

Closed-Loop BMS Communication Integration Guide: Deka duration & 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) allows 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.

BMS Communication Integration with Morningstar ReadyBMS:

The Morningstar [ReadyBMS](#) (RB-BMS) builds "lithium DNA" into any system equipped with a Morningstar Integrated Series host device equipped with ReadyRail/ReadyBlock expansion technology. It delivers true closed-loop control and communications with select lithium battery brands in Morningstar's Energy Storage Partner program, delivering total peace of mind with charger and battery working together in a system.



This document provides essential instructions and recommendations for implementing closed-loop control and communications with Deka duration lithium batteries using the ReadyBMS accessory with Morningstar [GenStar MPPT](#) controllers (GS-MPPT-60M-200V, GS-MPPT-80M-200V or GS-MPPT-100M-200V) as the host device. The same setup procedure will apply to future host devices that are compatible with the ReadyBMS.

The closed loop communication and integration was developed and tested in tandem between Deka and Morningstar to provide safe, effective charging of the batteries with the following capabilities:

- Improved charging control during absorption for high SoC with less stress on the battery
- Increased battery capacity
- maintains better health of the battery
- Battery data monitoring including State of Charge (SoC) and State of Health

Manufacturer and Battery Overview:

Deka Duration is engineered by an Italian manufacturer of lithium batteries for solar applications, based in Florence Italy. With an annual capacity of over 300,000 batteries / year. Deka Duration by MK Battery collaborates with the best manufacturers of solar inverters and chargers.

The new DD5300 batteries series can be monitored via WiFi app and/or can be set via the Bluetooth APP.

Deka Duration offers a warranty of 120 months / 7000 cycles.

Deka duration Energy Storage Webpage: <https://www.mkbattery.com/products/energy-storage>

Model: DD5300

Nominal Voltage: 52 Vdc

Voltage Range (BMS Limits): 48.5Vdc - 58.4Vdc

Watt Hour Capacity: 5.3 kWh

Amp Hour Capacity: 105 Ah

Charge Current Standard/ Maximum : 100Adc/ 110 Adc

Warranty Terms Charge / Discharge Current: 50Adc @ 77°F (25°C) 80% DoD

Storage

Battery Module shall be stored in original packaging, in a clean, level, dry, cool location indoors.

Recommended storage temperature is 77°F (25°C), but different storage ranges are acceptable:

- Range of 14°F to +32°F (-10°C to +0°C) : inspection* and recharge** every three months required
- Range of 32°F to +86°F (+0°C to +30°C) : inspection* and recharge** every six months required
- Range of 86°F to +113°F (+30°C to +45°C) : inspection* and recharge** every three months required

Max SoC for sea shipping is 30%

*Inspection parameters – identify the State of Charge (SOC), look for alarms and address accordingly, look for physical damage to the Battery Module.

**Charge at 0.1C up to 50% SOC and then discharge to the limit of SOC allowed by the local regulations, Suggested SOC 30%~50% when stored on land.

Suggested SOC 30%~50% when stored on land. If shipped by sea, you must refer to the UN38.3 standard; if by road, refer to the local codes.

Low Temperature

A battery that will deliver 100% of rated capacity at 77°F (25°C) will only deliver approximately 75% of rated capacity at +50°F (+10°C).

For safety reasons the battery shall not be recharged below 0°C as normal operation, however it is possible to resuscitate the battery from a Low Voltage status or even a low temperature if the battery cannot be easily moved.

Up to temperatures below 19.4°F (-7°C) the BMS will only allow 0.05C of charge current only for emergency circumstances and only for a limited time each charging session; at temperatures below 14°F (-10°C) charging is prohibited by the BMS.

The battery is capable of 1C operations for a limited time and within certain temperature levels. As part of the 120 months performance Warranty, Charge and Discharge shall be in the range 20-25°C, < 0.5C

Any usage outside this range is not covered by Performance Warranty

ReadyBMS Setup Instructions:

The ReadyBMS is one of Morningstar's "ReadyRail Integrated Series" of accessory products. The ReadyBMS provides a communications interface over CANbus for implementing closed-loop charging control between the GenStar MPPT controller (and other future Morningstar host device products) and Deka duration batteries.

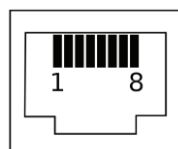
Please refer to the GenStar MPPT and BMSBlock Installation operation manuals for complete instructions.

An 8-conductor straight-through RJ-45 Ethernet cable is provided with the BMSBlock. The Ethernet cable will need to be modified to match the CAN Bus pins for the Deka CAN Bus terminals and the Morningstar CAN Bus terminals as indicated below.

RJ-45 Cable Pinout

ReadyBMS RJ-45 Pinout	CAN Terminal	Deka duration RJ-45 Pinout
Pin 4	CAN H	Pin 1
Pin 5	CAN L	Pin 2
Pin 2	GND	Pin 3

CAN Port Pinout



Cut the Ethernet cable at one end. Then use a crimping tool, crimp an RJ-45 Plug with the Deka duration Plug Pinout shown below. This side of the cable will connect to the Deka duration CAN port.

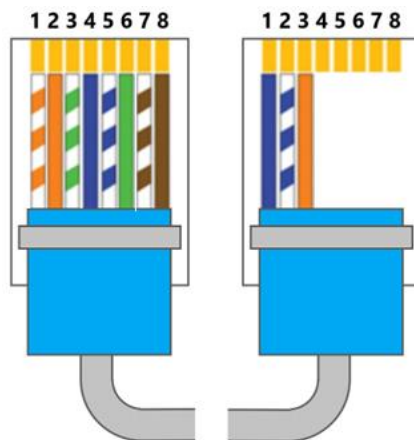
ReadyBMS RJ-45 Plug Pinout

Pin 4 - CAN H - Blue

Pin 5 - CAN L - Blue/ White

Pin 2 - GND - Orange

(Standard Ethernet Pinout)



Deka duration RJ-45 Plug Pinout

Pin 1 - CAN H - Blue

Pin 2 - CAN L - Blue/ White

Pin 3 - GND - Orange

Attach the end of the modified RJ-45 Ethernet cable that has the Deka duration Pinout to one of the RJ-45 CAN ports on Deka duration battery and the other end of the Cable to one of the RJ-45 CAN ports on the BMSBlock. When installing multiple Deka duration batteries in parallel, connect the RJ-45 cable to the Master battery. See the Deka duration Installation manual for instructions regarding BMS CAN controller installation.

If the ReadyBMS Block is used with the only Morningstar device in the system, or it is at the end of a CANBus Network, the ReadyBMS CANBus-RJ-45 port not connected to the BMS-battery will require installation of a terminator plug (120 Ohm terminator resistor installed across the CANL and CANH wires - Provided with the ReadyBMS)

Commissioning:

After the BMSBlock has been installed with the RJ-45 cable connected between the BMSBlock and Deka duration battery, the system can be powered up and commissioned for Closed Loop operation via the local meter of the host device. See the Commissioning / Initial Configuration in the host device manual for commissioning instructions (section 3.5 for the GenStar MPPT controller). If the host device has previously been commissioned it is necessary to perform a “Factory Reset” to recommission the device for closed-loop operation with the Deka duration battery.

Host Device Local Meter Display Commissioning Steps (after first power up or factory reset)

- Select Language
- Enable/ Disable Ethernet Writes (allows control commands and custom programming over Ethernet)
- Select System Voltage
- Set the UTC Time (Universal Time)
- Set the Local Time Offset for the time zone
- Select YES for BMS Block
- Select Deka for BMS Type
- Battery Load (LVD) Profile:
Use custom settings with LVD/ LVR = 50.6V/ 52.4V or Preset LVD/ LVR = 50.8V/ 53.0V
- Reboot controller after commissioning

Load Control Settings:

After selecting the battery type, the last settings to be made during commissioning are the Low Voltage Disconnect (LVD) and Low Voltage Reconnect (LVR) load control settings. Morningstar offers three different LVD/LVR Load Profile presets for 48V (16-cell) lithium batteries.

6 - LiFePO4 - Low = 50V/ 52.6V

7 - LiFePO4 - Medium = 50.8V/ 53V

8 - LiFePO4 - High = 51.4V/ 53.2V

After commissioning, the LVD/LVR settings can be custom programmed in LiveView or with the built-in display. Due to the possibility of self-discharge overnight, systems with a higher self-consumption should be configured with higher LVD/LVR settings. This may include systems that include inverters or other types of higher self-consumption equipment that remains connected when the battery voltage gets low.

In addition to LVD settings, The GenStar MPPT controller can be custom-programmed with Low State of Charge disconnect/ reconnect settings (LSOCD/ LSOCR). To maintain the state of health (SoH) and extend the useful life of the battery, Deka recommends setting the LSOCD to 20% or higher.

Charger Settings:

Once the host device has been commissioned there are no charge settings that can be implemented. However, the following settings that can be found in the Charger Setup screens can be used.

- Battery Size Ah capacity (LiveView or Display)
- SoC LED Transitions (LiveView)
- Battery Current Limit (LiveView or Display)

Both Voltages and SoC values can be entered for the SoC LED Transition values. With the ReadyBMS Block installed and configured, battery SoC indications will be based on an actual battery SoC percentage from the BMS. Since the SoC LED transitions are based on SoC the voltage values can be ignored.

Recommended SoC LED Transition Settings:

Green/ Yellow when below 75-80%

Yellow when below 50-60%

Yellow/ Red when below 25-40%

Open Loop Configuration Information:

It is recommended to configure the Morningstar/ Deka duration system with closed loop operation. However, if for some reason the BMS communication is not working it is possible to use open loop settings. To switch over from Closed loop to Open Loop custom settings it is necessary to perform a “Factory Reset” to recommission the device (from the meter interface with the GenStar MPPT controller). Please see the [Morningstar Deka duration Compatibility Technote](#) for details regarding charge settings for further details on custom settings.

Operation:

The closed loop operation of the Genstar (and other future Morningstar host equipment) is implemented in real time with control signals sent to the controller from the Deka duration BMS. This will include control of the following charging parameters.

- Target regulation voltage
- Maximum charge/ load currents
- Disable charging/ load

The closed-loop operation has been fully tested with the GenStar MPPT controller and meets all of the requirements specified by Deka. When used with the GenStar MPPT controller, the Genstar will charge to the requested voltage using up to the requested current. If the requested charge current is 0A, then the GenStar will not provide any current to the battery but can still power the GenStar load output with power from the PV array input to maintain 0A to the battery.

Morningstar ReadyShunt and ReadyRelay Integration:

For systems that include an external load or external charging source, independent from the GenStar MPPT controller, installing a [ReadyShunt](#) (RB-SHUNT) is recommended in order to maintain the requested current from the Deka duration BMS. Please refer to the ReadyShunt Installation operation manual for complete instructions.

When a ReadyShunt Block is installed with a Net Shunt for the battery circuit the GenStar MPPT controller can limit the charge current to the battery as requested by the BMS using the net shunt current. Otherwise, the requested charge current limit requested by the BMS will limit the net charge current from the GenStar only and not external loads or charging sources. There must be no load or charge circuits connected between the Net Shunt and the battery.

A [ReadyRelay](#) (RB-RELAY) Block can be used to control power to the connected load or to control external charging sources. Please refer to the ReadyRelay Installation operation manual for complete instructions.

For load control the ReadyRelay can be configured to turn a load relay OFF in the event of a low battery power condition. Once the reconnect threshold has been reached, the GenStar can reenale the load.

There are External Source Control (ESC) settings that can be used with the ReadyRelay to control external charging sources also. It is recommended to use a SoC threshold or voltage threshold Stop Charging settings to achieve the desired charging from the external source and prevent overcharging of the battery.

Disclaimer:

Deka and Morningstar Corporation are separate companies with unaffiliated ownership. Morningstar makes no representation or assumption of liability regarding the charging requirements for any type of battery or model. 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. Neither Deka nor Morningstar Corporation make any warranties explicit or implied with this product information.

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