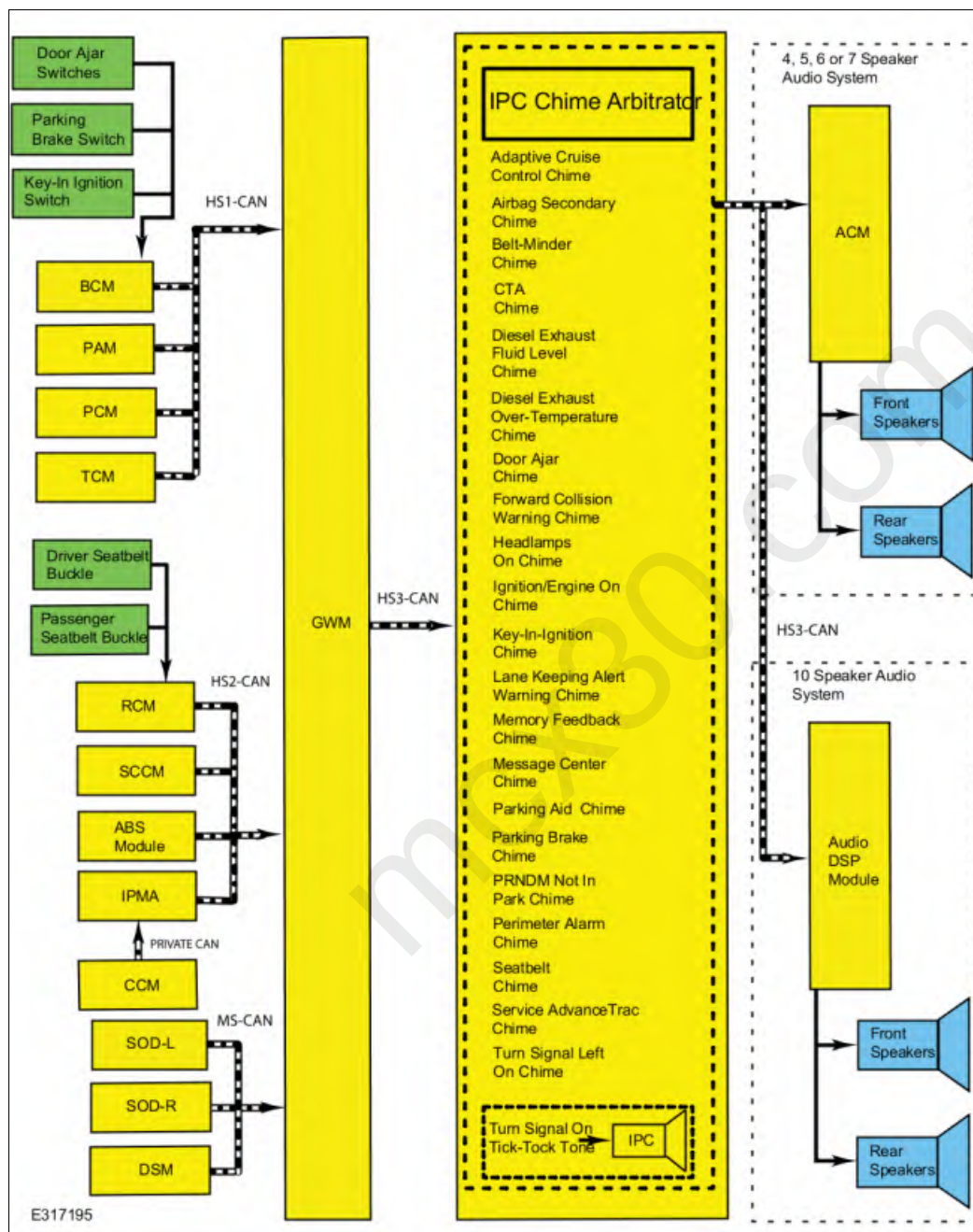


Warning Chimes - System Operation and Component Description

System Operation

System Diagram



Item	Description
1	Belt-Minder chime
2	Door ajar chime
3	Headlamps on chime
4	Parking brake chime
5	Seatbelt chime
6	Airbag secondary chime

7	Message center chime
8	Service AdvanceTrac chime
9	Ignition/engine on chime
10	Key-in-ignition chime
11	Memory feedback chime
12	Perimeter alarm chime
13	Turn signal left on chime
14	Adaptive cruise control chime
15	CTA chime
16	Forward collision warning chime
17	Lane keeping alert warning chime
18	PRNDM not in park chime
19	Diesel exhaust over-temperature chime
20	Diesel exhaust fluid level chime
21	Parking aid chime
22	IPC
23	Turn signal on tick-tock tone
24	ABS module
25	IPMA
26	BCM
27	Door ajar switches
28	Parking brake switch
29	RCM
30	PCM
31	GWM
32	Key-in ignition switch
33	ACM
34	Rear speakers
35	Front speakers
36	Audio DSP module
37	Rear speakers
38	Front speakers
39	10 speaker audio system
40	TCM
41	SODL
42	DSM
43	PAM
44	SCCM
45	4, 5, 6 or 7 speaker audio system
46	IPC chime arbitrator
47	SODR
48	Driver seatbelt buckle
49	Passenger seatbelt buckle
50	CCM

Module Network Input Messages - IPC

Broadcast Message	Originating Module	Message Purpose
Adaptive cruise control forward distance alert	IPMA	Input used to control the adaptive cruise control warning chime.
Audio chime status	ACM	Input used to provide chime operational confirmation to determine if the IPC needs to take control and sound the chimes internally.
Brake chime request	ABS module	Input used for the service AdvanceTrac® chime.
Cross traffic alert left status	SODL	Input used to control the CTA warning chime.
Cross traffic alert right status	SODR	Input used to control the CTA warning chime.
Cruise control status	PCM	Input used to control the adaptive cruise control warning chime.
Delayed accessory	BCM	Input used for the wake up signal to control the overall chime arbitration.
Diesel exhaust fluid contaminated	PCM	Input used to control the diesel exhaust fluid level warning chime.
Diesel exhaust fluid level range indicator	PCM	Input used to control the diesel exhaust fluid level warning chime.
Diesel exhaust fluid message display	PCM	Input used to control the diesel exhaust fluid level warning chime.
Diesel exhaust fluid warning indicator	PCM	Input used to control the diesel exhaust fluid level warning chime.
Driver door ajar status	BCM	- Input used for the wake up signal to control the overall chime arbitration. - Input used to control the ignition-engine on chime. - Input used to control the PRNDM not in park warning chime.
Driver seatbelt buckle status	RCM	- Input used to control the Belt-Minder® warning chime. - Input used to control the seatbelt warning chime.
Engine rpm data	PCM	Input used to control the chime volume.
Forward collision chime request	IPMA	Input used for the confirmation chime portion of the forward collision warning chime.
Forward collision warning message request	IPMA	Input used for the forward collision warning chime.
Gear lever position	PCM (gas engine) or TCM (diesel engine)	Input used to control the Belt-Minder® warning chime.
Headlamp on warning chime	BCM	Input used to control the headlamps on warning chime
Ignition status	BCM	- Input used for the wake up signal to control the overall chime arbitration. - Input used to control the PRNDM 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 rear door ajar status	BCM	Input used for the wake up signal to control the overall chime arbitration.
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 door ajar status	BCM	Input used for the wake up signal to control the overall chime arbitration.
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 rear door ajar status	BCM	Input used for the wake up signal to control the overall chime arbitration.
Right turn lamp on request	BCM	Input used for the turn signal on tick-tock chime tone.

Broadcast Message	Originating Module	Message Purpose
Side obstacle sensor status-left	SODL	Input used to control the CTA warning chime.
Side obstacle sensor status-right	SODR	Input used to control the CTA warning chime.
Tailgate ajar status	BCM	Input used for the wake up signal to control the overall chime arbitration.
Transmission gear display mode	PCM (gas engine) or TCM (diesel engine)	- Input used to control the ignition-engine on warning chime - Input used to control the PRNDM not in park warning chime.
Transport mode	BCM	Input used to control the PRNDM 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. - Input used to control the ignition-engine on warning chime - Input used to control the PRNDM not in park warning chime

Module Network Input Messages - ACM and DSP

Broadcast Message	Originating Module	Message Purpose
IPC chime request	IPC	Input from the IPC used to control the audio chime output.
Chime controls	IPC	- Input used to control the following chime operations: - chime priority. - chime volume level. - how long a chime tone sounds and how long a tone is off. - how often the chime tones. - which chime to sound. - which speakers (front/rear) sound specific chimes.
Chime source	IPC	Input used to configure the chime source (IPC or the audio system).
Chime module power up	IPC	Input used to initiate the audio system as the chime source.

Warning Chime Operation and Characteristics

The warning chimes all sound through the audio system except for the turn signal tick-tock chime. The audio system has the ability to sound up to 2 chimes at a time while the IPC can only sound a single chime at a time. In the event of audio system fault condition, the IPC sounds all chimes. The IPC uses multiple network messages to control the overall warning chime arbitrator.

The warning chimes use volume, chime frequency, length of time the chime sounds, length of off time between chime tones, 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)

The IPC receives the engine rpm data from the PCM and door ajar status, delayed accessory and ignition status messages from the BCM over the HS-CAN1. The IPC receives the audio chime status message from the ACM over the HS-CAN3.

The IPC sends the IPC chime request, chime source, chime module power up and chime controls messages to the ACM or DSP module to control the chimes.

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 IPMA.

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 forward distance alert 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 forward distance alert message from the IPMA over the HS-CAN2.

When a chime request is received, the IPC sends the IPC chime request message to the ACM or 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 or 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 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 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 seatbelt is fastened.

The IPC receives the vehicle speed and gear lever position 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 seatbelt buckle status message from the GWM over the HS-CAN3. The GWM receives the driver seatbelt buckle status message 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 or the audio DSP to sound the chime.

CTA Warning Chime

The CTA warning chime sounds to alert the driver that a vehicle has been detected or that there is a system fault. The 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 CTA left status, the CTA right status, side obstacle detect status-left and the side obstacle detect status-right request messages from the GWM over the HS-CAN3.

The GWM receives the CTA left status and the side obstacle detect status-left messages from the SODL over the MS-CAN.

The GWM receives the CTA right status and the side obstacle detect 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 or DSP to sound the chime.

Diesel Exhaust Fluid Level

The diesel exhaust fluid level warning chime informs the driver that the exhaust fluid level is getting low, is low or is contaminated. The diesel exhaust fluid level chime sounds five 0.25 second chime tones through the front speakers.

The IPC receives the diesel exhaust fluid contaminated, diesel exhaust fluid level range indicator, diesel exhaust fluid message display and diesel exhaust fluid warning indicator messages from the GWM over the HS-CAN3.

The GWM receives the diesel exhaust fluid contaminated, diesel exhaust fluid level range indicator, diesel exhaust fluid message display and diesel exhaust fluid warning indicator 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 or the audio DSP to sound the chime.

Diesel Exhaust Over-Temperature

The diesel exhaust over-temperature warning chime informs the driver that an exhaust over-temperature condition exists due to a powertrain fault. The diesel exhaust over-temperature chime sounds five 0.25 second chime tones through the front speakers.

The IPC receives the diesel exhaust over-temp message from the GWM over the HS-CAN3.

The GWM receives the diesel exhaust over-temp message from the PCM over the HS-CAN1.

When a chime request is received, the IPC sends the IPC chime request message to the ACM or the audio 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 or 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 or IPMA detects a forward collision warning system concern. Once the forward collision system detects a possible forward collision, the IPMA sends the HUD module the forward collision chime request message to flash the forward collision warning and the forward collision message request through the GWM to sound a 0.25-second chime tone 12 times to the IPC.

If the administrator key user set the forward collision warning to ON, 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 IPMA sends the IPC the forward collision chime request through the GWM to sound a 0.25-second chime tone 12 times. The forward collision warning chime and confirmation chime are both sounded through the front speakers.

If the administrator key user set the forward collision to OFF, an on/off menu popup appears when the vehicle is started by a MyKey[®] user. The MyKey[®] user can then leave the forward collision warning off or select the forward collision warning on.

NOTE: Note: if the MyKey[®] user selects the forward collision warning ON, they can not change the selection during the same ignition cycle. The ignition must be cycled off and back on for the forward collision warning to allow the driver to select it OFF again.

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

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

The GWM receives the headlamp on warning chime from the BCM over the HS-CAN1.

When a chime request is received, the IPC sends the IPC chime request message to the ACM or 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, transmission gear display mode and vehicle speed messaged inputs to control the ignition-engine on warning chime.

The IPC receives the driver door ajar status, power pack status, transmission gear display and vehicle speed 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 vehicle speed messages from the PCM over the HS-CAN1.

The GWM receives the transmission gear display mode message from the PCM (gas engine) or TCM (diesel engine) over the HS-CAN1.

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

Key-In-Ignition Warning Chime (Without Push Button Start)

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 or 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 keeping alert warning chime request from the GWM over the HS-CAN3.

The GWM receives the lane keeping alert 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 or 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 or 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 or the audio DSP to sound the chime.

Parking Aid Chime

The parking aid system uses a visual display in the centerstack infotainment display 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 or 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 or the audio DSP to sound the chime.

PRNDM Not In Park Warning Chime

The IPC provides a PRNDM 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 PRNDM not in park warning chime sounds fifteen 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 closed. If the ignition is OFF, the selector lever is not in PARK (P) and the driver door is open or ajar the PRNDM not in park warning chime sounds continuous 0.5-second chime tones through the front speakers for 10 seconds. The IPC requires the transmission gear display, brake pedal applied, vehicle speed, driver door ajar and ignition status to control the PRNDM not in park warning chime.

The IPC receives all required messages from the GWM over the HS-CAN3.

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

The GWM receives the transmission gear display mode message from the PCM (gas engine) or TCM (diesel engine) over the HS-CAN1.

The GWM receives the driver door ajar status, transport mode and ignition status message from the BCM over the HS-CAN1.

The IPC also uses the park position detect input to determine whether the vehicle is in PARK (P) along with the transmission gear display mode message.

See Park Position Detect Switch component description.

Refer to: Instrument Panel Cluster (IPC) - System Operation and Component Description (413-01 Instrumentation, Message Center and Warning Chimes, Description and Operation).

When a chime request is received, the IPC sends the IPC chime request message to the ACM or 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 3 chime tone sequences (twelve 1-second chime tones then nine 1-second chime tones and finally twelve 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 or 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 sequence of four 1-second chime tones 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 three 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 or 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 IPC receives the left turn lamp on request, the right turn lamp on request and the vehicle speed messages 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 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 or the audio DSP to sound the chime.
