Research & Vehicle Technology
"Infotainment Systems Product Development"

Feature – Volume

APIM Infotainment Subsystem Part Specific Specification (SPSS)

Version 1.3

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FORD CONFIDENTIAL

Revision History

Date	Version	Notes	
May 30, 2013	**1.0**	**Initial Release**	
June 5, 2014	**1.1**	**Updated Release**	
	VOL-FUR-REQ-014819/A-Volume Attenuation/Restoration (TcSE ROIN-27919-9)		jmyslin2/SORRIS1 - updated for eCall volume
	VOL-FUR-REQ-014819/D-Volume Attenuation/Restoration (TcSE ROIN-27919-9)		2014-03-17 DWALUS: Revised from TCsE to VSEM format.
	VOL-UC-REQ-014827/C-Increase Media Volume (TcSE ROIN-290273-1)		2014-03-17 DWALUS: Revised from TCsE to VSEM format.
	VOL-UC-REQ-014829/C-Decrease Media Volume (TcSE ROIN-290395-1)		2014-03-17 DWALUS: Revised from TCsE to VSEM format.
	VOL-UC-REQ-014833/C-Adjust Phone Volume (TcSE ROIN-290402-1)		2014-03-17 DWALUS: Revised from TCsE to VSEM format.
	VOL-UC-REQ-014834/C-Adjust TA Volume (TcSE ROIN-290403-1)		2014-03-17 DWALUS: Revised from TCsE to VSEM format.
	VOL-UC-REQ-014836/C-Infotainment System exits TA Mode with storing (TcSE ROIN-290404-1)		2014-03-17 DWALUS: Revised from TCsE to VSEM format.
	VOL-UC-REQ-014837/C-Infotainment System exits TA Mode without storing (TcSE ROIN-290405-1)		2014-03-17 DWALUS: Revised from TCsE to VSEM format.
	VOL-UC-REQ-014843/C-Activating the Feature Volume at the Media Volume (TcSE ROIN-291882-1)		2014-03-17 DWALUS: Revised from TCsE to VSEM format.
	VOL-SR-REQ-014858/C-Module specific volume requirements (TcSE ROIN-110928-5)		<jmyslin2> Updated so Volume Setting Client can receive SetVolume from Rear Seat Controller and the Volume Setting Client (ex SYNC Gen 3) transmits the SetVolume to the Volume Setting Server
April 29, 2015	**1.2**	**Updated Release**	
	VOLv2-UC-REQ-014842/C-Activating the Upper Feature Volume Border (TcSE ROIN-291881-1)		2015-01-28 MDAGE: Removed TA from this use case and pre-condition that media volume is lower than feature volume upper border. Added pre-condition that feature source is not currently active.
	VOLv2-UC-REQ-014845/C-Activating the Feature Volume at the last Feature Volume Level (TcSE ROIN-291883-1)		2015-01-28 MDAGE: Removed pre-condition that media volume had to be below feature volume and removed TA from this use-case. Added pre-condition that feature source is not currently active.
	VOLv2-UC-REQ-014846/C-Activating the Lower Volume Border (TcSE ROIN-291885-1)		2015-01-28 MDAGE: Removed TA from this use-case and pre-condition that media volume is below feature volume lower border. Added pre-condition that feature source is not currently active.
	VOLv2-UC-REQ-129751/A-Activating the TA Feature Volume at the last Feature Volume Level		2015-01-28 MDAGE: Initial release
	VOLv2-UC-REQ-129752/A-Activating the TA Lower Volume Border		2015-01-28 MDAGE: Initial Release
	VOLv2-UC-REQ-129753/A-Activating the TA Upper Feature Volume Border		2015-01-18 MDAGE: Initial Release
	VOL-SR-REQ-014857/C-Manual Audio Mute (TcSE ROIN-205228-2)+		<jmyslin2 / Nor Von wahl (HMI team)> Updated requirement so that the volume is increased from the volume right before the manual audio mute per the HMI team.
	VOL-SR-REQ-014858/G-Module specific volume requirements (TcSE ROIN-110928-5)		<jmyslin2> Updated for LIN ICP connected to system master (ex CHR/APIM Gen 3)
January 31, 2018	**1.3**	**Updated Release**	
	VOL-SR-REQ-292289/A-Volume Press and Hold Error Handling		<jmyslin2> New Requirement
	VOL-TMR-REQ-292290/A-T_Vol_RBAP_Timeout		<jmyslin2> New Requirement
	VOL-SR-REQ-014858/G-Module specific volume requirements (TcSE ROIN-110928-5)		<jmyslin2> Updated for LIN ICP connected to system master (ex CHR/APIM Gen 3)
	MD-REQ-275444/A-SetVolume+		<jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update

	MD-REQ-275444/B-SetVolume	<jmyslin2> Updated signal description
	MD-REQ-276034/A-SetVol_Level	<jmyslin2> Updated signal description
	MD-REQ-276074/A-SetVol_Source	<jmyslin2> Updated signal description
	MD-REQ-276073/A-SetVolume (LIN network only)	<jmyslin2> Updated signal description
	MD-REQ-276097/A-Audio_Vol_Level	<jmyslin2> Updated signal description
	MD-REQ-276098/A-Audio_Vol_Updated	<jmyslin2> Updated signal description
	MD-REQ-276184/A-Phone_Vol_Level	<jmyslin2> MD for signal
	MD-REQ-276185/A-Phone_Vol_Updated	<jmyslin2> MD for Phone
	MD-REQ-276186/A-Prompt_Vol_Level	<jmyslin2> MD for signal
	MD-REQ-276187/A-Prompt_Vol_Updated	<jmyslin2> MD for Phone
	MD-REQ-276188/A-TA_Vol_Level	<jmyslin2> MD for signal
	MD-REQ-276189/A-TA_Vol_Updated	<jmyslin2> MD signal
	MD-REQ-276190/A-VR_Vol_Level	<jmyslin2> MD for signal
	MD-REQ-276191/A-VR_Vol_Updated	<jmyslin2> MD signal
	VOL-FUR-REQ-026147/C-Press & Hold Volume Control MFD / APIM (TcSE ROIN-202657-2)	<jmyslin2> added tolerance
	VOL-FUR-REQ-014819/H-Volume Attenuation/Restoration (TcSE ROIN-27919-9)+	2016-05-19 MDAGE: Changed Attenuation 5 from volume step 7 to volume step 5 to correct a misinterpretation of gain vs attenuation which led to the previous change.
	VOL-FUR-REQ-014819/I-Volume Attenuation/Restoration (TcSE ROIN-27919-9)	2017-08-23 MDAGE: Removed statement that attenuation levels shall be maintained in a calibration file.
	VOL-SR-REQ-014851/D-Volume Setting Server Incrementing Volume via the EFP/ECP and SWC (TcSE ROIN-39827-2)	<jmyslin2> added clarification for the requirement for CGEA 1.2 only. No content change
	VOL-SR-REQ-014857/E-Manual Audio Mute (TcSE ROIN-205228-2)	<jmyslin2> Per the HMI team (Nora Von wahl / Karl Vandivier) and core audio (Dan Lebioda / Matt Dage) a volume down will cancel a manual audio mute (not just a volume up).

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1 Architectural Design

1.1 Volume Control Interface Requirements

1.1.1 MD-REQ-275444/B-SetVolume

Message Type: Request

Signal for incrementing / decrementing volume (used with a rotary volume knob)

Logical Signal Name	Literals	Value	Description
SetVolume	-30 steps	0x0	
	-29 steps	0x1	
	-28 steps	0x2	
	…continued		
	-2 steps	0x1C	
	-1 step	0x1D	Decrements volume
	Not Pressed / Inactive	0x1E	
	+1 step	0x1F	Increments volume
	+2 steps	0x20	
	+3 steps	0x21	
	…continued		
	+30 steps	0x3C	

1.1.2 MD-REQ-276034/A-SetVol_Level

Message Type: Request

Signal for selecting a particular volume level

Logical Signal Name	Literals	Value	Description
SetVol_Level	Not Pressed / Inactive	0x0	Note: also called SetPointVolume in some SPSS features
	No Volume	0x1	
	Vol_Step1	0x2	
	Vol_Step2	0x3	
	Vol_Step3	0x4	
	Continued		
	Vol_Step30	0x1F	

1.1.3 MD-REQ-276074/A-SetVol_Source

Message Type: Request

Signal for commanding the Volume Settings Server what source volume to adjust.

Logical Signal Name	Literals	Value	Description
SetVol_Source	Inactive	0x0	This has to be in the same message as the SetVol_Level.Rq and SetVolume.Rq signals that are to be used with this signal.
	SetTAVolume	0x1	
	SetPromptVolume	0x2	
	SetPhoneVolume	0x3	
	SetVRVolume	0x4	

	SetAudioVolume	0x5	

1.1.4 MD-REQ-276073/A-SetVolume (LIN network only)

Message Type: Request

LIN signal (as opposed to CAN) for incrementing / decrementing volume (used with a rotary volume knob)

Logical Signal Name	Literals	Value	Description
SetVolume (LIN network only)	-7 steps	0x0	
	-6 steps	0x1	
	-5 steps	0x2	
	cont.		
	-2 steps	0x5	
	-1 steps	0x6	Decrements volume
	Not Pressed / Inactive	0x7	
	+1 steps	0x8	Increments volume
	+2 steps	0x9	
	cont.		
	+5 steps	0xC	
	+6 steps	0xD	
	+7 steps	0xE	

1.1.5 MD-REQ-276097/A-Audio_Vol_Level

Message Type: Status

Signal from the Volume Setting Server indicating the volume level for the media sources (ex. Radio, CD, USB, Sat, Aux…).

Logical Signal Name	Literals	Value	Description
Audio_Vol_Level	No Volume	0x0	
	Vol_Step1	0x1	
	Vol_Step2	0x2	
	Vol_Step3	0x3	
	cont.		
	Vol_Step30	0x1E	

1.1.6 MD-REQ-276098/A-Audio_Vol_Updated

Message Type: Status

Signal from the Volume Setting Server to indicate if the media volume is being updated for the HMI.

Logical Signal Name	Literals	Value	Description
Audio_Vol_Updated	No Update	0x0	This signal needs to be in the same message as the Audio_Vol_Level.St signal.
	Updated	0x1	

1.1.7 MD-REQ-276184/A-Phone_Vol_Level

Message Type: Status

Signal from the Volume Setting Server indicating the volume level for the Phone source

Logical Signal Name	Literals	Value	Description
Phone_Vol_Level	No Volume	0x0	
	Vol_Step1	0x1	
	Vol_Step2	0x2	
	Vol_Step3	0x3	
	cont.		
	Vol_Step30	0x1E	

1.1.8 MD-REQ-276185/A-Phone_Vol_Updated

Message Type: Status

Signal from the Volume Setting Server to indicate if the phone volume is being updated for the HMI.

Logical Signal Name	Literals	Value	Description
Phone_Vol_Updated	No Update	0x0	This signal needs to be in the same message as the Phone_Vol_Level.St signal.
	Updated	0x1	

1.1.9 MD-REQ-276186/A-Prompt_Vol_Level

Message Type: Status

Signal from the Volume Setting Server indicating the volume level for the mixable prompt source

Logical Signal Name	Literals	Value	Description
Prompt_Vol_Level	No Volume	0x0	
	Vol_Step1	0x1	
	Vol_Step2	0x2	
	Vol_Step3	0x3	
	cont.		
	Vol_Step30	0x1E	

1.1.10 MD-REQ-276187/A-Prompt_Vol_Updated

Message Type: Status

Signal from the Volume Setting Server to indicate if the mixable prompt volume is being updated for the HMI.

Logical Signal Name	Literals	Value	Description
Prompt_Vol_Updated	No Update	0x0	This signal needs to be in the same message as the Prompt_Vol_Level.St signal.
	Updated	0x1	

1.1.11 MD-REQ-276188/A-TA_Vol_Level

Message Type: Status

Signal from the Volume Setting Server indicating the volume level for the TA (Traffic Announcement) source

Logical Signal Name	Literals	Value	Description
TA_Vol_Level	No Volume	0x0	

	Vol_Step1	0x1	
	Vol_Step2	0x2	
	Vol_Step3	0x3	
	cont.		
	Vol_Step30	0x1E	

1.1.12 MD-REQ-276189/A-TA_Vol_Updated

Message Type: Status

Signal from the Volume Setting Server to indicate if the TA volume is being updated for the HMI.

Logical Signal Name	Literals	Value	Description
TA_Vol_Updated	No Update	0x0	This signal needs to be in the same message as the TA_Vol_Level.St signal.
	Updated	0x1	

1.1.13 MD-REQ-276190/A-VR_Vol_Level

Message Type: Status

Signal from the Volume Setting Server indicating the volume level for the VR (Voice Recognition) source

Logical Signal Name	Literals	Value	Description
VR_Vol_Level	No Volume	0x0	
	Vol_Step1	0x1	
	Vol_Step2	0x2	
	Vol_Step3	0x3	
	cont.		
	Vol_Step30	0x1E	

1.1.14 MD-REQ-276191/A-VR_Vol_Updated

Message Type: Status

Signal from the Volume Setting Server to indicate if the VR volume is being updated for the HMI.

Logical Signal Name	Literals	Value	Description
VR_Vol_Updated	No Update	0x0	This signal needs to be in the same message as the VR_Vol_Level.St signal.
	Updated	0x1	

1.2 VOL-CLD-REQ-014813/B-Volume Button Input Client (Volume Button Transmitter) (TcSE ROIN-202553-1)

The Volume Button Input Client is the volume button press interface for the volume function

1.3 VOL-CLD-REQ-026161/A-Volume Settings Server (TcSE ROIN-202554-1)

The Volume Settings Server is responsible for controlling the volume output level.

1.4 VOL-CLD-REQ-026160/A-Volume Settings Client - SYNC (TcSE ROIN-202654-2)

The Volume Settings Client is the interface of the Volume Settings function as called out in the SPSS and as the interface for the volume HMI Output.

1.4.1 VOL-FUR-REQ-026147/C-Press & Hold Volume Control MFD / APIM (TcSE ROIN-202657-2)

When the volume Steering Wheel Controls are hardwired to the MFD / APIM then the MFD / APIM shall support the press and hold volume feature.

When the CAN volume button presses are sent to the MFD / APIM that result in the MFD / APIM sending the SetVolume signal to the Volume Settings Server then the MFD / APIM shall support press and hold volume feature. See requirement "VOLSYS-GREQ-014858-Module specific volume requirements" for when the MFD / APIM sends the SetVolume signal.

The MFD / APIM shall send a single SetVolume increment / decrement to the Volume Settings Server when the volume button press the MFD / APIM receives is initially pressed.

When the volume button is held longer than Tvolume_button_held then the MFD / APIM shall increment / decrement the SetVolume signal to the Volume Settings Server every 100 milliseconds (+/- 10%) the until the button is released.

1.4.2 VOL-TMR-REQ-014823/C-Volume Button Held Timer (TcSE ROIN-169727-3)

Name	Description	Units	Range	Resolution	Default
Volume Button Held Timer	Tvolume_button_held is a timer used to determine if the volume button (from steering wheel controls, etc) has been held. Note: Use the default value	msec	200 - 2000	100	500

1.4.3 VOL-FUR-REQ-014819/I-Volume Attenuation/Restoration (TcSE ROIN-27919-9)

Audio Volume Attenuation

The AHU/DSP amp shall meet the following requirements when receiving an *Attn_Info_Audio_* request:

- Audio Attenuation for chimes (ex. IPC_Infotainment : Attn_Info_Audio) shall apply to both the active audio source (media, phone, VR, TA, Resource Update Prompts) and alerts (SYNC prompts and beeps).
  Exception: Audio Attenuation for chimes shall not apply to emergency phone call conditions as defined in ~~FAS-E911-GREQ-285276-2-Emergency Phone Call Conditions~~EASSIST-SR-REQ-014809-Emergency Phone Call Conditions
  Note: for beeps at a minimum Attenuation 6 shall be supported (full mute). Reference applicable beep attenuation requirements/specifications if Attenuation 1 – Attenuation 5 are supported for beeps.
- Audio Attenuation for prompts (from the prompt generator – ex SYNC) shall apply to only the active audio source (media, phone, VR, TA) and shall NOT attenuate prompts, chimes and beeps.
  Exception: Audio Attenuation for prompts shall not apply to emergency phone call conditions as defined in ~~FAS-E911-GREQ-285276-2-Emergency Phone Call Conditions~~ EASSIST-SR-REQ-014809-Emergency Phone Call Conditions
- The audio volume shall only be attenuated if the level is above the specified attenuation level (Table 8.4.14).
- The volume shall not be user-adjustable during a Full Mute Audio Volume Attenuation event, unless otherwise noted. Upon exiting a full mute Audio Volume Attenuation event, the volume shall either be restored to the level just prior to the Audio Volume Attenuation event or to the next highest Audio Volume Attenuation level if another attenuation request is active.
- If the volume is NOT user adjusted during an Audio Volume Attenuation event, upon exiting, the volume shall either be restored to the level just prior to the Audio Volume Attenuation event or to the next highest Audio Volume Attenuation level if another attenuation request is active.
- If the user adjusts the volume during a partial Audio Volume Attenuation or Audio Volume Restoration event, the Audio Volume Attenuation or Audio Volume Restoration shall be cancelled and the volume level shall follow the user adjustment, except as noted above for a full mute attenuation.

- The AHU/DSP shall meet the Audio Volume Restoration requirements when transitioning to a new attenuation level.

~~The Audio Volume Attenuation levels defined below shall be maintained in a calibration file.~~

Table 8.4.14

Attenuation Level	Volume Step	Volume relative from max (0 dB)
Attenuation 0	No Attenuation	No Attenuation
Attenuation 1	18	-15.50 dB
Attenuation 2	15	-20.75 dB
Attenuation 3	13	-24.75 dB
Attenuation 4	12	-27.00 dB
Attenuation 5	~~5~~7	-~~40~~8.~~7~~25 dB
Attenuation 6	Full Mute	Full Mute
Unknown	No Attenuation	No Attenuation

Audio Volume Restoration
When an Audio Volume Attenuation changes to a less restrictive audio attenuation level, the AHU/DSP shall restore the volume level ~~at a rate of 50 msec/volume step.~~ as defined in SPSS requirement "VOL-FUR-REQ-088208-Audio Attenuation/Restoration".

Audio Volume Attenuation Fault Conditions
If the above signal is not received for 5 seconds or the signal state is set to 0x7 (Unknown), the AHU/DSP shall default to a "No Attenuation" condition.

2 Functional Definition

2.1 VOL-FUN-REQ-014826/A-Volume Control (TcSE ROIN-120283-1)

2.1.1 Use Cases

2.1.1.1 VOL-UC-REQ-014827/D-Increase Media Volume (TcSE ROIN-290273-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON Media source is active (ex CD, USB, AM/FM…)
Scenario Description	User selects <Increase Volume> via HMI. The infotainment system adjusts the media volume setting. HMI indicates {Media Volume Level} as level is being adjusted.
Post-conditions	HMI indicates final {Media Volume Setting}. The infotainment system will operate with updated media volume level.
List of Exception Use Cases	VOL-UC-REQ-014828-Increase Media Volume - Volume currently set to maximum
Interfaces	G-HMI, CBI, SWC

2.1.1.2 VOL-UC-REQ-014828/B-Increase Media Volume - Volume currently set to maximum (TcSE ROIN-290275-1)

Linked Elements
VOL-UC-REQ-014827/D-Increase Media Volume (TcSE ROIN-290273-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON Media source is active (ex CD, USB, AM/FM…) Media volume is currently at max volume
Scenario Description	User selects <Increase Volume> via HMI.
Post-conditions	Media Volume setting remains unchanged. HMI indicates {Media Volume Setting}.
List of Exception Use Cases	N/A
Interfaces	G-HMI, CBI, SWC

2.1.1.3 VOL-UC-REQ-014829/D-Decrease Media Volume (TcSE ROIN-290395-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON Media source is active (ex CD, USB, AM/FM…)
Scenario Description	User selects <Decrease Volume> via HMI. The infotainment system adjusts the media volume setting. HMI indicates {Media Volume Level} as level is being adjusted.
Post-conditions	HMI indicates final {Media Volume Setting}. The infotainment system will operate with updated media volume level.
List of Exception Use Cases	VOL-UC-REQ-014830-Decrease Media Volume - Volume currently set to minimum
Interfaces	G-HMI, CBI, SWC

2.1.1.4 VOL-UC-REQ-014830/B-Decrease Media Volume - Volume currently set to minimum (TcSE ROIN-290396-1)

Linked Elements
VOL-UC-REQ-014829/D-Decrease Media Volume (TcSE ROIN-290395-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON Media source is active (ex CD, USB, AM/FM…) Media volume is currently at minimum volume (no volume)
Scenario Description	User selects <Decrease Volume> via HMI.
Post-conditions	Volume setting remains unchanged. HMI indicates {Media Volume Setting}.
List of Exception Use Cases	N/A
Interfaces	G-HMI, CBI, SWC

2.1.1.5 VOL-UC-REQ-014831/D-Adjusts Voice Recognition (VR) Volume (TcSE ROIN-290398-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON VR is the active audio source
Scenario Description	User selects <Increase/Decrease Volume> via HMI. The infotainment system adjusts the VR volume setting. HMI indicates {VR Volume Level} as level is being adjusted.
Post-conditions	HMI indicates final {VR Volume Setting}. The infotainment system will operate with updated VR volume level.
List of Exception Use Cases	Reference the Media volume use case exceptions (currently at min and max volume) which applies to all volume sources (Media, VR, Prompts, Phone, TA) E1- VOL-GUC-290275-Increase Media Volume - Volume currently set to maximum E2 - VOL-GUC-290396-Decrease Media Volume - Volume currently set to minimum
Interfaces	G-HMI, CBI, SWC

2.1.1.6 VOL-UC-REQ-014832/C-Adjust Prompt Volume (TcSE ROIN-290401-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON Mixable Prompt are the active audio source (ex navigation prompts, TTS…)
Scenario Description	User selects <Increase/Decrease Volume> via HMI. The infotainment system adjusts the Prompt volume setting. HMI indicates {Prompt Volume Level} as level is being adjusted.
Post-conditions	HMI indicates final {Prompt Volume Setting}. The infotainment system will operate with updated Prompt volume level.
List of Exception Use Cases	Reference the Media volume use case exceptions (currently at min and max volume) which applies to all volume sources (Media, VR, Prompts, Phone, TA) E1-VOL-GUC-290275-Increase Media Volume - Volume currently set to maximum E2-VOL-GUC-290396-Decrease Media Volume - Volume currently set to minimum

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Interfaces	G-HMI, CBI, SWC

2.1.1.7 VOL-UC-REQ-014833/D-Adjust Phone Volume (TcSE ROIN-290402-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON Phone is the active audio source
Scenario Description	User selects <Increase/Decrease Volume> via HMI. The infotainment system adjusts the Phone volume setting. HMI indicates {Phone Volume Level} as level is being adjusted.
Post-conditions	HMI indicates final {Phone Volume Setting}. The infotainment system will operate with updated Phone volume level.
List of Exception Use Cases	Reference the Media volume use case exceptions (currently at min and max volume) which applies to all volume sources (Media, VR, Prompts, Phone, TA) VOL-UC-REQ-014828-Increase Media Volume - Volume currently set to maximum VOL-UC-REQ-014830-Decrease Media Volume - Volume currently set to minimum
Interfaces	G-HMI, CBI, SWC

2.1.1.8 VOL-UC-REQ-014834/D-Adjust TA Volume (TcSE ROIN-290403-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON TA Mode is active
Scenario Description	User selects <Increase/Decrease Volume> via HMI. The infotainment system adjusts the TA volume setting. HMI indicates {TA Volume Level} as level is being adjusted.
Post-conditions	HMI indicates final {TA Volume Setting}. The infotainment system will operate with updated TA volume level. Note: The TA volume is the same for all RDS related announcements like TA (Traffic Announcement), News and Alarm.
List of Exception Use Cases	Reference the Media volume use case exceptions (currently at min and max volume) which applies to all volume sources (Media, VR, Prompts, Phone, TA) VOL-UC-REQ-014828-Increase Media Volume - Volume currently set to maximum VOL-UC-REQ-014830-Decrease Media Volume - Volume currently set to minimum
Interfaces	G-HMI, CBI, SWC

2.1.1.9 VOL-UC-REQ-014835/B-Volume Borders Variant 1 (TcSE ROIN-292457-1)

2.1.1.9.1 VOL-UC-REQ-014836/C-Infotainment System exits TA Mode with storing (TcSE ROIN-290404-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON TA Mode is active
Scenario	User selects <Increase/Decrease Volume> via HMI to a value inside the

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Description	applicable borders and exits with storing conditions according to VOL-FUR-REQ-014816-User Volumes.
Post-conditions	HMI indicates final {TA Volume Setting}. The infotainment system will operate with updated TA volume level. Stored Volume value becomes active volume level on next TA
List of Exception Use Cases	
Interfaces	G-HMI, CBI, SWC

2.1.1.9.2 VOL-UC-REQ-014837/C-Infotainment System exits TA Mode without storing (TcSE ROIN-290405-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON TA Mode is active
Scenario Description	User selects <Increase/Decrease Volume> via HMI and is interrupted by an higher level audio priority (ex. Phone, VR,…) or by entertainment off. Details of exist conditions according VOL-FUR-REQ-014816-User Volumes.
Post-conditions	The previous stored TA Volume becomes active volume level on next TA.
List of Exception Use Cases	
Interfaces	G-HMI, CBI, SWC

2.1.1.9.3 VOL-UC-REQ-014838/B-Activating the Upper Feature Volume Border - Phone/VR/Prompt (TcSE ROIN-290406-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON. Phone/Prompt/VR is not the active audio source When the Feature volume was last active its volume level was above its upper volume border. Feature Volume for this use case could be Phone/Prompt/VR
Scenario Description	A feature volume source becomes the active audio source
Post-conditions	The Feature Volume becomes active and its volume level will be at the upper feature volume border level.
List of Exception Use Cases	
Interfaces	G-HMI, CBI, SWC

2.1.1.9.4 VOL-UC-REQ-014839/B-Activating the Lower Volume Border - Phone/VR/Prompt (TcSE ROIN-290407-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON. Phone/Prompt/VR is not the active audio source. When the Feature volume was last active its volume level was below its lower volume border.

	Feature Volume for this use case could be Phone/Prompt/VR
Scenario Description	A feature volume source becomes the active audio source
Post-conditions	The feature volume becomes active and its volume level will be at the lower feature volume border level.
List of Exception Use Cases	
Interfaces	G-HMI, CBI, SWC

2.1.1.9.5 VOL-UC-REQ-014840/B-Activating the Feature volume at the last Feature Volume Level - Phone/VR/Prompt (TcSE ROIN-291884-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON. Phone/Prompt/VR is not the active audio source. When the Feature volume was last active its volume level was below its upper volume border and above its lower volume border. Feature Volume for this use case could be Phone/Prompt/VR
Scenario Description	A feature volume source becomes the active audio source
Post-conditions	The Feature Volume becomes active and its volume level will be at the last used feature volume level.
List of Exception Use Cases	
Interfaces	G-HMI, CBI, SWC

2.1.1.10 VOLv2-UC-REQ-014841/B-Volume Borders Variant 2 (TcSE ROIN-292458-1)

2.1.1.10.1 VOLv2-UC-REQ-014842/C-Activating the Upper Feature Volume Border (TcSE ROIN-291881-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON. No Feature source is currently active. ~~Media Source (ex AM/FM, CD, USB…) is the active audio source and the Media volume is below the Feature upper volume limit.~~ When the Feature source was last active its volume level was above its Upper volume border. Feature Volume sources for this use case could be Prompts, Phone, or VR ~~or TA~~
Scenario Description	The Feature source becomes the active audio source
Post-conditions	The Feature Volume becomes active and its volume level will be at the upper volume border level.
List of Exception Use Cases	
Interfaces	G-HMI, CBI, SWC

2.1.1.10.2 VOLv2-UC-REQ-014845/C-Activating the Feature Volume at the last Feature Volume Level (TcSE ROIN-291883-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON. Feature source is not currently active. ~~Media Source (ex AM/FM, CD, USB…) is the active audio source and the Media volume is below the previous Feature volume level.~~ When the Feature source was last active its volume level was below the upper Feature volume border and above the Feature lower volume border. Feature Volume sources for this use case could be Prompts, Phone, or VR ~~or TA~~
Scenario Description	Feature source becomes the active audio source
Post-conditions	Feature volume becomes active and the previous Feature volume level will be active
List of Exception Use Cases	
Interfaces	G-HMI, CBI, SWC

2.1.1.10.3 VOLv2-UC-REQ-014846/C-Activating the Lower Volume Border (TcSE ROIN-291885-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON. Feature source is not currently active. ~~Media Source (ex AM/FM, CD, USB…) is the active audio source and the Media volume is below the Feature lower volume level border.~~ When the Feature souce was last active its volume level was below the Feature lower volume border level. Feature Volume sources for this use case could be Prompts, Phone, or VR ~~or TA~~
Scenario Description	The Feature source becomes the active audio source
Post-conditions	Feature volume becomes active and the Feature volume level will be at the Feature lower volume border level
List of Exception Use Cases	
Interfaces	G-HMI, CBI, SWC

2.1.1.10.4 VOLv2-UC-REQ-014843/C-Activating the TA Feature Volume at the Media Volume (TcSE ROIN-291882-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON. Media Source (ex AM/FM, CD, USB…) is the active audio source and the Media volume is above the previous Feature volume level. Feature Volume source~~s~~ for this use case ~~case could be Phone, VR, or~~

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	~~Prompts~~is TA
Scenario Description	The Feature source becomes the active audio source
Post-conditions	The Feature Volume becomes active ~~and its volume level will be at the Media volume level~~ and its volume will be at the Media volume level
List of Exception Use Cases	
Interfaces	G-HMI, CBI, SWC

2.1.1.10.5 VOLv2-UC-REQ-129751/A-Activating the TA Feature Volume at the last Feature Volume Level

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON. Media Source (ex AM/FM, CD, USB…) is the active audio source and the Media volume is below the previous Feature volume level. When the Feature source was last active its volume level was below the upper Feature volume border and above the Feature lower volume border. Feature Volume source for this use case is TA
Scenario Description	Feature source becomes the active audio source
Post-conditions	Feature volume becomes active and the previous Feature volume level will be active
List of Exception Use Cases	
Interfaces	G-HMI, CBI, SWC

2.1.1.10.6 VOLv2-UC-REQ-129752/A-Activating the TA Lower Volume Border

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON. Media Source (ex AM/FM, CD, USB…) is the active audio source and the Media volume is below the Feature lower volume level border. When the Feature source was last active its volume level was below the Feature lower volume border level. Feature Volume source for this use case is TA
Scenario Description	The Feature source becomes the active audio source
Post-conditions	Feature volume becomes active and the Feature volume level will be at the Feature lower volume border level
List of Exception Use Cases	
Interfaces	G-HMI, CBI, SWC

2.1.1.10.7 VOLv2-UC-REQ-129753/A-Activating the TA Upper Feature Volume Border

Actors	Vehicle Occupant
Pre-conditions	Infotainment System is powered ON. Media Source (ex AM/FM, CD, USB…) is the active audio source and the Media volume is below the Feature upper volume limit. When the Feature source was last active its volume level was above its Upper volume border. Feature Volume source for this use case is TA
Scenario Description	The Feature source becomes the active audio source
Post-conditions	The Feature Volume becomes active and its volume level will be at the upper volume border level.
List of Exception Use Cases	
Interfaces	G-HMI, CBI, SWC

2.1.2 Requirements

2.1.2.1 Volume Level Control

2.1.2.1.1 VOL-SR-REQ-014847/C-Audio Routing (TcSE ROIN-41507-12)

Modules present: SYNC (Gen2 / Gen3) / AHU / No DSP AMP

Source of signal To AHU	Audio Channel	Volume Line Level Output	Volume Master	Distributes audio to Speakers	AHU Volume State
External Media (Sync) (RequestedAudioSource = 0x8: APIM RequesterPriority = $B: Aux_ExtSource)	Stereo In 1	Fixed	AHU	AHU	Variable Gain
Phone (SYNC) (RequestedAudioSource = 0x8: APIM or 0x6: Bluetooth Phone RequesterPriority = 0x1: Telephony Service)	Stereo In 1	Fixed	AHU	AHU	Variable Gain
VR Prompt (SYNC) (RequestedAudioSource = $4: VoiceRecogniser RequesterPriority = $4: PttMutevoice)	Stereo In 1	Fixed	AHU	AHU	Variable Gain
Non-SYNC Prompt (Navigation) (RequestedAudio Source = 0xA Navigation ResourceUpdate : RequesterPriority = 0x5 Nav User Voice Cmd or 0x6 Nav Sys Voice command)	N/A	Fixed	AHU	AHU	Variable Gain
Mobile Navigation (RequestedAudio Source = 0xA Navigation ResourceUpdate : RequesterPriority = 0xC	N/A	Fixed	AHU	AHU	Variable Gain

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Mobile Nav/Tel Mute)					
Mixable Prompts (SYNC)	Prompt (SYNC Alert In 1 on Jan 2009 AHU Device Transmittal)	Fixed	AHU	AHU	Variable Gain
Chimes (AHU)	N/A	N/A	AHU	AHU	Fixed Gain
TA Prompts (AHU)	N/A	N/A	AHU	AHU	Variable Gain

Modules present: SYNC (Gen 2 / Gen 3) / AHU / DSP AMP OR No SYNC / AHU / DSP AMP

Source of signal to DSP AMP	Audio Channel	Volume Line Level Output	Volume Master	Distributes audio to Speakers	DSP Volume State
Media / Phone (AHU)	Stereo 1	* Fixed	DSP	DSP	Variable Gain
VR Prompt (AHU) (RequestedAudioSource = $4: VoiceRecogniser RequesterPriority = $4: PttMutevoice)	Stereo 1	Fixed	DSP	DSP	Variable Gain
Non-SYNC Prompt (Navigation) (RequestedAudioSource = 0xA Navigation ResourceUpdate : RequesterPriority = 0x5 Nav User Voice Cmd or 0x6 Nav Sys Voice command)	N/A	Fixed	DSP	DSP	Variable Gain
Mobile Navigation (RequestedAudio Source = 0xA Navigation ResourceUpdate : RequesterPriority = 0xC Mobile Nav/Tel Mute)	N/A	Fixed	DSP	DSP	Variable Gain
Mixable Prompts (SYNC)	Prompt	Fixed	DSP	DSP	Variable Gain
Chimes (AHU)	Alert 1 & 2	Fixed	DSP	DSP	Fixed Gain
TA Prompts (AHU)	Stereo	Fixed	DSP	DSP	Variable Gain

* unless specified otherwise for specific requirements.

Modules present: SYNC / DSP AMP (if SYNC and DSP AMP support S/PDIF)

Source of signal to DSP AMP	Audio Channel	Volume Master	Distributes audio to Speakers
SYNC External Media (USB, BT Audio) (SYNC) (RequestedAudioSource = 0x8: APIM RequesterPriority = $B: Aux_ExtSource)	S/PDIF (AES3)	DSP	DSP
Phone (SYNC) (RequestedAudioSource = 0x8: APIM or 0x6: Bluetooth Phone RequesterPriority = 0x1: Telephony Service)	S/PDIF (AES3)	DSP	DSP
VR Prompt (SYNC) (RequestedAudioSource = $4: VoiceRecogniser RequesterPriority = $4: PttMutevoice)	S/PDIF (AES3)	DSP	DSP
AHU Media (all media	Stereo 1	DSP	DSP

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sources other then SYNCs... ex AM/FM/SDARS...)	Line Level		
Mixable Prompts (SYNC)	Prompt	DSP	DSP
Chimes (AHU)	Alert 1 & 2	DSP	DSP
TA Prompts (AHU)	Stereo 1 Line Level	DSP	DSP

Modules present: SYNC Gen1 / AHU / No DSP AMP

Source of signal To AHU	Audio Channel	Volume Line Level Output	Volume Master	Distributes audio to Speakers	AHU Volume State
External Media (Sync) (RequestedAudioSource = 0x8: APIM RequesterPriority = $B: Aux_ExtSource)	Stereo In 1 (C346N, C520 and future global radio unless noted otherwise)	Fixed	AHU	AHU	Variable Gain
Phone (SYNC) (RequestedAudioSource = 0x8: APIM RequesterPriority = 0x1: Telephony Service)	Prompt (SYNC Alert In 1 on Jan 2009 AHU Device Transmittal)	Fixed	AHU	AHU	Variable Gain
VR Prompts (SYNC) (RequestedAudioSource = $4: VoiceRecogniser RequesterPriority = $4: PttMutevoice)	Prompt (SYNC Alert In 1 on Jan 2009 AHU Device Transmittal)	Fixed	AHU	AHU	Variable Gain
Non-SYNC Prompt (Navigation) (RequestedAudio Source = 0xA Navigation ResourceUpdate : RequesterPriority = 0x5 Nav User Voice Cmd or 0x6 Nav Sys Voice command)	Nav Audio (MFD5)	Fixed	AHU	AHU	Variable Gain & variable Mixing Ratio
Mobile Navigation (RequestedAudio Source = 0xA Navigation ResourceUpdate : RequesterPriority = 0xC Mobile Nav/Tel Mute)	N/A	Fixed	AHU	AHU	Variable Gain
Mixable Prompts (SYNC)	N/A	Fixed	AHU	AHU	Variable Gain
Chimes (AHU)	N/A	N/A	AHU	AHU	Fixed Gain
TA Prompts (AHU)	N/A	N/A	AHU	AHU	Variable Gain

Volume Master (volume settings server) shall be responsible for listening to volume change request (volume Button Input Server) and storage of the volume setting sources (Media, Phone, Prompt, VR, TA).

Note: for A2B volume routing see Digital Audio Bus SPSS.

2.1.2.1.2 VOL-SR-REQ-014848/B-Module that is the Volume Setting Server when AHU and DSP AMP present (TcSE ROIN-39823-2)

When there is both an AHU and DSP AMP on the vehicle at the same time then the DSP AMP shall be in control of the Active Volume Settings Sources (Media, Phone, Prompt, VR, TA) and shall be the Volume Server. When no DSP AMP is present the AHU shall be in control of the Active Volume Settings Sources and shall be the Volume Server.

2.1.2.1.3 VOL-SR-REQ-014849/B-Display Module Volume signals to look at between the AHU and DSP AMP (TcSE ROIN-39824-1)

When there is both an AHU and DSP AMP on the vehicle at the same time then the display module(s) shall only look at the volume settings status signals from the DSP AMP for display information. The AHU shall set its volume settings status signals to the default values when the DSP AMP is present.

2.1.2.1.4 VOL-SR-REQ-014850/B-Storage of volume levels by the volume Setting Server (TcSE ROIN-39825-2)

The Volume Settings Server is responsible for maintaining the last known state of the volume levels for the volume setting sources (Media, Phone, Prompt, VR, TA) during all modes of operation and transition of power modes.

2.1.2.1.5 VOL-SR-REQ-014851/D-Volume Setting Server Incrementing Volume via the EFP/ECP and SWC (TcSE ROIN-39827-2)

The Volume Settings Server shall monitor volume adjustments from the Volume Button Input Client via the 'BCP_Button_Press : SetVolume' signal and '_Steering_Wheel_Data2 : SteWhlCtl_Volume_(Up/Down) – CGEA 1.2 only' signals for incrementing / decrementing volume.

2.1.2.1.6 VOL-SR-REQ-014852/C-Volume Setting Server changing to a pre-defined volume level with the SetPointVolume signal (TcSE ROIN-39828-2)

The Volume Settings Server shall monitor volume adjustments from the Volume Button Input Client via the 'BCP_Button_Press : SetPointVolume' signal for setting predefined volume levels.

2.1.2.1.7 VOL-SR-REQ-014853/C-Volume Setting Server Updating Volume with the SetVolume.Rq or SetVol_Level.Rq signals (TcSE ROIN-39829-4)

The Volume Settings Server (ex AHU, DSP AMP) shall update the 'XXX_Volume_Level' and "XXX_Vol_Updated = Updated' signals within Tvol_update of the Volume Setting Server receiving the 'SetVolume.Rq' or 'SetVol_Level.Rq' signals from the Volume Settings Client (ex. APIM Gen 3, MFD…).

2.1.2.1.8 VOL-SR-REQ-014854/D-Volume Settings Server Updating volume status signals from the Button Input Client (TcSE ROIN-39831-3)

The Volume Settings Server (ex AHU, DSP AMP) shall update the 'XXX_Volume_Level' and "XXX_Vol_Updated = Updated' signals within Tvol_update of the Volume Settings Server receiving the volume button press event CAN message from the Button Input Client (ex SetVolume from the ECP, SYNC sending SetVolume for SWC button press).

Note: for the integrated AHU (Volume Setting Client and Volume Setting Server in one module) the CAN Volume Setting Client SetVolume is not necessarily sent since can be internal but logically it is sent and can be used to update the 'XXX_Volume_Level' and "XXX_Vol_Updated = Updated' signals. (example integrated AHU updating volume status/updated signals: SetVolume from the LIN ICP, SetVolume from the CAN ECP/EFP, SWC button press over CAN…)

2.1.2.1.9 VOL-SR-REQ-014855/F-Volume Display Updates (TcSE ROIN-39848-2)

The HMI Output shall update the display (if applicable per HMI) within Tdisplay_update of receiving the signal 'XXX_Vol_Updated = Updated'.

The Volume Setting Server should set "XXX_Vol_Updated = No Update" unless there is a requirement specifying "XXX_Vol_Updated = Updated" for a specified volume event or unless it is specified for the Volume Setting Server to update the Volume HMI.

Note: The XXX_Volume_Level.St signals should reflect the volume or stored volume level. The XXX_Volume_Level.St signals changing would not cause an HMI update and an HMI update would only occur when XXX_Vol_Updated = Updated.

Example using the Vol_Updated signal (see HMI for details of what is shown on the HMI):

1. The user had previously turned the Media volume to zero and the Volume Setting Server has the Media_Volume_Level.St = 0.
2. While at zero the user turns the volume knob down and the Volume Setting Client sends SetVolume = -1 volume step (see applicable requirements for details of using setVolume) to the Volume Setting Server. In response the Volume Setting Server leaves unchanged Media_Volume_Level.St = 0 but sets Media_Vol_Updated = Updated per SPSS requirement "VOL-REQ-014853 Volume Setting Server updating volume with the SetVolume or SetVol_Level.Rq signals".
3. The HMI Output displays some sort of minimum volume HMI if applicable.

Note2: Attn_Info_Audio (ex sent for chimes or SYNC_Alerts mixable prompts) there is no requirement to update the XXX_Vol_Updated signal when attenuating audio. So in this case the XXX_Volume_Level.St would be attenuated to the lower volume (if was above the attenuation level) but that would not result in XXX_Vol_Updated being set to Updated.

2.1.2.1.10 VOL-SR-REQ-014856/D-Volume Signals usage (TcSE ROIN-39849-10)

The Volume Settings Client & Server shall utilize the ResourceUpdate.St : ResourceRequestStatus = Granted (as defined in the Audio Management section) to identify the Active Volume Settings Source (Media, Phone, Prompt, VR, TA). The Volume Settings Server shall adjust its volume to the volume level of the source Granted in the ResourceUpdate.St message within 60 msec of the Volume Settings Server receiving the ResourceUpdate.St changing a source to "Granted".

The Active Volume Setting Source can play its audio through the loud speakers and monitors volume user adjustments for changing the volume level. When both Prompts and the active audio source are Granted in the ResourceUpdate message then while Prompts is Granted it is the Active Volume Settings Source.

Reference Audio Management SPSS requirement "AUMGNT-GREQ-014570-Audio Request - Allowable Combinations" for a list of the volume settings sources to be used for a particular setting of the ResourceUpdate.St message.

SYNC Mixable Prompts (SYNC_Alerts : Alert_Chan = Initialized for Prompts) are independent of the ResourceUpdate signal and are volume user adjustable also. Reference the Alert section of the SPSS for when SYNC prompts are the Active Volume Setting Source.

Chimes are independent of the ResourceUpdate status message and are NOT volume user adjustable.

If adjusting the volume independent of the Active Volume Settings Source from the Volume Setting Client (ex MFD/APIM) then use the SetVol_Source.Rq signal to identify the source volume is to be adjusted. The SetVol_Source.Rq can be used with the SetVol_Level.Rq or SetVolume.Rq signals. When the signal SetVol_Source is set to 'inactive' then utilize the ResourceUpdate status message to identify the source volume to be adjusted.

Since the SetVol_Level.Rq and SetVolume.Rq signals are in the same message the Volume Setting Client (ex MFD/APIM) shall only set one signal at a time with the other signal not being used set to inactive.

2.1.2.1.11 VOL-SR-REQ-014857/E-Manual Audio Mute (TcSE ROIN-205228-2)

The infotainment system audio can be muted by a "Manual Audio Mute" audio request:

AudioRequest.Rq(RequestAudioResource, Front Requester, Not Requested, Manual Audio Mute)

Upon reception of the request the Audio Resource Server shall process the request and gracefully mute the audio output of the infotainment system. When the ResourceUpdate message indicates a manual audio mute is Granted "ResourceUpdate.St (Front Requester, Not Requested, Manual Audio Mute, Granted)" then the Audio Volume Settings Server shall mute the Granted source (ex. no mute of SYNC Prompts, Chimes and applicable sources in table AUMGNT-GREQ-014552-Audio Request_Properties of Priorities_Overview).

While the volume is muted and the user adjusts the volume (increase or decrease volume) ~~customer increases the volume~~ then the "Manual Audio Mute" shall be released by the Audio Resource Server in the ResourceUpdate.st message and then the Audio Volume Settings Server shall unmute from the last volume step before the mute event.

Note: when a DSP AMP is present the AHU is still responsible for releasing the Manual Audio Mute with a volume change.

The Audio_Vol_Level status message will reflect the muted volume but the Media volume setting _Volume_Updated bit shall not be set to "Updated" for a manual audio mute transition but remain as "No Update".

While the infotainment system is muted, indicated by ResourceUpdate.St (Front Requester, Not Requested, Manual Audio Mute, Granted), and the Audio Resource Server receives the following audio request:

AudioRequest.Rq(ReleaseAudioResource, Front Requester, Not Requested, Manual Audio Mute)

The Audio Resource Server shall process the request and gracefully un-mute the audio output of the infotainment system. The restored audio volume level shall set to the previous volume level prior to the mute request.

The Audio Resource Server shall store the "Manual Audio Mute" status in case of system interrupts like TA, News, Alarm, Phone and Voice to mute again after the interrupt ends.

2.1.2.1.12 VOL-SR-REQ-014858/G-Module specific volume requirements (TcSE ROIN-110928-5)

When the ICP (BCP) Volume Button Input Client has a dedicated network connection to the Volume Settings Client (ex ICP LIN connection to the MFD / APIM / integrated AHU) then the Volume Settings Client will send the SetVolume signal to the Volume Setting Server for volume adjustments.

When the Steering Wheel Controls are hardwired to the Volume Settings Client then the SetVolume signal will be sent to the Volume Setting Server for volume adjustments.

For a CAN based EFP the SetVolume signal shall be sent directly to the Volume Settings Server over the infotainment bus.

For the CAN based Steering Wheel Controls using message 0x81 the Volume button presses will be sent directly to the Volume Settings Server over the infotainment bus.

For the CAN based Steering Wheel Controls using message 0x2A1 the Volume button presses will be sent to the Volume Settings Client (ex MFD / APIM / Integrated AHU) and the Volume Setting Client (ex MFD / APIM / Integrated AHU) will then send the SetVolume signal to the Volume Settings Server.

For the CAN based RSEM/RACM (Rear Seat Audio Controls) using message 0x2A2 RACM_Button_Press the volume button presses and SetVolume signal will be sent to the Volume Setting Client (ex MFD / APIM / integrated AHU) and the Volume Setting Client will then send the SetVolume signal to the Volume Setting Server.

Note: for the Volume Button Input Server (Button Receiver or Volume Setting Server) receiving the SetVolume and SetPointVolume signals from the Volume Button Input Client (Button Transmitter) reference the following requirements from the Button Strategy section: "BUTTON-GREQ-110929-1-Receivers of SetVolume Button presses" and "BUTTON-GREQ-110930-1-Receivers of SetPointVolume and MFD_SetVol_Level Button Presses".

See CAN dB and Input Translation Matrix for any additional volume press sources.

2.1.2.1.13 VOL-SR-REQ-292289/A-Volume Press and Hold Error Handling

The receiver of the volume up or volume down button press signal (ex SWCM volume Pressed / Not_Pressed) shall cancel the volume press and hold feature when:

- A volume button "Pressed" has been on the network without a volume button "Not_Pressed" for T_Vol_RBAP_Timeout.

OR

- Any volume button press opposite the current volume button press is received (ie volume up vs volume down)
    - Ex. SWC volume Up button is in a volume press and hold state and an EFP rotary volume Down button is set to "Pressed". The SWC volume up press and hold would be cancelled.

When the volume up or a volume down press and hold is cancelled by any of the scenarios in this requirement the receiver of the volume button press signal shall allow the same volume button press or same volume button press and hold function to occur again when:

- The infotainment system has been powered OFF and back ON again
    - Ex. HMIAudioMode = ON when press and hold cancelled and HMIAudioMode went OFF and back ON again

OR

- A Volume button "Not_Pressed" signal is received for the particular volume signal (ex from SWCM) that previously sent the Volume button Pressed without a Volume button Not_Pressed.
    - Ex. SWCM volume up press and hold was cancelled because of T_Vol_RBAP_Timout elapsing without a Volume Up Not_Press (error on SWCM where didn't send a Not_Pressed). The user presses the SWCM volume up button again (nothing happens) but when the user releases the SWCM volume up button if this time the SWCM sends a volume up "Not_Pressed" then the volume button press and volume button press and hold functionality would work on the next volume button press.

Reference requirements:

- VOL-TMR-REQ-292290-T_Vol_RBAP_Timeout
- BUTTON-SR-REQ-014704-Cancelling RBAP

2.1.2.1.14 VOL-TMR-REQ-292290/A-T_Vol_RBAP_Timeout

Name	Description	Units	Range	Resolution	Default
T_Vol_RBAP_Timeout	The time from when a volume button "Pressed" is received without receiving a volume button "Not_Press" before the volume press or press and hold function is cancelled. This is the T_RBAP_Timeout value for cancelling the volume button Receiver Button Activation Process (RBAP) for the volume button in Button SPSS requirement "Button-REQ-014704-Cancelling RBAP" Tolerance for the default value is +/- 100 msec Note: always use the Default Value	msec	5000 - 10000	100	5000

2.1.2.2 Media / Phone / Prompt / VR / TA Volume Settings

The Volume Settings Server will have to store multiple volume level settings for different volume sources / prompts and broadcast the volume level status on the Infotainment bus. Note: Chime volume level strategy is discussed in the Alert section.

2.1.2.2.1 VOL-SR-REQ-014859/B-Media Volume (TcSE ROIN-39859-1)

The Media volume (ie AM / FM / CD / SDARS / DAB / AUX / USB/BT Audio) level is indicated via the Volume Settings Server XXX_Audio_Volume_Level.St() signal. Refer to the Volume Setting Server component requirements for details on volume level outputs for each volume step.

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2.1.2.2.2 VOL-SR-REQ-014860/B-Phone Volume (TcSE ROIN-39861-1)

The Phone volume level is indicated via the Volume Settings Server XXX_Phone_Volume_Level.St() signal. Refer to the Volume Settings Server component requirements for details on volume level outputs for each volume step.

2.1.2.2.3 VOL-SR-REQ-014861/B-Prompt Volume (TcSE ROIN-39862-2)

The mixable Prompt volume level is indicated via the Volume Settings Server Prompt_Volume_Level.St signal. Refer to the Volume Setting Server component requirements for details on volume level outputs for each volume step.

2.1.2.2.4 VOL-SR-REQ-014862/B-TA Volume (TcSE ROIN-39863-1)

The Traffic Announcement volume level is indicated via the Volume Settings Server XXX_TA_Volume_Level.St() signal. Refer to the Volume Settings Server component requirements for details on volume level outputs for each volume step.

2.1.2.2.5 VOL-SR-REQ-014863/B-VR Volume (TcSE ROIN-39864-1)

The Voice Recognition volume level is indicated via the Volume Settings Server XXX_VR_Volume_Level.St() signal. Refer to the Volume Settings Server component requirements for details on volume level outputs for each volume step.

2.1.3 Sequence Diagrams

2.1.3.1 VOL-TMR-REQ-014864/B-Tdisplay_update (TcSE ROIN-39868-1)

Name	Description	Units	Range	Resolution	Default
Tdisplay_update	Maximum time allowed from when the HMI Output module receives the XXX_Volume_Level message with an update until the new volume level is updated on the display.	msec	0-1000	10	50

2.1.3.2 VOL-TMR-REQ-014865/B-Tvol_update (TcSE ROIN-39869-2)

Name	Description	Units	Range	Resolution	Default
Tvol_update	The maximum time allowed from when the Volume Settings Server receives a request to change volume until the Volume Level Status Message is put on the bus.	msec	0-1000	10	50

2.1.3.3 VOL-SD-REQ-014866/A-Volume adjustment from Volume Button Input Client directly to the Volume Settings Server (TcSE ROIN-39873-1)

Pre-condition
Volume is unchanged

Post-condition
Adjusted Volume level heard through the speakers and if applicable the volume updated on the display

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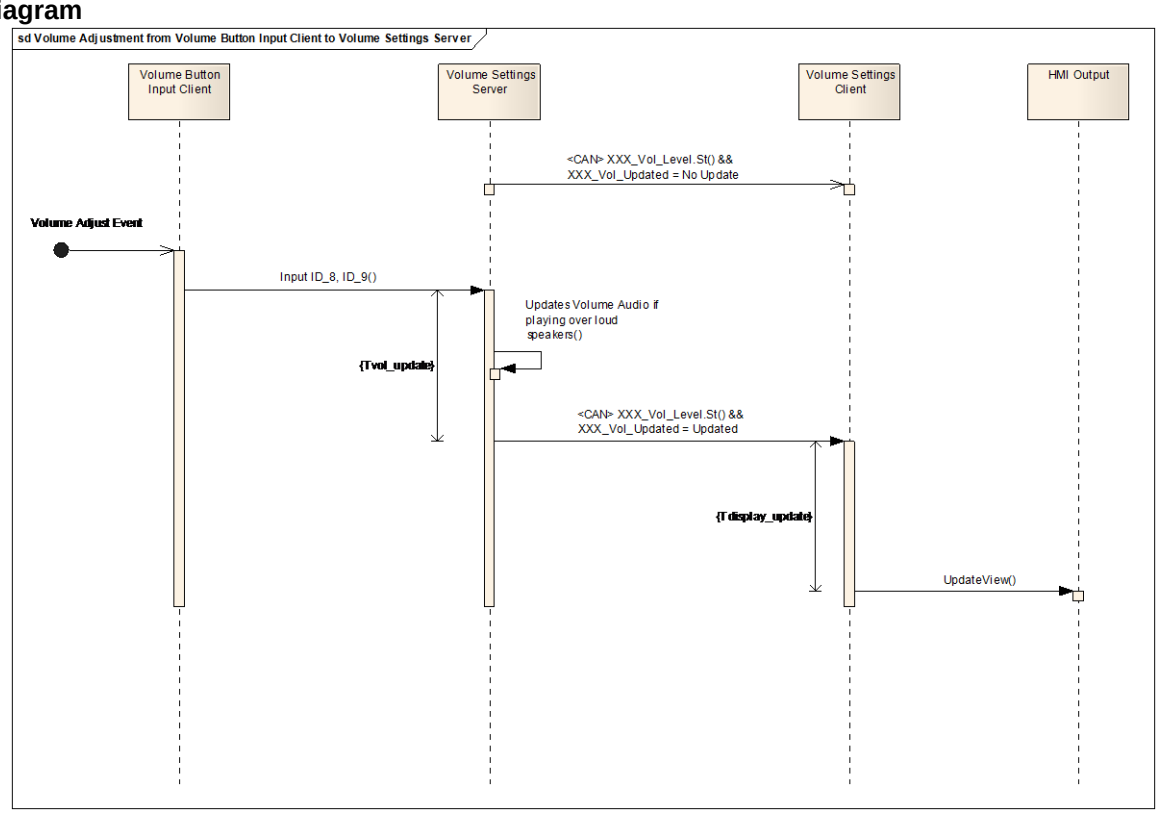
Sequence Diagram



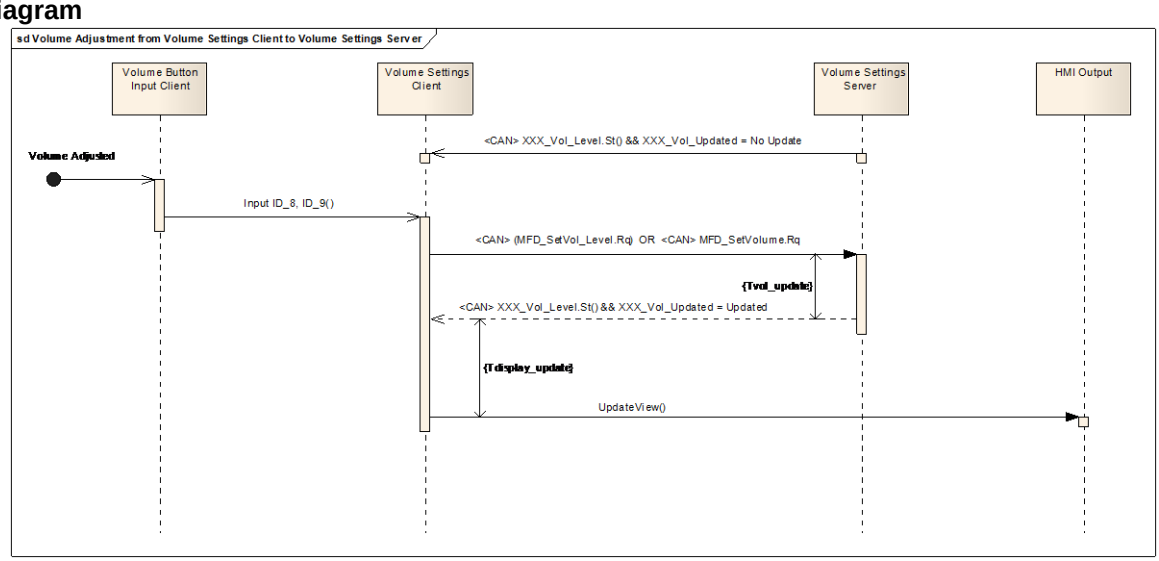
Note: an example for a scenario that would use this sequence diagram (but not limited to this) would be when a CAN EFP sends the setVolume signal directly to the AHU / DSP AMP

2.1.3.4 VOL-SD-REQ-014867/A-Volume adjustment from the Volume Settings Client to the Volume Settings Server (TcSE ROIN-39878-2)

Pre-condition
Volume is adjusted

Post-condition
Adjusted Volume level heard through the speakers and if applicable the volume updated on the display

Sequence Diagram



Note: some examples for a scenario that would use this sequence diagram would be when (not limited to these examples):

- a CAN SWC volume signal is sent from the Volume Button Input Client to the Volume Settings Client (ex APIM, MFD...) and then the Volume Settings Client sends the setVolume to the AHU or DSP AMP Volume Settings Server
- A LIN ICP with volume knob Volume Button Input Client sends setVolume from LIN ICP to Volume Settings Client (ex APIM, MFD..) which then sends the setVolume to the AHU or DSP AMP Volume Settings Server

3 Appendix: Reference Documents

Reference #	Document Title
1	
2	
3	
4	
5	
6	
7	
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9	
10	
11	
12	
13	
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