



**Research & Vehicle Technology**  
**“Infotainment Systems Product Development”**

**Feature – Power Management v2**

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

Version 1.1

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**FORD CONFIDENTIAL**



## Revision History

| Date              | Version   | Notes   |                                   |
|-------------------|---|---|-----------------------------------|
| September 6, 2018 | 1.0   | Initial SYNC 4.1 Release  | Integrates AHU features into SYNC |
| May 8, 2019       | 1.1   |   |                                   |
|                   | STR-539427/B-Architecture Design  | <jmyslin2> added new class descriptions   |                                   |
|                   | MD-REQ-273495/B-Veh_Lock_Status   | MBORREL4: Corrected encodings   |                                   |
|                   | MD-REQ-273721/C-LifeCycMde_D_Actl / CarMode   | <jmyslin2> added additional detail with Life Cycle mode signal. No content change, clarification only     |                                   |
|                   | PWRMAN-CLD-REQ-347949/A-ANC Generator   | <jmyslin2> New ANC Generator class description  |                                   |
|                   | PWRMAN-CLD-REQ-347950/A-ANC Amplifier   | <jmyslin2> New ANC amplifier class description  |                                   |
|                   | PWRMANv2-FUN-REQ-096800/B-Load Shed Strategy  | <jmyslin2> removed CGEA 1.3 from the function title. No content change                                    |                                   |
|                   | PWRMANv2-FUN-REQ-095504/C-Transport Mode Power Moding   | <jmyslin2> no content change, name only update  |                                   |
|                   | PWRMANv2-SR-REQ-014519/I-Transport Mode (TcSE ROIN-278271-1)  | <jmyslin2> No content change. Only added LifeCycMde_D_Actl signal name update                             |                                   |
|                   | PWRMAN-SR-REQ-014520/G-Transport Mode and CGEA Chimes (TcSE ROIN-40663-3)                               | <jmyslin2> No content change. Updated requirement to add LifeCycMde_D_Actl for naming only                |                                   |
|                   | PWRMAN-REQ-212042/E-Audio Settings when Transport Mode is deactivated on the Vehicle                    | <jmyslin2> updated to mention DSP AMP variant 2   |                                   |
|                   | PWRMAN-FUN-REQ-350922/A-Exiting Transport Mode to Normal Mode and restoring factory defaults            | <jmyslin2> New function for exiting transport mode  |                                   |
|                   | PWRMAN-SR-REQ-346790/A-Exiting Transport Mode to Normal Mode and restoring Factory Defaults             | jmyslin2 - New requirement for APIM restoring factory defaults when exit transport mode to normal mode    |                                   |
|                   | PWRMAN-FUN-REQ-347948/A-ANC PowerModing with DSP AMP variant 2 - ANC integrated in AHU/IAHU - variant 4 | <jmyslin2> New function for ANC power moding  |                                   |
|                   | PWRMAN-UC-REQ-347960/A-Activating ANC   | <jmyslin2> New use case for activating ANC  |                                   |
|                   | PWRMAN-UC-REQ-347961/A-Deactivating ANC   | <jmyslin2> New requirement for deactivating ANC   |                                   |
|                   | MD-REQ-347951/A-ActvNseMute_D_Statc   | <jmyslin2> New MD for ANC mute status   |                                   |
|                   | MD-REQ-347952/A-ActvNseMute_D_Rq  | <jmyslin2> New MD for ANC mute request  |                                   |
|                   | PWRMAN-SR-REQ-350927/A-Module Deployment - ANC  | <jmyslin2> New requirement  |                                   |
|                   | IFS-MMCAN-FUR-REQ-015112/C-Invalid - NoDataExist (TcSE ROIN-66250-2)                                    | <jmyslin2> clarification added for Null and Inactive since they are sometimes used.                       |                                   |
|                   | PWRMAN-SR-REQ-347956/A-Muting / Unmuting for the ANC  | <jmyslin2> new requirement for ANC  |                                   |
|                   | PWRMAN-TMR-REQ-347957/A-T_ANC_Rsp   | <jmyslin2> New ANC timing requirement   |                                   |
|                   | PWRMAN-SD-REQ-347958/A-Unmuting for ANC   | <jmyslin2> New sequence diagram for ANC   |                                   |
|                   | PWRMAN-SD-REQ-347959/A-Muting for ANC   | <jmyslin2> new sequence diagram for muting ANC  |                                   |
|                   | STR-539431/B-Appendix: Reference Documents  | <jmyslin2> referenced the Tuner Module spec for directions on SYNC powering the tuner module over A2B I2C |                                   |



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# 1 Architecture Design

## 1.1 Interface Requirements - APIM v2

### 1.1.1 MD-REQ-273358/B-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        | Inactive         | 0x0   |                            |
|                     | OFF              | 0x1   |                            |
|                     | ON               | 0x2   |                            |
|                     | Reserved         | 0x3   | N/A to Global Infotainment |
|                     | Reserved         | 0x4   | N/A to Global Infotainment |
|                     | Load Shed Active | 0x5   |                            |

### 1.1.2 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   |             |

### 1.1.3 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   |             |

### 1.1.4 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   |             |

### 1.1.5 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 /<br>CarMode / | Normal    | 0x0   |             |
|                                  | Factory   | 0x1   |             |
|                                  | Not Used  | 0x2   |             |
|                                  | Transport | 0x3   |             |

#### 1.1.6 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   |             |

#### 1.1.7 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          |

#### 1.1.8 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   |             |

**1.1.9 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   |             |

**1.1.10 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   |             |

**1.1.11 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   |             |

**1.1.12 MD-REQ-273763/A-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   |             |



**1.1.13 MD-REQ-273764/A-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   |             |

**1.1.14 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   |             |

**1.1.15 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   |   |

**1.1.16 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

**1.1.17 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   |   |

**1.2 PWRMANv2-CLD-REQ-324996/A-System Power Mode Master - APIM variant 2**

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/A-Predictive Triggers - APIM variant 2**

The APIM variant 2 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” so 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 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 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
- Post-Condition:
  - o The Infotainment System Master is in Display Only Mode for 3 minutes (unless noted otherwise in the P06 APIM spec)

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.

### 1.3 PWRMAN-CLD-REQ-347949/A-ANC Generator

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

### 1.4 PWRMAN-CLD-REQ-347950/A-ANC Amplifier

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



## 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 PWRMANv3-FUN-REQ-310858/A-Infotainment Network Management - APIM (integrated AHU functionality)

### 2.2.1 PWRMANv2-SR-REQ-310859/B-Network Management - APIM v2 (integrated AHU functionality)

The Infotainment System Master shall keep the CAN network it resides on awake when one of the following are true:

1. HMIAudioMode = ON, OR
2. Power\_Up\_Chime\_Modules = Active, OR
3. If needs to perform function with multiple modules over CAN in Standby (see those feature specifications to see what module is defined to keep the CAN network awake)

When none of the above conditions are true the Infotainment System Master shall not keep the network awake



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

### 2.3.1 PWRMAN-SR-REQ-014468/D-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.

### 2.3.2 PWRMAN-SR-REQ-014469/C-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 NoteWakeUpTime 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.

### 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 then 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 then 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.

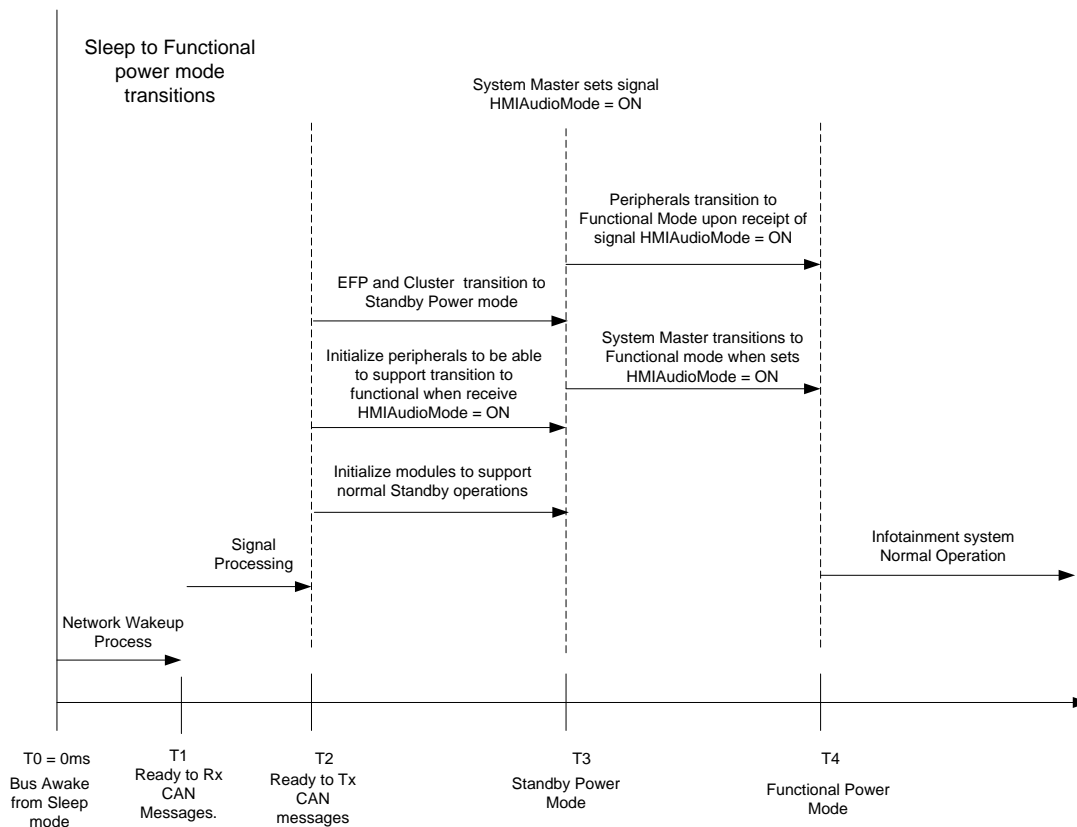


### 2.3.7 PWRMAN-SR-REQ-014474/B-Infotainment components transition time from Standby to Functional Power Mode (TcSE ROIN-40706-2)

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/D-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   |
| <b>MM Inactive</b>  | Standby                 | HMIAudioMode = OFF                                    | ON                             | <p>Background tasks may be running.</p> <p>Infotainment audio sources inactive (ex. AM/FM, SDARS/DAB, CD, VR, Bluetooth Phone, APIM, BT Audio, Prompts, USB, iPod...)</p> <p>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</p> <p>Display Only mode allowed if supported</p> |
| MM Inactive<br>Display only (ex.active clock, welcome, farewell etc)        | Standby / Sleep         | HMIAudioMode = OFF                                    | ON / OFF                       | <p>Background tasks may be running.</p> <p>HMI Output display as defined by the HMI.</p> <p>Infotainment audio sources inactive (ex. AM/FM, SDARS/DAB, CD, VR, Bluetooth Phone, APIM, BT Audio, Prompts, USB, iPod...)</p> <p>Non-Infotainment Standby Features can be supported (ex. Chimes – if enabled, Climate Control – if CC entry conditions met)</p>  |
| MM Inactive<br>Chime Only Mode – when infotainment system OFF               | Standby                 | HMIAudioMode = OFF<br>Power_Up_Chime_Modules = Active | ON                             | <p>Infotainment audio active for Chimes through the infotainment system</p> <p>Infotainment audio sources inactive (ex. AM/FM, SDARS/DAB, CD, VR, Bluetooth Phone, APIM, BT Audio, Prompts, USB, iPod...)</p>   |
| MM Inactive<br>Phone as a Key phone charging - when infotainment system OFF | Standby / Sleep         | HMIAudioMode = OFF<br>PrsnlDevChrgEnbl_B_Rq = Active  | ON / OFF                       | <p>Phone charging ports are active to charge a phone (ex USB port)</p> <p>Infotainment audio sources inactive (ex. AM/FM, SDARS/DAB, CD, VR, Bluetooth Phone, APIM, BT Audio, Prompts, USB, iPod...)</p>  |
| MM Inactive<br>ECG Key Off Power Moding                                     | Standby / Sleep         | HMIAudioMode = OFF<br>KeyOffPwMde_D_Stat = ON         | ON / OFF                       | <p>ECG has Infotainment System Master powered up for a key off function (ex OTA function)</p> <p>Infotainment audio sources inactive (ex. AM/FM, SDARS/DAB, CD, VR, Bluetooth Phone, APIM, BT Audio, Prompts, USB, iPod...)</p>   |
| <b>MM Active</b>  | 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...)  |
| <b>Extended Play</b>  | Functional              | HMIAudioMode = ON                                     | ON                             | <p>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, Prompts, USB, iPod...)</p> <p>Enables user to listen to infotainment system when Ignition is OFF and Delay Acc is OFF</p>   |

**Phone Mode**

Functional

HMAudioMode = 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 PWRMANv5-FUN-REQ-310866/A-System Master Power Moding - integrated AHU (APIM v2)

##### 3.1.1 PWRMANv5-SR-REQ-310867/A-System Master Power Moding - integrated AHU

The Infotainment System Master shall always remember the PowerMode state (ex MMActive, 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, MMActive) 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).



|   | <b>Pre-Condition:</b><br>Last State of Audio Stack in<br>MMActive / Phone Mode when<br>Ignition Status changes to OFF and<br>Delayed Accessory changes to OFF<br>(ie HMIAudioMode transitions from<br>ON to OFF) | <b>Event:</b><br>State of Extended Play when Ignition_Status<br>changes from OFF to Run/ACC | <b>Post-Condition:</b><br>Audio Stack at<br>Ignition_Status =<br>Run/ACC |
|---|--|---|--|
| 1 | OFF  | extended play never turned ON   | OFF  |
| 2 | OFF  | extended play was turned ON and then OFF by<br>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<br>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.

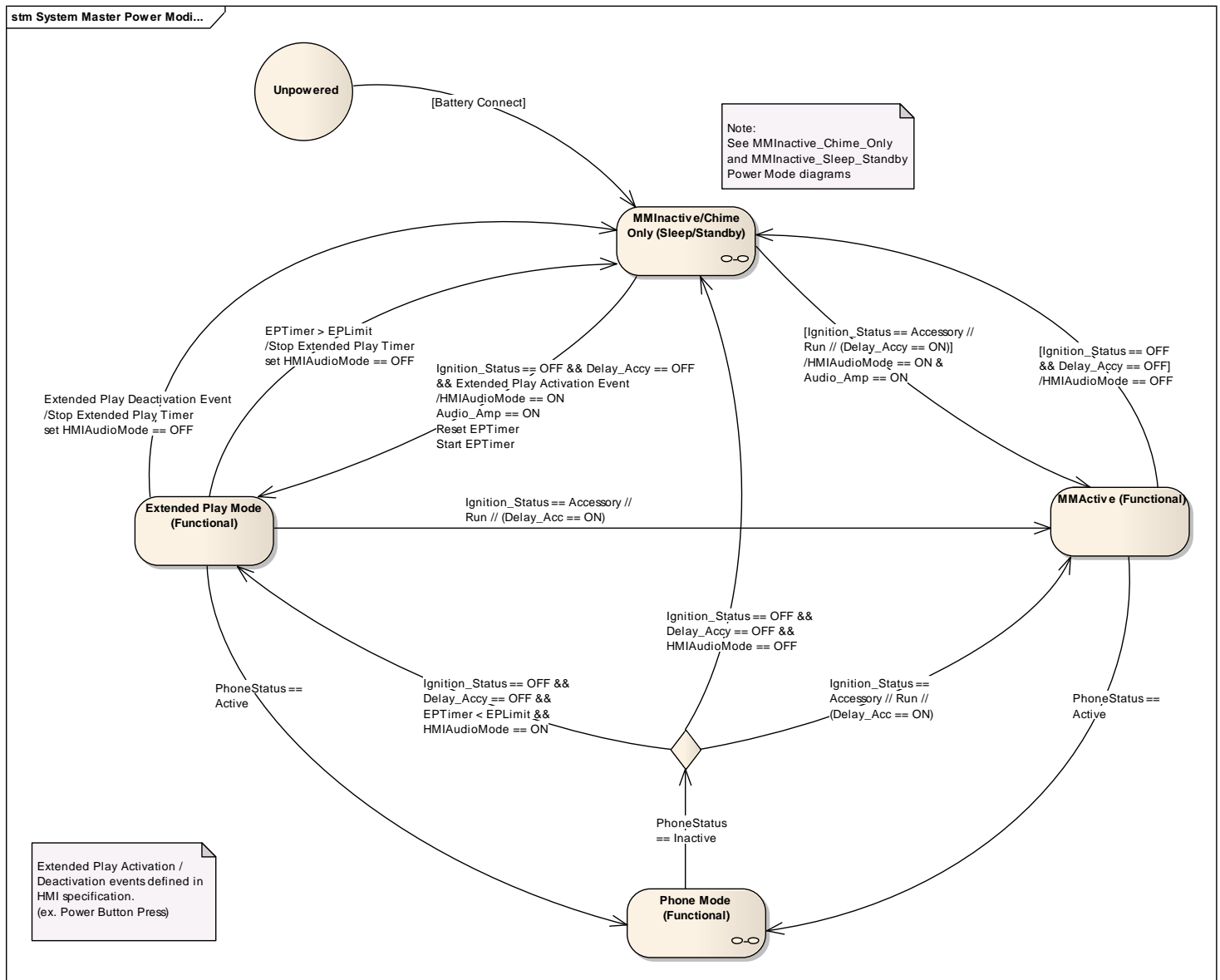
- See Chime SPSS requirement “[ALERT-SR-REQ-014735-Power-up time for infotainment components](#)” for details for time to first chime audio.
- See Infotainment Diagnostics Specification for chime diagnostics using the Power\_Up\_Chime\_Module signal. Chime diagnostics is part of the strategy for time 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](#)”



## System Master Power Mode Diagram:



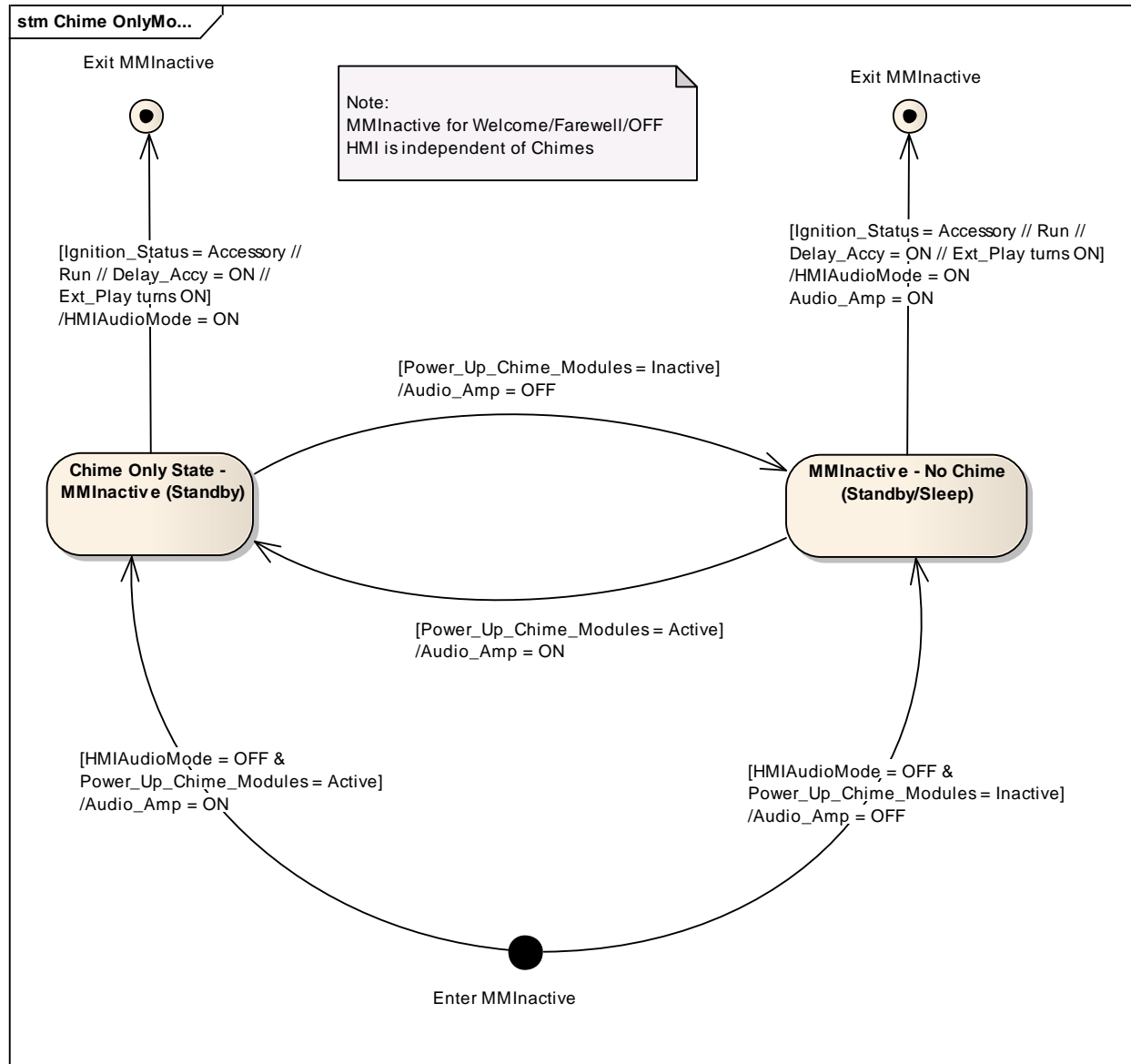
- See Phone, MMInactive\_Chime\_Only and MMInactive\_Sleep\_Standby power mode diagrams for internal power moding in those states
- The System Master shall set the Audio\_Amp signal within 40 msec of the conditions that result in changing the encoding value of the Audio\_Amp signal as shown in the power mode diagrams
  - o Ex. With HMIAudioMode = OFF and Power\_Up\_Chime\_Modules = OFF if Power\_Up\_Chime\_Modules went from Inactive to Active then the System Master sets Audio\_Amp from OFF to ON within 40 msec of receiving Power\_Up\_Chime\_Modules = Active
- The AHU is always powered up when Power\_Up\_Chime\_Module = Active unless noted otherwise as an exception. See Chime SPSS for details.



## 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      |

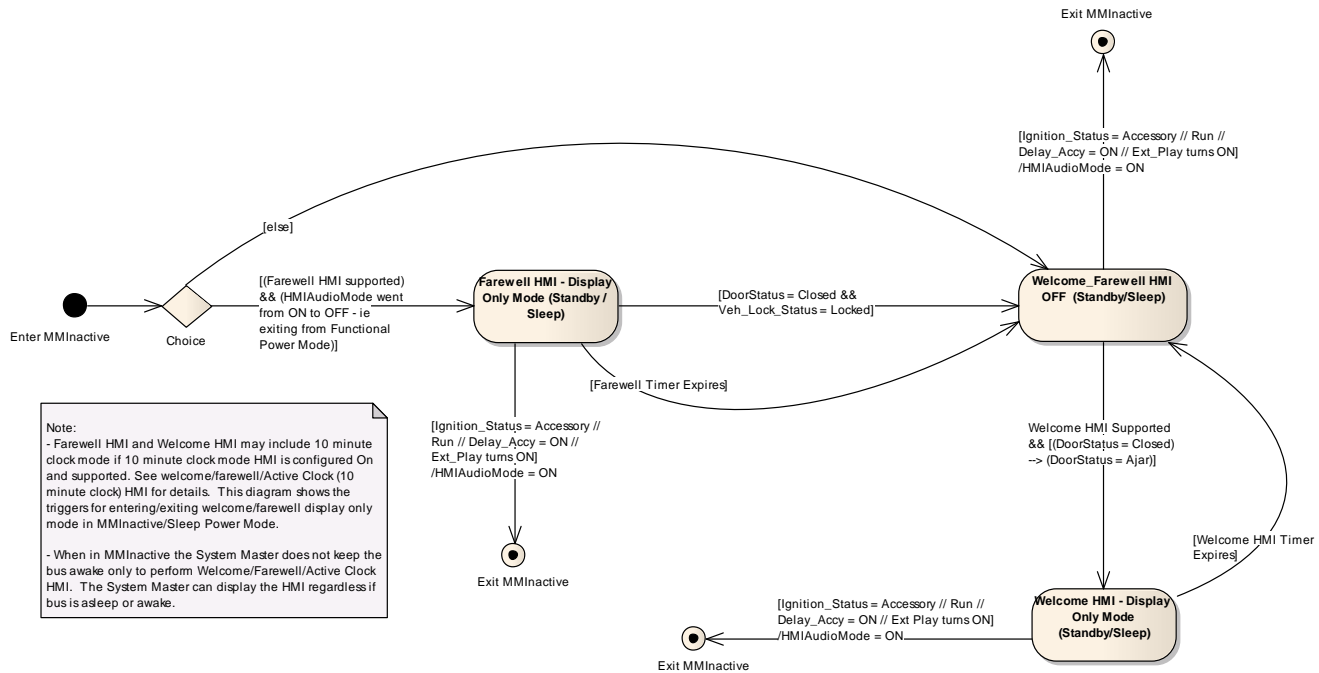
## 3.1.3 PWRMAN-SR-REQ-093959/C-MMInactive Chime Only Mode





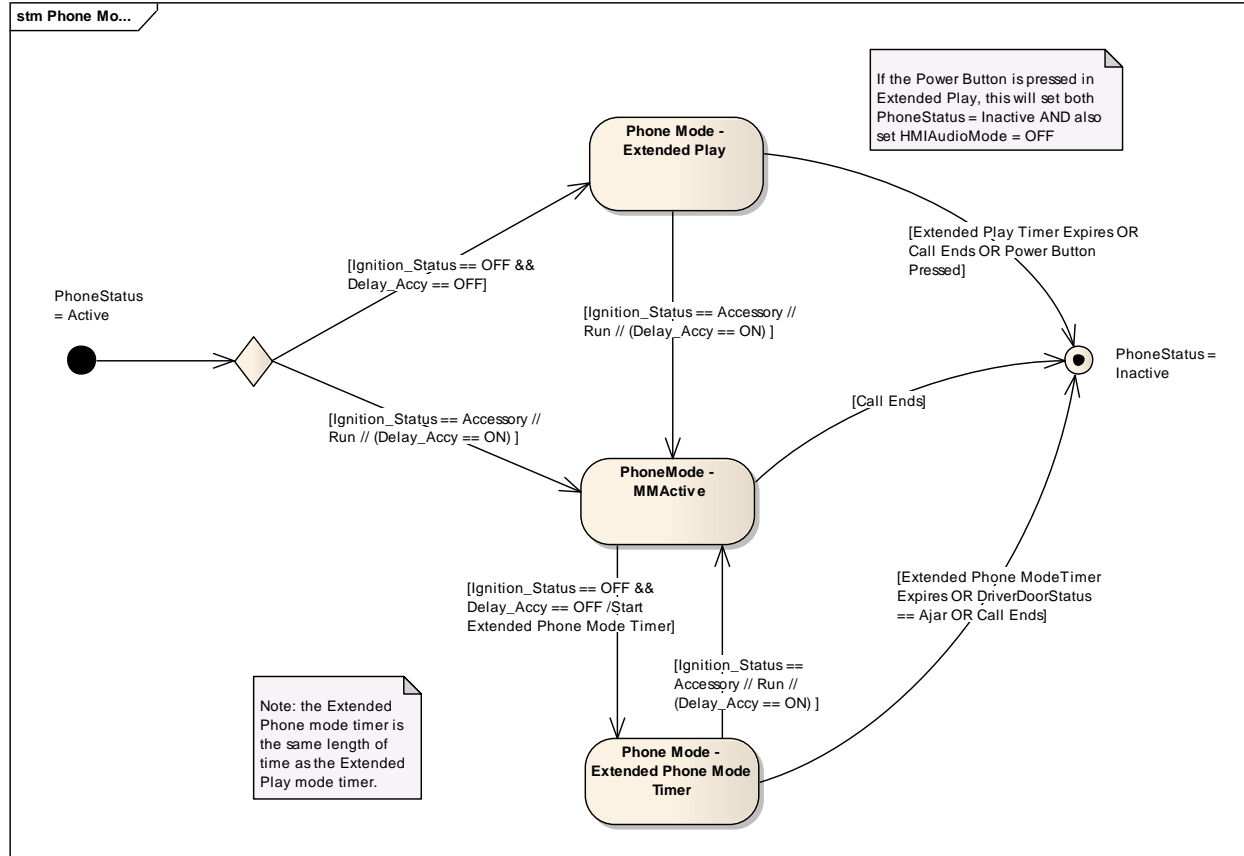
## 3.1.4 PWRMANv2-SR-REQ-093960/C-MMinactive\_Sleep\_Standby Power Mode Diagram

stm MMinactive\_Sle...





## 3.1.5 PWRMANv3-SR-REQ-093961/C-Phone Power Moding







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

### 3.2.1 Use Cases

#### 3.2.1.1 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<br>Ignition Status is OFF<br>Delayed Accessory is OFF<br>Load Shed is not active<br>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   |

#### 3.2.1.2 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<br>Load Shed is not active<br>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<br>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  |

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

|                             |  |
|-----------------------------|--|
| Actors                      | Vehicle Occupant   |
| Pre-conditions              | Infotainment System Powered ON<br>Ignition Status is OFF<br>Delayed Accessory is Active<br>Load Shed is not active<br>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   |



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

#### 3.3.1 Use Cases

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

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

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

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

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

|                                    |  |
|------------------------------------|--|
| <b>Actors</b>                      | Vehicle Occupant   |
| <b>Pre-conditions</b>              | Infotainment System Powered ON<br>Extended Play is active<br>Ignition Status is OFF<br>Delayed Accessory is OFF<br>Load Shed is not active<br>Transport Mode is not active |
| <b>Scenario Description</b>        | The Extended Play Mode timer expires   |
| <b>Post-conditions</b>             | The Infotainment System Powers OFF and Extended Play is exited   |
| <b>List of Exception Use Cases</b> | N/A  |



## Interfaces

CBI

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

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

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

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

**3.3.2 Requirements****3.3.2.1 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.

**3.3.2.2 PWRMAN-SR-REQ-014501/B-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.



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

#### 3.4.1 Use Cases

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

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

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

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

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

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

**3.4.1.4 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<br>Infotainment System Powered ON<br>With Ignition Status at OFF the Delayed Accessory timer expired during Phone Call and went to Extended Phone Mode<br>Load Shed is not active<br>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),<br>G-HMI (Graphic HMI),<br>SWC (Steering Wheel Control)   |



### 3.5 PWRMAN-FUN-REQ-033898/B-MMInactive\_Sleep (welcome, farewell, active clock) (TcSE ROIN-289945-1)

#### 3.5.1 Use Cases

##### 3.5.1.1 PWRMAN-UC-REQ-033899/A-Activating Welcome HMI - From entering vehicle (TcSE ROIN-289112-1)

|                                    |  |
|------------------------------------|--|
| <b>Actors</b>                      | Vehicle Occupant   |
| <b>Pre-conditions</b>              | Doors are closed<br>Infotainment System Powered OFF<br>Ignition Status is OFF<br>Delayed Accessory is OFF<br>Load Shed is not active<br>Transport Mode is not active |
| <b>Scenario Description</b>        | User opens the driver or passenger door to enter the vehicle   |
| <b>Post-conditions</b>             | The Welcome HMI is displayed   |
| <b>List of Exception Use Cases</b> | N/A  |
| <b>Interfaces</b>                  | Vehicle System Interface   |

##### 3.5.1.2 PWRMAN-UC-REQ-033900/A-Exiting Welcome HMI - Welcome Timer Expires (TcSE ROIN-289113-1)

|                                    |  |
|------------------------------------|--|
| <b>Actors</b>                      | Vehicle Occupant   |
| <b>Pre-conditions</b>              | Welcome HMI Active<br>Infotainment System Powered OFF<br>Ignition Status is OFF<br>Delayed Accessory is OFF<br>Load Shed is not active<br>Transport Mode is not active |
| <b>Scenario Description</b>        | The Welcome Timer expires  |
| <b>Post-conditions</b>             | The Welcome HMI is exited  |
| <b>List of Exception Use Cases</b> | N/A  |
| <b>Interfaces</b>                  | Vehicle System Interface   |

##### 3.5.1.3 PWRMAN-UC-REQ-033901/A-Exiting Welcome HMI - Turning ON the infotainment system (TcSE ROIN-289114-1)

|                             |  |
|-----------------------------|--|
| <b>Actors</b>               | Vehicle Occupant   |
| <b>Pre-conditions</b>       | Welcome HMI Active<br>Infotainment System Powered OFF<br>Ignition Status is OFF<br>Delayed Accessory is OFF<br>Load Shed is not active<br>Transport Mode is not active |
| <b>Scenario Description</b> | The user turns ON the infotainment system. This could be enter conditions such as changing ignition status to Run/ACC or turning on Extended play.                     |
| <b>Post-conditions</b>      | The Welcome HMI is exited  |



|                             |                          |
|-----------------------------|--------------------------|
| List of Exception Use Cases | N/A                      |
| Interfaces                  | Vehicle System Interface |

#### 3.5.1.4 PWRMAN-UC-REQ-033902/A-Activating Farewell HMI – from turning off infotainment system (TcSE ROIN-289115-1)

|                             |  |
|-----------------------------|--|
| Actors                      | Vehicle Occupant   |
| Pre-conditions              | Infotainment System Powered ON   |
| Scenario Description        | The user powers OFF the infotainment system. This could be exit conditions such as opening the door to exit delayed accessory or pressing the power button to end extended play. |
| Post-conditions             | The Farewell HMI is displayed  |
| List of Exception Use Cases | N/A  |
| Interfaces                  | Vehicle System Interface   |

#### 3.5.1.5 PWRMAN-UC-REQ-033903/A-Exiting Farewell HMI – Farewell Timer expires (TcSE ROIN-289116-1)

|                             |   |
|-----------------------------|---|
| Actors                      | Vehicle Occupant  |
| Pre-conditions              | Infotainment System Powered OFF<br>Farewell HMI is active |
| Scenario Description        | Farewell Timer expires                                    |
| Post-conditions             | The Farewell HMI is exited                                |
| List of Exception Use Cases | N/A   |
| Interfaces                  | Vehicle System Interface                                  |

#### 3.5.1.6 PWRMAN-UC-REQ-033904/A-Exiting Farewell HMI - Door Closed and Door Locked (TcSE ROIN-289133-1)

|                             |   |
|-----------------------------|---|
| Actors                      | Vehicle Occupant  |
| Pre-conditions              | Farewell HMI Active<br>Infotainment System Powered OFF<br>Ignition Status is OFF<br>Delayed Accessory is OFF<br>Load Shed is not active<br>Transport Mode is not active |
| Scenario Description        | The user closes the door and then locks the door while exiting the vehicle  |
| Post-conditions             | The Farewell HMI is exited  |
| List of Exception Use Cases | N/A   |
| Interfaces                  | Vehicle System Interface  |

**3.5.1.7 PWRMAN-UC-REQ-033905/A-Exiting Farewell HMI - Turning ON the infotainment system (TcSE ROIN-289134-1)**

|                                    |   |
|------------------------------------|---|
| <b>Actors</b>                      | Vehicle Occupant  |
| <b>Pre-conditions</b>              | Farewell HMI Active<br>Infotainment System Powered OFF<br>Ignition Status is OFF<br>Delayed Accessory is OFF<br>Load Shed is not active<br>Transport Mode is not active |
| <b>Scenario Description</b>        | The user turns ON the infotainment system. This could be enter conditions such as changing ignition status to Run/ACC or turning on Extended play                       |
| <b>Post-conditions</b>             | The Farewell HMI is exited  |
| <b>List of Exception Use Cases</b> | N/A   |
| <b>Interfaces</b>                  | Vehicle System Interface  |

**3.5.2 Requirements****3.5.2.1 PWRMAN-SR-REQ-030662/B-10 Minute Clock Mode (Active Clock mode in Standby power mode) (TcSE ROIN-40693-2)**

The user shall not be able to listen to the infotainment system while 10 Minute Clock mode (Active Clock Mode in Standby power mode) is active. 10 Minute Clock Mode display defined by the HMI.

**3.5.2.2 PWRMAN-SR-REQ-030663/C-10 Minute Clock Mode Supported / Not Supported (TcSE ROIN-40694-1)**

If support 10 minute clock mode for a particular market then 10 Minute Clock mode shall be configurable Supported / Not Supported. Reference IDS specification for details.





### 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)

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

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

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

- 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.

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 (ex. illumination).

Note: There may also be applicable Climate Control load shed requirements for modules the support Climate Control functionality.

### 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 PrsnIDevChrgEnbl\_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/C-Transport Mode Power Moding

#### 3.7.1 Use Cases

##### 3.7.1.1 PWRMAN-UC-REQ-033910/B-Entering Transport Mode Low Power State (TcSE ROIN-289902-1)

|                             |   |
|-----------------------------|---|
| Actors                      | Vehicle Occupant  |
| Pre-conditions              | Infotainment System Powered ON in MMActive or Extended Play<br><del>Ignition Status is OFF or Accessory</del><br>CGEA 1.2 / C1MCA architecture: Ignition Status is OFF or Accessory<br>CGEA 1.3+ architecture: Ignition Status is OFF, Acc, or Run with engine off<br>(but not engine off because of a start-stop engine off event)<br>Transport Mode is not active<br>Load Shed is not active<br>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} for an appropriate amount of time.   |
| List of Exception Use Cases | N/A   |
| Interfaces                  | Vehicle System Interface  |

##### 3.7.1.2 PWRMAN-UC-REQ-033911/B-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<br><del>Ignition Status is OFF or Accessory</del><br>CGEA 1.2 / C1MCA architecture: Ignition Status is OFF or Accessory<br>CGEA 1.3+ architecture: Ignition Status is OFF, Acc, or Run with engine off<br>(but not engine off because of a start-stop engine off event)<br>Load Shed is not active<br>eCall is not active |
| Scenario Description        | <del>User changes Ignition Status to Run</del><br>- For CGEA 1.2/ C1MCA architectures the User changes Ignition Status to Run<br>- For CGEA 1.3+ architectures the user starts the engine.  |
| Post-conditions             | The Infotainment System exits Transport Mode and enters MMActive  |
| List of Exception Use Cases | N/A   |
| Interfaces                  | Vehicle System Interface  |

##### 3.7.1.3 PWRMAN-UC-REQ-033912/B-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<br>Ignition Status is OFF or Accessory<br>Load Shed is not active<br>eCall is not active |
| Scenario Description | The Transport Mode event is ended  |



|                                    |   |
|------------------------------------|---|
| <b>Post-conditions</b>             | The Infotainment System enters the applicable power mode state.<br><br>If Ignition Status is Acc or Delayed Accessory is active then MMAActive would be entered.<br><br>If Ignition Status is OFF and Delayed Accessory is OFF (even if previous power mode state was extended play) then MMInactive would be entered |
| <b>List of Exception Use Cases</b> | N/A   |
| <b>Interfaces</b>                  | Vehicle System Interface  |

### 3.7.2 Requirements

#### 3.7.2.1 PWRMANv2-SR-REQ-014519/I-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 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.

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

#### 3.7.2.2 PWRMAN-SR-REQ-014520/G-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.



### 3.8 PWRMAN-FUN-REQ-212039/A-Transport Mode Audio Settings

#### 3.8.1 Use Cases

##### 3.8.1.1 PWRMAN-UC-REQ-212040/A-Audio Settings when Transport Mode is deactivated on the Vehicle

|                             |  |
|-----------------------------|--|
| <b>Actors</b>               | Vehicle Occupant   |
| <b>Pre-conditions</b>       | Vehicle is in Transport Mode (ex CarMode / Life Cycle Mode = Transport)<br><br>Audio Settings are not all set to the default settings              |
| <b>Scenario Description</b> | The vehicle is taken out of Transport Mode (ex CarMode / Life Cycle Mode = Normal)   |
| <b>Post-conditions</b>      | Audio Settings are set to the default settings.  |
| <b>Notes</b>                | This does not relate to powering on and off the infotainment system. This is in regards to whether the vehicle is in a Transport Mode state or not |
| <b>Interfaces</b>           | Vehicle System Interface   |

##### 3.8.1.2 PWRMAN-UC-REQ-212041/A-Audio Settings while powering ON and OFF the infotainment system while the vehicle is in Transport Mode

|                             |   |
|-----------------------------|---|
| <b>Actors</b>               | Vehicle Occupant  |
| <b>Pre-conditions</b>       | Vehicle is in Transport Mode (ex CarMode / Life Cycle Mode = Transport)<br><br>Audio Settings are NOT at the default settings<br><br>Infotainment System is ON (ie HMIAudioMode = ON)   |
| <b>Scenario Description</b> | The infotainment System is powered OFF and then back ON <ul style="list-style-type: none"><li>Example: HMIAudioMode = ON → OFF → Network Bus OFF → Bus ON → HMIAudioMode = ON</li></ul> |
| <b>Post-conditions</b>      | The Audio Settings do not change to the default settings  |
| <b>Notes</b>                |   |
| <b>Interfaces</b>           | Vehicle System Interface  |

#### 3.8.2 Requirements

##### 3.8.2.1 PWRMAN-REQ-212042/E-Audio Settings when Transport Mode is deactivated on the Vehicle

When Transport Mode is deactivated on the vehicle the AHU / DSP AMP shall set the audio settings to the default settings as defined below:

- “STMGNT-REQ-014654-AHU-DSP AMP Default Parameters”
  - Example: Active audio source switches to default setting for “Front Active Audio Source” in the requirement and switches to the default presets as defined in the requirement.
  - Note: for DSP AMP variant 2 only parameters it is responsible for are the ones it is the server for (example if DSP AMP v2 controls mid-range then it would be responsible for setting the mid-range default setting).
- “SDARS-FUR-REQ-024787-SDARS Factory Default Settings” for SDARS Server (wouldn't impact DSP AMP)
- AM/FM/DAB Tuner Presets listed in the Infotainment Diagnostics Specification
- Infotainment System shall disconnect all Connected Bluetooth devices and delete devices from the list
- USB directory structures (if applicable) – Remove all memorized structures





Transport Mode on the vehicle is deactivated when:

- CarMode = Transport Mode (last state – could be from previous ignition) → Normal (CGEA 1.2 / C1MCA)
- LifeCycMde\_D\_Actl = Transport Mode (last state – could be from previous ignition) → Normal (CGEA 1.3+)

Note: this requirement is not related to SPSS requirements “PWRMAN-SR-REQ-014518 -Transport Mode” and “PWRMANv2-SR-REQ-014519-Transport Mode” which are requirements for powering up and down the AHU / DSP AMP during transport mode. Those requirements are not related to the vehicle itself exiting transport mode (example gets to the dealership) and going to the default audio settings.





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

#### 3.9.1 PWRMAN-SR-REQ-346790/A-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 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



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

#### 3.10.1 Requirements

##### 3.10.1.1 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.



### 3.11 PWRMAN-FUN-REQ-014487/A-Exiting Audio AMP Low Power State (TcSE ROIN-268150-1)

#### 3.11.1 Requirements

##### 3.11.1.1 *PWRMAN-SR-REQ-014488/C-Exiting AMP low power state (TcSE ROIN-40717-2)*

When changing from an Audio AMP low power state to a fully operational state the AMP (ex AHU internal, smart DSP AMP...) shall be fully operational within T\_AMP\_ON.

- Example:

Pre-Condition: Power\_Up\_Chime\_Modules = Inactive and HMIAudioMode = OFF

Event: Power\_Up\_Chime\_Modules changes from Inactive to Active, OR HMIAudioMode changes from OFF to ON

Post-Condition: the AHU/DSP AMP has their AMP(s) power up within T\_AMP\_ON.

##### 3.11.1.2 *PWRMAN-TMR-REQ-014489/D-T\_AMP\_ON timer (TcSE ROIN-40718-2)*

| Name           | Description   | Units | Range  | Resolution | Default |
|----------------|---|-------|--------|------------|---------|
| T_AMP_ON timer | Maximum time it takes for the AMP (ex. AHU internal AMP, smart AMP...) to power-up from a low power state to a state capable of producing Audio.<br><br>Note: use default value | msec  | 0-2000 | 100        | 1000    |



## 3.12 PWRMANv3-FUN-REQ-311408/A-ANC PowerModing - ANC integrated in AHU

### 3.12.1 Requirements

#### 3.12.1.1 PWRMAN-SR-REQ-014525/B-ANC Status signal (TcSE ROIN-193463-2)

The ANC module (Active Noise Cancellation) shall transmit ActvNse\_B\_Actv = ON when it is producing a cancellation or enhancement signal and its output is active. When the ANC module is not transmitting a cancellation or enhancement signal or its output is switched off then ActvNse\_B\_Actv = OFF.



### 3.13 PWRMAN-FUN-REQ-347948/A-ANC PowerModing with DSP AMP variant 2 - ANC integrated in AHU/iAHU - variant 4

#### 3.13.1 PWRMAN-CLD-REQ-347949/A-ANC Generator

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

#### 3.13.2 PWRMAN-CLD-REQ-347950/A-ANC Amplifier

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

#### 3.13.3 Use Cases

##### 3.13.3.1 PWRMAN-UC-REQ-347960/A-Activating ANC

|                      |                               |
|----------------------|-------------------------------|
| Actors               | Vehicle Occupant              |
| Pre-conditions       | Engine is OFF                 |
| Scenario Description | The Engine is turned ON       |
| Post-conditions      | ANC is enabled in the vehicle |
| Notes                |                               |

##### 3.13.3.2 PWRMAN-UC-REQ-347961/A-Deactivating ANC

|                      |                                |
|----------------------|--------------------------------|
| Actors               | Vehicle Occupant               |
| Pre-conditions       | Engine is ON                   |
| Scenario Description | The Engine is turned OFF       |
| Post-conditions      | ANC is disabled in the vehicle |
| Notes                |                                |

#### 3.13.4 Interface Requirements

##### 3.13.4.1 MD-REQ-347951/A-ActvNseMute\_D\_Statc

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   | See requirement 015112 |
|                     | Not Muted | 0x1   |                        |
|                     | Muted     | 0x2   |                        |

##### 3.13.4.2 MD-REQ-347952/A-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   | See requirement 015112 (applies for this signal even though request) |
|                     | Unmute   | 0x1   |  |
|                     | Mute     | 0x2   |  |

#### 3.13.4.3 *PWRMAN-SR-REQ-350927/A-Module Deployment - ANC*

|               |                            |           |
|---------------|----------------------------|-----------|
|               | iAHU and DSP AMP variant 2 | iAHU only |
| ANC Generator | iAHU                       | iAHU      |
| ANC Amplifier | DSP AMP v2                 | iAHU      |

Note:

- IAHU stands for Integrated AHU. It references modules where the infotainment system master and AHU are integrated in one module (ex APIM module).

#### 3.13.4.4 *IFS-MMCAN-FUR-REQ-015112/C-Invalid - NoDataExist (TcSE ROIN-66250-2)*

For Status signals the value <0x0 – Invalid> or <0x0 – NoDataExist> will always be added to the CAN message list. There can be exceptions to this rule if there is a strong argument for it. This value will not be shown in the object specification for the same reason as for Request and Response.

The reason for having invalid or NoDataExist is that until the application has started and the value is known, the sending of periodic signals might have been started by the node. The invalid/NoDataExist state may also be set if the value for some reason is unknown to the application, e.g. if there is an internal communication loss. The receiver shall then know that the value is not yet valid and take appropriate actions.

Note:

- 0x0 is used as examples for NoDataExist / Invalid but sometimes the CAN dB will use other encodings for NoDataExist / Invalid as exceptions such as 0xFFFF.
- Sometimes Null and Inactive are used instead of Invalid and NoDataExist

### 3.13.5 Requirements

#### 3.13.5.1 *PWRMAN-SR-REQ-347956/A-Muting / Unmuting for the ANC*

The ANC Generator is responsible for unmuting the ANC Amplifier via the ActvNseMute\_D\_Rq signal before producing a cancellation or enhancement ANC signal. The ANC Generator shall hold the ActvNseMute\_D\_Rq = Unmute for as long as it requires the audio channels/streams assigned for ANC/ESE usage to be unmuted.

The ANC Generator is responsible for muting the ANC Amplifier via the ActvNseMute\_D\_Rq signal when the ANC Generator is no longer producing an ANC signal (ex engine off). The ANC Generator shall hold the ActvNseMute\_D\_Rq = Mute when it does not require the audio channels/streams assigned for ANC/ESE usage to be unmuted.

The ANC Amplifier shall set ActvNseMute\_D\_Stat to Mute or Not Muted based on the status of its ANC inputs.

The ANC Amplifier shall mute or unmute its ANC A2B input signals within T\_ANC\_Rsp of receiving the updated ActvNseMute\_D\_Rq signal (indicating a change in signal state).

- When ActvNseMute\_D\_Rq is equal to Inactive the state is considered unknown and the ANC Amplifier shall treat this the same as a mute.

If the ANC Generator sent an unmuting request to the ANC Amplifier then the ANC Generator shall not generate the ANC signal until after it receives the ActvNseMute\_D\_Stat = Not Muted response.



- Note:** the ANC Generator can initiate a retry strategy if it does not get a response or since the ActvNseMute\_D\_Rq is event-periodic the next periodic loop would effectively be a retry.

See sequence diagrams for examples of muting/unmuting events

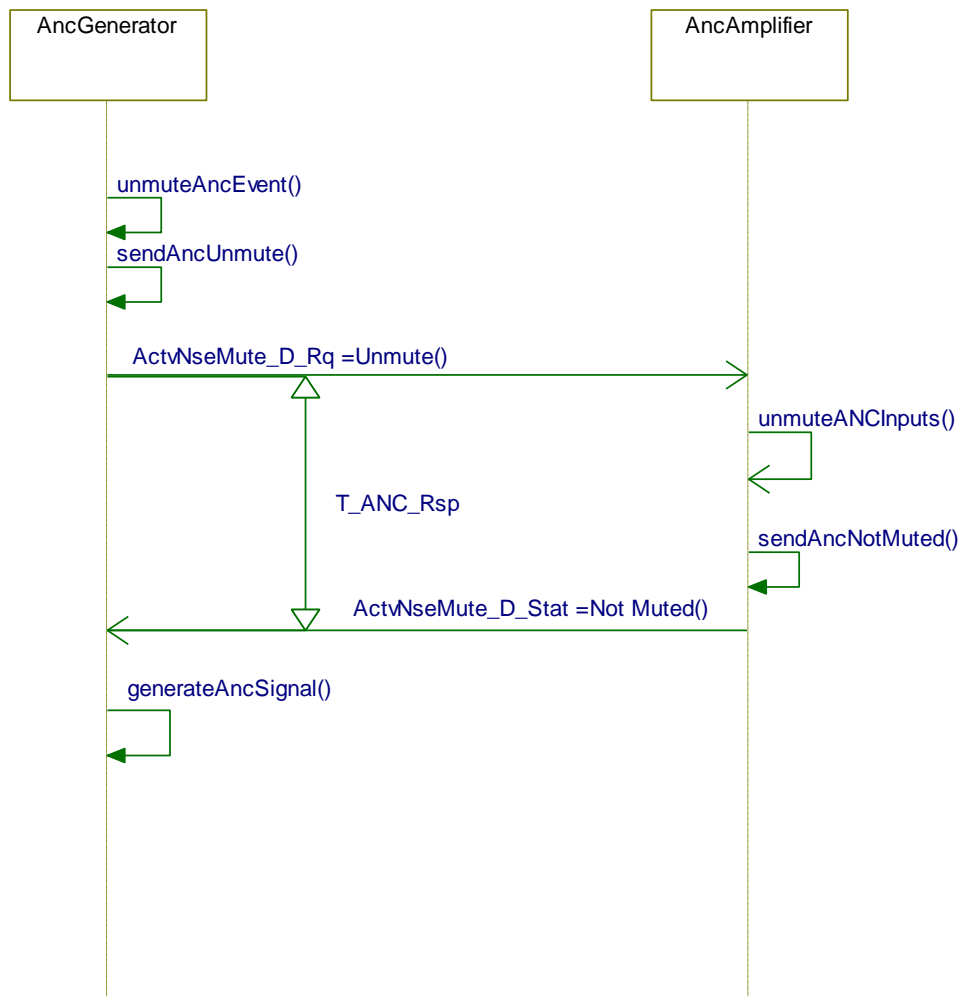
### 3.13.5.2 PWRMAN-TMR-REQ-347957/A-T\_ANC\_Rsp

| Name      | Description  | Units | Range | Resolution | Default |
|-----------|--|-------|-------|------------|---------|
| T_ANC_Rsp | Maximum time the ANC Amplifier shall take to respond to the ActvNseMute_D_Rq signal. The response will be in the ActvNseMute_D_Stat signal.<br><br>Maximum time defined as the default value | msec  |       |            | 150     |

### 3.13.6 Sequence Diagrams

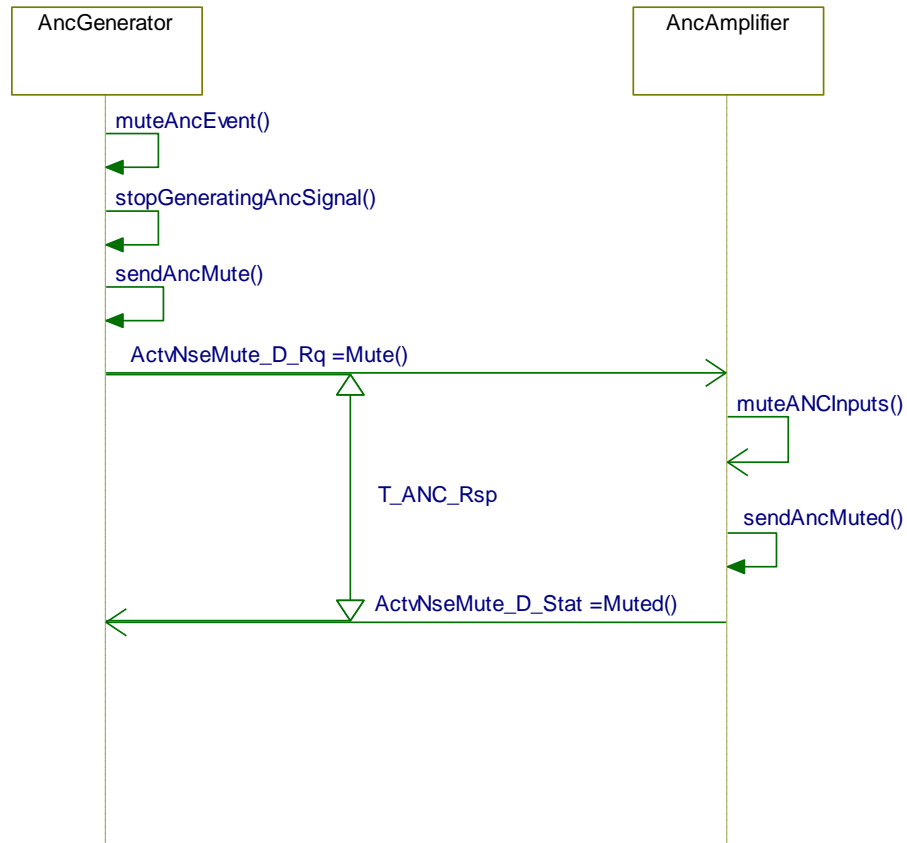
#### 3.13.6.1 PWRMAN-SD-REQ-347958/A-Unmuting for ANC

Pre-Condition: ANC Amplifier has its ANC inputs muted



#### 3.13.6.2 PWRMAN-SD-REQ-347959/A-Muting for ANC

Pre-Condition: ANC Amplifier has its ANC inputs unmuted







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

#### 3.14.1 Use Cases

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

|                             |   |
|-----------------------------|---|
| <b>Actors</b>               | Vehicle Occupant  |
| <b>Pre-conditions</b>       | The infotainment system is powered OFF so there no infotainment audio (ie HMIAudioMode = OFF).<br><br>The Vehicle System is not requesting infotainment be capable of charging a phone (ie PrsnIDevcChrgEnbl_B_Rq = Inactive)   |
| <b>Scenario Description</b> | The Vehicle System request the infotainment system to be capable of charging a phone (ie PrsnIDevcChrgEnbl_B_Rq = Active)   |
| <b>Post-conditions</b>      | The infotainment phone charging ports (ex USB) are able to charge a phone<br><br>The infotainment system is powered OFF so no infotainment audio (ie HMIAudioMode = OFF)  |
| <b>Notes</b>                | 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 PrsnIDevcChrgEnbl_B_Rq power moding signal to the infotainment system so the phone can be charged enough to start the vehicle. |
| <b>Interfaces</b>           | Vehicle System  |

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

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

#### 3.14.2 Requirements

##### 3.14.2.1 PWRMAN-SR-REQ-233262/D-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.

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.



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

#### 3.15.1 Use Case

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

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

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

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

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

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

#### 3.15.2 Requirements

##### 3.15.2.1 PWRMAN-SR-REQ-235509/J-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) | <i>Ignition_Status is prioritized over KeyOffMde_D_Actl</i><br><br>The Infotainment modules are not required to use any KOL Mode Reduced Current Drain Strategies when ignition status is not OFF.   |
| TRANSPORT  <br>NORMAL  <br>FACTORY | OFF                                  | These states are don't cares with the KeyOffMde_D_Actl signal. No new requirements. Follow existing strategies<br><br>Follow current strategy for LifeCycleMode_D_Actl / CarMode signal (ex Transport Mode, Factory Mode)  |
| HIBERNATE                          | OFF                                  | The Infotainment System Master shall disable the Welcome / Farewell strategy<br><br>The Infotainment System Master shall disable extended play<br><br>For TCU see applicable TCU specifications for reduced current drain strategies<br><br>Note: at the time this SPSS was written Hibernate mode is entered after 5 days of key off.   |
| CRITICAL_BATT                      | OFF                                  | The Infotainment System Master shall disable the Welcome/Farewell strategy <u>and all non-critical infotainment features (treat critical features as features that load shed would not shut down).</u><br><br><u>The infotainment System Master shall shut down the infotainment system and set HMIAudioMode = Load Shed. -The Infotainment System Master shall disable extended play.</u> <ul style="list-style-type: none"><li><u>Note: for infotainment load shed shutdown process see load shed requirement "PWRMAN-REQ-014508-System Master Load Shed Event Activation Process".</u></li></ul><br>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). The AHU shall set AHU_Chime_Supported = Not Supported.<br><br>For TCU see applicable TCU specifications for reduced current drain strategies |

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.



### 3.16 PWRMAN-FUN-REQ-235584/A-Factory Mode

#### 3.16.1 Use Case

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

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

##### 3.16.1.2 PWRMAN-UC-REQ-235603/A-Factory Mode - Extended Play

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

#### 3.16.2 Requirements

##### 3.16.2.1 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\_Actl 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).



### 3.17 PWRMAN-FUN-REQ-295539/A-OTA VehOnSrc\_D\_Stat Power Moding

#### 3.17.1 Requirements

##### 3.17.1.1 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   |             |

##### 3.17.1.2 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.



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

#### 3.18.1 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.

#### 3.18.2 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.

#### 3.18.3 Interface Requirements

##### 3.18.3.1 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   |   |

##### 3.18.3.2 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   |  |

#### 3.18.4 Requirements

##### 3.18.4.1 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.





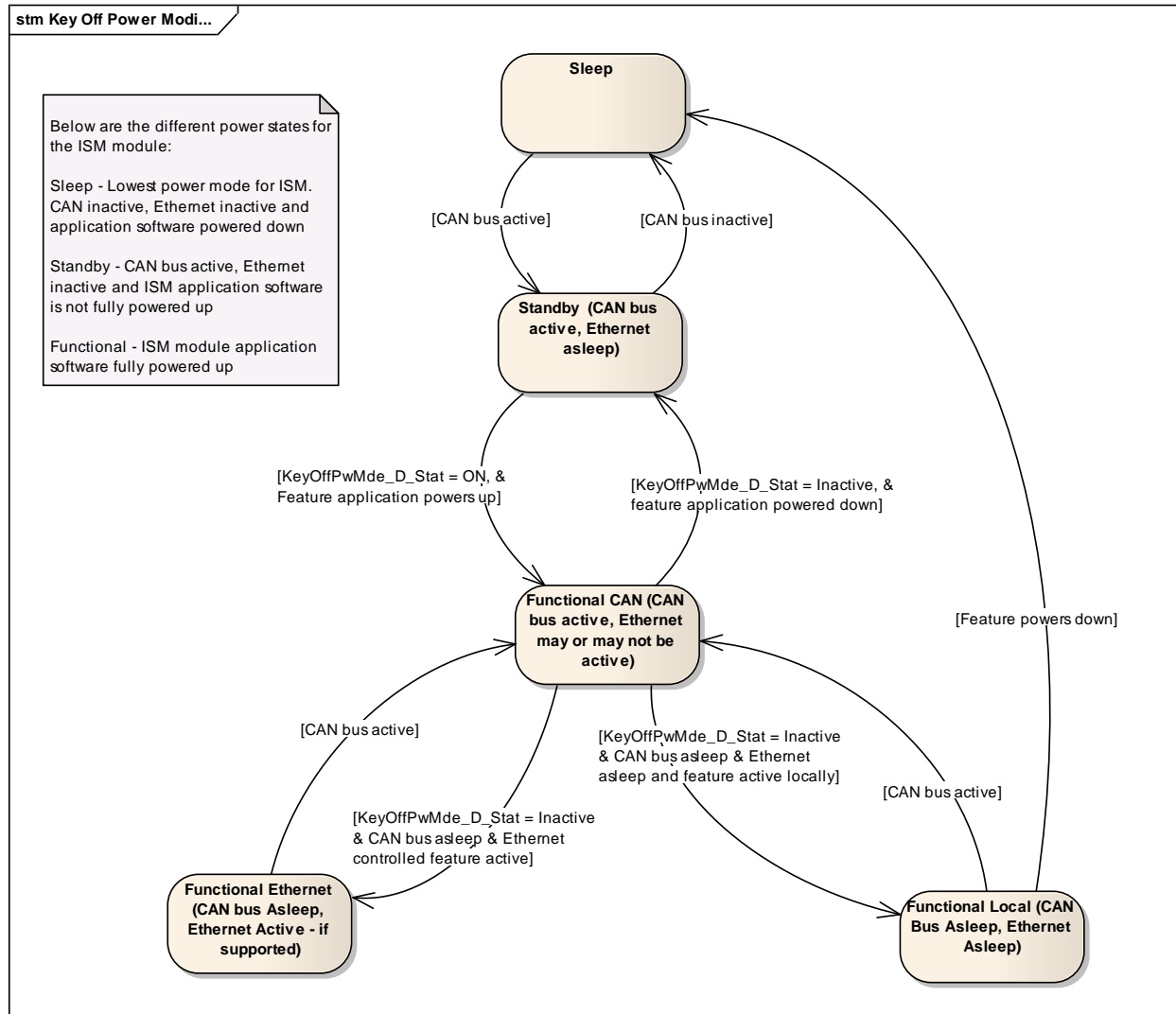
For details of implementing specific features and the associated CAN and/or Ethernet signals with those features reference the associated feature specs (ex OTA, WIR feature specifications).

#### 3.18.4.2 *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.

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



#### 3.18.4.4 *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.

#### 3.18.4.5 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.

#### 3.18.4.6 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 KeyOffPrwMde\_D\_Stat = ON if it is then put back to KeyOffPrwMde\_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.

3.18.4.7 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.

3.18.4.8 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.

3.18.4.9 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

3.18.4.10 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

#### **3.18.4.11 OTA specific Key Off power moding requirements**

##### **3.18.4.11.1 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.

#### **3.18.5 Sequence Diagram**

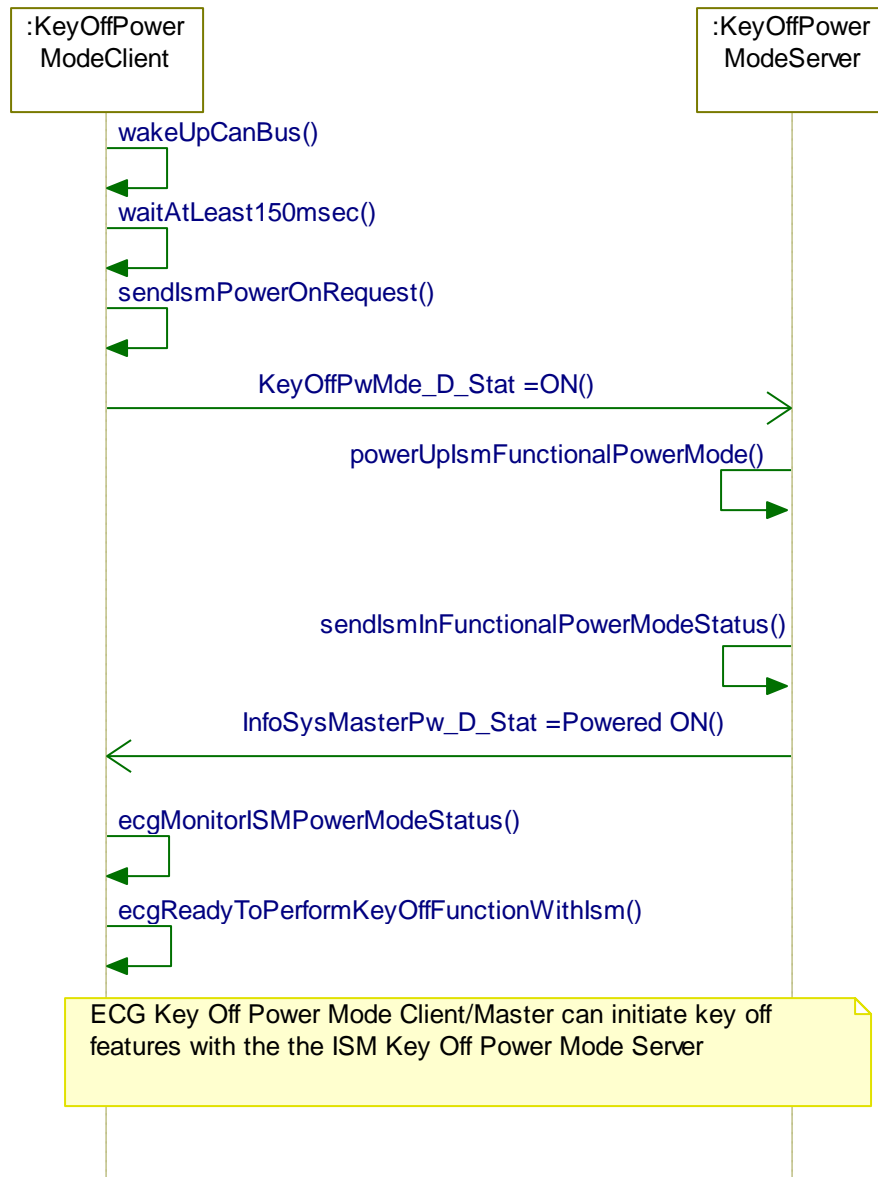
##### **3.18.5.1 PWRMAN-SD-REQ-298341/A-System Start up for ECG initiated Key Off feature**

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





## 4 Appendix: Reference Documents

| Reference # | Document Title   |
|-------------|--|
| 1           | APIM P06 power mode spec – SYNC 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           | APIM with integrated AHU Hardware spec requirements  |
| 4           | IDS (Infotainment Diagnostic Specification)  |
| 5           | EMC requirement for supporting worst case cold crank voltage profile (EMC requirement CI-230)  |
| 6           | Station Management SPSS (infotainment system start-up, crank requirements...)  |
| 7           | ANC power management specification   |
| 8           | HMI spec(s) – (SYNC 3 was "H22G_Sync3_Welcome_Power_Modes")  |
| 9           | Remote Tuner and A2B Init power moding spec (requirements for SYNC to power the tuner module).   |
| 10          |  |
| 11          |  |
| 12          |  |
| 13          |  |
| 14          |  |
|             |  |
|             |  |
|             |  |