming devices are turned OFF on the vehicle.
4. Select the SPS application and follow the onscreen instructions.
5. Select Reprogram ECU.
6. Select the IMMO Immobilizer Learn function.

7. Select the Program Transponder & Remote Keys function.
8. Follow the onscreen instructions.
9. After approximately 11 min. and after turn OFF the ignition for 1 min. the first key is learned. The screen will display "Learn Additional key?". Select YES until all existing vehicle keys are learned.
10. After programming all keys "Programming Complete" is displayed.
11. With a scan tool, clear any DTCs.

DESCRIPTION AND OPERATION

IMMOBILIZER DESCRIPTION AND OPERATION

The immobilizer system functions are provided by the body control module (BCM) and the engine control module (ECM), as well as any modules which store and report the security code.

When an ignition key (if equipped) is inserted into the ignition lock cylinder and the ignition is switched ON, the encrypted code in the key is energized by the immobilizer coil surrounding the ignition lock cylinder. This immobilizer coil is part of the immobilizer antenna. The encrypted code transmits a signal that contains its unique value, which is received by the BCM. The BCM then compares this value to a value stored in memory. The BCM also monitors various modules to determine that the stored environment ID matches.

If equipped with push button start, this immobilizer antenna is part of the console. Place key/fob in the pocket in the console. The inscribed code transmits a signal that contains its unique value, which is received by the BCM. The BCM then compares this value to a value stored in memory. The BCM also monitors various modules to determine that the stored security code matches.

If both the environment ID and the value received from the transponder match, the BCM will send the prerelease password via serial data to the ECM. If the encrypted codes unique value is incorrect or the environment ID does not match, the BCM will send the fuel disable message to the ECM.

When the ECM receives the BCM prerelease password, the ECM will challenge the password. The ECM sends this challenge back to the BCM via serial data. Both the ECM and BCM perform a calculation on this challenge. If the calculated response from the BCM equals the calculation performed by the ECM, the ECM will allow vehicle starting.

The components of the theft system are as follows:

- BCM
- ECM
- Immobilizer antenna
- Ignition key/fob
- Security indicator
- Various modules which store and report the environment ID are BCM, IPC, HVAC, EBCM, ECM and SDM

BCM is programmed with the environment ID at the manufacturer.

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/fob (transponder values).

The BCM uses the following inputs:

- Environment ID exchange with various modules
- Encrypted code from key/fob from immobilizer coil

The BCM uses the following outputs:

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

When an ignition key is inserted into the ignition lock cylinder and the ignition is switched ON, the encrypted code in the key is energized by the immobilizer coil surrounding the ignition lock cylinder. The energized transponder transmits a signal that contains its unique value, which is received by the BCM. The BCM then compares this value to the learned key code 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.

Engine Control Module (ECM)

When the ECM receives the BCM prerelease password, the ECM will challenge the password. The ECM sends this challenge back to the BCM via the serial data circuit. Both the ECM and BCM perform a calculation on this challenge. If the calculated response from the BCM equals the calculation performed by the ECM, the ECM will allow vehicle starting.

The ECM will disable vehicle starting if any of the following 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 ECM.

Immobilizer Antenna

The immobilizer antenna contains an immobilizer coil which surrounds the ignition cylinder. The coil passively powers the key/fob located in the ignition key when the key is in the ignition. When powered, the key/fob

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.

Immobilizer antenna is used to:

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

The Ignition Key/Fob

The ignition key/fob encrypted value is fixed and unable to be changed. The immobilizer system uses the ignition key transponder value to determine if a valid ignition key is being used to start the vehicle. There are approximately 3 trillion possible encrypted code values. There are no visible electrical contacts. The keys are identified by + symbol in a circle stamped into the steel shank of the key.

Environment ID

Various modules throughout the vehicle learn a specific environment ID during the module programming process. The environment ID learned by each individual module matches the security code stored in the BCM, which is the environment ID master. Prior to starting, each of the modules which store a environment ID will compare their ID to that of the ID stored in the BCM. If all the IDs match, the engine starting process will continue. If the environment ID do not match, engine starting will be disabled.

Security Indicator

The BCM will command the instrument panel cluster to illuminate the security indicator when the ignition key is in the ON position to indicate a fault is noted in the immobilizer system and when the engine starting is disabled.

REMOTE VEHICLE SPEED LIMITING DESCRIPTION AND OPERATION (STOLEN VEHICLE SLOW-DOWN)

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.