

# windynation



## 30A Flush Mount LCD PWM Solar Charge Controller

CHC-BTL-30FM

## User's Manual

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# 1 INTRODUCTION

The WindyNation 30BT Flush Mount Solar Charge Controller is the second-generation flush mount controller, with the addition of wireless control and monitoring via an app (download required) and a USB charging port. The controller provides an effective management solution for the solar charging of 12 and 24 volt battery systems.

The negative ground controller features an automatic 12V or 24V DC detect function\* that will identify the battery voltage upon initial battery connection and uses Pulse-Width Modulation (PWM) allowing for a highly efficient and battery-friendly charge control. \*NOTE: For Lithium batteries, the battery voltage charging parameters are manually set.

The enclosure is designed to be flush mounted into a cut-out of the wall of an RV or boat leaving the wires out of sight and providing an aesthetically appealing look. The front panel will remain accessible with visual LCD graphic symbols to provide status indications of charge, battery status, and system faults.

**Read this manual carefully before installing or using the controller and keep it for future reference.**

## 1.1 FEATURES

- ✓ Visual Backlit LCD display
- ✓ Intelligent 3-Stage PWM Charging (Boost, Float, and Equalization)
- ✓ User selectable battery type
- ✓ Accumulative function of charging
- ✓ Protection for battery bank discharging
- ✓ Battery reverse polarity protection
- ✓ Common Negative Ground
- ✓ Rear mounted screw terminals for clean wiring
- ✓ Plug & Play USB Type A Charging port
- ✓ Wireless control / monitoring via app
- ✓ Wide operating temperature range -35°C to +45°C (-31°F to +113°F)

## 1.2 SAFETY INFORMATION

Please read the installation and operating instructions carefully prior to use. Pay special attention to the **IMPORTANT** and **WARNING** statements in the manual.

### WARNING:

Solar panels produce power when exposed to light. Shade solar panels whenever solar panel wires are exposed.

Do not use with equipment that exceeds the rated power for this device.

## 1.3 SPECIFICATIONS

### 1.3.1 Electrical Specifications

Parameter	P30BT			
Rated Charge Current	30 Amps			
Typical Idle Consumption	At idle < 8mA			
Maximum Solar Input Voltage	55V DC			
Rated Working Voltage	12V DC or 24V DC (auto)			
Battery Types	FLD	SEL	GEL	LI
Boost Charging Voltage	14.6V / 29.2V	14.4V / 28.8V	14.2V / 28.4V	12.6V to 16.0V Adjustable
Equalization Charging Voltage	14.8V / 29.6V	14.4V / 28.8V	NA	NA
Float Charging Voltage	13.8V DC / 27.6V DC			NA
Boost Recovery Voltage	13.2V DC / 26.4V DC			NA
Low Voltage Protection	11.1V DC / 22.2V DC			8.0V to 16.0V Adjustable
Low Voltage Recovery	12.6V DC / 25.2V DC			

### 1.3.2 Physical Specifications

Parameter	Value
Dimension (H x W x D)	5.12" (130mm) x 6.69" (170mm) x 1.81" (46mm)
Unit Weight	15.9 oz. (0.45kg)
Operating Temperature	-31°F to +113°F (-35°C to 45°C)
Operating Altitude	≤3000 Meters
Wire Size	Up to 25mm <sup>2</sup> (6AWG)
Case Protection Rating	IP32

## 2 INSTALLATION

- Insure all terminating connections are clean and tight to prevent arcing and overheating.
- The controller must be installed in an area that satisfies all of the following conditions:
  1. Dry: Avoid any location where water can contact the controller
  2. Cool: Ambient air temperature between 30°F and 105°F (0°C and 40°C)
  3. Ventilated: Allow at least 4 in (10 cm) of clearance above and below and at least 1 in (25 mm) on each side for proper air flow.

### 2.1 ELECTROSTATIC (ESD) PRECAUTIONS

All electronic circuits may be damaged by static electricity. To minimize the likelihood of electrostatic damage, discharge yourself by touching an electrical ground (e.g.: copper pipe) prior to handling the unit and avoid touching components on the circuit boards. The risk of electrostatic damage is highest when relative humidity is below 40%.

### 2.2 MOUNTING

The P30BT is designed to be flush mounted in the required cut-out of a flat surface (e.g. wall), where the wire connections will be made from the back side of the controller and out of visible sight. If the back side of the controller is not accessible when mounted, it is important to make all the connections prior to securing the controller to the wall.

1. Select Mounting Location
  - Dry, well ventilated, and away from any heat sources.
  - Suitable to run the necessary wire connections
    - From solar panel(s)
    - To battery
    -
  - No more than 0.75" thick and able to be cut out
  - At least 3" clearance from the front of the surface for wire connections
2. Cut rectangular hole for controller using template locations in Section 6
3. Drill four pilot holes using the template from Section 6
  - The drill hole size will depend on the fastener being used

**IMPORTANT:** If the wires are not accessible from the rear of the mounting surface, you will need to make the connections in Section 2.3 prior to mounting the controller.

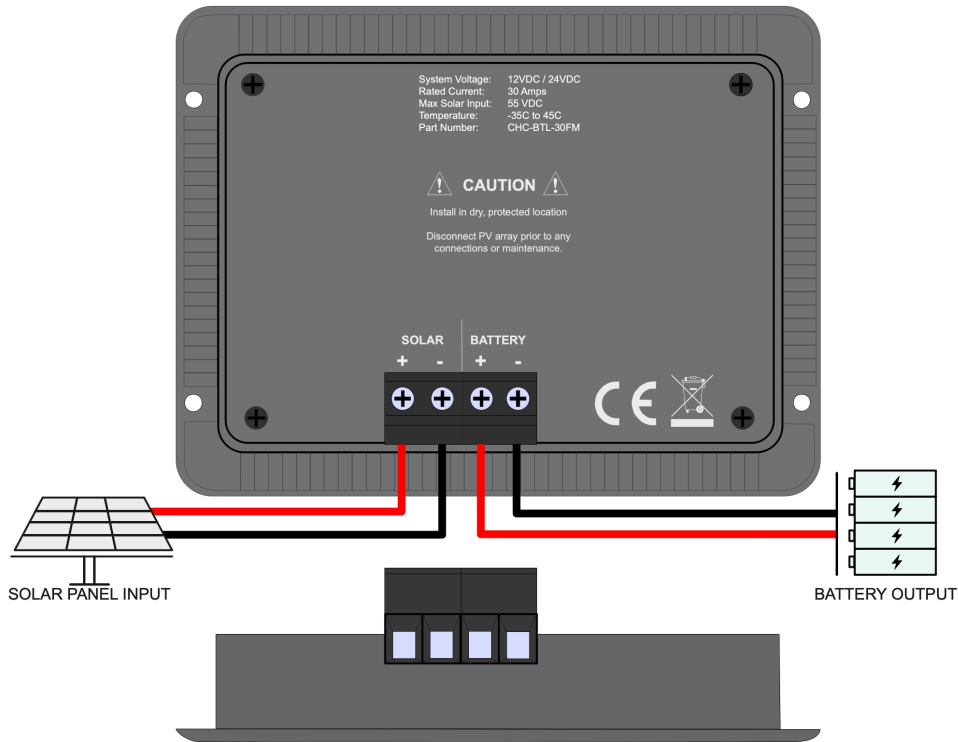
4. Place the controller into the cut-out made in step 2
5. Install four user-supplied fasteners through the four mounting holes in the controller and into the mounting surface.
6. Tighten all the fasteners to ensure the controller cannot slide in any direction.

**IMPORTANT:** For best results, mount the charge controller and batteries as close to the panels as practical.

### 2.3 CONNECTIONS

**WARNING:** Loose connectors result in excessive voltage drop and may over heat wires, which can cause the wire insulation to melt. This can cause electrical fires. Verify all connections are secure and have no voltage drop.

**IMPORTANT:** The NEC requires that the wires carrying the system current never exceed 80% of the conductor's current rating (sizing recommendations are located in Section 4).



**IMPORTANT:** The screw-down terminals on the charge controller accept 6~26AWG wire.

**IMPORTANT:** Strip the wire ends approximately 0.3" (7.6mm) before connecting to the charge controller. Use caution when handling the stripped wires to avoid electric shock.

**1) Connect the Battery Wires to the Charge Controller (First, connect the battery wires to the charge controller. Then connect the battery wires to the battery.)**

Connect the charge controller to the battery wires BEFORE connecting the solar panels to the charge controller. Insert the battery wiring into the BATTERY terminals on the back of the charge controller and tighten the terminals from the top of the terminal block using a screwdriver to ensure a good connection is made. Be sure to note the polarity of each terminal; the charge controller self-protection feature will prevent damage from reverse polarity connections, but the charge controller will not function until the battery is connected properly.

A 40-amp fuse is recommended in the positive wire connecting the charge controller to the battery; See Section 3.5 for a complete fusing diagram.

**2) Connect the Solar Panel (PV) Array (First, connect the solar panel wires to the charge controller. Then connect the solar panel wires to the solar panel(s).)**

Insert the solar panel wiring to the SOLAR terminals on the back of the charge controller and tighten the terminals from the top of the terminal block using a screwdriver to ensure a good connection is made. Be sure to note the polarity of each terminal; the charge controller self-protection feature will prevent damage from reverse polarity connections, but the charge controller will not function until the PV Array is connected properly.

A 30 amp MC4 in-line fuse is recommended in the positive wire connecting the charge controller to the solar panel(s); See Section 3.5 for a complete fusing diagram.

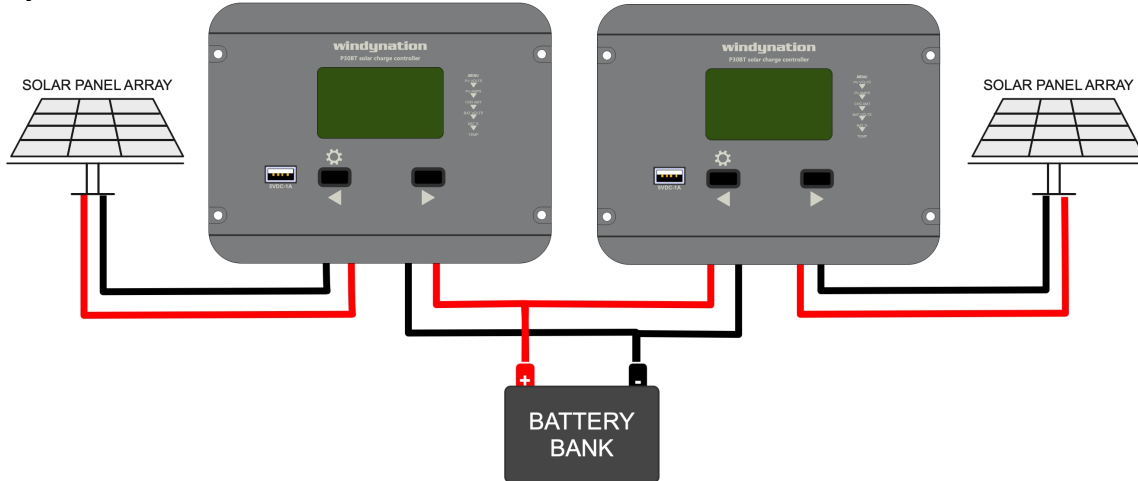
**WARNING:** High voltages may be present on the solar panel output wiring. Solar panels produce electricity when exposed to light. Make sure the solar panels are placed in the shade and are NOT in direct sunlight. Use caution and avoid touching any conductors in the system circuit to avoid electric shock.

**CAUTION:** High power electrical systems pose dangers, and it is the user's responsibility to be familiar with these dangers and take any necessary action to ensure safe use. Shorting a battery or connecting your controller to a battery can supply huge currents and have serious consequences including explosions, causing fire, damage to equipment, and personal injury including death.

**2.4 PARALLEL CONNECTIONS**

Multiple controllers can be installed in parallel on the same battery bank to achieve higher charging current. For example, connecting two units in parallel can allow for 60 amps of charging current, and connecting three units in parallel can allow for up to 90 amps of charging current.

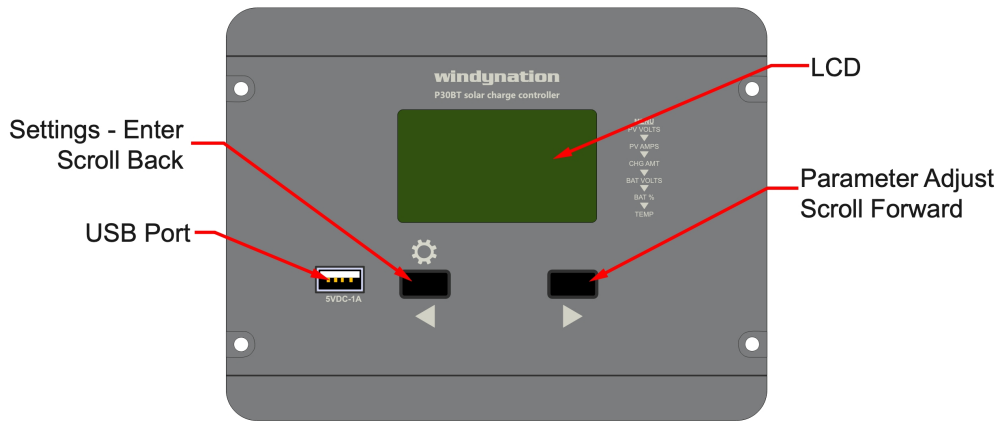
Additional parallel controllers can also be added in the future, however, each Controller must have its own PV array as shown below.



**3 OPERATION**

Once the controller is properly connected, the main display interface will appear in the LCD and the information pages will automatically cycle through, changing every five (5) seconds.

Press either of the buttons to manually move to any of the six (6) different interfaces available on the P30BT controller. The cycle pattern of the interfaces is presented in Section 3.3 as well as the definition of each interface.

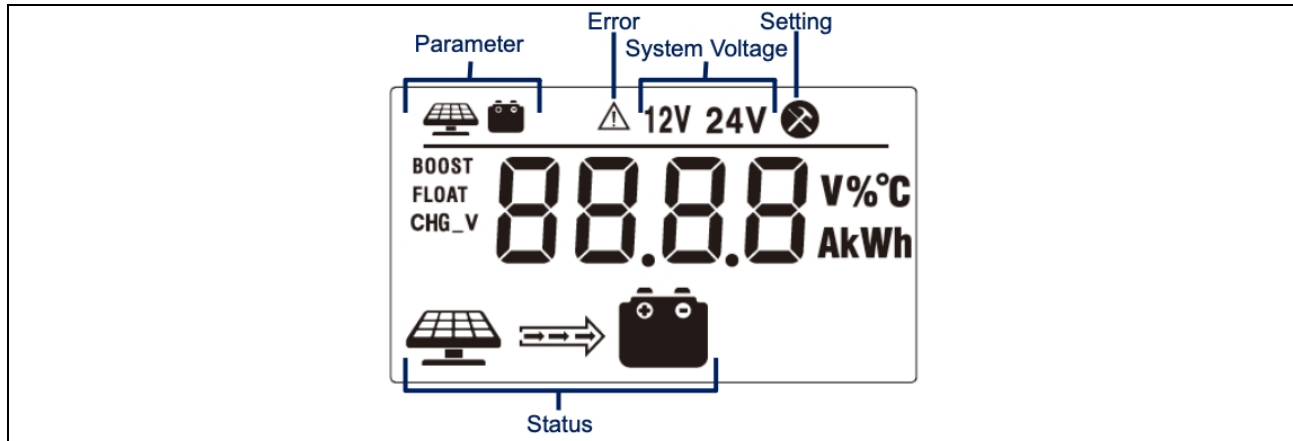


**3.1 BUTTON DEFINITIONS**

Button	Name	Description
	SETTINGS	Toggles the active LCD interface to previous page. Long Press (2s): Enter Battery Type Selection Menu.
	PARAMETER ADJUST	Toggles the active LCD interface to next page. When in Settings, used to adjust parameters.

**3.2 LCD DISPLAY**

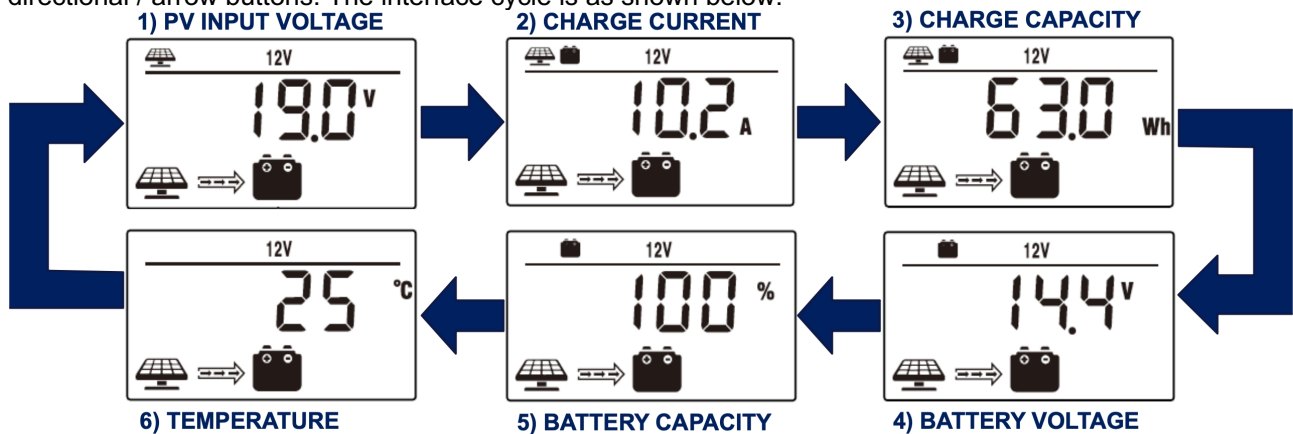
The controller features a back-lit LCD display to provide a continuous snapshot of the system.



Status Icon	Behavior	Description
	OFF	Solar Panel is not producing voltage
	Solid	Solar Panel is producing voltage and charging
	Blink	Solar Panel voltage is too high
	OFF	Battery is not active
	Solid	Battery is active
	Blink	Battery voltage is over discharge
	Solid	Charge is being sent to Battery
	Pulsing	Charge is being sent to Battery
<b>BOOST</b>	Solid	When visible, the controller will hold the voltage at the Boost set point, decreasing the current until the battery is fully charged.
<b>FLOAT</b>	Solid	When visible, voltage is reduced to controller set point and held constant. This mode can be used to maintain a fully charged battery indefinitely
<b>CHG_V</b>	Solid	Only visible from Lithium Battery settings, and is the charge voltage parameter

### 3.3 LCD MENU INTERFACE CYCLE – DEFINITIONS

The P30BT has six (6) different user menu interfaces to view the status of the controller. The interface will automatically cycle to the next interface every three (3) seconds or manually by pressing either of the directional / arrow buttons. The interface cycle is as shown below:



#### 3.3.1 PV Input Voltage

DC voltage currently being generated by the solar panels.

#### 3.3.2 Charge Current

Amperage currently being sent to the battery bank.

#### 3.3.3 Charge Capacity

Total charge sent to the battery bank in Watt-Hours (Wh)

**3.3.4 Battery Voltage**

DC voltage of the battery bank.

**3.3.5 Battery Capacity**

State of Charge (SOC) of battery shown as a percentage

**3.3.6 Temperature**

Temperature of controller

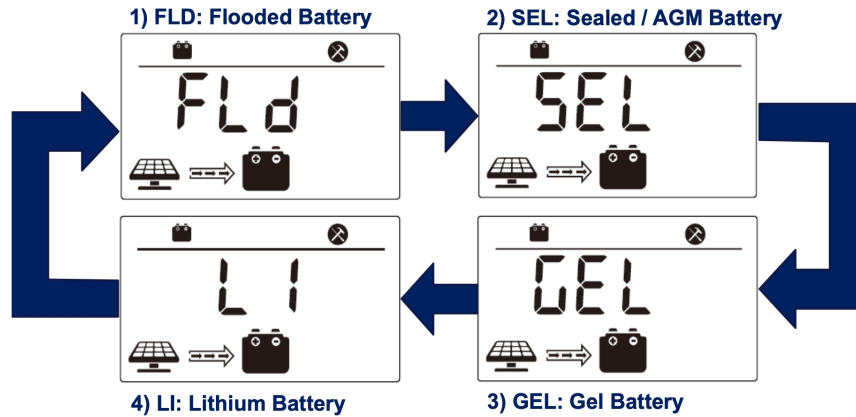
**3.4 SETTINGS INTERFACE**

The P30BT has only one (1) adjustable setting for the battery type and three (3) additional settings if the battery type is Lithium (LI).

The Settings Interface is accessible by long pressing the **SETTINGS** button for two seconds. Once the desired value is displayed, long press the **SETTINGS** button again for two seconds to store the settings.

**3.4.1 Battery Type Setting**

In this menu, you may select the battery type you are using as shown below:

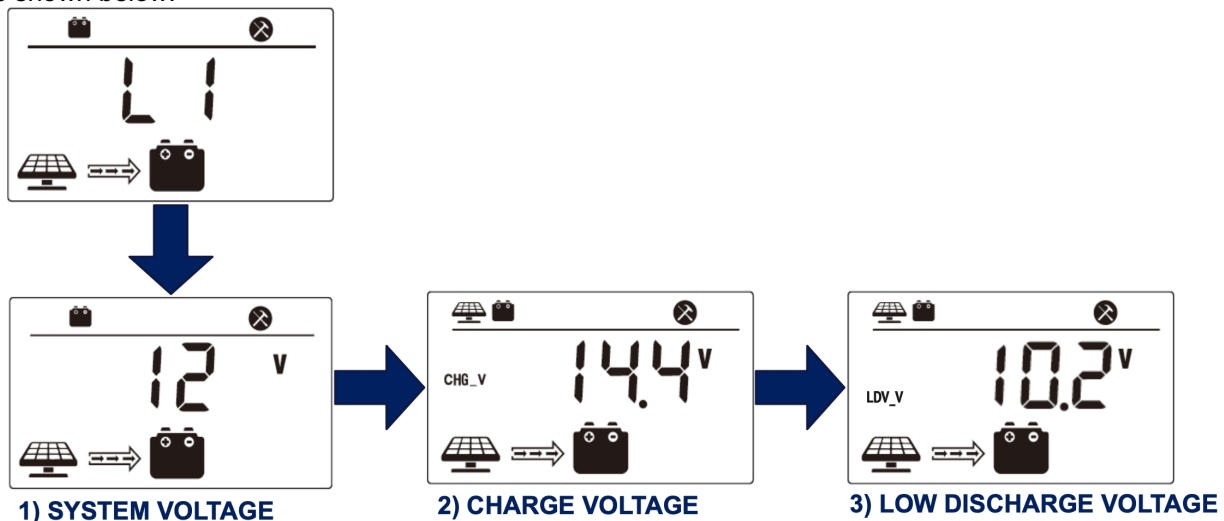


By pressing the **PARAMETER ADJUST** button from this interface, you can select the appropriate battery type for your system. If you are using a Lithium battery (LI), an additional Settings Interface will open as shown in Section 3.4.2. Default charge parameters are as follows:

Battery Type	Boost	Equalization	Float
FLD – Flooded	14.6V / 29.2V	14.8V / 29.6V	13.8V / 27.6V
SEL – Sealed / AGM	14.4V / 28.8V	14.6V / 29.2V	13.8V / 27.6V
GEL – Gel	14.2V / 28.4V	NA	13.8V / 27.6V
LI - Lithium	12.6V to 16.0V (Adjustable)		

**3.4.2 Lithium (LI) Battery Setting**

When Lithium batteries are used and selected from the Battery Type Menu, additional settings are displayed as shown below:





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**Revision 1.0**

By pressing the **PARAMETER ADJUST** button from this interface, you can set the appropriate values for each field as required by your battery supplier or the system specifications.

Parameter	Values	Guidance
System Voltage	12 V or 24 V	Select System Voltage
CHG_V: Charge Voltage	12.6V to 16.0V	Enter charge value from battery manufacturer
LDV_V: Low Discharge Voltage	8.0V to 16.0V	Enter lowest discharge value allowable

Once the desired value is displayed, long press the **SETTINGS** button for two seconds.

**IMPORTANT:** If a button is not pressed for 15 seconds, the current setting will be stored automatically.

**3.5 WIRELESS COMMUNICATION**

The P30BT features wireless Bluetooth connectivity that allows the user to monitor and configure the system from up to 50 feet away using a downloadable application on any smartphone or tablet with Bluetooth capabilities.

**3.5.1 Application Set-Up**

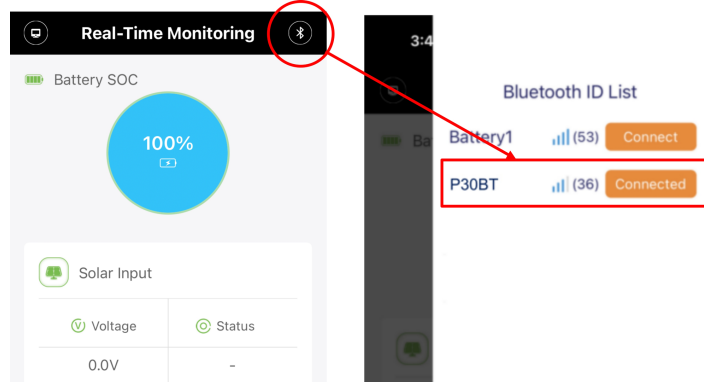
**IMPORTANT:** WindyNation did not develop the compatible application.

1. Download the free application from the App store directly to your smart device.
  - Android System: go to Google Play Store and search "ChargePro 2.0":
  - IOS System: Go to Apple app Store and search "ChargePro 2.0":



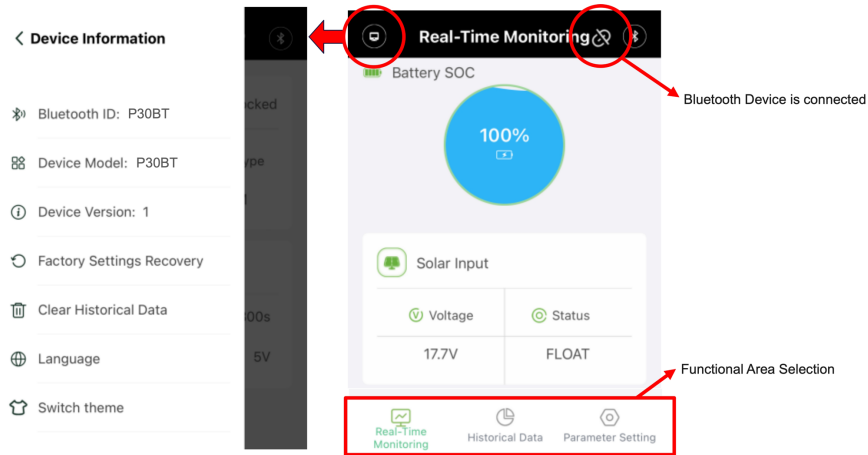
**ChargePro 2.0**

2. Be sure Bluetooth is enabled on your smartphone and open the application. The Main Screen "Real-Time Monitoring" will open.
  - a. Select the "Bluetooth" icon in the top right corner to open the Bluetooth ID List
  - b. Once the controller is found, it will appear as "P30BT", select the device and tap the "Connect" button
  - c. Upon successful connection, the device will appear as "Connected" and the Real-time monitoring values will update to reflect the status of the controller.



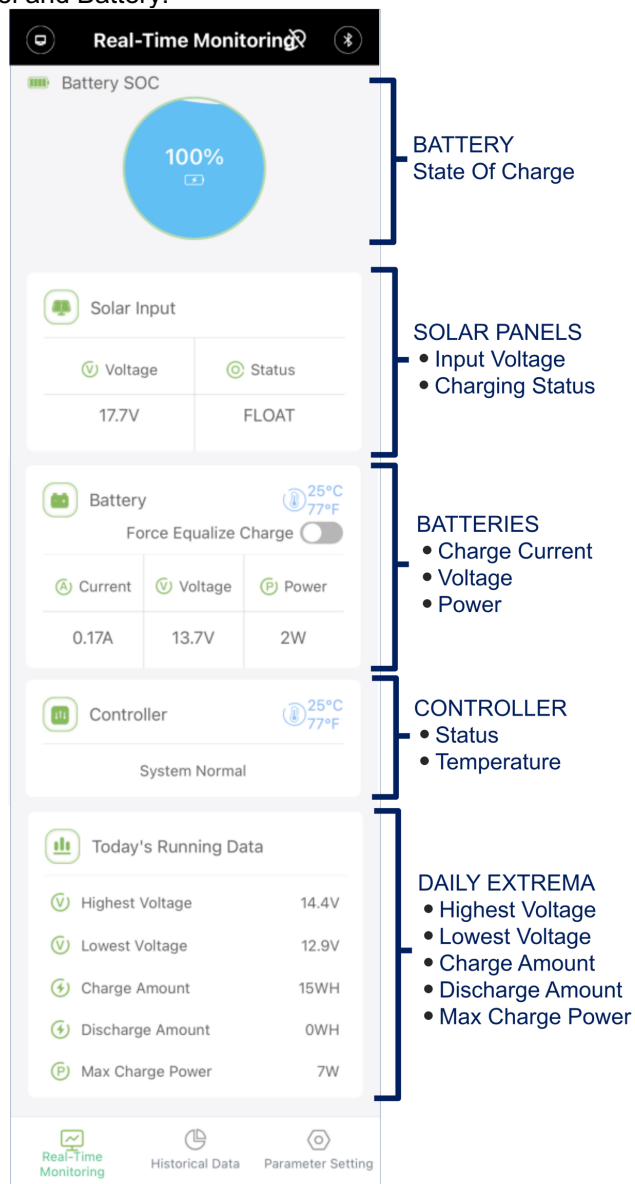
**3.5.2 Application Use**

The application features three (3) functional areas: Real-time Monitoring, Historical Data, and Parameter Setting. Device Information is available by selecting the device icon in the upper left corner. Each area is selectable by tapping the associated icon at the bottom of the application.



**3.5.2.1 Real-time Monitoring**

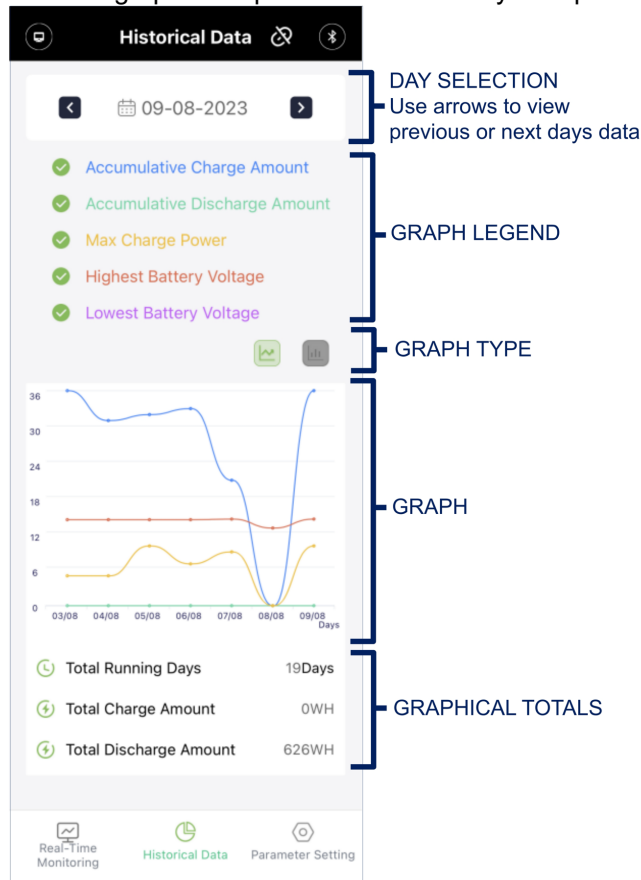
Select the “Real-Time Monitoring” icon from the bottom of the application screen to see real-time performance of the Solar Panel and Battery.



**3.5.2.2 Historical Data**

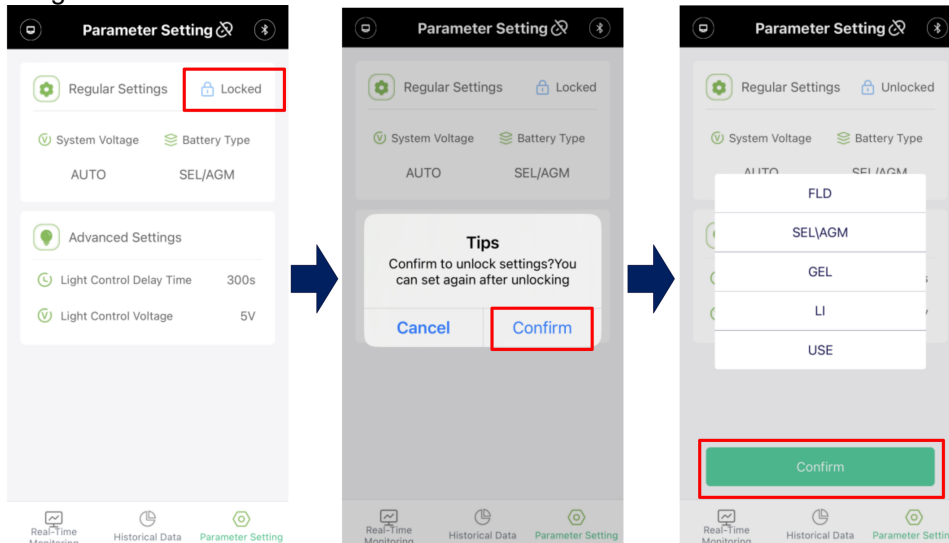
Select the “Historical Data” icon from the bottom of the application screen to see historical performance logged by the controller. You can view previous days records by selecting the arrows at the top of the screen.

The Historical Data will also show a graphical representation of the system performance over time.



**3.5.2.3 Parameter Setting**

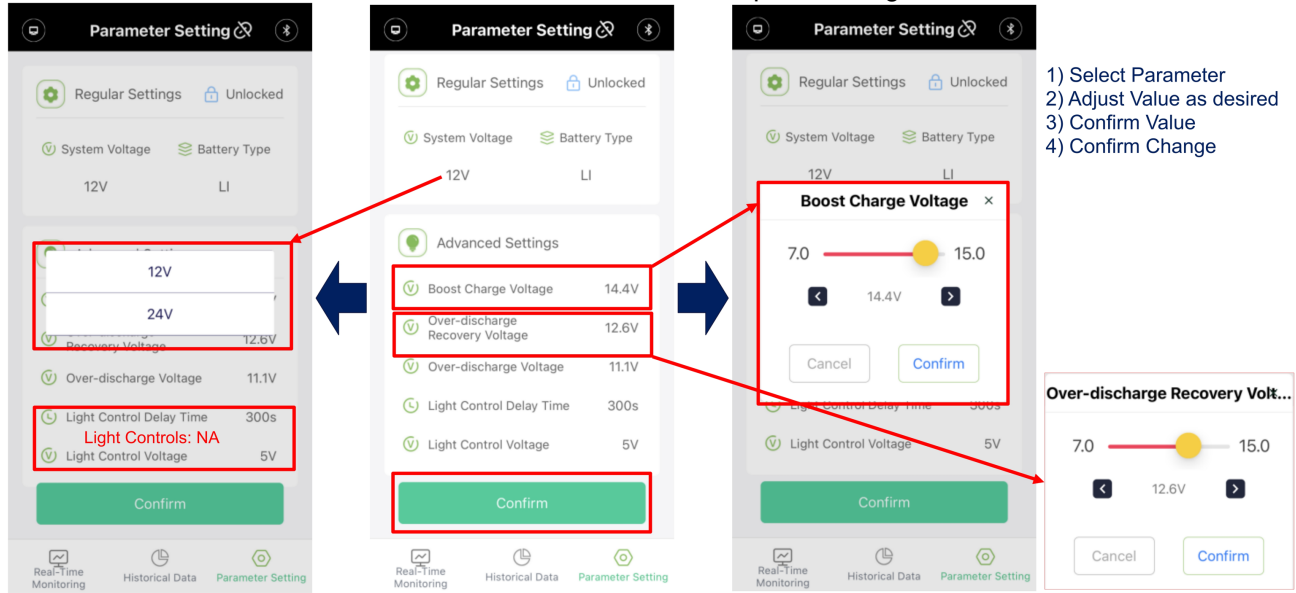
Select the “Parameter Setting” icon from the bottom of the application screen to view and edit the Battery Type set on the controller. Once in the Parameter Setting interface, click the “Locked” button and select “Confirm” which will bring up the list of battery types. Select the appropriate battery type from the list and select “Confirm” again as shown below:



**IMPORTANT:** The P30BT does NOT include Light Control. The Light Control parameters available under Advanced Settings, are Not Applicable for this controller.

When Battery Type **LI** or **USE** are selected, the charge parameters will appear under Advanced Settings and will be adjustable.

Each field is selectable by tapping the field on the app. To change the value, select the desired value, tap the first confirm button, and then the second confirm button to accept the changes as shown below:

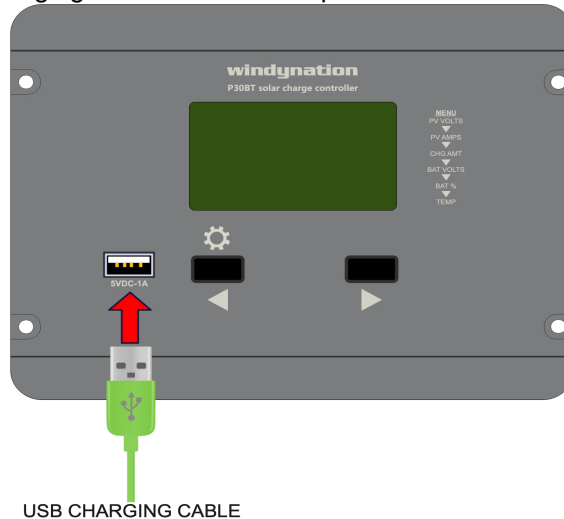


**IMPORTANT:** Battery Type “USE” is not recommended for standard usage and should only be used by Advanced Users.

### 3.6 USB CHARGING PORT

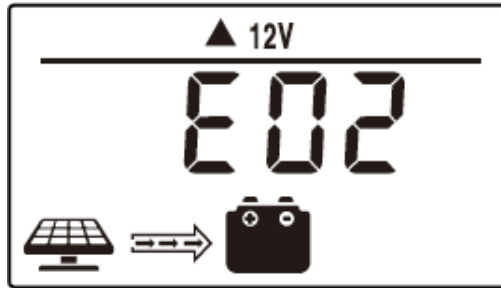
The P30BT has a Plug & Play USB Type A charging port, which can be used to charge all USB powered devices with a current draw of less than one (1) Amp.

Simply plug the USB Type A charging cable into the USB port as shown below.



### 3.7 ERROR CONDITIONS

The solar charge controller is protected against damage by various measures. Nevertheless, always take utmost care in the proper operation of the solar charge controller. In the event of an error, the LCD will automatically display an error code to provide a hint of the malfunction as shown below:



If an error code is displayed on the controller, please refer to the following table to help determine the root cause and resolve the issue. However, errors are only properly indicated in which the system has been properly installed. If there are other malfunctions than the ones described below, please check if the solar charge controller has been connected to the battery and solar panels correctly in the right polarity. Afterwards, check the safety fuses.

Code	Error	Problem	Possible Remedies
E01	Low Voltage	Battery has been discharged below normal range.	<ul style="list-style-type: none"> <li>• Reduce load(s) on battery</li> <li>• Increase solar array or battery capacity.</li> <li>• Charge battery using alternate charge source</li> </ul>
E02	Over Voltage	Battery voltage exceeds target charging voltage.	Disconnect charger(s) until battery voltage is lower than target charging voltage.
E06	Over Heat	The maximum allowable temperature has been exceeded.	<ul style="list-style-type: none"> <li>• Check ventilation at rear of controller</li> <li>• Protect the controller from direct sunshine.</li> <li>• Reduce heat near the controller.</li> </ul>
E08	Over Load	Solar PV input power exceeds 30 amps	Reduce the solar panel size or quantity
E10	PV Over Voltage	Solar PV input voltage exceeds 55 VDC	<ul style="list-style-type: none"> <li>• Check PV Voc</li> <li>• Wire panels so the max input voltage is not exceeded</li> </ul>
E13	PV Polarity	The PV module is not connected properly	<ul style="list-style-type: none"> <li>• Check polarity of solar panels</li> <li>• Check connections at controller for correct polarity</li> </ul>
E14	Battery Polarity	The Battery is not connected properly	<ul style="list-style-type: none"> <li>• Check polarity of battery cables</li> <li>• Check connections at controller for correct polarity</li> </ul>

**IMPORTANT:** The Error Code will clear once the issue has been corrected or once the values are within acceptable range.

## 4 APPLICATION

### 4.1 WIRE GAUGE REFERENCE

#### 4.1.1 Wire Thickness

AWG	Diameter inches (mm)	Ohms per 1000ft	Break Force	Square mm2
16	0.051 (1.29)	4.016	75 lbs	1.30
14	0.064 (1.63)	2.525	119 lbs	2.08
12	0.081 (2.05)	1.588	197 lbs	3.30
10	0.102 (2.59)	0.999	314 lbs	5.26
8	0.129 (3.26)	0.628	480 lbs	8.30
6	0.162 (4.11)	0.395	760 lbs	13.30
4	0.204 (5.19)	0.249	1210 lbs	21.15
2	0.258 (6.54)	0.156	1930 lbs	33.62
1	0.289 (7.35)	0.124	2430 lbs	42.41
0 (1/0)	0.325 (8.25)	0.098	3060 lbs	53.49

00 (2/0)	0.365 (9.27)	0.078	3860 lbs	67.43
000 (3/0)	0.410 (10.4)	0.062	4860 lbs	85.01
0000 (4/0)	0.460 (11.68)	0.049	6120 lbs	107.22

## 5 TROUBLESHOOTING AND MAINTENANCE

The Controller requires minimal care. It is recommended to inspect all the connections at least two times per year for insulation damage or corrosion and to ensure all connections are tight and secure.

### 5.1 MAINTENANCE & CARE

- Clean the area around the controller of any dirt or debris with a dry cloth.
- Tighten the screws on the terminals. Inspect for loose, broken, or burnt wire connections.
- Inspect batteries for cracked or bulging cases and corroded terminals.
- Make sure the PV array is clean and remove any debris.

### 5.2 TROUBLESHOOTING

Problem	Possible Remedies
LCD indicator never enters charging cycle.	<ol style="list-style-type: none"> <li>1. Check if the solar panel cables are connected properly.</li> <li>2. Check all wiring connections to make sure they are in their designated locations and make sure that there are no loose connections.</li> </ol>
No Display on LCD	<ol style="list-style-type: none"> <li>1. Check the battery voltage on the battery terminals of controller to ensure at least 9VDC is present</li> <li>2. Reset controller by removing battery power for ~1 minute and reconnecting</li> </ol>

### 5.3 SUPPORT

If you are experiencing technical problems, and cannot find a solution in this manual, you can contact Windy Nation Inc. for further assistance.

- Call: (805) 323-6445
- Email: [support@windynation.com](mailto:support@windynation.com)
- Write: 1404 Fleet Ave, Ventura, CA 93003

For challenging issues or to just ask a question, consider using our FREE Community Forums! Consult our community of DIY'ers for fast answers to all your questions.

Post on our Forums: <http://www.windynation.com/community/>

### 5.4 WARRANTY

Windy Nation warrants that the Power Controller (the "Product"), will be free from manufacturing defects in materials and workmanship under normal authorized use consistent with product instructions for a period of one (1) year from the date the original purchaser ("Customer") receives the Product (the "Warranty Period"). This warranty extends only to the original purchaser. The Customer's sole and exclusive remedy and the entire liability of Windy Nation, its suppliers and affiliates for breach of the warranty is, at Windy Nation's option, either (i) to replace the Product (or defective component part(s)) with a new or reconditioned Product (or component part(s)); (ii) to repair the reported problem; or (iii) to refund the purchase price of the Product. Repaired or replaced products are warranted for the remainder of the original warranty period only. No employee, agent, dealer or other person is authorized to give any warranties on behalf of Windy Nation not expressly set forth in this limited warranty.

#### 5.4.1 Restrictions

No warranty will apply if the Product (i) has been altered or modified except by Windy Nation; (ii) has not been installed, operated, repaired, or maintained in accordance with instructions supplied by Windy Nation; (iii) has been subjected to abnormal physical, thermal or electrical stress, misuse, negligence, or accident. If Windy Nation determines that the problem with the Product is not due to a manufacturing defect in Windy Nation's workmanship or materials, or otherwise does not qualify for warranty repair, then the Customer will be responsible for the costs of all necessary repairs and expenses incurred by Windy Nation.

#### **5.4.2 Warranty Claims & Return Procedures**

To be eligible for service under this warranty, the Customer must submit a service request within the Warranty Period by contacting Windy Nation in writing or via telephone and obtaining a Returned Materials Authorization (“RMA”) number. This RMA must be obtained before returning any product under this warranty. Notification must include a description of the alleged defect, the manner in which the Product was used, the serial number (if applicable), and the original purchase date in addition to the name, address, and telephone number of the Customer. Within five (5) business days of the date of notification, Windy Nation will provide the Customer with an RMA number and the location to which the Customer must return the defective Product. Any Product returned for warranty service shall be shipped at the expense and risk of the Customer. The Customer must return the entire Product kit (or, if authorized by Windy Nation, the defective component parts), within fifteen (15) days after issuance of the RMA number. Windy Nation will be under no obligation to accept any returned Product that does not have a valid RMA number. Customer’s failure to return the Product within fifteen (15) days of its receipt of an RMA number may result in cancellation of the RMA. All parts that Windy Nation replaces shall become Windy Nation’s property on the date Windy Nation ships the repaired Product or part back to the Customer. Windy Nation will use all reasonable efforts within thirty (30) days of receipt of the defective Product to repair or replace such Product. If a warranty claim is invalid for any reason, the Customer will be charged at Windy Nation’s then-current rates for services performed and will be charged for all necessary repairs and expense incurred by Windy Nation. If Windy Nation determines that a warranty claim is valid, it will ship the repaired or replaced Product to Customer at Windy Nation’s cost.

#### **5.4.3 Disclaimer**

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#### **5.4.4 Limitation of Liability**

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## 6 MOUNTING TEMPLATE

