

Install Guide & Owner's Manual

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CONTACT US

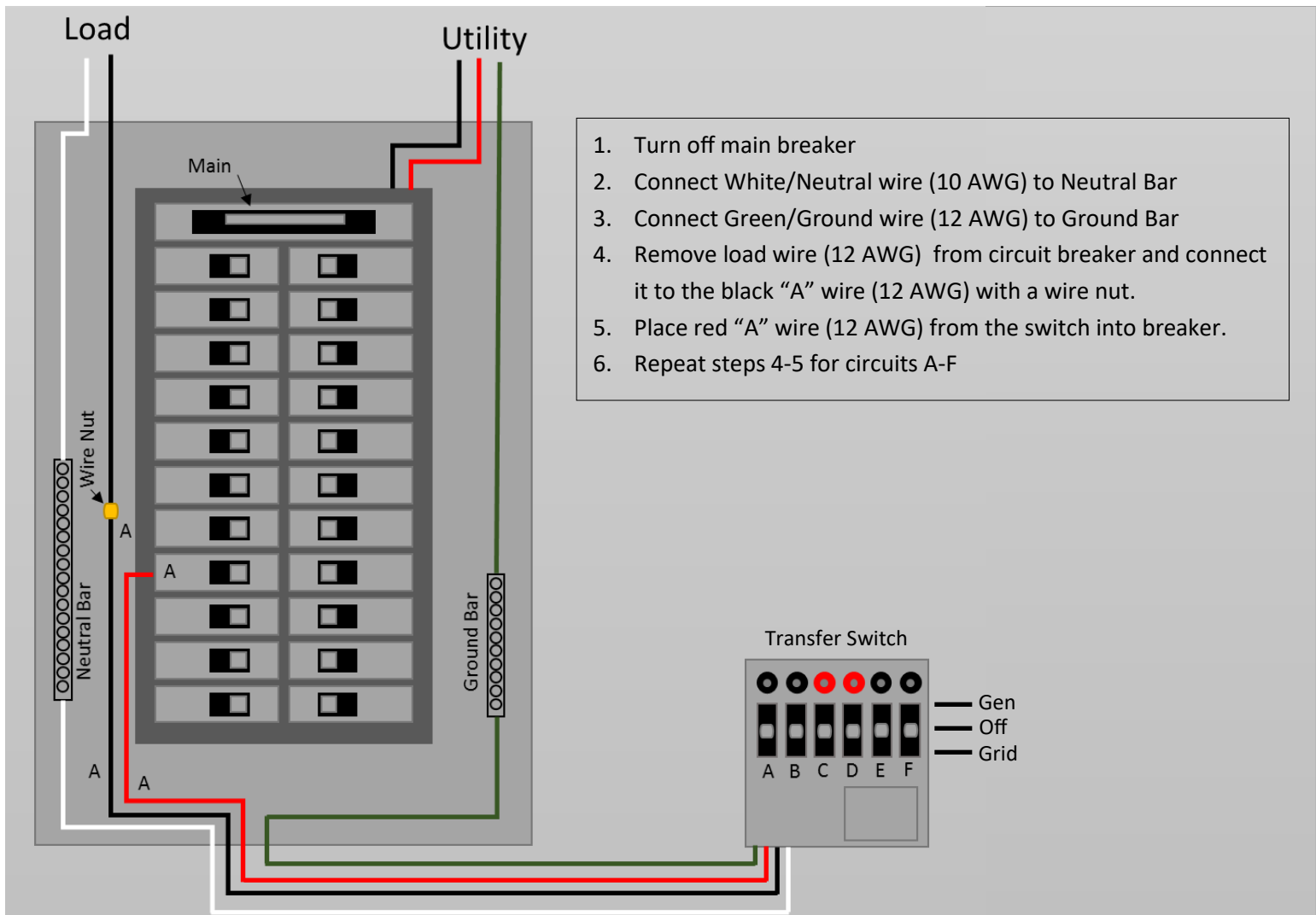
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2. Decide Critical Backup Circuits

- Decide which 4-5 circuits will be on backup power continuously and which 1-2 high power loads (microwave, furnace fan, coffee pot, toaster) will be able to be switched to backup power manually when needed. These circuits **must use non-GFI breakers** to work with the Transfer Switch. Sometimes low load circuits can be combined.
- Keep well within limits of inverter (6KW peak, 3KW continuous, 120V only).
- Verify each circuit load by measuring typical and max Amps clip-on meter. $A \times 120V = \text{Watts}$

3. Mount Transfer Switch

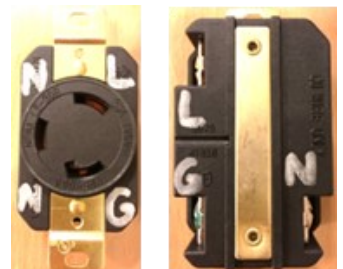


4. Install 30A non-GFI breaker and L5-30R receptacle (using 10 AWG)

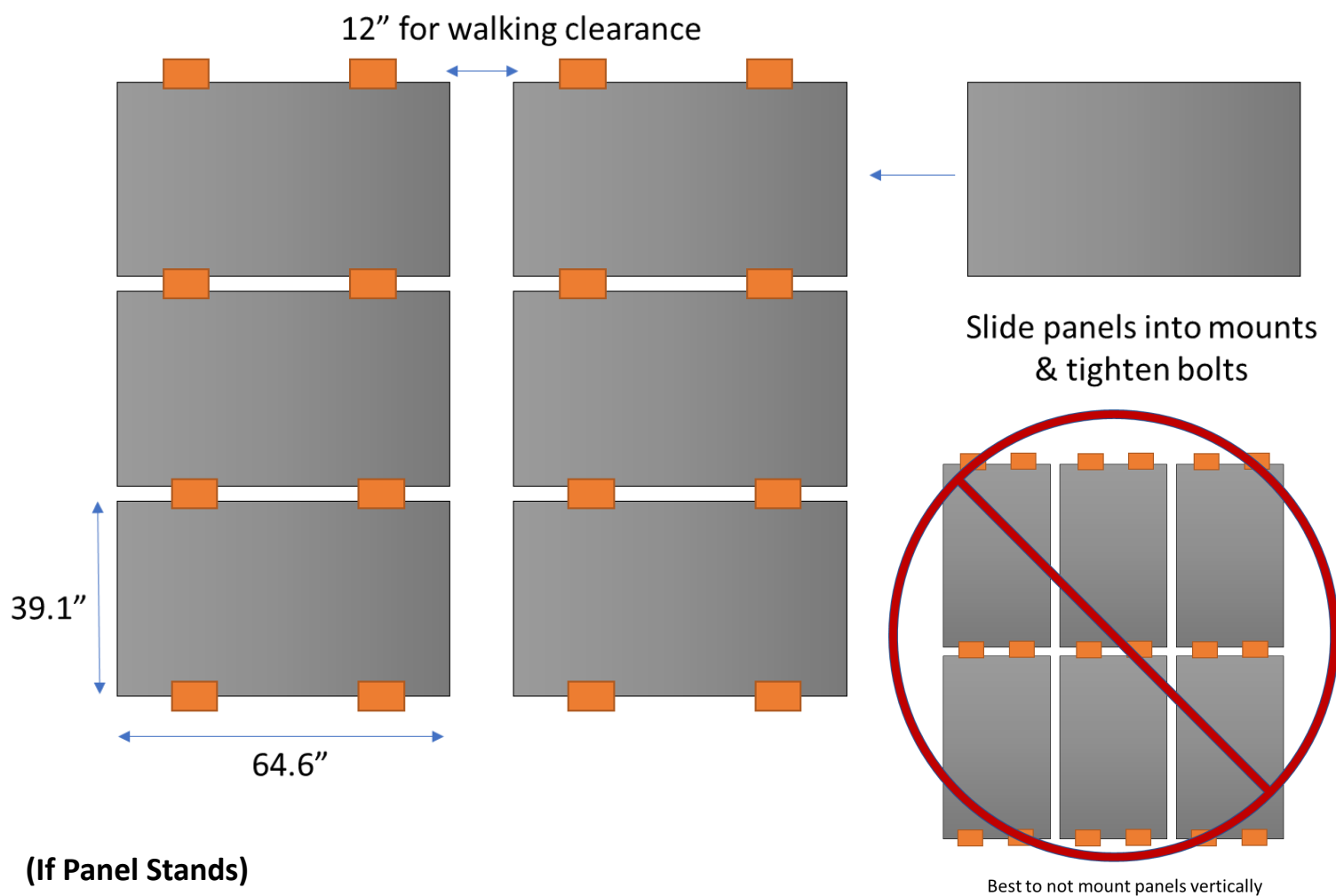
- Provide **120V ONLY (Not 240V)** power to Sol-Ark. The system works automatically to power generator circuits with solar during the day, grid at night, and batteries if grid fails.
- The inverter has a 30A synchronized automatic transfer switch, so it automatically switches from solar battery & Grid twice daily. You never have to manually switch critical loads on 6-circuit transfer switch because they are done in inverter.
- Inverter does not sell back to the grid. Transfer switch does not allow grid & solar to both power loads at the same time.
- FYI, if loads are too high for a poor solar day, system will detect 90% battery full and switch to Grid to recharge batteries.*



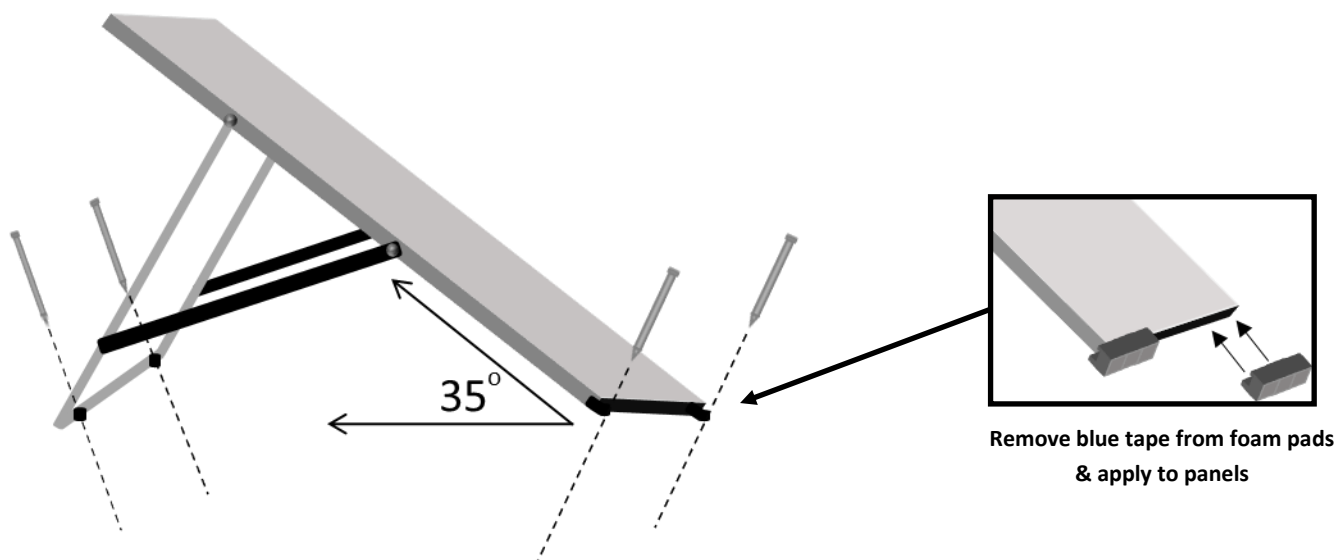
Do Not Wire Receptacle to 240V



8. Mount Panels (If on roof)



(If Panel Stands)



10. Power up Sequence

- Connect up Sol-Ark AC input power to required 30A outlet and Transfer Switch to Power Inverter Output. (Figure 1)
- (Powering up or down out of sequence may result in damage)**



1U. Connect batteries
(See Battery diagram)



2U. Connect panels and grid
(See Panel diagram)



3U. Flip Charger Breaker Up
(Stop if charger display does not turn on)



4U. Flip Panel Breakers Up



5U. Flip Inverter Breaker Up



6U. Power on Inverter

11. Power Down Sequence



Do not turn off Inverter Breaker (step 4D) before powering off the inverter (step 1D)

Do not turn off Charger Breaker (step 3D) before turning off the panel breakers (step 2D)

Turn off Panel Breaker (step 2D) before disconnecting solar panel wires



1D. Power off Inverter



2D. Flip Panel Breakers Down



3D. Flip Charger Breaker Down



4D. Flip Inverter Breaker Down

12B. Test Solar/Battery & Grid Mode

- Simulate night by turning off solar panel input breakers.



10 min



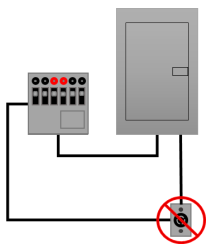
DC: 52.0V
AC: 120V P:512W

P
G

2D. Flip Panel Breakers Down

Inverter will switch to Grid in ~10 minutes. Make sure 30A 120V AC breaker to Sol-Ark system is on. This verifies your AC wiring and the AC charger is charging batteries.

- Turn off 30A 120V AC breaker to simulate Grid failure. Inverter immediately goes to Solar / Battery mode to keep appliances powered.



10ms



DC: 52.0V

AC: 120V

P:512W

B

- Restore 30A 120V breaker and system will go back to Grid mode.

DC: 52.0V

AC: 120V

P:512W

P

G

- Restore 30A DC breaker(s) turning on solar power. System will go back to Solar / Battery power in ~10 minutes.

DC: 52.0V

AC: 120V

P:512W

B

14. Install EMP suppressors around home (if applicable)

- If your system was purchased with Lightning / EMP Hardening, the vast majority of protection is in the Sol-Ark. But you also have EMP suppressors that get installed on the power cords of appliances that are connected on the transfer switch. It's not critical, but best installed as close as possible to the appliance.
- You also have EMP suppressors that get installed on both solar panel wires with a zip tie. Closer to the panel is better.



System Power Planning	Sol-Ark 48V
Max power budget/hr (no Grid)	565Wh - 12 panels
Max power budget/hr (with grid AC)	1000Wh - 12 panels
Suggested Average power/hr (with grid AC)	1000Wh - 12 panels
Solar Charge Controller (PV Solar Power In - Day)	
PV Panels Suggested	3120W (260Wx12)
Suggested Power Produced / day	14.3KWh
PV Panels Power In Max	3900W (260Wx15) or 3900W (325Wx12)
Max Power Produced / day	17.0KWh
Power Out Continuous	3300W (60A)
Efficiency	97%
Idle Current Power	35mA typical
Type	Maximum Power Point Tracking boosts power 15-20%
Wire to panels w/MC4 connectors	100ft, 10 AWG (max 200ft)
Type of panels	supports any, suggest 4-5 strings of 3 in parallel
PV Open Circuit Volts	Max 150V
Inverter (Power Out - Always)	
Model #	PortSol-3000PSW
Power Continuous	3000W (4000W in 240V mode)
Power Peak	6000W (9000W in 240V mode)
Frequency	50Hz or 60Hz programmable
DC Input Voltage	48V (42V - 63V)
Efficiency	>90%
Idle Current Power	25W 0.5A typical (<3W load seeking)
Type	Pure Sinewave THD <3%
AC input range	92V to 250V AC (should match output voltage)
Battery low protection voltage	42V +/-0.3V
Battery high protection voltage	63V +/-0.3V
Reverse Battery protection	No
Over Temperature protection	Yes 85C
Output Short Circuit Protection	Yes
Output Overload Protection	Yes
Most Inverter failures default back to Grid	Yes – “Grid Fail Safe”

Features

- Scalable in batteries (4,8,12,16) and Solar Panels (3,6,9,12,15)
- 48V 60A Maximum Power Point Tracking Solar Charge controller
- Low Idle power 3000W Pure Sine Inverter
- Internal smart AC transfer switches automatically using 3 energy sources as needed in this priority: 1) Solar panels 2) Utility Grid 3) batteries. (patent pending)
- AC Charger for Batteries when using Grid or Generator power
- Optional EMP / Solar Flare Hardening at the factory

Automatic AC Transfer Switch (built into Inverter)	
Model #	PortSol-3000PSW
Input Voltage	70-150 VAC, 185-250 VAC 50/60Hz
Input Current	30A (30A breaker via installer)
Nominal Voltage Out-	120 VAC, 240 VAC 50/60Hz
Output Current	30A (30A breaker)
Transfer Method	Phase Alignment, then Break before Make (open transition)
Transfer Time	10ms typical
Overload Protection	Yes
Short Circuit Protection	Yes
Over-Temperature	Yes
AC Charger (Utility Power In - Night and supplements Solar during day if needed)	
Power to Batt & Inverter	>280W 5A
DC Voltage	Adjustable. Typical 54.0V
Efficiency	>80% typical
Idle AC Power	included in inverter
AC Power to Loads / hr	3000W / hr - switches to Grid
Battery Capacity (Power Out - Night)	
Battery Recommended	12V 110Ah x 4 / 8 / 12 / 16
Power Stored	5KWh / 10KWh / 15KWh / 20KWh
Batt Night Power / hr	357W / 714W / 1071W / 1428W
Deep Cycle Battery Type Suggested	Sealed AGM or Wet cell
PV Solar Panels (if purchased with system)	
# of Panels per system	3, 6, 9, 12, 15 (3 panels per string)
Panel Power Maximum (Pmax)	260W
# PV Panels Suggested	3120W (260Wx12)
# PV Panels Max	3900W (260Wx15)
Type of Cell	Polycrystalline
Open Circuit Voltage (Voc)	38.0V
Max Power Voltage (Vpm)	30.6V
Max Power Current (Ipm)	8.53A
Module Efficiency %	16.0%
Dimensions w/ collapsible mount	64.6" L x 39.1" W x 1.57" (40mm) H
Weight w/collapsible mount	43 lbs

- Optional Solar Panels with self-storing adjustable angle mounts (patent pending)
- Optional 110Ah 12V batteries sealed AGM

Panel Stand user guide (for long term off-grid)

- Panels should have clear southern exposure that is free from shade

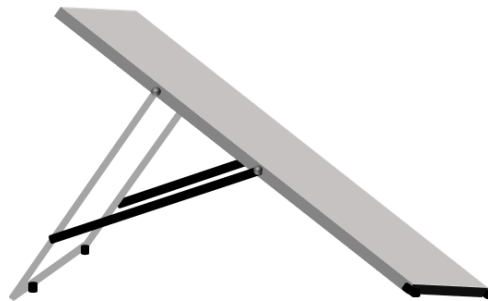
If you are in a long term Off Grid situation:

- Raise panels up to winter max angle (Oct 7th, Nov, Dec, Jan, Feb) where stand is completely vertical up/down. You must stake down panels or they will fall forward! (Optimum seasonal angle values will be provided if requested.)

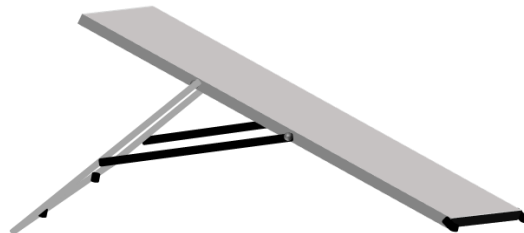
Hint: Proper positioning can get you +10% or more power when varying the angle seasonally. Variable angle and position is preferred to maximize the power.



- Place panels in spring angle (Mar 5th, Apr 18th) where stand is 90 angle to panel.



- Place panels in summer low angle (Apr 18th, May, June, July, Aug)

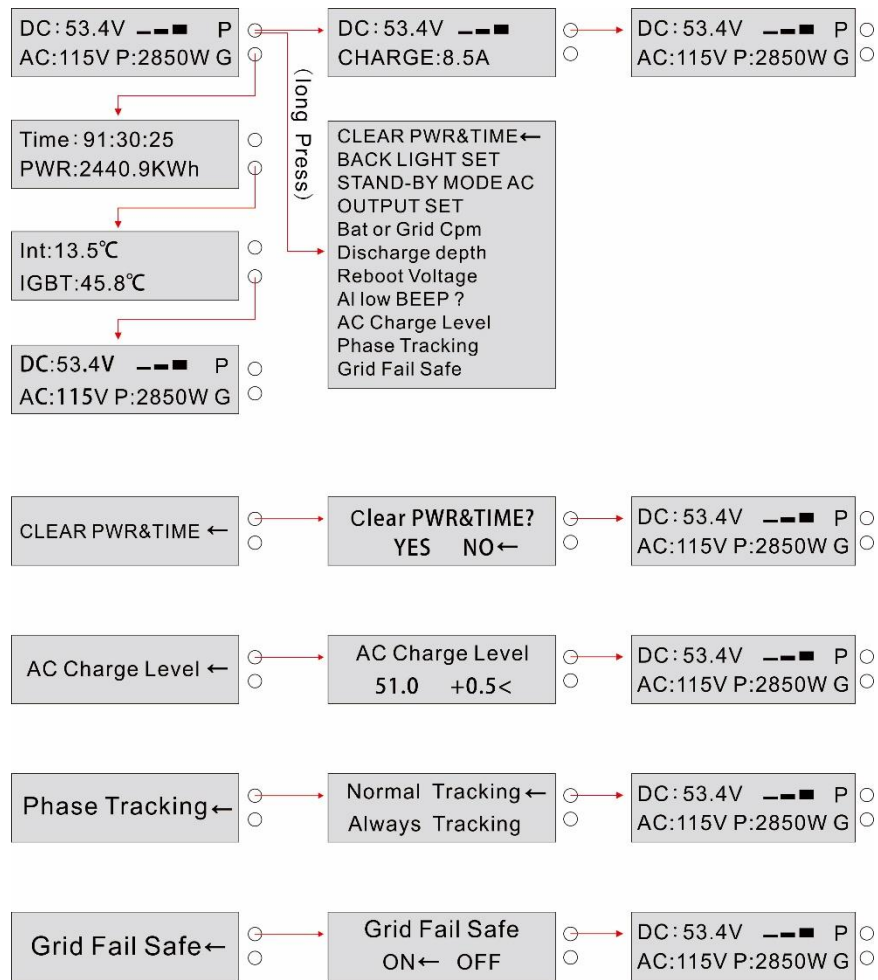


- Place panels in fall angle (Aug 24th, Sept, Oct 7th) where stand is 90 angle to panel. Same as spring angle.

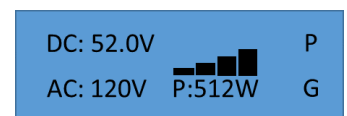
Critical: Each String must be in a straight line and same angle. If not, the least optimal panel will bring down the performance of the entire string. A circle or arc arrangement for the panels is very inefficient.

Inverter Operation

- The Smart Solar Inverter is the heart of your system. It converts DC to AC when powering on solar/batteries, AC to AC transfer when running at night, and AC to DC to charge batteries at night. It decides when to power the AC loads (outlets) on Batteries/Solar and Utility Grid. Below is a high level overview of the menus.



- Understanding the Display is Important!
 - Default home display shows
 - DC voltage of Batteries
 - AC output voltage
 - Power in Watts (example is 1308W)
 - Bar graph of battery level
 - Running on Batteries/Solar or Grid (example B = Batteries)



- If needed to move cursor to: CLEAR PWR&TIME
 - Press enter
 - Move cursor to YES
 - Press enter

CLEAR PWR&TIME ←
BACK LIGHT SET

- Backlight = On
 - You are welcome to turn off to avoid bug attraction
- Standby Mode = Off
 - This powers output on/off searching for a >40W load.
- AC Output Set = 120V / 60Hz
 - Don't reprogram with devices plugged into system or system plugged into Utility Grid
 - If your system came with EMP and you told us you may be using for a 240V well pump, 240V will not damage your EMP protection. If your system was focused on running 120V appliances, your EMP was customized to provide maximum protection for the devices you plugged into the solar system and you will have a warning sticker near the outlets. **DO NOT PROGRAM to 240V** without talking to us and removing a portion of your EMP protection or you will damage some of the protection.
- Battery or Grid Priority Mode = Battery 1st
 - Battery 1st mode uses solar/battery during the day and Grid/AC battery charger at night.
- Battery Discharge Depth = 47.0V
 - This is how low the battery voltage will go before switching from Solar to Grid. It is more a failsafe. The MPPT controller communicates with the inverter and switches when batteries are drained 10% = 90% full. 90% full condition is almost always a much higher voltage.
- Battery Reboot Voltage = 54.0V
 - Once battery discharge depth has tripped and inverter is charging the battery on the Grid, it waits to top off batteries at this voltage until it goes back to Solar.
- Allow Beep = Yes (for audio warnings)
- AC Charge Voltage Level = 55.0V Voltage at night time.
- Phase Tracking = Normal
 - Inverter only matches AC Grid phase only when switching from Solar/Battery to Grid. Always tracking mode is only used for debug.
- Grid Fail Safe = On
 - In Grid Fail Safe, if the user does not manually reset an inverter error or if there is a hardware failure, the inverter will connect the loads to the Utility Grid after 15 minutes (Grid is on or off).

STAND-BY MODE ←
AC OUTPUT SET

Bat or Grid Cpm ←
Discharge depth

Reboot Voltage ←
Allow BEEP?

AC Charge Level ←
Phase Tracking

Grid Fail Safe ←

MPPT Indicators

2 - Battery Status LED Indicator

Shows battery status or system errors.

1 – Solar Panel Status LED Indicator

Shows charging status and overvoltage of PV panels.

3 - Top Key1

Set load work mode, battery type and max charge current.

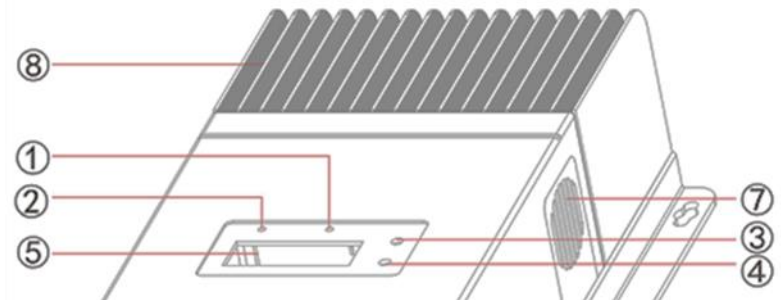
4 - Bottom Key2

Set load work mode, battery type and max charge current (in manual mode used for Inverter Grid ON/OFF).

5 - LCD Digital Display

Display the system status

7 - FAN



● Solar Panel Indicator (#1)

The green LED indicator will light whenever sunlight is available for battery charging, the green charging LED will stay on in normal charging. The charging LED indicator flashes when PV over voltage.

Color	Indication	Operation Status
Green	On solid	Charging
Green	Flashing	PV over-voltage

● Battery Indicator (#2)

GREEN when battery voltage in normal range

ORANGE when battery voltage low

RED when battery discharged

Color	Indication	Operating Status
Green	On solid	Normal (battery)
Orange	On solid	Battery voltage low
Red	On solid	Battery voltage discharged
Red	Flashing	Short circuit / damaged


● PV Overvoltage indicators

If the solar input open voltage (Voc) exceeds 150V, the array will remain disconnected until the Voc falls safely below the maximum rating.

Color	Indication	Operating Status
Green	Flashing	PV Over voltage

MPPT Programming

Hold down Top Key1 for 3 seconds enters programming mode. Pressing Bottom Key2

shows an  icon and allows changes the value. Unit will jump out of programming mode after 5 seconds. There are 5 menus you can cycle through hitting Top Key1:

1F) Dusk / Dawn operation mode tells inverter when to go to Grid or Battery/Solar

- Default = 1F 18 → Switches inverter to Grid at night (10min delay) and Battery/Solar during day. And also if % Battery <91% during day.
- Test mode = 1F 16 → Switches inverter to Grid immediately if Solar Panel Input breakers are turned off. Useful for verifying Grid connections are correct.
 - If using, always program back to 1F 18 when done testing.

Battery type	LCD
--------------	-----

Battery Charging Information

4-Stage Charging

The MPPT has a 4-stage battery charging algorithm for rapid, efficient, and safe battery charging. Figure below shows the sequence of the stages.

MPPT Charging Algorithm

Bulk Charge Stage

In Bulk charging stage, the battery is not at 100% state of charge and battery voltage has not yet charged to the Absorption voltage setpoint. The controller will deliver 100% of available solar power to recharge the battery.

Absorption Stage

When the battery has recharged to the Absorption voltage setpoint, constant-voltage regulation is used to maintain battery voltage at the Absorption setpoint. This prevents heating and excessive battery gassing. The battery is allowed to come to full state of charge at the Absorption voltage setpoint. Absorption lasts for 2 hours.

Float Stage

After the battery is fully charged in the Absorption stage, the MPPT reduces the battery voltage to the Float voltage setpoint. When the battery is fully recharged, there can be no more chemical reactions and all the charging current is turned into heat and gassing. The float stage provides a very low rate of maintenance charging while reducing the heating and gassing of a fully charged battery. The purpose of float is to protect the battery from long-term overcharge.

Battery Charging Setpoint (48V)

Battery Mode	Battery Type	Absorption Stage	Float Stage	Equalize Stage (every 30 days)	Suggested Inverter Settings
3Fb1	1-AGM, LiOn	14.4v (57.6v)	13.8v (55.2v)	14.6v (58.4v)	Battery Reboot = 54.0v AC Charge Level = 55.0v
3Fb2	2-AGM2, Gel	14.1v (56.4v)	13.5v (54.0v)		Battery Reboot = 53.0v AC Charge Level = 54.0v
3Fb3	3-not used	14.1v (56.4v)	13.2v (52.8v)	14.6v (58.4v)	Battery Reboot = 52.0v AC Charge Level = 53.0v
3Fb4	4-Flooded	14.6v (58.4v)	13.8v (55.2v)	15.1v (60.4v)	Battery Reboot = 54.0v AC Charge Level = 55.5v

Optional Transfer Switch for 6 AC circuits from Breaker Panel

This switch allows you to:

- Use your existing home electrical wiring to distribute the power from our solar powered inverter or generator.
 - Prevents back feeding of AC Utility Grid by solar inverter.
- Run 3-4 circuits continuously on solar power. Easily adjust solar loading.

Warranty

2-Year Limited Warranty for SOL-ARK Products; 1-Year on battery by the original manufacturer. Portable Solar LLC provides a Two-year (2) limited warranty ("Warranty") against defects in materials and workmanship for its Sol-Ark products ("Product"). The term of this Warranty begins on the Product(s) date of manufacture or the initial purchase date. This Warranty applies to the original Sol-Ark Product purchaser unless explicitly provided by Portable Solar LLC to the Transferee. The warranty does not apply to any Product or Product part that has been modified or damaged by the following:

- ❖ Installation or Removal (examples: wrong voltage batteries, connecting batteries backwards, damage due to water/rain to electronics, preventable damage to solar wires.)
- ❖ Alteration or Disassembly
- ❖ Normal Wear and Tear
- ❖ Accident or Abuse
- ❖ Corrosion
- ❖ Lightning; unless using EMP hardened system, then Portable Solar will repair product
- ❖ Repair or service provided by an unauthorized repair facility
- ❖ Operation or installation contrary to manufacturer product instructions
- ❖ Fire, Floods or Acts of Nature
- ❖ Shipping or Transportation
- ❖ Incidental or consequential damage caused by other components of the power system
- ❖ Any product whose serial number has been altered, defaced or removed
- ❖ Any other event not foreseeable by Portable Solar, LLC

Portable Solar LLC liability for any defective Product, or any Product part, shall be limited to the repair or replacement of the Product, at Portable Solar LLC discretion. Portable Solar LLC does not warrant or guarantee workmanship performed by any person or firm installing its Products. This Warranty does not cover the costs of installation, removal, shipping (except as described below), or reinstallation of Products or parts of Products.

THIS LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY APPLICABLE TO PORTABLE SOLAR LLC PRODUCTS. PORTABLE SOLAR LLC EXPRESSLY DISCLAIMS ANY OTHER EXPRESS OR IMPLIED WARRANTIES OF ITS PRODUCTS. PORTABLE SOLAR LLC ALSO EXPRESSLY LIMITS ITS LIABILITY IN THE EVENT OF A PRODUCT DEFECT TO REPAIR OR REPLACEMENT IN ACCORDANCE WITH THE TERMS OF THIS LIMITED WARRANTY AND EXCLUDES ALL LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION ANY LIABILITY FOR PRODUCTS NOT BEING AVAILABLE FOR USE OR LOST REVENUES OR PROFITS, EVEN IF IT IS MADE AWARE OF SUCH POTENTIAL DAMAGES.

Return Policy - No returns will be accepted without prior authorization and must include the Return Material Authorization (RMA) number. Please call and talk to one of our engineers to obtain this number at 972-575-8875.

Any product that is returned must be brand new, in excellent condition and packaged in the original manufacturer's carton with all corresponding hardware and documentation. Returns must be shipped with prepaid freight and insured via the carrier of your choice to arrive back at Portable Solar within 30 days of your initial delivery or pick-up. **Shipping charges will not be refunded.**

All returns are subject to a 20% restocking fee. **No returns will be accepted beyond 30 days of original delivery.** The value and cost of replacing any items missing (e.g. parts, manuals, etc.) will be deducted from the refund. If you have any questions regarding our return policy, please email us at sales@portablesolarllc.com or call us at the number above during regular (M-F) business hours.

- Too much power is being taken out of the batteries, reduce the loads on the Sol-Ark. If this issue continues you may need to increase the number of batteries in your battery bank or check your existing batteries.
- **MPPT battery LED is flashing Red** → Normal during startup or there could be a MPPT failure
 - There may be a failure in the MPPT. Check the battery voltage is <63 volts. Call us.
- **MPPT solar panel LED is flashing Red** → solar panels are not wired correctly
 - Panels should not be wired with more than 3 panels per string, reference the install guide or wiring diagrams.
 - If you are using 72 cell panels in extremely cold conditions, the voltage may be >150V. Please wire just 2 panels per string for this case only.
- **MPPT solar panel LED is off**
 - Normal during night time.
 - Solar Panels not connected or connected backwards. Check Solar Panel voltage display (page 8) and use volt meter on solar input wires.
- **MPPT will not turn on**
 - Make sure the solar charger output breaker is on
 - Make sure the batteries are connected correctly (40V to 60V)
- **Inverter will not turn on**
 - Make sure the inverter breaker is on
 - Make sure the batteries are connected correctly (40V to 60V)
 - Make sure round red button (On/Off/Reset in lower right corner) is depressed.
- **Batteries are not charging**
 - Grid-Interactive usage: Check 120V 30A breaker providing Grid power to the Sol-Ark.
 - Off-Grid usage: You can use a generator to recharge batteries and/or reduce your loads.
 - Make sure the solar panels are connected to the Sol-Ark and are wired correctly
 - Make sure the solar panel breakers are on
 - Make sure the inverter and charge controller are both on
 - If you were checking MPPT programming settings, verify the 1st menu item is 1F18 mode.
- **Solar Panels are not producing expected power**
 - Make sure the inverter is loaded. The MPPT will not produce more power than the batteries need to prevent overcharging
 - Make sure the panels are wired properly (check Y and Tri combiners) and are all connected to the Sol-Ark
 - Make sure both solar panel breakers are on
 - Make sure your panels are free from shade
 - Make sure your panels are not facing north
 - Make sure the angle of the panels is appropriate for your latitude (usually 20 to 35 degrees)
- **Inverter display is blank**
 - Reboot inverter, this can be caused by a power surge such as lightning
- **There is a buzzing sound coming from the system**
 - There is an internal fan that runs the most to keep the system cool. It is normal. There are 3 fans in the system and it can run on as little as one.
- **If not mentioned above, call our engineering support line at: 972-575-8875 Ext 2.**