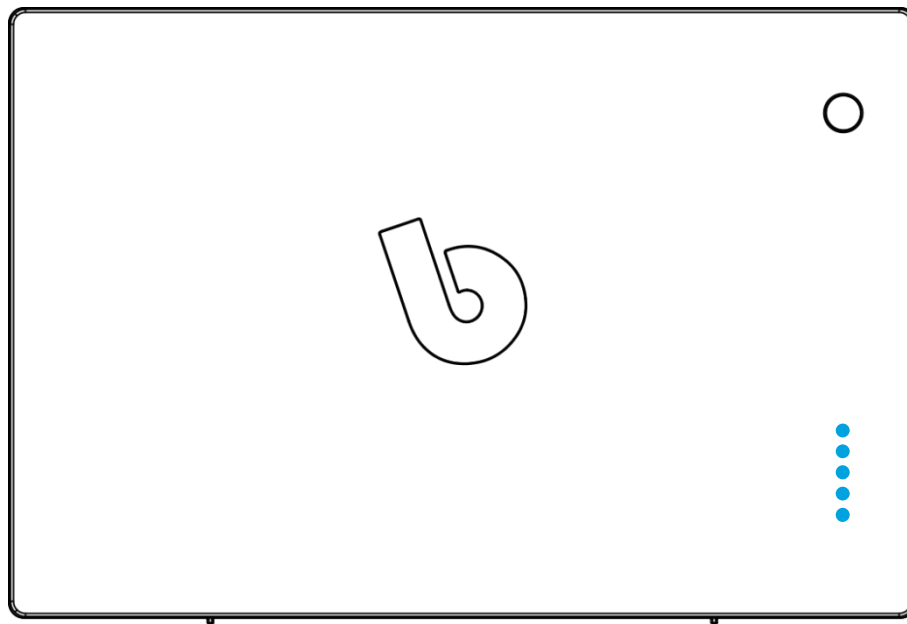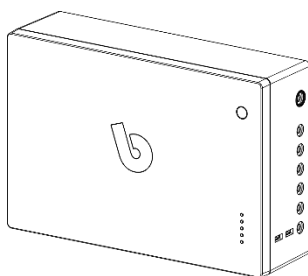**BBOXX Home**

Status Lights

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Introduction

This guide will show you how to understand the BBOXX Home status lights. The first section will explain how to understand battery state of charge from the lights during normal operation. The second section will explain how to understand the other light signals outside of normal operation.

Requirements

For this guide you will need the following tools:

1x BBOXX Home

Prerequisites

This guide has no prerequisites.

Status Light Introduction

Modes of Operation

The BBOXX Home status lights are multi-purpose and display different things depending on the mode of operation. The modes of operation are:

- **Normal**: No faults, enabled and charged

- **Discharged**: No faults and enabled but the outputs are forced off.

- **Disabled**: Disabled by the payment plan owner (via the SSD)

- **Fault**: Fuse blown or short circuit recognised

- **Sleep**: A very low power state has been entered for various reasons

During **Normal** operation the status lights will display the battery state of charge.

In **all other** modes of operation the status lights will display something specific to communicate the mode of operation or occurring problem.

Brightness Levels

The status lights can be displayed as **off**, **dim** or **bright**. This document will indicate off, dim and bright LEDs in the following way.

○	◉	●
Off	Dim	Bright

State of Charge

During normal operation the status lights represent the *estimated* state of charge (SoC) of the battery.

The SoC will only be displayed when the BBOXX Home is turned **on**.

Off	0 - 20%	20 - 40%	40 - 60%	60 - 80%	80 - 100%

Each status light represents 20% of available energy.

Example

The 100% usable energy capacity of a BBOXX Home is about 140Wh. Therefore, every status light represents about 28Wh of available energy.

If a user connects 4 x 1W LED bulbs to their BBOXX Home the total energy consumption per hour is 4Wh.

After 7 hours the LED bulbs will consume 28Wh. Therefore, one status light will turn off every 7 hours, for a total of 35 hours, if connected to a fully charged BBOXX Home.

Charging

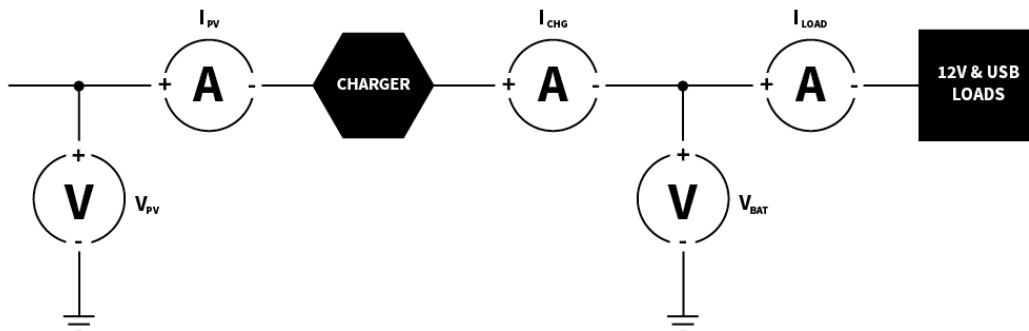When charging the status lights are animated to indicate charging is in progress.

Definition of 'Charging'

BBOXX Home identifies itself as charging when there is a current flowing <u>into</u> the battery, where the battery current is defined as:

$$I_{BAT} = I_{LOAD} - I_{CHG} \leq -50 \, mA$$

Where a negative result indicates charging and a positive result is discharging.
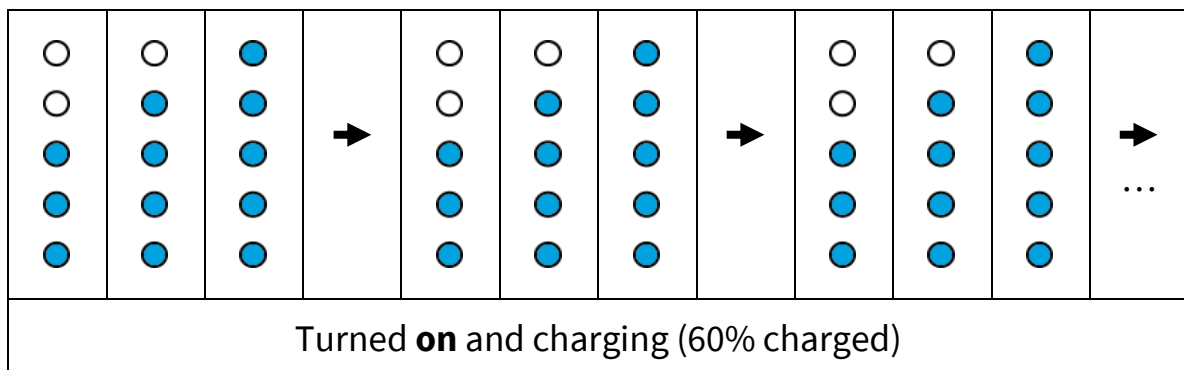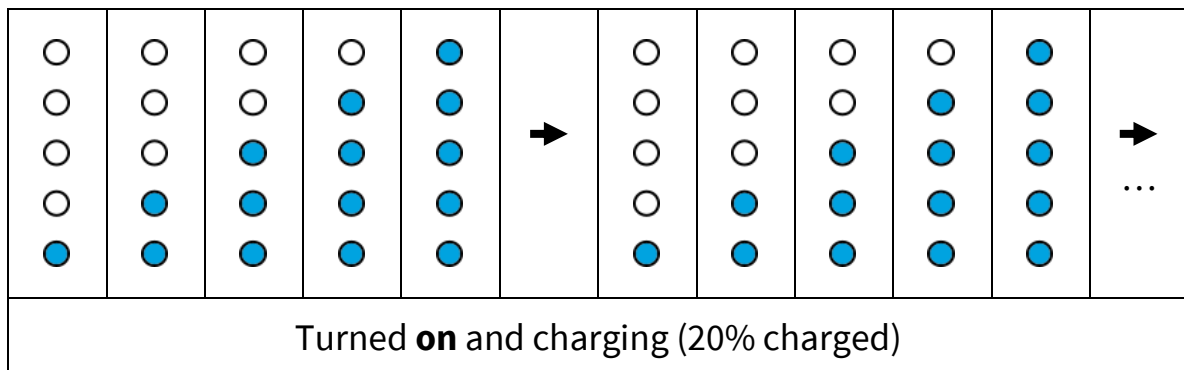
The below diagram shows the location of the sensors in a BBOXX Home including where I_{CHG} and I_{LOAD} are taken from.

If a BBOXX Home is being charged and discharged simultaneously and the above condition is not met then the BBOXX Home does not think it is charging and the status lights will simply show the non-animated state of charge display.

Animation

The status lights turn on to show which 20% regions of the battery are being filled. Once a region is full that status light will stay on while the other lights continue to animate.

Turned **on** and charging (20% charged)

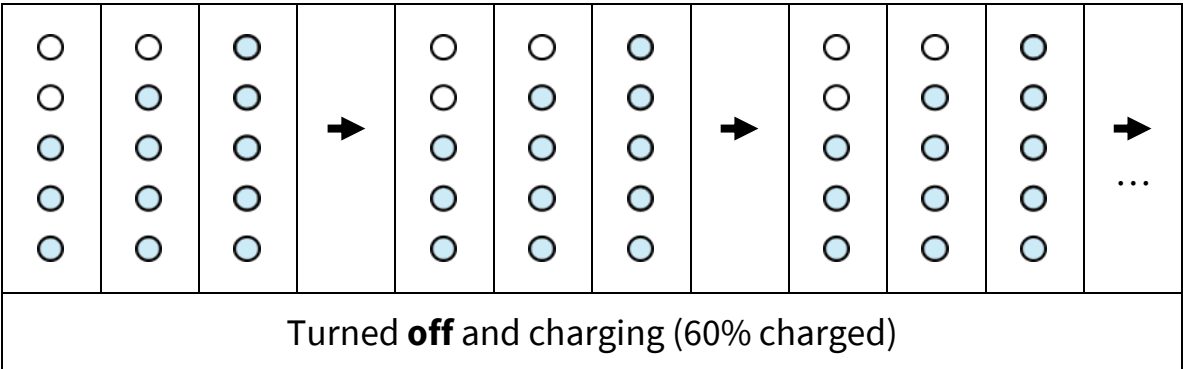Turned **on** and charging (60% charged)

Speed

The speed of the charging animation is directly proportional to the magnitude of the charging current so will be noticeably variable.

A slow animation indicates the BBOXX Home is being charged slowly (small charging current). The faster the animation the quicker the BBOXX Home is being charged.

Brightness

The charging animation is displayed both when a BBOXX Home is turned on and turned off.
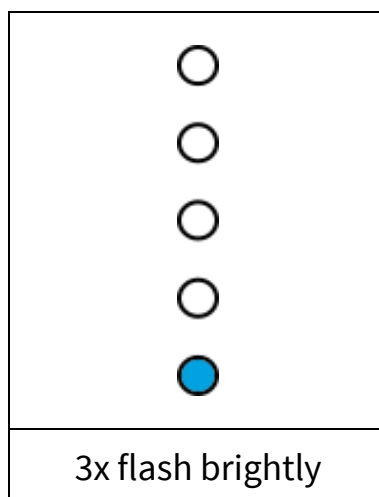
To indicate when a BBOXX Home is off but charging the status lights are dimmed. When turned on, the status lights will be bright.

Turned **off** and charging (60% charged)

Discharged Battery

If the battery is too discharged the BBOXX Home will force the outputs to always be off.

To indicate a discharged battery the **bottom status light will flash _brightly_ 3 times** when the power button is pressed.
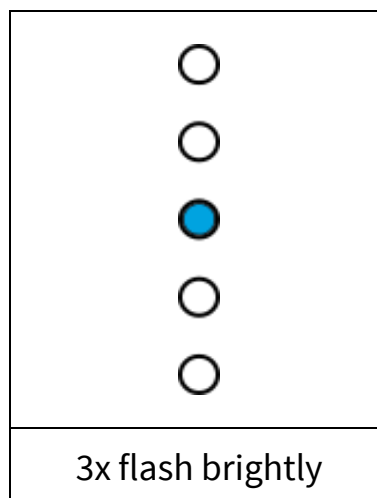

3x flash brightly

Disabled Device

A BBOXX Home can be remotely disabled by the pay plan owner for various reasons.

When disabled the BBOXX Home will force the outputs to be off. From the end users point of view this outcome is very similar to that of a Discharged Battery.

Therefore, the status lights will display something unique to indicate to the end user that the pay plan owner has disabled their product for some reason.

To indicate a disabled device the **middle** **light will flash** *brightly* **3 times** when the power button is pressed.
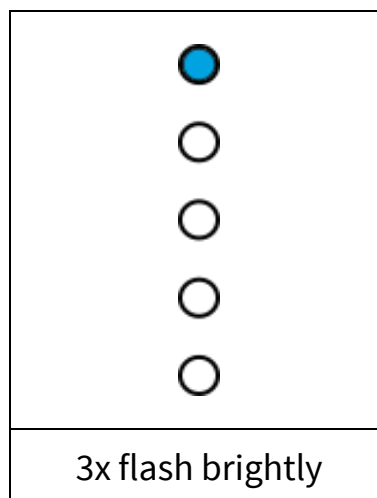

3x flash brightly

Fault

There are currently two types of fault that can be recognised by the BBOXX Home and communicated to the user to support non-invasive diagnosis.

10A Fuse Blown

The 10A fuse connects the output ports to the battery supply. Therefore, if this fuse has blown the outputs will not work.
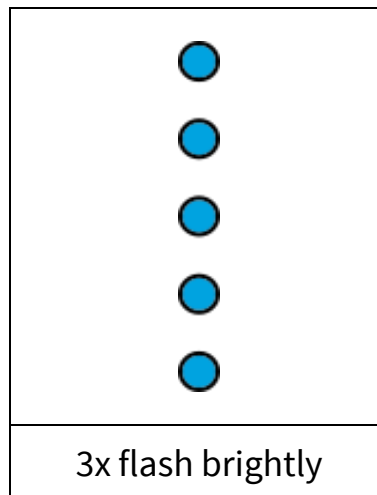
To indicate the 10A fuse has blown the **top** **light will flash** *brightly* **3 times** when the power button is pressed.

3x flash brightly

Short Circuit on Output(s)

If there is a short circuit on any of the outputs the BBOXX Home will disable the outputs to protect itself from potential damage. The short circuit could be on either the 12V output or the USB output.

To indicate a short circuit on one or both of the outputs **all lights will flash** *brightly* **3 times** when the power button is pressed.
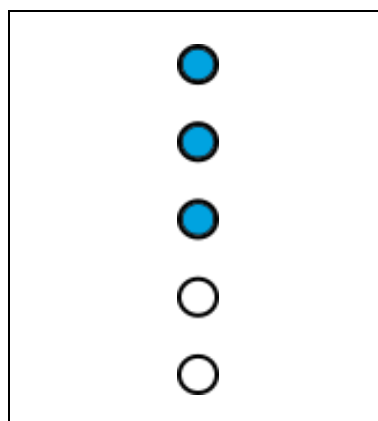

3x flash brightly

Overheating

Sealed lead-acid batteries are sensitive to temperature. Under high or low temperature conditions a battery will perform differently and will age differently.

If a BBOXX Home battery experiences a relatively high temperature, the outputs will be turned off to protect the battery from accelerated damage.

To indicate overheating of the battery, the **top three** **lights will flash** *brightly* **3 times** when the power button is pressed.
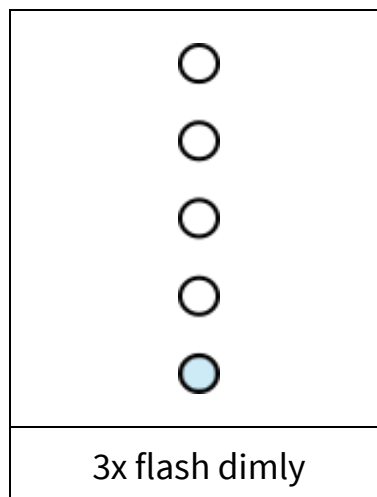
3x flash brightly

Sleep

A BBOXX Home will go into a very low power Sleep Mode state under the following conditions:

- No charging, button presses or loading in 5 or more days
- Battery voltage drops below 10.5V

To indicate a sleeping device the **bottom** **light will flash** *dimly* **3 times** when the power button is pressed.

3x flash dimly

Additional Support

If any of the below are true please contact BBOXX Product Support directly for help.

- I did not find this document helpful

- One or more of the steps in this document are confusing to follow

- There are errors in this document

Contact us at

products@bboxx.co.uk