

USER'S MANUAL

-----SOLAR POWER INVERTER-----

iMars BN Series(C)

Appliances-----



PC



TV



**Air-
conditioning**



Fridge



**Washing
machine**

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1 Figures of unit

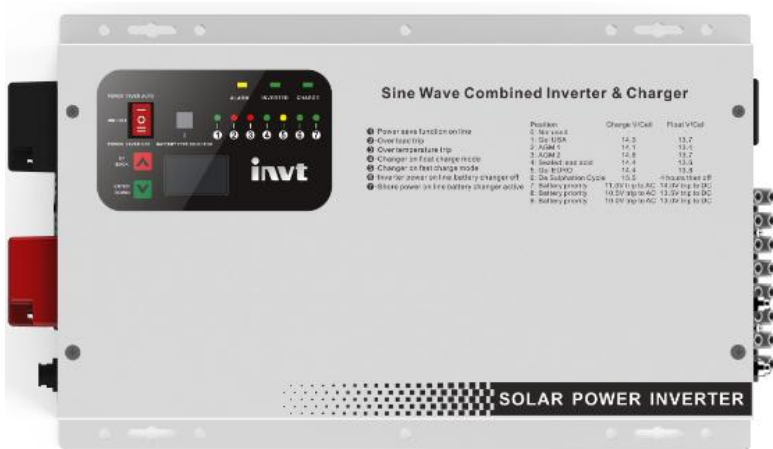


Figure 1 Top view



Figure 2 DC side



Figure 3 AC side

2 Specification

MODEL (BN series)	BN1~3kW			
	1024C	1524C	2024C	3024C
Line Mode Specification				
Nominal Input Voltage	220/230Vac			
AC Voltage Range	155Vac~272Vac \pm 2%			
Frequency	50Hz/ 60Hz (Auto detection)			
Frequency Range	47 \pm 0.3Hz ~ 55 \pm 0.3Hz for 50Hz; 57 \pm 0.3Hz ~ 65 \pm 0.3Hz for 60Hz			
Over-Load /Short Protection	Circuit breaker			
Efficiency	>95%			
Transfer Time (AC to DC or DC to AC)	10ms (typical)			
Back Feed Protect	Can			
Max Bypass Overload Current	30A			
Invert Mode Specification				
Output Voltage Waveform	Sine wave			
Rated Output Power (VA)	1000	1500	2000	3000
Rated Output Power (W)	1000	1500	2000	3000
Power Factor	1.0			
Output Voltage (V)	230Vac			
Output Voltage Regulation	\pm 10%			
Output Frequency (Hz)	50Hz \pm 0.3Hz/60Hz \pm 0.3Hz			
Efficiency	>85%			
Over-Load Protection	(110%<load<125%) \pm 10%: Fault (shutdown) after 15 minutes; (125%<load<150%) \pm 10%: Fault (shutdown) after 60s; Load>150% \pm 10%: Fault (shutdown) after 20s			
Surge Rating (10s)	3000VA	4500VA	6000VA	11000V A
Capable of starting electric motor	1 HP			2HP
Bypass Breaker Size	10A		30A	

MODEL (BN series)	BN1~3kW			
	1024C	1524C	2024C	3024C
Output Short-Circuit Protection	Current limit (Fault after 10s)			
Nominal DC Input Voltage	24V (Min DC start voltage 22V)			
DC voltage range	20.0Vdc~32Vdc , ± 0.6 Vdc regulation (Low alarm:21V; Shut-down: 20V; High fault: 32V; High recovery:31V)			
Power saver	Load ≤ 25 W (Enabled on "P/S auto" setting of Remote control)			
Charger(line)				
Charge Current	20A	25A	35A	50A
Charge Current Regulation	± 5 A _{dc}			
Battery initial voltage	20 ~31.4V _{dc}			
Short Circuit Protection	Circuit breaker			
Breaker Size	10A		30A	
Over Charge Protection	Bat. V ≥ 31.4 V _{dc} , beeps 0.5s every 1s & fault after 60s			
Charger(Solar)				
Max. PV Input Voltage	100 V _{dc}			
Max. PV Open Circuit Voltage	80V _{dc}			
MPPT Voltage Range	18—78V _{dc}			
Battery Voltage Range	20—31.4V _{dc}			
Max Output Power	1100W			
Solar Charger Output Current	45A			
Short Circuit Protection	Fuse			
General Specification				
Safety Certification	CE(EN62040-1)			
EMC Classification	EN62040-2, C2			
Operating Temperature Range/ Storage temperature	-15°C to 40°C / -25°C ~ 60°C			
Operation humidity	5% to 95%			
Audible Noise	60dB max			
Protection Class/Cooling	IP20 /Forced air, variable speed fan			
Size	1024C/1524C: 410mm*264mm*180mm 2024C/3024C: 460 mm*264mm*180mm			

Unit Components

This unit consists of the **inverter** and **solar charge controller**.

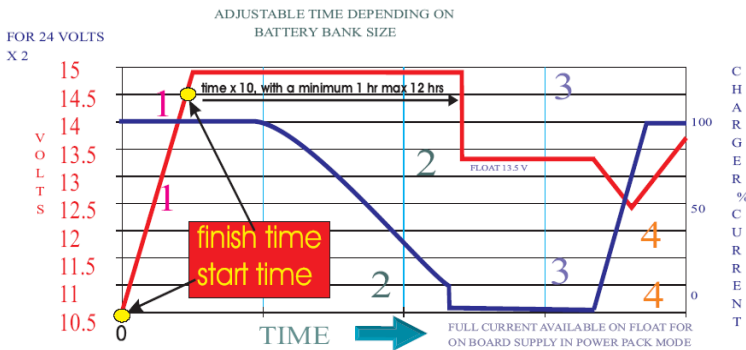
- 1) The main function of the inverter is converting the battery voltage into pure sine wave appliance.
- 2) The solar charge controller main function is to supply the energy for the battery and load.

Inverter Line Charge Stage Transition

Stage transition	Three stage: Boost CC (constant current stage) → Boost CV (constant voltage stage) → Float (constant voltage stage)
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Charge Stage Transition Definitions:

- ◆ **Boost CC Stage:** If AC input is applied, the charger will run at full current in CC mode until the charger reaches the boost voltage.
- ◆ Software timer will measure the time from AC start until the battery charger reaches 0.3V below the boost voltage, then take this time as T_0 and $T_0 \times 10 = T_1$.
- ◆ **Boost CV Stage:** Start a T_1 timer; the charger will keep the boost voltage in Boost CV mode until the T_1 timer has run out. Then drop the voltage down to the float voltage. The timer has a minimum time of 1 hour and a maximum time of 12 hours.
- ◆ **Float Stage:** In float mode, the voltage will stay at the float voltage.
- ◆ If the AC is reconnected or the battery voltage drops below 24Vdc, the charger will reset the cycle above.
- ◆ If the charge maintains the float state for 10 days, the charger will reset the cycle.



THE NEW BATTERY CHARGERS AND BOOSTERS OFFER THE FASTEST CHARGE RATE CURRENTLY AVAILABLE

STEP 1 = CONSTANT CURRENT CHARGE STEP 2 = ABSORPTION CHARGE AT 14.4/14.8 V

STEP 3 = CONSTANT VOLTAGE AT 13.5 VOLTS STEP 4 = LOW VOLTAGE RESET TO STEP 1

	Switch setting	Description	Boost Voltage	Float Voltage
Battery Type Setting	0	To be used by factory for set up	-	-
	1	Gel USA	28.0	27.4
	2	AGM 1	28.2	26.8
	3	AGM 2	29.2	27.4
	4	Sealed lead acid	28.8	27.2
	5	Gel EURO	28.8	27.6
	6	De Sulphation	31.0	4 hours then off
	7	Battery priority	22V trip to AC	28V trip to DC
	8	Battery priority	21V trip to AC	27V trip to DC
	9	Battery priority	20V trip to AC	26V trip to DC

Remark:

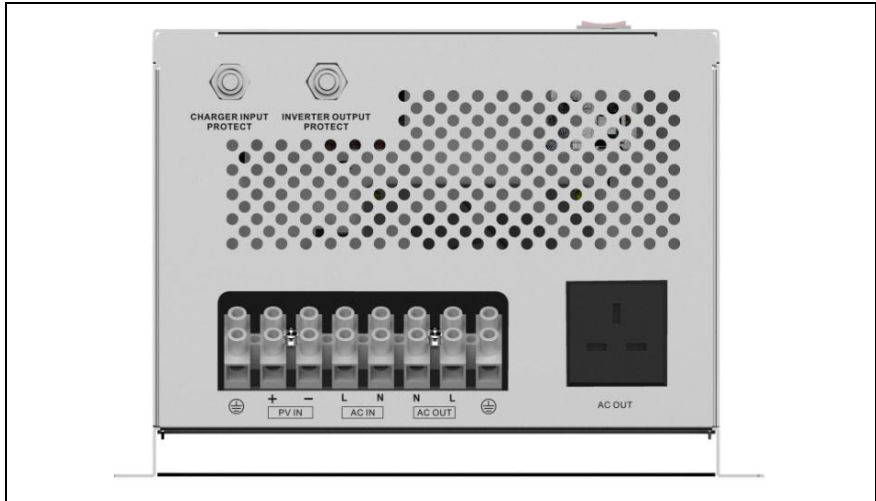
- 1) "0": Do not charge at AC input, charge by solar energy at level 1.
- 2) "1"~"6" level: AC input priority mode, namely AC input is preferred for offering load energy and the above three-stage charging mode will be applied to the battery based on the set charging voltage; however, when AC input exceeds AC input range, it will convert to inverter mode for offering load energy, namely the battery discharges. After AC input restores again, switch to AC input accordingly and recharge the battery per three stages.
- 3) "7"~"9" level: Battery priority mode, namely battery discharge will take precedence. When battery voltage is lower than the voltage corresponds to each level, convert to AC input for offering energy to load, during which AC input will charge the battery at 25% of above AC charge current value to avoid insufficient charge via solar. When solar energy and AC input charges the battery to the voltage higher than that of each level, inverter discharge will be applied to offer energy to the load.
- 4) If in doubt call your battery supplier and ask which charge voltage they want you to use for their battery type. Then select the closest to it to ensure battery lifetime.
- 5) In solar charge, battery will be charged based on the voltage corresponds to each level. For instance: In "1" level, when battery voltage is lower than 28V, solar energy charges at max power; when it is close to 28V, convert to constant voltage charge.



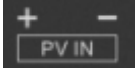


Protection																										
Over temperature protection	Inverter heat sink temp. $\geq 105^{\circ}\text{C}$, Fault (shutdown Output) after 30 seconds; solar charger heat sink temp. $\geq 75^{\circ}\text{C}$, de-rating; solar charger heat sink temp. $\geq 85^{\circ}\text{C}$, solar charger off;																									
Back-feed Protection	Yes																									
Fault recovery	By restart the machine																									
Reverse wiring protect	Have solar panel reverse wiring protect function																									
FAN Operation																										
Fan Operation	Variable speed fan operation is required in invert and charge mode. This is to be implemented in such a way as to ensure high reliability and safe unit and component operating temperatures in an operating ambient temperature up to 50°C . <ul style="list-style-type: none"> • Speed to be controlled in a smooth manner as a function of internal temperature and/or current. • Fan should not start/stop suddenly. • Fan should run at minimum speed needed to cool unit. • Fan noise level target $< 60\text{db}$. The fan logic as below:																									
	<table border="1"> <thead> <tr> <th>Condition</th> <th>Enter condition</th> <th>Leave condition</th> <th>Speed</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Inverter Heat sink temperature</td> <td>$T \leq 85^{\circ}\text{C}$</td> <td>$T > 85^{\circ}\text{C}$</td> <td>50%</td> </tr> <tr> <td>$T > 85^{\circ}\text{C}$</td> <td>$T \leq 80^{\circ}\text{C}$</td> <td>100%</td> </tr> <tr> <td rowspan="2">Line Charge Current</td> <td>$I \leq 50\%$</td> <td>$I > 50\%$</td> <td>50%</td> </tr> <tr> <td>$I > 50\% \text{ Max}$</td> <td>$I \leq 40\% \text{ Max}$</td> <td>100%</td> </tr> <tr> <td rowspan="2">Load% (Invert mode)</td> <td>Load $< 50\%$</td> <td>Load $\geq 50\%$</td> <td>50%</td> </tr> <tr> <td>Load $\geq 50\%$</td> <td>Load $\leq 40\%$</td> <td>100%</td> </tr> </tbody> </table>	Condition	Enter condition	Leave condition	Speed	Inverter Heat sink temperature	$T \leq 85^{\circ}\text{C}$	$T > 85^{\circ}\text{C}$	50%	$T > 85^{\circ}\text{C}$	$T \leq 80^{\circ}\text{C}$	100%	Line Charge Current	$I \leq 50\%$	$I > 50\%$	50%	$I > 50\% \text{ Max}$	$I \leq 40\% \text{ Max}$	100%	Load% (Invert mode)	Load $< 50\%$	Load $\geq 50\%$	50%	Load $\geq 50\%$	Load $\leq 40\%$	100%
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Load% (Invert mode)	Load $< 50\%$	Load $\geq 50\%$	50%																							
	Load $\geq 50\%$	Load $\leq 40\%$	100%																							

3 Front panel

<p>Switch</p>	<p>Power saver auto</p>	<p>Power on with saver mode (power saver $\leq 25W$)</p>
	<p>Unit Off</p>	<p>Power totally off</p>
	<p>Power saver off</p>	<p>Power on without saver mode</p>
	<p>Alarm</p>	<p>Inverter alarm mode on : Inverter have Alarm</p>
	<p>Inverter</p>	<p>Inverter mode : Power by battery</p>
	<p>Charge</p>	<p>Inverter power by utility & Fast Charging by Line (without "o" switch setting)</p>
	<p>Battery type selector</p>	<p>Battery type selector: Different battery type with different charger voltage (select the closest to your battery)</p>
	<p>State LED</p>	<p>Only can show inverter state on</p>




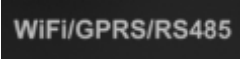
4 AC side panel



<p>Line Input</p>		<p>Line connect: L, N, PE</p>
<p>AC Output</p>		<p>Output connect: N, L, PE</p>
<p>Solar Input</p>		<p>Solar input wire connect: PV+, PV-</p>
<p>IEC Socket</p>		<p>Only allowed Max 10A output current</p>
<p>Protect breaker</p>		<p>Charge input protect & inverter output protect: Over current will protect</p>

5 DC side panel



<p>Battery Input</p>		<p>Battery input connect: Negative(-), Positive(+)</p>
<p>Earth</p>		<p>Earth connect: PE</p>
<p>RS232</p>		<p>RS232 connect: Only supply for E model</p>
<p>Other communicate</p>		<p>Communicate choice: WiFi, GPRS, RS485</p>

6 LED indication

LED indication for the inverter information	
① POWER SAVER ON	Green LED lighting on Power Saver Mode (power saver load ≤25W)
② OVER LOAD TRIP	Red LED lighting on Over Load
③ OVER TEMP TRIP	Red LED lighting on Over Temperature
④ FLOAT CHARGE	Green LED lighting on Float Charging Mode
⑤ FAST CHARGE	Yellow LED lighting on Fast Charging Mode
⑥ INVERTER ON	Green LED lighting on Inverter Mode
⑦ SHORE POWER ON	Green LED lighting on AC Mode

Indication&fault finding chart												
Status	Function	L.E.D.s on bottom							audible alarm	L. E. D. s on		
		①	②	③	④	⑤	⑥	⑦		Yellow (ALARM)	Green (INVERTER)	Green (CHARGE)
Line Charge Function	Constant current charge					on		on				on
	Constant voltage charge					Flash		on				on
	Float				on			on				on
	Standby							on				
Inverter mode	Inverter on							on				on
	Power saver on	on										
Alarms	Battery low voltage							on	beep 0.5s every 5s		on	on
	Battery high voltage							on	beep 0.5s every 5s		on	on
	Over load(inverter mode)		on					on	beep 0.5s every 5s		on	on
	Over temp(inverter mode)			on				on	beep 0.5s every 5s		on	on
	Over temp(line mode)			on		on		on	beep 0.5s every 5s		on	on
	Over charge					on		on	beep 0.5s every 5s		on	on
Fault Mode	Fan lock								beep continuous			
	Battery high voltage							on	beep continuous		on	
	Inverter mode overload		on						beep continuous			
	Over temperature			on					beep continuous			
	Back voltage							Flash	beep continuous	Flash		

7 LCD indication

Display Parameter Definition			
Display item	Definition		
V- pv: 0.0V	Solar panel input voltage		
I – pv: 0.0A	Solar panel input current		
W-pv: 0.0W	Solar panel input power		
V- Bat: 0.0V	Battery voltage		
I – Bat: 0.0A	Solar charger output current		
Load: 0%	Inverter output power (load percent)		
F- out: 50Hz	Inverter output frequency		
Input – V: 0.0V	AC input voltage		
Output –V: 0.0V	AC output voltage		
State: standby	Inverter work state		
No Fault: 180S	If the unit check no fault, the solar charger will run after 180 seconds		
Control panel setting			
Control panel	Item	Definition	
Setup Menu	Solar Charge	0%	Setting the percent of the solar charge controller output current (without control the inverter charge current)
		25%	
		50%	
		75%	
		100%	
	Language	English	Language choice
Chinese			
Remark:			
1) Button operation: Every button have two function was based on the continue press time.			
2) Up button: Press one second— up function; Press three seconds— back function;			
3) Down button: Press one second— down function; Press three seconds— enter function;			
4) Press both the up & down button with 5 seconds— If shut down the inverter, the solar charge controller will have a communication fault. Press both the up & down button with 5 seconds can clear the "Communication fault" of the unit in hand. The solar charge controller can continuously charge to the battery.			
5) LCD display will flash every five seconds.			

8 Check list

- 1) Ensure that the inverter has the correct DC voltage for your boat or vehicle system. ie 24V.
- 2) Fit as close to the batteries as possible. The shorter the DC cables the better. The voltage drop on long cables effect the unit's performance.
- 3) Do not reverse the cables! Connect the positive cable of the battery to the positive terminal (red) and the negative cable positive of the battery to the negative terminal (black).
- 4) Always use the inverter in an environment which is well ventilated, not exposed to direct sunlight or a heat source, away from water, moisture, oil or grease, away from any highly inflammable substance, out of reach from children.
- 5) The output voltage of this unit must never be on your AC system at the same time as any other AC source such as the 230V external mains line or a generator. All external power must go through the UNIT.
- 6) Always switch on the UNIT first, before plugging in any appliance.
- 7) Under new electrical legislation only professional electric should install this product.
- 8) The output frequency of the unit set consistency with the first AC input frequency on. The factory default to 50HZ.

9 Installation

- 1) Position the unit as close as the main battery bank as possible.
- 2) Position in a cool, dry & well ventilated space.
- 3) Orientation of the unit is not critical.
- 4) Either purchase the standard cable ser from Dealer which is about 1.5 meters, or if using your own cable, use the cable size chart provided on the installation drawing on ensure you have thick enough cable for the DC leads. In the event of not being able to get the size requested (it can be hard to get thick cable) then simply add multiple length of thinner cable, i.e. if you cannot get 90mm*mm cable then use 3*35mm*mm cable, at the end of the day it just copper we need.
- 5) Fit a fuse suitable for the job, again look at the installation drawing, we have a full range of high current fuses in the GANLR range of gold fuse products, ranging from 100-500A Ps. on the DC side .
- 6) Connect the cables from the batteries to the fuse then to the unit, this way if there is a fault at the unit the fuse is already in place and this will be safe. In the event of a isolation switch being used, please ensure the rating of the switch can handle the power of the unit.
- 7) Ensure the unit is switched off during installation.
- 8) On the AC side ensure the shore power (all external AC sources) are totally disconnected, connect the output from the inverter to suitable Residual Current Breaker (R.C.D. for earth protection) and current over load trips. Fuse the AC input side depending on through power requirements, the max through power is 30Amps, so fuse at 40A (allowing also for charger consumption) if you intend to use the full through power for standard 13-16 Amps throughput then a 30A fuse would be appropriate.
- 9) We recommend Multi core tri rated AC cable, if used on a boat or vehicle, as this is much safer where vibration is likely. Only use single solid household AC cable if the product is being used as a power source for a house or platform free of vibration.
- 10) Before attempting to switch on the unit, please ensure you have selected the correct battery type on the small battery type selector switch on the front of the main box, rotate the switch to your battery type. The progressive charge control software will automatically adjust for battery bank size and sate.

10 What cable to use can be better?

AC input & output wire

Inverter Model	Nominal input AC voltage	Nominal output AC voltage	AC breaker size minimum wire size
1024C	230Vac	230Vac	30 amps-12AWG
1524C	230Vac	230Vac	30 amps-12AWG
2024C	230Vac	230Vac	30 amps-12AWG
3024C	230Vac	230Vac	30 amps-12AWG

Battery input wire

Inverter Model	Minimum DC Voltage	Cable run distance 0-1.5m	Cable run distance 1.5-4.0m
1024C	20V	6AWG	2*6AWG
1524C	20V	6AWG	2*6AWG
2024C	20V	4AWG	2*4AWG
3024C	20V	4AWG	2*4AWG

Solar panel input wire

Inverter Model	Cable
1024C	10AWG
1524C	10AWG
2024C	10AWG
3024C	10AWG

Appendix A: System connect

