**Module Design Document**

**For**

**Active Pull Compensation**

**Jan 17, 2017**

**Prepared For:**

**Software Engineering**

**,**

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| **Sl. No.** | **Description** | **Author** | **Version** | **Date** |
| 1 | Initial Version | Akhil Krishna N D | 1.0 | 16-Oct-2015 |
| 2 | Updated to FDD version SF013A\_PullCmpActv\_Design\_1.4.0 | SB | 2.0 | 29-Feb-2016 |
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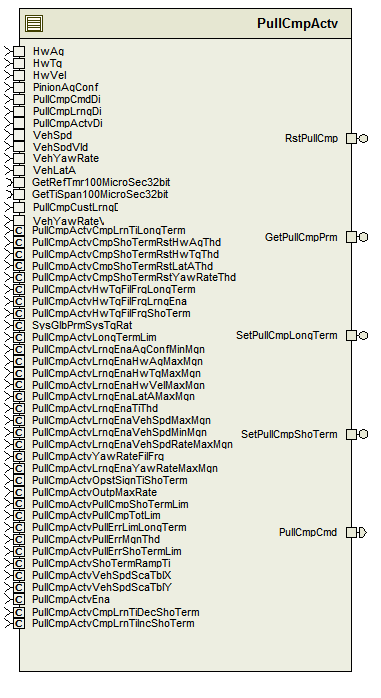
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# Active Pull Compensation & High-Level Description

*The Active Pull Compensation Function corrects vehicle pull issues by compensating for HW torque offsets detected by the steering system. These torque offsets are classified as short-term and long-term, each of which is compensated for independently by the algorithm. When the compensation is applied, the need for the driver to provide a constant input torque to counter these offsets is greatly reduced.*

# Design details of software module

## Graphical representation of Active Pull Compensation



## Data Flow Diagram

Please refer FDD.

### Component level DFD

Please refer FDD.

### Function level DFD

Please refer FDD.

# Constant Data Dictionary

## Program (fixed) Constants

### Embedded Constants

#### Local Constants

|  |  |  |  |
| --- | --- | --- | --- |
| Constant Name | Resolution | Units | Value |
| Please refer .m file |  |  |  |

# Software Component Implementation

## Sub-Module Functions

## Init: PullCmpActvInit1

## Design Rationale

None

## Module Outputs

None

## Per: PullCmpActvPer1

## Design Rationale

None

## Store Module Inputs to Local copies

None

## (Processing of function)………

Please refer FDD

## Store Local copy of outputs into Module Outputs

Please refer FDD

## Per: PullCmpActvPer2

## Design Rationale

Please refer FDD*.*

## Store Module Inputs to Local copies

Please refer FDD and design rationale noted above.

## (Processing of function)………

Please refer FDD.

## Store Local copy of outputs into Module Outputs

None

## Server Runnables

## GetPullCmpPrm

## Design Rationale

None

## (Processing of function)………

See GetPullCmpPrm block in FDD

## RstPullCmp

## Design Rationale

None

## (Processing of function)………

See RstPullCmp block in FDD

## SetPullCmpLongTerm

## Design Rationale

None

## (Processing of function)………

See SetPullCmpLongTerm block in FDD

## SetPullCmpShoTerm

## Design Rationale

None

## (Processing of function)………

See SetPullCmpShoTerm block in FDD

## Interrupt Functions

None

## Module Internal (Local) Functions

## Local Function #1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ActvCmpEna | Type | Min | Max |
| **Arguments Passed** | PullCmpActvShoTermRst\_Cnt\_T\_logl | boolean | FALSE | TRUE |
|  | AbslHwTqFild\_HwNwtMtr\_T\_f32 | float32 | 0.0 | 10.0 |
|  | AbslHwAg\_HwDeg\_T\_f32 | float32 | 0.0 | 1440.0 |
|  | AbslVehYawRateFild\_VehDegPerSec\_T\_f32 | float32 | 0.0 | 128.0 |
|  | AbslVehLatA\_MtrPerSecSqd\_T\_f32 | float32 | 0.0 | 10.0 |
|  | PinionAgConf\_Uls\_T\_f32 | float32 | 0.0 | 1.0 |
|  | VehSpd\_Kph\_T\_f32 | float32 | 0.0 | 511.0 |
|  | VehSpdVld\_Cnt\_T\_logl | boolean | FALSE | TRUE |
|  | AbslHwVel\_HwRadPerSec\_T\_f32 | float32 | 0.0 | 42.0 |
|  | PullCmpCustLrngDi\_Cnt\_T\_logl | Boolean | FALSE | TRUE |
|  | VehYawRateVld\_Cnt\_T\_logl | boolean | FALSE | TRUE |
| **Return Value** | LrngEnad\_Cnt\_T\_logl | boolean | FALSE | TRUE |

## Design Rationale

None

## Processing

(Place flowchart/design for local function)

Refer to the “ActvCmpEna” block of the Simulink model of the design.

## Local Function #2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | CalcIntgrGain | Type | Min | Max |
| **Arguments Passed** | HwTq\_HwNwtMtr\_T\_f32 | float32 | -10.0 | 10.0 |
|  | PullCmpShoTermPrev\_HwNwtMtr\_T\_f32 | float32 | -10.0 | 10.0 |
| **Return Value** | IntgtrGainShoTerm\_Uls\_T\_f32 | float32 | 0.0 | 1.0 |

## Design Rationale

None

## Processing

(Place flowchart/design for local function)

Refer to the “CalcIntgtrGain” block of the Simulink model of the design

## Local Function #3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ErrIntgtrActvLim | Type | Min | Max |
| **Arguments Passed** | PullCmpActvShoTermRst\_Cnt\_T\_logl | boolean | FALSE | TRUE |
|  | IntgtrGainShoTerm\_Uls\_T\_f32 | float32 | 0.0 | 1.0 |
|  | PullErrShoTerm\_HwNwtMtr\_T\_f32 | float32 | -10.0 | 10.0 |
|  | PullCmpShoTermPrev\_HwNwtMtr\_T\_f32 | float32 | -10.0 | 10.0 |
|  | RampDwnStepSize\_HwNwtMtr\_T\_f32 | float32 | 0.0 | 0.6 |
|  | ShoTermRst\_Cnt\_T\_logl | boolean | FALSE | TRUE |
| **Return Value** | PullCmpShoTerm\_HwNwtMtr\_T\_f32 | float32 | -10.0 | 10.0 |

## Design Rationale

None

## Processing

(Place flowchart/design for local function)

Refer to the “ErrIntgtr&ActvLim” block of the Simulink model of the design.

## GLOBAL Function/Macro Definitions

## GLOBAL Function #1

None

## Design Rationale

## processing

(Place flowchart/design for local function)

# 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 (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 : SF013A\_PullCmpActv\_Design | See Synergy sub project version |