

# Operational Settings for Power Control Electronics with Aspen Batteries

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Application note for Aspen 48S-2.2, Aspen 48M-25.9, and Aspen 24S-83 batteries  
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## 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 and time 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 document are recommendations only. They are intended to keep the batteries within their operational limits (maximum voltage, maximum current, etc.) and can be changed to optimize a system's performance. Contact Aquion Energy support (<http://aquionenergy.com>) 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. For an Aspen 48S or 24S battery, 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.

## Device-Specific Settings by Manufacturer

This section suggests settings for several power control devices when they are connected to Aspen batteries. All settings are for off-grid applications with battery stacks unless otherwise noted as being for battery modules or for grid-tied or UPS applications. If your device is not shown, contact Aquion Energy technical support (<http://aquionenergy.com>). Aquion has not tested these settings, and they may need to be adjusted for a specific installation’s use, configuration, or operating environment.

### MidNite

<i>Classic</i>	<i>48S</i>	<i>48M</i>	<i>24S</i>
T-Comp	-1.25 mV/cell/°C	-1.25 mV/cell/°C	-1.25 mV/cell/°C
Equalization	not needed; verify CHARGE>EQ>AUTOEQ>AUTO=0	not needed; verify CHARGE>EQ>AUTOEQ>AUTO=0	not needed; verify CHARGE>EQ>AUTOEQ>AUTO=0
Current Limit – CHARGE>LIMITS>Out Amps	20 A/stack	240 A/module	30 A/stack
Absorb Voltage – CHARGE>VOLTS>Absorb Volts	59.5 V	59.5 V	29.7 V
Float Voltage – CHARGE>VOLTS>Float Volts	55 V	55 V	27.5 V
Absorb Time	240 min	240 min	240 min
<hr/>			
<i>MidNite BRAT (for off-grid and grid-tied/UPS applications)</i>	<i>24S</i>		
S1-4 Battery 1	OFF		
S1-5 Battery 2	ON		

## 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.

<i>Tristar MPPT 150V</i>	<i>48S</i>	<i>48M</i>	<i>24S</i>
Switch 1	OFF	OFF	OFF
Switch 2	ON	ON	ON
Switch 3	ON	ON	OFF
Switch 4	ON	ON	ON
Switch 5	ON	ON	ON
Switch 6	ON	ON	ON
Switch 7	OFF	OFF	OFF
Switch 8	<User to decide>	<User to decide>	<User to decide>
<i>Custom settings:</i>			
Absorp. Stage	14.8	14.8	14.8
Float Stage	13.7	13.7	13.7
Equalize Stage	Disable	Disable	Disable
Absorp. Time	240	240	240
Equalize Time	Disable	Disable	Disable
Equalize Interval	Disable	Disable	Disable

<i>Tristar MPPT 600V</i>	<i>48S</i>	<i>48M</i>	<i>Sunsaver MPPT</i>	<i>24S</i>
Switch 1	OFF	OFF	Battery Type	Flooded
Switch 2	OFF	OFF	Battery Jumper	REMOVED
Switch 3	OFF	OFF	Switch 1	OFF
Switch 4	ON	ON	Switch 2	ON
Switch 5	ON	ON	Switch 3	OFF
Switch 6	ON	ON		
Switch 7	OFF	OFF		
Switch 8	<User to decide>	<User to decide>		
<i>Custom settings:</i>				
Absorp. Stage	59.5	59.5		
Float Stage	55	55		
Equalize Stage	Disable	Disable		
Absorp. Time	240	240		
Equalize Time	Disable	Disable		
Equalize Interval	Disable	Disable		

## Outback

<i>Charge Controller Menu</i>	<i>48S</i>	<i>48M</i>	<i>24S</i>
Absorb Voltage	59.5 V	59.5 V	29.7 V
Absorb Time	4 hr	4 hr	4 hr
Float Voltage	55 V	55 V	27.5 V
ReBulk Voltage	52 V	52 V	26 V
Output Current Limit	20 A/stack	240 A/module	30 A/stack
Absorb End Amps	2 A/stack	24 A/module	3 A/stack

<i>FX Class Inverter Menu</i>	<i>48S</i>	<i>48M</i>	<i>24S</i>
Low Battery Cut-Out Voltage	36 V	36 V	18 V
Low Battery Cut-In Voltage	40 V	40 V	20 V
Absorb Voltage	59.5 V	59.5 V	29.7 V
Absorb Time	4 hr	4 hr	4 hr
Float Voltage	55 V	55 V	27.5 V
Float Time	0 hr	0 hr	0 hr
Re-Float Voltage	54 V	54 V	27 V
Equalize Voltage	55 V	55 V	27.5 V
Equalize Time	0 hr	0 hr	0 hr

<i>Radian Menu</i>	<i>48S</i>	<i>48M</i>	<i>24S</i>
Low Battery Cut-Out Voltage	36 V	36 V	18 V
Low Battery Cut-In Voltage	40 V	40 V	20 V
Absorb Voltage	59.5 V	59.5 V	29.7 V
Absorb Time	4 hr	4 hr	4 hr
Float Voltage	55 V	55 V	27.5 V
Float Time	0 hr	0 hr	0 hr
Re-Float Voltage	54 V	54 V	27 V
Equalize Voltage	55 V	55 V	27.5 V
Equalize Time	0 hr	0 hr	0 hr
Grid-Tied Sell Voltage	54 V	54 V	27 V

<i>FLEXnet DC Menu</i>	<i>48S</i>	<i>48M</i>	<i>24S</i>
Battery Ah	42.3 Ah/stack	507.6 Ah/module	83.3 Ah/stack
Charged Voltage	58 V	58 V	29 V
Charged Time	1 hr	1 hr	1 hr
Charged Return Amps	2 A/stack	24 A/module	3 A/stack
Charge Factor (BCF)	85	85	85

## Schneider

<i>Conext XW/XW+</i>	<i>48S</i>	<i>48M</i>	<i>24S</i>
Batt Type	custom	custom	custom
Batt Capacity	42.3 Ah/stack	507.6 Ah/module	83.3 Ah/stack
Max Charge Rate	20 A/stack	240 A/module	30A/stack
Charge Cycle	2 stage	2 stage	2 stage
Float Voltage	55 V	55 V	27.5 V
Absorb Time	240 min	240 min	240 min
Bulk Voltage	59.5 V	59.5 V	29.7 V
Absorption Voltage	59.5 V	59.5 V	29.7 V
Equalize	disable	disable	disable
Batt Temp Comp	30 mV/°C	30 mV/°C	30 mV/°C

## SMA

See *Aquion Battery and SMA Sunny Island Inverter Installation Manual* at <http://aquion.energy/1KenUIP>.

## 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 Aspen 48S batteries in parallel, set the total battery capacity at 39 Ah x 4 = 156 Ah. Depth of discharge (DoD) is set at 70% by default.

*C8 capacity of single Aspen battery*

<i>48S</i>	<i>48M</i>	<i>24S</i>
39 Ah	464 Ah	77 Ah

## Steca

The following settings represent recommended example values for cyclical applications typical of many solar PV applications. These settings are applicable to the Aquion Aspen 48S battery. **Read the Steca charge controller manual before applying these settings.**

### Tarom MPPT 6000-M

The Steca Tarom MPPT 6000-M closely matches Aquion Energy's "Two-stage (Bulk & Absorption)" charging method, which is the preferred charging method for the Aspen 48S battery (consult Aquion Energy's "Aspen Battery Installation & Operation Manual" for more details). The Tarom MPPT 6000-M is therefore the preferred solar charge controller for this battery type with the following settings:

<i>Parameter</i>	<i>Setting (48S only)</i>
Battery type	
Main menu → Battery settings → Battery type →	Li-Ion battery
Battery capacity	
Main menu → Battery settings → Battery capacity →	40 Ah
Maximum charging current	
Main menu → Battery settings → Current limit device →	20 A
Charge voltage settings	
Main menu → Battery settings → Li-Ion battery settings...	
...Number of cells →	12
...Cell voltage →	4.0 V
...Charge voltage →	4.95 V
...Charge activation →	4.65 V*
...Charge Timer →	120 min.
...Temperature range →	Min. -5°C, Max. 40°C
<p><i>We strongly recommend using the external temperature sensor Steca PA TS-S and activating it in the Tarom MPPT 6000-M:</i></p>	
Main menu → Battery settings → Bat. Temperature sensor →	External

\* Default value. May be adjusted according to your requirements.

### Tarom MPPT 6000-S, Tarom 4545-48

The Steca Tarom MPPT 6000-S and Tarom 4545-48 are able to fulfill Aquion Energy's "Three-stage (Bulk, Absorption & Float)" charging method (consult the Aspen Battery Installation & Operation Manual for more details). The following settings apply to the Tarom MPPT 6000-S or Tarom 4545-48 for this alternative charging method:

<i>Parameter</i>	<i>Setting (48S only)</i>
Battery type	Main menu → Battery settings → Battery type → Lead acid Gel/AGM
Battery capacity	Main menu → Battery settings → Battery capacity → 40 Ah
Battery control mode	Main menu → Battery settings → Battery control mode → SOC control mode → Voltage control
Charge control settings	Main menu → Battery settings → Charge voltage → Float charge voltage → 55.0 V Main menu → Battery settings → Charge voltage → Boost charging... ...Starting threshold → 45.6 V ...Boost charge voltage → 59.5 V
Boost charge duration & temperature compensation	Main menu → Battery settings → Expert menu → Enter code [17038], then press [SET] for 1 second Boost charge duration → 120 min.* Temp. compensation (On/Off) → Off
Max. current (Tarom MPPT 6000-S only)	Main menu → Battery settings → Current limit device → 20 A <sup>†</sup>

\*Default value. May be increased up to 240 minutes (4 hours) if desired, but not above, so as to remain within battery specifications.

<sup>†</sup>For a PWM charge controller such as the Tarom 4545-48, the total MPP current of the PV module array should not be above 20A to remain within the battery charging current specifications.

## Studer

### Xtender – 48S

<i>Parameter</i>	<i>Default</i>	<i>Unit</i>	<i>Description</i>	<i>Setting</i>
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	20/stack max
1139	-3	mV/°C/cell	battery temperature compensation	-1.25
1140	54.4	V	float voltage	55
1156	57.6	V	absorption voltage	59.5
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
1191	ON		dynamic low voltage compensation	OFF

### Xtender – 48M

<i>Parameter</i>	<i>Default</i>	<i>Unit</i>	<i>Description</i>	<i>Setting</i>
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	240/module max
1139	-3	mV/°C/cell	battery temperature compensation	-1.25
1140	54.4	V	float voltage	55
1156	57.6	V	absorption voltage	59.5
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	24/module
1191	ON		dynamic low voltage compensation	OFF

### Xtender – 24S

<i>Parameter</i>	<i>Default</i>	<i>Unit</i>	<i>Description</i>	<i>Setting</i>
1108	23.1	V	battery undervoltage at no load	18
1109	21	V	battery undervoltage at full load	18
1110	24	V	restart voltage after batteries undervoltage	21
1121	34.1	V	battery overvoltage level	30
1122	34.1	V	restart voltage after an battery overvoltage	28.5
1138	30	A	battery charge current	30/stack max
1139	-3	mV/°C/cell	battery temperature compensation	-1.25
1140	27.2	V	float voltage	22.5
1156	28.8	V	absorption voltage	29.7
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	3/stack
1191	ON		dynamic low voltage compensation	OFF

## Victron

<i>Quattro (using VE configuration)</i>	<i>48S</i>	<i>48M</i>	<i>24S</i>
DC input low shut-down	37.20 V	37.20 V	18.6 V
Enable charger	ON	ON	ON
Stop after excessive bulk	ON	ON	ON
Lithium batteries	OFF	OFF	OFF
Storage mode	OFF	OFF	OFF
Use equalization	OFF	OFF	OFF
Charge curve	FIXED	FIXED	FIXED
Absorption voltage	59.5 V	59.5 V	29.7 V
Float voltage	55 V	55 V	27.5 V
Charge current	20 A/stack	240 A/module	30 A/stack
Repeated absorption time	4 Hr	4 Hr	4 Hr
Repeated absorption interval	3 Days	3 Days	3 Days
Absorption time	4 Hr	4 Hr	4 Hr

## Contact Us for More Information

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

## Legal/Disclaimer/Warranty

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