深圳市美克能源科技股份有限公司
SHENZHEN MUST ENERGY TECHNOLOGY CO.,LTD

Service Manual
PV18-2K/3K HM

Inverter/Charger

PV1800 2K/3K HM

Service Manual

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Service Manual

PV18-2K/3K HM

Table of Contents

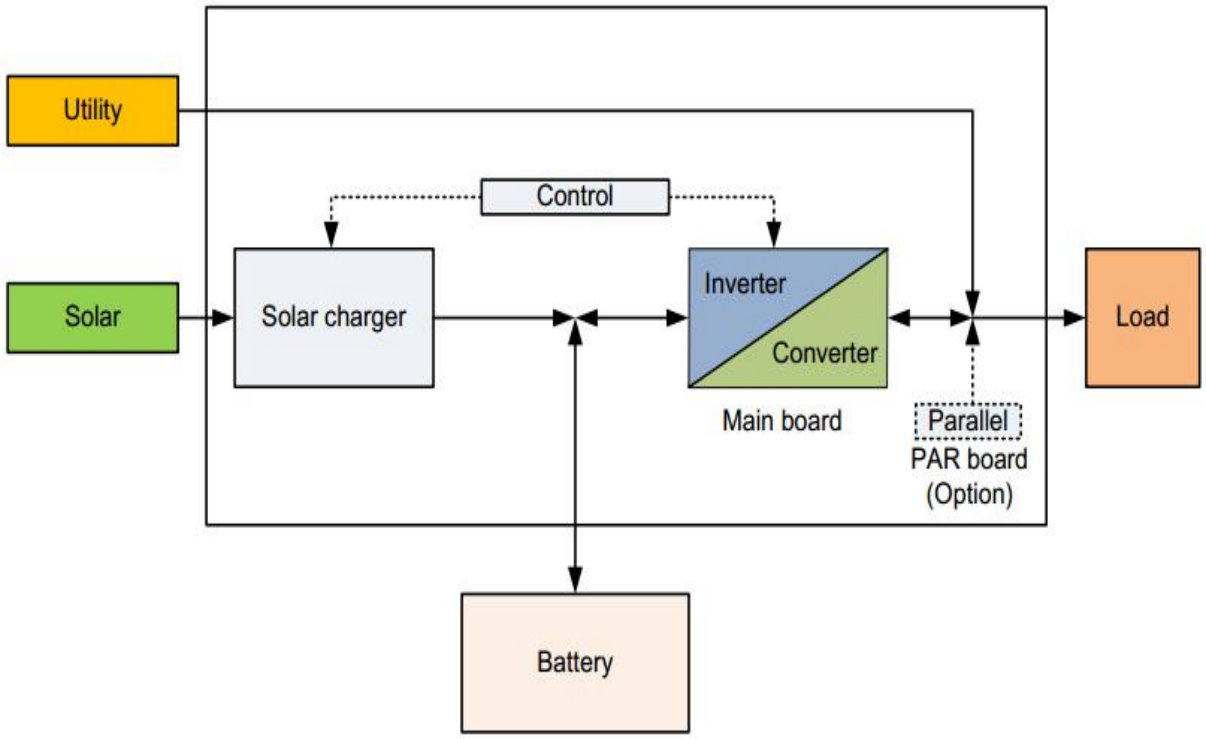
1. General Information

1.1 Brief Introduction

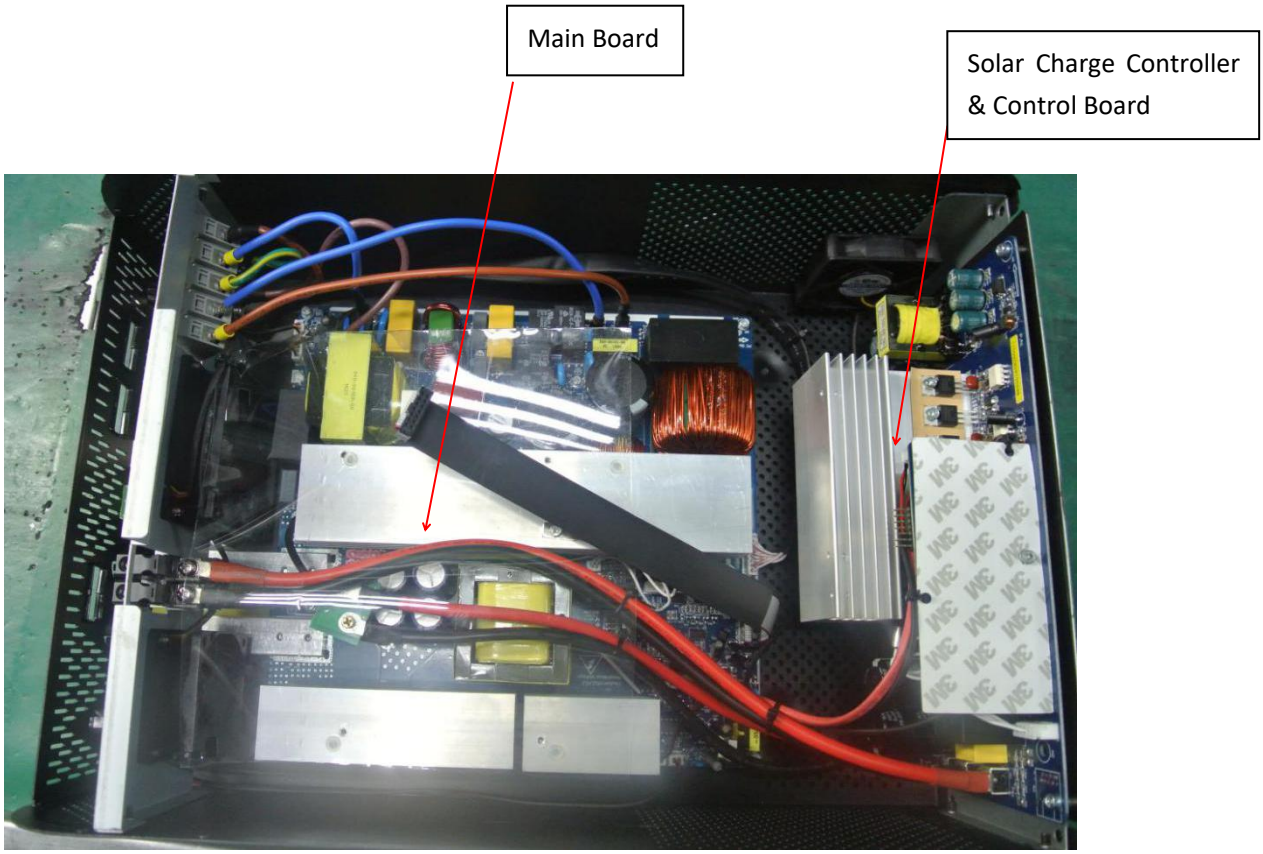
This manual is used as a tool of inspection and repairing guidance for PV18-2K/3K HM, as well as instructions of assembling and testing. It is best to have some electrical or electronic background knowledge. With this guidance, hope it will help you to check and inspect the inverter/charger first by yourself.

1.2 Basic Topology Introduction

The topology for 2KVA/3KVA shows as below:



1.3 Over review and Introduction of Inverter /charger Parts



2. Fault and Troubleshooting

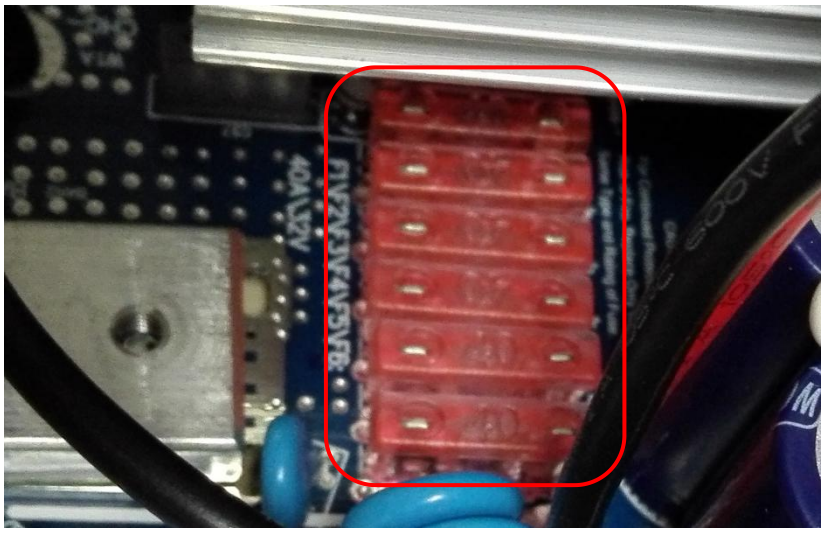
No LCD display when inverter turns on	First to test battery volt to check whether it is in range of 44v-52v; If it is in the range, to switch the inverter one to check whether the unit starts. If the unit does not run yet, please disconnect all connections and open the surface panel, take out the main board, then to check and repair according to 3.7
01	First to replace the fan, to check whether it is okay; if NG, please inspect the main board and repair according to 3.9
02	Please to check the main board and repair according to 3.8
03	Please to check first and then to repair the main board according to 3.1, 3.6 and 3.7
06	First to start up the inverter by only connecting battery, if the fault is still on, please inspect the main board following 3.3
08	To restart the inverter, to check whether the fault repeats, if yes, it requires to replace the control boards.
09	To Check the main board following 3.1.2, 3.2.1, 3.4.1 and 3.5 and to repair accordingly
52	First to restart inverter by only connecting to battery, if fault continues, then to check the main board according to 3.1.2 and 3.4
56	First to check the connection of battery cable, if good connection, then please to check and repair the main board following 3.1.1 and 3.1.2 accordingly
57	To replace the control board
58	First to restart inverter by connecting battery only, to check whether it is good? Second to connect battery and Utility but to keep switch off, checking whether inverter charges battery? Otherwise, to check and repair main board according to 3.1.2, 3.2.1 and 3.4.1 accordingly
72	To replace the control board

3. Steps to Repair

3.1 Battery Working Mode Test

3.1.1 To Check DC FUSE and Capacitance

F1-F6: 180-00001-00 (Fuse, F40A/32VDC UL)



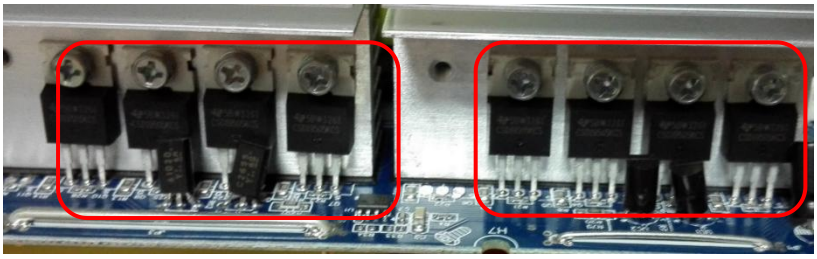
Positioning	Attribute	Reference Value	Failure Status
F1-F6	Resistor	0 ohm	open

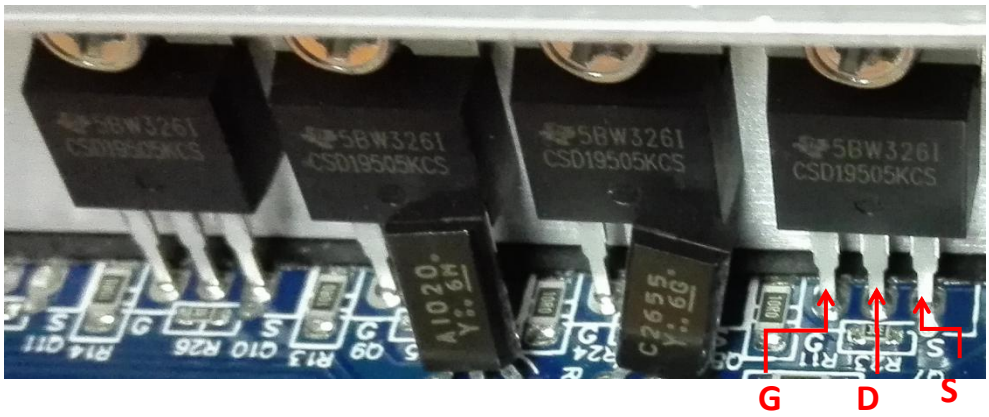
C19,C20,C39,C40: 140-00093-00 (Electrolytic Capacitor, 4200uF 35V M RAD 7.5mm 105℃)

If the capacitors explode, they need to be replaced.

3.1.2 DC/DC Boost Module

150-00052-00:MOSFET TI/CSD19505KCS 201A 80V N BULK TO-220





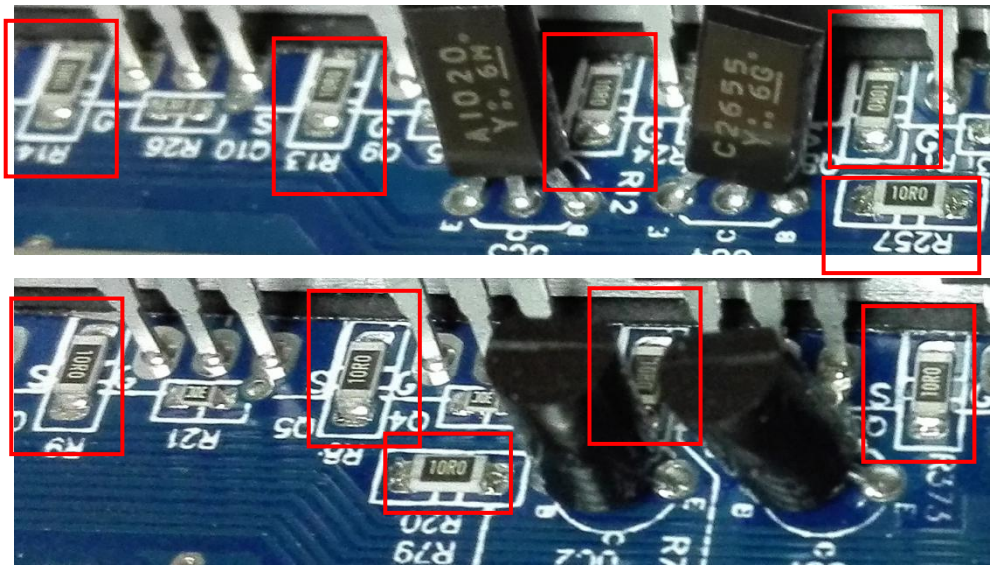
Positioning	Attribute	Reference Value	Failure Status
All MOSFET, 8pcs	Diode	SD:0.44V DS:OL	Short-circuit or Explosion
Note If one or more than one of them were broken, please replace all of them. For 2K, the main board has just 6pcs MOSFETS.			

3.1.3 Divers

Note: when there are power devices or components are damaged, Divers are usually required to check.

The reference resistors listed as below.

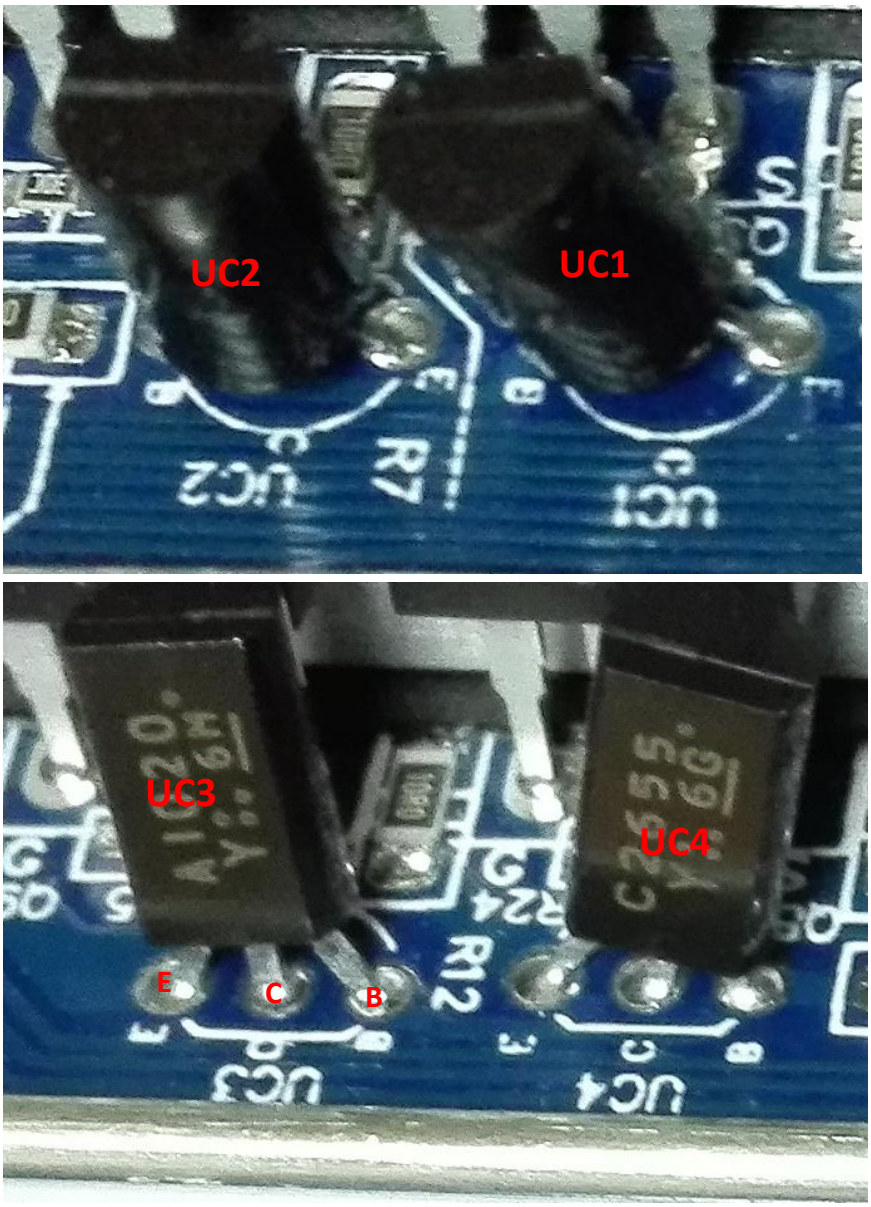
R373,R7,R8,R9,R10,R11,R12,R13,R14,R79,R257
All the resistors are 100-10010-00 (RES CHIP TF 1/4W 10 F(1206))



To use Multi-meter to measure each resistors till to find out the broken ones and to replace them, no need to change all the resistors.

Positioning	Attribute	Reference Value	Failure Status
All Resistors: 10 ohm	Resistor	22 ohm	Open Circuit or other value

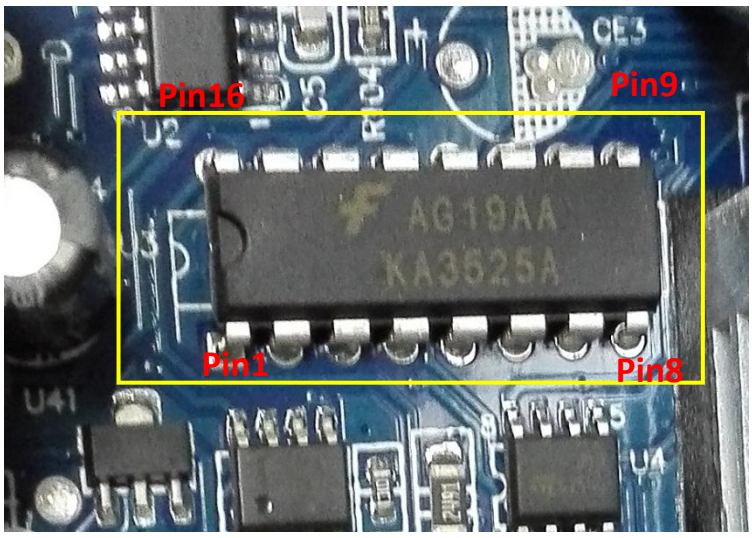
If resistors are need to replace, please check the diver transistors and controlling IC.



UC2,UC4:150-00005-00 (Plug-in Transistor TOSHIBA/2SC2655-Y 2A 50V)

UC1,UC3:150-00004-00 (Plug-in Transistor TOSHIBA/2SA1020-Y 2A 50V)

Positioning	Attribute	Reference Value	Failure Status
UC2,UC4	Diode	BE:0.6V BC:0.6V CE:1V	Short-circuit or burnt
UC1,UC3	Diode	BE:0.6V BC:1.3V CE:0.2V	Short-circuit or burnt



U3: 160-00006-00 (Plug-In : IC LINEAR FAIRCHILD/KA3525A)

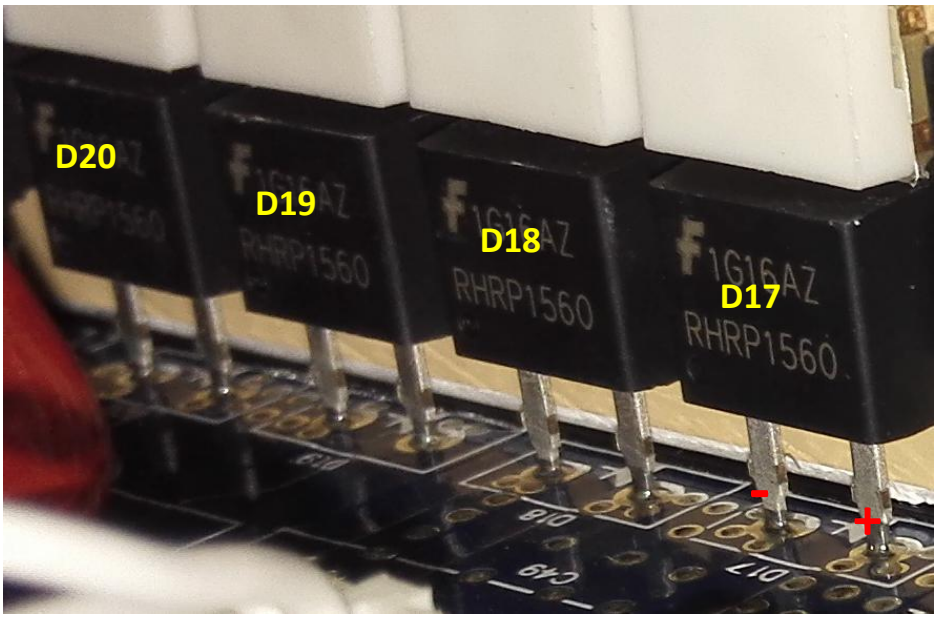
Positioning	Attribute	Reference Value	Failure Status
U3	Diode	Pin11-Pin12:5.4M Pin13-Pin12: 60K Pin14-Pin12: 5.4M	Short Circuit or Burnt

If unable to make sure which components, we would like to suggest to replace them all.

3.2 To Check BUS Module

3.2.1 Rectifier Diode

Rectifier Diode: D17,D18,D19,D20



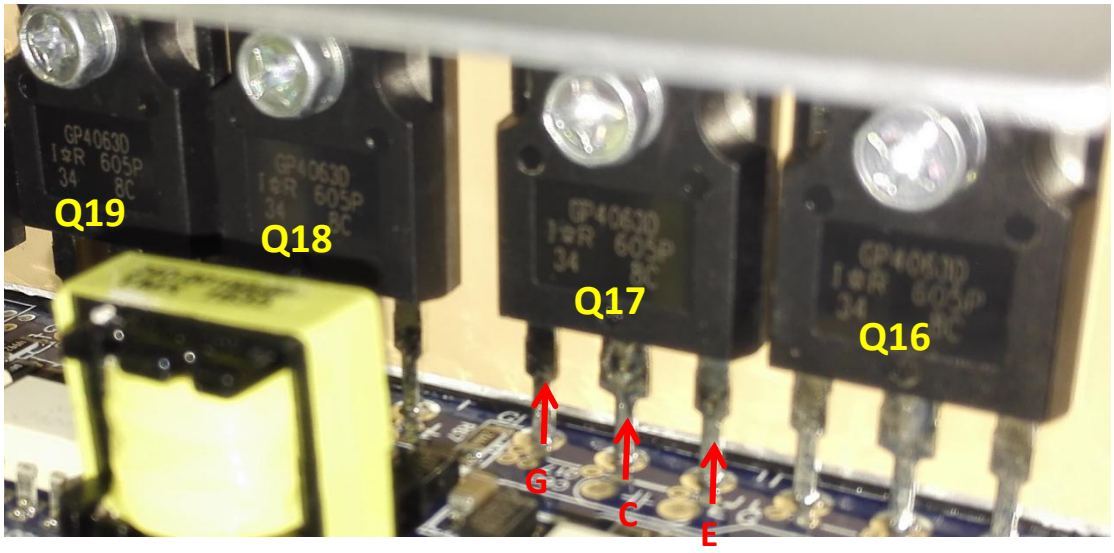
D17,D18,D19,D20: 150-10042-00 (FAIR./RHRP1560_NL 15A 600V)

Positioning	Attribute	Reference Value	Failure Status
D17,D18,D19,D20	Diode	+to-: 0.37V -to+: OL	Short Circuit or Broken
Note: If there is one or more than one components broken, please replace them all.			

3.3 To Check Full-Bridge Invert Circuit

3.3.1 Power Parts

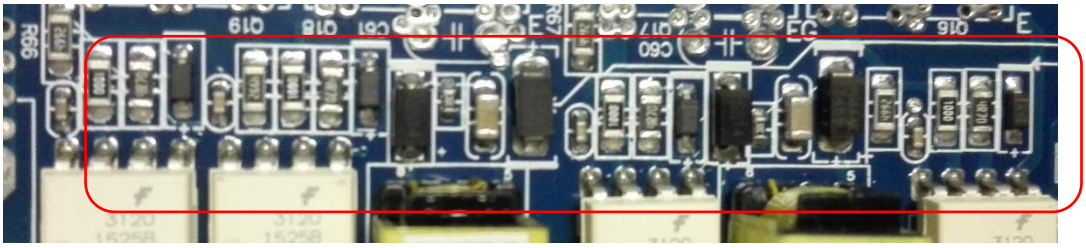
Q16,Q17,Q18,Q19:150-30088-00 (IGBT IR/IRGP4063D-EPBF 48A 600V TO-247)

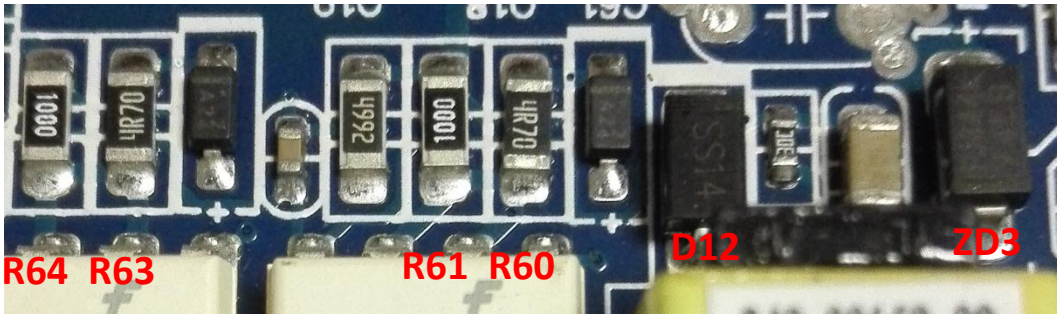


Positioning	Attribute	Reference Value	Failure Status
Q16,Q17,Q18,Q19	Diode	EC: 0.4V CE: OL	Short Circuit or Broken

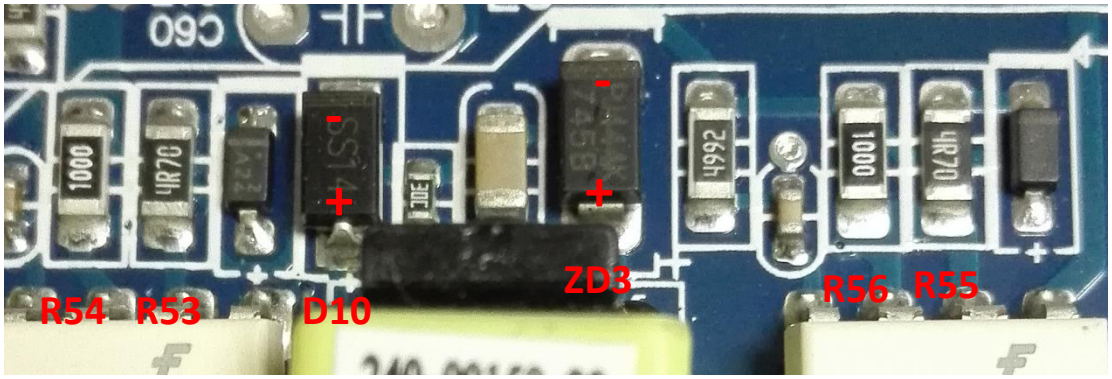
3.3.2 Divers

INV IGBT: Q16,Q17,Q18,Q19





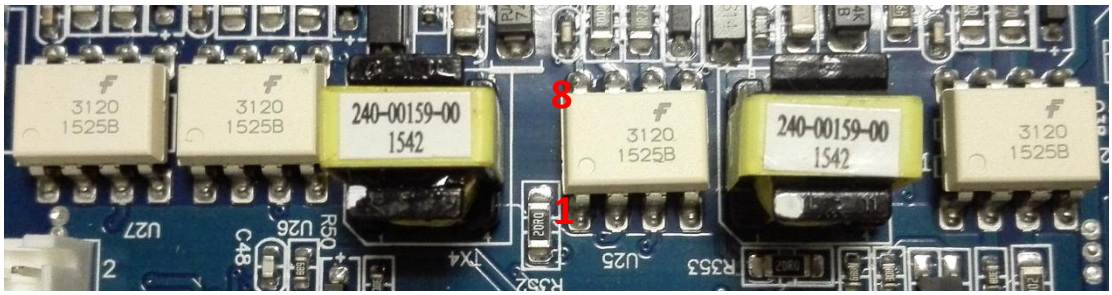
R53,R55,R60,R63: 100-17047-00 (SMD Resistor CHIP TF 1/4W 4.7 F(1206))
R54,R56,R61,R64: 100-10100-00 (SMD Resistor CHIP TF 1/4W 100 F(1206))
ZD2,ZD3: 120-20072-00 (SMD Zen-er Diode PAN JIT 1SMA4745 16V 1W SMD)
D10,D12: 120-20007-00 (SMD Diode PANJIT/SS14 1A 40V SMD)



Positioning	Attribute	Reference Value	Failure Status
R53,R55,R60,R63	Resistor	4.7 ohm	Open Circuit or other value
R54,R56,R61,R64	Resistor	100 ohm	
ZD2,ZD3	Diode	+ to -: 0.6V - to +: OL	Short Circuit or Broken
D10,D12	Diode	+ to -: 0.6V - to +: OL	

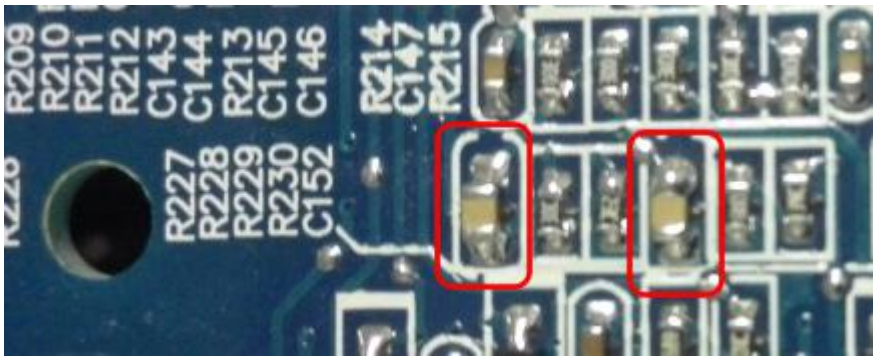
3.3.3 To Check Drivers

U24,U25,U26,U27: 120-10065-00 (IC Driver Chip FOD3120 SMT)



Positioning	Attribute	Reference Value	Failure Status
U24,U25,U26,U27	Resistor	Pin8-Pin5: 2K Pin7-Pin5:2K	Short Circuit or Broken

C150/C151: 110-10040-00 (SMD Capacitors CER MT 10nF 50V J NPO 103 (0805))

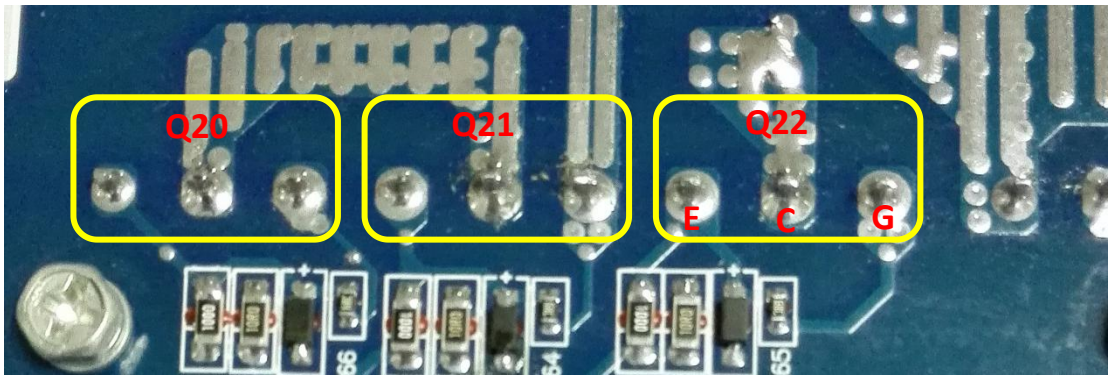


Positioning	Attribute	Reference Value	Failure Status
C150/C151	Capacitors	10nF	Short Circuit or Broken

3.4 To Check AC Charging Circuit

3.4.1 To Check Power Components

Q20,Q21,Q22: 150-30032-00 (Plug-in Transistor TSB/2SK3878 9A 900V N TUBE TO-3PN)

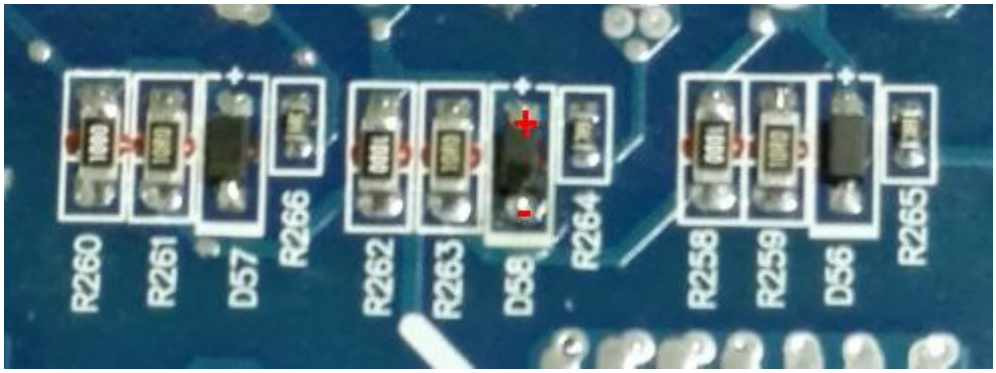


Positioning	Attribute	Reference Value	Failure Status
Q20,Q21,Q22	Diode	EC: 0.4V CE: OL	Short Circuit or Broken

Note: If there is one or more than one components broken, please replace them all.

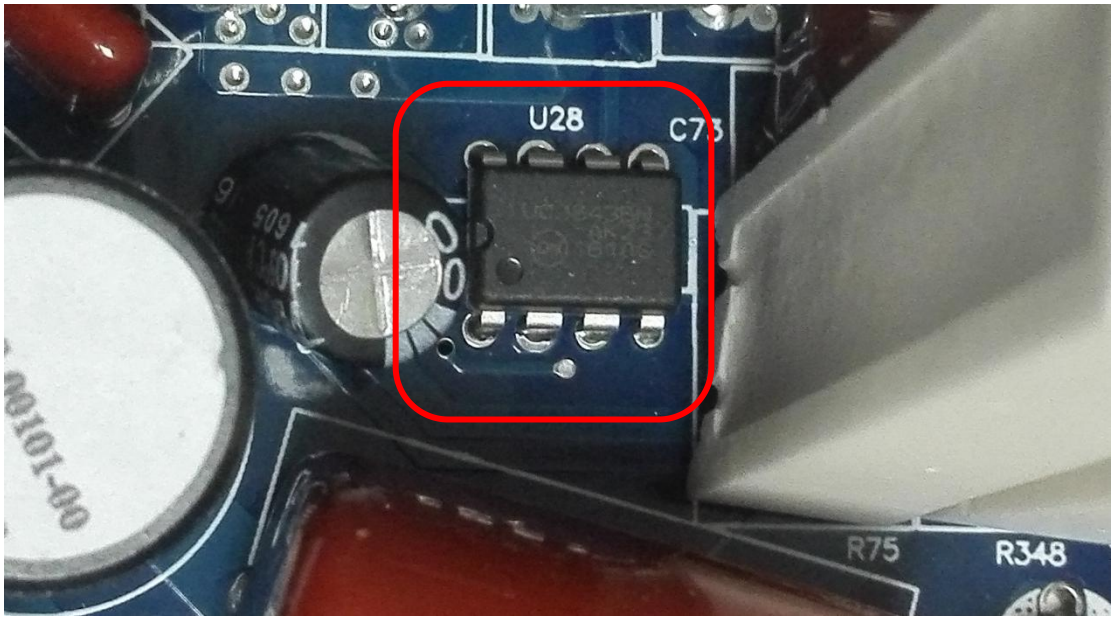
3.4.2 Drivers

R259,R261,R263: 100-10010-00 (SMD Resistor CHIP TF 1/4W 10 F(1206))
R258,R260,R262: 100-10100-00 (SMD Resistor CHIP TF 1/4W 100 F (1206))
D56/D57/D58: 120-20001-00 (SMD Diode PANJIT/1N4148W 0.15A 75V SOD123)



Positioning	Attribute	Reference Value	Failure Status
R259,R261,R263	Resistor	10 ohm	Open Circuit or other value
R258,R260,R262	Resistor	100 ohm	
D56/D57/D58	Diode	EC: 0.6V CE: OL	Short Circuit or Broken
Note: When test diodes, please remove R259, R261, R263, otherwise the test result is not right.			

UC3843: U28



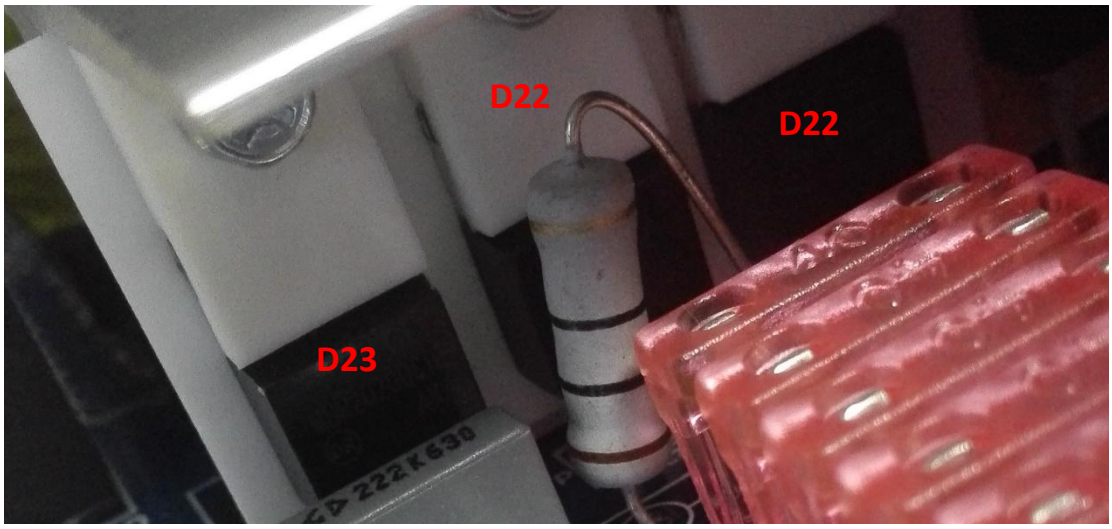
U28: 160-00001-00(Plug-in IC LINEAR ON/UC3843BNG)

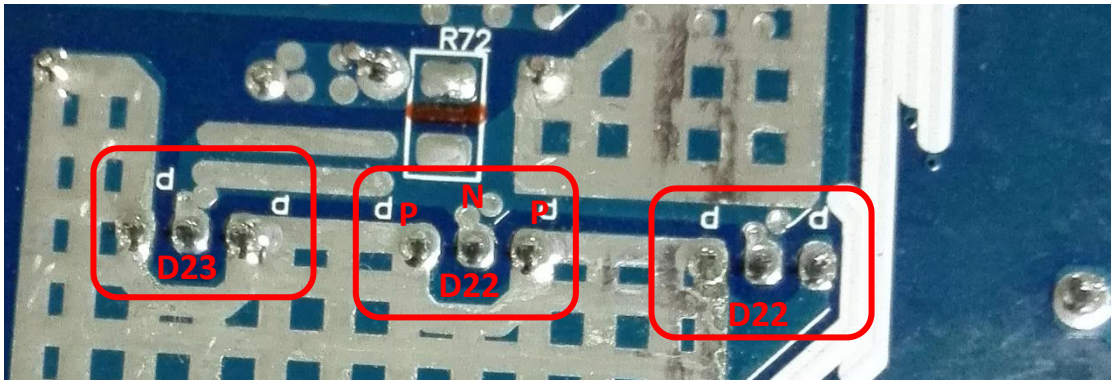
Positioning	Attribute	Reference Value	Failure Status
U28	Resistor	Pin7-Pin5: 42K ; Pin6-Pin5: 30K	Short Circuit or Broken

3.5 To Check Rectifier Circuit

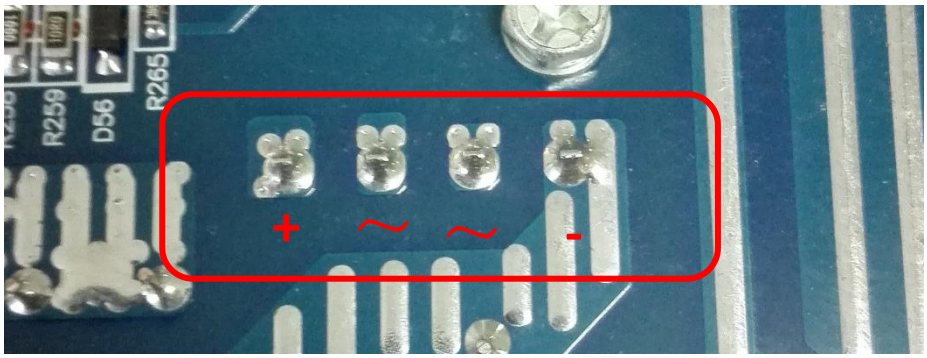
3.5.1 Charging Circuit

D21/D22/D23: 150-10061-00 (Plug-in Diode ON/MBR20200CT 20A 200V SCKY RAD BULK)





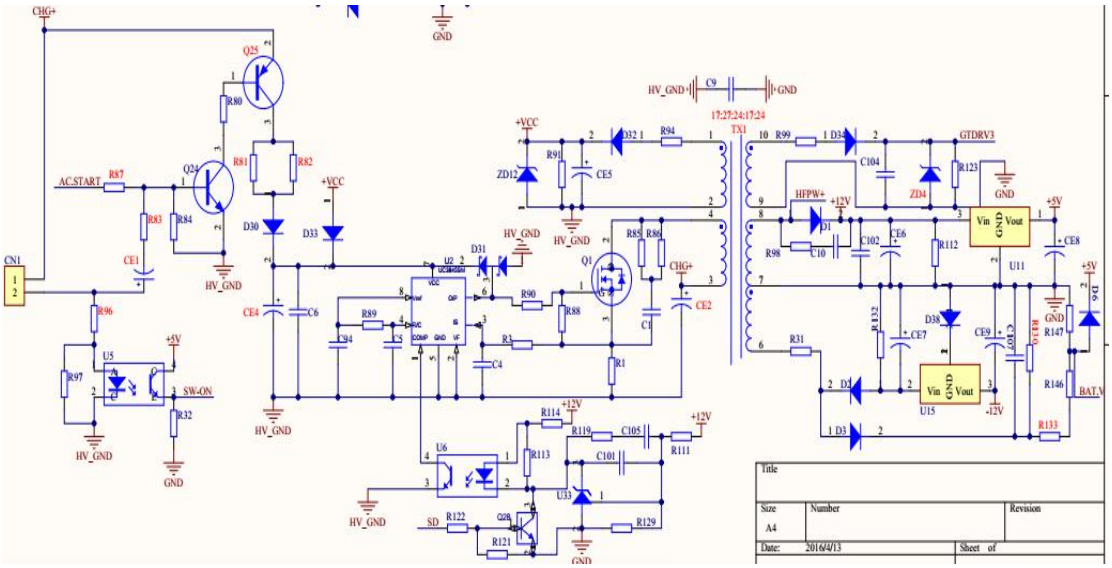
REC1: 150-10066-00 (Plug-in Diode HY/GBU8M 8A1000V)

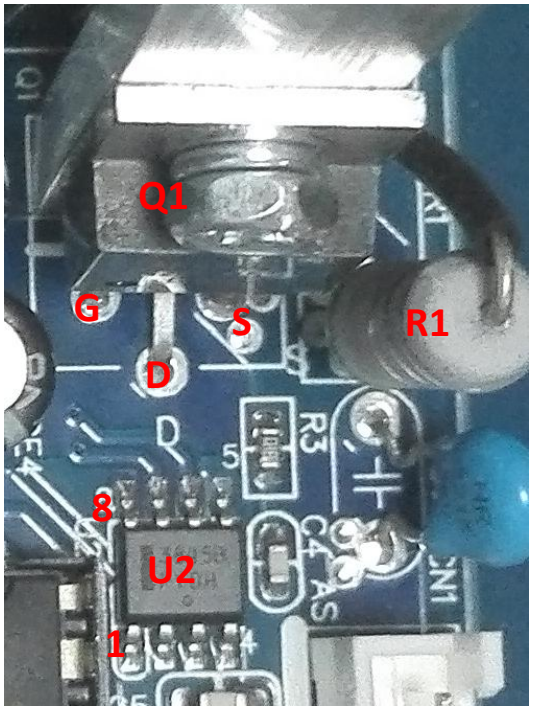


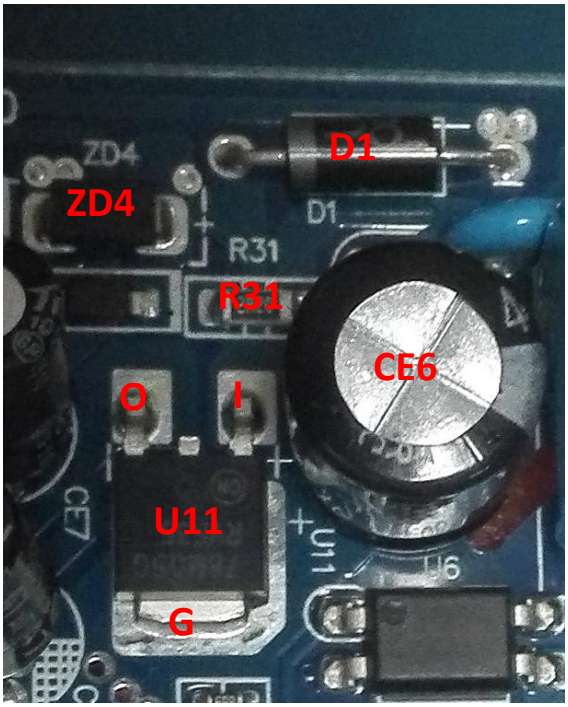
Positioning	Attribute	Reference Value	Failure Status
D21/D22/D23	Diode	P to N: 0.44V ; N to P: OL	Short Circuit or Broken
REC1	Diode	～ to +: 0.47V ; + to ～: OL - to ～: 0.47; ～ to -: OL	

3.6 To Check Power Circuit

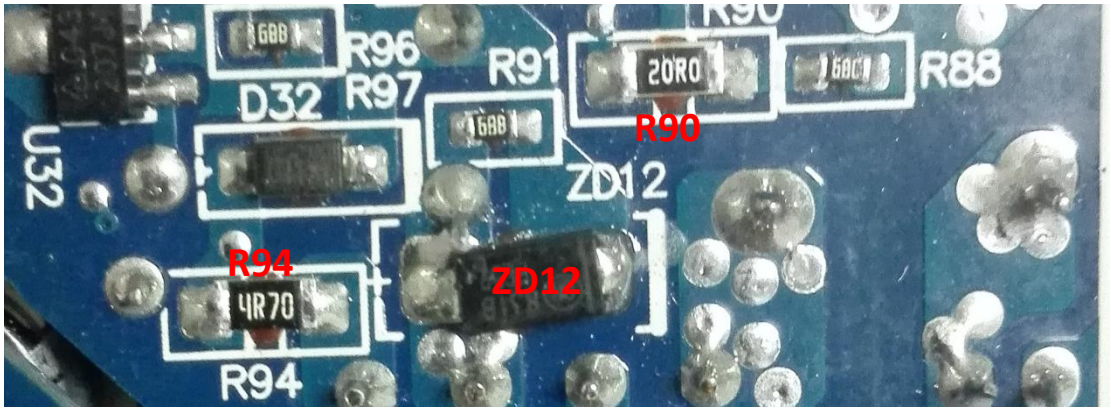
Q1: 150-30005-00 (Plug-in Transistor MOSFET IR/IRF640NPBF18A 200V)
R1: 130-00211-00 (Plug-in Resistor 3WS 0.15 J Rack F4)
U2: 120-10052-00 (IC PWM ON/UC3845BD1R2G L-1 SMD SOP-8)



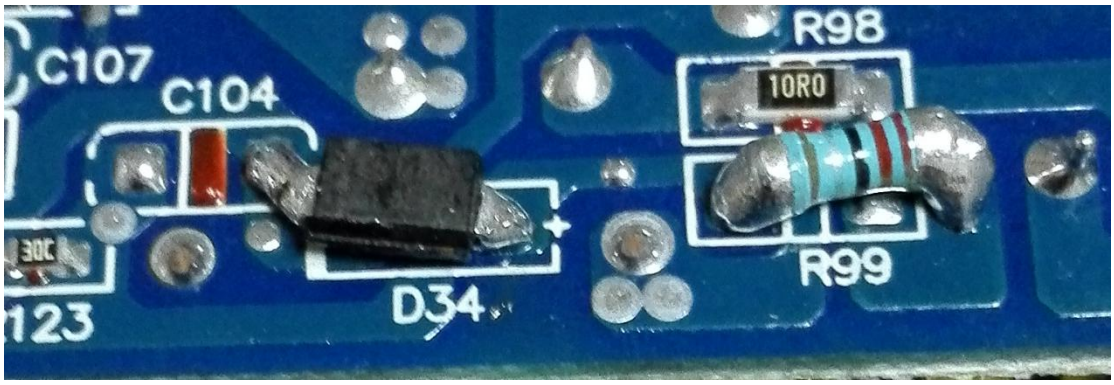




CE6: 140-00044-00 (Electrolytic Capacitor 470uF35V M 5mm 105℃ 10*16mm Tape) If the capacitor appears burst, please replace it.
R31: 100-17022-00 (SMD Resistor CHIP TF 1/4W 2.2 F (1206))
D1: 150-10009-00 (Plug-in Diode PAJIT/UF204 2A 400V ULTRAFAST AXI)
ZD4: 120-20072-00 (SMD Zen-er Diode PAN JIT 1SMA4745 16V 1W SMD)
U11: 120-10037-00 (IC ON/MC78M05CDTG DPAK-3 SMD)



R94: 100-17047-00 (SMD Resistor CHIP TF 1/4W 4.7 F (1206))
R90: 100-10020-00 (SMD Resistor CHIP TF 1/4W 20 F(1206))
ZD12: 120-00060-00 (SMD Diode ON/1SMA5931BT3G DO214AC1.5W 18V SMD)

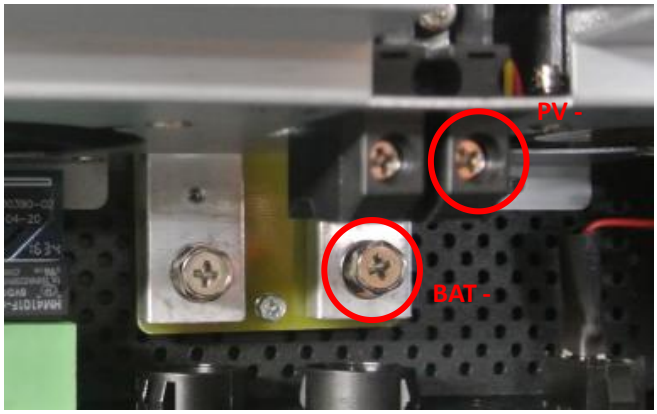


R99: 100-30022-00 (SMD Resistor CHIP TF 1W 2.2 F (0207))
D34: 120-20048-00 (SMD Diode ON/MURA120T3 1A 200V 403D SMD)

Positioning	Attribute	Reference Value	Failure Status
Q1	Diode	SD: 0.5V ; DS: OL	Short Circuit or Broken
D1	Diode	+ to -: 0.47V ; - to +: OL	
ZD4	Diode	+ to -:0.4V ; - to +:OL	
ZD12	Diode	+ to -:0.4V ; - to +: OL	
D34	Diode	+ to -: 0.47V ; - to +: OL	
U11	Resistor	I to O to G:OL	
R99	Resistor	2.2omh	Open Circuit or other Value
R1	Resistor	0.15omh	
R31	Resistor	2.2omh	
R94	Resistor	22 ohm	
R90	Resistor	4.7omh	
U2	Resistor	Pin7-Pin5:42K;Pin6-Pin5: 30K	Short Circuit or Broken

3.7 To Check MOSFETS for Reversed Protection on DC Terminal

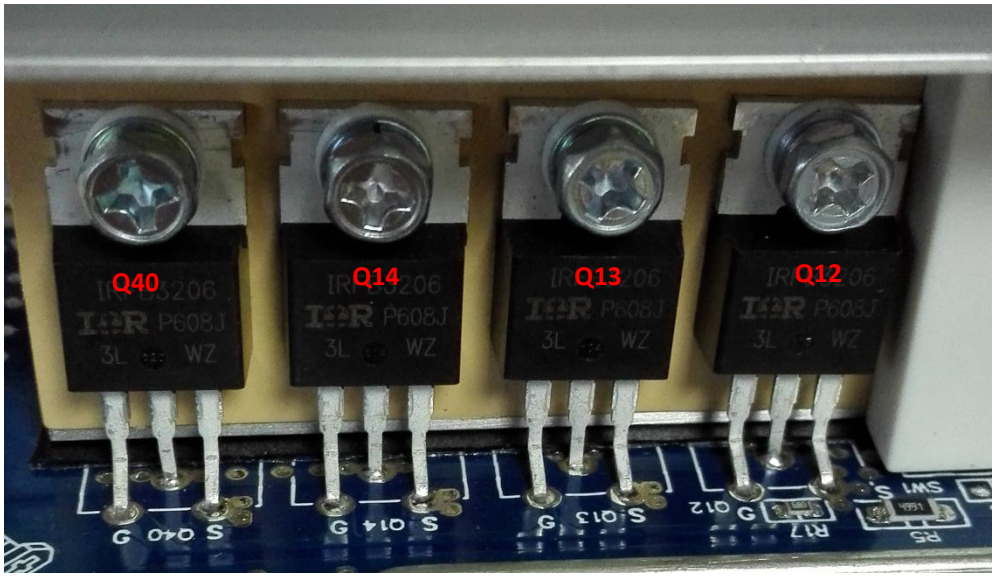
Please open the cover and measure as follows.



Positioning	Attribute	Reference Value	Failure Status
PV - to BAT -	Resistor	>10K	Short Circuit

If in Short Circuit, Please replace MOSFET in Main Board.

Q12,Q13,Q14,Q40: 150-30060-00 (MOSFET IR/IRFB3206PBF 210A 60V N TO-220AB)



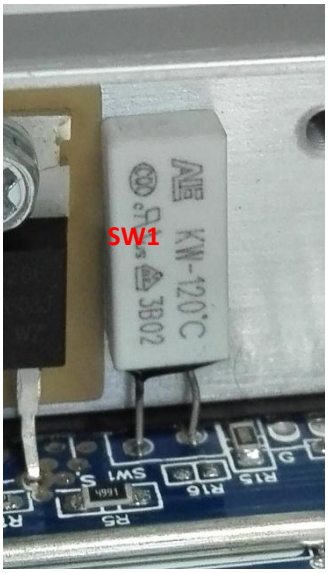
3.8 To Check NTC Circuit

On Main Board, there are three NTC, one is in DC-DC Boost Heat Sink, one is under boost transformer and one is in inverting heat sink.

When 02 fault code appears, it requires to check this step, please kindly note.

3.8.1 NTC in position of HS3 plugs in position of SW1 on main board.

After taking cover:



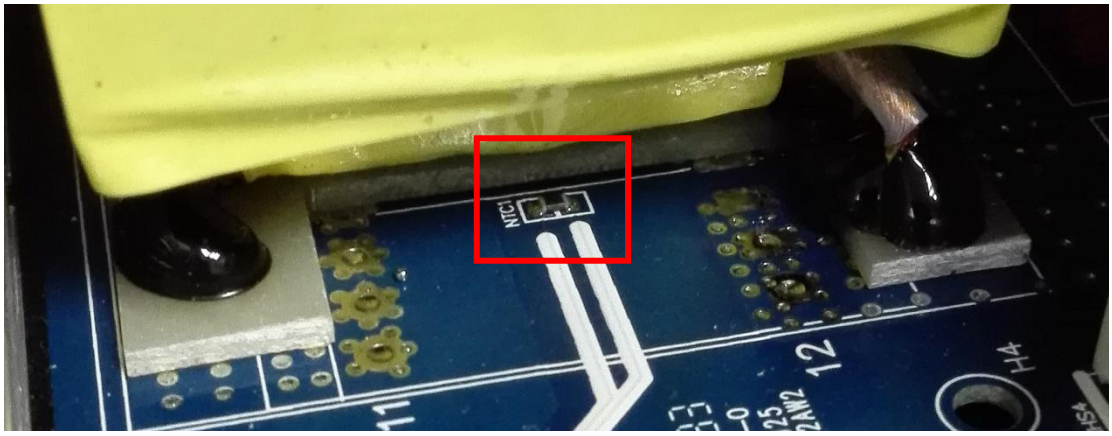
SW1: 130-20034-01 (Thermistor KI66-120B5 120℃ KW)

Positioning	Attribute	Reference Value	Failure Status
SW1	Resistor	0.1 ohm	Open Circuit

If it is not possible to check functioning, please make NTC short-circuit and test the inverter again; if the fault disappears, it means the NTC is wrong.

3.8.2 NTC1 under Transformer

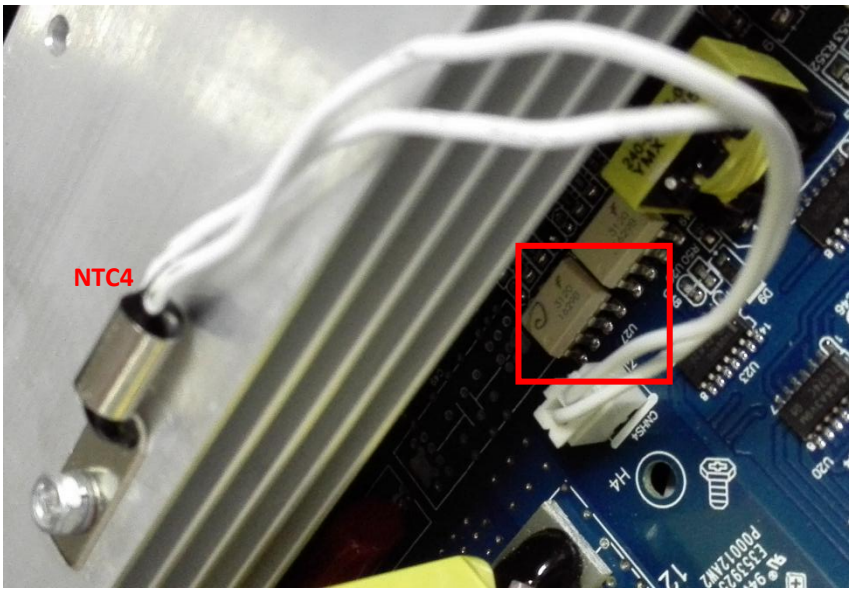
NTC1: 100-A0002-00 (Thermistor NTC 47K 240mW SMD 0805)



Positioning	Attribute	Reference Value	Failure Status
NTC4	Resistor	5.7K ohm	Short Circuit or Open Circuit

3.8.3 NTC in HS4

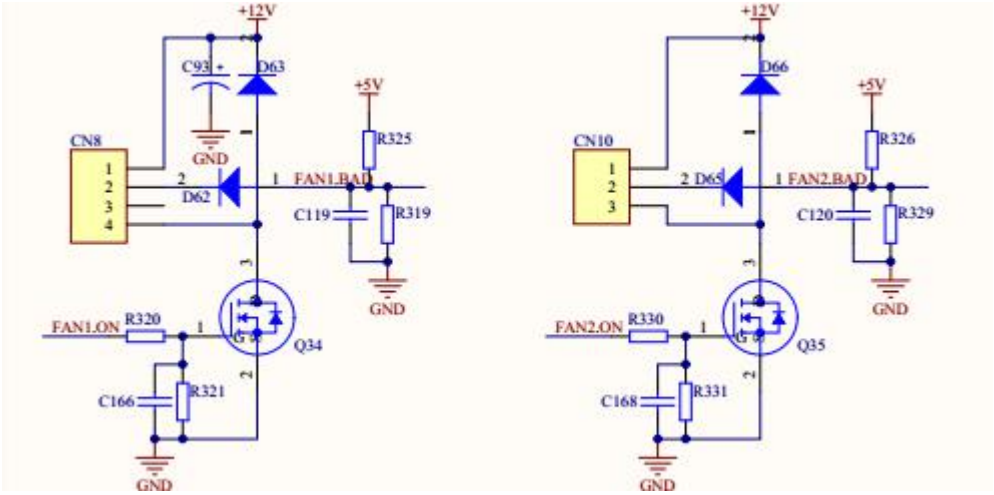
NTC_HS4: 130-20005-00 (Thermistor NTC 15K 2.5mA KW)

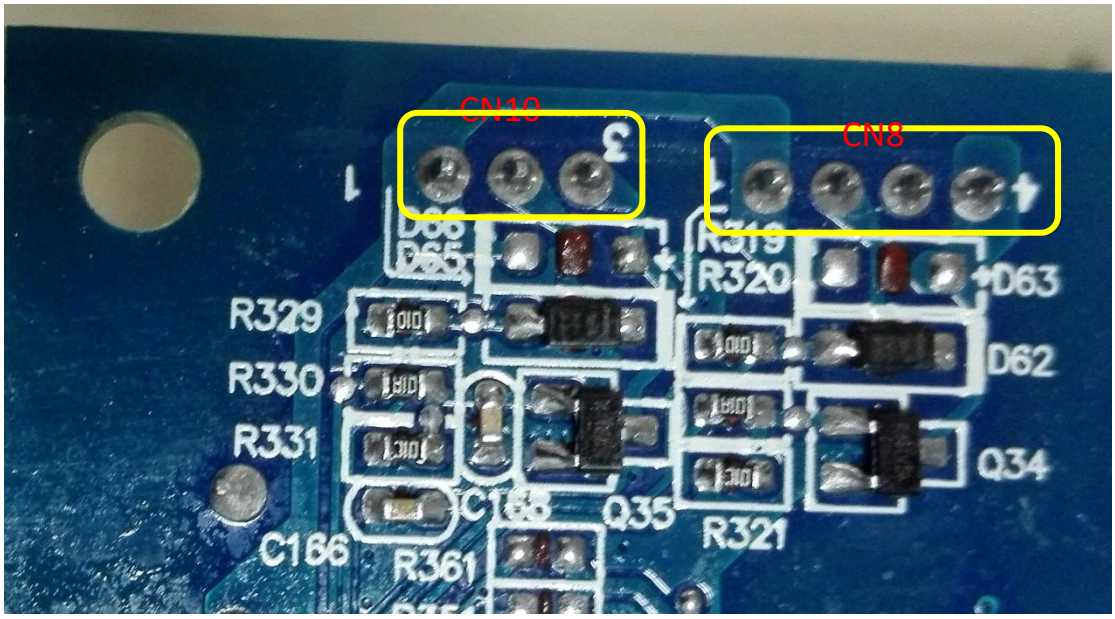


Positioning	Attribute	Reference Value	Failure Status
NTC_HS4	Resistor	5.5K ohm	Short Circuit or other value

If it is not possible to check functioning, please make NTC short-circuit and test the inverter again; if the fault disappears, it means the NTC is wrong.

3.9 To Check Fan Drive Circuit





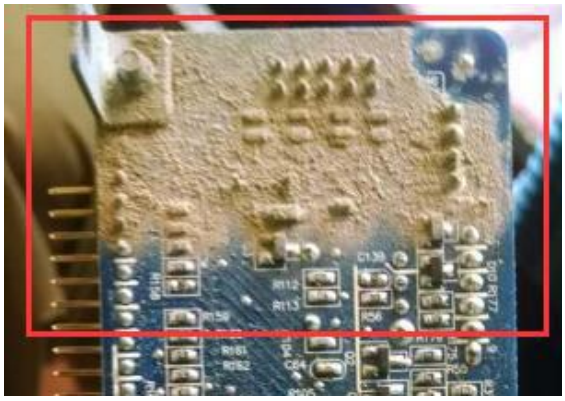
Positioning	Attribute	Reference Value	Failure Status
R319/R329	Resistor	100K ohm	Short Circuit or Other Value
R321/R325/R326/R331		10K ohm	
R320/R330		100 ohm	
D62/D65	Diode	+ to -:0.6V ; - to +: OL	Short Circuit or Burst
Q34/Q35		SD: 0.5V ; DS: OL	

4. Other Common Faulty Cases

4.1 MOSFET Burnt

4.2 Input Cable Disconnection

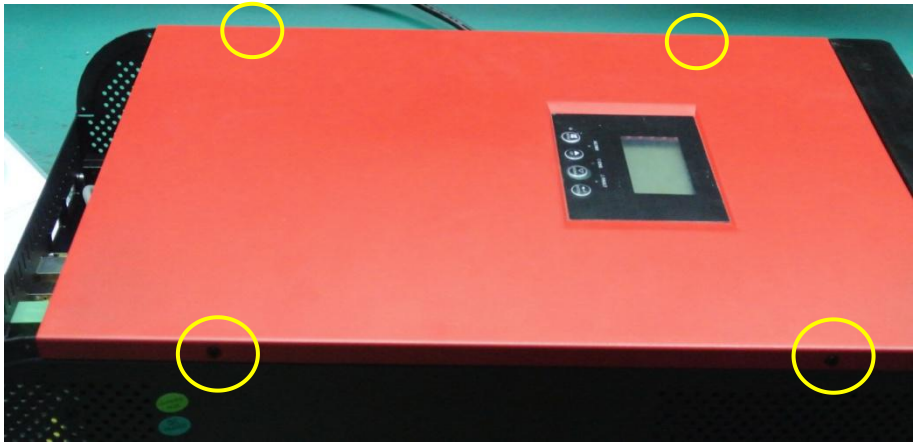
4.3 Dust-covered Control Board



5. Assembling Guidance

5.1 Unfix Upper Cover

5.1.1 Unscrew four screws of the cover as following

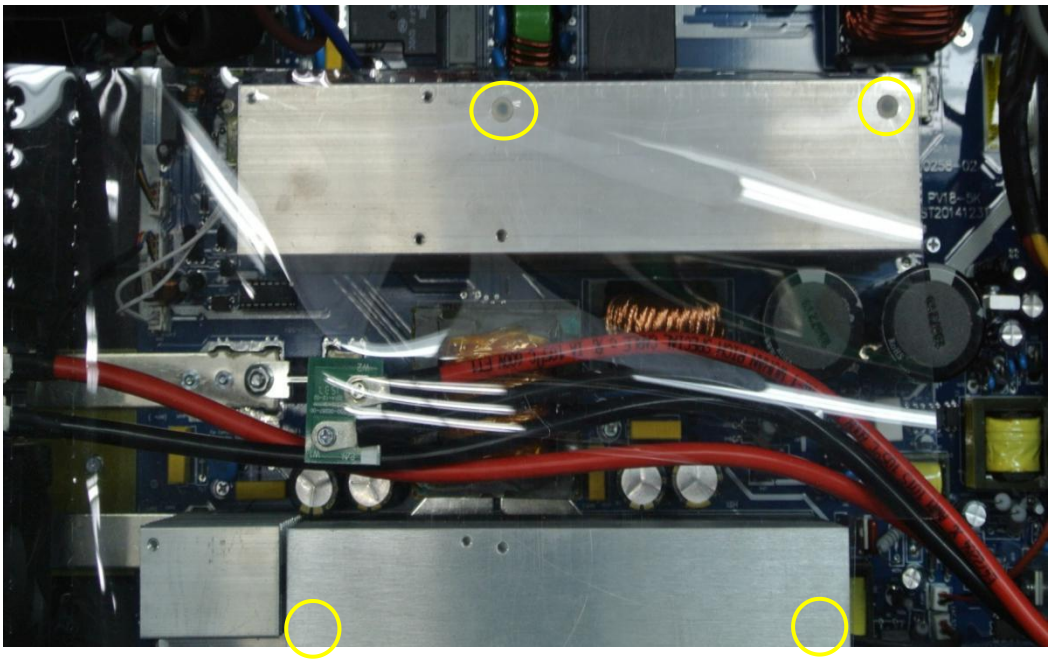


5.1.2 Pluck LCD disconnection cable and take the cover

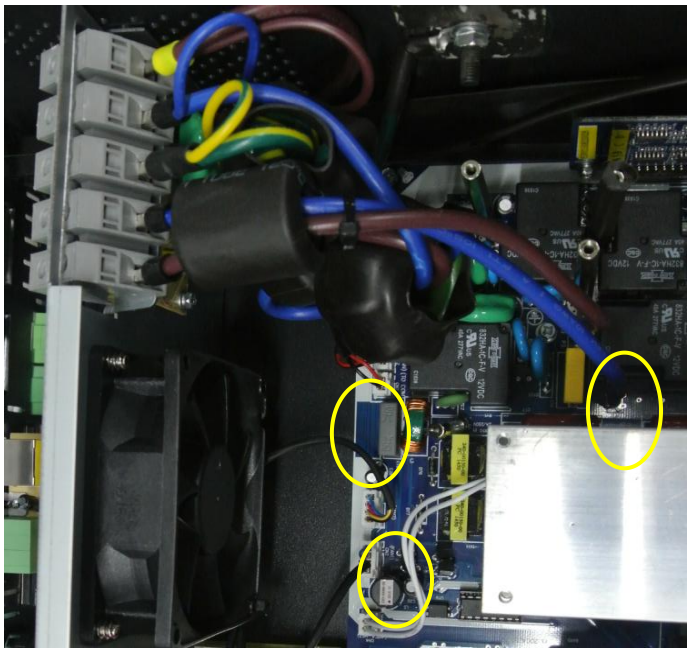
5.2 Unfix Power Board

5.2.1 To take the Air-duct Paper

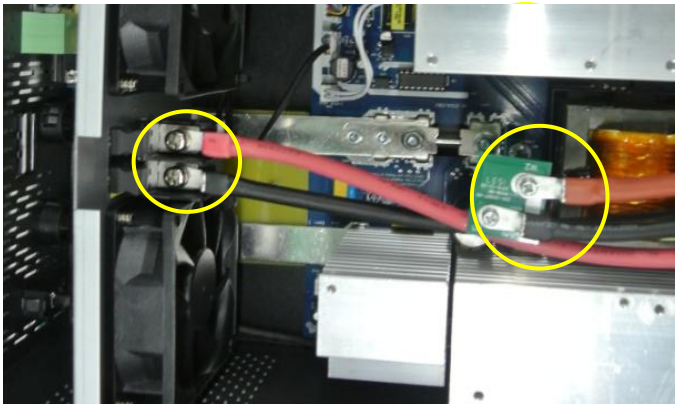
To take five plastic nails in heat sink and take out the air-duct paper



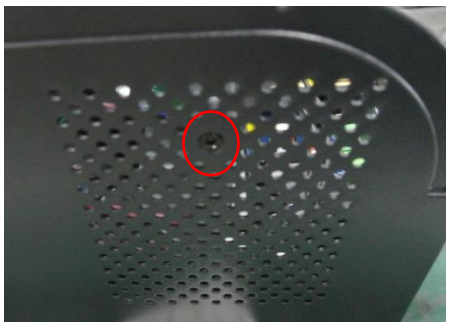
5.2.2 To pluck AC input and output cable and fan connection cable

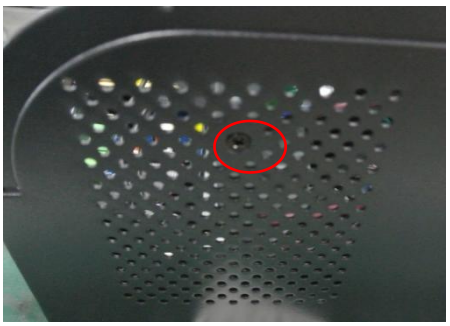


5.2.3 To Remove PV Connection Cable



5.2.4 To Remove the two screws on the side and take out the middle clapboard





5.2.5 Unscrew the two screws in control board and take the control board out.

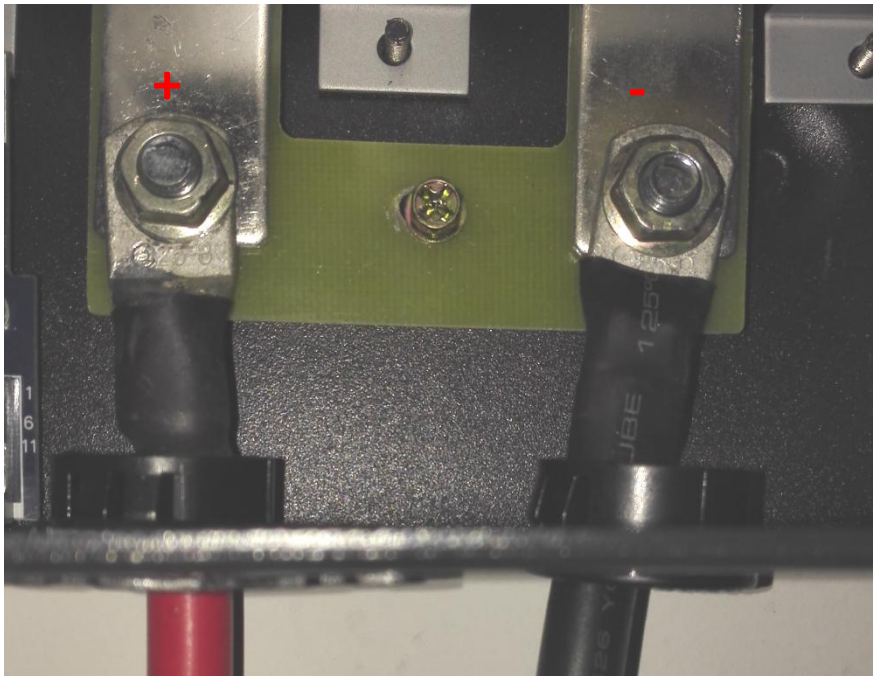
5.2.6 Unscrew the eleven screws in main boards and take main board out.

5.3 Assembling the Inverter

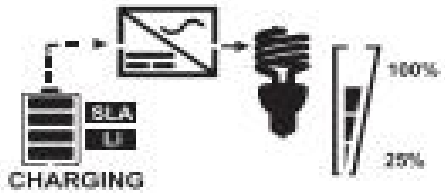
When Assemble the unit, please take opposite order of dissembling.

6. Test after Repairing

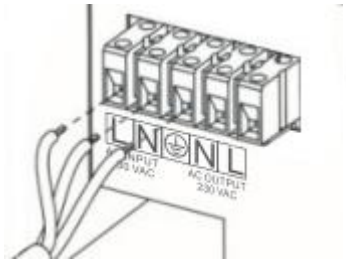
6.1 Before test, please connect to battery bank.

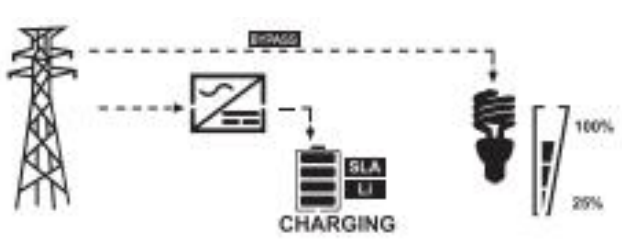


Afterwards, please Turn ON the unit.



6.2 To connect with AC Grid for testing





6.3 To connect PV for testing