

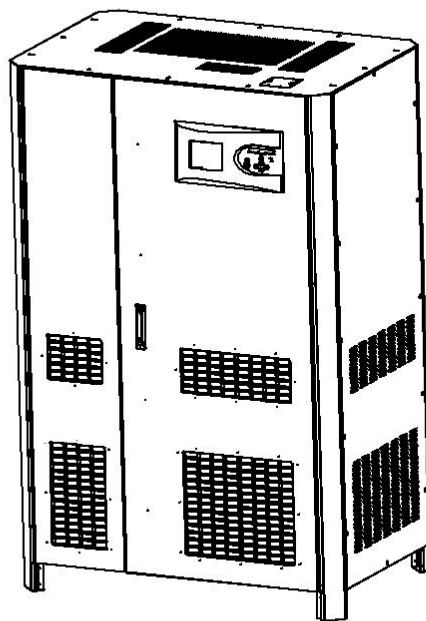
MAKELSON[®]

Uninterruptible Power Supplies

USER MANUAL

BOXER SERIES

300 KVA



USER MANUAL

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300 KVA

AG-SD-55

Documant P. No:1Rev:1

About The Manual

This manual is prepared for the users of Boxer 300 kVA.

Companion Manuals

For more info about this device and its options, please visit www.makelsan.com.tr.

Updates

Please, visit www.makelsan.com.tr for updates. Always use the latest manuals.

CONTENTS

1 SAFETY AND WARNINGS.....	1
1.1 Warnings.....	1
1.2 Clearance and Access.....	2
1.3 Storage.....	2
1.4 Shipment.....	2
2 PRODUCT DESCRIPTION.....	3
2.1 General Information.....	8
2.1.1 Static Transfer Switch	8
2.1.2 Battery Temperature Regulation.....	9
2.2 UPS's Operation Modes.....	9
2.2.1 Normal(Online) Mode	9
2.2.2 Battery(Stored) Mode	9
2.2.3 Bypass Mode	9
2.2.4 Automatic Restart Mode.....	10
2.2.5 Maintenance Mode.....	10
2.3 Battery Management.....	10
2.3.1 Normal Operation Mode.....	10
2.3.2 Advanced Level Functions(Automatic Battery Test)	11
2.4 User Panel.....	12
2.4.1 Opening Screen	14
2.4.2 Main Menu.....	14
2.4.3 Navigating Through Menus.....	14
2.4.4 Password Protected Menus	15
2.4.5 Control Menu	15
2.4.6 Status Menu	16
2.4.7 Setup Menu	17
2.4.8 Logging Menu.....	20
2.4.9 Service Menu.....	20
3 INSTALLATION.....	21
3.1 Single Module Installation	21
3.1.1 Warnings.....	21
3.1.2 Pre-Installation Check Up	22
3.1.3 Positioning.....	22

3.1.3.1 Positioning the UPS	22
3.1.3.2 Placing the External Batteries	23
3.1.4 Transportation Type of Cabinets	24
3.1.5 Mains, Load and Battery Connections	24
3.1.5.1 External Protections	25
3.1.5.2 Cable and Fuse Protection	25
3.1.5.3 Cable Connections	26
3.1.5.4 Connecting Batteries	30
3.1.5.4.1 External Battery Installation Procedure and Connection	30
3.1.5.5 Control and Communication Cable Connections	32
3.2 Parallel Setup	32
4 OPERATION	37
4.1 Operation Procedure	37
4.1.1 Circuit Breakers	37
4.1.2 First Start-Up	38
4.1.3 Testing the Operation Modes of UPS	40
4.1.3.1 Switching from Normal Mode to Battery Mode	40
4.1.3.2 Switching from Normal Mode to Static Bypass Mode	41
4.1.3.3 Switching from Static Bypass Mode to Normal Mode	41
4.1.3.4 Switching from Normal Mode to Maintenance Bypass Mode	42
4.1.4 Performing a Complete Shutdown	44
4.1.5 EPO(Emergency Power OFF)	45
4.1.6 RS232 Serial Communication Installation and Exemination	45
5 EXPLANATION OF LOGGING	46
6 TABLE of TECHNICAL SPECIFICATIONS	51
7 CONTACT INFORMATIONS	53

1 SAFETY AND WARNINGS

1.1 Warnings

This manual must definitely be read before installing the UPS. The installation and first start-up can be performed only by authorized MAKELSAN staff.

Installation or start-up by unauthorized personel may cause damage to the device and serious injury or death.

The UPS is designed to be used in continuous vertical fixed position applications.



UPS MUST BE USED WITH GROUND CONNECTION.

Connect the ground cable before connecting the mains.

The ground leakage current may rise up to 0,4A .



THE UPS MUST BE DISCONNECTED FROM THE MAINS AND BATTERIES BEFORE SERVICING. ALSO WAIT FOR AT LEAST 5 MINUTES FOR THE DC BUS CAPACITORS TO DISCHARGE AFTER POWER OFF.

Service-Maintenance

All service and maintenance operations are performed internally. All parts of the UPS can be serviced and replaced only by a trained technician.

Performing regular protective maintenance at least once a year is recommended beginning from the first installation. (This service will be provided for a fee by authorized MAKELSAN staff.)



BATTERY VOLTAGE MAY RISE UP TO 450 VDC!

Battery terminal voltages can be at hazardous levels (450VDC). Batteries must not be touched except the trained and authorized staff.

Batteries certainly must not be thrown into fire. Regarding the topic of batteries which are dead and defected: The waste batteries must definitely not be thrown to nature. They must delivered to MAKELSAN authorized technicians or to the foundations which are authorized for collecting waste batteries by the Ministry of Environment.

Fire extinguishing equipment for electrical fires must be kept nearby the UPS.

1.2 Clearance and Access

Clearance

There are no any air inlet or outlet grid on the rear side of our 300 kVA UPS. All air goes into UPS from the front and side openings and is evacuated through upside grids. There must be at least 850 mm at front side and at least 600 mm at rear side and back side of UPS. Should not be permanent or temporary use within the limits specified. Otherwise, the UPS's performance will decrease.

Access

Operator can reach the inside of UPS through all sides on 300 kVA UPS. Therefore, enough area must be left for operator. Estimated distance is 600 mm.

1.3 Storage

UPS should be kept in a room or area where is protected from excessive moisture and heat before commissioning.



Unused batteries must be charged at regular intervals. This time interval is determined by the battery supplier. Charging batteries can be performed periodically by connecting to proper mains for a while.

1.4 Shipment

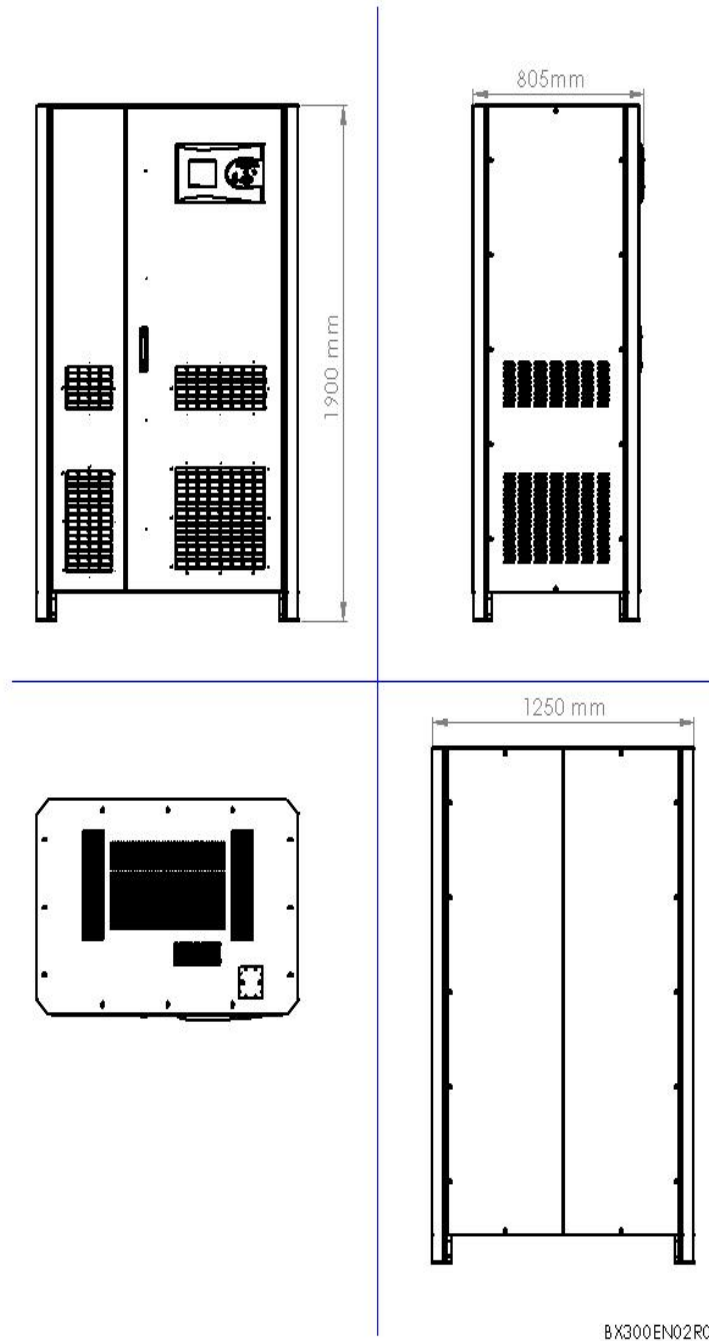
Carrying vehicles or handling accessories must have enough features and characteristics to carry UPS's weight.

Be more careful of sudden movements, especially when batteries are inside of cabinet.

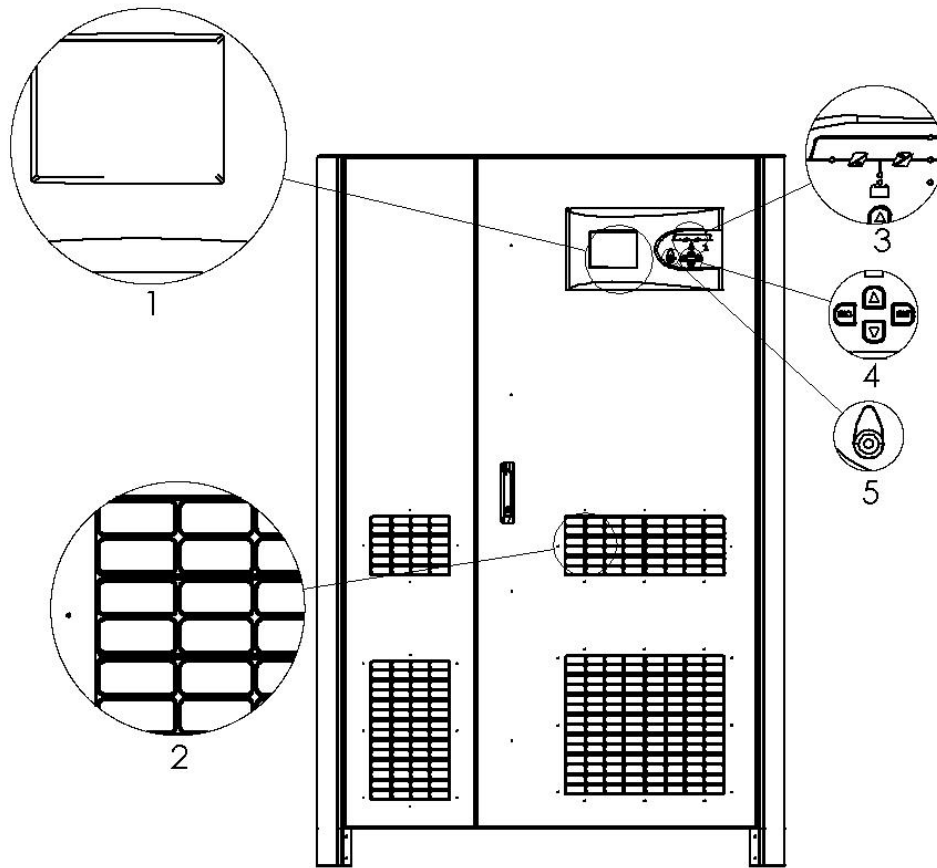
Move the UPS as rarely as possible.

2 PRODUCT DESCRIPTION

General View



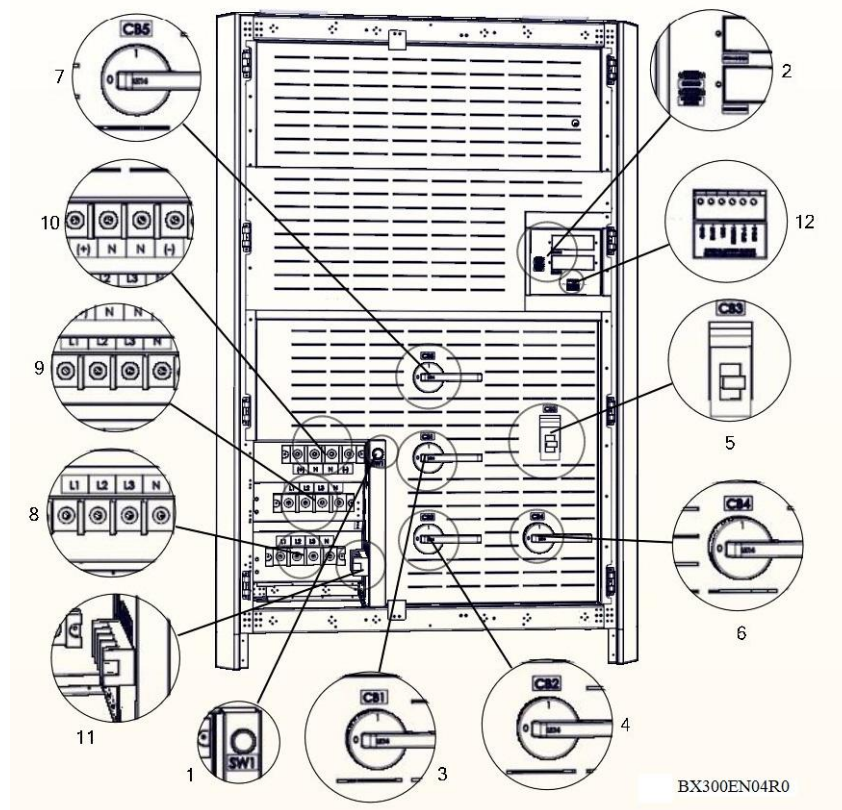
Front View



BX300EN03R0

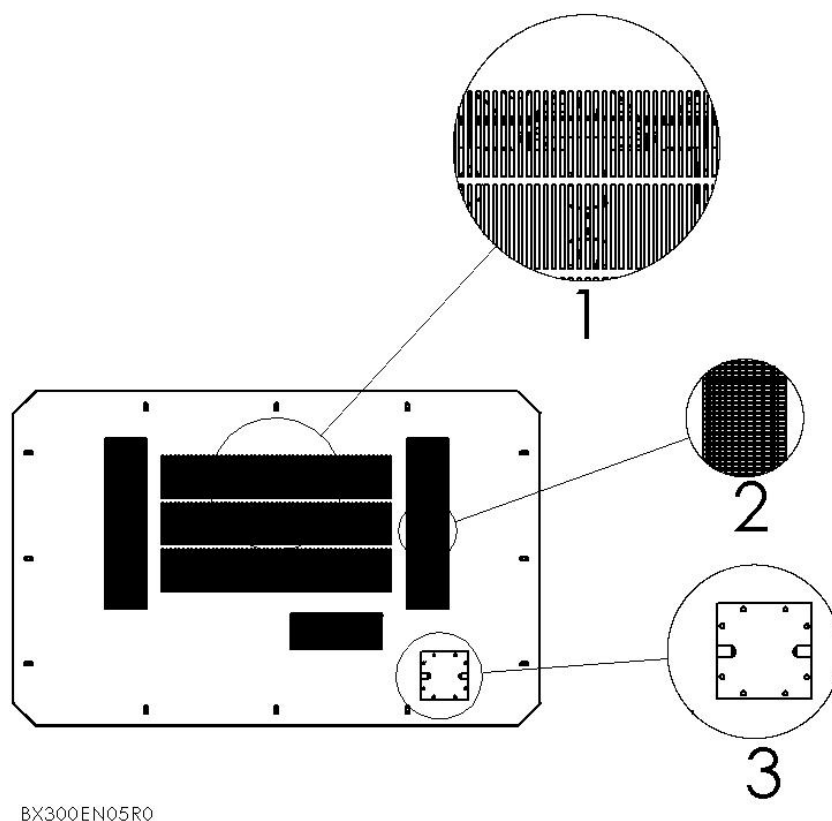
1	320x240 6" Graphic LCD
2	Fresh Air Vacuum Grid
3	Mimic Diagram
4	Menu Navigation Keys
5	EPO(Emergency Power Off) Button

Front Cover View



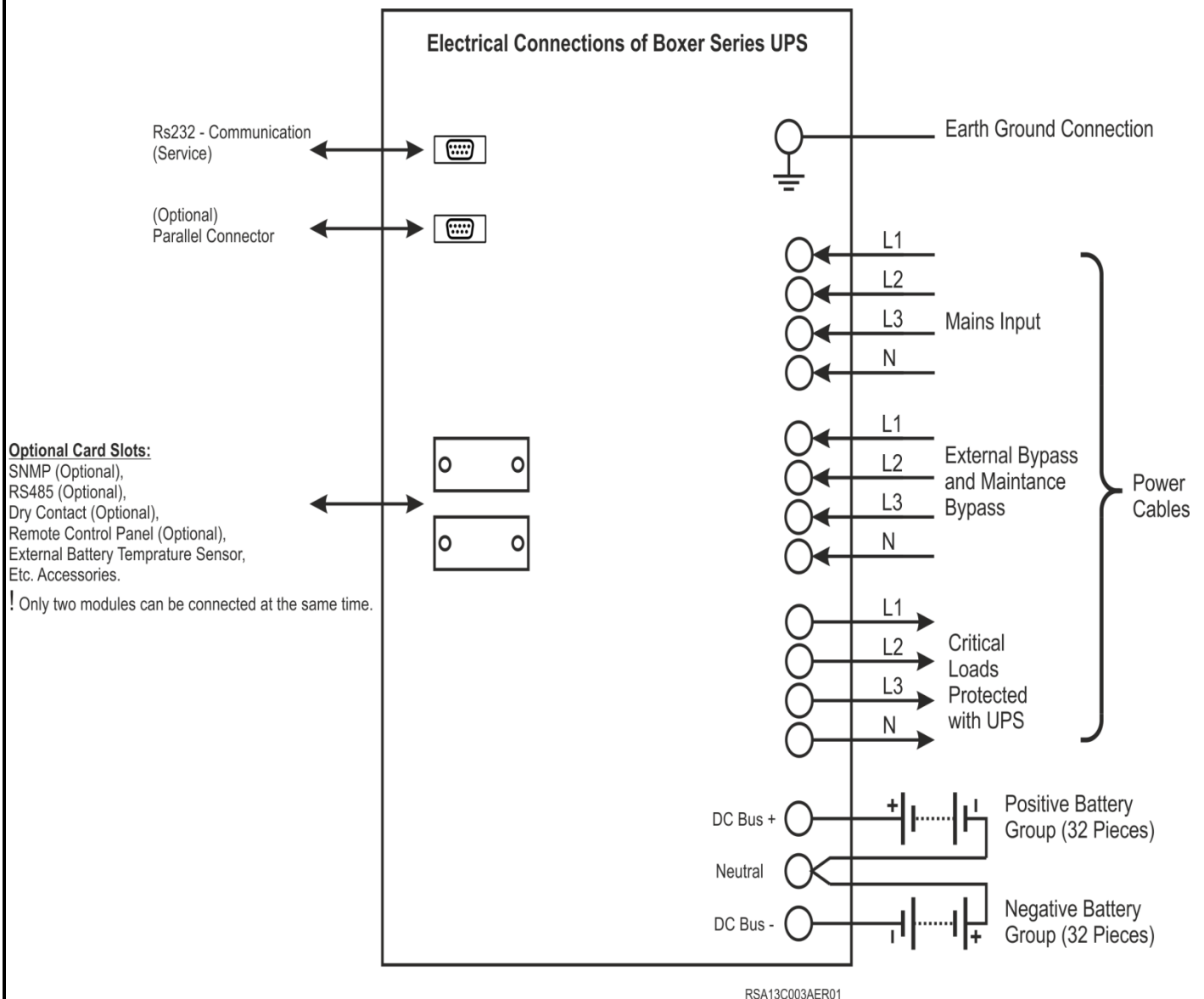
1	Soft Start Button
2	RS232 Serial Communications Socket and Optional Slot
3	Mains Circuit Breaker
4	Mechanic Bypass Circuit Breaker
5	Output Circuit Breaker
6	Battery Circuit Breaker
7	External Bypass Circuit Breaker
8	Input Terminals
9	Output Terminals
10	Battery Terminals
11	External Bypass Input
12	External Battery Temperature Measurement Port

Top View



1	Hot Air Evacuation Channel
2	Rectifier, charger, inverter Hot Air Evacuation Channel
3	Parallel Connection Socket Mounting Place

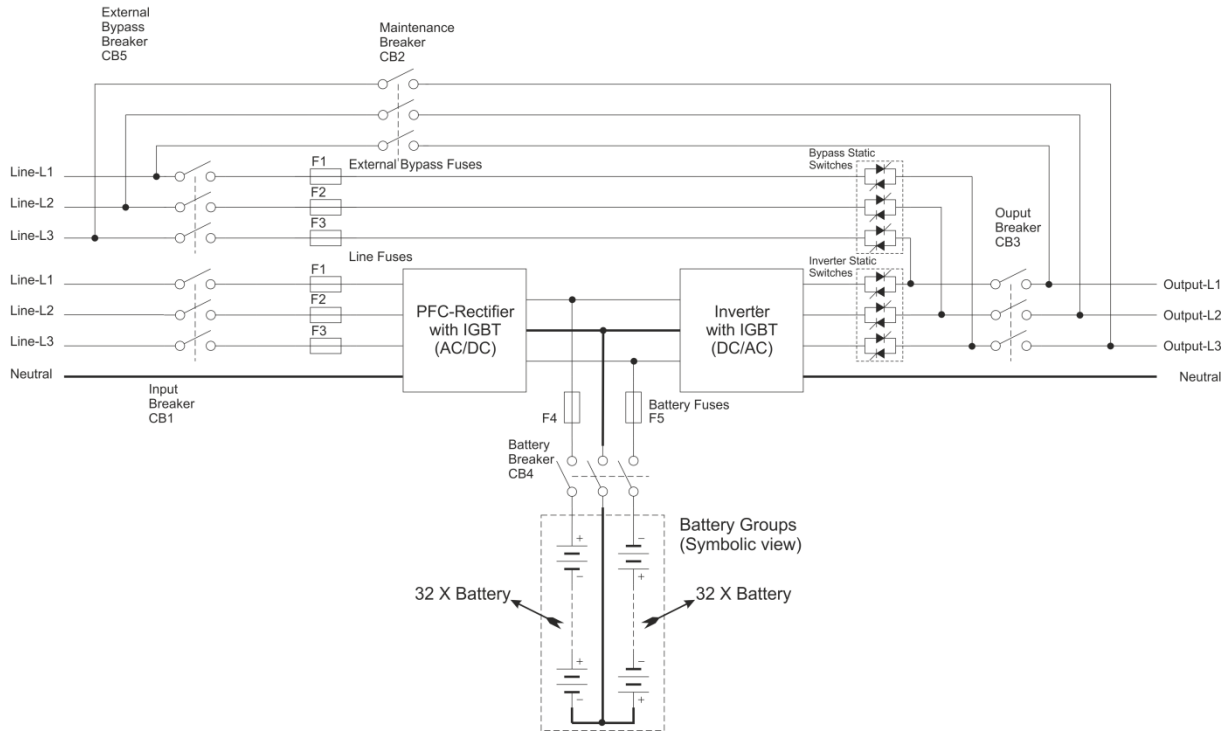
Electrical Connection



2.1 General Information

General operation topology of Boxer Series UPS can be recognized as follows.

MAKELSAN® Electrical Topology of Boxer Series UPS



The UPS is connected to the mains voltage through the CB1 breaker. The rectifier converts the AC mains to DC voltage and charges the batteries in a controlled manner. DC bus voltage is then converted to mains synchronized AC voltage by the inverter. This is a high quality voltage. Generated AC power will be applied to the loads through the static semiconductor transfer switches and output circuit breakers.

When maintenance or repair are needed, before input and output circuit breakers are turned OFF, switch the UPS from normal mode to static bypass mode(4.1.3.2). Secondly, turn ON the maintenance circuit breaker. After that, input and output circuit breakers are turned OFF respectively.

2.1.1 Static Transfer Switch

Some blocks are named as “static switches” as can be seen above. These blocks consist of inverse parallel connected thyristors. These switches, which are under the control of the mainboard control unit (DSP), provides controlling of feeding the loads through either mains or inverters. The loads are fed through inverter during the normal operating mode. Therefore, inverter static switches are active if there is no problem with the system.

System provides the loads to be fed smooth and seamless by mains or inverter. In order to manage his process at minimum risk, UPS synchronizes the inverter output and static (mains)

bypass as phase and frequency. Therefore, inverter frequency is the same as mains frequency as long as it is within acceptable frequency limit.

NOTE: In the meantime, the loads are unprotected against the power-off, damage, twist etc. problems.

2.1.2 Battery Temperature Regulation

Temperature sensor is given with external battery cabinets. Temperature of batteries is measured by this sensor. UPS adjusts battery charge parameters according to the information of the detected temperature. These parameters can be adjusted via LCD or TELNET interface by authorized staff.

2.2 UPS's Operation Modes

Boxer series UPS's on-line and has a double loop structure. Our products operate in the following modes:

- Normal (Online) Mode
- Battery Mode
- Bypass Mode
- Auto Restart Mode
- Maintenance Mode

2.2.1 Normal(Online) Mode

In this mode, UPS supplies the load through the inverters. Rectifier unit is fed by the AC mains. Inverter and battery charger units are fed by the generated DC supply by rectifier unit.

2.2.2 Battery(Stored) Mode

In case of any failure of the mains (line), UPS will feed the loads with the energy supplied by the batteries.

2.2.3 Bypass Mode

In case of any overload or any problem on inverter side and if bypass voltage and frequency are in tolerance, loads will be fed through bypass source. UPS switches from inverter to AC source (mains) via static transfer switches without any interruption. The inverter source and mains must be synchronized in order to manage this switchings without any problem. If inverter output and mains are not synchronized, this switching may take up to 15 msec, varying according to load type.

2.2.4 Automatic Restart Mode

In case of any failure of the mains, UPS will continue feeding the critical loads until the batteries reaches the end of discharge voltage level. UPS, will go on working until the batteries are drained and then will shutdown. After the mains conditions gets back to normal, UPS automatically starts to operate, in the period determined by the user. In this case, UPS continues to operates in normal (online) mode as long as the mains values are in desired criterions. For Boxer Series UPS, this feature is not activated as factory initial setups.

2.2.5 Maintenance Mode

UPS has a specific protection switch in order to keeping the loads powered in the maintenance mode. This switch is designed to handle UPS loads completely.

2.3 Battery Management

Lead – Acid Batteries are used with UPSs.

2.3.1 Normal Operation Mode

Constant Charge Current

Constant current as 1/10 rate of the battery capacity is applied to battery, until it reaches the float voltage.

Float Charge

Depending on the battery discharge current the third percent energy of the battery is charged at this level. Thanks to this level, batteries are kept ready for use at the highest capacity. For lead-acid batteries, this voltage varies between values 2.2-2.35 V/cell. This voltage may differ slightly with temperature adaptation. Option of setting this coefficient is provided with our UPS. If the temperature sensor is used, it is recommended to use.

Deep Discharge Protection

While the system is operating in the battery mode, if battery voltage has dropped below the discharge level UPS shuts down and stops absorbing energy from the batteries. This value varies between 1.6-1.75 V/cell for Lead-Acid batteries, and for Ni-Cd batteries between 0.9-1.1 V / cell.

Low Battery Warning Level

While the system operates in battery (stored) mode, according to actual loads if the battery capacity drops below its 40% value, it will give audible and visible alarms. This percentage value is adjustable for user between 20%-70%.

2.3.2 Advanced Level Functions(Automatic Battery Test)

The auto battery test discharges 10% of the battery energy in a user defined period (default is 90 days). This period can be adjusted between 30-360 days. Test reports the battery condition as “**good or replace**”. Results of the latest test can be seen on the battery screen from the status menu.



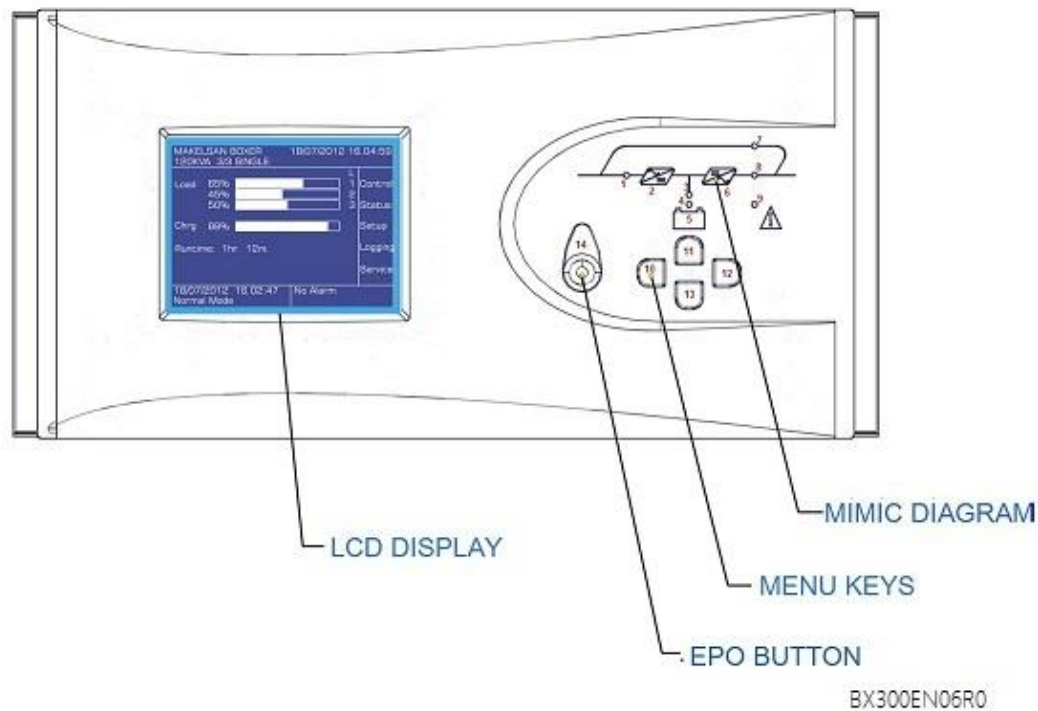
If the test result is “replace”, then the batteries are completely drained during the test. This situation may cause the load remained unpowered in case of mains voltage is out of the limits or mains power off.

This test can be started by command from front panel monitor, via TELNET interface, via RS232 smart communication or via UPSMAN (SNMP, see the options).

It is checked that if the batteries can supply the minimum back-up time needed in case of the first power-off by using the results of all these tests. Checking the test results with a regular period is recommended.

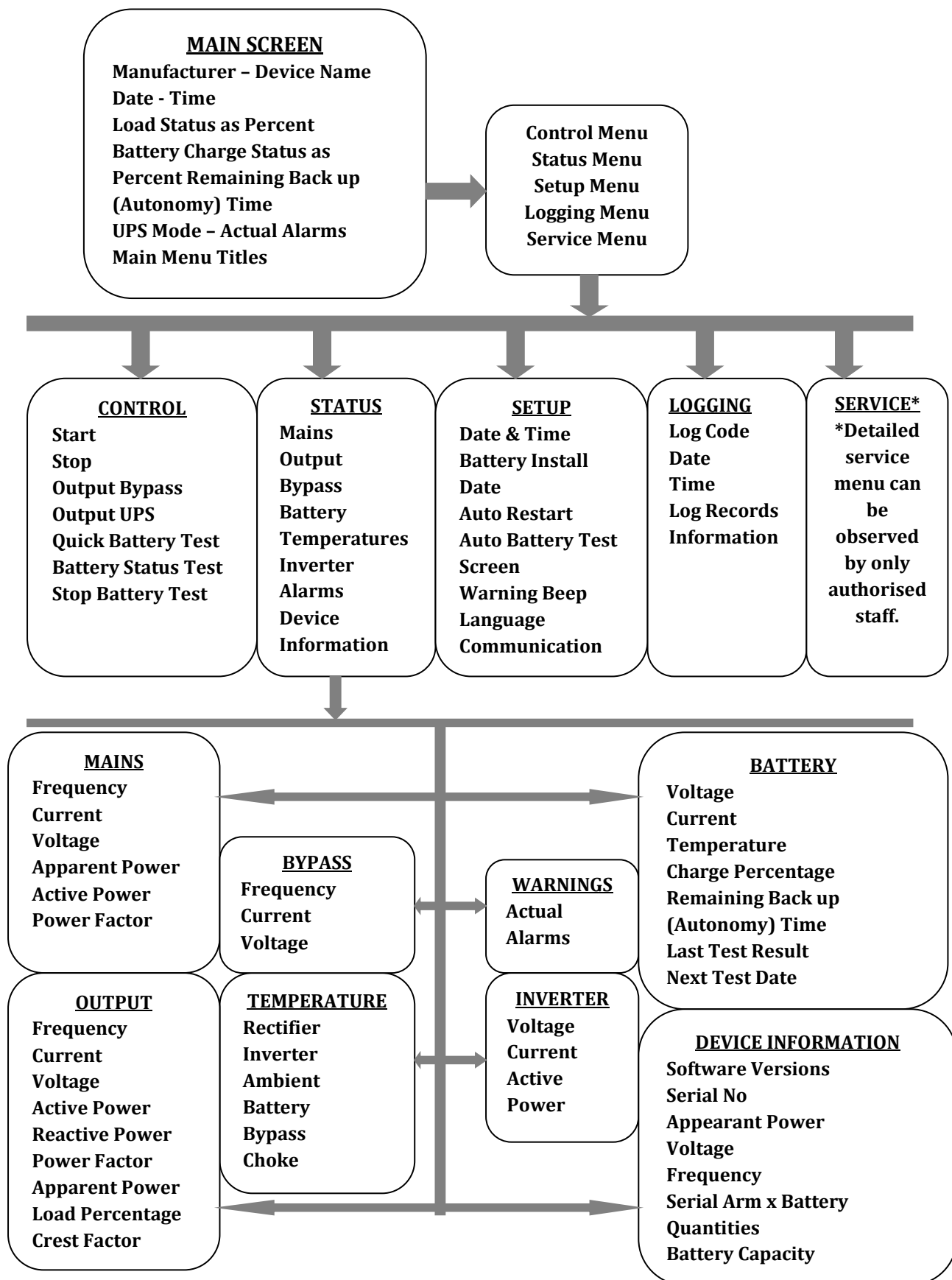
2.4 User Panel

User panel consists of mimic diagram, LCD screen, EPO button and menu keys. The UPS can be controlled via this panel.

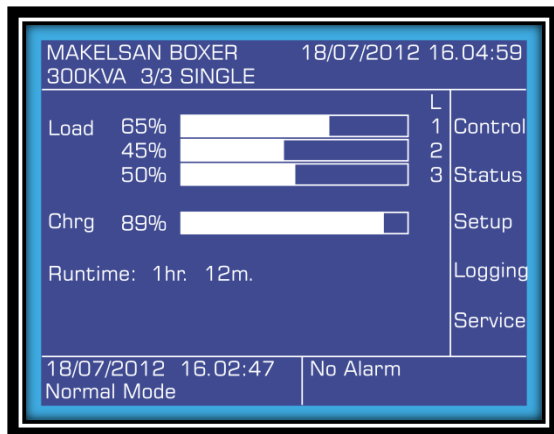


1	Rectifier indicator LED Illuminates when Rectifier works.
2	AC/DC module (Rectifier)
3	Battery charge indicator LED Illuminates in battery mode. Flashes when UPS is started up through batteries.
4	Battery charge indicator LED Illuminates while the batteries are charging.
5	Battery module
6	DC/AC module (Inverter)
7	Mains bypass indicator LED Illuminates while the loads are fed through bypass line.
8	Inverter static switch indicator LED Illuminates when the load is fed by the inverter
9	Alarm/Warning indicator LED
10-13	Menu keys
14	EPO (Emergency Power Off) Button

Menu Flow Chart

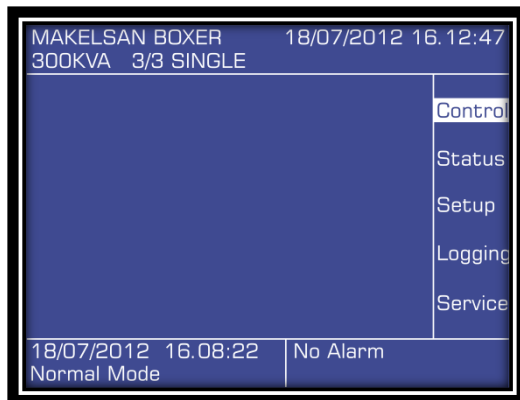


2.4.1 Opening Screen



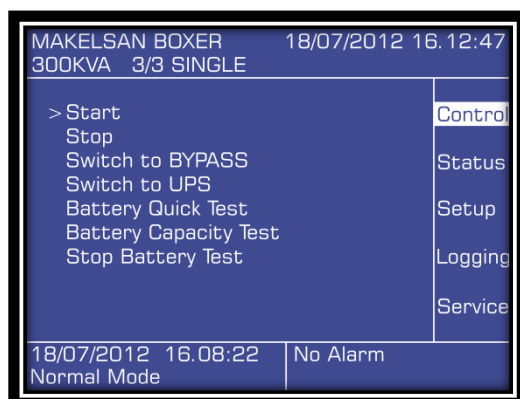
When the front panel monitor is turned on, firstly opening screen is observed. Manufacturer – Device Name, Date – Time, Load Status as Percent ,Battery Charge Status as Percent, Remaining Back up (Autonomy) Time, UPS Mode – Actual Alarms, Main Menu Titles can be observed here. In case of an alarming condition, alarms are shown on the left-down row. If no button is pressed for 5 minutes, system returns to the opening screen.

2.4.2 Main Menu



To switch from opening screen to the main menu, press Enter button.

2.4.3 Navigating Through Menus



Use up and down keys to move the cursor arrow. Press enter to open a sub-menu. Press ESC to go back to the previous menu.

Control sub-menu is shown on left.

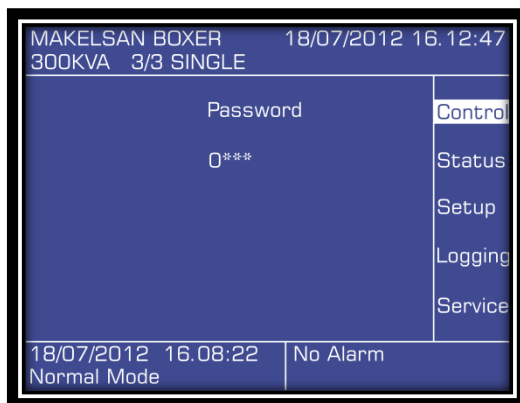
Keep pressing up or down key to navigate between the sub-menus.

Some menus have changeable options like ON/OFF, durations or quantities. To change some setups in such a menu, press ENTER.

To choose the variable, use up and down keys. To change the value, press ENTER.

To set the new value, press ESC to cancel.

2.4.4 Password Protected Menus



Some menus such as the control menu are password protected. Press ENTER to set each digit and press ENTER to confirm.

User level password is: 0000 (zero-zero-zero-zero)

2.4.5 Control Menu

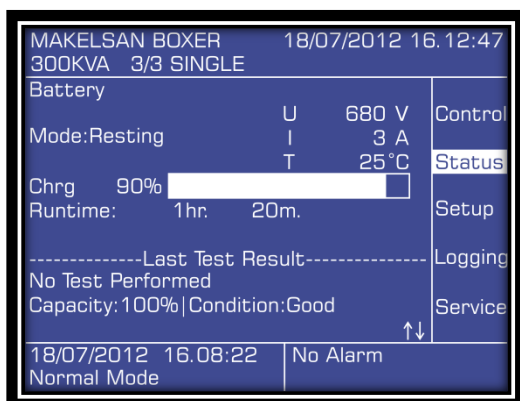
In the control menu, you can do one of the following.

- | | |
|-----------------------------|-------------------------------|
| ➤ Start | Start the UPS. |
| ➤ Stop | Stop the UPS. |
| ➤ Switch to BYPASS | Switch to static BYPASS mode. |
| ➤ Switch to UPS | Switch to online mode. |
| ➤ Bat. Quick Test | Start the quick battery test. |
| ➤ Bat. Capacity Test | Start the deep battery test. |
| ➤ Stop Battery Test | Stop the battery test. |

Battery status test, drains the 10% of battery energy and reports batteries which has more capacity than 10% as **“Good”**, less capacity than 10% as **“Replace”** according to the test results.

After UPS is started and every 24 hours, it makes a quick battery test ,if test counter value is zero (0).

Note: Batteries must have been fully charged and kept in floating situation for at least one hour before performing the quick battery test.



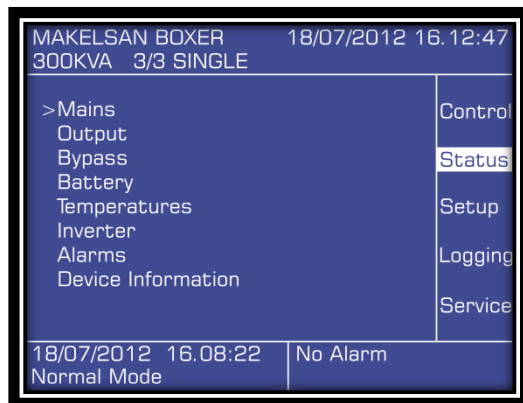
Batteries must have been fully charged and kept in floating situation for at least five hour before performing the battery test.

Battery tests are performed by directing the power to the mains, independently from the loads. If the mains values gets out of limits during the test, test will be canceled.

Following **Status > Battery** menu, how many minutes left to start the test can be observed.

If “**Stop Battery Test**” is chosen from the menu, the UPS cancels the battery test and goes back to the previous operating state.

2.4.6 Status Menu



You can see information about the mains, output, bypass line, battery, temperatures, inverter, alarms and device informations on this menu.

Mains

UP, I, UL

Voltage, current and frequency of each phase (phase-neutral, phase-phase)

S, P, PF

Active power, apparent power and power factor of each phase

Output

UP, I, UL

Voltage, current and frequency of each phase (phase-neutral, phase-phase)

S, P, PF

Active power, apparent power and power factor of each phase

L, CF

Load percent of each phase and crest factor

Bypass

UP, I, UL

Voltage, current and frequency of each phase (phase-neutral, phase-phase)

Battery

Mode

UPS operation mode

U, I, °C

Charging voltage, current and temperature.

Charge %

Charge percentage.

Autonomy Time

Remaining back-up (autonomy) time

Last Test Result

Capacity and status according to the last test results

Next Test Date

Next test date, time and remaining time for test

Temperature

°C, °C, °C, °C, °C

Rectifier, inverter, charger, ambient, battery and thyristor temperatures

Inverter

U, I, P

Voltage(phase-neutral), current and appearant power of each phase

Alarms

Alarms

Actual UPS alarms

Device Information____-____-____

KVA, V/Hz

x, Ah

Inverter, rectifier, CPLD, front panel software version

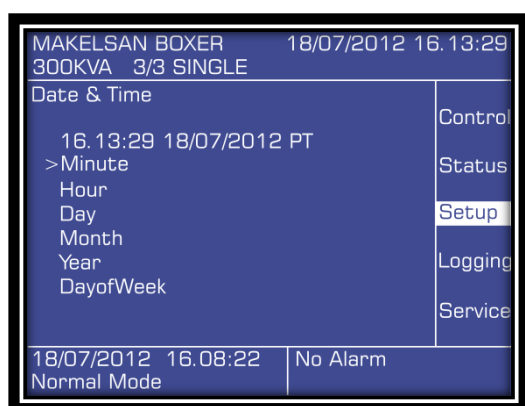
UPS serial no

Appearant power, instantaneous output voltage (phase-neutral), instantaneous output frequency

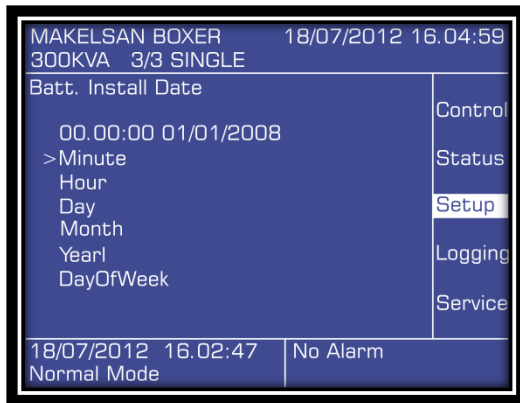
Parallel battery arm number x Serial battery arm number Battery capacity adjusted in UPS

2.4.7 Setup Menu

Setup menu consists of the following:

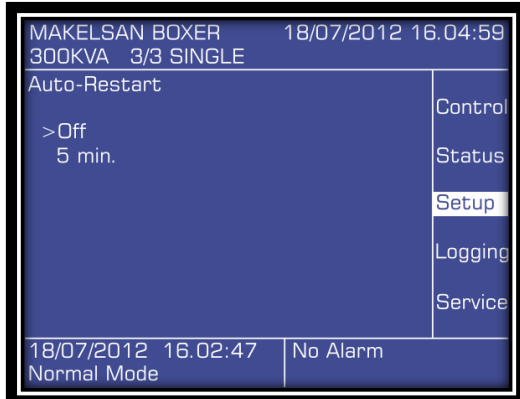
**Date&Time**

To set date and time, use up and down keys to choose the variable you want to set and press ENTER.



Battery Installation Date

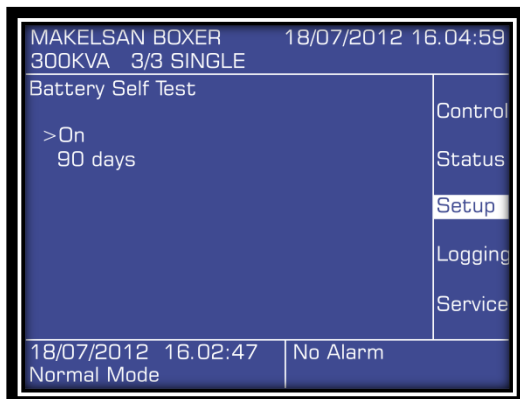
Use this menu to set the battery install date, only when new batteries are installed.



Auto Restart

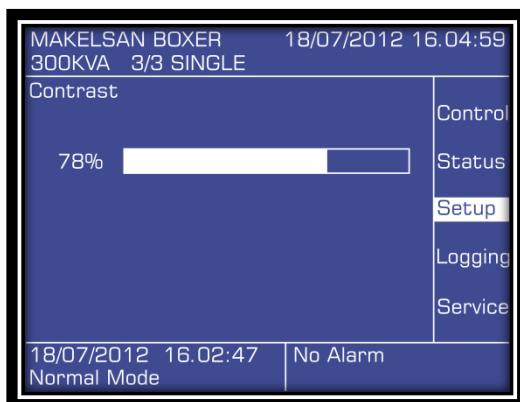
In battery mode, the device turns off at the end of battery discharge. Auto-restart can be used to restart the UPS automatically when the mains gets back into limit values.

Turn on auto-restart and set the time definition which refers to how much time after the device will be started after the mains is normal.



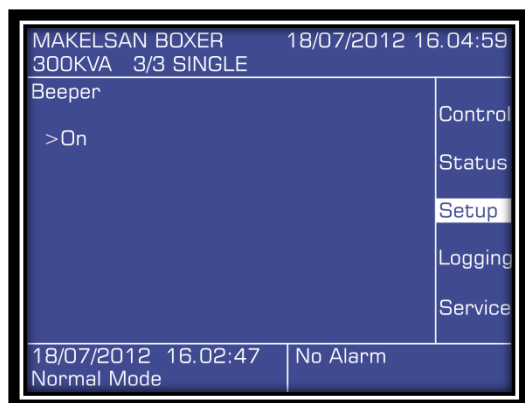
Battery Self Test

This menu can be used to setup the to turn ON/OFF automatic battery test and period (repeat period for the regular test) independently from user.

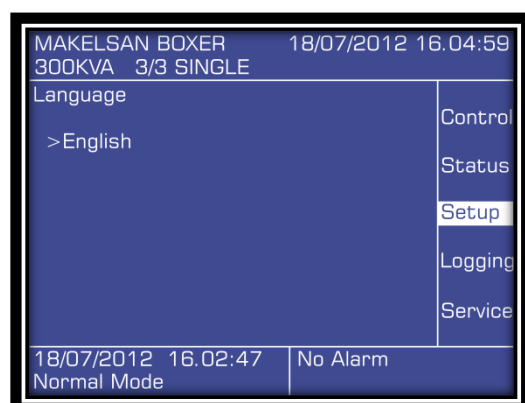


Screen

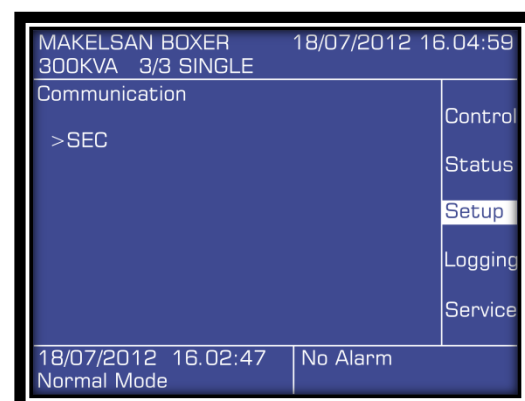
Change the screen contrast to make it more visible on different environmental conditions.

**Beeper**

Turn the beeper sound on/off.

**Language**

Set the menu language.

**Communication**

Set the protocol for the RS232 connection. The options are SEC and TELNET.

2.4.8 Logging Menu

MAKELSAN BOXER 18/07/2012 16.22:47 300KVA 3/3 SINGLE	
18/07/2012 16.15:18 E001 <----- Batteries Changed	Control
18/07/2012 16.08:22 E002 Ambient Abnor. Temp.	Status
18/07/2012 16.08:22 E003 EPO key pressed	Setup
	Logging
	Service
18/07/2012 16.15:18	No Alarm
Normal Mode	

The last 500 event (logs) can be observed in the logging menu.

During observation any of the logs, if ENTER button is pushed, all the informations (mains, battery, bypass,output values, alarms etc.) are shown.

Up/Down buttons can be used to observe older/actual logs.

MAKELSAN BOXER 25/07/2012 13.03:20 300KVA 3/3 SINGLE	
25/07/2012 11.13:51 E004 <----- Normal Load	Control
25/07/2012 10.50:50 E005 Over Load	Status
25/07/2012 10.49:02 E006 Bypass Mode	Setup
	Logging
	Service
25/07/2012 11.14:34	No Alarm
Normal Mode	

2.4.9 Service Menu

MAKELSAN BOXER 18/07/2012 16.12:47 300KVA 3/3 SINGLE	
Password	Control
0***	Status
	Setup
	Logging
	Service
18/07/2012 16.08:22	Alarms
Normal Mode	

Service menu is password protected.

It can be accessed only by authorized service staff.

3 INSTALLATION

3.1 Single Module Installation

In this section, the warnings which must be followed and the checking which must be performed before starting-up the UPS are stated. Additionally, you can find informations about the points you must pay attention during carrying style for cabinets, positioning and connections.

3.1.1 Warnings



**The UPS must be installed by a certified electrician.
Do not energize the UPS before proper installation.**



Battery Hazard!

Battery terminal voltage may reach up to 450 VDC during operation.

Proper safety gear must be used to protect the skin and the eyes from electrical arcs.

ESD-protected rubber gloves should be used.

Check the batteries for leakage before using them.

Batteries which have electroliquid leakage must not be used, definitely must be replaced.

Uninstalled batteries must be kept, carried and transferred to destruction points safely.

In case of contact with battery ingredients, rinse the skin with water, and consult a physician if irritation occurs.

Remove any metal accessories (ring, watch, etc.) before working on the device.

Battery ingredients are hazardous.

UPS needs three phase and four cable (+ground) supply system for input. This supply system type is confirmed as IEC60364-3 standards. UPSs have transformers which have ability to convert from 3 cable to 4 cable system. If IT AC power distribution system will be installed, 4 pole-circuit breaker system must be used. More detailed explanations can be found in the IEC60364-3 standards titles.

3.1.2 Pre-Installation Check Up

Before installing the device, the following checks should be carried on. These are the first and most important steps in the operation of the product correctly.

- Check if any damage was done to the device during transportation. Report any damages instantly.
- Make sure that the model power rating is right. Check the device label for the actual power rating.

3.1.3 Positioning

The UPS and the batteries are designed for indoor use, and must be placed on an area with cool air flow.

3.1.3.1 Positioning the UPS

For the Boxer 300 KVA Series, fresh air enters the device from the front, the bottom, the right and left side and goes out from the fans on the rear side of the device. Care must be taken in order not to cover the air entrance and exit spots. UPS must be positioned on a place where it is protected from water etc. contact risks.

If the area is dusty, optional filters must be used for such environments. These filters usage must be done following the instructions.

UPS is a losing-energy system structurally. Lost energy occurs as temperature. During operation, there is a remarkable amount of heat loss to room air, so an air conditioning system must be used to keep the temperature in limits. The following table shows the airing and ventilation features that must be followed.

UPS Power	Amount of BTU/h for cooling	Non-Linear Load for estimated BTU/h value
300 KVA	65600	78700

3.1.3.2 Placing the External Batteries

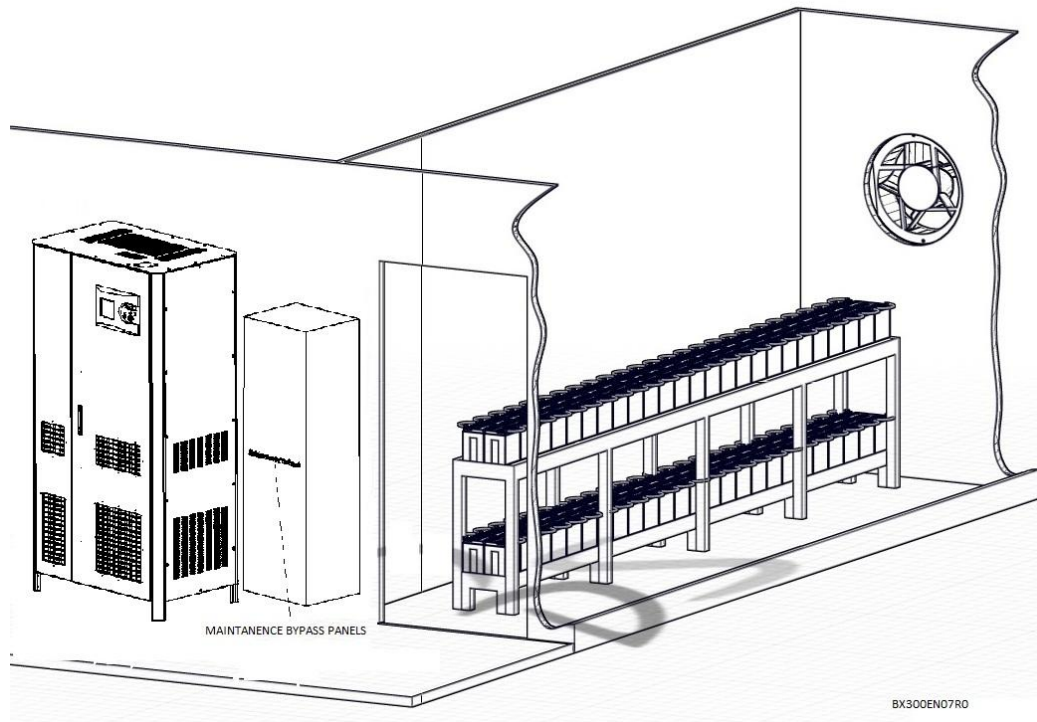
Batteries should be mounted in an environment where the temperature is consistent and even over the whole battery. Temperature is a major factor in determining the battery life and capacity. The recommended operating temperature for batteries by battery manufacturers is 20-25 °C . Operating above this range will reduce the battery life while operation below this range will reduce the battery capacity. Therefore, the expected backup time will not be obtained while autonomy. As a result, keep batteries away from heat sources and main air inlets. Pay attention and observe the following points.

- Keep batteries away from main heat sources.
- Keep batteries away from main air inlets.
- Keep batteries away from the humid places. Hereby batteries can be prevented from terminal oxidations and possible leakage currents.
- Please use aR or gR semi-conductor type fuse at the battery rooms and cabinets.
- If it is possible, please use breaker switch without fuse for the battery cabinet.
- Keep battery cabinets and shelves high above the ground. UPS should be protected against floods or liquid contacts.
- Battery rooms should be properly ventilated.
- Shelves will be accessible in touch if batteries are in battery room. Therefore please keep restricted accessing to battery room. Use necessary safety writings and strips.

Espacially, for the external cabinet batteries system of UPS, fuses must definitely be used. These fuses must be mounted as close as possible to the batteries. This closeness will increase the electrical operation safety.

BOXER EXTERNAL BATTERY CABINET CONFIGURATION	
Device Rating (KVA)	300
Batteries in series	32
Number of Paral. arms	2
Total number of Batt.	64
I_{bat.max} @ V_{bat.max} (A)	67,9
I_{bat.max} @ V_{cutoff} (A)	357
Recommended external cabinet fuse (A)	600

External battery cabinet and battery room applications are given below as an example. The application form may vary according to the customer.



Example Battery Chamber Application

3.1.4 Transportation Type of Cabinets

Carrying vehicles or handling accessories must have enough features and characteristics to carry UPS's weight.

UPS and optional battery cabinets are designed to be carried by a forklift or such vehicles.

Be more careful of sudden movements, especially when batteries are inside of cabinet.

Move the UPS as rarely as possible.

3.1.5 Mains, Load and Battery Connections

Makelsan strictly recommends a distribution board for the UPS outputs. Proper fuses and breakers must be used in such distribution board. Additionally variable speed fuses may be needed according to load. A-B type fuses or magnetic breakers are recommended if the load is suitable.

3.1.5.1 External Protections

To protect the AC inputs, thermal magnetic breakers or V type breakers must be installed on the distribution board. Herein, the cable intersections and fuse values must be determined and connected by an expert authorized person.

Over current protecting must be installed on mains input distribution board and fuses must be chosen 135% higher rated than the ones given in the table below. Fuses must be C-type.

Ground leakages flow to the ground through the EMI filters on the input and the output of the UPS. Makelsan recommends the use relays which are over 300mA for handling leakage currents.

Those relays must also be;

- Resistant to both positive and negative DC pulses,
- Not sensitive to transient currents,
- Must be sensitive to currents which is average between 0,3-1 A.

3.1.5.2 Cable and Fuse Protection

Cable designs must be compatible to current and voltage values stated herein, additionally local instructions must be obeyed about these topics.

UPS Rating (kVA)	Nominal Currents(A)					
	Input (mains) Currents @max charge current (3P+N)			Output Currents @100% Load (3P+N)		
	380V	400V	415V	380V	400V	415V
300	513,0	487,3	469,7	454,5	434,8	416,7

It should be noted that with non-linear loads, neutral current may rise upto 1.5 times the phase current.

Ground cable must be connected directly to ground line and must be kept as short as possible.

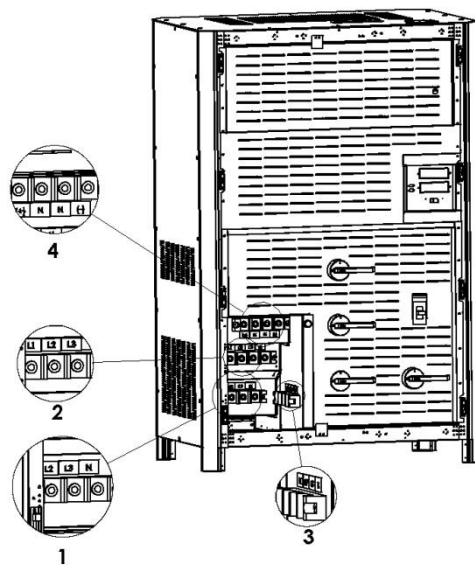
Typical ground cable cross sections are 240 mm² for 300 kVA. Proposed cable length is 5 meters.

3.1.5.3 Cable Connections

All electrical connections of the UPS are made from the rear side of the device. Remove the metal cover to reach the input and output connections.



ATTENTION! 3 pole-circuit breakers (switch) are used for the input and output of UPS, Neutral line is not be interrupted!



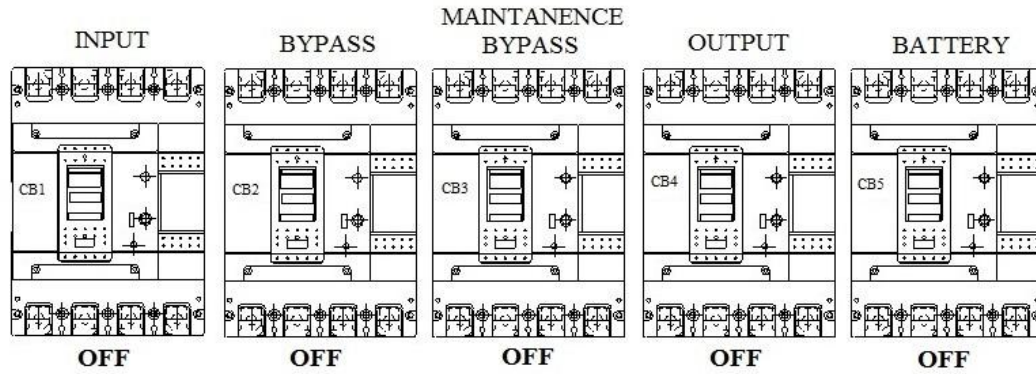
BK300EN08R1

1	Input Terminals
2	Output Terminals
3	External Bypass Input
4	Battery Terminals

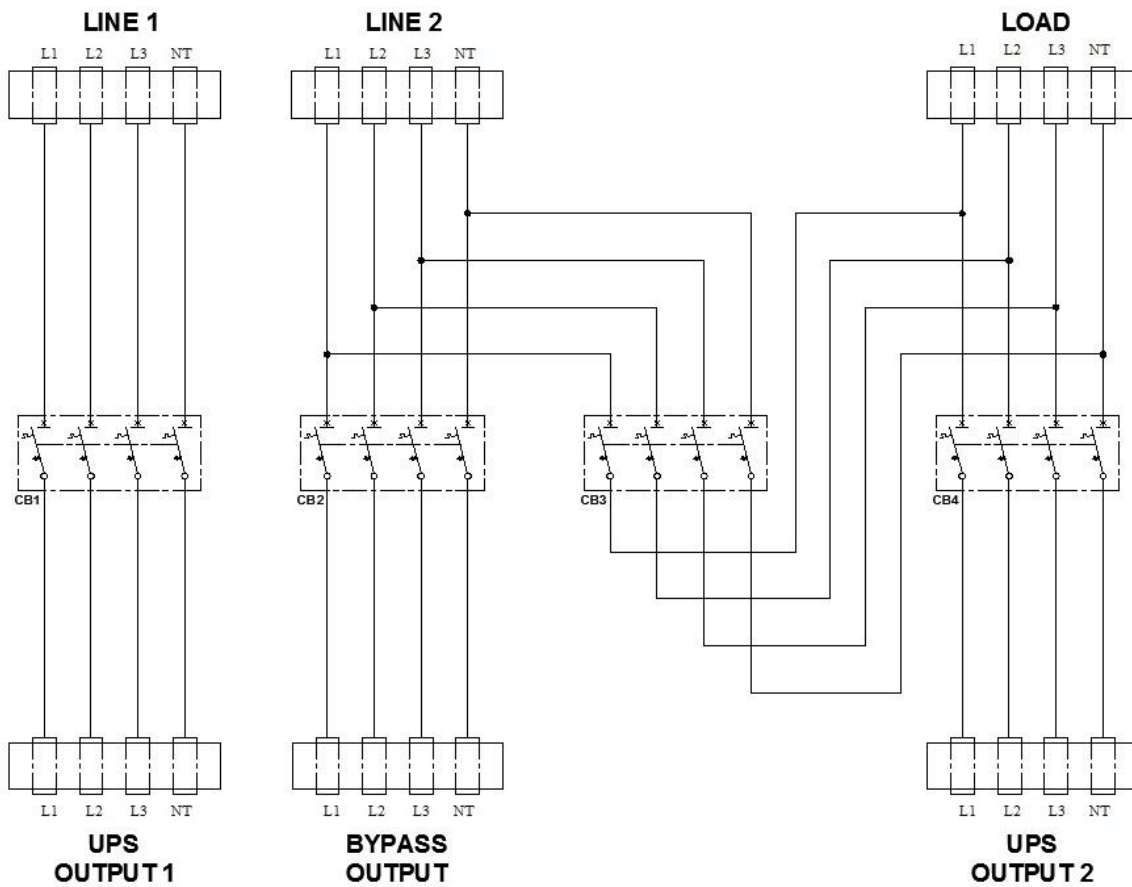
Follow the steps below to electrical connections:

1. Turn **OFF** all the distribution board breakers (both input and output distribution boards) to make sure that the load and mains are completely disconnected from any cable.

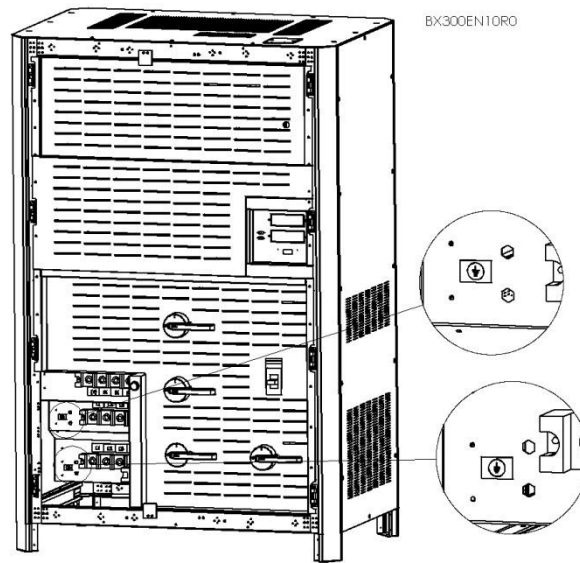
DISTRUBUTION BOARD



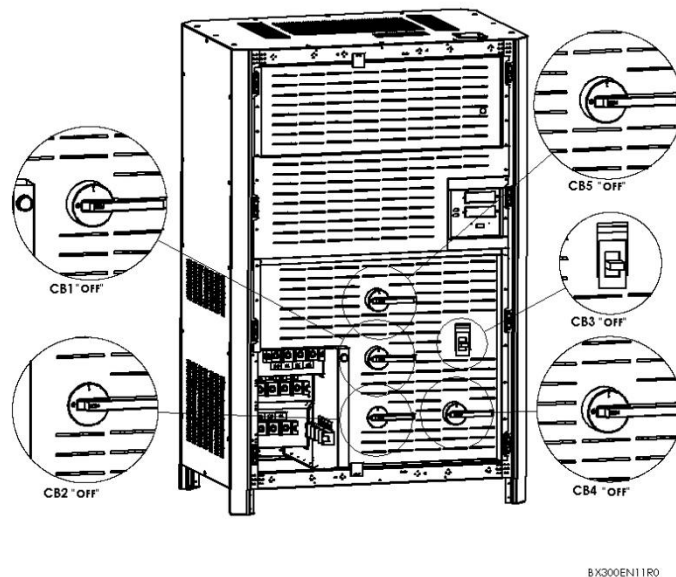
BX300EN09R0



2. Connect the ground cable.

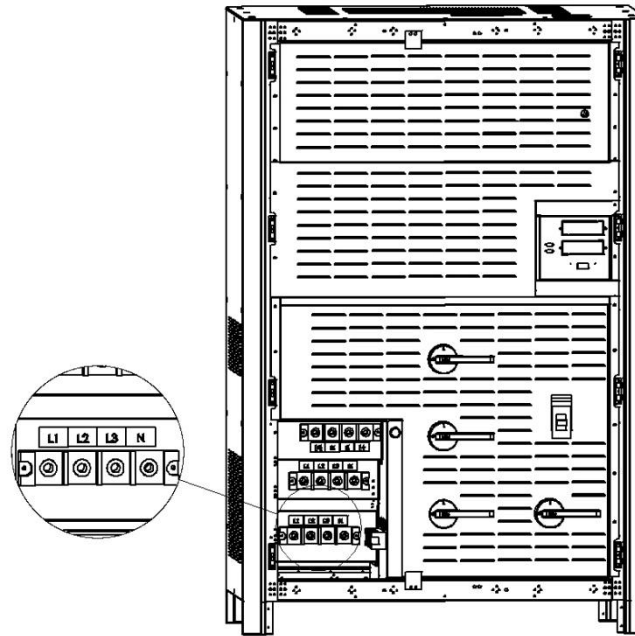


3. Make sure that the circuit breakers on the rear side are off. The use of these circuit breakers are explained in the next sections.



4. Connect the input cables;

- R phase to INPUT L1,
- S phase to INPUT L2,
- T phase to INPUT L3,
- N (Neutral) to Input N.



BX300EN12R0

5. Check the phase sequence.

6. Repeat steps 4-5 for output cables and external bypass.

Use the cable clips to stabilize the cables when the connections are done.



Make sure that the loads are isolated from the UPS output if they are not ready to be connected.



Make sure that the cables are connected properly before UPS is started. Additionally, check if there is galvanic isolation transformers at input of UPS and consider the local directions.



Check the grounding before starting the UPS. Wrong works or grounding on UPS or other devices of installation may be hazardous.

3.1.5.4 Connecting Batteries

You can find explanations about installation procedures and connections of internal and external batteries in this section.

3.1.5.4.1 External Battery Installation Procedure and Connection

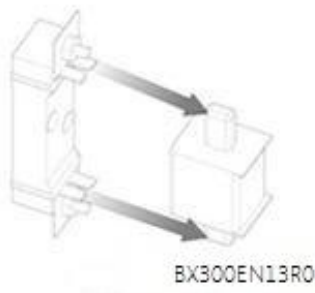
You can find details about how to configure external batteries above under "External Batteries Configuration" title.

The information about connection of external batteries and UPS is given in this section.



Avoid short circuiting batteries. Exploding batteries can damage you and your environment!
Battery terminal may rise up to 450 Vdc!

1. Switch "CB4" breaker OFF on UPS.
2. If there is breaker on battery cabinet, Switch it "OFF".
3. Remove the fuse on battery cabinet.
4. Remove battery fuse on UPS.

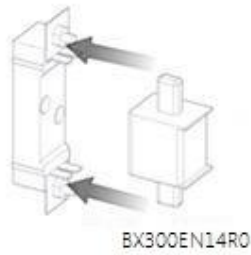


5. Make sure of serial and parallel connections of external battery packs are correct.
6. Connect the cable to terminals of two neutral "N (battery neutral)" , one "+Battery" and one "- Battery" respectively.
7. Connect four cables that come from UPS to terminals on battery cabinet or in battery room according to external battery connection diagram below. As follows:

➤ N(KGK)	←-----→	Positive Battery Group "-" terminal
➤ N(KGK)	←-----→	Negative Battery Group "+" terminal
➤ "+ BAT"	←-----→	Positive Battery Group "+" Terminali
➤ "- BAT"	←-----→	Negative Battery Group "-" Terminal

8. Make sure that the polarities are connected correctly by checking battery connections for the last time.
9. Replace battery fuse on UPS.

10. Replace battery fuse on battery cabinet.

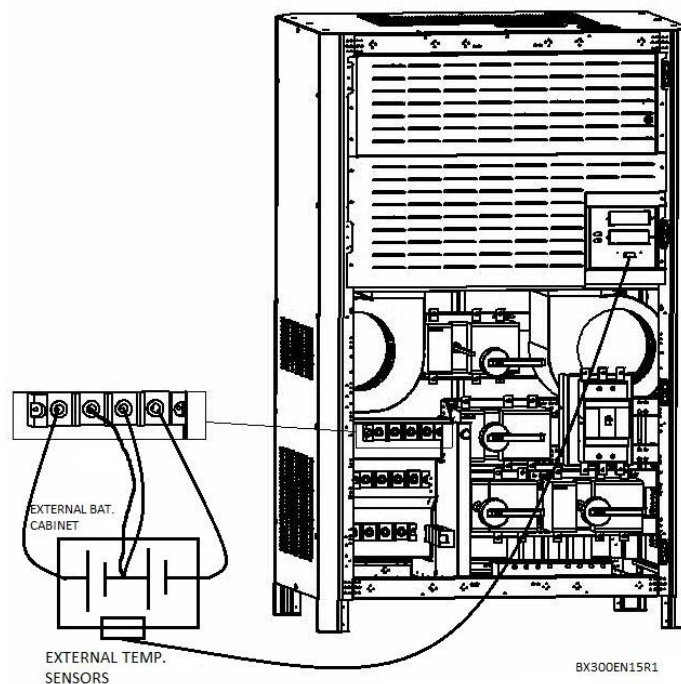


11. If there is breaker on battery cabinet, switch it "ON"..

12. Check if there is appropriate battery voltages to the battery input terminals by proper measuring device.

External battery cable selection is determined by application. Fuses which are recommended for UPS and battery cabinet are given. To connect to these type fuses, the lowest diameter cables are suggested. Please, refer to standard called EN 50525-2-31(VDE 0100-430) in this subject. The selection should be such that the cable will allow at most 0.5 Vdc decreasing.

"External Battery Temperature Measurement" is for optimization according to battery temperatures. Otherwise, your batteries will not be optimized according to temperature.



3.1.5.5 Control and Communication Cable Connections

MAKELSAN UPS have standart or optional connections of advanced external battery cabinet, environmental monitoring, control panels and various intelligent monitoring.

Connections on the rear side of UPS :

- One RS232 serial communication bus (RS232/Inverter Service)
- Two optional card slot

Connections at the top of UPS:

- One paralleling connection socket(optional)

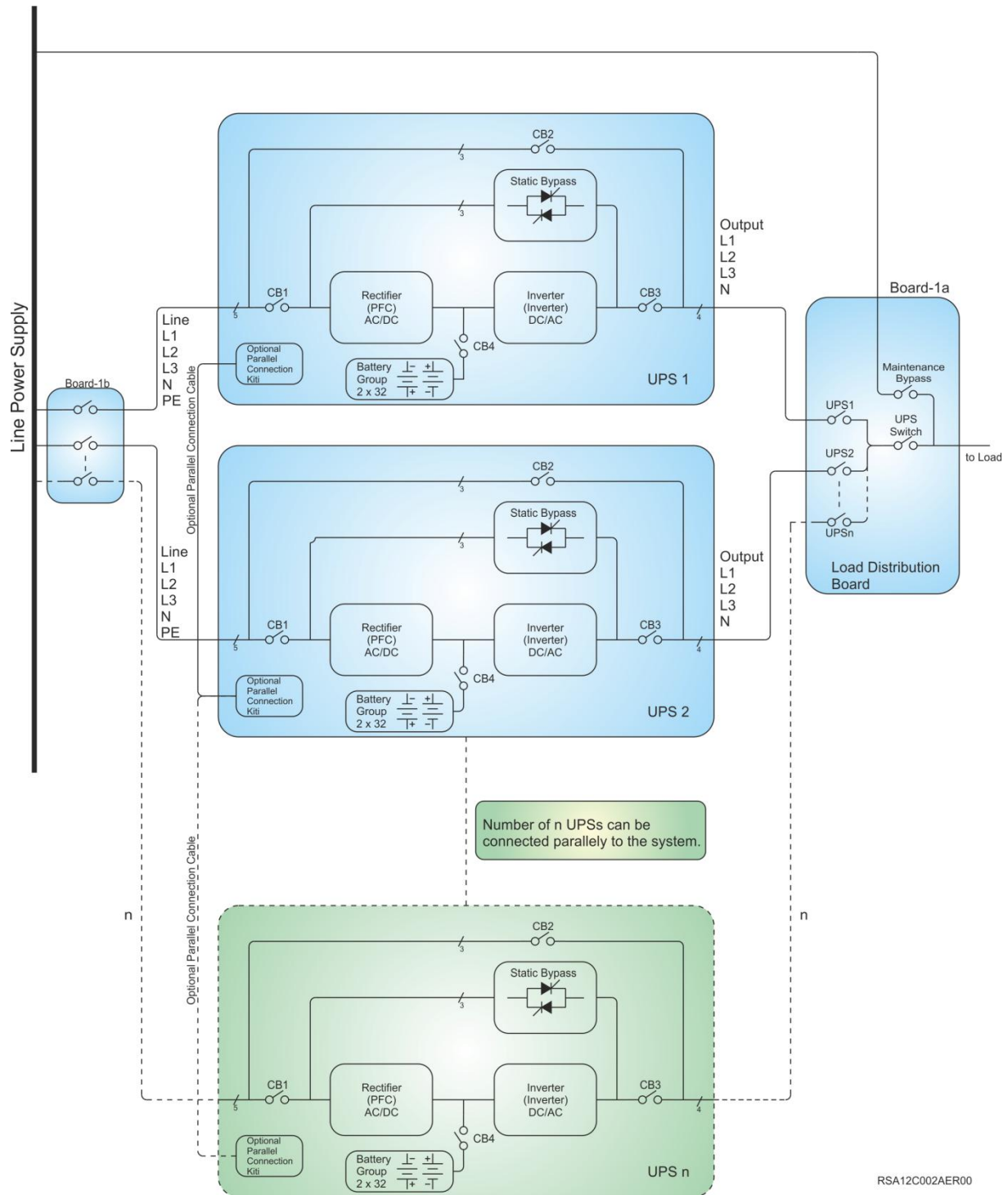
3.2 Parallel Setup

The product which you have bought can be operated in parallel; however, this feature is offered as an option. Please contact your dealer for parallel operation.

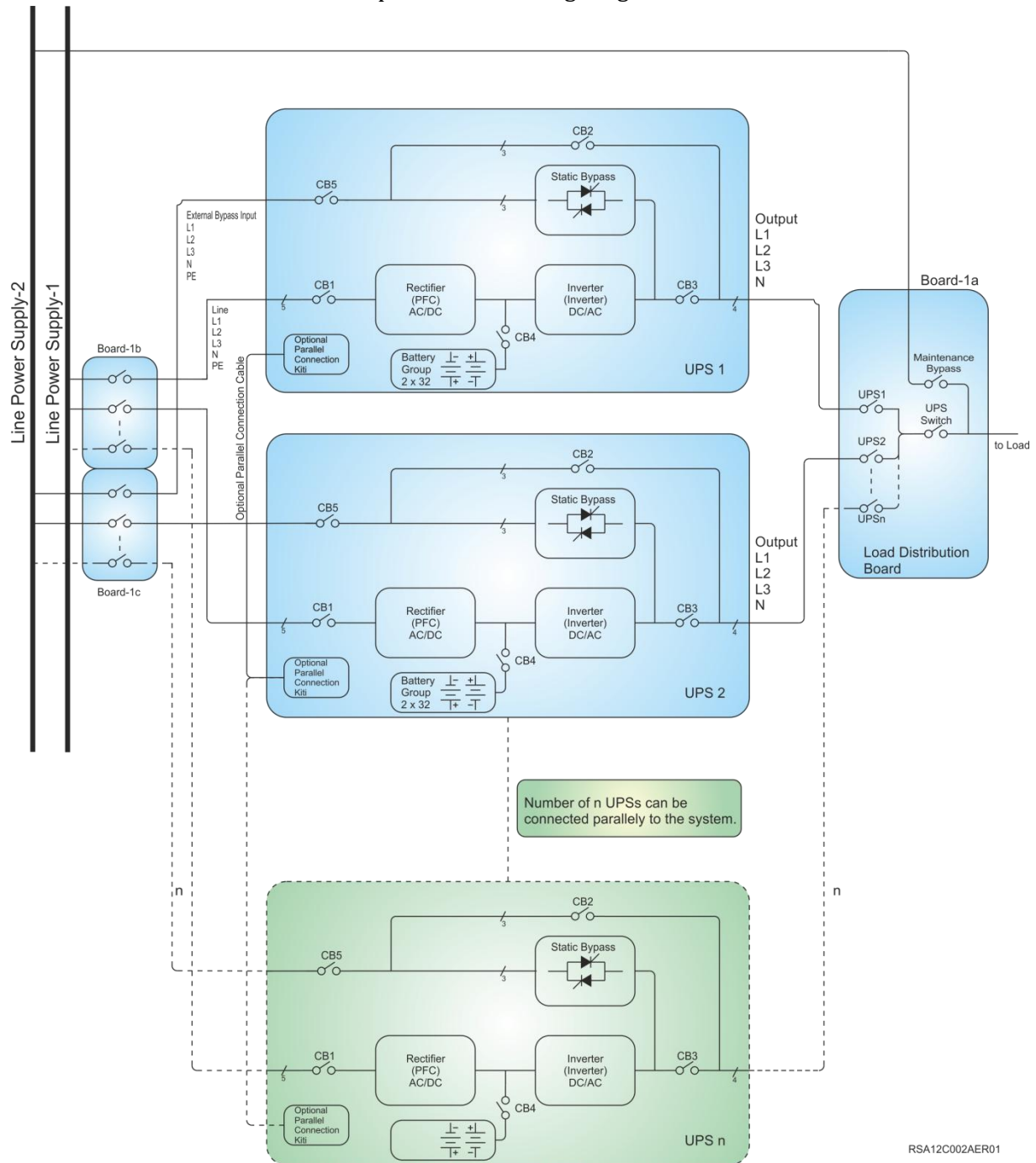


Parallel application should be made by authorized personal of MAKELSAN!

In case of need for redundancy or more power, Boxer series UPS can be operated in parallel up to quantity 8 (eight). A schematic diagram which shows two UPS connected in parallel can be seen below.



Optional Connecting Diagram



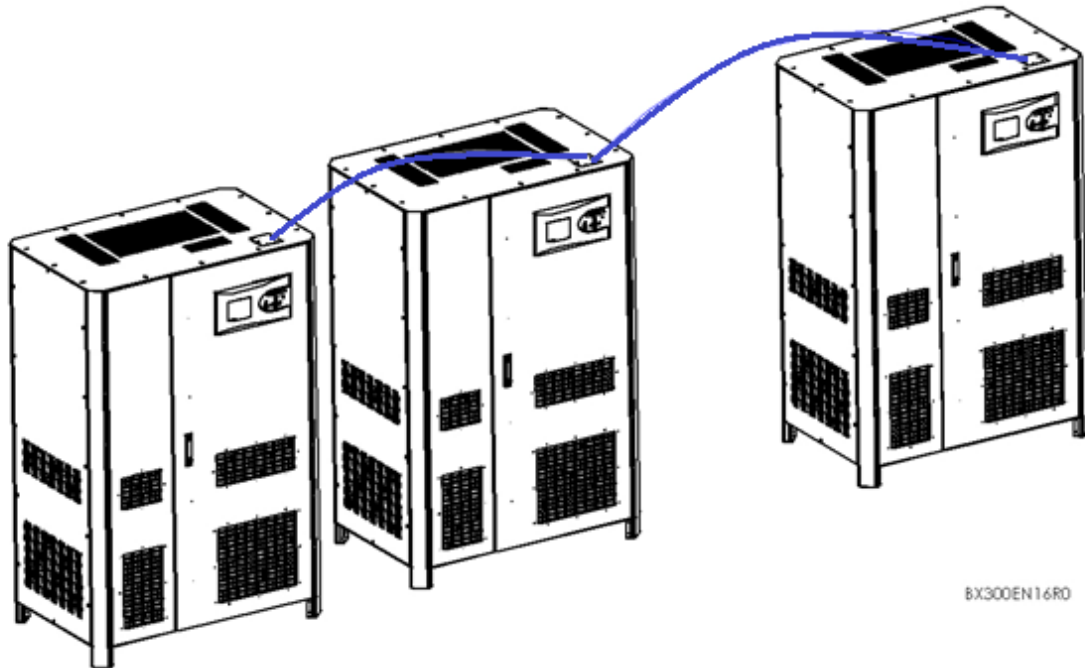
RSA12C002AER01

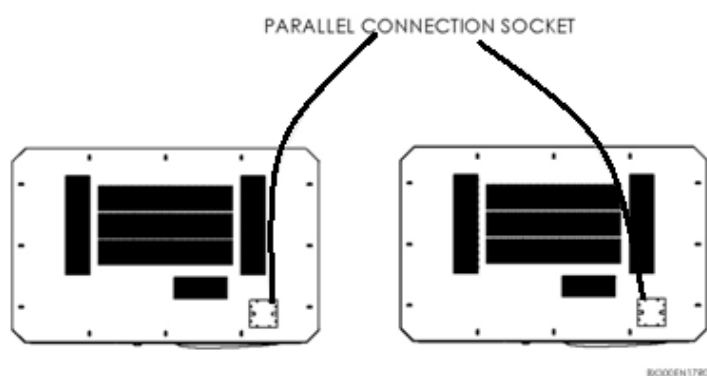
Input and output of more than one UPS are connected to each other; but definitely each battery group is different from another, batteries can not be used in common. The following points should be considered while placement of UPS in parallel system and their electrical connections are made:

- The UPSs which are connected in parallel must be from the same series and must have the same rated power.
- Devices must be running on the same firmware, if not, old firmwares must be updated.
- Devices must be located as close as possible to each other (max. 6*110 cm paralleling cable)
- Each device must have its own ground cable.
- Her cihazın farklı toprak bağlantısı olmalıdır.
- Devices must be connected through the distribution board and phases must in proper order. ($U_1-U_2-...-U_N$), ($V_1-V_2-...-V_N$), ($W_1-W_2-...-W_N$).
- Each UPS must have their own battery set, batteries cannot be used for more than one device at the same time.
- Power input and output cables from the device to the distribution board must be equal in length and cross section in order to proceed equal current sharing.

Parallel Settings

Connect the parallel cable as shown in figure below. Only use the cables provided by MAKELSAN.





Software settings on the operator panel are made by authorized person.

4 OPERATION

4.1 Operation Procedure

You can find informations about circuit breaker, first start-up , types of UPS operation tests , turning UPS off , EPO and RS232 serial communication system in this section.

4.1.1 Circuit Breakers

There are five circuit breakers on the front inside of the device. These are used for the AC input, maintenance bypass, output, the battery and static bypass connections respectively.

Three-phase AC voltage is applied through **CB1** to input of UPS.

AC input voltage will be applied directly to loads through **CB2**. In this way, maintenance purposed switching is done properly.



WARNING: If CB3 is turned on and UPS is working at online mode, before CB2 is turned on, UPS must be switched to static bypass mode.

CB3 is used to connect or separate AC voltage that come from static switches to the loads on UPS.

External batteries are connected to UPS through **CB4**.

Three-phase AC voltage applied to the input of the UPS static bypass through **CB5**.

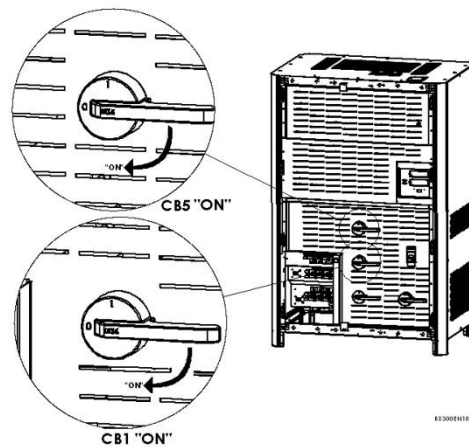
Active Breakers	Operation Mode	Explanation
CB1, CB3, CB4	Normal Mode	UPS operates in normal mode.
CB3, CB3, CB5	Static Bypass Mode	UPS is overloaded, loads will be transferred to static bypass line temporarily.
CB2	Maintenance Mode	UPS is shut down for maintenance, loads will be fed through mechanical bypass line.

4.1.2 First Start-Up



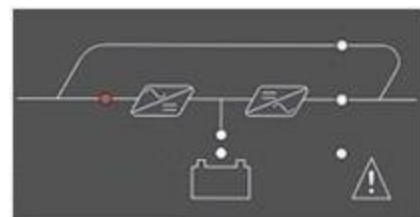
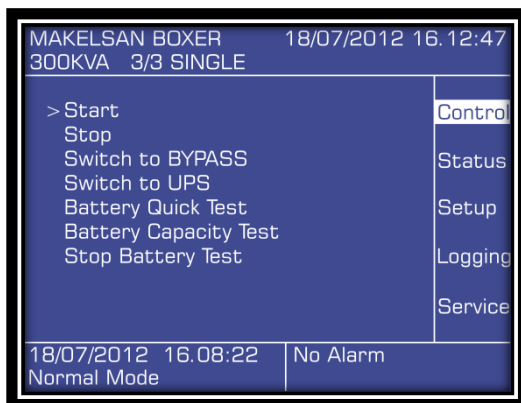
Wait for at least 5 seconds between each step.

1. Turn all circuit breakers OFF.
2. Push the soft start button (SW1) at least for 10 sec.
3. Turn input circuit breaker (CB1) and external bypass circuit breaker (CB5) ON.

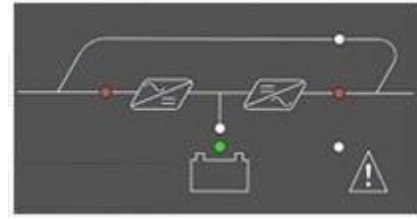


4. Start the UPS using the front panel.

Main menu > Control > Password > Start

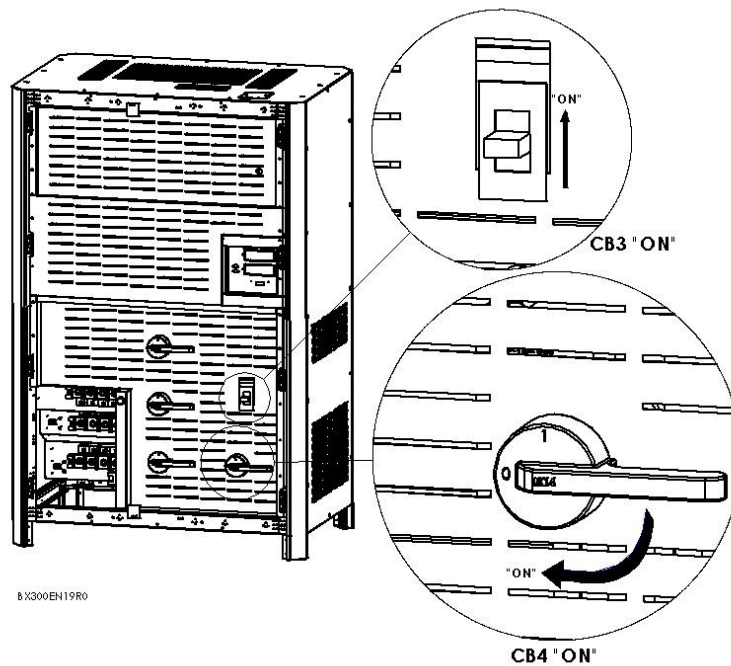


5. Check the UPS has switched to normal operation mode, via mimic diagram LEDs and LCD panel.



6. Turn battery circuit breaker (CB4) ON.

7. Turn output circuit breaker (CB3) ON.



8. The loads which are connected to UPS can be turned on.

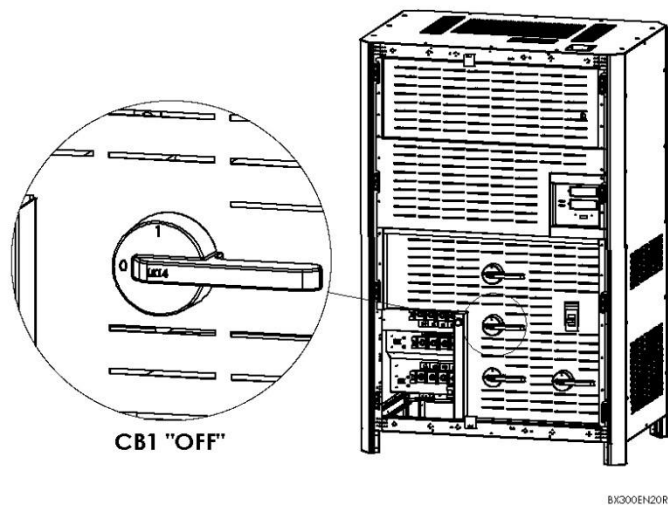
After all these steps, check that load is fed through inverter static switches via mimic diagram. In a contrary situation, check UPS total and phase loads. The UPS gives audio alerts in an overload condition, without feeding critical AC loads.

4.1.3 Testing the Operation Modes of UPS

After first start-up check device operation by switching between the following modes manually.

4.1.3.1 Switching from Normal Mode to Battery Mode

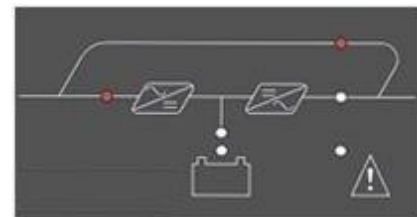
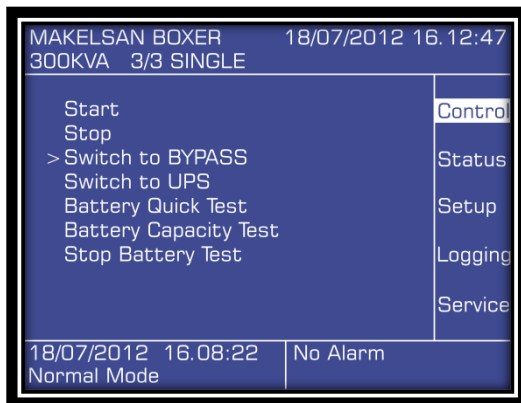
Turn CB1 OFF. This action cuts off the mains voltage and the UPS starts operating on battery mode. Turn CB1 back ON again if everything is ok.



4.1.3.2 Switching from Normal Mode to Static Bypass Mode

Use the front panel to switch the device to static bypass mode. Check the mimic panel to make sure that the device has switched to bypass mode.

Main menu > Control > Switch to Bypass

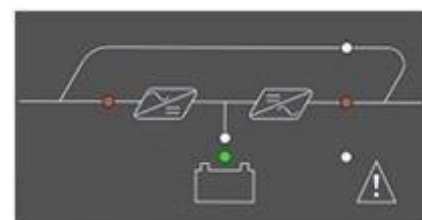
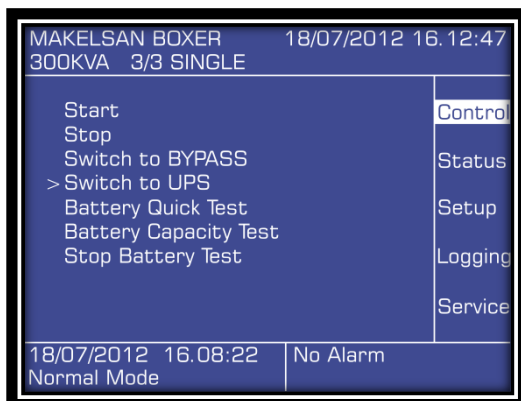


NOTE: UPS will not switch to bypass mode if the inverter voltage is out of limits or there is an overload or overtemperature situation.

4.1.3.3 Switching from Static Bypass Mode to Normal Mode

Use the front panel to switch the device to online mode. Check the mimic panel to make sure that the device has switched to online mode.

Main menu > Control > Switch to UPS



NOTE: UPS will not switch to normal mode if the inverter voltage is out of limits or there is an overload or overtemperature situation.

4.1.3.4 Switching from Normal Mode to Maintenance Bypass Mode



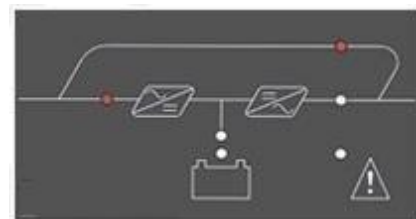
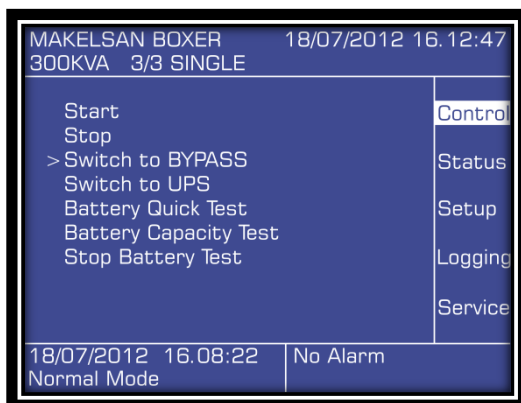
Make sure that the inverter output is synchronous with the maintenance bypass line before switching to maintenance bypass mode. Otherwise there is a possibility of cutting off the load power for a short while.



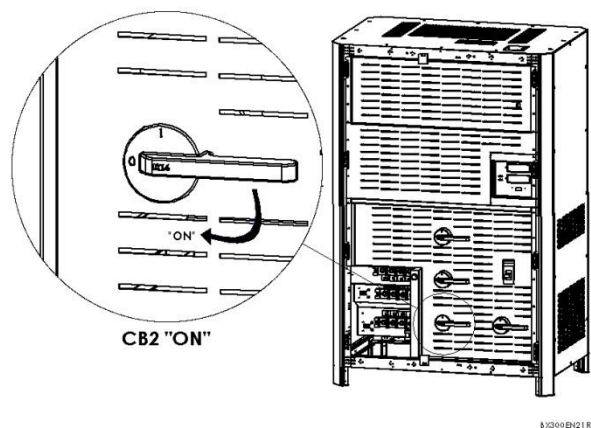
Warning! When device is fed through the maintenance bypass mode, any separate neutral connection is not used, so the neutral connections must not be disconnected at any point. Otherwise the neutral connection to the load will be interrupted and in such case critical loads will / may remain without energy.

Use the front panel to switch the device to static bypass mode. Check the mimic panel to make sure that the device has switched to bypass mode.

Main menu > Control > Switch to Bypass

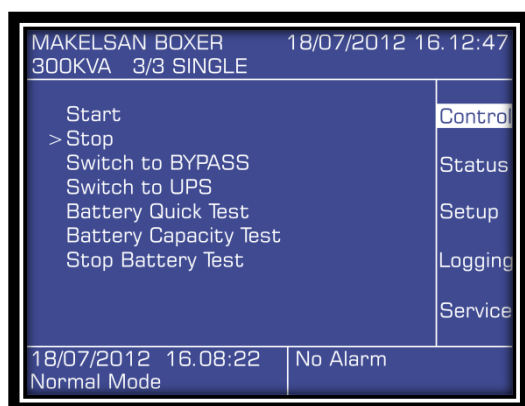


1. Turn CB2 **ON**.

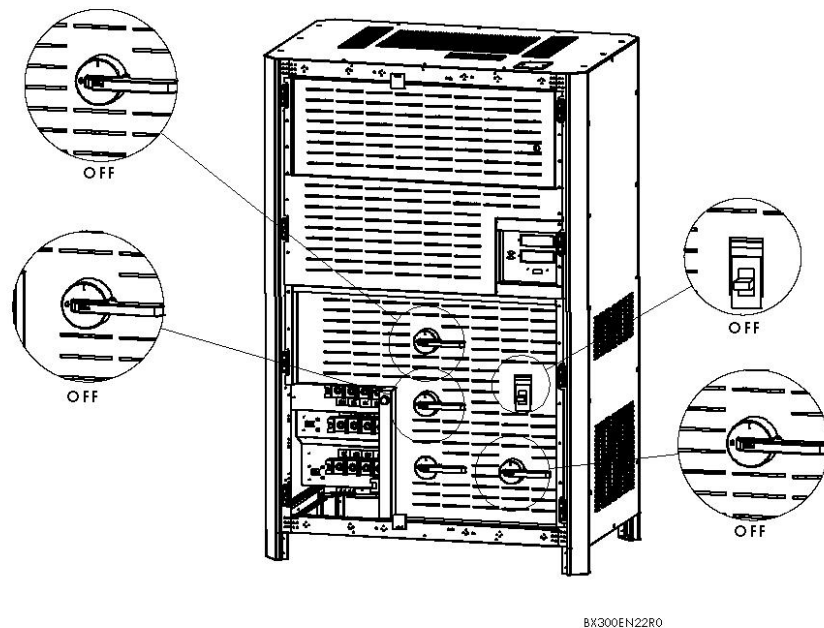


2. Stop the UPS using the user front panel.

Main Menu> Control> Password> Stop



3. Turn CB1, CB3, CB4 and CB5 **OFF**.

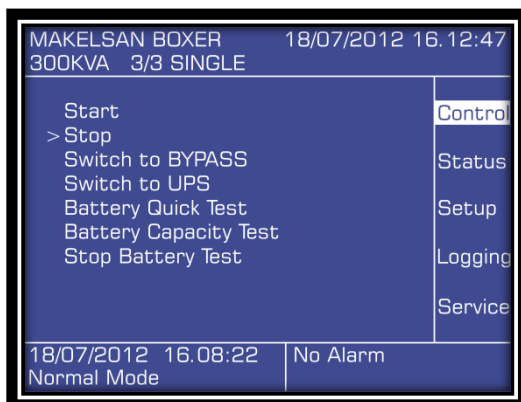


Wait at least 5 minutes before opening up the device after it is completely turned off, for safety.

4.1.4 Performing a Complete Shutdown

1. Turn off the loads connected to the device.
2. Use the front panel to turn the device OFF.

Main Menu> Control> Password> Stop



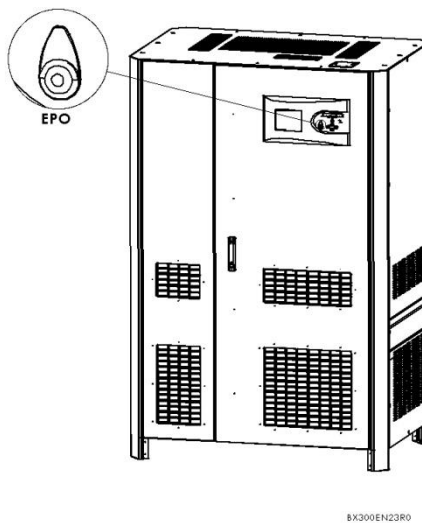
3. Check the UPS has switched to bypass mode, via mimic diagram LEDs and LCD panel.
4. Turn OFF respectively the output(CB3), battery (CB4),external bypass (CB5) and input (CB1).



Make sure that there are no critical loads on the UPS output before performing a complete shutdown.

4.1.5 EPO(Emergency Power OFF)

By pressing the EPO button, the device respectively turns the rectifier and the inverter OFF. If the output breaker turn off option is set, the UPS completely disconnects from the system.



4.1.6 RS232 Serial Communication Installation and Exemination

Boxer series has an RS-232 interface which supports SEC and TELNET protocol as standart. This interface is fully isolated and safe. UPS can be monitored remotely via a computer (PC) or SNMP by using this protocol. This connection works with all kinds of options.

5 EXPLANATION OF LOGGING

UPS will beep when any problem is detected. You can see the first information about the situation on the front monitor panel. This may not be enough most of the time. In this case, you can see the following warnings by using log screen.

	Event	Explanations
1	RS232 Start Command	UPS was started by RS232 communication software.
2	RS232 Stop Command	UPS was stopped by RS232 communication software.
3	Auto Restart	After the batteries discharge totally, UPS restarted itself automatically after the mean time which adjusted that follows the mains getting back to normal values.
4	UPS Startup	The main board of the UPS is energized.
5	Soft Start Fail	UPS could not ramp the DC bus up.
6	Quick Battery Test	Quick battery test has began.
7	Deep Battery Test	Battery capacity test has began.
8	Battery Self Test	Periodical battery test has began.
9	End Of Discharge	Batteries' voltage has gone below cut off voltage value while UPS was operating on the battery mode.
10	Overload Timeout	UPS has operated at overload more than time limit adjusted. The Loads will be transferred to bypass line.
11	End of Battery Test	Battery test has completed. You can see the all results via front panel status menu.
12	Batt. Test Aborted	Test was aborted manually or by UPS since the criterias were not provided during battery test.
13	Manuel Switch To BYP	Static switchs directions were changed manually to the bypass line via UPS command menu.
14	No Battery	No battery detected.
15	Maint. BYP. Sw. On	Maintenance bypass switch has been activated.
16	Ambient Abnor. Temp.	The ambient temperature is over limit. Check the ventilation of UPS room.
17	Inverter Overtemp.	Inverter's temperature is out of limit, in case of 5 degrees more increment, Load will be transferred to Bypass line.
18	PFC Overtemp.	Rectifier 's temperature is out of limit, in case of 5 degrees more increment, Load will be transferred to Bypass line.

19	STS Overtemp.	Static Transfer Switches' temperatures are out of limits. UPS will be stopped.
20	Outp.PL1 Cur. Limit.	Short circuit protection is activated for output L1 phase.
21	Outp.PL2 Cur. Limit.	Short circuit protection is activated for output L2 phase.
22	Outp.PL3 Cur. Limit.	Short circuit protection is activated for output L3 phase.
23	Bypass Voltage Bad	Bypass voltage value is out of limit while UPS was operating on the bypass mode. UPS will switch to normal mode if temperature and load status are normal. If not ,UPS will stop.
24	Bypass Freq. Bad	Bypass frequency value is out of limit while UPS was operating on the bypass mode. UPS will switch to normal mode if temperature and load status are normal. If not, UPS will stop.
25	Coil Overtemp	Over temperature is observed for UPS' inverter and rectifier coils.
26	Inverter Voltage Bad	Inverter voltage is out of limit. Load will be transferred to bypass line, when inverter voltage gets back to normal values, UPS will switch to normal mode again.
27	Overload	Output load value is over %105, overloading counter will start to count, If UPS is on normal mode, the charging will be stopped until load value gets back to normal.
28	Maint. BYP. Sw. Off	Maintenance bypass switch is deactivated.
29	Ambient Nor. Temp.	UPS ambient temperature has got back to allowed limit values.
30	Mains Voltage Nor.	Mains voltage is in the limited values, UPS will switch to normal mode.
31	Inverter Nor. Temp.	Inverter temperature is in the limited values. If load and temperature values are normal, UPS will switch to normal mode.
32	PFC Nor. Temp.	Rectifier temperature is in the limited values . If load and temperature values are normal, UPS will switch to normal mode.
33	Charger Nor. Temp.	Charger/booster module temperature is in the allowed limits, charging will be activated again.
34	STS Nor. Temp.	Temperature of Static transfer switches is in the allowed limit.
35	Bypass Voltage Nor.	Bypass voltage is within defined limits.
36	Bypass Freq. Nor.	Bypass frequency is within defined limits.
37	Coil Normal temp.	UPS inverter or rectifier coil temperature has got back to normal values.
38	Inverter Volt. Norm.	Inverter voltage is in the limited values, UPS will switch to normal mode.

39	Normal Load	Output load is under %100, If charging was OFF, It will be ON.
40	BYP Thyr.L1 Short C.	UPS has detected short circuit at bypass L1 thyristor. UPS will shut down.
41	BYP Thyr.L2 Short C.	UPS has detected short circuit at bypass L2 thyristor. UPS will shut down.
42	BYP Thyr.L3 Short C	UPS has detected short circuit at bypass L3 thyristor. UPS will shut down.
43	UPS Thyr.L1 Short C.	UPS has detected short circuit at inverter L1 thyristor. UPS will shut down.
44	UPS Thyr.L2 Short C.	UPS has detected short circuit at inverter L2 thyristor. UPS will shut down.
45	UPS Thyr.L3 Short C.	UPS has detected short circuit at inverter L3 thyristor. UPS will shut down.
46	UPS Thyr.L1 Open C.	UPS has detected that inverter L1 thyristor can not be activated. Load will be transferred to bypass line.
47	UPS Thyr.L2 Open C.	UPS has detected that inverter L2 thyristor can not be activated. Load will be transferred to bypass line.
48	UPS Thyr.L3 Open C.	UPS has detected that inverter L3 thyristor can not be activated. Load will be transferred to bypass line.
49	BYP Thyr.L1 Open C.	UPS has detected that bypass L1 thyristor can not be activated. Load will be transferred to inverter line.
50	BYP Thyr.L2 Open C.	UPS has detected that bypass L2 thyristor can not be activated. Load will be transferred to inverter line.
51	BYP Thyr.L3 Open C.	UPS has detected that bypass L3 thyristor can not be activated. Load will be transferred to inverter line.
52	Parl. Phs. Rot. Err.	One or more of UPSs which operate in paralel mode do not match in phase sequence.
53	Battery Start	Starting through battery command has been given to UPS.
54	Parl. Start Error	One or more of UPSs which operate in paralel mode could not start to operate.
55	Inverter Fault	UPS couldn't prepare the inverter voltage.
56	Output Off	Static transfer switches all disabled. The loads can not be energized.
57	Normal Mode	UPS is operating in the normal mode, load are energized through rectifier – inverter line.
58	Battery Mode	UPS is operating in the battery mode,load are energized through battery – inverter line.
59	Bypass Mode	UPS is operating in the bypass mode,load are energized through bypass line.
60	Maint. Bypass Mode	UPS is operating in the maintenance bypass mode, load are energized through maintenance bypass line.
61	Parallel Mode	2 or more UPS are operating in power sharing mode. Load is fed through UPSs' inverter lines.
62	Test Mode	UPS has switched to battery test mode, loads are energized through

		rectifier- battery- inverter line as source sharing.
63	Manual Switch to UPS	Switching to inverter(normal) mode command has been given via front panel.
64	Output Voltage Error	Output voltage is detected during the period of starting UPS. UPS has been stopped.
65	PFC Stop Cmd.	Abnormal situation is detected during the moment of rectifier operating. UPS has stopped itself.
66	Manuel Start Command	Start command is given via UPS command menu.
67	Manuel Stop Command	Stop command is given via UPS command menu.
68	UPS Stopped	UPS has been stopped.
69	Bypass Problem	UPS has switched to bypass mode so many times i a short period, UPS will be shut down.
70	Parameters Changed	Device-related parameters were changed on the service menu
71	Batterys Changed	Battery replacement date has been changed. Battery statistics will be reset.
72	Load impact Transfer	The load which can not be handled by inverter is activated. Loads will be transferred to bypass line.
73	Parallel Command	UPS which is operating in paralel mode has been given a command to change the status of static switches.
74	No P.CAN Bus Comm.	Slave UPS which is operating in paralel mode can't reach to master UPS from CAN bus. If UPS is operating, will be shut down.
75	Ext. Start Command	UPS which is operating in paralel mode has been given a command to start up by another (master) UPS.
76	Ext. Stop Command	UPS which is operating in paralel mode has been given a command to stop by another (master) UPS.
77	Ext. Switch To BYP.	UPS which is operating in paralel mode has been given a command to transfer the load to bypass line.
78	Ext. Switch To UPS	UPS which is operating in paralel mode has been given a command to transfer the load to inverter line.
79	Parallel Comm. FE.	Slave UPS which is operating in paralel mode has detected a failure of input current sharing.
80	Inverter OKEY	Inverter voltage reached needed value after UPS is started up. UPS can feed the loads through inverter.
81	Batt. Temp. Err.	Battery temperature is out of defined limits, batteries can be damaged.
82	EPO key pressed	EPO key button is pressed.
83	Battery Low	Battery capacity has decreased below defined " battery low limit" while UPS was operating in battery mode.
84	No P.485 Bus Comm.	Parallel RS485 communication between the systems is not available.
85	STS OverCurrent	OverCurrent in Bypass line.

86	BYP. Phase Rot. Err.	Reverse phase sequence was detected in mains at the UPS run time.
87	Output DC Volt.Fault	Over Inverter DC voltage. Loads will be transferred to the bypass line.
88	Output Offset Err.	One or more phase of slave UPS' output is not connected to master UPS in Parallel systems.
89	Battery Temp. Nor.	Battery temperature is normal.
90	PFC Pbus OverVoltage	Positive DC Bus overvoltage.
91	PFC Nbus OverVoltage	Negatif DC Bus overvoltage
92	PFC PhL1 OverCurrent	Short circuit protection is activated for rectifier L1 phase.
93	PFC PhL2 OverCurrent	Short circuit protection is activated for rectifier L2 phase.
94	PFC PhL3 OverCurrent	Short circuit protection is activated for rectifier L3 phase.
95	Single Stop	Command to stop itself has been given to UPS which is operating in paralel mode separately from paralel system.
96	Master Changed	UPS became master device in paralel system.
97	Par.Bus ID Collision	ID value of one or more UPS is the same as each other in parallel system.
98	Stop All Units	Stop all units command was given via front panel.
99	Pwr. Supply Fault	The error signal is detected on UPS through power source circuit debugger.
100	Generator Mode	Signal is detected from "generator mode input" of dry contact board. UPS will switch to "generator mode".

6 TABLE of TECHNICAL SPECIFICATIONS

Technical Specifications	
Power	300kVA
Active Power	240kW
INPUT	
Input Voltage Range	220/380 VAC - %15 + %18 3P + N + PE
Input Power Factor	At Full Load > 0,99
Input Frequency Range	45-65 Hz (Selectable)
Rectifier	IGBT Rectifier
Total Harmonic Distortion (THDi)	<%4
OUTPUT	
Output Voltage Range	220/380 VAC 3P + N $\pm$ 1% Static, $\pm$ 1% Dynamic
Recovery	At 0% - 100% - 0% load, maximum output tolerance %5, %1 Back to band <40ms.
Efficiency	Up to %93
Output Frequency Range	50Hz $\pm$ 0,5% synchronous with the network, 50Hz $\pm$ 0,2% Battery Mode
Output THD (THDv)	Lineer Load <%2
	Non-Lineer Load <%6
Crest Factor (CF)	3:1
Overload Capacity	At %125 load 10 min. , at %150 load 1 min.
Protections	The input voltage is out of tolerance, input frequency is out of tolerance, input phase failure, output voltage is out of tolerance, output frequency is out of tolerance, output phase failure, DC component that can occur at the output voltage, Overload that will occur at the output (out of the periods specified), Overheating that will cause failure related to over temperature, high voltage which will occur at DC Bus voltage, low voltage which will occur at DC Bus voltage, short circuit at the output.

BATTERY	
Quantity (12V DC VRLA)	64(consist of 2 x 32 Ah battery group
Charge Value (C)	Nominal 0,1 C, (selectable)
Battery Power	25% of the device power
COMMUNICATION	
Communication Port	RS232 Standart, RS485 ve SNMP Adapter option
Dry Contact	Optional
Protocol	SEC, TELNET
CERTIFICATES	
Quality	ISO 9001
Safety	IEC 62040-1, IEC 60950
EMC	IEC 62040-2
GENELRAL	
Running Temperature	For UPS 0 °C ~40 °C For Battery 0 ~ 25 °C)
Storage Temperature	For UPS 15 °C ~ 45 °C For Batteries-10 ~ 60°C)
Protection Class	IP20
Chassis	Anti-Static Paint Protection
Humidity	0-95 %
Altitude	<1000m, Correction Factor 1. <2000m, Correction Factor >0,92, <3000m; Correction Factor >0,84
Log Events	500Event Log. (Optional Status Record)
Parallel Operation	Parallel power increase up to 8 pcs.
EPO (Emergency Power Off)	Standart
Isolation Transformer	Optional
Net Weight	750 kg.
Dimensions (W x D x H)mm	1250x805x1900 mm

7 CONTACT INFORMATION



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