MARUSON®
TECHNOLOGY
Power Solutions for All Your Needs

Solar Home Series

Off-Grid Inverter

USER MANUAL

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1 IMPORTANT SAFETY INSTRUCTIONS

(SAFE THESE INSTRUCTIONS)

Before attempting to unpack, install, or operate the product, please read and follow all instructions carefully.

CAUTION! To prevent the risk of fire or electric shock, install in a temperature and humidity controlled indoor area free of conductive contaminants. **(Please see *Technical Specifications* section for acceptable temperature and humidity range.)**

CAUTION! The product must be installed in a protected environment away from heat-emitting appliances such as a radiator or heat register. The location should provide adequate air flow around the product for proper ventilation.

CAUTION! To reduce the risk of injury, use cables come with the product. Use appropriate and certified external battery cables.

CAUTION! To reduce risk of damage and injury, use batteries with good quality.

CAUTION! Risk of electric shock. **DO NOT** remove the cover. No user serviceable parts inside.

CAUTION! Provide adequate ventilation for the battery compartment. The battery enclosure should be designed to prevent accumulation and concentration of hydrogen gas at the top of the compartment.

CAUTION! A battery can present a risk of electrical shock and high short circuit current. When working on batteries, remove watches, rings, or other metal objects. Use tools with insulated handles.

CAUTION! Hazardous live parts inside can be energized by the battery even when the AC input power is disconnected.

CAUTION! To avoid electrical shock, turn off the unit and unplug it from the AC power source before installing equipment or servicing the battery. Servicing the battery can only be performed by trained personnel.

DO NOT USE FOR MEDICAL OR LIFE SUPPORT EQUIPMENT! Do not use in any circumstance that would affect the operation and safety of life support equipment, medical applications, or patient care.

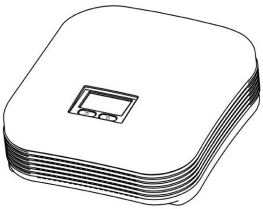
DO NOT USE WITH OR NEAR AQUARIUMS! To reduce the risk of fire or electric shock, do not use with or near an aquarium. Condensation from the aquarium can cause the unit to short out.

DO NOT USE THE PRODUCT ON ANY TRANSPORTATION! To reduce the risk of fire or electric shock, do not use the unit on any transportation such as airplanes or ships. The effect of shock or vibration caused during transit and the damp environment can cause the unit to short out.

2 INSTALLATION

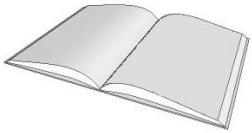
2-1 Unpacking

Inspect the product upon receipt. The box should contain the following:
(a) This product; (b) User Manual; (c) Input Power Cord



Inverter

Input Power Cord



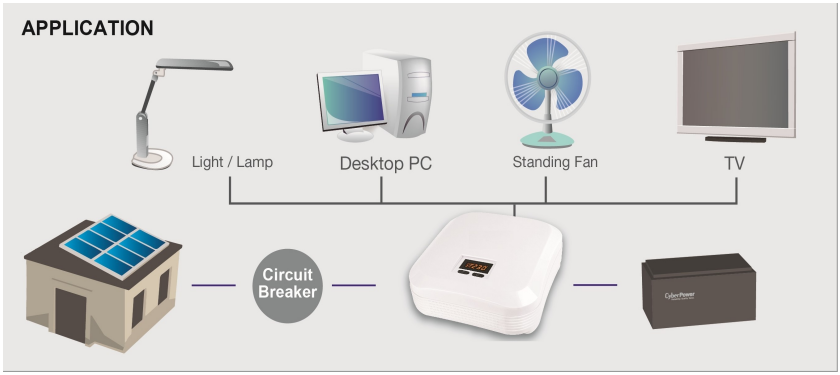
User Manual

2-2 Product Overview & Outlook

Solar Home Inverter converts renewable solar energy from panels into usable AC and store excess power in batteries as backup power during blackout and emergencies. The Solar Home Inverter comes with a small and compact design, which helps to simplify the installation process.

1. Multifunction LCD Readout
2. Power On/Off Switch
3. LCD Readout Toggle Button
4. DC Input Cable (Black "-")
5. DC Input Cable (Red "+")
6. Input Circuit Breaker
7. PV Input Terminals
8. Charger Control
9. Input Voltage Range Selector
10. AC outlet
11. AC Inlet

Application Diagram



2-3Power Requirements of Your Equipment

1. Ensure that the equipment plugged into the AC outlet does not exceed the product's rated capacity (1200VA/720W for1.2K; 2200VA/1320W for2.2K). If rated unit capacities are exceeded, an overload condition may occur and cause the unit to shut down or the circuit breaker trip.
2. There are many factors that can affect the amount of power that your appliances will require. For optimal system performance keep the load below 80% of the unit's rated capacity.

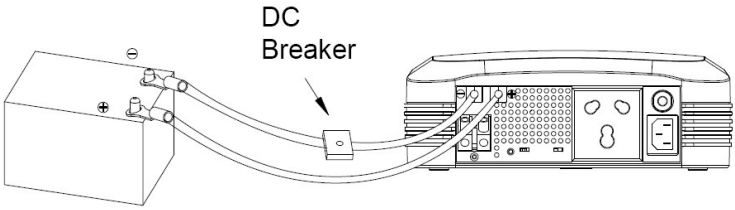
2-4 Hardware Installation Guide

Step 1 Connect the Battery

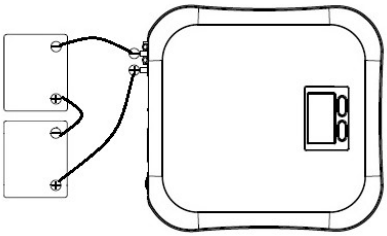
For optimal battery life and reasonable recharging time, make sure the batteries capacity no less than 100Ah. Use batteries with same brand, type, and capacity.

Connect DC input cables of this product to external batteries:
Red "+" cable to the battery's **Positive "+"** polarity
Black "-" cable to the battery's **Negative "-"** polarity

Single Battery Connection
Single battery voltage must be equal to DC voltage of the unit.

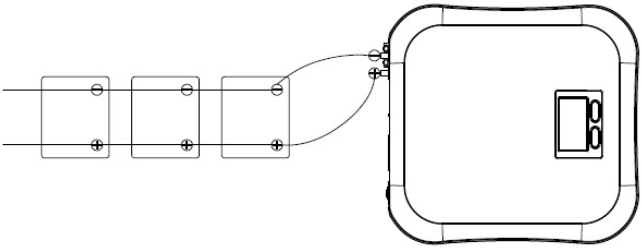


Multiple Batteries Connection – in Series
Connect two batteries in series can double the voltage. Sum of voltages must be equal to DC voltage of the unit.



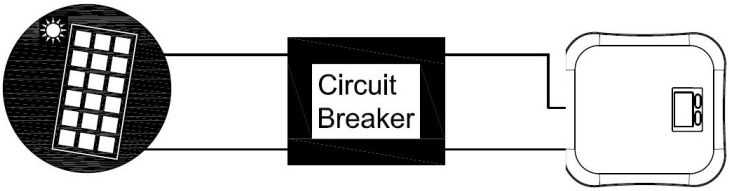
Multiple Batteries Connection – in Parallel

Connect multiple batteries in parallel can increase total battery capacity but still keep terminal voltage as single battery voltage.



Step 2 Connect the Solar Panel

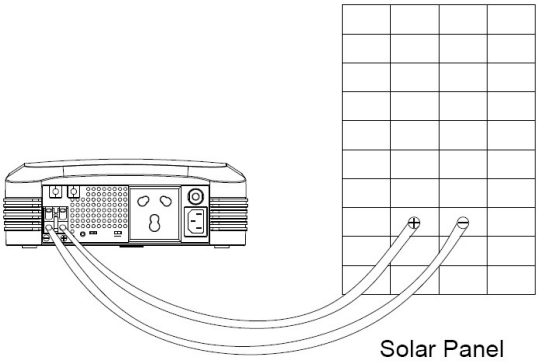
CAUTION! In order to switch off the power from PV for the need of maintenance and service, please install a circuit breaker between the product and PV module.



CAUTION! To reduce risk of injury, use appropriate cables for PV connection. The wiring can only be performed by trained personnel. Refer to below table for recommended cable size.

Model	PV Charging Current	Wire Gauge
1.2K	40A	12AWG
2.2K	40A	12AWG

Connect the cables from PV module to the unit's PV input terminals. Please check the polarity before connection.

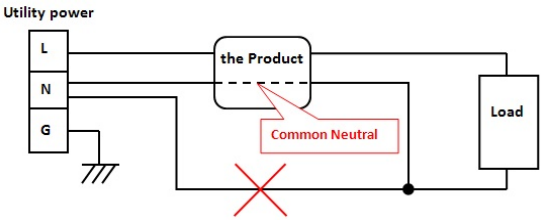


For more information about PV Module Selection, please refer to the *APPENDIX* section.

Step 3 Connect the Product to Utility

Connect the product to a wall outlet. Charging the battery for at least 8 hours is recommended to ensure that the battery's maximum charge capacity is achieved. To recharge the battery and maintain optimal battery charge, simply leave the unit plugged into a wall outlet at all times. The battery can be charged whether the unit is turned on or off.

DO NOT Connect Neutral of the Power Distribution Box to (a) the OUTPUT Neutral of this product, or (b) the INPUT Neutral of connected equipment. Otherwise, reversed polarity will damage the product and connected equipment.

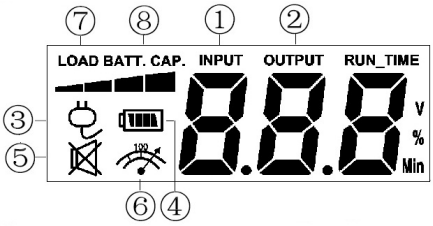


Step 4 Connect the Load

Connect the load to the unit's outlet. Make sure that the total loads of your appliances are below 80% of the unit's rated capacity.

3 DEFINITIONS FOR ILLUMINATED LCD INDICATORS

LCD Display



No.	Icon	Description
1	**INPUT VOLTAGE**	This meter measures the AC input voltage that the unit is receiving from the utility wall outlet. In the event of a complete power loss, severe brownout or over-voltage, the unit will rely on its external battery to supply consistent 230V output voltage. The Input Voltage Meter can be used as a diagnostic tool to identify poor quality input power.
2	**OUTPUT VOLTAGE**	This meter measures the AC voltage that the unit is providing to the connected device. It displays normal line mode and battery backup mode.
3	**LINE MODE**	The unit is supplying utility power to connected equipment.
4	**BATTERY MODE**	The unit is operating from its external batteries.
5	**MUTE**	This icon appears whenever the unit is in silent mode. The buzzer does not beep during silent mode until the battery reaches low capacity.
6	**OVERLOAD**	This icon appears and an alarm sounds to indicate the outlet is overloaded. To relieve the overload, unplug your equipment from the outlet until the icon disappears and the alarm stops.
7	**LOAD CAPACITY**	This meter displays the approximate output load level (in 25% increments) of the unit's outlet.
8	**BATTERY CAPACITY**	This meter displays the approximate charge level (in 25% increments) of the unit's external battery.

4 OPERATION & CONFIGURATION

Power On/Off

Power On: Press the POWER button to turn on the unit.
Power Off: Press the POWER button again to turn off the unit.

View LCD Information

Short press the DISPLAY button to view the information about the unit.

Display Pages	LCD Readout
Normal Mode (When the power button is pressed.)	
Page 1	Output voltage. The unit is **" V "**.
Page 2	Output power. The unit is **" KW "** but not shown on LCD.
Page 3	Input voltage. The unit is **" V "**.
Page 4	Priority of input power source. SOL : Solar first (default), solar energy will provide power to load as first priority. UtI : Utility first, utility will provide power to load as first priority.
Standby Charging Mode (When the power button is not pressed.)	
Mode 1 When Utility exist	LCD only displays icon . The unit bypasses utility power to output and charge the battery.
Mode 2 When PV exist	LCD only displays icon SoN. Solar power charges the battery and there is no output.
Mode 3 When both Utility & PV exist	LCD displays icon and SoN at the same time. The unit bypasses utility to output. The battery is charged by both Solar and utility power.
Additional	
Each Page	When PV is charging, the Solar ON icon SoN flashes within each page.

Audible Alarm On/Off

Press the DISPLAY button for 2 seconds to enable the audible alarm (beep once) or disable (beep once) the audible alarm. The MUTE icon will appear on the LCD display when the audible alarm is disabled. The default setting is for the alarm to be in the ON position.

PV / Utility Priority

To setup the priority of input power source, press the display button for 8 seconds (beep twice) and the priority changes from PV to Utility. The LCD will display utility first icon  If there is no action for 8 seconds, the LCD will go back to status display. The default setting is solar power first.

Charger Control

CAUTION! The setting should be performed by trained personnel. Incorrect operation will damage the battery.

- **Default:** The charging voltage is 13.7V for 1.2K and 27.4V for 2.2K.
- **Customized (for poor battery condition):** The charging voltage is 13.3V for 1.2K and 26.6V for 2.2K. If the battery is aging, lower the charging voltage to enhance the charging capability.

Input Voltage Range Selector

Input voltage range is defined in specification section. Output voltage is the same as input voltage in AC mode.

- **Narrow (170-280Vac):** For connected equipment that are sensitive to the fluctuation of voltage range, narrow the input voltage range and the output voltage will follow.
- **Wide (90-280Vac):** For connected equipment that are less sensitive to the fluctuation of voltage range, set the input voltage range wider and the output voltage will follow.
  Note: The transfer time will increase while the input voltage gets lower. If the connected equipment is sensitive to the transfer time, power interruption condition may occur.

5 TROUBLESHOOTING

Problem	Possible Cause	Solution
The product will not turn on.	The unit is not connected to an AC wall outlet.	The unit must be connected to a 220/230V outlet.
	The battery is worn out.	Replace the batteries.
	Mechanical problem.	Contact the service center.
Outlet does not provide power to connected equipment.	Circuit breaker has tripped due to an overload.	Turn the unit off and remove some of the connected equipment. Wait 10 seconds, reset the circuit breaker by depressing the button, and then turn the unit on.
	DC fuse is blown due to overload.	Servicing of the DC fuse should only be performed by trained personnel. For more information on DC fuse replacement, contact the service center.
	Batteries are discharged.	Recharge the unit for at least 8 hours.
	The product may require service.	Contact the service center.
There is no LCD display.	The product is not turned on.	Press the power button.
	Batteries are discharged.	Recharge the unit for at least 8 hours.
	The LCD is defective.	Contact the service center.
Utility power is normal but the unit is in Battery Mode.	AC input is missing.	Make sure the AC input is well-connected.
	Input protector is tripped.	Reset the input protector.
The audible alarm beeps continuously.	The unit is in Fault Mode.	Refer to Fault Code Table for further information. Contact the service center.

Fault Code Table

Fault Code	Event	Audible Alarm
A00	Overload	Rapid beeping every 1/2 second
A05	PV Voltage High	Beep every second
A06	Battery Low	Beep every 2 seconds
A07	PV Current High	Beep every second
E50	Output Voltage High	Constant tone
E51	Output Short	Constant tone
E52	Overload Fault	Constant tone
E53	Fan Fail	Constant tone
E54	Over Charge	Constant tone

6 TECHNICAL SPECIFICATIONS

Model	NV-S1200PV	INV-S2200PV
Power Rating (VA/Watt)	1200VA/720W	2200VA/1320W
Input		
Input Voltage Range	Narrow Mode: 170 - 280Vac Wide Mode: 90 - 280Vac	
Input Frequency	50/60Hz (Auto-sensing)	
Output		
Output Voltage	230Vac	
Output Frequency	50/60Hz	
Outlet Type	(1) UN	
Transfer Time	< 8ms (Typical Narrow Mode)	
Battery		
Battery Voltage	12V	24V
Charging Current	20A	10A
PV Input (Solar Charger)		
Maximum Input Power (Watt)	500W	1000W
Nominal PV Input Voltage	12Vdc	24Vdc
Optimal Operating Voltage Range	15~18VDC	30~36VDC
Maximum PV Input Voltage	40V	55V
Charging Current	40A	40A
Environmental		
Operating Temperature (°C)	0°C to 40°C	
Operating Relative Humidity	0 to 90% (non-condensing)	
Physical		
Dimensions (WxHxD) (mm.)	250 x 90 x 265	250 x 90 x 265
Weight (kg.)	2.23	2.32

APPENDIX PV MODULE SELECTION

Find the following PV panel parameters first, and calculate to see if it meets the product's acceptable spec range (See *Technical Specification* section).

PV Panel Parameters	Description	Corresponding Product Spec
Pmax	Max. output power (W)	Max. input power (W)
Vmp	Max. power voltage (V)	Optimal operating voltage range (V)
Imp	Max. power current (A)	Charging current (A)
Voc	Open-circuit voltage (V)	Max. PV input voltage (V)
Isc	Short-circuit current (A)	Max. PV input current (A)

Please consider below requirements:

(a) Total Voc < Product's max. PV input voltage

(b) Vmp falls within Product's optimal operating voltage range

If one PV module cannot meet this requirement, connect multiple PV modules in series to increase the total voltage.

Example for 1.2K

After considering Voc of PV module not exceeds 40VDC and Max. Vmp within 15~18VDC, we can choose PV module with below specification.

Pmax	85W	Max. PV module numbers in series 1→18VDC÷17.6
Vmp	17.6V	
Imp	4.83A	Max. PV module numbers in parallel 9→40A÷4.83 Total PV module numbers is 1×9=9
Voc	21.6V	
Isc	5.03A	

Example for 2.2K

After considering Voc of PV module not exceeds 55VDC and Max. Vmp within 30~36VDC, we can choose PV module with below specification.

Pmax	260W	Max. PV module numbers in series 1→36VDC÷30.9
Vmp	30.9V	
Imp	8.42A	Max. PV module numbers in parallel 5→40A÷8.42 Total PV module numbers is 1×5=5
Voc	37.7V	
Isc	8.89A	

CAUTION! Ensure that Open Circuit Voltage (Voc) of PV modules not exceeds 40V for 1.2k and 55V for 2.2K, or else the product may be damaged.
If PV voltage or current is out of normal range, the unit will stop solar charging and send a warning code.