



**EA900II Series Digital  
High-frequency UPS  
6—10KVA Maintenance Manual**

**V1.0**

GuangDong East Power Co., Ltd., UPS Product Department

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# **1. Introduction**

## **1.1 Product overview**

EA900II series high-frequency UPS is a brand-new intelligent high-frequency UPS, integrating the high-performance pure digital control and double conversion on line structure, featuring a serial of precision and maturity design such as input power factor correction, advanced DSP control, complete protection measures, excellent network management and rational HMI. As a new generation of high-frequency UPS characterized by its reliability, safety and maintainability, our product can meet the high requirement by a variety of fields for UPS.

The series of UPS is mainly employed to provide reliable and ideal AC UPS for all computers, data centers, network management centers and precision equipments. With the advanced full digital control, UPS can, in case of main power failure, continuously provide clean and uninterrupted power supply with stable voltage and frequency, applicable to sectors like the finance, telecommunication, security, tax administration, transportation, insurance, government and enterprises.

## 1.2 Product appearance (1-10KVA)



## 1.3 Product features

- ◆ DSP digital control, full digital control of rectification and inversion;
- ◆ High-frequency IGBT rectification is employed for input rectification, with input power factor up to 0.99;
- ◆ For single-phase series, input harmonic current is less than 6%, reducing the feedback interference of UPS and relatively energy-saving;
- ◆ 50Hz/60Hz frequency self-adaption: in case the first main power frequency ranges 45-55HZ, the rating frequency will be 50HZ by default; in case it ranges 55-65HZ, the rating frequency will be 60HZ by default.
- ◆ Overload capacity: continue working for a long term in case of less than 108%;
  - Turn to the bypass work mode after 10min 108%~125% load;
  - Turn to the bypass work mode after 1min 108%~125% load;
  - Turn to the bypass work mode after 1s 150% load.
- ◆ 54x35mm display screen, featuring visual and explicit display of data;
- ◆ Output standard configuration is RS232 communication port, communication ways like USB, EPO port, dry contact, RS485 and SNMP are optional;
- ◆ Fault diagnosis function, able to determine the fault reason by the displayed code and quickly find the fault location;
- ◆ Double-sided power board allows for more reliable and stable machine performance;
- ◆ Colorful LCD display contents, able to set output voltage value and ECO via LCD panel;
- ◆ Batter mode DC-DC converter can be switched from analog control to digital control;
- ◆ Via the panel, it is able to set ECO function (economic mode), with efficiency up to 95%;
- ◆ Battery number is regulated as fourteen and sixteen, relatively reducing the cost of standard

type;

◆ Wider voltage range (100-300vac), under main power mode and full-load condition, input voltage LOSS point can be 140vac;

◆ Better machine performance index. Under rated nonlinear load, the machine features the input power factor bigger than 0.98, input current harmonic distortion less than 6%, output voltage harmonic distortion less than 5%, and conversion efficiency bigger than 89% under main power mode and 86% under battery mode.

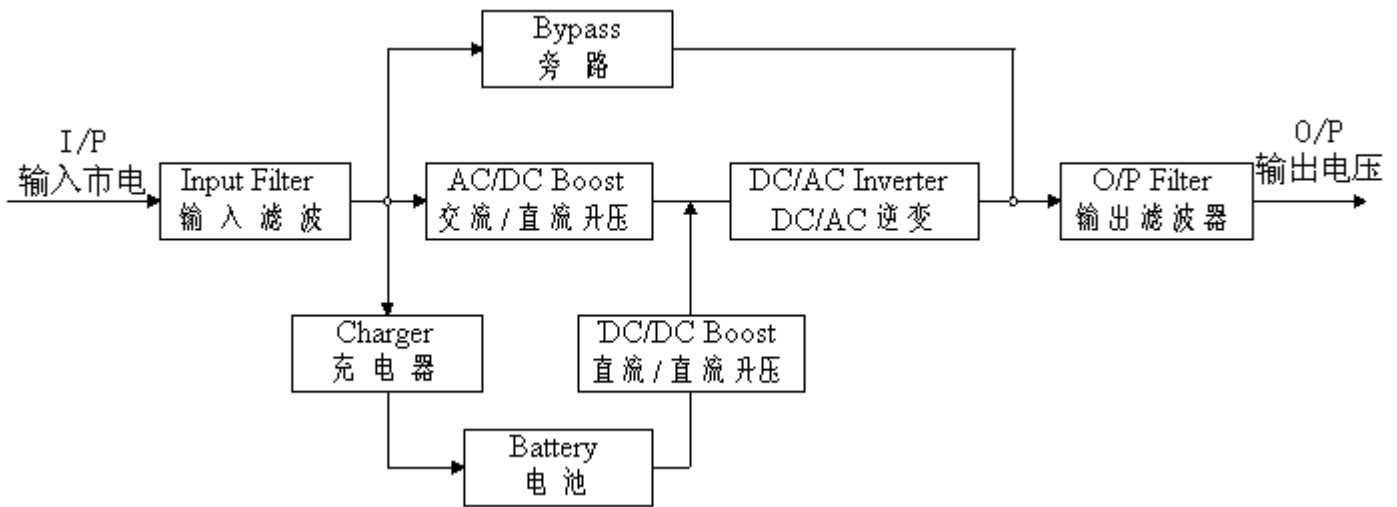
### 1.3.2 Electrical performance of product

Model	EA906II	EA9010II
Nominal capacity	1KVA	2KVA
<b>Input Specification</b>		
Rated input voltage	220V	
Rated input frequency	50Hz/60Hz self-adaption	
Input voltage range	120~300VAC (Half load) 140~300VAC (Full load)	
Input frequency range	45-55Hz+/-0.5% 50Hz	
	55-65Hz+/-0.5% 60Hz	
Phase number	Single-phase +N+GND	
Power factor correction	≥0.98	
Input standard current (Linear full load)	8A	
Input protection		
Rated current protection	50A air switch	80A air switch
Input current harmonic distortion	< 6%	< 5%
Bypass voltage range	186VAC-252VAC (Modifiable)	
<b>Output Specification</b>		
Output voltage	208VAC/210VAC/220VAC/230VAC/240VAC, able to set via LCD panel	
Output power factor	0.8	
Output power (VA/Watt)	6000VA/4800W	10000VA/8000W
Voltage regulation precision	±1 %	
Output DC component voltage	≤200mv	
Load peak ratio	3:1	
Bypass output prior to startup	No bypass output by default, settable	
Output frequency		
Under main power mode	Similar to the input frequency	
Under battery mode	(50/60±0.2) Hz	
Phase locking velocity	≤1Hz/s	
Total voltage harmonic distortion	It is< 3% when under linear full load and < 5% when under nonlinear full load.	
<b>Conversion time</b>		
From main power mode to battery mode	0ms	
From battery mode to main power mode	0ms	
From main power mode to bypass mode	<4ms	

From bypass mode to main power mode		<4ms
ECO mode conversion power failure		≤10ms
Overall efficiency	Main power full-load	≧91 %
	Battery full-load	≧90%
	ECO mode	≧94%
Over-load capacity		Turn to bypass working mode after 10 min 105%~125% load; Turn to bypass working mode after 1min 125%~150% load, with alarm prompt; Turn to bypass working mode after 1s load more than 150%, with alarm prompt
Auto restoration function		Yes
<b>Battery</b>		
Battery type		Omniseal maintenance-free lead-acid battery
DC rated voltage (V DC)		168V DC
Built-in battery of the standard type		9AH/12V
Number of battery (PCS)		14 or 16 PCS
Back-up time		Standard type half-load ≥5min, while the long backup type should depend on the battery capacity.
<b>Charger</b>		
Output voltage		196VDC(14PCS) or 224VDC(14PCS)
Charge mode		Three-stage charge
Charging time		Depending on battery capacity
Input voltage range		150VAC~300VAC
Charging current		Standard type 1A, long backup type 8A
<b>Working environment</b>		
Insulation resistance		>2M(500VDC)
Insulation strength		(Input and output to ground) 2820Vdc, 1min, leakage current is less than 3.5mA, no flashover.
Surge protection		Meet the IV grade installation site requirement specified by IEC60664-1, namely the ability to withstand 1.2/50us+8/20us combination wave is no less than 6KV/3KA.
Protection grade		IP20
<b>Physical property</b>		
Operation environment	Working temperature	0 ~ 40 °C
	Storage temperature	-25°C ~ 55 °C
	Working humidity	20 ~ 90% (no water condensation)
	Altitude	0m < altitude < 1500m, when exceeding 1500m, use via sub-rating.
Noise		<50db

## 2. Brief introduction of product principle and internal structure

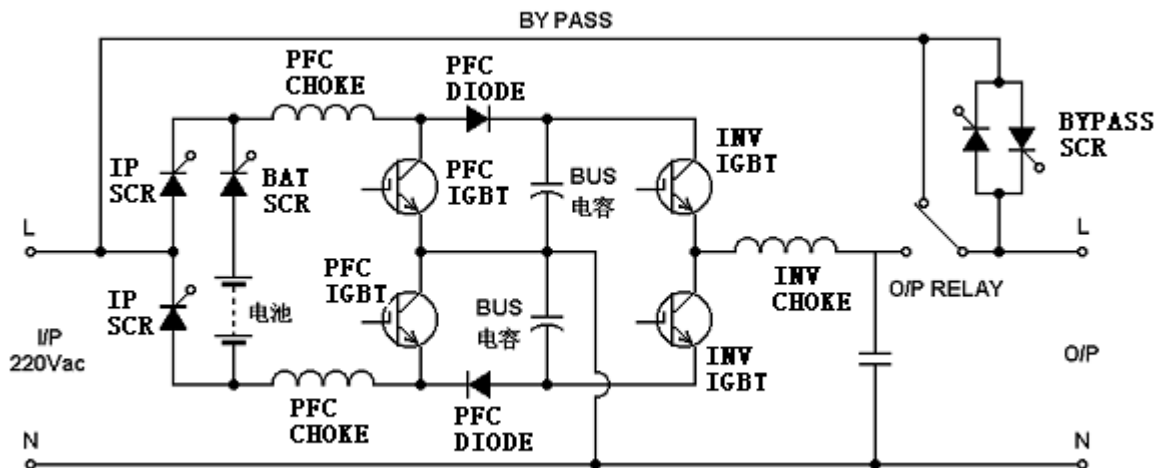
### 2.1 System functional block diagram



As the single-input single-output UPS, the EA900II series UPS is in serial connection between the power distribution system and load. The system design is applicable to provide the clean and uninterrupted power for the load and power distribution system even the upper line end of the AC power is interfered.

### 2.2 Schematic circuit diagram

#### 2.2.1 (6-10KVA) Schematic circuit diagram





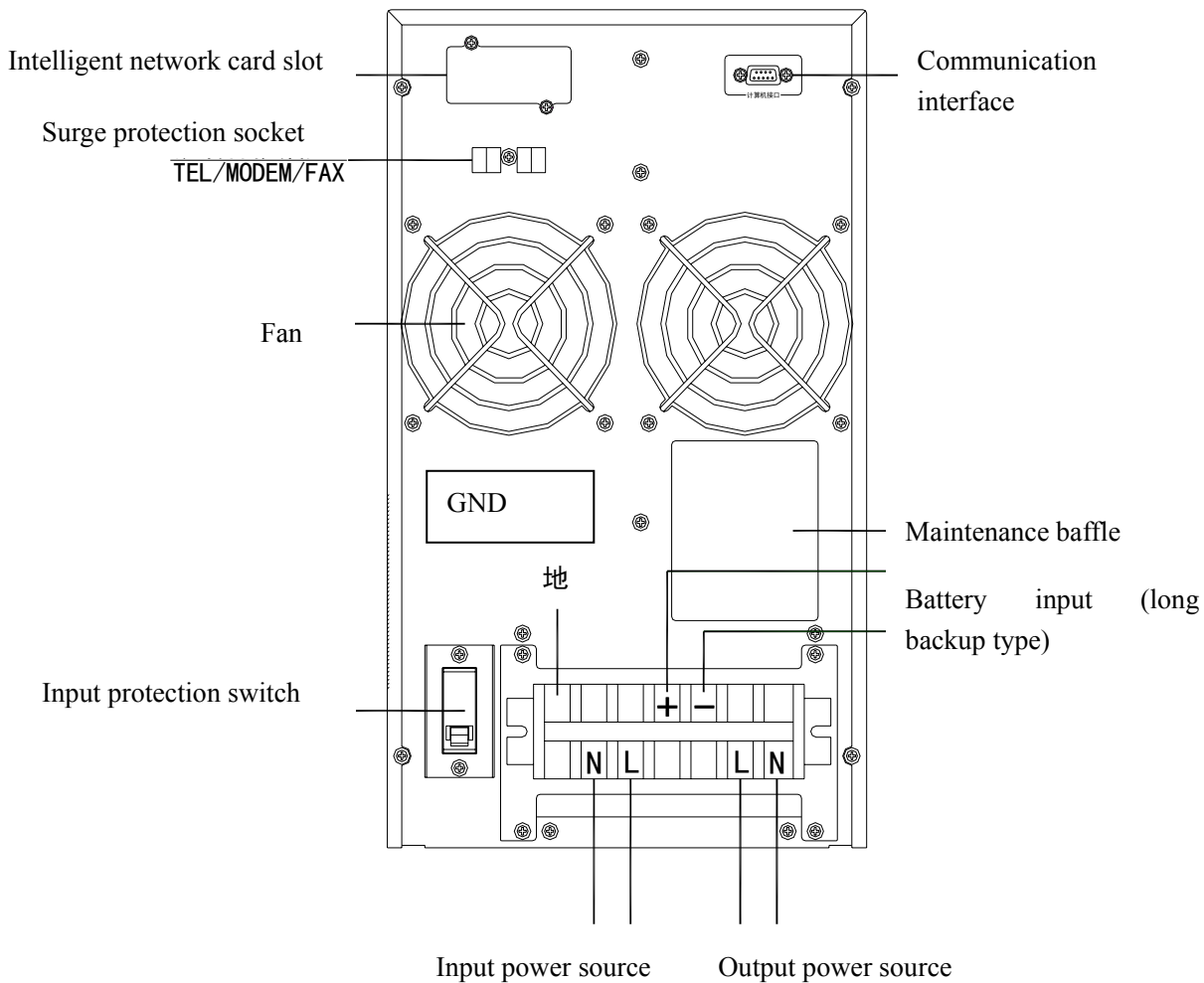
As shown in the schematic circuit diagram, when under normal condition, the main power generates bus voltage through the PFC boost circuit, and then converts it into AC power for the load through DC/AC inverter circuit.

When main power is under abnormal condition (exceeding UPS main power input range or power failure), the energy stored by the battery will provide DC voltage through DC boost circuit to the bus and convert DC bus voltage into AC voltage by inverter and then output the AC voltage.

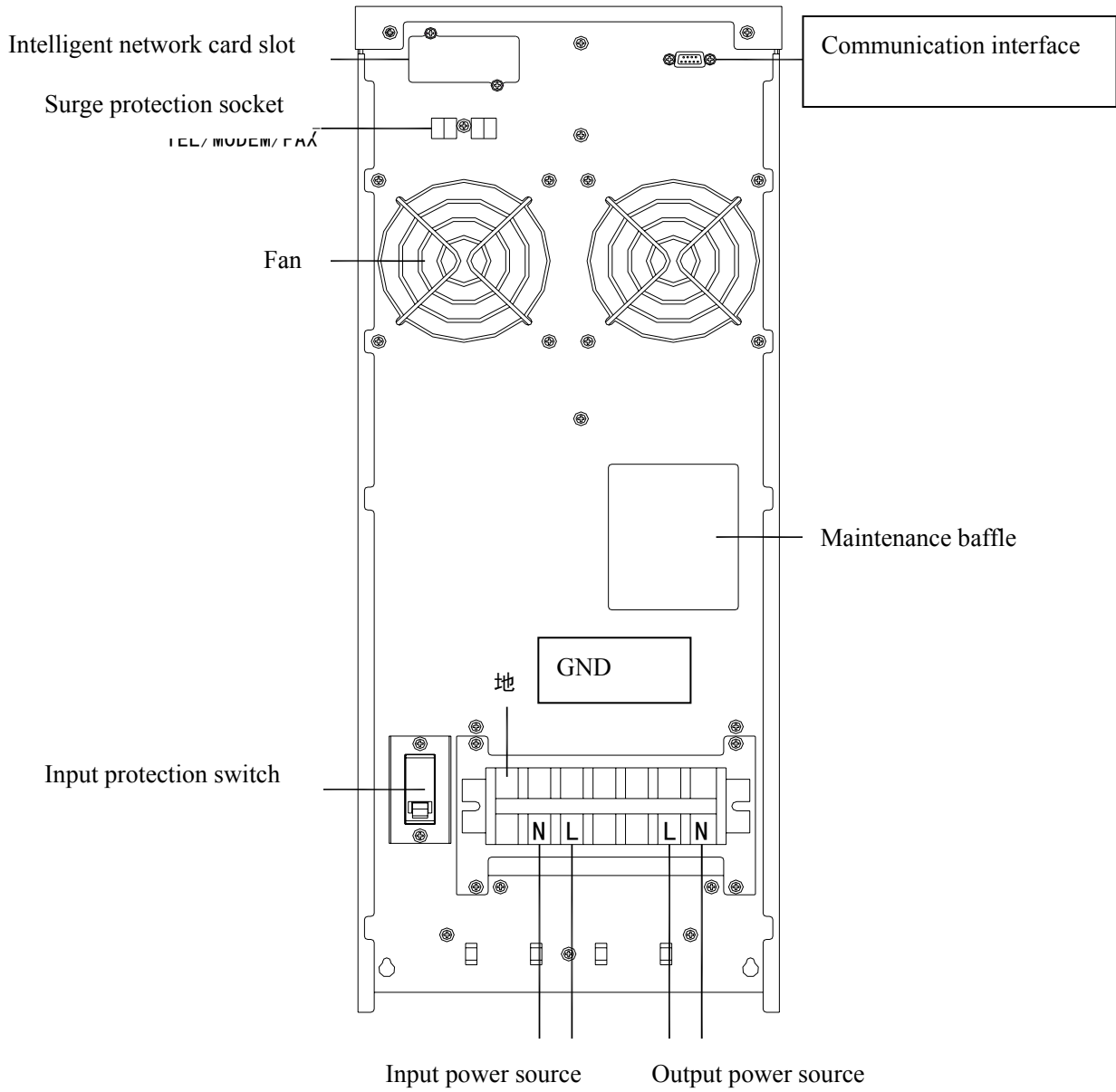
In case of any internal fault, UPS will incessantly switch to the bypass mode to provide continuous voltage for the load.

## 2.3 Graphical illustration for the product's internal architecture

### 2.3.1 Introduction of the UPS backboard

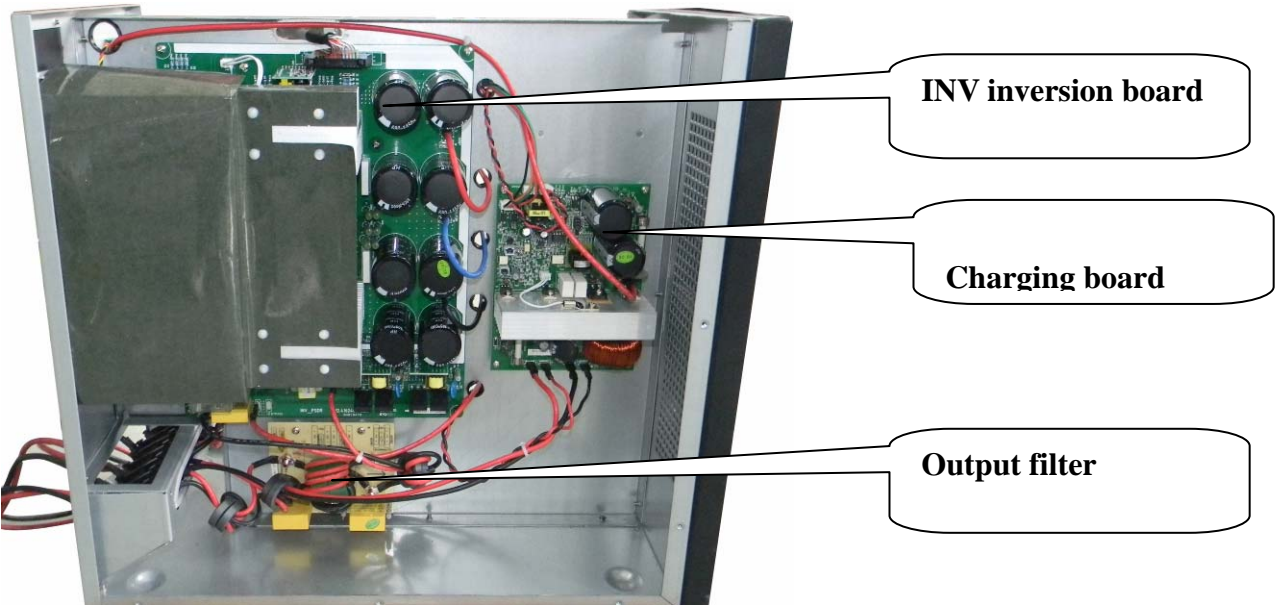
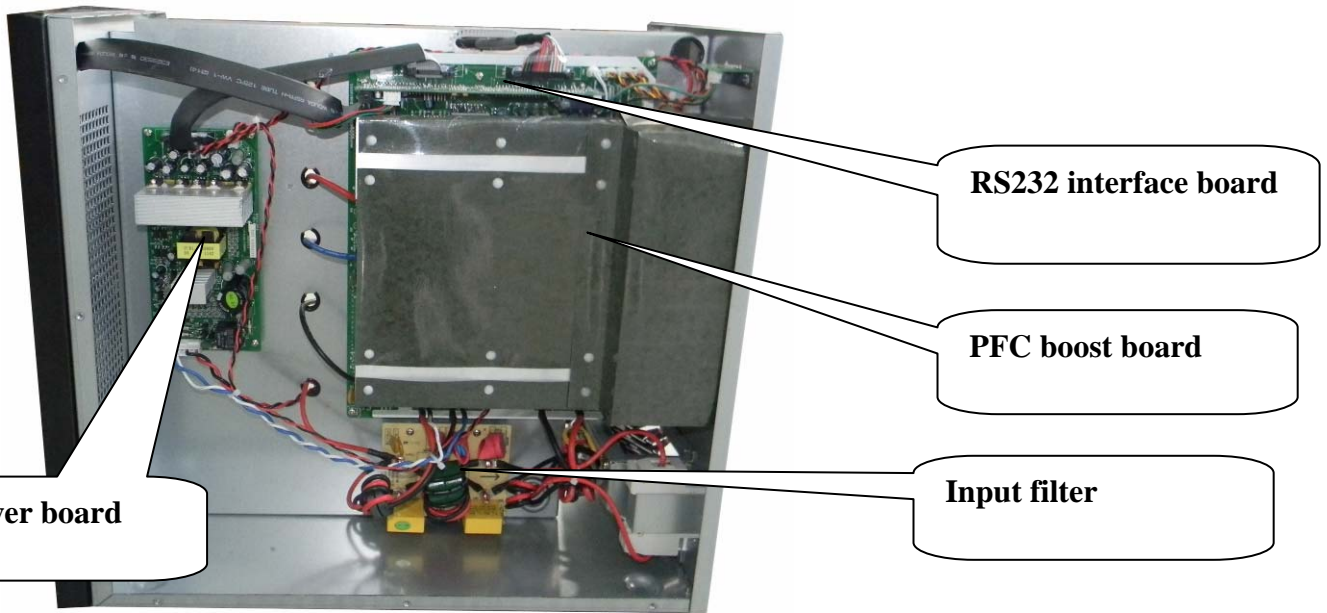


6-10KVA (long time-delay)

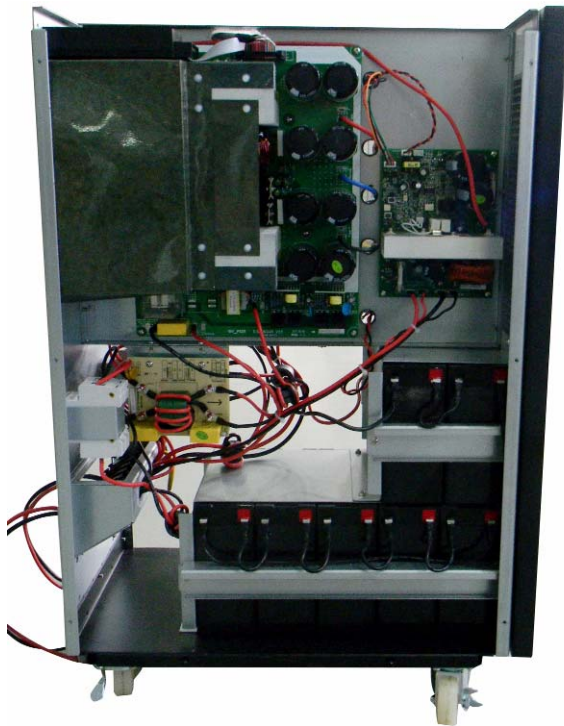


6-10KVA (Standard)

2.3.2 Description of the internal structure of 6-10KVA type



6/10KVA long backup type



6/10KVA Standard type

## 2.4 List of PCB board inside UPS

### List of 6KVA PCB board

Code	Name of material	Model
C.41.7010000	Circuit board- input filter	I/P EMI (for 6K/10K)
C.41.7010001	Circuit board- input filter	O/P EMI (6K)
C.41.7140000	Circuit board- surge protection board	TVSS (1-3K sharing)
C.41.G162101	Circuit board- power board	EA900II 6-10KVA SPS V4.0, AC/DC ip, 100W op
C.42.4100110	Circuit board- main control board	6-10K CNTL
C.45.0060500	Circuit board- display board	EA900 II -LCD (ZCM6174)
C.46.0010000	Circuit board- communication interface board	EA801-8A interface board
C.49.4162330	Circuit board- power board	EA906N PFC_PSDR(H)
C.49.4162310	Circuit board- power board	EA906N PFC_PSDR(S)
C.49.4162410	Circuit board- power board	EA906N INV_PSDR
C.4A.4164601	Circuit board- Charging board	EA906N 6/10K LCHG MODULE 80-300VAC IP,168V 1.5KW OP V2.0

### 2.4.5 10KVA PCB 板列表

#### 2.4.5 List of 10KVA PCB board

Code	Name of material	Model
C.41.7010000	Circuit board- surge protection board	I/P EMI (for 6K/10K)
C.41.7010001	Circuit board- input filter	O/P EMI (6K)
C.41.7140000	Circuit board- surge protection board	TVSS (1-3K sharing)
C.41.G162101	Circuit board- power board	EA900II 6-10KVA SPS V4.0, AC/DC ip, 100W op
C.42.4100110	Circuit board- main control board	6-10K CNTL
C.45.0060500	线路板-显示板 Circuit board- display board	EA900 II -LCD (ZCM6174)
C.46.0010000	Circuit board- communication interface board	EA801-8A interface board
C.49.4162340	Circuit board- power board	EA9010N PFC_PSDR(H)
C.49.4162320	Circuit board- power board	EA9010N PFC_PSDR(S)
C.49.4162420	Circuit board- power board	EA9010N INV_PSDR
C.4A.4164601	Circuit board- Charging board	EA906N 6/10K LCHG MODULE 80-300VAC IP,168V 1.5KW OP V2.0

# 3. PCB working principle and port definition

## 3.1 DSP control board

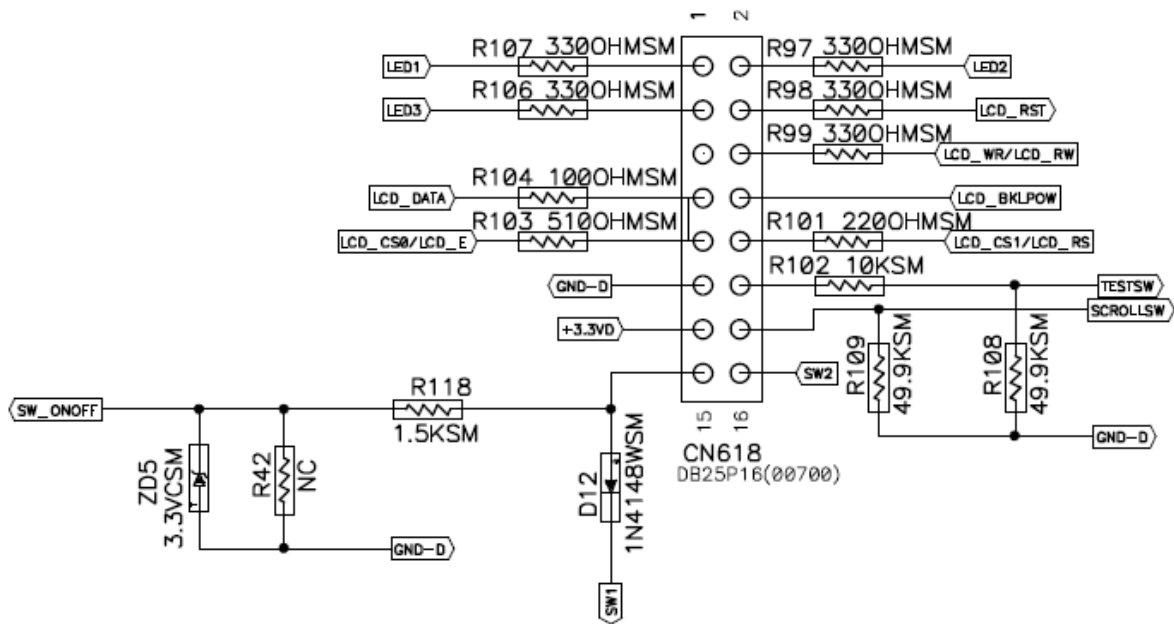
Control board is mainly composed of a 16-digit DSP controller and peripheral operational circuit; principally responsible for sequential control and PWM computation as well as the display and communication. It is the core part of UPS.

## 3.2 Description of the signal end of main control board



### 3.2.1 Main control board CN618

Connect to LCD display board



### 3.2.2 Main control board CN10

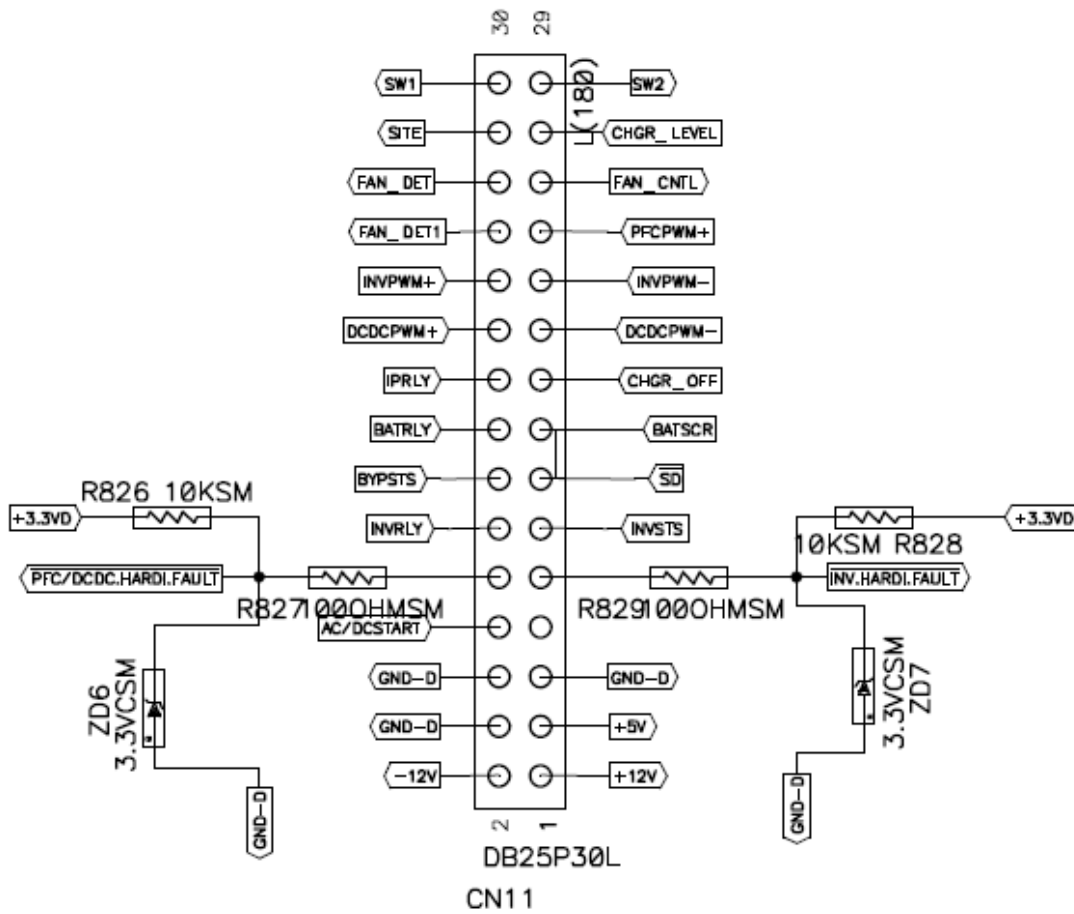
EPO functional interface

### 3.2.3 Main control CN7

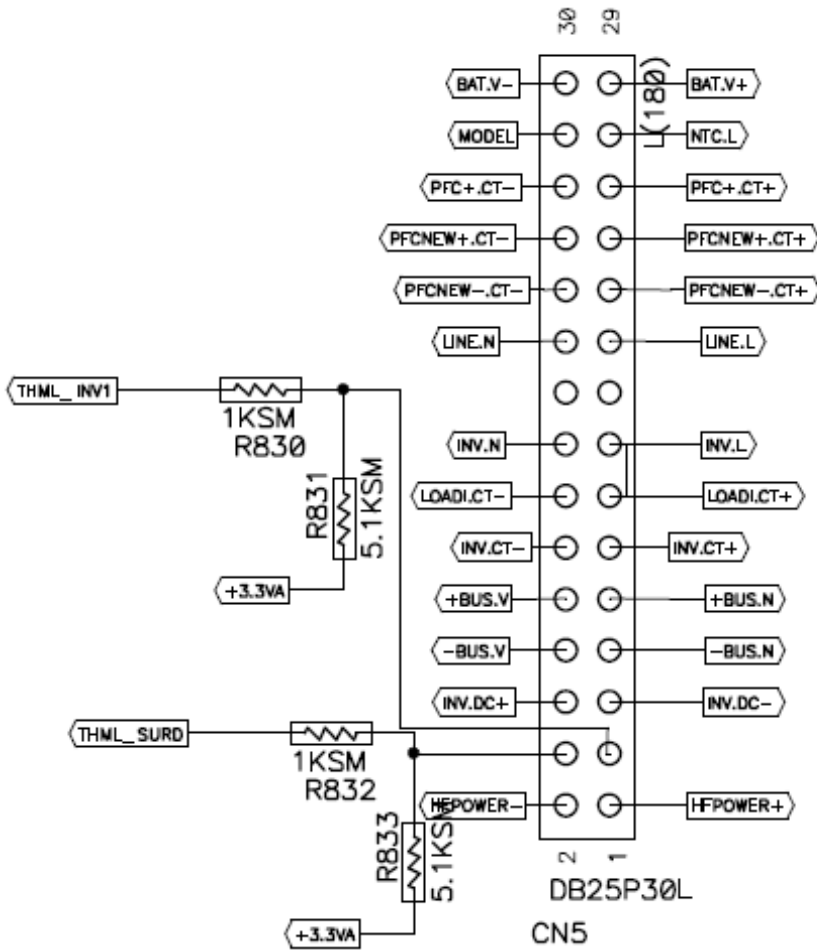
Special interface for burning program

### 3.2.4 Main control board CN11

PFC, DC, INV driving signal, connecting to power board CN1.



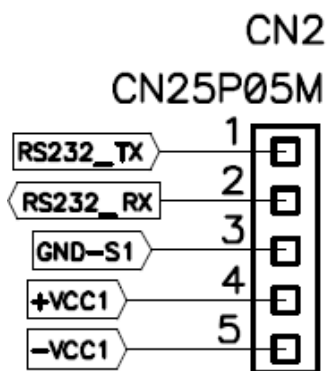
### 3.2.5 Main control board CN5



Sampled signal, connecting to the power board CN2

### 3.2.6 Main control board CN2

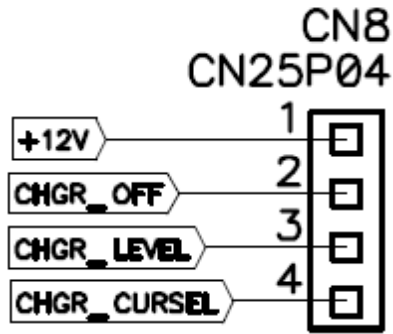
Connect to RS232.



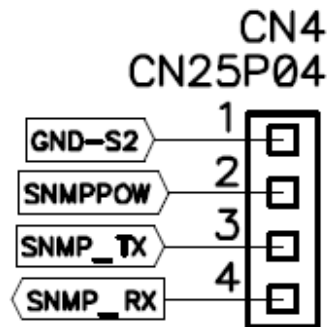
### 3.2.7 Main control board C

Connect to the long-life charging board





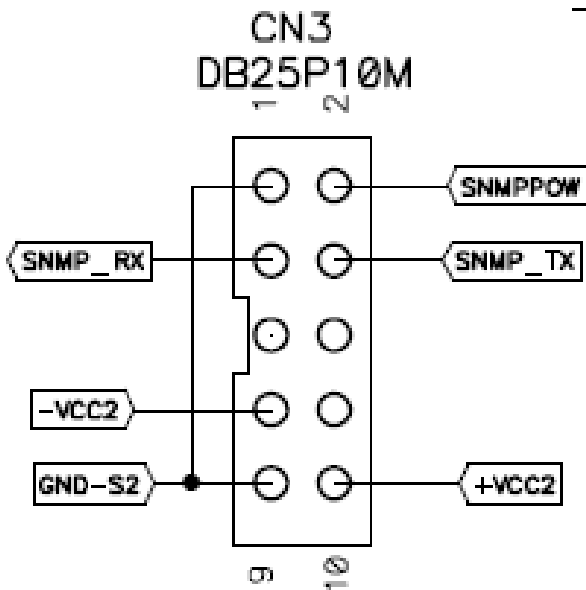
### 3.2.8 Main control board CN4



Reserved

### 3.2.9 Main control board CN3

Connect to the built-in SNMP card.

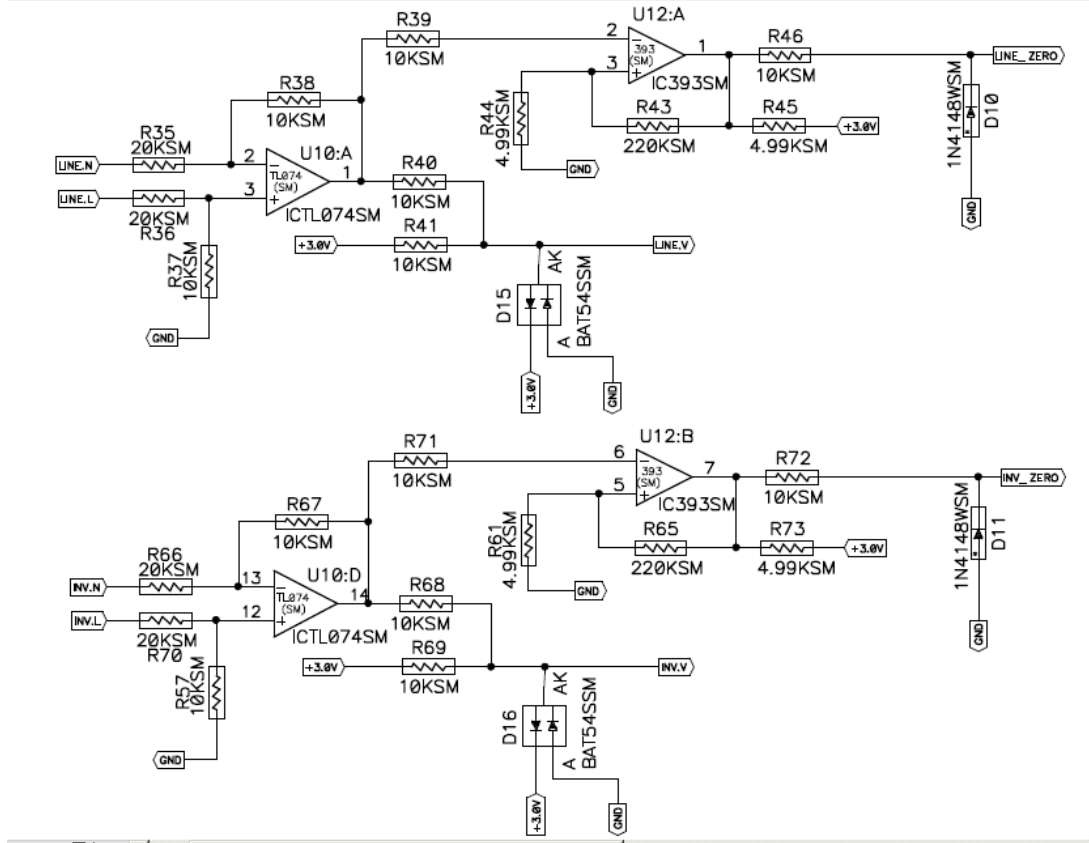


### 3.2.10 Main control board CN800

Burning power interface

## 6. Description of control board circuit

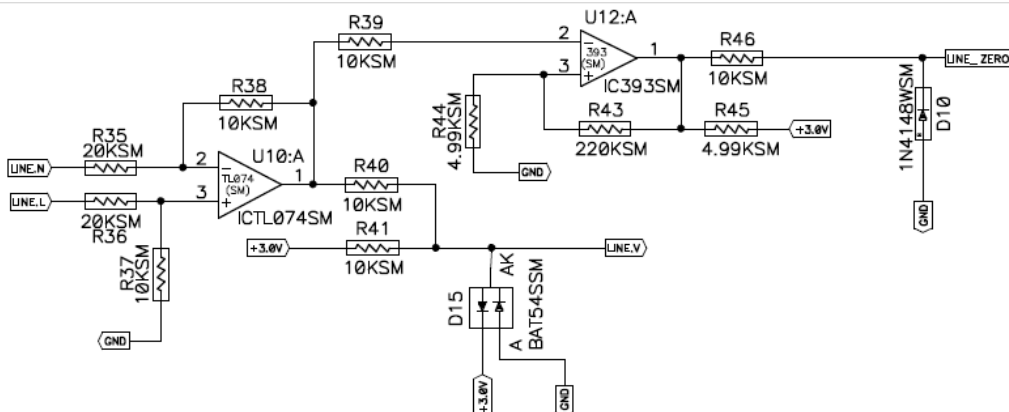
The control board can be used for main power voltage amplitude and frequency detection, inversion output voltage and frequency detection, battery voltage detection, BUS voltage detection, load detection and inversion inductive current detection.



### 1) Zero-crossing detection circuit

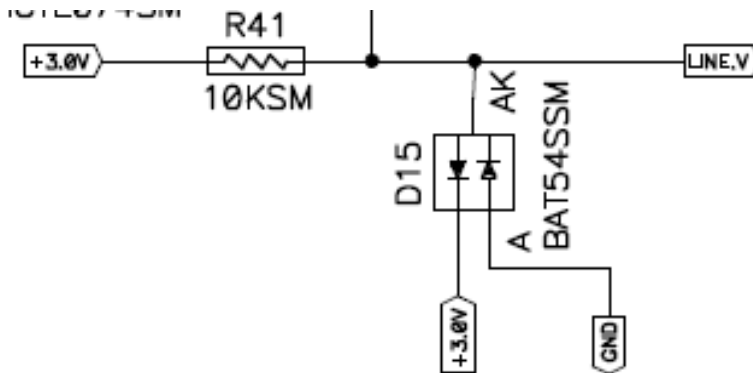
As the main power and inverter employs the same zero-crossing detection circuit, the main power zero-crossing detection circuit is taken as the example.

Main power voltage flows through the dropping resistor (on the power magnifier board); after being attenuated by a proportional amplifier, the sine signal, R44 and R43 forms the Schmidt link to prevent the misoperation caused by the vibration (i.e. connecting to generator) on the sine wave zero-crossing due to poor main power wave. D10 is added to prevent the conversion of CPU signal into negative voltage.



## 2) Amplitude detection circuit

As the main power and inverter employs the same amplitude detection circuit, the main power amplitude detection circuit is taken as the example.



## 3) BUS voltage detection circuit

BUS voltage detection circuit is used to detect the DC current around positive and negative 350V, which is sent to the main board via dropping resistor, and the main board sends it via the following difference channel to DSP. After constant detection of BUS voltage amplitude, BUS voltage is stabilized, and fault alarm will be given in case of higher or lower BUS voltage.

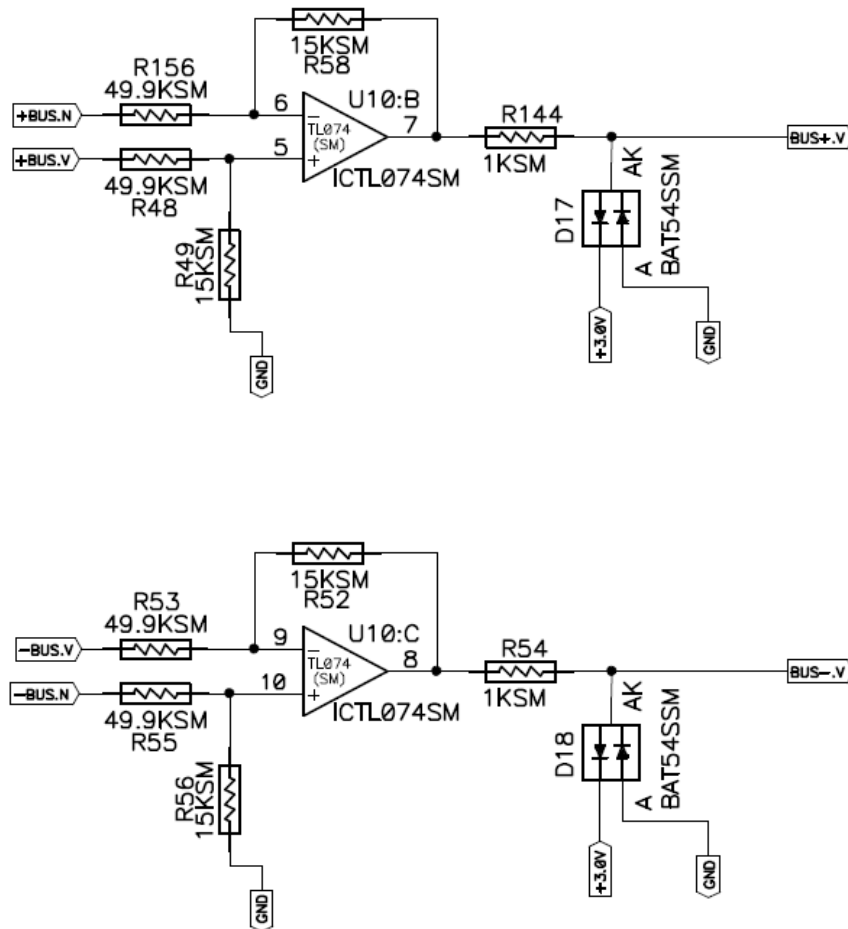
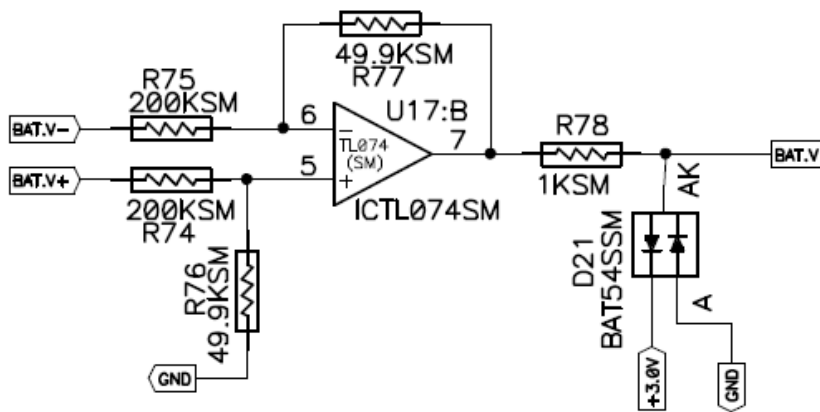


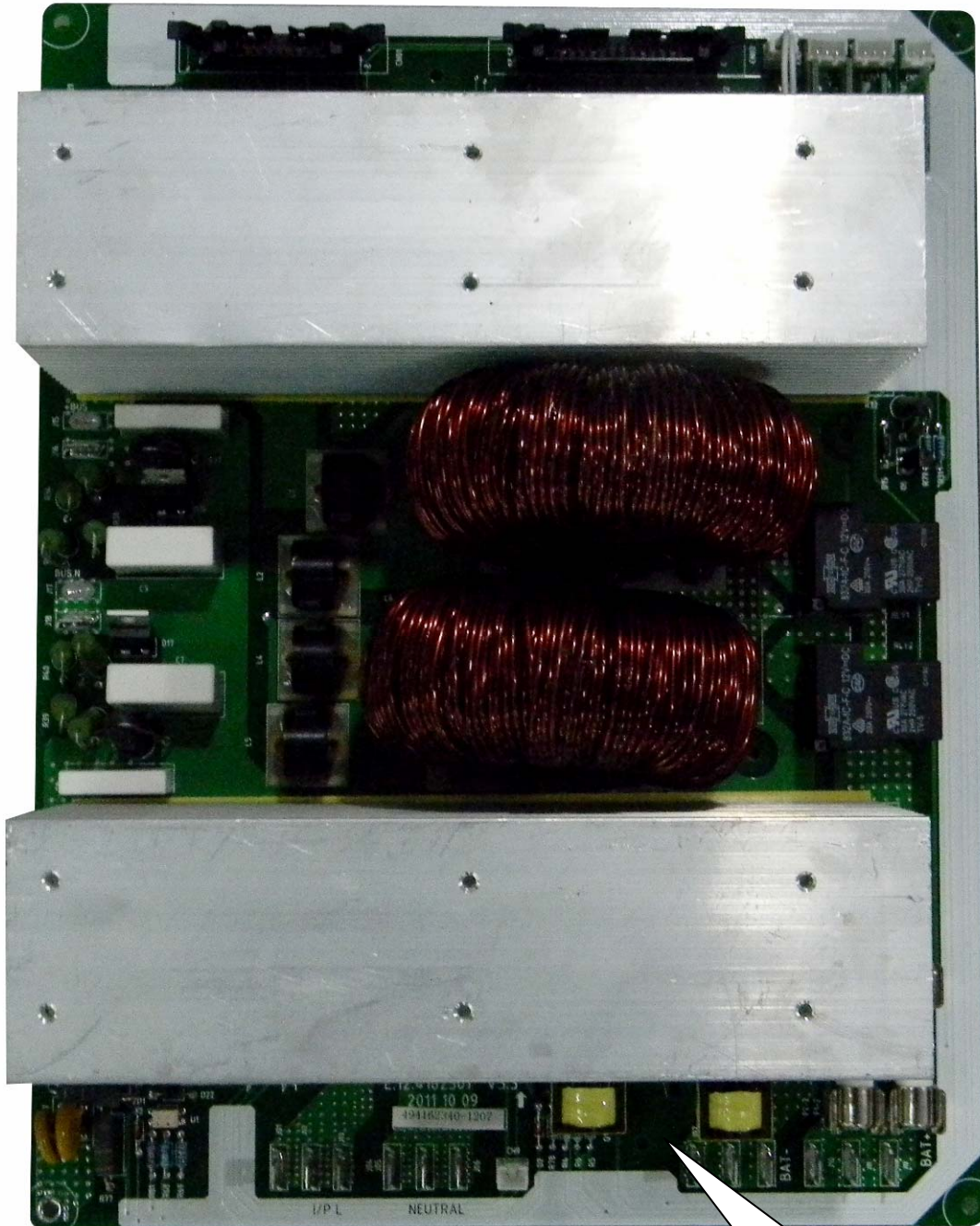
Figure 16 Circuit generated by the reference sign wave of inverter

## 4) Battery voltage detection circuit



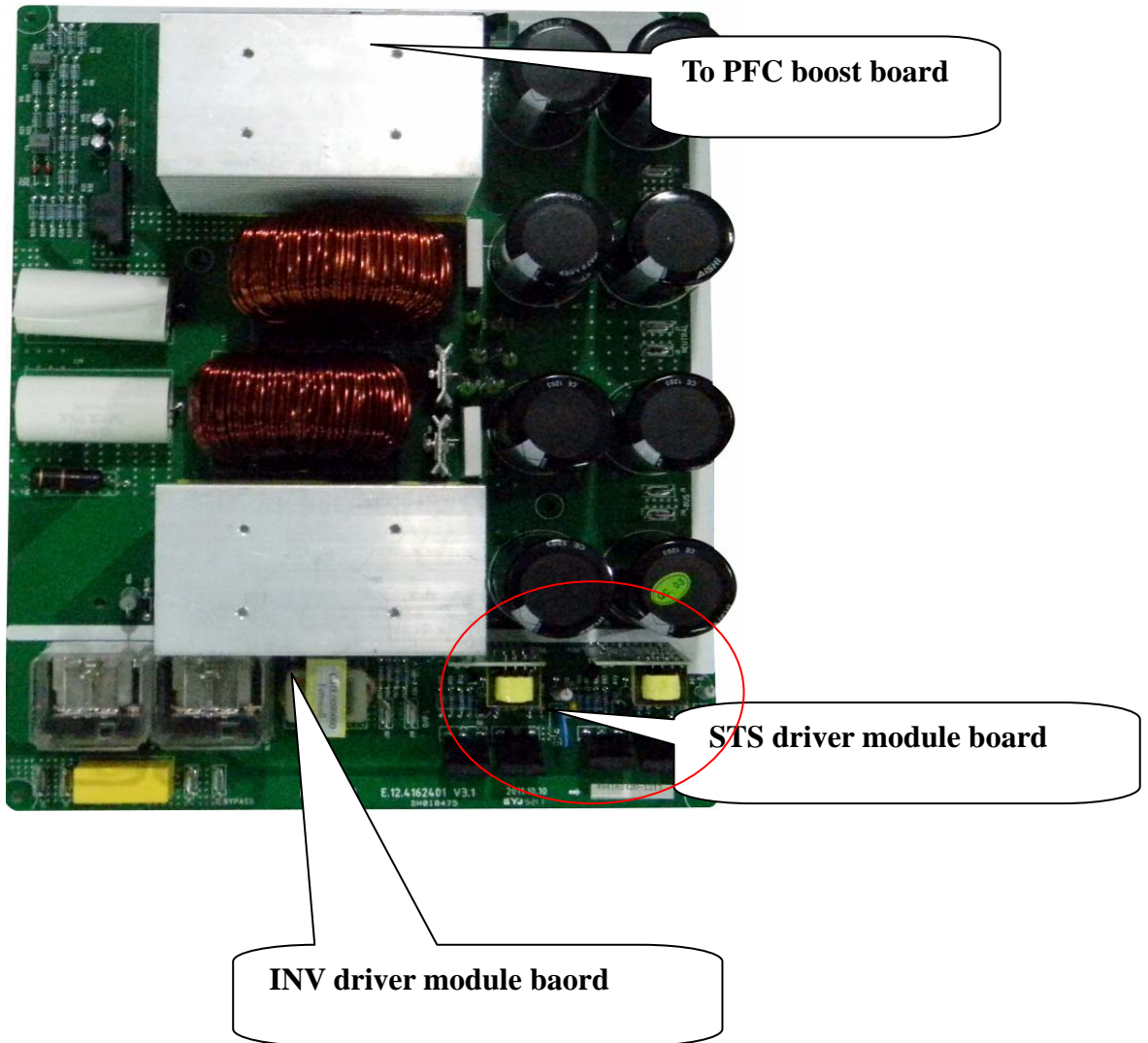
No further description is provided since the main power voltage amplitude and frequency detection, inversion output voltage and frequency detection, battery voltage detection, BUS voltage detection, load detection and inversion inductive current detection are mostly identical to each other.

### 3.4 Power board



6/10KVA PFC boost board

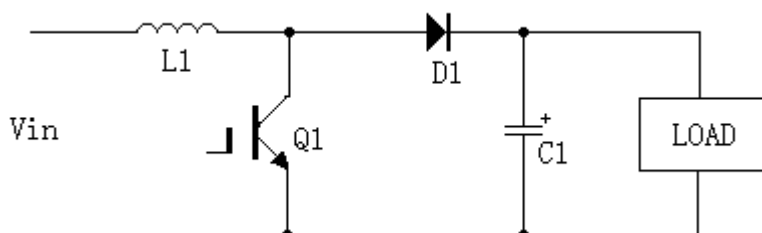
SCR driver module board



## INV inversion board

Main power sections of the power board:

1. Include the DC boosting, main power PPC boosting, DC filter, inversion output and bypass.
2. PFC, NV driver module (PFC is identical to the INV driver module), battery DC boosting module, SPS power module, fan detection module and charging module (standard type power board).
3. Main power voltage sampling circuit, output voltage sampling circuit, BUS voltage sampling circuit, main power zero and live line reversion detection circuit, and batter voltage sampling circuit.
4. PFC power factor correction



## Definition of power factor

Power factor refers to the ratio of active power to apparent power.

$$PF = P / (V_{RMS} * I_{RMS})$$

Two reasons may affect the power factor: first, the phase difference between voltage and current. If voltage and current is a standard sine wave,  $PF = \cos\theta$ , of which,  $\theta$  means their phase difference; if the voltage phase is leading current,  $\theta > 0$ , the load will be inductive or otherwise the capacitive.

Second, the harmonic content in the current wave. The bigger the harmonic content, the lower the power factor. For rectification load (such as the switch power with many reactive factor corrections), the phase difference between voltage and current is not big but the current harmonics. In addition, the current harmonics will cause pollution to the grid.

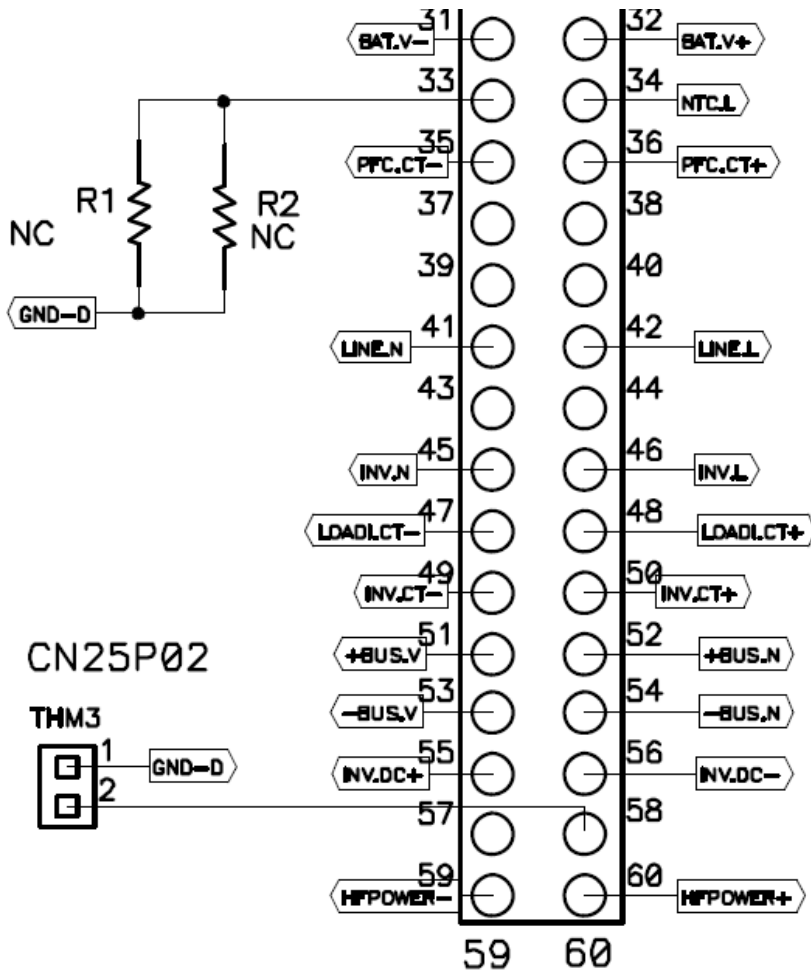
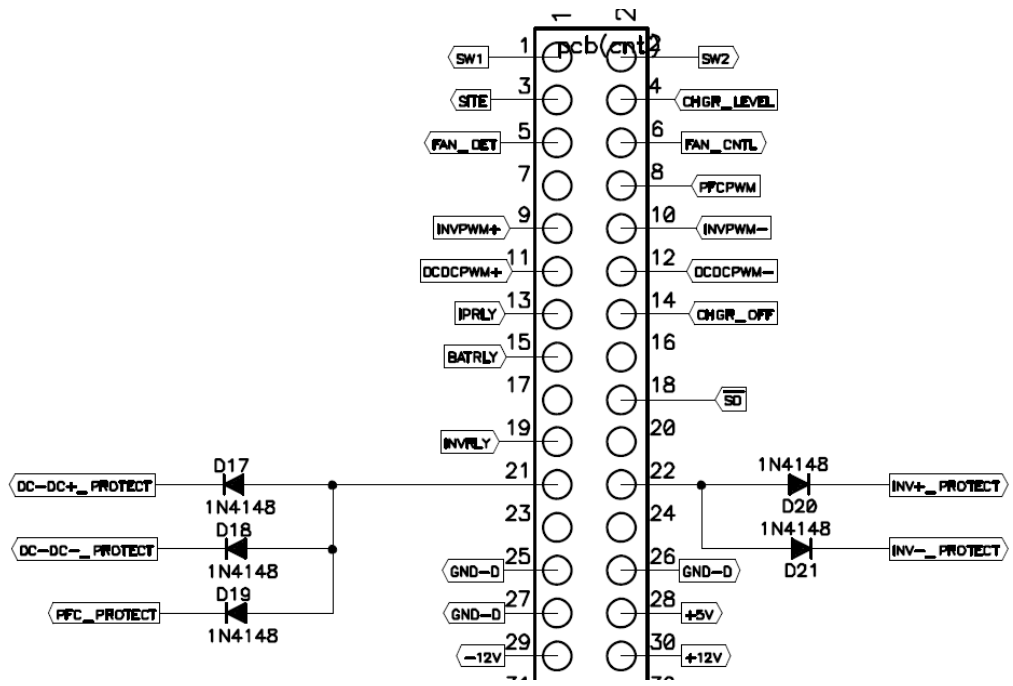
- Power factor correction means to improve the current wave to allow its shape identical to the voltage wave as much as possible; in such case the load will be typical of resistor property, with power factor approaching 1. After rectification, add DC/DC power factor corrector (PFC), and then by utilizing the operation of active switch, to rectify the input current into the sine wave similar to voltage wave, thus improving power factor. Boost circuit has many advantages in improving power factor, with working principles as follows:

When Q1 is closed, as the inductive current will not be subject to the sudden change, L1 generates the right-positive left-negative inductive potential in an attempt to prevent the attenuation of inductive current. In such case, D1 is on, the inductor L1 transfers the magnetic energy stored in the previous period via D1 to both charge C1 and provide for the load.

Therefore, it is able to control the voltage at both ends of the load by adjusting the on and off time of switch S. In addition, since the inductive current is not subject to sudden change, it can easily regulate the wave of inductive current (input current) to be identical to the voltage wave form.

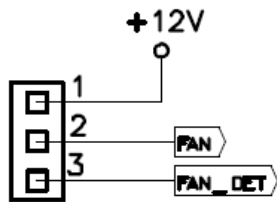
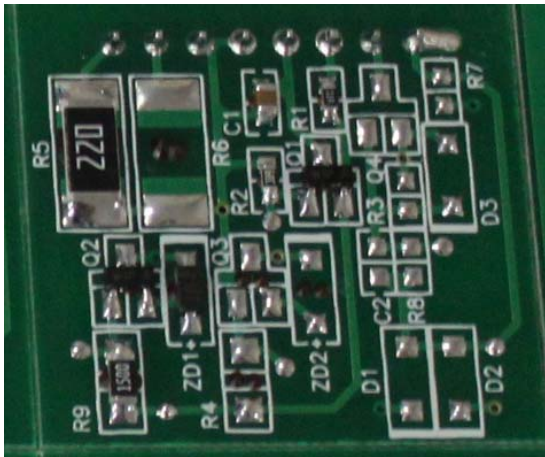
## 3.4 Description of the signal end of power board

### 3.4.1 Sampling signal, connecting to main control board CN6



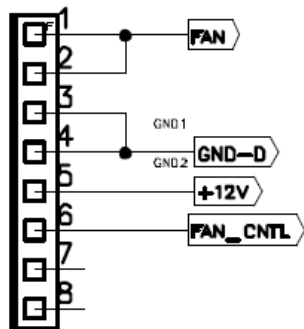


### 3.4.3 Port of fan module



CN25P03  
FAN1

PCB7



FANDRV(61002)

#### Fan module port signal

##### Control of FAN

- Functions of fan control module:
- ① Achieve four-speed control for the fan according to the load magnitude:
- LOAD > 70%      FANSPD DUTY = 1
- LOAD > 50%      FANSPD DUTY = 0.67
- LOAD > 25%      FANSPD DUTY = 0.34
- LOAD < 25%      FANSPD DUTY = 0

- ② Provide FANCLK SIGNAL for CPU to detect fan speed.

- 1). Regulation of fan speed

- Analyze the relation between FANSPD signal and fan speed:

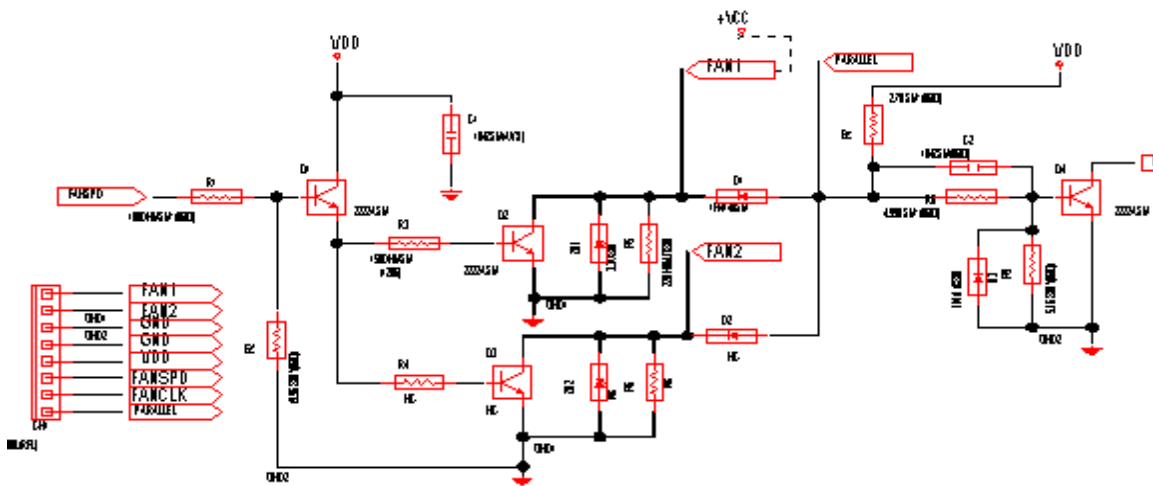
- LOAD < 25%     FANSPD DUTY = 0, average voltage on both ends of fan:  $12V - 3.3V = 8.7V$ ;

- LOAD > 25%     FANSPD DUTY = 0.34, average voltage on both ends of fan:  $12V - 3.3 \times (1 - 0.34) = 12V - 2.178V = 9.822V$ ;

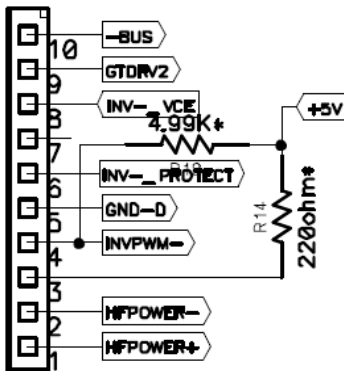
- LOAD > 50%     FANSPD DUTY = 0.67, average voltage on both ends of fan:  $12V - 3.3 \times (1 - 0.67) = 12V - 1.089V = 10.911V$ ;

- LOAD > 70% FANSPD DUTY = 1, average voltage on both ends of fan: 12V.

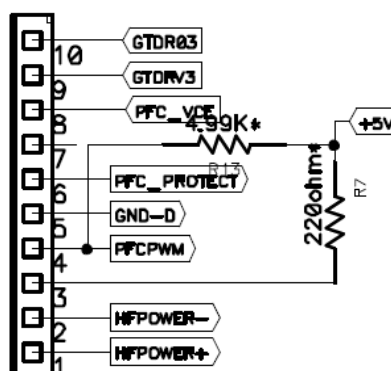
- Then, the fan speed is subject to the FANSPD DUTY, i.e. the bigger DUTY, the faster the fan speed.



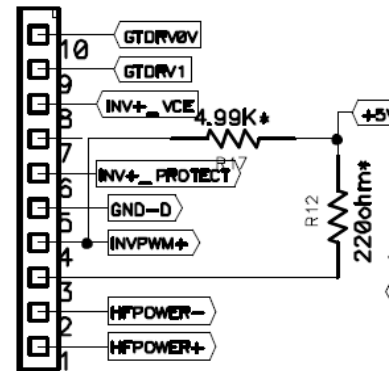
### 3. 4.5 PFC, INV driver module port



CB5  
GTDRV



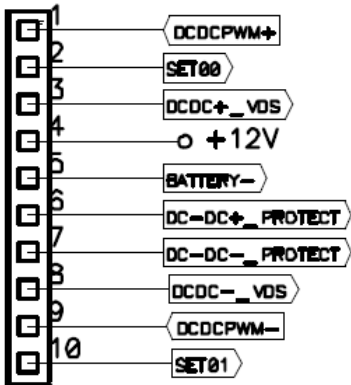
PCB3  
GTDRV



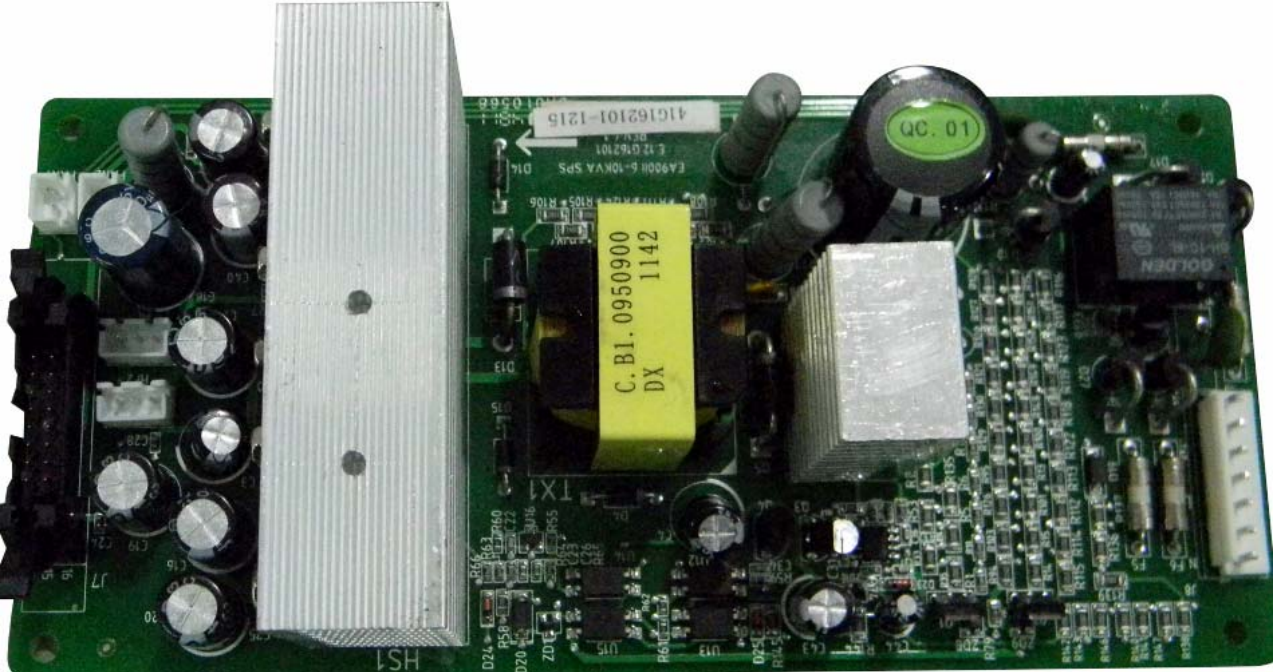
PCB4  
GTDRV

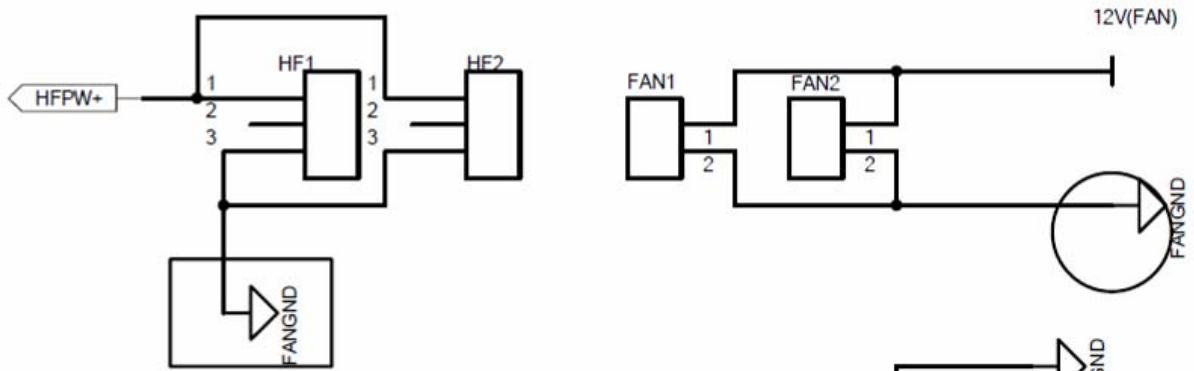
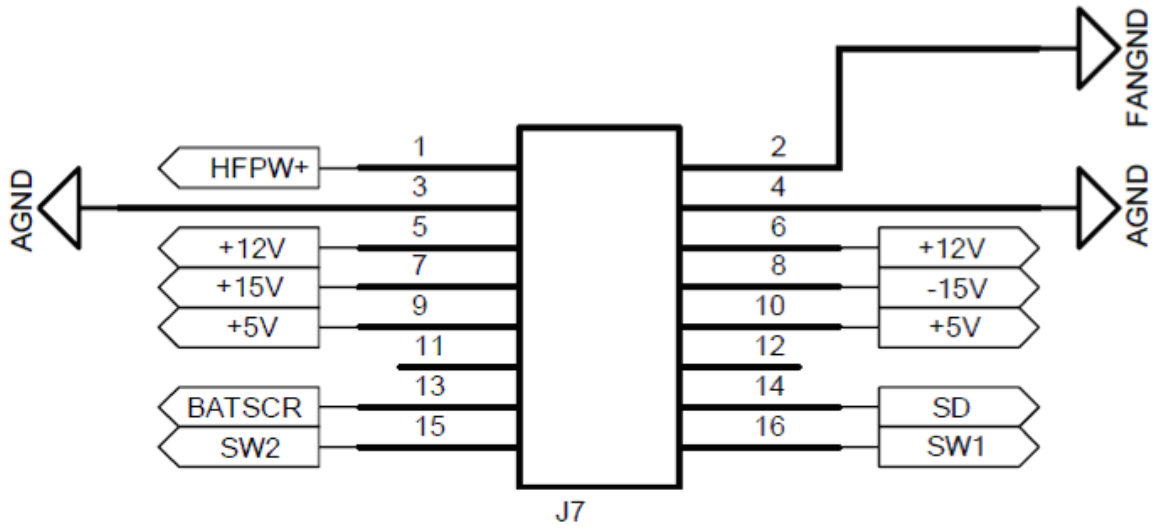
IGBT driver module (including PFC, INV)

# PCB6



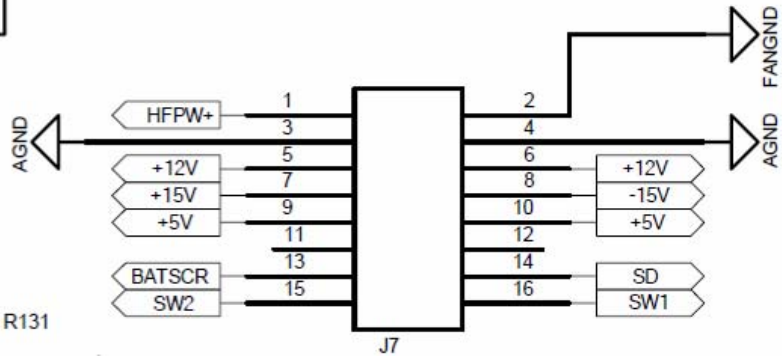
6-10KVA SPS power board

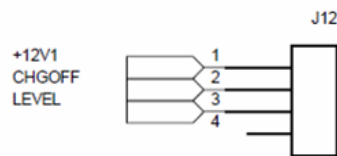
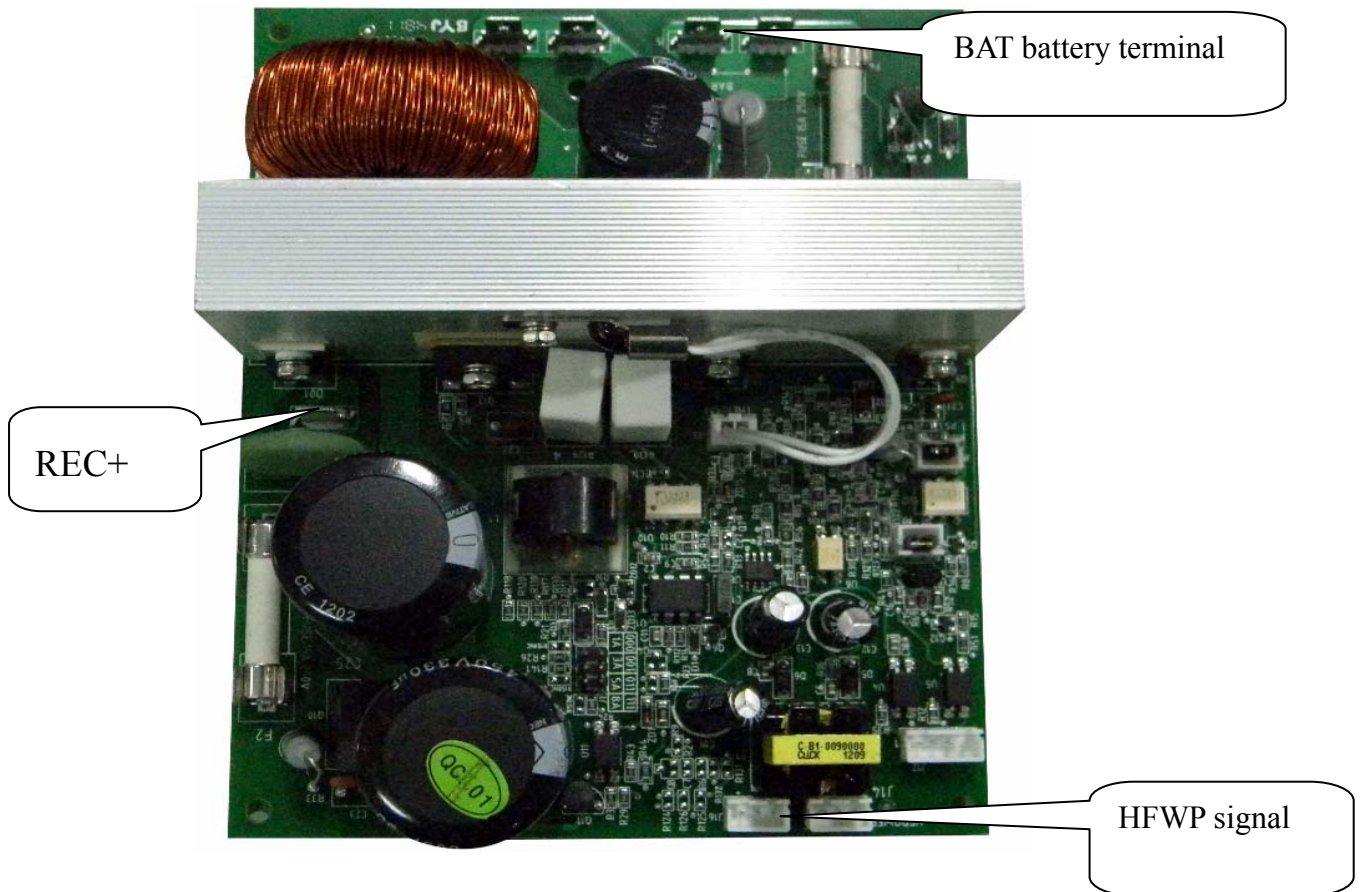




D27

R131



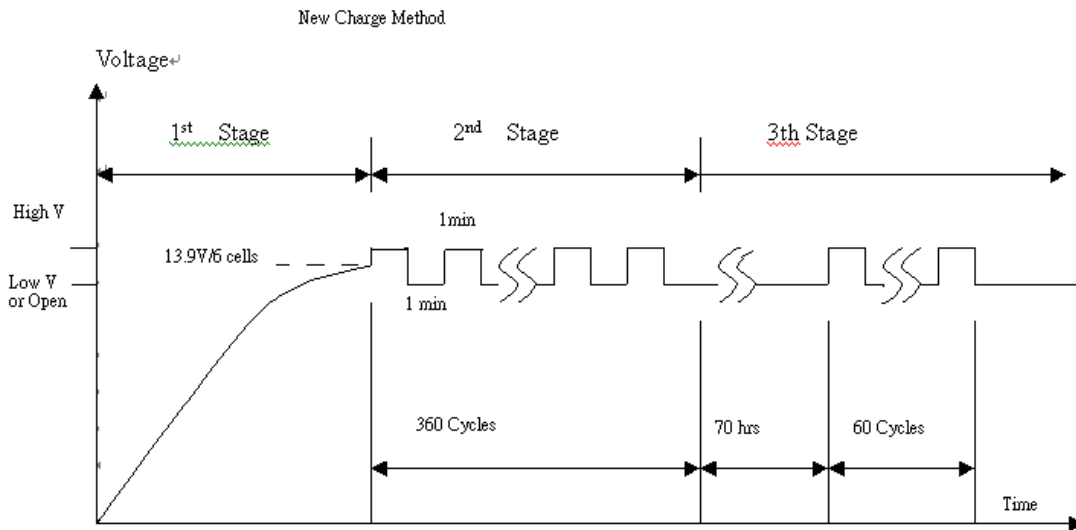


### 3.5 Long-life charging board

3.5.1 Main power passes through the input end of long time-delay charging board and the input filter, then charge the long time-delay external battery. It is equipped with main power high-voltage protection, charging output high-voltage protection, providing SPS power for power board consistent to the charging power.

3.5.2 Main board control signal is conveyed to charging board. The blockage protection will be activated in case of excessive high charging voltage at the time of startup.

### 3.5.3 Charging mode:



### 3.1 Three-stage charging mode:

**The first stage: recharge the batter with 90% capacity**

Constant power and marginal current: Charger's power is  $\cong 3$  hrs, recharge battery until full-load, discharge 5min, with 90% of capacity; When battery voltage reaches 13.9V/6 cells (F/W detection value error:  $n*(13.85V\sim 13.95V)$ , n; number of batteries in series connection), proceed with the second stage.

**The second stage: recharge the remaining 10% (from 90% to 100%), equalize capacity of batteries in series connection.**

The first cycle: after 1min high-voltage (Note 1) charging, proceed with 1 min low-voltage charging (or open), and 360 cycles later, start the third stage.

**The third stage: maintain battery capacity**

After 70hrs low voltage, maintain the battery capacity with 60 cycles (72 hrs per cycle) of high and low voltage. Note 1: the charging range of charger will vary according to the battery in series connection, as shown below ( $T_a: 25^\circ C$ ):

	Series connection $\leq 10$ Pcs	Series connection $> 10$ Pcs(Regulated By VR)
High-voltage range	(14.05~14.7V/6 cells)	(14.3~14.4V/6 cells)
Low-voltage range	(13.26~13.8V/6 cells)	(13.3~13.4V/6 cells)
F/W high-voltage timing voltage value	13.9 V	13.9V

When series connection  $\leq 10$  Pcs, voltage range is quite large, the existing charging voltage requires no VR regulation, controlled under  $\pm 2\%$ ; While UPS F/W requires turning off charger to start DC/DC Converter logic control, thus preventing damage to DC/DC Converter in case of high-voltage up to 14.7V.

Voltage temperature compensation: provide temperature compensation with  $-3\text{mV}/^\circ\text{C}$  regulation voltage for above voltage (based on  $25^\circ\text{C}$ ).

F/W: provide correction function to adjust the actual high-voltage timing voltage within the error range.

### **3.2 UPS will start the three-stage charging under any of following condition:**

3.2.1 Start machine, turn off the charger, and battery voltage is lower than 13.1V/pcs, with error range of 13.05~13.15V.

3.2.2 Batter discharges over 10% of its full-load capacity.

### **3.3 Recharging method for battery discharging capacity less than 10%**

3.3.1 Battery discharges when UPS is powered off during the second charging stage;

3.3.1.1 After repetitive high and low voltage charging less than 72 cycles, restart the third-stage charging;

3.3.1.2 After repetitive high and low voltage charging no less than 72 cycles, recharge with high and low voltage 36 cycles for every 1% of discharging capacity, less than 1% should be calculated as 1%.

For example: discharge time for the full-load UPS battery is 5 min, with standard capacity 3,000 (1/10 of the total capacity), 100 cycles (260 cycles left) have been recharged. When battery discharges, with 50% of load, discharge 6 sec, discharges 300, 1% of the total amount. When main power supply is recovered, recharge high and low voltage 260+36 Cycles.

3.3.1.3 In case of discharging capacity bigger than 10%, restart the third-stage charging.

3.3.2 Battery discharges in case of power failure during UPS third-stage charging.

3.3.2.1 Within 70hrs after the third-stage charging, recharge with high and low voltage 36 cycles for every 1% of discharging capacity, less than 1% should be calculated as 1%.

3.3.2.2 Within 70~72hrs after the third-stage charging, recharge with high and low voltage 36 cycles for every 1% of discharging capacity (based on the remainder of 60Cycles), less than 1% should be calculated as 1%.

For example: discharge time for the full-load UPS battery is 5 min, with standard capacity 3,000 (1/10 of the total capacity), 24 cycles of high and low voltage (36 cycles left) have been recharged during 70~72hrs of the third-stage. Battery with 50% of load will discharge 10 sec with



discharging capacity of 500, 1.66% of the total amount, calculated as 2%. When main power supply is recovered, recharge high and low voltage (36+36\*2=108 Cycles).

3.3.2.3 After high and low voltage recharging, recount from 0 to 70hrs.

### **3.4 abnormality detection:**

3.4.1 When exceeding 180 times of discharge time, UPS displays the warning for battery in abnormal condition.

The function is unnecessary under any of following circumstance:

- (a) Charger capacity is less for 3hrs service, recharge with full-load, then discharge 5min, and remaining 90% of capacity;
- (b) Power failure occurs when the third-stage charging have not yet completed;
- © UPS fails to employ the Battery Remain Time Module.

3.4.2 During the second and third stage, battery voltage is lower than 13.1V/pcs (error range: 13.05~13.15V), or bigger than 14.6V (error range: 14.55~14.65V) when more than 10 Pcs batteries are connected in series, protection point 14.9V (error range: 14.85~14.95V) when less than Pcs batteries are connected in series.

## **3.5 Battery Test**

3.5.1 Do not operate Battery Test manually during the first-stage discharging; periodic battery test can be carried out during the second-stage.

3.5.2 For manual battery test or periodic battery test during the second and third stage, it is able take subsequent operations, calculate the actual discharging capacity according to Battery Test discharge time and the load, then add cycles (with 1% of discharging capacity corresponding to 36 Cycles) to the original remaining high and low voltage cycles so as to recharge the high and low voltage.

3.5.2 For Battery Test, turn the charger ON after every 10 Sec discharging; stop discharging when voltage is lower than 10.5V, judge the battery NG. It can be carried out as per the demand of customer.

# **4. EA900II series UPS installation, switch and precautions**

## **4.1 Selection of environment**

·Working temperature: 0-40°C

Storage temperature: -40-70°C (no battery)

-20-55°C (with battery)

Relative humidity: 5%~95%, no condensation

Altitude: 1500m, meeting the requirement of GB3859.2-93 for sub-rating

Verticality: no vibration and jolt, vertical gradient not exceeding 5 degrees.

UPS system should be installed in a clean, cool and dustless environment with excellent ventilation and adequate humidity. Recommended working temperature: 20~25 °C, humidity: Around 50%; it is recommended to use as per sub-rating stated in the following table when the elevation is higher than 1,500 m.

Elevation m	1500	2000	2500	3000	3500	4000	4500	5000
Derating coefficient	100 %	95%	91%	86%	82%	78%	74%	70%

## 4.2 Location layout

- ✓ AC capacitance in the machine room should meet the normal operation of equipment. It is not allowed to share the same air switch with other equipment.
- ✓ UPS should be installed close to AC power output as much as possible.
- ✓ UPS should be installed on a floor capable of withstanding the weight of UPS system. It is forbidden to perform dangerous operation.
- ✓ The machine room should be equipped with fire-fighting apparatus and free of any inflammable and explosive articles.
- ✓ Keep ideal ventilation around UPS, do not block or impede UPS heat dissipation passage.
- ✓ The space reserved around UPS, at least 1m around, should be accessible for maintenance and operation by technicians.

- ✓ UPS machine room should be equipped with professionals for management, and unauthorized personnel are not allowed to enter UPS machine room.

### 4.3 Unpack inspection

#### 4.3.1 Unpack inspection

- Unpack UPS package and inspect the supplied accessories. Accessories should include a manual, communication line and disk. A battery connecting line shall be equipped for the long backup type.
- Inspect UPS for damage in transit. In case of any damage or deficiency, do not start up and notify the forwarding agent and distributor.
- Confirm machine model by checking the model on the front panel and rear board of machine

Model	Type	Model	Type
EA906SC II	6KVA standard type	EA906HC II	6KVA long backup type
EA9010SC II	10KVA standard type	EA9010HC II	10KVA long backup type

#### 4.3.2 Confirmation items for UPS specification

UPS capacity; input and output voltage and frequency; input and output phase number; battery voltage

### 4.4 Selection of air switch and cable

UPS designed with different capacity should be equipped with different cables, since the improper cables and air switch would easily result in dangerous conditions. Selection principle for power cable current density: medium and small size UPS power cables should be equipped in accordance with the current density of 3-5A/mm<sup>2</sup>; and high-power UPS power cables should be equipped in accordance with the current density of 2.5-3A/mm<sup>2</sup>, in addition, the maximum voltage drop on the power cable should be controlled less than 3V.

UPS power system is equipped with the bypass power input neutral line and UPS power output neutral line. For three-in one-out UPS, the sectional area of its input zero line should be 1.5-1.7 times of the phase-conductor cable.

UPS power system is also equipped with the protective earth wire and lightning protection earth wire, with sectional area 0.5-1.0 times of the phase-conductor cable, but no less than 6mm<sup>2</sup>.

#### 4.4.1 Selection of air switch

Power KVA	Input voltage VAC	Output voltage VAC	Maximum input current A	Maximum output current A	Input air switch A	Output air switch A
6	220	220	44	27	63	40
10	220	220	66	45	100	63

Note: earth leakage protection switch shall not be used at the front end of UPS.

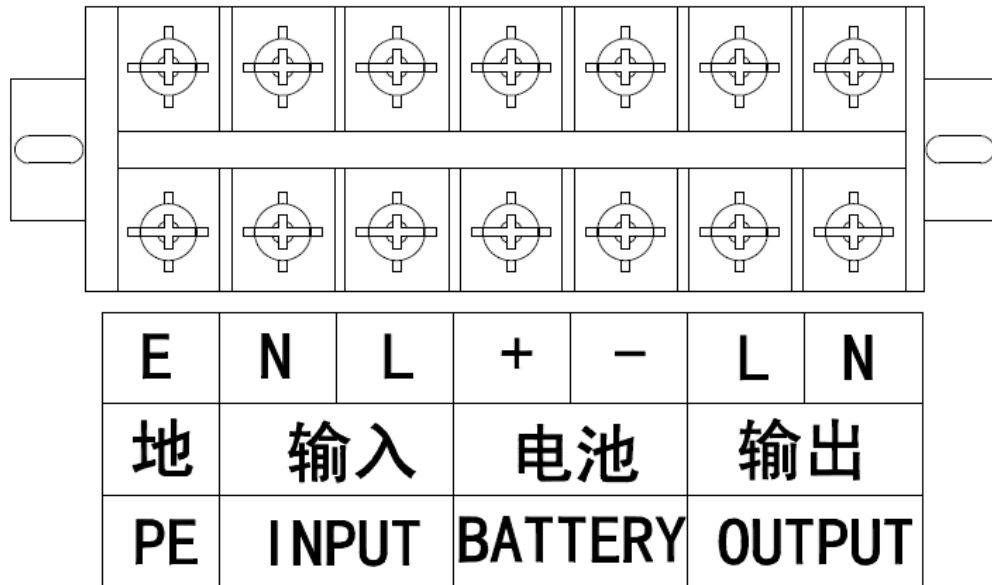
#### 4.4.2 Selection of cable

Name	6KVA	10KVA
	Cable mm <sup>2</sup>	Cable mm <sup>2</sup>
Input	8	16
Output	6	10
Battery	8	10
Zero line	8	16
Earth line	6	6

Note: Cable's actual line diameter should not be less than that stated in the table.

### 4.5 Description of inlet and outlet terminal

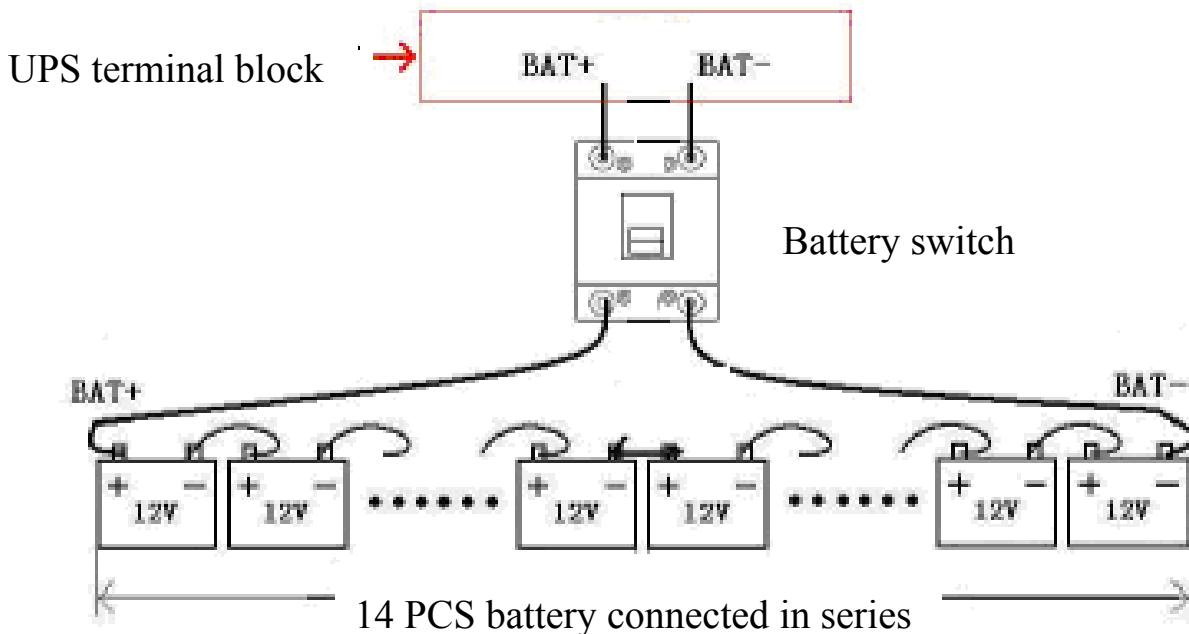
Upper and lower inlet wiring pattern is adopted for UPS host machine, with 6-10KVA terminal located at the rear of UPS. Definition of terminal block is described as below:



## 6-10KVA端子接线图

### 4.6 Battery connection

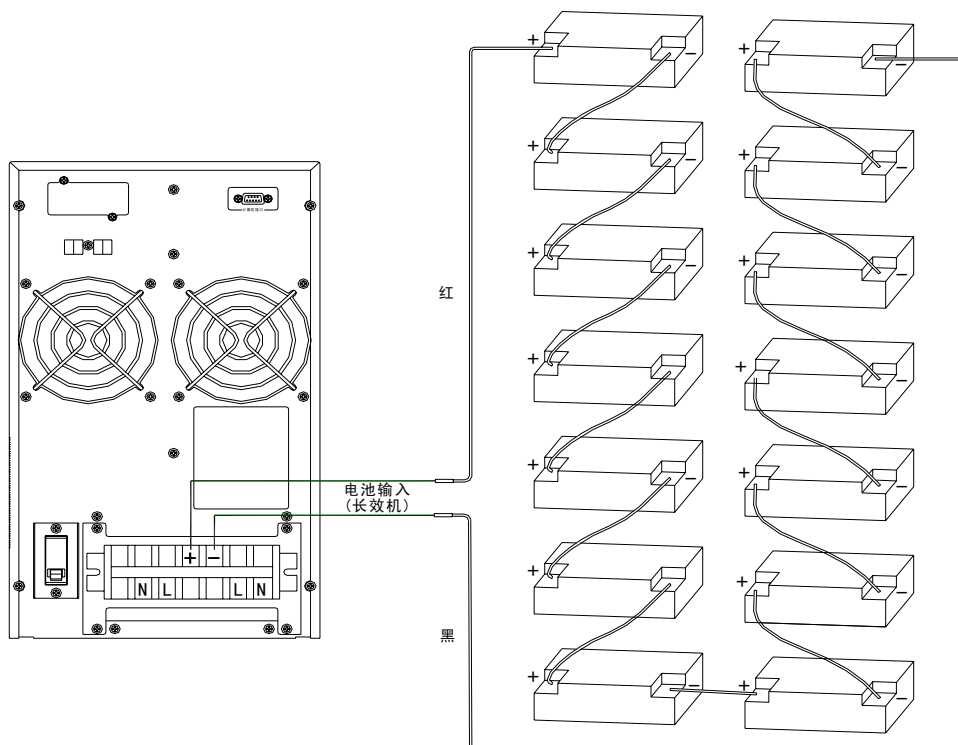
EA900II series UPS is designed with 14 PCS battery connected in series, user can select the number of battery group and battery according to the actual condition, with connection pattern as shown below:



Operating procedure for long backup type external battery:

- Use the correct battery group voltage according to the different UPS model: 14-battery 168VDC is designed for EA906II and EA9010II; connecting wrong number of batteries will result in abnormality.

- For 6-10KVA battery is equipped with open-type connection line for connecting to battery group. Please strictly follow the following battery connection procedures since failure to comply with the procedure may cause electric shocking:
  - ◇Connect battery group in serial to ensure proper battery voltage.
  - ◇Batter connecting line should be first connected to the battery end (connecting to UPS end first may cause electric shocking), with red line connecting to anode “+” and black one to the cathode “-”.
- Do not connect UPS to any load prior to completing power line connection and providing main power
- After connecting the charging line plug to UPS battery socket, UPS starts charging the battery group. Remember: red line should connect to the anode and black one to the cathode.



Connection diagram for EA906II and EA906III long-life external battery

## 4.7 Precautions for installation

- UPS should be stored in a place with ideal ventilation, away from water, flammable gas and corrosives.
- Do not put it on its side. The intake at the bottom end of front panel and the side of the box as well as the fan vent hole at the back shroud should be kept clear.
- The ambient temperature for UPS should be kept between 0°C~40°C.
- Since water condensation may occur when dismantling machine under low temperature, do not install and operate until the machine is completely dried, or otherwise there will be electric

shocking.

- Place UPS near the main power input socket so as to unplug it to power off in case of emergency.

Notice:

- It is required to shut down load prior to connecting the load to UPS, after connection, start up loads in sequence.

- Connect UPS to the special socket with over-current protection device.

- All power sockets should be connected to the protective earth wire.

- UPS output end may be electrified no matter the input power cable is connected to the main power socket, and built-in components are not ensured to be electrically neutral when UPS is shut down. If need stopping UPS output, press down the shutdown button and stop the main power supply.

- For standard type, an 8-hour battery charging is recommended prior to use. UPS will automatically charge battery once input main power is connected to the main machine. It is serviceable if not being charged, but its backup time will be less than the standard time.

- The initial power of UPS should be calculated when connecting to inductive loads with large initial power like the electric motor, display and laser printer, which should be twice of the rated one.

## **4.8 Operation instruction for startup and shutdown**

### **4.8.1 Startup**

Connect to main power, and start UPS.

①When main power is on, LCD will display 0 output voltage, indicating no output voltage; If needing bypass output voltage, set bPS under the setting interface as ON, or set it as OFF for no bypass output.

② Start up the inverter by continuously pressing on the combination key more than half a second. After startup, UPS will perform self-checking first, LED lamps are illuminated and out in sequence. After self-checking, the system will enter the main power mode with corresponding LED lamp illuminated, and then UPS operates under the main power mode.

Start UPS DC without main power input

① In case of no main power input, start UPS by a long press (more than half a second) on the startup combination key.

②During startup, UPS operates the same with the main power connection process. After self-checking, corresponding LED lamps are illuminated, and then UPS operates under the battery mode.

### **4.8.2 Shutdown**

Shut down UPS when main power is provided.

① Shut down the inverter by continuously pressing on the shutdown combination key more than half a second.

② After shutdown, LED lamps will be out, no output. If needing output, user can set bpS under the setting interface as OK.

Shut down UPS DC without main power

① Shut down machine by continuously pressing on the shutdown combination key more than half a second.

② During shutdown, UPS will first perform self-checking, LED lamps will be illuminated and then out in sequence until no display on panel.

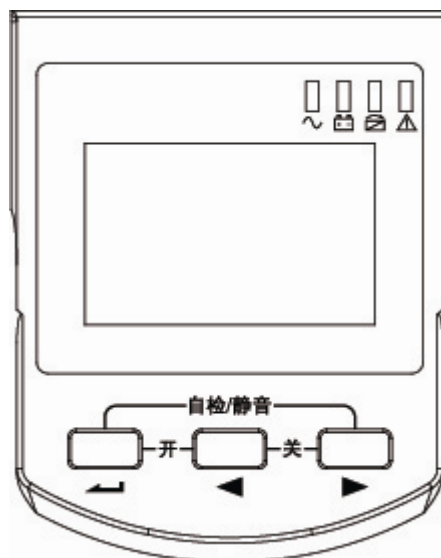
### 4.8.3 Manual self-checking and mute operation

① When UPS is under main power working mode, press down the system self-checking/mute operation combination key 1s, LED lamps will be illuminated and out in sequence, UPS enters the self-checking mode and tests relevant status. After self-checking, it will automatically exit and LED recovers.

② When UPS is under battery mode, press down the system self-checking/ mute operation combination key 1s, buzzer becomes mute, after another same operation, buzzer starts buzzing.


## 5. Description of UPS panel function and mode setting

Panel function and operation







## 5.1 Key function

- ❖ Startup combination key (  +  )

Execute the startup operation by pressing down the startup combination key more than half a second.

- ❖ Shutdown combination key (  +  )

Execute the UPS startup operation by pressing down the shutdown combination key more than half a second.



- ❖ System self-checking/silence combination key (  +  )



With a long press more than 1s under the main power or economy mode:  
UPS self-checking operation

With a long press more than 1s under battery mode: UPS mute operation



- ❖ Query key ( ,  )

Under non-functional setting mode:

Press  or  more than half a second but less than 2s: display options in the LCD item area successively from left to right.

Long press on  more than 2s: under polling mode, the displayed items will be automatically switched every 2s, after another long press on , back to the home page.

Under the function setting mode:

Short press on  or  more than half a second but less than 2s: select the setting options.

- ❖ Function setting key 

Under non-functional setting mode:

A long press more than 2s: enter the function setting interface.

Under the function setting mode:

Short press more than half a second but less than 2s: confirm the setting option.

Long press more than 2s: exit the function setting interface.

## 5.2 Functions of LED indicator light

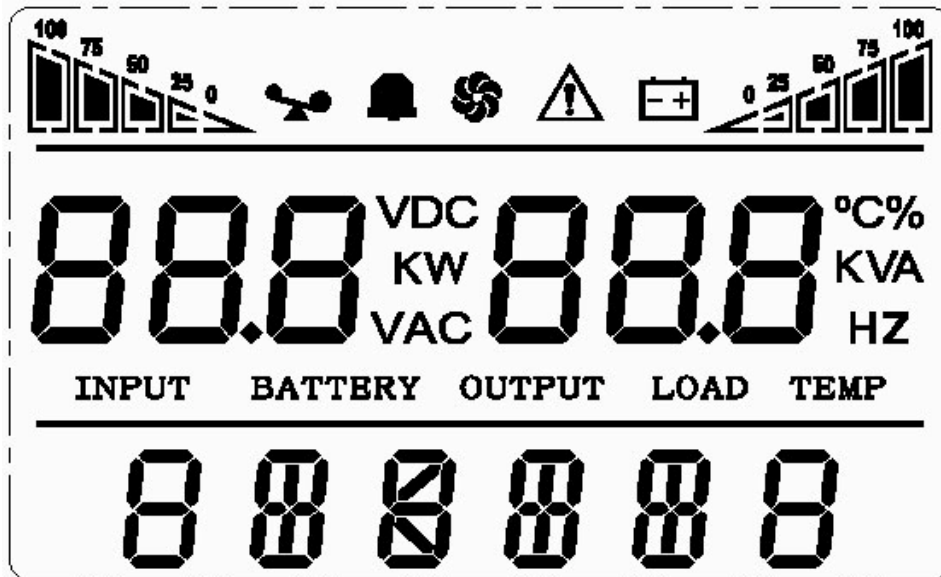


The inverter light, battery light, and bypass light and alarm light lies respectively from left to right.

- ❖ Inverter LED green light is constantly illuminated: UPS is under main power, ECO or battery supply mode.
- ❖ Battery LED yellow light is constantly illuminated: UPS works under battery mode.
- ❖ Bypass LED yellow light is constantly illuminated: UPS works under bypass mode.
- ❖ Alarm LED red light is constantly illuminated: UPS is under failure state.

Note: Refer to the List of LED Light/Display Panel and Alarm for LED indicator light under different mode.

## 5.3 LCD display



LCD panel display

**Graphic display area:**

- 1) The load and battery represents the load and battery capacity, 25% for each square. When UPS is overloaded, the load icon will flash, and the battery icon will flash when battery capacity is too low or the battery is not connected;
- 2) Fan icon represents its working status. Normally, the fan will rotate, but the fan icon will flash in case of fan failure or disconnection;
- 3) Under battery mode, press down mute key, buzzer icon will flash, while under other conditions, the icon will not be displayed;
- 4) Under failure mode, the failure icon will be illuminated, while under other conditions, the icon will not be displayed.

**Numerical display and function setting area:**

- 1) Under non-functional setting mode, display the output information under normal mode, it is able to display information relating to the input, battery, load and temperature by operating the left/right query key; under the failure mode, it mainly displays the fault code.

2) Under setting mode, it is able to set output voltage value and activate the bypass and eco mode by operating the function setting key and the left/right query key.

### Power grade and working mode display area:

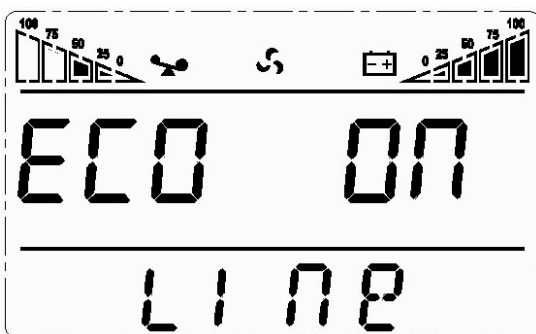
- 1) Within 20s after startup, the display area will mainly display the power grade of the machine;
- 2) 20s after startup, the display area will mainly display the working mode, such as the stdby (standby mode), bypass (bypass mode), line (main power mode), bat (battery mode), batt (battery self-checking mode), eco (economy mode) and shutdn (shutdown mode).

## 5.4 Panel setting operation

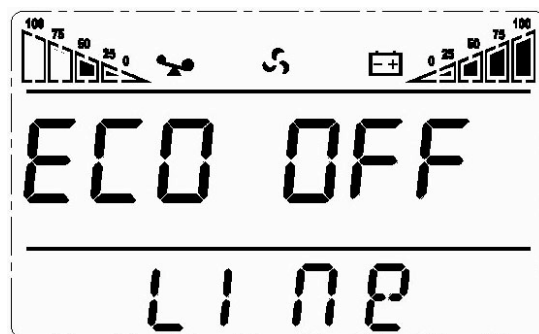
UPS, which is equipped with setting function, allows for setting under any mode, while it is recommended to complete setting under the standby mode. After setting, the setting will be activated once conditions are met. The setting parameter information can only be saved when the machine is connected to battery and shut down under normal condition.

With setting operation as below:


### 5.1 ECO output setting







ECO ON setting interface




ECO OFF setting interface 界面

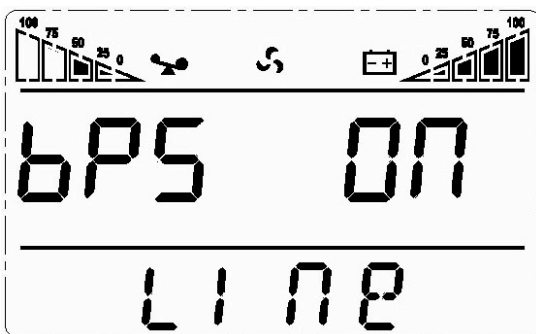
① Enter the setting interface with a long press more than 2s on the setting key , and then the character “ECO” will flash.

② Enter the ECO setting interface with a short press more than half a second but less than 2s on the setting key , the character “ECO” will be constantly illuminated, ON or OFF flashes at the right of character “ECO”; With a short press more than half a second but less than 2s on the query key  or , user can select activating ECO function or not, ON means to activate the function while OFF means to disable it.

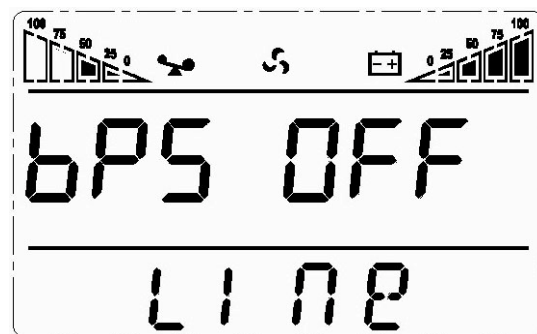
③ After selecting ON or OFF for confirmation and a short press more than half a second but less than 2s on the function setting key , ECO setting function confirmation is completed, in such case, the character “ON” (or OFF) at the right of ECO will constantly illuminate instead of flash.

④ After a long press more than 2s on the setting key , exit the setting interface, back to the main interface and display the UPS output information.

### 5.5 Bypass output setting









BPS ON setting interface





BPS OFF setting interface

① Enter the setting interface with a long press more than 2s on the function

setting key ; with a short press more than half a second but less than 2s on the query key  or , user can select the function setting and bypass output setting interface, then the character “bPS” will flash.

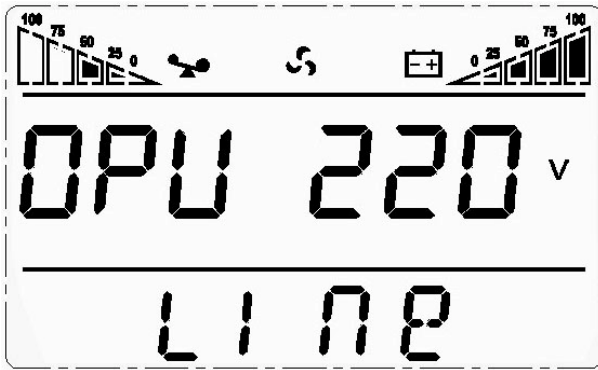
②Enter the bPS setting interface with a short press more than half a second but less than 2s on the setting key , the character “bPS” will be constantly illuminated, the character “ON” (or OFF) flashes at the right of character “BPS”; With a short press more than half a second but less than 2s on the query key  or , user can select activating bPS function or not, ON means to activate the function while OFF means to disable it.

③After selecting ON or OFF for confirmation and a short press more than half a second but less than 2s on the function setting key , bPS setting function confirmation is completed, in such case, the character “ON” (or OFF) at the right of bPS will constantly illuminate instead of flash.




④After a long press more than 2s on the setting key , exit the setting interface, back to the main interface and display the UPS output information.




⑤After setting bPS as ON, the machine will have bypass output but backup for power failure when connecting to main power with machine shut down or not started up. bPS is under OFF status by default.


## **5.6 Output voltage setting**




Output voltage setting interface



①Enter the setting interface with a long press more than 2s on the function setting key ; With a short press more than half a second but less than 2s on the query key  or , user can select the function setting; after selecting the output voltage setting interface, the character “OPU” will flash.


②Enter the output voltage OPU setting interface with a short press more than half a second but less than 2s on the setting key , the character “OPU” will be constantly illuminated, the numerical value flashes at the right of character “OPU”; with a short press more than half a second but less than 2s on the query key  or , user can select the numerical value corresponding to OPU function. voltage values like 208v, 210v, 220v, 230v, 240v are optional. The output voltage is 220v by default.

③After confirming the numerical value and a short press more than half a second but less than 2s on the function setting key , OPU setting function confirmation is completed, in such case, numerical values at the right of OPU will constantly illuminate instead of flash.

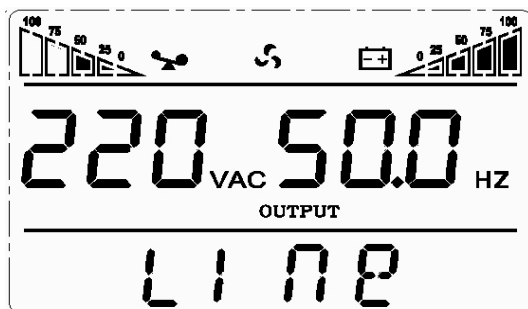
④After a long press more than 2s on the setting key , exit the setting interface, back to the main interface and display the UPS output information.

### 5.7 Parameter query

Check the information relating to input, battery, output, load and temperature with a short press more than half a second but less than 2s on the query key  or .

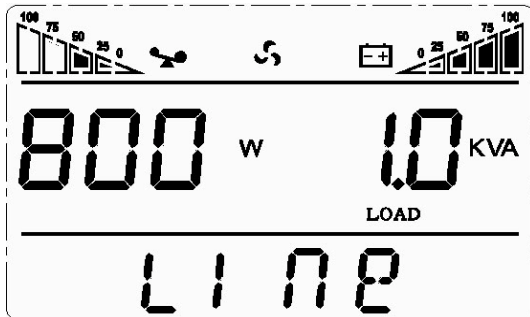
After a long press more than 2s on the right query key , LCD will display under the polling mode, automatically switch the displayed items every 2s, after 30s, display the output information under the default status, or return to the main interface with another long press within 30s.

Output: display UPS output voltage and output frequency, as shown in the following figure:



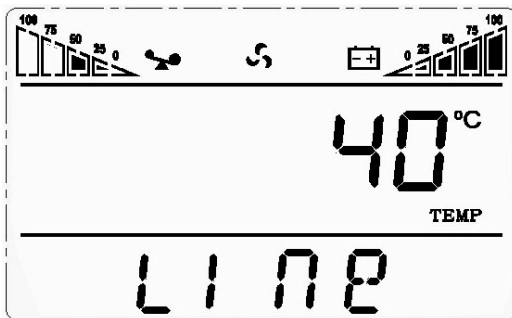
Load: display the value of WATT and VA of the load to be connected, depending on the load type and size, as shown in the following figure:



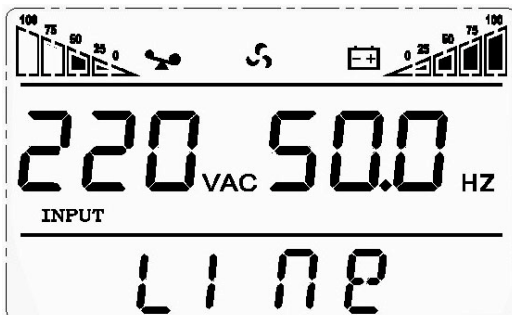


Note: under no-load condition, it is quite normal for LCD to display the smaller load value.

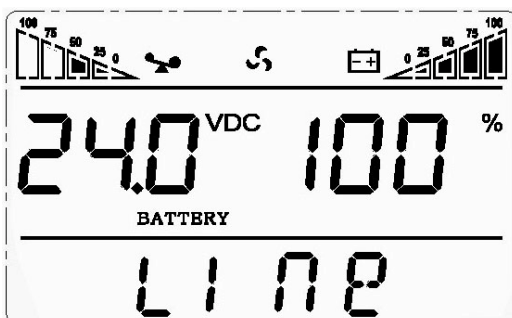
Temperature: display the maximum temperature point of the internal components, as shown below



Input: display the input voltage and frequency, as shown below:



Battery: display the battery voltage and capacity, as shown below:



## 6. Description of UPS working mode

### 6.1 Bypass mode

Under bypass mode, LED indicators are shown as below (white means the illuminate status), in addition, under LCD mode, the display area will display the character “Bypass”.



When bypass LED yellow light is illuminated, buzzer will sound every 2min accompanied by the illuminated alarm LED red light. LCD display screen can be determined according to the load and battery capacity.

Enter the bypass mode under two circumstances:

- ① UPS, which is powered by main power, fails to start up but activates the bypass output;
- ② Overload or over-temperature under main power mode.

**Note: No backup function for bypass mode.**

### 6.2 Main power mode

Under main power mode, LED indicators are shown as below: inverter LED green light is illuminate, and the display area under LCD mode will display the character “Line”.



UPS will work under main power mode when the input main power meets the UPS working condition.

### 6.3 Battery mode

LED indicators are shown as blow under the battery mode: constantly illuminated inverter LED green light and battery LED yellow light, buzzer alarms every 4s, LED red alarm light is illuminated, and the character bat is displayed in the display area under LCD mode. During battery self-checking, the inverter light, bypass light, battery light and fault light will flash in cycles, and the character batt is displayed in the display area under LCD mode.



UPS will immediately switch to battery mode in case of main power failure or instability.

### 6.4 ECO mode

LED indicators are shown as blow under the ECO mode: inverter LED green light and battery LED yellow light is constantly illuminated, in addition, the character “ECO” will be displayed in the display area under LCD mode.



When the input main power complies with the ECO input range and ECO function is started, UPS will work under the ECO mode. When input main power, within 1min, repeatedly exceeds ECO range but within the inverter input range, the machine will automatically operate under the main power inversion mode.

### 6.5 Fault mode

LED indicators are shown as blow under the fault mode: alarm LED red light

is constantly illuminated, in addition, the fault icon and code will be displayed in the display area under LCD mode.



In case of UPS fault, alarm light will be constantly illuminated and buzzer sounds. For instance, the overload fault, inversion fault and over-temperature fault, UPS will enter the fault mode, stop output and display the fault code with LCD. In such case, it is allowed to press down the mute key to pause buzzing for maintenance, or press the shutdown combination key if no severe faults are confirmed.

**Note: For fault codes, refer to the Reference Appendix: Table of fault code information and Table of Troubleshooting.**

## 7. List of LED and LCD display alarms

Appendix I: Corresponding table of fault code

Fault cause	Fault display code
Bus voltage fault	00—14
Soft start-up fault	15-24
Inversion voltage fault	25—39
Internal over-temperature	40—44

Output short-circuit	45—49
Overload	50—54
Input NTC fault	55—59
Power fault	60—64
Input fuse fault	65—69
Others	88

### Appendix I: Corresponding working status for displays

No.	Working status	Panel light signal display				Alarm sound	Remark
		Normal	Battery	Bypass	Fault		
1	Main power inversion mode						
	Normal main power voltage	•				No	
	Main power high/low voltage protection, switch to battery	•	•		★	One buzzing every four seconds	
2	Battery working mode						
	Normal battery voltage	•	•		★	One buzzing every four seconds	
	Warning for abnormal battery voltage	•	★		★	One buzzing every one second	
3	Bypass working mode						
	Normal main power voltage (under bypass)			•	★	One buzzing every two minute	
	High main power voltage warning (under bypass)				★	One buzzing every four seconds	
	Low main power voltage warning (under bypass)				★	One buzzing every four seconds	

4	Warning for battery disconnection						
	Under bypass status			•	★	One buzzing every four seconds	
	Under inversion status	•			★	One buzzing every four seconds	
	Power on or start up					Six buzzing	
5	Input overload protection						
	Overload under main power mode, warning	•			★	Two buzzing every one second	
	Overload under main power mode, protective operation			•	•	Long buzzing	
	Overload under battery mode, warning	•	•		★	Two buzzing every one second	
	Overload under battery mode, protective operation	•	•		•	Long buzzing	
6	Bypass overload warning			•	★	One buzzing every two seconds	
7	Fan fault (fan icon flashes)	▲	▲	▲	★	One buzzing every two seconds	
8	Fault mode				•	Long buzzing	

• \_Indicator light is constantly illuminated

★ \_Indicator light flashes

▲ \_Indicator light status depends on other conditions

Note:

Please provide following materials when contacting maintenance personnel:

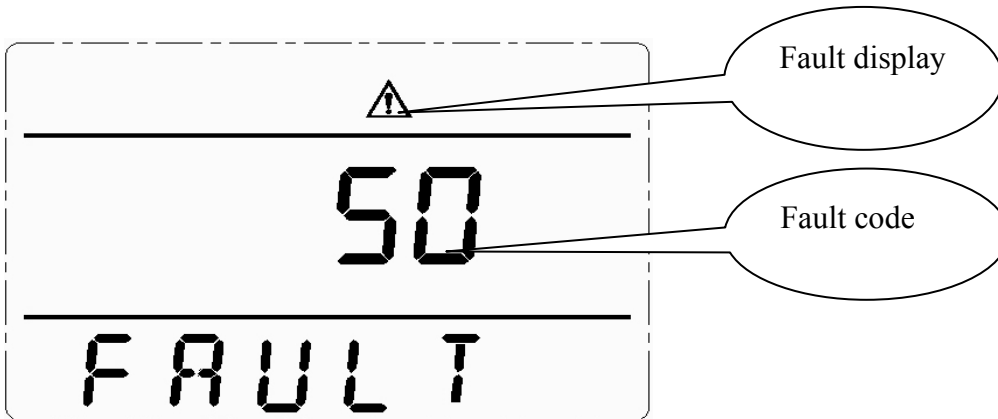
◇ UPS model ((MODEL NO.), machine serial No. (SERIAL NO.);

◇ Occurrence date;

◇ Complete description (including panel indicator light display, sound, power, load capacity; for long backup type, battery equipment information should also be provided).

## 8. Troubleshooting

LCD indications under fault mode are shown as below:



### Troubleshooting for abnormal conditions

Faults	Causes	Solutions
Fault indicator light is constantly illuminated, buzzer constantly sounds, with fault code 00-14	BUS voltage fault	Check if bus voltage is normal or contact with your supplier.
Fault indicator light is constantly illuminated, buzzer constantly sounds, with fault code 15-24.	Soft start-up fault	Find the soft start-up part and check the soft start-up resistor for damage, or contact with your supplier.
Fault indicator light is	Inverter voltage fault	Contact with your supplier.

constantly illuminated, buzzer constantly sounds, with fault code 25-39.		
Fault indicator light is constantly illuminated, buzzer constantly sounds, with fault code 40-44	Internal over-temperature	Ensure no UPS overload, no vent blockage and excessive high indoor temperature. Wait 10min to allow UPS cool down, restart it, if failed, contact with your supplier.
Fault indicator light is constantly illuminated, buzzer constantly sounds, with fault code 45—49	Output short circuit	Power off UPS, remove all loads. Ensure load is free of fault or internal short circuit. Restart it, if failed, contact with your supplier.
Fault indicator light is constantly illuminated, buzzer constantly sounds, with fault code 50—54	Over load	Check the load capacity and remove non-critical equipments, recalculate load efficiency and reduce the quantity of load connecting to UPS, inspect loading equipment for fault.
Fault indicator light is constantly illuminated,	Input NTC fault	Contact your supplier.



buzzer constantly sounds, with fault code 55-59		
Fault indicator light is constantly illuminated, buzzer constantly sounds, with fault code 60-64	Power fault	Find out the power part, check the power input and output, if any abnormal condition were found, contact your supplier.
Fault indicator light is constantly illuminated, buzzer constantly sounds, with fault code 65-69	Input fuse fault	Inspect the input fuse for damage. Restart machine after replacing fuse, if failed, please contact your supplier.
Fault indicator light is constantly illuminated; buzzer sounds every two seconds, and the fan icon on LCD flashes.	Fan fault	Inspect the fan for connection, rotation and damage, if any abnormal condition were found, please contact your supplier.
UPS is not operated when the startup key is pressed down.	Startup key pressing time is too short.	Start up UPS by pressing the key more than 2s in continuous.
	UPS input end is poorly connected or the standard battery is disconnected.	Connect the UPS input end, if the standard type battery has low voltage, power off first and then start up under no-load condition.

	Internal fault of UPS	Contact with your supplier.
Short battery discharge time	Battery undercharged	UPS should be connected to the main power in three consecutive hours, and recharge the battery.
	UPS overload	Check the load capacity and remove non-critical equipments.
	Aging battery with reduced capacity	Replace battery, and contact your supplier for the battery and its components.
Main power is normal but UPS is not powered by main power.	UPS input breaker disconnected.	Reset breaker manually.

Detailed solutions based on the fault code.

PCB01.PCB02 positive and negative UBS voltage detection module

Connecting to fan

Mutual inductor at PFC boost part

PCB04.PCB05 fan module  
PCB06 main power detection  
PCB07 battery detection

BUS absorption circuit

BAT- input relay

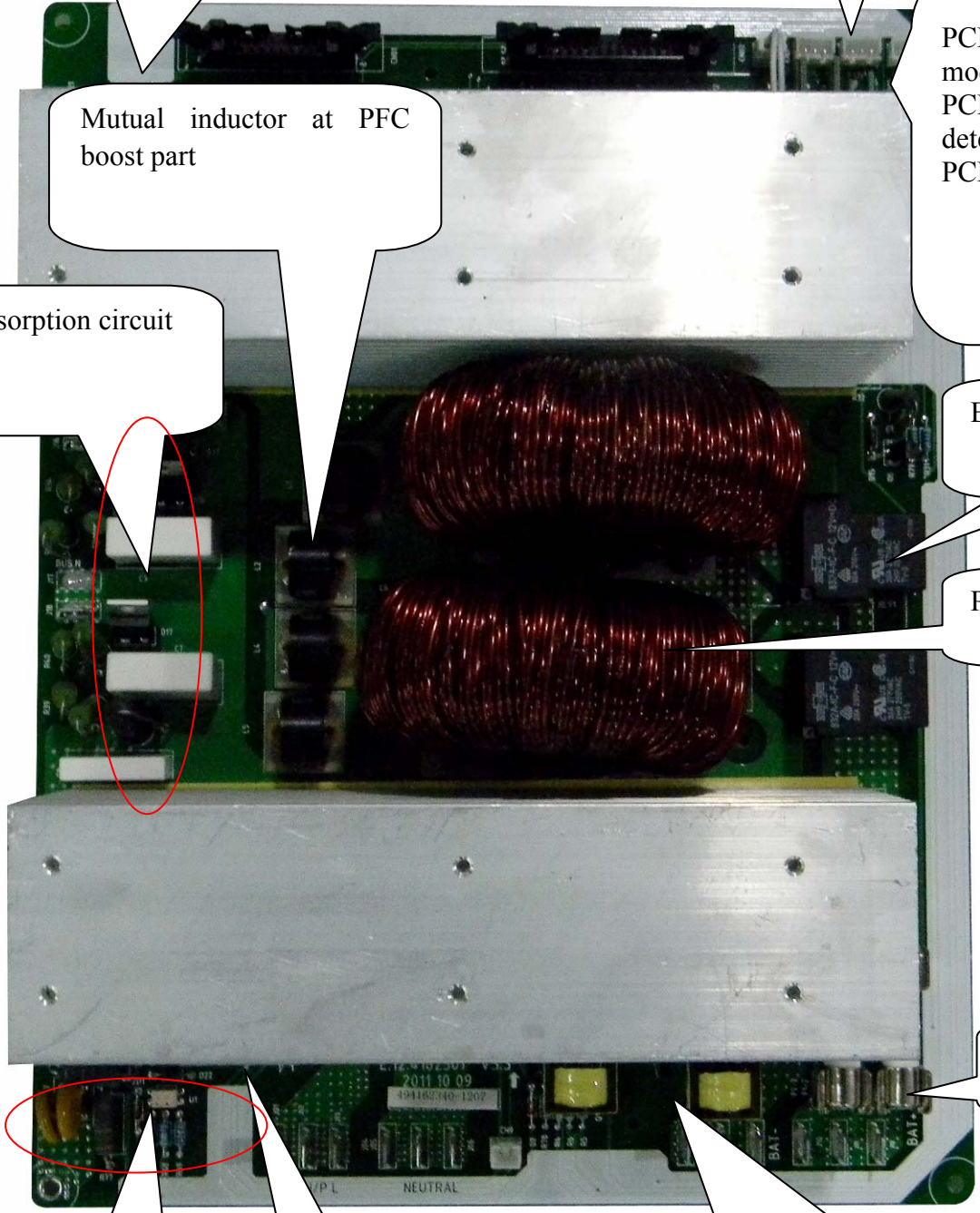
PFC boost inductor

Battery fuse

PCB10BAT-SCR driver module  
PCB09 main power -SCR driver module

Main power zero and live line reverse connection detection circuit

PCB08.PCB03 PFC driver module



Inversion inductive current detection

Output filter capacitor

DC BUS filter capacitor

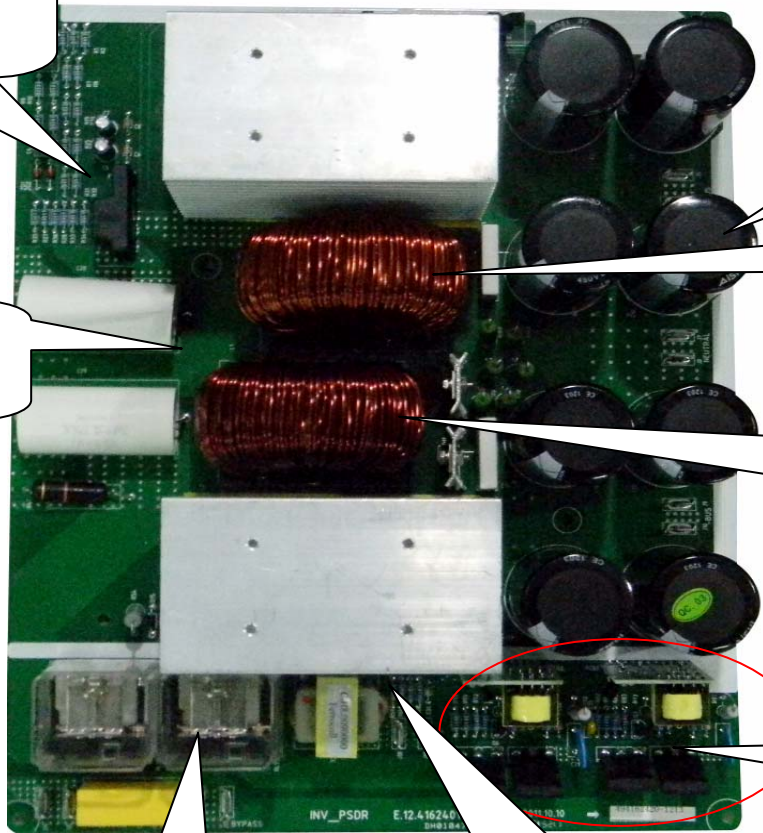
Output filter inductor

Inverted RCD absorption circuit

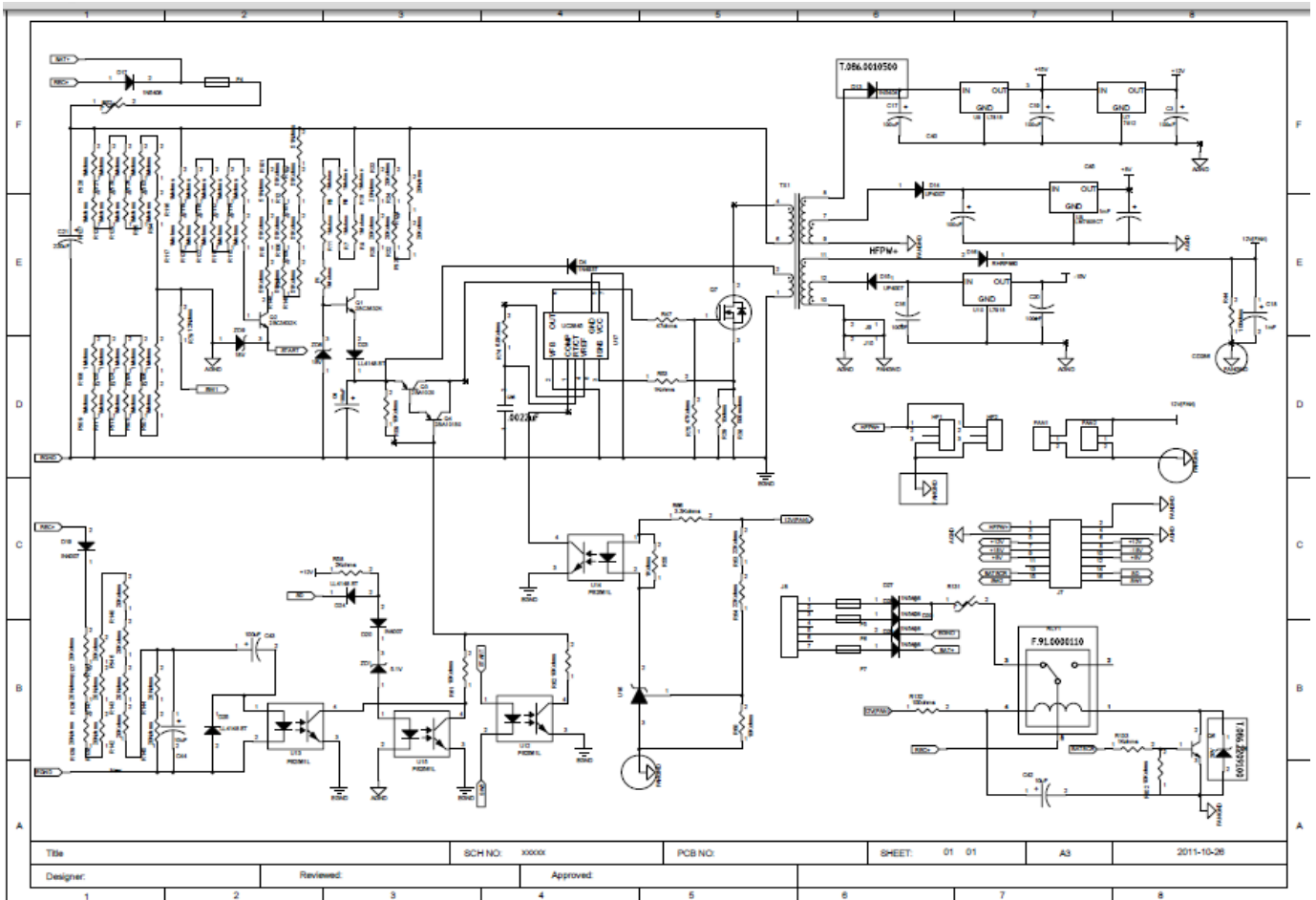
STS part circuit

Output relay

PCB1.PCB4 INV driver module

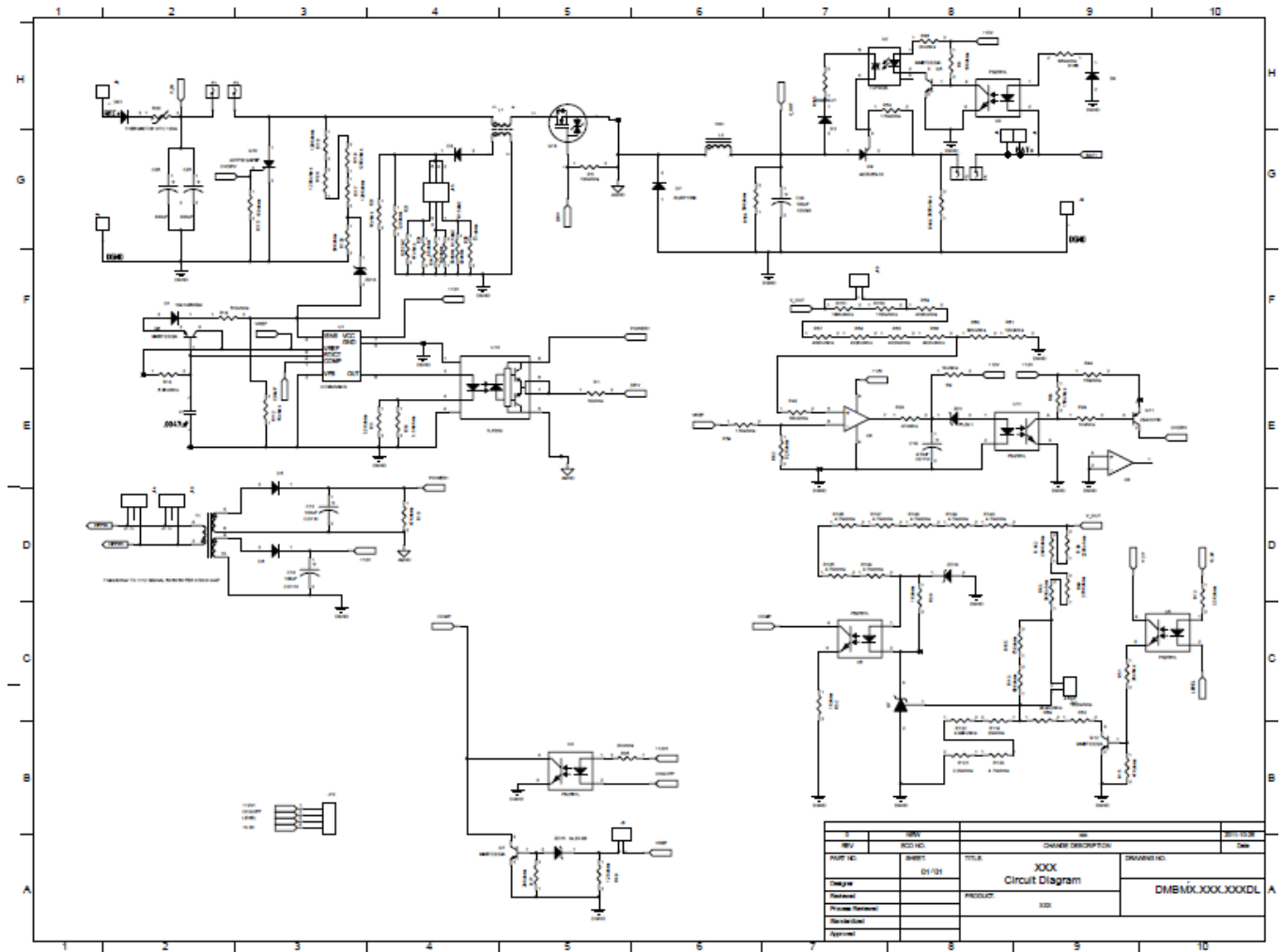


1. Working power generates circuit (See the following figure)



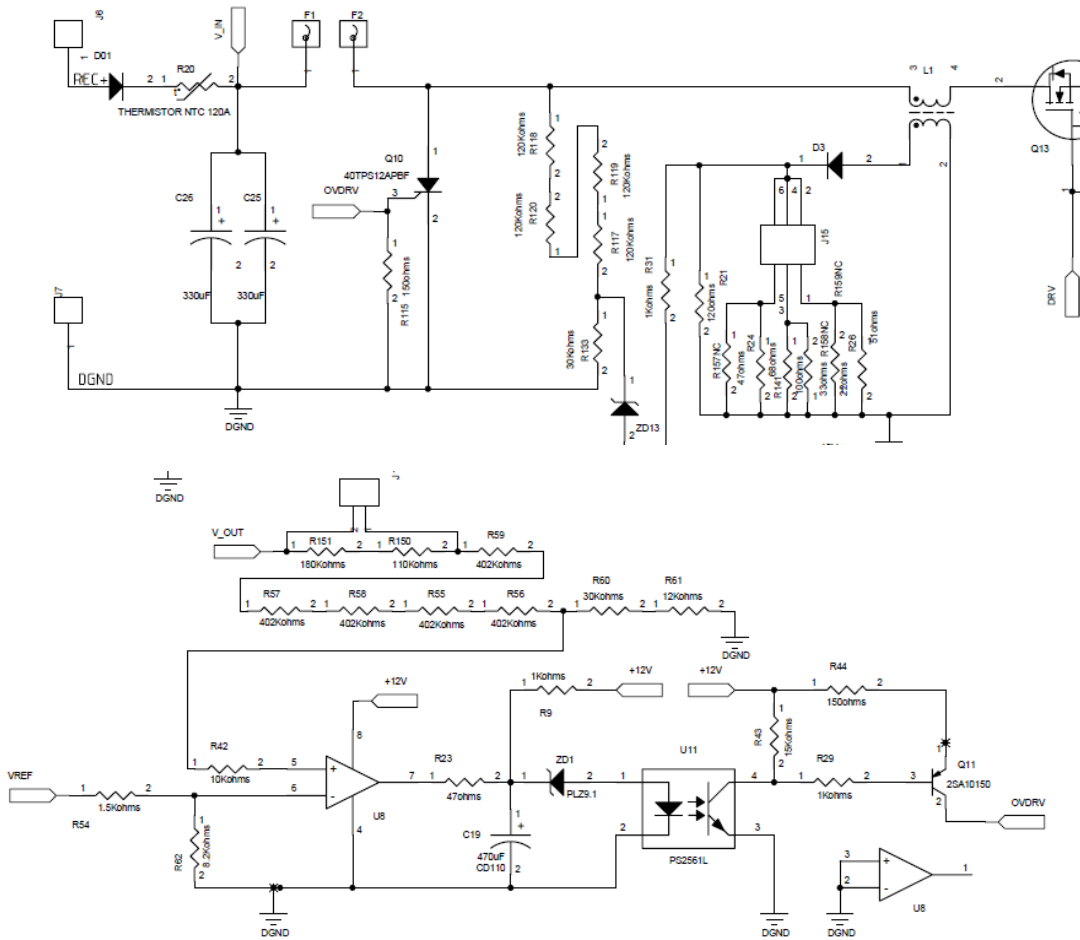
### A. Common fault handling

Fault	Fault component	Multimeter gear	Standard value	Fault value
No power	U1 (6-5)	Resistor gear	47 K $\Omega$	0 or too low
	Q1	Diode gear	SD interelectrode Around 0.37V	0
	TX1	Resistor gear	—	Infinite
	R8	Resistor gear	47 $\Omega$	Infinite
	ZD601	Diode gear	0.70V	0 or Infinite
	ZD602	Diode gear	0.70V	0 or Infinite
	R10	Resistor gear	0.1 $\Omega$	Infinite

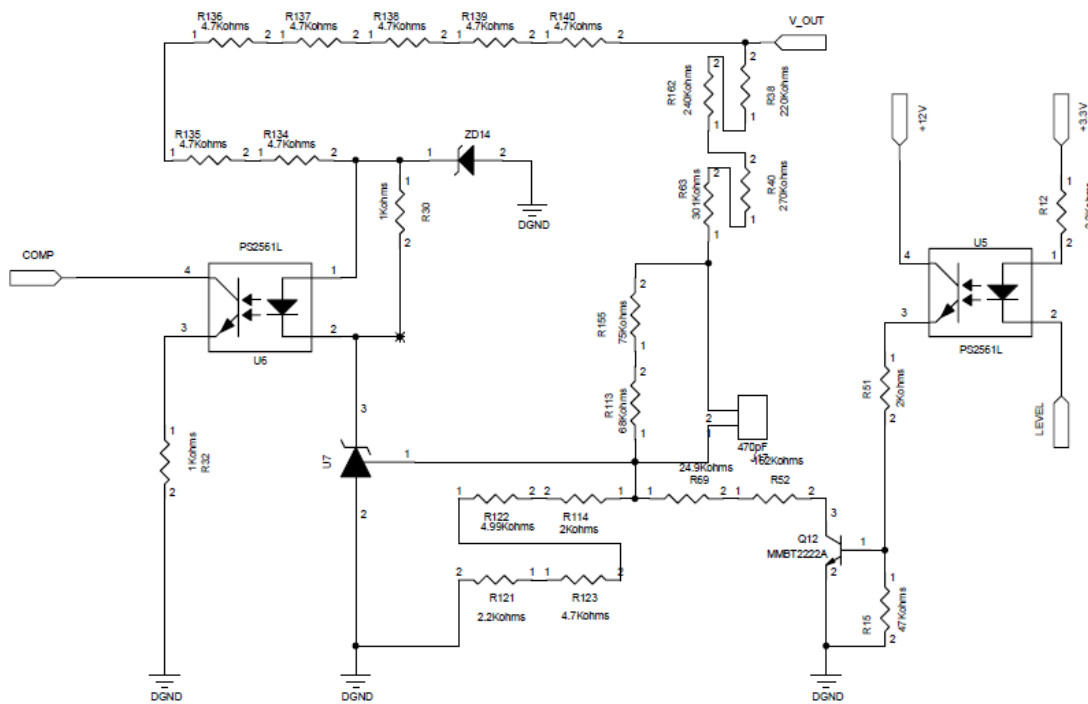


**Note: 6-10KVA long-life charging board input terminal operates from the REC part of power board PFC main power. After passing through BUCK circuit, the output voltage is DC168V (floating charge voltage is 196V). SCR-Q10 is a “suicide” circuit, SCR-Q10 will be on and its fuse F1-F2 will be burned out for protection when detecting excessive high output.**

**“Suicide” circuit:**



## 2. Output voltage feedback regulation:



## A. Charging board

Item	Checked components		DVM function	Reference Value	Fail Condition
1	FUUSE		$\Omega$	$0\Omega$	open
2	Q13	(E,C)	$\Omega$	$\approx 1M\Omega$	short
		(G,E)	$\Omega$	$10k\Omega$	short or open
3	D7		DIODE	$\approx 0.4V$	0V
4	R315		$\Omega$	$10\Omega$	open
5	R319		$\Omega$	$1k\Omega$	open
6	D09, D7		DIODE	$\approx 0.4V$	0V
7	R112, R159		$\Omega$	$10\Omega$	open
8	Q10, Q09	(A,K)	$\Omega$	$\approx 1M\Omega$	short
		(G,K)	$\Omega$	$\approx 12\Omega$	short

Power board PSDR

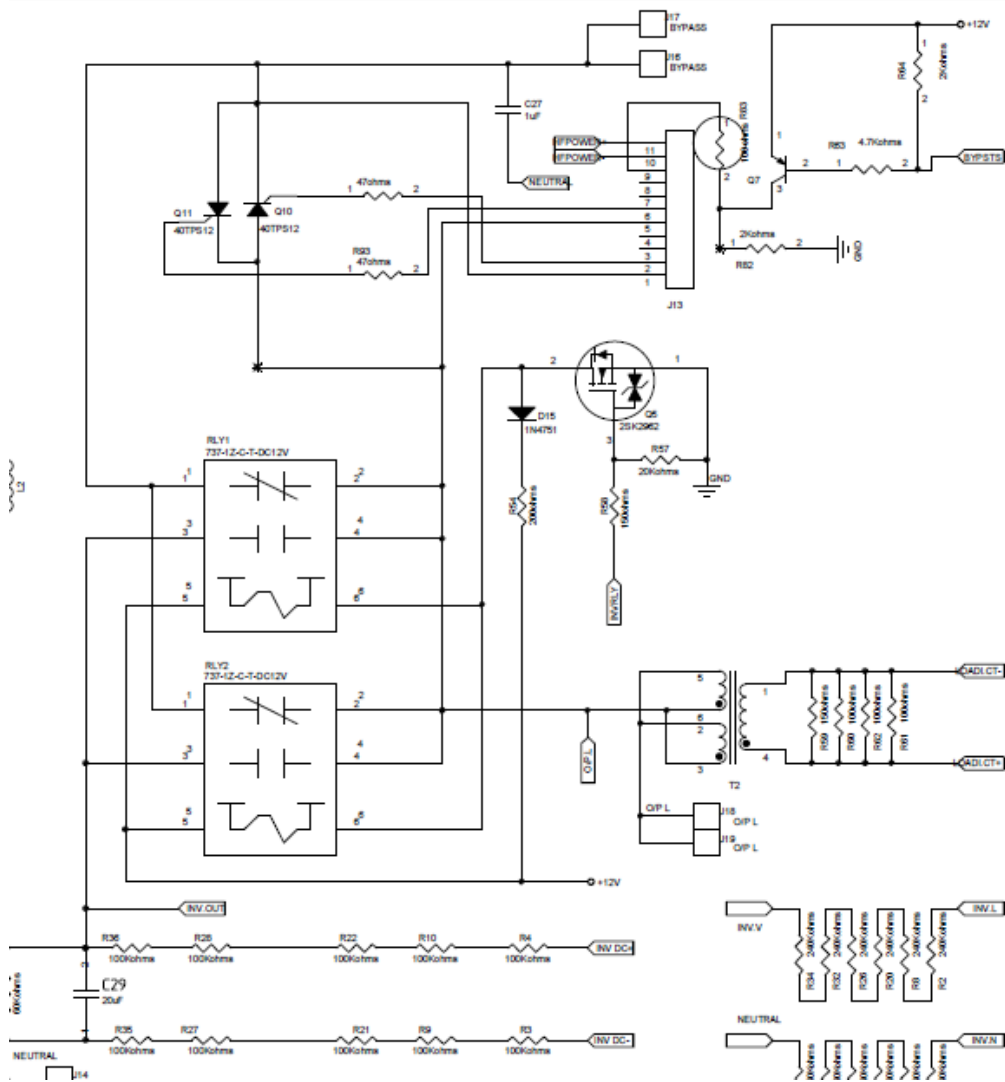
A:PFC part::

Item	Checked components		DVM Function	Reference Value	Fail Condition
1	F301, F302		$\Omega$	$0\Omega$	open
2	Q301	(A, K)	$\Omega$	$\approx 1.4M\Omega$	short
	Q302	(G, K)	$\Omega$	$\approx 10\Omega$	short



Item	Checked components		DVM Function	Reference Value	Fail Condition
1	Q306, Q308、	(E, C)	$\Omega$	$\approx 800k\Omega$	short
	Q310 Q307, Q309、 Q311	(G, E)	$\Omega$	$15.8k\Omega$	short or open
2	D308, D310		<b>DIODE</b>	$\approx 0.35V$	0V
3	R325, R331, R334, R342, R337, R328		$\Omega$	$10\Omega$	open
4	R390, R388, R389, R393, R392, R391		$\Omega$	$2.2\Omega$	open
4	D302, D304, D306, D303, D305, D307		<b>DIODE</b>	$\approx 12\Omega$	open





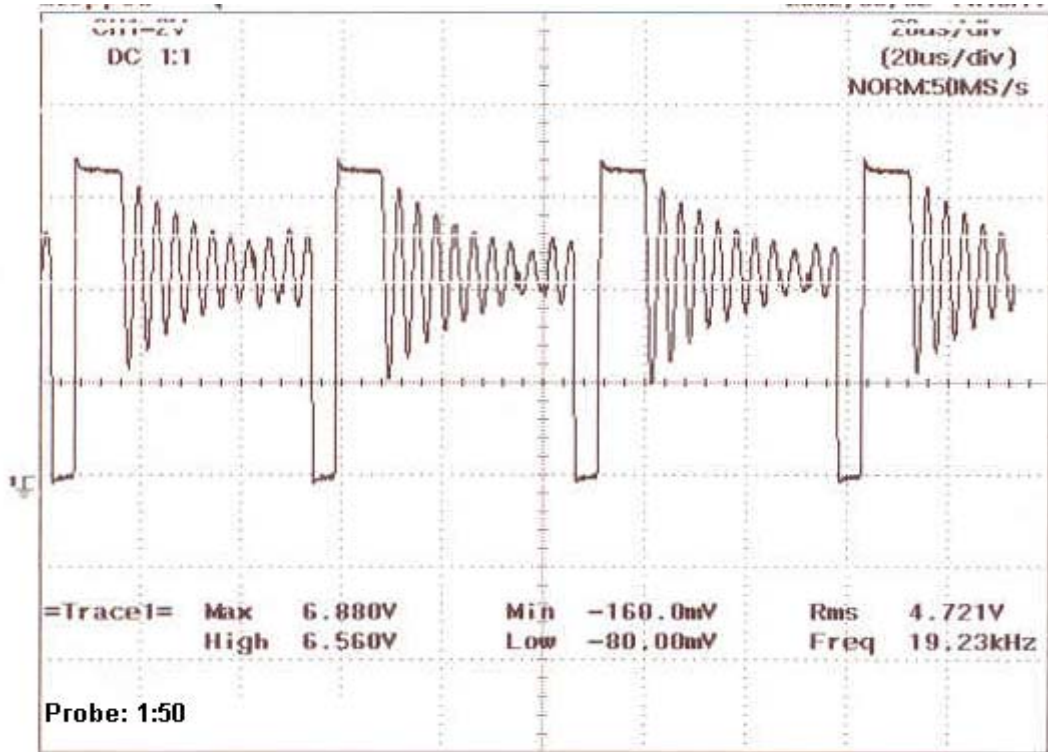
2. Include STS conversion (conversion between bypass and inversion, SCR's compensation and conversion time is 0ms) load detection, after inductive current detection signal is sent to the main board DSP.

Item	Checked components	DVM Function	Reference Value	Fail Condition	
2	Q11, Q10	(A, K)	$\Omega$	$\approx 2.5M\Omega$	short
		(G, K)	$\Omega$	$\approx 10\Omega$	short

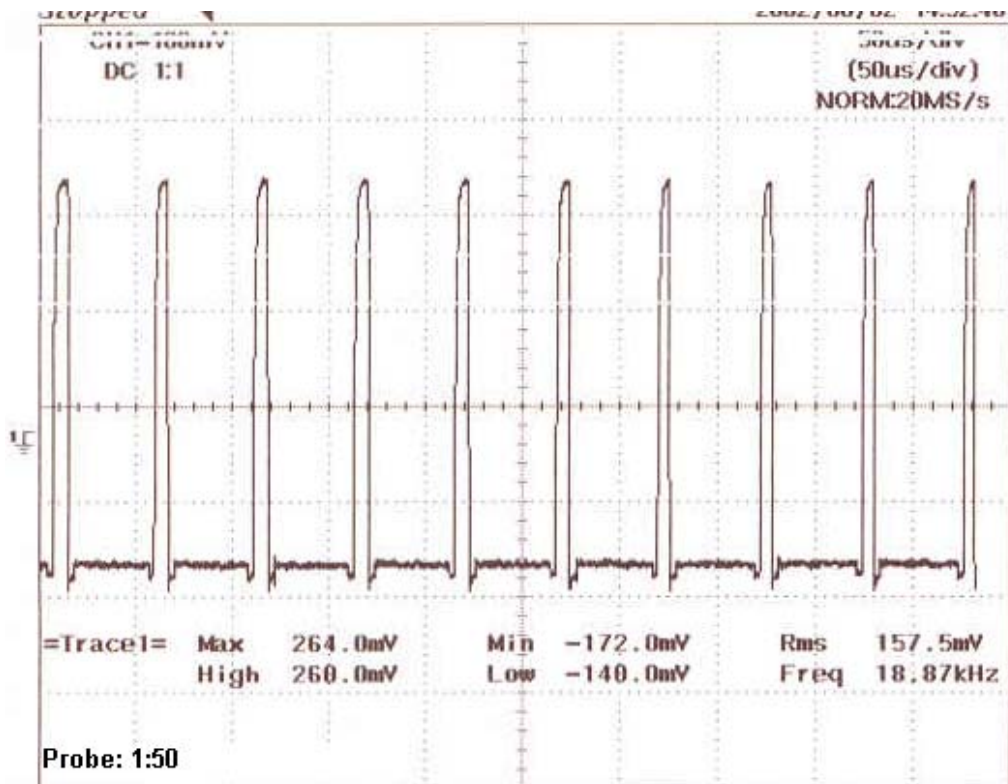
(B-4). Inverter part:

Item	Checked components		DVM Function	Reference Value	Fail Condition
1	Q1, Q2, Q3,Q4	(E, C)	$\Omega$	$\approx 100k\Omega$	short
		(G, E)	$\Omega$	$23.5k\Omega$	short or open
2	D2, D3, D4.D7, D5, D6, D13.D14		<b>DIODE</b>	$\approx 0.36V$	0V
3	R13, R16, R49, R52		$\Omega$	$10\Omega$	open
4	R12, R15, R50 R51		$\Omega$	$36\Omega$	open

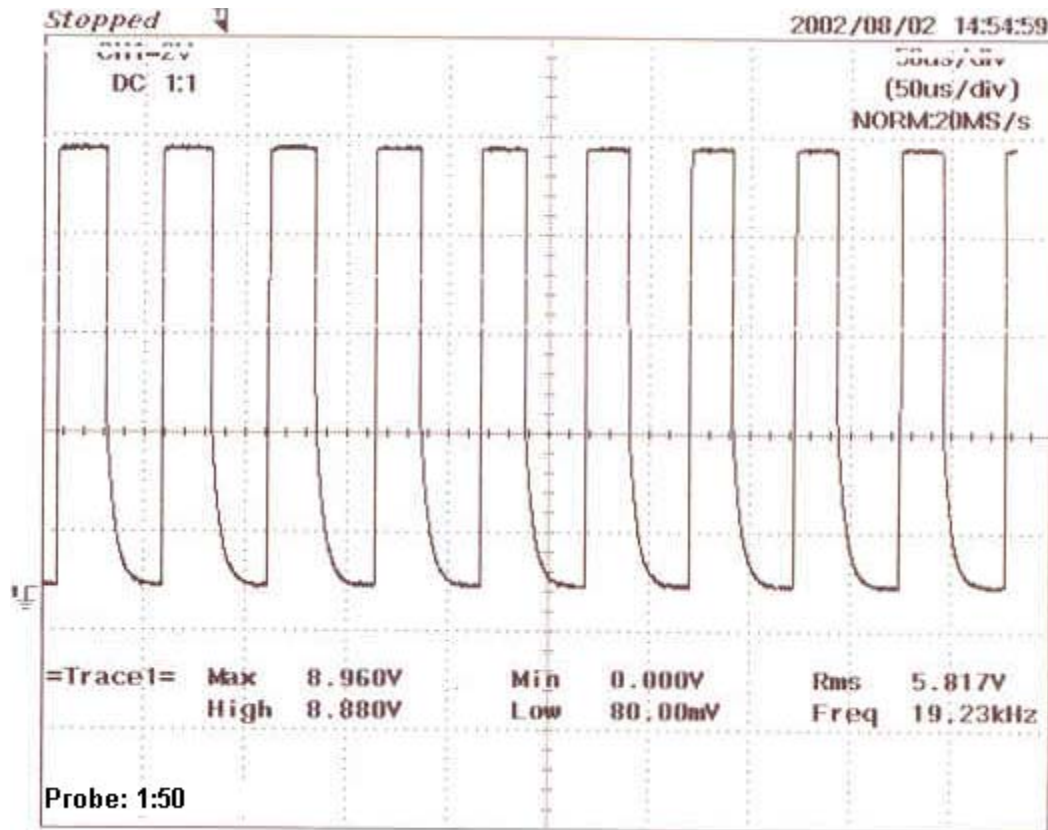
V. Voltage wave form



Voltage wave form ( $V_{CE}$ ) between C and E polarity of PFC IGBT under no-load condition



## Driving voltage wave form ( $V_{GE}$ ) at G and E of IGBT



## Voltage wave form ( $V_{CE}$ ) between C and E polarity of PFC IGBT

Note: precautions for maintenance

### 1. Current limit startup

**Current limit startup is required after maintenance or replacement of board. To prevent serious fault, it is forbidden to start up at will.**

Purpose of current limit startup:

- 1) Judge if UPS is under normal condition and prevent breakdown from expanding;
- 2) As working current is quite small during current limit startup, no power tube will be damaged even in case of component short-circuit;
- 3) Current limit startup is necessary for finding the fault and relevant fault information.◦

**Method of current limit startup:** (DC POWER SUPPLY OR CHARGER)

- 1) Pull out the battery line, carry out the DC source (current limit point should be adjusted around 3A) or charging board analog battery input;

- 2) Start up machine, observe and check signal, working power, positive and negative BUS voltage ( $\pm 350\text{VDC}$ ) and output voltage. In such case, it should work under no-load condition;
- 3) After it is normally started, connect to the main power and complete the corresponding measurements;
- 4) After confirming the machine is under normal condition, remove the DC source or charging board connection line, and connect to the battery.

## **2. Precautions for test**

- 1) Watch out for the polarity when measuring signal (battery, DC POWER SUPPLY);
- 2) Wear antistatic wrist strap to prevent damaging IC;
- 3) After each test, inspect DC BUS voltage for discharging prior to the next test.
- 4) If any abnormal condition were found during static measurement of power components, it is necessary to inspect parts for damage prior to startup, and current limit startup should not be carried out unless everything is confirmed OK.
- 5) Potentially problematic components: PFC-IGBT and its driver circuit, INV-IGBT and its driver circuit, BOOST-DIODE, DC/DC MOSFET and its driver circuit, CHARGER and FUSE, etc.

## **9. Precautions for battery handling**

- ◇ Before handling, take off metal articles like the ring and watch and the like;
- ◇ When need to replace battery wires, please purchase the raw material from our company service station or the distributor so as to prevent fire arising from heating or sparking due to undercapacity;
- ◇ To prevent explosion and injury, never handle with battery or battery group with fire;
- ◇ Do not damage or open the battery as the leaked electrolyte is highly toxic and hazardous to humans;
- ◇ It is necessary to prevent positive and negative polarities of the battery from being shorted or otherwise there will a fire or electric shocking;

◇Inspect battery for voltage prior to touch. There will be high voltage between the battery terminals and the ground if the battery loop and input voltage loop is not isolated.

## **10. Network communication**

EA901II~9010II (1KVA~10KVA) provides intelligent network card interface, and allows for the UPS network communication by combining the special Ethernet card (optional accessories). For details, please contact your distributor or the customer service center.

## **11. Description of communication interface**

UPS provides two types of signal aspects for communication with the host computer: the analogue relay tip, which utilizes the “ON” and “OFF” status of transistor to convey the input power and UPS status to the host computer, and the serial interface RS232, which provides serial communication interface to monitor the input power and UPS material as well as control UPS status.

### **Note:**

The attached special connection line provided by our company should be employed for the communication interface.

Data form of Rs232 is set as:

◇Bit rate: 2400bps



◇ Character length: 8bit

◇ End code: 1bit

◇ Parity bit: None