System Requirements Document

Feature Name: <Key In Ignition Reminder Chime>	Feature ID: F001790

LET																							
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FR																							

Date	LET	FR	Revisions	DR	CK

Reference:

Prepared/Approved By:

Checked By: | **Detailed By:**

Concurrence/Approval Signatures:

Design Engineering Supervisor

Design Engineering Manager

Other Approvals/Concurrences (as required):

STANDARD NOTES:
FOR CURRENT RELEASE STATUS, SEE THE WERS ENGINEERING NOTICE.

▽ CONTROL ITEM – THE ▽ ALSO IDENTIFIES CRITICAL CHARACTERISTICS DESIGNATED BY THE CROSS FUNCTIONAL TEAMS DEVELOPING THE PRODUCT. THESE, AND ADDITIONAL CRITICAL CHARACTERISTICS IDENTIFIED BY PROCESS REVIEWS, MUST APPEAR ON THE CONTROL PLANS ACCORDING TO ISO/TS 16949. THESE CONTROL PLANS REQUIRE PRODUCT ENGINEERING APPROVAL.

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1 INTRODUCTION

1.1 Purpose

The Aggregated Feature Specification (AFS) specifies **Key-In-Ignition Reminder Chime Feature** from feature level (customer & market perspective) down to implementations on an electrical platform.

The 3 chapters

- Feature Definitions
- Feature Decomposition
- Feature Deployment

correspond to the 3 levels of the RE Information Model - Feature Level, Function Level, and Component Level (cross-ECU/platform view only). The AFS requirements are cascaded to the ECU Functional Specs on Component Level.

1.2 Scope

The following set of features from the Global Feature & Function List and the deployment to the

- **Key-In-Ignition Reminder Chime Feature**

is described in this Functional Specification.

Feature ID	Feature Name	Owner	Reference
F001790	Key-In-Ignition Warning Chime	Fuentes rivera, Hiram Guil (H.)	<VSEM link>

Table 1: Feature(s) described in this AFS

1.3 Audience

The Feature Owner authors the AFS. All Stakeholders, i.e., all people who have a valid interest in the ECU behavior should read and, if possible, review the AFS. All stakeholders are required to have access to the latest valid version of the AFS.

The following table lists all stakeholders, who should be involved in the creation and maintenance of this AFS. Refer to the Roles & Responsibilities page in the in the Ford RE Wiki for a list of common Ford roles and responsibilities.

1.3.1 Stakeholder List

For the latest list of the feature stakeholder and their roles & responsibilities refer to KIR Stakeholders [3]

1.4 Document Organization

1.4.1 Document Context

Refer to the Specification Structure page in the Ford RE Wiki to understand how the AFS relates to other Ford Requirements Documents and Specifications.

1.4.2 Document Structure

The structure of this document is explained below:

Section 1 – Introduction how to use this document including responsibilities and requisite documents. Explains the terminology. Gives a clarification of the definitions, concepts and abbreviations used in the document.

Section 2 – Feature Definitions. Defines the feature level requirements of the features realized by the system described in this specification

Section 3 – Feature Decomposition: Specifies the functions of the functional architecture of the features, which realize the features from section 2.

Section 4 – Feature Deployment: Specifies details of how the features / functions are deployed to the given electrical platform.

Section 5 – Open Issues

Section 6 – Traceability information

Section 7 – Revision history.

1.5 References

1.5.1 Ford documents

List here all Ford internal documents, which are directly related to the feature.

Ref. number	Doc. ID	Title	Revision	Location
(2)	FS-JU5T-14B476-AAA	BCM Specifications 2.8.4 Key-In-Ignition Warning Chime	11.01 Dtd 11/19/15	Available from BCM directly
(3)	VDOC000333	Cluster Spec Key-In-Ignition Warning Chime - CGEA1.3 v1.2		VSEM Link
(4)	N/A	Generic Map Set Module Definitions	3/23/16	EESE Architecture Sharepoint
(5)	N/A	Generic Network Map - Ford	3/30/16	EESE Architecture Sharepoint
(6)	N/A	Generic Network Map - Lincoln	3/30/16	EESE Architecture Sharepoint

Table 1:- Ford Internal Documents [3]

1.5.2 External documents and publications

None of the external documents and publications is referred in this document

1.6 Terminology

<Terms, concepts and abbreviations used in the document can be defined and illustrated here. Note that changes to terms and/or concepts described in this section tend to cause major updates to this document.>

1.6.1 Definitions

<The tables below have feature specific definitions and abbreviations. For additional, non-feature specific terms please refer to the RE Glossary>

Definition	Description
Chime Arbitrator	The functional algorithm which receives various chime requests (including KIR Chime) and prioritizes each to be sounded by audio device.
Chime Battery Saver [3]	Chime Battery Saver is a system that will disable certain features after a given amount of time after vehicle is turned OFF in order to save battery life.
Key In Ignition	Bladed Key- Key is inserted in a physical ignition switch. Virtual Key- Key (electronic) is authenticated by vehicle.
Key-In-Ignition Reminder (KIR) Chime	It is the audible alert to remind the driver to take their keys with him/her while exiting the vehicle.
LOCK [3]	In some vehicle using bladed key, there is LOCK position on rotary ignition switch (Key Cylinder) for mechanically locking the steering wheel It is a separate position on ignition switch (along with others operational modes like RUN/START/ACC/OFF) and considered same as Ignition Status OFF. It is not a separate operational mode.
Police Secure Idle Mode	Police Secure Idle Mode is a system that allows a Police Vehicle to idle securely with the engine ON after the officer removes the key from the Ignition System.

Table 2: Definitions used in this document

1.6.2 Abbreviation

Abbr.	Stands for	Description
ACC	Accessory mode	
AFS	Aggregated Feature Specification	Type of this document
ASO	Automotive Safety Office -	Part of the Ford Environmental and Safety Engineering Staff
BCM	Body Control Module	-
BK	Bladed Key	
CAN	Controller Area Network	-
FSMS	Ford Standards Management System	
IPC	Instrument Panel Cluster	
KIR Chime	Key-In-Ignition-Reminder Chime	
PEPS	Passive Entry Passive Start	Key to open the door and start the engine without physical connection with vehicle
ROK	Republic of Korea	
VK	Virtual Key	Also termed as PEPS
VSEM [3]	Vehicle System Engineering Management	Official electronic document storage repository

Table 3: Abbreviations used in this document.

1.7 Notation

1.7.1 Requirements Templates

Each requirement (including goals and use cases) in the document shall start with the following heading, which gives a unique ID and a Title, followed by a description of the requirement (see below).

The heading shall be formatted by using the header styles "RE_Requirement" or "RE_UseCase". The requirement ID should be prefixed and suffixed with 3 hash characters. This will ease the import to VSEM (refer to "How to import specifications into VSEM as separate requirements") and enables indexing.

###<Req ID>### <Title>

<Description>

The guideline "How to write better requirements" shows how to structure the textual description of a requirement.

###<UseCase ID>### <Title>

<Use Case Template>

For specifying Use Cases refer to the Use Case template in the Ford RE Wiki This should replace the free-formated textual description. Refer also to the Use Case guideline in the Ford RE Wiki>

1.7.1.1 Identification of requirements

The unique requirement ID given in the headline of any requirement follows the requirement throughout the development process. The requirement ID format follows a well-defined syntax.

All identifiers in a AFS shall be composed of 5 parts:

- A leading letter F (= Feature).
- Followed by an abbreviation of the feature
- Followed by a letter indicating the category of requirement (whether it is a Goal (=G), a Use Case (=U) or a Requirement (=R))
- Ending with the actual requirement number
- Ending with a requirement version number and a requirement revision letter.

Example:

F_PCL_R0004_V1A	This is the fourth requirement on feature level for the feature Power Child Lock. It is the first version and revision of the requirement.

1.7.1.2 Requirements Attributes

Additionally attributes can be added to each requirement. This helps to classify requirements. A list of available attributes is given in the RE Wiki.

2 FEATURE DEFINITIONS

2.1 Key In Reminder Chime

2.1.1 Feature Description

2.1.1.1 Purpose and Overview of Feature

The purpose of this feature is to protect the vehicle from potential theft by giving alert to drivers to take their keys with them while exiting their vehicle.

1. **Physical key with Doors On : The alert is in form of chime (termed as Key-In-Ignition Reminder Chime) fairly audible to driver, when driver's door is opened [for the vehicle with Door is ON] and ignition key is left in the locking system physically.**
2. **Physical key with Doors Off : The alert is in form of chime (termed as Key-In-Ignition Reminder Chime) fairly audible to driver, when driver's door is OFF (if Doors Off feature is available) and ignition key is left in locking system physically.**
3. **Virtual key (e.g. PEPS) with Doors ON: The alert is in form of chime (termed as Key-In-Ignition Reminder Chime) fairly audible to driver, when driver's door is ON and ignition is OFF and Transmission is not in 'Park'**
4. **Virtual key (e.g. PEPS) with Doors Off: The alert is in form of chime (termed as Key-In-Ignition Reminder Chime) fairly audible to driver, when driver's door is OFF (if Doors Off feature is available) and ignition is OFF and Transmission is not in 'Park'.**

2.1.1.2 Background

2.1.1.1.1 Current State

This feature specification is outlined to comply with the FSMS regulatory requirements Doc ID RQT-110401-016955 (SO-0050), which focuses on theft protection of the vehicle.

2.1.1.1.2 Feature Opportunity

Current state of this feature is to document existing state of functionality. No further opportunities are identified at this time.

2.1.1.3 Feature Goals

This feature is intended to reduce incidents of vehicle theft caused by forgetting keys inside the vehicle, while limiting excessive battery usage.

2.1.1.4 Feature Objectives

Driver is reminded to the key while exiting, which will prevent potential theft or being locked out of vehicle.

The feature gives out the KIR chime based on following conditions:
1. state of driver door is ajar or doors removed
2. engine is stopped or OFF / ACC
3. key is in the locking system

Additionally, if vehicle is police vehicle the chime will be sounded when
- Police Idle Mode is activated
- state of driver door is ajar or doors removed

- engine is running
- key is in the locking system

In order to save battery life
- the chime activity is limited to 30 minutes after engine is stopped.

2.1.1.5 Feature Planning

This feature is required for all FMVSS and CMVSS compliant vehicles.

2.1.1.6 Feature Variants

- Key In Reminder chime when Doors Off Feature is available (i.e. Bronco)

2.1.1.7 Regions & Markets

Application Engineers must verify local market requirements and advise to any changes in regulations in this direction

Market / Region / Variant Name	North America	South America	Europe	Middle East/Africa	Asia / Pacific	China
KIR	US , US Territories, Mexico, Canada	Do not Apply	Do not Apply	Israel	ROK	Do not Apply
KIR Doors OFF	US , US Territories, Mexico, Canada	Do not Apply	Do not Apply	Do not Apply	Do not Apply	Do not Apply

Table 5:- Regions and market [2]

2.1.1.8 Input Requirements

2.1.1.8.1 Legal Requirements [3]

For the regulatory requirements, following FSMS documents are referenced:-

Requirement IDs	Region	Title
RQT-110401-016955	US, US territories	COLUMN MOUNTED IGNITION -KEY WARNING DEVICE
REG-190100-008133	Canada	USA/CDN F/CMVSS 114 Theft Protection and Rollaway Prevention
REG-190100-001228	Israel	ISRAEL THEFT PROTECTION AND ROLLAWAY PREVENTION
REG-003000-006460	ROK	USA-ROK FTA ANTI-THEFT

2.1.1.8.2 Trustmark Requirements

No additional Trustmark Requirements are necessary

2.1.1.8.3 Corporate Standard Requirements (FSMS)

No additional Corporate Standard Requirements are necessary

2.1.1.8.4 Industry Standards

No additional Industry Standards are necessary

2.1.1.9 Assumptions Dependencies & Constraints

Assumption -

- Vehicle shall be equipped with Chime Sounder to sound audible alerts

Dependency-

- No dependencies observed in this feature.

Constraints -

- When Feature is remained active for long period of time after Ignition State goes to OFF, KIR Chime will be turned off by Chime Battery Saver Time-Out Strategy to save battery from draining. Currently the Chime Battery Saver time out is 30 minutes as per ASO.
- Some Police vehicles come equipped with Police Idle Feature. Whenever this feature is ENABLED and Engine is running KIR chime feature will behave as when vehicle is turned OFF or in Accessory Mode
- Vehicles with Removable Doors Capabilities

2.1.2 **Feature Context**

2.1.2.1 Feature Context Diagram

Feature context diagram is shown as follows:

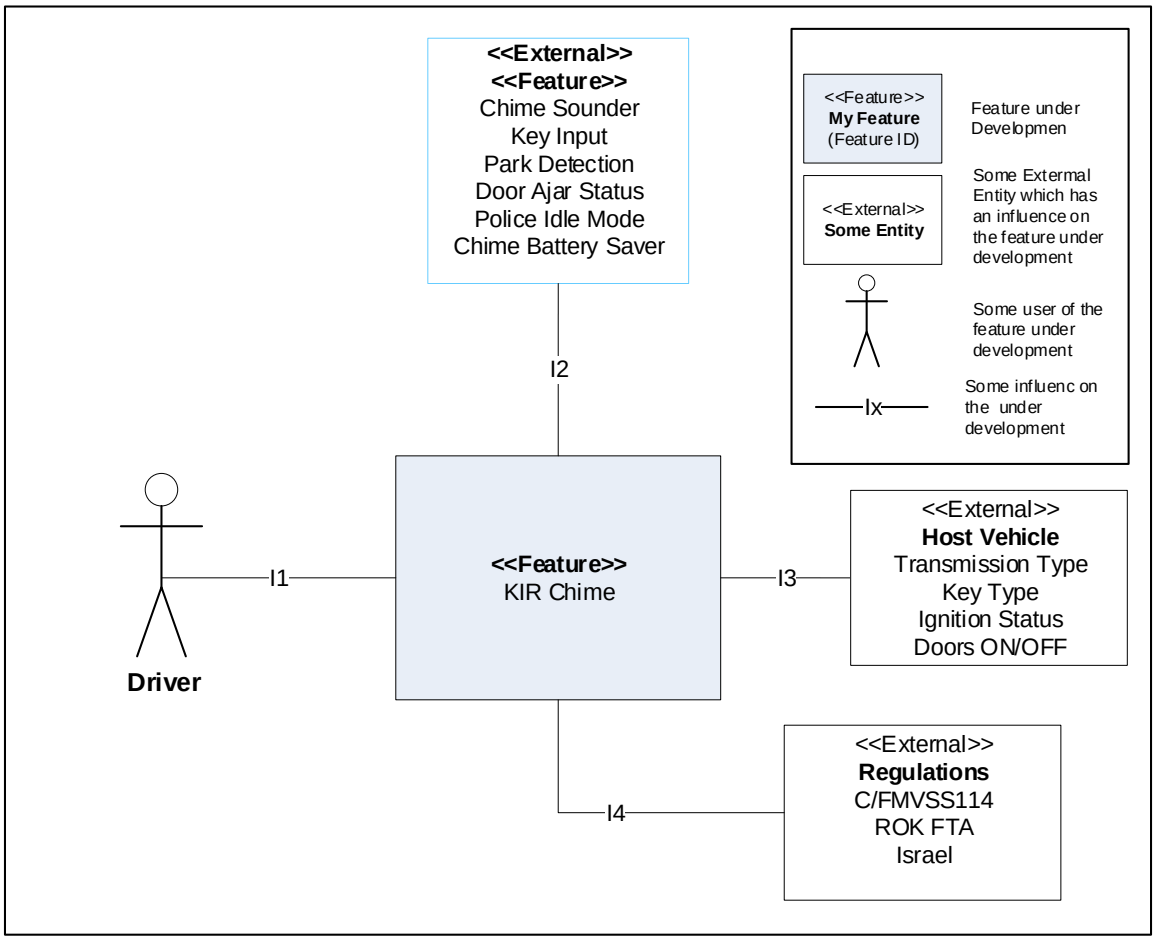


Figure 1 - Context Diagram

2.1.2.2 Feature Interactions

ID	External Entity	Influence	Influence Description
I1	Driver	Door Action	Closing / Opening of driver door
		Key-Vehicle Interaction	Vehicle Activation/deactivation with Key
		Selecting Ignition Modes	Selection of ON or OFF or on Accessory mode
I2	External Features	Chime Sounder	Sounding an audible Chime for driver notification
		Key Input	Determining presence of physical key in vehicle
		Park Detection	Determines if Vehicle is in park
		Door Ajar Status	Status of Driver door
		Police Idle Mode	For police vehicles, whether vehicle is secured

		Chime Battery Saver Seatbelt Status	To save battery from draining out due to prolonged activity of feature. To know the status of the seatbelt
I3	Host Vehicle	Transmission Type Key Type Ignition Status Doors On/Off	Establishes Vehicle Transmission Type Establishes the key type appropriate for the vehicle Ignition state of the Vehicle Indicates if Doors have been removed from vehicle (if available)
I4	Regulation	C/FMVSS 114 ROK FTA Israel	Regulations that requires continuous chime when key is left in vehicle.

Table 6: Feature Interactions [3] - updated

2.1.3 **Feature Modeling**

2.1.3.1 Operation Modes and States

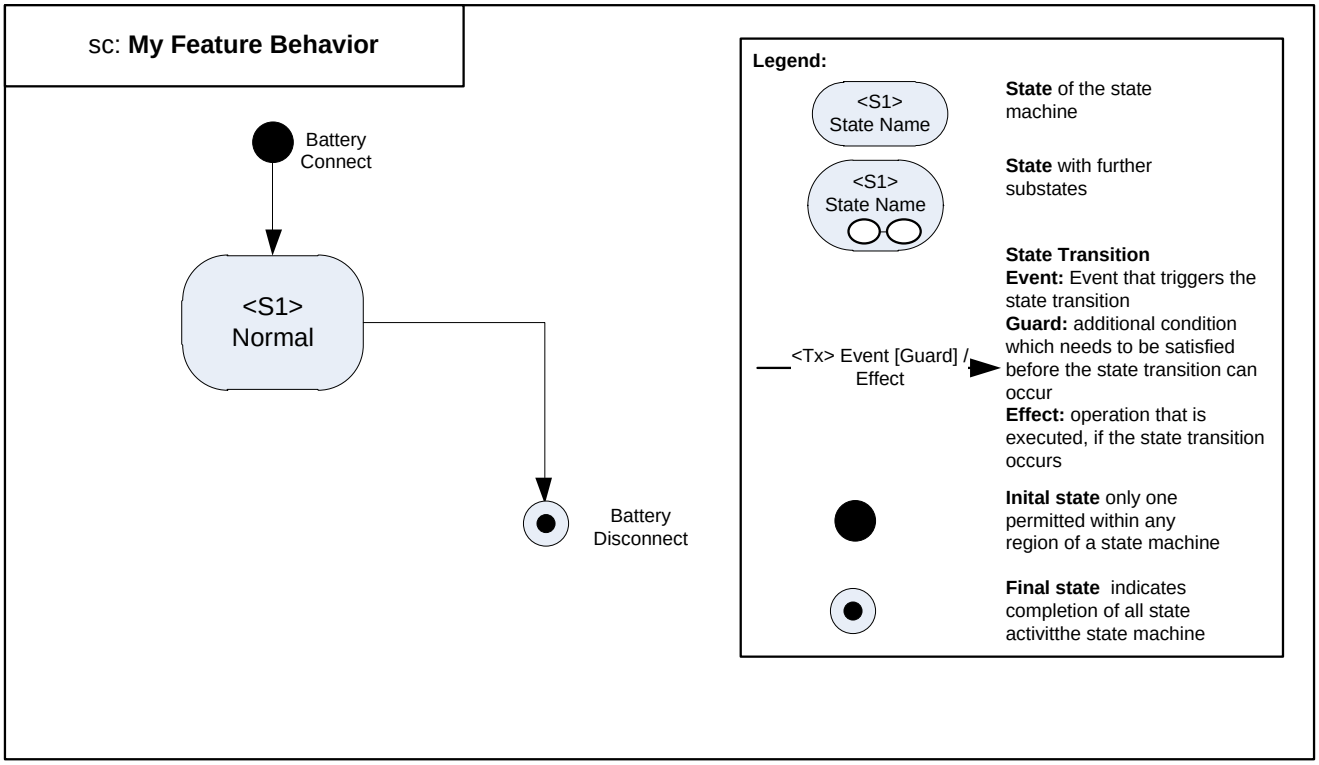


Figure 2 - Feature Operation States and Modes

State	Description	Requirements Reference
Normal	Operation is not affected by vehicle state	None

Table 4: Operation Modes

Transition ID	Description	Action	Requirements Reference
<T1>	N/A	None	
<T2>			

Table 5: Transition between Operational States

2.1.3.2 Use Cases

2.1.3.2.1 Use Case Diagram

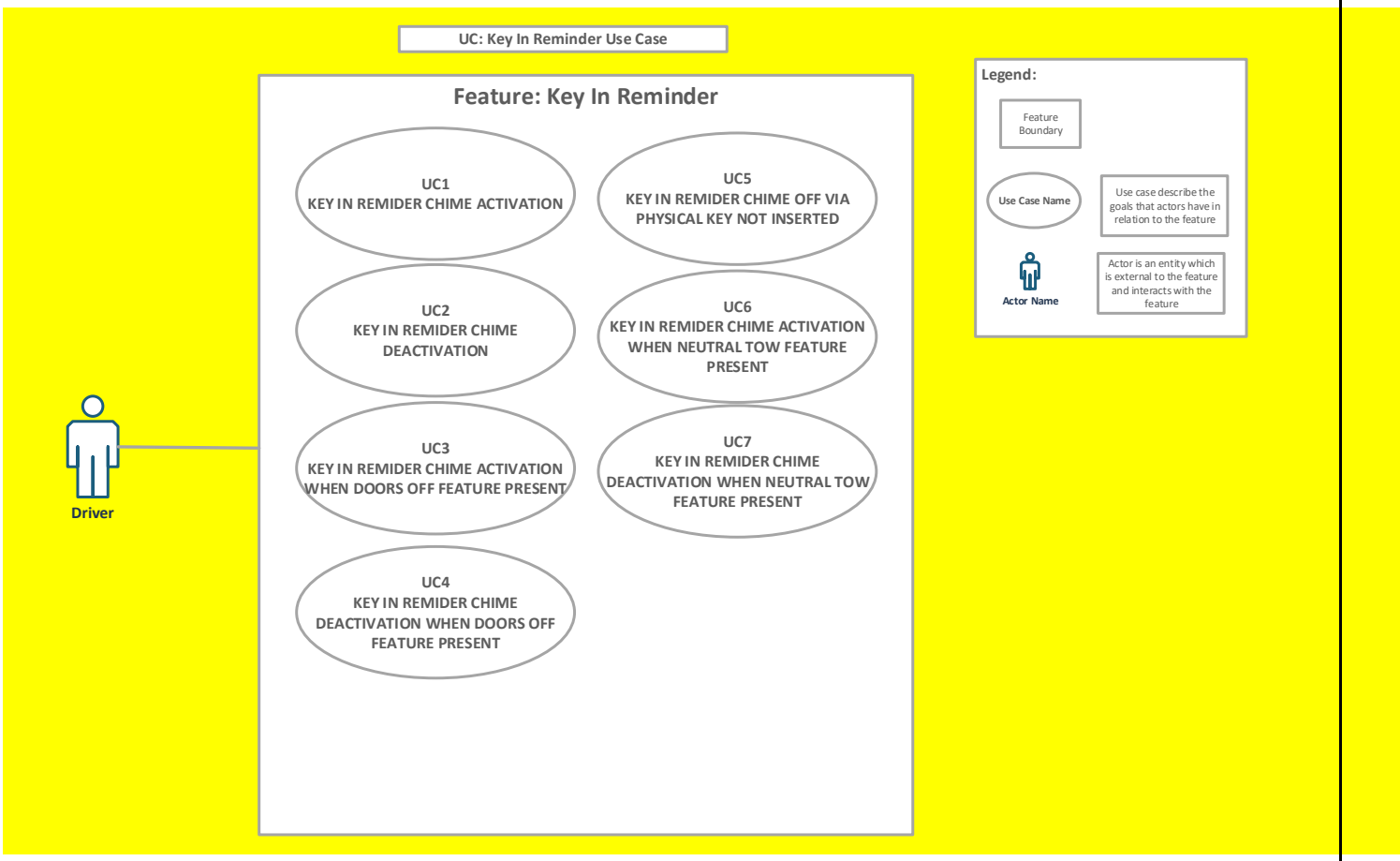


Figure 3 - Use Case Diagram

2.1.3.2.2 Actors

Actor	Description
Driver	The person seating at driver's seat, having access to driver door

2.1.3.2.3 Use Cases Descriptions

2.1.3.2.1.1 KEY IN REMIDER CHIME ACTIVATION

Use Case ID	**UC1a**
Use Case Title	Normal Chime Activation (Physical Key, mechanical Shifter (automatic transmission))
Actors	**Driver**
Pre-conditions	Driver Door Closed Physical Key in the Key Cylinder Engine Off or ACC Ignition State
Scenario Description	Driver opens driver door to leave vehicle but does not take keys out of the vehicle.
Post-Conditions	Key-In-Ignition Reminder chime is sounded.

Use Case ID	**UC1b**
Use Case Title	Normal Chime Activation (Physical Key, e-Shifter (automatic transmission))
Actors	**Driver**
Pre-conditions	Driver Door Closed Physical Key in the Key Cylinder Engine Off or ACC Ignition State
Scenario Description	Driver opens driver door to leave vehicle but does not take keys out of the vehicle.
Post-Conditions	Key-In-Ignition Reminder chime is sounded.

Use Case ID	**UC1c**
Use Case Title	Normal Chime Activation (Physical Key, manual Shifter (manual transmission))
Actors	**Driver**
Pre-conditions	Driver Door Closed Physical Key in the Key Cylinder Engine Off or ACC Ignition State
Scenario Description	Driver opens driver door to leave vehicle but does not take keys out of the vehicle.
Post-Conditions	Key-In-Ignition Reminder chime is sounded.

Use Case ID	**UC1d**
Use Case Title	Normal Chime Activation (Virtual Key, mechanical Shifter (automatic transmission))
Actors	**Driver**
Pre-conditions	Driver Door Closed Virtual Key in the Vehicle Engine Off (Ignition State) Transmission not in Park
Scenario Description	Driver opens driver door to leave vehicle but does not take keys out of the vehicle.
Post-Conditions	Key-In-Ignition Reminder chime is sounded.

Use Case ID	UC1e
Use Case Title	Normal Chime Activation (Virtual Key, e-shifter (automatic transmission))
Actors	Driver
Pre-conditions	Driver Door Closed Virtual Key in the Vehicle Engine Off (Ignition State) Transmission in Neutral Hold
Scenario Description	Driver opens driver door to leave vehicle but does not take keys out of the vehicle.
Post-Conditions	Key-In-Ignition Reminder chime is sounded.

Use Case ID	UC1f
Use Case Title	Normal Chime Activation (Virtual Key, mechanical Shifter (automatic transmission), Doors OFF)
Actors	Driver
Pre-conditions	Driver Door Removed (Door OFF) Virtual Key in the Vehicle Transmission not in Park
Scenario Description	Driver shut down the vehicle (Engine OFF) when Transmission not in Park Position
Post-Conditions	Key-In-Ignition Reminder chime is sounded.

Use Case ID	UC1g
Use Case Title	Chime with Police Idle
Actors	Driver
Pre-conditions	Ignition State at RUN or START. Vehicle has Police configuration and Police Idle Mode is ACTIVE Key is left in Ignition System Driver door is closed
Scenario Description	User opens driver door
Post-conditions	Key-In-Ignition Reminder chime is sounded

Use Case ID	UC1h
Use Case Title	Chime with Police Idle
Actors	Driver
Pre-conditions	Ignition State at RUN or START. Vehicle has Police configuration and Police Idle Mode is ACTIVE Virtual Key on the vehicle Driver door is closed
Scenario Description	User opens driver door
Post-conditions	Key-In-Ignition Reminder chime is sounded

2.1.3.2.1.2 KEY IN REMIDER CHIME DEACTIVATION

Use Case ID	UC2a
Use Case Title	Normal Chime Deactivation (Physical Key, mechanical Shifter (automatic transmission))
Actors	Driver
Pre-conditions	Driver Door Closed Physical Key in the Key Cylinder Run (Engine OFF) or Run (Engine ON) for Ignition State
Scenario Description	Driver opens driver door
Post-Conditions	Key-In-Ignition Reminder chime is not sounded.

Use Case ID	UC2b
Use Case Title	Normal Chime Deactivation (Physical Key, e-Shifter (automatic transmission))
Actors	Driver
Pre-conditions	Driver Door Closed Physical Key in the Key Cylinder Run (Engine OFF) [full accessory power] or Run (Engine ON) for Ignition State
Scenario Description	Driver opens driver door
Post-Conditions	Key-In-Ignition Reminder chime is not sounded.

Use Case ID	UC2c
Use Case Title	Normal Chime Deactivation (Physical Key, manual Shifter (manual transmission))
Actors	Driver
Pre-conditions	Driver Door Closed Physical Key in the Key Cylinder Run (Engine OFF) or Run (Engine ON) for Ignition State
Scenario Description	Driver opens driver door
Post-Conditions	Key-In-Ignition Reminder chime is not sounded.

Use Case ID	UC2d
Use Case Title	Normal Chime Deactivation (Virtual Key, mechanical Shifter (automatic transmission))
Actors	Driver
Pre-conditions	Driver Door Closed Virtual Key in the Vehicle Run (Engine OFF) or Run (Engine ON) for Ignition State
Scenario Description	Driver opens driver door
Post-Conditions	Key-In-Ignition Reminder chime is not sounded.

Use Case ID	UC2e
Use Case Title	Normal Chime Deactivation (Virtual Key, e-shifter (automatic transmission))
Actors	**Driver**
Pre-conditions	Driver Door Closed Virtual Key in the Vehicle Run (Engine OFF) or Run (Engine ON) for Ignition State or Engine OFF Transmission **NOT** in Neutral Hold
Scenario Description	Driver opens driver door
Post-Conditions	Key-In-Ignition Reminder chime is not sounded.

Use Case ID	UC2f
Use Case Title	Normal Chime Deactivation (Virtual Key, manual Shifter (manual transmission)
Actors	**Driver**
Pre-conditions	Driver Door Closed Virtual Key in the Vehicle
Scenario Description	Driver opens driver door
Post-Conditions	Key-In-Ignition Reminder chime is not sounded.

Use Case ID	UC2g
Use Case Title	Normal Chime Deactivation (Virtual Key, mechanical Shifter (automatic transmission), Doors OFF)
Actors	**Driver**
Pre-conditions	Driver Door Removed (Door OFF) Virtual Key in the Vehicle Run (Engine OFF) for Ignition State
Scenario Description	~~Driver opens driver door~~ Driver Run (Engine ON) the vehicle
Post-Conditions	Key-In-Ignition Reminder chime is not sounded.

Use Case ID	UC2g
Use Case Title	Normal Chime Deactivation (Virtual Key, mechanical Shifter (automatic transmission), Doors OFF)
Actors	**Driver**
Pre-conditions	Driver Door Removed (Door OFF) Virtual Key in the Vehicle Run (Engine ON) for Ignition State
Scenario Description	~~Driver opens driver door~~ Driver Run (Engine OFF) the vehicle
Post-Conditions	Key-In-Ignition Reminder chime is not sounded.

Use Case ID	**UC2h**
Use Case Title	**Deactivation due to Chime Battery Saver (Physical Key)**
Actors	**Driver**
Pre-conditions	Physical Key in the Key Cylinder Engine Off or ACC Ignition State Driver Door Open Key-In-Ignition Reminder Chime has been sounding for at least 30 minutes
Scenario Description	• Driver leaves driver door open for period more than Chime Battery Saver time-out
Post-Conditions	• Key-In-Ignition Reminder chime stops sounding.

Use Case ID	**UC2i**
Use Case Title	**Deactivation due to Chime Battery Saver (Virtual Key)**
Actors	**Driver**
Pre-conditions	Virtual Key in the Vehicle Engine Off (Ignition State) Transmission not in Park (mechanical shifter) -OR- Transmission in Neutral Hold (e-shifter) Driver Door Open Key-In-Ignition Reminder Chime has been sounding for at least 30 minutes Key-In-Ignition Reminder Chime has been sounding for at least 30 minutes
Scenario Description	• Driver leaves driver door open for period more than Chime Battery Saver time-out
Post-Conditions	• Key-In-Ignition Reminder chime stops sounding.

2.1.3.2.1.3 KEY IN REMIDER CHIME ACTIVATION WHEN DOORS OFF FEATURE PRESENT

Use Case ID	UC3a
Use Case Title	Normal Chime Activation when Doors OFF Feature (Present)
Actors	Driver
Pre-conditions	Driver Door Attached (Doors OFF Feature) Virtual Key in the Vehicle Engine Off (Ignition State) Transmission not in Park
Scenario Description	Driver remove Driver's Door (Door OFF) and disconnect electrical connector but leaves Transmission Shifter Not In Park
Post-Conditions	Key-In-Ignition Reminder chime is sounded.

Use Case ID	UC3b
Use Case Title	Normal Chime Activation when Doors OFF Feature (Present), shifter is moved to "P" Position and Shifter Button is not released
Actors	Driver
Pre-conditions	Driver Door OFF (Door Removed) Virtual Key in the Vehicle Engine Off (Ignition State) Transmission not in Park
Scenario Description	Shifter moved to Park "P" and shifter button is not released
Post-Conditions	Key-In-Ignition Reminder chime is sounded.

Use Case ID	UC3c
Use Case Title	Normal Chime Activation when Doors OFF Feature (Present), shifter is moved to "P" Position and Shifter Button is not released
Actors	Driver
Pre-conditions	Driver Door Closed Virtual Key in the Vehicle Engine Off (Ignition State) Transmission not in Park
Scenario Description	Driver Open Driver Door and Shifter moved to Park "P" and shifter button is not released
Post-Conditions	Key-In-Ignition Reminder chime is sounded.

2.1.3.2.1.4 KEY IN REMIDER CHIME DEACTIVATION WHEN DOORS OFF FEATURE PRESENT

Use Case ID	UC4a
Use Case Title	Normal Chime Deactivation when Doors OFF Feature (Present)
Actors	Driver
Pre-conditions	Driver Door Attached (Doors OFF Feature) Virtual Key in the Vehicle Engine Off (Ignition State) Transmission not in Park
Scenario Description	Driver remove Driver's Door (Door OFF) and disconnect electrical connector and moves Shifter Transmission to "Park"
Post-Conditions	Key-In-Ignition Reminder chime is not sounded.

2.1.3.2.1.5 KEY IN REMIDER CHIME OFF VIA PHYSICAL KEY NOT INSERTED

Use Case ID	UC5a
Use Case Title	Physical Key Not Inserted on Key Cylinder
Actors	Driver
Pre-conditions	Driver Door Open Physical Key in the Key Cylinder Engine Off (Ignition State)
Scenario Description	Driver removes Physical Key from Key Cylinder
Post-Conditions	Key-In-Ignition Reminder chime is not sounded.

2.1.3.2.1.6 KEY IN REMIDER CHIME ACTIVATION WHEN NEUTRAL TOW FEATURE IS PRESENT

Use Case ID	**UC6a**
Use Case Title	KIR Chime Activation when Neutral Tow Feature Present (Physical Key, mechanical Shifter (automatic transmission))
Actors	**Driver**
Pre-conditions	Driver Door Closed Physical Key in the Key Cylinder Engine Off or ACC Ignition State Neutral Tow Feature Activated
Scenario Description	Driver opens driver door to leave vehicle but does not take keys out of the vehicle.
Post-Conditions	Key-In-Ignition Reminder chime is sounded.

Use Case ID	**UC6b**
Use Case Title	KIR Chime Activation when Neutral Tow Feature Present (Physical Key, e-Shifter (automatic transmission))
Actors	**Driver**
Pre-conditions	Driver Door Closed Physical Key in the Key Cylinder Engine Off or ACC Ignition State Neutral Tow Feature Activated
Scenario Description	Driver opens driver door to leave vehicle but does not take keys out of the vehicle.
Post-Conditions	Key-In-Ignition Reminder chime is sounded.

Use Case ID	UC6c
Use Case Title	KIR Chime Activation when Neutral Tow Feature Present (Physical Key, manual Shifter (manual transmission))
Actors	Driver
Pre-conditions	Driver Door Closed Physical Key in the Key Cylinder Engine Off or ACC Ignition State Neutral Tow Feature Activated
Scenario Description	Driver opens driver door to leave vehicle but does not take keys out of the vehicle.
Post-Conditions	Key-In-Ignition Reminder chime is sounded.

Use Case ID	UC6d
Use Case Title	KIR Chime Activation when Neutral Tow Feature Present (Virtual Key, mechanical Shifter (automatic transmission))
Actors	Driver
Pre-conditions	Driver Door Closed Virtual Key in the Vehicle Engine Off (Ignition State) Neutral Tow Feature Activated
Scenario Description	Driver opens driver door to leave vehicle, but Vehicle is in Neutral Tow Mode
Post-Conditions	Key-In-Ignition Reminder chime is sounded.

Use Case ID	UC6e
Use Case Title	KIR Chime Activation when Neutral Tow Feature Present (Virtual Key, e-shifter (automatic transmission))
Actors	Driver
Pre-conditions	Driver Door Closed Virtual Key in the Vehicle Engine Off (Ignition State) Neutral Tow Feature Activated
Scenario Description	Driver opens driver door to leave vehicle, but Vehicle is in Neutral Tow Mode
Post-Conditions	Key-In-Ignition Reminder chime is sounded.

Use Case ID	UC6f
Use Case Title	KIR Chime Activation when Neutral Tow Feature Present (Virtual Key, mechanical Shifter (automatic transmission), Doors OFF)
Actors	Driver
Pre-conditions	Driver Door Removed (Door OFF) Virtual Key in the Vehicle Neutral Tow Feature Activated
Scenario Description	Driver shut down the vehicle (Engine OFF) when Neutral Tow is Activated
Post-Conditions	Key-In-Ignition Reminder chime **NOT** sound

Use Case ID	UC6g
Use Case Title	KIR Chime Activation when Neutral Tow Feature Present (Virtual Key, mechanical Shifter (automatic transmission), Doors OFF)
Actors	Driver
Pre-conditions	Driver Door NOT Removed (Door OFF) Door Closed Virtual Key in the Vehicle Neutral Tow Feature Activated
Scenario Description	Driver shut down the vehicle (Engine OFF) when Neutral Tow is Activated and Open Driver Door
Post-Conditions	Key-In-Ignition Reminder chime is sounded.

2.1.3.2.1.7 KEY IN REMIDER CHIME DEACTIVATION WHEN NEUTRAL TOW FEATURE IS PRESENT

Use Case ID	UC7a
Use Case Title	KIR Chime Deactivation when Neutral Tow Feature Present (Physical Key, mechanical Shifter (automatic transmission))
Actors	Driver
Pre-conditions	Driver Door Open Physical Key in the Key Cylinder Engine Off or ACC Ignition State Neutral Tow Feature Activated
Scenario Description	Driver close driver door
Post-Conditions	Key-In-Ignition Reminder chime stop sounding

Use Case ID	UC7b
Use Case Title	KIR Chime Deactivation when Neutral Tow Feature Present (Physical Key, e-Shifter (automatic transmission))
Actors	Driver
Pre-conditions	Driver Door Open Physical Key in the Key Cylinder Engine Off or ACC Ignition State Neutral Tow Feature Activated
Scenario Description	Driver close driver door
Post-Conditions	Key-In-Ignition Reminder chime stop sounding

Use Case ID	**UC7c**
Use Case Title	KIR Chime Deactivation when Neutral Tow Feature Present (Physical Key, manual Shifter (manual transmission))
Actors	**Driver**
Pre-conditions	Driver Door Open Physical Key in the Key Cylinder Engine Off or ACC Ignition State Neutral Tow Feature Activated
Scenario Description	Driver close driver door
Post-Conditions	Key-In-Ignition Reminder chime stop sounding

Use Case ID	**UC7d**
Use Case Title	KIR Chime Deactivation when Neutral Tow Feature Present (Virtual Key, mechanical Shifter (automatic transmission))
Actors	**Driver**
Pre-conditions	Driver Door Open Virtual Key in the Vehicle Engine Off (Ignition State) Neutral Tow Feature Activated
Scenario Description	Driver close driver door
Post-Conditions	Key-In-Ignition Reminder chime stop sounding

Use Case ID	**UC7e**
Use Case Title	KIR Chime Deactivation when Neutral Tow Feature Present (Virtual Key, e-shifter (automatic transmission))
Actors	**Driver**
Pre-conditions	Driver Door Open Virtual Key in the Vehicle Engine Off (Ignition State) Neutral Tow Feature Activated
Scenario Description	Driver close driver door
Post-Conditions	Key-In-Ignition Reminder chime stop sounding

Use Case ID	**UC7f**
Use Case Title	KIR Chime Deactivation when Neutral Tow Feature Present (Virtual Key, mechanical Shifter (automatic transmission), Doors OFF)
Actors	**Driver**
Pre-conditions	Driver Door Not Removed (Door OFF) Driver Door Open Virtual Key in the Vehicle Neutral Tow Feature Activated
Scenario Description	Driver close driver door
Post-Conditions	Key-In-Ignition Reminder chime stop sounding

2.1.4 Feature Requirements for KIR Chime

2.1.4.1 Functional Requirements

Referring to the FSMS Document ID RQT-110401-016955, (SO-0050) subsections can be defined according to following states/conditions of this feature that it will undergo

- Key-In-Ignition Status: IN/OUT
- Drive Door status: AJAR / CLOSED
- Chime Battery Saver Status: NO_EFFECT / OFF
- Ignition Status: RUN/START/OFF/ACC
- Police Idle Mode-: ACTIVE/INACTIVE
- KIR Chime request: OFF/ON
- **Doors Off Status: PRESENT / NOT PRESENT**
- **Neutral Tow Status: ENABLED / DISABLED**

R_KIR_051 ### "Key-In-Ignition Status" Definition for Bladed Key

For the purpose of KIR Chime with a physical key, Key-In-Ignition Status is defined as IN whenever the physical key is in the ignition system. Key-In-Ignition Status is defined as OUT whenever the physical key is not in the ignition system.

R_KIR_001 ### "Key-In-Ignition Status" IN Definition for Virtual Key [2]

For the purpose of KIR Chime with virtual key, Key-In-Ignition Status becomes IN whenever the Ignition Status becomes and remains ON.

R_KIR_002 ### "Key-In-Ignition Status" OUT Definition for Virtual Key [2]

For the purpose of KIR Chime with virtual key, Key-In-Ignition Status becomes OUT whenever the Ignition Status becomes OFF and in the case of Auto Transmission vehicle is in PARK.

R_KIR_003 ### Ignition Off based on key position

For the purpose of KIR Chime, Ignition Status is defined as OFF when the physical key is in OFF, LOCK position or removed from key cylinder. In addition, the Ignition Status is defined as OFF when no authenticated key is inside the vehicle electrical system. [3]

R_KIR_004 ### KIR chime with key removed from the ignition system

When Key-In-Ignition Status is OUT, KIR Chime shall be turned OFF.

R_KIR_005 ### KIR chime when door is closed

When Driver Door status is CLOSED, KIR Chime shall be turned OFF.

R_KIR_084 ### KIR chime when door is OFF

When Driver Door is OFF, KIR Chime shall be Activated at each ignition state and shifter position (PRND and L or S or M) and Neutral Hold Mode when Ignition is OFF

NOTE; This requirement will be valid when Neutral Tow Feature is NOT PRESENT [see ### R_KIR_089 ### KIR chime Deactivation when Neutral Tow AND Doors Off Features are present (Doors OFF) Requirement]

R_KIR_085 ### KIR chime for shifters with locking button when Doors Off is present

When shifter is moved to "any" Position and Shifter Button is not released for Automatic vehicles and Driver Door is OFF, "Key In Reminder Chime" is ON

R_KIR_006 ### KIR chime when door is open, and key is inside ignition system

When Key-In-Ignition Status is IN, Ignition Status is OFF/ACC and Driver Door AJAR; KIR Chime shall turn ON. Note that the Key-In-Ignition Status is assumed to be IN if Ignition Status is ACC.

R_KIR_007 ### KIR chime when Police Idle Mode inactive

When Ignition Status is RUN/START and Police Idle Mode is INACTIVE, KIR Chime request is OFF.

R_KIR_008 ### KIR chime when Police Idle Mode active

When Ignition Status is RUN/START, Police Idle Mode is ACTIVE, and Driver Door AJAR; KIR Chime request is ON.

R_KIR_009 ### KIR chime activation for extended period of time

Whenever the KIR chime ON conditions become met and remain satisfied, the KIR chime must sound for a minimum of 30 minutes.

R_KIR_086 ### KIR chime activation when Neutral Tow is Present

When Driver Door is OPEN and Neutral Tow Feature is ACTIVATED, Key In Reminder is ON

R_KIR_087 ### KIR chime deactivation when Neutral Tow is Present

When Driver Door is CLOSED and Neutral Tow Feature is ACTIVATED, Key In Reminder is OFF

R_KIR_088 ### KIR chime activation when Neutral Tow AND Doors Off Features are present (Doors ON)

When Driver Door is ATTACHED and OPEN and Neutral Tow Feature is ACTIVATED, Key In Reminder is ON

R_KIR_089 ### KIR chime Deactivation when Neutral Tow AND Doors Off Features are present (Doors OFF)

When Driver Door is OFF and Neutral Tow Feature is ACTIVATED, Key In Reminder is OFF

NOTE: Key In Reminder Chime OFF when Neutral Tow Active and Doors Removed (Doors OFF) topic has been reviewed approved on GSWG Meeting (09-FEB-2021); the agreement on the meeting is; It requires 8 deliberate steps to get into Neutral tow mode. Team is aligned with the strategy of no chime in Neutral tow mode with Doors off. There is no change to the CPRM direction, hence escalation to VSC or CPRM is not required.

2.1.5 Security Requirement

2.1.5.1.1 Error Handling

2.1.5.1 Nonfunctional Requirements

No additional non-functional requirements are necessary [3]

2.1.5.1.2 Performance

No additional performance requirements are necessary [3]

2.1.5.1.3 Security

No additional security requirements are necessary [3]

2.1.5.1.4 Reliability

No additional reliability requirements are necessary [3]

2.1.5.2 Safety ISO26262

The feature is not safety relevant

2.1.5.1.5 Functional Safety Goals

The feature is not safety relevant

2.1.5.1.6 Known Safety Requirements

The feature is not safety relevant

2.1.5.3 HMI Requirements

R_KIR_010 ### KIR chime is audible tone

Whenever the KIR chime is activated, an audible tone or pattern of audible tones shall be sounded by an auditory device. The audible tone shall continue as long as the conditions for the KIR chime is satisfied.

R_KIR_011 ### KIR chime sounder power modes

The KIR Chime shall be capable to be activated whenever the vehicle Ignition State is OFF, ACC, ON or START.

2.1.5.4 Other Requirements

2.1.5.1.7 Manufacturing Requirements

No additional service requirements are necessary

2.1.5.1.8 Service Requirements

No additional service requirements are necessary

2.1.5.1.9 After Sales Requirements

No additional sales requirements are necessary

2.1.5.1.10 Process requirements

No additional service requirements are necessary

3 FEATURE DECOMPOSITION (LOGICAL DESIGN)

3.1 Overview

This feature is composed into three functions. The first function, <F6>, includes gathering of the inputs from various sources and make decision of Key Status based on inputs. The second function, <F7>, determines status of the KIR Chime. The output of the second function will send the request to the chime arbitrator and sounder system. [3] The third function <F14>, determines status if Doors are Present or Not (Doors ON / Doors Off when available)

3.2 Functional Architecture

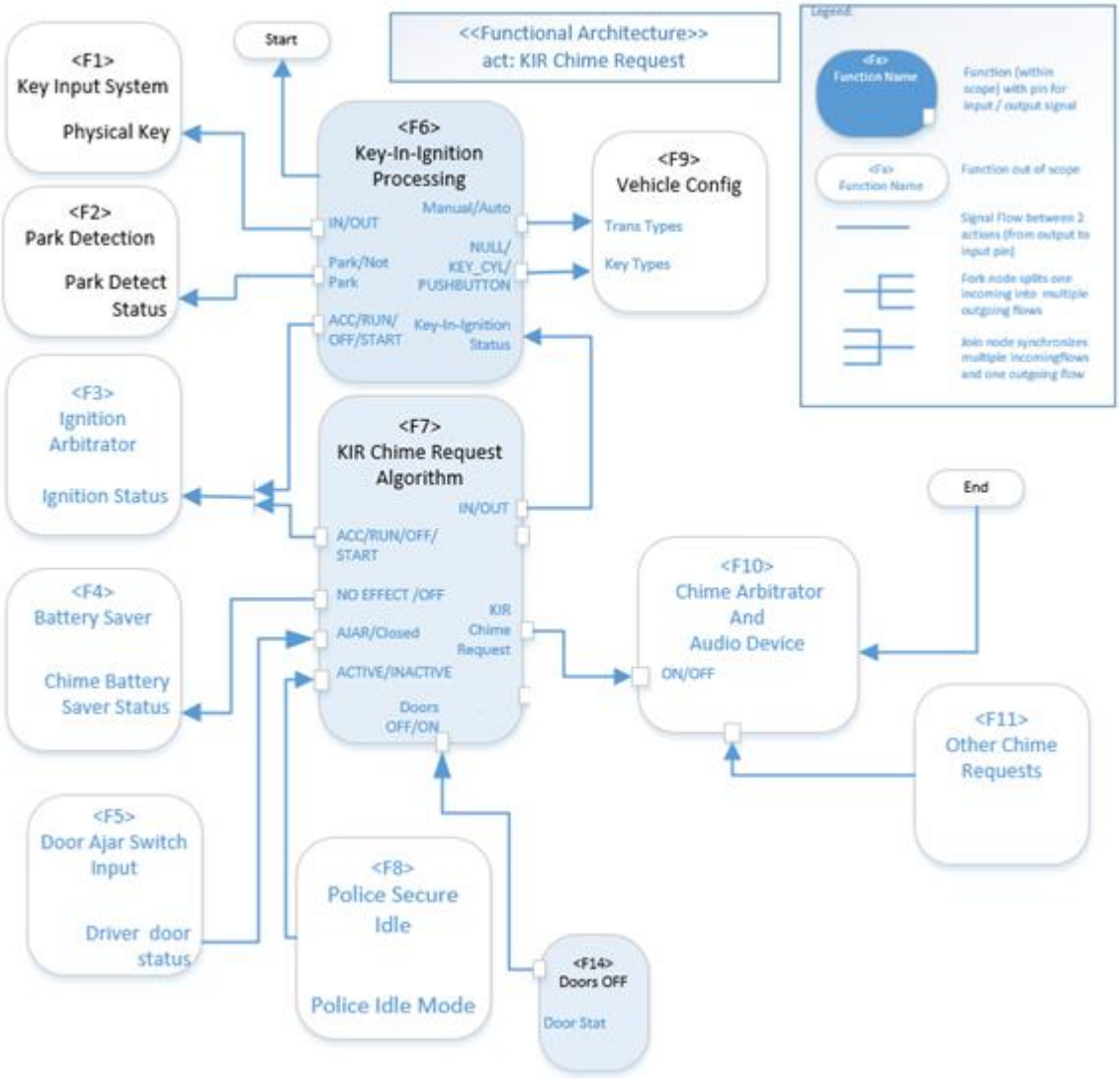


Figure 4 - Functional Architecture Diagram

3.3 Function List

The following table shall give a more detailed overview of the functions used by the feature. Additionally it shall help to find the related Function Requirements Specifications to check if consistency is given.

Section ID	Function Name	Description
S.3.4.1	KIR Chime Request Algorithm	Algorithm to send resulting KIR Chime Request
S.3.4.2	Key-In-Ignition Processing	Algorithm to judge presence of Key in the ignition system
S.3.4.3	Doors OFF	Algorithm to know the presence of doors

Table 9:- List of Logical Functions [2]

3.4 Logical Functions

3.4.1 KIR Chime Request Algorithm Function

3.4.1.1 Function Description

This function determines the state of all inputs and sends a request to the chime arbitrator and sounder and heard by the driver.

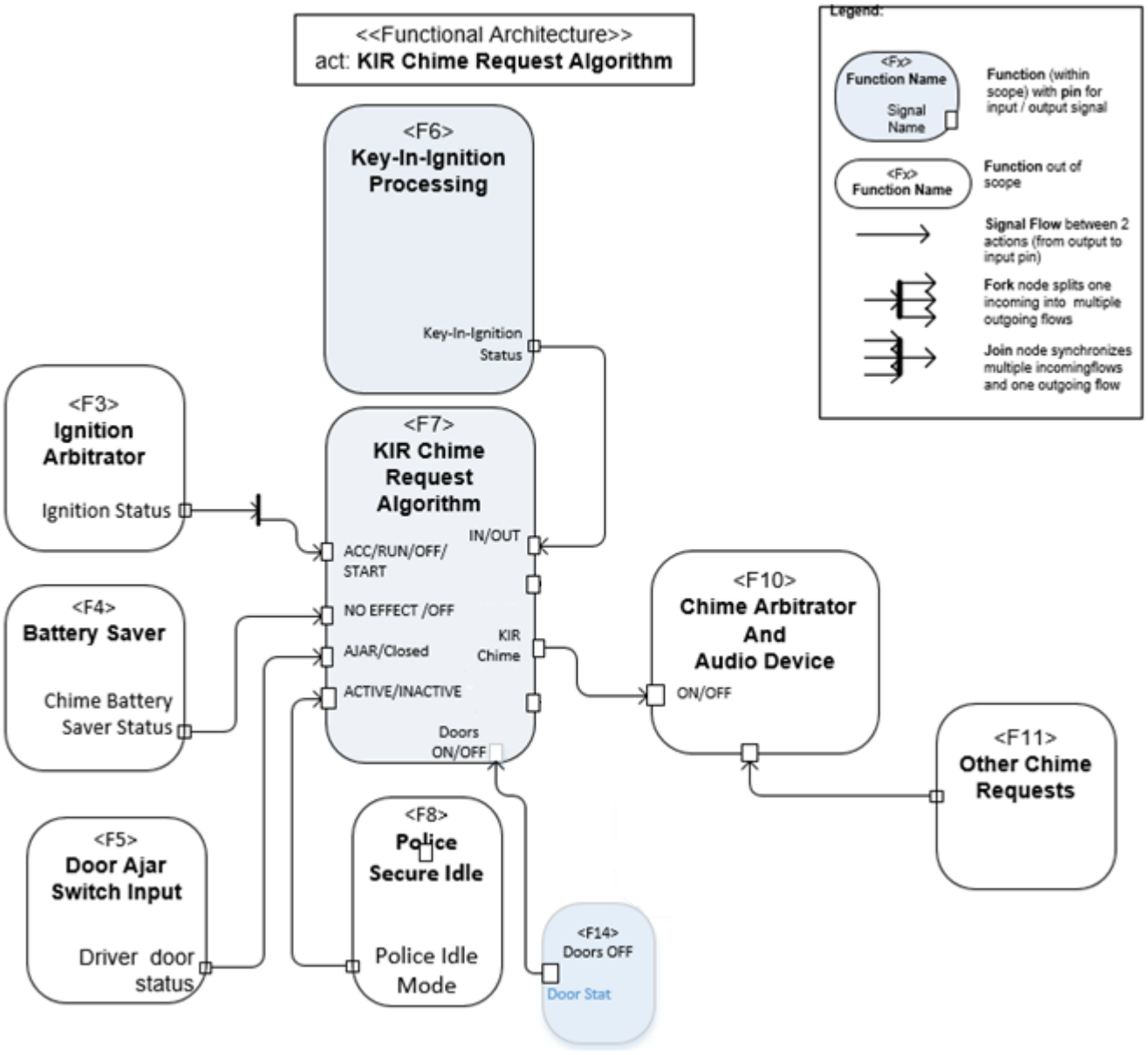


Figure 5 - KIR Chime Request Algorithm Functional Diagram [3] - added

3.4.1.2 Function Scope

The Request Algorithm is created based on the situation ideal for Key-In-Ignition Reminder Chime to be played. It takes input from various module (same or external) and makes a decision based on the request algorithm

3.4.1.3 Function Interfaces

Logical Input(s) and Logical Output(s) are shown in table as below:

3.4.1.3.1 Logical Inputs

Signal Name	Signal ID	Description
Key-In-Ignition Status	0x1 Key In 0x0 Key OUT	Signal to determine if the key is inserted into the vehicle system
Ignition Status	0x1 RUN 0x0 NOT RUN	Signal to determine the power state of the vehicle
Chime Battery Saver Status	0x1 OFF 0x0 NO EFFECT	Signal to determine how long chime is active
Drive Door Ajar status	0x1 AJAR 0x0 Closed	Signal for Driver Door Ajar Status
Police Idle Mode	0x1 Police Idle Active 0x0 Police Idle NOT Active	Signal to determine status of Police Secure Idle Mode
Doors OFF	0x1 Doors OFF 0x0 Doors ON	Signal to determine status of Doors (Doors OFF/ON)
Neutral Tow	**0x13 Neutral Tow Enabled** **0x2 Neutral Tow Entry** **0x14 Neutral Tow Disabled**	**Signal to determine status of Neutral Tow Feature**

3.4.1.3.2 Logical Outputs

Signal Name	Signal ID	Reference
KIR Chime Request	0x1 Chime ON 0x0 Chime OFF	Output to Chime Arbitrator and Sounder

3.4.1.3.3 Configuration Parameters [2] [3]

There are no configurations for this function

3.4.1.3.4 Tunable Parameters

There are no tunable parameters

3.4.1.4 Function Requirements

As per FSMS document ID RQT-110401-016955 (SO-0050), for reliable working of this feature, functional requirements are derived.

Rqmt No.	Chime Battery Saver Status	Ignition Status	Police Idle Mode	Drive Door Ajar status	Doors Off	Neutral Tow	Key-In-Ignition Status	KIR Chime Request
R_KIR_012	OFF	Don't care	Don't care	Don't care	Don't care	N/A	Don't care	OFF
R_KIR_013	NO_EFFECT	RUN/START	INACTIVE	Don't care	Don't care	N/A	Don't care	OFF
R_KIR_014	NO_EFFECT	RUN/START	ACTIVE	AJAR	FALSE	N/A	Don't care	ON
R_KIR_015	NO_EFFECT	RUN/START	ACTIVE	CLOSED	FALSE	N/A	Don't care	OFF
R_KIR_016	NO_EFFECT	OFF/ACC	Don't care	CLOSED	FALSE	N/A	Don't care	OFF
R_KIR_017	NO_EFFECT	OFF	Don't care	AJAR	FALSE	N/A	OUT	OFF
R_KIR_018	NO_EFFECT	ACC	Don't care	AJAR	FALSE	N/A	Don't care	ON
R_KIR_019	NO_EFFECT	OFF	Don't care	AJAR	FALSE	N/A	IN	ON
R_KIR_055	NO_EFFECT	RUN/START	ACTIVE	Don't care	TRUE	N/A	Don't care	ON
R_KIR_056	NO_EFFECT	OFF/ACC	Don't care	Don't care	TRUE	N/A	OUT	OFF
R_KIR_057	NO_EFFECT	ACC	Don't care	Don't care	TRUE	N/A	Don't care	ON
R_KIR_058	NO_EFFECT	OFF	Don't care	Don't care	TRUE	N/A	IN	ON
R_KIR_088	NO_EFFECT	RUN/START	Don't care	AJAR	FALSE	TRUE	Don't care	OFF
R_KIR_088	NO_EFFECT	RUN/START	Don't care	CLOSED	FALSE	TRUE	Don't care	OFF
R_KIR_088	NO_EFFECT	ACC/OFF	Don't care	AJAR	FALSE	TRUE	Don't care	ON
R_KIR_088	NO_EFFECT	ACC/OFF	Don't care	CLOSED	FALSE	TRUE	Don't care	OFF
R_KIR_089	NO_EFFECT	RUN/START	Don't care	Don't care	TRUE	TRUE	Don't care	OFF
R_KIR_089	NO_EFFECT	RUN/START	Don't care	Don't care	TRUE	FALSE	Don't care	OFF
R_KIR_089	NO_EFFECT	ACC/OFF	Don't care	Don't care	TRUE	TRUE	Don't care	OFF
R_KIR_089	NO_EFFECT	ACC/OFF	Don't care	Don't care	TRUE	FALSE	Don't care	OFF

Table 10:-Function Requirements

In addtion to the above, the following requirements apply:

R_KIR_020 ### KIR chime missing_status

If status of any input is unknown, KIR Chime request is turned OFF.

R_KIR_021 ### KIR chime determination_latency

Whenever the input conditions are changed/updated, the chime arbitrator shall receive the resulting KIR Chime Request signal within the latency period of no more than 250msec.

> **Note:** End-to-End Latency is defined as once the Publisher changes the internal value of their publishing signal, the Subscriber must begin to respond within this defined latency (some functionality will take time to fully enable the required functionality).

R_KIR_022 ### KIR chime acceptance

When KIR Chime Request is ON, the chime request shall be sounded according to the chime arbitrator priority.

R_KIR_023 ### KIR chime priority

When KIR Chime Request is ON, the chime request shall be assessed with a Criticality Risk = 0 and Urgency Risk = 1.

> **Note:** Criticality Risk and Urgency Risk terms referenced here are terms defined by HMI guidelines. Refer to the related HMI guideline for details related to this requirement.

R_KIR_024 ### KIR chime acceptance_latency

Whenever KIR Chime Request state changes and is received by chime arbitrator, the resulting chime shall follow the state change within the latency period of no more than 100msec.

> **Note:** End-to-End Latency is defined as once the Publisher changes the internal value of their publishing signal, the Subscriber must begin to respond within this defined latency (some functionality will take time to fully enable the required functionality).

R_KIR_025 ### KIR chime continuity

As long as KIR Chime Request remains ON and no other higher priority chime request is accepted, resulting chime shall be continuously sounded.

3.4.1.5 Non-Functional Requirements [3] - added

No Non-Functional requirements necessary

3.4.1.6 Error Handling Requirements [3] - added

No Error Handling requirements necessary

3.4.2 Key-In-Ignition Processing Function [2]

3.4.2.1 Function Description

This function determines the state of all inputs and sends the key in ignition status

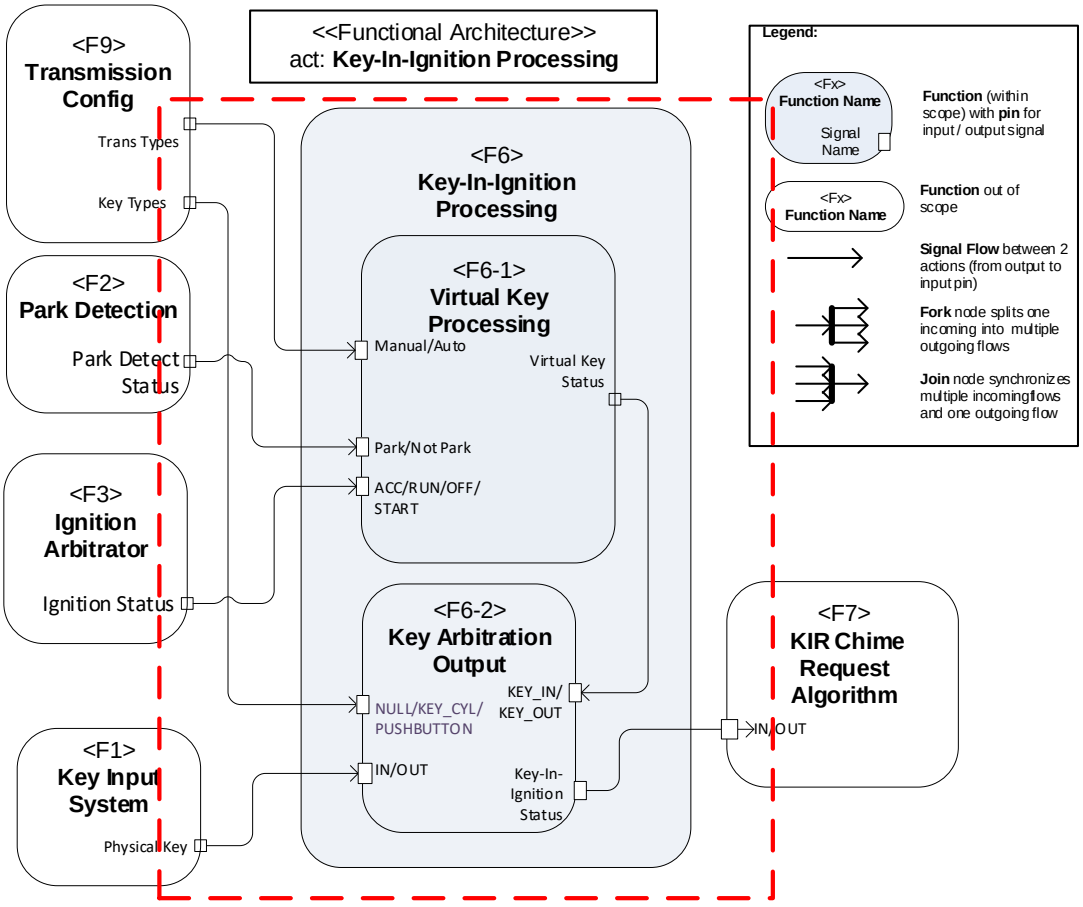


Figure 6 - Key-In-Ignition Processing [3] - updated

3.4.2.2 Function Scope

The Algorithm is created based on the situation ideal for Key-In-Ignition status. It takes input from various module (same or external) and makes a decision based on the algorithm.

3.4.2.3 Function Interfaces

Logical Input(s) and Logical Output(s) are shown in table as below:-

3.4.3.3.1 Logical Inputs

Signal Name	Signal ID	Description
Physical Key Status	0x1 Physical Key In 0x0 Physical Key OUT	Signal to determine if the physical key is inserted into the vehicle system
Ignition Status	0x1 RUN 0x0 NOT RUN	Signal to determine the power state of the vehicle
Park Detect Status	0x1 Park 0x0 NOT Park	Signal to determine is the vehicle is in Park
Virtual Key Status	0x1 Virtual Key In 0x0 Virtual Key OUT	Signal to determine if the virtual key is inserted into the vehicle system

3.4.3.3.2 Logical Outputs

Signal Name	Signal ID	Reference
Key-In-Ignition Status	0x1 Key In 0x0 Key OUT	Signal to determine if the key is inserted into the vehicle system

3.4.3.3.3 Configuration Parameters

Signal Name	Signal ID	Reference
Transmission Configuration	Trans_Cfg	Configuration to determine if vehicle is Manual or Auto trans
Key Source Configuration	KeySource_Cfg	Configuration to determine if what key type is expected

3.4.3.3.4 Tunable Parameters

There are no tunable parameters

3.4.2.4 Function Requirements

As per FSMS document ID RQT-110401-016955 (SO-0050), for reliable working of this feature, functional requirements are derived.

Function <F6-1> Virtual Key Processing

Rqmt No.	Ignition_ Status	Trans_ Cfg	Park_ Detect_ Status	Virtual_Key_ Status
R_KIR_026	Not(OFF)	Don't care	Don't care	KEY_IN
R_KIR_027	OFF	Not(AUTO)	Don't care	KEY_OUT
R_KIR_028	OFF	AUTO	NOT_PARK	No Change
R_KIR_029	OFF	AUTO	PARK	KEY_OUT

Table 11:-Function Requirements for virtual key processing

Function <F6-2> Key Arbitration Output

Rqmt No.	KeySource_Cfg	Physical_Key_ Status	Virtual_Key_ Status	Key_in_Ignition_ Status [3]
R_KIR_030 [3]	NULL	IN	Don't care	IN
R_KIR_031	NULL	OUT	KEY_IN	IN
R_KIR_032	NULL	OUT	KEY_OUT	OUT
R_KIR_033	KEY_CYL	IN	Don't care	IN
R_KIR_034	KEY_CYL	OUT	Don't care	OUT
R_KIR_035	PUSHBUTTON	IN	Don't care	IN
R_KIR_036	PUSHBUTTON	OUT	KEY_IN	IN
R_KIR_037	PUSHBUTTON	OUT	KEY_OUT	OUT
R_KIR_038	PASSIVE	Don't Care	KEY_IN	IN
R_KIR_039	PASSIVE	Don't Care	KEY_OUT	OUT

Table 12:-Function Requirements for virtual key processing

For Pushbutton Start (Fob-In-IP), this means that Key-In is reported once the fob is placed in the IP and authenticated and Key-Out is reported when the Fob is out of the IP AND the gear-shifter is locked in Park.

Note: For Passive Start**,** Physical_Key_Status needs to be set to OUT to allow Virtual_Key_Status to control what's reported. Also, for Key Cylinder Ignition, Virtual_Key_Status needs to always be set to OUT.

3.4.2.5 Non-Functional Requirements [3] - added

No Non-Functional requirements necessary

3.4.2.6 Error Handling Requirements [3] - added

No Error Handling requirements necessary

3.4.3 Doors OFF Processing Function

3.4.3.1 Function Description

This function determines the status of the doors, if there are ON/OFF the vehicle.

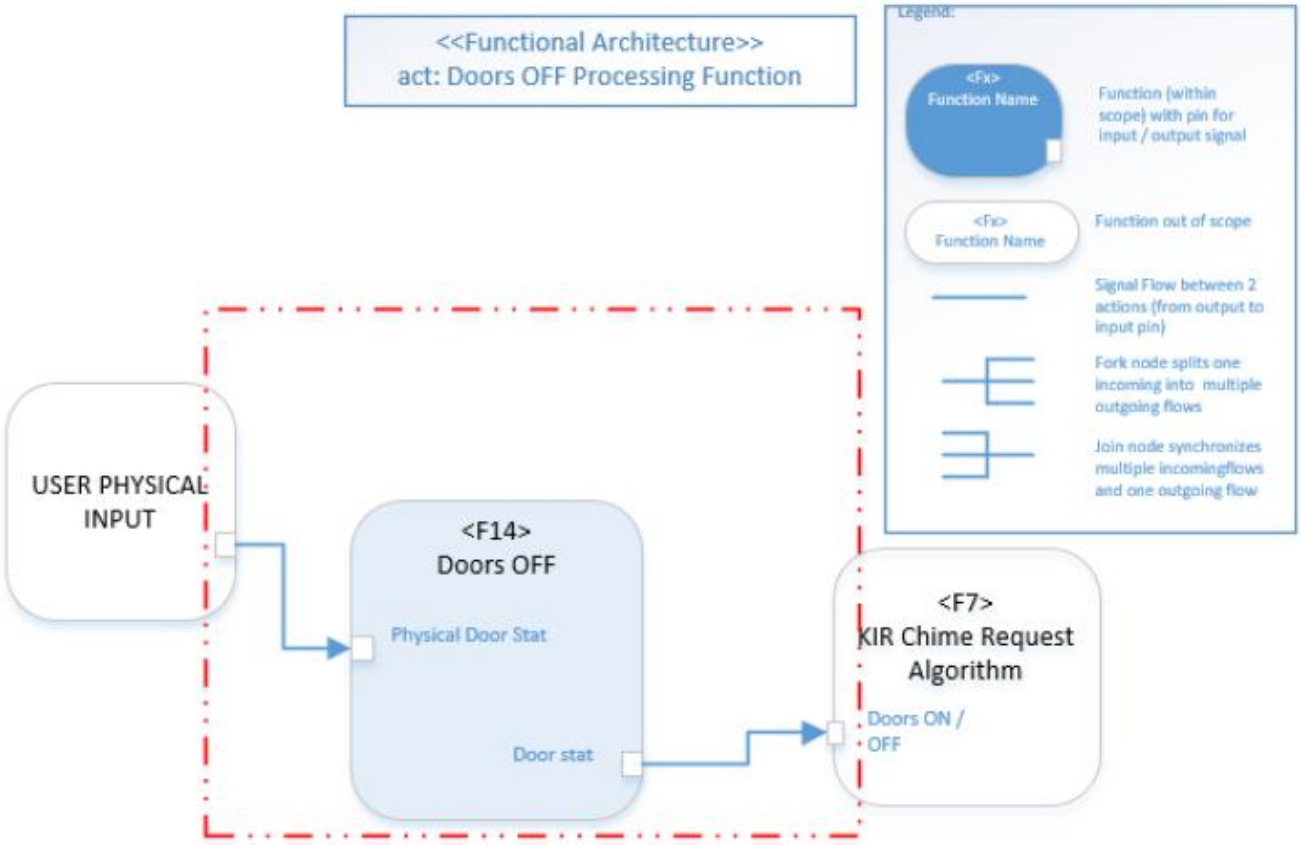


Figure 7 – Doors OFF Processing

3.4.3.2 Function Scope

The Algorithm is to determine when the Doors are ON/OFF the vehicle

3.4.3.3 Function Interfaces

Logical Input(s) and Logical Output(s) are shown in table as below:-
[Is there any Input Signal for it?]

3.4.5.3.1 Logical Outputs

Signal Name	Signal ID	Reference
Doors OFF	0x1 Doors OFF	Signal to determine status of Doors(Doors OFF/ON)
	0x0 Doors ON	

3.4.5.3.2 Configuration Parameters

There are no configurations for this function

3.4.5.3.3 Tunable Parameters

There are no tunable parameters

3.4.3.4 Function Requirements

As per FSMS document ID RQT-110401-016955 (SO-0050), for reliable working of this feature, functional requirements are derived.

Function <F13> Doors ON/OFF Manager

Rqmt No.	Physical Doors	Door Status
R_KIR_080	Doors	Doors ON
R_KIR_081	No Doors	Doors OFF

Table 11:-Function Requirements for virtual key processing

In addtion to the above, the following requirements apply:

R_KIR_082 ### KIR Doors OFF Manager

The Doors OFF Manager function shall have the capability to provide Doors OFF/ON status

R_KIR_083 ### KIR Doors OFF interface

The Doors OFF Manager function shall provide the Doors OFF/ON status to the Key In Reminder chime request algorithm

3.4.3.5 Non-Functional Requirements [3] - added

No Non-Functional requirements necessary

3.4.3.6 Error Handling Requirements [3] - added

No Error Handling requirements necessary

4 FEATURE DEPLOYMENT (SYSTEM DESIGN) *[PHYSICAL INSTRUMENTAL PANEL CLUSTER PRESENT]*

4.1 Function Deployment

Logical to implementation

Signal Name	Signal ID	Description	CAN ID	Description
Key-In-Ignition Status	0x1 Key In 0x0 Key OUT	Signal to determine if the key is inserted into the vehicle system	Internal Signal	N/A
Ignition Status	0x1 RUN 0x0 NOT RUN	Signal to determine the power state of the vehicle	Ignition_Status	Ignition State of the vehicle
Chime Battery Saver Status	0x1 OFF 0x0 NO EFFECT	Signal to determine how long chime is active	Internal Signal	N/A
Drive Door Ajar status	0x1 AJAR 0x0 Closed	Signal for Driver Door Ajar Status	DF_Door_Ajar_Status	Door Status
KIR Chime Request	0x1Chime ON 0x0Chime OFF	Output to Chime Arbitrator and Sounder	KeyInIgnWarn_B_Cmd	KIR Chime Request
Police Idle Mode	0x1 Police Idle Active 0x0 Police Idle NOT Active	Signal to determine status of Police Secure Idle Mode		
Doors OFF	0x1 Doors OFF 0x0 Doors ON	Signal to determine status of Doors(Doors OFF/ON)	DrPrsntDrv_D_Stat	Doors OFF stat
Physical Key Status	0x1 Physical Key In 0x0 Physical Key OUT	Signal to determine if the physical key is inserted into the vehicle system	Internal Signal	N/A
Park Detect Status	0x1 Park 0x0 NOT Park	Signal to determine is the vehicle is in Park	ParkDetect_Stat	Park Signal Status
Virtual Key Status	0x1 Virtual Key In	Signal to determine if the virtual key is inserted into the vehicle system	Internal Signal	N/A
Neutral Tow	**0x13 Neutral Tow Enabled**	**Signal to determine if Neutral Tow is enabled**	**AwdStat_D_RqDsply**	
	0x2 Neutral Tow Entry	**Signal to determine if Neutral Tow Entry**	**TrnNtrlTowCmd_D_Actl**	
	0x14 Neutral Tow Disabled	**Signal to determine if Neutral Tow is disabled**	**AwdStat_D_RqDsply**	

4.1.1 Electrical Architecture

Following diagrams are developed for defining electrical architecture of the feature

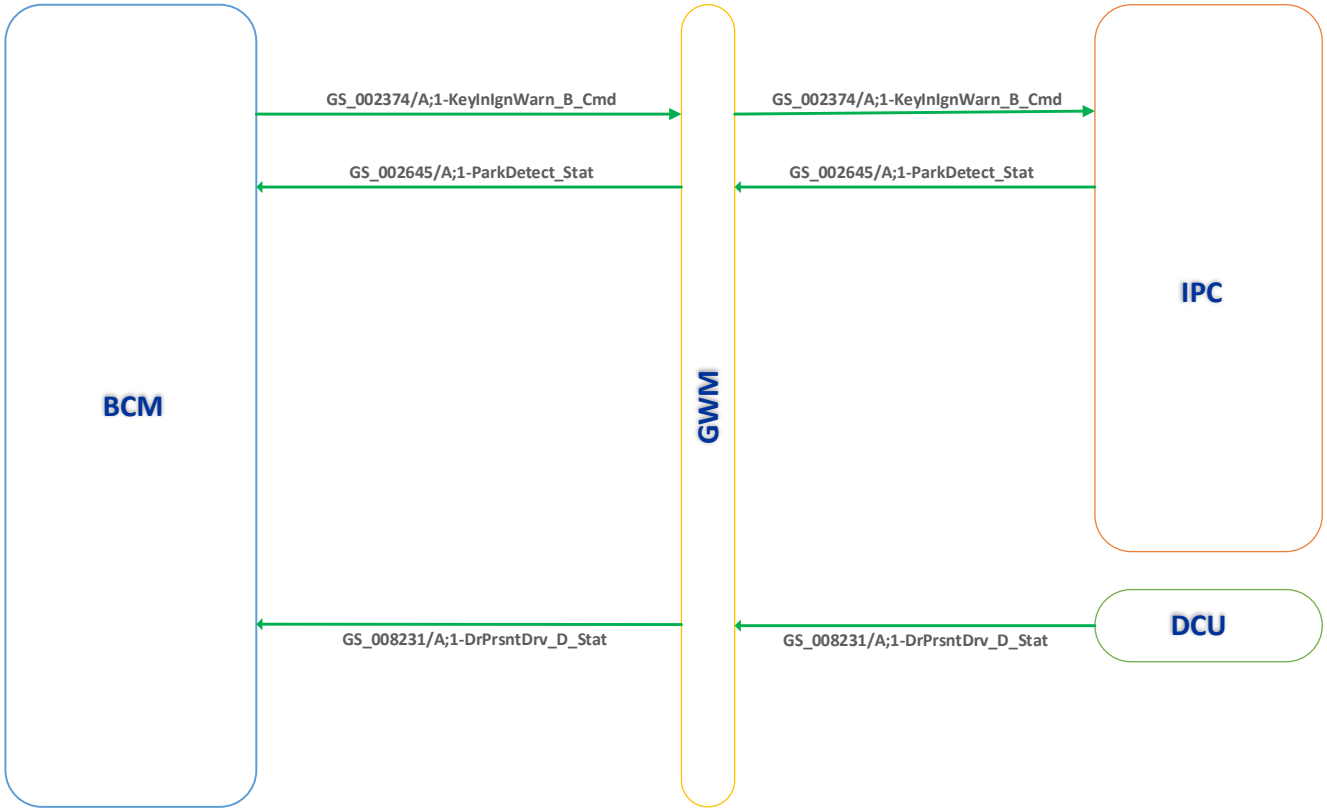
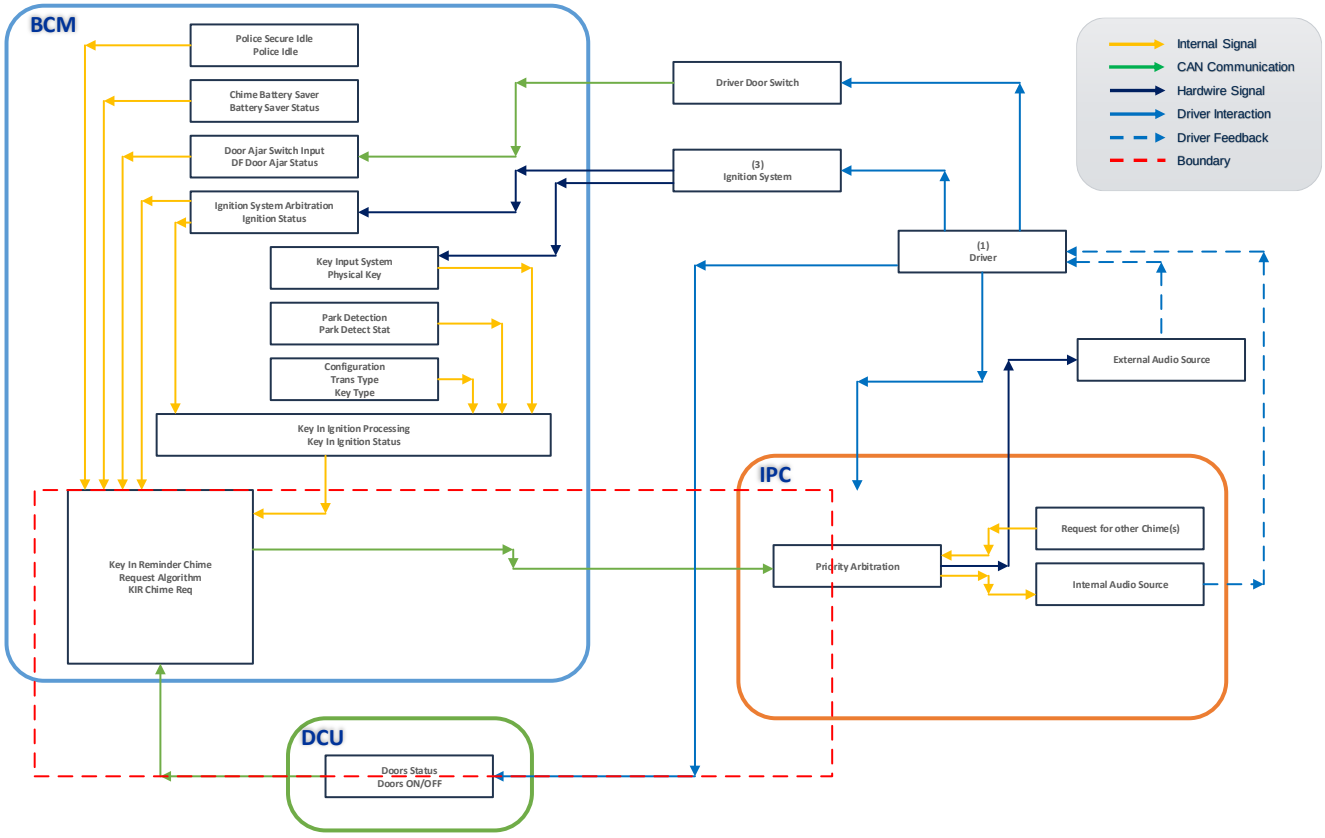


Figure 8 - Network Diagram

4.2 Block Diagram for KIR Chime



Block Diagram with Functional Deployment [2]

4.3 Boundary Diagram

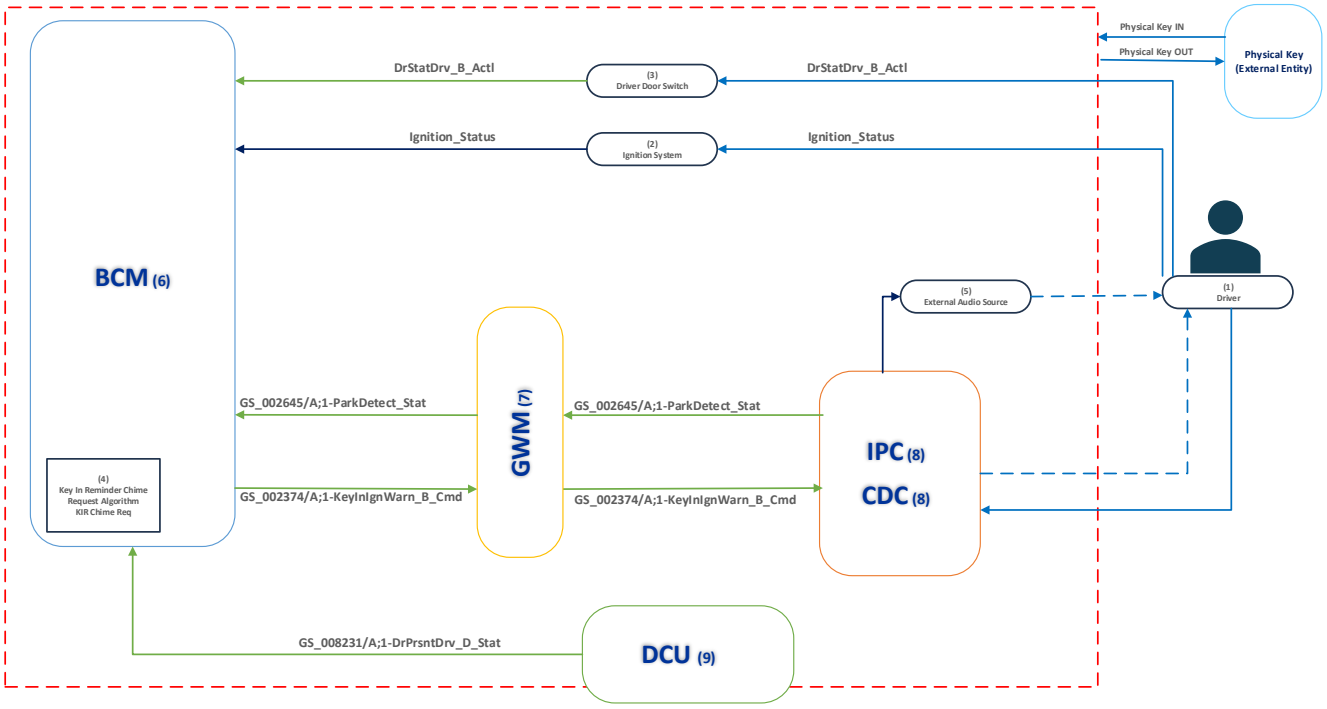


Figure 9 - Key In Reminder Boundary Diagram (Physical Key)

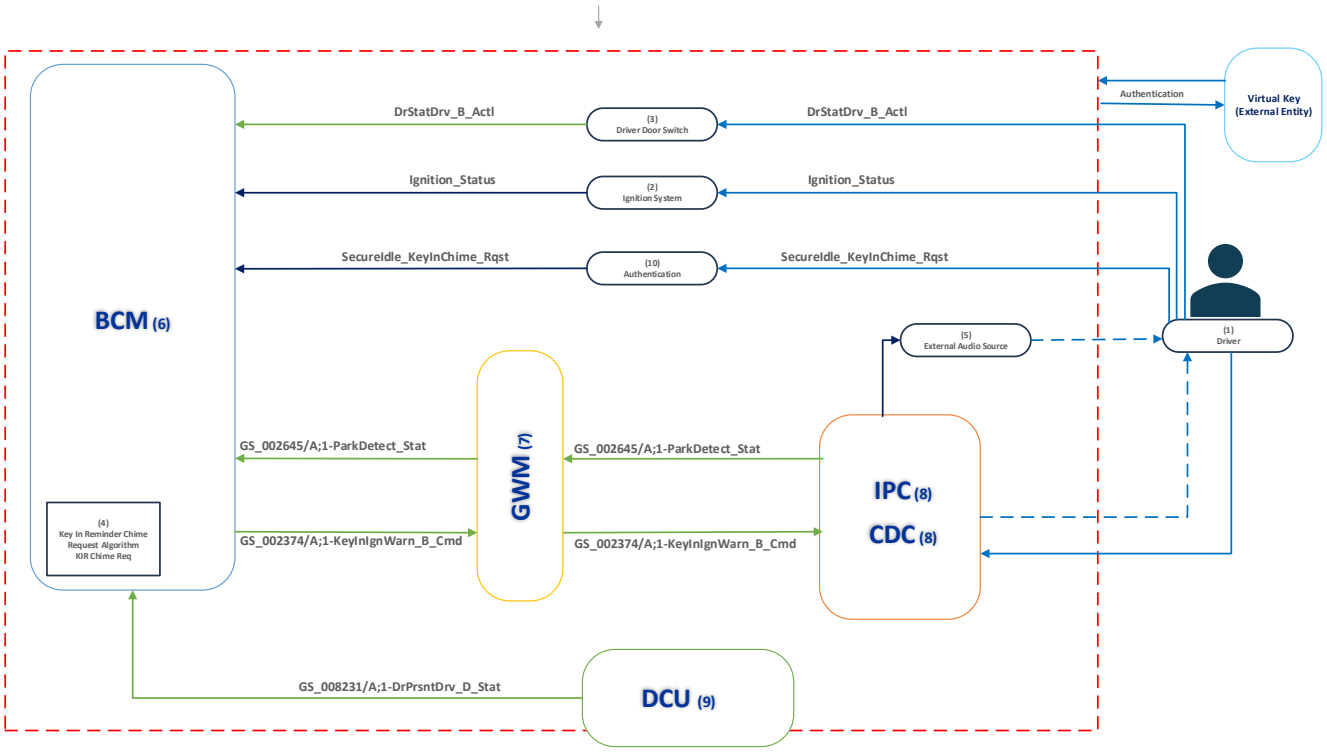


Figure 10 - Key In Reminder Boundary Diagram (Virtual Key)

4.4 Feature Implementation Requirements

4.4.1 Requirements on ECUs

4.4.1.1 BCM

4.4.5 Interface Requirements

###R_ FIRBCM _084 ### BCM Function Key In Reminder Chime Request Algorithm

The BCM shall implement the Key In Reminder Chime request algorithm function

###R_ FIRBCM _085 ### BCM Function Key In Ignition processing

The BCM shall implement the Key In Reminder Chime request algorithm function

4.4.1.1.1.1 Publisher Signals

Signal ID	Signal Name	Description
0x3C3	KeyInIgnWarn_B_Cmd	BCM Command to the IPC to activate the chime

Table 6: BCM Publisher Signals

4.4.1.1.1.2 Publisher Requirements

###R_ FIRBCM _087 ### BCM Chime Request

The BCM shall transmit a message that will Request the IPC the Key In Reminder Chime

4.4.1.1.1.3 Subscribed Signals

Signal ID	Signal Name	Description
0x3B2	Ignition_Status	Determine Ignition Status
0x1	DF_Door_Ajar_Status	Door Ajar
0x1	DrPrsntDrv_D_Stat	Doors OFF/ON

Table 7: BCM Subscribed Signals

4.4.1.1.1.4 Subscriber Requirements

###R_ FIRBCM _089 ### BCM Ignition status

The BCM shall receive the ignition status signal

###R_ FIRBCM _090 ### BCM Door Ajar

The BCM shall receive the Door Ajar signal

###R_ FIRBCM _091 ### BCM Door OFF/ON

The BCM shall receive the Doors OFF/ON signal

4.4.1.2 IPC

4.4.5 Interface Requirements

4.4.1.2.1.1 Publisher Signals

Signal ID	Signal Name	Description

Table 8: IPC Publisher Signals

4.4.1.2.1.2 Publisher Requirements

4.4.1.2.1.3 Subscribed Signals

Signal ID	Signal Name	Description
0x3C3	KeyInIgnWarn_B_Cmd	BCM Command to the IPC to activate the chime

Table 9: BCM Subscribed Signals

4.4.1.2.1.4 Subscriber Requirements

###R_ FIRIPC _097 ### IPC Chime Request

The IPC shall receive the KIR chime request to play the chime

4.4.1.3 DCU

4.4.5 Interface Requirements

###R_ FIRDCU _100 ### DCU Doors OFF Processing

The DCU shall implement the Doors OFF Processing function

4.4.1.3.1.1 Publisher Signals

Signal ID	Signal Name	Description
0x1	DrPrsntDrv_D_Stat	DCU signal to provide status for Doors OFF/ON

Table 10: DCU Publisher Signals

4.4.1.3.1.2 Publisher Requirements

###R_ FIRDCU _101 ### DCU Doors OFF/ON status

The DCU shall transmit a message that will contain the Doors OFF/ON status based of the physical presence of the doors in the vehicle

4.5 Network Communication

4.5.1 CAN Signal Handling Requirements

Requirements specific to input handling at the Subscriber side after it has been received.

Rqm't Num	µProcessor	Requirements
R_KIR_044	Awake	All CAN inputs sampled and processed normally (typically 20 ms FNOS process the message, and 20 ms to process the input).
R_KIR_045	Asleep	All CAN inputs sampled and processed normally (typically 50 ms NM transmit alive message, 50 ms transmit Application message/perform function, and 20 ms to process the input).

4.5.2 CAN Error Handling for Signal Gateway Messages

Requirements for signals that go missing either due to SNA or NC for a period of time, as per document name: "Diagnostic Fault Coverage and DTC Numbers Design Consideration", section 3.5 "Detection of faults caused by signal content and data values received from other ECUs"

Rqm't Num	Requirements
R_KIR_046	If a Signal gateway message containing the transmitted signal has an update bit which shows "not updated" for less than a period of time as per "Diagnostic Fault Coverage and DTC Numbers Design Consideration" (typically 5 seconds). Then the subscriber should continue using last known value of the signal
R_KIR_047	If a Signal gateway message containing the transmitted signal has an update bit which shows "not updated" for greater than a period of time as per "Diagnostic Fault Coverage and DTC Numbers Design Consideration" (typically 5 seconds). Then the subscriber should use the signal's default value as listed in the data dictionary

4.5.3 CAN Error Handling for Frame Gateway Messages

Requirements for Frame Message that go missing due to SNA or NC for a period of time as per document name: "Diagnostic Fault Coverage and DTC Numbers Design Consideration", section 3.5 "Detection of faults caused by signal content and data values received from other ECUs"

Rqm't Num	Requirements
R_KIR_048	If a Frame gateway message goes missing for less than a period of time as per "Diagnostic Fault Coverage and DTC Numbers Design Consideration" (typically 5 seconds). Then the subscriber should continue using last known value of the signal received in the last Frame message.
R_KIR_049	If a Frame gateway message goes missing for greater than a period of time as per "Diagnostic Fault Coverage and DTC Numbers Design Consideration" (typically 5 seconds). Then the subscriber should use the signal's default value as listed in the data dictionary

4.5.4 Can Error Recovery

Rqm't Num	Requirements
R_KIR_050	If frame/signal gateway massage is received after CAN error is detected as per Diagnostic Fault Coverage and DTC Numbers Design Consideration", then the subscriber should use most current value of that signal

5 OPEN ISSUES

ID	Issue Description	e-Tracker / Reference	Responsible	Status	Solution
1					
2					
3					
4					
5					
6					
7					
8					
9					

6 REVISION HISTORY

Rev. (revision)	Vers.	Date	Description	Approved by	Responsible
	A1	*2/24/2017*	*Initial Release*		*Chris Henderson* *Sumit Rashinkar*
[2]	*A2*	*5/4/2017*	*Update to include Key Input Processing*		*Chris Henderson* *Sumit Rashinkar*
[3]	*A3*	*7/25/2017*	*Update to align with RE feedback*		*Chris Henderson* *Sumit Rashinkar*
[4]	*A4*	*10/17/2018*	*Update to include Doors Off*		*Chris Henderson* *Erick Mogollon*
[5]	*A5*	*12/17/2018*	*Update to include Chime cancellation strategy*		*Erick Mogollon*
[6]	*A6*	*06/18/2020*	*Update documentation for Legacy Feature adding SYNC 4.2 Functionality* *IPC Functionality will be included in SYNC 4.2*		*Hiram Fuentes*
[7]	*A6*	*06/26/2020*	*Update documentation for Legacy Feature due to IVI Assumptions has been changed.*		*Hiram Fuentes*
[8]	*A6*		*Update Diagrams*		*Hiram Fuentes*
[9]	*A6*	*07/13/2020*	*Update documentation due to Doors Off Feature*		*Hiram Fuentes*
[10]	*A6*	*08/26/2020*	*Update Description to split between key types*		*Hiram Fuentes*
[11]	***V9_4***	***02/08/2021***	***Update Documentation due to Neutral Tow Requirements***		***Hiram Fuentes***
[12]	***V9_4_1***	***02/12/2021***	***Add ASO Approval for KIR Deactivation when NT Active and Door Removed***		***Hiram Fuentes***
[13]	***V9_4_2***	***02/15/2021***	***Add note on Req R_KIR_084***		***Hiram Fuentes***
[14]	***V9_4_3***	***03/08/2021***	***Update Document based on some findings related to misspell and customer clarification***		***Diego Silva*** ***Hiram Fuentes***

Appendix A - Data Dictionary [2] [3]

Signal ID	Description	Type	Size [Bits]	Logical Range	Unit	Scale	Offset	Default	Reference (Section)
Key_In_Ignition_Warn_Cmd	This signal denotes whether the key in ignition warning chime is ON or OFF	SED	1	***OFF; ON***	none	1	0	***OFF***	3.4.1
~~**KEY_IN_IGN_CHIME_STATUS_FLAG**~~	~~Indicates Incoming KIR Chime Request~~	~~SED~~	~~1~~	~~***OFF; ON***~~	~~none~~	~~1~~	~~0~~	~~***OFF***~~	~~3.3.2~~
PoliceIdleArm_Stat	Represents the current state of the Police Idle feature.	SED	NA	***DISARMED; ARMED; ACTIVE; PREARMED; TRIGGERED***	none	1	0	***DISARMED***	3.4.1
Req_Chime_BS_Command	Request from Chime Battery Saver to turn Off Chime	SED	NA	***NO_EFFECT; OFF***	none	1	0	***NO_EFFECT***	3.4.1
Ignition_Status	The processed value for current Ignition state.	SED	NA	***OFF; ACC; RUN; START;UNKNOWN; INVALID***	none	1	0	***OFF***	3.4.1,3.4.2
Key_In_Ignition_Status	Indicates whether the key is in the ignition switch cylinder.	SED	NA	***UNKNOWN; IN; OUT***	none	1	0	***UNKNOWN***	3.4.1
DF_Door_Ajar_Status	Indicates if the driver's front door is ajar.	SED	NA	***CLOSED; AJAR***	none	1	0	***CLOSED***	3.4.1
DRL_Trans_Cfg	Central configuration to specify if Automatic transmission or a manual transmission	SED	NA	**AUTO; MANUAL**					3.4.2
KeySource_Cfg	Indicates the type of ignition Key system the vehicle will be using.	SED	NA	**KEY_CYL; NULL; PASSIVE; PUSHBUTTON**	None	1			3.4.2
ParkDetect_Stat	Signal from Cluster signifying the state of the transmission shifter PARK Switch	SED	1	***NOT_PARK; PARK***	none	1	0	***NOT_PARK***	3.4.2