



**Power. On Your Terms.**



# SimpliPhi PHI ExprESS

## OPERATORS MANUAL

Optimized Energy Storage & Management for Residential & Commercial Applications Utilizing  
Efficient, Safe, Non-Toxic, Energy Dense Lithium Ferrous Phosphate (LFP) Chemistry

# SimpliPhi Your Energy Security and Independence

**and gain control of your own power.**

SimpliPhi Power helps you manage your power as a personal resource. Anytime. Anywhere. SimpliPhi energy storage optimizes integration of any power generation source – solar, wind, generator – on or off grid and protects your home and mission-critical business functions from power outages and intermittency. SimpliPhi storage technology eliminates operating temperature constraints, toxic coolants and the risk of thermal runaway and fire. Safe lithium ferrous phosphate. No cobalt. No hazards.

SimpliPhi's battery technology utilizes the industry's most environmentally benign chemistry combined with proprietary architecture and power electronics (BMS) that eliminate the need for cooling or ventilation to create products that provide energy security and resiliency – all with a 98% efficiency rate.

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*SimpliPhi Power offers proprietary, commercially available energy storage and management systems that are safe, non-toxic, reliable, durable, efficient, highly scalable, and economical over the lifetime of the ExprESS.*

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# 1.0 – Important Safety Information

This manual contains important safety instructions that must be followed when installing and operating this product. Before installing or using this product, read all instructions and safety information in this manual.



## 1.1 – Product Safety Instructions

- All electrical work must be performed in accordance with local, state, and federal electrical codes.
- This product is designed for indoor or outdoor installation. The enclosure is rated for NEMA-3R use.
- Use insulated tools to reduce the chance of electrical shock or accidental short circuits.
- Remove all jewelry such as rings, watches, bracelets, etc., when installing or performing maintenance on the PHI Battery Modules or Inverter.
- Always disconnect the batteries or energy source prior to installing or performing maintenance on the Inverter. Live power may be present at more than one point since an Inverter utilizes both batteries and AC. Turning off the Inverter may not reduce this risk. As long as AC power is connected, it will pass through the Inverter regardless of the ON/OFF power switch setting.
- Always verify proper wiring prior to starting the inverter.
- Do not operate the inverter if it has been damaged.
- Do not dismantle the inverter; there are no user-serviceable parts contained in this product. Attempting to service the unit yourself could cause electrical shock. Internal capacitors remain charged after all power is disconnected.



## 1.2 – Battery Safety Instructions

- Wear eye protection (safety glasses) when working with batteries.
- Remove all jewelry such as rings, watches, bracelets, etc., when installing or performing maintenance on the PHI Battery Modules or Inverter.
- Never work alone. Always have someone near you when working around batteries.
- Use proper lifting techniques when working with batteries.
- All batteries used in and/or paired with the ExprESS must be of the same nameplate voltage and form factor. Batteries with slightly different total energy capacities may be used within one battery bank, provided all PHI Installation Manual instructions (see the Manual's Section 4.4 – Battery Bank Expansion) are adhered to.
- Batteries are sensitive to changes in temperature. Always install batteries in a stable environment.
- PHI Batteries do not vent any harmful gasses, and do not require special ventilation or cooling.
- Although not applicable to PHI Modules, best practices recommend that you avoid smoking in the vicinity of batteries.
- To prevent a spark at the battery and reduce the chance of explosion, always connect the cables to the batteries first. Then connect the cables to the Inverter.
- Use insulated tools at all times.
- Always verify proper polarity and voltage before connecting the batteries to the Inverter.

- To reduce the chance of fire or explosion, do not short-circuit the batteries.
- Save all manuals and instructions for easy reference.

## 1.3 – Limitations of Use

PHI Battery Modules are not intended for use in connection with life support systems or other medical equipment or devices.



## 1.4 – Explosive Gas Precautions

This equipment is not ignition-protected. To prevent fire or explosion, do not install this product in locations that require ignition-protected equipment. This includes any confined space containing vented batteries, or flammable chemicals such as natural gas (NG), liquid petroleum gas (LPG) or gasoline (Benzine/Petrol).

Do not install in a confined space with machinery powered by flammable chemicals, or storage tanks, fittings, or other connections between components of fuel or flammable chemical systems.

## 1.5 – Regulatory Specifications

PHI Battery Modules intended for grid-interactive use in the United States and Canada must comply with the established standards of UL 1741 and IEEE 1547 and 1547.1. These standards provide regulation for acceptable output voltage ranges, acceptable output frequency, total harmonic distortion (THD) and anti-islanding performance when the Inverter is exporting power to a utility source. PHI Battery Modules are tested using the procedures listed in IEEE 1547.1 to the standards listed in both UL 1741 and IEEE 1547.

## 2.0 – Product Description

### 2.1 – Overview

The PHI ExprESS is a portable battery-powered generator that can operate as an uninterruptible power supply (UPS) or as a stand-alone AC power supply. Available in two models, the ExprESS uses state-of-the-art Lithium Ferrous Phosphate battery energy storage technology that is safe, environmentally responsible, and designed to offer years of service. The PHI Battery Modules power a Magnum Inverter / Charger that delivers 60Hz pure sine AC power. The ExprESS 5.8 is rated at 2,000 Watts and 120 Volts. The ExprESS 7.6 is rated at 4,400 and 120/240 Volts.

The PHI ExprESS features standard AC outlets with ground fault circuit interrupter (GFCI) protection. The outlets feature two USB 2-Amp outlets for charging portable devices. The PHI Battery Modules are charged using standard 120V 60Hz grid power via the Magnum Inverter/Charger. Simply connect the supplied extension cord from a wall outlet to the AC inlet on the ExprESS.

The PHI Battery Modules can also be charged using a PV array or other source of renewable energy compatible with the supplied charge controller (see Express 24V and ExprESS 48V specifications, including charge controllers, in Section 2.2 of this guide). Connection is performed using the supplied Neutrik Speakon panel mount connector and the supplied PV cable adaptor. All ExprESS components are protected by circuit breakers and disconnects.

The PHI ExprESS is designed and assembled in the United States.

## 2.2 – Specifications

Please review the table below for ExprESS unit specifications, including physical dimensions, Warranty period, and technical data.

Specifications	ExprESS™ 24V	ExprESS™ 48V
<b>General</b>		
Dimensions (W x H x D)	36 x 36 x 17 in. (w/feet) (92 x 92 x 43 cm)	36 x 36 x 17 in. (w/feet) (92 x 92 x 43 cm)
Weight	366 lbs. (166 kg) (incl. batteries)	411.5 lbs. (187 kg) (incl. batteries)
Enclosure Rating	NEMA 3R Outdoor rated	NEMA 3R Outdoor rated
Operating Temperature	-4 to 122 °F (-20 to 50 °C)	-4 to 122 °F (-20 to 50 °C)
Mounting	Free-standing or pad mounted	Free-standing or pad mounted
<b>Inverter</b>		
Magnum Energy	MS2024	MS4448 PAE
Application	On / Off Grid	On / Off Grid
AC Connections	(4) 115V GFCI sockets for powering devices rated up to 15 Amps	(4) 115V GFCI sockets for powering devices rated up to 15 Amps
AC Output	16 A, 120V AC, 60 Hz	18A x 2, 240VAC; 60 Hz
Rated Power	2 kW	4.4 kW (3.8 kW max load rate)
CEC Weighted Efficiency	94%	94%
<b>Battery</b>		
SimpliPhi Power	PHI 2.9 kWh 24VDC (x2)	PHI 3.8 kWh 48VDC (x2)
Rated kWh Capacity @ C/2	5.8 kWh	7.6 kWh
Depth of Discharge	up to 100%	up to 100%
Round Trip Efficiency	98%	98%
Cycle Life	10,000+ (@ 80% DOD)	10,000+ (@ 80% DOD)
Amp-Hours	230 Ah	150 Ah
Nominal Voltage	25.6 VDC	51.2 VDC
Max Charge Voltage	28 VDC	56 VDC
Minimum Operating Voltage	24 VDC (correlated with 100% DOD)	48 VDC (correlated with 100% DOD)
Max Combined Charge & Discharge Rate	90 ADC / 2.3 kW DC (continuous)	75 ADC / 3.84 kW DC (continuous)
Warranty Period	10 years	10 years
<b>Solar (PV inlet)</b>		
Morningstar Charge Controller	TriStar-45 MPPT	PT-100 MPPT
Max Input Power	1.3 kW	4.1 kW
Max Charge Current	45 A DC	75 A DC (reduced from 100 A DC)
PV Array Operating Voltage	36 to 145 V DC	72 to 187 V DC
Max PV Array Open Circuit Voltage	150 V DC	240 V DC
<b>Other Features</b>		
System Interface	ME-ARC	ME-ARC

## 2.3 – ExprESS Models and Power Capacity

The PHI ExprESS is available in two models:

- ExprESS 5.8 offers 5800Wh of DC storage using two PHI 2.9/24V Lithium Ferrous Phosphate battery modules.
- ExprESS 7.6 offers 7600Wh of DC storage using two PHI 3.8/48V Lithium Ferrous Phosphate battery modules.

Both models use pure sine AC power inverters. Maximum AC power is limited to 2000 Watts for the ExprESS 5.8 and 4400 watts for the ExprESS 7.6. AC output current is limited to 15 Amps, which is sufficient to operate computers, appliances, AV equipment, power tools, fans, and electric blankets, and other similar electrical loads. The PHI ExprESS also features redundant protection against excessive load.

## 2.4 – Energy Consumption for Common Appliances

The PHI ExprESS is a mobile battery-powered generator that generates electrical power wherever and whenever you need it.

The power required to run equipment in everyday situations varies with the electrical device. Appliances such as microwaves, irons, toaster ovens, and hair dryers require high current at relatively low volumes over time. By contrast, appliances such as televisions, computers, fans, and refrigerators use lower current for extended periods, using generally higher volumes over time.

The following tables show examples of energy consumption by common high-current and low-current devices.

**Table 1. Energy Consumption by High-Current Devices**

High-Current Device	Watts	Time (Minutes)	Usage (WH)
Toaster Oven	1100	30	550
Microwave	1200	15	300
Electric Kettle	1200	7	140
Hotplate	1160	15	290

**Table 2. Energy Consumption by Low-Current Devices**

Low-Current Device	Watts	Time (Hours)	Usage (WH)
Computer	50	3	150
Television	65	2	130
Radio	10	3	30
Lamp	40	5	200
Fan	35	3	105



## 3.0 – Installation

### 3.1 – Unpacking and Inspection

When the PHI ExprESS arrives, inspect all cartons for signs of rough handling or damage. If the equipment itself shows evidence of damage, record the damage on the receiving document before signing for receipt of the equipment. Damage claims should be filed directly with the carrier.

After checking for signs of damage, perform the following steps to unpack the equipment:

1. Open all cartons.
2. Compare the items received to the packing list. If an item is missing or damaged, contact SimpliPhi Power.
3. Remove all packing materials, envelopes, and boxes from the cartons. Please keep all packing materials and cartons in case you need to transport or ship the unit.

The PHI ExprESS includes the following items:

- This Operator Manual
- Two PHI battery storage modules based on the ExprESS model:
  - ExprESS 5.8: two PHI 24V 2900Wh battery storage modules
  - ExprESS 7.6: two PHI 48V 3800Wh battery storage modules
- One AC power cable
- One solar-power connector

### 3.2 – Required Tools for Battery Installation

The following tools are required to install the PHI ExprESS Batteries:

- Torque wrench
- 11/16 deep socket
- Ratcheting socket wrench
- 3/8 socket
- Protective wear

### 3.3 – Selecting a Location

The PHI ExprESS is a welcome addition to any commercial or residential facility. It is designed for use anywhere you would plug a device into a wall outlet or extension cord. It is ideally suited for use as an office or kitchen UPS. It also provides useful power for contractors on remote job sites or for any off-grid work site.

The ExprESS is moisture-resistant. However, keep it away from excessive moisture, mist, rain or wetness. Keep the ExprESS isolated from flammable materials or vapors.

## 3.4 – Breakers and Protection Circuitry

The number of circuit breakers on the PHI ExprESS varies by model:

- ExprESS 5.8 has nine integrated circuit breakers
- ExprESS 7.6 has eight integrated circuit breakers.

A Battery Disconnect 80-Amp breaker protects against battery overcurrent and provides a simple disconnect if the ExprESS requires servicing or needs to be stored for an extended period of time. The breaker is located on the front panel of the ExprESS 5.8 module and on the top of the ExprESS 7.6 module.

The remaining three breakers are housed inside the panel below the Inverter/charger. These breakers act as protection for AC output, PV or solar-power input, and AC input for battery charging or AC pass-through in UPS mode. They protect against excessive load current and offer protection from short circuits.

All circuit breakers serve as a disconnect for troubleshooting and maintenance. They can also be used to disconnect the battery from the Inverter during extended periods of storage.

## 3.5 – Installing the ExprESS 5.8

1. Confirm that all circuit breakers on the ExprESS 5.8 (including batteries) are in the OFF position.
2. Starting with the bottom module, slide the module into position. Make sure it is centered between the retaining brackets, with the circuit breaker facing forward.
3. Slide the next module into the bracket above the first module.
4. Using the supplied slotted hex screws, align the crossbars, and then hand-tighten the screws at the bottom crossbar and the top crossbar.
5. Make certain that the screws turn freely, and then tighten all four screws securing top module into place. The bottom module is held into place by the top module bracket.
6. Starting with the positive (red) cables, push the red booties onto the wire with the connecting lugs exiting the large opening. Then repeat this step with the negative (black) cables.
7. Remove the stainless steel 11/16 in. nut and lock washer from the positive terminals.



Do not try to remove the brass jam nut at the base of the terminal.

8. Align the positive cable onto the positive terminal.
9. With the connector lug resting on the brass jam nut, install the lock washer followed by the 11/16in nut, and then hand tighten.
10. Using the torque wrench, tighten 11/16in nut to 160 in-lbs/13.3 ft-lbs/18.07 nm. Repeat this step with the next positive cable and two negative cables.
11. Secure the red and black boots over terminals, and then make sure the boots are seated properly on the terminal base.

This completes the installation procedure for the ExprESS 5.8.

## 3.6 – Installing the ExprESS 7.6

1. Confirm that all circuit breakers on the ExprESS 7.6 (including batteries) are in the OFF position.
2. Ensure that the black ABS plastic plate is centered between the bolts retaining the casters in the bottom left of the unit.
3. Slide the first module close to the left side of the ExprESS, with the terminals facing the right side.
4. Slide the next module next to the first, making sure the retaining bracket is flush with the bottom side of the module.
5. Starting with the positive (red) cables, push the red booties onto the wire with the connecting lugs exiting the large opening. Then repeat this step with the negative (black) cables.
6. Remove the stainless steel 11/16in nut and lock washer from the positive terminals.



Do not try to remove the brass jam nut at the base of the terminal.

7. Align the positive cable onto the positive terminal.
8. With the connector lug resting on the brass jam nut, install the lock washer then 11/16in nut, and then hand tighten.
9. Using the torque wrench, tighten 11/16in nut to 160 in-lbs/13.3 ft-lbs/18.07 nm. Repeat this step with the next positive cable and the two negative cables.
10. Secure the red and black boots over terminals, and then make sure the boots are seated properly on the terminal base.

This completes the installation procedure for the ExprESS 7.6.

## 4.0 – Operation

The following sections describe how to operate the PHI ExprESS. The following figure shows the front panel of the ExprESS.



### 4.1 – Initial Start Up

To start the ExprESS:

1. Move the circuit breaker on the PHI Battery module(s) to the ON position.
2. Move the Inverter DC Disconnect breaker to the ON position.
3. When first commissioning the system, fully charge the batteries prior to connecting any loads.

The wired remote flashes. After 5 to 10 seconds, the Inverter will be ready for service.

After the ExprESS starts, you can operate it in stand-alone/off-grid mode or in uninterrupted power supply (UPS) mode:

- Use stand-alone/off-grid mode when you want to power connected devices from the ExprESS' internal batteries or from solar power.
- Use UPS mode when you want to power attached devices from an AC power grid connected to the ExprESS.

### 4.2 – Stand-alone/Off-Grid Mode

Depending on the model, a fully charged PHI ExprESS provides 2000W or 4400W of AC power. A PV Inlet connector on the left side of the module has a maximum 30 Amp DC rating and is provided for remote/mobile solar charging. Hard wire the solar PV array to the unit in the case of stationary systems. In either case, properly size the PV array for the respective unit: Pair a maximum 1.3 kW of solar PV with the ExprESS 5.8 kWh (2 x PHI 2.9 batteries) unit or a maximum 4.1 kW of solar PV with the ExprESS 7.6 kWh (2 x PHI 3.8 batteries) unit. The paired PV array's MPPT voltage must exceed the connected battery bank's charging voltage. In the case of the ExprESS 5.8 kWh unit, a solar array with a maximum power voltage (VMP) rating greater than or equal to 36 VDC is recommended. A VMP rating greater than or equal to 72 VDC is recommended for the ExprESS 7.6 kWh unit.

1. Place the ExprESS at the location where you need AC power.
2. Move BOTH circuit breakers on the ExprESS to the ON position.
3. Move the AC OUT circuit breaker to the ON position.
4. Turn on the ExprESS Inverter using the Magnum Controller Module.
5. Plug electronic devices and equipment into one of the ExprESS' AC or USB DC power outlets.

Power is now available to run your AC or DC electrical devices and equipment.

## 4.3 – UPS Mode

1. Plug the female end of the supplied AC cord into the ExprESS power connector labeled **AC in**. Plug the other end into a standard 115VAC wall outlet.
2. Move the AC IN circuit breaker to the ON position.
3. Plug electrical devices and equipment into one of the ExprESS's AC or USB DC power outlets.
4. The inverter should start automatically. If it doesn't, press the inverter button on the controller module. The charge cycle may start, depending on the battery charge state.

AC power from the grid is now available from the ExprESS AC outlet. The AC grid charges the ExprESS automatically when the batteries need recharging. If the grid fails, the ExprESS' UPS functions will power your equipment.

## 4.4 – About the PHI ExprESS GFCI

The PHI ExprESS has GFCI-protected AC outlets, which limit the risk of electric shock from the AC output. GFCI outlets are standard in all modern wiring installations.

If the GFCI circuit is tripped, use the push reset to enable AC operation. The circuit can then function as long as the fault has been corrected.

## 4.5 – Power Down

When you finish using the PHI ExprESS, turn off the Inverter at the remote control panel, and then disconnect all equipment and loads.

- In remote power applications, move the PHI Battery Module circuit breakers to OFF.
- In UPS mode, leave the ExprESS connected to the AC grid to charge the module's batteries.

## 4.6 – Battery Disconnect

The PHI ExprESS has an 80-Amp breaker that you can use as a Battery Disconnect to isolate the batteries from the Inverter for maintenance or long periods of storage (see section 3.4).

If there is no grid back-up power to charge the batteries at various intervals, the Inverter can drain the batteries down slowly. To ensure power on demand, use the battery disconnect in between periods of use. This is especially important for off-grid and remote power applications.

## 4.7 – MR-ARC Wired Remote Settings

The wired remote control has Flash memory that saves the module's factory settings. In some instances, changing Inverter settings could harm the battery bank. If changes are made, we recommend that you return the PHI ExprESS to the factory default settings in Table 3.

**Table 3. PHI ExprESS Factory Default Settings**

General	10k Cycles (80% DOD)	5k Cycles (90% DOD)	3.5k Cycles (100% DOD)
MS4024 / MS4448 Inverter			
ME-ARC	Remote Control		
SETUP			
01 System Setup			
01D Max Charge Amps	CC/CV Controlled Displayed once “CC/CV” is selected in 03C Battery Type menu		
01E Link PT CHG Settings	NO		
02 Inverter Setup			
	25.3V / 50.6V for 80% DOD	25V / 50V for 90% DOD	100% DOD
02B Low Batt CutOut <sup>2</sup> - LBCO (VDC)	24.4V / 48.8V	24.4V / 48.8V	24V / 48V
02D AC In - VDC	Grid power connection is required for this setting		
Connect Volts	25.1V / 50.2V for 80% DOD	24.8V / 49.5V for 90% DOD	
Disconnect Volts <sup>4</sup>	27.2V / 54.4V		
02F Power Up Always	OFF		
03 Charger Setup			
03C Battery Type	CC/CV		
Max Charge Amps <sup>1</sup> (ADC)	90A for 2 x PHI 2.9 24V (45A per battery)		
	75A for 2 x PHI 3.8 48V (37.5A per battery)		
CV Charge Volts (VDC)	27.2V / 54.4V		
CV Chg Done Time	1 Hr (set to “Hold CV Chg VDC” when generator charging)		
CV Chg Done Amps (ADC)	4A / 2A		
Max CC/CV Time (Hrs)	OFF		
Recharge Volts (VDC)	25.3V / 50.6V		
03D Absorb Done Time	CC/CV Controlled		
03E Max Charge Rate (%)	100% for 2 x PHI 2.9 24V		
	100% for 2 x PHI 3.8 48V		
03F Max Charge Time	CC/CV Controlled		
03G Final Charge Stage	CC/CV Controlled		
Rebulk Volts (VDC)	25.3V / 50.6V		
03H EQ Reminder Days	OFF		

**Notes:** 1. Per PHI battery – These settings are calculated by multiplying the nominal per-battery value times the number of batteries.

2. The maximum programmable setting of 24.4V / 48.8V is below the recommended LBCO setting. To maintain the batteries at a maximum 80% or 90% DOD, utilize the **02D AC In – VDC** setting for grid backup.

- Levels are typical at 25°C and may need adjusting at temperature extremes.
- When performing rapid deep charge/discharge cycles, the battery should be allowed to "rest" 15 minutes in between.

## 5.0 – Maintenance and Troubleshooting

### 5.1 – Recommended Care and Maintenance

The PHI ExprESS is designed to deliver many years of reliable service in a wide variety of environments. The ExprESS is resistant to most environmental elements, but should be isolated from excessive water or moisture, extreme heat, solvents, flammable materials, and environmental hazards.

If the ExprESS becomes dirty or grimy, wipe it as you would any kitchen cabinet. Do not use a pressure washer or hose to clean the ExprESS.

## 5.2 – Troubleshooting Guide

In the unlikely event you encounter a problem with your PHI ExprESS, refer to the troubleshooting suggestions in Table 4 to identify and resolve the problem.

*Table 4. Troubleshooting Suggestions*

Symptom	Possible Cause	Solution
AC outlet stops providing power and a <i>Low Battery CutOff</i> message appears on the Remote Control.	The battery has reached a low charge state and must be recharged.	Recharge PHI Battery Modules using one of the following methods. <ul style="list-style-type: none"> <li>Connect the AC inlet to a qualified 120V AC source. Initiate Charge via the remote control. Allow the Battery Modules to charge.</li> <li>Connect PV/solar panels to the ExprESS, and then allow the Battery Modules to charge.</li> </ul>
AC outlet does not provide AC power.	Inverter has not been moved to the ON position.	Turn on the Inverter at the Remote Control.
	AC output breaker has tripped.	Disconnect the load, and then reset the main AC output breaker. Do not connect loads exceeding 15 Amps to the ExprESS AC outlets.
	AC breaker on the Magnum Inverter has tripped.	Reset the Magnum 15A AC output breaker located on the side of the inverter.
	GFCI Detector on the AC outlet has tripped.	Disconnect the AC device. Reset the GFCI using the push-button on the AC outlet.  If the GFCI trips repeatedly, your equipment might have a fault. Discontinue use of this equipment.
ExprESS does not power on.	Battery Disconnect Breaker is OFF or has tripped.	Disconnect all devices. Move the Battery Disconnect to the ON position, and then perform the ExprESS initial start-up procedure (see section 4.1).



## 6.0 –Warranty

For your reference, see the PHI ExprESS 10-Year Warranty.

Failure to adhere to installation protocol will void the Warranty.

## 7.0 – Resources

Hard copies of the Magnum MS2024 or MS4448 PAE Inverter / Charger Manual are supplied with your PHI ExprESS and should be stored in the drawer. You can download digital copies of this manual from:

<http://www.magnumenergy.com/Literature/Manuals/Inverters/64-0035%20Rev%20A%20%28MM-AE%20Series%29.pdf>

Hard copies of the Magnum ME-ARC (wired) Remote Control Manual are supplied with your PHI ExprESS and should be stored in the drawer. You can download digital copies of this manual from:

[https://www.magnum-dimensions.com/sites/default/files/MagDocs/64-0030-Rev-C-ME-ARC\\_CD\\_Web.pdf](https://www.magnum-dimensions.com/sites/default/files/MagDocs/64-0030-Rev-C-ME-ARC_CD_Web.pdf)

The MMP – Mini Magnum Panel manual can be found here: <https://www.magnum-dimensions.com/product-panel/mmp-series-mini-magnum-panel-0>

The Morningstar TriStar-45 Charge Controller manual can be found here:

[https://2n1s7w3qw84d2ysnx3ia2bct-wpengine.netdna-ssl.com/wp-content/uploads/2014/02/TS.IOM\\_Operators\\_Manual.04.EN\\_1.pdf](https://2n1s7w3qw84d2ysnx3ia2bct-wpengine.netdna-ssl.com/wp-content/uploads/2014/02/TS.IOM_Operators_Manual.04.EN_1.pdf)

The PT-100 Charge Controller manual can be found here: <https://www.magnum-dimensions.com/pt-100-mppt-charge-controller>