



Research & Vehicle Technology
“Infotainment Systems Product Development”

Feature – Power Management variant 3

APIM Phoenix Domain Controller
Infotainment Subsystem Part Specific
Specification (SPSS)

Version 1.5

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Version Date: August 8, 2022

FORD CONFIDENTIAL



Revision History

Date	Version	Notes
July 23, 2021	1.0	Initial APIM PDC release
August 25, 2021	1.1	
	PWRMAN-SR-REQ-324997/F-Predictive Triggers - APIM	jmyslin2: update requirement for new predictive triggers for welcome CAN signals
	PWRMAN-FUN-REQ-435910/A-AVAS Power Moding	jmyslin2: new function for AVAS power moding
	PWRMAN-SR-REQ-435912/A-AVAS Power Moding	jmyslin2: AVAS power moding requirement refernece
September 22, 2021	1.2	
	STR-890012/C-Functional Definition	jmyslin2: removed "FUN-398359-Rear Seat Occupant Alertv2 Interface Client Power Management" as doesn't apply to the APIM PDC for the Phoenix architecture
	PWRMAN-SR-REQ-235509/K-KOL Mode Signal power management usage	jmyslin2: updated requirement for PAC on Phoenix architecture for the AHU_Chime_Supported signal
	PWRMAN-FUN-REQ-443537/A-Rear Seat Occupant Alert - variant when RSOA Interface Client is not responsible for RSOA chime	jmyslin2 / ndecia - new release for rear seat occupant alert
	RSOA-REQ-443519/A-Display Only Power Mode Extension (for variant when RSOA Interface Client is not responsible for RSOA Chime)	ndecia: updated to add further details of specific events to be tracked and reported
February 2, 2022	1.3	
	PWRMAN-SR-REQ-452777/A-Logical to Physical CAN signal mapping - APIM PDC Power Management (Phoenix)	jmyslin2: added logical to physical CAN signal mapping
	MD-REQ-273763/B-PrsnlDevChrgEnbl_B_Rq	jmyslin2: no update, ignore revision
	MD-REQ-452897/A-Power_Up_Chime_Modules	jmyslin2: new MD for Power_Up_Chime_Modules power mode signal
	MD-REQ-452917/A-VehWlcmFwrl_D_Stat	jmyslin2: new MD for an existing feature (part of predictive triggers).
	STR-890012/D-Functional Definition	jmyslin2: removed function "PWRMAN-FUN-416260-MMInactive_Sleep (Welcome, farewell)" since there is a separate SPSS for this now for Phoenix APIM PDC.
	PWRMANv6-SR-REQ-414688/B-System Master Power Moding - APIM PDC	jmyslin2: updated requirement to reference AVAS power mode
	PWRMAN-FUN-REQ-422330/A-AVAS Power Mode	jmyslin2: new function for AVAS power moding
	PWRMAN-SR-REQ-473678/A-AVAS power mode state definitions	jmyslin2: new requirement
	AVAS-SR-REQ-422324/A-Power-up time for AVAS audio components+	jmyslin2/bganesa7: New requirement for AVAS power moding
	PWRMAN-SR-REQ-422324/B-Power-up for AVAS audio components	jmyslin2: updated requirement for AVAS power up
	AVAS-SR-REQ-435883/A-AVAS audio components state during Power down+	jmyslin2/bganesa7: New requirement for AVAS power moding
	PWRMAN-SR-REQ-435883/B-Power down for AVAS audio components	<jmyslin2> added details for AVAS power down
	PWRMAN-STM-REQ-473590/A-AVAS Power Mode state diagram - AVAS Audio Components	jmyslin2: new requirement
	PWRMANv2-SR-REQ-383674/B-Internal Stop Mode timer	jmyslin2: updated typo
	RSOA-REQ-443519/B-Display Only Power Mode Extension (for variant when RSOA Interface Client is not responsible for RSOA Chime)	ndecia: new requirement to extend display only power mode
February 3, 2022	1.4	
	PWRMAN-SR-REQ-452777/B-Logical to Physical CAN signal mapping - APIM PDC Power Management (Phoenix)	jmyslin2: updated to add headlamp switch power mode signal
	MD-REQ-473178/A-HeadLghtSwch_D_Stat	jmyslin2: new signal MD for headlamp power mode
	PWRMAN-FUN-REQ-465759/A-Headlamp Power Moding	jmyslin2: new function for headlamp power moding



PWRMAN-UC-REQ-473199/A-Headlamp soft switch available on the HMI when turn vehicle OFF	jmyslin2: new use case
PWRMAN-UC-REQ-473200/A-Headlamp soft switch NOT on the HMI when turn vehicle OFF	jmyslin2: new use case
PWRMAN-UC-REQ-473202/A-Extended Play turned OFF, Vehicle OFF, Headlamp Soft Switch available	jmyslin2: new use case
PWRMAN-UC-REQ-473201/A-Vehicle OFF, Headlamp Soft Switch ON, turn off parklamps and headlamps	jmyslin2: new use case
PWRMAN-UC-REQ-473217/A-Exit Conditions - Headlamp soft switch HMI no longer available when Vehicle OFF	jmyslin2: new use case
PWRMAN-SR-REQ-465738/A-Headlamp Power Mode	jmyslin2: Power mode update for headlamp switch
PWRMAN-TMR-REQ-465818/A-T_HeadlampSwitchDuration	jmyslin2: new timing requirement for the headlamp switch duration
PWRMAN-STM-REQ-473197/A-MMIIInactive - Headlamp Power Moding State Diagram	jmyslin2: new requirement

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PWRMAN-SR-REQ-452777/C-Logical to Physical CAN signal mapping - APIM PDC Power Management (Phoenix)	jmyslin2: removed ANC signals which weren't power moding, added Perimeter_Alarm_Status
MD-REQ-486457/A-Perimeter_Alarm_Status	jmyslin2: new MD
STR-890012/F-Functional Definition+	jmyslin2: removed ANC Power Moding
PWRMAN-SR-REQ-014501/C-Extended Play Configuration Times (TcSE ROIN-40653-1)	jmyslin2: deleted comment on extended play up to 1 hour. Times will be defined in the diagnostic spec and configured there
PWRMAN-FUN-REQ-486437/A-Sentinel / Integrated Security Cameras (ISC) Power Moding	jmyslin2: new function for Sentinel
PWRMAN-UC-REQ-486459/A-Enter Sentinel Power Mode for possible intrusion event	jmyslin2: new use case for Sentinel Power Mode
PWRMAN-UC-REQ-486797/A-Exit Sentinel Power Mode - Sentinel Setting Disabled	jmyslin2: new use case Sentinel Power Mode
PWRMAN-UC-REQ-486798/A-Exit Sentinel Power Mode - Timer Expires	jmyslin2: new use case Sentinel Power Mode
PWRMAN-UC-REQ-486817/A-Exit Sentinel Power Mode - No Recording Storage Device available	jmyslin2: new use case for Sentinel Power Mode
PWRMAN-UC-REQ-488157/A-Exit Sentinel Power Mode - Record to Storage Device Setting is Disabled	jmyslin2: new use case for Sentinel Power Mode
PWRMAN-SR-REQ-486469/A-Power States when Sentinel Power Mode is Not Supported	jmyslin2: New Sentinel power mode requirement
PWRMAN-SR-REQ-486497/A-Entering Sentinel Power Mode	jmyslin2: new requirement for Sentinel power mode
PWRMAN-SR-REQ-486537/A-Exiting Sentinel Power Mode	jmyslin2: new requirement for exiting Sentinel power mode
PWRMAN-TMR-REQ-486516/A-T_SentinelPwrMde	jmyslin2: new Sentinel power mode timing requirement
PWRMAN-STM-REQ-487717/A-Sentinel Power Mode State Diagram	jmyslin2: new Sentinel power mode state diagram



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1 Architectural Design

1.1 PWRMAN-CLD-REQ-359656/A-Infotainment System Master

1.2 PWRMANv3-CLD-REQ-414686/A-System Power Mode Master - APIM variant 3 (PDC)

The System Power Mode Master is responsible for controlling most infotainment features/functions and power management of the infotainment system

1.2.1 PWRMAN-SR-REQ-324997/F-Predictive Triggers - APIM

If the Infotainment System Master cannot meet the boot up timing requirements called out in requirement “PWRMAN-SR-REQ-014472-System Master transition time from Standby to Functional Power Mode” then the Infotainment System Master shall utilize predictive triggers to power up the Infotainment System Master.

When a predictive trigger occurs the Infotainment System Master power shall power up internally to Display Only Mode such that if a trigger to go to Functional Power Mode occurs (ex ignition_status goes to Run/Acc) the Infotainment System Master can quickly turn on. Once a predictive trigger occurs it is recommended that the Infotainment System Master power up to Display Only mode for 3 minutes and then power back down unless another trigger occurs taking it out of Display Only mode (ex Ignition_Status changes from OFF to Run/Acc taking it to Functional Power Mode).

The default predictive trigger time is for 3 minutes. This value shall be configurable between 0 and 10 minutes.

The following predictive triggers shall be supported when:

- Pre-condition: The Infotainment System Master is powered off with HMIAudioMode = OFF in Standby low power mode or Sleep Power Mode
 - Predictive Trigger Events:
 - o The DriverDoorStatus (DrStatDrv_B_Actl), or PassengerDoorStatus (DrStatPsngr_B_Actl), or RearLeftDoorStatus (DrStatRI_B_Actl), or RearRightDoorStatus (DrStatRr_B_Actl), or TailgateDecklidStatus (DrStatTgate_B_Actl), LiftgateStatus (DrStatInnrTgate_B_Actl) signal changes from Closed to Ajar, OR
 - o The Veh_Lock_Status signal changes from Lock to Unlock, OR
 - o The approach detection signal VehWlcmFrwlMde_D_Stat equals Approach, OR
 - o The Remote_Start_Status signal equals Remote,
 - While Remote_Start_Status = Remote the Infotainment System Master powers up to Display Only mode and stays powered up as long as Remote_Start_Status = Remote
 - Once Remote_Start_Status change from Remote to not equal to Remote, [or the CAN bus goes to sleep](#) then the 3 minute timer to exit Display Only shall begin
 - OR
 - o The signal PlgActvArb_B_Dsply changes from 0x01 ON (ie charge cord plugged in) to 0x00 OFF (ie charge cord unplugged), OR
 - o The Departure time signals (with charger connected) are set as “ChrgGoTTouchEnbl_B_Rq = 0x1 Request” AND “ChrgStat_D3_Dspl = 0xB CabinPreconditioning”.
 - While this is true the Infotainment System Master powers up to Display only mode and stays powered up as long as this is true.
 - When ChrgGoTTouchEnbl_B_Rq != 0x1 Request, OR ChrgStat_D3_Dspl != 0xB CabinPreconditioning then the 3 minute timer to exit Display Only shall begin
 - OR
 - o The Departure time signals (with charger connected) are set as “ChrgGoTTouchEnbl_B_Rq = 0x1 Request” AND “ChrgStat_D2_Dspl = 0xB CabinPreconditioning”.
 - While this is true the Infotainment System Master powers up to Display only mode and stays powered up as long as this is true
 - When ChrgGoTTouchEnbl_B_Rq != 0x1 Request, OR ChrgStat_D2_Dspl != 0xB CabinPreconditioning then the 3 minute timer to exit Display Only shall begin
- [OR](#)
- [Phoenix architecture only \(welcome signals\)](#):



- (VehWlcmFrwl_D_Stat = Welcome) AND (VehWlcmFrwlMde_D_Stat = 0x1 Approach, or 0x2 IlluminatedEntry, or 0x3 CourtesyLightingAll, or 0x4 CourtesyLightingDelayAll, or 0x5 CourtesyLightingExtended, or 0x6 CourtesyLightingDelayExt) then the predictive trigger timer is started
 - The predictive trigger event is ended when VehWlcmFrwl_D_Stat != Welcome and VehWlcmFrwlMde_D_Stat != Approach and the predictive trigger timer (ex 3 minutes) has expired, OR
 - The predictive trigger event is ended when VehWlcmFrwlMde_D_Stat = 0x0 Null or 0x7 Illuminated Exit and the predictive trigger time has expired.

- Post-Condition:
 - The Infotainment System Master is in Display Only Mode for 3 minutes (unless noted otherwise in the P06 APIM spec)
- Remembering the last signal state between bus wake-up events:
 - When ignition is OFF, the infotainment network bus might wake up and go back to sleep a number of times and signals may be missing (if signals originate on different network buses). For the predictive triggers, so that the last state can be remembered for a transition, the infotainment system master shall remember the last state.

Display Only Mode SPSS definition:

- The Infotainment System Master is fully powered up in Standby, can turn on the display and can process CAN commands but HMIAudioMode = OFF
- The display is normally off unless a trigger activates it (ex door open for welcome animation)
- Certain APIM peripherals might be turned off to conserve power.
- The Infotainment System Master can power up quickly to functional power mode (within a second or two)

Note: Reference the P06 APIM spec for exact details of how predictive triggers are implemented on the APIM module. If conflict between the SPSS and P06 then the P06 takes precedence.

1.3 VS-CLD-REQ-359585/A-Clear Exit Assist Warning Client

The Clear Exit Assist Warning Client interfaces with the user via the HMI and interfaces with the Clear Exit Assist Warning Server to determine if HMI updates are needed.

1.4 VS-CLD-REQ-359586/A-Clear Exit Assist Warning Server

The Clear Exit Assist Warning Server is responsible for the control to the Clear Exit Assist function and interfaces with the Clear Exit Assist Warning Client.

1.5 RSOAv2-CLD-REQ-360906/B-RearSeatOccupantAlertV2InterfaceClient

The RearSeatOccupantAlertV2InterfaceClient is responsible for monitoring the status of all rear door signals, arming/disarming the notification trigger, displaying the visual reminder, and requesting the audible alert to be played via the audio system.

1.6 PWRMAN-CLD-REQ-347949/A-ANC Generator

The ANC Generator is responsible for generating the ANC (active noise cancellation) signal.

1.7 PWRMAN-CLD-REQ-347950/A-ANC Amplifier

The ANC Amplifier is responsible for producing the ANC audio through the vehicle loudspeakers.



1.8 Logical to Physical mapping - APIM PDC

1.8.1 PWRMAN-SR-REQ-452777/C-Logical to Physical CAN signal mapping - APIM PDC Power Management (Phoenix)

This CAN signal mapping table below maps the Power Management logical signals to the physical CAN signals.

Note: This is for reference only. If there is a conflict between the name in the CAN signal name column and what is found in the actual CAN dB then the CAN dB takes precedent. Please bring to Ford's attention if there is a conflict.

Logical Signal Name	CAN signal name	Comments
HMIAudioMode	HMI_HMIMode_St	
DriverDoorStatus	DrStatDrv_B_Actl	
PassengerDoorStatus	DrStatPsngr_B_Actl	
LifeCycleMode / CarMode	LifeCycMde_D_Actl	
Batt_Lo_SoC_B	Batt_Lo_SoC_B	Load Shed signals
Batt_Crit_SoC_B	Batt_Crit_SoC_B	
Shed_Level_Req	Shed_Level_Req	
Shed_Drain_Eng_Off_B	Shed_Drain_Eng_Off_B	
Shed_T_Eng_Off_B	Shed_T_Eng_Off_B	
PwPckTq_D_Stat	PwPckTq_D_Stat	
Eng_D_Stat	Eng_D_Stat	
Ignition_Status	Ignition_Status	
Delay_Accy	Delay_Accy	
Veh_Lock_Status	Veh_Lock_Status	
PrsnlDevcChrgEnbl_B_Rq	PrsnlDevcChrgEnbl_B_Rq	
KeyOffMde_D_Actl.St	KeyOffMde_D_Actl	
InfoSysMasterPw_D_Stat	InfoSysMasterPw_D_Stat	
KeyOffPwMde_D_Stat	KeyOffPwMde_D_Stat	
VehOnSrc_D_Stat	VehOnSrc_D_Stat	
VehWlcmFrwlMde_D_Stat	VehWlcmFrwlMde_D_Stat	
VehWlcmFrwl_D_Stat	VehWlcmFrwl_D_Stat	
RearLeftDoorStatus	DrStatRl_B_Actl	
RearRightDoorStatus	DrStatRr_B_Actl	
TailgateDecklidStatus	DrStatTgate_B_Actl	
LiftgateStatus	DrStatInnrTgate_B_Actl	
Remote_Start_Status	Remote_Start_Status	
PlgActvArb_B_Dsply	PlgActvArb_B_Dsply	
PwLoApim_T_Actl	PwLoApim_T_Actl	
ClrExitAsstActv_B_Rq	ClrExitAsstActv_B_Rq	
ChrgGoTTouchEnbl_B_Rq	ChrgGoTTouchEnbl_B_Rq	
ChrgStat_D2_Dsply	ChrgStat_D2_Dsply	
ChrgStat_D3_Dsply	ChrgStat_D3_Dsply	
Power_Up_Chime_Modules	Power_Up_Chime_Modules	
HeadLghtSwrch_D_Stat	HeadLghtSwrch_D_Stat	
Perimeter_Alarm_Status	Perimeter_Alarm_Status	



1.9 Interface Requirements - PDC

1.9.1 MD-REQ-273358/D-HMIAudioMode

Message Type: Status

Signal sent by the System Master to the Infotainment modules to indicate the power mode status of the infotainment system.

Logical Signal Name	Literals	Value	Description
HMIAudioMode / HMI_HMIMode_St	Inactive	0x0	
	OFF	0x1	
	ON	0x2	
	Reserved	0x3	N/A to Global Infotainment
	Reserved	0x4	N/A to Global Infotainment
	Load Shed Active	0x5	

1.9.2 MD-REQ-273495/B-Veh_Lock_Status

Message Type: Status

Signal to the infotainment system indicating the lock status of the vehicle

Logical Signal Name	Literals	Value	Description
Veh_Lock_Status	Lock Double	0x0	
	Lock All	0x1	
	Unlock All	0x2	
	Unlock Driver	0x3	

1.9.3 MD-REQ-273497/A-DriverDoorStatus

Message Type: Status

Signal to indicate if the front driver door is closed or ajar.

Logical Signal Name	Literals	Value	Description
DriverDoorStatus	Closed	0x0	
	Ajar	0x1	

1.9.4 MD-REQ-273720/A-PassengerDoorStatus

Message Type: Status

Signal to indicate if the front passenger door is closed or ajar.

Logical Signal Name	Literals	Value	Description
PassengerDoorStatus	Closed	0x0	
	Ajar	0x1	

1.9.5 MD-REQ-273721/C-LifeCycMde_D_Actl / CarMode

Message Type: Status

This signal defines what Car Mode / Life Cycle Mode state is active in the vehicle.



Note: In CAN dB CarMode is used for CGEA 1.2 and C1MCA, and LifeCycMde_D_Actl is used for CGEA 1.3 but in the SPSS CarMode is just the logical signal name representing both

Logical Signal Name	Literals	Value	Description
LifeCycMde_D_Actl / CarMode /	Normal	0x0	
	Factory	0x1	
	Not Used	0x2	
	Transport	0x3	

1.9.6 MD-REQ-273722/A- Battery_Mgmt_2

Message Type: Status

Signals received by the System Master to determine if a load shed event is occurring.

Logical Signal Name	Literals	Value	Description
Batt_Lo_SoC_B	Inactive	0x0	
	Active	0x1	
Batt_Crit_SoC_B	Inactive	0x0	
	Active	0x1	
Shed_Level_Req	No_Shed	0x0	
	SHED1	0x1	
	SHED2_TRANS	0x2	
	SHED2_CONTIN	0x3	
	SOON_ENG_OFF	0x4	
	SHED_ENG_OFF	0x5	
Shed_T_Eng_OFF_B	Inactive	0x0	
	Active	0x1	
Shed_Drain_Eng_Off_B	Inactive	0x0	
	Active	0x1	

1.9.7 MD-REQ-273727/A-ActvNse_B_Actv

Message Type: Status

The Active Noise Cancellation Server sends this signal to indicate ANC status

Logical Signal Name	Literals	Value	Description
ActvNse_B_Actv	Inactive / OFF	0x0	Set OFF when the ANC Server is not transmitting a cancellation or enhancement signal or its output is switched off
	Active	0x1	Set Active when the ANC server is producing a cancellation or enhancement signal and its output is active

1.9.8 MD-REQ-273747/A-PwPckTq_D_Stat

Message Type: Status

Signal sent to the Infotainment System indicating the engine torque status



Logical Signal Name	Literals	Value	Description
PwPckTq_D_Stat	Off Tq Not Available	0x0	
	On Tq Not Available	0x1	
	Strt In Prg No Tq	0x2	
	On Tq Available	0x3	

1.9.9 MD-REQ-273748/A-Eng_D_Stat**Message Type:** Status

Signal indicating the engine status

Logical Signal Name	Literals	Value	Description
Eng_D_Stat	EngOff	0x0	
	EngON	0x1	
	EngAutoStopped	0x2	
	NotUsed	0x3	

1.9.10 MD-REQ-273749/A-Audio_AMP.St**Message Type:** Status

Power Mode signal sent by Audio Power Mode master to the modules producing audio in the infotainment system

Logical Signal Name	Literals	Value	Description
Audio_AMP.St	NoDataExists	0x0	
	OFF (no audio)	0x1	
	Partial_AMP_Audio	0x2	
	ON (all speakers)	0x3	

1.9.11 MD-REQ-273750/A-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	

1.9.12 MD-REQ-273762/A-Delay_Acc**Message Type:** Status

Signal sent to the infotainment system indicating the status of delayed accessory

Logical Signal Name	Literals	Value	Description
Delay_Acc	OFF	0x0	
	ON	0x1	

**1.9.13 MD-REQ-273763/B-PrsnlDevChrgEnbl_B_Rq****Message Type:** Status

Phone as a Key power mode signal

Logical Signal Name	Literals	Value	Description
PrsnlDevChrgEnbl_B_Rq	Inactive	0x0	
	Active	0x1	

1.9.14 MD-REQ-273764/B-KeyOffMde_D_Actl.St**Message Type:** Status

Signal to manage Key Off Load of the vehicle

Logical Signal Name	Literals	Value	Description
KeyOffMde_D_Actl.St	Normal	0x0	
	Factory	0x1	
	Transport	0x2	
	Hibernate	0x3	
	Critical Battery	0x4	

1.9.15 MD-REQ-295565/A-VehOnSrc_D_Stat**Message Type:** Status

Signal used for OTA (over the air) events. Details of signal usages reference the OTA specifications

Logical Signal Name	Literals	Value	Description
VehOnSrc_D_Stat	OFF	0x0	
	Manual	0x1	
	RemoteStart	0x2	
	RemoteParkAssist	0x3	
	OverTheAir	0x4	

1.9.16 MD-REQ-295417/A-KeyOffPwMde_D_Stat**Message Type:** Status

Signal sent from the ECG to the ISM (Infotainment System Master) indicating if the ECG requires the ISM to be powered on or not.

Logical Signal Name	Literals	Value	Description
KeyOffPwMde_D_Stat	Inactive	0x0	The ECG does not require that the ISM be powered up
	ON	0x1	Used to power up the ISM for ECG initiated key off features
	
	Reserved	0x7	

1.9.17 MD-REQ-295418/A-InfoSysMasterPw_D_Stat**Message Type:** Status



Signal sent from the infotainment system master (ISM) indicating if the infotainment system master is powered up and ready to support network commands

Logical Signal Name	Literals	Value	Description
InfoSysMasterPw_D_Stat	Inactive	0x0	ISM application software is not fully powered up
	ISM Powered ON	0x1	ISM is application software is fully powered up
	
	Reserved	0x7	

1.9.18 MD-REQ-324998/A-VehWlcmFrwlMde_D_Stat

Message Type: Status

Signal sent indicating a user is approaching the vehicle

Logical Signal Name	Literals	Value	Description
VehWlcmFrwlMde_D_Stat	Null	0x0	
	Approach	0x1	Used for infotainment predictive trigger power moding
	IlluminatedEntry	0x2	
	CourtesyLightingAll	0x3	
	CourtesyLightingDelayAll	0x4	
	CourtesyLightingExtended	0x5	
	CourtesyLightingDelayExt	0x6	
	IlluminatedExit	0x7	

1.9.19 MD-REQ-372099/A-Remote_Start_Status

Message Type: Status

Signal to indicate if Remote Start is active on the vehicle.

Logical Signal Name	Literals	Value	Description
Remote_Start_Status	Null	0x0	
	Remote	0x1	Remote start is active
	Unknown	0x2	
	Invalid	0x3	

1.9.20 MD-REQ-372100/A-PlgActvArb_B_Dsply

Message Type: Status

Signal to indicate if the vehicle electric charge cord is plugged in or not

Logical Signal Name	Literals	Value	Description
PlgActvArb_B_Dsply	OFF	0x0	Charge cord unplugged
	ON	0x1	Charge cord plugged in

**1.9.21 MD-REQ-372987/A-RearLeftDoorStatus****Message Type:** Status

Signal to indicate if the Rear Left Door is closed or ajar.

Logical Signal Name	Literals	Value	Description
RearLeftDoorStatus / DrStatRI_B_Actl	Closed	0x0	
	Ajar	0x1	

1.9.22 MD-REQ-372988/A-RearRightDoorStatus**Message Type:** Status

Signal to indicate if the Rear Right Door is closed or ajar.

Logical Signal Name	Literals	Value	Description
RearRightDoorStatus / DrStatRr_B_Actl	Closed	0x0	
	Ajar	0x1	

1.9.23 MD-REQ-372989/A-TailgateDecklidStatus**Message Type:** Status

Signal to indicate if the Tailgate/Decklid is closed or ajar.

Logical Signal Name	Literals	Value	Description
TailgateDecklidStatus / DrStatTgate_B_Actl	Closed	0x0	
	Ajar	0x1	

1.9.24 MD-REQ-372990/A-LiftgateStatus**Message Type:** Status

Signal to indicate if the Liftgate is closed or ajar.

Logical Signal Name	Literals	Value	Description
LiftgateStatus / DrStatInnrTgate_B_Actl	Closed	0x0	
	Ajar	0x1	

1.9.25 MD-REQ-378492/A-PwLoApim_T_Actl**Message Type:** Status

Signal informing the Infotainment System Master how long it can stay in Stop Mode

Logical Signal Name	Literals	Value	Description
PwLoApim_T_Actl	0 minute	0x0	Shutdown if in Stop Mode to Sleep Mode
	1 minute	0x1	
	2 minutes	0x2	
	3 minutes	0x3	
	4 minutes	0x4	
	



	2,047 minutes	0x7FF	34 hours, 7 minutes

1.9.26 MD-REQ-359588/A-ClrExitAsstActv_B_Rq

Message Type: Request

Request signal from the Clear Exit Assist Warning Server to the Clear Exit Assist Warning Client / Infotainment System Master to remain powered up to display the clear exit assist warning HMI

Logical Signal Name	Literals	Value	Description
ClrExitAsstActv_B_Rq	False	0x0	
	True	0x1	

1.9.27 MD-REQ-414683/A-ChrgGoTTouchEnbl_B_Rq

Message Type: Request

Logical Signal Name	Literals	Value	Description
ChrgGoTTouchEnbl_B_Rq	No Request	0x0	
	Request	0x1	

1.9.28 MD-REQ-414685/A-ChrgStat_D2_Dspl

Message Type: Status

Logical Signal Name	Literals	Value	Description
ChrgStat_D2_Dsply	Don't care	0x0-0xA	
	Cabin Preconditioning	0xB	
	Don't Care	0xC – 0xF	

1.9.29 MD-REQ-414684/A-ChrgStat_D3_Dspl

Message Type: Status

Logical Signal Name	Literals	Value	Description
ChrgStat_D3_Dsply	Don't care	0x0-0xA	
	Cabin Preconditioning	0xB	
	Don't care	0xC – 0x1F	

**1.9.30 MD-REQ-347951/B-ActvNseMute_D_Stat**

Message Type: Status

Note: Status signal from the ANC Amplifier indicating if the A2B ANC inputs are muted or unmuted.

Logical Signal Name	Literals	Value	Description
ActvNseMute_D_Stat	Inactive	0x0	
	Not Muted	0x1	
	Muted	0x2	

1.9.31 MD-REQ-347952/B-ActvNseMute_D_Rq

Message Type: Request

Note: Request signal from the ANC Generator to the ANC Amplifier to request the A2B audio inputs are muted or unmuted for the ANC signal

Logical Signal Name	Literals	Value	Description
ActvNseMute_D_Rq	Inactive	0x0	
	Unmute	0x1	
	Mute	0x2	

1.9.32 MD-REQ-273727/A-ActvNse_B_Actv

Message Type: Status

The Active Noise Cancellation Server sends this signal to indicate ANC status

Logical Signal Name	Literals	Value	Description
ActvNse_B_Actv	Inactive / OFF	0x0	Set OFF when the ANC Server is not transmitting a cancellation or enhancement signal or its output is switched off
	Active	0x1	Set Active when the ANC server is producing a cancellation or enhancement signal and its output is active

1.9.33 MD-REQ-452897/A-Power_Up_Chime_Modules

Message Type: Status

Power mode state of chimes through the infotainment system

Logical Signal Name	Literals	Value	Description
Power_Up_Chime_Modules	Inactive	0x0	
	Active	0x1	

**1.9.34 MD-REQ-452917/A-VehWlcmFrwl_D_Stat**

Message Type: Status

Signal sent indicating the welcome, farewell state

Logical Signal Name	Literals	Value	Description
VehWlcmFrwl_D_Stat	Null	0x0	
	Welcome	0x1	Used as a predictive trigger
	Farewell	0x2	
	RunStart	0x3	

1.9.35 MD-REQ-473178/A-HeadLghtSwthch_D_Stat

Message Type: Status

Signal from the Headlamp Server module with the status of the headlamp

Logical Signal Name	Literals	Value	Description
HeadLghtSwthch_D_Stat	Off	0x0	
	Parklamp	0x1	
	Headlamp	0x2	
	Autolamp	0x3	

1.9.36 MD-REQ-486457/A-Perimeter_Alarm_Status

Message Type: Status

Signal from the Perimeter Alarm Server with the status of Perimeter Alarm

Logical Signal Name	Literals	Value	Description
Perimeter_Alarm_Status	Disarmed	0x0	
	Preamed	0x1	
	Armed	0x2	
	Activated	0x3	



2 General Requirements

2.1 PWRMAN-FUN-REQ-014457/A-Infotainment System Power Mode Descriptions (TcSE ROIN-267992-1)

2.1.1 Sleep Node

Sleep Nodes are nodes that are required to function for some application domain specified duration while the vehicle ignition is in the OFF position.

2.1.1.1 PWRMAN-SR-REQ-014458/C-Sleep Node Power Consumption (TcSE ROIN-40618-1)

Sleep nodes shall implement a low power consumption mode (sleep).

2.1.1.2 PWRMAN-SR-REQ-014459/B-Sleep Node Components (TcSE ROIN-40619-1)

All Infotainment System components shall be designated as Sleep Nodes.

2.1.2 Remote Wakeup

A Remote Wakeup is the result of another components Local Wakeup Event

2.1.2.1 PWRMAN-SR-REQ-014460/B-Remote Wake-up processing (TcSE ROIN-40621-1)

All infotainment system components shall process Remote Wakeups

2.1.2.2 PWRMAN-SR-REQ-014461/B-Remote Wake-up Power Mode Transitions (TcSE ROIN-40622-2)

For all infotainment system components, a Remote Wakeup shall result in a transition from Sleep to Standby.

2.1.3 Local Wakeup Event

A Local Wake Event results when a sleep node detects a dedicated local input while in the sleep power mode.

2.1.3.1 PWRMAN-SR-REQ-014462/B-Local Wake-up Network initialization (TcSE ROIN-40624-1)

Local Wake Events shall result in the initialization of the Network by the component processing the Local Wake Event.

2.1.4 Self-Directed Process

A Self-Directed Process results when a sleep node detects a local event while in the sleep or standby power modes and does NOT require information exchange across the network. Not all infotainment system components are required to implement Self-Directed Wakeups. Refer to component engineering specifications for list of Self-Direct Processes.

2.1.4.1 PWRMAN-SR-REQ-014463/B-Self-Directed Process (TcSE ROIN-40626-1)

A Self-Directed Process shall be implemented in parallel with the power moding requirement such that once a Self-Directed Process is launched, transitions to other power modes shall not interrupt the Self-Directed process. For example, the process of ejecting a disc shall not be canceled as the result of a transition to functional mode.

2.1.5 Power Modes

2.1.5.1 PWRMAN-SR-REQ-014464/D-Power Mode States (TcSE ROIN-167435-1)

UNPOWERED

Characteristics of UNPOWERED Mode is insufficient supply voltage to power components.

- This is typically entered with loss of B+. Note when say loss of B+ in the SPSS this does not include normal operations such as warm and cold cranks and their associated voltage dips. Warm and cold crank as defined in Ford specifications shall not send a module into unpowered mode (unless explicitly noted as allowed).



SLEEP

Characteristics of SLEEP Mode are defined as follows:

- Lowest power consumption mode.
- Network State set to asleep (inactive), or in "Limp Home" state.
- Self-Directed Events are valid. No functionality beyond Self-Directed events.
- Remote Wake-up Events are valid.
- Local Wake-up Events are valid.
- Local events which don't wake up the bus can be active
- Infotainment System States supported: OFF & Display only mode (if doesn't require the network bus).

STANDBY

Characteristics of STANDBY Mode are defined as follows:

- Low power consumption mode.
- Infotainment audio sources are OFF (ex. Media sources, VR, Phone, TA, Prompts). Non-Infotainment features may be active (ex. chimes, clock/welcome/farewell screens, illumination, climate control...).
- Background tasks may be running (ex. active pre-fetch).
- Self-Directed Events are valid.
- Network Bus in Normal Operation. (some module(s) are allowed to go to sleep but remain powered up in Standby locally. See power moding requirements/diagrams for individual modules if this is applicable)
- Network Bus off condition can occur.
- Example of Infotainment System States supported: MMInactive / Display Only mode (10 Minute Clock mode, welcome, farewell...), Chime Only power mode mode

Note: in Load Shed mode more internal features may be turned off such as background tasks running that typically operate in Standby. The component functional requirements or ES specs determine what shall be turned off in load shed Standby state.

FUNCTIONAL

Characteristics of FUNCTIONAL Modes are defined as follows:

- Modules in normal operation and Infotainment system is ON (HMI can be active, sound available, ex infotainment features available: AM/FM, SDARS/DAB, CD, Phone, VR, USB, AUX, BT Audio...).
- Network Bus in Normal Operation. (some module(s) are allowed to go to sleep but remain powered up in Functional locally. See power moding requirements/diagrams for individual modules if this is applicable)
- Network Bus State off condition can occur.
- Infotainment System States supported: MMActive, Extended Play, Phone Mode

**2.2 PWRMAN-FUN-REQ-014465/B-Infotainment Network Management (TcSE ROIN-267993-1)****2.2.1 PWRMAN-SR-REQ-014466/I-Network Management (TcSE ROIN-40615-5)**

Power Mode State	HMI/Audio Mode / Multimedia System Signal	Infotainment Components	Module keeps network awake	Comments
Standby	OFF	System Master	Y / N	System Master keeps network awake if need to perform function with multiple modules
		AHU	Y / N	<ul style="list-style-type: none"> - For Load/Eject AHU to keep bus awake long enough for display modules to read AHU status signals so can update the HMI - The AHU shall keep the network awake as long as Power_Up_Chime_Modules = Active - The AHU shall keep the network awake as long as Demand_PwrModing = ON if Demand Power Moding feature supported and configured on. - When none of the above conditions are true the AHU shall not keep the network awake
		ICP (LIN)	N	
		EFP / ECP (CAN)	N	Reference climate control specifications for EFP climate control network management if EFP contains climate functionality When EFP/ECP is not on the info-CAN bus see "PWRMANv2-GREQ-198326-EFP Power Moding" AND "PWRMAN-GREQ-60372" for additional network management requirements When EFP/ECP on info-CAN bus then EFP/ECP "Module network awake" is always set to No.
		DSP AMP	Y / N	<ul style="list-style-type: none"> - The DSP AMP shall keep the network awake as long as Power_Up_Chime_Modules = Active - The DSP AMP shall keep the network awake as long as Demand_PwrModing = ON if Demand Power Moding feature supported and configured on. - When none of the above conditions are true the DSP AMP shall not keep the network awake
		RSEM / RACM	N	When modules are on the info-CAN bus
		Non-SDLC Gateway	Y / N	<ul style="list-style-type: none"> - Whenever the vehicle bus is active then the Non-SDLC Gateway keeps the info-CAN bus active. - The Non-SDLC Gateway applies to the CGEA 1.2 Cluster gateway. Does not apply to CGEA 1.3 Cluster or future architectures
		Cluster	Y / N	The Cluster shall keep the network awake as long as Power_Up_Chime_Modules = Active.
		Remote CD	N	
		AAM	N	
Functional	ON	System Master	Y	
		AHU	Y / N	<ul style="list-style-type: none"> - The AHU shall keep the network awake as long as Power_Up_Chime_Modules = Active - The AHU shall keep the network awake as long as Demand_PwrModing = ON if Demand Power Moding feature supported and configured on. - When none of the above conditions are true the AHU shall not keep the network awake
		ICP (LIN)	Y	
		EFP (CAN)	N	Reference climate control specifications for EFP climate control network management if EFP contains climate functionality See "PWRMANv2-GREQ-198326-EFP Power Moding" AND "PWRMAN-GREQ-60372" for additional network management requirements
		DSP AMP	Y / N	<ul style="list-style-type: none"> - The DSP AMP shall keep the network awake as long as Power_Up_Chime_Modules = Active - The DSP AMP shall keep the network awake as long as Demand_PwrModing = ON if Demand Power Moding feature supported and configured on.



				- When none of the above conditions are true the DSP AMP shall not keep the network awake
		RSEM / RACM	N	When modules are on the info-CAN bus
		Non-SDLC Gateway	Y / N	Non-SDLC Gateway infotainment sleep ready indication based on if the vehicle bus is awake. The Non-SDLC Gateway applies to the CGEA 1.2 Cluster gateway. Does not apply to CGEA 1.3 Cluster or future architectures
		Cluster	Y / N	The Cluster shall keep the network awake as long as Power_Up_Chime_Modules = Active.
		Remote CD	N	
		AAM	N	

Note: additional network management detail may be contained in functional requirements

-- For SWCM see PWRMAN-GREQ-40710-SWCM Power Moding

-- Demand Power Moding is only applicable when configured ON. If not a configuration item to configure ON then consider not supported and Demand_PwrModing signal will not keep the bus awake. Demand Power Moding no longer applies. If already in the code for legacy modules it can remain in there but new modules shall not include it in their code.

-- For the APIM PDC (Phoenix Domain Controller) the System Master and Cluster are the same module so both those requirements apply to APIM PDC



2.3 PWRMAN-FUN-REQ-014467/A-Power Mode Transition Timing (TcSE ROIN-267994-1)

2.3.1 PWRMAN-SR-REQ-014468/E-Bus wake-up transition times from Sleep Power Mode (TcSE ROIN-40700-3)

Upon bus awake from sleep mode infotainment modules shall transition to Ready to Receive (T1) within 100 msec.

- ~~Note: if a Tx module sends a CAN request to a Rx module before 100 msec has elapsed from bus wake-up then the CAN request may be missed.~~

Upon bus awake from sleep mode infotainment modules shall transition to Ready to Transmit (T2) within 150 msec.

~~Note: T2 is the FNOS CAN dB attributes ""NodeWakeUpTime". When the attribute NodeWakeUpTime is greater than 0 in the CAN dB then use the CAN dB attributes mentioned above for T1 and T2 otherwise use the SPSS values.~~

Reference the FNOS CAN dB attribute "NodeWakeUpTime" for T2 (ie bus wake-up to Ready to Transmit). T1 is considered the same as T2.

2.3.2 PWRMAN-SR-REQ-014469/D-Bus wake-up transition times from Unpowered Mode (TcSE ROIN-40701-3)

Upon bus awake from Unpowered mode modules shall transition to Ready to Receive (T1) within 950 msec.

Upon bus awake from Unpowered mode modules shall transition to Ready to Transmit (T2) within 1000 msec.

~~Note: T2 is the FNOS CAN dB attribute "NodeStartUpTime". When the attribute NodeWakeUpTime is greater than 0 in the CAN dB then use the CAN dB attributes mentioned above for T1 and T2 otherwise use the SPSS values.~~

Reference the FNOS CAN dB attribute "NodeStartUpTime" for T2 (ie bus wake-up from unpowered mode to Ready to Transmit). T1 is considered the same as T2.

2.3.3 PWRMAN-SR-REQ-014470/C-EFP and Cluster transition time to Standby (TcSE ROIN-40702-2)

Upon infotainment bus ready to transmit (T2) the EFP and Cluster shall transition to Standby mode (T3) within 500 msec.

Note Functional and Standby mode are the same for the EFP and Cluster.

2.3.4 PWRMAN-SR-REQ-014471/B-Infotainment Components transition time to Standby (TcSE ROIN-40703-3)

Upon infotainment bus ready to transmit (T2) the infotainment modules shall be able to support normal Standby operations (T3) within 500 msec.

If the infotainment component supports HMIAudioMode then the infotainment peripheral shall be able to act upon HMIAudioMode = ON no later than T3.

If the infotainment component supports Audio_Amp then the infotainment peripheral shall be able to act upon Audio_AMP = ON / Partial_AMP_Audio no later than T3.

2.3.5 PWRMAN-SR-REQ-014472/B-System Master transition time from Standby to Functional Power Mode (TcSE ROIN-40704-2)

The System Master shall be able to transition to functional power mode (T4) from standby power mode (T3) within 250 msec of setting the signal HMIAudioMode to 'ON'.

2.3.6 PWRMAN-SR-REQ-014473/E-System Master timing to send HMIAudioMode (TcSE ROIN-40705-2)

The Infotainment System Master shall set the HMIAudioMode signal equal to 'ON' after 500 msec from bus ready to Tx (T2) but no later than 550 msec from bus ready to transmit (T2) if the conditions to enter Functional Power Mode are met.



Note: If the Infotainment System Master cannot meet the timing above (must be OK'd by Ford D&R) then the Infotainment System Master might want to implement predictive triggers such that when the Ignition changes to Run the boot up time could be reduced.

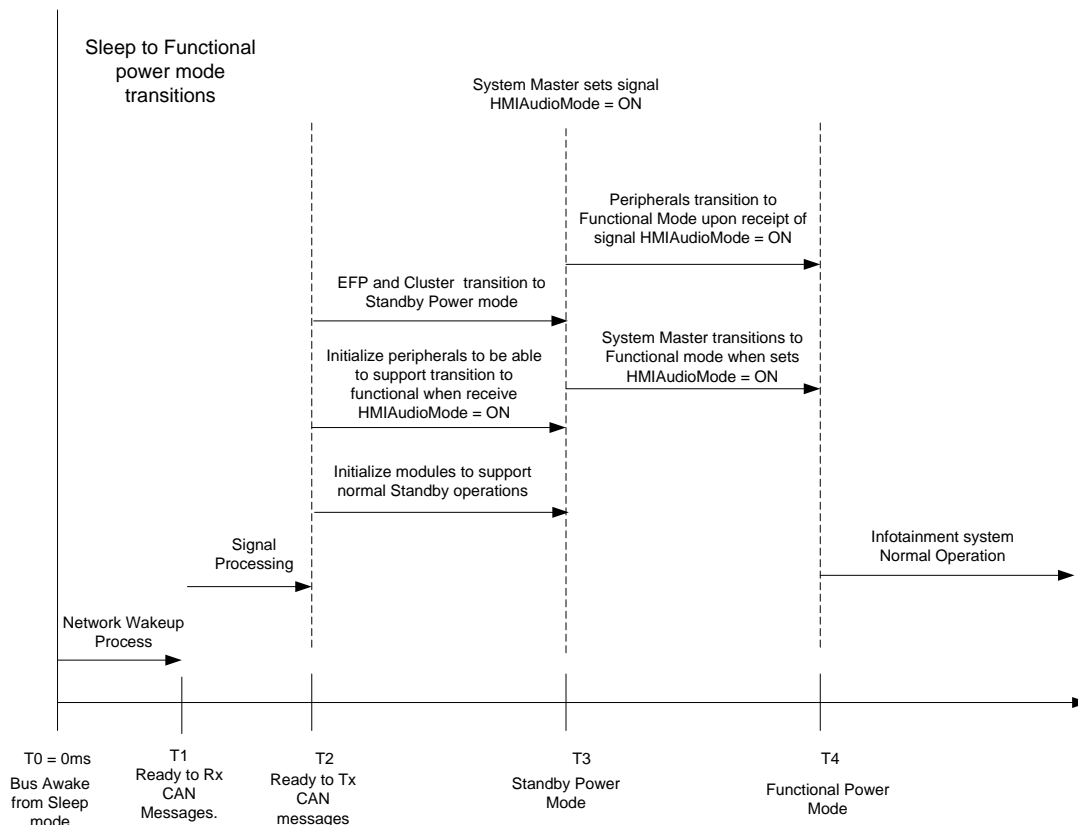
- Ex. If Door Unlock, Door Open or Approach Detection network signals are received by the System Master then those signals could potentially be used as predictive triggers where the System Master boots up internally even if there is no HMI or audio. By the time the user gets in the driver seat and changes ignition to Run the System Master may already be booted up or in the process of booting up reducing the time perceived by the customer for the infotainment system to power up.

2.3.7 PWRMAN-SR-REQ-014474/B-Infotainment components transition time from Standby to Functional Power Mode (TcSE ROIN-40706-2)

The infotainment peripherals (ie AHU, RSE...) shall be able to transition to functional power mode (T4) from Standby power mode (T3) within 250 msec of receiving the signal 'HMIAudioMode = ON'.

2.3.8 PWRMAN-SR-REQ-014475/C-Power Mode transitions Timing Table (TcSE ROIN-40707-2)

Infotainment modules shall follow the Power Mode Transitions as shown in the figure below.



Sleep to Functional Power Mode Transitions

**2.4 PWRMAN-FUN-REQ-014476/A-Power Management Infotainment System States (TcSE ROIN-267995-1)****2.4.1 PWRMAN-SR-REQ-014477/E-Infotainment System States (TcSE ROIN-40610-3)**

<u>System State</u>	<u>Power Mode State</u>	<u>Condition</u>	<u>Infotainment Bus Status</u>	<u>Result</u>
OFF	Sleep	N/A	OFF	Infotainment System OFF
<u>MM Inactive</u> <u>Stop Mode</u>	<u>Standby</u>	<u>HMIAudioMode = OFF</u> <u>Power_Up_Chime_Module = OFF</u>	<u>OFF</u>	<u>In Stop Mode as many current sources are tuned off as possible so in a low power state. This mode is used to improve start-up times</u>
MM Inactive	Standby	HMIAudioMode = OFF	ON	Background tasks may be running. Infotainment audio sources inactive (ex. AM/FM, SDARS/DAB, CD, VR, Bluetooth Phone, APIM, BT Audio, Prompts, USB, iPod...) Non-Infotainment Standby Features can be supported (ex. Chimes – if enabled, Climate Control – if CC entry conditions met), OTA (over the air software updates), Phone as a key phone charging, ECG key off power moding Display Only mode allowed if supported
MM Inactive Display only (ex.active clock, welcome, farewell etc)	Standby / Sleep	HMIAudioMode = OFF	ON / OFF	Background tasks may be running. HMI Output display as defined by the HMI. Infotainment audio sources inactive (ex. AM/FM, SDARS/DAB, CD, VR, Bluetooth Phone, APIM, BT Audio, Prompts, USB, iPod...) Non-Infotainment Standby Features can be supported (ex. Chimes – if enabled, Climate Control – if CC entry conditions met)
MM Inactive Chime Only Mode – when infotainment system OFF	Standby	HMIAudioMode = OFF Power_Up_Chime_Modules = Active	ON	Infotainment audio active for Chimes through the infotainment system Infotainment audio sources inactive (ex. AM/FM, SDARS/DAB, CD, VR, Bluetooth Phone, APIM, BT Audio, Prompts, USB, iPod...)
MM Inactive Phone as a Key phone charging - when infotainment system OFF	Standby / Sleep	HMIAudioMode = OFF PrsnlDevChrgEnbl_B_Rq = Active	ON / OFF	Phone charging ports are active to charge a phone (ex USB port) Infotainment audio sources inactive (ex. AM/FM, SDARS/DAB, CD, VR, Bluetooth Phone, APIM, BT Audio, Prompts, USB, iPod...)
MM Inactive ECG Key Off Power Moding	Standby / Sleep	HMIAudioMode = OFF KeyOffPwMde_D_Stat = ON	ON / OFF	ECG has Infotainment System Master powered up for a key off function (ex OTA function) Infotainment audio sources inactive (ex. AM/FM, SDARS/DAB, CD, VR, Bluetooth Phone, APIM, BT Audio, Prompts, USB, iPod...)
MM Active	Functional	HMIAudioMode = ON	ON	HMI active, sound available (sound can be off when audio stack is empty), infotainment features normal operation (ex. AM/FM, SDARS/DAB, CD, VR, Bluetooth Phone, APIM, BT Audio, USB, iPod...)
Extended Play	Functional	HMIAudioMode = ON	ON	HMI active, sound available (sound can be off when audio stack is empty), infotainment features normal operation



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				(ex. AM/FM, SDARS/DAB, CD, VR, Bluetooth Phone, APIM, BT Audio, Prompts, USB, iPod...) Enables user to listen to infotainment system when Ignition is OFF and Delay Acc is OFF
Phone Mode	Functional	HMIAudioMode = ON	ON	Phone call active through audio system. Note: independent of other System States while active

Note: MM Inactive the power mode states are not necessarily limited just to these.



3 Functional Definition

3.1 PWRMANv6-FUN-REQ-414687/A-System Master Power Moding - APIM PDC

3.1.1 PWRMANv6-SR-REQ-414688/B-System Master Power Moding - APIM PDC

The Infotainment System Master shall always remember the PowerMode state (ex MMAActive, Phone) between PowerMode signal transitions (Ignition Status = Run/Acc/Off, Delay_Acc...).

If the Ignition_Status signal is missing for more than 5 seconds in Run (or last state received was Run) then the System Master shall default to Standby Power mode with the infotainment system OFF.

If the Ignition_Status signal is set to Unknown in Run (or last state received was Run) then the System Master shall default to Standby Power mode with the infotainment system OFF.

If the Delayed Accessory signal is missing for more than 5 seconds in Run then the System Master shall assume Delayed_Accessory = OFF.

If the Veh_Lock_Status signal is missing for more than 5 seconds in Run then the System Master shall assume the missing signal state is unknown.

When Ignition_Status does not equal Run (ex. Accessory, OFF) and the System Master is no longer receiving the Ignition_Status, Delayed_Accessory or Veh_Lock_Status signals then the System Master shall assume the last state received of the signals.

To enter Functional Power Mode states from Standby the voltage at the system master shall be $10v < B+ < 16v$.

If during Functional Power Mode the voltage at the system master is $(B+ < 10v)$ OR $(B+ > 16v)$ for more than Thysterisis then the system shall turn the infotainment system OFF and enter Standby Power mode.

If entered Standby because the System Master was outside the allowable voltage range $(B+ < 10v)$ OR $(B+ > 16v)$ for more than Thysterisis then the System Master shall perform some voltage hysteresis before re-entering Functional power mode if the voltage re-enters at the defined voltage range.

- Ex. While in Run the voltage went below 10V for more than Thysterisis then the System Master enters Standby power mode. Then to re-enter functional power mode (ex crank the vehicle engine) the system master would add a voltage hysteresis such the system master goes to 10.5v for more than Thysterisis before re-entering functional power mode. If there is no voltage hysteresis then system could be continually be turned ON and OFF if on the voltage border.

When the power mode changes to Crank it will not cause a change in the current Power Mode System State (ex. won't exit phone mode, MMAActive) unless specifically noted elsewhere. Refer to the Station Management and Error Management SPSS for details of operation during Crank.

During a cold crank event if the power mode signal HMIAudioMode equals ON then the system master shall re-send HMIAudioMode = ON after the crank event ends but within 100 msec of the crank event ending (crank event ending as defined in "STMGNTv2-FUN-REQ-014669-Crank, Front System ON (CGEA 1.3)" / "STMGNT-FUN-REQ-014666-Crank, Front System ON (C1MCA)").

Upon a PowerMode signal change used to trigger a transition from Functional to a Standby power mode state the PowerMode signals shall be true for 100 msec +/- 10 msec before the transition occurs.

- For example, to transition out of Functional one of the triggers is Ignition_Status = OFF and Delay_Accy = OFF. If Ignition_Status = Accessory in functional and then for 10 msec equaled (Ignition_Status = OFF and Delay_Accy = OFF) and then goes back to and remains at (Ignition_Status = Accessory and Delay_Acc = OFF) then the System Master would remain in functional never transitioning to Standby (MMInactive, 10 Minute Clock mode).



	<u>Pre-Condition:</u> Last State of Audio Stack in MMActive / Phone Mode when Ignition Status changes to OFF and Delayed Accessory changes to OFF (ie HMIAudioMode transitions from ON to OFF)	<u>Event:</u> State of Extended Play when Ignition_Status changes from OFF to Run/ACC	<u>Post-Condition:</u> Audio Stack at Ignition_Status = Run/ACC
1	OFF	extended play never turned ON	OFF
2	OFF	extended play was turned ON and then OFF by user or timer expired	OFF
3	OFF	extended play is currently ON at transition	ON
4	ON	extended play never turned ON	ON
5	ON	extended play was turned ON and then OFF by user or timer expired	ON
6	ON	extended play is currently ON at transition	ON

OFF - empty audio stack, non-savable source active (ex Phone, VR...) with no savable
stacked source

ON - saveable Active Audio Source becomes active - AM/FM, SDARS, USB...

The Infotainment System Master is always powered up when Power_Up_Chime_Module = Active unless noted otherwise as an exception.

- See Chime SPSS requirement "[ALERT-SR-REQ-014735-Power-up time for infotainment components](#)" for details for time to first chime audio.

For ECG Key OFF Power Moding reference function: "[PWRMAN-FUN-295414-Key Off Power Moding – ECG and Infotainment System Master](#)"

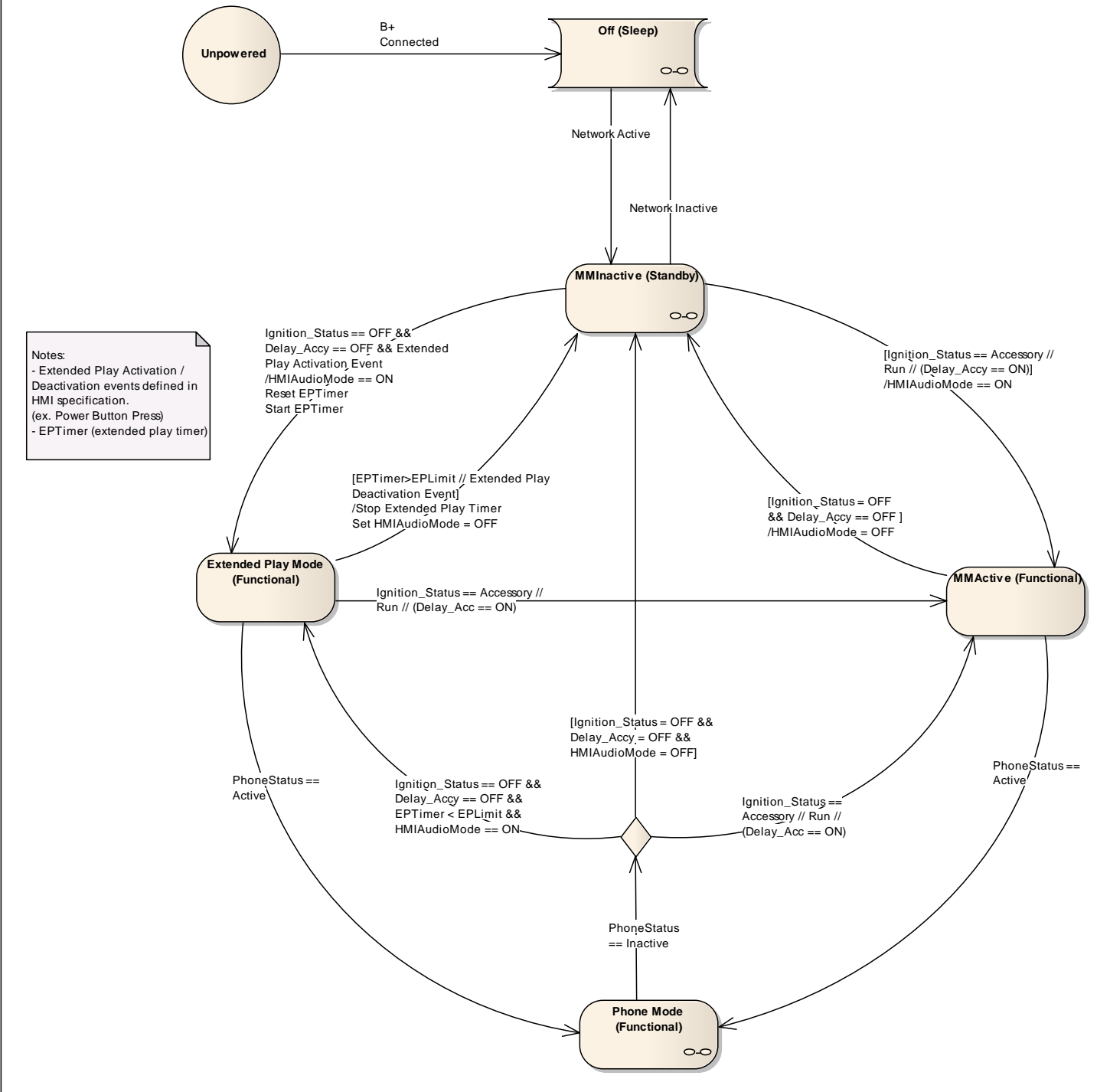
For Phone as a Key Phone Charging reference function: "[PWRMAN-FUN-233261-Phone as a Key – Phone Charging Power Moding](#)"

[For AVAS power mode reference function: "PWRMAN-FUN-422330-AVAS Power Mode"](#).

Power Mode Diagram:



stm System Master Power Modi...



See Phone, Chime and MMInactive/Sleep diagrams for internal power moding in those states

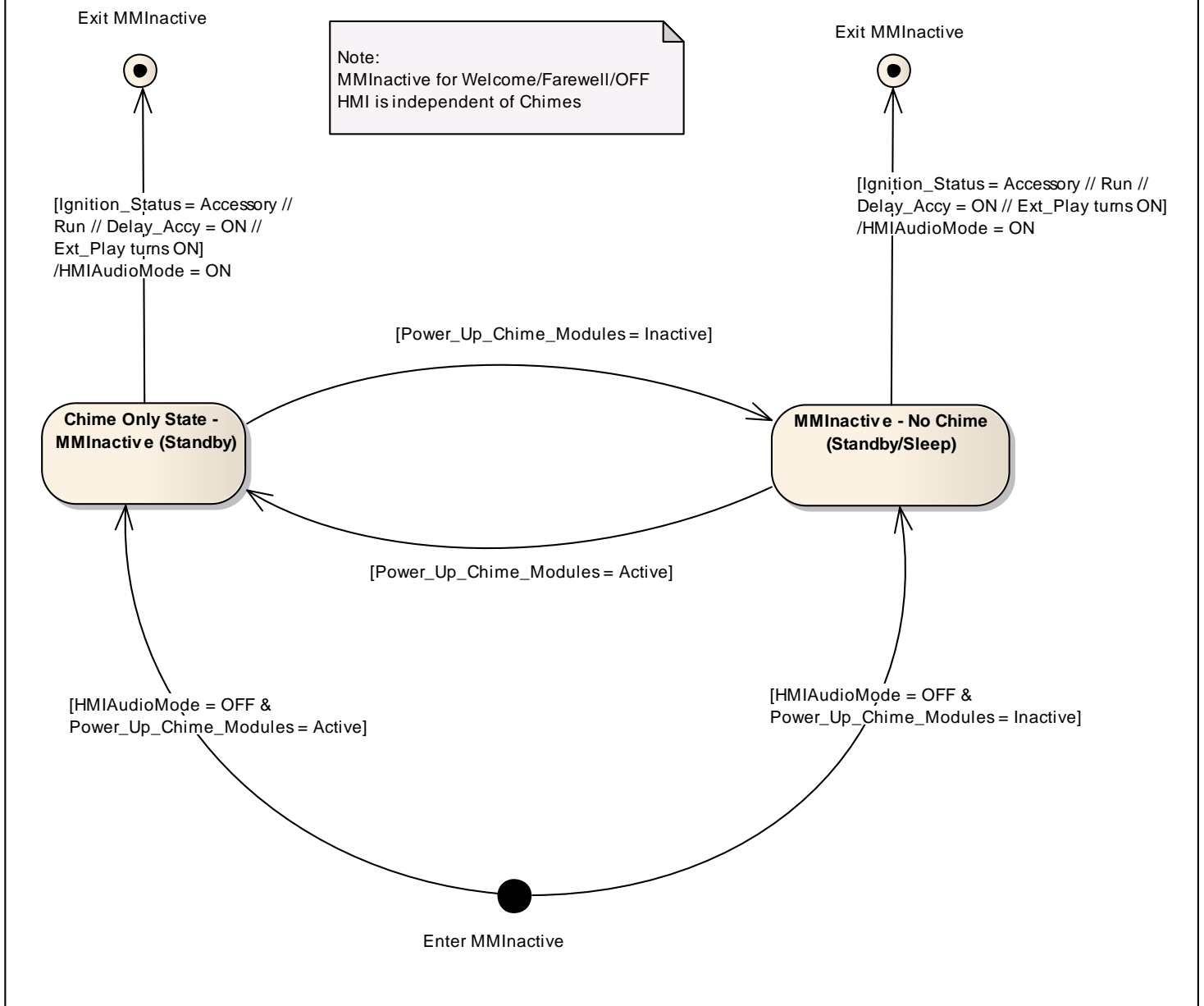
3.1.2 PWRMAN-TMR-REQ-030653/B-T_Hysteresis timer (TcSE ROIN-40635-1)

Name	Description	Units	Range	Resolution	Default
T_Hysteresis timer	Time that is required for the System Master to wait for the supply voltage to stabilize before transitioning to or from Functional Power Mode.	sec	0-20	1	10



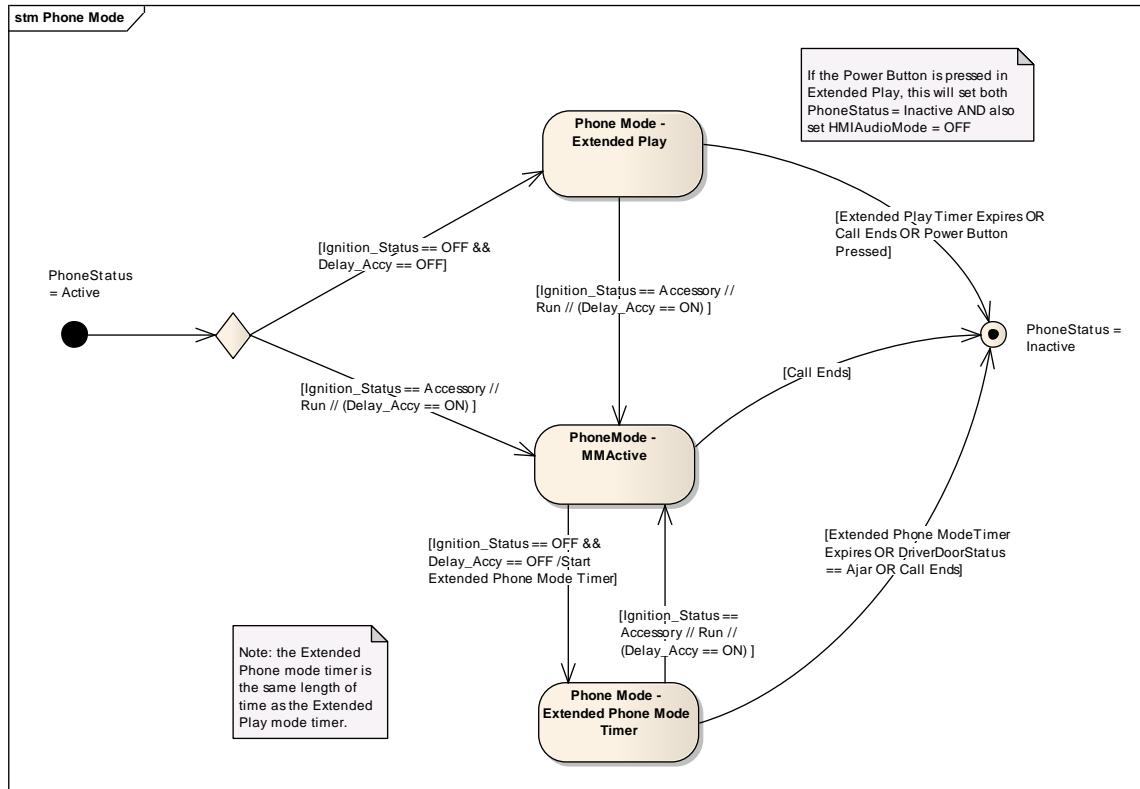
3.1.3 PWRMANv2-SR-REQ-414689/A-MMInactive_Chime Only Mode

stm Chime OnlyMo...

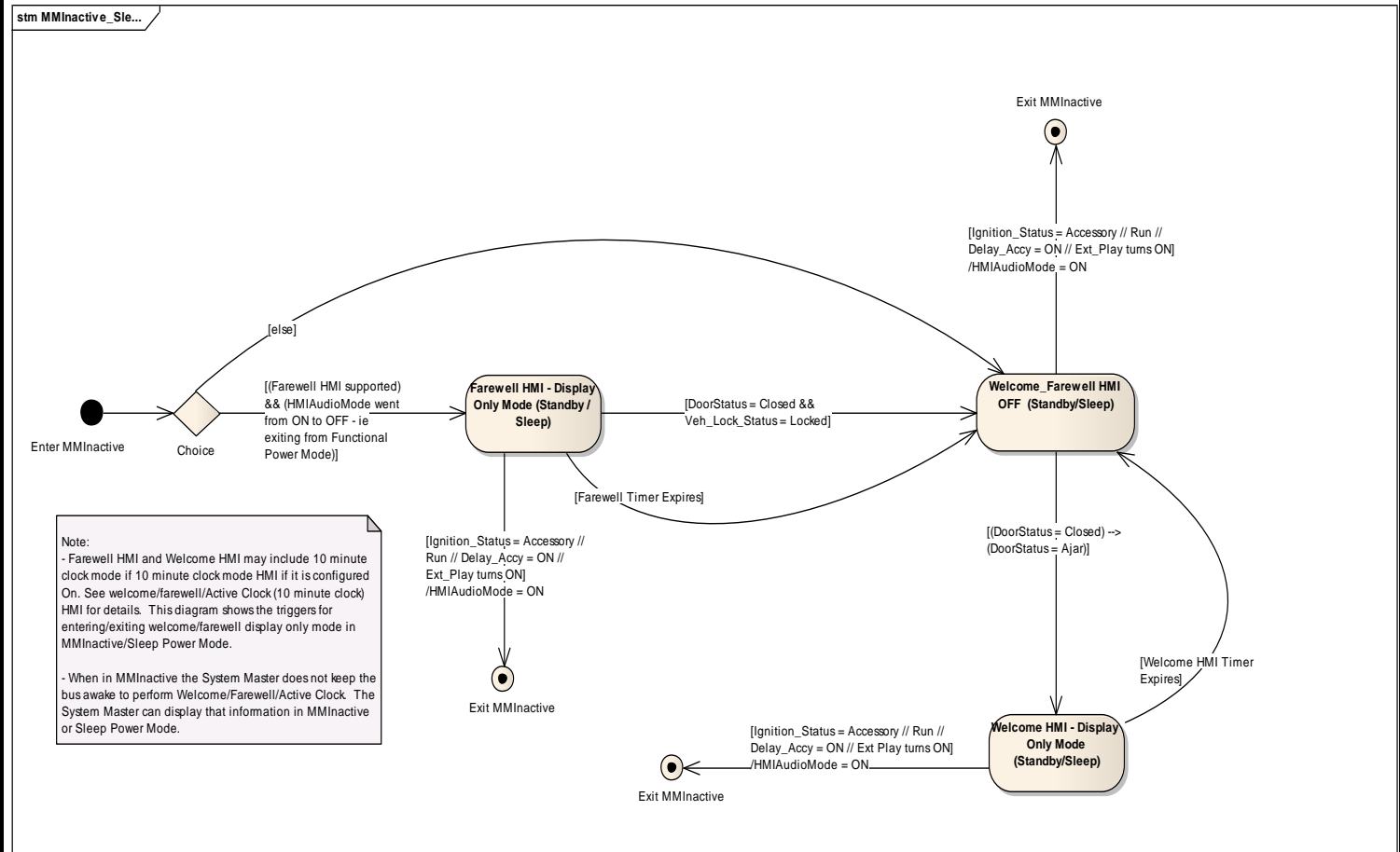




3.1.4 PWRMANv2-SR-REQ-031239/C-Phone Mode Power Moding (TcSE ROIN-275203-1)



3.1.5 PWRMAN-REQ-033882/C-MMInactive_Sleep Power Mode Diagram - Welcome_Farewell (TcSE ROIN-289985-2)



Note:

- this may be legacy and not supported. If there is a welcome / farewell specification, then follow the welcome / farewell specification and this is obsolete.
- If this is supported, this is only supposed to identify times the System Master needs to be powered for welcome and farewell in Standby/Sleep and not if the HMI is shown or for how long the HMI is shown if it is shown. See HMI specs for details.



3.2 PWRMAN-FUN-REQ-422330/A-AVAS Power Mode

3.2.1 Requirements

3.2.1.1 Physical Mapping of Classes

The table below shows how the logical classes may be mapped to physical modules for the AVAS power moding 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)
AVAS Internal Generator	APIM
AVAS Audio Source Server	PAC/AHU
AVAS Audio Components	APIM, PAC/AHU

3.2.1.2 PWRMAN-SR-REQ-473678/A-AVAS power mode state definitions

AVAS Sleep:

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

AVAS Standby:

AVAS Standby State is defined as the state where the CAN bus is active but AVAS functionality is not active and is powered down if possible.

- Note this can be a low power state if the AVAS Audio Source Server is not powered up for other non-AVAS features.

AVAS Functional:

AVAS Functional State is defined as the state where the CAN bus is active and AVAS functionality is powered up (including any external amps and speakers to support AVAS).

3.2.1.3 PWRMAN-SR-REQ-422324/B-Power-up for AVAS audio components

AVAS Audio Components shall transition from AVAS Standby/Sleep state to AVAS Functional state within 2 seconds of the Ignition_Status signal transitioning to Run.

- When the Ignition_Status signal changes to Start/Crank it will not cause a change in the current power mode system state (ex won't exit AVAS functional mode) unless specifically noted elsewhere.
- For the AVAS Internal Generator if the 2 second start-up time not possible then predictive triggers shall be used to improve start-up times to help improve the start-up time. Reference APIM requirement "[PWRMAN-REQ-3324997-Predictive Triggers – APIM](#)" for more details.
- Note: from sleep state this 2 second requirement to AVAS Functional starts at T0 on requirement "[PWRMAN-REQ-014475-Power Mode transitions Timing Table](#)" if the CAN bus is asleep.

When in AVAS Functional state the AVAS audio components shall be able to generate and play AVAS audio through infotainment external speakers. The AVAS components responsible for AVAS audio shall be capable of producing audio regardless of the following signal states:

- LifeCycMde_D_Actl signal whether set to Normal, Transport or Factory shall have no impact to AVAS power moding of AVAS audio components. This signal is a don't care for AVAS power moding.
- HMIAudioMode/HMI_HMIMode_St signal whether set to OFF, ON or Load Shed shall have no impact to AVAS power moding of AVAS audio components. This signal is a don't care for AVAS power moding.
- Power_Up_Chime_Module signal whether set to Active or Inactive shall have no impact to AVAS power moding of AVAS audio components. This signal is a don't care for AVAS power moding.



Only when the AVAS audio components DE bits are configured as enabled then the AVAS Audio Generator Server, AVAS Audio Source Server shall support the requirements covered in this spec (refer IDS spec for details of DE bits).

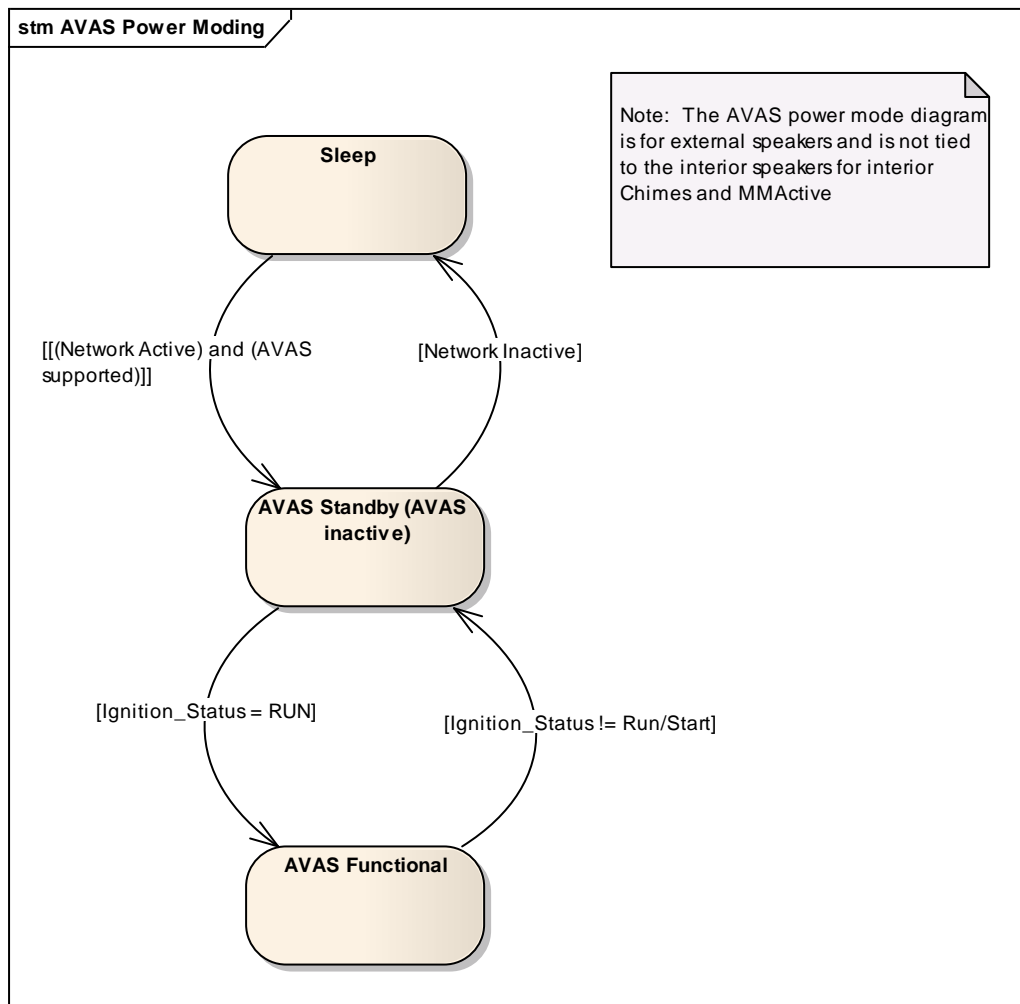
3.2.1.4 *PWRMAN-SR-REQ-435883/B-Power down for AVAS audio components*

When the Ignition_Status signal is not equal to Run or Start (ex OFF or Accessory) then the AVAS Audio Components shall transition to AVAS Standby state (or Sleep if the CAN bus is not active).

When the Ignition_Status signal is not equal to Run or Start (ex OFF or Accessory) AVAS audio components shall not be active, the AVAS audio components shall stop playing the AVAS audio (if active earlier) and shall support to gracefully mute the speaker audio channels within 150ms so that no audio blips or pops heard.

- To support the 150 msec gracefully mute the AVAS Audio Components shall wait 200 msec from Ignition_Status going from RUN/Start → OFF/Accessory before powering down AVAS functionality to give the AVAS audio components time to mute.

3.2.1.5 *PWRMAN-STM-REQ-473590/A-AVAS Power Mode state diagram - AVAS Audio Components*





3.3 PWRMAN-FUN-REQ-033883/B-MMAActive (TcSE ROIN-289933-1)

3.3.1 Use Cases

3.3.1.1 PWRMAN-UC-REQ-033884/A-Enter MMAActive – Enter MMAActive without going to Extended Play (TcSE ROIN-289140-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System Powered OFF Ignition Status is OFF Delayed Accessory is OFF Load Shed is not active Transport Mode is not active
Scenario Description	The user changes ignition status to Run/Acc
Post-conditions	The infotainment system powers ON in MMAActive
List of Exception Use Cases	N/A
Interfaces	Vehicle System Interface

3.3.1.2 PWRMAN-UC-REQ-033885/A-Exit MMAActive – key OFF and opening door (TcSE ROIN-289141-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System Powered ON Load Shed is not active Transport Mode is not active
Scenario Description	1. The user changes ignition status to OFF if not OFF already and remains powered up in delayed accessory 2. The user opens the driver or passenger door which cancels delayed accessory
Post-conditions	The infotainment system powers OFF and MMAActive is exited
List of Exception Use Cases	N/A
Interfaces	Vehicle System Interface

3.3.1.3 PWRMAN-UC-REQ-033886/A-Exit MMAActive – Delayed Accessory Expires (TcSE ROIN-289142-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System Powered ON Ignition Status is OFF Delayed Accessory is Active Load Shed is not active Transport Mode is not active
Scenario Description	The Delayed Accessory timer expires
Post-conditions	The infotainment system powers OFF and MMAActive is exited
List of Exception Use Cases	N/A
Interfaces	Vehicle System Interface



3.4 PWRMAN-FUN-REQ-033887/B-Extended Play (TcSE ROIN-289937-1)

3.4.1 Use Cases

3.4.1.1 PWRMAN-UC-REQ-033888/A-Enter Extended Play Mode (TcSE ROIN-289135-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System Powered OFF Ignition Status is OFF Delayed Accessory is OFF Load Shed is not active Transport Mode is not active
Scenario Description	The user selects <Infotainment ON> via HMI
Post-conditions	The infotainment system turns ON and enters Extended Play mode
List of Exception Use Cases	N/A
Interfaces	CBI

3.4.1.2 PWRMAN-UC-REQ-033889/A-Exit Extended Play Mode - User turns OFF Extended Play (TcSE ROIN-289136-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System Powered ON Extended Play is active Ignition Status is OFF Delayed Accessory is OFF Load Shed is not active Transport Mode is not active
Scenario Description	The user selects <infotainment OFF> via HMI
Post-conditions	The Infotainment System Powers OFF and Extended Play is exited
List of Exception Use Cases	N/A
Interfaces	CBI

3.4.1.3 PWRMAN-UC-REQ-033890/A-Exit Extended Play Mode - Extended Play Mode timer expires (TcSE ROIN-289137-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System Powered ON Extended Play is active Ignition Status is OFF Delayed Accessory is OFF Load Shed is not active Transport Mode is not active
Scenario Description	The Extended Play Mode timer expires
Post-conditions	The Infotainment System Powers OFF and Extended Play is exited



List of Exception Use Cases	N/A
Interfaces	CBI

3.4.1.4 *PWRMAN-UC-REQ-033891/A-Exit Extended Play Mode – Ignition Status changes to Run/Acc (TcSE ROIN-289138-1)*

Actors	Vehicle Occupant
Pre-conditions	Infotainment System Powered ON Extended Play is active Ignition Status is OFF Delayed Accessory is OFF Load Shed is not active Transport Mode is not active
Scenario Description	The ignition status changes to Run/ACC
Post-conditions	The Infotainment System Remains Powered ON in Run/ACC and Extended Play becomes inactive
List of Exception Use Cases	N/A
Interfaces	CBI

3.4.1.5 *PWRMAN-UC-REQ-033892/A-Exit Extended Play Mode – Transport / Load Shed active (TcSE ROIN-289139-1)*

Actors	Vehicle Occupant
Pre-conditions	Infotainment System Powered ON Extended Play is active Ignition Status is OFF Delayed Accessory is OFF Load Shed is not active Transport Mode is not active
Scenario Description	A Transport Mode or Load Shed event turns OFF the infotainment system
Post-conditions	The Infotainment System Powers OFF with {HMI Indication} for Load Shed or Transport Mode
List of Exception Use Cases	N/A
Interfaces	CBI

3.4.2 Requirements

3.4.2.1 *PWRMAN-SR-REQ-014500/B-Extended Play Supported / Not Supported (TcSE ROIN-40652-1)*

Extended Play mode shall be configurable Supported / Not Supported. Reference IDS specification for details.

3.4.2.2 *PWRMAN-SR-REQ-014501/C-Extended Play Configuration Times (TcSE ROIN-40653-1)*

Extended Play mode shall be configurable for various times up to 1 hour. Reference IDS specification for details.



3.5 PWRMAN-FUN-REQ-033893/B-Phone Mode (TcSE ROIN-289941-1)

3.5.1 Use Cases

3.5.1.1 PWRMAN-UC-REQ-033894/A-Entering Phone Mode (TcSE ROIN-289143-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System Powered ON in MMActive or Extended Play
Scenario Description	The user places or receives a Phone Call
Post-conditions	The infotainment system enters Phone Mode
List of Exception Use Cases	N/A
Interfaces	CBI (Center Stack Button Interface – Touch/Non Touch) G-HMI (Graphic HMI) SWC (Steering Wheel Control)

3.5.1.2 PWRMAN-UC-REQ-033895/A-Exit Phone Mode during MMActive Phone Mode (TcSE ROIN-289145-1)

Actors	Vehicle Occupant
Pre-conditions	Phone Call is active Infotainment System Powered ON Ignition Status is Run/ACC or Delayed Accessory is Active Load Shed is not active Transport Mode is not active
Scenario Description	Call is ended
Post-conditions	Phone mode is exited and the applicable power mode state is entered
List of Exception Use Cases	N/A
Interfaces	CBI (Center Stack Button Interface – Touch/Non Touch), G-HMI (Graphic HMI), SWC (Steering Wheel Control)

3.5.1.3 PWRMAN-UC-REQ-033896/A-Exit Phone Mode during Extended Play (ie Extended Play Phone Mode) (TcSE ROIN-289144-1)

Actors	Vehicle Occupant
Pre-conditions	Phone Call is active Infotainment System Powered ON Extended Play is active (ignition status is OFF and Delayed Acc is OFF) Load Shed is not active Transport Mode is not active
Scenario Description	Call is ended, or Extended Play timer expires, or Power Button is pressed
Post-conditions	Phone mode is exited: If the Extended Play timer expires or Power Button is pressed the infotainment system turns OFF.



	If the call is ended and extended play is still active then the infotainment system will remain in extended play
List of Exception Use Cases	N/A
Interfaces	Vehicle System Interface

3.5.1.4 PWRMAN-UC-REQ-033897/A-Exit Phone Mode during Extended Phone Mode (TcSE ROIN-289146-1)

Actors	Vehicle Occupant
Pre-conditions	Phone Call is active Infotainment System Powered ON With Ignition Status at OFF the Delayed Accessory timer expired during Phone Call and went to Extended Phone Mode Load Shed is not active Transport Mode is not active
Scenario Description	Call is ended, or Extended Phone Mode timer expires, or the driver door becomes ajar
Post-conditions	Phone mode is exited and the infotainment system powers off
List of Exception Use Cases	N/A
Interfaces	CBI (Center Stack Button Interface – Touch/Non Touch), G-HMI (Graphic HMI), SWC (Steering Wheel Control)



3.6 PWRMANv2-FUN-REQ-096800/B-Load Shed Strategy

3.6.1 Use Cases

3.6.1.1 PWRMAN-UC-REQ-033907/A-Entering Load Shed Low Power State (TcSE ROIN-289147-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System Powered ON in MMActive or Extended Play Load Shed is not active The engine is OFF Transport Mode is not active eCall is not active
Scenario Description	A Load Shed event occurs while the engine is OFF
Post-conditions	The Infotainment System enters MMInactive state with an Engine OFF Load Shed {HMI indication} for an appropriate amount of time.
List of Exception Use Cases	N/A
Interfaces	Vehicle System Interface

3.6.1.2 PWRMAN-UC-REQ-033908/A-Exiting Load Shed Low Power State (TcSE ROIN-289901-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System Powered OFF in Load Shed The engine is OFF Transport Mode is not active eCall is not active
Scenario Description	The Load Shed event is ended
Post-conditions	The Infotainment System exits Load Shed mode and enters the applicable power mode state. If Ignition Status is Run/Acc or Delayed Accessory is active then MMActive would be entered. If Ignition Status is OFF and Delayed Accessory is OFF (even if previous power mode state was extended play) then MMInactive would be entered
List of Exception Use Cases	N/A
Interfaces	Vehicle System Interface

3.6.2 Requirements

3.6.2.1 PWRMAN-SR-REQ-014507/B-Signals initiating an Engine OFF Infotainment Load Shed Event (TcSE ROIN-40679-2)

Unless noted otherwise the following load shed signals shall initiate an 'Engine OFF Infotainment Load Shed Event' for the System Master when:

- '_Battery_Mgmt_2 : Batt_Lo_SoC_B = Active' AND
 1. '_Battery_Mgmt_2 : Shed_Level_Req = SOON_ENG_OFF' OR
 2. '_Battery_Mgmt_2 : Shed_Level_Req = SHED_ENG_OFF'



OR

- '_Battery_Mgmt_2 : Batt_Crit_SoC_B = Active' AND
 1. '_Battery_Mgmt_2 : Shed_Level_Req = SOON_ENG_OFF' OR
 2. '_Battery_Mgmt_2 : Shed_Level_Req = SHED_ENG_OFF'

OR

- '_Battery_Mgmt_2 : Shed_Drain_Eng_Off_B = Active' AND
 1. '_Battery_Mgmt_2 : Shed_Level_Req = SOON_ENG_OFF' OR
 2. '_Battery_Mgmt_2 : Shed_Level_Req = SHED_ENG_OFF'

OR

- '_Battery_Mgmt_2 : Shed_T_Eng_Off_B = Active' AND
 1. '_Battery_Mgmt_2 : Shed_Level_Req = SOON_ENG_OFF' OR
 2. '_Battery_Mgmt_2 : Shed_Level_Req = SHED_ENG_OFF'

3.6.2.2 PWRMAN-SR-REQ-014508/B-System Master Load Shed Event Activation Process (TcSE ROIN-40680-3)

If an 'Engine OFF Infotainment Load Shed Event' is occurring then:

1. The System Master shall disconnect the audio source and then turn the infotainment system OFF by setting the HMIAudioMode = Load Shed
2. After the System Master turns OFF the infotainment system then a Load Shed message can be displayed as called out in by the HMI.
3. After displaying the HMI the System Master shall vote to go to sleep if no other non-infotainment features are required from the system master.

Note: when a Load Shed event and Transport Mode event are active at the same time the load shed event shall take priority. This includes any HMI displayed to the user.

3.6.2.3 PWRMAN-SR-REQ-014509/I-Infotainment Components Load Shed State requirements (TcSE ROIN-66172-3)

Unless otherwise noted the infotainment components shall transition to their Standby or Sleep Load Shed low power state when the signal HMIAudioMode == Load Shed.

In the Standby Load Shed low power state non-essential component functions shall be turned OFF (ex. active pre-fetch). Basic standby operations will still be followed such as supporting the Network bus and any regulatory requirements.

Note: There may also be applicable Climate Control load shed requirements for modules that support Climate Control functionality. See Climate specifications for details.

Chimes and Load Shed:

- The infotainment components that support chimes (ex. AHU, DSP AMP, AAM, ANC...) during a transition to load shed from state where chimes are through the infotainment system shall wait until the Cluster transfers control of the chimes back to the Cluster (as defined in ALERT-REQ-014761-Load Shed) before entering their low power states.
- Since the infotainment components that support chimes have to wait for Cluster to transfer chime control back to the Cluster (ie IPC_Infotainment : Chime_Source = Cluster) during a load shed event before they no longer support chimes the infotainment components would have Chime_Supported = Supported while supporting chimes.
- After chime control is transferred to the Cluster the infotainment components shall change Chime_Supported = Not_Supported while the load shed is active.

Chimes and Load shed – variant 3: (applies to Phoenix architecture)

- APIM PDC (Cluster and Chime Generator in one module): when HMIAudioMode = Load Shed the integrated Chime Client and Chime Generator shall use the VMCU back-up speaker and set Power_Up_Chime_Modules = Inactive and Chime_Source = Cluster.



- The PDC CCPU, AHUv2 and DSPv2 shall set their Chime_Supported signals equal to Not_Supported "Inactive" while a load shed event is active.
 - Note: Chime_Supported set to Inactive allow the chimes to go back to the infotainment system when the load shed event ends (ex engine is running). Chime_Supported = Not_Supported would lock out chimes for that whole ignition cycle.

~~Chimes and Load Shed — variant 2: (applies to SYNC 4.2)~~

- ~~SYNC 4.2 (AHU and Cluster in one module): when HMIAudioMode = Load Shed the integrated Chime Client and Chime Generator shall use the back-up speaker(s) and set Power_Up_Chime_Modules = Inactive and Chime_Source = Cluster (as defined in "Alertv2-REQ-372081-Load Shed — SYNC 4.2").~~

3.6.2.4 PWRMANv2-SR-REQ-014511/B-Infotainment Components transition from Load Shed State to Normal Operation (TcSE ROIN-275491-1)

For the System Master if a Load Shed event is ended after previously being active in the same ignition cycle then the infotainment system can return to its previous audio source in functional power mode. This does not apply in Extended Play mode when Ignition_Status = OFF and Delay_Accy = OFF.

The infotainment components shall become operable again if the signal HMIAudioMode changes from 'Load Shed' to 'ON' (functional) or 'OFF' (standby functions).

3.6.2.5 PWRMAN-SR-REQ-014512/C-Load Shed and High Criticality features (TcSE ROIN-40683-3)

For a particular module the module team needs to determine what/if there are high criticality items that will not be shut down for load shed. The items below should not be prevented from operating during a load shed event (not limited to the items below):

eCall:

If a priority assist call is active then the call does not have to be ended for a load shed event (System Master can keep HMIAudioMode = "ON" instead of going to "Load Shed").

If there is a load shed event currently active (HMIAudioMode = Load Shed) and a priority assist call needs to take place then the load shed event can be ended by the System Master (HMIAudioMode = Load Shed to ON) so the call can be made.

Reference priority assist phone requirements / HMI for different ways to end/place a priority assist phone call during a load shed event.

Phone as a Key Phone Charging:

For Phone as a Key a load shed event shall not prevent the phone charging module charging ports (ex SYNC USB) from being able to charge a phone when PrsnlDevChrgEnbl B Rq = Active.

- Note: the phone charging needs to be supported in case the user's phone is dead and they need to be able to charge it enough to start the vehicle.

3.6.2.6 PWRMAN-SR-REQ-014513/C-Ending a Load Shed Event (TcSE ROIN-40684-4)

The System Master shall end the load shed event and no longer have 'HMIAudioMode = Load Shed Active' when the signal Shed_Level_Req = NO_SHED or when the conditions in "PWRMAN-GREQ-014507-Signals initiating an Engine OFF Infotainment Load Shed Event" are no longer met.

3.6.2.7 PWRMANv2-SR-REQ-014515/B-EFP Load Shed (TcSE ROIN-278270-2)

If EFP supports load shed for infotainment it shall then shed loads as defined in the EFP component spec(s) when:

1. The signal "HMIAudioMode = Load Shed", AND
2. The signal "Ignition_Status = OFF or Accessory", AND
3. Doesn't violate any climate control, illumination or regulatory requirements

Note: Follow any Climate load shed requirements defined in applicable climate specifications.



Load Shed is not supported for Infotainment EFP functionality. When the EFP in a load shed state (could be in load shed for other EFP functionality such as climate control...) the EFP shall still support infotainment power moding and be able to send a infotainment button press whenever the CAN bus is active.

Note: When HMIAudioMode = Load_Shed then the EFP shall treat this the same as HMIAudioMode = OFF / Multimedia_System = OFF.

3.6.2.8 PWRMAN-SR-REQ-014516/C-SWCM Load Shed (TcSE ROIN-66176-2)

If the Steering Wheel Control module supports load shedding from the vehicle then during a load shed event the SWCM module cannot power down the infotainment buttons functionality whenever the Multimedia_System = ON / HMIAudioMode = ON (note if HMIAudioMode = ON the infotainment system is not in a load shed state even if the vehicle is).

- Example: The SWCM infotainment buttons would be operational during a priority assist call when the infotainment system is on regardless if the vehicle itself is in a load shed state (ie vehicle load shed modules sending network signals in a load shed state but HMIAudioMode = ON meaning the infotainment system is ON).

If the Steering Wheel Control module supports load shedding from the vehicle then during a load shed event the SWCM can support load shed from the vehicle if Multimedia_System = OFF / HMIAudioMode = (OFF / Load Shed).

Note: if the SWCM receives the HMIAudioMode signal instead of the Multimedia_System signals for a program CAN dB then the signals can be used interchangeably.

- Multimedia_System = OFF is the same as HMIAudioMode = OFF or HMIAudioMode = Load Shed.
 - HMIAudioMode = Load Shed means the infotainment system is in a load shed state.
- Multimedia_System = ON is the same as HMIAudioMode = ON.



3.7 PWRMANv2-FUN-REQ-095504/D-Transport Mode Power Moding

3.7.1 Transport Mode Overview

Transport Mode is a low power state, to conserve the life of the battery, from when the vehicle leaves the factory until it gets to the dealership.

3.7.2 Use Cases

3.7.2.1 PWRMAN-UC-REQ-033910/D-Entering Transport Mode Low Power State (TcSE ROIN-289902-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System Powered ON in MMActive or Extended Play <u>CGEA 1.2 / C1MCA architecture</u> (legacy architectures): Ignition Status is OFF or Accessory <u>CGEA 1.3 / FNV2+ architecture</u> : Ignition Status is OFF, Acc, or Run with engine off (but not engine off because of a start-stop engine off event) Transport Mode is not active Load Shed is not active eCall is not active
Scenario Description	Transport Mode becomes Active
Post-conditions	The Infotainment System enters Transport Mode low power state with an {HMI indication} (HMI indication if applicable).
List of Exception Use Cases	N/A
Interfaces	Vehicle System Interface
Notes	Use case applicable for the HMI post-condition only if the HMI specs support this use case. See HMI specs for details When say CGEA 1.3, FNV2+ architectures, the plus means that applies to all future architectures

3.7.2.2 PWRMAN-UC-REQ-033911/C-Exiting Transport Mode Low Power State by changing vehicle power mode state (TcSE ROIN-289903-1)

Actors	Vehicle Occupant
Pre-conditions	Infotainment System Powered OFF in Transport Mode <u>CGEA 1.2 / C1MCA architecture</u> (legacy architectures): Ignition Status is OFF or Accessory <u>CGEA 1.3 / FNV2+ architecture</u> : Ignition Status is OFF, Acc, or Run with engine off (but not engine off because of a start-stop engine off event) Load Shed is not active eCall is not active
Scenario Description	<ul style="list-style-type: none">- For CGEA 1.2 / C1MCA architectures the user changes Ignition Status to Run- For CGEA 1.3 / FNV2+ architectures the user starts the engine.
Post-conditions	The Infotainment System exits Transport Mode and enters MMActive
Notes	When say CGEA 1.3, FNV2+ architectures, the plus means that applies to all future architectures
Interfaces	Vehicle System Interface



3.7.2.3 *PWRMAN-UC-REQ-033912/C-Exiting Transport Mode Low Power State when vehicle is no longer in Transport Mode (TcSE ROIN-289906-1)*

Actors	Vehicle Occupant
Pre-conditions	Infotainment System Powered OFF in Transport Mode Ignition Status is OFF or Accessory Load Shed is not active eCall is not active
Scenario Description	The Transport Mode event is ended
Post-conditions	The Infotainment System enters the applicable power mode state. If Ignition Status is Acc or Delayed Accessory is active then MMActive would be entered. If Ignition Status is OFF and Delayed Accessory is OFF then MMInactive would be entered
List of Exception Use Cases	N/A
Interfaces	Vehicle System Interface

3.7.3 Requirements

3.7.3.1 *PWRMANv2-SR-REQ-014519/J-Transport Mode (TcSE ROIN-278271-1)*

When the infotainment components receive the signal LifeCycMde_D_Actl / CarMode = Transport' indicating Transport Mode is Active AND receive the 'HMIAudioMode = OFF' from the System Master then the infotainment system shall transition to Standby power mode in their transport mode low power state. The infotainment components shall exit Transport Mode low power state when either of these conditions are no longer true (ie: exit if HMIAudioMode = ON, OR LifeCycMde_D_Actl / CarMode != Transport).

The System Master shall enter Transport mode low power state only when:

- LifeCycMde_D_Actl / CarMode = Transport, and
- Ignition_Status = OFF, or Ignition_Status = Accessory, or Ignition_Status = Run and Eng_D_Stat does not equal EngON or EngAutoStopped (ie engine OFF – the driver hasn't started the engine).

The System Master shall set HMIAudioMode = OFF while in Transport Mode low power state. Unless noted otherwise the System Master shall exit Transport Mode low power state when these conditions are no longer true (ie LifeCycMde_D_Actl / CarMode != Transport or Ignition_Status = RUN and End_D_Stat = EngON or EngAutoStopped).

10 minute clock mode is inactive during Transport mode.

During Transport mode Climate requirements, illumination requirements, and regulatory requirements shall be followed as defined for Transport mode. Refer to the applicable Climate and Illumination specifications for details.

Refer to Operational Mode Management Specification for details of when LifeCycleMode is set to Transport mode.

Note: CarMode is generic for this requirement and is any signal that contains the Transport Mode signal for a given architecture (ex. CGEA 1.3 LifeCycleMode is the CAN signal with Transport Mode).

Note: this requirement is for CGEA 1.3+ vehicles

3.7.3.2 *PWRMAN-SR-REQ-014520/H-Transport Mode and CGEA Chimes (TcSE ROIN-40663-3)*

Audio Chimes shall NOT be enabled through the Infotainment System during Transport Mode. The Cluster shall support Chimes during Transport Mode.



During a transition to Transport Mode from another LifeCycMde_D_Actl/CarMode state where the chimes are through the infotainment system the Cluster shall set the 'Chime_Source' signal equal to 'Cluster' and Power_Up_Chime_Modules = Inactive.

- ~~The infotainment components that support chimes shall wait until the Cluster transfers control of the chimes back to the Cluster with the 'Chime_Source = Cluster' AND 'Power_Up_Chime_Module = Inactive' before entering their transport mode low power states.~~
 - ~~Since the infotainment components that support chimes have to wait for Cluster to transfer chime control back to the Cluster during a transport mode event before they no longer support chimes the infotainment components would have Chime_Supported = Supported while supporting chimes. After chime control is transferred to the Cluster the infotainment components can change Chime_Supported = Not_Supported while transport mode is active.~~
 - Legacy Infotainment components can continue follow the requirement above with strikethroughs (if already implemented) where they wait for the Cluster before setting Not_Supported. New modules (ex new AHU, DSP AMP) shall set Chime_Supported = Not_Supported when LifeCycMde_D_Actl = Transport.
- For the Phoenix architecture the AHUv2 and DSP AMPv2 shall set their Chime_Supported signals to Not_Supported when LifeCycMde_D_Actl = Transport.



3.8 PWRMAN-FUN-REQ-031040/A-Button Activation in Sleep Power Mode (TcSE ROIN-268143-1)

3.8.1 Requirements

3.8.1.1 PWRMAN-SR-REQ-030665/E-Button Activation in Sleep Power Mode (TcSE ROIN-60372-4)

For button activation events while the Button Input Client module (ex EFP/ECP or Rear EFP if applicable) is asleep the Button Input Client shall be capable of waking up the bus to Standby Power Mode to Tx the button press. This is only for buttons allowed to wake-up the bus.

Unless noted otherwise by the Ford Button Input Client D&R engineer the Front Power button <Infotainment On>, [Rear Power Button <Infotainment On> \(if supported\)](#), and Eject button when pressed shall wake up the bus when the Button Input Client is asleep so that those button presses can be sent out.

The Receiving module (ex System Master/APIM/MFD/CHR...) shall be capable of receiving the button press within 100 msec of bus wake-up (ie T1 - Ready to Receive) and capable of processing the button press once it enters Standby power mode.

Entering Extended Play mode: The user selects <Infotainment ON> via the Button Input Client while the bus is asleep. The Button Input Client wakes up the bus, transmits the button for <Infotainment ON> to the System Master while in Standby Power mode. The System Master processes the button press and turns the infotainment system ON in Extended Play Mode.

3.9 PWRMAN-FUN-REQ-031041/A-Disc Load / Eject (TcSE ROIN-268144-1)

3.9.1 Requirements

3.9.1.1 PWRMAN-SR-REQ-030666/C-Load / Eject in any Power Mode state (TcSE ROIN-40673-2)

In a CAN or network based infotainment system

The power mode state shall not prevent the user from inserting/ejecting a disc into the CD/DVD mechanism. Exception Unpowered mode.

Reference requirement "[SCD-UC-REQ-020450-Disc Eject, Audio Resource Server OFF, Vehicle OFF \(TcSE ROIN-0912-1\)](#)" for additional details when infotainment system is off (ie HMIAudioMode = OFF) and ejecting disc.

In an infotainment system without CAN or a network base of communication

Prevent the user from inserting/ejecting a disc into the CD/DVD mechanism when it is in the SLEEP MODE or UNPOWERED MODE.

Allow the user to insert/eject disc into the CD/DVD mechanism when it is in the STANDBY MODE or FUNCTIONAL MODE.



3.10 PWRMAN-FUN-REQ-233261/B-Phone as a Key - Phone Charging Power Moding

3.10.1 Use Cases

3.10.1.1 PWRMAN-UC-REQ-233263/B-Phone as a Key - Charging a Phone when the infotainment system is OFF

Actors	Vehicle Occupant
Pre-conditions	<p>The infotainment system is powered OFF so there no infotainment audio (ie HMIAudioMode = OFF).</p> <p>The Vehicle System is not requesting infotainment be capable of charging a phone (ie PrsnlDevcChrgEnbl_B_Rq = Inactive)</p>
Scenario Description	The Vehicle System request the infotainment system to be capable of charging a phone (ie PrsnlDevcChrgEnbl_B_Rq = Active)
Post-conditions	<p>The infotainment phone charging ports (ex USB) are able to charge a phone</p> <p>The infotainment system is powered OFF so no infotainment audio (ie HMIAudioMode = OFF)</p>
Notes	An example of when this might happen would be if the user's phone battery is dead and they enter the vehicle through the keypad (or door left unlocked), but with a dead phone battery they cannot start the car. The vehicle may use a strategy to determine if a person needs to charge their phone in the vehicle and send this PrsnlDevcChrgEnbl_B_Rq power moding signal to the infotainment system so the phone can be charged enough to start the vehicle.
Interfaces	Vehicle System

3.10.1.2 PWRMAN-UC-REQ-236924/A-Phone as a Key - Vehicle System no longer requesting the infotainment system be able to charge a phone

Actors	Vehicle Occupant
Pre-conditions	<p>The infotainment system is powered OFF so there no infotainment audio (ie HMIAudioMode = OFF).</p> <p>The Vehicle System requesting infotainment be capable of charging a phone (ie PrsnlDevcChrgEnbl_B_Rq = Active)</p> <p>The infotainment phone charging ports (ex USB) are able to charge a phone</p>
Scenario Description	The Vehicle System no longer requires the infotainment system to be capable of charging a phone (ie PrsnlDevcChrgEnbl_B_Rq = Inactive)
Post-conditions	<p>The infotainment phone charging ports (ex USB) are no longer required to be able to charge a phone to support Phone as a Key</p> <p>The infotainment system is powered OFF so no infotainment audio (ie HMIAudioMode = OFF)</p>
Notes	
Interfaces	Vehicle System

3.10.2 Requirements

3.10.2.1 PWRMAN-SR-REQ-233262/E-Phone as a Key - Phone Charging power moding

Whenever the infotainment system is powered on (ie HMIAudioMode = ON) the Infotainment Phone Charging modules (ex USB ports or any other phone charging ports) shall be capable of charging a phone.



An infotainment module that supports charging a Phone (ex. USB ports, infotainment power points...) shall support charging a phone whenever "PrsnlDevChrgEnbl_B_Rq = Active". This is regardless of HMIAudioMode power mode status.

- Example: If HMIAudioMode = OFF and PrsnlDevChrgEnbl_B_Rq = Active the Infotainment Phone Charging Module shall be capable of charging a phone (ex with the USB ports) while the infotainment system remains off.

The Infotainment module that supports charging a Phone shall power down to its low power state if PrsnDevChrgEnbl_B_Rq = Inactive and no other signals or features are powering up the infotainment module (ex Ignition_Status).

When Ignition_Status = OFF/Accessory if the signal PrsnlDevChrgEnbl_B_Rq is no longer on the network bus (either signal missing or update bit showing the signal is not fresh data) then the last signal state shall be remembered.

The Infotainment Phone Charging module shall not keep the bus awake for PrsnlDevChrgEnbl_B_Rq = Active and will remain powered up locally if the network bus is in sleep mode.

If the Infotainment System Phone Charging module has not received PrsnlDevChrgEnbl_B_Rq = Inactive for more than an hour after first receiving PrsnlDevChrgEnbl_B_Rq = Active then the Infotainment System Phone Charging module shall treat PrsnlDevChrgEnbl_B_Rq as though it equals Inactive.

- Whenever the Infotainment System Phone Charging module receives PrsnlDevChrgEnbl_B_Rq = Active the 1 hour timer shall be reset

When the infotainment system is in a load shed state (ex HMIAudioMode = Load Shed), or KOL Mode (ie KeyOffMde_D_Actl) is at hibernate/critical batt, if PrsnlDevChrgEnbl_B_Rq = Active then the Infotainment Phone Charging module shall still be capable of charging a phone.



3.11 PWRMAN-FUN-REQ-235503/C-Key Off Load Mode signal Power Management

3.11.1 Use Case

3.11.1.1 PWRMAN-UC-REQ-235517/B-Critical Batt - KOL Mode (Infotainment)

Actors	System
Pre-conditions	Ignition_Status = OFF Low battery critical battery event occurs (ie KeyOffMde_D_Actl = Normal → Critical Battery) and bus goes back to sleep
Scenario Description	User opens the door and presses the power button to enter extended play
Post-conditions	1. The Welcome screen does not turn On 2. Extended Play is not entered
Notes	
Interfaces	Vehicle System Interface

3.11.1.2 PWRMAN-UC-REQ-235518/D-Hibernate - KOL Mode (Infotainment)

Actors	System
Pre-conditions	Ignition_Status = OFF for more than 5 days (ie KeyOffMde_D_Actl = Hibernate)
Scenario Description	User opens the door and presses the power button to enter extended play
Post-conditions	1. The Welcome screen does not turn On 2. Extended Play is not entered
Notes	Hibernate was 5 days when the use case was written
Interfaces	Vehicle System Interface

3.11.1.3 PWRMAN-UC-REQ-235608/A-Critical Batt - KOL Mode (Chimes)

Actors	System
Pre-conditions	Ignition_Status = OFF Low battery critical battery event occurs (ie KeyOffMde_D_Actl = Normal → Critical Battery) and bus goes back to sleep
Scenario Description	User opens the door and activates a chime
Post-conditions	Chimes are played through the Cluster
Notes	
Interfaces	Vehicle System Interface

3.11.2 Requirements

3.11.2.1 PWRMAN-SR-REQ-235509/K-KOL Mode Signal power management usage

The purpose of the key off load mode signal is to minimize key off load in the vehicle in order to preserve the life of the battery.



Infotainment modules shall support the table below for the KeyOffMde_D_Actl signal (ie KOL_Mode) for entering and exiting different KOL mode states:

KeyOffMde_D_Actl	Ignition_Status	KOL Mode Requirements
Don't care	Not OFF (ie Crank / Accessory / Run)	<p><i>Ignition_Status is prioritized over KeyOffMde_D_Actl</i></p> <p>The Infotainment modules are not required to use any KOL Mode Reduced Current Drain Strategies when ignition status is not OFF.</p>
TRANSPORT NORMAL FACTORY	OFF	<p>These states are don't cares with the KeyOffMde_D_Actl signal. No new requirements. Follow existing strategies</p> <p>Follow current strategy for LifeCycleMode_D_Actl / CarMode signal (ex Transport Mode, Factory Mode)</p>
HIBERNATE	OFF	<p>The Infotainment System Master shall disable the Welcome / Farewell strategy</p> <p>The Infotainment System Master shall disable extended play</p> <p>For TCU see applicable TCU specifications for reduced current drain strategies</p> <p>Note: at the time this SPSS was written Hibernate mode is entered after 5 days of key off.</p>
CRITICAL_BATT	OFF	<p>The Infotainment System Master shall disable the Welcome/Farewell strategy and all non-critical infotainment features (treat critical features as features that load shed would not shut down).</p> <ul style="list-style-type: none"> The infotainment System Master shall shut down the infotainment system and set HMIAudioMode = Load Shed. The Infotainment System Master shall disable extended play. Note: for infotainment load shed shutdown process see load shed requirement "PWRMAN-REQ-014508-System Master Load Shed Event Activation Process". <p>The Cluster shall play the chimes and shall not set the infotainment system as the Chime Audio Source (ie Power_Up_Chime_Modules = Inactive and Chime_Source = Cluster).</p> <ul style="list-style-type: none"> The AHU shall set AHU_Chime_Supported = Not Supported for non-Phoenix architectures The PAC/AHU shall set AHU_Chime_Supported = Inactive for the Phoenix architecture <p>For TCU see applicable TCU specifications for reduced current drain strategies</p>

KeyOffMde_D_Actl (ie KOL_Mode) does not replace the LifeCycle Mode_D_Actl (ie CarMode) signal for Transport Mode or Factory Mode.



- Transport and Factory Mode encodings in the KeyOffMde_D_Actl signal are considered don't cares. Follow any existing SPSS requirements for Transport and/or Factory Mode (ex using LifeCycleMode_D_Actl).

KeyOffMde_D_Actl signal is defined to be to the "NORMAL" encoding when Ignition_Status is not OFF (ex RUN/ACC).

When Ignition_Status = OFF if there is no KeyOffMde_D_Actl signal on the bus or an update bit indicates not fresh data for the signal then assume the last KOL state.

KeyOffMde_D_Actl subscriber ECU's shall retain the last received KOL_Mode value during ECU sleep (for use on wake-up).

It is understandable that there will be race-conditions when both KeyOffMde_D_Actl and Ignition_Status are received via CAN (especially when they are in different CAN messages). In this case, the Subscriber ECUs are directed to prioritize Ignition_Status above KeyOffMde_D_Actl.

If KeyOffMde_D_Actl is missing for 5 seconds in Run and still missing when key changes out of Run (ex to ACC/OFF) then KeyOff Mode shall be treated as though KeyOffMde_D_Actl = Normal until the signal is no longer missing.

- Note: subscribers of KeyOffMde_D_Actl shall not set a DTC when the signal is missing because there are no customer noticeable issues when KeyOffMde_D_Actl is missing.

For infotainment module resets while Ignition_Status = OFF assume the last KOL Mode state (ex Normal, Hibernate, Critical Batt) if the signal is not present on the bus.

For Phone as a Key the KeyOffMde_D_Actl signal state (ie Critical_Batt, Hibernate) shall not prevent the phone charging module charging ports (ex SYNC USB) from being able to charge a phone when PrsnlDevChrgEnbl_B_Rq = Active.

- Note: the phone charging needs to be supported in case the user's phone is dead and they need to be able to charge it enough to start the vehicle.



3.12 PWRMAN-FUN-REQ-235584/A-Factory Mode

3.12.1 Use Case

3.12.1.1 PWRMAN-UC-REQ-235519/B-Factory Mode - Infotainment System Chimes

Actors	System
Pre-conditions	Vehicle is in Factory mode Chimes are through the infotainment system Delayed Accessory is Active Ignition_Status = OFF
Scenario Description	The front door is opened and delayed accessory is ended
Post-conditions	Chimes cannot remain through the infotainment system for more than 30 seconds after delayed accessory ends
Notes	No longer than 30 seconds after delayed accessory ends if chimes are needed they would have to be through the Cluster
Interfaces	Vehicle System Interface

3.12.1.2 PWRMAN-UC-REQ-235603/A-Factory Mode - Extended Play

Actors	System
Pre-conditions	Factory Mode is active Infotainment System is OFF (ie HMIAudioMode = OFF) Ignition_Status = OFF
Scenario Description	User presses the power button to enter Extended Play Mode
Post-conditions	1. Extended Play Mode is entered 2. After 1 minute Extended Play mode times out and the infotainment system turns OFF.
Notes	
Interfaces	Vehicle System Interface

3.12.2 Requirements

3.12.2.1 PWRMAN-SR-REQ-235583/D-Factory Mode

Unless noted otherwise (if called out otherwise in other specifications) the infotainment system shall operate normally in Factory Mode with the exceptions listed below.

Features limited in Factory Mode when the signal LifeCycleMode_D_Actl signal equals Factory:

1. The infotainment System Master shall only support Extended Play for 1 minute.
 - a. Note: this allows the extended play triggers to be tested in factory mode such as the power button press waking up and turning on the infotainment system but conserves vehicle battery by limiting the time allowed in extended play.
2. The Cluster shall not exceed 30 seconds in the time it keeps Power_Up_Chime_Module = Active after Delayed Accessory ends.

LifeCycleMode_D_Acl subscriber ECU's (ex Infotainment system master, Cluster) shall retain the last received LifeCycleMode_D_Actl value during ECU sleep (for use on wake-up).



3.13 PWRMAN-FUN-REQ-295539/A-OTA VehOnSrc_D_Stat Power Moding

3.13.1 Requirements

3.13.1.1 MD-REQ-295565/A-VehOnSrc_D_Stat

Message Type: Status

Signal used for OTA (over the air) events. Details of signal usages reference the OTA specifications

Logical Signal Name	Literals	Value	Description
VehOnSrc_D_Stat	OFF	0x0	
	Manual	0x1	
	RemoteStart	0x2	
	RemoteParkAssist	0x3	
	OverTheAir	0x4	

3.13.1.2 PWRMAN-SR-REQ-295540/A-VehOnSrc_D_Stat set to OTA Power Management

Power Supply requirement at time requirement cascaded to infotainment team:

- When Ignition = OFF and the signal VehOnSrc_D_Stat = OTA, to reduce energy consumption, modules must not activate any sensors, actuators, I/Os or customer facing interfaces due to OTA function.

This power supply requirement above includes (but not limited to):

- The Infotainment System Master shall not turn HMIAudioMode to ON if it is already OFF.
 - This includes:
 - Not activating Extended Play if it is currently off
 - Ex) pressing the power button when HMIAudioMode = OFF shall not turn on extended play
 - Not activating MMAActive if currently off
 - Ex) ignition_status changing from OFF to Run/Acc shall not turn HMIAudioMode from OFF to ON.
- The Infotainment System Master shall disable the Welcome / Farewell strategy
- The Cluster shall play the chimes and shall not set the infotainment system as the Chime Audio Source (ie Power_Up_Chime_Modules = Inactive and Chime_Source = Cluster).

VehOnSrc_D_Stat signal when set to OTA while infotainment system already ON:

The VehOnSrc_D_Stat signal is not supposed to be set to OTA when Ignition_Status = Run/Acc, Delayed_Accessory = Active or Power_Up_Chime_Modules = Active. If it is set while the infotainment system is already ON (ex ignition_status = Run/Acc or Delay_Acc = ON) then the System Master shall determine if the infotainment system powers down or remains powered up in infotainment mode. See OTA specs if there is any additional details use cases/error handling if this happens.

OTA functions when VehOnSrc_D_Stat = OTA:

OTA functions (ie over the air software updates/programming) are not limited by VehOnSrc_D_Stat = OTA for the infotainment system.

- Example: an OTA related feature might require the infotainment display to show OTA HMI if needed for an OTA event or may require other OTA related functions to be performed (ex software programming). Reference the OTA specs for details.



3.14 PWRMAN-FUN-REQ-295414/A-Key OFF Power Moding - ECG and Infotainment System Master

3.14.1 PWRMAN-CLD-REQ-295454/A-ISM KeyOff Power Mode Server

The ISM (Infotainment System Master) controls the infotainment system (display(s), WiFi, USB...) and is the Power Mode Server to the ECG Power Mode Client/Master for certain key off features.

3.14.2 PWRMAN-CLD-REQ-295455/A-ECG KeyOff Power Mode Client/Master

The ECG (Enhanced Central Gateway) is the Key Off Power Mode Client/Master powering on the ISM Power Mode Server for particular Key Off features.

3.14.3 Interface Requirements

3.14.3.1 MD-REQ-295417/A-KeyOffPwMde_D_Stat

Message Type: Status

Signal sent from the ECG to the ISM (Infotainment System Master) indicating if the ECG requires the ISM to be powered on or not.

Logical Signal Name	Literals	Value	Description
KeyOffPwMde_D_Stat	Inactive	0x0	The ECG does not require that the ISM be powered up
	ON	0x1	Used to power up the ISM for ECG initiated key off features
	
	Reserved	0x7	

3.14.3.2 MD-REQ-295418/A-InfoSysMasterPw_D_Stat

Message Type: Status

Signal sent from the infotainment system master (ISM) indicating if the infotainment system master is powered up and ready to support network commands

Logical Signal Name	Literals	Value	Description
InfoSysMasterPw_D_Stat	Inactive	0x0	ISM application software is not fully powered up
	ISM Powered ON	0x1	ISM is application software is fully powered up
	
	Reserved	0x7	

3.14.4 Requirements

3.14.4.1 Overview

The requirements in this power management SPSS function are only for how the ECG can power up the ISM module when it is powered down in key off. This includes the ECG powering up the ISM so it can support Ethernet communication for key off features.



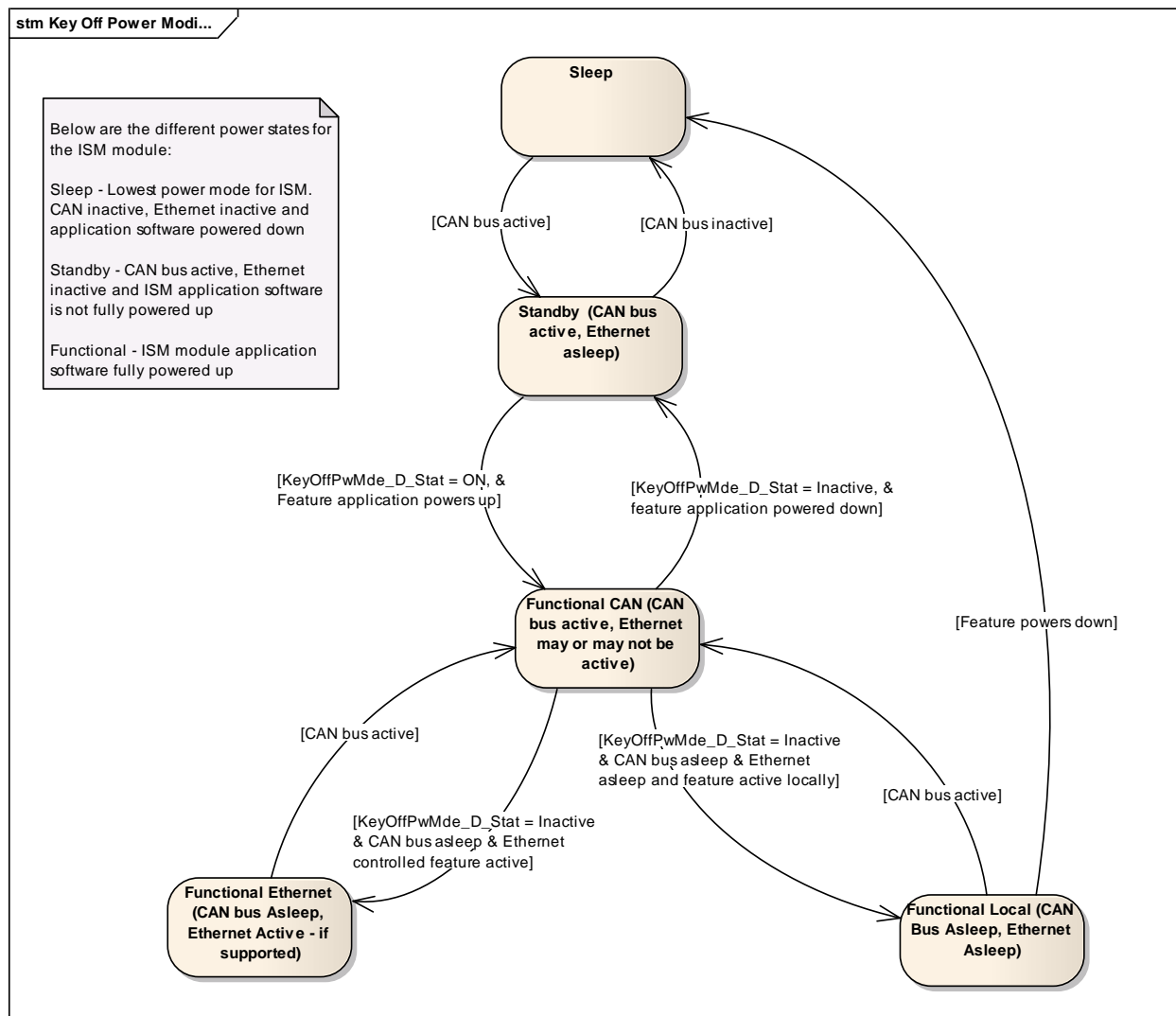
For details of implementing specific features and the associated CAN and/or Ethernet signals with those features reference the associated feature specs (ex OTA, WIR feature specifications).

3.14.4.2 *PWRMAN-SR-REQ-298572/A-CAN bus while Ethernet Network is awake*

During key off if the CAN network needs to be active for network management so Ethernet can remain up then the ECG shall be the module responsible for keeping the CAN bus active.

This requirement does not apply if the CAN bus can go to sleep while the Ethernet network remains active.

3.14.4.3 *PWRMAN-STM-REQ-298575/A-ISM Power Moding State Diagram*



3.14.4.4 *PWRMAN-SR-REQ-298568/A-ECG usage of KeyOffPwMde_D_Stat signal*

If Ignition_Status = OFF and a key off feature needs to be activated involving the Infotainment System Master then the ECG will need to power up the ISM module for the key off feature via the KeyOffPwMde_D_Stat power mode signal.

If the ECG needs the ISM powered up for a key off feature then the ECG shall:



- 1) Wake-up the CAN bus if it is not already awake
- 2) After 150 msec or more have elapsed since CAN bus wake-up then the ECG shall set KeyOffPwMde_D_Stat = ON.
 - i) Note: if the ECG woke up the CAN bus and a few msec later set KeyOffPwMde = ON and then back to inactive then the ISM module by time it is in ready to receive (100 msec later) would only see "Inactive" and will not power up.
 - ii) Since KeyOffPwMde_D_Stat is a periodic signal on CAN the ECG could always set KeyOffPwMde_D_Stat = ON at start-up and instead of putting back to inactive hold it state to ON as long as the ECG wants to ensure the ISM remains powered on.

The ECG shall set KeyOffPwMde_D_Stat = Inactive before letting the CAN bus go to sleep.

3.14.4.5 PWRMAN-SR-REQ-298258/A-ISM usage of KeyOffPwMde_D_Stat signal

When the ISM receives KeyOffPwMde_D_Stat = ON if the ISM application software is not powered up (ex HMIAudioMode = OFF) then the ISM shall power up its application software so that the ISM can receive and process network communication (ex CAN, Ethernet).

- Note: when ISM application software fully powered up then in Functional Power Mode state

The ISM module shall be able to receive KeyOffPwMde_D_Stat = ON within 100 msec of CAN bus wake-up (*T1).

The ISM module shall remain powered up in functional power mode state as long as KeyOffPwMde_D_Stat = ON.

When the ECG sets KeyOffPwMde_D_Stat = Inactive then the ISM will no longer rely on the ECG to remain powered up. The ISM shall remain powered up as specified by that feature and shall power down when no longer needed.

Note: For the ISM module if HMIAudioMode = OFF and KeyOffPwMde_D_Stat = ON then the ISM would be powered up within the current System Master Power Moding MMInactive Standby state.

*T1 definition for ISM see "PWRMAN-REQ-014468-Bus wake-up transition times from Sleep Power Mode".

Error Handling:

If the CAN bus goes to sleep while the ISM is still receiving KeyOffPwMde_D_Stat = ON then the ISM shall consider the KeyOffPwMde_D_Stat as equal to Inactive.

- This means if there is a feature/function that still requires the ISM to stay powered up it will (ex could be downloading software locally to itself) but if no key off feature/function is active requiring the ISM to stay up and the last state of KeyOffPwMde_D_Stat was ON before the bus went to sleep the ISM shall power down after the CAN bus goes to sleep.
 - Note: a function that could keep the ISM powered up is if the Ethernet network is allowed to stay awake while the CAN bus is asleep.

3.14.4.6 PWRMAN-SR-REQ-295421/A-ISM usage of the InfoSysMasterPw_D_Stat signal

The infotainment System Master shall set InfoSysMasterPw_D_Stat = ON whenever the ISM module feature applications powered up and can support network communication for those features (ex CAN or Ethernet communication).

- Note: When InfoSysMasterPw_D_Stat = ON this doesn't mean the infotainment system is ON regarding what the customer can see and hear (HMI_HMIMode_St could be OFF). This just means the ISM application software is fully powered up and can receive commands from the ECG or any other module.

The ISM keeping the CAN network awake is not tied to InfoSysMasterPw_D_Stat = ON. Unless called out specifically for the feature the ISM shall not keep the CAN bus awake when InfoSysMasterPw_D_Stat = ON.

- Note: when HMIAudioMode = ON it is called out that ISM keep the CAN network awake.

The infotainment System Master shall set InfoSysMasterPw_D_Stat = OFF/Inactive (default CAN setting) when the ISM feature applications are powered down and not able to interface for its features (ex commands via CAN, Ethernet for OTA...).

Some examples of when InfoSysMasterPw_D_Stat = ON (but not limited to these):

- Whenever HMIAudioMode = ON
- Whenever the ISM is powered up for a key off feature initiated by the ECG (ex OTA software update)

Error Handling key off features:

- When the ISM is powered up because KeyOffPwMde_D_Stat = ON if it is then put back to KeyOffPwMde_D_Stat = inactive, and after the ISM powers up and sets InfoSysMasterPw_D_Stat = ON if the ISM does not receive any commands/interface for a key off feature within 5 seconds of InfoSysMasterPw_D_Stat = ON then the ISM shall power back down.

Note:

If the ISM module was in a local power mode (ex SYNC VHM mode) initiated by the ECG with the network asleep (ex CAN, Ethernet) then if the ECG needs to know when the ISM powers down the ISM shall wake up the CAN bus and send InfoSysMasterPw_D_Stat = OFF to the ECG.

3.14.4.7 PWRMAN-SR-REQ-298569/A-ECG usage of the InfoSysMasterPw_D_Stat signal

The ECG shall monitor the InfoSysMasterPw_D_Stat signal waiting for it to equal ON to know that the ISM module can support network communications for feature (ex SOA/Ethernet, CAN).

Ethernet awake and CAN bus asleep:

If the vehicle allows the Ethernet network to be up while the CAN bus is sleep then the ECG shall not let the CAN bus the ISM is on go to sleep until after InfoSysMasterPw_D_Stat = ON.

3.14.4.8 PWRMAN-SR-REQ-295462/A-ISM Powered up locally to support an ECG controlled Key-Off feature

If the network doesn't need to be awake to perform a function then the ECG should command the ISM module what function to perform and let the bus go to sleep.

- An example of this is SYNC VHM Mode. If Ignition_Status = OFF (key off) and ISM/SYNC is downloading software to itself locally (ex SYNC WiFi, SYNC USB) then the CAN/Ethernet bus shall not be kept up the whole time during the download to preserve key off load off the battery. The exception to this is when the ECG is needed for command and control for ECG initiated VHM mode. See OTA specs for details.
- For features such as SYNC VHM mode there would need to be a strategy for how long the ISM could stay powered up locally. There could be a pre-determined amount of time, or the ECG could tell the ISM how long it is allowed to stay up or some other strategy.

3.14.4.9 PWRMAN-SR-REQ-295464/A-ISM internal hardware shutdown for hardware not needed for Key Off feature

When the ISM is powered off (ex HMI_HMIMode_St = OFF) and receives KeyOffPwMde_D_Stat = ON the ISM module shall power up to support Key Off features. Once powered up and the ISM receives the command and control from the ECG for the feature supported then the ISM could power down hardware (ex Display, WiFi, USB, Bluetooth, illumination for LIN ICP...) not needed for the key off feature to reduce the load on the vehicle battery.

ISM team to determine if can be supported

3.14.4.10 PWRMAN-SR-REQ-295465/A-Vehicle Low Power states and impact on ISM when KeyOffPwMde_D_Stat = ON

When the following low power states are already active the ISM shall not power up when KeyOffPwMde_D_Stat turns from OFF to ON for the following states:

- LifeCycMde_D_Actl = Transport Mode
- ISM is in a Load Shed state (ie HMI_HMIMode_St = Load Shed)
- KeyOffMde_D_Actl = Critical Battery

Note: When KeyOffMde_D_Actl = Hibernate and KeyOffPwMde_D_Stat turns from OFF to ON then the ISM module shall power up.

Note2: When VehOnSrc_D_Stat = OTA and KeyOffPwMde_D_Stat turns from OFF to ON then the ISM module shall power up.

Example:

- Pre-Condition:



- KeyOffMde_D_Actl = Critical Battery
- ISM is powered down
- KeyOffPwMde_D_Stat = OFF
- Event:
 - KeyOffPwMde_D_Stat changes from OFF to ON
- Post-Condition:
 - ISM remains powered down

If KeyOffPwMde_D_Stat = ON and the ISM is already powered up then the ISM shall remain powered up as long as KeyOffPwMde_D_Stat = ON.

Example:

- Pre-Condition:
 - Ignition_Status = OFF
 - Delayed_Accessory = OFF
 - KeyOffPwMde_D_Stat = ON (ISM powered ON)
- Event:
 - A load shed event becomes active
- Post-Condition:
 - Load shed is ignored while KeyOffPwMde_D_Stat = ON and ISM remains powered up

3.14.4.11 OTA specific Key Off power moding requirements

3.14.4.11.1 PWRMAN-SR-REQ-295419/A-OTA Network Management

For OTA key off events that require the CAN network to be active, the ECG shall be responsible for keeping the CAN network awake when communicating with the Infotainment System Master.

3.14.5 Sequence Diagram

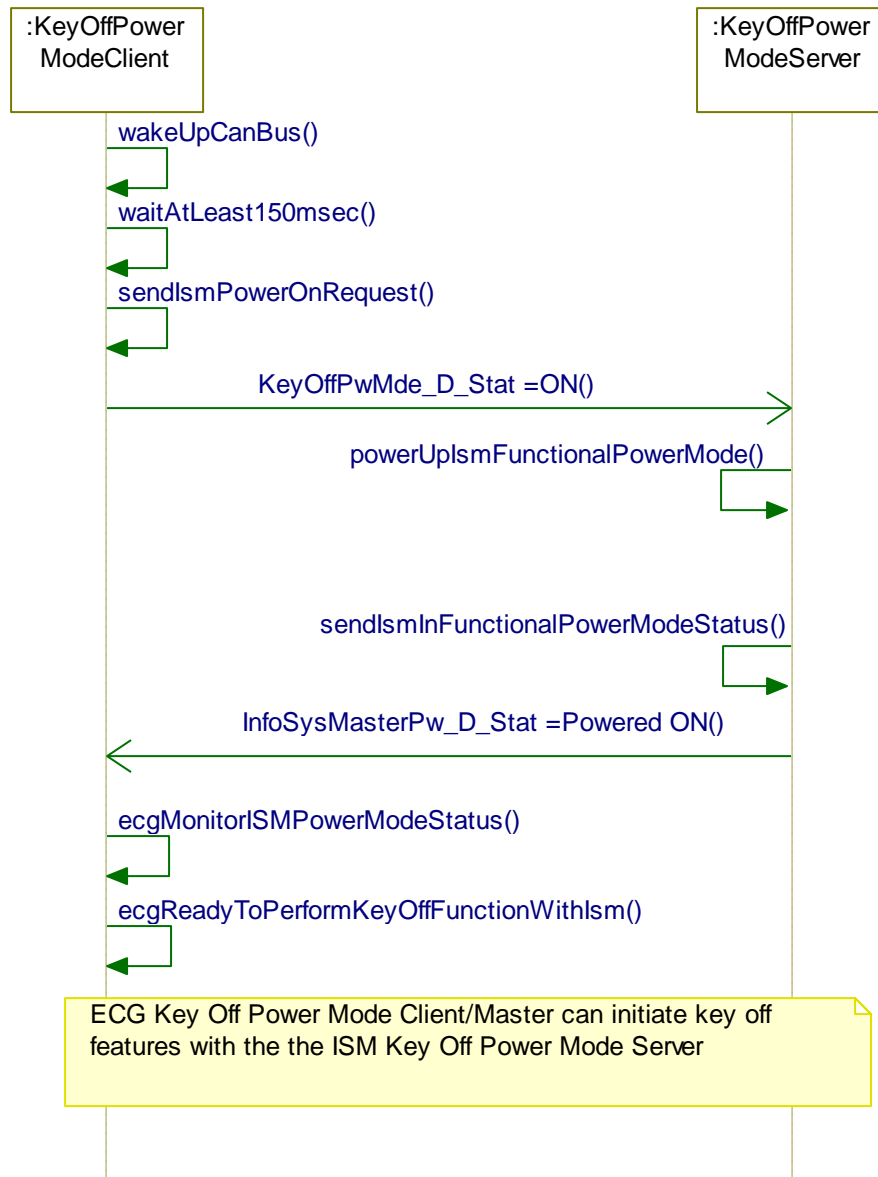
3.14.5.1 PWRMAN-SD-REQ-298341/A-System Start up for ECG initiated Key Off feature

Pre-condition:

- The ISM application software is powered down
- HMIAudioMode = OFF (last state before CAN bus sleep)
- CAN bus is asleep
- Ethernet is network is not active
- KeyOffPwMde_D_Stat = Inactive (last state before CAN bus sleep)
- InfoSysMasterPwr_D_Stat = Inactive (last state before CAN bus sleep)

Event:

- The ECG needs to perform a key off feature with the ISM module





3.15 PWRMAN-FUN-REQ-350922/A-Existing Transport Mode to Normal Mode and restoring factory defaults

3.15.1 PWRMAN-SR-REQ-346790/B-Exiting Transport Mode to Normal Mode and restoring Factory Defaults

The System Master module (ex. APIM) shall perform a master reset *locally restoring factory defaults when:

- the vehicle speed is 0 km/h, and
- LifeCycMde_D_Actl = Transport Mode (**last state – could be from previous ignition) → Normal

If the vehicle speed was greater than 0 km/h when the conditions above are met, then the System Master module shall perform a master reset the next time when the ignition_status signal changes to OFF/ACC.

*Performing a master reset locally means the System Master module does not set any master reset network signals to restore factory defaults and only the System Master module performs the master reset. That means signals for FactoryReset.Rq shall not be set to ResetFactoryDefaults. When the conditions above are met

The System Master performing the Master Reset shall still send the language request message to the Cluster to make sure the Language matches the System Master as called out in requirement “VS-REQ-136296-Master Reset Language”.

and the master reset is performed the FactoryReset.Rq signals shall remain set to inactive.

**The last LifeCycMde_D_Actl signal state shall be remembered between power mode and ignition cycles (ex between bus asleep and wake cycles)

Note: this requirement is not related to SPSS requirements “PWRMANv2-SR-REQ-014519-Transport Mode” which is the requirement for powering up and down the system master while transport mode is active on the vehicle (ie while LifeCycMde_D_Actl = Transport). That requirement is not related to the vehicle itself exiting transport mode (example gets to the dealership – LifeCycMde_D_Actl = Normal) and going to the default settings.

Reference “VS-FUN-REQ-025341-Master Reset to Factory Defaults – APIM” in the Vehicle Settings SPSS for Master Reset.

Reference “H22G_SYNC_Welcome_Power_Modes” HMI specification when exiting Transport Mode.

Reference “STMGNT-FUN-212052-Master Reset of Audio Settings” for APIM with integrated AHU. When AHU functionality is integrated use the entry conditions listed in this requirement.

Reference “P01a_MasterReset_vXXXX” for Sync Master Reset Behavior



3.16 PWRMAN-FUN-REQ-361257/A-Clear Exit Assist Power Moding

Note: See Vehicle Settings SPSS with details on implementing Clear Exit Assist feature. This function in the power management SPSS is only for the power moding portion.

3.16.1 VS-CLD-REQ-359585/A-Clear Exit Assist Warning Client

The Clear Exit Assist Warning Client interfaces with the user via the HMI and interfaces with the Clear Exit Assist Warning Server to determine if HMI updates are needed.

3.16.2 VS-CLD-REQ-359586/A-Clear Exit Assist Warning Server

The Clear Exit Assist Warning Server is responsible for the control to the Clear Exit Assist function and interfaces with the Clear Exit Assist Warning Client.

3.16.3 PWRMAN-CLD-REQ-359656/A-Infotainment System Master

3.16.4 Interface Requirements

3.16.4.1 MD-REQ-359588/A-ClrExitAsstActv_B_Rq

Message Type: Request

Request signal from the Clear Exit Assist Warning Server to the Clear Exit Assist Warning Client / Infotainment System Master to remain powered up to display the clear exit assist warning HMI

Logical Signal Name	Literals	Value	Description
ClrExitAsstActv_B_Rq	False	0x0	
	True	0x1	

3.16.5 Requirements

3.16.5.1 PWRMAN-SR-REQ-359648/A-Clear Exit Assist Power Moding

The Clear Exit Assist Warning Client shall update the HMI with the applicable HMI Warning when it receives the signal ClrExtAsstMsgTxt_D_Rq2 from the Clear Exit Assist Warning Server set to a particular warning encoding.

For the Clear Exit Assist feature the Clear Exit Assist Warnings can be displayed on the Clear Exit Assist Warning Client's HMI whenever the infotainment system is on (ie HMI_HMIMode_St = ON) or in MMInactive (Sleep/Standby) power mode as specified below.

The Infotainment System Master / Clear Exit Assist Warning Client shall support Clear Exit Assist Warning HMI in MMInactive (Sleep/Standby) power mode (ie HMI_HMIMode_St = OFF) when the following applies:

1. The Clear Exit Assist Warning Server power mode signal is set as ClrExitAsstActv_B_Rq = True, AND
2. 240 seconds has not elapsed since the signal Delay_Acc went from ON to OFF.

The Infotainment System Master / Clear Exit Assist Warning Client shall NOT remain powered up capable of displaying Clear Exit Assist HMI in MMInactive (Sleep/Standby) power mode because of the Clear Exit feature (might remain powered up because of other features) when the following applies:

1. The Clear Exit Assist Warning Server power mode signal ClrExitAsstActv_B_Rq = False, OR
2. 240 seconds has elapsed since the signal Delay_Acc went from ON to OFF

The Infotainment System Master / Clear Exit Assist Warning Client shall NOT keep the network awake for the Clear Exit Assist feature. This includes not keeping the network bus awake when ClrExitAsstActv_B_Rq = True and HMIAudioMode = OFF.



If the infotainment system master is in MMInactive (Sleep/Standby), with the network asleep but the conditions are true to be powered up for the Clear Exit Assist Warning feature then the Infotainment System Master shall power up locally (ie remain powered up waiting for warning signals even though the network bus is asleep).

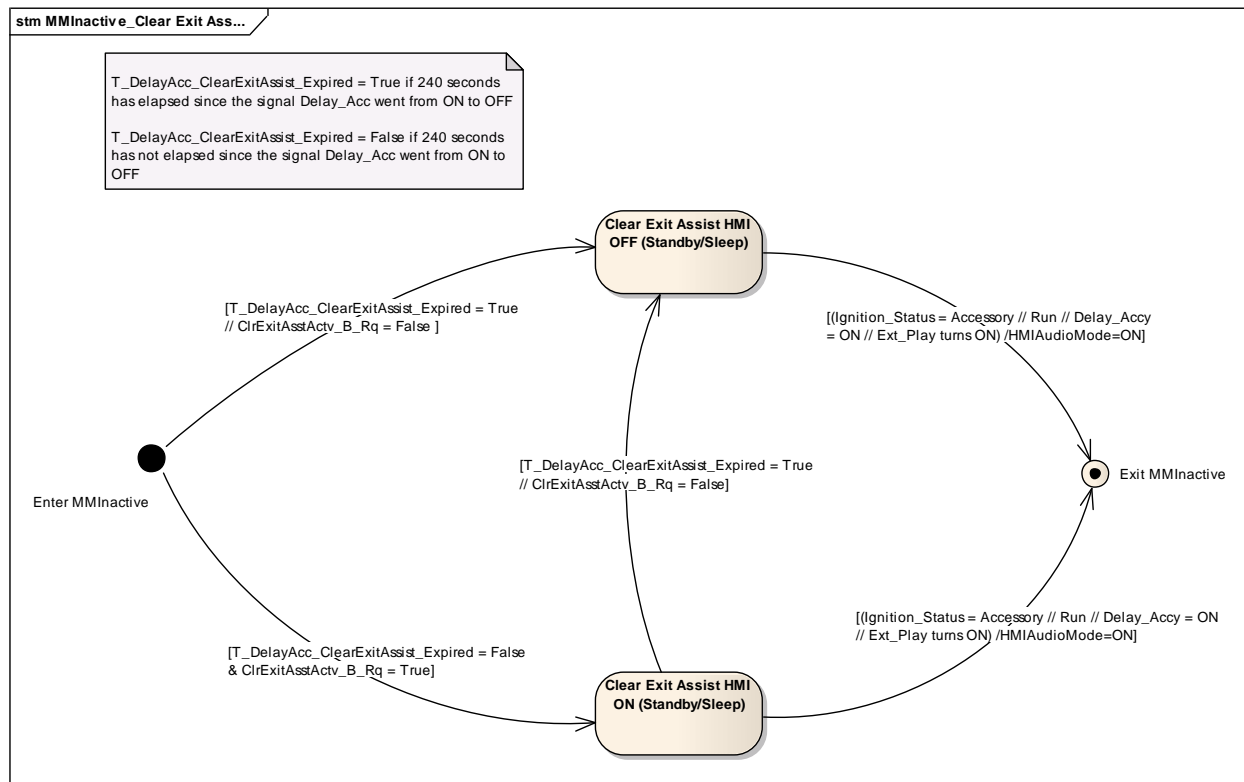
- Note: if the network bus is asleep then the Infotainment System Master / Clear Exit Assist Warning Client shall assume the last state of the ClrExitAsstActv_B_Rq signal.

If the ClrExitAsstActv_B_Rq is not on the network bus for 5 seconds or more while the signal Ignition_Status = RUN then the Infotainment System Master / Clear Exit Assist Warning Client shall consider the signal ClrExitAsstActv_B_Rq missing. When ClrExitAsstActv_B_Rq is missing the Infotainment System Master shall NOT remain powered up capable of displaying Clear Exit Assist HMI in MMInactive (Sleep/Standby) power mode because of the Clear Exit feature (might remain powered up because of other features).

Note:

- The Infotainment System Master and Clear Exit Assist Warning Client may be the same module. See implementation guide for details

3.16.5.2 *PWRMAN-SR-REQ-359676/A-MMInactive Sleep_Standby Clear Exit Assist Power Mode Diagram*





3.17 Stop Mode

3.17.1 PWRMAN-FUN-REQ-377259/B-Stop Mode - External module provides timer

3.17.1.1 Overview

Stop Mode is a low power sub-state of Standby Power Mode for the Infotainment System Master. Stop Mode is a state where the Infotainment System Master has as many infotainment features turned off as possible (both hardware and software) to allow for quick start-ups but at the same time to keep the current draw key off load (KOL) to the battery as low as possible. To the customer the infotainment system appears off, with the display and audio off, during Stop Mode.

3.17.1.2 Physical Mapping of Classes

The table below shows how the logical classes may be mapped to physical modules for the Stop Mode Power Mode. 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)
Battery State of Charge Server	BCM
Infotainment System Master	APIM

3.17.1.3 Interface Requirements

3.17.1.3.1 MD-REQ-378492/A-PwLoApim_T_Actl

Message Type: Status

Signal informing the Infotainment System Master how long it can stay in Stop Mode

Logical Signal Name	Literals	Value	Description
PwLoApim_T_Actl	0 minute	0x0	Shutdown if in Stop Mode to Sleep Mode
	1 minute	0x1	
	2 minutes	0x2	
	3 minutes	0x3	
	4 minutes	0x4	
	
	2,047 minutes	0x7FF	34 hours, 7 minutes

3.17.1.4 Functional Requirements

3.17.1.4.1 PWRMAN-REQ-377764/A-Stop Mode - Powering down internal power sources

During Stop Mode the Infotainment System Master shall power down all unnecessary internal power sources that are not required to quickly boot up to MMActive in Functional Power Mode. During Stop Mode the lowest possible current draw for the Infotainment System Master shall be targeted.



The Infotainment System Master shall not keep the network bus awake during Stop Mode.

3.17.1.4.2 PWRMAN-SR-REQ-377933/A-Battery State of Charge Server usage of PwLoApim_T_Actl signal

The Battery State of Charge Server monitors the battery state of charge and will set an amount of time via the PwLoApim_T_Actl signal that the Infotainment System Master can remain in Stop Mode.

The Battery State of Charge Server shall wake-up the bus and update the PwLoApim_T_Actl signal with additional time if the Battery State of Charge Server determines the battery state of charge has improved enough to warrant additional time in the PwLoApim_T_Actl signal.

- Example: the user connects a charge cord and start charging the vehicle battery

3.17.1.4.3 PWRMAN-SR-REQ-379474/A-Infotainment System Master internal timer based on the PwLoApim_T_Actl signal

When Ignition_Status does not equal Run/Start, the Infotainment System Master shall start an internal running timer based on the PwLoApim_T_Actl signal to use for Stop Mode power moding.

The signal PwLoApim_T_Actl shall always overwrite the Infotainment System Master internal timer if the value in the signal is different then what is running in the Infotainment System Master.

Note: at the time this spec was written the Battery State of Charge Server was updating the PwLoApim_T_Actl signal, on event, once every 60 seconds when the bus was active.

3.17.1.4.4 PWRMAN-SR-REQ-377707/A-Entering Stop Mode via the PwLoApim_T_Actl signal

The Infotainment System Master shall enter Stop Mode whenever Sleep Power Mode would normally be entered and the PwLoApim_T_Acl Stop Mode timer has not expired.

- Exception: The Battery State of Charge Server is causing a power down event to Sleep Power mode. Stop Mode shall not be entered in this case. Triggers for this includes the Load Shed signals and KeyOffMde_D_Actl = Hibernate or Critical Battery.

3.17.1.4.5 PWRMAN-SR-REQ-377932/A-Exiting Stop Mode via the PwLoApim_T_Actl signal

The Infotainment System Master shall power down from Stop Mode to Sleep Mode after the Stop Mode internal timer started based on the PwLoApim_T_Actl expires.

- Some cases where the Infotainment System Master internal Stop Mode timer might be used without valid data from the PwLoApim_T_Actl signal would be when the Ignition_Status does not equal Run/Start for some of the scenarios below:
 - Bus is asleep, OR
 - the Infotainment System Master is not receiving PwLoApim_T_Acl on the bus, OR
 - There is an Update Bit indicating that the PwLoApim_T_Actl signal data is not fresh data

The Infotainment System Master shall treat PwLoApim_T_Acl = 0 minutes received from the Battery State of Charge Server as Shutdown from Stop Mode and shall enter Sleep Mode (lowest power mode).

Note: The Infotainment System Master can always exit Stop Mode to other power mode states (ex Infotainment Mode (ie HMI_HMIMode_St = ON), Welcome, Farewell...).

3.17.1.4.6 PWRMAN-SR-REQ-378156/A-Additional usage of PwLoApim_T_Actl signal by Infotainment System Master

PwLoApim_T_Acl = 0 minutes does not cause the Infotainment System Master to exit any other power mode except Stop Power Mode.

- Ex. If Infotainment System Master is in Infotainment Mode (ie HMI_HMIMode_St = ON) or Standby features are active (ex Welcome/Farewell/OTA...) then signal PwLoApim_T_Actl = 0 minutes will have no effect on power moding.



- Note: other signal from the Battery State of Charge Server would still cause the Infotainment System Master to exit other power modes such as Load Shed signals, KeyOffMde_D_Actl = Critical Battery or Hibernate, etc.

When ignition_status does not equal Run/Start, if the PwLoApim_T_Actl signal is missing then the Infotainment System Master shall assume the last timer value sent from the Battery State of Charge Server.

When ignition_Status equal Run, if PwLoApim_T_Actl is missing for more than 5 seconds then this signal would be considered missing and 0 minutes shall be assumed in the signal.

3.17.1.4.7 PWRMAN-SR-REQ-378158/A-Infotainment System Reset from Stop Mode

If the Infotainment System Master has not powered down to Sleep Power Mode for more than T_Reset hours, then after T_Reset hours has elapsed, the Infotainment System Master shall enter Sleep Mode when it would normally enter Stop Mode.

- This could mean going from Stop Mode, to Functional Mode, to Display Only mode back to Stop Mode but never entering Sleep for T_Reset hours.

After entering Sleep Mode because T_Reset hours expired, if the PwLoApim_T_Actl timer has not expired then after powering down to sleep mode the Infotainment System Master shall reboot and after the reboot is complete the Infotainment System Master shall enter Stop Mode.

T_Reset time is a configurable value. At the time the spec was written, the default T_Reset time to use was 36 hours but it may not be the latest value for T_Reset.

Note: The reboot that occurs after T_Reset has elapsed is performed to make sure the Infotainment System Master has no functional issues (ex memory leakage).

3.17.1.4.8 PWRMAN-SR-REQ-378157/A-Transport and Factory Mode - Stop Mode

Stop Mode is not supported in Transport or Factory mode.

Stop Mode shall only be supported when LifeCycMde_D_Actl = Normal.



3.17.2 PWRMANv2-FUN-REQ-383672/A-Stop Mode variant 2 - infotainment internal timer

3.17.2.1 Overview

Stop Mode is a low power sub-state of Standby Power Mode for the Infotainment System Master. Stop Mode is a state where the Infotainment System Master has as many infotainment features turned off as possible (both hardware and software) to allow for quick start-ups but at the same time to keep the current draw key off load (KOL) to the battery as low as possible. To the customer the infotainment system appears off, with the display and audio off, during Stop Mode.

3.17.2.2 Functional Requirements

3.17.2.2.1 PWRMAN-SR-REQ-383673/A-Applicable Stop Mode variant

Stop Mode Variant 2, Stop Mode Variant 2 or Stop Mode disabled can all be configured on the Infotainment System Master. Stop Mode variant 1 (PWRMAN-FUN-377259 - Stop Mode - External module provides timer) and Stop mode variant 2 (PWRMAN-FUN-383672-Stop Mode variant 2 – infotainment internal timer) are mutually exclusive. Only one Stop Mode variant can be configured enabled at one time on the Infotainment System Master.

3.17.2.2.2 PWRMAN-REQ-377764/A-Stop Mode - Powering down internal power sources

During Stop Mode the Infotainment System Master shall power down all unnecessary internal power sources that are not required to quickly boot up to MMActive in Functional Power Mode. During Stop Mode the lowest possible current draw for the Infotainment System Master shall be targeted.

The Infotainment System Master shall not keep the network bus awake during Stop Mode.

3.17.2.2.3 PWRMANv2-SR-REQ-383674/B-Internal Stop Mode timer

When the Ignition_Status changes from Run/Acc to OFF the Infotainment System Master shall start a Stop Mode timer. When that timer has elapsed the Infotainment System Master is no longer allowed to enter Stop Mode.

Ex. If the Stop Mode internal timer on a program is 2 hours, then the timer shall begin when Ignition_Status goes from Run/Acc to Off. After 2 hours has elapsed from when ignition_status first went to OFF the Infotainment System Master is [no](#) longer allowed to enter Stop Mode.

Note: Predictive Triggers (ex door open, door unlock) will not restart the Stop Mode timer. For details on Predictive Triggers see requirement “PWRMAN-REQ-324997-Predictive Triggers”.

- Example: If the Stop Mode timer was 2 hours when ignition_status went to OFF, and 1 hour has elapsed when a predictive trigger event occurs, then after the predictive trigger one hour would still remain on the Stop Mode timer.

Once the Stop Mode timer has expired it (ex 2 hours expired) will be reset to the to the full time (ex 2 hours) once Ignition_Status = Run again.

The internal Stop Mode timer to the Infotainment System Master will vary between programs. Therefore, a range of values shall be protected for.

3.17.2.2.4 PWRMANv2-SR-REQ-383675/A-Entering Stop mode

The Infotainment System Master shall enter Stop Mode whenever Sleep Power Mode would normally be entered and the internal Stop Mode timer has not expired.

- Exception: The Battery State of Charge Server is causing a power down event to Sleep Power mode. Stop Mode shall not be entered in this case. Triggers for this includes the Load Shed signals and KeyOffMde_D_Actl = Hibernate or Critical Battery signal.



3.17.2.2.5 PWRMANv2-SR-REQ-383676/A-Exiting Stop mode

The Infotainment System Master shall power down from Stop Mode to Sleep Mode after the Stop Mode internal timer expires.

Signals from the Battery State of Charge Server would cause the Infotainment System Master to exit Stop Mode (ie cancel timer) to Sleep Mode such as Load Shed signals, KeyOffMde_D_Actl = Critical Battery or Hibernate

The Stop Mode timer expiring does not cause the Infotainment System Master to exit any other power mode except Stop Mode.

Note: The Infotainment System Master can always exit Stop Mode to other power mode states (ex Infotainment Mode (ie HMI_HMIMode_St = ON), Welcome, Farewell...).



3.18 PWRMAN-FUN-REQ-443537/A-Rear Seat Occupant Alert - variant when RSOA Interface Client is not responsible for RSOA chime

3.18.1 Physical Mapping of Classes

The table below shows how the logical classes may be mapped to physical modules for the Rear Seat Occupant Alert feature (variant when RSOA Interface Client is not responsible for RSOA chime). 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)
Rear Seat Occupant Alert Interface Client	APIM

3.18.2 Requirements

3.18.2.1 *RSOA-REQ-443519/B-Display Only Power Mode Extension (for variant when RSOA Interface Client is not responsible for RSOA Chime)*

To support the displaying the Rear Seat Occupant Alert pop-up after the a transition to Ignition OFF and Delayed Accessory OFF, the Rear Seat Occupant Alert Interface Client shall extend the duration of Display-Only mode for a period of T_NotificationDuration to allow for the displaying of the Rear Seat Occupant Alert pop-up for its full duration.

Likewise, to support the displaying the Rear Seat Occupant Alert pop-up after the termination of a Clear Exit Assist event, the Rear Seat Occupant Alert Interface Client shall extend the duration of Display-Only mode for a period of T_NotificationDuration after the termination of a Clear Exit Assist event to allow for the displaying of the Rear Seat Occupant Alert pop-up for its full duration.

3.18.2.2 *RSOA-TMR-REQ-392735/A-T_NotificationDuration*

Name	Description	Units	Range	Resolution	Default
T_NotificationDuration	The amount of time for the notification to be displayed. Note: Set by configurable parameter, refer to IDS	sec	See IDS		



3.19 PWRMAN-FUN-REQ-465759/A-Headlamp Power Moding

3.19.1 Overview

The headlamp power moding function supports the headlamp soft switch feature when the headlamp soft switch is supported on the HMI. Headlamp Power Mode enables the headlamp soft HMI switch to be available on the HMI when the infotainment audio system has powered down (ex not in Functional MMAActive).

For the non-power moding implementations of the headlamp soft switch such as the request / response interface for selecting headlamp states with the soft switch reference the "Exterior Lights Soft Switch SPSS".

3.19.2 Physical Mapping of Classes

The table below shows how the logical classes may be mapped to physical modules for the Headlamp Power Mode 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)
Headlamp Power Mode	APIM
Infotainment Server	
Headlamp Server Module	BCM

3.19.3 Interface Requirements

3.19.3.1 MD-REQ-473178/A-HeadLghtSwthch_D_Stat

Message Type: Status

Signal from the Headlamp Server module with the status of the headlamp

Logical Signal Name	Literals	Value	Description
HeadLghtSwthch_D_Stat	Off	0x0	
	Parklamp	0x1	
	Headlamp	0x2	
	Autolamp	0x3	

3.19.4 Use Cases

3.19.4.1 PWRMAN-UC-REQ-473199/A-Headlamp soft switch available on the HMI when turn vehicle OFF

Actors	Vehicle Occupant
Pre-conditions	Infotainment System configured to support Headlamp Soft Switch in the HMI. Infotainment System is in Functional power mode with ignition in Run/Acc, and/or Delayed Accessory is active. The headlamp soft switch is set to Park Lamps or Headlamps



Scenario Description	User turns ignition to OFF and exits delayed accessory (ex opens a front door)
Post-conditions	The headlamp soft switch continues to be shown on the HMI <ul style="list-style-type: none">Note: This is shown in headlamp power mode (Standby power mode)
Notes	

3.19.4.2 PWRMAN-UC-REQ-473200/A-Headlamp soft switch NOT on the HMI when turn vehicle OFF

Actors	Vehicle Occupant
Pre-conditions	Infotainment System configured to support Headlamp Soft Switch in the HMI. Infotainment System is in Functional power mode with ignition in Run/Acc, and/or Delayed Accessory is active. The headlamp soft switch is set to OFF or autolamps
Scenario Description	User turns ignition to OFF and exits delayed accessory (ex opens a front door)
Post-conditions	The headlamp soft switch is not shown on the HMI <ul style="list-style-type: none">Note: headlamp power mode is not entered
Notes	Headlamp power mode is not entered since the headlamp switch wasn't set to headlamps or park lamps.

3.19.4.3 PWRMAN-UC-REQ-473202/A-Extended Play turned OFF, Vehicle OFF, Headlamp Soft Switch available

Actors	Vehicle Occupant
Pre-conditions	Infotainment System configured to support Headlamp Soft Switch in the HMI. The vehicle is in Extended Play mode (functional power mode) The Ignition is in OFF and Delayed Accessory is Inactive The headlamp soft switch is set to Park Lamps or Headlamps
Scenario Description	The user presses the Power button to exit Extended Play
Post-conditions	The headlamp soft switch continues to be shown on the HMI <ul style="list-style-type: none">Note: This is shown in headlamp power mode (Standby Power Mode)
Notes	The headlamp soft switch continues to be shown until the exit conditions are met

3.19.4.4 PWRMAN-UC-REQ-473201/A-Vehicle OFF, Headlamp Soft Switch ON, turn off parklamps and headlamps

Actors	Vehicle Occupant
Pre-conditions	Infotainment System configured to support Headlamp Soft Switch in the HMI. Vehicle is OFF with Ignition equal to OFF and Delayed Accessory OFF The headlamp soft switch is available in the HMI <ul style="list-style-type: none">Note: This is shown in headlamp power mode



	The headlamp soft switch is set to Park Lamps or Headlamps
Scenario Description	The user changes the headlamp soft switch to OFF or Autolamps
Post-conditions	The headlamp soft switch remains available in the HMI <ul style="list-style-type: none">Note: Remains in headlamp power mode (Standby power mode)
Notes	Once entered headlamp power mode changing the soft switch won't exit headlamp power mode

3.19.4.5 PWRMAN-UC-REQ-473217/A-Exit Conditions - Headlamp soft switch HMI no longer available when Vehicle OFF

Actors	Vehicle Occupant
Pre-conditions	Infotainment System configured to support Headlamp Soft Switch in the HMI. Vehicle is OFF with Ignition equal to OFF and Delayed Accessory OFF The headlamp soft switch is available in the HMI <ul style="list-style-type: none">Note: This is shown in headlamp power mode (Standby power mode)
Scenario Description	The user opens and closes the driver door, OR The user changes the locks from unlocked to locked, OR The headlamp soft switch timer expires
Post-conditions	The headlamp soft switch is not shown on the HMI <ul style="list-style-type: none">Note: Headlamp power mode is exited
Notes	

3.19.5 Requirements

3.19.5.1 PWRMAN-SR-REQ-465738/A-Headlamp Power Mode

Headlamp Power Mode is the power mode state when the headlamp soft switch HMI can continue to be shown and interacted with on the HMI when in Standby power mode (ex MMInactive). Headlamp Power Mode does not affect the normal infotainment power moding for functional/infotainment mode (ie HMIAudioMode = ON) which is always capable of showing headlamp switch HMI.

If functional power mode is exited (ex exit MMAActive) to Standby (ex Display Only) and the headlamp exit conditions have not been met (still in Headlamp Power Mode), then in Standby Power Mode (ex Display Only) the user shall be able to interact with the headlamp HMI.

Headlamp Power Mode Entry Conditions:

Headlamp Power Mode is entered when the infotainment system powers down to Standby power mode from Functional power mode and the headlamps or parklamps are active. This happens when HMIAudioMode changes from ON to OFF and the signal HeadLghtSwch_D_Stat = Parklamp or Headlamp.

Note: Headlamp power mode will only be entered when Ignition_Status = OFF and Delay_Accy = Inactive since if either Ignition_Status = Run/Acc or Delay_Accy = Active then HMIAudioMode would equal ON and the HMI would be available in Functional Power Mode.

Headlamp Power Mode Exit Conditions while Ignition is OFF:

While in headlamp power mode, headlamp Power Mode is exited when:



- HMIAudioMode changes from OFF to ON.
 - Note when HMIAudioMode = ON the HMI is always available for the headlamp soft switch in Functional Power Mode (ex MMAActive). Ex of Functional Power mode is MMAActive when Ignition_Status = Run or Delay_Accy = Active.

OR

- The DrStatDrv_B_Actl (ie driver door) signal transitions from Ajar to Closed.
- OR
- The Veh_Lock_Status signal transitions from Unlock (either Unlock_All or Unlock_Drv) to Locked (Lock_DBL or Lock_All).
- T_HeadlampSwitchDuration has elapsed since HMI_HMIMode_St went from ON to OFF

Headlamp power moding is not supported during a Load Shed event.

Headlamp power moding is not supported while Transport Mode is active.

- Note: Headlamp HMI could still be shown while powered up Functional Power Mode (ie HMIAudioMode = ON) when LifeCycMde_D_Actl = Transport Mode.

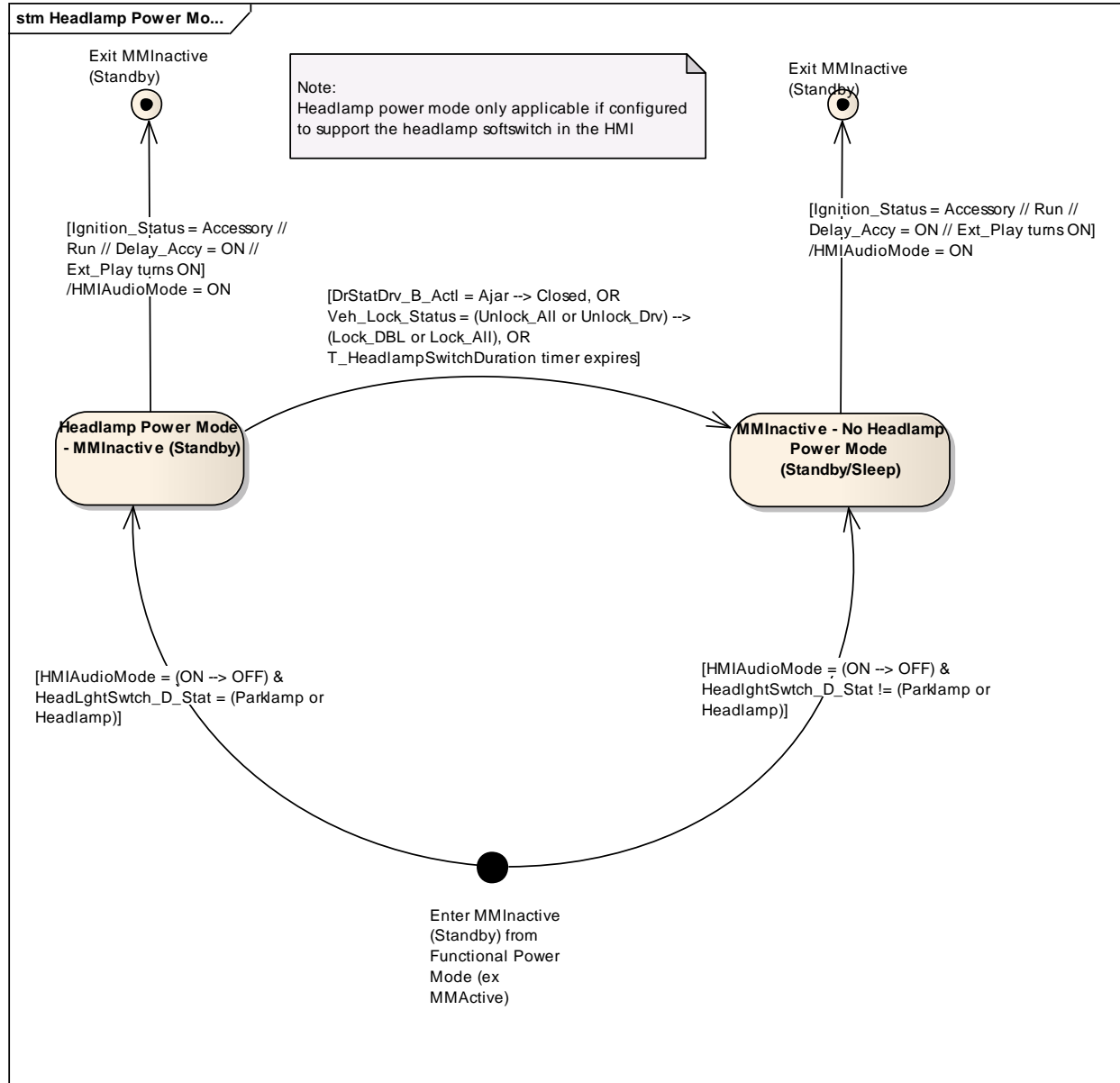
Headlamp power moding is only supported when the headlamp switch is supported on the HMI.

3.19.5.2 PWRMAN-TMR-REQ-465818/A-T_HeadlampSwitchDuration

Name	Description	Units	Range	Resolution	Default
T_HeadlampSwitchDuration	The amount of time to remained powered up in Headlamp Power Mode. Note: set by configurable parameter, refer to IDS (Infotainment Diagnostic Spec)	sec	See IDS		



3.19.5.3 PWRMAN-STM-REQ-473197/A-MMInactive - Headlamp Power Moding State Diagram





3.20 PWRMAN-FUN-REQ-486437/A-Sentinel / Integrated Security Cameras (ISC) Power Moding

3.20.1 Overview

This SPSS is for supporting Sentinel Power Mode for the Sentinel Power Mode Infotainment Server.

- Note: the Sentinel Power Mode Infotainment Server is the SentinelOnBoardClient in the Sentinel SPSS specification(s).

Sentinel is also called the Integrated Security Cameras (ISC feature). For this SPSS only Sentinel will be referred too but this is the same as Integrated Security Cameras (ISC).

During Sentinel Power Mode the Infotainment module will be recording and storing the video. See applicable specifications for details (Sentinel SPSS and Video Recording and Playback SPSS).

For the Sentinel subscription and if it is enabled please see the Sentinel SPSS and CCS Client SPSS for details (CCS - Customer Connectivity Settings).

Sentinel feature is a connected intelligent system offering security services to the users against theft and intrusion inside the truck bed, cargo area and surrounding the vehicle particularly for commercial vehicle customers.

Sentinel feature is an integrated security system that enables the user to:

- Detect intruders using AJAR sensors (or any sensor in the combined sensor module), Perimeter sensors, as well as accelerometer sensor
- Send a notification to the user about the detected intrusion,
- Start recording the video feed from the vehicle cameras locally on the vehicle and on the cloud,
- Enable streaming directly to a subscription app on the customer's mobile device.

3.20.2 Physical Mapping of Classes

The table below shows how the logical classes may be mapped to physical modules for the Sentinel Power Mode 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)
Perimeter Alarm Server	BCM
Sentinel Power Mode Infotainment Server / SentinelOnBoardClient	APIM

3.20.3 Interface Requirements

3.20.3.1 MD-REQ-486457/A-Perimeter_Alarm_Status

Message Type: Status

Signal from the Perimeter Alarm Server with the status of Perimeter Alarm

Logical Signal Name	Literals	Value	Description
Perimeter_Alarm_Status	Disarmed	0x0	
	Preamed	0x1	
	Armed	0x2	
	Activated	0x3	



3.20.4 Use Cases

3.20.4.1 PWRMAN-UC-REQ-486459/A-Enter Sentinel Power Mode for possible intrusion event

Actors	Sentinel Video Recording and Storage component, Sentinel System
Pre-conditions	Ignition_Status = OFF Vehicle supports the Sentinel feature (ie feature enabled EOL) The Sentinel video and recording component is not powered up in Sentinel Power Mode
Scenario Description	A possible intrusion event is detected
Post-conditions	The Sentinel video recording and storage component powers up (if not already up for a non-Sentinel feature), enters Sentinel Power Mode and verifies the Sentinel CCS setting is enabled The Sentinel video recording and storage component starts a power down timer counter Then Sentinel video recording and storage component starts recording and stores the video when complete.
Notes	The Sentinel Video Recording and Storage component is powered up and down by the Sentinel Power Mode Infotainment Server logical object which is part of it. For video recording and storage refer to the Video Recording and Playback SPSS

3.20.4.2 PWRMAN-UC-REQ-486797/A-Exit Sentinel Power Mode - Sentinel Setting Disabled

Actors	Sentinel Video Recording and Storage component, Sentinel System
Pre-conditions	Ignition_Status = OFF A possible intrusion event occurred. The Sentinel video and recording component is powered up in Sentinel Power Mode
Scenario Description	The Sentinel video and recording and storage component checks the setting status and the CCS Sentinel setting is disabled.
Post-conditions	The Sentinel video recording and storage component exits Sentinel Power Mode
Notes	The Sentinel Video Recording and Storage component is powered up and down by the Sentinel Power Mode Infotainment Server logical object which is part of it. For video recording and storage refer to the Video Recording and Playback SPSS CCS – Customer Connectivity Setting

**3.20.4.3 PWRMAN-UC-REQ-486798/A-Exit Sentinel Power Mode - Timer Expires**

Actors	Sentinel Video Recording and Storage component, Sentinel System
Pre-conditions	Ignition_Status = OFF A possible intrusion event occurred. The Sentinel video and recording component is powered up in Sentinel Power Mode The Sentinel CCS Setting is enabled
Scenario Description	The Sentinel video and recording and storage component Sentinel Power Mode timer expires
Post-conditions	The Sentinel video recording and storage component exits Sentinel Power Mode
Notes	The Sentinel Video Recording and Storage component is powered up and down by the Sentinel Power Mode Infotainment Server logical object which is part of it. For video recording and storage refer to the Video Recording and Playback SPSS CCS – Customer Connectivity Setting

3.20.4.4 PWRMAN-UC-REQ-486817/A-Exit Sentinel Power Mode - No Recording Storage Device available

Actors	Sentinel Video Recording and Storage component, Sentinel System
Pre-conditions	Ignition_Status = OFF A possible intrusion event occurred. The Sentinel video and recording component is powered up in Sentinel Power Mode The Sentinel CCS Setting is enabled
Scenario Description	The Sentinel video and recording and storage component does not have a storage device available (ex USB removed)
Post-conditions	The Sentinel video recording and storage component exits Sentinel Power Mode
Notes	The Sentinel Video Recording and Storage component is powered up and down by the Sentinel Power Mode Infotainment Server logical object which is part of it. For video recording and storage refer to the Video Recording and Playback SPSS CCS – Customer Connectivity Setting

3.20.4.5 PWRMAN-UC-REQ-488157/A-Exit Sentinel Power Mode - Record to Storage Device Setting is Disabled

Actors	Sentinel Video Recording and Storage component, Sentinel System
Pre-conditions	Ignition_Status = OFF



	A possible intrusion event occurred. The Sentinel video and recording component is powered up in Sentinel Power Mode The Sentinel CCS Setting is enabled
Scenario Description	The Sentinel Storage Setting to store videos to a storage device (ex USB) is disabled
Post-conditions	The Sentinel video recording and storage component exits Sentinel Power Mode
Notes	The Sentinel CCS setting enables/disables the Sentinel feature while the Sentinel Storage setting (ex USB) enables/disables the storage device The Sentinel Video Recording and Storage component is powered up and down by the Sentinel Power Mode Infotainment Server logical object which is part of it. For video recording and storage refer to the Video Recording and Playback SPSS CCS – Customer Connectivity Setting

3.20.5 Requirements

3.20.5.1 PWRMAN-SR-REQ-486469/A-Power States when Sentinel Power Mode is Not Supported

Sentinel Power mode is NOT supported by the Sentinel Power Mode Infotainment Server when:

1. LifeCycMde_D_Actl = Transport
2. Load Shed is active
3. KeyOffMde_D_Actl = Critical Battery and Ignition_Status = OFF

Sentinel Power Mode shall NOT be exited if the Sentinel Power Mode Infotainment Server is already in Sentinel Power Mode and then a load shed or critical battery event occurs. After the Sentinel Power Mode event ends (ex T_SentinelPwrMode timer expires), then the Sentinel Power Mode Infotainment Server will power down for the Load Shed or Critical Battery event and Sentinel Power Mode cannot be re-entered while either load shed or critical battery remain active.

3.20.5.2 PWRMAN-SR-REQ-486497/A-Entering Sentinel Power Mode

In order for Sentinel Power Mode to be entered the Sentinel Power Mode Infotainment Server has to be EOL configured to supported Sentinel Power Mode.

If Sentinel Power Mode is EOL configured enabled then the following conditions shall cause the Sentinel Power Mode Infotainment Server to enter Sentinel Power Mode:

1. Ignition_Status = OFF, AND
2. The signal Perimeter_Alarm_Status changes from Not Activated (ie Disarmed, Pre-armed, Armed) to Activated.

Sentinel power mode might overlap with infotainment functional power mode (ie HMI_HMIMode_St = ON) but they are independent. If Infotainment functional power mode ends (ie HMI_HMIMode_St = ON → OFF) but Sentinel Power Mode is still active then the Sentinel Power Mode Infotainment Server shall remain powered up in Sentinel Power Mode.

3.20.5.3 PWRMAN-SR-REQ-486537/A-Exiting Sentinel Power Mode

Once Sentinel Power Mode is entered as described in “PWRMAN-REQ-486497-Entering Sentinel Power Mode” the Sentinel Power Mode Infotainment Server shall exit Sentinel Power Mode when one of the following occur:

- The Sentinel CCS settings is disabled, OR



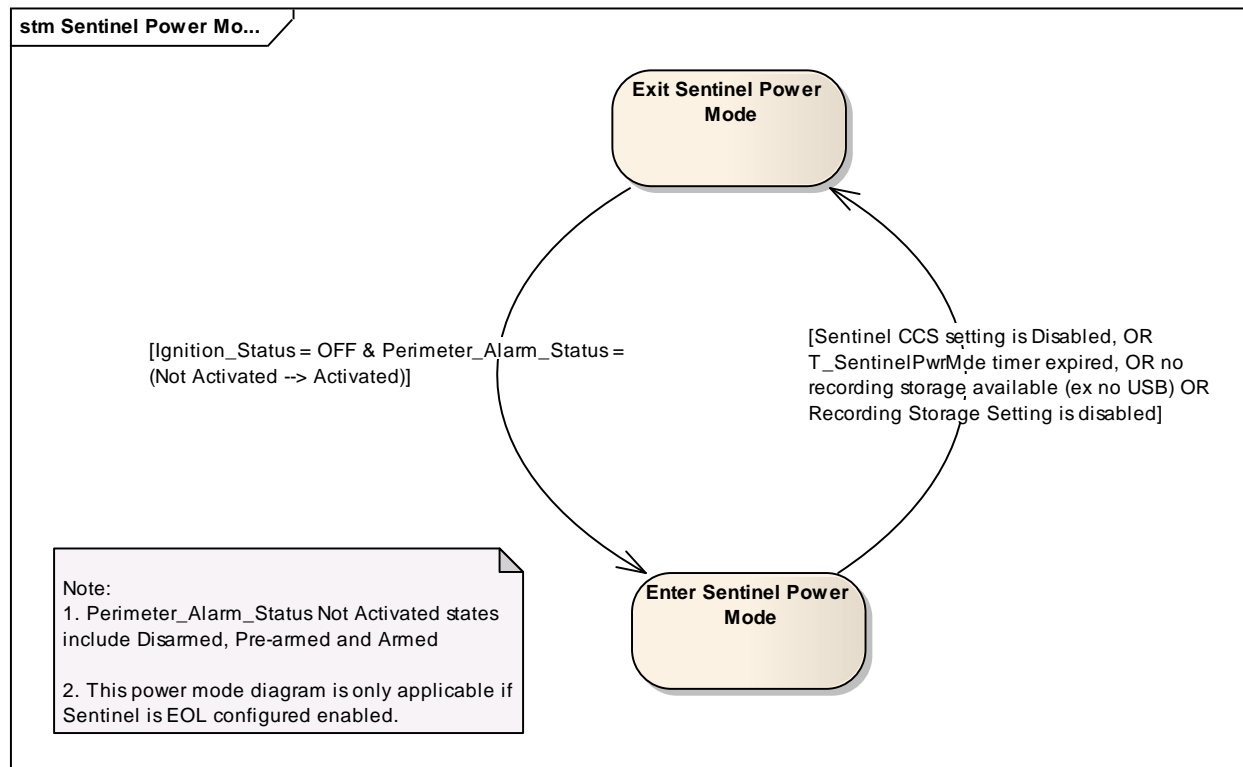
- Once the Sentinel Power Mode Infotainment Server first enters Sentinel Power Mode it shall check if the CCS Sentinel setting is enabled or disabled by checking the CCS database (Customer Connectivity Setting) (ie Feature 112 = ON). If the Sentinel setting is disabled in the CCS database then the Sentinel Power Mode Infotainment Server shall exit Sentinel Power Mode. See the Sentinel SPSS and CCS Client SPSS for details.
- The T_SentinelPwrMde timer expires, OR
- There is no storage device or storing the video is not enabled. See the Sentinel SPSS and Video Recording and Playback SPSS for details.

Note:

1. Sentinel power mode shall not be exited when Perimeter_Alarm_Status changes from Activated to another encoding (such as Disarmed).
2. If T_SentinelPwrMde timer expired and Perimeter_Alarm_Status still equals Activated the Sentinel Power Mode Infotainment Server shall still power down (ie need Perimeter_Alarm_Status to change from Activated to Not_Activated and then Activated again for Sentinel Power Mode to be re-activated).
3. If HMI_HMIMode_St = ON when Sentinel Power Mode is entered then HMI_HMIMode_St changing to OFF shall not cause Sentinel Power Mode to be exited.

3.20.5.4 PWRMAN-TMR-REQ-486516/A-T_SentinelPwrMde

Name	Description	Units	Range	Resolution	Default
T_SentinelPwrMde	This is the EOL configuration for the time that Sentinel Power Mode will remain powered up when Ignition_Status = OFF. The default is EOL configurable	sec	0-600	60	

3.20.5.5 PWRMAN-STM-REQ-487717/A-Sentinel Power Mode State Diagram



4 Appendix: Reference Documents

Reference #	Document Title
1	APIM P06 power mode spec – APIM internal power moding
2	"Global Power Supply Start/Stop Voltage Curve Specification" and Power Supply SDS requirement "RQT-002600-000443". Those specs are for surviving warm cranks if a VQM module is not on a vehicle
3	IDS (Infotainment Diagnostic Specification)
4	EMC requirement for supporting worst case cold crank voltage profile (EMC requirement CI-230)
5	Station Management SPSS (infotainment system start-up, crank requirements...)
6	HMI spec(s) – (SYNC 4 was "H22G_Sync3_Welcome_Power_Modes")