

SERVICE MANUAL

Axpert VM II-5000
and VM II-3000

Axpert VM II-5000/ VM II-3000 Service manual



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1. General information

1.1 Getting start

This manual is used as a checking and repairing guide for Axpert VMII-5000 and VMII-3000. 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.

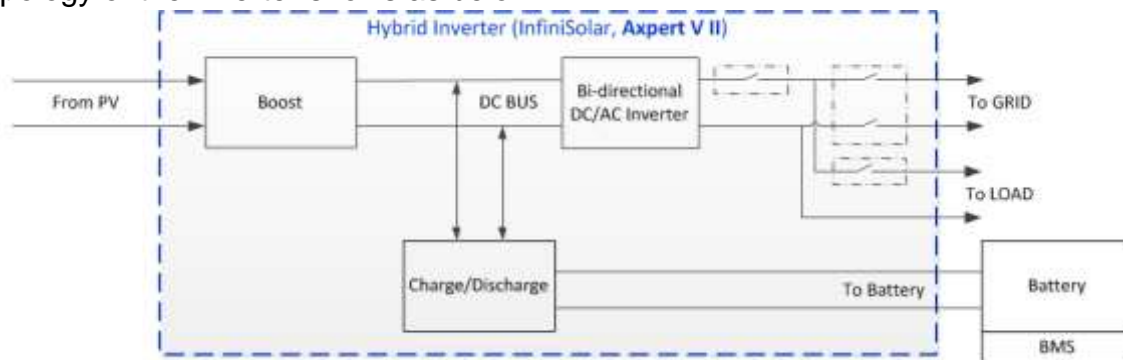
Checking and measuring guide: This part will teach you how to check or repair the inverter by measuring the critical components.

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 or for saving energy purpose. 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

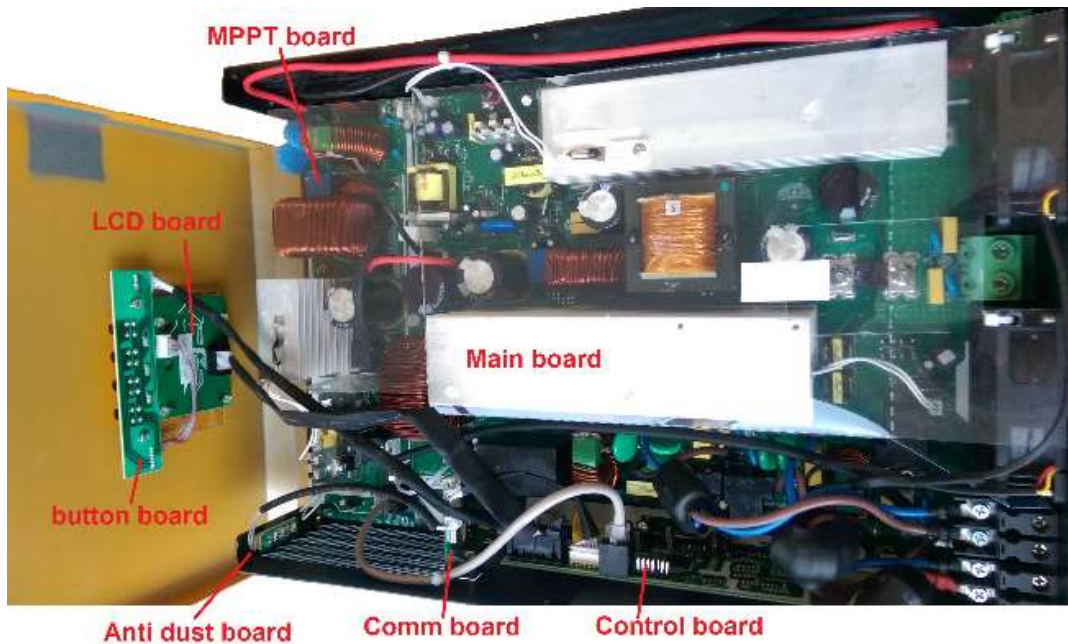
This service manual includes different models of the inverter, the table as below contains some important parameters with different models.

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
Axpert VMII-5000	5KVA	MPPT	1
Axpert VMII-3000	3KVA	MPPT	1

1.4 Overview the inverter

Axpert VMII-5000 and VMII-3000



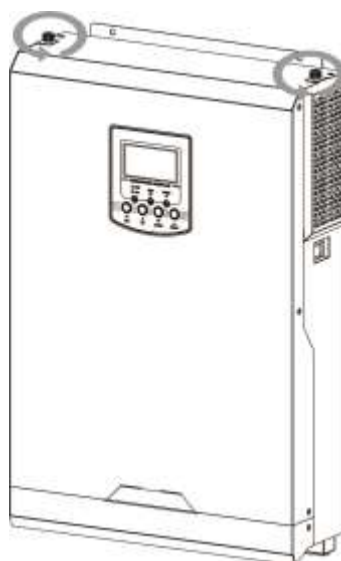
1.5 CLEARANCE AND MAINTENANCE FOR ANTI-DUST KIT

1.4.1 Overview

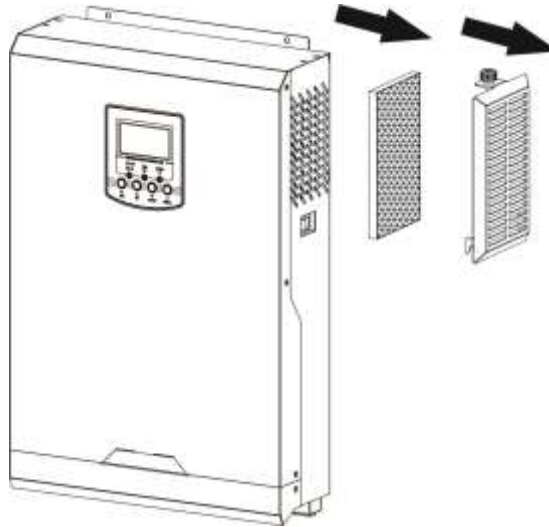
Every inverter is already installed with anti-dusk kit from factory. Inverter will automatically detect this kit and activate internal thermal sensor to adjust internal temperature. This kit also keeps dusk from your inverter and increases product reliability in harsh environment.

1.4.2 Clearance and Maintenance

Step 1: Please loosen the screw in counterclockwise direction on the top of the inverter.



Step 2: Then, dustproof case can be removed and take out air filter foam as shown in below chart.



Step 3: Clean air filter foam and dustproof case. After clearance, re-assemble the dust-kit back to the inverter.
NOTICE: The anti-dust kit should be cleaned from dust every one month.

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 and MPPT board or replace it directly.

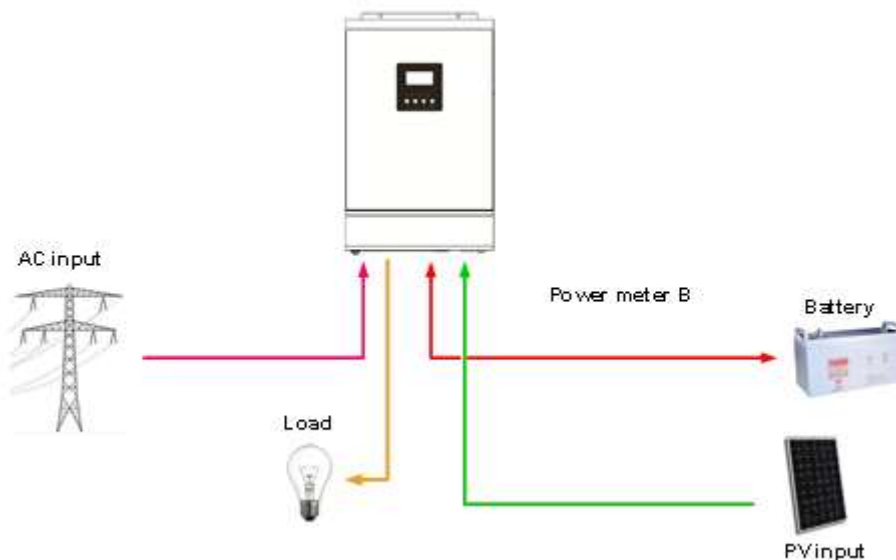
2.2.3. 56 fault

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:

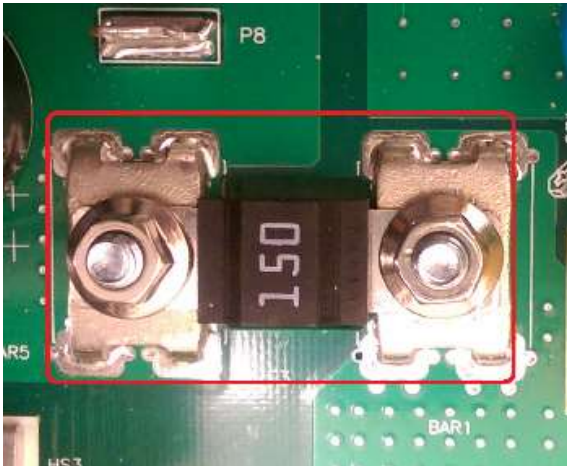


3. Checking and measuring guide

3.1 Check the battery side components on MAIN board

Fuse and capacitors

F3: (FUSE 150A)



Parts	Attribute	Reference values	Failure status
F1	Resistor	0 ohm	Open

For VMII-5000 C18/C13/C8: (6800UF 63V)



For VMII-3000 C18/C13/C11/C8: (4200u 35V)

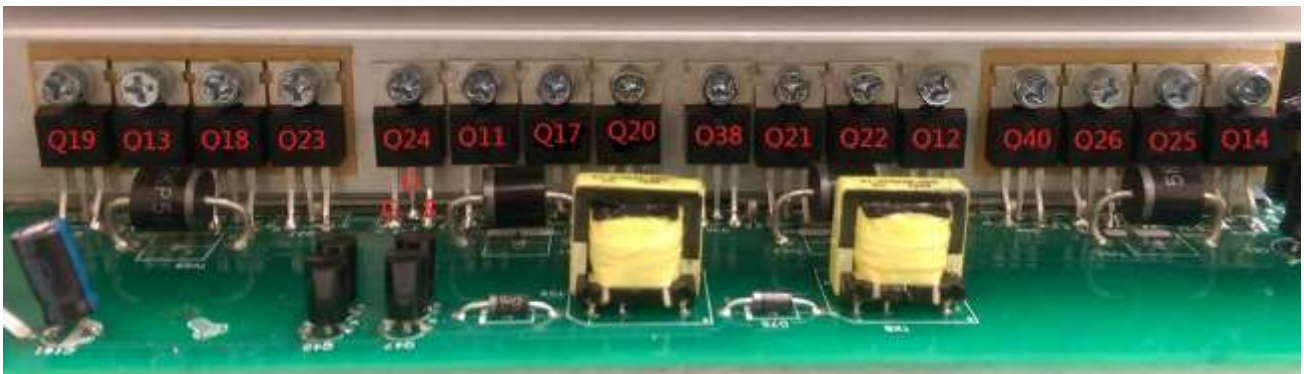


If the capacitors explode as below, they need to be replaced.



Power devices

DC/DC MOSFET: Q11/Q17/Q20/Q24 & Q38/Q21/Q22/Q12 & Q13/Q18/Q23/Q19 & Q40/Q26/Q25/Q14



For VMII-5000 ALL of the MOSFET are (TK100E08N1 214A 80V TO-220)

For VMII-3000 ALL of the MOSFET are (IRFB3206PBF 210A 60V TO-220)

Parts	Attribute	Reference values	Failure status
All: 11-320160-00G and 11-320126-00G	Resistor	GS: 11.75k GD: 252k DS: OL	Short or explosion
	Diode	SD: 0.43V 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.

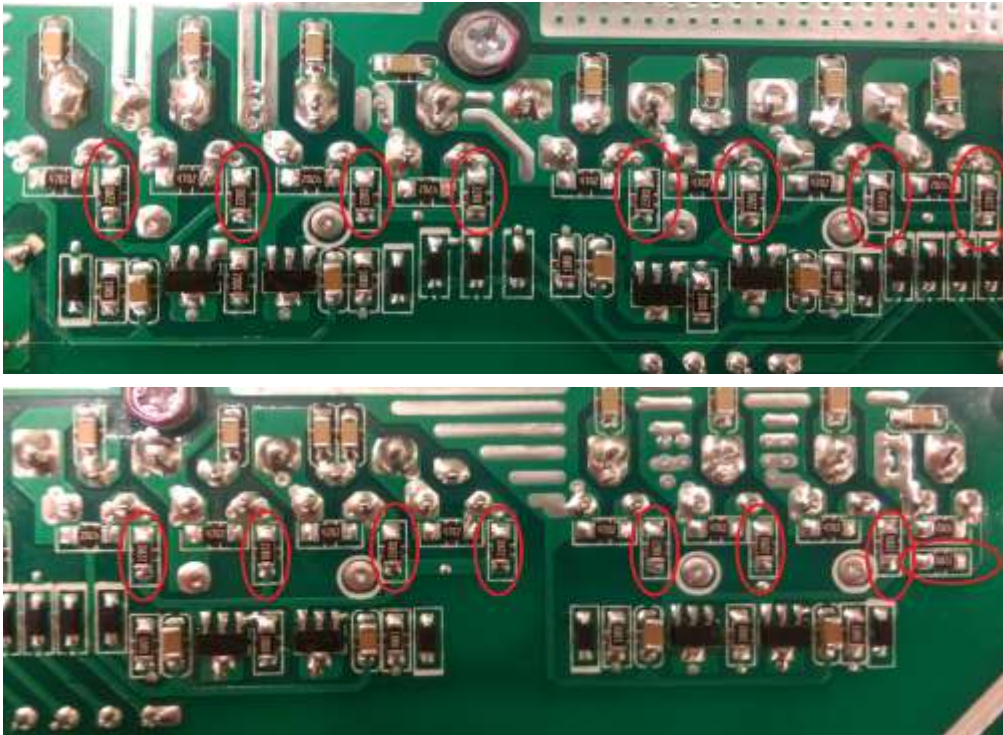
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The reference of the resistors list as below:

R41/R59/R70/R76/R80/R78/R75/R42/R52/R62/R81/R64/R93/R92/R87/R53

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.

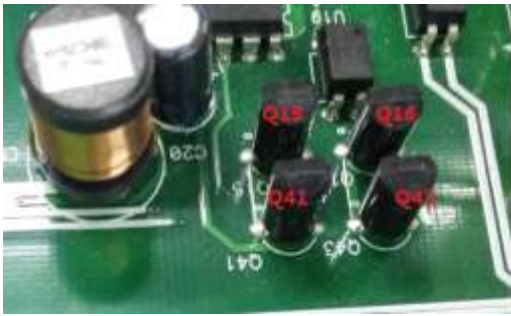


The Q46 and Q48 are (2SC2655 2A 50V NPN TO-92)

The Q47 and Q49 are (A1020 2A 50V PNP TO-92)

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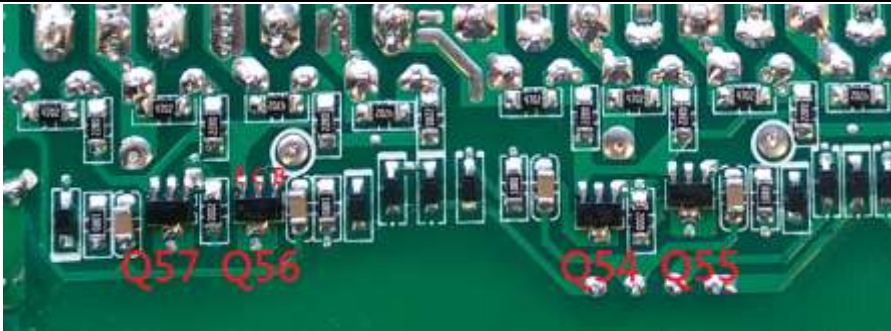
The Q41 and Q43 are (2SC2655 2A 50V NPN TO-92)

The Q15 and Q16 are (A1020 2A 50V PNP TO-92NL)

Parts	Attribute	Reference values	Failure status
Q46/Q48	Resistor	BE: 430k BC: 430k EC: 16k	Short or explosion
	Diode	BE: 0.65V BC: 0.65V CE: 0.28V	
Q41/Q43	Resistor	BE: 430k BC: 425k EC: 104k	Short or explosion
	Diode	BE: 0.65V BC: 0.65V CE: 0.28V	
Q47/Q49	Resistor	BE: 430k BC: 430k EC: 8k	Short or explosion
	Diode	BE: 0.65V BC: 1.5V CE: 0.20V	
Q15/Q16	Resistor	BE: 430k BC: 430k CE: 100k	Short or explosion
	Diode	BE: 0.65V BC: 1.5V CE: 0.28V	

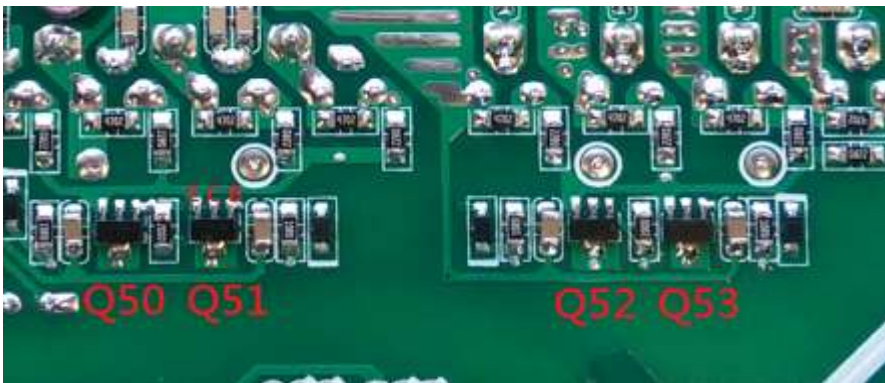
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The Q54 and Q56 are (2SD1624 2A 50V NPN SOT-89)

The Q55 and Q57 are (2SA1020 3A 50V PNP SOT-89)



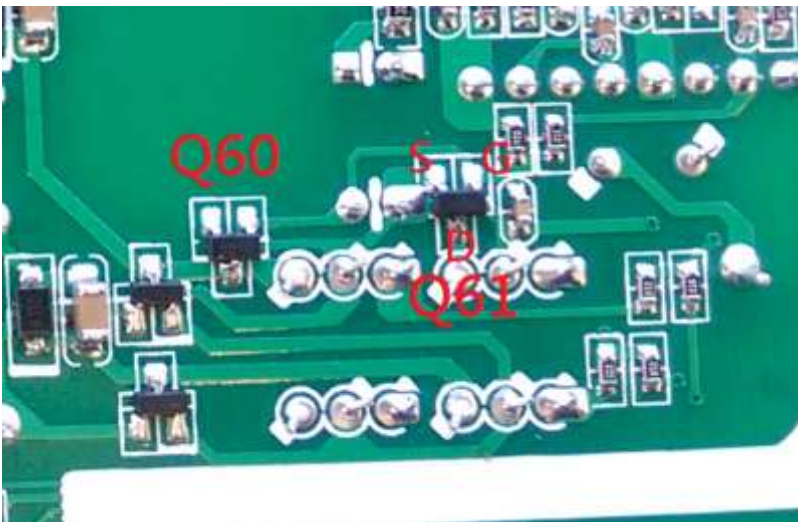
The Q51 and Q52 are (2SD1624 2A 50V NPN SOT-89)

The Q50 and Q53 are (2SA1020 3A 50V PNP SOT-89)

Parts	Attribute	Reference values	Failure status
Q54/Q56/Q51/Q52	Resistor	BE: 12k BC: 280k CE: OL	Short or explosion
	Diode	BE: 0.64V BC: 0.64V CE: OL	
Q55/Q57/Q50/Q53	Resistor	BE: 12k BC: OL CE: 280k	Short or explosion
	Diode	BE: 0.64V BC: OL CE: 1.09V	

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The Q60 and Q61 the MOSFET are (UT3404G 5.8A 30V SOT-23)

Parts	Attribute	Reference values	Failure status
Q60/Q61	Resistor	GS: 5.637k GD: 107k SD: 98k	Short or explosion
	Diode	SD: 0.28V DS: 1.14V	



The U9 is (IC PWM CNTL SG3525ANG DIP-16)

Parts	Attribute	Reference values	Failure status
U9	Resistor	PIN13 TO PIN12: 8.8k PIN11 TO PIN12: 432k PIN14 TO PIN12: 432k	Short or explosion

Note: If you are not sure about these components, we recommend you replacing them all.

3.2 Check the bus side components on MAIN board

Power devices

DC/DC IGBT: Q27/Q28/Q29/Q30



For VMII-5000 ALL of the IGBTs are (4063DPBF 48A 600V TO-247)

For VMII-3000 ALL of the IGBTs are (45HF60WDA 45A 600V TO-247)

Parts	Attribute	Reference values	Failure status
Q27/Q28/Q29/Q30	Resistor	GE: 22 ohm GC: 184k EC: 184K	Short or explosion
	Diode	EC: 0.37V 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.

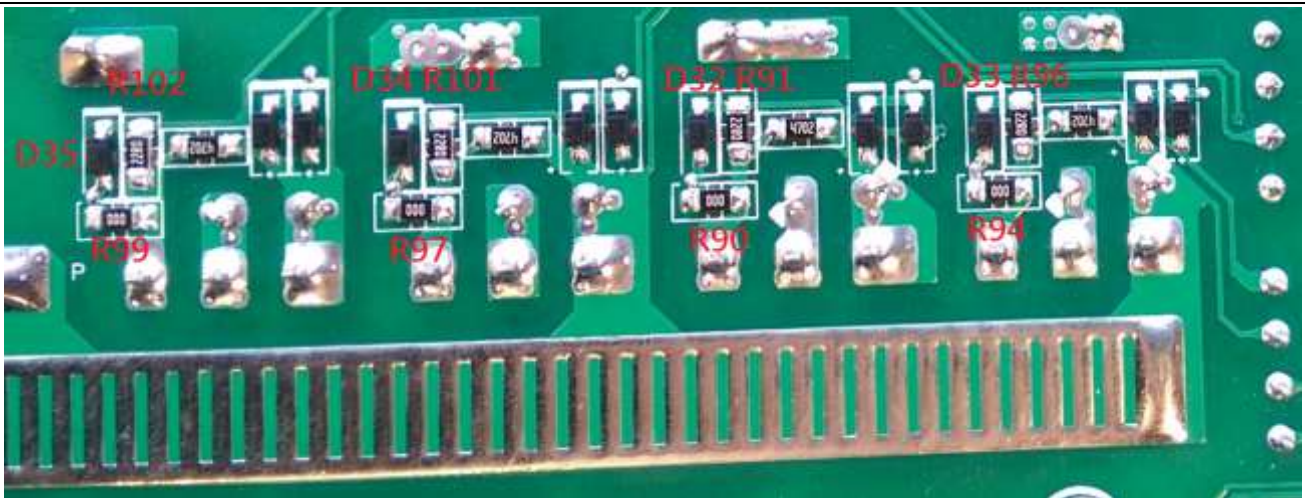
Drivers (This part is only used for repair checking)

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

R91/R102/R96/R101: (22R 1206)

R90/R99/R94/R97: (0R 1206)

D32/D35/D33/D34: (1N4148W 0.15A 75V SMD)



Parts	Attribute	Reference values	Failure status
R91/R102/R96/R101	Resistor	22 ohm	Open or other values
R90/R99/R94/R97	Resistor	0 ohm	
D32/D35/D33/D34 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/D13



For VMII-5000 the IGBTs Q32 is (4063DPBF 48A 600V TO-247)

For VMII-3000 the IGBTs Q32 is (45HF60WDA 45A 600V TO-247)

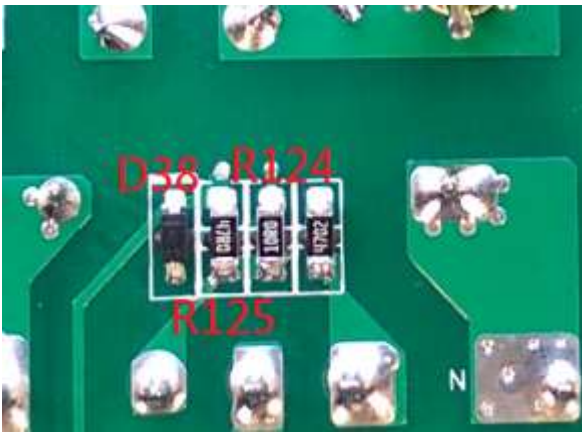
The D13 is (RHRP1560 15A 600V TO-220)

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Parts	Attribute	Reference values	Failure status
Q32	Resistor	GE: 22.8k GC: 49.5k CE: OL	Short or explosion
	Diode	CE: OL EC: 0.393V	
D13	Resistor	+ to -: 195k - to +: OL	
	Diode	+ to -: 0.39V - to +: OL	

Drivers (This part is only used for repair checking)



The R125 are (47R 1206)

The R124 are (10R 1206)

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

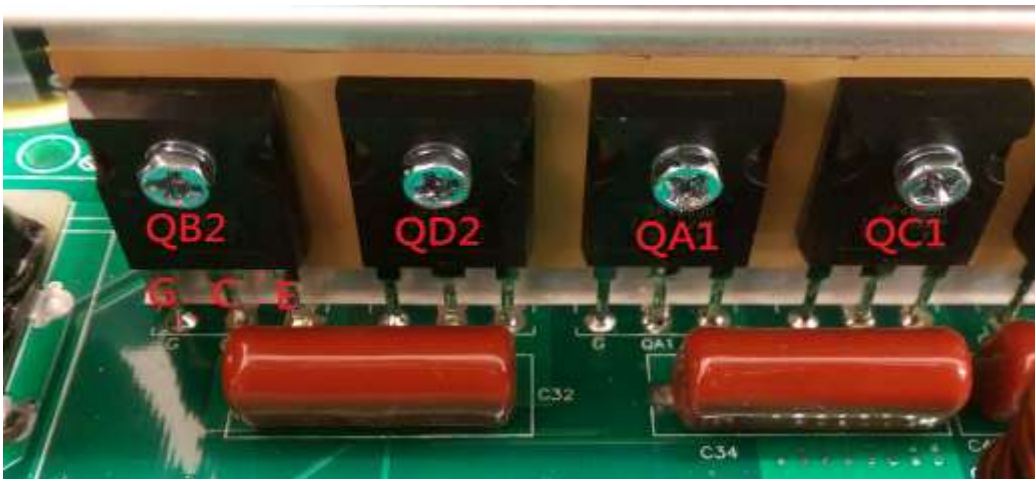
Parts	Attribute	Reference values	Failure status
R125	Resistor	47 ohm	Open or other values
R124	Resistor	10 ohm	
D38 ¹	Resistor	+ to -: 240k - to +: OL	Short or explosion
	Diode	+ to -: 0.6V - to +: OL	

Note1: When test the diode; please remove the R124 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/QC1/QB2/QD2



All of the IGBT are (4063DPBF 48A 600V TO-247)

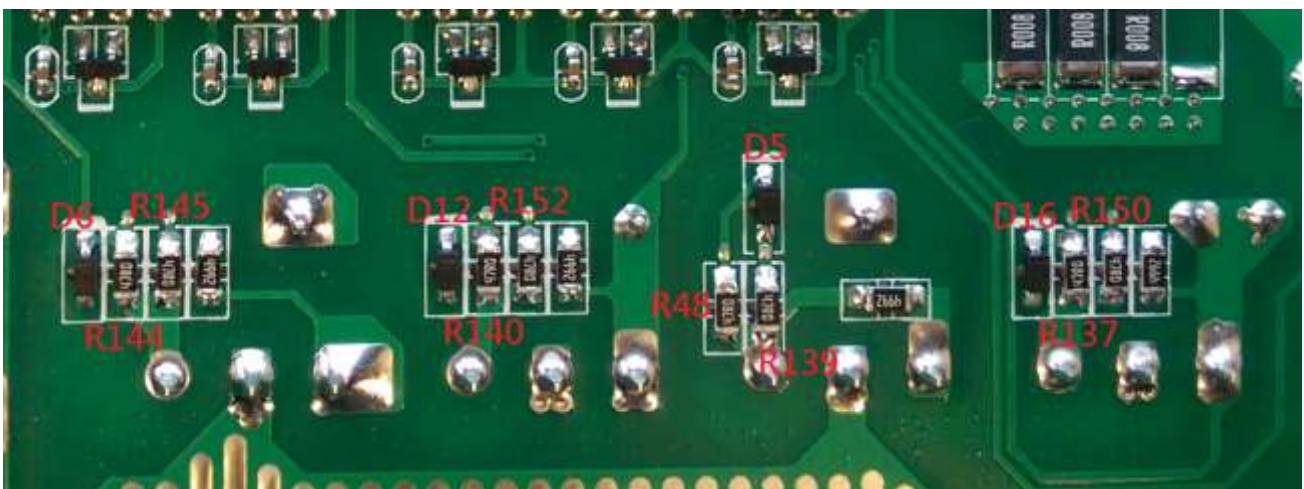
Parts	Attribute	Reference values	Failure status
QA1/QC1/QB2/QD2	Resistor	GE: 23k GC: 235k CE: 700k	Short or explosion
	Diode	EC: 0.4V CE: OL	

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

Drivers

R48/R144/R140/R137/R139/R145/R150/R152: (47R 1206)

D5/D6/D12/D16: (1N4148W 0.15A 75V SMD)



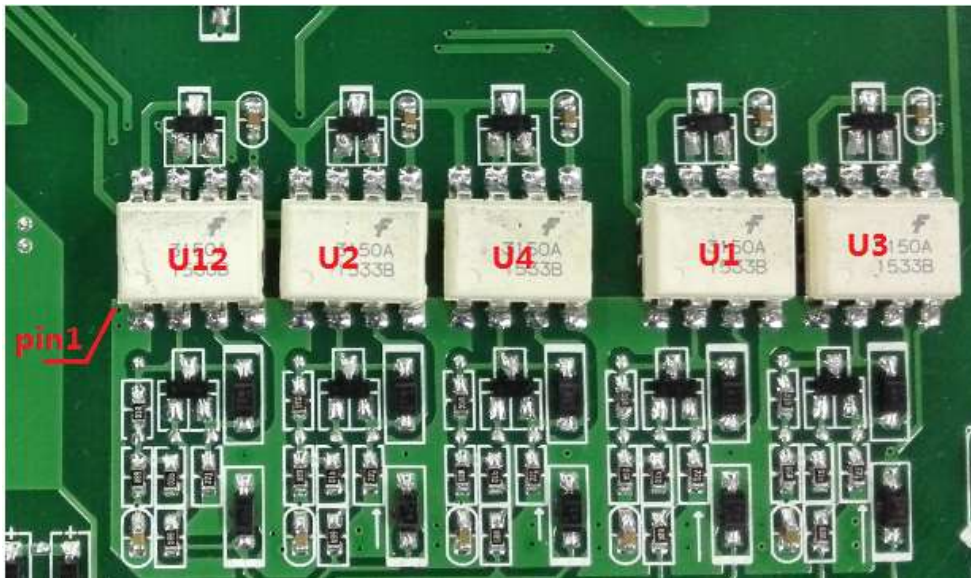
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Parts	Attribute	Reference values	Failure status
R48/R144/R140/R137 R139/R145/R150/R152	Resistor	47 ohm	Open or other values
D5/D6/D12/D16 ¹	Resistor	+ to -: 270k - to +: OL	Short or explosion
	Diode	+ to -: 0.6V - to +: OL	

Note1: When test the diode; please remove the R139/R145/R150/R152 from the board, ortherwise the test result is not right

Optocoupler: U1/U2/U3/U4/U12



ALL of the optocoupler are (FOD3150ASD SO-8)

Parts	Attribute	Reference values	Failure status
U2/U4/U12	Resistor	PIN8 TO PIN5: 57k PIN7 TO PIN5: 145k	Short or explosion
U1/U3	Resistor	PIN8 TO PIN5: 355k PIN7 TO PIN5: 410k	

3.5 Check BATT and Main Power SPS on MAIN board

BATT Power SPS

For VMII-5000 the F1 are (FUSE 3A 125V)

For VMII-3000 the F1 are (FUSE 5A 125V)

For VMII-5000 the NTC2 are (NTC 10ohm 3A)

For VMII-3000 the NTC2 are (NTC 5ohm 5A)

For VMII-5000 the MOSFET Q65 are (IRF740 10A 400V TO-220)

For VMII-3000 the MOSFET Q65 are (IRF640NPBF 18A 200V TO-220)

For VMII-5000 the R246 are NC

For VMII-3000 the R246 are (RES 3W 0.15ohm)

The TX2 are (FER EC28)

The R245 are (RES 3W 0.15ohm)

The D61 are (MUR4100ERLG 4A 1000V UFST)

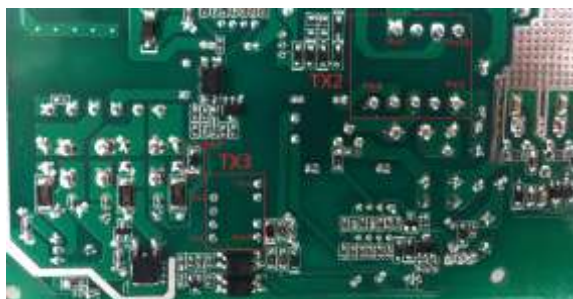
The D60 are (RHRP860 8A 600V SFST)

The U14 are (IC UC3845BNG DIP-8)

The Q6 are (PMBT2907A 0.6A 60V SMD)

The TX3 are (TX 16:16:16)

The D65 are (RS1006FL 1A 600V SOD-123FL)



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Parts	Attribute	Reference values	Failure status
F1	Resistor	0 ohm	Open or explosion
VMII-5K NTC2	Resistor	10 ohm	Open or explosion
VMII-3K NTC2	Resistor	5 ohm	Open or explosion
D61	Diode	+ to -: 0.47V - to +: OL	Short or explosion
D60	Diode	+ to -: 0.43V - to +:OL	Short or explosion
VMII-3K R245	Resistor	0.15 ohm	Open or other values
VMII-3K R245/R246	Resistor	0.75 ohm	Open or other values
Q65 ¹	Resistor	GS: 47k GD: 372k(VMII-5000) GD: 44.6k(VMII-3000) SD: 336K(VMII-5000) SD: 115K(VMII-3000)	Short or explosion
	Diode	SD: 0.55V GS: OL	
U14	Resistor	PIN7 TO PIN5: 77K PIN6 TO PIN5: 40K	Short or other values
Q6	Resistor	EB: 512k CB: 456k	Short or other values
	Diode	CB: 0.69V EB: 0.69V	
VMII-5K TX2	Resistor	PIN7 to PIN9: 0.2ohm	Short or other values
VMII-3K TX2	Resistor	PIN7 to PIN9: 0.5ohm	Short or other values
TX3	Resistor	PIN9 to PIN10: 0.3ohm	Short or other values
D65 ²	Diode	+ to -: 0.52V - to +: OL	Short or explosion
<p>Note1: When test the Q65; please remove the R245 from the board, otherwise the test result is not right</p> <p>Note2: When test the D65; please remove the D65 from the board, otherwise the test result is not right</p>			

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Main Power SPS

The MOSFET Q9 are (IRFBG30 3.1A 1000V TO-220)

The Q8 are (2SC5353BL 3A 750V TO-126C)

The U8 are (IC PWM UC3845BNG DIP-8)

The R203 are (RES 5W 0.5ohm)

The R204 are (100R 1206)

The D53 are (1N4148W 0.15A 75V SMD)

The R67 are (10R 1206)

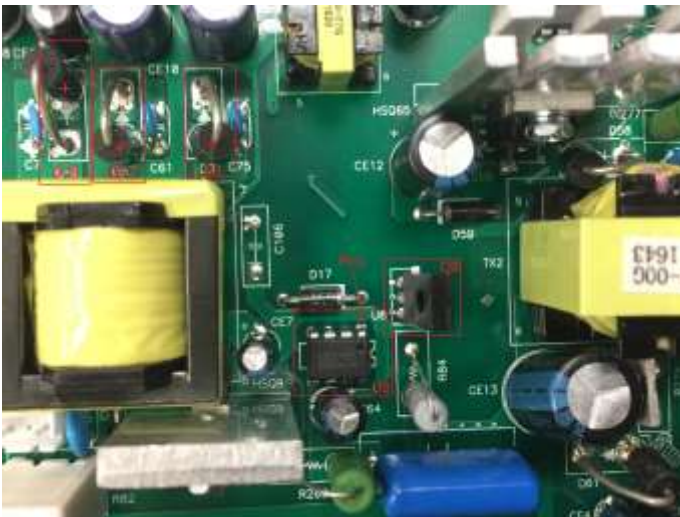
The D3 are (MUR460RLG 4A 600V UFST)

The D49 and D57 are (HER303 3A 200V UFST)

The U7 are (IC L7912CV 3P TO-220)

The U10 are (IC MC78M05CDTRKG DPAK-3)

The TX4 are (FER EE28)



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Parts	Attribute	Reference values	Failure status
Q9	Resistor	GS: 45k SD: 300K	Short or explosion
	Diode	SD: 0.52V SG: 0.73V	
Q8	Resistor	BC: 356k BE: 413k	Short or explosion
	Diode	BC: 0.59V BE: 0.61V	
U8	Diode	PIN5 TO PIN7: 0.48V PIN5 TO PIN6: 0.64V	Short or other values
R203	Resistor	0.5 ohm	Open or other values
R204	Resistor	100 ohm	Open or other values
D53 ¹	Diode	+ to -: 0.52V - to +: OL	Short or explosion
R67	Resistor	10 ohm	Open or other values
D3	Diode	+ to -: 0.4V - to +: 0.7V	Short or explosion
D49/D57	Diode	+ to -: 0.45V - to +: OL	Short or explosion
U7	Diode	PINI to PINO: 0.56V PINO to PING: 0.44V PINI to PING: 0.45V	Short or explosion
U10	Diode	PINA TO PINI: 0.45V PINA TO PINO: 0.5V	Short or explosion
TX4	Resistor	PIN1 TO PIN3: 0.4 ohm	Short or other values
Note1: When test the D53; please remove the R67 from the board, otherwise the test result is not right			

3.6 Check AC SPS on MPPT board

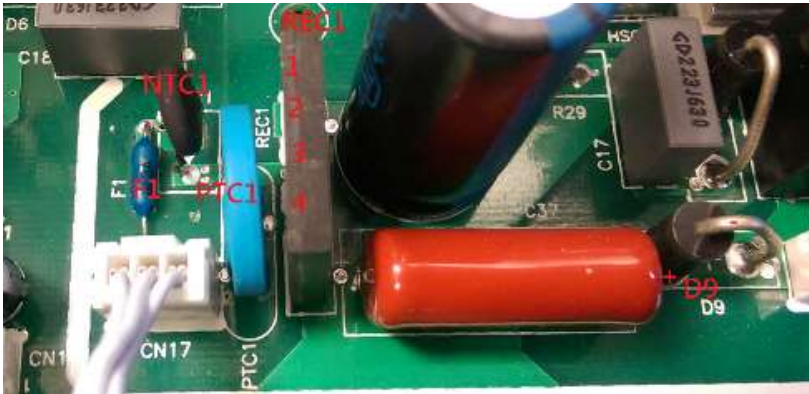
The F1 are (FUZE 5A 125V)

The NTC1 are (NTC 10 OHM 3.0A)

The PTC1 are (PTC 6 OHM 4.1A)

The REC1 are (GBU4M 4A 1000V UFST)

The D9 are (MUR4100ERLG 4A 1000V UFST)



Parts	Attribute	Reference values	Failure status
F1	Resistor	0 ohm	Open or explosion
NTC1	Resistor	10 ohm	
PTC1	Resistor	6.5 ohm	
D9	Diode	+ to -: 0.45V - to +: OL	Short or explosion
REC1	Diode	Pin2 to Pin1:0.57V Pin3 to Pin1:0.57V Pin4 to Pin3:0.57V Pin4 to Pin2:0.57V	Short or explosion

3.7 Check the bus soft start circuit on MPPT board (TX1: Especially for 09 fault)

The D6 are (RHRP8120 8A 1200V UFST)

The R29 are (RES 0.62 J)

The MOSFET Q3 are (IRFBG30 3.1A 1000V TO-220)

The D7 and D10 are (MUR4100ERLG 4A 1000V UFST)

The U2 are (IC UC3845BNG DIP-8)

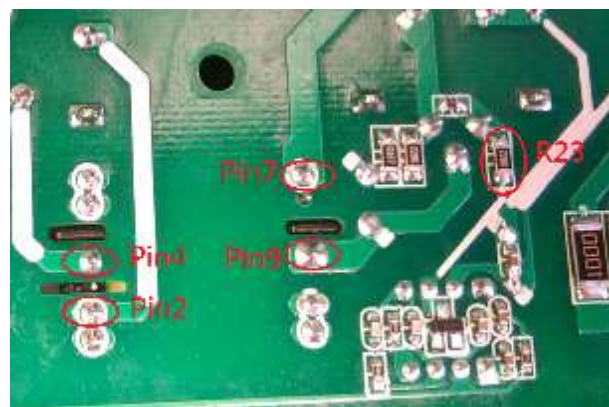
The TX1 are (FER EEL16)

The R23 are (22R 1206)

Note: If R23 is damaged, please replace U2 together.

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D6	Resistor	+ to -: 212k - to +: OL	Short or explosion
	Diode	+ to -: 0.45V - to +: OL	
Q3	Resistor	GS: 1.17k SD: 301k DS: OL	Short or explosion
	Diode	SD: 0.5V DS: OL	
R29	Resistor	0.62 ohm	Open or other values

SERVICE MANUAL

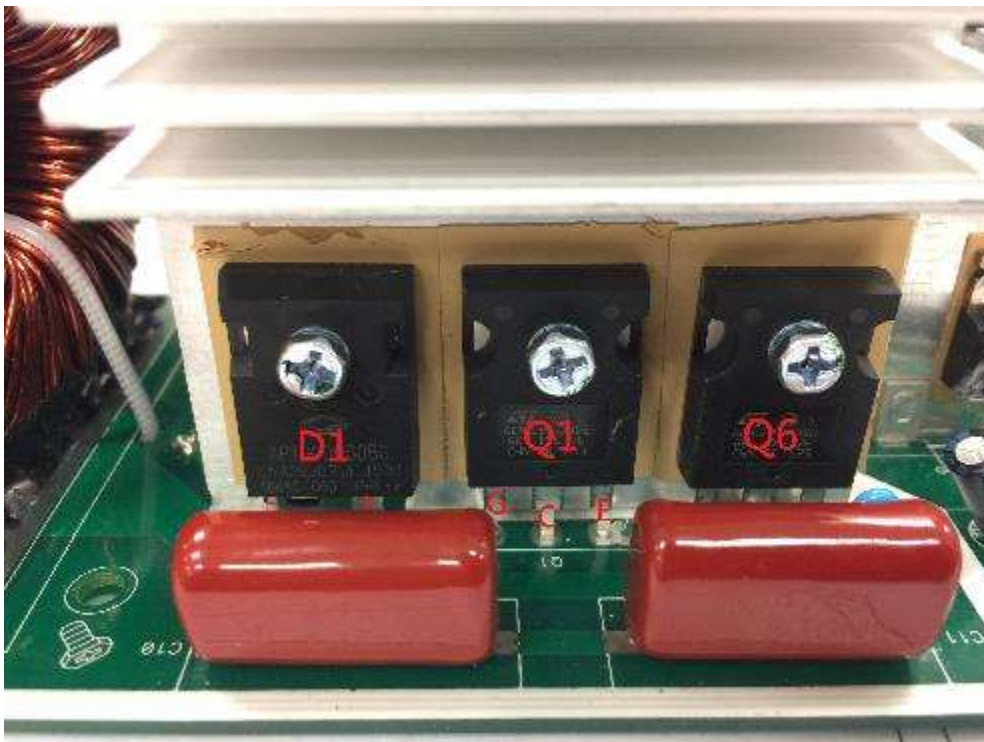
Axpert VM II-5000
and VM II-3000

D7/D10:	Diode	+ to -: 0.46V - to +: OL	Short or explosion
R245	Resistor	22 ohm	Open or other values
U2	Resistor	PIN7 TO PIN5: 72k PIN6 TO PIN5: 1.21k	Short or explosion
TX1	Resistor	PIN2 to PIN4: 2.8ohm PIN7 to PIN9: 1.4ohm	Short or other values
When 09 fault happens, and you couldn't find other damage, please check TX1!!			

3.8 Check the Boost on MPPT board

Power devices

Boost IGBT Q1/Q6 and Diode D1



The D1 are (30DQ60BG 30A 600V TO-247)

The Q1 and Q6 IGBT are (4063DPBF 48A 600V)

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Parts	Attribute	Reference values	Failure status
Q1, Q6	Resistor	GE: 23k GC: 188k CE: 352k	Short or explosion
	Diode	EC: 0.4V CE: OL	
D1	Diode	+ to -: 0.39V - to +: OL	

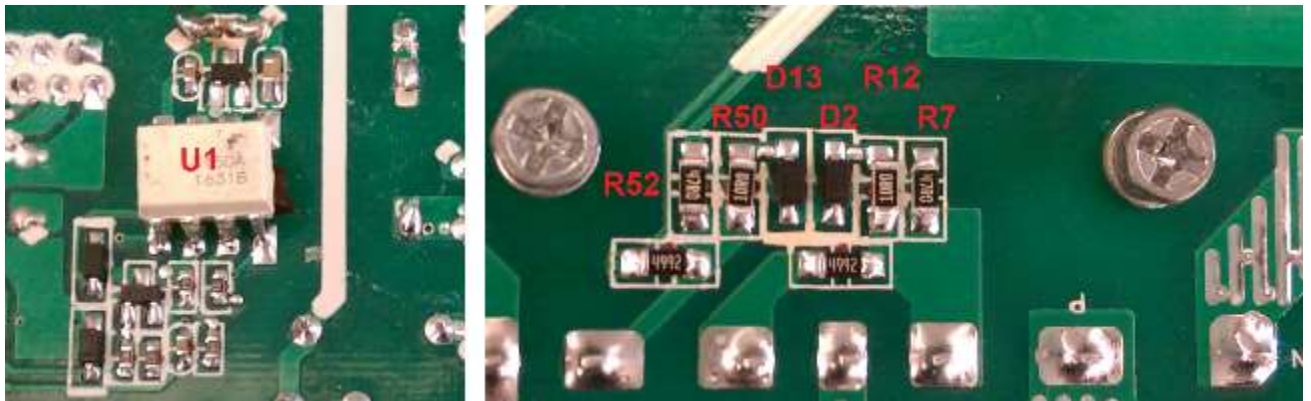
Drivers

The U1 are (FOD3150ASD SO-8)

The D13 and D2 are (1N4148W 0.15A 75V SMD)

The R12 and R50 are (10R 1206)

The R52 and R47 are (47R 1206)



Parts	Attribute	Reference values	Failure status
U1	Resistor	PIN8 TO PIN5: 355k PIN7 TO PIN5: 460k	Short or other values
D13/ D2	Diode	+ to -: 0.6V - to +: OL	Short or explosion
R12/ R50	Resistor	10ohm	Open or other values
R52/ R47	Resistor	47 ohm	Open or other values

Note: When test the diode; please remove the R12/R50 from the board, or the test result is not right.

SERVICE MANUAL

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4. Disassembling guide

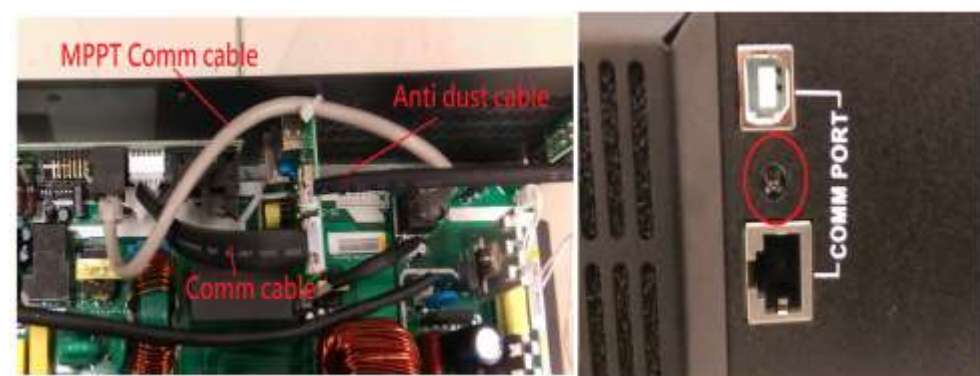
Remove 12 screws on top cover and rear panel.



Remove LED cable and LCD cable, and take out the top cover.
(Note: If you just only need to replace the control board, you can replace it at this step.)



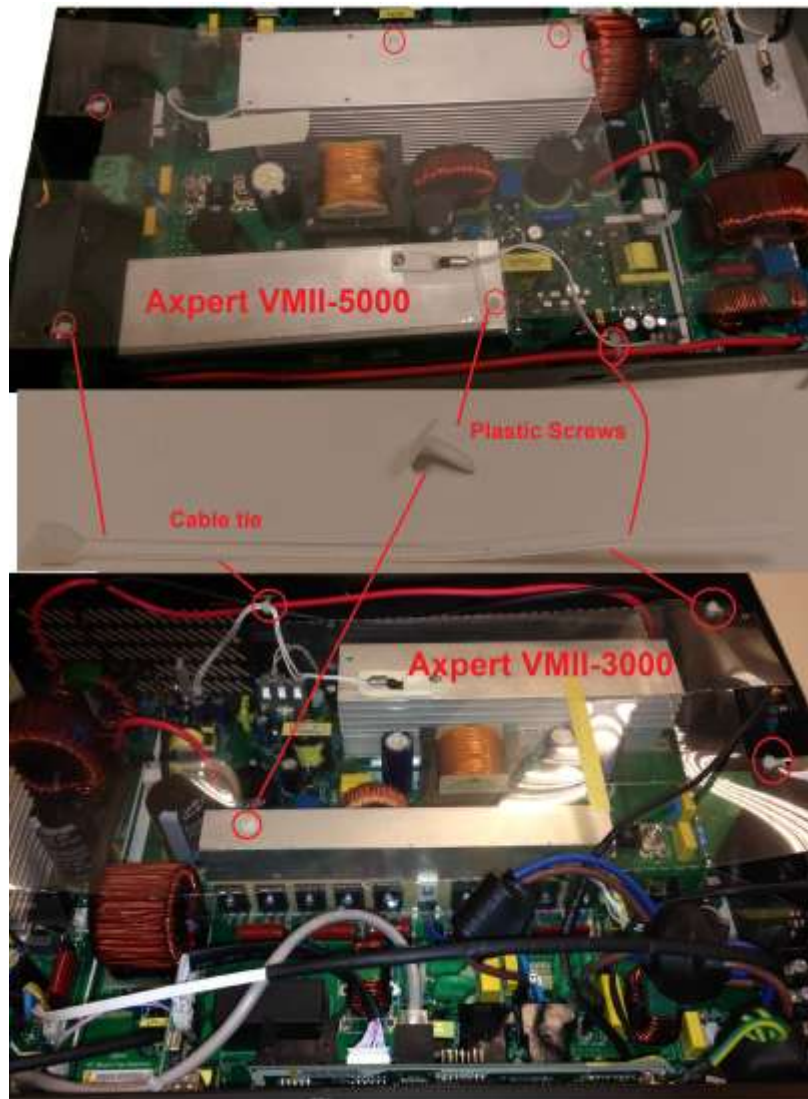
Remove comm cable and MPPT Comm cable and Anti dust cable and screw, and take out comm board.



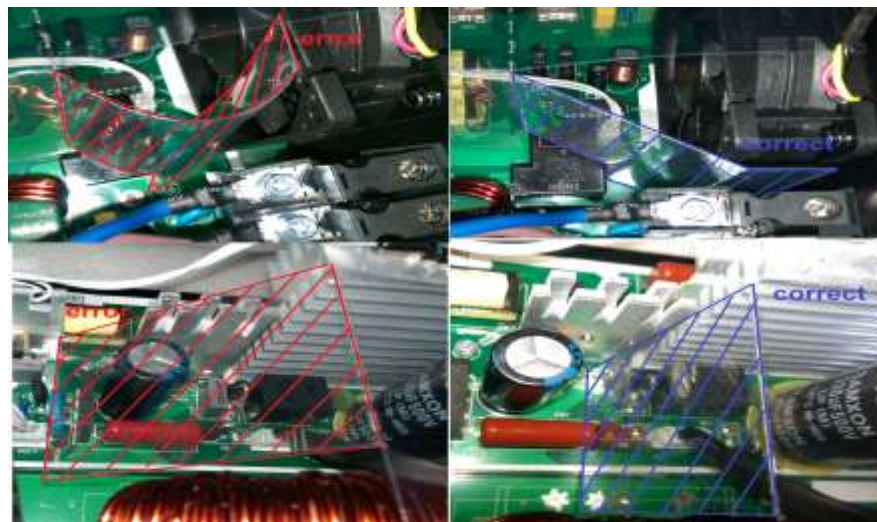
SERVICE MANUAL

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Remove the plastic screws of wind pipeline. Be careful not to damage them. You can use an oblique mouth clamp to help you to remove the clip.



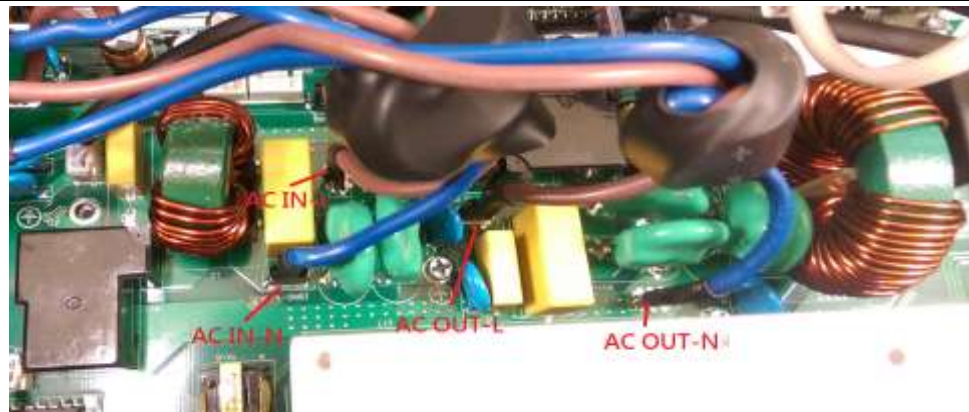
Note:
Please make sure that put the plastic sheet back and fix well. Otherwise it will affect the heat dissipation.



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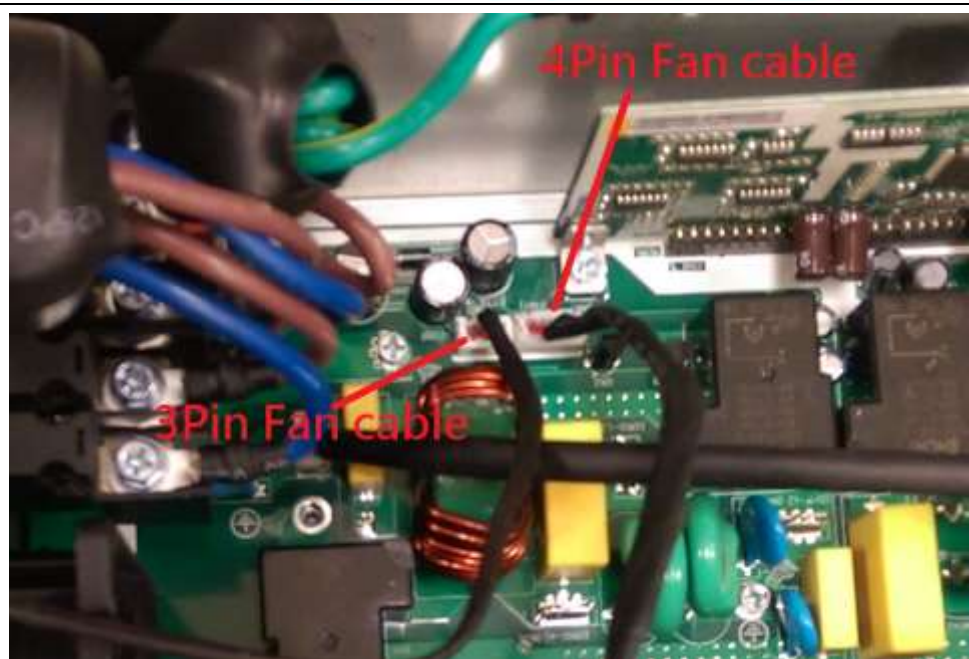
Remove I/P and
O/P cables.



Remove AC
SPS cable and
MPPT power
supply cables.



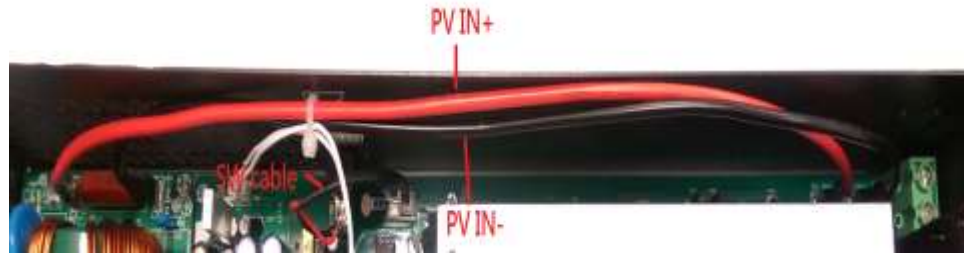
Remove the fan
cables.



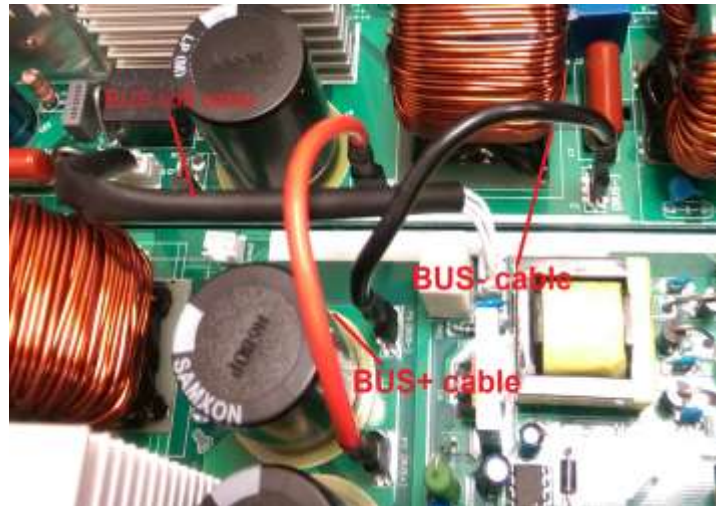
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Remove PV IN
cable and SW
cable



Remove BUS
cable and BUS
soft cable



MPPT NTC and
Converter NTC
and INV NTC



SERVICE MANUAL

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and VM II-3000

Remove 16 screws on main board and MPPT board, and 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!

