**Module Design Document**

**For**

**FordSysSt**

**04-Dec-2017**

**Prepared For:**

**Software Engineering**

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Table of Contents

[1 Introduction 6](#_Toc500326228)

[1.1 Purpose 6](#_Toc500326229)

[1.2 Scope 6](#_Toc500326230)

[2 FordSysSt & High-Level Description 7](#_Toc500326231)

[3 Design details of software module 8](#_Toc500326232)

[3.1 Graphical representation of FordSysSt 8](#_Toc500326233)

[3.2 Data Flow Diagram 8](#_Toc500326234)

[3.2.1 Component level DFD 8](#_Toc500326235)

[3.2.2 Function level DFD 8](#_Toc500326236)

[4 Constant Data Dictionary 9](#_Toc500326237)

[4.1 Program (fixed) Constants 9](#_Toc500326238)

[4.1.1 Embedded Constants 9](#_Toc500326239)

[5 Software Component Implementation 10](#_Toc500326240)

[5.1 Sub-Module Functions 10](#_Toc500326241)

[5.1.1 Init: FordSysStInit1 10](#_Toc500326242)

[5.1.1.1 Design Rationale 10](#_Toc500326243)

[5.1.1.2 Module Outputs 10](#_Toc500326244)

[5.1.2 Per: FordSysStPer1 10](#_Toc500326245)

[5.1.2.1 Design Rationale 10](#_Toc500326246)

[5.1.2.2 Store Module Inputs to Local copies 10](#_Toc500326247)

[5.1.2.3 (Processing of function) 10](#_Toc500326248)

[5.1.2.4 Store Local copy of outputs into Module Outputs 10](#_Toc500326249)

[5.2 Server Runnables 10](#_Toc500326250)

[5.3 Interrupt Functions 10](#_Toc500326251)

[5.4 Module Internal (Local) Functions 10](#_Toc500326252)

[5.4.1 Local Function #1 10](#_Toc500326253)

[5.4.1.1 Design Rationale 10](#_Toc500326254)

[5.4.1.2 Processing 11](#_Toc500326255)

[5.4.2 Local Function #2 11](#_Toc500326256)

[5.4.2.1 Design Rationale 11](#_Toc500326257)

[5.4.2.2 Processing 11](#_Toc500326258)

[5.4.3 Local Function #3 11](#_Toc500326259)

[5.4.3.1 Design Rationale 11](#_Toc500326260)

[5.4.3.2 Processing 11](#_Toc500326261)

[5.4.4 Local Function #4 11](#_Toc500326262)

[5.4.4.1 Design Rationale 11](#_Toc500326263)

[5.4.4.2 Processing 11](#_Toc500326264)

[5.4.5 Local Function #5 11](#_Toc500326265)

[5.4.5.1 Design Rationale 12](#_Toc500326266)

[5.4.5.2 Processing 12](#_Toc500326267)

[5.4.6 Local Function #6 12](#_Toc500326268)

[5.4.6.1 Design Rationale 12](#_Toc500326269)

[5.4.6.2 Processing 12](#_Toc500326270)

[5.4.7 Local Function #7 12](#_Toc500326271)

[5.4.7.1 Design Rationale 13](#_Toc500326272)

[5.4.7.2 Processing 13](#_Toc500326273)

[5.4.8 Local Function #8 13](#_Toc500326274)

[5.4.9 Design Rationale 13](#_Toc500326275)

[5.4.9.1 Processing 13](#_Toc500326276)

[5.4.10 Local Function #9 13](#_Toc500326277)

[5.4.11 Design Rationale 13](#_Toc500326278)

[5.4.11.1 Processing 13](#_Toc500326279)

[5.4.12 Local Function #10 13](#_Toc500326280)

[5.4.12.1 Design Rationale 13](#_Toc500326281)

[5.4.12.2 Processing 14](#_Toc500326282)

[5.4.13 Local Function #11 14](#_Toc500326283)

[5.4.14 Design Rationale 14](#_Toc500326284)

[5.4.14.1 Processing 14](#_Toc500326285)

[5.4.15 Local Function #12 14](#_Toc500326286)

[5.4.16 Design Rationale 14](#_Toc500326287)

[5.4.16.1 Processing 14](#_Toc500326288)

[5.4.17 Local Function #13 14](#_Toc500326289)

[5.4.18 Design Rationale 14](#_Toc500326290)

[5.4.18.1 Processing 14](#_Toc500326291)

[5.5 GLOBAL Function/Macro Definitions 14](#_Toc500326292)

[6 Known Limitations with Design 16](#_Toc500326293)

[7 UNIT TEST CONSIDERATION 17](#_Toc500326294)

[Appendix A Abbreviations and Acronyms 18](#_Toc500326295)

[Appendix B Glossary 19](#_Toc500326296)

[Appendix C References 20](#_Toc500326297)

# Introduction

## Purpose

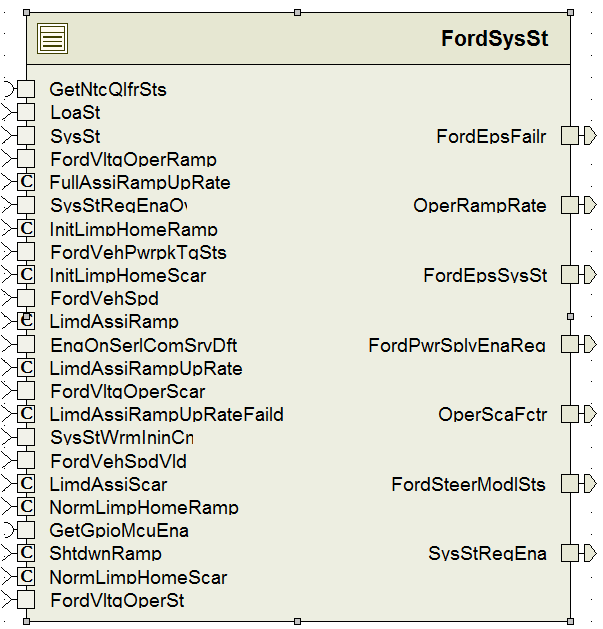
## Scope

# FordSysSt & High-Level Description

Ford System State will handle internal states and failure modes, and output the current state to the bus.

# Design details of software module

## Graphical representation of FordSysSt



## 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 |
| Refer .m file |  |  |  |

# Software Component Implementation

## Sub-Module Functions

### Init: Init1

## Design Rationale

*None*

## Module Outputs

*None*

### Per: Per1

## Design Rationale

*None*

## Store Module Inputs to Local copies

*Refer FDD*

## (Processing of function)

*Refer FDD*

## Store Local copy of outputs into Module Outputs

*Refer FDD*

## Server Runnables

*None*

## Interrupt Functions

*None*

## Module Internal (Local) Functions

## Local Function #1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ChkLvngWarmInit | Type | Min | Max |
| **Arguments Passed** | FordSysSt\_Cnt\_T\_enum | SysSt1 | 0U | 3U |
|  | FordLoaSt\_Cnt\_T\_enum | LoaSt1 | 0U | 5U |
|  | SysStWrmIninCmpl\_Cnt\_T\_logl | Boolean | FALSE | TRUE |
|  | FordVltgOperSt\_Cnt\_T\_enum | FordVltgOperSt1 | 0U | 6U |
|  | FordEpsSysSt\_Cnt\_T\_enum | FordEpsSysSt1 | 0U | 8U |
|  | OperScaFctr\_Cnt\_T\_f32 | float32 | 0.1 | 1 |
|  | OperRampRate\_Cnt\_T\_f32 | float32 | 0.1 | 1000 |
| **Return Value** | none |  |  |  |

## Design Rationale

None

## Processing

Check the conditions for leaving ChkLvngWarmInit.

## Local Function #2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ChkLvngLimpHome | Type | Min | Max |
| **Arguments Passed** | FordLoaSt\_Cnt\_T\_enum | LoaSt1 | 0U | 3U |
|  | FordEpsSysSt\_Cnt\_T\_enum | FordEpsSysSt1 | 0U | 8U |
| **Return Value** | none |  |  |  |

## Design Rationale

None

## Processing

## Local Function #3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ChkLvngLimpAside | Type | Min | Max |
| **Arguments Passed** | FordLoaSt\_Cnt\_T\_enum | LoaSt1 | 0U | 3U |
|  | FordEpsSysSt\_Cnt\_T\_enum | FordEpsSysSt1 | 0U | 8U |
| **Return Value** | none |  |  |  |

## Design Rationale

None

## Processing

Check the condtions for leaving LimpAside for another substate of EPSSystemFailure.

## Local Function #4

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ChkLvngRampOut | Type | Min | Max |
| **Arguments Passed** | FordLoaSt\_Cnt\_T\_enum | LoaSt1 | 0U | 3U |
|  | FordEpsSysSt\_Cnt\_T\_enum | FordEpsSysSt1 | 0U | 8U |
| **Return Value** | none |  |  |  |

## Design Rationale

None

## Processing

Check the condtions for leaving RampOut for another substate of EPSSystemFailure.

## Local Function #5

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ChkLvngEpsNormOperLimAssi | Type | Min | Max |
| **Arguments Passed** | LoaSt\_Cnt\_T\_enum | LoaSt1 | 0U | 3U |
|  | FordVltgOperSt\_Cnt\_T\_enum | FordVltgOperSt1 | 0U | 6U |
|  | SysSt\_Cnt\_T\_enum | SysSt1 | 0U | 3U |
|  | FordVehSpdVld\_Cnt\_T\_logl | boolean | FALSE | TRUE |
|  | FordVehSpd\_Cnt\_T\_f32 | float32 | 0.0F | 511.0F |
|  | FordVehPwrpkTqSts\_Cnt\_T\_enum | Ford\_PwPckTq\_D\_Stat | 0U | 3U |
|  | NtcQlfr\_Cnt\_T\_enum | SigQlfr1 | 0U | 2U |
|  | FordEpsSysSt\_Cnt\_T\_enum | FordEpsSysSt1 | 0U | 8U |
|  | OperScaFctr\_Cnt\_T\_f32 | float32 | 0.0F | 1.0F |
|  | OperRampRate\_Cnt\_T\_f32 | float32 | 0.0F | 1000.0F |
| **Return Value** | none |  |  |  |

## Design Rationale

None

## Processing

Check the conditions for leaving EpsNormOper-->LimAssi.

## Local Function #6

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ChkLvngEpsNormOperFullAssi | Type | Min | Max |
| **Arguments Passed** | FordLoaSt\_Cnt\_T\_enum | LoaSt1 | 0U | 3U |
|  | FordVltgOperSt\_Cnt\_T\_enum | FordVltgOperSt1 | 0U | 6U |
|  | FordSysSt\_Cnt\_T\_enum | SysSt1 | 0U | 3U |
|  | FordVehSpdVld\_Cnt\_T\_logl | boolean | FALSE | TRUE |
|  | FordVehSpd\_Cnt\_T\_f32 | float32 | 0.0F | 511.0F |
|  | FordVehPwrpkTqSts\_Cnt\_T\_enum | Ford\_PwPckTq\_D\_Stat | 0U | 3U |
|  | NtcQlfr\_Cnt\_T\_enum | SigQlfr1 | 0U | 2U |
| **Return Value** | none |  |  |  |

## Design Rationale

None

## Processing

Check the conditions for leaving EpsNormOper-->FullAssist.

## Local Function #7

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | PowerDown | Type | Min | Max |
| **Arguments Passed** | None |  |  |  |
| **Return Value** |  |  |  |  |

## Design Rationale

None

## Processing

Set FordEpsSystemSt to PowerDown

## Local Function #8

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | WarmInit | Type | Min | Max |
| **Arguments Passed** | None |  |  |  |
| **Return Value** |  |  |  |  |

## Design Rationale

None

## Processing

Set WarmInit conditions.

## Local Function #9

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | EpsSystemFailure | Type | Min | Max |
| **Arguments Passed** | None |  |  |  |
| **Return Value** |  |  |  |  |

## Design Rationale

None

## Processing

Set EpsSystemFailure variables common to the entire block.

## Local Function #10

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | EpsSystemFailureExitCheck | Type | Min | Max |
| **Arguments Passed** | FordSysSt\_Cnt\_T\_enum | SysSt1 | 0U | 3U |
|  | FordVehSpd\_Cnt\_T\_f32 | float32 | 0.0F | 511.0F |
|  | FordVehSpdVld\_Cnt\_T\_logl | boolean | FALSE | TRUE |
|  | FordVehPwrpkTqSts\_Cnt\_T\_enum | Ford\_PwPckTq\_D\_Stat | 0U | 3U |
|  | NtcQlfr\_Cnt\_T\_enum | SigQlfr1 | 0U | 2U |
| **Return Value** |  | boolean | FALSE | TRUE |

## Design Rationale

None

## Processing

Called whenever FordEpsSysSt is already in an EpsSystemFailure state.

## Local Function #11

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | LimAssist | Type | Min | Max |
| **Arguments Passed** | None |  |  |  |
| **Return Value** |  |  |  |  |

## Design Rationale

None

## Processing

Set LimAssist conditions.

## Local Function #12

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | FullAssist | Type | Min | Max |
| **Arguments Passed** | None |  |  |  |
| **Return Value** |  |  |  |  |

## Design Rationale

None

## Processing

Set FullAssist conditions.

## Local Function #13

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ShutDown | Type | Min | Max |
| **Arguments Passed** | None |  |  |  |
| **Return Value** |  |  |  |  |

## Design Rationale

None

## Processing

Set ShutDown conditions.

## GLOBAL Function/Macro Definitions

None

# Known Limitations with Design

None

# UNIT TEST CONSIDERATION

None

Abbreviations and Acronyms

| **Abbreviation or Acronym** | **Description** |
| --- | --- |
|  |  |
|  |  |

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 |  |

References

| **Ref. #** | **Title** | **Version** |
| --- | --- | --- |
| 1 | [AUTOSAR Specification of Memory Mapping](http://www.autosar.org/fileadmin/files/standards/classic/4-0/software-architecture/implementation-integration/standard/AUTOSAR_SWS_MemoryMapping.pdf?_sm_au_=iVVkW148vj2N42wj) | v1.3.0 R4.0 Rev 2 |
| 2 | MDD Guideline | EA4 01.00.00 |
| 3 | EA4 Software Naming Conventions | 01.01.00 |
| 4 | Software Design and Coding Standards | 2.1 |
| 5 | FDD – CF052A FordSysSt | See Synergy subproject version |