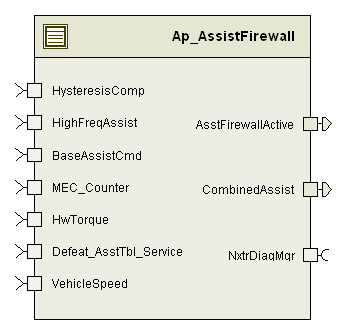
# Module --

# High-Level Description

This module limits the output from the Assist module according to safety requirements.

# Figures

## Component Diagram



# Variable Data Dictionary

For details on module input / output variable, refer to the Data Dictionary for the application. Input / output variable names are listed here for reference.

|  |  |  |
| --- | --- | --- |
| Module Inputs | Module Outputs | |
| BaseAssistCmd\_MtrNm\_f32 | | AsstFirewallActive\_Uls\_f32 |
| HighFreqAssist\_MtrNm\_f32 | | CombinedAssist\_MtrNm\_f32 |
| HwTorque\_HwNm\_f32 | |  |
| HysteresisComp\_MtrNm\_f32 | |  |
| VehicleSpeed\_Kph\_f32 | |  |
| Defeat\_AsstTbl\_Service\_Cnt\_lgc | |  |
| MEC\_Counter\_Cnt\_enum | |  |

## Module Internal Variables

This section identifies the name, range and resolutions for module specific data created by this module. If there are no range restrictions on the variable, the term “FULL” is placed into the table for legal range.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable Name | Resolution | Legal Range  (min) | Legal Range  (max) | Software Segment |
| UprBoundKSV\_M\_str |  |  |  | ASSISTFIREWALL\_START\_SEC\_VAR\_CLEARED\_UNSPECIFIED |
| LwrBoundKSV\_M\_str |  |  |  | ASSISTFIREWALL\_START\_SEC\_VAR\_CLEARED\_UNSPECIFIED |
| HiFreqKSV\_M\_str |  |  |  | ASSISTFIREWALL\_START\_SEC\_VAR\_CLEARED\_UNSPECIFIED |
| ActiveKSV\_M\_str |  |  |  | ASSISTFIREWALL\_START\_SEC\_VAR\_CLEARED\_UNSPECIFIED |
| ActiveRawAcc\_Cnt\_M\_u16 | 1 | FULL | FULL | ASSISTFIREWALL\_START\_SEC\_VAR\_CLEARED\_16 |
| PNCountStatus\_Cnt\_M\_lgc | n/a | FALSE | TRUE | ASSISTFIREWALL\_START\_SEC\_VAR\_CLEARED\_ BOOLEAN |
| AsstFWUprBound\_MtrNm\_D\_f32 | Single Precision Floating Point | -8.8 | 8.8 | ASSISTFIREWALL\_START\_SEC\_VAR\_CLEARED\_32 |
| AsstFWLwrBound\_MtrNm\_D\_f32 | Single Precision Floating Point | -8.8 | 8.8 | ASSISTFIREWALL\_START\_SEC\_VAR\_CLEARED\_32 |
| AsstFWSumInput\_MtrNm\_D\_f32 | Single Precision Floating Point | -26.4 | 26.4 | ASSISTFIREWALL\_START\_SEC\_VAR\_CLEARED\_32 |
| AsstFWLowFreqInput\_MtrNm\_D\_f32 | Single Precision Floating Point | -26.4 | 26.4 | ASSISTFIREWALL\_START\_SEC\_VAR\_CLEARED\_32 |
| AsstFWLowFreqLimited\_MtrNm\_D\_f32 | Single Precision Floating Point | -8.8 | 8.8 | ASSISTFIREWALL\_START\_SEC\_VAR\_CLEARED\_32 |
| AsstFWActiveRaw\_Uls\_D\_f32 | Single Precision Floating Point | 0 | 1 | ASSISTFIREWALL\_START\_SEC\_VAR\_CLEARED\_32 |
| AsstFWUprBoundFilt\_MtrNm\_D\_f32 | Single Precision Floating Point | -8.8 | 8.8 | ASSISTFIREWALL\_START\_SEC\_VAR\_CLEARED\_32 |
| AsstFWLwrBoundFilt\_MtrNm\_D\_f32 | Single Precision Floating Point | -8.8 | 8.8 | ASSISTFIREWALL\_START\_SEC\_VAR\_CLEARED\_32 |
| CombAsstSV\_MtrNm\_M\_f32 | Single Precision Floating Point | -8.8 | 8.8 | ASSISTFIREWALL\_START\_SEC\_VAR\_CLEARED\_32 |
| AsstFWOverBound\_Cnt\_D\_lgc | n/a | FALSE | TRUE | ASSISTFIREWALL\_START\_SEC\_VAR\_CLEARED\_BOOLEAN |
| AsstReducedPerfSV\_Cnt\_M\_lgc | n/a | FALSE | TRUE | ASSISTFIREWALL\_START\_SEC\_VAR\_CLEARED\_ BOOLEAN |

### User defined typedef definition/declaration

This section documents any user types uniquely used for the module.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Typedef Name | Element Name | User Defined Type | Legal Range  (min) | Legal Range  (max) |
| None |  |  |  |  |

# Constant Data Dictionary

## Calibration Constants

This section lists the calibrations used by the module. For details on calibration constants, refer to the Data Dictionary for the application.

|  |
| --- |
| Constant Name |
| k\_AsstFWInpLimitHysComp\_MtrNm\_f32 |
| k\_AsstFWInpLimitHFA\_MtrNm\_f32 |
| k\_AsstFWInpLimitBaseAsst\_MtrNm\_f32 |
| k\_AsstFWFiltKn\_Hz\_f32 |
| k\_AsstFWFWActiveLPF\_Hz\_f32 |
| t\_AsstFWVehSpd\_Kph\_u9p7[12] |
| t2\_AsstFWUprBoundX\_HwNm\_s4p11[12][11] |
| t2\_AsstFWUprBoundY\_MtrNm\_s4p11[12][11] |
| k\_AsstFWPstep\_Cnt\_u16 |
| k\_AsstFWNstep\_Cnt\_u16 |
| t\_AsstFWPstepNstepThresh\_Cnt\_u16[2] |
| t\_AsstFWDefltAssistX\_HwNm\_u8p8[20] |
| t\_AsstFWDefltAssistY\_MtrNm\_s4p11[20] |
| k\_RestoreThresh\_MtrNm\_f32 |

## Program(fixed) Constants

### Embedded Constants

All embedded constants whose values are provided in Eng units will be evaluated to the equivalent counts by using the FPM\_InitFixedPoint\_m() macro within the #define statement.

#### Local

|  |  |  |  |
| --- | --- | --- | --- |
| Constant Name | Resolution | Units | Value |
| None |  |  |  |

#### Global

This section lists the global constants used by the module. For details on global constants, refer to the Data Dictionary for the application.

|  |
| --- |
| Constant Name |
| D\_ONE\_ULS\_F32 |
| D\_ZERO\_ULS\_F32 |
| D\_2MS\_SEC\_F32 |
| BC\_ASSISTFIREWALL\_FAULTINJECTIONPOINT |
| STD\_ON |
| FLTINJ\_ASSTFIREWALL |
| D\_MTRTRQCMDLOLMT\_MTRNM\_F32 |
| D\_MTRTRQCMDHILMT\_MTRNM\_F32 |
| D\_NEGONE\_CNT\_S16 |
| D\_FALSE\_CNT\_LGC |

### Module specific Lookup Tables Constants

|  |  |  |  |
| --- | --- | --- | --- |
| Constant Name | Resolution | Value | Software Segment |
| None |  |  |  |

# Functions/Macros used by the Sub-Modules

## Library Functions / Macros

The library and functions / Macros that are called by the various sub modules are identified below,

1. LPF\_KUpdate\_f32\_m
2. LPF\_OpUpdate\_f32\_m
3. HPF\_KUpdate\_f32\_m
4. HPF\_OpUpdate\_f32\_m
5. BilinearXMYM\_s16\_s16XMs16YM\_Cnt
6. TableSize\_m
7. FPM\_FloatToFixed\_m
8. FPM\_FixedToFloat\_m
9. DiagPStep\_m
10. DiagNStep\_m
11. Rte\_Call\_NxtrDiagMgr\_SetNTCStatus

## Data Hiding Functions

1. None

## Global Functions/Macros Defined by this Module

None

## Local Functions/Macros Used by this MDD only

None

# Software Module Implementation

## Runtime Environment (RTE) Initial Values

This section lists the initial values of data written by this module but controlled by the RTE. After RTE initialization, the data in this table will contain these values.

|  |  |
| --- | --- |
| Data | Value |
| Rte\_InitValue\_AsstFirewallActive\_Uls\_f32 | 0 |
| Rte\_InitValue\_BaseAssistCmd\_MtrNm\_f32 | 0 |
| Rte\_InitValue\_CombinedAssist\_MtrNm\_f32 | 0 |
| Rte\_InitValue\_HighFreqAssist\_MtrNm\_f32 | 0 |
| Rte\_InitValue\_HwTorque\_HwNm\_f32 | 0 |
| Rte\_InitValue\_HysteresisComp\_MtrNm\_f32 | 0 |
| Rte\_InitValue\_VehicleSpeed\_Kph\_f32 | 0 |

## Initialization Functions

### Init: \_Init1

#### Design Rationale

An initialization function is required to initialize K for each of the filters.

#### Module Outputs

None

#### Module Internal

None

#### Initialize Filters



## Periodic Functions

### Per: \_Per1

#### Design Rationale

None

#### Program Flow Start

#### Rte\_Call\_AssistFirewall\_Per1\_CP0\_CheckpointReached()Store Module Inputs to Local copies

BaseAssistCmd\_MtrNm\_T\_f32 = Rte\_IRead\_AssistFirewall\_Per1\_BaseAssistCmd\_MtrNm\_f32()

HighFreqAssist\_MtrNm\_T\_f32 = Rte\_IRead\_AssistFirewall\_Per1\_HighFreqAssist\_MtrNm\_f32()

HwTorque\_HwNm\_T\_f32 = Rte\_IRead\_AssistFirewall\_Per1\_HwTorque\_HwNm\_f32()

HysteresisComp\_MtrNm\_T\_f32 = Rte\_IRead\_AssistFirewall\_Per1\_HysteresisComp\_MtrNm\_f32()

VehicleSpeed\_Kph\_T\_f32 = Rte\_IRead\_AssistFirewall\_Per1\_VehicleSpeed\_Kph\_f32()

AsstFWPstepNstep\_Cnt\_T\_str.PStep = k\_AsstFWPstep\_Cnt\_u16

AsstFWPstepNstep\_Cnt\_T\_str.NStep = k\_AsstFWNstep\_Cnt\_u16

AsstFWPstepNstep\_Cnt\_T\_str.Threshold = t\_AsstFWPstepNstepThresh\_Cnt\_u16[1]

AbsHwTrq\_HwNm\_T\_u8p8 = FPM\_FloatToFixed\_m(Abs\_f32\_m(HwTorque\_HwNm\_T\_f32), u8p8\_T)

DefeatAsstTblSvc\_Cnt\_T\_lgc = Rte\_IRead\_AssistFirewall\_Per1\_Defeat\_AsstTbl\_Service\_Cnt\_lgc()

MECCounter\_Cnt\_T\_enum = Rte\_IRead\_AssistFirewall\_Per1\_MEC\_Counter\_Cnt\_enum()

#### Sum and Filter Inputs



#### Determine Saturation Bounds and Perform Limiting



#### Determine Active State and Output



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

AsstFWUprBound\_MtrNm\_D\_f32 = UprBound\_MtrNm\_T\_f32

AsstFWLwrBound\_MtrNm\_D\_f32 = LwrBound\_MtrNm\_T\_f32

AsstFWUprBoundFilt\_MtrNm\_D\_f32 = UprBoundFilt\_MtrNm\_T\_f32

AsstFWLwrBoundFilt\_MtrNm\_D\_f32 = LwrBoundFilt\_MtrNm\_T\_f32

AsstFWSumInput\_MtrNm\_D\_f32 = SumInput\_MtrNm\_T\_f32

AsstFWLowFreqInput\_MtrNm\_D\_f32 = LowFreqInput\_MtrNm\_T\_f32

AsstFWLowFreqLimited\_MtrNm\_D\_f32 = LowFreqLimited\_MtrNm\_T\_f32

AsstFWActiveRaw\_Uls\_D\_f32 = AsstFWActiveRaw\_Uls\_T\_f32

Rte\_IWrite\_AssistFirewall\_Per1\_CombinedAssist\_MtrNm\_f32(CombAsstSV\_MtrNm\_M\_f32)

Rte\_IWrite\_AssistFirewall\_Per1\_AsstFirewallActive\_Uls\_f32(AsstFWActive\_Uls\_T\_f32)

#### Program Flow End

Rte\_Call\_AssistFirewall\_Per1\_CP1\_CheckpointReached()

## Fault Recovery Functions

None

## Shutdown Functions

None

## Interrupt Functions

None

## Serial Communication Functions

# Execution Requirements

## Execution Rates for sub-modules called by the Scheduler

This table serves as reference for the Scheduler design

|  |  |  |
| --- | --- | --- |
| Function Name | Calling Frequency | System State(s) in which the function is called |
| AssistFirewall\_Init1 | On Event | On Init |
| AssistFirewall\_Per1 | 2 ms | ALL |

## Execution Requirements for Serial Communication Functions

|  |  |
| --- | --- |
| Function Name | Sub-Module called by (Serial Comm Function Name) |
| <None> |  |

# Memory Map Definition Requirements

## Sub Modules (Functions)

This table identifies the software segments for functions identified in this module.

|  |  |
| --- | --- |
| Name of Sub Module | Software Segment |
| AssistFirewall\_Init1 | RTE\_START\_SEC\_AP\_ASSISTFIREWALL\_APPL\_CODE |
| AssistFirewall\_Per1 | RTE\_START\_SEC\_AP\_ASSISTFIREWALL\_APPL\_CODE |

## Local Functions

This table identifies the software segments for local functions identified in this module.

|  |  |
| --- | --- |
| Name of Sub Module | Software Segment |
|  |  |

# Known Issues / Limitations With Design

1. INLINE functions in GlobalMacro.h are not unit tested.

# Revision Control Log

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item #** | **Rev #** | **Change Description** | **Date** | **Author Initials** |
| 1 | 1.0 | Initial Version | 24-Apr-12 | OT |
| 2 | 2.0 | Fixed conflicting calibration names | 10-May-12 | OT |
| 3 | 3.0 | Added fault injection point | 18-May-12 | OT |
| 4 | 4.0 | Updated to SF-34 v002, fixed conflicting display variable names | 31-May-12 | OT |
| 5 | 5.0 | Updated to SF-34 v003 | 08-Jun-12 | OT |
| 6 | 6.0 | Fixed threshold assignment anomaly | 11-Jun-12 | OT |
| 7 | 7.0 | Updated to SF-34 v004 | 20-Jun-12 | OT |
| 8 | 8.0 | Updated to SF-34 Ver 005 and Ver 006 | 1-Aug-12 | NRAR |
| 9 | 9.0 | Inserted safe watchdog checkpoints | 15-Sept-12 | BWL |
| 10 | 10.0 | Corrected Unspecified variable name to “Boolean” | 18 –Sep-12 | SSK |
| 11 | 11.0 | Updates to meet SF-34 v007 | 01-Feb-13 | VK |
| 12 | 12.0 | MDD/ Src mismatch updates | 22-Feb-13 | VK |
| 13 | 13.0 | Updates to meet SF-34 v008 | 15-May-13 | SP |