



Nuvation Energy BMS Descartes Software

Release Notes

Document ID: NE-RN-002 | Revision: 1.1, 2024-08-10

BMS Software Version: Descartes Update 1
© 2024 Nuvation Energy

Table of Contents

- 1. Introduction 1
 - 1.1. UL 1973 compatibility 1
 - 1.2. Upgrading your Battery Management System 1
- 2. Descartes Update 1 3
 - 2.1. New Features 3
 - 2.1.1. Contactor Life Tracking 3
 - 2.1.2. Adaptive SOC Algorithm 3
 - 2.1.3. Improved Stack Full Condition 4
 - 2.2. Resolved Issues 4
 - 2.3. Added Components 5
 - 2.4. Removed Components 19
 - 2.5. Changed Components 23

1. Introduction

This document provides a summary of software changes for the Descartes Software release.



Nuvation Energy Software Release Naming Convention

Nuvation Energy BMS software releases have *names* along with *version numbers*. The release names are in alphabetical order to easily identify newer releases. For example: Ampere -> Babbage -> Curie.

Descartes Update 1

Applies to stack-level products like:

- G4 Stack Switchgear
- Stack Controller and Power Interface (modules only)
- Low-Voltage BMS



Finding the currently installed version

To find the current version of software installed on your Battery Management System:

- At the stack-level, check the *Service* screen in the Operator Interface.

1.1. UL 1973 compatibility

The Descartes Update 1 release is compatible for UL 1973 certification.

Stack-Level

To maintain firmware compliance for the UL 1998 safety assessment, the stack-level firmware must maintain a specific CRC on its program image. The Descartes release has completed UL 1998 functional safety to allow for compliance to higher level UL standards (such as UL 1973). The functional safety applies to all products listed in the *Introduction*.

The *Nuvation Energy G4 BMS: Safety Manual* was created to guide Nuvation Energy BMS owners on how to configure their system to comply with a UL 1973 review. This is a step by step instruction manual that provides a check list of configuration steps that the UL reviewer will request.



Please contact support@nuvationenergy.com for access to the *Nuvation Energy G4 BMS: Safety Manual*.

1.2. Upgrading your Battery Management System



If you would like to upgrade your G4 Stack Switchgear, please contact support@nuvationenergy.com for assistance with the upgrade process. These products are customized for their specific end-application and require additional considerations in the upgrade process.

Upgrades from releases prior to Descartes can use the Quick Start Wizard to generate a representative Descartes configuration to start from. The Quick Start Wizard may be accessed online through <https://ncloud.nuvationenergy.com>.

Operational configuration from a prior pre-Descartes configuration can be transferred to this Descartes configuration file using your *Product Manual*.



We thrive on your feedback and what we build is driven by your input.
Please submit support tickets to support@nuvationenergy.com.

2. Descartes Update 1

The software changes for Descartes Update 1 are with respect to the Curie Update 1 software release.

2.1. New Features

The following features were introduced into Descartes Update 1

1. Added safety function for contactor life tracking
2. Added an adaptive SOC algorithm
3. Added a hysteresis to the stack full current condition

2.1.1. Contactor Life Tracking

A new safety function was added to the BMS firmware to track the life of contactors. The tracking of contactor life is required for all G4 Stack Switchgear products. Stack designs which use either the Stack Controller or Low-Voltage BMS products must assess their own contactors used and decide if this feature should or should not be applied.

G4 Stack Switchgear products have different life configurations for their contactors. The *Nuvation Energy G4 BMS: Safety Manual* provides guidance on how to configure contactor life tracking feature for all of Nuvation Energy's Battery Management System products.

The accumulated life of the contactors is persisted in non-volatile memory. When the life reaches the maximum configurable limit, a corresponding warning/fault will be triggered. These warning/faults can not be cleared and the G4 Stack Switchgear unit must be returned to Nuvation Energy to assess damage and replace all contactors.

During operation, the life for a set contactors is increased under two conditions:

1. When contactors are opened above a minimum current threshold. The amount of life increase will be reflected on the magnitude of the breaking current.
 - Above a minimum opening current threshold and below a maximum opening current threshold, contactor life is incremented by one unit.
 - Above a maximum opening current threshold, the life is increased by the maximum life of the contactors. This condition will cause the contactor life fault to trigger.
2. A BMS stack loses power when the contactors are in a closed state. The amount of the life increase will be a single unit as the current information is lost and can not be determined.



It is highly recommended to apply a Uninterrupted Power Supply (UPS) to the Battery Management System input power to prevent a contactor life increment due to a loss of power when contactors are closed.

2.1.2. Adaptive SOC Algorithm

An adaptive SOC algorithm was added to the Nuvation Energy BMS and is continuing to be tested and

evolved for different battery chemistries. This algorithm attempts to adapt SOC to remove integration errors that can occur over a long operational time frame when a battery does not reach its full/empty states. By default this algorithm is disabled. However it is possible to execute both the original cumulative coulomb counting and the adaptive SOC algorithm at the same time. An operator can select which algorithm will be output its results to the `stack_soc[0].soc` and `stack_soc[0].dod` registers and corresponding SunSpec points. For more information on how to use this algorithm please contact support@nuvationenergy.com.



The adaptive SOC algorithm is not currently recommended for LFP battery chemistries.

2.1.3. Improved Stack Full Condition

A time hysteresis was added to the *iFull* to enforce a minimum duration of charging current before considering the stack is at a full condition (100% SOC). The additional configuration register settings are available to configure this additional constraint.

1. `stack_soc.ifull_period` is the hysteresis period for the current to be between the following range. The `ifull_period` register has units of microseconds.
2. When the charge current is between the `stack_soc.ifull` and negative `stack_charge_status.hold_current` for the minimum duration of `stack_soc.ifull_period` before the stack is considered full.



The registers `stack_soc.vfull` and `stack_soc.vfullavg` provide additional constraints on the stack full condition. Refer to the appropriate Battery Management System Product Manual for further details on the stack full state configuration.

2.2. Resolved Issues

The following bug fixes were corrected in the Descartes Update 1 release.

1. Flash drivers failed to report some write/erase failures.
2. Pre-Charge configuration updated to prevent incorrect operation.
3. Removed a small drift in the Stack Controller and Power Interface software clocks (always slower than wall clock).
4. Modbus-RTU handler could experience a buffer under-flow for malformed packets.
5. Added a configurable connect delay for each contactor.
6. Allow product maximum for G4 Cell Interface modules. Previous G4 Cell Interface limits were one less than maximum.
7. Contactors would not close for 8 seconds after exiting service lockout
8. Reject invalid stack voltage measurements immediately after initialization of AFE
9. SOC reporting at 100% while DoD significantly declines.
10. Improved BMS stack simulation

2.3. Added Components

cell_balance_values

Name	cell_balance_values
Description	Balancing Values
Base Address	86016
Instance Count	800

Name	Description	Storage Type	Type	Units
forcebalance	Whether a cell is forced balance	Volatile	Boolean	Flag
shouldbalance	Whether a cell should balance	Volatile	Boolean	Flag

cell_open_wire_diagnostics

Name	cell_open_wire_diagnostics
Description	Diagnostics Of Open Wire Scans
Base Address	289478
Instance Count	800

Name	Description	Storage Type	Type	Units
cell_bal_ratio	Cell balancing ratio	Volatile	UInt16	Value
channel_voltage	AFE chip channel voltages that make up a monoblock cell reading: cell i maps to the channel indices 4i, 4i+1, 4i+2 and 4i+3	Volatile	Voltage	mV

cell_states

Name	cell_states
Description	Estimated Cell States And Uncertainty
Base Address	293658
Instance Count	800

Name	Description	Storage Type	Type	Units
soc	Cell soc estimated using an adaptive filtering approach	Volatile	Float	Value
soc_variance	Variance of the cell soc estimate	Volatile	Float	Value
soc_vp_covariance	Covariance of the cell soc and polarization voltage estimate	Volatile	Float	Value
vp	Voltage drop across the resistor-capacitor pair in the equivalent circuit model representing battery polarization	Volatile	Float	Value

Name	Description	Storage Type	Type	Units
vp_soc_covariance	Covariance of the polarization voltage and cell soc estimate	Volatile	Float	Value
vp_variance	Variance of the cell polarization voltage estimate	Volatile	Float	Value

sc_batt_fault_hysteresis_aggregate

Name	sc_batt_fault_hysteresis_aggregate
Description	Trigger Aggregate
Base Address	279632
Instance Count	1

Name	Description	Storage Type	Type	Units
count	Number of tripped triggers	Volatile	Count	Number
initialized	True if aggregated faults have all been initialized	Volatile	Boolean	Flag
trig	True if a fault has triggered, otherwise false	Volatile	Boolean	Flag

sc_comm_fault_hysteresis_aggregate

Name	sc_comm_fault_hysteresis_aggregate
Description	Trigger Aggregate
Base Address	279616
Instance Count	1

Name	Description	Storage Type	Type	Units
count	Number of tripped triggers	Volatile	Count	Number
initialized	True if aggregated faults have all been initialized	Volatile	Boolean	Flag
trig	True if a fault has triggered, otherwise false	Volatile	Boolean	Flag

sc_fault_register_link

Name	sc_fault_register_link
Description	Boolean Trigger
Base Address	301456
Instance Count	1

Name	Description	Storage Type	Type	Units
disabled	True if the trigger is disabled, it will remain in an untripped state	Factory	Boolean	Flag

Name	Description	Storage Type	Type	Units
initialized	True if the component has been initialized by at least one sample	Volatile	Boolean	Flag
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag
trig	Trigger state	Volatile	Boolean	Flag

sc_register_link_summary

Name	sc_register_link_summary
Description	Register Link Summary
Base Address	301440
Instance Count	1

Name	Description	Storage Type	Type	Units
error	Whether any register link components have errors	Volatile	Boolean	Flag

sc_service_clock

Name	sc_service_clock
Description	Clocking Component
Base Address	167968
Instance Count	1

Name	Description	Storage Type	Type	Units
centiseconds	Count of 10s of milli-seconds	Volatile	UInt64	Value
deciseconds	Count of 100s of milli-seconds	Volatile	UInt64	Value
increment	Write to this register to increment the milli-seconds	Volatile	UInt64	Value
milliseconds	Count of milli-seconds	Volatile	UInt64	Value
seconds	Count of seconds	Volatile	UInt64	Value

sc_service_expiry

Name	sc_service_expiry
Description	Expiry Info
Base Address	167984
Instance Count	1

Name	Description	Storage Type	Type	Units
expiry_time	Expiry time in seconds	Volatile	UInt64	Value
time_remaining	Time remaining until expiry in seconds	Volatile	UInt64	Value

sc_stackbus_rx_wdt

Name	sc_stackbus_rx_wdt
Description	Watchdog
Base Address	77856
Instance Count	1

Name	Description	Storage Type	Type	Units
expired	1 indicates the watchdog expired, 0 indicates it has not expired. Writing into this register resets the internal timer	Volatile	Boolean	Flag
max_update_period	Max time period ever seen by the watchdog between updates	Volatile	Microseconds	uS
period	Time period within which the watchdog needs to be updated before it expires	Factory	Microseconds	uS

sc_stackbus_tx_wdt

Name	sc_stackbus_tx_wdt
Description	Watchdog
Base Address	77872
Instance Count	1

Name	Description	Storage Type	Type	Units
expired	1 indicates the watchdog expired, 0 indicates it has not expired. Writing into this register resets the internal timer	Volatile	Boolean	Flag
max_update_period	Max time period ever seen by the watchdog between updates	Volatile	Microseconds	uS
period	Time period within which the watchdog needs to be updated before it expires	Factory	Microseconds	uS

sc_upgrade_count

Name	sc_upgrade_count
Description	Upgrade Counts
Base Address	230400
Instance Count	1

Name	Description	Storage Type	Type	Units
factory_restore_count	How many times the system has been restored to factory settings	Volatile	Count	Number
upgrade_count	How many times the software has been upgraded	Volatile	Count	Number

sc_warn_hysteresis_aggregate

Name	sc_warn_hysteresis_aggregate
Description	Trigger Aggregate
Base Address	279648
Instance Count	1

Name	Description	Storage Type	Type	Units
count	Number of tripped triggers	Volatile	Count	Number
initialized	True if aggregated faults have all been initialized	Volatile	Boolean	Flag
trig	True if a fault has triggered, otherwise false	Volatile	Boolean	Flag

ssg_contactor_end_of_life_fresh

Name	ssg_contactor_end_of_life_fresh
Description	Freshness
Base Address	229408
Instance Count	1

Name	Description	Storage Type	Type	Units
max_update_period	Max time period between updates to the monitored data	Volatile	Microseconds	uS
period	Time period within which the data needs to be updated before it is stale	Factory	Microseconds	uS
stale	1 indicates the associated data has not been updated within the configured time. 0 indicates the data is still fresh. Writing to this register resets the internal timer	Volatile	Boolean	Flag

ssg_contactor_life_persist

Name	ssg_contactor_life_persist
Description	Persistent Parameters
Base Address	18544
Instance Count	1

Name	Description	Storage Type	Type	Units
crc	CRC16 of the persistent partition	Volatile	UInt16	Value
error	Whether an error has occurred during save/load	Volatile	Boolean	Flag
initialized	Whether the component has been initialized	Volatile	Boolean	Flag
load	Load persistent parameters	Volatile	Boolean	Flag
reset	Reset the persistent parameters, NOTICE: use with caution, this cannot be undone	Volatile	Boolean	Flag
save	Save persistent parameters	Volatile	Boolean	Flag
verification_error	Whether an error has occurred during verification	Volatile	Boolean	Flag
verify	Verify partition against in-register data	Volatile	Boolean	Flag

ssg_contactor_life_tracker

Name	ssg_contactor_life_tracker
Description	Contactor Monitor Parameters
Base Address	229888
Instance Count	4

Name	Description	Storage Type	Type	Units
current_capture_window	Window of current samples to consider, centered on contactor opening	Factory	Microseconds	uS
enabled	Enables contactor life tracking	Factory	Boolean	Flag
is_precharge	True if this is the precharge contactor	Factory	Boolean	Flag
life	Effective life of the contactor, calculated as a function of the contactor opening currents over its lifetime	Volatile	Count	Number
life_remaining	Remaining life of the contactor as a percentage	Volatile	Percentage	%
max_life	Maximum life before the contactor is deemed end-of-life	Factory	Count	Number
max_opening_current	Maximum opening current	Factory	Current	mA
max_rated_current	Max rated current of the contactors	Factory	Current	mA
min_opening_current	Minimum opening current	Factory	Current	mA
num_events	Total number of current capture events detected	Persistent	Count	Number
sanity_check_error	True if num_events does not match sum of all histogram bins	Volatile	Boolean	Flag
status	Response status to contactor status message (0 = Cleared, 1 = Acknowledged, 2 = Error)	Volatile	UInt8	Value
status_seq	Response status sequence number	Volatile	Count	Number

ssg_contactor_life_tracker_summary

Name	ssg_contactor_life_tracker_summary
Description	Contactor Monitor Summary
Base Address	230144
Instance Count	1

Name	Description	Storage Type	Type	Units
min_life_remaining	Life remaining of the contactor with the minimum life remaining	Volatile	Percentage	%
sanity_check_error	True if any contactor fails a sanity check	Volatile	Boolean	Flag

ssg_contactor_life_verify_fresh

Name	ssg_contactor_life_verify_fresh
Description	Freshness
Base Address	18672
Instance Count	1

Name	Description	Storage Type	Type	Units
max_update_period	Max time period between updates to the monitored data	Volatile	Microseconds	uS
period	Time period within which the data needs to be updated before it is stale	Factory	Microseconds	uS
stale	1 indicates the associated data has not been updated within the configured time. 0 indicates the data is still fresh. Writing to this register resets the internal timer	Volatile	Boolean	Flag

ssg_contactor_monitor

Name	ssg_contactor_monitor
Description	Contactor Monitor Parameters
Base Address	8016
Instance Count	4

Name	Description	Storage Type	Type	Units
close_delay	Time to wait after closing this contactor before another contactor may close	Factory	Microseconds	uS
enabled	Enables contactor life tracking	Factory	Boolean	Flag
status	Status of the contactor	Volatile	Count	Number
status_seq	Sequence number of the contactor status	Volatile	Count	Number

Name	Description	Storage Type	Type	Units
value	True if the contactors are closed	Persistent	Boolean	Flag

ssg_contactor_monitor_fresh

Name	ssg_contactor_monitor_fresh
Description	Freshness
Base Address	229392
Instance Count	1

Name	Description	Storage Type	Type	Units
max_update_period	Max time period between updates to the monitored data	Volatile	Microseconds	uS
period	Time period within which the data needs to be updated before it is stale	Factory	Microseconds	uS
stale	1 indicates the associated data has not been updated within the configured time. 0 indicates the data is still fresh. Writing to this register resets the internal timer	Volatile	Boolean	Flag

ssg_current_histogram

Name	ssg_current_histogram
Description	Contactor Current Histogram
Base Address	229632
Instance Count	40

Name	Description	Storage Type	Type	Units
bin	Count of readings that fit into the range (negative_bin + positive_bin)	Volatile	Count	Number
bin_max	Absolute upper limit of bin (inclusive)	Volatile	Current	mA
bin_min	Absolute lower limit of bin (inclusive)	Volatile	Current	mA
negative_bin	Count of negative readings that fit into the range	Persistent	Count	Number
positive_bin	Count of non-negative readings that fit into the range	Persistent	Count	Number

ssg_fault_config_contactor_life

Name	ssg_fault_config_contactor_life
Description	Boolean Trigger
Base Address	152960

Instance Count	1
-----------------------	---

Name	Description	Storage Type	Type	Units
disabled	True if the trigger is disabled, it will remain in an untripped state	Factory	Boolean	Flag
initialized	True if the component has been initialized by at least one sample	Volatile	Boolean	Flag
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag
trig	Trigger state	Volatile	Boolean	Flag

ssg_fault_config_contactor_life_verify

Name	ssg_fault_config_contactor_life_verify
Description	Boolean Trigger
Base Address	152976
Instance Count	1

Name	Description	Storage Type	Type	Units
disabled	True if the trigger is disabled, it will remain in an untripped state	Factory	Boolean	Flag
initialized	True if the component has been initialized by at least one sample	Volatile	Boolean	Flag
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag
trig	Trigger state	Volatile	Boolean	Flag

ssg_fault_contactor_end_of_life

Name	ssg_fault_contactor_end_of_life
Description	Basic Trigger
Base Address	299632
Instance Count	1

Name	Description	Storage Type	Type	Units
disabled	True if the trigger is disabled, it will remain in an untripped state	Factory	Boolean	Flag
initialized	True if the component has been initialized by at least one sample	Volatile	Boolean	Flag
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag
thresh	Trigger threshold	Factory	Percentage	%
trig	Trigger state	Volatile	Boolean	Flag

ssg_fault_contactor_end_of_life_wdt

Name	ssg_fault_contactor_end_of_life_wdt
Description	Boolean Trigger
Base Address	299616
Instance Count	1

Name	Description	Storage Type	Type	Units
disabled	True if the trigger is disabled, it will remain in an untripped state	Factory	Boolean	Flag
initialized	True if the component has been initialized by at least one sample	Volatile	Boolean	Flag
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag
trig	Trigger state	Volatile	Boolean	Flag

ssg_fault_contactor_life_sanity_check

Name	ssg_fault_contactor_life_sanity_check
Description	Boolean Trigger
Base Address	152992
Instance Count	1

Name	Description	Storage Type	Type	Units
disabled	True if the trigger is disabled, it will remain in an untripped state	Factory	Boolean	Flag
initialized	True if the component has been initialized by at least one sample	Volatile	Boolean	Flag
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag
trig	Trigger state	Volatile	Boolean	Flag

ssg_fault_contactor_life_verify_wdt

Name	ssg_fault_contactor_life_verify_wdt
Description	Boolean Trigger
Base Address	300144
Instance Count	1

Name	Description	Storage Type	Type	Units
disabled	True if the trigger is disabled, it will remain in an untripped state	Factory	Boolean	Flag

Name	Description	Storage Type	Type	Units
initialized	True if the component has been initialized by at least one sample	Volatile	Boolean	Flag
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag
trig	Trigger state	Volatile	Boolean	Flag

ssg_fault_contactor_monitor_wdt

Name	ssg_fault_contactor_monitor_wdt
Description	Boolean Trigger
Base Address	299600
Instance Count	1

Name	Description	Storage Type	Type	Units
disabled	True if the trigger is disabled, it will remain in an untripped state	Factory	Boolean	Flag
initialized	True if the component has been initialized by at least one sample	Volatile	Boolean	Flag
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag
trig	Trigger state	Volatile	Boolean	Flag

ssg_warn_contactor_end_of_life

Name	ssg_warn_contactor_end_of_life
Description	Basic Trigger
Base Address	153008
Instance Count	1

Name	Description	Storage Type	Type	Units
disabled	True if the trigger is disabled, it will remain in an untripped state	Configuration	Boolean	Flag
initialized	True if the component has been initialized by at least one sample	Volatile	Boolean	Flag
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag
thresh	Trigger threshold	Configuration	Percentage	%
trig	Trigger state	Volatile	Boolean	Flag

stack_adaptive_coulomb_counting

Name	stack_adaptive_coulomb_counting
Description	Stack Adaptive Coulomb Counting
Base Address	298598
Instance Count	1

Name	Description	Storage Type	Type	Units
adaptive_charge_dod_correction	Adaptive charge correction used in estimating the adaptive depth-of-discharge	Volatile	Float	Value
adaptive_charge_soc_correction	Adaptive charge correction used in estimating the adaptive state-of-charge	Volatile	Float	Value
enabled	Flag indicating whether the state-of-charge should be adapted based on the state estimator	Configuration	Boolean	Flag
measurement_error_dod_gain	Gain constant for adapting depth-of-discharge to account for measurement error	Configuration	Float	Value
measurement_error_soc_gain	Gain constant for adapting state-of-charge to account for measurement error	Configuration	Float	Value
self_discharge_current	Equivalent self-discharge current due to unwanted side reactions within the cell and BMS power draw	Configuration	Current	mA
self_discharge_gain	Gain constant for adapting state-of-charge to account for equivalent self discharge	Configuration	Float	Value

stack_balance_stat

Name	stack_balance_stat
Description	Statistics
Base Address	281344
Instance Count	1

Name	Description	Storage Type	Type	Units
avg	Average value	Volatile	UInt16	Value
max	Maximum value	Volatile	UInt16	Value
maxindex	Maximum value index	Volatile	Count	Number
min	Minimum value	Volatile	UInt16	Value
minindex	Minimum value index	Volatile	Count	Number
update	Write true to this to update the statistics, this is written internally on each update	Volatile	Boolean	Flag

stack_cell_soc_stat

Name	stack_cell_soc_stat
Description	Statistics

Base Address	298568
Instance Count	1

Name	Description	Storage Type	Type	Units
avg	Average value	Volatile	Float	Value
max	Maximum value	Volatile	Float	Value
maxindex	Maximum value index	Volatile	Count	Number
min	Minimum value	Volatile	Float	Value
minindex	Minimum value index	Volatile	Count	Number
update	Write true to this to update the statistics, this is written internally on each update	Volatile	Boolean	Flag

stack_cell_soc_variance_stat

Name	stack_cell_soc_variance_stat
Description	Statistics
Base Address	298578
Instance Count	1

Name	Description	Storage Type	Type	Units
avg	Average value	Volatile	Float	Value
max	Maximum value	Volatile	Float	Value
maxindex	Maximum value index	Volatile	Count	Number
min	Minimum value	Volatile	Float	Value
minindex	Minimum value index	Volatile	Count	Number
update	Write true to this to update the statistics, this is written internally on each update	Volatile	Boolean	Flag

stack_cell_soh

Name	stack_cell_soh
Description	Cell State Of Health Parameters
Base Address	266240
Instance Count	800

Name	Description	Storage Type	Type	Units
service	Indicator of whether the cell needs service	Volatile	Boolean	Flag
soh	SOH rating for the cell	Volatile	Percentage	%

stack_cell_soh_fresh

Name	stack_cell_soh_fresh
Description	Freshness
Base Address	301424
Instance Count	1

Name	Description	Storage Type	Type	Units
max_update_period	Max time period between updates to the monitored data	Volatile	Microseconds	uS
period	Time period within which the data needs to be updated before it is stale	Factory	Microseconds	uS
stale	1 indicates the associated data has not been updated within the configured time. 0 indicates the data is still fresh. Writing to this register resets the internal timer	Volatile	Boolean	Flag

stack_cell_state_estimator

Name	stack_cell_state_estimator
Description	Stack Cell State Estimator
Base Address	298558
Instance Count	1

Name	Description	Storage Type	Type	Units
enabled	Flag indicating whether the estimator is enabled	Configuration	Boolean	Flag
initial_soc_variance	Initial variance of the soc	Configuration	Float	Value
initial_vp_variance	Initial variance of the polarization voltage	Configuration	Float	Value
measurement_variance	Variance for the voltage measurement	Configuration	Float	Value
soc_process_variance	Process uncertainty for the soc state	Configuration	Float	Value
update	Written internally for each state estimation cycling	Volatile	Boolean	Flag
vp_process_variance	Process uncertainty for the polarization voltage state	Configuration	Float	Value

stack_model_soc

Name	stack_model_soc
Description	Stack Model SOC Estimates
Base Address	298588
Instance Count	1

Name	Description	Storage Type	Type	Units
critical_value	Critical value of the standard normal distribution used in calculating the confidence interval	Configuration	Float	Value
lower_confidence_limit	Lower confidence limit for the model state of charge	Volatile	Float	Value
model_soc	State of charge estimate based on the aggregation of cell level states	Volatile	Float	Value
upper_confidence_limit	Upper confidence limit for the model state of charge	Volatile	Float	Value

stack_therm_circuit

Name	stack_therm_circuit
Description	Thermistor Circuit Parameters
Base Address	18192
Instance Count	1

Name	Description	Storage Type	Type	Units
open_circuit_threshold	Voltage at which the thermistor circuit is considered an open circuit	Factory	Voltage	mV
short_circuit_threshold	Voltage at which the thermistor circuit is considered a short circuit	Factory	Voltage	mV

2.4. Removed Components

cell_soh

Name	cell_soh
Description	Cell State Of Health Parameters
Base Address	266240
Instance Count	800

Name	Description	Storage Type	Type	Units
service	Indicator of whether the stack needs service	Volatile	Boolean	Flag
soh	The SOH rating for the stack	Volatile	Percentage	%

open_wire_diagnostics

Name	open_wire_diagnostics
Description	Diagnostics related to open wire scans
Base Address	289478

Instance Count	800
-----------------------	-----

Name	Description	Storage Type	Type	Units
cell_bal_ratio	The cell balancing ratio	Volatile	UInt16	Value
channel_voltage	AFE chip channel voltages that make up a monoblock cell reading: cell i maps to the channel indices 4i, 4i+1, 4i+2 and 4i+3	Volatile	Voltage	mV

pi_queue_monitor

Name	pi_queue_monitor
Description	Queue Monitor
Base Address	7984
Instance Count	1

Name	Description	Storage Type	Type	Units
avg_enqueue_period	Average time per enqueue	Volatile	Microseconds	uS
avg_queue_length	Average queue length at queue index	Volatile	Count	Number
max_queue_length	Max queue length at queue index	Volatile	Count	Number
num_queues	Number of queues monitored	Volatile	Count	Number
queue_allocated_size	The maximum allowable size of the queue	Volatile	Count	Number
queue_enabled	True if queue profiling is enabled for this queue	Volatile	Boolean	Flag
queue_index	Queue index to monitor	Volatile	Count	Number
queue_name	Queue name at queue index	Volatile	String	ASCII
reset	Write any value to reset the statistics at queue index	Volatile	Boolean	Flag
var_queue_length	Queue length variance at queue index	Volatile	Count	Number

sc_config_info

Name	sc_config_info
Description	General Configuration Information
Base Address	155904
Instance Count	1

Name	Description	Storage Type	Type	Units
config_change_stamp	Identifier that is updated with every configuration change	Volatile	UInt64	Value

sc_queue_monitor

Name	sc_queue_monitor
Description	Queue Monitor
Base Address	278528
Instance Count	1

Name	Description	Storage Type	Type	Units
avg_enqueue_period	Average time per enqueue	Volatile	Microseconds	uS
avg_queue_length	Average queue length at queue index	Volatile	Count	Number
max_queue_length	Max queue length at queue index	Volatile	Count	Number
num_queues	Number of queues monitored	Volatile	Count	Number
queue_allocated_size	The maximum allowable size of the queue	Volatile	Count	Number
queue_enabled	True if queue profiling is enabled for this queue	Volatile	Boolean	Flag
queue_index	Queue index to monitor	Volatile	Count	Number
queue_name	Queue name at queue index	Volatile	String	ASCII
reset	Write any value to reset the statistics at queue index	Volatile	Boolean	Flag
var_queue_length	Queue length variance at queue index	Volatile	Count	Number

sc_stackbus

Name	sc_stackbus
Description	StackBus Parameters
Base Address	77824
Instance Count	1

Name	Description	Storage Type	Type	Units
rxwdtperiod	The RX watch dog timer period	Configuration	Microseconds	uS
rxwdtstate	Indicates whether the RX WDT has expired. Writing to this register resets the RX timer and value	Volatile	Boolean	Flag
txwdtperiod	The TX watch dog timer period	Configuration	Microseconds	uS
txwdtstate	Indicates whether the TX WDT has expired. Writing to this register resets the TX timer and value	Volatile	Boolean	Flag

service_clock

Name	service_clock
Description	Clocking Component
Base Address	167968

Instance Count	1
-----------------------	---

Name	Description	Storage Type	Type	Units
centiseconds	The count of 10s of milli-seconds	Volatile	UInt64	Value
deciseconds	The count of 100s of milli-seconds	Volatile	UInt64	Value
increment	Write to this register to increment the milli-seconds	Volatile	UInt64	Value
milliseconds	The count of milli-seconds	Volatile	UInt64	Value
seconds	The count of seconds	Volatile	UInt64	Value

service_expiry

Name	service_expiry
Description	Expiry Info
Base Address	167984
Instance Count	1

Name	Description	Storage Type	Type	Units
expiry_time	Expiry time in seconds	Volatile	UInt64	Value
time_remaining	Time remaining until expiry in seconds	Volatile	UInt64	Value

stack_cell_balancer_state

Name	stack_cell_balancer_state
Description	Balancing Values
Base Address	86016
Instance Count	800

Name	Description	Storage Type	Type	Units
forcebalance	Whether a cell is forced balance	Volatile	Boolean	Flag
shouldbalance	Whether a cell should balance	Volatile	Boolean	Flag

stack_cell_ratio_stat

Name	stack_cell_ratio_stat
Description	Statistics
Base Address	281344
Instance Count	1

Name	Description	Storage Type	Type	Units
avg	Average value	Volatile	UInt16	Value

Name	Description	Storage Type	Type	Units
max	Maximum value	Volatile	UInt16	Value
maxindex	Maximum value index	Volatile	Count	Number
min	Minimum value	Volatile	UInt16	Value
minindex	Minimum value index	Volatile	Count	Number
update	Write true to this to update the statistics. This is written internally on each update	Volatile	Boolean	Flag

2.5. Changed Components

cell_model

Added Registers

Name	Description	Storage Type	Type	Units
polarization_capacitance	Value for the capacitor in the resistor capacitor pair of the equivalent circuit model	Volatile	Farads	F
polarization_resistance	Value for the resistance in the resistor capacitor pair of the equivalent circuit model	Volatile	MicroOhms	uOhm

cell_val_persist

Added Registers

Name	Description	Storage Type	Type	Units
verify	Verify partition against in-register data	Volatile	Boolean	Flag

ci

Added Registers

Name	Description	Storage Type	Type	Units
rev_id_0	Revision ID of chip 0	Volatile	UInt8	Value
rev_id_1	Revision ID of chip 1	Volatile	UInt8	Value

pi_afe

Added Registers

Name	Description	Storage Type	Type	Units
fw_version	AFE firmware version	Volatile	UInt64	Value
mfg_info	AFE manufacturing information	Volatile	UInt64	Value
num_rejected_samples	Number of samples to reject at start	Factory	Count	Number
sample_one	Cached first voltage sample	Volatile	Voltage	mV
sample_three	Cached third voltage sample	Volatile	Voltage	mV
sample_two	Cached second voltage sample	Volatile	Voltage	mV
wdt_max_update_period	Max time period ever seen by the watch dog timer between updates	Volatile	Microseconds	uS

pi_afe_vadc

Current Component Details

Name	pi_afe_vadc
Description	Stack Voltage Sensing ADC
Base Address	4512
Instance Count	1

Previous Component Details

Name	pi_afe_vadc
Description	Stack Voltage Sensing ADC
Base Address	4496
Instance Count	1

pi_aux_persist

Added Registers

Name	Description	Storage Type	Type	Units
verify	Verify persistent parameter values at present match what has been saved	Volatile	Boolean	Flag

pi_board_id

Current Component Details

Name	pi_board_id
Description	PI Board ID
Base Address	4528

Instance Count	1
-----------------------	---

Previous Component Details

Name	pi_board_id
Description	PI board ID
Base Address	4512
Instance Count	1

pi_clock_check

Current Component Details

Name	pi_clock_check
Description	Clock Check
Base Address	7824
Instance Count	1

Previous Component Details

Name	pi_clock_check
Description	Clock check
Base Address	7824
Instance Count	1

pi_factory_persist

Added Registers

Name	Description	Storage Type	Type	Units
verify	Verify persistent parameter values at present match what has been saved	Volatile	Boolean	Flag

pi_factory_verify_fresh

Added Registers

Name	Description	Storage Type	Type	Units
max_update_period	Max time period between updates to the monitored data	Volatile	Microseconds	uS

pi_fault_config_factory_verify

Current Component Details

Name	pi_fault_config_factory_verify
Description	Boolean Trigger
Base Address	152944
Instance Count	1

Previous Component Details

Name	pi_fault_config_factory_verify
Description	Standalone Trigger
Base Address	152944
Instance Count	1

Removed Registers

Name	Description	Storage Type	Type	Units
error	True when the trigger should trip, otherwise false	Volatile	Boolean	Flag

pi_gpo

Added Registers

Name	Description	Storage Type	Type	Units
link_error	1 indicates a register link error	Volatile	Boolean	Flag

pi_mfg_persist

Added Registers

Name	Description	Storage Type	Type	Units
verify	Verify persistent parameter values at present match what has been saved	Volatile	Boolean	Flag

pi_op_state

Added Registers

Name	Description	Storage Type	Type	Units
initialized	True indicates all dependencies are initialized, false indicates they are not initialized	Volatile	Boolean	Flag

sc_aux_persist

Current Component Details

Name	sc_aux_persist
Description	Persistent Parameters
Base Address	18456
Instance Count	1

Previous Component Details

Name	sc_aux_persist
Description	Persistent Parameters
Base Address	18455
Instance Count	1

Added Registers

Name	Description	Storage Type	Type	Units
verify	Verify partition against in-register data	Volatile	Boolean	Flag

sc_canbus

Added Registers

Name	Description	Storage Type	Type	Units
actual_report_interval	Actual report interval for outgoing CAN messages	Volatile	Microseconds	uS

sc_ci_fresh

Added Registers

Name	Description	Storage Type	Type	Units
max_update_period	Max time period between updates to the monitored data	Volatile	Microseconds	uS

sc_ci_persist

Added Registers

Name	Description	Storage Type	Type	Units
verify	Verify partition against in-register data	Volatile	Boolean	Flag

sc_client_id

Current Component Details

Name	sc_client_id
Description	Client Unique Identifier
Base Address	279312
Instance Count	1

Previous Component Details

Name	sc_client_id
Description	Client unique identifier
Base Address	279312
Instance Count	1

sc_controller_wdt

Current Component Details

Name	sc_controller_wdt
Description	Watchdog
Base Address	221184
Instance Count	1

Previous Component Details

Name	sc_controller_wdt
Description	Watchdog Component
Base Address	221184
Instance Count	1

Added Registers

Name	Description	Storage Type	Type	Units
max_update_period	Max time period ever seen by the watchdog between updates	Volatile	Microseconds	uS

sc_ethernet

Current Component Details

Name	sc_ethernet
Description	Ethernet
Base Address	201984
Instance Count	1

Previous Component Details

Name	sc_ethernet
Description	Ethernet Parameters
Base Address	201984
Instance Count	1

sc_factory_persist

Added Registers

Name	Description	Storage Type	Type	Units
verify	Verify partition against in-register data	Volatile	Boolean	Flag

sc_factory_verify_fresh

Added Registers

Name	Description	Storage Type	Type	Units
max_update_period	Max time period between updates to the monitored data	Volatile	Microseconds	uS

sc_fault_config

Added Registers

Name	Description	Storage Type	Type	Units
count	Number of tripped triggers	Volatile	Count	Number

sc_fault_controller_wdt

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

sc_fault_fault_pilot_state_mismatch

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

sc_fault_fw_mismatch

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

sc_fault_pi_afe_wdt

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

sc_fault_pi_interlock

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

sc_fault_stackbus_rxwdt

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

sc_fault_stackbus_txwdt

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

sc_gpi

Added Registers

Name	Description	Storage Type	Type	Units
link_error	1 indicates a register link error	Volatile	Boolean	Flag
trigger_write	True indicates the address should be written to	Volatile	Boolean	Flag

sc_gpo

Added Registers

Name	Description	Storage Type	Type	Units
link_error	1 indicates a register link error	Volatile	Boolean	Flag

sc_gpo_shutdown

Added Registers

Name	Description	Storage Type	Type	Units
link_error	1 indicates a register link error	Volatile	Boolean	Flag

sc_linkbus

Current Component Details

Name	sc_linkbus
Description	Linkbus Parameters
Base Address	69632
Instance Count	1

Previous Component Details

Name	sc_linkbus
Description	LinkBus Parameters
Base Address	69632
Instance Count	1

sc_linkbus_packets

Current Component Details

Name	sc_linkbus_packets
Description	Linkbus Packet Counters
Base Address	69664
Instance Count	1

Previous Component Details

Name	sc_linkbus_packets
Description	LinkBus Packet Counters
Base Address	69664
Instance Count	1

sc_locked_cfg_persist

Added Registers

Name	Description	Storage Type	Type	Units
verify	Verify partition against in-register data	Volatile	Boolean	Flag

sc_mfg_persist

Added Registers

Name	Description	Storage Type	Type	Units
verify	Verify partition against in-register data	Volatile	Boolean	Flag

sc_op_state

Added Registers

Name	Description	Storage Type	Type	Units
initialized	True indicates all dependencies are initialized, false indicates they are not initialized	Volatile	Boolean	Flag

sc_persist

Added Registers

Name	Description	Storage Type	Type	Units
verify	Verify partition against in-register data	Volatile	Boolean	Flag

sc_ram_test_wdt

Added Registers

Name	Description	Storage Type	Type	Units
max_update_period	Max time period ever seen by the watchdog between updates	Volatile	Microseconds	uS

sc_rom_test_wdt

Added Registers

Name	Description	Storage Type	Type	Units
max_update_period	Max time period ever seen by the watchdog between updates	Volatile	Microseconds	uS

sc_val_persist

Added Registers

Name	Description	Storage Type	Type	Units
verify	Verify partition against in-register data	Volatile	Boolean	Flag

sc_warn_controller_wdt

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_breaker

Current Component Details

Name	stack_breaker
Description	Controls For Stack Breaker Switch And Motor Operator
Base Address	196608
Instance Count	1

Previous Component Details

Name	stack_breaker
Description	Controls for stack breaker switch and motor operator
Base Address	196608
Instance Count	1

Added Registers

Name	Description	Storage Type	Type	Units
request_state_address_enabled	Whether the output address is enabled	Factory	Boolean	Flag
request_state_link_error	1 indicates a register link error	Volatile	Boolean	Flag
state_address_enabled	Whether the output address is enabled	Factory	Boolean	Flag
state_link_error	1 indicates a register link error	Volatile	Boolean	Flag
tripped_address_enabled	Whether the output address is enabled	Factory	Boolean	Flag
tripped_link_error	1 indicates a register link error	Volatile	Boolean	Flag

stack_cell_fresh

Added Registers

Name	Description	Storage Type	Type	Units
max_update_period	Max time period between updates to the monitored data	Volatile	Microseconds	uS

stack_cell_model_estimator

Current Component Details

Name	stack_cell_model_estimator
Description	Short Shunt Detector Parameters
Base Address	281360
Instance Count	1

Previous Component Details

Name	stack_cell_model_estimator
Description	Stack Cell Model Estimator
Base Address	281360
Instance Count	1

Added Registers

Name	Description	Storage Type	Type	Units
nominal_time_constant	Time constant for an RC pair in the equivalent circuit model for a fresh cell	Configuration	Microseconds	uS
polarization_scaling_constant	Constant used to scale the ohmic resistance for polarization resistance estimation	Configuration	Float	Value

stack_cell_open_wire_fresh

Added Registers

Name	Description	Storage Type	Type	Units
max_update_period	Max time period between updates to the monitored data	Volatile	Microseconds	uS

stack_combined_fault_therm_hi

Added Registers

Name	Description	Storage Type	Type	Units
count	Number of tripped triggers	Volatile	Count	Number

stack_combined_fault_therm_lo

Added Registers

Name	Description	Storage Type	Type	Units
count	Number of tripped triggers	Volatile	Count	Number

stack_combined_fault_voltage_hi

Added Registers

Name	Description	Storage Type	Type	Units
count	Number of tripped triggers	Volatile	Count	Number

stack_combined_fault_voltage_lo

Added Registers

Name	Description	Storage Type	Type	Units
count	Number of tripped triggers	Volatile	Count	Number

stack_contactor

Added Registers

Name	Description	Storage Type	Type	Units
link_error	1 indicates a register link error	Volatile	Boolean	Flag

stack_control

Added Registers

Name	Description	Storage Type	Type	Units
disable_connecting	Disables connecting state	Factory	Boolean	Flag
disable_precharge	Disables precharge state	Factory	Boolean	Flag

Changed Registers

Current Register Details

Name	Description	Storage Type	Type	Units
precharge_error	Error occurred during operation.(1 = No measurement taken, 2 = Precharge current above precharge_max_current)	Volatile	UInt8	Value

Previous Register Details

Name	Description	Storage Type	Type	Units
precharge_error	Error occurred during operation	Volatile	Boolean	Flag

stack_factory_trigger_summary

Added Registers

Name	Description	Storage Type	Type	Units
batt_fault	Whether or not there is a battery level fault	Volatile	Boolean	Flag
batt_fault_count	Number of battery level faults	Volatile	Count	Number
clear_faults	Clear latched alarms	Volatile	Boolean	Flag
clear_warnings	Clear latched warnings	Volatile	Boolean	Flag
comm_fault	Whether or not there is a communications fault	Volatile	Boolean	Flag
comm_fault_count	Number of communications faults	Volatile	Count	Number
last_update	Time of last update in microseconds	Volatile	UInt64	Value
warning_count	Number of warnings	Volatile	Count	Number

Removed Registers

Name	Description	Storage Type	Type	Units
clear	Writing True to this register will attempt to clear all triggers	Volatile	Boolean	Flag

stack_fault_breaker_conflict

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_fault_breaker_tripped

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_fault_cell_hi

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_fault_cell_lo

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_fault_charge_current_hi

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_fault_charge_therm_hi

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_fault_charge_therm_lo

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_fault_coil_fail

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_fault_contactor_feedback_fail

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_fault_discharge_current_hi

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_fault_discharge_therm_hi

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_fault_discharge_therm_lo

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_fault_precharge_over_current

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_fault_precharge_timeout

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Changed Registers

Current Register Details

Name	Description	Storage Type	Type	Units
thresh	Trigger threshold	Factory	UInt8	Value
triggering_value	Value that caused the triggered state to change to true	Volatile	UInt8	Value

Previous Register Details

Name	Description	Storage Type	Type	Units
thresh	Trigger threshold	Factory	Boolean	Flag
triggering_value	Value that caused the triggered state to change to true.	Volatile	Boolean	Flag

stack_fault_voltage_hi

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_fault_voltage_lo

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_linkbus_fresh

Added Registers

Name	Description	Storage Type	Type	Units
max_update_period	Max time period between updates to the monitored data	Volatile	Microseconds	uS

stack_ocv_lut

Current Component Details

Name	stack_ocv_lut
Description	Stack Open Circuit Voltage Lut
Base Address	303104
Instance Count	101

Previous Component Details

Name	stack_ocv_lut
Description	Stack Open Circuit Voltage Curve
Base Address	289376
Instance Count	101

Added Registers

Name	Description	Storage Type	Type	Units
open_circuit_voltage_derivative	Derivative of the open circuit potential at a particular state of charge value	Volatile	Float	Value

stack_power_fresh

Added Registers

Name	Description	Storage Type	Type	Units
max_update_period	Max time period between updates to the monitored data	Volatile	Microseconds	uS

stack_soc

Current Component Details

Name	stack_soc
Description	Stack Soc
Base Address	90112
Instance Count	1

Previous Component Details

Name	stack_soc
Description	State Of Charge Parameters
Base Address	90112
Instance Count	1

Added Registers

Name	Description	Storage Type	Type	Units
accumulative_dod	Depth of discharge estimated using traditional coulomb counting with no corrections based on voltage measurements	Volatile	Charge	mAh
accumulative_soc	State of charge estimated using traditional coulomb counting with no corrections based on voltage measurements	Volatile	Percentage	%
adaptive_dod	Depth of discharge estimated using coulomb counting with gradual corrections based on voltage measurements	Volatile	Charge	mAh
adaptive_soc	State of charge estimated using coulomb counting with gradual corrections based on voltage measurements	Volatile	Percentage	%
ifull_period	Minimum amount of time the current needs to meet the ifull criteria before the stack is considered full	Configuration	Microseconds	uS
soc_output_select	Control knob to determine which soc value is exposed to all external interfaces, setting to 0 will expose accumulative soc, while setting to 1 will expose adaptive soc	Configuration	Boolean	Flag

stack_therm_fresh

Added Registers

Name	Description	Storage Type	Type	Units
max_update_period	Max time period between updates to the monitored data	Volatile	Microseconds	uS

stack_therm_poly

Current Component Details

Name	stack_therm_poly
Description	Polynomial Parameters
Base Address	18176
Instance Count	1

Previous Component Details

Name	stack_therm_poly
Description	Polynomial parameters
Base Address	18176
Instance Count	1

stack_trig_cell_hi

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_trig_cell_lo

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_trig_charge_current_hi

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_trig_charge_therm_hi

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_trig_charge_therm_lo

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_trig_discharge_current_hi

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_trig_discharge_therm_hi

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_trig_discharge_therm_lo

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_trig_therm_hi

Added Registers

Name	Description	Storage Type	Type	Units
count	Number of tripped triggers	Volatile	Count	Number

stack_trig_therm_lo

Added Registers

Name	Description	Storage Type	Type	Units
count	Number of tripped triggers	Volatile	Count	Number

stack_trig_voltage_hi

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_trig_voltage_lo

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_trigger_summary

Added Registers

Name	Description	Storage Type	Type	Units
last_update	Time of last update in microseconds	Volatile	UInt64	Value

stack_uvlo_cell_voltage

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_uvlo_combined

Added Registers

Name	Description	Storage Type	Type	Units
count	Number of tripped triggers	Volatile	Count	Number

stack_uvlo_stack_voltage

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_warn_cell_hi

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_warn_cell_lo

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_warn_charge_current_hi

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_warn_charge_therm_hi

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_warn_charge_therm_lo

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_warn_combined_voltage_hi

Added Registers

Name	Description	Storage Type	Type	Units
count	Number of tripped triggers	Volatile	Count	Number

stack_warn_combined_voltage_lo

Added Registers

Name	Description	Storage Type	Type	Units
count	Number of tripped triggers	Volatile	Count	Number

stack_warn_discharge_current_hi

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_warn_discharge_therm_hi

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_warn_discharge_therm_lo

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_warn_therm_hi

Added Registers

Name	Description	Storage Type	Type	Units
count	Number of tripped triggers	Volatile	Count	Number

stack_warn_therm_lo

Added Registers

Name	Description	Storage Type	Type	Units
count	Number of tripped triggers	Volatile	Count	Number

stack_warn_voltage_hi

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

stack_warn_voltage_lo

Added Registers

Name	Description	Storage Type	Type	Units
inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

Removed Registers

Name	Description	Storage Type	Type	Units
trig_inverted	True if triggers on low value, false if on high value	Volatile	Boolean	Flag

From time to time Nuvation Energy will make updates to products in response to changes in available technologies, client requests, emerging energy storage standards, and other industry requirements. The product specifications in this document, therefore, are subject to change without notice.

© 2024 Nuvation Energy