



Research & Vehicle Technology
“Infotainment Systems Product Development”

Feature – Tire Pressure Monitor System
Information on Demand

Infotainment Subsystem Part Specific
Specification (SPSS)

Version 1.0
UNCONTROLLED COPY IF PRINTED

Version Date: March 5, 2019

FORD CONFIDENTIAL



Revision History

Date	Ver	Notes	
March 5, 2019	1.0	Initial Release	



Table of Contents

REVISION HISTORY	2
1 OVERVIEW	4
2 ARCHITECTURAL DESIGN.....	5
2.1 TPMS-CLD-REQ-340179/A-TPMS Interface Client.....	5
2.2 TPMS-CLD-REQ-340181/A-TPMS Server	5
2.3 Physical Mapping of Classes	5
2.4 Logical Signal Mapping	5
2.5 TPMSInterfaceClient Interface	6
2.5.1 TPMS-IIR-REQ-340211/A-TPMSInterfaceClient_Rx	6
3 GENERAL REQUIREMENTS	10
3.1 TPMS-REQ-342319/A-Powermode Conditions	10
3.2 TPMS-REQ-342320/A-Feature Configuration.....	10
3.3 TPMS-REQ-346038/A-Dually Configuration	10
3.4 TPMS-REQ-342323/A-Missing Message Strategy	10
4 FUNCTIONAL DEFINITION	11
4.1 TPMS-FUN-REQ-344470/A-TPMS Display	11
4.1.1 Requirements	11
4.1.2 Use Cases	12
4.1.3 White Box Views.....	13
5 APPENDIX: REFERENCE DOCUMENTS.....	15



1 Overview

The Tire Pressure Monitor System IoD (information on demand) displays the driver information Tire Pressure data on the Centerstack HMI. See the HMI Spec for details of how this is displayed.



2 Architectural Design

2.1 TPMS-CLD-REQ-340179/A-TPMS Interface Client

The Tire Pressure Monitor System Interface Client (TPMSInterfaceClient) is responsible for the tasks listed below:

- Receiving tire pressure data and status from TPMSServer
- Displaying active tire pressure data and status on user interface

Please review the implementation guide/block diagram to locate the TPMSInterfaceClient class.

2.2 TPMS-CLD-REQ-340181/A-TPMS Server

The Tire Pressure Monitor System Server (TPMSServer) is responsible for the tasks listed below:

- Monitoring and handling active tire pressure data and status
- Transmitting tire pressure data and status to TPMSInterfaceClient

Please review the implementation guide/block diagram to locate the TPMSServer class.

2.3 Physical Mapping of Classes

The table below shows an example of how the logical classes that make up the TPMS IOD feature can be mapped into physical modules. This mapping is an example only and does not necessarily carryover to other carlines or vehicle architectures.

Logical Class	Physical Module (ECU)
TPMSServer	BCM
TPMSInterfaceClient	SYNC

2.4 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
TirePressureLeftFront_St	Tire_Press_LF_Stat
TirePressureRightFront_St	Tire_Press_RF_Stat
TirePressureLeftRear_St	Tire_Press_LR_OLR_Stat
TirePressureRightRear_St	Tire_Press_RR_ORR_Stat
TirePressureInnerLeftRear_St	Tire_Press_ILR_Stat
TirePressureInnerRightRear_St	Tire_Press_IRR_Stat
TirePressureDataLeftFront_St	Tire_Press_LF_Data
TirePressureDataRightFront_St	Tire_Press_RF_Data
TirePressureDataLeftRear_St	Tire_Press_LR_OLR_Data
TirePressureDataRightRear_St	Tire_Press_RR_ORR_Data
TirePressureDataInnerLeftRear_St	Tire_Press_ILR_Data
TirePressureDataInnerRightRear_St	Tire_Press_IRR_Data

Table: Logical name/CAN signal mapping



2.5 TPMSInterfaceClient Interface

2.5.1 TPMS-IIR-REQ-340211/A-TPMSInterfaceClient_Rx

2.5.1.1 MD-REQ-288953/A-TirePressureLeftFront_St

Message Type: Status

Signal indicating the left front tire pressure status.

Name	Literals	Value	Description
Type	-	-	Left front tire pressure status
	Unknown	0x0	
	Normal	0x1	
	Low	0x2	
	Fault	0x3	
	Alert	0x4	

2.5.1.2 MD-REQ-288954/A-TirePressureRightFront_St

Message Type: Status

Signal indicating the right front tire pressure status.

Name	Literals	Value	Description
Type	-	-	Right front tire pressure status
	Unknown	0x0	
	Normal	0x1	
	Low	0x2	
	Fault	0x3	
	Alert	0x4	

2.5.1.3 MD-REQ-288955/A-TirePressureLeftRear_St

Message Type: Status

Signal indicating the left rear tire pressure status.

Name	Literals	Value	Description
Type	-	-	Left rear tire pressure status
	Unknown	0x0	
	Normal	0x1	
	Low	0x2	
	Fault	0x3	
	Alert	0x4	

2.5.1.4 MD-REQ-288956/A-TirePressureRightRear_St

Message Type: Status

Signal indicating the right rear tire pressure status.

Name	Literals	Value	Description
Type	-	-	Right rear tire pressure status
	Unknown	0x0	



	Normal	0x1	
	Low	0x2	
	Fault	0x3	
	Alert	0x4	

2.5.1.5 MD-REQ-288957/A-TirePressureInnerLeftRear_St

Message Type: Status

Signal indicating the inner left rear tire pressure status.

Name	Literals	Value	Description
Type	-	-	Inner left rear tire pressure status
	Unknown	0x0	
	Normal	0x1	
	Low	0x2	
	Fault	0x3	
	Alert	0x4	

2.5.1.6 MD-REQ-288958/A-TirePressureInnerRightRear_St

Message Type: Status

Signal indicating the inner right rear tire pressure status.

Name	Literals	Value	Description
Type	-	-	Inner right rear tire pressure status
	Unknown	0x0	
	Normal	0x1	
	Low	0x2	
	Fault	0x3	
	Alert	0x4	

2.5.1.7 MD-REQ-289045/A-TirePressureDataLeftFront_St

Message Type: Status

Status used to indicate pressure of the left front tire.

Name	Literals	Value	Description
Type	-	-	Indicates left front tire pressure Unit: kilopascal Resolution:1 Offset:0
	kilopascal	0x0 to 0xFFFFD	

2.5.1.8 MD-REQ-289046/A-TirePressureDataRightFront_St

Message Type: Status

Status used to indicate pressure of the right front tire.

Name	Literals	Value	Description
------	----------	-------	-------------



Type	-	-	Indicates right front tire pressure Unit: kilopascal Resolution:1 Offset:0
	kilopascal	0x0 to 0xFFFFD	

2.5.1.9 MD-REQ-289048/A-TirePressureDataLeftRear_St

Message Type: Status

Status used to indicate pressure of the left rear tire.

Name	Literals	Value	Description
Type	-	-	Indicates left rear tire pressure Unit: kilopascal Resolution:1 Offset:0
	kilopascal	0x0 to 0xFFFFD	

2.5.1.10 MD-REQ-289049/A-TirePressureDataRightRear_St

Message Type: Status

Status used to indicate pressure of the right rear tire.

Name	Literals	Value	Description
Type	-	-	Indicates right rear tire pressure Unit: kilopascal Resolution:1 Offset:0
	kilopascal	0x0 to 0xFFFFD	

2.5.1.11 MD-REQ-289050/A-TirePressureDataInnerLeftRear_St

Message Type: Status

Status used to indicate pressure of the inner left rear tire.

Name	Literals	Value	Description
Type	-	-	Indicates inner left rear tire pressure Unit: kilopascal Resolution:1 Offset:0
	kilopascal	0x0 to 0xFFFFD	

2.5.1.12 MD-REQ-289051/A-TirePressureDataInnerRightRear_St

Message Type: Status

Status used to indicate pressure of the inner right rear tire.



Name	Literals	Value	Description
Type	-	-	Indicates inner right rear tire pressure Unit: kilopascal Resolution:1 Offset:0
	kilopascal	0x0 to 0xFFFD	



3 General Requirements

3.1 TPMS-REQ-342319/A-Powermode Conditions

The TPMSInterfaceClient shall only allow the functionality defined by this feature/SPSS when the IgnitionStatus_St = Run/Start, and the touch screen display is On.

If IgnitionStatus_St != Run/Start, the TPMSInterfaceClient shall display dashes (ex. "- -") in place of any TPMS data.

3.2 TPMS-REQ-342320/A-Feature Configuration

The TPMSInterfaceClient shall have a configurable parameter to determine whether the vehicle supports the TPMS IoD.

- If the parameter indicates the vehicle supports TPMS IoD, then all of the functionality and signals defined in this SPSS shall be supported, and the TPMS IoD shall be made available to the user.
- If the parameter indicates the vehicle does not support TPMS IoD, then none of the functionality defined in this SPSS shall be supported, and the TPMS IoD shall not be made available to the user.

3.3 TPMS-REQ-346038/A-Dually Configuration

The TPMSInterfaceClient shall use the Drive Type configurable parameter (DE04 Byte 7) to determine whether the TPMS IoD shall use/display the Dual Rear Wheel (Dually) pressure data values.

If the parameter is set to "Dually" (any variant, ex. 2WD, 4WD) the Dually pressure/status shall be shown and the below signals shall be used:

- TirePressureInnerLeftRear_St
- TirePressureInnerRightRear_St
- TirePressureDataInnerLeftRear_St
- TirePressureDataInnerRightRear_St

3.4 TPMS-REQ-342323/A-Missing Message Strategy

If any of the signals defined in this SPSS (used for displaying any TPMS data) become unavailable or missing from the bus for more than 5 seconds, the TPMSInterfaceClient shall display dashes (ex. "- -") in place of the corresponding TPMS data values with a "normal" status (no warning).



4 Functional Definition

4.1 TPMS-FUN-REQ-344470/A-TPMS Display

4.1.1 Requirements

4.1.1.1 TPMS-REQ-344471/A-Displaying TPMS Data

The TPMSInterfaceClient shall display the TPMS data values for each of the TPMS locations based on the table below:

TPMS Location	TPMS Signal
Left Front Tire	TirePressureDataLeftFront_St
Right Front Tire	TirePressureDataRightFront_St
Left Rear Tire	TirePressureDataLeftRear_St
Right Rear Tire	TirePressureDataRightRear_St
Left Rear Inner Tire	TirePressureDataInnerLeftRear_St
Right Rear Inner Tire	TirePressureDataInnerRightRear_St

The TPMSInterfaceClient shall convert the data values accordingly
(where TirePressureDataXXXX_St represents any of the above signals):

TPMS Units (REQ-344472)	TirePressureDataXXXX_St	Value Displayed
PSI	0x0 – 0xFFFC	### = Round ⁽¹⁾ ((TirePressureDataXXXX_St).14504)
kPa	0x0 – 0xFFFC	### = Round ⁽²⁾ (TirePressureDataXXXX_St)
BAR	0x0 – 0xFFFC	#.# = Round ⁽³⁾ ((TirePressureDataXXXX_St).01)
(PSI) (kPa)	(0xFFFD – 0xFFFF)	Dashes (- - -)
(BAR)	(0xFFFD – 0xFFFF)	Dashes (- . -)

- (1) Round means to round to nearest ones digit (.1 - .4 round down, .5 - .9 round up)
(2) Round means to round ones digit by fives (1, 2 round down), (3 – 7 round to 5), (8, 9 round up).
a. For ex: (341, 342,) → 340; (343, 344, 345, 346, 347) → 345; (348, 349) → 350.
(3) Round means to round to nearest tenths digit (.01 - .04 round down, .05 – .09 round up)

4.1.1.2 TPMS-REQ-344639/A-Displaying TPMS Status

The TPMSInterfaceClient shall display the TPMS status for each of the TPMS locations based on the table below:

TPMS Location	TPMS Signal
Left Front Tire	TirePressureLeftFront_St
Right Front Tire	TirePressureRightFront_St
Left Rear Tire	TirePressureLeftRear_St
Right Rear Tire	TirePressureRightRear_St
Left Rear Inner Tire	TirePressureInnerLeftRear_St
Right Rear Inner Tire	TirePressureInnerRightRear_St

If any of the signals above read (0x2) Low or (0x4) Alert, the TPMSInterfaceClient shall display the corresponding TPMS data value with a “warning” status. All other encodings shall not display a “warning” status.

4.1.1.3 TPMS-REQ-344472/A-Displaying TPMS Units

The TPMSInterfaceClient shall display the TPMS units that were queried/set as defined in the “Settings In Infotainment Centerstack SPSS.” The requirement specific to TPMS units is VS-SR-REQ-234035-Tire Pressure Unit.

**4.1.2 Use Cases****4.1.2.1 TPMS-UC-REQ-344474/A-Displaying TPMS Data to the User**

Actors	Vehicle Occupant
Pre-conditions	Powermode Conditions are met TPMSInterfaceClient is ON
Scenario Description	The user selects the TPMS IOD on the TPMSInterfaceClient
Post-conditions	The TPMSInterfaceClient displays the TPMS Data and corresponding Status
List of Exception Use Cases	REQ-344475-Displaying Missing Data to the User
Interfaces	TPMSInterfaceClient CAN, G-HMI

4.1.2.2 TPMS-UC-REQ-344475/A-Displaying Missing Data to the User

Actors	Vehicle Occupant
Pre-conditions	Powermode Conditions are not met, OR Signals from TPMSServer are missing from bus TPMSInterfaceClient is ON
Scenario Description	The user selects the TPMS IOD on the TPMSInterfaceClient
Post-conditions	The TPMSInterfaceClient displays dashes (ex. "--.-") in place of the all TPMS Data
List of Exception Use Cases	
Interfaces	TPMSInterfaceClient CAN, G-HMI

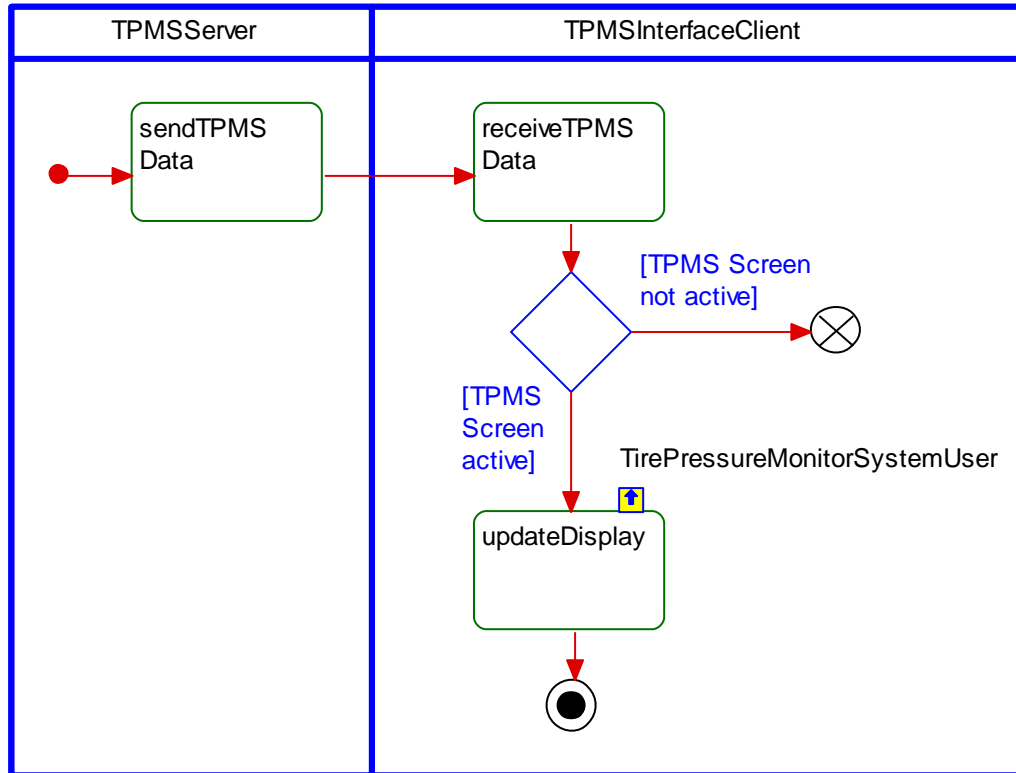


4.1.3 White Box Views

4.1.3.1 Activity Diagrams

4.1.3.1.1 TPMS-ACT-REQ-344477/A-TPMS Display

Activity Diagram



4.1.3.2 Sequence Diagrams

4.1.3.2.1 TPMS-SD-REQ-344478/A-TPMS Display

Constraints

Pre-Condition

Powermode Conditions are met
TPMSInterfaceClient is ON

Scenarios

Normal Usage

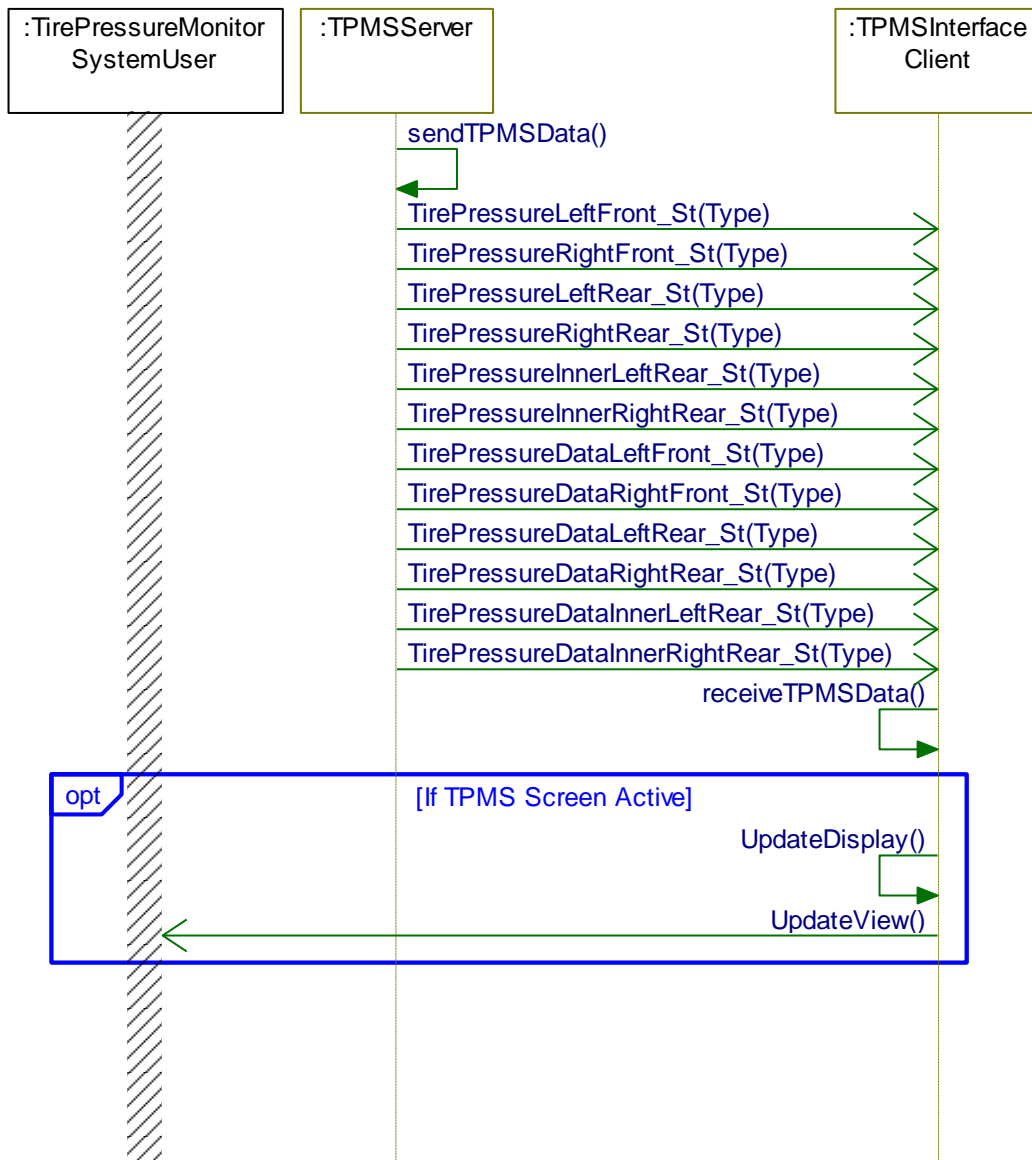
The user selects the TPMS IOD on the TPMSInterfaceClient

Post-Condition

The TPMSInterfaceClient displays the TPMS Data



Sequence Diagram





Appendix: Reference Documents

Reference #	Document Title
1	Settings In Infotainment CenterStack SPSS
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	