Lithionics Battery®

IONGage® User Manual

IONGAGE®

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Glossary of Terms

AGSR (Automatic Generator Start Relay): This is the feature within a BMS that can send a signal to a generator to turn on or off.

BMS (Battery Management System): This is the computer circuitry, either internal or external to the battery, that manages all battery functions.

CANBUS (Controller Area Network Bus): This is the communication network where all electronic controllers can share data with each other.

CANSA (CABUS Source Address): This is the address that identifies each component on the CANS network. Each device must have a unique address to avoid conflicts on the network.

Reserve Mode: When the battery has discharged below the “Reserve SOC” percentage setting or below the voltage set in the “Reserve Mode” setting, it will automatically shut off. The battery can be discharged further in Reserve Mode by powering the battery on again.

SOC (State of Charge): This is the value that represents the remaining capacity of the battery in terms of a percentage. 100% represents a full charge and 0% represents full discharge.

VPC (Volts per Cell): This is the value that represent the volts of the individual cells in the battery that are combined in series to create higher voltages. For example, a 12.8V battery is made up of four 3.2V cell groups connected in series.

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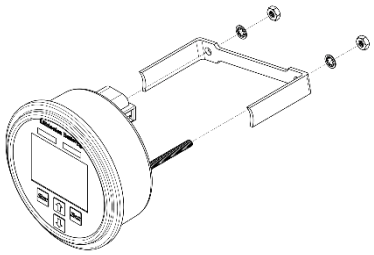
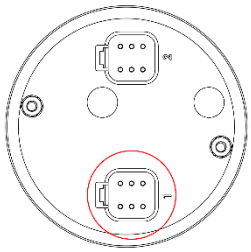
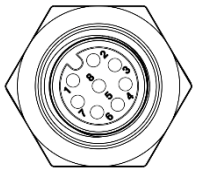
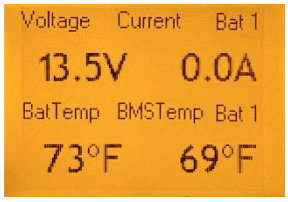
Quickstart Guide

For Single Battery Installations

STEP	DESCRIPTION	DIAGRAM
1	Secure the IONGage® in its mounting location with the provided hardware. The IONGage® will install from the front side of the panel and the mounting hardware installs from the rear side of the panel. A more detailed IONGage® mounting installation procedure can be found on page 5.	
2	Insert the 6-pin weather-sealed connector of the wiring harness to “Connector Socket 1” on the rear side of the IONGage®. Ensure that the connector is fully seated into the socket. There should be an audible “click” when the connector is fully seated. A diagram showing “Connector Socket 1” can be found on page 4.	
3	Insert the wire harness connector that is specific to your system configuration into the connector socket on the BMS/Battery. The connector type can vary depending on the BMS/Battery model. Please refer to the documentation specific to your BMS/Battery for more information.	
4	Note that IONGage power source must be in the 12V-24V range. DO NOT connect power directly to 51V or higher DC bus voltage, it will damage the unit !!! Lithionics provides different harnesses depending on the best source of DC power for IonGage, please check with Lithionics support for the best harness option for your system. Power on the battery to ensure functionality. The IONGage® will power on with the battery and is ready for general use.	
5	The Home Screen can display two gage parameters at a time with fourteen options for each position. Use the up [↑] arrow button to cycle through the parameter options on the top line and use the down [↓] arrow button to cycle through the parameter options on the bottom line. A detailed list of the Home Screen parameters and their descriptions can be found on page 6.	

For multiple battery installations please refer to “MULTIPLE BATTERY SETUP” on page 12.

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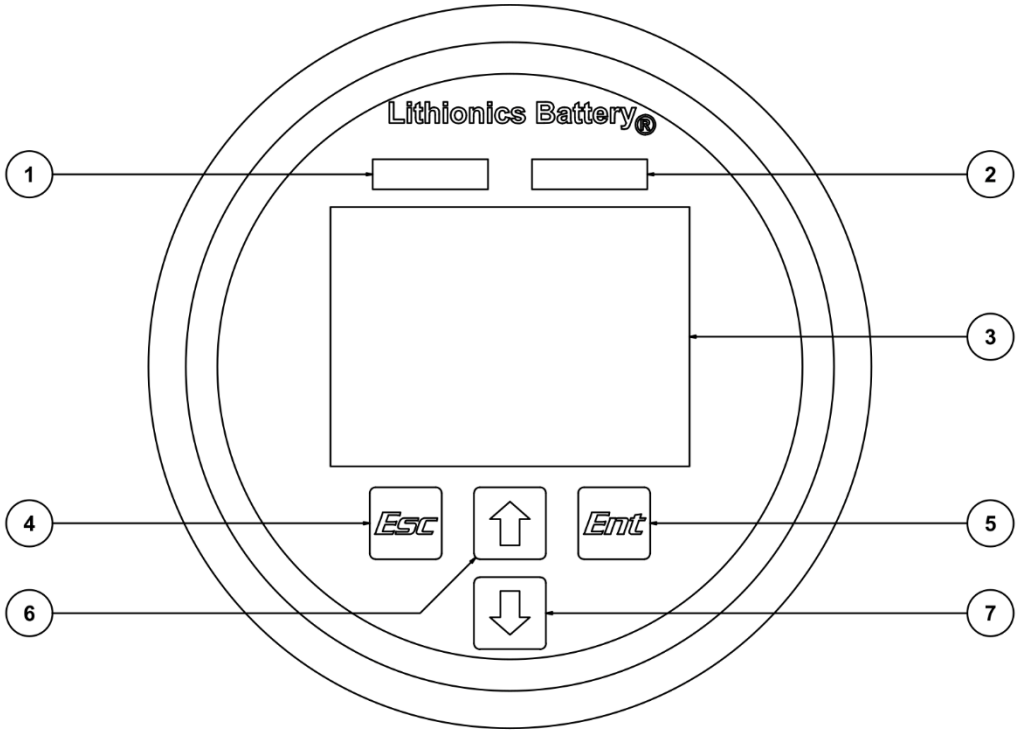
IONGage® Display Interface



ITEM	DESCRIPTION	FUNCTION
1	Yellow Warning LED	Indicates that a BMS warning event has occurred, such as a low battery warning.
2	Red Alert LED	Indicates that a BMS protection event has occurred, such a short circuit or high charging voltage.
3	LCD Display	Backlit LCD that displays gage functions and the settings menu structure.
4	Escape Button	Retreats backwards through the menu structure and cancels out of setting a gage parameter.
5	Enter Button	Advances forward through the menu structure and sets the gage parameters.
6	Up Arrow Button	Cycles through the gage functions on the top line of the home screen or moves the selector upwards in the diagnostics/settings menus.
7	Down Arrow Button	Cycles through the gage functions on the bottom line of the home screen or moves the selector downwards in the diagnostics/settings menus.

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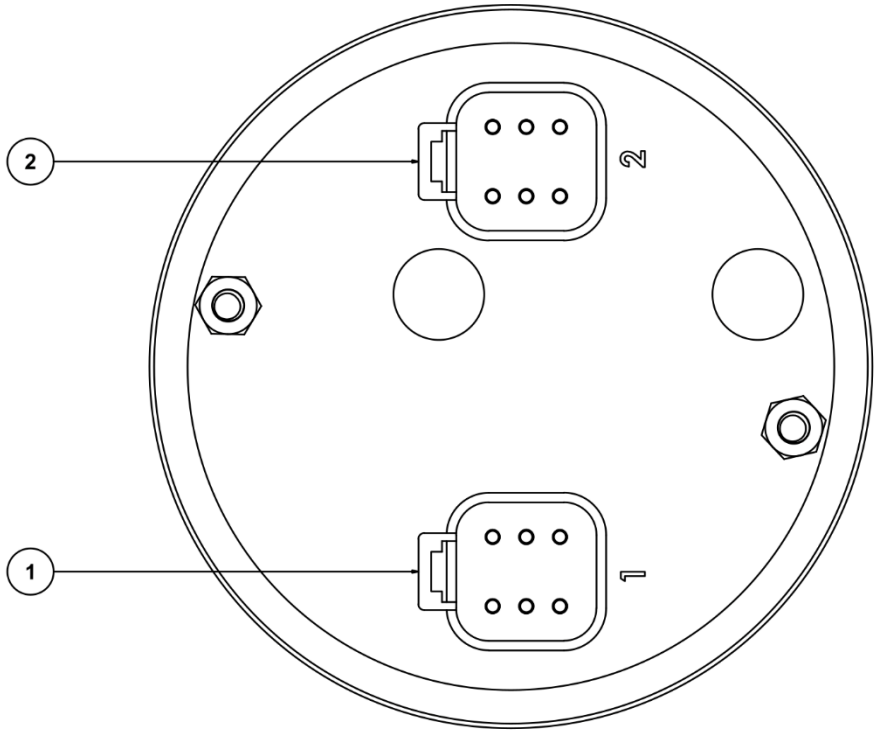
IONGage® Connector Diagram



ITEM	DESCRIPTION	FUNCTION
1	Connector Socket 1	Connects the IONGage® to the battery system via a cable harness.
2	Connector Socket 2	Not used.

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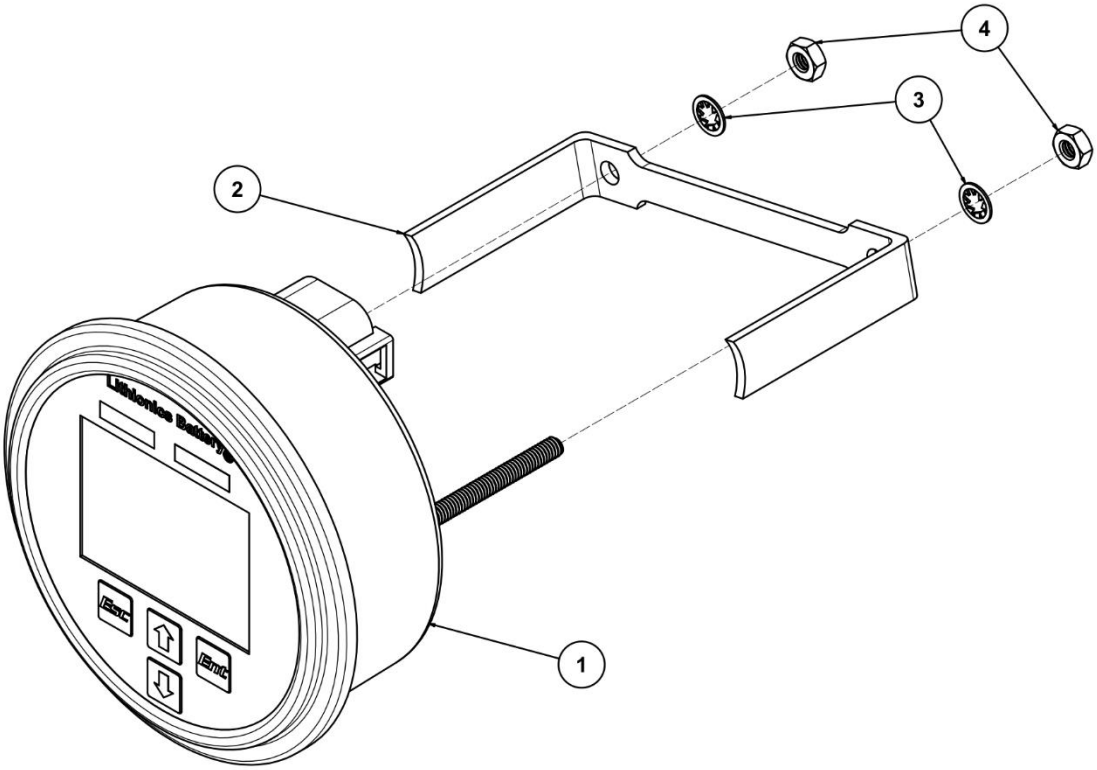
IONGage® Parts Diagram



ITEM	DESCRIPTION
1	IONGage®
2	Mounting Bracket
3	#8 Internal Tooth Lock Washer
4	#8-32 Hex Nut

IONGage® Panel Installation

The IONGage® is designed to be mounted to a panel with a 3.4” (86mm) through hole up to 0.4” (10mm) thick. A template for the panel hole cutout is located on page 13 of this user guide.

Installation Procedure:

STEP	DESCRIPTION
1	Place the IONGage® [1] into the through-hole from the front of the panel.
2	Place the Mounting Bracket [2] on the IONGage® mounting studs behind panel.
3	Place #8 Internal Tooth Lock Washer [3] on IONGage® mounting studs behind panel.
4	Place #8-32 Hex Nut [4] on IONGage® mounting studs behind panel and tighten.

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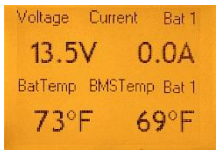
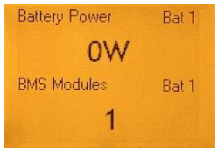
Home Screen

The Home Screen can display two gage parameters at a time with fourteen options for each postion. Use the up [↑] arrow button to cycle through the parameter options on the top line and use the down [↓] arrow button to cycle through the parameter options on the bottom line.

The Home Screen can be used to display two parameters of a single battery or the parameters of two individual batteries. This can be set in the “Select ID Line 1” and “Select ID Line 2” in the Settings Menu. Refer to “SETTINGS MENU” on page 8 for more details.

MENU ITEM	DESCRIPTION
	**Voltage/Current:** Displays the battery voltage in V (Volts) and the current in A (Amps).
	BatTemp/BMSTemp: Displays the present temperature of the battery and the present temperature of the BMS in the units selected in [Settings/Temperature units].
	**Battery SOC:** Displays the SOC of the battery as a percentage of energy remaining.
	Time Remaining: Estimated time until the battery is fully discharged or fully charged.
	**Battery Health:** A measure of the remaining useful life of the battery expressed as a percentage.
	Cap Remaining: Estimated remaining energy capacity of the battery in A·h (Amp·hours).
	**Battery Power:** The present power output of the battery in W (Watts).
	BMS Modules: Displays the number of BMS modules connected to the IONGage®.
	**MaxTemp/MinTemp:** Displays the highest and lowest temperature that the battery has ever sustained.
	Status Code: Displays the present Status Code that can used when troubleshooting issues.
	**Last Fault Code:** Displays the most recent fault code sustained by the BMS.
	Total Used AH: Displays the the total amount of A·h (Amp·hours) that has been discharged from the battery over its entire life.
	**BMS Firmware:** Displays the BMS Firmware version of the BMS.
	BMS SerNum: Displays the serial number of the BMS.

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IONGage® Menu Structure

A general overview of the IONGage® menu structure is shown in the chart below. A more in-depth explanation of the menu settings can be found on pages 8-11. Use the enter [Ent] button to advance forward through the menus and the escape [Esc] button to retreat backwards thought the menus. Use the up [↑] arrow and down [↓] arrow buttons to move the selector to the desired menu functions.

Main Menu	Menu Level 1	Menu Level 2	Menu Level 3	Min	Default	Max
Diagnostics	Active Fault Codes					
	System Information					
Settings	Adjust Contrast			0%	50%	100%
	Adjust Backlight			0%	50%	100%
	Temperature Units			Celsius		
				Fahrenheit		
	Popup Settings			Enabled		
				Disabled		
	Select ID Line 1			1	1	9
	Select ID Line 2			1	1	9
	Configure Parameters	Select Battery 1-9	Battery ID	1	1	9
			CAN SA	1	70	250
			Amp-Hours	01 Ah	†	3000 Ah
			Full Voltage	3.45 V	3.55 V	3.65 V
			Charge Voltage	3.45 V	3.60 V	3.65 V
			Reserve SOC	0%	10%	80%
			Reserve Mode	00 Disabled		
				01 Enabled*		
				02 Extended		
			AGSR Level ON‡	0%	0%	90%
			AGSR Level OFF‡	0%	0%	100%
			Heater Level ON§	00	†	65
			Idle Load	10 mA	†	900 mA
			Alarm‡	00 Disabled		
				01 Enable*		
			Power-Up Mode	00 Single Stage*		
				01 Dual Stage		
			Pre-Charge Time x 125ms‡	0	40*	240
			Pre-Charge Voltage‡	0%	75%	100%

*	Default Setting
†	Feature default dependent on BMS model/revision
‡	Feature availability dependent on BMS model/revision
§	Temperature units dependent on BMS model/revision

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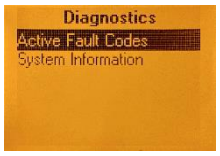
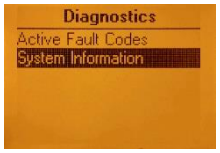
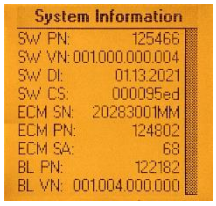
Diagnostics Menu

MENU ITEM	MENU	DESCRIPTION
		**Active Faults:** Displays the fault codes that are presently active. Faults will disappear from this screen once they are addressed.
		**System Information:** The information on this screen is for troubleshooting purposes with the manufacturer.

Fault Code Summary

These are all possible fault modes and for each one the fault status can be Low/High/Invalid/Failure. For example, when battery is depleted, the message will be “Battery Voltage Low”. Invalid or Failure status can indicate hardware faults in the system. Follow the battery user guide for further troubleshooting.

FAULT	LOW	HIGH	INVALID	FAILURE
Battery Voltage	●	●	●	
Battery Current		●	●	
Battery Temperature	●	●	●	
Battery State of Charge	●	●	●	
Battery State of Health	●		●	
BMS Main Power Switch				●
BMS Charge Buss Switch				●
Cell Voltage	●	●	●	

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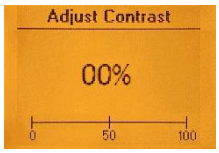
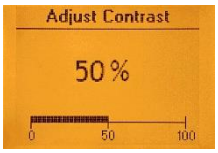
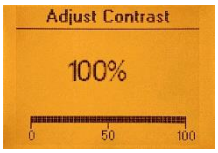
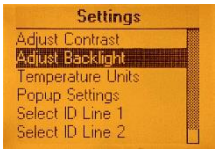
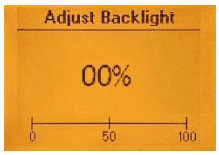
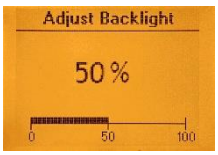
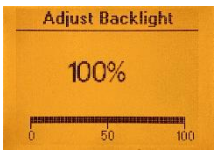
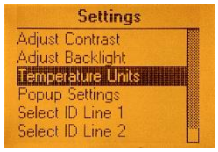
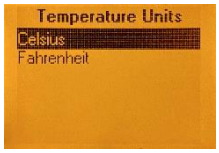
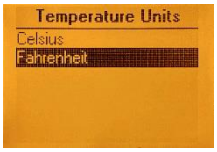
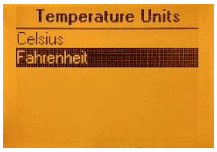
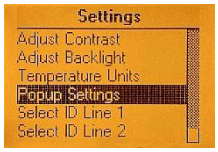
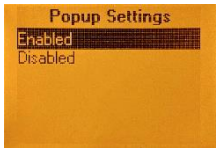
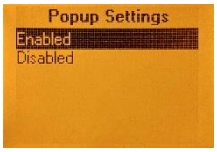
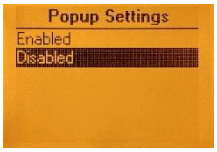
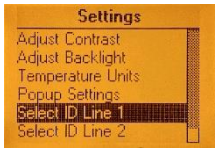
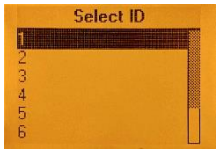
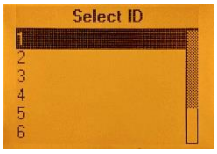
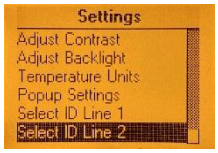
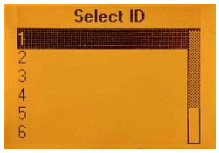
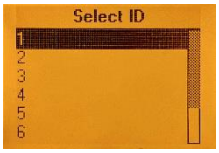
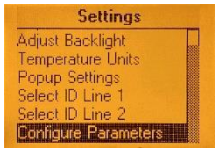
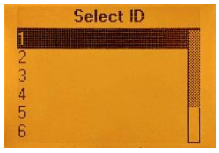
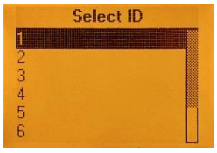
Settings Menu

MENU ITEM	DESCRIPTION	MINIMUM	DEFAULT	MAXIMUM
	**Adjust Contrast:** Adjusts the contrast of the IONGage® display from 0% to 100% in 2% increments. Default setting is 50%.			
	**Adjust Backlight:** Adjusts the brightness of the IONGage® display from 0% to 100% in 1% increments. Default setting is 50%.			
	**Temperature Units:** Sets the temperature units displayed by the IONGage® Home Screen to either Celsius or Fahrenheit. This setting does not affect units displayed in the Lithionics Battery® App or units in the [Setting] menu options.			
	**Popup Settings:** Enables or disables pop up alerts on the display. Default setting is enabled.			
	**Select ID Line 1:** Selects the battery to be displayed on the top line of the Home Screen. The value range is 1-9 and the default setting is 1. A battery can be assigned a number in [Configure Parameters/Battery ID].			
	**Select ID Line 2:** Selects the battery to be displayed on the bottom line of the Home Screen. The value range is 1-9 and the default setting is 1. A battery can be assigned a number in [Configure Parameters/Battery ID].			
	**Configure Parameters:** Configures the parameters of the connected Battery/BMS. Select the “Battery ID” of the specific battery to be configured. See next page for descriptions of the parameters.			

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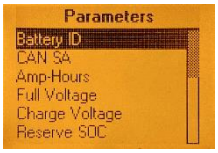
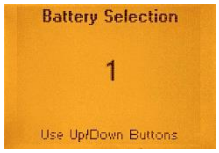
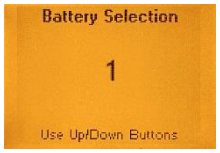
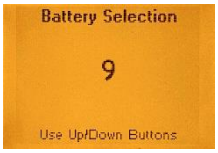
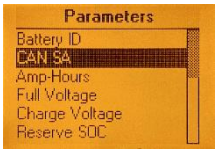
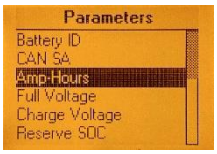
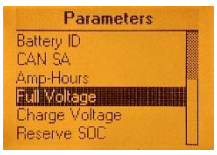
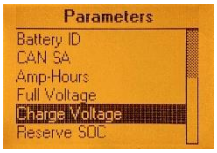
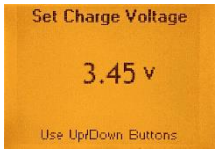
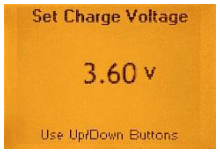
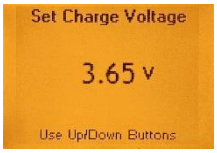
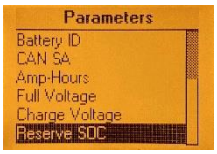
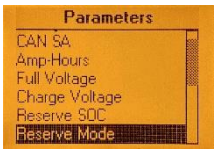
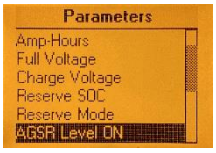
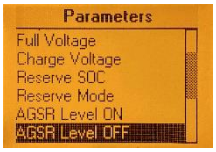
Configure Parameters Menu

WARNING: The parameters configured in this section are applied to the BMS itself and could affect the operation of the battery. Changes to these parameters should only be made with a full understanding of the outcome.

MENU ITEM	DESCRIPTION	MINIMUM	DEFAULT	MAXIMUM
	**Battery ID:** Sets the Battery ID Number for the battery actively selected in the [Configure Parameters] menu. The available Battery IDs are 1-9 and the default value is 1.			
	**CAN SA:** Sets the CANBUS Source Address. Each node on the CANBUS network must have a unique ID. The default address for a battery module/BMS is 70 and the address for the IONGage® is fixed at 68.			
	**Amp-Hours:** Sets the Amp-Hour rating of the connected battery for SOC calculations. Values can range from 1Ah to 3000Ah. The default setting depends on the connected battery.			
	**Full Voltage:** Sets cell level voltage used in SOC calculations. The values can range from 3.45V to 3.65% with a default setting at 3.55V.			
	**Charge Voltage:** Sets the charging voltage per cell when connected to a CANBUS capable battery charger. Values can range from 3.45V to 3.65V and the default value is 3.60V.			
	**Reserve Soc:** Sets the SOC percentage at which the BMS enters "Reseve Mode". The values can range from 00% to 80% with a default setting at 10%.			
	**Reserve Mode:** Expands on the "Reserve Mode" requirements to include voltage as an additional factor to enter Reserve Mode. 01 sets 3.0 Volts/Cell (VPC) and 02 sets 3.1 Volts/Cell (VPC). 00 disables this feature. Default setting is 01.			
	**AGSR Level ON:** Sets the SOC level where AGSR will turn on a generator if connected. The values can range from 00% to 90% with a default setting at 00%. Setting to 00% disables this feature.			
	**AGSR Level OFF:** Sets the SOC level where AGSR will turn off a generator. The values can range from 00% to 100% with a default setting at 00%. Setting to 00% disables this feature.			

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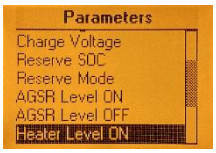
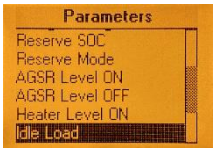
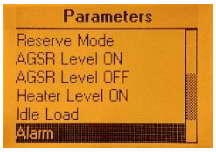
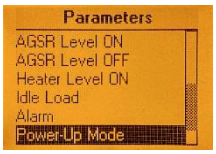
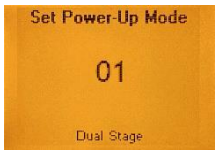
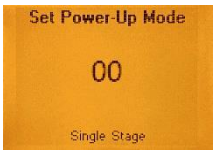
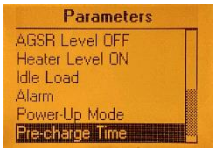
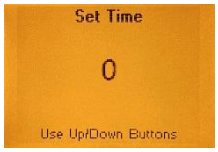
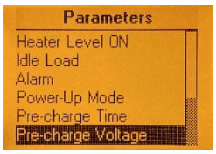
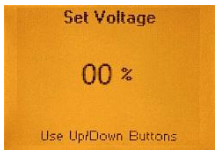
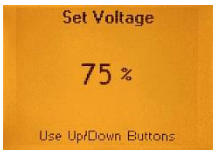
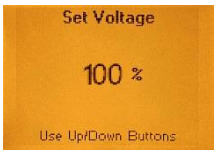
	**Heater Level ON:** Sets the temperature value at which the heater turns on. The value range is 00 – 65 temperature units. *Units can be Fahrenheit or Celsius depending on the BMS/Battery Module and the default value is typically a few degrees above the freezing point of water.*			
	**Idle Load:** This setting allows the Battery Management System to account for small loads when calculating the SOC. Value range is 10 mA – 900 mA in 10 mA increments. *The default setting varies depending on the BMS/Battery Module connected.*			
	**Alarm:** Enables or disables the alarm sound. 01 enables the alarm and 00 disables the alarm.The alarm is enabled by default.			
	**Power-Up Mode:** Enables or disables battery power to the battery terminals on first press of the power button. A second press will enable battery power. 01 is the “Dual Stage” mode and 00 is the “Single Stage” mode. Single Stage is the default setting.			
	**Pre-Charge Time:** Sets the time allowed for voltage rise detection during pre-charge cycle. This feature is used when a device may draw excessive current when first connected. Value range is 0-240. Each increment represents 0.125ms which corresponds to a range of 0-30 seconds. The default value is 40. *This feature is available only on select BMS.*			
	**Pre-Charge Voltage:** Sets the load voltage required to close the contactor during the time allowed for the pre-charge cycle. The load voltage set is a percentage of the battery voltage. Value range is 0%-100% and the default value is 75%. *This feature is available only on select BMS.*			

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Multiple Battery Setup

Support for multiple batteries on the same CANBUS network requires each battery to have a unique Battery ID address and CANSA address. All batteries ship from the factory with default Battery ID = 1 and CANSA = 70. Therefore, if a system has two batteries, then second battery must be re-configured to something other than the default address, for example Battery ID = 2 and CANSA = 71. However, when both batteries are connected to the CAN network and both have default addresses, IONGage® cannot distinguish one battery from the other. So, to change the address on battery #2, battery #1 must be temporarily removed from the CAN network. Also, some cable harnesses only power the IONGage® from the connector labeled as “BATTERY1”.

INITIAL SETUP

STEP	DESCRIPTION
1	Turn off and disconnect all batteries from the IONGage® Wiring Harness.
2	Connect the IONGage® to the IONGage® Cable Harness, if not already connected.
3	Connect the battery that is to have the Battery ID modified to the connector labeled “BATTERY1”, if present.
4	Power on the battery.
5	After the IONGage® is powered on, from the home screen, press enter [Ent].
6	Select [Settings] using the arrow buttons and press enter [Ent].
7	Select [Configure Parameters] menu option using the arrow buttons and press enter [Ent].
8	Press enter [Ent] again to [Select Battery].
9	If changing a Battery ID from the default settings, select option [1] by pressing enter [Ent]. If changing a Battery ID from something other than the default setting of [1], use the arrow buttons to select the active Battery ID number and press enter [Ent].
10	You should now be in the [Configure Parameters] for the chosen battery.

SETTING THE BATTERY ID

STEP	DESCRIPTION
10	Once in the [Configure Parameters] menu for the chosen battery, select [Battery ID] menu option and press enter [Ent].
11	Use the arrow buttons to select the desired number for the Battery ID and press enter [Ent]. If “---” is displayed, this indicates that a battery with the chosen Battery ID is not connected to the system. *Each battery must have a unique Battery ID*. When the Battery ID change is complete, the screen will return to the [Configure Parameters] menu.
12	Press escape [Esc] to return to the [Select Battery ID] menu.
13	Use the arrow buttons to select the new Battery ID number that was chosen, and press enter [Ent].
14	You should now be in the [Configure Parameters] for the new chosen Battery ID.

SETTING THE SOURCE ADDRESS (CAN SA)

STEP	DESCRIPTION
15	Once in the [Configure Parameters] menu for the chosen battery, select [CAN SA] menu option and press enter [Ent].
16	Use the arrow buttons to select the desired number for the CAN SA and press enter [Ent]. *Each battery must have a unique CAN SA*. When the CAN SA change is complete, the screen will return to the [Configure Parameters] menu.

FINALIZING THE INSTALL

STEP	DESCRIPTION
17	Once all Battery IDs are set, reconnect all batteries to the IONGage® cable harness.
18	Return to the [Settings] menu by pressing the escape button [Esc] three times and configure the “Select ID Line 1” and “Select ID Line 2” as desired.

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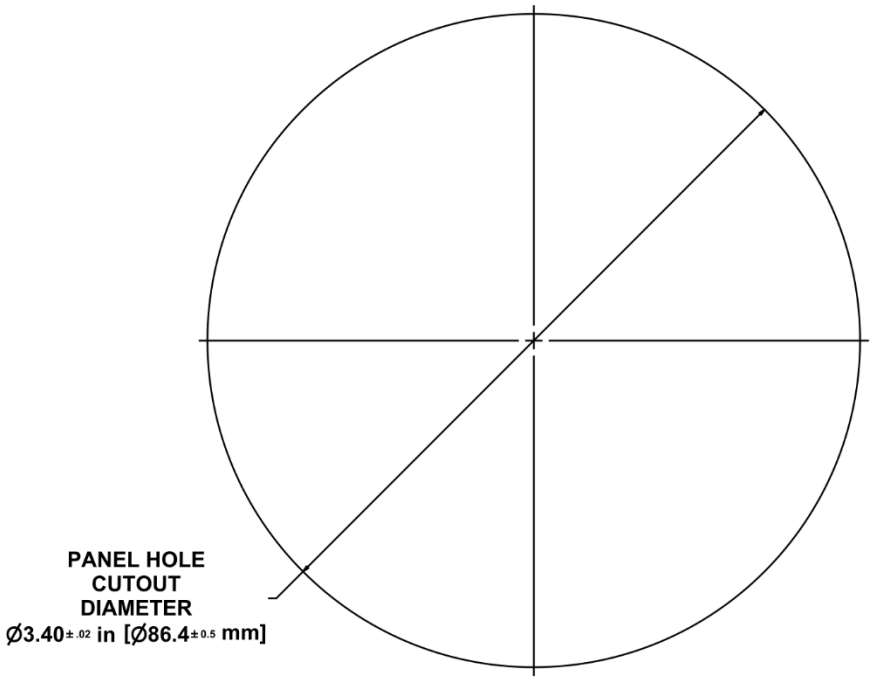
IONGage® Panel Mounting Template



SCALE 1:1

PRINT TO 100% SCALE

Recommended Hole Cutout Tool

LENOX TOOLS HOLE SAW 3-3/8” (1772945)

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