

维修手册					
专案名称:	LV6548 120V				
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LV6548 120V
Service manual



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1. General information

1.1 Getting start

This manual is used as a checking and repairing guide for LV6548. Before read this manual, it's better to have some electrical or electronic background knowledge. With this guide, you can fix the inverter by yourself firstly.

There are five main parts of this guide:

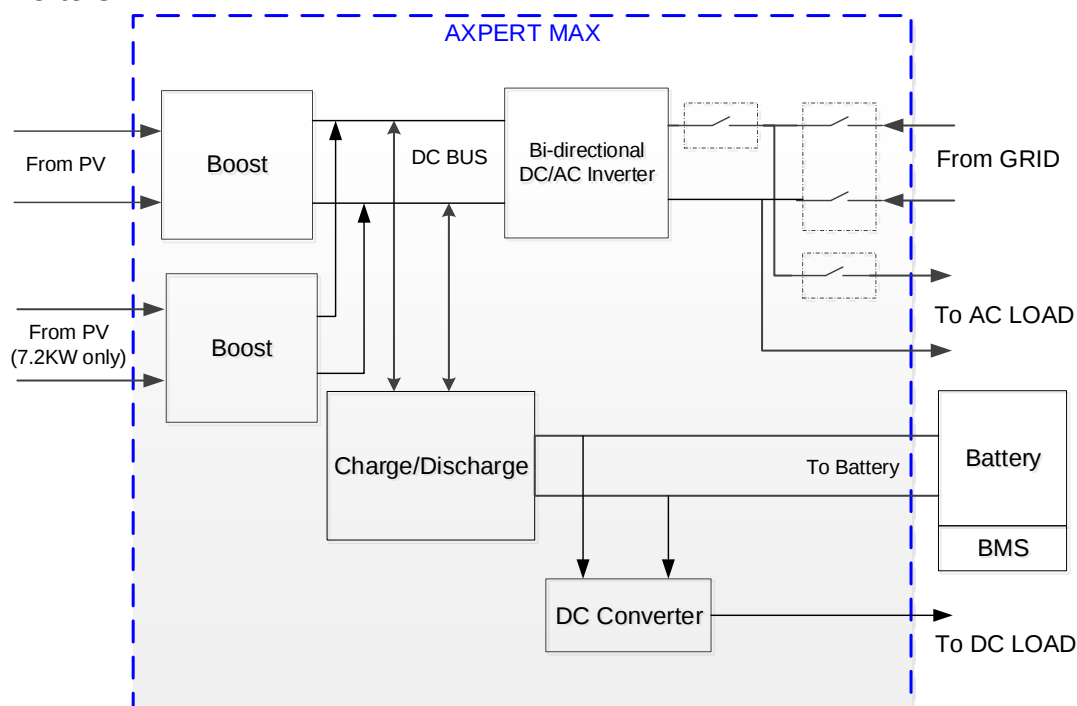
General information: This part is the basic information of the inverter; you can start to know the inverter from this chapter.

Troubleshooting: This part will tell you how to do when you face a problem.

Checking and measuring guide: This part will teach you how to check or repair the inverter by measuring the critical components.

Assembling guide: This part teaches you how to take the board outside and fix the new one.

Cables connection guide: This part will present the signal cables connection of the inverters.



1.2 Basic topology introduction

The topology of the inverter shows as below:

Compare with UPS or normal inverter, INVERTER combines a solar charger inside. Solar charger can be a supplement for battery when there is not grid. And with the solar charger, the inverter can have more working modes than UPS. For detail information please refer to our user manual.

1.3 Inverter family

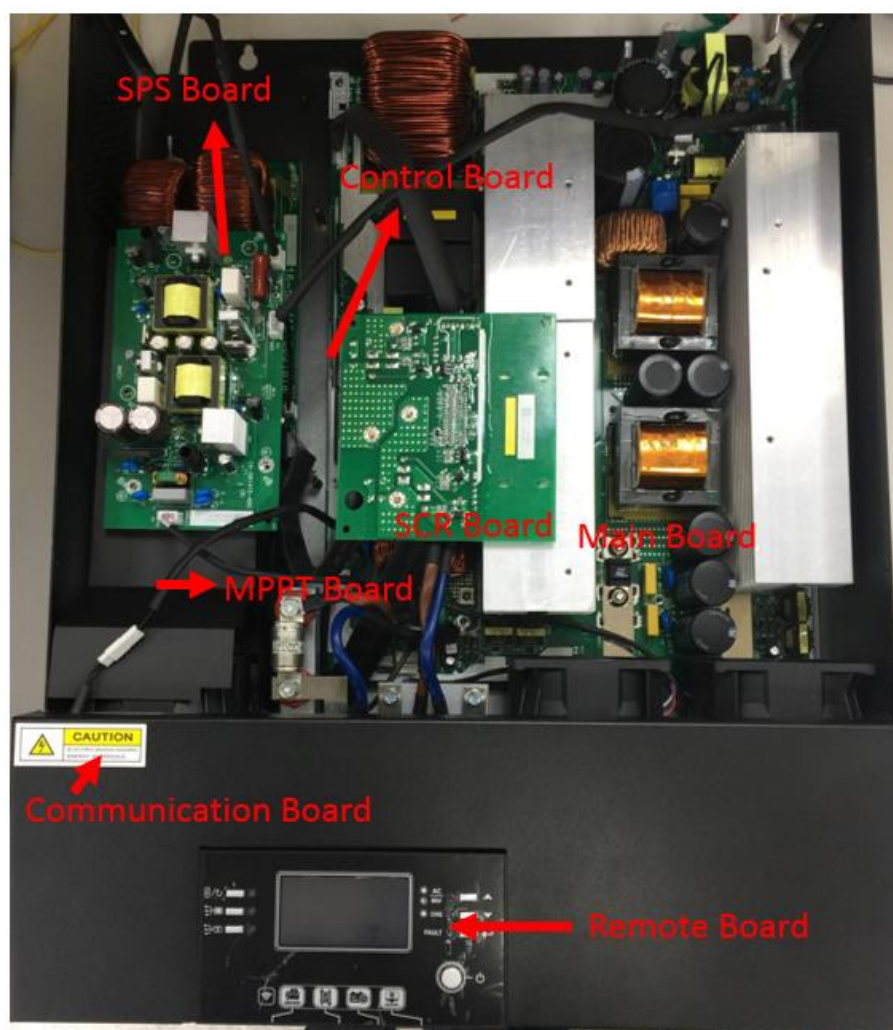
This service manual includes different models of the inverter, the table as below contains some important parameters with different models.

These models names are only neutral names; please match the real model name of your inverter to the model name in the table by comparing the typical characteristics.

Model name	Power rating	Charger type	Charger number
LV6548	6.5KVA	MPPT	1

1.4 Overview the inverter

LV6548 120V 48V



2. Troubleshooting

2.1 How to do

When the inverter was faulty, normally there are two main symptoms:

- No display at all;
- Fault code or warning code on the LCD;

When the fault occurred, please help to record the fault information and follow "How to

check” of part 2.2 to check the inverter, then feedback the checking result to the service center. It will be very helpful for solving the problem as soon as possible.

2.2 Fault condition

Note:

When open the top cover, please have a look first, are there any obviously damaged parts?

When take the main board out, please have a look around, are there any obviously damaged parts?

2.2.1. Not working at all/ No display

Description	The inverter couldn't startup completely.
Possible reason	1. SPS module damaged.
How to check	1. Firstly, please measure the resistor between BAT+ and BAT-. If it is not shorted, only connect the inverter with battery, and press "ON" button, could the inverter startup? If not, please check the fan. 2. If the LCD couldn't light up and fan doesn't work, please disconnect all the wires and open the top cover, and then take the main board outside by following part 4. 3. Check the main board by following "3.5 and 3.6"
How to solve	Repair the main or replace it directly.

2.2.2. 09 fault

Description	Bus soft start fails.
Possible reason	DC-DC module was damaged or BUS soft start module was damaged.
How to check	1. Check the main board by following "3.6; 3.7"; 2. Check the main board by following "3.1; 3.2; 3.3; 3.4".
How to solve	Repair the main board or replace it directly.

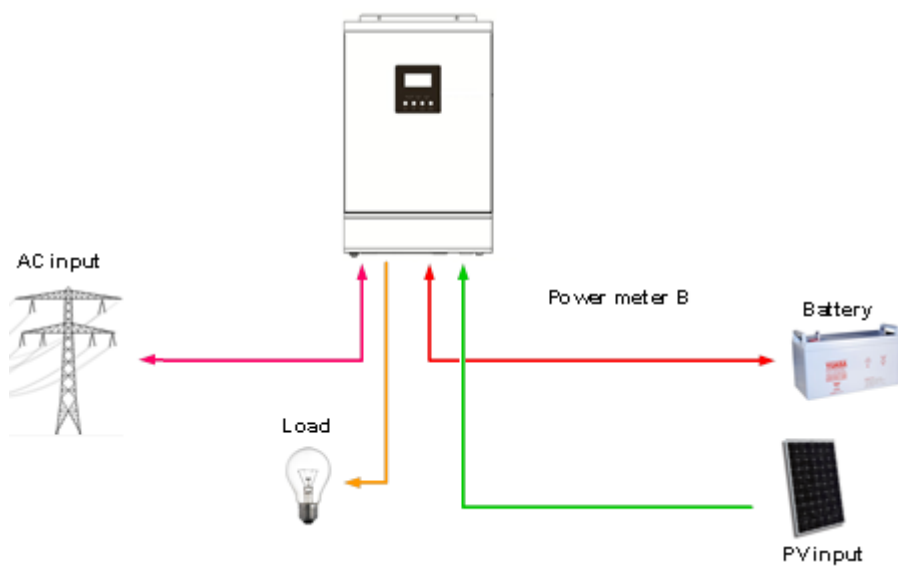
2.2.3. Warning

Description	Battery couldn't be detected.
Possible reason	Wire connection or fuse was burnt.
How to check	1. Check the wire connection, the priority of the battery cable; 2. Check the main board by following "3.1".
How to solve	Repair the main board or replace it directly.

2.3 Test step

After replacing all defected components, testing steps can be used to confirm the repair result and the reliability of the Inverter.

Set up the testing system as below:

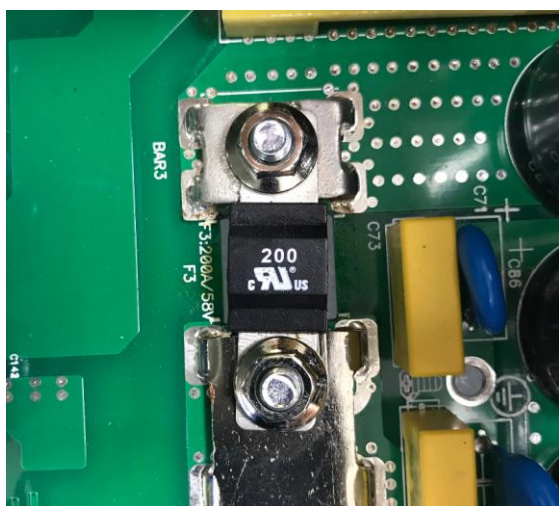


3. Checking and measuring guide

3.1 Check the battery side components on MAIN board

Fuse and capacitors

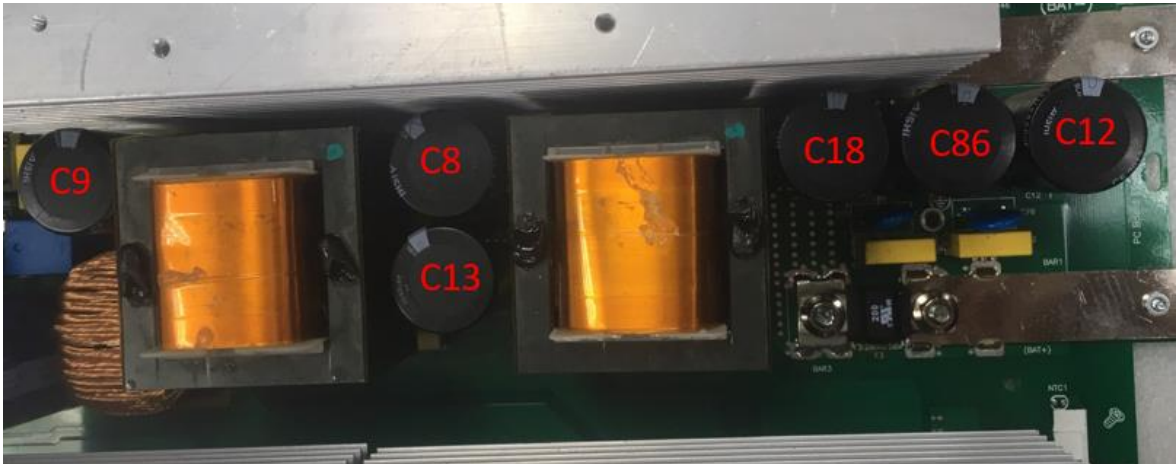
For LV6548 120V 48V



Parts	Attribute	Reference values	Failure status
F3	Resistor	0.2 ohm	Open

For Phocos 5K LV- C8/C9/C12/C13/C18/C86: (6800uF 63V)

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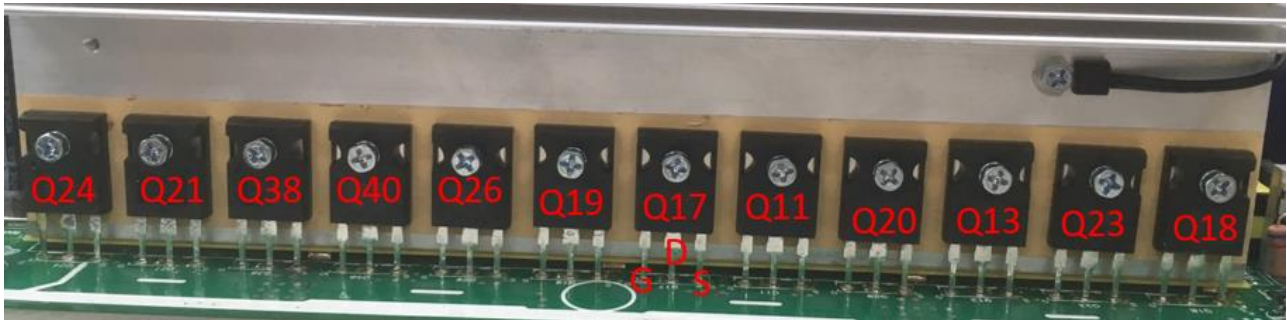


If the capacitors explode as below, they need to be replaced.



Power devices

DC/DC MOSFET: Q24/Q21/Q38 & Q40/Q26/Q19 & Q17/Q11/Q20 & Q13/Q23/Q18



For Phocos 5K LV ALL of the MOSFET are
(MOSFET IR/IRFP4668PBF 130A 200V N BULK TO-247)

Parts	Attribute	Reference values	Failure status
IRFP4668PBF	Resistor	GS: 15.67k GD: 510.0k DS: 581.0k	Short or explosion
	Diode	SD: 0.556V DS: OL	

Note1: When you use the multimeter to measure the resistor of the transistor, because of the capacitor in the circuit, it will cause the changing of the values when you measure the DS and GD. So we recommend you measure the diode forward voltage of SD, and the resistor of GS. These two values can reflect the situation of the transistor more correctly.

Note2: If one or more of them were damaged, please replace all of them.

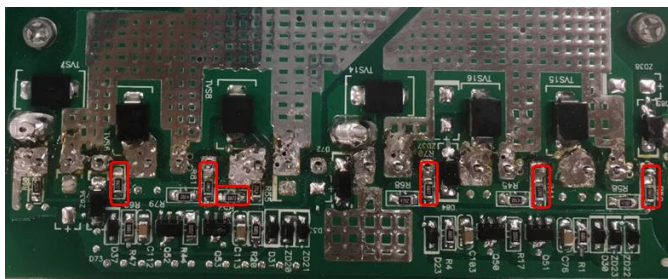
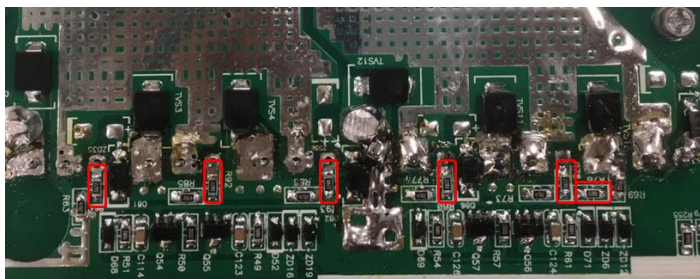
3.1.1. Drivers (This part is only used for repair checking)

Note: Drivers usually need to be checked when users want to repair the boards. Because when power devices were damaged, the high voltage will rush to driver circuit through the gates of power devices.

The reference of the resistors list as below:

R76/R78/R80/R93/R92/R64

R59/R41/R70/R52//R81/R62 All of the resistors are (22R 1206)

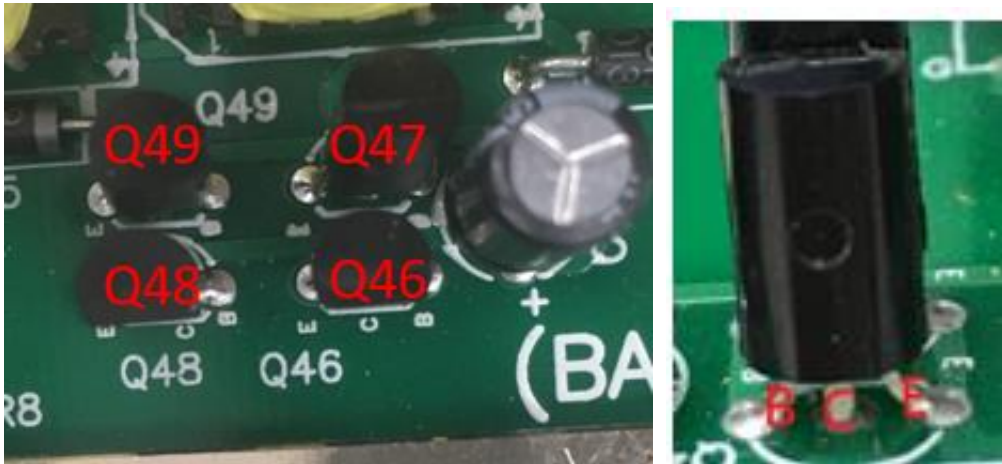


Use multimeter to measure each resistor, find the burnt resistors and replace them; don't need to replace them all.

Parts	Attribute	Reference values	Failure status
All: 22ohm	Resistor	22 ohm	Open or other values

If the resistors need to be replaced, please also check the driver transistors and control IC.

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The Q46and Q48 are (TR UTC/2SC2655 2A 50V NPN TAP TO-92)

The Q47and Q49 are (TR UTC/2SA1020L-Y-T9N-B 2A 50V PNP TAP TO-92NL)



The Q41and Q43 are (TR UTC/2SC2655 2A 50V NPN TAP TO-92)

The Q15and Q16 are (TR UTC/2SA1020L-Y-T9N-B 2A 50V PNP TAP TO-92NL)

Parts	Attribute	Reference values	Failure status
Q46/Q48	Resistor	BE: 429.6k BC: 425.5k EC: 15.7k	Short or explosion
	Diode	BE: 0.65V BC: 0.65V EC: 0.28V	
Q41/Q43	Resistor	BE: 428k	Short or explosion

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		BC: 425k EC: 15.5k	
	Diode	BE: 0.65V BC: 0.65V EC: 0.28V	
Q47/Q49	Resistor	BE: 431k CB: 398k CE: 1.07k	Short or explosion
	Diode	BE: 0.65V CB: 0.63V CE: 0.17V	
Q15/Q16	Resistor	BE: 430k CB: 393k CE: 1.07k	Short or explosion
	Diode	BE: 0.65V CB: 0.60V CE: 0.17V	



The Q54and Q56 are (TR UTC/2SD1624 2A 50V NPN SOT-89)

The Q55and Q57 are (TR UTC/2SA1020 3A 50V PNP SOT-89)

Parts	Attribute	Reference values	Failure status
Q54/Q56	Resistor	BE: 15.87k BC: 262.5k CE: OL	Short or explosion
	Diode	BE: 0.63V	

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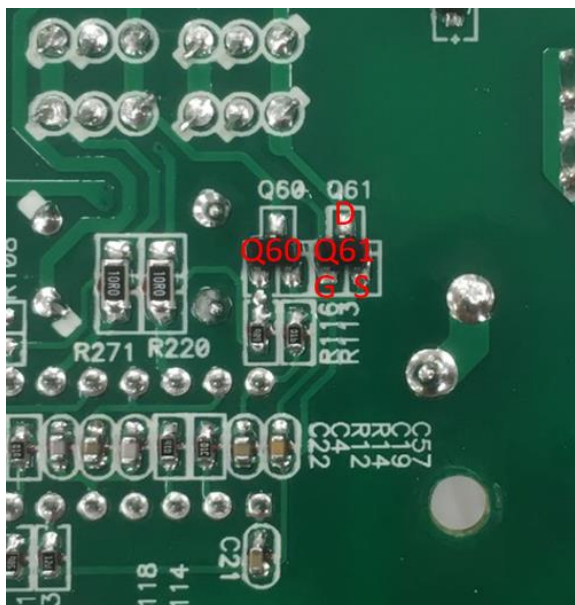
		BC: 0.63V CE: OL	
Q55/Q57	Resistor	BE: 15.87k BC: OL CE: 276.6k	Short or explosion
	Diode	BE: 0.63V BC: OL CE: 1.11V	



The Q51and Q52 are (TR UTC/2SD1624 2A 50V NPN SOT-89)

The Q50and Q53 are (TR UTC/2SA1020 3A 50V PNP SOT-89)

Parts	Attribute	Reference values	Failure status
Q51/Q52	Resistor	BE: 15.87k BC: 262.5k CE: OL	Short or explosion
	Diode	BE: 0.63V BC: 0.63V CE: OL	
Q53/Q54	Resistor	BE: 15.87k BC: OL CE: 276.6k	Short or explosion
	Diode	BE: 0.63V BC: OL CE: 1.11V	



Parts	Attribute	Reference values	Failure status
Q60/Q61	Resistor	GS: 4.123k GD: 9.58k SD: 1.12k	Short or explosion
	Diode	SD: 0.17V DS: 1.33V	



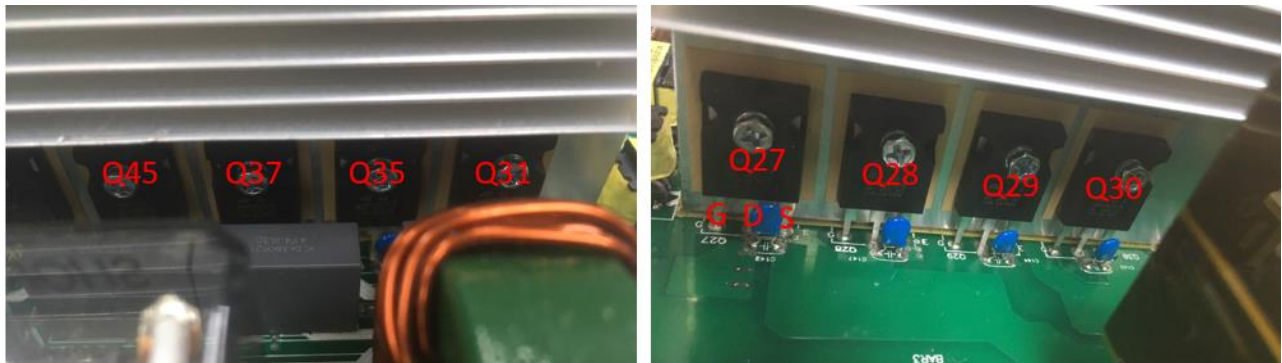
Parts	Attribute	Reference values	Failure status
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U9	Resistor	PIN13 TO PIN12: 8.8k PIN11 TO PIN12: 432k PIN14 TO PIN12: 432k	Short or explosion
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3.2 Check the bus side components on MAIN board

Power devices

DC/DC IGBT: Q27/Q28/Q29/Q30/Q31/Q35/Q37/Q45



For 7248MAX ALL of the IGBTs are (IGBT ST/STGW60H65DFB 60A 650V N BULK TO-247)

Parts	Attribute	Reference values	Failure status
Q27/Q28/Q29/Q30 Q45/Q37/Q35/Q31	Resistor	GE: 22.9 ohm GC: 169.4k EC: 169.1K	Short or explosion
	Diode	EC: 0.358V CE: OL	

Note1: When you use the multimeter to measure the resistor of the transistor, because of the capacitor in the circuit, it will cause the changing of the values when you measure the CE and GE. So we recommend you measure the diode forward voltage of EC, and the resistor of GE. These two values can reflect the situation of the transistor more correctly.

Note2: If one or more of them were damaged, please replace all of them.

Drivers (This part is only used for repair checking)

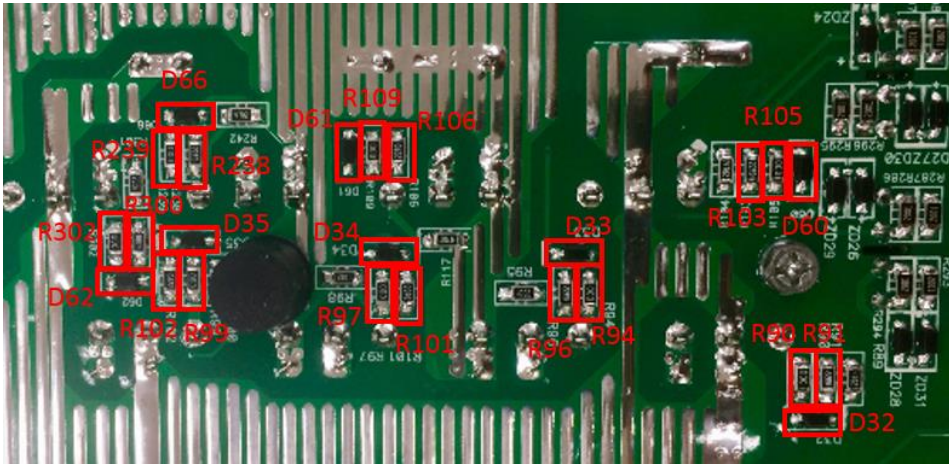
Meanwhile, we also need to check the driver tubes of these power tubes.

R91/R103/R102/R300/R96/R106/R101/R238: (22R 1206)

R90/R105/R99/R302/R94/R109/R97/R239: (0R 1206)

D32/D60/D35/D62/D33/D61/D34/D66: (1N4148W 0.15A 75V SMD)

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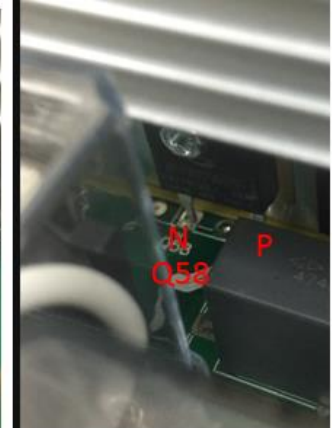
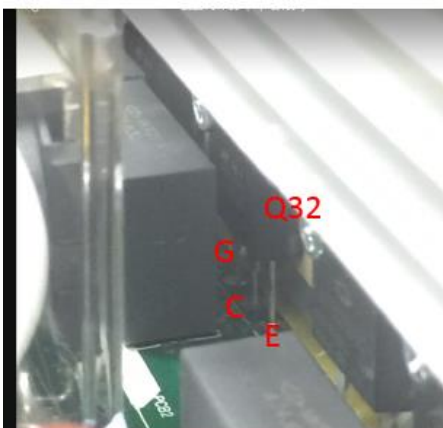
Parts	Attribute	Reference values	Failure status
R91/R103/R102/R300/ R96/R106/R101/R238	Resistor	22 ohm	Open or other values
R90/R105/R99/R302 /R94/R109/R97/R239	Resistor	0 ohm	
D32/D60/D35/D62/ D33/D61/D34/D66 ¹	Resistor	+ to -: 270k - to +: OL	Short or explosion
	Diode	+ to -: 0.6V - to +: OL	

Note1: When test the diode; please remove the R90/R99/R94/R97 from the board, or the test result is not right.

3.3 Check the buck circuit on MAIN board

Power devices

BUCK MOSFET and Diode: Q32/Q42/Q58



For Phocos 5K LV the IGBTs Q32 /Q42 are (IGBT ST/STGW80H65DFB 80A 650V N BULK TO-247)

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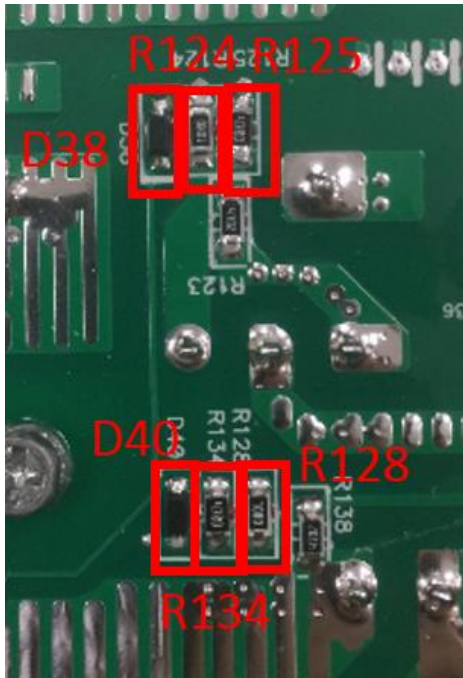
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The Q58 is (D ADVANCED/APT40DQ60BG 40A 600V FST RAD TO-247 BULK)

Parts	Attribute	Reference values	Failure status
Q32/Q42	Resistor	GE:17k GC: 190.8k CE: OL	Short or explosion
	Diode	CE: OL EC: 0.357V	
Q58	Resistor	+ to -: 23.8k - to +: OL	
	Diode	+ to -: 0.367V - to +: OL	

Drivers (This part is only used for repair checking)



The R124/R128 are (47R 1206)

The R125/R134 are (30R 1206)

The D38/D40 are (1N4148W 0.15A 75V SMD)

Parts	Attribute	Reference values	Failure status
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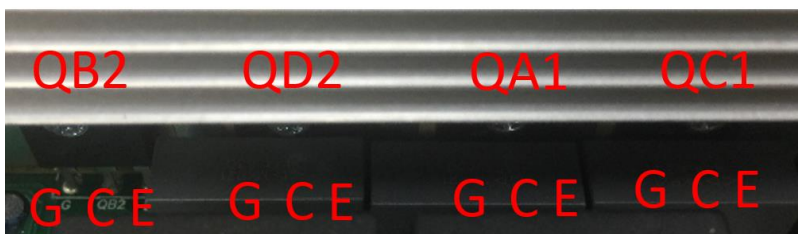
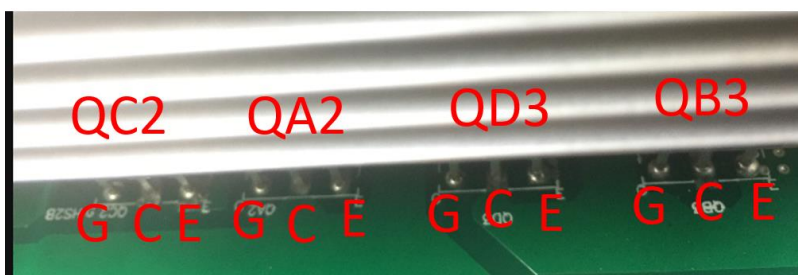
R125/R134	Resistor	30 ohm	Open or other values
R124/R128	Resistor	47 ohm	
D38/D40 ¹	Resistor	+ to -: 240k - to +: OL	Short or explosion
	Diode	+ to -: 0.6V - to +: OL	

Note1: When test the diode; please remove the R124/R128 from the board, otherwise the test result is not right.

3.4 Check the INV full bridge on MAIN board

Power devices

INV IGBT: QA1/QA2/QC1/QC2/QB2/QB3/QD2/QD3



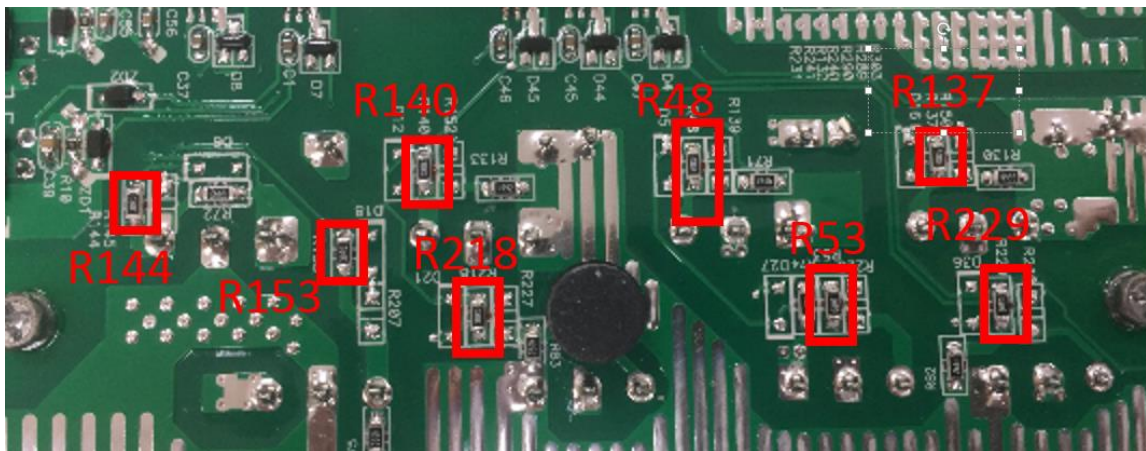
All of the IGBT are (IGBT ST/STGW80H65DFB 80A 650V N BULK TO-247)

Parts	Attribute	Reference values	Failure status
QA1/QA2/QC1/QC2/ QB2/QB3/QD2/QD3	Resistor	GE: 17.46k GC: 187k EC: 7.2M	Short or explosion
	Diode	EC: 0.355V CE: OL	

Note1: If one or more of them were damaged, please replace all of them.

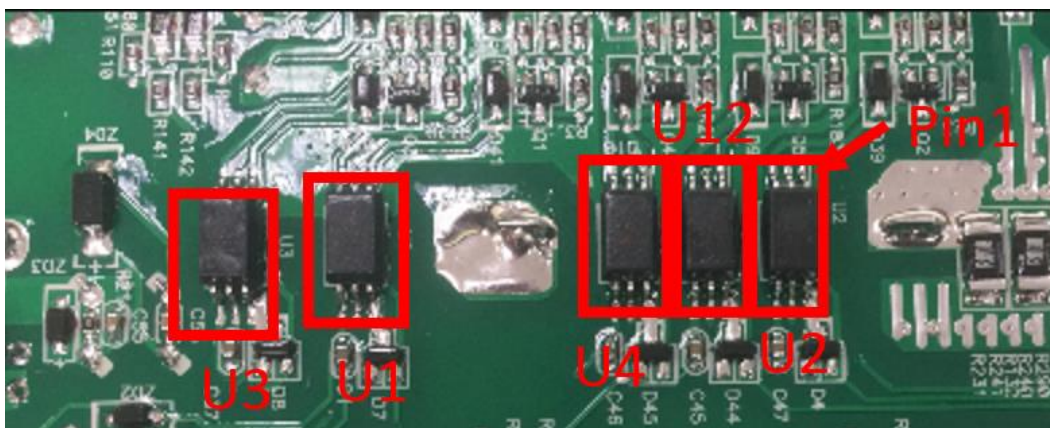
Drivers

R48/R53/R144/R153/R140/R218/R137/R229: (30R 1206)



Parts	Attribute	Reference values	Failure status
R48/R53/R144/R153/ R140/R218/R137/R229	Resistor	30 ohm	Open or other values

Optocoupler: U1/U2/U3/U4/U12



ALL of the optocoupler are (TI/UCC23513DWYR 6/SOIC SMD)

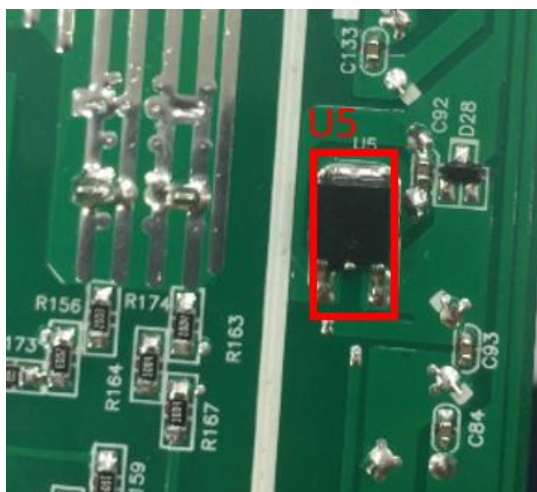
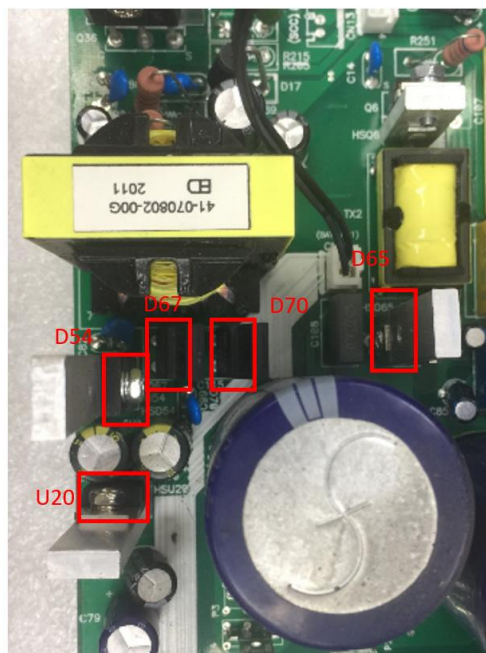
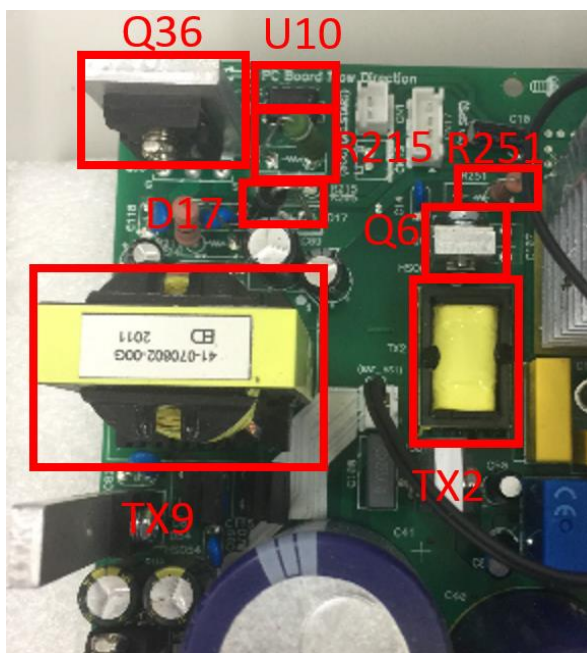
Parts	Attribute	Reference values	Failure status
U1/U2/U3/U4/U12	Diode	PIN4 TO PIN5: 0.63V PIN4 TO PIN6: 0.425V	Short or explosion
U2/U4/U12/ U1/U3	Resistor	PIN4 TO PIN5: 198.4k PIN4 TO PIN6: 160.7k	

3.5 Check BATT and Main Power SPS on MAIN board

BATT Power SPS&Main Power SPS

The Q36 is (MOSFET IR/IRFP4227PBF 46A 200V N BULK TO-247)

The Q6 is (MOSFET IR/IRF840 8A 500V N BULK TO-220)
The U10 is (IC PWM CNTL ON/UC3845BNG DIP-8)
The D17 is (D IO/HER303 3A 200V UFST AXI DO-27 TAP)
The TX9 is (TX 5:5:5:3:1:6 FER EC35)
The TX2 is (TX 15:200:15 FER EEL16)
The R215 is (RES 3W 0.15 J N-IND)
The R251 is (RES 2W 0.62 J RAD KINK N-IND TAP)
The D65 is (RHRP8120 8A 1200V)
The D70 is (ER802F 8A 200V)
The D67 is (ER802F 8A 200V)
The D54 is (ER802F 8A 200V)
The U20 is (IC LIN ST/L7912CV 3P/TO-220)
The U5 is (IC LIN ON/MC78M05CDTRKG DPAK-3 SMD)



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Parts	Attribute	Reference values		Failure status	
Q36	Resistor	SD: 275K SG: 16.4k		Short or explosion	
	Diode	SD: 0.46V SG: 0.65V			
Q6	Resistor	SD: 275k SG: 1.17k		Short or explosion	
	Diode	SD: 0.46V SG: 0.29V			
U10	Diode	PIN5 TO PIN7: 0.48V PIN5 TO PIN6: 0.64V		Short or explosion	
D17	Diode	+ to -: 0.45V - to +: OL		Short or explosion	
TX9	Resistor	PIN1 TO PIN3: 0.2 ohm		Short or other values	
TX2	Resistor	PIN2 TO PIN4: 2.7 ohm		Short or other values	
R215	Resistor	0.15 ohm		Open or other values	
R251	Resistor	0.62 ohm		Open or other values	
D65	Diode	+ to -: 0.448V - to +: OL		Short or explosion	
D70	Diode	+ to -: 0.457V - to +: OL		Short or explosion	
D67	Diode	+ to -:0.458 V - to +: OL		Short or explosion	
D54	Diode	+ to -: 0.384V - to +: OL		Short or explosion	
U20	Diode	PIN G TO PIN I: 1.96V PIN G TO PIN O: 1.36V		Short or explosion	
U5	Diode	PIN G TO PIN I: 0.45V		Short or explosion	

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		PIN G TO PIN O: 0.98V	
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3.6 Check AC SPS and PV SPS

The F1 is (FUSE 3A 250V)

The NTC1 is (NTC 10 OHM 3.0A)

The REC1 is (GBU4M 4A 1000V UFST)

The Q1 is (SPP11N80C3 11A 800V)

The TX1 is (TX 8:23:30:23 FER EER28)

The R21 is (RES 不燃性树脂型绕线 3W 0.47 J N-IND BULK)

The D6 is (RHRP860 8A 600V)

The Q2 is (SPP11N80C3 11A 800V)

The TX2 is (TX 8:23:30:23 FER EER28)

The R43 is (RES 不燃性树脂型绕线 3W 0.47 J N-IND BULK)

The D15 is (RHRP860 8A 600V)

Parts	Attribute	Reference values	Failure status
F1	Resistor	0.2 ohm	Open or explosion
NTC1	Resistor	9.9 ohm	
Q1	Resistor	SD: 212.2K SG: 15.55k	Short or explosion
	Diode	SD: 0.42V SG: 0.31V	
TX1	Resistor	PIN1 TO PIN3: 0.4 ohm	Short or other values

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R21	Resistor	0.47ohm	Open or other values
D6	Diode	+ to -: 0.428V - to +: OL	Short or explosion
Q2	Resistor	SD: 229.9K SG: 15.61k	Short or explosion
	Diode	SD: 0.417V SG: 0.301V	
TX2	Resistor	PIN1 TO PIN3: 0.3ohm	Short or other values
R43	Resistor	0.47ohm	Open or other values
D15	Diode	+ to -: 0.429V - to +: OL	Short or explosion

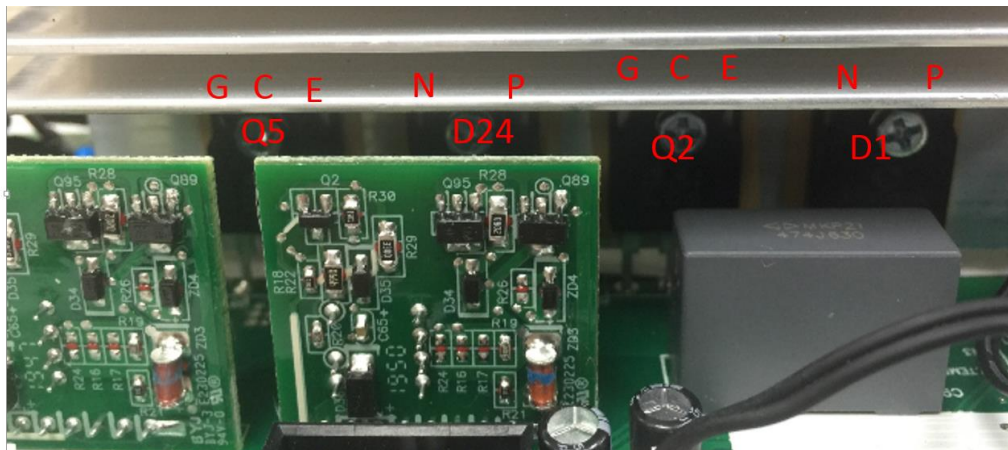
3.7 Check the Boost on MPPT board

Power devices

Boost IGBT Q2/Q5 and Diode D1/D24

The D1and D24 are (30DQ60BG 30A 600V TO-247)

The Q2 and Q5 IGBT are (STGW80H65DFB 80A 650V N BULK TO-247)



Parts	Attribute	Reference values	Failure status
Q2, Q5	Resistor	GE: 41.17k GC: 233.5k EC: 183.5k	Short or explosion

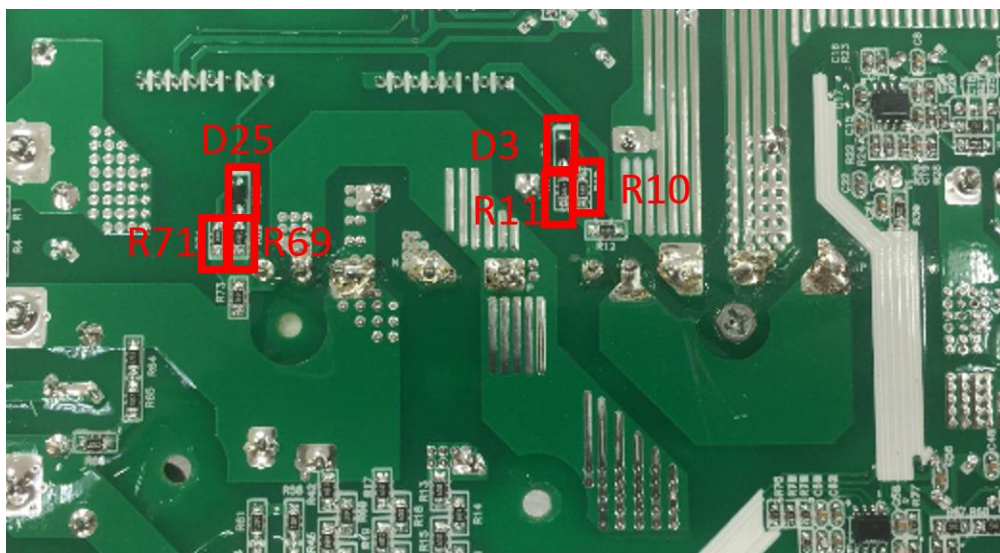
	Diode	EC: 0.382V CE: OL	
D1,D24	Diode	+ to -: 0.381V - to +: OL	

Drivers

The D3 and D25 are (1N4148W 0.15A 75V SMD)

The R10 and R71 are (30R 1206)

The R11 and R69 are (47R 1206)



Parts	Attribute	Reference values	Failure status
D3/ D25 ¹	Diode	+ to -: 0.6V - to +: OL	Short or explosion
R10/ R71	Resistor	30 ohm	Open or other values
R11/ R69	Resistor	47 ohm	Open or other values

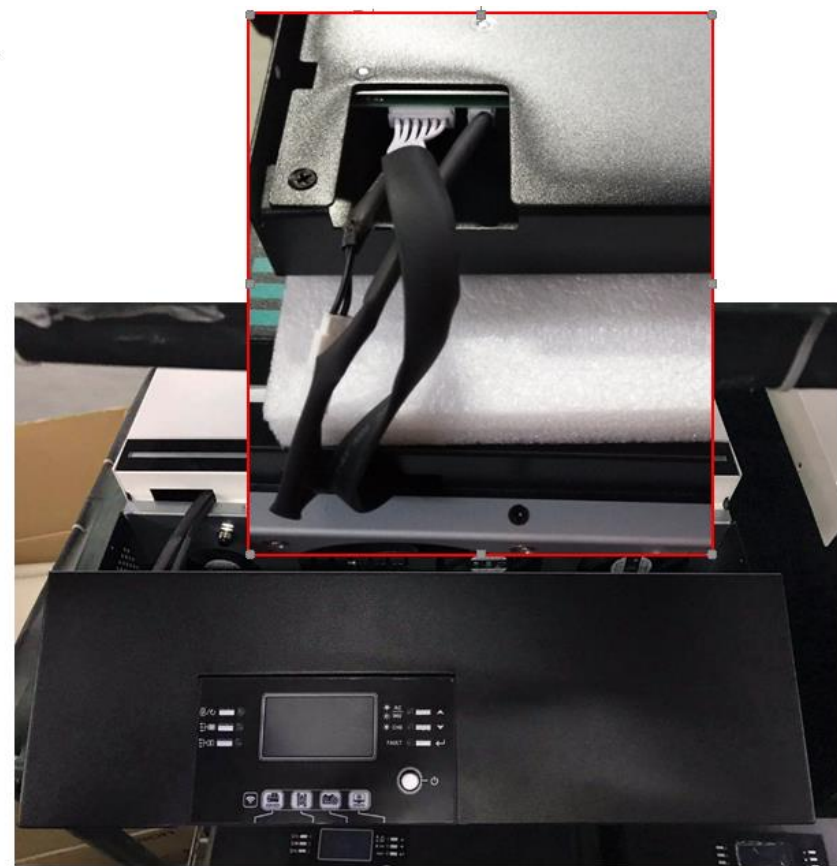
Note 1: When test the diode; please remove the R11/ R69 from the board, or the test result is not right.

4. Disassembling guide

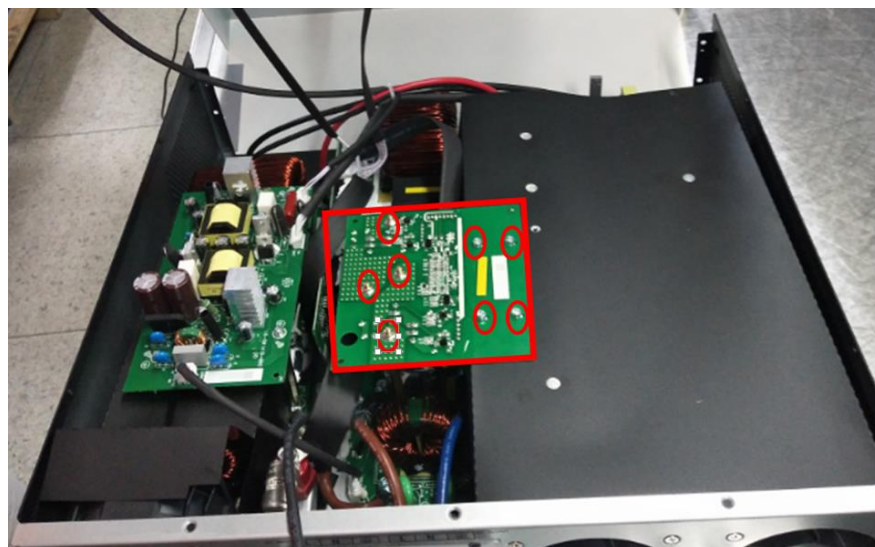
Remove 13 screws on top cover and rear panel.



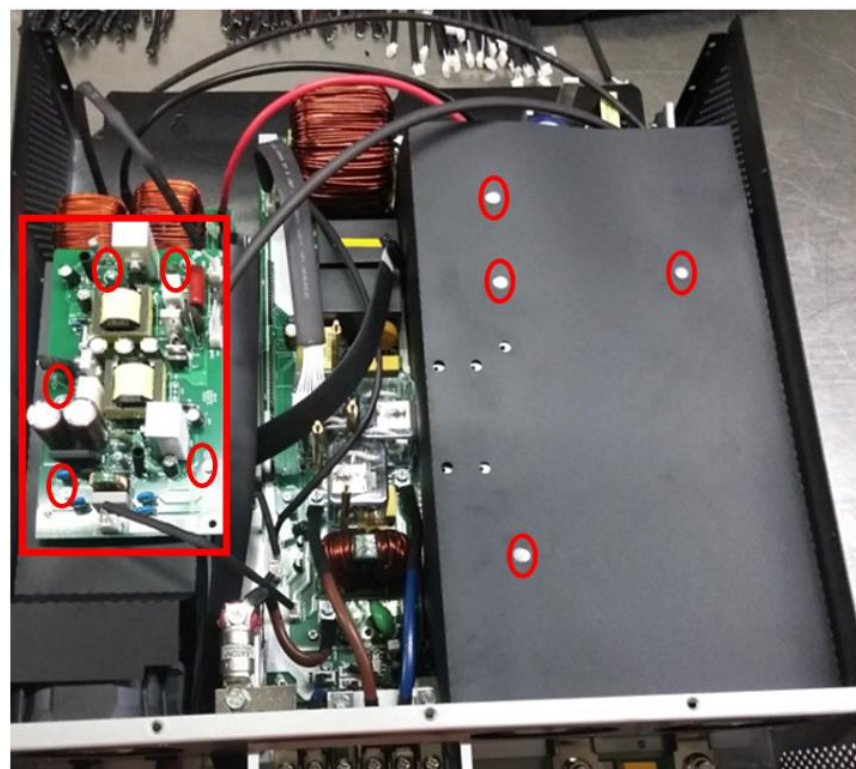
Remove the remote panel and 3 control cables.



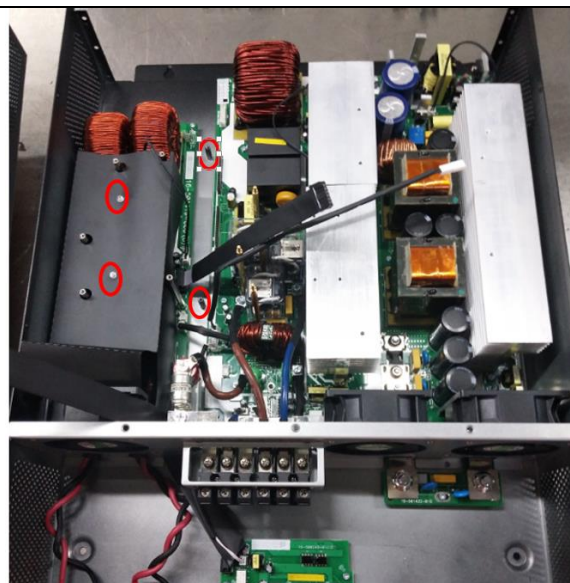
Remove 4 screws and 4 nuts on the SCR Board.



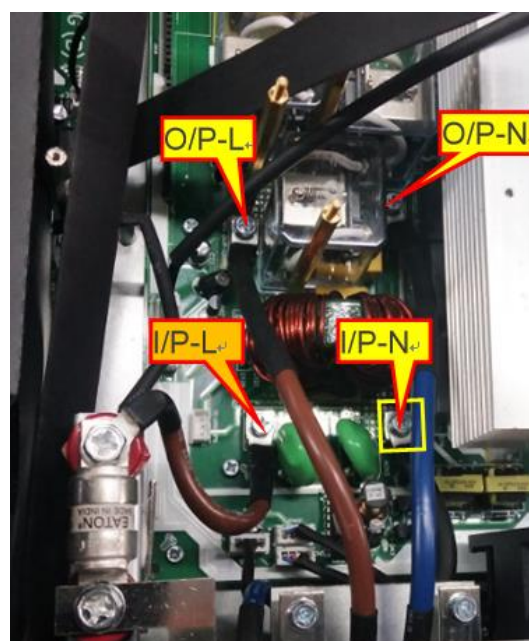
Remove 5 screws on the SPS Board ,and 4 plastic screws of wind pipeline.



Remove 2 plastic screws of wind pipeline and 2 screws beside the control board. Take out the control board.



Remove I/P and O/P cables.



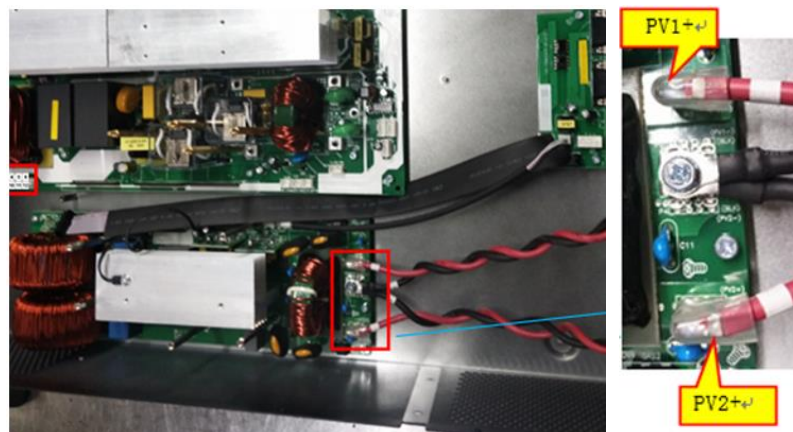
Remove the fan cables.

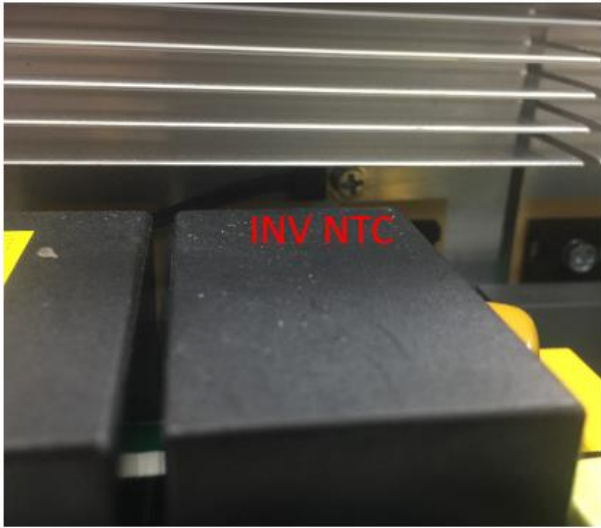
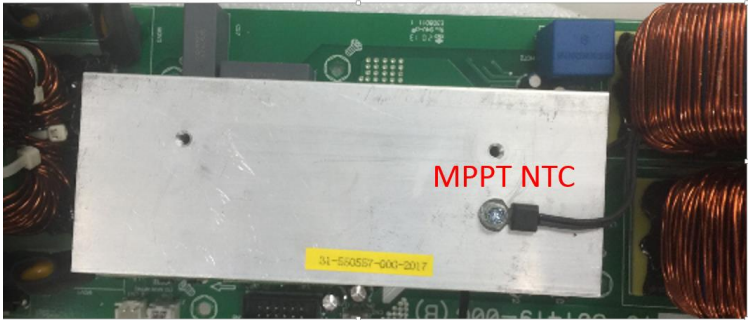


Remove 4 screws beside the fan frame.

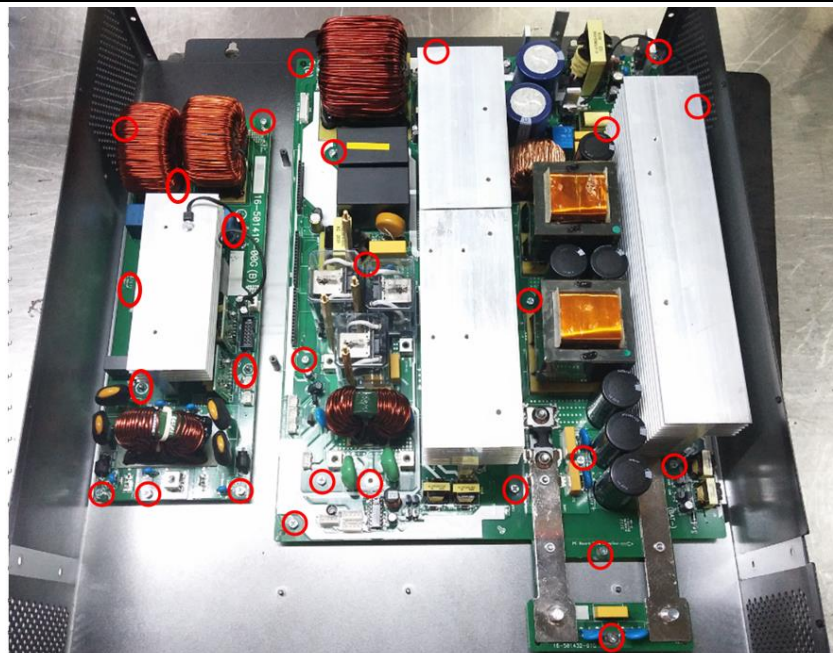


Remove PV IN cable.



维修手册					
专案名称:	LV6548 120V				
专案编号:	P1911061	修订版次:	00	PAGE	
Remove MPPT NTC, Converter NTC and INV NTC.    Remove 22 screws on main board and					

MPPT board.
Remove 5
copper pillars
on MPPT
board.
Take out the
main board and
MPPT board.



Total wiring diagram:

Note: Wrong connection of wires may cause inverter damage!

Please connect wires with care!

