



Research & Vehicle Technology
“Infotainment Systems Product Development”

Feature – EVSE

**Infotainment Subsystem Part Specific
Specification (SPSS)**

Version 1.0

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Ford Motor Company

Subsystem Part Specific Specification
Engineering Specification



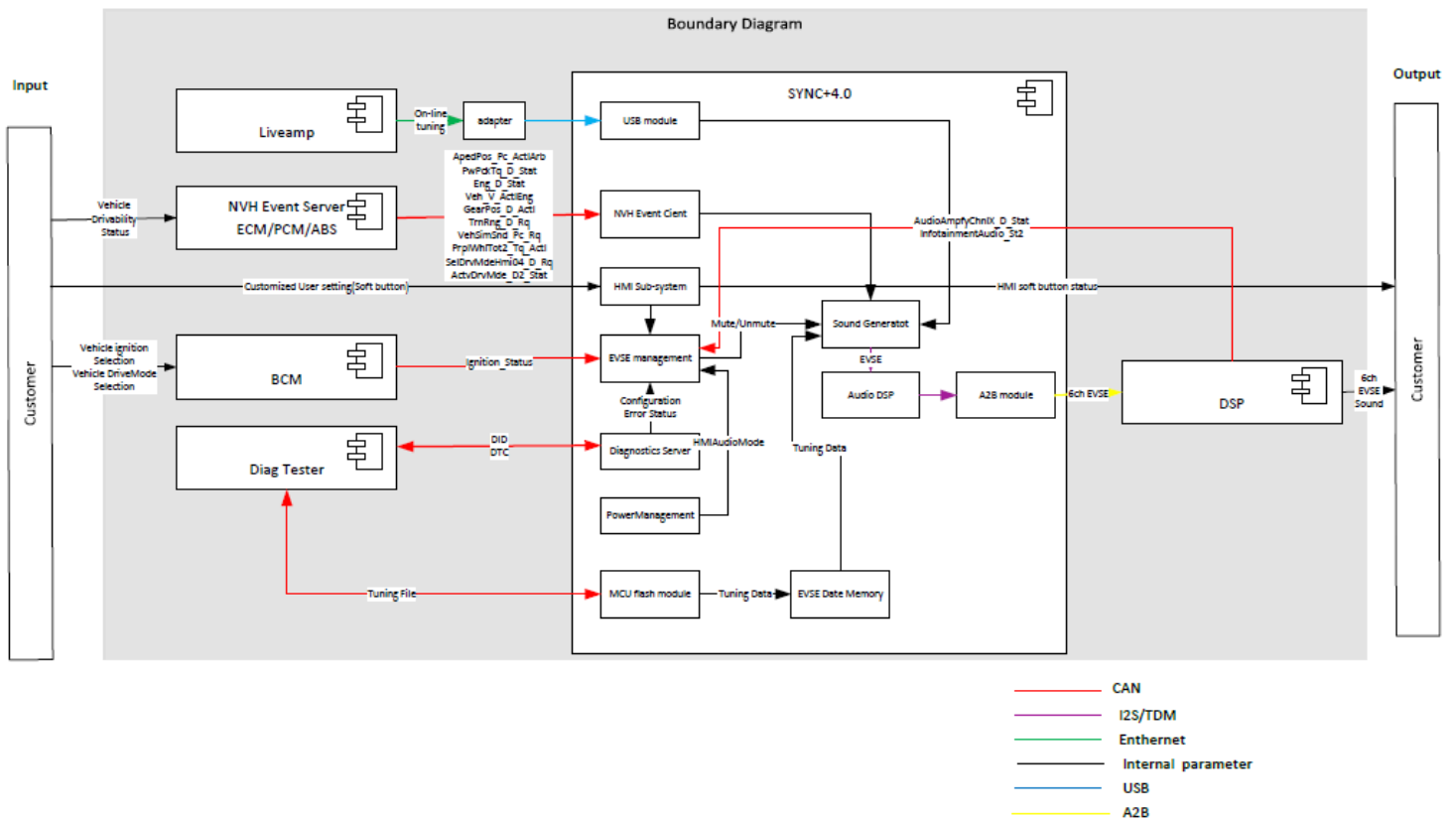
1 Overview

1.1 Feature Description

The term 'Electric Vehicle Sound Enhancement'('EVSE') refers to the vehicle's feature to add more complex non-combustive sound elements for enhancement of hybrid and full electric vehicle propulsion sound. This specification only applicable for SYNC+ integrated EVSE.

1.2 Library Calibration/Configuration file usage

The acoustic calibration "file" used for EVSE feature is unique to a specific vehicle model ,which is effected by speakers layout or powertrain module. Generally, calibration parameter also unique to a specific drive mode. All of this can be realize through DExx configurations.



2.2 EVSE Class Description

2.2.1 EVSE-CLD-REQ-xxxxxx/ NVH Event Server

The 'NVH Event Server' is responsible to notify the change in drivability status. Interfaces is used by EVSE sound tuning.

2.2.2 EVSE-CLD-REQ-xxxxxx/NVH Event Client

The 'NVH Event Client' receive drivability status from 'NVH Event Server' to controls the EVSE sound based on the status received.

2.2.3 EVSE-CLD-REQ-xxxxxx/BCM

The 'EVSE management server' is responsible to notify the change in vehicle status. Interfaces is used by EVSE work state management.

2.2.4 EVSE-CLD-REQ-xxxxxx/EVSE Diagnostics server

The 'EVSE Diagnostics server' is responsible for error status monitor and report. On one hand, it receive error status and configuration status which will influence EVSE sound play, notify 'EVSE management client' to control EVSE work state. On the other hand, it report error information to external diagnostic client, like DET.

2.2.5 EVSE-CLD-REQ-xxxxxx/EVSE management

The 'EVSE management server' receive power management status,error status, configurations and vehicle status from 'Power Management' 'DSP' 'EVSE Diagnostics server' and 'BCM' to control EVSE work state.



2.3 Interface Requirement

2.3.1 NVH event server to APIM_CIM

Transmitter	CANID	CAN Message name	CAN Signal Name	Description
PCM/ECM	0x204	EngVehicleSpThrottle_HS3	ApedPos_Pc_ActlArb	the accelerator pedal position, given in %
PCM/ECM	0x167	VehicleOperatingModes_HS3	PwPckTq_D_Stat	Power Pack Status, in codings
PCM/ECM	0x167	VehicleOperatingModes_HS3	Eng_D_Stat	Engine Status, in codings
			AutoTowActv_B_Stat	Auto tow activation status, reserved 821 DBC not include
PCM/ECM	0x202	EngVehicleSpThrottle2_HS3	Veh_V_ActlEng	Vehicle speed, in kph
PCM	0x176	PowertrainData_10_HS3	TrnRng_D_Rq	actual state of the shift lever or other device, in codings
			CnvtTopPos_Dn_Stat	convertible top position, reserved 821 DBC not include
			CnvtTopPos_Up_Stat	convertible top position, reserved 821 DBC not include
HPCM	0x410	AC_Compressor_Req_HS3	VehSimSnd_Pc_Rq	driving characteristic
PCM/ECM	0x167	VehicleOperatingModes_HS3	PrplWhlTot2_Tq_Actl	driving characteristic, reserved, replaced by VehSimSnd_Pc_Rq
PCM	0x176	PowertrainData_10_HS3	GearPos_D_Actl	actual gear from automatic transmission, Reserved
			SelDrvMdeHmi04_D_Rq	Reserved 821 DBC not include
ABS	0x420	SelectDriveModeData_HS3	ActvDrvMde_D2_Stat	Active drive mode, in codings

2.3.1.1 MD-REQ-xxxxxx/ApedPos_Pc_ActlArb

Message Type: Status

This method is used to indicate the accelerator pedal position, given in %.

Signal name	Literals	Values	Description
ApedPos_Pc_ActlArb	<Range>	0x000 – 0x3FF	0 to 102.3 Offset: 0 Resolution: 0.1

2.3.1.2 MD-REQ-xxxxxx/PwPckTq_D_Stat

Message Type: Status

This method is used to indicate the Power Pack Status.

Signal name	Literals	Values	Description
PwPckTq_D_Stat	-	-	-
	Off Tq Not Available	0x0	
	On Tq Not Available	0x1	
	Strt In Prg No Tq	0x2	
	On Tq Available	0x3	

2.3.1.3 MD-REQ-xxxxxx/Eng_D_Stat

Message Type: Status



This method is used to indicate the Engine Status.

Signal name	Literals	Values	Description
Eng_D_Stat	-	-	-
	EngOff	0x0	
	EngOn	0x1	
	EngAutoStopped	0x2	
	NotUsed	0x3	

2.3.1.4 MD-REQ-xxxxxx/AutoTowActv_B_Stat

Message Type: Status

Status signal to indicate Auto tow activation status.

Signal Name	Literals	Value	Description
AutoTowActv_B_Stat	No	0x0	
	Yes	0x1	

2.3.1.5 MD-REQ-xxxxxxVeh_V_ActlEng

Message Type: Status

This signal is used to represent the vehicle speed.

Signal Name	Literals	Value	Description
Veh_V_ActlEng	-	-	Indicates vehicle speed.
	<Range>	0x0 – 0xFFFF	0 to 655.35 kilometers / hour. Unit: kph Resolution:0.01 Offset:0

2.3.1.6 MD-REQ-xxxxxx/TrnRng_D_Rq

Message Type: Status

This signal is used to indicate the actual state of the shift lever or other device (and incorporates transmission state requests from outside functions such as FAPA).

Name	Literals	Value	Description
TrnRng_D_Rq	-	-	
	Park	0x0	
	Reverse	0x1	
	Neutral	0x2	
	Drive	0x3	
	Sport_DriveSport_Mposition	0x4	
	Low	0x5	
	Range1_M1_L1	0x6	
	Range2_M2_L2	0x7	



	Range3_M3_L3	0x8	
	Range4	0x9	
	Range5	0xA	
	Range6	0xB	
	NotUsed_1	0xC	
	NotUsed_2	0xD	
	Unknown_Position	0xE	
	Fault	0xF	

2.3.1.7 MD-REQ-xxxxxx/CnvtTopPos_Dn_Stat

Message Type: Status

Status signal to indicate convertible top position.

Signal Name	Literals	Value	Description
CnvtTopPos_Dn_Stat	Not_Down	0x0	
	Down	0x1	

2.3.1.8 MD-REQ-xxxxxx/CnvtTopPos_Up_Stat

Message Type: Status

Status signal to indicate convertible top position.

Signal Name	Literals	Value	Description
CnvtTopPos_Up_Stat	Not_Up	0x0	
	Up	0x1	

2.3.1.9 MD-REQ-xxxxxx/VehSimSnd_Pc_Rq

Message Type: Status

This signal is to request a level of simulated vehicle acceleration/deceleration sound according to driving characteristics, e.g. full, moderate or low vehicle acceleration/deceleration.

Name	Literals	Values	Description
VehSimSnd_Pc_Rq			-
	<Range>	-102.2 to 102.4	Min: -102.2 Max: 102.4 Resolution: 0.2 Offset: -102.2 Unit : %

2.3.1.10 MD-REQ-xxxxxx/PrplWhlTot2_Tq_Actl

Message Type: Status

This signal is used to represent the calculated torque currently being delivered to all the axles at wheel level



Signal Name	Literals	Value	Description
PrplWhlTot2_Tq_Actl	-	-	-
	<Range>	0x0 – 0xFFFF	-131060 to 131060 newton*meter Resolution:4 Offset:-131072

2.3.1.11 MD-REQ-xxxxxx/GearPos_D_Actl

Message Type: Status

Signal used to indicate actual gear from automatic transmission. During a shift, the value does not change until the gear ratio change is complete.

Name	Literals	Value	Description
Type	-	-	Actual gear from automatic transmission
	Neutral	0x0	
	First	0x1	
	Second	0x2	
	Third	0x3	
	Fourth	0x4	
	Fifth	0x5	
	Sixth	0x6	
	Seventh	0x7	
	Eighth	0x8	
	Ninth	0x9	
	Tenth	0xA	
	Undefined	0xB	
	Undefined	0xC	
	Undefined	0xD	
	Reverse	0xE	
	Unknown	0xF	

2.3.1.12 MD-REQ-xxxxxx/SelDrvMdeHmi04_D_Rq

Message Type: Status

Request signal to select drive mode

Logical Signal Name	Literals	Value	Description
SelDrvMdeHmi04_D_Rq	SelDrvMde01	0x0	
	SelDrvMde02	0x1	
	SelDrvMde03	0x2	
	SelDrvMde04	0x3	
	SelDrvMde05	0x4	
	SelDrvMde06	0x5	
	SelDrvMde07	0x6	
	SelDrvMde08	0x7	
	SelDrvMde09	0x8	
	SelDrvMde10	0x9	



	SelDrvMde11	0xA	
	SelDrvMde12	0xB	
	SelDrvMde13	0xC	
	SelDrvMde14	0xD	
	SelDrvMde15	0xE	
	SelDrvMde16	0xF	
	SelDrvMde17	0x10	
	SelDrvMde18	0x11	
	SelDrvMde19	0x12	
	SelDrvMde20	0x13	
	SelDrvMde21	0x14	
	SelDrvMde22	0x15	
	SelDrvMde23	0x16	
	SelDrvMde24	0x17	
	SelDrvMde25	0x18	
	SelDrvMde26	0x19	
	SelDrvMde27	0x1A	
	SelDrvMde28	0x1B	
	SelDrvMde29	0x1C	
	SelDrvMde30	0x1D	
	SelDrvMde31	0x1E	
	Faulty	0x1F	

2.3.1.13 MD-REQ-xxxxxx/ActvDrvMde_D2_Stat

Message Type: Status

Status signal to indicate active drive mode

Logical Signal Name	Literals	Value	Description
ActvDrvMde_D2_Stat	SelDrvMde01	0x0	
	SelDrvMde02	0x1	
	SelDrvMde03	0x2	
	SelDrvMde04	0x3	
	SelDrvMde05	0x4	
	SelDrvMde06	0x5	
	SelDrvMde07	0x6	
	SelDrvMde08	0x7	
	SelDrvMde09	0x8	
	SelDrvMde10	0x9	
	SelDrvMde11	0xA	
	SelDrvMde12	0xB	
	SelDrvMde13	0xC	



	SelDrvMde14	0xD	
	SelDrvMde15	0xE	
	SelDrvMde16	0xF	
	SelDrvMde17	0x10	
	SelDrvMde18	0x11	
	SelDrvMde19	0x12	
	SelDrvMde20	0x13	
	SelDrvMde21	0x14	
	SelDrvMde22	0x15	
	SelDrvMde23	0x16	
	SelDrvMde24	0x17	
	SelDrvMde25	0x18	
	SelDrvMde26	0x19	
	SelDrvMde27	0x1A	
	SelDrvMde28	0x1B	
	SelDrvMde29	0x1C	
	SelDrvMde30	0x1D	
	SelDrvMde31	0x1E	
	Faulty	0x1F	

2.3.2 BCM to APIM_CIM

Transmitter	CANID	CAN Message name	CAN Signal Name	Description
BCM	0x3B3	BodyInfo_3	Ignition_Status	

2.3.2.1 MD-REQ-xxxxxx/Ignition_Status

Message Type: Status

Signal sent to the infotainment system indicating the ignition status of the vehicle

Logical Signal Name	Literals	Value	Description
Ignition_Status	Unknown	0x0	
	OFF	0x1	
	Accessory	0x2	
	Run	0x4	
	Start	0x8	
	Invalid	0xF	

2.3.3 DSP to APIM_CIM

All of this signals only applicable for vehicles with external DSP. Configurations refer to diagnostic SPSS.

CANID	CAN Message name	CAN Signal Name	Description
		InfotainmentAudio_St2	
		AudioAmpfyChnl1_D_Stat	Front Left speakers channel status



	AudioAmpfyChnl2_D_Stat	Front Right speakers channel status
	AudioAmpfyChnl3_D_Stat	Rear Left speaker channel status
	AudioAmpfyChnl4_D_Stat	Rear Right speakers channel status
	AudioAmpfyChnl5_D_Stat	Center speakers channel status
	AudioAmpfyChnl6_D_Stat	Subwoofer speaker channel status
	AudioAmpfyChnl7_D_Stat	Reserved
	AudioAmpfyChnl8_D_Stat	Reserved
	AudioAmpfyChnl9_D_Stat	Reserved
	AudioAmpfyChnl10_D_St	Reserved
	AudioAmpfyChnl11_D_St	Reserved
	AudioAmpfyChnl12_D_St	Reserved
	AudioAmpfyChnl13_D_St	Reserved
	AudioAmpfyChnl14_D_St	Reserved
	AudioAmpfyChnl15_D_St	Reserved
	AudioAmpfyChnl16_D_St	Reserved
	AudioAmpfyChnl17_D_St	Reserved
	AudioAmpfyChnl18_D_St	Reserved
	AudioAmpfyChnl19_D_St	Reserved
	AudioAmpfyChnl20_D_St	Reserved
	AudioAmpfyChnl21_D_St	Reserved
	AudioAmpfyChnl22_D_St	Reserved
	AudioAmpfyChnl23_D_St	Reserved
	AudioAmpfyChnl24_D_St	Reserved

2.3.3.1 MD-REQ-xxxxxx/AudioAmplifier_Channel_St

Message Type: Status

Signal used to indicate the status of the channel(s) used by DSP AMP.

Note: For channels not used by DSP, signals should be set by 0x0(Null).

Signal Name	Literals	Value	Description
AudioAmpfyChnlX_D_St	Null	0x0	
	NormalOperation	0x1	
	ErrorState_NoAudio	0x2	
	Reserved	0x3	

2.3.3.2 MD-REQ-xxxxxx/InfotainmentAudio_St2

Message Type: Status

Signal sent by the DSP AMP indicating there is no infotainment audio because of an error condition when the infotainment system is powered ON.

Logical Signal Name	Literals	Value	Description
InfotainmentAudio_St2	Null / Inactive	0x0	Default State
	NormalOperation	0x1	Able to produce audio
	ErrorState_NoAudio	0x2	Unable to produce audio
	Reserved	0x3	'Place Holder' – Reserved state

**2.3.4 APIM_CIM send(Reserved)**

CANID	CAN Message name	CAN Signal Name	Description
		InfotainmentAudio_St	
		AuxAmpfy_D_Stat	
		AudioCtlChnl1_D_Stat	Front Left speakers channel status
		AudioCtlChnl2_D_Stat	Front Right speakers channel status
		AudioCtlChnl3_D_Stat	Rear Left speaker channel status
		AudioCtlChnl4_D_Stat	Rear Right speakers channel status
		AudioCtlChnl5_D_Stat	Center speakers channel status
		AudioCtlChnl6_D_Stat	Subwoofer speaker channel status
		AudioCtlChnl7_D_Stat	
		AudioCtlChnl8_D_Stat	
		AuxAmpfyChnl1_D_Stat	
		AuxAmpfyChnl1_D_Stat	
		AuxAmpfyChnl1_D_Stat	
		AuxAmpfyChnl1_D_Stat	

2.3.4.1 MD-REQ-xxxxxx/AudioCtlChnlX_D_Stat

Message Type: Status

Signal used to indicate the status of the Audio Head Unit channel(s).

Logical Signal Name	Literals	Value	Description
AudioCtlChnlX_D_Stat	Null	0x0	
	NormalOperation	0x1	
	ErrorState_NoAudio	0x2	
	Reserved	0x3	

2.3.4.2 MD-REQ-xxxxxx/AuxAmpfyChnlX_D_Stat

Message Type: Status

Signal used to indicate the status of the Aux Amplifier channel(s).

Note: For vehicle not applicable, this signals should set by 0 (Null).

Logical Signal Name	Literals	Value	Description
AuxAmpfyChnlX_D_Stat	Null	0x0	
	NormalOperation	0x1	
	ErrorState_NoAudio	0x2	
	Reserved	0x3	

2.3.4.3 MD-REQ-xxxxxx/InfotainmentAudio_St

Message Type: Status

Signal sent by the PAC indicating there is no infotainment audio because of an error condition when the infotainment system is powered ON.



Logical Signal Name	Literals	Value	Description
InfotainmentAudio_St	Null / Inactive	0x0	Default State
	NormalOperation	0x1	Able to produce audio
	ErrorState_NoAudio	0x2	Unable to produce audio
	Reserved	0x3	'Place Holder' – Reserved state

2.3.4.4 MD-REQ-xxxxxx/AuxAmpfy_D_Stat

Message Type: Status

Signal sent by the Aux amplifier to indicate the status when the infotainment system is powered ON (ex. non-channel-specific faults).

Note: For vehicle not applicable, this signals should set by 0 (Null).

Logical Signal Name	Literals	Value	Description
AuxAmpfy_D_Stat	Null / Inactive	0x0	Default State
	NormalOperation	0x1	Able to produce audio
	ErrorState_NoAudio	0x2	Unable to produce audio
	Reserved	0x3	'Place Holder' – Reserved state

Note: This signal is reported by the PAC, based on diagnostic status information provided by the Aux Amplifier to the PAC via the A2B bus.



3 General Requirements

3.1 EVSE-SR-REQ-xxxxxx/Feature Enable Configuration

Position	Definition	Coding	Description
DE05,byte4,bit7-5	ANC/ESE/EVSE	0x0: Disabled 0x1: EVSE 0x2: ESE 0x3: ANC+ESE 0x4: ANC only 0x5: Reserved 0x6: Reserved 0x7: Reserved	

When this configuration is set to 'EVSE' :

- All the functionality and signals defined in this SPSS shall be supported.
- DTCs can be logged.

When this configuration is set to Others:

- EVSE functionality and signals defined shall not be available
- DTCs can not be logged.

Note: If the DTC not be used only by EVSE, DTCs should be logged according to other function specification.

If signals not be used only by EVSE, signals should be sent or received according to other function specification.

Refer to the Infotainment Diagnostic Specification for the details on the configuration.

3.2 EVSE-SR-REQ-xxxxxx/Tuning Profile Configuration

Position	Definition	Coding	Description
DE05,byte14,bit7-0	ESE profile select	0x00:Not Available	Configure according to different vehicle config

This tuning profile is dedicated to one EVSE vehicle config. Tuning data will be packed in one file for all vehicle series, this configuration is used to decide what tuning data should be used for a certain vehicle configuration. This difference is lead by motortype, DSP type, ect.

Note: configuration parameter is released by NVH team.

3.3 EVSE-SR-REQ-xxxxxx/Tuning file Configuration for Drive Mode

Position	Definition	Coding	Description
DE09,byte1	SelDrvMde1	Sub-Profile	Configure sub-profile for drive mode 1
DE09,byte2	SelDrvMde2	Sub-Profile	Configure sub-profile for drive mode 2
DE09,byte3	SelDrvMde3	Sub-Profile	Configure sub-profile for drive mode 3
...
DE09,byte31	DE09,byte31	Sub-Profile	Configure sub-profile for drive mode 31

Configure sub-profile for supported drive mode. For drive mode which not support EVSE, configure as "Null"

Note: CX821 only work on sport mode (ActvDrvMde_D2_Stat=0x1,value start from 0x0).

Note: configuration parameter is released by NVH team.



3.4 EVSE-SR-REQ-xxxxxx/EVSE DTC

DTC Number	Configuration	Definition
0xE02951	ANC/ESE/EVSE=1 or AVAS=1	Loss of AVAS/EVSE calibration file Set when AVAS/EVSE calibration file is missing or corrupted
0xF00093	ANC/ESE/EVSE=1 or AVAS=1	AVAS/EVSE Initialization Fault
0xC10000	ANC/ESE/EVSE=1	Lost communication with ECM/PCM 0x167 0x176 0x202
0xC29300	ANC/ESE/EVSE=1	Lost communication with HPCM 0x410
0xC12100	ANC/ESE/EVSE=1	Lost communication with ABS 0x420
	ANC/ESE/EVSE=1	Lost communication with BCM 0x3B3
	ANC/ESE/EVSE=1 and Smart DSP=6(A2B Sonavox)	Lost communication with DSP
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#1 General Electrical Failure
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#1 Circuit Short To Ground
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#1 Circuit Short To Battery
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#1 Circuit Open
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#2 General Electrical Failure
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#2 Circuit Short To Ground
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#2 Circuit Short To Battery
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#2 Circuit Open
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#3 General Electrical Failure
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#3 Circuit Short To Ground
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#3 Circuit Short To Battery
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#3 Circuit Open
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#4 General Electrical Failure
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#4 Circuit Short To Ground
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#4 Circuit Short To Battery
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#4 Circuit Open
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#5 General Electrical Failure
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#5 Circuit Short To Ground
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#5 Circuit Short To Battery
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#5 Circuit Open
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#6 General Electrical Failure
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#6 Circuit Short To Ground
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#6 Circuit Short To Battery
	ANC/ESE/EVSE=1 and Smart DSP=5(A2B Subwoofer)	Speaker#6 Circuit Open
	ANC/ESE/EVSE=1 and Smart DSP=6(A2B Sonavox)	A2B Master Node General Electrical Failure
	ANC/ESE/EVSE=1 and Smart DSP=6(A2B Sonavox)	A2B Master Node Circuit Short To Ground
	ANC/ESE/EVSE=1 and Smart DSP=6(A2B Sonavox)	A2B Master Node Circuit Short To Battery
	ANC/ESE/EVSE=1 and Smart DSP=6(A2B Sonavox)	A2B Master Node Circuit Open

Note: Configurations only for EVSE feature, if other feature need to use this DTC number, then other configuration need to be considered. This rule also apply to definition.

3.5 EVSE-SR-REQ-xxxxxx/ DID-Internal Error



This DID is used to record DTC F00093 error type.

DID	Byte	Bit	Definition
FExx	1	7	AVAS Initialization fail
	1	6	AVAS run status error
	1	5-0	Reserved
	2	7	EVSE Initialization fail
	2	6	EVSE run status error
	2	5-0	Reserved

3.6 EVSE-SR-REQ-xxxxxx/EVSE Settings

EVSE can be enabled or disabled by customer, APIM_CIM need provide following interface to customer.

- HMI need provide interface to enable or disable EVSE by customer.
- VPA need provide interface to enable or disable EVSE by customer.
- ~~Short panel support EVSE status(Enabled or Disabled) display.~~



When EVSE work error, all interfaces will be not available, detail design refer to HMI UE.

3.7 EVSE-SR-REQ-xxxxxx/EVSE Enhanced Memory

For vehicles which support, EVSE setting need to support enhanced memory and store enable or disable status for all driver profile, when profile changed, EVSE setting need to update status accordingly. Detail information need to confirm with enhanced memory owner.

3.8 EVSE-SR-REQ-xxxxxx/EVSE Audio Path

EVS audio, generated by the EVSE algorithm, will be separate from and not affected by any audio processing steps which are applied to non-EVSE audio; such as volume, fader, balance, tone, vehicle EQ.



4 Functional Requirements

4.1 EVSE-SR-REQ-xxxxxx/EVSE Calibration File Structure

4.2 EVSE-FUN-REQ-xxxxxx/EVSE Power Mode

4.2.1 Functional Requirements

4.2.1.1 EVSE-SR-REQ-xxxxxx/EVSE power mode state definitions

EVSE Sleep:

EVSE Sleep State is defined as the state where the CAN bus is asleep and PS functionality is powered down.

EVSE Standby:

EVSE Standby State is defined as the state where the CAN bus is active, EVSE module is ready, but EVSE work condition not been met, HMIAudioMode=OFF or Ignition_Status =0x0(Unknown)/0x1(Off)/0xF(Invalid) .

EVSE Functional:

PS Functional State is defined as the state where the CAN bus is active, HMIAudioMode=ON and Ignition_Status =0x2(Acc)/0x4(Run)/0x8(Start) .

4.2.1.2 EVSE-SR-REQ-xxxxxx/Timing performance definition

EVSE component shall able to act upon HMIAudioMode=ON within 500ms from Can bus ready to transmit.

4.2.2 Use Case

4.2.2.1 EVSE-UC-REQ-xxxxxx/Startup-With DSP

Actors	Vehicle User
Pre-conditions	1. HMIAudioMode is in OFF state. 2. Infotainment System comprises APIM and DSP
Scenario Description	1. HMIAudioMode transition from OFF -> ON state. 2. NVH Management receives module status and channel status from DSP InfotainmentAudio_St2 and AudioAmplifier_Channel_St as 'NormalOperation' respectively. 3. Ignition_Status transition to Run.
Post-conditions	1. Infotainment system shall be able to play EVSE audio when ignition_Status transition to Run.
Exception Use Cases	1. 'ErrorState_NoAudio' status is received from DSP on 'InfotainmentAudio_St2*' and '*Channel_St' signal. 2. APIM Error is detected()
Notes	

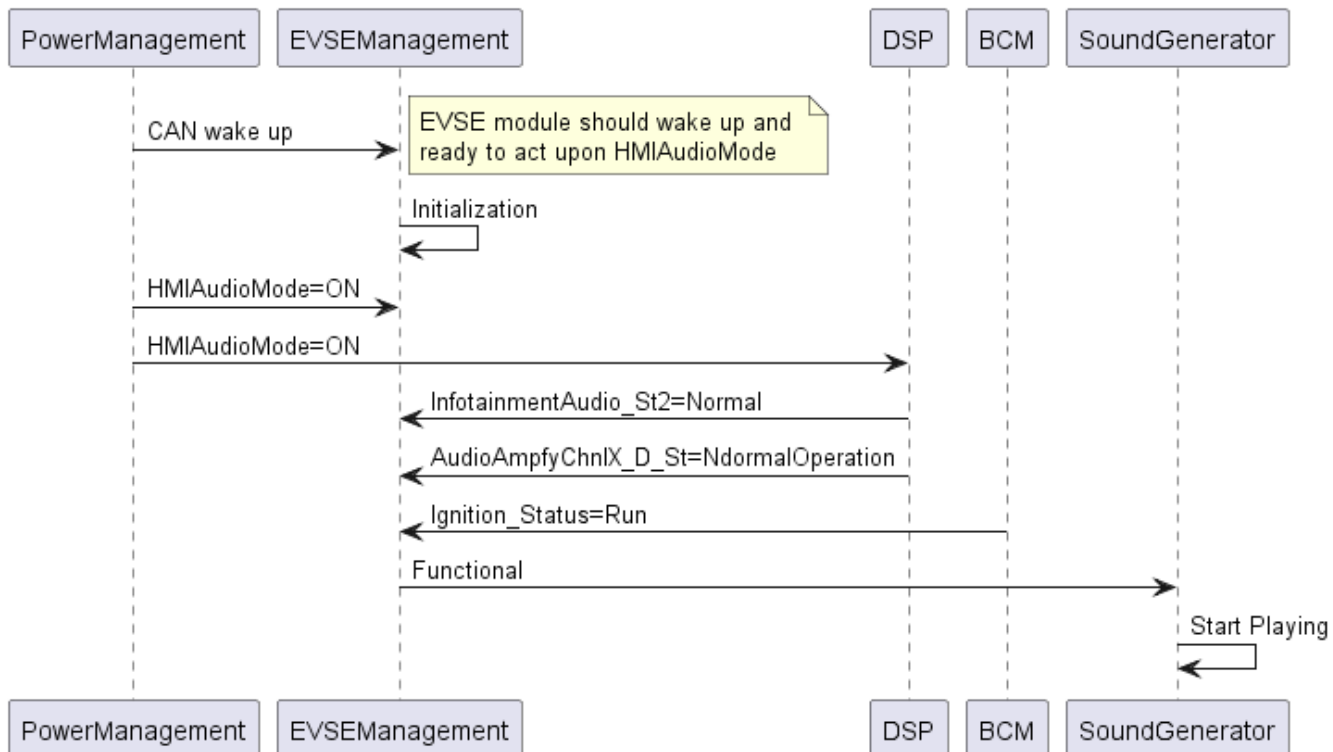
4.2.2.2 EVSE-UC-REQ-xxxxxx/Startup-Without DSP

Actors	Vehicle User
Pre-conditions	1. HMIAudioMode is in OFF state. 2. Infotainment System comprises APIM and DSP
Scenario	1. HMIAudioMode transition from OFF -> ON state.



Description	2. NVH Management receives module status and channel status from DSP InfotainmentAudio_St2 and AudioAmplifier_Channel_St as 'NormalOperation' respectively. 3. Ignition_Status transition to Run.
Post-conditions	1. Infotainment system shall be able to play EVSE audio when ignition_Status transition to Run.
Exception Use Cases	1. 'ErrorState_NoAudio' status is received from DSP on 'InfotainmentAudio_St2*' and '*Channel_St' signal. 2. Other Error is detected
Notes	

4.2.3 EVSE-SD-REQ-xxxxxx/EVSE Startup Sequence Diagram



4.3 EVSE-FUN-REQ-xxxxxx/EVSE Error Handling

4.3.1 Functional Requirement

4.3.1.1 EVSE-SR-REQ-xxxxxx/EVSE Error Handling-Audio System Related Error -With DSP

For audio system with DSP, all EVSE speakers is connected to DSP and EVSE sound stream is transferred to DSP via A2B. Generally, 4 types of error is considerate, Any of this errors will result in EVSE module enter into fault status where stop EVSE play.

- Internal algorithm error, which means some error is occurred in sound generator internal which result in EVSE sound can't be emitted;
- APIM Infotainment Audio error, which means some error is occurred in APIM component which is related with audio playing, like A2B error, LVI/OVI protection active, aDSP internal errors, ect.
- DSP Infotainment Audio error, which means some error is occurred in DSP component which is related with audio playing, like A2B error, LVI/OVI protection active, DSP internal errors, ect.



- DSP channel error, which means speakers connection fault which result in EVSE sound can't be emitted.

4.3.1.2 EVSE-SR-REQ-xxxxxx/ EVSE Error Handling-Audio System Related Error -With DSP

For audio system without DSP, all EVSE speakers is connected to DSP and EVSE sound stream is transferred to DSP via A2B. Generally, 3 types of error is considerate, Any of this errors will result in EVSE module enter into fault status where stop EVSE play.

- Internal algorithm error, which means some error is occurred in sound generator internal which result in EVSE sound can't be emitted;
- APIM Infotainment Audio error, which means some error is occurred in APIM component which is related with audio playing, like A2B error, LVI/OVI protection active, aDSP internal errors, ect.
- APIM channel error, which means speakers connection fault which result in EVSE sound can't be emitted.

4.3.1.3 EVSE-SR-REQ-xxxxxx/EVSE Error Handling-Lost communication DTC

All Lost communication DTCs defined in Chapter 'EVSE DTC' will result in EVSE module enter into fault status where stop EVSE play.

4.3.1.4 EVSE-SR-REQ-xxxxxx/EVSE Error Handling-Invalid Calibration File DTC

All missing calibration file missing or corrupted DTC defined in Chapter 'EVSE DTC' will result in EVSE module enter into fault status where stop EVSE play.

4.3.1.5 EVSE-SR-REQ-xxxxxx/EVSE Error Check Related Signals

Signals set condition refer to following guidance:

- When there has APIM Infotainment Audio error, set 'InfotainmentAudio_St' as ErrorState_NoAudio;
- When there has DSP Infotainment Audio error , set 'InfotainmentAudio_St2' as ErrorState_NoAudio;
- When there has DSP channel error, set 'AudioAmphyChnlX_D_Stat' as 'NormalOperation'. Unused channels set to "Null";
- When there has APIM channel error, set 'AudioCtlChnlX_D_Stat' as 'ErrorState_NoAudio'. Unused channels set to "Null";

4.3.2 Use Case

4.3.2.1 EVSE-UC-REQ-xxxxxx/Internal error is received while playing EVSE

Actors	Vehicle Occupant
Pre-conditions	Infotainment system is ON EVSE is Enabled, and the EVSE audio is played through vehicle speakers
Scenario Description	Internal algorithm error is detected
Post-conditions	Active EVSE audio shall be stopped and not recovery until error disappear; HMI setting display as 'OperationInvalid' (Detail refer to HMI UI/UE)
Exception Use Cases	
Notes	

**4.3.2.2 EVSE-UC-REQ-xxxxxx/APIM Infotainment error is received while playing EVSE**

Actors	Vehicle Occupant
Pre-conditions	Infotainment system is ON EVSE is Enabled, and the EVSE audio is played through vehicle speakers
Scenario Description	APIM infotainment error is detected, like A2B error
Post-conditions	Send 'InfotainmentAudio_St=ErrorState_NoAudio' by APIM Active EVSE audio shall be stopped and not recovery until error disappear; HMI setting display as 'OperationInvalid' (Detail refer to HMI UI/UE)
Exception Use Cases	
Notes	Applicable for other infotainment audio error

4.3.2.3 EVSE-UC-REQ-xxxxxx/DSP Infotainment error is received while playing EVSE -With DSP

Actors	Vehicle Occupant
Pre-conditions	Infotainment system is ON EVSE is Enabled, and the EVSE audio is played through vehicle speakers
Scenario Description	DSP infotainment error is detected, like A2B error , DSP Send 'InfotainmentAudio_St2=ErrorState_NoAudio' by APIM
Post-conditions	Active EVSE audio shall be stopped and not recovery until error disappear; HMI setting display as 'OperationInvalid' (Detail refer to HMI UI/UE)
Exception Use Cases	
Notes	Applicable for other infotainment audio error

4.3.2.4 EVSE-UC-REQ-xxxxxx/APIM channel error is received while playing EVSE -At least one channel used

Actors	Vehicle Occupant
Pre-conditions	Infotainment system is ON EVSE is Enabled, and the EVSE audio is played through vehicle speakers
Scenario Description	Speaker connected to APIM error
Post-conditions	Send 'AudioCtlChnlX_D_Stat=ErrorState_NoAudio'by APIM Active EVSE audio shall be stopped and not recovery until error disappear; HMI setting display as 'OperationInvalid' (Detail refer to HMI UI/UE)
Exception Use Cases	
Notes	Unused channels error not affect EVSE playing

4.3.2.5 EVSE-UC-REQ-xxxxxx/DSP channel error is received while playing EVSE -At least one channel used

Actors	Vehicle Occupant
Pre-conditions	Infotainment system is ON EVSE is Enabled, and the EVSE audio is played through vehicle speakers
Scenario Description	Speaker connected to DSP error, receive 'AudioAmplfyChnlX_D_Stat'=ErrorState_NoAudio'



Post-conditions	Active EVSE audio shall be stopped and not recovery until error disappear; HMI setting display as 'OperationInvalid' (Detail refer to HMI UI/UE)
Exception Use Cases	
Notes	Unused channels error not affect EVSE playing

4.3.2.6 EVSE-UC-REQ-xxxxxx/Lost communication is detected while playing EVSE

Actors	Vehicle Occupant
Pre-conditions	Infotainment system is ON EVSE is Enabled, and the EVSE audio is played through vehicle speakers
Scenario Description	Stop 0x420
Post-conditions	Active EVSE audio shall be stopped and not recovery until error disappear; HMI setting display as 'OperationInvalid' (Detail refer to HMI UI/UE)
Exception Use Cases	
Notes	Apply to other lost communication DTCs

4.3.2.7 EVSE-UC-REQ-xxxxxx/Calibration file is invalid while playing EVSE

Actors	Vehicle Occupant
Pre-conditions	Infotainment system is ON EVSE is Enabled, and the EVSE audio is played through vehicle speakers
Scenario Description	Erase calibration file
Post-conditions	Active EVSE audio shall be stopped and not recovery until error disappear; HMI setting display as 'OperationInvalid' (Detail refer to HMI UI/UE)
Exception Use Cases	
Notes	

4.4 EVSE-FUN-REQ-xxxxxx/EVSE Enable/Disable by user

4.4.1 EVSE-SR-REQ-xxxxxx/EVSE Audio Enable/Disable

PS Audio Components shall support to play PS audio along with the main audio source only when the PS audio is enabled through Infotainment Screen.

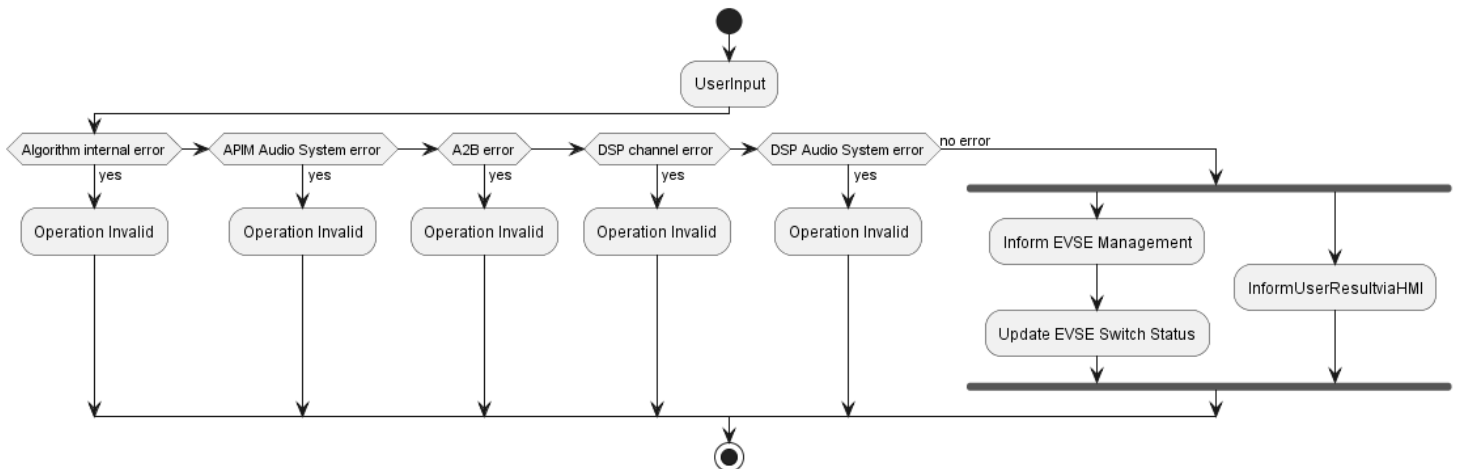
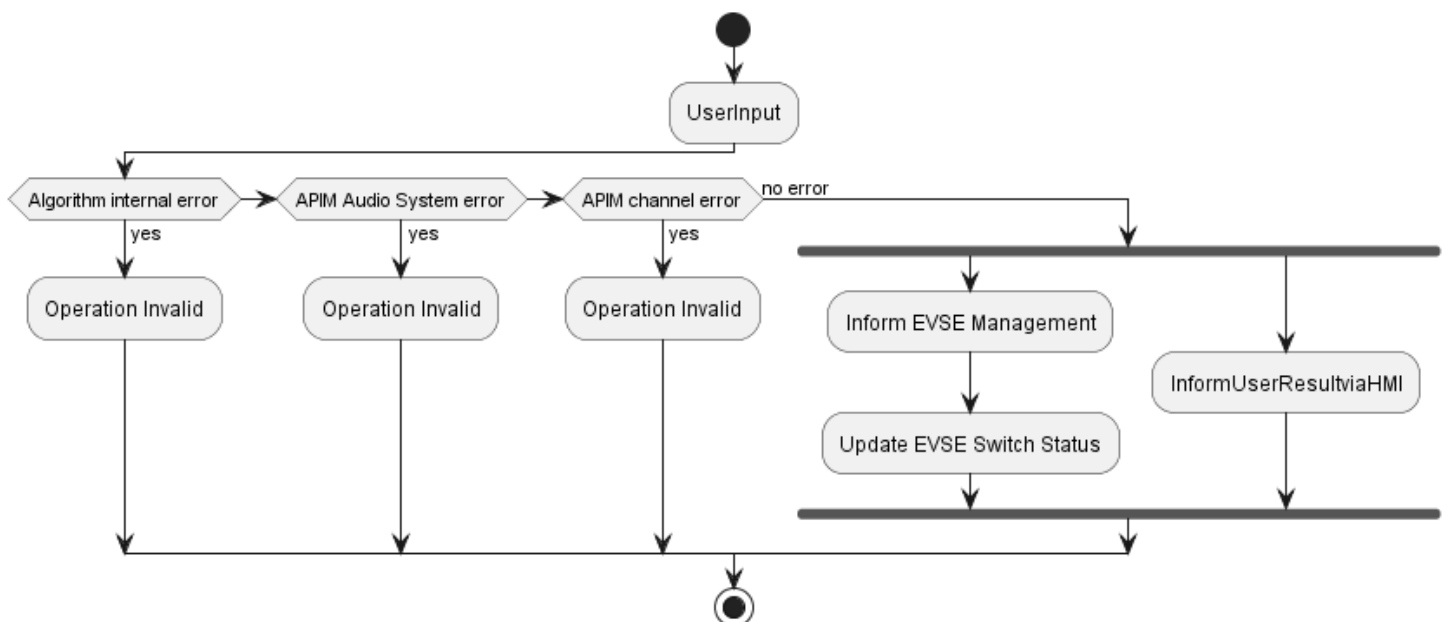
4.4.2 Use Case

4.4.2.1 EVSE-UC-REQ-xxxxxx/User Enables Propulsion Sound Setting

Actors	Vehicle User
Pre-conditions	Infotainment system is ON EVSE Sound is Disabled (user HMI)
Scenario Description	User change EVSE sound setting to enabled
Post-conditions	EVSE sound is enabled EVSE sound HMI is shown set to enabled.
Exception Use Cases	Error is detected

**4.4.2.2 EVSE-UC-REQ-xxxxxx/User Disables Propulsion Sound Setting**

Actors	Vehicle User
Pre-conditions	Infotainment System is ON Propulsion Sound is Enabled (user HMI)
Scenario Description	User changes propulsion sound setting to disabled
Post-conditions	Propulsion sound is disabled Propulsion sound HMI is shown set to disabled
Exception Use Cases	Error is detected

4.4.3 Activity Diagram**4.4.3.1 EVSE-ACT-REQ-xxxxxx/EVSE Sound Operation-With DSP****4.4.3.2 EVSE-ACT-REQ-xxxxxx/EVSE Sound Operation-Without DSP**



4.4.4 Sequence Diagram

4.4.4.1 EVSE-SD-REQ-xxxxxx/EVSE Sound Operation-With DSP

4.4.4.2 EVSE-SD-REQ-xxxxxx/EVSE Sound Operation-Without DSP