Research & Vehicle Technology
"Infotainment Systems Product Development"

Power to the Box

Infotainment Subsystem Part Specific Specification (SPSS)

Version 1.5

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FORD CONFIDENTIAL

Revision History

Date	Version	Notes	
August 13, 2018	**1.0**	**Initial Release**	
October 2, 2018	**1.1**		
	PttB-FRD-REQ-324959/B-Power to the Box Spss	tmertiri: Revised for V1.1 Release.	
	PttB-CLD-REQ-324953/B-Power to the Box Client	tmertiri: Update requirement type	
	PttB-CLD-REQ-324954/B-Power to the Box Server	tmertiri: Update requirement type	
	PttB-576300/B-Logical Signal Mapping	tmertiri: Update mapping table	
	PttB-IIR-REQ-324955/B-PttB Client Tx	Added signals	
	PttB-MD-REQ-325073/B-PwButton	tmertiri: no content change	
	PttB-MD-REQ-330029/A-LGfciTest	tmertiri: new signal	
	PttB-MD-REQ-330036/A-LGenBt	tmertiri: New signal	
	PttB-IIR-REQ-324956/B-PttB Client Rx	tmertiri: added new signals	
	PttB-MD-REQ-324965/B-FaltMsg	tmertiri: Update wording.	
	PttB-MD-REQ-324966/B-EngOnMsg	tmertiri: no content change	
	PttB-MD-REQ-324970/B-LoFuelMsg	tmertiri: Updated requirement wording.	
	PttB-MD-REQ-324974/B-PwMax	tmertiri: no content change	
	PttB-MD-REQ-330042/A-LInsPwOut1	tmertiri: New signal	
	PttB-MD-REQ-330043/A-LInsPwOut2	tmertiri: new signal	
	PttB-MD-REQ-330044/A-LInsPwLimit	tmertiri: New signal	
	PttB-MD-REQ-330382/A-IgnSt	tmertiri: New Signal	
	PttB-576282/B-General Requirements	tmertiri: Add new req	
	PttB-REQ-324976/B-Missing Signals	tmertiri: Change req type.	
	PttB-REQ-324977/B-Error Recovery	tmertiri: Change req type. Update wording for better clarification.	
	PttB-REQ-325074/B-Text display	tmertiri: Update wording for better clarification.	
	PttB-REQ-330383/A-Feature Availibility	tmertiri: New req	
	PttB-576283/B-Functional Definition	tmertiri: Structure update	
	PttB-FUN-REQ-330427/A-PttB Operation	tmertiri: Structure update	
	PttB-576284/B-Use Cases	tmertiri: new usecase added	
	PttB-UC-REQ-330381/A-GFCI Test	tmertiri: New usecase	
	PttB-576285/B-White Box Views	tmertiri: added new diagrams	
	PttB-ACT-REQ-330595/A-PttB AD	tmertiri: New diagrams	
	PttB-576287/B-Sequence Diagrams	Tmertiri: new diagram and previous diagram changes	
	PttB-SD-REQ-325006/B-PttB SD	tmertiri: Update Sequence diagram.	
	PttB-SD-REQ-330177/A-PttB Notifications SD	tmertiri: New Seq Diagram	
March 13, 2019	**1.2**		
	PttB-576300/C-Logical Signal Mapping	tmertiri: update mapping table with new signals	
	PttB-IIR-REQ-324955/C-PttB Client Tx	tmertiri: added new signal	
	PttB-MD-REQ-336747/A-LIdleRq	tmertiri: new signal	
	PttB-IIR-REQ-324956/C-PttB Client Rx	tmertiri: added new signals	
	PttB-MD-REQ-336748/A-LIdleSt	tmertiri: new signal	
	PttB-MD-REQ-336754/A-LSecureIdle	tmertiri: new signal	
	PttB-REQ-324976/C-Missing Signals	MBORREL4: Updated to describe intended functionality	
	PttB-FUN-REQ-330427/B-PttB Operation	MBORREL4: Added new STR	
	PttB-STR-623890/A-Requirements	MBORREL4: New STR and requirements	
	PttB-REQ-345182/A-Utility Idle – Button Enable/Disable	MBORREL4: New req.	
	PttB-REQ-345183/A-Utility Idle – Ready Notification	MBORREL4: New req.	

PttB-REQ-345184/A-Utility Idle – Ready Notification	MBORREL4: New req.
PttB-REQ-345185/A-Utility Idle – Arming Request	MBORREL4: New req.
PttB-REQ-345186/A-Utility Idle – Cancellation Request	MBORREL4: New req.
PttB-REQ-345187/A-Utility Idle – Turn Off Request	MBORREL4: New req.
PttB-REQ-345188/A-Utility Idle – Active Notification	MBORREL4: New req.
PttB-REQ-345189/A-Utility Idle – Active Notification Closure	MBORREL4: New req.
PttB-REQ-345190/A-PTTB Power Feature Request	MBORREL4: New req.
PttB-REQ-345191/A-PTTB Power Feature Status	MBORREL4: New req.
PttB-REQ-345192/A-PTTB Generator Mode Request	MBORREL4: New req.
PttB-REQ-345193/A-PTTB Generator Mode Status	MBORREL4: New req.
PttB-REQ-345194/A-PTTB Test GFCI Request	MBORREL4: New req.
PttB-REQ-345195/A-PTTB Fault Message Status – No Fault	MBORREL4: New req.
PttB-REQ-345196/A-PTTB Fault Message Status – Overcurrent Fault	MBORREL4: New req.
PttB-REQ-345197/A-PTTB Fault Message Status – Ground Fault	MBORREL4: New req.
PttB-REQ-345198/A-PTTB Fault Message Status – Temperature Fault	MBORREL4: New req.
PttB-REQ-345199/A-PTTB Fault Message Status – AC Fault	MBORREL4: New req.
PttB-REQ-345200/A-PTTB Fault Message Status – Fuel Fault	MBORREL4: New req.
PttB-REQ-345201/A-PTTB Fault Message Status – Reserve Fuel Fault	MBORREL4: New req.
PttB-REQ-345202/A-PTTB Fault Message Status – Circuit A Fault	MBORREL4: New req.
PttB-REQ-345203/A-PTTB Fault Message Status – Circuit B Fault	MBORREL4: New req.
PttB-REQ-345204/A-PTTB Fault Message Status – Circuit C Fault	MBORREL4: New req.
PttB-REQ-345205/A-PTTB Fault Message Status – Drive/Plug-in Fault	MBORREL4: New req.
PttB-REQ-345206/A-PTTB Fault Message Status – Plug-in Fault	MBORREL4: New req.
PttB-REQ-345207/A-PTTB Fault Message Status – Inverter Fault	MBORREL4: New req.
PttB-REQ-345208/A-PTTB Fault Message Status – Service Fault	MBORREL4: New req.
PttB-REQ-345209/A-PTTB Fault Message Status – Ignition Fault	MBORREL4: New req.
PttB-REQ-345210/A-PTTB Fault Message Status – Low Power Overcurrent Fault	MBORREL4: New req.
PttB-REQ-345211/A-PTTB Engine On Message Status – Display Warning	MBORREL4: New req.
PttB-REQ-345212/A-PTTB Engine On Message Status – Display Question	MBORREL4: New req.
PttB-REQ-345213/A-PTTB Reset Request	MBORREL4: New req.
PttB-REQ-345214/A-PTTB Power Off Request	MBORREL4: New req.
PttB-REQ-345215/A-PTTB Power High Request	MBORREL4: New req.
PttB-REQ-345216/A-PTTB Power Low Request	MBORREL4: New req.
PttB-576284/C-Use Cases	tmertiri: new usecase added
PttB-UC-REQ-336746/A-Utility Idle Button	tmertiri:New usecase
PttB-ACT-REQ-330595/B-PttB AD	MBORREL4: Updated diagram for utility idle
PttB-SD-REQ-325006/C-PttB SD	MBORREL4: Updated diagram for utility idle
PttB-576288/B-Appendix: Reference Documents	MBORREL4: Added reference table, updated name

	PttB-CLD-REQ-324954/C-Power to the Box Server	MBORREL4: Corrected format/roles
	PttB-576300/D-Logical Signal Mapping	MBORREL4: Replaced IgnSt with IgnitionStatus_St
	PttB-MD-REQ-324960/B-PwHiButtn	MBORREL4: Updated formatting only
	PttB-MD-REQ-324961/B-PwLoButtn	MBORREL4: Updated formatting only
	PttB-MD-REQ-324962/B-PwOffButtn	MBORREL4: Updated formatting only
	PttB-MD-REQ-324963/B-PwResetButtn	MBORREL4: Updated formatting only
	PttB-MD-REQ-324964/B-PwButtnFalt	MBORREL4: Updated formatting only
	PttB-MD-REQ-325073/C-PwButton	MBORREL4: Updated formatting only
	PttB-MD-REQ-330029/B-LGfciTest	MBORREL4: Updated formatting only
	PttB-MD-REQ-330036/B-LGenBt	MBORREL4: Updated formatting only
	PttB-MD-REQ-336747/B-LIdleRq	MBORREL4: Updated formatting and fixed encodings
	PttB-IIR-REQ-324956/D-PttB Client Rx	MBORREL: Replaced REQ-330382 with REQ-027149
	PttB-MD-REQ-324965/C-FaltMsg	MBORREL4: Updated formatting, removed state specific text under table (covered in other reqs in functional reqs)
	PttB-MD-REQ-324966/C-EngOnMsg	MBORREL4: Updated formatting only
	PttB-MD-REQ-324970/C-LoFuelMsg	MBORREL4: Updated formatting only
	PttB-MD-REQ-324971/B-ButtnHighlight	MBORREL4: Updated formatting only
	PttB-MD-REQ-324972/B-OutletA	MBORREL4: Updated formatting only
	PttB-MD-REQ-324973/B-OutletB	MBORREL4: Updated formatting only
	PttB-MD-REQ-324974/C-PwMax	MBORREL4: Updated formatting only
	PttB-MD-REQ-324975/B-HwConfig	MBORREL4: Updated formatting only
	PttB-MD-REQ-336748/B-LIdleSt	MBORREL4: Updated formatting only
	PttB-MD-REQ-336754/B-LSecureIdle	MBORREL4: Updated formatting only
	PttB-REQ-330383/B-Feature Availibility	MBORREL4: Updated IgnSt with IgnitionStatus_St
	PttB-STR-623890/B-Requirements	MBORREL4: Added REQ-362458
	PttB-REQ-345185/B-Utility Idle – Arming Request	MBORREL4: Updated to clarify use of (0x0) encoding
	PttB-REQ-345186/B-Utility Idle – Cancellation Request	MBORREL4: Updated to clarify use of (0x0) encoding. Corrected value to (0x3)
	PttB-REQ-345187/B-Utility Idle – Turn Off Request	MBORREL4: Updated to clarify use of (0x0) encoding. Corrected value to (0x2)
	PttB-REQ-362458/A-PTTB Power Mode Change Status	MBORREL4: New req.
	PttB-576284/D-Use Cases	MBORREL4: Added REQ-362459
	PttB-UC-REQ-362459/A-Power Mode Change Indicator	MBORREL4: New usecase
January 10, 2020	**1.4**	
	PttB-576300/E-Logical Signal Mapping	MBORREL4: Added FaltMsg2
	PttB-IIR-REQ-324956/E-PttB Client Rx	MBORREL4: Added REQ-372567
	PttB-MD-REQ-324965/D-FaltMsg	MBORREL4: Added HvacOn encoding
	PttB-MD-REQ-372567/A-FaltMsg2	MBORREL4: New req.
	PttB-576282/C-General Requirements	MBORREL4: Added REQ-372568
	PttB-REQ-372568/A-Fault Message Usage	MBORREL4: New req.
	PttB-STR-623890/C-Requirements	MBORREL4: Added REQ-372570-571
	PttB-REQ-372570/A-PTTB Fault Message Status - Air Conditioning Required Fault	MBORREL4: New req.
	PttB-REQ-372571/A-PTTB Fault Message Status - HEV Derating Fault	MBORREL4: New req.
February 10, 2020	**1.5**	
	PttB-576300/F-Logical Signal Mapping	MBORREL4: Added OutletA2 and OutletB2
	PttB-IIR-REQ-324956/F-PttB Client Rx	MBORREL4: Added REQ-377742, REQ-377744
	PttB-MD-REQ-377742/A-OutletA2	MBORREL4: New req.
	PttB-MD-REQ-377744/A-OutletB2	MBORREL4: New req.
	PttB-576282/D-General Requirements	MBORREL4: Added REQ-377757
	PttB-REQ-377757/A-Outlet Signal Usage	MBORREL4: New req.

Table of Contents

1 Architectural Design

1.1 Overview

Power to the box, is a feature that allows user to access AC power through vehicle power system. The client provides the user the ability to read any system errors, such as power overload, short circuit etc, and various readings, such as current power consumption.

1.2 PttB-CLD-REQ-324953/B-Power to the Box Client

The client provides the user interface to control this feature, and also with any internal warnings or errors.

1.3 PttB-CLD-REQ-324954/C-Power to the Box Server

The Power To The Box Server (PTTBServer) is responsible for the tasks listed below:

- Controlling the power and states of the PTTB feature
- Generating warnings and errors for display on the PTTBClient and/or PTTBClient2
- Receiving requests from the PTTBClient and PTTBClient2
- Sending statuses to the PTTBClient and PTTBClient2

Please review the implementation guide to locate the Power To The Box Server class and applicable requirements.

1.4 Logical Signal Mapping

The CAN signals mentioned throughout this document shall refer to the CAN signal's logical name. The logical names shall be mapped to their actual CAN signal names. Please use the table below to perform the mapping. The InfoCAN database file is the master file for the actual CAN signal names. Note: There may be cases where the actual CAN signal name is used in this documentation.

Logical Name	CAN Signal Name
PwHiButtn	DcacPwHiButtn_B_Stat
PwLoButtn	DcacPwLoButtn_B_Stat
PwOffButtn	DcacPwOffButtn_B_Stat
PwButton	DcacPwrButtn_B_Stat
PwResetButtn	DcacPwResetButtn_B_Stat
PwButtnFalt	DcacPwButtn_B_Falt
FaltMsg	DcacFaltMsgTxt_D_Rq
FaltMsg2	DcacFaltMsgTxt_D2_Rq
EngOnMsg	DcacEngOnMsgTxt_D_Rq
LoFuelMsg	DcacLoFuelMsgTxt_D_Rq
ButtnHighlight	DcacElPw_D_Stat
OutletA	DcacOut1_Pw_Dsply
OutletB	DcacOut2_Pw_Dsply
OutletA2	DcacOut1_Pw2_Dsply
OutletB2	DcacOut2_Pw2_Dsply
PwMax	DcacOut_Pw_DsplyMx
HwConfig	DcacHW_Config
LgfciTest	DcacGfciTestBttn_B_Stat
IgnitionStatus_St	Ignition_Status
LgenBt	DcacMdeButtn_B_Stat
LIdleRq	KeylessIdl_D_Rq
LIdleSt	KeylessIdl_B_Stat

LSecureIdle	immoSecureIdleMode

1.5 PttB-IIR-REQ-324955/C-PttB Client Tx

1.5.1 PttB-MD-REQ-324960/B-PwHiButtn

Message Type: Status

This signal is used to indicate the status of the high power button (request to provide high power).

Name	Literals	Value	Description
Type	-	-	Status of high power button
	ButtonNotPressed	0x00	
	ButtonPressed	0x01	

1.5.2 PttB-MD-REQ-324961/B-PwLoButtn

Message Type: Status

This signal is used to indicate the status of the low power button (request to provide low power).

Name	Literals	Value	Description
Type	-	-	Status of low power button
	ButtonNotPressed	0x00	
	ButtonPressed	0x01	

1.5.3 PttB-MD-REQ-324962/B-PwOffButtn

Message Type: Status

This signal is used to indicate the status of the off button (request to turn off the system).

Name	Literals	Value	Description
Type	-	-	Status of off button
	ButtonNotPressed	0x00	
	ButtonPressed	0x01	

1.5.4 PttB-MD-REQ-324963/B-PwResetButtn

Message Type: Status

This signal is used to indicate the status of the reset button (request to reset system).

Name	Literals	Value	Description
Type	-	-	Status of reset button
	ButtonNotPressed	0x00	
	ButtonPressed	0x01	

1.5.5 PttB-MD-REQ-324964/B-PwButtnFalt

Message Type: Status

This signal is used to indicate any errors in the client. If signal is faulted, the user request get invalidated and nullified.

Name	Literals	Value	Description
Type	-	-	Client fault status
	NotFaulted	0x00	
	Faulted	0x01	

1.5.6 PttB-MD-REQ-325073/C-PwButton

Message Type: Status

This signal is used to indicate the status of the power button (request to toggle between On and Low power).

Name	Literals	Value	Description
Type	-	-	Status of power button
	ButtonNotPressed	0x00	
	ButtonPressed	0x01	

1.5.7 PttB-MD-REQ-330029/B-LGfciTest

Message Type: Status

This signal is used to indicate the status of the GFCI Test button (request to perform a GFCI Test).

Name	Literals	Value	Description
Type	-	-	Status of GFCI Test button
	ButtonNotPressed	0x00	
	ButtonPressed	0x01	

1.5.8 PttB-MD-REQ-330036/B-LGenBt

Message Type: Status

This signal is used to indicate the status of the Generator Mode button (request to toggle between low and high power).

Name	Literals	Value	Description
Type	-	-	Status of Generator Mode button
	ButtonNotPressed	0x00	
	ButtonPressed	0x01	

1.5.9 PttB-MD-REQ-336747/B-LIdleRq

Message Type: Request

This signal is used to indicate user request to activate/cancel utility idle state.

Name	Literals	Value	Description
Type	-	-	Request to activate/cancel utility idle state
	Inactive	0x00	
	Active	0x01	
	IgnitionOff	0x02	
	Cancel	0x03	

1.6 PttB-IIR-REQ-324956/F-PttB Client Rx

1.6.1 PttB-MD-REQ-324965/D-FaltMsg

Message Type: Request

This signal is used to indicate a fault of the PTTB feature.

Name	Literals	Value	Description
Type	-	-	Indicates a fault of the PTTB feature
	Ok	0x00	Everything working good
	Overcurrent	0x01	Power turned off due to overconsumption.
	Gfci	0x02	Power off due to Ground fault.
	Temperature	0x03	Power off due to temp limits.
	AcOnOutput	0x04	AC power has been detected as being input to the system (not because of vehicle AC module)
	FuelLow	0x05	Power turned off due to low fuel.
	BreakerA	0x06	Overload in circuit A.
	BreakerB	0x07	Overload in circuit B.
	BreakerC	0x08	Overload in circuit C.
	PlugWarnDrive	0x09	Something is plugged in truck outlets when shifting in drive.
	PlugWarn	0x0A	Something is plugged in truck outlets
	NotAvailable	0x0B	Inverter is not available at this time.
	Service	0x0C	Inverter is not available at this time. Service is required.
	EngineRun	0x0D	Engine must be running to use inverter.
	OvercurrentLP	0x0E	Too much power is being used for the low power option. A request to use the higher power option may show up.
	HvacOn	0x0F	Air conditioning required to cool the cabin

1.6.2 PttB-MD-REQ-372567/A-FaltMsg2

Message Type: Request

This signal is used to indicate a fault of the PTTB feature (secondary fault signal with additional states).

Name	Literals	Value	Description
Type	-	-	Indicates a fault of the PTTB feature
	Ok	0x00	Everything working good
	Overcurrent	0x01	Power turned off due to overconsumption.
	Gfci	0x02	Power off due to Ground fault.
	Temperature	0x03	Power off due to temp limits.
	AcOnOutput	0x04	AC power has been detected as being input to the system (not because of vehicle AC module)
	FuelLow	0x05	Power turned off due to low fuel.
	BreakerA	0x06	Overload in circuit A.
	BreakerB	0x07	Overload in circuit B.
	BreakerC	0x08	Overload in circuit C.
	PlugWarnDrive	0x09	Something is plugged in truck outlets when shifting in drive.
	PlugWarn	0x0A	Something is plugged in truck outlets
	NotAvailable	0x0B	Inverter is not available at this time.
	Service	0x0C	Inverter is not available at this time. Service is required.

	EngineRun	0x0D	Engine must be running to use inverter.
	OvercurrentLP	0x0E	Too much power is being used for the low power option. A request to use the higher power option may show up.
	HvacOn	0x0F	Air conditioning required to cool the cabin
	HevDerate	0x10	Extended idling is reducing power
	NotUsed	0x11-0x3F	

1.6.3 PttB-MD-REQ-324966/C-EngOnMsg

Message Type: Request

This signal is used to request a message be displayed.

Name	Literals	Value	Description
Type	-	-	Request to display a message
	Ok	0x00	
	Display Warning	0x01	Displayed until user responds
	Display question	0x02	Displayed as long as state is active
	NotUsed	0x03	

1.6.4 PttB-MD-REQ-324970/C-LoFuelMsg

Message Type: Request

This signal is used to indicate the time left for sufficient fuel. Values 0x01 through 0x1E represent a number to be displayed in HMI indicating the time left for sufficient fuel.

Name	Literals	Value	Description
Type	-	-	Indicates time left for sufficient fuel.
	Display nothing	0x00	
	Display text warning in HMI	0x01 to 0x1E	

1.6.5 PttB-MD-REQ-324971/B-ButtnHighlight

Message Type: Status

This signal is used to indicate the active PTTB power level.

Name	Literals	Value	Description
Type	-	-	Indicates the active power level
	Power is Off	0x0	
	Low power is active	0x1	(Current at 400)
	High power is active	0x2	
	Not used	0x3	

1.6.6 PttB-MD-REQ-324972/B-OutletA

Message Type: Status

This signal is used to indicate the power output at outlet A. For proper value understanding, consult the database.

Name	Literals	Value	Description
Type	-	-	Indicates power output of Outlet A.
	watts	0x000-0x3FF	

1.6.7 PttB-MD-REQ-324973/B-OutletB

Message Type: Status

This signal is used to indicate the power output at Outlet B. For proper value understanding, consult the database.

Name	Literals	Value	Description
Type	-	-	Indicates power output of Outlet B.
	watts	0x000-0x3FF	

1.6.8 PttB-MD-REQ-377742/A-OutletA2

Message Type: Status

This signal is used to indicate the power output at outlet A. For proper value understanding, consult the database (higher resolution).

Name	Literals	Value	Description
Type	-	-	Indicates power output of Outlet A.
	watts	0x0000-0x1FFF	

1.6.9 PttB-MD-REQ-377744/A-OutletB2

Message Type: Status

This signal is used to indicate the power output at Outlet B. For proper value understanding, consult the database (higher resolution).

Name	Literals	Value	Description
Type	-	-	Indicates power output of Outlet B.
	watts	0x000-0x1FFF	

1.6.10 PttB-MD-REQ-324974/C-PwMax

Message Type: Status

This signal is used to indicate the maximum power output. For proper value understanding, consult the database.

Name	Literals	Value	Description
Type	-	-	Indicates max power output.
	watts	0x000-0x3FF	

1.6.11 PttB-MD-REQ-324975/B-HwConfig

Message Type: Status

This signal is used to indicate the configured maximum power value.

Name	Literals	Value	Description
Type	-	-	Indicates the configured maximum power value.
	NoPttbHardware	0x00	
	2.0kw	0x01	
	2.4kw	0x02	
	7.2kw	0x03	
	2.3kw	0x04	
	reserved	0x05	
	reserved	0x06	
	reserved	0x07	
	reserved	0x08	
	reserved	0x09	
	reserved	0x0A	
	reserved	0x0B	
	reserved	0x0C	
	reserved	0x0D	
	reserved	0x0E	
	reserved	0x0F	

1.6.12 MD-REQ-027149/A-IgnitionStatus_St (TcSE ROIN-225464-1)

Message Type: Status

Signal used to indicate ignition state.

Name	Literals	Value	Description
Type	-	-	Indicates ignition state
	Unknown	0x0	
	Off	0x1	
	Accessory	0x2	
	Run	0x4	
	Start	0x8	
	Invalid	0xF	

1.6.13 PttB-MD-REQ-336748/B-LIdleSt

Message Type: Status

This signal is used to acknowledge the receipt of the utility idle request from the client.

Name	Literals	Value	Description
Type	-	-	Status of acknowledgement
	Inactive	0x00	Utility idle request not received
	Active	0x01	Utility idle request received

1.6.14 PttB-MD-REQ-336754/B-LSecureIdle

Message Type: Status

This signal is used to indicate the status of the secure idle state.

Name	Literals	Value	Description
Type	-	-	Status of Secure Idle

	Inactive	0x0	
	Active	0x1	

2 General Requirements

2.1 PttB-REQ-324976/C-Missing Signals

If the signals received by the PTTBClient have been missing from the bus for less than 5 seconds, the PTTBClient shall operate on last known data.

If the signals received by the PTTBClient have been missing from the bus for more than 5 seconds, the following shall occur:

- All PTTB user inputs (buttons) shall be disabled on the PTTBClient
- All status information/displays shall revert to a null or disabled state so as to not convey invalid or outdated data

2.2 PttB-REQ-324977/B-Error Recovery

If a valid signal value is received after a DTC has been set, the client shall process the valid signal data.

2.3 PttB-REQ-325074/B-Text display

Text should only be displayed while the values from signals are set. If the states clear, the text should be removed. Unless otherwise noted for any particular popups .

2.4 PttB-REQ-330383/B-Feature Availibility

When in IgnitionStatus_St == RUN, the Client shall make PttB feature available (not gray) and let Server say whether PttB is On/Off.

When in IgnitionStatus_St != RUN, the Client shall make PttB feature unavailable (grayed out) in HMI.

2.5 PttB-REQ-372568/A-Fault Message Usage

There are two fault signals used for this feature: FaltMsg and FaltMsg2. The two signals are identical up to encoding (0xF) in FaltMsg. In order to allow for additional fault values, FaltMsg2 was created and supports up to encoding (0x3F), which shall eventually replace FaltMsg. Because of this, the PTTBClient may receive one or both of the signals at the same time. The PTTBClient shall use the fault signals as follows:

1. If the PTTBClient receives only FaltMsg, it shall use FaltMsg for all requirements in this SPSS referencing FaltMsg.
2. If the PTTBClient receives only FaltMsg2, it shall use FaltMsg2 for all requirements in this SPSS referencing FaltMsg.
3. If the PTTBClient receives both FaltMsg and FaltMsg2, it shall use FaltMsg2 for all requirements in this SPSS referencing FaltMsg.

2.6 PttB-REQ-377757/A-Outlet Signal Usage

There are two sets of Outlet signals used for this feature: OutletA, OutletB and OutletA2, OutletB2. The two sets of signals convey the same data but with different resolutions. OutletA2, OutletB2 shall eventually replace OutletA, OutletB. Because of this, the PTTBClient may receive one or both sets of these signals at the same time. The PTTBClient shall use the Outlet signals as follows:

1. If the PTTBClient receives only OutletA/OutletB, it shall use OutletA/OutletB for all requirements in this SPSS referencing OutletA and OutletB.
2. If the PTTBClient receives only OutletA2/OutletB2, it shall use OutletA2/OutletB2 for all requirements in this SPSS referencing OutletA and OutletB.
3. If the PTTBClient receives both OutletA/OutletB and OutletA2/OutletB2, it shall use OutletA2 and OutletB2 for all requirements in this SPSS referencing OutletA and OutletB.

3 Functional Definition

3.1 PttB-FUN-REQ-330427/B-PttB Operation

3.1.1 Requirements

3.1.1.1 PttB-REQ-345182/A-Utility Idle – Button Enable/Disable

The PTTBClient shall enable/show the Utility Idle button when GearLeverPosition = Park and ButtnHighlight = (0x02) HighPowerActive.

3.1.1.2 PttB-REQ-345183/A-Utility Idle – Ready Notification

The PTTBClient shall display a notification to the user indicating that Utility Idle is ready to be activated when LIdleSt = (0x1) Active is received from the PTTBServer.

3.1.1.3 PttB-REQ-345184/A-Utility Idle – Ready Notification

The PTTBClient shall continue to display the notification in REQ-345183 until LIdleSt = (0x0) Inactive, or LSecureIdle = (0x1) Active is received from the PTTBServer.

3.1.1.4 PttB-REQ-345185/B-Utility Idle – Arming Request

The PTTBClient shall send LIdleRq = (0x1) Active to the PTTBServer when the user requests to arm the Utility Idle feature. The PTTBClient shall send LIdleRq = (0x0) Inactive all other times.

Note: Arming the Utility Idle feature does not activate it. Activation requires additional actions.

3.1.1.5 PttB-REQ-345186/B-Utility Idle – Cancellation Request

The PTTBClient shall send LIdleRq = (0x3) Cancel to the PTTBServer when the user requests to cancel the Utility Idle feature. The PTTBClient shall send LIdleRq = (0x0) Inactive all other times.

3.1.1.6 PttB-REQ-345187/B-Utility Idle – Turn Off Request

The PTTBClient shall send LIdleRq = (0x2) IgnOff to the PTTBServer when the user requests to turn off the vehicle while the Utility Idle feature is active. The PTTBClient shall send LIdleRq = (0x0) Inactive all other times.

3.1.1.7 PttB-REQ-345188/A-Utility Idle – Active Notification

The PTTBClient shall display a notification to the user indicating that Utility Idle is active when LSecureIdle = (0x1) Active is received from the PTTBServer.

3.1.1.8 PttB-REQ-345189/A-Utility Idle – Active Notification Closure

The PTTBClient shall continue to display the notification in REQ-345188 until LSecureIdle = (0x0) Inactive is received from the PTTBServer.

3.1.1.9 PttB-REQ-345190/A-PTTB Power Feature Request

The PTTBClient shall send PwButton = (0x1) ButtonPressed to the PTTBServer when the user requests to activate or deactivate the PTTB feature. The PTTBClient shall send PwButton = (0x0) NotPressed all other times.

3.1.1.10 PttB-REQ-345191/A-PTTB Power Feature Status

The PTTBClient shall indicate that the PTTB feature is On when ButtnHighlight = (0x1) LowPowerActive or (0x2)HighPowerActive is received from the PTTBServer.

The PTTBClient shall indicate that the PTTB feature is Off when ButtnHighlight = (0x0) PowerIsOff is received from the PTTBServer.

3.1.1.11 PttB-REQ-345192/A-PTTB Generator Mode Request

The PTTBClient shall send LGenBt = (0x1) ButtonPressed to the PTTBServer when the user requests to activate or deactivate Generator Mode. The PTTBClient shall send LGenBt = (0x0) NotPressed all other times.

3.1.1.12 PttB-REQ-345193/A-PTTB Generator Mode Status

The PTTBClient shall indicate that Generator Mode is On when ButtnHighlight = (0x2) HighPowerActive is received from the PTTBServer.

The PTTBClient shall indicate that Generator Mode is Off when ButtnHighlight = (0x0) PowerIsOff or (0x1) LowPowerActive is received from the PTTBServer.

3.1.1.13 PttB-REQ-345194/A-PTTB Test GFCI Request

The PTTBClient shall send LGfciTest = (0x1) ButtonPressed to the PTTBServer when the user requests to Test GFCI. The PTTBClient shall send LGfciTest = (0x0) NotPressed all other times.

3.1.1.14 PttB-REQ-345195/A-PTTB Fault Message Status – No Fault

The PTTBClient shall not display any fault notification when FaltMsg= (0x00) Ok is received from the PTTBServer. This value indicates that there is no fault with the PTTB feature.

3.1.1.15 PttB-REQ-345196/A-PTTB Fault Message Status – Overcurrent Fault

The PTTBClient shall display a notification indicating that an overcurrent fault has occurred when FaltMsg= (0x01) Overcurrent is received from the PTTBServer.

3.1.1.16 PttB-REQ-345197/A-PTTB Fault Message Status – Ground Fault

The PTTBClient shall display a notification indicating that a ground fault has occurred when FaltMsg= (0x02) GFCI is received from the PTTBServer.

3.1.1.17 PttB-REQ-345198/A-PTTB Fault Message Status – Temperature Fault

The PTTBClient shall display a notification indicating that a temperature fault has occurred when FaltMsg= (0x03) Temperature is received from the PTTBServer.

3.1.1.18 PttB-REQ-345199/A-PTTB Fault Message Status – AC Fault

The PTTBClient shall display a notification indicating that an AC fault has occurred when FaltMsg= (0x04) AcOnOutput is received from the PTTBServer.

3.1.1.19 PttB-REQ-345200/A-PTTB Fault Message Status – Fuel Fault

The PTTBClient shall display a notification indicating that a fuel fault has occurred when FaltMsg= (0x05) FuelLow is received from the PTTBServer.

3.1.1.20 PttB-REQ-345201/A-PTTB Fault Message Status – Reserve Fuel Fault

The PTTBClient shall display a notification indicating that a reserve fuel fault has occurred when LoFuelMsg != (0x00) DisplayNothing is received from the PTTBServer. The value indicated by LoFuelMsg (from 0x01 - 0x1E) shall be used to represent the time (in minutes) remaining before automatically turning off Generator Mode.

3.1.1.21 PttB-REQ-345202/A-PTTB Fault Message Status – Circuit A Fault

The PTTBClient shall display a notification indicating that a Circuit A fault has occurred when FaltMsg= (0x06) BreakerA is received from the PTTBServer.

3.1.1.22 PttB-REQ-345203/A-PTTB Fault Message Status – Circuit B Fault

The PTTBClient shall display a notification indicating that a Circuit B fault has occurred when FaltMsg= (0x07) BreakerB is received from the PTTBServer.

3.1.1.23 PttB-REQ-345204/A-PTTB Fault Message Status – Circuit C Fault

The PTTBClient shall display a notification indicating that a Circuit C fault has occurred when FaltMsg= (0x08) BreakerC is received from the PTTBServer.

3.1.1.24 PttB-REQ-345205/A-PTTB Fault Message Status – Drive/Plug-in Fault

The PTTBClient shall display a notification indicating that a drive/plug-in fault has occurred when FaltMsg= (0x09) PlugWarnDrive is received from the PTTBServer.

3.1.1.25 PttB-REQ-345206/A-PTTB Fault Message Status – Plug-in Fault

The PTTBClient shall display a notification indicating that a plug-in fault has occurred when FaltMsg= (0x0A) PlugWarn is received from the PTTBServer.

3.1.1.26 PttB-REQ-345207/A-PTTB Fault Message Status – Inverter Fault

The PTTBClient shall display a notification indicating that an inverter fault has occurred when FaltMsg= (0x0B) NotAvailble is received from the PTTBServer.

3.1.1.27 PttB-REQ-345208/A-PTTB Fault Message Status – Service Fault

The PTTBClient shall display a notification indicating that a service fault has occurred when FaltMsg= (0x0C) Service is received from the PTTBServer.

3.1.1.28 PttB-REQ-345209/A-PTTB Fault Message Status – Ignition Fault

The PTTBClient shall display a notification indicating that an ignition fault has occurred when FaltMsg= (0x0D) EngineRun is received from the PTTBServer.

3.1.1.29 PttB-REQ-345210/A-PTTB Fault Message Status – Low Power Overcurrent Fault

The PTTBClient shall display a notification indicating that a low power overcurrent fault has occurred when FaltMsg= (0x0E) OvercurrentLP is received from the PTTBServer.

3.1.1.30 PttB-REQ-372570/A-PTTB Fault Message Status - Air Conditioning Required Fault

The PTTBClient shall display a notification indicating that an air conditioning required fault has occurred when FaltMsg= (0x0F) HvacOn is received from the PTTBServer.

3.1.1.31 PttB-REQ-372571/A-PTTB Fault Message Status - HEV Derating Fault

The PTTBClient shall display a notification indicating that a HEV derating fault has occurred when FaltMsg2 = (0x10) HevDerate is received from the PTTBServer.

3.1.1.32 PttB-REQ-345211/A-PTTB Engine On Message Status – Display Warning

The PTTBClient shall display a warning notification when EngOnMsg= (0x01) DisplayWarning is received from the PTTBServer.

3.1.1.33 PttB-REQ-345212/A-PTTB Engine On Message Status – Display Question

The PTTBClient shall display a question notification when EngOnMsg= (0x02) DisplayQuestion is received from the PTTBServer.

3.1.1.34 PttB-REQ-345213/A-PTTB Reset Request

The PTTBClient shall send PwResetButtn = (0x1) ButtonPressed to the PTTBServer when the user requests to perform a reset (when prompted). The PTTBClient shall send PwResetButtn = (0x0) NotPressed all other times.

3.1.1.35 PttB-REQ-345214/A-PTTB Power Off Request

The PTTBClient shall send PwOffButtn = (0x1) ButtonPressed to the PTTBServer when the user requests to turn off the PTTB feature (when prompted) or when closing a fault message that requires the feature to be turned off. The PTTBClient shall send PwOffButtn = (0x0) NotPressed all other times.

3.1.1.36 PttB-REQ-345215/A-PTTB Power High Request

The PTTBClient shall send PwHiButtn = (0x1) ButtonPressed to the PTTBServer when the user requests to stay in or transition to Generator Mode (when prompted). The PTTBClient shall send PwHiButtn = (0x0) NotPressed all other times.

3.1.1.37 PttB-REQ-345216/A-PTTB Power Low Request

The PTTBClient shall send PwLoButtn = (0x1) ButtonPressed to the PTTBServer when the user requests to turn off Generator Mode (when prompted). The PTTBClient shall send PwLoButtn = (0x0) NotPressed all other times.

3.1.1.38 PttB-REQ-362458/A-PTTB Power Mode Change Status

When the PTTBClient is not currently displaying PTTB feature or power status information, the PTTBClient shall provide a means (pop-up, transient, etc.) to indicate when a change in the power/generator mode has occurred. Using this means, the PTTBClient shall:

- Indicate that Generator Mode is On when ButtnHighlight = (0x2) HighPowerActive is received from the PTTBServer.
- Indicate that Low Power Mode is On when ButtnHighlight = (0x1) LowPowerActive is received from the PTTBServer.
- Indicate that Generator Mode is Off when ButtnHighlight = (0x0) PowerIsOff is received from the PTTBServer.

The above shall only trigger the notification once when changing from one state to another. The notification shall not persist for the duration of the above signal values.

3.1.2 Use Cases

3.1.2.1 PttB-UC-REQ-324978/A-Feature activation

Actors	Vehicle Occupant
Preconditions	Engine is On.
Scenario Description	User turns the feature On through soft button on the client. User plugs a power consuming device.
Post-conditions	The device gets adequate power. Client displays current user power selection and also the current power consumption.
List of Exception Use Cases	
Interfaces	HMI Vehicle System Interface

3.1.2.2 PttB-UC-REQ-324979/A-Feature gets disabled

Actors	Vehicle Occupant
Preconditions	One of the parameters that disable the feature gets activated. Such as high converter temperature, or short circuit etc.
Scenario Description	User turns the vehicle on. User tries to turn the feature on.
Post-conditions	User gets notified that the feature is disabled with a correct explanation.
List of Exception Use Cases	
Interfaces	HMI Vehicle System Interface

3.1.2.3 PttB-UC-REQ-324980/A-Internal fault

Actors	Vehicle Occupant
Preconditions	Vehicle is On. Feature is active.
Scenario Description	Converter detects an internal fault.
Post-conditions	PttB enters fault state and user is notified of that. Vehicle stops powering the devices.
List of Exception Use Cases	
Interfaces	HMI Vehicle System Interface

3.1.2.4 PttB-UC-REQ-324981/A-Feature deactivation

Actors	Vehicle Occupant
Preconditions	Vehicle is On. A device is being currently powered form the vehicle.
Scenario Description	User press the Off Switch to turn the power off. Or User turns the vehicle Off.
Post-conditions	Power turns off. Vehicle stops providing power.
List of Exception Use Cases	
Interfaces	HMI Vehicle System Interface

3.1.2.5 PttB-UC-REQ-324982/A-Shifting out of park

Actors	Vehicle Occupant
Preconditions	Feature is On and powering a device already connected to the vehicle bed power outlet. Vehicle is in Park
Scenario Description	User shifts the gear to Drive.
Post-conditions	User gets a popup telling them of the gear shift.
List of Exception Use Cases	
Interfaces	HMI Vehicle System Interface

3.1.2.6 PttB-UC-REQ-324983/A-Keycycle. Load already present

Actors	Vehicle Occupant
Preconditions	Vehicle is Off. Load already present in vehicle bed power outlet.
Scenario Description	Vehicle turns ON. Feature shows HMI warning that a load is already connected.
Post-conditions	User acknowledges the popup and confirms they want the device powered. Power gets provided to the device.
List of Exception Use Cases	
Interfaces	HMI Vehicle System Interface

3.1.2.7 PttB-UC-REQ-330381/A-GFCI Test

Actors	User
Pre-conditions	PttB feature is available.
Scenario Description	Driver presses GFCI test switch through HMI screen. Client will send a GFCI test message signal Press/Not press states.
Post-conditions	PTTB feature will be disabled and enter recoverable fault mode.

List of Exception Use Cases	
Interfaces	HMI Vehicle System Interface

3.1.2.8 PttB-UC-REQ-336746/A-Utility Idle Button

Actors	User
Pre-conditions	PttB is On Generator Mode is active
Scenario Description	User presses Utility Idle button in HMI screen.
Post-conditions	When confirmation is received from vehicle of the Utility Idle button state activation, Client displays the state to the user.
List of Exception Use Cases	
Interfaces	HMI Vehicle System Interface

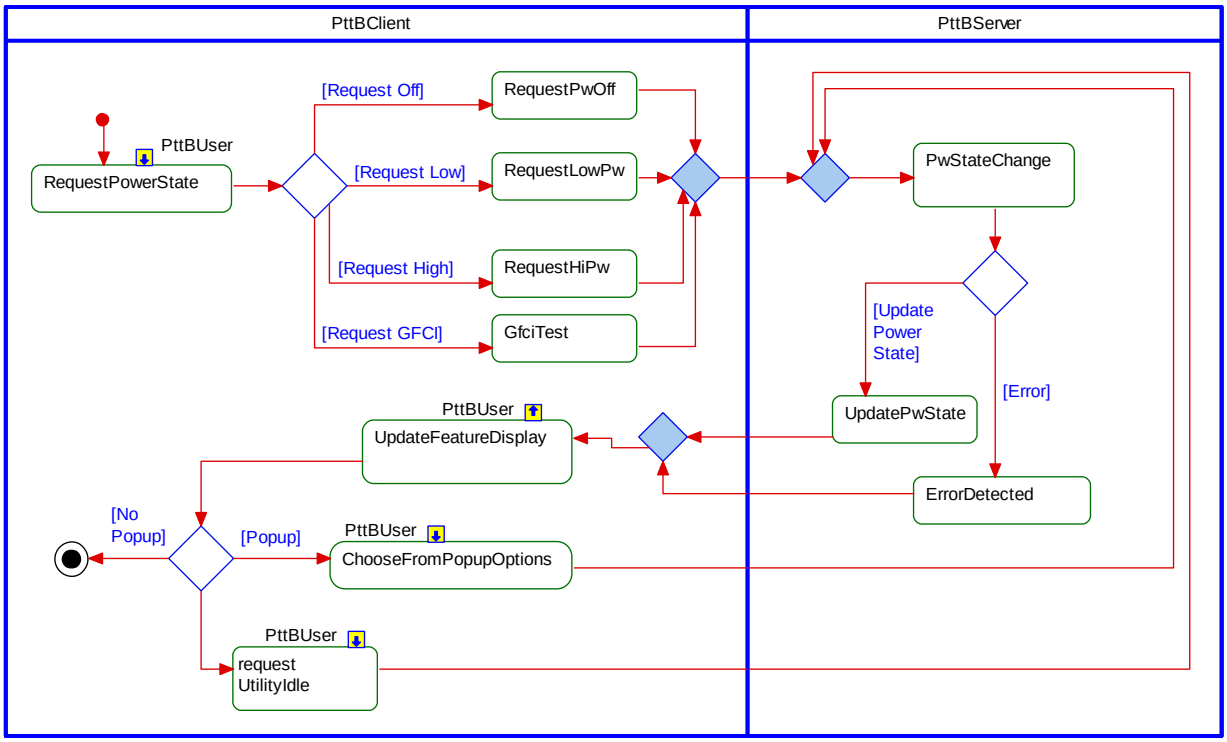
3.1.2.9 PttB-UC-REQ-362459/A-Power Mode Change Indicator

Actors	User
Pre-conditions	PttB is On Generator Mode is active PTTB HMI screen is not the active HMI screen
Scenario Description	User presses IP or Bed Panel hard button to change PTTB power status
Post-conditions	PTTBClient displays an indicator describing the PTTB power status change
List of Exception Use Cases	
Interfaces	HMI Vehicle System Interface

3.1.3 White Box Views

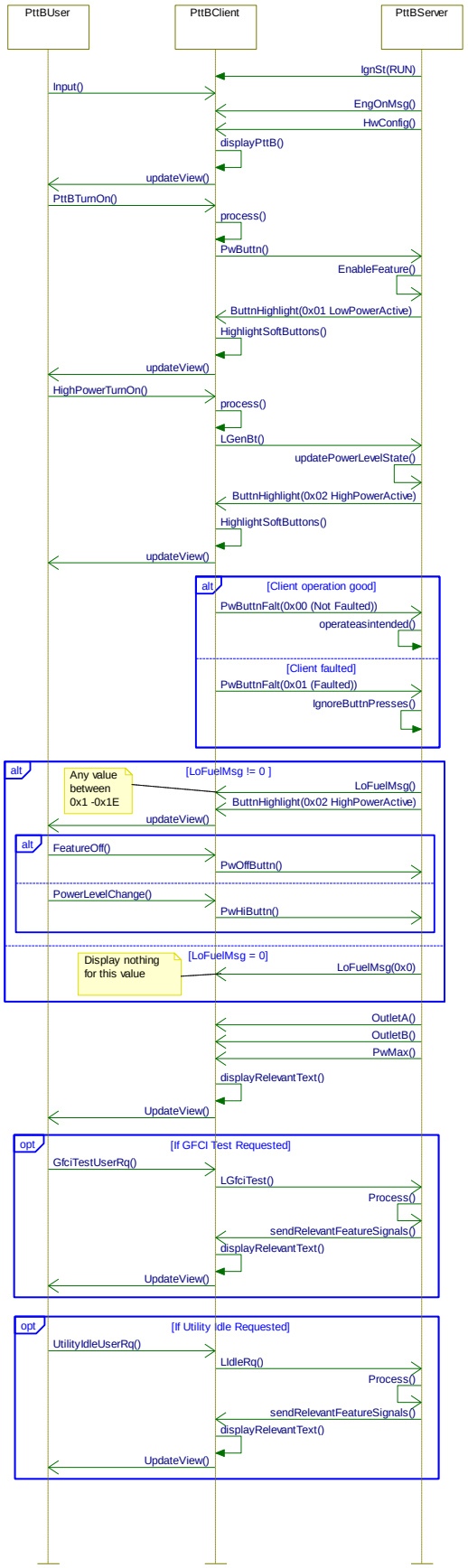
3.1.3.1 Activity Diagrams

3.1.3.1.1 PttB-ACT-REQ-330595/B-PttB AD

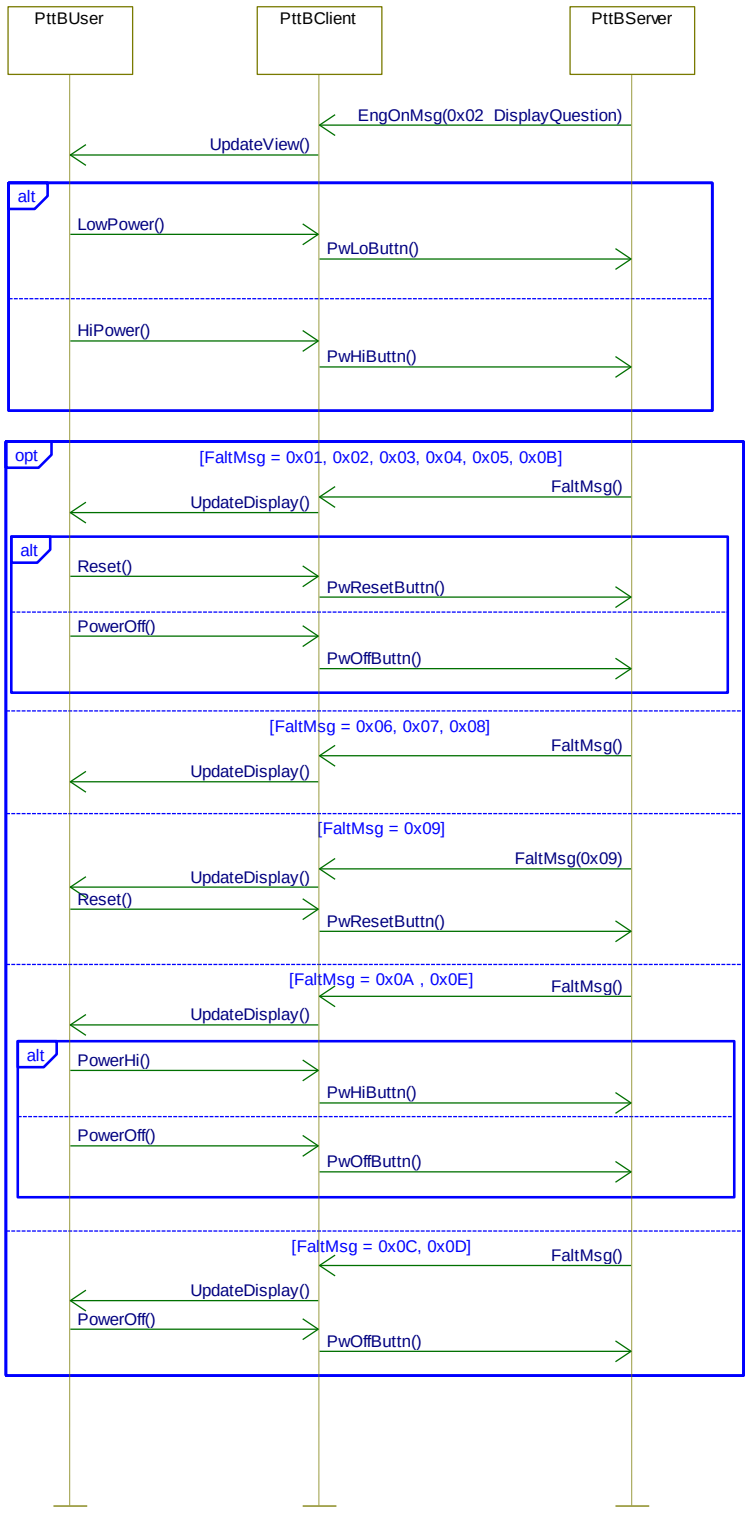


3.1.3.2 Sequence Diagrams

3.1.3.2.1 PttB-SD-REQ-325006/C-PttB SD


PttBUser
PttBClient
PttBServer
IgnSt(RUN)
Input()
EngOnMsg()
HwConfig()
displayPttB()
updateView()
PttBTurnOn()
process()
PwButtn()
EnableFeature()
ButtnHighlight(0x01 LowPowerActive)
HighlightSoftButtons()
updateView()
HighPowerTurnOn()
process()
LGenBt()
updatePowerLevelState()
ButtnHighlight(0x02 HighPowerActive)
HighlightSoftButtons()
updateView()
alt
[Client operation good]
PwButtnFalt(0x00 (Not Faulted))
operateasintended()
[Client faulted]
PwButtnFalt(0x01 (Faulted))
IgnoreButtnPresses()
alt
Any value between 0x1 -0x1E
[LoFuelMsg != 0]
LoFuelMsg()
ButtnHighlight(0x02 HighPowerActive)
updateView()
alt
FeatureOff()
PwOffButtn()
PowerLevelChange()
PwHiButtn()
Display nothing for this value
[LoFuelMsg = 0]
LoFuelMsg(0x0)
OutletA()
OutletB()
PwMax()
displayRelevantText()
UpdateView()
opt
[If GFCI Test Requested]
GfciTestUserRq()
LGfciTest()
Process()
sendRelevantFeatureSignals()
displayRelevantText()
UpdateView()
opt
[If Utility Idle Requested]
UtilityIdleUserRq()
LIdleRq()
Process()
sendRelevantFeatureSignals()
displayRelevantText()
UpdateView()

3.1.3.2.2 PttB-SD-REQ-330177/A-PttB Notifications SD



4 Appendix: Reference Documents

Reference #	Document Title
1	H86a_SYNC4_OnboardGenerator_RELEASED_vX.XX
2	
3	
4	
5	
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