

USER MANUAL

SAFEGUARD POWER SOLUTIONS

SIGMAPRO SERIES – 1524, 3024, 4048



Appliances



PC



TV



Air-
conditioning



Fridge



Washing
machine

TABLE OF CONTENTS

GENERAL PRECAUTIONS	1
PERSONNEL PRECAUTIONS	1
INTRODUCTION.....	3
FEATURES	3
PRODUCT OVERVIEW.....	4
LCD PANEL DESCRIPTION.....	4
BACK PANEL DESCRIPTION.....	4
INSTALLATION	5
UNPACKING AND INSPECTION	5
MOUNTING THE UNIT	5
DC WIRING SUGGESTIONS.....	6
AC INPUT/OUTPUT CONNECTIONS.....	7
AC WIRING.....	7
AC INPUT CONNECTION.....	8
AC OUTPUT CONNECTION	9
PV MODULE CONNECTION	9
OPERATION	10
OPERATION KEY INSTRUCTION	10
SETTING KEY INSTRUCTION.....	11
LCD DISPLAY.....	12
AGS FUNCTION	13
AGS FUNCTION INFORMATION	13
DRY CONTACT OPERATING RANGE.....	13
UNIT CHARGE FUNCTION	14
UTI/SBU FUNCTION	14
BTS FUNCTION.....	14
BTS FUNCTION DESCRIPTION.....	14
COMMUNICATION	15
SOFTWARE INSTALLATION.....	15
SPECIFICATIONS	16
INVERTER MODE SPECIFICATIONS.....	16
AC MODE SPECIFICATIONS	16
AC INPUT VOLTAGE RANGE ($\pm 5V$)	17
CHARGE MODE SPECIFICATIONS.....	17
CHARGE MODE AC RANGE.....	17
CHARGE MODE	17
SOLAR CHARGER (MPPT CONTROLLER) ELECTRICAL SPECIFICATION.....	18
FAULT MODE	19
BUZZER INFORMATION.....	19
LCD DISPLAY INSTRUCTION.....	19
MPPT CONTROLLER WARNING	20
FAULT CODE INFORMATION	20
TECHNICAL SUPPORT.....	21
REGISTER YOUR PRODUCT	21



WARNING

THIS MANUAL CONTAINS IMPORTANT INSTRUCTIONS FOR ALL INVERTER/CHARGER MODELS THAT SHALL BE FOLLOWED DURING INSTALLATION AND MAINTENANCE OF THE INVERTER.

THE FOLLOWING CASES ARE NOT WITHIN THE SCOPE OF WARRANTY:

- WARRANTY EXPIRED.
- SERIAL NUMBER WAS CHANGED OR LOST.
- INVERTER WAS DAMAGED CAUSED BY TRANSPORTATION, REMISSNESS, OR OTHER EXTERNAL FACTORS.
- INVERTER WAS DAMAGED CAUSED BY IRRESISTIBLE NATURAL DISASTERS.
- NOT IN ACCORDANCE WITH APPLICABLE LOCAL LAWS OR ELECTRICAL CODES.

GENERAL PRECAUTIONS

- TO REDUCE RISK OF INJURY, CHARGE ONLY LEAD-ACID RECHARGEABLE BATTERIES. IF FLOODED BATTERIES ARE USED, BATTERIES MUST BE MAINTAINED REGULARLY. OTHER BATTERY TYPES MAY CAUSE DAMAGE AND/OR SERIOUS BODILY INJURIES.
- DO NOT EXPOSE TO RAIN, SNOW OR ANY TYPE OF WET LIQUIDS. INVERTERS ARE DESIGNED FOR INDOOR USE ONLY.
- DO NOT ATTEMPT TO DISASSEMBLE IT. REACH OUT TO A QUALIFIED SERVICE CENTER WHEN SERVICE OR REPAIR IS NEEDED.
- TO PREVENT THE RISK OF ELECTRIC SHOCK, DISCONNECT ALL POWER SOURCES AND REMOVE ALL WIRING TO PERFORM ANY MAINTENANCE OR CLEANING. ONLY TURNING OFF THE UNIT WILL NOT REDUCE THE RISK OF INJURY.



WARNING

- PROVIDE VENTILATION FROM THE BATTERY COMPARTMENT TO OUTDOORS. THE BATTERY ENCLOSURE SHOULD BE DESIGNED TO PREVENT ACCUMULATION AND CONCENTRATION OF HYDROGEN GAS AT THE TOP OF THE COMPARTMENT.
- NEVER CHARGE A FROZEN BATTERY AND CONNECT SUCH 12V/24V/48V BATTERIES TO INVERTER.
- INPUT/OUTPUT AC WIRING SHALL BE AT LEAST 12AWG AND RATED FOR UNDER 75°C. BATTERY CABLE SHALL BE RATED FOR LESS THAN 75°C AND SHALL BE NO LESS THAN 4AWG/6AWG GAUGE. REFER TO “DC WIRING SUGGESTION” IN THIS MANUAL FOR THE APPROPRIATE GAUGE FOR DIFFERENT INVERTER MODELS.
- PAY SPECIAL ATTENTION WHEN WORKING WITH METAL TOOLS AROUND BATTERIES. BATTERIES SHORT-CIRCUITING COULD CAUSE AN EXPLOSION.
- READ THE BATTERY INSTALLATION AND MAINTENANCE INSTRUCTIONS CAREFULLY BEFORE OPERATING.






PERSONNEL PRECAUTIONS

- IN CASE BATTERY ACID CONTACTS SKIN, CLOTHING OR EYES, WASH IMMEDIATELY WITH SOAPY WATER.
- AVOID TOUCHING EYES WHILE WORKING NEAR BATTERIES.
- NEVER SMOKE OR ALLOW A SPARK OR FLAME NEAR BATTERIES.

- REMOVE PERSONAL METAL ITEMS SUCH AS RINGS, BRACELETS, NECKLACES, AND WATCHES WHEN WORKING WITH BATTERIES. BATTERIES MAY PROVIDE HEAVY SHORT-CIRCUIT CURRENT, WHICH WOULD BE ENOUGH TO MAKE METAL MELT AND CAUSES SEVERE BURN.
- IF A REMOTE OR AUTOMATIC GENERATOR START SYSTEM IS USED, DISABLE THE AUTOMATIC STARTING CIRCUIT OR DISCONNECT THE GENERATOR TO PREVENT ACCIDENTS DURING SERVICING.



ELECTRICAL SAFETY PRACTICES

	<p>GROUNDING:</p> <p>IN THE EVENT OF A MALFUNCTION OR BREAKDOWN, GROUNDING PROVIDES A PATH OF LEAST RESISTANCE FOR ELECTRIC CURRENT WHICH REDUCES THE RISK OF ELECTRICAL SHOCK.</p> <p>IMPROPER CONNECTION OF THE EQUIPMENT GROUNDING CONDUCTOR CAN RESULT IN A RISK OF ELECTRIC SHOCK. THE CONDUCTOR WITH INSULATION HAVING AN OUTER SURFACE THAT IS GREEN WITH OR WITHOUT YELLOW STRIPES IS THE EQUIPMENT-GROUNDING CONDUCTOR.</p> <p>CHECK WITH A QUALIFIED ELECTRICIAN, OR SERVICE PERSONNEL IF THE GROUNDING INSTRUCTIONS ARE NOT COMPLETELY UNDERSTOOD; OR IF IN DOUBT AS TO WHETHER THE UPS IS PROPERLY GROUNDED.</p> <p>AVOID BODY CONTACT WITH EARTHED OR GROUNDED SURFACES, SUCH AS PIPES, RADIATORS, RANGES, AND REFRIGERATORS. THERE IS AN INCREASED RISK OF ELECTRIC SHOCK IF YOUR BODY IS EARTHED OR GROUNDED.</p> <p>DO NOT REMOVE THE GROUND CONNECTION FROM THE UPS'S POWER PLUG.</p>
	<p>ONLY OPERATE THE INVERTER IN A DRY AND CLEAN ENVIRONMENT. DO NOT EXPOSE THE INVERTER TO RAIN OR WET CONDITIONS. MOISTURE WILL INCREASE THE RISK OF ELECTRIC SHOCK.</p>
	<p> WARNING</p> <p>USE PERSONAL PROTECTIVE EQUIPMENT. SAFETY GLASSES MUST BE WORN AT ALL TIMES BY ALL PERSONS INSTALLING THE INVERTER.</p>
	<p>HAVE YOUR INVERTER SERVICED BY A QUALIFIED REPAIR PERSON USING ONLY IDENTICAL REPLACEMENT PART.</p>

INTRODUCTION

The SigmaPro series are versatile solar charger inverters capable of accepting multiple power sources – AC Grid, Generator, Solar Panels. The SigmaPro inverters will be referred to as “Inverter” throughout the manual. With its classy and elegant form, it is also built with the most advanced technologies available. This inverter is a 120VAC pure sine wave single phase system in either 24VDC or 48VDC and it's built-in with a 80A MPPT solar controller. It is designed to handle multiple appliances. User may also program the output voltage, frequency, charging voltage, charging current. SigmaPro – the all-in-one system that provides reliable electricity during time of needs.

FEATURES

- Pure sine wave output
- Friendly user interface
- Multi-stage (3-step) charging
- MFD (multi-function display)
- Overload and short-circuit protection
- Set charging voltage/charging current
- Adjustable battery low voltage cutoff
- Power-save mode
- Set utility/battery priority
- Set utility input wide/narrow range
- Inverter voltage can be set to 100/110/120VAC
- Inverter frequency can be set to 50/60Hz
- Set utility charging on/off switch
- 80A MPPT charger

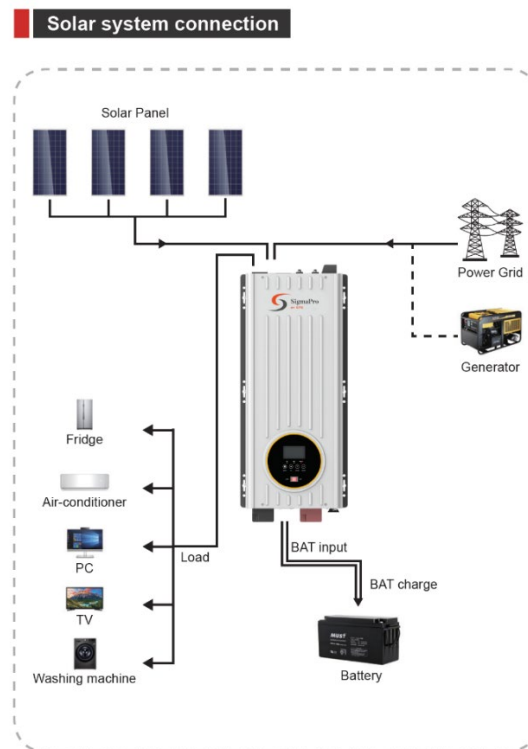
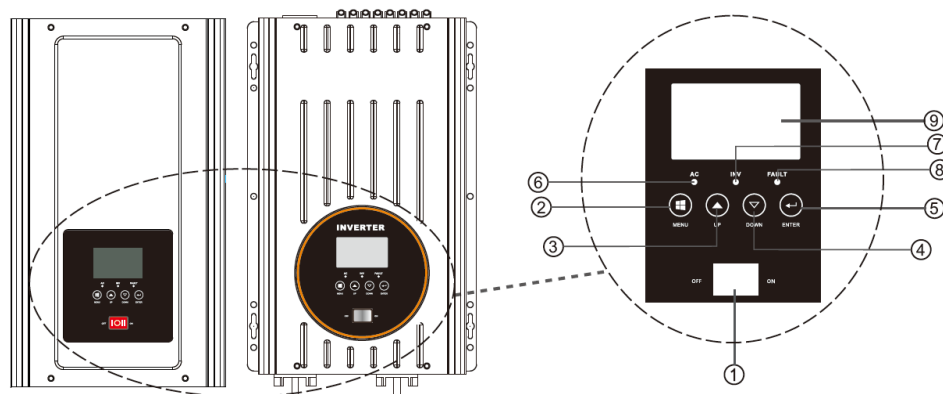


Figure 1 - Connection Overview

PRODUCT OVERVIEW

MODEL	SIGMAPRO - 1524
	SIGMAPRO - 3024
	SIGMAPRO - 4048

LCD PANEL DESCRIPTION



1. POWER ON/OFF SWITCH
2. MENU
3. UP
4. DOWN
5. ENTER

6. AC LED
7. INV LED
8. FAULT
9. LCD

BACK PANEL DESCRIPTION

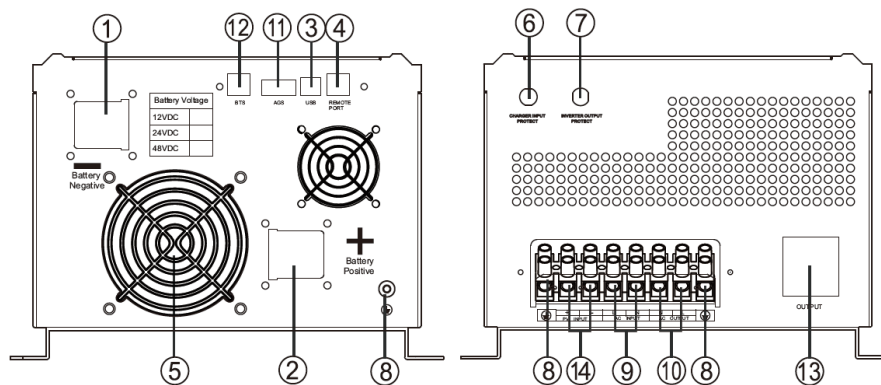


Figure 2 - AC Terminal Panel Description

1. Battery Terminal -
2. Battery Terminal +
3. USB
4. Remote Port
5. Fan
6. Charger input protect
7. Inverter output protect
8. Ground
9. AC input
10. AC output
11. AGS
12. BTS
13. AC output 10A (MAX)
14. PV input

INSTALLATION

UNPACKING AND INSPECTION

Before installation, please inspect whole unit. Be sure that nothing inside the package is damaged. You should have received the following items inside of the package.

- User Manual
- Communication Cable

MOUNTING THE UNIT

- Consider the following points before selecting where to install:
- Do not mount the inverter on flammable construction material.
- Mount on a solid surface.
- Install this inverter at eye level to read the LCD display clearly.
- For proper air circulation to dissipate heat, a minimum clearance of 50 cm to the sides and 80 cm above and below the unit is required.
- The ambient temperature should be between 0°C and 40°C to ensure optimal operation.
- The recommended installation position is to be adhered to the wall vertically.
- Be sure to leave sufficient space for future servicing.



SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACES ONLY.

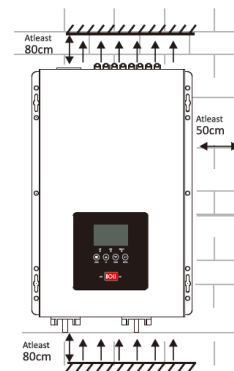


Figure 3 - Mounting clearance requirement

WARNING: CAREFULLY EXAMINE THE WEIGHT OF THE UNIT, IF IT'S TOO HEAVY, THEN THE FOLLOWING PROCEDURE SHALL BE CARRIED OUT BY 2 PERSONS TO AVOID POSSIBLE DROP INJURIES. MAKE SURE TO CLEAR THE SURROUNDING AREA TO BE FREE OF OBSTACLES BEFORE ATTEMPTING TO HANG THE UNIT.

Note: Mounting screws are not supplied with the unit due to varies mounting environments.

FOLLOWING THESE STEPS TO MOUNT THE INVERTER:

1. Mark the desired location to be installed.
2. If mounting surface is concrete, brick, or other masonry material, go to step 5.
3. If mount surface is drywall:
 - a. Using a stud finder, mark the center of two adjacent studs behind the wall. Mark the desired height. Install two horizontal wooden support beams across these two studs, one for the upper mounting holes and one for the lower mounting holes. It is recommended that the wooden support to be at least 1½ inch thick.
 - b. Drywall anchors can be used to install the inverter. Make sure the anchor is rated for more than the weight of the unit.
4. Mark the location of the first hole.
5. With a leveler, mark the second hole. Ensure both screws are lined up properly.
6. Drill through the marked holes and install wooden screws. Wooden screws must penetrate at least 1 inch into the support beam. Make sure not to screw in all the way yet, leave about ½" gap to hang the inverter.

7. With the help of a second person, lift the inverter and hang it onto the screws. Double check to ensure both screws are mounted properly.
8. With a level, check to make sure inverter is as level as possible. Adjust if necessary and tighten both upper screws.
9. Install the lower mounting screws and tighten.

DC WIRING SUGGESTIONS

It is suggested to keep battery banks as close as possible to the inverter. Battery cable length of 1m (3 ft) is suggested. Please find the following minimum wire sizes. If DC cable is longer than 1 m, please use thicker battery cables to bear power current going through.

Model	Battery Voltage Type	Wire Gauge
SigmaPro – 1524 (1.5KW)	24VDC	6 AWG
SigmaPro – 3024 (3KW)	24VDC	3 AWG
SigmaPro – 4048 (4KW)	48VDC	4 AWG

Please connect cable with minimum thickness above or combine several thinner cables to achieve the same gauge rating. Battery banks should be kept close to the inverter. For the most optimum inverter performance, always use shorter and higher gauge cables.

PLEASE FOLLOW BATTERY CONNECTION STEPS BELOW:

1. Assemble battery ring terminal.
2. Connect all battery packs as units requires. Note: For 24VDC models, two (2) 12V batteries connected in series are required; for 48VDC models, four (4) 12V batteries connected in series are required. To wire batteries in series, review the diagram below.
3. Though not required, but it's suggested to connect at least 100Ah for 1KW – 3KW models and 200Ah for 4KW models.

Note: Please only use sealed lead acid battery or sealed GEL/AGM lead-acid battery. Insert the ring terminal of the battery cable into inverter's battery connector, make sure the bolts are tightened with torque of 2-3Nm. Pay special attention to the polarity of the battery back to the inverter, positive to positive, negative to negative. Ensure ring terminals are tightly screwed to the battery terminals.

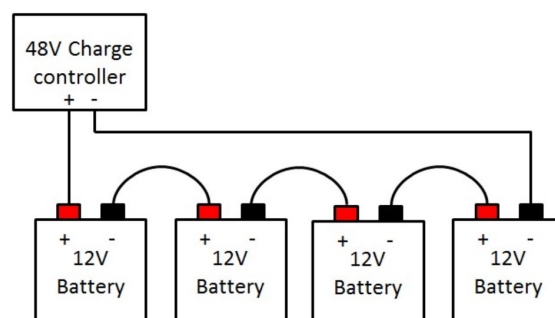


Figure 4 - Connecting 12V batteries in series, four (4) for 48VDC, two (2) for 24VDC



Figure 5 - Inverter battery terminal

⚠	WARNING: Shock Hazard Installation must be performed with care due to high battery voltage in series.
⚠	CAUTION!! Do not place anything between the flat part of the inverter terminal and the ring terminal. Otherwise, overheating may occur.
	CAUTION!! Do not apply antioxidant substance on the terminals before terminals are connected tightly.
	CAUTION!! Before making the final DC connection or closing DC breaker/ disconnect, be sure positive(+) must be connected to positive(+) and negative(-) must be connected to negative(-).

AC INPUT/OUTPUT CONNECTIONS

CAUTION!! Before connecting to AC input power source, please install a separate AC breaker between inverter and AC input power source. This will ensure inverter can be disconnected safely during maintenance and fully protected from over current of AC input.

Suggested AC breaker: 30A for 1KW-3KW, 40A for 4KW.

CAUTION!! Do NOT connect the output wiring to “Grid” terminal or connect the grid wiring to the “Load” terminal.

WARNING! All wiring must be performed by a qualified electrician.

WARNING! It's very important to use appropriate cable for Grid connection for system safety and efficient operation. To reduce risk of injury, please use the proper cable size below.

AC WIRING

It is recommended to use 10-5AWG wires to connect AC terminal blocks.

There are 3 different ways to connect AC wire to terminal block. All wirings are CE compliant, call tech support if you are not sure about how to wire any part of your inverter.

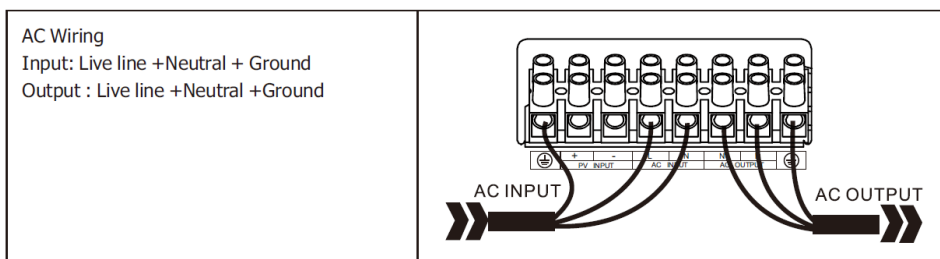


Figure 6 - Terminal block

It is recommended to use the following wire gauge for AC connection:

Model	Gauge	Torque Value
1-3KW	12 AWG	1.2-1.6Nm
4KW	10 AWG	1.4-1.6Nm

Please follow steps below to implement Load/Grid connection:

- Before Load/Grid connection, be sure to open DC protector first.
- Remove insulation sleeve about 10mm from wires. Then shorten L and N by 3mm.

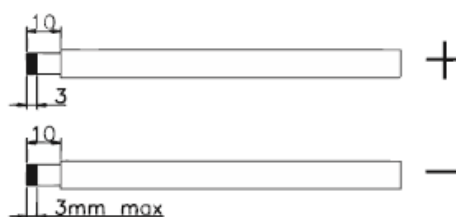


Figure 7 - Wire sleeve

- Connect Ground (PE or G) wire first by inserting the wire into the terminal as indicated on the inverter and tighten.
- Insert grid wires Hot and Neutral into inverter's terminal block according to polarities as indicated at connection point. Tighten terminal screws.
- Ensure that no more than ¼" of bare wire is exposed. If the wire is too long, remove the wire, shorten it and reinsert until proper length is reached.

AC INPUT CONNECTION

- G → Ground (Bare)
- L → Line (Black or red)
- N → Neutral (White or blue)

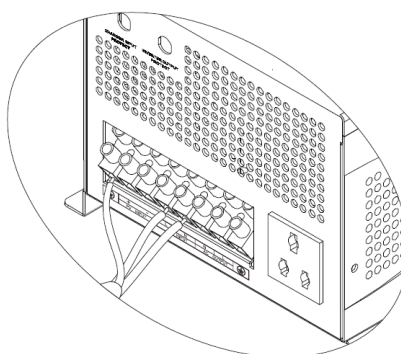


Figure 8 – AC input terminals



WARNING:

Be sure that AC power source is disconnected before hard-wire it to the unit.

- Now, insert Load wires according to polarities indicated on the terminal block and tighten terminal screws. Be sure to always connect the Ground wire first.

AC OUTPUT CONNECTION

- G → Ground (Bare)
- L → Line (Black or red)
- N → Neutral (Blue or white)

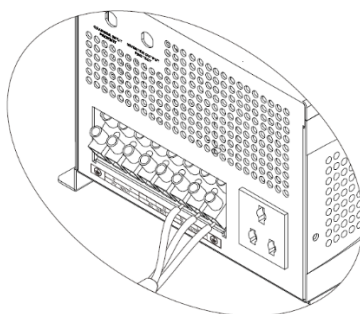


Figure 9 - AC output terminals

PV MODULE CONNECTION

PLEASE FOLLOW STEPS BELOW TO IMPLEMENT PV MODULE CONNECTIONS:

1. Remove insulation sleeves for positive and negative wires.
2. Connect positive pole (+) of connection wire to positive pole (+) of PV input connector. Connect negative pole (-) of connection wire to negative pole (-) of PV input connector.
3. Make sure the wires are securely fastened.

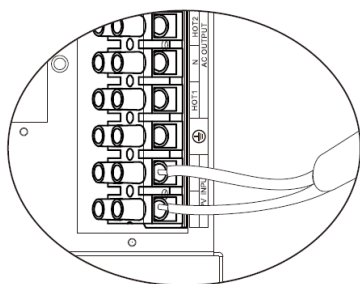


Figure 11 - PV Connection Terminals

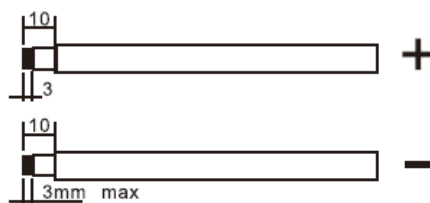
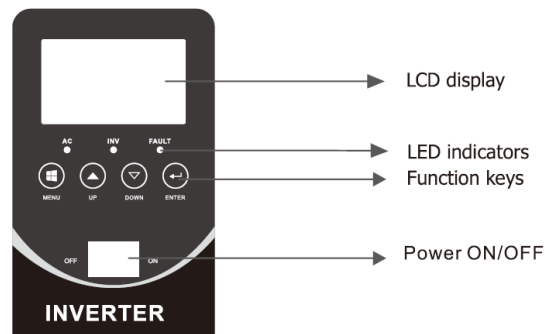


Figure 10 - Wire sleeve

CAUTION: Appliances such as air conditioner are required at least 2-3 minutes to restart because it's required to have enough time to balance refrigerant gas inside of circuits. If a power shortage occurs and recovers in a short time, it will cause damage to your connected appliances. To prevent this kind of damage, please check manufacturer of air conditioner if it's equipped with time-delay function before installation. Otherwise, this inverter will be triggered overload fault and cut off output to protect your appliance but sometimes it still causes internal damage to the air conditioner.

OPERATION








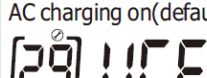
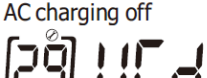


OPERATION KEY INSTRUCTION





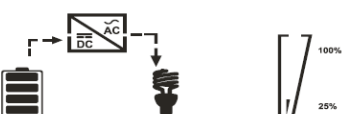
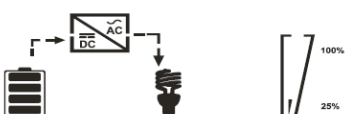
- Toggle Power button on/off to turn machine On and Off.
- There are four buttons: MENU, UP, DOWN, ENTER
- Short press UP and DOWN to check the various display parameters.
- Long press MENU to enter the setting menu page. MENU and ENTER will go to the next page in setting, UP and DOWN to set parameters. After desired selection, long press ENTER for 2s to save setting and exit the menu.

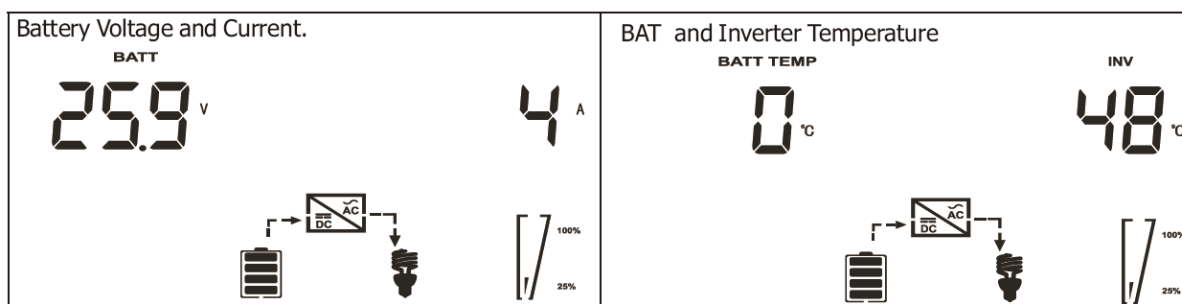
SETTING KEY INSTRUCTION

MENU	Function key	Function description	
01	Battery/AC priority setting	Utility priority(default) [01] UT ₁	If choice UTI, the inverter work in AC model until AC cut off or over the AC range.
		Battery priority [01] 56U	The inverter work in AC model if battery less 20set value. The inverter work in DC model if battery more than 21set value continue 1min.
02	Utility power range setting	vdE: Wide(default) [02] vdE	If set Wide, the AC range 140-270V.
		NRU: Narrow [02] NR-U	If set NRU, the AC range 180-270V.
03	120V Mode Inverter voltage setting	110V(default) [03] 110 _V	110/115/120V
	220V Mode Inverter voltage setting	220V(default) [03] 220 _V	220/230/240V
04	Inverter frequency setting	60HZ [04] 60.0 _{Hz}	50HZ(default) [04] 50.0 _{Hz}
13	AC charging setting	Rated current(default) [13] 40 _A	Range of adjustment: 10A - Max Regulation step 5A
17	Boost voltage setting	14.1V(default) [17] 14.1 _V	Range of adjustment 13.8-14.5V
18	Floating charging setting	13.5V(default) [18] 13.5 _V	Range of adjustment 13.5-13.7V
19	Battery low voltage shutdown point setting	10.5V(default) [19] 10.5 _V	Range of adjustment 10-11V
20	SBU Battery low voltage power point	11.5V(default) [20] 11.5 _V	Range of adjustment 10.5-12.0V If you choice SBU, when the battery voltage less than value, the inverter will work in AC model
21	SBU Battery high voltage inverter point	13.5V(default) [21] 13.5 _V	Range of adjustment 13V-14.0V If you choice SBU, when the battery voltage more than value continue 1min, the inverter will work in DC model.

23	LCD back light settings	LCD ON 	The LCD back light on.
		LCD OFF(default) 	Press any button to light up continue 1min.
24	Buzzer switch settings	Buzzer ON(default) 	Buzzer OFF
			
27	Save mode switch settings	SEN 	Save mode enable inverter is set to detect the load every 5/30 seconds
		Sdi(default) 	Save off The save model disenable.
28	Search time settings in Save mode	5s(default) 	5s inverter is set to detect the load every 5 seconds.
			30s inverter is set to detect the load every 30 seconds.
29	AC charging switch settings	AC charging on(default) 	AC charging off
			
UP	Page up key		
DOWN	Page down key		
ENTER	Confirm the exit key		

LCD DISPLAY

The software material No. & version No.325-00 shall be displayed on LCD Screen when switch on.		The Battery voltage and rated power shall be displayed on the LCD screen when switch on. As this shown in Screen:3024	
			
Default Page: Output Voltage and Output Frequency.		Input Voltage and Input Frequency.	
			
			



AGS FUNCTION

AGS FUNCTION INFORMATION

The inverter is capable to start a generator automatically via a dry contact when the battery is at low voltage.
NOTE: The generator must have dry contact function.

If both AC grid and Generator are connected to the inverter input at the same time, an interlock device shall be installed between generator output and inverter input. This will ensure the AC grid and generator will not provide power to the inverter at the same time. This is not necessary if only the AC Grid or only the generator is connected.

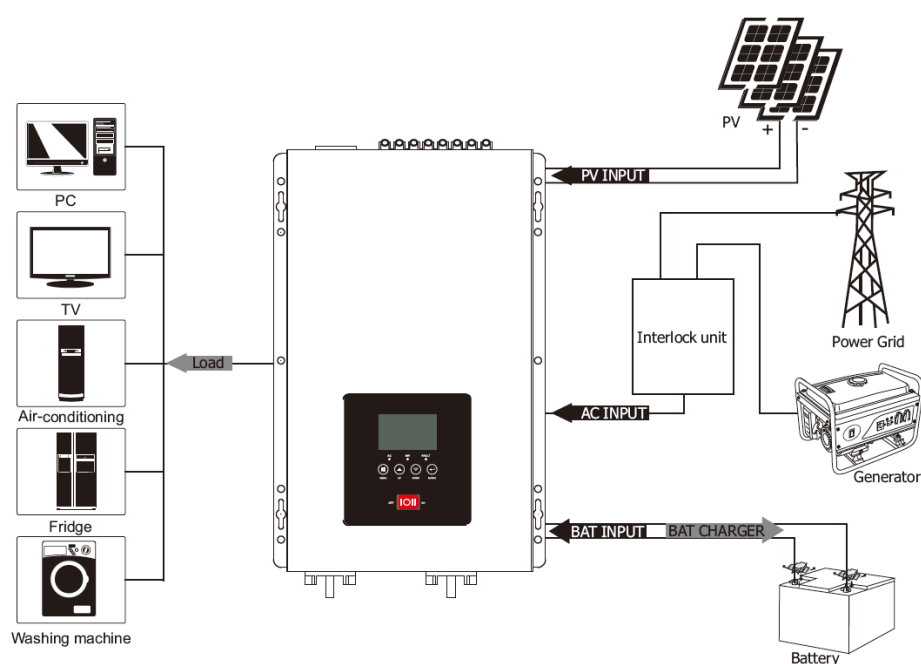


Figure 12 – Interlocking unit

DRY CONTACT OPERATING RANGE

Set Low Shutdown Voltage	Operation Voltage	Restoring Voltage
20V/40V	DC<21V/42V	DC>27V/54V
21V/42V	DC<22V/44V	DC>27V/54V
22V/44V	DC<23V/46V	DC>27V/54V

UNIT CHARGE FUNCTION

Inverter & MPPT controller: When solar energy is not enough, inverter will charge remaining current.

Inverter set charge current	Solar charge current	Inverter charge current
80A	0A	80A
	20A	60A
	>80A	0A

UTI/SBU FUNCTION

Set	Convert condition	Convert stage specification
UTI	until AC cut off or over the AC range	AC model to DC model
SBU	DC<20 set page parameter	DC model to AC model
	PV>15V _(12V) & DC>21set page parameter and 1min	AC model to DC model

BTS FUNCTION

BTS FUNCTION DESCRIPTION

- The inverter collects the battery temperature through the BTS port, based on 25°C with each rise of 1°C, the charging voltage drops by 18mV/1 at the set charging voltage (up to 60°C).
- BTS down charge voltage is based on drops of boost voltage and float voltage.
- Using an optional battery temperature cable to connect the inverter and battery (not supplied with package).

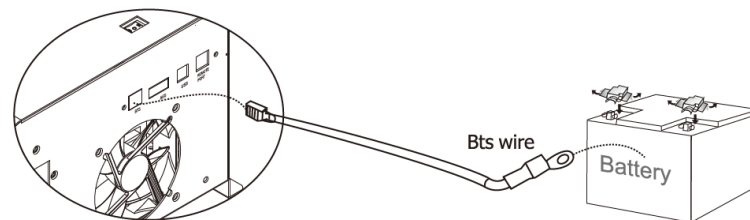


Figure 13 - BTS Connection

COMMUNICATION

This software supports the communication function for various product. The software will search the COM Port and inverter model automatically.

SOFTWARE INSTALLATION

The operation steps are as followed:

1. Download the SolarPowerMonitor software at www.safeguardpowersolutions.com/support
2. Connect the inverter with a communication cable to the computer's USB port.

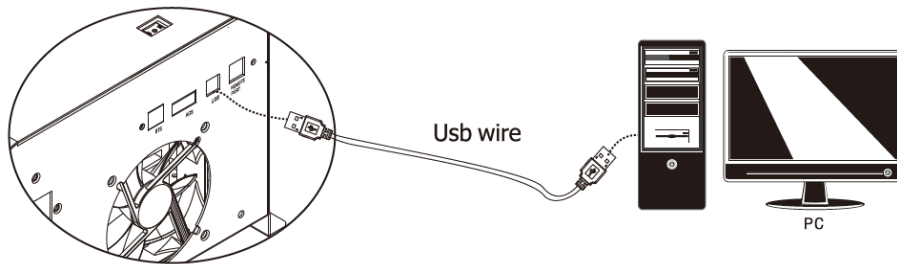
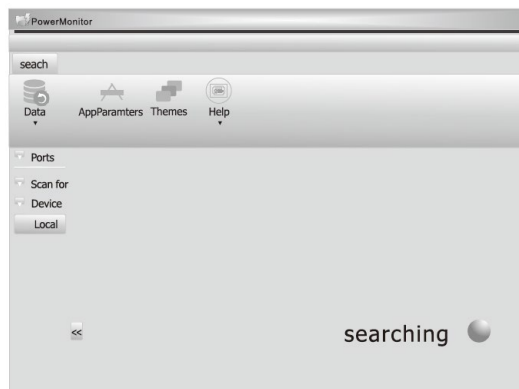
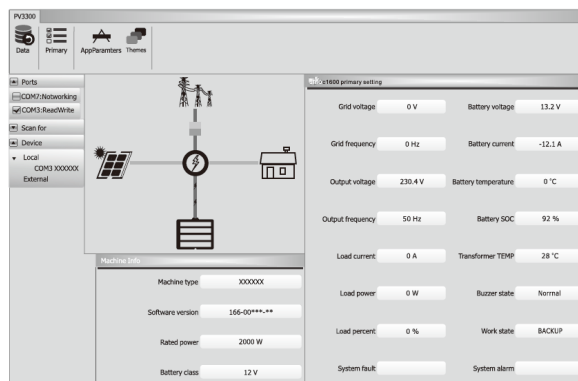


Figure 14 - Communication Port

3. Open the PowerMonitor software and turn on the inverter.
4. The SolarPowerMonitor will automatically scan communication ports.



5. After a short moment...



SPECIFICATIONS

INVERTER MODE SPECIFICATIONS

Model	SigmaPro – 1524	SigmaPro - 3024	SigmaPro – 4048
Rated power (W)	1500W	3000W	4000W
Power factor	1		
Wave form	Pure sine wave		
Output voltage RMS	100V/110V/120VAC \pm 10%		
Output frequency	50Hz or 60Hz (\pm 0.3Hz)		
Inverter efficiency (peak)	>80%		
Overload	100%<Load<110% (alarm 5 min then stop output and fault code 07) 110%<Load<125% (alarm 60s then stop output and fault code 07) Load>125% (alarm 10s then stop output and fault code 07)		
Surge rating	4500VA	9000VA	12000VA
Capable of starting electric motor	1 HP	1.5 HP	2 HP
Battery voltage	24VDC		48VDC
Low battery cutoff	(low voltage fault code04) 20/21/22V for 24V model 40/42/44V for 48V model		
Low battery alarm	Add 0.5V/battery: (low battery alarm one second one time) (20/21/22V) + 1VDC for 24V model (40/42/44V) + 2VDC for 48V model		
High voltage alarm	Add +1V/battery: (high voltage one second one time/after 30s fault 03) (27.6-29V) + 2V for 24V model (55.2-58) + 4V for 48V model		
Save mode	Load \leq 50 \pm 20W		

AC MODE SPECIFICATIONS

Input waveform	Pure sine wave
Nominal input voltage	120Vac \pm 3%
Max input voltage	140Vac MAX
Input frequency	50HZ/60HZ (auto sensing)
Output waveform	Same as input waveform
Overload protection	Breaker + software protection
Output short circuit	Breaker + software protection
Efficiency (AC mode)	>95% load, full battery
Transfer time AC to DC	15ms (max)
Transfer time DC to AC	15ms (max)

AC INPUT VOLTAGE RANGE ($\pm 5V$)

Model	Range	Low Cutoff	Low Recover	High Cutoff	High Recover
120V	Narrow	AC<90V	AC>95V	AC>140V	AC<135V
		F<40HZ	F>45HZ	F>70HZ	F<65HZ
	Wide	AC<70V	AC>75V	AC>140V	AC<135V
		F<40HZ	F>45HZ	F>70HZ	F<65HZ

CHARGE MODE SPECIFICATIONS

Max charge current: ($\pm 5A$)

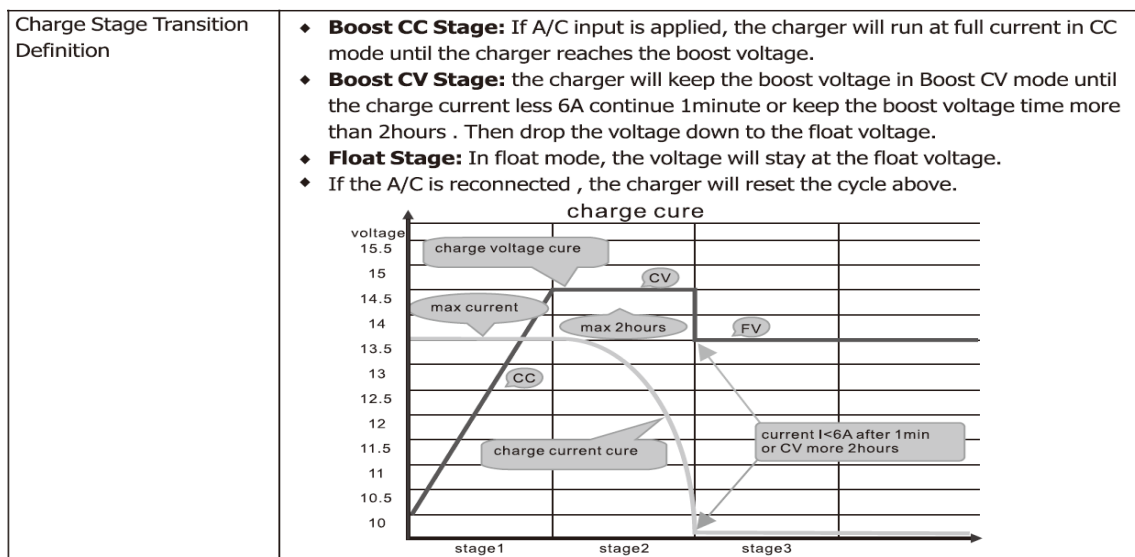
Model	1.5K	3K	4K
24V	25A	40A	
48V			30A
Min charge current 10A. change by every 5A.			

CHARGE MODE AC RANGE

Setting	Low voltage	Charge mode	Recover	Charge mode
120V AC wide range	AC>135V	Stop charge	AC<130V	Charge recover
	AC<75V	Stop charge	AC>80V	Charge recover
	40<F<70HZ charge			

CHARGE MODE

Charge current adjustable	Charge current adjustable: 10A~max (adjust by every 5A)
Battery voltage	20-29Vdc/40-58 VDC
Short circuit protection	Breaker
Over charge protection	Bat V \geq charge voltage+1V/battery, 1s 1 time for 30s then alarm 03
Rule	Boost CC \rightarrow Boost CV \rightarrow Boost FV



SOLAR CHARGER (MPPT CONTROLLER) ELECTRICAL SPECIFICATION

Type	MPPT-80A	
Nominal system voltage	12/24/48V (auto detection);	
Maximum charge current	80A±4A	
Battery voltage	24V	48V
Maximum solar input voltage	145±2V	
PV array MPPT voltage range	30-130V	60-130V
Maximum input power	2500W	5000W
Charging stages	Bulk, Absorption, Float	
Over charging voltage	30.0V/60.0V	
Over charging comeback voltage	29.5V/59.0V	
Battery defect voltage	17.0V/34.0V	
Charging curve	<p>The graph shows 'Battery Voltage, per cell' and 'Charging Current, %' on the y-axis (0 to 100%) and 'Time' on the x-axis. It is divided into three stages: Bulk (Constant Current), Absorption (Constant Voltage), and Maintenance (Floating). The Bulk stage shows a linear increase in voltage and a constant current. The Absorption stage shows a constant voltage and a decreasing current, with a 'T1' label. The Maintenance stage shows a constant voltage and a current that drops to near zero. A 'T0' label is also present in the Bulk stage.</p>	










FAULT MODE

BUZZER INFORMATION

Buzzer State	Information
Buzzer Off	Normal
Buzzer Beep	Caution
Buzzer On	Fault

LCD DISPLAY INSTRUCTION

When inverter alarms, it must be restarted to clear fault.

Fault code	Fault	Fault instruction	What to do
	Fan fault	Fan stop run	Check the fan.
	Over temperature	BTS over temperture: $T_{battery} > 65^{\circ}\text{C}$ 1s 1 time for 1min then fault alarm 02; $T_{battery} < 60^{\circ}\text{C}$ recovery Inverter over temperture: $T_{inv} > 90^{\circ}\text{C}$ 1s 1time for 1min then fault alarm 02; $T_{inv} < 85^{\circ}\text{C}$ recovery	Power off and waiting for minute
	DC voltage too high	Battery over voltage: $DC > V_{(charge\ voltage + 1V)/12V}$ alarm for 30s then fault code 03 Over voltage recovery: $DC < V_{(charge\ voltage + 1V) - 0.2V/12V}$	Check the battery specifications
	DC voltage too low	Low voltage alarm: $DC < V_{(cutoff + 0.5V)/12V}$ Alarm recovery: $DC > V_{(cutoff + 0.5) + 0.2/12V}$ Low voltage fault: $DC < V_{cutoff}$ fault code 04	Check the battery specifications
	Output short circuit in DC model	Output short circuit: short circuit test fault 05	Remove your load and restart
	Output over voltage	Output over voltage: $V_{output} > 135V/270V$ 500ms fault 06	Return to repair center
	Output over load	overload: $100\% < Load < 110\%$ alarm per every second (5min later inverter cutoff output and fault 07) $110\% < Load < 125\%$ alarm per every second (60s later inverter cutoff output and fault 07) $Load > 125\%$ alarm per every second (10s later cut off output and fault 07)	Decrease your load
	Output over current	Inverter Output over current: 1-3K: $I_{rms} > 40A$. 4-6K: $I_{rms} > 80A$ 200ms fault 51	Check if wiring is connected well and remove abnormal load.
	Output low voltage in DC model	Output low voltage: $V_{output} < 85V/170V$ 500ms fault 58	Decrease your load

MPPT CONTROLLER WARNING

Warn code	Warn information	Warn information specification	What to do
[80]▲	Hard ware protection		Return to repair center
[81]▲	Over current		
[82]▲	Current sensor error		
[83]▲	MPPT controller over temperature		Stop PV charge soon
[84]▲	PV voltage too high		Check PV
[85]▲	PV voltage too low		
[86]▲	Battery voltage too high		Check battery
[87]▲	Battery voltage too low		
[88]▲	Current is uncontrollable		Return to repair center
[89]▲	Parameter error		
[91]▲	MPPT controller fan		Check MPPT fan

FAULT CODE INFORMATION

If inverter enters fault mode, please remove input power. See chart below for fault code:

LED/Buzzer	LCD	Explanation / Possible cause	What to do
Buzzer beeps continuously and red LED is on	Fault code 01	Fan stop run	Check the fan.
	Fault code 02	Temperature of machine is too high.	Power off and waiting for minute
	Fault code 03	Battery voltage is too high.	Check the battery specifications
	Fault code 04	Battery voltage is too low.	Check the battery specifications
	Fault code 05	Output short circuited	Remove your load and restart
	Fault code 06	Inverter output voltage is high.	Return to repair center
	Fault code 07	Over load	Decrease your load
	Fault code 51	Output over current	Check if wiring is connected well and remove abnormal load.
	Fault code 58	Output voltage is too low.	Decrease your load

TECHNICAL SUPPORT

SafeGuard Power Solutions, LLC.

Email: support@sps-us.net

Phone: 855.484.6797 (M-F, 9-5 pst)

REGISTER YOUR PRODUCT

Go to: <https://safeguardpowersolutions.com/register-your-product/>

DATE OF PURCHASE: _____

POINT OF SALE: _____

ORDER NUMBER: _____

MODEL: _____

SERIAL NUMBER: _____

INSTALLER: _____