GTEC UPS MODEL:

NOVA 40 kVA

SERVICE MANUAL

www.gtec-power.eu

Preface

Model Description

This manual is applicable to the following models:

Model	Type
NOVA-40	Tower Online UPS

Using an object

For qualified technical support engineer or Maintenance engineer only.

Notice

1. No part of this manual may be reproduced or transmitted in any form or by any means without the prior written permission of the company.

2. The manual will update irregularly, due to the product upgrading or other reasons.

Unless otherwise agreed，the manual is only used as guide for technical support engineer or Maintenance engineer, all of information contained in this manual make no warranty expressed or implied.

Safety Precautions

This manual contains information concerning the installation and operation of Modular UPS. Please carefully read this manual prior to installation.

The Modular UPS cannot be put into operation until it is commissioned by engineers approved by the manufacturer (or its agent). Not doing so could result in personnel safety risk, equipment malfunction and invalidation of warranty.

1) Safety Message Definition

Danger: Serious human injury or even death may be caused, if this requirement is ignored.

Warning: Human injury or equipment damage may be caused, if this requirement is ignored.

Attention: Equipment damage, loss of data or poor performance may be caused, if this requirement is ignored.

Commissioning Engineer: The engineer who installs or operates the equipment should be well trained in electricity and safety and familiar with the operation, debug, and maintenance of the equipment.

2) Warning Label

The warning label indicates the possibility of human injury or equipment damage, and advises the proper step to avoid the danger. In this manual, there are three types of warning labels as below.

Labels	Description
 Danger	Serious human injury or even death may be caused, if this requirement is ignored.
 Warning	Human injury or equipment damage may be caused, if this requirement is ignored.
 Attention	Equipment damage, loss of data or poor performance may be caused, if this requirement is ignored.

3) Safety Instruction

 Danger	✧ Performed only by commissioning engineers. ✧ This UPS is designed for commercial and industrial applications only, and is not intended for any use in life-support devices or system.

 Warning	✧ Read all the warning labels carefully before operation, and follow the instructions.
 Hot	✧ When the system is running, do not touch the surface with this label, to avoid any hurt of scald.
 ESD	✧ESD sensitive components inside the UPS, anti-ESD measure should be taken before handling.

4) Move & Install

 Danger	✧Keep the equipment away from heat source or air outlets. ✧In case of fire, use dry powder extinguisher only, any liquid extinguisher can result in electric shock.
 Warning	✧ Do not start the system if any damage or abnormal parts founded. ✧ Contacting the UPS with wet material or hands may be subject to electric shock.
 Attention	✧Use proper facilities to handle and install the UPS. Shielding shoes, protective clothes and other protective facilities are necessary to avoid injury. ✧ During positioning, keep the UPS way from shock or vibration. ✧ Install the UPS in proper environment.

5) Debug & Operate

 Danger	✧ Make sure the grounding cable is well connected before connecting the power cables, the grounding cable and neutral cable must be in accordance with the local and national codes practice. ✧Before moving or re-connecting the cables, make sure to cut off all the input power sources, and wait for at least 10 minutes for internal discharge. Use a multi-meter to measure the voltage on terminals and ensure the voltage is lower than 36V before operation.
 Attention	✧ The earth leakage current of load will be carried by RCCB or RCD. ✧Initial check and inspection should be performed after long time storing of UPS.

6) Maintenance & Replacement

 **Danger**	✧ All the equipment maintenance and servicing procedures involving internal access need special tools and should be carried out only by trained personnel. The components that can only be accessed by opening the protective cover with tools cannot be maintained by user. ✧ This UPS full complies with "IEC62040-1-1-General and safety requirements for use in operator access area UPS". Dangerous voltages are present within the battery box. However, the risk of contact with these high voltages is minimized for non-service personnel. Since the component with dangerous voltage can only be touched by opening the protective cover with a tool, the possibility of touching high voltage component is minimized. No risk exists to any personnel when operating the equipment in the normal manner, following the recommended operating procedures in this manual.

Contents

1. Product structure

1.1 Inner Structure

The NOVA-40 consisting of follow parts: control PCB, control interface PCB, Fan interface PCB, input SCR PCB, output EMI PCB, PFC rectifier PCB, inverter PCB, auxiliary power supply PCB, charge PCB, rectifier signal PCB, inverter signal PCB and *Inductors.*

See annex A.

2. UPS Topology and Operational principle

2.1 Topology

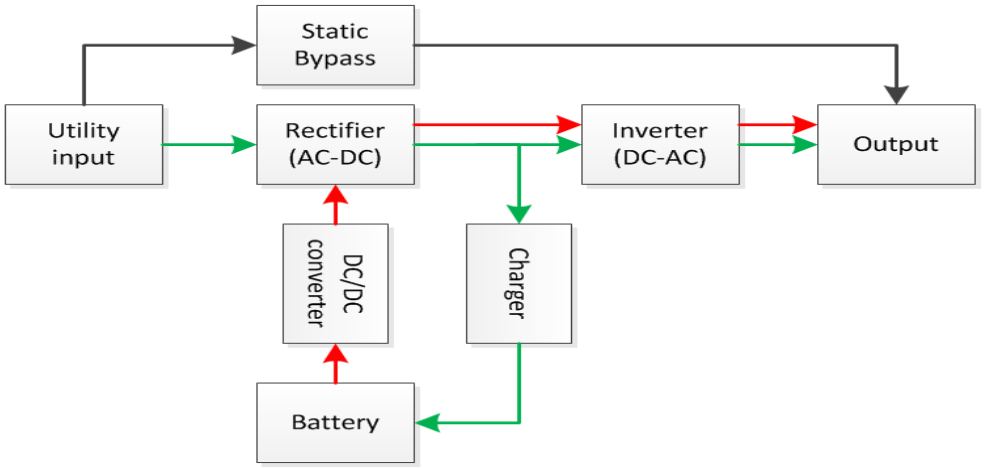
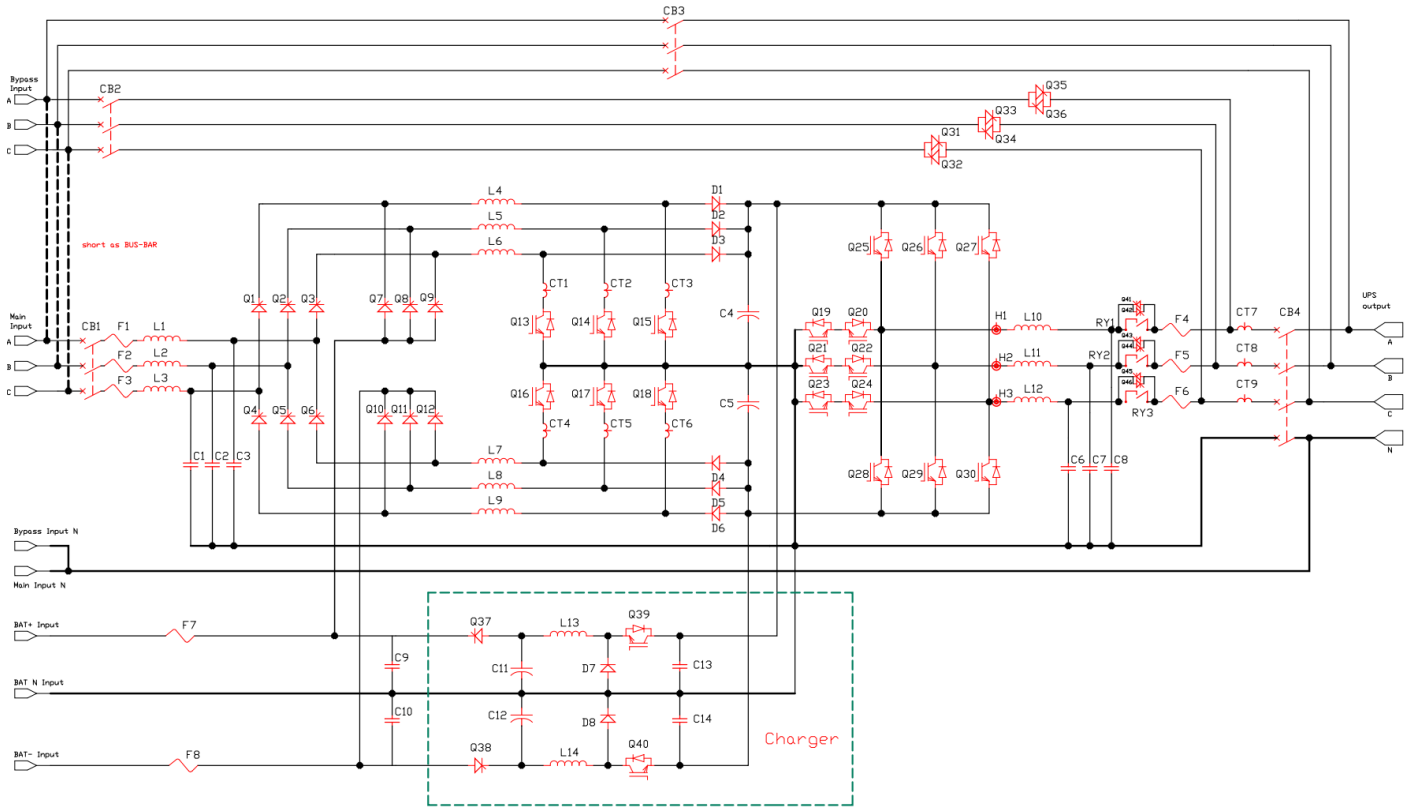


Fig.2-1 Uninterruptible Power Supply schematic diagram



Attention: Battery breaker disconnect internal battery

Fig.2-2 NOVA-40 topology

3. Components introduction and Service

3.1 Control Board

The detailed introduction of control board is shown as below:

J5: CAN communication;
J4: Power supply from auxiliary supply board;
J31: Temperature control;
J12: Identify module ID, short 7&8 pin for test service;
J8: Inverter voltage detect， inverter relay control signal etc.;
J3: Bypass detect and output voltage detect;
J2: SCR drive, battery voltage detect and input voltage detect, relay control;
J16: Outlet temperature detect;
J19: Control charger board

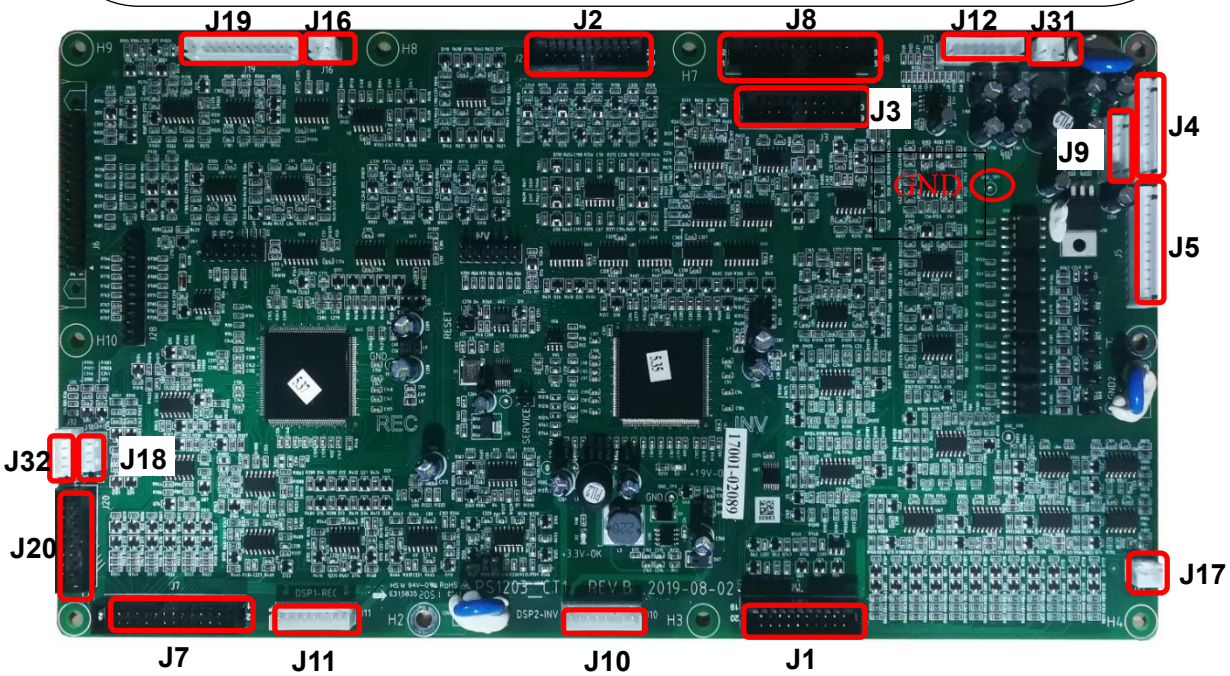


Fig.3-1 Control board introduction

J32: Temperature detect (on the heat sink);
J18: 24V and 3.3V power source;
J20: LED display; power for fans; fans detect;
J7: PFC drive and BUS detect;
J11: PFC TXD&RXD;
J10: INV TXD&RXD;
J1: Inverter drive and +15V power source;
J17: Inlet temperature detection.

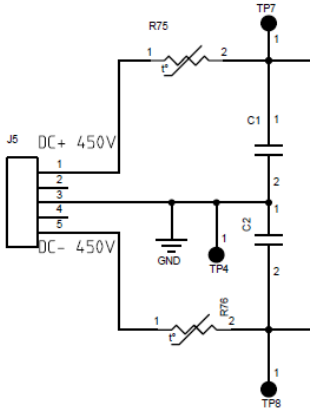
3.1.1 POWER SUPPLY

PW3

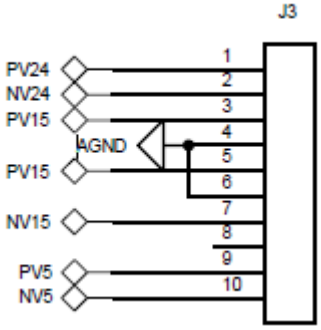
J5 Supply voltage arrive from:

EMI 1 board (by-pass) connector J5,
DR1 PCB connector J34 (input main) ,
CP1 board connector J8 (+ / – bus voltage)

Important: The cable from CP1-J8 to DR1-J34 is protect by fuse 5x20 put on the cable



J3 Auxiliary voltage
To control board CT1



3.2 Control Interface Board

The detailed introduction of control interface board is shown as below:

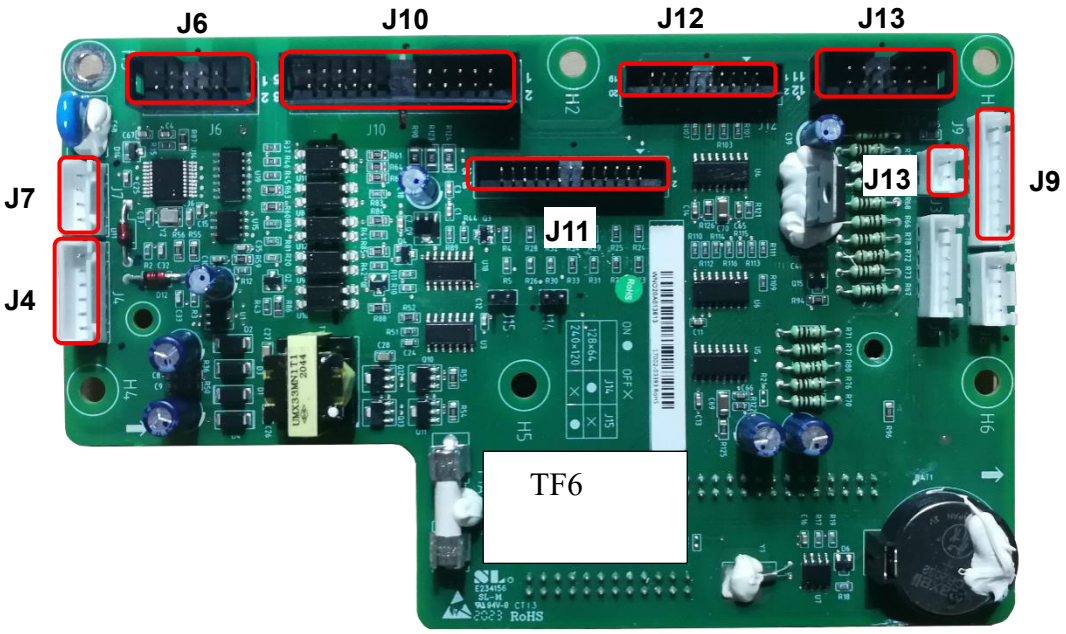


Fig.3-2 Control interface board introduction

J6: SNMP port;
J10: Parallel port;
J11~12: LED display;
J13: Dry contact port;
J9: Power and control bypass;
J7: USB port;
J4: Communication port.

3.3 Input SCR Board DR1

Functionality

Input, LC, Battery Input, Power Supply, Connector, Voltage detect

Main SCR, battery SCR, SCR driver port, snubber

Main Input SCR driver

Battery SCR driver

Charger

3.3.1 The Detailed Introduction of Input SCR Board

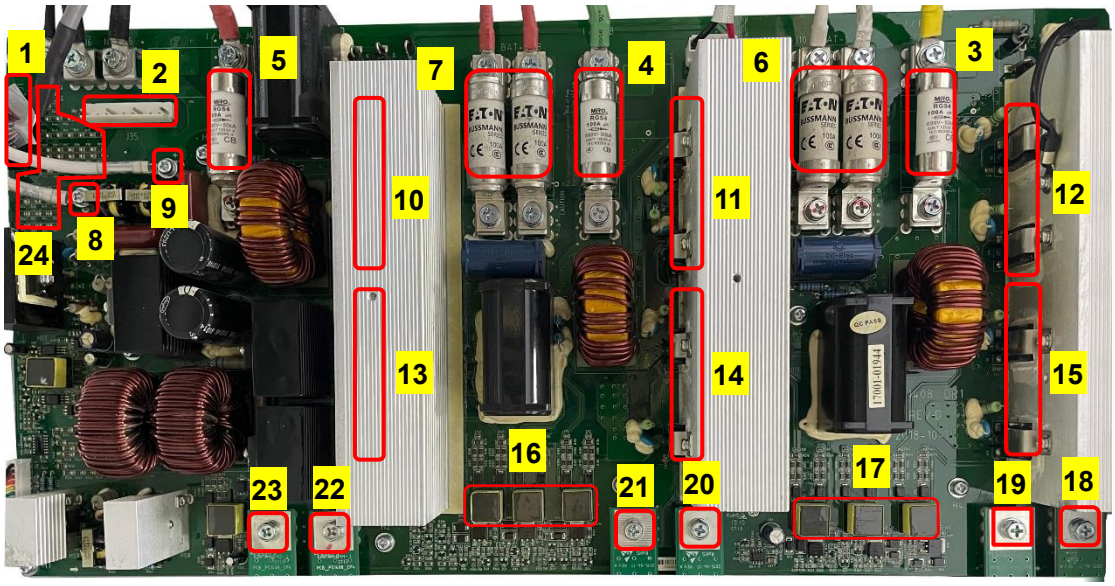


Fig.3-3 Input SCR board introduction

1: J1: Sampling
2: J35: Charger input
3: J2/J24: Input A fuse
4: J3/J26: Input B fuse
5: J4/J28: Input C fuse
6~7: BAT－,BAT+ fuses
8~9: BUS－,BUS+
10~12: Input SCR
13~15: Battery SCR
16~17:SCR driver
18: J16: REC_A－
19: J15:REC_ A+
20: J18: REC_B－
21: J17:REC_ B+
22: J19: REC_C－
23: J20: REC_C+
24: Sampling resistance

All fuse in the PCB are BS88-690V type 100A AR action

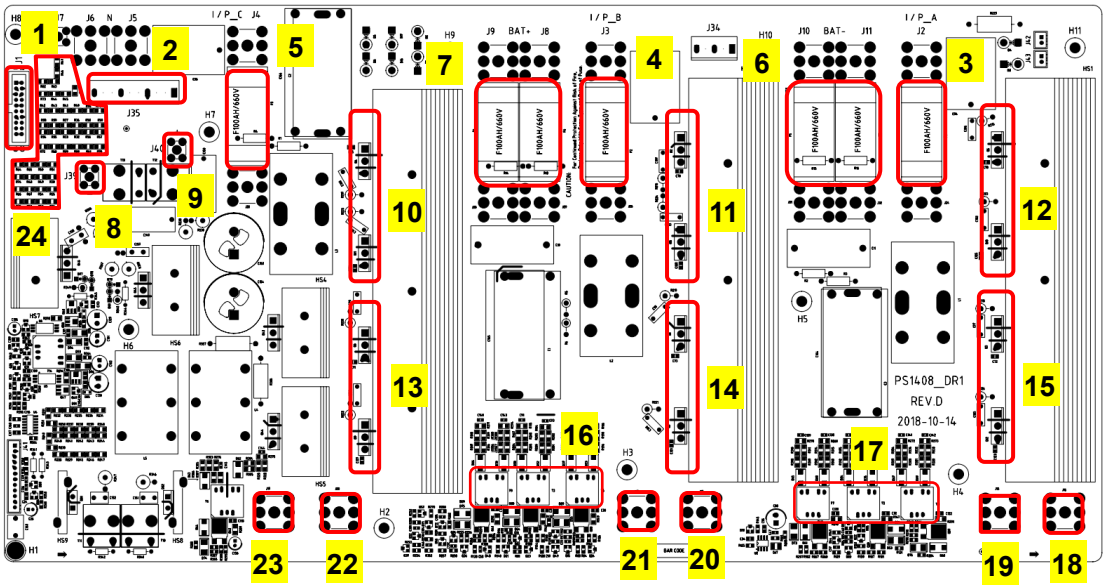


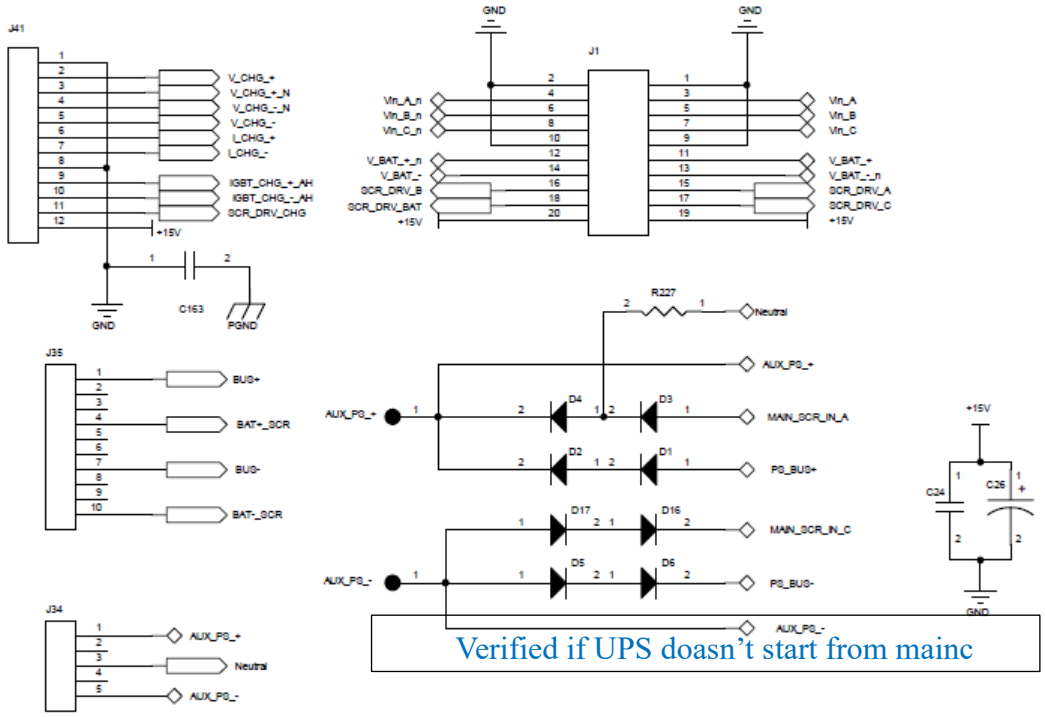
Fig.3-4 Input SCR board assembly diagram

Circuit present in DR1

Connectors

Charger connector

Battery and input ac measure + scr command



Verified if UPS doasn’t start from mainc

3.3.2 DR1 Detection of the Main Input Fuses

Prepare a multimeter ahead of time in order to detect the resistance of the fuses. Switch the multimeter to Resistance Channel, if the resistance is less than 0.08 ohm, it means the fuses with good condition. If the resistance is infinite or no value, the fuses should be damaged. As shown in tab.3-3-1
Please note the inner resistance of multimeter itself.

No.	Description	Type	Checked components	Meter stall	Normal	Abnormal
1	Main input A	FUSE	F1	Ω	0.08	Open
2	Main input B	FUSE	F2	Ω	0.08	Open
3	Main input C	FUSE	F3	Ω	0.08	Open
4	Battery+	FUSE	F4	Ω	0.08	Open
5	Battery+	FUSE	F6	Ω	0.08	Open
6	Battery-	FUSE	F5	Ω	0.08	Open
7	Battery-	FUSE	F7	Ω	0.08	Open

Main input FUSE detection Tab.3-3-1

3.3.3 Detection of SCR

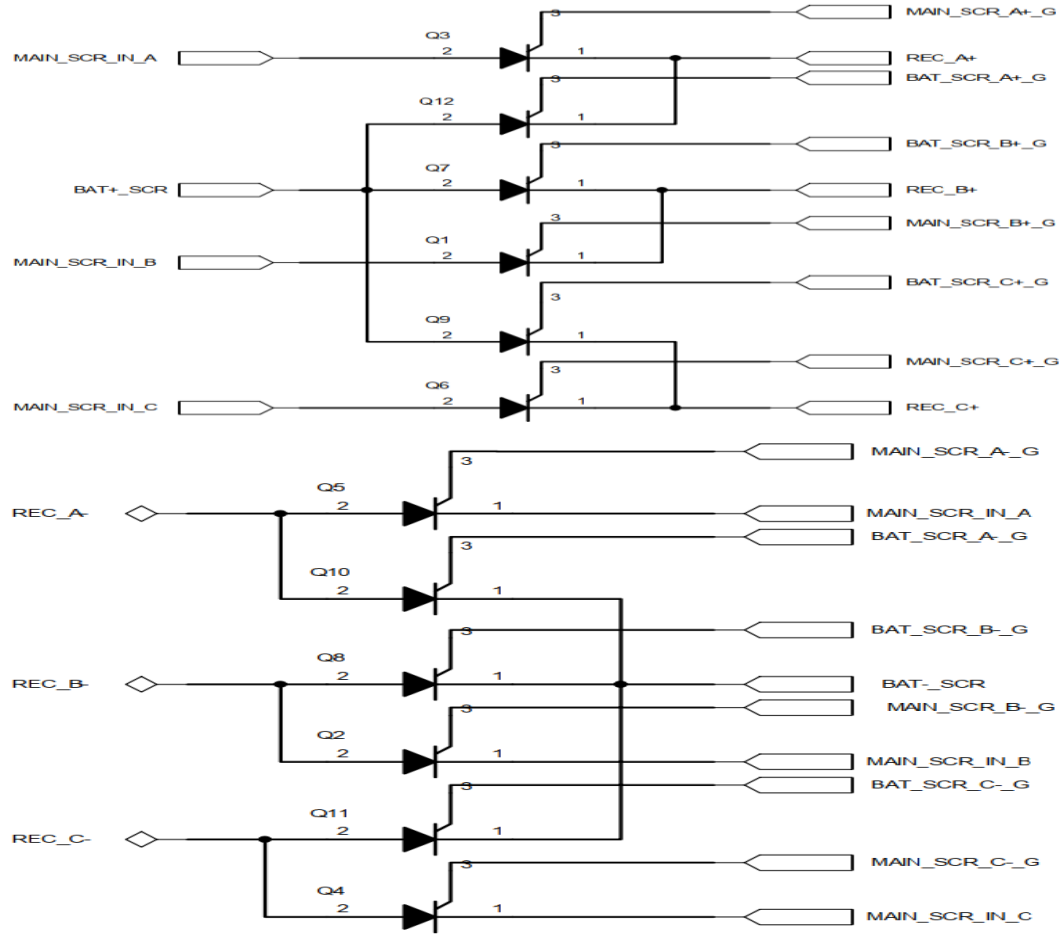
Use a multimeter to test the diode/resistance between the three electrodes of the components.

SCR Check Form (Test point on the PCB board). As shown in Tab.3-3-2:

No.	Description	Type	Red probe	Black probe	Meter stall	Normal	Abnormal
1	Main SCR A	SCR	J24	REC_A+	diode	Open	Short
2	BAT+ SCR A	SCR	J29/J30	REC_A+	diode	Open	Short
3	BAT+ SCR B	SCR	J29/J30	REC_B+	diode	Open	Short
4	Main SCR B	SCR	J26	REC_B+	diode	Open	Short
5	BAT+ SCR C	SCR	J29/J30	REC_C+	diode	Open	Short
6	Main SCR C	SCR	J28	REC_C+	diode	Open	Short
7	Main SCR A	SCR	REC_A-	J24	diode	Open	Short
8	BAT- SCR A	SCR	REC_A-	J31/J32	diode	Open	Short
9	BAT- SCR B	SCR	REC_B-	J31/J32	diode	Open	Short
10	Main SCR B	SCR	REC_B-	J26	diode	Open	Short
11	BAT- SCR C	SCR	REC_C-	J31/J32	diode	Open	Short
12	Main SCR C	SCR	REC_C-	J28	diode	Open	Short

Main input SCR detection Tab.3-3-2-

SCR Module schematic diagram:



3.4 Detection of Input/BAT Voltage Sampling Resistance

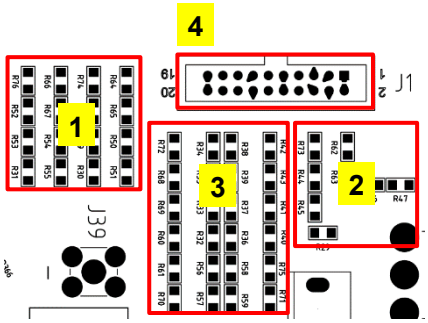


Fig.3-6 sampling resistance introduction
1~2: Input sampling resistance
3: Battery sampling resistance
4: J1: Input/ BAT sampling detect

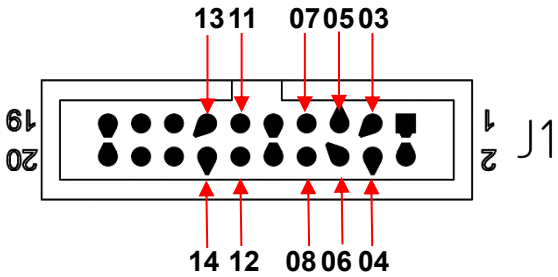


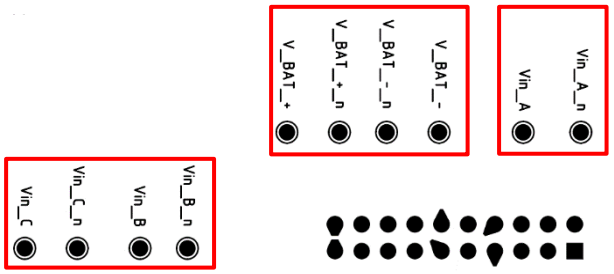
Fig.3-7 Detect area (J1 port PIN)
03PIN: Vin_A; 04PIN: Vin_A_n
05PIN: Vin_B; 06PIN: Vin_B_n
07PIN: Vin_C; 08PIN: Vin_C_n
11PIN: V_BAT_+; 12PIN:V_BAT_+_n
13PIN:V_BAT_-_n; 14PIN:V_BAT_-

Sampling resistance Check Form, use a multimeter to test resistors resistance. The test position is at port J1 of the input board, note the definition of the pins. Disconnect all cables on the board. As shown in Tab.3-3-4:

No.	Description	Type	Checkedcomponents	Probe	Probe	Meter stall	Normal	Abnormal
1	Main SCR A	Resistor	Input board J1 port	3PIN	4PIN	Ω	8M	±1%
2	Main SCR B	Resistor	Input board J1 port	5PIN	6PIN	Ω	8M	±1%
3	Main SCR C	Resistor	Input board J1 port	7PIN	8PIN	Ω	8M	±1%
4	Battery+	Resistor	Input board J1 port	11PIN	12PIN	Ω	12M	±1%
5	Battery+	Resistor	Input board J1 port	13PIN	14PIN	Ω	12M	±1%

Sampling resistance detection Tab.3-3-4

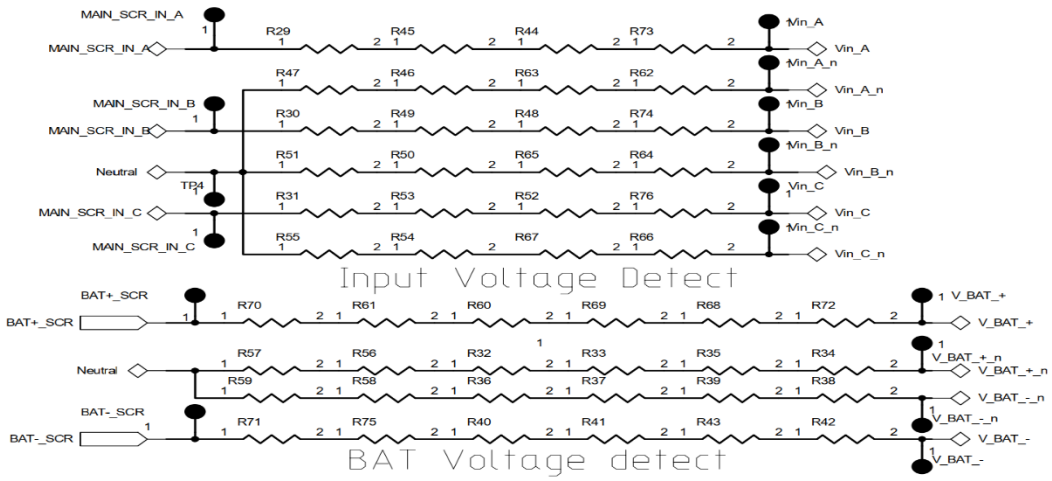
Another test method. The test point is on the back of the board. Pay attention to the influence of the three proofing paint.
As show in Tab.3-3-5:



•	Description	Type	Checked components	Probe	Probe	Meter stall	Normal	Abnormal
1	Main SCR A	Resistor	R29,R45,R44,R73,R47,R46, R63,R62	Vin_A	Vin_A _n	Ω	8M	±1%
2	Main SCR B	Resistor	R30,R49,R48,R74,R51,R50, R65,R64	Vin_B	Vin_B _n	Ω	8M	±1%
3	Main SCR C	Resistor	R31,R53,R52,R76,R55,R54, R67,R66	Vin_C	Vin_C _n	Ω	8M	±1%
4	BAT+ SCR	Resistor	R70,R61,R60,R69,R68,R72, R57,R56,R32,R33,R35,R34	V_BAT_+	V_BAT_+_n	Ω	12M	±1%
5	BAT－SCR	Resistor	R71,R75,R40,R41,R43,R42, R59,R58,R36,R37,R39,R38	V_BAT_－	V_BAT_－_n	Ω	12M	±1%

Sampling resistance detection Tab.3-3-5

Sampling resistance schematic diagram:



3.4 PFC Rectifier Board (DR2)

3.4.1 The Detailed Introduction of PFC Board

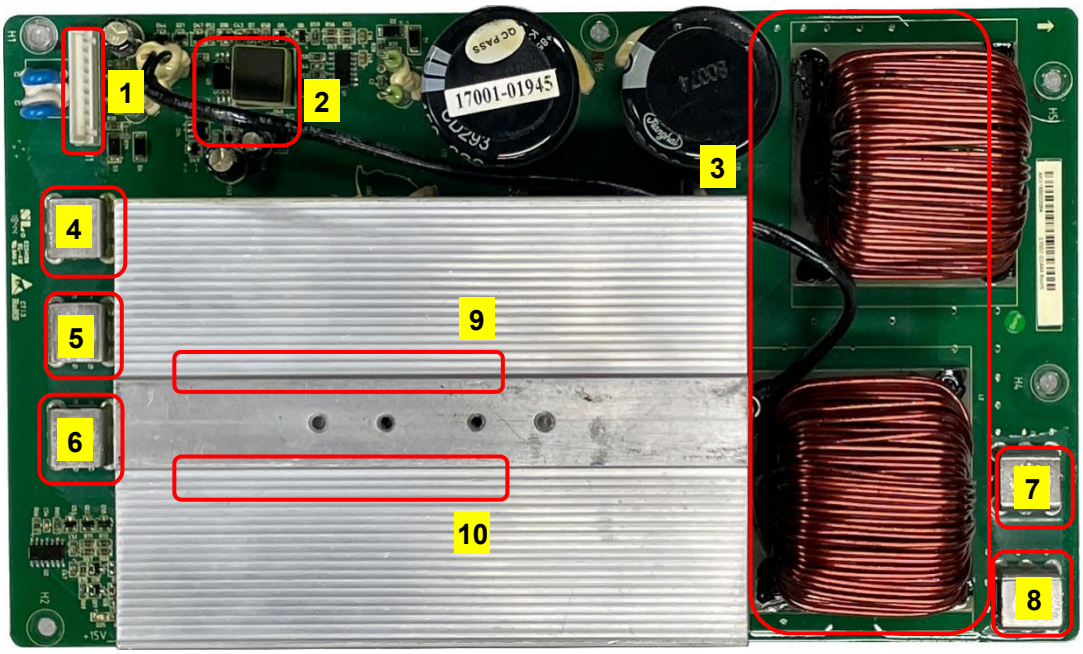


Fig.3-8 PFC board introduction

1: J1: Drive interface
2: IGBT drive
3: Boost inductance
4: J7: BUS－
5: J6: BUSN
6: J5: BUS+
7: J3: REC_L+
8: J4: REC_L－
9~10: IGBT

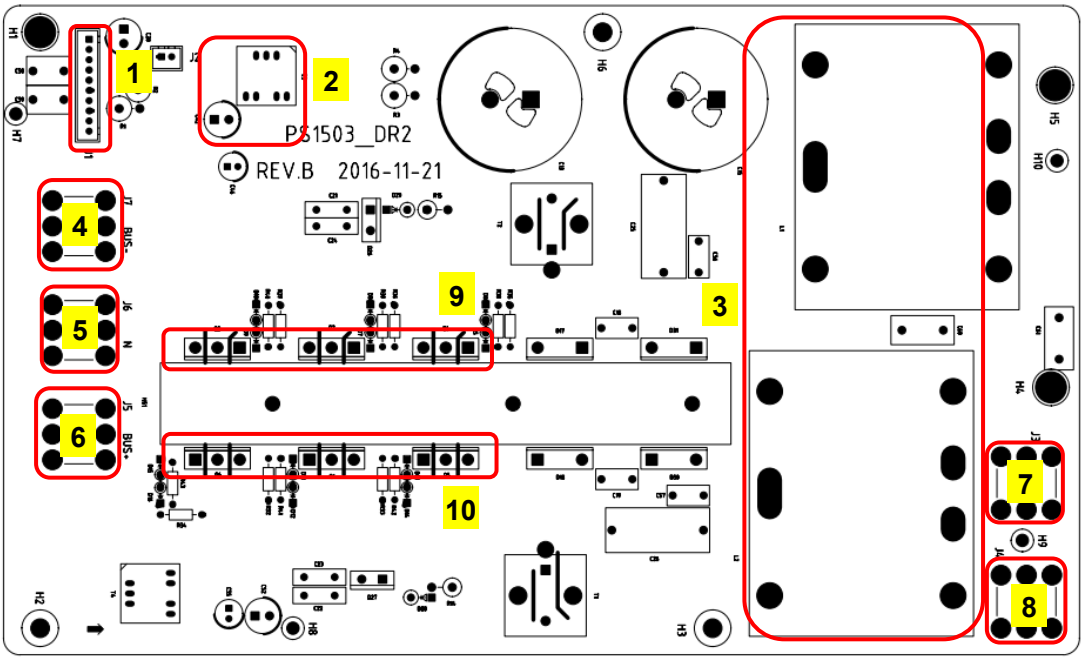


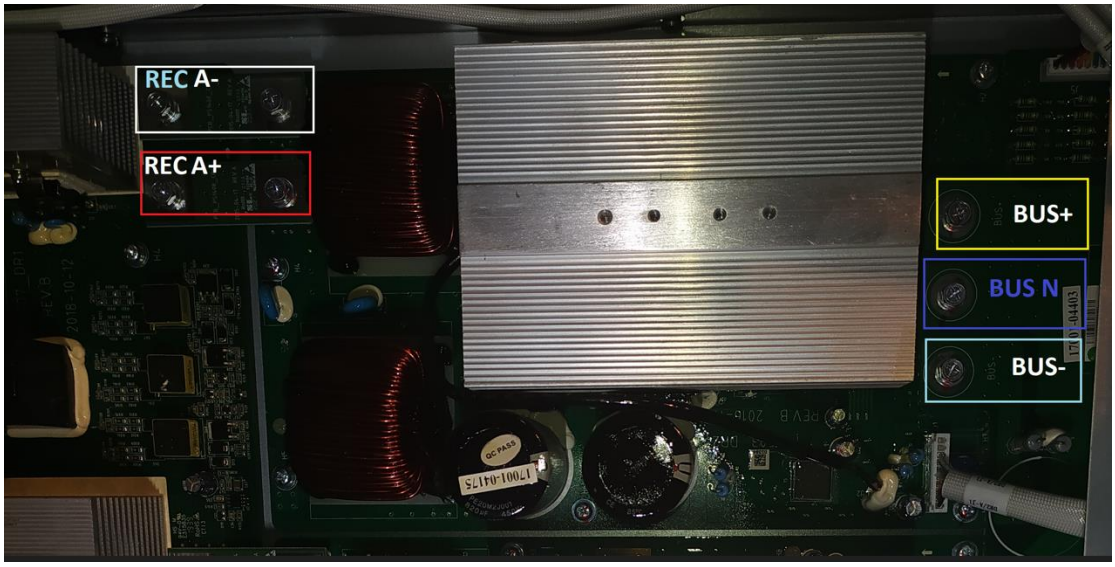
Fig. 3-9 PFC board assembly diagram

3.4.2 Detection of PFC IGBT

Switch the multimeter to Diode Chanel and measuring the voltage drop of the IGBTs, the normal value should be 0.35V～0.45V, as shown in Tab.3-4-1:

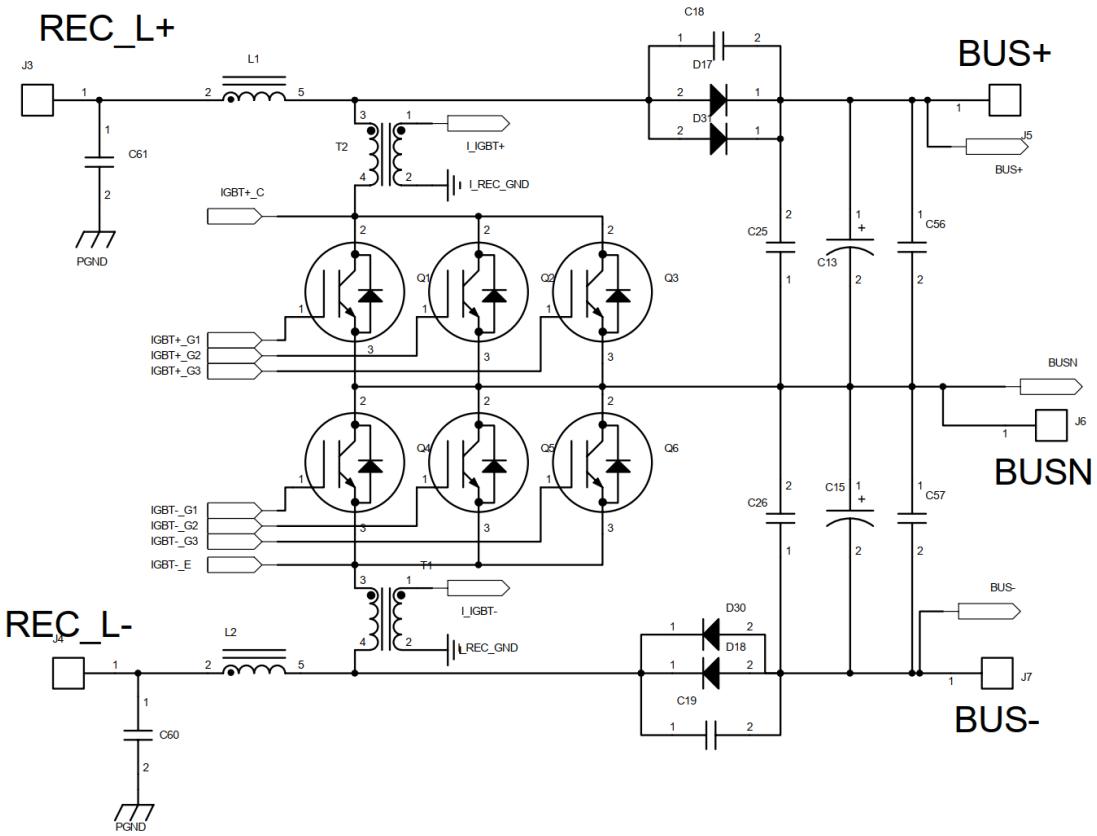
No.	Description	Type	Red probe	Black Probe	Meter	Normal	Abnormal
1	PFC IGBT A	IGBT	REC_A+	BUS+	Diode	0.4	Open or Short
2	PFC IGBT A	IGBT	BUSN	REC_A+	Diode	0.4	Open or Short
3	PFC IGBT A	IGBT	BUS-	REC_A-	Diode	0.4	Open or Short
4	PFC IGBT A	IGBT	REC_A-	BUSN	Diode	0.4	Open or Short
5	PFC IGBT B	IGBT	REC_B+	BUS+	Diode	0.4	Open or Short
6	PFC IGBT B	IGBT	BUSN	REC_B+	Diode	0.4	Open or Short
7	PFC IGBT B	IGBT	BUS-	REC_B-	Diode	0.4	Open or Short
8	PFC IGBT B	IGBT	REC_B-	BUSN	Diode	0.4	Open or Short
9	PFC IGBT C	IGBT	REC_C+	BUS+	Diode	0.4	Open or Short
10	PFC IGBT C	IGBT	BUSN	REC_C+	Diode	0.4	Open or Short
11	PFC IGBT C	IGBT	BUS-	REC_C-	Diode	0.4	Open or Short
12	PFC IGBT C	IGBT	REC_C-	BUSN	Diode	0.4	Open or Short

PFC IGBT detection Tab.3-4-1



Is the same for the phase b and c

PFC rectifier schematic diagram:



3.5 Inverter Power Board

3.5.1 The Detailed Introduction of Inverter Board

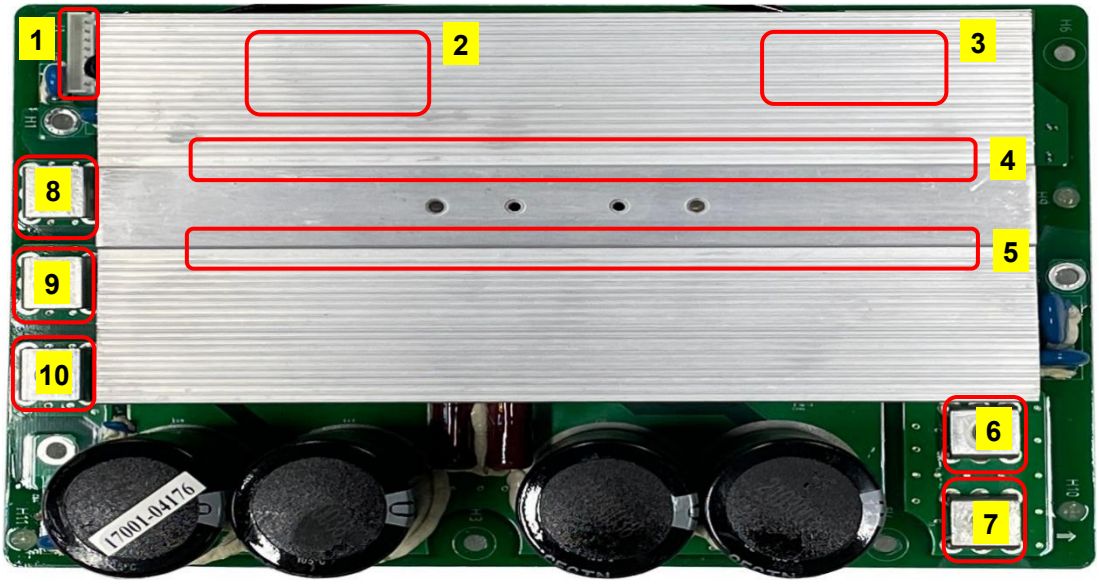


Fig.3-10 Inverter board introduction

1: J1: Inverter control
2~3: Inverter IGBT drive
4~5: INV IGBT
6: J7: INV_L
7: J3: INV_L
8: J6: BUS－
9: J5: BUSN
10: J4: BUS+

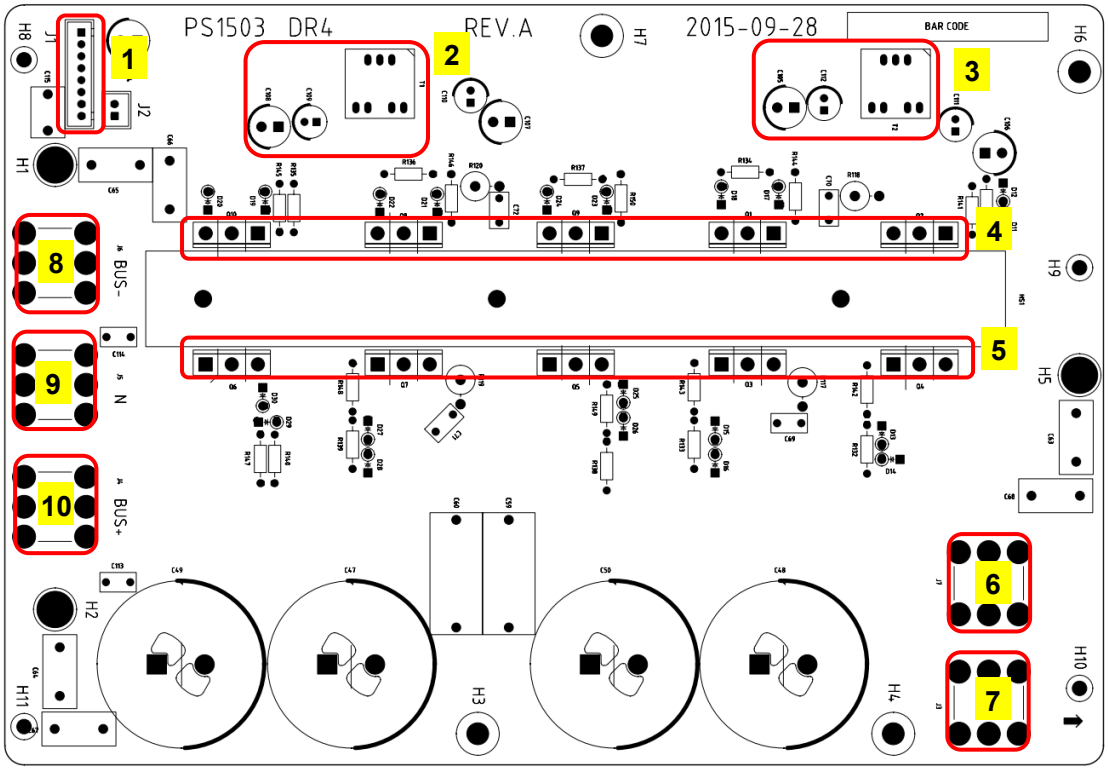


Fig.3-11 Inverter board assembly diagram

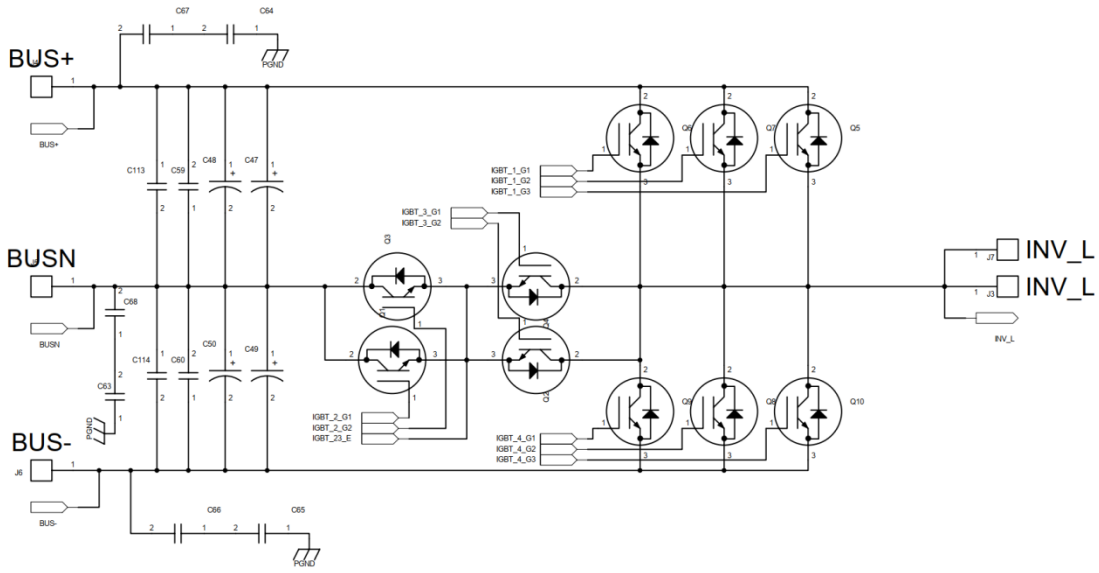
3.5.2 Detection of Inverter IGBTs

Switch the multimeter to Diode Chanel and measuring the voltage drop of the IGBTs, the normal value should be 0.35V～0.45V,as shown in Tab.3-5-1:

No.	Description	Type	Red Probe	Black Probe	Meter stall	Normal	Abnormal
1	INV IGBT A	IGBT	INV A	BUS+	Diode	0.4	Open or Short
2	INV IGBT A	IGBT	BUS-	INV A	Diode	0.4	Open or Short
3	INV IGBT B	IGBT	INV B	BUS+	Diode	0.4	Open or Short
4	INV IGBT B	IGBT	BUS-	INV B	Diode	0.4	Open or Short
5	INV IGBT C	IGBT	INV C	BUS+	Diode	0.4	Open or Short
6	INV IGBT C	IGBT	BUS-	INV C	Diode	0.4	Open or Short

Inverter IGBT detection Tab.3-5-1

Inverter IGBTs schematic diagram:



3.6 Output EMI Board

3.6.1 The Detailed Introduction of Output Board

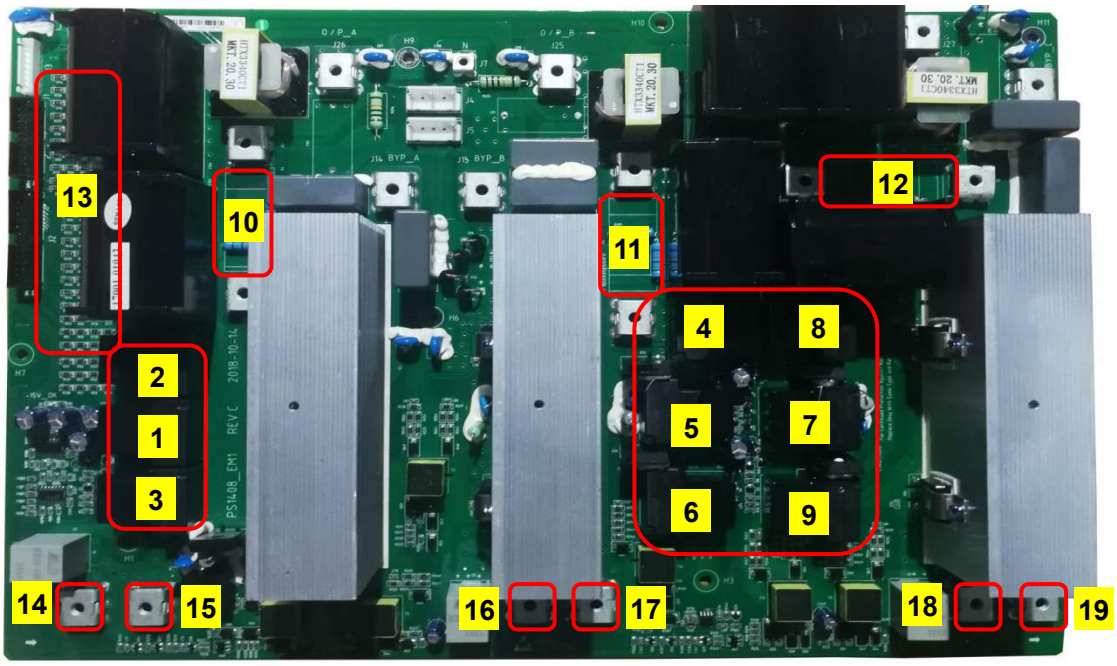


Fig.3-12 Output board introduction

1~3: Phase A relays
4~6: Phase B relays
7~9: Phase C relays
10: J17/J20: OUT_A fuse
11: J18/J22: OUT_B fuse
12: J19/J24: OUT_C fuse
13: Detect resistance
14: J8: INV_A_1
15: J9: INV_A_2
16: J10: INV_B_1
17: J11: INV_B_2
18: J12: INV_C_1
19: J13: INV_C_2

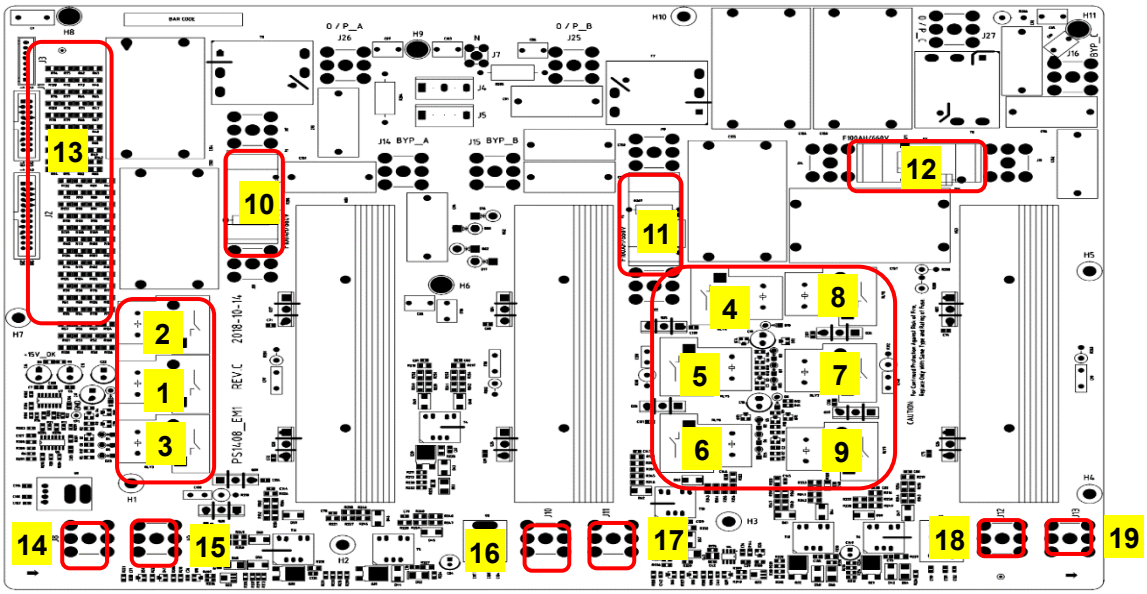


Fig.3-13 Output board assembly diagram

3.6.2 Detection of Output Fuses

Output fuses Check Form, as shown in Tab.3-6-1:

No.	Description	Type	Checked components	Probe	Probe	Meter stall	Normal	Abnormal
1	Output Phase A	FUSE	F1	J17	J20	Ω	0.05	Open
2	Output Phase B	FUSE	F2	J18	J22	Ω	0.05	Open
3	Output Phase C	FUSE	F3	J19	J24	Ω	0.05	Open

Output fuses detection Tab.3-6-1

3.6.3 Detection of Output Relays

Output relays Check Form, as shown in Tab.3-6-2:

No.	Description	Type	Checked components	Probe	Probe	Meter stall	Normal	Abnormal
1	Output Phase A	Relay	RLY1.2.3	J9	J20	Ω	Open	Short
2	Output Phase B	Relay	RLY4.5.6	J11	J22	Ω	Open	Short
3	Output Phase C	Relay	RLY7.8.9	J13	J24	Ω	Open	Short

Output relays detection Tab.3-6-2

3.6.4 Detection of INV/Output/BYP Voltage Sampling Resistance

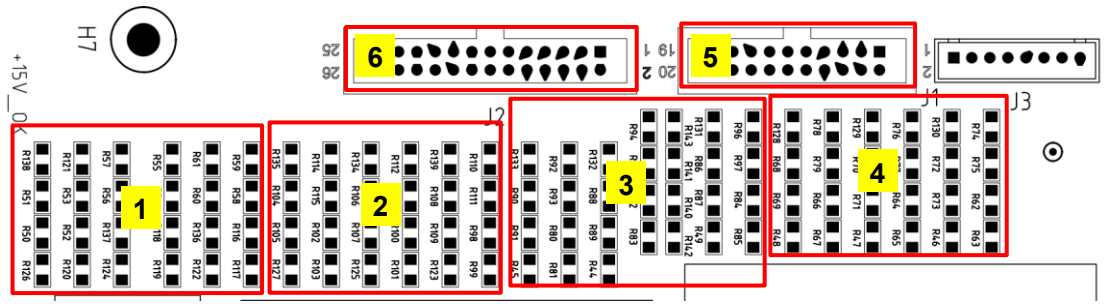


Fig.3-14 Sampling resistance introduction

1: INV DC voltage sampling resistance
2: INV voltage sampling resistance
3: Bypass voltage sampling resistance
4: Output voltage sampling resistance
5: J1: BYP/Output sampling detect
6: J2: INV/INV DC sampling detect

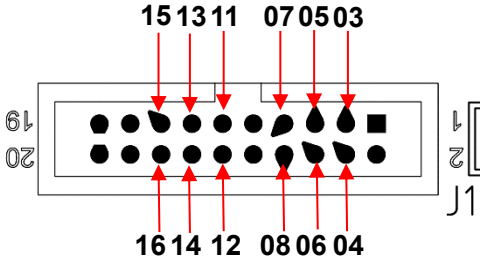


Fig.3-15 Detect area (J1 port PIN)

03PIN: V_BYP_A; 04PIN: V_BYP_A_N
05PIN: V_BYP_B; 06PIN: V_BYP_B_N
07PIN: V_BYP_C; 08PIN: V_BYP_C_N
11PIN: V_OUT_A; 12PIN: V_OUT_A_N
13PIN: V_OUT_B; 14PIN: V_OUT_B_N
15PIN: V_OUT_C; 16PIN: V_OUT_C_N

Sampling resistance Check Form, use a multimeter to test resistors resistance. The test position is at port J1 of the output board, note the definition of the pins. Disconnect all cables on the board. As shown in Tab.3-6-4:

No.	Description	Type	Checkedcomponents	Probe	Probe	Meter stall	Normal	Abnormal
1	Bypass A	Resistor	Output board J1 port	3PIN	4PIN	Ω	8M	±1%
2	Bypass B	Resistor	Output board J1 port	5PIN	6PIN	Ω	8M	±1%
3	Bypass C	Resistor	Output board J1 port	7PIN	8PIN	Ω	8M	±1%
4	Output A	Resistor	Output board J1 port	11PIN	12PIN	Ω	8M	±1%
5	Output B	Resistor	Output board J1 port	13PIN	14PIN	Ω	8M	±1%
6	Output C	Resistor	Output board J1 port	15PIN	16PIN	Ω	8M	±1%

Sampling resistance detection Tab.3-6-4

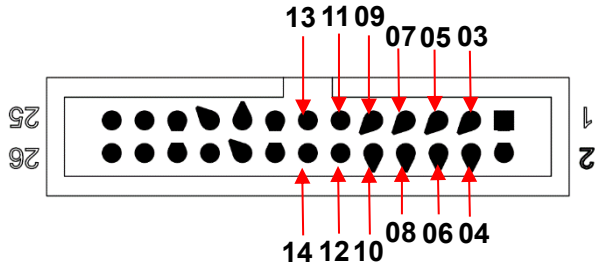


Fig.3-16 Detect area (J2 port PIN)

03PIN: V_INV_A; 04PIN: V_INV_A_N
05PIN: V_INV_B; 06PIN: V_INV_B_N
07PIN: V_INV_C; 08PIN: V_INV_C_N
09PIN: V_INV_A_DC;
10PIN: V_INV_A_DC_N
11PIN: V_INV_B_DC;
12PIN: V_INV_B_DC_N
13PIN: V_INV_C_DC;
14PIN: V_INV_C_DC_N

Sampling resistance Check Form, use a multimeter to test resistors resistance. The test position is at port J2 of the output board, note the definition of the pins. Disconnect all cables on the board. As shown in Tab.3-6-5:

No.	Description	Type	CheckedComponents	Probe	Probe	Meter stall	Normal	Abnormal
1	Inverter A	Resistor	Output board J2 port	3PIN	4PIN	Ω	8M	±1%
2	Inverter B	Resistor	Output board J2 port	5PIN	6PIN	Ω	8M	±1%
3	Inverter C	Resistor	Output board J2 port	7PIN	8PIN	Ω	8M	±1%
4	Inverter DC A	Resistor	Output board J2 port	9PIN	10PIN	Ω	8M	±1%
5	Inverter DC B	Resistor	Output board J2 port	11PIN	12PIN	Ω	8M	±1%
6	Inverter DC C	Resistor	Output board J2 port	13PIN	14PIN	Ω	8M	±1%

Sampling resistance detection Tab.3-6-5

Another test method. The test point is on the back of the board. Pay attention to the influence of the three proofing paint. As show in Tab.3-6-6:

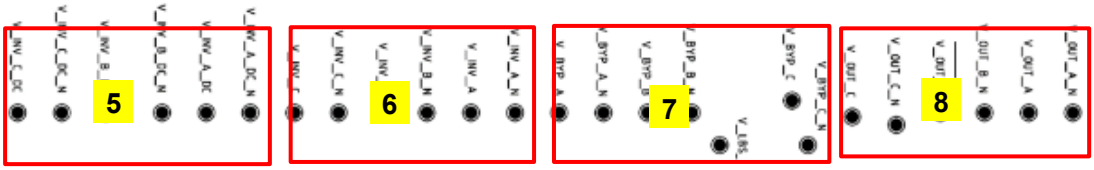


Fig.3-17 Detect area (back of the output board)

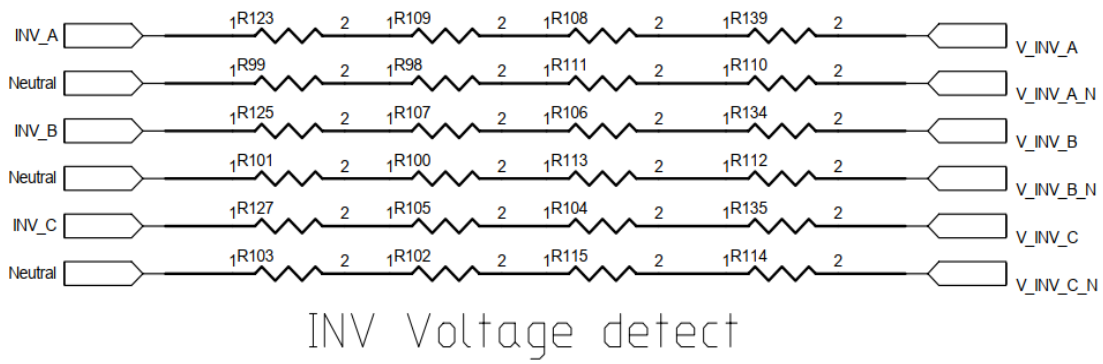
5: INV DC voltage detection point
6: INV voltage detection point
7: Bypass voltage detection point
8: Output voltage detection point

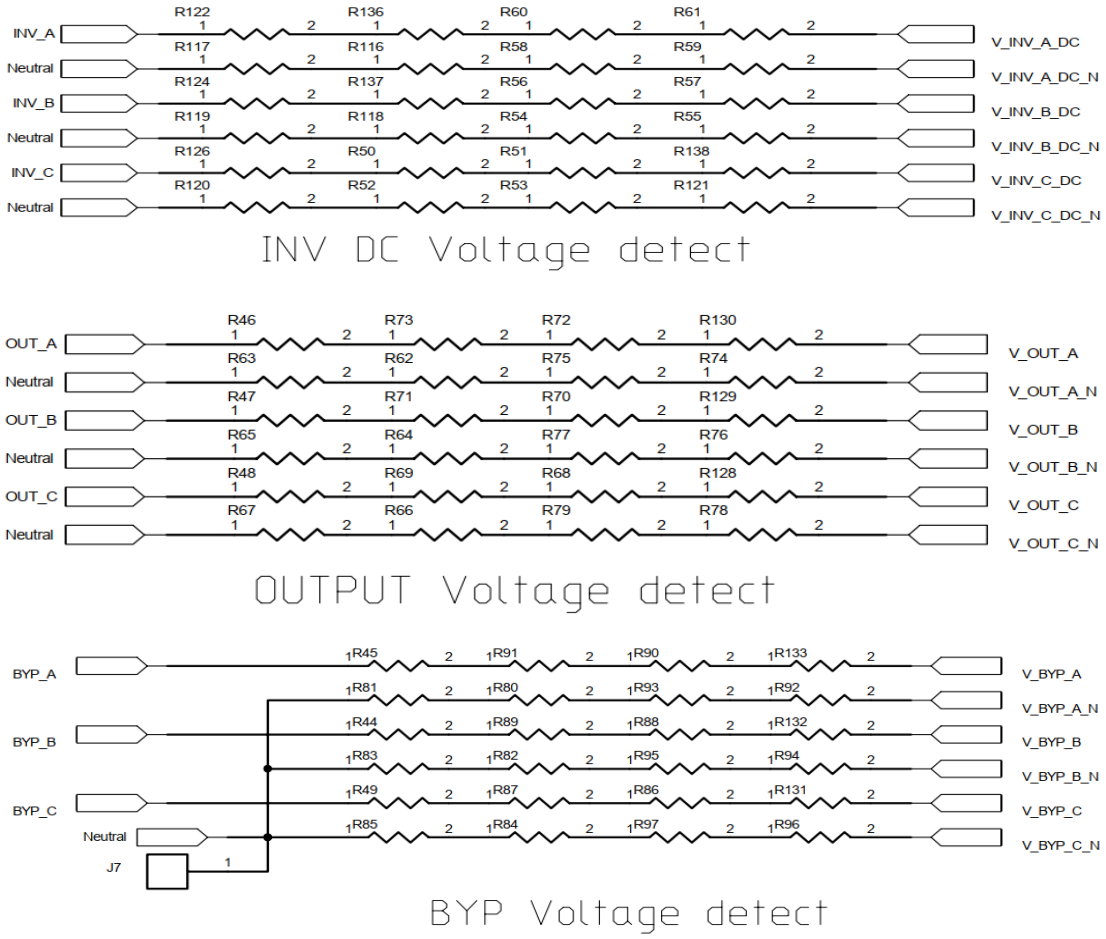
Sampling resistance Check Form, as shown in Tab.3-6-6:

No.	Description	Type	Checked components	Probe	Probe	Meter stall	Normal	Abnormal
1	Inverter A	Resistor	R123,R109,R109,R139 ,R99,R98,R111,R110	V_INV_A	V_INV_A_N	Ω	8M	±1%
2	Inverter B	Resistor	R125,R107,R106,R134, R101,R100,R113,R112	V_INV_B	V_INV_B_N	Ω	8M	±1%
3	Inverter C	Resistor	R127,R105,R104,R135 R103,R102,R115,R114	V_INV_C	V_INV_C_N	Ω	8M	±1%
4	Inverter DC A	Resistor	R122,R136,R60,R61, R117,R116,R58,R59	V_INV_A_DC	V_INV_A_DC_N	Ω	8M	±1%
5	Inverter DC B	Resistor	R124,R137,R56,R57, R124,R137,R56,R57	V_INV_B_DC	V_INV_B_DC_N	Ω	8M	±1%
6	Inverter DC C	Resistor	R126,R50,R51,R138 R120,R52,R53,R121	V_INV_C_DC	V_INV_C_DC_N	Ω	8M	±1%
7	Output A	Resistor	R46,R73,R72,R130, R63,R62,R75,R74	V_OUT_A	V_OUT_A_N	Ω	8M	±1%
8	Output B	Resistor	R47,R71,R70,R129, R65,R64,R77,R76	V_OUT_B	V_OUT_B_N	Ω	8M	±1%
9	Output C	Resistor	R48,R69,R68,R128 R67,R66,R79,R78	V_OUT_C	V_OUT_C_N	Ω	8M	±1%
10	Bypass A	Resistor	R45,R91,R90,R133, R81,R80,R93,R92	V_BYP_A	V_BYP_A_N	Ω	8M	±1%
11	Bypass B	Resistor	R44,R89,R88,R132, R83,R82,R95,R94	V_BYP_B	V_BYP_B_N	Ω	8M	±1%
12	Bypass C	Resistor	R49,R87,R86,R131 R85,R84,R97,R96	V_BYP_C	V_BYP_C_N	Ω	8M	±1%

Sampling resistance detection Tab.3-6-6

Sampling resistance schematic diagram:





3.7 Inverter Bus Board

3.7.1 The Detailed Introduction of Inverter Bus Board

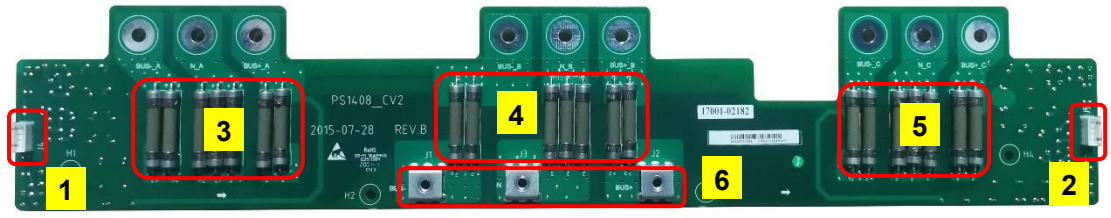


Fig.3-16 Inverter bus board introduction

1~2: BUS voltage detect

6:J1: BUS－, J2:BUS+, J3: BUSN

3~5: BUS fuses

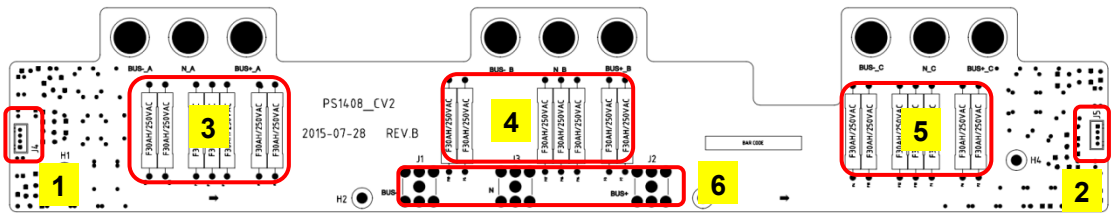


Fig.3-17 Inverter bus board assembly diagram

3.7.2 Detection of Inverter Bus Fuses

Inverter bus fuses Check Form, as shown in Tab.3-7-1:

No.	Description	Type	Checked components	Probe	Probe	Meter stall	Normal	Abnormal
1	BUS Phase A	FUSE	F8,F9,F11,F13,F15,F20,F21			Ω	0.5	Open
2	BUS Phase B	FUSE	F3,F5,F7,F14,F16,F17,F19			Ω	0.5	Open
3	BUS Phase C	FUSE	F1,F2,F4,F6,F10,F12,F18			Ω	0.5	Open

Inverter bus fuses detection Tab.3-7-1

3.8 Rectifier Bus Board

3.8.1 The Detailed Introduction of Rectifier Bus Board

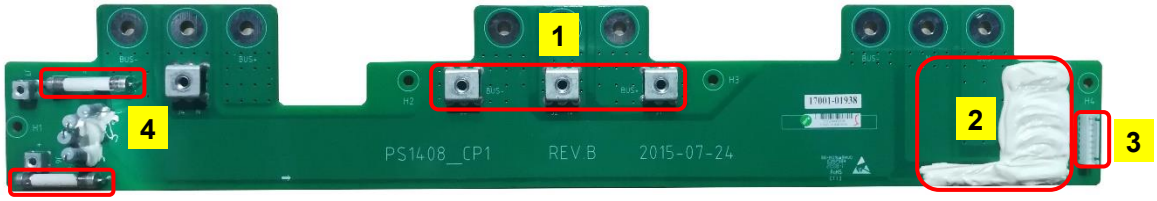


Fig.3-18 Rectifier bus board introduction

1: J1:BUS+,J2:BUSN,J3:BUS－

2: BUS sampling

3: J5: BUS voltage detect

4: Charger fuses

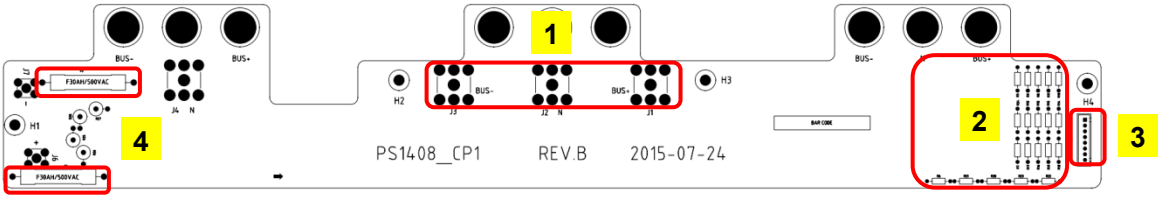


Fig.3-19 Rectifier bus board assembly diagram

3.8.2 Detection of Rectifier Bus Fuses

Rectifier bus fuses Check Form, as shown in Tab.3-8-1:

No.	Description	Type	Checked components	Probe	Probe	Meter stall	Normal	Abnormal
1	BUS+	FUSE	F1			Ω	0.5	Open
2	BUS－	FUSE	F2			Ω	0.5	Open

Rectifier bus fuses detection Tab.3-8-1

3.8.3 Detection of Rectifier Bus Voltage Sampling Resistance

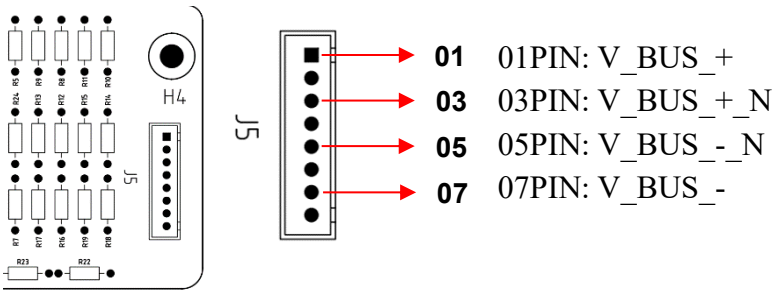


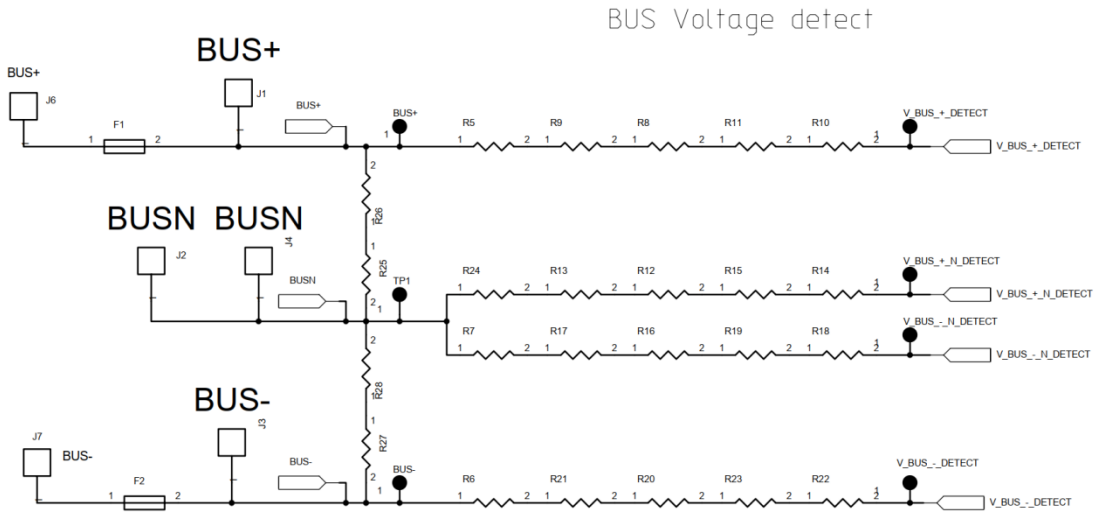
Fig.3-20 Detect sampling resistance area（J5 port PIN）

Sampling resistance Check Form, as shown in Tab.3-8-2:

No.	Description	Type	probe	probe	Meter stall	Normal	Abnormal
1	V_BUS_+& V_BUS_+_N	Resistor	1PIN	3PIN	Ω	10M	±1%
2	V_BUS_-& V_BUS_-_N	Resistor	7PIN	5PIN	Ω	10M	±1%
3	BUS+& BUS-	Resistor	1PIN	7PIN	Ω	10M	±1%

Rec bus sampling resistance detection Tab.3-8-2

Sampling resistance schematic diagram:



4. Maintenance

4.1 Trouble-shooting

When the UPS fault occurs, please prepare the following and contact to our after service engineers team.

1. Record the type and the serial number of the UPS.
2. Notice the status of LEDs on the front panel and check the present alarm.
3. Download the history log and S-CODE (notice: please select the correct type of ups).
4. Check the input and output cable and breaker.
5. Check whether there are any visible damage marks inside the machine.
6. The description of fault.

4.2 Common Faults and Maintenance

The common faults and solution is shown in Table.4-1.

Table 4-1 common faults and maintenance

Common faults	Solution and Maintenance
Input Grid Neutral Lost	Put on the output breaker, and turn on the ups again.
Utility Abnormal	Check the whether the input powers are normal, and then check whether the input fuses are work well. If the fuses are broken, replace the input board.
Rectifier Soft Start Fail	Replace the input board.
Rectifier Fail	Replace the rectifier board.
Inverter Protect	Replace the inverter board and bus fuses board
Inverter Fail	Replace the inverter board
INV IGBT Driver Block	Replace the inverter board and bus fuses board
Output short and output overload	Check the loads firstly, if the loads have no problem, replace the output board
Relays connection lost	Replace the output board.
Fans fail	Replace the fans

Appendix

History Log Code Contrast & Solution Form

ID	character	Remark	Solution
0	Load On UPS-Set	load on inverter	
1	Load On Bypass-Set	load on Bypass	
2	No Load-Set	UPS no output	
3	Battery Boost-Set	Battery Boost	
4	Battery Float-Set	Battery Float	
5	Battery Discharge-Set	Battery Discharge	
6	Battery Connected-Set	Battery Connected and battery normal	
7	Battery Not Connected-Set	Battery Not Connected or battery abnormal	1.Check battery connections 2.Check Battery voltage(positive and negative) 3. Maybe one of PM battery voltage detection fail
8	Maintenance CB Closed-Set	Maintenance CB Closed	1. Check Maintenance breaker NC/NO connector 2. Check NC/NO signal cable 3. Replace monitor board
9	Maintenance CB Open-Set	Maintenance CB Open	1. Check Maintenance breaker NC/NO connector
10	EPO-Set	EPO triggered	1. Dry contact board; 2. monitor board; 3. LCD panel key board
11	EPO-Clear		
12	Module On Less-Set	PM capacity less than load	1. Check Rating setting; 2. Check PM total capacity; 3. Check load

13	Module On Less-Clear		1. Check load rate and type 2. Check UPS rated setting (Three phase) 3. Check UPS power module rated capacity
14	Generator Input-Set	Generator Input-Dry contact board	
15	Generator Input-Clear		
16	Utility Abnormal-Set	Utility Abnormal	1. Check Utility power voltage (range and three phase); 2. Check main input Sequence
17	Utility Abnormal-Clear		
18	Bypass Sequence Error-Set	Bypass Sequence Error	1. Check Bypass input Sequence
19	Byp Sequence Error-Clear		
20	Bypass Volt Abnormal-Set	Bypass Volt Abnormal	1. Check Bypass voltage(range and three phase)
21	Byp Volt Abnormal-Clear		
22	Bypass Module Fail-Set	Bypass Module Fail	1. Bypass input voltage≠Bypass output Voltage; 2. SCR has fault 3. Bypass Driver board fail
23	Bypass Module Fail-Clear		
24	Bypass Overload-Set	Bypass Overload	1. Check Rated setting 2. Check load 3. Check CT of cabinet 4. Replace Bypass adaptor board 5. Replace monitor board
25	Bypass Overload-Clear		

26	Bypass Overload Tout-Set	Bypass Overload Timeout	1. Check load rate and type 2. Check UPS rated setting (Three phase) 3. Check UPS bypass input/output voltage and current
27	Byp Overload Tout-Clear		
28	Byp Freq Over Track-Set	Byp Frequency Over Track	1. Check Bypass frequency range and slew rate; 2. Check Bypass frequency on LCD
29	Byp Freq Over Track-Clear		
30	Exceed Tx Times Lmt-Set	Inverter transfer to bypass, and transfer back to inverter more than 5 times/hour	1. Transfer 5 times in one hour
31	Exceed Tx Times Lmt-Clear		
32	Output Short Circuit-Set	Output Short Circuit	1. Check UPS rated setting (Capacity) 2. Check load short circuit or load current more than 3 three time rated current
33	Output Short Circuit-Clear		
34	Battery EOD-Set	Battery end off discharge	1. Check battery if OK 2. Check battery EOD voltage setting
35	Battery EOD-Clear		
36	Battery Test-Set	Battery Test (Manual operation)	
37	Battery Test OK-Set		
38	Battery Test Fail-Set	Battery discharge less than 30S	1. Check battery if OK
39	Battery Maintenance-Set	Battery Maintenance test	

40	Batt Maintenance OK-Set	Batt Maintenance test OK	
41	Batt Maintenance Fail-Set	Batt Maintenance test Fail	1. Check battery if OK
42	Stop Test-Set	Stop Test	
43	Fault Clear-Set	Fault Clear	
44	Log Clear-Set	Log Clear	
45	Module Inserted-Set	Power module power on (connected well)	
46	Module Exit-Set	Power module pull out	
47	Rectifier Fail-Set	Rectifier Fail	1. PFC rectifier driver abnormal 2. PFC rectifier IGBT abnormal 3. DC BUS voltage abnormal or unbalance 4. DC BUS voltage sampling abnormal 5. PFC rectifier signal cable connected fail 6. Control board fail
48	Rectifier Fail-Clear		
49	Inverter Fail-Set	Inverter Fail	1. Inverter driver abnormal 2. Inverter IGBT abnormal 3. Inverter signal cable connected fail 4. Control board fail
50	Inverter Fail-Clear		
51	Rectifier Over Temp.-Set	Rectifier Over Temp	1. PFC rectifier over temperature 2.PFC rectifier temperature probe abnormal 3. Control board fail
52	Rectifier Over Temp.-Clear		

53	Fan Fail-Set	Fan Fail	1. Fan fail 2. Fan power board fail 3. Fan power board interface jumper lost 4. Control board fail 5. Fan power cable connected fail
54	Fan Fail-Clear		
55	Output Overload-Set	Output Overload	1. Check load rate and type 2. Check UPS rated setting (Three phase) 3. Check UPS input voltage and current(Three phase)
56	Output Overload-Clear		
57	Inverter Overload Tout-Set	Inverter Overload Timeout	1. Check load rate and type 2. Check UPS rated setting (Three phase) 3. Check UPS input voltage and current(Three phase)
58	INV Overload Tout-Clear		
59	Inverter Over Temp.-Set	Inverter Over Temp	1. Inverter over temperature 2. Inverter temperature probe abnormal 3. Control board fail
60	Inverter Over Temp.-Clear		
61	On UPS Inhibited-Set	On UPS Inhibited	1. UPS on bypass 2. UPS MCB closed 3. UPS inverter abnormal
62	On UPS Inhibited-Clear		
63	Manual Transfer Byp-Set	Manual Transfer to Bypass	
64	Esc Manual Bypass-Set		
65	Battery Volt Low-Set	Battery Volt Low	1. Check battery number and battery voltage 2. Check battery setting

66	Battery Volt Low-Clear		
67	Battery Wiring Error-Set	Battery Wiring Error	1. Check battery N wire 2. Check battery voltage on LCD 3. Check battery voltage on each power module 4. Power module battery voltage sampling abnormal
68	Battery Wiring Error-Clear		
69	Inverter Protect-Set	Inverter Protect	1. Inverter abnormal 2. DC BUS voltage abnormal or unbalance 3. DC BUS over voltage
70	Inverter Protect-Clear		
71	Input Neutral Lost-Set	Input Neutral Lost	1. Check UPS output breaker closed or not 2. Check input voltage, Input N connected fail 3. Check input voltage
72	Bypass Fan Fail-Set	Bypass Fan Fail	1. Fan fail1 2. Fan interface jumper lost 3. Monitor board fail
73	Bypass Fan Fail-Clear		
74	Manual Shutdown-Set	Manual Shutdown	
75	Manual Boost Charge-Set	Manual Boost Charge	
76	Manual Float Charge-Set	Manual Float Charge	
77	UPS Locked-Set	UPS Locked	
78	Parallel Cable Error-Set	Parallel Cable Error	1. Parallel Cable connected fail
79	Parallel Cable Error-Clear		

80	This Timer-Set		
81	Battery or Charger Fail-Set	Battery or Charger Fail	1. Check battery if OK 2. Check battery charger 3. Check battery input fuse 4. Check battery signal cable connected well
82	Batt or Charger Fail-Clear		
83	N+X Redundant Lost-Set	N+X Redundant Lost	1. Check battery N+X Redundant setting 2. Check load rate
84	N+X Redundant Lost-Clear		
85	EOD System Inhibited-Set	EOD System Inhibited	1. Check battery voltage 2. Check battery setting
86	EOD System Inhibited-Clear		
87	Signal Cable Fail-Set	Signal Cable Fail	1. Check signal cable on back of the cabinet 2. Check bypass module swap plug and signal cable connected well
88	Signal Cable Fail-Clear		
89	Ambient Over Temp.-Set	Ambient Over Temp	1. Check Ambient Temperature 2. Check Ambient Temperature probe
90	Ambient Over Temp.-Clear		3. Check Ambient Temperature setting 4. Check dry contact board 5. Check monitor board
91	REC CAN Fail-Set	REC CAN Fail	1. Control board fail 2. Monitor board fail
92	REC CAN Fail-Clear		
93	INV IO CAN Fail-Set	INV IO CAN Fail	1. Control board fail 2. Monitor board fail

94	INV IO CAN Fail-Clear		
95	INV DATA CAN Fail-Set	INV DATA CAN Fail	1. Control board fail 2. Monitor board fail
96	INV DATA CAN Fail-Clear		
97	Power Share Fail-Set	Power Share load Fail	1. Check each power module output voltage 2. Check UPS output voltage and current
98	Power Share Fail-Clear		
99	Sync Pulse Fail-Set	Sync Pulse Fail	1. Control board fail 2. Monitor board fail 3. Check signal cable connected well (back of the cabinet)
100	Sync Pulse Fail-Clear		
101	Input Volt Detect Fail-Set	Input Volt Detect Fail	1. Check power module input voltage 2. Check power module input voltage sampling circuit
102	Input Volt Detect Fail-Clear		
103	Battery Volt Detect Fail-Set	Battery Volt Detect Fail	1. Check battery number and battery voltage 2. Check battery N wire connected well 3. Check battery setting 4. Check each power module battery voltage
104	Batt Volt Detect Fail-Clear		
105	Output Volt Fail-Set	Output Volt Fail	1. Check UPS output voltage 2. Check power module output voltage 3. Check power module back interface power cable
106	Output Volt Fail-Clear		

107	Bypass Volt Detect Fail-Set	Bypass Volt Detect Fail	1. Check bypass voltage of input and output 2. Check bypass driver board 3. Check bypass driver signal cable 4. Check power module bypass voltage 5. Check cabinet swap plug
108	Byp Volt Detect Fail-Clear		
109	INV Bridge Fail-Set	INV Bridge Fail	1. Check inverter IGBT 2. Check inverter driver signal 3. Check DC BUS voltage
110	INV Bridge Fail-Clear		
111	Outlet Temp. Error-Set	Outlet Temp. Error	1. Check Outlet Temperature 2. Check Outlet Temperature probe 3. Check control board
112	Outlet Temp. Error-Clear		
113	Input Curr Unbalance-Set	Input Curr Unbalance	1. Check input current of three phase 2. Check input current sampling circuit 3. Check input SCR driver signal 4. Check input SCR driver cable
114	Input Curr Unbalance-Clear		
115	DC Bus Over Volt-Set	DC Bus Over Volt	1. PFC rectifier board fail 2. Load energy backflow to inverter 3. Check load rate, circulating current between power modules
116	DC Bus Over Volt-Clear		
117	REC Soft Start Fail-Set	REC Soft Start Fail	1. Check input SCR board 2. Check input SCR driver or signal cable 3. Check DC BUS voltage when start 4. Check PFC rectifier board driver signal or signal cable 5. Check control board
118	REC Soft Start Fail-Clear		

119	Relay Connect Fail-Set	Relay Connect Fail	1. Check output EMI board relay open 2. Check output EMI board signal cable 3. Check control board
120	Relay Connect Fail-Clear		
121	Relay Short Circuit-Set	Relay Short Circuit	1. Check output EMI board relay short circuit
122	Relay Short Circuit-Clear		
123	PWM Sync Fail-Set	PWM Sync Fail	1. Check control board 2. Check monitor board 3. Check signal cable (back of the cabinet)
124	PWM Sync Fail-Clear		
125	Intelligent Sleep-Set	Intelligent Sleep	
126	Intelligent Sleep-Clear		
127	Manual Transfer to INV-Set	Manual Transfer to INV	
128	Input Over Curr Tout-Set	Input Over Curr Tout	1. Check input current 2. Check UPS rated setting and rated capacity
129	Input Over Curr Tout-Clear		
130	No Inlet Temp. Sensor-Set	No Inlet Temp. Sensor	1. Check Inlet Temperature 2. Check Inlet Temperature probe 3. Check control board
131	No Inlet Temp Sensor-Clear		
132	No Outlet Temp. Sensor-Set	No Outlet Temp. Sensor	1. Check Outlet Temperature 2. Check Outlet Temperature probe 3. Check control board
133	No Outlet TmpSensor-Clear		

134	Inlet Over Temp.-Set	Inlet Over Temp.	1. Check Inlet Temperature 2. Check Inlet Temperature probe 3. Check control board 4. Check Inlet temperature setting
135	Inlet Over Temp.-Clear		
136	Capacitor Time Reset-Set	Capacitor Time Reset	
137	Fan Time Reset-Set	Fan Time Reset	
138	Battery History Reset-Set	Battery History Reset	
139	Bypass Fan Time Reset-Set	Bypass Fan Time Reset	
140	Battery Over Temp.-Set	Battery Over Temp.	1. Check battery temperature 2. Check Battery temperature setting 3. Check dry contact board 4. Check battery temperature probe
141	Battery Over Temp.-Clear		
142	Bypass Fan Expired-Set	Bypass Fan Expired	
143	Bypass Fan Expired-Clear		
144	Capacitor Expired-Set	Capacitor Expired	
145	Capacitor Expired-Clear		
146	Fan Expired-Set	Fan Expired	
147	Fan Expired-Clear		

148	INV IGBT Driver Block-Set	INV IGBT Driver Block	1. Check power module insert to cabinet and connected well 2. Check inverter power board 3. Check inverter power board driver signal or signal cable 4. Check control board
149	INV IGBT Driver Block-Clear		
150	Dust Filter Expired-Set	Dust Filter Expired	
151	Dust Filter Expired-Clear		
152	Battery Expired -Set	Battery Expired	
153	Battery Expired-Clear		
154	BMS RS485 Error-Set	BMS RS485 Error	1. Check BMS signal cable connected well
155	BMS RS485 Error-Clear		
156	BMS Fail-Set	BMS Fail	1. Check BMS
157	BMS Fail-Clear		
158	CAN Error-Set	CAN Error	1. Check control board 2. Check monitor board 3. Check signal cable (back of the cabinet)
159	CAN Error-Clear		
160	Cell Undervoltage -Set	Cell Undervoltage	lithium battery BMS
161	Cell Undervoltage -Clear		
162	Cell Overvoltage-Set	Cell Overvoltage	lithium battery BMS

163	Cell Overvoltage-Clear		
164	Cell Volt Difference Fail-Set	Cell Volt Difference Fail	lithium battery BMS
165	Cell Volt Difference Fail-Clear		
166	Batt Low Temperature-Set	Batt Low Temperature	lithium battery BMS
167	Batt Low Temperature-Clear		
168	Battery Over Temp.-Set	Battery Over Temp.	lithium battery BMS
169	Battery Over Temp.-Clear		
170	BMS Charge Inhibited-Set	BMS Charge Inhibited	lithium battery BMS
171	BMS Charge Inhibited-Clear		
172	BMS Discharge Inhibited-Set	BMS Discharge Inhibited	lithium battery BMS
173	BMS Discharge Inhibited-Clear		
174	Wave Trigger-Set	Wave Trigger	
175	Bypass CAN Fail-Set	Bypass CAN Fail	1. Check monitor board 2. Check power module control board
176	Bypass CAN Fail-Clear		
177	Bypass Power Fuse Fail-Set	Bypass Power Fuse Fail	1. Check bypass fuse 2. Check bypass interface board

178	Bypass Power Fuse Fail-Clear		
179	Firmware Error-Set	Firmware Error	1. Check control board fireware
180	Firmware Error-Clear		
181	No Ip SCR Temp. Sensor-Set	No Ip SCR Temp. Sensor	1. Check SCR temperature 2. Check SCR temperature probe 3. Check monitor board
182	No Ip SCR Temp. Sensor-Clear		
183	Input SCR Over Temp.-Set	Input SCR Over Temp.	1. Check SCR temperature 2. Check SCR temperature probe 3. Check monitor board
184	Input SCR Over Temp.-Clear		
185	Rated KVA Set OvRange-Set	Rated KVA Set OvRange	1. Check UPS rated setting (Capacity) 2. Check power module rated capacity
186	Rated KVA Set OvRange-Clear		
187	IGBT Or Byp Fan Fail-Set	IGBT Or Byp Fan Fail	1. Check monitor board
188	IGBT Or Byp Fan Fail-Clear		
189	Input SCR Fan Fail-Set	Input SCR Fan Fail	1. Check bypass fan 2. Check monitor board
190	Input SCR Fan Fail-Clear		
191	System Setting Error-Set	System Setting Error	1. Check monitor setting
192	Bypass Over Temp.-Set	Bypass Over Temp.	1. Check bypass temperature 2. Check bypass temperature probe 3. Check monitor board

193	Bypass Over Temp.-Clear		
194	Module ID Duplicate-Set	Module ID Duplicate	1. Check control board 2. Check back board ID jumper
195	Module ID Duplicate-Clear		
196	Electrolyte Leakage-Set	Electrolyte Leakage	1. Check capacitor 2. Check sensor
197	Electrolyte Leakage-Clear		
198	Power Units Num. Error-Set	Power Units Num. Error	1. Check power module status
199	Power Units Num. Error-Clear		