Research & Vehicle Technology
"Infotainment Systems Product Development"

Feature – Power Management

Wireless Accessory Charging Module (WACM) Infotainment Subsystem Part Specific Specification (SPSS)

Version 1.4

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Revision History

Date	Version	Notes	
October 8, 2015	**1.0**	**Initial Release**	
March 10, 2016	**1.1**		
	STMGNT-SR-REQ-210011/A-CGEA 1.3 Cold Crank+		<jmyslin2> new requirement for reference only on what constitutes a CGEAG 1.3 crank
October 6, 2016	**1.2**		
	WCG-UC-REQ-233256/A-Charging the phone for the Phone As A Key feature		<jmyslin2> Updated use case to support Phone as a Key
	PWRMAN-STM-REQ-163133/B-WACM Power Moding		<jmyslin2> Updated power mode diagram to support Phone as a Key
November 27, 2018	**1.3**		
	IIR-REQ-163136/B-Wireless Charging interface signals		<jmyslin2> added MD for Transport Mode
	MD-REQ-273358/A-HMIAudioMode+		<jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update
	MD-REQ-273358/B-HMIAudioMode		<jmyslin2> Formatting Update. No content change
	MD-REQ-273750/A-Ignition_Status		<jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update
	MD-REQ-273762/A-Delay_Acc		<jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update
	MD-REQ-273763/A-PrsnIDevChrgEnbl_B_Rq		<jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update
	MD-REQ-273721/A-CarMode+		<jmyslin2> Put interface table description in MD form. Not requirement content change and only a clarification and formatting update
	MD-REQ-273721/B-CarMode+		<jmyslin2> clarification added for CGEA 1.2, C1MCA and CGEA 1.3 for CarMode
	MD-REQ-273721/C-LifeCycMde_D_Actl / CarMode		<jmyslin2> added additional detail with Life Cycle mode signal. No content change, clarification only
	PWRMANv2-SR-REQ-094993/F-Network Management		<jmyslin2> Clarification only, no content change
	PWRMAN-SR-REQ-014468/D-Bus wake-up transition times from Sleep Power Mode (TcSE ROIN-40700-3)		<jmyslin2> added a comment for ready to receive. No content change
	PWRMAN-SR-REQ-014473/C-System Master timing to send HMIAudioMode (TcSE ROIN-40705-2)+		<jmyslin2> Added a note about predictive triggers when the Infotainment System Master boot-up time is longer than the timing in the requirement
	PWRMAN-SR-REQ-014473/D-System Master timing to send HMIAudioMode (TcSE ROIN-40705-2)+		jmyslin2 - added note about approach detection predictive trigger signals
	PWRMAN-SR-REQ-014473/E-System Master timing to send HMIAudioMode (TcSE ROIN-40705-2)		<jmyslin2> removed comment to set HMIAudioMode = ON when ready to support command and controls since SYNC is not doing it this way currently
	PWRMAN-SR-REQ-014477/D-Infotainment System States (TcSE ROIN-40610-3)		<jmyslin2> Updated chimes through the audio system, phone as a key, ECG key off power moding
	STR-240116/C-Functional Definition		<jmyslin2> added requirement for Transport Mode
	PWRMAN-SR-REQ-329943/A-Transport Mode - WACM		<jmyslin2> New requirement for Transport Mode
	PWRMAN-SR-REQ-014509/E-Infotainment Components Load Shed State requirements (TcSE ROIN-66172-3)		<jmyslin2> added clarifications to requirement
August 22, 2019	**1.4**		
	IIR-REQ-163136/B-Wireless Charging interface signals		<jmyslin2> added MD for Transport Mode
	MD-REQ-273358/C-HMIAudioMode		<jmyslin2> added clarification on signal name
	MD-REQ-273721/C-LifeCycMde_D_Actl / CarMode		<jmyslin2> added additional detail with Life Cycle mode signal. No content change, clarification only
	STR-240116/C-Functional Definition		<jmyslin2> added requirement for Transport Mode

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	PWRMAN-SR-REQ-237312/C-Phone as a Key - Phone Charging power moding (WACM)	<jmyslin2> added clarification. No content change
	PWRMAN-SR-REQ-329943/A-Transport Mode - WACM	<jmyslin2> New requirement for Transport Mode

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1 Architecture Design

1.1 IIR-REQ-163136/B-Wireless Charging interface signals

1.1.1 MD-REQ-273358/C-HMIAudioMode

Message Type: Status

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

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

1.1.2 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	

1.1.3 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	

1.1.4 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	

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

Message Type: Status

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

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

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

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 whice 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

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2.2 PWRMANv2-FUN-REQ-094995/B-Infotainment Network Management

2.2.1 PWRMANv2-SR-REQ-094993/F-Network Management

Power Mode State	HMIAudioMode / Multimedia System Signal	Infotainment Components	Module keeps network awake	Comments
Standby	OFF	System Master	Y / N	-System Master keeps network awake if need to perform function with multiple modules in Standby - The IAHU System Master shall keep the network awake as long as Power_Up_Chime_Modules = Active (applies if AHU integrated with the system Master)
		DSP AMP	Y / N	- The DSP AMP shall keep the network awake as long as Power_Up_Chime_Modules = Active - When none of the above conditions are true the DSP AMP shall not keep the network awake
		FES / RSEM / RACM	N	When modules are on the info-CAN bus
		AHU (non - integrated)	Y / N	If the AHU is not integrated with the System Master (ex MFD or APIM system master with distributed AHU) then this applies: - For Load/Eject AHU to keep bus awake long enough for display modules to read AHU status signals so can update the HMI - The AHU shall keep the network awake as long as Power_Up_Chime_Modules = Active - When none of the above conditions are true the AHU shall not keep the network awake
		EFP / ECP (CAN)	N	Reference climate control specifications for EFP climate control network management. See "PWRMANv2-GREQ-030656-EFP Power Moding (when not on the info-CAN bus)" AND "PWRMAN-GREQ-030655-EFP Power moding when the EFP is located on the info-CAN bus" for additional network management requirements
		SWCM	N	This only describes the power moding for infotainment buttons on the Steering Wheel Control module - See "PWRMAN-REQ-030659-SWCM Power Moding" for details
		Cluster	Y / N	The Cluster shall keep the network awake as long as Power_Up_Chime_Modules = Active.
		AAM / REFP	N	
		WACM	Y / N	When Ignition_Status = Run or Delayed Accessory = Active keep infotainment network awake (for case there is no audio modules on vehicle – no infotainment system mater) otherwise not keeping the bus awake. System master keeps infotainment network awake when HMIAudioMode = ON
Functional	ON	System Master/IAHU	Y	When HMIAudioMode = ON always keep the infotainment Network awake
		DSP AMP	Y / N	- The DSP AMP shall keep the network awake as long as Power_Up_Chime_Modules = Active - When none of the above conditions are true the DSP AMP shall not keep the network awake
		FES / RSEM / RACM	N	When modules our on the info-CAN bus
		AHU (non-integrated)	Y / N	- The AHU shall keep the network awake as long as Power_Up_Chime_Modules = Active - When none of the above conditions are true the AHU shall not keep the network awake
		EFP / ECP (CAN)	N	Reference climate control specifications for EFP climate control network management. See "PWRMANv2-GREQ-030656-EFP Power Moding (when not on the info-CAN bus)" AND

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				"PWRMAN-GREQ-030655-EFP Power moding when the EFP is located on the info-CAN bus" for additional network management requirements
		SWCM	N	This only describes the power moding for infotainment buttons on the Steering Wheel Control module - See "PWRMAN-REQ-030659-SWCM Power Moding" for details
		Cluster	Y / N	The Cluster shall keep the network awake as long as Power_Up_Chime_Modules = Active.
		AAM / REFP	N	
		WACM	Y / N	When Ignition_Status = Run or Delayed Accessory = Active keep infotainment network awake (for case there is no audio modules on vehicle – no infotainment system mater) otherwise not keeping the bus awake. System master keeps infotainment network awake when HMIAudioMode = ON

Note: additional network management detail may be contained in functional requirements
-- IAHU (integrated AHU) reference the System Master with the AHU functionality integrated into it (ex. connected HMI Radio, SYNC with AHU integrated…)

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.

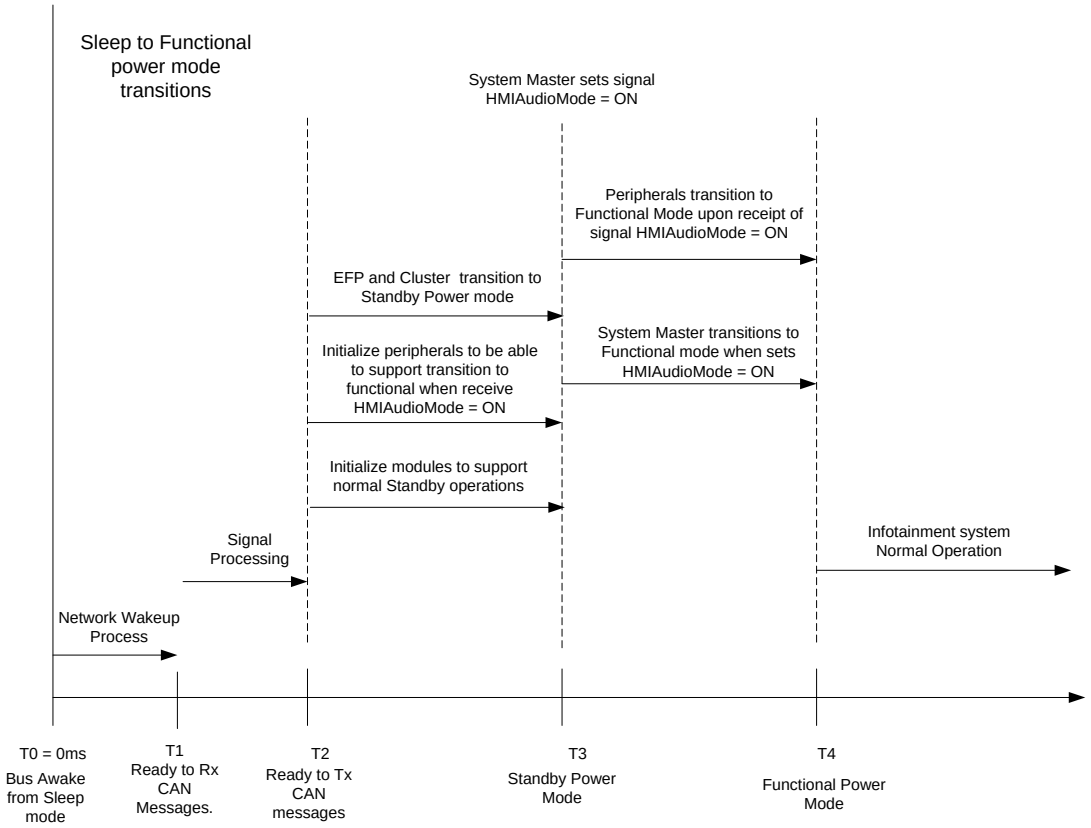
- Ex. If Door Unlock, Door Open or Approach Detection network signals are received by the System Master then those signals could potentially be used as predictive triggers where the System Master boots up internally even if there is no HMI or audio. By the time the user gets in the driver seat and changes 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)

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

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Phone Mode	Functional	HMIAudioMode = ON	ON	Phone call active through audio system. Note: independent of other System States while active

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

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3 Functional Definition

3.1 PWRMAN-FUN-REQ-163132/A-WACM Power Moding

3.1.1 Use Cases

3.1.1.1 WCG-UC-REQ-162480/E-Charging compartment Powers ON from OFF State

Actors	Wireless Accessory Charging Module
Pre-conditions	Infotainment system is powered OFF, and Ignition Status is OFF, and Delayed Accessory is OFF, and PrsnIDevChrgEnbl_B_Rq = Inactive. Wireless charging compartment is not capable of charging a phone
Scenario Description	The infotainment system is Powered ON, and/or Ignition Status becomes Accessory or Run, and/or Delayed Accessory becomes ON, and/or PrsnIDevChrgEnbl_B_Rq = Active
Post-conditions	The wireless charging module is capable of charging a phone
Interfaces	
Notes	If no infotainment system on the vehicle then just look at Ignition Status and Delayed Accessory If Phone as a Key is supported on a vehicle then PrsnIDevChrgEnbl_B_Rq will be included in the vehicle CAN dB

3.1.1.2 WCG-UC-REQ-162481/D-Charging compartment powers OFF from ON State

Actors	Wireless Accessory Charging Module
Pre-conditions	Infotainment system is powered ON, and/or ignition status is in Accessory or Run, and/or Delayed Accessory is ON, and/or PrsnIDevChrgEnbl_B_Rq = Active Wireless charging compartment is capable of charging a phone
Scenario Description	The infotainment system is Powered OFF, and Ignition Status is OFF, and Delayed Accessory is OFF, and PrsnIDevChrgEnbl_B_Rq = Inactive
Post-conditions	The wireless charging module is NOT capable of charging a phone
Interfaces	
Notes	Powering OFF can include Load Shed Mode events If Phone as a Key is supported on a vehicle then PrsnIDevChrgEnbl_B_Rq will be included in the vehicle CAN dB

3.1.1.3 WCG-UC-REQ-162491/D-Charger Powers OFF from ON state when Charging session finished

Actors	Wireless Accessory Charging Module
Pre-conditions	Infotainment system is powered ON, and/or ignition status is in Accessory or Run, or Delayed Accessory is ON, and/or PrsnIDevChrgEnbl_B_Rq = Active. Wireless charging compartment is capable of charging a phone

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	Charging session is not completed
Scenario Description	Charging session is100% completed
Post-conditions	Charging session is finished The wireless charging module is capable of charging a phone
Interfaces	
Notes	If Phone as a Key is supported on a vehicle then PrsnIDevChrgEnbl_B_Rq will be included in the vehicle CAN dB

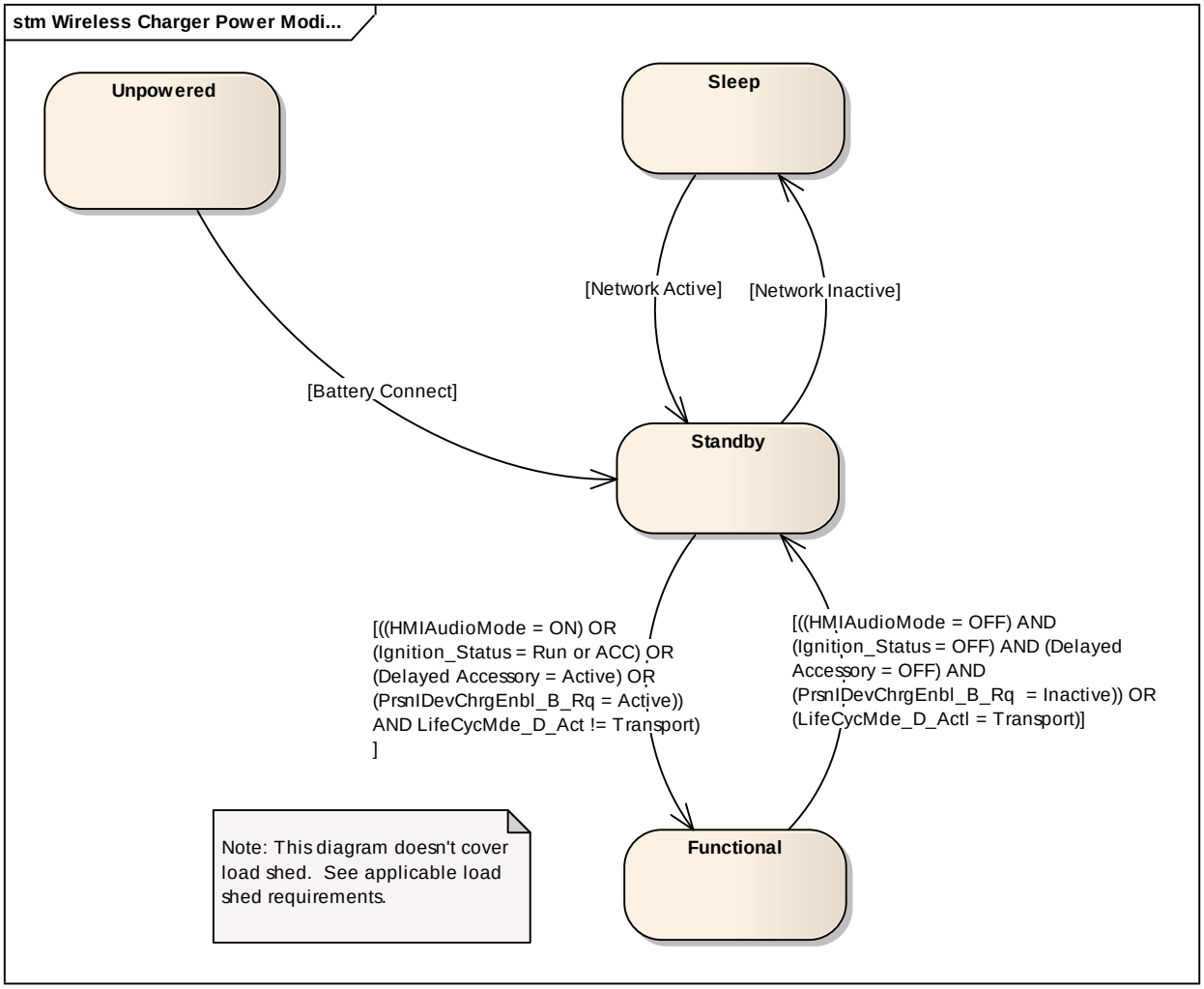
3.1.1.4 WCG-UC-REQ-233256/C-Charging the phone for the Phone As A Key feature

Actors	Wireless Accessory Charging Module
Pre-conditions	Infotainment System is powered OFF so no infotainment audio (ie HMIAudioMode = OFF) Ignition_Status = OFF, AND Delayed Accessory = OFF The wireless charger is in OFF/Standby and cannot charge a Phone The Vehicle System is not requesting infotainment be capable of charging a phone (ie PrsnIDevcChrgEnbl_B_Rq = Inactive)
Scenario Description	The Vehicle System request the infotainment system to be capable of charging a phone (ie PrsnIDevcChrgEnbl_B_Rq = Active)
Post-conditions	The wireless charging module is capable of charging a phone (ie while PrsnIDevcChrgEnbl_B_Rq = Active) • When PrsnIDevcChrgEnbl_B_Rq = Inactive the wireless charging module powers down to standby and no longer is capable of charging a phone The infotainment system is powered OFF so no infotainment audio (ie HMIAudioMode = OFF)
Interfaces	Vehicle Interface
Notes	An example of when this might happen would be if the user's phone battery is dead and they enter the vehicle through the keypad (or door left unlocked), but with a dead phone battery they cannot start the car. The vehicle may use a strategy to determine if a person needs to charge their phone in the vehicle and send this PrsnIDevcChrgEnbl_B_Rq power moding signal to the infotainment system so the phone can be charged enough to start the vehicle.

3.1.2 Requirements

3.1.2.1 PWRMAN-STM-REQ-163133/C-WACM Power Moding

State Diagram



3.1.2.2 PWRMAN-SR-REQ-237312/C-Phone as a Key - Phone Charging power moding (WACM)

The wireless phone charging module shall support charging a phone whenever “PrsnIDevChrgEnbl_B_Rq = Active”. This is regardless of HMIAudioMode power mode status.

The wireless phone charging module shall exit Functional Power Mode if PrsnDevChrgEnbl_B_Rq = Inactive and no other signals are powering the wireless phone charge module up (ex HMIAudioMode).

When Ignition_Status = OFF/Accessory if the signal PrsnIDevChrgEnbl_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 wireless phone charging module shall not keep the bus awake for PrsnIDevChrgEnbl_B_Rq = Active and will remain powered up locally if the network bus is in sleep mode.

If the wireless phone charging module has not received PrsnIDevChrgEnbl_B_Rq = Inactive for more than an hour after first receiving PrsnIDevChrgEnbl_B_Rq = Active then the wireless phone charging module shall treat PrsnIDevChrgEnbl_B_Rq as though it equals Inactive.

- Whenever the wireless phone charging module receives PrsnIDevChrgEnbl_B_Rq = Active the 1 hour timer shall be reset.

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When the infotainment system is in a load shed state (ex HMIAudioMode = Load Shed), if PrsnlDevChrgEnbl_B_Rq = Active then the wireless phone charging module shall be capable of charging a phone.

3.1.2.3 PWRMAN-SR-REQ-329943/A-Transport Mode - WACM

The WACM shall enter Transport Mode low power state when the WACM receives LifeCycMde_D_Actl = Transport.

- During Transport Mode the WACM shall not enter functional power mode as defined in SPSS requirement "PWRMAN-STM-REQ-163133-WACM Power Moding". The WACM is only allowed in Standby or Sleep power mode during Transport Mode so the WACM can remain in a low power state.
    - The power mode signals HMIAudioMode, Ignition_Status, Delay_Acc and PrsnlDevChrgEnbl_B_Tq shall not be used to transition from Standby to Functional power mode during Transport Mode.
        - Example: if HMIAudioMode = ON AND LifeCyclMde_D_Actl = Transport with the CAN bus active then the WACM would remain in Standby power mode and not enter Functional Power Mode

The WACM shall exit Transport Mode when LifeCycMde_D_Actl no longer equals Transport.

For questions on WACM power consumption during Transport Mode talk with Ford Power Supply team.

3.2 PWRMAN-FUN-REQ-162531/B-Load Shed Strategy - WACM

3.2.1 Requirements

3.2.1.1 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.

3.2.1.2 PWRMAN-SR-REQ-014510/B-Infotainment Components transition from Load Shed State to Normal Operation (TcSE ROIN-40682-2)

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 only applies if PowerMode > KeyOut (ie so audio doesn't come back up in Extended Play).

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

3.2.1.3 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).

3.3 STMGNTv2-FUN-REQ-014669/B-Crank, Front System ON (TcSE ROIN-202153-1)

Note: this function is for CGEA 1.3+

3.3.1 Requirements

3.3.1.1 STMGNTv2-SR-REQ-014670/D-Crank Audio Muting (TcSE ROIN-202160-5)

The AHU, AAM or DSP-AMP (if present) shall mute the audio for a Crank event unless noted otherwise.

Two methods can be used to provide indication to the audio system to mute during a crank event:

Method 1: Dedicated "start/crank" hardwired input combined with the Eng_D_Stat network signal.

Or

Method 2: Standalone network signals, monitoring both PwPckTq_D_Stat and Ignition_Status, to determine if the engine is in a cranking state.

Both methods may be utilized on a vehicle platform; therefore the mute shall occur on whichever method occurs first.

~~For method 1, the AHU shall mute on the assertion of the hardwired input and Eng_D_Stat != EngAutoStopped. If present, the AHU shall also mute the AAM / DSP AMP via the AMP enable/disable hardwire.~~

For method 1, the AHU shall mute on the assertion of the hardwired input and Eng_D_Stat == EngOFF. If present, the AHU shall also mute the AAM / DSP AMP via the AMP enable/disable hardwire. Once muted by hardwired input, the AHU shall remain muted until the hardwired input is released, regardless of the state of Eng_D_Stat.

For method 2, the AHU, AAM and DSP-AMP (if present) shall monitor both the PwPckTq_D_Stat and Ignition_Status network signals to perform audio muting based upon a "start" condition. Upon the AHU, AAM and DSP AMP (if present) receiving the first indication of start occurring, (either via "PwPckTq_D_Stat == Strt In Prg No Tq" or "Ignition_Status == Start"), the audio shall be muted within 30 msec.

The AHU shall unmute once the hardwire "start/crank" input (if present), and both the PwPckTq_D_Stat and Ignition_Status network signals are no longer triggering the audio mute. The AAM / DSP AMP shall unmute once the AMP enable/disable hardwire, and both the PwPckTq_D_Stat and Ignition_Status network signals are no longer triggering the audio mute. Once an unmute event occurs the AHU/AAM/DSP AMP shall unmute within 1000 msec.

Reference the AHU, AAM and DSP-AMP specification / component requirements for additional crank / low voltage muting requirements.

Reference the EMC specification(s) for the worst case cold crank voltage profile that needs to be supported (ex EMC requirement CI-230).

3.3.1.2 STMGNT-FUR-REQ-014671/A-Warm-Crank for Modules Not Regulated (TcSE ROIN-198168-2)

On Start-Stop vehicles any module with voltage not regulated by the VQM (Voltage Quality Monitor) shall function normally during warm crank events (re-start after stop event).

When the VQM is not present on Start-Stop vehicles the infotainment modules shall function normally during warm crank events. Warm cranks are defined in Power Supply "Global Power Supply Start/Stop Voltage Curve Specification – FS-0000-000001-A". Power Supply RQT "RQT-002600-000443" references specification FS-0000-000001-A.

3.3.1.3 STMGNT-SR-REQ-210011/F-CGEA 1.3 Cold Crank

When PwPckTq_D_Stat = StrtInPrgrss_TqNotAvail (“Strt In Prg No Tq” in SPSS requirement 014670 Crank Audio Muting) the starter motor starts to crank the engine for cold cranks.

- PwPckTq_D_Stat = StrtInPrgrss_TqNotAvail will not be set for start-stop warm cranks.

- Note: on many CGEA 1.3 vehicles PwPckTq_D_Stat will equal StrtInPrgrss_TqNotAvail 60 msec before the engine starts to crank and before the voltage dip due to the crank from the starter motor in-rush current. This isn't necessarily on all programs and would have to check with a specific CGEA 1.3 program if this is supported.

When PwPckTq_D_Stat no longer equals StrtInPrgrss_TqNotAvail the cold crank event is no longer active.

The Ignition_Status signal represents the position of the ignition state (ex position of the key). The Ignition_Status = Start / Crank the position of the ignition state is in the crank position (ex key in crank position).

Follow module specific requirements for crank events when there is a requirement in the SPSS (such as muting during a crank event). If no specific SPSS requirements on crank then the information above is for reference only.

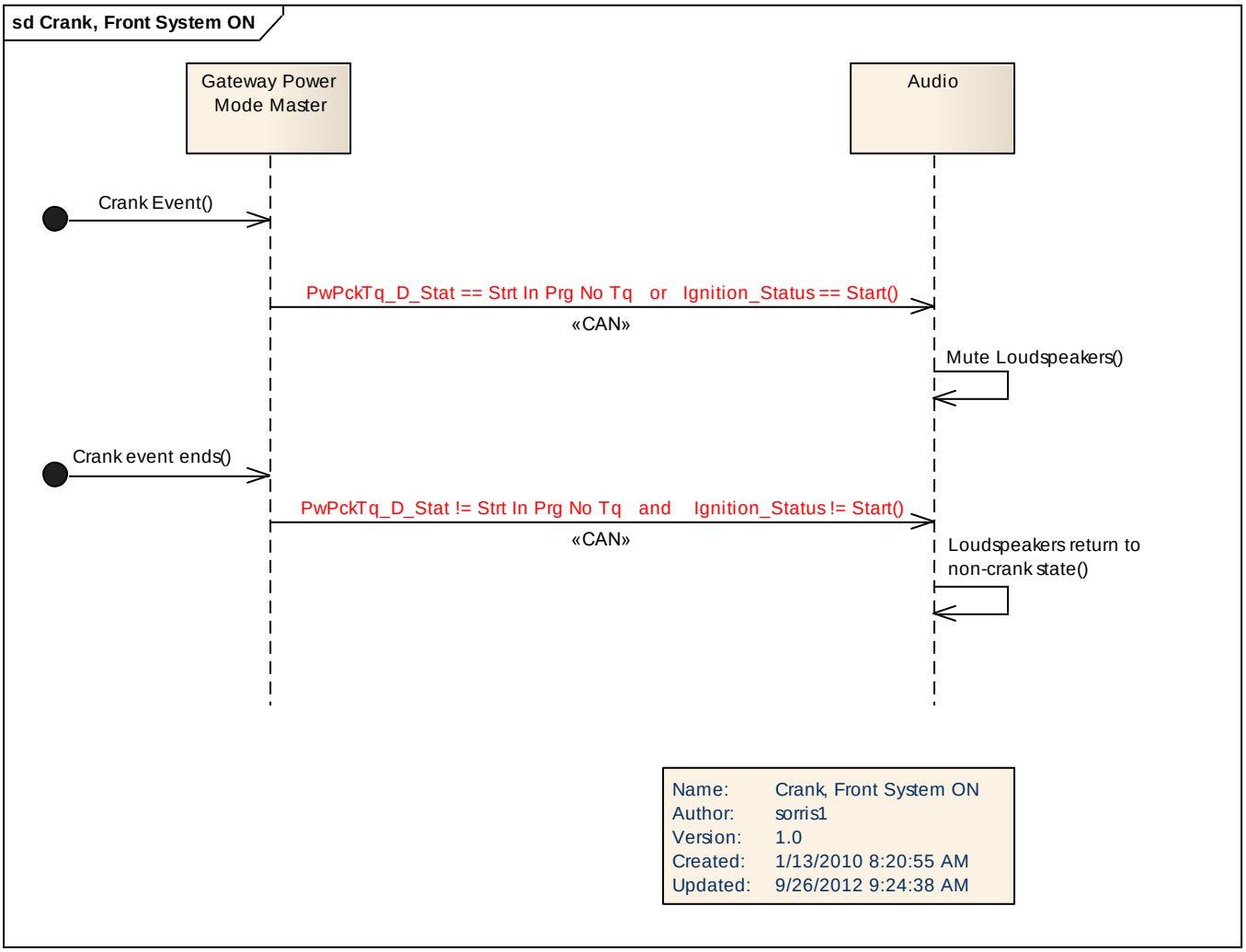
Reference the EMC specification(s) for the worst case cold crank voltage profile (ex EMC requirement CI-230).

3.3.2 Sequence Diagrams

3.3.2.1 STMGNTv2-SD-REQ-014672/A-Crank, Front System ON (TcSE ROIN-202161-2)

Pre-condition
Infotainment System ON in Functional Power Mode
Scenario
Crank event occurs
Post-condition
Infotainment System recovers following the crank event

Sequence Diagram



4 Appendix: Reference Documents

Reference #	Document Title
1	
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