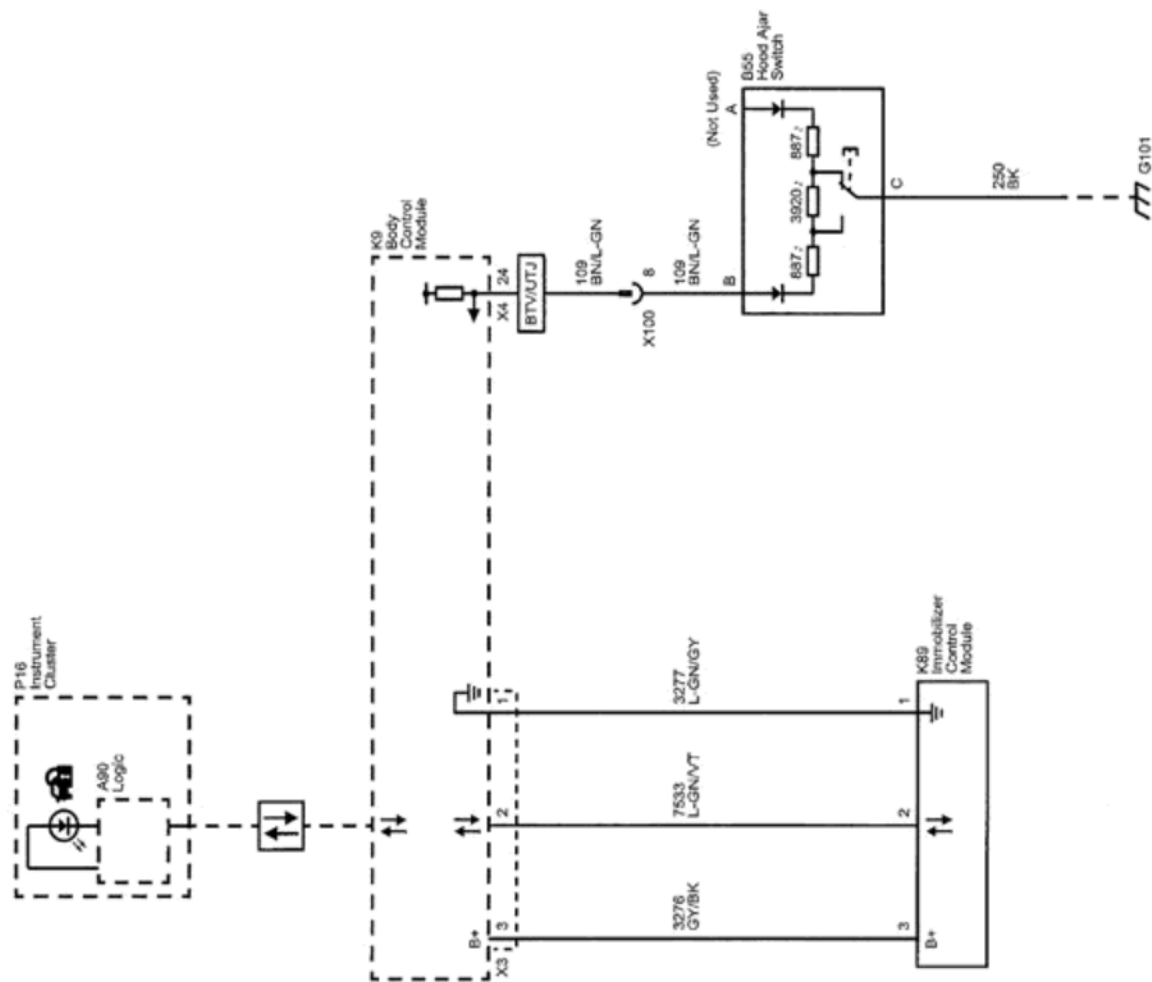


Immobilizer

Schematic and Routing Diagrams

Immobilizer Schematics (Immobilizer)



2782308

Diagnostic Information and Procedures

DTC B2955

Diagnostic Instructions

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

DTC Descriptor

DTC B2955: Security Sensor Data Circuit

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

Diagnostic Fault Information

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

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 coil 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 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 ignition cycles.

Reference Information

Schematic Reference

Immobilizer Schematics on page 13-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Immobilizer Description and Operation on page 13-31

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the K89 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**

- 2.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.

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

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω , replace the K9 Body Control Module.

⇓ **If the test lamp illuminates**

3. Ignition ON.

Note: In some instances, the K9 Body Control Module may only apply voltage for 3 s immediately after the ignition is turned ON. It may be necessary to monitor the DMM while turning the ignition ON to observe the voltage.

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

⇒ **If 9 V or less**

- 4.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.

- 4.2. Test for infinite resistance between the B+ circuit and ground.

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

⇓ If infinite resistance

- 4.3. Test for less than 2 Ω in the B+ circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω , replace the K9 Body Control Module.

⇓ **If greater than 9 V**

5. Test for greater than 4 V between the serial data circuit terminal 2 and ground.

⇒ **If 4 V or less**

- 5.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.

- 5.2. Test for infinite resistance between the serial data circuit and ground.

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

⇓ If infinite resistance

- 5.3. Test for less than 2 Ω in the serial data circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω , replace the K9 Body Control Module.

⇓ **If greater than 4 V**

6. Ignition OFF, disconnect the X3 harness connector at the K9 Body Control Module, ignition ON.

7. Test for less than 1 V between the K89 Immobilizer Control Module serial data circuit terminal 2 and ground.

⇒ **If 1 V or greater**

Repair the short to voltage on the circuit.

⇓ **If less than 1 V**

8. Replace the K89 Immobilizer Control Module.

9. Verify DTC B2955 does not set while operating the vehicle under the conditions for running the DTC.

⇒ **If DTC B2955 is set**

Replace the K9 Body Control Module.

⇓ **If DTC B2955 is not set**

10. All OK.

Repair Instructions

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

Control Module References on page 6-3 for body control module or immobilizer control module replacement, programming, and setup.

DTC B302A

Diagnostic Instructions

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

DTC Descriptor

DTC B302A: Mobile Telephone Communications Interface Requested Immobilization

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

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.

Reference Information

Schematic Reference

Immobilizer Schematics on page 13-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Immobilizer Description and Operation on page 13-31

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Verify 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.

13-8 Immobilizer

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

Diagnostic Instructions

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

DTC Descriptor

DTC B3031: Security Controller In Learn Mode

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

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. 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

Schematic Reference

Immobilizer Schematics on page 13-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Immobilizer Description and Operation on page 13-31

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Verify 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.

⇒ **If a key is not correct**

Replace the key

⇓ **If all keys are correct**

2. Perform the Replacing Keys procedure. Refer to *Key with Integrated Transmitter Programming* on page 13-30.

3. 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**

4. All OK.

Repair Instructions

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

Control Module References on page 6-3 for body control module replacement, programming, and setup.

DTC B3055

Diagnostic Instructions

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

DTC Descriptor

DTC B3055: No Transponder Modulation or No Transponder

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

Circuit/System Description

Without BTM and/or ATH/ATS

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 coil 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.

With BTM and/or ATH/ATS

When a ignition key is inserted into the key pocket/slot and the ignition mode switch is pressed, the transponder embedded in the key 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

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

Diagnostic Aids

- Because DTC B3055 may be caused by a malfunctioning vehicle key, it is necessary to have all available vehicle 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.
- For vehicle without BTM and/or ATH/ATS, verify the customer is not attempting to turn the ignition with the vehicle key partially folded. To ensure proper transponder communication, the key must be in a specific location in relation to the immobilizer control module. Attempting to start the vehicle with the key in the ignition and partially folded will result in no transponder communication and DTC B3055 will set.

Reference Information

Schematic Reference

Immobilizer Schematics on page 13-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Immobilizer Description and Operation on page 13-31

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

Without BTM and/or ATH/ATS

1. Ignition ON.
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 on page 6-69*.
- ↓ **If none of the DTCs are set**
3. Verify the scan tool body control module Accessory parameter changes between Active and Inactive when turning the ignition ON and OFF.
- ⇒ **If the parameter does not change**
Refer to *Vehicle Will Not Change Power Mode on page 11-523*.
- ↓ **If the parameter changes**
4. 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.
- ⇒ **If a key is not correct**
Replace the appropriate key.
- ↓ **If all keys are correct**
5. Verify that DTC B3055 does not set while attempting to start the vehicle with each available key.
- ⇒ **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.

With BTM and/or ATH/ATS

1. Ignition ON.
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 on page 6-69*.
- ↓ **If none of the DTCs are set**
3. Verify the scan tool body control module Accessory parameter changes between Active and Inactive when turning the ignition ON and OFF.
- ⇒ **If the parameter does not change**
Refer to *Power Mode Mismatch on page 11-515*.
- ↓ **If the parameter changes**
4. 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.
- ⇒ **If a key is not correct**
Replace the appropriate key.
- ↓ **If all keys are correct**
5. Remove the battery from each of the available vehicle keys.
6. 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 pocket/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**
7. All OK.

Repair Instructions

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

Control Module References on page 6-3 for immobilizer control module replacement, programming, and setup.

DTC B305C

Diagnostic Instructions

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

DTC Descriptor

DTC B305C: Immobilizer Transponder of Wrong Type Programmed

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

Circuit/System Description

Without BTM and/or ATH/ATS

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 coil 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.

With BTM and/or ATH/ATS

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

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

Reference Information

Schematic Reference

Immobilizer Schematics on page 13-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Immobilizer Description and Operation on page 13-31

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.
2. Verify all available keys/transmitters 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.
 - ⇒ **If a key is not correct**
Replace the appropriate key.
 - ↓ **If all keys are correct**
3. Verify the scan tool Key Part Number parameter displays a Key Part Number when turning the ignition ON with each key.
 - ⇒ **If a Key Part Number is not read**
Replace the appropriate key.
 - ↓ **If a Key Part Number is read for each key**
4. All OK.

DTC B3060

Diagnostic Instructions

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

DTC Descriptor

DTC B3060: Unprogrammed Transponder Identification Code Received

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

Circuit/System Description

Without BTM and/or ATH/ATS

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 coil 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.

With BTM and/or ATH/ATS

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

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.

Reference Information

Schematic Reference

Immobilizer Schematics on page 13-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Immobilizer Description and Operation on page 13-31

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Perform the Replacing Keys procedure. Refer to *Key with Integrated Transmitter Programming* on page 13-30.
2. Verify the K9 Body Control Module learns the vehicle key. The scan tool Master Keys Learned parameter should increment to indicate another key has been learned.
 - ⇒ **If the BCM does not learn the key**
Replace the key.
 - ↓ **If the BCM learns the key**
3. All OK.

DTC B389A

Diagnostic Instructions

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

DTC Descriptor

DTC B389A: Environment Identification

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

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.

Reference Information

Schematic Reference

Immobilizer Schematics on page 13-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Immobilizer Description and Operation on page 13-31

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Verify 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* on page 13-29.

⇓ **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* on page 13-16.

↓ **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* on page 13-29.
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* on page 6-92 after completing the repair.

Control Module References on page 6-3 for body control module replacement, programming, and setup.

DTC B3902

Diagnostic Instructions

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

DTC Descriptor

DTC B3902: Incorrect Immobilizer Identifier Received

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

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.

Reference Information

Schematic Reference

Immobilizer Schematics on page 13-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Immobilizer Description and Operation on page 13-31

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Perform the Programming and Setup procedure for the control module that set DTC B3902.
2. 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**
3. All OK.

Repair Instructions

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

Control Module References on page 6-3 for 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 B3935

Diagnostic Instructions

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

DTC Descriptor

DTC B3935: Transponder Authentication

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

Circuit/System Description

Without BTM and/or ATH/ATS

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 coil 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, the BCM will send the start disable password to the ECM.

With BTM and/or ATH/ATS

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, the BCM will send the start disable password to the ECM.

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 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 ignition cycles.

Reference Information

Schematic Reference

Immobilizer Schematics on page 13-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Immobilizer Description and Operation on page 13-31

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Replace the suspected inoperative or malfunctioning key.
2. Verify DTC B3935 does not set while operating the vehicle under the conditions for running the DTC.
 - ⇒ **If the DTC is set**
 - Replace the K9 Body Control Module.
 - ⇓ **If the DTC is not set**
3. All OK.

Repair Instructions

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

Control Module References on page 6-3 for body control module replacement, programming, and setup.

DTC B3976

Diagnostic Instructions

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

DTC Descriptor

DTC B3976: Unconfigured Transponder

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

Circuit/System Description

Without BTM and/or ATH/ATS

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 coil 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.

With BTM and/or ATH/ATS

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

- 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.

Reference Information

Schematic Reference

Immobilizer Schematics on page 13-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Immobilizer Description and Operation on page 13-31

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Verify 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.

DTC B3984

Diagnostic Instructions

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

DTC Descriptor

DTC B3984: Device 1 Environment Identifier Not Programmable

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

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 on page 13-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Immobilizer Description and Operation on page 13-31

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. 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* on page 6-92 after completing the repair.

Control Module References on page 6-3 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

Diagnostic Instructions

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

DTC Descriptor

DTC P0513: Immobilizer Key Incorrect

Circuit/System Description

The body control module (BCM) sends the pre-release information 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 will be cleared when a valid calculation is received.
- A history DTC will be cleared after 40 malfunction-free ignition cycles.

Reference Information

Schematic Reference

Immobilizer Schematics on page 13-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Immobilizer Description and Operation on page 13-31

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Verify 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* on page 6-69.
- ↓ **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* on page 13-29.
3. Verify the engine starts after the K9 Body Control Module completes the learn procedure.
⇒ **If the engine does not start**
Perform the K20 Engine Control Module immobilizer learn using the engine control module IMMO Learn in SPS. Refer to *Immobilizer System Component Programming* on page 13-29.
- ↓ **If the engine starts**
4. All OK.

DTC P0633

Diagnostic Instructions

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

DTC Descriptor

DTC P0633: Immobilizer Key Not Programmed

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 on page 13-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Immobilizer Description and Operation on page 13-31

Electrical Information Reference

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

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

Scan Tool Reference

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

Circuit/System Verification

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* on page 6-69.

- ↓ **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* on page 13-29.
 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 P1629

Diagnostic Instructions

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

DTC Descriptor

DTC P1629: Immobilizer Fuel Enable Signal Not Received

Circuit/System Description

The body control module (BCM) sends the pre-release information 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. The BCM follows this action by sending the remaining immobilizer data, referred to as the fuel enable or fuel continue signal, to the ECM. If the immobilizer data sent by the BCM matches that stored by the ECM, the ECM will allow the engine to remain running.

Conditions for Running the DTC

Ignition is in the ACCESSORY or RUN position.

Conditions for Setting the DTC

The ECM does not receive a correct fuel enable password 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 P1629 will be cleared when a correct fuel enable password is received.
- A history DTC will be cleared after 40 malfunction-free ignition cycles.

Reference Information

Schematic Reference

Immobilizer Schematics on page 13-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Immobilizer Description and Operation on page 13-31

Electrical Information Reference

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

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

Scan Tool Reference

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

Circuit/System Verification

1. Verify 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* on page 6-69.

⇓ **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* on page 13-29.
3. Verify the K9 Body Control Module successfully completes the learn procedure and the engine starts.

⇒ **If the BCM does not successfully learn or the engine does not start**

Perform the K20 Engine Control Module immobilizer learn using the Engine Control Module IMMO Learn in SPS. Refer to *Immobilizer System Component Programming* on page 13-29.

⇓ **If the vehicle starts**

4. All OK.

Repair Instructions

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

Control Module References on page 6-3 for engine control module replacement, programming, and setup.

DTC P162B

Diagnostic Instructions

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

DTC Descriptor

DTC 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 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.

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

OnStar Schematics on page 8-6

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Remote Vehicle Speed Limiting Description and Operation on page 13-32

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Perform the Stolen Vehicle Slow-Down Clear procedure with the scan tool.
2. Verify DTC P162B is not set.

⇒ **If DTC P162B is set**

Replace the K73 Telematics Communication Interface Control Module.

↓ **If DTC P162B is not set**

3. All OK.

Repair Instructions

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

Control Module References on page 6-3 for Telematics Communication Interface Control Module replacement, programming, and setup

DTC P1630

Diagnostic Instructions

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

DTC Descriptor

DTC P1630: Immobilizer Learn Mode Active

Circuit/System Description

When learning the security code, as well as the challenge and response sequence, the engine control module 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 engine control module is in learn mode.

Conditions for Setting the DTC

The engine control module 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 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.

Reference Information

Schematic Reference

Immobilizer Schematics on page 13-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Immobilizer Description and Operation on page 13-31

Electrical Information Reference

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

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

Scan Tool Reference

Control Module References on page 6-3

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* on page 6-69.

↓ **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* on page 13-29.

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* on page 6-92 after completing the repair.

Control Module References on page 6-3 for engine control module replacement, programming, and setup

DTC P1631

Diagnostic Instructions

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

DTC Descriptor

DTC P1631: Immobilizer Fuel Enable Signal Not Correct

Circuit/System Description

The body control module (BCM) sends the pre-release information 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. The BCM follows this action by sending the remaining immobilizer data to the ECM. If the immobilizer data sent by the BCM matches that stored by the ECM, the ECM will allow the engine to remain running.

Conditions for Running the DTC

Ignition is in the ACCESSORY or RUN position.

Conditions for Setting the DTC

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 will be cleared when correct immobilizer data is received.
- A history DTC will be cleared after 40 malfunction-free ignition cycles.

Reference Information

Schematic Reference

Immobilizer Schematics on page 13-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Immobilizer Description and Operation on page 13-31

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Verify 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* on page 6-69.
- ↓ **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* on page 13-29.
3. Verify the engine starts after the K9 Body Control Module completes the learn procedure.
⇒ **If the engine does not start**
Perform the K20 Engine Control Module immobilizer learn using the engine control module IMMO Learn in SPS. Refer to *Immobilizer System Component Programming* on page 13-29.
- ↓ **If the engine starts**
4. All OK.

DTC P1649

Diagnostic Instructions

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

DTC Descriptor

DTC 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 on page 13-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Immobilizer Description and Operation on page 13-31

Electrical Information Reference

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

Scan Tool Reference

Control Module References on page 6-3

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* on page 6-69.

↓ **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* on page 13-29.
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* on page 6-92 after completing the repair.

Control Module References on page 6-3 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* on page 6-66 before using the symptom tables in order to verify that all of the following are true:
 - There are no DTCs set.
 - The control modules can communicate via the serial data links.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to *Immobilizer Description and Operation* on page 13-31.

Visual/Physical Inspection

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

Intermittent

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

Symptom List

Refer to *OnStar Stolen Vehicle Slowdown Active* on page 13-27 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* on page 6-66 prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis* on page 6-58 for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions* on page 6-59 provides an overview of each diagnostic category.

Circuit/System Description

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 Schematics on page 8-6

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Remote Vehicle Speed Limiting Description and Operation on page 13-32

Electrical Information Reference

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

Scan Tool Reference

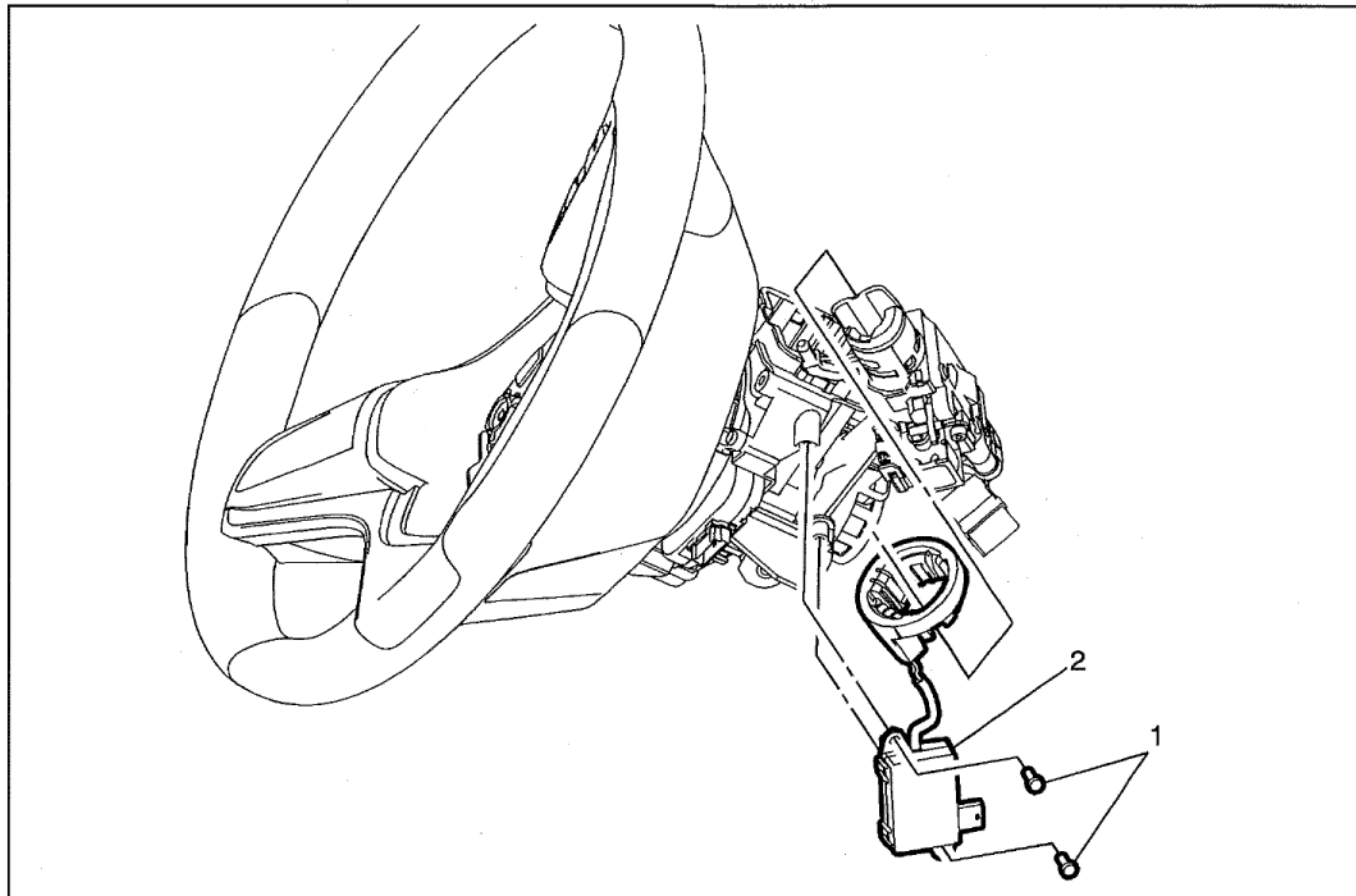
Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify 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**
 - 1.1. Perform the Remote Vehicle Speed Limiting Reset procedure with the scan tool.
 - 1.2. 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

Theft Deterrent Module Replacement



2502272

Theft Deterrent Module Replacement

Callout	Component Name
Preliminary Procedure 1. Remove the steering column upper trim cover. Refer to <i>Steering Column Upper Trim Cover Replacement</i> on page 15-28. 2. Remove the steering column lower trim cover. Refer to <i>Steering Column Lower Trim Cover Replacement</i> on page 15-29.	
1	Theft Deterrent Module Bolt/Screw (Qty: 2) Caution: Refer to <i>Fastener Caution</i> on page 0-8.
2	Theft Deterrent Module Procedure 1. Disconnect the electrical connector. 2. Refer to <i>Control Module References</i> on page 6-3 for programming and set up procedures.

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:

Immobilizer System Component Programming

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. Refer to the SPS application to determine if a particular vehicle is able to add keys using this method.
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. 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 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.
8. Follow the on-screen instructions.
9. After programming all keys "Programming Complete" is displayed.
10. Press the lock and unlock button on each transmitter that was programmed. This will awaken each transmitter and allow 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 transmitter and then start the vehicle. When verifying operation, make sure that no other keys are near the vehicle.

Key with Integrated Transmitter Programming

Keys can be programmed in various ways using the procedures outlined below. Using the Replacing Keys procedures 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 (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 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.
 7. Follow the on-screen instructions.
 8. After programming all keys, "Programming Complete" is displayed.
 9. Press the lock and unlock button on each key that was programmed. This will awaken each key and allow keyless entry functions to be established.
 10. With a scan tool, clear any DTCs.
 11. 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.

Replacing Keys (Without SPS) – United States only

Note:

- This procedure should be used without existing learned keys being present.
 - This procedure will take more than 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).
 - If the battery voltage is low, charge the battery before continuing with the procedure.
1. With an unlearned master vehicle key, turn ON the ignition, with the engine OFF.
 2. Observe the security indicator, after approximately 10 min the indicator will turn off.
 3. Turn OFF the ignition and wait 5 s.
 4. Repeat steps 1 - 3 two more times for a total of 3 cycles or 30 min.

Note: The body control module learns the key transponder information upon the ignition transition from OFF to ON. You must turn the ignition OFF before attempting to start the vehicle.

5. Start the vehicle. The vehicle has now learned the key transponder information.
6. Additional keys may be learned using the Adding Keys procedure.
7. Clear all DTCs.

Adding Keys (Without SPS) – North America, except Canada

Note:

- To initiate, this procedure requires that 1 learned key be available.
 - A total of eight keys may 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. With a previously learned key, turn the ignition ON.
 2. Turn the ignition OFF 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 key.

Adding Keys (Without SPS) – Canada, Europe, South America, Asia, and Middle East

Note:

- To initiate, this procedure requires that 2 learned key 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. With a previously learned key, turn the ignition ON.
 2. Turn the ignition OFF and remove the key.
 3. With a second previously learned key, turn the ignition ON.
 4. Turn the ignition OFF and remove the key.
 5. 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 key.

Adding Keys (With SPS) – North America

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.
 7. Follow the on-screen instructions.
 8. After programming all keys, "Programming Complete" is displayed.
 9. Press the lock and unlock button on each key that was programmed. This will awaken each key and allow keyless entry functions to be established.
 10. With a scan tool, clear any DTCs.

11. 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.

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 environment identifier.

When an ignition key is inserted into the ignition lock cylinder and the ignition is switched ON, the transponder in the key is energized by the immobilizer coil surrounding the ignition lock cylinder. This immobilizer coil is part of the immobilizer antenna. The transponder transmits a signal that contains its unique value, which is received by the BCM through the immobilizer coil. 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 ECM. 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 ECM.

When the ECM receives the BCM prerelease password, the ECM will challenge the password. The ECM sends this challenge to the BCM via serial data. Both the ECM and BCM perform a calculation on this challenge. If the BCM calculated response to the challenge 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
- 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 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 antenna 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 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 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 ECM.

Immobilizer Antenna

The immobilizer antenna contains an immobilizer coil which surrounds the ignition cylinder. The coil passively powers the transponder located in the ignition key when the key is in the ignition. 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

Ignition Key

Each ignition key 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 ignition key transponder value to determine if a valid ignition key 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 a 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.

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 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.