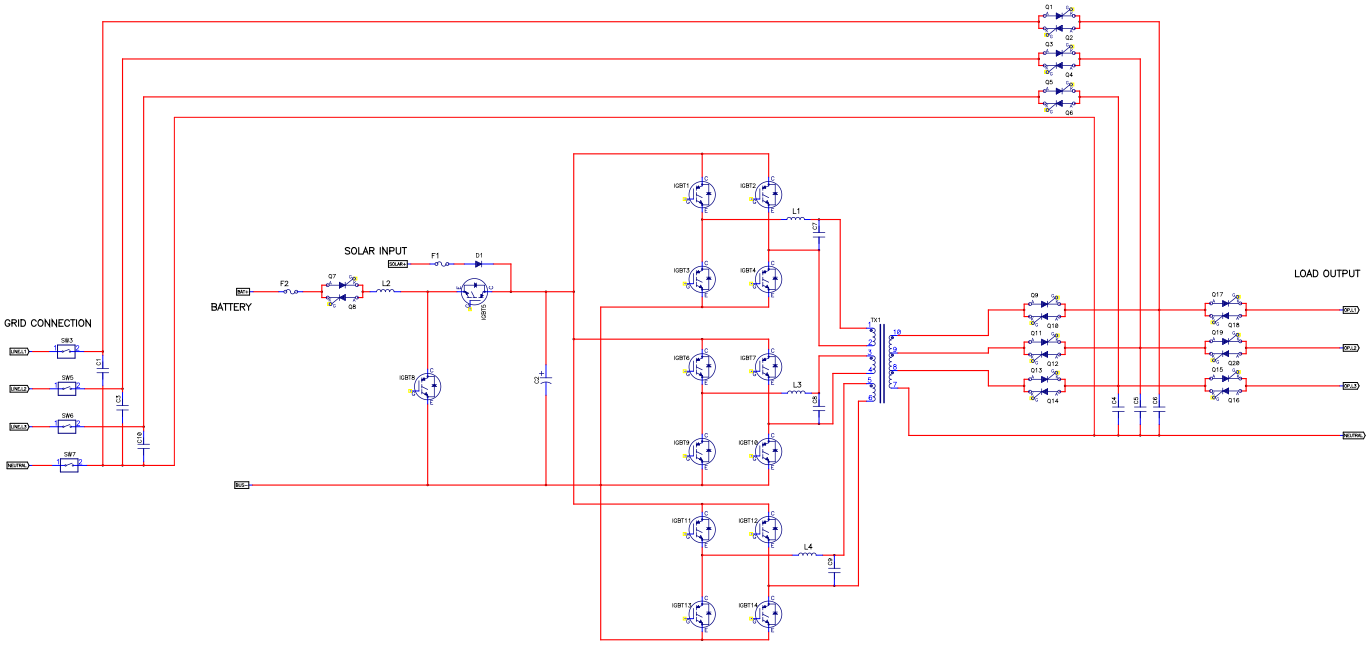
Hybrid 20KW PV Inverter
Service Manual

Version	Publish Date	Made by	Verified by	Approved by

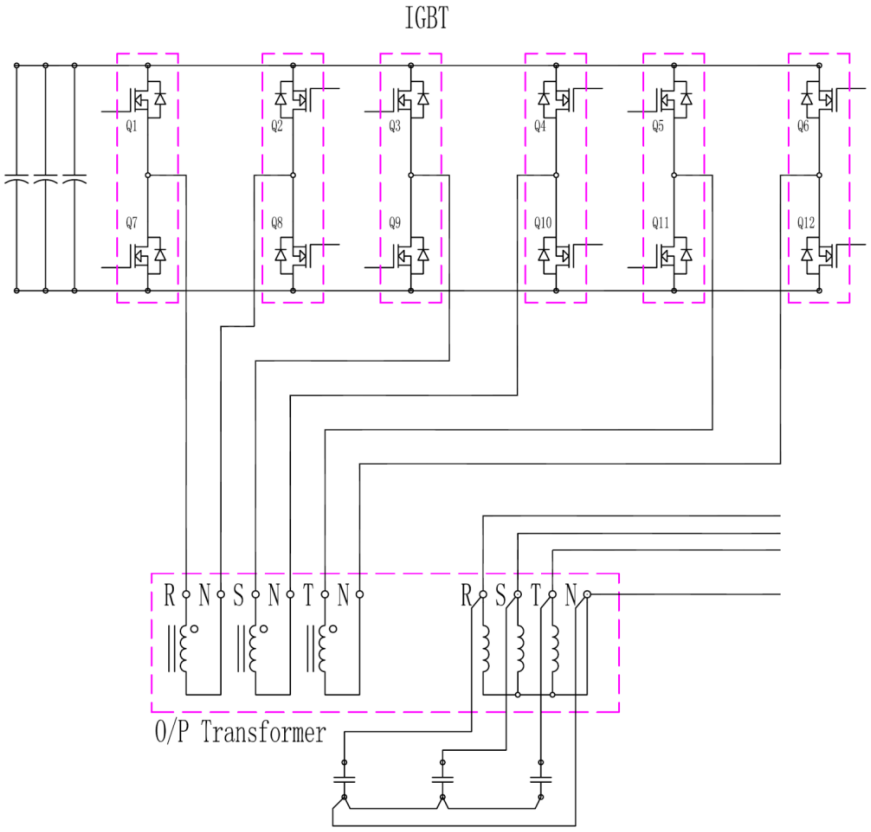
1.System Architecture

1.1 30K Overall Structure



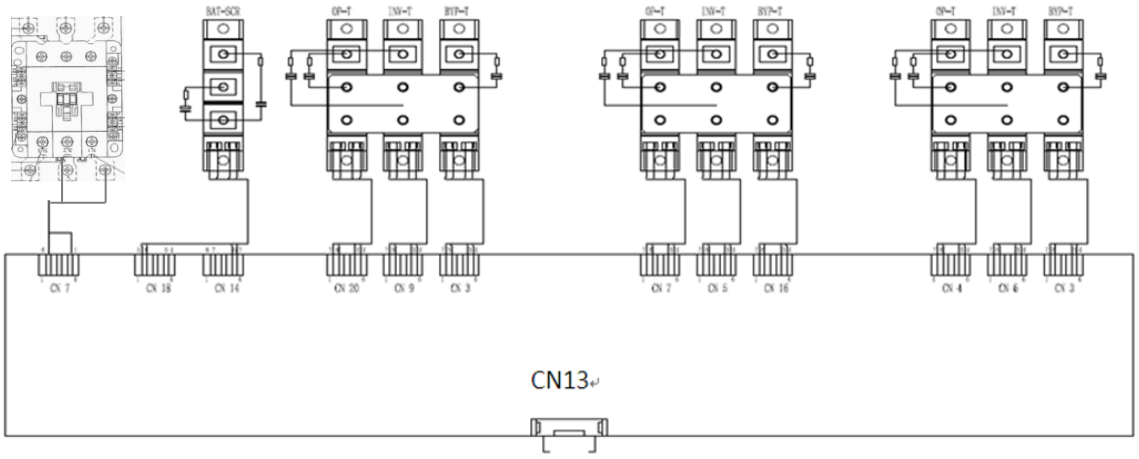
1.2Inverter Topology

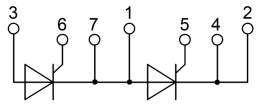
The following INVERTER 3-phase full-bridge inverter circuit diagram is shown below. By controlling Q1-Q12 in turns, it achieves DC/AC conversion. Through the boost of transformers and filter of the LC filter output, it provides pure sine wave voltage.


IGBT
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Q12
R N S N T N
R S T N
O/P Transformer

1.3 Model Power Line and signal one wiring Diagram(High-definition drawings attached.)

Diagram of SCR Control Portion



SCR: 

Input Relay:

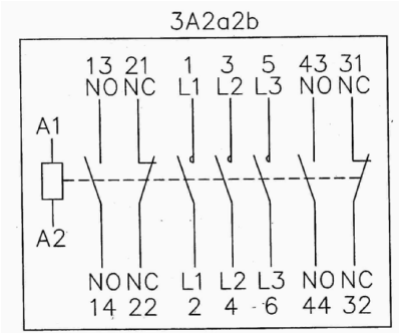


Diagram of Inverter Control Portion

Service Manual for Hybrid 30KW PV Inverter

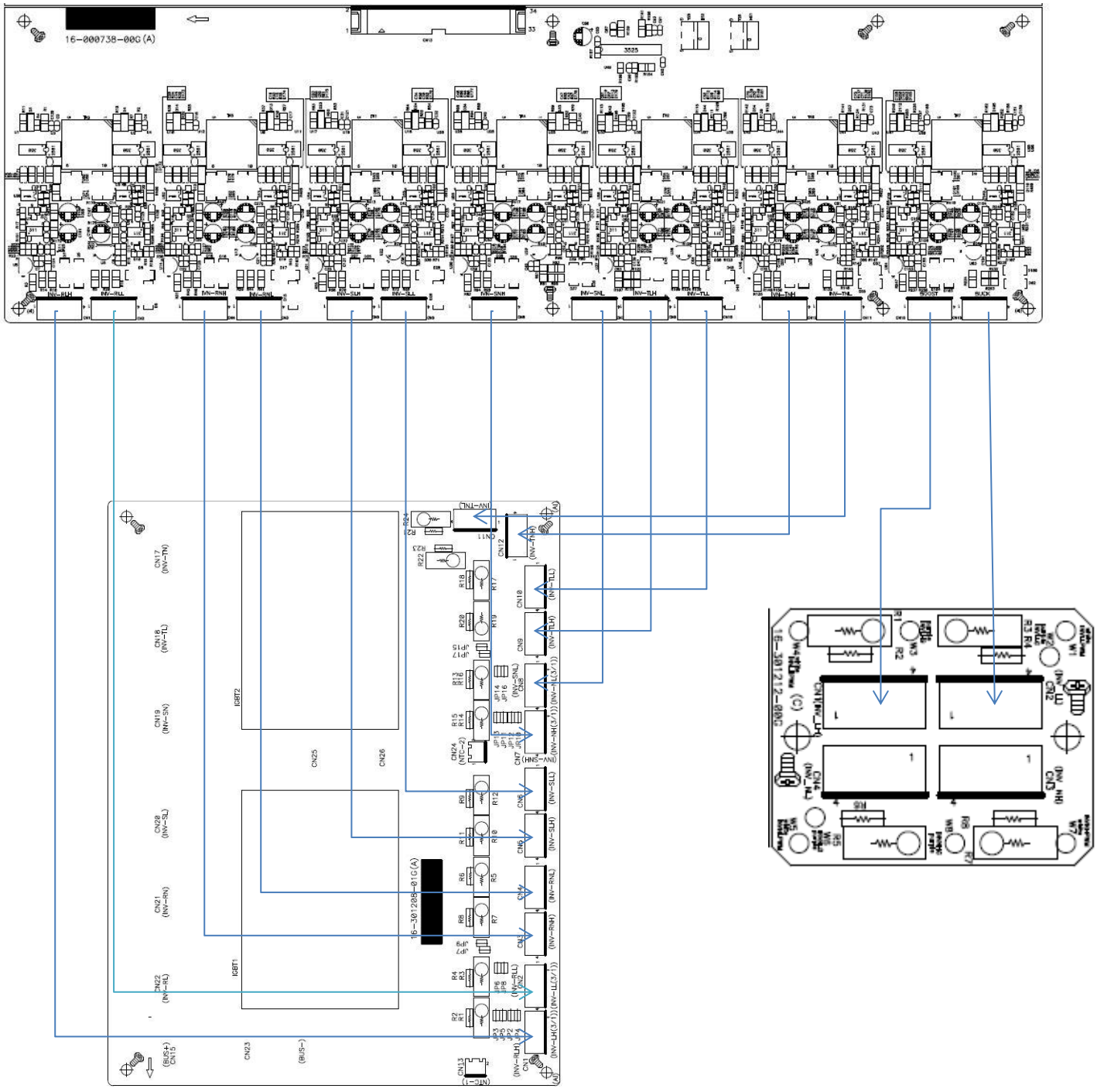
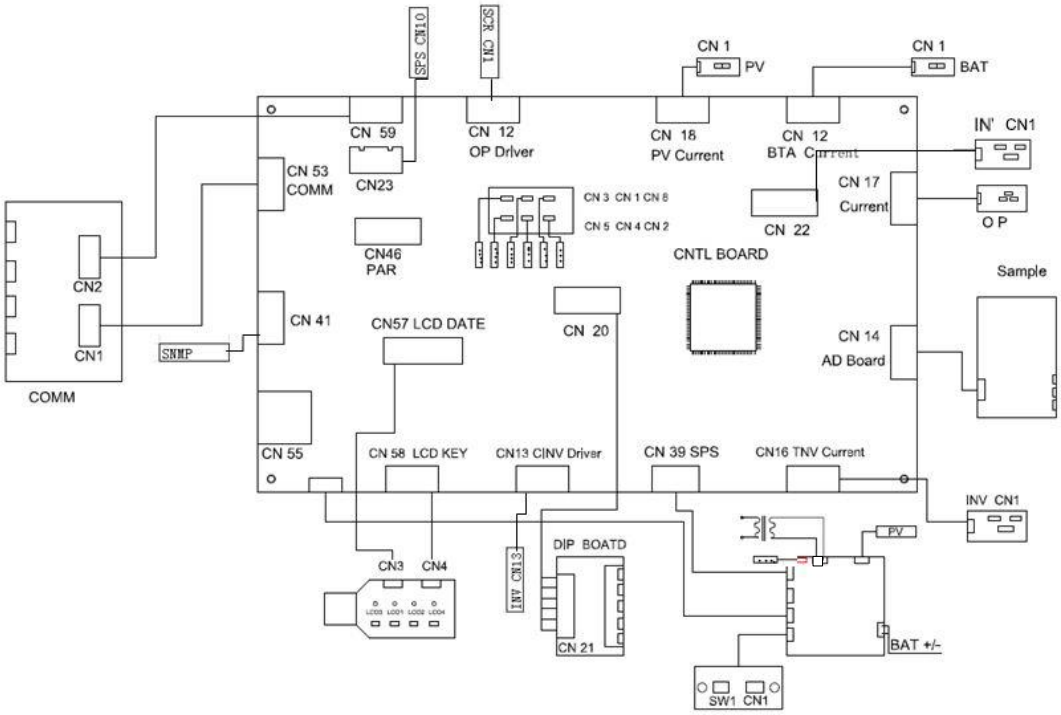


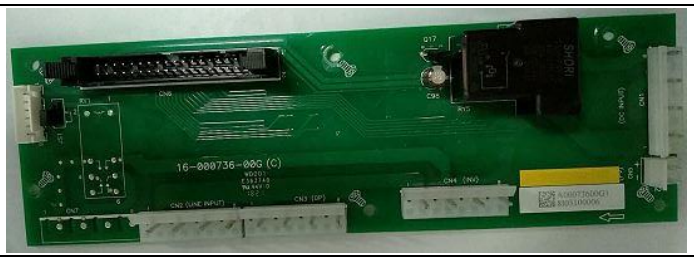
Diagram of control board wiring



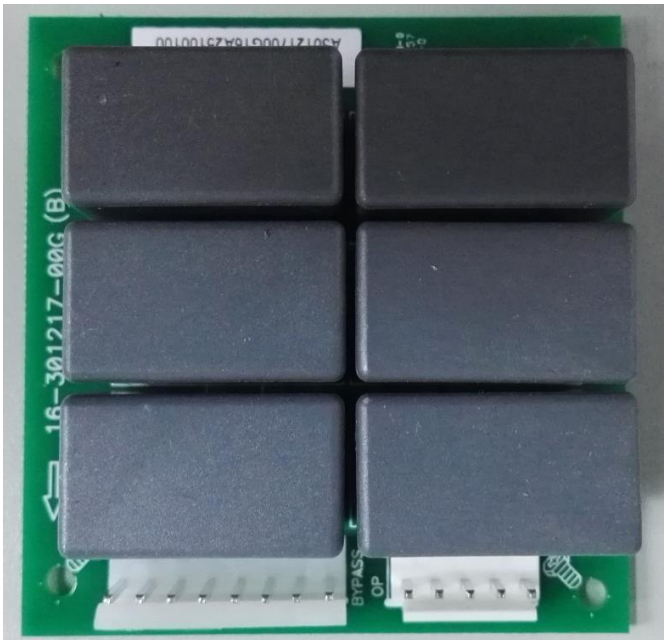
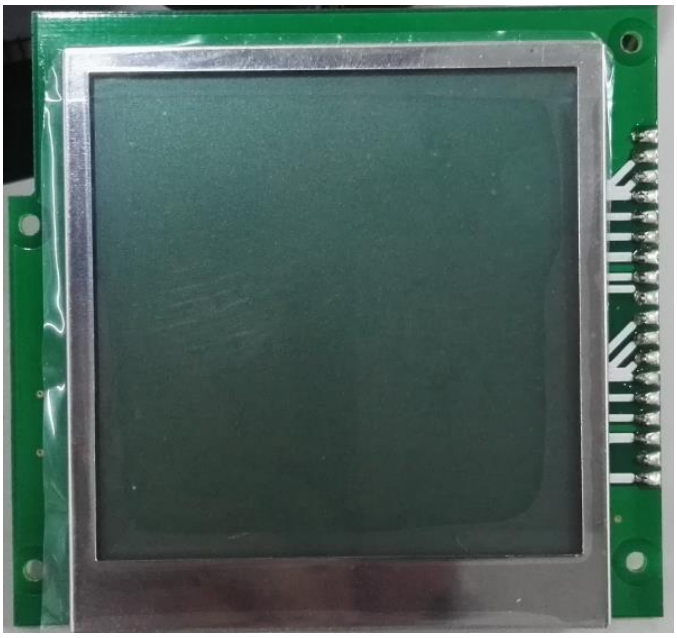
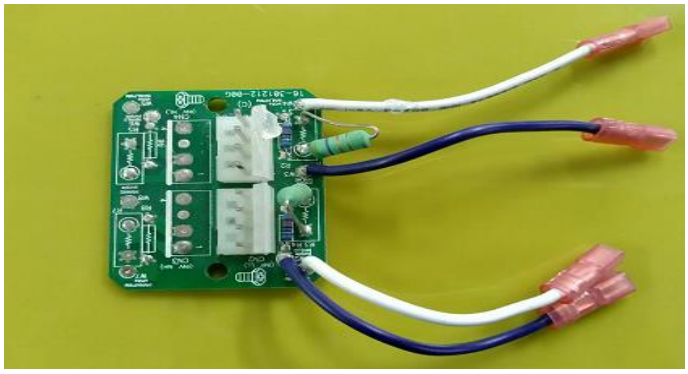
2.PC Panel

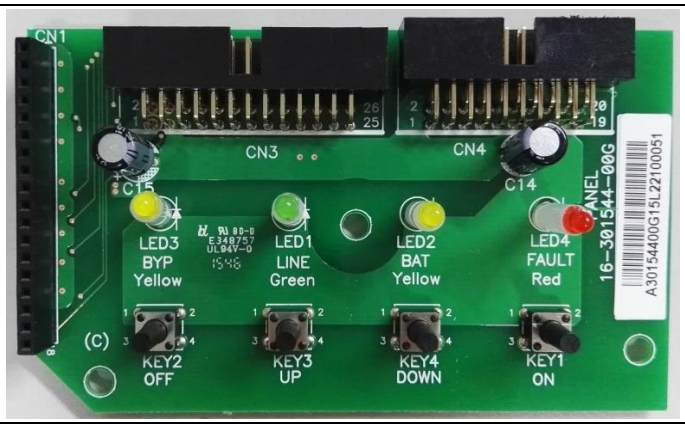
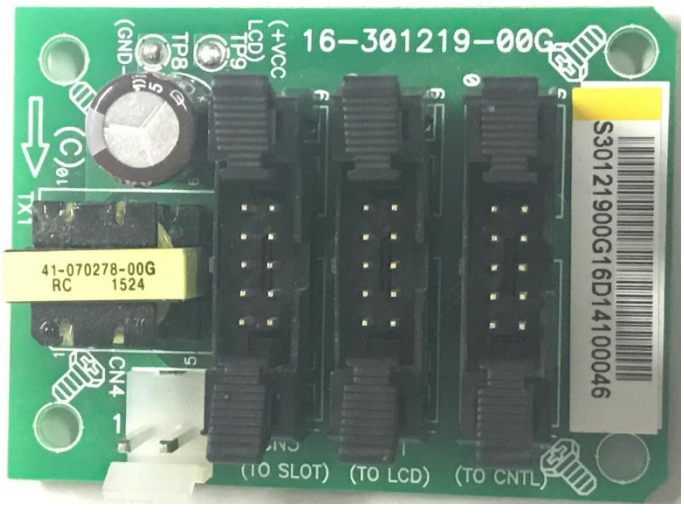
2.1 Introduction of PC Panel

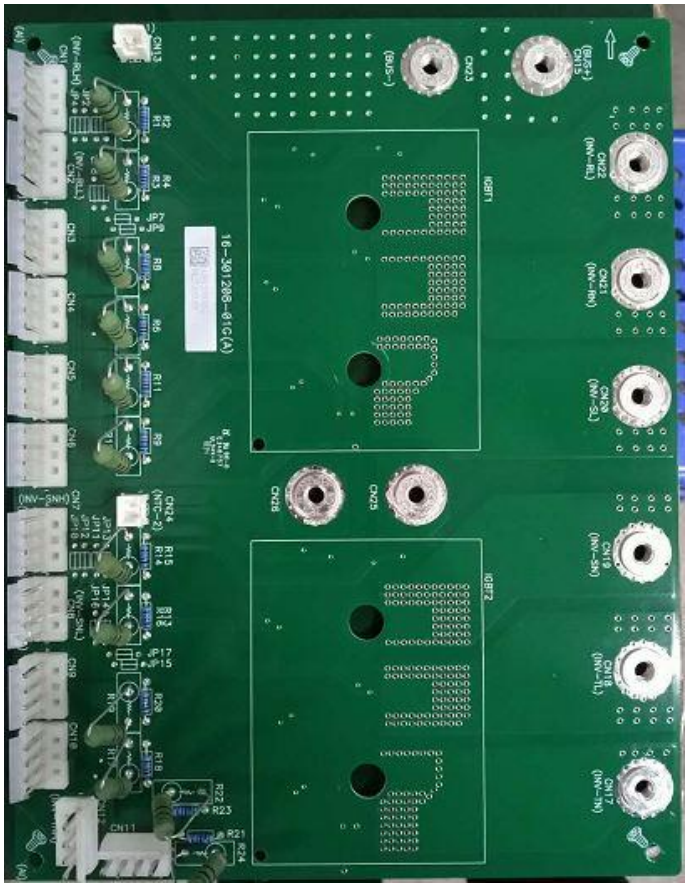
No.	Latest Ver.	Function (Board name)	Image	Purpose
1	01G	Control Board		31-500033-XXG:

2	00G	Power Board		31-500036-XXG:
3	00G	Voltage sampling board		31-500032-XXG:
4	01G	Inverter Current Sampling Board		31-530215-XXG:
5	00G	Battery/PV Current Sampling Board		71-301216-XXG:

6	00G	Output/ Input Current Sampling Board		31-530216-XXG:
7	00G	Inverter Control Board		31-500034-XXG
8	00G	SCR Driver Board		31-500031-XXG:
9	00G	Cold Start Button		71-301596-XXG:
10	04G	Model Switching Board		71-302188-XXG:

11	00G	Output Capacitor Board		31-530218-XXG:
12	00G	Display Screen		12-400134-XXG:
13	00G	Inverter Adapter		71-301212-XXG:

14	00G	LED Clicking Board		71-301544-XXG:
15	00G	Communication Board		31-530213-XXG:
16	00G	Parallel Board		71-301566-XXG:
17	00G	Touch Panel Connectors		Connect with touch panels

18		SNMPCard		(Selected Accessory)
19	01G	Inverter Power Adapter		71-301208-XXG

2.2 LED Indicator on PC Board

PC Board	Location of LED	Signal	Description
Control Board 31-500033-XXG	LED1	VD3.3	Always lighting:+3.3V Voltage supply is normal.
	LED3	DRY-OUT1	Always lighting: Dry Contact is normal.
Power Board 31-500036-XXG	LED1	VD+12	Always lighting:+12V Voltage supply is normal.
SCR Driver Board 31-500031-XXG	LD7	BATDIS.SCR	Always lighting: Battery discharge driver signal output indication
	LD8	BATCHG.SCR	Always lighting: Battery discharge driver signal output indication

	LD9	DRV.BYP R	Always lighting: Bypass R phase driver signal output indication
	LD10	DRV.OP R	Always lighting: Output R phase driver signal output indication
	LD15	DRV.OP T	Always lighting: Output T phase driver signal output indication
	LD11	DRV. INV S	Always lighting: Inverter S phase driver signal output indication
	LD16	DRV.INV T	Always lighting: Inverter T phase driver signal output indication
	LD12	DRV.INV R	Always lighting: Inverter R phase driver signal output indication
	LD13	DRV.BYP S	Always lighting: Bypass S phase driver signal output indication
	LD17	DRV.BYP T	Always lighting: Bypass T phase driver signal output indication
	LD14	DRV.OP S	Always lighting: Output S phase driver signal output indication
Panel Keyboard 71-301544-XXG	LED3	Solid On	Output is powered by utility in line mode.
		Flashing	Output is powered by battery or PV in battery mode.
	LED1	Solid On	Battery is fully charged.
		Flashing	Battery is charging.
	LED2	Solid On	PV is connected and can work normally.
		Flashing	PV is connected but the voltage is too low.
	LED4	Solid On	Fault occurs in the inverter.
		Flashing	Warning condition occurs in the inverter.

2.3 Function of connectors on PC board

Starting Point (From)		Ending Point (To)		Function of Connectors
Name of PC Board	Location	Name of PC Board	Location	
Control Board 31-500033-XXG	CN39	Power Board	CN2	The system is powered from DC power supply
	CN13	Inverter Control Board	CN13	Controlled by inverter
	CN58	LED Click Board	CN4	Controlled by panel indicators
	CN57	LED Click Board	CN3	Driver LCD indication
	CN54	Power Board	CN5	High frequency power supply
	CN14	Voltage Sampling Board	CN6	A/D Signal Sampling
	CN16	Inverter Current	CN1	Inverter current

		Sampling Board		detection
	CN17	Output Current Sampling Board	CN1	Output current detection
	CN15	Battery Current Sampling Board	CN1	Battery charge and discharge detection
	CN12	SCR Driver Board	CN1	SCR Control
	CN3	Inverter transformer Thermocouple	---	Over Temperature Protection
	CN4	Battery SCR NTC	---	Over Temperature Protection
	CN5	STS SCR NTC	---	Over Temperature Protection
	CN8	IGBT NTC(Left SINK)	---	Over Temperature Protection
	CN2	IGBT NTC(Right SINK)	---	Over Temperature Protection
	CN1	PFC.TEMP NTC	---	Over Temperature Protection
	CN59	Communication Board	CN2	Dry contact input/output signal
	CN53	Communication Board	CN1	External communication RS232/485
	CN41	SNMPCard	---	SNMP Card Communication
	CN46	Parallel Board	CN46	Parallel Communication Signal
	CN20	Model Switching Board	CN21	Model Setting and Version Identification
	CN23	Fan Control Board	CN10	Fan Control Signal
	CN22	INPUT Current Sampling Board	CN1	Current Sampling Board
	P1	Software Upload Switch in communication ports	---	Update MCU Usage
Voltage Sampling Board 31-500032-XXG	CN1	Battery terminals +/- and BUT capacitors +/-	---	BUS and Battery Voltage Detecting
	CN2	Utility switch (front point)	---	Utility Voltage Sampling
	CN3	Output switch (front point)	---	Output Voltage Sampling
	CN4	Inverter transformers	---	Inverter Voltage Sampling

		second side		
	CN6	Control Board	CN14	A/D Signal Sampling
Power Board 31-500036-XXG	CN4	SPS Transformer 1	---	Main Power Supply
	CN1	Battery Terminals +/-	---	DC Power Supply
	CN7	Cold Start Click Board	CN1	Cold Start
	CN2	Control Board	CN39	System DC Power Supply
	CN5	Control Board	CN54	Offer high frequency power
	CN3	Parallel Board	CN18	DC Power Supply
	CN11~CN16	Fan	---	Fan Control

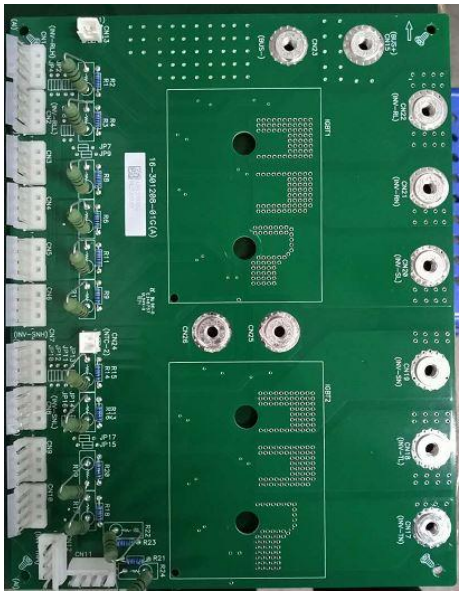
3.INVERTER Device

3.1 30K Inner View

1. INV module
2. INV transformer
3. INV filter capacitor
4. OP/BY/INV SCR
5. Input inductor
6. SPS (Switching power supply) board
7. INV driver board
8. Control board
9. SCR driver board

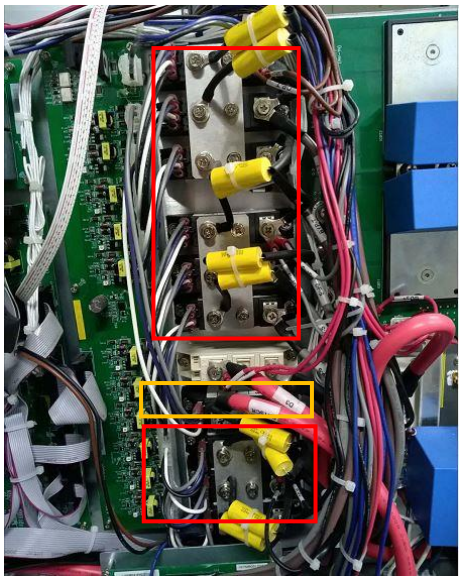
3.2 30K main power devices

IGBT module:



Critical components of OP/BYPASS/INV SCR（Red Box）

Critical components of BAT SCR（Yellow Box）



Critical components of BAT fuse

4.Troubleshooting

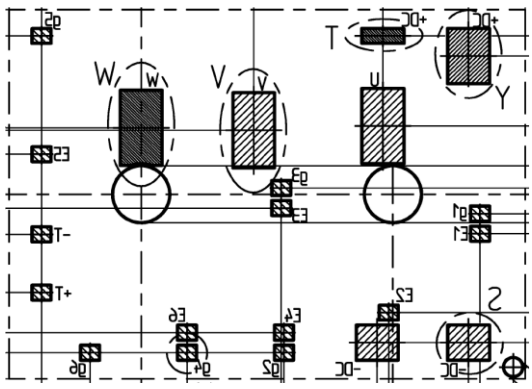
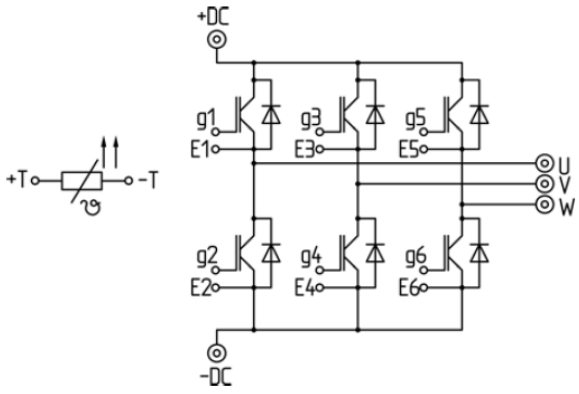
4.1 Static check

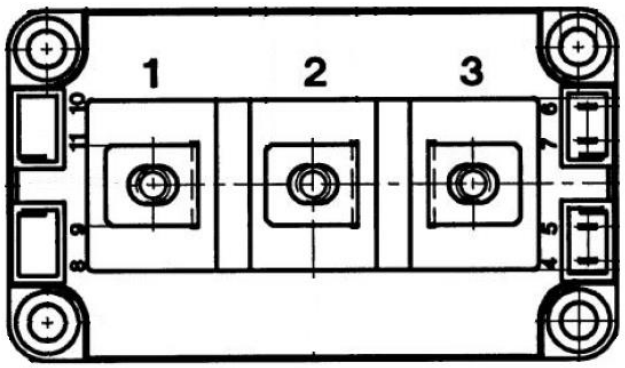
4.1.1 General checkpoint
Check the fuse
Check IGBT, diode
Check the power line and the signal line wiring
Check other key component parameters.

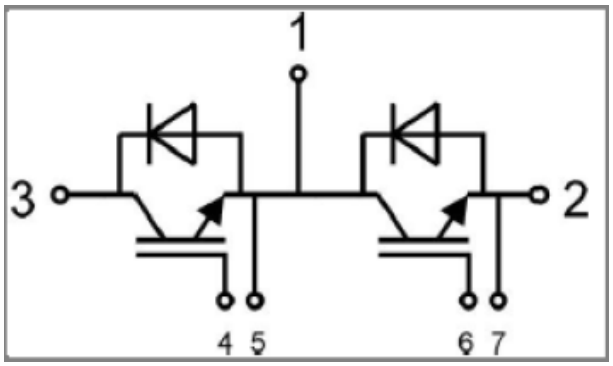
4.1.2 Critical inspection of critical components

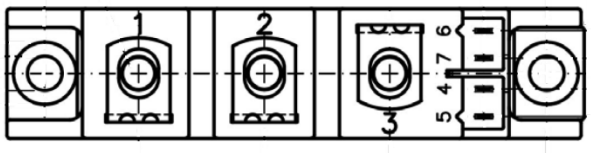
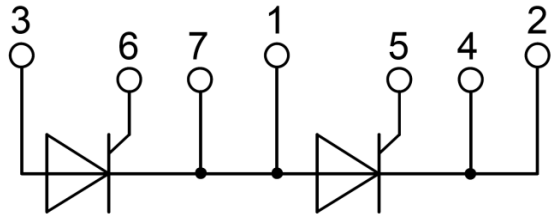
Check the components		Equipment function	Reference	Unqualified condition
Battery Fuse	F	Resistor	<1Ω	Open Circuit
Thyristors Module	SCR (4,5)(6,7)	Resistor	≈16Ω	Short circuit of Open Circuit
IGBT Module	(G,E)	Resistor	∞	Short circuit
	(G,E)	Capacitor	40nF	Short circuit of Open Circuit
Discharge Resistor	R	Resistor	≈10KΩ	Short circuit of Open Circuit
Slow Start Resistor	R	Resistor	≈50Ω	Short circuit of Open Circuit
BUS Capacitor	(+,-)	Resistor	∞	Short circuit

The following are the 30K packages for each module

IGBT package types	Cirresponding IGBT internal topology
	





SCR packages	Corresponding to the internal topology of the SCR
	

4.1.3 Static check of inverter control board

T25/26	(S,D)	Diode	≈0.544v	Short circuit or open circuit
	(S,G)	Diode	≈0.633v	Short circuit or open circuit
	(S,G)	Resistor	≈418KΩ	Short circuit or open circuit
U50/51/52/53/54/55/56/57/58/59/ 60/61/62/70	(3,4)	Diode	≈0.622v	Short circuit or open circuit
	(6,4)	Diode	≈0.618v	Short circuit or open circuit
	(4,3)	Resistor	≈222KΩ	Short circuit or open circuit
	(2,1)	Diode	≈0.617v	Short circuit or open circuit
	(2,8)	Diode	≈0.618v	Short circuit or open

				circuit
	(1,2)	Resistor	≈221KΩ	Short circuit or open circuit
R3/5/31/29/234/247/83/81/107/109/135/133	---	Resistor	≈0Ω	Open circuit
D74/71/65/68/85/82/76/79/84/81/75/78/72/69/63/66/100/101/102/91/72/70/64/67/86/83/80/77	(A,K)	Diode	≈0.221v	Short circuit or open circuit

4.1.6 Status Check of Power Board

Check the components		Equipment Function	Reference	Unqualified condition
Q2/Q6	(S,D)	Diode	≈0.508v	Short circuit or open circuit
	(S,G)	Diode	≈0.336v	Short circuit or open circuit
	(S,G)	Resistor	≈9.36KΩ	Short circuit or open circuit
D3/4	(A,K)	Diode	≈0.525v	Short circuit or open circuit
D2	(A,K)	Diode	≈0.449v	Short circuit or open circuit
D10	(P,N) (P,N)	Diode	≈0.791v	Short circuit or open circuit
ZD10/14/15/16	(A,K)	Diode	≈0.715v	Short circuit or open circuit
R14		Resistor	≈1.5Ω	Short circuit or open circuit

4.1.7 SCR Static check for driver board

Check the components		Equipment Function	Reference	Unqualified condition
Q7-Q17	(S,D)	Diode	≈0.466v	Short circuit or open circuit
	(S,G)	Diode	≈0.635v	Short circuit or open circuit
	(S,G)	Capacitor	≈10KΩ	Short circuit or open circuit
Z7-Z17	(A,K)	Diode	≈0.601v	Short circuit or open circuit
D35/32/67/74/75/76/68/69/40/41/43/45/47/49/58/59/55/57/53/51	(A,K)	Diode	≈0.497v	Short circuit or open circuit
D39/42/46/60/54/50/72/70/65/37/34	(A,K)	Diode	≈0.595v	Short circuit or open circuit

4.1.8 10-200K Static check of voltage sampling board

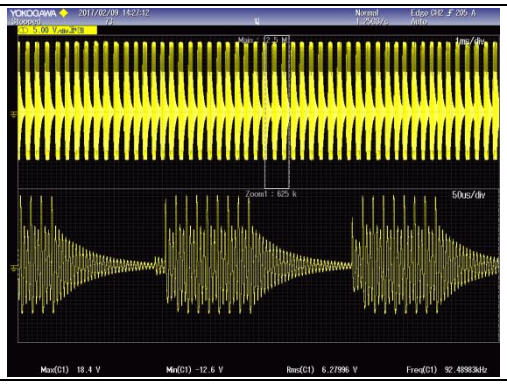
Check the components	Equipment Function	Reference	Unqualified condition

Q17	(C,B)	Diode	≈0.673v	Short circuit or open circuit
	(E,B)	Diode	≈0.674v	Short circuit or open circuit
	(E,B)	Resistor	≈10KΩ	Short circuit or open circuit
T1	(B,C)	Diode	≈0.681v	Short circuit or open circuit
	(B,E)	Diode	≈0.682v	Short circuit or open circuit
	(B,E)	Resistor	≈10KΩ	Short circuit or open circuit
D1	(A,K)	Diode	≈0.101v	Short circuit or open circuit
ZD12	(A,K)	Diode	≈0.679v	Short circuit or open circuit

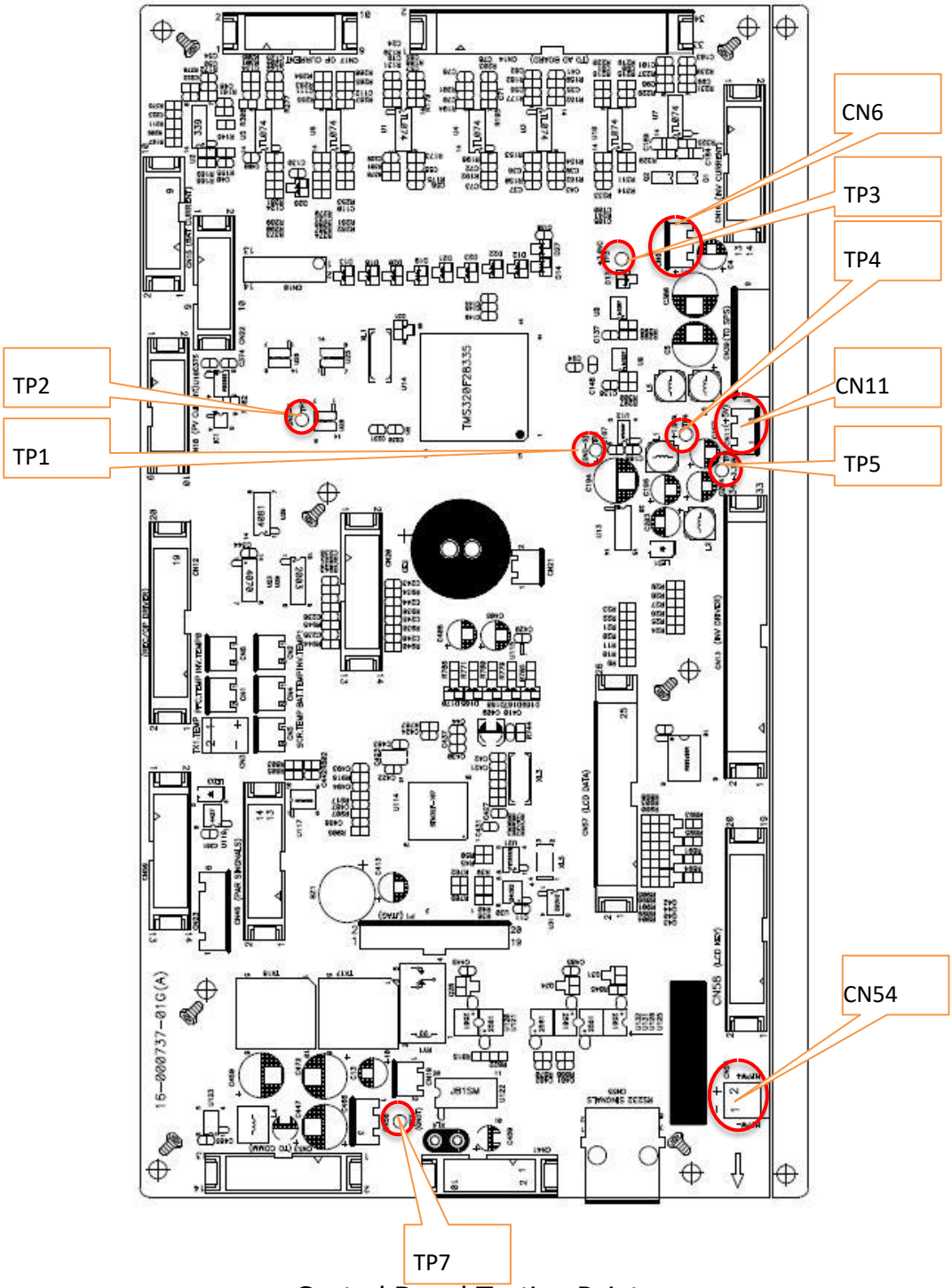
4.2 Status Check

4.2.1 General checkpoint
Check the LED status
Check the LCD display status (with or without alarm message)
Check information of LCD display voltage measurement
Check the critical driver signals, such as IGBT driver signals, SCR driver signals
Check the rectifier with the inverter voltage/current waveform during slow start.

4.2.2 Confirm control board power operation
Check the Power supply

No.	Probe -(Ground)	Probe +	Testing Result	Waveform
1	TP1/TP2	CN6-1	-12V	
2	TP1/TP2	CN6-3	+12V	
3	TP1/TP2	CN11-2	+5V	
4	TP1/TP2	TP4	+1.9V	
5	TP1/TP2	TP5	+3.3V	
6	TP1/TP2	TP7	+1.5V	
7	TP1/TP2	TP3	+3V	
8	CN54-1	CN54-2 High Frequency Power Supply	Vmax=18.4V; Freq.=92.49kHz	

a) Testing Measures (refer to section 5)
b) Check the driver signal (refer to section 5)

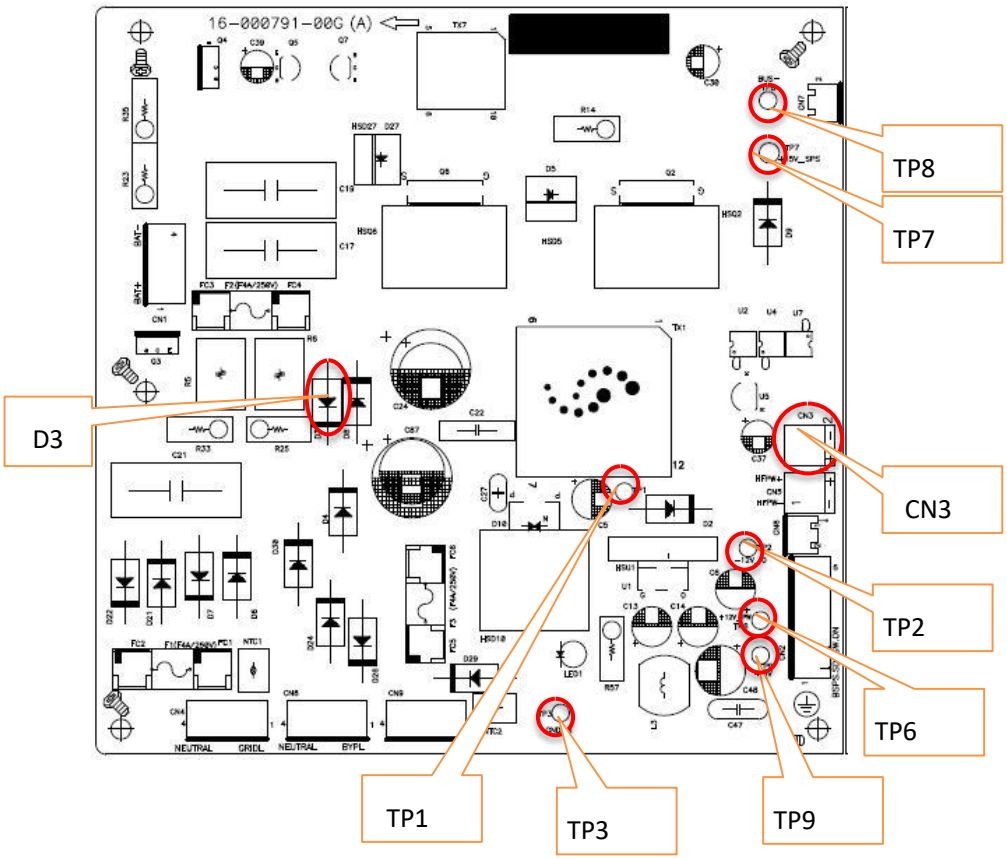


Control Board Testing Points

4.2.3 Confirmation of Operation of Power Board

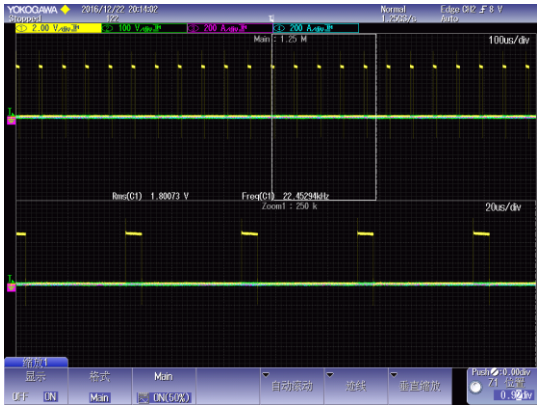
No.	Probe-(Ground)	Probe +	Testing Result	Waveform
1	TP3	TP1	-15V	
2	TP3	TP2	-12V	
3	TP3	TP6	+12V	
4	CN3-1	CN3-2	Vmax= 18V; Freq.=92.49kHz;	

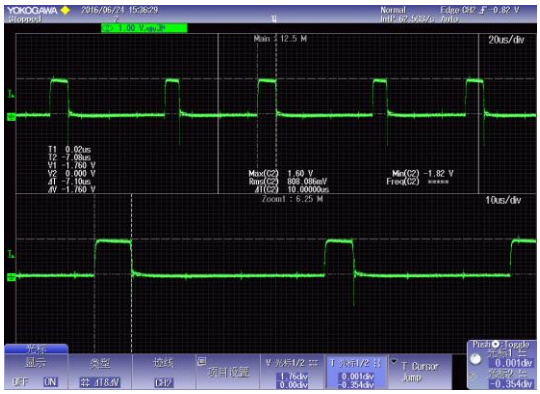
5	TP8	TP7	+15V	
6	TP8	D3-K	Effective value is about 360V (depending on the actual mains voltage.	
7	TP3	TP9	+5V	

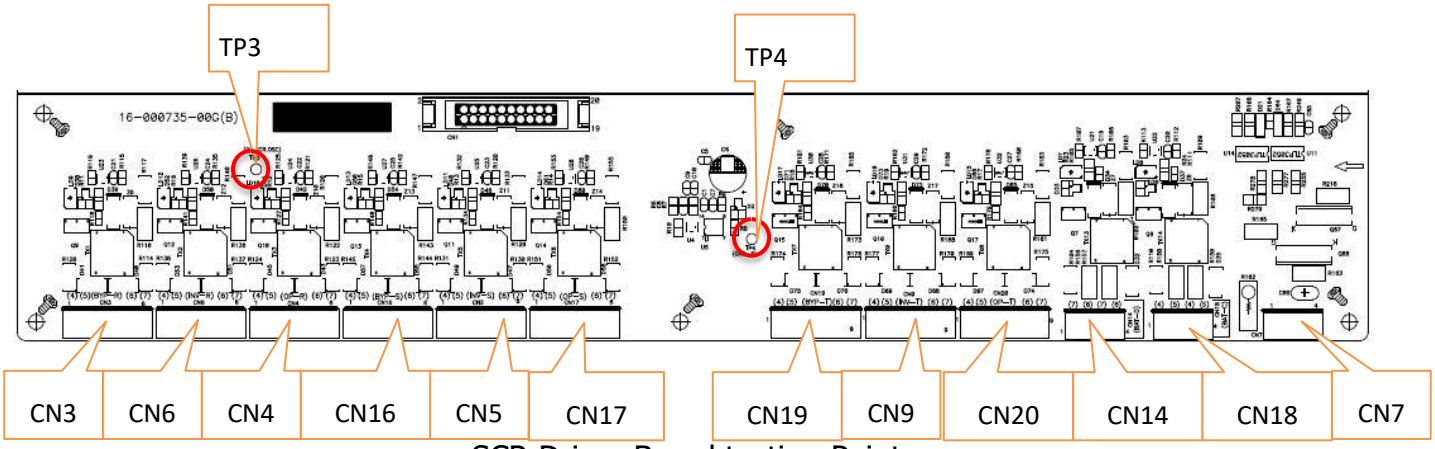


Testing Points on Power Board

4.2.4 SCR Confirmation of Driver Board Power Operation

No.	Probe-(ground)	Probe +	Testing Result	Waveform
5	TP4	TP3 (OP OSC)	Vmax= +5V; Freq.=22.45kHz; Duty cycle=13%	

6	CN3/4/5/6/16/17/9/19/20 CN14/18 SCR Driver Signals	Vmax= +1.6V; The Status of LED Lights, see section 2.2 for details	

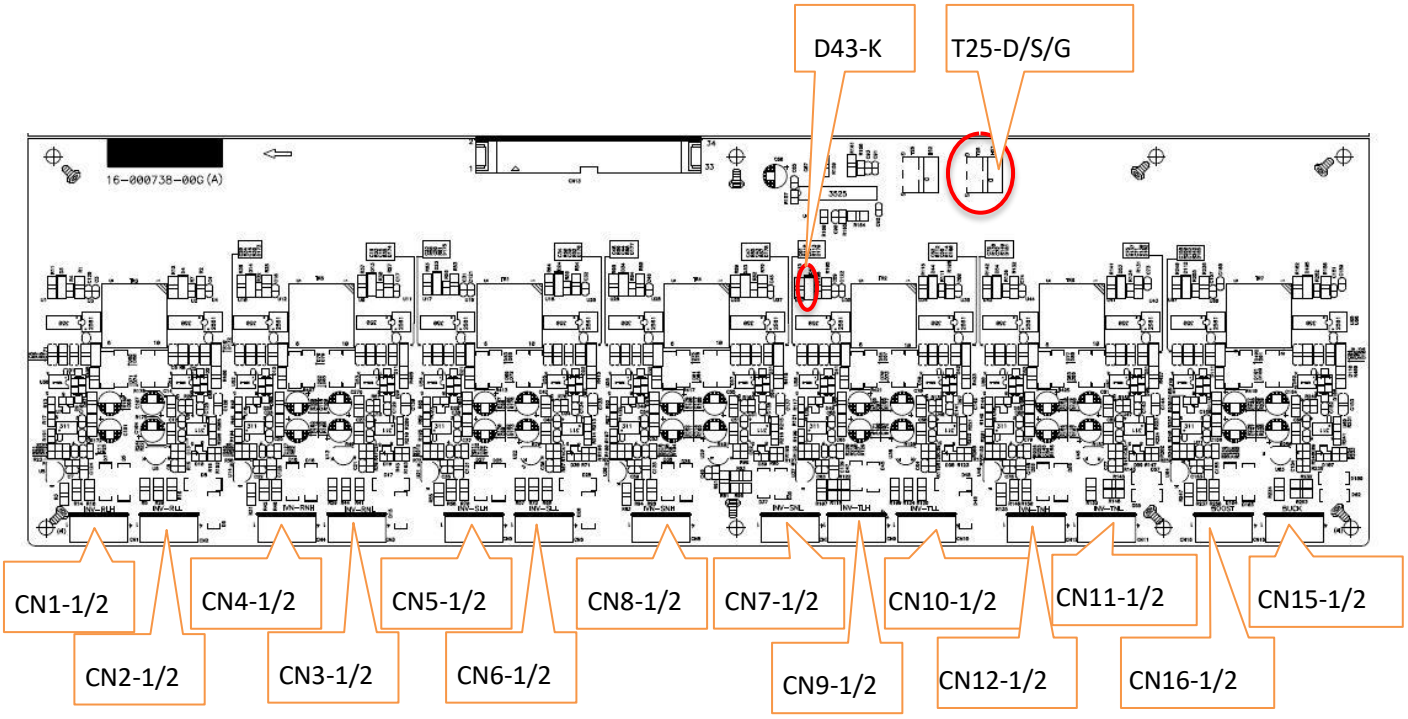


SCR Driver Board testing Points

4.2.5 Confirmation of Power Operation of inverter control panel

No.	Probe-(ground)	Probe+	Testing result	Waveform
1	T25-S	T25-D	+12V_PW	
2	T25-S	D43-K	+12V_D	
3	T25-S	T25-G	Vmax= +12.4V; Freq.=71.98kHz; Duty cycle=35.7%	
4	CN1-2 (RLH-)	CN1-1 (RLH+)	12V+/-5% -12V+/-5%	
5	CN2-2 (RLL-)	CN2-1 (RLL+)	12V+/-5% -12V+/-5%	
6	CN4-2 (RNH-)	CN4-1 (RNH+)	12V+/-5% -12V+/-5%	
7	CN3-2	CN3-1	12V+/-5%	

	(RNL-)	(RNL+)	-12V+/-5%	
8	CN5-2 (SLH-)	CN5-1 (SLH+)	12V+/-5% -12V+/-5%	
9	CN6-2 (SLL-)	CN6-1 (SLL+)	12V+/-5% -12V+/-5%	
10	CN8-2 (SNH-)	CN8-1 (SNH+)	12V+/-5% -12V+/-5%	
11	CN7-2 (SNL-)	CN7-1 (SNL+)	12V+/-5% -12V+/-5%	
12	CN9-2 (TLH-)	CN9-1 (TLH+)	12V+/-5% -12V+/-5%	
13	CN10-2 (TLL-)	CN10-1 (TLL+)	12V+/-5% -12V+/-5%	
14	CN12-2 (TNH-)	CN12-2 (TNH+)	12V+/-5% -12V+/-5%	
15	CN11-2 (TNL-)	CN11-1 (TNL+)	12V+/-5% -12V+/-5%	
16	CN16-2 (BOOST-)	CN16-1 (BOOST +)	12V+/-5% -12V+/-5%	
17	CN15-2 (BUCK-)	CN15-1 (BUCK +)	12V+/-5% -12V+/-5%	



Testing points of Inverter control board

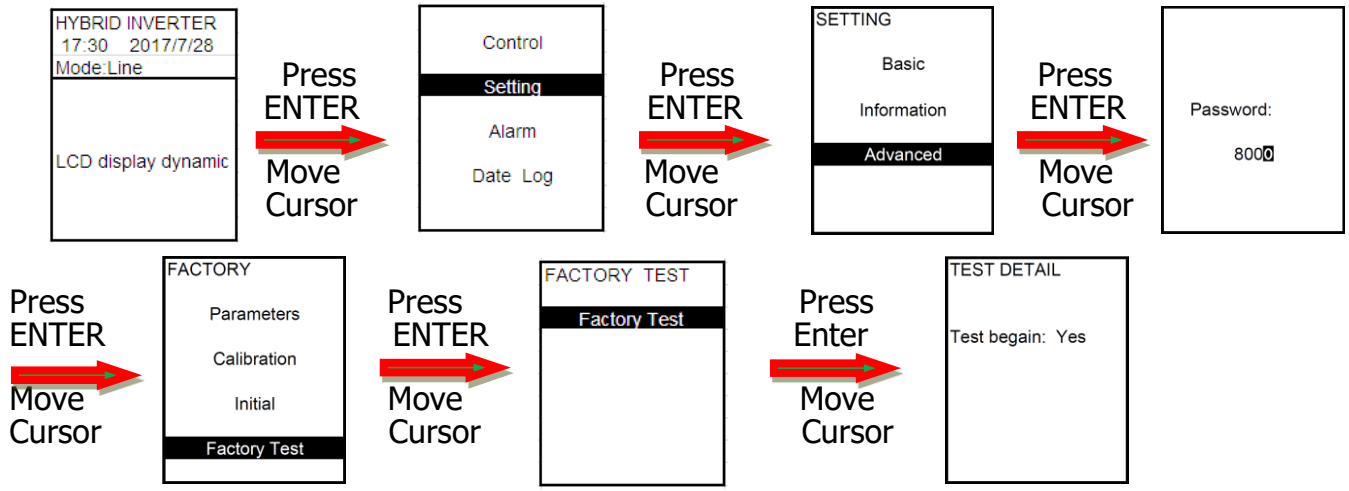
5.INVERTER Check after Assembly or maintenance

5.1 Preparation

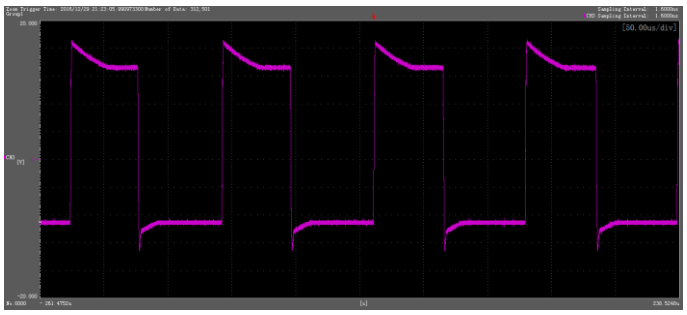
Make sure that the input, output and PV are off, and the battery is not damaged.
Check if Power rate components and wiring are significantly wrong.
Confirm that the input and output wiring (R-N/S-N/T-N/R-S/S-T/T-S) is not short-circuited.

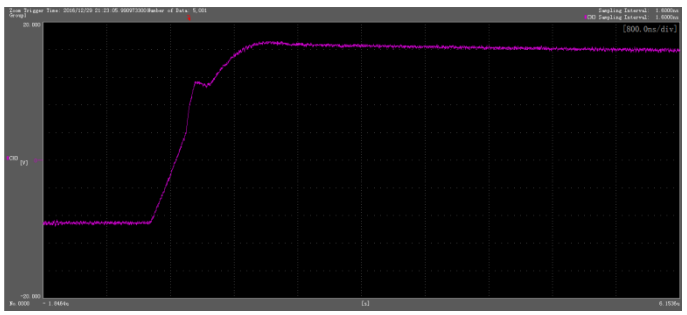
5.2 Measure the IGBT driver signal of the inverter

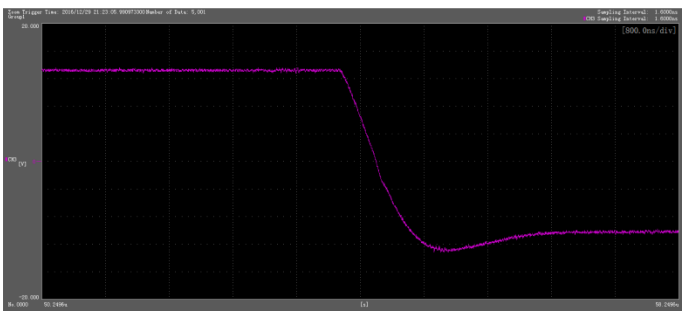
a) Only close the input switch (to confirm the PV and the battery switch are off.)
b) Press "Pulse Test" in the "Factory Test" Menu as below.
c)



d) Use the oscilloscope probe to measure the waveform between the IGBT side and the IGBT driver resistor of the inverter driver board and the corresponding driver ground, as shown in the diagram below:







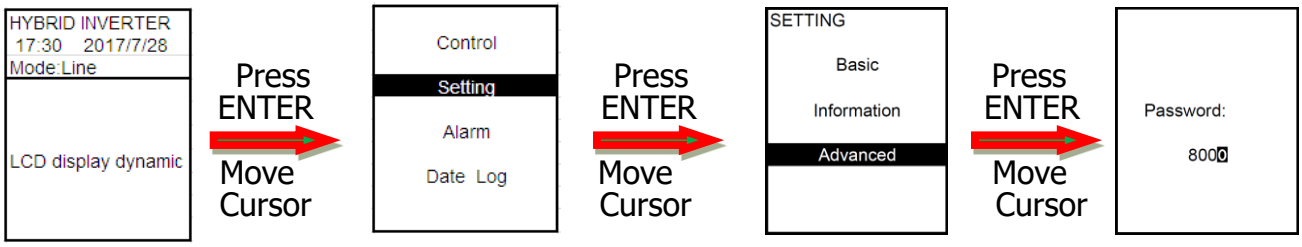
IGBT Open waveform IGBT Close waveform

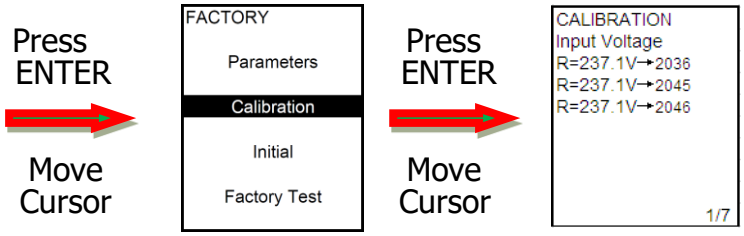
e) Confirm the waveform of the 6-arm driver signals. The maximum value is 15V, the minimum value is -10V.

5.3 Voltage and current calibration

5.3.1 The machine shuts down and cuts off the mains supply to short-circuit the output UVWN, and then Connect the machine to mains and restart it. The operation steps of calibrating the zero bias of the output voltage and current inverter voltage and current (the regulated range voltage is less than 0.2V and the current is less than 0.2A) are as follows

5.3.2 Please follow the procedure below to enter "calibration" in the "Factory Setup" Menu





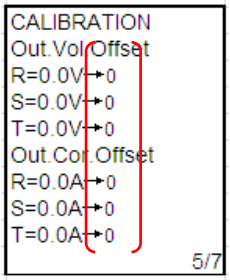
(Note: if there is no password, you can't calibrate the parameter)

5.3.3 The list of parameters need to be corrected.

Inverter voltage approaches zero	R-N,S-N,T-N
Output voltage approaches zero	R-N,S-N,T-N
Input Voltage	R-N,S-N,T-N
Output Voltage	R-N,S-N,T-N
Inverter Voltage	R-N,S-N,T-N
BUS Voltage	---
Battery Voltage	---
Output Current	R,S,T
Inverter Current	R,S,T
Recharging Current	---
Charging Current approaches zero	---

5.3.4 The voltage of inverter approaches zero, the output voltage is zero and parameter calibration.

a) Only switch on the input and the INVERTER operates in standby mode.
b) Follow the procedure in 5.4.2 to enter the parameter calibration below.

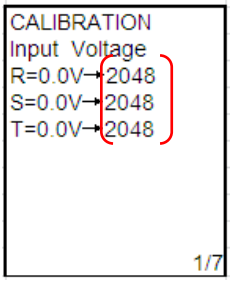


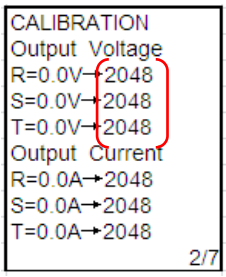
c) Press <ENTER>. the adding value on the right "XXXX" will flash.You can use <UP> and <DOWN> to adjust the display value on the left side of the LCD to zero (Note: The left side of the LCD display Value will change during calibration)
d) Press <ENTER> to confirm the setting (Do not use <ECS>, it can't save the data.)
e) Correct the voltage and output voltage of the 3-phase inverter in the same way.

5.3.5 Parameter Calibration of Input, output voltage

a) INVERTER is operating in inverter mode, no load is connected.

Follow the procedure in 5.3.2 to enter the parameter calibration below.



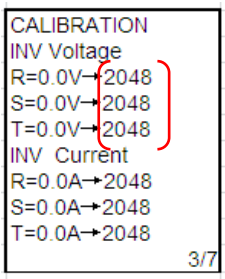


b) Press <ENTER>, the "XXXX" the adding value on the right will flash. You can use <UP>, and <DOWN> to adjust the LCD display to match the actual value of the multimeter measurement. (Note: The measured value on the left side will change during calibration)

c) Press <ENTER> to confirm the setting.
d) Correct the 3-phase input voltage and output voltage in the same way.

5.3.6 Parameter Calibration of inverter voltage

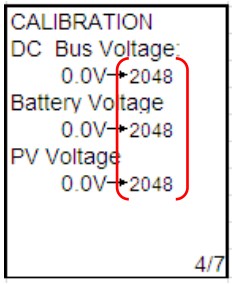
a) The INVERTER operates in inverter mode with 100% (or close to 100%) output.
b) Follow the procedure in 5.3.2 to enter the parameter calibration below.



c) Press <ENTER>, the adding value on the right will flash. You can use <UP>, and <DOWN> to adjust the LCD display to match the actual value of the multimeter measurement. (Note: the

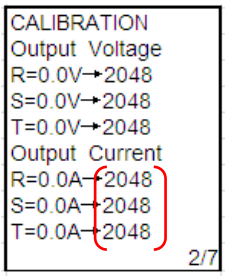
calibration can only change the actual measured value, the measured value on the left side of the LCD display will not be changed.)
d) Press <ENTER> to confirm the setting. (Do not use <ESC>, it can't save the data.)
e) Use the same method to correct inverter voltage of the other two-phase.

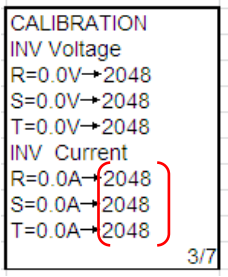
5.3.7 Parameter Calibration of Bus Voltage, battery voltage
a) The INVERTER is operating in inverter mode without any load.
b) Follow the procedure in 5.3.2 to enter the parameter calibration below.



c) When press <ENTER>, the adding value on the right "XXXX" will flash. You can use <UP>, and <DOWN> to adjust the LCD display to match the actual value of the multimeter measurement. (Note: The measured value on the left side will change during calibration)
d) Press <ENTER> to confirm the setting. (Do not use <ESC>, it can't save the data.)
e) Use the same method to correct the BUS voltage and battery voltage.

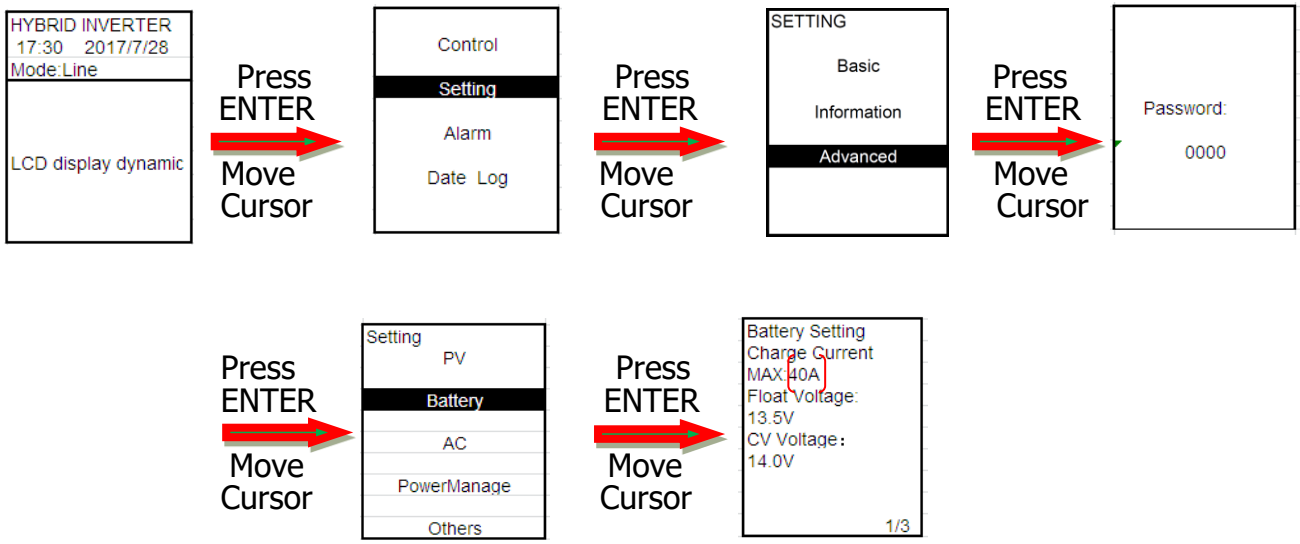
5.3.8 Parameter Calibration of Output current, and Inverter current
a) The INVERTER operates in inverter mode with 100% (or close to 100%) output.
b) Follow the procedure in 5.3.2 to enter the parameter calibration below.



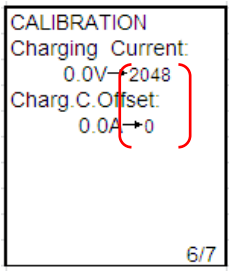


c) When press <ENTER>, the adding value on the right "XXXX" will flash. You can use <UP>, and <DOWN> to adjust the LCD display to match the actual value of the multimeter measurement. (Note: The measured value on the left side will change during calibration)
d) Press <ENTER> to confirm the setting. (Do not use <ESC>, it can't save the data.)
e)Use the same method to correct the output and inverter current.

5.3.9 Parameter Calibration of charge current, charge current zero deviation
a) The INVERTER operates in inverter mode and output without load.
b) Set the charging current based on the operation procedure.



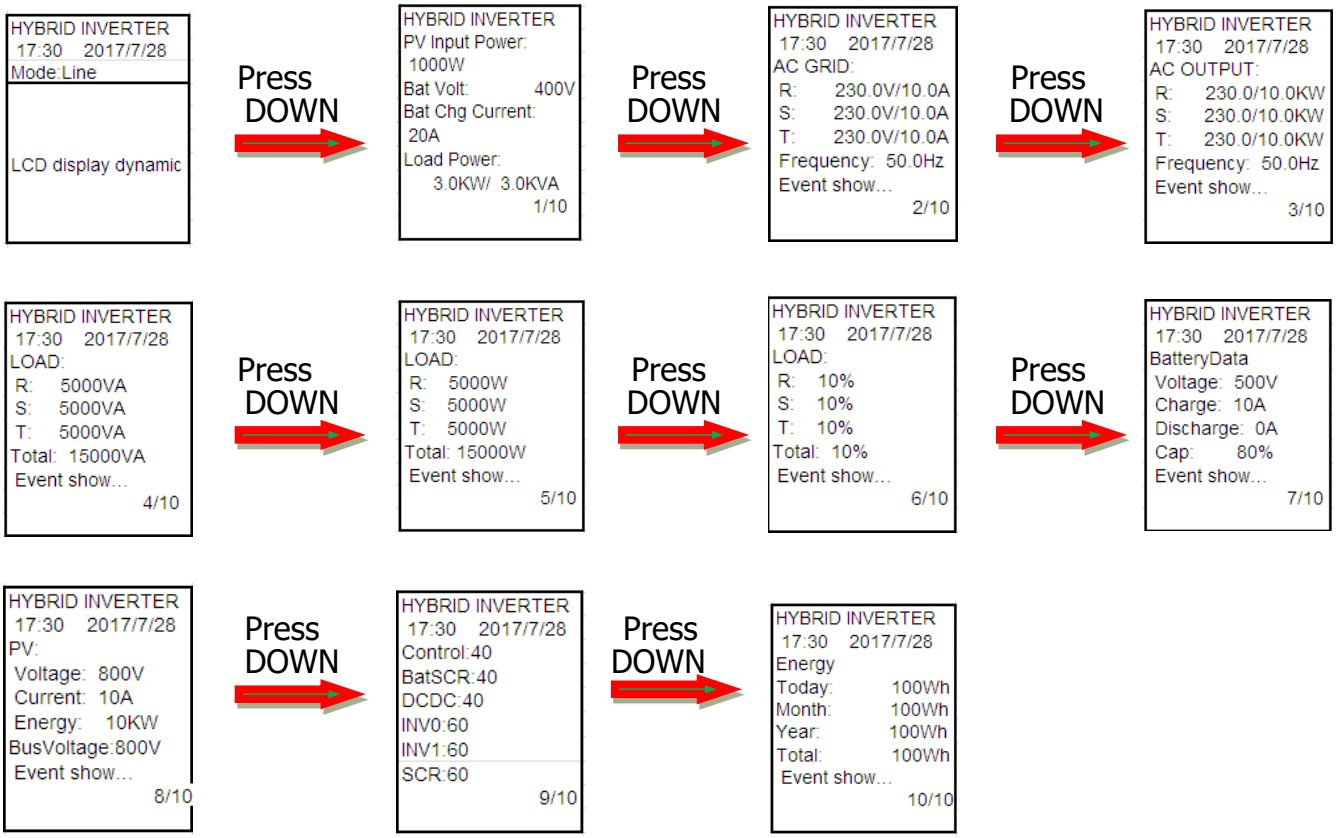
c) Follow the procedure in 5.3.2 to enter the parameter calibration below.



d) Press <ENTER>, the adding value on the right will flash. You can use <UP>, and <DOWN> to adjust the LCD display to match the actual value of the multimeter measurement. (Note: the calibration can only change the actual measured value, the measured value on the left side of the LCD display will not be changed.)

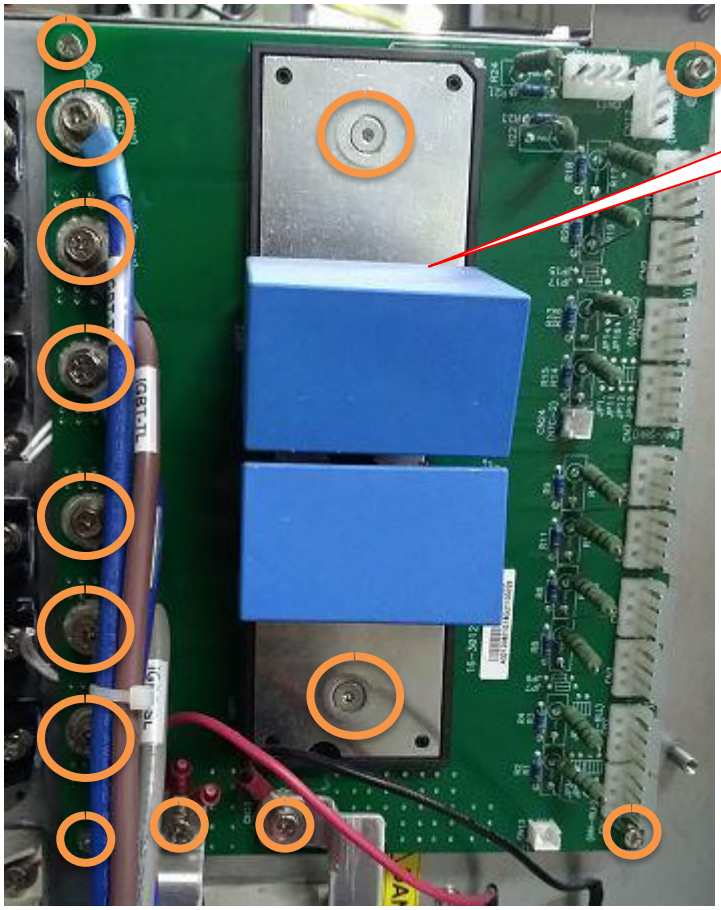
e) Press <ENTER> to confirm the setting. (Do not use <ESC>, it can't save the data.)

5.3.10 In the measurement menu below, check the difference between the LCD display value and the actual measure value of the multimeter/ current clamp and control within 1%.

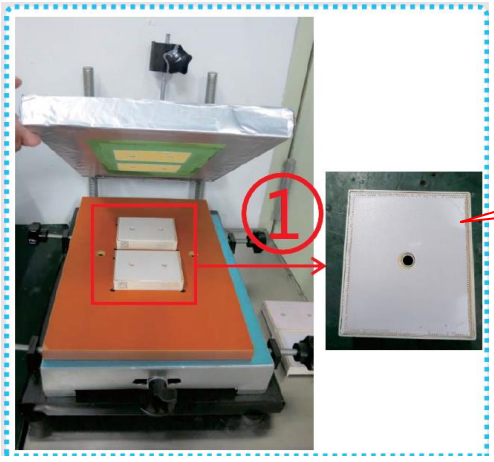


6.How to Replace Key Parts

6.1Circuit board (To take inverter power board as an example)

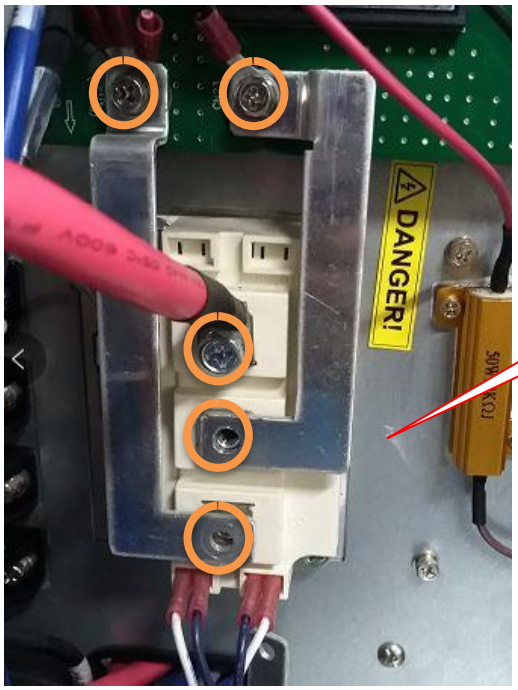


Remove the screws.

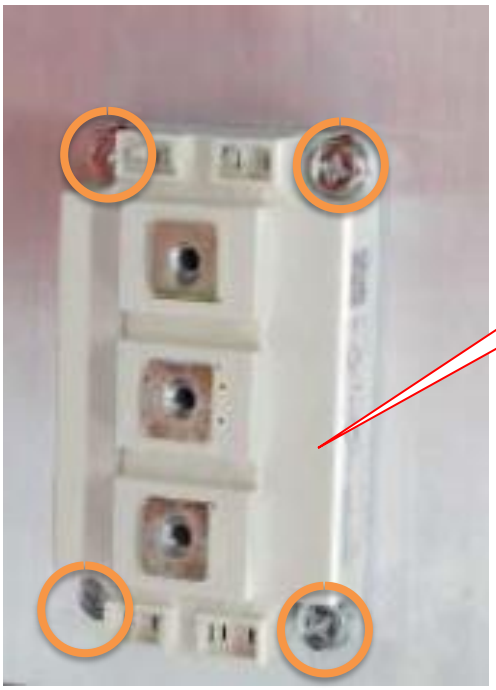


Replace the IGBT which was coated with heat dissipation, and damaged board. Put the wire back. Please be noted that the mounting position of the IGBT should be placed correctly.

6.2 IGBT Module

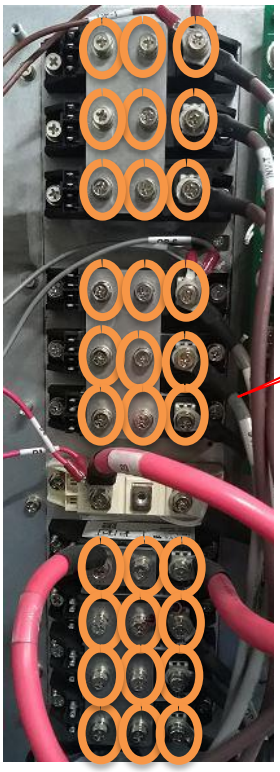


Remove the screws.



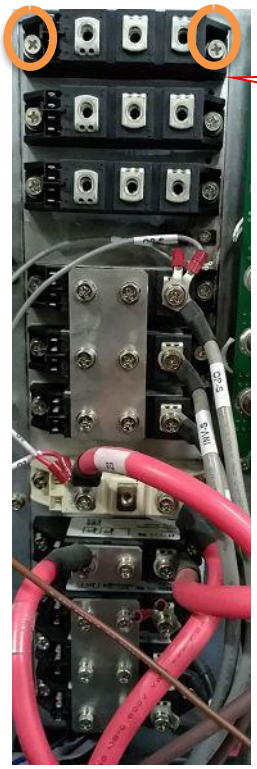
Remove the screws and replace the module

6.3 SCR Module



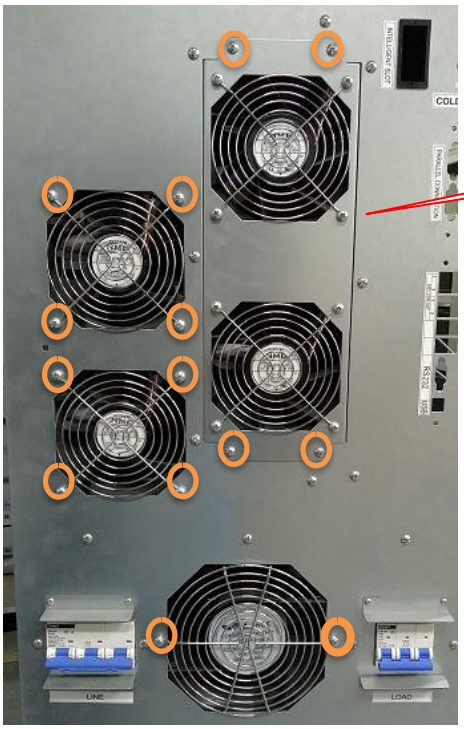
Remove the screws.

To take a SCR as an example



Remove the screws and replace the damaged module. Please be noted that the thermal paste should be coated evenly, and the polarity of the module pin should not be reversed.

6.4Cooling Fans



Remove the screws from the top

Change the broken fans

7.Other

7.2 Troubleshooting

a. Warning Code

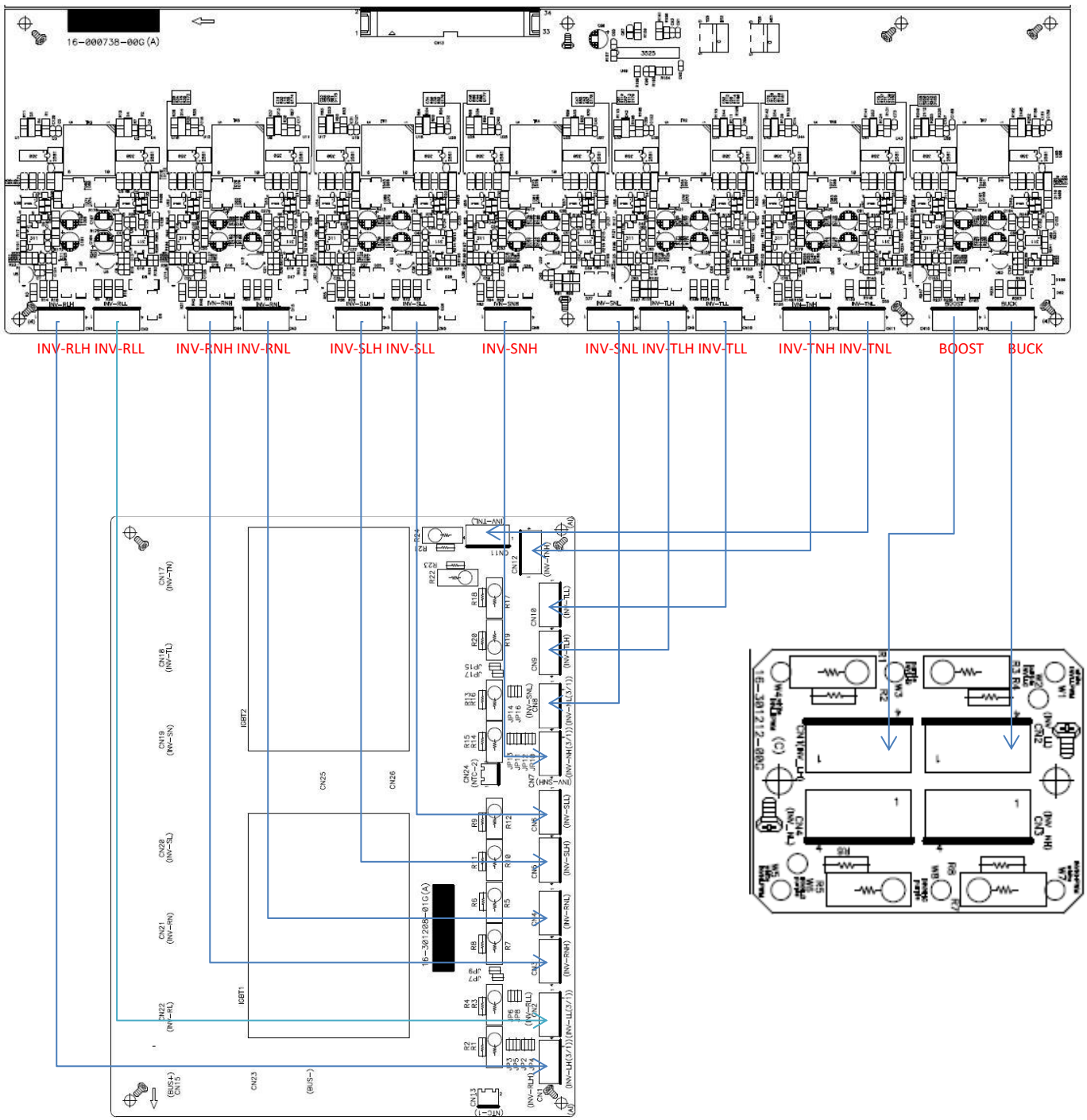
Code	Description	Possible Reasons
01	Battery is not connected.	Check if the battery is connected, the polarity is correct.
10	Mains Input Phase error	Check if the sequence of mains input phase is correct.
12	Overload	Reduce the load to the range of rated load.
11	EPO Open circuit	No short circuit EPO interface.
17	SolarLoss	PV voltage is too low.
13	DCDCOverTemp	Reduce the load or ambient operating temperature of the machine.
18	Inv0TempOver	
19	OPSCRTempOver	
20	Inv1TempOver	
21	BatSCRTempOver	
---	Change Battery	Reach the setting value of batter lifespan. Please replace the battery.
---	EEPROM Error	Restart the INVERTER. If you can't eliminate the error, please replace the control panel.
---	Battery Testing Fails	The battery voltage is too low. Charge the battery.
---	Parallel Wires loss	Check if the parallel communication cables is connected well and restart the INVERTER.

b. Fault Code

Code	Description	Possible Reasons
02	BUS High Voltage	It may be caused from frequent transient load.
03	BUS Low Voltage	Reduce the load. Please increase the charge current of the battery.
04	Inverter Soft start fails	Check if there is any damage in the inverter module. Restart the INVERTER. If the problem still exists, please contact service center.
34	Inverter High Voltage	Disconnect the load. If the INVERTER is normal after restart, please check the load.
33	Inverter Low Voltage	Disconnect the load. If the problem remains after restart, please contact service center.
40	R Phase Inverter Short	Disconnect the load. If the INVERTER is normal after restart, please check the load.
41	S Phase Inverter Short	Disconnect the load. If the INVERTER is normal after restart, please check the load.
42	T Phase Inverter Short	Disconnect the load. If the INVERTER is normal after restart, please check the load.
43	RS Phase Inverter Short	Disconnect the load. If the INVERTER is normal after

		restart, please check the load.
44	ST Phase Inverter Short	Disconnect the load. If the INVERTER is normal after restart, please check the load.
45	TR Phase Inverter Short	Disconnect the load. If the INVERTER is normal after restart, please check the load.
05	Inverter Overcurrent	Disconnect the load. If the INVERTER is normal after restart, please check the load.
---	R Phase Inverter IGBT overcurrent	Disconnect the load. If the INVERTER is normal after restart, please check the load.
---	S Phase Inverter IGBT overcurrent	Disconnect the load. If the INVERTER is normal after restart, please check the load.
---	T Phase Inverter IGBT overcurrent	Disconnect the load. If the INVERTER is normal after restart, please check the load.
---	Wrong wiring	Disconnect all power switches on the INVERTER and check the wiring.
46	Temp Over	Reduce the load or the ambient operating temperature.
47		
48		
49		
50		
51		
81	Processor communication failure	Restart the INVERTER. If the problem is still existing, contact the service center.
23	Overload	Reduce the loads
---	Synchronous action line error	1. If the parallel communication cable is connected well, please restart the INVERTER. 2. Re-plug the parallel communication cable, and check if the connection is proper. Then restart the INVERTER.
---	Wrong parallel line	
80	CAN Communication failure	
82	Parallel line lost	
---	Inconsistent output voltage	Use multimeter to measure if the output voltage of each stand-alone INVERTER is consistent.
71	Different parallel version	Contact the service center to update the version.
---	Synchronous action line lost	Turn off the INVERTER. Re-plug the parallel communication cable. Check if the connection is proper. Then restart the INVERTER.
---	Inconsistent parallel parameter	In standby mode, compare the parameters of the parallel INVERTERs, and correct them to same parameter.
17	Interruption of DSP and MCU communication	Restart the INVERTER. If the problem is still existing, contact the service center.
18	Firmware is not compatible	Restart the INVERTER. If the problem is still existing, contact the service center.
22	Battery High Voltage	Check if the voltage of batter is normal.

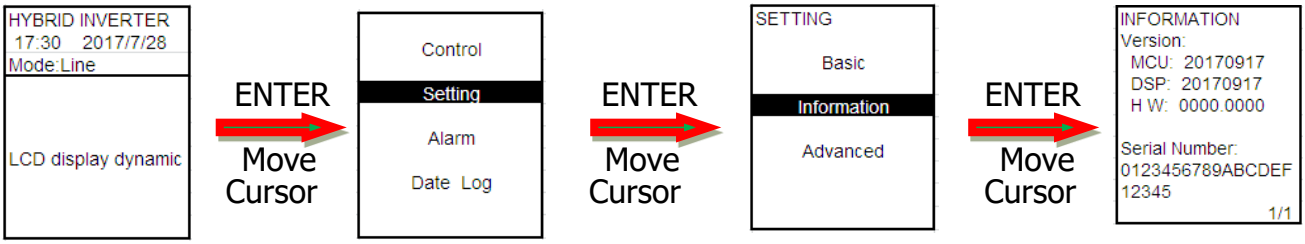
7.3 inverter module driver line (Attached with the high-definition drawings)



Dagram of Inverter IGBT driver line connection

7.4Inquire Software Versions

In the main screen, press <ENTER> to enter the information in the setup menu. The operation process is as below.



From the top to bottom, MCU version/ DSP version/LCD version

7.5Setting of Recharge Current

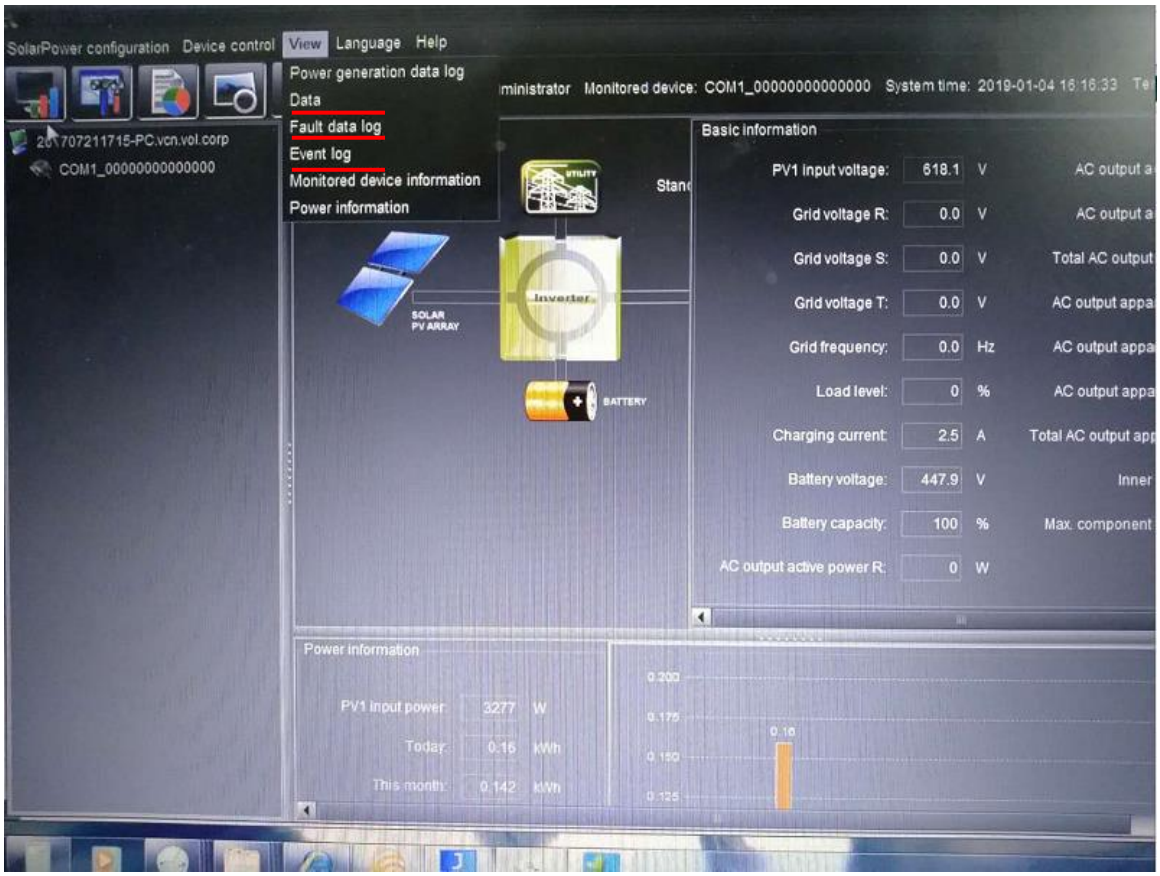
After setting the battery capacity, the maximum charging current of the battery will be automatically set based on 0.2*C (The C represents the battery capacity). Set the nominal charging current in the setting menu with the service passwords in 5.3.9.

7.6 INVERTER System Failure Restore

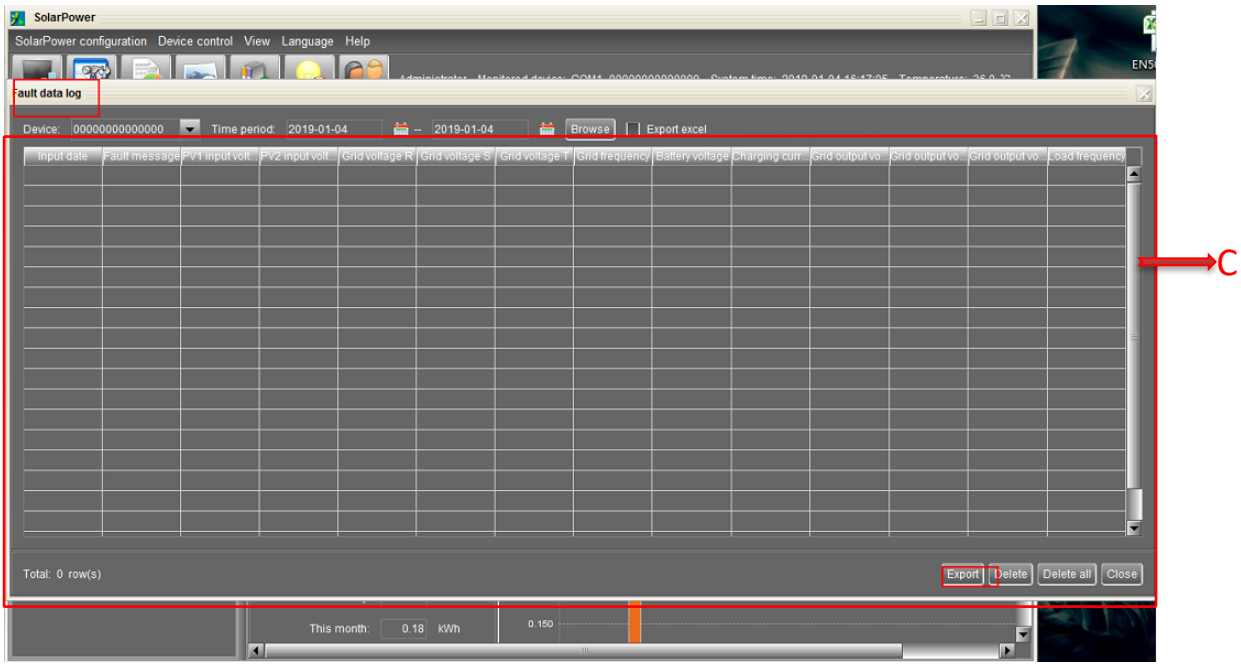
a. On the LCD screen of INVERTER2, press <ENTER> and go to "Control" in the main menu, and then press <ENTER> and select "Turn Off" and confirm the selection.
b. Disconnect the output switch.
c. Disconnect input switch
d. Disconnect the PV switch
e. Disconnect the battery switch
f. Restore the INVERTER

7.7Download of History Record

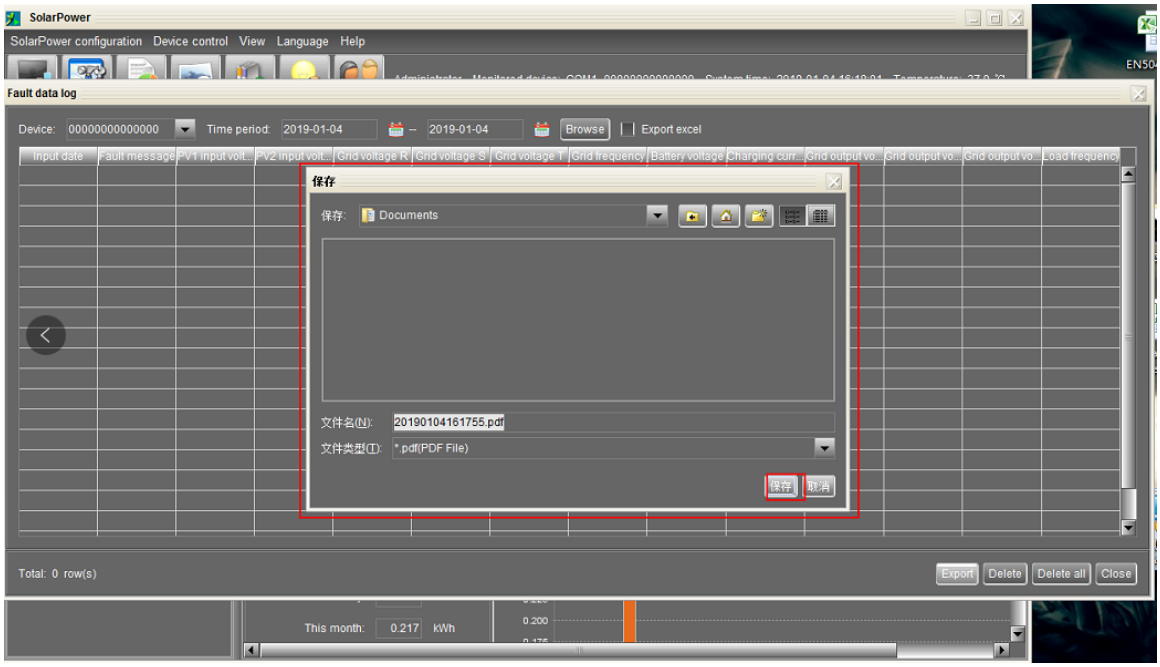
a. Prepare one notebook, and connect it with RS232 on the USB communication board.
b. Open the software SolarPower, please click "View" and the following interface shows.



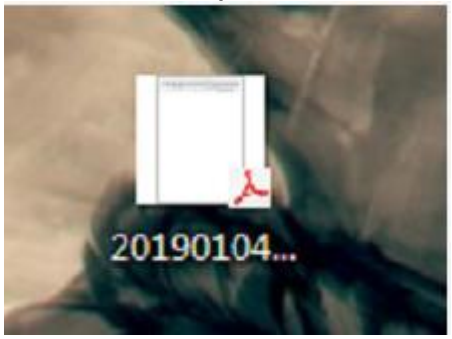
c. Take "Fault date log" as an example . If you need to retrieve the data record, please click "load.' when all data are recorded, they will be shown in the C square marked below.



d. If you need to export the history, click "export" and then create the file name. Select the file format and save it.



e. After executing the operation above, the user will see XLS file. Double click the files and you will see the history record.



7.8 Power Cable Connection

7.8.1Preparation

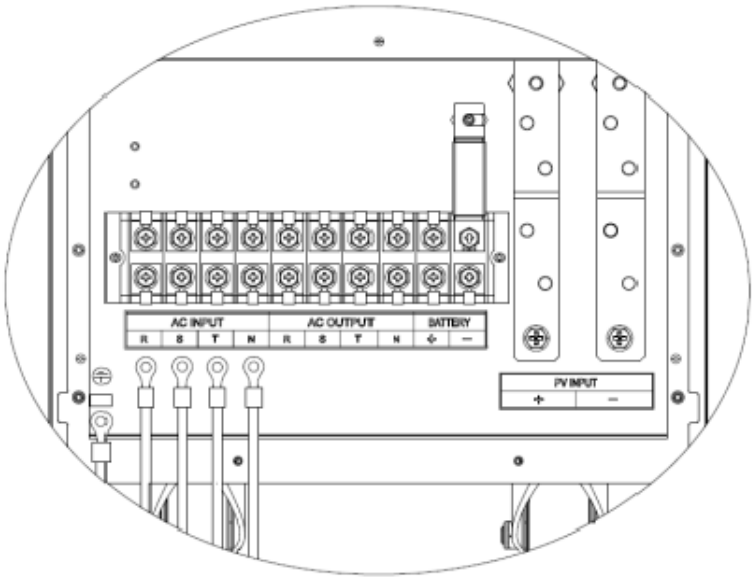
Before connecting to AC utility, please install a separate AC circuit breaker between inverter and AC utility. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of AC input.

WARNING! It is very important for system safety and efficient operation to use appropriate cable for battery connection. To reduce risk of injury, please use the proper recommended cable size as below.

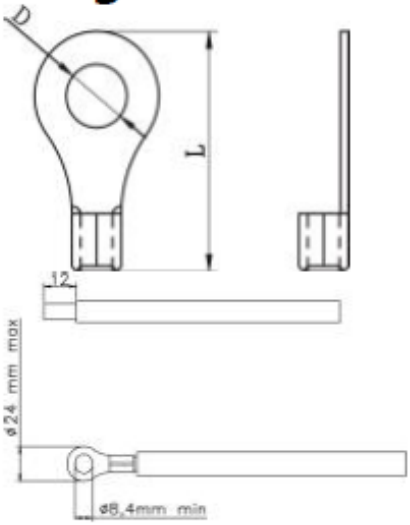
Nominal Grid Voltage	230VAC
Conductor cross-section (mm^2)	8
AWG no.	8

7.8.2 Connecting to the AC Utility

The interior view is shown below.



Ring terminal:



⏚→Ground (yellow-green)

R Phase→LINE (black)

Y Phase→LINE (gray)

B Phase→LINE (brown)

N→Neutral (blue)

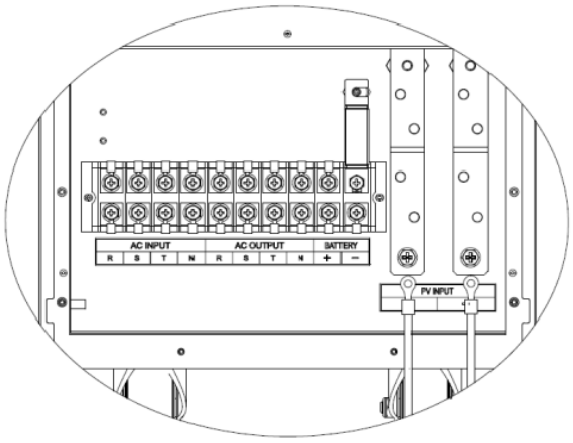
Connect AC Utility power cable, please refer the following table.

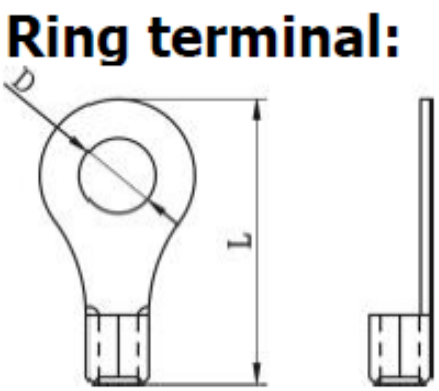
Wire Size	Ring Terminal			Torque value
	Cable mm^2	Dimensions		
		D (mm)	L (mm)	
8 AWG	8	8.4	29	12.0 Nm

CAUTION: To prevent risk of electric shock, ensure the ground wire is properly earthed before operating this hybrid inverter no matter the grid is connected or not.

7.8.3 PV Module (DC) Connection

PV wiring diagram is as follows:





Check correct polarity of connection cable from PV modules and PV input connectors . Then,connect positive pole(+)of connection cable to positive pole(+) of PV input connector .Connect negative pole(-) of connection cable to negative pole(-) of PV input connector.

Connect PV Module power cable, please refer the following table.

Wire Size	Ring Terminal			Torque value
	Cable mm^2	Dimensions		
		D (mm)	L (mm)	
6 AWG	14	8.4	32	12.0 Nm

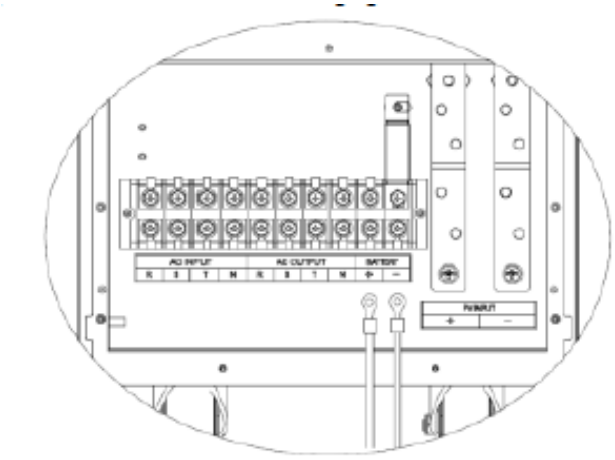
Recommended Panel Configuration

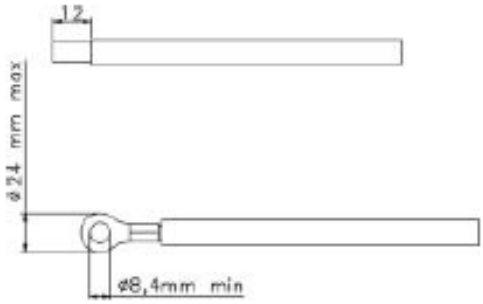
Solar Panel Spec. (reference)	# PV modules (Min in serial: 12pcs; Max. in serial: 21pcs)	Q'ty of panels	Total Input Power
- 300Wp - Vmp: 36.7Vdc - Imp: 6.818A - Voc: 44Vdc - Isc: 7.636A - Cells: 72	21pcs in serial	21pcs	6300W
	21 pcs in serial, 5 strings in parallel	105pcs	31500W
	21 pcs in serial, 7 strings in parallel	147pcs	44100W
	19 pcs in serial, 8 strings in parallel	152pcs	45600W

7.8.4Battery Connection

RED cable to the positive terminal(+);

BLACK cable to the negative terminal(-);



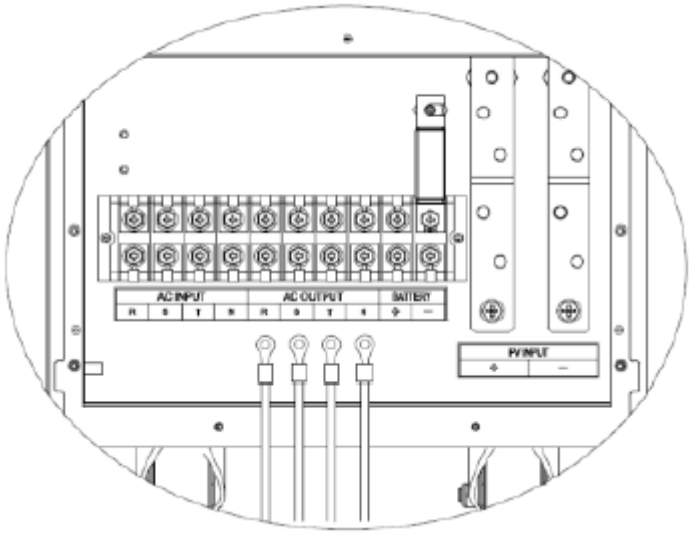


WARNING! It is very important for system safety and efficient operation to use appropriate cable for battery connection. To reduce risk of injury, please use the proper recommended cable size as below.

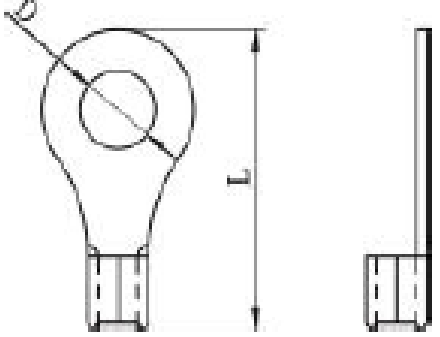
Nominal Battery Voltage	384V
Conductor cross-section (mm^2)	22
AWG no.	4

7.8.5Load(AC Output) Connection

The interior view is shown below.



Ring terminal:



 →**Ground (yellow-green)**

R Phase→LINE (black)

Y Phase→LINE (gray)

B Phase→LINE (brown)

N→Neutral (blue)

Recommended wire and terminal size:

Wire Size	Ring Terminal			Torque value
	Cable mm^2	Dimensions		
		D (mm)	L (mm)	
8 AWG	8	8.4	29	12.0 Nm

WARNING! It is very important for system safety and efficient operation to use appropriate cable for AC connection. To reduce risk of injury, please use the proper recommended cable size as below.

Model	30KW
Nominal Grid Voltage	230VAC
Conductor cross-section (mm^2)	8
AWG no.	8

7.9 RS232 Communication

Connect the computer with USB to RS232 (or use the supplied USB cable) and connect with INVERTER communication board. Click the SolarPower on your computer. At this moment, The serial number of the machine is always displayed in the upper left corner of the software and it presents the connection is completed. Enter the monitoring interface as below.

Fig1 in Inverter mode

Fig2 in Bypass with AC charging Mode

Fig3 in Standby with PV charging mode

7.10 SNMP Communication Card

Features of SNMP Web Pro:

a. Open monitor via Web Browser.

b. Offer SNMP MIB to monitor Inverter status.

c. Automatically detect and exchange 10M/100M Fast Ethernet.

d. Supported protocol such as TCP/IP, UDP, SNMP, SMTP, SNTP, HTTP, HTTPS, SSL, SSH, TELNET, IPV4/IPV6, DHCP and so on.

e. Able to store more than 200,000 threads of event log, including Inverter warnings, faults and EMD warnings, operation data logs from web users or SolarPower pro users. It will be stored safely without data loss even when power failure occurs.

f. Support daily reports for event log and data log.

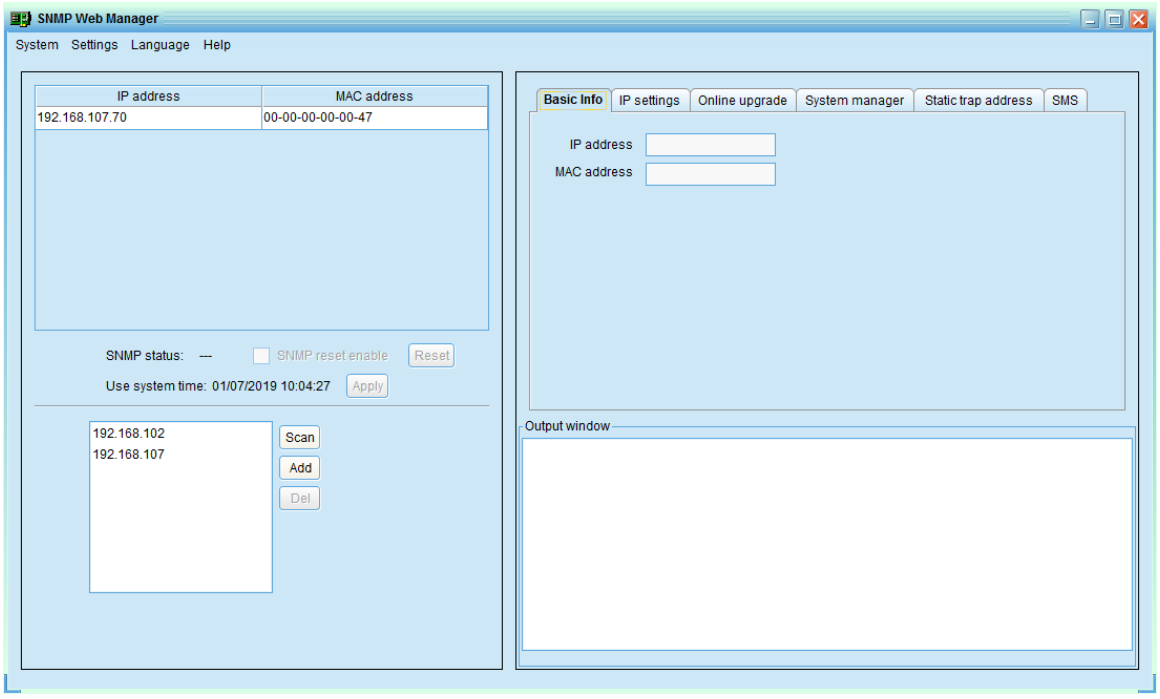
g. Simultaneously upload UPS data to http servers.

h. Support EMD monitoring and SMS service.

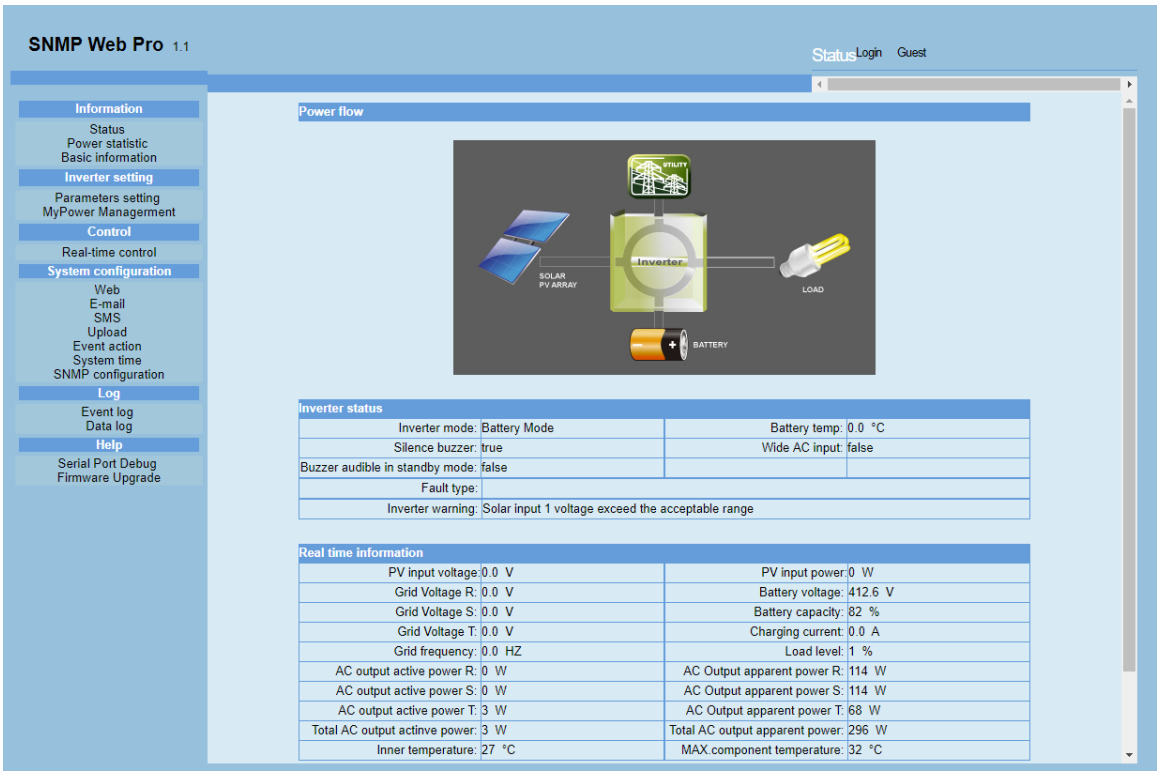
i. Set with real-time clock to record log by date and keep running up to 7 days even without power connection.

Please install SNMP Web Manager then enter specific IP address to search all SNMP devices in LAN. Open the monitoring page by double-clicking on the IP address.

Service Manual for Hybrid 30KW PV Inverter

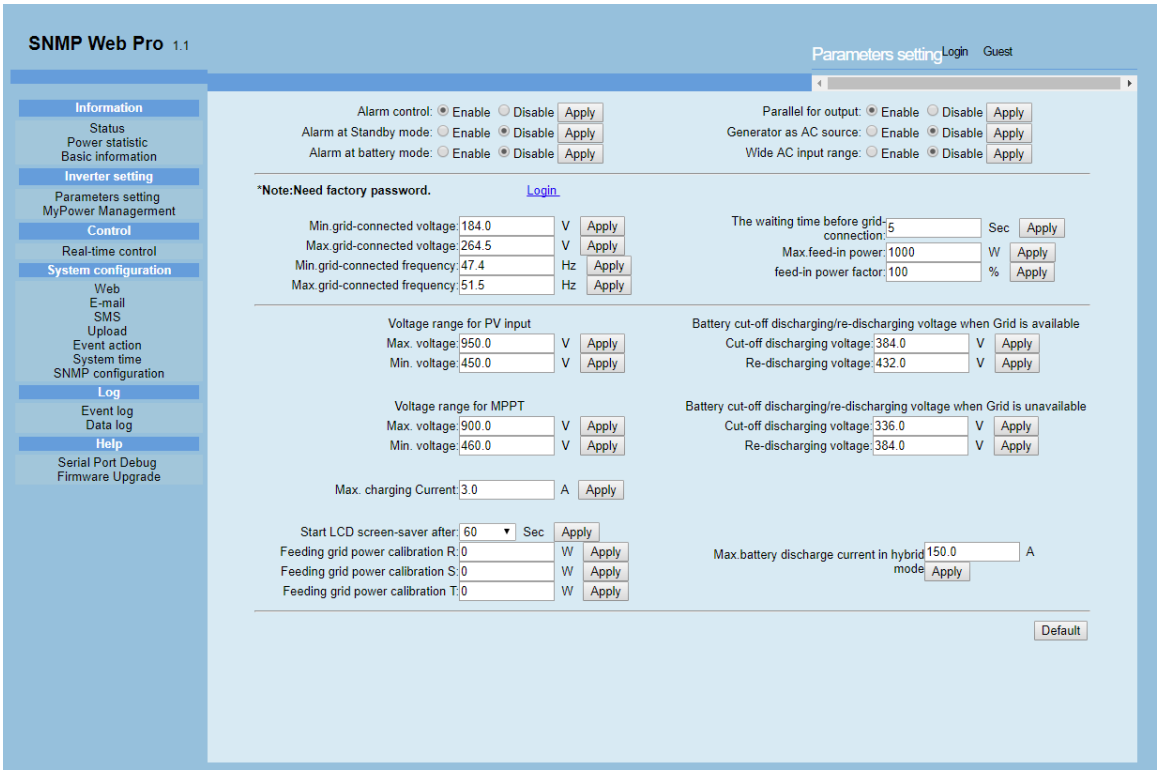


Status

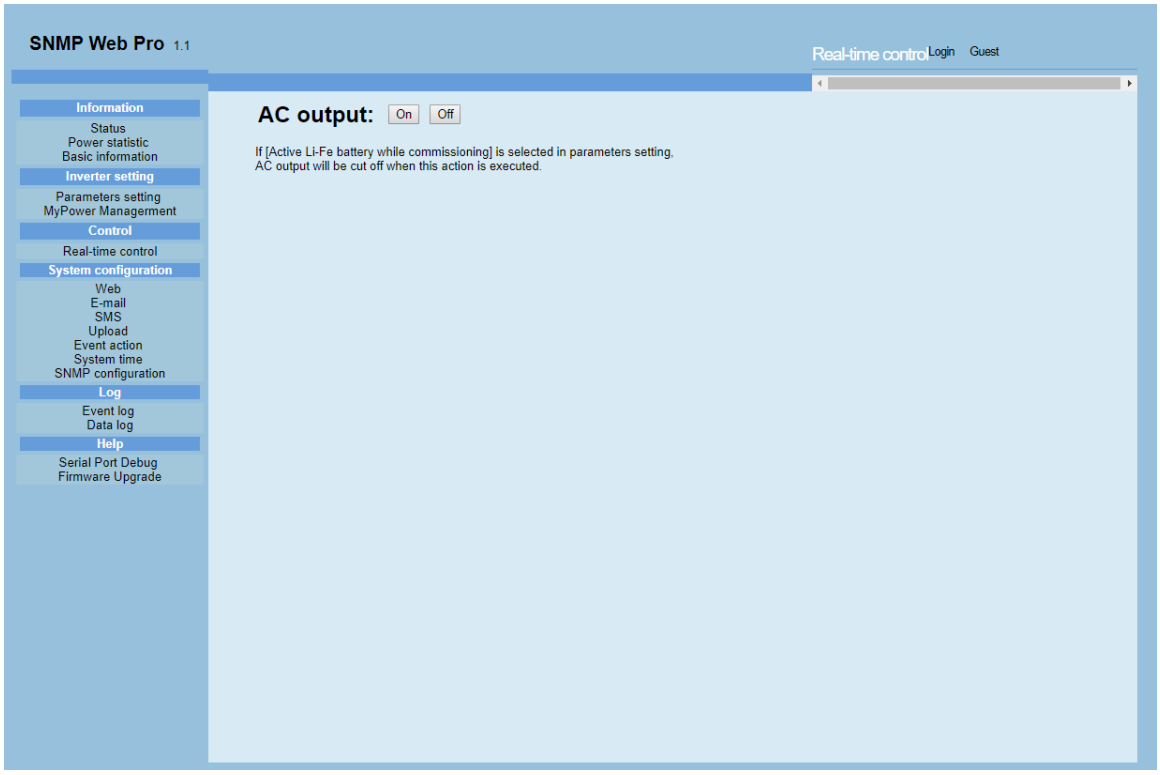


Inverter setting

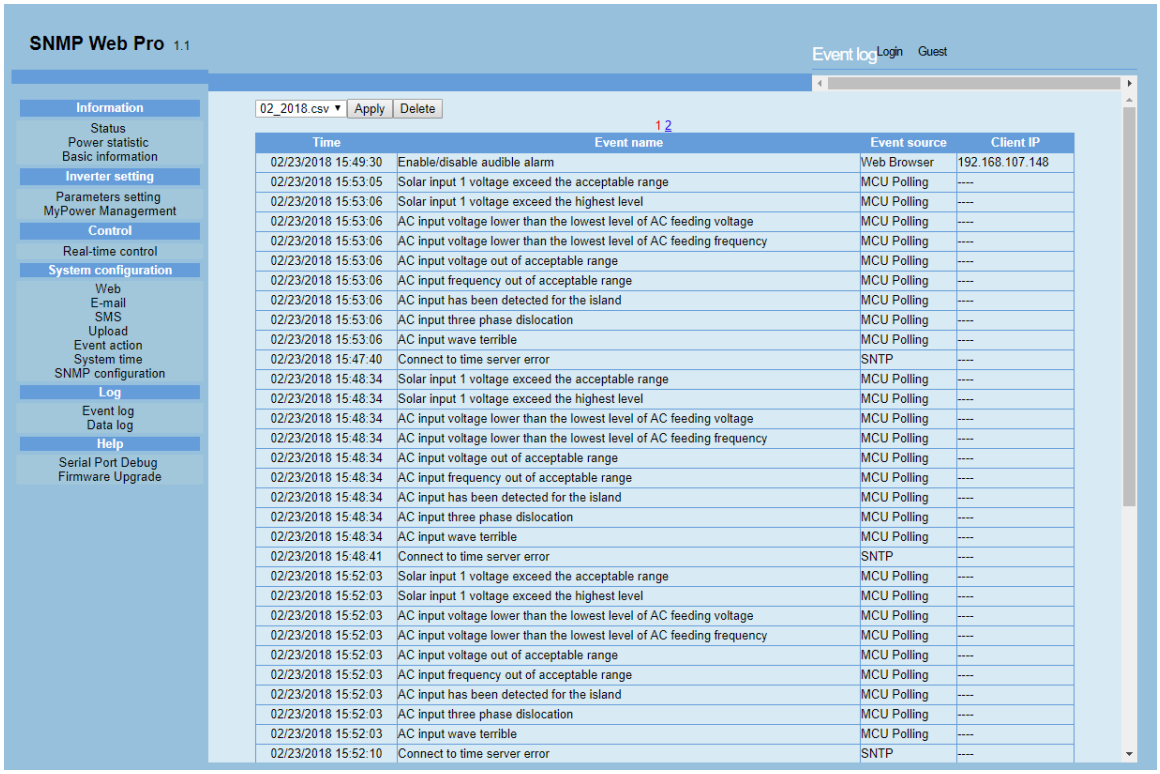
Service Manual for Hybrid 30KW PV Inverter



Control Interface

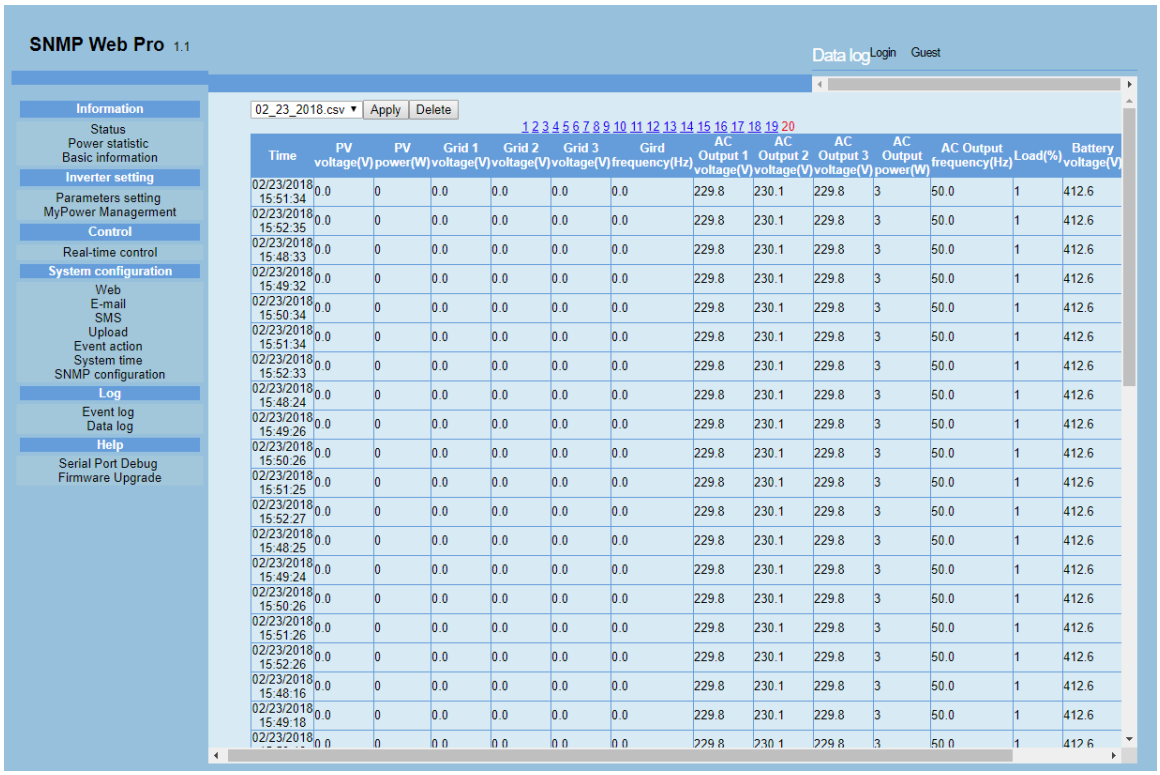


Event Journal



Date log

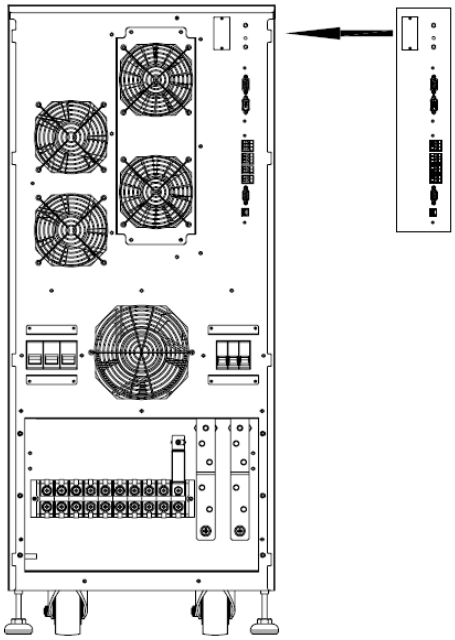
Service Manual for Hybrid 30KW PV Inverter



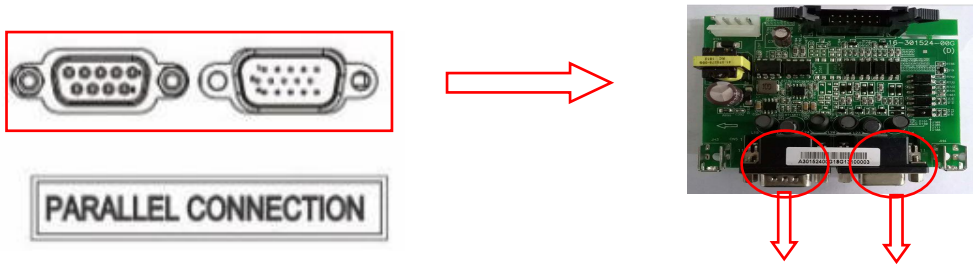
Time	PV voltage(V)	PV power(W)	Grid 1 voltage(V)	Grid 2 voltage(V)	Grid 3 voltage(V)	Gird frequency(Hz)	AC Output 1 voltage(V)	AC Output 2 voltage(V)	AC Output 3 voltage(V)	AC Output power(W)	AC Output frequency(Hz)	Load(%)	Battery voltage(V)
02/23/2018 15:51:34	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6
02/23/2018 15:52:35	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6
02/23/2018 15:48:33	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6
02/23/2018 15:49:32	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6
02/23/2018 15:50:34	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6
02/23/2018 15:51:34	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6
02/23/2018 15:52:33	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6
02/23/2018 15:48:24	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6
02/23/2018 15:49:26	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6
02/23/2018 15:50:26	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6
02/23/2018 15:51:25	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6
02/23/2018 15:52:27	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6
02/23/2018 15:48:25	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6
02/23/2018 15:49:24	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6
02/23/2018 15:50:26	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6
02/23/2018 15:51:26	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6
02/23/2018 15:52:26	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6
02/23/2018 15:48:16	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6
02/23/2018 15:49:18	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6
02/23/2018	0.0	0	0.0	0.0	0.0	0.0	229.8	230.1	229.8	3	50.0	1	412.6

8. Change Single INVERTER to Parallel INVERTER

8.1 Overview



8.2 The hardware toinstall all hardware configurations

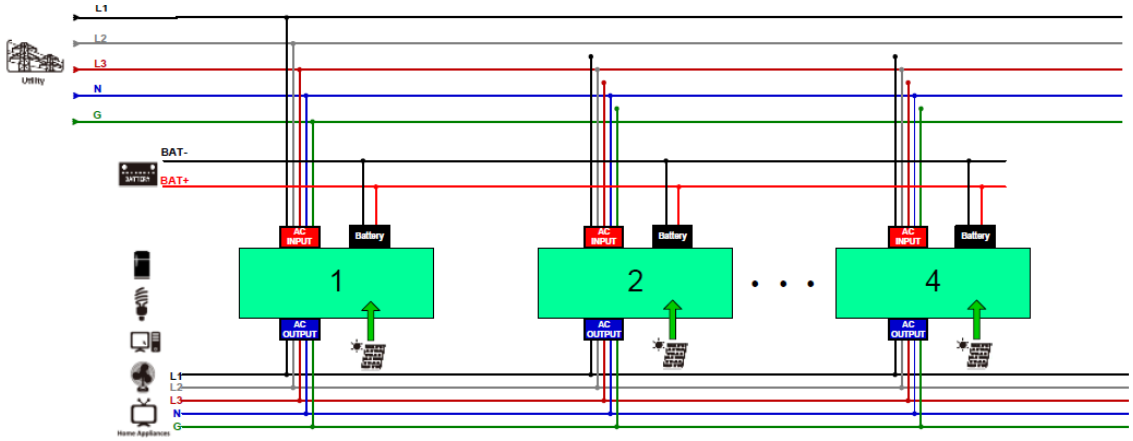


15pins Female PinMale Pin 15pins

Compared to the stand-alone INVERTER, a parallel board should be added to communication interface

8.3 Connect the power cable to the communication cable.

The capacity of the parallel INVERTER must be identical. According to wiring in the diagram below.



8.3.1 Input Cable

The input cable of each INVERTER to the power cable of the distribution cabinet should use the same diameter and length. Be sure to confirm the sequence of phase is the same.

8.3.2 Output Cable

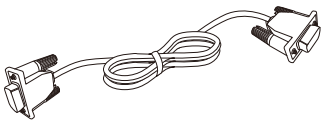
The output of each INVERTER to the feeder cabinet power cable must use the same diameter and length. Be sure to confirm the sequence is consistent.

8.3.3 Battery Cable

INVERTER in the parallel system has its battery pack and the battery pack can be shared.

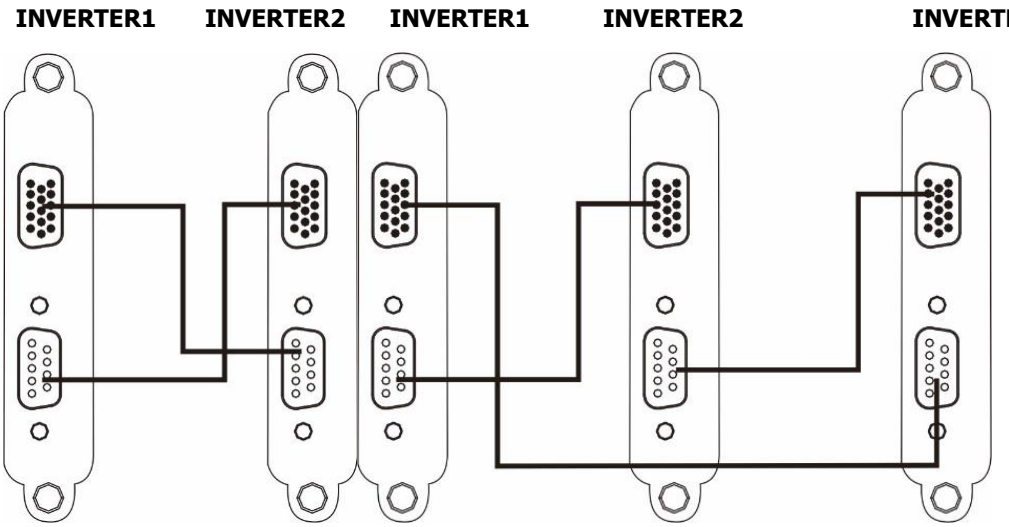
8.3.4 Communication Cable

a. The following parallel communication lines are about 5 meters long.



b. Connection of Communication cable

As shown in the diagram below, the parallel cables cross connect to form a circle. Use a screw to fix them firmly, and avoid communication failure because of loose cables



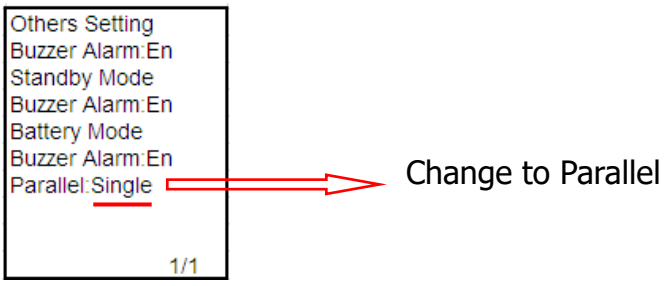
Connection Diagram of
Two stand-alone Parallel system

Connection diagram of three stand-alone
Parallel System

8.4Parallel Adjustment (Take 2 stand-alone parallel as an example)

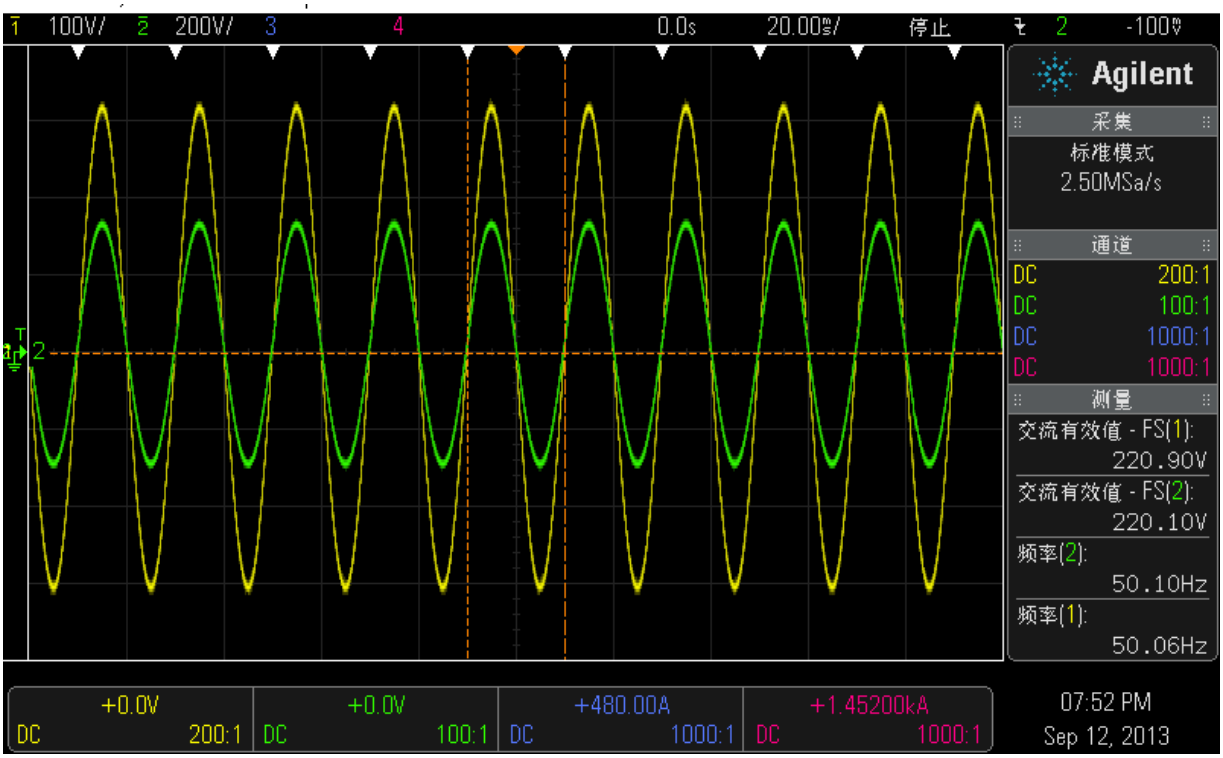
The default setting of the INVERTER is stand-alone. If you want to change it into parallel operation, you need to set the INVERTER in the display. You should have the service engineering code "XXXX" provided by the service engineer to execution the alternation.

press <ENTER>, Go to the "Setting" and select "Advanced" Enter the password "0000" and set the "Others" of the INVERTER. Select "parallel" as shown below. Last, cut off the power and save.



Close the two INVERTER input switch and Battary(output switch off), the oscilloscope two probes were hooked up two INVERTER inverter capacitors at both ends, the INVERTER1 and INVERTER2 boot, the system are in the Inverter Mode output, observe oscilloscope Ch1 and Ch2 are synchronized (same frequency, same amplitude, same phase), as shown below. If they didn't synchronize, shut down the two INVERTER, check the wiring, and then repeat this steps until the two INVERTER synchronize.

Then the synchronization waveform is as follows: CH1 INVERTER inverter voltage, CH2 INVERTER inverter voltage.



If they synchronize, close the two INVERTER output switch and test and confirm the characteristics of exchange current.

INVERTER1 and Inverter2 are running in the inverter mode, with linear full load, and with the current clamp meter to measure and record the output current value of each phase of the two INVERTER. Calculate the parallel load current imbalance required ≤ 5%, the formula is：Yi=||

Where, Yi- load current unbalance (whichever is greater) Io- Output
Other, Im- parallel output of the maximum and minimum
current in a single system: n- Number of INVERTER

a. After shut down the Invertor1, lock the ones without output. The load is supplied by Invertor2.

b. After shut down Invertor2., Invertor1 and Invertor2 turn into in Standby with PV charging mode.

c. Invertor1 and Invertor2 are in parallel operation. At the time, both Invertor turn into inverter output. Each Invertor take 50% of the load.

9.Guidance of Single and Parallel System Maintenance & Operation at Customer Site.

9.1 A separate system from the operation (Take INVERTER2 as an example)

g. On the LCD screen of INVERTER2, press <ENTER> and go to "Control" in the main menu, and then press <ENTER> and select "Turn Off" and confirm the selection.
h. Disconnect the output switch.
i. Disconnect input switch
j. Disconnect the PV switch
k. Disconnect the battery switch
l. The parallel system is powered by INVERTER1

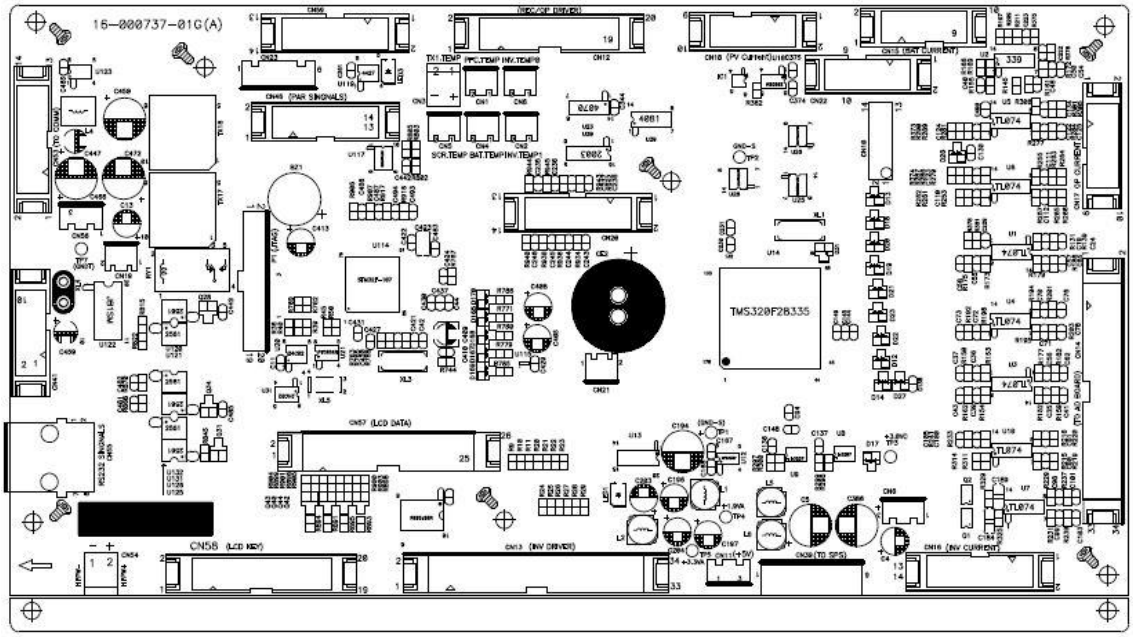
9.2 Operation by a single system (Take INVERTER2 as an example)

a. On the LCD screen of INVERTER2, press <ENTER> and go to "Control" in the main menu, and then press <ENTER> and select "Turn Off" and confirm the selection.
b. Disconnect the output switch.
c. Disconnect input switch
d. Disconnect the PV switch
e. Disconnect the battery switch
f. The output R/S/T/N of INVERTER1 connect to the output R/S/T/N of INVERTER2, The same output phase is shorted together.
g. Connect the battery switch
h. Connect the PV switch
i. Connect input switch
j. Connect the output switch.
k. On the LCD screen of INVERTER1 and INVERTER2, press <ENTER>, Go to the "Setting" and select "Advanced" Enter the password "0000" and set the "Others" of the INVERTER. Select "parallel"
l. . Last, cut off the power and save.
m. On the LCD screen of INVERTER1 and INVERTER2, press <ENTER> and go to "Control" in the main menu, and then press <ENTER> and select "Turn On" and confirm the selection.

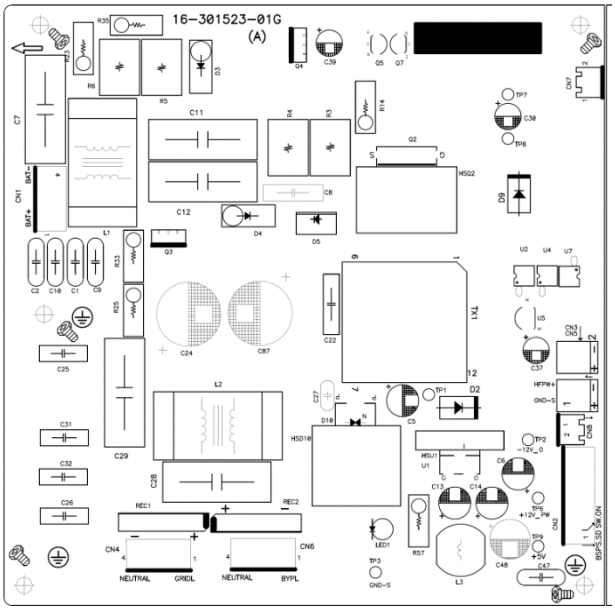
g.The parallel system is supplied by INVERTER1 and INVERTER2 simultaneously.

10. PCB Layout

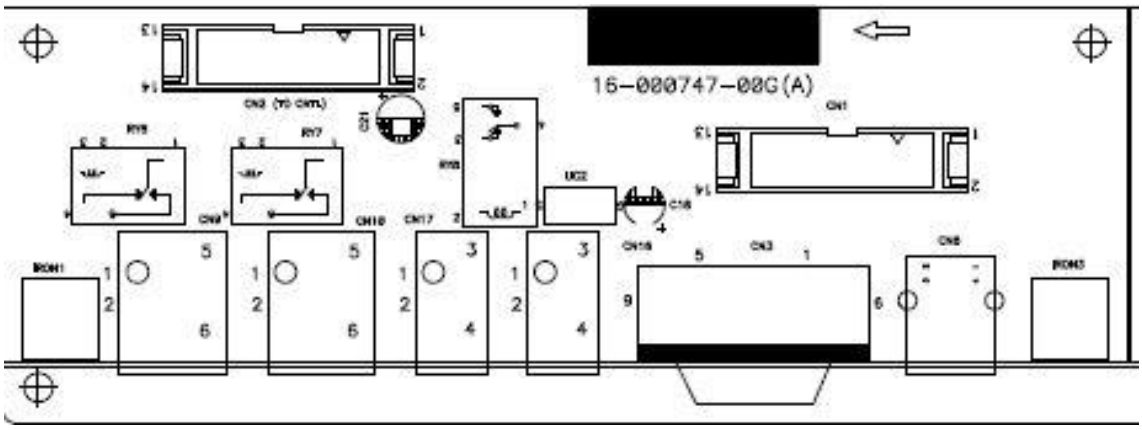
Control Board



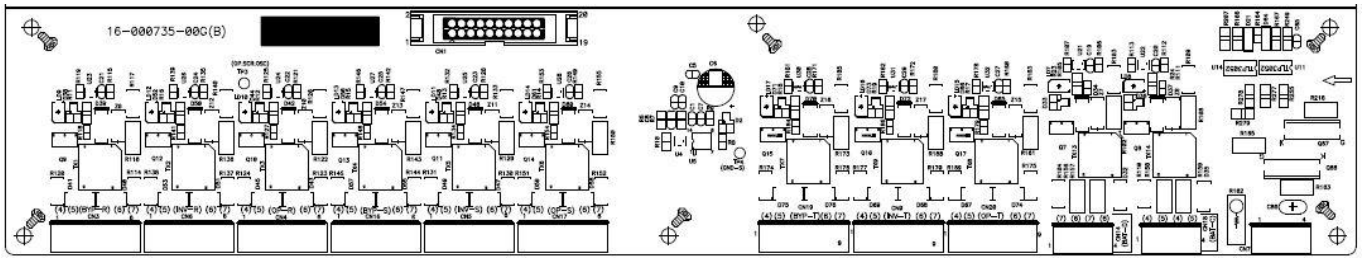
Power Board



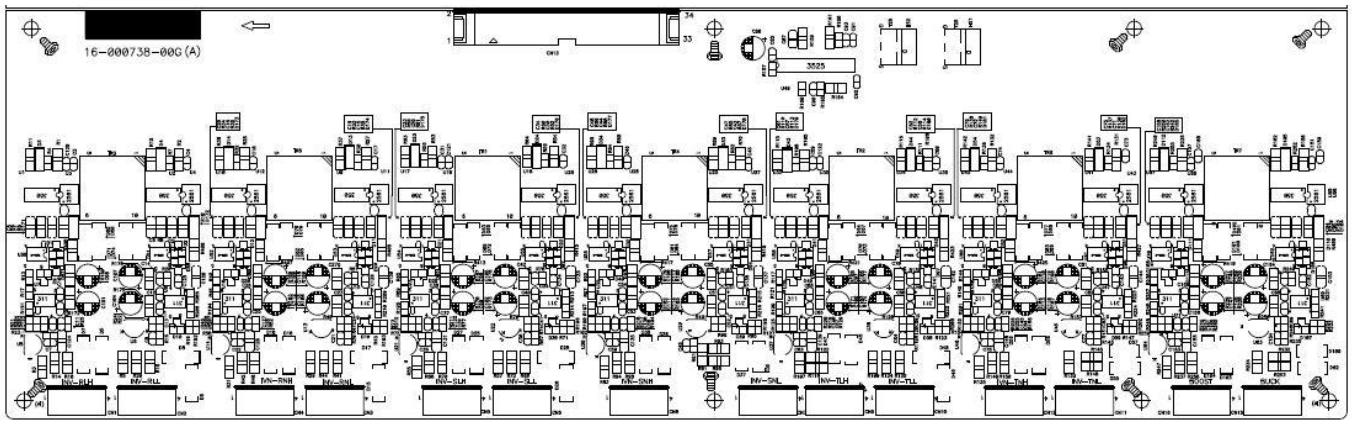
Communication Board



SCR Driver



Inverter Control Board



Voltage Sampling Board