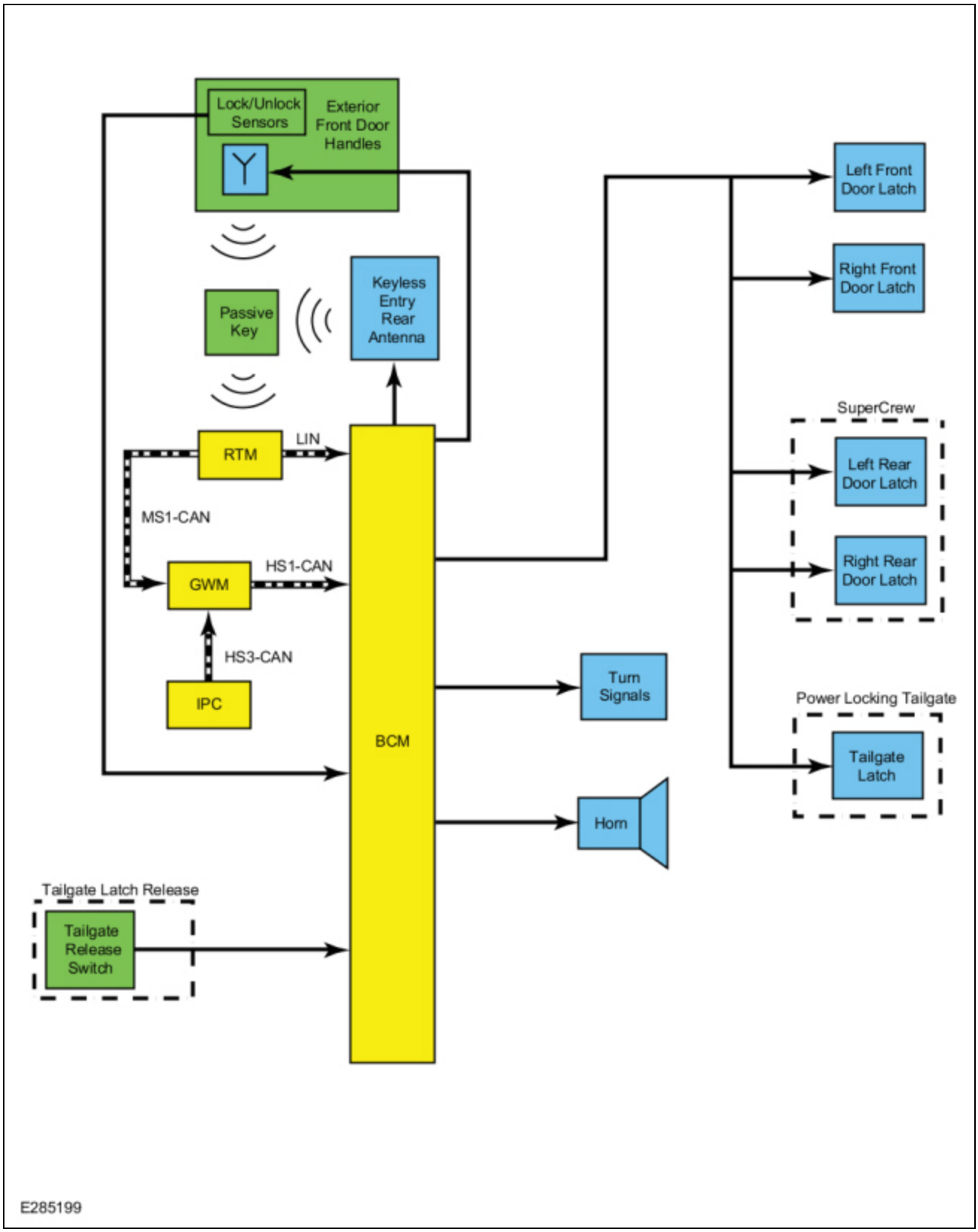
Handles, Locks, Latches and Entry Systems - System Operation and Component Description

System Operation

System Diagram



Network Message Chart

BCM Network Input Messages

Broadcast Message	Originating Module	Message Purpose
Vehicle speed	PCM	The BCM uses the vehicle speed data for the autolock and auto-unlock features.
RKE data	RTM	Provides the BCM with the lock/unlock request from the IKT or passive key (if equipped).

IPC Module Network Input Messages

Broadcast Message	Originating Module	Message Purpose
Message center feature configuration	IPC	Provides the BCM configuration settings selected by the driver of the vehicle, such as autolock and auto-unlock settings.

Power Door Locks

The BCM controls the door locks using a series of integrated relays (driver door unlock/all doors unlock/all doors lock). When the relays are not energized, ground is provided on both circuits to the lock motors within the latches. When an unlock relay energizes, voltage is provided to one side of the lock motor to unlock the door(s). When the lock relay energizes, the polarity is reversed and the motors lock the doors.

The BCM sends voltage signals to the door lock control switches. When a door lock control switch is pressed, the voltage signal is routed to ground, indicating a request to lock/unlock the doors.

The doors can also be centrally locked or unlocked using a key in the driver door lock cylinder. When a key is used in the driver door lock cylinder to lock or unlock the driver door, the BCM detects the lock/unlock feedback input change state and correspondingly locks or unlocks all the other doors.

Door Lock Indicators

Each door panel has a door lock indicator located in the lock switch to indicate the lock or unlock status of that door. The door lock indicators are controlled by the BCM. When activated, they illuminate to indicate a door is locked and are off when a door is unlocked.

Switch Inhibit Feature

The switch inhibit feature prevents unauthorized access to the vehicle from the door lock control switchs. The BCM disables the function of both door lock control switchs 20 seconds after the vehicle is electronically locked. If any of these switches are activated while they are inhibited, a chime sounds and a message is displayed in the message center to indicate the switches are inhibited. The BCM enables the function of these switches when the vehicle is electronically unlocked.

Power Door Locking Feedback

The exterior lamps and horn provide visual and audible feedback when unlocking and locking the doors under certain circumstances. Refer to the following table:

NOTE: *The mislock feature sounds the horn twice (no turn signal flash) if the hood or any door is ajar when the lock button is pressed on a valid programmed RKE transmitter. This feature can be configured on/off through the message center.*

Action	Status of Door(s)	Status of Hood	Visual/Audible Feedback
Press the lock button on the door lock control switch	Open	Closed	A short flash of the turn signals after all the doors are closed.
Press the unlock button on a RKE transmitter	Closed	Closed	A long flash of the turn signals.
Press the lock button on a RKE transmitter	Closed	Closed	A short flash of the turn signals.
Press the lock button on a RKE transmitter	Open	Closed	A short flash of the turn signals after all the doors are closed.
Press the lock button on a RKE transmitter	Closed	Open	A short flash of the turn signals after the hood is closed.
Press the lock button on a RKE transmitter twice within 3 seconds	Closed	Closed	The horn chirps twice and the turn signals flash twice.
Press the lock button on a RKE transmitter twice within 3 seconds	Open	Closed	The horn immediately chirps once and the turn signals flash twice after all the doors are closed.
Press the lock button on a RKE transmitter twice within 3 seconds	Closed	Open	The horn immediately chirps once and the turn signals flash twice after the hood is closed.

Power Locking Tailgate

The power locking tailgate feature operates in conjunction with the front passenger power door lock.

When the doors are electonically locked or unlocked, the tailgate is also locked or unlocked.

RKE (if equipped)

The RKE feature is controlled by the BCM. When a button is pressed, the Transmitter Identification Code (TIC) and RKE command is received by the RTM. The RTM interprets the information and sends a message to the BCM over a LIN, and when the network is awake over the CAN. If the BCM detects a programmed key, it carries out the command by controlling the door locks or activating the horn or turn signals as required.

The RKE system can be used to:

- unlock the driver door.
- unlock all doors.
- lock all doors.
- arm/disarm the perimeter alarm.
- activate/deactivate the panic alarm.
- remotely start the vehicle.
- configure the staged lock programming (2-stage unlock or global unlock).

The RKE transmitters have a normal operating range of 30 m (98 ft) in an open air, no obstruction environment.

The RKE transmitters and the BCM also utilize a rolling code to prevent the code from being captured by a code grabber. The system advances the counter in the RKE transmitter and the BCM every time a RKE transmitter button is pressed.

The message center displays Key Battery Low Replace Soon when the battery in the passive key needs to be replaced.

RKE Transmitter Unlock

The RKE feature provides a staged process for unlocking the doors. Upon receipt of the first request for unlocking the doors, the RKE feature unlocks only the driver door. If another unlock request is received within 3 seconds of the first, all the doors are unlocked. This feature can be disabled so that all the doors unlock on the first press of the unlock button (global unlock) using the message center settings or by pressing and holding both the RKE lock and unlock buttons simultaneously for 5 seconds (This will provide visual indication by flashing the indicators twice).

Vehicles come from the factory set with the 2-stage unlock feature disabled (single press unlocks all doors). For the passive entry RKE, while the 2-stage unlock feature is enabled for a remote key.

RKE Transmitter Lock

The RKE feature requests all of the doors lock when the lock button is pressed.

Panic Alarm

If equipped, the panic alarm feature provides audible and visual alarms which are evident from the exterior of the vehicle. When the panic alarm button is initially pressed, the panic alarm feature requests the turn signals flash and the horn sounds for up to 3 minutes or until deactivation. The flashing of the outputs occurs simultaneously.

The panic alarm can only be activated when the ignition is off. This feature is disabled at all other times. Deactivation of an active panic alarm is accomplished when:

- a second press of the RKE transmitter panic button is detected.
- the ignition status changes from off.
- a period of 2 minutes and 45 seconds have elapsed since the initial activation.

Autolock

The autolock feature locks all of the doors after all of the following have occurred:

- All the doors are closed.
- The ignition is on.
- The vehicle is shifted into any gear to put the vehicle in motion.
- The vehicle attains a speed greater than 20 km/h (12.4 mph)

The auto lock feature activates again during the same ignition cycle when all of the following have occurred:

- The vehicle speed is reduced to less than 15 km/h (9.3 mph)
- A door is opened and then closed.
- The vehicle attains a speed greater than 20 km/h (12.4 mph)

Auto-Unlock

NOTE: *The doors do not auto-unlock if the vehicle has been electronically locked before the driver door is manually unlocked.*

The auto-unlock feature unlocks all of the doors when all of the following conditions have been met:

- All the doors are closed and locked.
- The ignition was on.

- The vehicle was shifted out of park and a speed greater than 20 km/h (12.4 mph) was achieved.
- The vehicle has come to a stop.
- The ignition transitions to accessory or off and, within 10 minutes, the driver door is opened.

The auto-unlock feature can be enabled/disabled through the message center.

Smart Unlock (without push button start)

The smart unlock feature prevents the doors from electronically locking with the key in the ignition lock cylinder. When the BCM receives a lock command from a door lock control switch and the key is detected in the ignition lock cylinder with one of the front doors open, the BCM commands the doors to unlock.

To override the smart unlock feature and intentionally lock the doors with the key in the ignition lock cylinder, close all doors and lock the vehicle by pressing the lock button on another valid programmed IKT, or with another key using the driver door lock cylinder.

Smart Unlock (with push button start)

The smart unlock feature prevents the vehicle from electronically locking when a passive key is left inside the vehicle. When the doors are electronically locked while a door is ajar and then closed, the interior of the vehicle is scanned for a passive key. If a valid programmed passive key is detected inside the vehicle, the BCM unlocks the doors and chirps the horn twice.

Passive Entry

The passive entry feature unlocks or locks the doors without having to use a mechanical key blade or the RKE transmitter feature.

When the BCM detects a lock or unlock sensor is touched on an exterior door handle it activates the low frequency antenna in the corresponding exterior door handle. The low frequency antenna sends out a signal to activate the passive key. The passive key then responds by sending a high frequency signal back to the RTM. The RTM interprets the high frequency signal from the passive key and sends the information to the BCM. If the BCM detects a valid programmed passive key, the BCM unlocks the driver door, unlocks or locks all 4 doors and tailgate.

Door Passive Entry

With a programmed passive key within 1 m (3.28 ft) outside a door, touch the lock or unlock sensor on the exterior door handle. The doors lock or unlock depending upon which sensor was touched on the handle. The unlock button is located on the inside of the handle and the lock button is located on the outside face of the handle.

The driver front door passive entry feature either unlocks the driver door (if 2-stage unlock is enabled) or all four doors (if 2-stage unlock is disabled). The passive entry feature always locks all four doors when the lock button is touched.

The passenger door passive entry feature always locks or unlocks all four doors.

Component Description

Door Lock Control Switches

The door lock control switches are single pole, double throw switches. The BCM provide the voltage signals to the door lock control switch for the lock and unlock requests. When a switch is pressed to lock or unlock, the corresponding input circuit is routed to ground, indicating a request to lock or unlock the doors. Door lock switches contain door lock indicators.

Door Latches

The door latches are sealed units and contain the door lock actuator, lock/unlock feedback switch, and the door ajar switch. The door lock actuators operate in 2 directions, depending on the polarity of the voltage. The door latches can be lubricated, if needed.

Tailgate Latch Control Assembly

The tailgate lock actuator locks and unlocks the tailgate. It operates in 2 directions, depending on the polarity of the voltage.

IKT Key

The IKT incorporates both the PATS and RKE transmitter functions in a single device.

Passive Key

The passive key incorporates both the PATS and RKE transmitter functions in a single device.

During key programming procedures, the PATS and RKE transmitter Identification (ID) of a passive key are both programmed. A maximum of 4 passive keys can be programmed.

The passive key also contains a removable key blade that unlocks the driver door in the event of an electrical failure (such as a drained battery). The passive key requires 1 battery. For battery replacement instructions, refer to the Owner's Manual.

To start the vehicle in the event of a passive key battery failure, place the passive key in the backup starting location.
Refer to: Passive Anti-Theft System (PATS) - System Operation and Component Description (419-01B Passive Anti-Theft System (PATS), Description and Operation).

Exterior Door Handles

The exterior front door handles contain a keyless entry antenna and capacitive touch sensor(s) rear door handles have capacitive touch sensor(s). The antennas and lock/unlock sensors are wired to the BCM. When activated, the antenna transmits a low frequency signal to activate a passive key.

Keyless Entry Rear Antenna

The keyless entry rear antenna is wired to the BCM. When activated, it transmits a low frequency signal to activate a passive key.

RTM

The RTM communicates all RKE and passive key information to the BCM over a LIN-based circuit whether or not the CAN is active. The RTM is a receiving antenna that receives the high frequency signals from passive keys.

The RTM requires PMI when replaced.

BCM

The BCM is the master module in control of the power door lock system. It is responsible for locking/unlocking the doors. The BCM receives inputs for the door lock control switches, keys and RKE commands over the CAN and LIN-based circuits.

When the BCM is replaced, carry out the PMI and the parameter reset procedures and program at least 2 keys.