NorthStar 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:

NorthStar AGM thin plate lead carbon technology delivers ultra fast recharge times and more than three times as many cycles as standard AGMs, thanks to its PSOC compatibility. This not only ensures a more reliable power supply, but also reduces the cost of operation.

The Blue+ battery has been designed for applications where there are frequent power interruptions. Several features of the Blue+ battery have been enhanced to meet the demands: cyclic endurance for moderate to shallow cycles, charge acceptance and the ability to remain at partial state of charge. The battery uses more lead per capacity than normal AGM batteries and it uses specially selected carbon additives to enhance charge acceptance and endurance in partial state of charge. It also uses a higher compression in order to keep the active mass in place for harsh servicing conditions.

Key Advantages:
- Exceptional PSoC cyclic performance 2050 cycles @50% DoD
- Design life 12+ years at 20°C (68°F)
- EUROBAT design life definition: Very Long Life (12+ years)
- Ultra fast recharge
- Shelf life of up to 24 months
- Lead carbon added to negative electrodes increases power and reduces sulfation
- High potential fuel savings when used with hybrid genset applications

- Operating temperature range -40°C to +65°C (-40°F to 149°F)
- State-of-the-art automated manufacturing ensures consistency and reliability
- Advanced 3 stage terminal design to ensure leak-free operation - brass terminals provide maximum performance High modulus Polyphenylene Oxide (PPO) plastic materials designed to withstand extended elevated operating temperatures and maintain high battery compression essential for reliable operation
  - Non-halogenated, thermally sealed plastic casing
  - Flame retardant (UL 94 VO) and LOI of at least 28%
- Integral handles and front access terminals ensure ease of installation and maintenance
- Approved as non-hazardous cargo for ground, sea, and air transport - DOT 49CFR173.159(d), (i) and (ii)

Models: NSB 40FT BLUE+, NSB 100FT BLUE+, NSB 170FT BLUE+, NSB 190FT BLUE+, NSB 210FT BLUE+

Voltages: 12V, 24V, 48V

Amp Hour Capacities: 40-210Ah

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:

Critical Settings:

Absorption Voltage = 14.10 V

Absorption Time = 5 hrs

Absorption Ext = Not enabled

Temperature Compensation = -0.012 V/degC

Float/Float Voltage/Timeout = Enable/13.62 V/1 hr

Float Cancel/Voltage = Enable/12.00 V

Equalize/Voltage/Time/Auto Interval/Timeout = Enable/14.46 V/4 hrs/28 days (Not applicable - Set DIP Switch to 'Manual' for override and coincide with suggested maintenance interval)/6 hrs

Battery HVD = Not enabled

Load LVD (Low Voltage Disconnect) …………………………………….. 11.50 V

Load LVR (Low Voltage Reconnect) ……………………………………… 12.60 V

Optional Recommended Settings:

Low Battery Temperature Foldback = Not enabled

Battery Service Reminder = 180 days (Monitor battery health using SOC Gauge)

Max Regulation Limit/Voltage = Enable/15.00 V

Battery Current Limit = Not enabled

Delay Before Load LVD .... 5 min (Useful especially for cold temperatures)

Load Current Compensation .... Default = 0.020 Ω (V/A)
-        Reduces Load LVD based on size of load with respect to battery Ah capacity

Load HVD/High Voltage Disconnect/Reconnect............ Enable/15.10 V/14.00 V (Can be used to protect loads from voltage spikes due to external charging sources)

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

> LED G –> G/Y 75%+ = 13.60 V (2.27 V/per cell)
>
> LED G/Y –> Y 50% - 74% = 13.05 V (2.175 V/per cell)
>
> LED Y –> Y/R 25% - 49% = 12.20 V (2.03 V/per cell)
>
> LED Y/R –> R 10% or below = 11.10 V (1.85 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)

12-48V 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/2019/09/NorthStar-MSView-Configuration-Files.zip

Other links:

Morningstar Best Practices by Battery Chemistry

Morningstar Custom Settings Info Pages

IMPORTANT:

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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.