

## DC to AC Inverter



### **Safety Instructions**

#### General Safety Precautions

Warning! Before using the Inverter, read and file the safety instructions.

- ⚠ Do not expose the 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 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.
- ⚠ This equipment 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 includes 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 inverter may require user installed breaker or fuse. In AC output hardwire application, AC socket will not be provided. The inverter incorporates standard AC short circuit protection.
- ⚠ The following precautions should be taken when working on the inverter:
  - Step 1      Remove watches, rings, or other metal objects
  - Step 2      Use tools with insulated handles
  - Step 3      Wear rubber gloves and boots



## Other Safety Notes

- ⦿ Upon receipt, examine the carton box for damage. Notify the carrier immediately, before opening if damage is evident.
- ⦿ Do not operate near water or in excessive humidity.
- ⦿ Do not open or disassemble the inverter, and warranty may be voided.
- ⦿ The DC side connections should be firm and tight.
- ⦿ Grounding: 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 inverter in a well-ventilated area. Do not block the front air vents, or the rear air exhausts of the unit.
- ⦿ Wiring: Adequate input power must be supplied to the inverter for proper use; correct wiring sizes must be ensured.
- ⦿ Mount the inverter such that the fan axis is horizontal.
- ⦿ Do not operate the inverter close to combustible gas or open fire.
- ⦿ Do not operate appliances that may feed power back into the inverter.
- ⦿ Temperature: The inverter should be operated in an ambient temperature range of -20°C to +40°C otherwise the output efficiency may be affected. Air flow to the inverter must not be blocked.

## Installation and Maintenance

### AC Output Side (Front Panel) Introduction

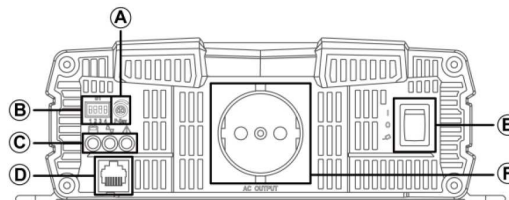


Figure 1. PVIPS8-24-2000 output panel view

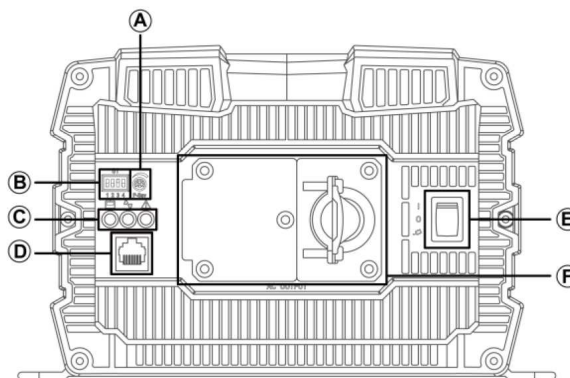


Figure 2. PVIPS8-24-3000/4000 output panel view



MODEL	PVIPS8-24-2000	PVIPS8-24-3000	PVIPS8-24-4000
<b>A</b>	Saving power adjustment		
<b>B</b>	Function switch		
<b>C</b>	Function LED		
<b>D</b>	TRC port (RJ45)		
<b>E</b>	Main switch		
<b>F</b>	AC output socket	AC output terminal	

Table 1. PVIPS8-24 series AC output side introduction

### Main Switch

The 3-stage rocker switch „E” is for turning on, turning off and remote mode.

### LED Indicator

Input voltage level: to display Input Voltages

LED status „C”	DC 24V
Red	<22.0V
Orange	22.0 ~ 23.0V
Green	23.0 ~ 30.0V
Orange	30.0 ~ 31.0V
Red	>31.0V

Table 2. Input Voltage Level LED Indicator

### Output Load Level to display AC Loads (PF=1)

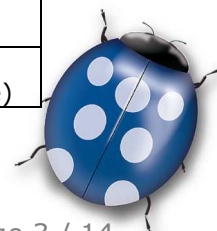
LED status „C”	Green	Orange	Red
PVIPS8-24-2000	0 ~ 2000VA	2000 ~ 2300VA	>2300VA
PVIPS8-24-3000	0 ~ 3000VA	3000 ~ 3450VA	>3450VA
PVIPS8-24-4000	0 ~ 4000VA	4000 ~ 4600VA	>4600VA

Table 3. Output Load Level LED Indicator

### Inverter Status to display Fault condition

LED status „C”	Status	Recovery point
Red	OCP/OLP (AC output short and over load)	
Red Blink	UVP (Input DC voltage under spec)	25V @ DC24V system
Red Fast Blink	OVP (Input DC voltage over spec)	29V @ DC24V system
Orange	Device startup process abnormal	-
Orange Fast Blink	UTP (Heat sink temp. under -20°C)	<0°C
Orange Slow Blink	OTP (Heat sink temp. over +80°C)	60°C (heat sink temperature)

Table 4. Inverter LED Status Indicator



## Function Switch Introduction

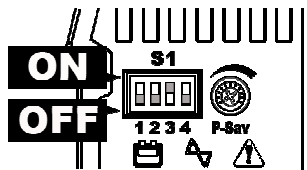


Figure 3. DIP switch ON/OFF position

## Function Switch Definition

DIP Switch „B“	Function
S1	Voltage select
S2	Voltage select
S3	Frequency select
S4	Power saving ON/OFF

Table 5. Function Switch Definition

## Output voltage selection (S1&S2)

Output voltage	S1	S2
100V/200V	OFF	OFF
110V/220V	ON	OFF
115V/230V	OFF	ON
120V/240V	ON	ON

Table 6. Function Switch definition: Output voltage selection

## Output Frequency selection (S3)

Frequency	S3
50Hz	OFF
60Hz	ON

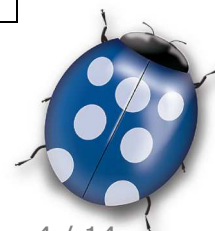
Table 7. Function Switch definition: Output Frequency selection

## Power Saving Load Adjustment

User can use variable resistor (VR) to set the input and wake up power saving threshold according to the load condition, and the setting range shows below:

„A“	Input Saving Power (Min.)	Saving Wake up Power (Min.)
PVIPS8-24-2000	<20VA	>40VA
PVIPS8-24-3000	<40VA	>60VA
PVIPS8-24-4000	<40VA	>60VA

Table 8. Power saving setting range (min)



	Input Saving Power (Max.)	Saving Wake up Power (Max.)
PVIPS8-24-2000	<110VA	>160VA
PVIPS8-24-3000	<240VA	>280VA
PVIPS8-24-4000	<240VA	>280VA

Table 9. Power saving setting range (max)

## TRC Port

PIN Number	Signal Description „D“	
1	Reserved	--
2	PH-L	Zero-Crossing Signal
3	PH-N	Zero-Crossing Signal
4	Bypass	Transfer Relay Driver Signal
5	12V	Internal power for TR40 controller
6	5V	Internal power for TR40 controller
7	GND	The same polarity and the negative battery
8	Reserved	--

Table 10. TRC Port: RJ45

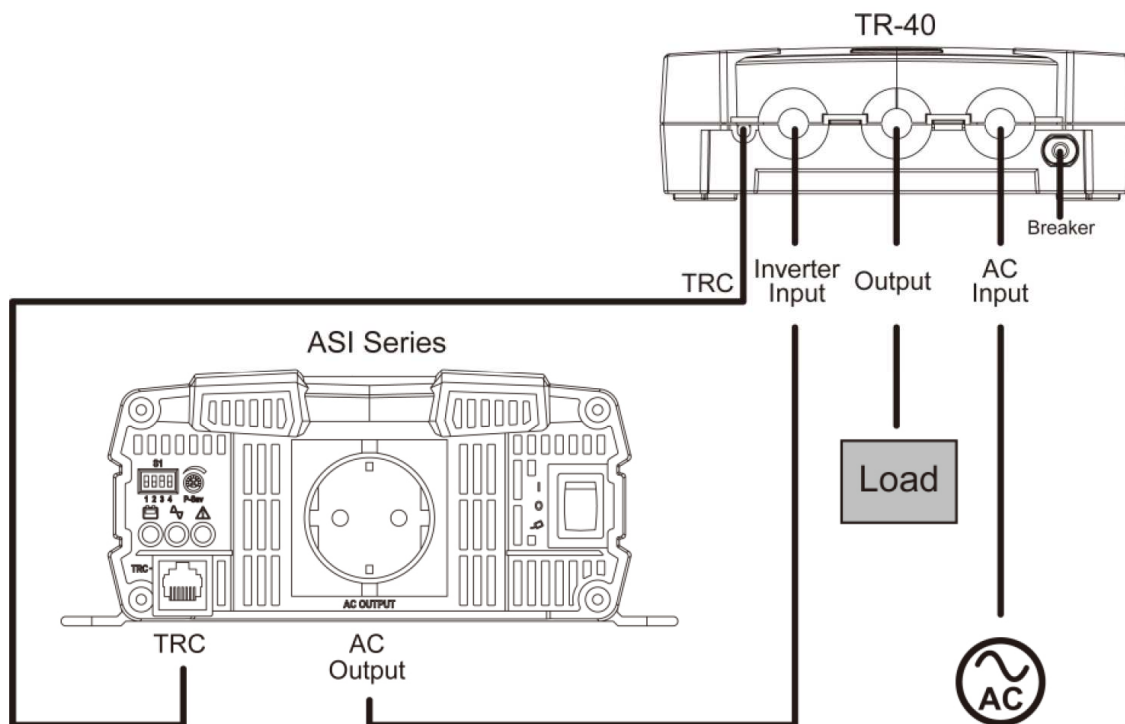


Figure 4. Wiring between PVIPS8-24 and TR-40



PVIPS8-24-3000/4000 AC output interface

Terminal „F“		Wire color	Wire lenght/gauge
AC terminal	Line (L)	Black	Within 16 feet/AWG# 200-240VAC> AWG12
	Neutral (N)	White	
FG (Ground)		Green/Yellow or Bare cooper	26~32feet/AWG#10~12

Table 11. PVIPS8-24-3000/4000 series AC output wiring

**DC Input Side (Rear Panel) Introduction**

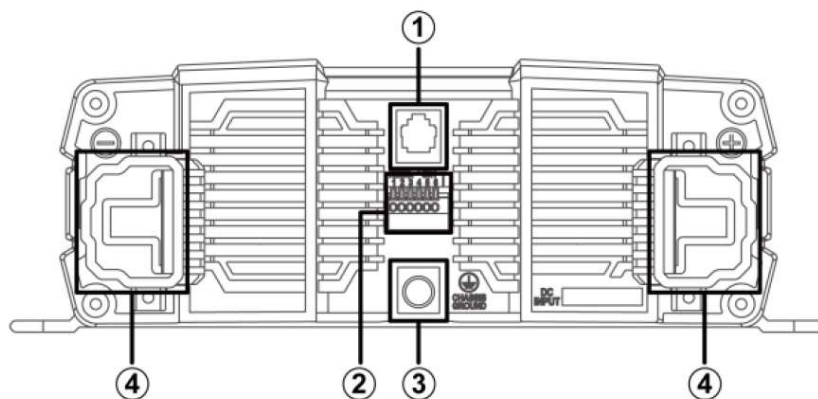


Figure 5. PVIPS8-24-2000

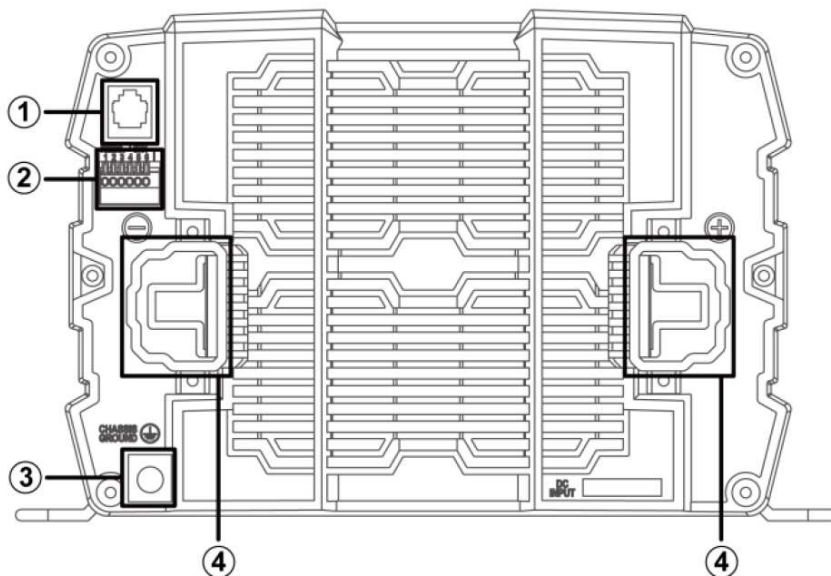


Figure 6. PVIPS8-24-3000/4000



MODEL	PVIPS8-24-2000	PVIPS8-24-3000	PVIPS8-24-4000
„1“	Remote port (RJ11)		
„2“	Remote control green terminal		
„3“	Chassis ground		
„4“	DC input connector		

Table 12. Series DC input side introduction

## Remote Port (RJ11)

The PVIPS8-24 Series Inverter can be compatible with CR-8 remote control via RS232 Communication.

Before using the remote control, make sure the main switch on inverter must be at „REMOTE“ position.

PIN Number	Signal Description „1“	
„1“	Reserved	--
„2“	GND	The same polarity as the battery negative side
„3“	RXD	RS232 RXD
„4“	TXD	RS232 TXD
„5“	RMT	Remote controller panel (positive)
„6“	VCC	Internal power for remote controller

Table 13. PVIPS8-24 Series Remote Port: RJ11

## Remote Control Green Terminal

Remote control green terminal „2“ may be connected to a Form C relay for „FAULT“ indication. When „FAULT“ occurs, the relay switches.

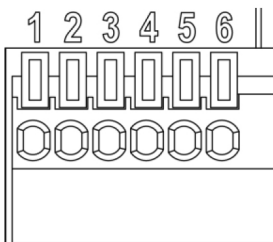


Figure 7. Remote Control terminal

ITEM	DESCRIPTION	ITEM	DESCRIPTION
„1“	Dry contact (Normal Open)	4	Enable+ (ENB)
„2“	Common	5	Enable- (ENB)
„3“	Dry contact (Normal Closed)	6	Ground

Table 14. Dry contact terminal definition





**Caution !** Please follow the following steps for the installation

- Before installing the inverter, ensure the main switch is at „OFF“
- Before using the remote function, ensure main switch pressed toward „REMOTE“
- Ensure that the remote contact are OFF
- Use 20~24 #AWG wire to connect the remote control terminals

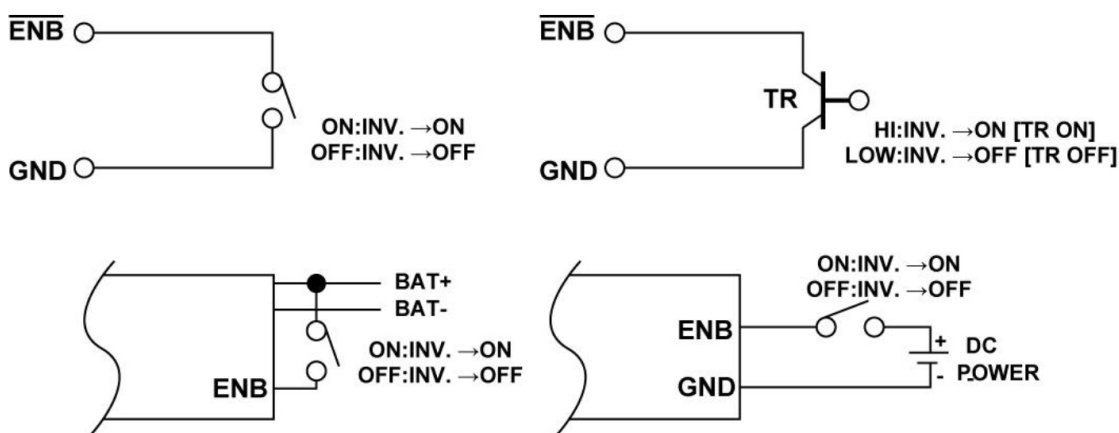


Figure 8. Wiring for control

## **General instruction before DC Input**

Before installation:

- The DC cables should be as short as possible (less than 1.8meters 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 warnings, and shutdown.
- UVP (under Voltage Protection) warning may result if there is excessive Voltage drop across the DC cables between the batteries and the inverter. Increasing your DC cable size will help improving the situation
- Batteries are capable of providing very large currents in case of short circuit. In case there is a short circuit in the cable run between the batteries and the input terminals of the inverter, it will result in overheating/melting of the cables and consequent risk of fire and injury. To prevent possibility of this hazard, use Very Fast Acting DC fuse in line with the positive cable. The fuse should be as close to the positive battery terminal as possible. Use Bussmann ANN series fuses (will also require Fuse Block 4164) or equivalent.





- The following sizes of cables and fuses are recommended for up to 6ft. Distance between the batteries and the inverter.

MODEL	Wire AWG	Inline fuse
PVIPS8-24-2000	#2	≥225A
PVIPS8-24-3000	#1/0	≥350A
PVIPS8-24-4000	#2/0	≥500A

Table 15. PVIPS8-24 Series Wiring Cable diameter and Inline Fuse

## Connection the DC cable

Connect DC input terminals to 24V battery or other DC power source [ + ] is positive, [ - ] is negative. Reverse polarity connection can blow the internal fuse and may damage the inverter permanently.



Figure 9. DC cable connection



**Warning!** Make sure that all the DC connections are tight (torque to 11.7~13Nm). Loose connections could result in overheating and can be a potential hazard.



**Warning !** The recommended inline fuse should be installed as close to the battery positive terminal as possible failure to use a fuse on the „+“ cable running between the inverter and battery may cause damage to the cable / inverter and will void warranty.



Also, only use high quality cooper wire and keep the cable lenght short which is a maximum of 3-6 feet.

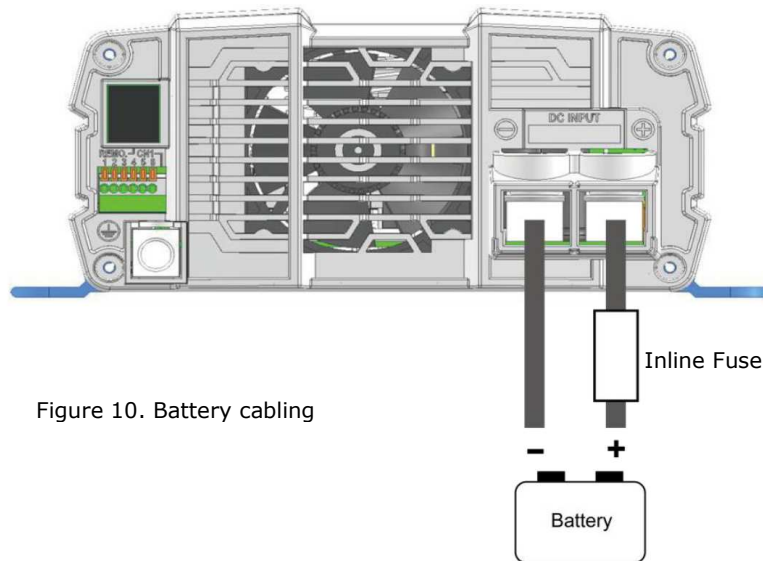


Figure 10. Battery cabling

## Chassis Ground

Must be connected to earth ground prior to making any other connections to the equipment.

## **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, 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.

A qualified service technician should perform regular service, and relocation of the inverter. Avoid spiling liquid on the inverter.

## **Operation**

### Chassis Ground

Before making the DC input side connections „4“, the main switch „E“ must be at „OFF“.

### Connecting the loads

Calculate the total power consumption of the output load. Make sure that the total power consumption does not exceed the rated power.



If the total power consumption over the rated power of the inverter, remove the non-critical: loads until the total power consumption is below the rated power.

## Switch ON Inverter

Set the power switch to the „ON“ position „E“. The inverter will carry out self-diagnosis and, the LED's will also appear various colors. Set the power switch to the „OFF“ position „E“. The inverter stops and all the lights that are on will go off.

## Protection Mechanism

MODEL	Over Voltage (DC)		Under Voltage Alarm	Under Voltage	
	Shutdown	Restart		Shutdown	Restart
24V	33V ± 0.5V	29V ± 0.5V	22V ± 0.3V	21V ± 0.5V	25V ± 0.5V

Table 16. Protection Mechanism

MODEL	Over temperature protection	
	Shutdown	Restart
24V	80	80

Table 17. Over Temperature Protection Mechanism

## RS232 Communication and Operation

### Switch ON Inverter

RS232 Port: Serial port monitoring and control through computer interface.

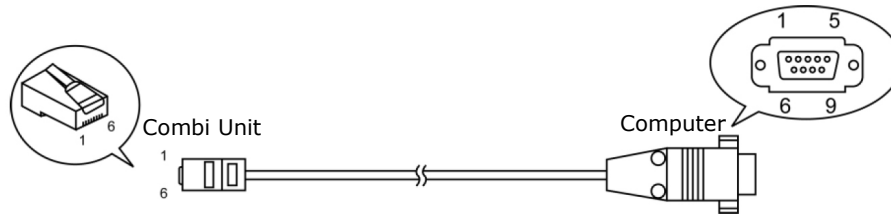


Figure 11. RS232 Cable

PVIPS8-24 Series		Computer	
PIN Number	Description	PIN Number	Description
1	Not used	Not used	1
2	GND	RXD	2
3	RXD	TXD	3
4	TXD	Not used	4
5	Remo control	GND	5
6	VCC	Not used	6
		Not used	7
		Not used	8
		Not used	9

Table 18. RS232 interface definition



## **RS232 Port Operating**

The following steps show the connection among inverter and computer.

- STEP 1 Connect the RS232 port to the PVIPS8-24 series unit on the front panel
- STEP 2 Run the computer communication program
- STEP 3 Set the transmission protocol  
Byte structure: START-BIP-8BIT DATA-STOP BIT  
Baud rate: 4800
- STEP 4 Select the COM port and start operation

## **Example of RS232 Port Operating**

### RS232 command format

This unit uses high-level language commands starts with CR(0DH) and (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:

- => CR LF: Command executed successfully
- ?> CR LF: Command error, not accepted
- !> CR LF: Command correct but execution error (e.g.parameters out of range)

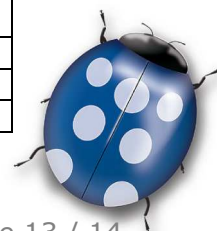
### Command format

The following table shows the useful command to operate PVIPS8-24 series.



Function	Command & description																								
Turn ON/OFF PVIPS8-24 series	Format: Power <value> <value> can be one of the following "0": Power OFF "1": Power ON																								
Query the PVIPS-24 series output frequency	Format: FRQ?																								
Query the PVIPS-24 series output voltage	Format: VINV?																								
Query the PVIPS-24 series output current	Format: IINV?																								
Query the PVIPS8-24 series status	Format: ERR? (PVIPS8-24-2000)																								
	<table border="1"> <thead> <tr> <th>Bit</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>BIT0</td> <td>0: No OLPL Protection 1: OLPL Protection</td> </tr> <tr> <td>BIT1</td> <td>0: No Sof Fail Protection 1: Sof Fail Protection</td> </tr> <tr> <td>BIT2</td> <td>0: No Poff Protection 1: Poff Protection</td> </tr> <tr> <td>BIT3</td> <td>0: No UVP Protection 1: UVP Protection</td> </tr> <tr> <td>BIT4</td> <td>0: No OVP Protection 1: OVP Protection</td> </tr> <tr> <td>BIT5</td> <td>0: No OLPM Protection 1: OLPM Protection</td> </tr> <tr> <td>BIT6</td> <td>0: No OLPH Protection 1: OLPH Protection</td> </tr> <tr> <td>BIT7</td> <td>0: No OTP Protection 1: OTP Protection</td> </tr> <tr> <td>BIT8</td> <td>0: No UTP Protection 1: UTP Protection</td> </tr> <tr> <td>BIT9</td> <td>0: No OOC Protection 1: OOC Protection</td> </tr> </tbody> </table>	Bit	Description	BIT0	0: No OLPL Protection 1: OLPL Protection	BIT1	0: No Sof Fail Protection 1: Sof Fail Protection	BIT2	0: No Poff Protection 1: Poff Protection	BIT3	0: No UVP Protection 1: UVP Protection	BIT4	0: No OVP Protection 1: OVP Protection	BIT5	0: No OLPM Protection 1: OLPM Protection	BIT6	0: No OLPH Protection 1: OLPH Protection	BIT7	0: No OTP Protection 1: OTP Protection	BIT8	0: No UTP Protection 1: UTP Protection	BIT9	0: No OOC Protection 1: OOC Protection		
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Query the PVIPS8-24 series status	Format: ERR? (PVIPS8-24-3000/4000)																								
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Query the PVIPS8-24 series DC input voltage of the battery	Format: VBAT?																								
Query the PVIPS8-24 series output power	Format: PINV?																								
Reset default	Format: *RST?																								
Select the Setup Menus with the help of Function Codes	Format: FUNC <Function Code>																								
	<table border="1"> <thead> <tr> <th>Function code</th> <th>Setting Menu</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>OVP setting</td> </tr> <tr> <td>1</td> <td>OVP Recovery</td> </tr> <tr> <td>2</td> <td>UVP Setting</td> </tr> <tr> <td>3</td> <td>UVP Recovery</td> </tr> <tr> <td>4</td> <td>UV Alarm</td> </tr> <tr> <td>5</td> <td>RS232 Baud-rate</td> </tr> </tbody> </table>	Function code	Setting Menu	0	OVP setting	1	OVP Recovery	2	UVP Setting	3	UVP Recovery	4	UV Alarm	5	RS232 Baud-rate										
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Query the functions No	Format: FUNC?																								
Query the setting value of the function	Format: SETT?																								
Set or adjust the value of the function	Format: SETT <value>																								

Table 19. RS232 interface command



The following data shows the function code detail setting value.

#### FUN 0: OVP Setting

SETT <value>	Default
300 ~ 330@100=1V	33.0V <330>

Table 20. OVP setting

#### FUN 1: OVP Recovery

SETT <value>	Default
270 ~ 290@100=1V	29.0V <290>

Table 21. OVP recovery

#### UVP Recovery

SETT <value>	Default
250 ~ 270@100=1V	25.0V <250>

Table 22. UVP recovery

#### FUN 4: UV Alarm

SETT <value>	Default
210 ~ 230@100=1V	21.0V <210>

Table 23. UV Alarm

#### FUN 5: RS232 Baud Rate

SETT <value>	Default	Model
2	3	-2000
3		-3000
4		-4000

Table 24. RS232 Baud Rate

#### FUN 6: Retry time

SETT <value>	Default
0	3
1	
2	
3	
4	

Table 25. Retry time



**Warning !** Do not open or disassemble the PVIPS8-24 series Inverter. Attempting to service the unit may cause risk of electrical shock or fire.

