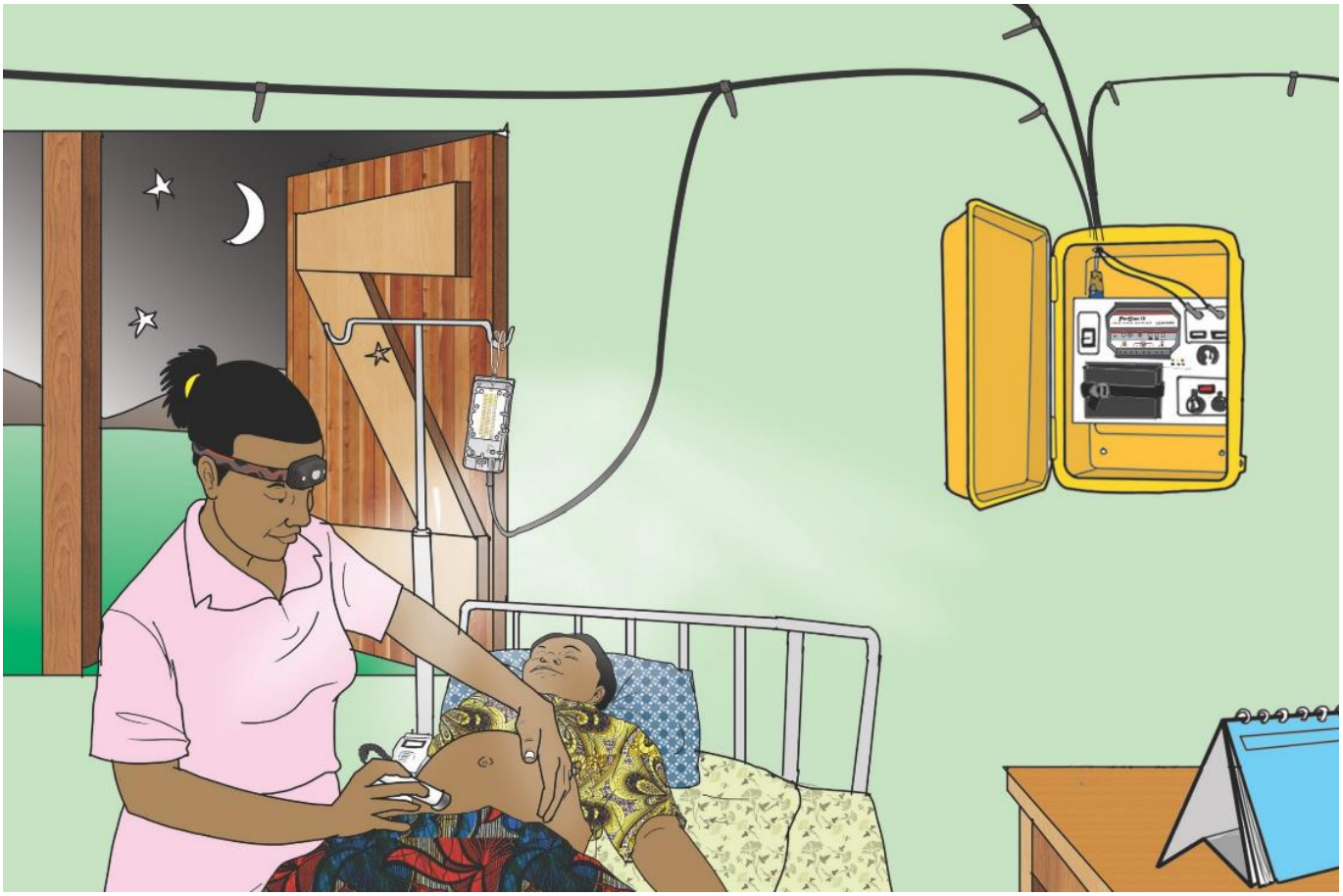
We Care Solar Suitcase®

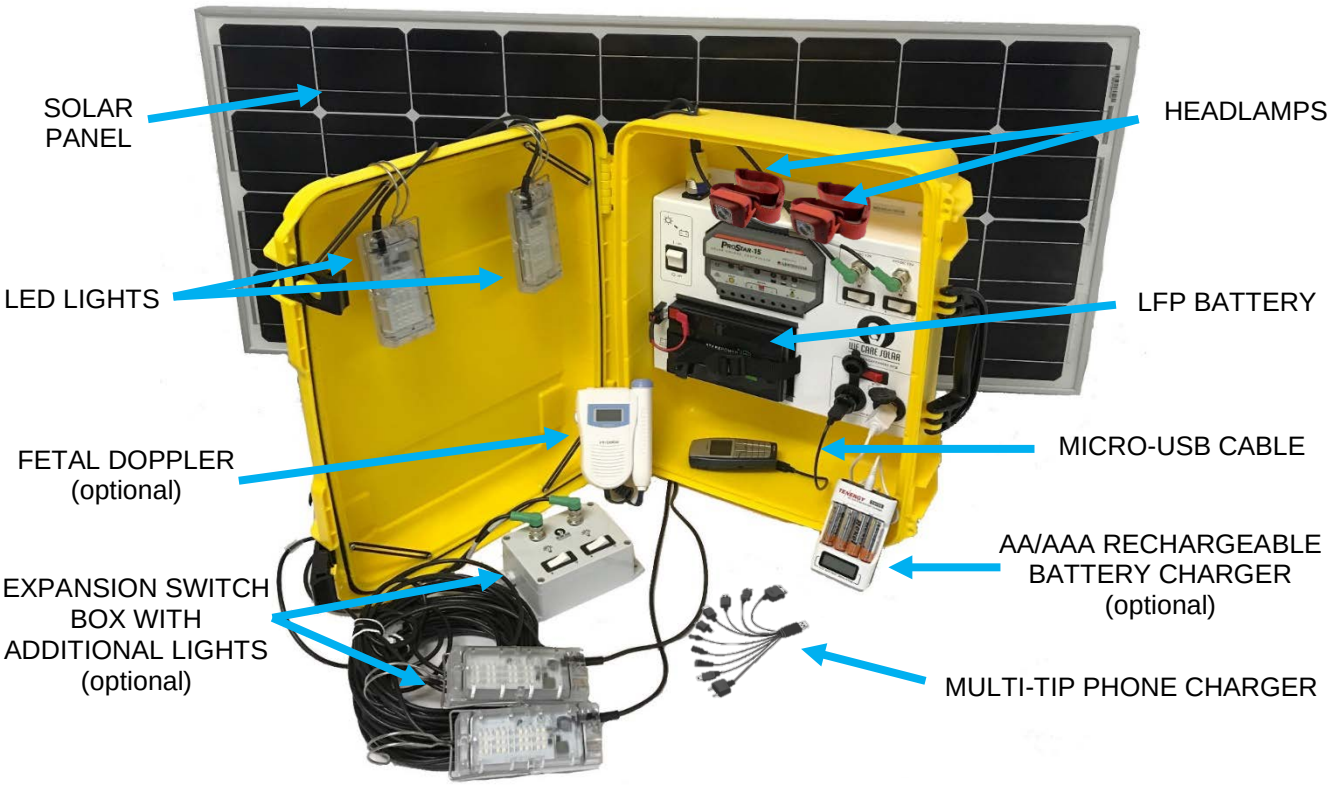
Installation & Maintenance Guide

Version 2



Contents

Solar Suitcase System Overview



The Solar Suitcase Includes:

1 Lithium Ferrous Phosphate (LFP) 12 volt battery

2 bright, rugged LED lights

1 homerun cable for solar panels

1 wall mounting hardware kit

1 roof mounting hardware kit

Solar panel(s) – ***EITHER:***

2 plastic-backed solar panels (20 watts each)

OR

1 aluminum glass solar panel (50-200 watts)

Appliances:

2 rechargeable headlamps with micro USB cable

1 multi-tip phone charger

1 2-slot USB adapter

1 Fetal Doppler

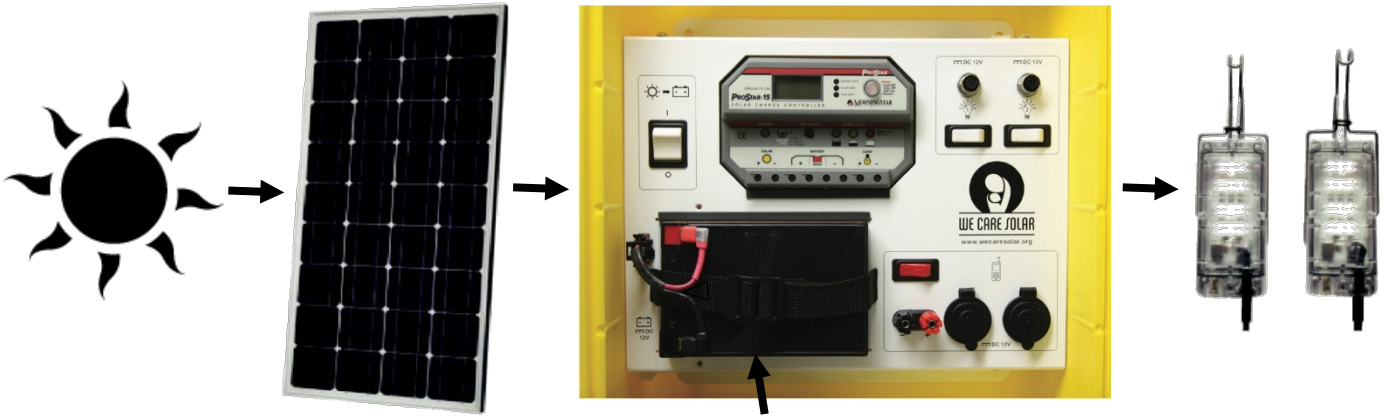
1 AA/AAA battery charger

Optional:

Expansion switch box (provides 2 additional lights)

Understanding the Solar Suitcase

Batteries, Panels, and Lights



Solar Panel
The solar panel turns sunlight into electricity.

Main Battery
The electricity is used to charge the main battery in the Solar Suitcase.

LED Lights

Main Battery

The Solar Suitcase includes a Lithium Ferrous Phosphate battery (LFP; 12 volt, 12 amp-hour) that stores electricity for night time use.

The LFP battery lasts for 5 years, and can be fully charged and discharged hundreds of times before it needs replacement. It can also be stored for months without harm to the battery.

The Solar Suitcase is also compatible with Sealed Lead Acid (SLA) batteries.

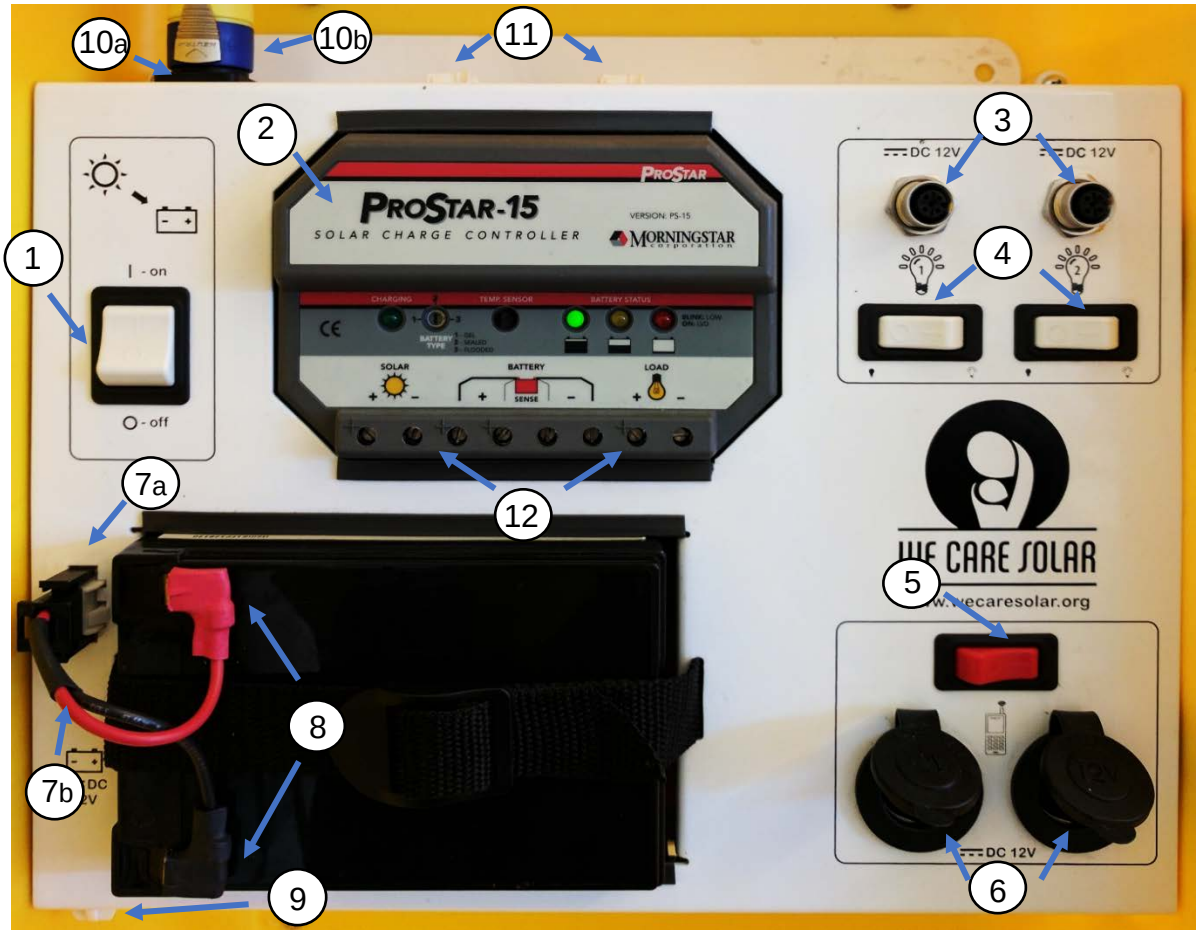
Main Battery Replacement

After years of usage, if you notice the battery is full at the beginning of the evening, but runs out of charge quickly (for example, the battery cannot provide enough power for one LED light through the night), it is time to replace the battery.

THIS SOLAR SUITCASE IS 12 VOLT DC
The LED lights can only be used with the Solar Suitcase.

Understanding the Solar Suitcase

Main Control Board



1	Main power switch/circuit breaker	7b	Internal battery cable
2	Charge controller	8	Battery terminals/slip-on connectors
3	Light sockets	9	External battery socket
4	Light switches/circuit breaker	10a	Solar socket
5	Appliance switch/circuit breaker	10b	Solar plug on homerun cable
6	Appliance sockets (12V DC)	11	2 expansion sockets
7a	Internal battery socket	12	Terminal screws (on charge controller)

Understanding the Solar Suitcase
The Charge Controller

The Solar Suitcase connects solar panels to a charge controller, which optimizes the solar charge into the battery. The charge controller also regulates the use of the energy stored in the battery to power lights and other appliances.

WCS-200
ProStar-15 Charge Controller

Solar Charging Light

Battery Status Lights

Battery Type Selector
(must be on **2-SEALED**)

WCS-230
SunSaver Charge Controller

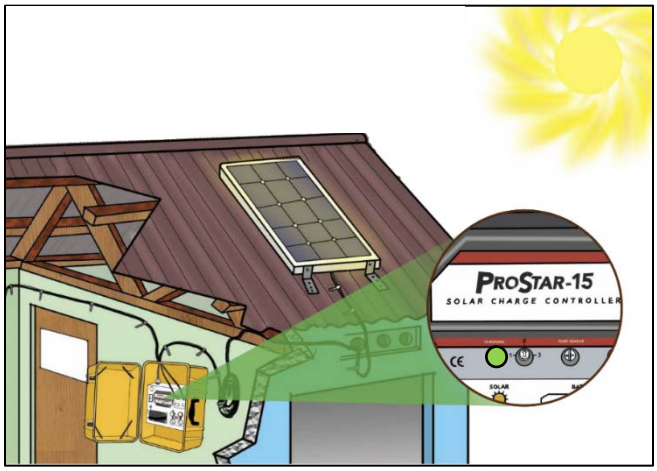
Solar Charging Light

The battery is charged every sunny day. But how do you know your battery is charging?

There is a green light on the charge controller above the sun. This light is called the solar charging light.

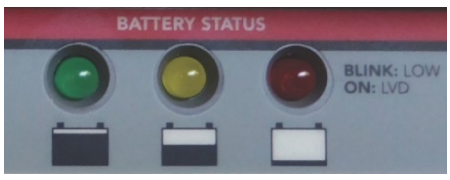
When it is daytime and the homerun cable is properly connected, this light will be green.

If you do not see this light in the daytime, the system is not properly connected.



Battery Status Lights

The three colored lights allow the user to assess the level of charge in the battery. The battery status light guides users as to when they can use lights and charge appliances.



Battery Status Light

The battery status light guides users as to when they can use lights and charge appliances.It is important to make sure users understand how to interpret these lights.

Lights

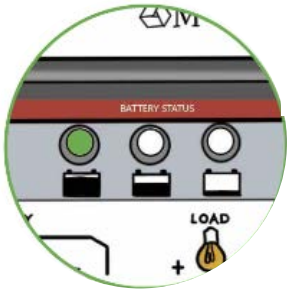
Phone Charging

Appliance Charging

BLINKING GREEN

100%

✓ ✓ ✓



SOLID GREEN

10%-90%

✓ ✓ ✗

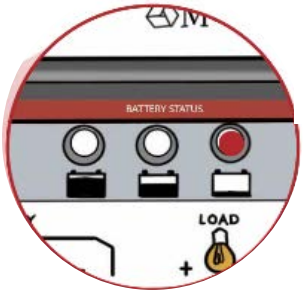
or on a sunny day

YELLOW

<10%

✗ ✗ ✗

RED OR BLINKING RED



0%

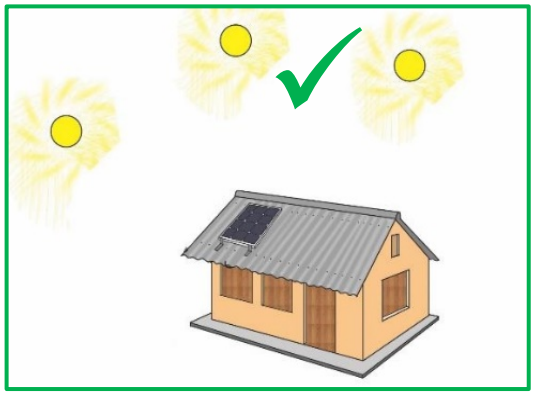
✗ ✗ ✗

or only in an emergency

Getting Started

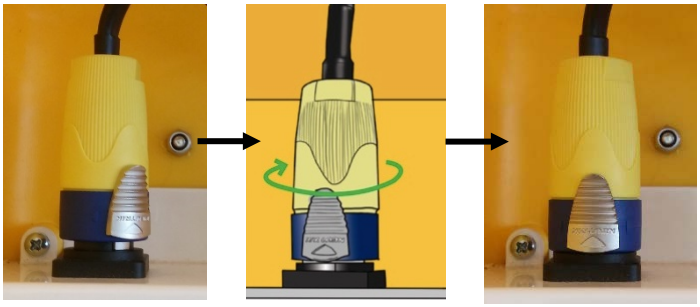
1. Place the solar panel(s) in the sun and connect the solar panels to the homerun cable

Place the solar panels in a sunny location. The panels should be permananetly mounted on a rooftop with no shade between the hours of 9 AM and 4 PM. The panels should have a minimum of 10 degree slope so that the rain will clean the panels off.



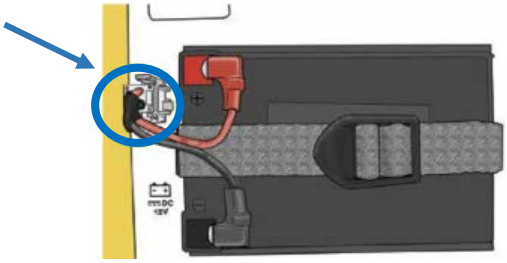
2. Connect the homerun cable to the Solar Suitcase

Make sure that the solar plug (yellow and blue) is fully inserted and rotated so that it is locked in. The silver tab will face forward and click into position.



3. Connect the battery to the Solar Suitcase

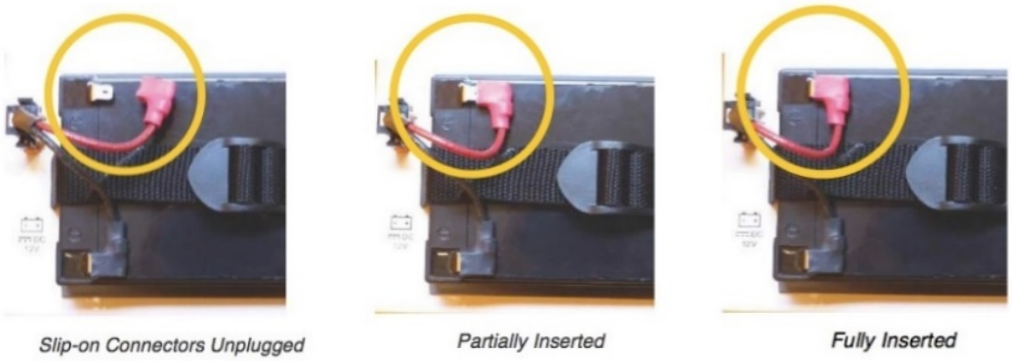
Insert the battery plug into the internal battery socket.



The Solar Suitcase arrives with a battery cable already connectred to the battery with slip-on connectors. If the slip-on connectors have come loose from the battery terminals, then:

Attach the (+) **RED** terminal on the battery to the (+) **RED** slip-on connector.
Attach the (–) **BLACK** terminal on the battery to the (–) **BLACK** slip-on connector.

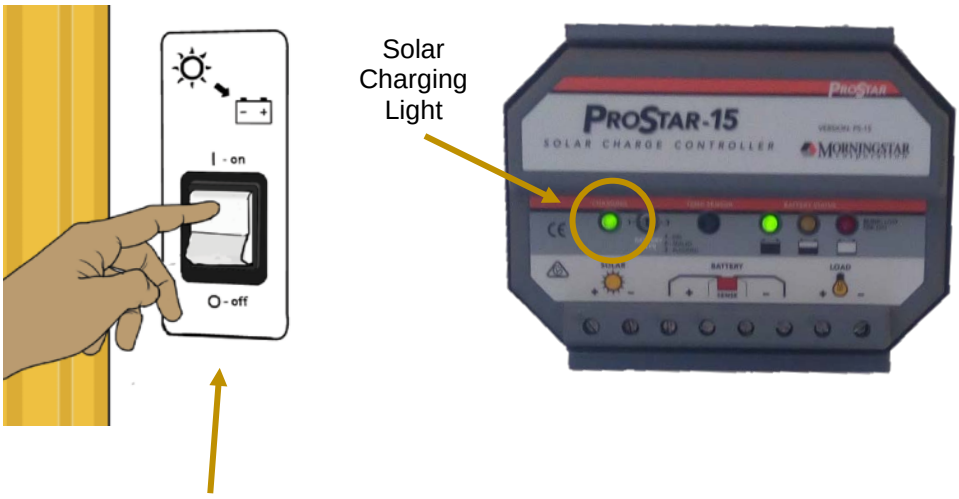
Make sure the slip-on connectors are fully inserted.



Slip-on Connectors Unplugged *Partially Inserted* *Fully Inserted*

4. Turn on the system

Once the solar panel and battery connections are secure, you can turn on the system. Use the main power switch to turn ON the system. The battery status lights will flash in sequence and the charge controller will turn on. After 3 seconds, the solar charging light will glow solid 🟢. The Solar Suitcase is now ready to use.



The main power switch should remain ON at all times The only time to turn the main power switch OFF is when you are replacing the main battery.

Appliances

The Solar Suitcase comes with the following appliances:

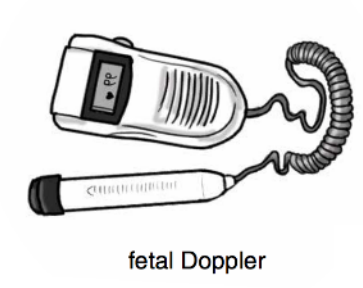
2 headlamps

Micro USB cable for headlamp

2-slot USB adaptor

Multi-tip phone charger

Depending on the product specifications ordered, your Solar Suitcase may also include the following **optional** appliances:



fetal Doppler

AA/AAA rechargeable battery charger

Charging Appliances

Appliances should only be **charged during the day** and when the battery status light is **green**. The battery status light on the charge controller will tell you whether or not it is ok to charge appliances.

If the battery is:

BLINKING GREEN – Battery is full. This is the best time to charge mobile phones and other appliances.

SOLID GREEN – Battery is between 10% and 90% charged. You may charge appliances on sunny days.

If the yellow or red lights are on, your battery is low. Do not charge any appliances at this time.

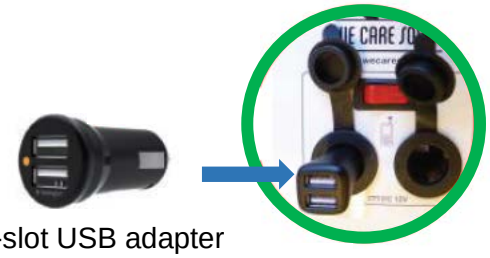
To charge appliances, BOTH the solar charging light AND the battery status light should be green.

Appliances
Phone Charger

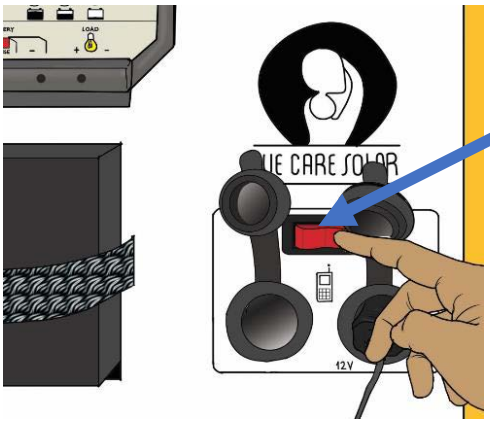
The Solar Suitcase comes with a multi-tip phone charger that is able to charge most types of cell phones.

Using the phone charger:

1) Plug the 2-slot USB adaptor into one of the appliance sockets and flip the appliance (red) switch to turn the appliance charger on.

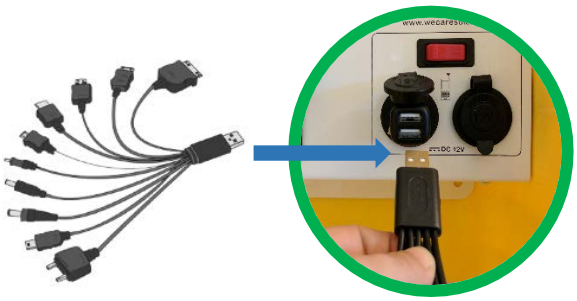


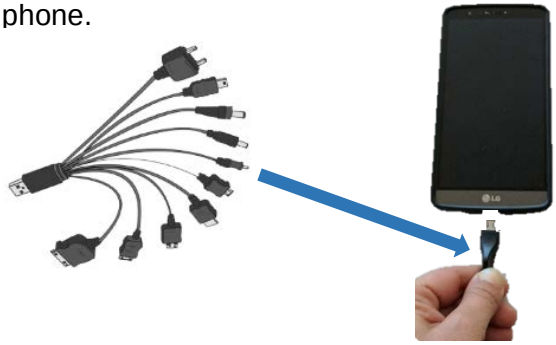
2-slot USB adapter



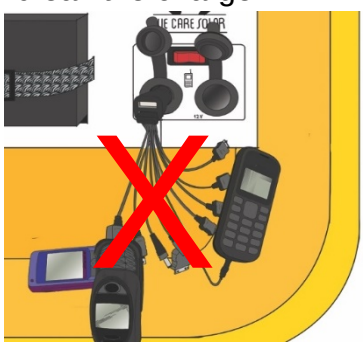
The appliance switch turns on both appliance sockets.

2) Plug the multi-tip phone charger into the 2-slot USB adapter and the appropriate plug on the other end of the multi-tip phone charger into the cell phone.





Only charge <u>ONE</u> phone at a time with the multi-tip charger. If you charge more than one at a time, it can break the charger.



You can also use your own cell phone charger with the Solar Suitcase, either by using the 2-slot USB adapter or by plugging a car charger directly into the appliance socket.

Appliances

Headlamps

The Solar Suitcase comes with two headlamps. Depending on when this Solar Suitcase was received, there could be different models of headlamps. The most likely models are pictured below.

A

On/off Button

One click to turn on the headlamp

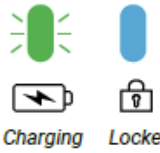
Long press to adjust the brightness

C

Battery Status Indicator

The indicator light comes on when the headlamp's power is on

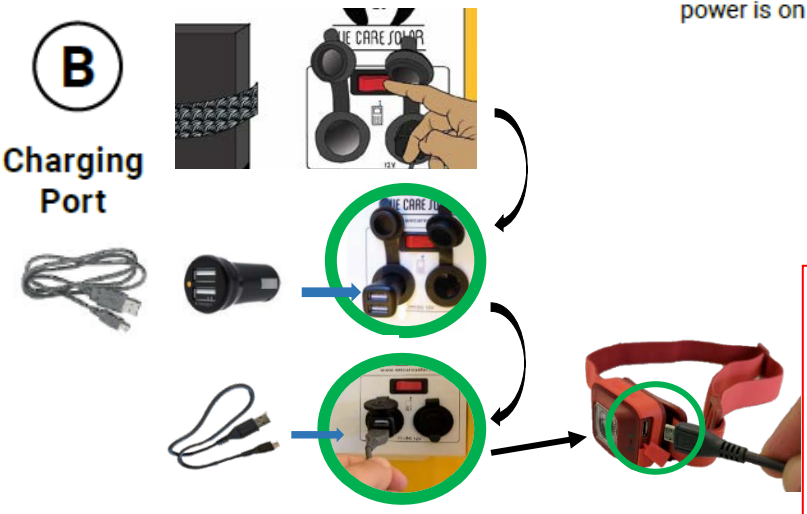
If it flashes orange, red, or white, it is time to charge the headlamp



If it flashes blue, press and hold for 4 seconds to unlock the lights

B

Charging Port

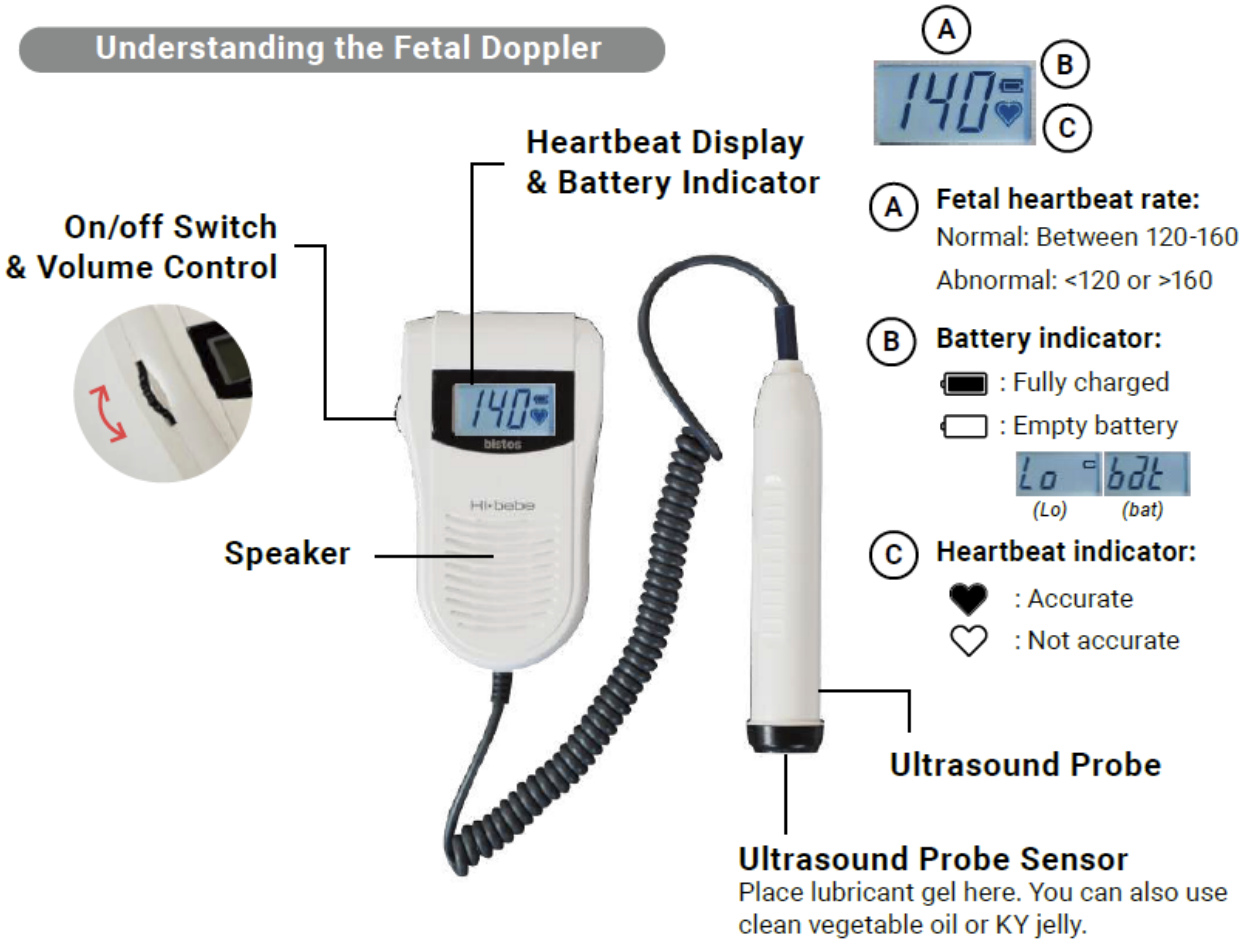


Note: If you have the white and the headlamp is not charging properly, you can try charging the batteries with the **rechargeable battery charger**. (The batteries in the orange headlamp are NOT removable.) The white headlamp takes three AAA rechargeable batteries.

Appliances

Fetal Doppler

Understanding the Fetal Doppler

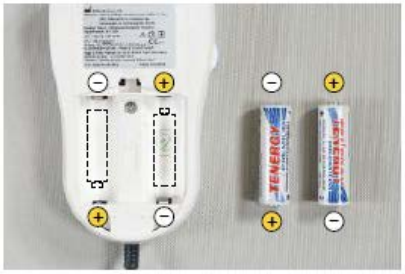


Loading AA Rechargeable Batteries into the Fetal Doppler

Step 1

Open the back cover
Press down and pull backward to open

Step 2



Place batteries
Make sure to match up the + & – symbols

Using the Fetal Doppler

1. Find the position of the baby and locate fetal chest

2. Place gel, clean vegetable oil, or KY jelly where you will best hear the heartbeat

3. Turn on the fetal Doppler

4. Hold the probe for 5 seconds and adjust the volume up if needed

5. If you don't hear the heartbeat, shift the angle of the probe and wait for 5 seconds

6. If you still don't hear the heartbeat, move the probe slightly to find the heartbeat and wait for 5 seconds

! Turn off the fetal Doppler when done

Rechargeable Battery Charger

The rechargeable battery charger charges AA and AAA rechargeable batteries, like those found in the fetal Doppler or some models of headlamps.

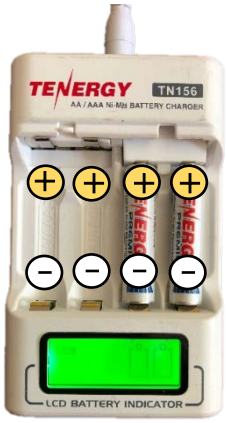
1) Open the back of the fetal Doppler or headlamp. Remove the batteries for charging.

2) To charge, place the positive side of the batteries in the positive side of the charger. To charge AA rechargeable batteries, the small white tab on the battery charger needs to be in the upright position. To charge AAA batteries, the small white tab needs to be moved downwards. Make sure you match up the + and – signs.

Charging AA batteries

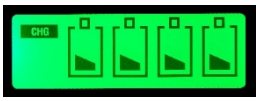
White tabs

Charging AAA batteries



Note: The positive tips of the batteries face in the same direction when they are placed in the charger.

3) Plug the rechargeable battery charger into the 12v socket. Read the rechargeable battery indicator. If the LCD screen is not lit, check that the charger is properly inserted into the appliance socket.



Charging

Fully charged

This battery shows the word “rechargeable” and can be used repeatedly

This battery is not rechargeable. It should be discarded when it is no longer working.

! Warning: Rechargeable Batteries vs Single-Use

- Only use rechargeable batteries with the TENERGY battery charger
- You should not throw away rechargeable batteries. They can be used over and over.

Installation Guide for Solar Suitcases

Installing the Solar Panel

Step 1: Safety

LOOK – Identify any potential dangers. This includes power lines, skylights, wasps, bats, holes in the roof, or rusty spots on the roof.

PLAN – Work safely. Make a plan with your team on how to work safely and communicate with your team.

BE AWARE- Do not touch electricity lines with your body or ladder. Do not walk near or over skylights. Avoid wasp nests. Avoid attics with bats or rodents.

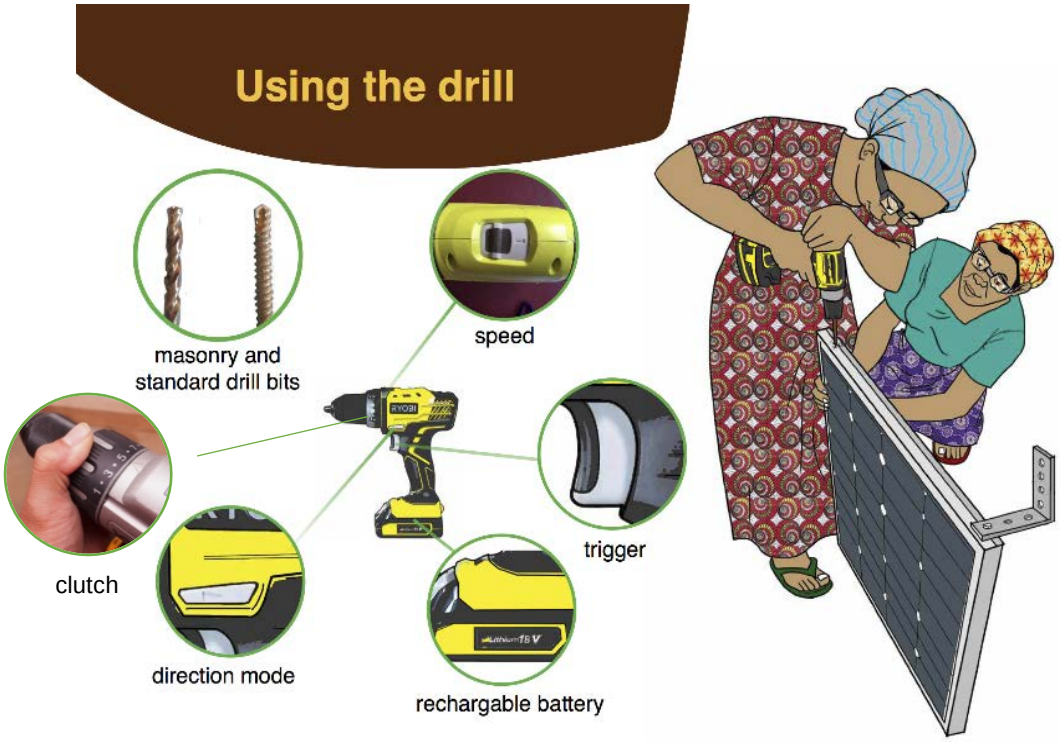
If roof is too steep or too weak for you to work on safely you can:

- Mount the solar panel on the eave of the roof while standing on the ladder. We do NOT want you to risk getting hurt.

- Mount the solar panel on a post or build a structure near the clinic to mount the solar panel and then route the Homerun cable into the clinic.

Ladder safety

- When you use a ladder, be careful and make sure it is stable before you climb.
- When standing at the base of the ladder, your outstretched arms should be able to reach the ladder.
- Only one person should be on the ladder at a time.
- Climb with your eyes facing the ladder.
- Have someone hold the ladder.
- When getting off the ladder onto the roof, step around the ladder and *not* over the top of the ladder.



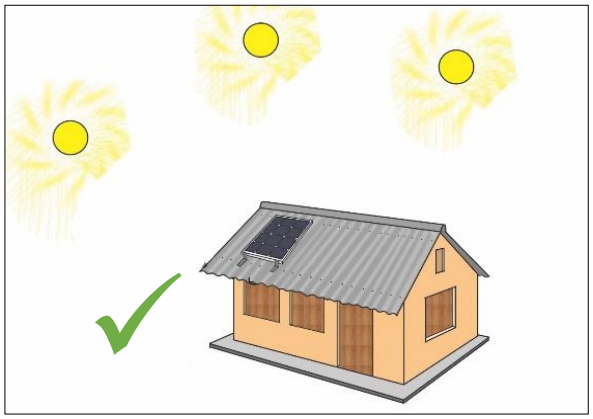
Using the drill

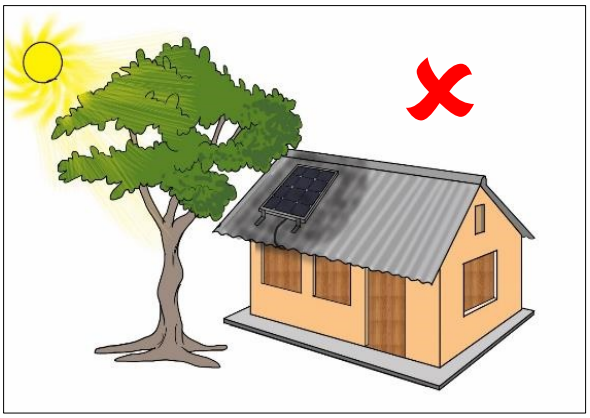
- Wear safety glasses when you are drilling.
- Make sure to point the drill straight.
- Use speed 1 for attaching screws and for drilling into concrete
- Use speed 2 for drilling into the panel

Step 2: Decide where you will place the solar panel.

Where is the best place to install the solar panel?

A solar panel needs sunlight to get energy, so install it where there are **no shadows** and where it gets **sun all year**.



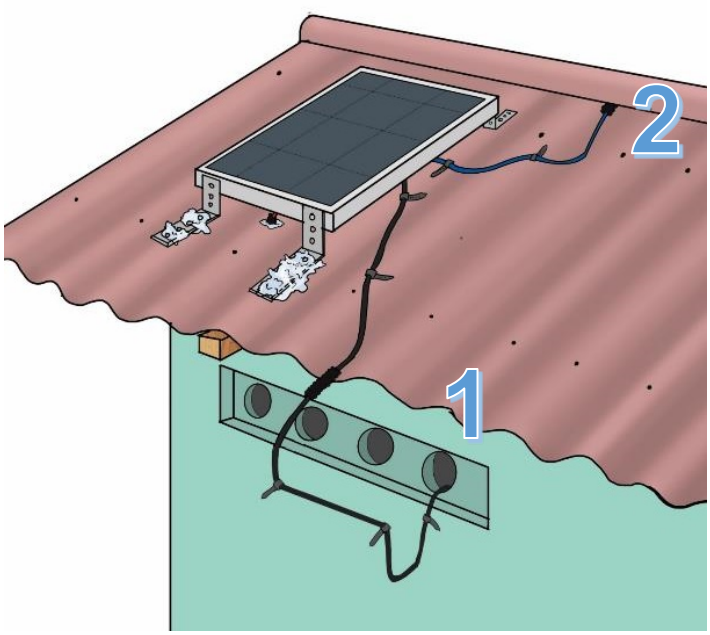


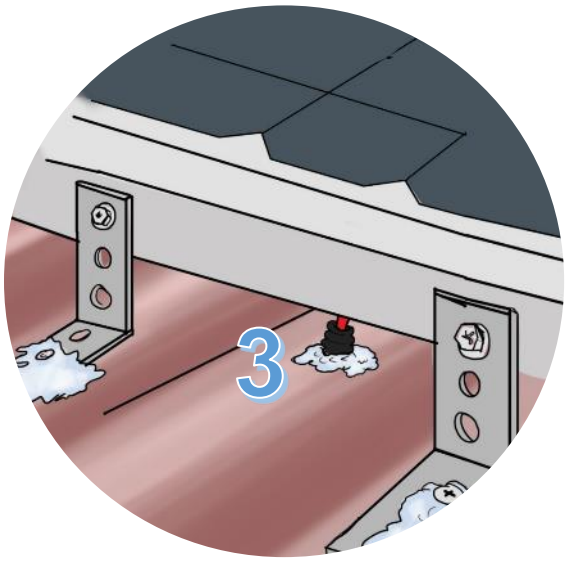
How far should it be from the Solar Suitcase?

The homerun cable that connects the panel to the Solar Suitcase is **only 11 meters**.

The picture shows 3 different ways the homerun cable could be routed:

1. Over the edge of the roof.
2. Under the ridge-cap of the roof.
3. Through the roof itself.



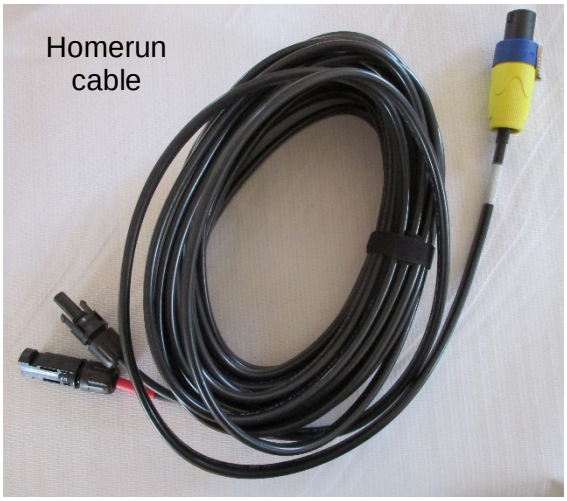


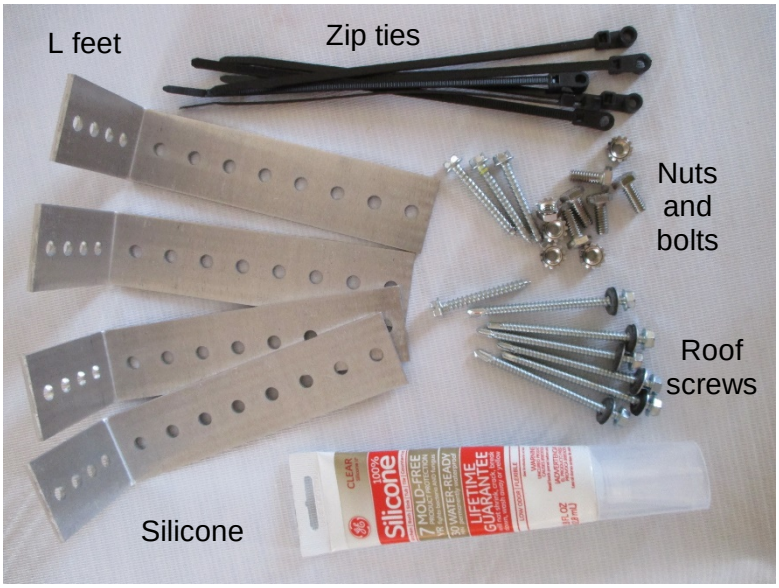
Step 3: Prepare the tools.

Prepare your equipment before climbing onto the roof so you do not have to climb many times and put yourself at risk.

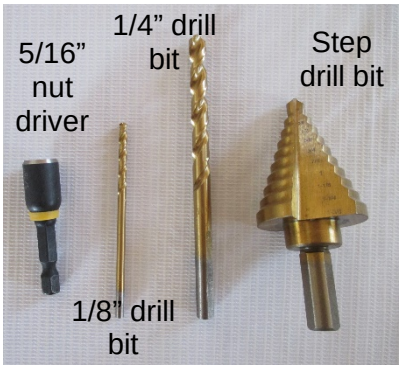
You will need the following tools to install the Solar Panel:

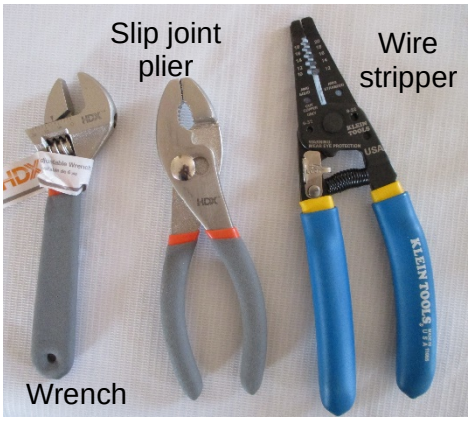
From the Solar Suitcase:



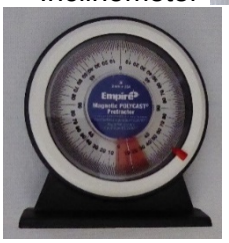


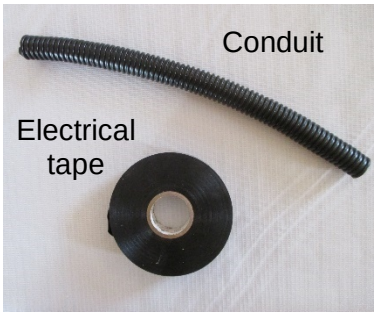
From the toolkit:





Inclinometer



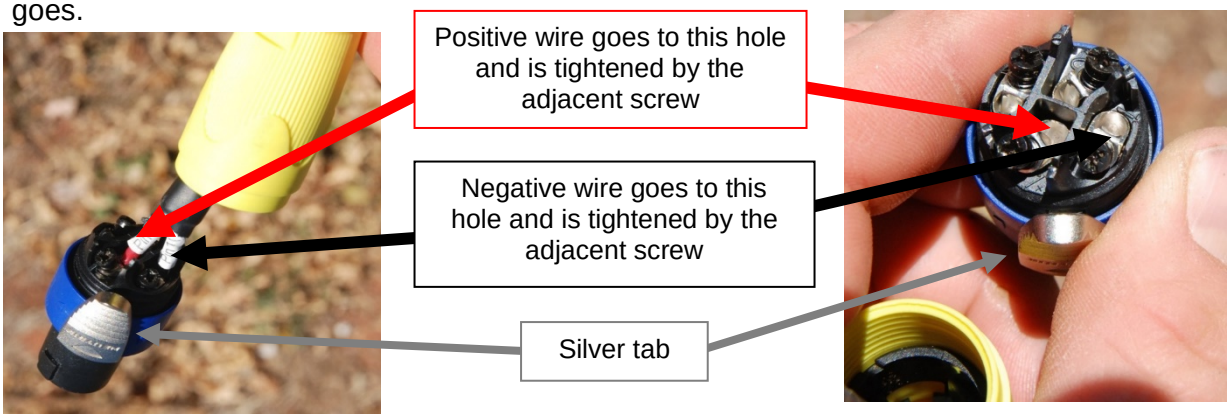


Step 4: If needed, prepare the homerun cable by removing the solar plug.

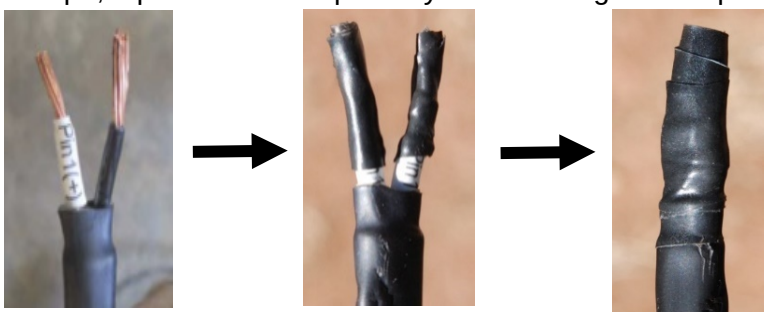
Sometimes it is easier to remove the solar plug when you are installing the solar panel. When you remove the solar plug, it is important to protect the wires with electrical tape so that they are not damaged while being passed through or over the roof.

To remove the cable from the solar plug:

- Unscrew the yellow and blue connector piece.
- Look carefully: There are four holes, but only two are used.
- Make note before removing the wires where the positive (+, red) and negative (–, black) wires go.
  - In the photos below, the hole to the left of the silver tab (marked “1+”) is where the red positive wire goes. The hole to the right of the silver tab (marked “1–“) is where the black negative wire goes.



- Loosen the screws until the wire can be removed. However, do not remove the screws.
- Using electrical tape, tape the wires separately and then together to protect them from damage.



To reattach the cable to the solar plug:

- Remove the protective electrical tape.
- Make sure to insert them into their correct holes. You must insert both wires in their respective holes at the same time.
- After inserting the wires into the proper holes, make sure the screws are tight.
- Pull on each wire to ensure they are locked firmly to the plug by the screws.
- Complete the job by putting the yellow and blue connector together and checking that it was done correctly.
  - The easiest way to check if it was done correctly is by plugging the homerun cable into the Solar Suitcase and seeing that the green solar charging light on the charge controller is illuminated. (Note: The homerun cable should be attached to the solar panel and the solar panel should be in the sun.)

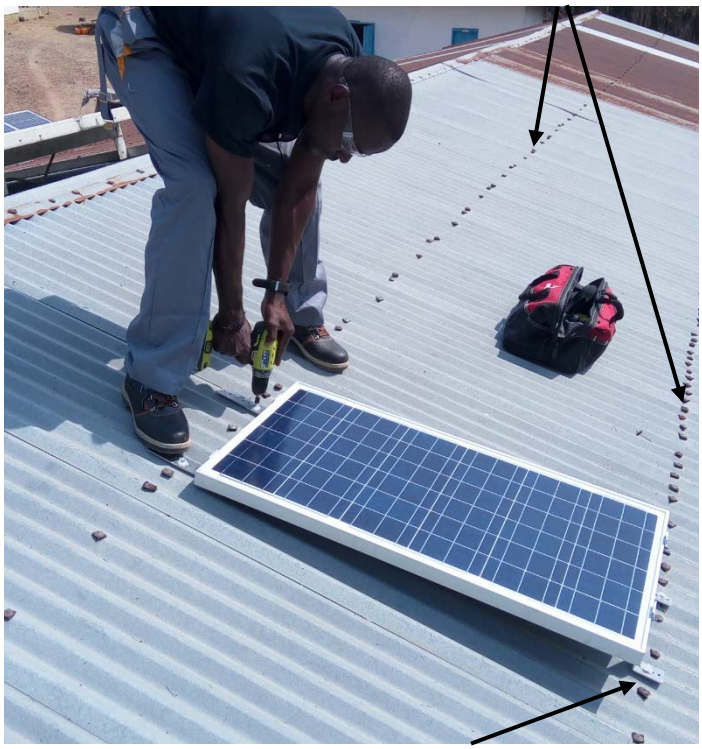
Step 5: Go up onto the roof and plan where you will mount the solar panel.

Choose carefully where you will step on the roof.

Look for a line of nails. The nails mean that there is a beam or rafter under the iron sheet. This is the safest part of the roof to walk on. Once you are on the roof there are a few more things to consider before attaching the panel.

- The solar panel must be attached to two beams.
  - ➢ You may need to adjust your L-feet to allow you to reach beams above and below the panel
- Tilt the panel 10-15 degrees to allow rainwater to flow off the panel and to maximize sun exposure (see figure 2).

Nails in the roof indicate roof beam location



L-foot is attached to the beam, indicated by the location of the nail

- On rare occasions, if you can't reach both beams, you can secure the middle of the panel to the beam using an L-foot on each side. Use one L-foot on the top and bottom of the panel to keep the panel from shifting (see figure 1).
- Depending on the situation, the L-feet can be placed in different positions in order to best reach the beams and change the angle of the panel.

Dotted red lines indicate roof beam location

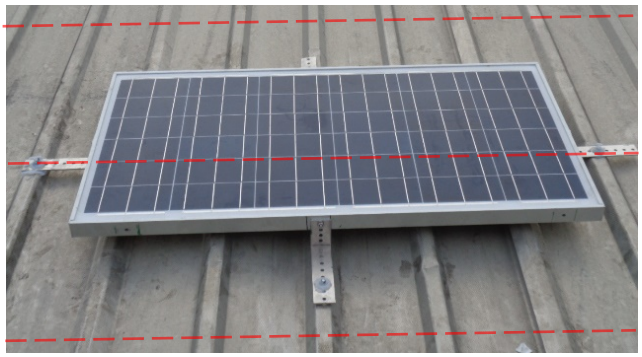


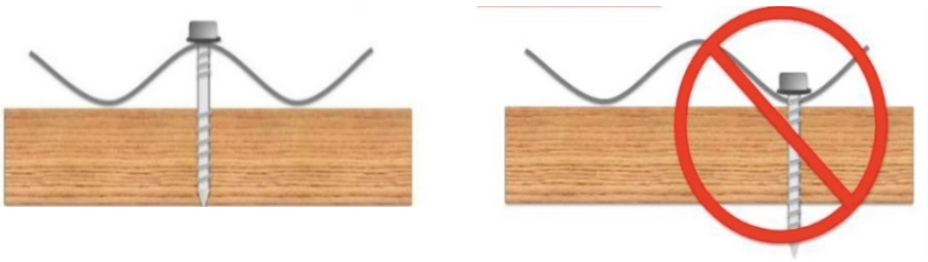
Figure 1

10-15 degree tilt

Figure 2

Step 6: Drill into the solar panel.

1. Locate the timbers/beams so that you will be able to screw the L feet into the roof timbers (framing/main support beams) and **into the peak of the corrugation**.

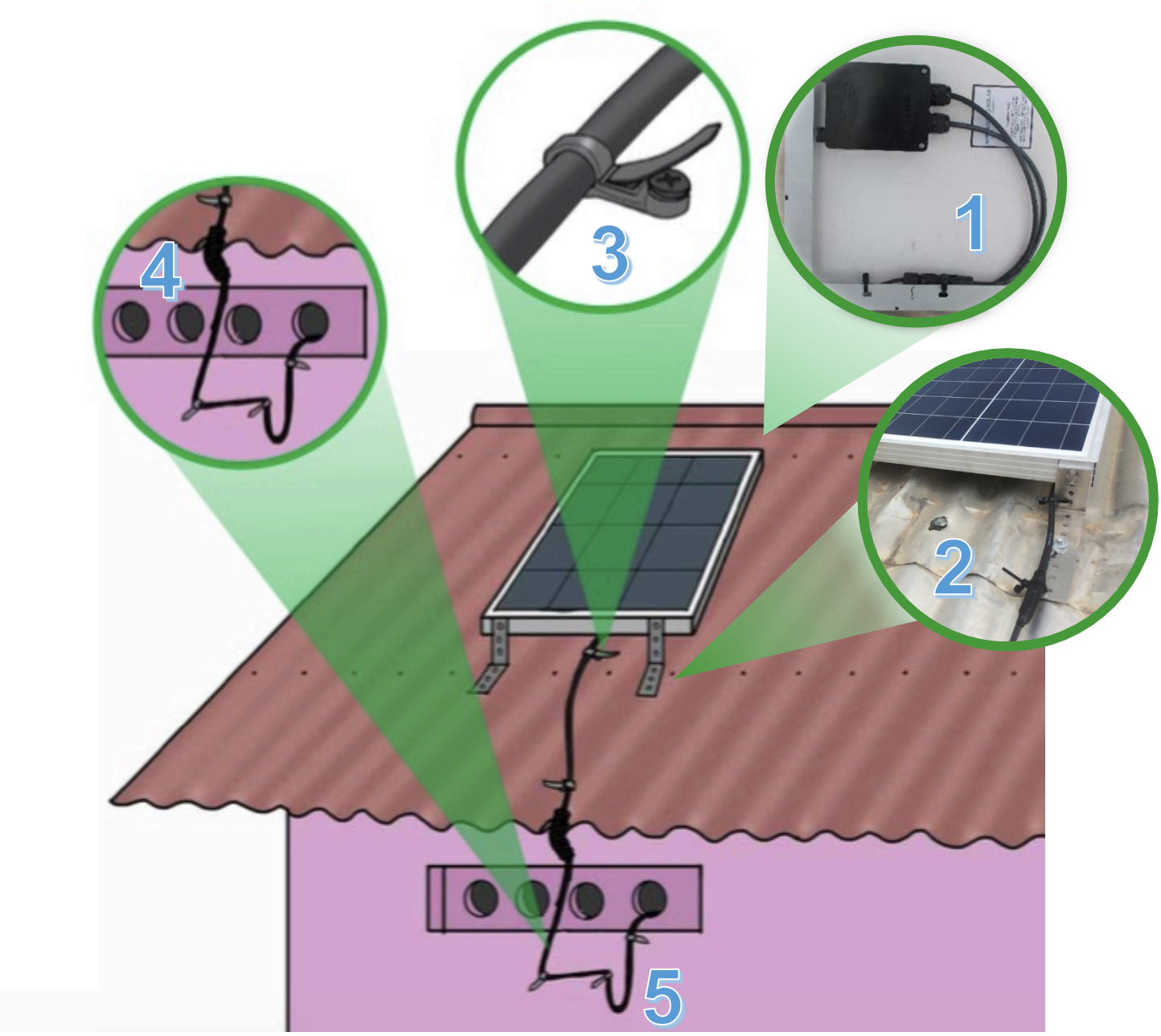


2. Mark the solar panel frame where the L feet are.
3. Mark the exact spot where you will drill into the panel on the center of the frame and the same distance from the edge of the frame.
4. Protect your eyes with the safety glasses and protect the back of the panel with an L foot.
5. Use the 1/4" drill bit to make the holes in the solar panel for the bolts to attach the L feet.

Step 7: Secure and protect the homerun cable.

Before you attach the solar panel to the roof, secure and protect the homerun cable. (The drip loop can be done after the solar panel is installed.)

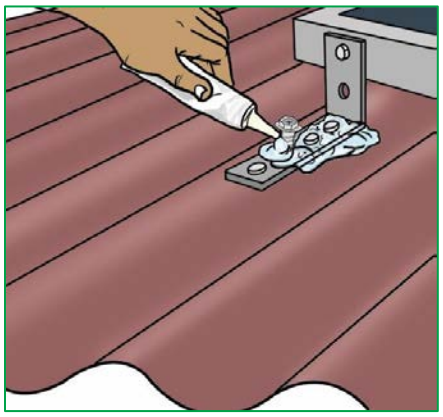
1. Stress relief near the junction box
2. Stress relief at another point on the panel
3. Stress relief on the roof
4. Protect the edge with conduit
5. Make a drip loop



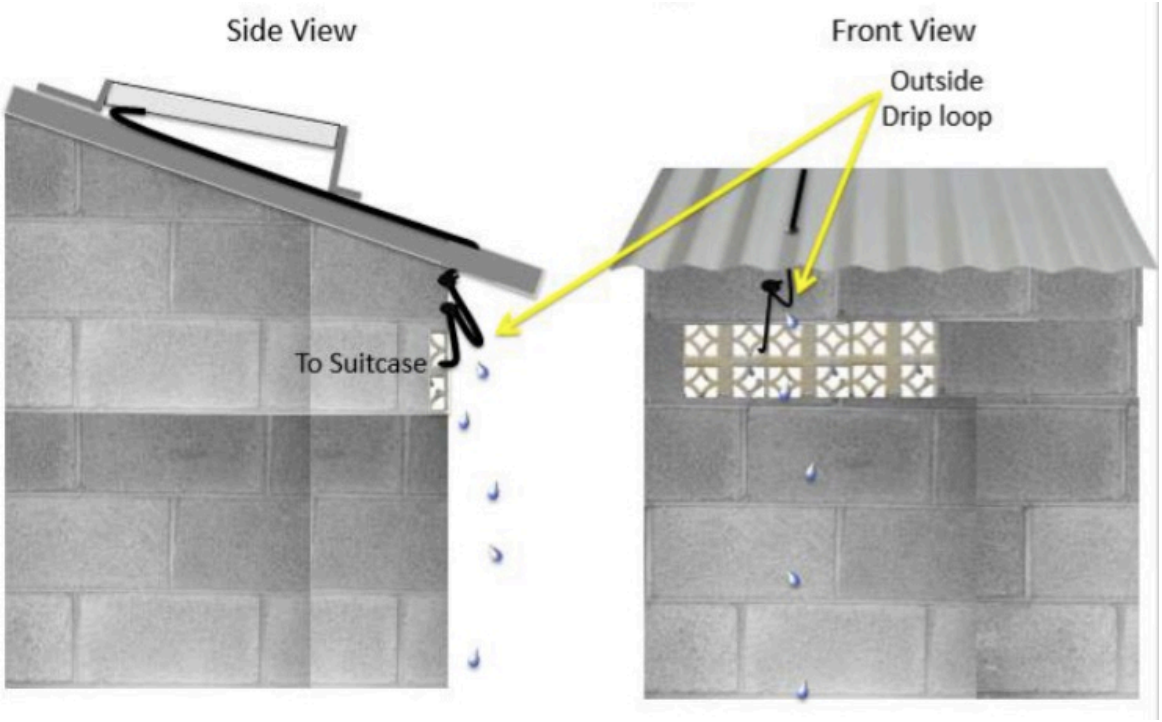
Step 8: Install the solar panel onto the roof.

1. Secure the L feet onto the solar panel using adjustable wrenches.
2. Mark the roof where where you will attach the L feet. *(Note: Do not mark where you will drill onto the roof until the L feet are attached to the panel.)*
3. Use the long roof screws to attach the L feet to the roof.
4. Be sure to use silicone to seal all the holes.

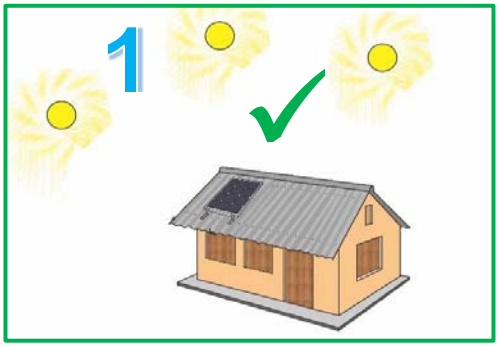


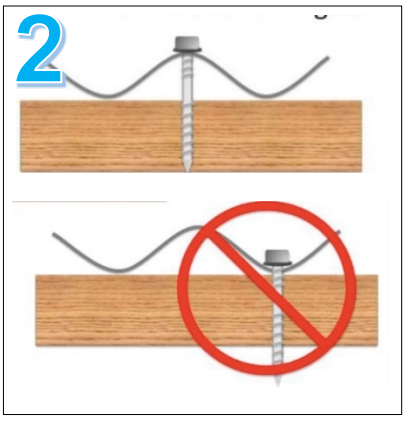


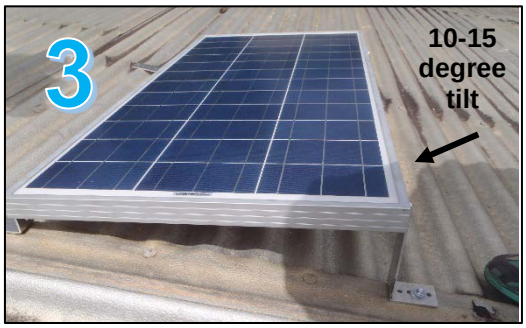
Step 9: Protect the Solar Suitcase from water damage by making a drip loop with the homerun cable.

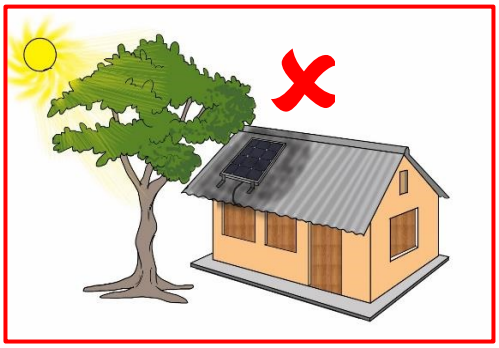


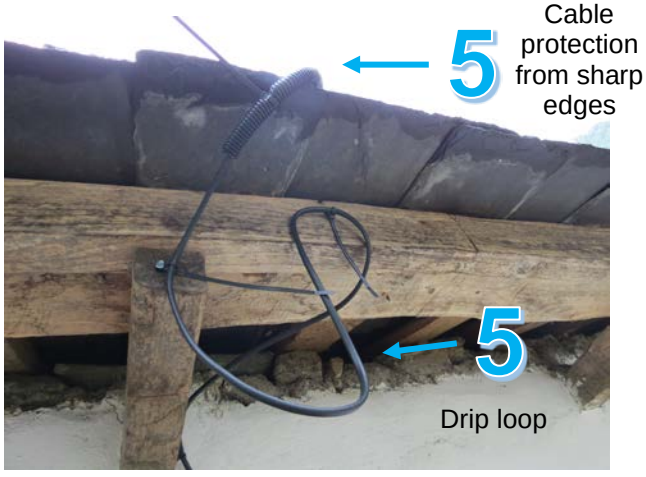
Solar Panel Installation Checklist	
1.	Solar panels have best access to sunshine and NOT SHADED ANY TIME of day.
2.	Solar panels are securely attached to the roof beams at the peak of the corrugation.
3.	Solar panels are installed at a tilt to prevent build-up of dirt and rain water.
4.	Solar panel frame looks straight and panel is not twisted.
5.	Homerun cable is wrapped with extra protection (e.g. with conduit) in places it might be damaged (sharp edges, doorways, etc.) and has a drip loop to protect water from getting into the Solar Suitcase.
6.	All roof holes are sealed with silicone.
7.	Cables on the back of the solar panel have stress relief to prevent the cable from being pulled.

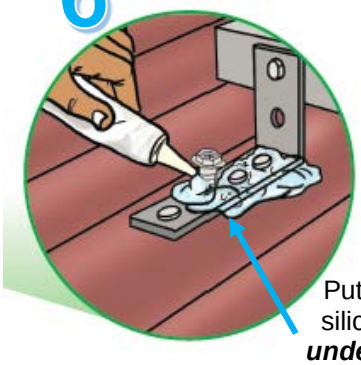


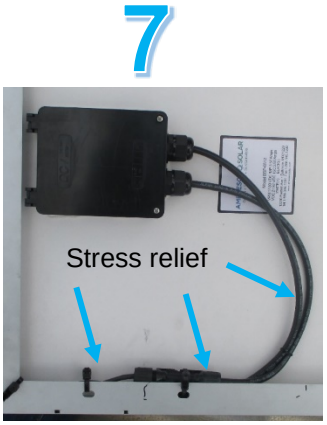




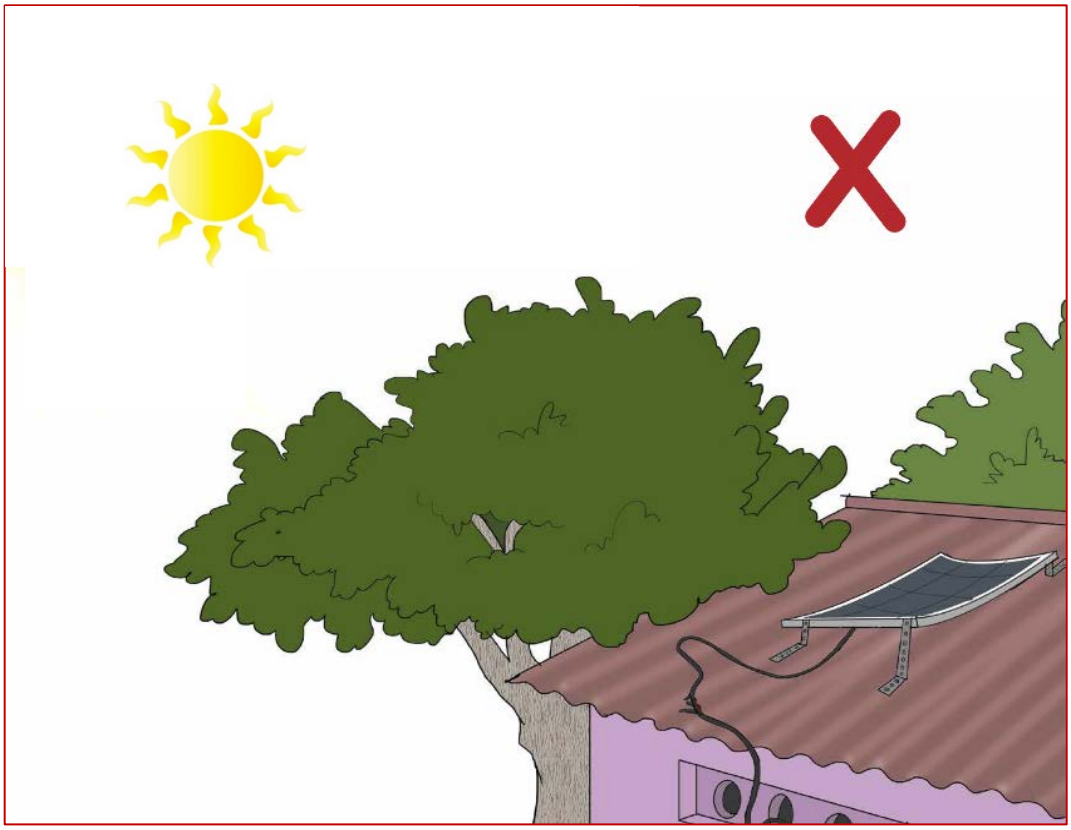


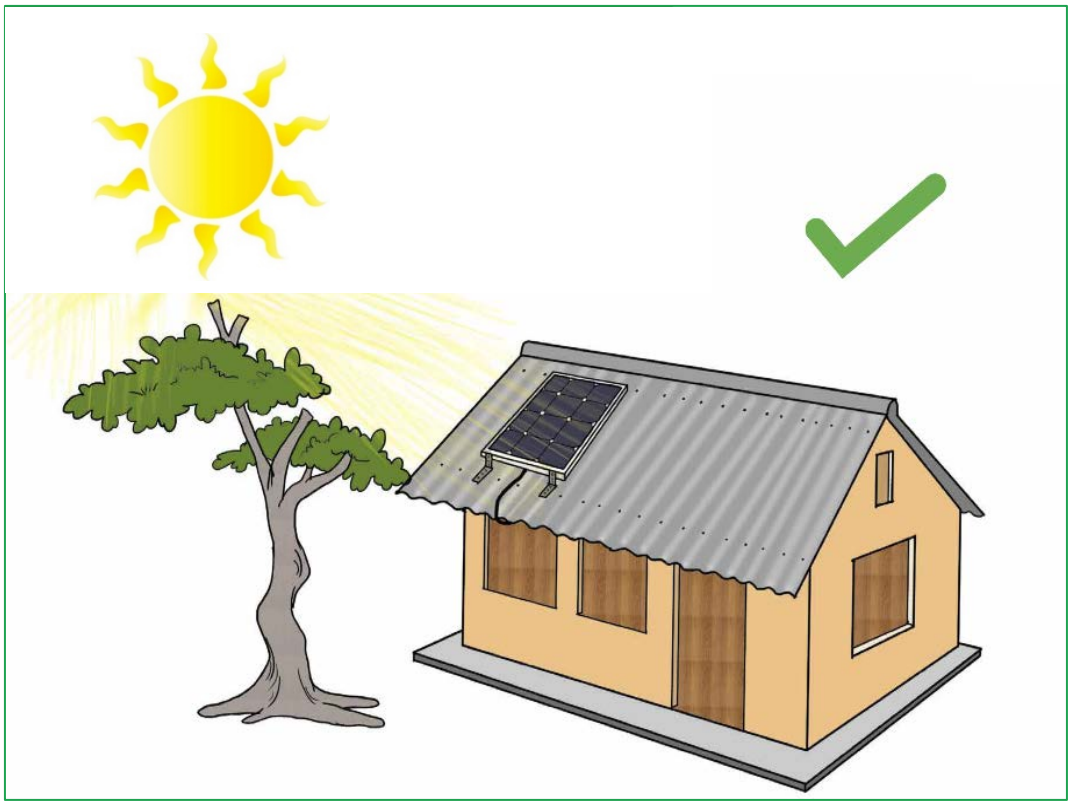






What's wrong with this installation?



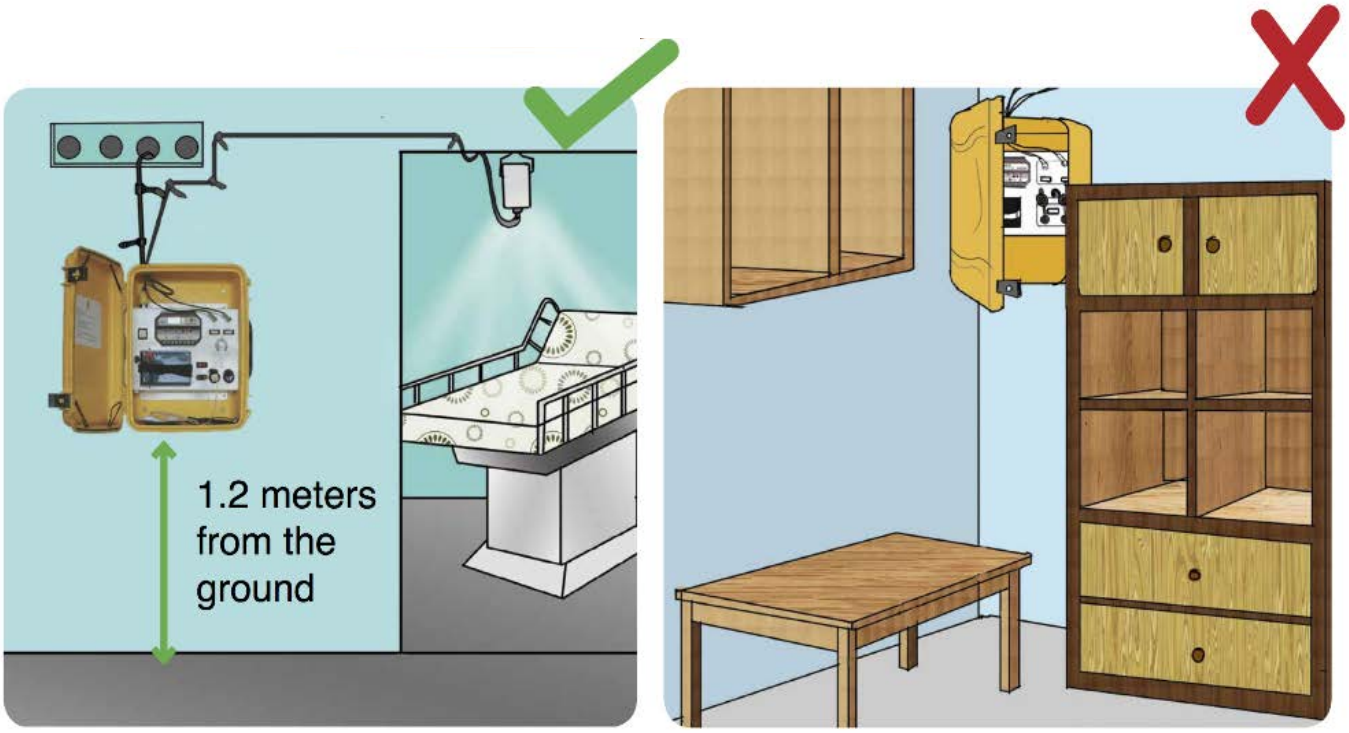


Installing the Solar Suitcase

Step 1: Choose a good location for the Solar Suitcase.

Before you install the Solar Suitcase, you need to make sure you have a good location that meets the needs of the healthcare staff:

- The Solar Suitcase gives power for the LED lights.
  - Install the Solar Suitcase where the lights can reach the delivery room.
  - Consider how the homerun cable from the solar panel on the roof will reach the Solar Suitcase.
- The Solar Suitcase has important appliances that should be easily accessed but are also safe.
  - Install in a room that is easy to access and secure.
  - Install where the door of the Solar Suitcase opens easily and is at a good height for the midwife to reach the light switches.
  - Do not install over water or over a patient bed.
- The Solar Suitcase is designed to be attached to the wall. However, sometimes you need another solution.
  - If the wall is too soft and the wall crumbles when drilling or the Solar Suitcase cannot be installed permanently,
  - Install it on a table to protect it from theft.



Step 2: Prepare the tools

The Solar Suitcase wall mounting kit has the tools you need to install the Solar Suitcase:

1. Larger hex head screws. Use these to attach the Solar Suitcase to the wall.
2. Use plastic screw anchors for screws in concrete or brick.
3. Zip ties can help you secure wires and cables to the wall.
4. There are smaller screws to attach zip ties to the wall.
5. You can use the hooks to hold lights that are moveable.
6. You can also use hooks to hold light wires.
7. Use the Velcro ties to keep the wires bundled and neat.
8. Screwdriver

You will also need the following tools from your toolkit:

9. Drill
10. 5/16” driver bit
11. Masonry drill bit or standard drill bit (depending on the wall type)
12. Safety glasses
13. Level

Step 3: Install the Solar Suitcase on the wall

1. Remove the contents of the Solar Suitcase, including the main control board (*Fig.1*).
2. Drill four holes in the back of the Solar Suitcase *outside of where the main control board will be reattached (Fig.2).*
3. Mark the wall where you will drill into the wall.
    - Use two people to mark the wall.
    - Make sure the Solar Suitcase doesn't move during marking – if not the holes will not line up.
    - Place a level on top of the Solar Suitcase to make sure the Solar Suitcase is even.
4. Set the first plastic anchor:
    - Drill holes 4 centimeters deep into the wall.
    - Insert the anchors into the holes all the way into the wall.
5. Attach the suitcase to the wall and mark the other 3 holes.
    - Use the level to keep it straight (*Fig.3*).
6. Take down the Solar Suitcase and place the remaining 3 plastic anchors.
7. Permanently install the Solar Suitcase to the wall with the LARGER hex-head screws.
8. Put the main control board back into the Solar Suitcase.
9. Cut grey plug so that it can wrap around the wires entering the Solar Suitcase and push it back into the hole to keep dust out

Remove all the contents of Solar Suitcase

Be sure to drill the holes outside of where the main control board will go.

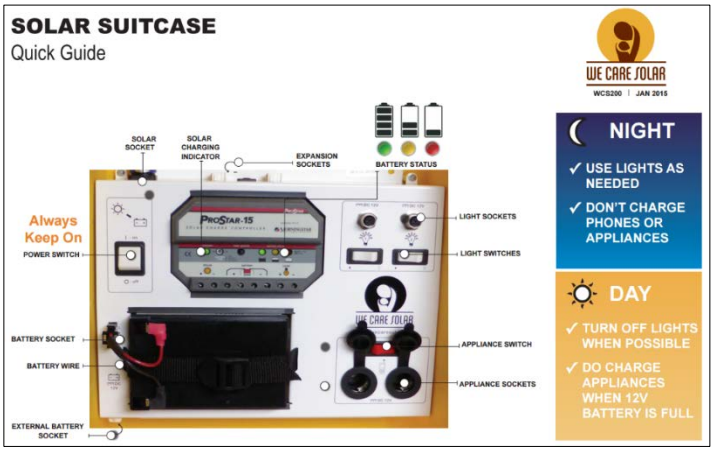
Use the level to keep it straight

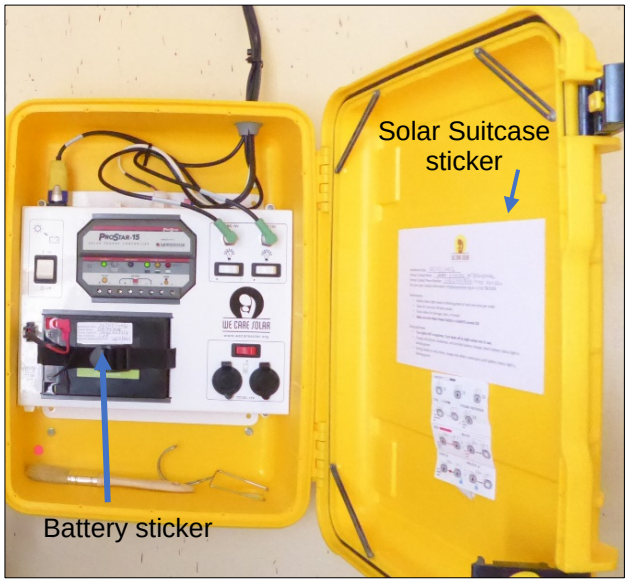
Step 4: Attach the poster and stickers

1. Attach Solar Suitcase poster to the wall near the Solar Suitcase in a place where the health workers can see it.
2. Fill in battery sticker and affix to battery.
3. Fill in Solar Suitcase sticker and affix to inside of Solar Suitcase door.

**See section titled “Installation Day – Documentation” for more details.

Solar Suitcase poster





Additional Solar Suitcase installation options

Reversing the door swing

If you want the Solar Suitcase door to open on the other side, follow these steps:

1. Remove the main control board
2. Rotate the Solar Suitcase 180 degrees
3. Drill a new hole in the new top of the Solar Suitcase for HR cable entry point

Table mount

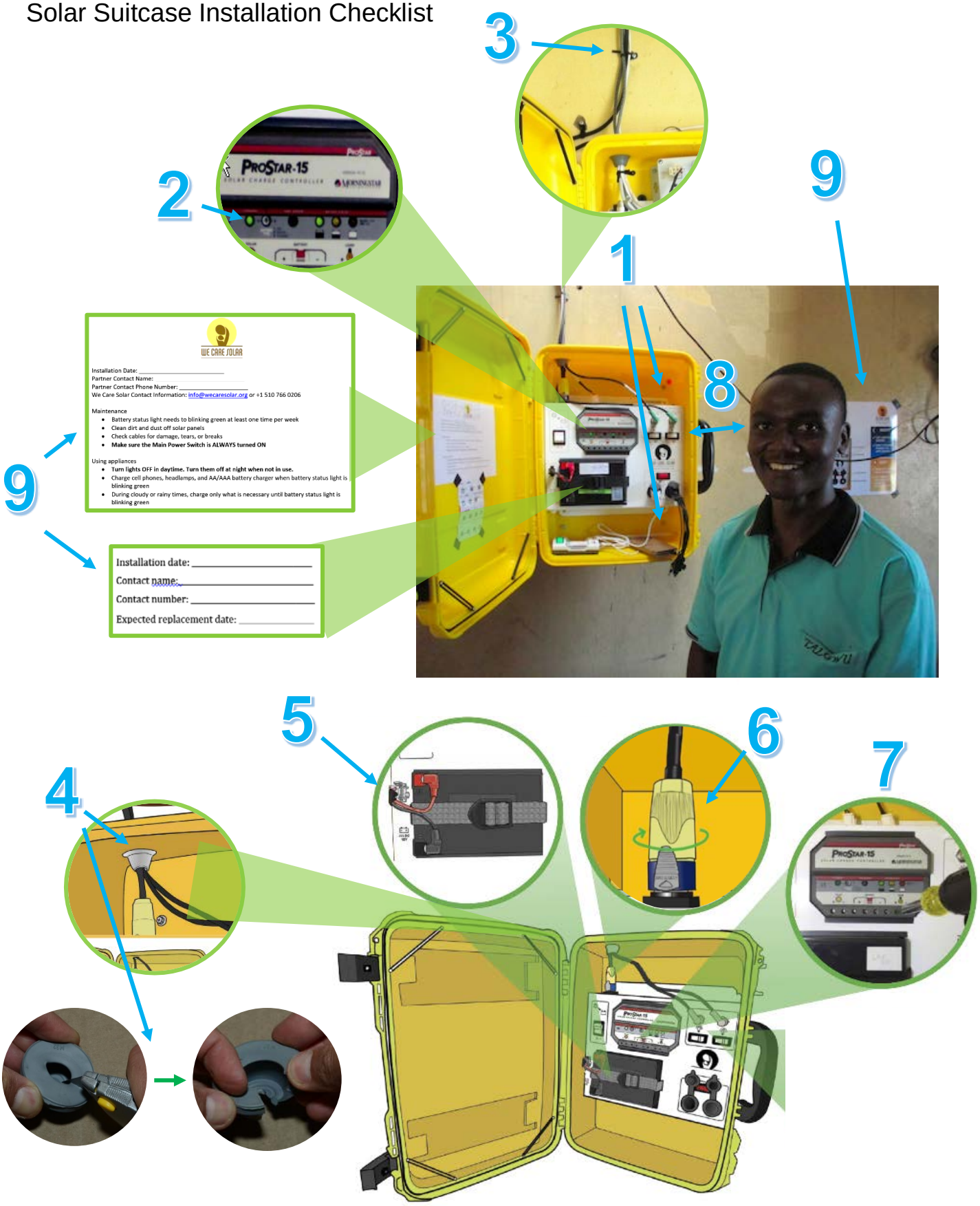
If the wall is too soft to install the Solar Suitcase, you can install it on a table:

- Mount the Solar Suitcase on a table that is a convenient height for use
- Attach the Solar Suitcase to the table with screws to prevent theft.
- Be sure to keep cables organized and off of the floor.

Table mount

Solar Suitcase Installation Checklist	
1.	The Solar Suitcase is firmly attached to the wall.
2.	The solar charging light is glowing green (during the day).
3.	Cables are fixed to the wall, making sure that the cables entering the Solar Suitcase are not being pulled (stress relief).
4.	Grey plug is firmly inserted into hole, protecting the Solar Suitcase from dust.
5.	The battery cables are properly connected (red to red, black to black) and attached to the main control board.
6.	The homerun cable is firmly clicked into place with the silver tab facing forward.
7.	Each charge controller screw is tight.
8.	The Solar Suitcase location is accessible and at an appropriate height for midwives and staff who will use it.
9.	Installation paperwork complete (see p.41).

Solar Suitcase Installation Checklist



Installing the LED Lights

Step 1: Determine the location for each light.

To determine essential medical activities that need light, ask the midwife the following three questions:

1. Where do you stand when conducting deliveries?
2. Where do you care for the baby after delivery?
3. Where does the mother rest after giving birth?

Most essential locations for lighting:

Delivery bed

Resuscitation table

Pre or post delivery room for patient observation

Other locations to consider (only after the above three are lit):

- Nursing station
- Receiving room
- Any other rooms that are related to maternal and newborn care
- Hallway

Location Factors to Consider:

- Light decreases intensity with distance
  - If you need a bright and focused light, place it directly in line with the area and as close as possible, or make it a mobile light so it can be brought closer if needed
  - If you are trying to illuminate a whole room, place the light in the center and as high as possible so the light reaches further
- Cable length = 10 meters
- Location of switches – make sure they are convenient for the health care workers
- Shadows – make sure that the light placement takes into account where medical staff will be standing

Step 2: Choose a method and install the light.

Methods for installing lights:

1. Fixed installation on a ceiling or wall

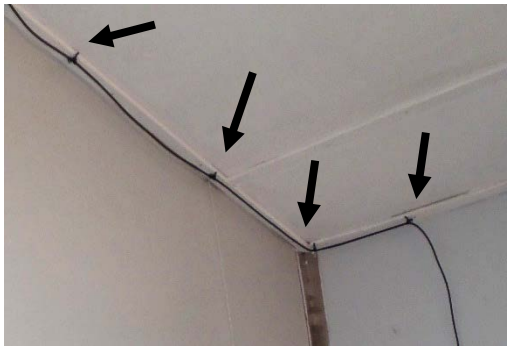
2. Moveable light on a fixed line

3. Movable light attached to the wall

- Use large hooks for the roll of light cable to hang on
- Use small hooks for the light to hang on
- Attach Velcro to help keep the light cable neat

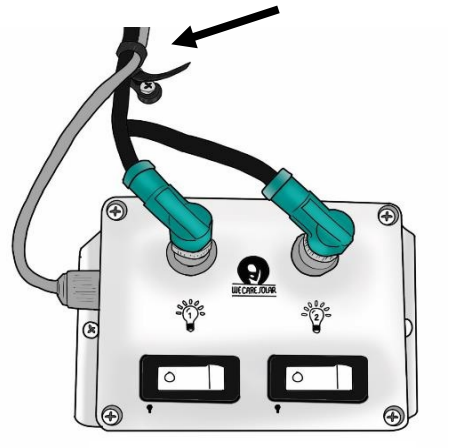
4. Moveable light hung on an IV pole or other fixture

Step 4: Install zipties to keep cables neat, out of the way of staff and off the floor.



Step 5: Install zipties to provide stress relief at Solar Suitcase and expansion switch box.

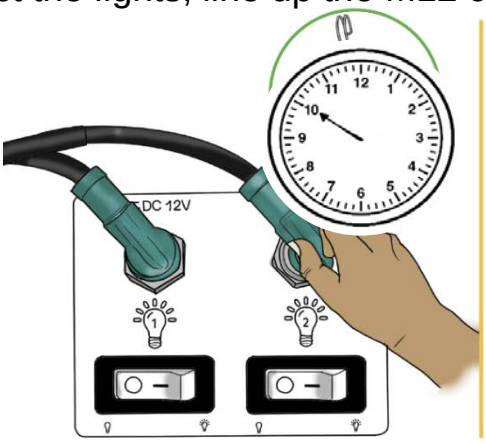
Note: Not all Solar Suitcases come with an expansion switch box.



expansion switch box

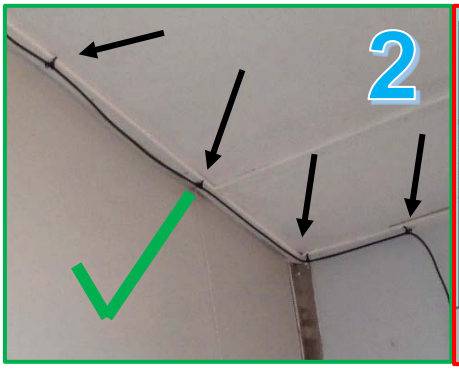
Step 6: Connect lights to the Solar Suitcase and expansion switch box.

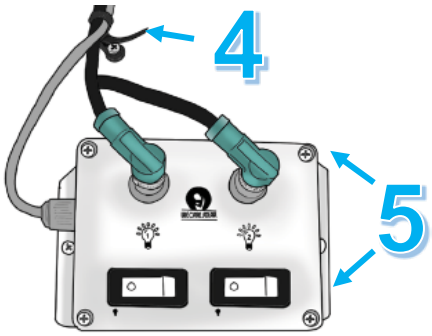
To connect the lights, line up the M12 connectors at the “10 o’clock position”.

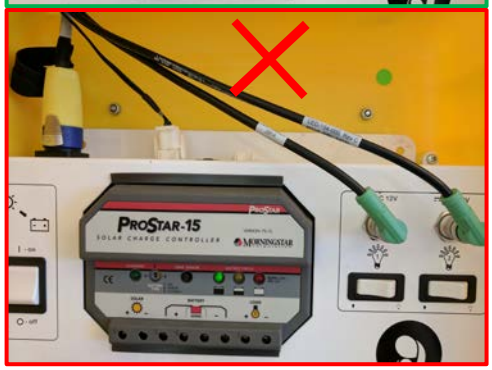


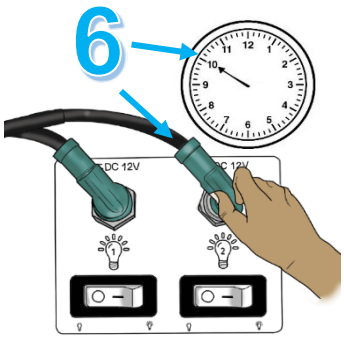
Step 7: Tighten zipties only when installation of all lights and homerun cable is complete!

LED Lights Installation Checklist	
1.	The lights are somewhere suitable for midwives, medical activities, and cable protection.
2.	The cables are neatly attached to the wall with zipties and are safe from damage.
3.	There is no stress at connection to light sockets and they have a comfort loop.
4.	Zipties provide stress relief for cables at entry to expansion switch box (if applicable) and to the Solar Suitcase.
5.	The expansion switch box is firmly attached to the wall (if applicable).
6.	Light connectors are properly connected to the light sockets at the “10 o’clock” position, and threaded locking rings are tightened.
7.	Hooks and lights are properly installed for fixed and mobile installations and midwives understand how to use the mobile lights.









Installation Day Documentation

Battery Sticker

The battery sticker informs the health clinic who to contact when the main battery needs to be replaced. On the battery sticker, fill in the installation date, expected replacement date (2 years for SLA battery, 5 years for LFP), and contact information of the person responsible for main battery replacement. If you are unsure who is responsible for the main battery replacement, contact the in-country organization in charge of this program. This sticker should be affixed to the battery on the Solar Suitcase.

Installation date: _____

Contact name: _____

Contact number: _____

Expected replacement date: _____

Solar Suitcase Sticker

The Solar Suitcase Sticker informs the health clinic who to contact if they are experiencing any problems with the Solar Suitcase or any of its components. On the Solar Suitcase sticker, fill in the installation date and the name and contact information of the in-country organization in charge of the program. We Care Solar's contact information is also on this sticker. This sticker should be affixed to the inside of the Solar Suitcase door.

WE CARE SOLAR

Installation Date: _____

Partner Contact Name: _____

Partner Contact Phone Number: _____

We Care Solar Contact Information: info@wecaresolar.org or +1 510 766 0206

Maintenance

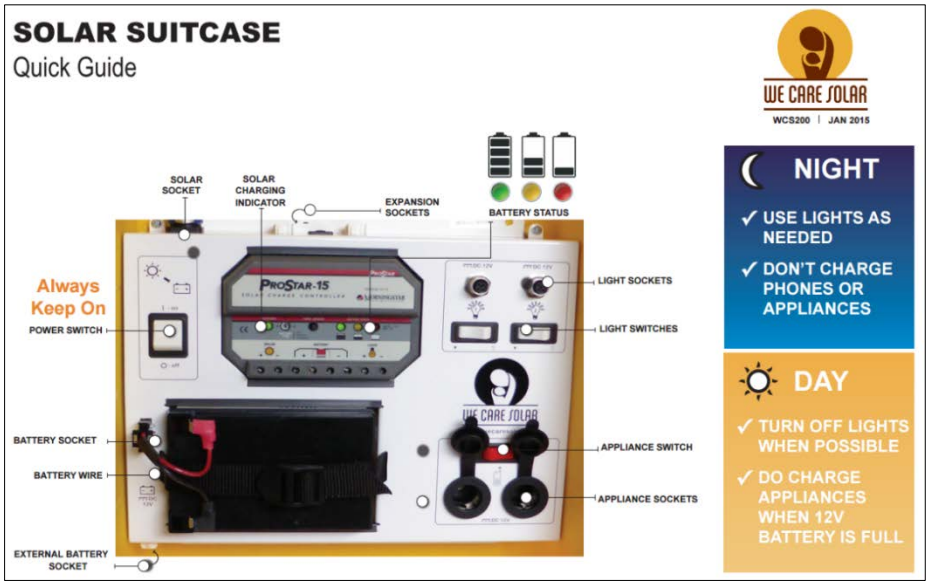
- Battery status light needs to blinking green at least one time per week
- Clean dirt and dust off solar panels
- Check cables for damage, tears, or breaks
- **Make sure the Main Power Switch is ALWAYS turned ON**

Using appliances

- **Turn lights OFF in daytime. Turn them off at night when not in use.**
- Charge cell phones, headlamps, and AA/AAA battery charger when battery status light is blinking green
- During cloudy or rainy times, charge only what is necessary until battery status light is blinking green

Solar Suitcase Poster

The Solar Suitcase Poster comes inside the Solar Suitcase and is a quick guide for the health facility staff. It should be affixed to the wall close to the Solar Suitcase and at eye level.



Teaching Healthcare Workers How to Use the Solar Suitcase

Check for Health Worker Knowledge

If the health workers were ALL present at the training on installation day, you can test their knowledge by asking the following questions:

Ask key users the following questions to demonstrate their knowledge of how to use the Solar Suitcase. Make sure ALL health workers can answer these questions:

1. Where is the main switch? When do you turn it off?
2. What do the different lights mean on the charge controller? (Make sure they know the difference between the solar charging light and the battery status light, as well as what to do when the battery status light is blinking green, green, yellow, and red.)
3. Where are the light switches? When should you use the lights?
4. Where is the appliance switch? When should you charge appliances?
5. Show me how to use the battery charger. What kinds of batteries can you charge in the battery charger? What does it mean to charge the batteries in “families”?
6. When can you charge your phone? How many phones can you charge at one time with the multi-tip phone charger?
7. Show me how to use the fetal Doppler. Should you turn it off when it is not in use? What kinds of lubricants can you use with the fetal Doppler?
8. Show me how to use the headlamp. How do you charge the headlamp?
9. Who do you contact if you have a problem with the Solar Suitcase? Who do you contact when the main battery needs to be replaced?

If healthcare workers can’t answer these questions correctly or there are some new health workers there, you should conduct a full refresher training. Refer to the section called Teaching Script for what topics to cover.

We Care Solar Suitcase Teaching Script

This script is an example of how to present all the information about the Solar Suitcase to the healthcare worker. It is meant to act as a guide. As you become familiar with the Solar Suitcase, you do not need to follow the script, but make sure that you have covered all the relevant topics described below.

1. **INTRODUCTION: [***Say who you are, why you are here, and your role in providing solar suitcase systems to health centers*.] For example, "My name is _____, I work [name of in-country organization], I help install Solar Suitcase systems and teach health center staff in the use of the Solar Suitcase."

2. **OVERVIEW: Explain briefly how the Solar Suitcase works using Solar Suitcase and poster.**

   The Solar Suitcase is a complete solar electric system:
   The Solar Panel captures sunlight and changes it into electricity.
   The Battery stores electricity: like a bucket storing water.
   The Home Run Cable brings electricity from solar panel to battery.
   The Charge Controller regulates the electricity going into and out of the battery.
   The Charge Controller is like our "eyes" into the battery. It tells us when the battery is full.
   The Solar Suitcase comes with Lights, Headlamps, a Cell phone charger, and a Fetal Doppler. [*Hold up each appliance.]*

   The Main Switch turns the whole system on**: <u>Must be on for Solar Suitcase to receive charge from the sun.</u>** Also must be on in order to be able to use lights and charge appliances like the headlamps, cell phones, fetal Doppler.
   - Allows electricity to flow from Solar Panel to Solar Suitcase, and from Battery to loads.
   - **This Main Switch should always remain on,** except when you want to change the main battery, or if you are transporting the Solar Suitcase**.** *[Invite someone to turn the main power switch from the off position to the on position.]*

   When **Main Switch** is turned on, the **Charge Controller** lights will turn ON. Now the solar suitcase is ready to be used.

   REVIEW OVERVIEW: [*Ask questions to ensure people have understood.]*
   1. What does the battery do?
   2. What does the solar panel do? Does it make electricity at night?
   3. What does the charge controller do?
   4. When should you turn off the **Main Switch**? → Answer: Only to change the main battery

3. **READING THE CHARGE CONTROLLER**
   - **Solar Charging Light:** Above the sun icon: green
     - When the solar panel is under the sun, this light will be lit green. *[Show the green light over the sun icon.]*
   - **Battery Status Lights:** Above battery icon: blinking green, green, yellow, blinking red, red
     - These lights tell us when the battery is full, has energy, is nearly empty, or is empty.

- It is important to know how full your battery is to help you know when to charge your appliances and when to save energy.

BLINKING GREEN battery status light **–** This means there is more power coming from the solar panel than the main battery can utilize. So…. There is EXTRA electricity available.

- ✓ It is a good time to charge your cell phone, your headlamps, or the AA batteries included in your Solar Suitcase for the fetal Doppler.

GREEN battery status light – the battery between 10% and 90% full.

- ✓ Only use lights at night.
- ✓ Only charge necessary appliances during the day.

YELLOW battery status light – the battery is almost empty.

- ✓ It is time to save energy. DO NOT charge up new appliances. Turn off your lights if they are not needed, OR only use one light, and wait for the sun to recharge your battery.
- ✓ If you have a medical procedure and need to use a light, we recommend you use ONE light rather than BOTH of the lights.
- ✓ Get your headlamps ready.
- ✓ Turn off all your other appliances.

RED battery status light – the battery is empty.

- ✓ The battery is depleted and the system will automatically shut off until the battery can recharge from the solar panels.
- ✓ When this occurs, turn off the appliance and light switches so that the battery can fully recharge the next day (when there is sunlight). **Keep the Main Switch ON**.
- ✓ Wait for the battery to recharge. The battery will recharge the next day using sunlight.
- ✓ When the battery status light is green you can use the Solar Suitcase again.

REVIEW CHARGE CONTROLLER *[Ask questions to ensure people have understood*.]

1. What do the different color lights indicate? →Answer: Blinking green – there is extra power; Green – battery is 10-90% full; Yellow – battery is getting close to empty; Red – battery is empty.
2. How do you know when it is ok to charge appliances? → Answer: When it is sunny and the battery light is blinking green or green.
3. How can you tell that the solar panel is properly connected? → Answer: When the green charging light on the charge controller is lit.

4. USING THE SYSTEM

a. USING THE SYSTEM during the NIGHT:

- The main function of Solar Suitcase is to provide lighting for medical procedures at night.
- **The Main Battery has a LIMITED amount of energy,** and is the only source of energy at night. A fully charged battery will keep the lights on all night.
- **Night is the time to use medical lights.**

- Use the lights when you need them.
- Each light has its own switch.
- Only use one light per room when you are not treating patients.
- Turn both lights off when they are not needed.

- *DO NOT* charge your cell phone or rechargeable batteries at night, unless there is an emergency. [*Refer to poster. Show that section. Have the entire group read this out loud.]*
- You may *use* appliances at night, however the batteries should be *charged* during the day.

b. USING THE SYTEM during the DAY:

- When it is **daytime**, make sure to TURN OFF your lights, unless needed for medical procedures.
- When the green battery status light is flashing you can use the Solar Suitcase to charge cell phones, the headlamps and rechargeable batteries. When the light is flashing green: There is extra energy, and on a sunny day, the Solar Suitcase can charge several phones and appliances.

REVIEW USING THE SYSTEM: *[Ask questions to ensure people have understood.]*

1. Should you charge cell phone at night? →Answer: No, unless needed for emergency.
2. Should I leave lights on all the time if battery is full? → Answer: No, use the lights when needed. Turn off when not needed.

5. APPLIANCES

a. Appliances- **CHARGING CELL PHONES**

- *[Show how to connect cell phone to suitcase with USB adapter.]*
- Charge only ONE cell phone at a time on the multi-tip phone charger.
- Make sure USB adapter is pushed all the way into the socket.
- *[Ask for volunteers to charge their phone.]*
- The **Red Appliance Switch** turns on both power sockets on bottom of the Solar Suitcase.
- If you cannot find the right attachment for your particular cell phone, or if the cell phone adaptor breaks, you can use any cell phone charger that comes with a car charger plug. These can be purchased locally.
- Turn OFF the Red Switch when you don't need to charge any device or batteries.

b. Appliances- **USING THE HEADLAMPS**

- There are two orange headlamps.
- These are special headlamps because they can be charged just like a cell phone.
- First, make sure to place the USB adapter into the appliance socket and turn on the Red Appliance switch.
- To charge the headlamp, insert the micro-USB plug into the hole under rubber stopper on the headlamp and the USB plug into the USB adapter in the appliance socket.

- When the headlamp is charging, the headlamp LED will be blinking green. When the headlamp is fully charged, the LED light on the headlamp will be solid green.
- To turn on headlamp: push the button on top. *[Show how to turn on the headlamps.]*
- Adjust the beam of the light like this. *[Show how to adjust where the light beam directs by swiveling the headlamps. Also, show the different light settings and how to hold down the button and dim the lights to conserve energy and make the batteries last longer]*
- [*Have students practice*]

c. Appliances - **USING THE AA/AAA BATTERY CHARGER.**

- AA/AAA battery charger will charge RECHARGABLE AA and AAA batteries.
  - RECHARGABLE AA batteries are included in the Solar Suitcase for the fetal Doppler.
  - The charger CANNOT be used with single-use batteries. If you place single-use batteries into the battery charger, the charger will break.
  - Only use the rechargeable batteries provided with the Solar Suitcase in your AA/AAA battery charger, or other batteries that are rechargeable.
  - Charge the batteries in "families", meaning they get charged and discharged together.
  - These batteries will power your fetal Doppler and other small devices.
- How to charge: place the positive side of the batteries in the positive side of the charger.
- Mark the positive side of the charger with a + sign.
- We included AA rechargeable batteries. The small white tab on the battery charger needs to be in the upright position to accommodate the AA batteries.
- [*Have volunteers demonstrate how to put in batteries in front of whole class.]*
- During the daytime, you CAN charge a phone and the rechargeable battery at the same time.
- If you run out of rechargeable batteries, the fetal Doppler can use single-use batteries. However, you cannot re-charge the single-use batteries in the Battery Charger. DON'T PUT SINGLE-USE BATTERIES IN BATTERY CHARGER.
- **ONLY RECHARGE BATTERIES ON SUNNY DAYS WHEN THE MAIN SOLAR SUITCASE BATTERY IS FULL!!!!!!**

d. Appliances- **USING THE FETAL DOPPLER**

- You can listen to a fetal heart beat by placing the fetal Doppler probe on the mother's abdomen where you think the baby's heart is.
  - Note: It is best to palpate the uterus FIRST and identify where the fetal ribcage should be, before trying to find the heart beat. Once you think you have identified the fetal back, **hold the fetal Doppler still in a single position to allow it to detect the heart beat.** If you need to adjust the position, do this slowly and allow time for the machine to detect the heart beat in the next position. The sound waves from the fetal Doppler bounce off the heart beat and this takes time.

- If your Solar Suitcase includes a fetal Doppler, it will use Rechargeable AA batteries included with the Solar Suitcase.
  - The batteries go in the back of the fetal Doppler.
  - Make sure they are placed correctly: positive to positive, negative to negative
  - The batteries that come with the Solar Suitcase are RECHARGEABLE.
- Once the fetal Doppler has fully charged batteries, turn it on with the switch on the side. *[Demonstrate turning on the fetal Doppler.]*
  - The switch on the side controls the volume.
  - When you are finished using the fetal Doppler, turn it off – listen for a *click.
- The fetal Doppler **only works with a lubricant on the mother's skin.**
  - You can use the gel in the case.
  - **If you run out of gel you can use any vegetable oil.** *Water does not conduct the sound well, and should not be used.*
- Ask the midwife to palpate the mother.
  - Identify the position of the fetus, and estimate the position of the fetal thorax.
  - Place gel or oil on the mother's skin close to where you think the fetal heart is.
  - Turn on the fetal Doppler, and hold the probe against the mother's skin, in the direction of the fetal heart.
  - Hold the machine still until you hear a sound. If you can't hear the heart beat, gently adjust the angle of the probe in another direction and wait again. Don't slide the probe around.
- Understanding the fetal Doppler display:
  - The fetal Doppler has a digital display that will show you the heart beat. You must see a solid black heart in the display to be receiving an accurate heart rate reading.
  - The fetal heart rate is normally between 120 and 160 beats per minute. IF the heart beat is less than 120 or more than 160, the baby may be in danger.
  - If the heart beat is less than 100, it may be the mother's heart beat. To confirm whether you are hearing the mother, check her wrist pulse with your hand while listening to the fetal heart rate.

REVIEW *APPLIANCES* [A*sk questions to ensure people have understood.]*

1. When can you charge your phone? → Answer: When the battery is full.
2. How do you know if battery is full? → Answer: Look for blinking green light on Charge Controller.
3. Should you charge rechargeable batteries at night? → Answer: No. (Why not?)
4. What should you do if you run out of gel that comes with Solar Suitcase? → Answer: You can use vegetable oil. (Can you use water? →Answer: No).
5. Can you recharge single-use batteries in the battery charger? → Answer: No.
6. When is the best time to charge cell phones? → Answer: During the day.
7. Should the lights stay on all the time? →Answer: No.

OVERALL REVIEW

ONE - Make sure that the solar panels have unshaded sunlight for at least five hours a day. You can leave the solar panels out in the rain and leave it out on cloudy days. Make sure your panels are clean – rinse them with water when they get dirty (but only if it is safe to do so). Do not climb on roof unless you are trained to do so.

TWO – Make sure that you ALWAYS LEAVE THE **MAIN POWER SWITCH ON**. This switch will turn on your solar panels and battery. If it is off, you cannot use the Solar Suitcase and the battery cannot charge from the sun.

THREE – At night time, only use the Solar Suitcase for lighting and do NOT charge other appliances. (If there is an emergency and you need to call for help, you can charge your cell phone anytime you need). In the day time, turn OFF the lights.

FOUR – During the day, you can charge your cell phones, headlamps, and AA batteries for the Doppler, when your battery is full. Your battery is full when the battery status light is blinking green.

FIVE – If you have questions, refer to the manual and poster that is included with the Solar Suitcase or call your local technician that installed the Solar Suitcase.

6. GROUP PRACTICE FIXING COMMON PROBLEMS

1. First: Start with the main power switch on and both lights on.
2. Second: Everyone cover your eyes until I say "open."
3. Third: Change something on the Solar Suitcase so it does not work (see options below).
4. Fourth: Invite people to open their eyes and choose a volunteer to come up and “solve” the problem with everyone watching.

Options for changing something on the Solar Suitcase so it does not work:

- Turn off the light switch **~** Have them figure out that they just need to turn switch on again.
- Turn off Main Switch **~** Have them figure out that the Main Switch needs to be turned ON to make lights work.
- Unplug the Battery Plug **~** Have them figure out that they need to plug in Battery Plug for system to work.
- Remove the red slip-on battery connector from the positive terminal of the Battery **~** They will need to slip it back on for the system to work.
- Partially unscrew and partially unplug one of the Light Connectors **~** They will need to plug it back in and screw it tight again.
- Partially disconnect the Home Run Cable Plug (blue and yellow end) from top of Main Control Board and see if they notice that no solar amps are coming in and that the charging light is OFF **~** They will need to turn it so it will click back into place.
- Partially plug in the plug in the battery charger, but not enough that it makes the electrical connection **~** They will need to plug it in all the way.
- Turn OFF the appliance switch (red) **~** They will need to turn it on for the battery charger to function.

Teaching Tips

Teaching Tips

- Use the Solar Suitcase User Manual (if available) as a teaching tool when teaching the healthcare workers
- Speak slowly and clearly
- All healthcare workers should know how to interact with the Solar Suitcases and appliances. Don't do it for them! Make sure they get to practice using the Solar Suitcase and appliances.


We Care Solar Suitcase®
User Manual
Rev 2.7

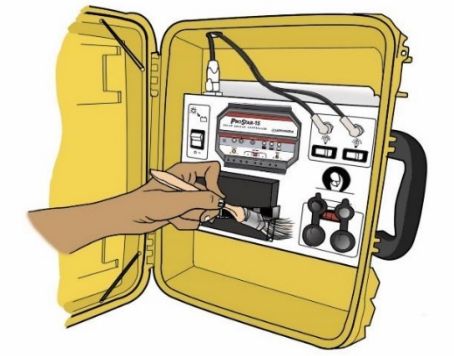
INSIDE THIS MANUAL

Contents

User Manual

- Repeat key messages.
- Check healthcare worker s understand by asking them to show you or explain what you just taught before moving on to the next topic.
- Reinforce reasons for training – proper usage will ensure midwives have light when they most need it.

Solar Suitcase Repair and Maintenance



Overview

The Solar Suitcases are built with the highest quality parts. When properly installed, used, and serviced, and with one LFP battery replacement every 5 years, the Solar Suitcases and panels (excluding appliances) can last 10+ years. Maintenance and repair are minimal. However, following up to ensure the system is working properly is the best way to ensure the Solar Suitcase continues to provide lighting and electricity for years to come.

Main Battery Replacement

The main batteries, which are lithium ferrous phosphate (LFP), will need to be replaced after 5 years. We recommend a 12V, 12Ah LFP battery. The Solar Suitcases are also compatible with 12V,12-14 Ah SLA batteries.

Solar Panels

Panels are built to last for 10+ years and are unlikely to need repair, although they may need to be cleaned periodically.

Appliance Anticipated Lifespan

Appliances that come with the Solar Suitcase include: two headlamps, one rechargeable battery charger, one 2-slot USB adaptor, one 10-in-1 USB phone charger, and one fetal Doppler. All of these appliances have a limited life span, and will need to be replaced.

Re-Training Health Workers and Training New Health Workers

Although health workers will have been trained during installation on how to properly use the Solar Suitcase, some users need refresher training and new health workers may lack information on how to use the Solar Suitcase. Training health workers is an important component of any maintenance visit.

Maintenance Visits

Planning & Preparation

Planning – Before the Day of your Visit

1. Identify maintenance team. Most teams will include one driver and 2-3 technicians.
2. Inform the local government technicians of your visit. If possible, they should accompany you to the facility for knowledge transfer and information sharing.
3. Location planning – Call the clinic at least one day in advance.
   a. **Ensure the person in charge of the clinic will be present**, as well as most of the midwives so that they can be trained on Solar Suitcase use and maintenance.

On the Day of your Maintenance Visit

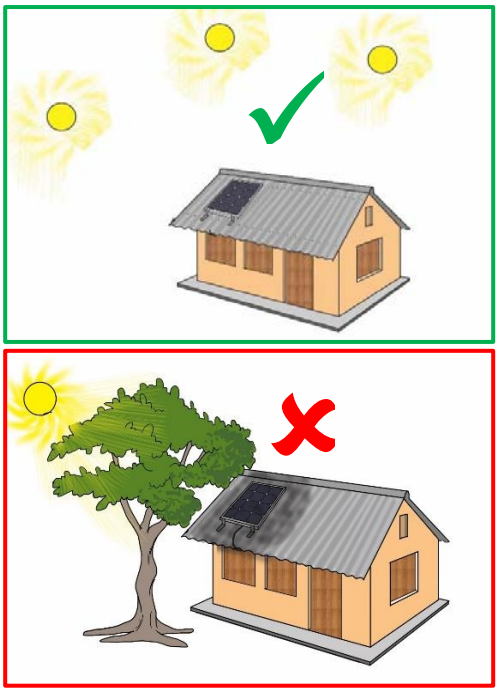
1. Prepare and load tools and spare parts in vehicle. Ensure you have the following items:
   a. Tools and drills
   b. Spare parts
   c. Ladder for getting onto the roof
   d. Forms/paperwork
   e. Water and snacks
2. Arrive and introduce yourselves to the person in charge of the clinic. Take a tour of the clinic with the medical team.
3. Ask the health workers about the Solar Suitcase. Some questions to ask include:
   a. Are you using the Solar Suitcase? Is it working?
   b. Are the lights staying on all night when you need them?
   c. Are you having any trouble charging or using the appliances?
   d. Does the main battery get fully discharged quicker than it used to?
4. Perform basic maintenance such as cleaning the case and solar panel (see section on Basic Maintenance).
5. Inspect the Solar Suitcase and ensure everything is functioning, including the main battery, lights, and appliances (see section on Solar Suitcase Inspection).
6. Troubleshoot and perform repairs if needed (see section on Troubleshooting).
7. Train the healthcare workers how to use and maintain the Solar Suitcase (see section on Teaching the Healthcare Worker).
8. Complete paperwork*.
9. Clean up the site – take away debris and re-organize any furniture moved.

**** Paperwork is extremely important. Please take the time to complete the necessary documentation.***

Basic Maintenance

Inspect and clean the Solar Panel

1. Using the ladder, safely climb up onto the roof.
2. Using water and soft cloth, clean any dirt or debris off of the solar panel.
3. Check that there is nothing shading the solar panel at any time of the day. If there is, trim the branches that are shading it if possible.



For more information on cleaning the solar panel, watch our *Video #15: Cleaning the Solar Panel* by clicking here.

Clean the Solar Suitcase and Lights

1. Using a soft brush, clean away any dirt that has accumulated on the Solar Suitcase
2. Inspect the back of the LED lights if possible. With a soft damp cloth, clean away and bugs or dirt.

Solar Suitcase Inspection

When you are conducting a maintenance visit, you should inspect and test every component of the Solar Suitcase. While it is important to ask the health workers how it is working, do not rely solely on their reponse. Visually inspect everything for yourself.

Charge Controller

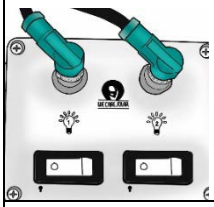
	YES	NO	Relevant Troubleshooting Section:
Are there lights on the charge controller?	✓	X	System is not functioning
If it is daytime, is the solar charging light green?	✓	X	System is not functioning
Are there any signs the wires or parts of the charge controller have gotten hot (melted plastic, etc.)?	X	✓	N/A – Replacement part needed

Main Battery

	YES	NO	Relevant Troubleshooting Section:
Look back at the charge controller. Is one of the the battery status lights on?	✓	X	System is not functioning
Is the battery cable missing or broken?	X	✓	N/A – Replacement part needed
Ask the health worker: Are the lights staying on all night when you need them?	✓	X	System performance is poor
Ask the health worker: Do the lights stay on as long as they did when you first got the Solar Suitcase?	✓	X	System performance is poor
Look at the battery replacement date on the battery sticker. Is it close to or past that date?	X	✓	Replacing the main battery

LED Lights

Turn on each LED light to answer the following questions:

 	YES	NO	Relevant Troubleshooting Section:
Do all of the lights turn on?	✓	X	Light is not functioning
Are any of the lights dimmer/weaker than the others?	X	✓	Light is not functioning
Do any of the lights flicker	X	✓	Light is not functioning
Inspect the light cords. Are there any tears/breaks in the cords?	X	✓	Light is not functioning
Are any of the individual LEDs off inside of the light?	X	✓	Light is not functioning

Appliances

The health facility should have the following appliances:


2 headlamps


Micro USB cable for headlamp


2-slot USB adaptor


Multi-tip phone charger


Fetal Doppler


Rechargeable battery charger

	YES	NO	Relevant Troubleshooting Section:
Are all of the appliances still present at the health facility?	✓	X	N/A – Replacement part needed
Are all of the appliances working when you try to use them?	✓	X	Appliance is not functioning
Does the headlamp and battery charger charge when connected to the Solar Suitcase?	✓	X	Appliance is not functioning

If any of your responses lead to X, then it is likely that the Solar Suitcase or a component is in need of repair or replacement parts. The next section on Troubleshooting is intended to guide you through troubleshooting and repairs.

Solar Suitcase Maintenance Visit Checklist

Use the checklist below to ensure you don't forget anything on the day of your visit to the health facilities:

1. Introduce yourself to the person in charge of the clinic. Take a tour of the clinic with the medical team.
2. Ask health workers about how they are using the Solar Suitcase and whether it is working for them.
3. Perform basic maintenance, such as cleaning the case and solar panel (see section on Basic Maintenance).
4. Inspect the Solar Suitcase and ensure everything is functioning, including the main battery, lights, and appliances (see section on Solar Suitcase Inspection).
5. Troubleshoot and perform repairs if needed (see section on Troubleshooting). Contact We Care Solar for technical support if you are unable to resolve the issue.
6. Train the healthcare workers how to use and maintain the Solar Suitcase (see section on Teaching the Healthcare Worker).
7. Complete paperwork. Paperwork to be completed will vary by country and program.
8. Clean up the site – take away debris and re-organize any furniture moved.

Troubleshooting

P.53 Appliance is Not Functioning

- One appliance socket is not working
- One specific appliance is not working

P.56 System Performance is Poor

- Lights turn off in the middle of the night
- Lights turn off earlier than they used to

P.58 Light is Not Functioning

- One or more lights do not work
- One or more lights are dimmer than the others
- One or more lights are flickering

P.59 System is Not Functioning

- No appliances or lights work
- No lights on the charge controller display
- It is daytime and the solar charging light is not lit
- Solar Suitcase is not operational

For an overview of troubleshooting common issues, please watch our video on Maintenance & Repair here.

Appliance is Not Functioning

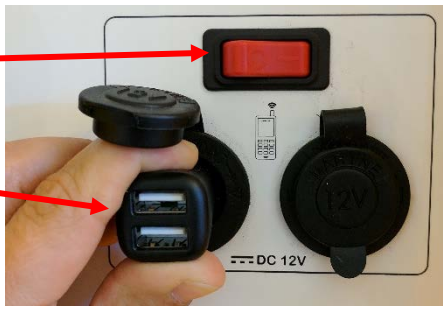
- One appliance socket is not working
- One specific appliance is not working

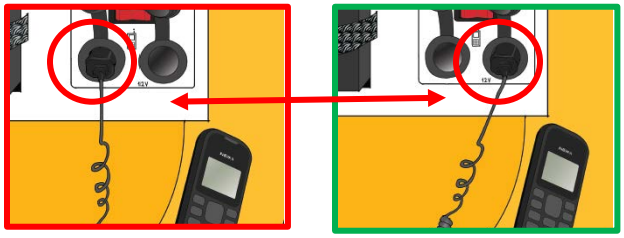
Make Sure Both Appliance Sockets Are Functioning

1) **Make sure the red appliance switch is in the ON position**

2) **Make sure the USB adapter is fully inserted into the socket**

3) **Make sure both sockets are functioning properly**

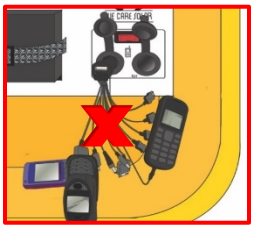




If the appliance still isn't working, follow the instructions below for that appliance.

Phone is Not Charging

i. **Make sure you are not mis-using the multi-tip phone charger. Charge ONE phone at a time.**



ii. **Change to another charger or purchase a new charger.**

iii. **If that doesn't work, it could also be that the battery in the phone doesn't work and you need to replace it.**

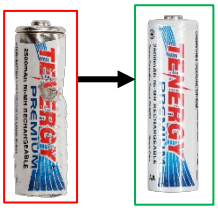
Rechargeable Headlamp is Not Working

1) Check if the rechargeable headlamp is charging properly.

When charging properly, the charging light should be flashing green. If the light is any other color than green, it is not charging.

a) If the headlamp has REMOVABLE BATTERIES and it is not charging, try removing the batteries and charging them using the AA/AAA battery charger.

b) If removing the batteries to charge them doesn't work, try replacing the batteries.



2) Check that the headlamp is being used correctly.
Review instructions on how to use the headlamp. A few reminders:

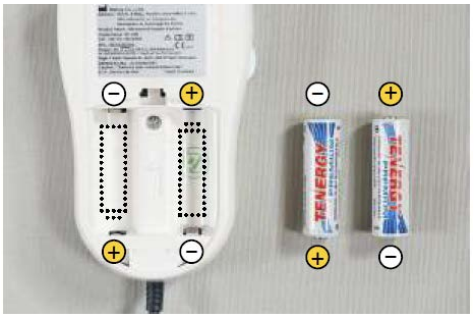
Make sure the headlamp is switched on properly. Switch off headlamp after use.

If the charging light is blinking blue when you try to turn it on, it means the headlamp is locked. To unlock it, hold down the main (top) button until the blue light turns off and main light turns on (about 4 seconds).

If it still doesn't work, it may need to be replaced.

Fetal Doppler is Not Working

1) Check the AA rechargeable batteries.



Make sure the batteries are inserted correctly
(+ to + and – to –)

Make sure the batteries are fully charged

Replace the AA rechargeable batteries if they are old or damaged

2) Check that the fetal Doppler is being used correctly.
Review instructions on how to use the fetal Doppler.

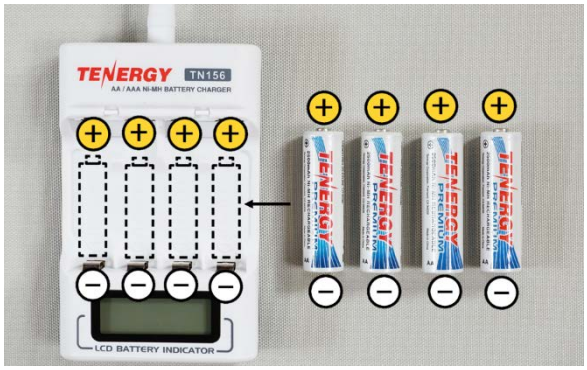
Be sure the on/off switch is turned on to use and turned off when done

Make sure it is being used correctly

Make sure you use lubricant gel, clean vegetable oil, or KY jelly

Rechargeable Battery Charger is Not Working

1) Check the rechargeable batteries.



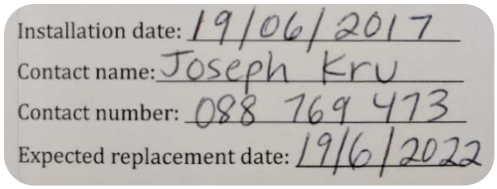
Make sure the batteries are inserted correctly
(+ to + and – to –)

Check the LCD BATTERY INDICATOR. If you see an ERROR message or one specific battery are not lighting up, that battery may need to be replaced.

System Performance is Poor

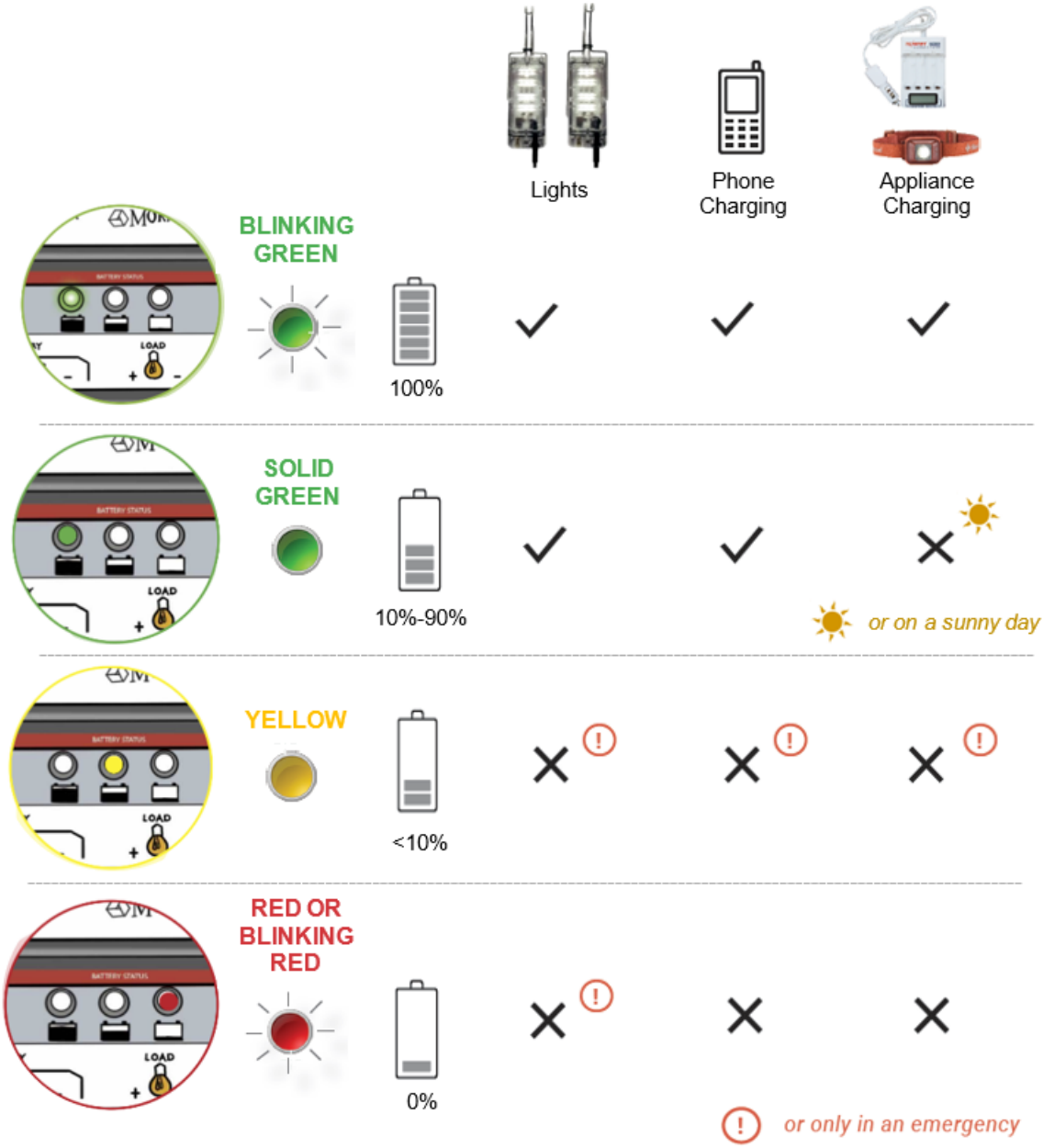
- Lights turn off in the middle of the night
- Lights turn off earlier than they used to

1) Check how old the battery is.



LFP batteries last about 5 years and SLA batteries last about 2 years. There is a sticker on the Solar Suitcase that tells you when the battery will likely need to be replaced. If it is close to or past that date, the Solar Suitcase may need a new battery. See section on Replacing the Main Battery.

2) Make sure the system is not being overused during the day.



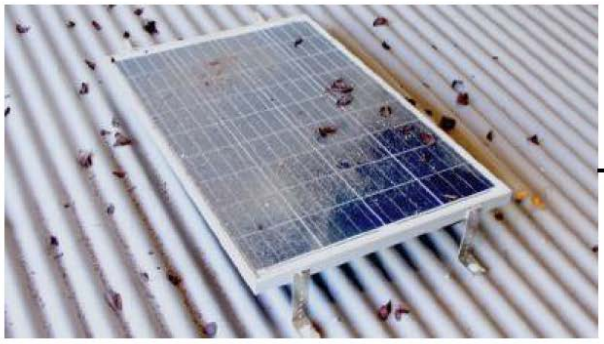
3) Now check what is causing the lack of energy.

If there is bad weather….

Use the lights only when needed and don't charge appliances

If there is shade…

Trim the tree or move the solar panel to an area of the roof that is not shaded



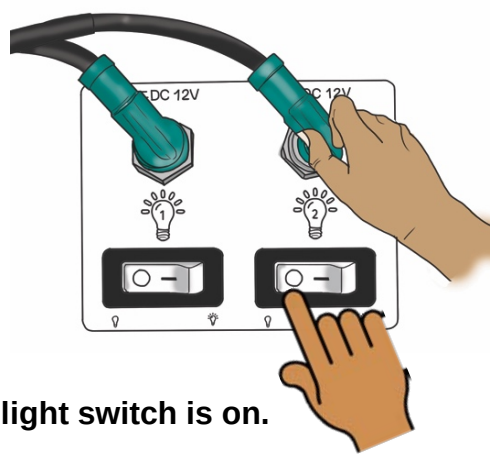
If solar panel is dirty…

Wash panel with water and a soft cloth

Light is Not Functioning

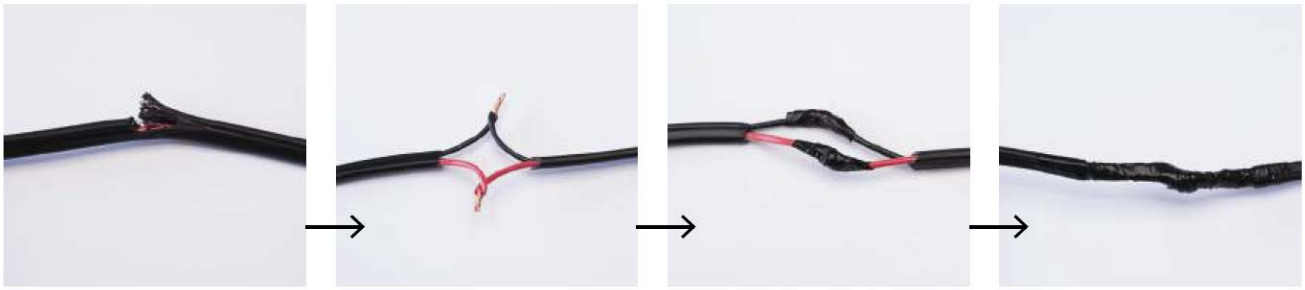
- One or more lights do not work
- One or more lights are dimmer than the others
- One or more lights are flickering

1) **Check that the light connectors are inserted correctly and the locking nut is firmly tightened.**



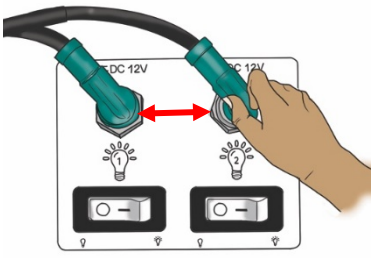
2) **Check that the light switch is on.**

3) **Check the light cable for damage.**
If the wire inside is severely damaged or you can see the metal wire in the cable, wrap electrical tape around each separate negative and positive wire within the larger wire, then wrap tape around the whole bundle.



For more information on repairing a cable, watch our *Video #16: Repairing a Cable* at www.wecaresolar.org/solar-suitcase/instructional-videos/ or click here.

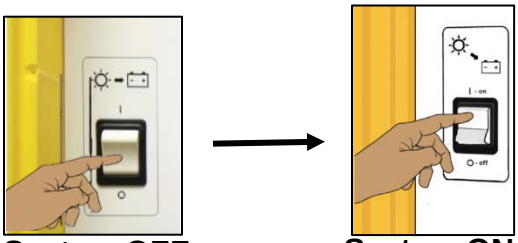
4) **Try swapping light connections to see if it is the light or the socket is faulty.**
If the light is faulty, the light will need to be replaced.



System is Not Functioning

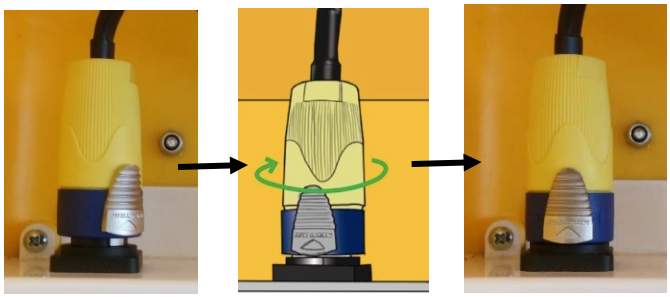
- No appliances or lights work
- No lights on the charge controller display
- It is daytime and the solar charging light is not lit
- Solar Suitcase is not operational

1) Press the main power switch to OFF. Wait 10 seconds. Press main power switch to ON.

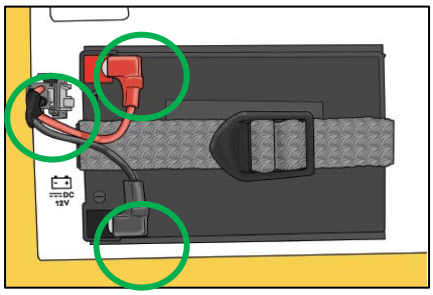


System OFF **System ON**

2) Check if the homerun cable and battery cables are firmly connected.

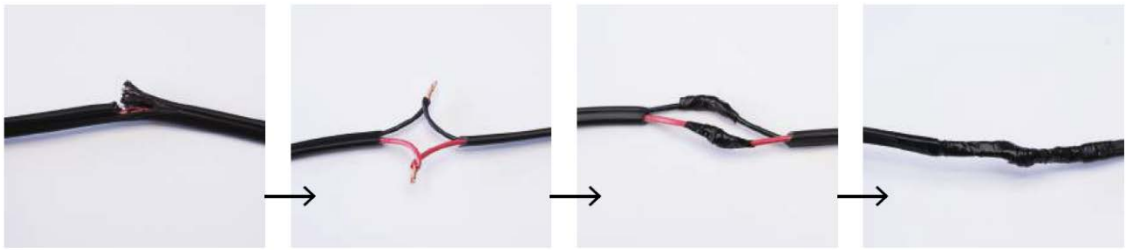


The homerun cable is properly connected when the silver tab clicks into place



3) Check the homerun cable for cuts.

If the wire inside is severely damaged or you can see the metal wire in the cable, wrap electrical tape around each separate negative and positive wire within the larger wire, then wrap tape around the whole bundle.



Note: If the wire is only damaged on the black casing, wrap with electrical tape to prevent further damage.

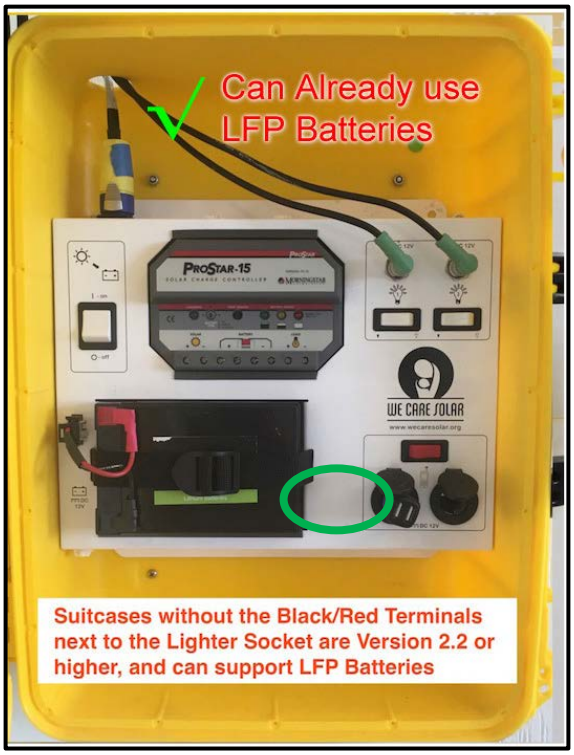
For more information on repairing a cable, watch our *Video #16: Repairing a Cable* at www.wecaresolar.org/solar-suitcase/instructional-videos/ or click here.

Replacing the Main Battery

Before you begin, you first want to confirm which type of battery your Solar Suitcase needs. Look at the images below. Does your Suitcase have the red and black binding posts (circled in red below)? If so, your Suitcase is only compatible with an SLA battery. Any system WITHOUT the black and red binding posts are compatible with an SLA or LFP battery

Version 2 - 100 Series
Cannot use LFP Battery
Replace with SLA battery

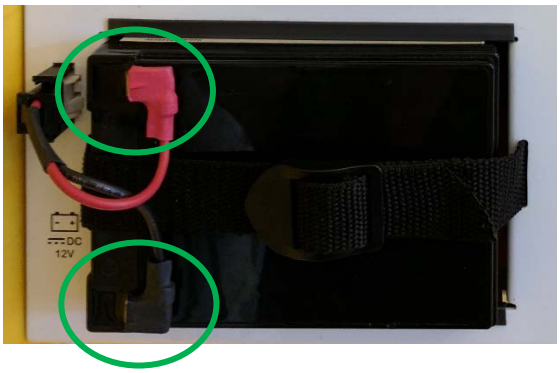
Version 2 – 200 Series
Can use LFP Batteries
Replace with LFP battery if available



To Replace the Main Battery:

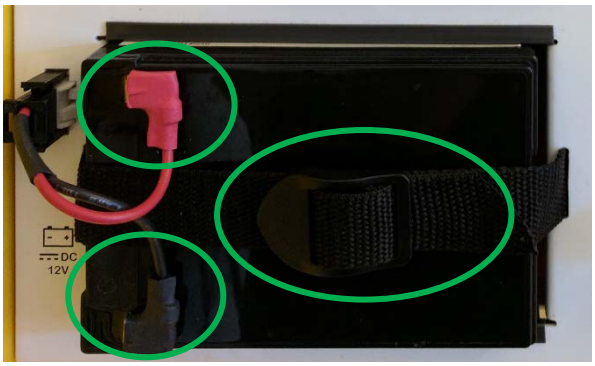
1) Turn the Solar Suitcase main power switch OFF. The lights on the charge controller should go off.

2) Remove the black and red wires from the battery.



3) Undo the strap that is holding the battery and remove the battery.

4) Insert the new battery and secure it to the Solar Suitcase with the strap. Insert the red and black wires back into the battery.



! Ensure the wires are firmly attached to the battery. If the connections are loose, remove the connectors, squeeze the connectors slightly with pliers, and re-insert.

5) Turn the Solar Suitcase main power switch back ON. The lights should come on on the charge controller, indicating the battery is properly connected.

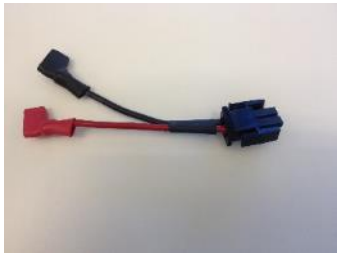
Spare Parts

The following is a list of spare parts for the Solar Suitcase. Which items you have available to you may vary by program:

Headlamps with USB charging cord

LED lights

Internal battery cables



USB adapters

Expansion box with 2 LED lights

Maternal health (fetal Doppler) kits

Multi-tip phone chargers

Rechargeable battery chargers

Solar panels

AA & AAA rechargeable batteries

Hardware mounting kits

Homerun cables

14Ah LFP batteries

Please visit our website for more information on the Version 2 Solar Suitcase.

For any questions, please email service@wecaresolar.org.

Artwork in this manual courtesy of:

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