## Research & Vehicle Technology
## "Infotainment Systems Product Development"

# Feature – Audio Settings

# APIM Infotainment Subsystem Part Specific Specification (SPSS)

Version 1.8

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**Version Date: August 27, 2021**

**FORD CONFIDENTIAL**

# Revision History

| Date | Version | Notes | |
|---|---|---|---|
| **May 30, 2013** | **1.0** | **Initial Release** | |
| | | | |
| **March 13, 2014** | **1.1** | | |
| | AUDSET-HMI-REQ-050361/D-Speed Compensated Volume values when HMI has SCV settings OFF, LOW, MED and HIGH (HMI) | | HMI requirement for SCV with Hi, Med, Low settings |
| | AUDSET-TMR-REQ-014897/B-T_audio hold(TcSE ROIN-184723-1) | | RZLOTNIK - Initial Release |
| | AUDSET-FUN-REQ-052014/A-Source Dependent Bass, Treble, Mid-Range Tonal Settings | | <jmyslin2 / Ron Zlotnick> Per core audio new source dependent Bass, Treble, Mid-Range Tonal Settings function |
| | AUDSET-UC-REQ-052010/B-Entering the Sound Menu and displaying Bass, Mid-Range, Treble for a particular audio source | | <jmyslin2 / Ron Zlotnik> Updated per core audio team for Bass, Treble, Mid-Range to be source dependent |
| | AUDSET-UC-REQ-052011/A-Change BTMBF Settings while the HMI shows the Sound Menu | | <jmyslin2 / Ron Zlotnik> Update per core audio team use case for adjustable Bass, Treble, Mid-Range with different audio sources |
| | AUDSET-UC-REQ-052012/A-Bass, Mid-Range, Treble, Balance, Fade settings when on a source that does not have an adjustable BTMBF source setting (ex durin | | <jmyslin2 / Ron Zlotnik> Core audio new use case for adjustable Bass, Treble, Mid-Range based on active audio source |
| | AUDSET-UC-REQ-052032/A-Change Audio Source while Sound Menu active | | <jmyslin2 / Ron Zlotnik> Per core audio use case for source dependent BTM |
| | AUDSET-HMI-REQ-052013/A-Audio Setting Client updating the Sound HMI display for BTMBF when there are source dependent Bass, Treble, Mid-Range | | <jmyslin2 / Ron Zlotnik> per core audio updated requirement for when display module configured for source dependent adjustable Bass, Treble, Mid-Range and HMI out |
| | AUDSET-FUR-REQ-052056/A-Audio Settings Server Bass, Treble, Mid-Range audio sources supported | | <Ron Zlotnik> Audio Setting Server supporting Bass, Treble, Mid-Range for different audio sources |
| | | | |
| **June 10, 2015** | **1.2** | | |
| | AUDSET-FRD-REQ-033725/B-Audio Settings (TcSE ROIN-290243-1) | | <jmyslin2> added EQ mode per Frank Nowack from core audio since the AHU's will be supporting |
| | SD-REQ-088157/B-Press and Hold - Increase Bass Sequence Diagram+ | | <jmyslin2> example given by press and hold for BTMBF. This is sequence diagram to core audio requirement that was added for press and hold "AUDSET-TMR-014897-T_audio hold". |
| | AUDSET-SD-REQ-088157/C-Press and Hold - Increase Bass Sequence Diagram | | <jmyslin2> example given by press and hold for BTMBF. This is sequence diagram to core audio requirement that was added for press and hold "AUDSET-TMR-014897-T_audio hold". |
| | AUDSET-UC-REQ-052010/D-Entering the Sound Menu and displaying Bass, Mid-Range, Treble for a particular audio source+ | | 2014-08-08 MDAGE: changed list of sources to refer to AHU-HR-REQ-026308-Mode Dependent BMT settings for sources.<br><br>2014-09-30 MDAGE: Changed reference requirement to AUDSET-FUR-REQ-096764-Mode Dependent BMT Settings. |
| | AUDSET-UC-REQ-052010/E-Entering the Sound Menu and displaying Bass, Mid-Range, Treble for a particular audio source | | 2015-02-27 MDAGE: Per Alan Norton, this feature has been removed |
| | AUDSET-UC-REQ-052011/C-Change BTMBF Settings while the HMI shows the Sound Menu+ | | 2014-08-08 MDAGE: Changed list of audio sources to refer to AHU-HR-REQ-026308-Mode Dependent BMT settings for sources.<br><br>2014-09-30 MDAGE: Changed reference requirement to AUDSET-FUR-REQ-096764-Mode Dependent BMT Settings. |
| | AUDSET-UC-REQ-052011/D-Change BTMBF Settings while the HMI shows the Sound Menu | | 2015-02-27 MDAGE: Per Alan Norton, this feature has been removed. |
| | AUDSET-UC-REQ-052012/D-BTMBF settings when on a source that does not have an adjustable BTMBF source setting (ex VR, Phone, TA, Beeps...)+ | | 2014-08-08 MDAGE: Removed list of audio sources and replaced with reference to sources listed in AHU-HR-REQ-026308-Mode Dependent BMT settings.<br><br>2014-09-30 MDAGE: Changed reference requirement to AUDSET-FUR-REQ-096764-Mode Dependent BMT Settings. |
| | AUDSET-UC-REQ-052012/E-BTMBF settings when on a source that does not have an adjustable BTMBF source setting (ex VR, Phone, TA, Beeps...) | | 2015-02-27 MDAGE: Per Alan Norton, this feature has been removed. |
| | AUDSET-UC-REQ-052032/B-Change Audio Source while Sound Menu active+ | | 2014-08-08 MDAGE: Removed list of audio sources and replaced with reference to sources in AHU-HR-REQ-026308-Mode Dependent BMT settings. |

| | | |
|---|---|---|
| | | 2014-09-30 MDAGE: Changed reference requirement to AUDSET-FUR-REQ-096764-Mode Dependent BMT Settings. |
| | AUDSET-UC-REQ-052032/C-Change Audio Source while Sound Menu active | 2015-02-27 MDAGE: Per Alan Norton, this feature has been removed. |
| | AUDSET-HMI-REQ-052013/F-Audio Setting Client updating the Sound HMI display for BTMBF when there are source dependent Bass, Treble, Mid-Range | 2015-02-27 MDAGE: Per Alan Norton, this feature has been removed. |
| | AUDSET-FUR-REQ-052056/C-Audio Settings Server Bass, Treble, Mid-Range audio sources supported+ | 2014-08-08 MDAGE: Added full requirement name of the requirement referenced.<br>2014-09-30 MDAGE: Changed reference requirement to AUDSET-FUR-REQ-096764-Mode Dependent BMT Settings. |
| | AUDSET-FUR-REQ-052056/D-Audio Settings Server Bass, Treble, Mid-Range audio sources supported | 2015-02-27 MDAGE: Per Alan Norton, this feature has been removed. |
| | AUDSET-FUR-REQ-096764/A-Mode Dependent BMT Settings+ | <Dave Walus> Added requirement stating what source dependent Bass, Treble, Mid-Range will be supported by the AHU and DSP AMP |
| | AUDSET-FUR-REQ-096764/C-Mode Dependent BMT Settings | 2015-02-27 MDAGE: Per Alan Norton, this feature has been removed. |
| | SD-REQ-088159/A-Change Speed Compensated Volume from Level 1 to Level 2+ | <jmyslin2> example given by press and hold for BTMBF. This is sequence diagram to core audio requirement that was added for press and hold "AUDSET-TMR-014897-T_audio hold". |
| | AUDSET-SD-REQ-088159/B-Change Speed Compensated Volume from Level 1 to Level 2 | <jmyslin2> example given by press and hold for BTMBF. This is sequence diagram to core audio requirement that was added for press and hold "AUDSET-TMR-014897-T_audio hold". |
| | SD-REQ-088158/A-Change Occupance Mode from All Seats to Driver Seats+ | <jmyslin2> example given by press and hold for BTMBF. This is sequence diagram to core audio requirement that was added for press and hold "AUDSET-TMR-014897-T_audio hold". |
| | AUDSET-SD-REQ-088158/B-Change Occupance Mode from All Seats to Driver Seats | <jmyslin2> example given by press and hold for BTMBF. This is sequence diagram to core audio requirement that was added for press and hold "AUDSET-TMR-014897-T_audio hold". |
| | SD-REQ-088161/A-Change from Stereo to ON_Stage DSP Mode+ | <jmyslin2> example given by press and hold for BTMBF. This is sequence diagram to core audio requirement that was added for press and hold "AUDSET-TMR-014897-T_audio hold". |
| | AUDSET-SD-REQ-088161/B-Change from Stereo to ON_Stage DSP Mode | <jmyslin2> example given by press and hold for BTMBF. This is sequence diagram to core audio requirement that was added for press and hold "AUDSET-TMR-014897-T_audio hold". |
| | | |
| **November 30, 2016** | **1.3** | |
| | AUDSET-UC-REQ-016378/C-User selected BTMBF Settings when Audio Source is Phone/Chimes/VR/Beeps/Mixable Prompts (ex Nav Prompts) (TcSE ROIN-290158-1)+ | <jmyslin2> Updated use case so user cannot adjust media BTMBF when audio is OFF |
| | AUDSET-FUN-REQ-238444/A-Sound Immersion | <jmyslin2> New Sound Immersion feature |
| | | |
| **November 6, 2019** | **1.4** | |
| | MD-REQ-276198/A-SetBalance | <jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update |
| | MD-REQ-276206/A-Balance.St+ | <jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update |
| | MD-REQ-276206/B-Balance.St | <jmyslin2> deleted setting from description |
| | MD-REQ-276207/A-SetBass | <jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update |
| | MD-REQ-276208/A-Bass.St | <jmyslin2> created MD |
| | MD-REQ-276209/A-SetMidRange | <jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update |
| | MD-REQ-276210/A-MidRange.St | <jmyslin2> created MD |
| | MD-REQ-276448/A-SetTreble | <jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update |
| | MD-REQ-276453/A-Treble.St | <jmyslin2> created MD |
| | MD-REQ-276451/A-SetFade | <jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update |

| | |
|---|---|
| MD-REQ-276454/A-Fade.St | <jmyslin2> created MD |
| MD-REQ-276456/A-SetSpeed_Comp_Vol | <jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update |
| MD-REQ-276457/A-Speed_Comp_Vol.St | <jmyslin2> created MD |
| MD-REQ-276458/A-Vehicle_Speed.St+ | <jmyslin2> created MD |
| MD-REQ-276458/B-Vehicle_Speed.St | <jmyslin2> MD clarification |
| MD-REQ-276459/A-Vehicle_Speed_QF | <jmyslin2> created MD |
| MD-REQ-276463/A-Surround_Sound_Upmix.Rq | <jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update |
| MD-REQ-276464/A-Surround_Sound_Upmix.St | <jmyslin2> created MD |
| MD-REQ-276465/A-Surround_Sound_Upmix2.Rq | <jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update |
| MD-REQ-276466/A-Surround_Sound_Upmix2.St | <jmyslin2> created MD |
| MD-REQ-276461/A-SetOccupancy_Mode | <jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update |
| MD-REQ-276462/A-Occupancy_Mode.St | <jmyslin2> created MD |
| MD-REQ-276467/A-AutoConfigOcc_AllSeats.St | <jmyslin2> created MD |
| MD-REQ-276468/A-AutoConfigOcc_Driver.St+ | <jmyslin2> created MD |
| MD-REQ-276468/B-AutoConfigOcc_Driver.St | <jmyslin2> added clarification |
| MD-REQ-276469/A-AutoConfigOcc_Front.St+ | <jmyslin2> created MD |
| MD-REQ-276469/B-AutoConfigOcc_Front.St | <jmyslin2> added clarification |
| MD-REQ-276470/A-AutoConfigOcc_Rear.St | <jmyslin2> created MD |
| MD-REQ-276496/A-Audio_Demo_CMND+ | <jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update |
| MD-REQ-276496/B-Audio_Demo_CMND | <jmyslin2> accidental revision bump. No change |
| MD-REQ-276502/A-Audio_Demo_Status | <jmyslin2> created MD |
| MD-REQ-276504/A-SetDSPProgram.St+ | <jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update |
| MD-REQ-276504/B-SetDSPProgram.St | <jmyslin2> Clarification only, no content change |
| MD-REQ-276505/A-DSPProgram.St | <jmyslin2> created MD |
| MD-REQ-014871/B-CnvtTopPosUp_St (TcSE ROIN-280563-1) | <jmyslin2> Grammar update. Not content change |
| MD-REQ-276211/A-ImmersionLevel_D_Rq | <jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update |
| MD-REQ-276212/A-ImmersionLevel_D_St | <jmyslin2> created MD |
| MD-REQ-354821/A-AudioToneTouch_D_Rq | <jmyslin2> New Tone Touch interface MD requirement |
| MD-REQ-354822/A-AudioToneTouch_D_Stat | <jmyslin2> New Tone Touch interface MD requirement |
| MD-REQ-354819/A-AudioToneTouchX_D_Rq | <jmyslin2> New Tone Touch interface MD requirement |
| MD-REQ-354820/A-AudioToneTouchX_D_Stat | <jmyslin2> New Tone Touch interface MD requirement |
| MD-REQ-354830/A-AudioToneTouchY_D_Rq | <jmyslin2> New interface MD for the Tone Touch feature |
| MD-REQ-354831/A-AudioToneTouchY_D_Stat | <jmyslin2> New interface MD for the Tone Touch feature |
| AUDSET-CLD-REQ-354781/A-ToneTouch Client | <jmyslin2> Tone Touch Client class description |
| AUDSET-CLD-REQ-354796/A-ToneTouch Server | <jmyslin2> New Tone Touch Server class description |
| STR-090178/B-General Requirements (TcSE ROIN-290263) | <jmyslin2> added requirement "IFS-REQ-015114-Sending of Request and Response". |
| AUDSET-SR-REQ-014882/C-Audio Settings Server module controlling Tonal Settings (TcSE ROIN-40208-3) | <jmyslin2> Updated requirement to include the DSP AMP variant 2 |
| AUDSET-SR-REQ-014883/E-Display module looking at the correct Audio Settings Server Module (TcSE ROIN-40209-2) | <jmyslin2> updated to include DSP AMP variant 2 module |
| AUDSET-SR-REQ-310962/A-HMI updates from server module status signals+ | <jmyslin2> Requirement clarifing Status signal are used to update the HMI |
| AUDSET-SR-REQ-310962/B-HMI updates from server module status signals | <jmyslin2> corrected type. Removed volume typo |

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| | IFS-MMCAN-FUR-REQ-015114/D-Sending of Request and Response (TcSE ROIN-66252-1) | jmyslin2 - updated requirement to state inactive/null instead of just inactive |
| | STR-090180/E-Functional Definition (TcSE ROIN-290264) | <jmyslin2> added ToneTouch function |
| | AUDSET-SD-REQ-014902/B-Set Speed Compensated Volume Sequence Diagram (TcSE ROIN-40218-2) | fnowack2: Content regarding quality factor deleted |
| | AUDSET-SR-REQ-016384/D-Auto-Configuring for Occupancy Mode (TcSE ROIN-40734-4) | <jmyslin2> Updated to note the AHU auto-config signals are not applicable if AHU integrated with display module |
| | AUDSET-SR-REQ-014926/C-Audio during an Audio Demonstration event (TcSE ROIN-39733-2) | <jmyslin2> no content change. Just noted that the audio demonstration audio is a media source. |
| | AUDSETv2-FUN-REQ-016388/B-Simulated Surround Sound (DSP Mode Setting) - Variant 2 (TcSE ROIN-290236-1) | <jmyslin2> No content change. Just added variant 2 to the title of the function |
| | AUDSET-FUN-REQ-354743/A-ToneTouch | <jmyslin2> New ToneTouch function |
| | AUDSET-UC-REQ-354839/A-User Enables ToneTouch | <jmyslin2> New ToneTouch use case |
| | AUDSET-UC-REQ-354842/A-User Disables ToneTouch | <jmyslin2> added Tone Touch use case |
| | AUDSET-UC-REQ-354903/A-User changes ToneTouch coordinates | <jmyslin2> New Tone Touch use case |
| | AUDSET-UC-REQ-354905/A-Real Time Audible Feedback when adjusting the ToneTouch setting | <jmyslin2> New Tone Touch use case |
| | AUDSET-UC-REQ-354908/A-Select ToneTouch presets | <jmyslin2> new ToneTouch use case |
| | AUDSET-UC-REQ-354929/A-Store ToneTouch custom presets | <jmyslin2> new ToneTouch use case |
| | AUDSET-UC-REQ-354934/A-Select DSP mode setting (Stereo, Surround) via ToneTouch | <jmyslin2> New Tone Touch use case |
| | AUDSET-SR-REQ-355233/A-Saving ToneTouch settings between power modes | <jmyslin2> New ToneTouch requirement |
| | AUDSET-SR-REQ-355396/A-Enabling ToneTouch | <jmyslin2> New ToneTouch requirement |
| | AUDSET-SR-REQ-355397/A-Disabling ToneTouch | <jmyslin2> New ToneTouch requirement |
| | AUDSET-SR-REQ-355398/A-ToneTouch and BTM mutual exclusivity | <jmyslin2> New ToneTouch requirement |
| | AUDSET-SR-REQ-355399/A-ToneTouch HMI | <jmyslin2> New ToneTouch requirement |
| | AUDSET-REQ-355400/A-Default ToneTouch Setting | <jmyslin2> New ToneTouch requirement |
| | AUDSET-SR-REQ-358467/A-ToneTouch X,Y grid coordinates | <jmyslin2> New ToneTouch requirement |
| | AUDSET-SR-REQ-355386/A-ToneTouch x, y coordinate change | <jmyslin2> New ToneTouch requirement |
| | AUDSET-SR-REQ-358190/A-ToneTouch enable/disable setting change | <jmyslin2> New tone touch requirement |
| | AUDSET-SR-REQ-358191/A-Surround Sound | <jmyslin2> New ToneTouch requirement |
| | AUDSET-SR-REQ-358192/A-ToneTouch Presets | <jmyslin2> New ToneTouch requirement |
| | AUDSET-SD-REQ-355017/A-ToneTouch set to Enabled via the HMI | <jmyslin2> New ToneTouch sequence diagram |
| | AUDSET-SD-REQ-355018/A-ToneTouch set to Disabled via the HMI | <jmyslin2> New ToneTouch sequence diagram |
| | AUDSET-SD-REQ-355019/A-Changing the ToneTouch setting | <jmyslin2> New ToneTouch sequence diagram |
| | | |
| **January 21, 2020** | **1.5** | |
| | AUDSET-SR-REQ-358467/B-ToneTouch X,Y grid coordinates | jmyslin2: updated requirement for circular design and x,y coordinates to support |
| | AUDSET-SR-REQ-355386/B-ToneTouch x, y coordinate change | jmyslin2: updated example to include the new x,y coordinate range |
| | AUDSET-SR-REQ-358192/B-ToneTouch Presets | jmyslin2: updated presets |
| | AUDSET-SR-REQ-372715/A-Default ToneTouch Coordinates | jmyslin2: new requirement for default ToneTouch coordinates |
| | AUDSET-SD-REQ-355019/B-Changing the ToneTouch setting | <jmyslin2> updated sequence diagram with updated x,y coordinates |
| | | |
| **Septembre 29, 2020** | **1.6** | |
| | STR-668766/B-Interface Requirements | rhardt / jmyslin2: removed the surround sound signals as ToneTouch feature does not define which one to use. See applicable section of the Audio Settings SPSS |
| | STR-668748/C-Requirements | rhardt / jmyslin2: removed the surround sound requirement as ToneTouch feature does not define which one to use. See applicable section of the Audio Settings SPSS |

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| **June 10, 2021** | **1.7** | |
| | AUDSETv3-CLD-REQ-420764/A-Audio Demo Client | jmyslin2: new class MD for Phoenix variant 3 of Audio Demo Client |
| | AUDSETv3-CLD-REQ-420767/A-Audio Demo Server | jmyslin2: new Audio Demo Server class description variant 3 for the Phoenix audio system |
| | AUDSETv3-CLD-REQ-420768/A-Audio Demo Audio Switch Server | jmyslin2: new class description for Audio Demo Audio Switch Server Phoenix variant 3 |
| | MD-REQ-276496/C-Audio_Demo_CMND | jmyslin2 - added note for Phoenix architecture |
| | AUDSET-SR-REQ-014882/D-Audio Settings Server module controlling Tonal Settings (TcSE ROIN-40208-3) | jmyslin2: no content change just removed the note about DSPv2 since SYNC 4.1/4.2 cancelled |
| | AUDSET-SR-REQ-014883/F-Display module looking at the correct Audio Settings Server Module (TcSE ROIN-40209-2) | jmyslin2: no content change just removed note about SYNC 4.1/4.2 and DSP v2 |
| | IFS-MMCAN-FUR-REQ-015114/E-Sending of Request and Response (TcSE ROIN-66252-1) | jmyslin2: added clarification on 100 msec request/response |
| | AUDSET-SR-REQ-016384/E-Auto-Configuring for Occupancy Mode (TcSE ROIN-40734-4) | jmyslin2: update requirement to include DSP AMP |
| | STR-055694/B-Requirements (TcSE ROIN-290210) | jmyslin2: removed zone mode requirement since not applicable |
| | AUDSETv3-FUN-REQ-420758/A-Audio Demonstration Mode - variant 3 (Phoenix) | jmyslin2: new function for Audio Demonstration on the Phoenix architecture between the PDC and DSP AMP |
| | AUDSETv2-UC-REQ-420880/A-Audio Demo Mode - Enable | jmyslin2: new use case for Phoenix |
| | AUDSETv2-UC-REQ-420881/A-Audio Demo Mode - Cancel | jmyslin2: new use case for Phoenix |
| | AUDSET-SR-REQ-014923/C-Zone mode and Audio Demonstration (TcSE ROIN-39724-1) | jmyslin2: updated requirement for zone mode, such as on the Phoenix audio system |
| **August 27, 2021** | **1.8** | |
| | AUDSET-CLD-REQ-436834/A-Audio Settings Client - Phoenix PDC | jmyslin2: new Class Description for Phoenix PDC programs only (not applicable to SYNC 3 and SYNC 4) |
| | AUDSET-FUR-REQ-436704/A-Speed Sensitive Volume Control - PDC | Matt Dage: new requirement |
| | AUDSET-SR-REQ-437157/A-Speed Compensated Volume - Volume Controller (Phoenix only) | jmyslin2: new requirement for the Phoenix architecture for speed compensated volume |

# Table of Contents

# 1 Architectural Design

## 1.1 AUDSET-CLD-REQ-050382/A-Audio Settings Client - SYNC Gen 3

The Audio Settings Client is the interface of the Audio Settings function. It acts with other system parts that control the Audio Settings or need data from it.

### 1.1.1 AUDSET-HMI-REQ-050361/D-Speed Compensated Volume values when HMI has SCV settings OFF, LOW, MED and HIGH (HMI)

The Speed Compensated Volume Client shall request the following Speed Compensated Volume settings when the HMI buttons (OFF, Low, Med, High) are activated by the user: Off = SCV 0, Low = SCV 1, Med = SCV 4, High = SCV 7.

At infotainment start-up (ie HMI_HMIMode_St from OFF to ON) if the Speed Compensated Volume Server SCV values in its status message are not equal to Off = 0, Low = 1, Med = 4, High = 7 then the Speed Compensated Client shall request the following SCV values from the Speed Compensated Volume Server:

- If the Speed Compensated Volume Server status message is set to SCV 2 then the Speed Compensated Client requests SCV = 1 (Low)
- If the Speed Compensated Volume Server status message is set to SCV 3 or 5 then the Speed Compensated Client requests SCV = 4 (Med)
- If the Speed Compensated Volume Server status message is set to SCV 6 then the Speed Compensated Client requests SCV = 7 (High)

If the Speed Compensated Volume Server doesn't respond to the Speed Compensated Volume Client request for Off = 0, Low = 1, Med = 4, High = 7 then the following shall be mapped to the SCV HMI buttons: SCV setting of 1 or 2 is mapped to HMI Low, SCV setting of 3,4,5 is mapped to HMI Medium and SCV setting of 6 or 7 is mapped to HMI High.

Note: The Speed Compensated Volume Client is a subset of the Audio Settings Client and the Speed Compensated Volume Server is a subset of the Audio Settings Server.

## 1.2 AUDSET-CLD-REQ-436834/A-Audio Settings Client - Phoenix PDC

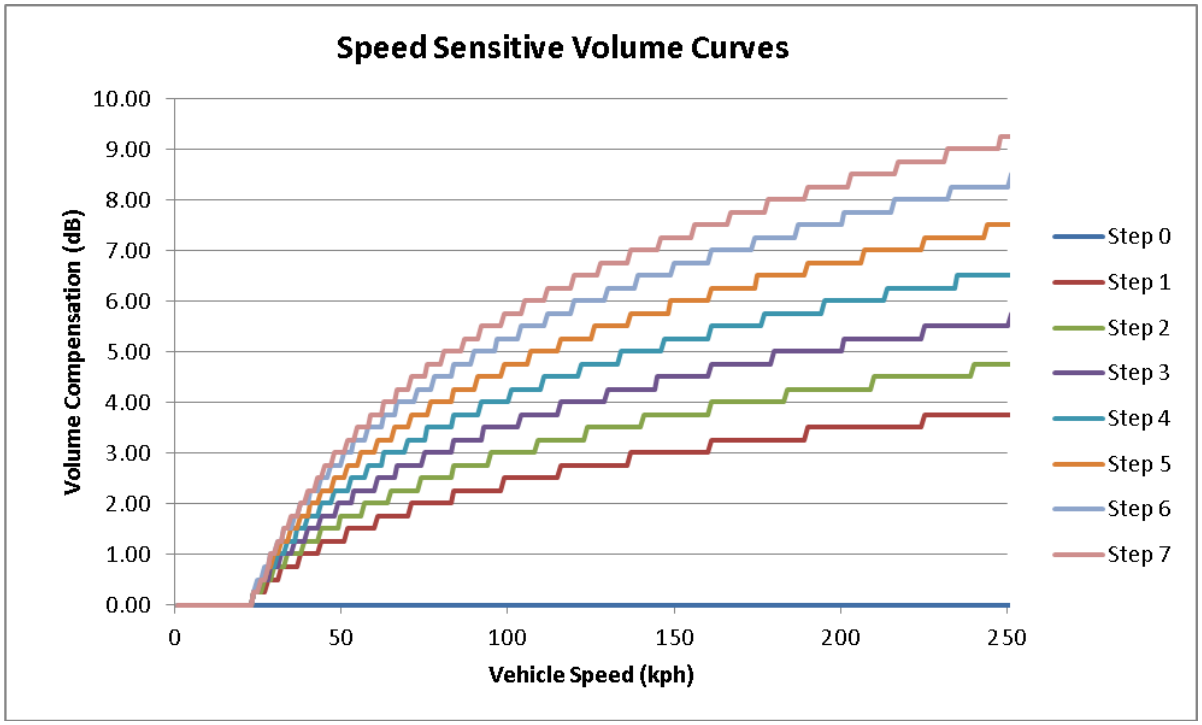
### 1.2.1 AUDSET-FUR-REQ-436704/A-Speed Sensitive Volume Control - PDC

Phoenix architecture PDC only

(Hardware support does not apply to "Fixed Line Level, only HS-CAN message outputs apply)

The PDC shall provide a Speed Sensitive Volume Control feature. Gain compensation for speed adjusted volume control shall consist of 8 user selectable levels, and operate as follows:

**Figure: Speed Sensitive Volume Gain Compensation**




The PDC shall provide speed sensitive volume control characteristics as defined in the table below:

| kph | Step 0 | Step 1 | Step 2 | Step 3 | Step 4 | Step 5 | Step 6 | Step 7 |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 4 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 8 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 9 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 11 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 12 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 13 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 14 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 15 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 16 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 17 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 18 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 19 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 20 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 21 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 22 | 0 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| 23 | 0 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.50 | 0.25 |
| 24 | 0 | 0.25 | 0.25 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |

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|---|---|---|---|---|---|---|---|---|
| 25 | 0 | 0.25 | 0.50 | 0.50 | 0.50 | 0.50 | 0.75 | 0.50 |
| 26 | 0 | 0.50 | 0.50 | 0.50 | 0.75 | 0.75 | 0.75 | 0.75 |
| 27 | 0 | 0.50 | 0.50 | 0.75 | 0.75 | 0.75 | 1.00 | 1.00 |
| 28 | 0 | 0.50 | 0.75 | 0.75 | 0.75 | 1.00 | 1.00 | 1.00 |
| 29 | 0 | 0.50 | 0.75 | 0.75 | 1.00 | 1.00 | 1.25 | 1.25 |
| 30 | 0 | 0.75 | 0.75 | 1.00 | 1.00 | 1.25 | 1.25 | 1.25 |
| 31 | 0 | 0.75 | 0.75 | 1.00 | 1.00 | 1.25 | 1.50 | 1.50 |
| 32 | 0 | 0.75 | 1.00 | 1.00 | 1.25 | 1.25 | 1.50 | 1.50 |
| 33 | 0 | 0.75 | 1.00 | 1.00 | 1.25 | 1.50 | 1.50 | 1.75 |
| 34 | 0 | 0.75 | 1.00 | 1.25 | 1.25 | 1.50 | 1.75 | 1.75 |
| 35 | 0 | 0.75 | 1.00 | 1.25 | 1.50 | 1.50 | 1.75 | 1.75 |
| 36 | 0 | 1.00 | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | 2.00 |
| 37 | 0 | 1.00 | 1.25 | 1.25 | 1.50 | 1.75 | 2.00 | 2.00 |
| 38 | 0 | 1.00 | 1.25 | 1.50 | 1.75 | 1.75 | 2.00 | 2.25 |
| 39 | 0 | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | 2.25 | 2.25 |
| 40 | 0 | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | 2.25 | 2.25 |
| 41 | 0 | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | 2.25 | 2.50 |
| 42 | 0 | 1.25 | 1.50 | 1.75 | 2.00 | 2.25 | 2.50 | 2.50 |
| 43 | 0 | 1.25 | 1.50 | 1.75 | 2.00 | 2.25 | 2.50 | 2.75 |
| 44 | 0 | 1.25 | 1.50 | 1.75 | 2.00 | 2.25 | 2.50 | 2.75 |
| 45 | 0 | 1.25 | 1.50 | 1.75 | 2.00 | 2.25 | 2.75 | 2.75 |
| 46 | 0 | 1.25 | 1.50 | 1.75 | 2.25 | 2.50 | 2.75 | 3.00 |
| 47 | 0 | 1.25 | 1.50 | 2.00 | 2.25 | 2.50 | 2.75 | 3.00 |
| 48 | 0 | 1.25 | 1.75 | 2.00 | 2.25 | 2.50 | 2.75 | 3.00 |
| 49 | 0 | 1.25 | 1.75 | 2.00 | 2.25 | 2.50 | 3.00 | 3.00 |
| 50 | 0 | 1.50 | 1.75 | 2.00 | 2.25 | 2.75 | 3.00 | 3.25 |
| 51 | 0 | 1.50 | 1.75 | 2.00 | 2.50 | 2.75 | 3.00 | 3.25 |
| 52 | 0 | 1.50 | 1.75 | 2.25 | 2.50 | 2.75 | 3.25 | 3.25 |
| 53 | 0 | 1.50 | 1.75 | 2.25 | 2.50 | 2.75 | 3.25 | 3.50 |
| 54 | 0 | 1.50 | 1.75 | 2.25 | 2.50 | 3.00 | 3.25 | 3.50 |
| 55 | 0 | 1.50 | 2.00 | 2.25 | 2.50 | 3.00 | 3.25 | 3.50 |
| 56 | 0 | 1.50 | 2.00 | 2.25 | 2.75 | 3.00 | 3.50 | 3.50 |
| 57 | 0 | 1.50 | 2.00 | 2.25 | 2.75 | 3.00 | 3.50 | 3.75 |
| 58 | 0 | 1.50 | 2.00 | 2.25 | 2.75 | 3.00 | 3.50 | 3.75 |
| 59 | 0 | 1.75 | 2.00 | 2.50 | 2.75 | 3.25 | 3.50 | 3.75 |
| 60 | 0 | 1.75 | 2.00 | 2.50 | 2.75 | 3.25 | 3.50 | 3.75 |
| 61 | 0 | 1.75 | 2.00 | 2.50 | 3.00 | 3.25 | 3.75 | 4.00 |
| 62 | 0 | 1.75 | 2.00 | 2.50 | 3.00 | 3.25 | 3.75 | 4.00 |
| 63 | 0 | 1.75 | 2.25 | 2.50 | 3.00 | 3.25 | 3.75 | 4.00 |
| 64 | 0 | 1.75 | 2.25 | 2.50 | 3.00 | 3.50 | 3.75 | 4.00 |
| 65 | 0 | 1.75 | 2.25 | 2.75 | 3.00 | 3.50 | 4.00 | 4.25 |
| 66 | 0 | 1.75 | 2.25 | 2.75 | 3.00 | 3.50 | 4.00 | 4.25 |
| 67 | 0 | 1.75 | 2.25 | 2.75 | 3.00 | 3.50 | 4.00 | 4.25 |
| 68 | 0 | 1.75 | 2.25 | 2.75 | 3.25 | 3.50 | 4.00 | 4.25 |
| 69 | 0 | 2.00 | 2.25 | 2.75 | 3.25 | 3.75 | 4.00 | 4.50 |
| 70 | 0 | 2.00 | 2.25 | 2.75 | 3.25 | 3.75 | 4.00 | 4.50 |
| 71 | 0 | 2.00 | 2.25 | 2.75 | 3.25 | 3.75 | 4.25 | 4.50 |
| 72 | 0 | 2.00 | 2.50 | 2.75 | 3.25 | 3.75 | 4.25 | 4.50 |
| 73 | 0 | 2.00 | 2.50 | 3.00 | 3.25 | 3.75 | 4.25 | 4.50 |

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|---|---|---|---|---|---|---|---|---|
| 74 | 0 | 2.00 | 2.50 | 3.00 | 3.50 | 3.75 | 4.25 | 4.75 |
| 75 | 0 | 2.00 | 2.50 | 3.00 | 3.50 | 4.00 | 4.25 | 4.75 |
| 76 | 0 | 2.00 | 2.50 | 3.00 | 3.50 | 4.00 | 4.50 | 4.75 |
| 77 | 0 | 2.00 | 2.50 | 3.00 | 3.50 | 4.00 | 4.50 | 4.75 |
| 78 | 0 | 2.00 | 2.50 | 3.00 | 3.50 | 4.00 | 4.50 | 4.75 |
| 79 | 0 | 2.00 | 2.50 | 3.00 | 3.50 | 4.00 | 4.50 | 5.00 |
| 80 | 0 | 2.00 | 2.50 | 3.00 | 3.50 | 4.00 | 4.50 | 5.00 |
| 81 | 0 | 2.00 | 2.50 | 3.00 | 3.50 | 4.00 | 4.50 | 5.00 |
| 82 | 0 | 2.25 | 2.75 | 3.25 | 3.75 | 4.25 | 4.75 | 5.00 |
| 83 | 0 | 2.25 | 2.75 | 3.25 | 3.75 | 4.25 | 4.75 | 5.00 |
| 84 | 0 | 2.25 | 2.75 | 3.25 | 3.75 | 4.25 | 4.75 | 5.00 |
| 85 | 0 | 2.25 | 2.75 | 3.25 | 3.75 | 4.25 | 4.75 | 5.25 |
| 86 | 0 | 2.25 | 2.75 | 3.25 | 3.75 | 4.25 | 4.75 | 5.25 |
| 87 | 0 | 2.25 | 2.75 | 3.25 | 3.75 | 4.25 | 4.75 | 5.25 |
| 88 | 0 | 2.25 | 2.75 | 3.25 | 3.75 | 4.25 | 5.00 | 5.25 |
| 89 | 0 | 2.25 | 2.75 | 3.25 | 3.75 | 4.50 | 5.00 | 5.25 |
| 90 | 0 | 2.25 | 2.75 | 3.25 | 4.00 | 4.50 | 5.00 | 5.50 |
| 91 | 0 | 2.25 | 2.75 | 3.50 | 4.00 | 4.50 | 5.00 | 5.50 |
| 92 | 0 | 2.25 | 2.75 | 3.50 | 4.00 | 4.50 | 5.00 | 5.50 |
| 93 | 0 | 2.25 | 3.00 | 3.50 | 4.00 | 4.50 | 5.00 | 5.50 |
| 94 | 0 | 2.25 | 3.00 | 3.50 | 4.00 | 4.50 | 5.00 | 5.50 |
| 95 | 0 | 2.25 | 3.00 | 3.50 | 4.00 | 4.50 | 5.25 | 5.50 |
| 96 | 0 | 2.25 | 3.00 | 3.50 | 4.00 | 4.50 | 5.25 | 5.50 |
| 97 | 0 | 2.50 | 3.00 | 3.50 | 4.00 | 4.75 | 5.25 | 5.75 |
| 98 | 0 | 2.50 | 3.00 | 3.50 | 4.00 | 4.75 | 5.25 | 5.75 |
| 99 | 0 | 2.50 | 3.00 | 3.50 | 4.25 | 4.75 | 5.25 | 5.75 |
| 100 | 0 | 2.50 | 3.00 | 3.50 | 4.25 | 4.75 | 5.25 | 5.75 |
| 101 | 0 | 2.50 | 3.00 | 3.50 | 4.25 | 4.75 | 5.25 | 5.75 |
| 102 | 0 | 2.50 | 3.00 | 3.75 | 4.25 | 4.75 | 5.50 | 5.75 |
| 103 | 0 | 2.50 | 3.00 | 3.75 | 4.25 | 4.75 | 5.50 | 6.00 |
| 104 | 0 | 2.50 | 3.00 | 3.75 | 4.25 | 4.75 | 5.50 | 6.00 |
| 105 | 0 | 2.50 | 3.00 | 3.75 | 4.25 | 5.00 | 5.50 | 6.00 |
| 106 | 0 | 2.50 | 3.00 | 3.75 | 4.25 | 5.00 | 5.50 | 6.00 |
| 107 | 0 | 2.50 | 3.25 | 3.75 | 4.25 | 5.00 | 5.50 | 6.00 |
| 108 | 0 | 2.50 | 3.25 | 3.75 | 4.25 | 5.00 | 5.50 | 6.00 |
| 109 | 0 | 2.50 | 3.25 | 3.75 | 4.50 | 5.00 | 5.50 | 6.00 |
| 110 | 0 | 2.50 | 3.25 | 3.75 | 4.50 | 5.00 | 5.75 | 6.25 |
| 111 | 0 | 2.50 | 3.25 | 3.75 | 4.50 | 5.00 | 5.75 | 6.25 |
| 112 | 0 | 2.50 | 3.25 | 3.75 | 4.50 | 5.00 | 5.75 | 6.25 |
| 113 | 0 | 2.50 | 3.25 | 3.75 | 4.50 | 5.00 | 5.75 | 6.25 |
| 114 | 0 | 2.75 | 3.25 | 4.00 | 4.50 | 5.25 | 5.75 | 6.25 |
| 115 | 0 | 2.75 | 3.25 | 4.00 | 4.50 | 5.25 | 5.75 | 6.25 |
| 116 | 0 | 2.75 | 3.25 | 4.00 | 4.50 | 5.25 | 5.75 | 6.25 |
| 117 | 0 | 2.75 | 3.25 | 4.00 | 4.50 | 5.25 | 5.75 | 6.25 |
| 118 | 0 | 2.75 | 3.25 | 4.00 | 4.50 | 5.25 | 6.00 | 6.50 |
| 119 | 0 | 2.75 | 3.25 | 4.00 | 4.50 | 5.25 | 6.00 | 6.50 |
| 120 | 0 | 2.75 | 3.25 | 4.00 | 4.75 | 5.25 | 6.00 | 6.50 |
| 121 | 0 | 2.75 | 3.25 | 4.00 | 4.75 | 5.25 | 6.00 | 6.50 |
| 122 | 0 | 2.75 | 3.50 | 4.00 | 4.75 | 5.25 | 6.00 | 6.50 |

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|---|---|---|---|---|---|---|---|---|
| 123 | 0 | 2.75 | 3.50 | 4.00 | 4.75 | 5.25 | 6.00 | 6.50 |
| 124 | 0 | 2.75 | 3.50 | 4.00 | 4.75 | 5.50 | 6.00 | 6.50 |
| 125 | 0 | 2.75 | 3.50 | 4.00 | 4.75 | 5.50 | 6.00 | 6.50 |
| 126 | 0 | 2.75 | 3.50 | 4.00 | 4.75 | 5.50 | 6.00 | 6.75 |
| 127 | 0 | 2.75 | 3.50 | 4.00 | 4.75 | 5.50 | 6.00 | 6.75 |
| 128 | 0 | 2.75 | 3.50 | 4.25 | 4.75 | 5.50 | 6.25 | 6.75 |
| 129 | 0 | 2.75 | 3.50 | 4.25 | 4.75 | 5.50 | 6.25 | 6.75 |
| 130 | 0 | 2.75 | 3.50 | 4.25 | 4.75 | 5.50 | 6.25 | 6.75 |
| 131 | 0 | 2.75 | 3.50 | 4.25 | 4.75 | 5.50 | 6.25 | 6.75 |
| 132 | 0 | 2.75 | 3.50 | 4.25 | 5.00 | 5.50 | 6.25 | 6.75 |
| 133 | 0 | 2.75 | 3.50 | 4.25 | 5.00 | 5.50 | 6.25 | 6.75 |
| 134 | 0 | 2.75 | 3.50 | 4.25 | 5.00 | 5.50 | 6.25 | 6.75 |
| 135 | 0 | 3.00 | 3.50 | 4.25 | 5.00 | 5.75 | 6.25 | 7.00 |
| 136 | 0 | 3.00 | 3.50 | 4.25 | 5.00 | 5.75 | 6.25 | 7.00 |
| 137 | 0 | 3.00 | 3.50 | 4.25 | 5.00 | 5.75 | 6.50 | 7.00 |
| 138 | 0 | 3.00 | 3.50 | 4.25 | 5.00 | 5.75 | 6.50 | 7.00 |
| 139 | 0 | 3.00 | 3.75 | 4.25 | 5.00 | 5.75 | 6.50 | 7.00 |
| 140 | 0 | 3.00 | 3.75 | 4.25 | 5.00 | 5.75 | 6.50 | 7.00 |
| 141 | 0 | 3.00 | 3.75 | 4.25 | 5.00 | 5.75 | 6.50 | 7.00 |
| 142 | 0 | 3.00 | 3.75 | 4.25 | 5.00 | 5.75 | 6.50 | 7.00 |
| 143 | 0 | 3.00 | 3.75 | 4.50 | 5.00 | 5.75 | 6.50 | 7.00 |
| 144 | 0 | 3.00 | 3.75 | 4.50 | 5.00 | 5.75 | 6.50 | 7.25 |
| 145 | 0 | 3.00 | 3.75 | 4.50 | 5.25 | 5.75 | 6.50 | 7.25 |
| 146 | 0 | 3.00 | 3.75 | 4.50 | 5.25 | 5.75 | 6.50 | 7.25 |
| 147 | 0 | 3.00 | 3.75 | 4.50 | 5.25 | 6.00 | 6.50 | 7.25 |
| 148 | 0 | 3.00 | 3.75 | 4.50 | 5.25 | 6.00 | 6.75 | 7.25 |
| 149 | 0 | 3.00 | 3.75 | 4.50 | 5.25 | 6.00 | 6.75 | 7.25 |
| 150 | 0 | 3.00 | 3.75 | 4.50 | 5.25 | 6.00 | 6.75 | 7.25 |
| 151 | 0 | 3.00 | 3.75 | 4.50 | 5.25 | 6.00 | 6.75 | 7.25 |
| 152 | 0 | 3.00 | 3.75 | 4.50 | 5.25 | 6.00 | 6.75 | 7.25 |
| 153 | 0 | 3.00 | 3.75 | 4.50 | 5.25 | 6.00 | 6.75 | 7.25 |
| 154 | 0 | 3.00 | 3.75 | 4.50 | 5.25 | 6.00 | 6.75 | 7.50 |
| 155 | 0 | 3.00 | 3.75 | 4.50 | 5.25 | 6.00 | 6.75 | 7.50 |
| 156 | 0 | 3.00 | 3.75 | 4.50 | 5.25 | 6.00 | 6.75 | 7.50 |
| 157 | 0 | 3.00 | 3.75 | 4.50 | 5.25 | 6.00 | 6.75 | 7.50 |
| 158 | 0 | 3.00 | 3.75 | 4.50 | 5.25 | 6.00 | 6.75 | 7.50 |
| 159 | 0 | 3.25 | 4.00 | 4.75 | 5.50 | 6.25 | 7.00 | 7.50 |
| 160 | 0 | 3.25 | 4.00 | 4.75 | 5.50 | 6.25 | 7.00 | 7.50 |
| 161 | 0 | 3.25 | 4.00 | 4.75 | 5.50 | 6.25 | 7.00 | 7.50 |
| 162 | 0 | 3.25 | 4.00 | 4.75 | 5.50 | 6.25 | 7.00 | 7.50 |
| 163 | 0 | 3.25 | 4.00 | 4.75 | 5.50 | 6.25 | 7.00 | 7.50 |
| 164 | 0 | 3.25 | 4.00 | 4.75 | 5.50 | 6.25 | 7.00 | 7.50 |
| 165 | 0 | 3.25 | 4.00 | 4.75 | 5.50 | 6.25 | 7.00 | 7.75 |
| 166 | 0 | 3.25 | 4.00 | 4.75 | 5.50 | 6.25 | 7.00 | 7.75 |
| 167 | 0 | 3.25 | 4.00 | 4.75 | 5.50 | 6.25 | 7.00 | 7.75 |
| 168 | 0 | 3.25 | 4.00 | 4.75 | 5.50 | 6.25 | 7.00 | 7.75 |
| 169 | 0 | 3.25 | 4.00 | 4.75 | 5.50 | 6.25 | 7.00 | 7.75 |
| 170 | 0 | 3.25 | 4.00 | 4.75 | 5.50 | 6.25 | 7.00 | 7.75 |
| 171 | 0 | 3.25 | 4.00 | 4.75 | 5.50 | 6.25 | 7.00 | 7.75 |

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|---|---|---|---|---|---|---|---|---|
| 172 | 0 | 3.25 | 4.00 | 4.75 | 5.50 | 6.25 | 7.25 | 7.75 |
| 173 | 0 | 3.25 | 4.00 | 4.75 | 5.50 | 6.50 | 7.25 | 7.75 |
| 174 | 0 | 3.25 | 4.00 | 4.75 | 5.50 | 6.50 | 7.25 | 7.75 |
| 175 | 0 | 3.25 | 4.00 | 4.75 | 5.75 | 6.50 | 7.25 | 7.75 |
| 176 | 0 | 3.25 | 4.00 | 4.75 | 5.75 | 6.50 | 7.25 | 8.00 |
| 177 | 0 | 3.25 | 4.00 | 4.75 | 5.75 | 6.50 | 7.25 | 8.00 |
| 178 | 0 | 3.25 | 4.00 | 5.00 | 5.75 | 6.50 | 7.25 | 8.00 |
| 179 | 0 | 3.25 | 4.00 | 5.00 | 5.75 | 6.50 | 7.25 | 8.00 |
| 180 | 0 | 3.25 | 4.00 | 5.00 | 5.75 | 6.50 | 7.25 | 8.00 |
| 181 | 0 | 3.25 | 4.00 | 5.00 | 5.75 | 6.50 | 7.25 | 8.00 |
| 182 | 0 | 3.25 | 4.25 | 5.00 | 5.75 | 6.50 | 7.25 | 8.00 |
| 183 | 0 | 3.25 | 4.25 | 5.00 | 5.75 | 6.50 | 7.25 | 8.00 |
| 184 | 0 | 3.25 | 4.25 | 5.00 | 5.75 | 6.50 | 7.25 | 8.00 |
| 185 | 0 | 3.25 | 4.25 | 5.00 | 5.75 | 6.50 | 7.50 | 8.00 |
| 186 | 0 | 3.25 | 4.25 | 5.00 | 5.75 | 6.50 | 7.50 | 8.00 |
| 187 | 0 | 3.25 | 4.25 | 5.00 | 5.75 | 6.50 | 7.50 | 8.00 |
| 188 | 0 | 3.50 | 4.25 | 5.00 | 5.75 | 6.75 | 7.50 | 8.25 |
| 189 | 0 | 3.50 | 4.25 | 5.00 | 5.75 | 6.75 | 7.50 | 8.25 |
| 190 | 0 | 3.50 | 4.25 | 5.00 | 5.75 | 6.75 | 7.50 | 8.25 |
| 191 | 0 | 3.50 | 4.25 | 5.00 | 5.75 | 6.75 | 7.50 | 8.25 |
| 192 | 0 | 3.50 | 4.25 | 5.00 | 5.75 | 6.75 | 7.50 | 8.25 |
| 193 | 0 | 3.50 | 4.25 | 5.00 | 6.00 | 6.75 | 7.50 | 8.25 |
| 194 | 0 | 3.50 | 4.25 | 5.00 | 6.00 | 6.75 | 7.50 | 8.25 |
| 195 | 0 | 3.50 | 4.25 | 5.00 | 6.00 | 6.75 | 7.50 | 8.25 |
| 196 | 0 | 3.50 | 4.25 | 5.00 | 6.00 | 6.75 | 7.50 | 8.25 |
| 197 | 0 | 3.50 | 4.25 | 5.00 | 6.00 | 6.75 | 7.50 | 8.25 |
| 198 | 0 | 3.50 | 4.25 | 5.00 | 6.00 | 6.75 | 7.50 | 8.25 |
| 199 | 0 | 3.50 | 4.25 | 5.25 | 6.00 | 6.75 | 7.75 | 8.25 |
| 200 | 0 | 3.50 | 4.25 | 5.25 | 6.00 | 6.75 | 7.75 | 8.25 |
| 201 | 0 | 3.50 | 4.25 | 5.25 | 6.00 | 6.75 | 7.75 | 8.50 |
| 202 | 0 | 3.50 | 4.25 | 5.25 | 6.00 | 6.75 | 7.75 | 8.50 |
| 203 | 0 | 3.50 | 4.25 | 5.25 | 6.00 | 6.75 | 7.75 | 8.50 |
| 204 | 0 | 3.50 | 4.25 | 5.25 | 6.00 | 6.75 | 7.75 | 8.50 |
| 205 | 0 | 3.50 | 4.25 | 5.25 | 6.00 | 7.00 | 7.75 | 8.50 |
| 206 | 0 | 3.50 | 4.25 | 5.25 | 6.00 | 7.00 | 7.75 | 8.50 |
| 207 | 0 | 3.50 | 4.25 | 5.25 | 6.00 | 7.00 | 7.75 | 8.50 |
| 208 | 0 | 3.50 | 4.50 | 5.25 | 6.00 | 7.00 | 7.75 | 8.50 |
| 209 | 0 | 3.50 | 4.50 | 5.25 | 6.00 | 7.00 | 7.75 | 8.50 |
| 210 | 0 | 3.50 | 4.50 | 5.25 | 6.00 | 7.00 | 7.75 | 8.50 |
| 211 | 0 | 3.50 | 4.50 | 5.25 | 6.00 | 7.00 | 7.75 | 8.50 |
| 212 | 0 | 3.50 | 4.50 | 5.25 | 6.25 | 7.00 | 7.75 | 8.50 |
| 213 | 0 | 3.50 | 4.50 | 5.25 | 6.25 | 7.00 | 7.75 | 8.50 |
| 214 | 0 | 3.50 | 4.50 | 5.25 | 6.25 | 7.00 | 8.00 | 8.50 |
| 215 | 0 | 3.50 | 4.50 | 5.25 | 6.25 | 7.00 | 8.00 | 8.75 |
| 216 | 0 | 3.50 | 4.50 | 5.25 | 6.25 | 7.00 | 8.00 | 8.75 |
| 217 | 0 | 3.50 | 4.50 | 5.25 | 6.25 | 7.00 | 8.00 | 8.75 |
| 218 | 0 | 3.50 | 4.50 | 5.25 | 6.25 | 7.00 | 8.00 | 8.75 |
| 219 | 0 | 3.50 | 4.50 | 5.25 | 6.25 | 7.00 | 8.00 | 8.75 |
| 220 | 0 | 3.50 | 4.50 | 5.25 | 6.25 | 7.00 | 8.00 | 8.75 |

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|---|---|---|---|---|---|---|---|---|
| 221 | 0 | 3.50 | 4.50 | 5.25 | 6.25 | 7.00 | 8.00 | 8.75 |
| 222 | 0 | 3.50 | 4.50 | 5.25 | 6.25 | 7.00 | 8.00 | 8.75 |
| 223 | 0 | 3.75 | 4.50 | 5.50 | 6.25 | 7.25 | 8.00 | 8.75 |
| 224 | 0 | 3.75 | 4.50 | 5.50 | 6.25 | 7.25 | 8.00 | 8.75 |
| 225 | 0 | 3.75 | 4.50 | 5.50 | 6.25 | 7.25 | 8.00 | 8.75 |
| 226 | 0 | 3.75 | 4.50 | 5.50 | 6.25 | 7.25 | 8.00 | 8.75 |
| 227 | 0 | 3.75 | 4.50 | 5.50 | 6.25 | 7.25 | 8.00 | 8.75 |
| 228 | 0 | 3.75 | 4.50 | 5.50 | 6.25 | 7.25 | 8.00 | 8.75 |
| 229 | 0 | 3.75 | 4.50 | 5.50 | 6.25 | 7.25 | 8.00 | 8.75 |
| 230 | 0 | 3.75 | 4.50 | 5.50 | 6.25 | 7.25 | 8.00 | 9.00 |
| 231 | 0 | 3.75 | 4.50 | 5.50 | 6.25 | 7.25 | 8.25 | 9.00 |
| 232 | 0 | 3.75 | 4.50 | 5.50 | 6.25 | 7.25 | 8.25 | 9.00 |
| 233 | 0 | 3.75 | 4.50 | 5.50 | 6.50 | 7.25 | 8.25 | 9.00 |
| 234 | 0 | 3.75 | 4.50 | 5.50 | 6.50 | 7.25 | 8.25 | 9.00 |
| 235 | 0 | 3.75 | 4.50 | 5.50 | 6.50 | 7.25 | 8.25 | 9.00 |
| 236 | 0 | 3.75 | 4.50 | 5.50 | 6.50 | 7.25 | 8.25 | 9.00 |
| 237 | 0 | 3.75 | 4.50 | 5.50 | 6.50 | 7.25 | 8.25 | 9.00 |
| 238 | 0 | 3.75 | 4.75 | 5.50 | 6.50 | 7.25 | 8.25 | 9.00 |
| 239 | 0 | 3.75 | 4.75 | 5.50 | 6.50 | 7.25 | 8.25 | 9.00 |
| 240 | 0 | 3.75 | 4.75 | 5.50 | 6.50 | 7.25 | 8.25 | 9.00 |
| 241 | 0 | 3.75 | 4.75 | 5.50 | 6.50 | 7.25 | 8.25 | 9.00 |
| 242 | 0 | 3.75 | 4.75 | 5.50 | 6.50 | 7.50 | 8.25 | 9.00 |
| 243 | 0 | 3.75 | 4.75 | 5.50 | 6.50 | 7.50 | 8.25 | 9.00 |
| 244 | 0 | 3.75 | 4.75 | 5.50 | 6.50 | 7.50 | 8.25 | 9.00 |
| 245 | 0 | 3.75 | 4.75 | 5.50 | 6.50 | 7.50 | 8.25 | 9.00 |
| 246 | 0 | 3.75 | 4.75 | 5.50 | 6.50 | 7.50 | 8.25 | 9.25 |
| 247 | 0 | 3.75 | 4.75 | 5.50 | 6.50 | 7.50 | 8.25 | 9.25 |
| 248 | 0 | 3.75 | 4.75 | 5.50 | 6.50 | 7.50 | 8.25 | 9.25 |
| 249 | 0 | 3.75 | 4.75 | 5.75 | 6.50 | 7.50 | 8.50 | 9.25 |
| 250 | 0 | 3.75 | 4.75 | 5.75 | 6.50 | 7.50 | 8.50 | 9.25 |

- Speed sensitive volume has no effect until vehicle reaches 22 KPH.•
- The PDC shall not increase volume above 250KPH.
- Speed Compensated Volume does not increase the maximum volume of the PDC, it only causes the maximum volume to be reached at a lower volume step.
- When the Speed Compensated Volume feature is enabled, if there is a loss of speed signal the PDC shall disable the Speed Compensated Volume feature for the duration of the key cycle. After IGN cycles from OFF back to run, the Speed Compensated Volume feature can be re-enabled if the Speed signal is present.
- Assess the QF of speed signal (Vehicle_Speed_QF in message 0x202) 1000ms after changing IGN signal from “Start” to “Run”. If QF = OK then activate AVC, if QF signal is ≠ OK keep AVC deactivated.
- The availability of this feature (enabled/disabled status) shall be EOL configurable via HS-CAN. Refer to applicable IDS specification for configuration information.
- The speed sensitive volume control modifies the Prompt, Phone and Call Ring volume groups that are controlled by the PDC Volume control in Cabin Mode. Reference the Speed Compensate Volume signal to see what SCV is set to.
- Resultant electrically measured volume levels shall be within +/- 0.75 dB of the calculated values.
- Volume level tolerances shall not be interpreted to allow compensation levels to "overlap" but rather are intended to allow variation in the overall gain lineup. For example, volume step 2 should always be higher than volume step 1 unless the calculations result in a difference of less than 0.25 dB. .

When the MyKey feature is active Speed Compensated Volume shall be disabled.

## 1.3 AUDSET-CLD-REQ-030726/A-Audio Settings Server (TcSE ROIN-202555-1)

The Audio Settings Server is responsible for control of acoustical properties, such as BTMBF. It shall also manage speed compensated volume, occupancy mode and others.

## 1.4 AUDSET-CLD-REQ-014872/A-Audio Demo Client (TcSE ROIN-202556-1)

The Audio Demo Client is the interface for the Audio Demo function

## 1.5 AUDSET-CLD-REQ-014873/A-Audio Demo Server (TcSE ROIN-202557-1)

The Audio Demo Server is responsible for control of the Audio Demo function

## 1.6 AUDSET-CLD-REQ-014876/A-Surround Sound Client (TcSE ROIN-202560-1)

The Surround Sound Client is the interface for the Surround Sound function

## 1.7 AUDSET-CLD-REQ-014877/A-Surround Sound Server (TcSE ROIN-202561-1)

The Surround Sound Server is responsible for control of the Surround Sound function

## 1.8 AUDSET-CLD-REQ-238552/A-Immersion Setting Client

## 1.9 AUDSET-CLD-REQ-238553/A-Immersion Setting Server

## 1.10 AUDSET-CLD-REQ-354781/A-ToneTouch Client

The ToneTouch Client interfaces with the user via the HMI and is responsible for sending the ToneTouch HMI requests to the ToneTouch Server.

## 1.11 AUDSET-CLD-REQ-354796/A-ToneTouch Server

The ToneTouch Server is responsible for the control of the ToneTouch feature and interfaces with the ToneTouch Client.

## 1.12 AUDSETv3-CLD-REQ-420764/A-Audio Demo Client

The Audio Demo Client is the interface for activating and deactivating the Audio Demo function.

## 1.13 AUDSETv3-CLD-REQ-420767/A-Audio Demo Server

The Audio Demo Server is responsible for control of the Audio Demo function

## 1.14 AUDSETv3-CLD-REQ-420768/A-Audio Demo Audio Switch Server

The Audio Demo Audio Switch Server is responsible for muting, adjusting any acoustical parameters and unmuting the audio demonstration audio inputs and responsible for the speakers to use for audio demonstration.

## 1.15 Interface Requirements - APIM

### 1.15.1 MD-REQ-276198/A-SetBalance

**Message Type**: Request

Signal sent by the Audio Setting Client to the Audio Settings Server to set the Balance level.

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| SetBalance | -7 | 0x0 | Set balance all the way to the Left |
| | -6 | 0x1 | |
| | -5 | 0x2 | |
| | -4 | 0x3 | |
| | -3 | 0x4 | |
| | -2 | 0x5 | |
| | -1 | 0x6 | |
| | 0 | 0x7 | Mid-Point |
| | +1 | 0x8 | |
| | +2 | 0x9 | |
| | +3 | 0xA | |
| | +4 | 0xB | |
| | +5 | 0xC | |
| | +6 | 0xD | |
| | +7 | 0xE | Set balance all the way to the Right |
| | Inactive/Invalid | 0xF | |

### 1.15.2 MD-REQ-276206/B-Balance.St

**Message Type**: Status

Signal sent by the Audio Setting Server with the current status of the Balance level

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| Balance.St | -7 | 0x0 | Balance all the way to the Left |
| | -6 | 0x1 | |
| | -5 | 0x2 | |
| | -4 | 0x3 | |
| | -3 | 0x4 | |
| | -2 | 0x5 | |
| | -1 | 0x6 | |
| | 0 | 0x7 | Mid-Point |
| | +1 | 0x8 | |
| | +2 | 0x9 | |
| | +3 | 0xA | |
| | +4 | 0xB | |
| | +5 | 0xC | |
| | +6 | 0xD | |
| | +7 | 0xE | Balance all the way to the Right |
| | Inactive/Invalid | 0xF | |

### 1.15.3 MD-REQ-276207/A-SetBass

**Message Type**: Request

Signal sent by the Audio Setting Client to the Audio Settings Server to set the Bass level.

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| SetBass | -7 | 0x0 | Min Bass |
| | -6 | 0x1 | |
| | -5 | 0x2 | |
| | -4 | 0x3 | |
| | -3 | 0x4 | |
| | -2 | 0x5 | |
| | -1 | 0x6 | |
| | 0 | 0x7 | Mid-Point |
| | +1 | 0x8 | |
| | +2 | 0x9 | |
| | +3 | 0xA | |
| | +4 | 0xB | |
| | +5 | 0xC | |
| | +6 | 0xD | |
| | +7 | 0xE | Max Bass |
| | Inactive/Invalid | 0xF | |

### 1.15.4 MD-REQ-276208/A-Bass.St

**Message Type**: Status

Signal sent by the Audio Setting Server with the current status of the Bass level

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| Bass.St | -7 | 0x0 | Min Bass |
| | -6 | 0x1 | |
| | -5 | 0x2 | |
| | -4 | 0x3 | |
| | -3 | 0x4 | |
| | -2 | 0x5 | |
| | -1 | 0x6 | |
| | 0 | 0x7 | Mid-Point |
| | +1 | 0x8 | |
| | +2 | 0x9 | |
| | +3 | 0xA | |
| | +4 | 0xB | |
| | +5 | 0xC | |
| | +6 | 0xD | |
| | +7 | 0xE | Max Bass |
| | Inactive/Invalid | 0xF | |

### 1.15.5 MD-REQ-276209/A-SetMidRange

**Message Type**: Request

Signal sent by the Audio Setting Client to the Audio Settings Server to set the Mid Range level.

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| SetMidRange | -7 | 0x0 | Min MidRange |
| | -6 | 0x1 | |

| | | | |
|---|---|---|---|
| | -5 | 0x2 | |
| | -4 | 0x3 | |
| | -3 | 0x4 | |
| | -2 | 0x5 | |
| | -1 | 0x6 | |
| | 0 | 0x7 | Mid-Point |
| | +1 | 0x8 | |
| | +2 | 0x9 | |
| | +3 | 0xA | |
| | +4 | 0xB | |
| | +5 | 0xC | |
| | +6 | 0xD | |
| | +7 | 0xE | Max MidRange |
| | Inactive/Invalid | 0xF | |

### 1.15.6 MD-REQ-276210/A-MidRange.St

**Message Type**: Status

Signal sent by the Audio Setting Server with the current status of the Mid Range level

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| MidRange.St | -7 | 0x0 | Min MidRange |
| | -6 | 0x1 | |
| | -5 | 0x2 | |
| | -4 | 0x3 | |
| | -3 | 0x4 | |
| | -2 | 0x5 | |
| | -1 | 0x6 | |
| | 0 | 0x7 | Mid-Point |
| | +1 | 0x8 | |
| | +2 | 0x9 | |
| | +3 | 0xA | |
| | +4 | 0xB | |
| | +5 | 0xC | |
| | +6 | 0xD | |
| | +7 | 0xE | Max MidRange |
| | Inactive/Invalid | 0xF | |

### 1.15.7 MD-REQ-276448/A-SetTreble

**Message Type**: Request

Signal sent by the Audio Setting Client to the Audio Settings Server to set the Treble level.

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| SetTreble | -7 | 0x0 | Min Treble |
| | -6 | 0x1 | |
| | -5 | 0x2 | |
| | -4 | 0x3 | |
| | -3 | 0x4 | |

| | | | |
|---|---|---|---|
| | -2 | 0x5 | |
| | -1 | 0x6 | |
| | 0 | 0x7 | Mid-Point |
| | +1 | 0x8 | |
| | +2 | 0x9 | |
| | +3 | 0xA | |
| | +4 | 0xB | |
| | +5 | 0xC | |
| | +6 | 0xD | |
| | +7 | 0xE | Max Treble |
| | Inactive/Invalid | 0xF | |

### 1.15.8 MD-REQ-276453/A-Treble.St

**Message Type**: Status

Signal sent by the Audio Setting Server with the current status of the Treble level

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| Treble.St | -7 | 0x0 | Min Treble |
| | -6 | 0x1 | |
| | -5 | 0x2 | |
| | -4 | 0x3 | |
| | -3 | 0x4 | |
| | -2 | 0x5 | |
| | -1 | 0x6 | |
| | 0 | 0x7 | Mid-Point |
| | +1 | 0x8 | |
| | +2 | 0x9 | |
| | +3 | 0xA | |
| | +4 | 0xB | |
| | +5 | 0xC | |
| | +6 | 0xD | |
| | +7 | 0xE | Max Treble |
| | Inactive/Invalid | 0xF | |

### 1.15.9 MD-REQ-276451/A-SetFade

**Message Type**: Request

Signal sent by the Audio Setting Client to the Audio Settings Server to set the Fade level.

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| SetFade | -7 | 0x0 | Fade all the way to the Back |
| | -6 | 0x1 | |
| | -5 | 0x2 | |
| | -4 | 0x3 | |
| | -3 | 0x4 | |
| | -2 | 0x5 | |
| | -1 | 0x6 | |
| | 0 | 0x7 | Mid-Point |

| | | | |
|---|---|---|---|
| | +1 | 0x8 | |
| | +2 | 0x9 | |
| | +3 | 0xA | |
| | +4 | 0xB | |
| | +5 | 0xC | |
| | +6 | 0xD | |
| | +7 | 0xE | Fade all the way to the Front |
| | Inactive/Invalid | 0xF | |

### 1.15.10 MD-REQ-276454/A-Fade.St

**Message Type**: Status

Signal sent by the Audio Setting Server with the current status of the Fade level

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| Fade.St | -7 | 0x0 | Fade all the way to the Back |
| | -6 | 0x1 | |
| | -5 | 0x2 | |
| | -4 | 0x3 | |
| | -3 | 0x4 | |
| | -2 | 0x5 | |
| | -1 | 0x6 | |
| | 0 | 0x7 | Mid-Point |
| | +1 | 0x8 | |
| | +2 | 0x9 | |
| | +3 | 0xA | |
| | +4 | 0xB | |
| | +5 | 0xC | |
| | +6 | 0xD | |
| | +7 | 0xE | Fade all the way to the Front |
| | Inactive/Invalid | 0xF | |

### 1.15.11 MD-REQ-276456/A-SetSpeed_Comp_Vol

**Message Type**: Request

Signal sent by the Audio Setting Client to the Audio Settings Server to set the Speed Compensated Volume level.

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| SetSpeed_Comp_Vol | OFF | 0x0 | |
| | Level1 | 0x1 | |
| | Level2 | 0x2 | |
| | cont. | | |
| | Level7 | 0x7 | |
| | Inactive | 0xF | |

### 1.15.12 MD-REQ-276457/A-Speed_Comp_Vol.St

**Message Type**: Status

Signal sent by the Audio Setting Server with the current status of the Speed Compensated Volume level

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| Speed_Comp_Vol.St | OFF | 0x0 | |
| | Level1 | 0x1 | |
| | Level2 | 0x2 | |
| | Level3 | 0x3 | |
| | cont. | | |
| | Level7 | 0x7 | |
| | Inactive | 0xF | |

### 1.15.13 MD-REQ-276458/B-Vehicle_Speed.St

**Message Type**: Status

Signal with the current status of the Vehicle Speed

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| Vehicle_Speed.St | See info-CAN database for signal details | See info-CAN database for signal details | |

### 1.15.14 MD-REQ-276459/A-Vehicle_Speed_QF

**Message Type**: Status

Signal with the Vehicle Speed Quality Factor

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| Vehicle_Speed_QF | Faulty | 0x0 | |
| | No_Data_Exists | 0x1 | |
| | Not_Within_Specifications | 0x2 | |
| | OK | 0x3 | |

### 1.15.15 MD-REQ-276463/A-Surround_Sound_Upmix.Rq

**Message Type**: Request

Signal sent by the Surround Sound Client to the Surround Sound Server to set the Simulated Surround Sound.

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| Surround_Sound_Upmix.Rq | Inactive | 0x0 | |
| | Stereo | 0x1 | |
| | Surround | 0x2 | |

### 1.15.16 MD-REQ-276464/A-Surround_Sound_Upmix.St

**Message Type**: Status

Signal sent by the Surround Sound Server with the current status of the Simulated Surround Sound

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| Surround_Sound_Upmix.St | Inactive | 0x0 | |
| | Stereo | 0x1 | |
| | Surround | 0x2 | |

### 1.15.17 MD-REQ-276465/A-Surround_Sound_Upmix2.Rq

**Message Type**: Request

Signal sent by the Surround Sound Client to the Surround Sound Server to command the Surround Sound Server to go into a particular sound mode

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| Surround_Sound_Upmix2.Rq | Inactive | 0x0 | |
| | Stereo | 0x1 | |
| | Surround | 0x2 | |
| | ON_Stage | 0x3 | |
| | Audience | 0x4 | |
| | Reserved | 0x5 – 0x7 | |

### 1.15.18 MD-REQ-276466/A-Surround_Sound_Upmix2.St

**Message Type**: Status

Signal sent by the Surround Sound Server with the current status of the what particular sound mode is active

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| Surround_Sound_Upmix2.St | Inactive | 0x0 | |
| | Stereo | 0x1 | |
| | Surround | 0x2 | |
| | ON_Stage | 0x3 | |
| | Audience | 0x4 | |
| | Reserved | 0x5 – 0x7 | |

### 1.15.19 MD-REQ-276461/A-SetOccupancy_Mode

**Message Type**: Request

Signal sent by the Audio Setting Client to the Audio Settings Server to set the Occupancy Mode.

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| SetOccupancy_Mode | Inactive | 0x0 | |
| | All Seats | 0x1 | |
| | Driver Seat | 0x2 | |
| | Passenger Seat | 0x3 | Used for RH drive vehicles – see IDS (infotainment diagnostic spec) for details |
| | Reserved | 0x4-0x6 | |
| | Front Seats | 0x7 | |
| | Rear Seats | 0x8 | |

### 1.15.20 MD-REQ-276462/A-Occupancy_Mode.St

**Message Type**: Status

Signal sent by the Audio Setting Server with the current status of the Occupancy Mode

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| Occupancy_Mode.St | Inactive | 0x0 | |
| | All Seats | 0x1 | |
| | Driver Seats | 0x2 | |
| | Passenger | 0x3 | Use for RH drive vehicles – See IDS (infotainment diagnostic spec) for details |
| | Reserved | 0x4-0x6 | |
| | Front Seats | 0x7 | |
| | Rear Seats | 0x8 | |

### 1.15.21 MD-REQ-276467/A-AutoConfigOcc_AllSeats.St

**Message Type**: Status

Signal sent by the Audio Settings Server indicating if All Seats Occupancy Mode is supported by the Audio Settings Server

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| AutoConfigOcc_AllSeats.St | Not_Supported | 0x0 | |
| | Supported | 0x1 | |

### 1.15.22 MD-REQ-276468/B-AutoConfigOcc_Driver.St

**Message Type**: Status

Signal sent by the Audio Settings Server indicating if Driver Seat Occupancy Mode is supported by the Audio Settings Server

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| AutoConfigOcc_Driver.St | Not_Supported | 0x0 | |
| | Supported | 0x1 | |

### 1.15.23 MD-REQ-276469/B-AutoConfigOcc_Front.St

**Message Type**: Status

Signal sent by the Audio Settings Server indicating if Front Seat Occupancy Mode is supported by the Audio Settings Server

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| AutoConfigOcc_Front.St | Not_Supported | 0x0 | |
| | Supported | 0x1 | |

### 1.15.24 MD-REQ-276470/A-AutoConfigOcc_Rear.St

**Message Type**: Status

Signal sent by the Audio Settings Server indicating if Rear Seats Occupancy Mode is supported by the Audio Settings Server

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| AutoConfigOcc_Rear.St | Not_Supported | 0x0 | |

| | | | |
|---|---|---|---|
| | Supported | 0x1 | |

### 1.15.25 MD-REQ-276496/C-Audio_Demo_CMND

**Message Type**: Request

Signal sent by the Audio Demo Client to the Audio Demo Server telling the Audio Demo Server to start or end an Audio Demonstration event.

For Audio Demo variant 3 (Phoenix) this is sent from the Audio Demo Server to the Audio Demo Audio Switch Client.

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| Audio_Demo_CMND | Inactive | 0x0 | |
| | OFF | 0x1 | |
| | ON | 0x2 | |

### 1.15.26 MD-REQ-276502/A-Audio_Demo_Status

**Message Type**: Status

Signal sent by the Audio Demo Server with the current status of the Audio Demonstration

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| Audio_Demo_Status | Inactive / OFF | 0x0 | |
| | Active | 0x1 | |

### 1.15.27 MD-REQ-276504/B-SetDSPProgram.St

**Message Type**: Request

Signal sent by the Audio Setting Client to set the EQ Mode Sound Setting.

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| SetDSPProgram.Rq | Inactive | 0x0 | |
| | Normal | 0x1 | |
| | Pop | 0x2 | |
| | Classical | 0x3 | |
| | Rock | 0x4 | |
| | Voice | 0x5 | |
| | Reserved | 0x6 | |
| | Reserved | 0x7 | |

### 1.15.28 MD-REQ-276505/A-DSPProgram.St

**Message Type**: Status

Signal sent by the Audio Setting Server with the current sound setting status of EQ mode.

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| DSPProgram.St | Inactive | 0x0 | |
| | Normal | 0x1 | |
| | Pop | 0x2 | |
| | Classical | 0x3 | |

| | | | |
|---|---|---|---|
| | Rock | 0x4 | |
| | Voice | 0x5 | |
| | Reserved | 0x6 | |
| | Reserved | 0x7 | |

### 1.15.29 MD-REQ-014871/B-CnvtTopPosUp_St (TcSE ROIN-280563-1)

**Message Type:** Status
Reports the status of whether the roof is closed or not

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| CnvtTopPosUp_St | Not_Up | 0x0 | The convertible top is not closed |
| | Up | 0x1 | The convertible top is closed |

### 1.15.30 MD-REQ-276211/A-ImmersionLevel_D_Rq

**Message Type**: Request

Signal sent by the Immersion Settings Client to request a change to the Immersion Level

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| ImmersionLevel_D_Rq | Inactive | 0x0 | |
| | Level0 | 0x1 | |
| | Level1 | 0x2 | |
| | Level2 | 0x3 | |
| | Level3 | 0x4 | |
| | cont. | | |
| | Level125 | 0x7E | |
| | Level126 | 0x7F | |
| | Level127 | 0x80 | |

### 1.15.31 MD-REQ-276212/A-ImmersionLevel_D_St

**Message Type**: Status

Signal sent by the Immersion Settings Server with the status of the immersion level

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| ImmersionLevel_D_St | Inactive | 0x0 | |
| | Level0 | 0x1 | |
| | Level1 | 0x2 | |
| | Level2 | 0x3 | |
| | Level3 | 0x4 | |
| | cont. | | |
| | Level125 | 0x7E | |
| | Level126 | 0x7F | |
| | Level127 | 0x80 | |

### 1.15.32 MD-REQ-354821/A-AudioToneTouch_D_Rq

Message Type: Request

Note: Request signal from the Tone Touch Client to the Tone Touch Server to enable or disable the feature

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| AudioToneTouch_D_Rq | Null | 0x0 | |
| | Disabled | 0x1 | |
| | Enabled | 0x2 | |

### 1.15.33 MD-REQ-354822/A-AudioToneTouch_D_Stat

Message Type: Status

Note: Status signal from the Tone Touch Server with the status of Tone Touch feature

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| AudioToneTouch_D_Stat | Null | 0x0 | |
| | Disabled | 0x1 | |
| | Enabled | 0x2 | |

### 1.15.34 MD-REQ-354819/A-AudioToneTouchX_D_Rq

Message Type: Request

Note: Request signal from the Tone Touch Client to the Tone Touch Server with the requested X coordinates

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| AudioToneTouchX_D_Rq | Null | 0x00 | |
| | 0 | 0x01 | |
| | 1 | 0x02 | |
| | 2 | 0x03 | |
| | 3 | 0x04 | |
| | … | … | |
| | 254 | 0xFF | |

### 1.15.35 MD-REQ-354820/A-AudioToneTouchX_D_Stat

Message Type: Status

Note: Status signal from the Tone Touch Server with the X coordinate status of Tone Touch feature

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| | Null | 0x00 | |
| | 0 | 0x01 | |

| | | | |
|---|---|---|---|
| AudioToneTouchX_D_Stat | 1 | 0x02 | |
| | 2 | 0x03 | |
| | 3 | 0x04 | |
| | … | … | |
| | 254 | 0xFF | |

### 1.15.36 MD-REQ-354830/A-AudioToneTouchY_D_Rq

Message Type: Request

Note: Request signal from the Tone Touch Client to the Tone Touch Server with the requested Y coordinates

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| AudioToneTouchY_D_Rq | Null | 0x00 | |
| | 0 | 0x01 | |
| | 1 | 0x02 | |
| | 2 | 0x03 | |
| | 3 | 0x04 | |
| | … | … | |
| | 254 | 0xFF | |

### 1.15.37 MD-REQ-354831/A-AudioToneTouchY_D_Stat

Message Type: Status

Note: Status signal from the Tone Touch Server with the Y coordinate status of Tone Touch feature

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| AudioToneTouchY_D_Stat | Null | 0x00 | |
| | 0 | 0x01 | |
| | 1 | 0x02 | |
| | 2 | 0x03 | |
| | 3 | 0x04 | |
| | … | … | |
| | 254 | 0xFF | |

# 2 General Requirements

## 2.1 Tonal Settings Control (BTMBF, Occupancy Mode, EQ Mode, Speed Compensated Volume)

2.1.1 AUDSET-SR-REQ-014882/D-Audio Settings Server module controlling Tonal Settings (TcSE ROIN-40208-3)

The tonal settings adjustment will be sent from the Audio Settings Client to the Audio Settings Server. When the DSP AMP is on the vehicle the DSP AMP shall be the Audio Settings Server for tonal settings.

When the AAM (Audio Amp Module) is on the vehicle then it shall be the Audio Settings Server for the Occupancy Mode function only. The AHU shall be the Audio Settings Server for all other Tonal Settings.

~~When the DSP AMPv2 (DSP AMP variant 2) is on the vehicle then the DSPv2 shall be the Audio Settings Server for Occupancy Mode, Speed Compensated Volume, Balance and Fade. The AHU/iAHU shall be the Audio Settings Server for all other Tonal Settings (ie Bass, Treble, Mid-Range).~~ DSP AMP variant 2 no longer supported since SYNC 4.1/4.2 no longer supported.

~~Note: iAHU is for the integrated AHU module (ex display and AHU integrated in one module).~~

2.1.2 AUDSET-SR-REQ-014883/F-Display module looking at the correct Audio Settings Server Module (TcSE ROIN-40209-2)

When there is both an AHU and DSP AMP on the vehicle then the DSP AMP is the Audio Settings Server for tonal settings. The Audio Settings Client display module(s) shall only look at the tonal settings values (ex. BTMBF, SCV…) from the DSP AMP signals for display information when it is the Audio Settings Server. The AHU shall set its tonal settings to the default values when the DSP AMP is present.

When there is both an AHU and AAM (Audio Amp Module) on the vehicle then the AAM shall be the Audio Settings Server for the Occupancy Mode function only. The Audio Settings Client display module(s) shall only look at the Occupancy Mode signals from the AAM for display information. All other Audio Settings Server display information shall come from the AHU.

~~When there is both an AHU/iAHU (integrated AHU) and DSP AMPv2 (DSP AMP variant 2) on the vehicle then the DSP AMPv2 shall be the Audio Settings Server for Speed Compensated Volume, Balance, Fade, and Occupancy Mode only. The Audio Settings Client display module(s) shall only look at the Speed Compensated Volume, Occupancy Mode, Balance and Fade signals from the DSP AMPv2 for display information. All other Audio Settings Server display information for Tonal Settings (ie Bass, Treble, Mid-Range) shall come from the AHU/iAHU.~~ Removed not since SYNC 4.1/4.2 and DSP AMPv2 are no longer supported

~~Note: iAHU is for the integrated AHU module (ex display and AHU integrated in one module).~~

2.1.3 AUDSET-SR-REQ-014884/C-Audio Settings Server saving the Tonal Settings (TcSE ROIN-40210-1)

The Audio Setting Server is responsible for maintaining the last known Tonal Settings state (ex. BTMBF, Occupancy Mode, DSP Program Mode, SCV…) during all times of operation and transition of power modes.

### 2.1.4 AUDSET-TMR-REQ-014885/D-T_Tonal_Response (TcSE ROIN-40212-1)

| Name | Description | Units | Range | Resolution | Default |
|---|---|---|---|---|---|
| T_Tonal_Response | Maximum time allowed for the 'Audio Setting Server' to respond with the status message update to an "Audio Setting Client' request for a Tonal Settings value change.<br><br>Note: use the default value | msec | 0-1000 | 5 | 75 |

## 2.2 AUDSET-SR-REQ-310962/B-HMI updates from server module status signals

The Audio Setting Client HMI shall use what is in the Audio Setting Server status signal to display the feature status to the HMI unless specifically noted otherwise.

- Note: this is shown in the sequence diagrams also

The Audio Setting Client may request a setting (the HMI may show button pressed) but whether the HMI shows the settings active or not depends on what the Audio Setting Server module signal is set to.

- Ex. The user presses the increase bass button to Bass +6. The HMI may show the increase button HMI button press selected when pressed. The Bass level shown in the vehicle though is not shown as Bass +6 unless the Audio Setting Server status signal says Bass +6.

## 2.3 IFS-MMCAN-FUR-REQ-015114/E-Sending of Request and Response (TcSE ROIN-66252-1)

As a general rule, request and response signals will be sent out at the requested value and not put back to inactive/null until 100 msec +/- 10% has elapsed since the requested value was first put on the bus.

For some event only requests (not event-periodic) it may be important to send the requested value only once before putting back to inactive / null. In this case the signals should be set back to inactive/null as soon as FNOS has reported that the signal has been transmitted.

- For event only based signals this has to be done in order to keep FNOS from accidentally sending out the signal twice when another signal in the same frame is to be transmitted, either by a change of another signal or by a periodic transmission.

Reference applicable feature SPSS specs for actual implementation.

~~Unless noted otherwise request and response signals shall only be sent once and when they have been sent it is important that they are set to inactive/null again. The signals should be set back to inactive/null as soon as FNOS has reported that the signal has been transmitted unless noted otherwise.~~

- ~~Example of an exception: an event-periodic signal going across network gateway and encoding value may need to be held until other bus wakes up. Reference the feature specs for exceptions.~~

~~For event only based signals this has to be done in order to keep FNOS from accidentally sending out the signal twice when another signal in the same frame is to be transmitted, either by a change of another signal or by a periodic transmission.~~

~~Some signals (such as many settings) require the request to be sent out and held for 100 msec at the requested value before being put back to inactive/null again. Reference the applicable SPSS for details.~~

# 3 Functional Definition

## 3.1 AUDSET-FUN-REQ-016365/A-Bass, Treble, Midrange, Balance, Fade (TcSE ROIN-290183-1)

### 3.1.1 Use Cases

#### *3.1.1.1 AUDSET-UC-REQ-016366/B-Increase Bass/MidRange/Treble Setting (TcSE ROIN-290134-1)*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment system powered ON |
| **Scenario Description** | User selects <Increase Bass> via HMI<br>Infotainment System adjusts bass setting.<br>HMI indicates {Bass Setting} as level is being adjusted. |
| **Post-conditions** | HMI indicates {Bass Setting} (final setting).<br>The Infotainment system will operate with the new bass setting. |
| **List of Exception Use Cases** | E1 –AUDSET-GUC-290136-1-Increase Bass/MidRange/Treble Setting - Currently set to Max<br>E2 –AUDSET-GUC-290137-1-Increase Bass/MidRange/Treble Setting - User selects and holds via HMI<br>E3 –AUDSET-GUC-290158-1-User selected BTMBF Settings when Audio Source is Phone/Chimes/VR/Beeps/Mixable Prompts (ex Nav Prompts) |
| **Notes** | For the use case MidRange and Treble setting behave the same as the Bass setting. |
| **Interfaces** | G-HMI, CBI |

#### *3.1.1.2 AUDSET-UC-REQ-016367/B-Increase Bass/MidRange/Treble Setting - Currently set to Max (TcSE ROIN-290136-1)*

**Linked Elements**
AUDSET-UC-REQ-016366/B-Increase Bass/MidRange/Treble Setting (TcSE ROIN-290134-1)

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System Powered ON<br>Bass at Max Level |
| **Scenario Description** | User selects <Increase Bass> via HMI. |
| **Post-conditions** | Bass setting remains unchanged.<br>HMI indicates {Bass Setting}. |
| **List of Exception Use Cases** | N/A |
| **Notes** | For the use case MidRange and Treble setting behave the same as the Bass setting. |
| **Interfaces** | G-HMI; CBI |

#### *3.1.1.3 AUDSET-UC-REQ-016368/B-Increase Bass/MidRange/Treble Setting - User selects and holds <increase Bass/MidRange/Treble> via HMI (TcSE ROIN-290137-1)*

**Linked Elements**
AUDSET-UC-REQ-016366/B-Increase Bass/MidRange/Treble Setting (TcSE ROIN-290134-1)

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System Powered ON |

| | |
|---|---|
| **Scenario Description** | User selects and holds <increase Bass> via HMI |
| **Post-conditions** | Infotainment system adjusts bass setting with increasing by 1 step every T_audio hold.<br>HMI indicates {Bass Settings} as level being adjusted |
| **List of Exception Use Cases** | N/A |
| **Notes** | For the use case MidRange and Treble setting behave the same as the Bass setting. |
| **Interfaces** | G-HMI, CBI |

#### *3.1.1.4 AUDSET-UC-REQ-016369/B-Decrease Bass/MidRange/Treble Setting (TcSE ROIN-290151-1)*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment system powered ON |
| **Scenario Description** | User selects <Decrease Bass> via HMI<br>Infotainment System adjusts bass setting.<br>HMI indicates {Bass Setting} as level is being adjusted. |
| **Post-conditions** | HMI indicates {Bass Setting} (final setting).<br>The Infotainment system will operate with the new bass setting. |
| **List of Exception Use Cases** | E1–AUDSET-GUC-290152-1-Decreaes Bass/MidRange/Treble Setting - Currently set to Minimum<br>E2–AUDSET-GUC-290153-1-Decrease Bass/MidRange/Treble Setting - User selects and holds via HMI<br>E3-AUDSET-GUC-290158-1-User selected BTMBF Settings when Audio Source is Phone/Chimes/VR/Beeps/Mixable Prompts (ex Nav Prompts) |
| **Notes** | For the use case MidRange and Treble setting behave the same as the Bass setting. |
| **Interfaces** | G-HMI, CBI |

#### *3.1.1.5 AUDSET-UC-REQ-016370/B-Decreaes Bass/MidRange/Treble Setting - Currently set to Minimum (TcSE ROIN-290152-1)*

**Linked Elements**
AUDSET-UC-REQ-016369/B-Decrease Bass/MidRange/Treble Setting (TcSE ROIN-290151-1)

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System Powered ON<br>Bass at Minimum Level |
| **Scenario Description** | User selects <Decrease Bass> via HMI. |
| **Post-conditions** | Bass setting remains unchanged.<br>HMI indicates {Bass Setting}. |
| **List of Exception Use Cases** | N/A |
| **Notes** | For the use case MidRange and Treble setting behave the same as the Bass setting. |
| **Interfaces** | G-HMI; CBI |

### *3.1.1.6 AUDSET-UC-REQ-016371/B-Decrease Bass/MidRange/Treble Setting - User selects and holds <decrease Bass/MidRange/Treble> via HMI (TcSE ROIN-290153-1)*

**Linked Elements**
AUDSET-UC-REQ-016369/B-Decrease Bass/MidRange/Treble Setting (TcSE ROIN-290151-1)

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System Powered ON |
| **Scenario Description** | User selects and holds <decrease Bass> via HMI |
| **Post-conditions** | Infotainment system adjusts bass setting with decreasing by 1 step every T_audio hold.<br>HMI indicates {Bass Settings} as level being adjusted |
| **List of Exception Use Cases** | N/A |
| **Notes** | For the use case MidRange and Treble setting behave the same as the Bass setting. |
| **Interfaces** | G-HMI, CBI |

### *3.1.1.7 AUDSET-UC-REQ-016372/B-Change Balance Setting (TcSE ROIN-290154-1)*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | The infotainment system is powered ON |
| **Scenario Description** | User selects <Change Balance Left or Change Balance Right> via HMI.<br>Infotainment System adjusts Balance setting.<br>HMI indicates {Balance Setting} as level is being adjusted. |
| **Post-conditions** | HMI indicates {Balance Setting} (final setting).<br>The Infotainment system will operate with the new Balance setting. |
| **List of Exception Use Cases** | E1–AUDSET-GUC-290156-1-Change Balance Setting - Balance currently set to all the way Left or Right<br>E2–AUDSET-GUC-290157-1-Change Balance Setting - User selects and holds via HMI<br>E3–AUDSET-GUC-290158-1-User selected BTMBF Settings when Audio Source is Phone/Chimes/VR/Beeps/Mixable Prompts (ex Nav Prompts) |
| **Interfaces** | G-HMI, CBI |

### *3.1.1.8 AUDSET-UC-REQ-016373/B-Change Balance Setting - Balance currently set to all the way Left or Right (TcSE ROIN-290156-1)*

**Linked Elements**
AUDSET-UC-REQ-016372/B-Change Balance Setting (TcSE ROIN-290154-1)

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System powered ON<br>Balance set all the way to the Left |
| **Scenario Description** | User selects <Change Balance Left> via HMI. |
| **Post-conditions** | Balance setting remains unchanged.<br>HMI indicates {Balance Setting}. |
| **List of Exception Use Cases** | N/A |
| **Notes** | This use case concept for balance set all the way to the left also applies to balance set all the way to the right |
| **Interfaces** | G-HMI; CBI |

### *3.1.1.9 AUDSET-UC-REQ-016374/B-Change Balance Setting - User selects and holds <change Balance Left/Right> via HMI (TcSE ROIN-290157-1)*

**Linked Elements**
AUDSET-UC-REQ-016372/B-Change Balance Setting (TcSE ROIN-290154-1)

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON |
| **Scenario Description** | User selects and holds <change balance> via HMI |
| **Post-conditions** | Infotainment System adjusts Balance setting with level changing by 1 step every T_audio hold .<br>HMI indicates {Balance Setting} as level is being adjusted. |
| **List of Exception Use Cases** | N/A |
| **Interfaces** | G-HMI; CBI |

### *3.1.1.10 AUDSET-UC-REQ-016375/B-Change Fade Setting (TcSE ROIN-290159-1)*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON |
| **Scenario Description** | User selects <Change Fade Front/Rear> via HMI.<br>Infotainment system adjusts Fade setting.<br>HMI indicates {Fade Setting} as level is being adjusted. |
| **Post-conditions** | HMI indicates {Fade Setting} (final setting).<br>The infotainment system will operate with the new Fade setting. |
| **List of Exception Use Cases** | E1–AUDSET-GUC-290160-1-Change Fade Setting - Fade currently set to all the way to Front/Rear<br>E2–AUDSET-GUC-290161-1-Change Fade Setting - User selects and holds via HMI<br>E3–AUDSET-GUC-290158-1-User selected BTMBF Settings when Audio Source is Phone/Chimes/VR/Beeps/Mixable Prompts (ex Nav Prompts) |
| **Interfaces** | G-HMI; CBI |

### *3.1.1.11 AUDSET-UC-REQ-016376/B-Change Fade Setting - Fade currently set to all the way to Front/Rear (TcSE ROIN-290160-1)*

**Linked Elements**
AUDSET-UC-REQ-016375/B-Change Fade Setting (TcSE ROIN-290159-1)

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System powered ON<br>Fade is set all the way to the Front |
| **Scenario Description** | User selects <Change Fade Front> via HMI |
| **Post-conditions** | Fade setting remains unchanged.<br>HMI indicates {Fade Setting}. |
| **List of Exception Use Cases** | N/A |
| **Notes** | This use case concept for Fade set all the way to the Front also applies to fade set all the way to the rear |
| **Interfaces** | G-HMI; CBI |

#### *3.1.1.12 AUDSET-UC-REQ-016377/B-Change Fade Setting - User selects and holds <Change Fade Front/Rear> via HMI (TcSE ROIN-290161-1)*

**Linked Elements**
AUDSET-UC-REQ-016375/B-Change Fade Setting (TcSE ROIN-290159-1)

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System Powered ON |
| **Scenario Description** | User selects and holds <Change Fade Front/Rear> via HMI |
| **Post-conditions** | Infotainment System adjusts Fade setting with level increasing by 1 step every T_audio hold .<br>HMI indicates {Fade Setting} as level is being adjusted. |
| **List of Exception Use Cases** | N/A |
| **Interfaces** | G-HMI; CBI |

#### *3.1.1.13 AUDSET-UC-REQ-016378/D-User selected BTMBF Settings when Audio Source is Phone/Chimes/VR/Beeps/Mixable Prompts (ex Nav Prompts) (TcSE ROIN-290158-1)*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON<br>Media Source (ex CD, USB) is the active audio source using the user selected BTMBF setting |
| **Scenario Description** | A phone call, or infotainment chime, or VR session, or Beep or Mixable Prompts (ex Nav Prompt) becomes active |
| **Post-conditions** | Phone/Chimes/VR/Beeps/Mixable Prompts are not affected by the user selected BTMBF setting |
| **Notes** | Also the user cannot adjust BTMBF when the audio is OFF (ie empty audio stack)<br><br>See SPSS requirement "Volv2-REQ-014817-User Volume Behavior" for additional details supporting the use case above for the AHU and DSP AMP. |
| **Interfaces** | G-HMI; CBI |

### 3.1.2 Requirements

#### *3.1.2.1 AUDSET-TMR-REQ-014897/D-T_audio hold (TcSE ROIN-184723-1)*

| Name | Description | Units | Range | Resolution | Default |
|---|---|---|---|---|---|
| T_audio hold | Once in a press and hold state this is the time until the Audio Settings Client increases/decreases to the next level for a persistent press and hold operation.<br>Note: reference the HMI specification(s) for time a button is held before the Audio Settings Client considers it in in a press and hold state.<br><br>Note: use default value | msec | 50 - 200 | 1 | 100 |

### 3.1.3 Sequence Diagrams

#### *3.1.3.1 AUDSET-SD-REQ-014898/A-Adjustment to BTMBF Sequence Diagram (TcSE ROIN-40213-1)*

The 'Audio Settings Client' can command the 'Audio Settings Server' to change it's BTMBF status via the SetBTMBF.Rq() signal.

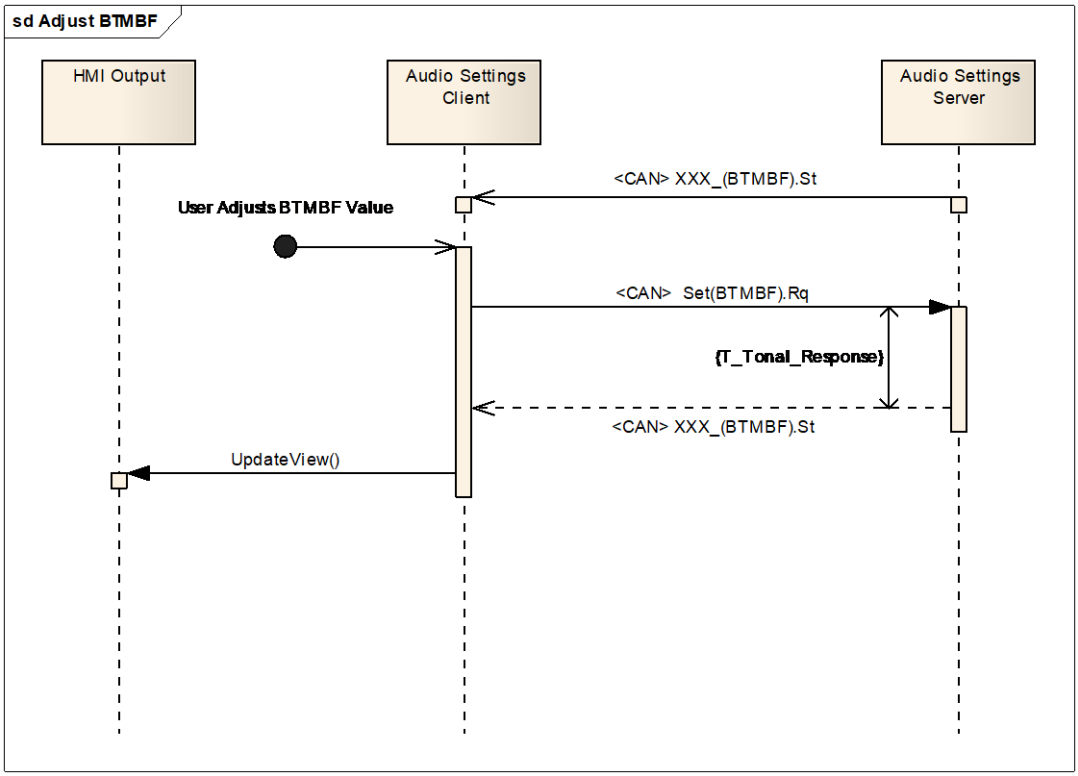
The BTMBF Display status can be updated based on the BTMBF.St() signal from the 'Audio Settings Server'.

**Pre-condition**
Sound Settings Display is Active

**Scenario**
The user adjusts a BTMBF setting

**Post-condition**
The BTMBF setting is adjusted
The BTMBF setting has changed on the display

**Sequence Diagram**



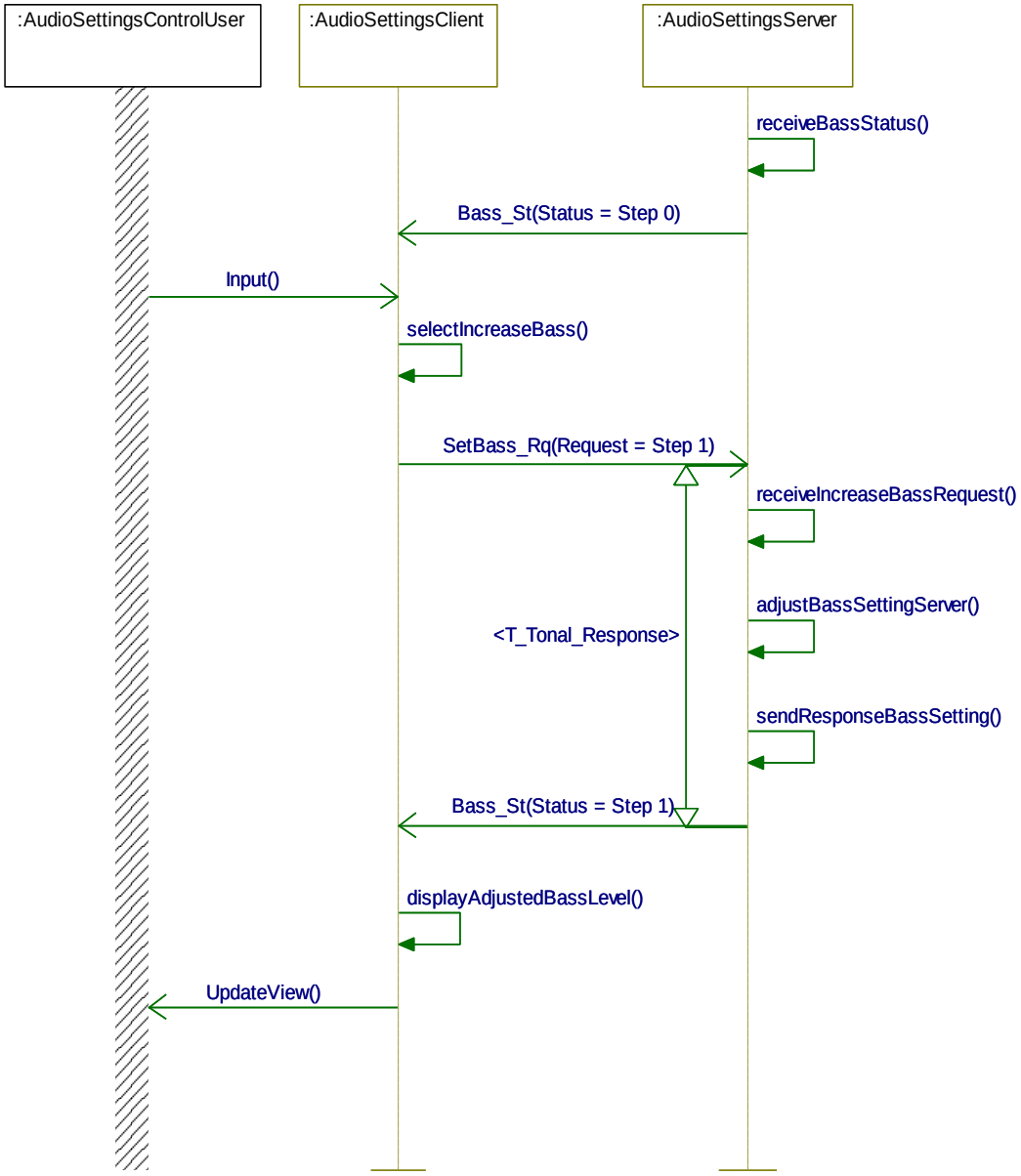

#### *3.1.3.2 AUDSET-SD-REQ-088155/B-Increase Bass Sequence Diagram*

**Pre-Condition**
Bass is set to Step 0

**Event**
User increases Bass by one Step

**Post-Condition**
Bass is increased by one step

**Sequence Diagram**



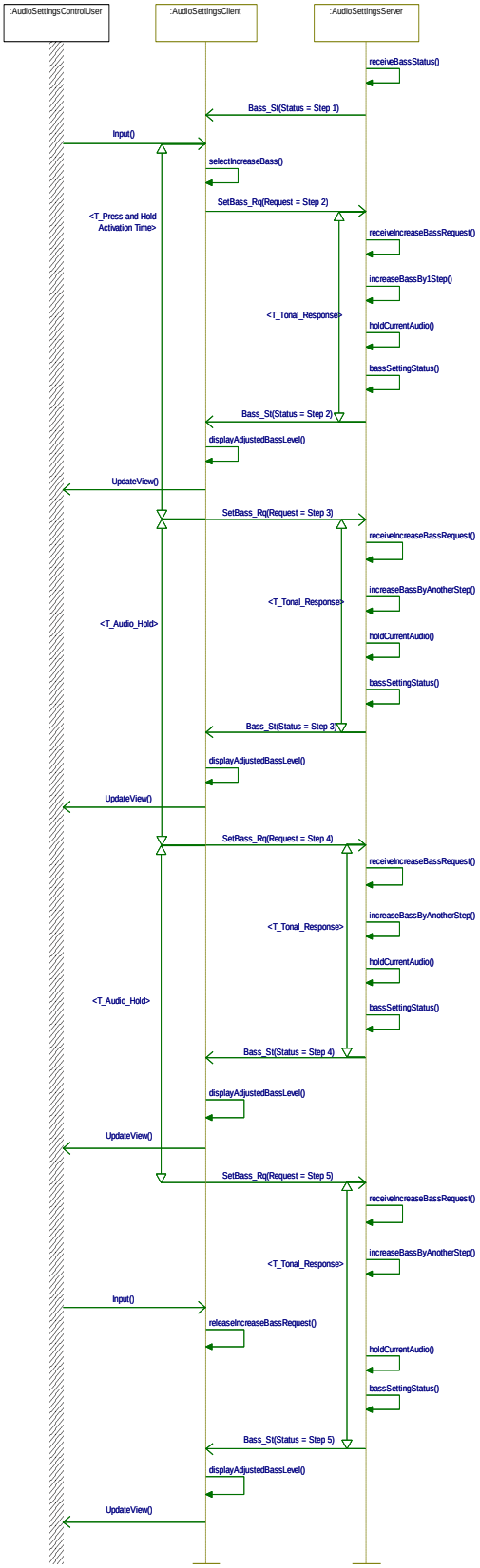

### *3.1.3.3 AUDSET-SD-REQ-088157/C-Press and Hold - Increase Bass Sequence Diagram*

**Pre-Condition**
Bass is set to Step 1

**Event**
User press and holds increase Bass

**Post-Condition**
Bass is increased while being increase Bass is being held
Bass stops increasing when increase Bass button is released

## Sequence Diagram



## 3.2 AUDSET-FUN-REQ-052014/E-Source Dependent Bass, Treble, Mid-Range Tonal Settings

### 3.2.1 AUDSET-UC-REQ-052010/E-Entering the Sound Menu and displaying Bass, Mid-Range, Treble for a particular audio source

| | |
|---|---|
| ~~Actors~~ | ~~Vehicle Occupant~~ |
| ~~Pre-conditions~~ | ~~Infotainment System powered ON~~ |
| ~~Scenario Description~~ | ~~User selects <Sound screen active> via HMI~~ |
| ~~Post-conditions~~ | ~~<Sound screen becomes active> via HMI.~~<br>~~HMI indicates {Bass, Mid-Range, Treble, Balance, Fade setting} from the Audio Settings Server for one of the current active audio source shown below:~~<br>~~- FM, AM, DAB, SAT, CD, USB/BTs per AHU-HR-REQ-026308-Mode Dependent BMT settings~~ |
| ~~Notes~~ | ~~This use case concept is for entering the Sound HMI screen and selecting the sound menu and displaying the BTMBF HMI based on the currently playing active audio source.~~<br>~~- Note that Balance and Fade settings are not unique to the listed active audio sources.~~ |
| ~~Interfaces~~ | ~~G-HMI; CBI~~ |

This feature has been removed

### 3.2.2 AUDSET-UC-REQ-052011/D-Change BTMBF Settings while the HMI shows the Sound Menu

| | |
|---|---|
| ~~Actors~~ | ~~Vehicle Occupant~~ |
| ~~Pre-conditions~~ | ~~Infotainment System powered ON~~<br>~~<Sound screen active> via HMI~~ |
| ~~Scenario Description~~ | ~~User <adjusts the Bass, Mid-Range, Treble, Balance, Fade setting> for a particular active audio source per AHU-HR-REQ-026308-Mode Dependent BMT settings. :~~<br>~~- FM, AM, DAB, SAT, CD, USB/BT~~ |
| ~~Post-conditions~~ | ~~- HMI indicates {Bass, Mid-Range, Treble, Balance, Fade setting} from the Audio Settings Server for one of the current active audio source shown below:~~<br>~~- FM, AM, DAB, SAT, CD, USB/BT per AHU-HR-REQ-026308-Mode Dependent BMT settings.~~<br><br>~~- The Audio Setting Server remembers the Bass, Treble, Mid-Range for the specific audio source selected~~<br><br>~~- The Audio Setting Server remembers the Balance and Fade setting and it is not specific to a particular active audio source~~ |
| ~~Notes~~ | ~~This use case concept for changing the Bass, Treble, Fade values on the Sound HMI based on the active audio source.~~<br>~~- Note that Balance and Fade settings are not unique to the listed active audio sources.~~ |
| ~~Interfaces~~ | ~~G-HMI; CBI~~ |

This feature has been removed

### 3.2.3 AUDSET-UC-REQ-052012/E-BTMBF settings when on a source that does not have an adjustable BTMBF source setting (ex VR, Phone, TA, Beeps...)

| | |
|---|---|
| ~~Actors~~ | ~~Vehicle Occupant~~ |
| ~~Pre-conditions~~ | ~~Infotainment System powered ON~~<br>~~<Sound screen active> via HMI.~~<br>~~The active audio source is one of the following:~~<br>~~- FM, AM, DAB, SAT, CD, USB/BT~~ |

| | |
|---|---|
| ~~Scenario Description~~ | ~~The active audio source changes to a source that is not one of the following listed below (ex VR, Phone becomes active):<br>- FM, AM, DAB, SAT, CD, USB/BTlisted in AHU-HR-REQ-026308-Mode Dependent BMT settings~~ |
| ~~Post-conditions~~ | ~~HMI to decide what should be shown<br><br>The Audio Settings Server does not allow the user to change the BTMBF settings~~ |
| ~~Notes~~ | ~~This use case concept is for when there is an active audio source other then FM, AM, DAB, SAT, CD, USB/BT and how the source dependent BTMBF HMI should be shown~~ |
| ~~Interfaces~~ | ~~G-HMI; CBI~~ |

This feature has been removed

### 3.2.4 AUDSET-UC-REQ-052032/C-Change Audio Source while Sound Menu active

| | |
|---|---|
| ~~Actors~~ | ~~Vehicle Occupant~~ |
| ~~Pre-conditions~~ | ~~Infotainment System powered ON<br>{BTMBF sound screen active for source X} via HMI~~ |
| ~~Scenario Description~~ | ~~<User changes the audio source to source Y>~~ |
| ~~Post-conditions~~ | ~~If the HMI keeps the sound screen up then the HMI sound screen would have to show the {source Y} BTMBF sound HMI screen. Source Y could be one of the sources below:<br>FM, AM, DAB, SAT, CD, USB/BTlisted in AHU-HR-REQ-026308-Mode Dependent BMT settings.~~ |
| ~~Interfaces~~ | ~~G-HMI; CBI~~ |

This feature has been removed.

### 3.2.5 AUDSET-HMI-REQ-052013/F-Audio Setting Client updating the Sound HMI display for BTMBF when there are source dependent Bass, Treble, Mid-Range

~~If configured for source dependent Bass, Treble, Mid-Range the Audio Setting Client shall look at the ResourceUpdate message and/or CurrentTUBand.St to determine the active audio source so the applicable source dependent BTM (Bass, Treble, Mid-Range) HMI screen can be shown. See requirement "AUDSET-FUR-REQ-096764-Mode Dependent BMT Settings" for the Media audio sources with unique Bass/Midrange/Treble.~~

~~If the ResourceUpdate message has an active audio source that doesn't have a BTM HMI screen then the previous active audio source HMI can be used unless otherwise defined in the HMI (what is defined in the HMI should be used).~~
~~Ex. The user had CD as the active audio source and then VR became the active audio source. The stacked audio source CD would still be used for the BTM HMI since it was the last audio source when the sound menu was entered.~~

~~The Balance and Fade do not change with the different active audio sources.~~

This feature has been removed.

### 3.2.6 AUDSET-FUR-REQ-052056/D-Audio Settings Server Bass, Treble, Mid-Range audio sources supported

~~The Audio Settings Server shall have unique Bass, Treble, Mid-Range settings as called out in hardware spec SPSS requirement: AHU-HR-REQ-026308-Mode Dependent BMT Settings.~~
This feature has been removed.

### 3.2.7 AUDSET-FUR-REQ-096764/C-Mode Dependent BMT Settings

~~The AHU/DSP AMP shall support and store unique Bass/Midrange/Treble settings without changing Balance/Fade settings for each of these modes.~~

~~Each of the following media source groups shall have a dedicated BMT tone control setting related to that source group (only modes supported by the applicable hardware are required):~~

~~- FM(with and w/o HD)~~
~~- AM(with and w/o HD)~~
~~- DAB~~
~~- SAT~~
~~- CD (internal AHU or via external input)~~
~~- USB/BT/Phone/AIJ (ex internal AHU or SYNC)~~

~~The BMT settings shall change in synchronization with the media source change and reported out via CAN (if applicable in a distributed system).~~

~~The default battery connect settings for each mode shall be detents and once the settings are changed by the customer for each mode, those settings are to be maintained uniquely~~
This feature has been removed.

## 3.3 AUDSET-FUN-REQ-016379/A-Speed Compensated Volume (TcSE ROIN-290192-1)

### 3.3.1 Use Cases

#### *3.3.1.1 AUDSET-UC-REQ-016380/B-Change Speed Sensitive Volume (SSV) (TcSE ROIN-290162-1)*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON |
| **Scenario Description** | User selects <Increase/Decrease SSV> via HMI. |
| **Post-conditions** | HMI indicates updated {SSV Setting}.<br>The infotainment system will operate with updated SSV level.<br>HMI display returns to display appropriate for currently selected audio source. |
| **List of Exception Use Cases** | E1–AUDSET-GUC-290163-1-Change Speed Sensitive Volume (SSV) - SSV currently set to maximum |
| **Interfaces** | G-HMI; CBI |

#### *3.3.1.2 AUDSET-UC-REQ-016381/B-Change Speed Sensitive Volume (SSV) - SSV currently set to maximum (TcSE ROIN-290163-1)*

**Linked Elements**
AUDSET-UC-REQ-016380/B-Change Speed Sensitive Volume (SSV) (TcSE ROIN-290162-1)

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON<br>SSV (speed sensitive volume) set to maximum |
| **Scenario Description** | User selects <Increase SSV> via HMI |
| **Post-conditions** | SSV setting remains unchanged |
| **List of Exception Use Cases** | N/A |
| **Interfaces** | G-HMI; CBI |

### 3.3.2 Requirements

*3.3.2.1 AUDSET-SR-REQ-437157/A-Speed Compensated Volume - Volume Controller (Phoenix only)*

This requirement only applies to Phoenix architecture vehicles for the Speed Compensated Volume function.

As already noted in this spec:

- The Speed Compensated Server is the PAC/AHU if no DSP AMP is present and it sends the SCV status signal.
- The Speed Compensated Server if a DSP AMP is present is the DSP AMP and it sends the SCV status signal.

The module that is the Volume Controller is responsible for performing the Speed Compensated Volume function on the volume. See Volume SPSS and volume requirement "VOLv2-REQ-412367-Module Deployment and Audio Routing" for the module that is the Volume Controller for a particular volume source (ie Media, RA, Phone, Call Ring and Prompts). If the Volume Controller is a different module then Speed Compensated Server then the Volume Controller shall look at the Speed_Comp_Vol.St signal for the SCV level to be used.

For disabling Speed Compensated Volume during MyKey reference requirement "MKv7-REQ-435450-Disable Speed Compensated Volume (Phoenix)" in the MyKey SPSS.

### 3.3.3 Sequence Diagrams

#### *3.3.3.1 AUDSET-SD-REQ-014902/B-Set Speed Compensated Volume Sequence Diagram (TcSE ROIN-40218-2)*

The 'Audio Settings Client' can command the 'Audio Settings Server' to change it's Speed Compensated Volume setting via the SetSpeed_Comp_Vol.Rq() signal.

The Speed Compensated Volume Display status can be updated based on the Speed_Comp_Volume.St() signal from the 'Audio Settings Server'.

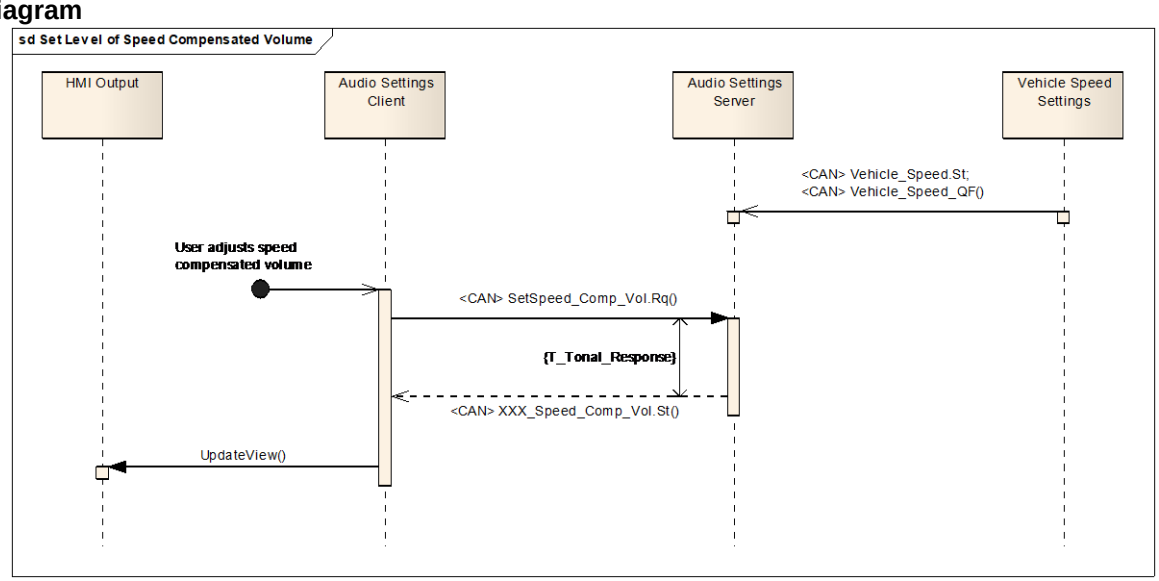
~~If the Vehicle Speed Quality Factor network signal is not set to OK then the "Audio Settings Server' shall treat the vehicle speed as though the vehicle is not moving for the speed compensated volume feature.~~

**Pre-condition**
Sound Settings Display is Active

**Scenario**
The user adjusts the Speed Compensated Volume setting

**Post-condition**
The Speed Compensated Volume setting is adjusted
The Speed Compensated Volume setting has changed on the display

**Sequence Diagram**



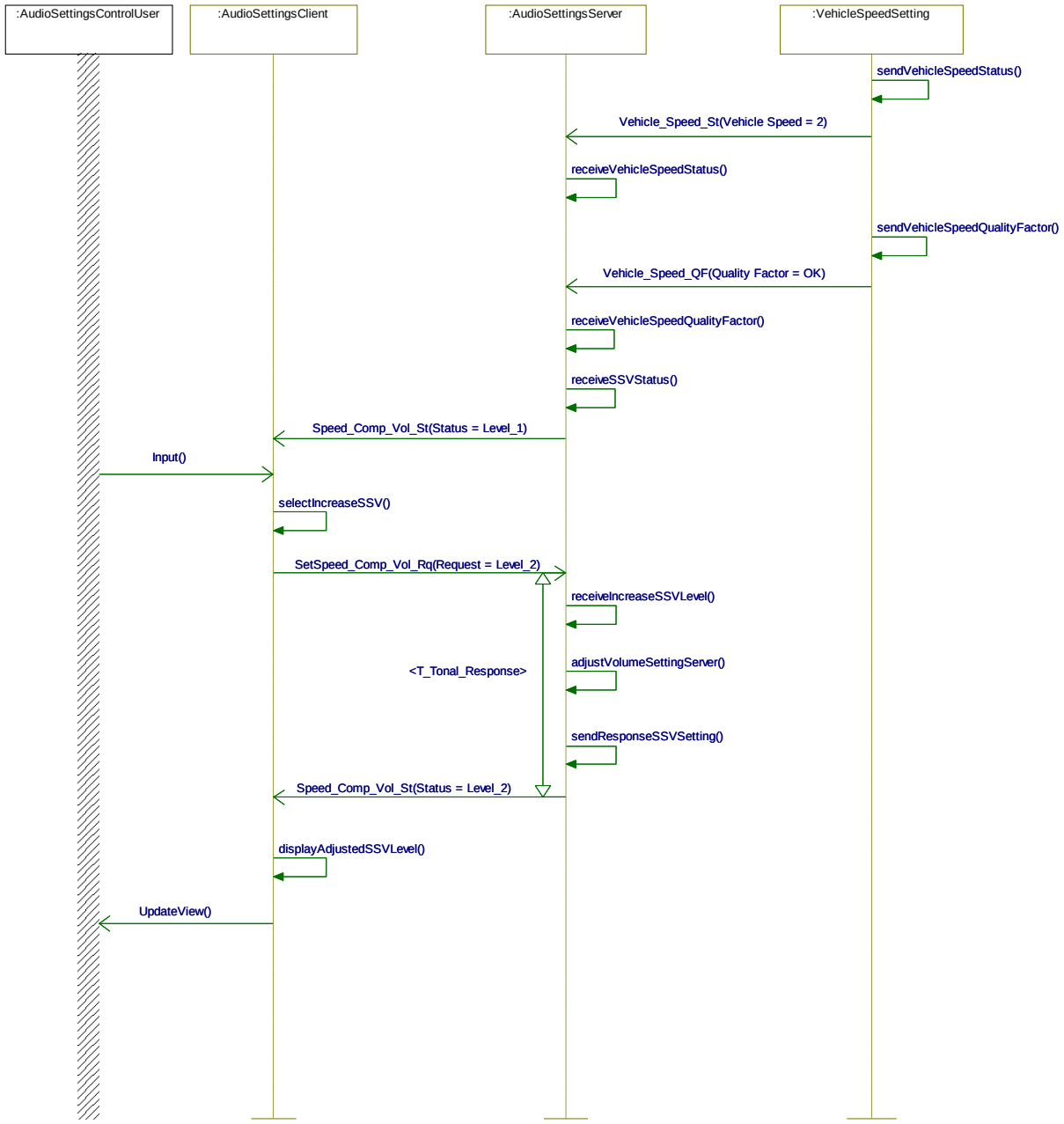

#### *3.3.3.2 AUDSET-SD-REQ-088159/B-Change Speed Compensated Volume from Level 1 to Level 2*

**Pre-Condition**
Speed Compensated Volume is at Level 1

**Event**
User selects Speed Compensated Volume Level 2

**Post-Condition**
The infotainment system goes to Speed Compensated Volume Level 2 and the HMI is updated

## Sequence Diagram



## 3.4 AUDSET-FUN-REQ-016382/B-Occupancy Mode (TcSE ROIN-290196-1)

Note: see IDS specification for configuring occupancy mode for RH or LH drive vehicles

For Left Hand Drive vehicles if the user selects the Driver occupancy HMI the Audio Setting Client will send SetOccupancyMode_Rq = Driver. The Audio Setting Server will respond with Occupancy_Mode_St = Driver.

For Right Hand Drive vehicles if the user selects the Driver occupancy HMI the Audio Setting Client will send SetOccupancyMode_Rq = Passenger. The Audio Setting Server will respond with Occupancy_Mode_St = Passenger.

### 3.4.1 Use Cases

#### *3.4.1.1 AUDSET-UC-REQ-016383/B-Select Occupancy Mode Settings (TcSE ROIN-290164-1)*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON |
| **Scenario Description** | User selects <Occupancy Mode x> via HMI (where "x" represents "Driver Seat", "All Seats", etc setting). |
| **Post-conditions** | The infotainment system will operate with the new occupancy mode setting. HMI displays selected Occupancy Mode. The selected occupancy mode remains enabled until a new selection is made by the user. |
| **List of Exception Use Cases** | N/A |
| **Interfaces** | G-HMI; CBI |

### 3.4.2 Requirements

*3.4.2.1 AUDSET-SR-REQ-016384/E-Auto-Configuring for Occupancy Mode (TcSE ROIN-40734-4)*

The AHU, AAM or DSP AMP shall tell the display module(s) what occupancy modes are supported via the periodic _AutoConfigOcc_XXX CAN signals. The display modules shall store what occupancy modes are supported between ignition cycles.

For example, the Audio Settings Client display would only show to the user the selectable occupancy modes that were supported by a particular AHU / AAM / DSP AMP (_Auto_ConfigOcc_XXX = Supported) and not show the selectable occupancy modes that were not supported (_Auto_ConfigOcc_XXX = Not Supported).

Note: if display module is EOL configurable for occupancy mode then the display module shall ignore the auto-config signals and use the EOL occupancy mode configuration.

Note2: this requirement is not about the user selecting or storing a particular occupancy mode. This requirement is about what Occupancy Modes are shown to the user as possible occupancy modes that can be selected for a particular vehicle.

The AHU _AutoConfigOcc_XXX CAN signals are not applicable if the display module is integrated with the AHU.

### 3.4.3 Sequence Diagrams

#### *3.4.3.1 AUDSET-SD-REQ-016385/A-Set Occupancy Mode Sequence Diagram (TcSE ROIN-40224-1)*

The 'Audio Settings Client' can command the 'Audio Settings Server' to change it's Occupancy Mode setting via the SetOccupancy_Mode.Rq() signal.

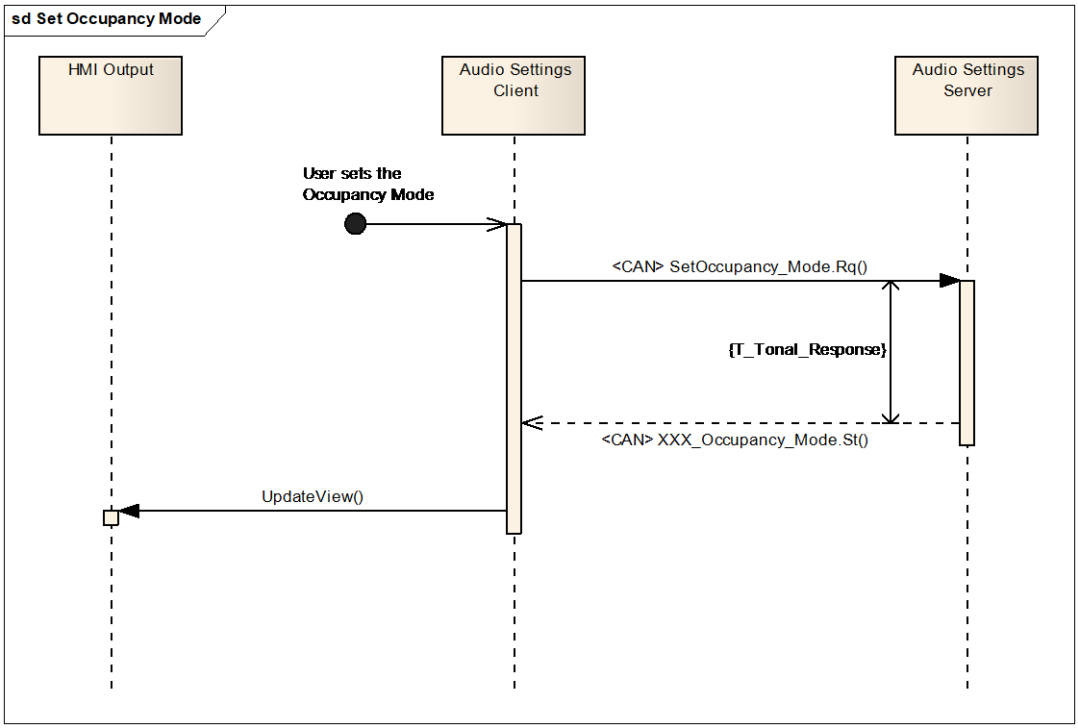
The Occupancy Mode Display status can be updated based on the Occupancy_Mode.St() signal from the 'Audio Settings Server'.

**Pre-condition**
Sound Settings Display is Active

**Scenario**
The user adjusts the Occupancy Mode settings

**Post-condition**
The Occupancy Mode setting is adjusted
The Occupancy Mode setting has changed on the display

**Sequence Diagram**



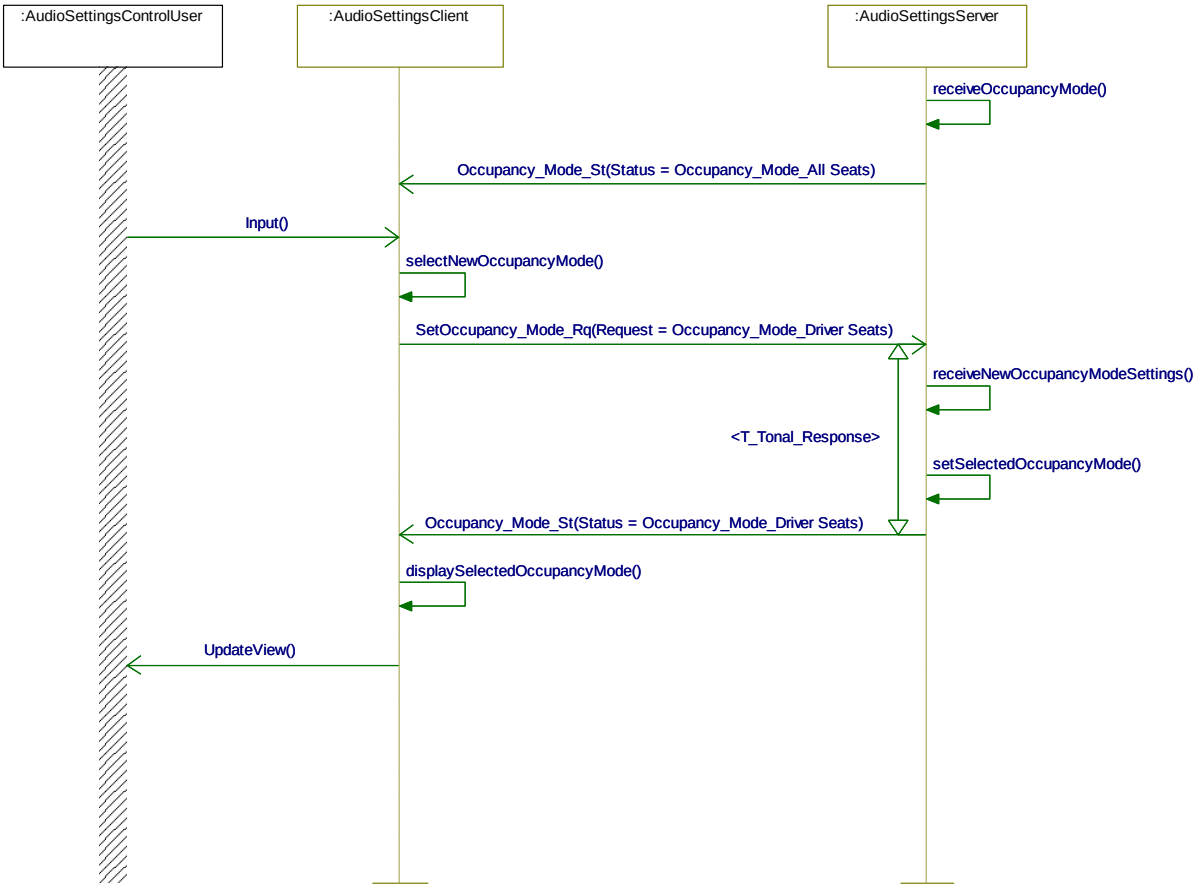

### *3.4.3.2 AUDSET-SD-REQ-088158/B-Change Occupance Mode from All Seats to Driver Seats*

**Pre-Condition**
Occupancy mode is on All Seats

**Event**
User selects Driver Seat occupancy mode

**Post-Condition**
Driver Seat occupancy mode is enabled and the HMI is updated

## Sequence Diagram



## 3.5 AUDSET-FUN-REQ-016386/A-Convertible Auto-EQ Occupancy Mode (TcSE ROIN-290228-1)

### 3.5.1 Use Cases

#### *3.5.1.1 AUDSET-UC-REQ-016387/B-Auto EQ Mode - Convertible Roof Up/Down Occupancy Mode (TcSE ROIN-290181-1)*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON |
| **Scenario Description** | User selects to change the position of the convertible roof to x (where x represents Roof Up (closed) or Roof Down (Open)). |
| **Post-conditions** | The Infotainment system mutes the audio.<br>The Infotainment System sets the EQ cabin mode to <EQ Cabin Mode x> (where x represents Convertible Roof Up or Roof Down occupancy mode).<br>The Infotainment System unmutes the audio.<br>The user selected Occupancy Mode shall remain unchanged (ex. Driver, All, Rear).<br>HMI is not affected.<br>The EQ cabin mode remains unchanged until the convertible roof up/down position is changed by the user. |
| **List of Exception Use Cases** | N/A |
| **Interfaces** | Vehicle System Interface |

### 3.5.2 Requirements

*3.5.2.1 AUDSET-FUR-REQ-014936/B-Activating Convertible Roof Closed Occupancy Mode (TcSE ROIN-280694-1)*

IF

1. the Convertible Audio Settings Server receives CnvtTopPos_Up_Stat = Up, AND
2. the current Convertible Occupancy Mode state is set to Roof Open, THEN

If

1. Vehicle Speed is < 5KPH, AND
2. If CnvtTopPos_Up_Stat = Not_Up for at least 3 seconds before switching to CnvtTopPos_Up_Stat = Up

Then

Immediately change to the Convertible Occupancy Mode to Roof Closed. Note: when converitble occupancy mode changes reference IDS for setting DID indicating convertible occupancy mode status.

Else if

1. Vehicle Speed is < 5KPH, AND
2. If CnvtTopPos_Up_Stat = Up for more than 3 seconds (protects for hysteresis)

Then

Immediately change to the Convertible Occupancy Mode to Roof Closed. Note: when converitble occupancy mode changes reference IDS for setting DID indicating convertible occupancy mode status.

Else

Remain in the current convertible occupancy mode state

*3.5.2.2 AUDSET-FUR-REQ-014937/B-Activating Convertible Roof Open Occupancy Mode (TcSE ROIN-280695-1)*

IF

1. the Convertible Audio Settings Server receives CnvtTopPos_Up_Stat = Not_Up, AND
2. the current Convertible Occupancy Mode state is set to Roof Closed, THEN

If

1. Vehicle Speed is < 5KPH, AND
2. If CnvtTopPos_Up_Stat = Up for at least 3 seconds before switching to CnvtTopPos_Up_Stat = Not_Up

Then

Immediately change to the Convertible Occupancy Mode to Roof Open. Note: when converitble occupancy mode changes reference IDS for setting DID indicating convertible occupancy mode status.

Else if

1. Vehicle Speed is < 5KPH, AND
2. If CnvtTopPos_Up_Stat = Not_Up for more than 3 seconds (protects for hysteresis)

Then

Immediately change to the Convertible Occupancy Mode to Roof Open. Note: when converitble occupancy mode changes reference IDS for setting DID indicating convertible occupancy mode status.

Else

Remain in the current convertible occupancy mode state

*3.5.2.3 AUDSET-FUR-REQ-014938/B-Error State for Convertible Roof Open Occupancy Mode (TcSE ROIN-280696-1)*

The Convertible Occupancy Mode Server shall remember the Convertible Occupancy Mode Roof Open / Roof Closed state between power mode states. (ex when HMIAudioMode goes from ON -> OFF -> ON, bus sleep and wake-up events…)

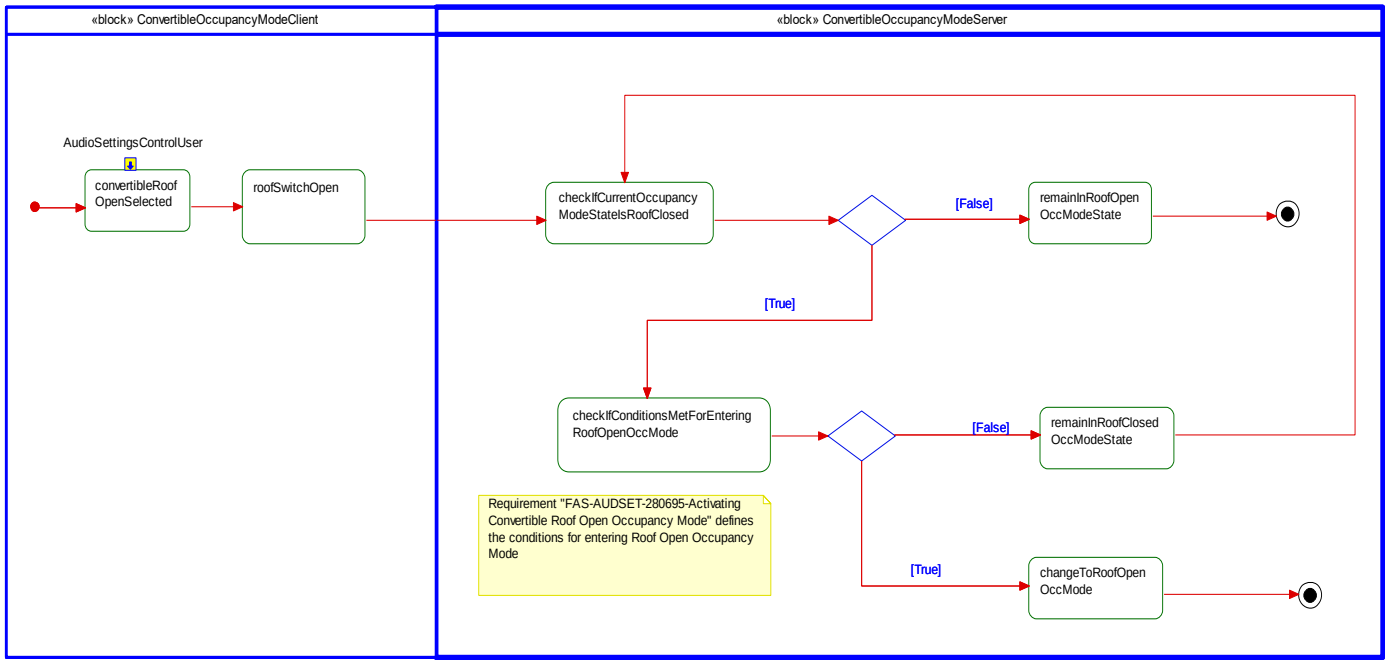
Upon loss of Convertible Occupancy Mode setting because of a loss of B+ the Convertible Occupancy Mode Server shall default to Convertible Roof Closed Occupancy state upon a new battery connection event. The Convertible Occupancy Mode server shall remember convertible occupancy mode state during an engine crank event.

Note: reference IDS for setting DID indicating convertible occupancy mode status.

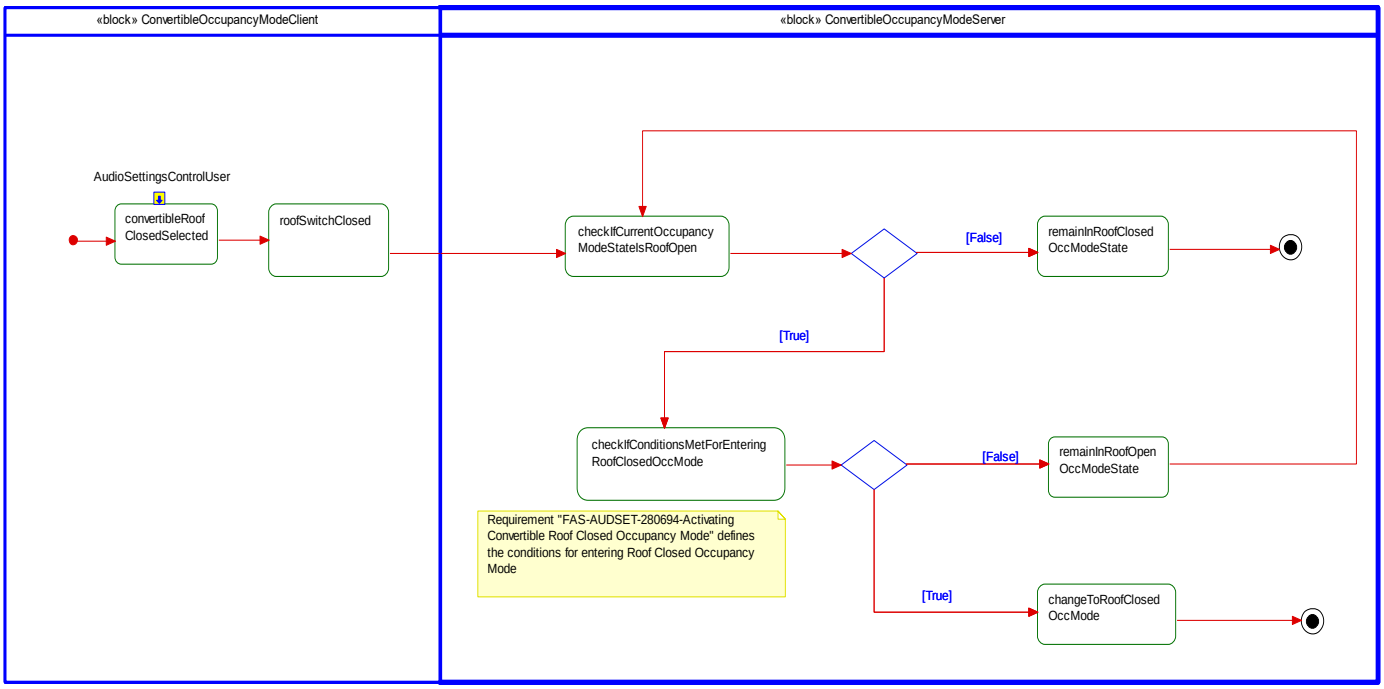
## 3.5.3 White Box View

### *3.5.3.1 Activity Diagrams*

#### 3.5.3.1.1 AUDSET-ACT-REQ-014939/A-Activating Convertible Roof Open Occupancy Mode (TcSE ROIN-281068-1) Activity Diagram




#### 3.5.3.1.2 AUDSET-ACT-REQ-014940/A-Activating Convertible Roof Closed Occupancy Mode (TcSE ROIN-281071-1) Activity Diagram



### *3.5.3.2 Sequence Diagrams*

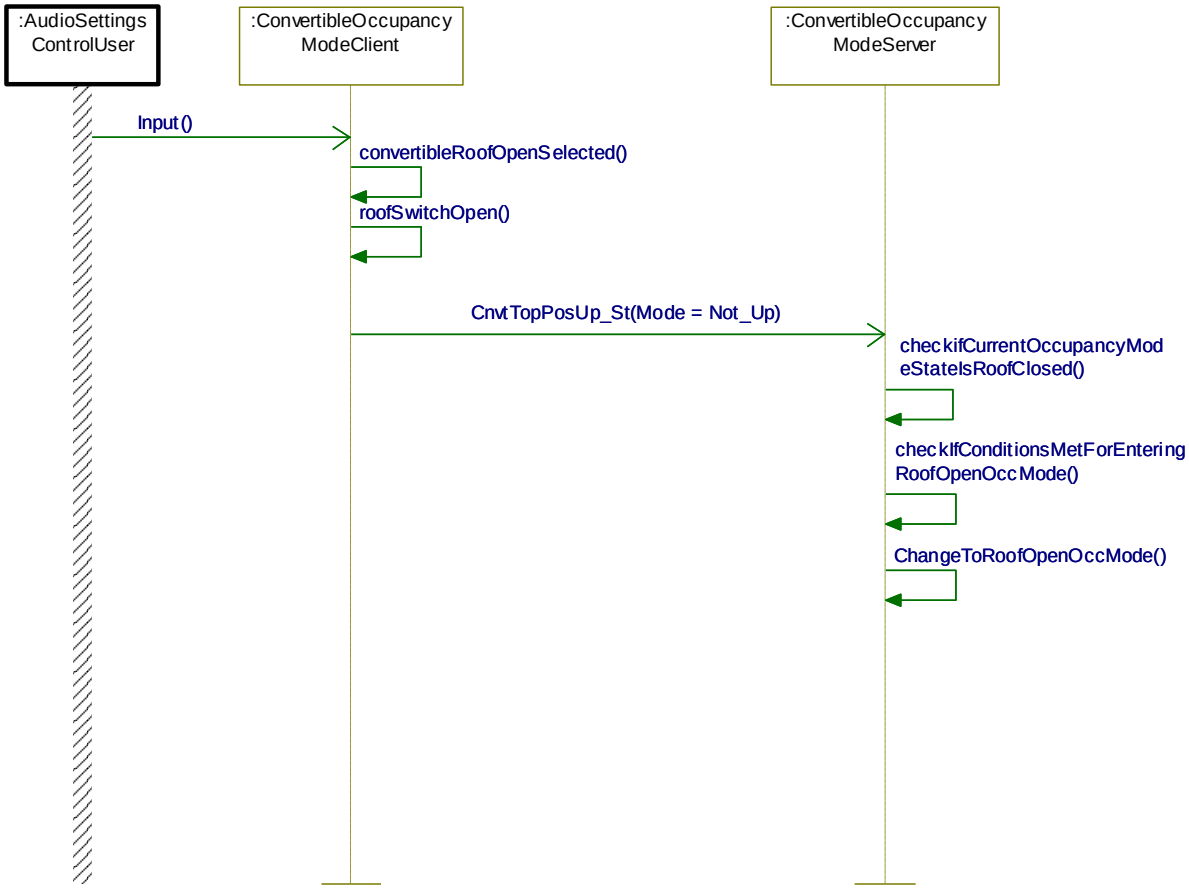
#### 3.5.3.2.1 AUDSET-SD-REQ-014941/A-Activating Convertible Roof Open Occupancy Mode (TcSE ROIN-280698-1)

**Pre-condition**
The Infotainment System is ON
**Pre-condition**
The Convertible Occupancy Mode Server is in Roof Closed Occupancy Mode

**Normal Usage**
The user activates a convertible top roof open event

**Post-condition**
The Convertible Occupancy Mode is in Roof Open Occupancy Mode

**Sequence Diagram**



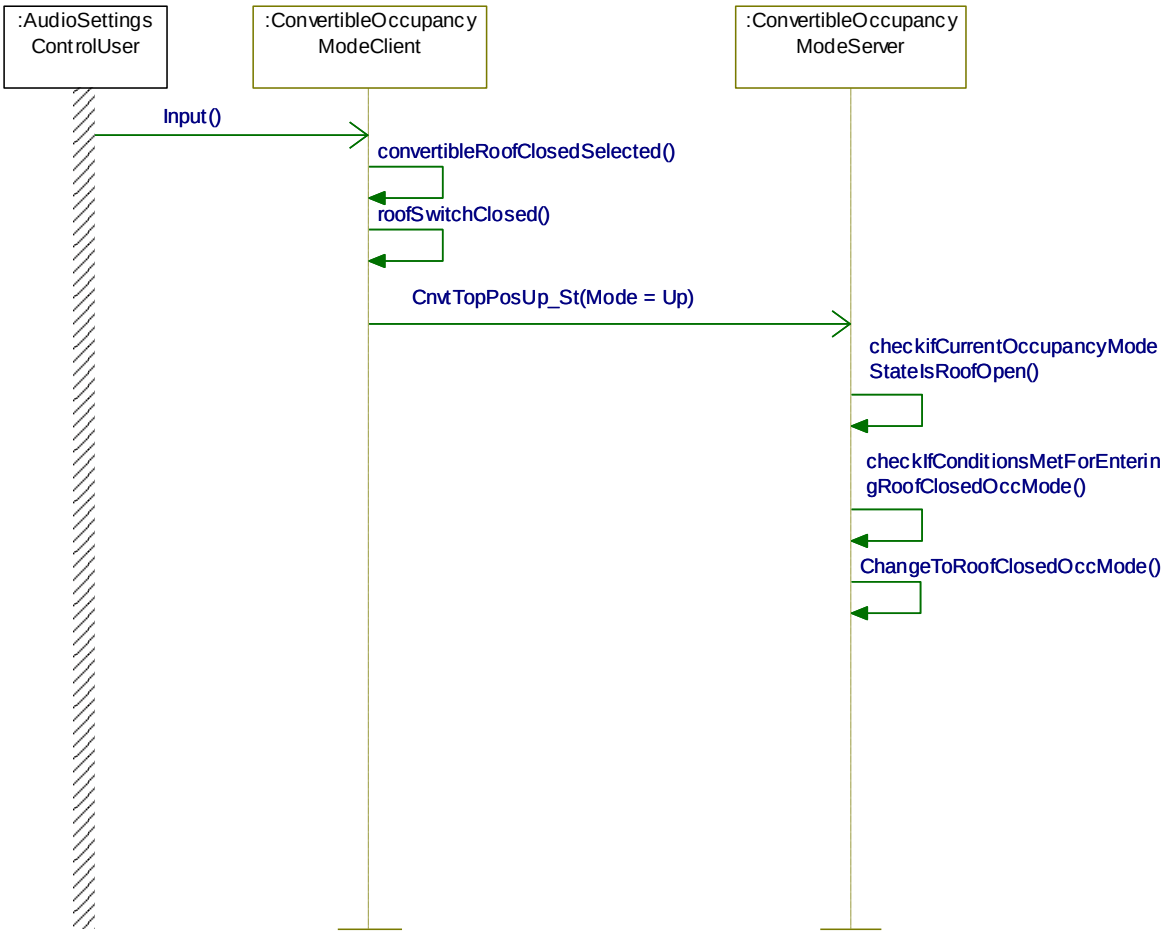

#### 3.5.3.2.2 AUDSET-SD-REQ-014942/A-Activating Convertible Roof Closed Occupancy Mode (TcSE ROIN-280706-1)

**Pre-condition**
The Infotainment System is ON
**Pre-condition**
The Convertible Occupancy Mode Server is in Roof Open Occupancy Mode

**Normal Usage**
The user activates a convertible top roof closed event

**Post-condition**
The Convertible Occupancy Mode is in Roof Closed Occupancy Mode

## Sequence Diagram



## 3.6 AUDSET-FUN-REQ-016390/A-Audio Demonstration Mode (TcSE ROIN-290208-1)

The user may have the ability to initiate an Audio Demonstration of a particular sound system which will play the stored audio.

### 3.6.1 Use Cases

#### *3.6.1.1 AUDSET-UC-REQ-016391/D-Audio Demo Mode - Enable (TcSE ROIN-290166-1)*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment system is powered ON<br>Audio Demo is OFF<br>A Media source is active |
| **Scenario Description** | User selects <Audio Demo ON> via HMI. |
| **Post-conditions** | The Infotainment System plays Audio Demo audible elements at reference audio settings.<br>HMI displays {audio demo} visual elements (e.g. splash screen, video clip, etc.).<br>User may adjust <volume> during the Audio Demo via HMI.<br>The audio demo will play until completion or cancellation by the user.<br>Audio system will return to previous audio source and settings when Audio Demo is complete |
| **List of Exception Use Cases** | N/A |
| **Interfaces** | G-HMI; CBI |

#### *3.6.1.2 AUDSET-UC-REQ-016392/B-Audio Demo Mode - Cancel (TcSE ROIN-290180-1)*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON<br>Audio Demo is ON |
| **Scenario Description** | User selects <Audio Demo OFF> or <button press ≠ volume> via HMI. |
| **Post-conditions** | Audio demo is cancelled.<br>Infotainment system will return to previous audio source and settings. |
| **List of Exception Use Cases** | N/A |
| **Interfaces** | G-HMI; CBI; SWC |

### 3.6.2 Requirements

*3.6.2.1 AUDSET-SR-REQ-014922/B-Chimes and Prompts during Audio Demonstration (TcSE ROIN-39723-1)*

During an Audio Demonstration event the vehicle chimes / prompts shall still be functional and be able to be mixed in with the Audio Demonstration audio.

*3.6.2.2 AUDSET-SR-REQ-014924/C-Audio Demo Client activation of an Audio Demo event (TcSE ROIN-39725-1)*

The Audio Demo Client shall activate an Audio Demonstration event by Tx the 'Audio_Demo_CMND = ON' request to the Audio Demo Server.

*3.6.2.3 AUDSET-SR-REQ-014925/B-Audio Demo Server response to Audio_Demo_CMND = ON from the Audio Demo Client (TcSE ROIN-39726-1)*

The Audio Demo Server shall respond to 'Audio_Demo_CMND = ON" from the Audio Demo Client within Taudio_DSP_rsp with the signal 'Audio_Demo_Status = Active'. Before responding back with 'Audio_Demo_Status = Active' the Audio Demo

Server shall mute the FSE (Front Seat Entertainment) audio into the Audio Demo Server (if there is an active source), unmute the rear speakers (if muted in dual play), and then Tx 'Audio_Demo_Status = Active' when the Audio Demo Server starts playing the audio demonstration.

#### *3.6.2.4 AUDSET-SR-REQ-014926/C-Audio during an Audio Demonstration event (TcSE ROIN-39733-2)*

The Media Audio will not be heard during an Audio Demonstration event but the Audio Demo Server will only send out audio for the Audio Demonstration unless noted otherwise. The Audio Demonstration audio is a Media audio source.

Audio Demonstration shall not prevent chimes from being played.

#### *3.6.2.5 AUDSET-SR-REQ-014927/C-Audio Demo Server response when an Audio Demonstration event is complete (TcSE ROIN-39734-1)*

When the Audio Demonstration completes the Audio Demo Server shall mute the rear speakers (if in dual play), unmute the active audio source into the Audio Demo Server and Tx the signal 'Audio_Demo_Status = Inactive/OFF' to the Audio Demo Client.

#### *3.6.2.6 AUDSET-SR-REQ-014928/B-Audio Demo Client ending an Audio Demonstration event (TcSE ROIN-39735-1)*

If the Audio Demonstration is interrupted and ended by the Audio Demo Client for any reason such as a source change, power mode change, or a button press (except volume button) before the audio Demonstration is complete then the Audio Demo Client shall use the signal 'Audio_Demo_CMND = OFF' to end the audio demonstration. When ending the audio demonstration because of a source change the Audio Demo Client shall not send the DSP AMP the signal 'Audio_Demo_CMND = OFF' until the source change is complete (this is so don't momentarily hear the previous FSE Audio Source).

After the Audio Demo Server receives the 'Audio_Demo_CMND = OFF' it shall then exit Audio Demonstration mode and return to the FSE Audio Source as indicated in the ResourceUpdate status message.

#### ***3.6.2.7 AUDSET-TMR-REQ-014929/B-Taudio_DSP_rsp (TcSE ROIN-39731-1)***

| Name | Description | Units | Range | Resolution | Default |
|---|---|---|---|---|---|
| Taudio_DSP_rsp | Maximum time allowed from when the DSP AMP receives the 'Audio_Demo_CMND = ON' command, mute/unmute as required and responds with the "Audio_Demo_Status = Active" when the DSP AMP is about to begin playing the audio. | msec | 0-1000 | 10 | 125 |

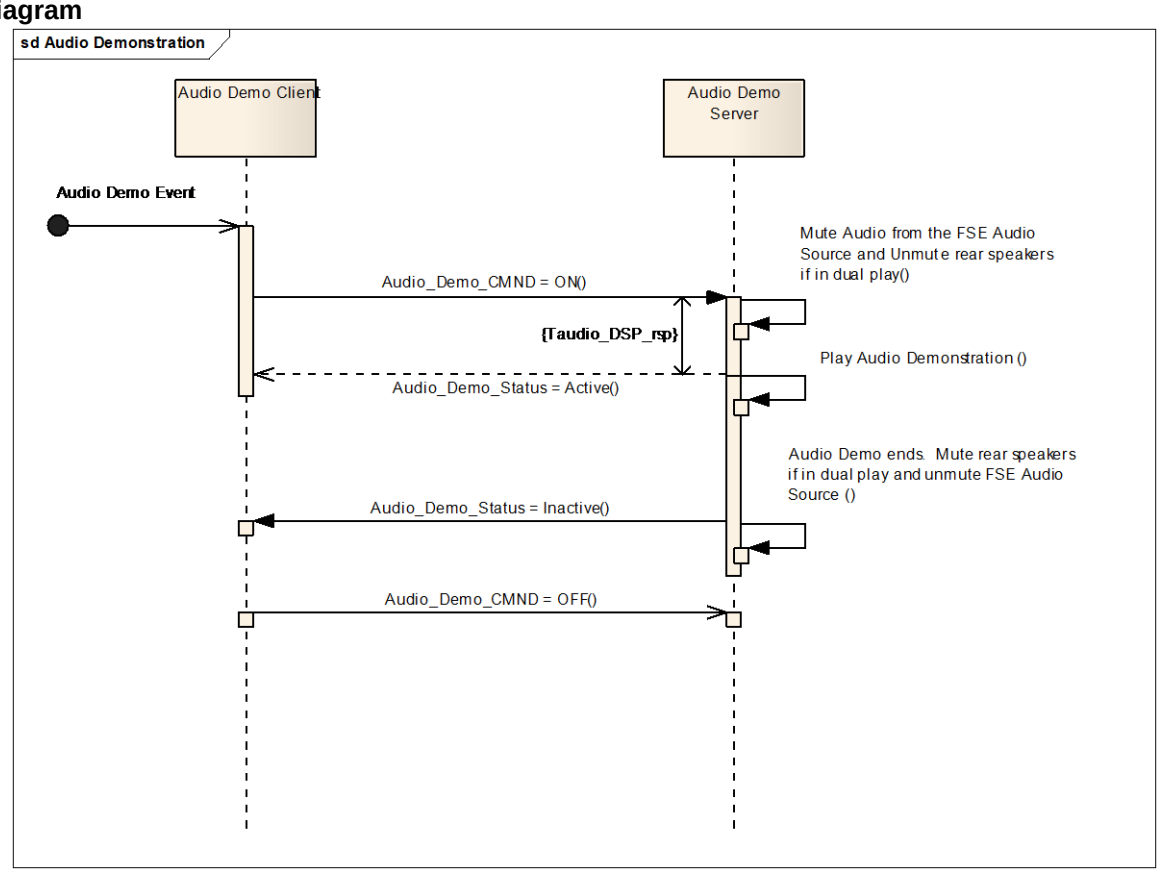
### 3.6.3 Sequence Diagrams

#### ***3.6.3.1 AUDSET-SD-REQ-014930/A-Audio Demo Event Sequence Diagram (TcSE ROIN-39727-1)***

**Pre-condition**
Audio Demonstration is not active

**Post-condition**
Audio Demonstration is Inactive and the Audio Demo Server can play audio from an active audio source

## Sequence Diagram



## 3.7 AUDSETv3-FUN-REQ-420758/A-Audio Demonstration Mode - variant 3 (Phoenix)

### 3.7.1 AUDSETv3-CLD-REQ-420764/A-Audio Demo Client

The Audio Demo Client is the interface for activating and deactivating the Audio Demo function.

### 3.7.2 AUDSETv3-CLD-REQ-420767/A-Audio Demo Server

The Audio Demo Server is responsible for control of the Audio Demo function

### 3.7.3 AUDSETv3-CLD-REQ-420768/A-Audio Demo Audio Switch Server

The Audio Demo Audio Switch Server is responsible for muting, adjusting any acoustical parameters and unmuting the audio demonstration audio inputs and responsible for the speakers to use for audio demonstration.

### 3.7.4 Deployment

The table below shows how the logical classes may be mapped to physical modules for the Audio Demonstration variant 3 (Phoenix) feature. The table below covers the lead program.

At the time the specification was written the below table was the latest. If there are additional modules deployed to the class descriptions or the vehicle architecture changed since the spec was written and released, then the applicable implementation guide class description would cover those modules. If there is a conflict between the implementation guide and the table below the implementation guide takes precedent.

| Logical Class | Physical Module (ECU) |
|---|---|
| Audio Demonstration Client | APIM PDC |
| Audio Demonstration Server | APIM PDC |
| Audio Demonstration Audio Switch Server | DSP AMP |

### 3.7.5 Use Cases

#### *3.7.5.1 AUDSETv2-UC-REQ-420880/A-Audio Demo Mode - Enable*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment system is powered ON<br>Audio Demo is OFF<br>A Media source is active |
| **Scenario Description** | User selects <Audio Demo ON> via HMI. |
| **Post-conditions** | The Infotainment System plays Audio Demo audible elements at reference audio settings.<br>HMI displays {audio demo} visual elements (e.g. splash screen, video clip, etc.).<br>User may adjust <volume> during the Audio Demo via HMI.<br>The audio demo will play until completion or cancellation by the user.<br>Audio system will return to previous audio source and settings when Audio Demo is complete |
| **List of Exception Use Cases** | N/A |
| **Interfaces** | G-HMI; CBI |

#### *3.7.5.2 AUDSETv2-UC-REQ-420881/A-Audio Demo Mode - Cancel*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON<br>Audio Demo is ON |
| **Scenario Description** | User selects <Audio Demo OFF> or <button press ≠ volume> via HMI. |
| **Post-conditions** | Audio demo is cancelled.<br>Infotainment system will return to previous audio source and settings. |
| **List of Exception Use Cases** | N/A |
| **Interfaces** | G-HMI; CBI; SWC |

### 3.7.6 Requirements

*3.7.6.1 AUDSET-SR-REQ-014923/C-Zone mode and Audio Demonstration (TcSE ROIN-39724-1)*

~~If an Audio Demonstration event is selected during Dual Play then all the vehicle speakers will be used for the Audio Demonstration. The RSE (Rear Seat Entertainment) Audio Source will continue to play through the headphones except that none of the rear speakers will be muted. After the Audio Demonstration is complete the rear speakers will be muted again for the RSE Audio Source.~~

If the audio system supports zone mode (ie separate audio zones for users in the vehicle) then Audio Demonstration shall not be supported while in zone mode. Audio Demonstration shall only be supported in cabin mode (ie full speaker mode with one audio zone for the whole vehicle).

*3.7.6.2 AUDSETv2-SR-REQ-350948/A-Chimes and Prompts during Audio Demonstration*

During an Audio Demonstration event the vehicle chimes / prompts shall still be functional and be able to be mixed in with the Audio Demonstration audio.

*3.7.6.3 AUDSET-SR-REQ-348162/A-Activation of an Audo Demo event*

The Audio Demo Server shall initiate an Audio Demonstration event to the Audio Demo Audio Switch Server by transmitting Audio_Demo_CMND = ON.

When the Audio Demo Audio Switch Server receives Audio_Demo_CMND = ON, then the Audio Demo Audio Switch Server shall mute, adjust any acoustical settings and unmute for Audio Demonstration before responding with Audio_Demo_Status = Active. The Audio Demo Audio Switch Server shall respond to Audio_Demo_CMND = ON (ie unmuted) within T_AudioDemo_Rsp of receiving Audio_Demo_CMND = ON.

When the Audio Demo Server receives Audio_Demo_Status = Active then the Audio Demo Server shall generate the Audio demonstration audio.

See sequence diagrams for detailed example

See applicable specs whether certain Media audio sources should be paused or not during an audio demonstration event.

Note:

Audio_Demo_Status = Active means the Audio Demo Audio Switch Server is unmuted for an audio demonstration event.

Audio_Demo_Status = Inactive/OFF mean the Audio Demo Audio Switch Server is not ready for audio for an audio demonstration event. When Audio_Demo_Status = Inactive/OFF then Media audio could be muted or Media audio acoustics could be set for other media sources (ex sound immersion, surround sound etc).

*3.7.6.4 AUDSETv2-SR-REQ-350947/A-Audio during an Audio Demonstration event*

The Media Audio will not be heard during an Audio Demonstration event but the Audio Demo Server will only send out audio for the Audio Demonstration unless noted otherwise. The Audio Demonstration audio is a Media audio source.

Audio Demonstration shall not prevent chimes from being played.

*3.7.6.5 AUDSET-SR-REQ-348207/A-Completion of an Audio Demonstration event*

Whenever an Audio Demonstration event is not occurring the Audio Demonstration Server will send Audio_Demo_CMND = inactive/OFF.

When the Audio Demo Audio Switch Server receives Audio_Demo_CMND = OFF, then the Audio Demo Audio Switch Server shall mute and adjust for any media acoustical settings and unmute Media audio (ex Sound immersion, Surround Sound, etc if applicable) before responding with Audio_Demo_Status = Inactive. The Audio Demo Audio Switch Server shall respond to Audio_Demo_CMND = OFF within T_AudioDemo_Rsp of receiving Audio_Demo_CMND = OFF.

*3.7.6.6 AUDSET-SR-REQ-348205/A-Cancelling Audio Demonstration during an audio demonstration event*

The Audio Demo Server is responsible for ending an Audio Demo event.

Some reasons for cancelling an Audio Demo event (but not limited to these) are a source change, power mode change (ie HMIAudioMode from ON to OFF), user selects audio demo off or there is an infotainment button press (except volume button).

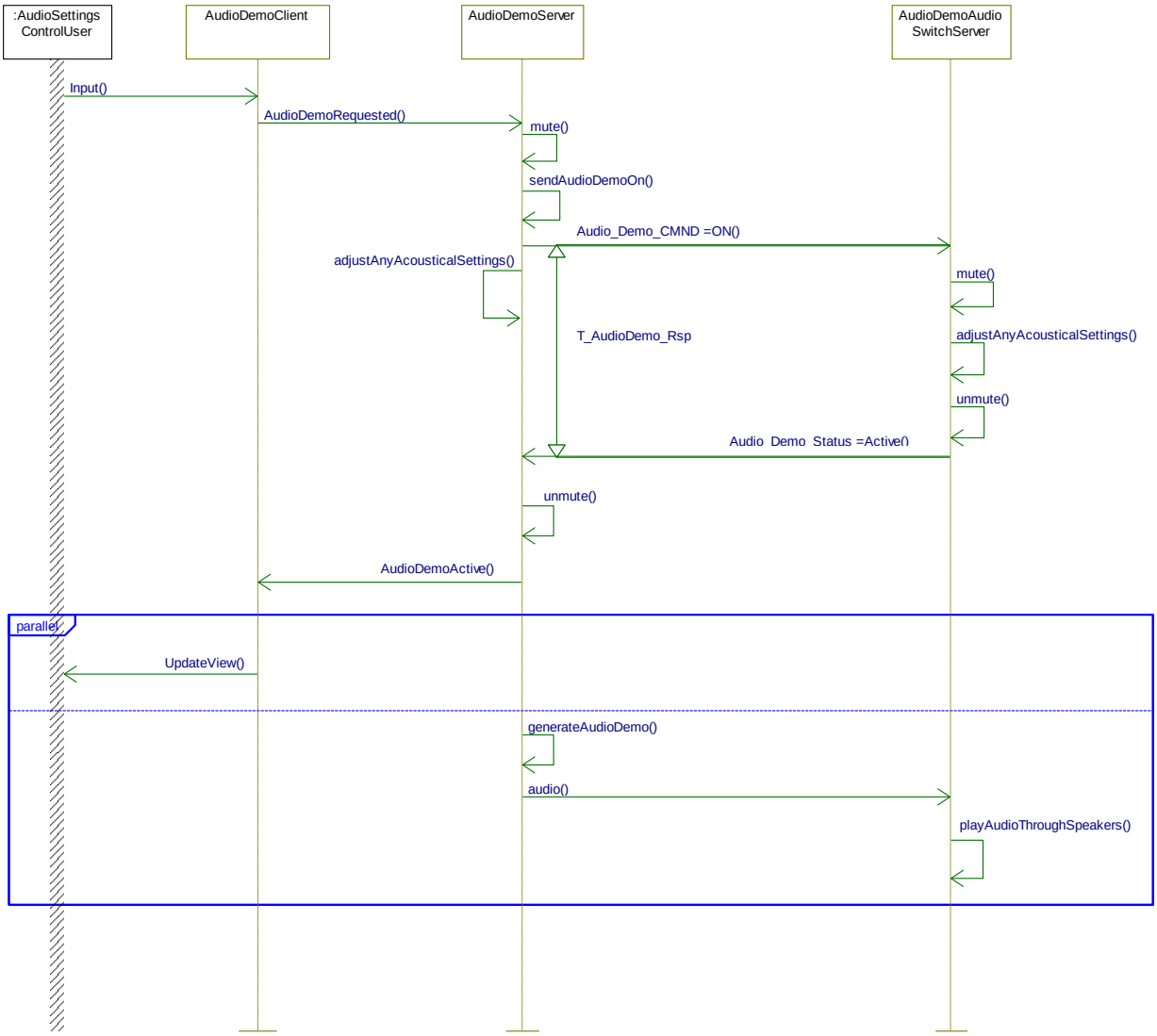
***3.7.6.7 AUDSETv2-TMR-REQ-348206/A-T_AudioDemo_Rsp***

| Name | Description | Units | Range | Resolution | Default |
|---|---|---|---|---|---|
| T_AudioDemo_Rsp | Maximum time allowed from when the Audio Demo Audio Switch Server receives the Audio_Demo_CMND command (Mute or Unmute) until the Audio_Demo_Status signal is updated with the response.<br><br>Note: use the default value | msec | | | 300 |

### 3.7.7 Sequence Diagrams

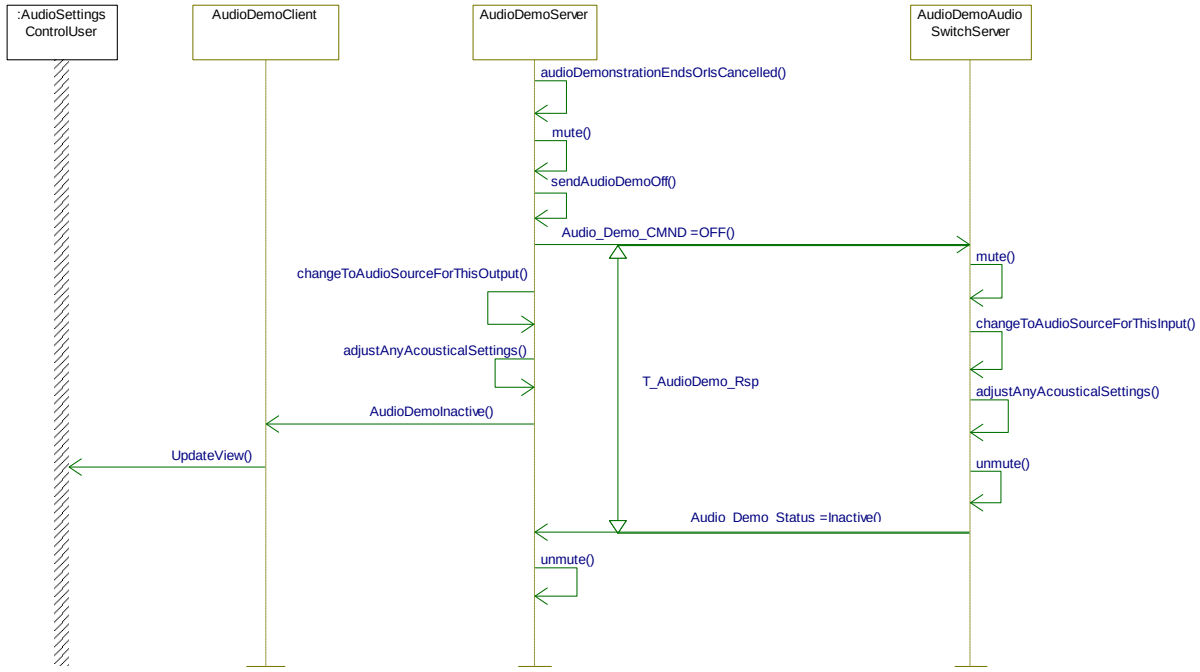
***3.7.7.1 AUDSET-SD-REQ-348208/A-Activating Audio Demonstration Mode***

Pre-Condition:
Audio Demonstration is not active
A media source is active




### *3.7.7.2 AUDSET-SD-REQ-348209/A-Deactivating Audio Demonstration Mode*

Pre-Condition:
Audio Demonstration is Active


:AudioSettings ControlUser
AudioDemoClient
AudioDemoServer
AudioDemoAudio SwitchServer
audioDemonstrationEndsOrIsCancelled()
mute()
sendAudioDemoOff()
Audio_Demo_CMND =OFF()
mute()
changeToAudioSourceForThisOutput()
changeToAudioSourceForThisInput()
adjustAnyAcousticalSettings()
T_AudioDemo_Rsp
adjustAnyAcousticalSettings()
AudioDemoInactive()
UpdateView()
unmute()
Audio_Demo_Status =Inactive()
unmute()

## 3.8 AUDSET-FUN-REQ-016393/A-Simulated Surround Sound (DSP Mode Setting) (TcSE ROIN-292781-1)

The Surround Sound Server may have the ability to 'Upmix' an audio stereo signal to a simulated surround sound when commanded by the Surround Sound Client.

### 3.8.1 Use Cases

#### *3.8.1.1 AUDSET-UC-REQ-016394/B-Select DSP Mode Settings (ex Stereo, Surround) (TcSE ROIN-292780-1)*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON |
| **Scenario Description** | User selects <DSP Mode x> via HMI (where "x" represents Stereo, Surround). |
| **Post-conditions** | The Infotainment System sets the DSP mode to the selected setting. The infotainment system will operate with the new DSP mode setting.<br><br>HMI indicates {DSP Mode x Selected} (where "x" represents Stereo, Surround).<br><br>The selected DSP mode remains enabled until a new selection is made by the user. |
| **List of Exception Use Cases** | N/A |
| **Interfaces** | G-HMI; CBI |

### 3.8.2 Requirements

*3.8.2.1 AUDSET-SR-REQ-014908/B-Surround Sound Client signal usage (TcSE ROIN-39721-3)*

The Surround Sound Client shall Tx the 'Surround_Sound_Upmix = Surround' signal to the Surround Sound Server to request the Surround Sound Server to enter simulated surround sound mode.

The Surround Sound Client shall Tx the 'Surround_Sound_Upmix = Stereo' signal to the Surround Sound Server to request the Surround Sound Server to enter Stereo mode.

The Surround Sound Client will know the status of the DSP Setting Mode (ex. Surround, Stereo) using the surround sound status signal "DSP_Sur_Sound_Upmix.St".

*3.8.2.2 AUDSET-SR-REQ-014909/B-Surrround Sound Server signal usage (TcSE ROIN-39722-2)*

The Surround Sound Server shall provide the status of the DSP Mode Setting that is being used via the DSP_Sur_Sound_Upmix.St signal.

The Surround Sound Server shall provide simulated surround audio when 'Surround_Sound_Upmix = Surround' unless noted otherwise

The Surround Sound Server shall provide stereo audio when 'Surround_Sound_Upmix = Stereo'

### 3.8.3 Sequence Diagrams

#### *3.8.3.1 AUDSET-SD-REQ-014910/A-DSP Mode Sequence Diagram (TcSE ROIN-286581-1)*

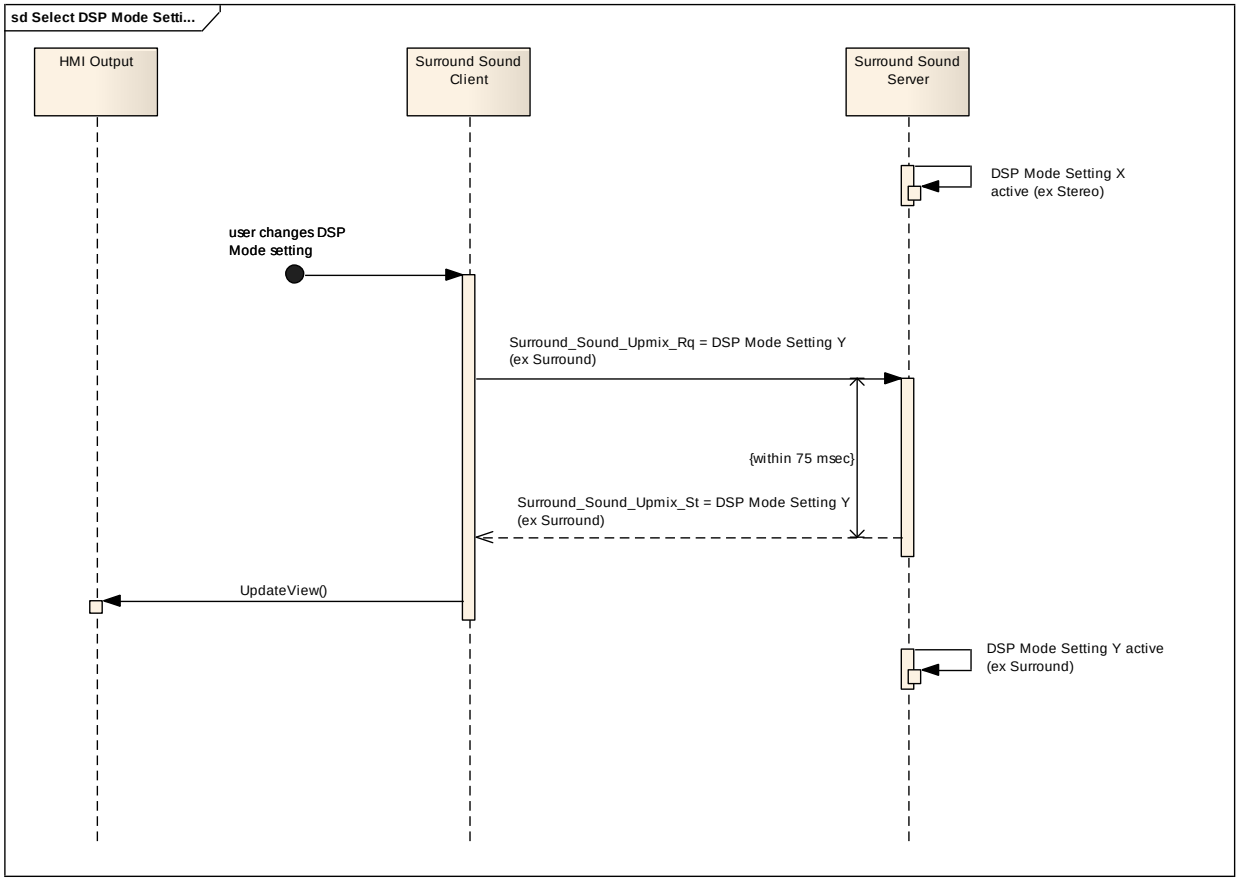
**Pre-condition**
The Infotainment System is ON

**Pre-condition**
The Surrond Sound Server is in DSP Mode Setting X

**Normal Usage**
The user activates DSP Mode Setting Y

**Post-condition**
The DSP Mode Setting Y is active

## Sequence Diagram



## 3.9 AUDSETv2-FUN-REQ-016388/B-Simulated Surround Sound (DSP Mode Setting) - Variant 2 (TcSE ROIN-290236-1)

### 3.9.1 Use Cases

#### *3.9.1.1 AUDSET-UC-REQ-016389/B-Select DSP Mode Settings (ex Stereo, Surround, OnStage, Audience...) (TcSE ROIN-290165-1)*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is powered ON |
| **Scenario Description** | User selects <DSP Mode x> via HMI (where "x" represents Stereo, Surround, OnStage, or Audience…). |
| **Post-conditions** | The Infotainment System sets the DSP mode to the selected setting. The infotainment system will operate with the new DSP mode setting.<br><br>HMI indicates {DSP Mode x Selected} (where "x" represents Stereo, Surround, Onstage, Audience…).<br><br>The selected DSP mode remains enabled until a new selection is made by the user. |
| **List of Exception Use Cases** | N/A |
| **Note** | Some setups may only support Stereo and Surround while others may support different settings such as OnStage or Audience. For display module reference configuration set-up for what should be displayed as DSP Mode options to the user. |
| **Interfaces** | G-HMI; CBI |

### 3.9.2 Requirements

*3.9.2.1 AUDSETv2-REQ-014913/B-Surround Sound Client signal usage (TcSE ROIN-286960-1)*

The Surround Sound Client shall request a DSP Setting Mode setting by sending the Surround_Sound_Upmix2_Rq signal to the Surround Sound Server.

The Surround Sound Client will know the status of the DSP Setting Mode (ex. Stereo, Surround, OnStage, Audience…) using the surround sound status signal "Surround_Sound_Upmix2_St" from the Surround Sound Server.

*3.9.2.2 AUDSETv2-REQ-014914/B-Surround Sound Server signal usage (TcSE ROIN-286961-1)*

The Surround Sound Server shall provide the status of the DSP Mode Setting that is being used via the Surround_Sound_Upmix2_St signal.

*3.9.2.3 AUDSETv2-REQ-014915/B-Surround Sound Server DSP Mode Setting between PowerMode changes (TcSE ROIN-287105-1)*

The Surround Sound Server shall remember the DSP Mode Settings between power mode states. (ex when HMIAudioMode goes from ON -> OFF -> ON, bus sleep and wake-up events…).
Upon loss of DSP Mode setting because of a loss of B+ the Surround Sound Server shall default to its default state upon a new battery connection event. The Surround Sound Server shall remember DSP Mode Setting during an engine crank event.

*3.9.2.4 AUDSETv2-REQ-014916/B-Surround Sound Server receives invalid request (TcSE ROIN-287106-1)*

If the Surround Sound Server receives a Surround_Sound_Upmix2_Rq for a DSP Mode setting it does not support then the Surround Sound Server shall ignore the request and respond with its current DSP Mode setting.

*3.9.2.5 AUDSETv2-REQ-014917/B-Revel Branded Specific DSP Mode Setting (TcSE ROIN-287107-1)*

The Revel specific Surround Sound Server shall support the following:
1. OFF (ie Surround_Sound_Upmix2_St = Stereo)
2. Audience
3. On Stage

The Revel Specific default setting is 0x2 Audience (the default setting as described in requirement - FAS-AUDSETv2-GREQ-287105-1-Surround Sound Server DSP Mode Setting between PowerMode changes).

### 3.9.3 Sequence Diagrams

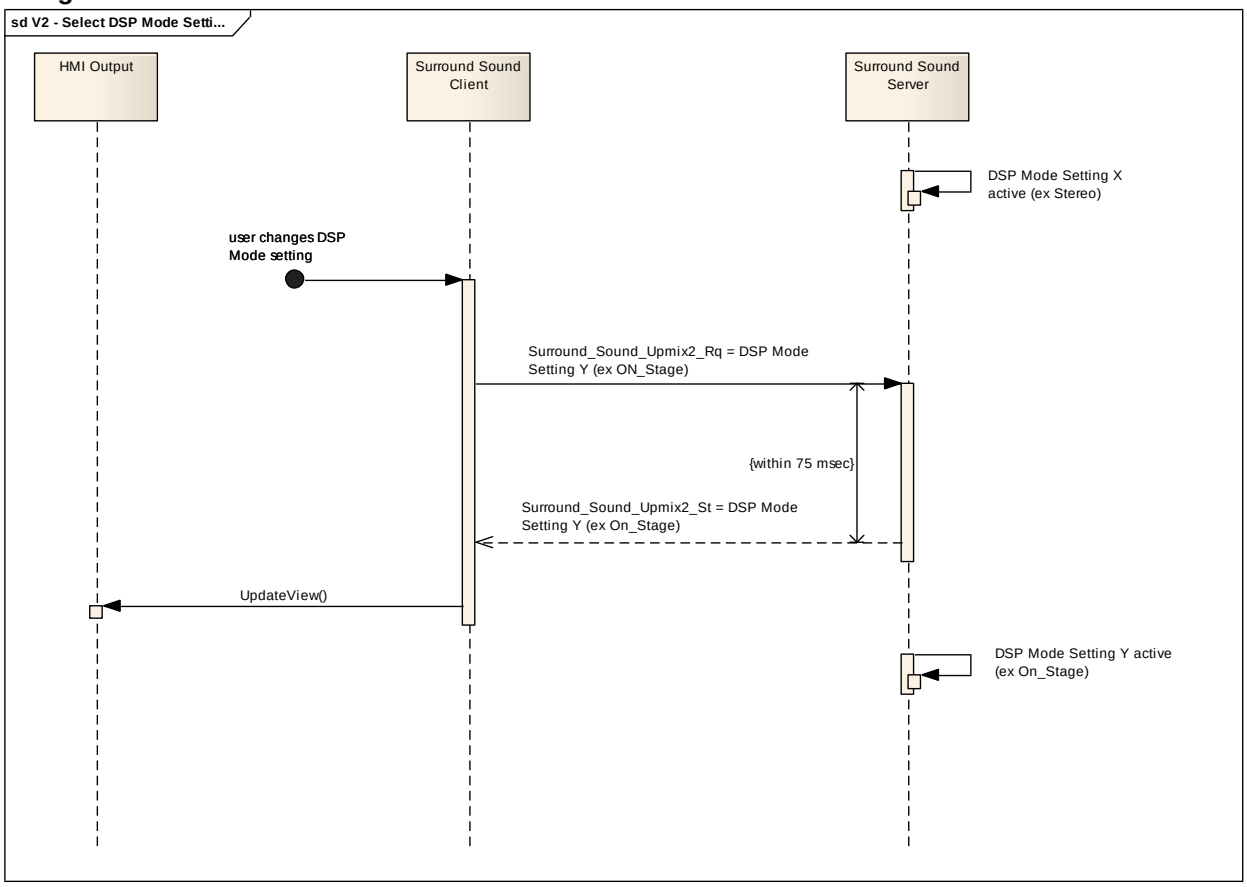
#### *3.9.3.1 AUDSETv2-SD-REQ-014918/A-DSP Mode Sequence Diagram (TcSE ROIN-286752-1)*

**Pre-condition**
The Infotainment System is ON
**Pre-condition**
The Surrond Sound Server is in DSP Mode Setting X

**Normal Usage**
The user activates DSP Mode Setting Y

**Post-condition**
The DSP Mode Setting Y is active

**Sequence Diagram**



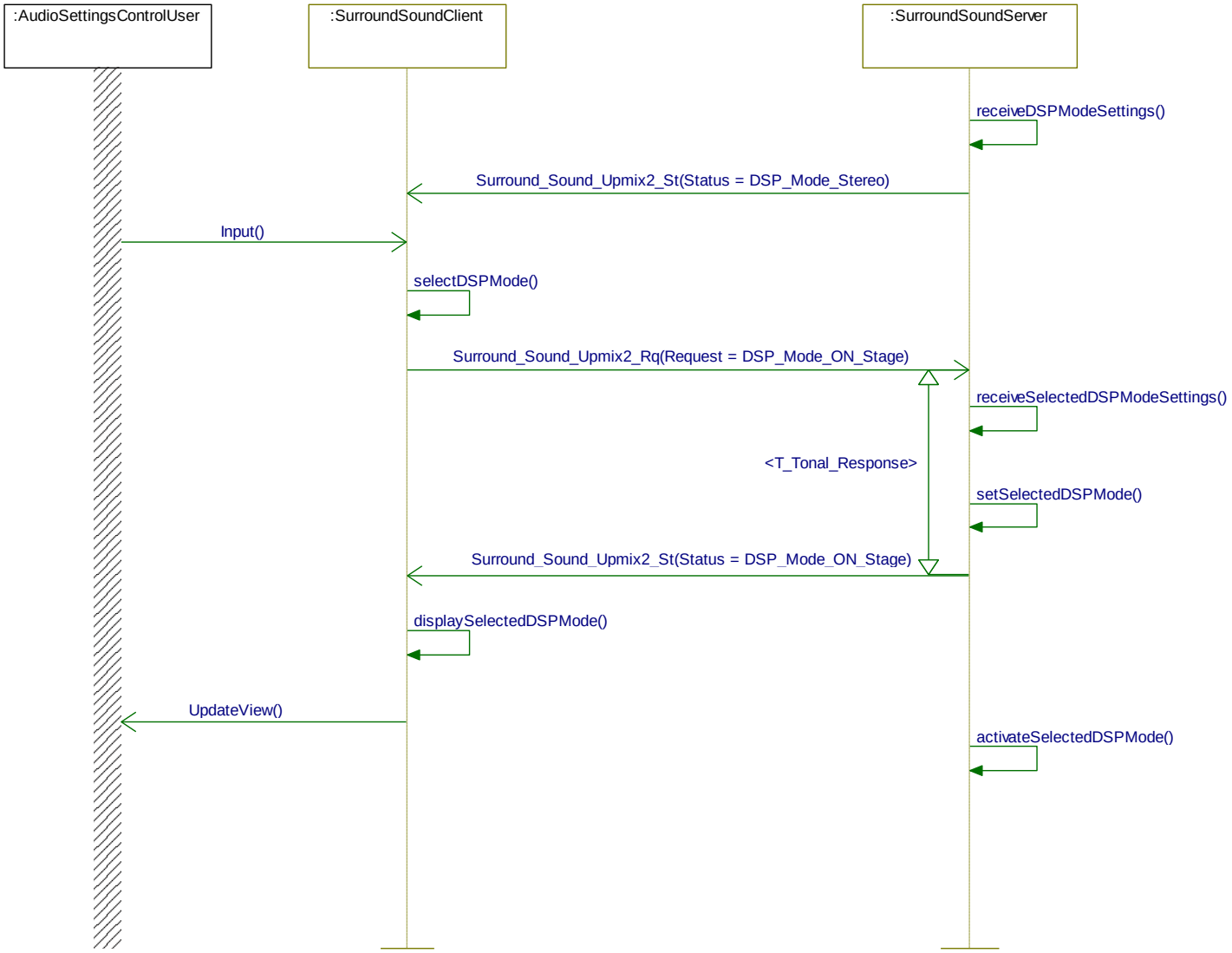

### *3.9.3.2 AUDSET-SD-REQ-088161/B-Change from Stereo to ON_Stage DSP Mode*

**Pre-Condition**
DSP Mode is set to Stereo

**Event**
User selects ON_Stage DSP Mode

**Post-Condition**
The infotainment system goes to DSP Mode ON_Stage and HMI is updated

**Sequence Diagram**


:AudioSettingsControlUser
:SurroundSoundClient
:SurroundSoundServer
receiveDSPModeSettings()
Surround_Sound_Upmix2_St(Status = DSP_Mode_Stereo)
Input()
selectDSPMode()
Surround_Sound_Upmix2_Rq(Request = DSP_Mode_ON_Stage)
receiveSelectedDSPModeSettings()
<T_Tonal_Response>
setSelectedDSPMode()
Surround_Sound_Upmix2_St(Status = DSP_Mode_ON_Stage)
displaySelectedDSPMode()
UpdateView()
activateSelectedDSPMode()

## 3.10 AUDSET-FUN-REQ-016363/B-Equalizer Mode Settings (Rock, Pop, etc) (TcSE ROIN-290240)

### 3.10.1 Use Cases

#### *3.10.1.1 AUDSET-UC-REQ-014904/B-Select Equalizer Mode Settings (Rock, Pop, etc.) (TcSE ROIN-225150-1)*

**Scenarios**

**Normal Usage**

User selects <Equalizer Mode x> via HMI (where "x" represents "Rock", "Pop", etc setting).
The AHU sets the equalizer mode to the selected setting.
HMI indicates {Equalizer Mode x Selected} (where "x" represents "Rock", "Pop", etc setting).
The selected equalizer mode remains enabled until a new selection is made by the user.

**Constraints**

**Post-condition**

The multimedia system will operate with the new equalizer mode setting.

**Pre-condition**

Phone source Not Active

**Pre-condition**

AHU is ON

### 3.10.2 Sequence Diagrams

#### *3.10.2.1 AUDSET-SD-REQ-014905/A-Set Equalizer Mode (Pop, Rock, etc) (TcSE ROIN-159927-1)*

**Pre-condition**

Sound Settings display is active

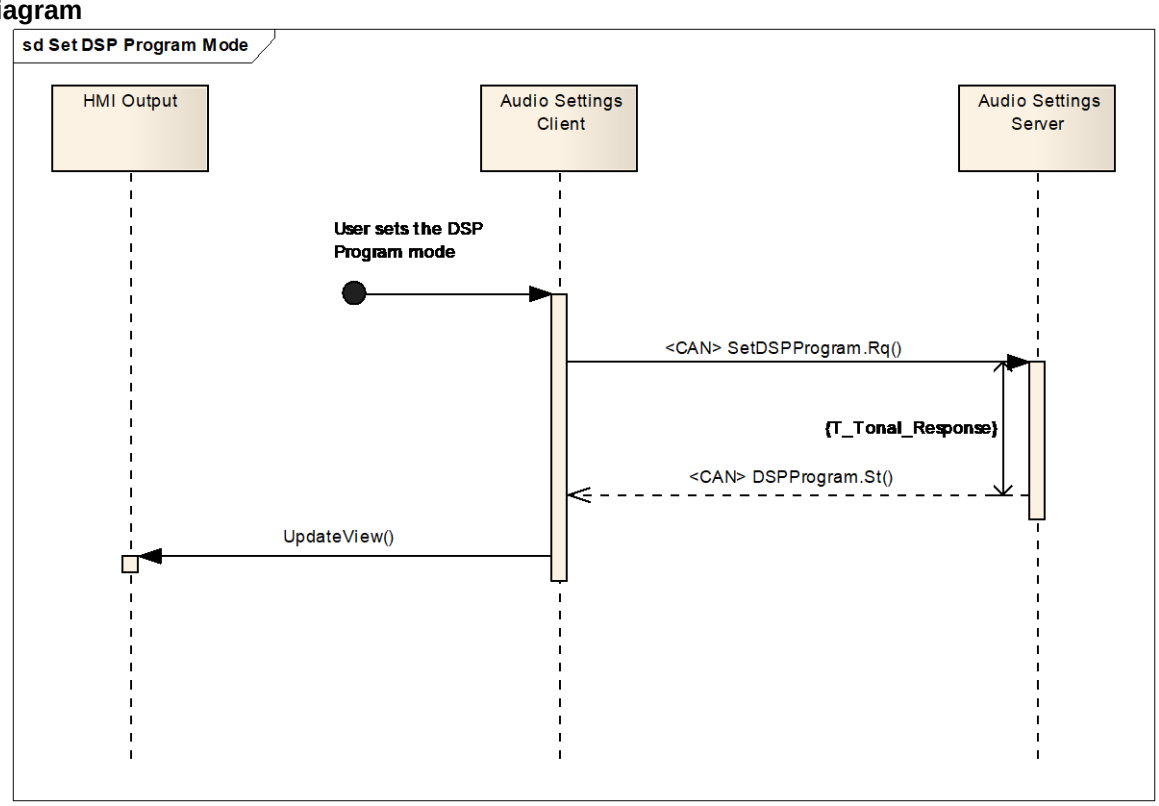
**Scenario**

The user adjusts the Equalizer mode setting

**Post-condition**

The Equalizer mode is adjusted
The Equalizer mode has changed on the display

## Sequence Diagram



## 3.11 AUDSET-FUN-REQ-238444/A-Sound Immersion

### 3.11.1 Use Cases

#### *3.11.1.1 AUDSET-UC-REQ-238445/B-Change from Stereo immersion level to the default OnStage immersion level by selecting the OnStage DSP Mode HMI setting*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is Powered ON.<br><br>Media Source is active<br><br>DSP Mode is set to Stereo<br><br>Immersion level is set to minimum (i.e. immersion level = 0) |
| **Scenario Description** | The user selects DSP Mode “Onstage” from the HMI |
| **Post-conditions** | The infotainment system sets the DSP Mode to Onstage<br><br>The infotainment system sets the Audio Immersion level to the default setting for Onstage<br><br>The HMI for Immersion Level is set to the default setting for Onstage<br><br>The HMI for DSP mode is set to “Onstage”<br><br>The selected DSP mode and Immersion level remains saved until a new selection is made by the user. |
| **Notes** | Same general strategy going from Onstage to Stereo.<br><br>Immersion Setting 0 = Stereo<br>Immersion Setting 64 = Audience default setting<br>Immersion Setting 127 = Onstage default setting<br><br>Note: The HMI should be updated quickly enough to give the user the experience of the immersion setting change occurring in real-time.<br><br>This is only applicable to Media sources and does not apply to other audio sources (such as VR, Phone, Mixable Prompts and TA) |
| **Interfaces** | G-HMI, CBI |

#### *3.11.1.2 AUDSET-UC-REQ-238446/B-Change from an Audience immersion level to Stereo immersion level by selecting the Stereo DSP Mode HMI setting*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is Powered ON.<br><br>Media Source is active |

| | |
|---|---|
| | DSP Mode is set to Audience<br><br>Immersion level is set to a level in the Audience immersion range (i.e. immersion level between 1 – 64) |
| **Scenario Description** | The user selects DSP Mode “Stereo” from the HMI |
| **Post-conditions** | The infotainment system sets the DSP Mode to Stereo<br><br>The infotainment system sets the Audio Immersion level to minimum (i.e. immersion level = 0)<br><br>The HMI for Immersion Level is set to the default setting for Stereo<br><br>The HMI for DSP mode is set to “Stereo”<br><br>The selected DSP mode and Immersion level remains saved until a new selection is made by the user. |
| **Notes** | Same general strategy going from Stereo to Audience.<br><br>Immersion Setting 0 = Stereo<br>Immersion Setting 64 = Audience default setting<br>Immersion Setting 127 = Onstage default setting<br><br>Note: The HMI should be updated quickly enough to give the user the experience of the immersion setting change occurring in real-time.<br><br>This is only applicable to Media sources and does not apply to other audio sources (such as VR, Phone, Mixable Prompts and TA) |
| **Interfaces** | G-HMI, CBI |

#### *3.11.1.3 AUDSET-UC-REQ-238447/B-Change an Onstage immersion level to the default Audience immersion level by selecting the Audience DSP Mode HMI setting*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is Powered ON.<br><br>Media Source is active<br><br>DSP Mode is set to Onstage<br><br>Immersion level is set to an Onstage Level in the range support for Onstage (i.e. immersion level between 65 - 127) |
| **Scenario Description** | The user selects DSP Mode “Audience” from the HMI |
| **Post-conditions** | The infotainment system sets the DSP Mode to Audience<br><br>The infotainment system sets the Audio Immersion level to the default setting for Audience (i.e. immersion level = 64)<br><br>The HMI for Immersion Level is set to the default setting for Audience |

| | |
|---|---|
| | The HMI for DSP mode is set to “Audience”<br><br>The selected DSP mode and Immersion level remains saved until a new selection is made by the user. |
| **Notes** | Same general strategy going from Audience to Onstage.<br><br>Immersion Setting 0 = Stereo<br>Immersion Setting 64 = Audience default setting<br>Immersion Setting 127 = Onstage default setting<br><br>Note: The HMI should be updated quickly enough to give the user the experience of the immersion setting change occurring in real-time.<br><br>This is only applicable to Media sources and does not apply to other audio sources (such as VR, Phone, Mixable Prompts and TA) |
| **Interfaces** | G-HMI, CBI |

#### *3.11.1.4 AUDSET-UC-REQ-238448/B-Change from Stereo immersion level to an Onstage Immersion level by dragging the wiper to the OnStage region*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is Powered ON.<br><br>Media Source is active<br><br>DSP Mode is set to Stereo<br><br>Immersion level is set to minimum (i.e. immersion level = 0) |
| **Scenario Description** | The user holds the HMI immersion wiper and drags it to the intended Onstage Immersion level setting in the Onstage region of the HMI |
| **Post-conditions** | As the HMI immersion wiper is dragged from the Immersion level minimum position to the intended Onstage immersion level the HMI and Audio are continuously updated real time as the wiper is moved.<br>• As the HMI wiper passes the immersion level on HMI from Stereo to the Audience region the HMI is updated to show the DSP Mode set to “Audience”<br>• As the HMI immersion wiper passes the immersion level on the HMI from the Audience region to the beginning of the Onstage immersion level region the HMI is updated to show the DSP Mode set “Onstage”<br><br>The user stops dragging and releases the HMI immersion wiper in the Onstage region and the immersion level Medio audio remains at the selected Onstage immersion level.<br><br>The selected DSP mode and Immersion level remains saved until a new selection is made by the user. |
| **Notes** | Same general strategy going from Onstage to Stereo<br><br>Immersion Setting 0 = Stereo |

| | |
|---|---|
| | Immersion Setting 64 = Audience default setting<br>Immersion Setting 127 = Onstage default setting<br><br>Note: Refer to HMI whether immersion wipers or some other method is used for controlling the immersion level. Wipers are just used as an example in this use case.<br><br>Note: The HMI should be updated quickly enough to give the user the experience of the immersion setting change occurring in real-time.<br><br>This is only applicable to Media sources and does not apply to other audio sources (such as VR, Phone, Mixable Prompts and TA) |
| **Interfaces** | G-HMI, CBI |

#### *3.11.1.5 AUDSET-UC-REQ-238449/B-Change from an Audience immersion level to the Stereo Immersion level by dragging the wiper to the Stereo region*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is Powered ON.<br><br>Media Source is active<br><br>DSP Mode is set to Audience<br><br>Immersion level is set to a level in the Audience immersion range (i.e. immersion level between 1 – 64) |
| **Scenario Description** | The user holds an HMI immersion wiper and drags it to the intended Stereo immersion level setting of the HMI |
| **Post-conditions** | As the HMI immersion wiper is dragged from the Audience immersion level setting to the intended Stereo immersion level, the HMI and media audio are continuously updated real-time as the wiper is moved.<br>• As the HMI immersion wiper passes the immersion level on the HMI from the Audience region to the Stereo setting, the HMI is updated to show the DSP Mode is set to “Stereo”<br><br>The user stops dragging and releases the wiper on the Stereo setting and the immersion level media audio remains at the selected Stereo immersion level.<br><br>The selected DSP mode and Immersion level remains saved until a new selection is made by the user. |
| **Notes** | Same general strategy going from Stereo to Audience<br><br>Immersion Setting 0 = Stereo<br>Immersion Setting 64 = Audience default setting<br>Immersion Setting 127 = Onstage default setting<br><br>Note: Refer to HMI whether wipers or some other method is used for controlling the immersion level. Wipers are just used as an example in this use case. |

| | |
|---|---|
| | Note: The HMI should be updated quickly enough to give the user the experience of the immersion setting change occurring in real-time.<br><br>This is only applicable to Media sources and does not apply to other audio sources (such as VR, Phone, Mixable Prompts and TA) |
| **Interfaces** | G-HMI, CBI |

#### *3.11.1.6 AUDSET-UC-REQ-238450/B-Change from an Onstage immersion level to an Audience immersion level by dragging the wiper to the Audience region*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is Powered ON.<br><br>Media source is active<br><br>DSP Mode is set to “Onstage”<br><br>Immersion level is set to a level in the Onstage immersion range (i.e. immersion level between 65 - 127) |
| **Scenario Description** | The user holds an HMI immersion wiper and drags it to the intended immersion level setting in the Audience region of the HMI |
| **Post-conditions** | As the HMI immersion wiper is dragged from the Onstage immersion level setting to the intended Audience immersion level, the HMI and media audio are continuously updated real-time as the HMI immersion wiper is moved.<br>• As the HMI immersion wiper passes the immersion level on the HMI from the Onstage region to the Audience region, the HMI is updated to show the DSP Mode is set to “Audience”.<br><br>The user stops dragging and releases the HMI immersion wiper on the desired immersion setting in the Audience HMI region, and the immersion level media audio remains at the selected Audience immersion level.<br><br>The selected DSP mode and Immersion level remains saved until a new selection is made by the user. |
| **Notes** | Same general strategy going from Audience to Onstage<br><br>Immersion Setting 0 = Stereo<br>Immersion Setting 64 = Audience default setting<br>Immersion Setting 127 = Onstage default setting<br><br>Note: Refer to HMI whether wipers or some other method is used for controlling the immersion level. Wipers are just used as an example in this use case.<br><br>Note: The HMI should be updated quickly enough to give the user the experience of the immersion setting change occurring in real-time.<br><br>This is only applicable to Media sources and does not apply to other audio sources (such as VR, Phone, Mixable Prompts and TA) |
| **Interfaces** | G-HMI, CBI |

### *3.11.1.7 AUDSET-UC-REQ-238451/B-Change from Stereo immersion level to an Onstage immersion level by pressing & releasing in the OnStage region*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System is Powered ON.<br><br>Media Source is active<br><br>DSP Mode is set to “Stereo”<br><br>Immersion level is set to minimum (i.e. immersion level = 0) |
| **Scenario Description** | The user changes the immersion level setting by pressing and releasing a point in the Onstage immersion level region of the HMI immersion wheel. |
| **Post-conditions** | As the user presses and releases a location in the Onstage region of the HMI immersion wheel and the HMI and media audio is updated to the new Onstage immersion level setting.<br><br>The HMI is updated to show the HMI immersion wipers at the location of the press and release and the DSP mode is updated to the “Onstage” setting.<br><br>The selected DSP mode and Immersion level remains saved until a new selection is made by the user. |
| **Notes** | Same general strategy changing from any immersion setting to a new immersion setting in any region with a press and release HMI action.<br><br>Immersion Setting 0 = Stereo<br>Immersion Setting 64 = Audience default setting<br>Immersion Setting 127 = Onstage default setting<br><br>Note: Refer to HMI whether wipers or some other method is used for controlling the immersion level. Wipers are just used as an example in this use case.<br><br>Note: The HMI should be updated quickly enough to give the user the experience of the immersion setting change occurring in real-time.<br><br>This is only applicable to Media sources and does not apply to other audio sources (such as VR, Phone, Mixable Prompts and TA) |
| **Interfaces** | G-HMI, CBI |

### 3.11.2 Requirements

*3.11.2.1 AUDSET-SR-REQ-238562/B-DSP Mode signals supporting Sound Immersion*

For the Immersion Settings Server (ex DSP AMP) supporting both immersion levels and DSP Modes (ex OnStage, Audience) for the DSP Mode signals use the same CAN signals and strategy for communication as defined in Audio Settings SPSS function: "AUDSETv2-FUN-REQ-016388-Simulated Surround Sound (DSP Mode Setting)".

*3.11.2.2 AUDSET-SR-REQ-238551/B-Immersion Level settings*

The DSP Mode for the immersion level default settings shall be defined as:

- Immersion Setting 0 = Stereo (ie ImmersionLevel_D_St = Level 0)
- Immersion Setting 64 = Audience default setting (ie ImmersionLevel_D_St = Level 64)
- Immersion Setting 127 = Onstage default setting (ie ImmersionLevel_D_St = Level 127)

The DSP Mode range of immersion level settings shall be defined as:

- Stereo setting (immersion level 0)
- Audience Region (immersion settings 1 - 64)
- OnStage Region (immersion settings 65 – 127)

*3.11.2.3 AUDSET-SR-REQ-238565/D-Immersion Setting Client - Immersion Level Rq and St signal usage*

The Immersion Setting Client shall request an immersion level setting by sending the ImmersionLevel_D_Rq signal to the Immersion Setting Server.

The Immersion Setting Client will know the status of the Audio Immersion Level using the immersion level status signal "ImmersionLevel_D_St" from the Surround Sound Server. The ImersionLevel_D_St shall be used for updating HMI (ex when release wiper the final HMI location of the wiper would depend on the ImmersionLevel_D_St status signal).

On the HMI if the user updates the Immersion Level quickly covering many immersion levels in a short period of time then the quickest Immersion Setting Client shall send the ImmersionLevel_D_Rq is 20 msec +/-10%.

- An example of updating the Immersion Level quickly could be the user quickly dragging the immersion Wiper HMI from one immersion level across many immersion levels until the wiper is released on another immersion level.
    - For example the immersion level was level 2 and then the HMI immersion wiper is dragged across 20 immersion levels in 100 msec then only 5 ImmersionLevel_D_Rq would be sent out 20 msec +/- 10% apart. This could be something like:

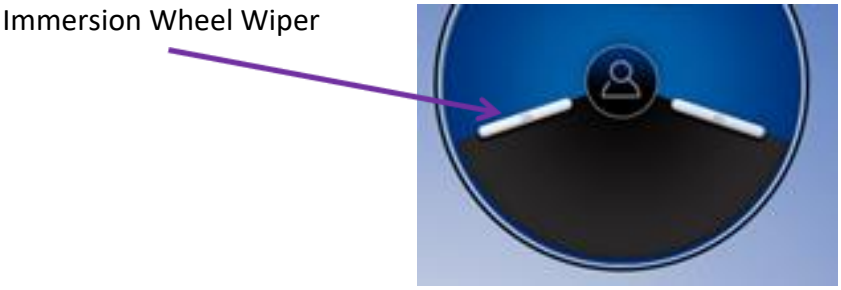
      Pre-Condition:
      The Immersion Level is at Level 2 (ie ImmersionLevel_D_St = Level2)
      Event:
      The HMI immersion wiper is quickly dragged and
      1. 20 msec after first started dragging "ImmerisonLevel_D_Rq = Level5" →
      2. 20 msec later "ImmersionLevel_D_Rq = Level9" →
      3. 20 msec later "ImmersionLevel_D_Rq = Level13 →
      4. 20 msec laster "ImmersionLevel_D_Rq = Level15 →
      5. 20 msec later "ImmersionLevel_D_Rq = Level22" when the user releases the HMI wiper

      Post-Condition:
      When the Wiper is released final resting place of the HMI wiper would depend on what the last ImmersionLevel_D_St is set to. It should be set to ImmersionLevel_D_St = Level22 within 75 msec of the last ImmersionLevel_D_Rq request.

Note:

See the actual HMI for how immersion level can be increased by the user. The example given in the Sound Immersion function is using the immersion HMI wiper as shown below. Another method other than wipers may be used on the actual HMI but the same concept and logic would apply in the SPSS.

The picture below is not an actual representation of HMI. See Sound Immersion HMI specifications for actual representation of the HMI.




*3.11.2.4 AUDSET-SR-REQ-238566/E-Immersion Setting Server - Immersion level Rq and St signal usage*

The Immersion Setting Server shall provide the status of the Immersion Audio Level setting via the ImmersionLevel_D_St signal.

When the Immersion Setting Server receives a valid ImmersionLevel_D_Rq request from the Immersion Setting Client, then the Immersion Setting Server shall update the ImmersionLevel_D_St signal to that immersion level within T_Tonal_Response.

When the Immersion Setting Server receives a valid DSP Mode request (ex Surround_Sound_Upmix2_Rq = OnStage) from the Immersion Setting Client resulting in a DSP Mode setting change (ex Audience → OnStage), then the Immersion Setting Server shall set the immersion level to the default immersion level for the DSP Mode.

When the Immersion Setting Server changes its ImmersionLevel_D_St to a value that results in a new DSP Mode setting, or a DSP Mode setting changes to a new setting resulting in a new immersion level, then both the DSP Mode signal "Surround_Sound_Upmix2_St" and the immersion level signal "ImmersionLevel_D_St" shall be updated on the network bus within T_Update_Response of each other.

Rapid change to the Immersion Level:
For multiple quick immersion level updates the Immersion Setting Server shall not put consecutive event based ImmersionLevel_D_St updates on the network bus quicker than 20 msec +/- 10% a part.

- ex user drags immersion level HMI wiper quickly across HMI screen so multiple quick ImmersionLevel_D_Rq requests are received by the Immersion Setting Server resulting in quick Immersion Level updates

***3.11.2.5 AUDSET-TMR-REQ-239290/B-T_Update_Response***

| Name | Description | Units | Range | Resolution | Default |
|---|---|---|---|---|---|
| T_Update_Response | Maximum timed allowed for the Immersion Setting Server to respond with the updated Immersion Level status signal once an updated DSP Mode signal is put on the network bus, OR<br><br>Maximum timed allowed for the Immersion Setting Server to respond with the updated DSP Mode status signal once an updated Immersion level status signal is put on the network bus (ie if the immersion level update changed the DSP Mode – ex Stereo to OnStage)<br><br>Note: use the default value | msec | 0-1000 | 5 | 50 |

*3.11.2.6 AUDSET-SR-REQ-238567/B-Immersion Setting Server saving Immersion Levels between PowerMode changes*

The Immersion Setting Server shall remember the Immersion Level Settings between power mode states. (ex when HMIAudioMode goes from ON -> OFF -> ON, bus sleep and wake-up events…).

Upon loss of Immersion Level setting because of a loss of B+ (if remembers through B+ this doesn't apply) the Immersion Level Server shall default to its default state upon a new battery connection event.

The Immersion Setting Server shall remember Immersion Level Setting during an engine cold crank event.

*3.11.2.7 AUDSET-SR-REQ-238568/A-Immersion Level Server receives invalid request*

If the Immersion Setting Server receives a ImmersionLevel_D_Rq for a DSP Mode setting it does not support then the Immersion Setting Server shall ignore the request and respond with its current Immersion Level setting.

*3.11.2.8 AUDSET-SR-REQ-238570/B-Applicable Audio Sources supporting Immersion Levels*

Only the Media Audio Sources in the ResourceUpdate.St message shall support Sound immersion levels.

The VR, Phone, Prompt and TA audio sources shall not support Sound immersion levels.

See the Volume Settings column in audio management requirement "AUMGNT-SR-REQ-014570-Audio Request – Allowable Combination" which defines whether the source is Media, TA, Phone, Prompt or VR.

### 3.11.3 Sequence Diagrams

#### *3.11.3.1 SD-REQ-242071/A-Change from Stereo immersion level to the default OnStage immersion level by selecting the OnStage DSP Mode HMI Setting*

Pre-Condition:

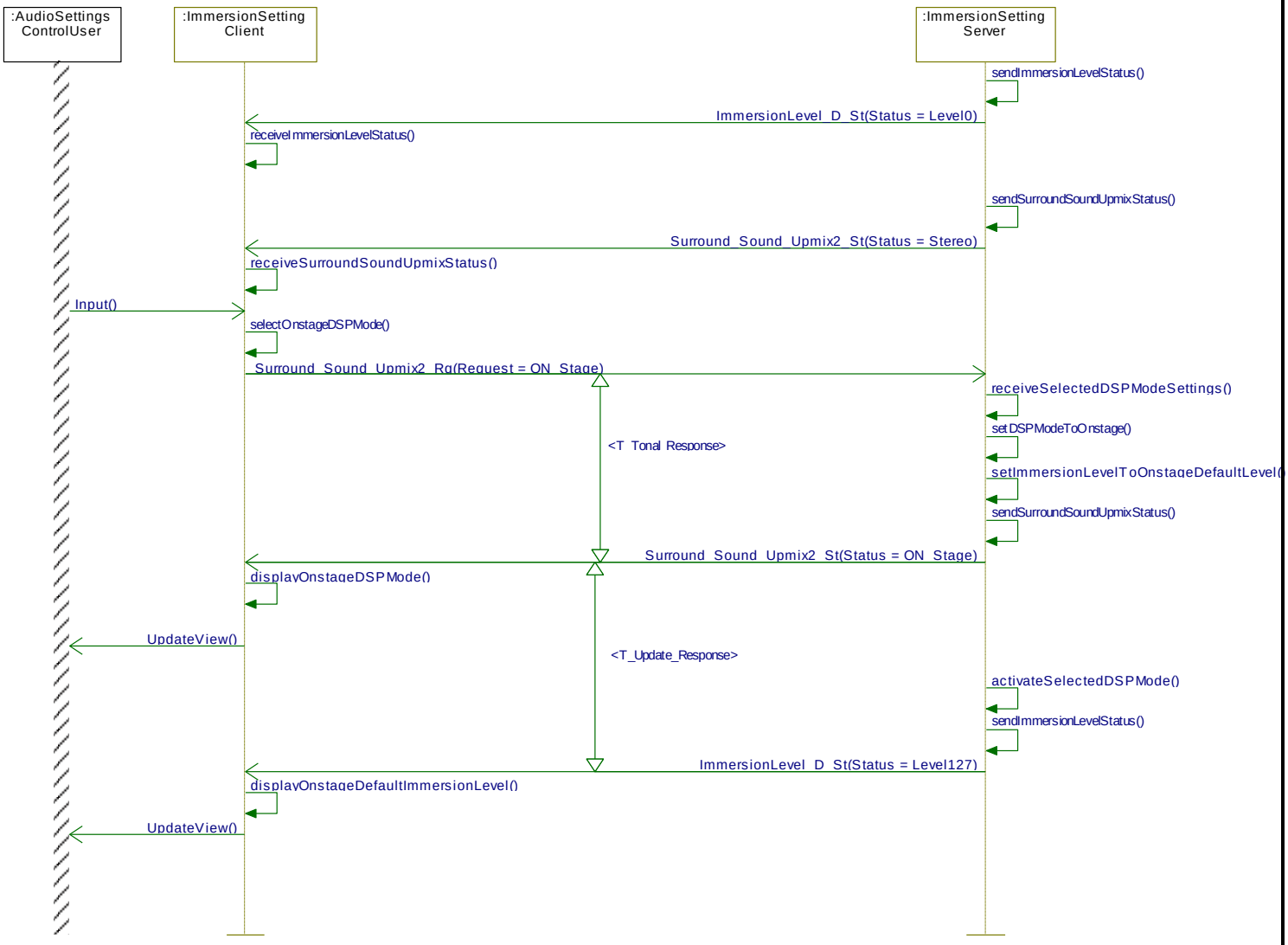
Immersion Level is at Level 0
DSP Mode is set to Stereo
Infotainment System is Powered ON
Media Source is Active

Event:

The user selects DSP Mode “OnStage” from the HMI

Post-Condition:

The HMI for DSP mode is set to “OnStage”
The HMI for Immersion Level is set to 127 (default setting)
The Immersion Level Audio is set to 127 (default setting)



### *3.11.3.2 SD-REQ-242072/A-Change from an Audience immersion level to Stereo immersion level by selecting the Stereo DSP Mode HMI setting*

Pre-Condition:

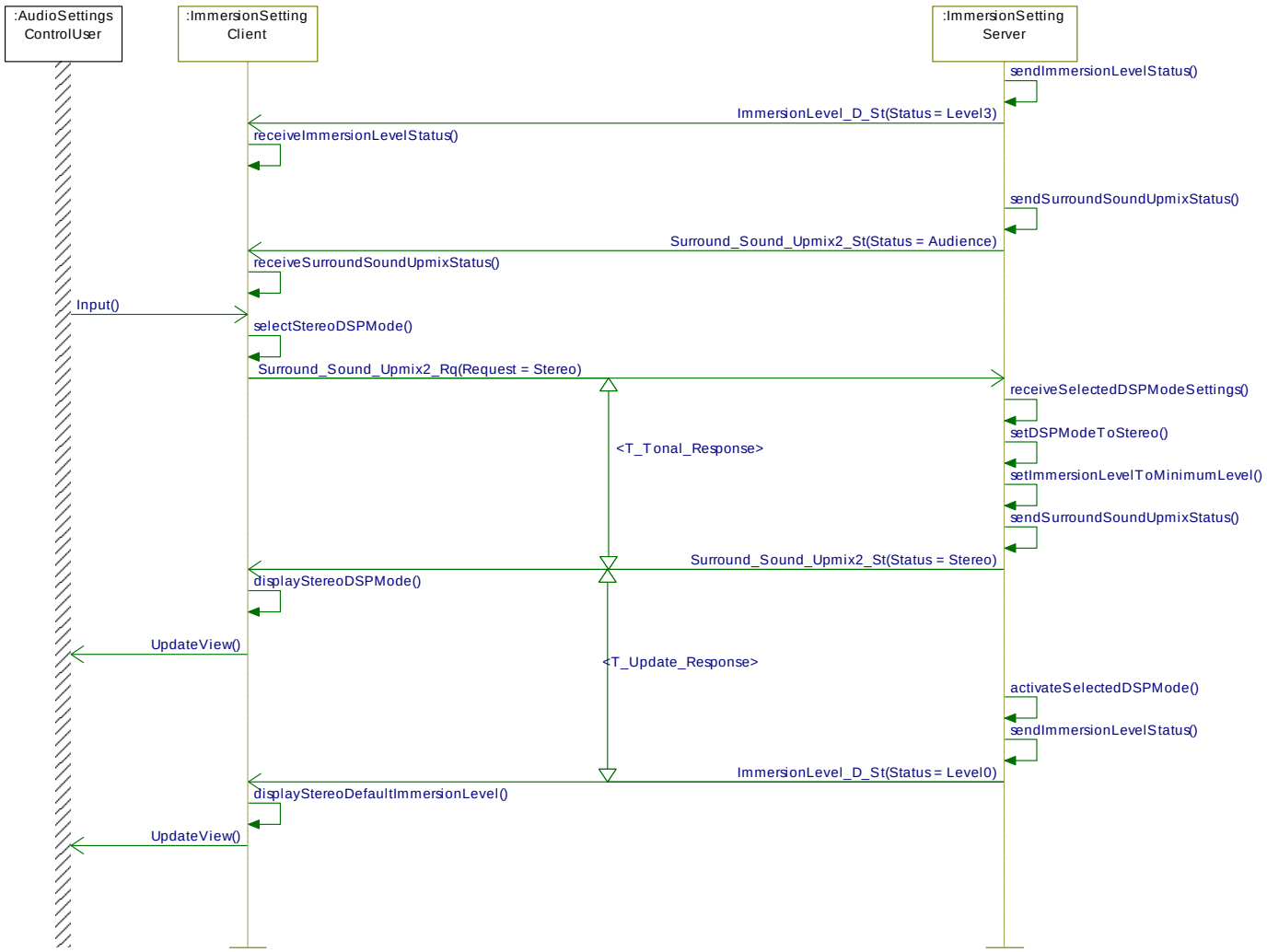
Immersion Level is Level 3
DSP Mode is Audience
Infotainment System is Powered ON
Media Source is Active

Event:

The user selects DSP Mode “Stereo” from the HMI

Post-Condition:

The HMI for DSP Mode is set to Stereo
The HMI for Immersion Level is set to minimum (level 0)
The Immersion Level is set to minimum (level 0)



### *3.11.3.3 SD-REQ-242076/A-Change an Onstage immersion level to the default Audience immersion level by selecting the Audience DSP Mode HMI setting*

Pre-Condition:

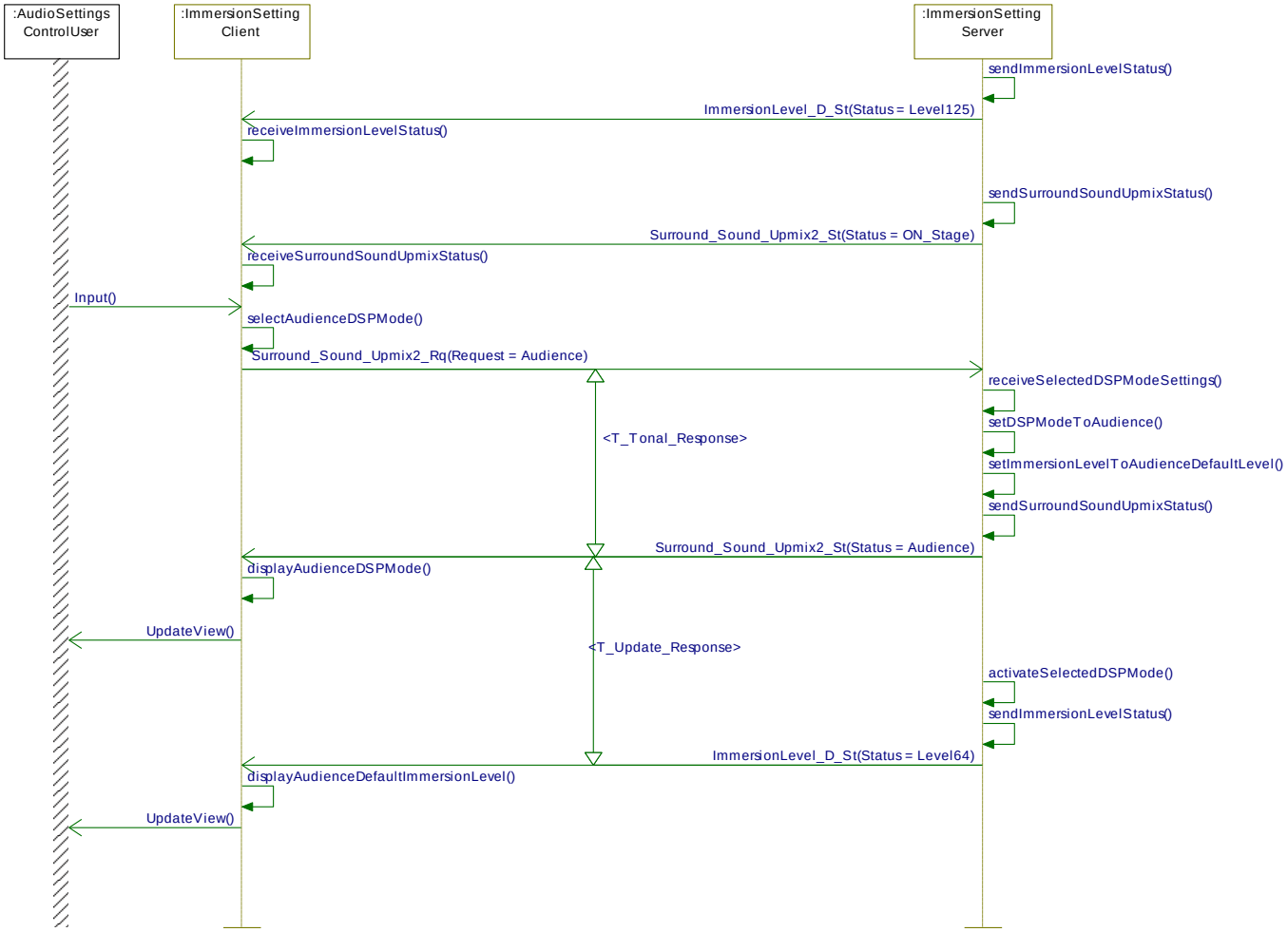
Immersion level is at level 125
DSP Mode is OnStage
Infotainment System is powered ON
Media Source is active

Event:

The user selects DSP mode “Audience” from the HMI

Post-Condition:

The infotainment system and HMI have DSP Mode set to Audience
The immersion level HMI is set to level 64 (audience default level)
The immersion level audio is set to level 64 (audience default level)



#### *3.11.3.4 SD-REQ-242078/B-Change from Stereo immersion level to an Onstage Immersion level by dragging the wiper to the OnStage region*

Pre-Condition:

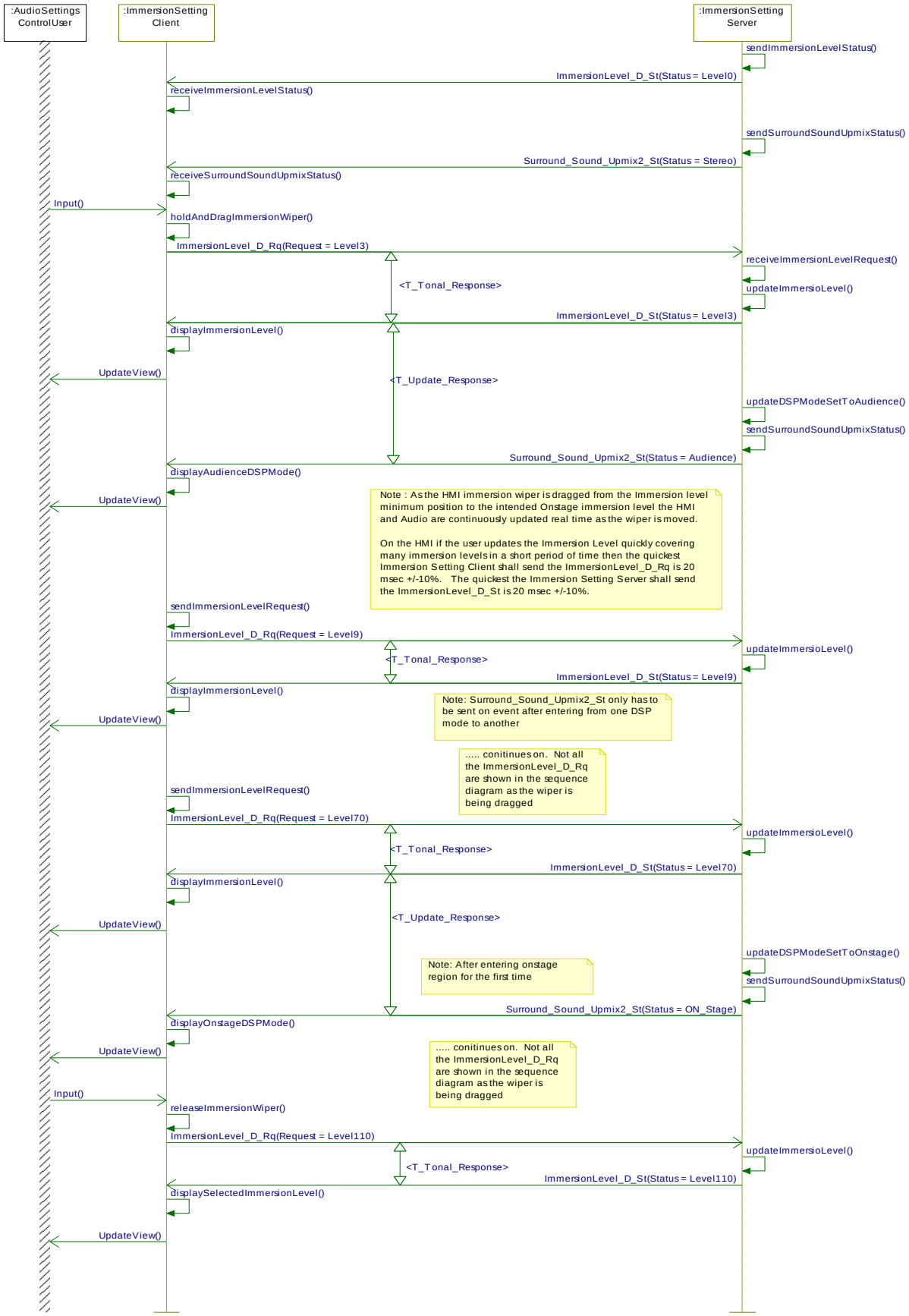
Immersion Level is at Level 0
DSP mode is set to Stereo
Infotainment System is powered ON

Event:

The user holds the HMI immersion wiper and drags it to the intended OnStage immersion level setting in the OnStage region of the HMI (in this example drags and releases at level 110)

Post-Condition:

The Immersion Level audio is at level 110
The HMI shows DSP Mode set to OnStage
The HMI shows immersion level 110 (ex HMI immersion wipers resting at immersion level 110)


:AudioSettings ControlUser
:ImmersionSetting Client
:ImmersionSetting Server
sendImmersionLevelStatus()
ImmersionLevel_D_St(Status = Level0)
receiveImmersionLevelStatus()
sendSurroundSoundUpmixStatus()
Surround_Sound_Upmix2_St(Status = Stereo)
receiveSurroundSoundUpmixStatus()
Input()
holdAndDragImmersionWiper()
ImmersionLevel_D_Rq(Request = Level3)
receiveImmersionLevelRequest()
<T_Tonal_Response>
updateImmersioLevel()
ImmersionLevel_D_St(Status = Level3)
displayImmersionLevel()
UpdateView()
<T_Update_Response>
updateDSPModeSetToAudience()
sendSurroundSoundUpmixStatus()
Surround_Sound_Upmix2_St(Status = Audience)
displayAudienceDSPMode()
UpdateView()
Note : As the HMI immersion wiper is dragged from the Immersion level minimum position to the intended Onstage immersion level the HMI and Audio are continuously updated real time as the wiper is moved.
On the HMI if the user updates the Immersion Level quickly covering many immersion levels in a short period of time then the quickest Immersion Setting Client shall send the ImmersionLevel_D_Rq is 20 msec +/-10%. The quickest the Immersion Setting Server shall send the ImmersionLevel_D_St is 20 msec +/-10%.
sendImmersionLevelRequest()
ImmersionLevel_D_Rq(Request = Level9)
updateImmersioLevel()
<T_Tonal_Response>
ImmersionLevel_D_St(Status = Level9)
displayImmersionLevel()
Note: Surround_Sound_Upmix2_St only has to be sent on event after entering from one DSP mode to another
UpdateView()
..... conitinues on. Not all the ImmersionLevel_D_Rq are shown in the sequence diagram as the wiper is being dragged
sendImmersionLevelRequest()
ImmersionLevel_D_Rq(Request = Level70)
updateImmersioLevel()
<T_Tonal_Response>
ImmersionLevel_D_St(Status = Level70)
displayImmersionLevel()
UpdateView()
<T_Update_Response>
updateDSPModeSetToOnstage()
Note: After entering onstage region for the first time
sendSurroundSoundUpmixStatus()
Surround_Sound_Upmix2_St(Status = ON_Stage)
displayOnstageDSPMode()
UpdateView()
..... conitinues on. Not all the ImmersionLevel_D_Rq are shown in the sequence diagram as the wiper is being dragged
Input()
releaseImmersionWiper()
ImmersionLevel_D_Rq(Request = Level110)
updateImmersioLevel()
<T_Tonal_Response>
ImmersionLevel_D_St(Status = Level110)
displaySelectedImmersionLevel()
UpdateView()

### *3.11.3.5 SD-REQ-242088/B-Change from Stereo immersion level to an Onstage immersion level by pressing & releasing in the OnStage region*

Pre-Condition:

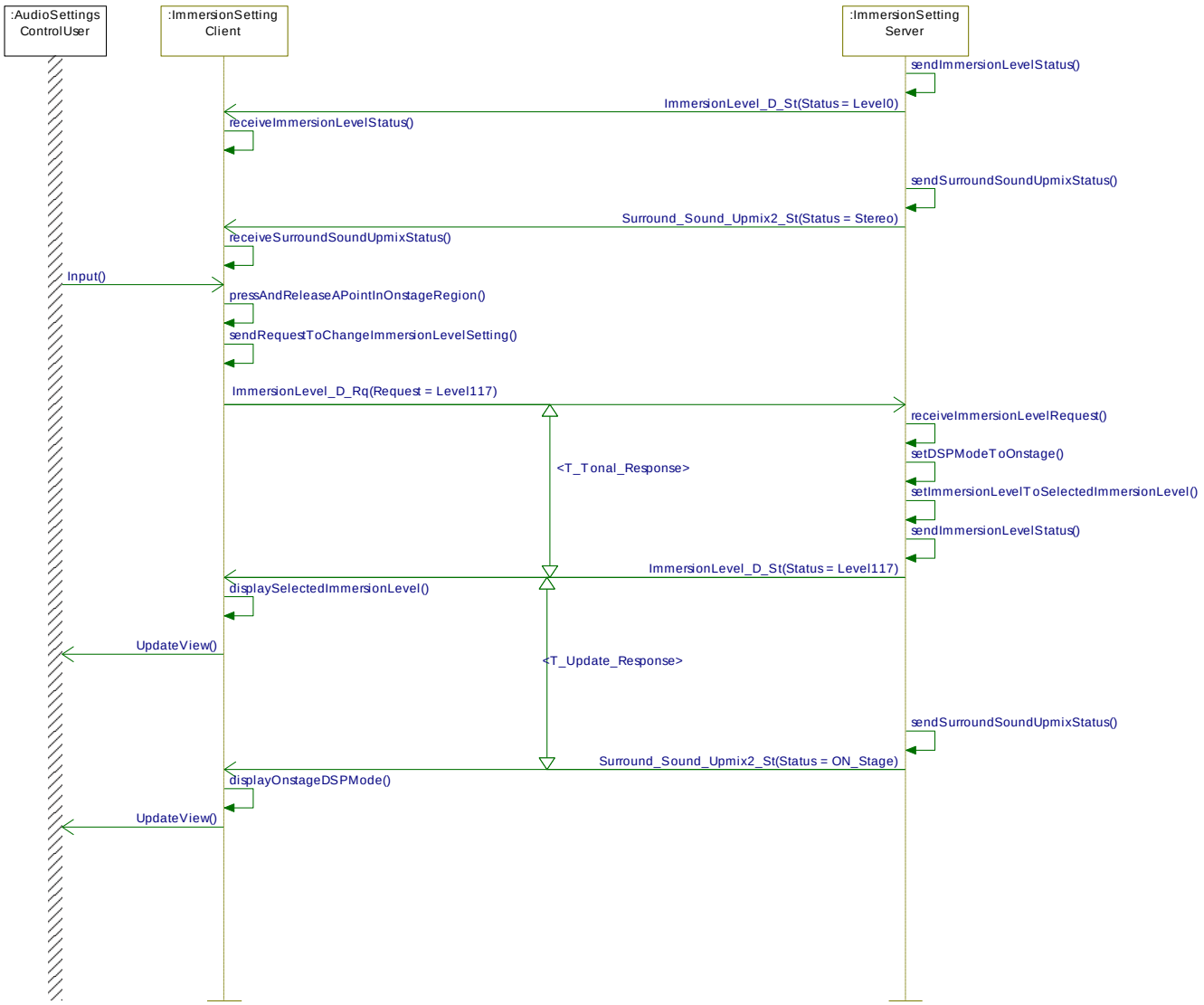
Immersion Level is at the minimum (level 0)
DSP mode is set to Stereo
Infotainment System is powered ON
Media Source is Active

Event:

The user changes the immersion level setting by pressing and releasing a point in the OnStage immersion level region (in this example 117) of the HMI immersion wheel.

Post-Condition:

The Immersion Level Audio is set to Immersion Level 117
The HMI shows DSP Mode is set to OnStage
The HMI shows the immersion level at 117 (ex HMI immersion wipers resting at immersion level 117)



### *3.11.3.6 SD-REQ-239291/B-Change from Stereo immersion level to an Audience immersion level by pressing and releasing in the Audience region*

Pre-Condition:

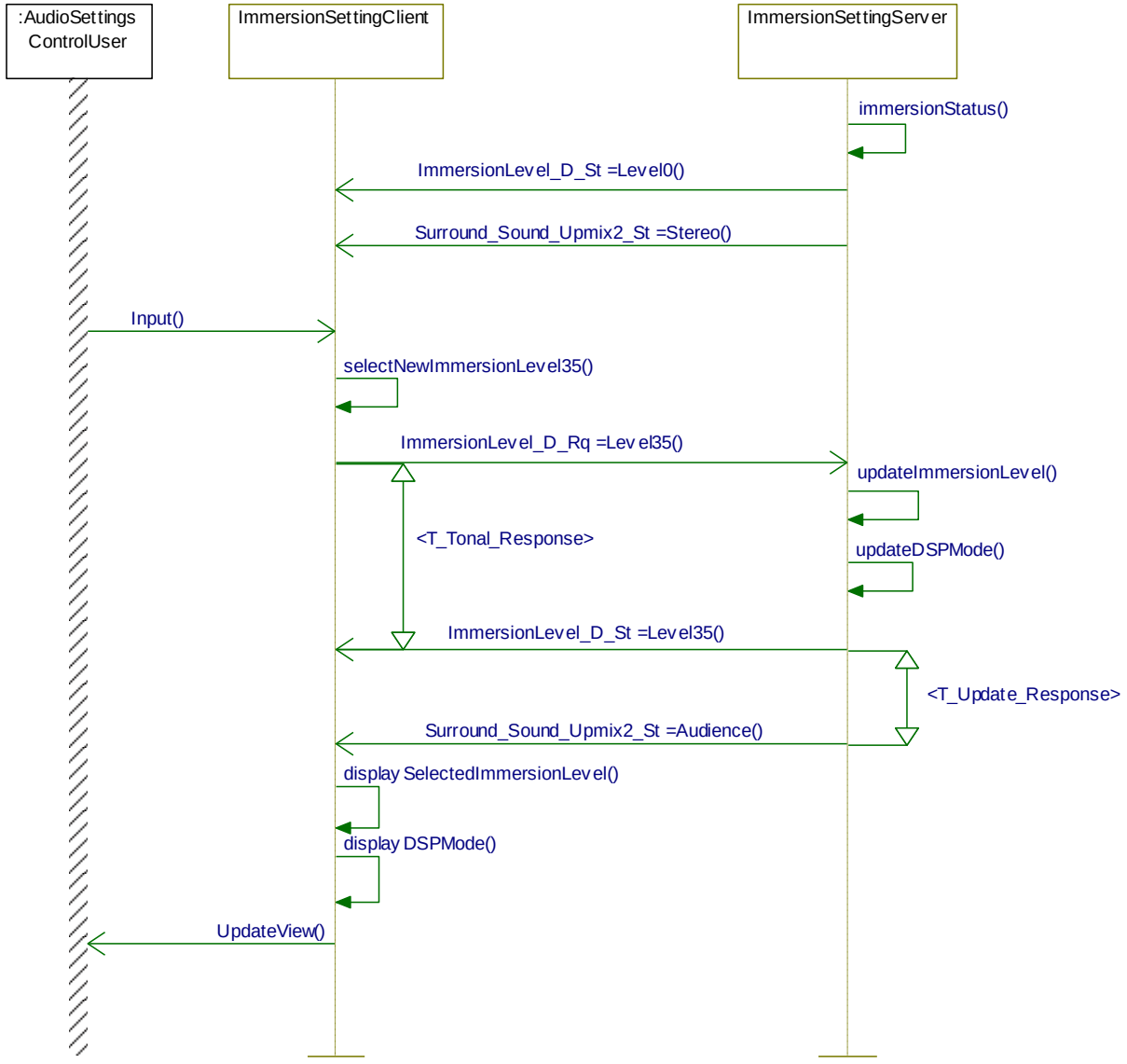
Immersion Level is at level 0
DSP Mode is at Stereo
Infotainment System is Powered ON
Media Source is Active

Event:

The user presses and releases a touch point in the audience region of the HMI to change to the Immersion level 35

Post-Condition:

The Immersion Level Audio is set to Immersion level 35
The HMI shows DSP Mode is set to Audience
The HMI shows at immersion level 35 (ex. HMI immersion wipers resting at immersion level 35)



## 3.12 AUDSET-FUN-REQ-354743/A-ToneTouch

### 3.12.1 AUDSET-CLD-REQ-354781/A-ToneTouch Client

The ToneTouch Client interfaces with the user via the HMI and is responsible for sending the ToneTouch HMI requests to the ToneTouch Server.

### 3.12.2 AUDSET-CLD-REQ-354796/A-ToneTouch Server

The ToneTouch Server is responsible for the control of the ToneTouch feature and interfaces with the ToneTouch Client.

### 3.12.3 Interface Requirements

#### *3.12.3.1 MD-REQ-354821/A-AudioToneTouch_D_Rq*

Message Type: Request

Note: Request signal from the Tone Touch Client to the Tone Touch Server to enable or disable the feature

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| AudioToneTouch_D_Rq | Null | 0x0 | |
| | Disabled | 0x1 | |
| | Enabled | 0x2 | |

#### *3.12.3.2 MD-REQ-354822/A-AudioToneTouch_D_Stat*

Message Type: Status

Note: Status signal from the Tone Touch Server with the status of Tone Touch feature

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| AudioToneTouch_D_Stat | Null | 0x0 | |
| | Disabled | 0x1 | |
| | Enabled | 0x2 | |

#### *3.12.3.3 MD-REQ-354819/A-AudioToneTouchX_D_Rq*

Message Type: Request

Note: Request signal from the Tone Touch Client to the Tone Touch Server with the requested X coordinates

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| AudioToneTouchX_D_Rq | Null | 0x00 | |
| | 0 | 0x01 | |
| | 1 | 0x02 | |
| | 2 | 0x03 | |
| | 3 | 0x04 | |
| | … | … | |
| | 254 | 0xFF | |

#### *3.12.3.4 MD-REQ-354820/A-AudioToneTouchX_D_Stat*

Message Type: Status

Note: Status signal from the Tone Touch Server with the X coordinate status of Tone Touch feature

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| AudioToneTouchX_D_Stat | Null | 0x00 | |
| | 0 | 0x01 | |
| | 1 | 0x02 | |
| | 2 | 0x03 | |
| | 3 | 0x04 | |
| | … | … | |
| | 254 | 0xFF | |

#### *3.12.3.5 MD-REQ-354830/A-AudioToneTouchY_D_Rq*

Message Type: Request

Note: Request signal from the Tone Touch Client to the Tone Touch Server with the requested Y coordinates

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| AudioToneTouchY_D_Rq | Null | 0x00 | |
| | 0 | 0x01 | |
| | 1 | 0x02 | |
| | 2 | 0x03 | |
| | 3 | 0x04 | |
| | … | … | |
| | 254 | 0xFF | |

#### *3.12.3.6 MD-REQ-354831/A-AudioToneTouchY_D_Stat*

Message Type: Status

Note: Status signal from the Tone Touch Server with the Y coordinate status of Tone Touch feature

| Logical Signal Name | Literals | Value | Description |
|---|---|---|---|
| AudioToneTouchY_D_Stat | Null | 0x00 | |
| | 0 | 0x01 | |
| | 1 | 0x02 | |
| | 2 | 0x03 | |
| | 3 | 0x04 | |
| | … | … | |
| | 254 | 0xFF | |

### 3.12.4 Use Cases

#### *3.12.4.1 AUDSET-UC-REQ-354839/A-User Enables ToneTouch*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System Powered ON<br>ToneTouch setting disabled<br>Infotainment audio supports the selected Bass, MidRange and Treble<br>Bass, MidRange, Treble settings can be adjusted in the HMI<br>ToneTouch coordinates cannot be adjusted in the HMI |
| **Scenario Description** | User selects ToneTouch Enabled via the HMI |
| **Post-conditions** | ToneTouch setting is enabled<br>Infotainment audio supports the selected ToneTouch coordinates<br>ToneTouch coordinates can be adjusted in the HMI<br>Bass, MidRange, Treble settings cannot be adjusted in the HMI |
| **Notes** | The ToneTouch and BTM HMI screens are mutually exclusive. |

#### *3.12.4.2 AUDSET-UC-REQ-354842/A-User Disables ToneTouch*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment System Powered ON<br>ToneTouch setting enabled<br>Infotainment audio supports the selected ToneTouch coordinates<br>Bass, MidRange, Treble settings cannot be adjusted in the HMI<br>ToneTouch coordinates can be adjusted in the HMI |
| **Scenario Description** | User selects ToneTouch disabled via the HMI |
| **Post-conditions** | ToneTouch setting is disabled<br>Infotainment audio supports the selected Bass, MidRange and Treble<br>ToneTouch coordinates cannot be adjusted in the HMI<br>Bass, MidRange, Treble settings can be adjusted in the HMI |
| **Notes** | The ToneTouch and BTM HMI screens are mutually exclusive. |

#### *3.12.4.3 AUDSET-UC-REQ-354903/A-User changes ToneTouch coordinates*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment system powered ON<br>ToneTouch is active |
| **Scenario Description** | User changes the ToneTouch x,y coordintes within a 2-dimentional matrix via the HMI to a new x,y coordinate value |
| **Post-conditions** | The Infotainment system audio is supporting the new ToneTouch x,y coordinate values.<br><br>HMI shows ToneTouch x,y coordinates the user selected (final coordinates). |
| **Notes** | |

#### *3.12.4.4 AUDSET-UC-REQ-354905/A-Real Time Audible Feedback when adjusting the ToneTouch setting*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment system powered ON<br>ToneTouch is active |
| **Scenario Description** | User is changing the ToneTouch x,y coordinates real time within a 2-dimentional matrix via the HMI |
| **Post-conditions** | As the user is changing the x,y coordinates on the HMI, the infotainment system is supporting the corrsponding audio for each new x,y coordinate |
| **Notes** | |

#### *3.12.4.5 AUDSET-UC-REQ-354908/A-Select ToneTouch presets*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment system powered ON<br>ToneTouch is active |
| **Scenario Description** | User selects a ToneTouch preset via the HMI |
| **Post-conditions** | The infotainment system is supporting the presets x,y coordinates<br><br>The ToneTouch HMI updated to reflect new ToneTouch preset |
| **Notes** | |

#### *3.12.4.6 AUDSET-UC-REQ-354929/A-Store ToneTouch custom presets*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment system powered ON<br>ToneTouch is active<br>User selects ToneTouch x,y coordinates on the HMI |
| **Scenario Description** | User interfaces with the HMI to store the current x, y coordinates to the customizable preset |
| **Post-conditions** | The customizable preset is stored.<br><br>The customizable preset can be used later to recall the x,y coordinates stored in the preset. |
| **Notes** | This use case is only applicable if HMI supports customizable presets |

#### *3.12.4.7 AUDSET-UC-REQ-354934/A-Select DSP mode setting (Stereo, Surround) via ToneTouch*

| | |
|---|---|
| **Actors** | Vehicle Occupant |
| **Pre-conditions** | Infotainment system powered ON<br>ToneTouch is active |
| **Scenario Description** | User changes DSP mode (ex stereo, surround) via the ToneTouch HMI |
| **Post-conditions** | The infotainment system operates with the new DSP mode setting<br><br>The ToneTouch HMI is updated to show the new DSP mode setting |
| **Notes** | This use case is only applicable if final HMI shows DSP mode in the ToneTouch HMI |

### 3.12.5 Requirements

*3.12.5.1 AUDSET-SR-REQ-355233/A-Saving ToneTouch settings between power modes*

The ToneTouch Server shall store the ToneTouch settings between power modes (ie HMI_HMIMode_St ON/OFF). This includes whether ToneTouch was enabled and disabled and the x, y coordinates for the ToneTouch setting.

*3.12.5.2 AUDSET-SR-REQ-355396/A-Enabling ToneTouch*

When AudioToneTouch_D_Stat = Enabled then ToneTouch feature is enabled and the non-ToneTouch tonal settings BTM (ie Bass, Treble & Mid-Range) are disabled.

*3.12.5.3 AUDSET-SR-REQ-355397/A-Disabling ToneTouch*

When AudioToneTouch_D_Stat = Disabled then ToneTouch feature is disabled and the non-ToneTouch BTM settings are enabled.

*3.12.5.4 AUDSET-SR-REQ-355398/A-ToneTouch and BTM mutual exclusivity*

ToneTouch and BTM (ie Bass, Treble & Mid-Range) are mutually exclusive. Both features cannot be enabled at the same time.

Changing BTM or ToneTouch values does not impact the other value.

- Example: changing the ToneTouch x,y coordinates does not change the previously stored BTM values.

*3.12.5.5 AUDSET-SR-REQ-355399/A-ToneTouch HMI*

The ToneTouch Client shall update the HMI to show BTM HMI or ToneTouch HMI based on what the AudioToneTouch_D_Stat signal is set to.

If AudioToneTouch_D_Stat is enabled, then the ToneTouch Client shall update the x, y coordinates HMI based on what x,y coordinates signals AudioToneTouchX_D_Stat and AudioToneTouchY_D_Stat are set to.

*3.12.5.6 AUDSET-REQ-355400/A-Default ToneTouch Setting*

If the ToneTouch Server is configured as supporting ToneTouch then ToneTouch enabled is the default setting delivered to the customer. From there it can be changed by the customer to BTM.

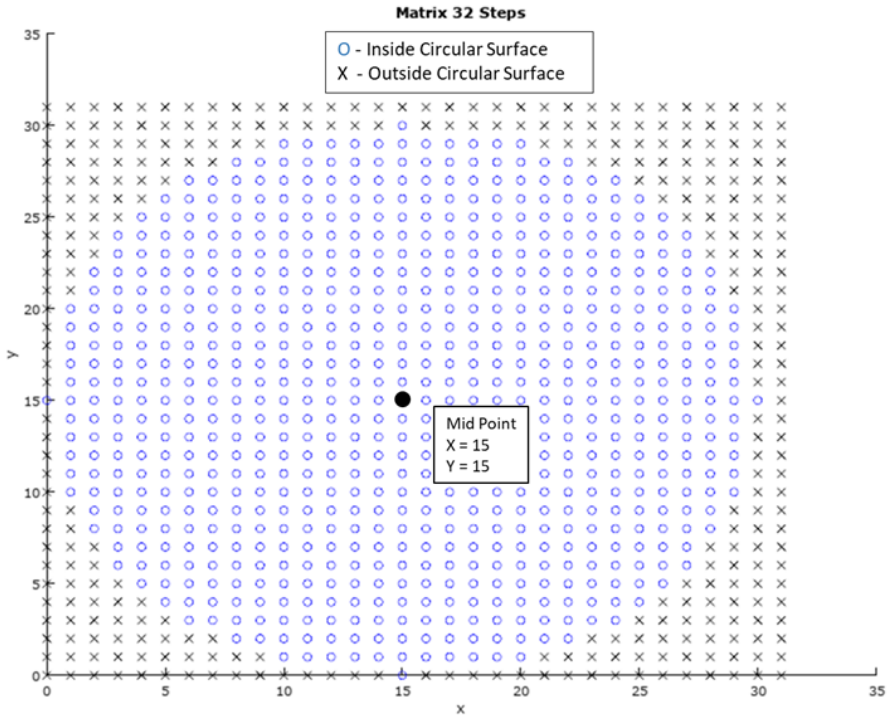
*3.12.5.7 AUDSET-SR-REQ-358467/B-ToneTouch X,Y grid coordinates*

The ToneTouch HMI shall use x,y coordinates to send the touch point position.

Below is grid layout for HMI where the touch point could be located.

- Grid coordinates on x-axis shall be distributed in segments of equal size
- Grid coordinates on y-axis shall be distributed in segments of equal size

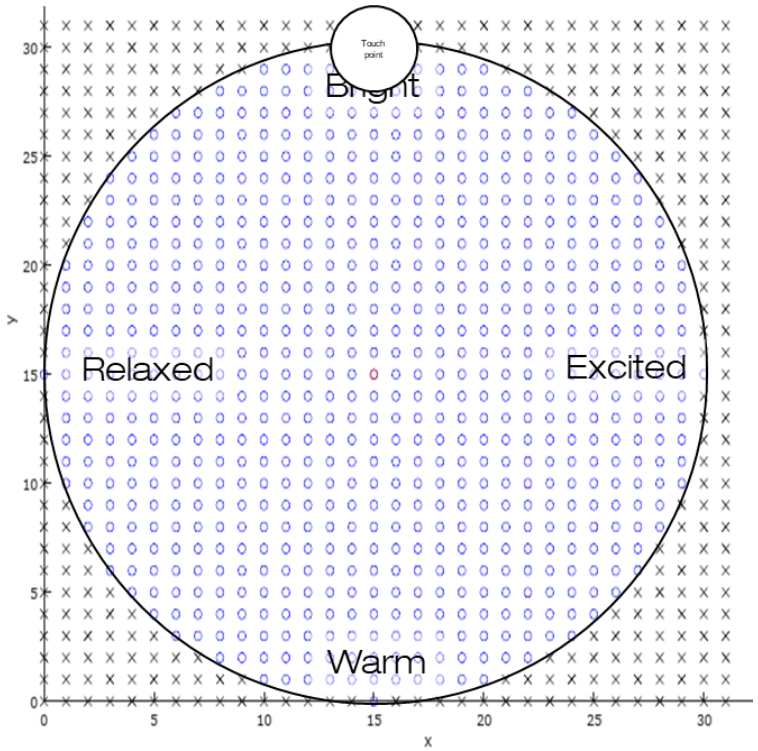
If coordinate is located within circular design, coordinate shall be transferred to ToneTouch server.




- The circular surface shall have a diameter of 31 coordinates.
- Mid point of circular surface is at X=15 and Y=15.

Below is an example with ToneTouch HMI using the grid table. Reference HMI spec for the actual HMI.

The grid table above should be superimposed on the table below. For example, the top most coordinate would be 15, 30.



*3.12.5.8 AUDSET-SR-REQ-355386/B-ToneTouch x, y coordinate change*

When the ToneTouch x,y coordinate is selected via the HMI:

1. The ToneTouch Client shall send the coordinate request signals to the ToneTouch Server via the AudioToneTouchX_D_Rq and AudioToneTouchY_D_Rq signals.
2. Once the ToneTouch Client sent AudioToneTouchX_D_Rq and AudioToneTouchY_D_Rq with the requested coordinates then the ToneTouch Client shall set the request signals to Null/Inactive as defined in requirement "IFS-MMCAN-REQ-015114-Sending of Request and Response".
3. The ToneTouch Server shall respond within T_Tonal_Response to the AudioToneTouch(X or Y)_D_Rq signals with the AudioToneTouch(X or Y)_D_Stat signals and update the ToneTouch audio according to the x and y coordinates.
4. The ToneTouch Client shall update the final HMI (if there is an update) with the ToneTouch status after receiving the AudioToneTouch(X or Y)_D_Stat response to the request.

See sequence diagram for example

When the ToneTouch x, y coordinates are being updated quickly:

On the HMI if the user updates the ToneTouch coordinates quickly covering many ToneTouch levels in a short period of time then the ToneTouch Client shall send the AudioToneTouch_D_Rq signals separated by no more than 20 msec +/- 10%.

As the requests are being received by the ToneTouch Server the ToneTouch Server is updating the ToneTouch audio real time so the user can hear the audio change as the ToneTouch coordinates are being updated.

The ToneTouch status signals are updated real time as the AudioToneTouch_D_Rq request signals are being received.

- Example: if the HMI has a circle or some HMI object to be dragged across the TouchTone HMI over many ToneTouch audio levels until the user releases the HMI object 100 msec later then AudioToneTouchX_D_Rq and AudioToneTouchY_D_Rq signals would be sent out 20 msec +/- 10% apart. This could be something like:

  Pre-Condition:
  AudioToneTouchX_D_Stat = 5
  AudioToneTouchY_D_Stat = 12

  Event:
  The HMI object is quickly dragged across the ToneTouch HMI screen and
  1. AudioToneTouchX_D_Rq = 9 & AudioToneTouchY_D_Rq = 17 →
  2. 20 msec later AudioToneTouchX_D_Rq = 15 & AudioToneTouchY_D_Rq = 28 →
  3. 20 msec later AudioToneTouchX_D_Rq = 10 & AudioToneTouchY_D_Rq = 12 →
  4. 20 msec later AudioToneTouchX_D_Rq = 05 & AudioToneTouchY_D_Rq = 10 →
  5. 20 msec later AudioToneTouchX_D_Rq = 05 & AudioToneTouchY_D_Rq = 26 →

  The HMI object is released
  6. 20 msec later AudioToneTouchX_D_Rq = 01 & AudioToneTouchY_D_Rq = 30 →
  7. 20 msec later AudioToneTouchX_D_Rq = Null/Inactive & AudioToneTouchY_D_Rq = Null/Inactive

  Note:
  for the event portion of this example as the ToneTouch HMI object is being dragged across the ToneTouch HMI the ToneTouch Server would be updating the ToneTouch audio to those ToneTouch x, y coordinates it is receiving real time.

  Also for quickly dragging the TouchTone HMI object across the HMI might want to show what is being dragged and ignore the TouchTone Server status message updating the HMI until the object is released (ie give the ToneTouch Server time to respond too when released). Up to the HMI team how to handle.

  Post-Condition:
  1. The ToneTouch Server sets AudioToneTouchX_D_Stat = 01 & AudioToneTouchY_D_Stat = 30 within T_Tonal_Response from receiving the last request. The ToneTouch audio would be set at the values in the status signals.
  2. The final resting place of the HMI object would depend on what the status signals are set to from the ToneTouch Server.

See sequence diagram for example

*3.12.5.9 AUDSET-SR-REQ-358190/A-ToneTouch enable/disable setting change*

The ToneTouch Client shall use the AudioToneTouch_D_Stat status signal from the ToneTouch Server to show the ToneTouch setting as Enabled or Disabled.

When the ToneTouch setting is selected via the HMI:

1. The ToneTouch Client shall set the AudioToneTouch_D_Rq signal to enabled or disabled based on what the user selected.
2. The ToneTouch Server shall response within T_Tonal_Response to the AudioToneTouch_D_Rq request with the response of the ToneTouch Server via the AudioToneTouch_D_Stat signal.
3. The ToneTouch Client shall update the HMI (if there is an update) with the ToneTouch status after receiving the AudioToneTouch_D_Stat response to the request.

*3.12.5.10 AUDSET-SR-REQ-358192/B-ToneTouch Presets*

The Fixed Presets names and x,y values are stored by the ToneTouch Client.

The ToneTouch Custom Preset x,y value is selected by the user. The Custom Preset x,y values are stored by the ToneTouch Client between power modes.

- This includes saving when the infotainment system powers ON, OFF and back ON (ie HMI_HMIMode_St = ON → OFF → ON and between sleep wake cycles)

| Fixed Presets | x-Axis Value | y-Axis Value |
|---|---|---|
| Preset 1 | 15 | 04 |
| Preset 2 | 27 | 19 |
| Preset 3 | 05 | 23 |

See HMI spec for the HMI names displayed to customer for Preset 1, 2 and 3 above

| Custom Preset(s) | x-Axis Value | y-Axis Value |
|---|---|---|
| Custom Preset | user selectable | user selectable |

| Neutral Preset | x-Axis Value | y-Axis Value |
|---|---|---|
| Neutral / Center of circle | 15 | 15 |

*3.12.5.11 AUDSET-SR-REQ-372715/A-Default ToneTouch Coordinates*

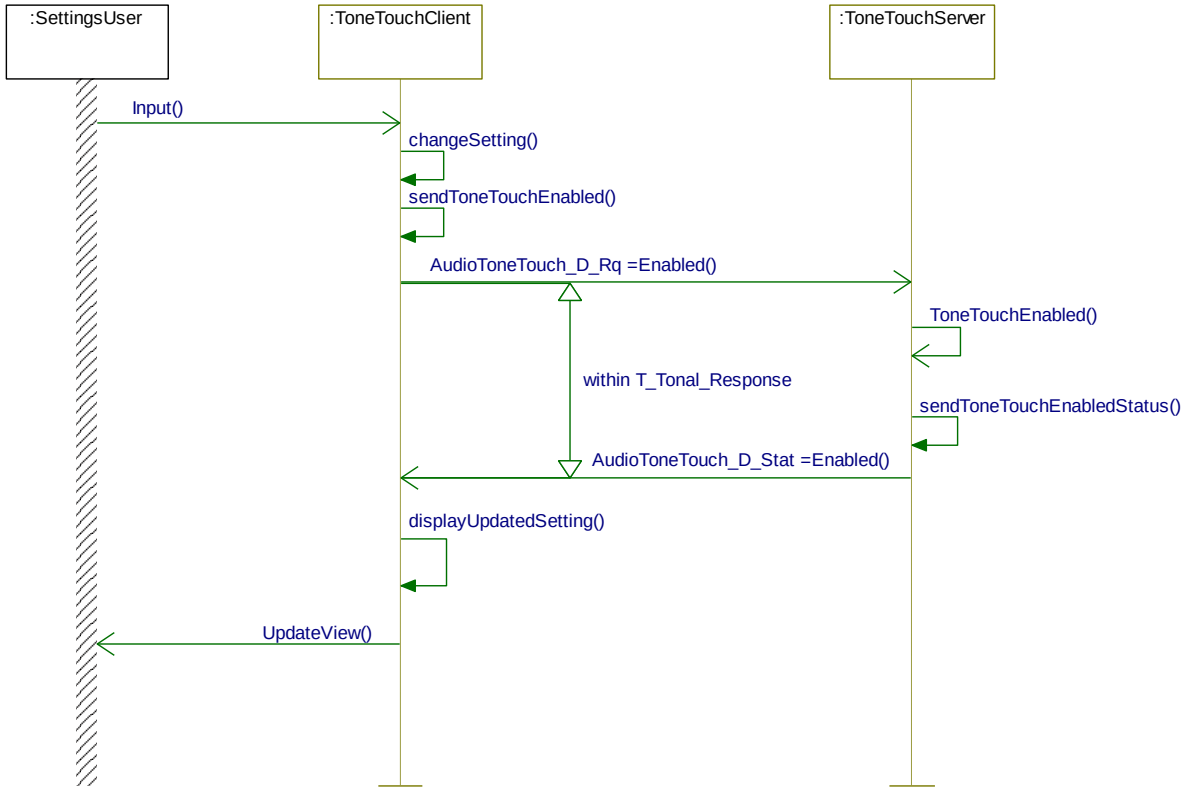
If the ToneTouch Server runs through a factory reset, x- and y- coordinates shall be set to mid-point.

See SPSS requirement “STMGNT-REQ-212054-Master Reset of Audio Settings” for signals for a master reset (ie user initiated factory reset using CAN signals).

### 3.12.6 Sequence Diagrams

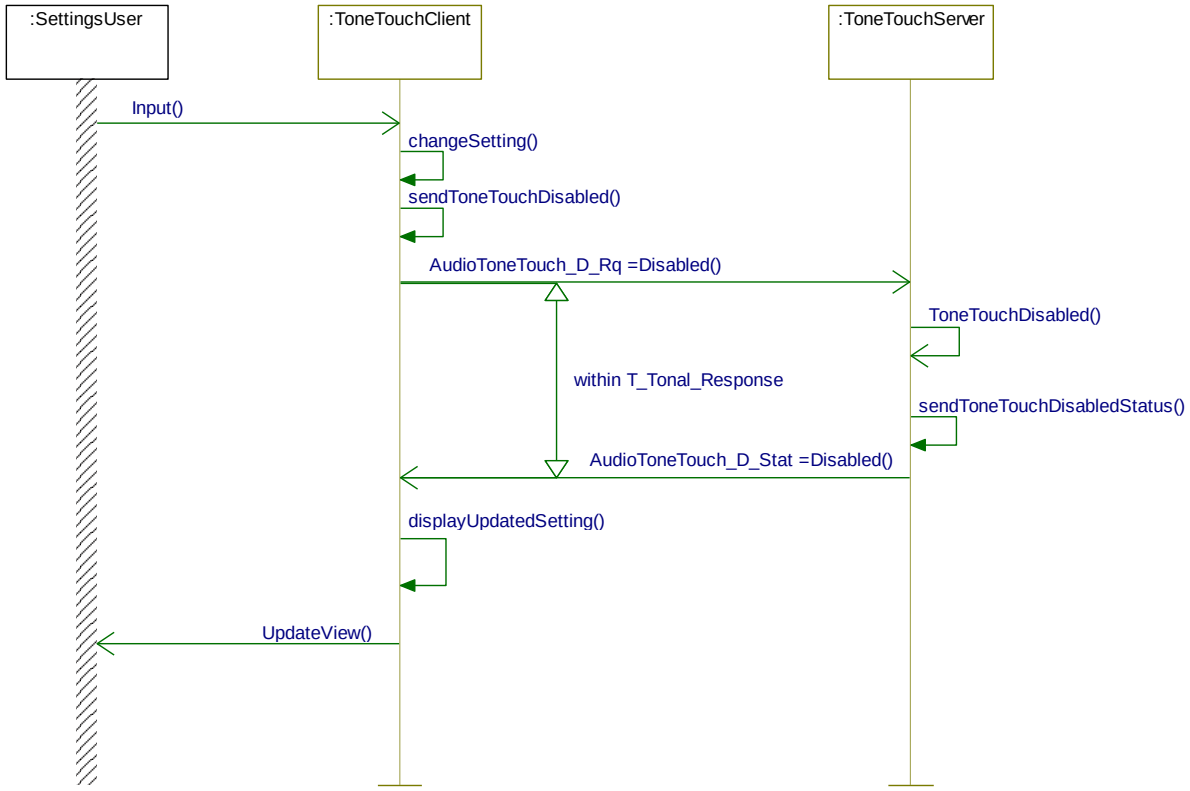
#### *3.12.6.1 AUDSET-SD-REQ-355017/A-ToneTouch set to Enabled via the HMI*

Pre-Condition: ToneTouch set to Disabled




#### *3.12.6.2 AUDSET-SD-REQ-355018/A-ToneTouch set to Disabled via the HMI*

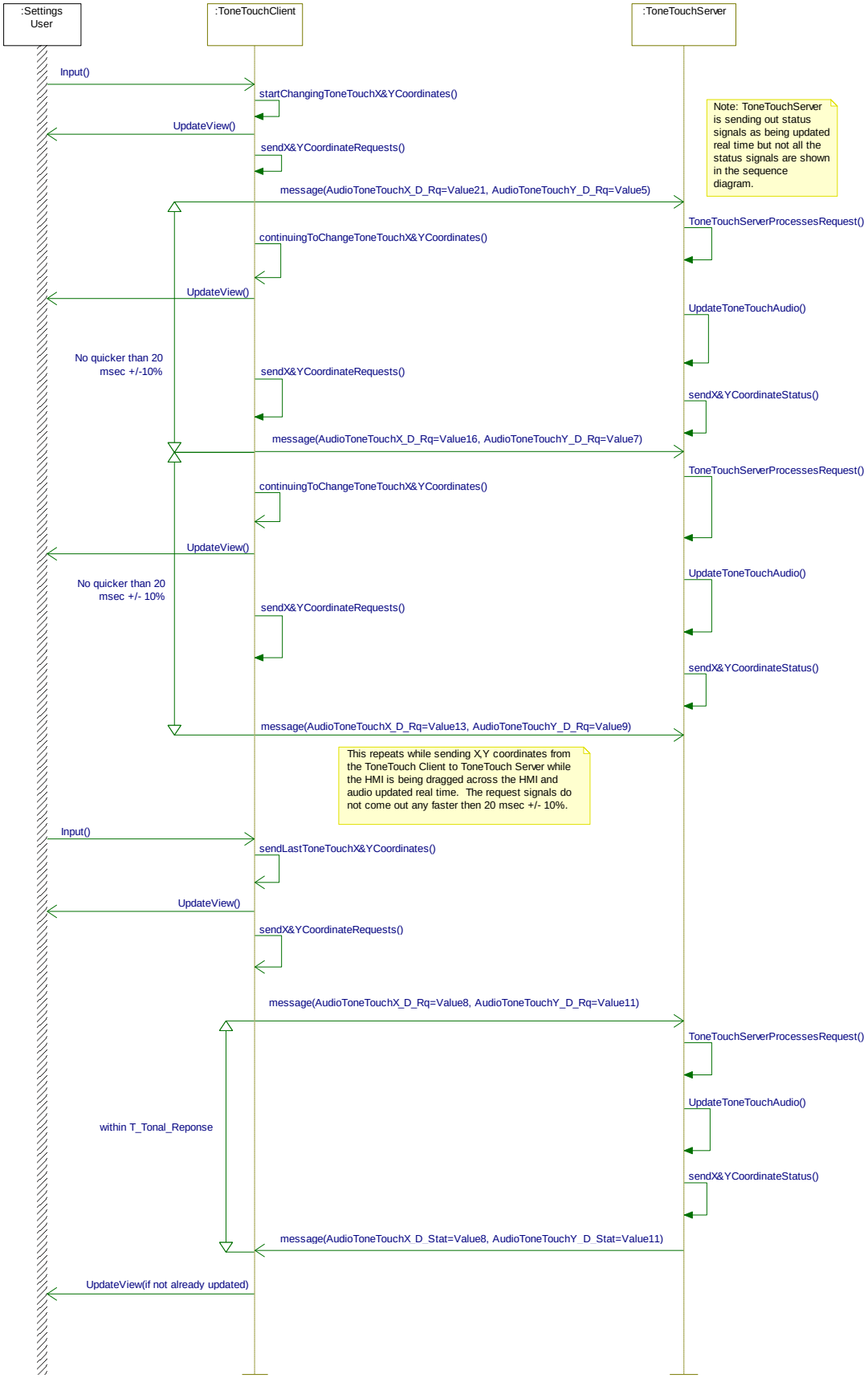
Pre-Condition: ToneTouch set to Enabled




### *3.12.6.3 AUDSET-SD-REQ-355019/B-Changing the ToneTouch setting*

Pre-Condition:

ToneTouch is enabled (ie AudioToneTouch_D_Stat = Enabled)
X coordinate is 24 (AudioToneTouchX_D_Stat = value 24)
Y coordinate is 3 (AudioToneTouchY_D_Stat = value 3)


:Settings User
:ToneTouchClient
:ToneTouchServer
Input()
startChangingToneTouchX&YCoordinates()
Note: ToneTouchServer is sending out status signals as being updated real time but not all the status signals are shown in the sequence diagram.
UpdateView()
sendX&YCoordinateRequests()
message(AudioToneTouchX_D_Rq=Value21, AudioToneTouchY_D_Rq=Value5)
ToneTouchServerProcessesRequest()
continuingToChangeToneTouchX&YCoordinates()
UpdateView()
UpdateToneTouchAudio()
No quicker than 20 msec +/-10%
sendX&YCoordinateRequests()
sendX&YCoordinateStatus()
message(AudioToneTouchX_D_Rq=Value16, AudioToneTouchY_D_Rq=Value7)
ToneTouchServerProcessesRequest()
continuingToChangeToneTouchX&YCoordinates()
UpdateView()
UpdateToneTouchAudio()
No quicker than 20 msec +/- 10%
sendX&YCoordinateRequests()
sendX&YCoordinateStatus()
message(AudioToneTouchX_D_Rq=Value13, AudioToneTouchY_D_Rq=Value9)
This repeats while sending X,Y coordinates from the ToneTouch Client to ToneTouch Server while the HMI is being dragged across the HMI and audio updated real time. The request signals do not come out any faster then 20 msec +/- 10%.
Input()
sendLastToneTouchX&YCoordinates()
UpdateView()
sendX&YCoordinateRequests()
message(AudioToneTouchX_D_Rq=Value8, AudioToneTouchY_D_Rq=Value11)
ToneTouchServerProcessesRequest()
UpdateToneTouchAudio()
within T_Tonal_Reponse
sendX&YCoordinateStatus()
message(AudioToneTouchX_D_Stat=Value8, AudioToneTouchY_D_Stat=Value11)
UpdateView(if not already updated)

# 4 Appendix: Reference Documents

| Reference # | Document Title |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
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