APPLICATION NOTE

Operational Settings for Power Control Electronics

For Aquion S30-0080 Battery Stacks and M110-LS83 Battery Modules   **April 19, 2016**

Contents

Introduction

The 48 V Aquion Energy battery is designed to be compatible with the majority of charge controllers and inverters that work with lead acid batteries. With the appropriate voltage, time, and temperature compensation settings, the Aquion battery can use the common lead acid charge profile of Bulk, Absorb, Float. The Aquion battery does not require a float current, as lead acid batteries do, but there is a regulation voltage at which the battery can be held following its absorption charge cycle.

The inverter settings in this appendix are recommendations only. They are intended to keep the batteries within their operational limits (maximum voltage, maximum current, etc.). These settings can

be changed to optimize the performance of your particular system. Please contact Aquion Energy support at http://www.aquionenergy.com/support for further assistance.

Definitions

+ Bulk current – Maximum current at which the battery can be charged.
+ Absorption voltage – Voltage at which the battery can be maintained in the constant voltage "absorption" stage of the charge profile. This condition allows the battery to charge at a faster rate.
+ Absorption time – Length of time that the battery should be held at absorption voltage.
+ Hold (float) voltage – Voltage at which the battery can be held following the absorption stage. The hold stage allows the battery to maintain a full state of charge when the system is generating more power than is required by the system loads.

How to Charge Aquion Batteries

All off-grid power control devices that have temperature compensation have a battery temperature sensor accessory. Affix the battery temperature sensor to the side of the topmost battery in the eight-battery stack. For groups of stacks, install the battery temperature sensor on the most central stack. Aquion recommends that the sensor be attached with high-quality adhesive tape, in addition to any self-adhesive included with the sensor.

Temperature Compensation

The Aquion AHI battery is capable of operating at higher ambient temperatures than lead acid batteries can. The reference temperature for the AHI battery is 30°C, rather than the 25°C typical of lead acid technologies. Because most off-grid power electronics are designed to use 25°C as the reference temperature and have varying temperature compensation functions, care must be taken when selecting the appropriate charge settings for an AHI battery.

Voltage Limits vs. Temperature

The table below shows the maximum absorption and float voltages as a function of ambient temperature. If your power control electronics do not allow you to set temperature-compensation values, use 57.6 V as the maximum absorption voltage.

Table 1. Voltage limits versus ambient temperature for Aquion batteries.

Charge Phase	Ambient Temperature (°C)				
	0	**10**	**23**	**30**	**40**
Absorption Voltage (V)	58.5	58.2	57.8	57.6	57.3
Float Voltage (V)	54.9	54.6	54.2	54.0	53.7

Device-Specific Settings by Manufacturer

This section suggests settings for several power control devices when they are connected to Aquion batteries. All settings are for off-grid applications with battery stacks unless otherwise noted as being for modules or for grid-tied or UPS applications. If your device is not shown, derive the settings from Table 1 above or contact Aquion Energy technical support (http://www.aquionenergy.com/support). Settings may need to be adjusted for a specific installation's use, configuration, or operating environment.

Morningstar

Several Morningstar charge controllers can be configured using their serial/Modbus adapter and the MSView software. The charge controllers operate at different voltages (12, 24, or 48 V) depending on the initial battery voltage when power is connected.

Tristar MPPT 150V

Switch 1	OFF
Switch 2	ON
Switch 3	ON
Switch 4	ON
Switch 5	ON
Switch 6	ON
Switch 7	OFF
Switch 8	<User to decide>

Custom settings:

Absorp. Stage	14.4
Float Stage	13.5
Equalize Stage	Disable
Absorp. Time	240
Equalize Time	Disable
Equalize Interval	Disable

Tristar MPPT 600V

Switch 1	OFF
Switch 2	OFF
Switch 3	OFF
Switch 4	ON
Switch 5	ON
Switch 6	ON
Switch 7	OFF
Switch 8	<User to decide>

Custom settings:

Absorp. Stage	57.6
Float Stage	54.0
Equalize Stage	Disable
Absorp. Time	240
Equalize Time	Disable
Equalize Interval	Disable

Sunsaver MPPT

Charge Settings:

Battery Type	Flooded
Battery Jumper	REMOVED
Switch 1	OFF
Switch 2	ON
Switch 3	OFF

MidNite

Classic

T-Comp ....−1.25 mV/cell/°C
Equalization .... not needed; verify that CHARGE>EQ>AUTOEQ>AUTO = 0
Current Limit – CHARGE>LIMITS>Out Amps .... 17 A/stack -or- 204 A/module
Absorb Voltage – CHARGE>VOLTS>Absorb Volts...57.6 V*
Float Voltage – CHARGE>VOLTS>Float Volts ....54.0 V
Absorb Time...240 min

*At 30°C; otherwise, refer to Table 1.

MidNite BRAT (Settings are for off-grid and grid-tied/UPS applications.)

S1-4 Battery 1 .... OFF
S1-5 Battery 2 .... ON

Outback

Charge Controller Menu

Absorb Voltage ....57.6 V*
Absorb Time.. 4 hr
Float Voltage...54.0 V
ReBulk Voltage...52 V
Output Current Limit .... 17 A/stack -or- 204 A/module
Absorb End Amps...................... 2 A/stack -or- 24 A/module

*At 30°C; otherwise, refer to Table 1.

Radian Class Inverter Menu

Low Battery Cut-Out Voltage ....36 V
Low Battery Cut-In Voltage..40 V
Absorb Voltage ....57.6 V*
Absorb Time.. 4 hr
Float Voltage...54.0 V
Float Time .... 0 hr
Re-Float Voltage ....53 V
Equalize Voltage ....54.0 V
Equalize Time.. 0 hr
Grid-Tie Sell Voltage ....54 V

*At 30°C; otherwise, refer to Table 1.

FX Class Inverter Menu

Low Battery Cut-Out Voltage .... 36 V
Low Battery Cut-In Voltage .... 40 V
Absorb Voltage.. 57.6 V*
Absorb Time .... 4 hr
Float Voltage .... 54.0 V
Float Time .... 0 hr
Re-Float Voltage... 53 V
Equalize Voltage .... 54.0 V
Equalize Time .... 0 hr

*At 30°C; otherwise, refer to Table 1.

FLEXnet DC Menu

Battery Ah ....51 Ah/stack -or- 612 Ah/module
Charged Voltage.. 56 V
Charged Time .... 1 hr
Charged Return Amps .... 2 A/stack -or- 24 A/module
Charge Factor (BCF).. 85

SMA

Sunny Island: See the Application Note *Aquion AHI Energy Batteries with the SMA Sunny Island Inverter* at http://aquion.energy/1KenUlP.

Schneider

Conext XW+

Batt Type.. custom
Batt Capacity..................... 51 Ah/stack -or- 612 Ah/module
Max Charge Rate.................. 17 A/stack -or- 204 A/module
Charge Cycle .... 2 stage
Float Voltage ....54.0 V
Absorb Time..240 min
Bulk Voltage ....57.6 V*
Absorption Voltage ....57.6 V*
Equalize... disable
Batt Temp Comp ....30 mV/°C

*At 30°C; otherwise, refer to Table 1.

Solar Eclipse

Select "Aquion" battery type from the menu and set the capacity of the Aquion battery bank considering a 8-hour charge and 8-hour discharge. For example, if there are four S30 battery stacks in parallel, set the total battery capacity at 37 Ah x 4 = 148 Ah.

Depth of discharge (DoD) is set at 70% by default.

Studer

Xtender

Parameter	Default	Unit	Description	Setting
1108	46.3	V	battery undervoltage at no load	36
1109	42	V	battery undervoltage at full load	36
1110	48	V	restart voltage after batteries undervoltage	42
1121	68.2	V	battery overvoltage level	60
1122	64.8	V	restart voltage after an battery overvoltage	57
1138	60	A	battery charge current	17/stack -or- 204/module max
1139	-3	mV/°C/cell	battery temperature compensation	−1.25
1140	54.4	V	float voltage	54.0
1156	57.6	V	absorption voltage	57.6*
1157	2	hrs	absorption time	4 hr
1158	No		End of absorption triggered with current	Yes
1159	4	A	current limit to quit the absorption phase	2/stack -or- 24/module
1191	ON		dynamic low voltage compensation	OFF

*At 30°C; otherwise, refer to Table 1.

Victron

Quattro (using VE configuration)

DC input low shut-down	37.20V
Enable charger	ON
Stop after excessive bulk	ON
Lithium batteries	OFF
Storage mode	OFF
Use equalization	OFF
Charge curve	FIXED
Absorption voltage	57.60V*
Float voltage	54.00V
Charge current	17A/stack -or- 204A/module
Repeated absorption time	4 Hr
Repeated absorption interval	3 Days
Absorption time	4 Hr

*At 30°C; otherwise, refer to Table 1.

Contact Us for More Information

If you purchased your batteries from an authorized Aquion Energy dealer, please contact the dealer for assistance. If you purchased your batteries directly from Aquion Energy, contact Aquion Technical Support: http://www.aquionenergy.com/support.

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