Research & Vehicle Technology
"Infotainment Systems Product Development"

Feature – Cross Traffic Alert

APIM Infotainment Subsystem Part Specific Specification (SPSS)

Version 1.4

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Version Date: December 2, 2020

FORD CONFIDENTIAL

Revision History

Date	Version	Notes	
October 5, 2015	**1.0**	**Initial Release**	
October 26, 2015	**1.1**		
	CTA-REQ-198035/A-Missing Signal		tmertiri: Added Signal missing time due to Europe team request by email.
March 11, 2016	**1.2**		
	STR-296334/B-Overview		tmertiri - added text clarification for display timing
June 23, 2020	**1.3**		
	CTA-CLD-REQ-195204/A-CTA Client		tmertiri - added
	CTA-CLD-REQ-195205/A-CTA Server		tmertiri - added (i.e Vehicle Side)
	STR-296335/B-Logical Signal Mapping		tmertiri: add RBA signals
	CTA-IIR-REQ-195214/B-CrossTrafficAlertClient_Rx		tmertiri: add RBA signals
	MD-REQ-392860/A-LCtaBrkLeft		tmertiri: new signal
	MD-REQ-392861/A-LCtaBrkRight		tmertiri: new signal
	STR-296324/B-General Requirements		sberg15: Added requirements CTA-FUR-REQ-321999/A-CTA Indicator Animation; CTA-FUR-REQ-322000/A-CTA Indicator Animation Frequency; CTA-FUR-REQ-322002/A-CTA HMI Side Independency; CTA-FUR-REQ-322004/A-CTA HMI Indicators Synchronization; CTA-FUR-REQ-322014/A-CTA HMI Indicator Strategy; for clarification purpose.
	CTA-REQ-195286/A-Client notification		tmertiri - initial requirement declaration
	CTA-REQ-198035/B-Missing Signal		tmertiri: added the new signals to the requirement
	CTA-REQ-392984/A-CTA with Brakes		tmertiri: new req for the brake signal changes
	STR-296211/B-Use Cases		tmertiri: add reverse braking usecase
	CTA-UC-REQ-393443/A-CTA With Braking Activation		tmertiri: added new usecase
	STR-296319/B-Sequence Diagrams		tmertiri:add new sq diagram
	CTA-SD-REQ-392878/A-CTA with RBA Activation		tmertiri: new sq diagram
December 2, 2020	**1.4**		
	STR-296325/B-Functional Definition		tmertiri: added new fun for CTA180
	CTA-FUN-REQ-400057/A-CTA180		tmertiri: part of new function. CTA180
	809095/A-Overview		tmertiri: part of new function. CTA180
	809047/A-Functional Requirements		tmertiri: part of new function. CTA180
	CTA-REQ-400064/A-CTA180 Available		tmertiri: part of new function. CTA180
	CTA-REQ-400060/A-SplitView Initialization		tmertiri: part of new function. CTA180
	CTA-REQ-400061/A-SplitView Timer		tmertiri: part of new function. CTA180
	CTA-REQ-404113/A-Split View Exit		tmertiri: part of new function, CTA180
	809050/A-Use Cases		tmertiri: part of new function. CTA180
	CTA-UC-REQ-404104/A-CTA Split View Switching to be not available		tmertiri: new usecase, part of new function CTA180
	CTA-UC-REQ-404105/A-CTA Split View Switching with CTA Alert(s)		tmertiri: new usecase, part of new function CTA180
	CTA-UC-REQ-404106/A-CTA Split View Switching Back to Normal view after CTA Alert(s)		tmertiri: new usecase, part of new function CTA180
	CTA-UC-REQ-404107/A-CTA Split View Switching with CTA with Braking		tmertiri: new usecase, part of new function CTA180
	CTA-UC-REQ-404108/A-CTA Split View Switching Back to Normal after CTA with Braking		tmertiri: new usecase, part of CTA180

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1 Architectural Design

1.1 Overview

Cross Traffic Alert (CTA) is a feature that provides user assistance while the vehicle is in Reverse gear. Input signals for this feature are from side mounted radar sensors. The signal is periodic. Upon receiving a message indicating that the sensors have detected an incoming vehicle. Sync shall display an icon indicating from which direction the obstruction is detected and display relevant icon (one side or both if applicable) for as long as the signals are being sent by the sensors.

1.2 CTA-CLD-REQ-195204/A-CTA Client

Responsibility: The CTA (Cross Traffic Alert) Client is responsible for displaying the sensor information to the vehicle user.

1.3 CTA-CLD-REQ-195205/A-CTA Server

Responsibility: The CTA (Cross Traffic Alert) Server is responsible for supplying sensor data to the display.

1.4 Logical Signal Mapping

The CAN signals mentioned throughout this document shall refer to the CAN signal's logical name. The logical names shall be mapped to their actual CAN signal names. Please use the table below to perform the mapping. The InfoCAN database file is the master file for the actual CAN signal names. Note: some CAN signals referenced throughout this document may use the logical name while some may use the actual CAN signal name.

Logical Name	CAN Signal Name
CTAAlert_St(Left = Off, Right = On)	CtaAlrtRight_D_Stat
CTAAlert_St(Left = On, Right = Off)	CtaAlrtLeft_D_Stat
LCtaBrkLeft	CtaBrkLeftMsgTxt_B_Rq
LCtaBrkRight	CtaBrkRightMsgTxt_B_Rq

Table. Logical name/CAN signal mapping

1.5 CTA-IIR-REQ-195214/B-CrossTrafficAlertClient_Rx

1.5.1 MD-REQ-195213/A-CTAAlert_St

Message Type: Status

This signal is used to inform the CrossTrafficAlertClient the current state of the CTA signal.

Name	Literals	Value	Description
Left			
	Off	0x0	No vehicle detected.
	On	0x1	A vehicle is detected sideways.
Right			
	Off	0x0	No vehicle detected.
	On	0x1	A vehicle is detected sideways.

1.5.2 MD-REQ-392860/A-LCtaBrkLeft

LCtaBrkLeft: this signal is sent form the server to the client to indicate when CTA with braking left side detection has stopped the vehicle.

Configuration	Parameter Description
0x0	Disable- Braking is not active currently
0x1	Enable: Braking is currently active

1.5.3 MD-REQ-392861/A-LCtaBrkRight

LCtaBrkRight : this signal is sent form the server to the client to indicate when CTA with braking right side detection has stopped the vehicle.

Configuration	Parameter Description
0x0	Disable- Braking is not active currently
0x1	Enable: Braking is currently active

2 General Requirements

2.1 CTA-REQ-195286/A-Client notification

SOD sensors CTA feature generates the periodic signal to indicate whether or not there is any incoming vehicle on the left or right side. Upon detecting such signal, the client will display proper notification icon on the display depending on which side the incoming vehicle has been detected.

2.2 CTA-REQ-198035/B-Missing Signal

If any signals are missing such as any of the below:
CTAAlert_St (CtaAlrtLeft_D_Stat or CtaAlrtRight_D_Stat) or LCtaBrkLeft or LCtaBrkRight for more than a defined period of time, as specified in the Diagnostic Spec, the Cross Traffic Alert Client shall not display any CTA icons, regardless of their previous state.

2.3 CTA-REQ-392984/A-CTA with Brakes

Some vehicles may not have CTAAlert signals in them due to the transmit module missing. For some of those vehicles, to still have a functioning CTA, the client is to make use of LCtBrkLeft and LCtaBrkRight signals (when those signals are present in the bus).

3 Functional Definition

3.1 CTAv1-FUN-REQ-195228/A-CTA

3.1.1 Use Cases

3.1.1.1 CTA-UC-REQ-194519/A-Cross Traffic Alert Right and Left Activation

Actors	Vehicle Occupant
Pre-conditions	The infotainment system is powered on. The ignition status is Run/Start.
Scenario Description	The driver activates the Cross Traffic Alert (CTA) by placing the vehicle in Reverse Gear. An incoming car is detected by the vehicle right & left sensors.
Post-conditions	The vehicle display shows the right and left side CTA Icon
List of Exception Use Cases	
Interfaces	G-HMI Vehicle System Interface

3.1.1.2 CTA-UC-REQ-194520/A-Cross Traffic Alert No Activation

Actors	Vehicle Occupant
Pre-conditions	The infotainment system is powered on. The ignition status is Run/Start.
Scenario Description	The driver activates the Cross Traffic Alert (CTA) by placing the vehicle in Reverse Gear. No incoming car is detected by the vehicle sensor
Post-conditions	The vehicle display does not lit any CTA Icon
List of Exception Use Cases	
Interfaces	G-HMI Vehicle System Interface

3.1.1.3 CTA-UC-REQ-194518/A-Cross Traffic Alert Left Activation

Actors	Vehicle Occupant
Pre-conditions	The infotainment system is powered on. The ignition status is Run/Start.
Scenario Description	The driver activates the Cross Traffic Alert (CTA) by placing the vehicle in Reverse Gear. An incoming car is detected by the vehicle left sensor.
Post-conditions	The vehicle display shows the left side CTA Icon
List of Exception Use Cases	
Interfaces	G-HMI Vehicle System Interface

3.1.1.4 CTA-UC-REQ-194511/A-Cross Traffic Alert Right Activation

Actors	Vehicle Occupant
Pre-conditions	The infotainment system is powered on. The ignition status is Run/Start.

Scenario Description	The driver activates the Cross Traffic Alert (CTA) by placing the vehicle in Reverse Gear. An incoming car is detected by the vehicle right sensor.
Post-conditions	The vehicle display shows the right side CTA Icon
List of Exception Use Cases	
Interfaces	G-HMI Vehicle System Interface

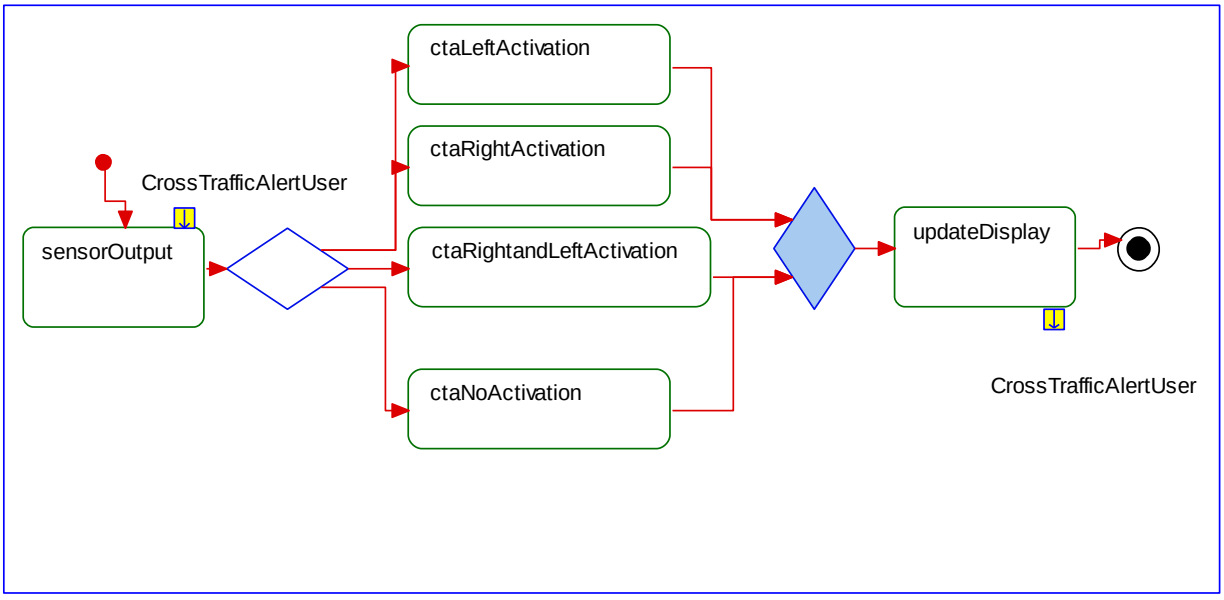
3.1.1.5 CTA-UC-REQ-393443/A-CTA With Braking Activation

Actors	Vehicle Occupant
Pre-conditions	The infotainment system is powered on. The ignition status is Run/Start.
Scenario Description	The driver activates the Cross Traffic Braking system by placing the vehicle in Reverse Gear. An incoming car is detected by either or both Cross Traffic Braking Sensors.
Post-conditions	The vehicle display shows the Cross Traffic Braking HMI.
List of Exception Use Cases	
Interfaces	G-HMI Vehicle System Interface

3.1.2 White Box Views

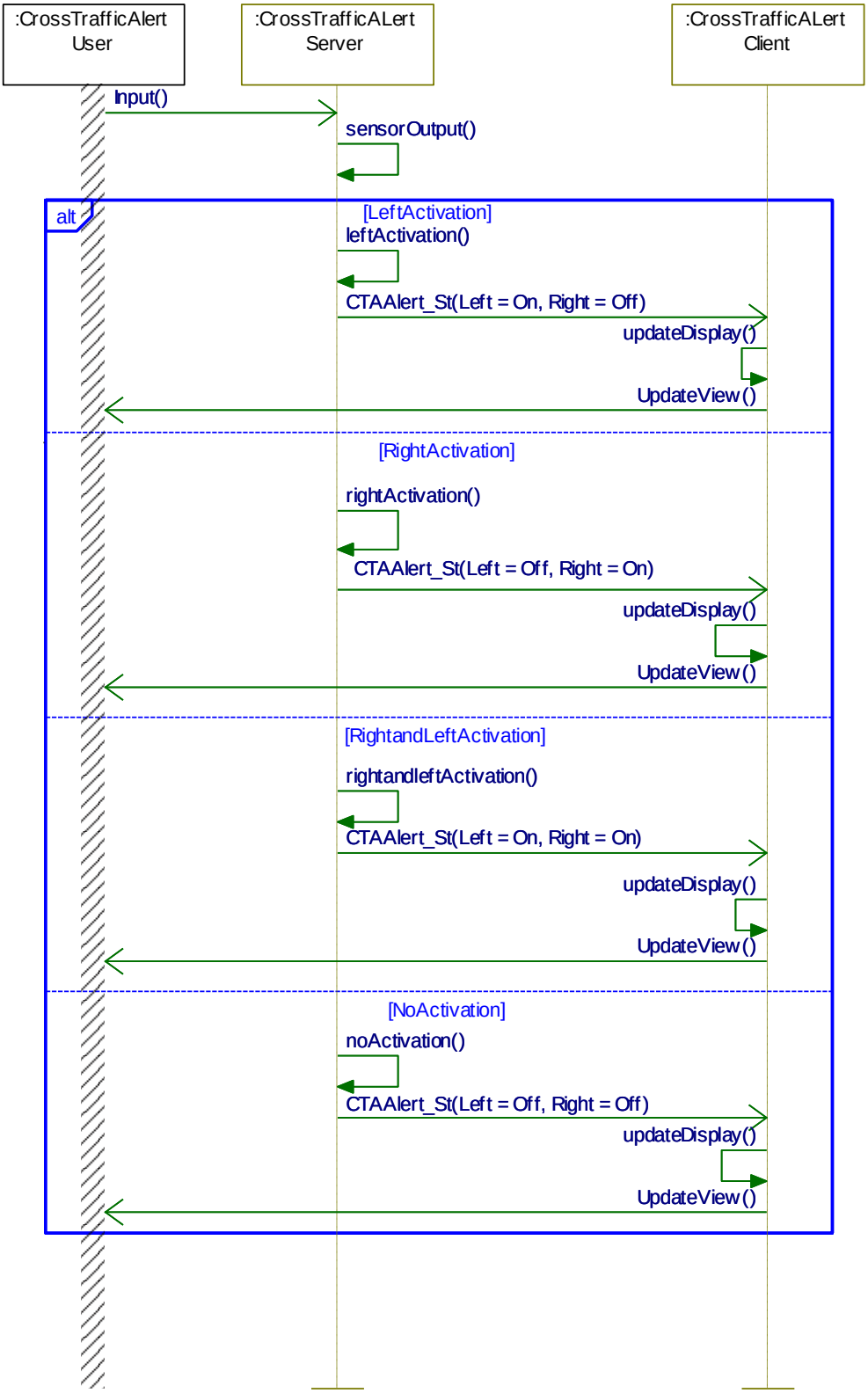
3.1.2.1 Activity Diagrams

3.1.2.1.1 CTA-ACT-REQ-194529/A-Cross Traffic Alert Activation

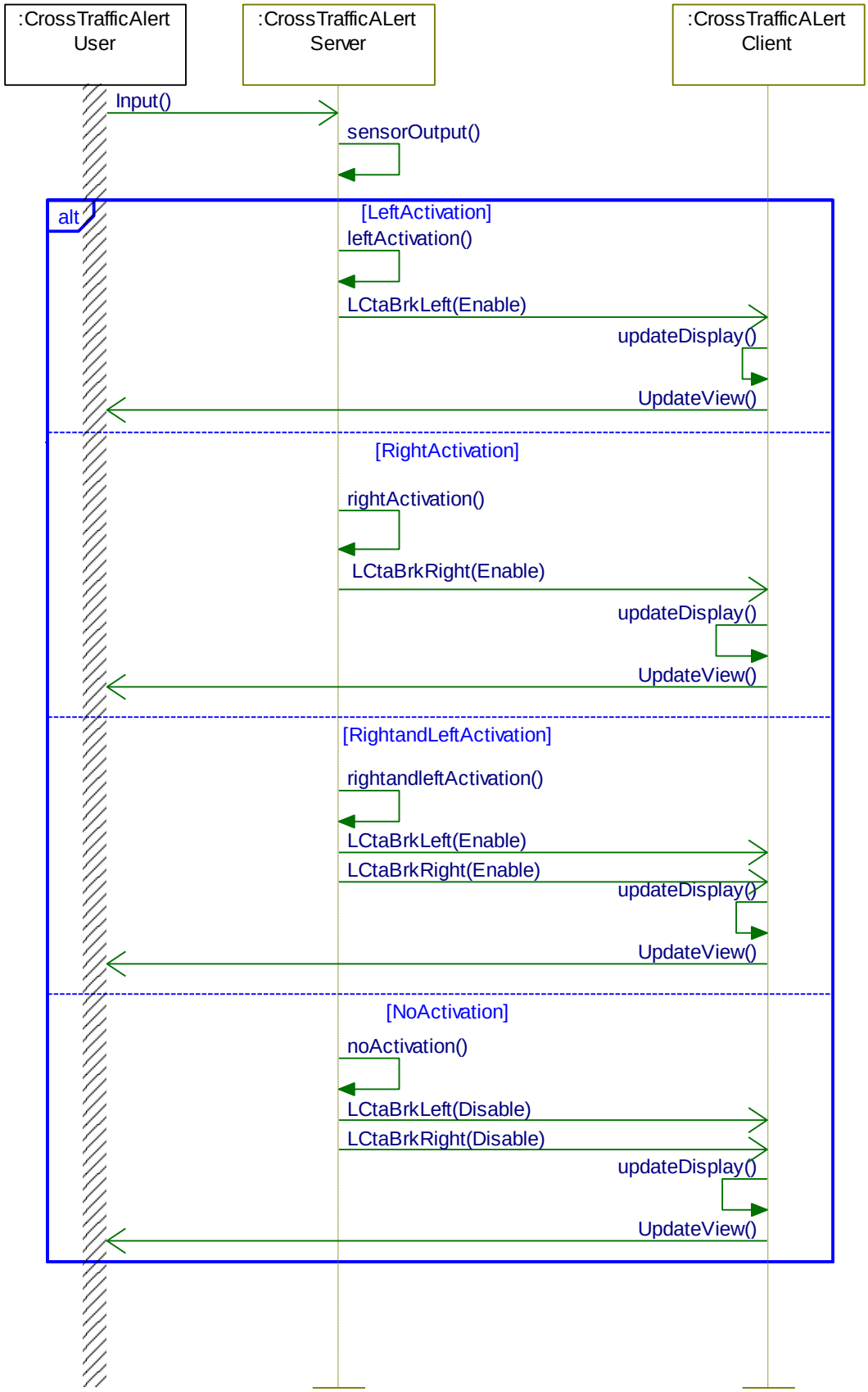


3.1.2.2 Sequence Diagrams

3.1.2.2.1 CTA-SD-REQ-194667/A-Cross Traffic Alert Activation



3.1.2.2.2 CTA-SD-REQ-392878/A-CTA with RBA Activation



3.2 CTA-FUN-REQ-400057/A-CTA180

3.2.1 Overview

CTA180 is a camera function that is available only in vehicles with CTA active and only if this function is configured. It enables SplitView whenever any of CTA signals become active and trigger. The client requests a split view to camera server and the camera server updates the RVC to RVC split view thus providing a “wide angle” view to the user. Upon CTA warning being turned off due to no further activity in the rear of the vehicle, the view will change to rear Normal after a specific timer expires.

This function has requirements that touch camera feature domain. To avoid spec duplication, the consumers of this function shall refer to Stand Alone Rear View Camera SPSS for any Split View requirements or other camera requirements.

3.2.2 Functional Requirements

3.2.2.1 CTA-REQ-400064/A-CTA180 Available

This function and its requirements shall be mandatory on the clients that have been configured with CTA180 as Active.

3.2.2.2 CTA-REQ-400060/A-SplitView Initialization

Whenever a client receives any of the signals CtaAlrtRight_D_Stat (On) , CtaAlrtLeft_D_Stat(On), CtaBrkLeftMsgTxt_B_Rq (Enable), CtaBrkRightMsgTxt_B_Rq(Enable) with parameters as noted, the client shall request SplitView active to the Camera Server. The client shall transmit CamraViewSplit_B_Rq (On) .

3.2.2.3 CTA-REQ-400061/A-SplitView Timer

For as long as any of the signals CtaAlrtRight_D_Stat (On) , CtaAlrtLeft_D_Stat(On), CtaBrkLeftMsgTxt_B_Rq (Enable), CtaBrkRightMsgTxt_B_Rq(Enable) come with the parameters as noted, The client shall request and disaply Split View.

When all signals are back to default (CtaAlrtRight_D_Stat (Off) , CtaAlrtLeft_D_Stat(Off), CtaBrkLeftMsgTxt_B_Rq (Disable), CtaBrkRightMsgTxt_B_Rq(Disable) , the client shall start a timer. Upon that timer termination, the client shall request Rear Normal View to camera server.

If during this timer counter , any of the signals come with On or Enable, the client requests Rear Split View and the timer is reset.

3.2.2.4 CTA-REQ-404113/A-Split View Exit

When timer expires or when client wants to get out of split view, such as when going out of reverse gear, client shall send signal CamraViewSplit_B_Rq (0x0).

3.2.3 Use Cases

3.2.3.1 CTA-UC-REQ-404104/A-CTA Split View Switching to be not available

Actors	Vehicle Occupant
Pre-conditions	• CLIENT has Config for CtaSV Configuration set to “Disabled” • Vehicle is shifted to REVERSE gear
Scenario Description	CTA Alert is triggered
Post-conditions	CLIENT functions without requesting Split View
List of Exception Use Cases	E1 – Vehicle is not RUN/START E2 – Loss of communication with IPMB module E3 – Valid camera video signal not present E4 – User switches to Rear Split View manually by selecting the soft button
Interfaces	

3.2.3.2 CTA-UC-REQ-404105/A-CTA Split View Switching with CTA Alert(s)

Actors	Vehicle Occupant
Pre-conditions	• CLIENT has Config for CtaSV Configuration set to “Enabled” • Vehicle is shifted to REVERSE gear
Scenario Description	CLIENT receives CTA alert trigger(s)
Post-conditions	CLIENT requests split view
List of Exception Use Cases	E1 – Vehicle is not RUN/START E2 – Loss of communication with IPMB module E3 – Valid camera video signal not present
Interfaces	

3.2.3.3 CTA-UC-REQ-404106/A-CTA Split View Switching Back to Normal view after CTA Alert(s)

Actors	Vehicle Occupant
Pre-conditions	• CLIENT has Config for CtaSV Configuration set to “Enabled” • CTA Alert is active • Split View is currently active
Scenario Description	CTA Alert(s) no longer active
Post-conditions	1. CLIENT starts a timer (for the configured value) after the CTA Trigger is no longer active 2. After the configured timer has expired, CLIENT requests split view off
List of Exception Use Cases	E1 – Vehicle is not RUN/START E2 – Loss of communication with IPMB module E3 – Valid camera video signal not present E4- CTA with brake triggered
Interfaces	

3.2.3.4 CTA-UC-REQ-404107/A-CTA Split View Switching with CTA with Braking

Actors	Vehicle Occupant
Pre-conditions	• CLIENT has Config for CtaSV Configuration set to “Enabled” • Vehicle is shifted to REVERSE gear
Scenario Description	CLIENT receives CTA with Brake trigger(s)
Post-conditions	CLIENT requests split view
List of Exception Use Cases	E1 – Vehicle is not RUN/START E2 – Loss of communication with IPMB module E3 – Valid camera video signal not present
Interfaces	

3.2.3.5 CTA-UC-REQ-404108/A-CTA Split View Switching Back to Normal after CTA with Braking

Actors	Vehicle Occupant
Pre-conditions	• CLIENT has Config for CtaSV Configuration set to “Enabled”

	• CTA Emergency Braking trigger(s) is active • Split View is currently active
Scenario Description	CTA brake activation is no longer active.
Post-conditions	1. CLIENT starts a timer (for the configured value) after the CTA Trigger is no longer active 2. After the configured timer has expired, CLIENT requests split view off
List of Exception Use Cases	E1 – Vehicle is not RUN/START E2 – Loss of communication with IPMB module E3 – Valid camera video signal not present E4 – CTA Alert Triggered
Interfaces	

4 Appendix: Reference Documents

Reference #	Document Title
1	
2	
3	
4	
5	