Battery Guard® 1000 (RV-C)

Part number: 00-01130-000

Description:

This document is a guide for system integrators which provides the necessary information for communicating and interfacing with the Battery Guard® 1000. Included in this document is a description of the devices functionality and full list of supported DGN's regarding the communication and configuration of the Battery Guard® 1000.

The Battery Guard® 1000 communicates via CANbus utilitizing the RV-C protocol. The device provides two seperate parallel CANbus connections, one which provides continuous power and the other which provides switched power. The physical connectors used for the communicating on the RV-C network are 4-pin MiniFit connectors with the pin definitions listed in the table below:

Pin	Description
1	CAN H
2	CAN L
3	GND
4	PWR

The RV-C protocol defines the data rate for all transmitters shall be 250 kbits/s with a sample point rate being between the range of 85% to 90%. For more information on the physical layer of an RV-C network please refer to the RV-C specification provided on the RV-C website.

RV-C Product Specifications

The Battery Guard® 1000 supports dynamic source addressing. As defined in the RV-C specification, the preferred dynamic address ranged is 0x90-0x9F.

Manufacturer Code:	0x69
Default Source Address:	0x8B
Product Definition	DC Disconnect

Note: The BG1000® RV-C will utilize two instances. One instance for the main disconnect and a second instance for the AUX disconnect.

Primary Instance	1	(Default)
Auxiliary Instance	10	(Default)

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Supported RV-C DGN's

DGN 1FED0h

Name DC Disconnect Status

Description Defines the state of the Battery Guard® 1000 primary and auxiliary disconnect.

Byte	Bit	Name	Data Type	Value Description
0	-	Instance	Uint8	0 – Invalid 1 – Main House Battery Disconnect 2 – Chassis Battery Disconnect 3 – House/Chassis Bridge 4-250 - Other
1	0 to 1	Circuit Status	bit	00b – Circuit is disconnected. 01b – Circuit is connected.
	2 to 3	Last Command	bit	00b – Disconnect circuit. 01b – Connect circuit.
	4 to 5	Bypass Detect	bit	Not Supported

DGN 1FFFDh

Name DC Disconnect Command

Description Control message for disconnecting and reconnecting the Battery Guard® 1000 Primary and Auxiliary disconnects.

Byte	Bit	Name	Data Type	Value Description
0	-	Instance	Uint8	0 – Invalid 1 – Main House Battery Disconnect 2 – Chassis Battery Disconnect 3 – House/Chassis Bridge 4-250 - Other
1	0 to 1	Command	bit	00b – Disconnect Circuit. 01b – Connect Circuit.

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DGN 1FECFh

Name DC Source Status 1

Description Provides the voltage and current being drawn from the DC source the Battery Guard® 1000 is connected to.

Byte	Bit	Name	Data Type	Value Description
0	-	Instance	Uint8	0 – Invalid 1 – Main House Battery Disconnect 2 – Chassis Battery Disconnect 3 – House/Chassis Bridge 4-250 - Other
1	-	Device Priority	-	40 – Voltmeter/Ammeter
2 to 3	-	DC Voltage	Uint16	0 to 3212.5 Volts
4 to 7	-	DC Amperage	Uint32	-2,000,000 to 2,221,081.2 Amps

DGN 1FE9Fh

Name Generic Alarm Status

Description The alarm status indicates when the Battery Guard® 1000 is in a low voltage condition and will disconnect the primary load when the isolation delay timer has expired. When elapsed time equals the isolation delay value. The automatic disconnect will perform.

Byte	Bit	Name	Data Type	Value Description
0	-	Instance	Uint8	1 – Impending Low Voltage Cutoff
1	-	DSA	Uint8	139 – DC Disconnect
2	0 to 1	Alarm Triggered	bit	00b – Alarm is not Triggered. 01b – Alarm is Triggered
	2 to 3	Alarm Ready	bit	00b – Alarm condition is not being monitored. 01b – Alarm condition is being monitored.
	4 to 5	Alarm is Acknowledged	bit	00b – Alarm has not been acknowledged. 01b – Alarm has been triggered and acknowledged.
	6 to 7	Auto Reset	bit	Set permanently to 1
3 to 5	-	Elapsed Time	Uint16	Time in minutes since alarm triggered

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DGN 1FE9Eh

Name Generic Alarm Command

Description Generic alarm command allows the user to acknowledge the alarm condition and disable alarm.

Byte	Bit	Name	Data Type	Value Description
0	-	Instance	Uint8	1 – Impending Low Voltage Cutoff
1	-	DSA	Uint8	139 – DC Disconnect
2	0 to 1	-	-	Always 11b
	2 to 3	Ready Alarm	bit	00b – Stop Monitoring Alarm condition. 01b – Start Monitoring Alarm condition.
	4 to 5	Ack Alarm	bit	00b – No Action 01b – Acknowledge Alarm.
	6 to 7	Auto Reset	bit	Set Permanently to 1

DGN 17F00h

Name General Reset

Description General reset allows the user to perform a software reset, clear faults or put the Battery Guard® 1000 back into factory setting.

Byte	Bit	Name	Data Type	Value Description
0	0 to 1	Reboot	Bit	00b - No action 01b - Reboot
	2 to 3	Clear Faults	Bit	00b - No action 01b - Clear faults
	4 to 5	Reset Default	Bit	00b - No action 01b - Restore settings to default values
	6 to 7	Reset Stats	bit	Not Supported
1	0 to 1	Test Mode	bit	00b – Quit testing node 01b – Initiate testing node
	2 to 3	Restore OEM Settings	bit	Not Supported
	4 to 5	Reboot/Enter Bootloader Mode	bit	Not Supported

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DGN 17FB0h

Name Instance Status

Description Reports all instances supported by the Battery Guard® 1000.

Byte	Bit	Name	Data Type	Value Description
0	-	Device Type	Uint8	DSA of the target device Instance.
1	-	Base Instance	Uint8	
2	-	Max Instance	Uint8	0xFF = Applies to single instance only.
3 to 4	-	Base Internal Address	Uint16	
5 to 6	-	Max Internal Address	Uint16	0xFFFF = Applies to single instance only
7	-	Reserved	Uint8	

DGN 17C00h (Lower two bytes of DGN is destination address)

Name Instance Assignment

Description The Instance Assignment provide a generalized method for configuring the instances used. The Battery Guard® 1000 only supports single instance updates. The Primary Disconnect has a base internal address is 0 and the Auxiliary Disconnect has a base internal address is 1. After successful instance assignment the device will respond with an acknowledgment message.

Byte	Bit	Name	Data Type	Value Description
0	-	Device Type	Uint8	DSA of the target device Instance.
1	-	Base Instance	Uint8	0 – Invalid 1 – Main House Battery Disconnect 2 – Chassis Battery Disconnect 3 – House/Chassis Bridge 4-250 – Other 0xFF = Send INSTANCE_STATUS for all Instances of the indicated device type.
2	-	Max Instance	Uint8	0xFF = Applies to single instance only.
3 to 4	-	Base Internal Address	Uint16	
5 to 6	-	Max Internal Address	Uint16	0xFFFF = Applies to single instance only
7	-	Reserved	Uint8	

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DGN EF00h (Lower two bytes of DGN is destination address)

Name Proprietary Message

Description The proprietary messages used by the Battery Guard® 1000 allow read and write access to configurable parameters within the device, the ability to calibrate the current sensing and the ability to read the disconnect / reconnect log.

Note: More on proprietary messaging described in the proprietary messaging section of this document.

Byte	Bit	Name	Data Type	Value Description
0	-	MFG Code	Uint8	0x69 – Intellitec Manufacturer Code
1	-	Function	Uint8	0x00 – Read Configuration 0x01 – Write Configuration 0x02 – Calibrate 0x03 – Read Log
2	-	Parameter	Uint8	Configurable parameter being addressed
3 to 4	-	Parameter Value	Uint16	Value of parameter define in Parameter Table
5 to 6	-	Reserved	Uint8	Value of log (upper bytes)
7	-	Reserved	Uint8	0x69 Manufacturer Code

DGN EA00h (Lower two bytes of DGN is destination address 0xFF for global)

Name Request for DGN

Description Request for a DGN allows the user to instantly obtain the status messages of the Battery Guard® 1000. Instead of waiting for the standard message timing, immediate information may be obtained. Supported Request include:
DC_DISCONNECT_STATUS
DC_SOURCE_STATUS_1
PRODUCT_IDENTIFICATION

Byte	Bit	Name	Data Type	Value Description
0 to 2	-	Desired DGN	Uint17	LSB in Byte 0
3	-	Instance	Uint8	0 - 253 - Instance desired, if multi-instanced. 0xFFh if not multi-instanced, or reports from all instances is desired.
4	-	Instance Bank or Secondary Instance	Uint8	Not supported
5 to 7	-	Reserved	Uint8	

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DGN 1FECAh

Name Diagnostic Message

Description All devices compliant to this communication profile shall support the "DM_RV" message. This message allows the communication of diagnostic information and general operating status. If there are no active faults, data bytes 2 to 5 shall be set to FFh. The DM_RV is still broadcast, allowing other nodes to see its operating status.

Byte	Bit	Name	Data Type	Value Description
0	0 to 1	Operating Status	Uint2	0x00 – Disabled / Not operating 0x05 – Normal / On condition
	2 to 3	Operating Status	Uint2	
	4 to 5	Yellow Lamp Status	Uint2	Indicates minor fault
	6 to 7	Red Lamp Status	Uint2	Indicates critical fault
1	-	DSA	Uint8	69h – default source address
2	-	SPN-MSB	Uint8	Refer to SPN section of document
3	-	SPN-ISB	Uint8	Refer to SPN section of document
4	5 to 7	SPN-LSB	Uint3	Refer to SPN section of document
	0 to 4	FMI	Uint5	Refer to SPN section of document
5	0 to 6	Occurrence Count	Uint7	0 – 126 counts
	7	Reserved	Bit1	Always 1
6	-	DSA Extension	Uint8	0xFF
7	0 to 3	Bank Select	Uint4	0xF

DGN 17D00h (Lower two bytes of DGN is destination address, must not be 0xFF)

Name Download

Description The Download Message allows the Battery Guard® 1000 to update its firmware in the field via bootloader. A windows-based application is provided with the Omniscope referred to as Downloader.exe. For more information on the bootloader protocol please contact us.

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Proprietary Messages

The Battery Guard® 1000 offers parameters that are configurable via RV-C network. This allows installers or users the ability to make changes to their module as they feel necessary. Byte 1 of the proprietary messages determines what function is being performed. 0x00 and 0x01 allow the reading and writing of these configurable parameters respectively. The table below shows how to access each of these parameters, what the upper and lower bounds are and a description of how the parameter functions.

Byte[2]	**Limits**	**Description**
0x00	12.5 > Val > 10.5	Primary Low Voltage Threshold is the voltage at which the device determines that the battery is getting too low and must perform a primary disconnect.
0x01	14.2 > Val > LVT	Primary Warning Threshold allows for a warning indication to occur prior to reaching the Low Voltage threshold. This is indicated on both the alarm output and via RV-C message.
0x02	300 >= Val >= 60	Primary Isolation Delay is the delay the voltage must remain below the threshold before performing a primary disconnect.
0x03	14.2 >= Val > 12.5	Primary Reconnect Threshold is the voltage at which the device determines charging is occurring and will attempt to reconnect primary disconnect.
0x04	300 >= Val >= 60	Primary Reconnect Delay is the delay the voltage must remain above the reconnect threshold before performing a primary reconnect.
0x05	12.5 > Val > 9.0	Auxiliary Low Voltage Threshold is the voltage at which the device determines that the battery is getting too low and must perform an Auxiliary disconnect.
0x06	300 >= Val >= 60	Auxiliary Isolation Delay is the delay the voltage must remain below the threshold before performing an auxiliary disconnect.
0x07	14.2 >= Val > 12.5	Auxiliary Reconnect Threshold is the voltage at which the device determines charging is occurring and will attempt to reconnect the auxiliary output.
0x08	300 >= Val >= 60	Auxiliary Reconnect Delay is the delay the voltage must remain above the reconnect threshold before performing an auxiliary reconnect.

Note: Values being address are represented as seconds for timing parameters and 100 of millivolts for voltage parameters (i.e. 12.1V = 121 or 79h).

If a read request is performed the Battery Guard® 1000 will echo the request but will fill byte[3] and byte[4] with the parameter value. An example of a read sequence of the Primary Low Voltage Threshold with a default value of 12.1V is described below.

Request:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x69	0x00	0x00	0xFF	0xFF	0xFF	0xFF	0x69

Battery Guard® 1000:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x69	0x00	0x00	0x79	0x00	0xFF	0xFF	0x69

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On a write request the Battery Guard® 1000 will respond with an ACK DGN if the value being assigned is valid and successfully save into the EEprom. If either of these cases is not true, the device will respond with a NACK DGN. An example of a write request to change the low voltage threshold value of the Battery Guard 1000 to 11.5V is described below.

Request:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x69	0x01	0x00	0x73	0x00	0xFF	0xFF	0x69

Battery Guard® 1000:

ACK DGN

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x00	0x01	0xFF	0xFF	0xFF	0x00	0xEF	0x00

The calibration feature built into the Battery Guard® 1000 allows the ability to zero out the primary solenoid's current sensing. The calibration process is straight forward, simply disconnect any loads from the primary solenoid, ensure the solenoid is in the connected state and send the calibration message via RV-C. This will remove any offset in the positive or negative direction. The message to calibrate is expressed in the below message:

Requestor:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x69	0x02	0xFF	0xFF	0xFF	0xFF	0xFF	0x69

The Battery Guard® 1000 logs the number of solenoid disconnects and reconnects. To access this information, a read log request must be sent. The log records 4 different events all of which are stored as 32-bit integers allowing for over 1,000,000 records for each event. The device will echo the request from the user and return the 32-bit value in byte[3]-byte[6], where byte[3] is the LSB and byte[6] is the MSB. The event index is listed in the table below:

Index	Event
0	Automatic Disconnect
1	Automatic Reconnect
2	Manual Disconnect
3	Manual Reconnect

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The sequence for accessing the number of automatic reconnects is described below:

Request:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x69	0x03	0x01	0xFF	0xFF	0xFF	0xFF	0x69

Battery Guard® 1000:

Byte[0]	Byte[1]	Byte[2]	Byte[3]	Byte[4]	Byte[5]	Byte[6]	Byte[7]
0x69	0x03	0x01	0x40	0x42	0x0F	0x00	0x69

This result returned 1,000,000 automatic reconnect events.

Service Point Number

Several SPN's are supported by the Battery Guard® 1000. The following table identifies the SPN and FMI values for each of the supported faults:

SPN MSB	SPN ISB	SPN LSB	FMI	Description
1	Instance	0	0x07	Failed to disconnect or reconnect
1	Instance	1	0x00	Primary disconnect over-current
1	Instance	2	0x00	Primary disconnect over-temperature
1	Instance	3	0x00	Auxiliary disconnect over-current

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Available Product Literature and Guides:

Brochure:	53-01130-000
Product Specification:	53-01130-001
User's Guide:	53-01130-100
Installation and Applications:	53-01130-200
Supporting Documents:	53-01130-300

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