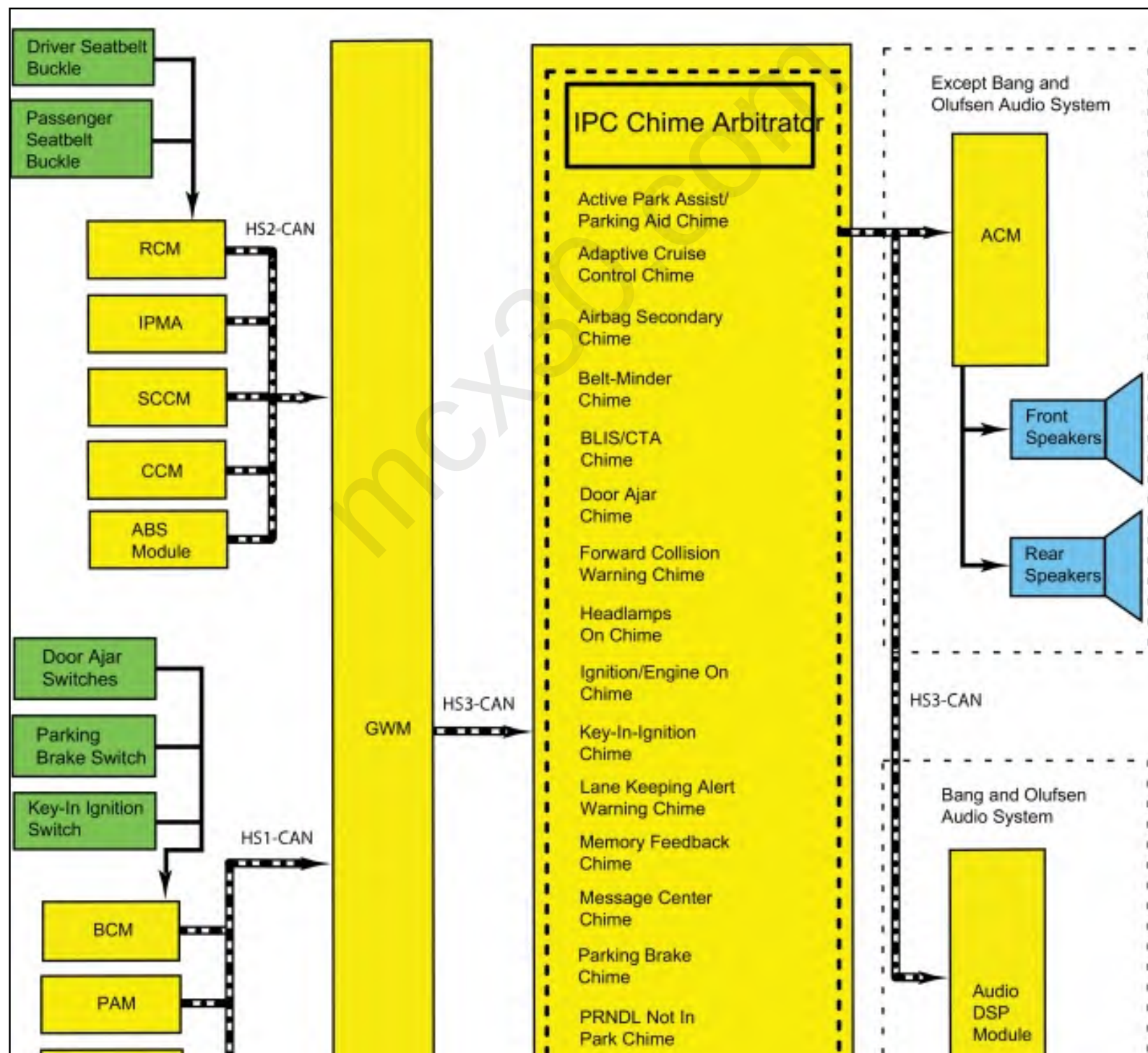
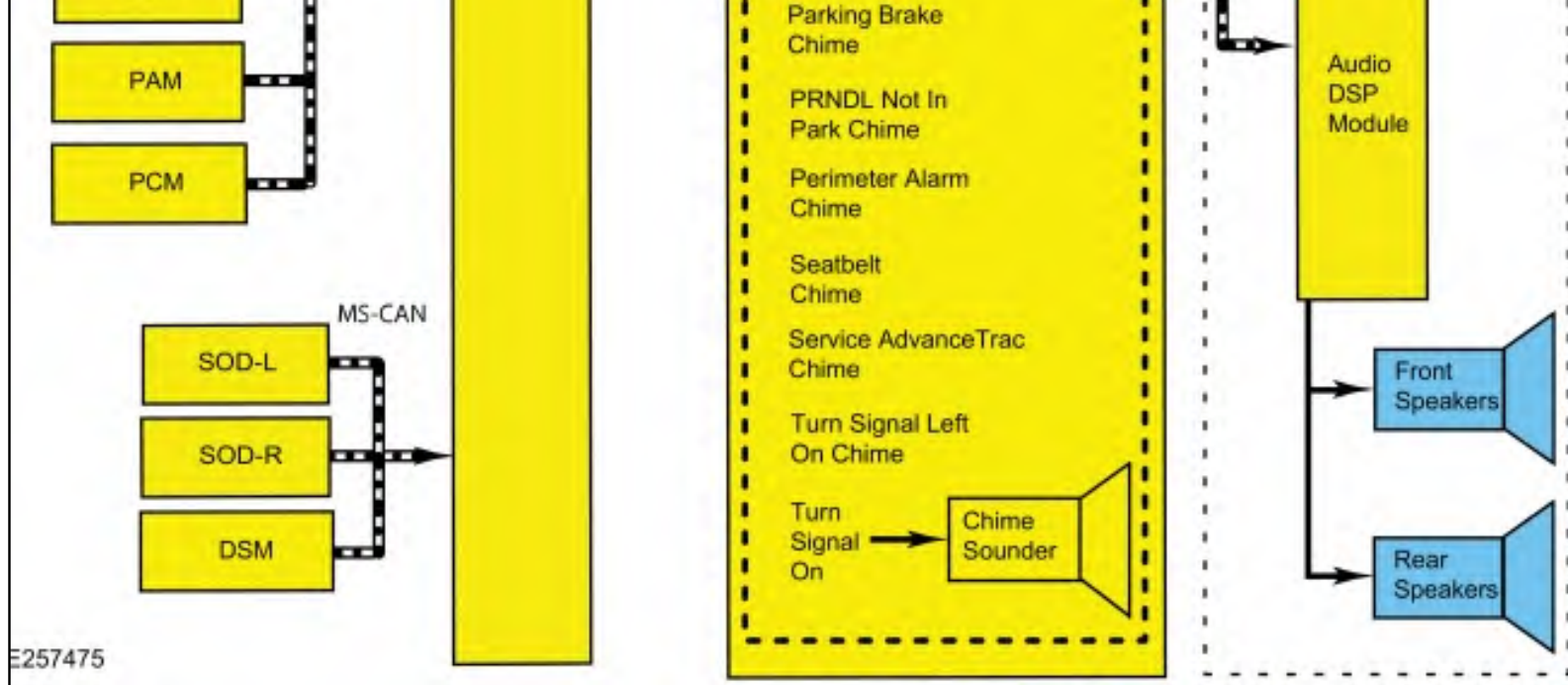


# Warning Chimes - System Operation and Component Description

## System Operation

## System Diagram





## Network Message Chart

### Module Network Input Messages - IPC

| Broadcast Message                       | Originating Module                     | Message Purpose                                                                                          |
|-----------------------------------------|----------------------------------------|----------------------------------------------------------------------------------------------------------|
| Adaptive cruise control warning request | CCM / IPMA (with pre-collision assist) | Input used to control the adaptive cruise control warning chime.                                         |
| Brake chime request                     | ABS module                             | Input used for the service AdvanceTrac® chime.                                                           |
| Cruise control status                   | PCM                                    | Input used to control the adaptive cruise control warning chime.                                         |
| Cross traffic alert left status         | SODL                                   | Input used to control the Blind Spot Information System (BLIS®)/Cross Traffic Alert (CTA) warning chime. |
| Cross traffic alert right status        | SODR                                   | Input used to control the Blind Spot Information System (BLIS®)/Cross Traffic Alert (CTA) warning chime. |
| Driver door ajar status                 | BCM                                    | Input used for the ignition-engine on chime and the PRNDL not in park warning chime.                     |
| Driver seatbelt buckle status           | RCM                                    | Input used to control the Belt-Minder® warning chime and the seat belt warning chime.                    |

|                                           |                                   |                                                                                                          |
|-------------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------|
| Forward collision chime request           | CCM / IPMA (pre-collision assist) | Input used for the confirmation chime portion of the forward collision warning chime.                    |
| Forward collision warning message request | CCM / IPMA (pre-collision assist) | Input used for the forward collision warning chime.                                                      |
| Front passenger detect status             | RCM                               | Input used to control the Belt-Minder® warning chime.                                                    |
| Gear lever position                       | PCM                               | Input used to control the Belt-Minder® warning chime.                                                    |
| Headlamp high/low status                  | BCM                               | Input used to control the headlamps on warning chime                                                     |
| Ignition status                           | BCM                               | Input used to control the PRNDL not in park warning chime.                                               |
| Key-in-ignition status                    | BCM                               | Input used to control the key-in-ignition warning chime.                                                 |
| Lane keeping alert warning chime request  | IPMA                              | Input used to control the lane keeping alert (hands off steering wheel) warning chime.                   |
| Left turn lamp on request                 | BCM                               | Input used for the turn signal on tick-tock chime tone.                                                  |
| Memory feedback request                   | DSM                               | Input used to control the memory feedback confirmation chime.                                            |
| Parking aid chime request                 | PAM                               | Input used to control the parking aid warning chime.                                                     |
| Parking brake chime request               | BCM                               | Input used to control the parking brake warning chime.                                                   |
| Passenger seatbelt buckle status          | RCM                               | Input used to control the Belt-Minder® warning chime.                                                    |
| Perimeter alarm chime request             | BCM                               | Input used to control the perimeter alarm warning chime.                                                 |
| Power pack status                         | PCM                               | Input used for the ignition-engine on warning chime.                                                     |
| Right turn lamp on request                | BCM                               | Input used for the turn signal on tick-tock chime tone.                                                  |
| Side obstacle sensor status-left          | SODL                              | Input used to control the Blind Spot Information System (BLIS®)/Cross Traffic Alert (CTA) warning chime. |
|                                           |                                   |                                                                                                          |

|                                   |      |                                                                                                                                     |
|-----------------------------------|------|-------------------------------------------------------------------------------------------------------------------------------------|
| Side obstacle sensor status-right | SODR | Input used to control the Blind Spot Information System (BLIS®)/Cross Traffic Alert (CTA) warning chime.                            |
| Transmission gear display mode    | PCM  | Input used for the ignition-engine on warning chime and the PRNDL not in park warning chime.                                        |
| Transport mode                    | BCM  | Input used to control the PRNDL not in park warning chime.                                                                          |
| Turn signal switch status         | SCCM | Input used for the turn signal left on warning chime.                                                                               |
| Odometer count                    | PCM  | Input used for the turn signal left on warning chime.                                                                               |
| Vehicle speed                     | PCM  | Input used to control the Belt-Minder® warning chime, the PRNDL not in park warning chime and the turn signal tick-tock chime tone. |

### Module Network Input Messages - ACM and DSP

| Broadcast Message       | Originating Module | Message Purpose                                                         |
|-------------------------|--------------------|-------------------------------------------------------------------------|
| Belt-Minder® audio mute | IPC                | Input from the IPC used to control the Belt-Minder® audio chime output. |
| Chime source            | IPC                | Input used to configure the chime source (IPC or the audio system).     |
| IPC chime request       | IPC                | Input from the IPC used to control the audio chime output.              |
| Power up chime modules  | IPC                | Input used to initiate the audio system as the chime source.            |

### Warning Chime Characteristics

The warning chimes use volume, chime frequency, length of time the chime sounds, decay of the chime tone and the number of chime tones to identify which chime is sounding. Most warning chimes have unique characteristics, however, there are chimes that do sound the same. The chime characteristics are defined by the different chime types:

- Information
- Soft-warning
- Hard-warning
- Tick-tock (on-off)

## **Active Park Assist Warning Chime**

The active park assist system uses informational and instructional messages displayed in the FCDIM to direct the driver's interaction with the system. The active park assist system chimes alert or draw the driver's attention to the requested actions as displayed in the FCDIM messages. The active park assist chime sounds through the front and rear speakers depending on the location (front or rear) of the object detected.

The IPC receives the parking aid chime request from the GWM over the HS-CAN3.

The GWM receives the parking aid chime request from the PAM over the HS-CAN1.

The IPC then sends the IPC chime request message to the ACM and the audio DSP to sound the chime.

## **Adaptive Cruise Control Warning Chime**

The adaptive cruise control warning chime supplements the message center displays to draw the driver's attention to the need to intervene and take control of the vehicle. There are 2 levels of chime output (high priority and low priority) based upon the nature and urgency of the warning. The adaptive cruise control warning chime sounds through the front speakers. The audio system sounds the appropriate warning chime when it receives the adaptive cruise control warning request (high priority chime) or cruise control status (low priority chime) message from the CCM (without pre-collision assist) or IPMA (with pre-collision assist).

The low priority adaptive cruise control warning chime is a single-tone, 1-second chime that sounds to alert the driver the adaptive cruise control system has shut itself off due to low vehicle speed (approximately 32 km/h [20 mph]) and the driver needs to intervene if further braking is required or to resume the adaptive cruise control operation.

The high priority adaptive cruise control warning chime is a 0.25-second chime that sounds 12 times. The chime alerts the driver the vehicle is approaching the vehicle ahead at a faster rate than the adaptive cruise control system can brake the vehicle and the driver needs to apply the brakes to slow the vehicle down.

The IPC receives the cruise control status and the adaptive cruise control warning request messages from the GWM over the HS-CAN3.

The GWM receives the cruise control status message from the PCM over the HS-CAN1.

The GWM receives the adaptive cruise control warning request message from the CCM over the HS-CAN2 on vehicles without pre-collision assist. The GWM receives the adaptive cruise control warning request message from the IPMA over the HS-CAN2 on vehicles with pre-collision assist.

When a chime request is received, the IPC sends the IPC chime request message to the ACM and the audio DSP to sound the chime.

## **Air Bag Secondary Warning Chime**

The air bag secondary warning chime warns the air bag warning indicator LED is inoperative. The air bag secondary warning chime sounds through the front speakers. If the IPC detects a fault with the air bag warning indicator LED during the bulb prove out, the air bag secondary warning chime sounds. If the IPC detects a fault in the air bag warning indicator when a SRS fault condition exists and the RCM has sent the IPC the air bag indicator request, the air bag secondary warning chime sounds. The air bag chime is a 0.5-second chime that sounds 5 times.

When a fault condition is detected, the IPC sends the IPC chime request message to the ACM and the audio DSP to sound the chime.

## **Belt-Minder® Feature**

**NOTE:** *Whenever the vehicle is operated using MyKey®, the IPC enables the Belt-Minder®.*

The Belt-Minder® is configurable on or off.

Refer to: [Seatbelt Minder Deactivating/Activating](#) (413-01 Instrumentation, Message Center and Warning Chimes, General Procedures).

The Belt-Minder® feature supplements the current seatbelt warning function and is enabled after the current seatbelt warning is complete. The Belt-Minder® reminds the driver that the driver or front passenger seatbelt is unbuckled by intermittently sounding a chime through the front speakers and simultaneously illuminating the seatbelt warning indicator. The Belt-Minder® begins once the current seatbelt warning has ended and the vehicle speed has exceeded 10 km/h (6 mph) with the driver or front passenger seatbelt unbuckled. While activated, the Belt-Minder® chime provides a series of chimes/seatbelt warning indicator flash sequences.

If the vehicle speed drops below 5 km/h (3 mph) once the Belt-Minder® chime has activated, the chime turns off and the seatbelt warning indicator remains on. When the vehicle speed exceeds 10 km/h (6 mph) again, the Belt-Minder® chime resumes.

When MyKey® is in use, the driver cannot configure the Belt-Minder® off. Once the Belt-Minder® is activated, the Belt-Minder® continues to chime periodically (does not time out after 5 minutes) and the audio system is muted until the driver and passenger seatbelts are fastened.

To control the Belt-Minder®, the IPC receives the vehicle speed, gear lever position, driver and passenger seatbelt buckle status and front passenger detect status messages from the GWM over the HS-CAN3.

The GWM receives the vehicle speed and gear lever position messages from the PCM over the HS-CAN1.

The IPC receives the driver and passenger seatbelt buckle status messages from the RCM over the HS-CAN2.

When the conditions require the Belt-Minder® chime, the IPC sends the IPC chime request message to the ACM and the audio DSP to sound the chime.

## **Blind Spot Information System (BLIS®)/Cross Traffic Alert (CTA) Warning Chime**

The Blind Spot Information System (BLIS®)/Cross Traffic Alert (CTA) warning chime sounds to alert the driver that a vehicle has been detected or that there is a system fault. The Blind Spot Information System (BLIS®)/Cross

Traffic Alert (CTA) warning chime sounds a 0.25-second chime continuously until the request is ended. The active park assist chime sounds through the rear speakers.

The IPC receives the Cross Traffic Alert (CTA) left status, the Cross Traffic Alert (CTA) right status, side obstacle sensor status-left and the side obstacle sensor status-right request messages from the GWM over the HS-CAN3.

The GWM receives the Cross Traffic Alert (CTA) left status and the side obstacle sensor status-left messages from the SODL over the MS-CAN.

The GWM receives the Cross Traffic Alert (CTA) right status and the side obstacle sensor status-right request messages from the SODR over the MS-CAN.

When a chime request is received, the IPC sends the IPC chime request message to the ACM and DSP to sound the chime.

### **Door Ajar Warning Chime**

The door ajar warning chime warns that a door is ajar and sounds the chime through the front speakers. When a door becomes ajar while the ignition is in RUN with vehicle speed greater than 5 km/h (3 mph), the IPC displays the appropriate door ajar warning message and sounds a single chime tone for each door opened. The door ajar chime only sounds once for each time the door is opened, and only repeats the chime if the door is closed then reopened.

The IPC receives the door ajar status messages (driver, passenger, left rear and right rear) from the GWM over the HS-CAN3. The GWM receives the door ajar status messages (driver, passenger, left rear and right rear) from the BCM over the HS-CAN1.

When a chime request is received, the IPC sends the IPC chime request message to the ACM and the audio DSP to sound the chime.

### **Forward Collision Warning Chime**

The forward collision warning chime warns that a forward collision potential has been detected or the CCM and/or IPMA (with pre-collision assist) detects a forward collision warning system concern. Once the forward collision system detects a possible forward collision, the CCM (without pre-collision assist) or IPMA (with pre-collision assist) sends the HUD module the heads up flash rate message to flash the forward collision warning and the forward collision warning message request through the GWM to sound a 0.25-second chime tone 12 times to the IPC .

The forward collision warning system and chime can be disabled or turned off using the message center. When MyKey® is in use, the driver cannot configure the forward collision warning system or chime off. When the driver disables the forward collision warning chime, the CCM (without pre-collision assist) or IPMA (with pre-collision assist) sends the IPC the forward collision chime request through the GWM to sound a 0.25-second chime tone 12 times at 50% volume. The forward collision warning chime and confirmation chime are both sounded through the front speakers.

The IPC receives the forward collision warning message request and the forward collision chime request from the GWM over the HS-CAN3.

The GWM receives the forward collision warning message request and the forward collision chime request from the CCM over the HS-CAN2 on vehicles without pre-collision assist. The GWM receives the forward collision warning message request and the forward collision chime request from the IPMA over the HS-CAN2 on vehicles with pre-collision assist.

When a chime request is received, the IPC sends the IPC chime request message to the ACM and the audio DSP to sound the chime.

### **Headlamps On Warning Chime**

The headlamps on warning chime warns the headlamps are on when exiting the vehicle. When the driver exits the vehicle with the driver door ajar, the headlamp switch in the PARK or HEADLAMP position and the ignition OFF, the BCM sends the headlamp switch status message to the IPC through the GWM to sound the headlamps on chime. The headlamps on chime sounds a 1-second chime tone continuously through the front speakers.

The IPC receives the headlamp high/low status message from the GWM over the HS-CAN3.

The GWM receives the headlamp high/low status from the BCM over the HS-CAN1.

When a chime request is received, the IPC sends the IPC chime request message to the ACM and the audio DSP to sound the chime.

### **Ignition-Engine On Warning Chime**

The ignition-engine on chime informs the driver they are exiting the vehicle when the ignition has been left on (engine off) or the engine is running. When the driver exits the vehicle with the ignition on or with the engine running, the ignition-engine on warning chime sounds five 1-second chime tones through the front speakers. The IPC uses driver door ajar status, power pack status and transmission gear display mode messaged inputs to control the ignition-engine on warning chime.

The IPC receives the driver door ajar status, power pack status and transmission gear display messages from the GWM over the HS-CAN3.

The GWM receives the driver door ajar status message from the BCM over the HS-CAN1.

The GWM receives the power pack status and transmission gear display mode messages from the PCM over the HS-CAN1.

When a chime request is received, the IPC sends the IPC chime request message to the ACM and the audio DSP to sound the chime.

### **Key-In-Ignition Warning Chime (Without Passive Key)**

The key-in-ignition warning chime warns the key is still in the ignition lock cylinder or the ignition is in ACC when the driver door is ajar. The key-in-ignition warning chime sounds repetitive 0.5-second chime tones through the front speakers until either the key is removed from the lock cylinder, the ignition is in RUN or the driver door is closed.

The IPC receives the key-in-ignition status from the GWM over the HS-CAN3.

The GWM receives the key-in-ignition status from the BCM over the HS-CAN1.

When a chime request is received, the IPC sends the IPC chime request message to the ACM and the audio DSP to sound the chime.

### **Lane Keeping Alert Warning System Chime**

The lane keeping alert warning chime alerts the driver they have removed their hands from the steering wheel. The lane keeping alert warning system chime sounds three 0.25-second chime tones through the front speakers.

The IPC receives the lane departure warning chime request from the GWM over the HS-CAN3.

The GWM receives the lane keeping aid warning chime request from the IPMA over the HS-CAN2.

When a chime request is received, the IPC sends the IPC chime request message to the ACM and the audio DSP to sound the chime.

### **Memory-Stored Feedback Chime**

The memory-stored feedback chime informs the driver their preferences have been successfully programmed through the memory set procedure. The memory-stored feedback chime sounds a 100-millisecond chirp when the DSM successfully stores a memory change through the front speakers.

The IPC receives the memory feedback request from the GWM over the HS-CAN3.

The GWM receives the memory feedback request from the DSM over the MS-CAN.

When a chime request is received, the IPC sends the IPC chime request message to the ACM and the audio DSP to sound the chime.

### **Message Center Warning Chime**

The message center warning chime feature draws the driver's attention to the message center display to view new warning messages. There are 3 different message center warning chime types that are defined by the length of the chime tone, which are designed to create a greater sense of urgency based on the nature of the condition and message displayed in the message center.

- Informational (1-second chime)
- Soft warning (0.5-second chime)

- Hard warning (0.25-second chime)

When a new message request is received, the IPC sends the IPC chime request message to the ACM and the audio DSP to sound the chime.

### **Parking Aid Chime**

The parking aid system uses a visual display in the FCDIM and a chime to alert the driver objects are close to the vehicle. The parking aid chime sounds a repetitive chime tone that decreases the time off between chime tones as objects get closer to the sensor until a continuous tone is heard through the rear speakers.

The IPC receives the parking aid chime request from the GWM over the HS-CAN3.

The GWM receives the parking aid chime request from the PAM over the HS-CAN1.

When a chime request is received, the IPC sends the IPC chime request message to the ACM and the audio DSP to sound the chime.

### **Park Brake Warning Chime**

The parking brake warning chime warns the parking brake is engaged when the vehicle is in motion. The parking brake warning chime sounds if the ignition is in RUN, the parking brake is engaged, and the vehicle speed is greater than 5 km/h (3 mph). The parking brake warning chime stops sounding and resets if the parking brake is released, the ignition is not in RUN, the vehicle speed is less than 5 km/h (3 mph), or after 90 seconds from the time the chime is activated. The parking brake warning chime sounds a repetitive 0.5 second chime tone through the front speakers.

The IPC receives the parking brake chime request from the GWM over the HS-CAN3.

The GWM receives the parking brake chime request from the ABS module over the HS-CAN1.

When a chime request is received, the IPC sends the IPC chime request message to the ACM and the audio DSP to sound the chime.

### **PRNDL Not In Park Warning Chime**

The IPC provides a PRNDL not in park warning chime that sounds along with the transmission not in park message center display to inform the driver the vehicle is not in PARK (P). The IPC displays the shift to park message and the PRNDL not in park warning chime sounds three 0.5-second chime tones through the front speakers if the selector lever is not in PARK (P), the ignition is OFF and the driver door is open or ajar. The IPC requires the transmission gear display, brake pedal applied, vehicle speed, driver door ajar and ignition status to control the PRNDL not in park warning chime.

Refer to Shift To Park Message Display for message details.

Refer to: Message Center (413-01 Instrumentation, Message Center and Warning Chimes) .

When a chime request is received, the IPC sends the IPC chime request message to the ACM and the audio DSP to sound the chime.

### **Perimeter Alarm Warning Chime**

The perimeter alarm warning chime alerts the driver the perimeter alarm is armed when the driver door is unlocked before disarming the alarm. The IPC displays a perimeter alarm message in the message center and the perimeter alarm warning chime sounds 12 1-second chime tones through the front speakers when the driver door is opened. The perimeter alarm warning chime turns off when the perimeter alarm is disarmed (either by using the key fob or turning the key to the ON position). After the twelve second warning chime duration, the warning chime stops sounding and the perimeter alarm activates, sounding the horn and flashing the turn signal lamps.

The IPC receives the perimeter alarm chime request from the GWM over the HS-CAN3.

The GWM receives the perimeter alarm chime request from the BCM over the HS-CAN1.

When a chime request is received, the IPC sends the IPC chime request message to the ACM and the audio DSP to sound the chime.

### **Seatbelt Warning Chime**

The seatbelt warning chime warns the seatbelt is not fastened. The seatbelt warning chime sounds a repetitive 1-second chime tone for 6 seconds through the front speakers when the driver seatbelt is not fastened and the ignition is transitioned from OFF or ACC to ON or START. The seatbelt warning chime stops sounding when the seatbelt is fastened, when the ignition is transitioned from ON or START to OFF or ACC, or when the chime has sounded for 6 seconds.

The IPC receives the driver seatbelt buckle status message from the GWM over the HS-CAN3.

The GWM receives the driver seatbelt buckle status from the RCM over the HS-CAN2.

When the conditions require the seatbelt warning chime, the IPC sends the IPC chime request message to the ACM and DSP to sound the chime.

### **Service AdvanceTrac® Warning Chime**

The service AdvanceTrac® warning chime warns the ABS module has detected a fault condition in the stability control system. If a fault condition exists in the stability-traction control system, the ABS module sends the IPC the brake chime request to display SERVICE ADVANCETRAC in the message center and to sound the chime.

The service AdvanceTrac® warning chime sounds 3 0.5-second chime tones through the front speakers.

The IPC receives the brake chime request from the GWM over the HS-CAN3.

The GWM receives the brake chime request from the ABS module over the HS-CAN2.

When a chime request is received, the IPC sends the IPC chime request message to the ACM and the audio DSP to sound the chime.

### **Turn Signal On Chime Tone**

The IPC provides a repetitive 1-second on/off tick-tock chime tone along with visual RH or LH turn indicators to inform the driver the turn signal or hazard lamp function is on. The turn signal on chime tone provides a speed compensated volume feature that uses vehicle speed to step up the volume of the chime tone.

The IPC receives the left turn lamp on request and the right turn lamp on request from the GWM over the HS-CAN3.

The GWM receives the left turn lamp on request and the right turn lamp on request from the BCM over the HS-CAN1.

The IPC receives the vehicle speed message from the GWM over the HS-CAN3. The GWM receives the vehicle speed message from the PCM over the HS-CAN1.

### **Turn Signal Left On Chime**

The turn signal left on or turn signal minder chime uses both odometer and turn signal status messages. The turn signal left on chime sounds a repetitive 1-second chime through the front speakers when the vehicle is driven with the turn signal on for more than 3.2 km (2.0 miles).

The IPC receives the turn signal switch status from the GWM over the HS-CAN3.

The GWM receives the turn signal switch status from the BCM over the HS-CAN1.

When a chime request is received, the IPC sends the IPC chime request message to the ACM and the audio DSP to sound the chime.