CA10289

Pure Sine Wave Inverter System

YOHAKO

USER MANUAL

JAPAN TECHNOLOGY

TABLE OF CONTENT

1. SAFETY INSTRUCTIONS

SAFETY INSTRUCTIONS

1.1 General

Please familiarize yourself with the safety features and instructions by first reading the documentation supplied with this product before using the equipment.This product has been designed and tested in accordance with international standards.The equipment must be used exclusively for the purpose for which it was designed.

The product is used in conjunction with a permanent energy source (battery).Input and/or output terminals may still be dangerously energized,even when the equipment is switched off.Always switch off the AC supply and the battery before carrying out maintenance or servicing the product.

The product has no internal user-serviceable components.Do not remove the front plate or operate the product if any panels have been removed.Only Qualified personnel must undertake all servicing.

Never use the product in around where there is a risk of gas or dust explosions.(before using) Consult the battery manufacture's to confirm the products if can be used with the battery.Always comply with the battery manufacturer's safety instructions.

1.2 Installation

Read the installation instructions in the installation manual before installing the equipment.

This is a Safety Class I product (supplied with a protective grounding terminal).Uninterruptible protective grounding must be provided at the AC input and/or output terminals.Alternatively the grounding point

located externally on the product may be used.Whenever it is likely that the grounding protection has been damaged,the product must be turned off and secured against unintended operation.

Ensure that the DC and AC input cables are fused and fitted with circuit breakers.Never replace a safety component with a different type. Always consult the manual to determine the correct component.

Before applying power,ensure that the available power source matches the required specification of the product as described in the manual.

Ensure that the equipment is used under the correct ambient conditions.Never operate the product in a wet or dusty environment. Ensure there is adequate free space for ventilation around the product and check that the ventilation vents are not blocked.

Ensure that the required system voltage does not exceed the product's capacity.

1.3 Transport and Storage

Ensure that the mains power and battery leads have been disconnected before storing or transporting the product.

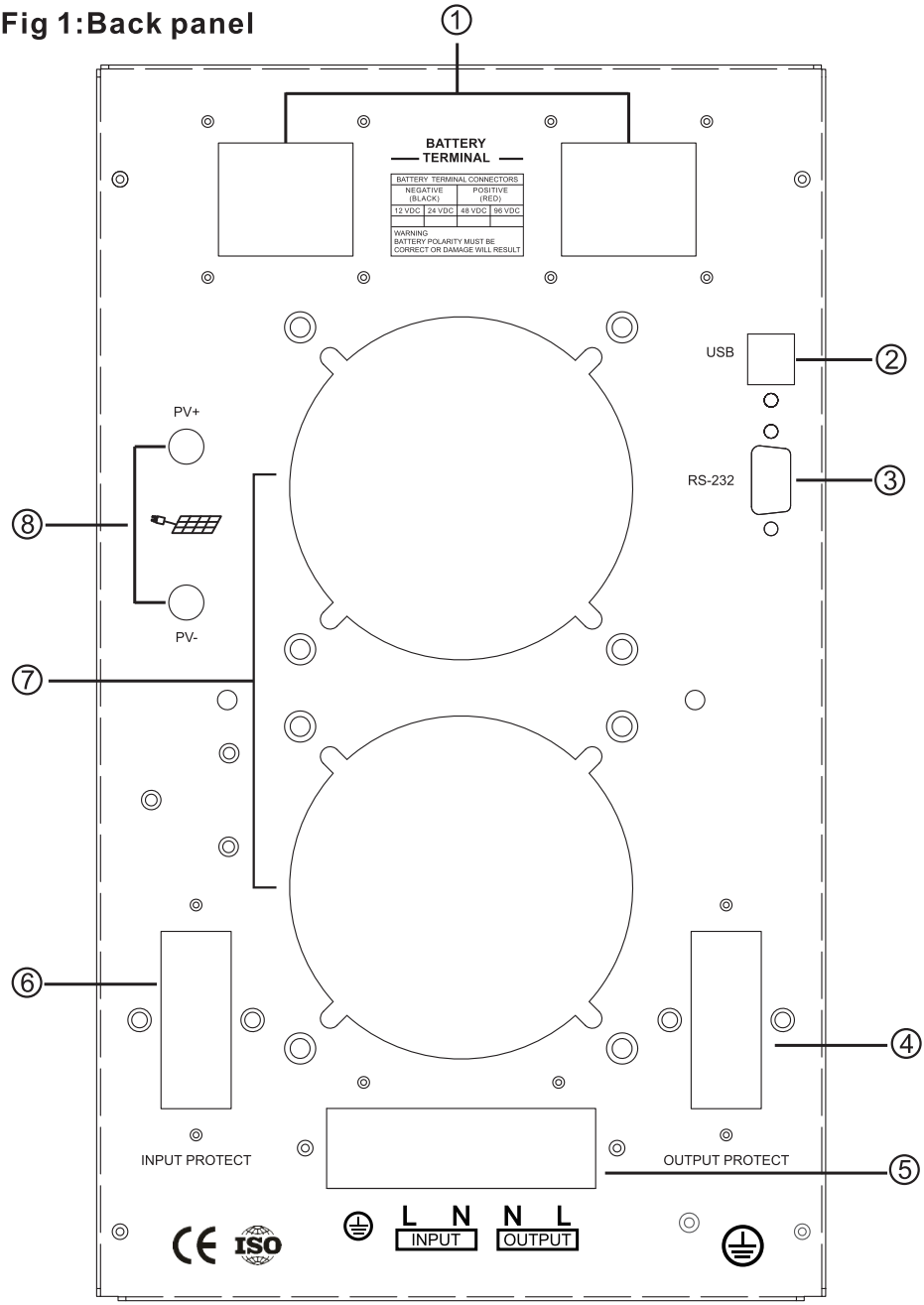
No liability can be accepted for any transport damage if the equipment is shipped in non-original packaging.

Store the product in a dry environment;the storage temperature must be between-20℃ and 60℃.

Consult the battery manufacturer's manual in respect of transport, storage,charging,recharging and disposal of the battery.

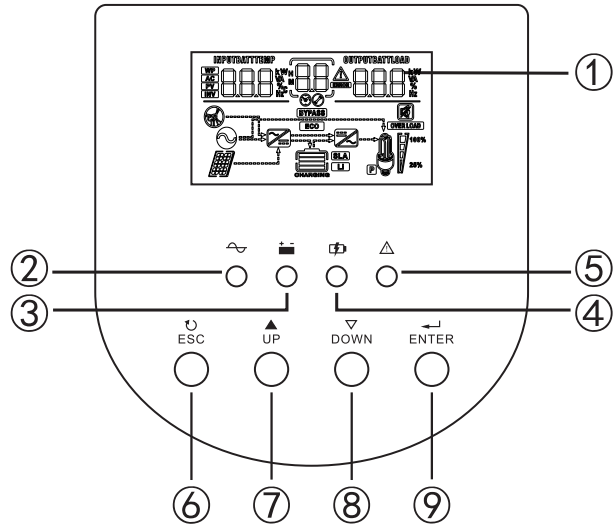
2. DESCRIPTION

Fig 1:Back panel

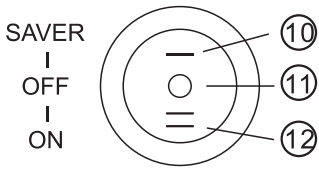


1. Battery Terminal
2. USB
3. RS232 Communication Inferface
4. Output circuit breaker
5. AC connector
6. Input circuit breaker
7. Fan
8. Solar Panel Input

Fig 2:LCD Screen



1..... Indicator Screen
2..... AC In LED
3..... Inverter LED
4..... Charge LED
5..... Alarm LED
6..... Escape Key
7..... Page UP Key
8..... Page Down Key
9..... Confirm Key



10.....Power Button SAVER Model
11.....Power Button OFF Model
12.....Power Button ON Model

3. Display And Settings

3.1 Error Code

Error Code shows after Inverter power off

Error Events	Error Code
Over Load	102,103
Short circuit or Wrong phase setting	105
Over heat	106
Battery Low	134
Battery voltage too high	135

3.2 Normal Mode

There are 4 pages on Normal Mode,change the page by pressing the UP/DOWN button:

P1:Shows Input voltage, Input frequency, Output voltage and Output frequency;
P2:Shows Battery voltage and Charging current from NEPA;
P3:Shows the working mode(UTI[Mains Priority]/SBU[Solar Priority]);
P4:Shows the Solar charging voltage and Solar charging current;
P5:Shows the version number of control board software.

In the normal mode on the P1 page, the left digital tubes display the input voltage and frequency, the right digital tubes display the output voltage and frequency. Every 10s is a display period. Under normal conditions, the voltage parameter is displayed in the first 8s, and the frequency parameter is displayed in the last 2s. If the alarm information is generated, the voltage parameter is displayed in the first 8s and the alarm information is displayed in the last 2s.

The left digital tubes display	Cause of the alarm	The right digital tubes display
ALA	Battery voltage low	027
	Battery voltage high	028
	Over load	031
	Loading time is enough to shut down	032
	Over heat	041

3.3 Setting Mode

Enter setting mode, Press "ENTER" button for 10 seconds.
Exit setting mode, Press "ESC" button repeatedly.
1.Press "UP" or "DOWN" button to choose the parameter and then press "ENTER" button.
2.When parameter is flashing, press "UP" or "DOWN" to change it and then press "ENTER" button to confirm.
3.In normal mode, press "ESC" button for 10 seconds to switch to ECO mode.
When setting: Setting icon is flashing
Setting succeed: Left-sided frame of the parameter will flash
Setting failed: FAULT light on

Settings	Display (Left)	Display (Mid)	Display (Right)	Setting range	Descriptions
Mains input voltage range	AIr	00	UPS	Narrow range	Mains input range is 180-265V
			APL	Wide range	Mains input range is 155-265V
Mains frequency oltage range	AFr	01	LO	Narrow range	Mains input frequency range is 45-65HZ
			HI	Wide range	Mains input frequency range is 40-70HZ
Working mode	None	02	UTI	Mains priority	The utility power will provide power to the load first. Only when the utility power is not enough to supply the load, the solar energy And the battery will provide power to the load.
			SOL	Solar priority	When solar energy is sufficient, solar energy will be preferentially provided to the load. When there is solar energy but not enough, the solar energy and battery power will provide power to the load at the same time. When there is no solar power, the utility will provide power to the load. At the same time, If the battery voltage drops to the low-battery warning voltage point or the set DC-to-AC voltage point, the mains will also provide power to the load.
			SBU	Battery priority	When solar energy is sufficient, solar energy will be preferentially provided to the load. When there is solar energy but not enough, the solar energy and battery power will provide power to the load at the same time. If the battery voltage drops to the low battery warning voltage point or the set DC to AC voltage point, the mains will provide power to the load.
Charging mode	None	03	CUT	Mains priority	The energy of the mains and the solarenergy charge the battery at the same time
			CSO	Solar priority	In the solar priority mode, when the PV meets the requirements, the battery is charged with solar energy preferentially, and when the battery voltage is too low, the mains charge will be started
			OSO	Solar charging only	The machine simply uses the energy of solar energy to charge the battery
Mains charging current ratio	ACP	04	100%	10~100%	Adjustable charging current ratio of mains
Solar charging current ratio	SCP	05	100%	20~100%	You can adjust the charging current proportional solar
Boost charging voltage	CU	06	14.2V	13.5~15.0V	Bulk charging voltage setting, according to different types of batteries

Settings	Display (Left)	Display (Mid)	Display (Right)	Setting range	Descriptions
Float charging voltage	FLU	07	13.6V	12.5~14.0V	Float voltage setting, according to different types of batteries
Battery lockdown voltage	COU	08	10.2V	9.5V~11.5V	Set the shutdown voltage point of battery protection voltage
Charging voltage of mains recovery	DTA	09	12.0V	11.5~12.5V	Set the battery voltage point when the mains power is involved in the solar energy priority charging mode
Charging voltage of mains off	ATD	10	13.5V	13.0V~14.0V	Select the voltage point of converting from mains to solar power in solar priority mode
Inv. output voltage	OU	11	220V	200~240V	Set the inverter output voltage
Mains detection speed	CST	12	HI	High speed	Mains sensitivity settings: high medium low
			IDE	Mid. speed	
			LO	Low speed	
Inv. output frequency	OF	13	50Hz		Set inverter output frequency
			60Hz		
Fault restart switch	RA	14	TE	On	Restart 3 times after short circuit or overload
			TD	Off	No restart after short circuit or overload
Backlight control	BLC	15	LON	Always on	The display backlight is always on
			LOF	Always off	The display backlight is always off
			LOD	Delay off	Display backlight smart switch
Buzzer control switch	BEC	16	AON	On	Allows beeping in fault state
			AOF	Off	No beeping in any state
Low battery alarm switch	BOL	17	OFF	Off	Intelligent battery protection function, it is not recommended to change
			ON	On	
Load limit	LL	18	OFF	Off	Intelligent transformer temperature protection function, it is not recommended to change
			ON	On	
Load alarm limit	LEL	19	OFF	Off	This setting does not adapt to this inverter. Setting not available.
			ON	On	
Baud rate	BAU	20	0	2400	Set the communication baud rate
			1	4800	
			2	9600	
Output display mode	ODT	21	220V	220V	Set display output voltage
			110V	110V	
Swon bat voltage	BLS	22	11.5V	10.5V~12.2V	After the machine is shut down abnormally, the battery voltage must be higher than the set value before it can be turned on normally
Bat low off restart vol	BRU	23	13.0V	12.0V~14.0V	After the machine is shut down abnormally, the battery voltage must be higher than the set value before it can be turned on normally
Battery type	BTT	24	SEL	SEL	Sealed Lead Acid Battery
			GEL	GEL	Gel Battery
			FLD	FLD	Inter Cell
			USER	USER	Customer Customization
			TER	LiCoMnNi02	Ternary Lithium Battery
			LIF	BAT-LiFePO4	Lithium Iron Phosphate Battery
Factory	RS	25	OFF	Off	All settings are restored to factory settings
			ON	On	No recovery process, keep existing settings

Battery Type	SEL	Sealed Lead Acid Battery
	GEL	Gel Battery
	FLD	Inter Cell
	USER	Customer Customization
	LiCoMnNi02	Ternary Lithium Battery
	BAT-LiFePO4	Lithium Iron Phosphate Battery
Factory Reset	YES	All settings are restored to factory settings
	NO	No recovery process, keep existing settings
BMS Function Switch	On	Whether to enable the BMS communication function
	Off	
Bat Soc Under Lock	5~50%	BMS low voltage SOC value, if the BMS SOC value is lower than the set value, the inverter will shut down to protect the battery
Bat Soc Turn To Ac	5~50%	When the working mode of the inverter is set to the battery priority mode, the inverter will be forced to enter the mains charging when the SOC of the BMS is lower than the set value.
Bat Soc Turn To Dc	50~100%	When the working mode of the inverter is set to the battery priority mode, the inverter resumes the DC working mode when the SOC of the BMS is higher than the set value.
Bat Restart Soc	30~100%	When the inverter is turned on, the SOC must be higher than the set value to work normally.
Factory Reset	On	All settings are restored to factory settings
	Off	No recovery process, keep existing settings
ECO Mode	On	ECO mode switching
	Off	

Error Codes for reference

Display (Left)	Display (Right)	Details
ALA	021	Inverter communication connection failure alarm
ALA	233	Abnormal mains output alarm
ALA	236	Abnormal machine load alarm
ALA	237	Inverter overload alarm
ALA	231	Abnormal output alarm
ALA	234	High battery voltage alarm
ALA	235	Low battery voltage alarm
ALA	241	Memory chip read and write error alarm
ALA	232	Memory chip connection failure alarm
ALA	238	Inverter over temperature alarm
ALA	239	Load-causing over temperature alarm
ALA	242	Host computer software planned shutdown alarm
ALA	244	BMS other faults
ALA	245	BMS communication abnormal
ALA	246	BMS charging overcurrent
ALA	247	BMS discharge overcurrent
ALA	248	BMS High Temperature
ALA	249	BMS Low Temperature
FAL	102	Inverter overload shutdown fault
FAL	104	Abnormal output fault
FAL	105	Abnormal load fault
FAL	106	Inverter over temperature fault
FAL	135	High battery voltage fault
FAL	134	Low battery voltage fault
FAL	123	Load-causing over temperature fault
FAL	169	Current detection signal failure
FAL	161	Abnormal mains output fault
FAL	152	Temperature sensor connection failure
FAL	162	Host computer software planned shutdown failure

4. INSTALLATION

⚠ WARNING
A qualified electrician should install this product.

4.1 Locating and Mounting the Inverter

The product must be installed in a dry and well-ventilated area,as close as possible to the batteries.There should be a clear space of at least 10cm around the appliance for cooling.

Excessively high ambient temperature will result in the following:

- Reduced service life.
- Reduced charging current.
- Reduced peak capacity,or shutdown of the inverter.

The interior of the product must remain accessible after installation. Try and keep the distance between the product and the battery to a minimum in order to minimize cable voltage losses.

For safety purposes,this product should be installed in a heat-resistant environment if it is used with equipment where a substantial amount of power is to be converted.You should prevent the presence of e.g. chemicals,synthetic components,curtains or other textiles,etc.,in the immediate vicinity.

4.2 AC Wiring

This is a Safety Class I product (supplied with a protective grounding terminal).**Uninterruptible protective grounding must be provided at the AC input and/or output terminals and/or chassis grounding point located externally on the product.**

AC Wiring should be connected in the following order:

- **AC INPUT (Source)**
- **AC OUTPUT (Load)**

Fig 3:AC input/Output Connections

AC Input: The inverter comes installed with Input protection circuit breaker.This should be switched off before the cable is installed.

Remove the AC wiring compartment cover to gain access to the AC terminal strip inside.

Run the three conductors AC INPUT (source) wiring into the wiring compartment.Connect the AC INPUT ground wire first to the ground terminal (ground symbol with circle around it),and then connect the AC INPUT line (L) and neutral wire (N) to the corresponding AC input terminals.

AC Output: The inverter comes installed with Input protection circuit breaker.This should be switched off before the cable is installed.
In a similar manner,connect the AC OUTPUT (load) wiring to the Inverter AC output terminal as was done on the AC Input

After wiring ,double check and review all connections to make sure the wires are in the correct terminals and the terminals are tight

To ensure the best performance from your inverter system,do not use old or untested batteries.Batteries should be of the same size,type, rating,and age.

AC Safety Grounding: During the AC wiring installation,AC input and output ground wires are connected to the inverter.The AC input ground wire must connect to the incoming ground from your AC utility source. The AC output ground wire should go to the grounding point for your loads (e.g.a distribution panel ground bus).

4.3 DC Wiring:

WARNING

DO NOT connect the DC wires from the battery bank to the inverter until:

- All AC wiring is complete,
- The correct DC and AC protection switches are OFF
- The correct DC voltage and polarity have been verified

Depending upon the type of batteries you use in the installation (6 or 12 VDC),the batteries must be wired in series,parallel,or series-parallel. The interconnecting DC wires must be sized and rated exactly the same as those that are used between the battery bank and the inverter.

To ensure the best performance from your inverter system,do not use old or untested batteries.Batteries should be of the same size,type, rating,and age.

4.3.1 procedure

In order to fully utilize the full capacity of the product,batteries with sufficient capacity and battery cables with sufficient cross section should be used.

Proceed as follows to connect the battery cables:

WARNING

- Use an insulated box spanner in order to avoid shorting the battery.
- Avoid shorting the battery cables.

Connect the battery cables: the + (red) on the left and the-(black) on the right,to the battery.Reverse polarity connection (+ to - and - to +) will cause damage to the product.(Safety fuse inside the Inverter unit can be damaged)

The DC overcurrent device (i.e.,fuse or circuit breaker) must be placed in the positive (RED) DC cable line between the inverter's positive DC terminal and the battery's positive terminal (RED);as close to the battery as possible.

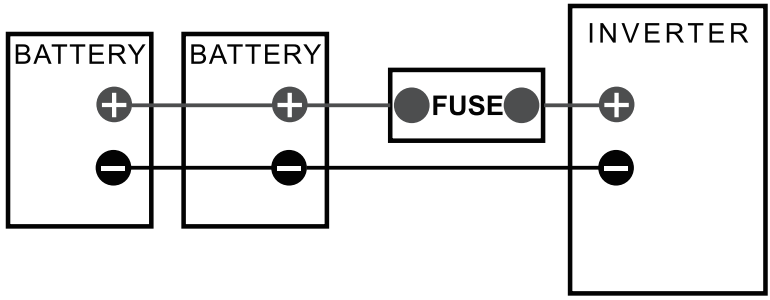


Fig 4:Inline fuse

A brief spark or arc may occur when connecting the battery cables to the inverter DC terminals;this is normal and due to the inverter's internal capacitors being charged.

All wiring to the battery terminals should be checked periodically (once a month) for proper tightening

Secure the nuts tightly in order to reduce the contact resistance as much as possible.
Be aware that over-tightening or misthreading the nuts on the DC terminals can cause the bolts to strip and snap/break off.

4.3.2 DC Wiring Size

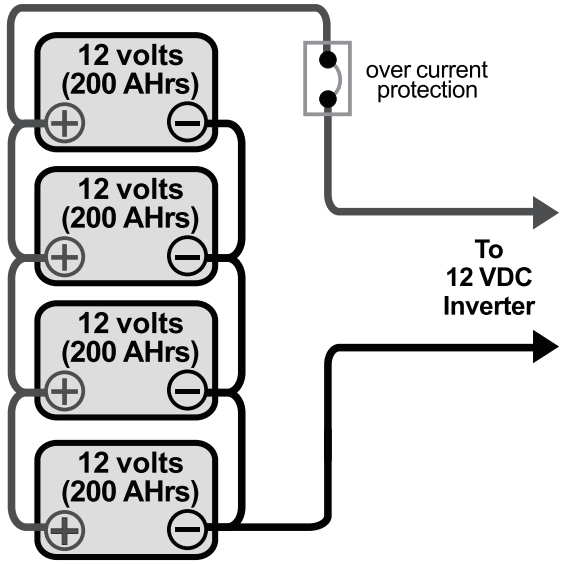
It is important to use the correct sized DC wire to achieve maximum efficiency from the system and to reduce fire hazards associated with overheating.Always keep your wire runs as short as practical to prevent low voltage shutdowns and to keep the DC breaker from nuisance tripping (or open fuses) because of increased current draw.
The correct minimum DC wiresize (and corresponding overcurrent device) is required in order to reduce stress on the inverter,minimize voltage drops,increase system efficiency and ensure the inverter's ability to surge heavy loads.
If the distance from the inverter to the battery bank is ⩽5 feet,use a minimum DC wire size of #2 AWG (33.6 mm2).If the distance between the inverter and the battery is>5 feet,the DC wire will need to be increased.Longer distances cause an increase in resistance,which affects the performance of the inverter.

Tab.III

Models	Minimum DC Wire Size(rating)	Maximum DC Fuse size	DC Grounding wire size
1012/24/48	16/8/4mm^2	100/50/50A	2.5mm^2
1512/24/48	25/16/8mm^2	160/80/50A	2.5mm^2
2012/24/48	32/16/8mm^2	200/100/50A	2.5mm^2
3024/48/96	25/16/6mm^2	150/80/50A	2.5mm^2
3524/48/96	32/16/8mm^2	200/100/50A	2.5mm^2
5024/48/96	50/25/16mm^2	250/160/80A	2.5mm^2
6024/48/96	50/25/16mm^2	300/160/80A	4mm^2
7548/96/180	32/16/8mm^2	200/100/60A	4mm^2
10048/96/180	50/25/16mm^2	250/160/80A	4mm^2

4.3.3 Parallel and Series Connection

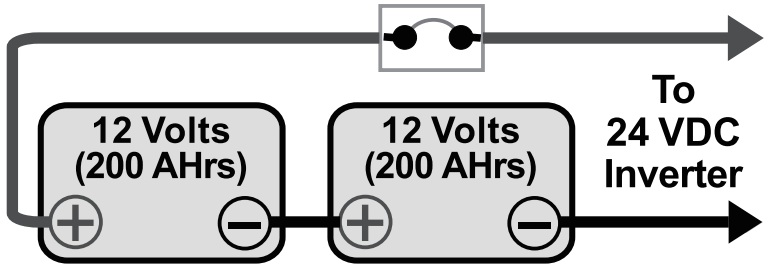
12 Volts Battery In Parallel



12 volt battery (total capacity=800 Ah)

Fig 5. Parallel Battery Wiring

12 volts Battery in Series

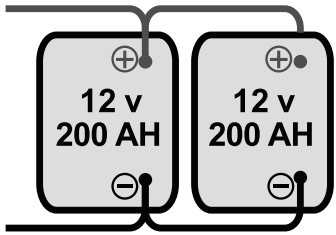


24 Volts battery (total capacity=200 Ah)

Fig 6. Parallel Battery Wiring

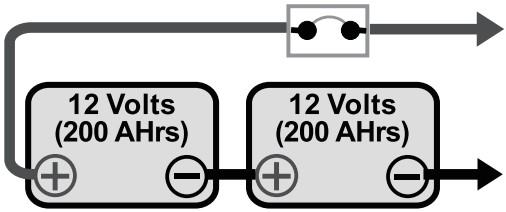
Difference between Series and Parallel connection

Batteries in Parallel
Voltage remain the same
Ah capacity doubles



System Voltage = 12Volts
Ah Capacity = 400AH

Batteries in Series
Voltage doubles
Ah capacity stays the same



System Voltage=24V
Ah Capacity=200AH

Tab.IV

Models	DC Rating (Volts)	Minimum Batteries	Maximum Batteries
1012/24/48	12/24/48V	1/2/4	3/6/8
1512/24/48	12/24/48V	1/2/4	3/6/8
2012/24/48	12/24/48V	1/2/4	3/6/8
3024/48/96	24/48/96V	2/4/8	6/8/8
3524/48/96	24/48/96V	2/4/8	6/8/8
5024/48/96	24/48/96V	2/4/8	6/8/16
6024/48/96	24/48/96V	2/4/8	8/8/16
7548/96/180	48/96/180V	4/8/15	12/16/30
10048/96/180	48/96/180V	4/8/15	16/16/30

5. TROUBLESHOOTING

Proceed as follows for quick detection of common faults.DC loads must be disconnected from the batteries and the AC loads must be disconnected from the inverter before the inverter and/or battery charger is tested.

Consult your local dealer/repair center if the fault cannot be resolved.

Tab.V

Problem	Cause	Solution
The inverter fails to operate when switched on	Battery terminal not firm	Tighten the battery terminals.
Continuous spark from the inverter terminal	Battery terminal reversal	Check and connect the cable to the right terminal lead.
No output from inverter	Output cable terminals loosed	Open the casing and connect the output cable terminals firm to the appropriate lead.
Inverter not charging battery	input power less than(<) 150VAC	A step-up stabilizer of rating higher than the inverter should be installed.
Continuous alarm when the inverter is loaded	Overloading condition	Check the loads and disconnect heavier loads.

6. TECHNICAL DATASHEET

MODEL	1012 /24/48	1512 /24/48	2012 /24/48	3024 /48/96	3524 /48/96	5024 /48/96	6024 /48/96	7548 /96/180	10048 /96/180
Input									
Capacity (VA)	1000VA	1500VA	2000VA	3000VA	3500VA	5000VA	6000VA	7500VA	10000VA
Voltage (DC)	12/24/48V	12/24/48V	12/24/48V	24/48/96V	24/48/96V	24/48/96V	24/48/96V	48/96/180V	48/96/180V
Nominal Voltage	220VAC/110VAC								
Voltage Range	154-265VAC/77-135VAC								
Frequency	50-60Hz Auto sensing								
Output									
Watt	800W	1200W	1600W	2400W	3000W	4000W	4800W	6000W	8000W
Voltage	220VAC/110VAC								
Frequency	50/60Hz								
Waveform	Pure sinewave								
Transfer time(AC to DC)	<8ms								
Transfer time(DC to AC)	<8ms								
Output voltage regulation	10%rms								
Bypass Mode	Yes								
Saver Mode	Yes								
Efficiency	>98%								
Protection									
Input Protection	Circuit Breaker								
Output Protection	Circuit Breaker								
Battery									
Battery Type	AGM-Deep Cycle,GEL								
	Up to 500Ah								
Charging current	20/10/5A	30/15/7A	35/18/9A	30/15/7A	30/15/7A	40/20/10A	45/22/11A	35/17/8A	50/25/12A
Low Level disconnect (Selectable)	12V:(10V or 10.5V) 24V:(20V or 21V) 48V:(40V or 42V)								
LCD Indicator status	Input AC,Output AC								
	Battery DC,Output Load								
	Alarm,Fault								
	Battery Charge Level								
	Output Frequency								
LED Indicator status	AC Line In:Green								
	Inverter:Green								
	Charging:Yellow								
	Alarm:Red								
Battery low alarm	12V:battery light discharge 11. 5V; battery load discharge 11.5V@load<20% ; 11V@load>50%/10.5V@load>50%; 24V:battery light discharge 23V; battery load discharge 23V@load<20% ; 22V@load>50%/21V@load>50%; 48V:battery light discharge 46V; battery load discharge 46V@load<20% ; 44V@load>50%/42V@load>50%;								
Battery low recovery	12V:battery light discharge 12V ; battery load discharge 12V@load<20%; 11.5V@load>50%/11V@load>50%; 24V:battery light discharge 24V ; battery load discharge 24V@load<20%; 23V@load>50%/22V@load>50%; 48V:battery light discharge 48V ; battery load discharge 48V@load<20%; 46V@load>50%/44V@load>50%;								
DC low voltage shutdown	12V:battery light discharge 11V ; battery load discharge 11V@load<20%; 10.5V@load>50%/10V@load>50%; 24V:battery light discharge 22V ; battery load discharge 22V@load<20%; 21V@load>50%/20V@load>50%; 48V:battery light discharge 44V ; battery load discharge 44V@load<20%; 42V@load>50%/40V@load>50%;								
DC high voltage alarm and fault	16/32/64V								
DC high voltage recovery	15/30/60V								

Maximum PV array power	12V:800W 24V:1600W 48V:3200W
MPPT/PWM input voltage range	12V:MPPT15-150VDC(or PWM15VDC-50VDC) 24V:MPPT30-150VDC(or PWM30VDC-60VDC) 48V:MPPT60-150VDC(or PWM60VDC-105VDC)
Maximum PV array open circuit voltage	12V:MPPT150VDC(or PWM50VDC) 24V:MPPT150VDC(or PWM60VDC) 48V:MPPT150VDC(or PWM105VDC)
Maximum solar charging current	60A
Alarm	
Low battery alarm	Audible alarm-1 beeping per second
Overload alarm	Audible alarm-continuous beeping
Fault	Audible alarm-continuous beeping
Environment	
Temperature	-10~50℃
Humidity	C0-95 %, Non condensing
Accoustic Noise(db)	<45dB

7. Warranty scope:

The following is not within the scope of warranty:

(a) Battery configured by user.

(b) Do not operate according to the user's manual,resulting in damage to the machine.

(c) Machanical damage due to natural disasters such as fire,flood, etc.

(d) Products beyond the warranty period, the implementation of paid maintenance services

55304-200-021(09)