UPG Universal 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:
UPG's Universal Battery® LiFePO4 (LFP) batteries are the future in battery technology. Engineered for exceptional power, yet ultra-light weight, and more powerful than traditional sealed lead-acid batteries, Universal Battery® LFP batteries deliver the best in quality and performance.

Universal Battery® LFP compared to traditional sealed lead-acid batteries:
Performance
- Cycle life over 2000 cycles – 10x greater cycle life
- Charges 3x faster
- Ultra-lightweight – 1/3 of the weight
- 2.5x longer shelf life
- Performs at close to 100 percent of the battery capacity even at higher currents

Safety
- Smart Battery Management System protection
- Built-in low voltage protection to prevent damage to the battery
- Built-in high current protection to prevent overloading and damage to the battery
- Low and high temperature cutoffs to prevent damage to the battery
- Eco-friendly – No harmful pollutants, corrosive acids or toxic heavy metals

Models: UPG Universal Battery® LFP1260, LFP12120, LFP12180, and LFP121030
Battery Voltage: 12 Volt; Amp Hour Capacity: 6Ah, 12Ah, 18Ah, and 103Ah

Note: At the time of this publication single 12V battery system configurations are supported with this model. For information regarding battery bank configuration options, please contact the battery manufacturer.

LFP1260, 12V 6Ah; we recommend the SunKeeper SK-6 or ProStar MPPT PS-MPPT-25 (custom programmed)
No Temperature Compensation and maximum charge current 6 amps.

LGP12120, 12v 12Ah; we recommend the SunKeeper SK-6/SK-12 or ProStar MPPT PS-MPPT-25 (custom programmed)
No Temperature Compensation and maximum charge current 12 amps.

LFP12180, 12v 18Ah; we recommend the SunKeeper SK-6/SK-12, SunSaver MPPT SS-MPPT-15 (custom programmed), ProStar PS-15 (custom programmed) or ProStar MPPT PS-MPPT-25 (custom programmed)
No Temperature Compensation and PS-MPPT-25 maximum charge current 15 amps.

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

SunKeeper Charge Settings (non-programable):

Absorption Voltage = 14.1 V

Absorption Time = 120 minutes

Float Voltage = 13.7 V

Temperature Compensation: Disabled (Cut blue Temperature Compensation Wire Loop)

Please note that SunKeeper controllers do not include Low Voltage Disconnect (LVD).

ProStar, ProStar MPPT and SunSaver MPPT Charge Settings (based on 12V nominal values):

Models:

PS-MPPT-25 - LFP1260, LGP12120 and LGP12180

PS-15 and PS-15 - LGP12180 only

Absorption Voltage = 14.1 V

Absorption Time = 20 minutes

Absorption Ext = Not enabled

Temperature Compensation = 0.0 V/deg C (Disabled)

Low Battery Temperature Foldback = Optional (High limit = 2 deg C, Low limit = 0 deg C) with ProStar and ProStar MPPT only

Battery Service Reminder = Not enabled

Float/Float Voltage/Timeout = Enable/ 13.5 V / 30 minutes

Float Cancel = Not enabled

Equalize = Not enabled

Battery HVD/High Voltage Disconnect/Reconnect = Enable/ 14.7 V/ 14 V Max

Regulation Limit = Not enabled

Battery Current Limit = Amp Hour Battery Rating (< Max allowable charge current) for PS-MPPT only

Load Settings (where applicable for controller models which include LVD settings): Low Voltage Disconnect (LVD) = 12.5 V

Low Voltage Reconnect (LVR) = 13 V Delay

Before LVD = 1 minute

Load Current Compensation .005 Ω (V/A) (reduces LVD Voltage based on size of load: 0.005 suggested)

HVD/High Voltage Disconnect/Reconnect: Enable/ 15 V/ 14 V (Load HVD)

Note:
Many lithium batteries include a BMS that can implement an internal battery disconnect in the event of a deep discharge or high voltages in order to prevent permanent damage to the battery chemistry. It is important that proper low voltage load disconnect settings and charge settings are used to prevent this from occurring during discharging and 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. Adjustments to these controller settings (raising the LVD setting, lowering the Absorption/Float voltages or shortening the Absorption time settings) or changing system parameters should be considered.

For more information regarding settings adjustments please contact Morningstar at support@morningstarcorp.com.

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

LED G –> G/Y 75%+ = 13.3 V

LED G/Y –> Y 50% - 74% = 13.1 V LED

Y –> Y/R 25% - 49% = 12.9 V

LED Y/R –> R 10% or below = 12.7 V

(*More information regarding these settings provided by Morningstar*)

<u>These custom settings are available for the Morningstar controllers listed below:</u>

SunSaver MPPT

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

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

Communications hardware required for programming Custom Settings with MSView:

SunSaver MPPT, ProStar MPPT, ProStar (Gen 3)

UMC-1 USB MeterBus Adapter- **********.morningstarcorp.com/products/usb-meterbus-adapter/

MSC PC RS-232 MeterBus Adapter- **********.morningstarcorp.com/products/pc-meterbus-adapter/

EMC-1 Ethernet MeterBus Converter- **********.morningstarcorp.com/products/ethernet-meterbus-

converter/

MSView Software Download: **********.morningstarcorp.com/msview/

MSView Configuration Files: Link to be added for the config files

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.