Power Conversion®

TX90 6kVA & 10kVA Online UPS

6kVA, 10kVA Models

Service Manual

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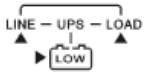
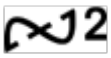
Product Information

Symbols on the LCD Display Panel

Item	Symbol	Description
1	***LINE***	Utility or Bypass Source
2		Battery Low
3		Battery Abnormal
4		UPS Overloaded
5		UPS Working in specified mode*
6		A Blackout Transfer occurred in UPS Output.
7		Bypass Input Abnormal, UPS fails to transfer to bypass, Bypass Abnormal at ECO mode
8		Utility Input Abnormal
9	**OFF**	UPS Shut off
10	LINE OFF	UPS Abnormal Lock
11		UPS Flow Display
12		4-Digit Measurement Display
13		Indicates the item to be measured
14		UPS ON Switch or Alarm Silence
15		UPS OFF Switch
16		Previous Page or Setting Change
17		Next Page
18		Special Function Log In/Out

19		Enter or Reconfirm
20		Utility Input Normal LED
21		Bypass Input Normal LED
22		UPS under Redundancy Mode
23		UPS under ECO Mode
24		UPS Fault or Abnormal Warning LED
25	**EPO**	Emergency Power Off
The below items from 26 to 31 show the UPS is on Service Mode		
26	**Sr01**	The UPS is on Service Mode now
27	**Sr02**	Inverter's & PFC's PWM Output On (It shall be -6Vdc ~ +15Vdc/20KHz square wave)
28	**Sr03**	1st Soft Start (Charger or battery pre-charges +/-BUS now)
29	**Sr04**	2nd Soft Start (It means AC SCR Driver on or Battery SCR Driver On)
30	**Sr05**	3rd Soft Start (Boosts +/-BUS up to desired voltage)
31	**Sr06**	Inverter Soft Start (to reach to the desired output voltage of Inverter)
The below Error Codes indicate you the error status of the UPS		
1	**Er01**	1st stage DC BUS capacitor pre-charge abnormal after 50 seconds or Battery Fuse fails
2	**Er02**	AC SCR or Battery SCR soft Start abnormal after 2 seconds
3	**Er03**	3rd PFC(Boost) soft start abnormal after 30 seconds
4	**Er04**	Inverter out of order
5	**Er05**	Battery Weak or Dead
6	**Er06**	Output Short Circuit
7	**EPO**	EPO Mode
8	**Er08**	DC Bus high-voltage-level abnormal
9	**Er09**	DC Bus low-voltage-level abnormal
10	**Er10**	Inverter Over-current
11	**Er11**	UPS Overheat
12	**Er12**	Inverter Overload
13	**Er13**	Charger out of order or abnormal

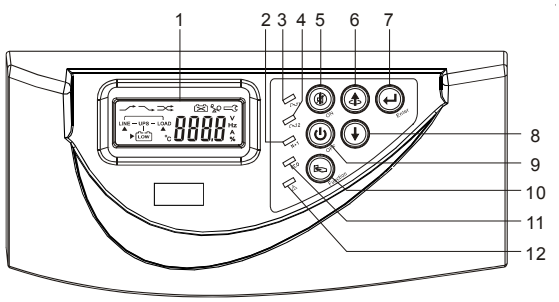
14	**Er14**	Fan out of order
15	**Er15**	Wrong Procedure to Enter Maintenance Mode
16	**Er16**	Output Parameters Set Error in Parallel System
17	**Er17**	ID Numbers are in conflict in Parallel System or ID number Error in single unit
18	**Er18**	EEPROM's data error. Its values are reset to default. (Nomral/220V/adj0%/+/-3Hz/low sensitivity)
19	**Er19**	Reserved
20	**Er20**	DC Bus voltage can't be discharged
21	**Er21**	Parallel communication error (communication wire disconnected or failure to find ID1 UPS) in parallel system
22	**Er22**	Bypass SCR or Output Fuse Fails
23	**Er23**	Inverter Relay or SCR or Output Fuse Fails
24	**Er24**	Bypass Input found when Running on CVCF mode
25	**Er25**	Reserved
26	**Er26**	PFC over-current
27	**Er27**	The UPS must be operated in normal mode in parallel system
28	**Er28**	Bypass Overload Time out and cut off output.
29	**Er29**	Charger Overcharges battery (>300Vdc)
30	**Er30**	Inverter Balance Error
31	**Er31**	The settings of both control board and driver board are not matched each other.
32	**Er32**	Sync Signal Error
33	**Er33**	Isolated transformer overheat
34	**Er34**	Balance function conflict
35	**ER35**	Output Parallel Failed
36	**CEr1**	Utility voltage out of range
37	**CEr2**	Bypass Voltage out of range
38	**CEr3**	Inverter Voltage out of range
39	**CEr4**	Load Percentage out of range
40	**CEr5**	Battery Voltage out of range
41	**CEr6**	UPS Output Voltage out of range

Remarks:

1. When one of the Er06, EPO, Er23, Er24, Er28, Er32 ,or Er33 error message occurs, the UPS will have no output and lock itself immediately.
2. If the bypass voltage is normal(within specs), but one of the Er01, Er02, Er03, Er05, Er13, Er14, Er20, Er22, Er26, Er29 or Er30 error message occur, the UPS will transfer to Bypass loop and lock itself.
3. If the bypass voltage is normal(within specs), one of the Er04, Er08, Er09, Er10, Er11 or Er12 error message occurs, the UPS will transfer to Bypass loop, then try to transfer back to Inverter mode automatically. If the symptoms happen 4 times in one hour, the UPS will lock itself; otherwise, the error messages and the times of the error messages will be clear and reset automatically.
4. If the Er16, Er17, Er21, Er27, Er31 or Er34 error message occurs, the inverter of the UPS will have no output and the user is prohibited to turn on the UPS from the front panel.

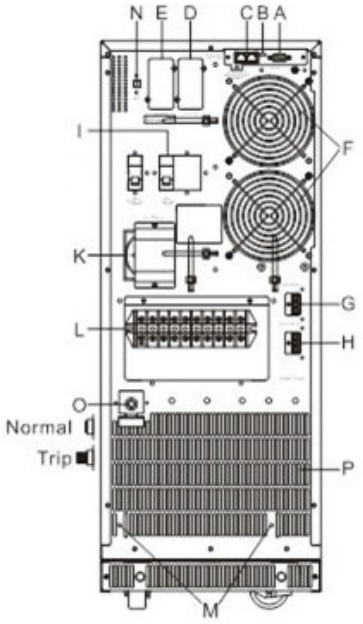
Panel Explanation

Front Panel Function Explanations



1. LCD
2. Green LED indicates that the UPS is able to run under redundancy mode.
3. Solid green LED indicates that the utility input voltage is within the acceptable window. Flashing green LED indicates that the utility input voltage is outside the acceptable window.
4. Green LED indicates that Bypass Input is normal.
5. UPS ON/Alarm Silence
6. Go to previous page or change the setting of the UPS.
7. Confirm a changed setting.
8. Go to the next page.
9. UPS OFF Switch
10. Special functions log in/out
11. UPS is working under ECO (Economy) mode.
12. UPS Fault or Abnormal

Rear Panel Explanation



A. RS-232 Port
B. Terminal Resistor for Parallel function
C. CAN Bus Connection Port for Parallel System
D. Optional Communication Slot 1
E. Optional Communication Slot 2

F. Cooling Fans
G. External Battery Connector
H. External Charger Connector
I. Utility Input Breaker CB1
K. CAM Switch (Maintenance Bypass Switch)
L. Input/Output Terminal Block (shown with cover removed)
M. Mounting Holes for External Charger Cabinet
N. EPO (Emergency Power Off): Short to enable the function
O. Thermal breaker for the protection of Load in abnormal condition: CB3 (TX90-10K only)
P. Air Ventilation Hole

Communication Port

The communication port on the UPS provides for RS-232 communication with the UPS software to remotely monitor the power and UPS status.

You may use optional interface cards for Relay (Dry Contact) and SNMP. These cards may be used simultaneously.

The software bundled with the UPS is compatible with many operating systems such as Windows 98, 2000, ME, NT and XP. For other applications such as Novell NetWare, Unix, or Linux please contact your local distributor for a proper solution.

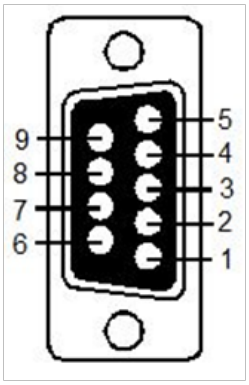
When the optional interface cards are used together with the onboard RS-232 port the EPO signals will get highest priority, then the SNMP/WEB card, then the shutdown command at the relay card, and then finally the onboard RS-232 port gets the lowest priority.

True RS-232

Interface Settings
The RS-232 interface shall be set as follows:

Baud Rate	2400 bps
Data Length	8 bits
Stop Bit	1 bit
Parity	None

Pin Assignments
The Pin Assignments of true RS-232 are as follows (The connector is male):



Pin 3: RS-232 Rx
Pin 2: RS-232 Tx
Pin 5: Ground

Installation and Operation

Carefully inspect the UPS for shipping damage before installation. Retain the packing material for future use.

Unpacking

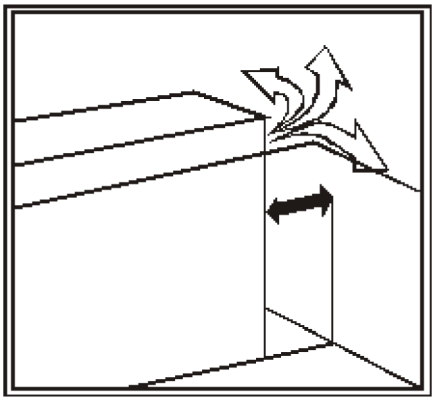
Standard package contents:

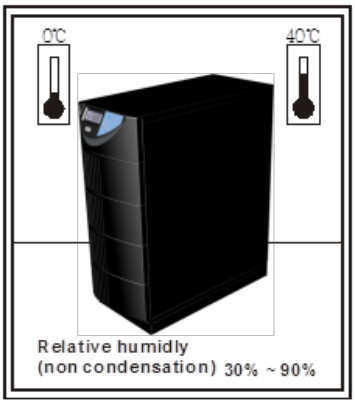
- Quick start guide
- User manual
- Upsilon 2000 software CD
- (3) Output jumpers
- (4) Small Phillips head screws
- RS-232 cable
- Optional skirt assembly including: (2) 22 3/4” side skirt, (2) 11.5” front and rear skirt, and (1) plastic skirt

Selecting Installation Position

Install the UPS in a proper environment to minimize the possibility of damage to the UPS and to extend the life of the UPS. Please follow these requirements:

1. Keep at least 12 inches clearance from the rear panel of the UPS to the wall.
2. Keep at least 8 inches clearance from the rear panel of the External Battery Pack (EBP) to the wall. Refer to the T90-EBP920, EBP940, EBP960 user manual for more details.
3. Do not block the air flow to the ventilation openings of the unit.
4. Ensure that the installation site is not excessively hot or moist.
5. Do not place the UPS in an environment near dust, corrosive or salty material, or flammable objects.
6. Do not expose the UPS to the outdoors.





Terminal Block Explanation

TX90-6K & 10K MODELS

OUTPUT						INPUT			
G2	N22	L22	N21	L23	L21	G1	N1	L12	L11

N22, L22, N21, L23, L21: UPS OUTPUT
G2 : OUTPUT EARTH GROUND

L12-N1: UTILITY INPUT
G1 : INPUT EARTH GROUND

L11 NOT USED: all systems are single input
N1, L12, G1: the terminals for utility input with single input connection
G1: the terminal for UPS input ground
N1: line 1 (L1) input
L12: line 2 (L2) input
G2, N22, L22, N21, L23, L21: the terminals for UPS output, see below output options for configuration details
G2: the terminal for UPS output ground

Remarks:

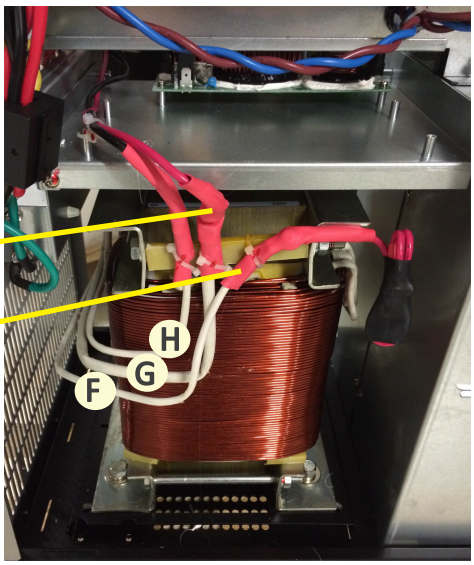
1. The maximum current for each terminal is 30 Amps for 6 kVA, 50 Amps for 10 kVA.
2. The UPS is always a Single Input configuration. The Dual Input configuration is not used. The AC source can be 208V or 240V landed to the L12 and N1 terminals.
3. Use No. 6 AWG, 75°C minimum copper wire and 23 lb-in Torque force when connecting to terminal block.
4. The transformer has two input voltage options, 208V and 240V. If the input is configured at 208V but the actual input is 240V, then the output voltages will boost up 15%.

Input Configuration

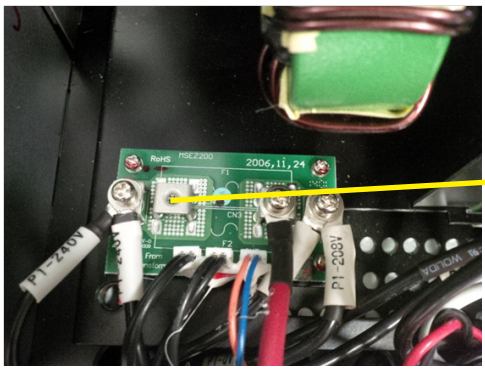
208V input applications: 208V input with a 120/240V output is the default for these systems. This means the inverter output is programmed to 208V and the output transformer primary tap is set to the 208V setting. These are the default settings for this system. Please refer to output Option 1 in this section.

240V input applications: If the input voltage is 240V, the following steps must be performed to obtain a 120/240V output with a 240V input.

1. With no AC applied to the unit, change the transformer primary tap from 208V default setting to 240V shown below. Access to tap settings is gained by removing the side covers.



TX90-6K Input Taps

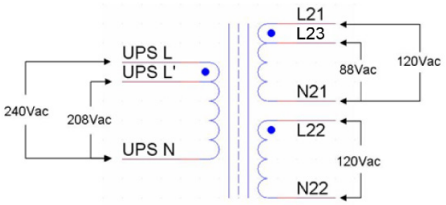


TX90-10K Input Tap Board

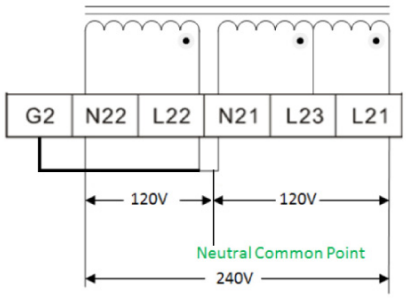
2. The UPS inverter output voltage must also be programmed to 240V. Refer to the Changing the UPS Default Settings section for more details. Option 1 below provides a 120/240V output with a 240V input.

Output Configuration

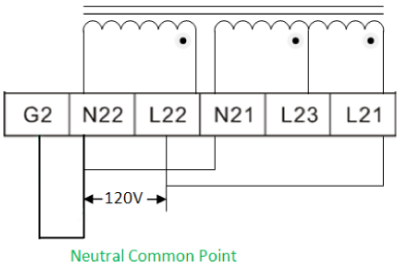
All of the output options shown below apply to 208V input systems and 240V input systems.



Option 1: 120V/240VAC - THIS IS THE DEFAULT OPTION FOR ALL UNITS: Each branch max loading 50%. Please note the jumpers between G2-L22 and L22-N21 for this option.



Option 2: 120V full capacity output. Please note the jumpers between G2-N22, N22-N21, and L22-L21 for this option. See below.



For any other output configurations needed, please contact Xtreme Power Tech Support.

Please refer to the specifications of input current, output current and recommended conductors listed below.

a. AC input and output (minimum 75°C copper wire)

Model	Maximum Input Current	Input Breaker Size	Input & Output Conductor Section	Terminal Torque Force
6KVA	33 A	40 A	AWG #8	17.7/11 lb-in
10KVA	54.3 A	60 A	AWG #6	23 lb-in

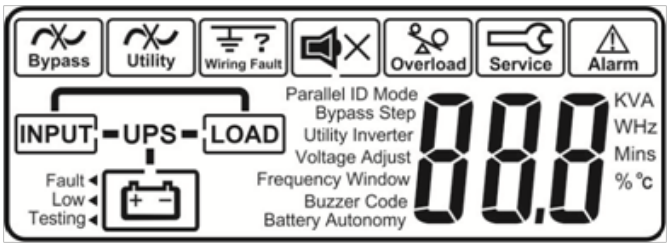
b. Battery input

Model	Maximum Current	Conductor Section
6KVA	25 A	AWG #10
10KVA	41 A	AWG #10

Start Up in Normal Mode

- Open the terminal block cover on the rear panel. Before starting the installation make sure the wiring is connected properly.
- Make sure the utility input breaker and the UPS' input breaker are in the "Off" position.
- Switch on the utility input breaker on the distribution panel and the UPS input breaker. Then the UPS will start up. Green LEDs and show that the Utility and Bypass inputs are normal. UPS will display first figure A1 and then figure B.

A1



B

- The UPS is now in Bypass Mode. It will proceed to self-test automatically. If no abnormal message appears then the pre-startup of the UPS was successful and the charger begins to charge the batteries
- Press the UPS On switch for approximately three seconds. The Buzzer sounds twice and the LCD display changes from figure B to figure C.

C

- The UPS is in self-test mode again. The LCD display will change from figure C to figure D, and the UPS will remain in battery mode for approximately four seconds. Then the display will change from figure E1 to figure F if the self-test was successful.

D

"test"

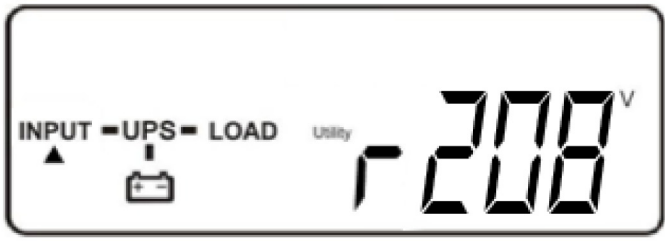
E1

“OK” in self-test

E2

“Fail” in self-test

F



“208 VAC” in Utility Input

- If the self-test fails the LCD display will change from figure D to figure E2. Then an error code or error status will appear on the screen.
- Your start-up operation of the UPS is complete now. Make sure the UPS is connected to utility and charging at least 8 hours and the batteries are fully charged before connecting the device to be protected.

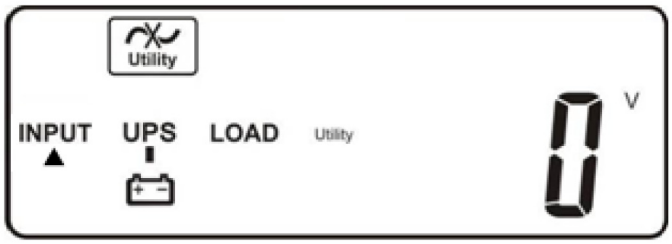
Start-up in Battery Mode (Cold Start)

- Make sure the UPS has at least one string (20 pcs) of batteries.
- Push the UPS On switch ⏻ once for approximately 5 seconds to wake the UPS. The buzzer will sound twice. The LCD display will change from figure A to figure G for approximately 15 seconds.
- Press the UPS On switch ⏻ again for about three seconds until the LCD display changes from figure G to figure H. Then the UPS will be in self-test mode. The UPS may offer energy to the output in a minute, and the LCD displays figure I. In case of failure in pushing the UPS On switch for 15 seconds, the UPS will automatically turn off. You must then repeat steps.

G

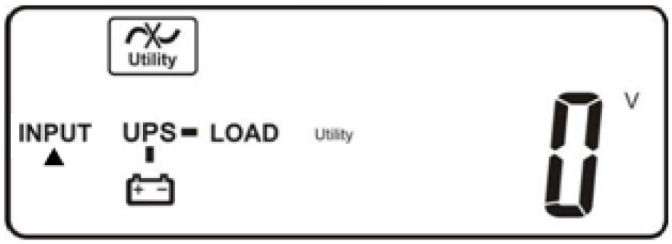
“Off”, which means the UPS pre-start was successful

H



Utility input is “0” and Utility Abnormal.

I



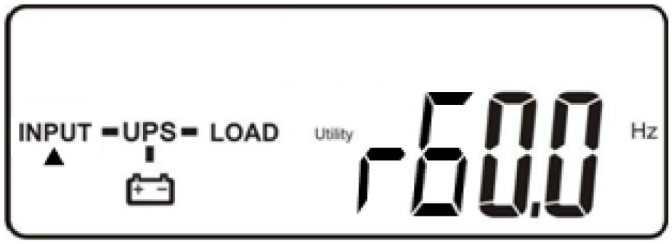
Check Measured Values and Figures Detected by the UPS

- If you would like to check the measured values and figures detected by the UPS, use the scroll up ⓤ and scroll down ⓓ keys. When you scroll down the LCD will display figure C (Voltage from Utility Input) → figure I1 (Voltage from Bypass Input) → figure J (Frequency from Utility Input) → figure K (Frequency from Bypass Input) → figure L (UPS Output Voltage) → figure M (UPS Output Frequency) → figure N (UPS Output Load %) → figure O (UPS Battery Voltage) → figure P (UPS Inner Temperature).

I1

Voltage comes from Bypass Input.

J



Frequency of Utility Input

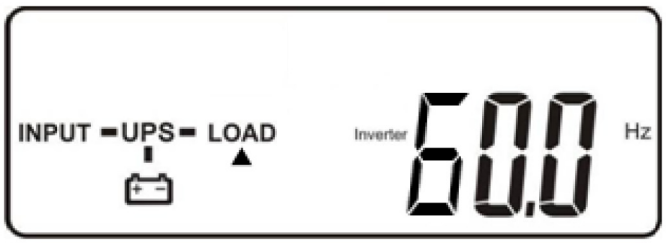
K

Frequency of Bypass Input

L

UPS output voltage

M

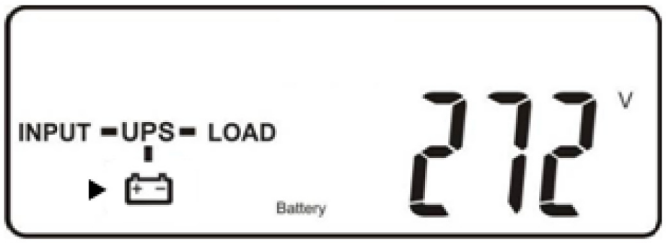


UPS output frequency

N

UPS output load level (%)

O



Battery voltage

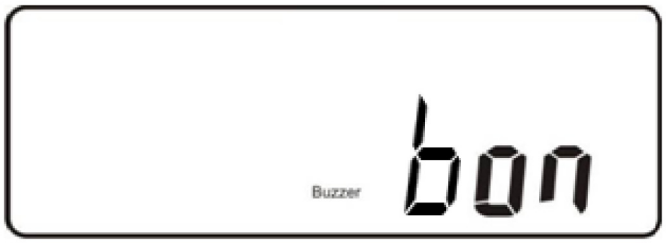
P

UPS inner temperature

Viewing the UPS Default Settings

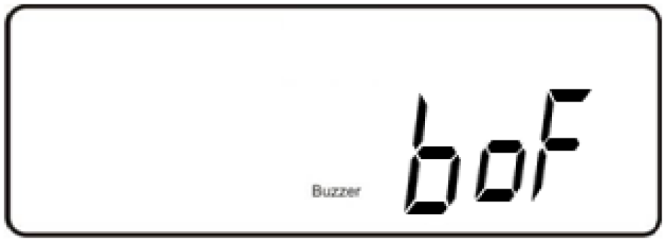
- After the UPS completely starts up, press the (function) key to change the LCD display to figure Q1.

Q1



Buzzer "On". Use the key to toggle the setting and then save.

Q2



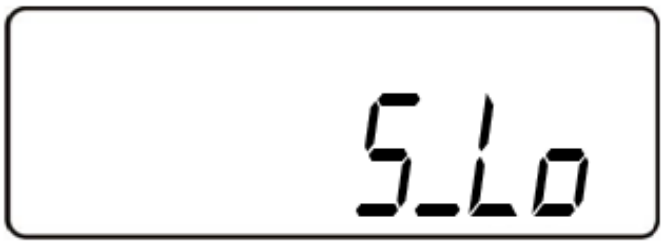
Buzzer "Off"

- Press the key to scroll through the UPS settings. The LCD will display in sequence figure Q1 (buzzer) → figure R (Self-test) → figure S (Bypass Voltage Windows) → figure T (Output Frequency Synchronization Window) → figure U (Inverter Output Voltage) → figure V (UPS Operation Mode) → figure W (Output Voltage Micro Tune Value) → figure X (UPS Id) → figure Y (Parallel function status).
- Buzzer and Self-test can only be changed in this mode while the UPS is on. All other settings must be changed while the inverter is off in this mode. See Changing the UPS Default Settings on page 22.
- Default settings shown below.

R

Self-test is not "On". Use the key to toggle the setting and then save.

S



Bypass Voltage is adjusted to narrow range. Selectable to Lo or Hi.

T

Frequency Window is +/-3 Hz. Selectable to ± 1Hz.

U

Inverter output voltage set to 208V. Selectable to 200, 208, 220, 230, 240V. This is the voltage sent to the output transformer primary. The UPS output voltages depend on what output configuration is chosen. Please refer to the Output Configuration section of this manual.

V

The UPS is operating in “normal mode”. Selectable to ECO, CF50, CF60, and Normal.

W

Output Voltage Adjustment (-1, -2, -3, 0, 1, 2, 3%)

X

UPS position in parallel mode

Y

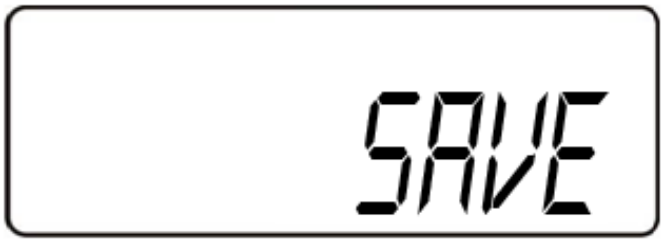
The parallel function is disabled.

- Press the scroll up key to execute special functions. The functions include buzzer ON (as in figure Q1), buzzer OFF (as in figure Q2, Alarm silence for UPS Warning), and self-test OFF (as in figure R). The UPS will execute the battery test for ten seconds. If the self-test is successful it will display figure E1; otherwise, it will display figure E2 and an error message at the same time.)

Changing the UPS Default Settings

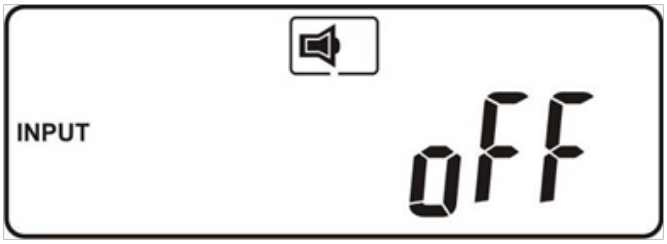
- Make sure the UPS is not "On". Press the On and scroll down keys simultaneously for approximately three seconds. The buzzer will sound twice, and the LCD will display figure Q1, indicating that the UPS is in setting mode.
- Except for Buzzer (figures Q1 and Q2) and Self-test (figure R) all of the other default settings may be changed by pressing the scroll up key.
- Figure S indicates the bypass input acceptable window. It can be 184-260 VAC or 195-260 VAC.
- Figure T indicates the bypass frequency window of the Inverter Output. The acceptable setting values are ±3 Hz and ±1 Hz.
- Figure U indicates the acceptable Inverter Output Voltage. Possible values are 200, 208, 220, 230, or 240 VAC. **The inverter output voltage needs to match the input voltage for this system.**
- Figure V indicates the operation modes of the UPS. Possible values are Online, Eco (Economy) mode, fixed 50 Hz Output, and fixed 60 Hz Output.
- Figure W indicates the adjustment of the Inverter Output voltage, which may be set to 0%, +1%, -1%, +2%, -2%, +3%, or -3%.
- Figure X indicates the position of the UPS when the UPS is in Parallel mode. Possible positions are 1, 2, 3, and 4. The position must be 1 if the UPS is not in Parallel mode.
- Figure Y indicates the parallel function status. "P 01" indicates that the parallel function is disabled, and "P 02" indicates that the parallel function is enabled.
- After changing settings you must scroll to the "SAVE" screen (figure Z) and then press the enter key to save all of your changes. Then the LCD will display figure AA to indicate completion of the setting changes. To cancel your changes rather than save them press and hold the "OFF" key for five seconds. The LCD displays figure AA directly, which indicates that your changes were canceled.

Z



Press the Enter key to save changes.

AA



The UPS is locked.

- Turn Off the Utility Input Breaker
- Your setting changes are now complete.
- Restart the UPS

Troubleshooting when the UPS is Off Due to Unknown Reasons

- If there is a serious abnormal condition the UPS will lock itself in the “OFF” position as shown in figure AA, and an “abnormal” message will appear on the LCD.
- After three seconds all messages will be locked except Bypass messages (LED ~J2 and LCD Bypass). If the Utility is abnormal after the UPS is locked the LED ~J2 will be extinguished and the LCD Bypass will appear on the LCD.
- To release the UPS lock proceed as follows:
  1. Check the recorded error messages.
  2. Check the error messages in the Troubleshooting guide to help troubleshoot the problem. For further help consult your local distributor.
  3. Press the Off ⏻ key for five seconds. A buzzer will sound twice.
  4. Turn Off the Utility Input breaker.
  5. Even if the UPS lock problem is solved now, consult with your local distributor to make sure that the error condition is resolved.

Shut Off

1. Press the Off ⏻ key for five seconds. The Inverter output will be turned off, and the output load will be supplied by the Bypass loop. The LCD will display figure B.
2. Turn Off the Utility and Bypass Input breakers.
3. The UPS is now turned off completely.

Maintenance Bypass Mode

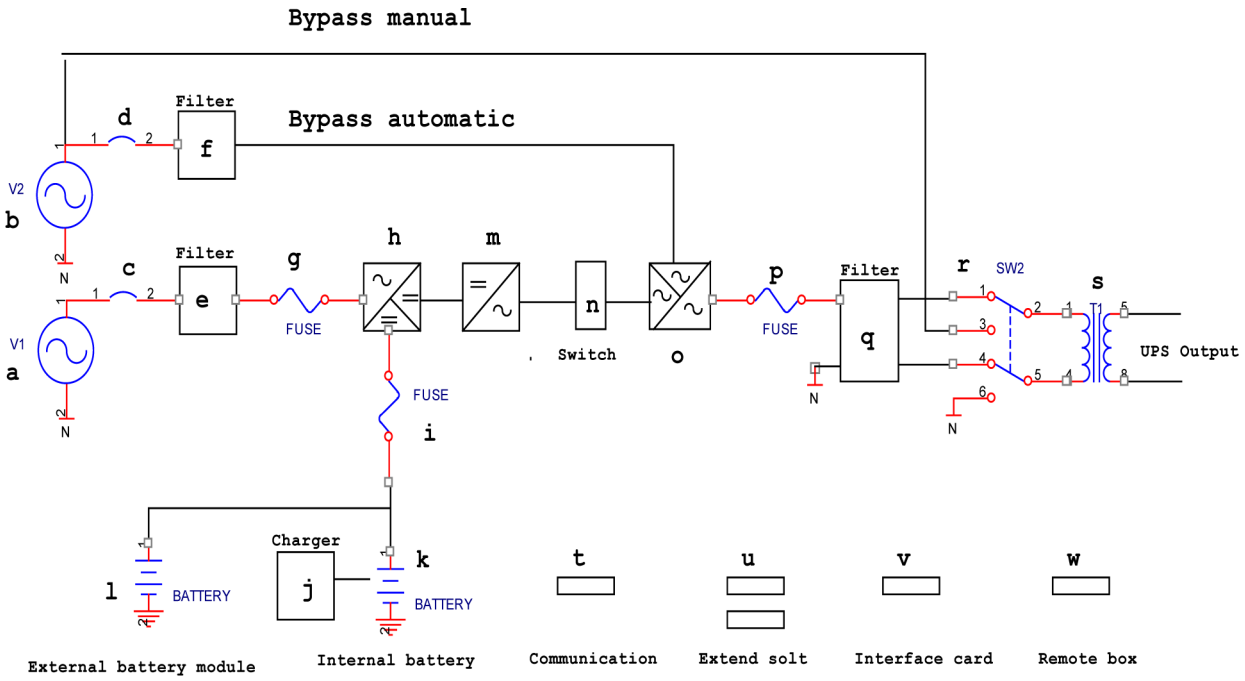
1. Maintenance Bypass Mode is for UPS maintenance only. Only authorized technicians are allowed to perform the following procedures. If there is any damage during unauthorized execution of these procedures your warranty will be void immediately.
2. Press the Off ⏻ key for approximately five seconds. The LCD will display figure B, and the UPS output will be in bypass mode.
3. Remove the cover of the CAM Switch (Maintenance Bypass Switch), then turn on the CAM Switch to

"Bypass" mode. In the upper right-hand corner of the LCD a Service sign will appear.

4. Turn off the UPS Utility breaker. You may proceed with UPS maintenance now.
5. When you are done with UPS maintenance put the UPS back into normal working mode as explained previously. Then return the CAM switch to "INV" mode, replace the cover. The UPS will switch back to inverter mode.
6. The UPS will alert for ten seconds to warn that the procedure is abnormal and may damage the UPS due to uncertain utility status. The UPS will switch back to Inverter mode immediately if you turn the CAM switch back to "INV".

System Block Diagram and PCB Wiring Diagram

System Block Diagram



a. UPS Utility Input: to provide the AC source to the UPS rectifier circuit and charger.
b. UPS Bypass Input: to provide the AC source to the UPS Bypass Input and Maintenance Bypass loop.
c. UPS Utility Input Breaker: to protect the UPS Rectifier circuit from over-current.
d. UPS Bypass Input Breaker: to protect the UPS Bypass circuit from over-current.
e. EMI Filter on UPS Utility Input : to eliminate the magnetic interference from AC Source or UPS Utility Input.
f. EMI Filter on UPS Bypass Input: to eliminate the magnetic interference from AC Source or UPS Bypass Input.
g. Fuse for UPS Utility Input: to provide over-current protection for UPS Rectifier Circuit.
h. Rectifier and Booster: When Utility is normal, they will converts the AC to DC and correct input power factor. When Utility is abnormal, the batteries will be boosted to provide the DC voltage to the Inverter.
i. Input fuse for Battery: to protect batteries when DC-Booster is out of order.
j. Charger: the battery charging device.
k. Internal Battery: When AC abnormal, it provide the backup power from the batteries.
l. External Battery Bank: To provide longer backup time by adding additional Battery bank.
m. Inverter Generator: To convert the DC voltage to AC voltage
n. Inverter Output Switch: Only when the UPS is overloaded or abnormal, or the UPS is working on ECO mode or if EPO(Emergency Power Off) is activated, the Switch will be opened.
o. Auto Bypass Loop: When the UPS is overloaded or abnormal, the UPS will Switch the UPS from inverter output to bypass output automatically.

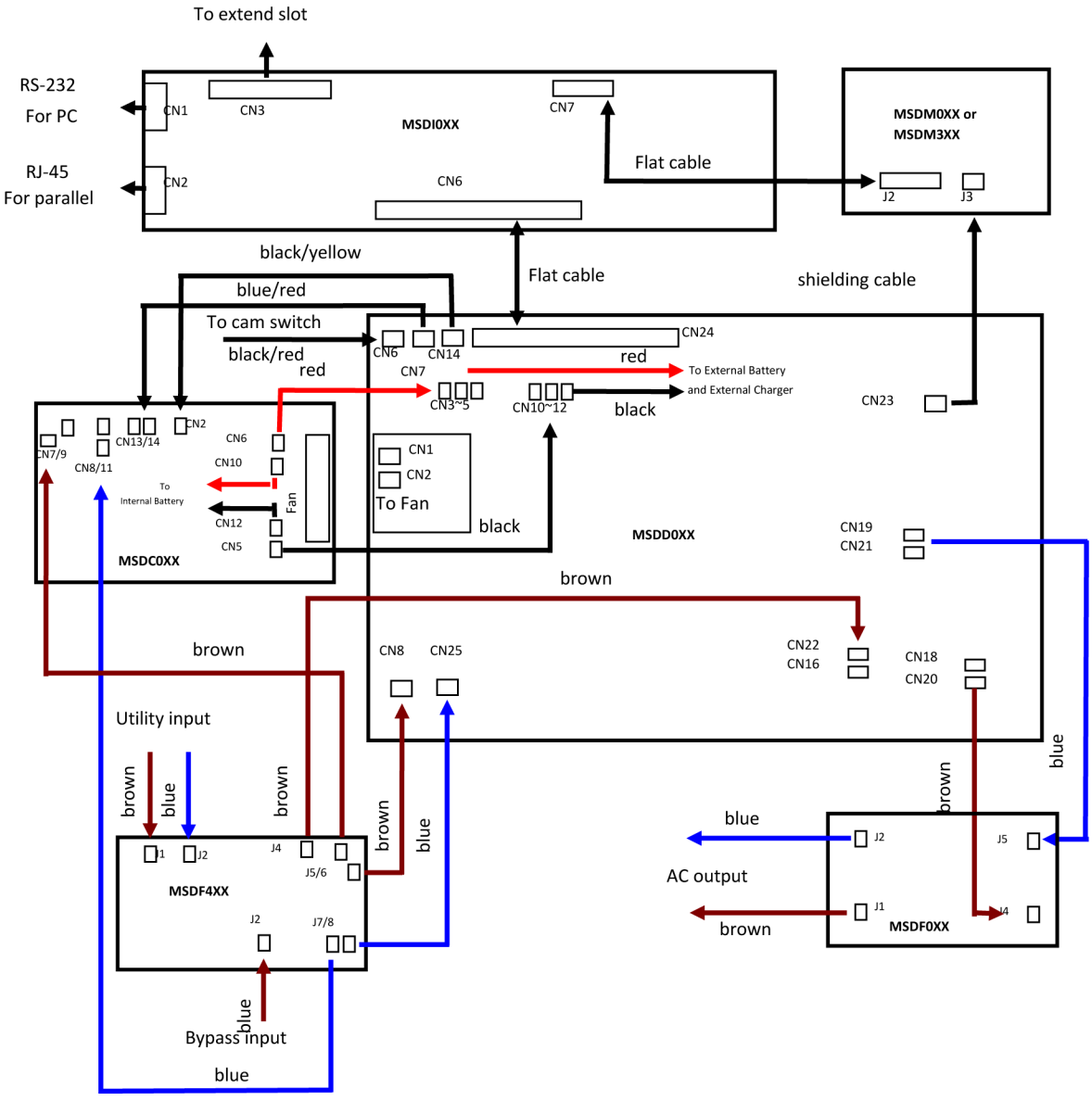
p. UPS Output Fuse: When the UPS is overloaded, the fuse will open.
q. UPS Output EMI Filter: To eliminate the magnetic interference from the UPS Output and avoid the interference caused by the output load and the UPS.
r. CAM Switch(Maintenance Bypass Switch): Through this switch, the output load can be supplied by Bypass Source, so a routine maintenance job can be proceeded without interruption of the systems connected to the output.
s. UPS Isolation Transformer:
t. Communication: RS232 serial port & RJ45 parallel port with CAN technology.
u. Optional Slots: for variety use of interfaces provided such as SNMP card, 2nd RS232, USB, Relay Contact Board, etc.
v. Optional Interface Boards: WEB/SNMP card, Dry Contact Board, RS485 card, USB card, 2nd RS232 card, etc.
w. Remote Control Box: To provide remote monitoring and control functions.

Unit Wiring Diagram

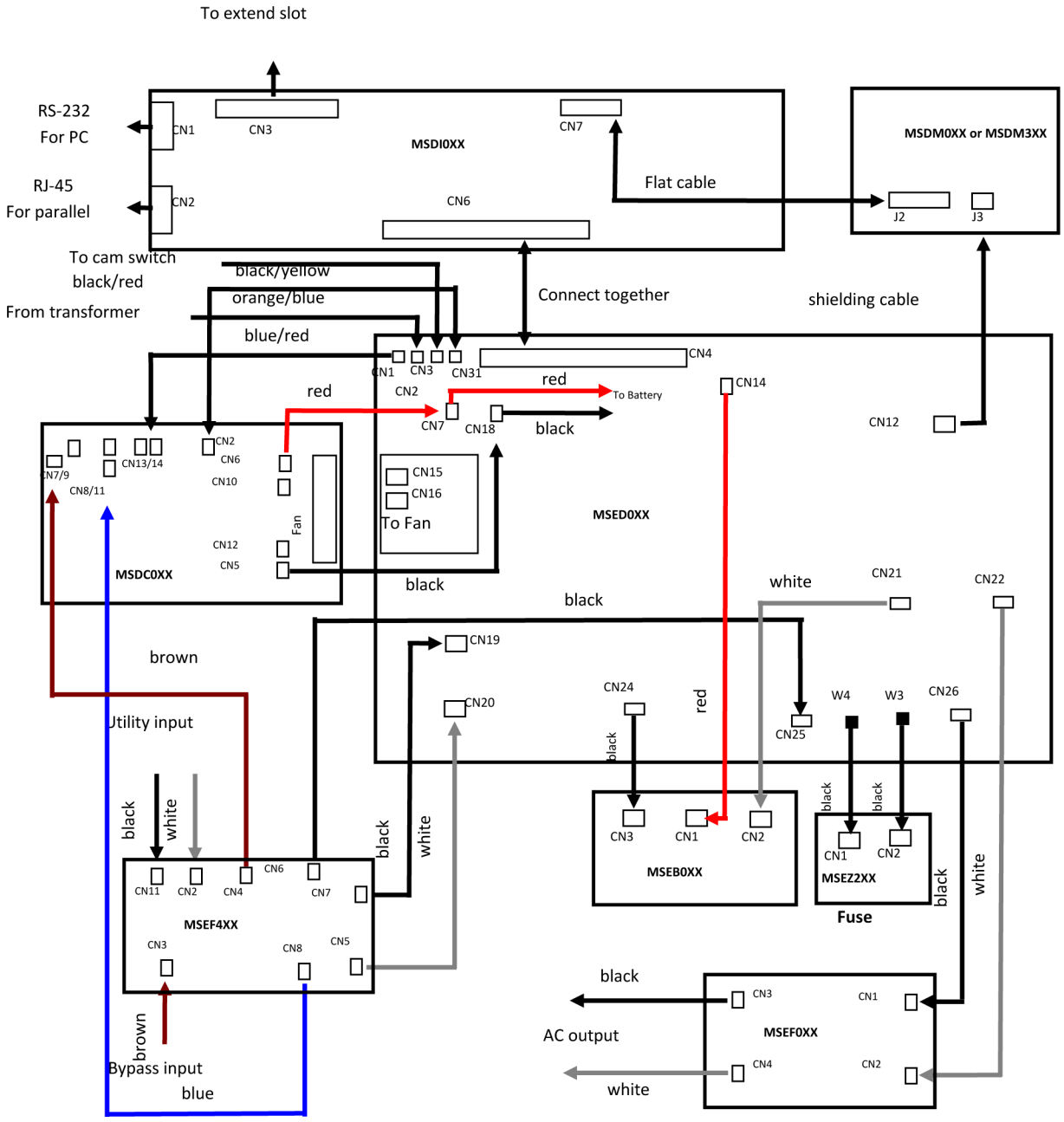
MSII series PCB boards. Please find the description as below:

Item	Description	Part No.	Function
1	Control	MSDI0XX	To generate all control signals and also AC/DC detecting signals.
2	Power(Driver)	MSDD0XX	AC/DC, DC/DC, AC/AC and circuit working power supply.
		MSED0XX	
		MSED5XX	AC/DC Rectify module
		MSFD5XX MSFD6XX	AC/DC, DC/DC, AC/AC and circuit working power supply.
3	EPO	MSXN0XX	Emergency Power Off
4	LCD Display	MSDM0XX MSDM3XX	To control and display UPS Status and values
5	Charger	MSDC0XX	Battery Charger
6	I/P EMI filter	MSDF4XX	UPS Input noise filtering and surge protection
		MSEF4XX	
		MSEF5XX	
7	O/P EMI filter	MSDF0XX	UPS Output noise filtering
		MSEF0XX	
		MSFF3XX	
8	DC Capacitor	MSEB0XX	DC Energy for Inverter
		MSFB0XX	
9	Relay	MSEK0XX	Suppress inrush current from isolated transformer
10	Fuse or Terminal	MSEZ2XX	Protect output device or Terminal for power connection

Unit Wiring Diagram of TX90/T90-6K



Unit Wiring Diagram of TX90/T90-10K



Unit Test, Calibration Setting Explanation

VR Function Explanation

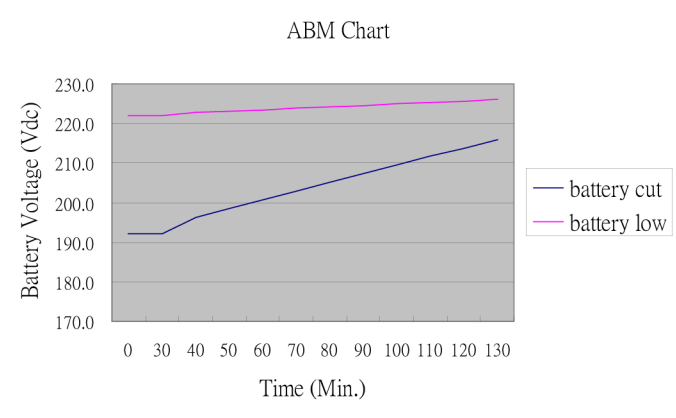
PCB Number	Function	Location
MSDC0XX	Adjust Charger Output Voltage	VR1
CHEC0XX	Adjust Charger Output Voltage	VR1

Electrical Characteristics

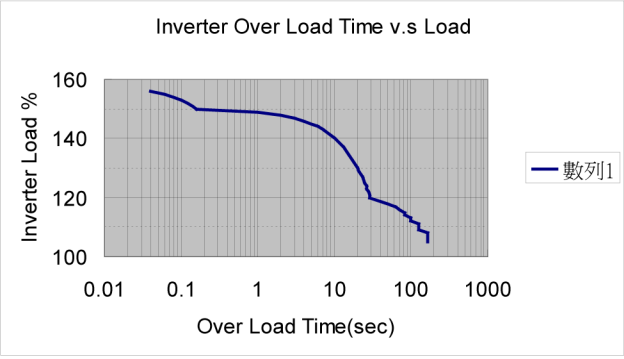
Battery Charging Voltage (25°C)

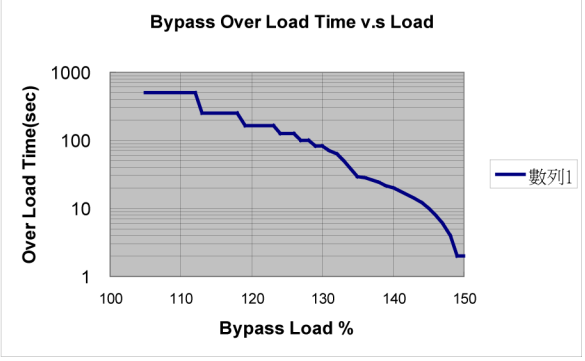
Model	Battery Charging Voltage
TX90/T90 6kVA & 10kVA	273.0Vdc

Battery Low Warning and Battery Cut-off

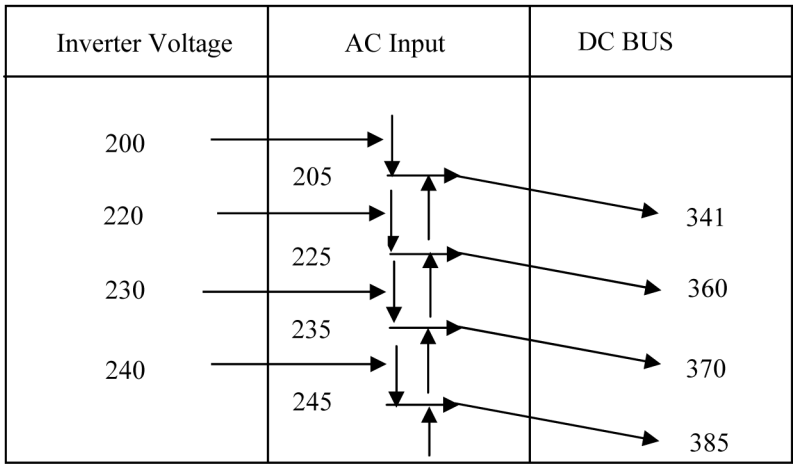


Overload time out versus Inverter mode and Bypass mode





DC BUS Voltage Regulation



Startup Procedure for Debug UPS

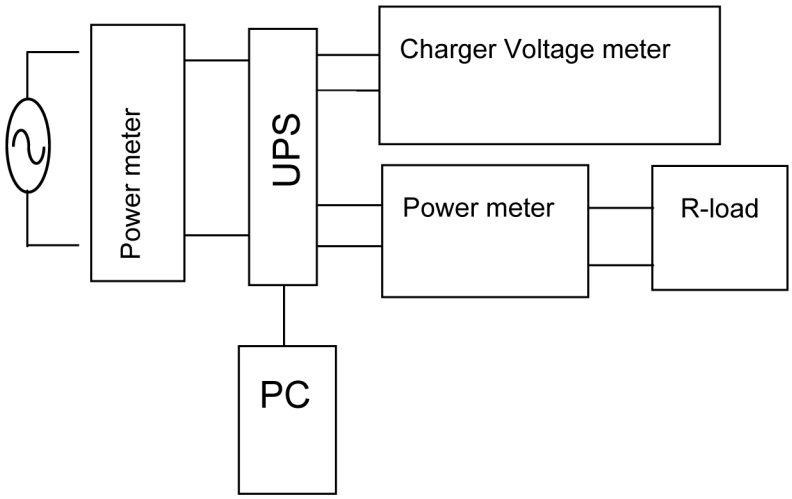
- Connect an AC 220Vac/50(60)Hz onto L11 & L12.
- Remove the output loads connected to the UPS and remove the battery connecting wires of the UPS.
- Remove the Fuse of utility input (TX90-6K : F2 of the MSDD0XX PCB, TX90-10K : F1 and F2 of the MSEF4XX).
- Remove the control wires CN13 & CN14 of the MSDC0XX PCB and measure the DC Bus voltage by using multi-meter. (MSDD0XX PCB: Bus + is to measure CN19 to the upper end of C38 and Bus – is to measure CN19 to the upper end of C37, MSEB0XX PCB : Bus + is to measure CN1 to CN2 and Bus – is to measure CN2 to CN23.)
- Turn off CB2 and turn on CB1 for 6K/10K, utility breaker for 20K.
- Push key pad and key pad for approx. 3 seconds till buzzer beeps twice, then the UPS will go to service mode.
- Push key pad for a second till the buzzer beeps twice, and LCD displays from Sr01 to Sr02. Measure the waveform of the PFC and Inverter IGBT gate, it shall be a square wave with voltage/frequency at -6Vdc ~ +15Vdc / 20KHz, then buzzer will beep once.
- Push key pad for a second till buzzer beeps twice. The LCD displays from Sr02 to Sr03, then the UPS proceeds the 1st stage soft start, which means charger is charging the BUS + & -, then buzzer will beep once.
- Push key pad for a second till buzzer beeps twice. The LCD displays from Sr03 to Sr04, then the UPS proceeds the 2nd stage soft start, which means battery SCR is turned on to charge the BUS + & -, then the buzzer will beep once.
- Push key pad for a second till buzzer beeps twice. The LCD displays from Sr04 to Sr05, then UPS proceeds the 3rd stage soft start, which means the DC voltage is boosted up to the desired voltage, then the buzzer will beep once.
- Push key pad for a second till buzzer beeps twice. The LCD displays from Sr05 to Sr06, then the UPS proceeds the voltage setting from Inverter Soft Start to Inverter Output, then the buzzer will beep once.
- Push key pad for a second till buzzer beeps twice. The LCD displays form SR06 to OFF, then the UPS proceeds DC Bus discharging. The UPS will shut itself off automatically after discharged.
- Turn off CB1 and put the Fuse of utility input back.
- Turn on both CB1 and CB2
- The LCD displays “oFF”, then measure the output of the UPS is nominal voltage such as 220Vac/50(60Hz) or not.
- Adjust the voltage of Bypass Input at 170Vac/50(60)Hz and check if the UPS output voltage is near 0Vac?
- Adjust the voltage of Bypass Input at nominal voltage such as 220Vac/50(60)Hz.
- Push key pad for 3 seconds until buzzer beeps twice, then the UPS proceeds AC start procedure. When self-test is executed completely, the UPS will switch from bypass output to Inverter output. Measure the

UPS output waveform to see whether it is stable.

- Change the frequency of Utility to 56Hz, the UPS will switch to Backup Mode automatically.
- UPS will go back to Utility mode once the Utility frequency goes back to 50Hz.
- Connect the control wire of the Charger and push the function key to execute self-test, then the UPS will detect this abnormal condition and display battery abnormal on the LCD.
- Use Scroll up key pad and Scroll down key pad to see if any abnormal display content or values on the LCD panel.
- Push key pad for 5 seconds until buzzer beeps twice, then UPS will shut off and close the input of Utility.
- Your UPS Unit test is done completely.

UPS Inverter Output Balance Check

Connect the UPS as shown below

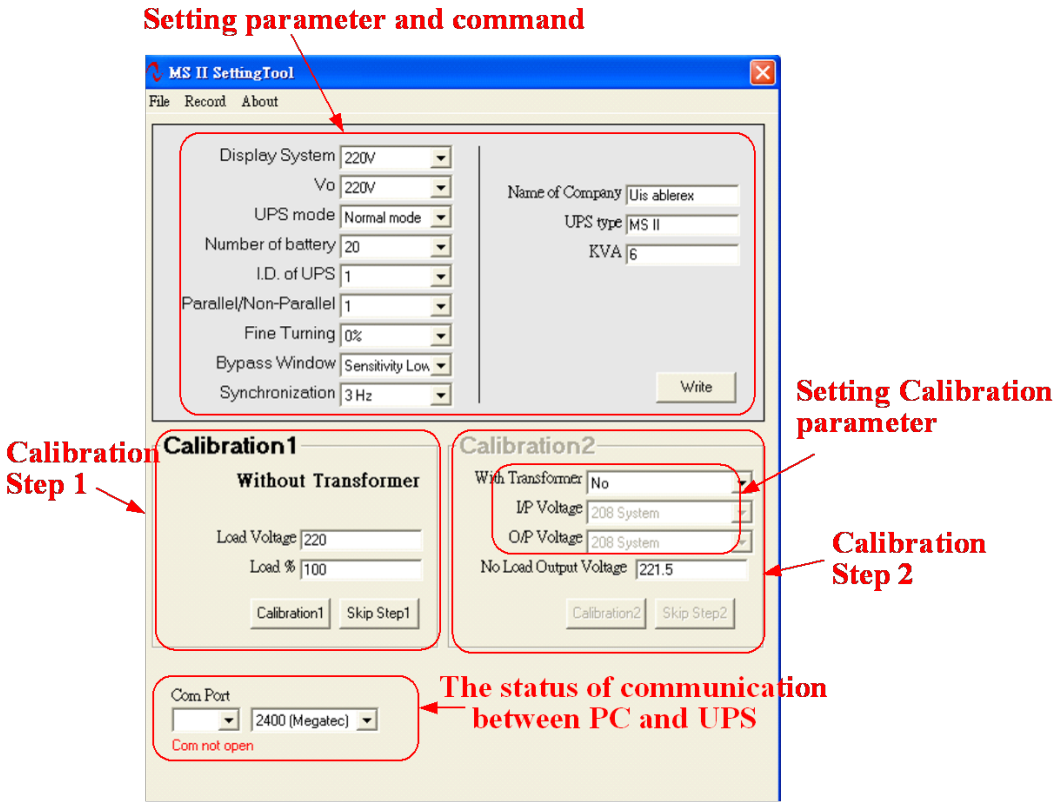


- Disconnect the isolation transformer if any; otherwise, it is not possible to measure whether the UPS output waveform is in balance or not.
- Connect a 220Vac/50(60)Hz to the UPS to start up the UPS and make sure it is on Line Mode.
- Without output load connected, please connect a fixture in parallel.(The fixture is made with 1M ohms resistors and 1uF/63V capacitor in serial. Then, measure the two ends of 1uF/63V capacitor to see whether the DC voltage is below 20mV.
- Connected a 6Kva/4200W resistor load to the output and repeat.

Unit Calibration and Setting Procedure

General Parameter Setting Procedure

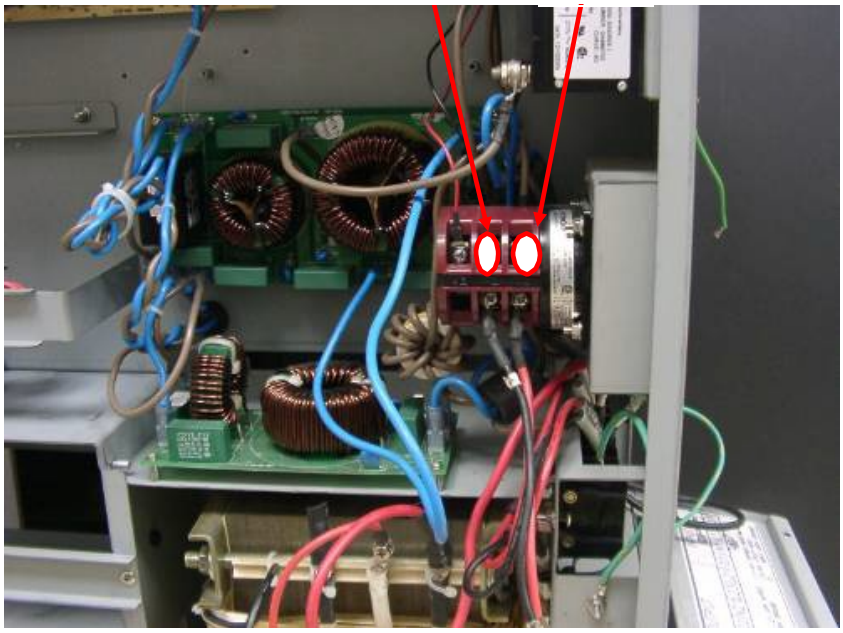
- Please connect the UPS.
- Connect a 50/60Hz 220Vac source to the UPS, start up the Utility and Bypass breakers on the rear panel as well the Inverter Switch on the front panel.
- Connect the RS232 cable to the UPS and computer, then execute MSII Setting tool program.(MAKE SURE THAT THE PROGRAM IS INSTALLED COMPLETELY, BEFORE THIS SETTING PROGRAM IS IN USE.)



- Enter the desired parameter to the “Setting parameter and command” then click “write” icon. If buzzer beeps twice, it means your setting is successful.
- If the buzzer beeps continuously, it means your setting is in failure.

Calibration: It is divided into two parts, one is front panel calibration and the other is PC calibration

Notice: The calibration with load connected doesn’t include the power loss of the galvanic isolation transformer; therefore, the load can only be connected behind the output filter as indicated as A & B (the UPS with galvanic isolation transformer or the output terminal bar(the UPS without galvanic isolation transformer.)



Calibration from the Front Panel

Notice: For No load Inverter calibration, you are required to use the setting software to do it. The Calibration from the front panel is just only for the calibration with load connected.

- Connect the UPS as figure.
- Connect a AC 1ϕ220Vac/50(60)Hz / 3ϕ380Vac/50(60)Hz source to the UPS input and adjust the charging voltage to 273.7Vdc. (Make sure the batteries are disconnected.)
- Turn on CB1 & CB2, Press key & key on the front panel simultaneously to make the UPS into the calibration mode (The "N+1"LED lit means the UPS is working under Calibration Step 1 now).
- Use key key key & key on the front panel to proceed calibration and setting.
- Enter correct voltage & load%, then press key to go into self-calibration.

The functions of those key pads are:

key: +/- adjustment
key: next item
key: Your adjustments are done completely, new data is written into EEPROM, then Escape from the Calibration mode. If the UPS beeps twice, it means your Setting is successful; on the contrary, if the UPS beeps continuously, it means your setting is in failure.
key: Give up this calibration and turn off the UPS.

Adjustable Parameters

Adjustable Items	Specifications	Remarks
AC Input Voltage	1ϕ220Vac(3ϕ380Vac)	Including Rectified & Bypass input
Inverter Voltage	220Vac	
Load %	>30%	
Battery Voltage	273.0Vdc	

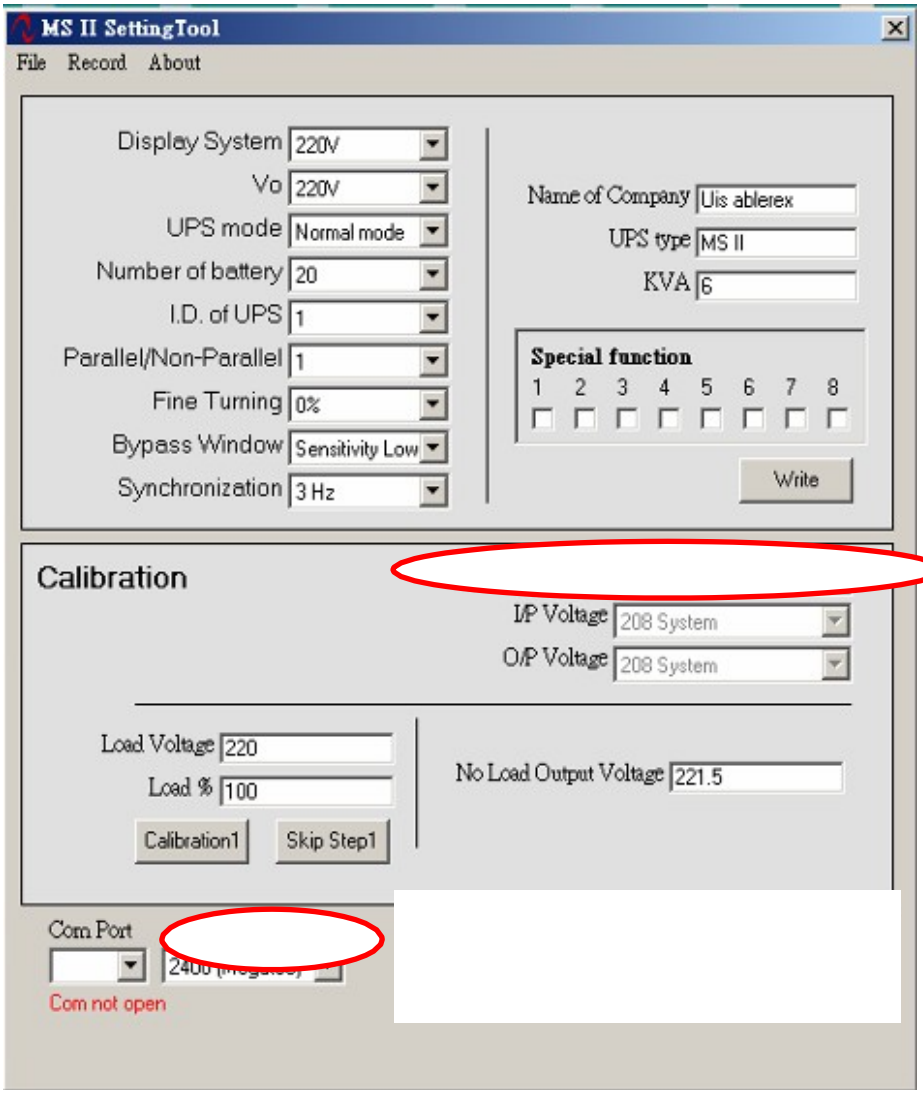
- The UPS will escape from the calibration mode if the calibration is not finished in 10 minutes and go to shutdown automatically and show "Line OFF" on LCD panel.
- Tuning the values shown on the LCD display are the same as that on the meter, then you may go to next Calibration item.
- The load% on LCD panel means the higher value of VA or W; therefore, you are recommended to use Resistance Load to go for calibration. To make sure the calibration is precisely, you are also recommended to use full load to calibration the UPS
- The sequence of the LCD display is shown as Output Volt ← → LOAD%.
- After all the items desired are calibrated, press key and write them into EEPROM.
- When the UPS beeps twice, the UPS will go to shutdown and show "Line OFF"on the LCD panel.
- And then re-start the UPS to check if all values which have been calibrated on the LCD panel is the same as those on the Power Meter.
- If the buzzer beeps intermittently and continuously, it means your calibration is in failure.

Caution:

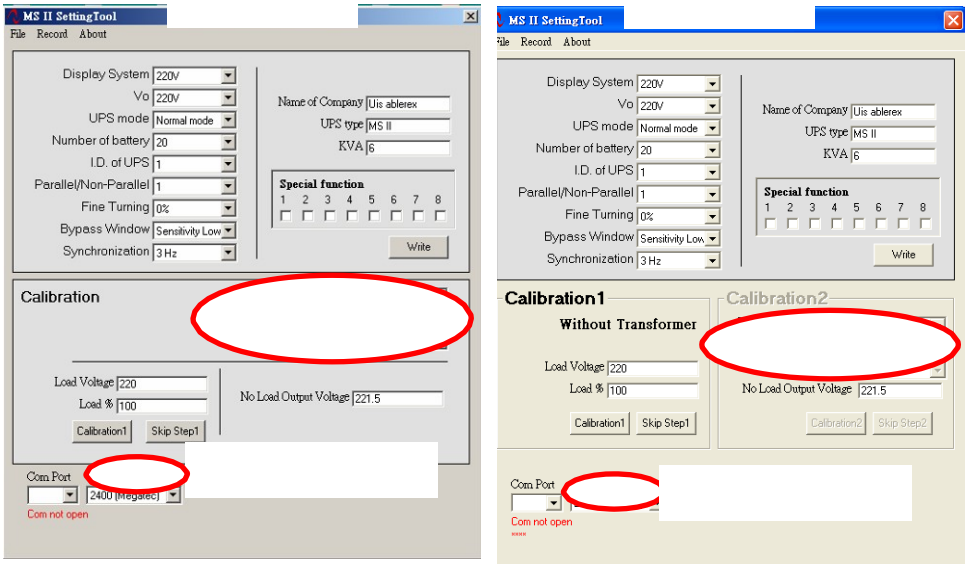
- You are suggested to connect with 80% to 100% load in order to make sure the tolerance of the calibrated values will be smaller and the values will be more accurate. All values can be calibrated except the value of load% if the output load of UPS are less than 30% when you proceed calibrated action.
- Make sure the tolerance of the adjustable range will be less than 8% for Voltage and 15% for Load; otherwise, the setting will be in failure and the error code will be shown on the LCD panel.
- The values of both "load%" and "output voltage" must be round to Integer.

PC Calibration

Set the communication baud rate to 2400. Set “With Transformer” in the calibration setting to “No” as shown below.



- Connect a resistance load to point A and point B
- Fill in the values of the voltage and load% measured from the Power Meter into Calibration Step 1, then click “ Calibration1” icon.
- If the buzzer beeps intermittently and continuously, it means your calibration is in failure. You may click “skip step 2” icon and repeat
- If the buzzer beeps twice, it means the Calibration Step 1 is done successfully, then you may enter into Calibration Step 2. (The ”ECO”LED light up to indicate the UPS is working under the Calibration Step2).
- Remove the load to “Null” status, then remove the power meter to the output of the terminal block of the UPS.
- Set a correct wiring diagram of the output transformer from the “Setting Calibration parameter” menu indicated as below.



- Fill the output voltage measured by the power meter to Calibration Step2, then click ”Calibration2” icon.
- Press Calibration 2 icon after the figure is filled, then buzzer will beep twice to show the calibration is complete.
- After calibration, the output voltage will be changed and remained for approx. 4 seconds. Please quickly check with Power meter if the output voltage shown as below:
- The output voltage shall be 220.7 +/-0.3V (220.4V~221.0V) if no transformer is installed.
- Otherwise, please refer to the followings if there is a transformer installed.

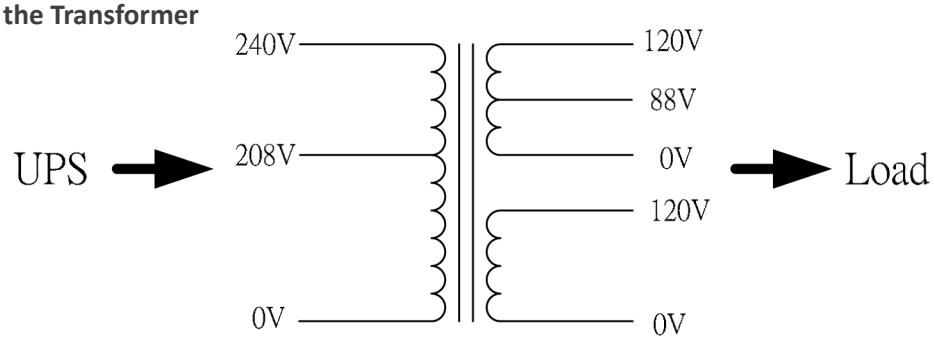
Setting calibration parameter	Output Voltage Range
I/P → Else system, O/P → 240V system	225.0 +/-0.3V (224.7V~225.3V)
I/P → Else system, O/P → 120V system	112.5 +/-0.3V (112.2V~112.8V)
I/P → 208V system, O/P → 208V system	225.0 +/-0.3V (224.7V~225.3V)
I/P → 208V system, O/P → 120V system	129.8 +/-0.3V (129.5V~131.1V)

Caution:

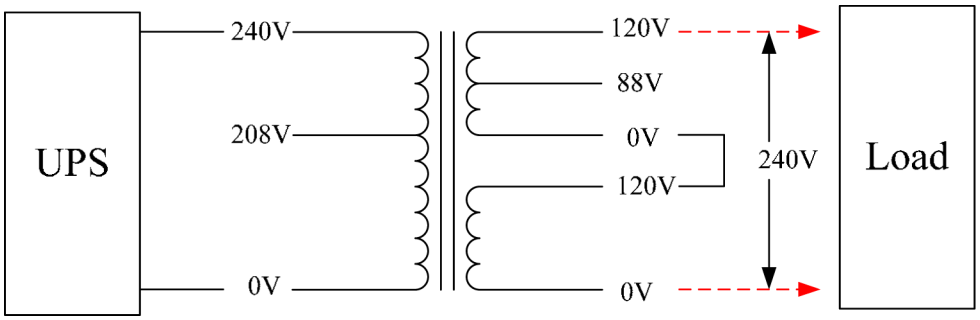
- You are suggested to connect with 80% to 100% load in order to make sure the tolerance of the calibrated values will be smaller and the values will be more accurate. All values will be calibrated except the value of load% if the output load of UPS are less than 30% when you proceed calibrated action.
- Make sure the tolerance of the adjustable range will be less than 8% for Voltage and 15% for Load; otherwise, the setting will be in failure and the error code will be shown in the LCD panel.
- The UPS will escape from calibration mode if the setting is not complete in 10 min. after the UPS is in the calibration mode.
- The values of both “load%” and “output voltage” must be round to Integer.
- **The input voltage in the Calibration 2 shall be accurate; therefore, make sure you will round the value to 1st decimal place.**

The Wiring Diagram of the Transformer (The red lines indicated below are for the connections of the no load in calibration.)

The Structure of the Transformer

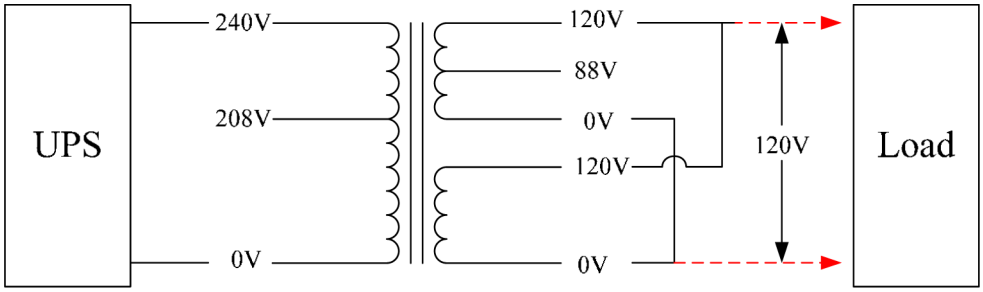


Input Coil: 0V~240V, Output Coil: 0V~240V
Calibration2 Block: I/P Voltage → Else system, O/P Voltage → 220V system



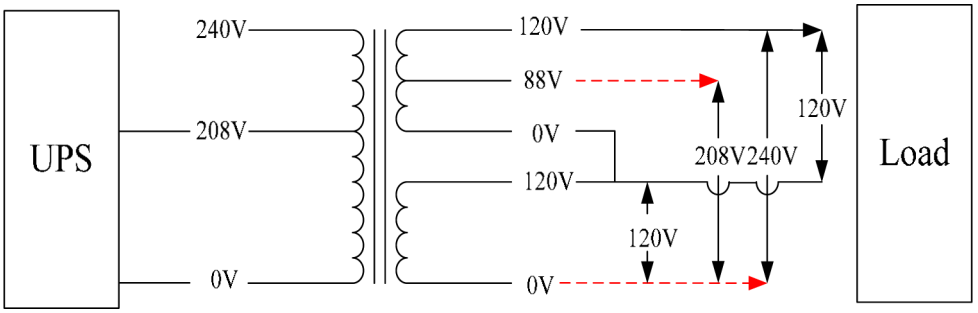
The turns ratio of Primary and Secondary of the transformer is 1 to 1.

Input Coil: 0V~240V, Output Coil: 0V~120V
Calibration2 Block: I/P Voltage → Else system, O/P Voltage → 120V system



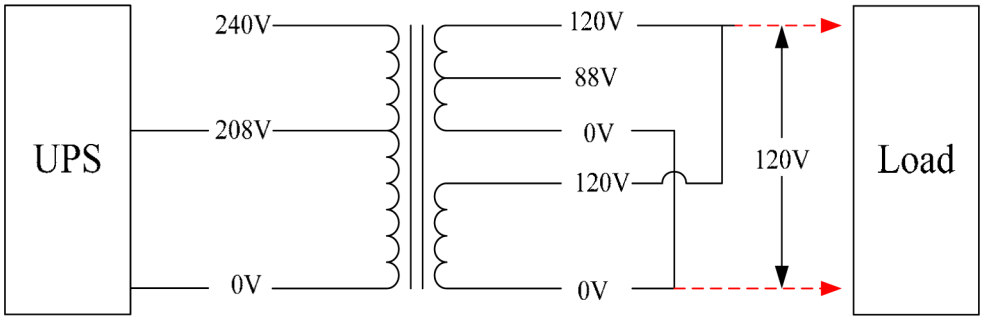
The turns ratio of primary and secondary of the transformer is 2 to 1.

Input Coil: 0V~208V, Output Coil: 0V~208V
Calibration2 Block: I/P Voltage → 208V system, O/P Voltage → 208V system



The turns ratio of Primary and secondary of the transformer is 1 to 1.

Input Coil: 0V~208V, Output Coil: 0V~120V
Calibration2 Block: I/P Voltage → 208 system, O/P Voltage → 120V system



The turns ratio Primary and Secondary of the transfomer is 208 to 120.

Frequency Converter (CVCF Mode) Setting Notice

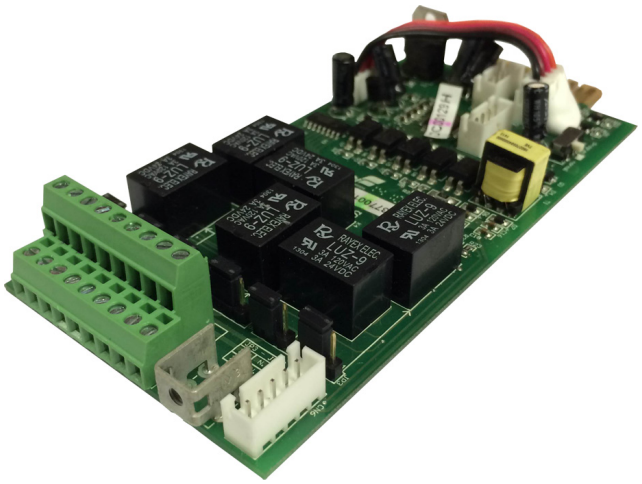
The UPS can be set as Frequency Converter(CVCF mode). If the UPS is Dual Input Model, you have to make sure the Bypass Input Breaker is set at “OFF” position; on the contrary, if the UPS is Single Input Model, you have to remove the power wire of the Bypass Input.

Optional Interface Cards

Relay (Dry Contact) Card

Pin assignments of 10-pin terminal:

1	2	3	4	5	6	7	8	9	10

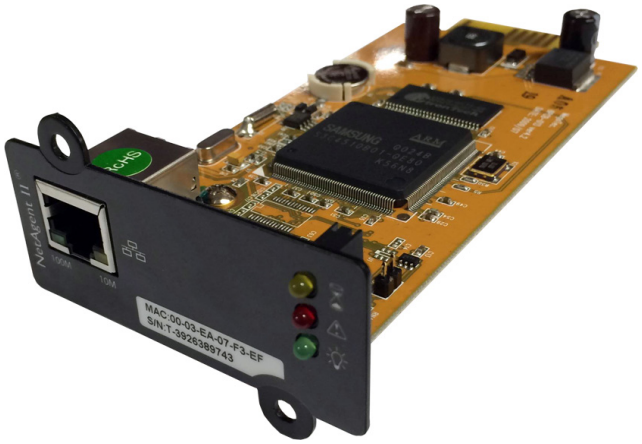


Pin 1: UPS on Bypass mode
Pin 2: Utility Abnormal
Pin 3: Utility Normal
Pin 4: Inverter On
Pin 5: Battery Low
Pin 6: Battery Bad or Abnormal
Pin 7: UPS Alarm
Pin 8: Common
Pin 9: Shutdown UPS positive (+) signal
Pin 10: Shutdown UPS negative (-) signal

- The shutdown function will be activated after +6~+25 VDC is applied between pin 9 and pin 10 for 5 seconds.
- The capacity of each relay contact is 40 VDC/25mA.
- Installation Position: slot 1 (CHA-CN7) or slot 2 (CHB-CN8)
- Flexible signal output for N.C. (Normal close) or N.O. (Normal open) contact by shorting pins 1-2 or pins 2-3 from JP1-5
- The shutdown function will be enabled 1 minute after blackout occurs if pins 1-2 of both CN1 and CN6 are shorted. Otherwise the shutdown function can be enabled only by pins 9-10 of CN3 if pins 2-3 of both CN1 and CN6 are shorted.

SNMP Card

- Net Agent II Internal Card
- For installation please refer to the card's user manual.
- Position: slot 2 (CHB)



Interface Card Installation

1.

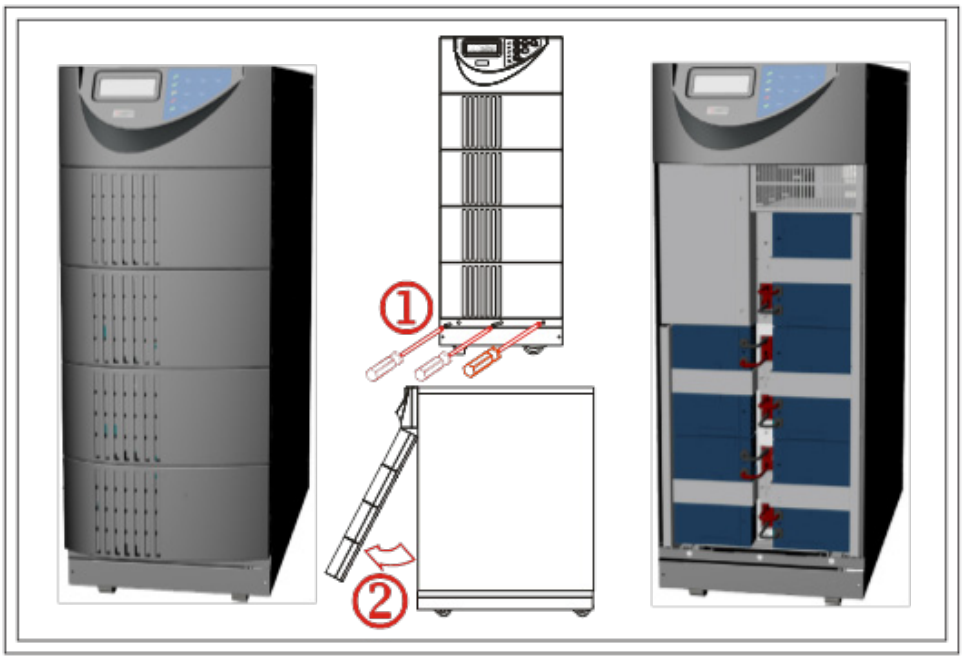
3.

2.

Replacing Batteries

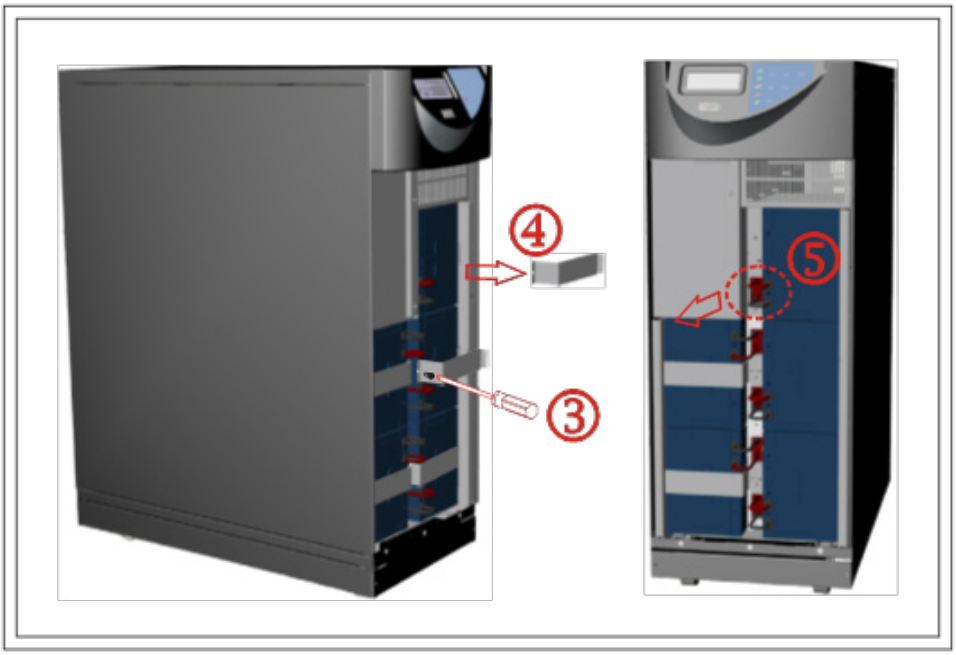
To be performed by qualified personnel only

1. Unscrew the bottom of the front panel as indicated in Step 1 below.
2. Remove the front panel as indicated in Step 2.

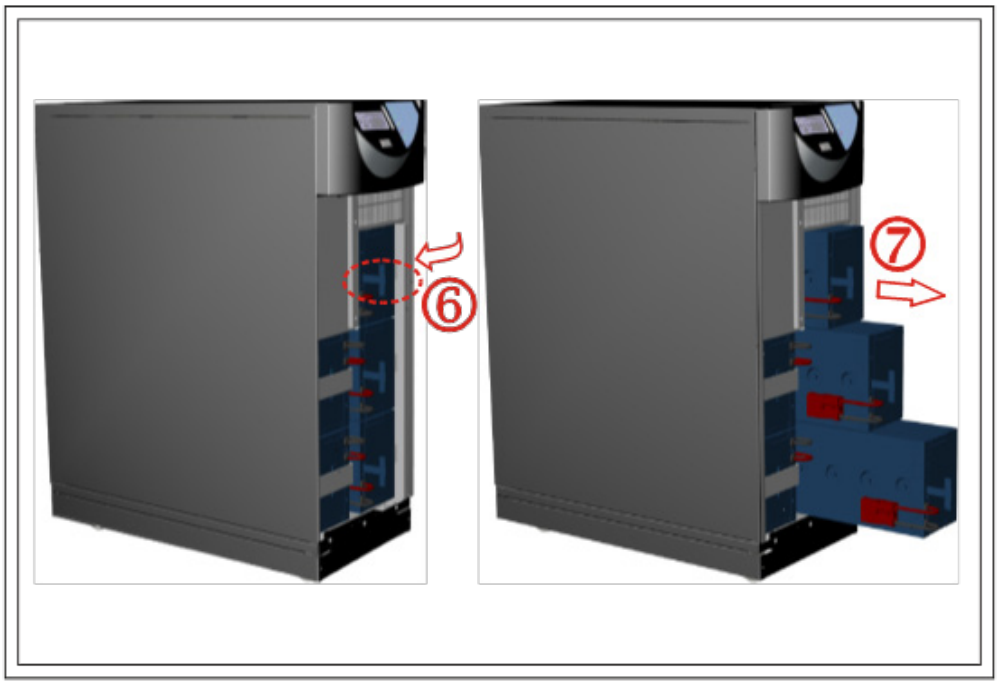


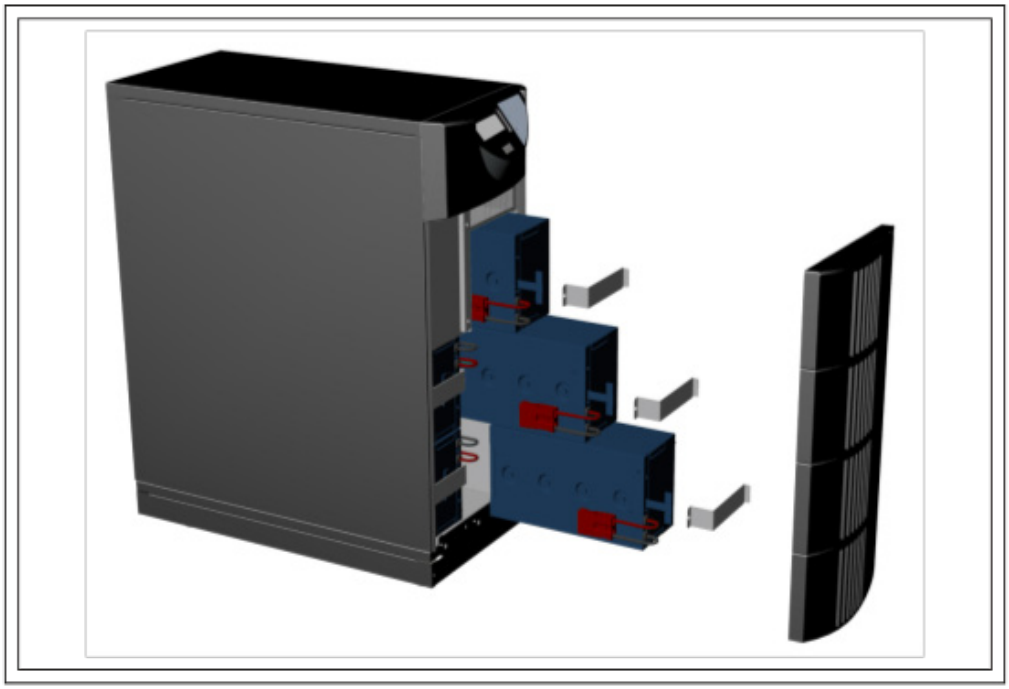
TX90-6K shown above

3. Remove the screw of the battery pack fastener as shown in Step 3.
4. Remove the fastener as shown in Step 4.
5. Unplug the hot-swappable battery connectors as shown in Step 5.



6. Rotate the battery pack handle 90 degrees as shown in Step 6.
7. Remove the battery packs from the UPS as shown in Step 7.





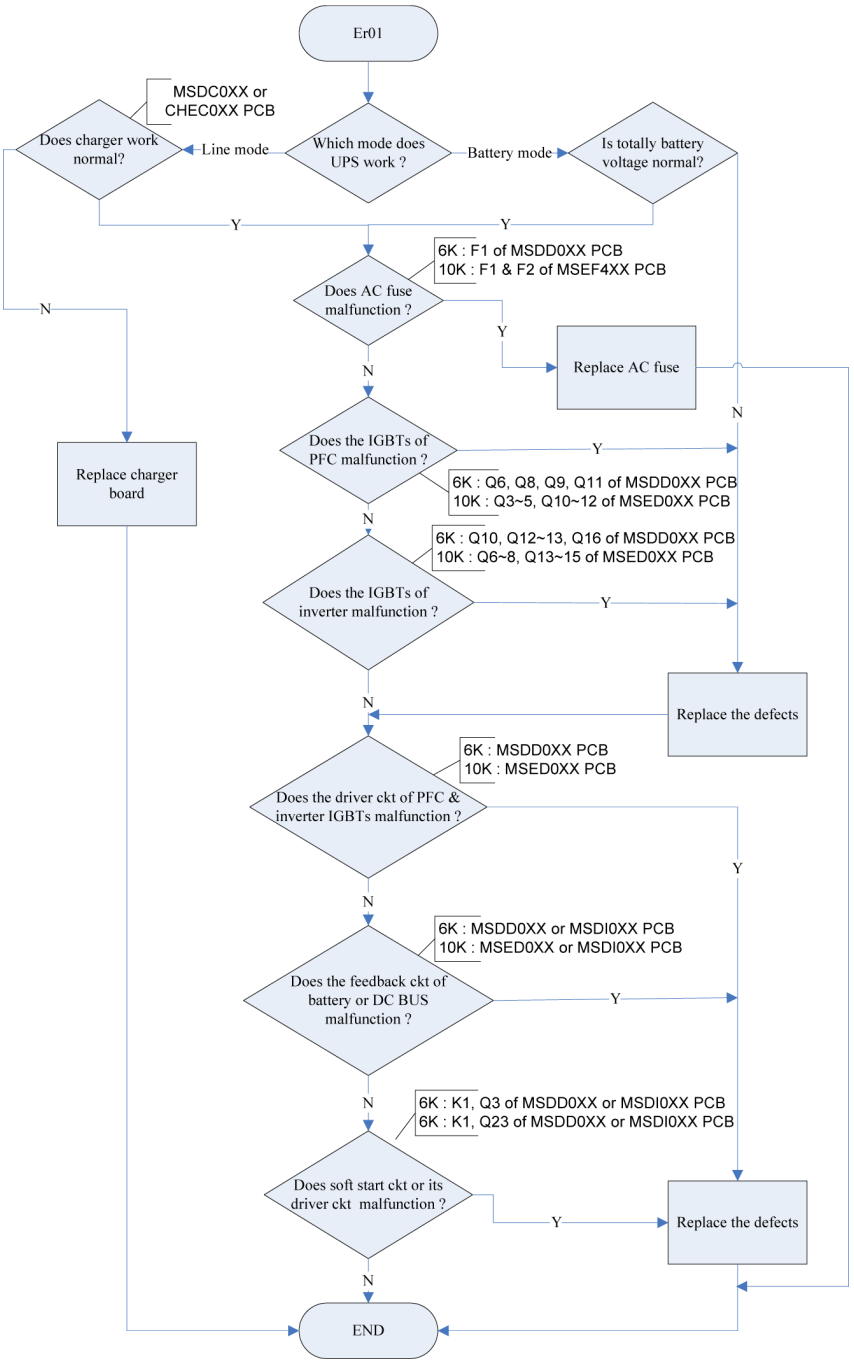
Troubleshooting

If there is a abnormal condition occurred, the LCD display will show an error code as indicated at Chapter 1. Please follow the troubleshooting indicated below.

Error Code Er01

Definition: The UPS is in the 1st stage soft start procedure, but the DC bus voltage can not reach 50Vdc within 5 seconds, or can not reach anticipative charging voltage (about either present 80% of battery voltage or present output voltage of charger) within 30 seconds.

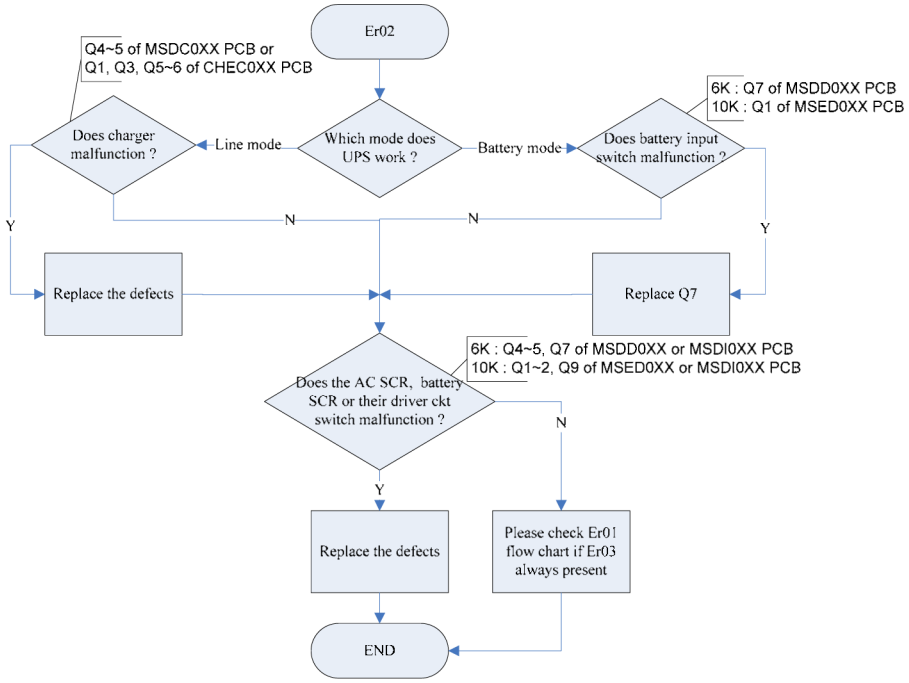
Flow Chart



Error Code Er02

Definition: The UPS is in 2nd stage soft start procedure, but the DC Bus can not reach and maintain anticipative charging voltage after 2 seconds (approx. present 85% of peak voltage of utility, either present 80% of battery voltage or output voltage of charger).

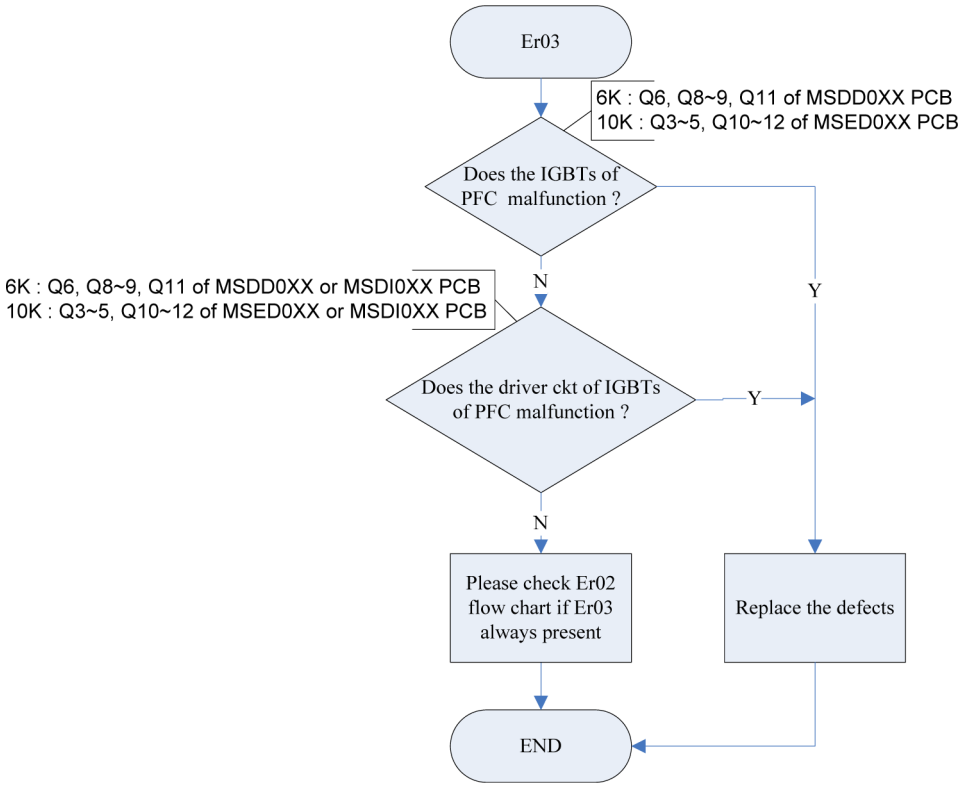
Flow Chart



Error Code Er03

Definition: The UPS is in 3rd stage soft start procedure, but the DC bus voltage can not reach to anticipative charging voltage within 30 seconds.

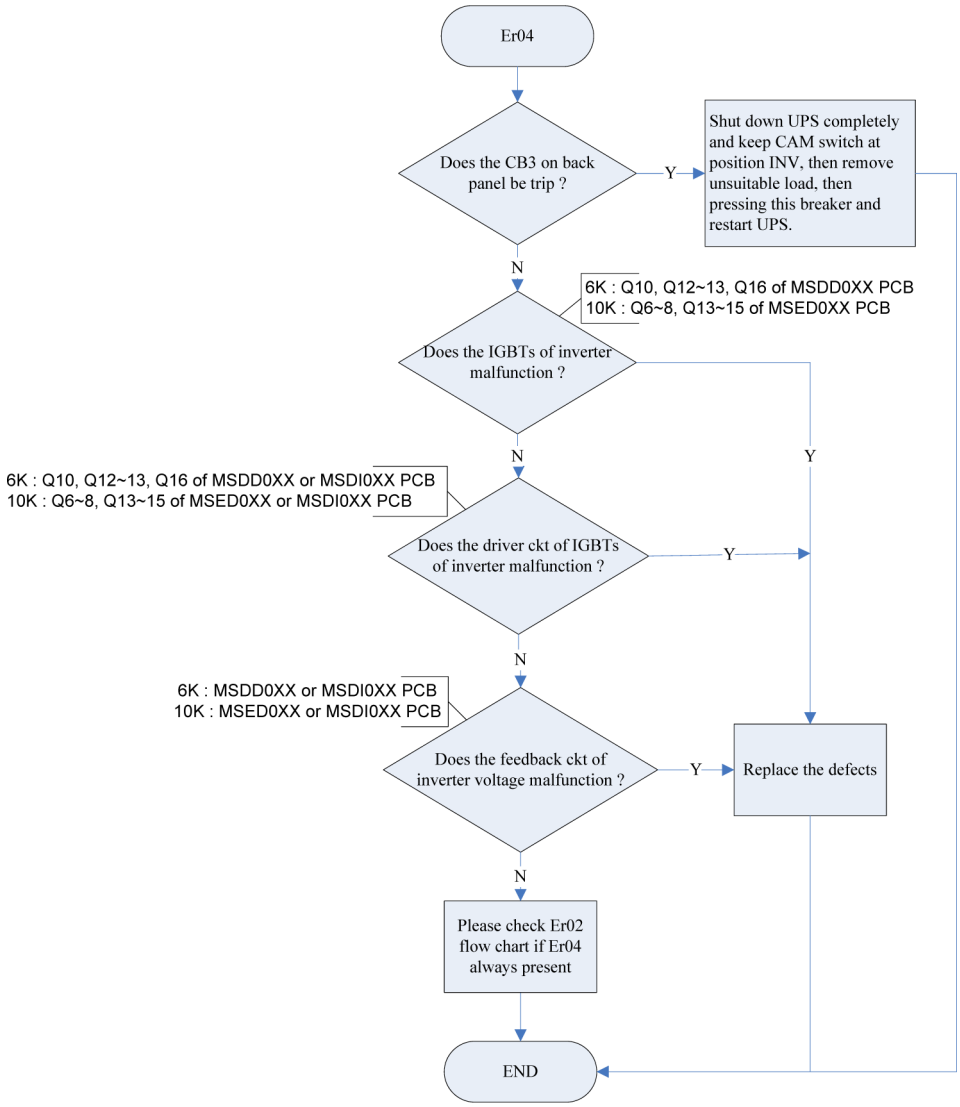
Flow Chart



Error Code Er04

Definition: It means the UPS Inverter Output is Abnormal.

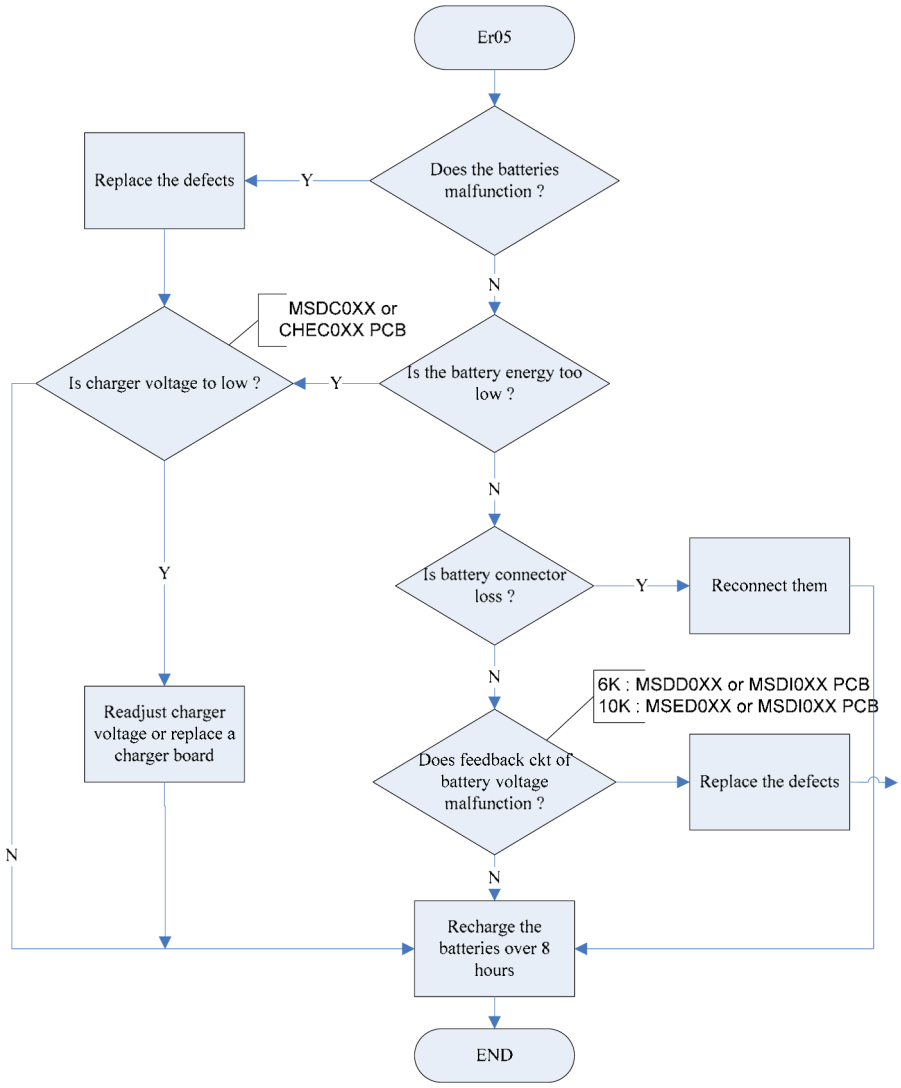
Flow Chart



Error Code Er05

Definition: It means the battery is weak or bad after self test is executed.

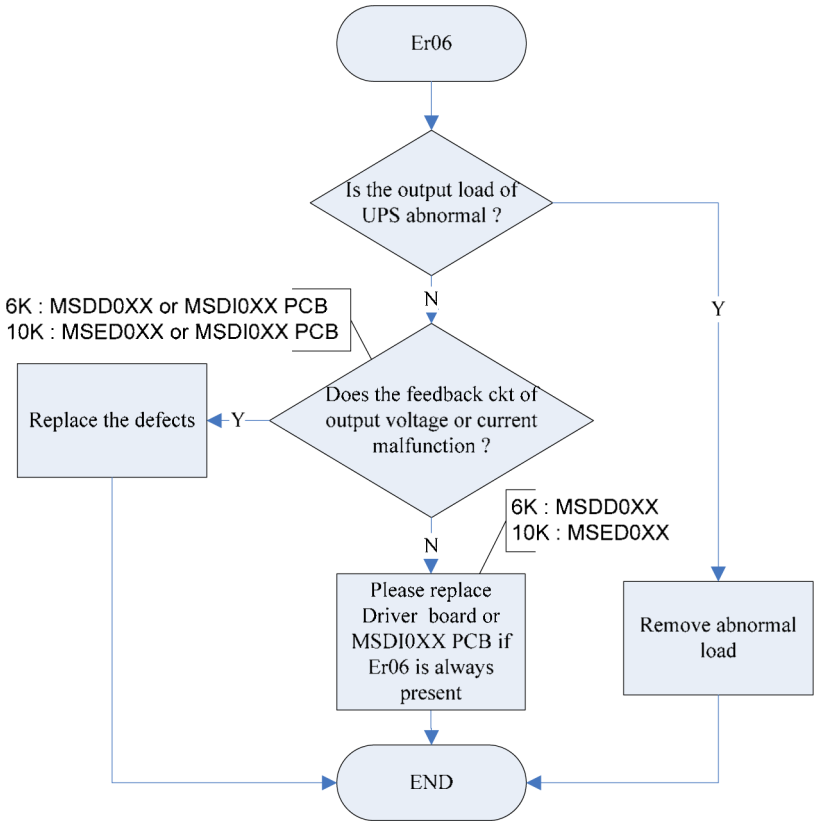
Flow Chart



Error Code Er06

Definition: It means the UPS is protected from short-circuited.

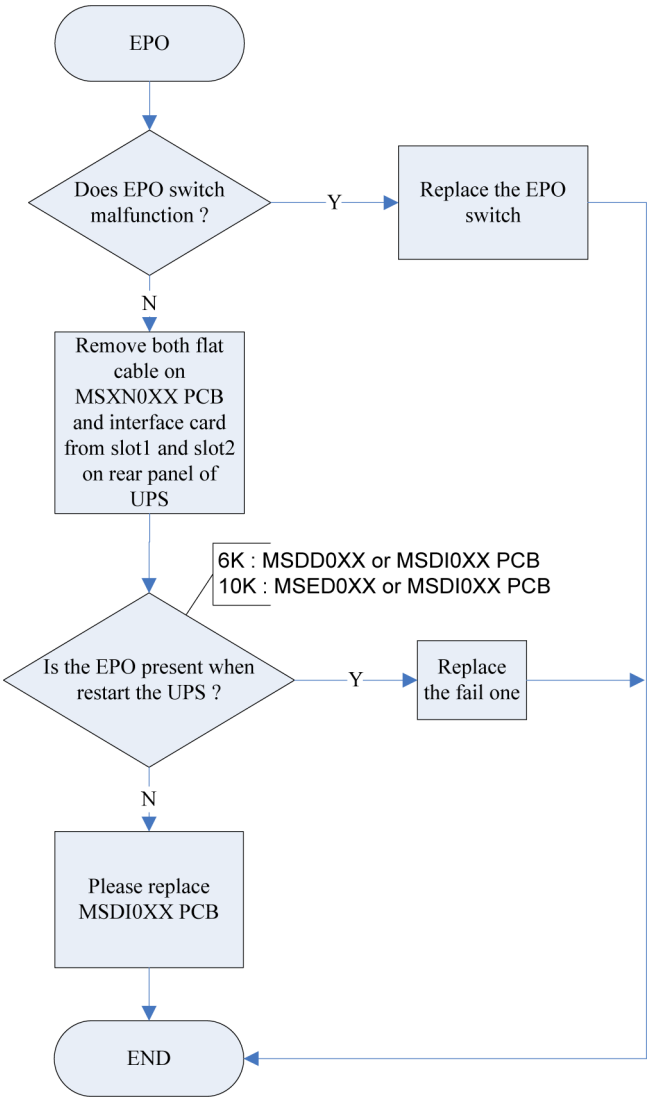
Flow Chart



Error Code EPO

Definition: It means the UPS enters into EPO (Emerge Power Off) mode.

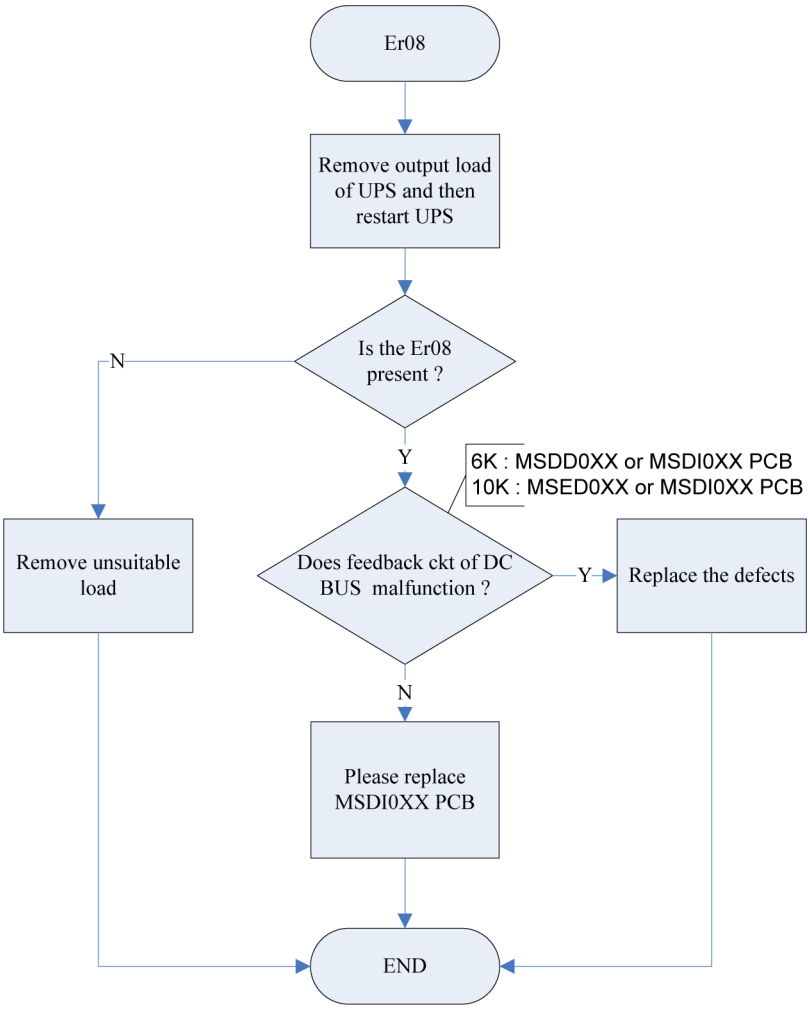
Flow Chart



Error Code Er08

Definition: It means the DC Bus of the UPS is protected from over-voltage.

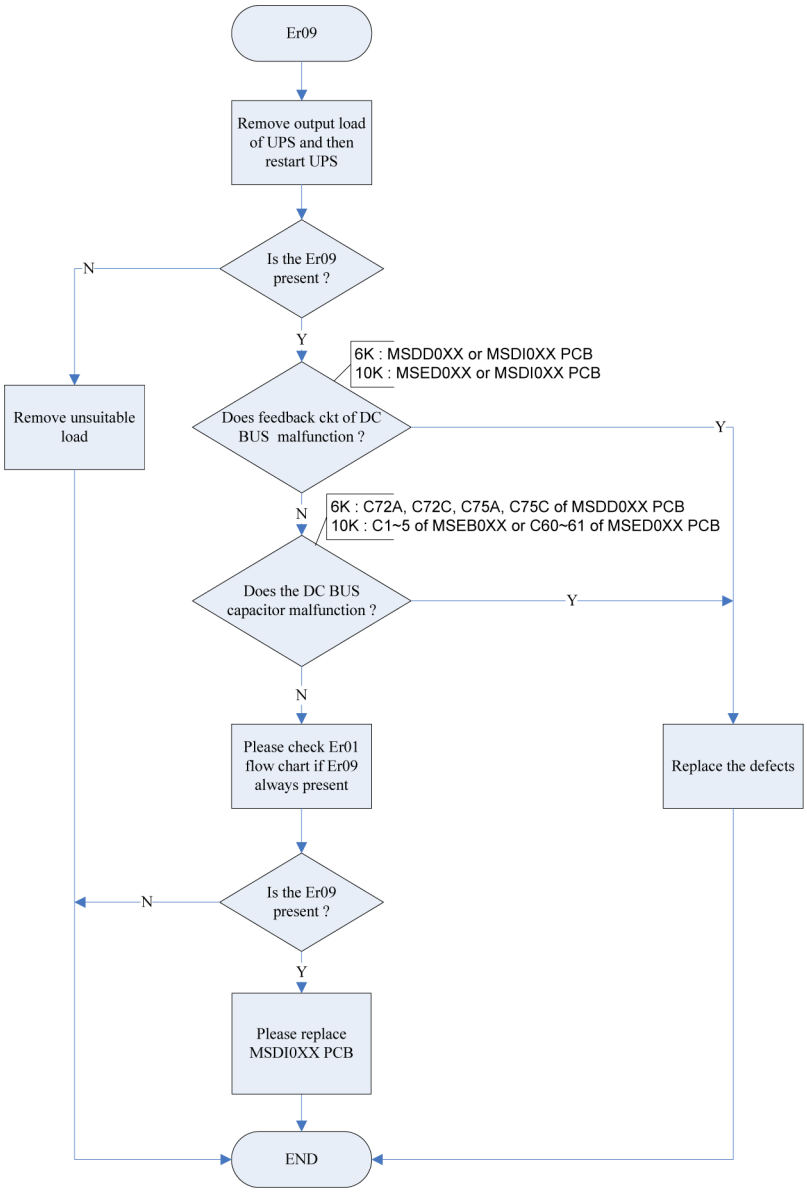
Flow Chart



Error Code Er09

Definition: It means the DC Bus of the UPS is protected from under-voltage.

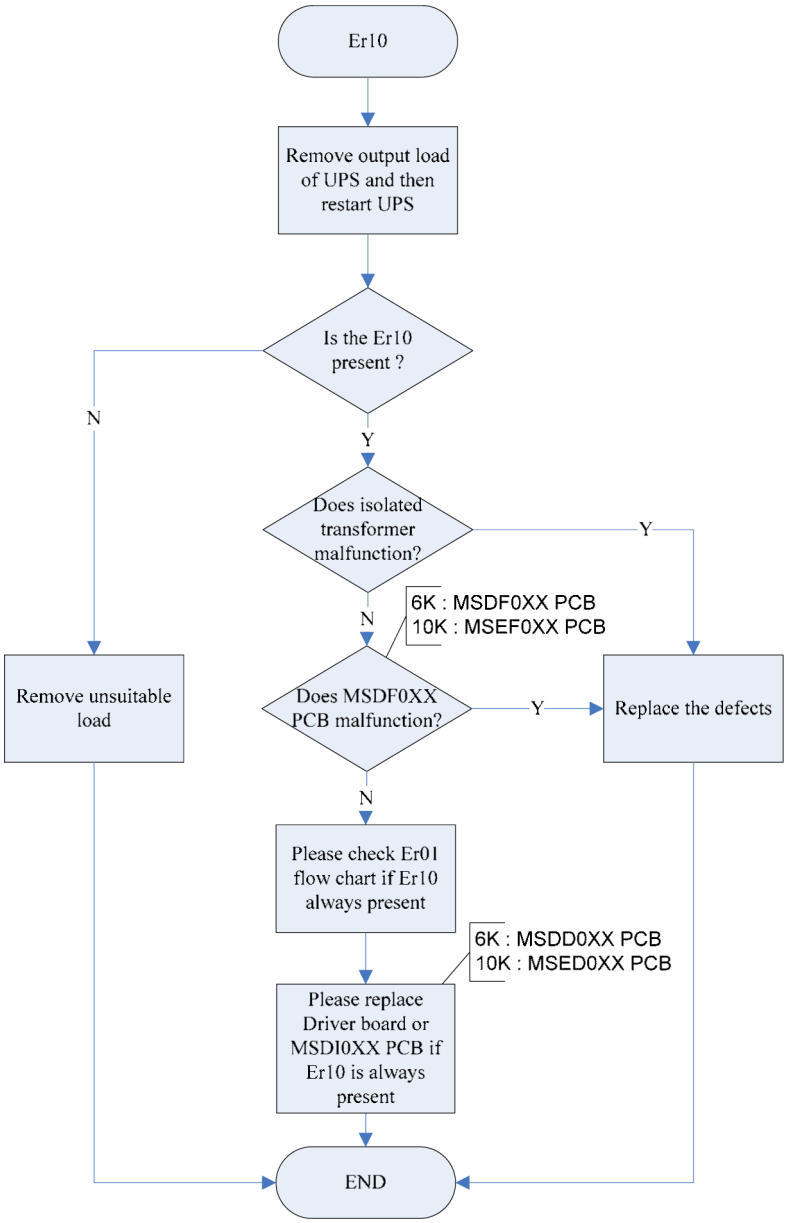
Flow Chart



Error Code Er10

Definition: It means the UPS Inverter is protected from over-current.

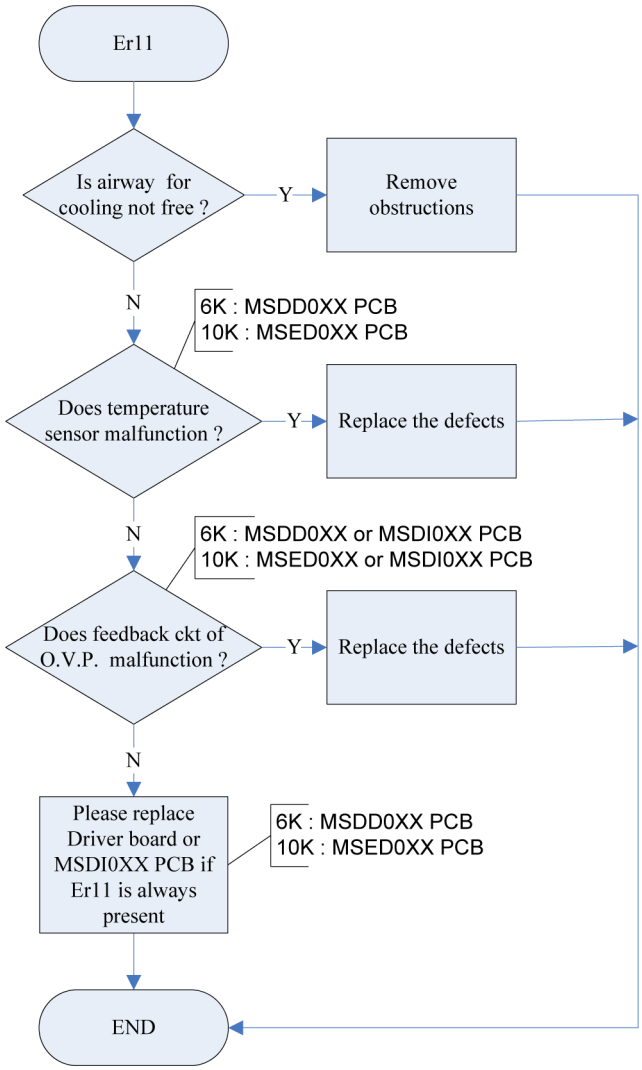
Flow Chart



Error Code Er11

Definition: It means the UPS is protected from over-heat.

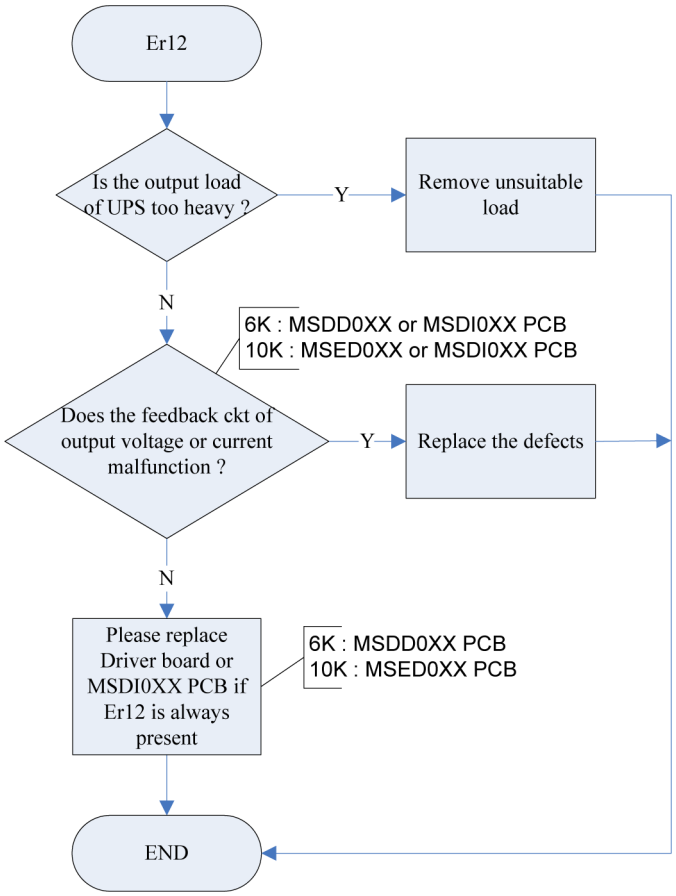
Flow Chart



Error Code Er12

Definition: It means the UPS inverter is protected from overloaded.

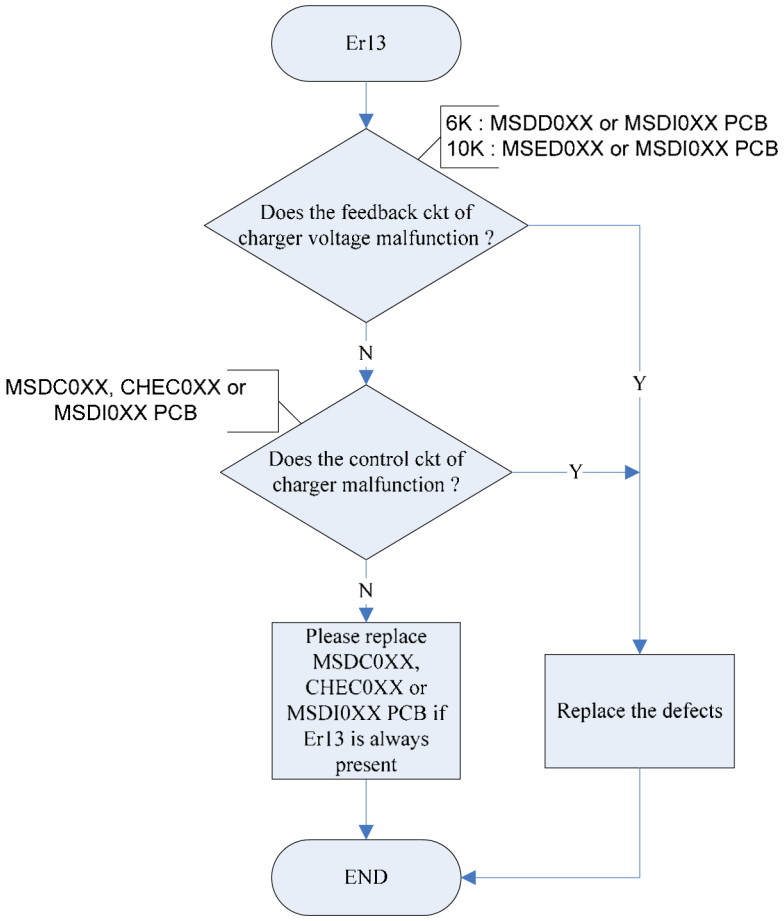
Flow Chart



Error Code Er13

Definition: It means the charger is out of order.

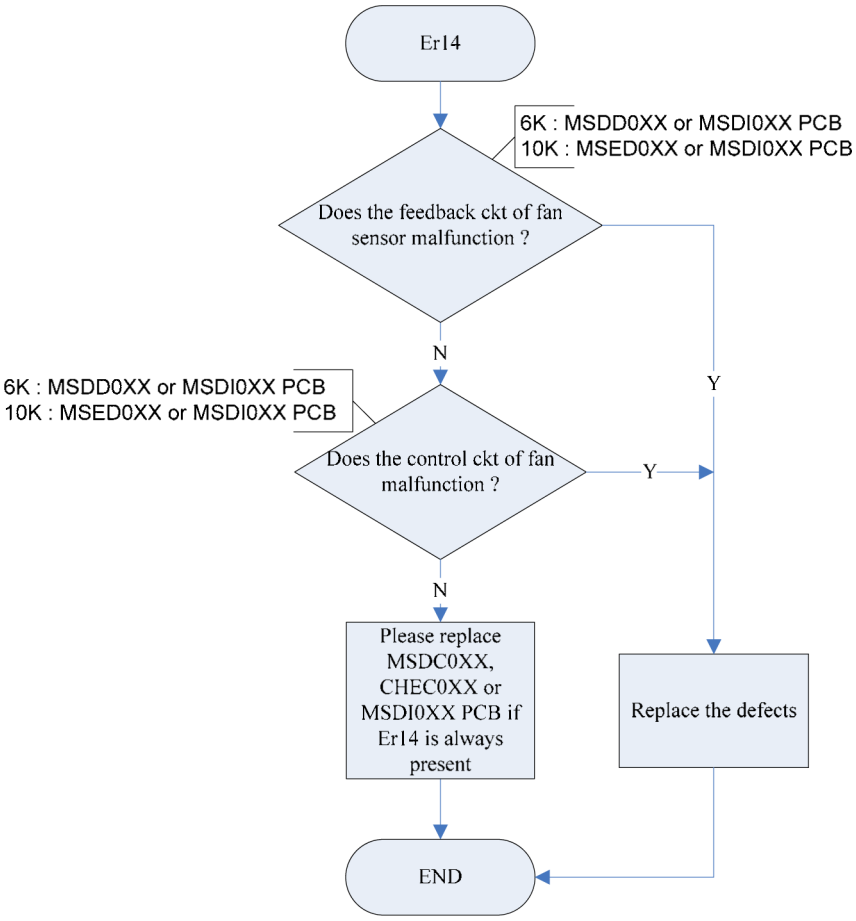
Flow Chart



Error Code Er14

Definition: It means the fan of the UPS is abnormal.

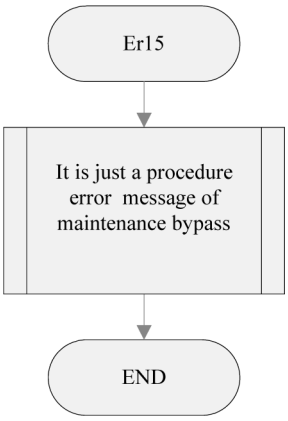
Flow Chart



Error Code Er15

Definition: It means Maintenance Bypass Switch(CAM Switch) is not used properly, or the Maintenance Bypass Switch is activated when the UPS is in CVCF mode.

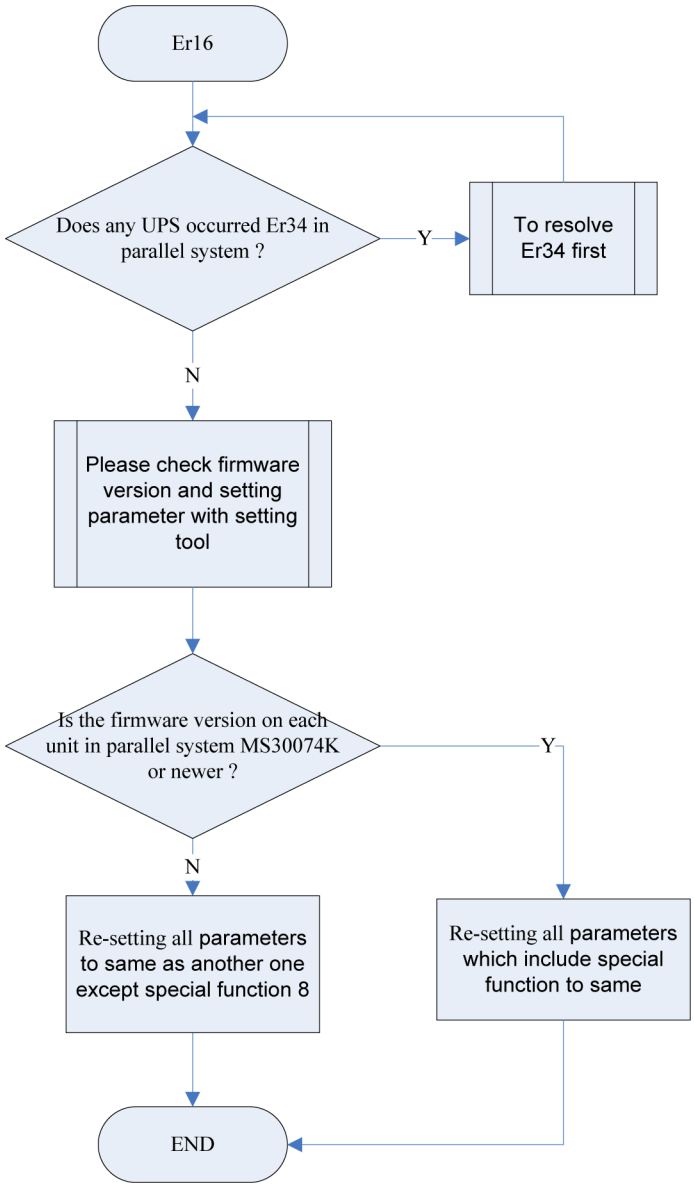
Flow Chart



Error Code Er16

Definition: It means the output parameter set error in parallel system.

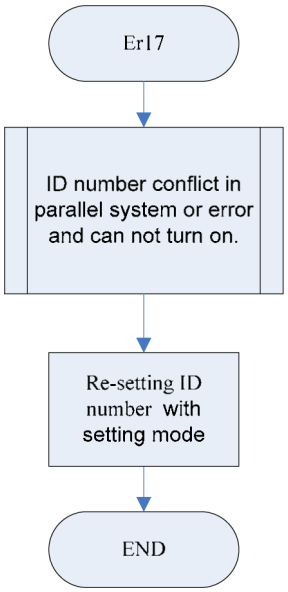
Flow Chart



Error Code Er17

Definition: It means the ID number is in conflict in parallel system or ID number error in single unit.

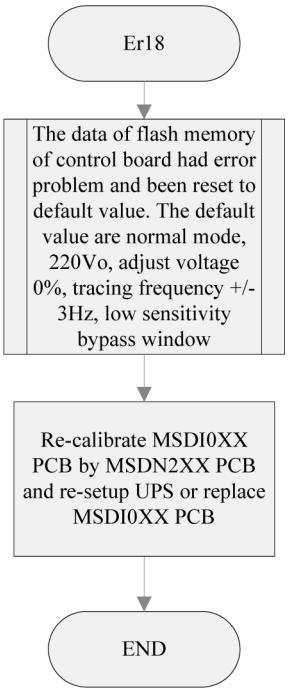
Flow Chart



Error Code Er18

Definition: It means the data inside of the EEPROM on the control board is abnormal and the data is set as default values.

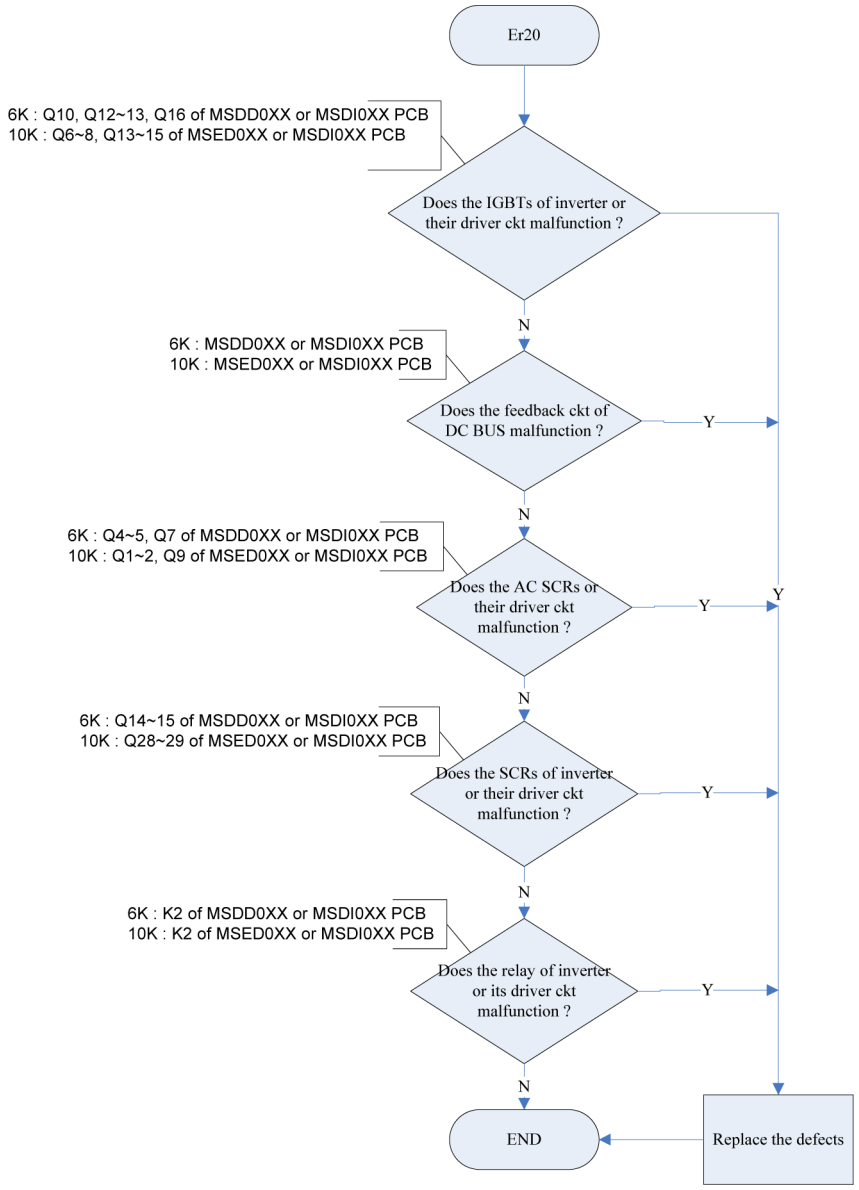
Flow Chart



Error Code Er20

Definition: It means the capacitor in the DC Bus of the UPS can not be discharged.

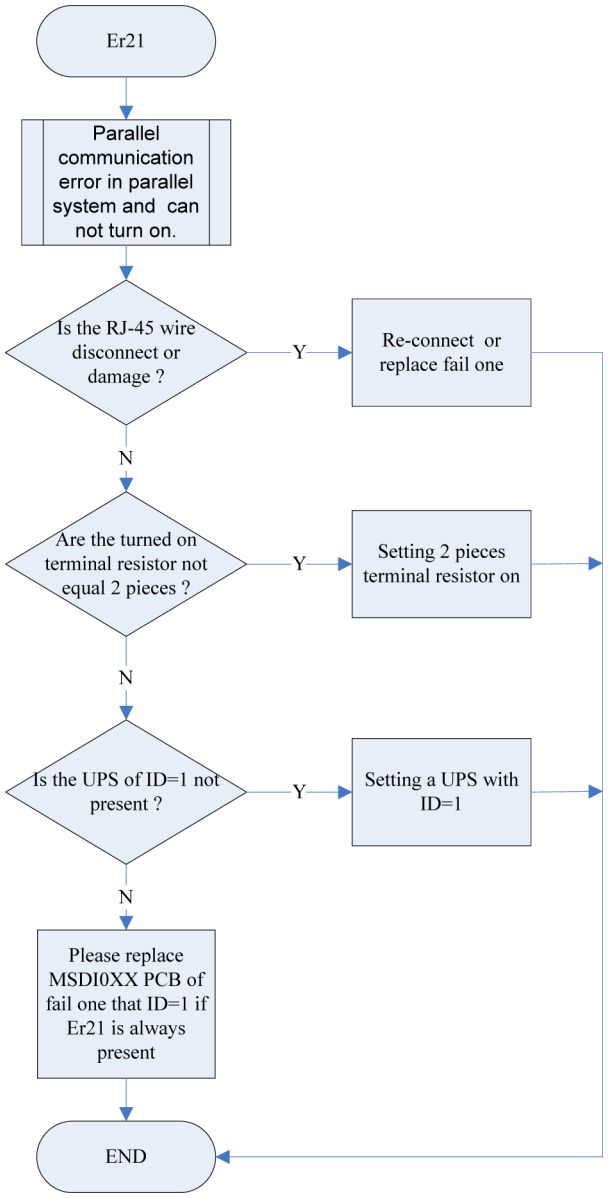
Flow Chart



Error Code Er21

Definition: It means the communication error in parallel system or can't find the UPS which ID=1.

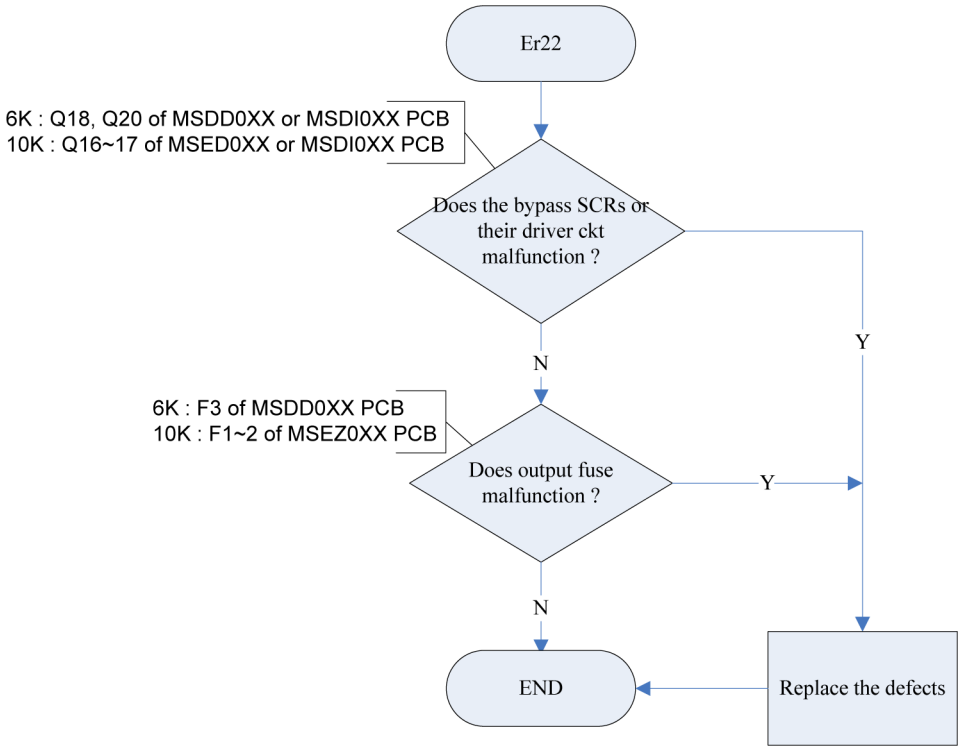
Flow Chart



Error Code Er22

Definition: It means the SCR in UPS bypass loop or the output fuse is abnormal.

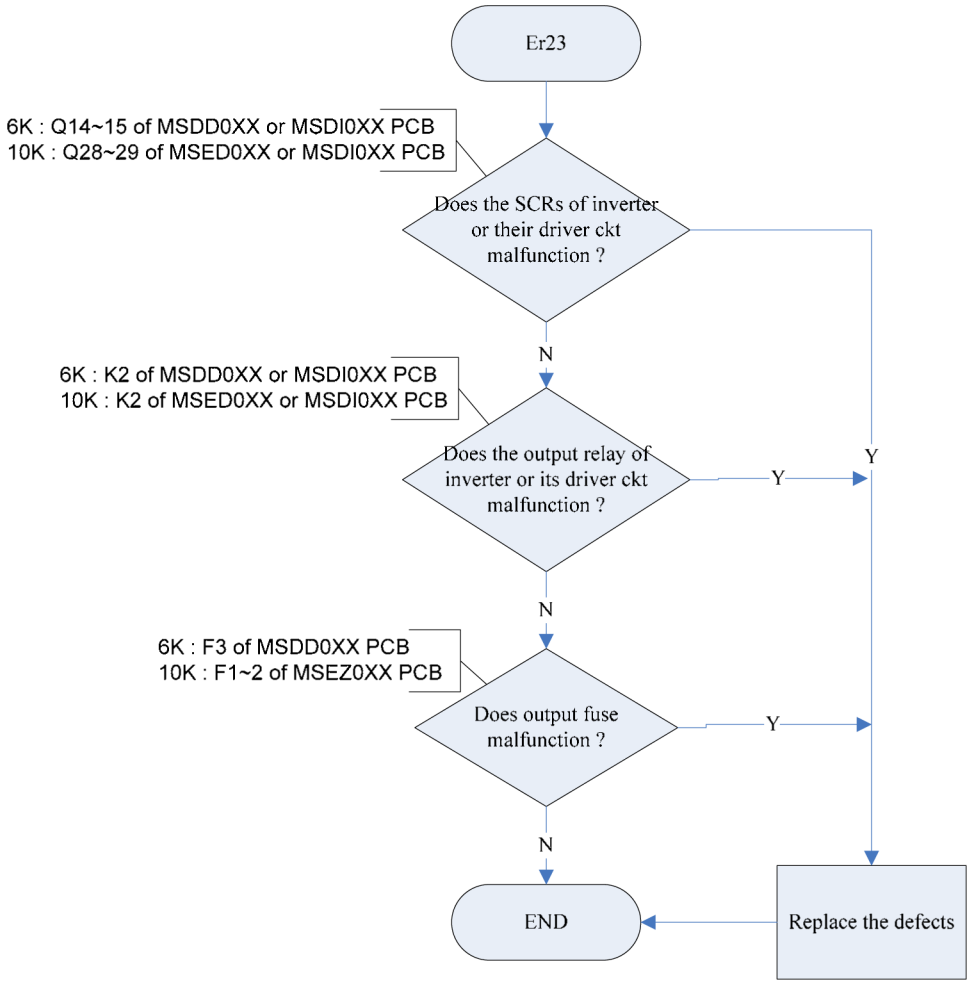
Flow Chart



Error Code Er23

Definition: It means the SCR, Relay of the UPS in Inverter loop or output fuse is abnormal.

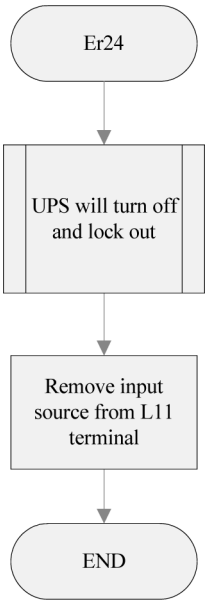
Flow Chart



Error Code Er24

Definition: It means there is voltage in bypass loop when the UPS is operated in CVCF mode.

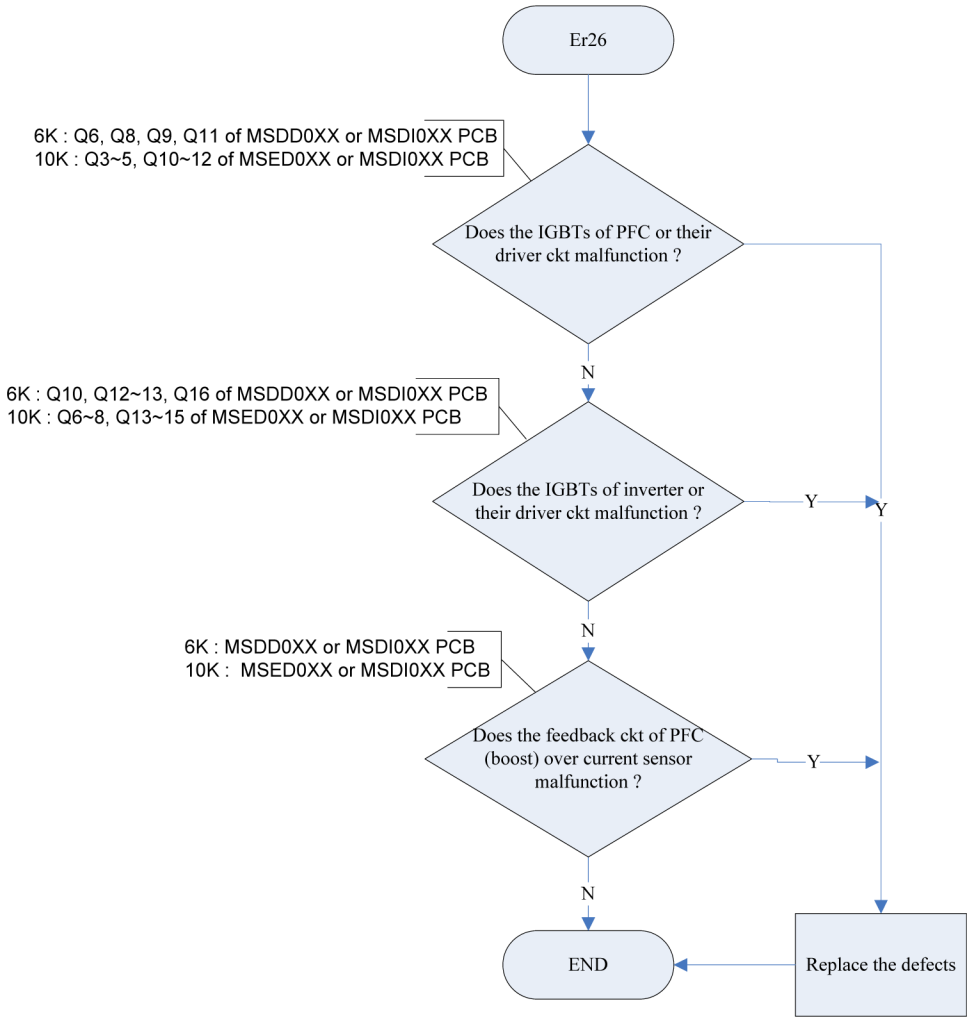
Flow Chart



Error Code Er26

Definition: It means the PFC of the UPS is protected from over-current.

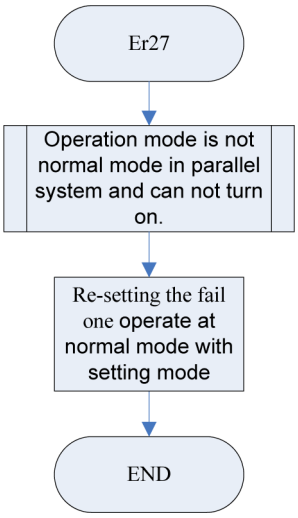
Flow Chart



Error Code Er27

Definition: It means the UPS isn't operated in normal mode in parallel system.

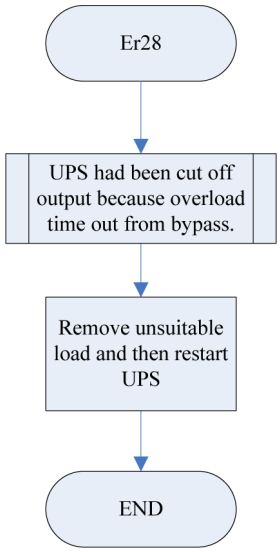
Flow Chart



Error Code Er28

Definition: It means when the UPS is operated in bypass mode, there is an overload time out occurred.

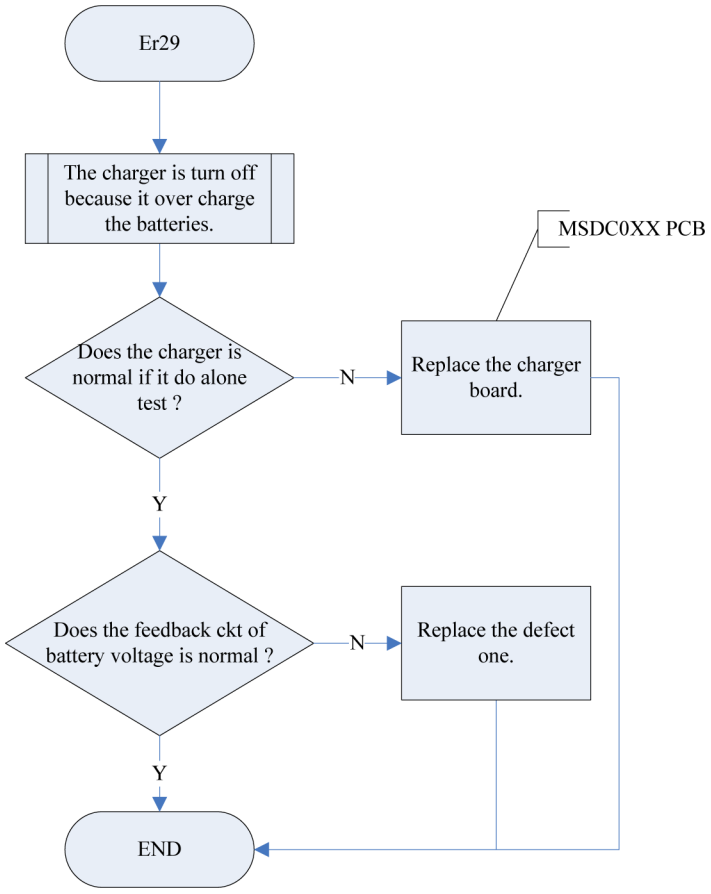
Flow Chart



Error Code Er29

Definition: It means the charger voltage is higher than 300Vdc and the charger is been off.

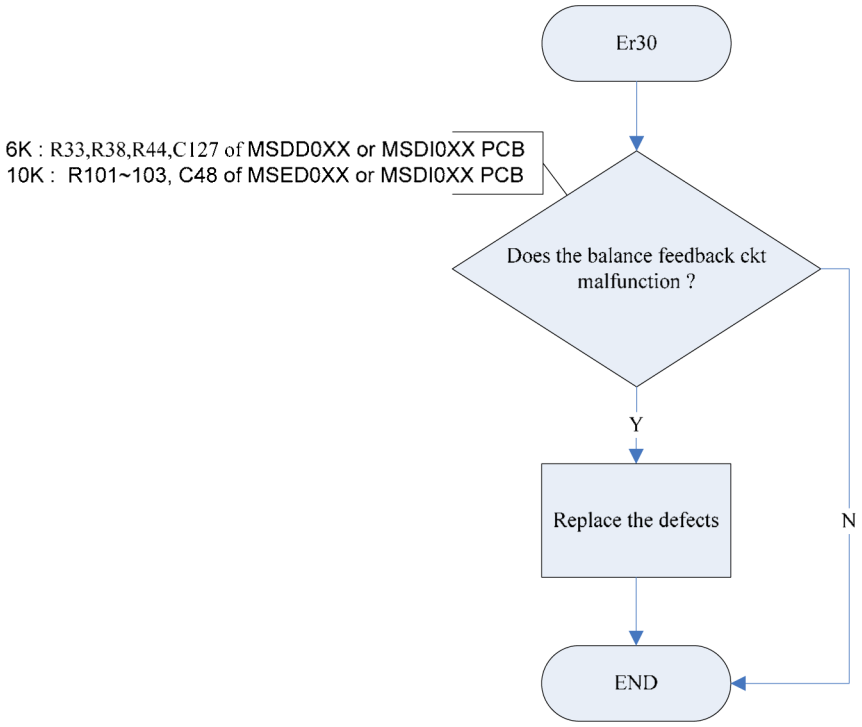
Flow Chart



Error Code Er30

Definition: It means the inverter balance error over than 30 seconds.

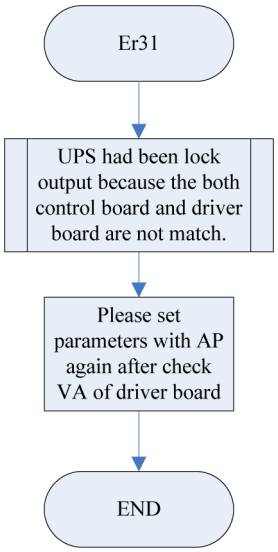
Flow Chart



Error Code Er31

Definition: It means the capacity of driver board is less than control board setting value.

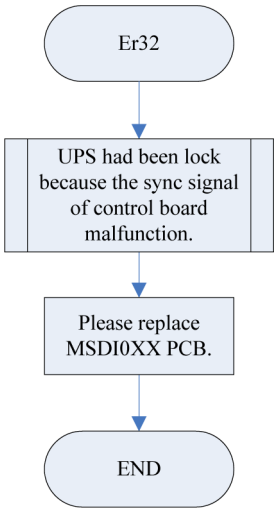
Flow Chart



Error Code Er32

Definition: It means the signal of sync error occurred in communication for parallel function.

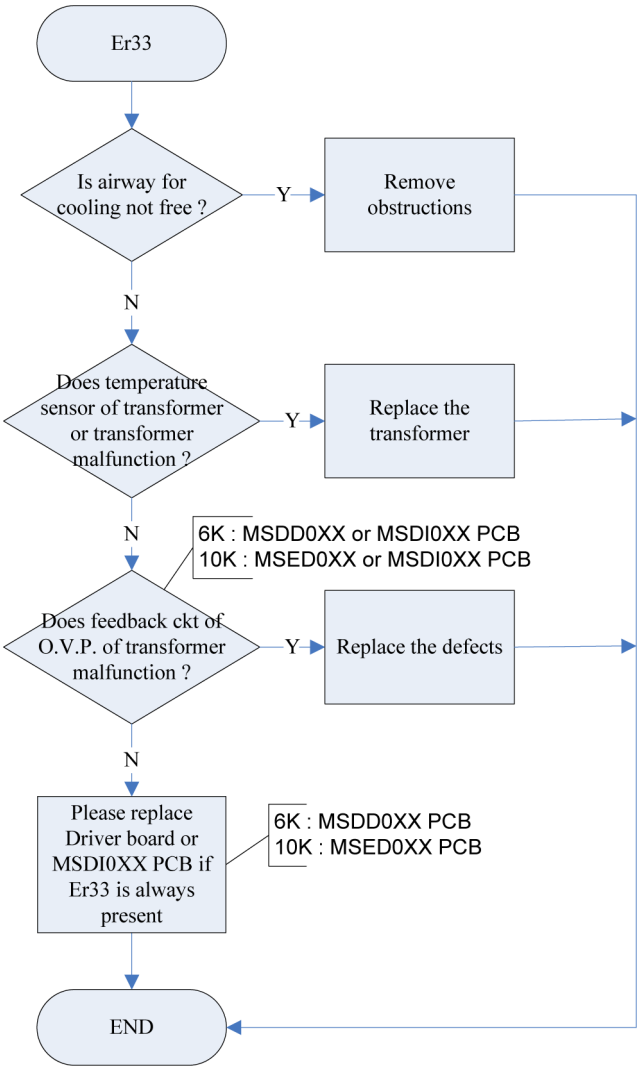
Flow Chart



Error Code Er33

Definition: It means the isolated transformer of the UPS is protected from over-heat.

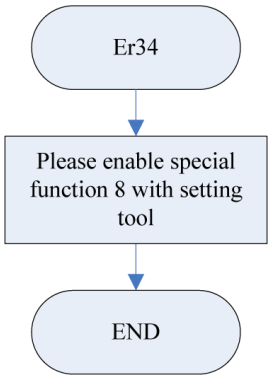
Flow Chart



Error Code Er34

Definition: It means the balance function conflict in parallel system.

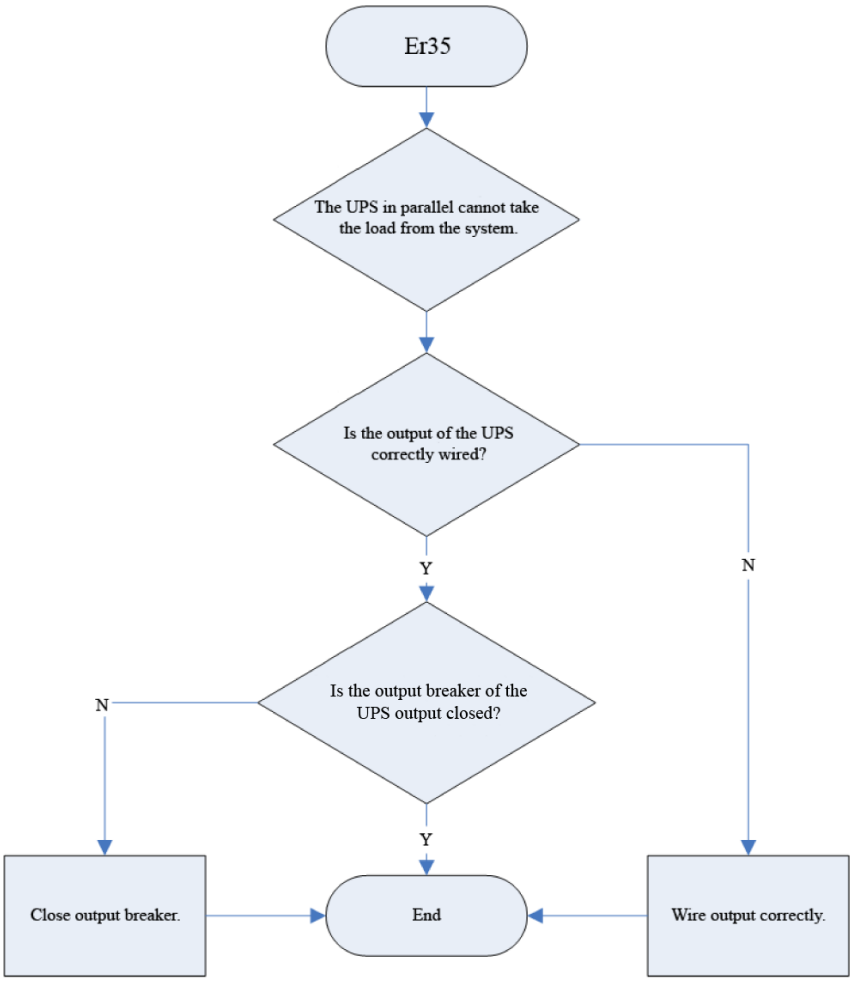
Flow Chart



Error Code Er35

Definition: It means output parallel failed.

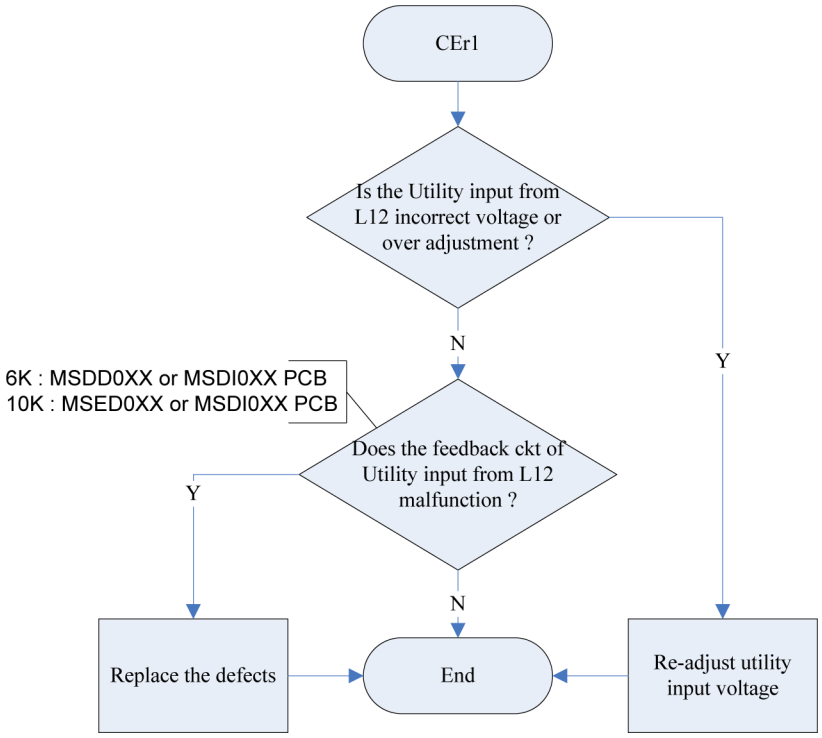
Flow Chart



Calibration Error Code CEr1

Definition: It means the input voltage of the UPS is excessive of adjustable range.

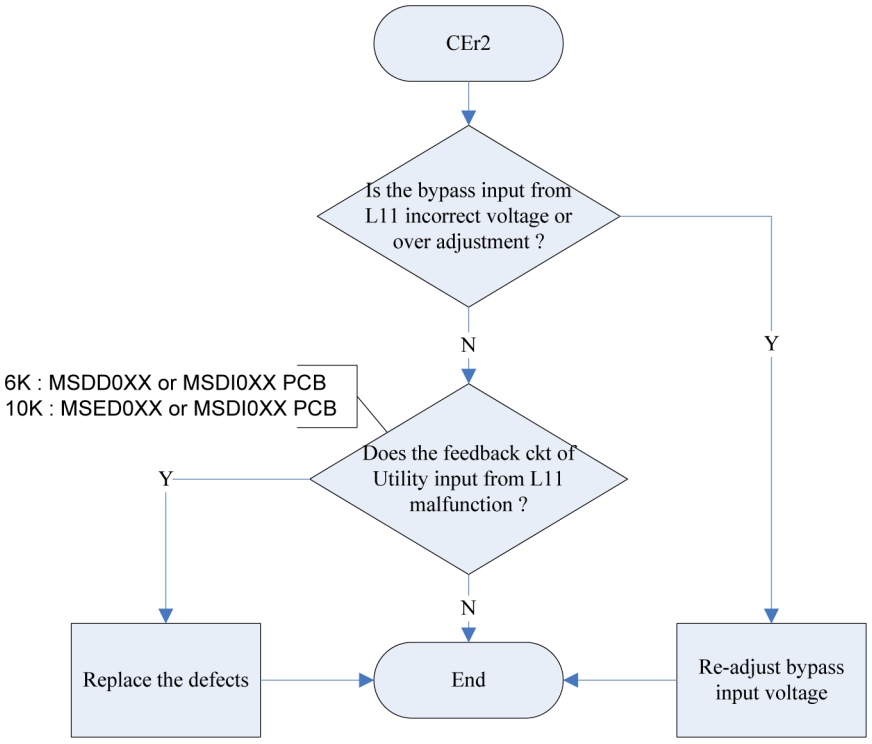
Flow Chart



Calibration Error Code CEr2

Definition: It means the bypass input voltage of the UPS is out of adjustable range.

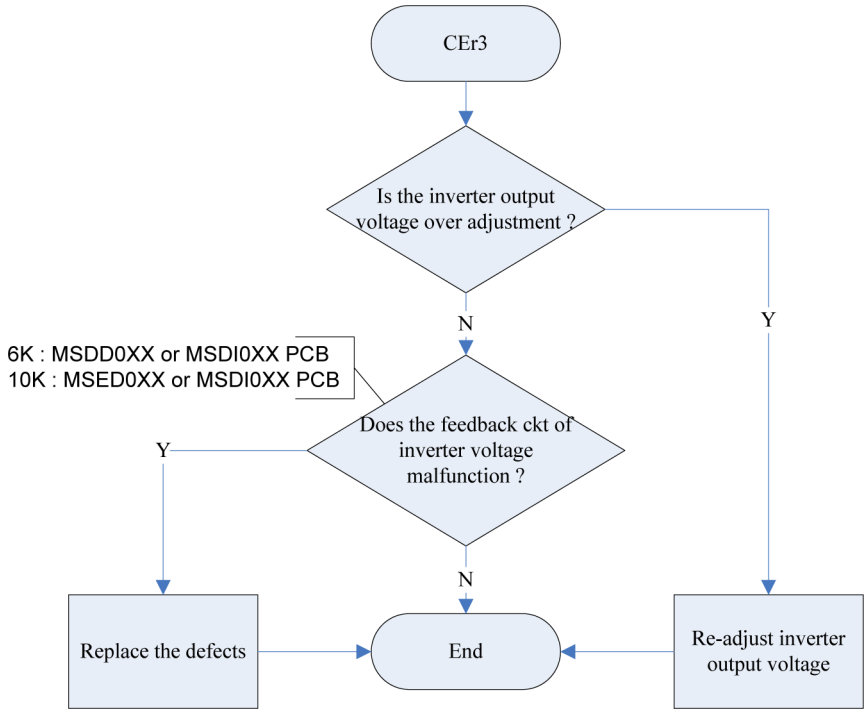
Flow Chart



Calibration Error Code CEr3

Definition: It means the Inverter Output Voltage of the UPS is out of adjustable range.

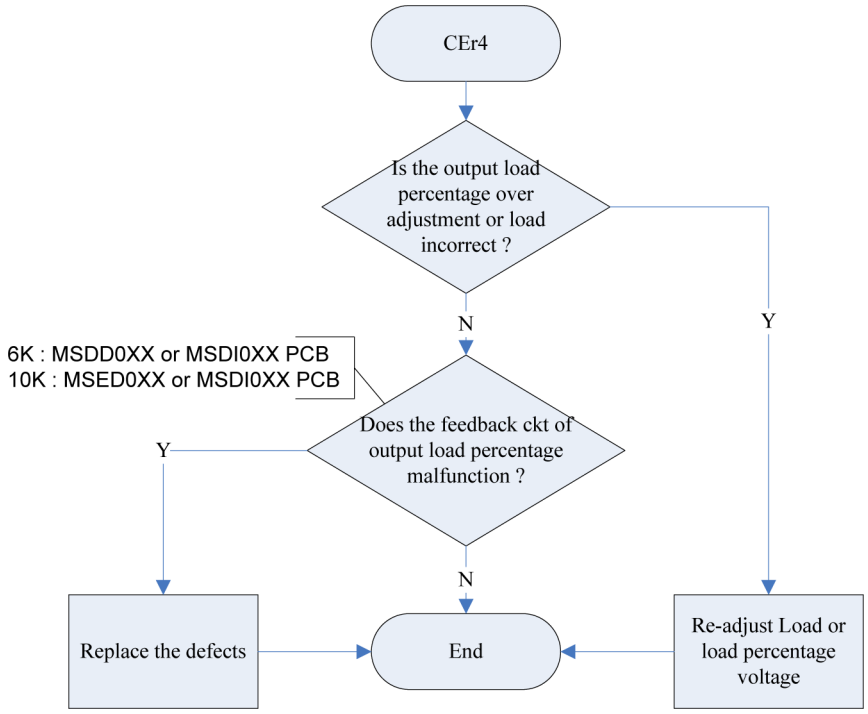
Flow Chart



Calibration Error Code CEr4

Definition: It means the output load level of the UPS is out of adjustable range.

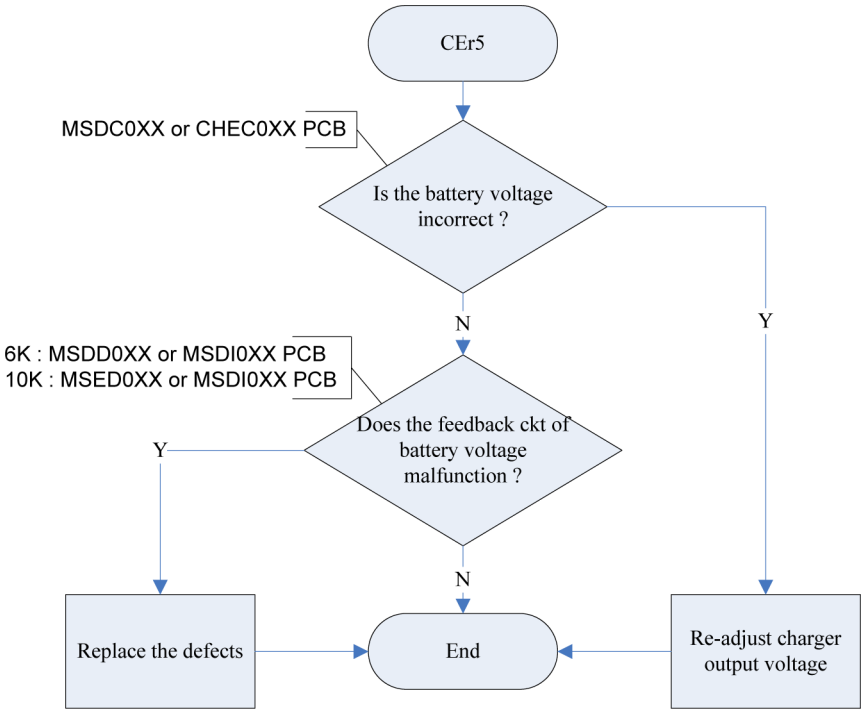
Flow Chart



Calibration Error Code CEr5

Definition: It means the battery voltage of the UPS is out of adjustable range.

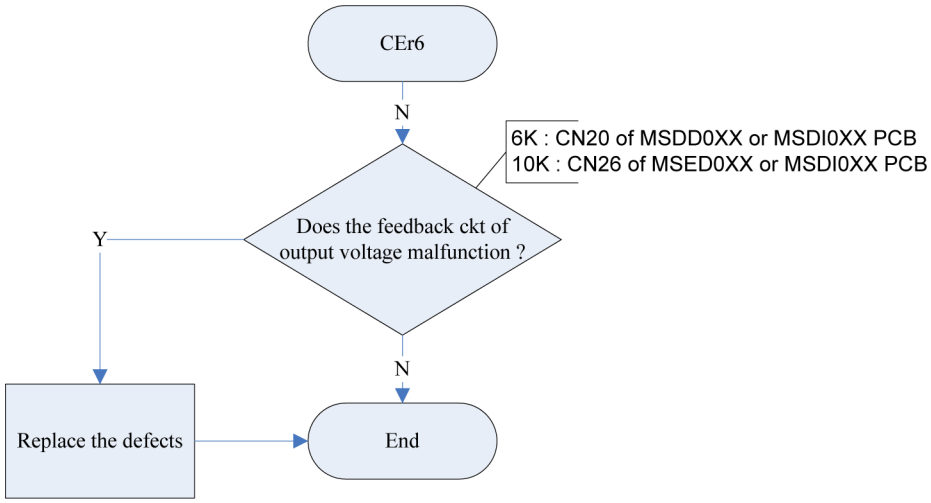
Flow Chart



Calibration Error Code CEr6

Definition: It means the output voltage of the UPS is out of adjustable range.

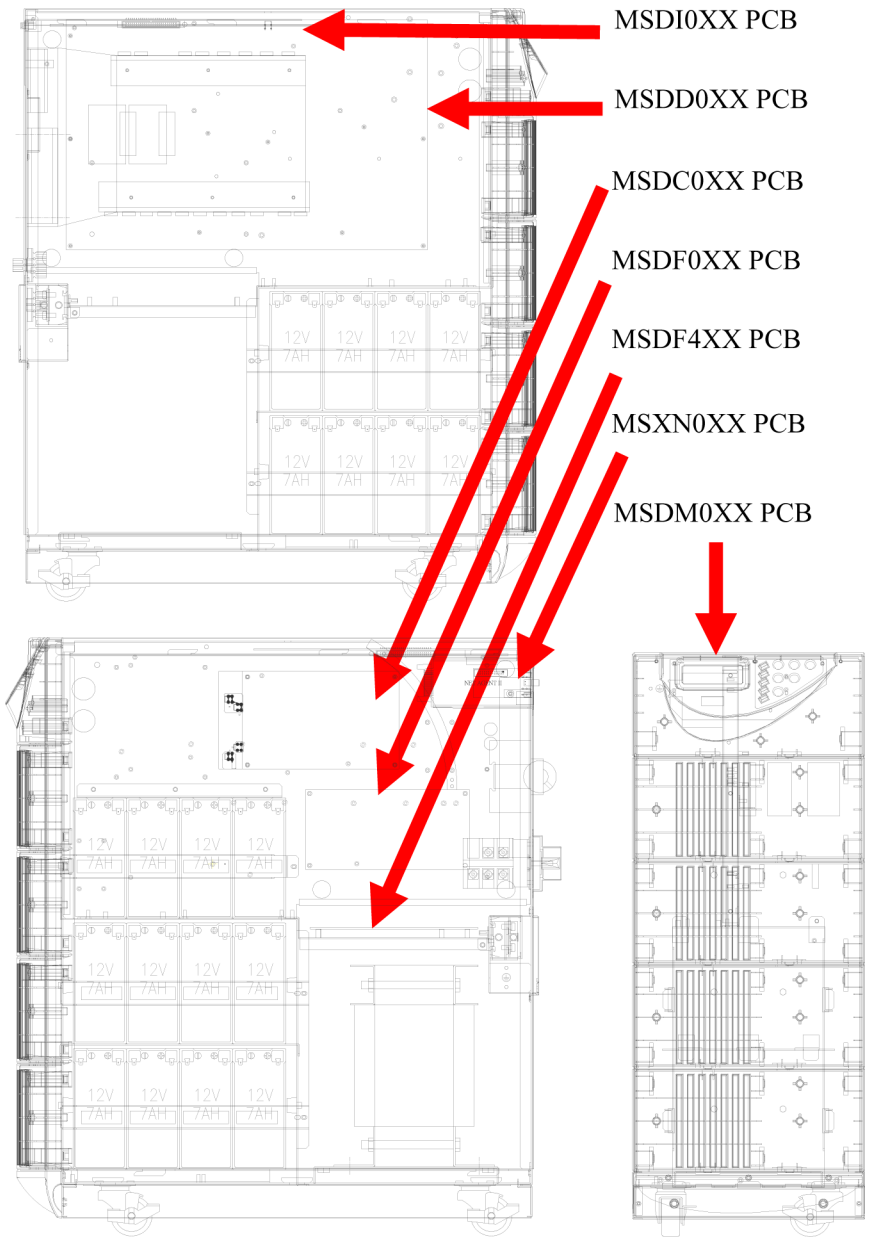
Flow Chart



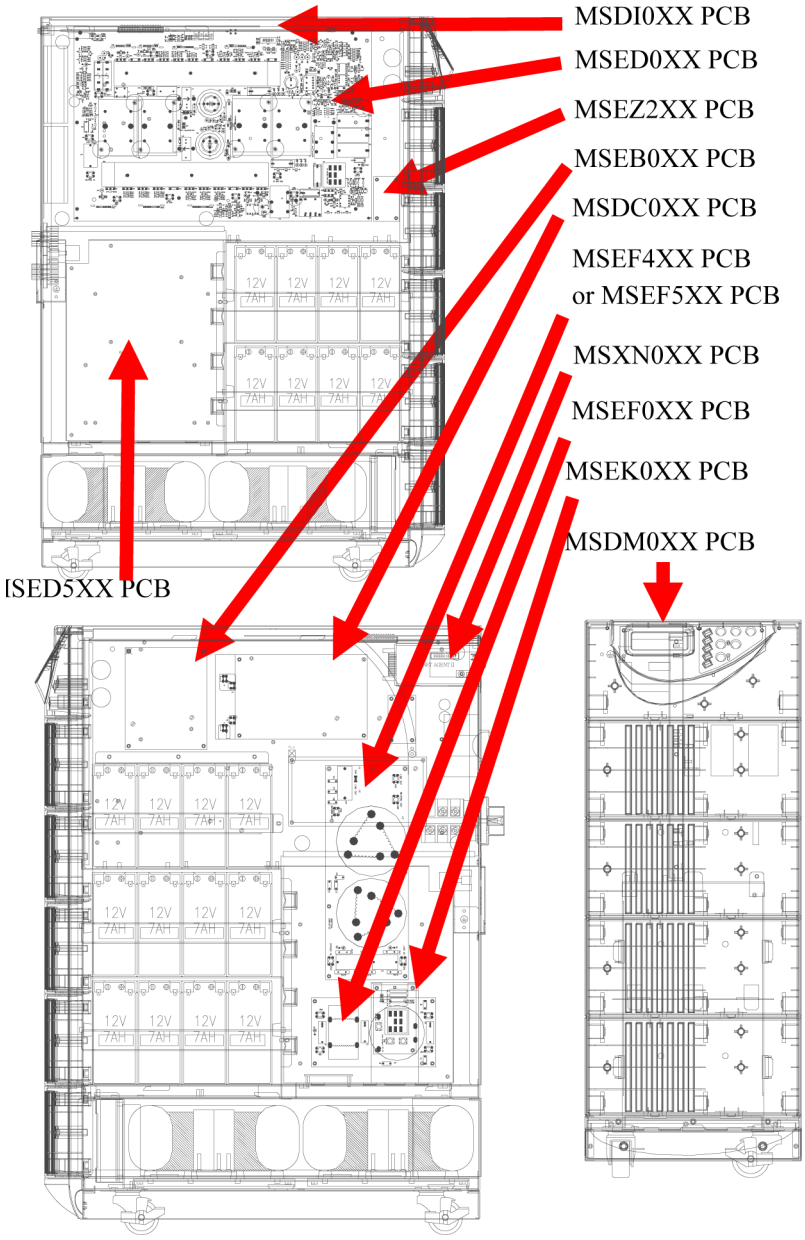
Appendix A

PCB Installation Position

The PCB of TX90/T90-6K Installation Position

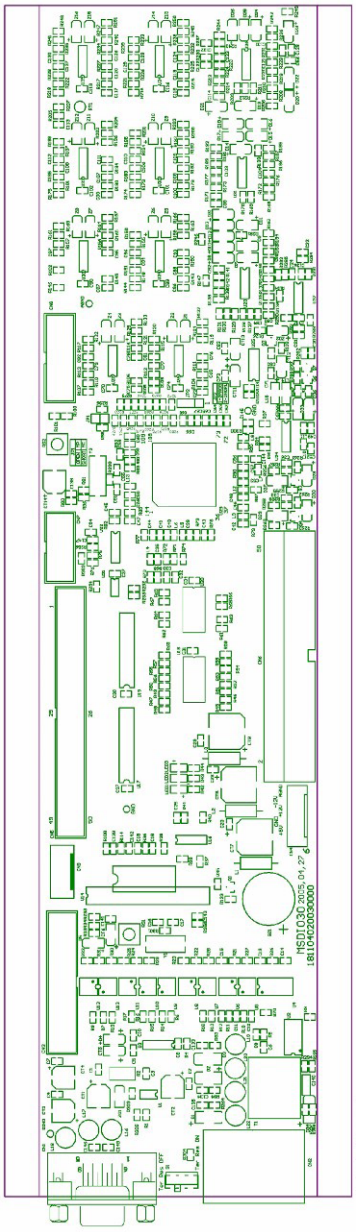


The PCB of TX90/T90-10K Installation Position

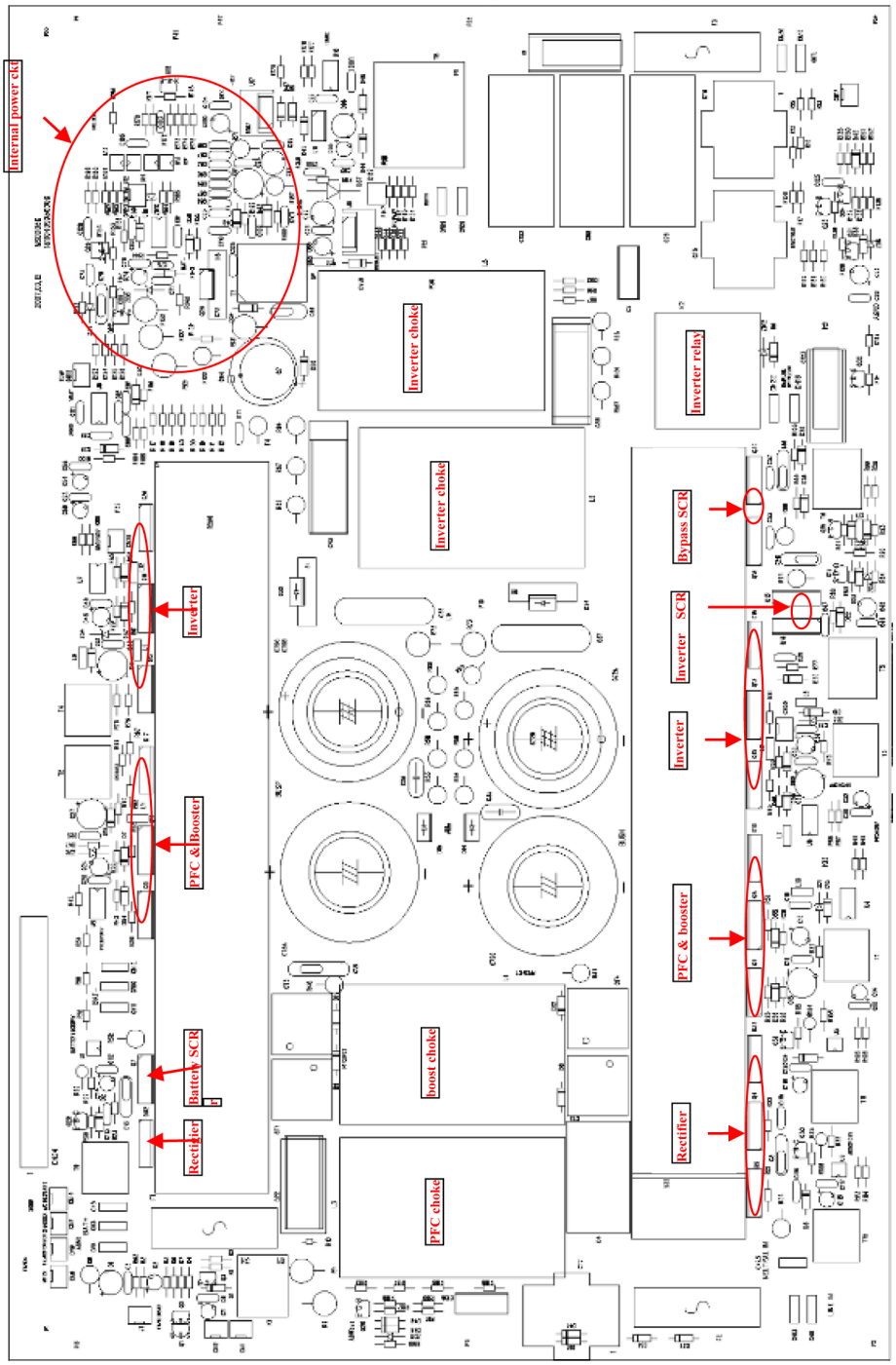


PCB Placement

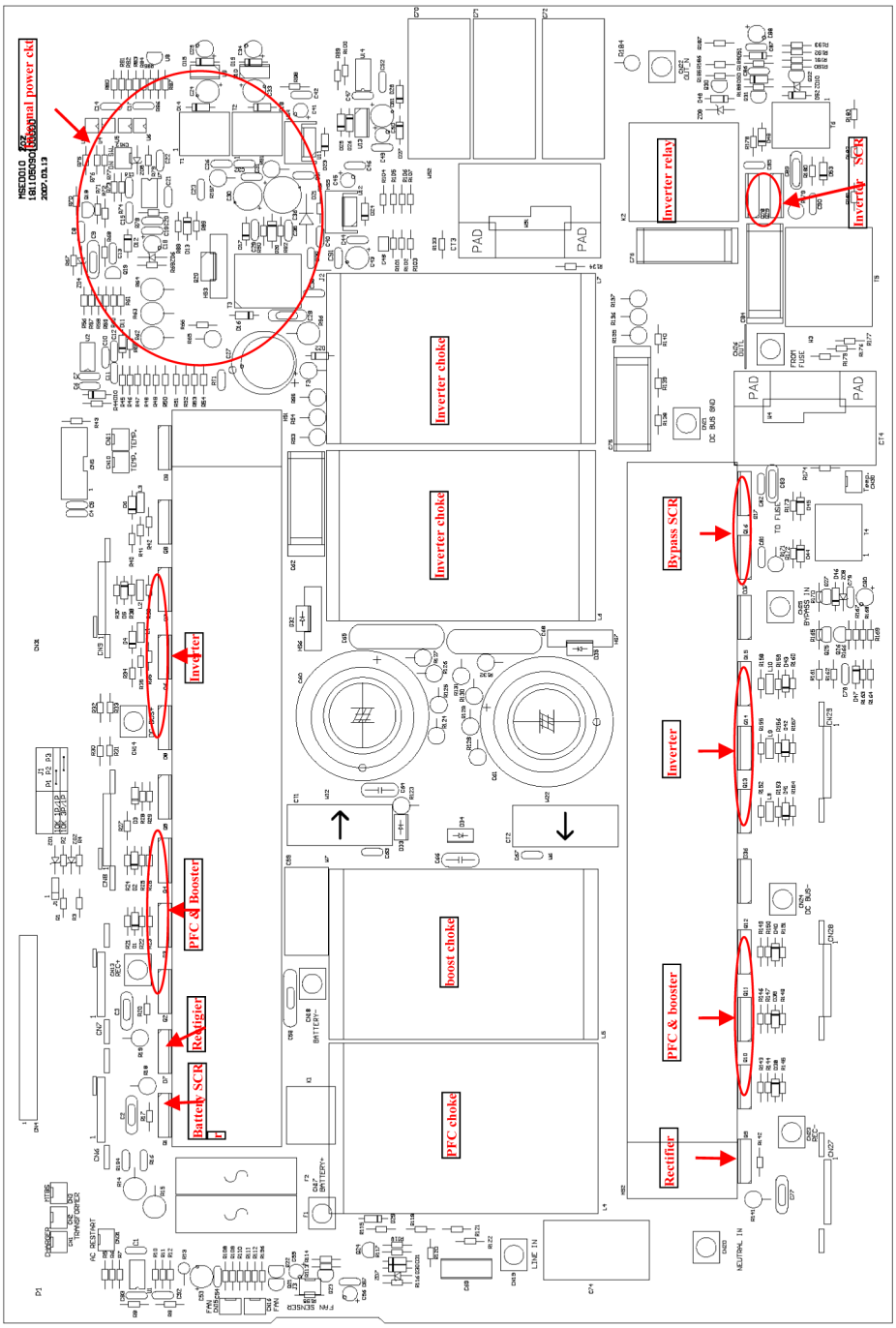
MSDI0XX PCB



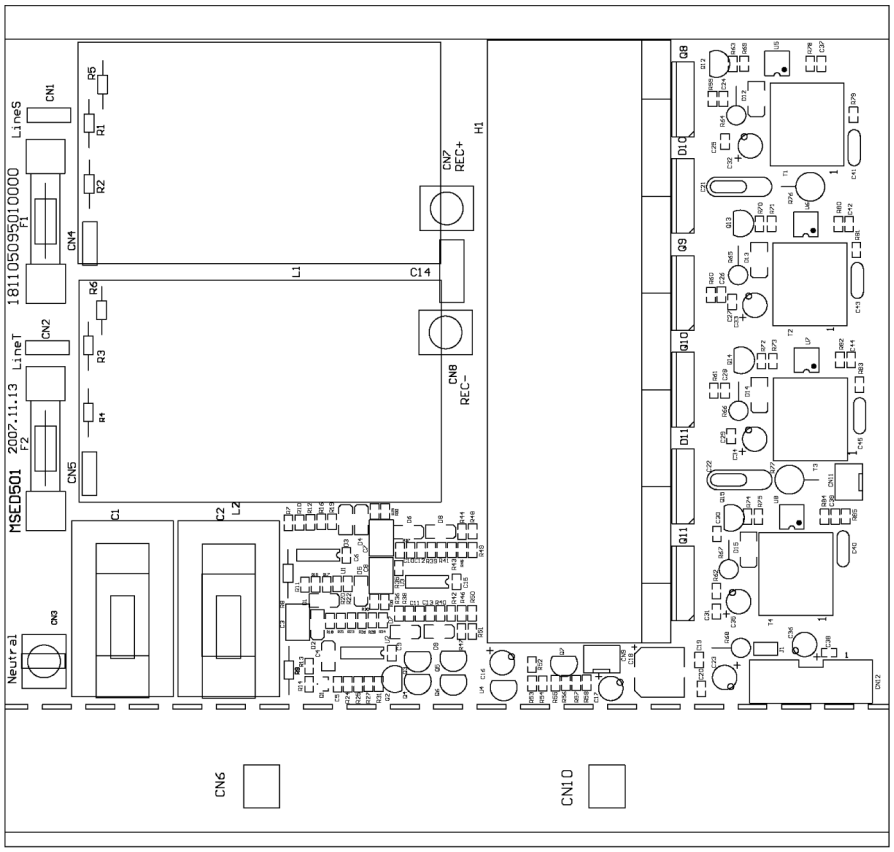
MSDD0XX PCB


Internal power ckt
Inverter choke
Inverter relay
Inverter choke
Bypass SCR
Inverter SCR
Inverter
Inverter
PFC &Booster
PFC & booster
boost choke
Battery SCR
Rectifier
Rectifier
PFC choke

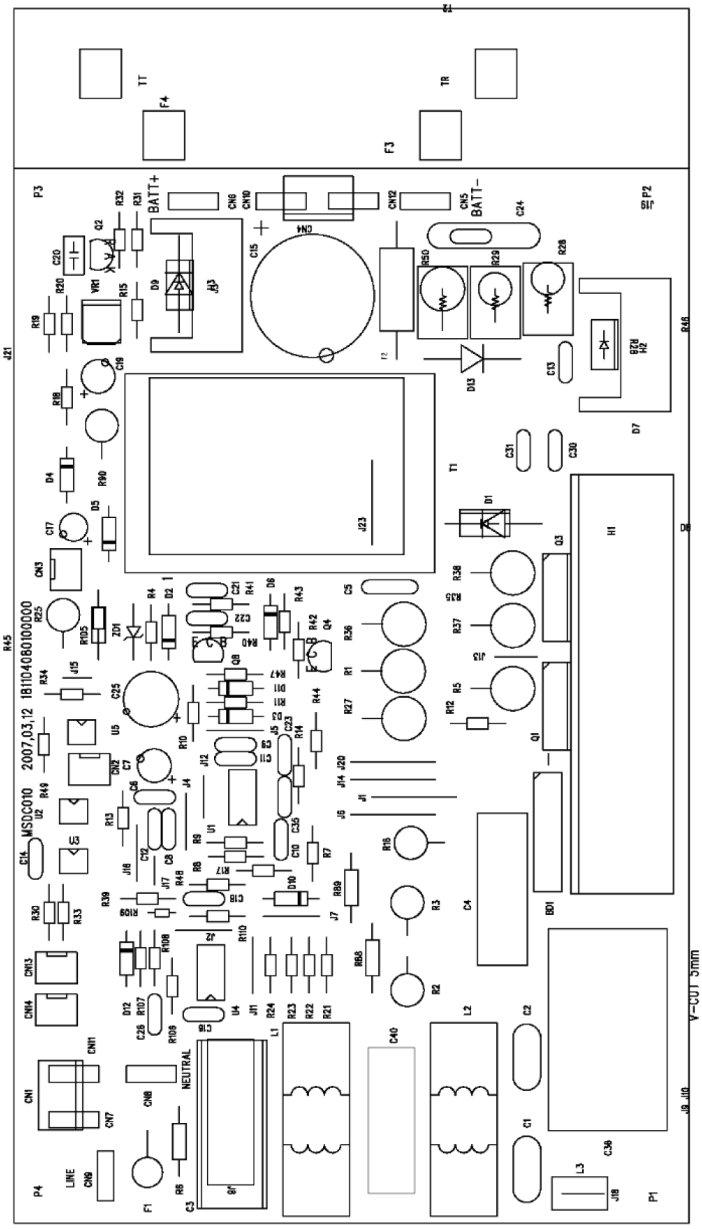
MSED0XX PCB


Signal power ckt
Inverter relay
Inverter SCR
Inverter choke
Inverter choke
Bypass SCR
Inverter
Inverter
PFC & Booster
boost choke
Rectifier
PFC & booster
Battery SCR
PFC choke
Rectifier
PAD
PAD
PAD
PAD

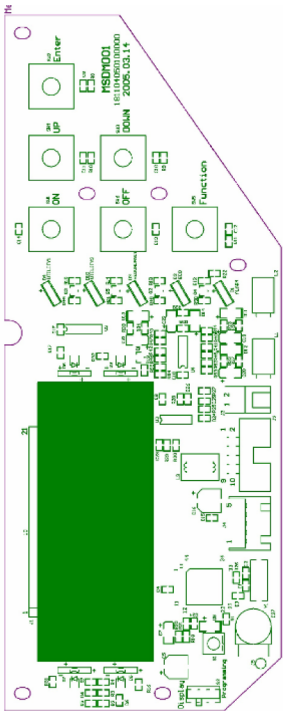
MSEDSXX PCB


MSED501
181105095010000
2007.11.13
LineS
LineT
Neutral
CN1
CN2
CN3
CN4
CN5
CN6
CN7
REC+
CN8
REC-
CN10
L1
L2
C1
C2
C14
H1
F1
F2
R1
R2
R3
R4
R5
R6

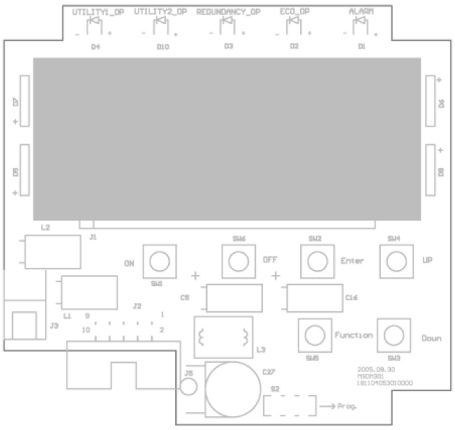
MSDC0XX PCB



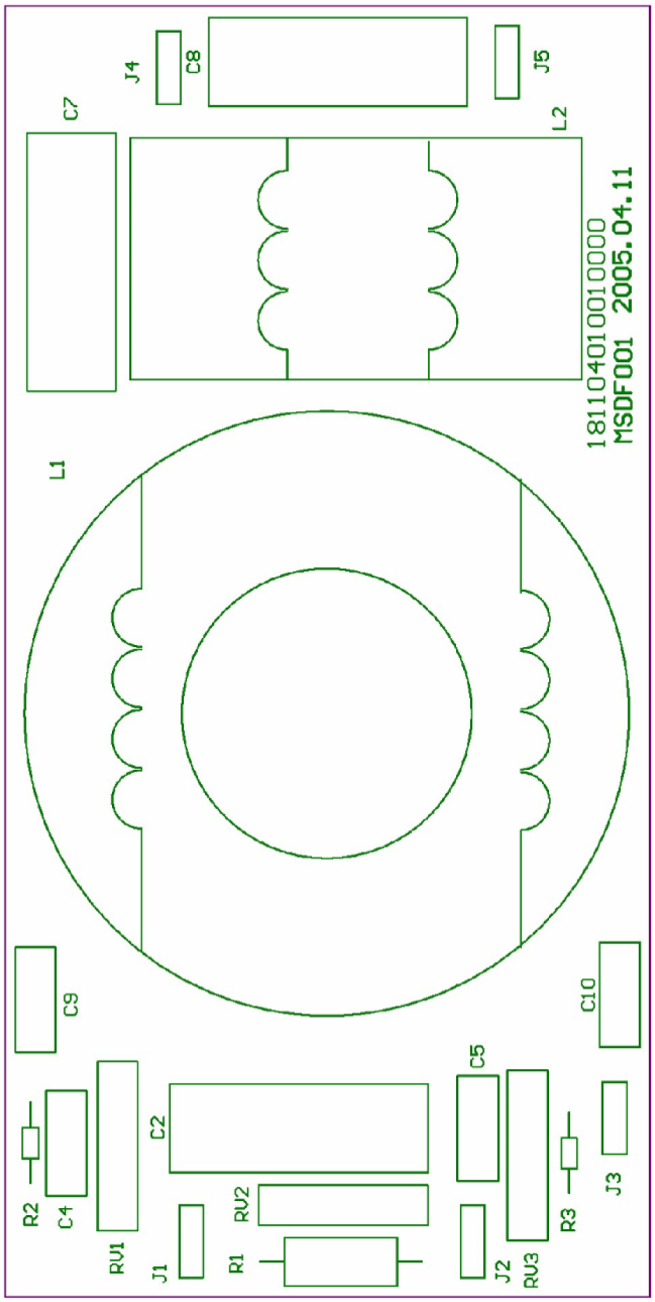
MSDM0XX PCB



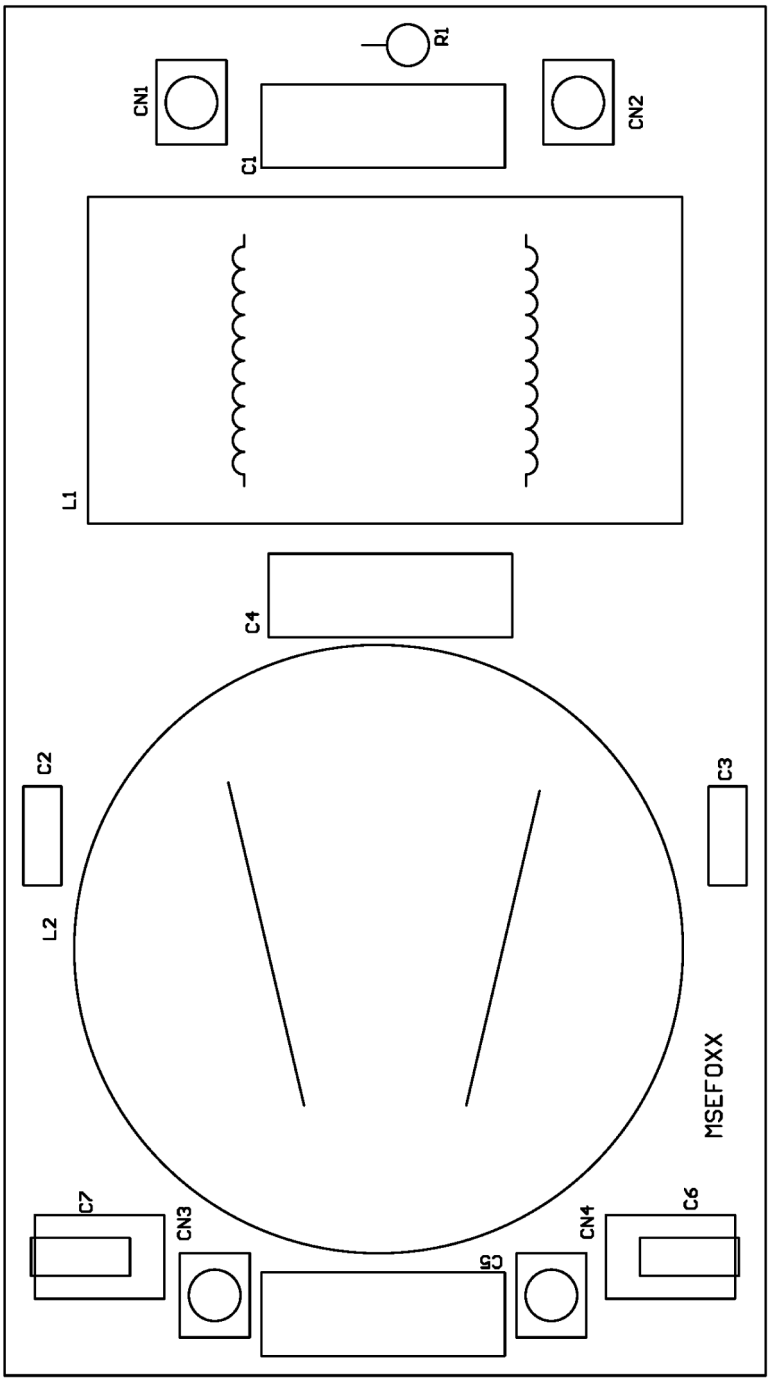
MSDM3XX PCB



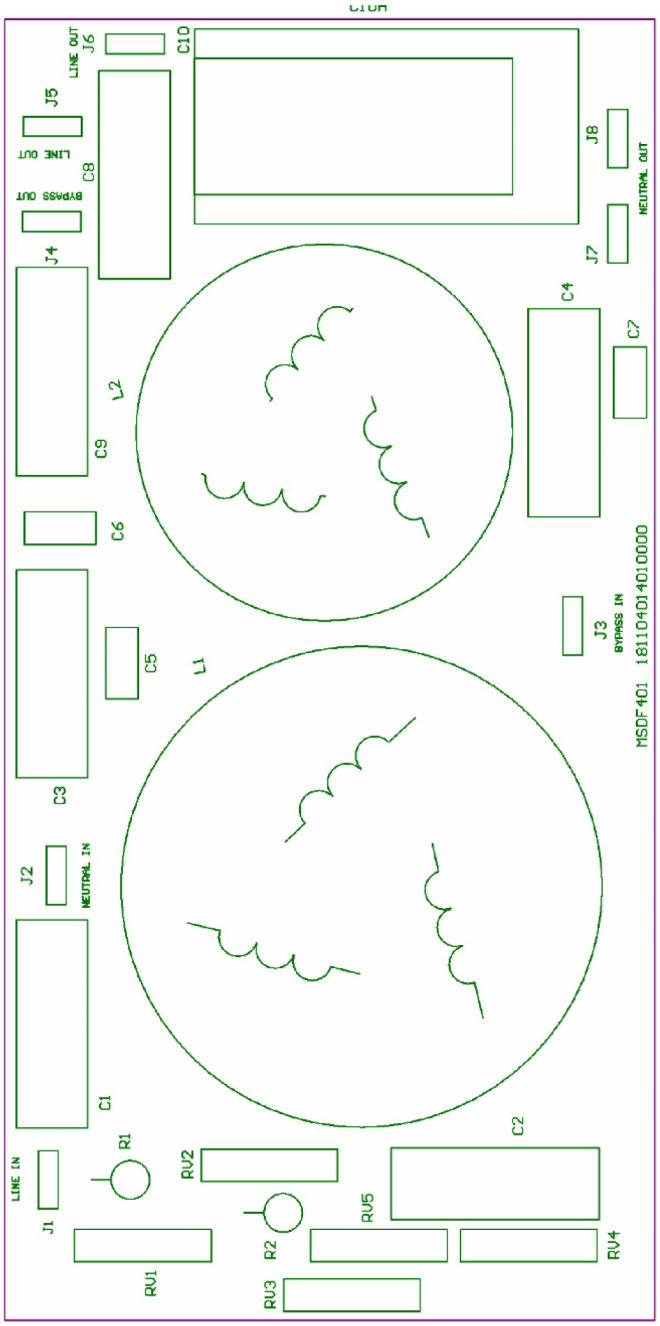
MSDF0XX PCB


J4
C8
J5
C7
L2
L1
181104010010000
MSDF001 2005.04.11
C9
C10
C5
C2
R2
C4
RV1
RV2
J1
R1
J2
RV3
R3
J3

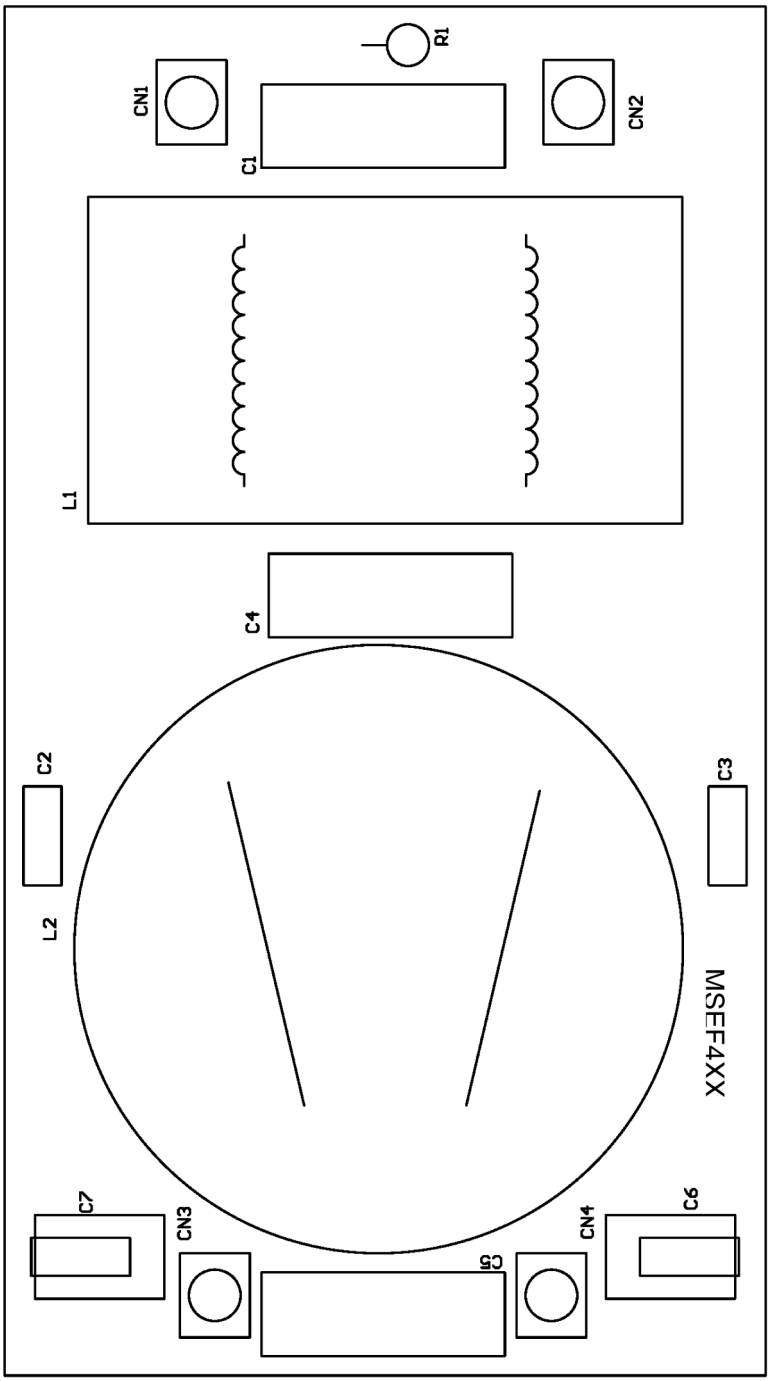
MSEF0XX PCB



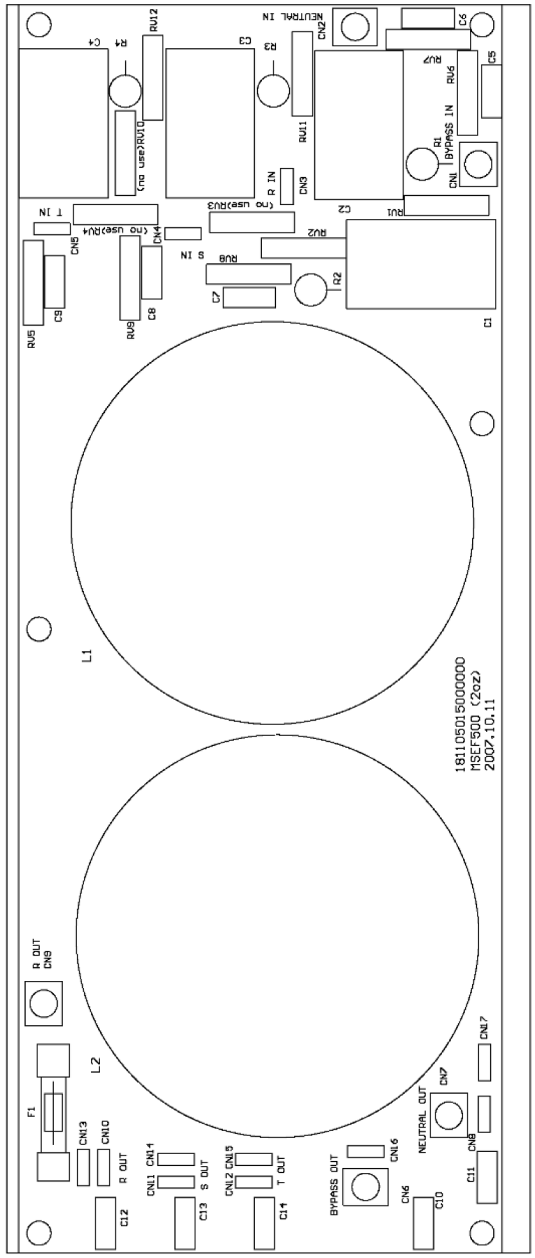
MSDF4XX PCB


LINE OUT
J6
C10
J5
LINE OUT
C8
BYPASS OUT
J8
NEUTRAL OUT
J4
J7
C4
C7
L2
C9
C6
MSDF401 181104014010000
J3
BYPASS IN
C5
L1
C3
J2
NEUTRAL IN
C1
R1
C2
LINE IN
RV2
J1
RV5
R2
RV4
RV1
RV3

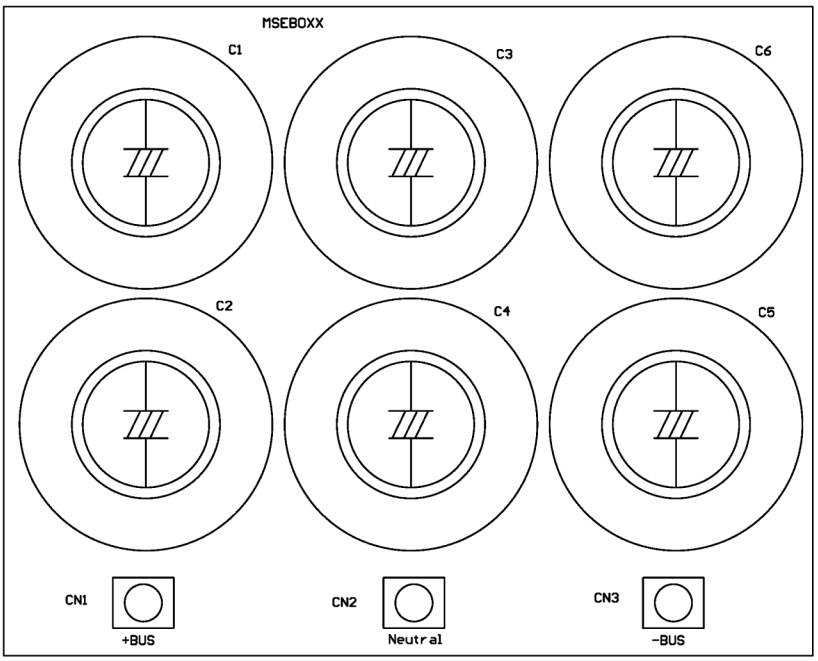
MSEF4XX PCB



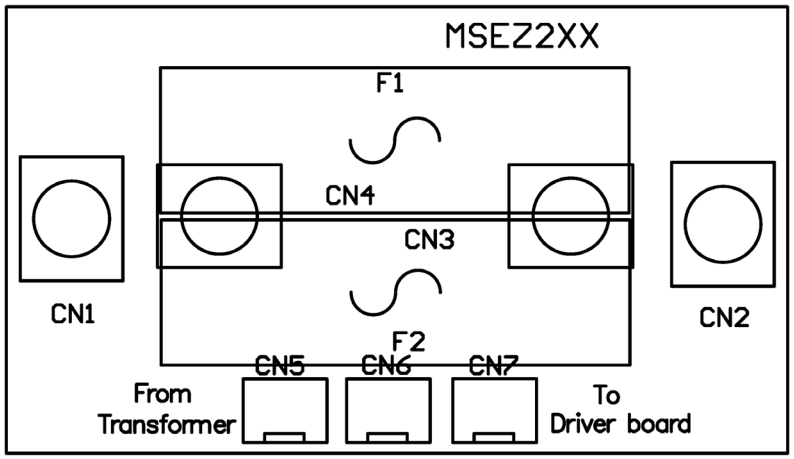
MSEFSXXPCB


NEUTRAL IN
BYPASS IN
R IN
S IN
T IN
L1
L2
1811050150000OD
MSEF500 (2oz)
2007.10.11
R OUT
S OUT
T OUT
BYPASS OUT
NEUTRAL OUT
F1

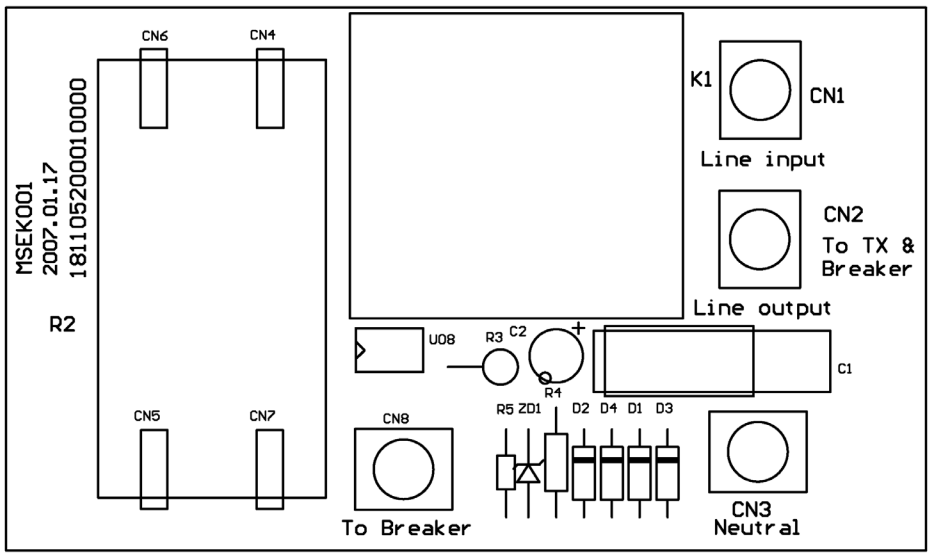
MSEB0XX PCB



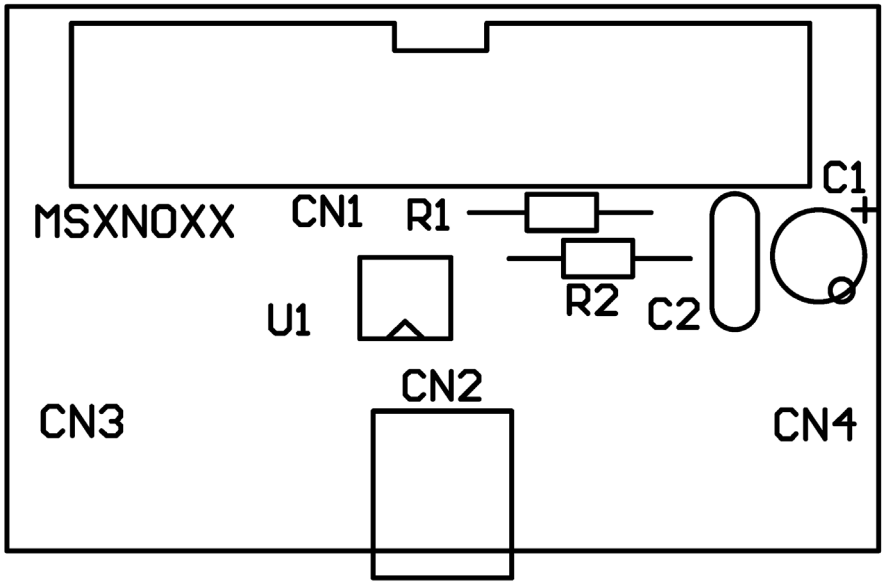
MSEZ2XX PCB



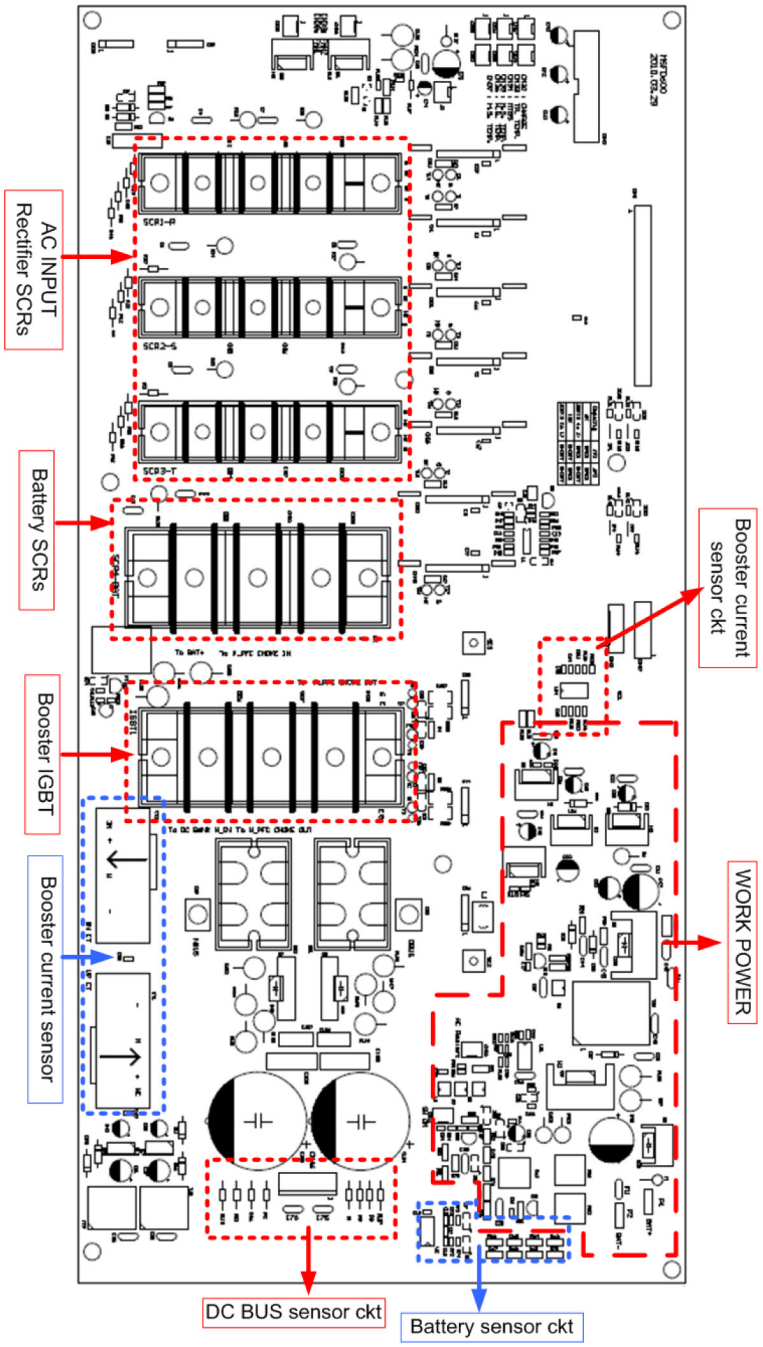
MSEK0XX PCB



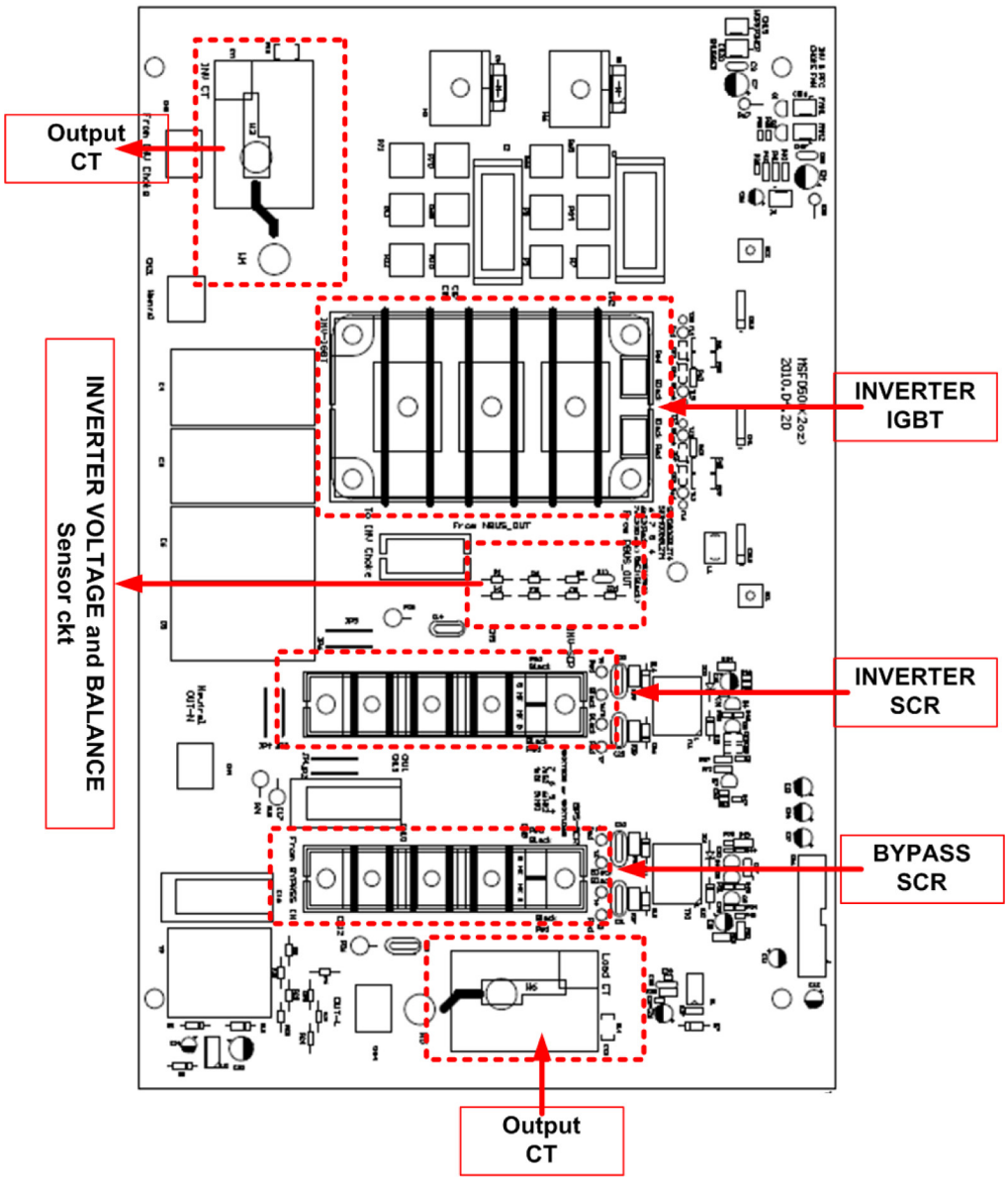
MSXN0XX PCB



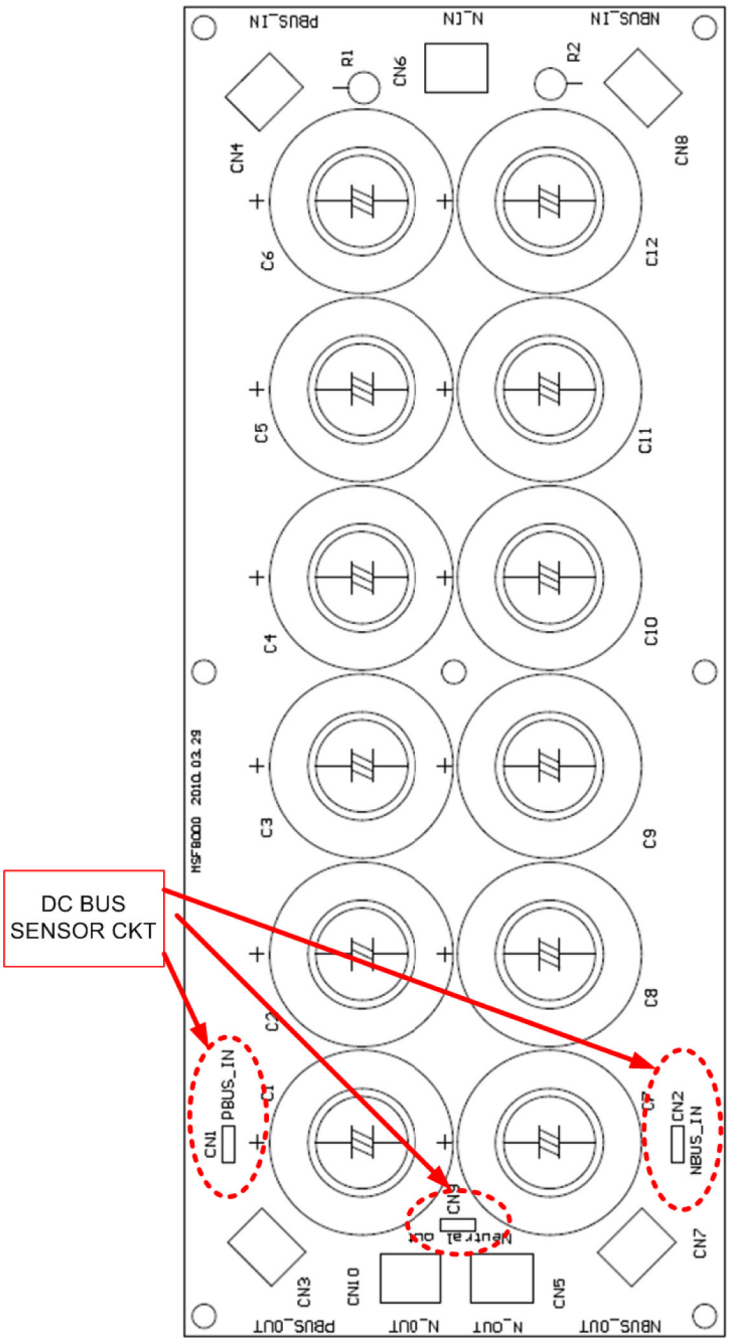
MSFD6XX


AC INPUT
Rectifier SCRs
Battery SCRs
Booster IGBT
Booster current sensor
Booster current sensor ckt
WORK POWER
DC BUS sensor ckt
Battery sensor ckt

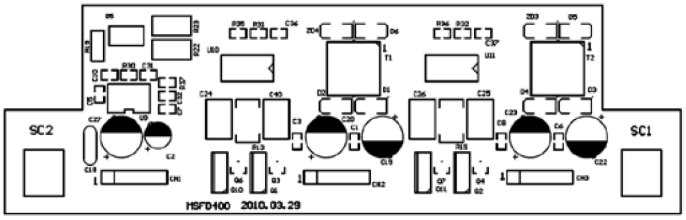
MSFD5XX


Output CT
INVERTER VOLTAGE and BALANCE Sensor ckt
INVERTER IGBT
INVERTER SCR
BYPASS SCR
Output CT

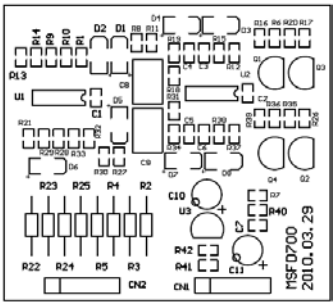
MSFB0XX



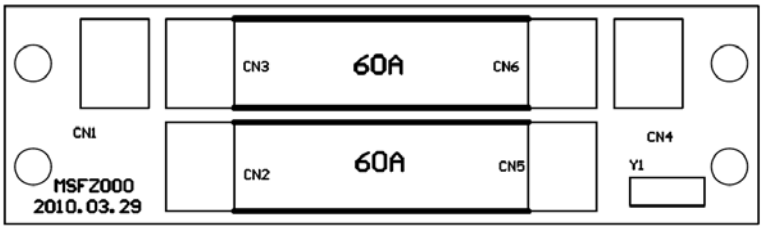
MSFD4XX



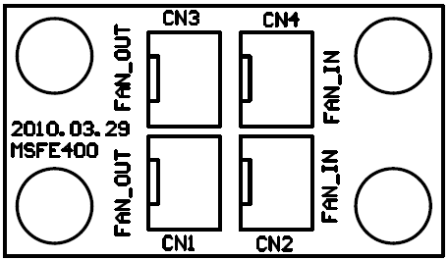
MSFD7XX



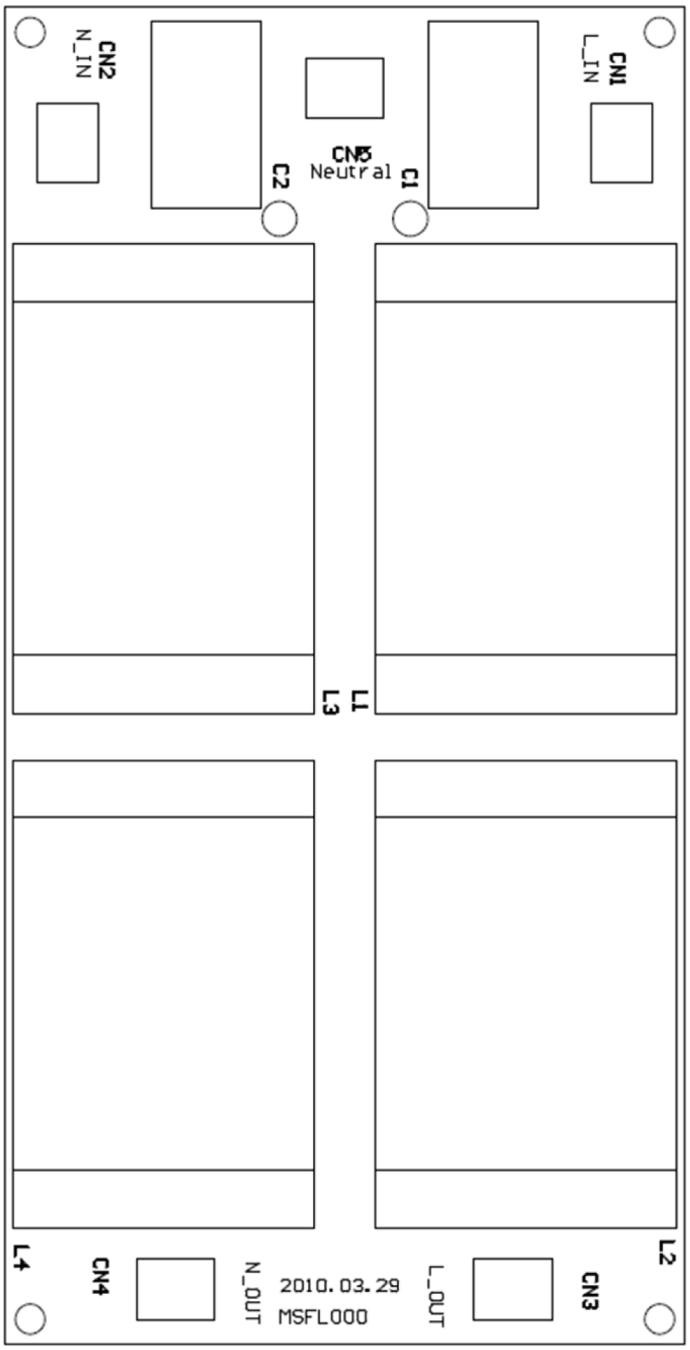
MSFZ0XX



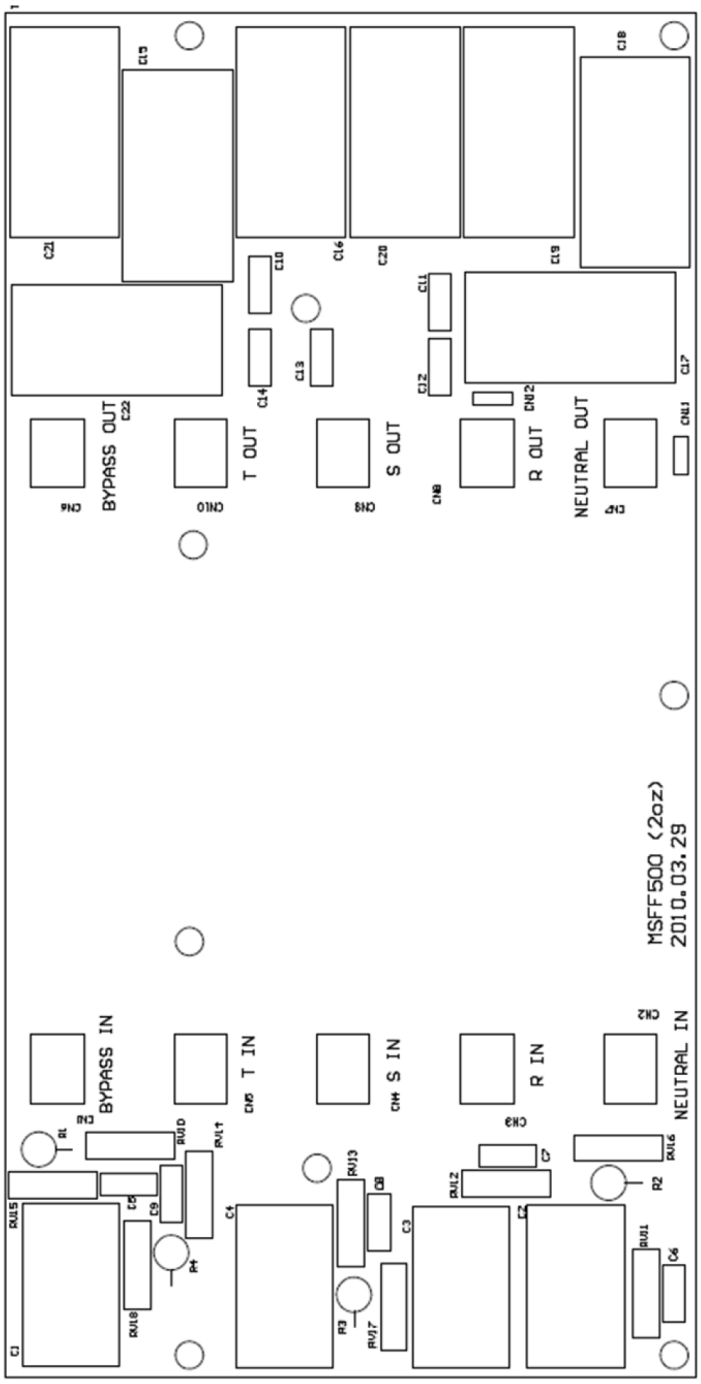
MSFE4XX



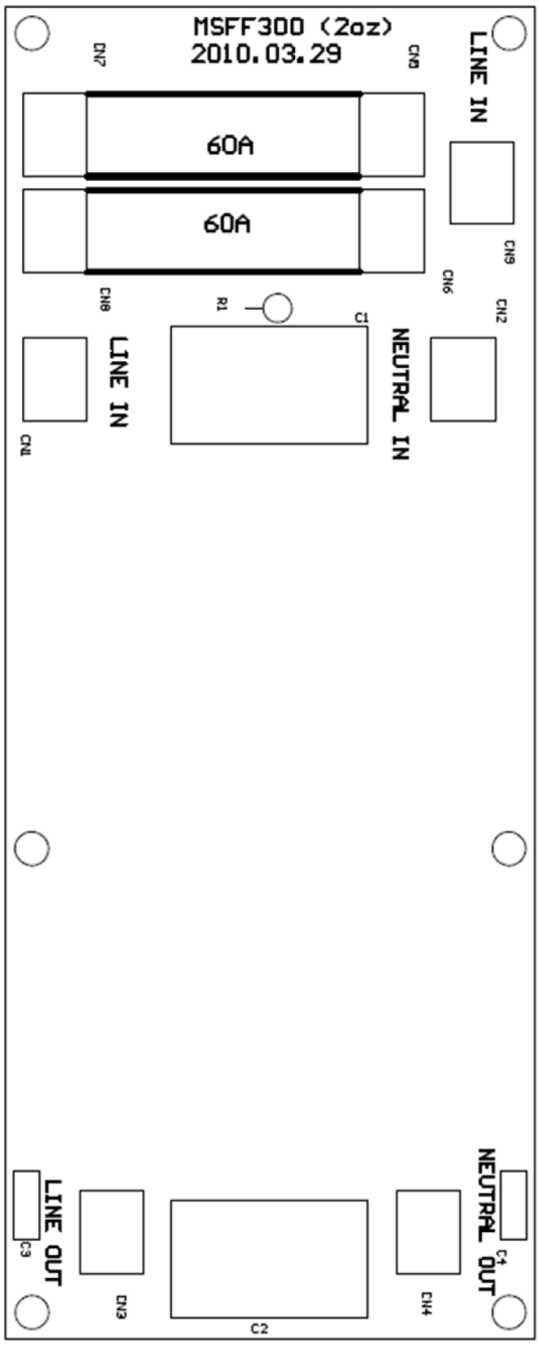
MSFL0XX


CN2
N_IN
CN1
L_IN
CN5
Neutral
C2
C1
L3
L1
L4
CN4
N_OUT
2010.03.29
MSFL000
L_OUT
CN3
L2

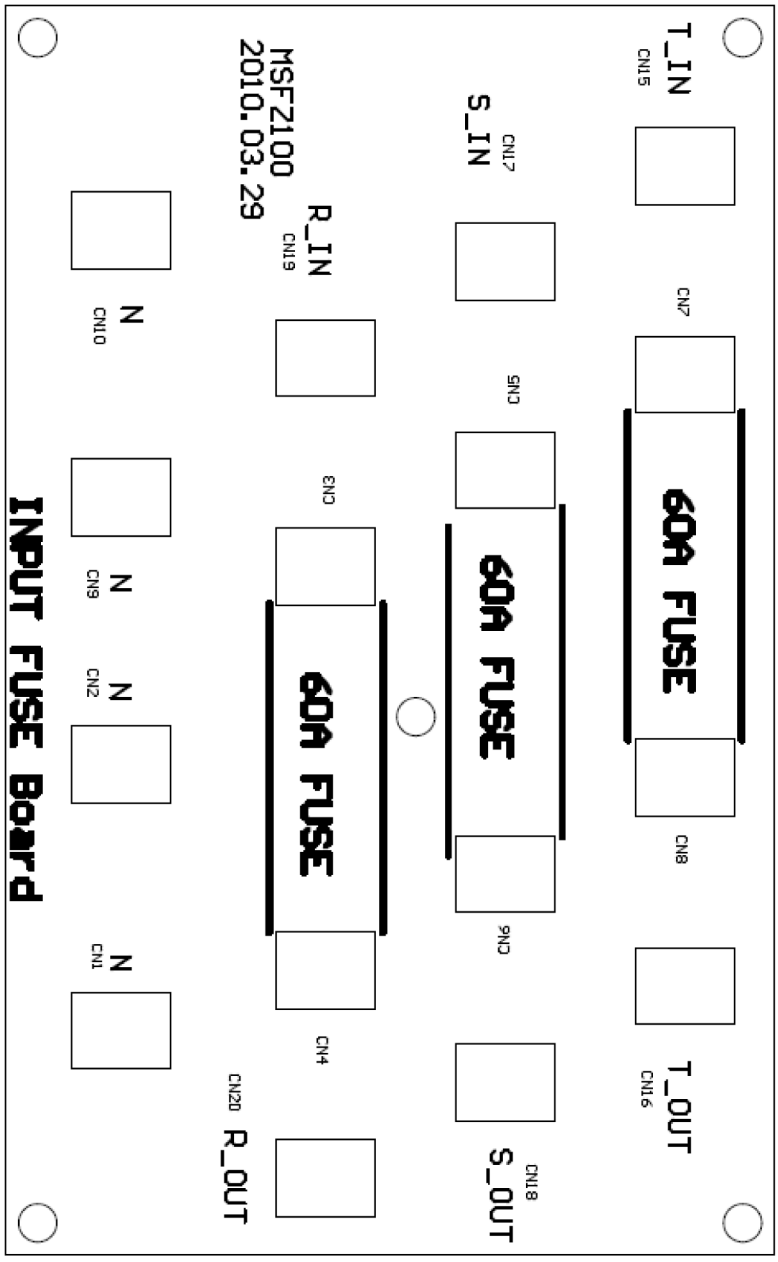
MSFF5XX


BYPASS OUT
T OUT
S OUT
R OUT
NEUTRAL OUT
BYPASS IN
T IN
S IN
R IN
NEUTRAL IN
MSFF500 (2oz)
2010.03.29

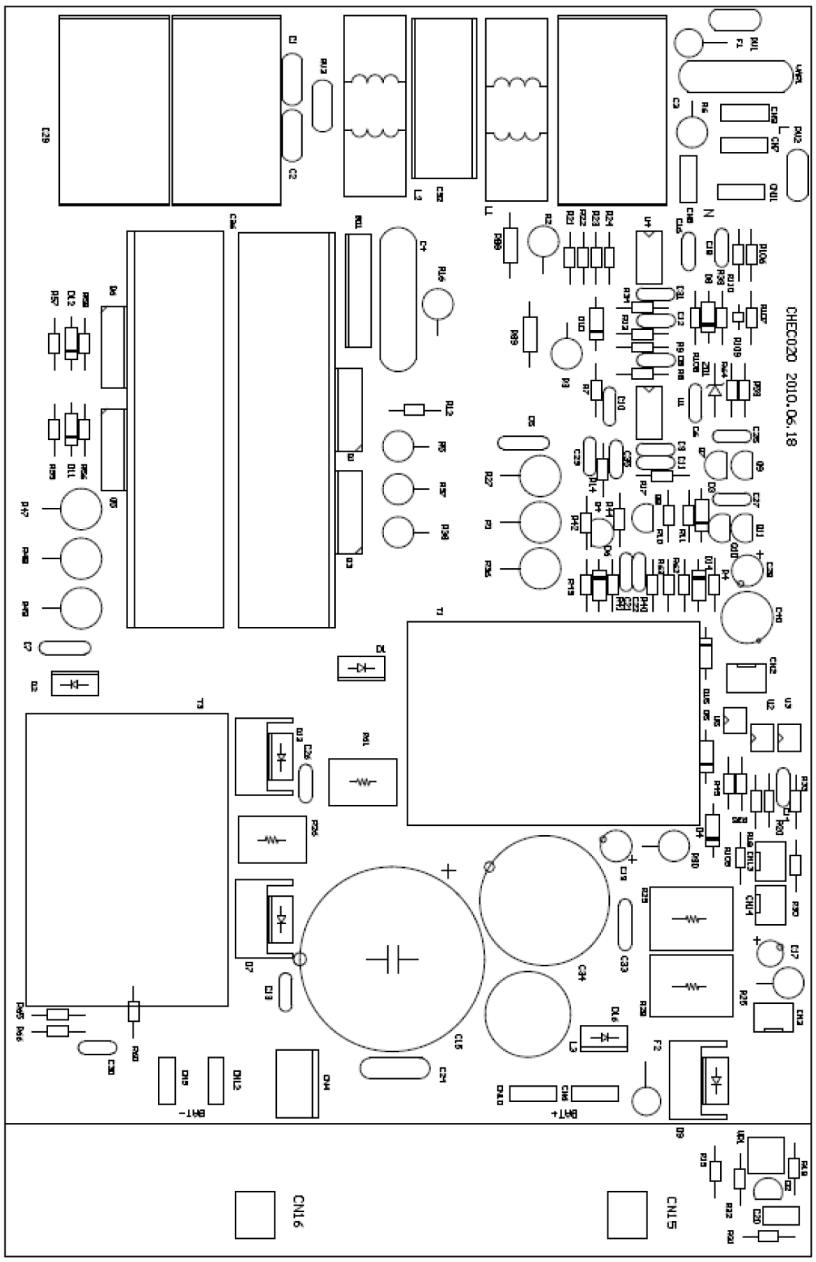
MSFF3XX


MSFF300 (2oz)
2010.03.29
CN7
CN5
LINE IN
60A
60A
CN9
CN6
CN2
CN8
R1
C1
LINE IN
NEUTRAL IN
CN1
LINE OUT
C3
CN3
C2
CN4
NEUTRAL OUT
C4

MSFZ1XX


T_IN
CN15
S_IN
CN17
R_IN
CN19
MSFZ100
2010.03.29
N
CN10
N
CN9
N
CN2
N
CN1
INPUT FUSE Board
CN7
60A FUSE
CN8
T_OUT
CN16
CN5
60A FUSE
CN6
S_OUT
CN18
CN3
60A FUSE
CN4
R_OUT
CN20

CHECOXX



CHECOXX