# Auto Hitch Chime

## Functional Description

The Auto Hitch Chimes are used to inform the driver of important changes during the operation of the Auto Hitch system and draw the driver’s attention to the system instructions on the Sync screen. The Auto Hitch feature will include the following chimes:

* The Auto Hitch Trailer Found Chime will inform the driver that a compatible trailer has been recognized in the Auto Hitch feature zone of operation.
* The Auto Hitch Maneuver Ready Chime will inform the driver that the automatic maneuver is ready to begin. User would still need to press the keep-alive button before the maneuver begins.
* The Auto Hitch Stop Now Chime is issued to alert the driver to remove hands from steering wheel during automatic maneuvering.
* The Auto Hitch Non-Critical Alert Chime is issued to inform driver that the Auto Hitch maneuver has completed successfully and the trailer is ready to be lowered onto the trailer ball, to request the driver install a hitch ball if one is missing, to request the driver release parking brake, or to inform the driver that the Auto Hitch feature has been cancelled by the driver.
* The Auto Hitch Warning Chime is issued to alert the driver that immediate driver takeover is required due to system fault, to inform the driver that the system is exiting and handing over control back to the driver, or to inform the driver that the Auto Hitch feature deactivated (by external event or system, not user initiated) and the drive should stop the vehicle.

The IPC will correlate the Operational Mode and the TrlrHitchChime\_D\_Rq CAN signal to set the Auto\_Hitch\_Trailer\_Found\_Chime\_Status\_Flag, the Auto\_Hitch\_Maneuver\_Ready\_Chime\_Status\_Flag, the Auto\_Hitch\_Stop\_Now\_Chime\_Status\_Flag, the Auto\_Hitch\_Non-Critical\_Alert\_Chime\_Status\_Flag, and the Auto\_Hitch\_Warning\_Chime\_Status\_Flag that will feed the Chime Arbitrator.

## Interfaces

### Interface Context Diagram (I/O Block Diagram)

Figure 1: Auto Hitch Chime Context Diagram



### Inputs

* Internal
  + Operational\_Mode
* MUX message on the CAN Bus

1. TrlrHitchChime\_D\_Rq Signal

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Signal Name** | **Size (bits)** | **Detail** | **Units** | **Res.** | **Offset** | **State**  **Encoded** | **Min** | **Max** |
| TrlrHitchChime\_D\_Rq | 3 |  | SED | 1 | 0 |  | 0 (0x0) | 7 (0x7) |
|  |  | NoChime |  |  |  | 0x0 |  |  |
|  |  | TrailerFoundChime |  |  |  | 0x1 |  |  |
|  |  | ManeuveringReadyChime |  |  |  | 0x2 |  |  |
|  |  | StopNowChime |  |  |  | 0x3 |  |  |
|  |  | NonCriticalAlertChime |  |  |  | 0x4 |  |  |
|  |  | WarningChime |  |  |  | 0x5 |  |  |
|  |  | NotUsed\_1 |  |  |  | 0x6 |  |  |
|  |  | NotUsed\_2 |  |  |  | 0x7 |  |  |

### Outputs

* Internal flags to the Chime Arbitrator
* Auto\_Hitch\_Trailer\_Found\_Chime\_Status\_Flag
* Auto\_Hitch\_Maneuver\_Ready\_Chime\_Status\_Flag
* Auto\_Hitch\_Stop\_Now\_Chime\_Status\_Flag
* Auto\_Hitch\_Non-Critical\_Alert\_Chime\_Status\_Flag
* Auto\_Hitch\_Warning\_Chime\_Status\_Flag

## Function/Performance

### Operational Modes

|  |  |
| --- | --- |
| **Mode** | **Differentiating Vehicle Conditions** |
| Sleep | Inactive |
| Limited | Inactive |
| Normal | Active / Inactive |
| Crank | Active / Inactive |

### Voltage Levels

Refer to the Cluster Features table located in the Operational Modes and Voltage Range Strategies section in this SPSS

### Human-Machine Interface

#### Visual

None

#### Audio

Refer to Audio Section in Chimes & Chime Arbitrator SPSS Section

#### Switch Control Logic

None

### System Accuracy

Within 100 msec of receiving a message that results in a change of state the cluster will update the output flag to the proper state.

### Operation: Performance and Functional

#### Subsystem Algorithm Flowchart / State Diagram

1. State Matrix for Auto Hitch Chime Status Flags

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Operational\_Mode | TrlrHitchChime\_D\_Rq | Auto\_Hitch\_Trailer\_Found\_  Chime\_Status\_Flag | Auto\_Hitch\_Maneuver\_Ready\_  Chime\_Status\_Flag | Auto\_Hitch\_Stop\_Now\_  Chime\_Status\_Flag | Auto\_Hitch\_Non-Critical\_Alert\_  Chime\_Status\_Flag | Auto\_Hitch\_Warning\_  Chime\_Status\_Flag |
| Normal | Crank | 0x1 (TrailerFoundChime) | Active | Inactive | Inactive | Inactive | Inactive |
| 0x2 (ManeuveringReadyChime) | Inactive | Active | Inactive | Inactive | Inactive |
| 0x3 (StopNowChime) | Inactive | Inactive | Active | Inactive | Inactive |
| 0x4 (NonCriticalAlertChime) | Inactive | Inactive | Inactive | Active | Inactive |
| 0x5 (WarningChime) | Inactive | Inactive | Inactive | Inactive | Active |
| All Other Cases | | Inactive | Inactive | Inactive | Inactive | Inactive |

#### Operation Description (supports algorithm flowchart / state diagram)

* The Auto\_Hitch\_Trailer\_Found\_Chime\_Status\_Flag, Auto\_Hitch\_Maneuver\_Ready\_Chime\_Status\_Flag, Auto\_Hitch\_Stop\_Now\_Chime\_Status\_Flag, Auto\_Hitch\_Non-Critical\_Alert\_Chime\_Status\_Flag, and Auto\_Hitch\_Warning\_Chime\_Status\_Flag are set, maintained and cleared by this Chime software module.
* IPC shall request chimes as per the Chime Arbitrator section of this SPSS.

#### Function Safety Classification (EMC)

Class B

#### Memory Storage

| **Parameter Name** | **Description** | **Value at Battery connect** | **Value at**  **Module Wake-up** |
| --- | --- | --- | --- |
| Auto\_Hitch\_Trailer\_Found\_Chime\_Status\_Flag | State indicator for the chime | Inactive (0x0) | Inactive (0x0) |
| Auto\_Hitch\_Maneuver\_Ready\_Chime\_Status\_Flag | State indicator for the chime | Inactive (0x0) | Inactive (0x0) |
| Auto\_Hitch\_Stop\_Now\_Chime\_Status\_Flag | State indicator for the chime | Inactive (0x0) | Inactive (0x0) |
| Auto\_Hitch\_Non-Critical\_Alert\_Chime\_Status\_Flag | State indicator for the chime | Inactive (0x0) | Inactive (0x0) |
| Auto\_Hitch\_Warning\_Chime\_Status\_Flag | State indicator for the chime | Inactive (0x0) | Inactive (0x0) |
| Operational\_Mode | Four state operational mode | Limited | Limited,  Normal, or  Crank |
| TrlrHitchChime\_D\_Rq (CAN Signal) | CAN Signal | 0x0 | Do Not Init |

**Note:** "Do Not Init" = last known value

#### Prove Out

No

#### Reconfigurable Telltale

No

## Error Handling

### Missing Message Strategy

None.

## Diagnostics

### Self Test

None

### Engineering Test Mode

None

### Part II Performance

**DID $DEXX**

None.

**Supported Diagnostic Trouble Codes (DTCs)**

None.

## Reference Specification

EF-0033 SAFETY – CHIME ARBITRATOR

IS-0379 NORTH AMERICAN WARNINGS AND INDICATORS STRATEGY

## Revision History

**SPSS Module Revision History**

|  |  |  |  |
| --- | --- | --- | --- |
| **Revision Level** | **Name** | **Change Description** | **Date** |
| 1.0 | J. Gregoire | Initial release.  Approve in DI CC March 8, 2018.  Aleksey Shepelev (ashepele) is the feature owner. | 4/25/2018 |
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