**Module Design Document**

**For**

**Sensor Offset Learning**

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**Prepared For:**

**Software Engineering**

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# Introduction

Refer the Design Subproject.

# SnsrOffsLrng & High-Level Description

Refer the Design Subproject.

# Design details of software module

## Graphical representation of SnsrOffsLrng

**

# Constant Data Dictionary

## Program (fixed) Constants

### Embedded Constants

#### Local Constants

|  |  |  |  |
| --- | --- | --- | --- |
| Constant Name | Resolution | Units | Value |
| HWTQOFFSHILIM\_HWNWTMTR\_F32 | Single precision float | HwNwtMtr | 4 |
| HWTQOFFSLOLIM\_HWNWTMTR\_F32 | Single precision float | HwNwtMtr | -4 |
| VEHYAWRATEOFFSHILIM\_VEHDEGPERSEC\_F32 | Single precision float | VehDegPerSec | 20 |
| VEHYAWRATEOFFSLOLIM\_VEHDEGPERSEC\_F32 | Single precision float | VehDegPerSec | -20 |
| HWAGOFFSHILIM\_HWDEG\_F32 | Single precision float | HwDeg | -30 |
| HWAGOFFSLOLIM\_HWDEG\_F32 | Single precision float | HwDeg | -30 |
| MTRXSIZE\_CNT\_U08 | 1 | Cnt | 3 |

# Software Component Implementation

## Sub-Module Functions

### Init: SnsrOffsLrngInit1

## Design Rationale

*Refer the Design.*

## Module Outputs

*Refer the Design.*

### Per: SnsrOffsLrngPer1

## Design Rationale

*Refer the Design.*

## Store Module Inputs to Local copies

*Refer the Design.*

## (Processing of function)………

*Refer the Design.*

## Store Local copy of outputs into Module Outputs

*Refer the Design.*

### Per: SnsrOffsLrngPer2

## Design Rationale

*Refer the Design.*

## Store Module Inputs to Local copies

*Refer the Design.*

## (Processing of function)………

*Refer the Design.*

## Store Local copy of outputs into Module Outputs

*Refer the Design.*

## Server Runables

### SnsrOffsLrng\_RstHwTq

## Design Rationale

*Refer the Design.*

## Store Module Inputs to Local copies

*Refer the Design.*

## (Processing of function)………

*Refer the Design.*

## Store Local copy of outputs into Module Outputs

*Refer the Design.*

### SnsrOffsLrng\_RstYawAndAg

## Design Rationale

*Refer the Design.*

## Store Module Inputs to Local copies

*Refer the Design.*

## (Processing of function)………

*Refer the Design.*

## Store Local copy of outputs into Module Outputs

*Refer the Design.*

### SnsrOffsLrng\_SetHwAgOffs

## Design Rationale

*Refer the Design.*

## Store Module Inputs to Local copies

*Refer the Design.*

## (Processing of function)………

*Refer the Design.*

## Store Local copy of outputs into Module Outputs

*Refer the Design.*

### SnsrOffsLrng\_GetHwAgOffs

## Design Rationale

*Refer the Design.*

## Store Module Inputs to Local copies

*Refer the Design.*

## (Processing of function)………

*Refer the Design.*

## Store Local copy of outputs into Module Outputs

*Refer the Design.*

### SnsrOffsLrng\_SetHwTqOffs

## Design Rationale

*Refer the Design.*

## Store Module Inputs to Local copies

*Refer the Design.*

## (Processing of function)………

*Refer the Design.*

## Store Local copy of outputs into Module Outputs

*Refer the Design.*

### SnsrOffsLrng\_GetHwTqOffs

## Design Rationale

*Refer the Design.*

## Store Module Inputs to Local copies

*Refer the Design.*

## (Processing of function)………

*Refer the Design.*

## Store Local copy of outputs into Module Outputs

*Refer the Design.*

### SnsrOffsLrng\_SetYawRateOffs

## Design Rationale

*Refer the Design.*

## Store Module Inputs to Local copies

*Refer the Design.*

## (Processing of function)………

*Refer the Design.*

## Store Local copy of outputs into Module Outputs

*Refer the Design.*

### SnsrOffsLrng\_GetYawRateOffs

## Design Rationale

*Refer the Design.*

## Store Module Inputs to Local copies

*Refer the Design.*

## (Processing of function)………

*Refer the Design.*

## Store Local copy of outputs into Module Outputs

*Refer the Design.*

## Module Internal (Local) Functions

### Module Internal (Local) Functions

##### Calculate **LearnHwAg**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Function Name** | LearnHwAg | Type | Min | Max | UTP Tol. |
| **Arguments Passed** | HwAgLrngLrngCdnVld\_Cnt\_T\_logl | Boolean | FALSE | TRUE |  |
|  | HwAgLrngEna\_Cnt\_T\_logl | Boolean | FALSE | TRUE |  |
|  | SysTqFild\_HwNm\_T\_f32 | float32 | -8.8 | 8.8 |  |
|  | HandwheelPosition\_HwDeg\_T\_f32 | float32 | -1440 | 1440 |  |
| **Return Value** | None |  |  |  |  |

#### Description

No flowchart added. For Unit test FDD should provide the information needed regarding function processing

##### Calculate **SOaCHierarchyManager**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Function Name** | SOaCHierarchyManager | Type | Min | Max | UTP Tol. |
| **Arguments Passed** | \*EnableYOC\_Cnt\_T\_logl | Boolean | FALSE | TRUE |  |
|  | \*HwAgLrngEna\_Cnt\_T\_logl | Boolean | FALSE | TRUE |  |
|  | \*HwAgLrngRst\_Cnt\_T\_logl | Boolean | FALSE | TRUE |  |
| **Return Value** |  |  |  |  |  |

#### Description

No flowchart added. For Unit test FDD should provide the information needed regarding function processing

##### Calculate **Perform\_TqInpDetn**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Function Name** | Perform\_TqInpDetn | Type | Min | Max | UTP Tol. |
| **Arguments Passed** | None |  |  |  |  |
|  |  |  |  |  |  |
| **Return Value** |  |  |  |  |  |

#### Description

No flowchart added. For Unit test FDD should provide the information needed regarding function processing

##### Calculate **EnableLearning**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Function Name** | **EnableLearning** | Type | Min | Max | UTP Tol. |
| **Arguments Passed** |  |  |  |  |  |
|  |  |  |  |  |  |
| **Return Value** | HwTqLrngEna\_Cnt\_T\_logl | Boolean | FALSE | TRUE |  |

#### Description

No flowchart added. For Unit test FDD should provide the information needed regarding function processing

##### Calculate CalculateKVector

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Function Name** | CalculateKVector | Type | Min | Max | UTP Tol. |
| **Arguments Passed** | TqMdlXAry\_HwRadpS\_T\_f32[3] | float32 | -42 | 42 |  |
|  | KVect\_Uls\_T\_f32[3] | float32 | -42 | 42 |  |
| **Return Value** |  |  |  |  |  |

#### Description

No flowchart added. For Unit test FDD should provide the information needed regarding function processing

##### Calculate **EnablePreProcessing**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Function Name** | **EnablePreProcessing** | Type | Min | Max | UTP Tol. |
| **Arguments Passed** | HwTqPreproc\_dB\_T\_f32 | float32 | -100 | 30 |  |
|  | SampleCntrLim\_Cnt\_T\_u16 | Uint16 | 1 | 65535 |  |
|  | TqInpPrsntVld\_Cnt\_T\_logl | Boolean | FALSE | TRUE |  |
|  | TqInpPrsnt\_Cnt\_T\_logl | Boolean | FALSE | TRUE |  |
| **Return Value** |  |  |  |  |  |

#### Description

No flowchart added. For Unit test FDD should provide the information needed regarding function processing

##### Calculate **UpdateCovarianceMatrix**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Function Name** | UpdateCovarianceMatrix | Type | Min | Max | UTP Tol. |
| **Arguments Passed** | TqMdlXAry\_HwRadpS\_T\_f32[3] | float32 | -42 | 42 |  |
|  | KVect\_Uls\_T\_f32[3] | float32 | -42 | 42 |  |
| **Return Value** |  |  |  |  |  |

#### Description

No flowchart added. For Unit test FDD should provide the information needed regarding function processing

TblSize\_Cnt\_T\_u16 is size of the single dimension of TqMdlAryKVect\_Uls\_T\_f32.

##### Calculate **UpdateHwTqOffs**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Function Name** | **UpdateHwTqOffs** | Type | Min | Max | UTP Tol. |
| **Arguments Passed** | HwTqEstimnVld\_Cnt\_T\_logl | boolean | FALSE | TRUE |  |
|  | HwTqDriftEstimnOnCentr\_HwNm\_T\_f32 | float32 | -10 | 10 |  |
| **Return Value** | None |  |  |  |  |

#### Description

No flowchart added. For Unit test FDD should provide the information needed regarding function processing

##### Calculate **UpdateSampleCnt**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Function Name** | **UpdateSampleCnt** | Type | Min | Max | UTP Tol. |
| **Arguments Passed** | HwAgMeasd\_HwDeg\_T\_f32 | float32 | -1440 | 1440 |  |
|  |  |  |  |  |  |
| **Return Value** | None |  |  |  |  |

#### Description

No flowchart added. For Unit test FDD should provide the information needed regarding function processing

# Known Limitations with Design

The service SetRamblockStatus is used instead Per Instance memory “SetRamBlkSts “ as there is no concept of transition function in EA4. So SetRamblockStatus() is called and set to true whenever SetRamBlkSts PIM is made as True.

# 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 (Link:[AUTOSAR\_SWS\_MemoryMapping.pdf](http://www.autosar.org/download/R4.0/AUTOSAR_SWS_MemoryMapping.pdf)) | v1.3.0 R4.0 Rev 2 |
| 2 | MDD Guideline | EA4 01.00.01 |
| 3 | [Software Naming Conventions.doc](http://misagweb01.nexteer.com/eRoomReq/Files/erooms8/NextGeneration/0_fc55f/Software%20Naming%20Conventions%2003x(In%20Work).doc) | 1.0 |
| 4 | [Software Design and Coding Standards.doc](http://eroom1.nexteer.com/eRoomReq/Files/erooms8/NextGeneration/0_1a67a9/Software%20Design%20and%20Coding%20Standards.doc) | 2.0 |
| 5 | SF051A\_SnsrOffsLrng\_Design | See the synergy sub-project version included. |