Lithionics Battery & Morningstar

Introduction:

With over four million sold since 1993, Morningstar is recognized as the expert in charging technology throughout the solar industry. As solar-plus-storage becomes more prevalent in mainstream installations, battery chemistries are becoming more advanced—and battery makers are increasingly looking for ways to help their customers maintain and protect their long-term investment.

Morningstar's *Energy Storage Partner program* (ESP) makes it possible for selected premium battery partners to offer additional value and support for their customers by offering them a more proven, better documented and controlled storage system. With energy storage typically accounting for a very large share of the overall system's cost, ESP helps advanced chemistry battery manufacturers to provide the maximum level of assurance that system owners and operators need. This document is intended to provide essential information and recommendations for integrating Morningstar charge controllers with the Energy Storage Partner's batteries. Proper integration of these products is dependent upon successful implementation of the custom settings outlined in the sections below. These settings are the result of cooperation between manufacturers and have been agreed upon by both parties.

Battery Overview & Key Advantages:

> ➢ Safety a Must:
>> • High Quality & Safe Lithium Iron Phosphate Chemistry
>> • ION EXT (Nano-Ceramic Kevlar Shutdown Curtain) Cell Fire Prevention Technology
>> • 3rd Party UL & UN DOT Safety Testing
> ➢ Dedicated to Quality:
>> • Cell Testing & Impedance Matching
>> • FLIR Thermal Imaging for Quality Assurance
>> • Documented 100% System Load & Capacity Testing
> ➢ Proprietary NeverDie® Battery Management System:
>> • Pushbutton Battery Power/Storage Switch
>> • Protective UL Safety Features
>> • State-of-Charge Telemetry
>> • State-of-Health Monitoring (Status & Fault Codes)
> ➢ American Made:
>> • Designed, Manufactured and Serviced in the USA.
>> • On-site HazMat Pick-Up Available for Service & Repair (US 48 States)

Models: See full list of batteries (with internal BMS), modules (with external BMS)
Voltages: 12V (4S), 24V (8S), 48V (15S), 51V (16S)

Amp Hour Capacities: 75-600Ah

Note: For information regarding battery bank configuration options, please contact the battery manufacturer.

For optimal integration, the recommended settings (based on 12V nominal values) are as follows:

<u>**Critical Settings**</u>:

Absorption Voltage = 14.40 V

Absorption Time = 30 min

Temperature Compensation = 0.0 V/degC (Disabled)

Float/Float Voltage/Timeout = Enable/13.40 V/30 min (Float stage not required while battery is in storage)

Equalize = Not enabled

Battery HVD/High Voltage Disconnect/Reconnect = Enable/14.80 V/14.40 V

Load LVD (Low Voltage Disconnect) ………………………………….. 12.50 V

Load LVR (Low Voltage Reconnect) …………………………………… 13.25 V

Note:

Many lithium batteries include a BMS that can implement an internal battery disconnect in the event of a deep discharge to prevent permanent damage to the battery chemistry. It is important that proper low voltage load disconnect settings are used to prevent this from occurring during charging. Damage to the controller due to a battery disconnect during charging is typically not covered under warranty. Incidental damage to loads is also not covered under warranty.

<u>**Optional Recommended Settings**</u>:

Absorption Ext = Not enabled

Low Battery Temperature Foldback = Optional (High limit = 1 degC, Low limit = 0 degC)

Battery Service Reminder = Not enabled (Monitor battery health using SOC Gauge or optional Bluetooth telemetry)

Float Cancel = Not enabled

Max Regulation Limit = Not enabled

Battery Current Limit = Optional (Reference battery spec sheet)

Delay Before Load LVD .... 1 min (Possibly longer for cold temperatures)

Load Current Compensation .... Default = 0.001 Ω (V/A), should be calculated based on 0.35/C (Reduces Load LVD based on size of load with respect to battery Ah capacity)

Load HVD/High Voltage Disconnect/Reconnect............. Enable/15.00 V/14.80 V (Can be used to protect loads from voltage spikes in the event of battery failure during charging operation)

Battery Charge LED Indications (Not intended for accurate SoC measurement):

> LED G –> G/Y 75%+ = 13.6 V (3.45 V/per cell)
>
> LED G/Y –> Y 50% - 74% = 13.4 V (3.325 V/per cell)
>
> LED Y –> Y/R 25% - 49% = 13.2 V (3.275 V/per cell)
>
> LED Y/R –> R 10% or below = 12.8 V (3.2 V/per cell)
>
> (*More information regarding these settings provided by Morningstar*)

These settings are available for the Morningstar controllers listed below:

12-24V systems:

ProStar MPPT (includes low temperature foldback to limit the max. charge current)

SunSaver MPPT

ProStar (PWM) Gen 3 (includes low temperature foldback to limit the max. charge current)

12-51V systems:

TriStar MPPT (compatible with 12V, 24V, 36V, 48V, 60V nominal systems)

TriStar MPPT 600V (compatible with 24V, 36V, 48V and 60V nominal systems) [*not compatible w/ 12V*]

TriStar [PWM] (compatible with 12V, 24V, 36V and 48V nominal systems)

Communications hardware required for programming Custom Settings with MSView:

TriStar, TriStar MPPT, TS-MPPT-600V
Includes an RS-232 port for connection to a PC.

EMC-1 Ethernet MeterBus Converter-
http://www.morningstarcorp.com/products/ethernet-meterbus-converter/

Tripp Lite U209-000-R USB / Serial DB-9 (RS-232) Adapter Cable (not available from Morningstar)

All TS-MPPT-60 (150V and 600V) models also include an Ethernet port and EIA-485 port.

MSView Software Download: http://www.morningstarcorp.com/msview/

MSView Configuration Files:
https://www.morningstarcorp.com/wp-content/uploads/2019/06/Lithionics-MSView-Configuration-Files.zip

Other links:

Morningstar Best Practices by Battery Chemistry

Morningstar Custom Settings Info Pages

IMPORTANT:

Lithionics Battery and Morningstar Corporation are separate companies with unaffiliated ownership.

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Some of the material being presented may be based on information that has been provided by other parties such as battery specs and operational parameters.

Performance may vary depending on use conditions and application.