

WaveShark Repeater

User Manual

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Covers *WaveShark Communicator* firmware version 1.3.6 and above
Covers *WaveShark Terminal* version 1.0.45 and above



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WaveShark Repeater introduction

The WaveShark Repeater is a solar-powered, weather-proof version of the WaveShark Communicator. It is intended for outdoor operation to extend the range / coverage of WaveShark networks. It can be permanently installed outside or rapidly-deployed as needed. The device should operate perpetually from its built-in solar panel provided that it is exposed to a few hours of direct Sun per day and that it is operating in power-saving mode (more on power-saving mode later in this manual and also in the *WaveShark Communicator User Manual*). Additionally, the device will continue to operate for several days during periods where no direct Sun is available (overcast conditions, etc).

The WaveShark Repeater offers all features included in the hand-held WaveShark Communicator product. Please see the *WaveShark Communicator User Manual* for more details.

- Off-grid wireless text messaging and general purpose data modem
- Built-in mesh networking to automatically extend the range of any group of WaveShark devices
- Low power long distance LoRa™ transceiver
- Bluetooth Low Energy (BLE) connectivity for WaveShark Android and iOS messaging apps
- Wi-Fi network connectivity, both for joining existing Wi-Fi networks and for acting as its own Wi-Fi Access Point (AP)
- USB Serial port for use with PCs, Macs, Raspberry Pis, and a variety of other devices
- Extensive control interface via USB Serial port
- Built-in optional AES 128-bit encryption for private communications
- High capacity 3,300 mAh internal rechargeable LiFePO4 battery
- *WaveShark Terminal* software for point and click configuration and operation on Windows
- Field updateable firmware
- Designed, assembled, and individually tested in the USA

Preparing your WaveShark Repeater

Step one: Open enclosure

The WaveShark Repeater enclosure can be opened using the L-shaped T10 Torx driver included with each unit. Four screws with T10 Torx heads fasten the front outside lid of the WaveShark Repeater to the enclosure.

This is what you will see when you first open the enclosure.



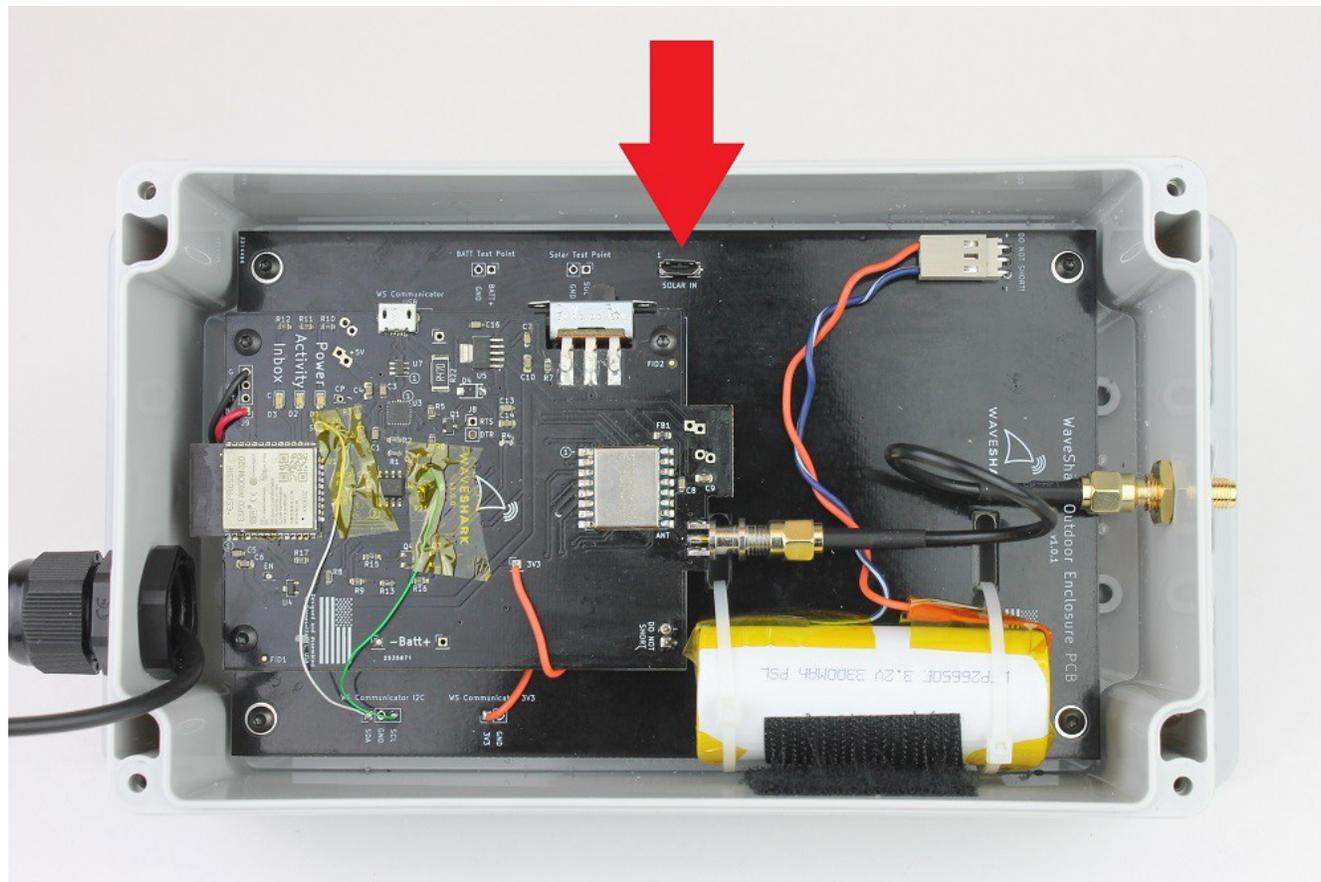
Step two: Charge internal battery

Various regulations, rules, laws, etc prevent us from shipping the WaveShark Repeater with a fully charged battery. Therefore, it is highly recommended that you charge its internal 3,300 mAh LiFePO4 battery before installing the unit. The WaveShark Repeater features a built-in Battery Management System (BMS) that prevents over-charging the internal battery. Simply connect a USB cable between the “SOLAR IN” MicroUSB receptacle on the WaveShark Repeater’s internal Printed Circuit Board (PCB) to a standard 5V 1A USB power supply (a typical “wall wart” that comes with many devices or a USB port on a computer). We recommend leaving the USB cable plugged into the “SOLAR IN” receptacle for 6 hours to ensure a full charge.

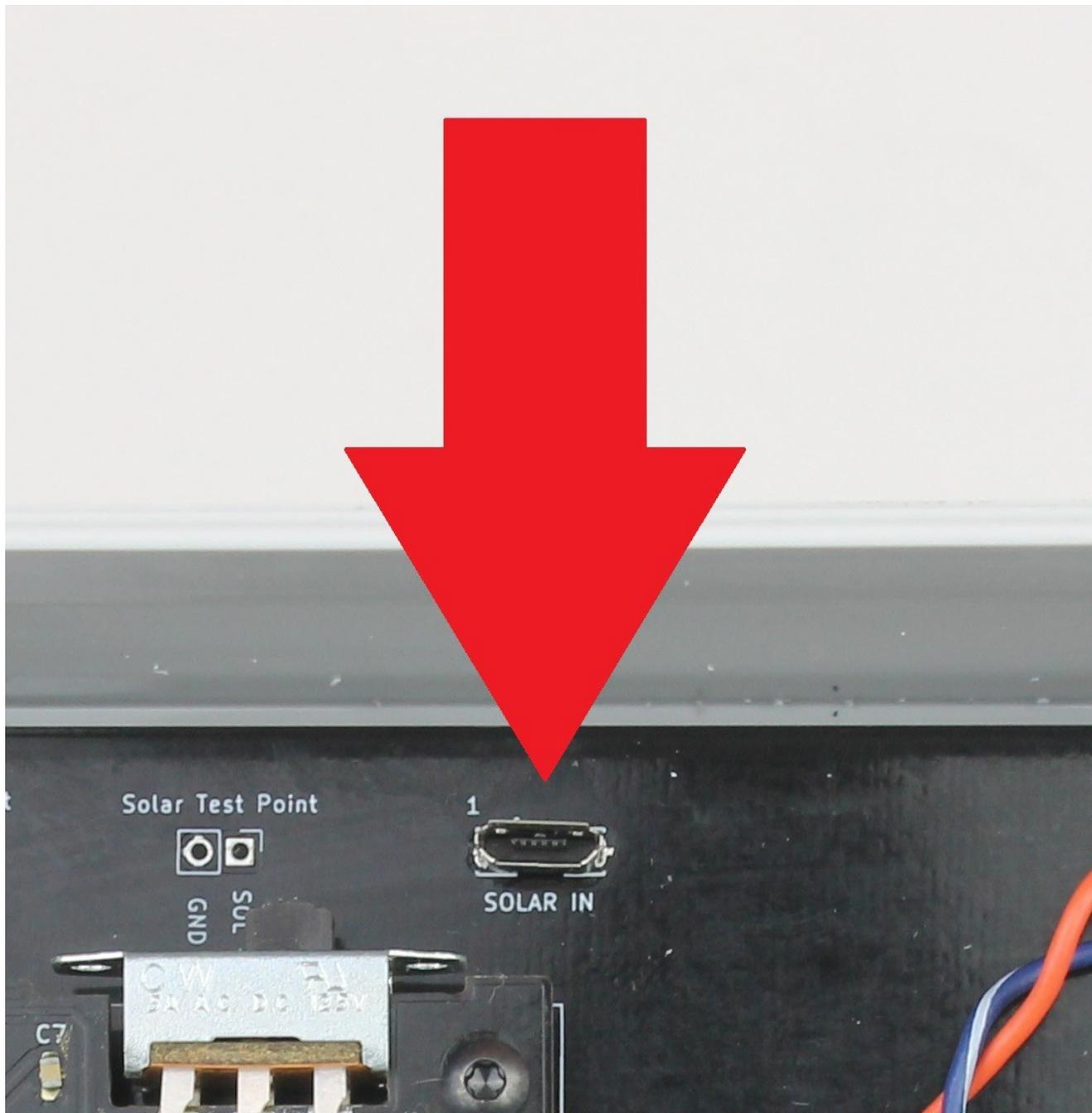
You can locate the “SOLAR IN” MicroUSB receptacle once you have moved the solar panel cable out of the way.



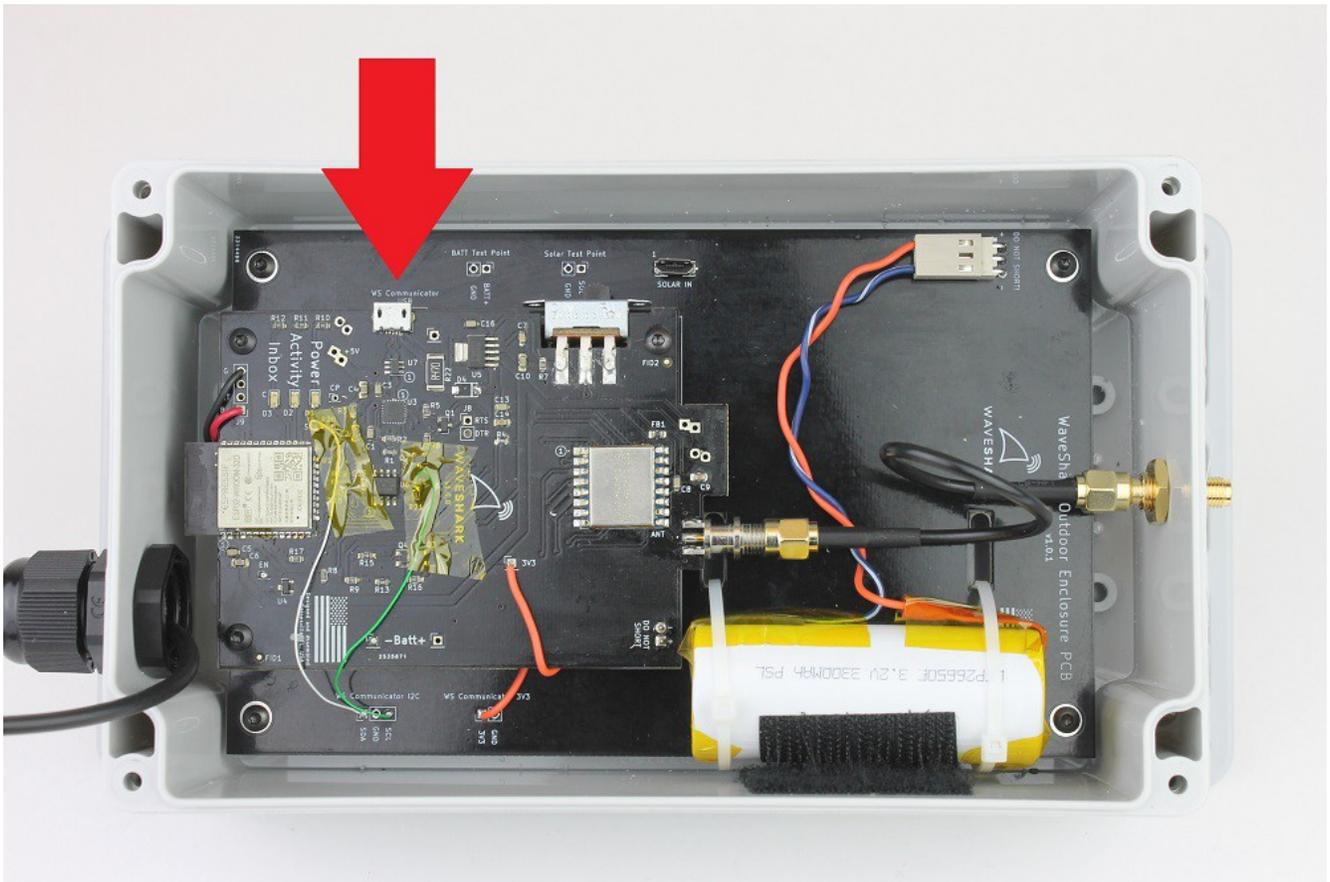
Location of “SOLAR IN” MicroUSB receptacle



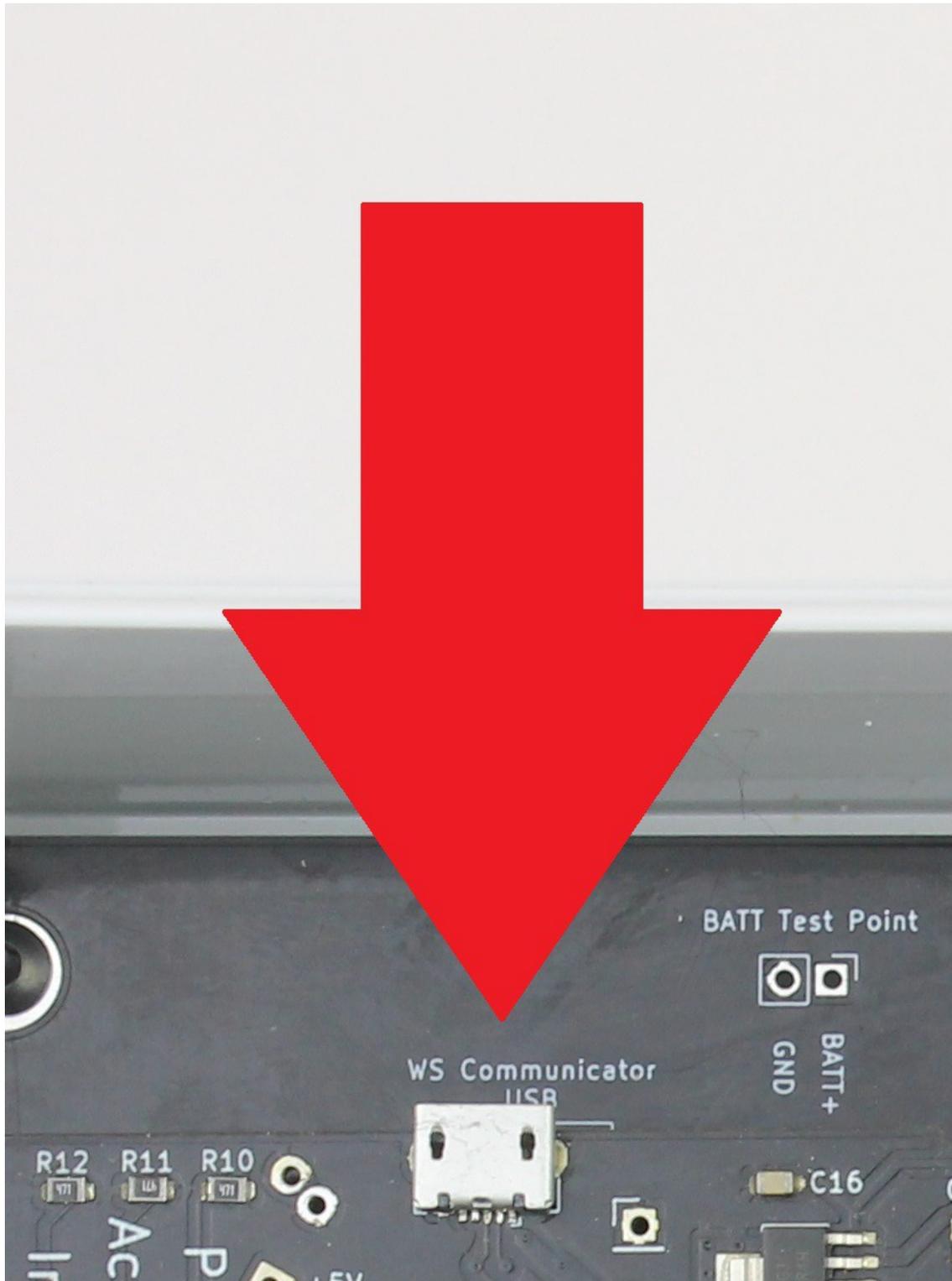
Close-up view of location of “SOLAR IN” MicroUSB receptacle



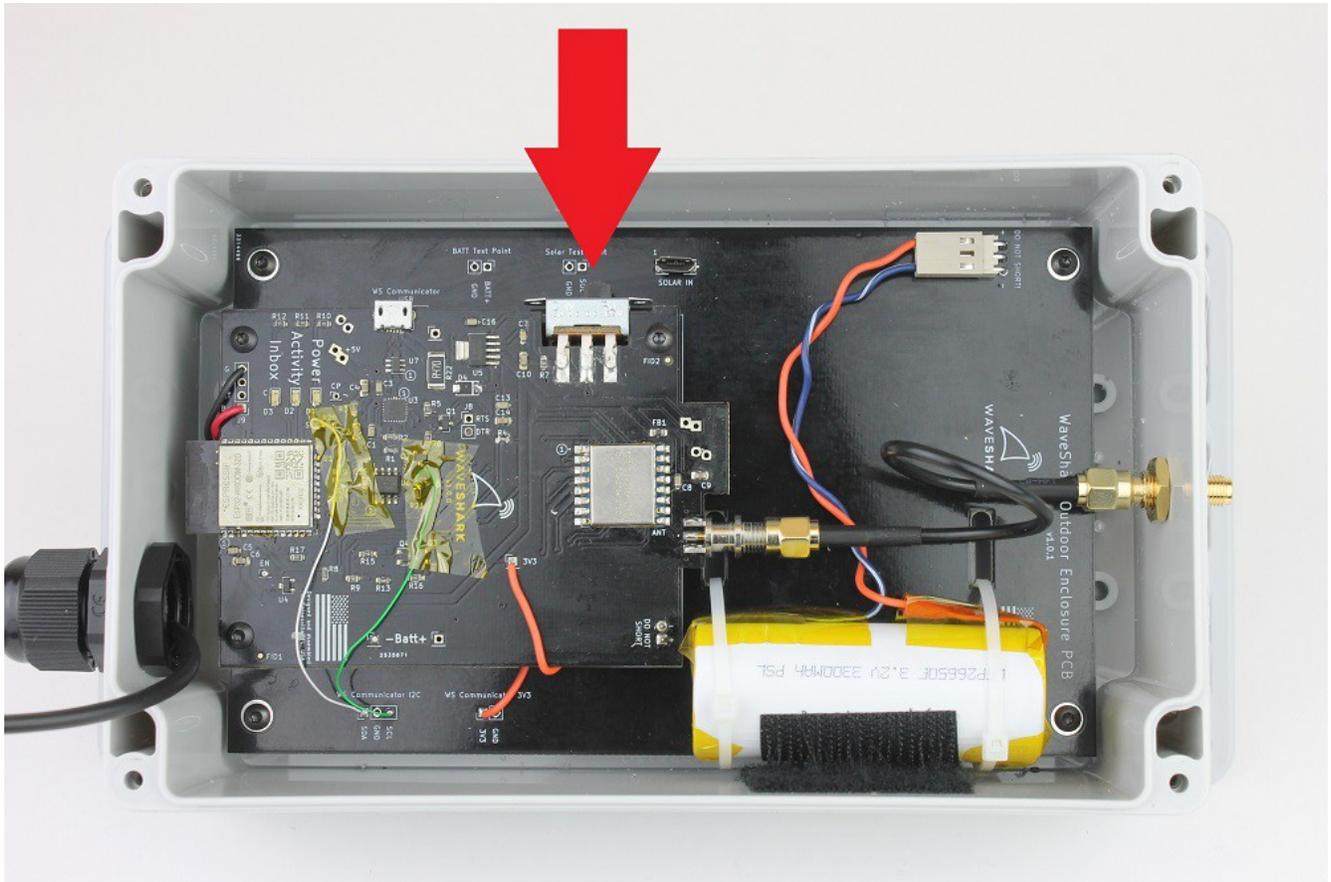
Do not mistake the WaveShark Communicator's MicroUSB receptacle for the WaveShark Repeater's motherboard MicroUSB receptacle. The "SOLAR IN" MicroUSB receptacle is in a vertical position and will be easy to reach and plug into. The WaveShark Communicator's MicroUSB receptacle is in a horizontal position and will not be easy to reach or plug into.



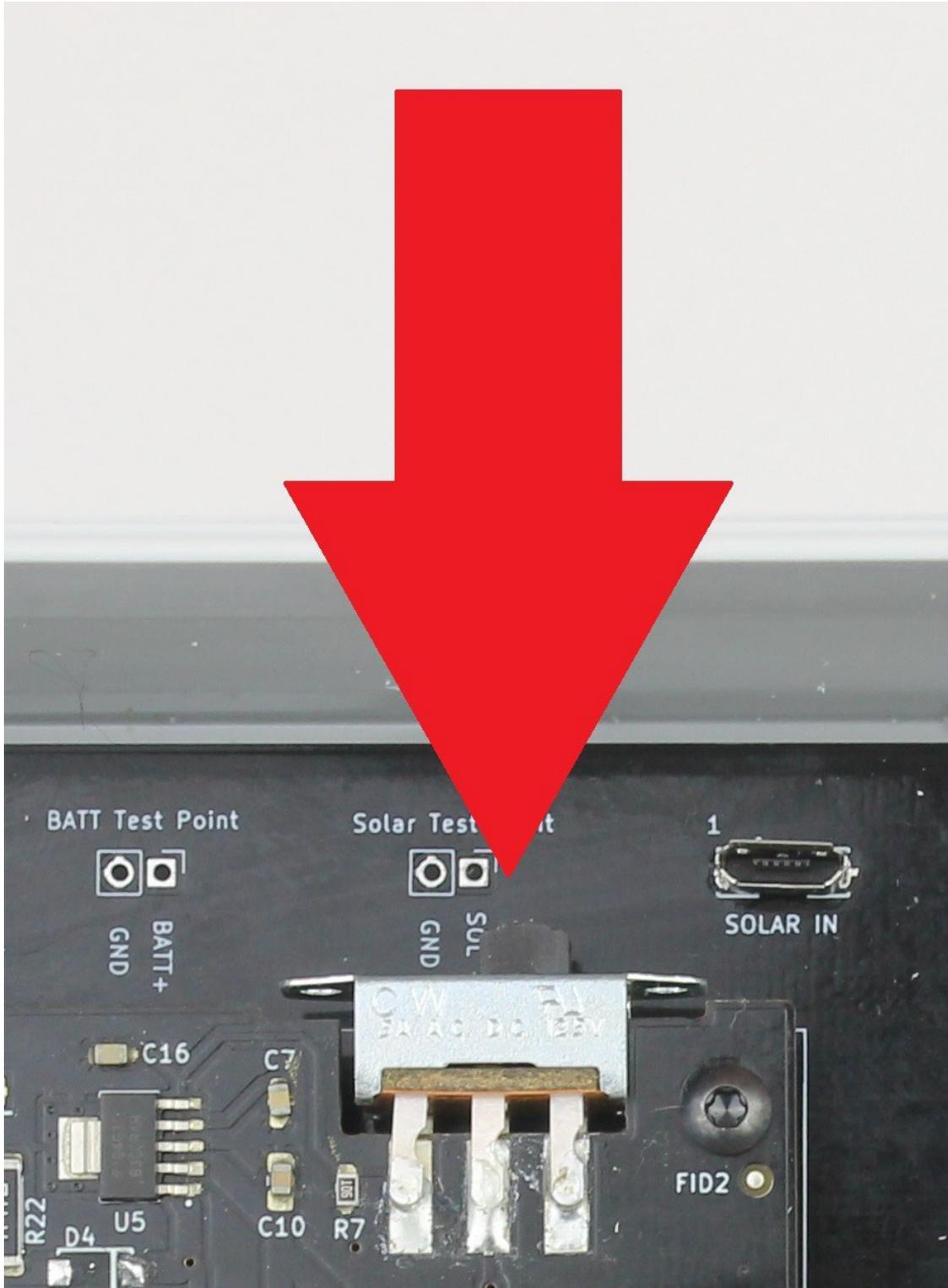
Close-up view of location of WaveShark Communicator MicroUSB receptacle



We also recommend that you leave the device powered off while charging to ensure the fastest possible charging. You can locate the power switch as shown in the following images. The “Power” LED pictured below will be OFF when the power switch is in the OFF position. The OFF position is when the switch is in the position toward the antenna connector and away from where the solar panel cable enters the enclosure.



Close-up view of power switch location



Ensure that the “Power” LED is not on.



Close-up view of location of “Power” LED



Now that you have connected a USB power source to the “SOLAR IN” MicroUSB receptacle and ensured that the device's power is off, allow 6 hours of charging to ensure a fully charged battery.

Step three: Connect solar panel cable to “SOLAR IN” MicroUSB receptacle

Now that your battery is fully charged, it is time to connect the solar panel cable to the “SOLAR IN” MicroUSB receptacle. Simply disconnect the USB cable that you used for charging and plug in the solar panel's cable in its place.

Step four: Power up device

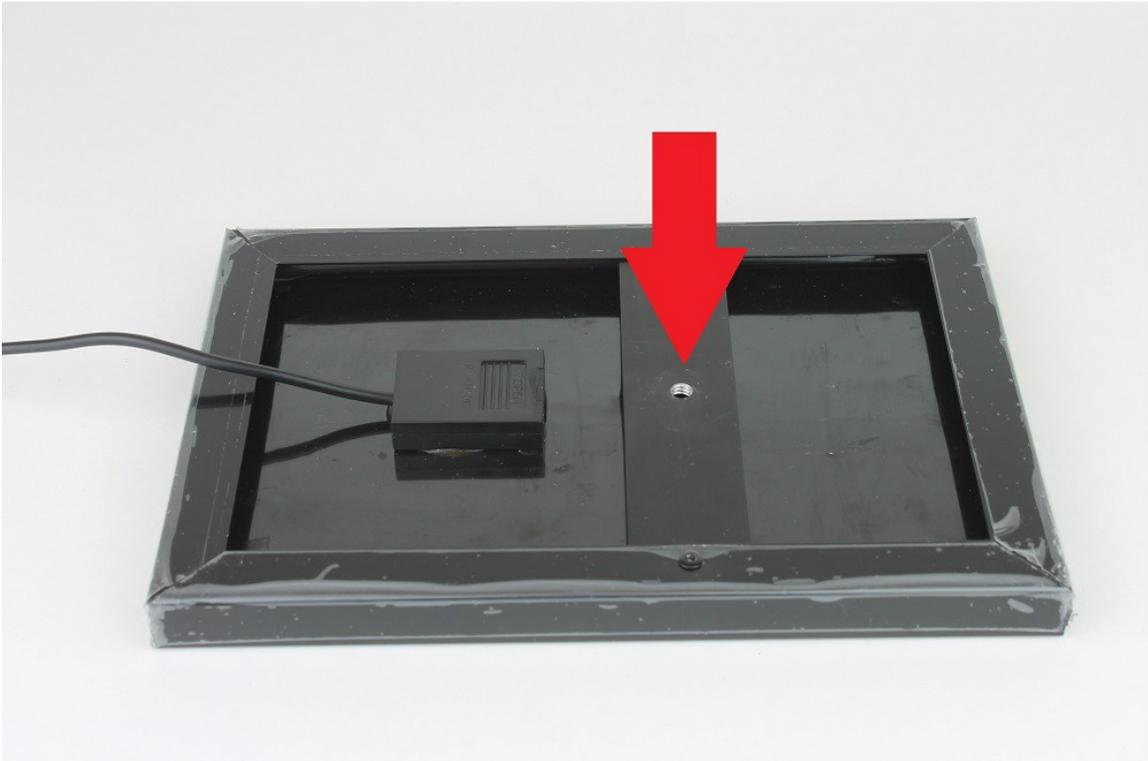
You can locate the power switch as shown in the previous images. The ON position is when the switch is in the position away from the antenna connector and toward where the solar panel cable enters the enclosure. The “Power” LED pictured previously will be ON when the power switch is in the ON position.

Step five: Close enclosure

Securely tighten the four screws that hold the front lid onto the enclosure. Ensure a good, secure fit so that a weather-proof seal is made between the enclosure body, the internal gasket embedded in the lid, and the lid itself.

Step six: Attach solar panel to enclosure lid

Attach the solar panel to the solar panel receptacle on the lid. See the following two images for the mechanical connection that needs to be made. The solar panel mount is very versatile and can be aimed in a number of different positions and at a number of different angles. We typically recommend an angle of approximately 30 degrees to maximize the solar panel's exposure to the Sun.



Step seven: Attach antenna

Attach the included antenna to the enclosure's outside antenna connector as shown below.



Step eight: Change default settings

Your WaveShark Repeater should now have a fully charged battery, its solar panel connected and mounted, its antenna connected, and be powered on. Now it is time to change the device's default settings. See *Connecting to your WaveShark Repeater* (below).

Connecting to your WaveShark Repeater

Wi-Fi Access Point (AP) and Remote Control

Each WaveShark Repeater comes with its Wi-Fi Access Point (AP) and *Remote Control* (see below) enabled by default. This is to make it easier to control the WaveShark Repeater without having to connect to its internal USB port. While an update to the WaveShark iOS and Android apps is coming soon that will allow users complete control over all WaveShark device settings, presently the best way to have access to all settings is via Wi-Fi or *Remote Control*.

Wi-Fi Access Point (AP)

Each WaveShark Repeater comes with its Wi-Fi Access Point (AP) enabled by default. This allows you to see your WaveShark Repeater in your list of nearby Wi-Fi networks (Access Points) and connect to it in order to change its default settings.

The following are the default Wi-Fi settings for each WaveShark Repeater:

- Wi-Fi SSID (Access Point name): *WaveShark XXXXXX*
 - Where XXXXXX is some unique combination of the numbers 0-9 and the letters A-F
 - For example, *WaveShark 2AD95C*
- Wi-Fi password: A randomly generated eight character password
 - For example: *DvMWgQ7X*
 - This password will be provided on a sheet included with each WaveShark Repeater
- Wi-Fi Access Point IP address: 192.168.4.1

See the WaveShark Communicator User Manual for more information on controlling a WaveShark device via Wi-Fi

Remote Control

Each WaveShark Repeater comes with *Remote Control* enabled by default. This allows you to change your WaveShark Repeater's settings with a WaveShark Communicator, provided that you have the same *Remote Control key* configured on that WaveShark Communicator.

The default *Remote Control key* for your WaveShark Repeater will be provided on a sheet included with each WaveShark Repeater. The default *Remote Control key* will be the same as the default Wi-Fi password.

See the WaveShark Communicator User Manual for more information on controlling a WaveShark device via Remote Control

Recommended changes to default settings

We recommend changing the following settings to enable the lowest power consumption of the WaveShark Repeater so that the device requires only a minimum amount of direct Sun in order to maintain perpetual operation.

- Give the device a meaningful name:
 - */NAME <New device name>*
 - For example, */NAME EASTSIDE* or */NAME Johns House*
- Disable LEDs:
 - */LEDS OFF*
- Disable Wi-Fi:
 - */WIFI OFF* (this will cause the device to reboot)
- Change the default Remote Control key (optional)
 - */RCKEY <New Remote Control key>*
 - For example, */RCKEY YqX5zfrt*

NOTE: These last two settings (disabling LEDs and disabling Wi-Fi) are required for the device to enter into power-saving mode. Power-saving mode is highly recommended for the solar-powered WaveShark Repeater. See the *WaveShark Communicator User Manual* for more information on power-saving mode.

ALSO NOTE: Bluetooth is already disabled by default on the WaveShark Repeater and thus nothing needs to be done regarding Bluetooth in order to have your device enter power-saving mode. Of course, should you choose, Bluetooth can be enabled on the WaveShark Repeater at any time. See the *WaveShark Communicator User Manual* for more details.

Basic assembly and setup complete

You are now complete with the assembly and basic configuration of your WaveShark Repeater. We would like to point you to the *WaveShark Communicator User Manual*, available for download on www.waveshark.net for more advanced configuration and usage instructions.

Appendix A: Accessing internal WaveShark Communicator via USB

The WaveShark Repeater is based on largely on the WaveShark Communicator, which is WaveShark's hand-held product. In the event that you disable both Wi-Fi and *Remote Control* on your WaveShark Repeater then you will need to access the MicroUSB receptacle on the internal WaveShark Communicator in order to change settings.

Because of the positioning of the MicroUSB receptacle of the WaveShark Communicator within the WaveShark Repeater enclosure, you will either need a 90 degree USB cable (available for purchase on the WaveShark web site and from a number of different vendors) or you will need to temporarily remove the WaveShark Repeater motherboard to gain access to this receptacle. Using a 90 degree USB cable is highly recommended over temporary removal of the WaveShark Repeater motherboard. Should you want to temporarily remove the WaveShark Repeater motherboard then please refer to Appendix B (below) for information on the fasteners used.

NOTE: Please do not remove the WaveShark Communicator Printed Circuit Board (PCB) from the WaveShark Repeater motherboard PCB as you will risk breaking electrical connections between the two boards and will need to perform soldering to re-establish these connections.

Please refer to images in previous sections for photos of location of WaveShark Communicator MicroUSB receptacle.

Appendix B: Enclosure fasteners

The WaveShark Repeater enclosure can be opened using a T10 Torx driver. Complete disassembly of the unit can be accomplished with the addition of a T8 Torx driver.

Four longer 4-40 threaded screws with T10 Torx heads fasten the front outside lid of the WaveShark Repeater to the enclosure and 7 shorter 4-40 threaded screws with T8 Torx heads fasten the two internal Printed Circuit Boards (PCBs) to the inside of the enclosure.

An L-shaped T10 Torx driver is included with each WaveShark Repeater so that the enclosure can be easily opened for initial setup and for future maintenance needs. A T8 Torx driver is not included because removal of the internal PCBs by customers should never be necessary. Please contact WaveShark if you find yourself in a situation where you feel it is necessary to remove the WaveShark Repeater's internal PCBs. In the event that you must remove the internal PCBs without contacting us, T8 Torx drivers can be easily and inexpensively purchased from companies such as *McMaster-Carr*.