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NUV100-GBC
Nuvation BMS™ Grid Battery Controller Datasheet
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DISCLAIMER: From time to time Nuvation will make updates to Nuvation BMS™ in response to changes in available technologies, client requests, emerging energy storage standards and other industry requirements. The product specifications shown in this document therefore, are subject to change without notice.

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System Overview

When multiple stacks are connected in parallel to form a large system, a Grid Battery Controller is required to aggregate information from each Stack Controller in the system and to provide a unified interface to the large battery system.

Nuvation BMS™ is generally comprised of the following modules:

- one or more Stack Controllers
- one or more Power Interfaces
- one or more Cell Interfaces

The GBC is required when there is a need to combine multiple Nuvation BMS™ systems into a large-scale energy storage system.

An example configuration is shown in Figure 1.
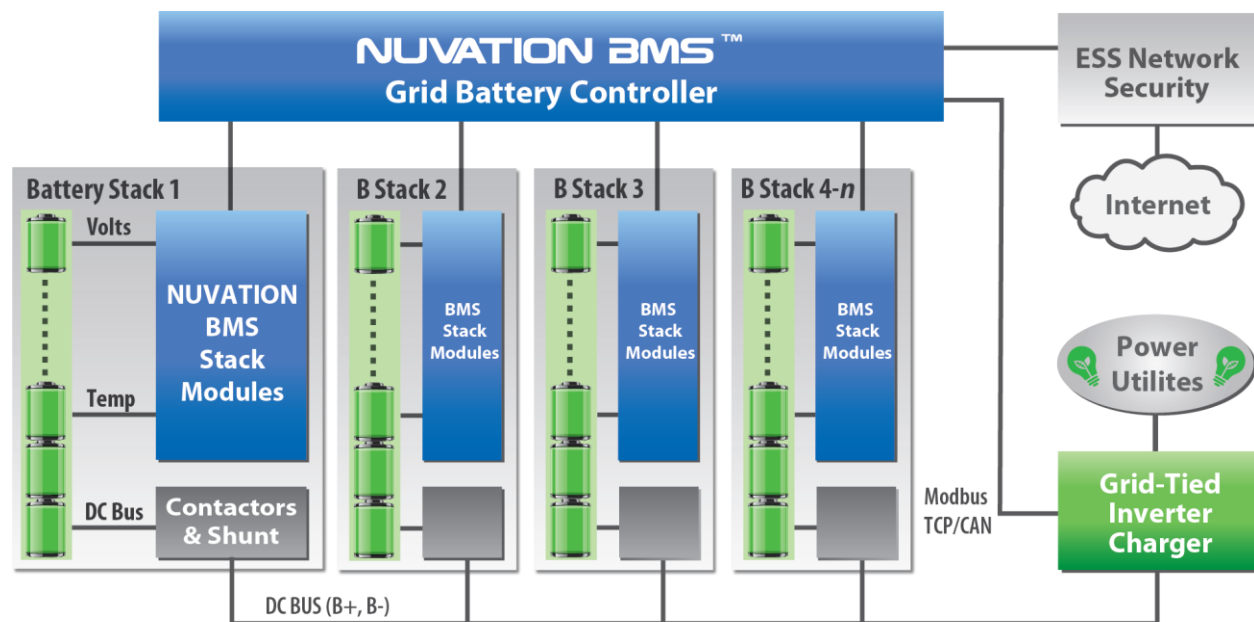
Figure 1: Nuvation BMS™ Example System Diagram

This datasheet addresses the Grid Battery Controller. For more information about other Nuvation BMS™ modules, please refer to the Stack Controller, Power Interface or Cell Interface datasheets.

Software Overview

The GBC manages all cells and stacks across the entire battery from a single device. This device provides a unified view of the multi-stack battery, enables data analytics, and pushes BMS configuration and firmware updates across the entire battery.

Designed in compliance with MESA (Modular Energy Storage Architecture) Open Standards for Energy Storage (mesastandards.org, draft 3), the Grid Battery Controller was created specifically for integration with a wide range of grid batteries and inverters.

The Grid Battery Controller (GBC) provides the following important features for large-scale multi-stack energy storage systems:

Main Functions

Manages multiple stacks
Up to 24 stacks can be managed.

Provides Unified View of Entire Battery
Access diagnostics and performance data of entire multi-stack battery from one user interface.

Provides Remote Access
Allows remote access for data analytics and capture. Users can view or adjust battery operation remotely via Internet browser on PC or tablet computer.

Automates System-Wide Fault Response
Identifies and acts upon faults anywhere in the battery pack.

Communications
Hardened BMS communications bus over Ethernet.
Battery Level Control interface for Site controllers provides current limiting functionality across multi stacks.

Unified View Operator Interface

Browser user interface, which supports Chrome and Firefox, provides a view of:

Statistics View
Provides pack-level voltage, temperature, and current statistics for all cells.

Real-Time View
Streams measurements and control signals for real-time display.

Aggregate SOC and SOH
Calculates and displays State of Charge and State of Health for the entire battery.

Flow-Through I/O
Provides a single entry point to all measurement and control points in the BMS.

Communications Status
Makes available measurements, control signals, and other data to external systems.

Faults and Warnings
Aggregates faults and warnings to provide a system-wide overview and provides a detailed drill-down of battery pack diagnostics.

Communications & Data Analytics

Data Capture Support
Streams data in real time to external servers for analytics and trend data capture.

Isolated BMS Network Traffic
Two Gigabit Ethernet ports isolate BMS network traffic from external network traffic.

Inverter Support
Modbus TCP supports MESA storage models for connection to Power Conversion Systems as well as other external systems through multiple concurrent client connections.

Maintenance and Management

Multi-Stack Current Limiting
Determines operating current for entire pack and uses this data to control the inverter and protect the battery pack from over charging or discharging.

Pack-Level Safety
Identifies faults anywhere in the battery pack and initiates preventive action to operate the battery within configured parameters.

Servicing
Brings stacks offline or online for service, maintenance, modifications, etc. Enables connection of multiple stacks onto the DC power bus.

Network Environment Flexibility
Multi-socket Ethernet interface allows concurrent operation of both local and remote operator panels, data analytics streaming, and Modbus TCP inverter control.

Battery Performance Tuning
Low-level fine tuning controls enables optimization and on-the-fly experimentation.

Hardware Overview

The Grid Battery Controller (GBC) module contains an industrial server that handles all the aggregation processes and system-level decision-making required by Nuvation BMS™.

Indicator LEDs

The Power LED indicates that the GBC is operational and the HDD LED indicates read/write activity to the internal storage media.

Connections

The GBC does not have high-voltage connectors and does not connect to any battery stack-referenced signals, making it safe to handle and connect to external equipment. For wiring/pin-out information, please refer to the *Nuvation BMS Implementation Guidebook*.

Ethernet – 2 ports

The Ethernet jack is a standard RJ45 Cat5e rated jack. The ETH1 interface is used as the primary means of connecting the GBC to each Stack Controller. The ETH2 interface is used as the primary means of connecting an external system to the BMS to configure the operating parameters, receive MESA control messages and observe the status. The two LEDs on the Ethernet jack indicate link status (green LED) and network activity (yellow LED).

DisplayPort

The DisplayPort connector is a standard DisplayPort connector. Not used.

DC Power

The DC Power connector is a Phoenix Contact™ VARIOSUB D-SUB POWER-SUBCON® 3-position receptacle, providing an entry point for the GBC operating power. The GBC requires a nominal 24VDC power supply for. A mating connector for this is a Phoenix Contact™ 3-position terminal block plug, part number 1841909.

USB 2.0 & 3.0 Host

The USB 3.0 Host connector is a standard Type-A connector. Not used.

RS232

The RS232 connector is a Male DE-9 connector. Not used.

Operating Limits

Table 1: Electrical Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Power Specifications						
+Vin	Input Voltage		19.2	24	28.8	Vdc
	Input Current	+VSYS = 24Vdc	-	-	2.5	Adc
USB 3.0 Specifications						
+5V_USB3.0	USB Current		-	-	900	mAdc
USB3.0_Data	USB supported data rates		1.0	-	3.0	
USB 2.0 Specifications						
+5V_USB2.0	USB Current		-	-	500	mAdc
USB2.0_Data	USB supported data rates		1.0	-	2.0	
Ethernet Specifications						
ETH_Protocol	Ethernet data speeds		10	-	1000	Base-T
ETH_Connector	Ethernet jack rating		-	Cat5e	-	

Table 2: Environmental Conditions

| Symbol	Parameter	Conditions	Min	Typ	Max	Units
Thermal Specifications						
Ta	Operating Temperature		-10	25	60	°C
	Storage Temperature		-10	25	60	°C
Humidity Specifications						
RH	Operational RH		5	-	85	%
	Storage RH		5	-	85	%
Shock and Vibration Specifications						
Vertical	Vertical shock/vibration		-	-	1	m/s^2
Longitudinal	Longitudinal shock/vibration		-	-	1	m/s^2
Transverse	Transverse shock/vibration		-	-	1	m/s^2

The GBC meets industry standards CISPR 22 Class A and IEC/EN 61000-4-2 for EMC/EMI and ESD respectively. All components are EU RoHS/China RoHS compliant.

WARNING: Exceeding the maximum ratings will damage the module.
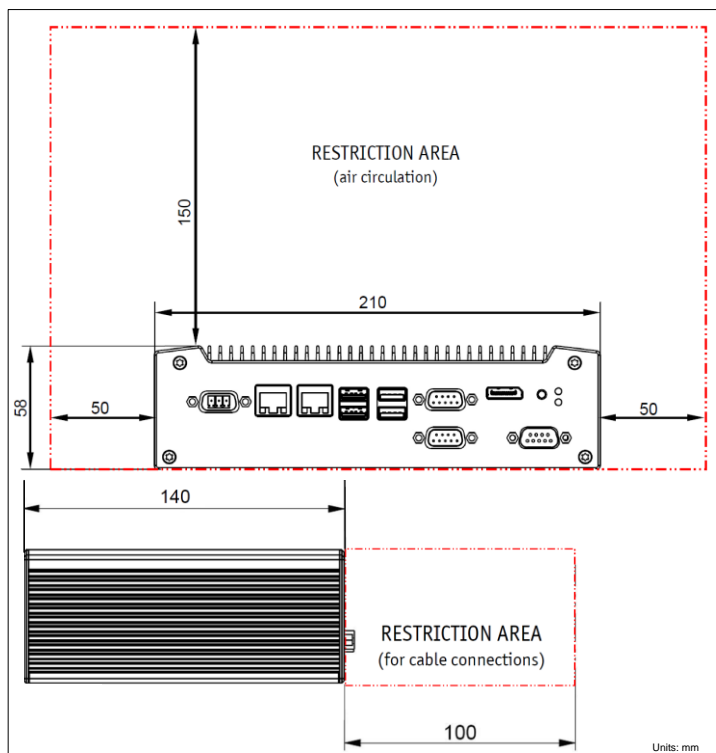
Mechanical Overview

The overall dimensions of the GBC are 210mm X 65mm X 140mm. It comes standard with a DIN clip, enabling it to be securely mounted to EN50022-compliant DIN rail. Extra space should be provided around the module to allow for easy installation/maintenance.

The GBC weighs approximately 2.5kg.
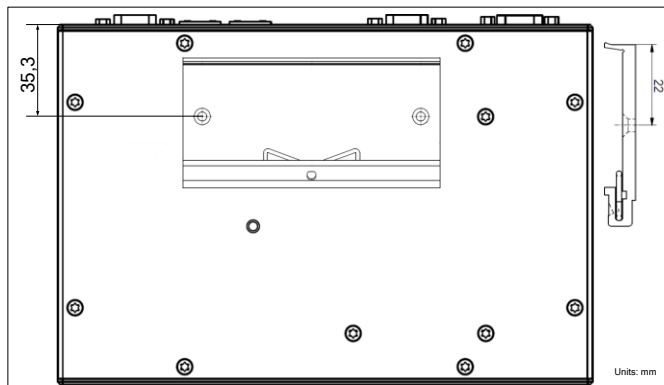
Figure 2: DIN Clip Location

The GBC requires free space around its enclosure to provide adequate cooling.

Figure 3: Restricted Areas

Ordering Info

Model Number	Description
NUV100-GBC	Grid Battery Controller
NUV100-GBC-C	Grid Battery Controller with CAN interface