GRAINPRO®
SOLAR BUBBLE DRYER™ 50
INSTRUCTION MANUAL

MA4040RAD0914-12

GRAINPRO
STORING THE FUTURE

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1. INTRODUCTION

The GrainPro® Solar Bubble Dryer™ 50 (SBD50) is a collapsible, tunnel-type dryer with a 1.0 metric ton (1,000 kg) drying capacity, designed to protect the agricultural commodity from intermittent/sudden rains during drying and prevent spillage and contamination. The drying performance is dependent on solar radiation, the relative humidity of ambient air, and the moisture content of the concerned agricultural commodity. The SBD50 consists of a transparent cover made of UV-resistant polyethylene film, connected to the black reinforced PVC drying floor by a heavy-duty zipper. Through the transparent top cover, solar radiation enters the drying chamber and heats up the agricultural commodity inside. Moisture content is vaporized in the process and pushed by the ventilators out of the drying chamber.

The SBD50 technology makes drying possible even during unpredictable weather conditions. It can dry grains and seeds at an average rate of 0.5% per hour, based on paddy and corn. However, during full sunny conditions, drying time is about 6 to 8 hours for the moisture content of 22% to 14%. It is a multicrop dryer that can be used to dry paddy, corn, coffee, and other commodities.

There are two GrainPro SBD50 commercial models, namely: SBD50-Solar, which is purely on solar energy to dry the commodity and run the ventilators; and SBD50-Electric, which uses electric power from the grid. There is also a rake mixer that can be used in all-terrain and a tube mixer, an optional mixing device, which provides undulation during the mixing operation.

1.1. FEATURES:

1.1.1. The collapsible dryer can be installed on any flat surface, a multi-commodity dryer.
1.1.2. Protects the commodity being dried from sudden rains, spillage, and contamination.
1.1.3. Protects the commodity from fowls, birds, and other animals.
1.1.4. Protects the commodity from unhealthy and hazardous contaminants.
1.1.5. Designed to address the effects of climate change.
1.1.6. The SBD50-Solar doesn't use fossil fuels that contribute to climate change.
1.1.7. Minimizes condensation and inhibits or controls both mold growth and infestation.

1.2. PRODUCT GUARANTEE:

1.2.1. In accordance with the terms and conditions herewith, GrainPro® Inc. fully guarantees the quality of this product provided it is used according to the instructions in this manual.

1.2.2. Please read and understand the manual thoroughly before using the Solar Bubble Dryer 50.

1.3. COMMENTS, COMPLAINTS, AND/OR CLARIFICATIONS:

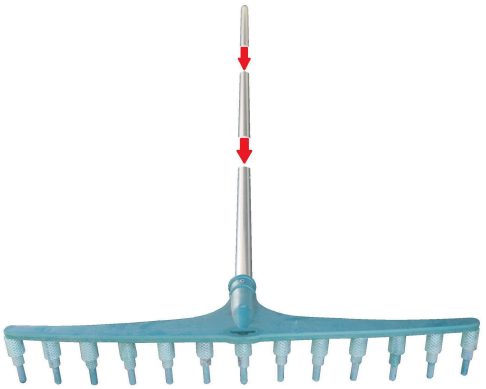
1.3.1. Please contact customercare@grainpro.com.

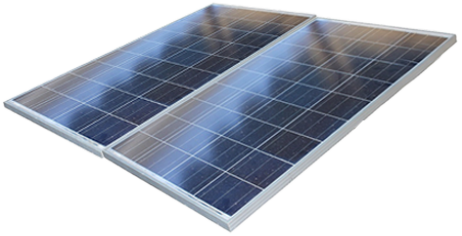
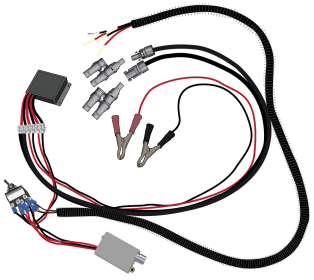
1.3.2. All queries will be answered by our team of post-harvest solutions experts.

2. CHECKLIST

Please inspect your GrainPro® Solar Bubble Dryer™ 50 (SBD50) package to ensure it includes the following items:

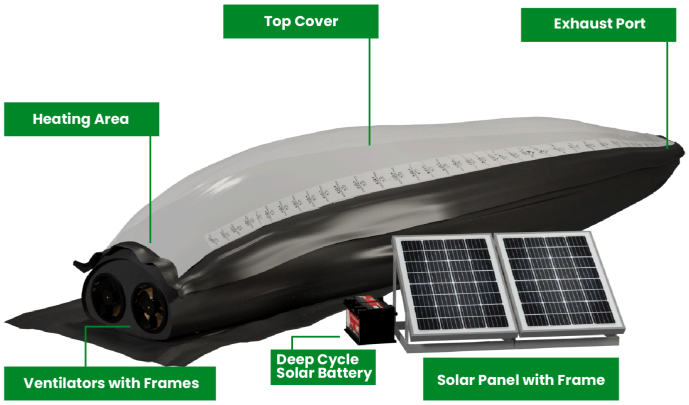
PART NAME	IMAGE
2.1. Carrying Bag a. SBD50 b. Ventilator cover.	
2.2. SBD50 - SOLAR OR ELECTRIC a. UV-Resistant waterproof and transparent top cover (UV-LDPE). b. Drying floor made of black reinforced PVC (610 gsm).	
2.3. Repair Tape a. PE repair tape (UV resistant and transparent) for top cover repair or patching. b. PVC duct tape (grey) for drying floor repair.	 
2.4. Small Parts a. Cable ties. b. Screwdriver. c. Bolts and winged nuts. d. LDPE Rodent Guard.	

	
2.5. RAKE MIXER a. Rake Mixer consists of: - Handle, three (3) pieces joined by couplers. - Rake head with teeth, one (1) unit.	
2.6. TUBE MIXER (Optional) a. Disassembled mixing devices consist of three (3) parts. One (1) unit. b. Offset Box Wrench, two (2) pieces.	
2.7. Ventilator a. 220V AC Ventilators, **two (2) units for SBD50-Electric.** b. 12V DC Ventilators, **two (2) units for SBD50-Solar.**	

2.8. Ventilator Frame a. Supporting an aluminum clamp to hold the ventilator, two (2) sets.	
2.9. Solar Panels a. Used to convert light into electricity, 12V	
2.10. Solar Panel Support Frame a. Supporting aluminum structure for the solar panels. b. Two (2) legs. c. Two (2) Brackets. d. One (1) horizontal brace.	
2.11. Exhaust Support Frame a. Supporting aluminum structure for the SBD exhaust port. One (1) assembly.	
2.12. Wiring Harness a. The Electrical components of the SBD50-Solar include: a solar charge controller, a PWM DC motor speed controller, and a toggle switch. One (1) assembly.	

2.13. Extension Cord a. Extension wire for the SBD50-Electric, ten (10) meters.	
2.14. Battery (Optional) a. AGM Battery to store energy to run the ventilator of the SBD50-Solar 12V, 70 ampere-hour, one (1) unit.	
2.15. Rodent Guard a. For the platform post to prevent rodent access when storing the empty SBD, four (4) pieces per pack.	
2.16. Instruction Manual. a. Installation Instructions. b. Maintenance Instructions. c. Frequently Asked Questions. d. Warranty Clause.	

3. COMPONENTS



4. SPECIFICATIONS

Parameters	Standard SBD50	
	Solar	Electric
Top Cover		
Material	UV-LDPE	
Thickness, mm (inch)	0.15 (0.006)	
Color	Transparent	
Drying Floor		
Material	Reinforced PVC	
Thickness, mm (inch)	0.52 (0.02)	
Thickness tolerance, mm (inch)	±0.01 (±0.0004)	
Color	Black	
Material weight, g/m^2	610	
Zipper		
Material	Heavy Duty Zipper	
Color	Black	
Rake Mixer		
Material	Plastic rake head with stainless disassembled handle	
Length, m (ft)	2.2 (7.22)	
Tube/Roller Mixer		
Material	G.I. Pipe, 2” Ø with 2 pcs Offset box wrench, 17 x 19mm	
Length, m (ft)	2.6 (8.53)	
Electronic Components		
Wiring Harness	#14 auto wire (Black & Red)	#14 Duplex wire
Solar Charge Controller	12V/20A	N/A

PWM	Pulse width modular DC motor speed controller	N/A
Toggle Switch	4PDT	N/A
Connector/Terminals	MC4, Bullet, Terminal block, Alligator Clip	N/A
Outlet	N/A	2-Gang Receptacle Outlet
Plug	N/A	Heavy Duty Plug
Battery	AGM Battery, 12V, 70AH	N/A
Transformer	N/A	Step-up (110V-220V)
Ventilator	12V DC Ventilator, 2 units	220V AC Ventilator, 2 units
Solar Panel	100W, 2 units	N/A
Dimension, m (ft) (B x A)	26.0 x 2.0 (85.3 x 6.56)	
Dimension Tolerance, m (ft)	±0.1(±0.33)	
Drying Area, m^2 (ft^2)	50(538.2)	
Capacity, kg (lbs.) based on paddy	1,000(2,204.62)	
Warranty, years	1	
Shelf life, years	2	
Packed Dimension, m (ft) (L x W x H)	110 x 1.00 x 0.40	110 x 1.00 x 0.32
Packed Weight, kg (lbs) (without optional components	83(182.98)	63(138.89)

- *Included for the countries with a 110V electric energy supply*
- *Optional purchase*

5. WARNING!

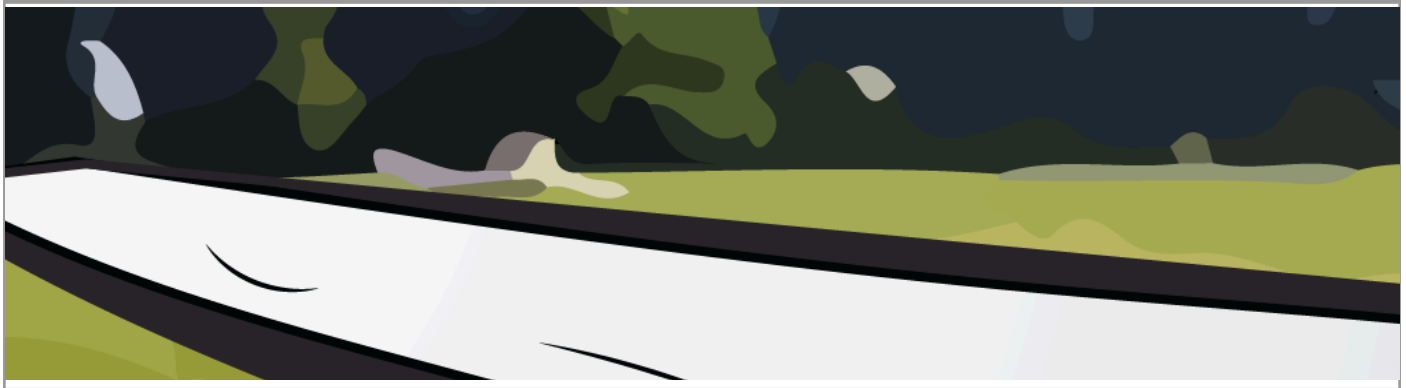
5.1. Do not remove the solar panel cover until all steps and/or connections are executed. Refer to 6.3.3.
5.2. Do not load the commodity into the pre-heating area within 1.5m of the ventilator.
5.3. Do not smoke during installation, cigarette butts might burn and damage the Solar Bubble Dryer™ 50.
5.4. Don't leave the batteries empty for too long—charge them after using to keep them working well.
5.5. Keep the battery away from fire, heat, and electrical sources.
5.6. Do not keep the Solar Bubble Dryer™ 50 unclean. Refer to 6.2.
5.7. Keep the Solar Bubble Dryer™ 50 away from heat, direct sunlight, and out of reach of rodents, preferably on a shelf, an elevated pallet, or suspended from a beam or girder.
5.8. Do not place heavy objects on top of the stored bag of Solar Bubble Dryer™ 50, as it may damage or deform.
5.9. When using the Solar Bubble Dryer™ 50 for demonstration purposes, make sure that the drying floor is cooled down before folding. Open the top cover and aerate the drying floor before folding the body for safekeeping. Do not allow the top cover to touch the RPVC while still hot.
5.10. When utilized for drying commodities, if possible, stop gathering the grains during noon time. Instead, gather the grains in the afternoon when the

temperature is lower to allow the drying floor to cool down before folding the SBD unit for safekeeping.

5.11. Do not deflate the Solar Bubble Dryer™ 50 at noon or when the sun is high up to prevent the top cover from coming in contact with the hot drying floor.

6. ASSEMBLY AND OPERATING PROCEDURE

6.1. SITE SELECTION



6.1.1. In selecting the site, look for:

a. A level ground away from standing or running water.
b. An area of about 4m wide and 30m long.

6.1.2. Preparing the selected site by:

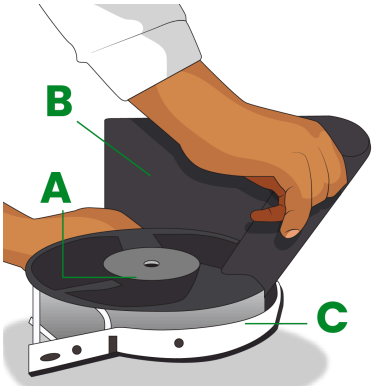
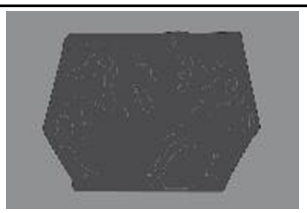
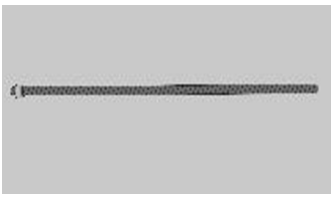
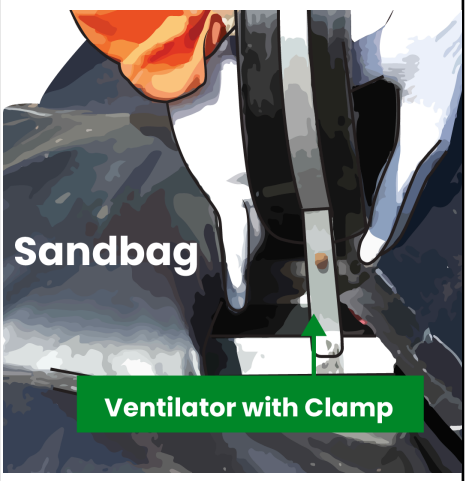
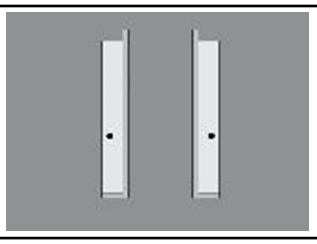
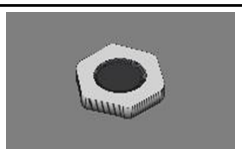
a. Clear away all sharp and pointed objects – stones, broken glass, nails, etc. – which can puncture the SBD50 drying floor. In addition, refrain from smoking while working because hot ashes may also damage the SBD50 materials.
b. Make sure there is sufficient space around the SBD50 for pulling the "Tube Mixer" on both sides of the dryer.
c. The positioning of the SBD50 and solar panel should be in a location where maximum exposure to solar radiation can be obtained.

6.2. INSTALLATION

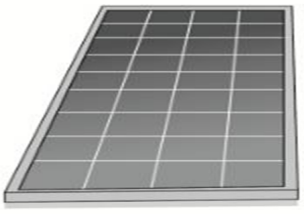
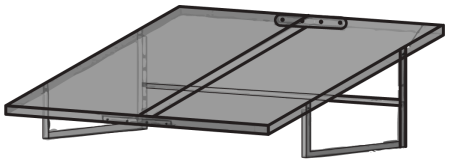
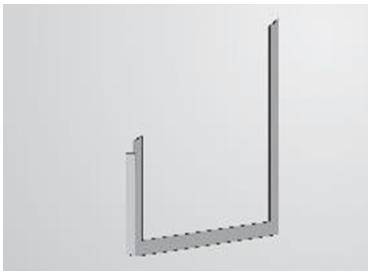
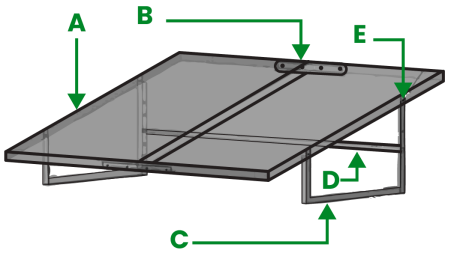
6.2.1. Set-up/Installation

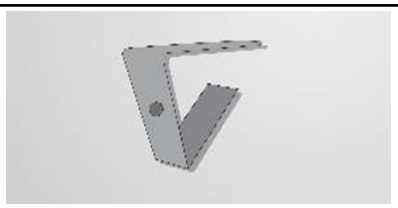
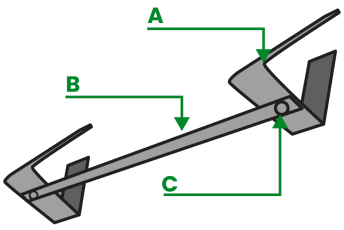
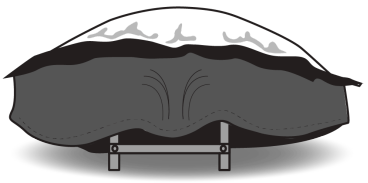
a. Unfold the SBD50. Take note of the folding pattern while it is being unfolded. This unfolding sequence should be followed in reverse when preparing for proper storage.

b. Pull the other end to get rid of the folds before laying on the ground. Make sure that the drying floor is properly stretched, two (2) meters wide for the drying area, along the full length of the SBD50. This will ensure that the drying floor will stay flat when using the "Tube Mixer".

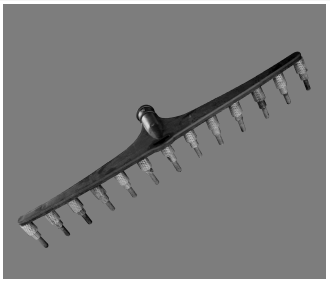
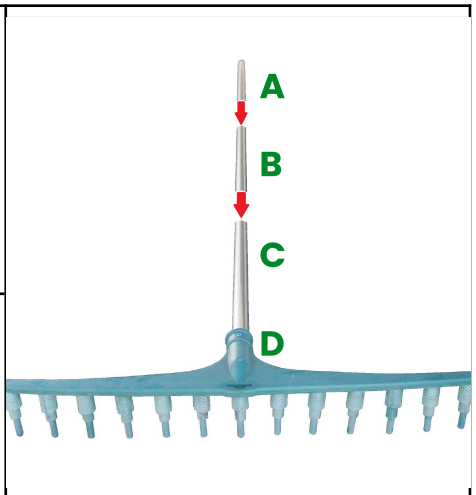
6.2.2. Ventilator and Supporting Structures:		
COMPONENT	IMAGE	SEQUENCE OF ASSEMBLY
a. Ventilator, two (2) units.		
b. Ventilator cover, two (2) pieces.		
c. Ventilator support clamp, two (2) pieces.		
d. Horizontal brace, two (2) pieces.		
e. Ventilator support legs, four (4) pieces.		
f. Bolts and winged nuts, four (4) sets.		
g. Hex nuts, four (4) pieces		

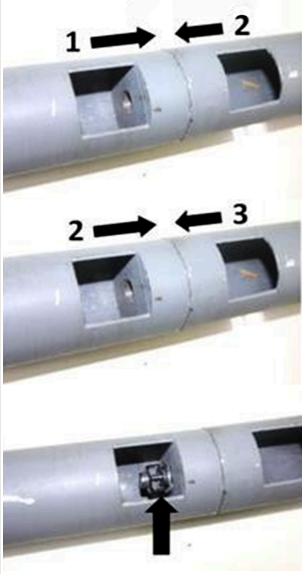
6.2.3. SBD Solar Panel and Support Assembly:		
COMPONENT	IMAGE	SEQUENCE OF ASSEMBLY

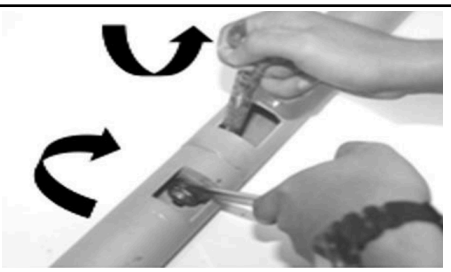
a. Solar Panel, two (2) units.		
b. Bracket, two (2) pieces.		
c. Legs, two (2) pieces.		
d. Horizontal brace, one (1) piece.		
e. Bolts and winged nuts, sixteen (16) sets.		

6.2.4. Exhaust Support Assembly:		
COMPONENT	IMAGE	SEQUENCE OF ASSEMBLY
a. Support legs, two (2) units.		
b. Horizontal braces, one (1) piece.		
c. Bolts and winged nuts, two (2) sets.		

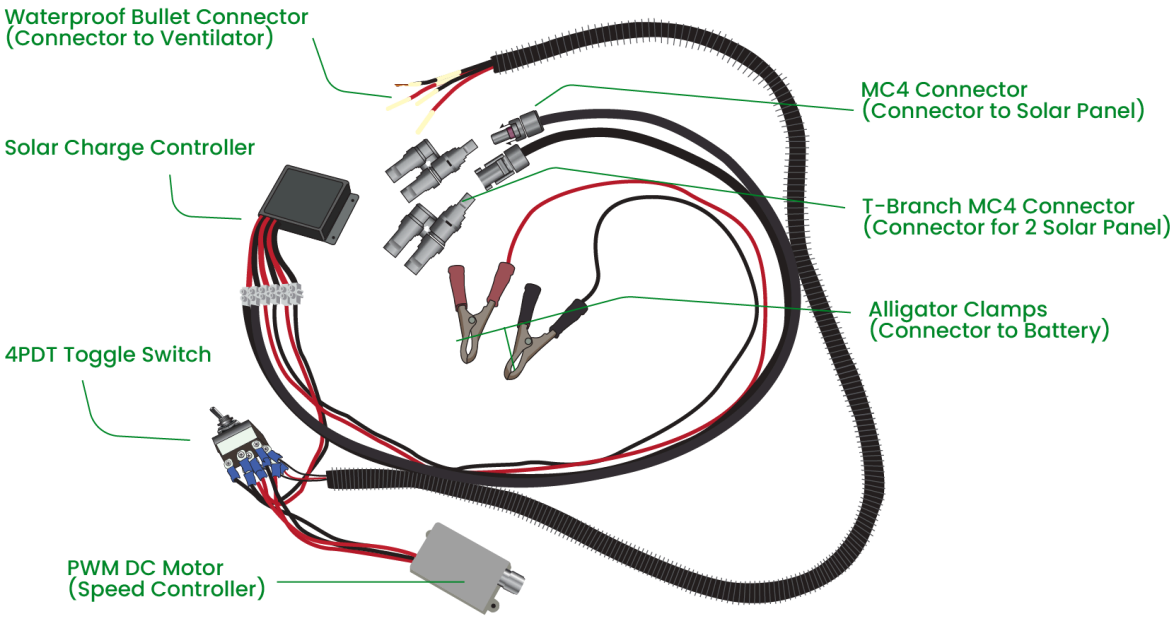
6.2.5. Rake Mixer Assembly:		
COMPONENT	IMAGE	SEQUENCE OF ASSEMBLY

a. Rake Head, one (1) unit.		
b. Rake Handle, three (3) pieces.		
c. Bolts and hex nuts, one (1) Set.		

6.2.6. Tube Mixer Assembly:		
COMPONENT	IMAGE	SEQUENCE OF ASSEMBLY
a. Disassembled tube mixer, one (1) unit.		
b. Internal coupler, two (2) pieces.		

c. Box wrench, two (2) pieces.		

6.3. WIRING CONNECTION AND ELECTRICAL SAFETY FOR SBD50-SOLAR



6.3.1. Battery Setup

NOTE: Preparations related to the battery, including charging and safety measures, must be completed before proceeding with the wiring installation. The required battery is an AGM type (12V, 70 Ah).

6.3.1.1. Battery Safety

a. Keep the battery in a place where children cannot reach.
b. **Red** color stands for positive, while **black** stands for negative. Please connect the poles of the battery correctly.
c. Do not attempt to disassemble or modify the battery by yourself. The sulfuric acid and lead inside the batter can cause damage to the human body and the environment.
d. Prevent the battery from being continually undercharged and or overcharged. Continual undercharging and overcharging will reduce the battery capacity and shorten the battery life span.
e. Do not short-circuit the positive and negative terminals; otherwise, it will easily cause an electric shock, fire, or breakdown.
f. Always disconnect the main power supply upon installation.

g. Do not use the battery for AC power. A converter like UPS is essential for AC purposes.
h. Do not charge the battery in a sealed container or an upside-down position. It is recommended to charge the battery in a well-ventilated place.
i. Do not charge the battery near a heater or any place where heat accumulation may occur. Do not charge the battery in direct sunlight.
j. Do not dispose of the battery in water or on fire. Do not expose the battery.
k. Do not put your face near the top of the battery. Wear gloves and eye protection when you measure or repair the battery.

6.3.1.2. Pre-Battery Installation and Charging.

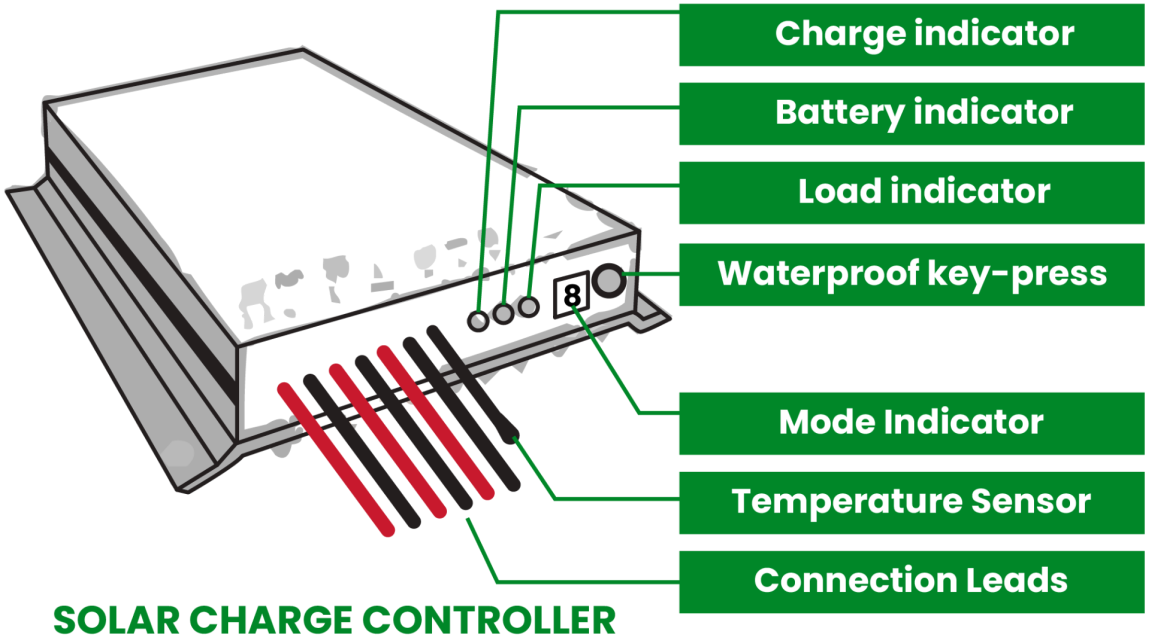
a. Place the battery on a level surface.

WARNING! Keep the battery away from sparks and flames.

Note:

- If the terminal voltage is higher than or equal to 12.40V, proceed with installation.
- If the terminal voltage is lower than 12.40V, boost charge the battery before installation.

6.3.2. Solar Wiring Schematic Diagram (for SBD50-Solar)

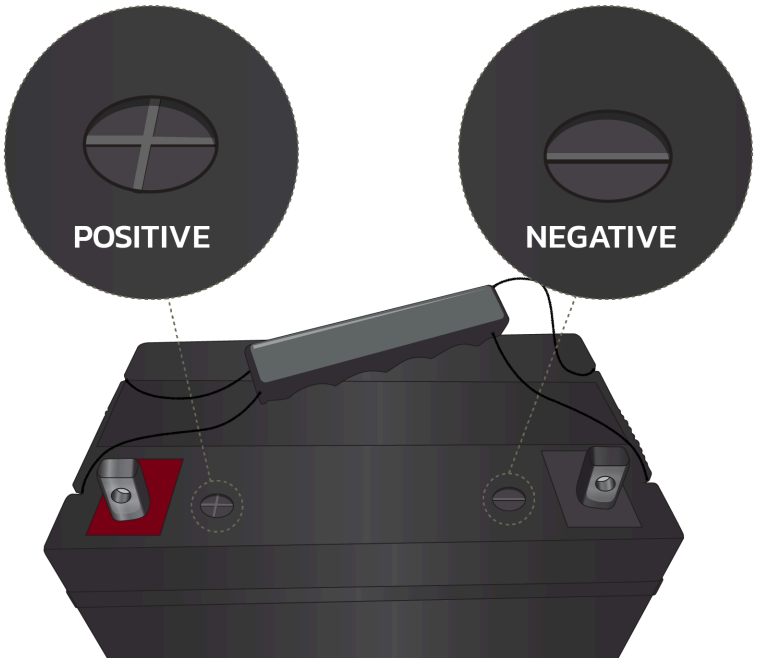


6.3.3. Battery Connection

WARNING! DO NOT REMOVE SOLAR PANEL COVER UNTIL ALL STEPS AND CONNECTIONS ARE EXECUTED.

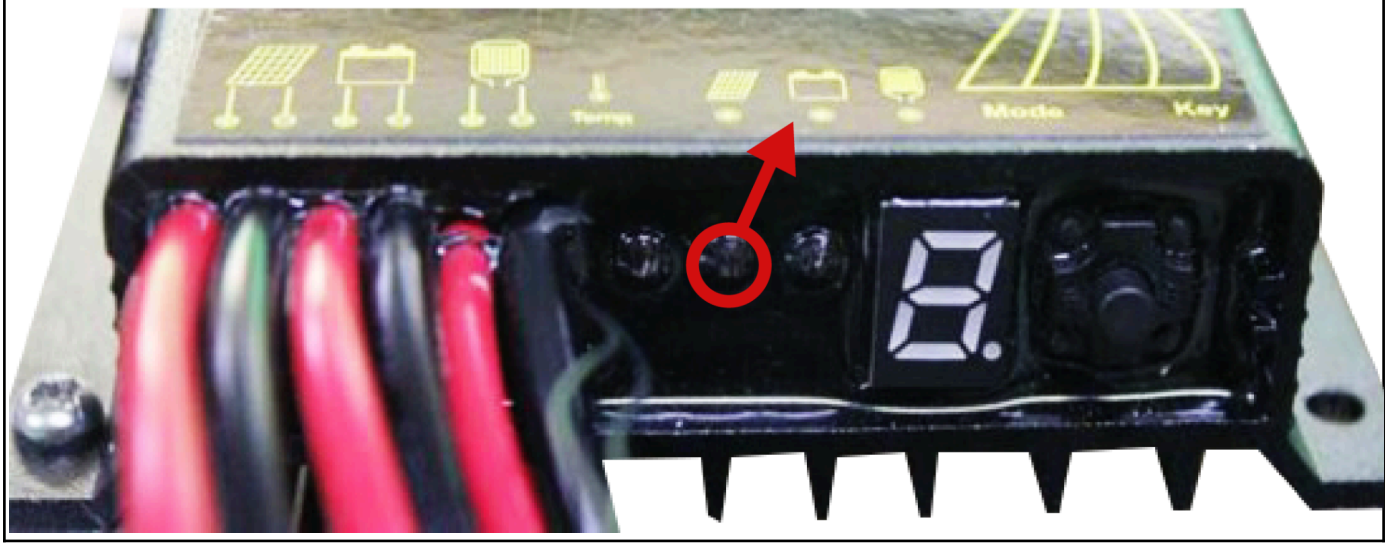
Note:

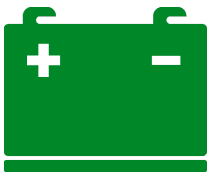
- In case of the absence of cover, flatten the solar panel cardon box and cover the front of the solar panel.



a. When installing the wiring harness, first connect it to the battery. Afterward, connect the red alligator clip to the positive “+” battery terminal and the black alligator clip to the negative “-” battery terminal. Refer to the image above.
b. The controller starts operations after automatically recognizing the battery voltage. For a 12V system, the mode indicator displays a Zero dot [**0.**] initially and then displays a seven-dot [**7.**]. The battery indicator also lights up; otherwise, check whether the connection is right.

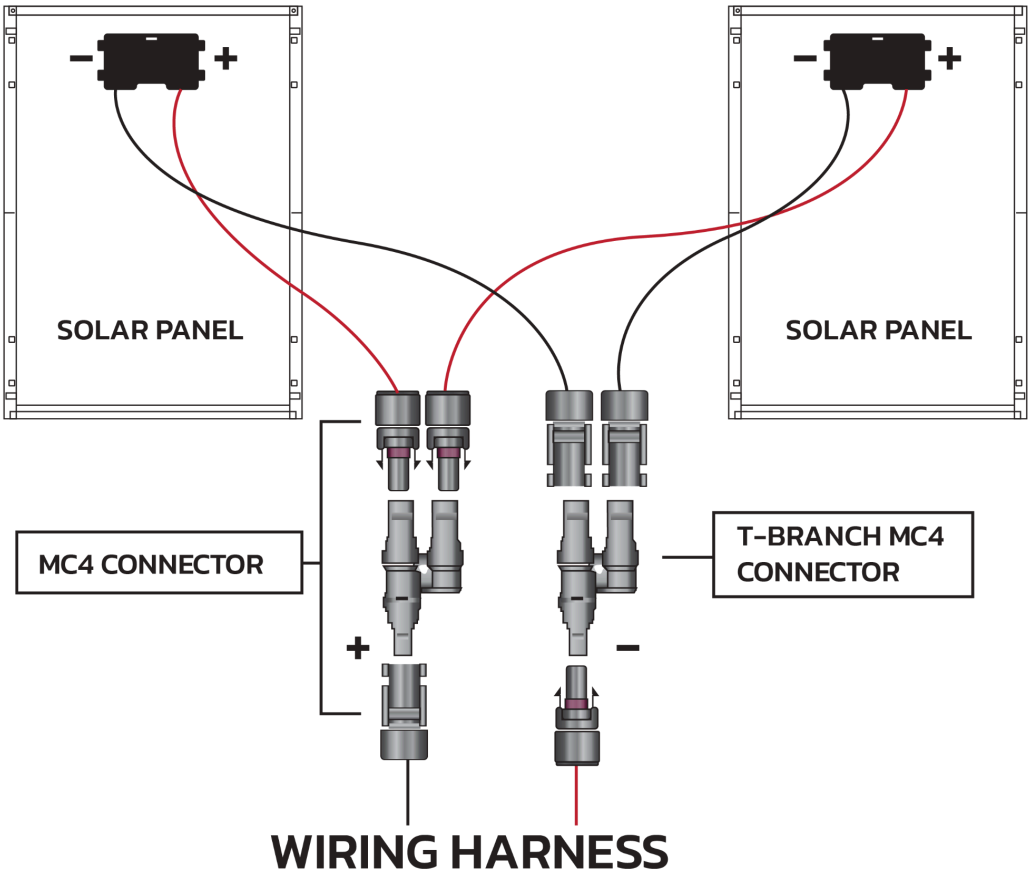
Battery Indicator



LED Lamp	Indications	Status	Functions	Action
	Battery	Steady ON	Normal Battery function	Proceed to 6.3.4
		Steady OFF	Battery not connected	Refer to Troubleshooting Case 1
		Slow flashing	Battery under voltage	Refer to Troubleshooting Case 2
		Quick flashing	Battery overcharge	Refer to Troubleshooting Case 3

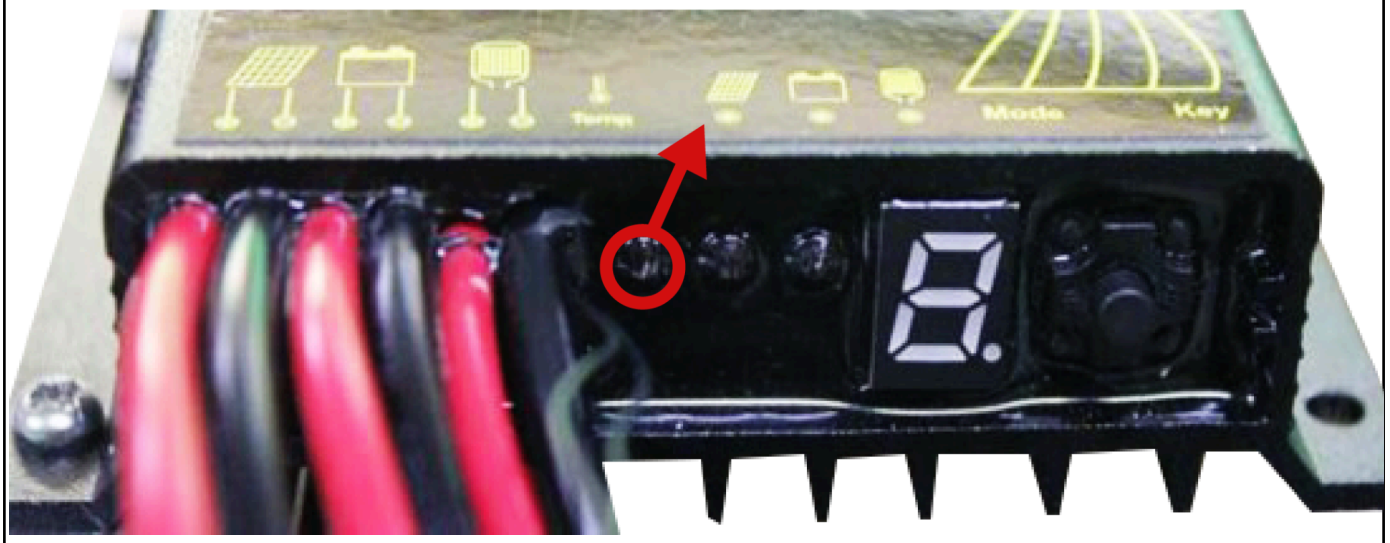
6.3.4. Solar Panel Connection

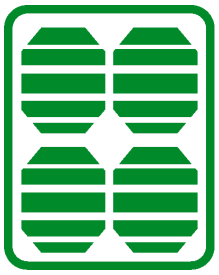
a. Connect the T-brach MC4 connectors of the wiring harness to the MC4 connectors on the solar panels. Positive "+" and negative "-" connections are not interchangeable.



b. Due to the solar panels being covered, **the solar panel/charge indicator shall not light up.** When all connections are done, the cover shall be removed; if sunlight is present, the solar panel/charge indicator lights up. Otherwise, check whether the connection is correct.

Charge Indicator



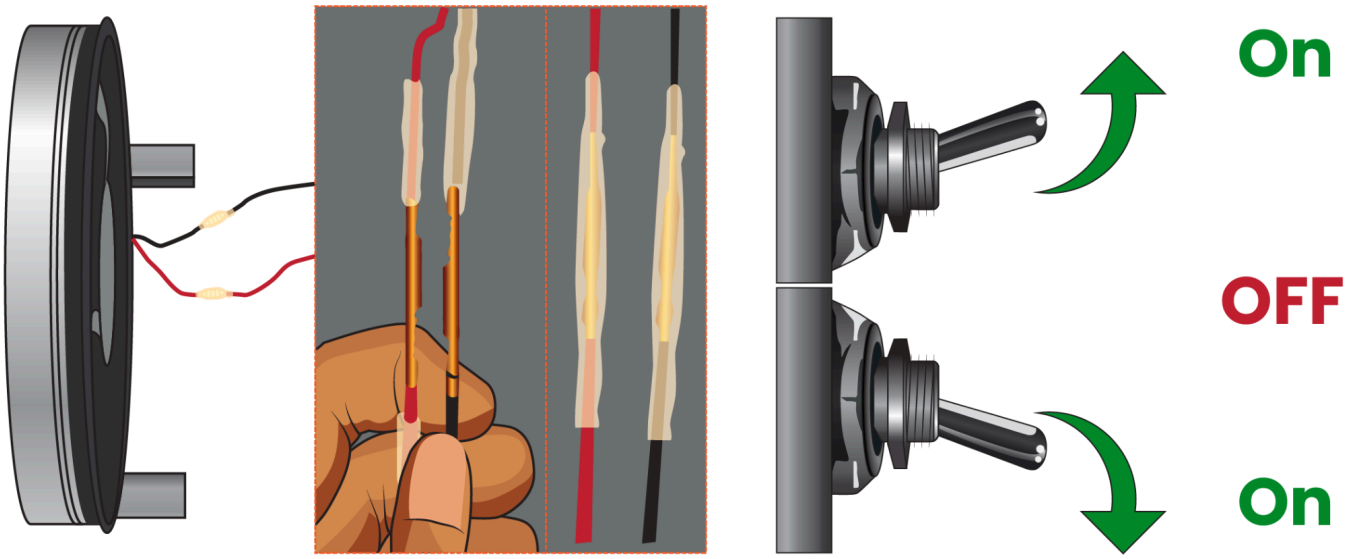
LED Lamp	Indications	Status	Functions	Actions
	Charging	Steady ON	Solar panel with voltage	Wait for slow flashing and proceed to 6.3.5.
		Steady OFF	Solar panel with no voltage	Refer to Troubleshooting Case 4
		Slow flashing	Charging in process	Proceed to 6.3.5
		Quick flashing	System overvoltage	Refer to Troubleshooting Case 5

6.3.5. Ventilator Connection

a. Check the wires with snap-in/bullet connectors. Connect the longer red wire and the longer black wire to 1 ventilator and the shorter red wire and the shorter black wire to another ventilator.

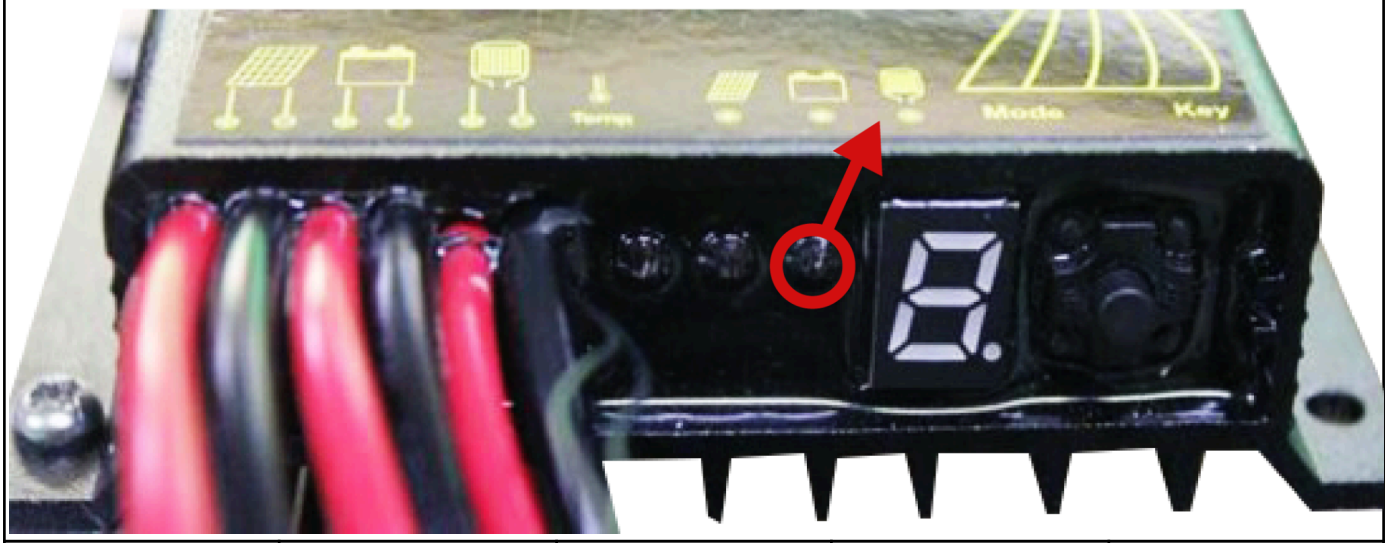
NOTE: Shorter wires control the speed of the ventilator.

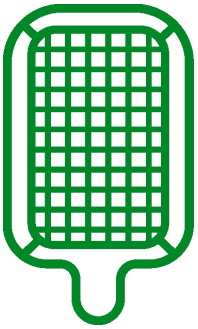
b. Connect the snap-in/bullet connectors of the wiring harness to the snap-in/bullet connector of the ventilator. Positive "+" red and negative "-" black connections are not interchangeable.



c. The load indicator automatically lights up. Turn on the ventilator from the toggle switch: upwards for daytime operations and downwards for night-time operations. Turn off the ventilator before loading commodities.

Load Indicator

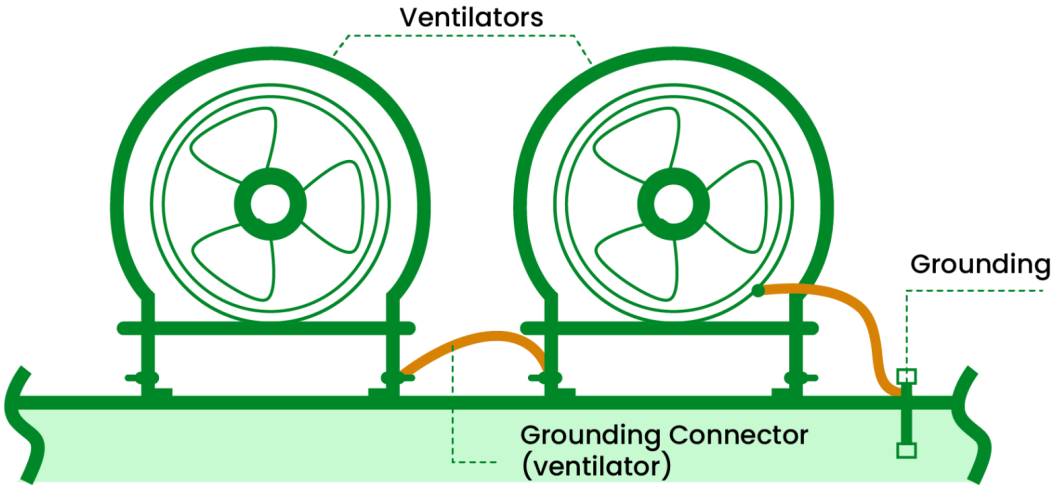


LED Lamp	Indications	Status	Functions	Action
	Load	Steady ON	Load turned ON	If the ventilator is running, the wiring system is working accordingly. If the ventilator is not running, refer to troubleshooting Case 6.
		Steady OFF	Load turned OFF	Refer to troubleshooting

				Case 7
		Slow flashing	Overload protection	Refer to troubleshooting Case 8
		Quick flashing	Short-circuit protection	Refer to troubleshooting Case 9

6.3.6. Grounding Connection

a. Connect the grounding connector (green/yellow-green wire) to the two ventilator frames.
b. Connect the grounding wire (green/yellow-green) with the ring terminal to the ventilator frame and fix the other end with a peg to the ground.
c. If the area is cemented, lay the peg on the cement and put a heavy object over it (e.g., a stone) to have the SBD50 grounded.



GROUNDING CONNECTION DIAGRAM

6.4. WIRING CONNECTION AND ELECTRICAL SAFETY FOR SBD50-ELECTRIC

6.4.1. Ventilator Connection

- Every AC ventilator has its own plug. To run the ventilator, just connect it to a 22V electrical outlet. If the outlet is rated 110V, use the step-up transformer to convert 110V to 220V. A 10-meter extension cord is provided with the SBD50-Electric. Use a longer extension cord if needed. Be careful to avoid possible grounding.

6.4.2. Grounding Connection

- Make sure to connect the grounding wires (green/yellow-green) from the ventilator to the ground by pushing the peg into the soil. If the area is cemented, place the peg on the cement and secure it with a heavy object (e.g., a stone) to ensure the SBD50 is properly grounded.

6.5. LOADING

6.5.1. Unzip and open one side of the dryer before loading the agricultural commodity.

NOTE:

- Loading requires at least two (2) persons.

6.5.2. Place the bag with the commodity onto the drying floor and spread evenly on the designated drying area (2m wide).

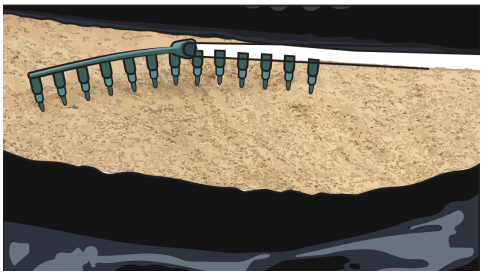
NOTE:

- Use elevated racks to dry high MC commodities.
- The SBD is not designed for drying "dripping wet" commodities. In those cases, the commodity needs to be sun dried, and final drying **(<30% MC)** can be performed in the SBD.
- Do not load the commodity into the preheating area within 1.5m of the ventilator.
- Leave a space of about 30cm on both sides of the drying floor that will serve as the side wall of the SBD50.

6.5.3. Use the rake mixer to spread the commodity evenly on the drying floor.

NOTE:

- Make sure the tool for spreading the commodity does not have sharp edges that may damage the drying floor.



6.6. CLOSING

6.6.1. After spreading the commodity evenly, close the drying area by completely zipping the heavy-duty zipper around it to connect the top cover and the drying floor.

NOTE:

- To open, follow the reverse procedure.

6.7. FIXING WALL WITH SUPPORT LOOPS

6.7.1. There are six (6) support loops which are located at the SBD50 wall:

a. Near the heating area.
b. At the halfway point of the drying floor.
c. Near the exhaust port.

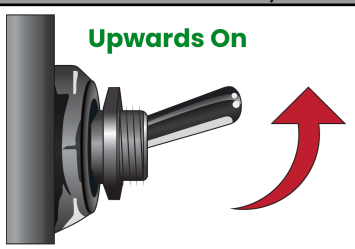
NOTE:

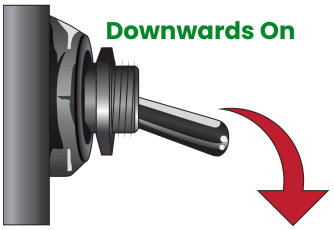
- The use of the middle wall support loop can be optional, especially if the "Tube mixer" will be used.

6.7.2. Support the SBD50 by using a rope to tie loops and peg them to the ground.
6.7.3. This will prevent the SBD50 from being blown by sudden strong winds.
6.7.4. On a concrete pavement, it can be tied to a sandbag, a heavy stone, or other heavy objects.

6.8. VENTILATOR MANAGEMENT (SBD50-SOLAR AND SBD-ELECTRIC)

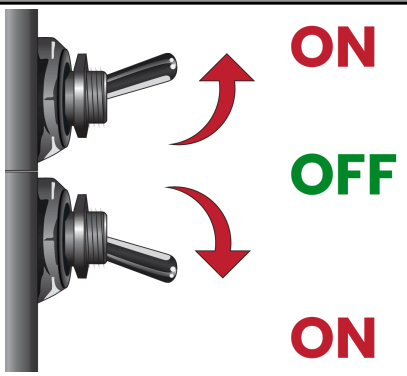
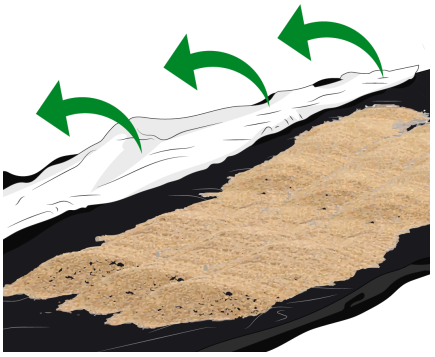
6.8.1. Daytime Operations (ventilator running at normal speed) - switch the toggle switch upwards to turn ON.



6.8.2. Nighttime Operations (ventilator running at controlled speed using PWM) - switch the toggle switch downwards ON.	
6.8.3. If the ventilator shuts down, press the button on the Solar Charge Controller. The ventilator will run automatically in about 5 seconds if there is enough energy stored in the battery. Otherwise, wait till the battery is recharged via the solar panel. NOTES: • For the SBD50-Electric: connect the 220V ventilators to the grid. If the outlet is 110V, use the step-up transformer to convert the 110V to 220V required by the 220V AC ventilator. • For the SBD50-Solar: connect the ventilators to the solar power system. Be careful to avoid a possible electric shock. OBSERVE SAFETY FIRST>	

6.9. MIXING	
6.9.1. Rake mixer: a. Insert the rake mixer along with the partly opened zipper liner.	
b. Close both zippers up to the rake handle.	
c. Mixing is done like a normal rake mixing in the sun drying method. As the rake handle is moved along the zipper line, ensure that you close the zipper slider around the rake handle.	
6.9.2. Tube Mixer (optional): a. Designed to provide vertical oscillating motion to mix the commodity inside the Bubble Dryer.	
b. Two (2) persons are needed to pull the tube mixer under the drying floor. They must pull the tube mixer at the same speed while maintaining the same direction and the same motion. NOTE: • Untie the rope in the middle of the SBD50 wall before the operation of the tube mixer. • For the best mixing results, the tube mixer must be	

pulled as fast as possible. • It is recommended to bring the tube mixer to the other end within 12 to 15 seconds.	

6.10. UNLOADING	
6.10.1. Switch off the ventilator after drying the commodity to the desired moisture content.	
6.10.2. Open the Bubble Dryer and bring the top cover to the other side. **NOTE:** • Make sure the tool for scooping the commodity does not have sharp edges that may damage the drying floor.	
6.10.3. Transfer the commodity to bags or other preferred containers for transport. **NOTE:** Make sure the tool for scooping the commodity does not have sharp edges that may damage the drying floor.	

7. MAINTENANCE AND CARE

7.1. REPAIRING PUNCTURES AND OTHER DAMAGES

7.1.1. Repair procedures for the drying floor:

a. Use the duct tape (grey) found in the repair kit to patch the damaged sections.

b. Clean the surface of the damaged area with a damp cloth and allow it to dry before applying the PVC duct tape.

c. Cut out a piece large enough to cover the damaged section to be applied at the outside surface of the drying floor, preventing the drumming of the rake during the mixing of the commodity.

d. Manually press the patching tape against the damaged area.

7.1.2. Protective maintenance:

a. Check the patched ducting tape occasionally and replace or re-patch if necessary.

7.1.3. Repair procedures for the transparent top cover:

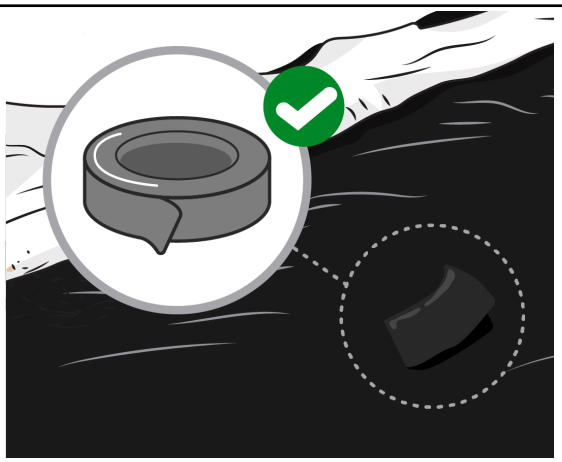
a. Use the UV-Transparent PE tape found in the repair kit to patch the damaged section.

b. Clean the surface of the damaged section with a damp cloth and allow it to dry before applying the PE tape.

c. Cut out a piece large enough to cover the damaged section and to be applied to the outside surface of the transparent cover, preventing rainwater.

7.1.4. Protective maintenance:

a. Check the patched PE tape occasionally and replace or re-patch if necessary.



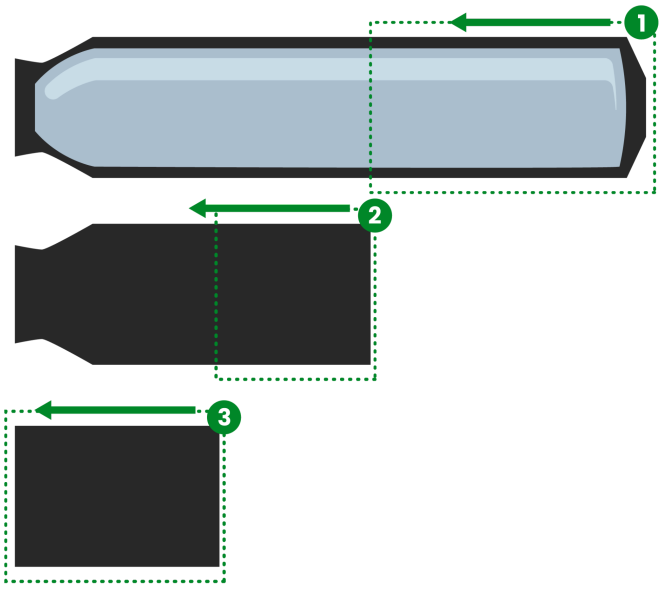
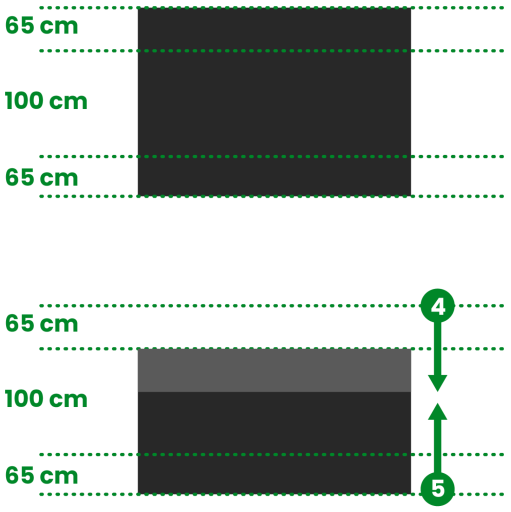
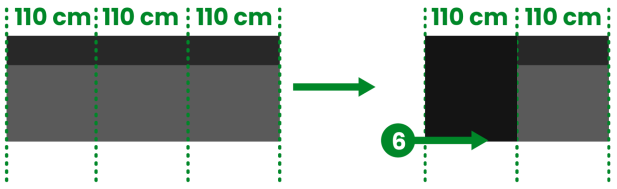
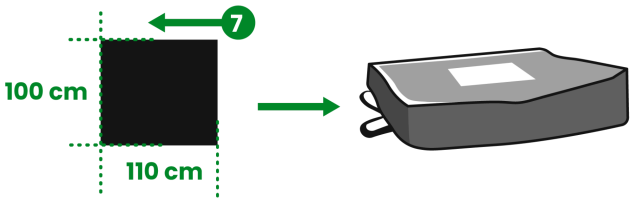
7.2. CLEANING THE TOP COVER AND BOTTOM SECTION

7.2.1. Clean with soap and water.

7.2.2. Dry in the sun.

7.3. BODY FOLDING INSTRUCTIONS

7.3.1. Lay down the SBD50 body on a flat surface and make sure that all the components of the body are assembled. The top cover shall be attached to the drying floor.

7.3.2. Fold the SBD body in half 3 times by holding and pulling the exhaust port to the heating area.	
7.3.3. Fold each side with a measure of 65cm. Make sure that the 100cm width in the middle is maintained.	
7.3.4. Fold the length indigo three (3) equal parts. Make sure that the first portion to fold is where both ends (heating area and exhaust) are located.	
7.3.5. Make sure that the final dimension is 100 cm x 100 cm to fit into the carrying bag.	

7.4. BATTERY CHARGING, MAINTENANCE, AND STORAGE

7.4.1. Battery Charging.

a. Batteries should be charged after every use to ensure they do not sit in a low state of charge for extended periods.
b. Lead-acid batteries do not have a memory effect and do not need to be fully discharged before charging.
c. Add water cells after charging up to a level of ⅛" below the bottom of the vent well. Do not overfill the battery. Do not use tap water. Use distilled water only.
d. Never add acids/electrolytes to the cells.
e. Check your battery once a month after installation to determine the proper watering schedule.

7.4.2. Battery Inspection and Cleaning.

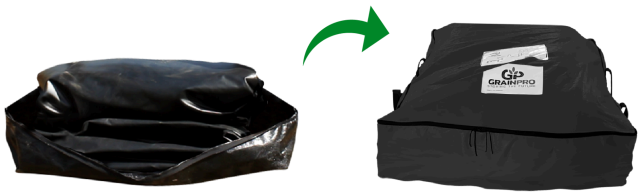
a. Keep batteries clean and dry.
b. Check that all vent caps are tight.
c. Check that all connections are tight.
d. Terminal protectors should be applied to terminals to reduce corrosion.
e. Use a solution of baking soda and water to clean if there is acid residue on the battery or corrosion on the terminals.

7.4.3. Battery Storage

a. It is suggested to store the battery in a well-ventilated place. If the battery has high temperature or poor ventilation during storage and delivery, the self-discharge will increase.
b. The best storage temperature is 25℃.
c. Keep batteries away from fire, flames, heat sources, etc.
d. Do not store the batteries in a discharged state for a long period of time; recharge the battery after discharge to keep its capacity.

7.5. SAFEKEEPING

7.5.1. Once GrainPro® Solar Bubble Dryer™ 50 is clean and clear of dust, fold it neatly to avoid creases that may weaken the material over time. Store away from heat, direct sunlight, and rodents.



7.5.2. Place the GrainPro® Solar Bubble Dryer™ 50 in a dry and cool storage, free from pests and humidity, until the next use. To prevent rodent attack, place it on an elevated pallet or suspended from a beam or girder.

7.6. RECYCLING

GrainPro® Solar Bubble Dryer™ 50, its material is made of reinforced PVC and LDPE.

7.6.1. The products can be delivered to the nearest recycling facilities in the area.

7.6.2. Plastic #3 - PVC (Vinyl) can be recycled into paneling, flooring, speed bumps, decks, or roadway gutters.

7.6.3. Where to dispose of your used GrainPro® Solar Bubble Dryer™ 50?

a. In Malaysia, Grainpro® partnered with Gargeon to collect and recycle used hermetic liners. To connect with them, visit their website at www.gargeon.com.

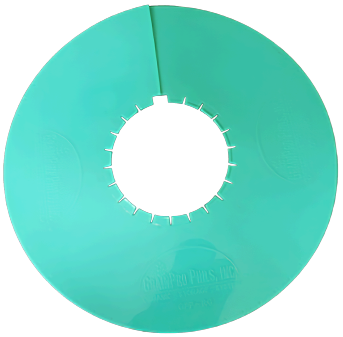
b. For the US or EU, hermetic liners may be sent to the GrainPro® and Neumann Recycling Project. For more information, email us at sustainability@grainpro.com.

7.7. INSTALLATION OF RODENT GUARD (RG).

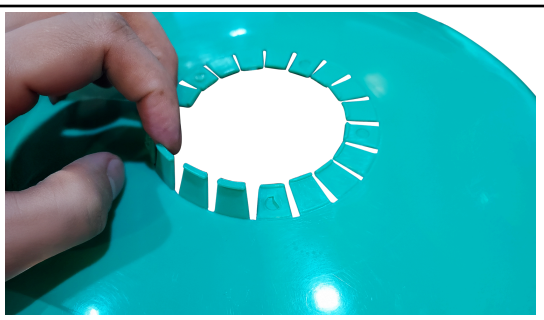
7.7.1. For protection against rodent attacks, one set contains four (4) pieces of rodent guard.

a. The set can be installed on any platform legs with a leg perimeter of 22 cm (9”) to 44 cm (17”), either round or square.

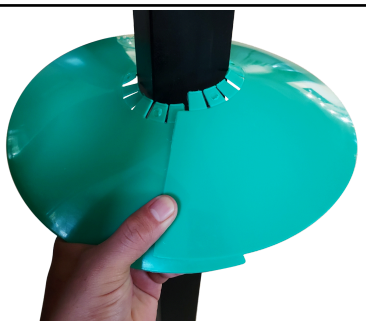
b. If the leg area is smaller, the rodent guard can be cut in half to fit. Cut along the lines at the back of the rodent guard.



7.7.2. Fold the rodent guard’s teeth upwards against the sides of the leg to keep it from slipping.



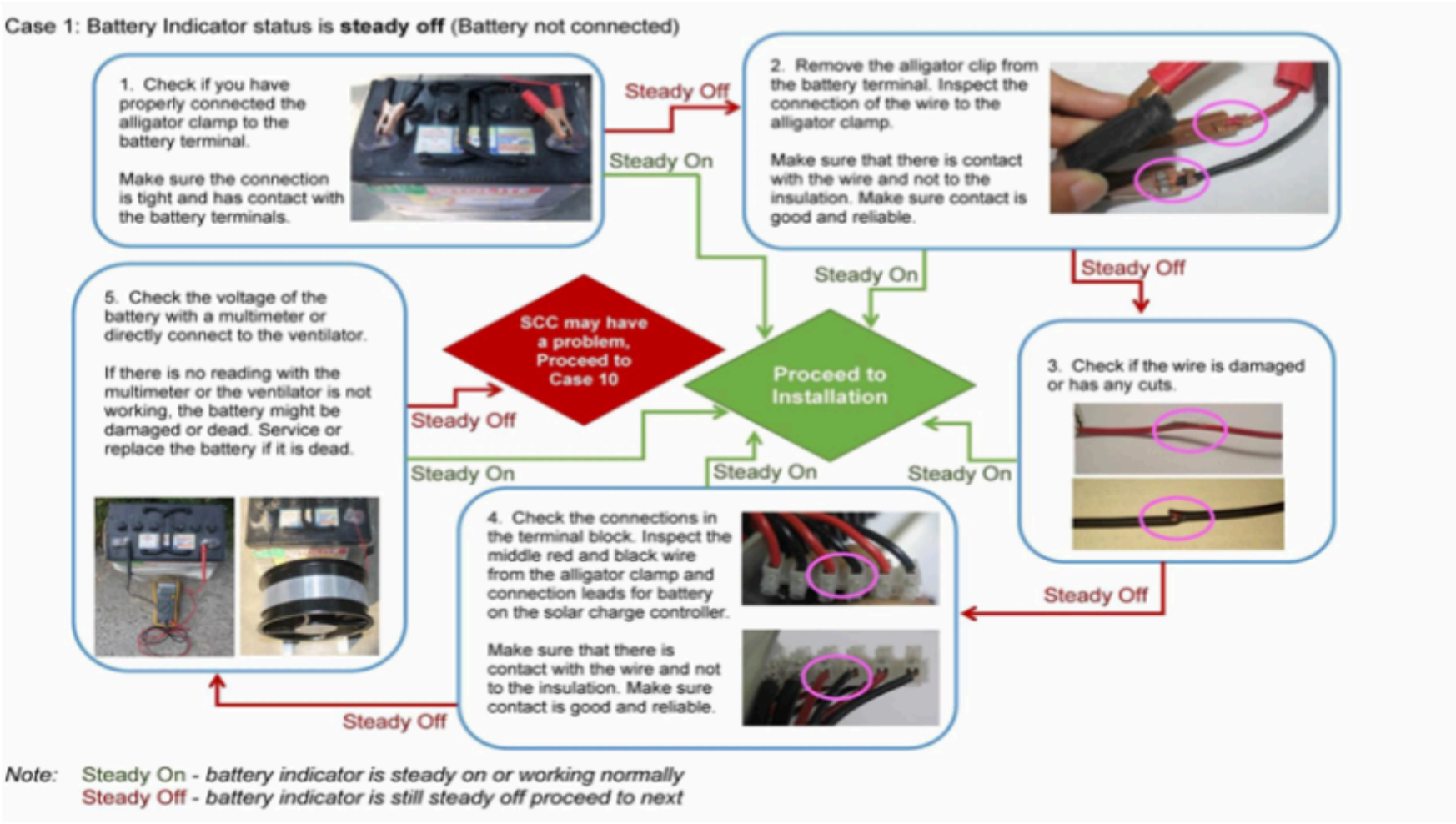
7.7.3. Make sure to overlap the sides at least one inch.



7.7.4. Lock the overlap using staple wire, cable wire, or any fastener. A user guide is included in the rodent guard sets for the complete installation procedure.

8. TROUBLESHOOTING: GRAINPRO® SOLAR BUBBLE DRYER™ 50 WIRRING HARNESS

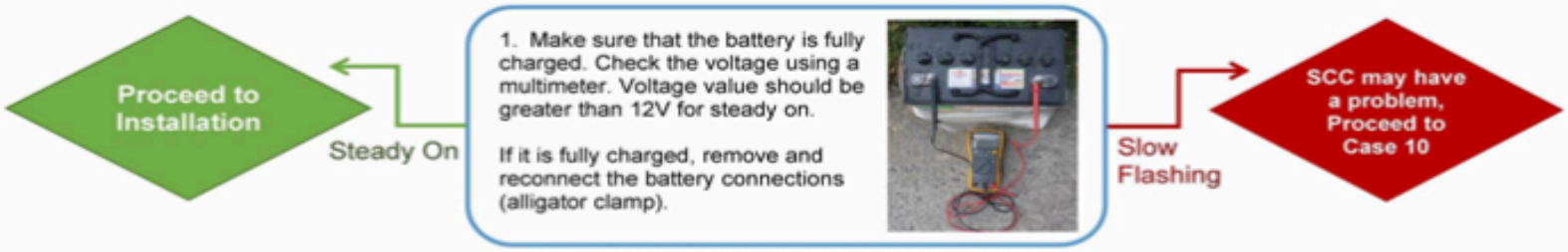
8.1. CASE 1: BATTERY INDICATOR STATUS IS “STEADY OFF” (BATTERY NOT CONNECTED)



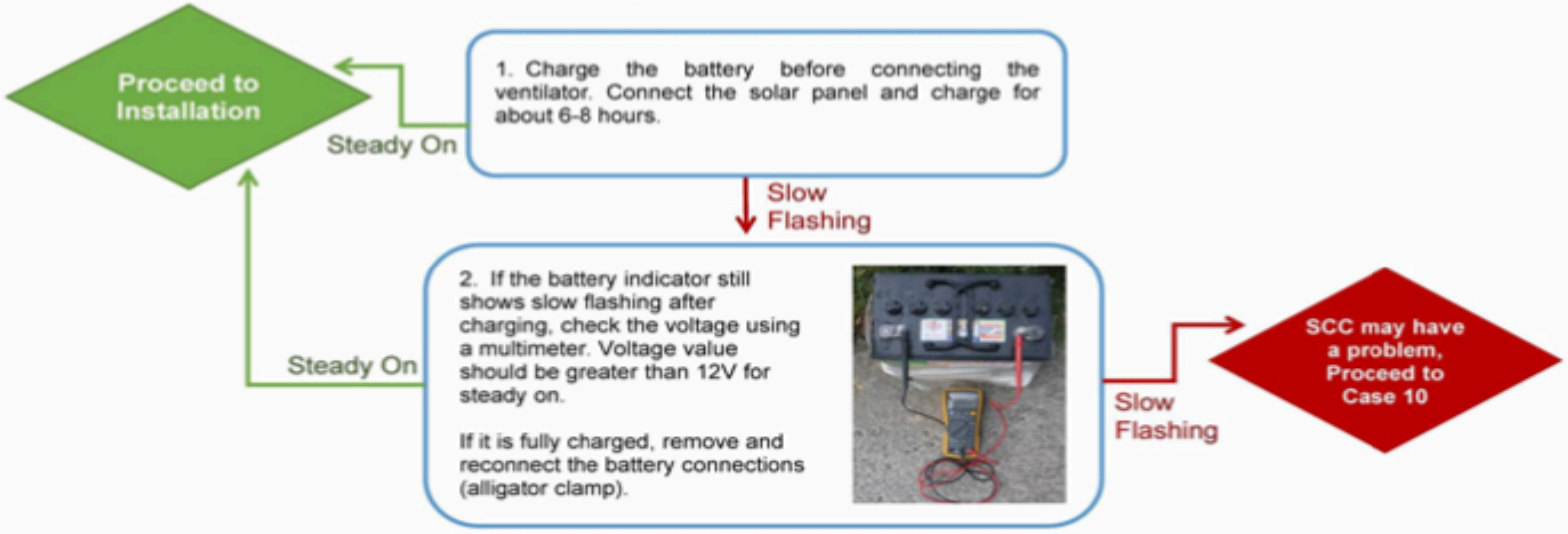
8.2. CASE 2: BATTERY INDICATOR STATUS IS “SLOW FLASHING” (BATTERY UNDER VOLTAGE)

Case 2: Battery Indicator status is **slow flashing** (Battery under voltage)

- **Battery fully charged and shows slow flashing**



- **Battery not fully charged and shows slow flashing**

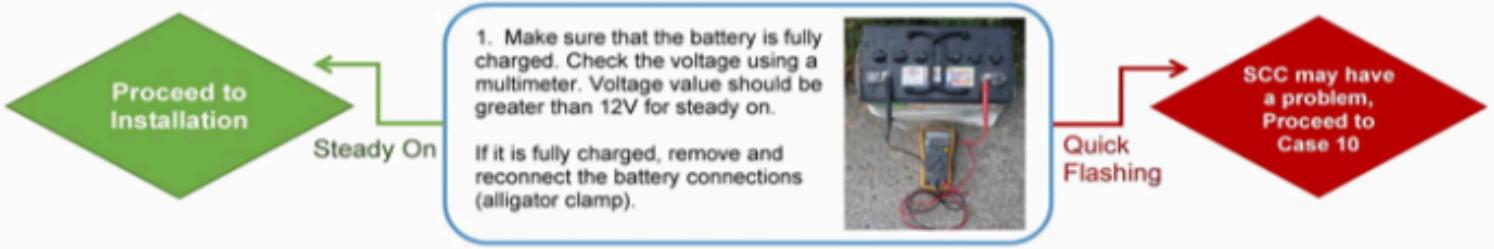


Note: Steady On - *battery indicator is steady on or working normally*
Slow Flashing - *battery indicator is still slow flashing proceed to next*

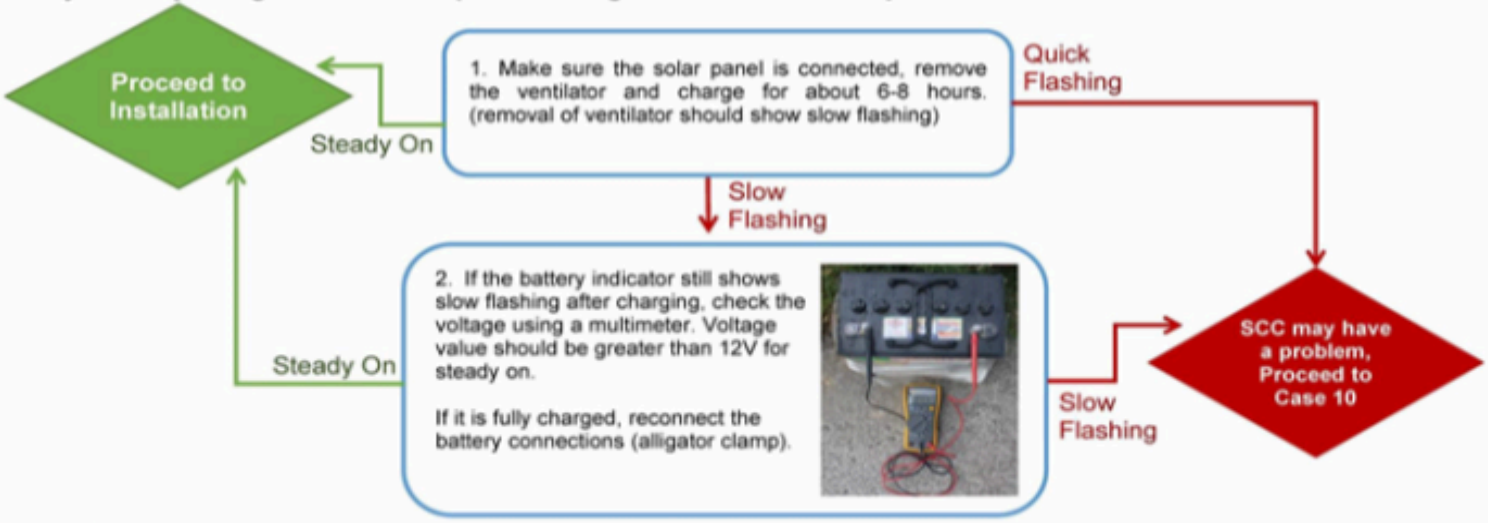
8.3. CASE 3: BATTERY INDICATOR STATUS IS “QUICK FLASHING” (BATTERY OVER DISCHARGED)

Case 3: Battery Indicator status is **quick flashing** (Battery over discharged)

- **Battery fully charged and shows quick flashing with load connected (both for ventilator running and not running)**

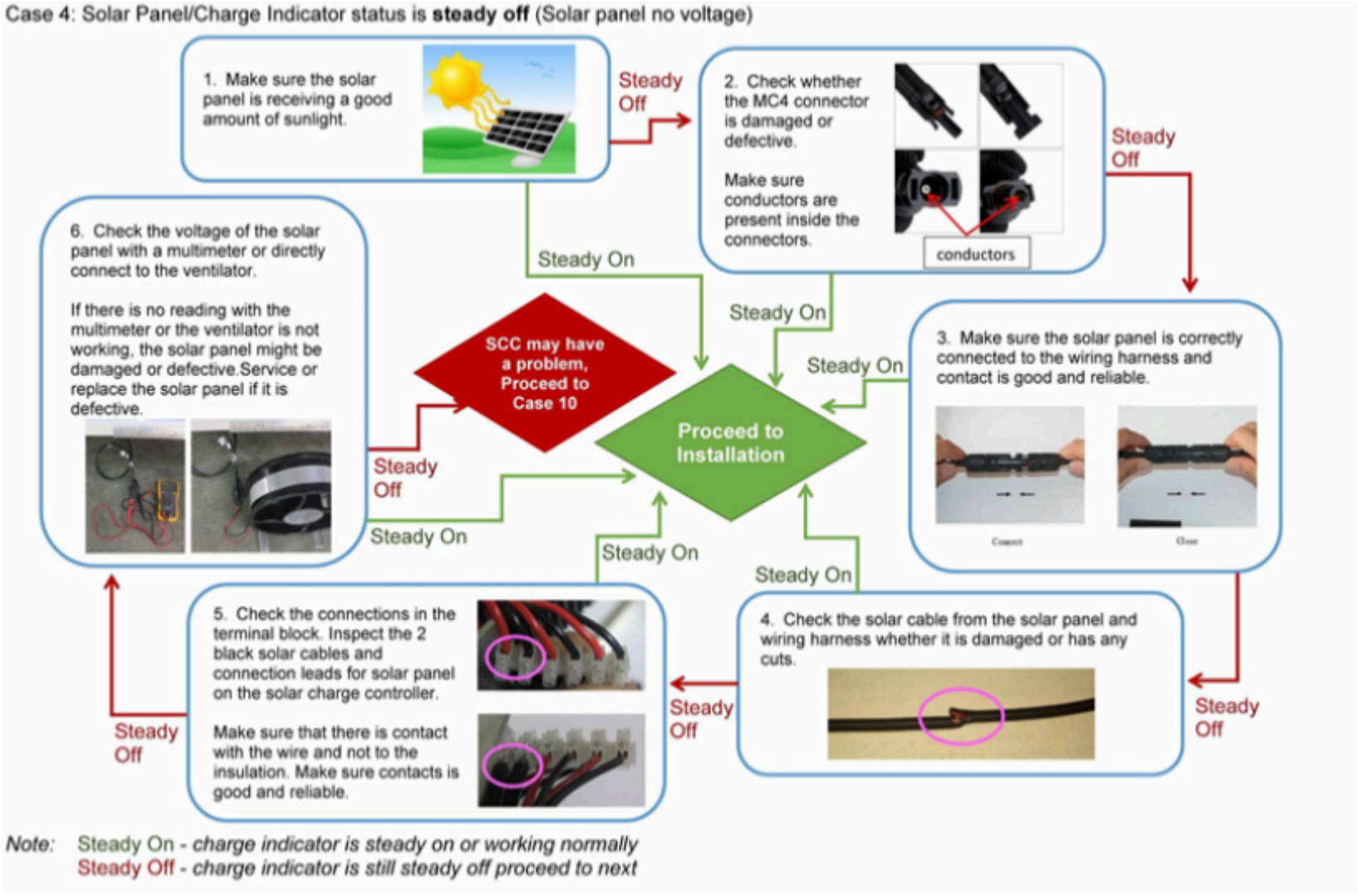


- **Battery not fully charged and shows quick flashing with load and no output**

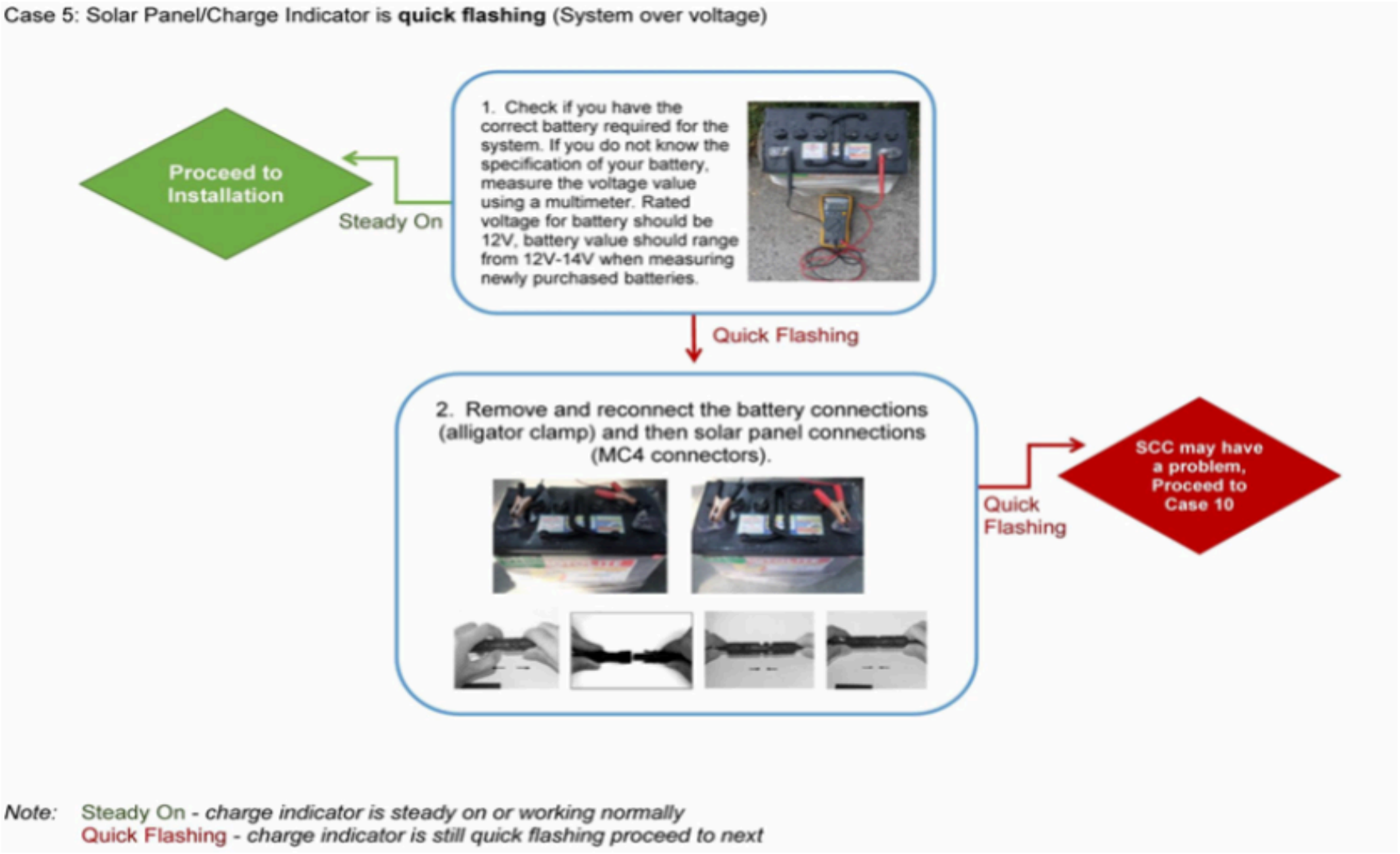


Note: Steady On - *battery indicator is steady on or working normally*
Quick Flashing - *battery indicator is still quick flashing proceed to next*
Slow Flashing - *battery indicator is still slow flashing proceed to next*

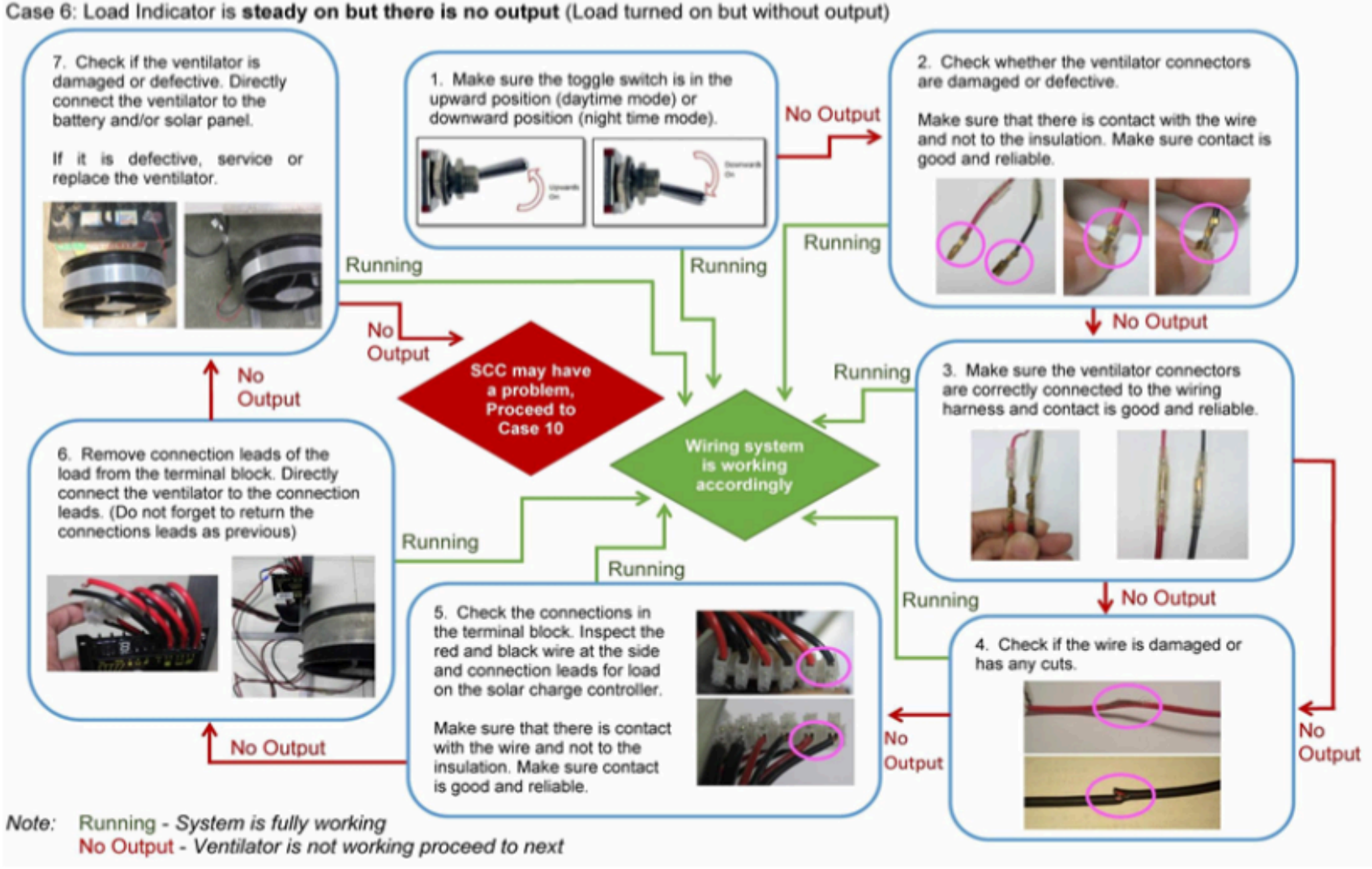
8.4. CASE 4: SOLAR PANEL/CHARGE INDICATOR IS “STEADY OFF” (SOLAR PANEL NO VOLTAGE)



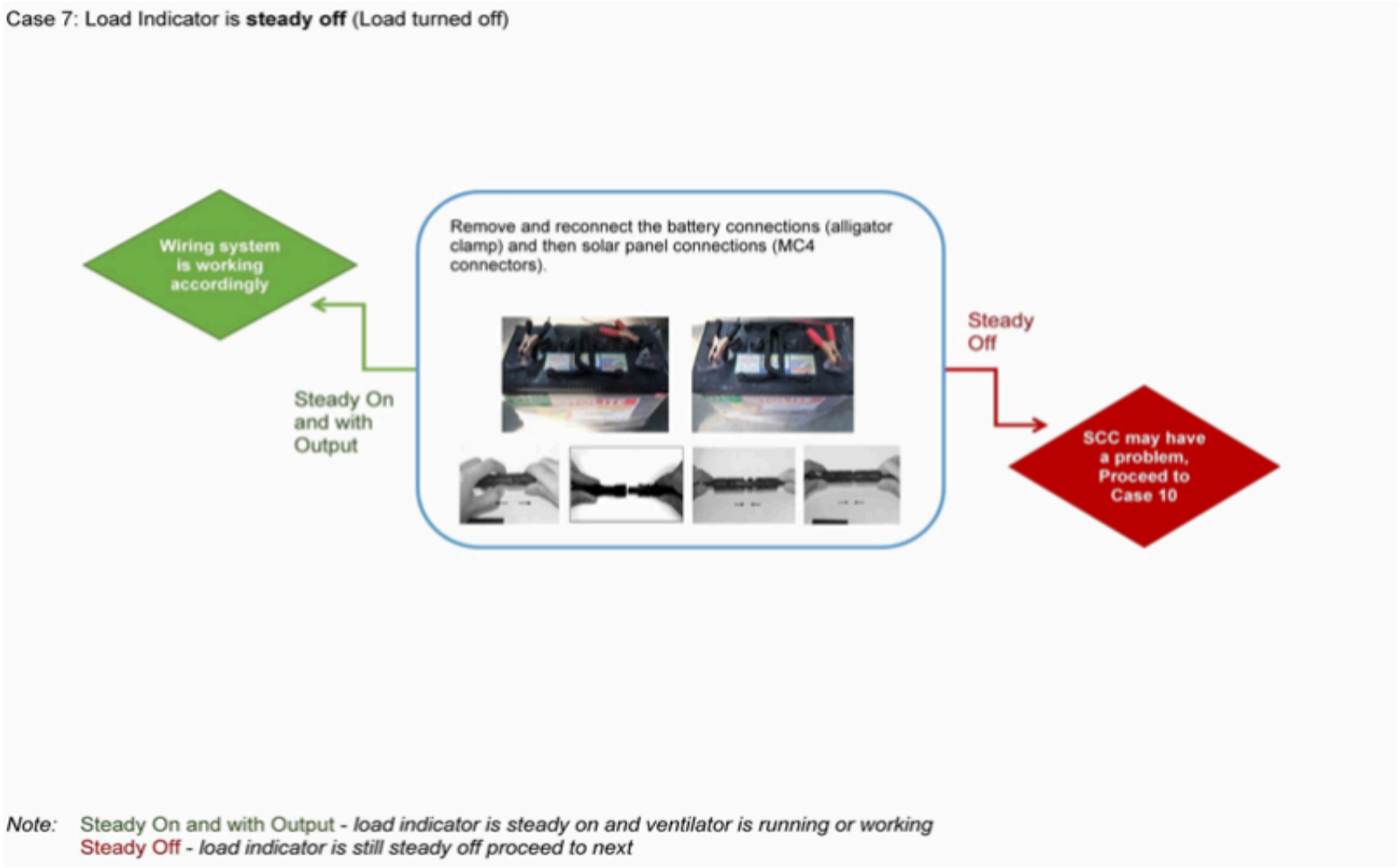
8.5. CASE 5: SOLAR PANEL/CHARGE INDICATOR IS “QUICK FLASHING” (SYSTEM OVERVOLTAGE)



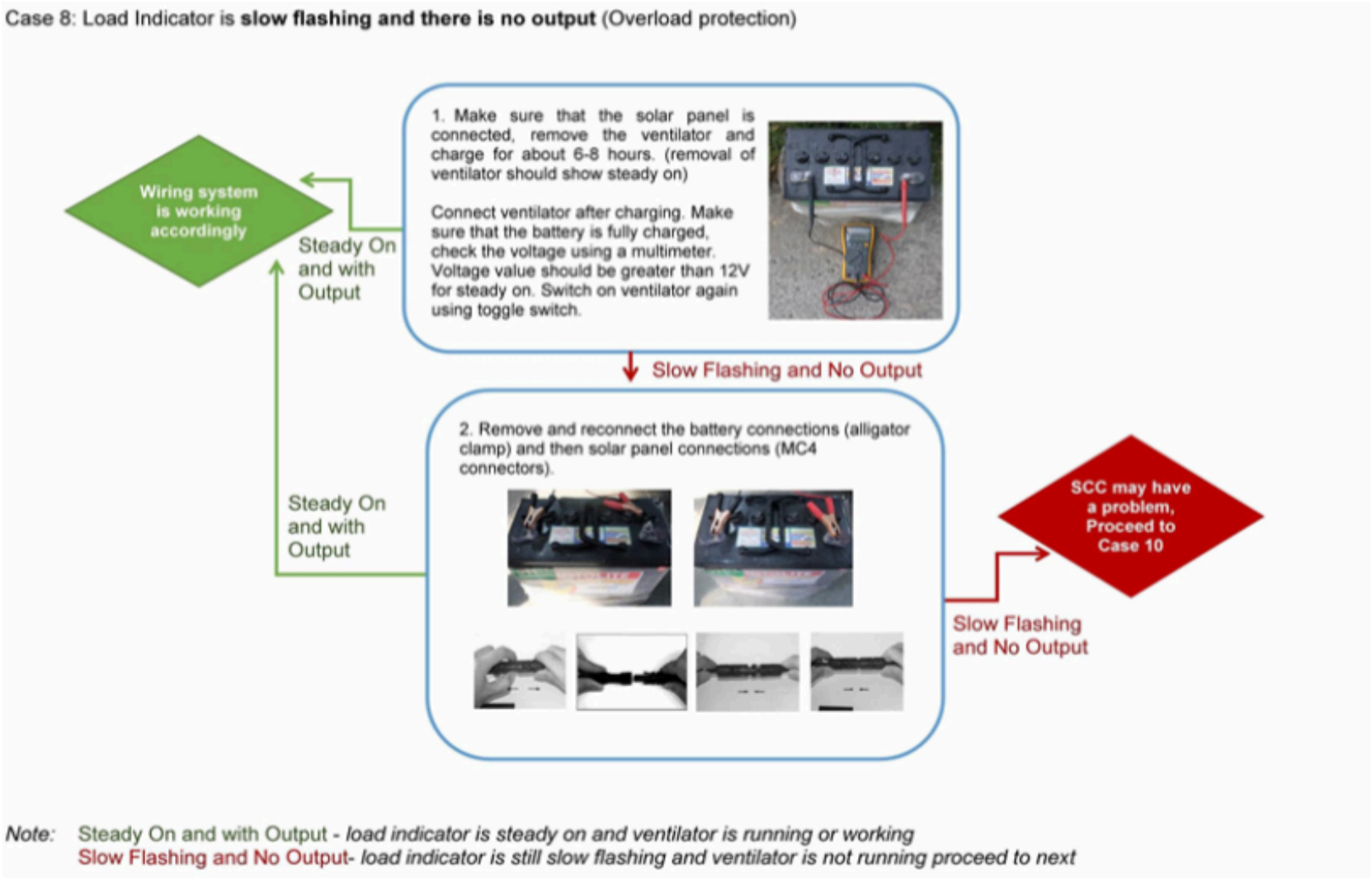
8.6. CASE 6: LOAD INDICATOR IS “STEADY ON BUT THERE IS NO OUTPUT” (LOAD TURNED ON BUT WITHOUT OUTPUT)



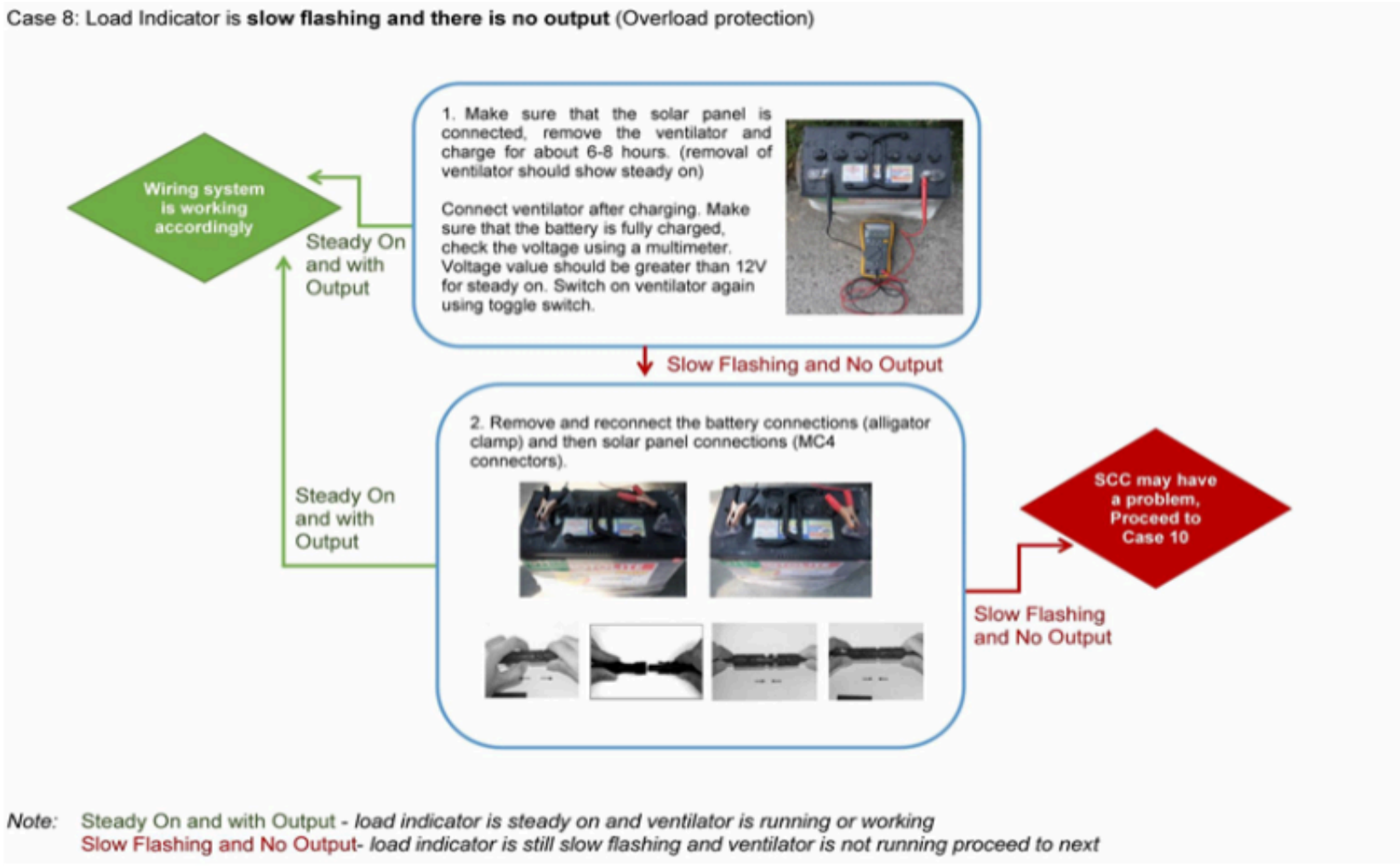
8.7. CASE 7: LOAD INDICATOR IS “STEADY OFF” (LOAD TURNED OFF)



8.8. CASE 8: LOAD INDICATOR IS “SLOWLY FLASHING AND THERE IS NO OUTPUT” (OVERLOAD PROTECTION)



8.9. CASE 9: LOAD INDICATOR IS “QUICK FLASHING AND THERE IS NO OUTPUT” (SHORT-CIRCUIT PROTECTION)



8.10. CASE 10: SOLAR CHARGE CONTROLLER IS NOT WORKING PROPERLY

Case 10: Solar Charge Controller is **not working properly**

- **Mode Indicator is not showing seven dot [7.]**

Mode Indicator	Mode	Mode Indicator	Mode
0	Purely light-operated	9	Light control + time control (9 hours)
1	Light control + time control (1 hour)	0.	Light control + time control (10 hours)
2	Light control + time control (2 hours)	1.	Light control + time control (11 hours)
3	Light control + time control (3 hours)	2.	Light control + time control (12 hours)
4	Light control + time control (4 hours)	3.	Light control + time control (13 hours)
5	Light control + time control (5 hours)	4.	Light control + time control (14 hours)
6	Light control + time control (6 hours)	5.	Manual mode
7	Light control + time control (7 hours)	6.	Debugging mode
8	Light control + time control (8 hours)	7.	Normal On mode

Mode Indicator	Battery Type	Mode Indicator	Battery Type
1	Sealed lead-acid battery	5	4 strings of ternary-material lithium batteries
2	GEL lead-acid battery	6	7 strings of ternary-material lithium batteries
3	Flooded lead-acid battery	7	4 strings of lithium iron phosphate batteries
4	3 strings of ternary-material lithium batteries	8	8 strings of lithium iron phosphate batteries

Load Working Mode Setting Method

1. Press the key for no less than 3 seconds, the mode indicator will begin to flash indicating that the system can be adjusted, release the key after.
2. Click the key until you see seven dot [7.] on the mode indicator.
3. Wait until the mode indicator stops flashing or press the key again for no less than 3 seconds to complete the settings.

Battery Type Setting Mode Method

1. Repeat step 1 and 2 of **Load Working Mode Setting Method** but click the key until five dot [5.].
2. Release the key, and long press the key again. The three light indicator and mode indicator will begin to flash.
3. Click the key until you see two [2] for the appropriate battery type mode.
4. Long press the key. When the light indicators stop flashing, the setting is complete and mode indicator exits to the seven dot [7.] mode.
5. Temporarily cover the key press button with masking tape.

- **Charge, Battery, and/or Load Indicator not working properly**

1. Remove all connections.
2. Go to item **5.3 Wiring Connection and Electrical Safety**, Make sure to follow all the setup and steps accordingly.

Note: If the key is covered with a "do not remove" sticker, just press the covered key. Avoid pressing the key/covered key in the future. Provided/ suggested battery is flooded lead-acid battery. Battery type can be changed depending on the battery used.

9. FREQUENTLY ASKED QUESTIONS

9.1. WHAT IS THE GRAINPRO® SOLAR BUBBLE DRYER™ 50?

- The GrainPro® Solar Bubble Dryer™ 50 is a state-of-the-art solar drying product for agricultural commodities. It is designed to improve the drying process and prevent the growth of aflatoxin-producing molds due to delays caused by intermittent rainfall during the drying process. With the “greenhouse effect”, the GrainPro® Solar Bubble Dryer™ 50 traps solar radiation and heats up the commodity inside. As it vaporizes moisture, the ventilator then pushes the moist air out.

9.2. HOW MANY PERSONS ARE NEEDED TO ASSEMBLE AND OPERATE THE GRAINPRO® SOLAR BUBBLE DRYER™ 50?

- A minimum of two (2) persons are needed to assemble and operate the GrainPro® Solar Bubble Dryer™ 50.

9.3. WHAT COMMODITIES CAN BE DRIED IN IT?

- The GrainPro® Solar Bubble Dryer™ 50 can be used to dry a wide variety of grains, including rice paddy, maize, wheat, nuts, coffee, cocoa, soybean, and others. When in doubt, you may reach out to GrainPro support.

9.4. WHAT IS THE GRAINPRO® SOLAR BUBBLE DRYER™ 50 DRYING CAPACITY?

- For paddy and corn, it has an optimum drying capacity of one (1) metric ton or 1,000 kg. For faster drying, a 30-minute mixing interval is recommended.

9.5. WHAT HAPPENS IF I DRY MORE THAN THE RECOMMENDED CAPACITY?

- The drying time will be longer.

9.6. HOW QUICKLY CAN THE GRAINPRO® SOLAR BUBBLE DRYER™ 50 DRY THE COMMODITY?

- The drying time is dependent on the type of commodity, moisture content, air temperature, and the relative humidity of the ambient air. On a full sunny day, paddy can be dried in about 8 hours from 22% to 14% moisture, but the drying rate can be increased by increasing the mixing frequency. The average drying rate for paddy and maize is about 1% MC per 2 hours under intermittent rains and cloudy weather.

9.7. WHAT SETS THE SBD APART FROM OTHER TYPES OF MECHANICAL DRYERS?

- The GrainPro® Solar Bubble Dryer™ 50 uses purely solar energy. It does not contribute to environmental pollution and climate change. Unlike the flatbed dryer, it does not require the construction of a shed to protect the grains from the elements.

9.8. HOW DOES HEAT FROM THE SUN AFFECT THE COMMODITIES BEING DRIED IN THE GRAINPRO® SOLAR BUBBLE DRYER™ 50?

- Yes. The amount of solar radiation significantly affects the drying rate and the amount of solar energy available for storage in the AGM battery.

9.9. WHAT ARE THE CHANCES OF “BAKING” THE COMMODITY BEING DRIED?

- If the ventilators are running, the commodity is frequently mixed at regular intervals, and the moisture content is regularly checked, then the “baking” or overheating of the commodity will be prevented.

9.10. CAN I RUN THE GRAINPRO® SOLAR BUBBLE DRYER™ 50 AT NIGHTTIME?

- Yes. The ventilator will run at a controlled speed (using PWM) to keep the bubbles up.

9.11. IS IT SAFE TO SET UP THE GRAINPRO® SOLAR BUBBLE DRYER™ 50 WHEN IT’S RAINING OUTSIDE?

- No. Setting up the GrainPro® Solar Bubble Dryer™ 50 should be done while it’s not raining to avoid water accumulation on the drying floor and soaking the commodity to be dried. It is recommended to wait for the rain to stop before setting up the GrainPro® Solar Bubble Dryer™ 50.

9.12. CAN I RUN THE GRAINPRO® SOLAR BUBBLE DRYER™ 50 EVEN WHEN IT IS RAINING HEAVILY?

- Yes. If there is a commodity inside, just make sure that the ventilator is running so rainwater does not seep inside.

9.13. CAN THE VENTILATORS RUN CONTINUOUSLY?

- Yes. However, it depends on battery voltage and weather conditions. The battery should be fully charged before use, and the weather conditions should be clear and sunny. In the case of intermittent weather conditions, a fully charged AGM battery that we suggest can last up to 4-5 days.

9.14. IS IT NECESSARY TO HAVE THE TOP COVER INFLATED WHEN THERE’S A COMMODITY INSIDE THE GRAINPRO® SOLAR BUBBLE DRYER™ 50?

- Yes. The top cover protects the commodity, especially when it’s raining. It also helps in minimizing condensation.

9.15. WHICH DIRECTION SHOULD THE GRAINPRO® SOLAR BUBBLE DRYER™ 50 FACE FOR BEST RESULTS?

- In terms of wind direction, the ventilator should be facing the incoming wind, while the solar panel should be facing South for best exposure to solar radiation.

9.16. CAN I SET UP THE GRAINPRO® SOLAR BUBBLE DRYER™ 50 JUST ABOUT ANYWHERE?

- The GrainPro® Solar Bubble Dryer™ 50 can be set up on any relatively flat surface (i.e., grassland, rice field, etc.) as long as there is optimal access to solar radiation.

9.17. CAN IT WITHSTAND STORMS AND FLOODS?

- It’s not advisable to use the GrainPro® Solar Bubble Dryer™ 50 during stormy weather, though it can prevent water entry into the drying chamber up to a certain extent (i.e., less than 10 cm).

9.18. HOW LONG DOES IT TAKE TO SET UP THE SBD50?

- Typically, it would take about 30 minutes to set it up, depending on the skills and familiarity of the person setting up the SBD50.

9.19. FOR THE GRAINPRO® SOLAR BUBBLE DRYER™ 50-SOLAR, WILL THE VENTILATORS STILL RUN EVEN IF THERE'S NO SOURCE OF SOLAR ENERGY?

- If there's not enough energy stored in the AGM battery, the ventilator will automatically stop. The AGM battery is protected by the solar charge controller. When the solar charge controller detects a critical energy level of the battery, all devices will stop drawing energy from the battery.

9.20. IS IT QUICKER TO DRY IN THE GRAINPRO® SOLAR BUBBLE DRYER™ 50 -ELECTRIC OR IN THE GRAINPRO® SOLAR BUBBLE DRYER™ 50-SOLAR?

- The drying rate is stable in the GrainPro® Solar Bubble Dryer™ 50-Electric because the power supply from the grid is relatively stable. Unlike in GrainPro® Solar Bubble Dryer™ 50-Solar, the energy supply is dependent on the available solar radiation.

9.21. IS THERE A DIFFERENCE IN THE QUALITY OF GRAINS AND SEEDS DRIED IN THE GRAINPRO® SOLAR BUBBLE DRYER™ 50 COMPARED TO REGULAR SUN-DRYING?

- Grains dried in the GrainPro® Solar Bubble Dryer™ 50 have higher head rice recovery and are free from foreign contaminants (i.e., animal excreta, urine, sand, etc.).

9.22. IS THERE A WAY TO ENSURE THAT THE COMMODITY IS DRIED EQUALLY?

- Yes, by frequently and uniformly mixing the commodity during drying. A 30-minute mixing interval, on average, is recommended. But a 20-minute mixing interval will be much better and will shorten the drying time.

9.23. IS THERE A WAY TO CHECK IF THE COMMODITY IS DRIED TO THE CORRECT MC?

- Yes. Use a calibrated moisture meter for better accuracy of moisture content readings. Farmers tend to have expertise in determining whether a product is already dry enough for milling or seed-keeping purposes. However, they cannot give an exact reading, like a moisture meter.

9.24. IS THERE ANY DIFFERENCE BETWEEN CROPS DRIED NEAR THE VENTILATOR COMPARED TO THOSE AT THE FARTHER END OF THE GRAINPRO® SOLAR BUBBLE DRYER™ 50?

- There's a slight, but insignificant, moisture content gradient. When the dried commodity is gathered, this moisture gradient equilibrates with the moisture content of the rest.

9.25. DO I NEED TO STORE THE GRAINPRO® SOLAR BUBBLE DRYER™ 50 WHEN I'M NOT USING IT?

- Yes. When not in use, it's recommended to clean the GrainPro® Solar Bubble Dryer™ 50 properly. Fold the top cover, dry the floor, and store it in a clean area away from rodents and objects that could damage it.

9.26. WHAT ARE THE MAINTENANCE REQUIREMENTS FOR THE GRAINPRO® SOLAR BUBBLE DRYER™ 50?

- After using, clean the drying floor and inspect it for cuts or holes. If there are holes or cuts, patch them using the repair tape. Put the SBD50 in the carrying bag and store it, along with its accessories, out of the reach of rodents. Avoid dragging the SBD50 drying floor on rough surfaces.

9.27. WHAT IS THE USEFUL LIFE SPAN OF THE GRAINPRO® SOLAR BUBBLE DRYER™ 50?

- The GrainPro® Solar Bubble Dryer™ 50 comes with a 1-year warranty for normal wear and tear. However, the GrainPro® Solar Bubble Dryer™ 50 must be used and taken care of according to the instructions in the manual to last several useful years.

10. WARRANTY CLAUSE

GrainPro® hereby warrants that the product sold to buyers shall be free of defects in workmanship and materials for a period as follows, starting from the date of shipment (B/L): One year for the GrainPro® Solar Bubble Dryer™ 50 (SBD50).

The warranty liability is limited to the replacement of defective products within the warranty period at GrainPro's plant in accordance with the provisions specifically and expressly set forth herein.

The Buyer will pay for the products that need to be replaced under warranty, a percentage of the full list price according to the ratio between the period that has passed until replacement and the full warranty period.

The Buyer shall bear the shipping costs for shipment of defective Products to GrainPro®, and GrainPro® shall bear the shipping costs of returning good Products to the Buyer.

The Warranty does not cover the cost of any service, work, or material required for the replacement of defective Products at the site of installation.

GrainPro® shall have no obligation under the warranty to replace defective Products or parts thereof if the defect is a result of any of the following: normal wear and tear; damages occurring after delivery, accidents, acts of God, or catastrophes, buyer's fault or negligence, improper storage or installation, and improper maintenance.

Replacement costs and shipping charges for Products found not to be under warranty as specified above shall be paid in full by the Buyer before new/refurbished Products are shipped.

Notwithstanding the above, if the Products include main parts or sub-assemblies purchased by GrainPro® from other vendors ("Additional Equipment"), then the period and terms of warranty for Additional Equipment are limited to the period and terms offered by the vendors of such equipment.

The Buyer agrees that the warranty liabilities of GrainPro® shall be and are limited to the express foregoing terms: THE EXPRESS WARRANTIES AND OBLIGATIONS SET FORTH ABOVE ARE AND SHALL BE IN LINE OF ALL OTHER WARRANTIES AND OBLIGATIONS OF GRAINPRO®, and EXPRESSED OR IMPLIED. EXCEPT TO THE EXTENT HEREIN PROVIDED, GRAINPRO® DOES NOT MAKE AND SHALL NOT BE DEEMED TO MAKE ANY WARRANTY WHATSOEVER TO ANY END USER OR ANY OTHER PERSON OR PARTY, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR USE OR PURPOSE. GRAINPRO® SHALL NOT BE LIABLE FOR ANY LOSS OF USE, SALES, OR PROFIT OR ANY INDIRECT, CONSEQUENTIAL, OR INCIDENTAL DAMAGES CAUSED BY OR SUFFERED AS A RESULT OF THE SALE OR USE OF THE PRODUCTS.

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