**Module Design Document**

**For**

**Tuning Select Authority**

**May 17, 2016**

**Prepared For:**

**Software Engineering**

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| --- | --- | --- | --- | --- |
| **Sl. No.** | **Description** | **Author** | **Version** | **Date** |
| 1 | Initial MDD implementing FDD SF-23 v001 | VK | 1.0 | 03Jul12 |
| 2 | Updates to provide the switching of tuning sets and personalities | LWW | 2.0 | 03/08/12 |
| 3 | Added checkpoints and memmap software segment is updated for static variables | Selva | 3.0 | 24-Sep-12 |
| 4 | Updated trigger rate for Per1 | BWL | 4.0 | 24-Oct-12 |
| 5 | Updated per1 for tune-on-the-fly phase 1 support. | KJS | 5.0 | 30-Jul-13 |
| 6 | Updated to version 4 and 5 of FDD | SB | 6.0 | 17-May-16 |
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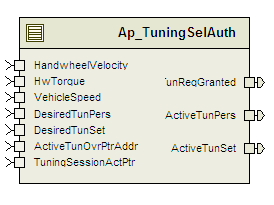
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# TuningSelAuth & High-Level Description

*This function broadcasts an authority to allow switching between calibration subsets while driving. It compares handwheel torque and vehicle speed to calibratable thresholds and outputs either a zero or a one.*

# Design details of software module

## Graphical representation of TuningSelAuth



## Data Flow Diagram

### Module level DFD

N/A

### Sub-Module level DFD

N/A

## Component diagram

N/A

## Variable Data Dictionary

### User defined ‘typedef’ definition/declaration

N/A

### Variable definition for enumerated types

N/A

## Constant Data Dictionary

### Program Constants

#### Local Constants

Refer .m file

#### Global Constants

Refer .m file

|  |
| --- |
| Constant Name |
| T\_TunSetSelectionTbl\_Ptr\_Str[] \* |
| T\_TunPersSelectionTbl\_Ptr\_Str[][] \* |

*\* Note: For unit testing purposes, these arrays of pointers are of size [3] and [3][5] respectively and are defined as pointers to uint16 (as opposed to pointers to tuning structures) for simplicity.*

### Module Specific Lookup Tables

None

## Software Module Implementation

<The detailed design of the function is provided in the FDD. The detail design shall only be add to the MDD when it is not provided in the FDD or the FDD is not adequate and clarification is needed.>

### Sub-Module Functions

#### Initialization sub-module TuningSelAuth\_Init1()

##### **Design Rationale**

LPF\_KUpdate\_f32 is used to initialize the LPF filter instead of the full LPF\_Init\_f32 macro as an optimization since the required initial state of the filter is 0, which is the initialized value of the RAM, so there is no need to explicitly initialize the state variables in this init function.

**Store Module Inputs to Local copies**

*Refer to FDD*

##### **(Processing of function)………**

*Refer to FDD*

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

*Refer to FDD*

#### Periodic sub-module TuningSelAuth\_Per1()

Refer ‘TuningSelAuthPer1’ block in the Simulink model.

##### **Design Rationale**

None

##### **Store Module Inputs to Local copies**

Refer ‘TuningSelAuthPer1’ block in the Simulink model.

##### **(Processing of function)………**

Refer ‘TuningSelAuthPer1’ block in the Simulink model.

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

Refer ‘TuningSelAuthPer1’ block in the Simulink model.

#### Non Periodic sub-module {\_NONPer()}

None

### Interrupt Service Routines

None

### \_SCOMM () Functions

None

### Module Internal (Local) Functions

None

### Transition Functions

None

# Known Limitations with Design

1. The FDD indicates that this module will store the EEPROM value for tuning set, however, this implementation doesn’t provide this block. Instead, it is assumed that some other module will contain the tuning selection block. This was done to enable programs that don’t have multiple tuning sets to just use the default “0” without having to manage an EEPROM block.

# UNIT TEST CONSIDERATION

1. INLINE functions defined in “GlobalMacro.h” are not unit tested.
2. For unit testing purposes inputs - TunPer\_Ptr\_Str, TunSet\_Ptr\_Str are defined as pointers to uint16 (as opposed to pointers to tuning structures) for simplicity.
3. For unit testing purposes, arrays of pointers - T\_TunSetSelectionTbl\_Ptr\_Str[],T\_TunPersSelectionTbl\_Ptr\_Str[][] are of size [3] and [3][5] respectively and are defined as pointers to uint16 (as opposed to pointers to tuning structures) for simplicity.

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 | Process release 04.02.01 |
| 3 | [Software Naming Conventions.doc](http://misagweb01.nexteer.com/eRoomReq/Files/erooms8/NextGeneration/0_fc55f/Software%20Naming%20Conventions%2003x(In%20Work).doc) | Process release 04.02.01 |
| 4 | [Software Design and Coding Standards.doc](http://eroom1.nexteer.com/eRoomReq/Files/erooms8/NextGeneration/0_1a67a9/Software%20Design%20and%20Coding%20Standards.doc) | Process release 04.02.01 |
| 5 | FDD SF023A\_TuningSelAuth\_Design | See Synergy Subproject version |