

# GREEN Tiera SERIES

**SINGLE PHASE IN – SINGLE PHASE OUT**

**3-10kVA**

# USER MANUAL



**UNINTERRUPTIBLE POWER SYSTEMS**

## **Important Notices!**

Thank you for choosing Inform UPS Systems.

This manual contains important information about technical properties, installation, commissioning of the UPS and contains safety information for users and loads. Learning and applying of the subjects in this manual is necessary to use UPS safely and correctly.



Read the manual completely before working on this equipment!



Keep this manual near UPS for easy consultation!



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Units that are labeled with a CE mark comply with the Standard: EN 62040-1 and EN 62040-2.



## **Description of the Symbols Used in the Manual**



This symbol points out the instructions which are especially important.



This symbol points out the risk of electric shock if the following instruction is not obeyed.



This symbol points out the instructions, which may be resulted with the injury of the operator or damage of the equipment if not obeyed.



All packing material must be recycled in compliance with the laws in force in the country where the system is installed.

## **Description of the Abbreviations Used in the Guide**

UPS: Uninterruptible Power Systems

EPO: Emergency Power Off

RS232: Serial Communication Protocol

SNMP: Simple Network Management Protocol

MODBUS: Industrial Serial Communication Protocol

V: Voltage

A: Ampere

P: Power

For Input, Output and Manual Bypass Circuit Breaker;

“1” (ON): Closing the Circuit

“0” (OFF): Opening the Circuit

For Battery Circuit Breaker;

Active (ON/I): Closing the Fast Fuse Holder

Passive (OFF/O): Opening the Fast Fuse Holder

## Manufacturer

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## 1. WARRANTY

### 1.1. Terms of Warranty

- Warranty period begins from the date of commissioning of the UPS by Inform or authorized Inform distributor technical personnel.
- The UPS including all the internal parts is under the warranty of Inform.
- If the UPS is malfunctioned because of component, manufacturing, or installation (if it's done by authorized personnel) problems during the warranty period, the UPS will be repaired without asking any price for spare parts and labor cost.

Replacements, repairs or modifications of the parts during the warranty period can not extend the duration of the warranty

### 1.2. Out of Warranty Terms and Conditions

This Warranty does not cover any defects or damages caused by;

- If the UPS is not used or installed according to the terms in the manual, then the UPS is out of warranty,
- Neglect, accident, misuse, misapplication or incorrect installation,
- Failure due to fortuitous circumstances or force majeure
- After delivery of the UPS to the customer, unloading and transportation damage and failures,
- Damage or injuries caused by negligence, lack of inspection or maintenance, or improper use of the products,
- Faulty electrical wiring,
- Defects arising either from designs or parts imposed or supplied by the purchaser,
- Defects and damage by fire and lightning,
- Failures due to modification in the products without Inform approval,
- Improper testing, operation, maintenance, repair, alteration, adjustment, or modification of any kind by unauthorized personnel,

The Manufacturer will repair the device above cases for a fee and is not responsible for the shipment of the equipment.

This Warranty is not valid if the Product's serial number have been removed or is illegible.



## 2. SAFETY

### 2.1. Important Notice for UPS



Information related to safety of the UPS, battery, load and the user is summarized below. But the equipment should not be installed before reading the manual completely.

- The equipment may only be installed and commissioned by authorized technical personnel.
- This manual contains important instructions that you should follow during installation and maintenance of the UPS and batteries. Please read all instructions before operating the equipment and save this manual for future reference.
- Not obeying the instructions written on this manual which may be resulted with the injury of the operator or damage of the equipment.
- Even with no connections have been done, hazardous voltages and/or high temperature may exist on connection terminals and inside the UPS. Before beginning with the any installation or maintenance, isolate the input and output of UPS and wait for 5 minutes for DC capacitor discharge. If UPS has internal battery; remove the cover of UPS and disconnect the battery cables.
- The equipment shall be packed properly during transportation and proper equipment should be used for transportation.
- The UPS must always stands in a vertical position. Make sure that the floor can support the weight of the system.
- Connect the PE ground connector before connecting any other cable.
- UPS is designed for indoor use. To reduce the risk of fire or electric shock, install this UPS in a temperature and humidity controlled indoor environment, free of conductive contaminants. Ambient temperature must not exceed 40°C (104°F). Do not operate near water or excessive humidity (95% maximum).
- Equipment and batteries whose packages are damaged during transportation shall be inspected by qualified technical personnel before starting with the installation.
- UPS requires Ph-N+PE input connection.
- It should be checked between all the terminals included PE to be sure that no hazardous voltages exist.
- Do not connect the output neutral to the protective ground or protective bounding.
- The connections shall be made with cables of appropriate cross-section in order to prevent the risk of fire. All cables shall be of insulated type and shall not be laid out on the walking path of the persons.
- Contact your local recycling or hazardous waste center for information on proper disposal of the used battery or UPS.
- Make sure that the UPS is not overloaded to provide a higher quality supply to the loads.
- In case of an extraordinary situation (damaged body or cabinet or connections, penetration of foreign materials into the body or cabinet etc.) deenergize the UPS immediately and consult to the Technical Service.

## 2.2. Important Notice for Battery

- **The batteries may only be installed and commissioned by authorized technical personnels.**
- Make sure that the battery qty is proper for the unit and they are same type and capacity. Otherwise danger of explosion and fire is within the bounds of possibility.
- Do not dispose of batteries in a fire. The batteries may explode.
- Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.
- In case of electrolyte in contact with skin, immediately wash the contaminated skin with water.
- Replaced batteries must be disposed of at authorized waste disposal centers.
- **A battery can present risk of electric shock and high short circuit currents.**

The following precautions should be observed when working on batteries;

- ❖ Remove rings, watches, necklaces, bracelets and all metal objects.
- ❖ Only use tools with insulated handles.
- ❖ Wear rubbers gloves and a rubber apron when handling batteries.
- ❖ Do not lay tools or metal parts on top of batteries.
- ❖ Eye protection should be worn to prevent injury from accidental electrical arcs.
- **Before a maintenance or repair work on the UPS;**
  - ❖ Switch the input, output and battery circuit breakers (F1, F2 and F3) to "0" position.
  - ❖ If UPS has internal batteries; Remove + battery (red), - battery (black) and battery neutral cables.
  - ❖ If UPS has external batteries; switch the circuit breakers of the battery cabinet to "0" position.
  - ❖ Determine if the battery is inadvertently grounded. If inadvertently grounded; remove source of ground. Contact with any part of a grounded battery can result in electrical shock.
- Battery fuses shall only be replaced with the same rating and type which came along with the UPS.

## 2.3. Description of the Symbols Used on the Labels Applied to the UPS



PE: PROTECTIVE EARTH



PB: PROTECTIVE BOUNDING



DANGER! HIGH VOLTAGE (BLACK/YELLOW)



This symbol points out the instructions, which may be resulted with the injury of the operator or damage of the equipment if not obeyed.

### 3. REQUIREMENT

#### 3.1. Transportation



The UPS must be placed and stand in a vertical position throughout the transportation.



Use suitable equipment to remove the UPS from the pallet.



The equipment shall be packed properly during transportation. Therefore it is recommended to keep the original package for future need.



All packing material must be recycled in compliance with the laws in force in the country where the system is installed.

#### 3.2. Placement

- UPS is not designed for outdoor application.
- The equipment and the batteries should not be exposed to direct sunlight or placed near to a heat source.
- Recommended operating temperature and humidity values are listed on the [Appendix-4 Technical Specifications](#) section. To provide the required environmental condition.
- Avoid dusty environments or areas where dust of conductive or corrosive materials is present.
- The connection and the circuit breakers are at the back side of UPS. Leave at least 50 cm at the back side of the UPS for maintenance.
- Air outlets of the UPS are present on the front and back sides. Leave at least 50 cm at the front and back side of the UPS for ventilation.
- Even though the operating temperature of the UPS and batteries are between 0-40 °C, it is suggested to provide an environment temperature between 20-25°C to get maximum performance from the UPS and batteries.
- Advised Environmental humidity condition is between 20% 80% (none condensing).

#### 3.3. Storage

Please store the UPS in an environment where the temperature is between -25 °C +55 °C, no receipt of direct sunlight, far from the heating, in a dry place.

Environmental humidity must be between 20% 95% (none condensing).

Recommended storage temperature, humidity and altitude values are listed on the [Appendix-4 Technical Specifications](#) section.

If the batteries will be stored for longer than 6 months, they shall be charged periodically. Charge period depends on the storage temperature. The relationship is as shown below:

- ❖ Every 9 months if the temperature is below 20°C,
- ❖ Every 6 months if the temperature is between 20°C and 30°C,
- ❖ Every 3 months if the temperature is between 30°C and 40°C,
- ❖ Every 2 months if the temperature is over 40°C

For long storage duration; please follow up the instructions of installation described in [Section 4](#), start-up UPS described in [Section 7](#) and charge the batteries at least 10 hours.

## 4. UNPACKING AND INSTALLATION OF UPS



Equipment and batteries whose packages are damaged during transportation shall be inspected by qualified technical personnel before starting with the installation.



If any equipment has been damaged during shipment, keep the shipping and packing materials for the carrier or place of purchase and file a claim for shipping damage. If you discover damage after acceptance, file a claim for concealed damage.

Check if the following are provided with the equipment

- UPS
- User manual
- Test Report



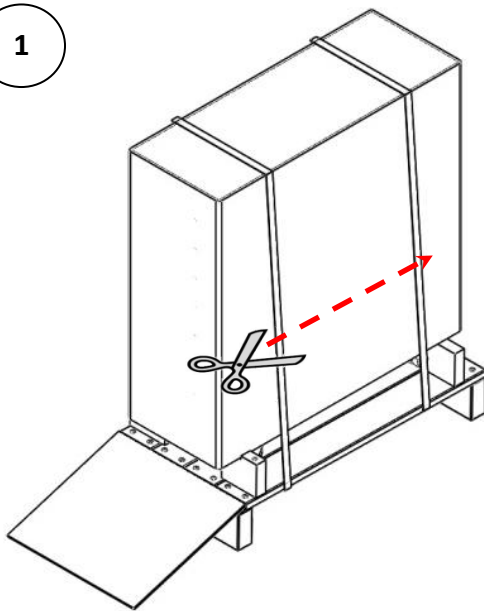
Before the installation, please check if your UPS is customized following your special requirements (if any).



UPS output voltage and frequency is set to 220V/50Hz, as default. Bu bilgiye gerek yok, çıkaralım. Belki biz 230V a ayarlayıp göndereceğiz

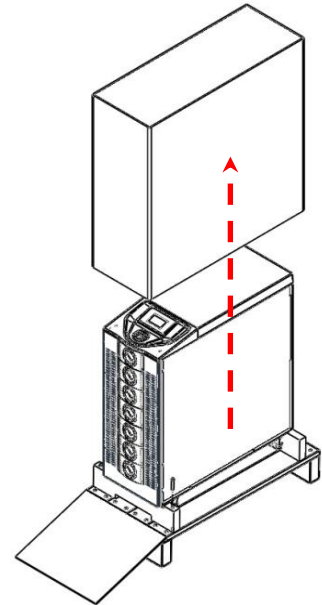
### 4.1. Unpacking and Moving

1



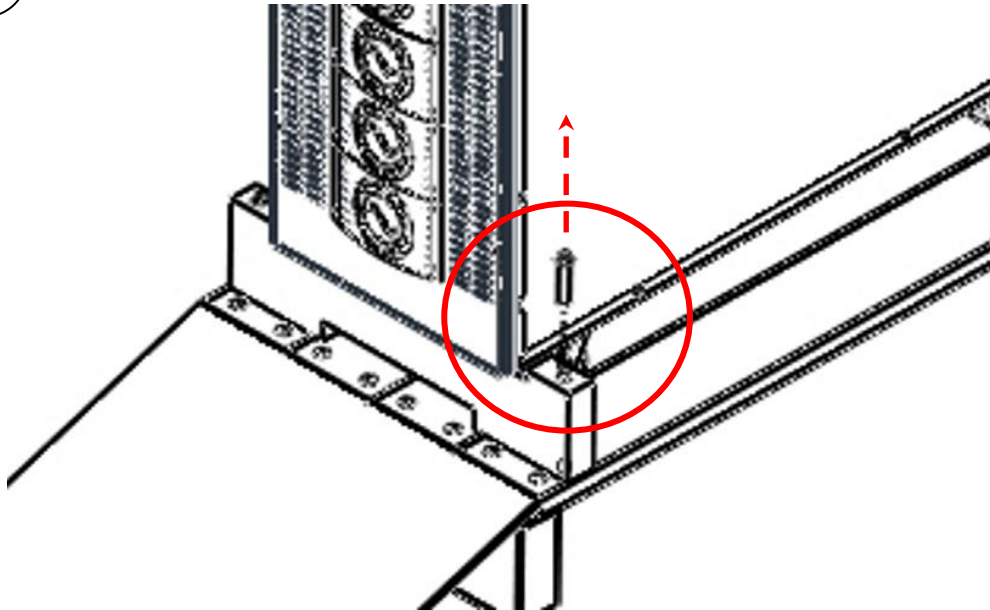
Replace the platform and remove the wrap.

2



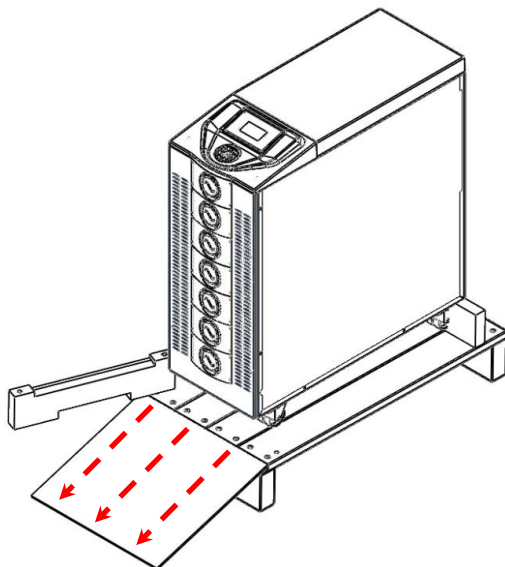
Remove the package.

3



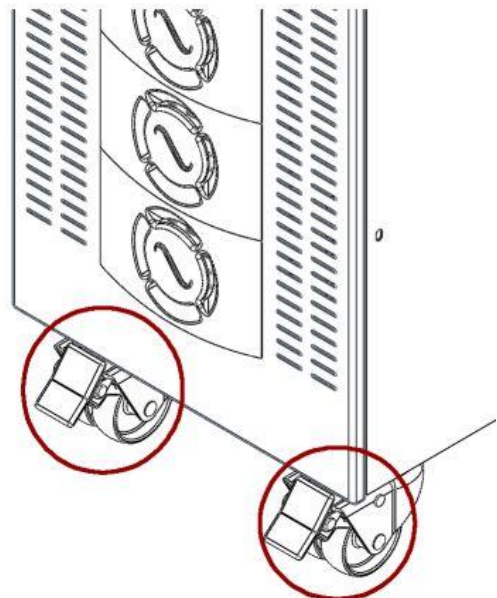
Screw off the stop plates placed at the front of UPS.

4



Slideshift the stop plates and reload the UPS via wheels.

5



Lock the wheels where installed.

## 4.2. Installation Procedures



The equipment may only be installed and commissioned by authorized technical personnel.

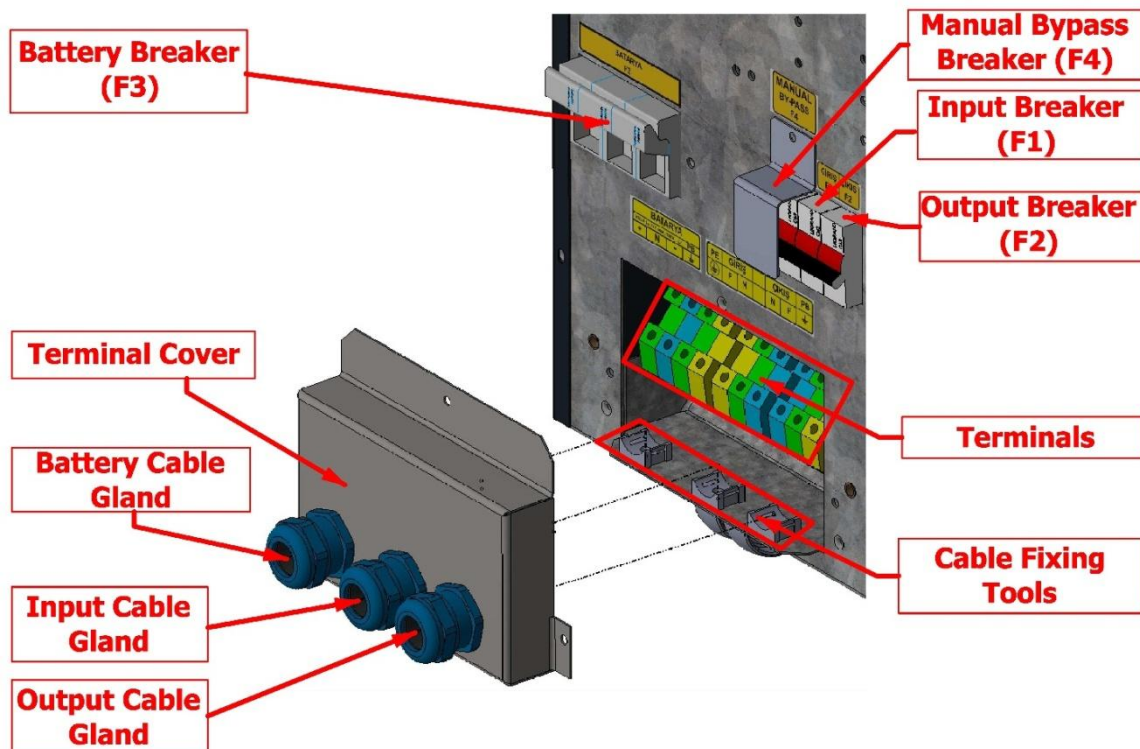


When the UPS is brought from a cold place to a warmer place, humidity of the air may condensate in it. In this case, wait for 2 (two) hours before beginning with the installation.

The installation must comply with national installation regulations.

Connection terminals are in the rear side of the UPS. Please take out the terminal cover to make the connections.

Standard UPS circuit breakers and terminal-settlements are shown below;



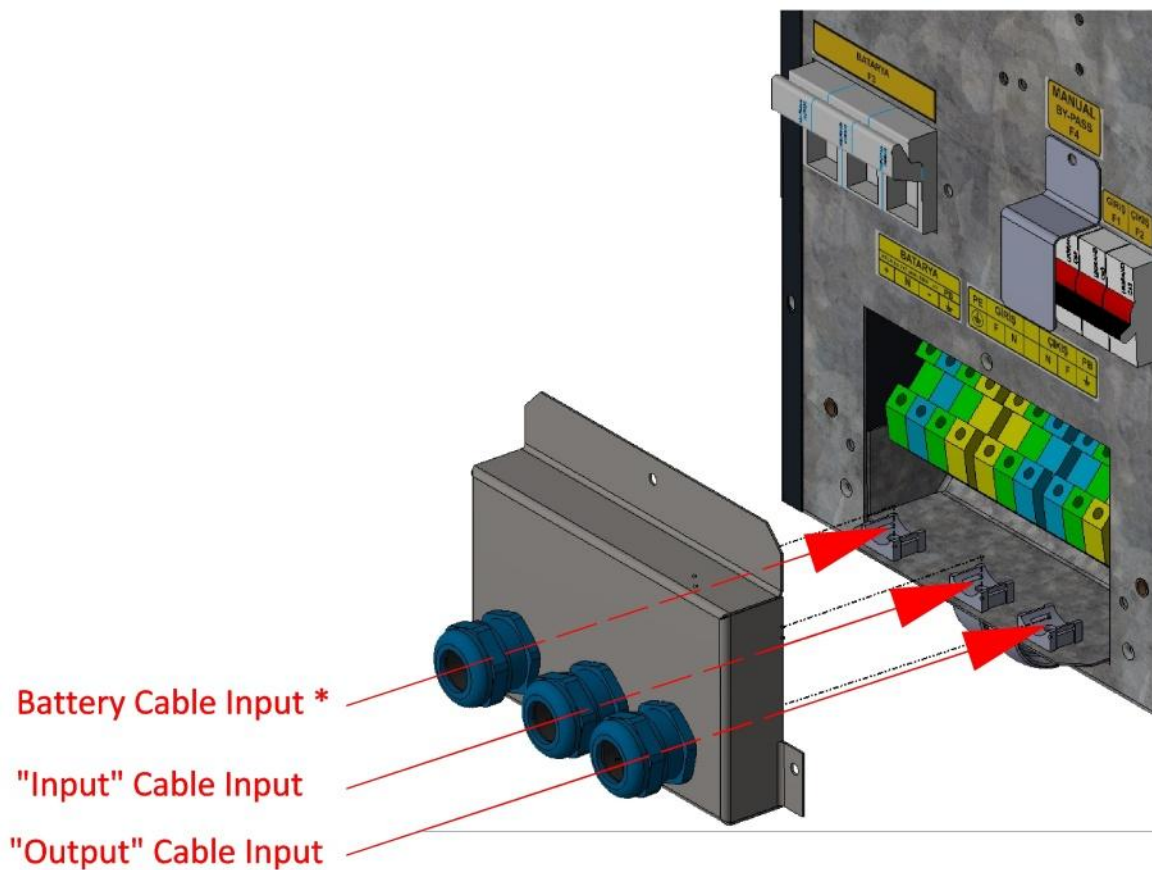
If UPS has internal battery; even the battery circuit breaker is at "0" position and even no connections have been done, UPS may produce output voltage whenever "C. START" key is pressed.



The following table shows the recommended size of circuit breakers used in distribution panel and input/output cables for the linear loads.

POWER	INPUT CIRCUIT BREAKER	OUTPUT CIRCUIT BREAKER	CABLE CROSS SECTION			
			INPUT	OUTPUT	NEUTRAL	PE & PB
3KVA	20A	20A	2,5mm <sup>2</sup>	2,5mm <sup>2</sup>	2,5mm <sup>2</sup>	4mm <sup>2</sup>
5KVA	32A	32A	6mm <sup>2</sup>	6mm <sup>2</sup>	6mm <sup>2</sup>	6mm <sup>2</sup>
6KVA	32A	32A	6mm <sup>2</sup>	6mm <sup>2</sup>	6mm <sup>2</sup>	6mm <sup>2</sup>
8KVA	50A	40A	10mm <sup>2</sup>	10mm <sup>2</sup>	10mm <sup>2</sup>	10mm <sup>2</sup>
10KVA	63A	50A	10mm <sup>2</sup>	10mm <sup>2</sup>	10mm <sup>2</sup>	10mm <sup>2</sup>

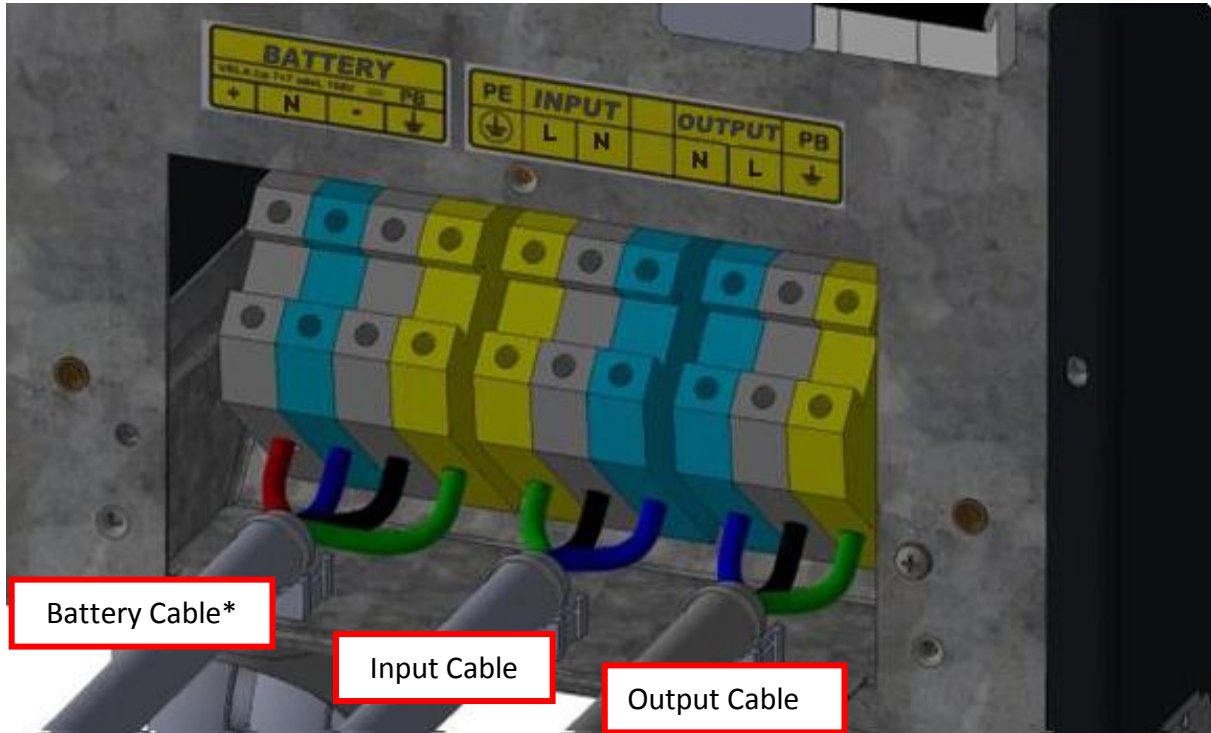
After removing the terminal cover; input/output and battery cables shall be passed through the assigned glands.



Pass the cables through the glands



Cables shall be connected to the terminals as shown below;



There should be no external battery terminal when internal batteries are used.  
Internal and External batteries can not be used at the same time.

#### Cable connection

Connections shall be made in the following order;

##### 4.2.1. PE Connection



Connect the PE ground connector before connecting any other cable.

Input protective earth connection terminal “**PE**” of the UPS shall be connected to ground with a low impedance connection.

The load shall be grounded via output protective earth terminal “**PB**”.

If there is an external battery cabinet present, it shall be grounded via battery protective earth terminal “**PB**” of the UPS.



PE cable should be min. 10cm longer than the other cables.

#### 4.2.2. Input Connection



The installation and adjustment of distribution panel should be done by authorized technical personnel.



Switth the circuit breaker on the distribution panel to “0” position before making the connections.

Please add double pole miniature circuit breaker (equivalent UPS input breaker) to distribution board where UPS is to be connected. Do not connect any other load to this circuit breaker and please do not forget to add leakage current relay.

Leakage protection relay value must be the total value of 30 mA (UPS input leakage current relay) and total leakage current value of the load connected to UPS. Relay must be protected type against peak current that can be happened on EMI filter capacitor.

Connect the phase cable to input “L” terminal, the neutral to input “N” terminal.



According to EN 62040-1-2, the user should place a warning label on the input distribution board and the other primary power isolators, in order to prevent the risk of voltage feedback. The label should carry the following indication:



##### **RISK OF VOLTAGE BACKFEED**

- Isolate Uninterruptable Power Supply before working on this circuit.
- Then check for Hazardous Voltage between all terminals including the protective earth (PE)

#### 4.2.3. Battery Connection

If the batteries are already built-in inside the UPS cabinet; remove the cover of UPS and connect the Positive (red), Negative (black) and Neutral (blue) cables of the batteries. There is no need any further connection so replace the cover.

If the batteries shall be put in a separate additional battery cabinet, please follow up the instructions below;

- Connect the “PB” terminal on the external battery cabinet to battery “PB” terminal on the UPS.
- Switch on to “0” position the battery cabinet circuit breaker.
- Connect the “-” on the battery cabinet to “-” on the UPS.
- Connect the “+” on the battery cabinet to “+” on the UPS.
- Connect the “N” on the battery cabinet to “N” on the UPS.



The batteries must be charged min. 10 hours before first-use.



In the event of an extended period of UPS non-operation, the batteries must be charged periodically in order to prolong battery life. The charge period, which depends on the temperature, is given in the [Section 3.3](#) of the manual.



Battery fast fuses shall only be replaced with fuses of the same type and rating.

#### 4.2.4. Output Connection

Please add double-pole miniature circuit breaker (equivalent to UPS output breaker) to distribution board where the loads are to be connected. Connect the phase cable to output “**L**” terminal and the neutral cable to output “**N**” terminal.



To enable the short circuit protection feature of the UPS, each load shall be supplied through a separate circuit breaker chosen according to the load current. This may provide quick disconnection of the short circuited load and maintain operation continuity of the other loads. To obtain maximum protection, the rating of each individual load circuit breaker shall have the minimum value, which is enough to carry the full load current continuously.



Make sure that all circuit breakers are at “0” position before starting with the installation.



Each load should be supplied through separate circuit breaker and the cable cross section should be chosen according to the load current value.



Make sure that the UPS is not overloaded to provide a higher quality supply to the loads.

#### 4.2.5. Communication Interface Connection

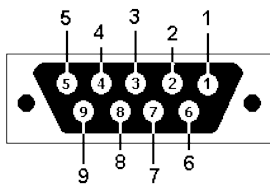
Connectivity cards allow the UPS to communicate in a variety of networking environments and with different type of devices.

Options are listed below;

- Serial Communication (Standard Hardware)
- USB Converter (Optional)
- Dry Contacts (Optional)
- Internal or External SNMP Card (Optional)
- MODBUS (Optional)

#### 4.2.5.1. Serial Communication (RS232)

UPS is equipped with Serial Communication as standard. DSUB-9 female connector with the following pin layout shall be used on the UPS side of the connection cable.



RS232 PIN LAYOUT		
PIN#	Signal Name	Signal Description
2	RX	Receive Data
3	TX	Transmit Data
5	GND	Signal Ground

RS232 cable shall be shielded and shorter than 15m.

The hardware and software listed below can be used with this port;

- **Monitoring Software - UPSMAN (Optional):** This software is installed on a computer. To establish communication between the UPS and a computer, connect your computer to the UPS communication port using the RS232 communication cable. With the software; many ups parameters such voltage, current, frequency ...etc can be monitored.
- **External SNMP Adapter (Optional):** It gives opportunity to monitor UPS through a Web browser interface without UPSMAN installation. External SNMP adapter is connected via serial communication cable to UPS (If there is no internal SNMP). By IP address assignment SNMP adapter is connected to current network, hence UPS can be monitored on web browser interface.

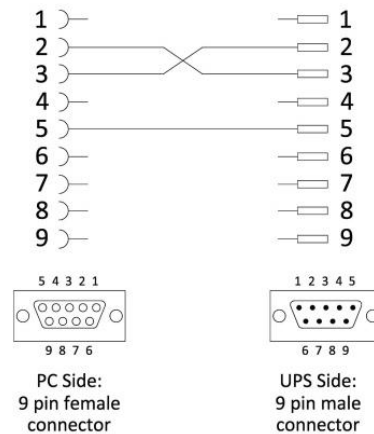
Via SNMP; the information listed below can be monitored;

- ❖ Real-Time Date&Time
- ❖ The Latest Battery Test Date
- ❖ UPS Information (example: 220V - 50Hz)
- ❖ Input Data ( $V_{in}$ ,  $F_{in}$ ,  $V_{max}$  vb.)
- ❖ Output Data ( $V_{out}$ , Load Percentge...etc.)
- ❖ Battery Situation ( $V_{batt}$ ...etc)

Over SNMP communication; battery test can be started or current test can be cancelled. UPS can be shut-down or stand-by (stand-by duration is adjustable). Alarms can be discarded.

- **Service Software:** This software is used only by authorized Technical Service Personnel. Do not let unauthorized to use this software; otherwise, damage may occur to your equipment and void your warranty.

If cable is needed, it can be produced according to the pin configuration described as below;

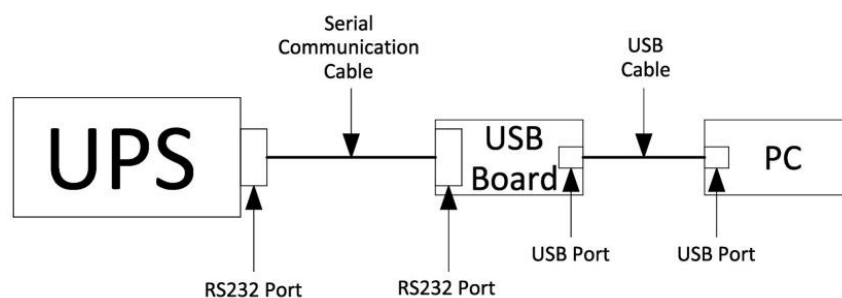


Cable Schema of Serial Communication

#### 4.2.5.2. USB Converter (Optional)

This card is connected to serial port of UPS. It maintains connection availability to to USB port present on your computer.

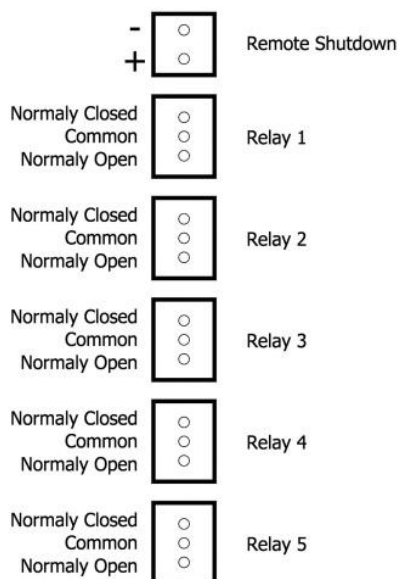
The connection of the USB converter card is described below;



#### 4.2.5.3. Dry Contacts

There are “Remote Power Off (RPO)” and 5 dry contact sockets on the dry contact board.

RPO is used to shut down the UPS from a distance.



To make RPO, apply 5VDC...12VDC from an external source hence UPS would be shut-down and load would be deenergized. In case “REM.OFF.A.ST” is ENABLE (under SETTINGS menu), UPS would be started-up as soon as applied voltage is removed.

Additionally, there are 5 different “Dry Contacts” which can be programmable from **RELAYS** menu (under SETTINGS menu). “Bypass Active, General Alarm, High Temperature, Synchronization OK, Battery Test Failure, Output Failure, Input Failure” alarms can be assigned to the contacts. Each alarm can be assigned to separate contacts but also one alarm may be assigned to all contacts.

Each relay has both a normally open (NO) and a normally closed (NC) contact. One end of these contacts is common. Normal states of the relay contacts are shown on the figure on the side. The maximum values of the relays is 250VAC 5A.

#### 4.2.5.4. Internal SNMP Communication

Internal SNMP can be installed into SNMP slot placed at the back rear of UPS. As soon as SNMP installed, RS232 port would be disabled.

Internal SNMP has the same logic with External SNMP so please read [Section 4.2.5.1](#) for more information.



In case of internal SNMP use with UPS, serial communication port (RS232) is disabled.

#### 4.2.5.5. Modbus Communication

Modbus allows you secure monitor of the UPS in your Building Management System (BMS) continuously. It is connected to 9-Pin D-SUB male connector.

- A (+) output connected to Pin 9.
- B (-) output connected to Pin 9.
- The other Pins are Null.

Via Modbus, the user can monitor UPS information and also send some commands to UPS. Please see the complete Modbus list in [Appendix-3 Modbus List](#).

## 5. MODES OF OPERATION

Uninterruptible Power Supplies (UPS) have an important function in the protection of the critical and sensitive loads from the irregular mains electricity conditions and they are used to supply uninterruptible energy to these loads. In such irregular mains electricity conditions, the user can provide an artificial energy supply to the equipment present in the office or at home by using an UPS.

Green Trier UPS during Inverter operation provides stable pure sine wave. This pure sine wave is not affected from the input voltage fluctuations. This helps to extend the life time of your sensible loads. Power factor of the current consumed from the mains is nearly one. You do not have any problem on generator or isolation transformer applications. The reactive energy consumption decreases.

During the mains failure, the energy needed for the load is provided by the battery in UPS (or in external battery cabinet/s). These batteries are charged by an intelligent battery charging circuit during the mains within the limits. Batteries are lead acid battery (VRLA) and do not require any maintenance until the end of their life time.

In case of longer overload or inverter failure situation, UPS transfers the load to Bypass line, and load is supplied from the mains. When the condition turns back to normal, UPS shall continue to supply the load through inverter.

UPS control and management is done by Digital Signal Processor (DSP) which is 200 times faster than standard microprocessors. This helps to make your UPS smarter. DSP uses all the sources on optimum conditions, observes the failure conditions, and communicates with your computer system.

UPS can be operated in one of the following operational modes depending on the condition of mains, battery, bypass, UPS and/or user preference.

You may see the block diagram of UPS in [Appendix-5 Description of UPS and Block Diagram](#).



### 5.1. Online Operation

Energy is drawn from the mains input. Loads are supplied through the rectifier and the inverter. The AC voltage at the input is converted to a DC voltage by the rectifier. The inverter converts this DC voltage to an AC voltage with a stable sinusoidal waveform, amplitude and frequency. Output voltage and frequency can be set via front panel. Output voltage is sinusoidal and has a regulated amplitude and frequency. It is independent from the input voltage. The loads are not affected by the negativities of the mains.

If the mains voltage and frequency are in certain range, Online Operation is possible. For the mains limits for Online Operation, please see [Appendix-4 Technical Specifications](#).

The upper limit of mains voltage is independent from the load percentage and it is 270V. UPS switches to Battery Operation mode when the mains is over 270V. The mains is required to decrease below 260V for UPS to return Online Operation.

Online Operation Conditions;

- In case Online Operation is set as operation mode of UPS, the mains is within the limits and/or if there is no abnormal condition (overheat, overload, failure...etc.) UPS operates in Online Operation. Except for failures, as soon as the abnormal conditions are eliminated, UPS switches to Online Operation automatically.
- In case Green Operation is set as operation mode of UPS and the voltage and frequency is out of the bypass limits but within the rectifier limits, UPS switches to Online Operation.

### 5.2. Green Operation (Eco-Mode)

In this mode, as long as the mains voltage and frequency within the limits, the load is supplied by the mains in a controlled manner (the inverter is in standby state). The purpose of using this mode is to increase the efficiency up to 98% and to provide energy saving; since the loads are fed supplied by the mains directly, the loads are unprotected against any possible future risks. (e.g. surge voltage, etc.).

To operate the UPS in Green Mode (Eco-Mode), the Operation Mode must be chosen "Green Operation" through the Settings Menu. UPS does not switch to Green Operation automatically. "Green Operation" is chosen as the operating mode hence UPS operates continuously in this mode.

UPS switches from Green Operation to another mode under the following conditions:

- In case of the mains voltage or frequency out of the limits of the bypass (UPS returns to Green Operation when the mains voltage or frequency turn back to within the limits of bypass).
- In case Online Operation is set as Operation mode through Settings Menu.



Green Operation mode does not provide perfect stability in frequency/waveform/rms value of the output voltage like in Online Operation. Thus, the use of this mode should be carefully executed according to the level of protection required by the application.





Green Operation mode does not provide electronic short circuit protection like in Online Operation. If a short circuit occurs on the output during this operation, the thermal/magnetic protection will act and all loads will be deenergized.



Prolonged overloads in Green Operation may cause the thermal/magnetic protection act. In this case, all loads will be deenergized.

### 5.3. Bypass Operation

This mode can not be chosen by the user, UPS transfers the loads automatically to the mains in order to protect them during abnormal conditions (the inverter is disabled).

While UPS operates in Online Operation, UPS switches to bypass automatically (in case the mains voltage and frequency is within the limits of bypass) in the following conditions;

- Inverter Fault
- Prolonged Overload
- High Heatsink Temperature

After these conditions are eliminated, the UPS automatically returns to inverter.

### Green and Bypass Operation Voltage Range

The mains voltage is required to be in certain range for Green and Bypass Operation. Voltage tolerance is set  $\pm 10\%$  of the output voltage in the factory. For instance; if the output voltage is 220V, the tolerance range of bypass voltage would be 198V – 242V. In case the input voltage decreases below 198V or increases above 242V; if UPS runs in Green Operation UPS switches to Online Operation; if UPS runs in Online Operation it can not switch to Bypass Operation even if a fault occurs. If the batteries and the inverter are suitable to supply the loads, UPS switches to Battery Operation.

Bypass and Green Operation voltage tolerance limit can be adjusted in certain ranges depends on the customer's request in the factory as well as at the field by Technical Service Personnel.

To return to Green Operation; the mains voltage should turn back to +5V above of lower limit, -5V down of upper limit of bypass limits. Default settings are 203V – 237V for 220V UPS.

### 5.4. Battery Operation

In this operation, energy is drawn from the batteries. The loads are supplied via inverter. Output voltage is sinusoidal and has a regulated amplitude and frequency. It is independent from the battery voltage. Battery voltage should be in acceptable limits and the inverter should be enabled for the UPS to operate in this mode.

UPS operates in Battery Operation in the following cases:

- While UPS is operating in Online Operation or Green Operation, if the rectifier is disabled or frequency/waveform/rms value of mains voltage is not in acceptable limits.

- After UPS is started-up with C.START key if only battery circuit breaker is switched to “I” position, UPS runs in Battery Operation and supplies the energy needed for the loads from the batteries.

### Battery Management and Battery Back-Up Time

UPS charges the batteries when the mains voltage is between 90V - 270V. Charging voltage is independent from the load.

As it is known, battery back-up can not be indicated with 100% accuracy, but approximation can be done. Even UPS operates in Online or Green/Bypass Operation; it continuously calculates and displays the remaining back-up time. **However the calculated values will be more healthier and accurate a few minutes after the UPS switches to Battery Operation.**

Autonomy time depends on battery type, quantity, capacity, situation and load level. UPS stops supplying the loads if the battery voltage decreases under a specific value.



In order to obtain longer autonomy time, you may add batteries in an external battery cabinet. Depending on battery capacity, additional charger cards may be needed to add to achieve ideal recharge time, please consult & contact to your authorized service.



When the mains voltage turns back to normal conditions after Battery Operation, UPS charges the batteries for 10 hours and tests the batteries. This procedure is repeated after each Battery Operation. If Battery Test is successful, UPS resumes normal operation. If not, “BATT: TEST FAILURE” alarm is displayed on LCD.

Battery life depends on some parameters such as battery type, charge-discharge cycle, and depth of discharge, ambient temperature, conditions. Please look at [Appendix-4: Technical Specifications](#) for the ideal environmental conditions for the batteries. Using the batteries outside this temperature range will decrease battery operation time and battery life.

### 5.5. Frequency Converter Operation

This mode is used when the load is different operating frequency of the mains frequency. For example; this mode must be chosen to supply the load which requires 60Hz where the mains frequency is 50Hz. In this mode, the output voltage can be adjusted between 208V – 242V and output frequency can be set as 50Hz or 60Hz.

UPS operates in this mode with batteries or without batteries depending on the user’s preference. During Frequency Converter Operation, bypass must be set as disabled since bypass would be functionless.



**During Frequency Converter Operation, You must not switch Maintenance Bypass Circuit Breaker (F4) to “I” position!**

### 5.6. No Operation

This mode is used to make settings through front panel or by service software. To start-up UPS in No Operation mode; the batteries must be connected, all the circuit breakers must be at "0" position. After that you may press C.START key to turn on UPS in NO OPERATION. In this mode UPS does not produce output voltage to supply the loads.

### 5.7. Manual Bypass Operation

Manual by-pass enables the user to isolate the electronic circuitry of the UPS from the mains and the load without interrupting the load operation by connecting the loads directly to the bypass utility supply. This feature is useful while performing maintenance or service and shall only be executed by authorized technical service personnel.



During Manual Bypass operation; in case of any mains interruption occurs, all loads on the output will be deenergized. Manual Bypass Operation should not be preferred for long time use.

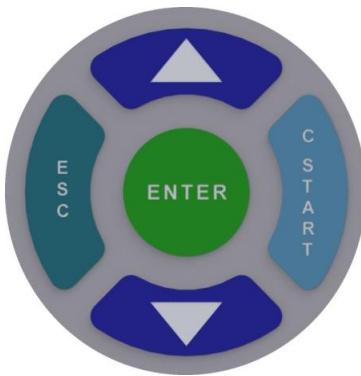
## 6. FRONT PANEL

The front panel located at the front side of the UPS informs the user about operating status, alarm conditions and measurements. It also provides access to control and configuration parameters.

### 6.1. Front Panel Segments

Front panel shown below consists of two segments. **LCD** (Liquid Crystal Display) offers detailed information about UPS and **KEYPAD** enables the user to access the UPS.

#### 6.1.1. Keypad



**ESC:** Exit from the current menu.

**UP (▲):** Scrolls the available menus/values upwards. It increases the value each time it is pressed when changing a parameter.

**DOWN (▼):** Scrolls the available menus/values downwards. It decreases the value each time it is pressed when changing a parameter.

**ENTER:** Enters the menu displayed on the screen. It makes selections or confirms the choice/changes made.

**C START:** Start-up UPS in No Operation. UPS turns off unless the circuit breakers are switched to “I” position.

#### 6.1.2. Liquid Crystal Display (LCD)

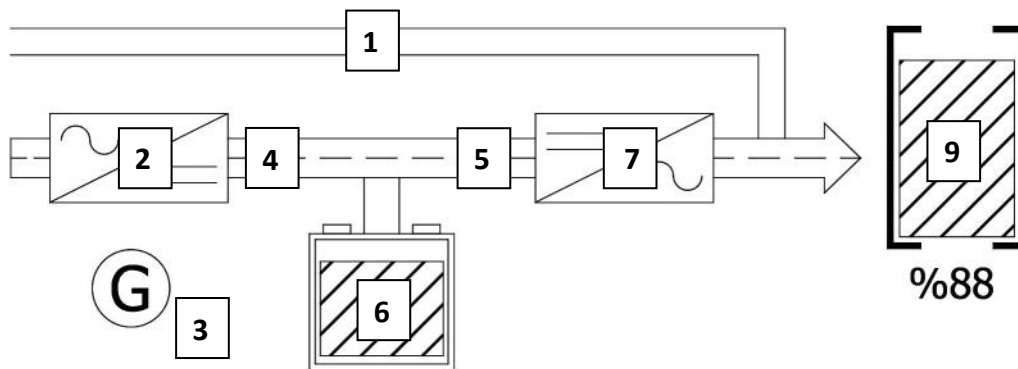
**ENERGY FLOW DIAGRAM/MODES OF OPERATION** and **MENUs** are displayed on LCD.

### 6.2. Screen Images

#### 6.2.1. Energy Flow Diagram/Modes of Operation

Main screen image shows the energy flow path and Operation Modes. The information of the current operation is written at the bottom of the panel. Additionally, the energy flow path is given by a graphical animation.

Single Line Operation Diagram;



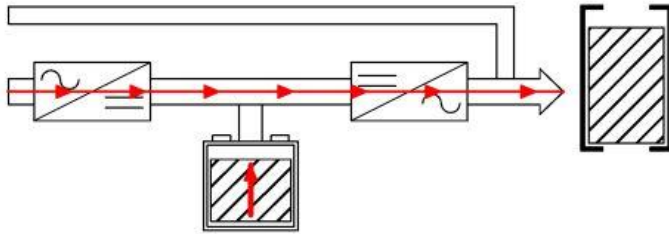
## ON-LINE OPERATION 8

The description of the symbols in the energy flow diagram:

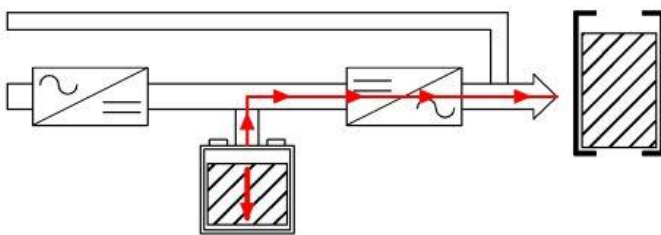
- 1. Bypass Line:** Shows that the loads are supplied via Bypass.
- 2. Rectifier:** The part that AC voltage at the input is converted to DC voltage.
- 3. Green Mode:** It appears when UPS works in Green Mode. It blinks in case if UPS does not work in Green Mode, although Green Mode is chosen via SETTINGS menu.
- 4. Rectifier Line:** It blinks when the mains has normal conditions.
- 5. Inverter Line:** It blinks when the loads are supplied via Inverter.
- 6. Battery:** Shows the batteries' condition. If the batteries discharge the indicator goes down, if they charge the indicator goes up. If any problem with the batteries, it blinks.
- 7. Inverter:** The part that DC voltage is converted to AC voltage.
- 8. Operation Mode Information:** The part that shows UPS's operation mode.
- 9. Load:** Shows the percentage of the load as numerical and graphical information. If there is overload at the output the load graphic blinks.

## 6.2.2 Operation Modes of UPS and Energy Flow Diagram

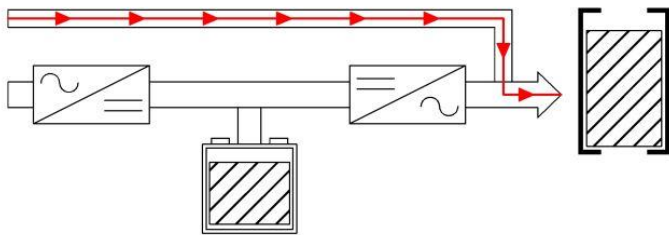
Online Operation/Frequency Converter Operation:



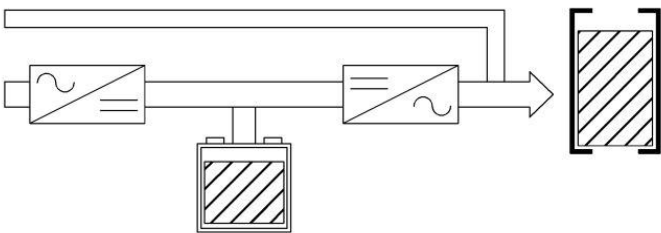
Battery Operation:



Green/Bypass/Manual Bypass Operation:



No Operation:



### 6.3. Menu

The related sub-menus under the main Menu is present which provides information to user about the measurements about the UPS and status of UPS. It can be reached by pressing “ENTER” button on the mains screen image on LCD.

“UP” - “DOWN” and “ENTER” – “ESCAPE” keys enable the user move in the menu, to make selection and exit from the menu.

You may reach the menu with the order listed below;

1. Measure
2. Alarms
3. Events
4. Commands
5. Settings
6. About

#### 6.3.1. Measure Menu

It provides useful measurements about the UPS itself.

The first screen of MEASURE menu as below;

MEASURE		1.1
LOAD	:	0%
OUTPUT (P)	:	0W
OUTPUT (VA)	:	0VA
OUTPUT C.	:	0A
P.FACTOR	:	0.6

“UP” - “DOWN” keys enables the user to move to other measurement screens.

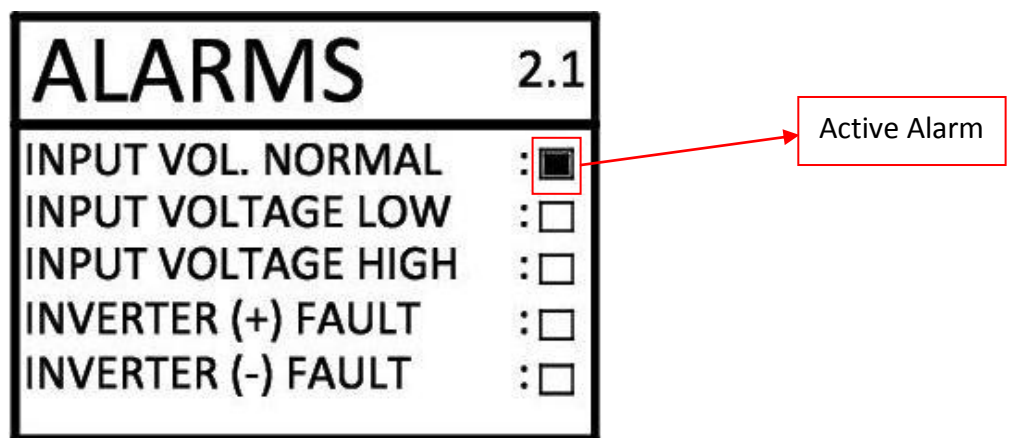
The following table shows all measurements and description under MEASURE menu;

Display#	Measurment	Description
1.1	LOAD	The load percantage
1.1	OUTPUT (P)	Active power at the output (W)
1.1	OUTPUT (S)	Apparent power at the output (VA)
1.1	OUTPUT C.	Output current (A)
1.1	P. FACTOR	Output power factor
1.2	INPUT VOL.	Input voltage (AC Volt)
1.2	BYPASS V.	Bypass voltage (AC Volt). It is the same with input voltage.

1.2	OUTPUT V.	Output voltage (AC Volt) (Load voltage)
1.2	+BATT.VOL.	The battery voltage between + and Neutral (DC Volt)
1.2	-BATT.VOL.	The battery voltage between – and Neutral (DC Volt)
1.3	INPUT FRQ.	Input frequency (Hz)
1.3	OUTPUT F.	Output frequency (Hz)
1.3	DCBUS + V.	DC BUS voltage between + and Neutral (DC Volt)
1.3	DCBUS – V.	DC BUS voltage between - and Neutral (DC Volt)
1.3	BAT. TIME	Battery back-up time. (Active on Battery Operation)
1.4	AMB. TEMP.	Ambient temperature (°C)
1.4	HEATSINK 1	Rectifier heatsink temperature (°C)
1.4	HEATSINK 2	Inverter heatsink temperature (°C)

### 6.3.2. Alarms Menu

UPS displays 42 different alarms/conditions/notices in Alarm List. If any active alarm exists; the little box on the right side of the related alarms would be filled, passive ones' box would be stayed unfilled.



All alarms and the descriptions are in the [Appendix-1 Alarm List](#).

**NOTE:** If any alarm occurs; (in case WARNING WIND: ENABLE) mains screen image (flow path/operation mode) rotates with **Warning Window** which displays the current alarms with an audible sound in order to warn the user about the new situation. Detailed information may be reached in ALARMS and/or EVENTS menu.



### 6.3.3. Events Menu

All the alarms/conditions/warnings are logged real-time.



Set the date and time of UPS to save real time event logs.

UPS displays up to 500 last events. Events are stored in EEPROM using FIFO method. Order number of last occurred event is 001, the oldest event is erased.

You must press ENTER key on current event and press ENTER key to look event details, and to move on the events list use UP/DOWN keys.

You may see the EVENTS Menu's screen as below. The event log is at the left side, and the details of the chosen event is at the right side.

EVENTS	1/3	EVENTS	1/3
16:16 30.03.09 F BYP.LO		00:52:00 29.03.2009	
16:15 30.03.09 V BYP.LO		PHASE UNLOCKED	
00:52 29.03.09 NO SYNC		ERROR CODES	
00:52 29.03.09 V.IN LO		0000 01	
00:40 29.03.09 COM LOST		9202 4028 1020 0000	

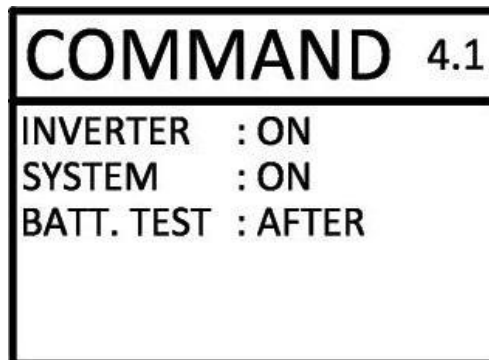
All events and the descriptions are in the [Appendix-2 Events List](#).



If technical support required; taking notes of current event logs would be useful.

#### 6.3.4. Command Menu

Through this menu; you may send some commands to UPS.  
You may see the COMMAND Menu's screen as below;



The commands placed under COMMAND menu are explained in the following;

##### 6.3.4.1. Inverter

Via this menu; you may control the output of UPS by making inverter ON or OFF.  
When INVERTER is OFF; UPS operates in No Operation mode. Rectifier continuous to operate but UPS does not supply the loads.

**INVERTER: ON is default setting.**

To set:

- i. Select "INVERTER".
- ii. Press "ENTER".
- iii. Select "ON" (Inverter is enable) or "OFF" (Inverter is disable) by "UP" and "DOWN" keys.
- iv. To confirm the selection press "ENTER".



In case of setting "INVERTER: OFF", all loads on the output will be deenergized.

##### 6.3.4.2. System

This command makes UPS turned off while UPS is in Battery Operation mode. This command is nonfunctional while the mains exist (Input circuit breaker is at "I" position).



If you set "SYSTEM: OFF", all loads on the output will be deenergized.

**"SYSTEM: ON" is default setting.**

To turn the UPS off:

- i. Select "SYSTEM".
- ii. Press "ENTER".

- iii. Select "OFF" by "UP" and "DOWN" keys.
- iv. To confirm the selection press "ENTER".
- v. To switch off the UPS; press "ENTER" again.

#### 6.3.4.3. BATT. TEST

With this command, the UPS battery test feature can be controlled. When "NOW" selected, the test begins, and at that moment BATTERY TEST MODE is written on the screen. During the battery test when "AFTER" is selected; the test is terminated and shifted to 90 days later.

To start the battery test or cancel it:

- i. Select "BAT.TEST".
- ii. Press "ENTER".
- iii. Select "NOW" or "AFTER" by "UP" and "DOWN" keys.
- iv. To confirm the selection press "ENTER".



When the mains voltage turns back to normal conditions after Battery Operation, UPS charges the batteries for 10 hours and tests the batteries. This procedure is repeated after each Battery Operation. If Battery Test is successful, UPS resumes normal operation. If not, "BATT: TEST FAILURE" alarm displays on LCD.

#### 6.3.5. Settings Menu

This menu is the section where all the settings related to the operation of UPS can be done.

SETTINGS		6.1
ALARM VOICE	:	ENABLED
KEY VOICE	:	DISABLED
LCD CNTRST	:	70
DATE/TIME	:	----->
RUNNING MODE	:	ONLINE

It must be entered the password to make changes some of the settings in this section.

<b>PASSWORD</b>
0000 ENTER

When the password Screen comes to encounter; first character would be selected. Press ENTER to select it than it starts flashing now you may change value of it by UP/DOWN keys. After the required value selected press ENTER to confirm. Use UP/DOWN keys to pass the next character. The above actions are repeated till the required password is entered. Afterwards, to terminate the password enter; select ENTER by UP/DOWN keys and press ENTER to confirm.



All UPS settings should be done during No Operation.

#### 6.3.5.1. ALARM VOICE

UPS gives audible warning when a problem begins. Alarm voice can be silenced if requested.

To set:

- i. Select "ALARM VOICE".
- ii. Press "ENTER".
- iii. Select "ENABLED" (Alarm voice is active) or "DISABLED" (Alarm voice is passive) by "UP" and "DOWN" keys.
- iv. To confirm the selection press "ENTER".



Although Alarm Voice is silenced by making it PASSIVE, in case any other problem occurs later different than the previous reason, the alarm voice would be active again in order to warn the user about the new situation.

#### 6.3.5.2. KEY VOICE

It is used to make the voice of keys as active or passive.

To set:

- i. Select "KEY VOICE".
- ii. Press "ENTER".
- iii. Select "ENABLED" (Key voice is active) or "DISABLED" (Key voice is passive) by "UP" and "DOWN" keys.
- iv. To confirm the selection press "ENTER".

#### 6.3.5.3. LCD CNTRST

It is used to increase or decrease the contrast setting of LCD screen.

To adjust:

- i. Select "LCD CNTRST".
- ii. Press "ENTER".
- iii. Adjust the contrast value between 50-100 by "UP" and "DOWN" keys.
- iv. To confirm the adjustment press "ENTER".

#### 6.3.5.4. DATE/TIME

UPS records the event logs with the date and time information. Thus, the events can be followed by chronologically.

To set:

- i. Select "DATE/TIME".
- ii. Press "ENTER".
- iii. Select the part that required changing (day, month, year, hour and minute).
- iv. Press "ENTER".
- v. Change the selected part by "UP" and "DOWN" keys.
- vi. To confirm the selection press "ENTER".
- vii. After all the settings done, by pressing "ESC" exit from "DATE/TIME" menu.



Set the date and time of UPS during pre-setting.

#### 6.3.5.5. RUN MODE

Operation Mode of UPS is selected from this tab. One of ONLINE (Online Operation), FRQ.CON. (Frequency Converter Operation) and GREEN (Green Operation) can be selected. The description of these operation modes is explained in [Section 5](#). **You must enter the password to make changes.**



It is recommended to change the settings of UPS in No Operation.

To set the Operation Mode:

- i. Select "RUN MODE".
- ii. Press "ENTER".
- iii. Enter the required password.
- iv. Select the required operation mode (ONLINE – FRQ.CON-GREEN) by "UP" and "DOWN" key.
- v. To confirm the selection press "ENTER".

#### 6.3.5.6. BYPASS

It brings Static Bypass to Passive or Active. **You must enter the password to make changes.**



It is recommended to change the settings of UPS in No Operation.



If you set "BYPASS: DISABLED" and in case UPS Inverter is not enable because of any reason, all loads on the output would be deenergized.



During Bypass/Green Operation; If you set “BYPASS: DISABLED”, all loads on the output will be deenergized.

To set:

- i. Select “BYPASS”.
- ii. Press “ENTER”.
- iii. Enter the required password.
- iv. Select “ENABLED” (Bypass is active) or “DISABLED” (Bypass is passive) by “UP” and “DOWN” keys.
- v. To confirm the selection press “ENTER”.

#### 6.3.5.7. INVERTER

It turns off the output of UPS. When it is set to PASSIVE; UPS runs but do not supply the loads. **You must enter the password to make changes.**



It is recommended to change the settings of UPS in No Operation.

To set:

- i. Select “INVERTER”.
- ii. Press “ENTER”.
- iii. Enter the required password.
- iv. Select “ENABLED” (Inverter is active) or “DISABLED” (Inverter is passive) by “UP” and “DOWN” keys.
- v. To confirm the selection press “ENTER”.

#### 6.3.5.8. RELAYS

As described in [Section 4.2.5.3](#); selected alarms can be assigned to dry contacts. **You must enter the password to make changes.**



It is recommended to change the settings of UPS in No Operation.

To adjust the relays:

- i. Select “RELAYS”.
- ii. Press “ENTER”.
- iii. Enter the required password.
- iv. Select the required relay (RELAY1, RELAY2, RELAY3, RELAY4 or RELAY5) set the function by “UP” and “DOWN” keys.
- v. Press “ENTER”.
- vi. Adjust the required function by “UP” and “DOWN” key.
- vii. To confirm the selection press “ENTER”.

viii. After all the adjustment is done press “ESC” to exit from “RELAYS” menu.

There are 7 different alarms defined. 5 of them are assigned to each 5 relays as default; however they can be changed by the user. It is also possible to assign the same alarm to each 5 relays.

Default factory setting of the relays is as below;

ALARM	DESCRIPTION	DEFAULT SETTINGS
BYPASS ACTIVE	UPS operates in Bypass Mode.	RELAY 1
GENERAL ALARM	UPS has a general alarm.	RELAY 5
HIGH TEMP.	Ambient temperature is high.	
SYNC. OK	Synchronization is OK.	RELAY 2
BAT. FAIL	Battery failure.	RELAY 3
OUTPUT NOT OK	No output of UPS.	
INPUT NOT OK	Input voltage is OK.	RELAY 4

#### 6.3.5.9. PARALLEL

This menu is password-protected. Only Technical Service Personnel authorized to enter it.

#### 6.3.5.10. OUTPUT VOL.

Output voltages can be adjusted between 208V and 242V in this menu. Range of voltage steps in this process is 1V. **You must enter the password to make changes.**



It is recommended to change the settings of UPS in No Operation.

To set:

- Select “OUTPUT VOL.”
- Press “ENTER”.
- Enter the required password.
- Adjust the required output voltage value between 208-242V by “UP” and “DOWN” keys.
- To confirm the selection press “ENTER”.

#### 6.3.5.11. OUTPUT FRQ.

50Hz or 60Hz Output frequency can be adjusted in order to supply the different load types. **You must enter the password to make changes.**



It is recommended to change the settings of UPS in No Operation.

To set:

- i. Select "OUTPUT FRQ."
- ii. Press "ENTER".
- iii. Enter the required password.
- iv. Select output frequency "50HZ" or "60HZ" by "UP" and "DOWN" keys.
- v. To confirm the selection press "ENTER".

#### **6.3.5.12. SYNC. FRQ. (Synchronization Frequency)**

The output frequency of the UPS synchronizes to bypass/mains frequency within the range of adjusted synchronous frequency. It can be adjusted between  $\pm 0.5\text{Hz}$ .... $\pm 5\text{Hz}$ . Range of steps in this process is 0.5Hz.

For example, if 50Hz output frequency with  $\pm 5\text{Hz}$  synchronous frequency is selected; UPS output synchronizes to bypass/mains within 45-55HZ range. **You must enter the password to make changes.**



It is recommended to change the settings of UPS in No Operation.

To set:

- i. Select "SYNC. FRQ."
- ii. Press "ENTER".
- iii. Enter the required password.
- iv. Adjust the synchronization frequency value between  $\pm 0.5\text{Hz}$  -  $\pm 5\text{Hz}$  by "UP" and "DOWN" keys.
- v. To confirm the selection press "ENTER".

#### **6.3.5.13. BATTERY**

UPS calculates the back-up time. For the accurate calculation of back-up time; the battery capacity and parallel battery string qty must be entered correctly. In case UPS operates without battery, the number of parallel string qty must be selected as "0".

**You must enter the password to make changes.**



It is recommended to change the settings of UPS in No Operation.



To set:

- i. Select "BATTERY".
- ii. Press "ENTER".
- iii. Enter the required password.
- iv. Select "CAPACITY".
- v. Press "ENTER".
- vi. Set the battery capacity by "UP" and "DOWN" keys.
- vii. To confirm the selection press "ENTER".
- viii. Select "PARALLEL".
- ix. Press "ENTER".
- x. Set the battery parallel number by "UP" and "DOWN" keys.
- xi. To confirm the selection press "ENTER".
- xii. After all the adjustment done, press "ESC" to exit from "BATTERY" menu.

Example: If UPS operates with 2 parallel strings of 12Ah battery;

CAPACITY: 12Ah

PARALLEL: 2

should be chosen.

#### **6.3.5.14. AUTO START (Automatic Start)**

UPS has the ability to work from mains utility automatically when it detects the mains voltage during battery operation or to make auto start up after a shut down due to battery discharge. When "AUTO START" is "ENABLED", the UPS detects the mains voltage and starts operating automatically. In case of this feature is not used, it must be set as "DISABLED".

**You must enter the password to make changes.**



It is recommended to change the settings of UPS in No Operation.

To set:

- i. Select "AUTO START".
- ii. Press "ENTER".
- iii. Enter the required password.
- iv. Select "ENABLED" (Automatic start is active) or "DISABLED" (Automatic start is passive) by "UP" and "DOWN" keys.
- v. To confirm the selection press "ENTER".

#### 6.3.5.15. WARNING WND (Warning Window)

UPS warns the user with the warning window alternately with mains screen image if any alarms occur. It shall be passive if not required to use. In this case UPS alerts the user with audible alarm voice, the detail of the alarms can be reached from ALARMS menu.

To set:

- i. Select "WARNING WND".
- ii. Press "ENTER".
- iii. Select "ENABLED" (Warning Window is active) or "DISABLED" (Warning Window is passive) by "UP" and "DOWN" keys.
- iv. To confirm the selection press "ENTER".

#### 6.3.5.16. EVENT LOGS

The UPS is capable of accumulating a total of 500 event logs memory. If event log function is required to keep the event logs; it must be set as ENABLED. If not, it must be set as DISABLED. If you want to clear the current logs it must be set as DELETE.

To set:

- i. Select "EVENT LOGS".
- ii. Press "ENTER".
- iii. Select "ENABLED" (Logging is active) or "DISABLED" (Logging is passive) or "DELETE" (erase the log) by "UP" and "DOWN" keys.
- iv. To confirm the selection press "ENTER".

#### 6.3.5.17. EPO A. START (Emergency Power Off Automatic Start)

When EPO (look at [Section 7.7](#)) command sent to UPS, it disconnects the output, when EPO command is removed, UPS provides energy at the output again. If auto-start is not required, "EPO A. START." shall be passive. **You must enter the password to make changes.**



It is recommended to change the settings of UPS in No Operation.

To set:

- i. Select "EPO A. START".
- ii. Press "ENTER".
- iii. Select "ENABLED" (Auto Start is active) or "DISABLED" (Auto Start is passive) by "UP" and "DOWN" keys.
- iv. To confirm the selection press "ENTER".

#### 6.3.5.18. REM. OFF. A. ST. (Remote Off Automatic Start)

As explained in [Section 4.2.5.3](#), shutdown command can be sent via dry contact card to UPS. If the command is removed, UPS continues to supply the load. In case auto-start is not required, "REM. OFF. A. ST." shall be passive. **You must enter the password to make changes.**



It is recommended to change the settings of UPS in No Operation.

To set:

- i. Select "REM. OFF. A. ST. ".
- ii. Press "ENTER".
- iii. Select "ENABLED" (Automatic Start is active) or "DISABLED" (Automatic Start is passive) by "UP" and "DOWN" keys.
- iv. To confirm the selection press "ENTER".

#### 6.3.5.19. BYP. FAIL.CLR.

This menu is password-protected. Only Technical Service Personnel authorized to enter it.

#### 6.3.5.20. MODBUS ID

It must be provided a separate Modbus ID (number) to each device. If you have UPS modbus card, ID number for the UPS can be set here. **You must enter the password to make changes.**



It is recommended to change the settings of UPS in No Operation.

To set:

- i. Select "MODBUS ID".
- ii. Press "ENTER".
- iii. Adjust ID between 1-250 value by "UP" and "DOWN" keys.
- iv. To confirm the selection press "ENTER".

#### 6.3.5.21. LANGUAGE

You may choose the language package installed in UPS.

To set:

- i. Select "LANGUAGE".
- ii. Press "ENTER".
- iii. Set the required language by "UP" and "DOWN" keys.
- iv. To confirm the selection press "ENTER".

### 6.3.6. About Menu

This menu provides information about the UPS itself; maximum power, inverter and front panel software version and serial number.

<b>ABOUT</b>	<b>6.1</b>
INVERTER (5KVA) VERSION V.3.3.06 FRONT PANEL VERSION V.3.3.01 SERIAL NO 0000X0000000	

## 7. OPERATING PROCEDURES

### 7.1. Preparations

UPS is shipped with 3pcs battery fast fuses and 1pc EPO connector in a plastic package attached to the rear side of UPS. Separate the package from UPS and take out the fuses and the connector.



After all connections are completed as described in [Section 4](#), EPO connector and the battery fuses must be placed as shown below.



Do not leave the battery fuse package at the back of UPS. Otherwise the fans would be blocked and UPS may overheat.



- Insert the EPO connector to the socket labeled “EPO”.
- Insert the battery fuses to battery circuit breaker located just below the fans.

## 7.2. Presettings of UPS

In case no special request is specified, UPS will be shipped with the following features:

- i. Run Mode : Inverter
- ii. Output Voltage : 220V
- iii. Output Frequency : 50Hz
- iv. Battery Capacity : 7Ah
- v. Battery Parallel Number :1

After all connections have been done; if required to use UPS in different mode from the above features, you need to change some settings.



It is recommended to change the settings of UPS in No Operation. Please read [Section 5.6](#) to start-up UPS in No Opeartion mode.

- i. If you want to change the operation mode to Frequency Converter; you may follow the steps explained in [Section 6.3.5.5](#). You have to make bybass disable as described in [Section 6.3.5.6](#). If output frequency is required to change, you may change it as described in [Section 6.3.5.11](#).
- ii. If output voltage is different from 220V you may change it as described in [Section 6.3.5.10](#).
- iii. If output frequency is different from 50HZ you may change it as described in [Section 6.3.5.11](#).
- iv. If different battery capacity is used you may change it as described in [Section 6.3.5.13](#).
- v. If the battery parallel string number is different from “1” you may change it as described in [Section 6.3.5.13](#).

## 7.3. Commissioning

After all connections and settings have been done, UPS can be started-up in two ways. If the mains is in normal condition, you may start-up with the mains. If it is not, you may start-up the UPS from the battery.



Even with no connections have been done, hazardous voltages may exist on connection terminals and inside the UPS. Do not touch these parts.



If you work on terminals; all circuit breakers in the input/bypass distribution panel, and the battery circuit breakers in the external battery cabinet should be brought to “0” position.



Units with internal batteries have hazardous voltages on the battery connectors even if the battery circuit breaker is at “0” position. **Do not touch the battery connectors!**

### 7.3.1. Start-Up with the Mains

#### a. UPS with Internal Battery:

1. Put the battery fast fuses into the battery circuit breaker (F3).
2. Switch the battery circuit breaker (F3) to “ON” position.
3. Switch the input circuit breaker on the distribution panel to “ON” position.
4. Switch the input circuit breaker (F1) to “ON” position.
5. Wait till chosen operation mode for example ‘Online Operation’ shown on LCD.
6. Switch the output circuit breaker (F2) to “ON” position.
7. Switch the output circuit breaker on the distribution panel to “ON” position.

Afterwards UPS starts to supply the loads.

#### b. UPS with External Battery:

1. Put the battery fast fuses into the battery circuit breaker (F3).
2. Switch the circuit breakers on external battery cabinet to “ON” position.
3. Switch the battery circuit breaker (F3) to “ON” position.
4. Switch the input circuit breaker on the distribution panel to “ON” position.
5. Switch the input circuit breaker (F1) to “ON” position.
6. Wait till chosen operation mode for example ‘Online Operation’ shown on LCD.
7. Switch the output circuit breaker (F2) to “ON” position.
8. Switch the output circuit breaker on the distribution panel to “ON” position.

Afterwards UPS starts to supply the loads.

When the order described above is followed, UPS makes a short test to determine whether there is a situation exists or not for a proper operation. During this test "Preparing" message will be shown on LCD till the selected mode will be activated in 1 minute.

In case the order is not followed, “No Operation” will be shown on LCD for 1 minute. Meantime, a number of alarms can be seen on the screen with audible warnings. You may supply the load through UPS as soon as the alarms removed and the selected operation mode is shown on LCD. If the alarms continue, then check the alarms and apply the actions explained in [TROUBLESHOOTING](#).

### 7.3.2. Start-Up with the Battery (Cold Start)

Where the mains is out of the limits, you may start-up UPS from battery. The start-up order is explained below. This process is called “COLD START” and operation time depends on battery capacity, battery condition and load capacity.



In order to obtain longer autonomy time, It is recommended to start-up UPS with the mains as far as possible.

#### a. UPS with Internal Battery:

1. Put the battery fast fuses into the battery circuit breaker (F3).
2. Switch the battery circuit breaker (F3) to “ON” position.
3. Press ‘C START’ key.
4. Wait till ‘Battery Operation’ shown on LCD.
5. Switch the output circuit breaker (F2) to “ON” position.
6. Switch the output circuit breaker on the distribution panel to “ON” position.

Afterwards UPS starts to supply the loads.

#### **b. UPS with External Battery:**

1. Put the battery fast fuses into the battery circuit breaker (F3).
2. Switch the circuit breakers on external battery cabinet to “ON” position.
3. Switch the battery circuit breaker (F3) to “ON” position.
4. Press ‘C START’ key.
5. Wait till ‘Battery Operation’ shown on LCD.
6. Switch the output circuit breaker (F2) to “ON” position.
7. Switch the output circuit breaker on the distribution panel to “ON” position.

Afterwards UPS starts to feed the loads.

A number of alarms can be seen on the screen with audible warnings. You may supply the load through UPS as soon as the alarms are removed and the selected operation mode is shown on LCD. If the alarms continue, then check the alarms and apply the actions explained in [TROUBLESHOOTING](#).

### **7.4. Decommissioning**

Follow the order written below to decommission the UPS:

1. Switch the output circuit breaker on the distribution panel to “OFF” position.
2. Switch the output circuit breaker (F2) to “OFF” position.
3. Switch F3 and external battery cabinet circuit breakers to “OFF” position.
4. Switch the input circuit breaker on the distribution panel to “OFF” position.
5. Switch the input circuit breaker (F1) to “OFF” position.
6. From Command Menu set the “SYSTEM: OFF”.

### **7.5. Start-Up without Battery**

It is possible to use UPS without batteries as a voltage and frequency regulator. If the UPS is used in this feature, you must set the battery PARALLEL string number to “0” as described in [Section 6.3.5.13](#).



If you set “BYPASS: DISABLED” and in the meantime the inverter is disabled or blocked because of any reason, all loads at the output would be deenergized.

### **7.6. Manual (Maintenance) Bypass Instructions and Decommissioning**

Manual by-pass enables the user to isolate the electronic circuitry of the UPS from the mains and the load without interrupting the load operation by connecting the loads directly to the bypass supply.

This feature is useful while performing maintenance or service and shall only be executed by authorized technical service personnel.



This procedure may only be executed by authorized technical service personnel.



In order to transfer to Manual Bypass without interruption, do the following instruction respectively;

- Remove the cover of Manual Bypass circuit breaker.
- Switch the manual bypass circuit breaker (F4) to “ON” position.
- See “Manual Bypass Operation” written on LCD.
- Switch the output circuit breaker (F2), the input circuit breaker (F1) and the battery circuit breakers (F3) –the breakers on external battery cabinets if any- to “0” position.

Front panel power will be cut off, the loads will be continued to be supplied directly from the mains.



During Manual Bypass operation; in case of any mains interruption-occurs, all loads on the output will be deenergized. Manual Bypass Operation should not be preferred for long time use.

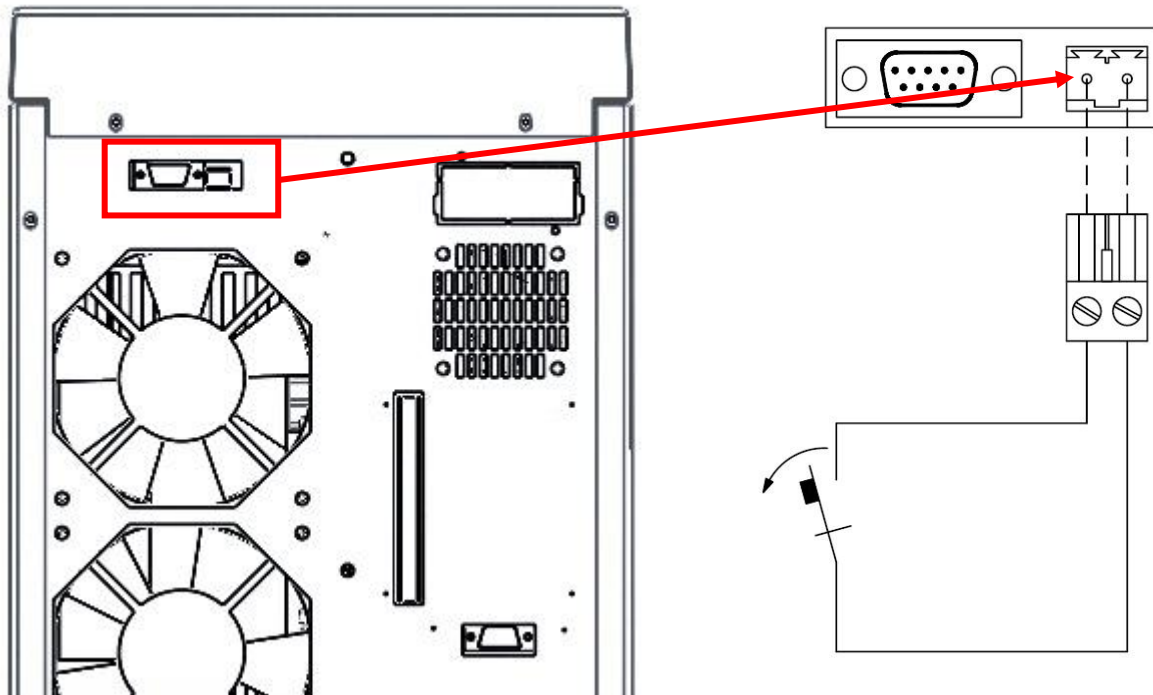
In order to transfer the loads from Manual Bypass to UPS without interruption, do the following instruction respectively;

- Switch the output circuit breaker (F2), the input circuit breaker (F1) and the battery circuit breakers (F3) –the breakers on external battery cabinets if any- to “1” position.
- See “Manual Bypass Operation” written on LCD.
- Wait 2 minutes till the UPS completes the test.
- Switch the manual bypass circuit breaker (F4) to “0” position.
- See “Online Operation” written on LCD.
- Replace the cover of Manual Bypass circuit breaker.

### 7.7. Emergency Power Off (EPO)

UPS output can be cut off immediately by EPO connection if desired. EPO connection is normally closed (NC), i.e. when the EPO connection is open circuited UPS output cuts off.

In case EPO connection is used in distance; a latched switch can be used as described in below figure. When UPS operates in Online Operation; the latch switch shall be normally closed (NC). Whenever any emergency occurs you have to make the switch opened to turn the UPS off.



EPO switch should be placed where unauthorized people can not reach it. Unauthorized use may cause the load be deenergized.

### 7.8. Remote Shut Down

UPS can be connected to the Automation System with free contact option and turning off UPS remotely is possible. For this feature, between 5Vdc to 12Vdc voltage is applied to Remote Turn Off contact. If the command is removed UPS continues to supply the load in case REM. OFF. A. ST.: ENABLED. If it is not active UPS does not start-up automatically.

For more detailed information about communication with the remote free contact; please see [Section 4.2.5.3](#) and [Section 6.3.5.18](#).

## 8. MAINTENANCE

Maintenance includes fully control of all the electronic and mechanical components in UPS. And they needed to be replaced after their lifetime is over. Systematic maintenance ensures to improve UPS's efficiency and to extend life-time. INFORM recommends every 3 to 6 months of period for systematic maintenance after warranty by authorized service.



All the maintenance operations should be done by authorized technical service personnel.

### 8.1. Batteries

The life of batteries strongly depends on the usage and environmental conditions. (ambient temperature, frequency of electricity cuts, etc.). There are also other factors like the number of charge-discharge cycles and discharge depth. Performing battery test can provide you information about battery condition. (See [Section 6.3.4.3](#) for more information on battery test). But not to come across any unrequired condition during electricity cut, the batteries should be maintained periodically by authorized technical personnel.



Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.



When replacing batteries; use the same quantity and type that were originally fitted.



Batteries must always be disposed of according to local environmental laws.

### 8.2. Fans

The life of fans used to cool the power circuits depends on the usage and environmental conditions. Please look at [Appendix-4: Technical Specifications](#) for detailed environment conditions. Preventive maintenance shall be done by authorized Technical Personnel periodically.

### 8.3. Capacitors

The life of the electrolytic capacitors on the DC BUS and the capacitors used for output and input filtering purposes depends on the usage and environmental conditions. Preventive maintenance should be done by authorized Technical Personnel periodically.

## 9. TROUBLESHOOTING

The aim of this chapter is to understand some specific problems, to verify the cause of the problems and to provide solution to them.

### First things to do:

1. Check and verify if the mains exists and if it is between the limits.
2. Check and verify if all the cables are connected to the right terminals.
3. Check and verify that all the circuit breakers for UPS in the distribution panel are at “I” position.
4. Check and verify that all the circuit breakers of UPS are at “I” position.

### 9.1. Short Circuit at the Output

If a short circuit occurs at the output of the unit, UPS acts like a current source (as long as the over current is drawn, it decreases the output voltage keeping the output current constant at a certain value) forcing to trigger the circuit breaker that is between the UPS and the short-circuited load. By triggering the mentioned circuit breaker, the short circuited line is being removed and the other loads that are present on the other lines are being prevented to be affected from this failure.



To enable the short circuit protection feature of the UPS, each load shall be supplied over a separate circuit breaker chosen according to the load current. This may provide quick disconnection of the short circuited line and operation continuity of the other loads. To obtain maximum protection, the rating of each individual load circuit breaker shall have the minimum value, which is enough to carry the full load current continuously. Additionally UPS should operate in Online or Battery Operation.

Please follow the steps below when output short-circuited alarm occurs;

- Switch the output circuit breaker of UPS to “0” position.
- Switch the output circuit breaker of UPS to “0” position and start-up UPS in Online Operation.
- Wait to see “Online Operation” shown on LCD.
- Switch the output circuit breaker of UPS to “I” position.
- If the rating of each individual load circuit breaker is well-adjusted; the circuit breaker of short circuit load would be blown, If not well-adjusted, “Short Circuit Alarm” would be shown on LCD. In this case the short-circuited load should be found-out and removed.

### 9.2. High Inrush Current Load at the Output

Some loads absorb more current than their nominal current value for a short period of time when they are energized. Ordinary UPS’s either switch off their output and they cause all the loads to remain without energy or they pass to by-pass, transferring all the loads to the mains.

UPS behaves like a current source in such a situation. (As long as the over current is drawn, it decreases the output voltage keeping the output current constant at a certain value). Thus none of the loads on the output are affected from this situation.



UPS performs this feature if it is working in Online or Battery Operation.

### 9.3. Input Circuit Breaker Blown Out

If the input circuit breaker blows; it points out that there is output short circuit on Bypass Operation or UPS might be breakdown. Please look at also [Section 9.1. Short Circuit at the Output](#).

### 9.4. Ambient Temperature High

It is shown “**AMBIENT T. HIGH**” on Alarm List. If the ambient temperature is high, it causes a rise in the internal temperature of UPS and this alarm appears. In this case; the first thing to do is cool the environment.

### 9.5. Overload Alarms

Connected loads to the output of the UPS that exceed the nominal power of the unit is called “**OVERLOAD**”. Check if there is an overload and remove the excessive load. Hence the alarm would be off.

UPS can supply the load that exceeds the nominal power of the unit for a limited period while operating Online. This period depends on the load quantity and the initial temperature of the overload on the semiconductors.

The Unit follows up the following procedure in the calculation of the overload time:

- It supplies the load for a period which is specified in [Appendix-4 Technical Specifications](#), and then it transfers the load to by-pass line if the bypass input voltage/frequency value is within the allowed limits.
- Meanwhile if the junction temperature passes over a certain value, than it transfers the load to by-pass line (assuming the bypass voltage/frequency is acceptable).



If the unit is working on by-pass mode during the initial start of the overload or if it has passed to by-pass mode because of the overload, then the only protection in the system is the automatic circuit breakers in the circuit. In case of the UPS circuit breaker is switched off then all the loads on the output would be deenergized.



Make sure that the UPS is not overloaded to provide a higher quality supply to the loads.

### 9.6. Manual Bypass Active Alarm

It is shown “**MANUAL BYP ACTIVE**” on Alarm List. If Manual Mypass circuit breaker is brought to “I” position, this alarm appears. In this case Manual Bypass circuit breaker is brought to “I” position without any reason (except the reasons explained in [Section 7.6](#)), to remove the alarm; bring this circuit breaker to “0” position.

### 9.7. Battery Test Fail Alarm

It is shown “**BATT TEST FAILURE**” on Alarm List. UPS tests the batteries periodically. In case the batteries failed in the battery test, this alarm appears. Perform the test again when the batteries have been charged for a long time and verify the battery circuit breaker is at “I” position.

If the alarm continues, contact to authorized Technical Service.

### 9.8. Input Voltage High/Low Alarms

It is shown **“INPUT VOLTAGE LOW”** or **“INPUT VOLTAGE HIGH”** on Alarm List. If the input voltage is not in specified limits, these alarms appear. In case, UPS operates in Battery Operation mode, as soon as the mains turns back to specified limits, the alarm would disappear.



If the mains does not come back to normal conditions during Battery Operation, UPS will be turned off and all loads at the output would be deenergized at the end of battery autonomy.

### 9.9. Bypass Voltage High/Low Alarms

It is shown **“BYPASS VOL. LOW”** or **“BYPASS VOL. HIGH”** on Alarm List. If the input voltage is not within the specified limits, these alarms appear. In this case, UPS operates in Online Operation mode, as soon as the mains comes back to specified limits, the alarm would disappear, but never switches to Bypass Operation. If UPS needs to be switched to bypass at this moment, UPS will cut the output and load would be deenergized.

### 9.10. Bypass Frequency High/Low Alarms

It is shown **“BYPASS FREQ. LOW”** or **“BYPASS FREQ. HIGH”** on Alarm List. If the input frequency is not within specified limits, these alarms appear. In this case, UPS operates in Online Operation mode, as soon as the mains comes back to specified limits, the alarm would disappear but never switches to Bypass Operation. If UPS needs to be switched to bypass at this moment, UPS will cut the output and load would be deenergized.

### 9.11. Heatsink Temperature High Alarms

It is shown **“HEATSINK T. HIGH”** on Alarm List. If temperature of the heatsink where the power components installed rises up, this alarm appears. The reasons can be; overload (see [Section 9.5](#)), broken fans and high ambient temperature (see [Section 9.4](#)). If the fans are broken or any other problem is defined, contact to an authorized Technical Service.

Any other alarm occurs except the alarms explained above, contact to an authorized Technical Service instantly.

Please have the following information ready before you contact to service:

- Ensure you read the troubleshooting section carefully and apply the procedure.
- Model Number
- Serial Number
- Firmware version
- Date of failure or problem
- Symptoms of failure or problem
- Customer return address and contact information

You may find all the alarms and description in [Appendix-1: Alarms List](#).

## Appendix-1: Alarms List

<b>INPUT VOLTAGE LOW</b>	It means that input voltage dropped below under the lower limit which is specified in the Technical Specifications Table. In the meantime, the UPS operates in Battery Operation. When the mains turns back to normal, UPS starts to operate in Online Operation.
<b>INPUT VOLTAGE HIGH</b>	It means that input voltage exceeded the upper limit which is specified in the Technical Specifications Table. In the meantime, the UPS operates in Battery Operation. When the mains turns back to normal, UPS starts to operate in Online Operation.
<b>INVERTER (+) FAULT</b>	It means that a fault is occurred in (+) alternans of the inverter circuit.
<b>INVERTER (-) FAULT</b>	It means that a fault is occurred in (-) alternans of the inverter circuit.
<b>BYPASS VOLTAGE LOW</b>	It means that bypass voltage dropped below the lower limit which is specified in the Technical Specifications Table. In this case, UPS can not switch to Bypass Operation.
<b>BYPASS VOLTAGE HIGH</b>	It means that bypass voltage exceeded the upper limit which is specified in the Technical Specifications Table. In this case, UPS can not switch to Bypass Operation.
<b>HEATSINK T. HIGH</b>	It means that, one of heatsink temperature has been exceeded 70°C. In this case; if bypass line is suitable, then the UPS switches to Bypass Operation. If not, UPS cuts the energy of the loads. The temperature of the heatsink must fall under 70°C for UPS to turn back to normal.
<b>BYPASS FREQ. LOW</b>	It means that bypass frequency dropped below under the lower limit which is specified in the Technical Specifications Table. In this case, UPS can not switch to Bypass Operation.
<b>BYPASS FREQ. HIGH</b>	It means that bypass frequency is exceeded the upper limit which is specified in the Technical Specifications Table. In this case, UPS can not switch to Bypass Operation.
<b>AMBIENT T. HIGH</b>	The ambient temperature exceeded 40°C. In this case, UPS resumes normal operation but gives audible alarm.
<b>BATT. TEST FAILURE</b>	It means that the batteries doesn't pass the Battery Test. Some or all of the batteries failed.
<b>OVERLOAD TIME (BAT)</b>	The load percentage exceeded 100% during Battery Operation. UPS operates for 30sec. and switches off.
<b>OVERLOAD (ONLINE)</b>	The load percentage exceeded 100% during Online Operation. Please look at <a href="#">Appendix-4 Technical Specifications</a> for Overload Protection and the duration. UPS switches to Bypass Operation at the end of the specified duration.
<b>OVERLOAD</b>	UPS is overloaded during any operation mode.
<b>RECTIFIER FAULT</b>	UPS has a fault on the rectifier circuit. In this case, UPS switches to Bypass Operation if bypass line is suitable. If not, UPS cuts the output.
<b>OUTPUT VOL. LOW</b>	Output voltage is lower than the adjusted value.
<b>OUTPUT VOL. HIGH</b>	Output voltage is higher than the adjusted value.

<b>PHASE LOCKED</b>	Output voltage and input voltage is synchronized.
<b>MANUAL BYP ACTIVE</b>	It means that Manual Bypass circuit breaker is at "ON" position and the loads are supplied directly from mains. In this case, UPS does not have any control on voltage and current of the loads. UPS will supply the loads via rectifier and the inverter when Manual Bypass is brought to "OFF" position.
<b>BATT. C. LIMITED</b>	Current drawn from the battery is high. In this case, UPS will limit the current drawn from the battery.
<b>OVERLOAD (BYPASS)</b>	The load percentage exceeded 175% during Bypass/Green Operation. In this case, UPS cuts the output.
<b>OVERLOAD (BATTERY)</b>	The load percentage exceeded 100% during Battery Operation. UPS gives audible alarm to warn the user.
<b>EPO MODE ACTIVE</b>	Emergency Shutdown is occurred as described in <a href="#">Section 7.7</a> .
<b>BYPASS ACTIVE</b>	Indicates that the UPS operates in Bypass Operation.
<b>DCBUS VOLTAGE LOW</b>	Positive and/or negative DC bus voltages are under the limits.
<b>DCBUS VOLTAGE HIGH</b>	Positive and/or negative DC bus voltages are over the limits.
<b>INVERTER ACTIVE</b>	Indicates that the UPS inverter operates.
<b>REMOTE OFF ACTIVE</b>	Remote Shutdown is occurred as described in <a href="#">Section 7.8</a> .
<b>BATT. VOLTAGE LOW</b>	The battery voltage is under 71V (for 7pcs) or 102V (for 10pcs).
<b>BATT. VOLTAGE HIGH</b>	The battery voltage is over 98V (for 7pcs) or 140V (for 10pcs).
<b>BATTERY FUSE FAIL</b>	Battery circuit breaker is "OFF" or blown out.
<b>H.S. SENSOR FAIL</b>	The communication lost with the temperature sensors.
<b>FAN CURRENT FAIL</b>	Cooling fans have been failed.
<b>BYP. THYRISTOR FAIL</b>	A short circuit situation occurred on bypass thyristors. Contact to Technical Service.



## Appendix-2: Event List

V.IN LO	:	Input Voltage Low
V.IN HI	:	Input Voltage High
V.BYP.LO	:	Bypass Voltage Low
V.BYP.HI	:	Bypass Voltage High
F.BYP.LO	:	Bypass Frequency Low
F.BYP.HI	:	Bypass Frequency High
V.INV.LO	:	Inverter Voltage Low
V.INV.HI	:	Inverter Voltage High
I.INV.HI	:	Inverter Current High
V.OUT LO	:	Output Voltage Low
V.OUT HI	:	Output Voltage High
FAN ERR.	:	Fan Error
V.DC LO	:	DC BUS Voltage Low
V.DC LO2	:	DC BUS Voltage Low 2
V.DC HI	:	DC BUS Voltage High
V.DC HI2	:	DC BUS Voltage High 2
V.DC HI3	:	DC BUS Voltage High 3
V.BAT.LO	:	Battery Voltage Low
V.BAT.HI	:	Battery Voltage High
T.J.HIGH	:	Junction Temperature High
T.AMB.HI	:	Ambient Temperature High
BAT.FUSE	:	Battery Fuse Failure
T.SENSOR	:	Temperature Sensor Failure
OVERLOAD	:	Overload
RECT.	:	Rectifier Error
INV.(+)	:	Positive Side Inverter Error
INV.(-)	:	Negative Side Inverter Error
OUT SHRT	:	Output Short Circuit
M.BYPASS	:	Manual Bypass
TEMP.LO1	:	Low Temperature 1
TEMP.LO2	:	Low Temperature 2
HS.T.HI	:	Heatsink Temperature High
J.T.LOW	:	Junction Temperature Low
NO SYNC	:	Not Synchronized
COM LOST	:	Communication Lost
BAT.C.L.	:	Battery Current Limited
BY.OVER.	:	Bypass Overload
BA.OVER.	:	Battery Overload
BA.OV.TO	:	Battery Overload Time Out
ON.OVER.	:	Online Overload
BAT.FAIL	:	Battery Test Failure
EPO	:	Emergency Power Off

<b>BY.O.TO.</b>	:	Bypass overload Time Out
<b>BYP.THYR</b>	:	Bypass Thyristor Failure
<b>OR.TRIP</b>	:	OFF Reason: Trip
<b>OR.VDCL2</b>	:	OFF reason: DC BUS Voltage Low 2
<b>OR.VDCH2</b>	:	OFF Reason: DC BUS Voltage High 2
<b>OR.VDCH3</b>	:	OFF Reason: DC BUS Voltage High 3
<b>OR.C.I.H</b>	:	OFF Reason: Inverter Current High
<b>OR.TEMP</b>	:	OFF Reason: Temperature
<b>OR.OVER.</b>	:	OFF Reason: Overload
<b>OR.VO.L2</b>	:	OFF Reason: Output Voltage Low 2
<b>OR.VO.H2</b>	:	OFF Reason: Output Voltage High 2
<b>OR.VO.SC</b>	:	OFF Reason: Output Short Circuit
<b>OR.DC CL</b>	:	OFF Reason: DC Current Limit
<b>OR.BYP.O</b>	:	OFF Reason: Bypass Overload
<b>OR.BAT.O</b>	:	OFF Reason: Battery Overload
<b>OR.BAT.T</b>	:	OFF Reason: Battery Overload Time Out
<b>OR.OVER%</b>	:	OFF Reason: Overload %2
<b>OR.EPO</b>	:	OFF Reason: Emergency Power OFF
<b>OR.D.PSU</b>	:	OFF Reason: Driver Power Supply Unit Failure
<b>OR.LOW T</b>	:	OFF Reason: Low Temperature
<b>OR.REMO.</b>	:	OFF Reason: Remote OFF
<b>OR.BYP.T</b>	:	OFF Reason: Bypass Overload Time Out

### Appendix-3: Modbus List

While reading data through MODBUS, the following addresses can be used. "Read Holding Registers 4X" must be selected to read the MODBUS datas.

Reading		
Address	Data	Definition
100	Model No	
101	Production Date	
102	Stock Code	
103	Order Code	
104	Serial Number	
105	Version Number	
106	Factory Adjusted Output Voltage	
107	Factory Adjusted Output Frequency	
108	UPS Power	
109	Load CosPhi / Power Factor	
110	UPS Operation Mode	0 : ECO 1 : Inverter 2: Frequency Converter
112	Load Percentage	
113	Output Active Power (W)	Received data must be divided by 10.
114	Output Apperant Power (VA)	Received data must be divided by 10.
115	Load Power Factor	Received data must be divided by 1000.
116	Input Voltage (V)	Received data must be divided by 10.
117	Bypass Voltage (V)	Received data must be divided by 10.
118	Output Voltage (V)	Received data must be divided by 10.
119	Output Current (A)	Received data must be divided by 10.
120	Positive Battery Voltage (V)	Received data must be divided by 10.
121	Negative Battery Voltage (V)	Received data must be divided by 10.
122	Positive DC Bus Voltage (V)	Received data must be divided by 10.
123	Negative DC Bus Voltage (V)	Received data must be divided by 10.
124	Ambient Temperature (°C)	Received data must be divided by 10.
125	Bypass Frequency (Hz)	Received data must be divided by 10.
126	Output Frequency (Hz)	Received data must be divided by 10.

Also we can use address 127 to get the UPS status. A decimal value will be received from address 127. If that value is converted to binary number, the UPS status can be read.

15.bite	Phase Locked	Output voltage is synchronized to bypass voltage
14.bite	VIN OK	Input voltage is within the limits
13.bite	VBYP OK	Bypass voltage is within the limits
12.bite	FBYP OK	Bypass frequency is within the limits
11.bite	VOUT OK	Output voltage is normal
10.bite	VBAT OK	Battery voltage is normal
9.bite	Temperature OK	Ambient temperature is normal
8.bite	EPO Active	EPO is activated
7.bite	Utility Fail	Utility voltage is failed
6.bite	Bypass	Load is on bypass
5.bite	Manual Bypass	Manual Bypass Breaker is "ON"
4.bite	Battery Low	Battery voltage is low
3.bite	Battery Abnormal	Battery problem
2.bite	Test in Progress	Battery test is in progress
1.bite	Shutdown Active	Shutdown is activated
0.bite	Beeper On	

**Example:** Let's receive 28673 (DEC) from address 127. If that value is converted to binary number, 111000000000001 will be obtained. Then the following status can be read from that number:

Phase Locked  
VIN OK  
VBYP OK  
Beeper ON

We can send commands by using MODBUS. To do that function 6x must be used. Following addresses can be used as commands:

111	Beeper	If "1" is sent then beeper will be on. If "0" is sent then beeper will be off.
128	Bat_test	If "1" is sent then a battery test will start.

## Appendix-4: Technical Specifications

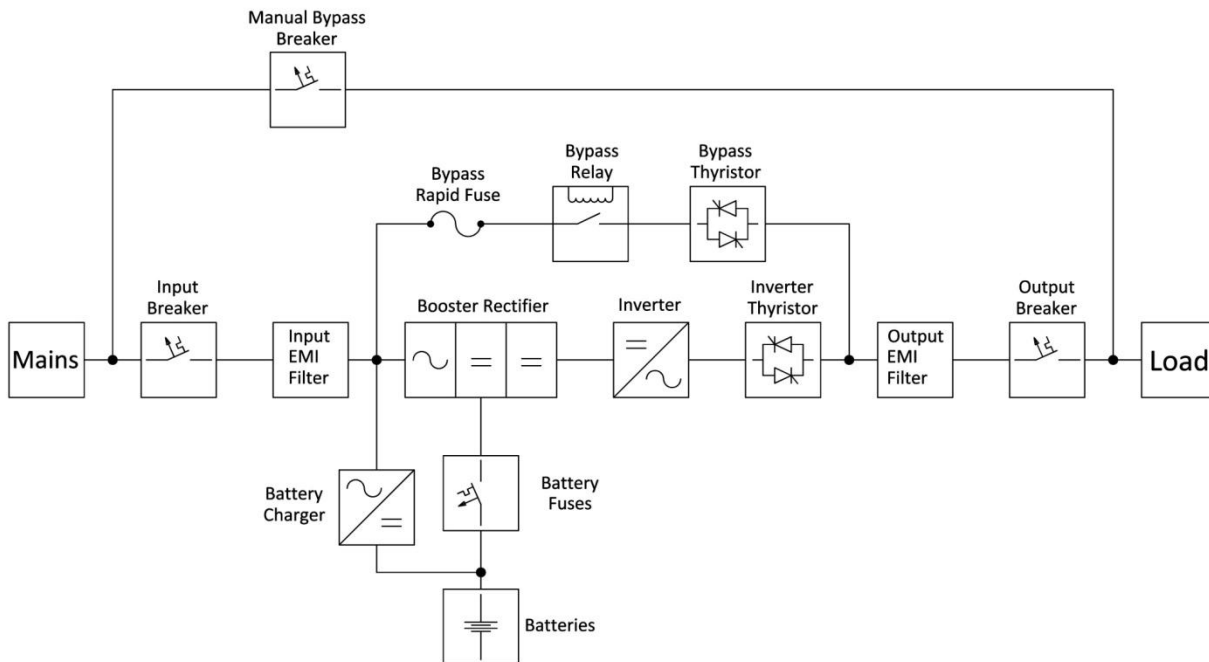
Tower Model (1Ph/1Ph)	GTR1103	GTR1105	GTR1106	GTR1108	GTR1110
Output Power (kVA)	3000	5000	6000	8000	10000
Nominal Active Power (kW)	2700	4500	5400	7200	9000
INPUT					
Input Voltage Tolerance (V) (at 50% Load)	90 - 270				
Input Voltage Tolerance (V) (at 100% Load)	180 - 270				
Frequency (Hz)	45 - 65				
Power Factor	> 0.99				
OUTPUT					
Nominal Voltage (V)	220V [208 - 242 (Adjustable)]				
Power Factor	0.9				
Wave Form	Sinus				
Frequency (Hz)	50 or 60 (Adjustable)				
Frequency Tolerance (Battery Operation)	0,005%				
Voltage Regulation (Static)	±1%				
Crest Factor	3:1				
Nominal Power (VA)	3000	5000	6000	8000	10000
Overload Protection (sec)	> 600 (at 125% Load) > 60 (at 125% Load)				
Toltal Efficiency*	≥ 94% (Green Mode Operation > 98%)				
THD <sub>v</sub>	Non-Linear Load < 3.5% Linear Load < 1.5%				
BATTERY					
Battery Type	Mainstenance-Free Lead Acid Batteries				
Battery Quantity (Pcs)	14	20	20	20	20
BYPASS					
Voltage Tolerance	10% (Customizable)				
Frequency Tolerance (Hz)	±0.5 - 5 (Adjustable)				
Transfer Time (sec)	0				
PROTECTION					
	Overload Protection, High Temperature, Over Voltage, Over Current, Back Feed Protection, Battery Deep Discharge Protection, Short-Circuit Protection				
COMMUNICATION**					
RS232, EPO, (standard), USB Converter, Modbus, SNMP, Programmable Free Contacts (optional )					
ENVIRONMENT					
Operating Temperature Range (°C)	0 - 40				
Battery Temperature Range (°C)	20 - 25 (Recommended For Longer Battery Life)				
Maximum Altitude without Derating (m)	1000				
Relative Humudity Range	20-95% (Non-Condensing)				
Acoustic Noise (dBA)	< 50 (at 1m)				
STANDARDS					
Safety	IEC/EN 60950,62040-1				
EMC	IEC/EN 62040-2				
Performance	IEC/EN 62040-3				
Protection Class	IP 20				

\* Varies depending on UPS power.

\*\* Please contact with your local authorized distributor.

\*\*\* The manufacturer reserves the rights to change the technical specifications and design without notice.

## Appendix-5: Description of UPS and Block Diagram



**Input & Output EMI Filter:** These filters (EMI – Electro Magnetic Interference) prevent electromagnetic interference between the mains and the load. Additionally, protect UPS and loads from any surge.

**Bypass Thyristor:** In case any inverter fault occurs; Bypass thyristor transfers the energy electronically from input to output without any cut at the output.

**Bypass Relay:** If any Bypass thyristor short-circuit occurs; this relay gets open-circuit and prevents current flow from output to input.

**Battery Charger:** The charger charges the batteries

**Booster Rectifier:** On mains operation, the boost rectifier adjusts the mains voltage to the necessary DC voltage level required for the inverter and helps to provide sinus current with a power factor near to 1 from the mains.

On battery mode it increases the battery voltage level, required for the inverter and uses current from the battery with a low ripple ratio thus extending the battery life.

**Inverter:** The inverter helps to obtain a very constant AC voltage level at the output by using DC voltage at the rectifier's output.

**Inverter Thyristor:** This helps to separate inverter from the output electronically in case of by pass mode operation or UPS output off conditions.

**Battery Thyristor:** This helps to separate battery from the boost rectifier electronically.

**Battery:** The necessary energy is supplied from the batteries when the mains is not available.

**Manual Bypass Breaker:** This is an automatic breaker which connects the output of the UPS to the Bypass input. It is used mainly for maintenance purposes on the UPS without deenergizing the load and supplying by the mains.