Component Procedures: Keyless Entry

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Component Procedures: Keyless Entry

Parts and Labor (itype_189)

Labor

Operation	Qualifier Path	Skill	Std Hrs	Wty Hrs
Remove & Replace	Keyless Entry Components > Receiver, R&R	B	0.4	0.0
Remove & Replace	Keyless Entry Components > Transmitter, R&R	B	0.5	0.0

Keyless Entry System (Article 13233)

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

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

The keyless entry system has the following components:

- Keyless entry transmitters
- Body control module
- Remote control door lock receiver

Keyless Entry Transmitters

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

OnStar ® Remote Link (if equipped)

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

Body Control Module (BCM)

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

Remote Control Door Lock Receiver

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

Unlock Doors

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

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

Lock All Doors

Press the transmitter LOCK button to perform the following functions:

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

Trunk Release, if equipped

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

Power Liftgate, if equipped

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

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

Vehicle Locator/Panic Alarm

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

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

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

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

Remote Vehicle Start, if equipped

The remote vehicle start function allows engine starting while not in the vehicle. It also allows the vehicle HVAC system and other vehicle systems to enable, providing a comfortable vehicle upon entry. The HVAC system will operate in the following possible ways:

- If the vehicle is equipped with a manual HVAC system it will be on and operating in the same way that the settings were adjusted when the vehicle was last used.
- If the vehicle is equipped with an automatic HVAC system it will operate as necessary to meet the temperature setting it was left at. If the conditions are such that the system needs AC, rear defrost, or defrost then those functions will operate. The indicator lights for these functions will not illuminate even if the features are on.
- If the vehicle is equipped with an automatic HVAC system but the system is in manual mode then it will operate the same as a manual system equipped vehicle with the HVAC operating however it was adjusted when the vehicle was last used.

The turn signal lamps will illuminate to indicate the vehicle has received the remote start request. Each time a remote vehicle start is performed, the vehicle doors are locked, however they may then be unlocked/locked with the transmitter at any time. Only the first and second vehicle transmitters are able to control the remote vehicle start function. Any additional remote transmitters programmed to the vehicle will perform all other remote functions. Once activated, the engine is allowed to run for 10 minutes. The remote vehicle start time may be extended by an additional 10 minutes by again pressing and releasing the lock button and then pressing and holding the remote vehicle start buttons on the transmitter. This feature is called a remote vehicle start continue and allows a maximum of 20 minutes of engine running. If the remote vehicle start continue is performed at 7 minutes into the initial 10 minute time-out, a total of 17 minutes of engine running would occur. The remote vehicle start event may be suspended at any time by pressing only the remote vehicle start button on the transmitter or by entering the vehicle and turning ON the hazard lamps.

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

Enable/Disable Remote Vehicle Start

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

Hood Ajar Switch

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

Remote Vehicle Start Circuit Description

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

the following conditions are met:
- A valid hood ajar switch closed signal is present.
- The doors are locked.
- The low fuel warning light is off.
- The hazard switch is OFF.
- The vehicle power mode is correct.
- No content theft deterrent alarm triggers are present.
When the BCM determines all conditions meet those required for a remote vehicle start event, a message is sent via serial data to the ECM. The ECM relies on the remote vehicle start message from the BCM to enable remote vehicle start when the crank request signal is received. If the ECM does not receive a valid remote vehicle start message, it will not attempt to start the engine. While the ECM is in remote vehicle start mode it will suspend engine operation if any of the following additional conditions occur:
- Vehicle speed is greater than 0
- Transmission is not in PARK
- Excessive engine coolant temperature
- Low oil pressure
- The malfunction indicator lamp (MIL) is commanded ON
- Engine crank time is greater than 30 seconds
- Excessive engine speed
- Accelerator pedal position too high
- Remote start timer equals 0
- Immobilizer system indicates tamper
Keyless Entry Personalization
Vehicle lock/unlock functions and remote vehicle start settings may be personalized. For functional descriptions and personalization instructions, refer to the vehicle owners manual.

Remote Function Schematics (Article 13252)

Figure 1: Keyless Entry
Figure 2: Garage Door Opener

Remote Functions - Fastener Specifications (Article 13254)

Application	Specification
Metric	English
Garage Door Opener Bolt Screws	2.5 Nm 22 lb in
Overhead Console Screws	2.5 Nm 22 lb in

All New Technical Service Bulletins (itype_432)

Tsbs
- Diagnostic Tip - Unable to Learn RKE Transmitters (PIT4945H, 2019/02/19)
- Diagnostic Tip - Security Light on Intermittently / No Crank/No Start or Start Stall / Keyless Access Vehicles May Display No Remote/Fob Detected / Poor or No RKE Range / Service TPM (PIC5650M, 2025/08/06)

All Technical Service Bulletins (itype_100)

Tsbs
- Normal Characteristic - Heated Seat Operation After Performing A Remote Vehicle Start (RVS) (PIC5322D, 2015/05/29)
- Key & Transmitter Programming (PIC6401, 2020/02/03)
- Diagnostic Tip - Unable to Learn RKE Transmitters (PIT4945H, 2019/02/19)
- Information on Using MyBuick, MyCadillac, MyChevrolet, and MyGMC Phone Applications to Control GM Accessory Remote Start Kits (16-NA-355, 2018/10/22)
- Information for Fleet Vehicles - Ignition Key, Fob and Key Rings Configuration (14-00-89-004D, 2017/10/23)
- Tire Monitor System - TPMS Lamp On, No Tire Pressures Displayed (PI1241, 2014/05/16)
- Intermittent Remote Keyless Entry Inoperative (PIT5119F, 2017/11/20)
- Information on How to Prevent Inadvertent Vehicle Starting from Key Fob or OnStar Mobile Application (17-NA-244, 2017/07/25)
- Diagnostic Tip - Security Light on Intermittently / No Crank/No Start or Start Stall / Keyless Access Vehicles May Display No Remote/Fob Detected / Poor or No RKE Range / Service TPM (PIC5650M, 2025/08/06)
- Keyless Start Transmitter - Poor Appearence After Blade Removal (15-09-83-001A, 2015/07/20)
- Information on Poor, Limited, Reduced Remote Keyless Entry (RKE) or Remote Vehicle Start (RVS) Range

(PI1018A, 2015/02/05)

Customer Interest Bulletins (itype_109)

Tsbs
- Keyless Start Transmitter - Poor Appearence After Blade Removal (15-09-83-001A, 2015/07/20)

Repair Tips (itype_110)

Tsbs
- Tire Monitor System - TPMS Lamp On, No Tire Pressures Displayed (PI1241, 2014/05/16)

Symptoms - Remote Functions (Article 13248)

- Perform Diagnostic System Check - Vehicle before using the Symptom Tables in order to verify that all of the following are true:
- There are no DTCs set.
- The control modules can communicate via the serial data link.
- 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 .
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent
Faulty electrical connections, wiring, terminals, connectors, poor voltage and ground connections, temperature sensitivity, electromagnetic interference, electrical noise and/or incorrect control module installed may be the cause of intermittent conditions. Refer to Testing for Intermittent Conditions and Poor Connections .

Symptom List
Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:
- Garage Door Opener Malfunction
- Keyless Entry System Malfunction
- Remote Vehicle Start Malfunction

Keyless Entry System Malfunction (Article 13246)

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

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

Diagnostic Aids
- Unwanted or inadvertent door lock/unlock activation may be requested by the OnStar ® Remote Link app. It is possible that a customer may be unaware of account usage, result in an unwanted or phantom door lock/unlock. If normal system diagnosis does results in an inability to verify the customer’s concern, contact Technical Assistance Center (TAC).
- If available, the EL 43241 Keyless Entry Tester may be used to diagnose a low transmitter battery or a malfunctioning transmitter. To test, place the transmitter on the test pad of the EL 43241 and press each transmitter button one at a time, holding each button for three seconds. If the green light on the tester does not illuminate and a tone does not sound, first replace the transmitter battery and retest. If the malfunction continues after replacing the transmitter battery, replace the transmitter.
- When using the EL 43241 Keyless Entry Tester, first inspect the keyless entry transmitter part number to determine that it is the correct model for the vehicle. An incorrect part number transmitter may pass the test, but it will not activate the keyless entry system.

- When the vehicle key is in the ignition, the keyless entry functions are disabled from all keyless entry transmitters.

Reference Information

Schematic Reference

Remote Function Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Keyless Entry System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Special Tools

EL 43241 - Keyless Entry Tester

Circuit/System Verification

- Verify the Tire Pressure Monitoring System is functioning by adding air to one tire to see the air pressure display increase.
- If the pressure does not increases Refer to Symptoms - Tire Pressure Monitoring
- If the pressure increases
- Verify the VIN information for the vehicle transmitter is correct using theEL-52545 .
- If the VIN is blank Refer to Remote Control Door Lock and Theft Deterrent Transmitter Programming.
- If the VIN is incorrect This transmitter is not for this vehicle, it may already be programmed to work with a different vehicle but cannot be programmed to this vehicle.
- If the VIN is correct
- Verify the frequency of the transmitter matches the frequency of the tire pressure monitoring system and the remote control door lock receiver using the EL-52545 .
- If the transmitter frequency is incorrect Replace the vehicle transmitter.
- If the transmitter frequency is correct
- Verify the part number information for the vehicle transmitter is correct using the EL-52545.
- If the vehicle transmitter part number is incorrect Replace the vehicle transmitter.
- If the vehicle transmitter part number is correct
- Verify the transmitter output is above 20% on theEL-52545 signal strength meter by pressing a button on the transmitter ten times.
- If the transmitter output is lower than 20% Replace the transmitter battery.
- Note: Before replacing the transmitter, inspect the transmitter battery contacts for any corrosion or damage. If no corrosion or damage is found, replace the transmitter battery and retest before replacing the transmitter. For transmitter battery replacement refer to Remote Keyless Entry (RKE) System Operation in the owner manual.
- If the transmitter output is higher than 20%
- Using the scan tool read the number of transmitters learned in the K9 Body Control Module. Using theEL-52545 read the number of transmitters learned in the transmitter.
- If the transmitters learned is less than the number programmed Program the transmitter. Refer to Remote Control Door Lock and Theft Deterrent Transmitter Programming.
- If the transmitters learned is equal to the number programmed
- Lock the vehicle using the keyless entry transmitter.
- If either the doors or the rear compartment do not unlock/unlatch and open Refer to Circuit/System Testing.
- If both doors and the rear compartment unlock/unlatch and open
- The concern may be caused by temporary RF interference. Discuss the conditions in which the concern occurs with the customer. RF interference from aftermarket devices such as 2-way radios, power inverters, cellular phone chargers, computers, etc. may cause a system malfunction. High RF traffic areas, such as gas stations which use pay-at-the-pump RF transponders, may also cause interference that could lead to a malfunction.

Circuit/System Testing

- Ignition OFF and all vehicle systems OFF, scan tool disconnected, disconnect the harness connector at the K77 Remote Control Door Lock Receiver. It may take up to 2 min for all vehicle systems to power down.
- Test for less than 30 Ω between the low reference circuit terminal 1 and ground.
- If 30 Ω or greater

- Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
- Test for less than 2 Ω in the low reference circuit end to end.
- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω, replace the K9 Body Control Module.
- If less than 30 Ω
- Ignition ON.
- Test for greater than 11.5 V between the B+ circuit terminal 4 and ground.
- If 11.5 V or less
- 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.
- Test for less than 2 Ω in the B+ circuit end to end.
- If greater than 11.5 V
- Test for 0.1–6 V between the serial data circuit terminal 2 and ground.
- If less than 0.1 V
- Test for infinite resistance between the serial data circuit and ground.
- If infinite resistance
- Test for less than 2 Ω in the serial data circuit end to end.
- If greater than 6 V
- Ignition OFF, disconnect the harness connector at the K9 Body Control Module, ignition ON.
- Test for less than 0.1 V between the serial data circuit and ground.
- If 0.1 V or greater, repair the short to voltage on the circuit.
- If less than 0.1 V, replace the K9 Body Control Module.
- If between 0.1–6 V
- Ignition OFF, disconnect the X1 and X2 harness connectors at the K9 Body Control Module, ignition ON.
- Test for less than 0.1 V between the K9 Body Control Module serial data circuit terminal 26 X1 and ground.
- If 0.1 V or greater Repair the short to voltage on the circuit.
- Ignition OFF.
- Test for infinite resistance between the K9 Body Control Module serial data circuit terminal 26 X1 and ground.
- If less than infinite resistance Repair the short to ground on the circuit.
- Test for less than 2 Ω between the K9 Body Control Module serial data circuit terminal 26 X1 and the K77 Remote Control Door Lock Receiver serial data circuit terminal 3.
- If 2 Ω or greater Repair the open/high resistance in the circuit.
- If less than 2 Ω
- Replace the K77 Remote Control Door Lock Receiver.
- Verify the keyless entry functions operate.
- If the keyless entry functions do not operate Replace the K9 Body Control Module
- If the keyless entry functions operate
- All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair.
- Transmitter Programming
- Control Module References for body control module replacement, programming, and setup

Remote Vehicle Start Malfunction (Article 13247)

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

Circuit/System Description

Remote vehicle start begins as a radio frequency message received by the body control module (BCM) from a keyless entry transmitter . The BCM monitors system conditions such as content theft deterrent , hood ajar status, and body DTCs to determine if a remote vehicle start event will occur. If conditions are determined to be acceptable, the remote vehicle start message is sent to the engine control module (ECM). The ECM monitors system conditions such as engine control parameters and vehicle theft deterrent to determine if engine starting will be allowed. If conditions are acceptable, the ECM will initiate engine starting. During the engine run time in a remote vehicle start attempt, before the operator enters the vehicle, the ECM may discontinue engine operation if system conditions require it or a message is received from the BCM requesting the engine be turned OFF.

Diagnostic Aids

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

Reference Information

Schematic Reference

Remote Function Schematics

Connector End View Reference

Master Electrical Component List

Description and Operation

Keyless Entry System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

- Verify that the keyless entry functions operate with all available keyless entry transmitters.
- If any keyless entry functions do not operate properly Refer to Keyless Entry System Malfunction .
- If all keyless entry functions operate properly
- Verify that no Diagnostic Status History or Start Disable items are present in the scan tool BCM Remote Start Diagnostic Status History and the ECM Remote Vehicle Start Disable History parameters.
- If remote vehicle start disable history items are present Refer to the appropriate subsection in which the malfunction occurred.
- If remote vehicle start disable history items are not present
- Verify all scan tool BCM Content Theft Trigger History parameters display None.
- If any BCM Content Theft Trigger History parameter does not display None Refer to Content Theft Deterrent Malfunction .
- If all BCM Content Theft Trigger History parameters display None
- All OK.

Erratic Operation (itype_132)

Tsbs
- Diagnostic Tip - Unable to Learn RKE Transmitters (PIT4945H, 2019/02/19)
- Keyless Start Transmitter - Poor Appearence After Blade Removal (15-09-83-001A, 2015/07/20)

Inoperative (itype_148)

Tsbs
- Intermittent Remote Keyless Entry Inoperative (PIT5119F, 2017/11/20)

Poor performance (itype_162)

Tsbs
- Information on Poor, Limited, Reduced Remote Keyless Entry (RKE) or Remote Vehicle Start (RVS) Range (PI1018A, 2015/02/05)

Miscellaneous Information (itype_111)

Tsbs
- Normal Characteristic - Heated Seat Operation After Performing A Remote Vehicle Start (RVS) (PIC5322D, 2015/05/29)
- Information on Using MyBuick, MyCadillac, MyChevrolet, and MyGMC Phone Applications to Control GM Accessory Remote Start Kits (16-NA-355, 2018/10/22)
- Information for Fleet Vehicles - Ignition Key, Fob and Key Rings Configuration (14-00-89-004D, 2017/10/23)
- Information on How to Prevent Inadvertent Vehicle Starting from Key Fob or OnStar Mobile Application (17-NA-244, 2017/07/25)

OEM Policies and Procedures (itype_120)

Tsbs
- Key & Transmitter Programming (PIC6401, 2020/02/03)