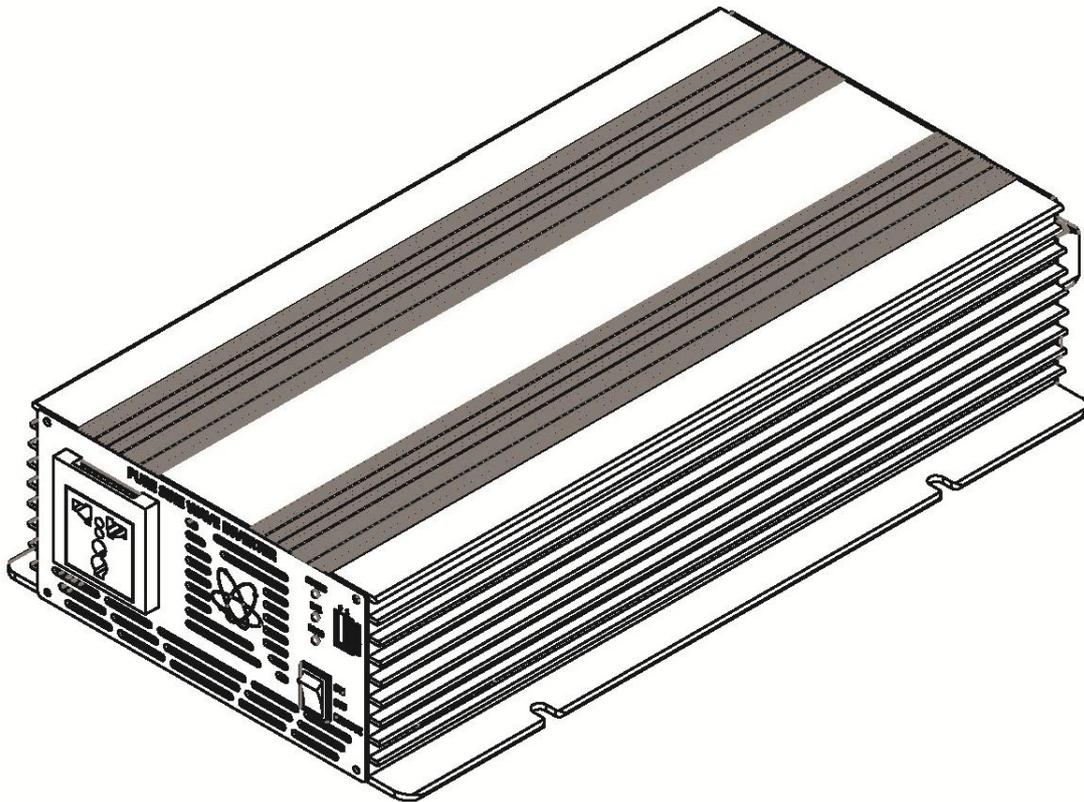


# DC AC POWER INVERTER



**TPS - 700 / 1000 / 1500 / 2000 / 3000**  
**User Manual**

## Save This Manual

Please read this manual carefully prior to storage, installation, wiring, operation and maintenance of power inverter.

This manual contains important instructions and warnings that you should follow during the storage, installation, wiring, operation and maintenance of power inverter. Failure to follow these instructions and warnings will void the warranty.

Please note that only qualified and trained technician can do installation, wiring, operation and maintenance of power inverter.

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# Section 1: Safety Instruction

## 1-1 General Safety



Do not expose the power inverter to rain, snow, spray or dust. To reduce the risk of fire hazard, do not cover or obstruct the ventilation openings and do not install the power inverter in a zero-clearance compartment.



To avoid the risk of fire and electric shock, make sure that the existing wiring is in good electrical condition, and the wire size is not undersized.



The power inverter contains components which can produce arcs or sparks. To prevent fire or explosion do not install in compartment containing batteries or flammable materials or in location which require ignition protected equipment. This included any space containing gasoline-powered machinery, fuel tanks, or joints, fittings, or other connection between components of the fuel system.



Depending on the user scenario, the AC output of the power inverter may require user installed breaker or fuse. In AC output hardwire application, AC socket will not be provided. The power inverter incorporates standard AC short circuit protection.



An over current protection at the time of installation shall be provided by others for the AC output circuit.



Additional breakers suitable for 20A branch circuit protection shall be provided for the GFCI receptacles.



When working on the power inverter, please remove watches, rings, or other metal objects. Use tools with insulated handles and wear rubber gloves and boots.

## 1-2 Other Safety



Upon receipt, examine the carton box for damage. If you have found any damage on the carton box please notify the company you purchased this power inverter from.



Do not operate near water or in excessive humidity.



Do not open or disassemble the power inverter, and warranty may be voided.



The DC side connections should be firm and tight.



Reliable grounding should be maintained.



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



Install the power inverter in a well ventilated area. Do not block the front air vents or the rear air exhausts of the power inverter.



Adequate input power must be supplied to the power inverter for proper use; correct wiring sizes must be ensured.



Mount the power inverter such that the fan axis is horizontal.



Do not operate the power inverter close to combustible gas or open fire.



Do not operate appliances that may feed power back into the power inverter.



The power inverter should be operated in an ambient temperature range of  $-20^{\circ}\text{C}$  to  $40^{\circ}\text{C}$  otherwise the output efficiency may be affected. Air flow to the power inverter must not be blocked.

### **1-3 Installation on Boat**



Incorrect use or installation of the power inverter on boat may lead to corrosion of the boat. Please allow qualified personnel to perform the installation of the power inverter.

## Section 2: Introduction

### 2-1 Product Introduction

This is a state-of-the-art DC to AC pure sine wave power inverter. With advanced digital signal processing technology, the power inverter has multiple functions such as power turbo mode, power saving mode, adjustable output voltage / frequency, fan speed control... etc.

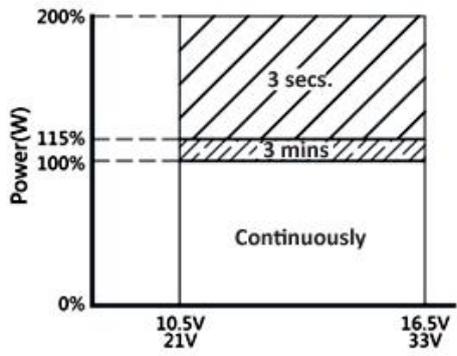
The power inverter has outstanding protection included input DC polarity reversed protection, input DC over/under voltage protection, internal over temperature protection, overload protection and output short circuit protection.

With RS232 communication port, it can be easily to monitor status of the power inverter.

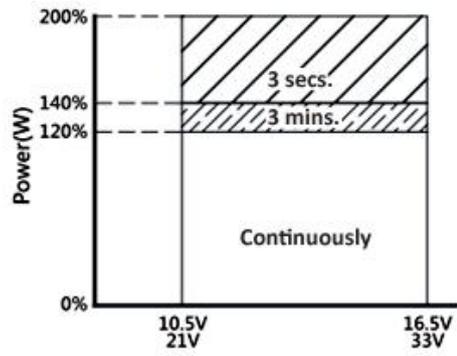
### 2-2 Functions and Features

- DC input polarity reversed protection: no components will be damaged.
- Input DC over/under voltage protection.
- Internal over temperature protection.
- Output overload protection.
- Output short circuit protection.
- Adjustable AC output voltage and frequency.
- Fan speed control.
- ECO mode available: power consumption <1W.
- Turbo mode available: 120% continuous output power when temperature <30 ° c.
- High efficiency: max up to 93%.
- Low THDv: <2.5%.
- With RS232 communication port.
- With dry contact terminal.
- Remote LCD display controller.

### 2-3 Output Power and Input Voltage Curve

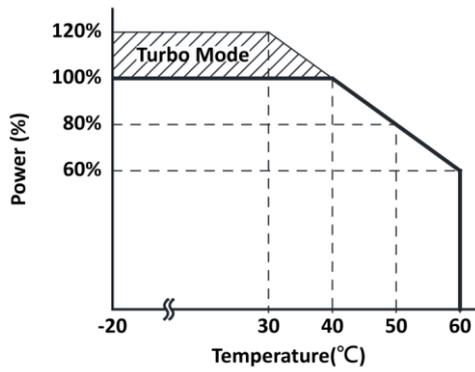


Normal Mode



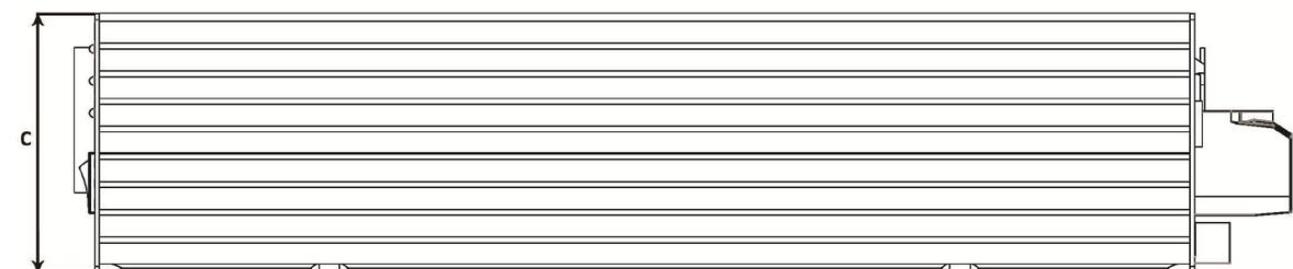
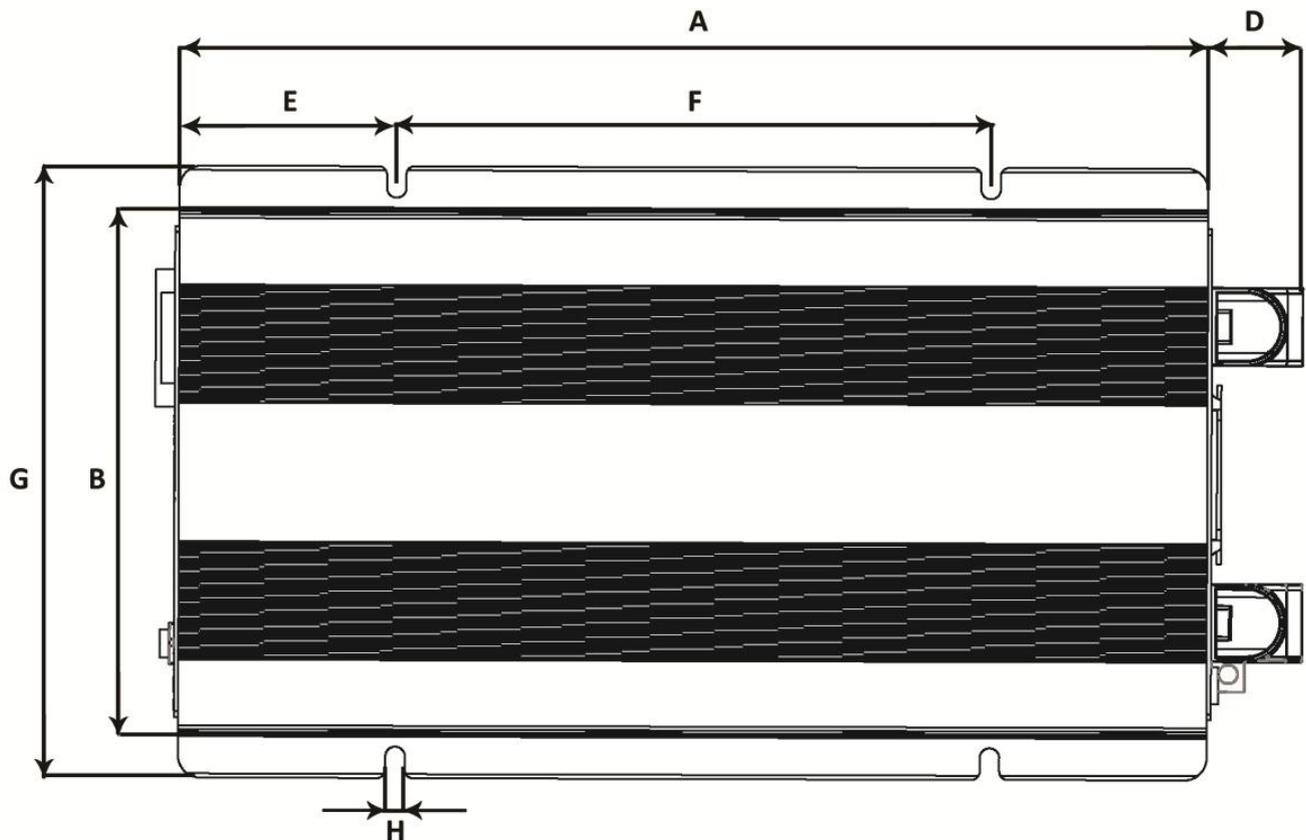
Turbo Mode

### 2-4 Output Power and Temperature Curve



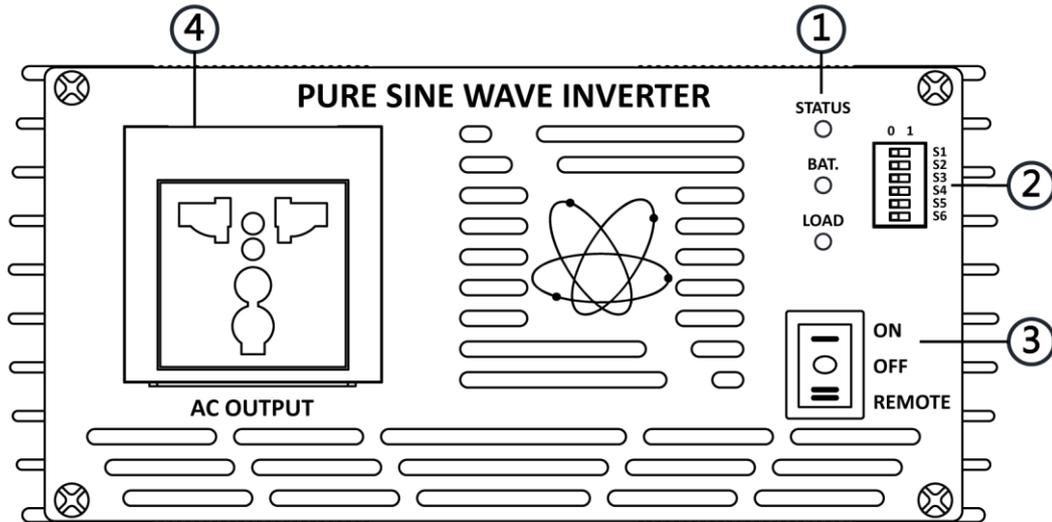
## Section 3: Appearance and Mechanism

### 3-1 Appearance and Dimension



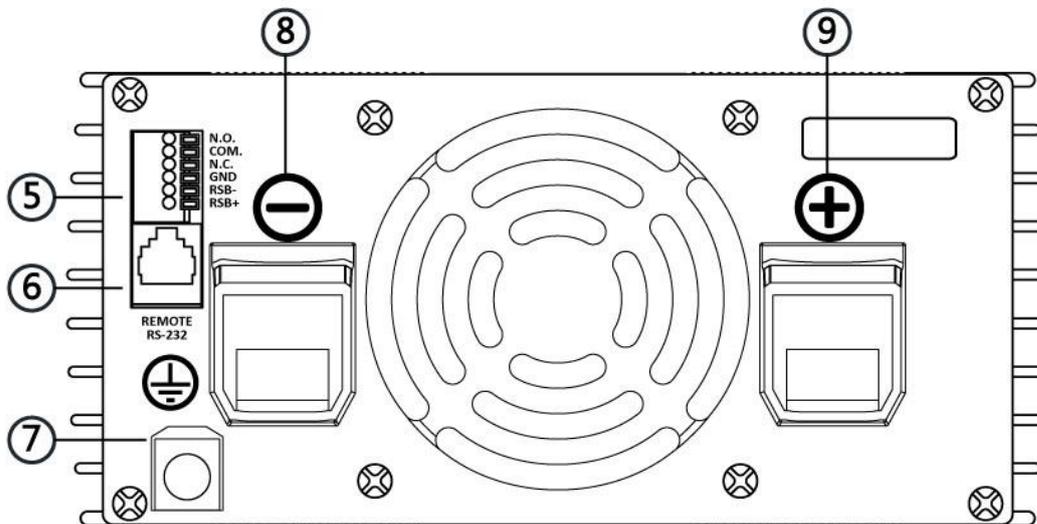
Model	A $\pm$ 1.0	B $\pm$ 1.0	C $\pm$ 0.5	D $\pm$ 0.5	E $\pm$ 0.5	F $\pm$ 0.5	G $\pm$ 1.0	H $\pm$ 1.0
TPS-700	207	192	88.9	33	48.5	110	222	7
TPS-1000	247	192	88.9	33	48.5	150	222	7
TPS-1500	307	192	88.9	33	78.5	150	222	7
TPS-2000	372	192	88.9	33	78.5	215	222	7
TPS-3000	452	192	88.9	33	78.5	295	222	7

### 3-2 Front Panel



No.	Description
1.	LED indicators
2.	DIP switch
3.	Main switch
4.	AC output socket

### 3-3 Rear Panel



No.	Description
5.	Dry contact
6.	Remote port
7.	Ground terminal
8.	Battery - terminal
9.	Battery + terminal

### 3-4 AC Output Socket

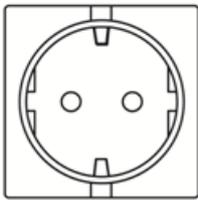
#### 3-4-1 Default Output Socket

##### Universal Type

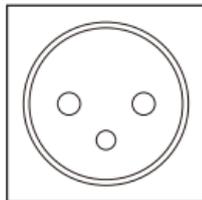


#### 3-4-2 Output Socket for 220VAC System

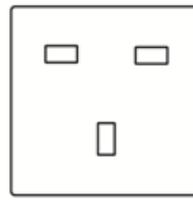
##### EU Type



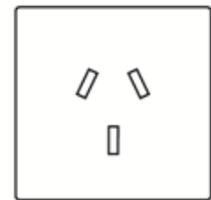
##### French Type



##### UK Type

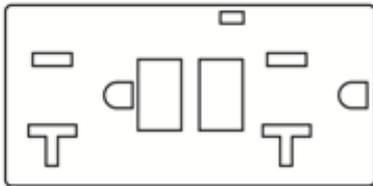


##### Australian Type

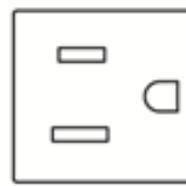
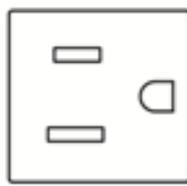


#### 3-4-3 Output Socket for 110VAC System

##### GFCI



##### NEMA 15



##### NEMA 20



## Section 4: Installation and Wiring

### 4-1 Prior to Installation



Only a qualified and trained technician can do the installation. If you want to install by yourself, installation must be under the supervision of qualified and trained technician.



During the transportation, some unpredictable situations might occur. It is recommended that you inspect the power inverter exterior packaging. If you notice any damage, please immediately contact company you purchased this power inverter from.



Make sure the MAIN SWITCH is at OFF position.

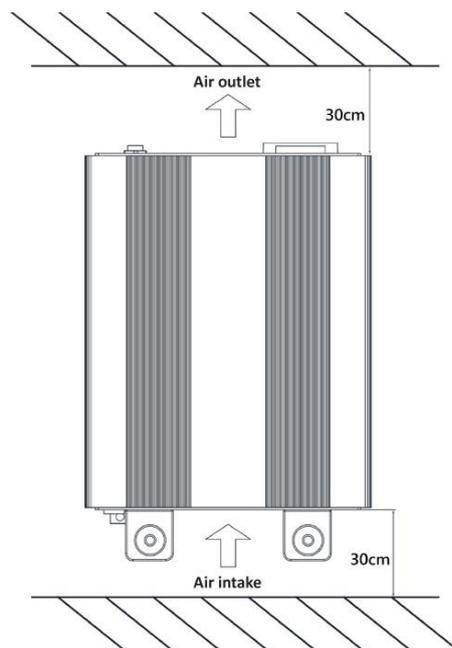
### 4-2 Installation Environment



The power inverter has to be installed in a dry and clean place, not exposed to humidity and heat source.



Make sure that the place is well ventilated. If installed inside a cabinet, ensure proper ventilation. At least keep a free space of 30cm around the power inverter.



Do not install the power inverter in the same cabinet with battery. Gas discharged from the battery will damage the power inverter.



The air intake and the air outlet of the power inverter should not be blocked.



The installation surface must be level and of sufficient strength.

### 4-3 Prior to Wiring



The DC cables should be as short as possible: less than 6 feet / 1.8 meter ideally.



The size of the cable should be thick enough to limit the voltage drop to less than 2% when carrying the maximum input current to prevent frequent low-input voltage alarm and shutdown.



If cables have to be fed through metal walls or other walls with sharp edges, use ducts or wire bushings to prevent damage.



Do not lay the 110VAC / 220VAC cable and the 12VDC / 24VDC cable in the same duct.



Do not lay cables which are loose or bent next to electrically conductive material (metal).

### 4-4 Cable Size and Breaker / Fuse

The following size of cables and breakers / fuses are recommended. Distance: <6 feet / <1.8 meter between the battery and the power inverter.

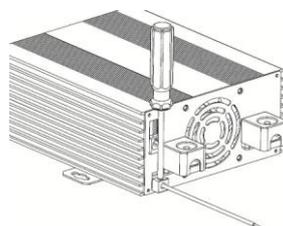
Model	Cable Size	Breaker / Fuse (slow)
TPS-3000-012S1 / S2	# 3/0 AWG	500A
TPS-3000-024S1 / S2	# 1 AWG	250A
TPS-2000-012S1 / S2	# 0 AWG	320A
TPS-2000-024S1 / S2	# 3 AWG	160A
TPS-1500-012S1 / S2	# 1 AWG	250A
TPS-1500-024S1 / S2	# 4 AWG	125A
TPS-1000-012S1 / S2	# 3 AWG	160A
TPS-1000-024S1 / S2	# 6 AWG	80A
TPS-700-012S1 / S2	# 4 AWG	120A
TPS-700-024S1 / S2	# 7 AWG	60A

**\* Note: Batteries are capable of providing very large currents in case of short circuit. The fuse should be as close to the positive battery terminal as possible.**

### 4-5 Wiring

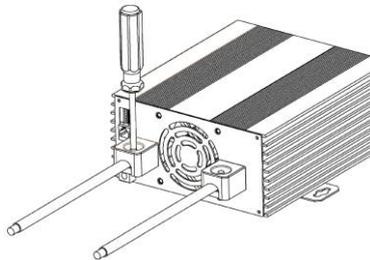
#### 4-5-1 Connecting the Ground

Must be connected to earth ground prior to make any other connections to the equipment. Please use 18 AWG ~ 10 AWG cable for grounding.



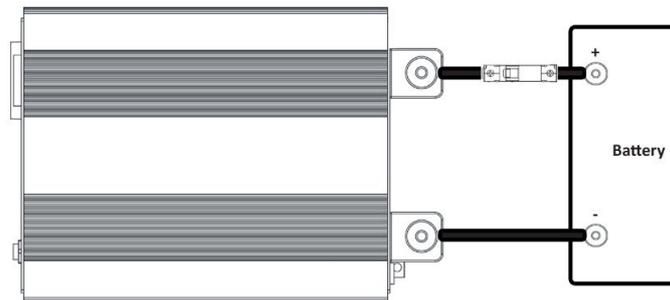
### 4-5-2 Connecting the Battery

Connect DC input terminals to 12VDC / 24VDC battery or other DC power source. **【+】** is positive and **【-】** is negative.



**\* Note:**

- **Use high quality copper wire and keep the cable length short which is a maximum of 3 ~ 6 feet.**
- **Make sure all DC connections are tight (torque to 11 ft-lbs, 15Nm). Loose connections could result in overheating and can be a potential hazard.**
- **The recommended breaker / fuse should be installed as close to the battery positive terminal as possible. Failure to use breaker / fuse between the power inverter and battery may cause damage to cable / power inverter and will void warranty.**



### 4-5-3 Connecting the Loads

Make sure total power consumption of loads do not exceed the rated power of power inverter. If the total power consumption of loads over rated power of power inverter, remove the non-critical loads until the total power consumption is below the rated power of power inverter.

**\* Note: When connecting devices with motor drive such as power drills and refrigerators, please make sure peak power of such devices first. The peak power of such devices will be higher than nominal power rating.**

# Section 5: LED Indicators and Setting

## 5-1 LED Indicators

STATUS



BAT.



LOAD



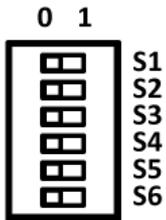
LED Indicators		STATUS	BAT.	LOAD
Green Light				
Light Continuously	————	Normal	Normal	Loads 0% ~ 104%
Flash Slowly	- - -	Standby		ECO Mode
Flash Quickly	• • • • •			Turbo Mode Loads 104% ~ 120%
Orange Light				
Light Continuously	————		Low Voltage	Loads >104%
Flash Quickly	• • • • •		High Voltage Alarm	
Flash Slowly	- - -		Low Voltage Alarm	
Red Light				
Light Continuously	————	VBUS Failure Overload 5 Times		Overload
Flash Quickly	• • • • •	Battery High Voltage Protection		
Flash Slowly	- - -	Battery Low Voltage Protection		
Flash Intermittently	-- --	Over Temperature		

## 5-2 Main Switch



Position	Function
ON	Power ON
OFF	Power OFF
REMOTE	Enable remote ON / OFF

### 5-3 DIP Switch



DIP Switch	Function
S1	Output voltage setting (refer to 5-3-1)
S2	
S3	Output frequency setting (refer to 5-3-2)
S4	ECO mode setting (refer to 5-3-3)
S5	Turbo mode setting (refer to 5-3-4)
S6	DIP switch setting (refer to 5-3-5)

#### 5-3-1 Output Voltage Setting (S1 & S2)

Output Voltage	S1	S2
200VAC	0	0
220VAC	1	0
230VAC	0	1
240VAC	1	1

#### 5-3-2 Output Frequency Setting (S3)

Output Frequency	S3
50HZ	0
60HZ	1

#### 5-3-3 ECO Mode Setting (S4)

ECO Mode	S4
Disable	0
Enable	1

**\* Note: If ECO mode enable, the power inverter will automatically enter power saving mode when loads <5W for 10 seconds. If loads >15W then power inverter will be ON within 10 seconds.**

#### 5-3-4 Turbo Mode Setting (S5)

Turbo Mode	S5
Disable	0
Enable	1

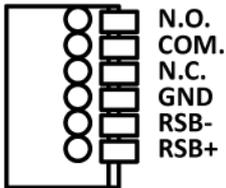
**\* Note: If turbo mode enable, the continuous output power will increase 20% than rated power when internal temperature <30 ° C. If internal temperature >30 ° C and internal heat sink temperature >70 ° C, then turbo mode will stop automatically.**

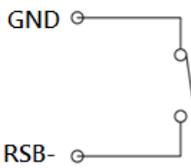
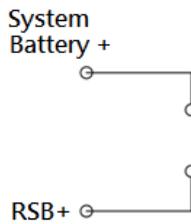
### 5-3-5 DIP Switch Setting (S6)

DIP Switch Setting		S6
Disable		0
Enable		1

**\* Note: If DIP switch setting disable, above setting (S1 / S2 / S3 / S4 / S5) will be ignored.**

### 5-4 DRY Contact



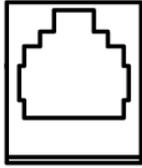
Contact	Function	Wiring	Description
N.O. COM N.C.	Abnormal events such as overload, no output, short circuit	Switch power: 60W Rating: 2A @ 30VDC Wire size: 20~24AWG	Normal: N.O. – COM short Abnormal: N.C. – COM short
GND RSB-	Remote ON / OFF	Put switch between GND and RSB- Wire size: 20~24AWG 	Power ON: short Power OFF: open
RSB+		Put switch between battery+ and RSB+ Wire size: 20~24AWG 	Power ON: short Power OFF: open

**\* Note: The MAIN SWITCH position must at REMOTE position to enable Remote ON / OFF function.**

## Section 6: Remote Port

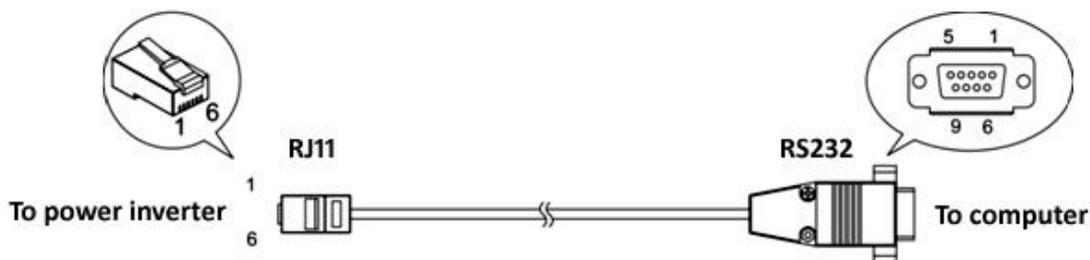
Remote port can monitor and set the power inverter through computer interface.

### 6-1 Communication Cable



REMOTE  
RS-232

Please follow below demonstration to make communication cable.



To Power Inverter		To Computer	
PIN Number	RJ11	RS232 (COM) Port	PIN Number
1		Not used	N/A
2		GND	5
3		RX	2
4		TX	3
5		RMT	N/A
6		VCC	N/A

### 6-2 Configuration and Setting

The power inverter uses high level language commands starts with CR (0DH) and LF (0AH) as the end of the command. The system would interpret and execute the command only after these two characters are received. After the unit executes the command, it would send a response string to the computer. The response string is as follows:

String	Description
= >	Command executed success
? >	Command error, not accepted
! >	Command correct but execution error (e.g. parameters out of range)

**\* Note: If response string is not the same as above string as the end, please check whether communication cable or computer COM port setting is abnormal or not.**

## 6-2-1 Query Command

Command	Description
OUTOFF 0	Power ON
OUTOFF 1	Power OFF
*RST	Reset to default
FINV?	Reply output frequency
PINV?	Reply output power
TSINK?	Reply heat sink temperature
TAMB?	Reply internal temperature
*IDN?	Reply power inverter information
VINV?	Reply output voltage
IINV?	Reply output current
STA1	Reply power inverter power OFF status <i>*see appendix for details</i>
STA2	Reply power inverter alarm status <i>*see appendix for details</i>
VBAT?	Reply battery voltage
DIPSW?	Reply DIP switch status
VER?	Reply program version

## 6-2-2 Setting Command

Command	Description
FUNC0	Battery high voltage protection setting
FUNC1	Battery high voltage restart setting
FUNC2	Battery low voltage protection setting
FUNC3	Battery low voltage restart setting
FUNC4	Output voltage setting
FUNC5	Output frequency setting
FUNC6	RS232 baud rate setting
FUNC7	ECO mode setting
FUNC8	Turbo mode setting

**\* Note: There is a space between FUNC and NUMBER (ASCII code 20H).**

e.g. If you want to set output frequency from 50HZ to 60HZ, please follow below steps:

- FUNC 5 - this command means you want to set output frequency.
- SETT? - this command checks output frequency of current setting, then it will reply as below:  
50  
=>
- SETT 60 - this command sets output frequency from 50HZ to 60HZ, then it will reply as below:  
=>

### 6-2-3 Setting Range and Default Value

#### 6-2-3-1 Battery High Voltage Protection (FUNC0)

Model	Default	Setting Range
12VDC	16.5VDC	15VDC ~ 16.5VDC
24VDC	33VDC	30VDC ~ 33VDC

#### 6-2-3-2 Battery High Voltage Restart (FUNC1)

Model	Default	Setting Range
12VDC	14VDC	13.5VDC ~ 14.5VDC
24VDC	28VDC	27VDC ~ 29VDC

#### 6-2-3-3 Battery Low Voltage Protection (FUNC2)

Model	Default	Setting Range
12VDC	10.5VDC	10.5VDC ~ 12.5VDC
24VDC	21VDC	21VDC ~ 25VDC

#### 6-2-3-4 Battery Low Voltage Restart (FUNC3)

Model	Default	Setting Range
12VDC	13.5VDC	11.5VDC ~ 13.5VDC
24VDC	27VDC	23VDC ~ 27VDC

#### 6-2-3-5 Output Voltage (FUNC4)

Model	Default	Setting Range
120VAC	110VAC	97VAC ~ 123VAC
230VAC	230VAC	194VAC ~ 246VAC

#### 6-2-3-6 Output Frequency (FUNC5)

Model	Default	Setting Range
120VAC	60Hz	50Hz or 60Hz
230VAC	50Hz	50Hz or 60Hz

#### 6-2-3-7 RS232 Baud Rate (FUNC6)

Model	Default	Setting Value
All	9600	0 = 1200
		1 = 2400
		2 = 4800
		3 = 9600
		4 = 19200

### 6-2-3-8 ECO Mode (FUNC7)

Model	Default	Setting Value
All	0	0 = disable 1 = enable

### 6-2-3-9 Turbo Mode (FUNC8)

Model	Default	Setting Value
All	0	0 = disable 1 = enable

## Section 7: Troubleshooting

Please see below for troubleshooting:

LED Indicator	Possible Cause	Solution
STATUS flash Intermittently (red)	Over temperature	<ol style="list-style-type: none"><li>1. Reduce some loads</li><li>2. Check if fan runs normally</li><li>3. Choose a well-ventilated area</li></ol>
BAT. flash quickly (red)	Battery voltage too high	<ol style="list-style-type: none"><li>1. Check battery voltage</li><li>2. Reduce series connection quantity of battery</li></ol>
BAT. flash slowly (red)	Battery voltage too low	<ol style="list-style-type: none"><li>1. Check battery voltage</li><li>2. Check battery wiring length and cable size</li><li>3. Charge battery</li></ol>
LOAD light continuously (red)	Overload	<ol style="list-style-type: none"><li>1. Remove loads</li><li>2. Check loads whether short circuit or not</li></ol>

## **Section 8: Maintenance**

Make sure that the fan vents are not blocked.

Use a vacuum cleaner to remove any dust from the fan area. When cleaning the case or front panel, use a soft and dry cloth only. If the case or front panel is very dirty, use a neutral, non-abrasive detergent. Do not use alcohol or ammonia based solutions.

Regular service and relocation of the power inverter should be performed by a qualified service technician. Avoid spilling liquid on the power inverter.

## Section 9: Specification

Model	TPS70-12 TPS70-24	TPS100-12 TPS100-24	TPS150-12 TPS150-24	TPS200-12 TPS200-24	TPS-300-12 TPS-300-24
Capacity	700W	1000W	1500W	2000W	3000W
Output Power					
Continuous	700W	1000W	1500W	2000W	3000W
Surge	1400W	2000W	3000W	4000W	6000W
Turbo Mode	840W	1200W	1800W	2400W	3600W
Output Voltage	100VAC / 110VAC / 115VAC / 120VAC (Dip Switch Selectable) 200VAC / 220VAC / 230VAC / 240VAC (Dip Switch Selectable)				
Output Frequency	50Hz / 60Hz (Dip Switch Selectable)				
Wave Form	Pure Sine Wave				
THDv	<2.5%				
Input Voltage Range	10.5VDC ~ 16.5VDC 21.0VDC ~ 33.0VDC				
12VDC					
24VDC					
Max Efficiency	92% 93%				
12VDC					
24VDC					
No Load Power Consumption					
12VDC	< 1.2A	< 1.2A	< 1.2A	< 1.2A	< 1.2A
24VDC	< 0.6A	< 0.6A	< 0.6A	< 0.6A	< 0.6A
ECO Mode	< 1W	< 1W	< 1W	< 1W	< 1W
Low Battery Alarm	11.0VDC 22.0VDC				
12VDC					
24VDC					
High Battery Alarm	16.0VDC 32.0VDC				
12VDC					
24VDC					
Protection	DC Input Polarity Reversed / DC Under Voltage / DC Over Voltage / Output Short Circuit / Overload / Over Temperature				
Environment	-20 ° C ~ 60 ° C (De-rating Begin 40 ° C ~ 60 ° C) -30 ° C ~ 70 ° C 95%, non-condensing				
Operating Temperature					
Storage Temperature					
Humidity					
Dimension (W * H * D) mm	192*88.9*237	192*88.9*280	192*88.9*335	192*88.9*407	192*88.9*480
Weight (kgs)	2.6	3.5	4.5	5.8	6.5
Remote Control (Option)	Yes				
GFCI (Option)	Yes				
Safety & EMC	Meet UL458 (110VAC System)* / Meet EN62368 (220VAC System) Meet FCC (110VAC System) / Meet CE (220VAC System) Meet CISPR 25; ISO 7637-2 (220VAC System)				
Safety Standards					
EMC Standards					
E-mark					

\*GFCI receptacles

## **Section 10: Warranty**

We guarantee this power inverter against defects in materials and workmanship for a period of 24 months from the date of purchase. In case you need to repair or replace any defective power inverter, please contact LONG TIME local distributor.

This warranty will be considered void if the power inverter has been misused, altered, or accidentally damaged. LONG TIME is not liable for anything that occurs as a result of the user's fault.

## Appendix – Query Command Response

“STA1?” + 0x0d + 0x0a

<ECHO> + 0x0d + 0x0a

Description		Status Definition	
BIT0	Battery Low Voltage Protection	0: Normal	1: Power Off
BIT1	Battery High Voltage Protection	0: Normal	1: Power Off
BIT2	Overload Protection	0: Normal	1: Power Off
BIT3	Heat Sink Over Temperature Protection	0: Normal	1: Power Off
BIT4	VBUS High Voltage Protection	0: Normal	1: Power Off
BIT5	Software Shutdown	0: Normal	1: Power Off
BIT6	Power Inverter Failure	0: Normal	1: Power Off
BIT7	EEPROM Abnormal	0: Normal	1: Power Off

e.g. response 1 (0b00000001) means battery low voltage protection.

“STA2?” + 0x0d + 0x0a

<ECHO> + 0x0d + 0x0a

Description		Status Definition	
BIT0	Battery Low Voltage Alarm	0: Normal	1: Alarm
BIT1	Battery High Voltage Alarm	0: Normal	1: Alarm
BIT2	Overload Alarm	0: Normal	1: Alarm
BIT3	ECO Mode	0: Normal	1: ECO Mode
BIT4	Power OFF Protection	0: Normal	1: Power Off

e.g. response 8 (0b00001000) means ECO mode.