

CS series

Inverter Charger Combination



USER MANUAL

Version 2.0

Date: Oct 2010

About TBB

TBB Power is a dedicated designer and manufacturer of sophisticated and environmentally rugged power electronics equipment.

We are offering a wide range of power conversion product from standalone inverter, N+1 redundant inverter, UPS to battery charger, inverter charger combination and solar charge controller.

We ensure consistent product quality by subjecting every product to strictly choice of superior quality components, rigorous testing and burn-in through out the production process. TBB Power is certified by TUV in accordance with ISO9001 and can be your reliable power solution provider.

Disclaimer

Unless specially agreed in writing, TBB Power Co.,Ltd

- Take no warranty as to the accuracy, sufficiency of suitability of any technical or other information provided in this manual or other documentation.
- Assumes no responsibility or liability for loss or damage, whether direct, indirect, consequential or incidental, which might arise out of the use of such information

About this Manual

This manual describes our product features and provides procedure of installations. This manual is for anyone intending to install our equipment.

Contact Information

TBB Power Co.,Ltd

Web: www.tbbpower.com

Tel: +86-592-5212299

Fax: +86-592-5796070

Email: service@tbbpower.com

General Instruction

Thanks for choosing our products and this manual were suitable for CS series inverter charger combination.

This chapter contains important safety and operation instructions. Read and keep this User Guide well for later reference.

The CS series Combi S needs to be installed by professionals and please pay attention to the following points prior to installation:

- 1> Please check the input voltage or voltage of battery is same to the nominal input voltage of this inverter.
- 2> Please connect positive terminal “+” of battery to “+” input of the inverter.
- 3> Please connect negative terminal “-” of battery to “-” input of the inverter.
- 4> Please use the shortest cable to connect and ensure the secure connection.
- 5> While connecting, please secure the connection and avoid short cut between positive terminal and negative terminal of battery, which will cause damage of battery.
- 6> Inverter will have high voltage inside. Only authorized electrician can open the case.
- 7> The inverter WAS NOT designed to use in any life retaining equipment.

1. General Safety Instruction

1.1 Safety Instruction

As dangerous voltages and high temperature exist within the COMBI S, only qualified and authorized maintenance personnel are permitted to open and repair it.

This manual contains information concerning the installation and operation of the Combi S. All relevant parts of the manual should be read prior to commencing the installation. Please follow the local stipulation meantime.

Any operation against safety requirement or against design, manufacture, safety standard, and are out of the manufacturer warranty.

1.2 General Precaution

- 1.2.1 Do not expose to dust, rain, snow or liquids of any type, it is designed for indoor use. DO NOT block off ventilation, otherwise the INVERTER would be overheating.
- 1.2.2 To avoid fire and electric shock, make sure all cables selected with right gauge and being connected well. Smaller diameter and broken cable are not allowed to use.
- 1.2.3 Please do not put any inflammable goods near to inverter.

1.3 Precaution regarding battery operation

- 1.3.1. Use plenty of fresh water to clean in case battery acid contacts skin, clothing, or eyes and consult with doctor as soon as possible.
- 1.3.2. The battery may generate flammable gas during charging. NEVER smoke or allow a spark or flame in vicinity of a battery.
- 1.3.3. Do not put the metal tool on the battery, spark and short circuit might lead to explosion.
- 1.3.4. REMOVE all personal metal items such as rings, bracelets, necklaces, and watches while working with batteries. Batteries can cause short-circuit current high enough to make metal melt, and could cause severe burns.

2.0 Introduction and Specification

2.1 Inverter Charger Combination Introduction

Combi S is an inverter/chargers combination providing true sine-wave inverter, three stage battery charging and a high speed AC transfer switch as well. It is suitable for the most demanding mobile and off grid application.

++ Pure Sine Wave output

Combi S produces virtually distortion free sine-wave AC power for household appliance and sensitive electronics without worry, such as TV, stereo, laptop.

++ Sophisticated Battery Charger

- Power factor corrected battery charging gets the most out of your shore cord.
- Three stage charging algorithm guarantee your battery getting the quick and right maintenance.
- Meantime, it offer various charging algorithm for multiple battery chemicals including AGM, GEL, Maintenance Free...
- Temperature compensation for better charging (new model, coming from Mar 2011).

++ Uninterrupted AC Power

In even of a grid failure, the output will switch to inverter automatically and take over the power supply to the load. The transfer time is ultra fast (ab. 10ms) that the IT load will not be interrupted.

++ Outstanding overload capability

Combi S provided with outstanding overload capability in together with super fast protection make it suitable for all kinds of load, especially for heavy load like air-con, fridge, power tools etc.

++ Remote control and communication

We offer remote controller and RS485 communication port make it convenient to use and apply to any system.

++ Robust Construction

The robust aluminum construction (for structure A and B only), featuring light weight and corrosion resistant

2.2 Specification

Electrical

DC Input	
Norminal Voltage	12VDC / 24VDC / 48VDC
Min start voltage	10.4V / 20.8V / 41.6V
Low voltage protection	10.5V / 21V / 42V
Low voltage disconnect	10.2V / 20.4V / 40.8

AC Input	
Nominal Input AC voltage	230VAC
Low voltage disconnect	184VAC \pm 4%
Minimum engage	194V \pm 4%
High vol. disconnect	270V \pm 4%
High voltage reengage	260V \pm 4%
Nominal input fre.	50Hz/60Hz - auto detec
Low frequency trip	47Hz/57Hz
High frequency trip	55Hz/65Hz
Short circuit protection	Circuit breaker
Overload protection	Circuit breaker

Safety & Enviroment

Operating Temp.	-25C - 50C full load
Storage Temp.	-40C - 85C full load
Isolation	AC - DC : 2000Vrms
	DC – ground : 2000Vrms
	AC - ground : 2000Vrms

Standard

Safety	EN60950-1
Emmission	EN55022
Immunity	EN55022

AC Output	
Output power	12VDC: 600W-3000W
	24VDC: 600W-5000W
	48VDC: 600W-6000W
Wave form	Pure sine wave
Power factor	0.9-1.0
Norminal output	110/230VAC
Voltage variation	Max \pm 2%
Output frequency	50/60Hz
THD	<3% liner load
	<5% non-liner load
Crest factor	3:1
Efficiency	88%
Overload	120% 15mins
	150% 1min
Status Power Consumption	40W - normal mode
	<25W - power save mode
Dynamic response time	< 20ms

DC Output

Input range	196V-245VAC
Battery types	multi to be selectable
Nominal output	12VDC/24VDC/48VDC
Output current	refer to separate list
De-sulphation	15.5V / 31V / 62V

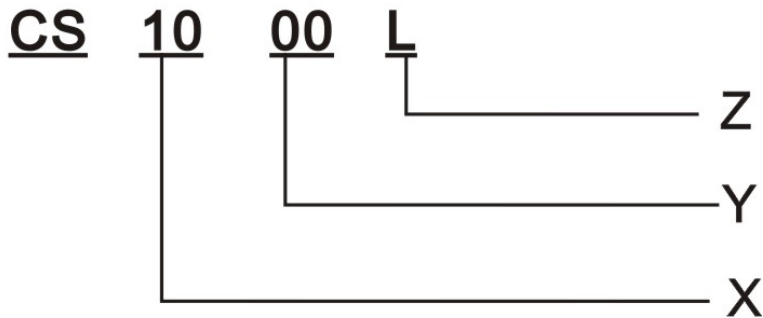
Model	CS0625L	CS1035L	CS1545L	CS2065L	CS3075L
Nomi. DC input voltage	12V				
continuous power (W)	600	1000	1500	2000	3000
Nominal output voltage	12V				
Output current (A)	25	35	45	65	75
De-sulphation	15.5V for 4hrs				
Size	420x180x135		460x180x180		640x180x180
Weight (kgs)	9.5	14	16	18.5	28

Model	CS0615M	CS1020M	CS1530M	CS2035M	CS3045M	CS4065M	CS5070M
Nomi. DC input voltage	24V						
continuous power (W)	600	1000	1500	2000	3000	4000	5000
Nominal output voltage	24V						
Output current (A)	15	20	30	35	45	65	70
De-sulphation	31V for hours						
Size	420x180x135		460x180x180			640x180x180	
Weight (kgs)	9.5	14	16	18.5	22.5	34.5	38

Model	CS2020S	CS3030S	CS4035S	CS5040S	CS6050S
Nomi. DC input voltage	48V				
continuous power (W)	2000	3000	4000	5000	6000
Nominal output voltage	48V				
Output current (A)	20	30	35	40	50
De-sulphation	62V for 4hrs				
Size	460x180x180		640x180x180		
Weight (kgs)	18.5	22.5	34.5	38	42

2.3 Model definition

CS XX YY L



field	figure	explanation	
	CS	series name	
X	6	Inverter output power: 10=1000W	600W
	10		1000W
	15		1500W
	20		2000W
	30		3000W
	40		4000W
	50		5000W
	60		6000W
Y	25	Charger capacity	25A
	35		35A
	45		45A
	65		65A
	75		75A
Z	L	Battery bank Voltage	12VDC
	M		24VDC
	S		48VDC

Example:

CS1500M: Pure Sine Wave Inverter 24V 1500W

CS3000L: Pure Sine Wave Inverter 12V3000W

CS1545L : Inverter Charger Combination 12V 1500W 45A

3.0 Structure and Display

3.1 Structure

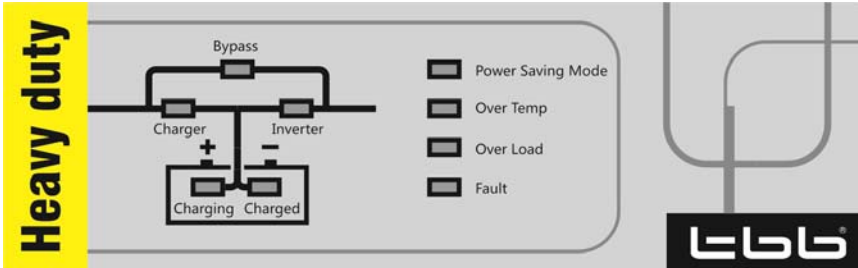
There is three size available in CS series, please refer to specification for each model



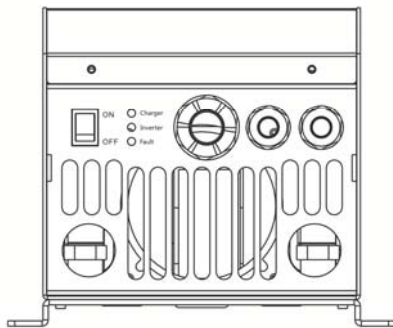
	Size (LxWxH)
Structure A	420x180x135
Strucuure B	460x180x180
Structure C	640x180x180

3.2 Display

3.2.1 Top panel display



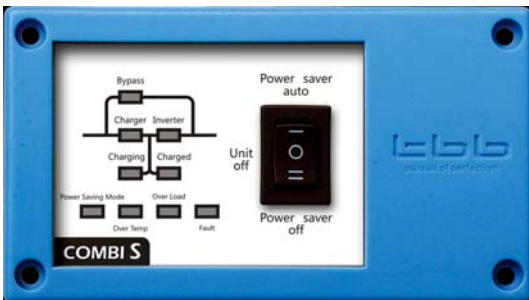
3.2.2 Front panel display



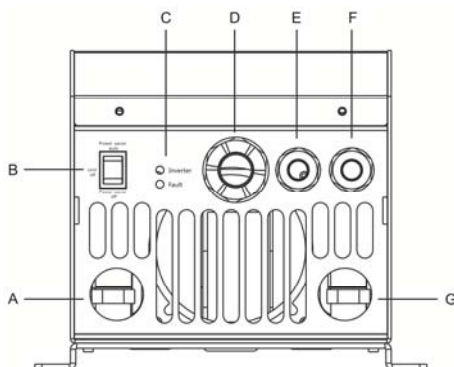
Three LED indicating working mode and fault .

3.2.3 Remote Controlle

CS inverter charger combination



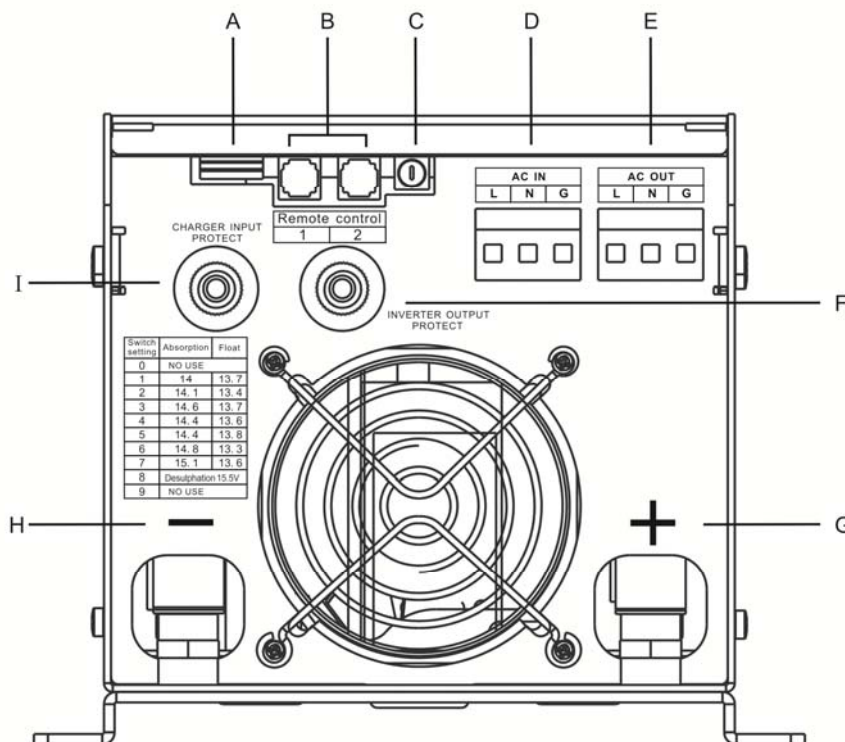
3.3.1 Front Panel



A	DC cable through hole
B	Main switch
C	LED
D	Gland for remote control cable
E	Gland for AC input
F	Gland for AC output
G	DC cable through hole

3.3.2 Central Panel

Loose screw and remove the top panel you will see the central panel where all connection block located.



A	Cable to front panel switch
B	Remote Control connecter
C	Battery Switch
D	AC Input
E	AC output
F	Inverter output over current protection
G	DC +
H	DC -
I	Charger input overcurrent protection

4.0 Installation

4.1 Material list

The unit is packed with following materials:

- equipment
- Please confirm the series number on inverter is same to that on outer carton.
- Cable and Cable Terminal
- M6 screw, Fuses, breakers etc.
- Tools

4.2 Location

Please install the equipment in a location of Dry, Clean, Cool with good ventilation.

- Working temperature: 0-40°C
- Storage temperature: -40-70°C
- Relative Humidity: 0%-95%, non-condensing
- Cooling: forced air
- Vertical angle: No vibration and hanging angle less than 5 degree

4.3 Wiring

Please find the following minimum wire size

System capacity	AC wiring		DC wiring		
	110VAC	220VAC	48VDC	24DC	12VDC
600W	2mm ²	2mm ²	4mm ²	6mm ²	12mm ²
1KW	4mm ²	2mm ²	6mm ²	12mm ²	20mm ²
1.5KW	4mm ²	2mm ²	8mm ²	16mm ²	32mm ²
2KW	6mm ²	2.5mm ²	12mm ²	25mm ²	40mm ²
3KW	8mm ²	4mm ²	16mm ²	35mm ²	\
4KW	10mm ²	5mm ²	21mm ²	42mm ²	\
5KW	12mm ²	6mm ²	26mm ²	52mm ²	\
6KW	14mm ²	7mm ²	32mm ²	\	\

4.4 General advice

- Ensure that the inverter has the correct DC voltage with your existing battery system
- Install the CS as close to the batteries as possible reducing the voltage drop on cable for the better performance of the equipment



Do not connect the output of this equipment to your AC system at the same time as any other A/C source such as the 230V external mains or a generator.

- We recommend connecting a DC fuse between battery and CS. The fuse will offer protection to the system in case of failure.
- On the AC output side, we recommend connecting the output from the inverter to a suitable Residual Current Circuit Breaker and Circuit Breaker.
- On the AC input side, the fuse was determined by the power you used. Max power of this series is 30A.

4.5 Installation



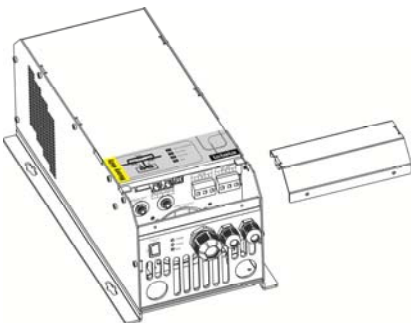
For the user operation safety, cut off the power before installation

4.5.1 Place the unit

Use M6 to fix the unit securely on the surface

4.5.2 Connecting the cable

- Loose the screw and remove the top panel
- (if necessary) There is cable connecting the LED/switch of front panel to equipment, please plug out the connector at front panel. Then, loose the screw and remove the front panel



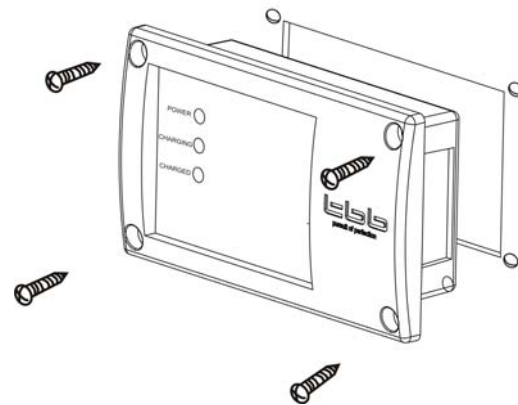
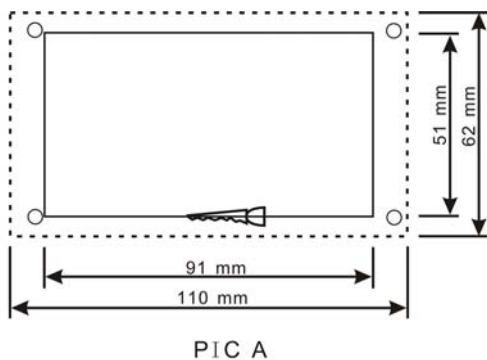
- Pull through the DC cable through the hole , clamp the cable terminal on cable.
- Connect DC input cable: choose the right cable size and follow polarity guide marked on the panel. Secure the battery cable on DC terminal.
- Pull through the AC input cable through Gland and connect it on AC input block
- Pull through the AC output cable through Gland and connect it on AC output block
- If necessary, pull through the remote controller cable through Gland and connect it on communication port.
- Install the front panel, connect the front panel display cable. tightening of all Gland
- Installed the top panel



Please double check the AC input and AC output was right after connection. Wrong connection will cause permanent damage of equipment and it is out of warranty.

4.5.3 Install the remote controller

Please cut the hole according to following size and screw the remote controller securely through four screw at corners.



5.0 Operation

5.1 Setting

Battery type setting : Please select the battery type at the clock diagram, or choose the type follow the battery manufacturer recommendation. Following please find the list of available battery type

Switch setting	Battery type	Absorption	Float
0	NO USE		
1	GEL 1	14	13.7
2	AGM 1	14.1	13.4
3	AGM 2	14.6	13.7
4	Sealed lead acid	14.4	13.6
5	GEL 2	14.4	13.8
6	Open lead acid	14.8	13.3
7	Calcium	15.1	13.6
8	Desulphation 15.5V with max 4hrs timer		
9	NO USE		



Please refer to 5.5 for details of de-sulphation charging.

5.2 Double Checking

- Check the DC input voltage of this inverter is same to your battery nominal voltage. NEVER try to connect different DC input to inv
- Inspect the right polarity of DC input, otherwise unit can not power ON.
- Inspect AC input and AC output is correct, make sure unit is no short cut

5.3 Switch on the inverter

- Leave AC input switch off, switching on the unit, the leds will cycle through analysis then there should be AC available at inverter output.
- Then switch on the AC input, the combi S should go on bypass mode feeding the power into load and meantime battery charger will start work.

5.4 Power Saving mode

- In case there is no load, you could choose the equipment entering into power saving mode through press the switch either on main panel or remote controller. After entering into power saving mode, the equipment status power consumption will be dramatically reduced.

5.5 Performing Desulphation Charging



It is strongly recommended to read this section carefully before you set the de-sulphation charging and DO NOT leave battery unattended while performing de-sulphation.

About Desulphation

Frequency: Maximum once a month, you may wish to equalize your flooded batteries by using the battery charger equalization mode.

Important: Equalization can damage your batteries if it is not performed properly. Never equalize a battery more than twice a month. Always check battery fluid before and after equalization. Fill batteries only with distilled water.

Always check the equalization switch is set back to OFF after each time's equalization.

Battery manufactures' recommendations on equalization vary. Always follow the battery manufacturer's instructions so batteries are properly equalized. As a guide, a heavily used battery may require equalization once a month while a battery in light duty service, only needs equalizing once every 2 to 4 months.

Battery type Only perform equalization to flooded lead-acid batteries. Do not equalize Gel, AGM batteries.

Performing an Equalization



During equalization, the battery generates potentially flammable gases. Follow all the battery safety precautions listed in this guide. Ventilate the area around the battery thoroughly and ensure that there are no sources of flame or sparks in the vicinity



When battery temperature reach above 50C, please stop charging.

Turn off or disconnect all loads on the battery during equalization. The voltage applied to the battery during equalization may be above the safe levels for some loads. Be sure to check battery electrolyte before and after equalization. Fill only with distilled water.

Please monitor the voltage while performing the de-sulphation charging,

- When you switch on this charging, you will see the voltage increase to full (15.5V for 12V battery, 31V for 24V battery)
- After some time (there is a timer inside), the voltage will drop to 11V/22V, which indicate this charging finished.
- You can switch off the combi, change the setting back to normal
- Switch on the CS again for normal operation.

6.0 Trouble Shooting

Status	Description	LED on front panel						
		Charger	Inverter	Charging	Charged	Over load	Over temp	Fault
Charger	Constant current charge	ON		ON				
	Constant voltage charge	ON		flash				
	Float	ON			ON			
Inverter	Inverter ON		ON					
Fault	Battery low voltage		ON					ON
	Battery high volt		ON					ON
	Over load		ON			ON		ON
	Over temp (inverter mode)		ON				ON	ON
	Over temp (charger mode)	ON					ON	ON
	Over charge	ON		ON				ON