**Module Design Document**

**For**

**FordMsg216BusHiSpd**

**27-Apr-2018**

**Prepared For:**

**Software Engineering**

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# Introduction

## Purpose

Module Design Document for MM064A\_FordMsg216BusHiSpd\_Impl.

## Scope

The following definitions are used throughout this document:

* **Shall**: indicates a mandatory requirement without exception in compliance.
* **Should**: indicates a mandatory requirement; exceptions allowed only with documented justification.
* **May**: indicates an optional action.

# FordMsg216BusHiSpd & High-Level Description

The purpose of the Ford Message 216 Bus High Speed function is to provide the Electric Power Steering system with signal values for the Trailer Back Up Assist, Torque Steer Compensation, and Brake Oscillation Reduction functions from CAN. The Ford Message216 function will perform the missing message diagnostic as well as provide a validity signal for the received message.

# Design details of software module

## Graphical representation of FordMsg216BusHiSpd



## Data Flow Diagram

Refer FDD

### Component level DFD

Refer FDD

### Function level DFD

Refer FDD

# Constant Data Dictionary

## Program (fixed) Constants

### Embedded Constants

#### Local Constants

|  |  |  |  |
| --- | --- | --- | --- |
| Constant Name | Resolution | Units | Value |
| Please Refer DD | NA | NA | NA |

# Software Component Implementation

## Sub-Module Functions

The sub-module functions are grouped based on similar functionality that needs to be executed in a given “State” of the system (refer States and Modes). For a given module, the MDD will identify the type and number of sub-modules required. The sub-module types are described below.

### Init: FordMsg216BusHiSpdInit1

#### Design Rationale

Refer FDD

#### Module Outputs

Refer FDD

### Per: FordMsg216BusHiSpdPer1

#### Design Rationale

Refer FDD

#### Store Module Inputs to Local copies

Refer FDD

#### (Processing of function) ………

Refer FDD

#### Store Local copy of outputs into Module Outputs

Refer FDD

## Server Runnable

### ComIPduCallout\_WheelData\_FD1

## 5.2.1.1 Design Rationale

None

## 5.2.1.2 Processing of function

None

### ComTimeoutNotification\_WhlDirFl\_D\_Actl

## 5.2.2.1 Design Rationale

None

## 5.2.2.2 Processing of function

None

## Interrupt Functions

None

## Module Internal (Local) Functions

## Local Function #1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | DiagEna | Type | Min | Max |
| Arguments Passed | FordTqSteerCmpEnad\_Cnt\_T\_logl | boolean | 0U | 1U |
| FordBrkOscnRednEnad\_Cnt\_T\_logl | boolean | 0U | 1U |
| FordTrlrBackUpAssiEnad\_Cnt\_T\_logl | boolean | 0U | 1U |
| ClrDiagcFlgProxy\_Cnt\_T\_u08 | uint8 | 0U | 255U |
| FordCanDtcInhb\_Cnt\_T\_logl | boolean | 0U | 1U |
| \*MissMsgDiagEna\_Cnt\_T\_logl | boolean | 0U | 1U |
| \*ClrDiagcFlgProxyEna\_Cnt\_logl | boolean | 0U | 1U |
| Return Value |  |  |  |  |

## Design Rationale

## Processing

Please refer to the below path in the FDD model.

MM064A\_FordMsg216BusHiSpd\_SIL/FordMsg216BusHiSpd/FordMsg216BusHiSpdPer1/DiagEna

## Local Function #2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | MissMsg | Type | Min | Max |
| Arguments Passed | FordEpsLifeCycMod\_Cnt\_T\_u08 | uint8 | 0 | 255U |
| MissMsgDiagEna\_Cnt\_T\_logl | boolean | 0U | 1U |
| ClrDiagcFlgProxyEna\_Cnt\_logl | boolean | 0U | 1U |
| \*FordVehFrntLeWhlDirRaw\_Cnt\_T\_enum | Enum | 0U | 3U |
| \*FordVehFrntRiWhlDirRaw\_Cnt\_T\_enum | Enum | 0U | 3U |
| \*FordVehReLeWhlDirRaw\_Cnt\_T\_enum | Enum | 0U | 3U |
| \*FordVehReRiWhlDirRaw\_Cnt\_T\_enum | Enum | 0 | 3U |
| \*FordVehFrntLeWhlRollgCntr\_Cnt\_T\_u08 | uint8 | 0 | 255U |
| \*FordVehFrntRiWhlRollgCntr\_Cnt\_T\_u08 | uint8 | 0 | 255U |
| \*FordVehReLeWhlRollgCntr\_Cnt\_T\_u08 | uint8 | 0 | 255U |
| \*FordVehReRiWhlRollgCntr\_Cnt\_T\_u08 | uint8 | 0 | 255U |
| \*FordVehFrntLeWhlCntrDirVld\_Cnt\_T\_logl | boolean | 0U | 1U |
| \*FordVehFrntRiWhlCntrDirVld\_Cnt\_T\_logl | boolean | 0U | 1U |
| \*FordVehReLeWhlCntrDirVld\_Cnt\_T\_logl | boolean | 0U | 1U |
| \*FordVehReRiWhlCntrDirVld\_Cnt\_T\_logl | boolean | 0U | 1U |
| Return Value |  |  |  |  |

## Design Rationale

## Processing

Please refer to the below path in the FDD model.

MM064A\_FordMsg216BusHiSpd\_SIL/FordMsg216BusHiSpd/FordMsg216BusHiSpdPer1/FordMsg064MsgMiss

## Local Function #3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | MissMsgNtcFail | Type | Min | Max |
| Arguments Passed | MissMsgDiagEna\_Cnt\_T\_logl | boolean | 0U | 1U |
| ClrDiagcFlgProxyEna\_Cnt\_logl | boolean | 0U | 1U |
| BusHiSpdMissTiThd\_Cnt\_T\_u16 | unit16 | 0 | 65535 |
| Return Value |  |  |  |  |

## Design Rationale

## Processing

Please refer to the below path in the FDD model.

MM064A\_FordMsg216BusHiSpd/FordMsg216BusHiSpd/FordMsg216BusHiSpdPer1/FordMsg064MsgMiss

## Local Function #4

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | MissMsgOutpProcg | Type | Min | Max |
| Arguments Passed | \*FordVehFrntLeWhlCntrDirVld\_Cnt\_T\_logl | boolean | 0U | 1U |
| \*FordVehFrntRiWhlCntrDirVld\_Cnt\_T\_logl | boolean | 0U | 1U |
| \*FordVehReLeWhlCntrDirVld\_Cnt\_T\_logl | boolean | 0U | 1U |
| \*FordVehReRiWhlCntrDirVld\_Cnt\_T\_logl | boolean | 0U | 1U |
| Return Value |  |  |  |  |

## Design Rationale

## Processing

Please refer to the below path in the FDD model.

MM064A\_FordMsg216BusHiSpd/FordMsg216BusHiSpd/FordMsg216BusHiSpdPer1/FordMsg064MsgMiss

## Local Function #5

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | MsgPrsnt | Type | Min | Max |
| Arguments Passed | Ford\_WhlDirFl\_D\_Actl\_Cnt\_T\_enum | Enum | 0U | 3U |
| Ford\_WhlDirFr\_D\_Actl\_Cnt\_T\_enum | Enum | 0U | 3U |
| Ford\_WhlDirRl\_D\_Actl\_Cnt\_T\_enum | Enum | 0U | 3U |
| Ford\_WhlDirRr\_D\_Actl\_Cnt\_T\_enum | Enum | 0U | 3U |
| Ford\_WhlRotatFl\_No\_Cnt\_Cnt\_T\_u08 | uint8 | 0 | 255U |
| Ford\_WhlRotatFr\_No\_Cnt\_Cnt\_T\_u08 | uint8 | 0 | 255U |
| Ford\_WhlRotatRl\_No\_Cnt\_Cnt\_T\_u08 | uint8 | 0 | 255U |
| Ford\_WhlRotatRr\_No\_Cnt\_Cnt\_T\_u08 | uint8 | 0 | 255U |
| MissMsgDiagEna\_Cnt\_T\_logl | boolean | 0U | 1U |
| ClrDiagcFlgProxyEna\_Cnt\_logl | boolean | 0U | 1U |
| \*FordVehFrntLeWhlDirRaw\_Cnt\_T\_enum | Enum | 0U | 3U |
| \*FordVehFrntRiWhlDirRaw\_Cnt\_T\_enum | Enum | 0U | 3U |
| \*FordVehReLeWhlDirRaw\_Cnt\_T\_enum | Enum | 0U | 3U |
| \*FordVehReRiWhlDirRaw\_Cnt\_T\_enum | Enum | 0U | 3U |
| \*FordVehFrntLeWhlRollgCntr\_Cnt\_T\_u08 | uint8 | 0 | 255U |
| \*FordVehFrntRiWhlRollgCntr\_Cnt\_T\_u08 | uint8 | 0 | 255U |
| \*FordVehReLeWhlRollgCntr\_Cnt\_T\_u08 | uint8 | 0 | 255U |
| \*FordVehReRiWhlRollgCntr\_Cnt\_T\_u0, | uint8 | 0 | 255U |
| \*FordVehFrntLeWhlCntrDirVld\_Cnt\_T\_logl | boolean | 0U | 1U |
| \*FordVehFrntRiWhlCntrDirVld\_Cnt\_T\_logl | boolean | 0U | 1U |
| \*FordVehReLeWhlCntrDirVld\_Cnt\_T\_logl | boolean | 0U | 1U |
| \*FordVehReRiWhlCntrDirVld\_Cnt\_T\_logl) | boolean | 0U | 1U |
| Return Value |  |  |  |  |

## Design Rationale

## Processing

Please refer to the below path in the FDD model.

MM064A\_FordMsg216BusHiSpd/FordMsg216BusHiSpd/FordMsg216BusHiSpdPer1/Msg\_Prsnt

## Local Function #6

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | MissMsgNtcPass | Type | Min | Max |
| Arguments Passed | MissMsgDiagEna\_Cnt\_T\_logl | boolean | 0U | 1U |
| ClrDiagcFlgProxyEna\_Cnt\_logl | boolean | 0U | 1U |
| Return Value |  |  |  |  |

## Design Rationale

## Processing

Please refer to the below path in the FDD model.

MM064A\_FordMsg216BusHiSpd/FordMsg216BusHiSpd/FordMsg216BusHiSpdPer1/Msg\_Prsnt

## Local Function #7

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | FordVehWhlDirRawProcg | Type | Min | Max |
| Arguments Passed | Ford\_WhlDir\_D\_Actl | Enum | 0U | 3U |
| \*FordVehWhlDirRaw\_Cnt\_T\_enum | Enum | 0U | 3U |
| \*FordVehWhlDirRawVldFlg\_Cnt\_T\_logl | boolean | 0U | 1U |
| Return Value |  |  |  |  |

## Design Rationale

## Processing

Please refer to the below path in the FDD model.

MM064A\_FordMsg216BusHiSpd/FordMsg216BusHiSpd/FordMsg216BusHiSpdPer1/Msg\_Prsnt/OutputProcessing

## Local Function #8

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | VldElpdTi | Type | Min | Max |
| Arguments Passed | CntrDirVldRefTi\_Cnt\_T\_u32 | Uint32 | 0 | 4294967295 |
| FordMsg216BusHiSpdWhlCntrDirTiThd\_MilliSec\_T\_u16 | Uint16 | 0 | 65535 |
| \* WhlCntrDirVldElpdTi\_Cnt\_T\_logl | boolean | 0U | 1U |
| Return Value |  |  |  |  |

## Design Rationale

## Processing

Please refer to the below path in the FDD model.

MM064A\_FordMsg216BusHiSpd/FordMsg216BusHiSpd/FordMsg216BusHiSpdPer1/Msg\_Prsnt/OutputProcessing/VldElpdTi

## Local Function #9

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ChkElpdTiFrnt | Type | Min | Max |
| Arguments Passed | FordVehFrntLeWhlCntrDirVldFlg\_Cnt\_T\_logl | boolean | 0U | 1U |
| FordVehFrntRiWhlCntrDirVldFlg\_Cnt\_T\_log | boolean | 0U | 1U |
| FrntLeWhlCntrDirVldPassdElpdTi\_Cnt\_T\_logl | boolean | 0U | 1U |
| FrntLeWhlCntrDirVldFaildElpdTi\_Cnt\_T\_logl | boolean | 0U | 1U |
| FrntRiWhlCntrDirVldPassdElpdTi\_Cnt\_T\_logl | boolean | 0U | 1U |
| FrntRiWhlCntrDirVldFaildElpdTi\_Cnt\_T\_logl | boolean | 0U | 1U |
| \*FordVehFrntLeWhlCntrDirVld\_Cnt\_T\_logl | boolean | 0U | 1U |
| \*FordVehFrntRiWhlCntrDirVld\_Cnt\_T\_logl | boolean | 0U | 1U |
| Return Value |  |  |  |  |

## Design Rationale

## Processing

Please refer to the below path in the FDD model.MM064A\_FordMsg216BusHiSpd\_SIL/FordMsg216BusHiSpd/FordMsg216BusHiSpdPer1/Msg\_Prsnt/OutputProcessing/ChkElpdTi

## Local Function #10

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ChkElpdTiRear | Type | Min | Max |
| Arguments Passed | FordVehReLeWhlCntrDirVldFlg\_Cnt\_T\_logl | boolean | 0U | 1U |
| FordVehReRiWhlCntrDirVldFlg\_Cnt\_T\_logl | boolean | 0U | 1U |
| ReLeWhlCntrDirVldPassdElpdTi\_Cnt\_T\_logl | boolean | 0U | 1U |
| ReLeWhlCntrDirVldFaildElpdTi\_Cnt\_T\_logl | boolean | 0U | 1U |
| ReRiWhlCntrDirVldPassdElpdTi\_Cnt\_T\_logl | boolean | 0U | 1U |
| ReRiWhlCntrDirVldFaildElpdTi\_Cnt\_T\_logl | boolean | 0U | 1U |
| \*FordVehReLeWhlCntrDirVld\_Cnt\_T\_logl | boolean | 0U | 1U |
| \*FordVehReRiWhlCntrDirVld\_Cnt\_T\_logl | boolean | 0U | 1U |
| Return Value |  |  |  |  |

## Design Rationale

## Processing

Please refer to the below path in the FDD model.MM064A\_FordMsg216BusHiSpd\_SIL/FordMsg216BusHiSpd/FordMsg216BusHiSpdPer1/Msg\_Prsnt/OutputProcessing/ChkElpdTi

## GLOBAL Function/Macro Definitions

None

# Known Limitations with Design

None

# UNIT TEST CONSIDERATION

None

1. Abbreviations and Acronyms

| **Abbreviation or Acronym** | **Description** |
| --- | --- |
| FDD | Functional Design Document. (See references) |

1. Glossary

**Note**: Terms and definitions from the source “Nexteer Automotive” take precedence over all other definitions of the same term. Terms and definitions from the source “Nexteer Automotive” are formulated from multiple sources, including the following:

* ISO 9000
* ISO/IEC 12207
* ISO/IEC 15504
* Automotive SPICE® Process Reference Model (PRM)
* Automotive SPICE® Process Assessment Model (PAM)
* ISO/IEC 15288
* ISO 26262
* IEEE Standards
* SWEBOK
* PMBOK
* Existing Nexteer Automotive documentation

| **Term** | **Definition** | **Source** |
| --- | --- | --- |
| MDD | Module Design Document |  |
| DFD | Data Flow Diagram |  |

1. References

|  |  |  |
| --- | --- | --- |
| Ref. # | Title | Version |
| 1 | AUTOSAR Specification of Memory Mapping (Link:AUTOSAR\_SWS\_MemoryMapping.pdf) | v1.3.0 R4.0 Rev 2 |
| 2 | MDD Guideline | EA4 01.02 |
| 3 | Software Naming Conventions.doc | EA4 01.02 |
| 4 | Software Design and Coding Standards.doc | EA4 2.01 |
| 5 | FDD: MM064A\_FordMsg216BusHiSpd\_Design | See Synergy subproject version |