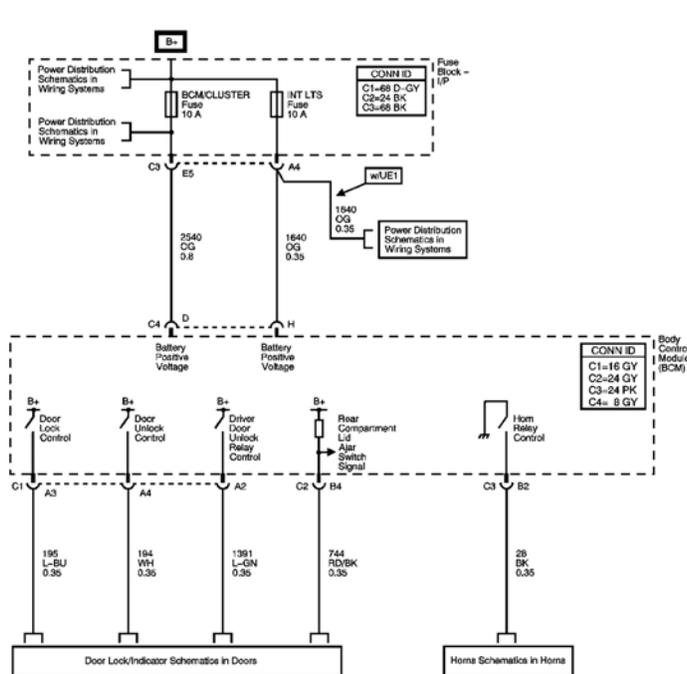# SCHEMATIC AND ROUTING DIAGRAMS

KEYLESS ENTRY SCHEMATICS

Fig. 1: Keyless Entry Schematic
Courtesy of GENERAL MOTORS CORP.

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - KEYLESS ENTRY

Begin the system diagnosis with. The Diagnostic System Check will provide the following information:

- The identification of the control module(s) which command the system
- The ability of the control module(s) to communicate through the serial data circuit
- The identification of any stored diagnostic trouble codes (DTCs) and their status

The use of the Diagnostic System Check will identify the correct procedure for diagnosing the system and

where the procedure is located.

DIAGNOSTIC SYSTEM CHECK - REMOTE KEYLESS ENTRY

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: Lack of communication may be due to a partial malfunction of the class 2 serial data circuit or due to a total malfunction of the class 2 serial data circuit. The specified procedure will determine the particular condition.

4: The presence of DTCs which begin with "U" indicate some other module is not communicating. The specified procedure will compile all the available information before tests are performed.

5: Any other body control module DTCs displayed by the scan tool do not apply to Remote Keyless Entry and should be diagnosed in the applicable section.

Diagnostic System Check - Remote Keyless Entry

Step	Action	Yes	No
1	Install a scan tool. Does the scan tool power up?	Go to **Step 2**	Go to **Scan Tool Does Not Power Up** in Data Link Communications
2	1. Turn ON the ignition, with the engine OFF. 2. Attempt to establish communication with the body control module. Does the scan tool communicate with the body control module?	Go to **Step 3**	Go to **Scan Tool Does Not Communicate with Class 2 Device** in Data Link Communications
3	Select the BCM display DTCs function on the scan tool. Does the scan tool display any DTCs?	Go to **Step 4**	Go to **Symptoms - Keyless Entry**
4	Does the scan tool display any DTCs which begin with a "U"?	Go to **Scan Tool Does Not Communicate with Class 2 Device** in Data Link Communications	Go to **Step 5**
5	Does the scan tool display DTC B3109?	Go to **Diagnostic Trouble Code (DTC) List**	Go to **Symptoms - Keyless Entry**

SCAN TOOL OUTPUT CONTROLS

Scan Tool Output Controls

Scan Tool Output		

Control	Additional Menu Selection(s)	Description
Add/Replace Key Fobs	After Selecting Body Control Module, Select Special Functions and Program Key Fobs	The BCM programs a new keyless entry transmitter or a replacement transmitter for the keyless entry system.
Clear Memory and Program all Fobs	After Selecting Body Control Module, Select Special Functions and Program Key Fobs	The BCM programs all of the keyless entry transmitters for the keyless entry system.

SCAN TOOL DATA LIST

The Keyless Entry Scan Tool Data List contains all of the keyless entry related parameters that are available on the scan tool. The parameters in the list are arranged in alphabetical order. The column, "Data List," indicates the location of the parameter within the scan tool menu selections. Use the Keyless Entry Scan Tool Data List as directed by a diagnostic table or in order to supplement the diagnostic procedures. Begin all of the diagnostic procedures with **Diagnostic System Check - Remote Keyless Entry** .

Use the Scan Tool Data List only after the following is determined:

- There is no published DTC procedure nor published symptom procedure for the customer concern.
- The DTC or symptom diagnostic procedure indicated by the diagnostic system check does not resolve the customer concern.

The Typical Data Values are obtained from a properly operating vehicle under the conditions specified in the first row of the Scan Tool Data List table. Comparison of the parameter values from the suspect vehicle with the Typical Data Values may reveal the source of the customer concern.

Scan Tool Data List

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Ignition ON/Engine OFF			
Battery 1	Door Locks	Volts	12Volts
Dome Lamp Command	Interior Lamps	On/Off	Off
DRL Relay Command.	Exterior Lamps	On/Off	On
Horn Relay Cmd.	Security Command	On/Off	Off
Remote Lock Command.	Door Locks	Yes/No	No
Remote Panic Command	Door Locks	Yes/No	No
Remote Unlock Command	Door Locks	Yes/No	No

SCAN TOOL DATA DEFINITIONS

Battery 1

The scan tool displays the current state of the battery in volts.

Dome Lamp Command

The scan tool displays On/Off to indicate the current state of the interior lamps as commanded by the body control module. The scan tool display will indicate On when the lamps are commanded On

DRL Relay Command

The scan tool displays On/Off. This output displays the commanded state of the daytime running lamp relay located inside the BCM.The scan tool display will indicate On when the lamps are commanded On.

Horn Relay Command

The scan tool displays On/Off. This output displays the commanded state of the horn relay located inside the BCM.The scan tool display will indicate On when the horn is commanded On.

Remote Lock Command

The scan tool displays Yes/No. This input displays Yes when the remote keyless entry transmitter lock button is pressed.

Remote Panic Command

The scan tool displays Yes/No. This input displays Yes when the remote keyless entry transmitter panic button is pressed.

Remote Unlock Command

The scan tool displays Yes/No. This input displays Yes when the remote keyless entry transmitter unlock button is pressed.

DIAGNOSTIC TROUBLE CODE (DTC) LIST

Diagnostic Trouble Code (DTC) List

DTC	Diagnostic Procedure	Module(s)
B3109	**DTC B3109**	RFA

DTC B3109

Circuit Description

The LOW battery detection is handled inside the transmitter. The transmitter sends a battery condition signal to the body control module (BCM) when any transmitter button is pressed.

Conditions for Setting the DTC

This code shall be set whenever a low battery signal is received from any programmed transmitter.

Conditions for Clearing the DTC

- This code is cleared as current when a normal transmitter voltage signal is received from any programmed transmitter.
- A scan tool may be used to clear history and current DTC(s).

Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

2: This step identifies the transmitter with a low battery signal.

4: This step verifies that the battery replacement corrected the fault.

DTC B3109

Step	Action	Yes	No
1	Did you perform the Diagnostic System Check?	Go to **Step 2**	Go to Diagnostic System Check - Remote Keyless Entry
2	1. With a scan tool, clear the DTC. 2. Press a button on each of the transmitters while monitoring the scan tool body control module (BCM) DTC list. Does the scan tool indicate that DTC B3109 reset when the button was pressed on any of the transmitters?	Go to **Step 3**	Go to Testing for Intermittent and Poor Connections in Wiring Systems
3	Replace the battery on the transmitter(s) that reset DTC B3109. Refer to Transmitter Battery Replacement. Did you complete the battery(s) replacement?	Go to **Step 4**	-
4	1. Use the scan tool in order to clear the DTCs. 2. Operate the transmitter(s) that had the battery replaced. Does the DTC reset?	Go to **Step 5**	Go to **Step 8**
5	1. Replace the transmitter(s). 2. Ensure that the replacement transmitter(s) is the correct model for the vehicle. 3. All transmitters must be programmed at the same time. Refer to Transmitter Programming. Did you complete the replacement?	Go to **Step 6**	-
6	1. Use the scan tool in order to clear the DTCs. 2. Operate the replaced transmitter(s) 3 consecutive times.		

Does the DTC reset?	Go to **Step 8**	Go to **Step 7**

7	**IMPORTANT:** **When replacing the BCM, perform the transmitter programming procedure.** Replace the BCM. Refer to in Body Control Systems.Did you complete the replacement?	Go to **Step 8**	-
8	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 2**

SYMPTOMS - KEYLESS ENTRY

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

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

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the Keyless Entry System. Refer to **Checking Aftermarket Accessories** in Wiring Systems.
- 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** in Wiring Systems.

Symptom List

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

- **Panic Mode Inoperative**
- **Keyless Entry System Inoperative**

PANIC MODE INOPERATIVE

Panic Mode Inoperative

Step	Action	Yes	No
1	Did you perform the Diagnostic System Check?	Go to **Step 2**	Go to **Diagnostic System Check - Remote Keyless Entry**
2	With the keyless entry transmitter, attempt to operate the panic function. Do the horns pulse and the daytime running lamps flash on and off?	Go to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems	Go to **Step 3**
3	Do any of the panic functions operate?	Go to **Step 4**	Go to **Keyless Entry System Inoperative**
4	Do the horns pulse on and off?	Go to **Headlights/Daytime Running Lights (DRL) Schematics (w/ T82)** or **Headlights/Daytime Running Lights (DRL) Schematics (w/o T82)** in Lighting Systems	Go to **Diagnostic System Check - Horns** in Horns

KEYLESS ENTRY SYSTEM INOPERATIVE

Keyless Entry System Inoperative

Step	Action	Yes	No
1	Did you perform the Diagnostic System Check?	Go to **Step 2**	Go to **Diagnostic System Check - Remote Keyless Entry**
2	**IMPORTANT:** **Inspect that the keyless entry transmitter is the correct model for the vehicle remote system. A wrong model transmitter will not activate the vehicle remote system.** Press each button of the transmitter one at a time.Does the system operate normally?	Go to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems	Go to **Step 3**
3	Lock and unlock the door locks using the controls inside the vehicle. Do the locks operate properly?	Go to **Step 4**	Go to **Diagnostic System Check - Door Systems** in Doors
4	1. Perform the transmitter synchronization procedure. Refer to **Transmitter Resynchronization** . 2. Press each button of the transmitter one at a time.		

|			
	Does the system operate normally?	Go to **Step 9**	Go to **Step 5**
5	1. Reprogram the transmitter. Refer to **Transmitter Programming** 2. Press each button of the transmitter one at a time. Does the system operate normally?	 Go to **Step 9**	 Go to **Step 6**
6	1. Install a scan tool. Select BCM, Data Display, Door Locks, and monitor the remote lock, unlock, and panic command parameters. 2. Press each button of the transmitter one at a time. Does the appropriate scan tool parameter indicate Yes after each button is pressed?	 Go to **Step 8**	 Go to **Step 7**
7	**IMPORTANT:** **the transmitter programming procedure must be performed whenever a transmitter is replaced. Refer to Transmitter Programming** 1. Replace the transmitter. 2. Press each button of the transmitter one at a time. Does the system operate normally?	 Go to **Step 9**	 Go to **Step 8**
8	**IMPORTANT:** **When replacing the BCM, perform the BCM programming procedure. Also program all transmitters. Refer to Transmitter Programming** Replace the body control module (BCM). Refer to **Body Control Module Replacement** in Body Control Systems.Did you complete the replacement?	 Go to **Step 9**	 -
9	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 3**

REPAIR INSTRUCTIONS

TRANSMITTER BATTERY REPLACEMENT

NOTE: **Use of the wrong battery size may damage the transmitter.**

NOTE: When removing the battery, use care not to touch any of the circuitry. Static from your body transferred to these surfaces may damage the transmitter.

IMPORTANT: If the transmitter won't work, perform the RKE System Check before replacing the battery. Also, before replacing the battery in the transmitter, make sure that the battery is touching both the negative and positive contacts inside of the transmitter.

For battery replacement, use a Panasonic type CR2032 3-volt battery, or equivalent.
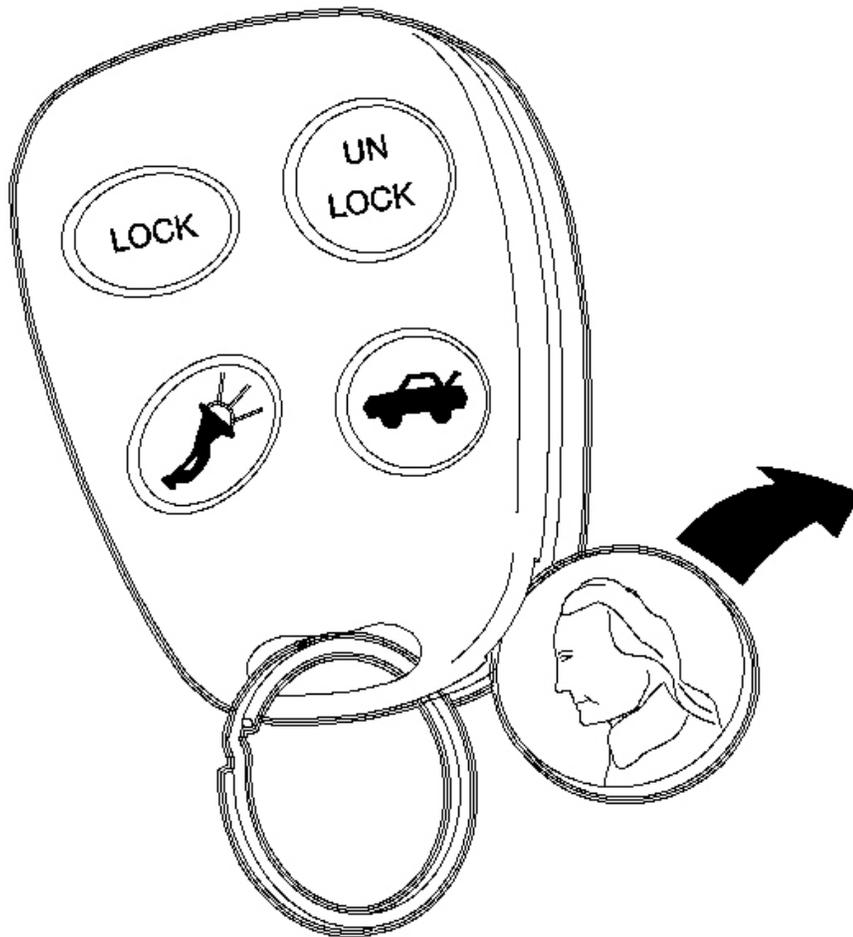
Fig. 2: Separating Bottom of Transmitter From Top
Courtesy of GENERAL MOTORS CORP.

1. Use a small coin, or flat-head screwdriver, to separate the bottom of the transmitter from the top.

    NOTE: **Do not use sharp objects to help slide the battery out of the clip. This may result in damage to the circuit board.**

2. Remove the circuit board from the transmitter housing and key pad by pressing on the LOCK button.
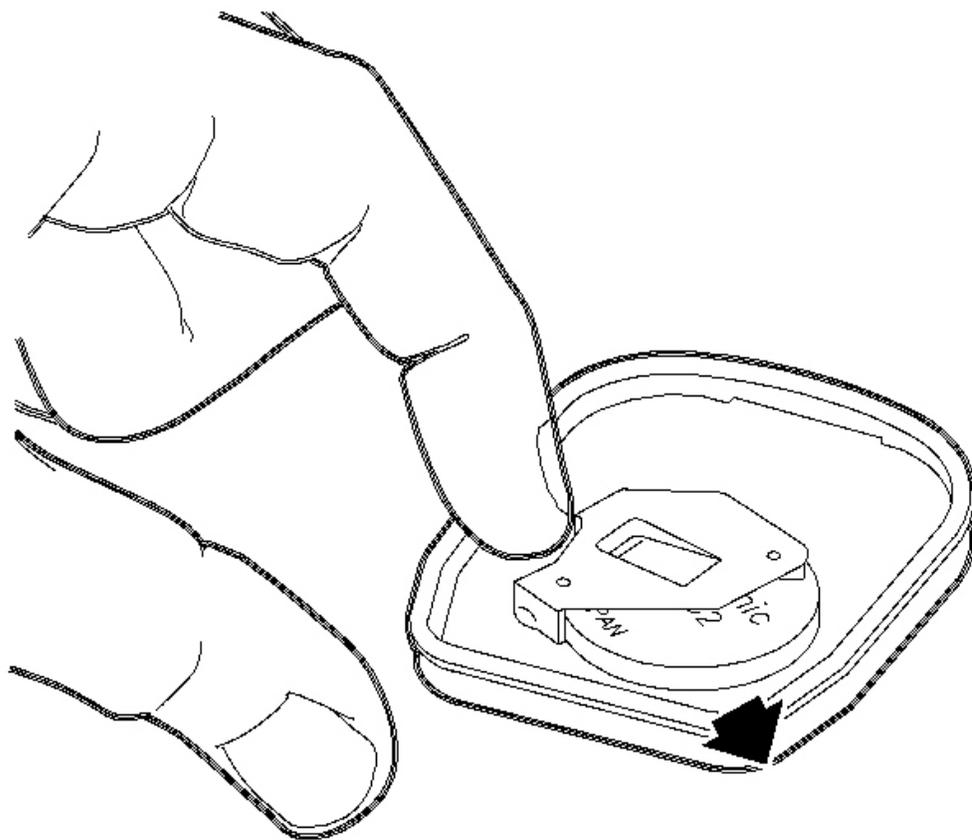
Fig. 3: Removing Battery Out of Battery Clip
Courtesy of GENERAL MOTORS CORP.

3. Remove the battery by sliding the battery out of the battery clip. This may require a push from the back side of the clip.
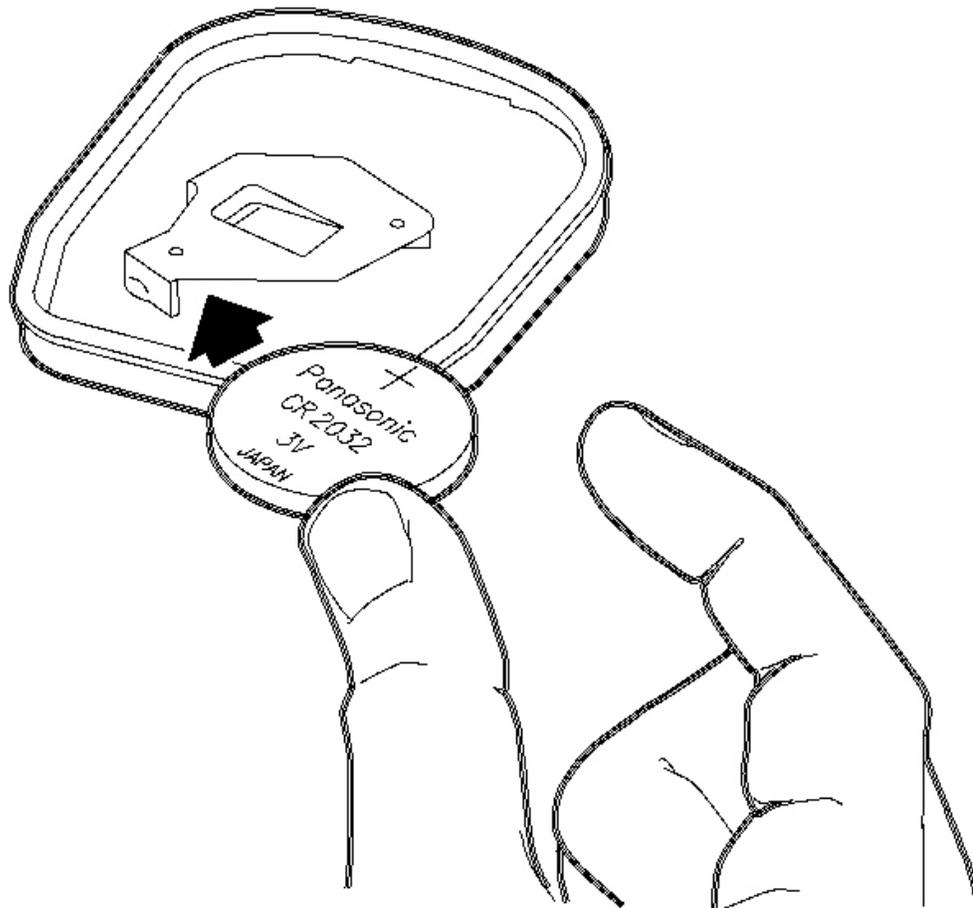
Fig. 4: Installing Battery
Courtesy of GENERAL MOTORS CORP.

4. Replace the battery with the new one making sure that the (+) side of the battery faces away from the circuit board.

   IMPORTANT: Be careful not to pinch the key pad while closing the housing.

5. Reassemble the circuit board and key pad, and replace them in the transmitter housing which does not contain the key pad openings.
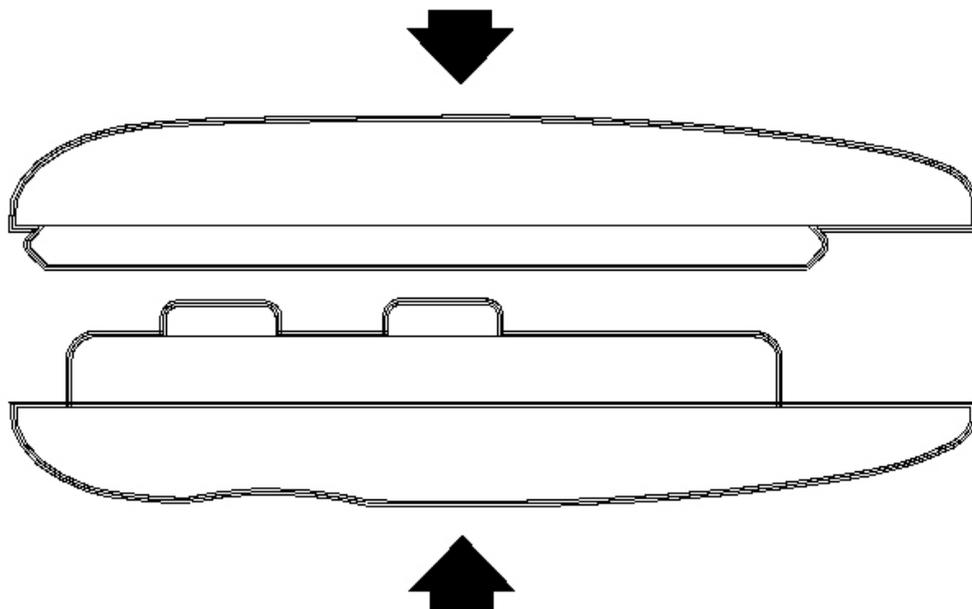
6. Line up and replace the lower housing by snapping the upper and lower housings together.
7. Test the operation of the transmitter with the vehicle by pressing and holding the LOCK and UNLOCK buttons for 7 or more seconds. This is required to reestablish communications with the vehicle.

TRANSMITTER PROGRAMMING

IMPORTANT: Up to 4 transmitters can be programmed. Do not operate or program the transmitters in the vicinity of other vehicles that are in the keyless entry program mode. This prevents the programming of the transmitters to the incorrect vehicle. The order in which the transmitters are programmed is

important. The first transmitter programmed will be transmitter #1, and the second transmitter programmed will be transmitter #2. Use care to program the transmitters correctly.

1. Install a scan tool.
2. Turn ON the ignition with the engine OFF.
3. Select Body Control Module.
4. Select Special Functions.
5. Select Program Key Fobs.
6. If you are adding a transmitter to the system, or are replacing a transmitter, choose the Add/Replace Key Fobs option. This allows new transmitters to be added without deleting those currently programmed to the module.

   If you are replacing all transmitters or none of the transmitters are working, choose the Clear memory and Program All Fobs option. This prevents lost or stolen transmitters from being used to access the vehicle.

7. Follow the scan tool on-screen directions.
8. After programming the last transmitter, remove the scan tool.
9. Exit the vehicle. Attempt to lock/unlock the doors to verify the programming.
10. Operate the transmitter functions in order to verify correct system operation.

DESCRIPTION AND OPERATION

KEYLESS ENTRY SYSTEM DESCRIPTION AND OPERATION

The remote keyless entry (RKE) system allows operation of the door locks and interior lighting from outside the vehicle. Radio frequencies or discharged batteries may disable the system.

Keyless entry allows you to operate the following components:

- The door locks
- The illuminated entry lamps
- The panic alarm (instant alarm)

The keyless entry system has the following main components:

- The transmitters
- The body control module (BCM)

When you press a button on a transmitter, the transmitter sends a signal to the BCM. The BCM interprets the signal and activates the requested function.

Unlock Driver's Door Only

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

- Unlock the driver door only.
- Illuminate the interior lamps for approximately 20 seconds or until the ignition is turned ON.
- Flash the daytime running lamps twice (if selected ON in personalization).
- Disarm the content theft deterrent (CTD) system (if equipped).
- Deactivate the CTD system when in the Alarm Mode (if equipped).
- Chirp the horn twice (if selected ON in personalization).

Unlock All Doors (Second Operation)

Momentarily press the UNLOCK button a second time (within 5 seconds of the first press) in order to perform the following functions:

- Unlock the remaining doors.
- Illuminate the interior lamps for approximately 20 seconds or until the ignition is turned ON.
- Flash the daytime running lamps twice (if selected ON in personalization).
- Chirp the horn twice (if selected ON in personalization).

Lock All Doors

Press the LOCK button in order to perform the following functions:

- Lock all of the doors.
- Illuminate the interior lamps for 2 seconds after all doors are closed.
- Flash thedaytime running lamps(if selected ON in personalization).
- Chirp the horn if the lock button is pressed a second time within 5 seconds (if selected ON in personalization).
- Arm the content theft deterrent (CTD) system.
- Sound the chime 3 times if any door is open when the lock button is pressed (delayed locking).

Alarm

A single press of the panic button performs the following functions:

- Illuminate the interior lamps.
- Pulse the horn.
- Flash the head lamps.
- All will occur for a predetermined period of time or until any of the following conditions occur:
  - The panic button is pressed again.
  - The ignition switch is turned to the RUN position with a valid key.
  - The vehicle is unlocked with the key.

Rolling Code

The keyless entry system uses rolling code technology. Rolling code technology prevents anyone from recording the message sent from the transmitter and using the message in order to gain entry to the vehicle. The term "rolling code" refers to the way that the keyless entry system sends and receives the signals. The transmitter sends the signal in a different order each time. The transmitter and the Body Control Module (BCM) are synchronized to the appropriate order. If a programmed transmitter sends a signal that is not in the order that the BCM expects, then the transmitter is out of synchronization. This occurs after 256 presses of any transmitter button when it is out of range of the vehicle.

Transmitter Resynchronization

This is used to keep the transmitter of the vehicle communicating with the receiver of the vehicle. Resynchronization may be required due to the security method used by this system.

Your vehicle has an automatic resynchronization function built into the system. If your transmitter is not working properly and you have to manually resynchronize, press the lock and unlock buttons at the same time for seven seconds while you are near your vehicle. The doors will lock or unlock, depending on their starting position. If they do not, contact your retailer for service.