**Module Design Document**

**For**

**Customer Battery Voltage Diagnostics**

**VERSION: 5**

**DATE: 24-Nov-2015**

**Revision History**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sl. No.** | **Description** | **Author** | **Version** | **Date** |
| 1 | Initial version | Steve Horwath | 1 | 15-Oct-2014 |
| 2 | Input update, cleanup | Owen Tosh | 2 | 14-Jan-2015 |
| 3 | Updates for SCIR 003B | Owen Tosh | 3 | 20-Jul-2015 |
| 4 | Corrected E8 timer conditions | Owen Tosh | 4 | 14-Sept-2015 |
| 5 | Implemented NTC E9 | Owen Tosh | 5 | 24-Nov-2015 |

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# Abbrevations And Acronyms

|  |  |
| --- | --- |
| Abbreviation | Description |
| MDD | Module design Document |

# References

This section Lists the title & version of all the documents that are referred for development of this document

|  |  |  |
| --- | --- | --- |
| Sr. No. | Title | Version |
| 1 | MDD Guidelines | 1 |
| 2 | Software Naming Conventions | 1 |
| 3 | Coding Standands | 1 |
| 4 | PSA BMPV SCIR | 003E |

# Battery Voltage Diagnostic High-Level Description

This module is responsible for applying voltage and time based hysteresis to the battery voltage to determine customer specific over voltage and low voltage faults. Requirements for all these faults are detailed in the SCIR.

# Design details of software module

## Graphical representation of CustBattDiag

None

## Data Flow Diagram

None

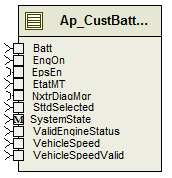
## Module level DFD

None

## Sub-Module level DFD

None

## COMPONENT FLOW DIAGRAM



# Variable Data Dictionary

## User defined typedef definition/declaration

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

## Variable definition for enumerated types

|  |  |  |
| --- | --- | --- |
| Enum Name | Element Name | Value |
| None |  |  |

# Constant Data Dictionary

## Program(fixed) Constants

## Embedded Constants

## Local

|  |  |  |  |
| --- | --- | --- | --- |
| Constant Name | Resolution | Units | Value |
| D\_TESTPASSED\_CNT\_U08 | 1 | Count | 0 |
| D\_TESTFAILED\_CNT\_U08 | 1 | Count | 1 |
| D\_INDEADBAND\_CNT\_U08 | 1 | Count | 2 |
| D\_LOCKED\_CNT\_U08 | 1 | Count | 0x00 |
| D\_CUT\_CNT\_U08 | 1 | Count | 0x01 |
| D\_STARTING\_CNT\_U08 | 1 | Count | 0x02 |
| D\_ENGRUNNING\_CNT\_U08 | 1 | Count | 0x03 |
| D\_STOPPED\_CNT\_U08 | 1 | Count | 0x04 |
| D\_DRVRESTART\_CNT\_U08 | 1 | Count | 0x05 |
| D\_DEGRESTART\_CNT\_U08 | 1 | Count | 0x06 |
| D\_ENGPREPARING\_CNT\_U08 | 1 | Count | 0x07 |
| D\_AUTOSTARTING\_CNT\_U08 | 1 | Count | 0x0A |
| D\_AUTORESTART\_CNT\_U08 | 1 | Count | 0x0D |
| D\_INVALID\_CNT\_U08 | 1 | Count | 0x0F |

## Global

|  |
| --- |
| Constant Name |
| RTE\_MODE\_StaMd\_Mode\_WARMINIT |
| RTE\_MODE\_StaMd\_Mode\_OPERATE |
| RTE\_MODE\_StaMd\_Mode\_DISABLE |

## Module specific Lookup Tables Constants

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

## Library Functions / Macros

None

## Data Hiding Functions

Rte\_Call\_SystemTime\_GetSystemTime\_mS\_u32 ()

Rte\_Call\_SystemTime\_DtrmnElapsedTime\_mS\_u16 ()

Rte\_Call\_NxtrDiagMgr\_SetNTCStatus ()

# Software Module Implementation

## Initialization Functions

None

## PERIODIC FUNCTIONS

## Per: CustBattDiag\_Per1

## Design Rationale

The under voltage and over voltage diagnostics(NTC 0xE5 and 0xE7) are specified to run in all states and at a 10ms rate. Due to the faster diagnostic timing and different enable conditions, these two NTCs were moved into their own periodic.

## Store Module Inputs to Local copies

BattVoltage\_Volts\_T\_f32 = Rte\_IRead\_CustBattDiag\_Per1\_Batt\_Volt\_f32()

BattVoltage\_Volts\_T\_u10p6 = FPM\_FloatToFixed\_m(BattVoltage\_Volts\_T\_f32, u10p6\_T)

## Ntc 0xE5 and 0xE7 Diagnostics



## Store Local copy of outputs into Module Outputs

None

## Per: CustBattDiag\_Per2

## Design Rationale

The battery voltage diagnostics were split into two periodics. Per1 handles the faster 10ms diagnostics while Per2 handles the rest.

## Store Module Inputs to Local copies

BattVoltage\_Volts\_T\_f32 = Rte\_IRead\_CustBattDiag\_Per2\_Batt\_Volt\_f32()

VehSpd\_Kph\_T\_f32 = Rte\_IRead\_ CustBattDiag \_Per2\_VehicleSpeed\_Kph\_f32()

EngOn\_Cnt\_T\_lgc = Rte\_IRead\_ CustBattDiag \_Per2\_EngOn\_Cnt\_lgc()

EtatMT\_Cnt\_T\_u08 = Rte\_IRead\_ CustBattDiag \_Per2\_EtatMTMT\_Cnt\_u08()

BattVoltage\_Volts\_T\_u10p6 = FPM\_FloatToFixed\_m(BattVoltage\_Volts\_T\_f32, u10p6\_T)

SttdSelcted\_Cnt\_T\_lgc = Rte\_IRead\_ CustBattDiag \_Per2\_STTdSelected\_Cnt\_lgc()

ValidEngineStatus\_Cnt\_T\_lgc = Rte\_IRead\_CustBattDiag\_Per2\_ValidEngineStatus\_Cnt\_lgc()

VehSpdValid\_Cnt\_T\_lgc = Rte\_IRead\_CustBattDiag\_Per2\_VehicleSpeedValid\_Cnt\_lgc()

SystemState\_Cnt\_T\_enum = Rte\_Mode\_SystemState\_Mode()

Rte\_Call\_EpsEn\_OP\_GET(&EpsEn\_Cnt\_T\_lgc)

Rte\_Call\_SystemTime\_GetSystemTime\_mS\_u32(&SystemTime\_mS\_T\_u32)

## Battery Voltage Diagnostics





## Store Local copy of outputs into Module Outputs

None

## Interrupt Functions

None

## TRANSIENT FUNCTIONS

None

## Serial Communication Functions

None

## Local Function/Macro Definitions

## Control Timers

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function Name** | ControlTimers | Type | Min | Max |
| **Arguments Passed** | CompareType\_T\_u08 | Uint08 | 0 | 15 |
|  | SetTimer\_T\_ptr | uint32\* | 0 | 2^32-1 |
|  | ClrTimer\_T\_ptr | uint32\* | 0 | 2^32-1 |
|  | SetTimer\_ms\_T\_u16p0 | uint16 | 0 | 65535 |
|  | ClrTimer\_ms\_T\_u16p0 | uint16 | 0 | 65535 |
|  | NTCNum\_T\_u16 | uint16 | 0 | 255 |
| **Return Value** | None |  |  |  |

## Description

CompareType\_T\_u08: Passed data to indicate passed, failed or in the hysteresis deadband

SetTimer\_T\_ptr: Pointer to the appropriate module specific 32-bit set timer under test (examples are set timer for over voltage, low voltage, battery Ok, etc.)

ClrTimer\_T\_ptr: Pointer to the appropriate module specific 32-bit clear timer under test (examples are set timer for over voltage, low voltage, battery Ok, etc.)

SetTimer\_ms\_T\_u16p0: Calibration used for the time based hysteresis to set the condition. Note that the calibrations will differ for set timers for over voltage, low voltage, etc.

ClrTimer\_ms\_T\_u16p0: Calibration used for the time based hysteresis to clear the condition. Note that the calibrations will differ for set timers for over voltage, low voltage, etc.

NTCNum\_T\_u16: Identifies the NTC number to set or clear



## GLObAL Function/Macro Definitions

# Known Limitations With Design

# UNIT TEST CONSIDERATION

None

# Appendix A – Configuration Schemes