Sinergex™

PureSine²

Pure Sine Wave Inverter
User's Manual

2007.05

5. Maintenance:

Very little maintenance is required to keep your inverter operating properly. You should clean the exterior of the unit periodically with a damp cloth to prevent accumulation of dust and dirt.
At the same time, tighten the screws on the DC input terminals.

6. Warranty:

We warrant this product against defects in materials and workmanship for a period of 24 months from the date of purchase and will repair or replace any defective Power Inverter when directly returned, postage paid, to us.
This warranty will be considered void if the unit has suffered any obvious physical damage or alteration either internally or externally -and does not cover damage arising from improper use such as plugging the unit into an unsuitable power sources or attempt to operate products with excessive power consumption requirements, or use in unsuitable environments.
This is the only warranty that the company makes.
No other warranties express or imply including warranties of merchantability and fitness for a particular purpose.
Repair and replacement are your sole remedies and the company shall not be liable for damages, whether direct, incidental, special or consequential, even though caused by negligence or other fault.

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1. Important Safety Instructions

WARNING!
Before using the Inverter, read and save the safety instructions.

1-1. General Safety Precautions

1-1-1. Do not expose the Inverter to rain, snow, spray, bilge or dust. To reduce risk of hazard, do not cover or obstruct the ventilation openings. Do not install the Inverter in a zero-clearance compartment. Overheating may result.

1-1-2. To avoid a risk of fire and electronic shock. Make sure that existing wiring is in good electrical condition; and that wire size is not undersized.
Do not operate the Inverter with damaged or substandard Wiring.

1-1-3. This equipment contains components which can produce arcs or sparks. To prevent fire or explosion do not install in compartments containing batteries or Flammable materials or in locations which require ignition protected equipment. This includes any space containing petrol-powered machinery, fuel tanks, or joints, fittings, or other connection between components of the fuel system.

1-2. Precautions When Working with Batteries

1-2-1. If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eye, immediately flood eye with running cold water for at least 20 minutes and get medical attention immediately.

1-2-2. Never smoke or allow a spark or flame in vicinity of battery or engine.

1-2-3. Do not drop a metal tool on the battery. The resulting spark or short-circuit on the battery of other electrical part may cause an explosion.

1-2-4. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a lead-acid battery,
A lead-acid battery produces a short-circuit current high enough to weld a ring or the like to metal, causing a severe burn.

4. Troubleshooting guide:

WARNING!
Do not open or disassemble the Inverter.
Attempting to service the unit yourself may result in a risk of electrical shock or fire.

Problems and Symptoms	Possible Cause	Solutions
"No AC Power Output"		
STATUS illuminates the red LED		
a. Blinking fast	Over input voltage. (OVP)	Check input voltage. Reduce input voltage.
b. Blinking slow.	Low input voltage. (UVP)	Recharge battery. Check connections and cable.
c. Blinking Intermittently.	Thermal shutdown. (OTP)	Improve ventilation. Make sure ventilation openings in inverter are not obstructed. Reduce ambient temperature.
d. Solid ON.	Short circuit or Wiring error. Overload.(OLP)	Check AC wiring for short circuit. Reduce load.

Ground Fault Circuit Interrupters (GFCI):

Installations in Recreational Vehicles (for North American approvals) will require GFCI protection of all branch circuits connected to the AC output of the hardwire terminal equipped Inverter. In addition, electrical codes require GFCI protection of certain receptacles in residential installations. While the pure sine wave output of the Inverter is equivalent to the waveform provided by utilities, compliance with UL standards requires us to test and recommend specific GFCI.
We have tested the following GFCI – protected 20A receptacles and found that they functioned properly when connected to the output of the Inverter.

3-7. Inverter Operation:

To operate the power inverter, turn the main switch ON. The power inverter is now ready to deliver AC power to your loads. If there is several loads present, turn them on separately after the inverter has been "ON" in order to prevent the OVP present caused by the surge power.

3-7-1. Set the power switch to the "ON" position and the buzzer will send out "Beep" sounds, at that moment the inverter will do self-diagnosis, then the LED's indicators will also appear various colors.
Finally the buzzer will sound another "Beep" and the Input Level and Status LED indicators will turn to "Green" color, the inverter starts working successfully.

3-7-2. Set the power switch to the OFF position, the inverter stops and all the lights that are On, go Off.

3-7-3. Set power inverter switch to the ON position and turn the test load On. The inverter should supply power to the load. If you plan to accurately measure the true output r.m.s. voltage of the inverter, a meter
such as FLUKE 45 BECKMAN 4410 or TRIPLETT 4200 must be used.

2. Features

- Pure sine wave output (THD < 3%)
- Output frequency: 50 / 60Hz switch selectable
- Input & output fully isolation design
- Low power " Power Saving Mode " to conserve energy
- High efficiency 89~94%
- Capable of driving highly reactive & capacitive loads at start moment.
- Tri-Color indicators display input voltage & output load level
- Loading controlled cooling fan
- Advanced microprocessor
- Protection: Input low voltage, Overload, Short circuit, Low battery alarm, Input over voltage, Over temperature

2-1. Application

2-1-1. Power tools – circular saws, drills, grinders, sanders, buffers, weed and hedge trimmers, air compressors.

2-1-2. Office equipment – computers, printers, monitors, facsimile machines, scanner.

2-1-3. Household items – vacuum cleaners, fans, fluorescent and incandescent lights, shavers, sewing machines.

2-1-4. Kitchen appliances – coffee makers, blenders, ice makers, toasters.

2-1-5. Industrial equipment – metal halide lamp, high – pressure sodium lamp.

2-1-6. Home entertainment electronics – television, VCRs, video games, stereos, musical instruments, satellite equipment.

2-2. Electrical Performance

Specification	Model No.					
Item	PS2-700-112	PS2-700-124	PS2-700-148	PS2- 700-212	PS2-700-224	PS2-700-248
Continuous Output Power	700W					
Maximum Output Power (3Min.)	800W					
Surge Rating	1400W					
Input voltage	12V	24V	48V	12V	24V	48V
Output Voltage	100 / 110 / 120V +/- 5%			220 / 230 / 240V +/- 3%		
Frequency (Switch Selectable)	50 / 60Hz +/- 0.05%					
Output Waveform	Pure Sine Wave (THD < 3%)					
Efficiency (full load)	89.0%	91.0%	92.0%	91.0%	93.0%	94.0%
No Load Current Draw	1.25A	0.64A	0.31A	1.20A	0.60A	0.28A
Stand-By Current Draw	0.25A	0.15A	0.08A	0.25A	0.15A	0.08A
Input Voltage Regulation	10.5-15 VDC	21.0-30 VDC	42-60 VDC	10.5-15 VDC	21.0-30 VDC	42-60 VDC
Input Level Indicator	Red / Orange / Green LED					
Load Level Indicator						
Failure Indicator	Red LED					
Protection	Overload, Short Circuit, Reverse Polarity (Fuse), Over / Under Input Voltage, Over Temperature.					
Remote Control Unit	CR-6 / CR-7 / CR-8 Optional					
Safety	UL458			EN60950-1		
EMC	FCC Class A			EN55022: 1997 EN55024: 1997 EN61000-3-2: 1998 EN61000-3-3: 1995		e-Mark
Operating Temperature Range	0 - 40 DEGREES CELSIUS					
Storage Temperature Range	-30 to 70 DEGREES CELSIUS					
Cooling	Loading controlled cooling fan					
Dimensions	295(L)*180(W)*72(H)mm / 11.61(L)*7.09(W)*2.83(H) Inch					
Weight	2.7kg / 5.4 Lbs.					

Note: The specifications are subject to change without notice.

3-6. AC Safety Grounding:

The AC output ground wire should go to the grounding point for your loads (for example, a distribution panel ground bus).

3-6-1. Neutral Grounding (GFCI'S):

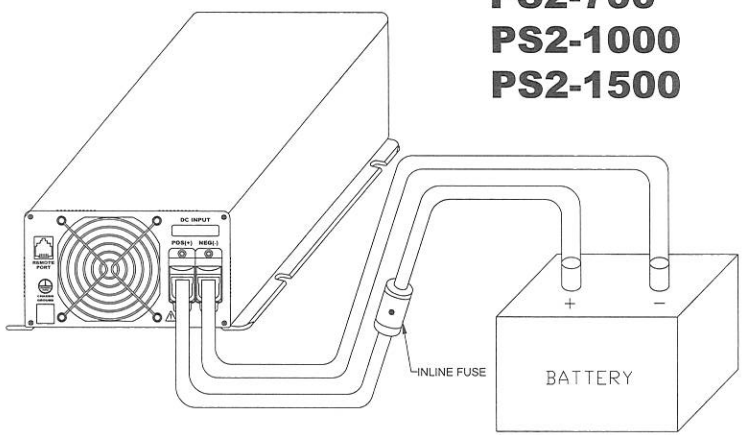
3-6-1-1. **120V models:** The neutral conductor of the AC output circuit of the Inverter is automatically connected to the safety ground during inverter operation. In accordance with the National Electrical Code requirements, that separately derived AC sources (such as inverter and generators) have their neutral conductors tied to ground in the same way that the neutral conductor from the utility is tied to ground at the AC breaker panel. For models configured with a transfer relay, while AC utility power is present and the Inverter is in bypass mode, this connection (neutral of the Inverter's AC output to input safety ground) is not present so that the utility neutral is only connected to ground at your breaker panel, as required.

3-6-1-2. **230V models:** There is no connection made to inverter interior between either the line or neutral conductor to the safety ground.

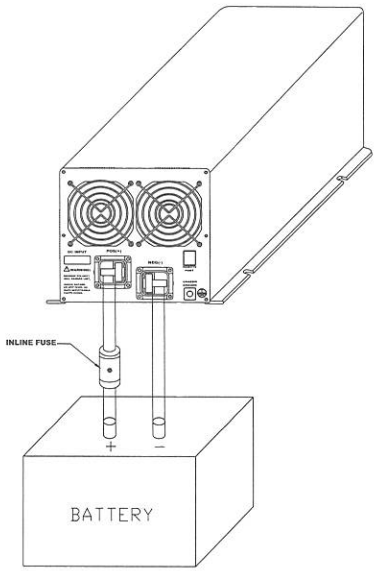
WARNING!

Risk of electronic shock. Use only Pass and Seymour, type 2091-W or 2094-W, ground – fault circuit-interrupter receptacles. Others may fail in operating the inverter when connecting to the inverter's equipment.

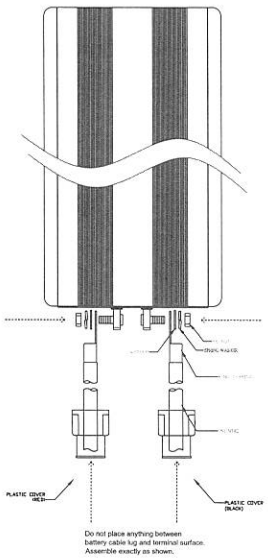
PS2-700
PS2-1000
PS2-1500



PS2-2000
PS2-3000



Battery to inverter cable connection



Specification	Model No.					
Item	PS2-1000-112	PS2-1000-124	PS2-1000-148	PS2-1000-212	PS2-1000-224	PS2-1000-248
Continuous Output Power	1000W					
Maximum Output Power (3Min.)	1150W					
Surge Rating	2000W					
Input voltage	12V	24V	48V	12V	24V	48V
Output Voltage	100 / 110 / 120V +/- 5%			220 / 230 / 240V +/- 3%		
Frequency (Switch Selectable)	50 / 60Hz +/- 0.05%					
Output Waveform	Pure Sine Wave (THD < 3%)					
Efficiency (full load)	89.0%	92.0%	93.0%	91.0%	94.0%	95.0%
No Load Current Draw	1.43A	0.75A	0.38A	1.25A	0.65A	0.35A
Stand-By Current Draw	0.25A	0.15A	0.09A	0.25A	0.15A	0.09A
Input Voltage Regulation	10.5-15 VDC	21.0-30 VDC	42-60 VDC	10.5-15 VDC	21.0-30 VDC	42-60 VDC
Input Level Indicator	Red / Orange / Green LED					
Load Level Indicator						
Failure Indicator	Red LED					
Protection	Overload, Short Circuit, Reverse Polarity (Fuse), Over / Under Input Voltage, Over Temperature.					
Remote Control Unit	CR-6 / CR-7 / CR-8 Optional					
Safety	UL458			EN60950-1		
EMC	FCC Class A			EN55022: 1997 EN55024: 1997 EN61000-3-2: 1998 EN61000-3-3: 1995		e-Mark
Operating Temperature Range	0 - 40 DEGREES CELSIUS					
Storage Temperature Range	-30 to 70 DEGREES CELSIUS					
Cooling	Loading controlled cooling fan					
Dimensions	383(L)*182(W)*88(H)mm / 15.08(L)*7.17(W)*3.46(H) Inch					
Weight	4 kg / 8.8 Lbs.					

Note: The specifications are subject to change without notice.

Specification	Model No.					
Item	PS2-1500-112	PS2-1500-124	PS2-1500-148	PS2-1500-212	PS2-1500-224	PS2-1500-248
Continuous Output Power	1500W					
Maximum Output Power (3Min.)	1725W					
Surge Rating	3000W					
Input voltage	12V	24V	48V	12V	24V	48V
Output Voltage	100 / 110 / 120V +/- 5%			220 / 230 / 240V +/- 3%		
Frequency (Switch Selectable)	50 / 60Hz +/- 0.05%					
Output Waveform	Pure Sine Wave (THD < 3%)					
Efficiency (full load)	88.0%	91.0%	92.0%	90.0%	93.0%	94.0%
No Load Current Draw	1.45A	0.75A	0.40A	1.40A	0.70A	0.40A
Stand-By Current Draw	0.28A	0.15A	0.09A	0.28A	0.15A	0.09A
Input Voltage Regulation	10.5-15 VDC	21.0-30 VDC	42-60 VDC	10.5-15 VDC	21.0-30 VDC	42-60 VDC
Input Level Indicator	Red / Orange / Green LED					
Load Level Indicator						
Failure Indicator	Red LED					
Protection	Overload, Short Circuit, Reverse Polarity (Fuse), Over / Under Input Voltage, Over Temperature.					
Remote Control Unit	CR-6 / CR-7 / CR-8 Optional					
Safety	UL458			EN60950-1		
EMC	FCC Class A			EN55022: 1997 EN55024: 1997 EN61000-3-2: 1998 EN61000-3-3: 1995		e-Mark
Operating Temperature Range	0 - 40 DEGREES CELSIUS					
Storage Temperature Range	-30 to 70 DEGREES CELSIUS					
Cooling	Loading controlled cooling fan					
Dimensions	415(L)*191(W)*88(H)mm / 16.34(L)*7.52(W)*3.46(H) Inch					
Weight	4.8 kg / 10.56 Lbs.					

Note: The specifications are subject to change without notice.

3-5-1. Connect the cables to the power input terminals on the rear panel of the inverter. The red terminal is positive (+) and black terminal is negative (-). Insert the cables into the terminals and tighten screw to clamp the wires securely.

WARNING!

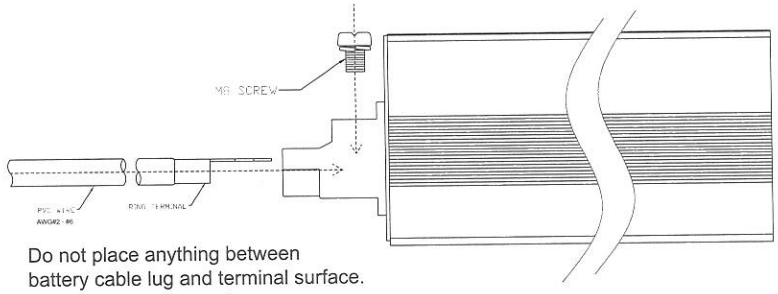
Make sure all the DC connections are tight (torque to 9 – 10 ft-lbs, 11.7 – 13 Nm). Loose connections could result in overheating, a potential hazard.

WARNING!

The installation of a fuse must be on positive cable. Failure to place a fuse on "+" cables running between the inverter and battery may cause damage to the inverter and will void warranty.

Also, use only high quality copper wire and keep cable length short, a maximum of 3 - 6 feet.

Battery to inverter cable connection



Do not place anything between battery cable lug and terminal surface. Assemble exactly as shown.

3-5. Making DC Wiring Connections:

Follow this procedure to connect the battery cables to the DC input terminals of the Inverter. Your cables should be as short as possible (Ideally, less than 6 feet / 1.8 meters) enough to handle the required current in accordance with the electrical codes or regulations application. Cables are not adequate if (too narrow) or to long it will decrease the inverter performances such as poor surge capability and frequent low input voltage warnings and shutdowns. UVP warning occurs due to DC voltage drop across the cables from the inverter to the batteries.
The longer or narrower the cables, the greater the voltage drop.
Increasing your DC cable size will help improve the situation.
Following cable recommendations for the best performance of inverter.
(Apply both 120V and 230V versions)

Model No	Wire AWG	Inline Fuse
PS2-700-112-212	# 4	100 A
PS2-700-124-224	# 6	50 A
PS2-700-148-248	# 8	30 A
PS2-1000-112-212	# 2	150 A
PS2-1000-124-224	# 4	80 A
PS2-1000-148-248	# 6	40 A
PS2-1500-112-212	# 2	200 A
PS2-1500-124-224	# 4	100 A
PS2-1500-148-248	# 6	50 A
PS2-2000-112-212	# 2/0	250 A
PS2-2000-124-224	# 1/0	125 A
PS2-2000-148-248	# 2	70 A
PS2-3000-112-212	# 4/0	400 A
PS2-3000-124-224	# 2/0	200 A
PS2-3000-148-248	# 1/0	100 A

Specification	Model No.					
Item	PS2-2000-112	PS2-2000-124	PS2-2000-148	PS2-2000-212	PS2-2000-224	PS2-2000-248
Continuous Output Power	2000W					
Maximum Output Power (3Min.)	2300W					
Surge Rating	4000W					
Input voltage	12V	24V	48V	12V	24V	48V
Output Voltage	100 / 110 / 120V +/- 5%			220 / 230 / 240V +/- 3%		
Frequency (Switch Selectable)	50 / 60Hz +/- 0.05%					
Output Waveform	Pure Sine Wave (THD < 3%)					
Efficiency (full load)	89.0%	92.0%	93.0%	91.0%	94.0%	95.0%
No Load Current Draw	2.8A	1.5A	0.7A	2.64A	1.32A	0.65A
Stand-By Current Draw	0.60A	0.30A	0.15A	0.60A	0.25A	0.15A
Input Voltage Regulation	10.5-15 VDC	21.0-30 VDC	42-60 VDC	10.5-15 VDC	21.0-30 VDC	42-60 VDC
Input Level Indicator	Red / Orange / Green LED					
Load Level Indicator						
Failure Indicator	Red LED					
Protection	Overload, Short Circuit, Reverse Polarity (Fuse), Over / Under Input Voltage, Over Temperature.					
Remote Control Unit	CR-6 / CR-7 / CR-8 Optional					
Safety	UL458			EN60950-1		
EMC	FCC Class A			EN55022: 1997 EN55024: 1997 EN61000-3-2: 1998 EN61000-3-3: 1995		e-Mark
Operating Temperature Range	0 - 40 DEGREES CELSIUS					
Storage Temperature Range	-30 to 70 DEGREES CELSIUS					
Cooling	Loading controlled cooling fan (65 DEG. ON , 45 DEG. OFF)					
Dimensions	422(L)*208(W)*166(H)mm / 16.6(L)*8.18(W)*6.53(H) Inch					
Weight	9 kg / 19.8 Lbs.					

Note: The specifications are subject to change without notice.

Specification	Model No.					
Item	PS2-3000-112	PS2-3000-124	PS2-3000-148	PS2-3000-212	PS2-3000-224	PS2-3000-248
Continuous Output Power	3000W					
Maximum Output Power (3Min.)	3450W					
Surge Rating	6000W					
Input voltage	12V	24V	48V	12V	24V	48V
Output Voltage	100 / 110 / 120V +/- 5%			220 / 230 / 240V +/- 3%		
Frequency (Switch Selectable)	50 / 60Hz +/- 0.05%					
Output Waveform	Pure Sine Wave (THD < 3%)					
Efficiency (full load)	88.0%	91.0%	92.0%	90.0%	93.0%	94.0%
No Load Current Draw	2.0A	1.6A	0.8A	2.8A	1.5A	0.7A
Stand-By Current Draw	0.55A	0.35A	0.19A	0.55A	0.35A	0.19A
Input Voltage Regulation	10.5-15 VDC	21.0-30 VDC	42-60 VDC	10.5-15 VDC	21.0-30 VDC	42-60 VDC
Input Level Indicator	Red / Orange / Green LED					
Load Level Indicator						
Failure Indicator	Red LED					
Protection	Overload, Short Circuit, Reverse Polarity (Fuse), Over / Under Input Voltage, Over Temperature.					
Remote Control Unit	CR-6 / CR-7 / CR-8 Optional					
Safety	UL458			EN60950-1		
EMC	FCC Class A			EN55022: 1997 EN55024: 1997 EN61000-3-2: 1998 EN61000-3-3: 1995		e-Mark
Operating Temperature Range	0 - 40 DEGREES CELSIUS					
Storage Temperature Range	-30 to 70 DEGREES CELSIUS					
Cooling	Loading controlled cooling fan					
Dimensions	452(L)*208(W)*166(H)mm / 17.80(L)*8.18(W)*6.53(H) Inch					
Weight	9.8 kg / 22 Lbs.					

Note: The specifications are subject to change without notice.

3-4. Installation:

Where to install. The power inverter should be installed in a location that Meets the following requirements:

3-4-1. Dry – Do not allow water to drip or splash on the inverter.

3-4-2. Cool – Ambient air temperature should be between 0 ° C and 40 °C, the cooler the better.

3-4-3. Safe – Do not install in a battery compartment or other areas where flammable fumes may exist, such as fuel storage areas or engine compartments.

3-4-4. Ventilated – Allow at least one inch of clearance around the inverter for air flow. Ensure the ventilation openings on the rear and front of the unit are not obstructed.

3-4-5. Dust – Do not install the Inverter in dusty environments where dust, wood particles or other filings/shavings are present. These particles can be pulled into the unit when the cooling fan is operating.

3-4-6. Close to batteries – Avoid excessive cable lengths but do not install the Inverter in the same compartment as batteries.
Use the recommended wire lengths and sizes (see section 3-5).
Also do not mount the Inverter where it will be exposed to the gases produced by the battery.
These gases are very corrosive and prolonged exposure also will damage the Inverter.

WARNING!

Shock Hazard. Before proceeding further, carefully check that the Inverter is NOT connected to any batteries, and that all wiring is disconnected from any electrical sources. Do not connect the output terminals of the Inverter to an incoming AC source.

3-2-3. DC Input Terminals:

Connect to 12V / 24V / 48V battery or other power sources. (+) is positive, (-) is negative. Reverse polarity connection will blow internal fuse and may damage inverter permanently.

Model	DC Input Voltage	
	Minimum	Maximum
12 V	10.5	15.0
24 V	21.0	30.0
48 V	42.0	60.0

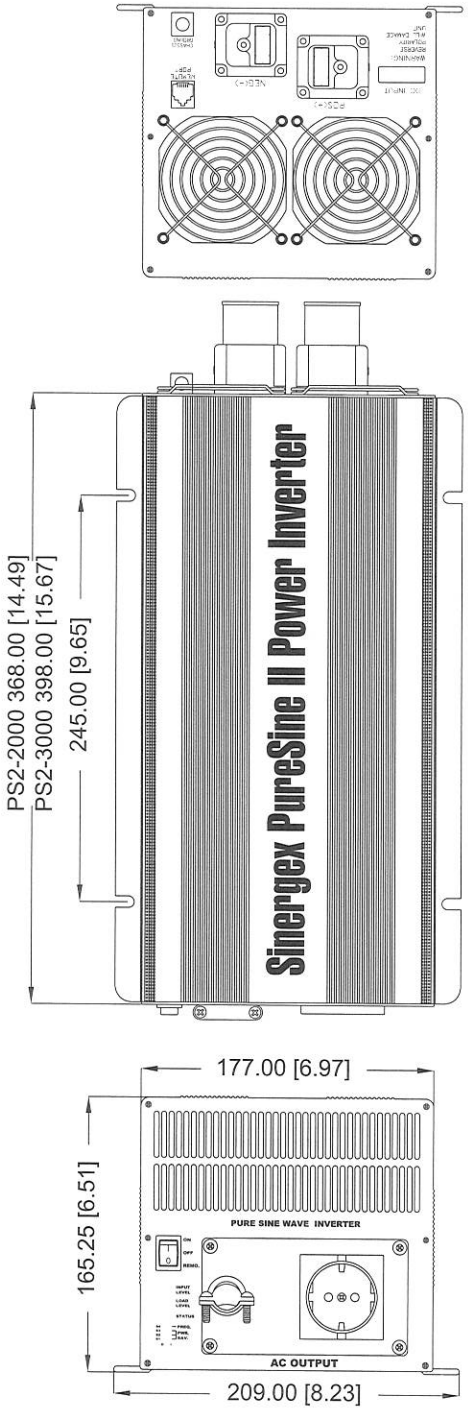
3-2-4. Chassis Ground: using # 8 AWG wire to connect vehicle chassis.

WARNING!
Operation of the inverter without a proper ground connection may result in an electrical safety hazard.

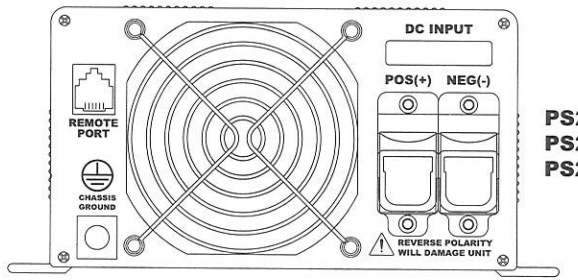
3-3. Protection Features:

Model	DC Input (VDC)					Over Temperature Protection			
	Over Voltage		Under Voltage Alarm	Under Voltage		INTERIOR		HEAT SINK	
	Shut-down	Restart		Shut-down	Restart	Shut-down	Restart	Shut-down	Restart
12 V	15.3V	14.3V	11.0V	10.2V	12.7V	70°	45°	90°	60°
24 V	30.6V	28.6V	22.0V	20.3V	25.2V				
48 V	61.0V	57.2V	44.0V	40.8V	49.7V				

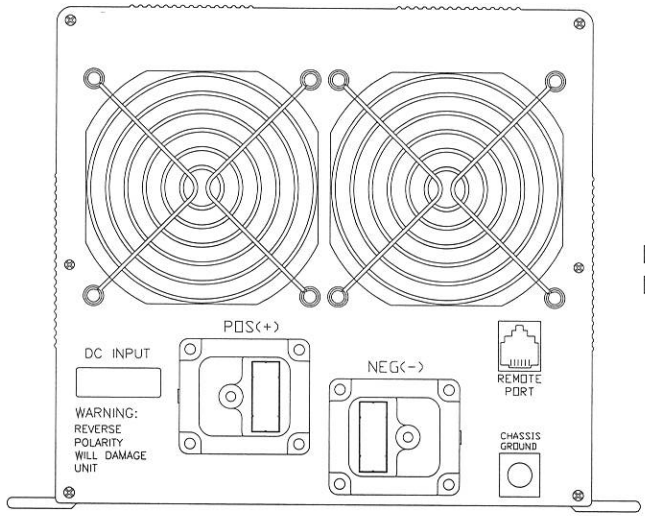
2-3. Mechanical Drawings



3-2. Rear Panel Operations:



PS2-700
PS2-1000
PS2-1500



PS2-2000
PS2-3000

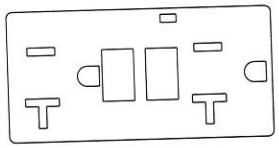
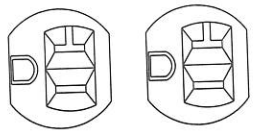
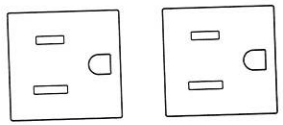
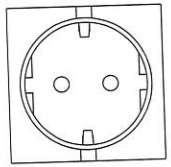
3-2-1. Remote Port:

The PS2 Series Inverter is compatible with any of these remote controllers, CR-6, CR-7 or CR-8.
Before using the remote unit, make sure the main switch is set to " REMOTE".

3-2-2. Fan Ventilation:

Do not obstruct, allow at least 1 inch for proper air flow.

3-1-8. AC outlets (available):

North America (GFCI)	NEMA 5-20R
	
NEMA 5-15R	**Continental European**
	
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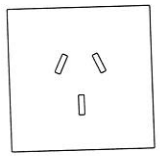	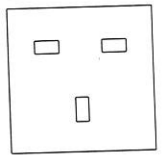
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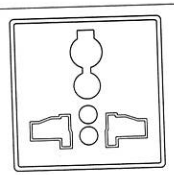	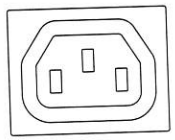
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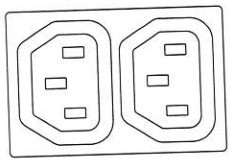
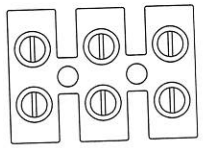
	

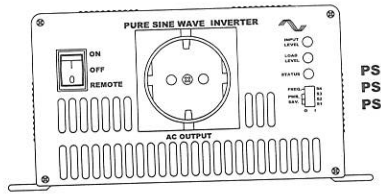
3. Introduction

Thank you for purchasing a Sinergex PureSine II true sine wave power inverter. The PureSine II series are some of the most advanced line of mobile AC power systems available.

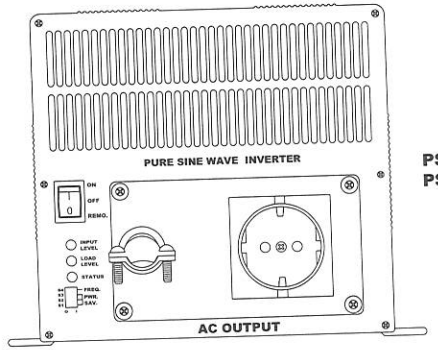
To get the most out of your power inverter, it must be installed and used properly. Please read the instructions in this manual before installation and operation of your model

3-1. Front Panel Operations:

3-1-1. Front view:



PS2-700
PS2-1000
PS2-1500



PS2-2000
PS2-3000

3-1-2. ON / OFF/ REMOTE (Main) switch:

A. Before installing the inverter, please make sure the power ON/OFF/Remote switch is in the OFF position.

B. Before operating the inverter using the Remote Control panel, please make sure the Power ON/OFF/Remote switch is in the “Remote” position.

3-1-3. Input Level: Display Input Voltages

LED Status	DC 12V	DC 24V	DC 48V
RED Slow Blink	10.3~10.6V	20.5~21.2V	40.8~42.4V
RED	10.6~11.0V	21.2~21.8V	42.4~43.5V
ORANGE	11.0~12.1V	21.8~24.1V	43.5~48.1V
GREEN	12.1~14.2V	24.1~28.6V	48.1~56.3V
ORANGE Blink	14.2~15.0V	28.6~30.0V	56.3~59.6V
OVER RED Blink	15.0V↑	30.0V↑	59.6V↑

3-1-4. Load Level: Display AC Loads (Watts)

LED status	DARK	GREEN	ORANGE	RED	RED BLINK
SK700	0 ~ 56W	56 ~ 230W	230 ~ 525W	525 ~ 672W	Over 672W
SK1000	0 ~ 80W	80 ~ 330W	330 ~ 750W	750 ~ 960W	Over 960W
SK1500	0 ~ 120W	120 ~ 495W	495 ~ 1125W	1125 ~ 1450W	Over 1450W
SK2000	0 ~ 160W	160 ~ 660W	660 ~ 1500W	1500 ~ 1920W	Over 1920W
SK3000	0 ~ 240W	240 ~ 990W	990 ~ 2250W	2250 ~ 2880W	Over 2880W

3-1-5. AC Frequency:Selected by “S4” Dip Switch

Frequency	S4
50 HZ	OFF
60 HZ	ON

3-1-6. Status: Display Power & Fault Status

Green LED	LED Signal	Status
Solid	————————	Power OK
Blink (Slow)	– – – –	Power Saving
Red LED	**LED Signal**	**Status**
Blink (Fast)	– – – – – – – – – –	OVP
Blink (Slow)	– – – –	UVP
Blink (Intermittently)	- - - - - -	OTP
Solid	————————	OLP

3-1-7. Power Saving Mode: Power Saving Mode is adjustable and set by the Dip Switches, S1, S2 and S3 on the front panel.

Example: With the watt setting at 15W, a 15W ↑ load will bring the inverter to operate normally, under 15W ↓ load, the Power saving mode is present.

PS2-700	PS2-1000 PS2-1500	PS2-2000 PS2-3000	S1	S2	S3
DISABLE	DISABLE	DISABLE	OFF	OFF	OFF
15W	20W	40W	ON	OFF	OFF
25W	40W	80W	OFF	ON	OFF
40W	55W	125W	ON	ON	OFF
50W	75W	170W	OFF	OFF	ON
65W	95W	210W	ON	OFF	ON
75W	115W	245W	OFF	ON	ON
85W	135W	280W	ON	ON	ON