TPMS

(Core FNV3 / FNV2)

(F000109 )

|  |  |  |  |
| --- | --- | --- | --- |
| Document Type | **Feature Implementation Specification (FIS)** | |  |
| Template Version | **6.1a** | |  |
| SysML Report Template Version | **6.1a.8** | |  |
| Document ID |  | |  |
| Document Location |  | |  |
| Document Owner | **Baldi, Valter (V. Z.)** | |  |
| Document Revision | **FIS0** | |  |
| Document Status | **Draft** | |  |
| Date Issued | **2022/08/30** | |  |
| Date Revised | **2022/08/30** | |  |
| Model Name and Version | **F000109 - Tire Pressure Monitor System (TPMS) - GANUNCIA1 - [#3]** | |  |
| Document Classification | GIS1 Item Number: | **27.60/35** |  |
| GIS2 Classification: | **Confidential** |

|  |  |  |  |
| --- | --- | --- | --- |
| Document Approval | | | |
| Person | Role | Email Confirmation | Date |
|  |  |  |  |
|  |  |  |  |

This document contains Ford Motor Company Confidential information. Disclosure of the information contained in any portion of this document is not permitted without the expressed, written consent of a duly authorized representative of Ford Motor Company, Dearborn, Michigan, U.S.A.

Copyright ©2021, Ford Motor Company

**Auto-Generated by MagicDraw**

Printed Copies Are Uncontrolled

**Disclaimer**

**This document contains Ford Motor Company Confidential information. Disclosure of the information contained in any portion of this document is not permitted without the expressed, written consent of a duly authorized representative of Ford Motor Company, Dearborn, Michigan, U.S.A.**

This document contains information developed and accumulated by and for FORD MOTOR COMPANY. As such, it is a proprietary document, which, if disseminated to unauthorized persons, would provide others with restricted information, data, or procedures not otherwise available, exposing the FORD MOTOR COMPANY to potential harm.

Employees and suppliers having custody of this specification or authorized to use it must be cognizant of its proprietary nature and ensure that the information herein is not made available to unauthorized persons.

FORD MOTOR COMPANY reserves the right to protect this work as an unpublished copyrighted work in the event of an inadvertent or deliberate unauthorized publication. FORD MOTOR COMPANY also reserves its rights under copyright laws to protect this work as a published work.

This document or portions thereof shall not be distributed outside FORD MOTOR COMPANY without prior written consent. Refer all questions concerning disclosure to the author(s) or any duly authorized representative of Ford Motor Company.

**Copyright** © **2021 Ford Motor Company**

**Contents**

1 Introduction 26

1.1 Document Purpose 26

1.2 Document Scope 26

1.3 Document Audience 27

1.3.1 Stakeholder List 27

1.4 Document Organization 28

1.4.1 Document Context 28

1.4.2 Document Structure 28

1.5 Document Conventions 28

1.5.1 Requirements Templates 28

1.5.1.1 Identification of requirements 28

1.5.1.2 Requirements Attributes 29

1.6 References 29

1.6.1 Ford Documents 29

1.6.2 External Documents and Publications 29

1.7 Glossary 30

1.7.1 Definitions 30

1.7.2 Abbreviations 31

2 Feature Implementation Overview 32

2.1 Description 32

2.2 Input Requirements/Documents 32

2.3 Lessons Learned 33

2.4 Assumptions 34

3 Feature Implementation Architecture 35

3.1 Functional Architecture 35

3.1.1 Description 35

3.1.2 Function List 35

3.1.3 Signal List 36

3.2 Physical Architecture 37

3.2.1 E/E Architecture 37

3.2.1.1 E/E Architecture Variants 37

3.2.1.2 E/E Components 39

3.2.1.3 E/E Connections 40

3.2.1.4 Signal List 41

3.2.2 Software Component Architecture 41

3.2.2.1 Description 41

3.3 Function Deployment 42

3.3.1 Deployment Variants 42

3.3.1.1 Deployment “Variant 1” 42

3.3.1.2 Deployment 42

3.3.2 Function Allocation 43

4 Feature Implementation Modeling 45

4.1 Component Interaction Diagrams 45

4.2 Component Interface Behavior Diagrams 45

5 Feature Implementation Requirements 46

5.1 Functional Safety 46

5.1.1 ASIL Decomposition of Technical Safety Requirements 46

5.2 Requirements on Components 46

5.2.1 46

5.2.1.1 Technology Function 46

5.3 Requirements on Connections 50

5.3.1 Networks 50

5.3.1.1 “CAN Bus xxx” 50

5.3.1.2 “LIN Bus xxx” 51

5.3.1.3 “Ethernet xxx” 51

5.3.2 HW I/Os 51

5.3.2.1 “HW I/O xxx” 52

5.4 Requirements on Development Process 52

6 Open Concerns 53

7 Revision History 54

8 Appendix 55

8.1 Data Dictionary 55

8.1.1 Logical Signals 55

8.1.2 Logical Parameters 55

8.1.3 Technical Signals 55

8.1.3.1 GSDB Signals 56

8.1.3.2 HW I/Os 56

8.1.3.3 Diagnostic Interfaces 56

8.1.4 Technical Parameters 57

8.1.5 Mappings 57

8.1.6 Technical Interfaces 57

8.1.6.1 AIS Interfaces 57

8.1.6.2 AUTOSAR Ports 58

8.1.7 Messages/APIs 58

8.1.7.1 CAN Bus “<Bus Name>” 58

8.1.7.2 LIN Bus “<Bus Name>” 58

8.1.7.3 AUTOSAR Interfaces 58

8.1.7.4 SOA Service Contracts 59

8.1.8 Encoding Types 59

8.1.9 Technology State Machines 60

**List of Figures**

Figure 1‑1-‑1‑: ‑ 2

Figure 3‑1: 35

Figure 3‑2-‑1‑: ‑ 39

Figure 3‑3: 42

Figure 8‑1: ‑ 60

**List of Tables**

Table 1‑1: Input Signal mappings of Function 14

Table 1‑2: Output Signal mappings of Function 15

Table 1‑3: Parameter mappings of Function 15

Table 1‑1: Electrical Architecture(s) referenced in this document 27

Table 1‑2: Ford internal Documents 29

Table 1‑3: External documents and publications 30

Table 1‑4: Definitions used in this document 31

Table 1‑5: Abbreviations used in this document. 31

Table 2‑1: Input Requirements/Documents 33

Table 3‑1: List of Functions 36

Table 3‑2: List of Functions on 36

Table 3‑3: List of Logical Signals 37

Table 3‑4: List of Logical Signals 37

Table 3‑5: List of E/E Architecture Variants 38

Table 3‑6: Electrical Components 40

Table 3‑7: E/E Connections 41

Table 3‑8: List of Technical Signals 41

Table 3‑9: Function Allocation Table (Basic) 43

Table 3‑10: Function Allocation Table (Functional Safety Extension) 44

Table 5‑5: Component Specific Requirements 49

Table 6‑1: Open Concerns 53

Table 8‑1: Operation Modes and States on ‑ 60

Table 8‑2: Transitions between Operation Modes and States on ‑ 63

# Introduction

## Document Purpose

The Feature Implementation Specification (FIS) specifies the deployment of the logical functions of a feature to an electrical architecture. The FIS specifies all interactions between the ECUs of the electrical architecture required for the feature including the technical signals and the interfaces. It also gives interface and integration requirements, which are specific to the feature for the electrical architecture.

To get more information about the concept of feature, function and component level abstraction refer to the [Ford RE Wiki](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Engineering+for+SW+Enabled+Features).

## Document Scope

This FIS describes the deployment of the feature TPMS to the following electrical architecture(s):

*No Electrical Architecture found.*

## Document Audience

The FIS is authored by **Baldi, Valter (V. Z.)** . All Stakeholders, i.e., all people who have a valid interest in the feature implementation should read and, if possible, review the FIS. It needs to be guaranteed, that all stakeholders have access to the currently valid version of the FIS.

### Stakeholder List

For the latest list of stakeholder of the feature and their influence refer to: [Click here to open the latest Stakeholders List.](https://www.vsemweb.ford.com/tc/launchapp?-attach=true&-s=226TCSession&-o=ypkFCvJIx3NrTDAAAAAAAAAAAAA&servername=Production_Server)

## Document Organization

### Document Context

Refer to the [Specification Structure page](http://wiki.ford.com/display/RequirementsEngineering/Specification+templates) in the [Ford RE Wiki](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Engineering+for+SW+Enabled+Features) to understand how the FIS relates to other Ford Requirements Documents and Specifications.

### Document Structure

The structure of this document is explained below:

**Section 1** – Introduction – Giving an explanation how to use this document including responsibilities and the scope of the document. Additionally, it contains the revision history and a list of unsettled but known issues that have to be consolidated in future versions. It explains the terminology and gives a clarification of the definitions, concepts and abbreviations used in the document.

**Section 2** – Feature Implementation Description – Giving an overview of the platform and listing assumptions, constraints or dependencies

**Section 3** – Feature Implementation Architecture – Describing 3 Architecture Views:

* Functional Architecture – Showing the logical architecture of functions
* Physical Architecture – Showing the physical architecture (first of all the E/E Architecture), which the Logical Functions get allocated to.
* Software Architecture – Showing the software architecture relevant for the feature (for features with in-house development only)
* Function Deployment – Presenting the allocation of logical functions and signals to the electrical and other components

**Section 4** – Deployment Specific Modeling –Modeling techniques providing additional detail on e.g. interface behavior

**Section 5** – Deployment Specific Requirements – Deployment specific requirements for ECUs, Network Communication, and Process

**Section 6** – List of Open Concerns

**Section 7** – Revision History

**Section 8** – Appendix - Presenting additional data mainly in a tabular form, e.g., a data dictionary

## Document Conventions

### Requirements Templates

Refer to “[How to use the Specification Templates](http://wiki.ford.com/display/RequirementsEngineering/How+to+use+the+Specification+Templates?src=contextnavpagetreemode)” on how to use the specification templates and the VBA macros to create/edit the requirements in the specifications.

The VBA macro enable the import of the specification to VSEM (refer to ["How to import specifications into VSEM as separate requirements"](http://wiki.ford.com/pages/viewpage.action?pageId=104991616&src=contextnavpagetreemode)).

#### Identification of requirements

The unique requirement ID given in the headline of any requirement follows the requirement throughout the development process. The requirement ID format follows a well-defined syntax.

All identifiers in an FIS shall be composed of 4 parts:

* A leading prefix, which indicates the type of requirement (R=Requirement, UC=Use Case, SC=Scenario, …)
* A prefix, which indicates the abstraction level (F=Feature, FNC=Function, CMP = component).
* Followed by a name, indicating the scope, which the requirement belongs to (e.g. feature or function name )
* Ending with the actual requirement number

*Example:*

*R\_CMP\_LockArbitrator\_00004* This is the fourth requirement on component level for the function Lock Arbitrator.

#### Requirements Attributes

Additionally attributes can be added to each requirement. This helps to classify requirements. A [list of available attributes](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes?src=contextnavpagetreemode) is given in the RE Wiki.

## References

### Ford Documents

The list of all Ford internal documents, which are directly related.

| **Reference** | **Title** | **Doc. ID** | **Document Location** | **Revision** |
| --- | --- | --- | --- | --- |
| Ford GIS Standard | Ford GIS Standard |  |  |  |

Table 1‑2: Ford internal Documents

### External Documents and Publications

The list of external documents could include books, reports and online sources.

| **Reference** | **Document / Publication** | **Document Location** |
| --- | --- | --- |
| IEEE Std 1012-2004 IEEE Standard for Software Verification and Validation |  |  |
| ISO/IEC 19500-2:2003 | Information technology -- Open Distributed Processing -- Part 2 |  |
| UML Testing Profile (UTP), v1.2 |  |  |
| Wikipedia |  |  |

Table 1‑3: External documents and publications

## Glossary

### Definitions

| **Definition** | **Description** |
| --- | --- |
| Cold tire inflation pressure | Tire pressure at ambient temperature in the absence of any pressure increase due to tire usage. |
| In service operating pressure | Inflation pressure for each tire position elevated from cold tire pressure by temperature effects during vehicle usage. |
| LowOff | Internal tire pressure threshold to extinguish telltale according to regulatory requirement. |
| LowOn | Internal tire pressure threshold to cause telltale illumination during mature drive duration. |
| placard pressure | Programmed tire inflation pressure values for front and rear matching vehicle sticker / label. |
| Recommended cold inflation pressure | Tire pressure recommended for each tire position for vehicle manufacturer for the intended service conditions of the given vehicle. |
| significantly under-inflated | Tire pressure value that meets the legal target to cause telltale illumination (varies by regulatory authority). |
| Vehicle Placard and Tire Inflation Pressure label | Sources of information for the vehicle manufacturer recommended cold tire inflation pressure. |
| VeryLowOn | Internal tire pressure threshold to cause telltale illumination during early drive duration. |
| Warm operating tire pressure | Same as "in service operating pressure". |

Table 1‑4: Definitions used in this document

### Abbreviations

| **Abbr.** | **Stands for** |
| --- | --- |
| BLE | Bluetooth Low Energy |
| BUN | Bluetooth Ultrawide Near Field Communication Module |
| CCIOA |  |
| DRW | Dual Rear Wheel |
| DTC | Diagnostic Trouble Code |
| ECE | United Nations Economic Commission for Europe |
| EOL | End of Line |
| FMVSS | Federal Motor Vehicle Safety Standards |
| FNA | Ford North America |
| HMI | Human-Machine Interface |
| ILR | Inner Left Rear |
| IOD | Information On-demand |
| IRR | Inner Right Rear |
| LF | Left Front |
| LR | Left Rear |
| OLR | Outer Left Rear |
| ORR | Outer Right Rear |
| RF | Right Front |
| RR | Right Rear |
| SLD | Sensor Localization Data |
| TPMS | Tire Pressure Monitoring System |

Table 1‑5: Abbreviations used in this document.

# Feature Implementation Overview

## Description

ILR Sensor

TPMS Sensor of Inner Left Rear Tire

IRR Sensor

TPMS Sensor of Inner Right Rear Tire

LF Sensor

TPMS Sensor of Left Front Tire

LR Sensor

TPMS Sensor of Left Rear Tire (OLR Outer Left Rear for Dual rear Tire)

RF Sensor

TPMS Sensor of Right Front Tire

RR Sensor

TPMS Sensor of Right Rear Tire (ORR Outer Right Rear for Dual rear Tire)

RTM

ECU responsible to receive the TPMS sensor signal (Radio Signal) and send the data to BCM (LIN)

TPMS Physical

The Tire Pressure Monitoring System (TPMS) is constructed to provide a warning to the user of a vehicle if a low tire pressure is detected. This warning is accomplished using sensors interior to the tire that monitor the pressure and temperature and transmits that information to a central receiver and can be displayed to the user. The receiver then transmits this data to a processing module, that compares the pressure in each tire to a predetermined threshold to detect a potential issue.

If any tire is determined to be low, this module requests that audible feedback and a warning message be displayed by lighting a telltale on the HMI and by a text message on the vehicle message center, if equipped. In addition to the responsibilities above, this module also monitors the state of the Tire Pressure Monitoring System and will alert the operator if any fault is detected that compromises the ability to provide warnings.

This system needs to be capable to allow the user of training the sensors position, in case of a tire rotation or sensors replacement.

TPMS Sensors

## Input Requirements/Documents

|  |  |  |  |
| --- | --- | --- | --- |
| **Reference**  (Reference as listed in ch. “References”) | **Section/Requirement** | **Description** | **Derived Requirement**  (optional – reference to requirement in ch. “Feature Implementation Requirements”) |
| **Feature/Function Requirements** | | | |
|  |  |  |  |
|  |  |  |  |
| **Ford Engineering Standards** | | | |
|  |  |  |  |
|  |  |  |  |
| **Legal Regulations** | | | |
|  | Compliance with FMVSS138 | The Feature shall comply with FMVSS138. (North America) |  |
|  | Compliance with GB 26149-2017 | The Feature shall comply with GB 26149-2017. (China) |  |
|  | Compliance with ECE-R141 | The Feature shall comply with ECE-R141. (Europe) |  |
|  | Compliance with FMVSS101 | The Feature shall comply with FMVSS101. (Telltale) |  |
|  |  |  |  |
| **Industry Standards** | | | |
|  | ISO 26262 | The system should be developed according to Ford's implementation of Functional Safety. |  |
|  |  |  |  |
| **Other Sources** | | | |
|  |  |  |  |
|  | Sensor Lifespan | TPMS Sensors shall last for at least 10 years or 150 thousand miles, which one occurs first. |  |
|  | Status Change Robustness | TPMS shall receive two transmissions in order to set or clear a Low Tire Pressure Status from any Sensor/Tire. |  |
|  | Sensor Transceiver Frequency | TPMS Sensors shall communicate using BLE 5.0 (3 channels), for Advertise and optional Connected Mode. |  |
|  | Sensor Continuous Survivability Temperature | TPMS Sensors shall survive exposure to 100° Celsius for minimum period (uninterrupted) of 72 hours. |  |
|  | Sensor Weight | The sensor/transmitter assembly shall satisfy the weight requirements as specified in the Engineering Specification (Latest revision of the ES-9L3A-1A180-xx). |  |
|  | Auto Location Data | TPMS Sensors shall provide SLD data during 10 first minutes of driving. |  |
|  | Sensor Pressure Range | TPMS Sensors shall measure tire pressure between 0 psi and 115 psi (passenger vehicles), and between 0 psi and 150 psi (heavy trucks). |  |
|  | Sensor Response to Motion | TPMS shall receive updated tire pressure values from associated sensors within 2 minutes drive duration above 30 km/h. |  |
|  | Sensor Delta P Response Time | TPMS Sensors shall transmit in response to sampled Delta P events no later than 10 seconds after continuous air mass change. |  |
|  | Example |  |  |
|  | Sensor Motion Sensing | TPMS Sensors shall begin rolling transmissions when vehicle motion is above 30 km/h. |  |
|  | Sensor Low Frequency Response | TPMS Sensor shall support communication using Low Frequency 125 kHz. |  |
|  | Power Off Monitoring Time | TPMS shall monitor for at least seven days after vehicle is parked Power Off. |  |
|  | Pressure Display Accuracy | The pressure values displayed to user are no more than 1 psi difference from sensor measurements. |  |
|  | Sensor Operating Temperature Range | TPMS Sensors shall operate between -40° Celsius and 100° Celsius. |  |
|  | Sensor Temperature Measurement Range | TPMS Sensors shall support measurements between -40° Celsius and 125° Celsius. |  |
|  | Example AR |  |  |
|  | Sensor Delta P threshold | TPMS Sensor shall transmit in response to sampled Delta P events. Maximum allowable Delta P difference from prior transmission shall be 2 psi. |  |
|  |  |  |  |

Table 2‑1: Input Requirements/Documents

## Lessons Learned

No lessons learned specified.

## Assumptions

No Assumptions specified.

# Feature Implementation Architecture

## Functional Architecture

### Description

Description of the diagram and content about Functional Architecture in Documentation field of Functional Boundary Diagram.

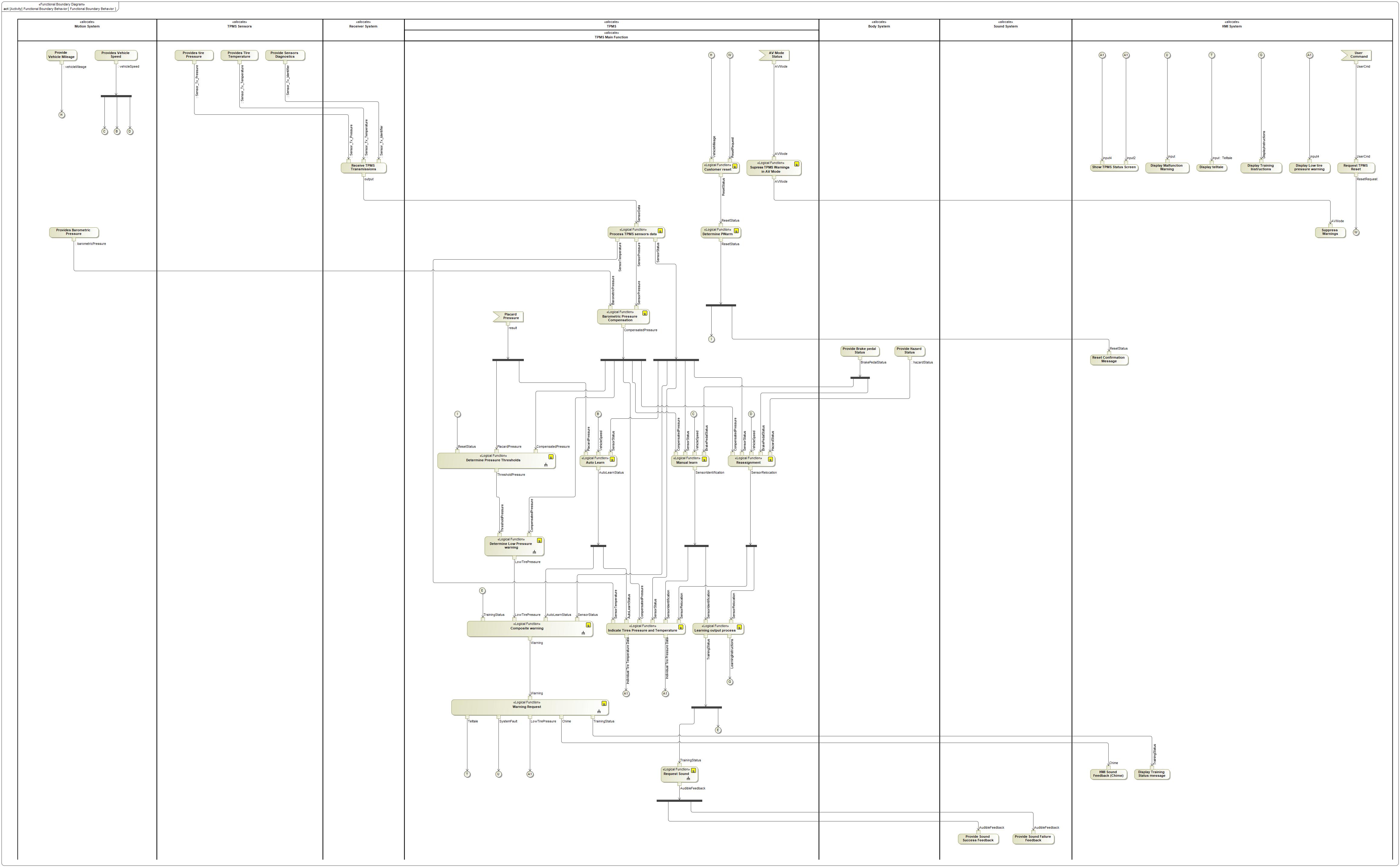


Figure 3‑1: Functional Boundary Behavior

### Function List

The following functions from the [Global Feature & Function List](https://www.vsemweb.ford.com:443/tc/launchapp?-attach=true&-s=226TCSession&-o=ZmZNi0JHx3NrTDAAAAAAAAAAAAA) are referenced in this Feature Implementation Specification:

| **Function ID** | Function Name | Function Description |
| --- | --- | --- |
| LFn:1 | -2025415894.jpg Auto Learn | This function automatically determines TPMS sensors location when vehicle is in motion (over 32kph). |
| LFn:2 | -2025415894.jpg Barometric Pressure Compensation | This function compensates the tire pressures received by each tire pressure sensors with the barometric pressure. |
| LFn:3 | -2025415894.jpg Composite warning | This function determines the priority of the various warning statuses per tire to create a single output. |
| LFn:4 | -2025415894.jpg Customer reset | This function enables European customer / dealer to reset the TPMS system via HMI in the vehicle after tire maintenance is performed. A Customer Reset input enables the Auto Learn and Pwarm algorithms to learn new ID’s and new operating pressure per tire. |
| LFn:5 | -2025415894.jpg Determine Low Pressure warning | This function determines if a low pressure warning needs to be requested according to TPMS sensors information and thresholds. |
| LFn:6 | -2025415894.jpg Determine Pressure Thresholds | This function determines the low tire pressure thresholds according to each market. |
| LFn:7 | -2025415894.jpg Determine PWarm | This function allows the customer to determine the warm placard pressure for each tire location to meet regulatory requirements (Regulatory item for Europe). |
| LFn:8 | -2025415894.jpg Indicate Tires Pressure and Temperature | This function requests the HMI to display tire pressures. |
| LFn:9 | -2025415894.jpg Learning output process | This function requests HMI to indicate TPMS learnings and steps. |
| LFn:10 | -2025415894.jpg Manual learn | This function makes the initial TPMS sensors identification and location. |
| LFn:11 | -2025415894.jpg Process TPMS sensors data | This function processes TPMS sensors information (tire pressure, tire temperature and diagnostics). |
| LFn:12 | -2025415894.jpg Reassignment | This function makes the TPMS sensors re-location after tires rotation. |
| LFn:13 | -2025415894.jpg Request Sound | This function requests horn to beep during Manual learn and Reassignment procedures after each TPMS sensor is located. |
| LFn:14 | -2025415894.jpg Supress TPMS Warnings in AV Mode | This function makes TPMS warnings to be supressed in AV (Autonomous Vehicle) mode. |
| LFn:15 | -2025415894.jpg Warning Request | This function requests the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale). |

Table 3‑1: List of Functions

### Signal List

| **Signal Name** | **Description** |
| --- | --- |
| -1910009838.jpg **barometricPressure** | (AirAmb\_P\_Actl)  Units: mbar  Resolution: 10  Offset: 500  Minimum value: 500 (0x0)  Maximum value: 1110 (0x3D)  0x3E = NoDataExists  0x3F = Fault  Provides ambient barometer measurement. |
| -1910009838.jpg **gearLeverPosition** |  |
| -1910009838.jpg **HMI\_Selected\_Screen** |  |
| -1910009838.jpg **resetRequest** | Command via user input to reset / default TPMS. |
| -1910009838.jpg **resetResponse** | Success or failure confirmation of TPMS reset request. |
| -1910009838.jpg **Sensor\_Status** |  |
| -1910009838.jpg **Sensor\_Tx\_Identifier** | Sensor identification code. |
| -1910009838.jpg **telltaleStatus** | Provides TPMS telltale output state.  (Tire\_Press\_Telltale,  0x0 = Off,  0x1 = On,  0x2 = Flash,  0x3 = Not\_Used). |
| -1910009838.jpg **TPMS\_IDs** | Provides set of learned / associated TPMS sensor identifier codes. |
| -1910009838.jpg **TPMS\_System\_Status** | Provides composite TPMS status, controls HMI message center output.  (Tire\_Press\_System\_Stat  0x0 = Unknown\_Composite\_Stat  0x1 = Systm\_Fault\_Composite\_Stat  0x2 = Sensr\_Fault\_Composite\_Stat  0x3 = Low\_Composite\_Stat  0x4 = Systm\_Activ\_Composite\_Stat  0x5 = Train\_LeftFront\_tire  0x6 = Train\_RightFront\_tire  0x7 = Train\_RightRear\_tire  0x8 = Train\_OutsideRtRear\_tire  0x9 = Train\_InsideRtRear\_tire  0xA = Train\_LeftRear\_tire  0xB = Train\_OutsideLeftRear\_tire  0xC = Train\_InsideLeftRear\_tire  0xD = Training\_Complete  0xE = Tires\_not\_trained). |
| -1910009838.jpg **vehicleMileage** | Provides odometer mileage data. |
| -1910009838.jpg **vehicleSpeed** | Provides vehicle speedometer data. |
| -1910009838.jpg **wheelSpeedStatus** | Provides wheel rotation measurement data. |

Table 3‑3: List of Logical Signals

## Physical Architecture

### E/E Architecture

#### E/E Architecture Variants

*No E/E Architecture Variant found.*

##### E/E Architecture “Architecture Variant: Physical Architecture “

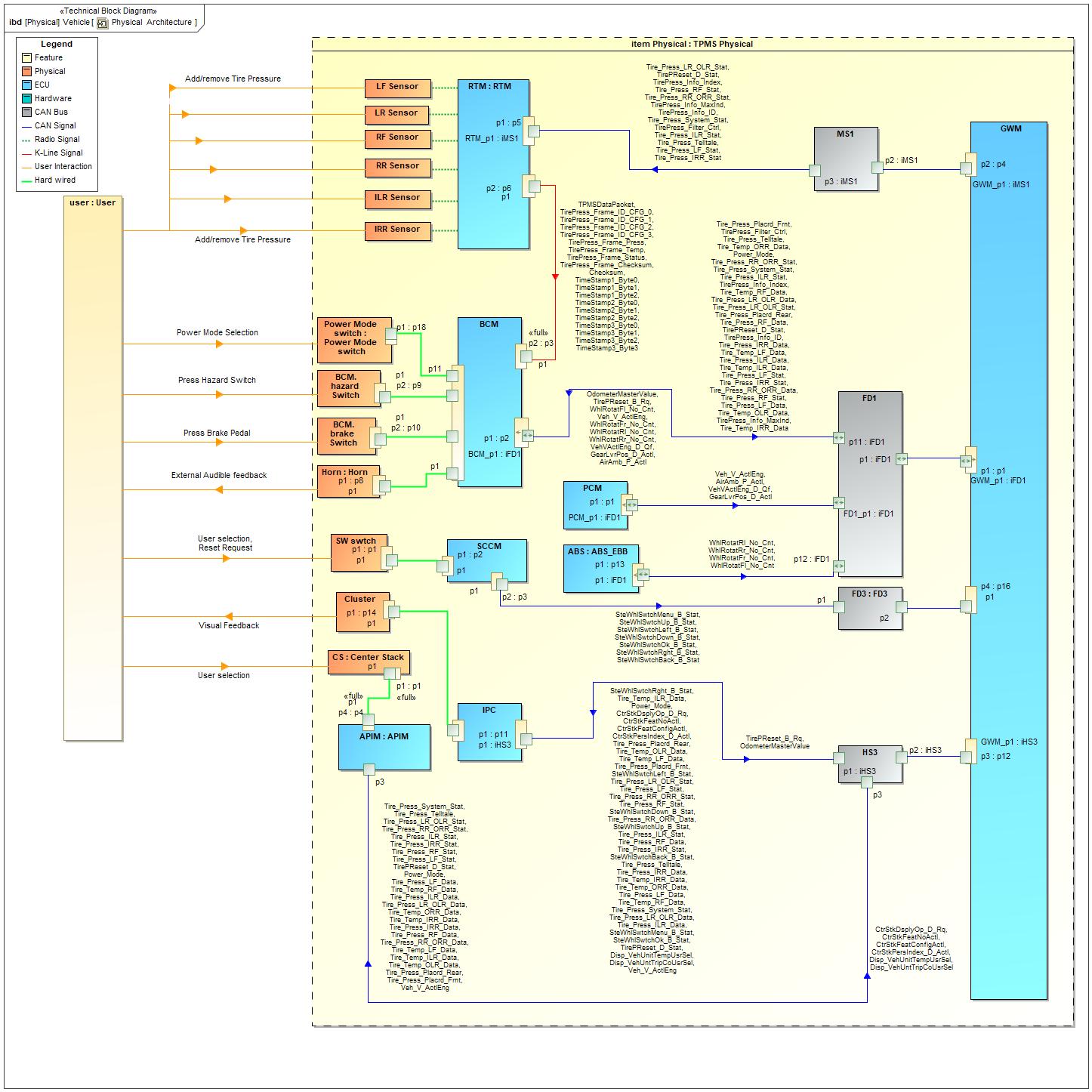


Figure 3‑2-1: Physical Architecture

#### E/E Components

|  |  |
| --- | --- |
| Component Name | **Description** |
| ABS (ABS\_EBB) | ECU responsible to provide each wheel speed |
| APIM | ECU responsible to provide the metrics unit to use by vehicle (Temperature and Pressure) |
| BCM | ECU responsible for all TPMS System Process Frame, providing the tire temperature, pressure compensated and status by tire. |
| brake Switch (Brake Switch) | Actuator used to send the signal to reset the BCM counter (Learn Mode) |
| Cluster | Display of IPC Data (TPMS monitor, Learn Instructions, Warning Messages and TPMS Reset) |
| CS (Center Stack) | HMI interface between User and APIM, to selet the temperature and pressure unit |
| FD1 | CAN Flexible Data-rate 1 |
| FD3 | CAN Flexible Data-rate 3 |
| GWM | ECU responsible to convert the CAN signal |
| hazard Switch (Hazard Switch) | Actuator used to active the Manual Learn Mode to BCM |
| Horn | Actuator responsible to provide the external sound audible, to support the learn mode |
| HS3 | CAN High Speed 3 |
| ILR Sensor | TPMS Sensor of Inner Left Rear Tire |
| IPC (APIM) | ECU responsible to provide the metrics unit to use by vehicle (Temperature and Pressure) |
| IRR Sensor | TPMS Sensor of Inner Right Rear Tire |
| item Physical (TPMS Physical) | The Tire Pressure Monitoring System (TPMS) is constructed to provide a warning to the user of a vehicle if a low tire pressure is detected. This warning is accomplished using sensors interior to the tire that monitor the pressure and temperature and transmits that information to a central receiver and can be displayed to the user. The receiver then transmits this data to a processing module, that compares the pressure in each tire to a predetermined threshold to detect a potential issue.  If any tire is determined to be low, this module requests that audible feedback and a warning message be displayed by lighting a telltale on the HMI and by a text message on the vehicle message center, if equipped. In addition to the responsibilities above, this module also monitors the state of the Tire Pressure Monitoring System and will alert the operator if any fault is detected that compromises the ability to provide warnings.  This system needs to be capable to allow the user of training the sensors position, in case of a tire rotation or sensors replacement. |
| LF Sensor | TPMS Sensor of Left Front Tire |
| LR Sensor | TPMS Sensor of Left Rear Tire (OLR Outer Left Rear for Dual rear Tire) |
| MS1 | CAN Middle Speed 1 |
| PCM | ECU responsible to provide the barometric pressure, vehicle speed and gear shift position |
| Power Mode switch | Actuator used to activate the ECUs and used to active the Reassignment Learn Mode to BCM |
| RF Sensor | TPMS Sensor of Right Front Tire |
| RR Sensor | TPMS Sensor of Right Rear Tire (ORR Outer Right Rear for Dual rear Tire)  TPMS Sensor of Right Rear Tire (ORR Outer Right Rear for Dual rear Tire) |
| RTM | ECU responsible to receive the TPMS sensor signal (Radio Signal) and send the data to BCM (LIN) |
| SCCM | ECU responsible to convert the Steering Wheel Switch Buttons commands in CAN signal to vehicle (Cluster Navigation) |
| SW swtch (Steering wheel switch) | Actuators of Steering Wheel used by User to navigate on cluster |
| user (User) | Operator of vehicle |

Table 3‑6: Electrical Components

#### E/E Connections

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Connection Name | **Connection Type** | **Protocol**  Only if ‘Connection Type’ is “Network”/”RF-Digital” | **Description** | **Allocated Messages**  Only if ‘Connection Type’ is “Network”/”RF-Digital” | **Connected Nodes** |
| HS3-CAN | Network | CAN (High Speed) | Infotainment High Speed CAN Bus | 0x434 Cluster\_Info\_3 TirePReset\_B\_Rq 0x430 Cluster\_Info1 OdometerMasterValue 0x3E2 Personality\_APIM\_Data CtrStkDsplyOp\_D\_Rq CtrStkFeatNoActl CtrStkFeatConfigActl CtrStkPersIndex\_D\_Actl 0x191 MFD\_Request\_Signals4 Disp\_VehUnitTempUsrSel Disp\_VehUntTripCoUsrSel |  |
| FD3-CAN | Network | CAN FD | Infotainment Flexible Data CAN Bus | 0x81 Steering\_Wheel\_Data2 SteWhlSwtchBack\_B\_Stat SteWhlSwtchDown\_B\_Stat SteWhlSwtchLeft\_B\_Stat SteWhlSwtchRght\_B\_Stat SteWhlSwtchUp\_B\_Stat SteWhlSwtchOk\_B\_Stat SteWhlSwtchMenu\_B\_Stat |  |
| FD1-CAN | Network | CAN FD | Infotainment Flexible Data CAN Bus | 0x3B4 Tire\_Pressure\_Stat Tire\_Press\_System\_Stat Tire\_Press\_Telltale TirePReset\_D\_Stat Tire\_Press\_LF\_Stat Tire\_Press\_RF\_Stat Tire\_Press\_IRR\_Stat Tire\_Press\_ILR\_Stat Tire\_Press\_RR\_ORR\_Stat Tire\_Press\_LR\_OLR\_Stat Tire\_Press\_Placrd\_Frnt Tire\_Press\_Placrd\_Rear 0x3B6 RKE\_Packet TirePress\_Filter\_Ctrl 0x3B7 TPM\_Frame TirePress\_Info\_Index TirePress\_Info\_MaxInd TirePress\_Info\_Id 0x3B5 Tire\_Pressure\_Data Tire\_Press\_LF\_Data Tire\_Press\_RF\_Data Tire\_Press\_RR\_ORR\_Data Tire\_Press\_LR\_OLR\_Data 0x3B8 Tire\_Pressure\_Data\_DRW Tire\_Press\_IRR\_Data Tire\_Press\_ILR\_Data 0x3BB Tire\_Temp\_Data Tire\_Temp\_IRR\_Data Tire\_Temp\_ILR\_Data Tire\_Temp\_LF\_Data Tire\_Temp\_RF\_Data Tire\_Temp\_OLR\_Data Tire\_Temp\_ORR\_Data 0x3B3 BodyInfo\_3 Ignition\_Status 0x178 EngineClimateData\_HS1 AirAmb\_P\_Actl 0x202 EngVehicleSpThrottle2\_HS1 Veh\_V\_ActlEng VehVActlEng\_D\_Qf 0x230 TransGearData GearLvrPos\_D\_Actl 0x216 WheelData WhlRotatFl\_No\_Cnt WhlRotatFr\_No\_Cnt WhlRotatRl\_No\_Cnt WhlRotatRr\_No\_Cnt |  |

Table 3‑7: E/E Connections

#### Signal List

| **Signal Name** | **Description** |
| --- | --- |
|  |  |
| 1111160605.jpg **AirAmb\_P\_Actl** | Atmospheric pressure (also known as "ambient air pressure" or "barometric pressure").  Sometimes measured, sometimes estimated (inferred) - depends on application. |
| 172051543.jpg **Checksum** | The checksum is created by summing up all the bytes of the data including the carry bit. |
| 1111160605.jpg **CtrStkDsplyOp\_D\_Rq** | Display Operation. Type of operation the centerstack display device is requesting. |
| 1111160605.jpg **CtrStkFeatConfigActl** | Indicates the value of the feature setting that is being requested to change from the centerstack either from the display HMI or from an upload request. |
| 1111160605.jpg **CtrStkFeatNoActl** | Indicates the number of the feature from the master feature list that is being requested from the centerstack either from the display HMI or from an upload or download request. |
| 1111160605.jpg **CtrStkPersIndex\_D\_Actl** | Indicates which personality profile is being accessed by the centerstack. |
| 1111160605.jpg **Disp\_VehUnitTempUsrSel** | Generated from auto-import |
| 1111160605.jpg **Disp\_VehUntTripCoUsrSel** | Generated from auto-import |
| 1111160605.jpg **GearLvrPos\_D\_Actl** | Automatic Transmission Gear Lever Position (Driver Selected Gear Lever Position), for 6 speed Automatic Transmissions.  Automatic Transmission Gear Lever Position (Driver Selected Gear Lever Position, except for PARK). PARK is now actual confirmed versus unconfirmed requested. This is true starting with 10, 9, and 8 speed Automatic Transmissions due to hardware changes. For functions that are looking for driver desired position CAN Signal TrnRng\_D\_Rq is the most direct replacement for GearLvrPos\_D\_Actl.  Agreed to keep this signal (in addition to TrnIpcDsplyGear\_D\_Actl, id#823) in order to decouple the HMI display from the actual gear position selection. |
| 1111160605.jpg **OdometerMasterValue** | Odometer Record from the IPC (Instrument Panel Cluster). |
| 1111160605.jpg **SteWhlSwtchBack\_B\_Stat** | CAN input from the SCCM stating whether the "Back"  button is pressed or not. |
| 1111160605.jpg **SteWhlSwtchDown\_B\_Stat** | Steering button cursor input. |
| 1111160605.jpg **SteWhlSwtchLeft\_B\_Stat** | Steering button cursor input. |
| 1111160605.jpg **SteWhlSwtchMenu\_B\_Stat** | Steering wheel Menu button signal from SCCM to IPC |
| 1111160605.jpg **SteWhlSwtchOk\_B\_Stat** | Steering button cursor input. |
| 1111160605.jpg **SteWhlSwtchRght\_B\_Stat** | Steering button cursor input. |
| 1111160605.jpg **SteWhlSwtchUp\_B\_Stat** | Steering button cursor input. |
| 172051543.jpg **TimeStamp1\_Byte0** | Time sample 1 Byte0 |
| 172051543.jpg **TimeStamp1\_Byte1** | Time sample 1 Byte1 |
| 172051543.jpg **TimeStamp1\_Byte2** | Time sample 1 Byte2 |
| 172051543.jpg **TimeStamp2\_Byte0** | Time sample 2 Byte0 |
| 172051543.jpg **TimeStamp2\_Byte1** | Time sample 2 Byte1 |
| 172051543.jpg **TimeStamp2\_Byte2** | Time sample 2 Byte2 |
| 172051543.jpg **TimeStamp3\_Byte0** | Time sample 3 Byte0 |
| 172051543.jpg **TimeStamp3\_Byte1** | Time sample 3 Byte1 |
| 172051543.jpg **TimeStamp3\_Byte2** | Time sample 3 Byte2 |
| 172051543.jpg **TimeStamp3\_Byte3** | Time sample 3 Byte3 |
| 1111160605.jpg **Tire\_Press\_ILR\_Stat** | Indicates the status of the inside left rear tire pressure. |
| 1111160605.jpg **Tire\_Press\_IRR\_Stat** | Indicates the status of the inside right rear tire pressure. |
| 1111160605.jpg **Tire\_Press\_LF\_Stat** | Indicates the status of the left front tire pressure. |
| 1111160605.jpg **Tire\_Press\_LR\_OLR\_Stat** | Indicates the status of the outside left rear tire pressure. |
| 1111160605.jpg **Tire\_Press\_RF\_Stat** | Indicates the status of the right front tire pressure. |
| 1111160605.jpg **Tire\_Press\_RR\_ORR\_Stat** | Indicates the status of the outside right rear tire pressure. |
| 1111160605.jpg **Tire\_Press\_System\_Stat** | No description. |
| 1111160605.jpg **Tire\_Press\_Telltale** | Request for tire pressure telltale operation. |
| 1111160605.jpg **TirePReset\_B\_Rq** | The request to reset TPMS feature.  The signal TirePReset\_B\_Rq2 with the exact same meaning and definition has been created. Any change to this signal must be coordinated with a change to the signal TirePReset\_B\_Rq2. |
| 1111160605.jpg **TirePReset\_D\_Stat** | The status of the TPMS reset request. |
| 1111160605.jpg **TirePress\_Filter\_Ctrl** | Request to either filter on learned TPM IDs or pass all received TPM frames. |
| 172051543.jpg **TirePress\_Frame\_Checksum** | Checksum to validate frame |
| 172051543.jpg **TirePress\_Frame\_ID\_CFG\_0** | Byte #0 of TPMSensor ID |
| 172051543.jpg **TirePress\_Frame\_ID\_CFG\_1** | Byte #1 of TPMSensor ID |
| 172051543.jpg **TirePress\_Frame\_ID\_CFG\_2** | Byte #2 of TPMSensor ID |
| 172051543.jpg **TirePress\_Frame\_ID\_CFG\_3** | Byte #3 of TPMSensor ID |
| 172051543.jpg **TirePress\_Frame\_Press** | Byte indicating in pressure |
| 172051543.jpg **TirePress\_Frame\_Status** | Byte indicating sensor status |
| 172051543.jpg **TirePress\_Frame\_Temp** | Byte indicating in temperature |
| 1111160605.jpg **TirePress\_Info\_ID** | Request to send learned IDs for use when filtering, 4 byte ID value. This signal will be reloaded and sent for each element in the ID\_Cfg[] array. |
| 1111160605.jpg **TirePress\_Info\_Index** | Request to send learned IDs for use when filtering, 1 byte array index value. This signal will be reloaded and sent for each element in the ID\_Cfg[] array. |
| 1111160605.jpg **TirePress\_Info\_MaxInd** | No Data Dictionary Dataflow exists for this CAN Signal - CMDB Domain Value 0 : 255 |
| 172051543.jpg **TPMS\_Sensor** | TPM Sensor itself |
| 172051543.jpg **TPMSDataPacket** | Header for TPMS Data Packet |
| 1111160605.jpg **Veh\_V\_ActlEng** | Vehicle speed source from engine control module. This is usually the primary vehicle speed source in FNA vehicles.  In non-failure mode operation this will be based on transmission output shaft speed.  In FiE vehicles the primary source is usually Veh\_V\_ActlBrk (ID#503). Both signals will be on HS-CAN for all CGEA V1.1 vehicles.  The receiving modules will be configured to honor one signal as the master.  Use VehVActlEng\_D\_Qf (id#1191) for quality factor information. |
| 1111160605.jpg **VehVActlEng\_D\_Qf** | Quality factor for signal Veh\_V\_ActlEng (#1190). |
| 1111160605.jpg **WhlRotatFl\_No\_Cnt** | Front left wheel rolling angle counts to support navigation and parking assist features. Rolling counter where 126 counts equal one wheel rotation. Fault information is embedded in the corresponding wheel speed signal (id#586). FSMS: RQT-060900-006081 |
| 1111160605.jpg **WhlRotatFr\_No\_Cnt** | Front right wheel rolling angle counts to support navigation and parking assist features. Rolling counter where 126 counts equal one wheel rotation. Fault information is embedded in the corresponding wheel speed signal (id#588). FSMS: RQT-060900-006081 |
| 1111160605.jpg **WhlRotatRl\_No\_Cnt** | Rear left wheel rolling angle counts to support navigation and parking assist features. Rolling counter where 126 counts equal one wheel rotation. Fault information is embedded in the corresponding wheel speed signal (id#590). FSMS: RQT-060900-006081 |
| 1111160605.jpg **WhlRotatRr\_No\_Cnt** | Rear right wheel rolling angle counts to support navigation and parking assist features. Rolling counter where 126 counts equal one wheel rotation. Fault information is embedded in the corresponding wheel speed signal (id#592). FSMS: RQT-060900-006081 |

Table 3‑8: List of Technical Signals

### Software Component Architecture

**No Software Component Architecture Diagrams identified.**

## Function Deployment

### Deployment Variants

#### Deployment Vehicle System Behavior

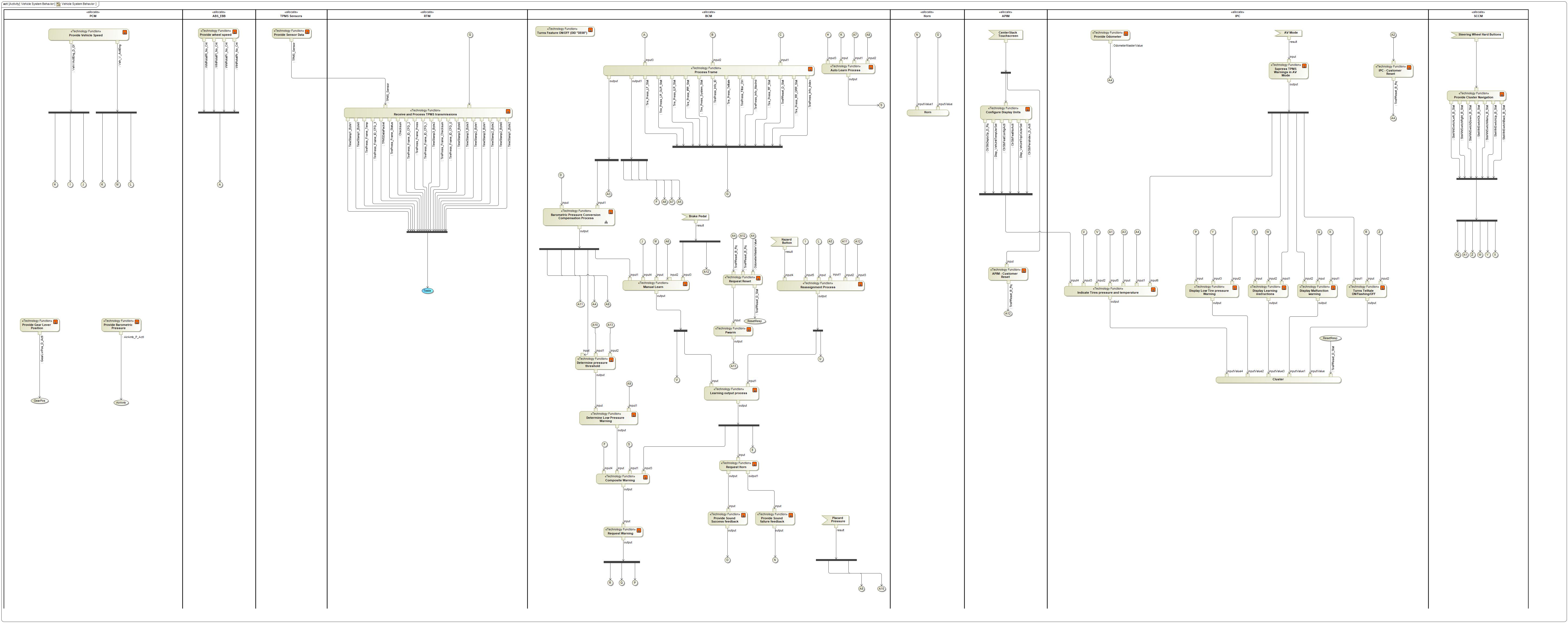


Figure 3‑3: Vehicle System Behavior

### Function Allocation

| Component | Technology Function Name | Logical Function Name |
| --- | --- | --- |
|
| -325319595.jpg SCCM | -1543687678.jpg Provide Cluster Navigation | * -325319595.jpg SCCM * -879124200.jpg Indicate Tires Pressure and Temperature |
| -325319595.jpg TPMS Sensors | -1543687678.jpg Provide Sensor Data | * -325319595.jpg TPMS Sensors |
| -325319595.jpg BCM | -1543687678.jpg Provide Sound failure feedback | * -325319595.jpg BCM * -879124200.jpg Request Sound |
| -1543687678.jpg Provide Sound Success feedback | * -325319595.jpg BCM * -879124200.jpg Request Sound |
| -1543687678.jpg Determine pressure threshold | * -879124200.jpg Determine Pressure Thresholds * -325319595.jpg BCM |
| -1543687678.jpg Pwarm | * -325319595.jpg BCM * -879124200.jpg Determine PWarm |
| -1543687678.jpg Learning output process | * -879124200.jpg Learning output process * -325319595.jpg BCM |
| -1543687678.jpg Request Reset | * -325319595.jpg BCM |
| -1543687678.jpg Determine Low Pressure Warning | * -325319595.jpg BCM * -879124200.jpg Determine Low Pressure warning |
| -1543687678.jpg Barometric Pressure Conversion Compensation Process | * -879124200.jpg Barometric Pressure Compensation * -325319595.jpg BCM |
| -1543687678.jpg Request Horn | * -325319595.jpg BCM * -879124200.jpg Request Sound |
| -1543687678.jpg Process Frame | * -879124200.jpg Process TPMS sensors data * -325319595.jpg BCM |
| -1543687678.jpg Composite Warning | * -879124200.jpg Composite warning * -325319595.jpg BCM |
| -1543687678.jpg Request Warning | * -879124200.jpg Warning Request * -325319595.jpg BCM |
| -1543687678.jpg Turns Feature ON/OFF (DID "DE08") | * -325319595.jpg BCM |
| -1543687678.jpg Reassignment Process | * -879124200.jpg Reassignment * -325319595.jpg BCM |
| -1543687678.jpg Auto Learn Process | * -325319595.jpg BCM * -879124200.jpg Auto Learn |
| -1543687678.jpg Manual Learn | * -325319595.jpg BCM * -879124200.jpg Manual learn |
| -325319595.jpg RTM | -1543687678.jpg Receive and Process TPMS transmissions | * -879124200.jpg Process TPMS sensors data * -325319595.jpg RTM |
| -325319595.jpg APIM | -1543687678.jpg Configure Display Units | * -879124200.jpg Indicate Tires Pressure and Temperature * -325319595.jpg APIM |
| -1543687678.jpg APIM - Customer Reset | * -325319595.jpg APIM |
| -325319595.jpg ABS\_EBB | -1543687678.jpg Provide wheel speed | * -325319595.jpg ABS\_EBB |
| -325319595.jpg PCM | -1543687678.jpg Provide Gear Lever Position | * -325319595.jpg PCM |
| -1543687678.jpg Provide Vehicle Speed | * -325319595.jpg PCM |
| -1543687678.jpg Provide Barometric Pressure | * -325319595.jpg PCM |
| -325319595.jpg IPC | -1543687678.jpg Indicate Tires pressure and temperature | * -879124200.jpg Indicate Tires Pressure and Temperature * -325319595.jpg IPC |
| -1543687678.jpg Display Learning instructions | * -879124200.jpg Learning output process * -325319595.jpg IPC |
| -1543687678.jpg Turns Telltale ON/Flashing/OFF | * -879124200.jpg Warning Request * -325319595.jpg IPC |
| -1543687678.jpg IPC - Customer Reset | * -879124200.jpg Customer reset * -325319595.jpg IPC |
| -1543687678.jpg Display Low Tire pressure Warning | * -879124200.jpg Warning Request * -325319595.jpg IPC |
| -1543687678.jpg Supress TPMS Warnings in AV Mode | * -879124200.jpg Supress TPMS Warnings in AV Mode * -325319595.jpg IPC |
| -1543687678.jpg Display Malfunction warning | * -879124200.jpg Warning Request * -325319595.jpg IPC |
| -1543687678.jpg Provide Odometer | * -325319595.jpg IPC |

Table 3‑9: Function Allocation Table (Basic)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Component | | Technology Function Name | TSR | |
| Name | ASIL |  | ID | ASIL |

Table 3‑10: Function Allocation Table (Functional Safety Extension)

# Feature Implementation Modeling

## Component Interaction Diagrams

**No Component Interaction Diagrams identified.**

## Component Interface Behavior Diagrams

**No Component Interface Diagrams identified.**

*See Appendix Section 8.1.9 for Technology State Machines*

# Feature Implementation Requirements

## Functional Safety

### ASIL Decomposition of Technical Safety Requirements

#### Decomposition of Safety Requirement (ASIL )

Safety Requirement is decomposed as described in the following table:

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Safety Requirement |  | | |
| Decomposition Rationale |  | | |
| **Method for Decomposition** |  | D 🡺 C(D) + A(D) | |
|  | D 🡺 B(D) + B(D) | |
|  | D 🡺 D(D) + QM(D) | |
|  | C 🡺 B(C) + A(C) | |
|  | C 🡺 C(C) + QM(C) | |
|  | B 🡺 A(B) + A(B) | |
|  | B 🡺 B(B) + QM(B) | |
|  | A 🡺 A(A) + QM(A) | |
|  | D(D) 🡺 C(D) + A(D) | |
|  | D(D) 🡺 B(D) + B(D) | |
|  | D(D) 🡺 D(D) + QM(D) | |
|  | C(D) 🡺 B(D) + A(D) | |
|  | C(D) 🡺 C(D) + QM(D) | |
|  | B(D) 🡺 A(D) + A(D) | |
|  | B(D) 🡺 B(D) + QM(D) | |
|  | A(D) 🡺 A(D) + QM(D) | |
|  | C(C) 🡺 B(C) + A(C) | |
|  | C(C) 🡺 C(C) + QM(C) | |
|  | B(C) 🡺 A(C) + A(C) | |
|  | B(C) 🡺 B(C) + QM(C) | |
|  | A(C) 🡺 A(C) + QM(C) | |
|  | B(B) 🡺 A(B) + A(B) | |
|  | B(B) 🡺 B(B) + QM(B) | |
|  | A(B) 🡺 A(B) + QM(B) | |
|  | A(A) 🡺 A(A) + QM(A) | |
| Technical Safety Requirement 1 after Decomposition | T-S-Req.-ID | |  |
| T-S-Req. Title | | Main Function FSR |
| ASIL | | QM(A) |
| Rationale | |  |
| Technical Safety Requirement 2 after Decomposition | T-S-Req.-ID | |  |
| T-S-Req. Title | | Monitor Function FSR |
| ASIL | | A(A) |
| Rationale | |  |
| Technical Safety Requirement for Independence  *Note: should consider commonly used input, output and processing*  *Note: additional rows should be added if additional* *requirements for Independence are necessary* | T-S-Req.-ID | |  |
| T-S-Req. Title | | Main and Monitor Independence |
| ASIL | |  |
| Rationale | |  |

## Requirements on Components

### SCCM

SCCM

#### Technology Function -1543687678.jpg Provide Cluster Navigation

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| -1910009838.jpg HMI\_Selected\_Screen | 658883941.jpg SteWhlSwtchBack\_B\_Stat | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| -1910009838.jpg HMI\_Selected\_Screen | 658883941.jpg SteWhlSwtchLeft\_B\_Stat | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| -1910009838.jpg HMI\_Selected\_Screen | 658883941.jpg SteWhlSwtchRght\_B\_Stat | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| -1910009838.jpg HMI\_Selected\_Screen | 658883941.jpg SteWhlSwtchDown\_B\_Stat | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| -1910009838.jpg HMI\_Selected\_Screen | 658883941.jpg SteWhlSwtchOk\_B\_Stat | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| -1910009838.jpg HMI\_Selected\_Screen | 658883941.jpg SteWhlSwtchMenu\_B\_Stat | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| -1910009838.jpg HMI\_Selected\_Screen | 658883941.jpg SteWhlSwtchUp\_B\_Stat | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Provide Cluster Navigation

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0013 TPMS Placard (ECE-141)

IPC shall allow the customer to determine the warm placard pressure for each tire location to meet regulatory requirements (Regulatory item for Europe).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall allow the customer to determine the warm placard pressure for each tire location to meet regulatory requirements (Regulatory item for Europe). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_SCCM\_FIS\_0001 Steering wheel signals

The SCCM module shall provide steering wheel buttons signals over CAN to IPC and allow Cluster Menus navigation:

- SteWhlSwtchBack\_B\_Stat;

- SteWhlSwtchUp\_B\_Stat;

- SteWhlSwtchDown\_B\_Stat;

- SteWhlSwtchRight\_B\_Stat;

- SteWhlSwtchLeft\_B\_Stat;

- SteWhlSwtchOk\_B\_Stat;

- SteWhlSwtchMenu\_B\_Stat.

Satisfied by:

* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The SCCM module shall provide steering wheel buttons signals over CAN to IPC and allow Cluster Menus navigation:  - SteWhlSwtchBack\_B\_Stat;  - SteWhlSwtchUp\_B\_Stat;  - SteWhlSwtchDown\_B\_Stat;  - SteWhlSwtchRight\_B\_Stat;  - SteWhlSwtchLeft\_B\_Stat;  - SteWhlSwtchOk\_B\_Stat;  - SteWhlSwtchMenu\_B\_Stat. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0011 TPMS IOD

IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0012 TPMS Reset Request (ECE-141)

IPC shall allow the customer to make TPMS system Reset Request (only for European customer / dealer). A customer Reset input shall enable the Auto Learn and Pwarm algorithms to learn new ID’s and new operating pressure per tire.

TirePReset\_B\_Rq is the Reset Request signal from HMI to BCM.

Tire\_Press\_System\_Stat, Tire\_PReset\_D\_Stat are feedback from BCM to HMI to confirm the reset was successfull.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall allow the customer to make TPMS system Reset Request (only for European customer / dealer). A customer Reset input shall enable the Auto Learn and Pwarm algorithms to learn new ID’s and new operating pressure per tire.    TirePReset\_B\_Rq is the Reset Request signal from HMI to BCM.    Tire\_Press\_System\_Stat, Tire\_PReset\_D\_Stat are feedback from BCM to HMI to confirm the reset was successfull. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0006 TPMS IPC to HMI to display the warnings

IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0002 Steering wheel signals

IPC shall receive the steering wheel button CAN signals from SCCM:

- SteWhlSwtchBack\_B\_Stat;

- SteWhlSwtchUp\_B\_Stat;

- SteWhlSwtchDown\_B\_Stat;

- SteWhlSwtchRight\_B\_Stat;

- SteWhlSwtchLeft\_B\_Stat;

- SteWhlSwtchOk\_B\_Stat;

- SteWhlSwtchMenu\_B\_Stat.

Satisfied by:

* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall receive the steering wheel button CAN signals from SCCM:  - SteWhlSwtchBack\_B\_Stat;  - SteWhlSwtchUp\_B\_Stat;  - SteWhlSwtchDown\_B\_Stat;  - SteWhlSwtchRight\_B\_Stat;  - SteWhlSwtchLeft\_B\_Stat;  - SteWhlSwtchOk\_B\_Stat;  - SteWhlSwtchMenu\_B\_Stat. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0003 TPMS system - BCM to APIM/IPC

The BCM shall provide the following signals to IPC and APIM:

- Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);

- Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);

- TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;

-Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

- Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).

-Tire\_Press\_XXX\_Data: Tire pressure value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

-Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).

- Ignition\_Status / Power Mode.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Cluster Navigation

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall provide the following signals to IPC and APIM:  - Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);  - Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);  - TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;  -Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  - Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).  -Tire\_Press\_XXX\_Data: Tire pressure value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  -Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).  - Ignition\_Status / Power Mode. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0005 TPMS tires pressure in the cluster

IPC module shall display Tires Pressure in the cluster.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall display Tires Pressure in the cluster. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

### BCM

BCM

#### Technology Function -1543687678.jpg Provide Sound failure feedback

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Provide Sound failure feedback

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0011 Manual Learn

The BCM shall implement a Manual Learn algorithm for TPMS sensors association and location, in case of service. The following criteria and rules shall be satisfied:

- the manual Learn process initialization shall be requested through special tool or through specific sequence of brake and ignition switches activations, according to technical service guide;

- the vehicle must be in Park (speed = 0kph);

- 2 (two) identical and consecutive sensor frames shall be received before acccepting a new sensor ID during Manual Learn Mode;

- tire pressure warnings shall not be requested when associating TPMS sensors to the vehicle;

- the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;

- If Learn Mode is True and any tire reports a low pressure, the BCM shall report it upon successful completion of learn mode;

- Upon successful completion of the Manual Learn process, the BCM shall self clear all sensor fault DTCs.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Gear Lever Position
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Provide Vehicle Speed
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a Manual Learn algorithm for TPMS sensors association and location, in case of service. The following criteria and rules shall be satisfied:  - the manual Learn process initialization shall be requested through special tool or through specific sequence of brake and ignition switches activations, according to technical service guide;  - the vehicle must be in Park (speed = 0kph);  - 2 (two) identical and consecutive sensor frames shall be received before acccepting a new sensor ID during Manual Learn Mode;  - tire pressure warnings shall not be requested when associating TPMS sensors to the vehicle;  - the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;  - If Learn Mode is True and any tire reports a low pressure, the BCM shall report it upon successful completion of learn mode;  - Upon successful completion of the Manual Learn process, the BCM shall self clear all sensor fault DTCs. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0013 TPMS External Audible Feedback

The BCM shall command the horn to guide the user during Manual Learn or Reassignment process. The horn shall be commanded according to the following:

- single horn chirp shall be provided to confirm manual learn or reassignment process initilization, and also for each tire successfull association/location;

- double horn chirp shall be provided in case of unsuccesfull association/location process.

Satisfied by:

* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Horn

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall command the horn to guide the user during Manual Learn or Reassignment process. The horn shall be commanded according to the following:  - single horn chirp shall be provided to confirm manual learn or reassignment process initilization, and also for each tire successfull association/location;  - double horn chirp shall be provided in case of unsuccesfull association/location process. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0012 Reassignment Mode

The BCM shall implement a Reassignment algorithm to reassign sensor locations after tires rotation (when no new sensors have been mounted). The following criteria and rules shall be satisfied:

- this procedure shall not require special tool and instructions shall be provided in the Owner´s Manual;

- the vehicle must be in Park (speed = 0kph);

- BCM shall process each TPMS sensor reassignment by detecting a 'rapid tire pressure change' (removing or adding air in the tire);

- BCM shall not request any tire pressure warning when Re-Assigning sensors to the vehicle;

- the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;

- upon successful completion of the reassignment process the BCM shall self clear all sensor fault DTCs;

- while Re-Assignment Mode is True and if any tire reports a low pressure, the BCM shall immediately report it upon successful completion of Re-Assignment mode;

- the following sequence of hazard and ignition switches activation shall be used for reassignment process initialization: when Ignition Status is RUN/START and Learn mode is FALSE, and the Hazard switch has been turned from OFF to ON, and turned to OFF, Reassignment mode entry counter is incremented and timer is started. Once the Reassignment mode entry count is greater than Hazard Cycle reassignment count, then Reassignment mode is activated. In case, the timer expires before it enters Reassignment mode, or brake pedal is pressed, or Ignition Status is changed to OFF/ACC or if Vehicle speed is increased more than 4kph, then Reassignment mode is exited.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Gear Lever Position
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Provide Vehicle Speed
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a Reassignment algorithm to reassign sensor locations after tires rotation (when no new sensors have been mounted). The following criteria and rules shall be satisfied:  - this procedure shall not require special tool and instructions shall be provided in the Owner´s Manual;  - the vehicle must be in Park (speed = 0kph);  - BCM shall process each TPMS sensor reassignment by detecting a 'rapid tire pressure change' (removing or adding air in the tire);  - BCM shall not request any tire pressure warning when Re-Assigning sensors to the vehicle;  - the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;  - upon successful completion of the reassignment process the BCM shall self clear all sensor fault DTCs;  - while Re-Assignment Mode is True and if any tire reports a low pressure, the BCM shall immediately report it upon successful completion of Re-Assignment mode;  - the following sequence of hazard and ignition switches activation shall be used for reassignment process initialization: when Ignition Status is RUN/START and Learn mode is FALSE, and the Hazard switch has been turned from OFF to ON, and turned to OFF, Reassignment mode entry counter is incremented and timer is started. Once the Reassignment mode entry count is greater than Hazard Cycle reassignment count, then Reassignment mode is activated. In case, the timer expires before it enters Reassignment mode, or brake pedal is pressed, or Ignition Status is changed to OFF/ACC or if Vehicle speed is increased more than 4kph, then Reassignment mode is exited. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Provide Sound Success feedback

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Provide Sound Success feedback

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0011 Manual Learn

The BCM shall implement a Manual Learn algorithm for TPMS sensors association and location, in case of service. The following criteria and rules shall be satisfied:

- the manual Learn process initialization shall be requested through special tool or through specific sequence of brake and ignition switches activations, according to technical service guide;

- the vehicle must be in Park (speed = 0kph);

- 2 (two) identical and consecutive sensor frames shall be received before acccepting a new sensor ID during Manual Learn Mode;

- tire pressure warnings shall not be requested when associating TPMS sensors to the vehicle;

- the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;

- If Learn Mode is True and any tire reports a low pressure, the BCM shall report it upon successful completion of learn mode;

- Upon successful completion of the Manual Learn process, the BCM shall self clear all sensor fault DTCs.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Gear Lever Position
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Provide Vehicle Speed
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a Manual Learn algorithm for TPMS sensors association and location, in case of service. The following criteria and rules shall be satisfied:  - the manual Learn process initialization shall be requested through special tool or through specific sequence of brake and ignition switches activations, according to technical service guide;  - the vehicle must be in Park (speed = 0kph);  - 2 (two) identical and consecutive sensor frames shall be received before acccepting a new sensor ID during Manual Learn Mode;  - tire pressure warnings shall not be requested when associating TPMS sensors to the vehicle;  - the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;  - If Learn Mode is True and any tire reports a low pressure, the BCM shall report it upon successful completion of learn mode;  - Upon successful completion of the Manual Learn process, the BCM shall self clear all sensor fault DTCs. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0013 TPMS External Audible Feedback

The BCM shall command the horn to guide the user during Manual Learn or Reassignment process. The horn shall be commanded according to the following:

- single horn chirp shall be provided to confirm manual learn or reassignment process initilization, and also for each tire successfull association/location;

- double horn chirp shall be provided in case of unsuccesfull association/location process.

Satisfied by:

* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Horn

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall command the horn to guide the user during Manual Learn or Reassignment process. The horn shall be commanded according to the following:  - single horn chirp shall be provided to confirm manual learn or reassignment process initilization, and also for each tire successfull association/location;  - double horn chirp shall be provided in case of unsuccesfull association/location process. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0012 Reassignment Mode

The BCM shall implement a Reassignment algorithm to reassign sensor locations after tires rotation (when no new sensors have been mounted). The following criteria and rules shall be satisfied:

- this procedure shall not require special tool and instructions shall be provided in the Owner´s Manual;

- the vehicle must be in Park (speed = 0kph);

- BCM shall process each TPMS sensor reassignment by detecting a 'rapid tire pressure change' (removing or adding air in the tire);

- BCM shall not request any tire pressure warning when Re-Assigning sensors to the vehicle;

- the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;

- upon successful completion of the reassignment process the BCM shall self clear all sensor fault DTCs;

- while Re-Assignment Mode is True and if any tire reports a low pressure, the BCM shall immediately report it upon successful completion of Re-Assignment mode;

- the following sequence of hazard and ignition switches activation shall be used for reassignment process initialization: when Ignition Status is RUN/START and Learn mode is FALSE, and the Hazard switch has been turned from OFF to ON, and turned to OFF, Reassignment mode entry counter is incremented and timer is started. Once the Reassignment mode entry count is greater than Hazard Cycle reassignment count, then Reassignment mode is activated. In case, the timer expires before it enters Reassignment mode, or brake pedal is pressed, or Ignition Status is changed to OFF/ACC or if Vehicle speed is increased more than 4kph, then Reassignment mode is exited.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Gear Lever Position
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Provide Vehicle Speed
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a Reassignment algorithm to reassign sensor locations after tires rotation (when no new sensors have been mounted). The following criteria and rules shall be satisfied:  - this procedure shall not require special tool and instructions shall be provided in the Owner´s Manual;  - the vehicle must be in Park (speed = 0kph);  - BCM shall process each TPMS sensor reassignment by detecting a 'rapid tire pressure change' (removing or adding air in the tire);  - BCM shall not request any tire pressure warning when Re-Assigning sensors to the vehicle;  - the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;  - upon successful completion of the reassignment process the BCM shall self clear all sensor fault DTCs;  - while Re-Assignment Mode is True and if any tire reports a low pressure, the BCM shall immediately report it upon successful completion of Re-Assignment mode;  - the following sequence of hazard and ignition switches activation shall be used for reassignment process initialization: when Ignition Status is RUN/START and Learn mode is FALSE, and the Hazard switch has been turned from OFF to ON, and turned to OFF, Reassignment mode entry counter is incremented and timer is started. Once the Reassignment mode entry count is greater than Hazard Cycle reassignment count, then Reassignment mode is activated. In case, the timer expires before it enters Reassignment mode, or brake pedal is pressed, or Ignition Status is changed to OFF/ACC or if Vehicle speed is increased more than 4kph, then Reassignment mode is exited. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Determine pressure threshold

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Determine pressure threshold

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0013 TPMS Placard (ECE-141)

IPC shall allow the customer to determine the warm placard pressure for each tire location to meet regulatory requirements (Regulatory item for Europe).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall allow the customer to determine the warm placard pressure for each tire location to meet regulatory requirements (Regulatory item for Europe). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0004 TPMS HMI Specs

IPC and APIM shall follow specifications according to:

- TPMS\_\_with\_EUreset\_PressureByLocation\_PlacardDsply\_DRW CGEA1.3\_v12.1

- Tire Temperature Function - CGEA1.3\_v1.2

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC and APIM shall follow specifications according to:  - TPMS\_\_with\_EUreset\_PressureByLocation\_PlacardDsply\_DRW CGEA1.3\_v12.1  - Tire Temperature Function - CGEA1.3\_v1.2 | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0025 TPMS BCM Configs - TPMS Sensor by valve type

The BCM shall implement a routine to make valve type proper assembly confirmation during EOL testing through:

- Method#2: TPMSValveType\_Cfg (0x0 = low speed valve; 0x1 = high speed valve);

- Method#3: TPMSValveCheck\_Cfg (0x0 = disabled; 0x1 = enabled).

Satisfied by:

* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a routine to make valve type proper assembly confirmation during EOL testing through:  - Method#2: TPMSValveType\_Cfg (0x0 = low speed valve; 0x1 = high speed valve);  - Method#3: TPMSValveCheck\_Cfg (0x0 = disabled; 0x1 = enabled). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0012 TPMS Reset Request (ECE-141)

IPC shall allow the customer to make TPMS system Reset Request (only for European customer / dealer). A customer Reset input shall enable the Auto Learn and Pwarm algorithms to learn new ID’s and new operating pressure per tire.

TirePReset\_B\_Rq is the Reset Request signal from HMI to BCM.

Tire\_Press\_System\_Stat, Tire\_PReset\_D\_Stat are feedback from BCM to HMI to confirm the reset was successfull.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall allow the customer to make TPMS system Reset Request (only for European customer / dealer). A customer Reset input shall enable the Auto Learn and Pwarm algorithms to learn new ID’s and new operating pressure per tire.    TirePReset\_B\_Rq is the Reset Request signal from HMI to BCM.    Tire\_Press\_System\_Stat, Tire\_PReset\_D\_Stat are feedback from BCM to HMI to confirm the reset was successfull. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0007 Low Tire Pressure by market

The BCM module shall provide low tire pressure warning indication according to each market-applicable regulation.

TPMS system and sensors status over CAN from BCM to IPC and APIM:

- Tire\_Press\_System\_Stat

- Tire\_Press\_Telltale

- TirePReset\_D\_Stat

- Tire\_Press\_LF\_Stat

- Tire\_Press\_RF\_Stat

- Tire\_Press\_IRR\_Stat

- Tire\_Press\_ILR\_Stat

- Tire\_Press\_RR\_ORR\_Stat

- Tire\_Press\_LR\_OLR\_Stat

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall provide low tire pressure warning indication according to each market-applicable regulation.    TPMS system and sensors status over CAN from BCM to IPC and APIM:  - Tire\_Press\_System\_Stat  - Tire\_Press\_Telltale  - TirePReset\_D\_Stat  - Tire\_Press\_LF\_Stat  - Tire\_Press\_RF\_Stat  - Tire\_Press\_IRR\_Stat  - Tire\_Press\_ILR\_Stat  - Tire\_Press\_RR\_ORR\_Stat  - Tire\_Press\_LR\_OLR\_Stat | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0004 TPMS system - ECUs to BCM

The BCM module shall receive the following signals from other modules:

- TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);

- Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);

- Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);

- TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Odometer
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall receive the following signals from other modules:  - TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);  - Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);  - Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);  - TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0008 Low Tire Pressure determined by BCM

The BCM shall determine if a low pressure warning needs to be requested according to TPMS sensors data and thresholds.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall determine if a low pressure warning needs to be requested according to TPMS sensors data and thresholds. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0019 TPMS System Reset

When a system reset is requested by the user, the BCM shall execute auto learn and pwarm algorithms to learn new sensor´s ID and operating pressure per tire (Regulatory item for Europe).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | When a system reset is requested by the user, the BCM shall execute auto learn and pwarm algorithms to learn new sensor´s ID and operating pressure per tire (Regulatory item for Europe). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0026 TPMS BCM DIDs

The BCM shall implement the following DIDs:

- 0x214: TPMS Last Reset History Data

- 0x280B - Tire Pressure Monitoring System (TPMS) - Last Received

Sensor Data

- 0x280D - Tire Pressure Monitoring System (TPMS) Status

- 0x281C, 0x281E, 0x281F, 0x2820, 0x2821 - Tire Pressure Monitoring System (TPMS) Last Warning Events

- 0x280F, 0x2810, 0x2811, 0x2812, 0x2819, 0x281A - Tire sensors ID

- 0x2813, 0x2814, 0x2815, 0x2816, 0x2817, 0x2818 - Barometric Compensated tire pressures

- 0x2827, 0x2828 - placard pressures, front and rear tires

- 0x2863, 0x2864, 0x2865 - TPMS Auto Locate Last Event Data, Variance and Decision

- 0x2866 - TPMS Auto Locate Last Event IDs

- 0x2867 - TPMS Auto Locate Status

- 0x2868 - TPMS Auto Learn Timer Value At The Last Locate Event

- 0x2869 - TPMS History Of Successful Auto Location Completion Event

Count

- 0x286A - TPMS History Of Auto Location Fault Count

- 0x286B - TPMS Recent Auto Location Fault Count

- 0x287C, 0x287D, 0x287E, 0x287F, 0x2880 - Tire Pressure Monitoring System (TPMS) Low Threshold at

Last Warning Events

Satisfied by:

* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement the following DIDs:  - 0x214: TPMS Last Reset History Data  - 0x280B - Tire Pressure Monitoring System (TPMS) - Last Received  Sensor Data  - 0x280D - Tire Pressure Monitoring System (TPMS) Status  - 0x281C, 0x281E, 0x281F, 0x2820, 0x2821 - Tire Pressure Monitoring System (TPMS) Last Warning Events  - 0x280F, 0x2810, 0x2811, 0x2812, 0x2819, 0x281A - Tire sensors ID  - 0x2813, 0x2814, 0x2815, 0x2816, 0x2817, 0x2818 - Barometric Compensated tire pressures  - 0x2827, 0x2828 - placard pressures, front and rear tires  - 0x2863, 0x2864, 0x2865 - TPMS Auto Locate Last Event Data, Variance and Decision  - 0x2866 - TPMS Auto Locate Last Event IDs  - 0x2867 - TPMS Auto Locate Status  - 0x2868 - TPMS Auto Learn Timer Value At The Last Locate Event  - 0x2869 - TPMS History Of Successful Auto Location Completion Event  Count  - 0x286A - TPMS History Of Auto Location Fault Count  - 0x286B - TPMS Recent Auto Location Fault Count  - 0x287C, 0x287D, 0x287E, 0x287F, 0x2880 - Tire Pressure Monitoring System (TPMS) Low Threshold at  Last Warning Events | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0017 TPMS Config (DID config)

IPC shall provide the following configurations through EOL:

- DID DE08: TPMS\_ByLocation\_Cfg to allow the TPMS feature to be enabled or disabled. Tire Pressure Units Setting and Info (On Demand) screens are shown only if TPMS\_ByLocation\_Cfg = 0x1. If TPMS\_ByLocation\_Cfg = 0x0 then Tire Pressure Units Setting and Info (On Demand) screen are not shown.

- DID DE08: TPMS Units Default to allow default unit definition;

- DID DE02: TPMS FedReg Config to allow market regulation definition;

- DID DE06: TPMS Dual Rear Wheel to allow definition if Single or Dual Rear Wheels;

- DID DE0A: Tire Temperature Display to allow definition if temperatures are displayed or not to the user.

Satisfied by:

* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall provide the following configurations through EOL:  - DID DE08: TPMS\_ByLocation\_Cfg to allow the TPMS feature to be enabled or disabled. Tire Pressure Units Setting and Info (On Demand) screens are shown only if TPMS\_ByLocation\_Cfg = 0x1. If TPMS\_ByLocation\_Cfg = 0x0 then Tire Pressure Units Setting and Info (On Demand) screen are not shown.  - DID DE08: TPMS Units Default to allow default unit definition;  - DID DE02: TPMS FedReg Config to allow market regulation definition;  - DID DE06: TPMS Dual Rear Wheel to allow definition if Single or Dual Rear Wheels;  - DID DE0A: Tire Temperature Display to allow definition if temperatures are displayed or not to the user. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Pwarm

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Pwarm

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0001 Tire Pressure wake up

The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).

BCM (Tx) tire pressure values over CAN:

- Tire\_Press\_LF\_Data

- Tire\_Press\_RF\_Data

- Tire\_Press\_IRR\_Data

- Tire\_Press\_ILR\_Data

- Tire\_Press\_RR\_ORR\_Data

- Tire\_Press\_LR\_OLR\_Data

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).    BCM (Tx) tire pressure values over CAN:  - Tire\_Press\_LF\_Data  - Tire\_Press\_RF\_Data  - Tire\_Press\_IRR\_Data  - Tire\_Press\_ILR\_Data  - Tire\_Press\_RR\_ORR\_Data  - Tire\_Press\_LR\_OLR\_Data | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0013 TPMS Placard (ECE-141)

IPC shall allow the customer to determine the warm placard pressure for each tire location to meet regulatory requirements (Regulatory item for Europe).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall allow the customer to determine the warm placard pressure for each tire location to meet regulatory requirements (Regulatory item for Europe). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0004 TPMS HMI Specs

IPC and APIM shall follow specifications according to:

- TPMS\_\_with\_EUreset\_PressureByLocation\_PlacardDsply\_DRW CGEA1.3\_v12.1

- Tire Temperature Function - CGEA1.3\_v1.2

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC and APIM shall follow specifications according to:  - TPMS\_\_with\_EUreset\_PressureByLocation\_PlacardDsply\_DRW CGEA1.3\_v12.1  - Tire Temperature Function - CGEA1.3\_v1.2 | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0002 Tire Low strategy

The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_ABS\_FIS\_0002 Wheel Speed Signals - wheel speed sensor data

The ABS/EBB module shall process raw wheel speed sensor data (of each invidividual wheel) and publish wheel speed signals over CAN within 7ms.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide wheel speed
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The ABS/EBB module shall process raw wheel speed sensor data (of each invidividual wheel) and publish wheel speed signals over CAN within 7ms. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0012 TPMS Reset Request (ECE-141)

IPC shall allow the customer to make TPMS system Reset Request (only for European customer / dealer). A customer Reset input shall enable the Auto Learn and Pwarm algorithms to learn new ID’s and new operating pressure per tire.

TirePReset\_B\_Rq is the Reset Request signal from HMI to BCM.

Tire\_Press\_System\_Stat, Tire\_PReset\_D\_Stat are feedback from BCM to HMI to confirm the reset was successfull.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall allow the customer to make TPMS system Reset Request (only for European customer / dealer). A customer Reset input shall enable the Auto Learn and Pwarm algorithms to learn new ID’s and new operating pressure per tire.    TirePReset\_B\_Rq is the Reset Request signal from HMI to BCM.    Tire\_Press\_System\_Stat, Tire\_PReset\_D\_Stat are feedback from BCM to HMI to confirm the reset was successfull. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0007 Low Tire Pressure by market

The BCM module shall provide low tire pressure warning indication according to each market-applicable regulation.

TPMS system and sensors status over CAN from BCM to IPC and APIM:

- Tire\_Press\_System\_Stat

- Tire\_Press\_Telltale

- TirePReset\_D\_Stat

- Tire\_Press\_LF\_Stat

- Tire\_Press\_RF\_Stat

- Tire\_Press\_IRR\_Stat

- Tire\_Press\_ILR\_Stat

- Tire\_Press\_RR\_ORR\_Stat

- Tire\_Press\_LR\_OLR\_Stat

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall provide low tire pressure warning indication according to each market-applicable regulation.    TPMS system and sensors status over CAN from BCM to IPC and APIM:  - Tire\_Press\_System\_Stat  - Tire\_Press\_Telltale  - TirePReset\_D\_Stat  - Tire\_Press\_LF\_Stat  - Tire\_Press\_RF\_Stat  - Tire\_Press\_IRR\_Stat  - Tire\_Press\_ILR\_Stat  - Tire\_Press\_RR\_ORR\_Stat  - Tire\_Press\_LR\_OLR\_Stat | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0004 TPMS system - ECUs to BCM

The BCM module shall receive the following signals from other modules:

- TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);

- Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);

- Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);

- TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Odometer
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall receive the following signals from other modules:  - TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);  - Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);  - Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);  - TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0008 Low Tire Pressure determined by BCM

The BCM shall determine if a low pressure warning needs to be requested according to TPMS sensors data and thresholds.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall determine if a low pressure warning needs to be requested according to TPMS sensors data and thresholds. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0019 TPMS System Reset

When a system reset is requested by the user, the BCM shall execute auto learn and pwarm algorithms to learn new sensor´s ID and operating pressure per tire (Regulatory item for Europe).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | When a system reset is requested by the user, the BCM shall execute auto learn and pwarm algorithms to learn new sensor´s ID and operating pressure per tire (Regulatory item for Europe). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_RTM\_FIS\_0002 TPMS sensors recognize

The RTM module shall be able to recognize and support 6 vehicle TPMS sensors through Radio Frequency.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The RTM module shall be able to recognize and support 6 vehicle TPMS sensors through Radio Frequency. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_ABS\_FIS\_0001 Wheel Speed Signals - wheel speed signal

The ABS/EBB module shall send wheel speed signal (of each invidividual wheel) to BCM module.

Observation: WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide wheel speed
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The ABS/EBB module shall send wheel speed signal (of each invidividual wheel) to BCM module.  Observation: WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Learning output process

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Learning output process

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0001 Tire Pressure wake up

The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).

BCM (Tx) tire pressure values over CAN:

- Tire\_Press\_LF\_Data

- Tire\_Press\_RF\_Data

- Tire\_Press\_IRR\_Data

- Tire\_Press\_ILR\_Data

- Tire\_Press\_RR\_ORR\_Data

- Tire\_Press\_LR\_OLR\_Data

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).    BCM (Tx) tire pressure values over CAN:  - Tire\_Press\_LF\_Data  - Tire\_Press\_RF\_Data  - Tire\_Press\_IRR\_Data  - Tire\_Press\_ILR\_Data  - Tire\_Press\_RR\_ORR\_Data  - Tire\_Press\_LR\_OLR\_Data | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_SCCM\_FIS\_0001 Steering wheel signals

The SCCM module shall provide steering wheel buttons signals over CAN to IPC and allow Cluster Menus navigation:

- SteWhlSwtchBack\_B\_Stat;

- SteWhlSwtchUp\_B\_Stat;

- SteWhlSwtchDown\_B\_Stat;

- SteWhlSwtchRight\_B\_Stat;

- SteWhlSwtchLeft\_B\_Stat;

- SteWhlSwtchOk\_B\_Stat;

- SteWhlSwtchMenu\_B\_Stat.

Satisfied by:

* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The SCCM module shall provide steering wheel buttons signals over CAN to IPC and allow Cluster Menus navigation:  - SteWhlSwtchBack\_B\_Stat;  - SteWhlSwtchUp\_B\_Stat;  - SteWhlSwtchDown\_B\_Stat;  - SteWhlSwtchRight\_B\_Stat;  - SteWhlSwtchLeft\_B\_Stat;  - SteWhlSwtchOk\_B\_Stat;  - SteWhlSwtchMenu\_B\_Stat. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0011 TPMS IOD

IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0014 TPMS sensors learning instructions

IPC shall indicate instructions to user when manual learn/train or re-assignment procedures are active.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall indicate instructions to user when manual learn/train or re-assignment procedures are active. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0011 Manual Learn

The BCM shall implement a Manual Learn algorithm for TPMS sensors association and location, in case of service. The following criteria and rules shall be satisfied:

- the manual Learn process initialization shall be requested through special tool or through specific sequence of brake and ignition switches activations, according to technical service guide;

- the vehicle must be in Park (speed = 0kph);

- 2 (two) identical and consecutive sensor frames shall be received before acccepting a new sensor ID during Manual Learn Mode;

- tire pressure warnings shall not be requested when associating TPMS sensors to the vehicle;

- the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;

- If Learn Mode is True and any tire reports a low pressure, the BCM shall report it upon successful completion of learn mode;

- Upon successful completion of the Manual Learn process, the BCM shall self clear all sensor fault DTCs.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Gear Lever Position
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Provide Vehicle Speed
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a Manual Learn algorithm for TPMS sensors association and location, in case of service. The following criteria and rules shall be satisfied:  - the manual Learn process initialization shall be requested through special tool or through specific sequence of brake and ignition switches activations, according to technical service guide;  - the vehicle must be in Park (speed = 0kph);  - 2 (two) identical and consecutive sensor frames shall be received before acccepting a new sensor ID during Manual Learn Mode;  - tire pressure warnings shall not be requested when associating TPMS sensors to the vehicle;  - the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;  - If Learn Mode is True and any tire reports a low pressure, the BCM shall report it upon successful completion of learn mode;  - Upon successful completion of the Manual Learn process, the BCM shall self clear all sensor fault DTCs. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0006 TPMS IPC to HMI to display the warnings

IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0003 TPMS system - BCM to APIM/IPC

The BCM shall provide the following signals to IPC and APIM:

- Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);

- Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);

- TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;

-Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

- Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).

-Tire\_Press\_XXX\_Data: Tire pressure value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

-Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).

- Ignition\_Status / Power Mode.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Cluster Navigation

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall provide the following signals to IPC and APIM:  - Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);  - Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);  - TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;  -Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  - Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).  -Tire\_Press\_XXX\_Data: Tire pressure value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  -Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).  - Ignition\_Status / Power Mode. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0012 Reassignment Mode

The BCM shall implement a Reassignment algorithm to reassign sensor locations after tires rotation (when no new sensors have been mounted). The following criteria and rules shall be satisfied:

- this procedure shall not require special tool and instructions shall be provided in the Owner´s Manual;

- the vehicle must be in Park (speed = 0kph);

- BCM shall process each TPMS sensor reassignment by detecting a 'rapid tire pressure change' (removing or adding air in the tire);

- BCM shall not request any tire pressure warning when Re-Assigning sensors to the vehicle;

- the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;

- upon successful completion of the reassignment process the BCM shall self clear all sensor fault DTCs;

- while Re-Assignment Mode is True and if any tire reports a low pressure, the BCM shall immediately report it upon successful completion of Re-Assignment mode;

- the following sequence of hazard and ignition switches activation shall be used for reassignment process initialization: when Ignition Status is RUN/START and Learn mode is FALSE, and the Hazard switch has been turned from OFF to ON, and turned to OFF, Reassignment mode entry counter is incremented and timer is started. Once the Reassignment mode entry count is greater than Hazard Cycle reassignment count, then Reassignment mode is activated. In case, the timer expires before it enters Reassignment mode, or brake pedal is pressed, or Ignition Status is changed to OFF/ACC or if Vehicle speed is increased more than 4kph, then Reassignment mode is exited.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Gear Lever Position
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Provide Vehicle Speed
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a Reassignment algorithm to reassign sensor locations after tires rotation (when no new sensors have been mounted). The following criteria and rules shall be satisfied:  - this procedure shall not require special tool and instructions shall be provided in the Owner´s Manual;  - the vehicle must be in Park (speed = 0kph);  - BCM shall process each TPMS sensor reassignment by detecting a 'rapid tire pressure change' (removing or adding air in the tire);  - BCM shall not request any tire pressure warning when Re-Assigning sensors to the vehicle;  - the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;  - upon successful completion of the reassignment process the BCM shall self clear all sensor fault DTCs;  - while Re-Assignment Mode is True and if any tire reports a low pressure, the BCM shall immediately report it upon successful completion of Re-Assignment mode;  - the following sequence of hazard and ignition switches activation shall be used for reassignment process initialization: when Ignition Status is RUN/START and Learn mode is FALSE, and the Hazard switch has been turned from OFF to ON, and turned to OFF, Reassignment mode entry counter is incremented and timer is started. Once the Reassignment mode entry count is greater than Hazard Cycle reassignment count, then Reassignment mode is activated. In case, the timer expires before it enters Reassignment mode, or brake pedal is pressed, or Ignition Status is changed to OFF/ACC or if Vehicle speed is increased more than 4kph, then Reassignment mode is exited. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0001 TPMS data

IPC and APIM modules shall receive the following signals from BCM:

- Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);

- Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);

- TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;

- Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

- Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).

-Tire\_Press\_XXX\_Data: Tire pressure value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

-Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).

- Ignition\_Status / Power Mode.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC and APIM modules shall receive the following signals from BCM:  - Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);  - Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);  - TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;  - Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  - Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).  -Tire\_Press\_XXX\_Data: Tire pressure value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  -Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).  - Ignition\_Status / Power Mode. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0003 TPMS IPC Signals

IPC shall provide the following CAN signals to BCM:

- OdometerMaterValue: accumulated vehicle odometer;

- TirePReset\_B\_Rq: TPMS system reset request according to ECE regulation.

Satisfied by:

* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Odometer
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall provide the following CAN signals to BCM:  - OdometerMaterValue: accumulated vehicle odometer;  - TirePReset\_B\_Rq: TPMS system reset request according to ECE regulation. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Request Reset

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| -1910009838.jpg resetRequest | 658883941.jpg TirePReset\_B\_Rq | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| -1910009838.jpg vehicleMileage | 658883941.jpg OdometerMasterValue | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| -1910009838.jpg resetRequest | 658883941.jpg TirePReset\_B\_Rq | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| -1910009838.jpg resetResponse | 658883941.jpg TirePReset\_D\_Stat | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Request Reset

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0013 TPMS Placard (ECE-141)

IPC shall allow the customer to determine the warm placard pressure for each tire location to meet regulatory requirements (Regulatory item for Europe).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall allow the customer to determine the warm placard pressure for each tire location to meet regulatory requirements (Regulatory item for Europe). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0004 TPMS HMI Specs

IPC and APIM shall follow specifications according to:

- TPMS\_\_with\_EUreset\_PressureByLocation\_PlacardDsply\_DRW CGEA1.3\_v12.1

- Tire Temperature Function - CGEA1.3\_v1.2

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC and APIM shall follow specifications according to:  - TPMS\_\_with\_EUreset\_PressureByLocation\_PlacardDsply\_DRW CGEA1.3\_v12.1  - Tire Temperature Function - CGEA1.3\_v1.2 | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0002 Tire Low strategy

The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_SCCM\_FIS\_0001 Steering wheel signals

The SCCM module shall provide steering wheel buttons signals over CAN to IPC and allow Cluster Menus navigation:

- SteWhlSwtchBack\_B\_Stat;

- SteWhlSwtchUp\_B\_Stat;

- SteWhlSwtchDown\_B\_Stat;

- SteWhlSwtchRight\_B\_Stat;

- SteWhlSwtchLeft\_B\_Stat;

- SteWhlSwtchOk\_B\_Stat;

- SteWhlSwtchMenu\_B\_Stat.

Satisfied by:

* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The SCCM module shall provide steering wheel buttons signals over CAN to IPC and allow Cluster Menus navigation:  - SteWhlSwtchBack\_B\_Stat;  - SteWhlSwtchUp\_B\_Stat;  - SteWhlSwtchDown\_B\_Stat;  - SteWhlSwtchRight\_B\_Stat;  - SteWhlSwtchLeft\_B\_Stat;  - SteWhlSwtchOk\_B\_Stat;  - SteWhlSwtchMenu\_B\_Stat. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0012 TPMS Reset Request (ECE-141)

IPC shall allow the customer to make TPMS system Reset Request (only for European customer / dealer). A customer Reset input shall enable the Auto Learn and Pwarm algorithms to learn new ID’s and new operating pressure per tire.

TirePReset\_B\_Rq is the Reset Request signal from HMI to BCM.

Tire\_Press\_System\_Stat, Tire\_PReset\_D\_Stat are feedback from BCM to HMI to confirm the reset was successfull.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall allow the customer to make TPMS system Reset Request (only for European customer / dealer). A customer Reset input shall enable the Auto Learn and Pwarm algorithms to learn new ID’s and new operating pressure per tire.    TirePReset\_B\_Rq is the Reset Request signal from HMI to BCM.    Tire\_Press\_System\_Stat, Tire\_PReset\_D\_Stat are feedback from BCM to HMI to confirm the reset was successfull. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0004 TPMS system - ECUs to BCM

The BCM module shall receive the following signals from other modules:

- TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);

- Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);

- Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);

- TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Odometer
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall receive the following signals from other modules:  - TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);  - Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);  - Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);  - TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0019 TPMS System Reset

When a system reset is requested by the user, the BCM shall execute auto learn and pwarm algorithms to learn new sensor´s ID and operating pressure per tire (Regulatory item for Europe).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | When a system reset is requested by the user, the BCM shall execute auto learn and pwarm algorithms to learn new sensor´s ID and operating pressure per tire (Regulatory item for Europe). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0006 TPMS IPC to HMI to display the warnings

IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0002 Steering wheel signals

IPC shall receive the steering wheel button CAN signals from SCCM:

- SteWhlSwtchBack\_B\_Stat;

- SteWhlSwtchUp\_B\_Stat;

- SteWhlSwtchDown\_B\_Stat;

- SteWhlSwtchRight\_B\_Stat;

- SteWhlSwtchLeft\_B\_Stat;

- SteWhlSwtchOk\_B\_Stat;

- SteWhlSwtchMenu\_B\_Stat.

Satisfied by:

* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall receive the steering wheel button CAN signals from SCCM:  - SteWhlSwtchBack\_B\_Stat;  - SteWhlSwtchUp\_B\_Stat;  - SteWhlSwtchDown\_B\_Stat;  - SteWhlSwtchRight\_B\_Stat;  - SteWhlSwtchLeft\_B\_Stat;  - SteWhlSwtchOk\_B\_Stat;  - SteWhlSwtchMenu\_B\_Stat. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0015 TPMS Reset Request by user (ECE-141)

APIM and IPC modules shall support user selectable TPMS system reset If required to meet regulation.

Satisfied by:

* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | APIM and IPC modules shall support user selectable TPMS system reset If required to meet regulation. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_RTM\_FIS\_0002 TPMS sensors recognize

The RTM module shall be able to recognize and support 6 vehicle TPMS sensors through Radio Frequency.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The RTM module shall be able to recognize and support 6 vehicle TPMS sensors through Radio Frequency. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0003 TPMS IPC Signals

IPC shall provide the following CAN signals to BCM:

- OdometerMaterValue: accumulated vehicle odometer;

- TirePReset\_B\_Rq: TPMS system reset request according to ECE regulation.

Satisfied by:

* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Odometer
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall provide the following CAN signals to BCM:  - OdometerMaterValue: accumulated vehicle odometer;  - TirePReset\_B\_Rq: TPMS system reset request according to ECE regulation. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Determine Low Pressure Warning

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Determine Low Pressure Warning

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0001 Tire Pressure wake up

The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).

BCM (Tx) tire pressure values over CAN:

- Tire\_Press\_LF\_Data

- Tire\_Press\_RF\_Data

- Tire\_Press\_IRR\_Data

- Tire\_Press\_ILR\_Data

- Tire\_Press\_RR\_ORR\_Data

- Tire\_Press\_LR\_OLR\_Data

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).    BCM (Tx) tire pressure values over CAN:  - Tire\_Press\_LF\_Data  - Tire\_Press\_RF\_Data  - Tire\_Press\_IRR\_Data  - Tire\_Press\_ILR\_Data  - Tire\_Press\_RR\_ORR\_Data  - Tire\_Press\_LR\_OLR\_Data | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0004 TPMS HMI Specs

IPC and APIM shall follow specifications according to:

- TPMS\_\_with\_EUreset\_PressureByLocation\_PlacardDsply\_DRW CGEA1.3\_v12.1

- Tire Temperature Function - CGEA1.3\_v1.2

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC and APIM shall follow specifications according to:  - TPMS\_\_with\_EUreset\_PressureByLocation\_PlacardDsply\_DRW CGEA1.3\_v12.1  - Tire Temperature Function - CGEA1.3\_v1.2 | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0002 Tire Low strategy

The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0010 TPMS cluster warnings during same ignition cycle

IPC shall not allow TPMS warnings for a unique low pressure/malfunction event to reappear during the same ignition session.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall not allow TPMS warnings for a unique low pressure/malfunction event to reappear during the same ignition session. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0011 TPMS IOD

IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0007 Low Tire Pressure by market

The BCM module shall provide low tire pressure warning indication according to each market-applicable regulation.

TPMS system and sensors status over CAN from BCM to IPC and APIM:

- Tire\_Press\_System\_Stat

- Tire\_Press\_Telltale

- TirePReset\_D\_Stat

- Tire\_Press\_LF\_Stat

- Tire\_Press\_RF\_Stat

- Tire\_Press\_IRR\_Stat

- Tire\_Press\_ILR\_Stat

- Tire\_Press\_RR\_ORR\_Stat

- Tire\_Press\_LR\_OLR\_Stat

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall provide low tire pressure warning indication according to each market-applicable regulation.    TPMS system and sensors status over CAN from BCM to IPC and APIM:  - Tire\_Press\_System\_Stat  - Tire\_Press\_Telltale  - TirePReset\_D\_Stat  - Tire\_Press\_LF\_Stat  - Tire\_Press\_RF\_Stat  - Tire\_Press\_IRR\_Stat  - Tire\_Press\_ILR\_Stat  - Tire\_Press\_RR\_ORR\_Stat  - Tire\_Press\_LR\_OLR\_Stat | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0006 TPMS IPC to HMI to display the warnings

IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0007 TPMS cluster warnings when Power Mode On/Run/Start

IPC module shall display warnings (if present) when Ignition is On/Run/Start.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall display warnings (if present) when Ignition is On/Run/Start. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0020 TPMS Low Warning

[ECE-R141] The BCM shall support monitoring of warm operating tire pressure for each tire location.

Satisfied by:

* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | [ECE-R141] The BCM shall support monitoring of warm operating tire pressure for each tire location. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0008 Low Tire Pressure determined by BCM

The BCM shall determine if a low pressure warning needs to be requested according to TPMS sensors data and thresholds.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall determine if a low pressure warning needs to be requested according to TPMS sensors data and thresholds. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0009 TPMS cluster warnings message at a time

IPC shall display only one TPMS warning message at a time.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall display only one TPMS warning message at a time. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0003 TPMS system - BCM to APIM/IPC

The BCM shall provide the following signals to IPC and APIM:

- Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);

- Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);

- TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;

-Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

- Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).

-Tire\_Press\_XXX\_Data: Tire pressure value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

-Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).

- Ignition\_Status / Power Mode.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Cluster Navigation

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall provide the following signals to IPC and APIM:  - Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);  - Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);  - TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;  -Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  - Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).  -Tire\_Press\_XXX\_Data: Tire pressure value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  -Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).  - Ignition\_Status / Power Mode. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0001 TPMS data

IPC and APIM modules shall receive the following signals from BCM:

- Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);

- Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);

- TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;

- Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

- Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).

-Tire\_Press\_XXX\_Data: Tire pressure value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

-Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).

- Ignition\_Status / Power Mode.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC and APIM modules shall receive the following signals from BCM:  - Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);  - Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);  - TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;  - Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  - Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).  -Tire\_Press\_XXX\_Data: Tire pressure value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  -Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).  - Ignition\_Status / Power Mode. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Barometric Pressure Conversion Compensation Process

The pressure received from the sensor is compensated to the local barometric pressure and converted from millibars to PSI.

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Barometric Pressure Conversion Compensation Process

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0009 TPMS sensors status composite

The BCM shall determine a composite TPMS status based on the status communicated from all supported TPMS sensors.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall determine a composite TPMS status based on the status communicated from all supported TPMS sensors. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0002 Tire Low strategy

The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0007 Low Tire Pressure by market

The BCM module shall provide low tire pressure warning indication according to each market-applicable regulation.

TPMS system and sensors status over CAN from BCM to IPC and APIM:

- Tire\_Press\_System\_Stat

- Tire\_Press\_Telltale

- TirePReset\_D\_Stat

- Tire\_Press\_LF\_Stat

- Tire\_Press\_RF\_Stat

- Tire\_Press\_IRR\_Stat

- Tire\_Press\_ILR\_Stat

- Tire\_Press\_RR\_ORR\_Stat

- Tire\_Press\_LR\_OLR\_Stat

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall provide low tire pressure warning indication according to each market-applicable regulation.    TPMS system and sensors status over CAN from BCM to IPC and APIM:  - Tire\_Press\_System\_Stat  - Tire\_Press\_Telltale  - TirePReset\_D\_Stat  - Tire\_Press\_LF\_Stat  - Tire\_Press\_RF\_Stat  - Tire\_Press\_IRR\_Stat  - Tire\_Press\_ILR\_Stat  - Tire\_Press\_RR\_ORR\_Stat  - Tire\_Press\_LR\_OLR\_Stat | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0004 TPMS system - ECUs to BCM

The BCM module shall receive the following signals from other modules:

- TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);

- Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);

- Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);

- TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Odometer
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall receive the following signals from other modules:  - TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);  - Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);  - Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);  - TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0008 Low Tire Pressure determined by BCM

The BCM shall determine if a low pressure warning needs to be requested according to TPMS sensors data and thresholds.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall determine if a low pressure warning needs to be requested according to TPMS sensors data and thresholds. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_PCM\_FIS\_0001 Powertrain signals

The PCM (Powertrain Module) shall provide the following signals to BCM:

- barometric pressure (AirAmb\_P\_Actl);

- vehicle speed with quality factor (Veh\_V\_ActlEng, VehVActlEng\_D\_Qf);

- gear lever position (GearLvrPos\_D\_Actl).

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Provide Barometric Pressure
* -1543687678.jpg Provide Gear Lever Position

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The PCM (Powertrain Module) shall provide the following signals to BCM:  - barometric pressure (AirAmb\_P\_Actl);  - vehicle speed with quality factor (Veh\_V\_ActlEng, VehVActlEng\_D\_Qf);  - gear lever position (GearLvrPos\_D\_Actl). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0006 TPMS BP compensation

The BCM shall compensante the tire pressure values from the TPMS sensors with local barometric pressure (AirAmb\_P\_Actl).

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Provide Barometric Pressure

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall compensante the tire pressure values from the TPMS sensors with local barometric pressure (AirAmb\_P\_Actl). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0005 TPMS tires pressure in the cluster

IPC module shall display Tires Pressure in the cluster.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall display Tires Pressure in the cluster. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Request Horn

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Request Horn

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0013 TPMS External Audible Feedback

The BCM shall command the horn to guide the user during Manual Learn or Reassignment process. The horn shall be commanded according to the following:

- single horn chirp shall be provided to confirm manual learn or reassignment process initilization, and also for each tire successfull association/location;

- double horn chirp shall be provided in case of unsuccesfull association/location process.

Satisfied by:

* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Horn

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall command the horn to guide the user during Manual Learn or Reassignment process. The horn shall be commanded according to the following:  - single horn chirp shall be provided to confirm manual learn or reassignment process initilization, and also for each tire successfull association/location;  - double horn chirp shall be provided in case of unsuccesfull association/location process. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Process Frame

The 'Process Frame' process conditions the Measured\_Pressure and Sensor\_Function\_Code data for later use. In addition, this

process is also responsible to determine whether each tire sensor is operating normally or a fault condition is present.

It is important to note that there are either 4 or 6 process frame routines, one for each tire, executing simultaneously

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 658883941.jpg Tire\_Press\_LR\_OLR\_Stat | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 658883941.jpg TirePress\_Info\_Index | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 658883941.jpg Tire\_Press\_RF\_Stat | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| -1910009838.jpg resetResponse | 658883941.jpg TirePReset\_D\_Stat | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 658883941.jpg Tire\_Press\_RR\_ORR\_Stat | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 658883941.jpg TirePress\_Info\_MaxInd | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| -1910009838.jpg Sensor\_Tx\_Identifier  -1910009838.jpg TPMS\_IDs | 658883941.jpg TirePress\_Info\_ID | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 658883941.jpg TirePress\_Filter\_Ctrl | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| -1910009838.jpg TPMS\_System\_Status  -1910009838.jpg Sensor\_Status | 658883941.jpg Tire\_Press\_System\_Stat | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 658883941.jpg Tire\_Press\_ILR\_Stat | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| -1910009838.jpg telltaleStatus | 658883941.jpg Tire\_Press\_Telltale | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 658883941.jpg Tire\_Press\_LF\_Stat | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 658883941.jpg Tire\_Press\_IRR\_Stat | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Process Frame

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0001 Tire Pressure wake up

The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).

BCM (Tx) tire pressure values over CAN:

- Tire\_Press\_LF\_Data

- Tire\_Press\_RF\_Data

- Tire\_Press\_IRR\_Data

- Tire\_Press\_ILR\_Data

- Tire\_Press\_RR\_ORR\_Data

- Tire\_Press\_LR\_OLR\_Data

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).    BCM (Tx) tire pressure values over CAN:  - Tire\_Press\_LF\_Data  - Tire\_Press\_RF\_Data  - Tire\_Press\_IRR\_Data  - Tire\_Press\_ILR\_Data  - Tire\_Press\_RR\_ORR\_Data  - Tire\_Press\_LR\_OLR\_Data | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0009 TPMS sensors status composite

The BCM shall determine a composite TPMS status based on the status communicated from all supported TPMS sensors.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall determine a composite TPMS status based on the status communicated from all supported TPMS sensors. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0004 TPMS HMI Specs

IPC and APIM shall follow specifications according to:

- TPMS\_\_with\_EUreset\_PressureByLocation\_PlacardDsply\_DRW CGEA1.3\_v12.1

- Tire Temperature Function - CGEA1.3\_v1.2

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC and APIM shall follow specifications according to:  - TPMS\_\_with\_EUreset\_PressureByLocation\_PlacardDsply\_DRW CGEA1.3\_v12.1  - Tire Temperature Function - CGEA1.3\_v1.2 | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0002 Tire Low strategy

The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0017 TPMS DTCs System

The BCM shall implement diagnostic codes to indicate when vehicle has not finished TPMS configuration/sensors association (re: Build Mode). Presence of TPMS Diagnostic codes shall cause TPMS Telltale to remain illuminated.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement diagnostic codes to indicate when vehicle has not finished TPMS configuration/sensors association (re: Build Mode). Presence of TPMS Diagnostic codes shall cause TPMS Telltale to remain illuminated. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0022 TPMS DTCs received for BCM by RTM

BCM diagnostic codes for each individual sensors location shall be cleared only when data transmissions from the associated sensors have been received without any impairment/compatibility problems. BCM diagnostic codes for individual sensor locations shall not be cleared in other ways.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | BCM diagnostic codes for each individual sensors location shall be cleared only when data transmissions from the associated sensors have been received without any impairment/compatibility problems. BCM diagnostic codes for individual sensor locations shall not be cleared in other ways. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0015 TPMS Sensors ID Verify

Except while Learn Mode is True, the BCM shall verify If the received TPM Sensors ID match with the already saved ID's. In case of any TPMS Sensor ID does not match, then the BCM shall set Sensor Status data flow to ‘INVALID’.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | Except while Learn Mode is True, the BCM shall verify If the received TPM Sensors ID match with the already saved ID's. In case of any TPMS Sensor ID does not match, then the BCM shall set Sensor Status data flow to ‘INVALID’. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0023 TPMS sensors Auto-Location

The BCM module shall not complete automatic association of new sensors or automatic wheel location determination while any TPMS sensor has status of Fault/Malfunction.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall not complete automatic association of new sensors or automatic wheel location determination while any TPMS sensor has status of Fault/Malfunction. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0007 Low Tire Pressure by market

The BCM module shall provide low tire pressure warning indication according to each market-applicable regulation.

TPMS system and sensors status over CAN from BCM to IPC and APIM:

- Tire\_Press\_System\_Stat

- Tire\_Press\_Telltale

- TirePReset\_D\_Stat

- Tire\_Press\_LF\_Stat

- Tire\_Press\_RF\_Stat

- Tire\_Press\_IRR\_Stat

- Tire\_Press\_ILR\_Stat

- Tire\_Press\_RR\_ORR\_Stat

- Tire\_Press\_LR\_OLR\_Stat

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall provide low tire pressure warning indication according to each market-applicable regulation.    TPMS system and sensors status over CAN from BCM to IPC and APIM:  - Tire\_Press\_System\_Stat  - Tire\_Press\_Telltale  - TirePReset\_D\_Stat  - Tire\_Press\_LF\_Stat  - Tire\_Press\_RF\_Stat  - Tire\_Press\_IRR\_Stat  - Tire\_Press\_ILR\_Stat  - Tire\_Press\_RR\_ORR\_Stat  - Tire\_Press\_LR\_OLR\_Stat | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0018 TPMS DTCs by Sensor

The BCM diagnostic codes shall indicate when individual sensor locations have not been setup or have confirmed impairment/compatibility problems.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM diagnostic codes shall indicate when individual sensor locations have not been setup or have confirmed impairment/compatibility problems. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_ABS\_FIS\_0001 Wheel Speed Signals - wheel speed signal

The ABS/EBB module shall send wheel speed signal (of each invidividual wheel) to BCM module.

Observation: WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide wheel speed
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The ABS/EBB module shall send wheel speed signal (of each invidividual wheel) to BCM module.  Observation: WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0005 TPMS tires pressure in the cluster

IPC module shall display Tires Pressure in the cluster.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall display Tires Pressure in the cluster. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0005 TPMS data - RTM/Sensor to BCM

The BCM module shall receive and process the TPMS sensors data frames (tire pressure, tire temperature and sensors diagnostics) of all mounted/installed road tires, not including monitoring for spare tire.

TPMS data sent from RTM to BCM through Private CAN:

- TPMSDataPacket

- TirePress\_Frame\_ID\_CFG\_0

- TirePress\_Frame\_ID\_CFG\_1

- TirePress\_Frame\_ID\_CFG\_2

- TirePress\_Frame\_ID\_CFG\_3

- TirePress\_Frame\_Press

- TirePress\_Frame\_Temp

- TirePress\_Frame\_Status

- TirePress\_Frame\_Checksum

- Checksum

- TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2

- TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2

- TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3

Note: TPMS sensor ID information shall include characters to confirm final TPMS assembly (TPMS Sensor + Valve Stem type).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall receive and process the TPMS sensors data frames (tire pressure, tire temperature and sensors diagnostics) of all mounted/installed road tires, not including monitoring for spare tire.    TPMS data sent from RTM to BCM through Private CAN:  - TPMSDataPacket  - TirePress\_Frame\_ID\_CFG\_0  - TirePress\_Frame\_ID\_CFG\_1  - TirePress\_Frame\_ID\_CFG\_2  - TirePress\_Frame\_ID\_CFG\_3  - TirePress\_Frame\_Press  - TirePress\_Frame\_Temp  - TirePress\_Frame\_Status  - TirePress\_Frame\_Checksum  - Checksum  - TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2  - TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2  - TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3    Note: TPMS sensor ID information shall include characters to confirm final TPMS assembly (TPMS Sensor + Valve Stem type). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0013 TPMS Placard (ECE-141)

IPC shall allow the customer to determine the warm placard pressure for each tire location to meet regulatory requirements (Regulatory item for Europe).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall allow the customer to determine the warm placard pressure for each tire location to meet regulatory requirements (Regulatory item for Europe). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_ABS\_FIS\_0002 Wheel Speed Signals - wheel speed sensor data

The ABS/EBB module shall process raw wheel speed sensor data (of each invidividual wheel) and publish wheel speed signals over CAN within 7ms.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide wheel speed
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The ABS/EBB module shall process raw wheel speed sensor data (of each invidividual wheel) and publish wheel speed signals over CAN within 7ms. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_RTM\_FIS\_0003 TPMS sensors (RTM to BCM)

The RTM module shall send TPMS sensors data frames (pressure, temperature, diagnostics) through Private CAN to BCM module.

RTM signals sent to BCM through private CAN:

- TPMSDataPacket

- TirePress\_Frame\_ID\_CFG\_0

- TirePress\_Frame\_ID\_CFG\_1

- TirePress\_Frame\_ID\_CFG\_2

- TirePress\_Frame\_ID\_CFG\_3

- TirePress\_Frame\_Press

- TirePress\_Frame\_Temp

- TirePress\_Frame\_Status

- TirePress\_Frame\_Checksum

- Checksum

- TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2

- TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2

- TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The RTM module shall send TPMS sensors data frames (pressure, temperature, diagnostics) through Private CAN to BCM module.    RTM signals sent to BCM through private CAN:  - TPMSDataPacket  - TirePress\_Frame\_ID\_CFG\_0  - TirePress\_Frame\_ID\_CFG\_1  - TirePress\_Frame\_ID\_CFG\_2  - TirePress\_Frame\_ID\_CFG\_3  - TirePress\_Frame\_Press  - TirePress\_Frame\_Temp  - TirePress\_Frame\_Status  - TirePress\_Frame\_Checksum  - Checksum  - TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2  - TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2  - TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3 | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0012 TPMS Reset Request (ECE-141)

IPC shall allow the customer to make TPMS system Reset Request (only for European customer / dealer). A customer Reset input shall enable the Auto Learn and Pwarm algorithms to learn new ID’s and new operating pressure per tire.

TirePReset\_B\_Rq is the Reset Request signal from HMI to BCM.

Tire\_Press\_System\_Stat, Tire\_PReset\_D\_Stat are feedback from BCM to HMI to confirm the reset was successfull.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall allow the customer to make TPMS system Reset Request (only for European customer / dealer). A customer Reset input shall enable the Auto Learn and Pwarm algorithms to learn new ID’s and new operating pressure per tire.    TirePReset\_B\_Rq is the Reset Request signal from HMI to BCM.    Tire\_Press\_System\_Stat, Tire\_PReset\_D\_Stat are feedback from BCM to HMI to confirm the reset was successfull. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0021 TPMS DTCs (BCM Internal memory to sensor ID)

Writing/injecting any data into memory reserved for storage of TPMS sensor identification data shall cause BCM Diagnostic codes for all individual sensor locations to be created or re-applied (if previously cleared).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | Writing/injecting any data into memory reserved for storage of TPMS sensor identification data shall cause BCM Diagnostic codes for all individual sensor locations to be created or re-applied (if previously cleared). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_RTM\_FIS\_0001 Communication TPMS sensors to RTM

The RTM module shall communicate with TPMS sensors through UHF frequency 433.9 MHz +- xx, and support LF service frequency in legacy FNV2, FNV3 Electrical Architectures.

Note: In FNV4 and beyond, the BUN module shall communicate through Bluetooth technology with TPMS sensors.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The RTM module shall communicate with TPMS sensors through UHF frequency 433.9 MHz +- xx, and support LF service frequency in legacy FNV2, FNV3 Electrical Architectures.    Note: In FNV4 and beyond, the BUN module shall communicate through Bluetooth technology with TPMS sensors. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0008 Low Tire Pressure determined by BCM

The BCM shall determine if a low pressure warning needs to be requested according to TPMS sensors data and thresholds.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall determine if a low pressure warning needs to be requested according to TPMS sensors data and thresholds. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0016 TPMS Sensors Auto-Location (algorithm)

The BCM shall implement an auto-location algorithm to determine to which road wheel each TPMS sensor is mounted when vehicle is driven (over 32kph). The auto-location algorithm shall be executed every ignition cycle.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement an auto-location algorithm to determine to which road wheel each TPMS sensor is mounted when vehicle is driven (over 32kph). The auto-location algorithm shall be executed every ignition cycle. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0019 TPMS System Reset

When a system reset is requested by the user, the BCM shall execute auto learn and pwarm algorithms to learn new sensor´s ID and operating pressure per tire (Regulatory item for Europe).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | When a system reset is requested by the user, the BCM shall execute auto learn and pwarm algorithms to learn new sensor´s ID and operating pressure per tire (Regulatory item for Europe). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0014 TPMS Sensors Auto-Location (type)

The BCM shall attempt to determine which TPMS sensors are mounted/installed on road wheels when vehicle is driven (ver 32kph).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall attempt to determine which TPMS sensors are mounted/installed on road wheels when vehicle is driven (ver 32kph). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_RTM\_FIS\_0002 TPMS sensors recognize

The RTM module shall be able to recognize and support 6 vehicle TPMS sensors through Radio Frequency.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The RTM module shall be able to recognize and support 6 vehicle TPMS sensors through Radio Frequency. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Composite Warning

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Composite Warning

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0001 Tire Pressure wake up

The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).

BCM (Tx) tire pressure values over CAN:

- Tire\_Press\_LF\_Data

- Tire\_Press\_RF\_Data

- Tire\_Press\_IRR\_Data

- Tire\_Press\_ILR\_Data

- Tire\_Press\_RR\_ORR\_Data

- Tire\_Press\_LR\_OLR\_Data

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).    BCM (Tx) tire pressure values over CAN:  - Tire\_Press\_LF\_Data  - Tire\_Press\_RF\_Data  - Tire\_Press\_IRR\_Data  - Tire\_Press\_ILR\_Data  - Tire\_Press\_RR\_ORR\_Data  - Tire\_Press\_LR\_OLR\_Data | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0002 Tire Low strategy

The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0010 TPMS cluster warnings during same ignition cycle

IPC shall not allow TPMS warnings for a unique low pressure/malfunction event to reappear during the same ignition session.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall not allow TPMS warnings for a unique low pressure/malfunction event to reappear during the same ignition session. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0011 TPMS IOD

IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0010 TPMS system status message priority

BCM shall determine the priority of the various warning statuses per tire to create a single output.

TPMS system overall status shall be sent over CAN through:

- Tire\_Press\_System\_Stat

- Tire\_Press\_Telltale

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | BCM shall determine the priority of the various warning statuses per tire to create a single output.    TPMS system overall status shall be sent over CAN through:  - Tire\_Press\_System\_Stat  - Tire\_Press\_Telltale | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0006 TPMS IPC to HMI to display the warnings

IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0009 TPMS cluster warnings message at a time

IPC shall display only one TPMS warning message at a time.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall display only one TPMS warning message at a time. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0003 TPMS system - BCM to APIM/IPC

The BCM shall provide the following signals to IPC and APIM:

- Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);

- Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);

- TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;

-Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

- Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).

-Tire\_Press\_XXX\_Data: Tire pressure value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

-Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).

- Ignition\_Status / Power Mode.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Cluster Navigation

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall provide the following signals to IPC and APIM:  - Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);  - Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);  - TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;  -Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  - Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).  -Tire\_Press\_XXX\_Data: Tire pressure value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  -Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).  - Ignition\_Status / Power Mode. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0001 TPMS data

IPC and APIM modules shall receive the following signals from BCM:

- Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);

- Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);

- TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;

- Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

- Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).

-Tire\_Press\_XXX\_Data: Tire pressure value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

-Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).

- Ignition\_Status / Power Mode.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC and APIM modules shall receive the following signals from BCM:  - Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);  - Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);  - TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;  - Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  - Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).  -Tire\_Press\_XXX\_Data: Tire pressure value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  -Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).  - Ignition\_Status / Power Mode. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0007 TPMS cluster warnings when Power Mode On/Run/Start

IPC module shall display warnings (if present) when Ignition is On/Run/Start.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall display warnings (if present) when Ignition is On/Run/Start. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Request Warning

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Request Warning

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0001 Tire Pressure wake up

The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).

BCM (Tx) tire pressure values over CAN:

- Tire\_Press\_LF\_Data

- Tire\_Press\_RF\_Data

- Tire\_Press\_IRR\_Data

- Tire\_Press\_ILR\_Data

- Tire\_Press\_RR\_ORR\_Data

- Tire\_Press\_LR\_OLR\_Data

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).    BCM (Tx) tire pressure values over CAN:  - Tire\_Press\_LF\_Data  - Tire\_Press\_RF\_Data  - Tire\_Press\_IRR\_Data  - Tire\_Press\_ILR\_Data  - Tire\_Press\_RR\_ORR\_Data  - Tire\_Press\_LR\_OLR\_Data | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0010 TPMS cluster warnings during same ignition cycle

IPC shall not allow TPMS warnings for a unique low pressure/malfunction event to reappear during the same ignition session.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall not allow TPMS warnings for a unique low pressure/malfunction event to reappear during the same ignition session. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_RTM\_FIS\_0003 TPMS sensors (RTM to BCM)

The RTM module shall send TPMS sensors data frames (pressure, temperature, diagnostics) through Private CAN to BCM module.

RTM signals sent to BCM through private CAN:

- TPMSDataPacket

- TirePress\_Frame\_ID\_CFG\_0

- TirePress\_Frame\_ID\_CFG\_1

- TirePress\_Frame\_ID\_CFG\_2

- TirePress\_Frame\_ID\_CFG\_3

- TirePress\_Frame\_Press

- TirePress\_Frame\_Temp

- TirePress\_Frame\_Status

- TirePress\_Frame\_Checksum

- Checksum

- TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2

- TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2

- TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The RTM module shall send TPMS sensors data frames (pressure, temperature, diagnostics) through Private CAN to BCM module.    RTM signals sent to BCM through private CAN:  - TPMSDataPacket  - TirePress\_Frame\_ID\_CFG\_0  - TirePress\_Frame\_ID\_CFG\_1  - TirePress\_Frame\_ID\_CFG\_2  - TirePress\_Frame\_ID\_CFG\_3  - TirePress\_Frame\_Press  - TirePress\_Frame\_Temp  - TirePress\_Frame\_Status  - TirePress\_Frame\_Checksum  - Checksum  - TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2  - TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2  - TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3 | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0010 TPMS system status message priority

BCM shall determine the priority of the various warning statuses per tire to create a single output.

TPMS system overall status shall be sent over CAN through:

- Tire\_Press\_System\_Stat

- Tire\_Press\_Telltale

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | BCM shall determine the priority of the various warning statuses per tire to create a single output.    TPMS system overall status shall be sent over CAN through:  - Tire\_Press\_System\_Stat  - Tire\_Press\_Telltale | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0009 TPMS cluster warnings message at a time

IPC shall display only one TPMS warning message at a time.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall display only one TPMS warning message at a time. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0007 TPMS cluster warnings when Power Mode On/Run/Start

IPC module shall display warnings (if present) when Ignition is On/Run/Start.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall display warnings (if present) when Ignition is On/Run/Start. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

##### Function Interfaces

###### Inputs

(No inputs have been defined)

###### Outputs

(No outputs have been defined)

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Turns Feature ON/OFF (DID "DE08")

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0025 TPMS BCM Configs - TPMS Sensor by valve type

The BCM shall implement a routine to make valve type proper assembly confirmation during EOL testing through:

- Method#2: TPMSValveType\_Cfg (0x0 = low speed valve; 0x1 = high speed valve);

- Method#3: TPMSValveCheck\_Cfg (0x0 = disabled; 0x1 = enabled).

Satisfied by:

* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a routine to make valve type proper assembly confirmation during EOL testing through:  - Method#2: TPMSValveType\_Cfg (0x0 = low speed valve; 0x1 = high speed valve);  - Method#3: TPMSValveCheck\_Cfg (0x0 = disabled; 0x1 = enabled). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0004 TPMS system - ECUs to BCM

The BCM module shall receive the following signals from other modules:

- TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);

- Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);

- Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);

- TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Odometer
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall receive the following signals from other modules:  - TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);  - Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);  - Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);  - TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0024 TPMS BCM Configs - DID Enable/Disable feature

The BCM shall provide the following configurations through EOL:

- DID DE09: TPMEnable\_Cfg to allow the TPMS feature to be enabled or disabled;

- DID DE09: SensorType\_Cfg to allow sensor type definition;

- DID DE09: PlacardFront\_Cfg and PlacardRear\_Cfg to allow pressure tables definition;

- DID DE37: FedReg\_Cfg to allow regulation definition;

- DID DE37: NumTires\_Cfg to confirm if Single Duar Rear Wheels or Dual Rear Wheels definition;

- DID DE37 - feature functionalities setup: Reassignment\_Enable\_Cfg, SensorAutoRange\_Cfg, TPMAutoLearnEnable\_Cfg, TPM\_AutoLocate\_Cfg, TPMS\_Temperature\_Display\_Cfg, OffRoad\_TirePress\_Enable\_Cfg, TPMSValveType\_Cfg.

Satisfied by:

* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall provide the following configurations through EOL:  - DID DE09: TPMEnable\_Cfg to allow the TPMS feature to be enabled or disabled;  - DID DE09: SensorType\_Cfg to allow sensor type definition;  - DID DE09: PlacardFront\_Cfg and PlacardRear\_Cfg to allow pressure tables definition;  - DID DE37: FedReg\_Cfg to allow regulation definition;  - DID DE37: NumTires\_Cfg to confirm if Single Duar Rear Wheels or Dual Rear Wheels definition;  - DID DE37 - feature functionalities setup: Reassignment\_Enable\_Cfg, SensorAutoRange\_Cfg, TPMAutoLearnEnable\_Cfg, TPM\_AutoLocate\_Cfg, TPMS\_Temperature\_Display\_Cfg, OffRoad\_TirePress\_Enable\_Cfg, TPMSValveType\_Cfg. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0018 TPMS Config (DID TPMS On or Off)

APIM shall provide the following configurations through EOL:

- DID DE08: Tire Monitor/Pressure Reset Setting - to allow definition if Tire Pressure Monitor Reset Request is present or not;

- DID DE08: TPMS By Location - to allow definition if TPMS feature is present or not. In case of TPMS is not present, Menus and options related to the feature shall be entirely disabled and not displayed to the user.

Satisfied by:

* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | APIM shall provide the following configurations through EOL:  - DID DE08: Tire Monitor/Pressure Reset Setting - to allow definition if Tire Pressure Monitor Reset Request is present or not;  - DID DE08: TPMS By Location - to allow definition if TPMS feature is present or not. In case of TPMS is not present, Menus and options related to the feature shall be entirely disabled and not displayed to the user. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0026 TPMS BCM DIDs

The BCM shall implement the following DIDs:

- 0x214: TPMS Last Reset History Data

- 0x280B - Tire Pressure Monitoring System (TPMS) - Last Received

Sensor Data

- 0x280D - Tire Pressure Monitoring System (TPMS) Status

- 0x281C, 0x281E, 0x281F, 0x2820, 0x2821 - Tire Pressure Monitoring System (TPMS) Last Warning Events

- 0x280F, 0x2810, 0x2811, 0x2812, 0x2819, 0x281A - Tire sensors ID

- 0x2813, 0x2814, 0x2815, 0x2816, 0x2817, 0x2818 - Barometric Compensated tire pressures

- 0x2827, 0x2828 - placard pressures, front and rear tires

- 0x2863, 0x2864, 0x2865 - TPMS Auto Locate Last Event Data, Variance and Decision

- 0x2866 - TPMS Auto Locate Last Event IDs

- 0x2867 - TPMS Auto Locate Status

- 0x2868 - TPMS Auto Learn Timer Value At The Last Locate Event

- 0x2869 - TPMS History Of Successful Auto Location Completion Event

Count

- 0x286A - TPMS History Of Auto Location Fault Count

- 0x286B - TPMS Recent Auto Location Fault Count

- 0x287C, 0x287D, 0x287E, 0x287F, 0x2880 - Tire Pressure Monitoring System (TPMS) Low Threshold at

Last Warning Events

Satisfied by:

* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement the following DIDs:  - 0x214: TPMS Last Reset History Data  - 0x280B - Tire Pressure Monitoring System (TPMS) - Last Received  Sensor Data  - 0x280D - Tire Pressure Monitoring System (TPMS) Status  - 0x281C, 0x281E, 0x281F, 0x2820, 0x2821 - Tire Pressure Monitoring System (TPMS) Last Warning Events  - 0x280F, 0x2810, 0x2811, 0x2812, 0x2819, 0x281A - Tire sensors ID  - 0x2813, 0x2814, 0x2815, 0x2816, 0x2817, 0x2818 - Barometric Compensated tire pressures  - 0x2827, 0x2828 - placard pressures, front and rear tires  - 0x2863, 0x2864, 0x2865 - TPMS Auto Locate Last Event Data, Variance and Decision  - 0x2866 - TPMS Auto Locate Last Event IDs  - 0x2867 - TPMS Auto Locate Status  - 0x2868 - TPMS Auto Learn Timer Value At The Last Locate Event  - 0x2869 - TPMS History Of Successful Auto Location Completion Event  Count  - 0x286A - TPMS History Of Auto Location Fault Count  - 0x286B - TPMS Recent Auto Location Fault Count  - 0x287C, 0x287D, 0x287E, 0x287F, 0x2880 - Tire Pressure Monitoring System (TPMS) Low Threshold at  Last Warning Events | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0005 TPMS tires pressure in the cluster

IPC module shall display Tires Pressure in the cluster.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall display Tires Pressure in the cluster. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0017 TPMS Config (DID config)

IPC shall provide the following configurations through EOL:

- DID DE08: TPMS\_ByLocation\_Cfg to allow the TPMS feature to be enabled or disabled. Tire Pressure Units Setting and Info (On Demand) screens are shown only if TPMS\_ByLocation\_Cfg = 0x1. If TPMS\_ByLocation\_Cfg = 0x0 then Tire Pressure Units Setting and Info (On Demand) screen are not shown.

- DID DE08: TPMS Units Default to allow default unit definition;

- DID DE02: TPMS FedReg Config to allow market regulation definition;

- DID DE06: TPMS Dual Rear Wheel to allow definition if Single or Dual Rear Wheels;

- DID DE0A: Tire Temperature Display to allow definition if temperatures are displayed or not to the user.

Satisfied by:

* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall provide the following configurations through EOL:  - DID DE08: TPMS\_ByLocation\_Cfg to allow the TPMS feature to be enabled or disabled. Tire Pressure Units Setting and Info (On Demand) screens are shown only if TPMS\_ByLocation\_Cfg = 0x1. If TPMS\_ByLocation\_Cfg = 0x0 then Tire Pressure Units Setting and Info (On Demand) screen are not shown.  - DID DE08: TPMS Units Default to allow default unit definition;  - DID DE02: TPMS FedReg Config to allow market regulation definition;  - DID DE06: TPMS Dual Rear Wheel to allow definition if Single or Dual Rear Wheels;  - DID DE0A: Tire Temperature Display to allow definition if temperatures are displayed or not to the user. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Reassignment Process

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 658883941.jpg VehVActlEng\_D\_Qf | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Reassignment Process

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0001 Tire Pressure wake up

The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).

BCM (Tx) tire pressure values over CAN:

- Tire\_Press\_LF\_Data

- Tire\_Press\_RF\_Data

- Tire\_Press\_IRR\_Data

- Tire\_Press\_ILR\_Data

- Tire\_Press\_RR\_ORR\_Data

- Tire\_Press\_LR\_OLR\_Data

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).    BCM (Tx) tire pressure values over CAN:  - Tire\_Press\_LF\_Data  - Tire\_Press\_RF\_Data  - Tire\_Press\_IRR\_Data  - Tire\_Press\_ILR\_Data  - Tire\_Press\_RR\_ORR\_Data  - Tire\_Press\_LR\_OLR\_Data | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0009 TPMS sensors status composite

The BCM shall determine a composite TPMS status based on the status communicated from all supported TPMS sensors.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall determine a composite TPMS status based on the status communicated from all supported TPMS sensors. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0004 TPMS HMI Specs

IPC and APIM shall follow specifications according to:

- TPMS\_\_with\_EUreset\_PressureByLocation\_PlacardDsply\_DRW CGEA1.3\_v12.1

- Tire Temperature Function - CGEA1.3\_v1.2

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC and APIM shall follow specifications according to:  - TPMS\_\_with\_EUreset\_PressureByLocation\_PlacardDsply\_DRW CGEA1.3\_v12.1  - Tire Temperature Function - CGEA1.3\_v1.2 | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0002 Tire Low strategy

The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0004 TPMS system - ECUs to BCM

The BCM module shall receive the following signals from other modules:

- TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);

- Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);

- Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);

- TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Odometer
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall receive the following signals from other modules:  - TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);  - Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);  - Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);  - TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0006 TPMS IPC to HMI to display the warnings

IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0005 TPMS data - RTM/Sensor to BCM

The BCM module shall receive and process the TPMS sensors data frames (tire pressure, tire temperature and sensors diagnostics) of all mounted/installed road tires, not including monitoring for spare tire.

TPMS data sent from RTM to BCM through Private CAN:

- TPMSDataPacket

- TirePress\_Frame\_ID\_CFG\_0

- TirePress\_Frame\_ID\_CFG\_1

- TirePress\_Frame\_ID\_CFG\_2

- TirePress\_Frame\_ID\_CFG\_3

- TirePress\_Frame\_Press

- TirePress\_Frame\_Temp

- TirePress\_Frame\_Status

- TirePress\_Frame\_Checksum

- Checksum

- TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2

- TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2

- TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3

Note: TPMS sensor ID information shall include characters to confirm final TPMS assembly (TPMS Sensor + Valve Stem type).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall receive and process the TPMS sensors data frames (tire pressure, tire temperature and sensors diagnostics) of all mounted/installed road tires, not including monitoring for spare tire.    TPMS data sent from RTM to BCM through Private CAN:  - TPMSDataPacket  - TirePress\_Frame\_ID\_CFG\_0  - TirePress\_Frame\_ID\_CFG\_1  - TirePress\_Frame\_ID\_CFG\_2  - TirePress\_Frame\_ID\_CFG\_3  - TirePress\_Frame\_Press  - TirePress\_Frame\_Temp  - TirePress\_Frame\_Status  - TirePress\_Frame\_Checksum  - Checksum  - TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2  - TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2  - TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3    Note: TPMS sensor ID information shall include characters to confirm final TPMS assembly (TPMS Sensor + Valve Stem type). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0013 TPMS Placard (ECE-141)

IPC shall allow the customer to determine the warm placard pressure for each tire location to meet regulatory requirements (Regulatory item for Europe).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall allow the customer to determine the warm placard pressure for each tire location to meet regulatory requirements (Regulatory item for Europe). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_SCCM\_FIS\_0001 Steering wheel signals

The SCCM module shall provide steering wheel buttons signals over CAN to IPC and allow Cluster Menus navigation:

- SteWhlSwtchBack\_B\_Stat;

- SteWhlSwtchUp\_B\_Stat;

- SteWhlSwtchDown\_B\_Stat;

- SteWhlSwtchRight\_B\_Stat;

- SteWhlSwtchLeft\_B\_Stat;

- SteWhlSwtchOk\_B\_Stat;

- SteWhlSwtchMenu\_B\_Stat.

Satisfied by:

* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The SCCM module shall provide steering wheel buttons signals over CAN to IPC and allow Cluster Menus navigation:  - SteWhlSwtchBack\_B\_Stat;  - SteWhlSwtchUp\_B\_Stat;  - SteWhlSwtchDown\_B\_Stat;  - SteWhlSwtchRight\_B\_Stat;  - SteWhlSwtchLeft\_B\_Stat;  - SteWhlSwtchOk\_B\_Stat;  - SteWhlSwtchMenu\_B\_Stat. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_RTM\_FIS\_0003 TPMS sensors (RTM to BCM)

The RTM module shall send TPMS sensors data frames (pressure, temperature, diagnostics) through Private CAN to BCM module.

RTM signals sent to BCM through private CAN:

- TPMSDataPacket

- TirePress\_Frame\_ID\_CFG\_0

- TirePress\_Frame\_ID\_CFG\_1

- TirePress\_Frame\_ID\_CFG\_2

- TirePress\_Frame\_ID\_CFG\_3

- TirePress\_Frame\_Press

- TirePress\_Frame\_Temp

- TirePress\_Frame\_Status

- TirePress\_Frame\_Checksum

- Checksum

- TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2

- TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2

- TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The RTM module shall send TPMS sensors data frames (pressure, temperature, diagnostics) through Private CAN to BCM module.    RTM signals sent to BCM through private CAN:  - TPMSDataPacket  - TirePress\_Frame\_ID\_CFG\_0  - TirePress\_Frame\_ID\_CFG\_1  - TirePress\_Frame\_ID\_CFG\_2  - TirePress\_Frame\_ID\_CFG\_3  - TirePress\_Frame\_Press  - TirePress\_Frame\_Temp  - TirePress\_Frame\_Status  - TirePress\_Frame\_Checksum  - Checksum  - TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2  - TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2  - TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3 | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0012 TPMS Reset Request (ECE-141)

IPC shall allow the customer to make TPMS system Reset Request (only for European customer / dealer). A customer Reset input shall enable the Auto Learn and Pwarm algorithms to learn new ID’s and new operating pressure per tire.

TirePReset\_B\_Rq is the Reset Request signal from HMI to BCM.

Tire\_Press\_System\_Stat, Tire\_PReset\_D\_Stat are feedback from BCM to HMI to confirm the reset was successfull.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall allow the customer to make TPMS system Reset Request (only for European customer / dealer). A customer Reset input shall enable the Auto Learn and Pwarm algorithms to learn new ID’s and new operating pressure per tire.    TirePReset\_B\_Rq is the Reset Request signal from HMI to BCM.    Tire\_Press\_System\_Stat, Tire\_PReset\_D\_Stat are feedback from BCM to HMI to confirm the reset was successfull. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0014 TPMS sensors learning instructions

IPC shall indicate instructions to user when manual learn/train or re-assignment procedures are active.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall indicate instructions to user when manual learn/train or re-assignment procedures are active. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_RTM\_FIS\_0001 Communication TPMS sensors to RTM

The RTM module shall communicate with TPMS sensors through UHF frequency 433.9 MHz +- xx, and support LF service frequency in legacy FNV2, FNV3 Electrical Architectures.

Note: In FNV4 and beyond, the BUN module shall communicate through Bluetooth technology with TPMS sensors.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The RTM module shall communicate with TPMS sensors through UHF frequency 433.9 MHz +- xx, and support LF service frequency in legacy FNV2, FNV3 Electrical Architectures.    Note: In FNV4 and beyond, the BUN module shall communicate through Bluetooth technology with TPMS sensors. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0013 TPMS External Audible Feedback

The BCM shall command the horn to guide the user during Manual Learn or Reassignment process. The horn shall be commanded according to the following:

- single horn chirp shall be provided to confirm manual learn or reassignment process initilization, and also for each tire successfull association/location;

- double horn chirp shall be provided in case of unsuccesfull association/location process.

Satisfied by:

* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Horn

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall command the horn to guide the user during Manual Learn or Reassignment process. The horn shall be commanded according to the following:  - single horn chirp shall be provided to confirm manual learn or reassignment process initilization, and also for each tire successfull association/location;  - double horn chirp shall be provided in case of unsuccesfull association/location process. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0012 Reassignment Mode

The BCM shall implement a Reassignment algorithm to reassign sensor locations after tires rotation (when no new sensors have been mounted). The following criteria and rules shall be satisfied:

- this procedure shall not require special tool and instructions shall be provided in the Owner´s Manual;

- the vehicle must be in Park (speed = 0kph);

- BCM shall process each TPMS sensor reassignment by detecting a 'rapid tire pressure change' (removing or adding air in the tire);

- BCM shall not request any tire pressure warning when Re-Assigning sensors to the vehicle;

- the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;

- upon successful completion of the reassignment process the BCM shall self clear all sensor fault DTCs;

- while Re-Assignment Mode is True and if any tire reports a low pressure, the BCM shall immediately report it upon successful completion of Re-Assignment mode;

- the following sequence of hazard and ignition switches activation shall be used for reassignment process initialization: when Ignition Status is RUN/START and Learn mode is FALSE, and the Hazard switch has been turned from OFF to ON, and turned to OFF, Reassignment mode entry counter is incremented and timer is started. Once the Reassignment mode entry count is greater than Hazard Cycle reassignment count, then Reassignment mode is activated. In case, the timer expires before it enters Reassignment mode, or brake pedal is pressed, or Ignition Status is changed to OFF/ACC or if Vehicle speed is increased more than 4kph, then Reassignment mode is exited.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Gear Lever Position
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Provide Vehicle Speed
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a Reassignment algorithm to reassign sensor locations after tires rotation (when no new sensors have been mounted). The following criteria and rules shall be satisfied:  - this procedure shall not require special tool and instructions shall be provided in the Owner´s Manual;  - the vehicle must be in Park (speed = 0kph);  - BCM shall process each TPMS sensor reassignment by detecting a 'rapid tire pressure change' (removing or adding air in the tire);  - BCM shall not request any tire pressure warning when Re-Assigning sensors to the vehicle;  - the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;  - upon successful completion of the reassignment process the BCM shall self clear all sensor fault DTCs;  - while Re-Assignment Mode is True and if any tire reports a low pressure, the BCM shall immediately report it upon successful completion of Re-Assignment mode;  - the following sequence of hazard and ignition switches activation shall be used for reassignment process initialization: when Ignition Status is RUN/START and Learn mode is FALSE, and the Hazard switch has been turned from OFF to ON, and turned to OFF, Reassignment mode entry counter is incremented and timer is started. Once the Reassignment mode entry count is greater than Hazard Cycle reassignment count, then Reassignment mode is activated. In case, the timer expires before it enters Reassignment mode, or brake pedal is pressed, or Ignition Status is changed to OFF/ACC or if Vehicle speed is increased more than 4kph, then Reassignment mode is exited. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_RTM\_FIS\_0002 TPMS sensors recognize

The RTM module shall be able to recognize and support 6 vehicle TPMS sensors through Radio Frequency.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The RTM module shall be able to recognize and support 6 vehicle TPMS sensors through Radio Frequency. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Auto Learn Process

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 658883941.jpg VehVActlEng\_D\_Qf | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Auto Learn Process

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0009 TPMS sensors status composite

The BCM shall determine a composite TPMS status based on the status communicated from all supported TPMS sensors.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall determine a composite TPMS status based on the status communicated from all supported TPMS sensors. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0001 Tire Pressure wake up

The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).

BCM (Tx) tire pressure values over CAN:

- Tire\_Press\_LF\_Data

- Tire\_Press\_RF\_Data

- Tire\_Press\_IRR\_Data

- Tire\_Press\_ILR\_Data

- Tire\_Press\_RR\_ORR\_Data

- Tire\_Press\_LR\_OLR\_Data

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).    BCM (Tx) tire pressure values over CAN:  - Tire\_Press\_LF\_Data  - Tire\_Press\_RF\_Data  - Tire\_Press\_IRR\_Data  - Tire\_Press\_ILR\_Data  - Tire\_Press\_RR\_ORR\_Data  - Tire\_Press\_LR\_OLR\_Data | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0004 TPMS HMI Specs

IPC and APIM shall follow specifications according to:

- TPMS\_\_with\_EUreset\_PressureByLocation\_PlacardDsply\_DRW CGEA1.3\_v12.1

- Tire Temperature Function - CGEA1.3\_v1.2

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC and APIM shall follow specifications according to:  - TPMS\_\_with\_EUreset\_PressureByLocation\_PlacardDsply\_DRW CGEA1.3\_v12.1  - Tire Temperature Function - CGEA1.3\_v1.2 | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0017 TPMS DTCs System

The BCM shall implement diagnostic codes to indicate when vehicle has not finished TPMS configuration/sensors association (re: Build Mode). Presence of TPMS Diagnostic codes shall cause TPMS Telltale to remain illuminated.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement diagnostic codes to indicate when vehicle has not finished TPMS configuration/sensors association (re: Build Mode). Presence of TPMS Diagnostic codes shall cause TPMS Telltale to remain illuminated. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0022 TPMS DTCs received for BCM by RTM

BCM diagnostic codes for each individual sensors location shall be cleared only when data transmissions from the associated sensors have been received without any impairment/compatibility problems. BCM diagnostic codes for individual sensor locations shall not be cleared in other ways.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | BCM diagnostic codes for each individual sensors location shall be cleared only when data transmissions from the associated sensors have been received without any impairment/compatibility problems. BCM diagnostic codes for individual sensor locations shall not be cleared in other ways. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0015 TPMS Sensors ID Verify

Except while Learn Mode is True, the BCM shall verify If the received TPM Sensors ID match with the already saved ID's. In case of any TPMS Sensor ID does not match, then the BCM shall set Sensor Status data flow to ‘INVALID’.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | Except while Learn Mode is True, the BCM shall verify If the received TPM Sensors ID match with the already saved ID's. In case of any TPMS Sensor ID does not match, then the BCM shall set Sensor Status data flow to ‘INVALID’. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0023 TPMS sensors Auto-Location

The BCM module shall not complete automatic association of new sensors or automatic wheel location determination while any TPMS sensor has status of Fault/Malfunction.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall not complete automatic association of new sensors or automatic wheel location determination while any TPMS sensor has status of Fault/Malfunction. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0004 TPMS system - ECUs to BCM

The BCM module shall receive the following signals from other modules:

- TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);

- Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);

- Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);

- TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Odometer
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall receive the following signals from other modules:  - TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);  - Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);  - Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);  - TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0018 TPMS DTCs by Sensor

The BCM diagnostic codes shall indicate when individual sensor locations have not been setup or have confirmed impairment/compatibility problems.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM diagnostic codes shall indicate when individual sensor locations have not been setup or have confirmed impairment/compatibility problems. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_ABS\_FIS\_0001 Wheel Speed Signals - wheel speed signal

The ABS/EBB module shall send wheel speed signal (of each invidividual wheel) to BCM module.

Observation: WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide wheel speed
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The ABS/EBB module shall send wheel speed signal (of each invidividual wheel) to BCM module.  Observation: WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0005 TPMS data - RTM/Sensor to BCM

The BCM module shall receive and process the TPMS sensors data frames (tire pressure, tire temperature and sensors diagnostics) of all mounted/installed road tires, not including monitoring for spare tire.

TPMS data sent from RTM to BCM through Private CAN:

- TPMSDataPacket

- TirePress\_Frame\_ID\_CFG\_0

- TirePress\_Frame\_ID\_CFG\_1

- TirePress\_Frame\_ID\_CFG\_2

- TirePress\_Frame\_ID\_CFG\_3

- TirePress\_Frame\_Press

- TirePress\_Frame\_Temp

- TirePress\_Frame\_Status

- TirePress\_Frame\_Checksum

- Checksum

- TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2

- TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2

- TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3

Note: TPMS sensor ID information shall include characters to confirm final TPMS assembly (TPMS Sensor + Valve Stem type).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall receive and process the TPMS sensors data frames (tire pressure, tire temperature and sensors diagnostics) of all mounted/installed road tires, not including monitoring for spare tire.    TPMS data sent from RTM to BCM through Private CAN:  - TPMSDataPacket  - TirePress\_Frame\_ID\_CFG\_0  - TirePress\_Frame\_ID\_CFG\_1  - TirePress\_Frame\_ID\_CFG\_2  - TirePress\_Frame\_ID\_CFG\_3  - TirePress\_Frame\_Press  - TirePress\_Frame\_Temp  - TirePress\_Frame\_Status  - TirePress\_Frame\_Checksum  - Checksum  - TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2  - TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2  - TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3    Note: TPMS sensor ID information shall include characters to confirm final TPMS assembly (TPMS Sensor + Valve Stem type). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0013 TPMS Placard (ECE-141)

IPC shall allow the customer to determine the warm placard pressure for each tire location to meet regulatory requirements (Regulatory item for Europe).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall allow the customer to determine the warm placard pressure for each tire location to meet regulatory requirements (Regulatory item for Europe). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_ABS\_FIS\_0002 Wheel Speed Signals - wheel speed sensor data

The ABS/EBB module shall process raw wheel speed sensor data (of each invidividual wheel) and publish wheel speed signals over CAN within 7ms.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide wheel speed
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The ABS/EBB module shall process raw wheel speed sensor data (of each invidividual wheel) and publish wheel speed signals over CAN within 7ms. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_RTM\_FIS\_0003 TPMS sensors (RTM to BCM)

The RTM module shall send TPMS sensors data frames (pressure, temperature, diagnostics) through Private CAN to BCM module.

RTM signals sent to BCM through private CAN:

- TPMSDataPacket

- TirePress\_Frame\_ID\_CFG\_0

- TirePress\_Frame\_ID\_CFG\_1

- TirePress\_Frame\_ID\_CFG\_2

- TirePress\_Frame\_ID\_CFG\_3

- TirePress\_Frame\_Press

- TirePress\_Frame\_Temp

- TirePress\_Frame\_Status

- TirePress\_Frame\_Checksum

- Checksum

- TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2

- TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2

- TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The RTM module shall send TPMS sensors data frames (pressure, temperature, diagnostics) through Private CAN to BCM module.    RTM signals sent to BCM through private CAN:  - TPMSDataPacket  - TirePress\_Frame\_ID\_CFG\_0  - TirePress\_Frame\_ID\_CFG\_1  - TirePress\_Frame\_ID\_CFG\_2  - TirePress\_Frame\_ID\_CFG\_3  - TirePress\_Frame\_Press  - TirePress\_Frame\_Temp  - TirePress\_Frame\_Status  - TirePress\_Frame\_Checksum  - Checksum  - TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2  - TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2  - TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3 | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0012 TPMS Reset Request (ECE-141)

IPC shall allow the customer to make TPMS system Reset Request (only for European customer / dealer). A customer Reset input shall enable the Auto Learn and Pwarm algorithms to learn new ID’s and new operating pressure per tire.

TirePReset\_B\_Rq is the Reset Request signal from HMI to BCM.

Tire\_Press\_System\_Stat, Tire\_PReset\_D\_Stat are feedback from BCM to HMI to confirm the reset was successfull.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall allow the customer to make TPMS system Reset Request (only for European customer / dealer). A customer Reset input shall enable the Auto Learn and Pwarm algorithms to learn new ID’s and new operating pressure per tire.    TirePReset\_B\_Rq is the Reset Request signal from HMI to BCM.    Tire\_Press\_System\_Stat, Tire\_PReset\_D\_Stat are feedback from BCM to HMI to confirm the reset was successfull. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0021 TPMS DTCs (BCM Internal memory to sensor ID)

Writing/injecting any data into memory reserved for storage of TPMS sensor identification data shall cause BCM Diagnostic codes for all individual sensor locations to be created or re-applied (if previously cleared).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | Writing/injecting any data into memory reserved for storage of TPMS sensor identification data shall cause BCM Diagnostic codes for all individual sensor locations to be created or re-applied (if previously cleared). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_RTM\_FIS\_0001 Communication TPMS sensors to RTM

The RTM module shall communicate with TPMS sensors through UHF frequency 433.9 MHz +- xx, and support LF service frequency in legacy FNV2, FNV3 Electrical Architectures.

Note: In FNV4 and beyond, the BUN module shall communicate through Bluetooth technology with TPMS sensors.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The RTM module shall communicate with TPMS sensors through UHF frequency 433.9 MHz +- xx, and support LF service frequency in legacy FNV2, FNV3 Electrical Architectures.    Note: In FNV4 and beyond, the BUN module shall communicate through Bluetooth technology with TPMS sensors. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0016 TPMS Sensors Auto-Location (algorithm)

The BCM shall implement an auto-location algorithm to determine to which road wheel each TPMS sensor is mounted when vehicle is driven (over 32kph). The auto-location algorithm shall be executed every ignition cycle.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement an auto-location algorithm to determine to which road wheel each TPMS sensor is mounted when vehicle is driven (over 32kph). The auto-location algorithm shall be executed every ignition cycle. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0010 TPMS system status message priority

BCM shall determine the priority of the various warning statuses per tire to create a single output.

TPMS system overall status shall be sent over CAN through:

- Tire\_Press\_System\_Stat

- Tire\_Press\_Telltale

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | BCM shall determine the priority of the various warning statuses per tire to create a single output.    TPMS system overall status shall be sent over CAN through:  - Tire\_Press\_System\_Stat  - Tire\_Press\_Telltale | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0019 TPMS System Reset

When a system reset is requested by the user, the BCM shall execute auto learn and pwarm algorithms to learn new sensor´s ID and operating pressure per tire (Regulatory item for Europe).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | When a system reset is requested by the user, the BCM shall execute auto learn and pwarm algorithms to learn new sensor´s ID and operating pressure per tire (Regulatory item for Europe). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0014 TPMS Sensors Auto-Location (type)

The BCM shall attempt to determine which TPMS sensors are mounted/installed on road wheels when vehicle is driven (ver 32kph).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall attempt to determine which TPMS sensors are mounted/installed on road wheels when vehicle is driven (ver 32kph). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_RTM\_FIS\_0002 TPMS sensors recognize

The RTM module shall be able to recognize and support 6 vehicle TPMS sensors through Radio Frequency.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The RTM module shall be able to recognize and support 6 vehicle TPMS sensors through Radio Frequency. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Manual Learn

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 658883941.jpg VehVActlEng\_D\_Qf | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Manual Learn

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0001 Tire Pressure wake up

The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).

BCM (Tx) tire pressure values over CAN:

- Tire\_Press\_LF\_Data

- Tire\_Press\_RF\_Data

- Tire\_Press\_IRR\_Data

- Tire\_Press\_ILR\_Data

- Tire\_Press\_RR\_ORR\_Data

- Tire\_Press\_LR\_OLR\_Data

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).    BCM (Tx) tire pressure values over CAN:  - Tire\_Press\_LF\_Data  - Tire\_Press\_RF\_Data  - Tire\_Press\_IRR\_Data  - Tire\_Press\_ILR\_Data  - Tire\_Press\_RR\_ORR\_Data  - Tire\_Press\_LR\_OLR\_Data | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0005 TPMS data - RTM/Sensor to BCM

The BCM module shall receive and process the TPMS sensors data frames (tire pressure, tire temperature and sensors diagnostics) of all mounted/installed road tires, not including monitoring for spare tire.

TPMS data sent from RTM to BCM through Private CAN:

- TPMSDataPacket

- TirePress\_Frame\_ID\_CFG\_0

- TirePress\_Frame\_ID\_CFG\_1

- TirePress\_Frame\_ID\_CFG\_2

- TirePress\_Frame\_ID\_CFG\_3

- TirePress\_Frame\_Press

- TirePress\_Frame\_Temp

- TirePress\_Frame\_Status

- TirePress\_Frame\_Checksum

- Checksum

- TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2

- TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2

- TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3

Note: TPMS sensor ID information shall include characters to confirm final TPMS assembly (TPMS Sensor + Valve Stem type).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall receive and process the TPMS sensors data frames (tire pressure, tire temperature and sensors diagnostics) of all mounted/installed road tires, not including monitoring for spare tire.    TPMS data sent from RTM to BCM through Private CAN:  - TPMSDataPacket  - TirePress\_Frame\_ID\_CFG\_0  - TirePress\_Frame\_ID\_CFG\_1  - TirePress\_Frame\_ID\_CFG\_2  - TirePress\_Frame\_ID\_CFG\_3  - TirePress\_Frame\_Press  - TirePress\_Frame\_Temp  - TirePress\_Frame\_Status  - TirePress\_Frame\_Checksum  - Checksum  - TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2  - TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2  - TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3    Note: TPMS sensor ID information shall include characters to confirm final TPMS assembly (TPMS Sensor + Valve Stem type). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0009 TPMS sensors status composite

The BCM shall determine a composite TPMS status based on the status communicated from all supported TPMS sensors.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall determine a composite TPMS status based on the status communicated from all supported TPMS sensors. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_SCCM\_FIS\_0001 Steering wheel signals

The SCCM module shall provide steering wheel buttons signals over CAN to IPC and allow Cluster Menus navigation:

- SteWhlSwtchBack\_B\_Stat;

- SteWhlSwtchUp\_B\_Stat;

- SteWhlSwtchDown\_B\_Stat;

- SteWhlSwtchRight\_B\_Stat;

- SteWhlSwtchLeft\_B\_Stat;

- SteWhlSwtchOk\_B\_Stat;

- SteWhlSwtchMenu\_B\_Stat.

Satisfied by:

* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The SCCM module shall provide steering wheel buttons signals over CAN to IPC and allow Cluster Menus navigation:  - SteWhlSwtchBack\_B\_Stat;  - SteWhlSwtchUp\_B\_Stat;  - SteWhlSwtchDown\_B\_Stat;  - SteWhlSwtchRight\_B\_Stat;  - SteWhlSwtchLeft\_B\_Stat;  - SteWhlSwtchOk\_B\_Stat;  - SteWhlSwtchMenu\_B\_Stat. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_RTM\_FIS\_0003 TPMS sensors (RTM to BCM)

The RTM module shall send TPMS sensors data frames (pressure, temperature, diagnostics) through Private CAN to BCM module.

RTM signals sent to BCM through private CAN:

- TPMSDataPacket

- TirePress\_Frame\_ID\_CFG\_0

- TirePress\_Frame\_ID\_CFG\_1

- TirePress\_Frame\_ID\_CFG\_2

- TirePress\_Frame\_ID\_CFG\_3

- TirePress\_Frame\_Press

- TirePress\_Frame\_Temp

- TirePress\_Frame\_Status

- TirePress\_Frame\_Checksum

- Checksum

- TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2

- TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2

- TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The RTM module shall send TPMS sensors data frames (pressure, temperature, diagnostics) through Private CAN to BCM module.    RTM signals sent to BCM through private CAN:  - TPMSDataPacket  - TirePress\_Frame\_ID\_CFG\_0  - TirePress\_Frame\_ID\_CFG\_1  - TirePress\_Frame\_ID\_CFG\_2  - TirePress\_Frame\_ID\_CFG\_3  - TirePress\_Frame\_Press  - TirePress\_Frame\_Temp  - TirePress\_Frame\_Status  - TirePress\_Frame\_Checksum  - Checksum  - TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2  - TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2  - TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3 | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0014 TPMS sensors learning instructions

IPC shall indicate instructions to user when manual learn/train or re-assignment procedures are active.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall indicate instructions to user when manual learn/train or re-assignment procedures are active. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0004 TPMS system - ECUs to BCM

The BCM module shall receive the following signals from other modules:

- TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);

- Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);

- Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);

- TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Odometer
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall receive the following signals from other modules:  - TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);  - Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);  - Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);  - TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0011 Manual Learn

The BCM shall implement a Manual Learn algorithm for TPMS sensors association and location, in case of service. The following criteria and rules shall be satisfied:

- the manual Learn process initialization shall be requested through special tool or through specific sequence of brake and ignition switches activations, according to technical service guide;

- the vehicle must be in Park (speed = 0kph);

- 2 (two) identical and consecutive sensor frames shall be received before acccepting a new sensor ID during Manual Learn Mode;

- tire pressure warnings shall not be requested when associating TPMS sensors to the vehicle;

- the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;

- If Learn Mode is True and any tire reports a low pressure, the BCM shall report it upon successful completion of learn mode;

- Upon successful completion of the Manual Learn process, the BCM shall self clear all sensor fault DTCs.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Gear Lever Position
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Provide Vehicle Speed
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a Manual Learn algorithm for TPMS sensors association and location, in case of service. The following criteria and rules shall be satisfied:  - the manual Learn process initialization shall be requested through special tool or through specific sequence of brake and ignition switches activations, according to technical service guide;  - the vehicle must be in Park (speed = 0kph);  - 2 (two) identical and consecutive sensor frames shall be received before acccepting a new sensor ID during Manual Learn Mode;  - tire pressure warnings shall not be requested when associating TPMS sensors to the vehicle;  - the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;  - If Learn Mode is True and any tire reports a low pressure, the BCM shall report it upon successful completion of learn mode;  - Upon successful completion of the Manual Learn process, the BCM shall self clear all sensor fault DTCs. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_RTM\_FIS\_0001 Communication TPMS sensors to RTM

The RTM module shall communicate with TPMS sensors through UHF frequency 433.9 MHz +- xx, and support LF service frequency in legacy FNV2, FNV3 Electrical Architectures.

Note: In FNV4 and beyond, the BUN module shall communicate through Bluetooth technology with TPMS sensors.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The RTM module shall communicate with TPMS sensors through UHF frequency 433.9 MHz +- xx, and support LF service frequency in legacy FNV2, FNV3 Electrical Architectures.    Note: In FNV4 and beyond, the BUN module shall communicate through Bluetooth technology with TPMS sensors. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0006 TPMS IPC to HMI to display the warnings

IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0013 TPMS External Audible Feedback

The BCM shall command the horn to guide the user during Manual Learn or Reassignment process. The horn shall be commanded according to the following:

- single horn chirp shall be provided to confirm manual learn or reassignment process initilization, and also for each tire successfull association/location;

- double horn chirp shall be provided in case of unsuccesfull association/location process.

Satisfied by:

* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Horn

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall command the horn to guide the user during Manual Learn or Reassignment process. The horn shall be commanded according to the following:  - single horn chirp shall be provided to confirm manual learn or reassignment process initilization, and also for each tire successfull association/location;  - double horn chirp shall be provided in case of unsuccesfull association/location process. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_RTM\_FIS\_0002 TPMS sensors recognize

The RTM module shall be able to recognize and support 6 vehicle TPMS sensors through Radio Frequency.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The RTM module shall be able to recognize and support 6 vehicle TPMS sensors through Radio Frequency. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

### RTM

RTM

#### Technology Function -1543687678.jpg Receive and Process TPMS transmissions

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. | 172051543.jpg TPMS\_Sensor | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. | 172051543.jpg TimeStamp1\_Byte1 | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 172051543.jpg TimeStamp2\_Byte0 | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 172051543.jpg TimeStamp1\_Byte2 | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 172051543.jpg TimeStamp2\_Byte1 | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 172051543.jpg TimeStamp2\_Byte2 | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 172051543.jpg TimeStamp3\_Byte3 | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 172051543.jpg TimeStamp3\_Byte0 | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 172051543.jpg TimeStamp3\_Byte1 | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 172051543.jpg TimeStamp3\_Byte2 | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 172051543.jpg TirePress\_Frame\_Checksum | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 172051543.jpg TirePress\_Frame\_ID\_CFG\_0 | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 172051543.jpg TirePress\_Frame\_ID\_CFG\_1 | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 172051543.jpg TirePress\_Frame\_ID\_CFG\_2 | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 172051543.jpg TirePress\_Frame\_ID\_CFG\_3 | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 172051543.jpg TirePress\_Frame\_Press | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 172051543.jpg TirePress\_Frame\_Status | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 172051543.jpg TirePress\_Frame\_Temp | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 172051543.jpg TPMSDataPacket | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 172051543.jpg TimeStamp1\_Byte0 | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 172051543.jpg Checksum | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Receive and Process TPMS transmissions

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0001 Tire Pressure wake up

The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).

BCM (Tx) tire pressure values over CAN:

- Tire\_Press\_LF\_Data

- Tire\_Press\_RF\_Data

- Tire\_Press\_IRR\_Data

- Tire\_Press\_ILR\_Data

- Tire\_Press\_RR\_ORR\_Data

- Tire\_Press\_LR\_OLR\_Data

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).    BCM (Tx) tire pressure values over CAN:  - Tire\_Press\_LF\_Data  - Tire\_Press\_RF\_Data  - Tire\_Press\_IRR\_Data  - Tire\_Press\_ILR\_Data  - Tire\_Press\_RR\_ORR\_Data  - Tire\_Press\_LR\_OLR\_Data | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0002 Tire Low strategy

The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_RTM\_FIS\_0003 TPMS sensors (RTM to BCM)

The RTM module shall send TPMS sensors data frames (pressure, temperature, diagnostics) through Private CAN to BCM module.

RTM signals sent to BCM through private CAN:

- TPMSDataPacket

- TirePress\_Frame\_ID\_CFG\_0

- TirePress\_Frame\_ID\_CFG\_1

- TirePress\_Frame\_ID\_CFG\_2

- TirePress\_Frame\_ID\_CFG\_3

- TirePress\_Frame\_Press

- TirePress\_Frame\_Temp

- TirePress\_Frame\_Status

- TirePress\_Frame\_Checksum

- Checksum

- TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2

- TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2

- TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The RTM module shall send TPMS sensors data frames (pressure, temperature, diagnostics) through Private CAN to BCM module.    RTM signals sent to BCM through private CAN:  - TPMSDataPacket  - TirePress\_Frame\_ID\_CFG\_0  - TirePress\_Frame\_ID\_CFG\_1  - TirePress\_Frame\_ID\_CFG\_2  - TirePress\_Frame\_ID\_CFG\_3  - TirePress\_Frame\_Press  - TirePress\_Frame\_Temp  - TirePress\_Frame\_Status  - TirePress\_Frame\_Checksum  - Checksum  - TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2  - TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2  - TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3 | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_RTM\_FIS\_0001 Communication TPMS sensors to RTM

The RTM module shall communicate with TPMS sensors through UHF frequency 433.9 MHz +- xx, and support LF service frequency in legacy FNV2, FNV3 Electrical Architectures.

Note: In FNV4 and beyond, the BUN module shall communicate through Bluetooth technology with TPMS sensors.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The RTM module shall communicate with TPMS sensors through UHF frequency 433.9 MHz +- xx, and support LF service frequency in legacy FNV2, FNV3 Electrical Architectures.    Note: In FNV4 and beyond, the BUN module shall communicate through Bluetooth technology with TPMS sensors. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_RTM\_FIS\_0002 TPMS sensors recognize

The RTM module shall be able to recognize and support 6 vehicle TPMS sensors through Radio Frequency.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The RTM module shall be able to recognize and support 6 vehicle TPMS sensors through Radio Frequency. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

### APIM

APIM

#### Technology Function -1543687678.jpg Configure Display Units

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. | -1228322518.jpg Disp\_VehUnitTempUsrSel | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | -1228322518.jpg Disp\_VehUntTripCoUsrSel | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | -1228322518.jpg CtrStkFeatConfigActl | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | -1228322518.jpg CtrStkPersIndex\_D\_Actl | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | -1228322518.jpg CtrStkFeatNoActl | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | -1228322518.jpg CtrStkDsplyOp\_D\_Rq | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Configure Display Units

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0005 TPMS data - RTM/Sensor to BCM

The BCM module shall receive and process the TPMS sensors data frames (tire pressure, tire temperature and sensors diagnostics) of all mounted/installed road tires, not including monitoring for spare tire.

TPMS data sent from RTM to BCM through Private CAN:

- TPMSDataPacket

- TirePress\_Frame\_ID\_CFG\_0

- TirePress\_Frame\_ID\_CFG\_1

- TirePress\_Frame\_ID\_CFG\_2

- TirePress\_Frame\_ID\_CFG\_3

- TirePress\_Frame\_Press

- TirePress\_Frame\_Temp

- TirePress\_Frame\_Status

- TirePress\_Frame\_Checksum

- Checksum

- TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2

- TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2

- TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3

Note: TPMS sensor ID information shall include characters to confirm final TPMS assembly (TPMS Sensor + Valve Stem type).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall receive and process the TPMS sensors data frames (tire pressure, tire temperature and sensors diagnostics) of all mounted/installed road tires, not including monitoring for spare tire.    TPMS data sent from RTM to BCM through Private CAN:  - TPMSDataPacket  - TirePress\_Frame\_ID\_CFG\_0  - TirePress\_Frame\_ID\_CFG\_1  - TirePress\_Frame\_ID\_CFG\_2  - TirePress\_Frame\_ID\_CFG\_3  - TirePress\_Frame\_Press  - TirePress\_Frame\_Temp  - TirePress\_Frame\_Status  - TirePress\_Frame\_Checksum  - Checksum  - TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2  - TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2  - TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3    Note: TPMS sensor ID information shall include characters to confirm final TPMS assembly (TPMS Sensor + Valve Stem type). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0004 TPMS system - ECUs to BCM

The BCM module shall receive the following signals from other modules:

- TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);

- Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);

- Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);

- TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Odometer
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall receive the following signals from other modules:  - TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);  - Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);  - Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);  - TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0005 TPMS tires pressure in the cluster

IPC module shall display Tires Pressure in the cluster.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall display Tires Pressure in the cluster. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg APIM - Customer Reset

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| -1910009838.jpg resetRequest | 658883941.jpg TirePReset\_B\_Rq | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function APIM - Customer Reset

##### Function Requirements

###### Component Specific Requirements

No “Approved” or “Ready for Review” requirements identified for this function.

### ABS\_EBB

ABS\_EBB

#### Technology Function -1543687678.jpg Provide wheel speed

##### Function Interfaces

###### Inputs

(No inputs have been defined)

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| -1910009838.jpg wheelSpeedStatus | -1228322518.jpg WhlRotatRr\_No\_Cnt | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| -1910009838.jpg wheelSpeedStatus | -1228322518.jpg WhlRotatFr\_No\_Cnt | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| -1910009838.jpg wheelSpeedStatus | -1228322518.jpg WhlRotatFl\_No\_Cnt | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| -1910009838.jpg wheelSpeedStatus | -1228322518.jpg WhlRotatRl\_No\_Cnt | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Provide wheel speed

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_ABS\_FIS\_0002 Wheel Speed Signals - wheel speed sensor data

The ABS/EBB module shall process raw wheel speed sensor data (of each invidividual wheel) and publish wheel speed signals over CAN within 7ms.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide wheel speed
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The ABS/EBB module shall process raw wheel speed sensor data (of each invidividual wheel) and publish wheel speed signals over CAN within 7ms. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_ABS\_FIS\_0001 Wheel Speed Signals - wheel speed signal

The ABS/EBB module shall send wheel speed signal (of each invidividual wheel) to BCM module.

Observation: WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide wheel speed
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The ABS/EBB module shall send wheel speed signal (of each invidividual wheel) to BCM module.  Observation: WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

### TPMS Sensors

TPMS Sensors

#### Technology Function -1543687678.jpg Provide Sensor Data

##### Function Interfaces

###### Inputs

(No inputs have been defined)

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. | 172051543.jpg TPMS\_Sensor | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Provide Sensor Data

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0001 Tire Pressure wake up

The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).

BCM (Tx) tire pressure values over CAN:

- Tire\_Press\_LF\_Data

- Tire\_Press\_RF\_Data

- Tire\_Press\_IRR\_Data

- Tire\_Press\_ILR\_Data

- Tire\_Press\_RR\_ORR\_Data

- Tire\_Press\_LR\_OLR\_Data

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).    BCM (Tx) tire pressure values over CAN:  - Tire\_Press\_LF\_Data  - Tire\_Press\_RF\_Data  - Tire\_Press\_IRR\_Data  - Tire\_Press\_ILR\_Data  - Tire\_Press\_RR\_ORR\_Data  - Tire\_Press\_LR\_OLR\_Data | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0002 Tire Low strategy

The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0017 TPMS DTCs System

The BCM shall implement diagnostic codes to indicate when vehicle has not finished TPMS configuration/sensors association (re: Build Mode). Presence of TPMS Diagnostic codes shall cause TPMS Telltale to remain illuminated.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement diagnostic codes to indicate when vehicle has not finished TPMS configuration/sensors association (re: Build Mode). Presence of TPMS Diagnostic codes shall cause TPMS Telltale to remain illuminated. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0022 TPMS DTCs received for BCM by RTM

BCM diagnostic codes for each individual sensors location shall be cleared only when data transmissions from the associated sensors have been received without any impairment/compatibility problems. BCM diagnostic codes for individual sensor locations shall not be cleared in other ways.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | BCM diagnostic codes for each individual sensors location shall be cleared only when data transmissions from the associated sensors have been received without any impairment/compatibility problems. BCM diagnostic codes for individual sensor locations shall not be cleared in other ways. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0015 TPMS Sensors ID Verify

Except while Learn Mode is True, the BCM shall verify If the received TPM Sensors ID match with the already saved ID's. In case of any TPMS Sensor ID does not match, then the BCM shall set Sensor Status data flow to ‘INVALID’.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | Except while Learn Mode is True, the BCM shall verify If the received TPM Sensors ID match with the already saved ID's. In case of any TPMS Sensor ID does not match, then the BCM shall set Sensor Status data flow to ‘INVALID’. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0023 TPMS sensors Auto-Location

The BCM module shall not complete automatic association of new sensors or automatic wheel location determination while any TPMS sensor has status of Fault/Malfunction.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall not complete automatic association of new sensors or automatic wheel location determination while any TPMS sensor has status of Fault/Malfunction. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0018 TPMS DTCs by Sensor

The BCM diagnostic codes shall indicate when individual sensor locations have not been setup or have confirmed impairment/compatibility problems.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM diagnostic codes shall indicate when individual sensor locations have not been setup or have confirmed impairment/compatibility problems. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

-466516290.jpg - R\_F\_TPMS\_FIS\_0001 TPMS sensors data to RTM

TPMS sensors shall communicate:

- with BUN module through Bluetooth technology in FNV4 Electrical Archictures and beyond;

- with RTM through UHF frequency 433.9 MHz +- xx, and support LF service frequency in legacy FNV2, FNV3 Electrical Architectures.

Satisfied by:

* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Provide Sensor Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | TPMS sensors shall communicate:  - with BUN module through Bluetooth technology in FNV4 Electrical Archictures and beyond;  - with RTM through UHF frequency 433.9 MHz +- xx, and support LF service frequency in legacy FNV2, FNV3 Electrical Architectures. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0021 TPMS DTCs (BCM Internal memory to sensor ID)

Writing/injecting any data into memory reserved for storage of TPMS sensor identification data shall cause BCM Diagnostic codes for all individual sensor locations to be created or re-applied (if previously cleared).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | Writing/injecting any data into memory reserved for storage of TPMS sensor identification data shall cause BCM Diagnostic codes for all individual sensor locations to be created or re-applied (if previously cleared). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0011 Manual Learn

The BCM shall implement a Manual Learn algorithm for TPMS sensors association and location, in case of service. The following criteria and rules shall be satisfied:

- the manual Learn process initialization shall be requested through special tool or through specific sequence of brake and ignition switches activations, according to technical service guide;

- the vehicle must be in Park (speed = 0kph);

- 2 (two) identical and consecutive sensor frames shall be received before acccepting a new sensor ID during Manual Learn Mode;

- tire pressure warnings shall not be requested when associating TPMS sensors to the vehicle;

- the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;

- If Learn Mode is True and any tire reports a low pressure, the BCM shall report it upon successful completion of learn mode;

- Upon successful completion of the Manual Learn process, the BCM shall self clear all sensor fault DTCs.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Gear Lever Position
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Provide Vehicle Speed
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a Manual Learn algorithm for TPMS sensors association and location, in case of service. The following criteria and rules shall be satisfied:  - the manual Learn process initialization shall be requested through special tool or through specific sequence of brake and ignition switches activations, according to technical service guide;  - the vehicle must be in Park (speed = 0kph);  - 2 (two) identical and consecutive sensor frames shall be received before acccepting a new sensor ID during Manual Learn Mode;  - tire pressure warnings shall not be requested when associating TPMS sensors to the vehicle;  - the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;  - If Learn Mode is True and any tire reports a low pressure, the BCM shall report it upon successful completion of learn mode;  - Upon successful completion of the Manual Learn process, the BCM shall self clear all sensor fault DTCs. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0016 TPMS Sensors Auto-Location (algorithm)

The BCM shall implement an auto-location algorithm to determine to which road wheel each TPMS sensor is mounted when vehicle is driven (over 32kph). The auto-location algorithm shall be executed every ignition cycle.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement an auto-location algorithm to determine to which road wheel each TPMS sensor is mounted when vehicle is driven (over 32kph). The auto-location algorithm shall be executed every ignition cycle. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0014 TPMS Sensors Auto-Location (type)

The BCM shall attempt to determine which TPMS sensors are mounted/installed on road wheels when vehicle is driven (ver 32kph).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall attempt to determine which TPMS sensors are mounted/installed on road wheels when vehicle is driven (ver 32kph). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0012 Reassignment Mode

The BCM shall implement a Reassignment algorithm to reassign sensor locations after tires rotation (when no new sensors have been mounted). The following criteria and rules shall be satisfied:

- this procedure shall not require special tool and instructions shall be provided in the Owner´s Manual;

- the vehicle must be in Park (speed = 0kph);

- BCM shall process each TPMS sensor reassignment by detecting a 'rapid tire pressure change' (removing or adding air in the tire);

- BCM shall not request any tire pressure warning when Re-Assigning sensors to the vehicle;

- the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;

- upon successful completion of the reassignment process the BCM shall self clear all sensor fault DTCs;

- while Re-Assignment Mode is True and if any tire reports a low pressure, the BCM shall immediately report it upon successful completion of Re-Assignment mode;

- the following sequence of hazard and ignition switches activation shall be used for reassignment process initialization: when Ignition Status is RUN/START and Learn mode is FALSE, and the Hazard switch has been turned from OFF to ON, and turned to OFF, Reassignment mode entry counter is incremented and timer is started. Once the Reassignment mode entry count is greater than Hazard Cycle reassignment count, then Reassignment mode is activated. In case, the timer expires before it enters Reassignment mode, or brake pedal is pressed, or Ignition Status is changed to OFF/ACC or if Vehicle speed is increased more than 4kph, then Reassignment mode is exited.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Gear Lever Position
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Provide Vehicle Speed
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a Reassignment algorithm to reassign sensor locations after tires rotation (when no new sensors have been mounted). The following criteria and rules shall be satisfied:  - this procedure shall not require special tool and instructions shall be provided in the Owner´s Manual;  - the vehicle must be in Park (speed = 0kph);  - BCM shall process each TPMS sensor reassignment by detecting a 'rapid tire pressure change' (removing or adding air in the tire);  - BCM shall not request any tire pressure warning when Re-Assigning sensors to the vehicle;  - the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;  - upon successful completion of the reassignment process the BCM shall self clear all sensor fault DTCs;  - while Re-Assignment Mode is True and if any tire reports a low pressure, the BCM shall immediately report it upon successful completion of Re-Assignment mode;  - the following sequence of hazard and ignition switches activation shall be used for reassignment process initialization: when Ignition Status is RUN/START and Learn mode is FALSE, and the Hazard switch has been turned from OFF to ON, and turned to OFF, Reassignment mode entry counter is incremented and timer is started. Once the Reassignment mode entry count is greater than Hazard Cycle reassignment count, then Reassignment mode is activated. In case, the timer expires before it enters Reassignment mode, or brake pedal is pressed, or Ignition Status is changed to OFF/ACC or if Vehicle speed is increased more than 4kph, then Reassignment mode is exited. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

### PCM

PCM

#### Technology Function -1543687678.jpg Provide Gear Lever Position

##### Function Interfaces

###### Inputs

(No inputs have been defined)

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| -1910009838.jpg gearLeverPosition | -1228322518.jpg GearLvrPos\_D\_Actl | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Provide Gear Lever Position

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0011 Manual Learn

The BCM shall implement a Manual Learn algorithm for TPMS sensors association and location, in case of service. The following criteria and rules shall be satisfied:

- the manual Learn process initialization shall be requested through special tool or through specific sequence of brake and ignition switches activations, according to technical service guide;

- the vehicle must be in Park (speed = 0kph);

- 2 (two) identical and consecutive sensor frames shall be received before acccepting a new sensor ID during Manual Learn Mode;

- tire pressure warnings shall not be requested when associating TPMS sensors to the vehicle;

- the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;

- If Learn Mode is True and any tire reports a low pressure, the BCM shall report it upon successful completion of learn mode;

- Upon successful completion of the Manual Learn process, the BCM shall self clear all sensor fault DTCs.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Gear Lever Position
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Provide Vehicle Speed
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a Manual Learn algorithm for TPMS sensors association and location, in case of service. The following criteria and rules shall be satisfied:  - the manual Learn process initialization shall be requested through special tool or through specific sequence of brake and ignition switches activations, according to technical service guide;  - the vehicle must be in Park (speed = 0kph);  - 2 (two) identical and consecutive sensor frames shall be received before acccepting a new sensor ID during Manual Learn Mode;  - tire pressure warnings shall not be requested when associating TPMS sensors to the vehicle;  - the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;  - If Learn Mode is True and any tire reports a low pressure, the BCM shall report it upon successful completion of learn mode;  - Upon successful completion of the Manual Learn process, the BCM shall self clear all sensor fault DTCs. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_PCM\_FIS\_0001 Powertrain signals

The PCM (Powertrain Module) shall provide the following signals to BCM:

- barometric pressure (AirAmb\_P\_Actl);

- vehicle speed with quality factor (Veh\_V\_ActlEng, VehVActlEng\_D\_Qf);

- gear lever position (GearLvrPos\_D\_Actl).

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Provide Barometric Pressure
* -1543687678.jpg Provide Gear Lever Position

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The PCM (Powertrain Module) shall provide the following signals to BCM:  - barometric pressure (AirAmb\_P\_Actl);  - vehicle speed with quality factor (Veh\_V\_ActlEng, VehVActlEng\_D\_Qf);  - gear lever position (GearLvrPos\_D\_Actl). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0012 Reassignment Mode

The BCM shall implement a Reassignment algorithm to reassign sensor locations after tires rotation (when no new sensors have been mounted). The following criteria and rules shall be satisfied:

- this procedure shall not require special tool and instructions shall be provided in the Owner´s Manual;

- the vehicle must be in Park (speed = 0kph);

- BCM shall process each TPMS sensor reassignment by detecting a 'rapid tire pressure change' (removing or adding air in the tire);

- BCM shall not request any tire pressure warning when Re-Assigning sensors to the vehicle;

- the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;

- upon successful completion of the reassignment process the BCM shall self clear all sensor fault DTCs;

- while Re-Assignment Mode is True and if any tire reports a low pressure, the BCM shall immediately report it upon successful completion of Re-Assignment mode;

- the following sequence of hazard and ignition switches activation shall be used for reassignment process initialization: when Ignition Status is RUN/START and Learn mode is FALSE, and the Hazard switch has been turned from OFF to ON, and turned to OFF, Reassignment mode entry counter is incremented and timer is started. Once the Reassignment mode entry count is greater than Hazard Cycle reassignment count, then Reassignment mode is activated. In case, the timer expires before it enters Reassignment mode, or brake pedal is pressed, or Ignition Status is changed to OFF/ACC or if Vehicle speed is increased more than 4kph, then Reassignment mode is exited.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Gear Lever Position
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Provide Vehicle Speed
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a Reassignment algorithm to reassign sensor locations after tires rotation (when no new sensors have been mounted). The following criteria and rules shall be satisfied:  - this procedure shall not require special tool and instructions shall be provided in the Owner´s Manual;  - the vehicle must be in Park (speed = 0kph);  - BCM shall process each TPMS sensor reassignment by detecting a 'rapid tire pressure change' (removing or adding air in the tire);  - BCM shall not request any tire pressure warning when Re-Assigning sensors to the vehicle;  - the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;  - upon successful completion of the reassignment process the BCM shall self clear all sensor fault DTCs;  - while Re-Assignment Mode is True and if any tire reports a low pressure, the BCM shall immediately report it upon successful completion of Re-Assignment mode;  - the following sequence of hazard and ignition switches activation shall be used for reassignment process initialization: when Ignition Status is RUN/START and Learn mode is FALSE, and the Hazard switch has been turned from OFF to ON, and turned to OFF, Reassignment mode entry counter is incremented and timer is started. Once the Reassignment mode entry count is greater than Hazard Cycle reassignment count, then Reassignment mode is activated. In case, the timer expires before it enters Reassignment mode, or brake pedal is pressed, or Ignition Status is changed to OFF/ACC or if Vehicle speed is increased more than 4kph, then Reassignment mode is exited. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Provide Vehicle Speed

##### Function Interfaces

###### Inputs

(No inputs have been defined)

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| -1910009838.jpg vehicleSpeed | -1228322518.jpg Veh\_V\_ActlEng | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. | 658883941.jpg VehVActlEng\_D\_Qf | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Provide Vehicle Speed

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0011 Manual Learn

The BCM shall implement a Manual Learn algorithm for TPMS sensors association and location, in case of service. The following criteria and rules shall be satisfied:

- the manual Learn process initialization shall be requested through special tool or through specific sequence of brake and ignition switches activations, according to technical service guide;

- the vehicle must be in Park (speed = 0kph);

- 2 (two) identical and consecutive sensor frames shall be received before acccepting a new sensor ID during Manual Learn Mode;

- tire pressure warnings shall not be requested when associating TPMS sensors to the vehicle;

- the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;

- If Learn Mode is True and any tire reports a low pressure, the BCM shall report it upon successful completion of learn mode;

- Upon successful completion of the Manual Learn process, the BCM shall self clear all sensor fault DTCs.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Gear Lever Position
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Provide Vehicle Speed
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a Manual Learn algorithm for TPMS sensors association and location, in case of service. The following criteria and rules shall be satisfied:  - the manual Learn process initialization shall be requested through special tool or through specific sequence of brake and ignition switches activations, according to technical service guide;  - the vehicle must be in Park (speed = 0kph);  - 2 (two) identical and consecutive sensor frames shall be received before acccepting a new sensor ID during Manual Learn Mode;  - tire pressure warnings shall not be requested when associating TPMS sensors to the vehicle;  - the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;  - If Learn Mode is True and any tire reports a low pressure, the BCM shall report it upon successful completion of learn mode;  - Upon successful completion of the Manual Learn process, the BCM shall self clear all sensor fault DTCs. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0012 Reassignment Mode

The BCM shall implement a Reassignment algorithm to reassign sensor locations after tires rotation (when no new sensors have been mounted). The following criteria and rules shall be satisfied:

- this procedure shall not require special tool and instructions shall be provided in the Owner´s Manual;

- the vehicle must be in Park (speed = 0kph);

- BCM shall process each TPMS sensor reassignment by detecting a 'rapid tire pressure change' (removing or adding air in the tire);

- BCM shall not request any tire pressure warning when Re-Assigning sensors to the vehicle;

- the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;

- upon successful completion of the reassignment process the BCM shall self clear all sensor fault DTCs;

- while Re-Assignment Mode is True and if any tire reports a low pressure, the BCM shall immediately report it upon successful completion of Re-Assignment mode;

- the following sequence of hazard and ignition switches activation shall be used for reassignment process initialization: when Ignition Status is RUN/START and Learn mode is FALSE, and the Hazard switch has been turned from OFF to ON, and turned to OFF, Reassignment mode entry counter is incremented and timer is started. Once the Reassignment mode entry count is greater than Hazard Cycle reassignment count, then Reassignment mode is activated. In case, the timer expires before it enters Reassignment mode, or brake pedal is pressed, or Ignition Status is changed to OFF/ACC or if Vehicle speed is increased more than 4kph, then Reassignment mode is exited.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Gear Lever Position
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Provide Vehicle Speed
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a Reassignment algorithm to reassign sensor locations after tires rotation (when no new sensors have been mounted). The following criteria and rules shall be satisfied:  - this procedure shall not require special tool and instructions shall be provided in the Owner´s Manual;  - the vehicle must be in Park (speed = 0kph);  - BCM shall process each TPMS sensor reassignment by detecting a 'rapid tire pressure change' (removing or adding air in the tire);  - BCM shall not request any tire pressure warning when Re-Assigning sensors to the vehicle;  - the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;  - upon successful completion of the reassignment process the BCM shall self clear all sensor fault DTCs;  - while Re-Assignment Mode is True and if any tire reports a low pressure, the BCM shall immediately report it upon successful completion of Re-Assignment mode;  - the following sequence of hazard and ignition switches activation shall be used for reassignment process initialization: when Ignition Status is RUN/START and Learn mode is FALSE, and the Hazard switch has been turned from OFF to ON, and turned to OFF, Reassignment mode entry counter is incremented and timer is started. Once the Reassignment mode entry count is greater than Hazard Cycle reassignment count, then Reassignment mode is activated. In case, the timer expires before it enters Reassignment mode, or brake pedal is pressed, or Ignition Status is changed to OFF/ACC or if Vehicle speed is increased more than 4kph, then Reassignment mode is exited. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Provide Barometric Pressure

##### Function Interfaces

###### Inputs

(No inputs have been defined)

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| -1910009838.jpg barometricPressure | -1228322518.jpg AirAmb\_P\_Actl | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Provide Barometric Pressure

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_PCM\_FIS\_0001 Powertrain signals

The PCM (Powertrain Module) shall provide the following signals to BCM:

- barometric pressure (AirAmb\_P\_Actl);

- vehicle speed with quality factor (Veh\_V\_ActlEng, VehVActlEng\_D\_Qf);

- gear lever position (GearLvrPos\_D\_Actl).

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Provide Barometric Pressure
* -1543687678.jpg Provide Gear Lever Position

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The PCM (Powertrain Module) shall provide the following signals to BCM:  - barometric pressure (AirAmb\_P\_Actl);  - vehicle speed with quality factor (Veh\_V\_ActlEng, VehVActlEng\_D\_Qf);  - gear lever position (GearLvrPos\_D\_Actl). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0006 TPMS BP compensation

The BCM shall compensante the tire pressure values from the TPMS sensors with local barometric pressure (AirAmb\_P\_Actl).

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Provide Barometric Pressure

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall compensante the tire pressure values from the TPMS sensors with local barometric pressure (AirAmb\_P\_Actl). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

### IPC

IPC

#### Technology Function -1543687678.jpg Indicate Tires pressure and temperature

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Indicate Tires pressure and temperature

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0001 Tire Pressure wake up

The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).

BCM (Tx) tire pressure values over CAN:

- Tire\_Press\_LF\_Data

- Tire\_Press\_RF\_Data

- Tire\_Press\_IRR\_Data

- Tire\_Press\_ILR\_Data

- Tire\_Press\_RR\_ORR\_Data

- Tire\_Press\_LR\_OLR\_Data

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).    BCM (Tx) tire pressure values over CAN:  - Tire\_Press\_LF\_Data  - Tire\_Press\_RF\_Data  - Tire\_Press\_IRR\_Data  - Tire\_Press\_ILR\_Data  - Tire\_Press\_RR\_ORR\_Data  - Tire\_Press\_LR\_OLR\_Data | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0002 Tire Low strategy

The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0011 TPMS IOD

IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0015 TPMS Sensors ID Verify

Except while Learn Mode is True, the BCM shall verify If the received TPM Sensors ID match with the already saved ID's. In case of any TPMS Sensor ID does not match, then the BCM shall set Sensor Status data flow to ‘INVALID’.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | Except while Learn Mode is True, the BCM shall verify If the received TPM Sensors ID match with the already saved ID's. In case of any TPMS Sensor ID does not match, then the BCM shall set Sensor Status data flow to ‘INVALID’. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0023 TPMS sensors Auto-Location

The BCM module shall not complete automatic association of new sensors or automatic wheel location determination while any TPMS sensor has status of Fault/Malfunction.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall not complete automatic association of new sensors or automatic wheel location determination while any TPMS sensor has status of Fault/Malfunction. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0007 Low Tire Pressure by market

The BCM module shall provide low tire pressure warning indication according to each market-applicable regulation.

TPMS system and sensors status over CAN from BCM to IPC and APIM:

- Tire\_Press\_System\_Stat

- Tire\_Press\_Telltale

- TirePReset\_D\_Stat

- Tire\_Press\_LF\_Stat

- Tire\_Press\_RF\_Stat

- Tire\_Press\_IRR\_Stat

- Tire\_Press\_ILR\_Stat

- Tire\_Press\_RR\_ORR\_Stat

- Tire\_Press\_LR\_OLR\_Stat

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall provide low tire pressure warning indication according to each market-applicable regulation.    TPMS system and sensors status over CAN from BCM to IPC and APIM:  - Tire\_Press\_System\_Stat  - Tire\_Press\_Telltale  - TirePReset\_D\_Stat  - Tire\_Press\_LF\_Stat  - Tire\_Press\_RF\_Stat  - Tire\_Press\_IRR\_Stat  - Tire\_Press\_ILR\_Stat  - Tire\_Press\_RR\_ORR\_Stat  - Tire\_Press\_LR\_OLR\_Stat | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0006 TPMS IPC to HMI to display the warnings

IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0005 TPMS tires pressure in the cluster

IPC module shall display Tires Pressure in the cluster.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall display Tires Pressure in the cluster. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

-466516290.jpg - R\_F\_TPMS\_FIS\_0001 TPMS sensors data to RTM

TPMS sensors shall communicate:

- with BUN module through Bluetooth technology in FNV4 Electrical Archictures and beyond;

- with RTM through UHF frequency 433.9 MHz +- xx, and support LF service frequency in legacy FNV2, FNV3 Electrical Architectures.

Satisfied by:

* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Provide Sensor Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | TPMS sensors shall communicate:  - with BUN module through Bluetooth technology in FNV4 Electrical Archictures and beyond;  - with RTM through UHF frequency 433.9 MHz +- xx, and support LF service frequency in legacy FNV2, FNV3 Electrical Architectures. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0008 Low Tire Pressure determined by BCM

The BCM shall determine if a low pressure warning needs to be requested according to TPMS sensors data and thresholds.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall determine if a low pressure warning needs to be requested according to TPMS sensors data and thresholds. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0016 TPMS Sensors Auto-Location (algorithm)

The BCM shall implement an auto-location algorithm to determine to which road wheel each TPMS sensor is mounted when vehicle is driven (over 32kph). The auto-location algorithm shall be executed every ignition cycle.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement an auto-location algorithm to determine to which road wheel each TPMS sensor is mounted when vehicle is driven (over 32kph). The auto-location algorithm shall be executed every ignition cycle. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0003 TPMS system - BCM to APIM/IPC

The BCM shall provide the following signals to IPC and APIM:

- Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);

- Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);

- TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;

-Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

- Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).

-Tire\_Press\_XXX\_Data: Tire pressure value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

-Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).

- Ignition\_Status / Power Mode.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Cluster Navigation

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall provide the following signals to IPC and APIM:  - Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);  - Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);  - TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;  -Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  - Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).  -Tire\_Press\_XXX\_Data: Tire pressure value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  -Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).  - Ignition\_Status / Power Mode. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0014 TPMS Sensors Auto-Location (type)

The BCM shall attempt to determine which TPMS sensors are mounted/installed on road wheels when vehicle is driven (ver 32kph).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall attempt to determine which TPMS sensors are mounted/installed on road wheels when vehicle is driven (ver 32kph). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0001 TPMS data

IPC and APIM modules shall receive the following signals from BCM:

- Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);

- Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);

- TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;

- Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

- Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).

-Tire\_Press\_XXX\_Data: Tire pressure value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

-Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).

- Ignition\_Status / Power Mode.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC and APIM modules shall receive the following signals from BCM:  - Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);  - Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);  - TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;  - Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  - Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).  -Tire\_Press\_XXX\_Data: Tire pressure value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  -Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).  - Ignition\_Status / Power Mode. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Display Learning instructions

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Display Learning instructions

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0011 TPMS IOD

IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0014 TPMS sensors learning instructions

IPC shall indicate instructions to user when manual learn/train or re-assignment procedures are active.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall indicate instructions to user when manual learn/train or re-assignment procedures are active. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0011 Manual Learn

The BCM shall implement a Manual Learn algorithm for TPMS sensors association and location, in case of service. The following criteria and rules shall be satisfied:

- the manual Learn process initialization shall be requested through special tool or through specific sequence of brake and ignition switches activations, according to technical service guide;

- the vehicle must be in Park (speed = 0kph);

- 2 (two) identical and consecutive sensor frames shall be received before acccepting a new sensor ID during Manual Learn Mode;

- tire pressure warnings shall not be requested when associating TPMS sensors to the vehicle;

- the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;

- If Learn Mode is True and any tire reports a low pressure, the BCM shall report it upon successful completion of learn mode;

- Upon successful completion of the Manual Learn process, the BCM shall self clear all sensor fault DTCs.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Gear Lever Position
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Provide Vehicle Speed
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a Manual Learn algorithm for TPMS sensors association and location, in case of service. The following criteria and rules shall be satisfied:  - the manual Learn process initialization shall be requested through special tool or through specific sequence of brake and ignition switches activations, according to technical service guide;  - the vehicle must be in Park (speed = 0kph);  - 2 (two) identical and consecutive sensor frames shall be received before acccepting a new sensor ID during Manual Learn Mode;  - tire pressure warnings shall not be requested when associating TPMS sensors to the vehicle;  - the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;  - If Learn Mode is True and any tire reports a low pressure, the BCM shall report it upon successful completion of learn mode;  - Upon successful completion of the Manual Learn process, the BCM shall self clear all sensor fault DTCs. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0006 TPMS IPC to HMI to display the warnings

IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0003 TPMS system - BCM to APIM/IPC

The BCM shall provide the following signals to IPC and APIM:

- Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);

- Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);

- TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;

-Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

- Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).

-Tire\_Press\_XXX\_Data: Tire pressure value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

-Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).

- Ignition\_Status / Power Mode.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Cluster Navigation

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall provide the following signals to IPC and APIM:  - Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);  - Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);  - TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;  -Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  - Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).  -Tire\_Press\_XXX\_Data: Tire pressure value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  -Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).  - Ignition\_Status / Power Mode. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0012 Reassignment Mode

The BCM shall implement a Reassignment algorithm to reassign sensor locations after tires rotation (when no new sensors have been mounted). The following criteria and rules shall be satisfied:

- this procedure shall not require special tool and instructions shall be provided in the Owner´s Manual;

- the vehicle must be in Park (speed = 0kph);

- BCM shall process each TPMS sensor reassignment by detecting a 'rapid tire pressure change' (removing or adding air in the tire);

- BCM shall not request any tire pressure warning when Re-Assigning sensors to the vehicle;

- the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;

- upon successful completion of the reassignment process the BCM shall self clear all sensor fault DTCs;

- while Re-Assignment Mode is True and if any tire reports a low pressure, the BCM shall immediately report it upon successful completion of Re-Assignment mode;

- the following sequence of hazard and ignition switches activation shall be used for reassignment process initialization: when Ignition Status is RUN/START and Learn mode is FALSE, and the Hazard switch has been turned from OFF to ON, and turned to OFF, Reassignment mode entry counter is incremented and timer is started. Once the Reassignment mode entry count is greater than Hazard Cycle reassignment count, then Reassignment mode is activated. In case, the timer expires before it enters Reassignment mode, or brake pedal is pressed, or Ignition Status is changed to OFF/ACC or if Vehicle speed is increased more than 4kph, then Reassignment mode is exited.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Gear Lever Position
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Provide Vehicle Speed
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a Reassignment algorithm to reassign sensor locations after tires rotation (when no new sensors have been mounted). The following criteria and rules shall be satisfied:  - this procedure shall not require special tool and instructions shall be provided in the Owner´s Manual;  - the vehicle must be in Park (speed = 0kph);  - BCM shall process each TPMS sensor reassignment by detecting a 'rapid tire pressure change' (removing or adding air in the tire);  - BCM shall not request any tire pressure warning when Re-Assigning sensors to the vehicle;  - the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;  - upon successful completion of the reassignment process the BCM shall self clear all sensor fault DTCs;  - while Re-Assignment Mode is True and if any tire reports a low pressure, the BCM shall immediately report it upon successful completion of Re-Assignment mode;  - the following sequence of hazard and ignition switches activation shall be used for reassignment process initialization: when Ignition Status is RUN/START and Learn mode is FALSE, and the Hazard switch has been turned from OFF to ON, and turned to OFF, Reassignment mode entry counter is incremented and timer is started. Once the Reassignment mode entry count is greater than Hazard Cycle reassignment count, then Reassignment mode is activated. In case, the timer expires before it enters Reassignment mode, or brake pedal is pressed, or Ignition Status is changed to OFF/ACC or if Vehicle speed is increased more than 4kph, then Reassignment mode is exited. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0001 TPMS data

IPC and APIM modules shall receive the following signals from BCM:

- Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);

- Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);

- TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;

- Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

- Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).

-Tire\_Press\_XXX\_Data: Tire pressure value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

-Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).

- Ignition\_Status / Power Mode.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC and APIM modules shall receive the following signals from BCM:  - Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);  - Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);  - TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;  - Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  - Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).  -Tire\_Press\_XXX\_Data: Tire pressure value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  -Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).  - Ignition\_Status / Power Mode. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Turns Telltale ON/Flashing/OFF

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Turns Telltale ON/Flashing/OFF

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0009 TPMS sensors status composite

The BCM shall determine a composite TPMS status based on the status communicated from all supported TPMS sensors.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall determine a composite TPMS status based on the status communicated from all supported TPMS sensors. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0002 Tire Low strategy

The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0010 TPMS cluster warnings during same ignition cycle

IPC shall not allow TPMS warnings for a unique low pressure/malfunction event to reappear during the same ignition session.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall not allow TPMS warnings for a unique low pressure/malfunction event to reappear during the same ignition session. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0011 TPMS IOD

IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0017 TPMS DTCs System

The BCM shall implement diagnostic codes to indicate when vehicle has not finished TPMS configuration/sensors association (re: Build Mode). Presence of TPMS Diagnostic codes shall cause TPMS Telltale to remain illuminated.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement diagnostic codes to indicate when vehicle has not finished TPMS configuration/sensors association (re: Build Mode). Presence of TPMS Diagnostic codes shall cause TPMS Telltale to remain illuminated. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0022 TPMS DTCs received for BCM by RTM

BCM diagnostic codes for each individual sensors location shall be cleared only when data transmissions from the associated sensors have been received without any impairment/compatibility problems. BCM diagnostic codes for individual sensor locations shall not be cleared in other ways.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | BCM diagnostic codes for each individual sensors location shall be cleared only when data transmissions from the associated sensors have been received without any impairment/compatibility problems. BCM diagnostic codes for individual sensor locations shall not be cleared in other ways. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0007 Low Tire Pressure by market

The BCM module shall provide low tire pressure warning indication according to each market-applicable regulation.

TPMS system and sensors status over CAN from BCM to IPC and APIM:

- Tire\_Press\_System\_Stat

- Tire\_Press\_Telltale

- TirePReset\_D\_Stat

- Tire\_Press\_LF\_Stat

- Tire\_Press\_RF\_Stat

- Tire\_Press\_IRR\_Stat

- Tire\_Press\_ILR\_Stat

- Tire\_Press\_RR\_ORR\_Stat

- Tire\_Press\_LR\_OLR\_Stat

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall provide low tire pressure warning indication according to each market-applicable regulation.    TPMS system and sensors status over CAN from BCM to IPC and APIM:  - Tire\_Press\_System\_Stat  - Tire\_Press\_Telltale  - TirePReset\_D\_Stat  - Tire\_Press\_LF\_Stat  - Tire\_Press\_RF\_Stat  - Tire\_Press\_IRR\_Stat  - Tire\_Press\_ILR\_Stat  - Tire\_Press\_RR\_ORR\_Stat  - Tire\_Press\_LR\_OLR\_Stat | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

-466516290.jpg - R\_F\_IPC\_APIM\_FIS\_0008 TPMS telltale proveout

IPC shall prove out (illuminate TPMS telltale, then extinguish if no TPMS warning active) each Ignition cycle, first illuminating no later than five (5) seconds after Ignition has been set to ON/Run/Start from Off/Accessory.

Satisfied by:

* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall prove out (illuminate TPMS telltale, then extinguish if no TPMS warning active) each Ignition cycle, first illuminating no later than five (5) seconds after Ignition has been set to ON/Run/Start from Off/Accessory. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0018 TPMS DTCs by Sensor

The BCM diagnostic codes shall indicate when individual sensor locations have not been setup or have confirmed impairment/compatibility problems.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM diagnostic codes shall indicate when individual sensor locations have not been setup or have confirmed impairment/compatibility problems. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0006 TPMS IPC to HMI to display the warnings

IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0007 TPMS cluster warnings when Power Mode On/Run/Start

IPC module shall display warnings (if present) when Ignition is On/Run/Start.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall display warnings (if present) when Ignition is On/Run/Start. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_ABS\_FIS\_0001 Wheel Speed Signals - wheel speed signal

The ABS/EBB module shall send wheel speed signal (of each invidividual wheel) to BCM module.

Observation: WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide wheel speed
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The ABS/EBB module shall send wheel speed signal (of each invidividual wheel) to BCM module.  Observation: WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0013 TPMS Placard (ECE-141)

IPC shall allow the customer to determine the warm placard pressure for each tire location to meet regulatory requirements (Regulatory item for Europe).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall allow the customer to determine the warm placard pressure for each tire location to meet regulatory requirements (Regulatory item for Europe). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_ABS\_FIS\_0002 Wheel Speed Signals - wheel speed sensor data

The ABS/EBB module shall process raw wheel speed sensor data (of each invidividual wheel) and publish wheel speed signals over CAN within 7ms.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide wheel speed
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The ABS/EBB module shall process raw wheel speed sensor data (of each invidividual wheel) and publish wheel speed signals over CAN within 7ms. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0020 TPMS Low Warning

[ECE-R141] The BCM shall support monitoring of warm operating tire pressure for each tire location.

Satisfied by:

* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | [ECE-R141] The BCM shall support monitoring of warm operating tire pressure for each tire location. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_RTM\_FIS\_0003 TPMS sensors (RTM to BCM)

The RTM module shall send TPMS sensors data frames (pressure, temperature, diagnostics) through Private CAN to BCM module.

RTM signals sent to BCM through private CAN:

- TPMSDataPacket

- TirePress\_Frame\_ID\_CFG\_0

- TirePress\_Frame\_ID\_CFG\_1

- TirePress\_Frame\_ID\_CFG\_2

- TirePress\_Frame\_ID\_CFG\_3

- TirePress\_Frame\_Press

- TirePress\_Frame\_Temp

- TirePress\_Frame\_Status

- TirePress\_Frame\_Checksum

- Checksum

- TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2

- TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2

- TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The RTM module shall send TPMS sensors data frames (pressure, temperature, diagnostics) through Private CAN to BCM module.    RTM signals sent to BCM through private CAN:  - TPMSDataPacket  - TirePress\_Frame\_ID\_CFG\_0  - TirePress\_Frame\_ID\_CFG\_1  - TirePress\_Frame\_ID\_CFG\_2  - TirePress\_Frame\_ID\_CFG\_3  - TirePress\_Frame\_Press  - TirePress\_Frame\_Temp  - TirePress\_Frame\_Status  - TirePress\_Frame\_Checksum  - Checksum  - TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2  - TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2  - TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3 | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0012 TPMS Reset Request (ECE-141)

IPC shall allow the customer to make TPMS system Reset Request (only for European customer / dealer). A customer Reset input shall enable the Auto Learn and Pwarm algorithms to learn new ID’s and new operating pressure per tire.

TirePReset\_B\_Rq is the Reset Request signal from HMI to BCM.

Tire\_Press\_System\_Stat, Tire\_PReset\_D\_Stat are feedback from BCM to HMI to confirm the reset was successfull.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall allow the customer to make TPMS system Reset Request (only for European customer / dealer). A customer Reset input shall enable the Auto Learn and Pwarm algorithms to learn new ID’s and new operating pressure per tire.    TirePReset\_B\_Rq is the Reset Request signal from HMI to BCM.    Tire\_Press\_System\_Stat, Tire\_PReset\_D\_Stat are feedback from BCM to HMI to confirm the reset was successfull. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0021 TPMS DTCs (BCM Internal memory to sensor ID)

Writing/injecting any data into memory reserved for storage of TPMS sensor identification data shall cause BCM Diagnostic codes for all individual sensor locations to be created or re-applied (if previously cleared).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | Writing/injecting any data into memory reserved for storage of TPMS sensor identification data shall cause BCM Diagnostic codes for all individual sensor locations to be created or re-applied (if previously cleared). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0014 TPMS sensors learning instructions

IPC shall indicate instructions to user when manual learn/train or re-assignment procedures are active.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall indicate instructions to user when manual learn/train or re-assignment procedures are active. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0011 Manual Learn

The BCM shall implement a Manual Learn algorithm for TPMS sensors association and location, in case of service. The following criteria and rules shall be satisfied:

- the manual Learn process initialization shall be requested through special tool or through specific sequence of brake and ignition switches activations, according to technical service guide;

- the vehicle must be in Park (speed = 0kph);

- 2 (two) identical and consecutive sensor frames shall be received before acccepting a new sensor ID during Manual Learn Mode;

- tire pressure warnings shall not be requested when associating TPMS sensors to the vehicle;

- the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;

- If Learn Mode is True and any tire reports a low pressure, the BCM shall report it upon successful completion of learn mode;

- Upon successful completion of the Manual Learn process, the BCM shall self clear all sensor fault DTCs.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Gear Lever Position
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Provide Vehicle Speed
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a Manual Learn algorithm for TPMS sensors association and location, in case of service. The following criteria and rules shall be satisfied:  - the manual Learn process initialization shall be requested through special tool or through specific sequence of brake and ignition switches activations, according to technical service guide;  - the vehicle must be in Park (speed = 0kph);  - 2 (two) identical and consecutive sensor frames shall be received before acccepting a new sensor ID during Manual Learn Mode;  - tire pressure warnings shall not be requested when associating TPMS sensors to the vehicle;  - the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;  - If Learn Mode is True and any tire reports a low pressure, the BCM shall report it upon successful completion of learn mode;  - Upon successful completion of the Manual Learn process, the BCM shall self clear all sensor fault DTCs. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0008 Low Tire Pressure determined by BCM

The BCM shall determine if a low pressure warning needs to be requested according to TPMS sensors data and thresholds.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall determine if a low pressure warning needs to be requested according to TPMS sensors data and thresholds. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0009 TPMS cluster warnings message at a time

IPC shall display only one TPMS warning message at a time.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall display only one TPMS warning message at a time. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0012 Reassignment Mode

The BCM shall implement a Reassignment algorithm to reassign sensor locations after tires rotation (when no new sensors have been mounted). The following criteria and rules shall be satisfied:

- this procedure shall not require special tool and instructions shall be provided in the Owner´s Manual;

- the vehicle must be in Park (speed = 0kph);

- BCM shall process each TPMS sensor reassignment by detecting a 'rapid tire pressure change' (removing or adding air in the tire);

- BCM shall not request any tire pressure warning when Re-Assigning sensors to the vehicle;

- the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;

- upon successful completion of the reassignment process the BCM shall self clear all sensor fault DTCs;

- while Re-Assignment Mode is True and if any tire reports a low pressure, the BCM shall immediately report it upon successful completion of Re-Assignment mode;

- the following sequence of hazard and ignition switches activation shall be used for reassignment process initialization: when Ignition Status is RUN/START and Learn mode is FALSE, and the Hazard switch has been turned from OFF to ON, and turned to OFF, Reassignment mode entry counter is incremented and timer is started. Once the Reassignment mode entry count is greater than Hazard Cycle reassignment count, then Reassignment mode is activated. In case, the timer expires before it enters Reassignment mode, or brake pedal is pressed, or Ignition Status is changed to OFF/ACC or if Vehicle speed is increased more than 4kph, then Reassignment mode is exited.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Gear Lever Position
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Provide Sound failure feedback
* -1543687678.jpg Provide Sound Success feedback
* -1543687678.jpg Provide Vehicle Speed
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement a Reassignment algorithm to reassign sensor locations after tires rotation (when no new sensors have been mounted). The following criteria and rules shall be satisfied:  - this procedure shall not require special tool and instructions shall be provided in the Owner´s Manual;  - the vehicle must be in Park (speed = 0kph);  - BCM shall process each TPMS sensor reassignment by detecting a 'rapid tire pressure change' (removing or adding air in the tire);  - BCM shall not request any tire pressure warning when Re-Assigning sensors to the vehicle;  - the sequence for associating sensors to the vehicle shall always start at the left front tire and proceed clockwise around the vehicle for the rolling tires;  - upon successful completion of the reassignment process the BCM shall self clear all sensor fault DTCs;  - while Re-Assignment Mode is True and if any tire reports a low pressure, the BCM shall immediately report it upon successful completion of Re-Assignment mode;  - the following sequence of hazard and ignition switches activation shall be used for reassignment process initialization: when Ignition Status is RUN/START and Learn mode is FALSE, and the Hazard switch has been turned from OFF to ON, and turned to OFF, Reassignment mode entry counter is incremented and timer is started. Once the Reassignment mode entry count is greater than Hazard Cycle reassignment count, then Reassignment mode is activated. In case, the timer expires before it enters Reassignment mode, or brake pedal is pressed, or Ignition Status is changed to OFF/ACC or if Vehicle speed is increased more than 4kph, then Reassignment mode is exited. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0001 TPMS data

IPC and APIM modules shall receive the following signals from BCM:

- Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);

- Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);

- TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;

- Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

- Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).

-Tire\_Press\_XXX\_Data: Tire pressure value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

-Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).

- Ignition\_Status / Power Mode.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC and APIM modules shall receive the following signals from BCM:  - Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);  - Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);  - TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;  - Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  - Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).  -Tire\_Press\_XXX\_Data: Tire pressure value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  -Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).  - Ignition\_Status / Power Mode. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg IPC - Customer Reset

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| -1910009838.jpg resetRequest | 658883941.jpg TirePReset\_B\_Rq | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function IPC - Customer Reset

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0009 TPMS sensors status composite

The BCM shall determine a composite TPMS status based on the status communicated from all supported TPMS sensors.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall determine a composite TPMS status based on the status communicated from all supported TPMS sensors. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0004 TPMS HMI Specs

IPC and APIM shall follow specifications according to:

- TPMS\_\_with\_EUreset\_PressureByLocation\_PlacardDsply\_DRW CGEA1.3\_v12.1

- Tire Temperature Function - CGEA1.3\_v1.2

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC and APIM shall follow specifications according to:  - TPMS\_\_with\_EUreset\_PressureByLocation\_PlacardDsply\_DRW CGEA1.3\_v12.1  - Tire Temperature Function - CGEA1.3\_v1.2 | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0011 TPMS IOD

IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0007 Low Tire Pressure by market

The BCM module shall provide low tire pressure warning indication according to each market-applicable regulation.

TPMS system and sensors status over CAN from BCM to IPC and APIM:

- Tire\_Press\_System\_Stat

- Tire\_Press\_Telltale

- TirePReset\_D\_Stat

- Tire\_Press\_LF\_Stat

- Tire\_Press\_RF\_Stat

- Tire\_Press\_IRR\_Stat

- Tire\_Press\_ILR\_Stat

- Tire\_Press\_RR\_ORR\_Stat

- Tire\_Press\_LR\_OLR\_Stat

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall provide low tire pressure warning indication according to each market-applicable regulation.    TPMS system and sensors status over CAN from BCM to IPC and APIM:  - Tire\_Press\_System\_Stat  - Tire\_Press\_Telltale  - TirePReset\_D\_Stat  - Tire\_Press\_LF\_Stat  - Tire\_Press\_RF\_Stat  - Tire\_Press\_IRR\_Stat  - Tire\_Press\_ILR\_Stat  - Tire\_Press\_RR\_ORR\_Stat  - Tire\_Press\_LR\_OLR\_Stat | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0004 TPMS system - ECUs to BCM

The BCM module shall receive the following signals from other modules:

- TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);

- Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);

- Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);

- TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Odometer
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall receive the following signals from other modules:  - TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);  - Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);  - Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);  - TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0006 TPMS IPC to HMI to display the warnings

IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_ABS\_FIS\_0001 Wheel Speed Signals - wheel speed signal

The ABS/EBB module shall send wheel speed signal (of each invidividual wheel) to BCM module.

Observation: WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide wheel speed
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The ABS/EBB module shall send wheel speed signal (of each invidividual wheel) to BCM module.  Observation: WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0005 TPMS data - RTM/Sensor to BCM

The BCM module shall receive and process the TPMS sensors data frames (tire pressure, tire temperature and sensors diagnostics) of all mounted/installed road tires, not including monitoring for spare tire.

TPMS data sent from RTM to BCM through Private CAN:

- TPMSDataPacket

- TirePress\_Frame\_ID\_CFG\_0

- TirePress\_Frame\_ID\_CFG\_1

- TirePress\_Frame\_ID\_CFG\_2

- TirePress\_Frame\_ID\_CFG\_3

- TirePress\_Frame\_Press

- TirePress\_Frame\_Temp

- TirePress\_Frame\_Status

- TirePress\_Frame\_Checksum

- Checksum

- TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2

- TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2

- TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3

Note: TPMS sensor ID information shall include characters to confirm final TPMS assembly (TPMS Sensor + Valve Stem type).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Reassignment Process

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall receive and process the TPMS sensors data frames (tire pressure, tire temperature and sensors diagnostics) of all mounted/installed road tires, not including monitoring for spare tire.    TPMS data sent from RTM to BCM through Private CAN:  - TPMSDataPacket  - TirePress\_Frame\_ID\_CFG\_0  - TirePress\_Frame\_ID\_CFG\_1  - TirePress\_Frame\_ID\_CFG\_2  - TirePress\_Frame\_ID\_CFG\_3  - TirePress\_Frame\_Press  - TirePress\_Frame\_Temp  - TirePress\_Frame\_Status  - TirePress\_Frame\_Checksum  - Checksum  - TimeStamp1\_Byte0, TimeStamp1\_Byte1, TimeStamp1\_Byte2  - TimeStamp2\_Byte0, TimeStamp2\_Byte1, TimeStamp2\_Byte2  - TimeStamp3\_Byte0, TimeStamp3\_Byte1, TimeStamp3\_Byte2, TimeStamp3\_Byte3    Note: TPMS sensor ID information shall include characters to confirm final TPMS assembly (TPMS Sensor + Valve Stem type). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0013 TPMS Placard (ECE-141)

IPC shall allow the customer to determine the warm placard pressure for each tire location to meet regulatory requirements (Regulatory item for Europe).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall allow the customer to determine the warm placard pressure for each tire location to meet regulatory requirements (Regulatory item for Europe). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_SCCM\_FIS\_0001 Steering wheel signals

The SCCM module shall provide steering wheel buttons signals over CAN to IPC and allow Cluster Menus navigation:

- SteWhlSwtchBack\_B\_Stat;

- SteWhlSwtchUp\_B\_Stat;

- SteWhlSwtchDown\_B\_Stat;

- SteWhlSwtchRight\_B\_Stat;

- SteWhlSwtchLeft\_B\_Stat;

- SteWhlSwtchOk\_B\_Stat;

- SteWhlSwtchMenu\_B\_Stat.

Satisfied by:

* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The SCCM module shall provide steering wheel buttons signals over CAN to IPC and allow Cluster Menus navigation:  - SteWhlSwtchBack\_B\_Stat;  - SteWhlSwtchUp\_B\_Stat;  - SteWhlSwtchDown\_B\_Stat;  - SteWhlSwtchRight\_B\_Stat;  - SteWhlSwtchLeft\_B\_Stat;  - SteWhlSwtchOk\_B\_Stat;  - SteWhlSwtchMenu\_B\_Stat. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_ABS\_FIS\_0002 Wheel Speed Signals - wheel speed sensor data

The ABS/EBB module shall process raw wheel speed sensor data (of each invidividual wheel) and publish wheel speed signals over CAN within 7ms.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide wheel speed
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The ABS/EBB module shall process raw wheel speed sensor data (of each invidividual wheel) and publish wheel speed signals over CAN within 7ms. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0012 TPMS Reset Request (ECE-141)

IPC shall allow the customer to make TPMS system Reset Request (only for European customer / dealer). A customer Reset input shall enable the Auto Learn and Pwarm algorithms to learn new ID’s and new operating pressure per tire.

TirePReset\_B\_Rq is the Reset Request signal from HMI to BCM.

Tire\_Press\_System\_Stat, Tire\_PReset\_D\_Stat are feedback from BCM to HMI to confirm the reset was successfull.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall allow the customer to make TPMS system Reset Request (only for European customer / dealer). A customer Reset input shall enable the Auto Learn and Pwarm algorithms to learn new ID’s and new operating pressure per tire.    TirePReset\_B\_Rq is the Reset Request signal from HMI to BCM.    Tire\_Press\_System\_Stat, Tire\_PReset\_D\_Stat are feedback from BCM to HMI to confirm the reset was successfull. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0008 Low Tire Pressure determined by BCM

The BCM shall determine if a low pressure warning needs to be requested according to TPMS sensors data and thresholds.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall determine if a low pressure warning needs to be requested according to TPMS sensors data and thresholds. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0019 TPMS System Reset

When a system reset is requested by the user, the BCM shall execute auto learn and pwarm algorithms to learn new sensor´s ID and operating pressure per tire (Regulatory item for Europe).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | When a system reset is requested by the user, the BCM shall execute auto learn and pwarm algorithms to learn new sensor´s ID and operating pressure per tire (Regulatory item for Europe). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0015 TPMS Reset Request by user (ECE-141)

APIM and IPC modules shall support user selectable TPMS system reset If required to meet regulation.

Satisfied by:

* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | APIM and IPC modules shall support user selectable TPMS system reset If required to meet regulation. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Display Low Tire pressure Warning

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Display Low Tire pressure Warning

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0001 Tire Pressure wake up

The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).

BCM (Tx) tire pressure values over CAN:

- Tire\_Press\_LF\_Data

- Tire\_Press\_RF\_Data

- Tire\_Press\_IRR\_Data

- Tire\_Press\_ILR\_Data

- Tire\_Press\_RR\_ORR\_Data

- Tire\_Press\_LR\_OLR\_Data

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).    BCM (Tx) tire pressure values over CAN:  - Tire\_Press\_LF\_Data  - Tire\_Press\_RF\_Data  - Tire\_Press\_IRR\_Data  - Tire\_Press\_ILR\_Data  - Tire\_Press\_RR\_ORR\_Data  - Tire\_Press\_LR\_OLR\_Data | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0002 Tire Low strategy

The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Reset
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall receive two TPMS transmissions from RTM module above Low Off threshold before clearing a Low Tire Pressure Status from any Sensor/Tire. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0010 TPMS cluster warnings during same ignition cycle

IPC shall not allow TPMS warnings for a unique low pressure/malfunction event to reappear during the same ignition session.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall not allow TPMS warnings for a unique low pressure/malfunction event to reappear during the same ignition session. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0011 TPMS IOD

IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0007 Low Tire Pressure by market

The BCM module shall provide low tire pressure warning indication according to each market-applicable regulation.

TPMS system and sensors status over CAN from BCM to IPC and APIM:

- Tire\_Press\_System\_Stat

- Tire\_Press\_Telltale

- TirePReset\_D\_Stat

- Tire\_Press\_LF\_Stat

- Tire\_Press\_RF\_Stat

- Tire\_Press\_IRR\_Stat

- Tire\_Press\_ILR\_Stat

- Tire\_Press\_RR\_ORR\_Stat

- Tire\_Press\_LR\_OLR\_Stat

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall provide low tire pressure warning indication according to each market-applicable regulation.    TPMS system and sensors status over CAN from BCM to IPC and APIM:  - Tire\_Press\_System\_Stat  - Tire\_Press\_Telltale  - TirePReset\_D\_Stat  - Tire\_Press\_LF\_Stat  - Tire\_Press\_RF\_Stat  - Tire\_Press\_IRR\_Stat  - Tire\_Press\_ILR\_Stat  - Tire\_Press\_RR\_ORR\_Stat  - Tire\_Press\_LR\_OLR\_Stat | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0006 TPMS IPC to HMI to display the warnings

IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0007 TPMS cluster warnings when Power Mode On/Run/Start

IPC module shall display warnings (if present) when Ignition is On/Run/Start.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall display warnings (if present) when Ignition is On/Run/Start. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0020 TPMS Low Warning

[ECE-R141] The BCM shall support monitoring of warm operating tire pressure for each tire location.

Satisfied by:

* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | [ECE-R141] The BCM shall support monitoring of warm operating tire pressure for each tire location. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0008 Low Tire Pressure determined by BCM

The BCM shall determine if a low pressure warning needs to be requested according to TPMS sensors data and thresholds.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall determine if a low pressure warning needs to be requested according to TPMS sensors data and thresholds. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0010 TPMS system status message priority

BCM shall determine the priority of the various warning statuses per tire to create a single output.

TPMS system overall status shall be sent over CAN through:

- Tire\_Press\_System\_Stat

- Tire\_Press\_Telltale

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | BCM shall determine the priority of the various warning statuses per tire to create a single output.    TPMS system overall status shall be sent over CAN through:  - Tire\_Press\_System\_Stat  - Tire\_Press\_Telltale | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0009 TPMS cluster warnings message at a time

IPC shall display only one TPMS warning message at a time.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall display only one TPMS warning message at a time. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0003 TPMS system - BCM to APIM/IPC

The BCM shall provide the following signals to IPC and APIM:

- Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);

- Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);

- TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;

-Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

- Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).

-Tire\_Press\_XXX\_Data: Tire pressure value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

-Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).

- Ignition\_Status / Power Mode.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Cluster Navigation

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall provide the following signals to IPC and APIM:  - Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);  - Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);  - TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;  -Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  - Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).  -Tire\_Press\_XXX\_Data: Tire pressure value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  -Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).  - Ignition\_Status / Power Mode. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0001 TPMS data

IPC and APIM modules shall receive the following signals from BCM:

- Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);

- Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);

- TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;

- Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

- Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).

-Tire\_Press\_XXX\_Data: Tire pressure value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

-Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).

- Ignition\_Status / Power Mode.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC and APIM modules shall receive the following signals from BCM:  - Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);  - Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);  - TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;  - Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  - Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).  -Tire\_Press\_XXX\_Data: Tire pressure value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  -Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).  - Ignition\_Status / Power Mode. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Supress TPMS Warnings in AV Mode

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Supress TPMS Warnings in AV Mode

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0010 TPMS cluster warnings during same ignition cycle

IPC shall not allow TPMS warnings for a unique low pressure/malfunction event to reappear during the same ignition session.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall not allow TPMS warnings for a unique low pressure/malfunction event to reappear during the same ignition session. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0011 TPMS IOD

IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0017 TPMS DTCs System

The BCM shall implement diagnostic codes to indicate when vehicle has not finished TPMS configuration/sensors association (re: Build Mode). Presence of TPMS Diagnostic codes shall cause TPMS Telltale to remain illuminated.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement diagnostic codes to indicate when vehicle has not finished TPMS configuration/sensors association (re: Build Mode). Presence of TPMS Diagnostic codes shall cause TPMS Telltale to remain illuminated. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0022 TPMS DTCs received for BCM by RTM

BCM diagnostic codes for each individual sensors location shall be cleared only when data transmissions from the associated sensors have been received without any impairment/compatibility problems. BCM diagnostic codes for individual sensor locations shall not be cleared in other ways.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | BCM diagnostic codes for each individual sensors location shall be cleared only when data transmissions from the associated sensors have been received without any impairment/compatibility problems. BCM diagnostic codes for individual sensor locations shall not be cleared in other ways. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

-466516290.jpg - R\_F\_IPC\_APIM\_FIS\_0008 TPMS telltale proveout

IPC shall prove out (illuminate TPMS telltale, then extinguish if no TPMS warning active) each Ignition cycle, first illuminating no later than five (5) seconds after Ignition has been set to ON/Run/Start from Off/Accessory.

Satisfied by:

* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall prove out (illuminate TPMS telltale, then extinguish if no TPMS warning active) each Ignition cycle, first illuminating no later than five (5) seconds after Ignition has been set to ON/Run/Start from Off/Accessory. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0004 TPMS system - ECUs to BCM

The BCM module shall receive the following signals from other modules:

- TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);

- Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);

- Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);

- TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Odometer
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall receive the following signals from other modules:  - TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);  - Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);  - Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);  - TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0018 TPMS DTCs by Sensor

The BCM diagnostic codes shall indicate when individual sensor locations have not been setup or have confirmed impairment/compatibility problems.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM diagnostic codes shall indicate when individual sensor locations have not been setup or have confirmed impairment/compatibility problems. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0006 TPMS IPC to HMI to display the warnings

IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0007 TPMS cluster warnings when Power Mode On/Run/Start

IPC module shall display warnings (if present) when Ignition is On/Run/Start.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall display warnings (if present) when Ignition is On/Run/Start. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0005 TPMS tires pressure in the cluster

IPC module shall display Tires Pressure in the cluster.

Satisfied by:

* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall display Tires Pressure in the cluster. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0020 TPMS Low Warning

[ECE-R141] The BCM shall support monitoring of warm operating tire pressure for each tire location.

Satisfied by:

* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | [ECE-R141] The BCM shall support monitoring of warm operating tire pressure for each tire location. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0021 TPMS DTCs (BCM Internal memory to sensor ID)

Writing/injecting any data into memory reserved for storage of TPMS sensor identification data shall cause BCM Diagnostic codes for all individual sensor locations to be created or re-applied (if previously cleared).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | Writing/injecting any data into memory reserved for storage of TPMS sensor identification data shall cause BCM Diagnostic codes for all individual sensor locations to be created or re-applied (if previously cleared). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0014 TPMS sensors learning instructions

IPC shall indicate instructions to user when manual learn/train or re-assignment procedures are active.

Satisfied by:

* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall indicate instructions to user when manual learn/train or re-assignment procedures are active. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0010 TPMS system status message priority

BCM shall determine the priority of the various warning statuses per tire to create a single output.

TPMS system overall status shall be sent over CAN through:

- Tire\_Press\_System\_Stat

- Tire\_Press\_Telltale

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | BCM shall determine the priority of the various warning statuses per tire to create a single output.    TPMS system overall status shall be sent over CAN through:  - Tire\_Press\_System\_Stat  - Tire\_Press\_Telltale | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0009 TPMS cluster warnings message at a time

IPC shall display only one TPMS warning message at a time.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall display only one TPMS warning message at a time. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

-466516290.jpg - R\_F\_IPC\_APIM\_FIS\_0016 TPMS warnings for AV

IPC shall suppress TPMS warnings when AV (Autonomous Vehicle) mode is enabled (refer to HMI RQT-003801-719204).

Note: IPC and APIM shall implement unique aspects of TPMS regulation impacted by AV (Autonomous Vehicle) mode.

Satisfied by:

* -1543687678.jpg Supress TPMS Warnings in AV Mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall suppress TPMS warnings when AV (Autonomous Vehicle) mode is enabled (refer to HMI RQT-003801-719204).  Note: IPC and APIM shall implement unique aspects of TPMS regulation impacted by AV (Autonomous Vehicle) mode. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Display Malfunction warning

##### Function Interfaces

###### Inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Subscriber Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Inputs | | | |

Table 1‑1: Input Signal mappings of Function

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| No logical signals Realized by this Technology signal. |  | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Display Malfunction warning

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0001 Tire Pressure wake up

The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).

BCM (Tx) tire pressure values over CAN:

- Tire\_Press\_LF\_Data

- Tire\_Press\_RF\_Data

- Tire\_Press\_IRR\_Data

- Tire\_Press\_ILR\_Data

- Tire\_Press\_RR\_ORR\_Data

- Tire\_Press\_LR\_OLR\_Data

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Receive and Process TPMS transmissions
* -1543687678.jpg Request Warning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall update tire pressure values from associated sensors within 2 minutes drive duration above the threshold motion speed (20mph or 32kph).    BCM (Tx) tire pressure values over CAN:  - Tire\_Press\_LF\_Data  - Tire\_Press\_RF\_Data  - Tire\_Press\_IRR\_Data  - Tire\_Press\_ILR\_Data  - Tire\_Press\_RR\_ORR\_Data  - Tire\_Press\_LR\_OLR\_Data | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0010 TPMS cluster warnings during same ignition cycle

IPC shall not allow TPMS warnings for a unique low pressure/malfunction event to reappear during the same ignition session.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall not allow TPMS warnings for a unique low pressure/malfunction event to reappear during the same ignition session. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0011 TPMS IOD

IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall display tire pressure values for all associated tire pressure sensor locations in a user selectable dedicated screen. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0017 TPMS DTCs System

The BCM shall implement diagnostic codes to indicate when vehicle has not finished TPMS configuration/sensors association (re: Build Mode). Presence of TPMS Diagnostic codes shall cause TPMS Telltale to remain illuminated.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall implement diagnostic codes to indicate when vehicle has not finished TPMS configuration/sensors association (re: Build Mode). Presence of TPMS Diagnostic codes shall cause TPMS Telltale to remain illuminated. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0022 TPMS DTCs received for BCM by RTM

BCM diagnostic codes for each individual sensors location shall be cleared only when data transmissions from the associated sensors have been received without any impairment/compatibility problems. BCM diagnostic codes for individual sensor locations shall not be cleared in other ways.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | BCM diagnostic codes for each individual sensors location shall be cleared only when data transmissions from the associated sensors have been received without any impairment/compatibility problems. BCM diagnostic codes for individual sensor locations shall not be cleared in other ways. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0015 TPMS Sensors ID Verify

Except while Learn Mode is True, the BCM shall verify If the received TPM Sensors ID match with the already saved ID's. In case of any TPMS Sensor ID does not match, then the BCM shall set Sensor Status data flow to ‘INVALID’.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | Except while Learn Mode is True, the BCM shall verify If the received TPM Sensors ID match with the already saved ID's. In case of any TPMS Sensor ID does not match, then the BCM shall set Sensor Status data flow to ‘INVALID’. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0018 TPMS DTCs by Sensor

The BCM diagnostic codes shall indicate when individual sensor locations have not been setup or have confirmed impairment/compatibility problems.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM diagnostic codes shall indicate when individual sensor locations have not been setup or have confirmed impairment/compatibility problems. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0006 TPMS IPC to HMI to display the warnings

IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Learning output process
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Cluster Navigation
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall request the HMI to display TPMS telltale and messages (Low Pressure Warning, Malfunctions / Alerts / Telltale) when applicable. In such cases, chime shall also be applied. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0007 TPMS cluster warnings when Power Mode On/Run/Start

IPC module shall display warnings (if present) when Ignition is On/Run/Start.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC module shall display warnings (if present) when Ignition is On/Run/Start. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_ABS\_FIS\_0001 Wheel Speed Signals - wheel speed signal

The ABS/EBB module shall send wheel speed signal (of each invidividual wheel) to BCM module.

Observation: WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide wheel speed
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The ABS/EBB module shall send wheel speed signal (of each invidividual wheel) to BCM module.  Observation: WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_ABS\_FIS\_0002 Wheel Speed Signals - wheel speed sensor data

The ABS/EBB module shall process raw wheel speed sensor data (of each invidividual wheel) and publish wheel speed signals over CAN within 7ms.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide wheel speed
* -1543687678.jpg Pwarm
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The ABS/EBB module shall process raw wheel speed sensor data (of each invidividual wheel) and publish wheel speed signals over CAN within 7ms. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

-466516290.jpg - R\_F\_TPMS\_FIS\_0004 TPMS sensors specification - temperature

The TPMS Sensors shall operate between -40degC and +100degC.

Satisfied by:

* -1543687678.jpg Display Malfunction warning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The TPMS Sensors shall operate between -40degC and +100degC. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

-466516290.jpg - R\_F\_TPMS\_FIS\_0005 TPMS sensors specification - Delta pressure

The TPMS sensors shall transmit in response to sampled Delta Pressure events. Maximum allowable Delta Pressure difference from prior transmission shall be 2 psi.

Satisfied by:

* -1543687678.jpg Display Malfunction warning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The TPMS sensors shall transmit in response to sampled Delta Pressure events. Maximum allowable Delta Pressure difference from prior transmission shall be 2 psi. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0021 TPMS DTCs (BCM Internal memory to sensor ID)

Writing/injecting any data into memory reserved for storage of TPMS sensor identification data shall cause BCM Diagnostic codes for all individual sensor locations to be created or re-applied (if previously cleared).

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Process Frame
* -1543687678.jpg Provide Sensor Data
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | Writing/injecting any data into memory reserved for storage of TPMS sensor identification data shall cause BCM Diagnostic codes for all individual sensor locations to be created or re-applied (if previously cleared). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

-466516290.jpg - R\_F\_TPMS\_FIS\_0006 TPMS sensors specification - ID

The TPMS sensor shall provide TPMS sensor ID to RTM module including special characters to confirm the TPMS final assembly (TPMS Sensor + Valve Stem type).

Satisfied by:

* -1543687678.jpg Display Malfunction warning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The TPMS sensor shall provide TPMS sensor ID to RTM module including special characters to confirm the TPMS final assembly (TPMS Sensor + Valve Stem type). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

-466516290.jpg - R\_F\_TPMS\_FIS\_0003 TPMS sensors specification - weight

The TPMS sensors/transmitter assembly shall satisfy the weight requirements as specified in the Engineering Specification (Latest revision of the ES-9L3A-1A180-xx).

Satisfied by:

* -1543687678.jpg Display Malfunction warning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The TPMS sensors/transmitter assembly shall satisfy the weight requirements as specified in the Engineering Specification (Latest revision of the ES-9L3A-1A180-xx). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0010 TPMS system status message priority

BCM shall determine the priority of the various warning statuses per tire to create a single output.

TPMS system overall status shall be sent over CAN through:

- Tire\_Press\_System\_Stat

- Tire\_Press\_Telltale

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Composite Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | BCM shall determine the priority of the various warning statuses per tire to create a single output.    TPMS system overall status shall be sent over CAN through:  - Tire\_Press\_System\_Stat  - Tire\_Press\_Telltale | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0009 TPMS cluster warnings message at a time

IPC shall display only one TPMS warning message at a time.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Request Warning
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall display only one TPMS warning message at a time. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_BCM\_FIS\_0003 TPMS system - BCM to APIM/IPC

The BCM shall provide the following signals to IPC and APIM:

- Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);

- Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);

- TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;

-Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

- Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).

-Tire\_Press\_XXX\_Data: Tire pressure value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

-Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).

- Ignition\_Status / Power Mode.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Cluster Navigation

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM shall provide the following signals to IPC and APIM:  - Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);  - Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);  - TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;  -Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  - Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).  -Tire\_Press\_XXX\_Data: Tire pressure value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  -Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).  - Ignition\_Status / Power Mode. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0001 TPMS data

IPC and APIM modules shall receive the following signals from BCM:

- Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);

- Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);

- TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;

- Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

- Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).

-Tire\_Press\_XXX\_Data: Tire pressure value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)

- Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).

-Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. "XXX" stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).

- Ignition\_Status / Power Mode.

Satisfied by:

* -1543687678.jpg Composite Warning
* -1543687678.jpg Determine Low Pressure Warning
* -1543687678.jpg Display Learning instructions
* -1543687678.jpg Display Low Tire pressure Warning
* -1543687678.jpg Display Malfunction warning
* -1543687678.jpg Indicate Tires pressure and temperature
* -1543687678.jpg Learning output process
* -1543687678.jpg Turns Telltale ON/Flashing/OFF

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC and APIM modules shall receive the following signals from BCM:  - Tire\_Press\_System\_Stat: Overall system status (system okay, sensors fault, low tire pressure, train status);  - Tire\_Press\_Telltale: TPMS telltale status (Off, On, Flash);  - TirePReset\_D\_Stat: Reset request status (acknowledged, not acknowledged) - ECE regulation;  - Tire\_Press\_XXX\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Stat / Tire\_Press\_LR\_OLR\_Stat: TPMS status for each tire - Unknown, Normal, Fault, Low pressure, Alert - Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  - Tire\_Press\_Placrd\_Frnt / Tire\_Press\_Placrd\_Rear: Nominal tire pressure (front and rear tires).  -Tire\_Press\_XXX\_Data: Tire pressure value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear)  - Tire\_Press\_RR\_ORR\_Data / Tire\_Press\_LR\_OLR\_Data: Tire pressure value for each tire. Outer Right Rear (RR\_ORR) and Outer Left Rear (LR\_OLR).  -Tire\_Temp\_XXX\_Data: Tire temperature value for each tire. XXX stands for LF (Left Front), RF (Right Front), IRR (Inner Right Rear), ILR (Inner Left Rear), ORR (Outer Right Rear), OLR (Outer Left Rear).  - Ignition\_Status / Power Mode. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

-466516290.jpg - R\_F\_TPMS\_FIS\_0002 TPMS sensors durability

TPMS sensors shall comply with 10 years durability (150 thousand miles durability).

Satisfied by:

* -1543687678.jpg Display Malfunction warning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | TPMS sensors shall comply with 10 years durability (150 thousand miles durability). | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

#### Technology Function -1543687678.jpg Provide Odometer

##### Function Interfaces

###### Inputs

(No inputs have been defined)

###### Outputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Outputs: | | | | | | |
| **Logical Signal Name** | **Technical Signal Name** | | | **Mapping Details** *(Conditional)* | **Publisher Interface** | **Connection**  (*Optional)* |
| -1910009838.jpg vehicleMileage | 658883941.jpg OdometerMasterValue | | |  | Not supported by Magicdraw generation. | Not supported by Magicdraw generation. |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1 | End of Outputs | | | |

**Table 1‑2: Output Signal mappings of Function**

###### Parameters

(No parameters have been defined)

###### Interface Requirements

No Interface Requirements identified for Function Provide Odometer

##### Function Requirements

###### Component Specific Requirements

1783357690.jpg - R\_F\_BCM\_FIS\_0004 TPMS system - ECUs to BCM

The BCM module shall receive the following signals from other modules:

- TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);

- Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);

- Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);

- TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC.

Satisfied by:

* -1543687678.jpg Auto Learn Process
* -1543687678.jpg Barometric Pressure Conversion Compensation Process
* -1543687678.jpg Configure Display Units
* -1543687678.jpg Determine pressure threshold
* -1543687678.jpg IPC - Customer Reset
* -1543687678.jpg Manual Learn
* -1543687678.jpg Provide Odometer
* -1543687678.jpg Pwarm
* -1543687678.jpg Reassignment Process
* -1543687678.jpg Request Reset
* -1543687678.jpg Supress TPMS Warnings in AV Mode
* -1543687678.jpg Turns Feature ON/OFF (DID "DE08")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | The BCM module shall receive the following signals from other modules:  - TPMS data frames (pressure, temperature, diagnostics) from RTM module through Private CAN (TPMSDataPacket; TirePress\_Frame\_ID\_CFG\_X; TirePress\_Frame\_Press; TirePress\_Frame\_Temp; TirePress\_Frame\_Status, TimeStamp1-3);  - Vehicle Speed (Veh\_V\_ActlEng), Odometer (OdometerMasterValue), Barometric Air Pressure (AirAmb\_P\_Actl) and GearLvrPos\_D\_Actl (Gear Status) from PCM (Powertrain Module);  - Wheel Speed (invididual values of each wheel) from ABS/EBB module (WhlRotatXX\_No\_Cnt signals. XX = Fl, Fr, Rl, Rr);  - TPMS Reset Request (TirePReset\_B\_Rq) and accumulated odometer (OdometerMasterValue) value from IPC. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

1783357690.jpg - R\_F\_IPC\_APIM\_FIS\_0003 TPMS IPC Signals

IPC shall provide the following CAN signals to BCM:

- OdometerMaterValue: accumulated vehicle odometer;

- TirePReset\_B\_Rq: TPMS system reset request according to ECE regulation.

Satisfied by:

* -1543687678.jpg Learning output process
* -1543687678.jpg Provide Odometer
* -1543687678.jpg Request Reset

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: | | | | | | | |
| **Rationale** | IPC shall provide the following CAN signals to BCM:  - OdometerMaterValue: accumulated vehicle odometer;  - TirePReset\_B\_Rq: TPMS system reset request according to ECE regulation. | | | | | | |
| **Acceptance Criteria** |  | | | | | | |
| **Notes** |  | | | | | | |
| **Source** |  | | | | | **Owner** |  |
| **Source Req.** |  | | | | | **V&V Method** |  |
| **Type** |  | | | **Priority** |  | **Status** | Ready for Review |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.0c | End of Requirement | | | | |

## Requirements on Connections

### Networks

#### “CAN Bus xxx”

*Not supported by MagicDraw report generation.*

##### Protocol Requirements

*Not supported by MagicDraw report generation.*

##### Electrical Requirements

*Not supported by MagicDraw report generation.*

#### “LIN Bus xxx”

*Not supported by MagicDraw report generation.*

##### Protocol Requirements

*Not supported by MagicDraw report generation.*

###### Schedule Table

*Not supported by MagicDraw report generation.*

##### Electrical Requirements

*Not supported by MagicDraw report generation.*

#### “Ethernet xxx”

*Not supported by MagicDraw report generation.*

### HW I/Os

#### “HW I/O xxx”

*Not supported by MagicDraw report generation.*

## Requirements on Development Process

No Requirements with “In-Progress” Status identified.

# Open Concerns

*Not supported by MagicDraw report generation.*

| ID | Concern Description | e-Tracker Reference | Status | Solution |
| --- | --- | --- | --- | --- |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |

Table 6‑1: Open Concerns

# Revision History

No Revision History found.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Revision | Date | Description | Approved by | Responsible |
| A |  | Initial version |  |  |
|  |  |  |  |  |

## Template Revisions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Version | Rev. | Date | Description | Responsible |
| 0 | 2 | 2015-08-05 | * TOC corrected * Document Properties adapted to match needs of VBA macros | Awegman1 |
| 1 | 0 | 2015-11-16 | * Revision History moved to chapter 7 * Table-Styles removed | Awegman1 |
| 1 | 1 | 2016-03-02 | * Rework according to PCL example | Jbaden1 |
| 1 | 2 | 2016-03-22 | * V1.3: Footer formating corrected (Issue 19) * “Constraints” chapter renamed to “Input Requirements” (Issue 20) | Jbaden1 |
| 1 | 3 | 2016-04-20 | * Broken Wiki links repaired | Jbaden1 |
| 2 | 0 | 2016-05-23 | * Prepared for Specification\_Macros.dotm v2.0 * Additional explanations added to ch. 2.2 “Input Requirements” (ARL and SDS requirements often go here) | Jbaden1 |
| 2 | 1 | 2016-07-08 | * Template version added to footer | Jbaden1 |
| 2 | 2 | 2016-07-15 | * Sample SysML diagrams added * Data Dictionary reworked * Alignment with relevant sections in SRD templated | Jbaden1 |
| 3 | 0 | 2016-09-05 | * Lessons learned from IPRB incorporated | Jbaden1 |
| 4 | 0 | 2016-09-27 | * Alignment with QPIP Feature Function Ownership workstream. Platform Spec renamed to Feature Implementation Spec | Jbaden1 |
| 4 | 1 | 2016-11-04 | * Chapters “Purpose” and “Scope” reworked. | Jbaden1 |
| 4 | 1 | 2016-11-10 | * Subsection for “Logical Service Interfaces” added. | Jbaden1 |
| 5 | 0 | 2017-01-13 | * Meta data updated for specification macros, version 3.1 * SW Unit chapter removed for the time being * Green boxes added for user hints | Jbaden1 |
| 5 | 1 | 2017-01-18 | * Minor editorial changes (e.g. hyperlinks highlighted in comments) | Jbaden1 |
| 5 | 1b | 2017-01-20 | * Some editorial corrections * Substructure of old Network Communication (now Connections) moved to Requirements on Connections | Jbaden1 |
| 6 | 0 | 2018-07-24 | * CR53: * Add new cover sheet * Add disclaimer section * Add the following meta-data to the doc properties for the the new cover sheet   + DocGis1ItemNumber   + DocGis2Classification   + DocType   + DocStatus   + DocIssueDate   + DocReleaseDate * CR63: Update FuSa sharepoint references in templates | Jbaden1 |
| 6 | 0 | 2018-08-06 | * CR81: Incorporate lessons learned from System Service Spec pilot (Vehicle Speed) into AFS and FIS | Jbaden1 |
| 6 | 0 | 2018-09-28 | * Broken links to RE Wiki repaired | Jbaden1 |
| 6 | 0 | 2018-10-31 | * Minor corrections on cover sheet and in footer to be more GIS compliant and VSEM aligned * “Overview” and “Description” exchanged in headings (following common sense) | Jbaden1 |
| 6 | 0 | 2018-11-30 | * Update of Functional Safety sections after review by Functional Safety Team * Initial support for variant handling | Jbaden1 |
| 6 | 0 | 2018-12-01 | * Variant condition fields added consistently * Links updated | Jbaden1 |
| 6 | 0 | 2018-12-11 | * Variant condition fields removed from mapping/allocation tables * Mapping tables simplified * Explanatory text for “Variants” sections revised | Jbaden1 |
| 6 | 0a | 2019-01-04 | * Chapter heading “Inherited Function Requirements” removed. Corresponding table renamed to “Requirements not cascaded”. * E/E Connection table got another column for allocated messages * Naming conventions for Implemented Functions corrected (FncName\_CmpName instead of FncName\_on\_CmpName) * Editorial corrections on the cover sheet * Explanatory text added to “Ethernet” section in chapter “Requirements on Connections” * AIS templates updated. Linked to Wiki page | Jbaden1 |
| 6 | 0a | 2019-01-04 | * Minor restructuring in FuSa chapter – after aligning with ECU Functional Spec * Bugfix: table 13 renamed from FTTI table to FHT table, includes a bug fix: each FSR is allocated to only one ECU/component | Jbaden1 |
| 6 | 0b | 2019-02-04 | * Change: Chapter “Interface Requirements” added to “Implemented Function xxx” section (to have a single chapter for to collect subscriber/publisher interface and mapping requirements which to not conform to the corresponding Data Dictionary objects) * Change: “CAN Interface” subsection renamed to “AIS Interfaces” again. Although several Subscriber/Publisher interface attributes are probably CAN bus specific, other attributes seem to be well suited for other networks than CAN. * Change: Chapter “ECU Specific Requirements” renamed to “Component Specific Requirements” in chapter “Implemented Function xxx”. Table “Requirements not cascaded” renamed to “Component Specific Requirements” and refined to describe changes from Logical Function requirements set more formally. This is also to help during VSEM import to identify those requirements of the Logical Function which cannot be simply carried over to the ECU. * Change: Explanatory text in section “Implemented Function xxx” improved. | Jbaden1 |
| 6 | 0c | 2019-02-05 | * Change: Layout of AIS Interfaces in Data Dictionary reworked to enable Excel Import | Jbaden1 |
| 6 | 0c | 2019-02-20 | * Bugfix: In AIS Interfaces none-picklist fields formatted as invisible | Jbaden1 |
| 6 | 1a | 2019-02-05 | Functional Safety related changes:   * Table “Architectural Redundancy Summary” updated * Section “Functional Flows for FTTI ‘xyz’” added to chapter “Component Interaction Diagrams” * Fault Tolerant Time Summary section added to Functional Safety chapter * Chapter “HW Metrics” added | Jbaden1 |
| 6 | 1a | 2019-04-02 | Headings of “Architectural Redundancy Summary” table clarified | Jbaden1 |
| 6 | 1a | 2019-04-10 | * ASIL Decomposition table moved from Function Spec into the Feature Implementation Spec (ASIL Decomposition of Technical Safety Requirements) * 2 alternative versions of the Function Allocation Table (Standard variant vs. Functional Safety variant) placed next to each other. | Jbaden1 |
| 6 | 1a | 2019-05-31 | * Function Allocation Table split into a base (non FuSa) part and a FuSa part to allow a more flexible mapping of MBSE functions (Logical and Technology) to RE functions (Atomic Logical and Implemented). | Jbaden1 |
| 6 | 1a | 2019-05-31 | * “Input Requirement” section reworked (symmetrically to all other templates). * Sections “Functional Flows for FTTI xyz” and “Fault Tolerant Time Summary” removed, because guidance is not available yet. * “Reference” and “Glossary” section moved back to introduction, i.e., to the very beginning of the document (such that also section 2 can already rely on it). * Some mostly editorial changes per request from FuSa team. | Jbaden1 |
| 6 | 1a | 2019-07-02 | * "Important" box added on cover sheet which points to the macros * “Input Requirements” section renamed to Input Information (after discussion with FuSa team) | Jbaden1 |
| 6 | 1a | 2019-07-17 | * Chapter “Message List” removed from CAN and LIN specific chapters of section “Requirements on Connections” | Jbaden1 |
| 6 | 1a | 2019-10-08 | * Chapter “ASIL Decomposition of Technical Safety Requirements”: Input TSRs are specified in the chapter right above the decomposition table. | Jbaden1 |
| 6 | 1a | 2019-10-09 | * Chapter “Service Oriented Communication” moved to section “Messages” in the Data Dictionary. Details from Central SW Wiki about FNV2 SOA added | Jbaden1 |
| 6 | 1a | 2019-10-25 | * Minor updates for HW IOs/Signals * Subsection “Functional Safety” removed from chapter “Feature Implementation Modeling”. Per requrest from FuSa team since no guidance is available how to model e.g. FHT timing diagram. | Jbaden1 |
| 6 | 1a | 2019-05-11 | * Copyright notice shortened and moved to cover sheet and added to footer (to be compliant [with Ford copyright guidelines](http://www.fgti.ford.com/client/NewFGTI/CopyrightNotice.html)) * Term “Disclaimer” no longer used for what is actually only a copyright notice | Jbaden1 |
| 6 | 1a | 2019-22-11 | * Some minor modifications for the SOA APIs/MQTT Messages in the section “Messages” of the Data Dictionary (section references Service Contracts via the API name) * Some minor updates of the Input/Output mapping tables in section “Requirements on Components” for mappings to SOA APIs and EDAS signals. | Jbaden1 |
| 6 | 1a | 2019-12-05 | * Upstream Documents section added to “Input Requirements/Documents” table * Custom style table formatting removed | Jbaden1 |
| 6 | 1a | 2020-01-07 | * Some fine tuning for naming conventions of E/E components and connections. * List of HW I/O signal types reduced to RF-A, RF-D, D, A, Networked and PWM. * Protocol column added to the E/E connection table | Jbaden1 |
| 6 | 1a | 2020-01-07 | * “HW Metric” and “Architecture Redundancy Summary” sections removed per request from the Functional Architecture Team (based on Governance Board decision [FSTGB-97](mailto:TrackLite%20%23%20FSTGB-97:%20https://www.tracklite.ford.com/prweb/PRAuth/TrackLiteSSO?pyActivity=@baseclass.RedirectAndRunWraper&ThreadName=WorkLinkThread&bPurgeTargetThread=true&AccessGroupName=FSTGB:ProjectAdministrators&Location=pyActivity%3DWork-.Open%26Action%3DReview%26HarnessPurpose%3DReview%26InsHandle%3DFORD-FSTGB-WORK+FSTGB-97)) * “Functional Safety” chapter moved to “Feature Implementation Requirements” section. “Function Allocation” chapter seemed no longer appropriate. | Jbaden1 |
| 6 | 1a | 2020-01-07 | * Ordering of fields in AIS interfaces tables modified to conform with the Macro Template and the Importer Sheet * Page Header: no longer in bold letters | Jbaden1 |
| 6 | 1a | 2020-03-09 | * Missing doc property “LatestSigMappingID” and “LatestAisInterfaceID” added * doc property “CopyrightDate” re-formatted to text and copyright date field in footer corrected * Version numbering re-initialized as 0.1 * Init value of version/revision date set to “yyyy/mm/dd” instead of “yyyy-mm-dd” to be in line with the “Edit Document Property” dialog * Type of “Latest….ID” doc properties changed from Text to Number | Jbaden1 |
| 6 | 1a | 2020-03-11 | * “Mapping” table removed from template. Has been migrated to macro. | Jbaden1 |
| 6 | 1a | 2020-03-13 | * Separate chapter “Technical Safety Requirements” removed. Content already covered by Allocation Table in chapter Function Allocation. * “Implemented Function” replaced by term “Technology Function” | Jbaden1 |

# Appendix

## Data Dictionary

### Logical Signals

-1910009838.jpg barometricPressure

(AirAmb\_P\_Actl)

Units: mbar

Resolution: 10

Offset: 500

Minimum value: 500 (0x0)

Maximum value: 1110 (0x3D)

0x3E = NoDataExists

0x3F = Fault

Provides ambient barometer measurement.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of barometricPressure

-1910009838.jpg gearLeverPosition

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of gearLeverPosition

-1910009838.jpg HMI\_Selected\_Screen

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 1499499817.jpg HMI\_Selected\_Screen |

Table: Signal Details of HMI\_Selected\_Screen

-1910009838.jpg resetRequest

Command via user input to reset / default TPMS.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of resetRequest

-1910009838.jpg resetResponse

Success or failure confirmation of TPMS reset request.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of resetResponse

-1910009838.jpg Sensor\_Status

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of Sensor\_Status

-1910009838.jpg Sensor\_Tx\_Identifier

Sensor identification code.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of Sensor\_Tx\_Identifier

-1910009838.jpg telltaleStatus

Provides TPMS telltale output state.

(Tire\_Press\_Telltale,

0x0 = Off,

0x1 = On,

0x2 = Flash,

0x3 = Not\_Used).

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of telltaleStatus

-1910009838.jpg TPMS\_IDs

Provides set of learned / associated TPMS sensor identifier codes.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TPMS\_IDs

-1910009838.jpg TPMS\_System\_Status

Provides composite TPMS status, controls HMI message center output.

(Tire\_Press\_System\_Stat

0x0 = Unknown\_Composite\_Stat

0x1 = Systm\_Fault\_Composite\_Stat

0x2 = Sensr\_Fault\_Composite\_Stat

0x3 = Low\_Composite\_Stat

0x4 = Systm\_Activ\_Composite\_Stat

0x5 = Train\_LeftFront\_tire

0x6 = Train\_RightFront\_tire

0x7 = Train\_RightRear\_tire

0x8 = Train\_OutsideRtRear\_tire

0x9 = Train\_InsideRtRear\_tire

0xA = Train\_LeftRear\_tire

0xB = Train\_OutsideLeftRear\_tire

0xC = Train\_InsideLeftRear\_tire

0xD = Training\_Complete

0xE = Tires\_not\_trained).

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TPMS\_System\_Status

-1910009838.jpg vehicleMileage

Provides odometer mileage data.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of vehicleMileage

-1910009838.jpg vehicleSpeed

Provides vehicle speedometer data.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of vehicleSpeed

-1910009838.jpg wheelSpeedStatus

Provides wheel rotation measurement data.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of wheelSpeedStatus

### Logical Parameters

### Technical Signals

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of

-1228322518.jpg AirAmb\_P\_Actl

Atmospheric pressure (also known as "ambient air pressure" or "barometric pressure").

Sometimes measured, sometimes estimated (inferred) - depends on application.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -1228322518.jpg AirAmb\_P\_IncldQfET |

Table: Signal Details of AirAmb\_P\_Actl

172051543.jpg Checksum

The checksum is created by summing up all the bytes of the data including the carry bit.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of Checksum

-1228322518.jpg CtrStkDsplyOp\_D\_Rq

Display Operation. Type of operation the centerstack display device is requesting.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -1228322518.jpg DsplyOp\_D\_ET |

Table: Signal Details of CtrStkDsplyOp\_D\_Rq

-1228322518.jpg CtrStkFeatConfigActl

Indicates the value of the feature setting that is being requested to change from the centerstack either from the display HMI or from an upload request.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -1228322518.jpg UnitlessValue16bit\_ET |

Table: Signal Details of CtrStkFeatConfigActl

-1228322518.jpg CtrStkFeatNoActl

Indicates the number of the feature from the master feature list that is being requested from the centerstack either from the display HMI or from an upload or download request.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -1228322518.jpg UnitlessValue16bit\_ET |

Table: Signal Details of CtrStkFeatNoActl

-1228322518.jpg CtrStkPersIndex\_D\_Actl

Indicates which personality profile is being accessed by the centerstack.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -1228322518.jpg PersIndex\_D\_ET |

Table: Signal Details of CtrStkPersIndex\_D\_Actl

-1228322518.jpg Disp\_VehUnitTempUsrSel

Generated from auto-import

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -1228322518.jpg ZZ\_Disp\_VehUnitTempUsrSel |

Table: Signal Details of Disp\_VehUnitTempUsrSel

-1228322518.jpg Disp\_VehUntTripCoUsrSel

Generated from auto-import

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -1228322518.jpg ZZ\_Disp\_VehUntTripCoUsrSel |

Table: Signal Details of Disp\_VehUntTripCoUsrSel

-1228322518.jpg GearLvrPos\_D\_Actl

Automatic Transmission Gear Lever Position (Driver Selected Gear Lever Position), for 6 speed Automatic Transmissions.

Automatic Transmission Gear Lever Position (Driver Selected Gear Lever Position, except for PARK). PARK is now actual confirmed versus unconfirmed requested. This is true starting with 10, 9, and 8 speed Automatic Transmissions due to hardware changes. For functions that are looking for driver desired position CAN Signal TrnRng\_D\_Rq is the most direct replacement for GearLvrPos\_D\_Actl.

Agreed to keep this signal (in addition to TrnIpcDsplyGear\_D\_Actl, id#823) in order to decouple the HMI display from the actual gear position selection.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -1228322518.jpg GearLvrPos\_D\_Actl\_ET |

Table: Signal Details of GearLvrPos\_D\_Actl

658883941.jpg OdometerMasterValue

Odometer Record from the IPC (Instrument Panel Cluster).

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg Odometer\_ET |

Table: Signal Details of OdometerMasterValue

658883941.jpg SteWhlSwtchBack\_B\_Stat

CAN input from the SCCM stating whether the "Back"

button is pressed or not.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg PressedNotPressed\_ET |

Table: Signal Details of SteWhlSwtchBack\_B\_Stat

658883941.jpg SteWhlSwtchDown\_B\_Stat

Steering button cursor input.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg PressedNotPressed\_ET |

Table: Signal Details of SteWhlSwtchDown\_B\_Stat

658883941.jpg SteWhlSwtchLeft\_B\_Stat

Steering button cursor input.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg PressedNotPressed\_ET |

Table: Signal Details of SteWhlSwtchLeft\_B\_Stat

658883941.jpg SteWhlSwtchMenu\_B\_Stat

Steering wheel Menu button signal from SCCM to IPC

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg PressedNotPressed\_ET |

Table: Signal Details of SteWhlSwtchMenu\_B\_Stat

658883941.jpg SteWhlSwtchOk\_B\_Stat

Steering button cursor input.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg PressedNotPressed\_ET |

Table: Signal Details of SteWhlSwtchOk\_B\_Stat

658883941.jpg SteWhlSwtchRght\_B\_Stat

Steering button cursor input.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg PressedNotPressed\_ET |

Table: Signal Details of SteWhlSwtchRght\_B\_Stat

658883941.jpg SteWhlSwtchUp\_B\_Stat

Steering button cursor input.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg PressedNotPressed\_ET |

Table: Signal Details of SteWhlSwtchUp\_B\_Stat

172051543.jpg TimeStamp1\_Byte0

Time sample 1 Byte0

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TimeStamp1\_Byte0

172051543.jpg TimeStamp1\_Byte1

Time sample 1 Byte1

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TimeStamp1\_Byte1

172051543.jpg TimeStamp1\_Byte2

Time sample 1 Byte2

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TimeStamp1\_Byte2

172051543.jpg TimeStamp2\_Byte0

Time sample 2 Byte0

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TimeStamp2\_Byte0

172051543.jpg TimeStamp2\_Byte1

Time sample 2 Byte1

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TimeStamp2\_Byte1

172051543.jpg TimeStamp2\_Byte2

Time sample 2 Byte2

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TimeStamp2\_Byte2

172051543.jpg TimeStamp3\_Byte0

Time sample 3 Byte0

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TimeStamp3\_Byte0

172051543.jpg TimeStamp3\_Byte1

Time sample 3 Byte1

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TimeStamp3\_Byte1

172051543.jpg TimeStamp3\_Byte2

Time sample 3 Byte2

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TimeStamp3\_Byte2

172051543.jpg TimeStamp3\_Byte3

Time sample 3 Byte3

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TimeStamp3\_Byte3

658883941.jpg Tire\_Press\_ILR\_Stat

Indicates the status of the inside left rear tire pressure.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg Tire\_Press\_Stat\_ET |

Table: Signal Details of Tire\_Press\_ILR\_Stat

658883941.jpg Tire\_Press\_IRR\_Stat

Indicates the status of the inside right rear tire pressure.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg Tire\_Press\_Stat\_ET |

Table: Signal Details of Tire\_Press\_IRR\_Stat

658883941.jpg Tire\_Press\_LF\_Stat

Indicates the status of the left front tire pressure.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg Tire\_Press\_Stat\_ET |

Table: Signal Details of Tire\_Press\_LF\_Stat

658883941.jpg Tire\_Press\_LR\_OLR\_Stat

Indicates the status of the outside left rear tire pressure.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg Tire\_Press\_Stat\_ET |

Table: Signal Details of Tire\_Press\_LR\_OLR\_Stat

658883941.jpg Tire\_Press\_RF\_Stat

Indicates the status of the right front tire pressure.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg Tire\_Press\_Stat\_ET |

Table: Signal Details of Tire\_Press\_RF\_Stat

658883941.jpg Tire\_Press\_RR\_ORR\_Stat

Indicates the status of the outside right rear tire pressure.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg Tire\_Press\_Stat\_ET |

Table: Signal Details of Tire\_Press\_RR\_ORR\_Stat

658883941.jpg Tire\_Press\_System\_Stat

No description.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg Tire\_Press\_System\_Stat\_ET |

Table: Signal Details of Tire\_Press\_System\_Stat

658883941.jpg Tire\_Press\_Telltale

Request for tire pressure telltale operation.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg SingleFlashRate\_ET |

Table: Signal Details of Tire\_Press\_Telltale

658883941.jpg TirePReset\_B\_Rq

The request to reset TPMS feature.

The signal TirePReset\_B\_Rq2 with the exact same meaning and definition has been created. Any change to this signal must be coordinated with a change to the signal TirePReset\_B\_Rq2.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg ResetNull\_ET |

Table: Signal Details of TirePReset\_B\_Rq

658883941.jpg TirePReset\_D\_Stat

The status of the TPMS reset request.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg TirePReset\_D\_ET |

Table: Signal Details of TirePReset\_D\_Stat

658883941.jpg TirePress\_Filter\_Ctrl

Request to either filter on learned TPM IDs or pass all received TPM frames.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg TirePress\_Filter\_Ctrl\_ET |

Table: Signal Details of TirePress\_Filter\_Ctrl

172051543.jpg TirePress\_Frame\_Checksum

Checksum to validate frame

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TirePress\_Frame\_Checksum

172051543.jpg TirePress\_Frame\_ID\_CFG\_0

Byte #0 of TPMSensor ID

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TirePress\_Frame\_ID\_CFG\_0

172051543.jpg TirePress\_Frame\_ID\_CFG\_1

Byte #1 of TPMSensor ID

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TirePress\_Frame\_ID\_CFG\_1

172051543.jpg TirePress\_Frame\_ID\_CFG\_2

Byte #2 of TPMSensor ID

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TirePress\_Frame\_ID\_CFG\_2

172051543.jpg TirePress\_Frame\_ID\_CFG\_3

Byte #3 of TPMSensor ID

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TirePress\_Frame\_ID\_CFG\_3

172051543.jpg TirePress\_Frame\_Press

Byte indicating in pressure

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TirePress\_Frame\_Press

172051543.jpg TirePress\_Frame\_Status

Byte indicating sensor status

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TirePress\_Frame\_Status

172051543.jpg TirePress\_Frame\_Temp

Byte indicating in temperature

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TirePress\_Frame\_Temp

658883941.jpg TirePress\_Info\_ID

Request to send learned IDs for use when filtering, 4 byte ID value. This signal will be reloaded and sent for each element in the ID\_Cfg[] array.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg UnitlessValue32bit\_ET |

Table: Signal Details of TirePress\_Info\_ID

658883941.jpg TirePress\_Info\_Index

Request to send learned IDs for use when filtering, 1 byte array index value. This signal will be reloaded and sent for each element in the ID\_Cfg[] array.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg UnitlessValue8bit\_ET |

Table: Signal Details of TirePress\_Info\_Index

658883941.jpg TirePress\_Info\_MaxInd

No Data Dictionary Dataflow exists for this CAN Signal - CMDB Domain Value 0 : 255

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg |

Table: Signal Details of TirePress\_Info\_MaxInd

172051543.jpg TPMS\_Sensor

TPM Sensor itself

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TPMS\_Sensor

172051543.jpg TPMSDataPacket

Header for TPMS Data Packet

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -- |
| Value Range | [ - ] |
| Resolution |  |
| Unit |  |

Table: Signal Details of TPMSDataPacket

-1228322518.jpg Veh\_V\_ActlEng

Vehicle speed source from engine control module. This is usually the primary vehicle speed source in FNA vehicles.

In non-failure mode operation this will be based on transmission output shaft speed.

In FiE vehicles the primary source is usually Veh\_V\_ActlBrk (ID#503). Both signals will be on HS-CAN for all CGEA V1.1 vehicles.

The receiving modules will be configured to honor one signal as the master.

Use VehVActlEng\_D\_Qf (id#1191) for quality factor information.

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -1228322518.jpg Veh\_V\_ET |

Table: Signal Details of Veh\_V\_ActlEng

658883941.jpg VehVActlEng\_D\_Qf

Quality factor for signal Veh\_V\_ActlEng (#1190).

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | 658883941.jpg QualityFactor\_ET |

Table: Signal Details of VehVActlEng\_D\_Qf

-1228322518.jpg WhlRotatFl\_No\_Cnt

Front left wheel rolling angle counts to support navigation and parking assist features. Rolling counter where 126 counts equal one wheel rotation. Fault information is embedded in the corresponding wheel speed signal (id#586). FSMS: RQT-060900-006081

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -1228322518.jpg UnitlessValue8bit\_ET |

Table: Signal Details of WhlRotatFl\_No\_Cnt

-1228322518.jpg WhlRotatFr\_No\_Cnt

Front right wheel rolling angle counts to support navigation and parking assist features. Rolling counter where 126 counts equal one wheel rotation. Fault information is embedded in the corresponding wheel speed signal (id#588). FSMS: RQT-060900-006081

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -1228322518.jpg UnitlessValue8bit\_ET |

Table: Signal Details of WhlRotatFr\_No\_Cnt

-1228322518.jpg WhlRotatRl\_No\_Cnt

Rear left wheel rolling angle counts to support navigation and parking assist features. Rolling counter where 126 counts equal one wheel rotation. Fault information is embedded in the corresponding wheel speed signal (id#590). FSMS: RQT-060900-006081

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -1228322518.jpg UnitlessValue8bit\_ET |

Table: Signal Details of WhlRotatRl\_No\_Cnt

-1228322518.jpg WhlRotatRr\_No\_Cnt

Rear right wheel rolling angle counts to support navigation and parking assist features. Rolling counter where 126 counts equal one wheel rotation. Fault information is embedded in the corresponding wheel speed signal (id#592). FSMS: RQT-060900-006081

|  |  |  |
| --- | --- | --- |
| **ASIL** | |  |
| **Value** | Encoding Name | -1228322518.jpg UnitlessValue8bit\_ET |

Table: Signal Details of WhlRotatRr\_No\_Cnt

#### GSDB Signals

*Not supported by MagicDraw report generation.*

#### HW I/Os

*Not supported by MagicDraw report generation.*

#### Diagnostic Interfaces

##### DTCs

<Some Description of the DTC.

Refer to VSEM document “[Diagnostic Fault Coverage and DTC Numbers](https://www.vsemweb.ford.com/tc/launchapp?-attach=true&-s=226TCSession&-o=yAUtrNhnx3NrTDAAAAAAAAAAAAA&servername=Production_Server)

[Design Consideration](https://www.vsemweb.ford.com/tc/launchapp?-attach=true&-s=226TCSession&-o=yAUtrNhnx3NrTDAAAAAAAAAAAAA&servername=Production_Server)”, what to fill into the attributes below>

|  |  |
| --- | --- |
| **Test Period Time** |  |
| **Test Run Criteria,** |  |
| **Enable Criteria (EC)** |  |
| **Applicable** |  |
| **FailureTypeBytes** |  |
| **Test Period Time** |  |
| **Test Run Criteria,** |  |

##### DIDs

*Not supported by MagicDraw report generation.*

### Technical Parameters

### Mappings

-1044064860.jpg SteWhlSwtchUp\_B\_Stat - HMI\_Selected\_Screen

-1044064860.jpg SteWhlSwtchMenu\_B\_Stat - HMI\_Selected\_Screen

-1044064860.jpg SteWhlSwtchLeft\_B\_Stat - HMI\_Selected\_Screen

-1044064860.jpg OdometerMasterValue - vehicleMileage

-1044064860.jpg WhlRotatRl\_No\_Cnt - wheelSpeedStatus

-1044064860.jpg SteWhlSwtchOk\_B\_Stat - HMI\_Selected\_Screen

-1044064860.jpg Veh\_V\_ActlEng - vehicleSpeed

-1044064860.jpg SteWhlSwtchRght\_B\_Stat - HMI\_Selected\_Screen

-1044064860.jpg WhlRotatFl\_No\_Cnt - wheelSpeedStatus

-1044064860.jpg WhlRotatRr\_No\_Cnt - wheelSpeedStatus

-1044064860.jpg TirePReset\_B\_Rq - resetRequest

-1044064860.jpg Tire\_Press\_Telltale - telltaleStatus

-1044064860.jpg Tire\_Press\_System\_Stat - Sensor\_Status

-1044064860.jpg Tire\_Press\_System\_Stat - TPMS\_System\_Status

-1044064860.jpg SteWhlSwtchDown\_B\_Stat - HMI\_Selected\_Screen

-1044064860.jpg WhlRotatFr\_No\_Cnt - wheelSpeedStatus

-1044064860.jpg SteWhlSwtchBack\_B\_Stat - HMI\_Selected\_Screen

-1044064860.jpg AirAmb\_P\_Actl - barometricPressure

-1044064860.jpg TirePReset\_D\_Stat - resetResponse

-1044064860.jpg GearLvrPos\_D\_Actl - gearLeverPosition

-1044064860.jpg TirePress\_Info\_ID - Sensor\_Tx\_Identifier

-1044064860.jpg TirePress\_Info\_ID - TPMS\_IDs

### Technical Interfaces

*Not supported by MagicDraw report generation.*

#### AIS Interfaces

##### Publisher Interfaces

##### Subscriber Interfaces

#### AUTOSAR Ports

*Not supported by MagicDraw report generation.*

### Messages/APIs

#### CAN Bus “<Bus Name>”

*Not supported by MagicDraw report generation.*

#### LIN Bus “<Bus Name>”

*Not supported by MagicDraw report generation.*

#### AUTOSAR Interfaces

*Not supported by MagicDraw report generation.*

#### SOA Service Contracts

*Not supported by MagicDraw report generation.*

### Encoding Types

#### Logical Encoding Types

1499499817.jpg HMI\_Selected\_Screen

|  |  |
| --- | --- |
| Value Range | [TPMS\_Screen, TPMS\_Units\_Settings, TPMS\_Generic\_Screen, ] |
| Resolution |  |
| Units |  |

#### Technology Encoding Types

-1228322518.jpg AirAmb\_P\_IncldQfET

005357

|  |  |  |
| --- | --- | --- |
| Value Range | [500.0 - 1110.0] | |
| Resolution | 10.0 | |
| Interpretation |  | |
|  | 500 to 1110 millibar |  |
|  | No data exists |  |
|  | Faulty |  |
| Units | millibar | |

-1228322518.jpg DsplyOp\_D\_ET

005535

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
|  | Null |  |
|  | Query |  |
|  | Set |  |
|  | Upload |  |
|  | Restore |  |
|  | Copy |  |
| Units |  | |

-1228322518.jpg UnitlessValue16bit\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units | unitless | |

-1228322518.jpg UnitlessValue16bit\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units | unitless | |

-1228322518.jpg PersIndex\_D\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

-1228322518.jpg ZZ\_Disp\_VehUnitTempUsrSel

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

-1228322518.jpg ZZ\_Disp\_VehUntTripCoUsrSel

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

-1228322518.jpg GearLvrPos\_D\_Actl\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg Odometer\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units | kilometer | |

658883941.jpg PressedNotPressed\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg PressedNotPressed\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg PressedNotPressed\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg PressedNotPressed\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg PressedNotPressed\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg PressedNotPressed\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg PressedNotPressed\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg ResetNull\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg TirePReset\_D\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg TirePress\_Filter\_Ctrl\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg UnitlessValue32bit\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units | unitless | |

658883941.jpg UnitlessValue8bit\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units | unitless | |

658883941.jpg

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg Tire\_Press\_Stat\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg Tire\_Press\_Stat\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg Tire\_Press\_Stat\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg Tire\_Press\_Stat\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg Tire\_Press\_Stat\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg Tire\_Press\_Stat\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg Tire\_Press\_System\_Stat\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg SingleFlashRate\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

658883941.jpg QualityFactor\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units |  | |

-1228322518.jpg Veh\_V\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units | kilometers / hour | |

-1228322518.jpg UnitlessValue8bit\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units | unitless | |

-1228322518.jpg UnitlessValue8bit\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units | unitless | |

-1228322518.jpg UnitlessValue8bit\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units | unitless | |

-1228322518.jpg UnitlessValue8bit\_ET

|  |  |  |
| --- | --- | --- |
| Value Range | [ - ] | |
| Resolution |  | |
| Interpretation |  | |
| Units | unitless | |

### Technology State Machines

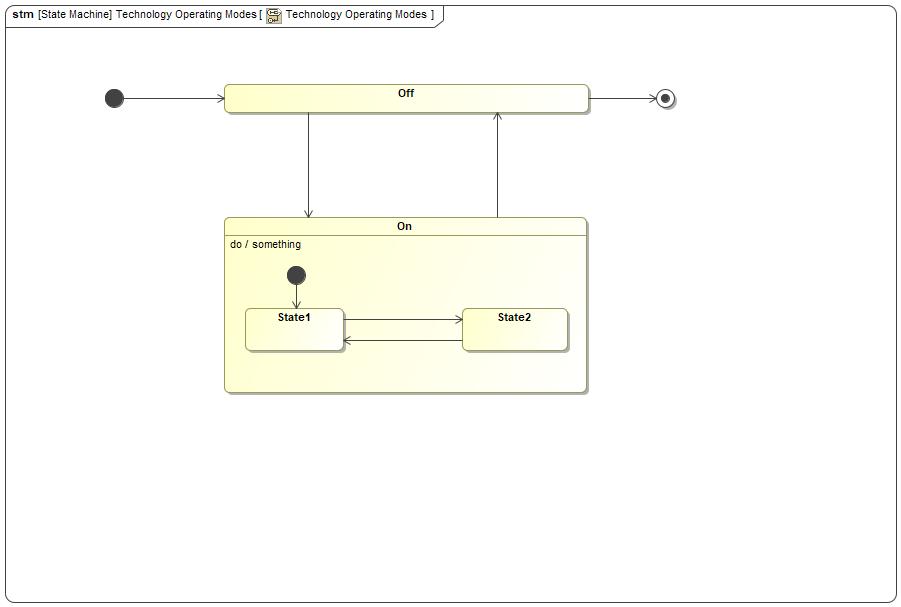


Figure 8‑1: Technology Operating Modes

|  |  |  |
| --- | --- | --- |
| **State** | **Description** | **Requirements Reference** (optional) |
| Off |  | Not supported by Magicdraw generation. |
| On | Do behavior: something | Not supported by Magicdraw generation. |
| State1 |  | Not supported by Magicdraw generation. |
| State2 |  | Not supported by Magicdraw generation. |

Table 8‑1: Operation Modes and States on Technology Operating Modes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Transition ID** | **Source** | **Destination** | **Description** | **Requirements Reference**  (optional) |
| T1 | Off | On |  |  |
| T2 | Off | a |  |  |
| T3 |  |  |  |  |
| T4 | On | Off |  |  |
| T5 |  |  |  |  |
| T6 | State2 | State1 |  |  |
| T7 | State1 | State2 |  |  |

Table 8‑2: Transitions between Operation Modes and States on Technology Operating Modes

Document ends here.