Liebert® MTP Online UPS

User Manual

20kVA/40kVA/80kVA

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Technical Support Site

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures.

Visit https://www.vertiv.com/en-us/support/ for additional assistance.

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1 Important Safety Instructions

WARNING! Risk of electric shock. Can cause serious injury or death. Lethal voltages are present in this UPS. All the repairs and services must be performed by authorized and qualified service personnel only. In the UPS, there are no user serviceable parts.

- This UPS is designed for commercial and industrial purpose, and it is not permitted to be used for any life sustainment and support.
- The UPS system contains its own energy source. The output terminals may contain live voltage even when UPS is disconnected from an AC source.
- The UPS must be installed in a controlled room with temperature and humidity monitoring to reduce the risk of fire or electrical shock. Ambient temperature must not exceed 40°C. The system is only for indoor use.
- Ensure that all power is disconnected before installation or service.
- Service and maintenance should be performed by authorized and qualified service personnel only.

WARNING! Risk of voltage back feed. Before working on this circuit, isolate uninterruptible power supply (UPS) then check for hazardous voltage between all terminals including the protective earth.

When service and maintenance want to check the inside of the UPS, should follow.

1.1 EMC

CAUTION: This product is designed for commercial and industrial applications in the second environment. Installation restrictions or additional measures may be required to prevent disturbances.

1.2 Installation

- Installation must be performed by authorized and qualified service personnel only.
- The cabinets must be installed on a level floor that can accommodate computer or electronic equipment.
- The UPS cabinet is heavy and can cause serious injury if the unloading instructions are not followed carefully.
- The cabinets should not be tilted more than 10 degrees.
- Ensure the ground conductor is properly installed according to the instructions before switching ON the UPS.
- Installation and wiring must be performed in accordance with the local electrical laws and regulations.

IMPORTANT! The disconnection device must be selected based on the input current and should be capable of breaking both line and neutral conductors—4 poles for 3 phases.

NOTE: For the rated input and output current, refer the Table 2.2 on page 13 .

- The short circuit capacity of the upstream protective devices must be equal to or larger than the capacity of the UPS's input protective devices.
- The battery disconnection device should be chosen based on the DC input current and should break Battery +, Battery and neutral conductors three poles for three phases.

Table 1.1 Power Rating and Rated Battery Discharge Current (A)

Power rating	20kVA	40kVA	80kVA
Rated Battery Discharge Current (A)	62	124	247

For safety, it is necessary to install circuit breakers or fused isolators in the input AC supply and external battery system. Given that every installation has its own characteristics, this section provides guidelines for qualified installation personnel with knowledge of operating practices, regulatory standards and the equipment to be installed. External overcurrent protection must be provided. See equipment specification in the UPS manual for overload capacity.

An external battery protection device shall be installed to ensure adequate protection in case of short circuit fault: fuses or circuit breakers suitable for DC applications. The external battery protection device shall be sized in accordance to the available battery short circuit current and the battery string voltage.

WARNING! In case of missing or incorrect battery protection extensive damage to the batteries, the UPS, and ancillary equipment can occur.

1.3 Maintenance

- Battery installation must be performed by authorized and qualified service personnel only. While performing the battery installation, follow the below precautions:
  - Remove watches, rings, or other metal objects.
  - Use tools with insulated handles.
  - Wear rubber gloves and boots.
  - Do not lay tools or metal parts on top of batteries or battery cabinets.
  - Disconnect the charging source prior to connecting or disconnecting terminal.
  - Check the battery has been accidentally grounded. Remove the source of grounding if this is the case. Contacting with any part of the ground might result in electrical shock. If such grounds are removed during installation and maintenance, the risk of electric shock can be reduced.
- This UPS is designed to supply power even when it is disconnected from the utility power. Internal access to the UPS should be attempted by authorized and qualified service personnel only after disconnecting the utility and DC power.
- Do not disconnect the batteries while the UPS is in battery mode.
- Before connecting or disconnecting the terminals, disconnect the charging source.
- High short circuit current in batteries can cause electrical shock or burn.
- When replacing batteries, use the same number of sealed, lead acid batteries.
- Do not open or mutilate the battery. The electrolyte that is released might be toxic and potentially hazardous and is harmful for the skin and eyes.

WARNING! Risk of electrical shock and hazardous voltage. Can cause damage to the equipment, injury or death to personnel. Extreme caution is required when performing maintenance/repair. Be constantly aware that the UPS system operates with hazardous voltages.

CAUTION: Risk of hazardous voltage. Can cause equipment damage, injury or death to personnel. Extreme precaution is required when working with the UPS system as it is connected to the neutral main connector even after the UPS system input breakers are disconnected.
System doesn't have any breaker or switch on neutral terminal.

WARNING! Risk of electric shock and hazardous voltage. Can cause equipment damage, injury or death to personnel. Disconnect the neutral bar, before conducting any kind of service or maintenance and verify that no voltage between terminals and the ground is present.

WARNING! Risk of electric shock and hazardous voltage. Can cause equipment damage, injury or death to personnel. Servicing of UPS should be performed or supervised by personnel experienced with the UPS and with the required precautions. Keep unauthorized personnel away.

WARNING! Risk of electric shock and high short-circuit current. It can cause damage to the property and injury or death to personnel. Remove wristwatches, rings, and other metal objects before installation and maintenance or repair. Use tools with insulated handles. Wear rubber gloves and boots during installation and maintenance or repair.

CAUTION: Risk of fire and damage to the equipment. Replace the fuse only if it is the same type and amperage.

NOTE: Do not disassemble the UPS system.

1.4 Recycling the Used Battery

- Do not dispose of the battery in a fire as it may explode. The battery must be disposed of properly. Refer to the local codes for battery disposal.
- Do not open or mutilate the battery. The electrolyte that is released might be toxic and potentially hazardous and is harmful for the skin and eyes.
- Do not discard the UPS or the UPS batteries in the trash. This product contains sealed, lead acid batteries and must be disposed properly. Contact your local recycling/reuse or hazardous waste center for proper disposal.
- Do not discard waste electrical or electronic equipment in the trash. Contact your local recycling/reuse or hazardous waste center for proper disposal.

CAUTION: Risk of explosion. May cause injury or death if the battery is replaced by an incorrect type. Dispose of the used batteries according to the instructions. Refer to the local codes for battery disposal.

1.5 Connection Warnings

There is no standard back feed protection inside of the UPS. However, there are relays on the Input to cut off line voltage and while the neutral is still connected to UPS.

Figure 1.1 Input Relay Diagram

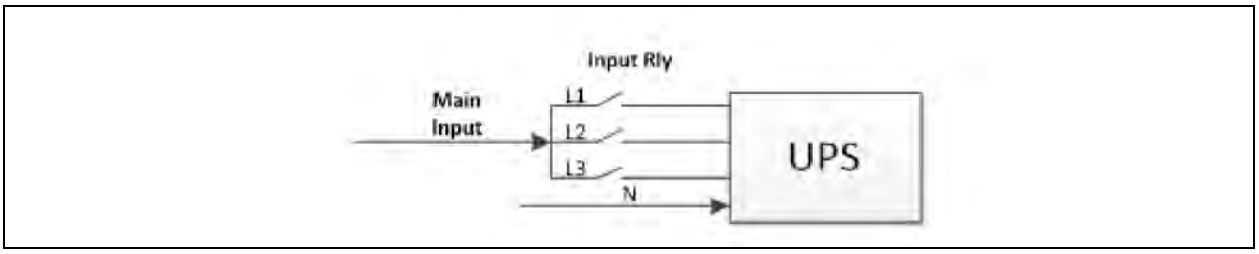
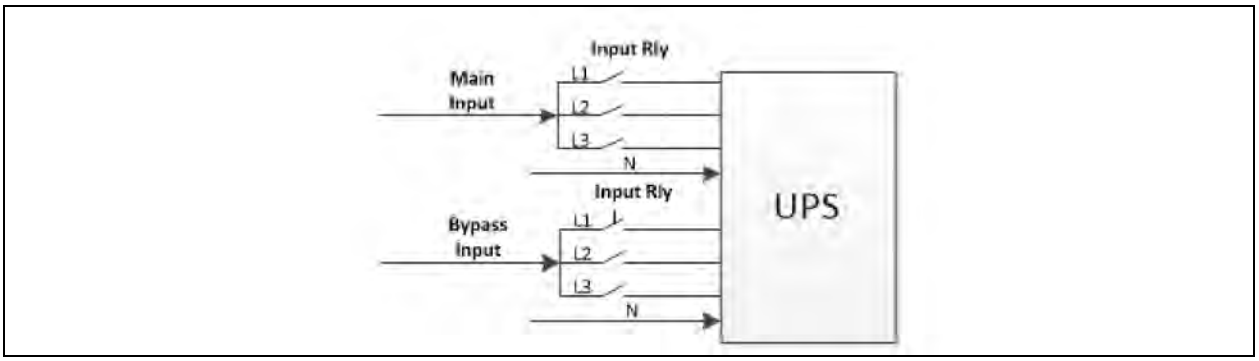


Figure 1.2 Input Relay Diagram for Dual-input Mode



This UPS should be connected with TN grounding/earthing system.

The power input for this unit must be three-phase rated in accordance with the equipment nameplate. It also must be suitably grounded.

Use of this equipment in medical instrument of any life sustaining equipment where failure of this equipment can reasonably be expected to cause the failure of the life sustaining equipment or to significantly affect its safety or effectiveness is not recommended. Do not use this equipment in the presence of a flammable mixture with air, oxygen, or nitrous oxide.

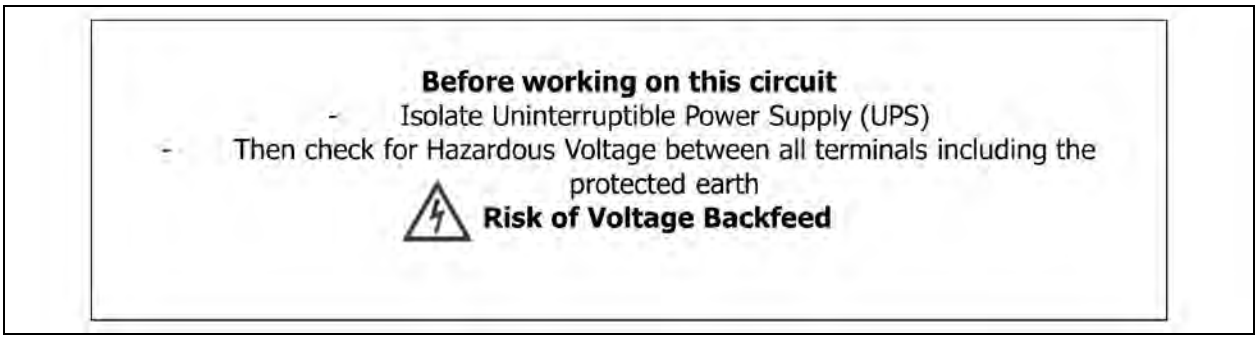
Connect grounding terminal of UPS to a grounding electrode conductor.

In accordance with safety standard EN-IEC 62040-1, installation has to be provided with a back feed protection system, as for example a contactor, which will prevent the appearance of voltage or dangerous energy in the input mains during a mains fault (respect the wiring diagram of back feed protection depending if the equipment is with single or three-phase input).

NOTE: There can be no derivation in the line that goes from the back feed protection to the UPS, as the standard safety would be infringed.

Warning labels should be placed on all primary power switches installed in places away from the unit to alert the electrical maintenance personnel of the presence of a UPS in the circuit. The label will bear the following or an equivalent text:

Figure 1.3 Warning Label



Back feed protection can also be implemented by means of coil-based system controlled by UPS itself through output dry contact triggered in case of back feed. Output dry contacts are configurable.

WARNING! High earth leakage current: Earth connection is critical before connecting the input supply (including both mains supply and battery). This equipment is installed with an EMC filter. Earth leakage current is less than 3000 mA. Transient and steady state earth leakage currents, which m ay occur when the equipment is started, should be taken in to account in the selection of instantaneous RCCBs or RCD devices. RCCB which is sensitive to unidirectional DC pulse (class A) and insensitive to transient state current pulse must be selected. Note also that the earth leakage currents of the load will be carried by the RCCBs or RCDs. The equipment must be earthed in accordance with the local electrical code of practice.

WARNING! The selection of the upstream distribution protection equipment of the UPS shall be selected in accordance with the details and shall comply with the local electrical regulations.

WARNING! Back feeding protection
This UPS is fitted with a dry contact closure signal for use with an external automatic disconnect device (supplied by others) to protect against back feeding voltage into the incoming terminal through the rectifier or bypass static switch circuit. A label must be added at all external incoming primary supply disconnect device to warn service personnel that the circuit is connected to a UPS. The text of the label has the following meaning: Risk of voltage back feed! Isolate the UPS, then check for hazardous voltage between all terminals including the protective earth before working on this circuit.

1.6 Operation

NOTE: Do not disconnect the grounding/earthing conductor cable on the UPS or the building wiring terminals under any circumstance.

NOTE: The UPS system features its own, internal current source (batteries). The UPS output sockets or output terminal blocks may be electrically live even if the UPS system is not connected to the building mains/live wires. (only for standard models)

NOTE: Press the “OFF” button and then disconnect the mains/live wires to fully disconnect the UPS system.

CAUTION: Risk of equipment damage. Ensure that no liquid or other foreign objects can enter into the UPS system.

NOTE: Any person, with no prior experience can operate the UPS.

1.7 Standards

* Safety	
IEC/EN 62040-1	
* EMI	
Conducted Emission.....: IEC/EN 62040-2	Category C3
Radiated Emission.....: IEC/EN 62040-2	Category C3
*EMS	
ESD.....: IEC/EN 61000-4-2	CD Level 2 AD Level 3
RS.....: IEC/EN 61000-4-3	Level 3
EFT.....: IEC/EN 61000-4-4	Level 3
SURGE.....: IEC/EN 61000-4-5	Level 3
CS.....: IEC/EN 61000-4-6	Level 3
Power-frequency Magnetic field.....: IEC/EN 61000-4-8	Level 4
Low Frequency Signals.....: IEC/EN 61000-2-2	
WARNING! This is a product for commercial and industrial application in the second environment installation restrictions or additional measures may be needed to prevent disturbances.	

2 Installation and Operation

2.1 Unpacking and Inspection

Unpack the package and check the package contents. The shipping package should contain:

- One UPS
- One user manual
- One monitoring software CD
- One RS-232 cable
- One USB cable
- One parallel cable (only available for parallel model) (option)
- One shared current cable (only available for parallel model) (option)

NOTE: Before the installation, inspect the unit. Make sure that there is no physical damage to the unit. Do not turn on the unit and notify the carrier and dealer immediately if there is any damage or missing parts and accessories. Keep the original packaging for future use. It is recommended to keep each equipment and battery set in their original packaging because they have been designed to provide maximum protection during transportation and storage.

1. Use a forklift to move the product to the installed area. See Figure 2.1 below . Make sure the bearing capacity of the forklift is sufficient.
2. See Figure 2.2 on the next page to remove carton and foams.

Figure 2.1 Moving of the Unit to the Installed Area

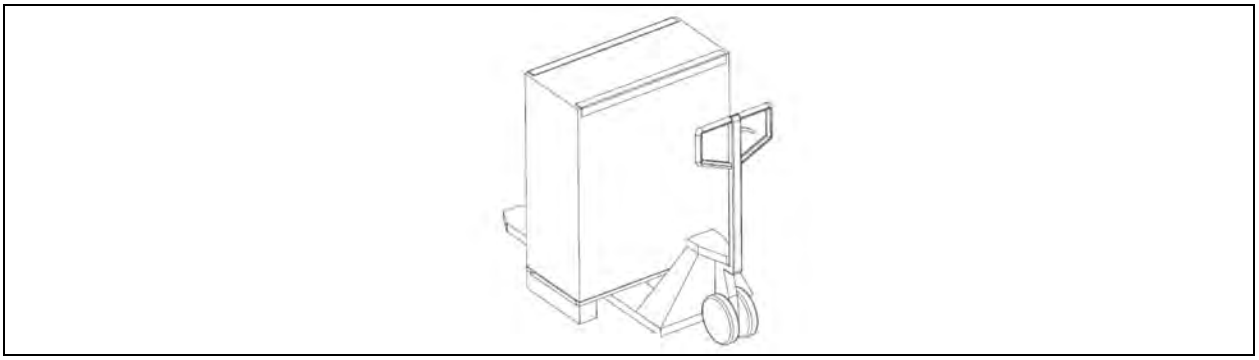
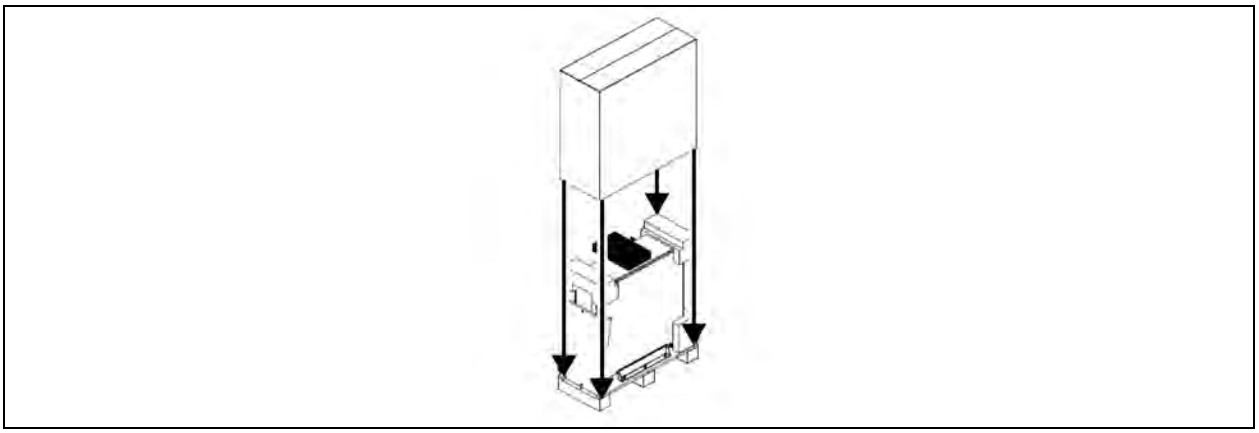
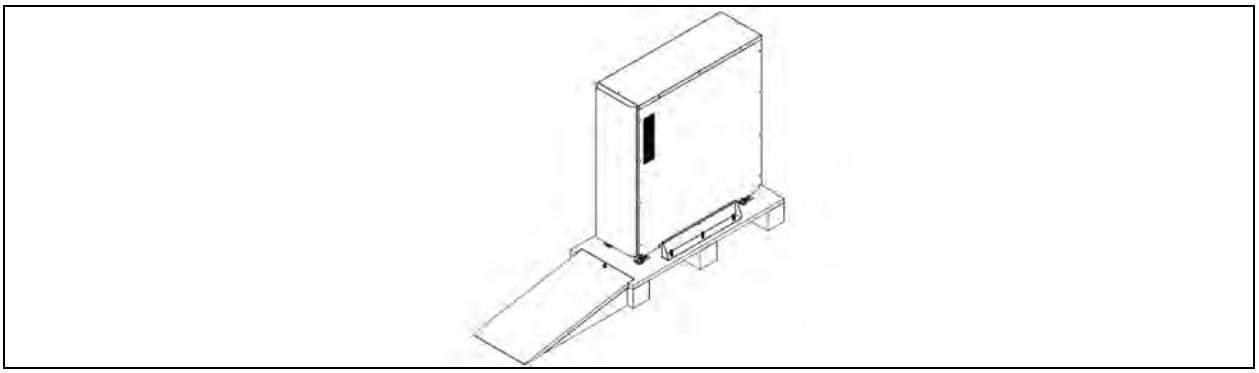


Figure 2.2 Removal of the Carton and foams



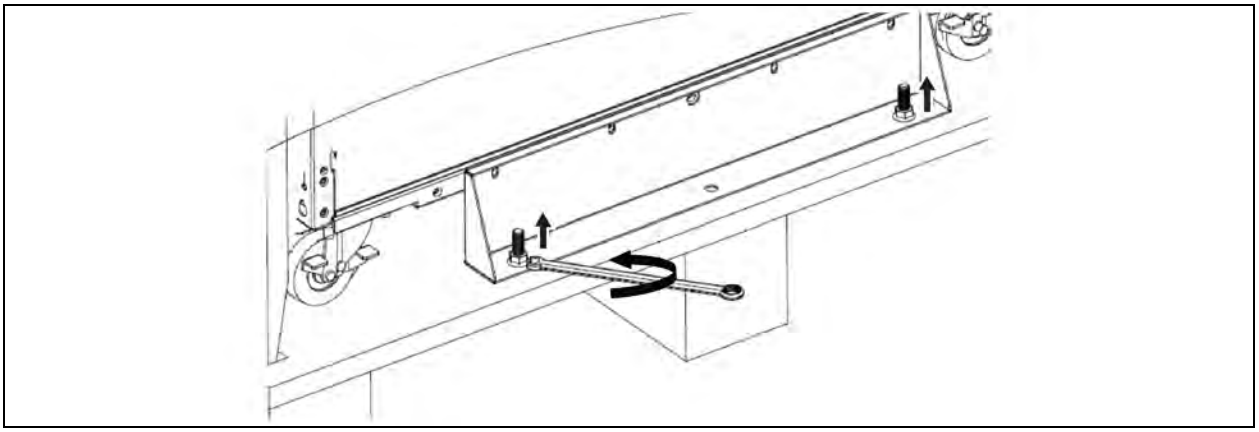
3. Put a ramp in front of the cabinet. See Figure 2.3 below .

Figure 2.3 Placement of Ramp



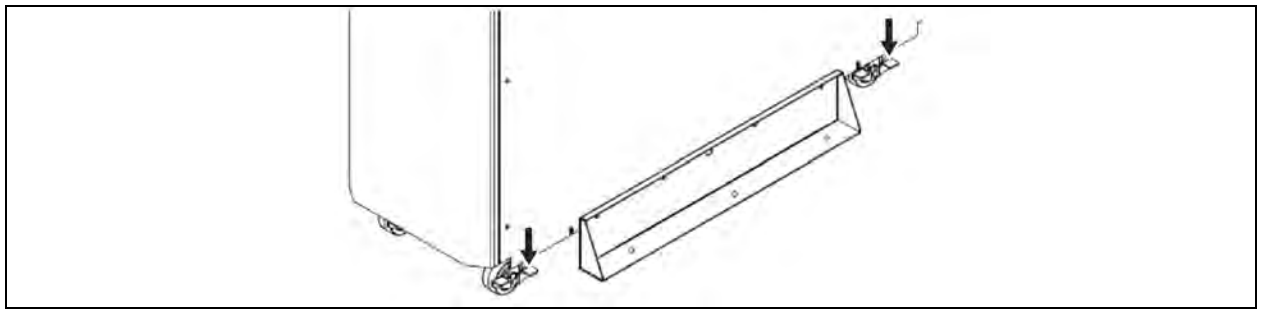
4. Remove two fixing cabinet plates and move the cabinet from the pallet. See Figure 2.4 below .

Figure 2.4 Removal of Two Fixing Cabinet Plates



5. To fix the cabinet in position, step on the roller brake and fix the cabinet board to fix the cabinet in place. See Figure 2.5 on the facing page .

Figure 2.5 Fixing of The Cabinet



2.2 Wiring Terminal View

Figure 2.6 HV 20kVA Rear Panel

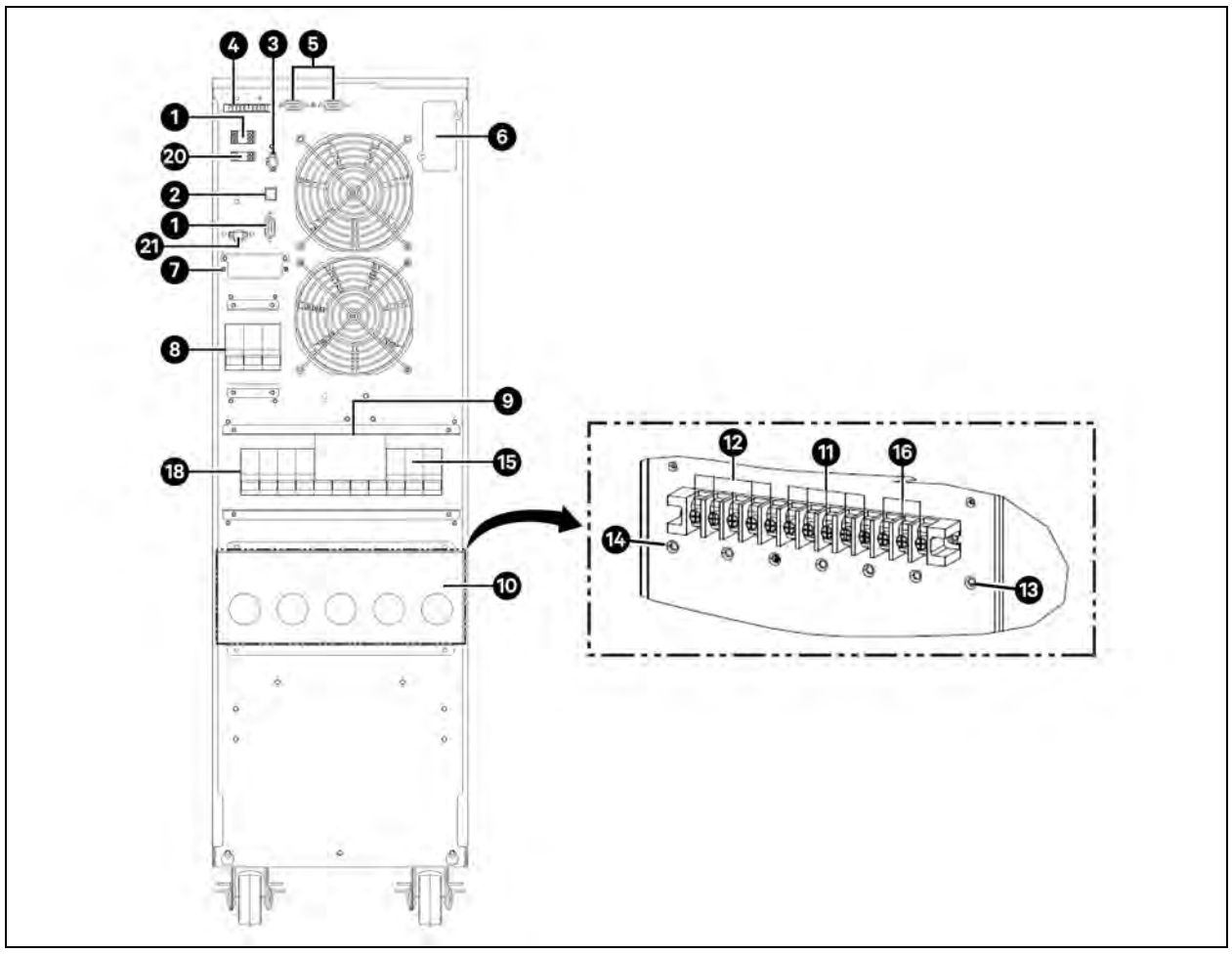


Figure 2.7 HV 40kVA Rear Panel

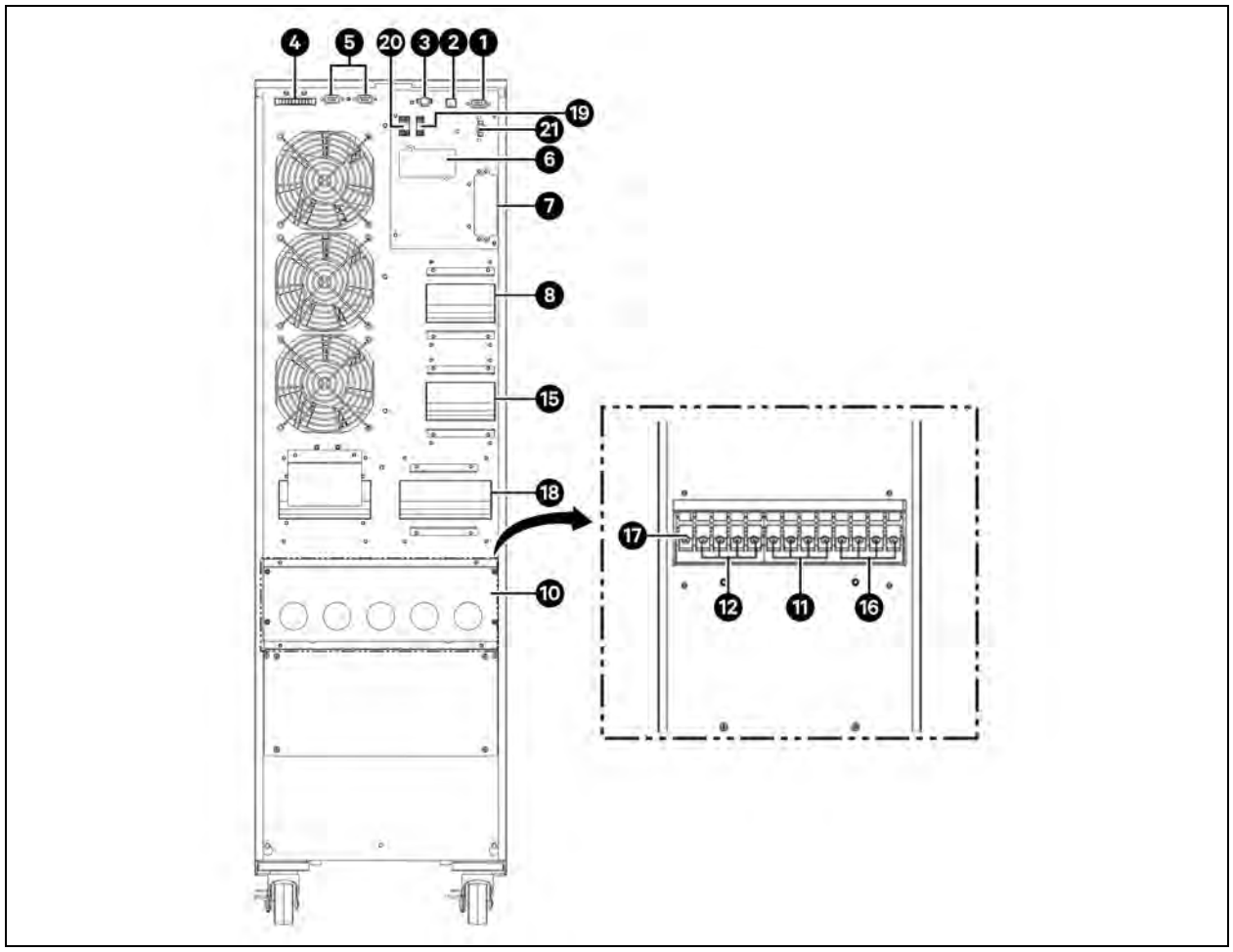
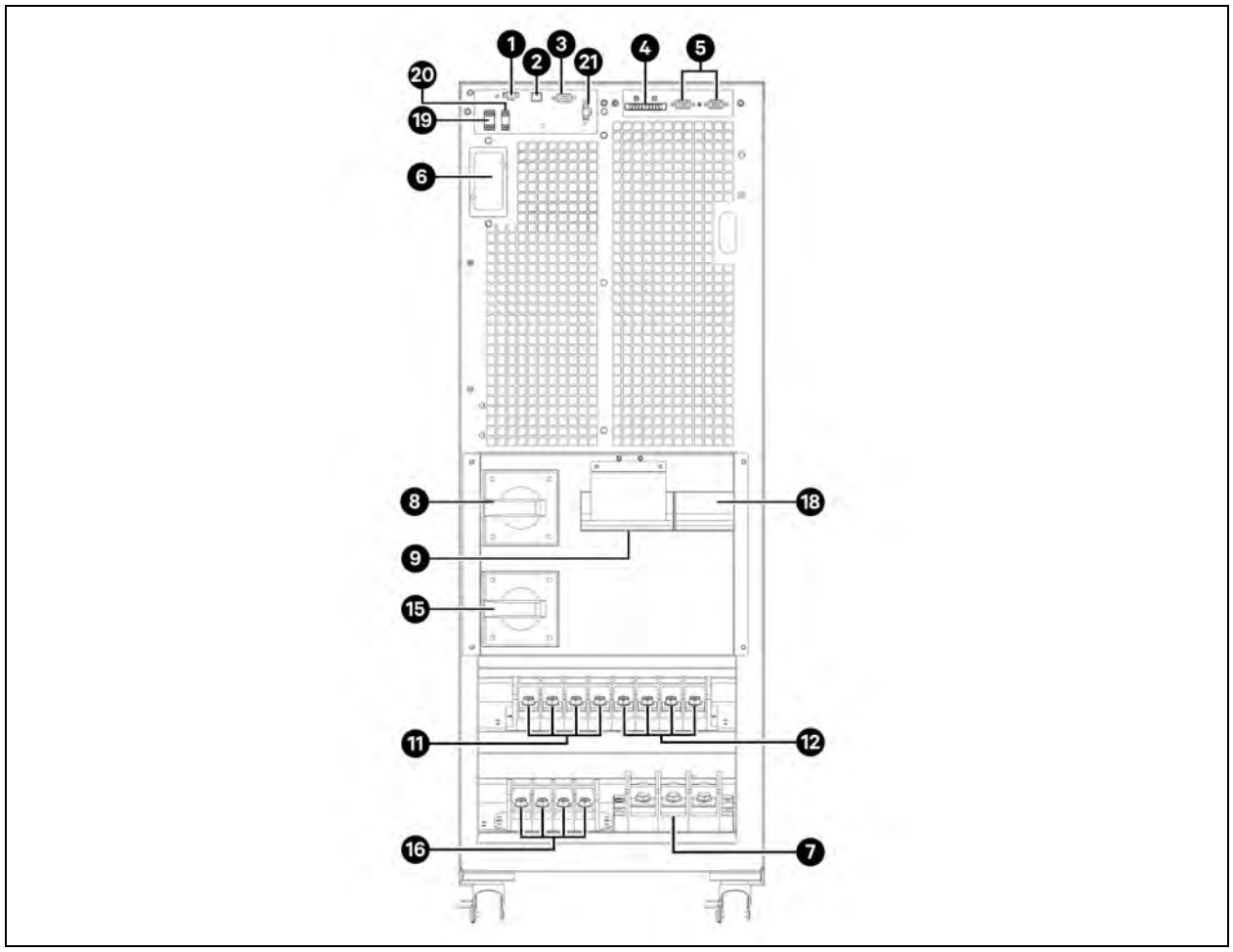


Figure 2.8 HV 80kVA DUAL Front View with Door Open



Item	Description
1	RS-232 communication port
2	USB communication port
3	Emergency power off function connector (EPO connector)
4	Share current port (only available for parallel model)
5	Parallel port (only available for parallel model)
6	Intelligent slot
7	External battery connector/terminal
8	Line input circuit breaker/switch
9	Maintenance bypass switch
10	Input/Output terminal
11	Line input terminal

Item	Description
12	Output terminal
13	Input grounding terminal
14	Output grounding terminal
15	Bypass input circuit breaker/switch
16	Bypass input terminal
17	Grounding terminal
18	Output switch
19	Output dry contact port
20	Input dry contact port
21	Battery temperature detection connection
NOTE: Item and description is same for HV 20kVA Rear Panel , HV 40kVA Rear Panel, and HV 80kVA Front View with Door Open.	

2.3 Single UPS Installation

Installation and wiring must be conducted in accordance with the local electric laws and regulations by trained professionals.

1. Make sure that the mains wire and breakers of the building are rated for the capacity of the UPS to prevent electric shock or risk of fire.

NOTE: Do not use the wall receptacle as the input power source for the UPS, as its rated current is less than the UPS's maximum input current. The receptacle may be damaged and destroyed.

2. Switch off the mains switch in the building before installation.
3. Turn off all the connected devices before connecting to the UPS.
4. Prepare wires based on the Table 2.2 on the facing page .

NOTE: Input/output breakers must be designed according to maximum UPS current values.

NOTE: In case external batteries are installed, a suitable protection should be installed according to Table 2.2 on the facing page .

Table 2.1 Cable Size (AWG) and Terminal Block Torque (N/M)

Model	Cable size (AWG)					Terminal Block Torque (N/m)		
	Input (Ph)	Output (Ph)/ Bypass (Ph)	Neutral	Battery	Ground	Input		
10K (3-In 3-Out)	14	14	10	8	8	2	2	-
10K (3-In 1-Out)	14	8	8	8	8	2	2	-
15K (3-In 3-Out)	12	12	10	8	8	2	2	-

Table 2.1 Cable Size (AWG) and Terminal Block Torque (N/M) (continued)

Model	Cable size (AWG)					Terminal Block Torque (N/m)		
	Input (Ph)	Output (Ph)/ Bypass (Ph)	Neutral	Battery	Ground	Input		
15K (3-In 1-Out)	12	6	6	8	8	2	2	-
20K (3-In 3-Out)	10	10	6	6	6	2	2	-
20K (3-In 1-Out)	10	4	4	6	6	2	2	-
30K (3-In 3-Out)	8	8	4	4	4	3	3	-
40K (3-In 3-Out)	6	6	4	4	4	3	3	-
80K (3-In 3-Out)	2	2	1/0	1/0	2	4.5	4.5	5

Table 2.2 Maximum Current Values

UPS Power (kVA)	PF	Input voltage (V)	Output Voltage (V)	Battery Number (+ and -)	Charge current (Max) (A)	Input Current (A)	Output Current (A)	Max Battery Discharge current with 32 blocks per string (A)
10 (3-In 3-Out)	1,0	220	220	16	12	25	15	33
10 (3-In 1-Out)	1,0	220	220	16	12	25	46	33
10 (3-In 3-Out)	1,0	230	230	16	12	24	14	33
10 (3-In 1-Out)	1,0	230	230	16	12	24	44	33
10 (3-In 3-Out)	1,0	240	240	16	12	23	14	33
10 (3-In 1-Out)	1,0	240	240	16	12	23	42	33
15 (3-In 3-Out)	1,0	220	220	16	12	33	23	46
15 (3-In 1-Out)	1,0	220	220	16	12	33	69	46
15	1,0	230	230	16	12	31	22	46

Table 2.2 Maximum Current Values (continued)

UPS Power (kVA)	PF	Input voltage (V)	Output Voltage (V)	Battery Number (+ and -)	Charge current (Max) (A)	Input Current (A)	Output Current (A)	Max Battery Discharge current with 32 blocks per string (A)
(3-In 3-Out)								
15 (3-In 1-Out)	1,0	230	230	16	12	31	66	46
15 (3-In 3-Out)	1,0	240	240	16	12	30	21	46
15 (3-In 1-Out)	1,0	240	240	16	12	30	63	46
20 (3-In 3-Out)	1,0	220	220	16	12	41	30	62
20 (3-In 1-Out)	1,0	220	220	16	12	41	91	62
20 (3-In 3-Out)	1,0	230	230	16	12	39	29	62
20 (3-In 1-Out)	1,0	230	230	16	12	39	87	62
20 (3-In 3-Out)	1,0	240	240	16	12	37	28	62
20 (3-In 1-Out)	1,0	240	240	16	12	37	84	62
30 (3-In 3-Out)	1,0	220	220	16	16	59	45	93
30 (3-In 3-Out)	1,0	230	230	16	16	57	43	93
30 (3-In 3-Out)	1,0	240	240	16	16	54	42	93
40 (3-In 3-Out)	1,0	220	220	16	16	75	61	124
40 (3-In 3-Out)	1,0	230	230	16	16	72	58	124
40 (3-In 3-Out)	1,0	240	240	16	16	69	56	124

Table 2.2 Maximum Current Values (continued)

UPS Power (kVA)	PF	Input voltage (V)	Output Voltage (V)	Battery Number (+ and -)	Charge current (Max) (A)	Input Current (A)	Output Current (A)	Max Battery Discharge current with 32 blocks per string (A)
80 (3-In 3-Out)	1,0	220	220	16	24	145	121	247
80 (3-In 3-Out)	1,0	230	230	16	24	139	116	247
80 (3-In 3-Out)	1,0	240	240	16	24	133	111	247

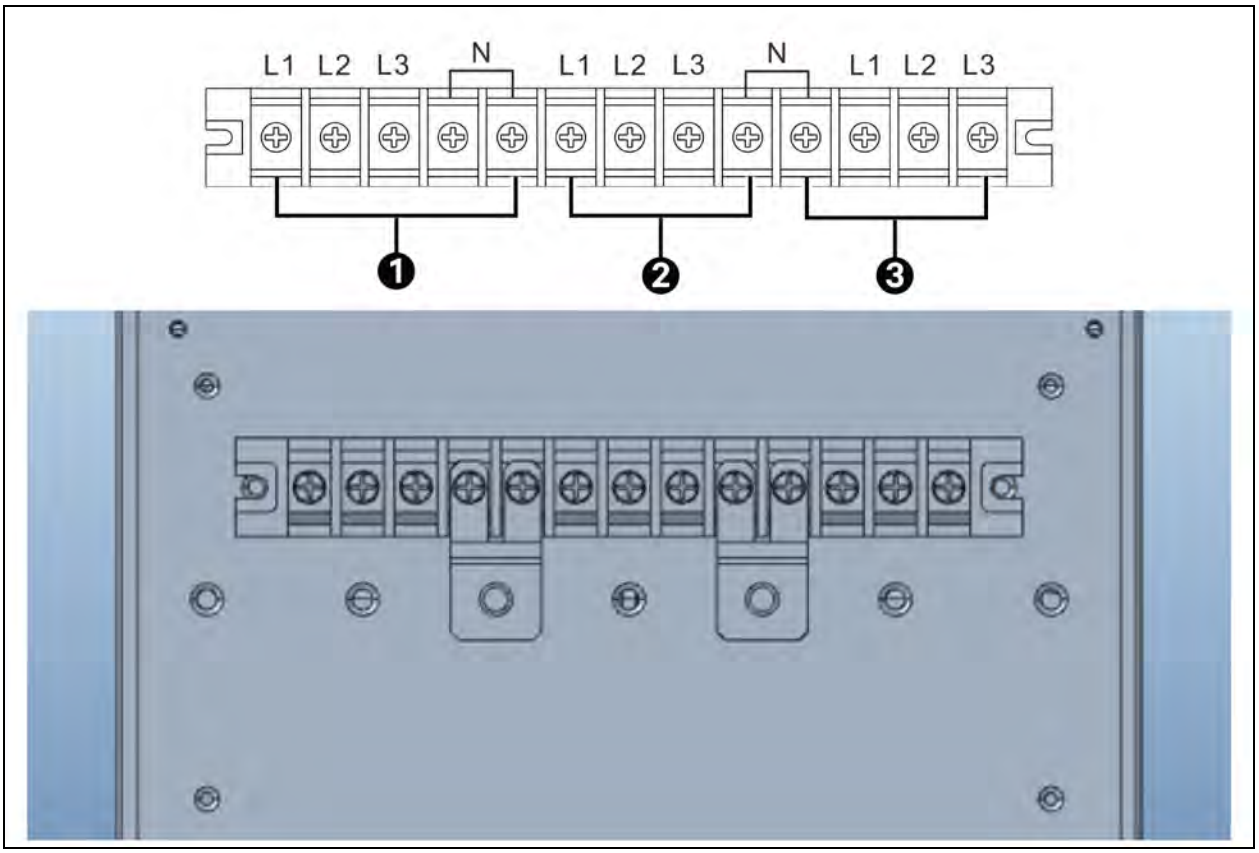
NOTE: The local electrical laws and regulations should be followed for the selection of the color of wires.

5. Remove the terminal block cover at the rear panel of UPS and connect the wires according to the following terminal block diagrams.

WARNING! Risk of electric shock. Can cause injury and death. Connect the grounding/earthing wire first when making other wire connections. Remove the grounding/earthing wire last when disconnecting the UPS.

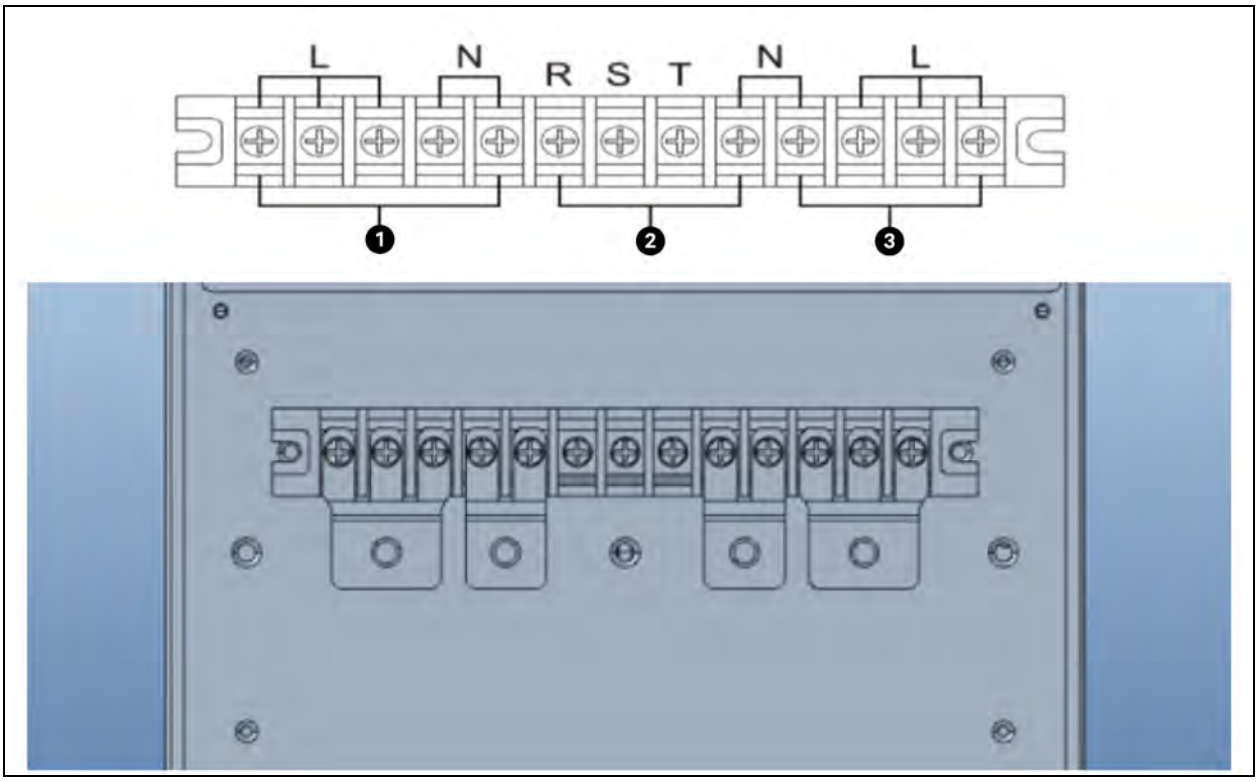
NOTE: For dual input model with single input power system, connect input terminals to the AC power source and connect input and bypass input together (shows dashed line in below wiring diagrams).

Figure 2.9 Terminal Block Wiring Diagram and Schematic Diagram of HV 10/15/20kVA with 3-In 3-Out configuration



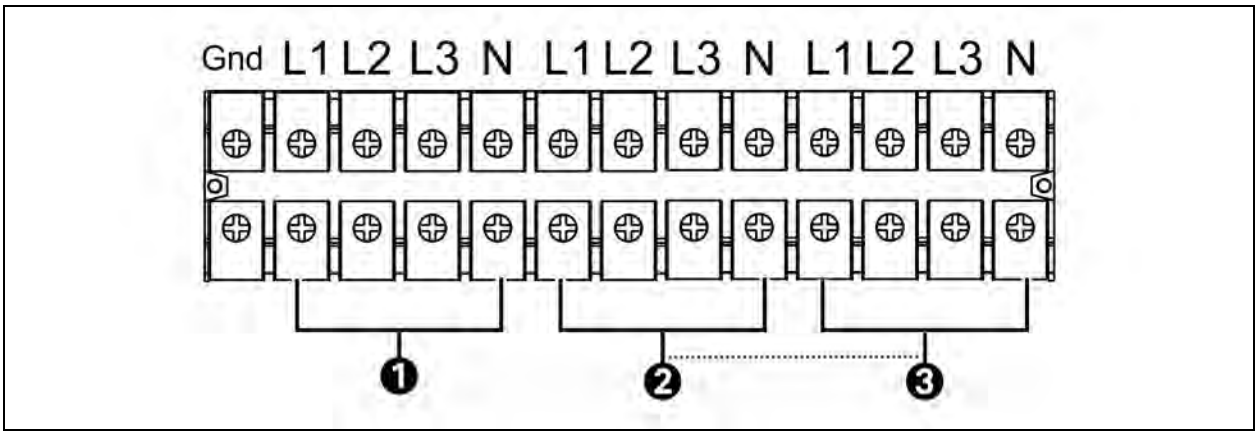
Item	Description
1	Output
2	Input
3	Bypass Input

Figure 2.10 Terminal Block Wiring Diagram and Schematic Diagram of HV 10/15/20kVA with 3-In 1-Out configuration



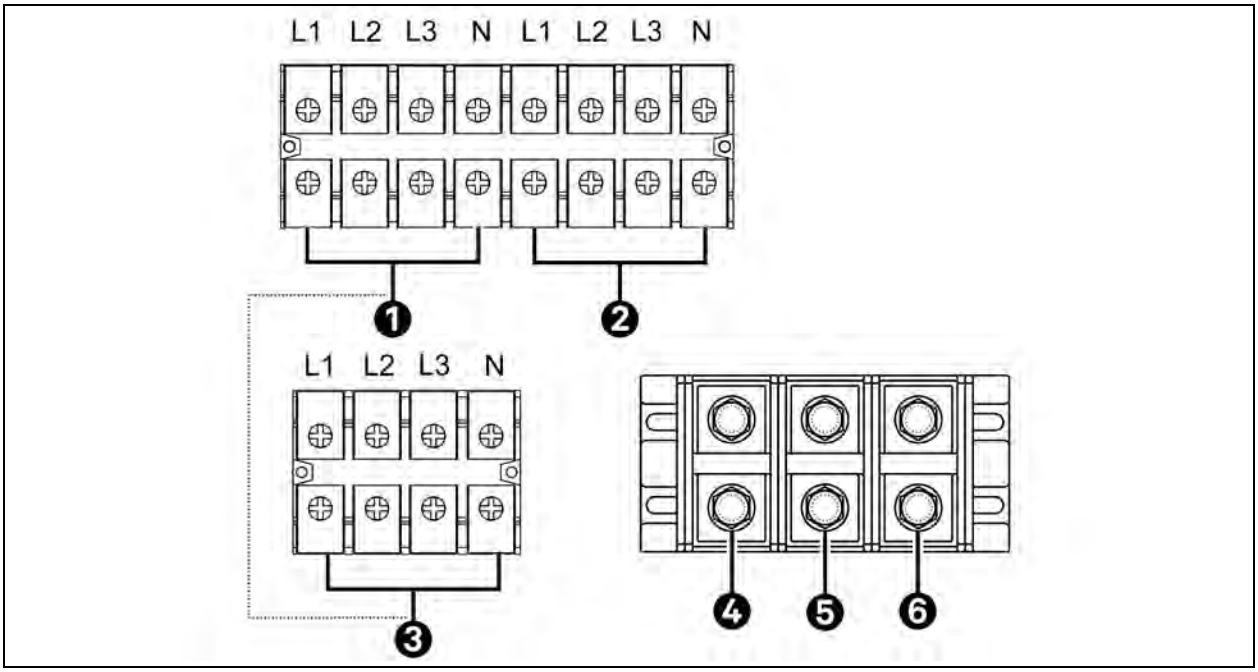
Item	Description
1	Output
2	Input
3	Bypass Input

Figure 2.11 Terminal Block Wiring Diagram for HV 40/30kVA



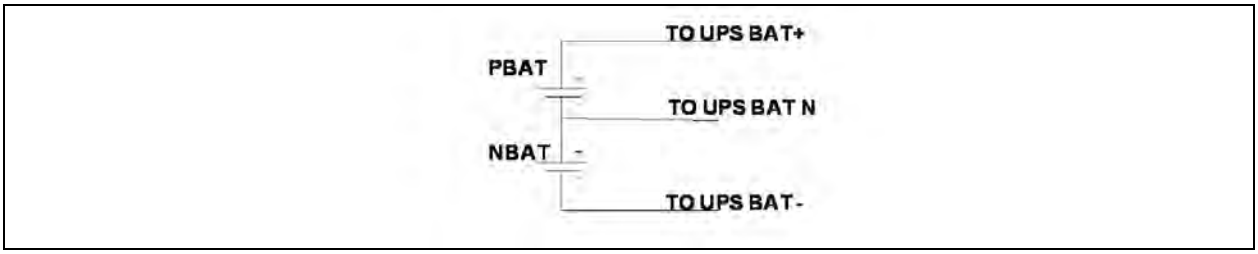
Item	Description
1	Output
2	Input
3	Bypass Input

Figure 2.12 Terminal Block Wiring Diagram for HV 80kVA



Item	Description
1	Input
2	Output
3	Bypass Input
4	BAT+
5	BAT-N
6	BAT-

Figure 2.13 Battery Wires Connection Schematic



NOTE: Make sure that the wires are connected securely with the terminals.

NOTE: Install the output breaker between the output terminal and the load, and the breaker should have leakage current protective function if necessary.

6. Put the terminal block cover back at the rear panel of the UPS.

Adhere to the below safety instructions when installing the standard model.

WARNING! Risk of electric shock. Can cause injury and death. Make sure the UPS is off before the installation. The UPS should not be turned on during wiring connection.
Do not try to connect the standard internal battery to the external battery. The battery type and voltage may be different, risk of electric shock or fire may occur! for 20kVA and 40kVA, in case it is necessary to connect in parallel internal and external batteries, these should be of the same model (same supplier and capacity) and should have the same battery blocks number.

NOTE: Set the battery pack breaker in "OFF" position and then install the battery pack.

WARNING! Risk of equipment damage. Can cause injury and death. Pay special attention to the rated battery voltage marked on the rear panel. If you want to change the numbers of the battery in a chain, make sure you modify the UPS setting accordingly. Connection with wrong battery voltage may cause irreversible damage of the UPS.

WARNING! Risk of equipment damage. Can cause injury and death. Pay special attention to the polarity marking on external battery terminal block. Connection with wrong battery voltage may cause irreversible damage of the UPS.

WARNING! Make sure the protective grounding/earthing wiring is adequate. The current spec, color, position, connection, and conductance reliability of the wire should be verified.

WARNING! Make sure the utility input & output wiring is rated correctly. The current spec, color, position, connection, and conductance reliability of the wire should be verified. Make sure the L/N side is correct, not reverse or short-circuited.

2.3.1 MTP 10-15-20kVA from 3-3 Setting to 3-1 Setting

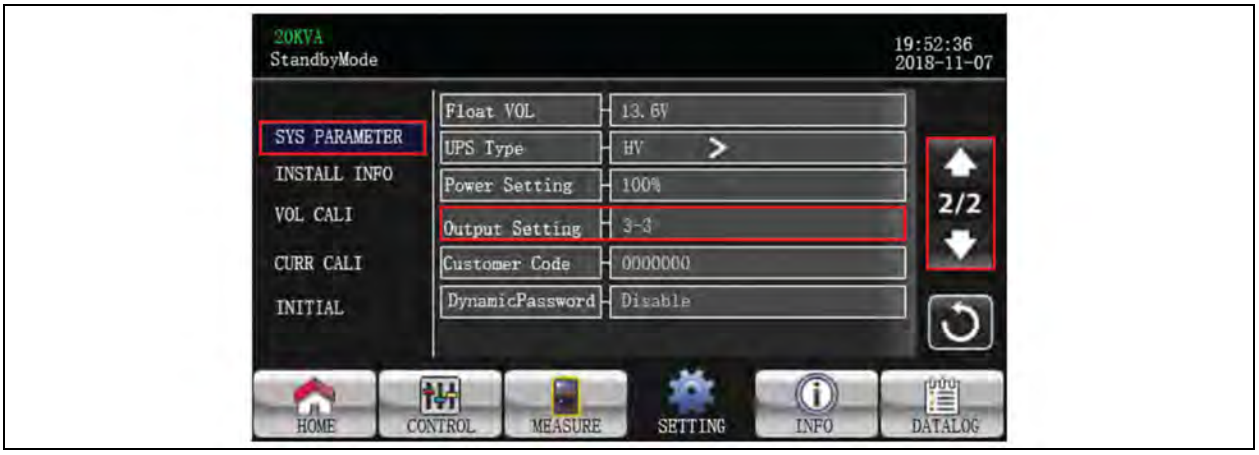
NOTE: The following procedure is applicable only to MTP 10-15-20kVA. MTP 30-40kVA and MTP 80kVA cannot have Single phase output.

1. Disconnect the EPO connector.
2. Turn ON the main input breaker and connect the batteries. Keep turned OFF the bypass input breaker and the output breaker.
3. Confirm on the display main page that the UPS is in standby mode.
4. Go to setting and click on *Advance* and enter the maintainer level password.

Figure 2.14 Bypass Mode—Advance

5. Go to SYS PARAMETER (Page 2/2) and modify the Output Setting from 3-3 to 3-1.

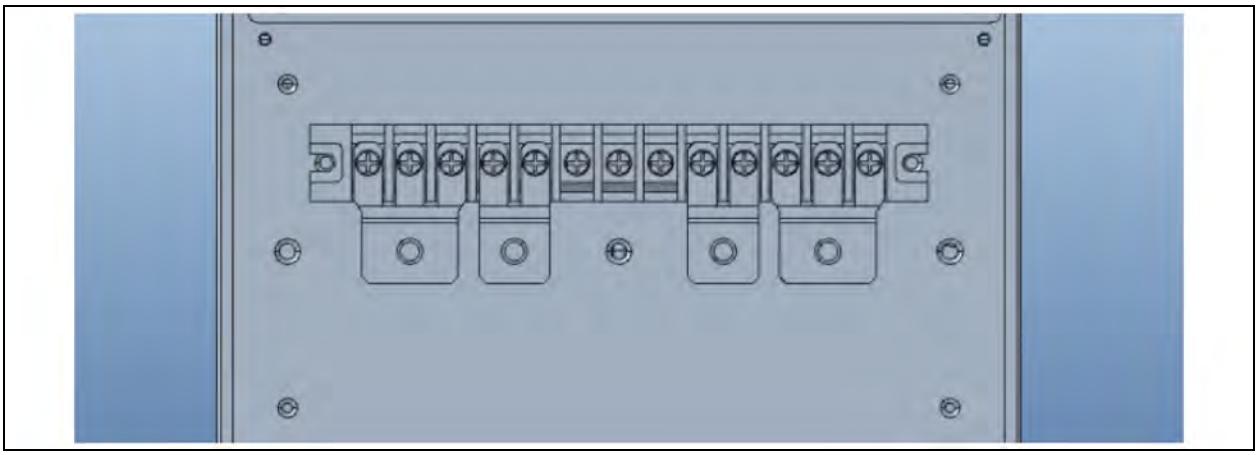
Figure 2.15 Standby Mode—SYS Parameter



NOTE: The 3-1 parameter settings will be saved only when UPS shutdown normally with battery connected.

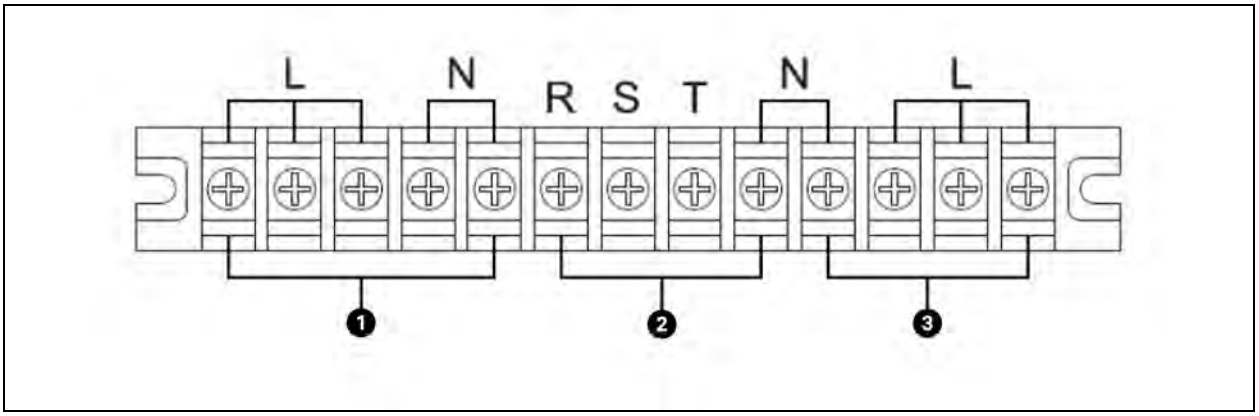
6. Turn OFF all the UPS breakers (main input, bypass input, and output).
7. Use the provided bars to short the power terminals according to the Figure 2.16 on the facing page .

Figure 2.16 Busbars



8. Connect the power lines according to the Figure 2.17 below .

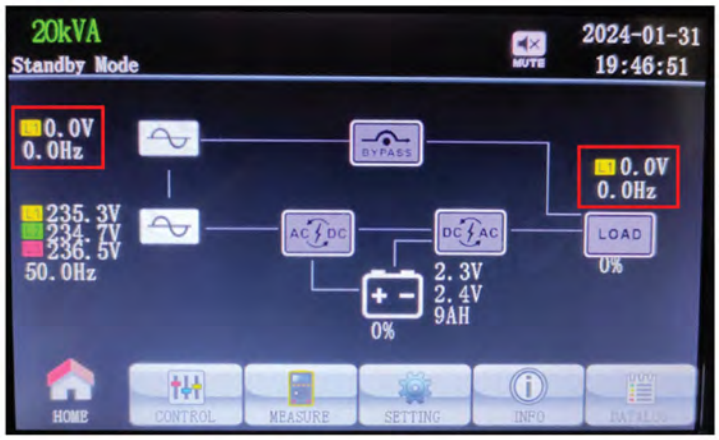
Figure 2.17 Connection of Power Lines



Item	Description
1	Output
2	Input
3	Bypass input

9. Keep the EPO connector still disconnected. Then turn ON the output breaker, bypass breaker, and main input breaker in this order.
10. Confirm on the display main page that the bypass and output are single phase.

Figure 2.18 Display Main Screen



11. Reconnect the EPO connector.

2.4 UPS Installation for Parallel System

The parallel system of MTP 20kVA, 40kVA, and 80kVA can be composed of up to four (4) UPSs of the same power rating and connected in parallel without the need of a centralized mains static bypass. Instead, in case it is necessary to supply the load from Bypass source, the bypass static switches of each UPS will share the load.

In order to correctly operate, a parallel system requires to share control signals among the UPSs to manage the load sharing, synchronizing and bypass switching.

In addition, it is requested that:

1. The UPSs are of the same model and power rating and have the same Firmware version.
2. The bypass and rectifier input supplies must use the same neutral line input terminal.
3. If the input has a current leakage protective device, the current leakage protective device must be fitted upstream of the neutral line input terminal.
4. The power cables (including the bypass input cables and UPS output cables) of each UPS should be of the same length and specifications to facilitate the load sharing.
5. The Bypass supply should be the same for all the UPSs in parallel.

Moreover, in case of a Parallel system, it is suggested to have:

1. Independent output breaker for each UPS.
2. All Output breakers connected to a major output breaker.
3. External Maintenance Bypass line and breaker.

If the UPS is only for single operation, you may skip this section.

1. Install and wired the UPS. See Single UPS Installation on page 12 .
2. Connect the output wires of each UPS to an output breaker.
3. Connect all output breakers to a major breaker. This major output breaker will connect directly to the loads.
4. Either common battery packs or independent battery packs for each UPS are allowed.
5. See **Figure 2.19** on the facing page .

Figure 2.19 Wiring Diagram of Parallel System of 10-15-20kVA with 3-In 3-Out configuration

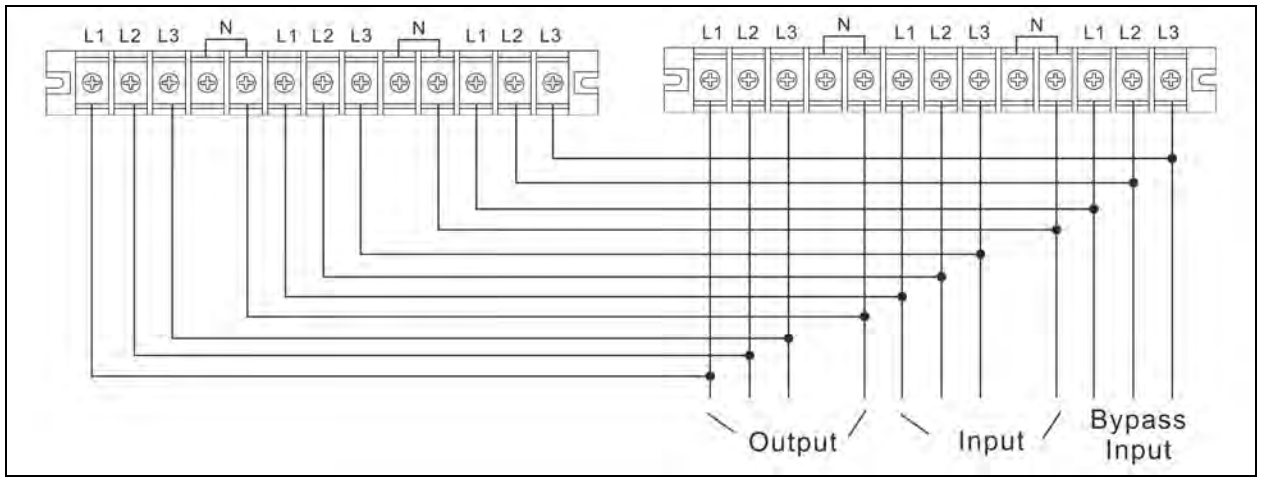


Figure 2.20 Wiring Diagram of Parallel System for 10-15-20kVA with 3-In 1-Out configuration

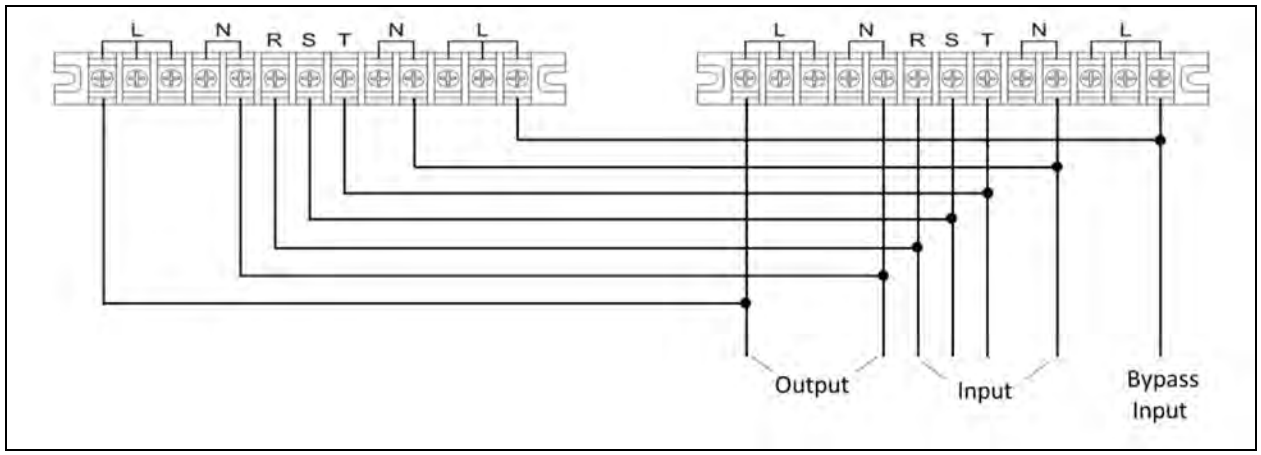


Figure 2.21 Wiring Diagram of Parallel System for HV 40kVA

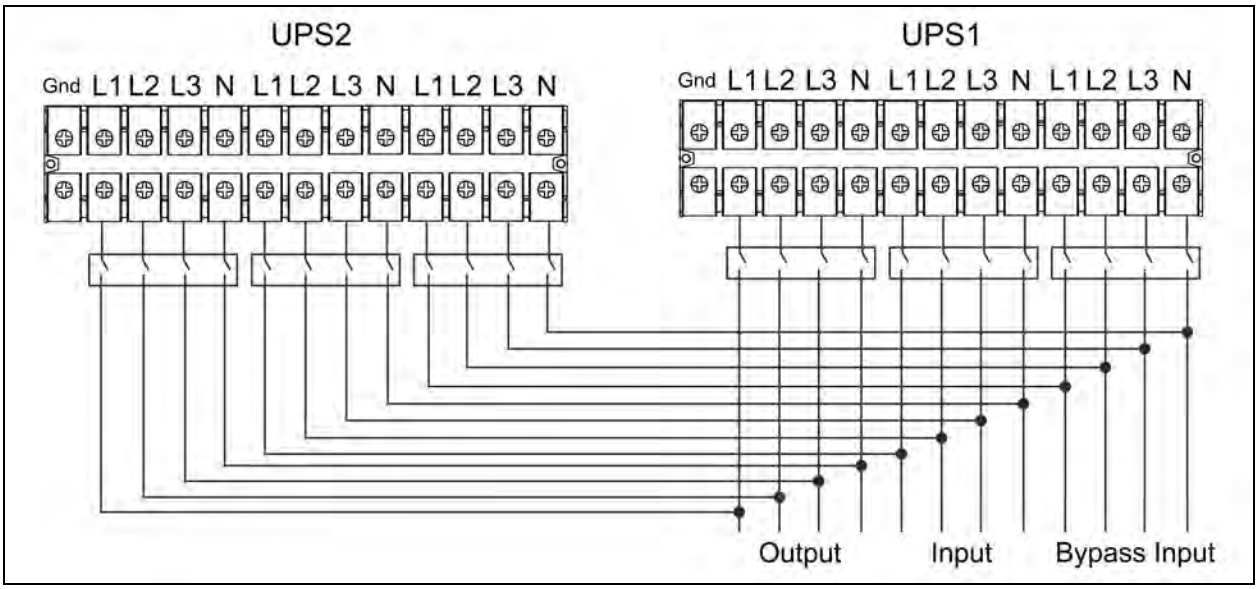
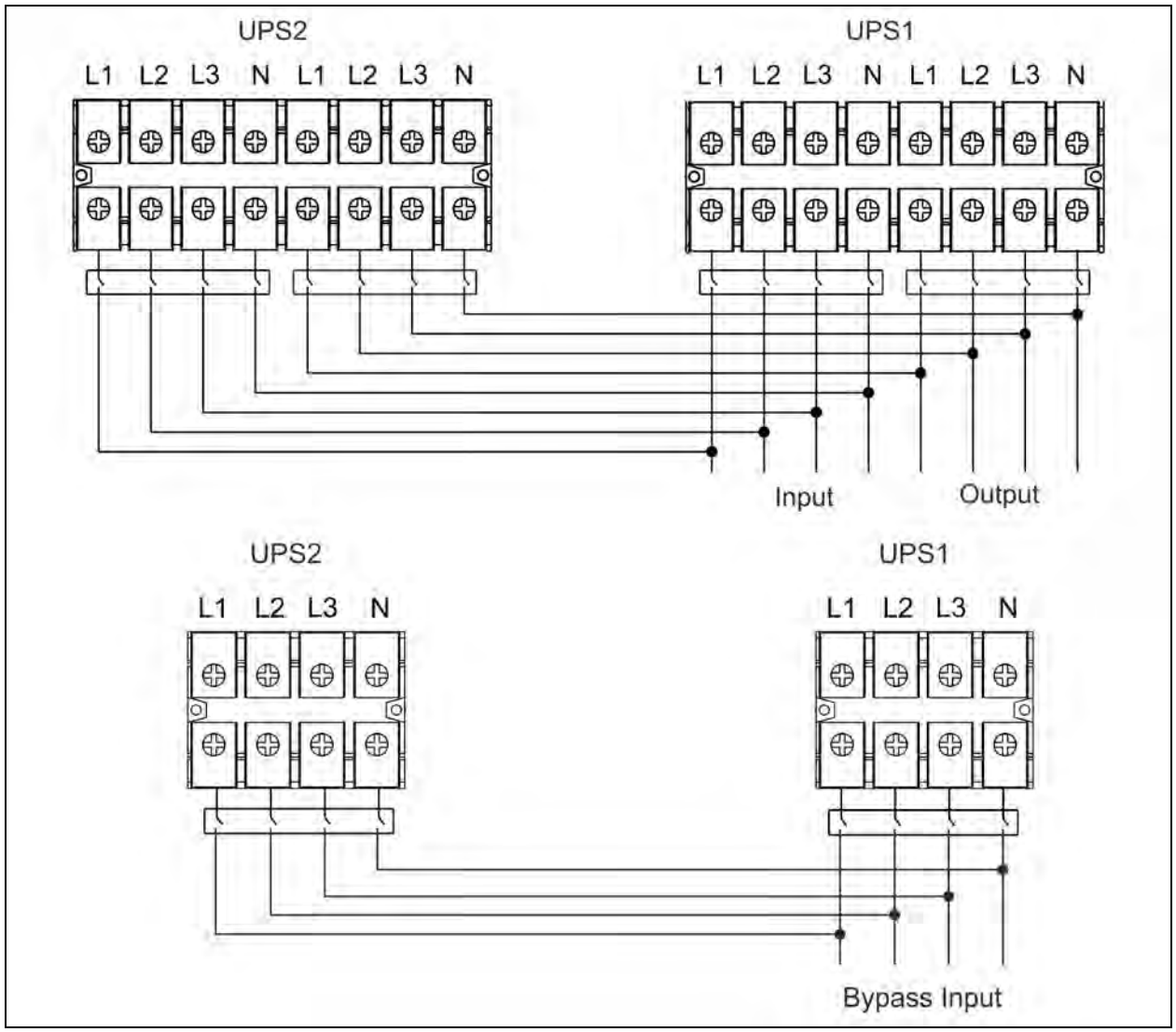


Figure 2.22 Wiring Diagram of Parallel System for HV 80kVA



2.5 Software Installation

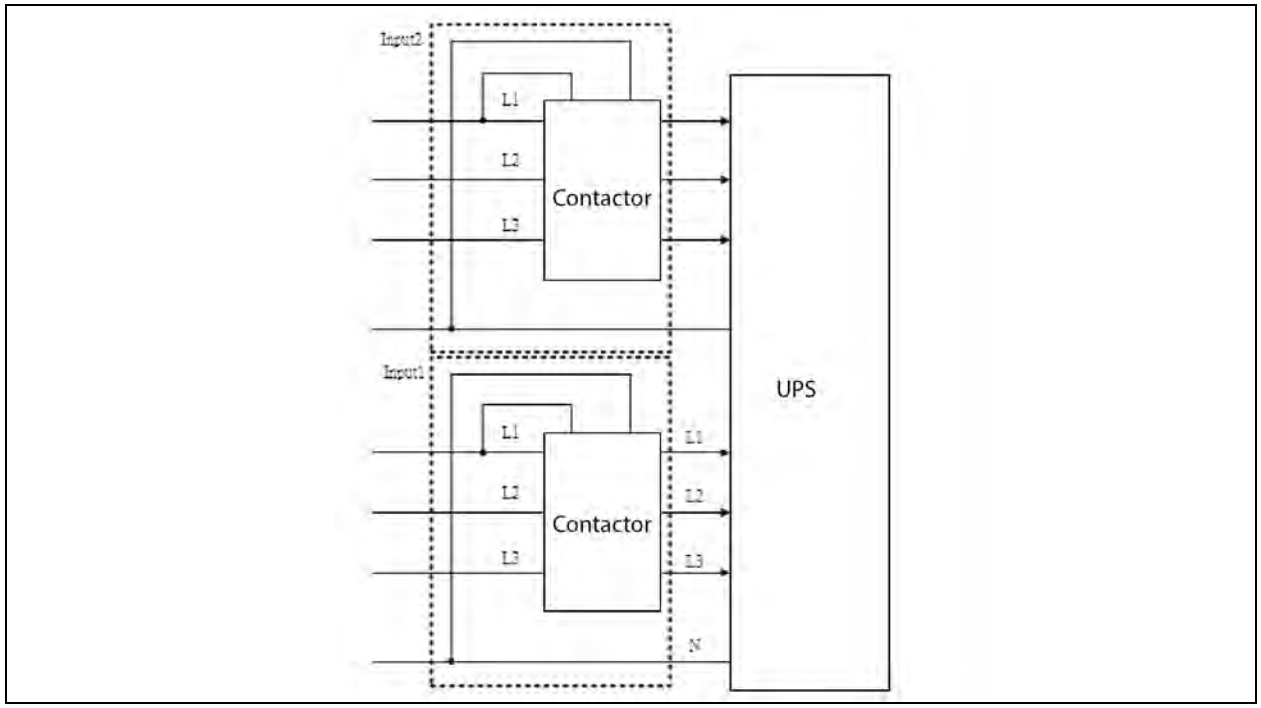
For optimal computer system protection, install UPS monitoring software to configure UPS shutdown operation.

2.6 Back feed Protection

Back feed protection device shields the bypass line from static switch failure. The UPS has no back feed device inside. It should be installed externally by following methods.

- An external disconnect device, coil is energized by input voltage. When input AC Loss, it will open the contactor.

Figure 2.23 External Contactor



2.7 Connecting and Disconnecting Internal Battery Terminals (MTP 20-40kVA)

During commissioning, the UPS is equipped with internal batteries (only valid for MTP 20-40kVA), it is required to connect the internal batteries to the UPS terminals.

1. To do it, use the appropriate tools to open the top and side panels of the UPS.
2. Connect the battery blocks interconnection cables provided with the UPS (4 cables for MTP 20kVA, 8 cables for MTP 40kVA).
3. While performing this operation, wear arc protective gloves and arc protective clothing.

Figure 2.24 Connecting and Disconnecting Internal Battery Terminals (MTP 20-40kVA)

WARNING! To perform the servicing UPS, make sure to disconnect the cable connections between the UPS and batteries. Failure to do so may result in electric shock or battery arc risk.

WARNING! Batteries may only be serviced by qualified personnel and the appropriate protective equipment and clothing must be used at all times.

WARNING! If maintenance is required, wait 10 minutes for the internal DC bus capacitors to discharge.

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3 Operations

3.1 Operation Mode

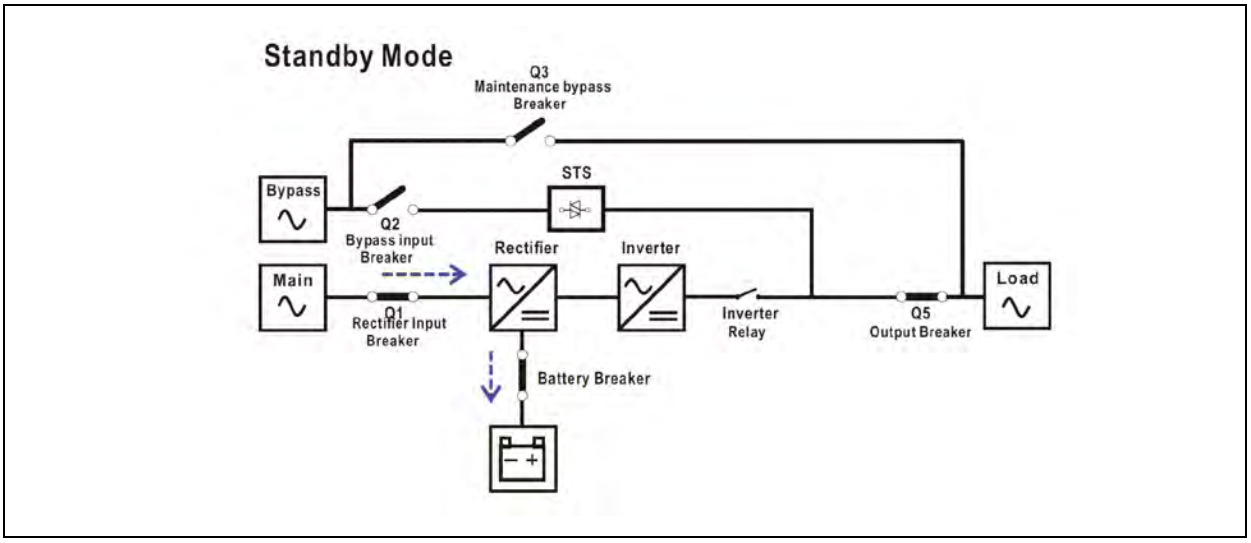
This UPS is a 3-phase, 4 wire on-line, double conversion UPS that permits operation in the following modes:

- Standby Mode
- Line Mode (AC Mode)
- Battery Mode
- Bypass Mode
- ECO Mode
- Shutdown Mode
- Maintenance Bypass Mode (Manual Bypass)

3.1.1 Standby mode

When the UPS is connected to the utility input power and the BYPASS enable setting is disabled, the UPS will be in standby mode until it is turned ON. The charger function will be activated when the battery is available. The load is not powered in this mode.

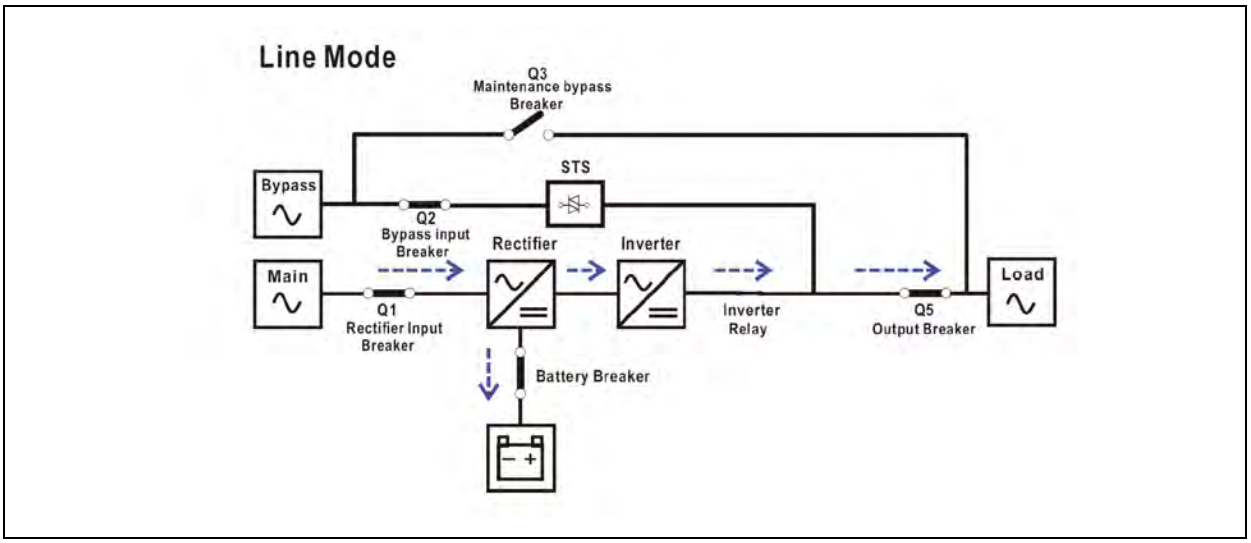
Figure 3.1 Standby Mode Diagram



3.1.2 Line mode (AC mode)

In line mode, the rectifier obtains power from the utility and supplies DC power to the inverter while the charger charges the battery. The inverter filters the DC power before converting it to clean and stable AC power to the load.

Figure 3.2 Line Mode (AC Mode) Diagram

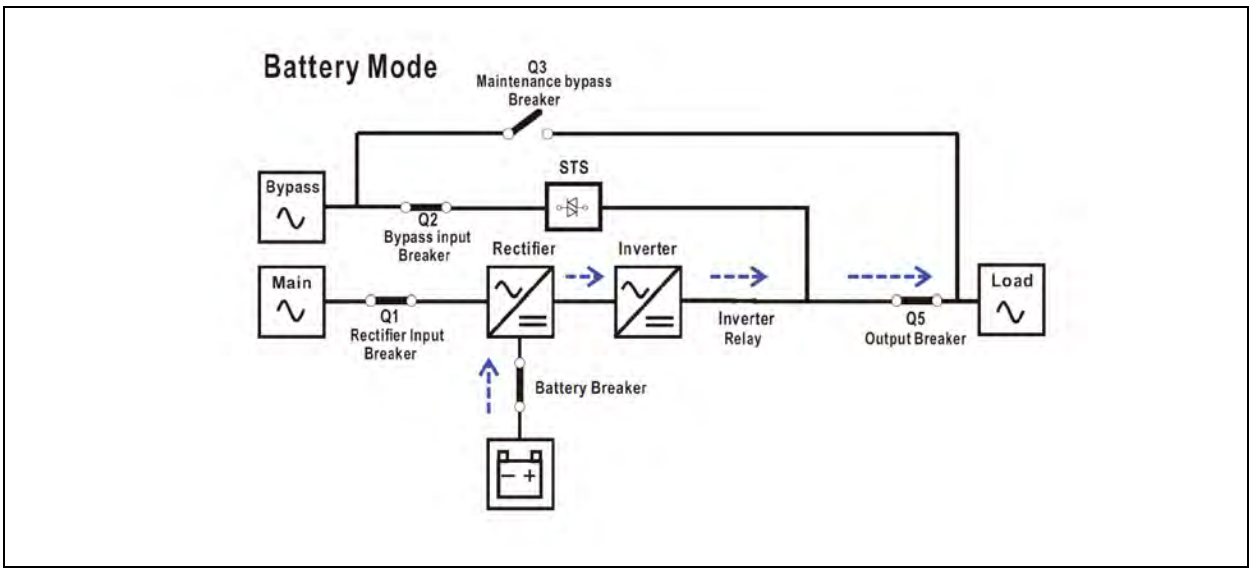


3.1.3 Battery mode

When the utility power fails, the UPS automatically switches to the battery mode in order to avoid interruption in power to the critical load in the event of power failure.

In battery mode, the rectifier obtains power from the battery and supplies DC power to the inverter. The inverter then filters the DC power before converting it to clean and stable AC power to the load.

Figure 3.3 Battery Mode Diagram

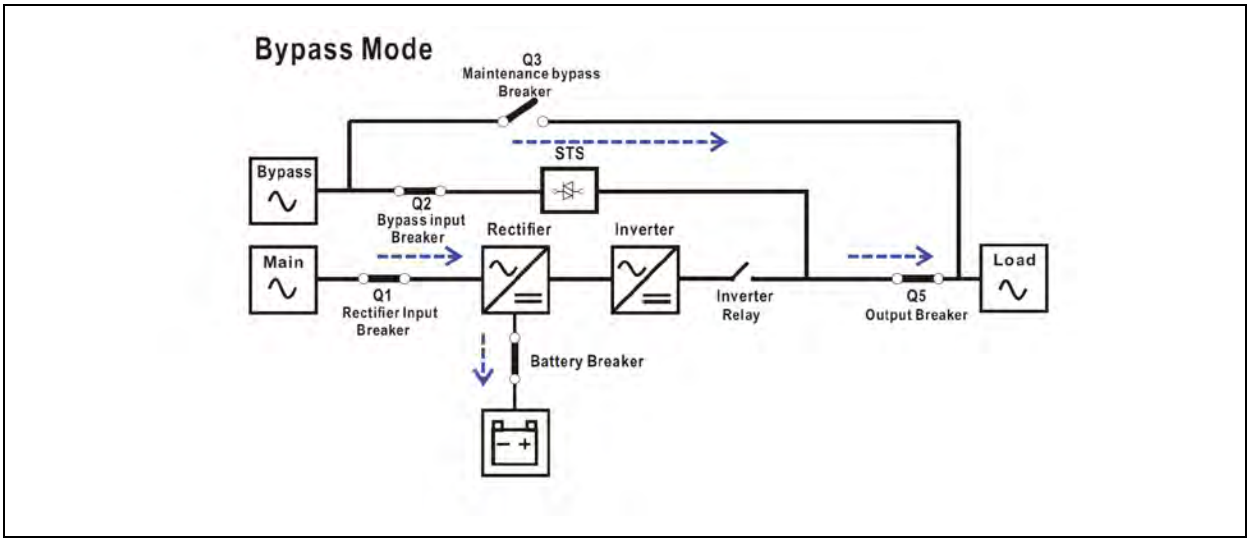


3.1.4 Bypass mode

When the UPS is connected to the utility input power and the BYPASS enable setting is enabled, the UPS will be in bypass mode until it is turned ON, and the charger function will be activated when the battery is available.

If the UPS encounters any unusual condition such as over temperature or overload. After it has been turned ON, the static transfer switch will act as a transference and will transfer the load from the inverter to the bypass source without any interruption. When the abnormal situation is resolved, the UPS will return to line mode if the transference was caused by a recoverable reason.

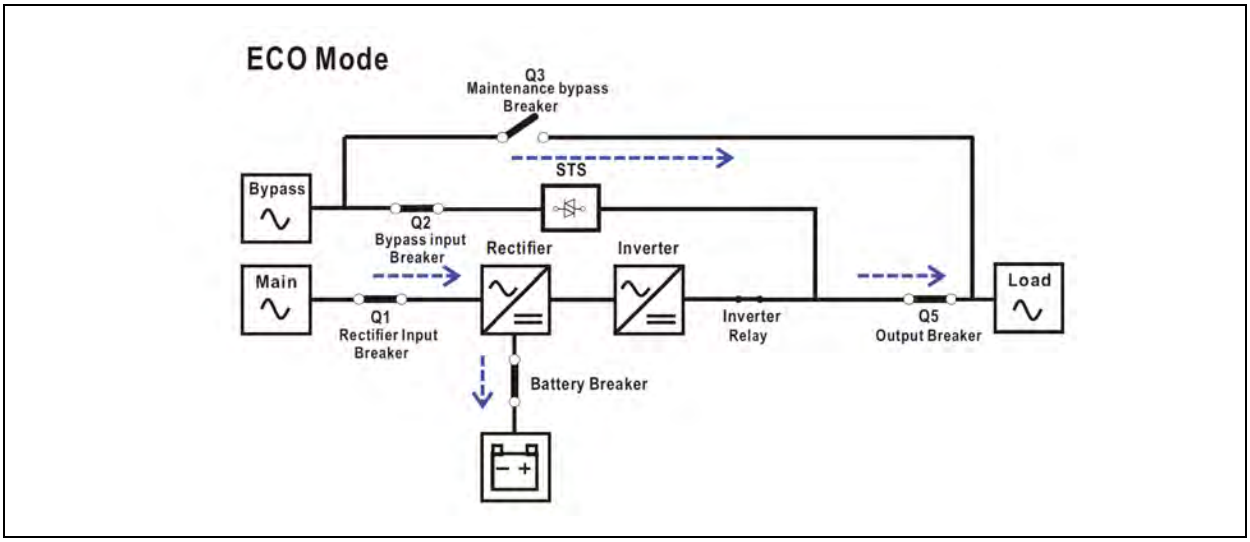
Figure 3.4 Bypass Mode Diagram



3.1.5 ECO mode

The ECO mode can be enabled through the settings menu of LCD panel. When the bypass voltage and frequency are within acceptable range, the load is powered by bypass in ECO mode. The UPS will transfer the power source of load from bypass to inverter if the bypass is out of range. When the UPS is in ECO mode, the rectifier and inverter are turned on to reduce the transfer time.

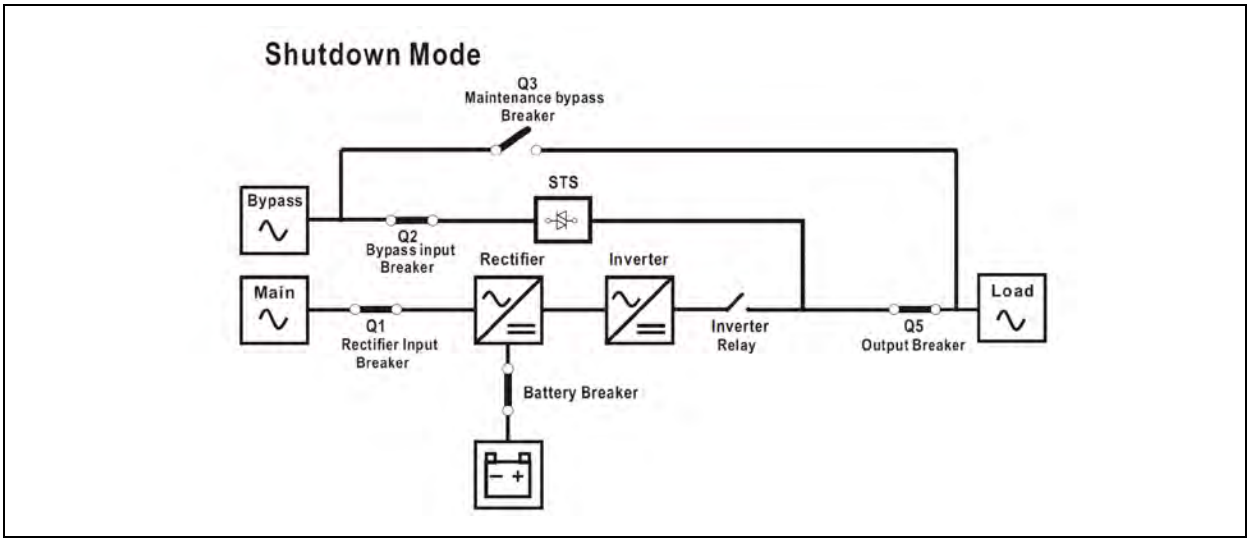
Figure 3.5 ECO Mode Diagram



3.1.6 Shutdown mode

When the UPS is in the OFF state and the utility power source is not available, the UPS will enter into shutdown mode. Alternatively, the UPS will enter into shutdown mode once the battery has been discharged to the cut off level. The UPS will turn OFF the control power when it enters this mode. The rectifier, charger, and inverter are all in the OFF state.

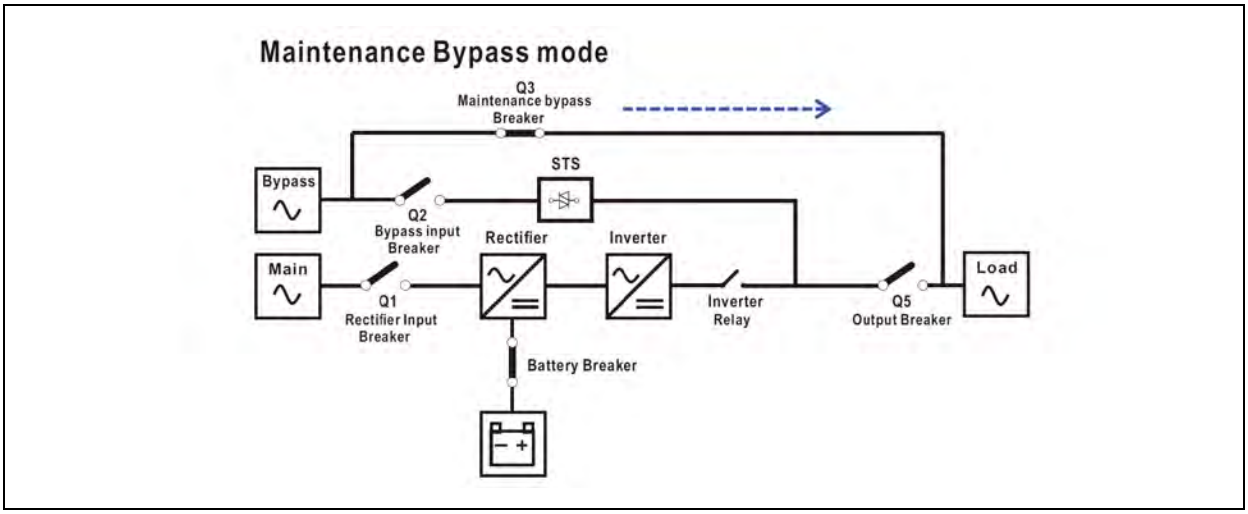
Figure 3.6 Shutdown Mode Diagram



3.1.7 Maintenance bypass mode

When the UPS is unable to supply power during the maintenance process, a manual bypass switch is available to ensure continuous supply of power to the critical load. Ensure that the bypass power source is normal, before enabling the maintenance bypass mode.

Figure 3.7 Maintenance Bypass Mode Diagram



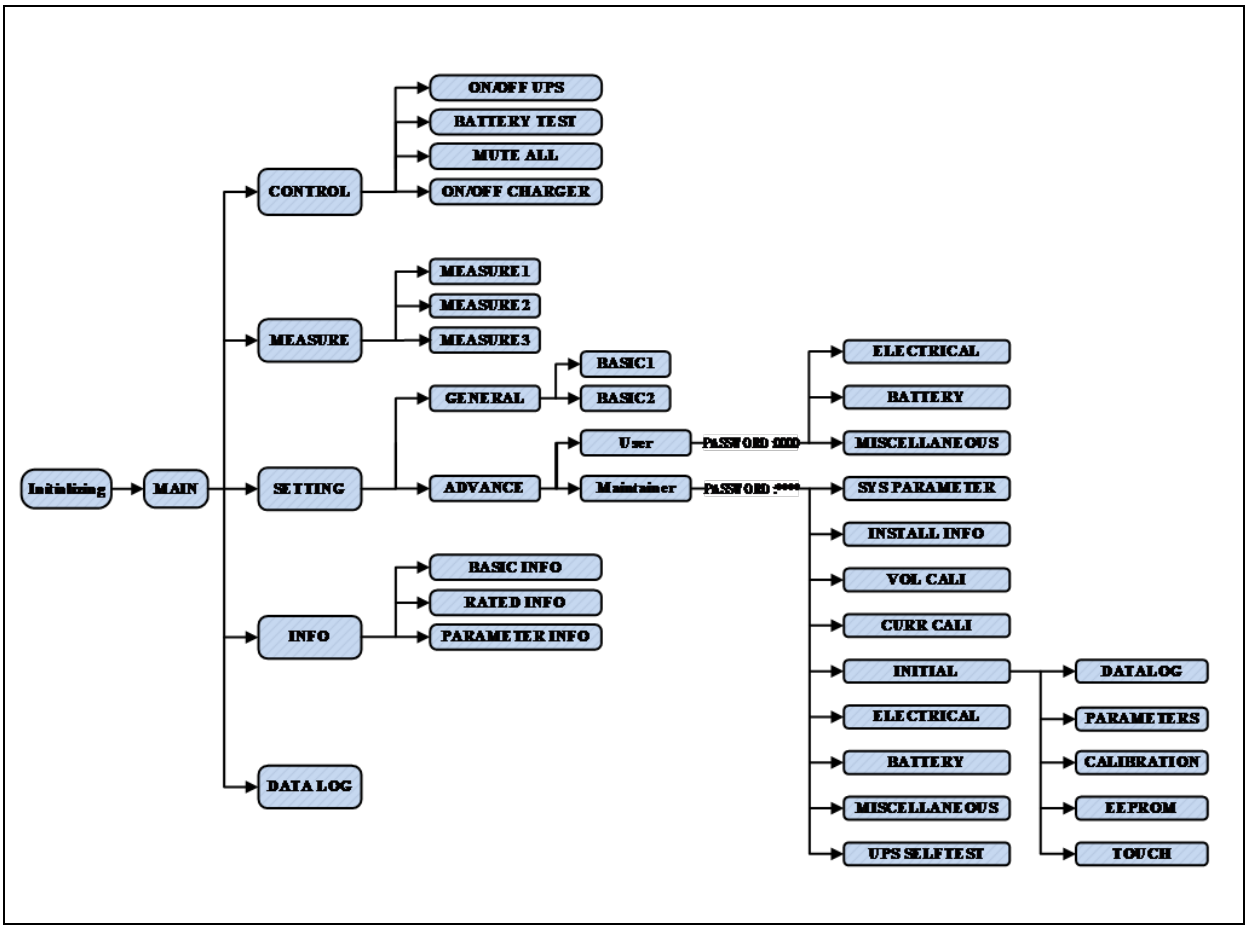
3.2 Button Operation

1. Press the “COLD START” button to power on the power supply for the UPS to turn on the LCD display. UPS will enter initialization mode. After initialization, follow the “CONTROL” menu to operate the UPS. This button only works when UPS is completed off with battery connected but without AC input. When the UPS is with AC grid connected, just follow the “CONTROL” menu to operate the UPS after LCD initialization.

3.3 Screen Description

After initialization, the LCD will display main screen. There are five sub-menus: Control, measure, setting, information and data log. Touch any sub-menu icon to enter into the sub-screen.

Figure 3.8 Menu Tree



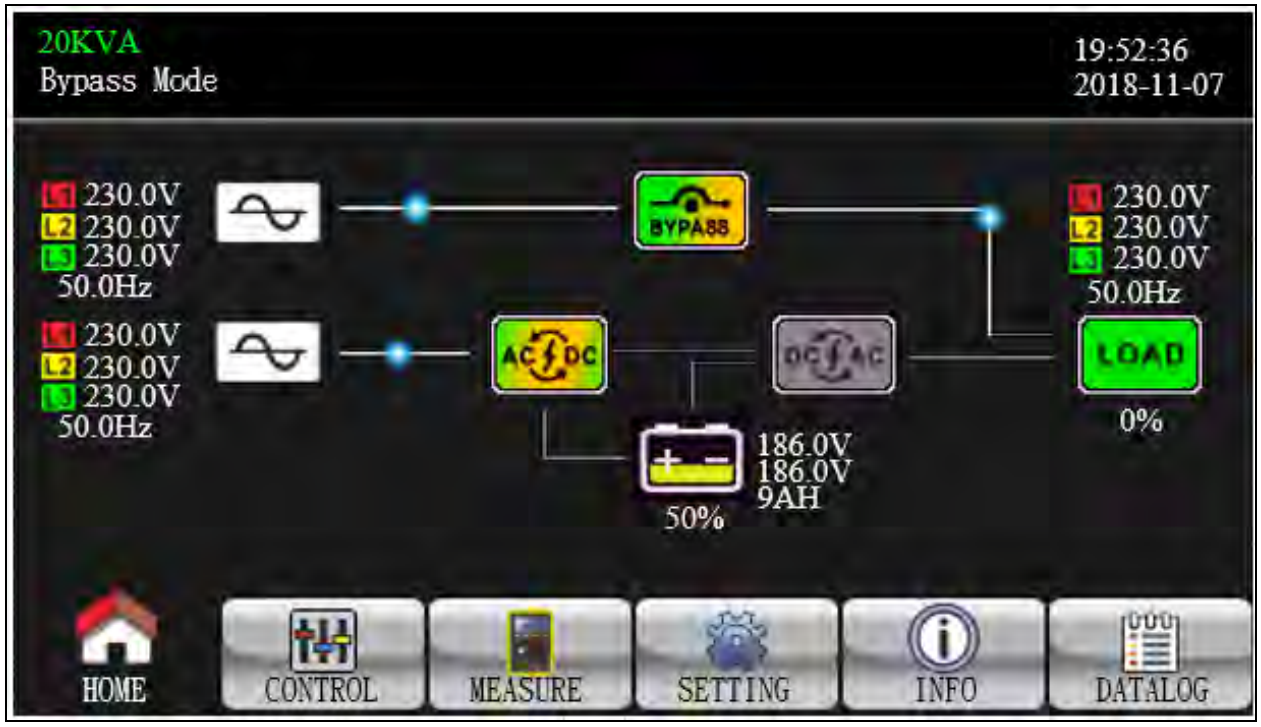
3.3.1 Main screen

When the power is turned on, the LCD will start initialization approximately few seconds as shown below.

Figure 3.9 Starting Screen

After initialization, the main screen will display as shown below. On the button, there are five icons to represent five sub-menus: Control, measure, setting, information, data log.

Figure 3.10 Main Screen

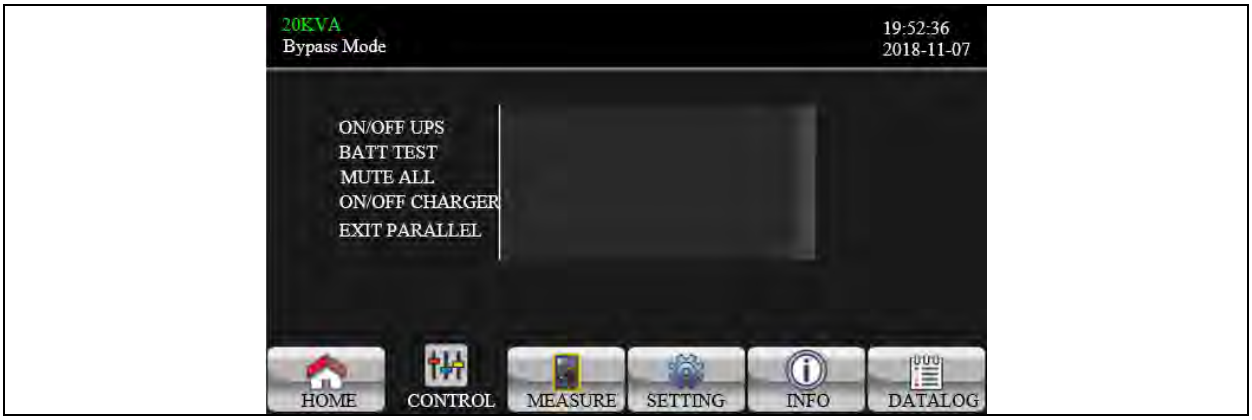


3.3.2 Control Screen

Touch the 

icon to enter control sub-menu.

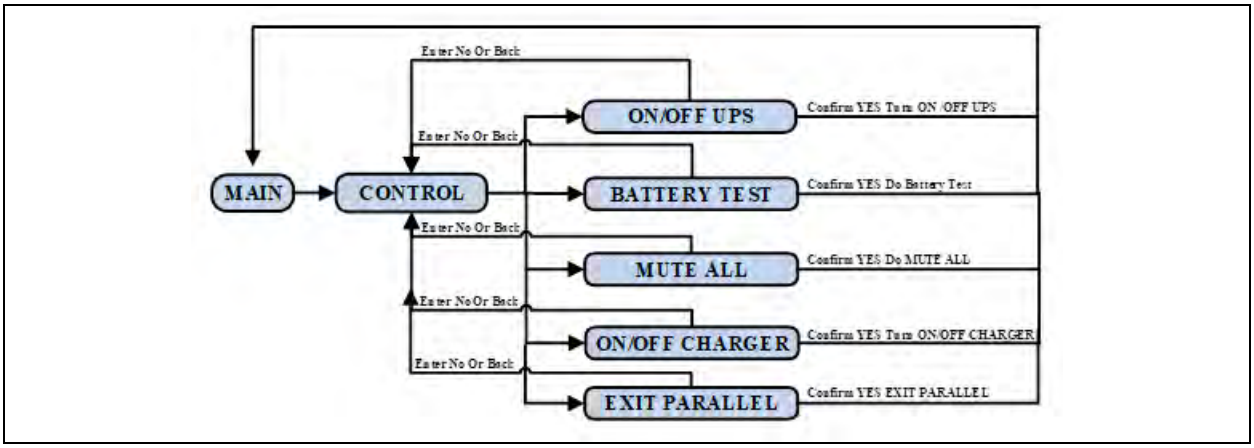
Figure 3.11 Control Screen



Touch the 

icon to return to main screen no matter it's in any screen of any sub-menu.

Figure 3.12 Screen 1.0 «Control» and its Sub-Menus



On/Off UPS (Inverter)

It will show “Turn on UPS?” when UPS Inverter is off.

It will show “Turn off UPS?” when UPS Inverter is on.

Touch “YES” to turn on or off the UPS Inverter. Then, the screen will return to main screen (screen 0.0).

Touch “Back” to return to main screen immediately or “No” to cancel this operation and back to main screen (screen 0.0).

Figure 3.13 Turn ON UPS Screen

Figure 3.14 Turn Off UPS Screen

Battery Test

It will show “Battery Test” if the UPS is not in test. Touch “Yes” to start battery test. Then, it will show Battery testing during battery test period. After few seconds, battery test result will show on the screen. Touch “Back” to return to main screen immediately or “No” to cancel this operation and back to main screen (screen 0.0).

It will show “Cancel battery test” if the UPS is in test.

Figure 3.15 Battery Test Screen

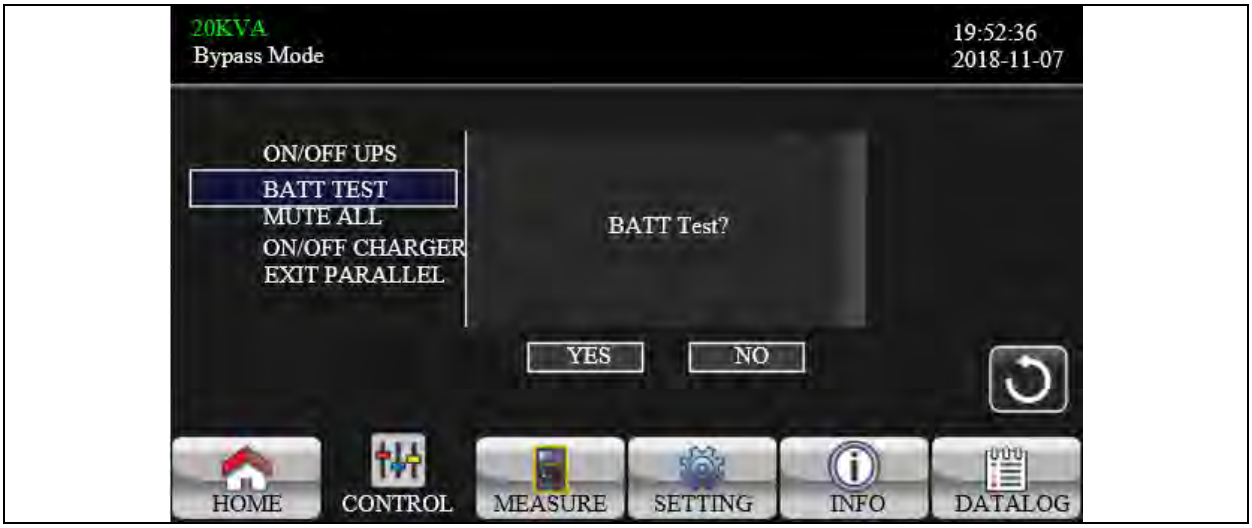


Figure 3.16 Cancel Battery Test Screen

Audio Mute

It will show “Mute all” if the audio is active. Touch “Yes” to activate mute. If “Mute all” is active, it will show 

icon on the top left corner of the main screen. Touch “Back” to return to CONTROL screen immediately or “No” to cancel this operation and back to CONTROL screen (screen 0.0).

It will show “Cancel mute” if the UPS is mute already. Touch “Yes” to activate audio function or “No” keep mute. Touch “Back” to return to CONTROL screen. (screen 0.0)

Figure 3.17 Mute All Screen

Figure 3.18 Cancel Mute All Screen

On-Off Charger

It will show “Turn on Charger?” when the charger is off. It will show “Turn off Charger?” when the charger is on. Touch “YES” to turn on or off the charger. Or touch “NO” to cancel this operation. Then, the screen will return to the main screen.

Touch “Back” to return to CONTROL screen immediately.

WARNING! This function should be operated only from qualified technicians and only to perform maintenance operations. During normal operation of the UPS the charger will be automatically turned ON from the UPS. In case the charger is manually turned ON through this command, it will be necessary then to turn OFF and ON the UPS in order to restore the automatic operation of the charger. If this UPS restart is not performed, a battery damage can occur.

Figure 3.19 Turn ON Charger Screen

Figure 3.20 Turn Off Charger Screen

Exit parallel

It will show “Exit Parallel?” when the units in parallel system. Touch “YES” to remove units from the parallel system. Or touch “NO” to cancel this operation. Then, the screen will return to the main screen.

Figure 3.21 Exit Parallel Screen

3.3.3 Measure Screen

Touch the icon 

to enter measure page. Touch the icon  or  to browse information. Touch the icon 

to return to main screen. Touch the icon  to go back to previous menu.

Figure 3.22 Measure Screen

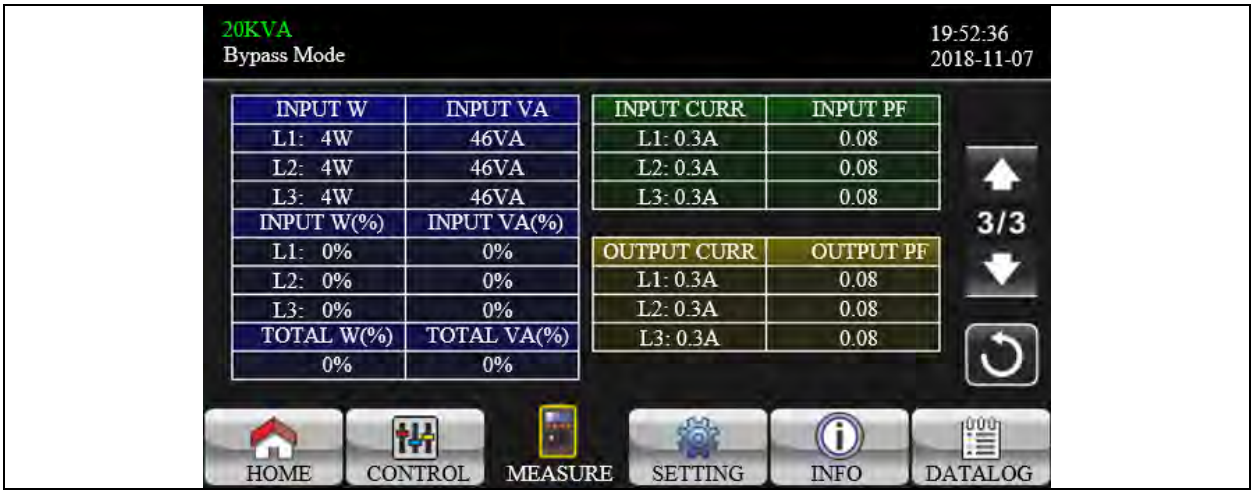
1. LINE VOL: The real time value of L1, L2 and L3 phase voltage, L1L2/L2L3/L3L1 voltage and input frequency.
2. INVERTER VOL: The real time value of L1, L2 and L3 inverter voltage, L1L2/L2L3/L3L1 voltage and frequency.
3. BYPASS VOL: The real time value of L1, L2 and L3 bypass voltage, L1L2/L2L3/L3L1 voltage and frequency.

4. **OUTPUT VOL:** The real time value of L1, L2 and L3 output voltage, L1L2/L2L3/L3L1 voltage and frequency.

Figure 3.23 Measure Screen Page 2

1. **OUTPUT W:** L1, L2, and L3 output power in Watt.
2. **OUTPUT VA:** L1, L2, and L3 output power in VA.
3. **OUTPUT W (%):** L1, L2, and L3 output active power in percentage.
4. **OUTPUT VA (%):** L1, L2, and L3 output apparent power in percentage.
5. **Total Watt and VA:** Total output load in Watt and VA.
6. **BATT Voltage/Bus Voltage/Charging Current/Discharging Current:** The real time value of DC related information.
7. **Temperature:** Temperature of L1, L2, and L3 phases.

Figure 3.24 Measure Screen Page 3



1. **INPUT W:** L1, L2, and L3 input power in Watt.
2. **INPUT VA:** L1, L2, and L3 input power in VA.
3. **INPUT W (%):** L1, L2, and L3 input active power in percentage.

4. **INPUT VA (%):** L1, L2, and L3 input apparent power in percentage.
5. **Input current:** The real-time value of input current in L1, L2 and L3 phases.
6. **Output current**: The real-time value of output current in L1, L2 and L3 phases.

3.3.4 Setting Screen

This sub menu is used to set the parameters of UPS. Touch the icon 

to enter setting menu page.

There are two options: Basic and Advanced. Touch the icon 

to return to main screen. Touch the icon  to go back to previous menu.

NOTE: Not all settings are available in every operation mode. If the setting is not available in present mode, the LCD will keep its original setting parameter showed instead of changing the parameters.

Figure 3.25 Setting Screen

1. **GENERAL:** It is to set up basic information of the UPS. It is not related to any function parameter.
2. **ADVANCE:** It is required to enter password to access to the “ADVANCED” setting. There are two types of authority, User and Maintainer.

General Setting

Figure 3.26 Setting Screen Page 1

1. **Language:** Set the LCD language. There are three options: English, Simplified Chinese, and Traditional Chinese. English is default setting.
2. **Input Source:** Select the input source. There are two options: Line (utility) and generator. Line is default setting. This setting value will show on the main page. When “generator” is selected, the acceptable input frequency will be fixed at the range of 40~75Hz. This setting value will show on the status bar.
3. **Contact:** Set the name of contact person and the maximum length is 18 characters.
4. **Phone:** Set the service phone number. Only 0~9, + and – are accepted. The maximum length is 14 characters.
5. **Mail:** Set the service email and the maximum length is 18 characters.

Figure 3.27 General Screen Page 2

1. **Audio Alarm:** There are two events available to mute. You may choose “Enable” or “Disable” alarm when related events occur.
    a. **Enable:** When selected, alarm will be mute when related events occur.
    b. **Disable:** When selected, UPS will alarm when related events occur.

- All Mute: When “enable” is selected, all the faults and warnings will be mute. It will show icon 

on the top right corner of the main screen.
- Mode Mute: UPS status mode alarm enable/disable. If “Mode Mute” is activated, it will show icon 

on the top right corner of the main screen.

Advance Setting

CAUTION: The changes in electronic and battery windows may cause a load drop, therefore these advance setting changes must be performed by qualified personnel.

CAUTION: The changes in the setting of CVCF mode, bypass forbid, and neutral line check directly affect the load, therefore these advance setting changes must be performed by qualified personnel.

Figure 3.28 Advance Password Screen

It’s required to enter password (4 digits) to access to the “ADVANCE” page.

Advance → User

To access to the “Advance → User” Setting menu page, the default password is “0000”.

If entered password is right, the page will jump to setting screen. If the password is wrong, it will ask to enter again.

Figure 3.29 Password Error Screen

Figure 3.30 Advance Setting Menu Screen

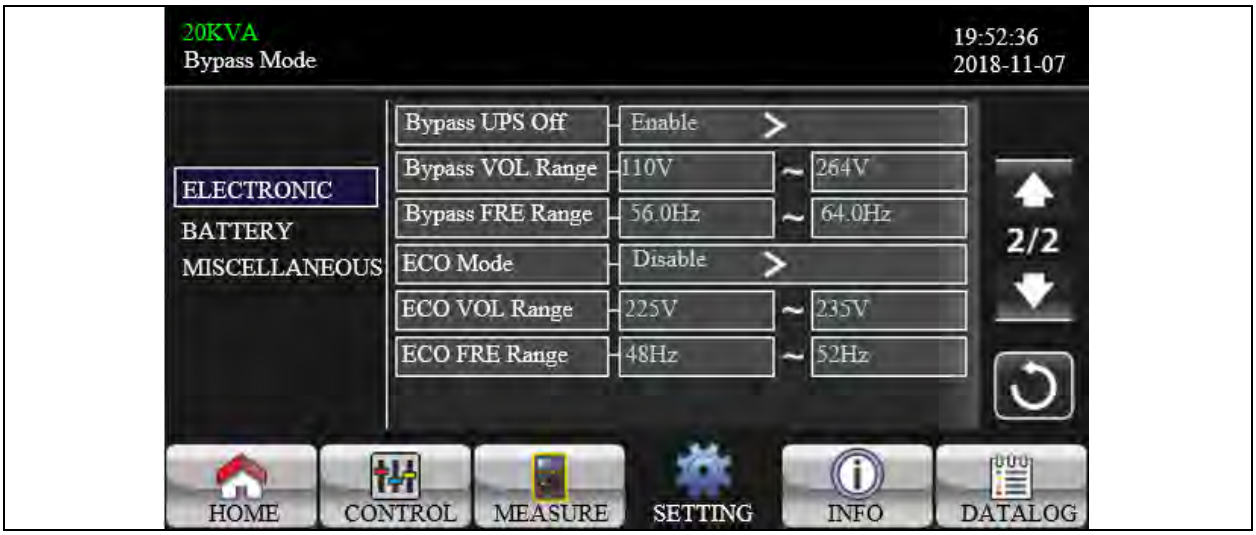
There are three sub menus under “Advance→User” setting: ELECTRONIC, BATTERY and MISCELLANEOUS.

Electronic

Figure 3.31 Electrical Setting Screen 1

1. Output VOL: Select the output rated voltage.
   a. If the UPS is HV system, there are four options, 208V, 220V, 230V and 240V.
   b. If the UPS is LV system, there are two options, 120V and 127V.
2. Output FRE: Select output rated frequency.
   a. 50Hz: The output frequency is setting for 50Hz.
   b. 60Hz: The output frequency is setting for 60Hz.
3. CVCF Mode (constant voltage and constant frequency function)
   a. Enable: CVCF function is enabled. The output frequency will be fixed at 50Hz or 60Hz according to setting of "OP Freq.". The input frequency could be from 40Hz to 70Hz.
   b. Disable: CVCF function is disabled. The output frequency will synchronize with the bypass frequency within 45~55Hz for 50Hz system or within 55~65Hz for 60Hz system. Disable is the default setting.
4. Bypass Forbid:
   a. Enable: Bypass forbid is allowed. When selected, it is not allowed for running in Bypass mode under any situations.
   b. Disable: Bypass forbid is not allowed. When selected, UPS will run in Bypass mode depending on "Bypass at UPS off" setting. It is the default setting.
5. Neutral Line Check: Indicates neutral loss detection function.
   a. Disable: Disable the neutral line check function. The UPS will not detect if the neutral line is loss or not.
   b. Auto: The UPS will automatically detect if the neutral is lost or not. If neutral loss is detected, an alarm will be generated. If the UPS is turned on, it will transfer to battery mode. When neutral line is restored and detected, the alarm will be muted automatically and the UPS will go back to normal mode automatically.
   c. Check: The UPS will automatically detect the neutral loss. If neutral loss is detected, an alarm will be generated. If the UPS is turned on, it will transfer to battery mode. When neutral is restored, the alarm will NOT be muted automatically and the UPS will NOT go back to normal mode automatically.
6. ISO Compensation:
   When UPS is connected to output isolation, it will compensate the output voltage.

Figure 3.32 Electrical Setting Screen 2



1. Bypass UPS off: Select the bypass status when manually turning off the UPS. This setting is only available when "Bypass forbid." is set to "Disable".
    a. Enable: Bypass enabled. When selected, bypass mode is activated.
    b. Disable: Bypass disabled. When selected, no output through bypass when manually turning off the UPS.
2. Bypass Voltage Range: Set the bypass voltage range.
    a. L: Low voltage point for bypass. The setting range is 176V ~ 209V when UPS is HV system. The setting range is 96V ~ 110V when UPS is LV system.
    b. H: High voltage point for bypass. The setting range is 231V ~ 264V when UPS is HV system. The setting range is 130V ~ 146V when UPS is LV system.
3. Bypass FRE Range: Set the bypass frequency range.
   The acceptable bypass frequency ranges from 46Hz to 54Hz when UPS is 50Hz system and from 56Hz to 64Hz when UPS is 60Hz system.
4. ECO mode: Enable/Disable ECO mode. Default setting is "Disable".
5. ECO VOL Range: Set the ECO voltage range.
    a. L: Low voltage point for ECO mode. The setting range is from (Rated output voltage – 5V) to (Rated output voltage - 11V). "Rated output voltage – 5V" is default setting.
    b. H: High voltage point for ECO mode. The setting range is from (Rated output voltage + 5V) to (Rated output voltage + 11V). "Rated output voltage + 5V" is default setting.
6. ECO FRE Range: Set the ECO frequency range. The setting range is from 46Hz to 54Hz when the UPS is 50Hz system and from 56Hz to 64Hz when the UPS is 60Hz system.

Battery

Figure 3.33 Battery Setting Screen

1. BATT Warning VOL:
    a. **HIGH:** High battery warning voltage. The setting range is 14.0V ~ 15.0V per battery block. 14.4V is default setting.
    b. **LOW:** Low battery warning voltage. The setting range is 10.1V ~ 14.0V per battery block. 11.4V is default setting. This parameter setting is related to “Shutdown Voltage” setting. This setting value should be higher than “Shutdown Voltage” setting.
2. **Shutdown VOL:** If battery voltage is lower than this point in battery mode, inverter will automatically shut down. The setting range is 10.5V ~ 12V per battery block. 10.7V is default setting.
3. **Battery Parameters:**
    - Battery AH: setting battery capacity.

Miscellaneous

Figure 3.34 Miscellaneous Setting Screen

1. **Auto Restart:**

a. **Enable:** After “Enable” is set, no matter what the UPS previous status is, the UPS will restart to Online mode automatically after utility restores.

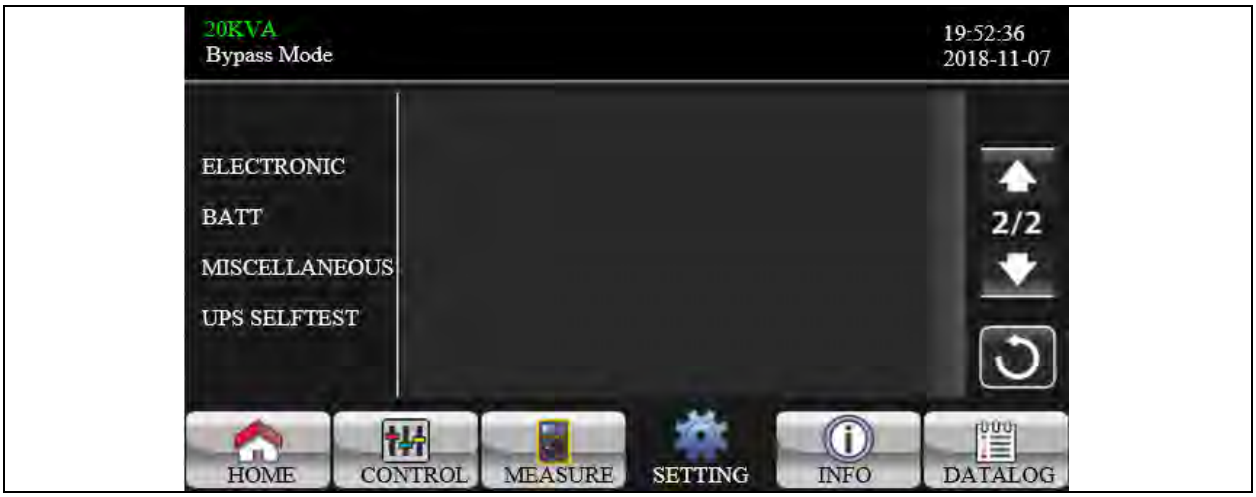
b. **Disable:** After “Disable” is set, the UPS will operate normally. If the UPS shuts down due to low battery, the UPS will still restart to online mode after utility restores. If the UPS was turned OFF manually and the utility restores, the UPS will switch to standby mode or bypass mode depends on the UPS configuration.

2. **Shutdown Delay:** UPS will shut down in setting minutes. The countdown will start after confirming the pop-up screen.
3. **Restore Delay:** UPS will automatically restart in setting minutes after the UPS shuts down.
4. **New Password:** Set up new password to enter “ADVANCE→User” menu.

We are going to see now the Advanced Settings available with the Maintainer level password.

Figure 3.35 Advance: Maintainer Setting Menu Screen 1

Figure 3.36 Advance: Maintainer Setting Menu Screen 2



To access the Advance→Maintainer setting menu page, it’s required to enter password. Contact the dealer to get maintainer password.

CAUTION: This setting menu is only for qualified technician. Otherwise, mis-operation will cause UPS damage.

There are nine sub-menus under Advance➔Maintainer setting: SYS PARAMETER, INSTALL INFO, VOL CALI, CURR CALI, INITIAL, ELECTRONIC, BATT, MISCELLANEOUS and UPS SELFTEST.

SYS Parameter

Figure 3.37 SYS Parameter Screen 1

1. Mode Name: Set the UPS model name.
2. Serial Number: Set the serial number.
3. Manufacturer: Set the UPS manufacturer.
4. Charger Number: The number of charging boards installed in the UPS.

NOTE: It is required to restart the UPS after setting.

5. Max Charge CURR:
   a. One piece of charger: There are twelve options: 1A, 2A, 3A, 4A, 5A, 6A, 7A, 8A, 9A, 10A, 11A, 12A.
   b. Two pieces of charger: There are twelve options: 2A, 4A, 6A, 8A, 10A, 12A, 14A, 16A, 18A, 20A, 22A, 24A.
6. BATT Number: The number of installed batteries in half string (the total number is double this value). It is required to restart the UPS after setting. The setting range is 16 ~ 20. 16 is default setting.

Figure 3.38 SYS Parameter Screen 2

1. **Float VOL:** The setting point of battery float voltage. 13.6V is default setting.
2. **UPS Type:** There are two options, HV and LV. This change is only allowed for qualified technician.

NOTE: It is required to restart the UPS after setting.

3. **Power Setting:** Set power factor in percentage.
4. **Output setting:** Set UPS output setting. There are two selections, 3-1 (it is available only for 10-15-20kVA) and 3-3.

NOTE: It is required to restart the UPS after setting.

5. **Customer Code:** Set customer code. It is a necessary setting when using dynamic password function.
6. **Dynamic Password:** Enable or disable dynamic password function.

Install Info

Figure 3.39 Install Info Screen

1. SYS Install Date: Set the date of UPS installation.
2. BAT Install Date: Set the date of Battery installation.
3. Date/Time: Set the date and time. The format is YYYY-MM-DD HH:MM:SS. The calendar day will be automatically changed when the year, month and date are set.

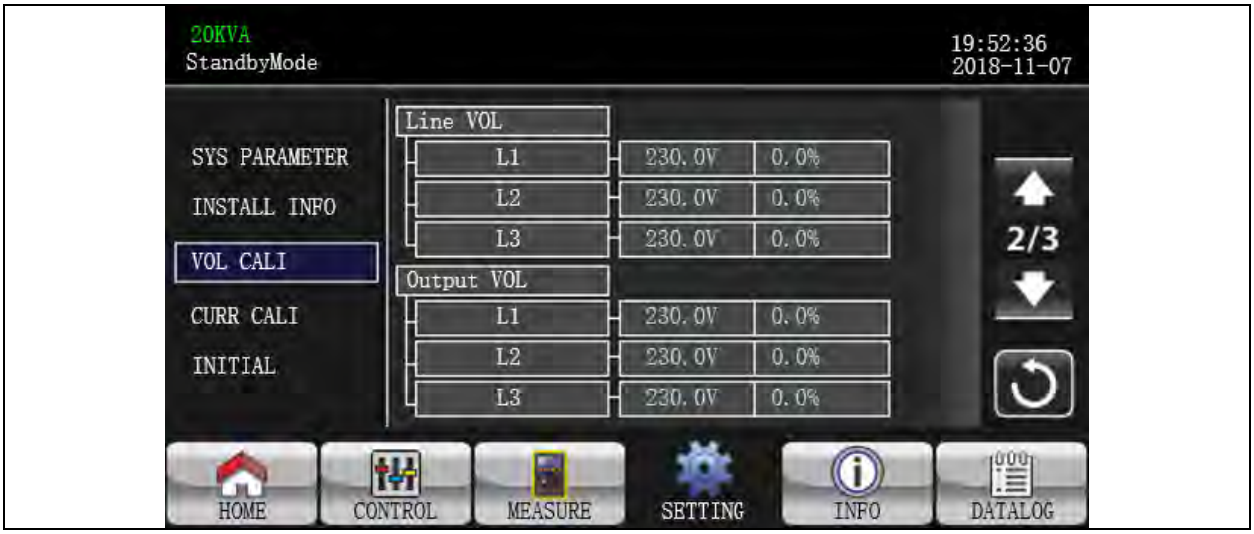
VOL CALI

Figure 3.40 VOL CALI Screen 1

1. Bus VOL: BUS voltage calibration. Click value columns and it will pop up  . Then, each click is 0.1% no matter it is pressing up or down key  . Press “up” key to increase 0.1% and press “down” key to decrease 0.1%. Press “OK” key to confirm the modification.

2. **BATT VOL:** Battery voltage calibration. Click value columns and it will pop up  . Then, each click is 0.1% no matter it is pressing up or down key  . Press “up” key to increase 0.1% and press “down” key to decrease 0.1%. Press “OK” key to confirm the modification.

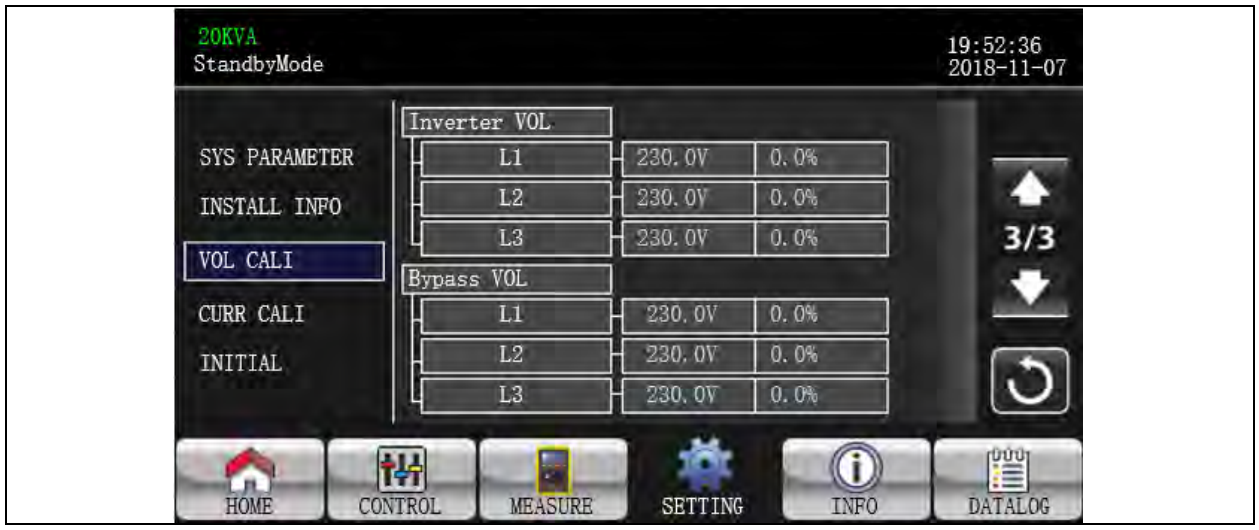
Figure 3.41 VOL CALI Screen 2



1. **Line VOL:** Line voltage calibration. Click value columns and it will pop up  . Then, each click is 0.1% no matter it is pressing up or down key  . Press “up” key to increase 0.1% and press “down” key to decrease 0.1%. Press “OK” key to confirm the modification.

2. **Output VOL:** Output voltage calibration. Click value columns and it will pop up  . Then, each click is 0.1% no matter it is pressing up or down key  . Press “up” key to increase 0.1% and press “down” key to decrease 0.1%. Press “OK” key to confirm the modification.

Figure 3.42 VOL CALI Screen 3

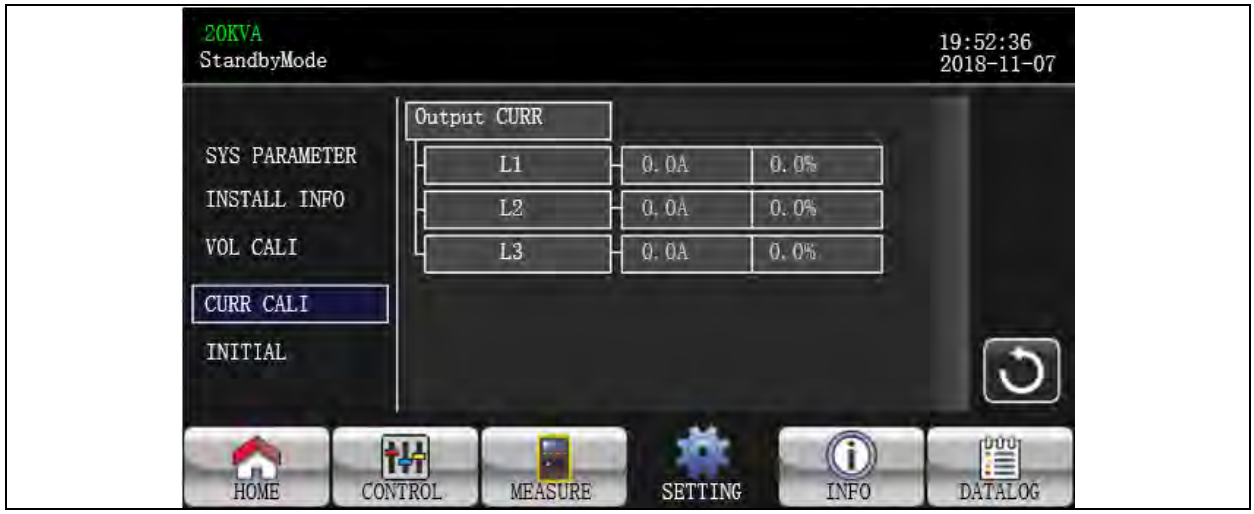


1. **Inverter VOL:** Inverter voltage calibration. Click value columns and it will pop up  . Then, each click is 0.1% no matter it is pressing up or down key  . Press “up” key to increase 0.1% and press “down” key to decrease 0.1%. Press “OK” key to confirm the modification.

2. **Bypass VOL:** Bypass voltage calibration. Click value columns and it will pop up  . Then, each click is 0.1% no matter it is pressing up or down key  . Press “up” key to increase 0.1% and press “down” key to decrease 0.1%. Press “OK” key to confirm the modification.

CURR CALI

Figure 3.43 CURR CALI Screen



- **Output CURR:** Output current calibration. Click value columns and it will pop up  . Then, each click is 0.1% no matter it is pressing up or down key  . Press “up” key to increase 0.1% and press “down” key to decrease 0.1%. Press “OK” key to confirm the modification.

Initial

Figure 3.44 Initial Menu Screen

Figure 3.45 Initial Data Log Screen

- **DATA LOG:** After clicking “DATA LOG”, it will pop up a message board as shown in above screen. Touch “YES” to clear the DATALOG page. Touch “Back” or “No” to cancel this operation and back to INITIAL menu page.

Figure 3.46 Initial Parameters Page

- PARAMETERS: After clicking “PARAMETERS”, it will pop up a message screen as shown in above screen. Touch “YES” to restore default value. Touch “Back” or “No” to cancel this operation and back to INITIAL menu page.

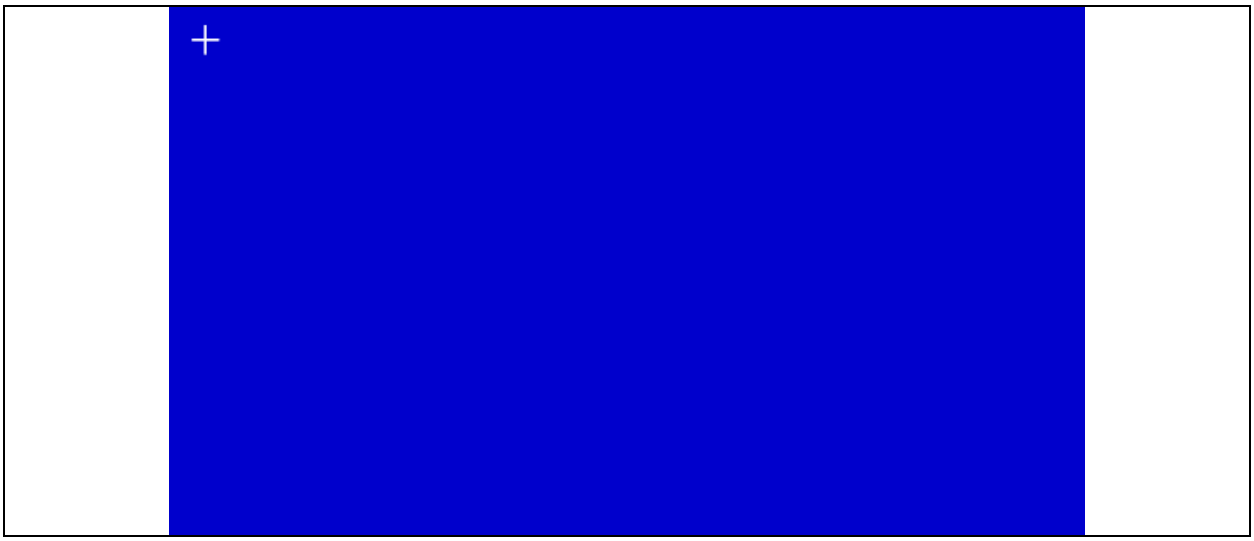
Figure 3.47 Initial CALI Screen

- CALI: After clicking “CALI”, it will pop up a message board as shown in above screen. Touch “YES” to restore default calibration value. Touch “Back” or “No” to cancel this operation and back to INITIAL menu page.

Figure 3.48 Initial EEPROM Screen

- **EEPROM:** After clicking “EEMPROM”, it will pop up a message board as shown in above screen. Touch “YES” to clear all setting value in EEPROM. Touch “Back” or “No” to cancel this operation and back to INITIAL menu page.

Figure 3.49 Initial TOUCH CALI Screen



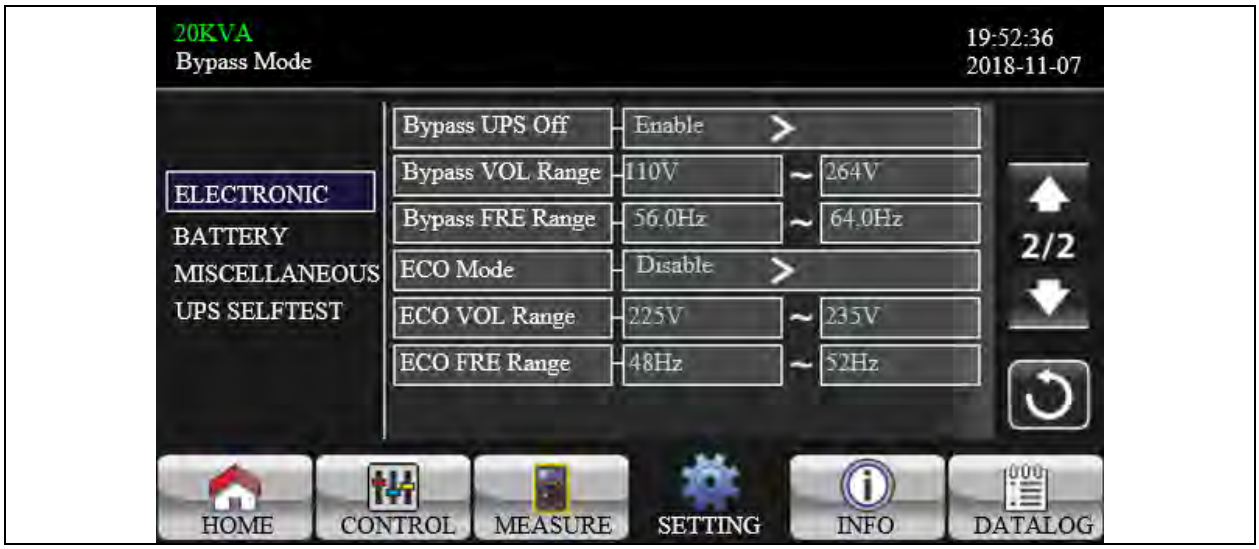
- **TOUCH CALI:** After pressing the confirmation window, it will pop up as shown in above screen. Touch screen to recalibrate. Then, the blue screen appears and click on the cross on the touch screen.

Electronic

Figure 3.50 Electronic Setting Screen 1

1. Output VOL: Select the output rated voltage.
    a. When UPS is HV system, there are four options, 208V , 220V ,230V and 240V.
    b. When UPS is LV system, there are two options, 120V and 127V.
2. Output FRE: Select output rated frequency.
    a. 50Hz: The output frequency is setting for 50Hz.
    b. 60Hz: The output frequency is setting for 60Hz.
3. CVCF Mode (constant voltage and constant frequency function)
    a. Enable: CVCF function is enabled. The output frequency will be fixed at 50Hz or 60Hz according to setting of “Output Freq.”. The input frequency could be from 46Hz to 64Hz.
    b. Disable: CVCF function is disabled. The output frequency will synchronize with the bypass frequency within 46~54Hz for 50Hz system or within 54~64Hz for 60Hz system. Disable is the default setting.
4. Bypass Forbid:
    a. Enable: Bypass Forbid is enabled. It’s not allowed for running in Bypass mode under any situations.
    b. Disable: Bypass Forbid is disabled. UPS will run in Bypass mode. It is the default setting.
5. Neutral Line Check: Check if neutral line is correctly connected or not.
    a. Disable: Disable the neutral loss detection function. The UPS will not detect the neutral loss or not.
    b. Auto: The UPS will automatically detect the neutral is lost or not. If neutral loss is detected, an alarm will be generated. If the UPS is turned on, it will transfer to battery mode. When neutral is restored and detected, the alarm will be muted automatically and the UPS will go back to normal mode automatically.
    c. Check: The UPS will detect the neutral loss or not only when first commission. If neutral loss is detected, an alarm will be generated. If the UPS is turned on, it will transfer to battery mode. When neutral is restored, the alarm will NOT be muted automatically and the UPS will NOT go back to normal mode automatically. Make sure to enter this selection and restart the UPS again to mute alarm.
6. ISO Compensation:
When UPS is connected to output isolation, it will compensate the output voltage.

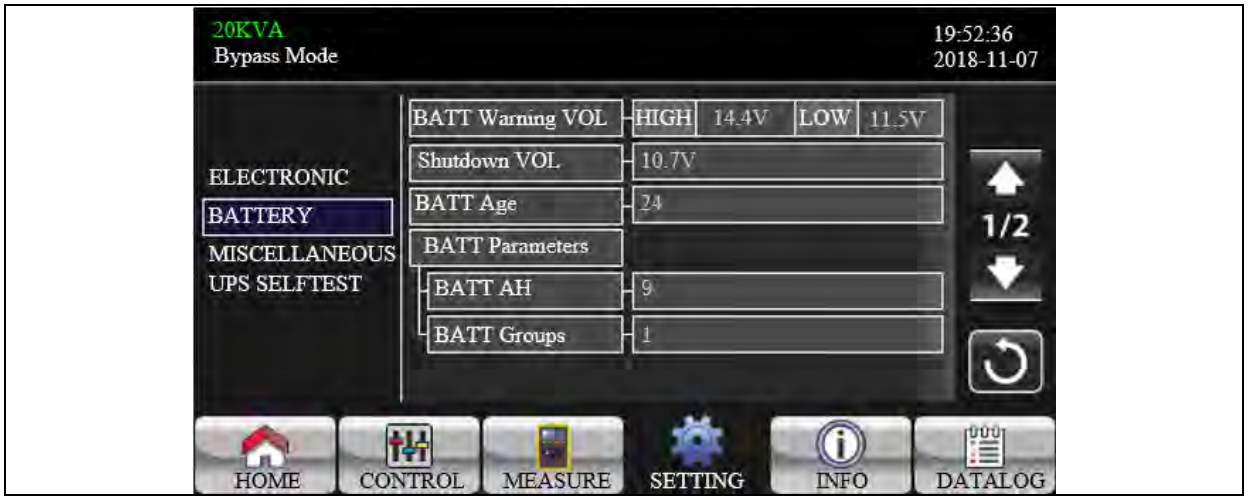
Figure 3.51 Electronic Setting Screen 2



1. Bypass UPS off: Select the bypass status when manually turning off the UPS. This setting is only available when "Bypass forbid" is set to "Disable".
    a. Enable: Bypass enabled. When selected, bypass mode is activated.
    b. Disable: Bypass disabled. When selected, no output through bypass when manually turning off the UPS. To protect power continuity on output load, when UPS fault or UPS transfers to bypass due to overload on AC mode, the UPS will force to turn on bypass output by default.
2. Bypass VOL Range: Set the bypass voltage range.
    a. L: Low voltage point for bypass. The setting range is 176V ~ 209V when the UPS is HV system. The setting range is 96V ~ 110V when the UPS is LV system.
    b. H: High voltage point for bypass. The setting range is 231V ~ 264V when the UPS is HV system. The setting range is 139V ~ 146V when the UPS is LV system.
3. Bypass FRE Range: Set the bypass frequency range.
   The acceptable bypass frequency range from 46Hz to 54Hz when UPS is 50Hz system and from 56Hz to 64Hz when UPS is 60Hz system.
4. ECO mode: Enable/Disable ECO mode. Default setting is "Disable".
5. ECO VOL Range: Set the ECO voltage range.
    a. L: Low voltage point for ECO mode. The setting range is from (Rated output voltage – 5V) to (Rated output voltage - 11V). "Rated output voltage – 5V" is default setting.
    b. H: High voltage point for ECO mode. The setting range is from (Rated output voltage + 5V) to (Rated output voltage + 11V). "Rated output voltage + 5V" is default setting.
6. ECO FRE Range: Set the ECO frequency range. The setting range is from 48Hz to 52Hz when the UPS is 50Hz system and from 58Hz to 62Hz when the UPS is 60Hz system.

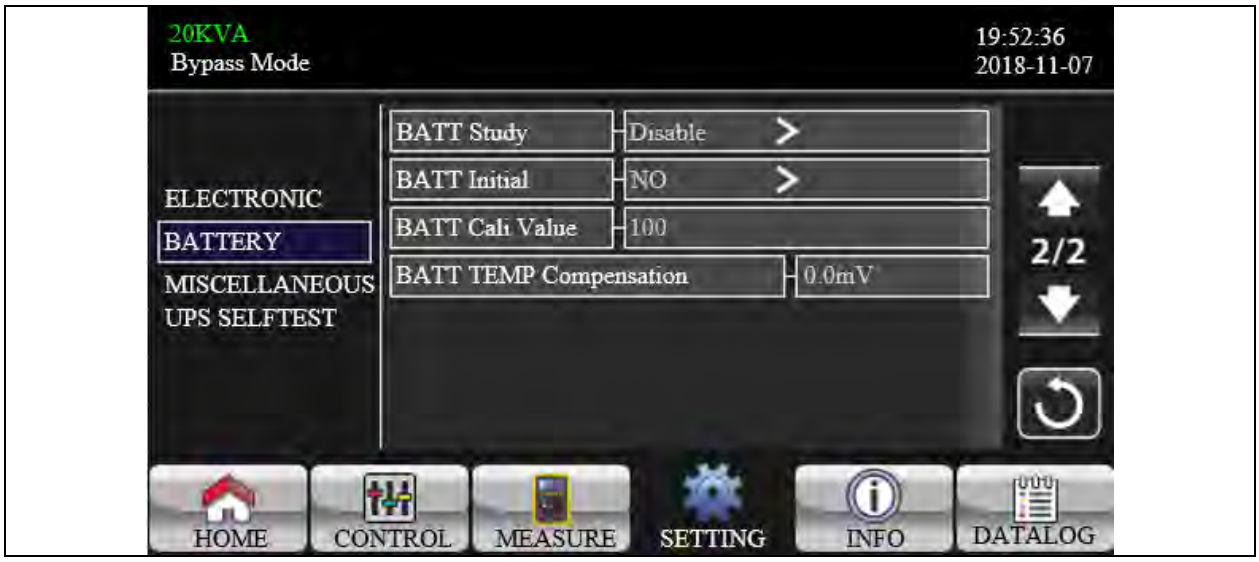
Battery

Figure 3.52 Battery Setting Screen 1



1. Battery Warning VOL:
   a. HIGH: High battery warning voltage. The setting range is 14.0V ~ 15.0V per battery block. 14.4V is default setting.
   b. LOW: Low battery warning voltage. The setting range is 10.1V ~ 14.0V per battery block. 11.4V is default setting. This parameter setting is related to “Shutdown Voltage” setting. The setting value should be higher than “Shutdown Voltage” setting.
2. Shutdown VOL: If battery voltage is lower than this point in battery mode, inverter will automatically shut down. The setting range is 10.5V ~ 12.0V per battery block. 10.7V is default setting.
3. BATT Age: Set up battery age.
4. BATT Parameters:
   a. BATT AH: setting battery capacity.
5. BATT Groups: setting battery groups.

Figure 3.53 Battery Setting Screen 2



1. **Battery Study:** When battery aging occurs, this function is to calibrate backup time estimation. It's a self-learning function for battery. Currently, this function is not available.
    a. **Enable:** When enabled, UPS will enter battery test mode one time. It will calibrate backup time estimation by calibrating battery virtual capacity according to a complete charging and discharging process.
    b. **Disable:** When disabled, the backup time will not be updated during the charging and discharging process.
2. **Battery Initial:**
    a. **Yes:** When selected, the battery virtual capacity will be initialized to 100%. Because battery study is a self-learning function, after the battery is used for a long time, the virtual capacity of the battery will be continuously updated based on each full charging process. After replacing the new battery, the virtual capacity of the battery needs to be initialized.
    b. **No:** When selected, the virtual capacity of the battery will not be initialized.
3. **BATT Cali Value:** Calibrate backup time.
4. **BATT TEMP Compensation:** Compensate charging voltage according to battery temperature.

Miscellaneous

Figure 3.54 Miscellaneous Setting Screen

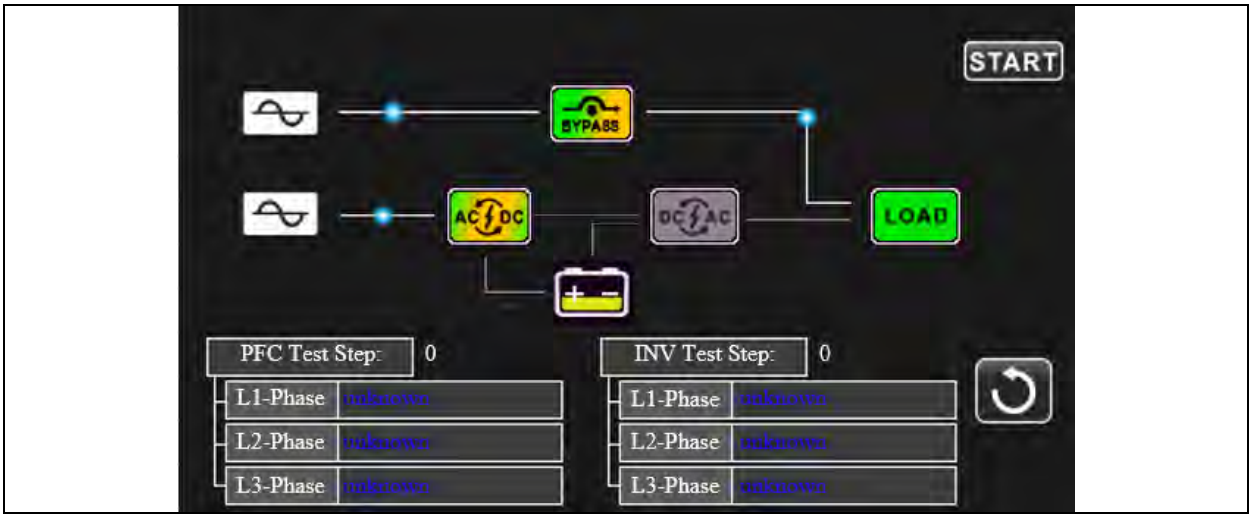
1. Auto Restart:
   a. Enable: After "Enable" is set, no matter what the UPS previous status is, the UPS will restart to Online mode automatically after utility restores.
   b. Disable: After "Disable" is set, the UPS will operate normally. If the UPS shuts down due to low battery, the UPS will still restart to online mode after utility restores. If the UPS was turned OFF manually and the utility restores, the UPS will switch to standby mode or bypass mode depends on the UPS configuration.

WARNING! The default setting is Disable. Setting to Enable exposes personnel to risk of injury or death.

2. Shutdown Delay: UPS will shut down in setting minutes. The countdown will start after confirming the pop-up screen.
3. Restore Delay: UPS will automatically restart in setting minutes after the UPS shuts down.
4. New Password: Set up new password to enter "ADVANCE →User" menu page.
5. Default User Password:
   a. YES: After "YES" is set, User password will restore default setting value.
   b. NO: After "NO" is set, the UPS will cancel this operation.
6. Battery Lock: Currently, this setting is not available.

UPS Self Test

Figure 3.55 UPS Self Test Screen



NOTE: This operation should be performed only from Vertiv qualified personnel.

This function is only effective when UPS type setting is HV. Therefore, disconnect all loads and utility first before executing this function. Then, please change UPS type to HV. For the detailed operation, please check System Parameter menu under Advance→Maintainer directory.

After changing UPS type to HV, you have to restart the UPS. After the UPS is restarted, enter Advance screen and enter Maintainer password. It will show “UPS SELFTEST” selection in the screen. In the screen, all tested items are shown “unknown”. Simply click “UPS SELFTEST” button, the UPS will start self-test. If the UPS is normal, it will show “Normal” in all columns. Otherwise, “Unknown” will be displayed in the columns.

After the UPS self-test passes, the screen will be black automatically. If the UPS self-test is abnormal, it will stop on the abnormal screen. At this time, the maintenance personnel should repair the UPS according to the self-test instructions. Check local dealer for self-test instructions.

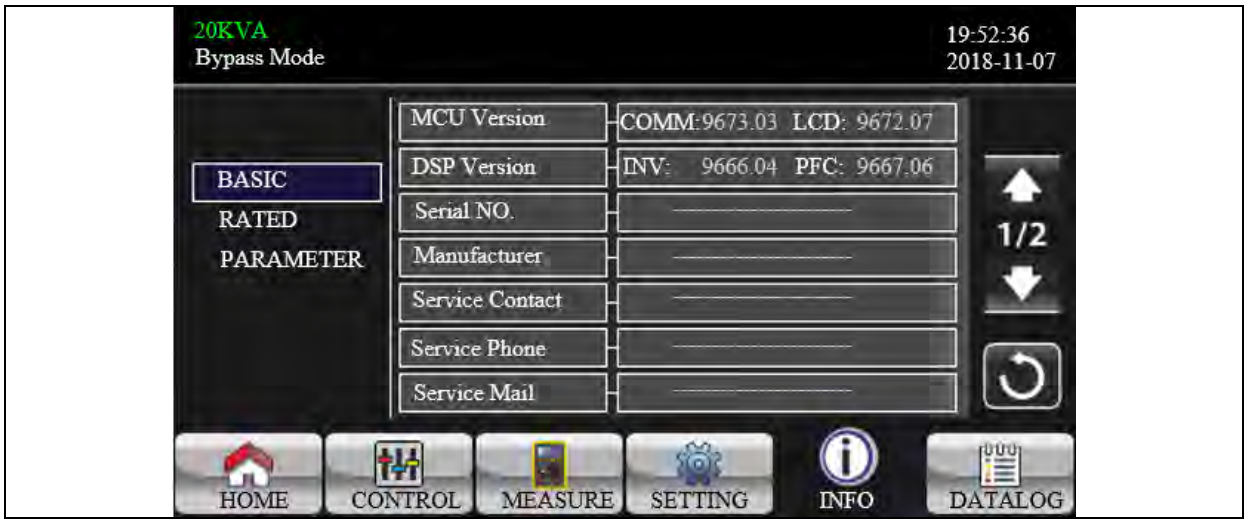
3.3.5 Information Screen

Touch the icon 

to enter information page. Touch the icon  or  to browse information. Touch the icon 

to return to main screen. Touch the icon  to go back to previous menu.

Figure 3.56 Basic Information Screen 1



Basic Information

1. **MCU Version:** MCU version.
2. **DSP Version:** DSP version.
3. **Serial NO.:** The serial number of UPS.
4. **Manufacturer:** The information about manufacturer.
5. **Service Contact:** The contact's name is set in “Basic Setting”.
6. **Service Phone:** The listed numbers are set in “Basic Setting”.
7. **Service Mail:** The service email account is set in “Basic Setting”.

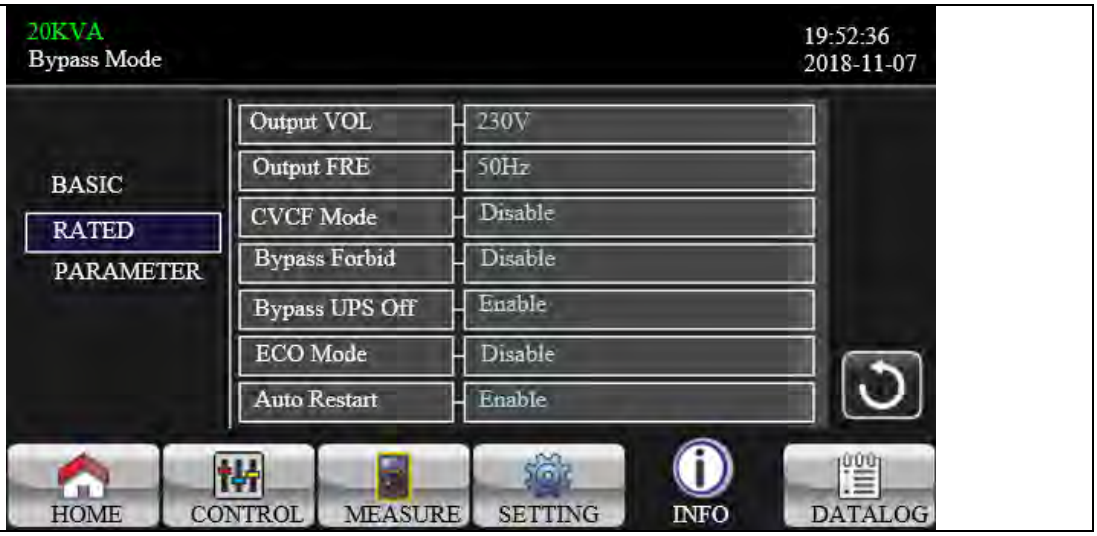
Figure 3.57 Basic Information Screen 2

1. **PAR State**: The information of parallel status.
2. **PAR ID:** The UPS ID number in parallel status.
3. **Customer Code:** Customer code.
4. **Dynamic Password:** Enable/disable dynamic password.

NOTE: In case the dynamic password is enabled, the Maintainer password will become dynamic and will change every day. In order to get this password, then, it will be necessary to contact your local dealer and the provided password will be valid only for that day.

Rated Information

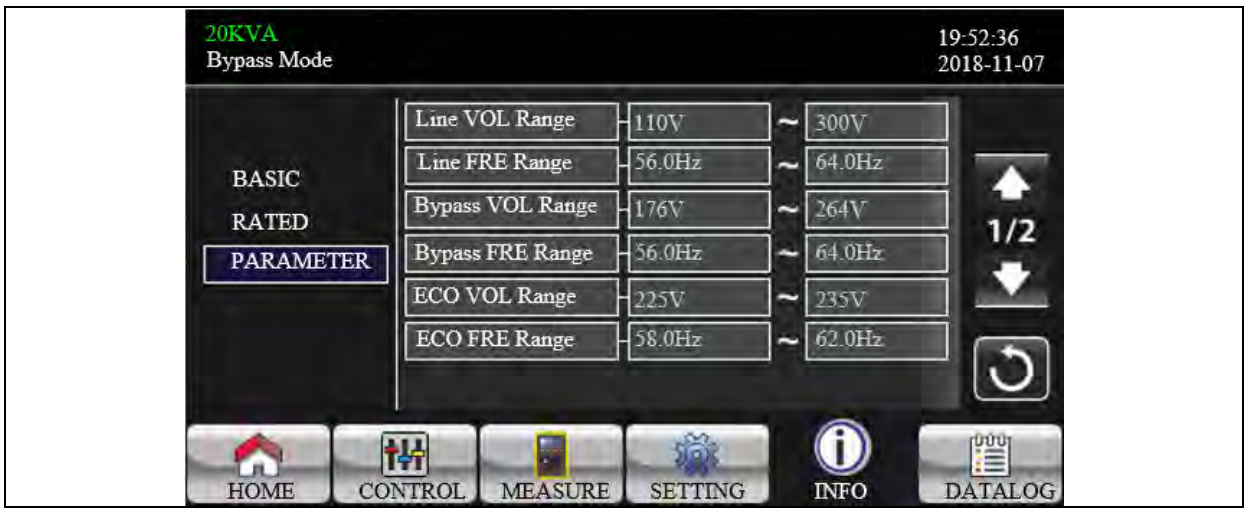
Figure 3.58 Rated Information Screen



1. **Output VOL:** It shows output rated voltage.
2. **Output FRE:** It shows output rated frequency.
3. **CVCF Mode:** Enable/Disable CVCF mode.
4. **Bypass Forbid:** Enable/disable bypass function.
5. **Bypass UPS Off:** Enable/disable auto bypass function when UPS is off.
6. **ECO Mode:** Enable/disable ECO function.
7. **Auto Restart**: Enable/disable auto-restart function.

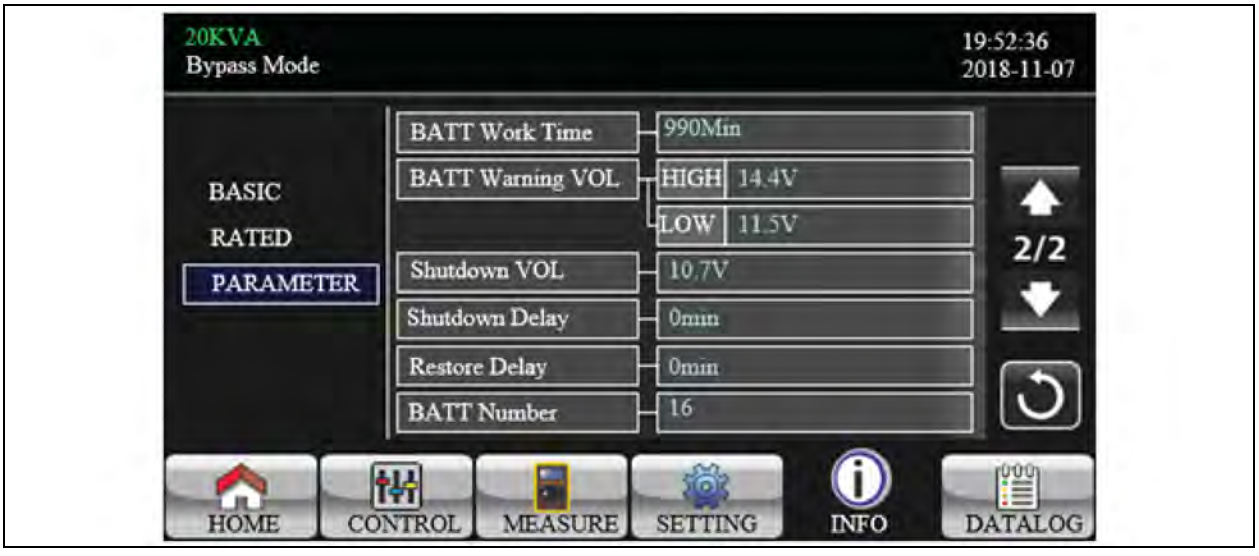
Parameter Information

Figure 3.59 Parameter Information Screen 1



1. Line VOL Range: The acceptable line input voltage range.
2. Line FRE Range: The acceptable line input frequency range.
3. Bypass VOL Range: The acceptable input voltage range for bypass mode.
4. Bypass FRE Range: The acceptable input frequency range for bypass mode.
5. ECO VOL Range: The acceptable input voltage range for ECO mode.
6. ECO FRE Range: The acceptable input frequency range for ECO mode.

Figure 3.60 Parameters Information Screen 2



1. BATT Work Time: The maximum discharge time in battery mode.
2. BATT Warning VOL:
   a. HIGH: High battery warning voltage.
   b. LOW: Low battery warning voltage.

3. **Shutdown VOL**: If battery voltage is lower this point, UPS will automatically shut down.
4. **Shutdown Delay:** UPS will shut down in setting minutes. The countdown will start after confirming the pop-up screen.
5. **Restore Delay:** UPS will automatically restart in setting minutes after the UPS shuts down.
6. **BATT Number:** It shows battery number.

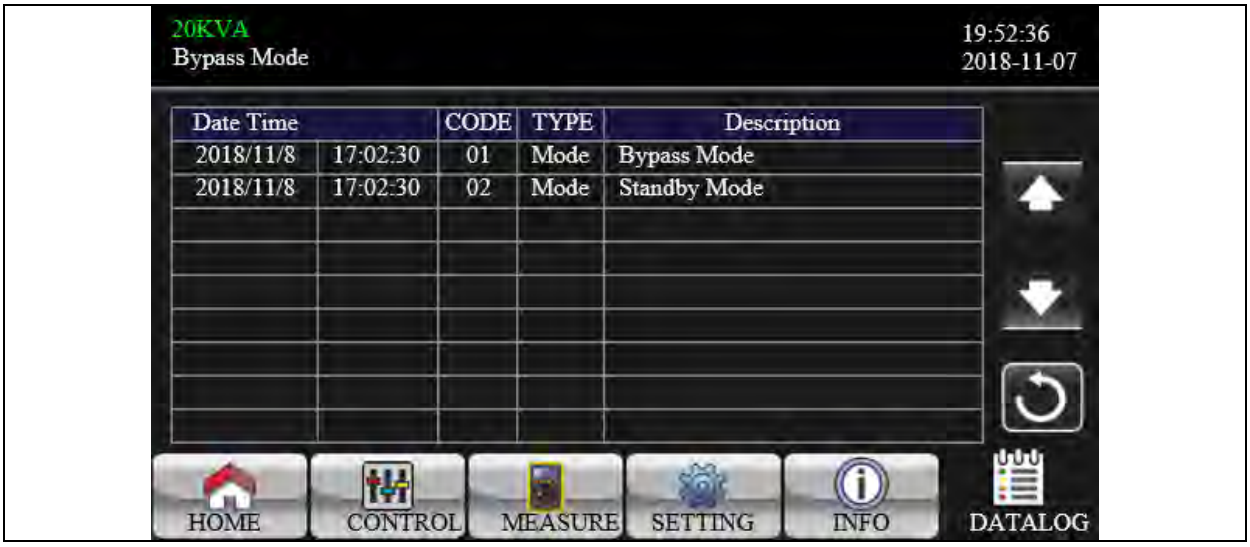
3.3.6 Data Log Screen

Touch the icon 

to enter date log page. Data log is used to record the warning and fault information of the UPS. The record contains date & time, code, type, and description. Touch the icon  or  to page up or down if there are more than one page in the date log. Touch the icon 

to return to main screen. Press the icon  to go back to main menu. Refer Warning Code on page 75 and Fault Code on page 75 for warning and fault code list.

Figure 3.61 Data Log Screen



3.4 Single UPS Operation

Turn on the UPS with utility power (in AC mode):

1. After power mains is connected correctly, set the breaker of the battery pack to ON position (in case of external battery). Then set the output breaker, bypass input breaker, and line input breaker to ON position in this order. At the same time the fan will start running and the UPS will start initialization. In just a few seconds, the UPS will supply power to the loads via the bypass mode.

NOTE: When UPS is in Bypass mode, the output voltage will be directed from mains after you switch on the input breaker. In Bypass mode, the load is not protected by the UPS. To protect your devices, you should turn on the UPS. Refer to next step.

2. Touch CONTROL and select UPS on/off icon. It will show Turn on UPS? in screen and select Yes. See **Figure 3.13** on page 37 .

3. In just a few seconds, the UPS will enter into AC mode. If the mains is abnormal, the UPS will operate in Battery mode without interruption.

NOTE: When the UPS runs out battery, it will shut down automatically in Battery mode. When the mains is normalized, the UPS will auto restart in AC mode.

Turn on the UPS without utility power supply (in battery mode):

1. Make sure that the required strings of batteries are connected correctly in order of +,GND,- terminals and the breaker of the battery pack is at ON position (in case of external battery).
2. Turn ON the output breaker.
3. Press the *COLD START* button to wake up the LCD screen first. Touch *CONTROL* and select *UPS on/off* icon. It will show Turn on UPS? in screen and select Yes. See Figure 3.13 on page 37.
4. In just a few seconds, the UPS will be turned on and enter into battery mode.

Connect devices to UPS:

After the UPS is turned on, you can connect devices to the UPS.

1. Turn on the UPS first and then switch on the devices one by one. The LCD panel will display total load level.
2. If it is necessary to connect the inductive loads such as a printer, the in rush current of the load should be calculated carefully to see if it meets the overload capability of the UPS. Any load more than 150% over designed capacity the runtime will be less than 60ms.
3. If the UPS is overload, the buzzer will beep twice every second.
4. When the UPS is overload, remove some loads immediately. It is recommended to have the total loads connected to the UPS less than 80% of its nominal power capacity to prevent overload for system safety.
5. If the overload time is over acceptable time listed in spec in AC mode, the UPS will automatically transfer to Bypass mode. After the overloading was resolved, it will return back to AC mode. If the overload time is over acceptable time listed in spec in Battery mode, the UPS will enter fault status. At this time, if bypass is enabled, the UPS will power to the load via bypass. If bypass function is disabled or the input power is not within bypass acceptable range, it will cut off output entirely.

Charge the batteries:

1. After the UPS is connected to the mains and turned on in AC mode, the charger will charge the batteries automatically except in battery mode, during battery self-test, overload or when battery voltage is high.
2. It is recommended to charge batteries for at least 10 hours before operation. Otherwise, the backup time may be shorter than expected.

Battery mode operation:

1. When the UPS is in Battery mode, the buzzer will sound according to different battery capacity. If the battery capacity is more than 25%, the buzzer will beep once every 4 seconds. If the battery voltage drops to the alarm level, the buzzer will beep once every sec to remind users that the battery is at low level and the UPS will shut down imminently. Users could switch off some non-critical loads to disable the shutdown alarm and prolong the backup time. If there is no more load to be switched off, you have to prepare shutdown procedure to preserve working data or devices. Otherwise, there is a risk of data loss or load failure.
2. In Battery mode, users can touch SETTING → Basic → Audio Mute to enable Mode Mute to disable the buzzer.
3. In case of external battery installation, the backup time depends on the external battery capacity.
4. The backup time may vary from different operating temperature and load type.

5. When setting discharging time for 16.5 hours (default value from LCD menu), after discharging 16.5 hours, UPS will shut down automatically to protect the battery.

Test the batteries:

1. If you need to check the battery status when the UPS is running in AC mode/CVCF mode, you could touch "CONTROL" and select "Battery Test". See Figure 3.15 on page 38 .
2. Users also can set battery self-test through monitoring software.

Turn off the UPS with utility power supply in AC mode:

1. Touch CONTROL and select On/Off UPS icon. It will show Turn off UPS? in screen and select Yes. See Figure 3.14 on page 37 .

NOTE: If the UPS has been set to bypass output, it will bypass voltage from the mains to output terminal even though you have turned off the UPS (inverter).

NOTE: After turning off the UPS, be aware that the UPS is working in Bypass mode, there will be risk of power loss for connected devices.

NOTE: If the Auto Restart is set to Enable (see Auto Restart: on page 63) the inverter will start automatically to online mode if utility power is removed and restored.

2. In Bypass mode, output voltage of the UPS is still present. In order to cut off the output, switch off the bypass input breaker. The LCD display will turn off and UPS is now completely off.

Turn off the UPS without utility power supply in Battery mode:

1. Touch "CONTROL" and select "On/Off UPS" icon. It will show "Turn off UPS?" in screen and select "Yes". See Figure 3.14 on page 37 .
2. Then UPS will cut off power to output terminals.

WARNING! If the Auto Restart is set to Enable (see Auto Restart: on page 63) the inverter will start automatically to online mode when utility is removed and restored.

Mute the buzzer:

1. Touch "SETTING" and select "BASIC" item. There are two events available to mute. See Figure 3.25 on page 43 .
2. Some warning alarms can not be muted unless the error is fixed. Refer to Single UPS Operation on page 68 for details.

Operation in warning status:

1. When warning code flashes and the buzzer beeps once every second, it means that a warning event occurs on UPS. Users can read the warning messages from DATA LOG menu. Refer to the Troubleshooting on page 79 .
2. Some warning alarms can not be muted unless the error is fixed. Refer to Single UPS Operation on page 68 for details.

Operation in Fault mode:

1. When fault code lights on the LCD screen and the buzzer beeps continuously, it means that there is a fatal error with the UPS. Users can get the fault code from DATA LOG menu. Refer to the Troubleshooting on page 79 for details.

2. Check the loads, wiring, ventilation, mains, battery and so on after the fault occurs. Do not try to turn on the UPS again before solving the issues. If the problems persist, contact the distributor or service personnel immediately.
3. In case of an emergency, shut off connections from mains, external battery, and output immediately to avoid damage to the UPS or equipment.

Transfer from Line Mode (AC Mode) to Maintenance Bypass Mode:

This operation should only be performed by maintenance personnel or qualified technicians.

When the UPS needs to repair or service and the load could not be shut off, the UPS needs to be put into maintenance mode.

1. Check inside the Setting Page (Advance section, Password 0000) that the Bypass parameters are set in such a way to allow the transfer on Bypass mode when the UPS is turned OFF. In particular, it is necessary to have:

   Bypass Forbid --> Disable

   Bypass UPS OFF --> Enable

2. Go to CONTROL page and select UPS on/off icon. The screen will show Turn off UPS?. Select Yes.
3. At this point the load will be passed on Bypass and the display will show the indication Bypass Mode.
4. Go to the breakers area on the UPS (rear panel for MTP 20-40kVA, front panel behind the front door for MTP 80kVA) and remove the Maintenance Bypass metallic cover.
5. Put the Maintenance Bypass Switch in ON position. The Load is now supplied from the Maintenance Bypass.
6. Put in OFF position the Line input breaker, the Bypass input breaker and the Output switch. The fans and the LCD will switch OFF. The load, however, is still supplied from the Maintenance Bypass.

Neutral Disconnection

Figure 3.62 Breaker for Vertiv 20k Input Disconnect N

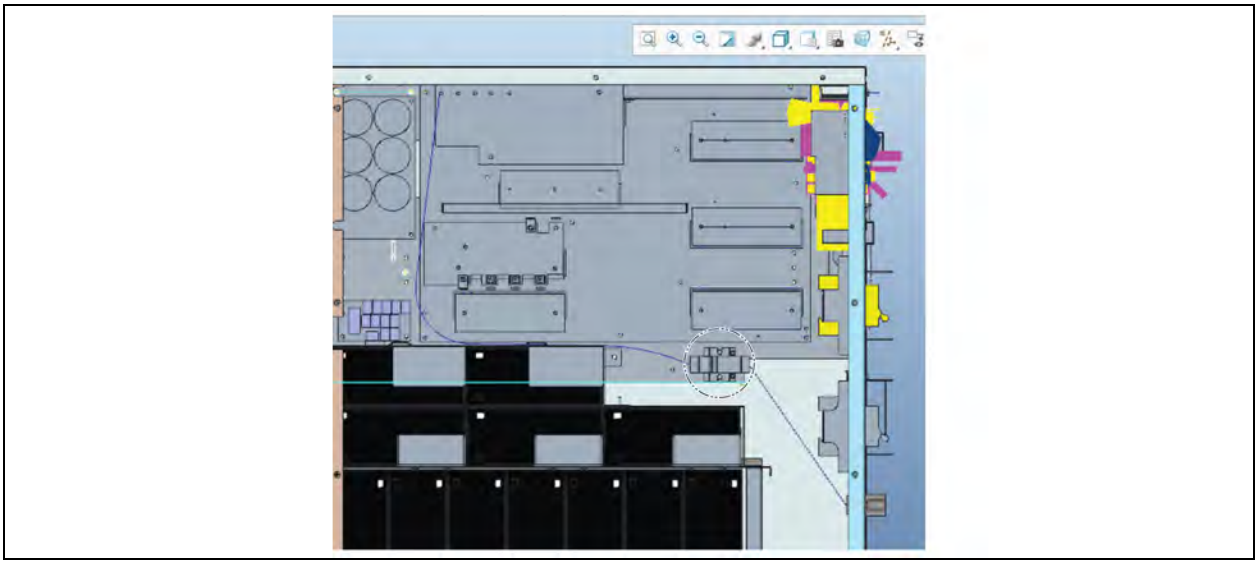


Figure 3.63 Breaker for Vertiv 40k Input Disconnect N

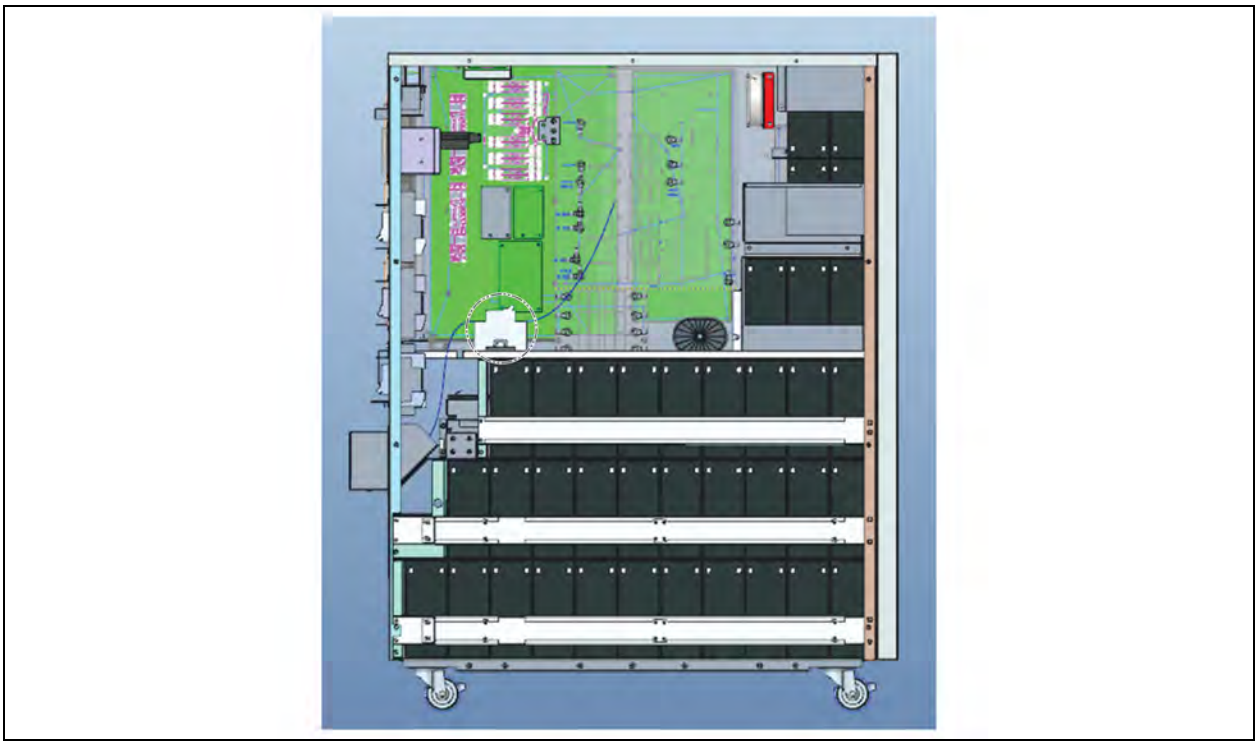
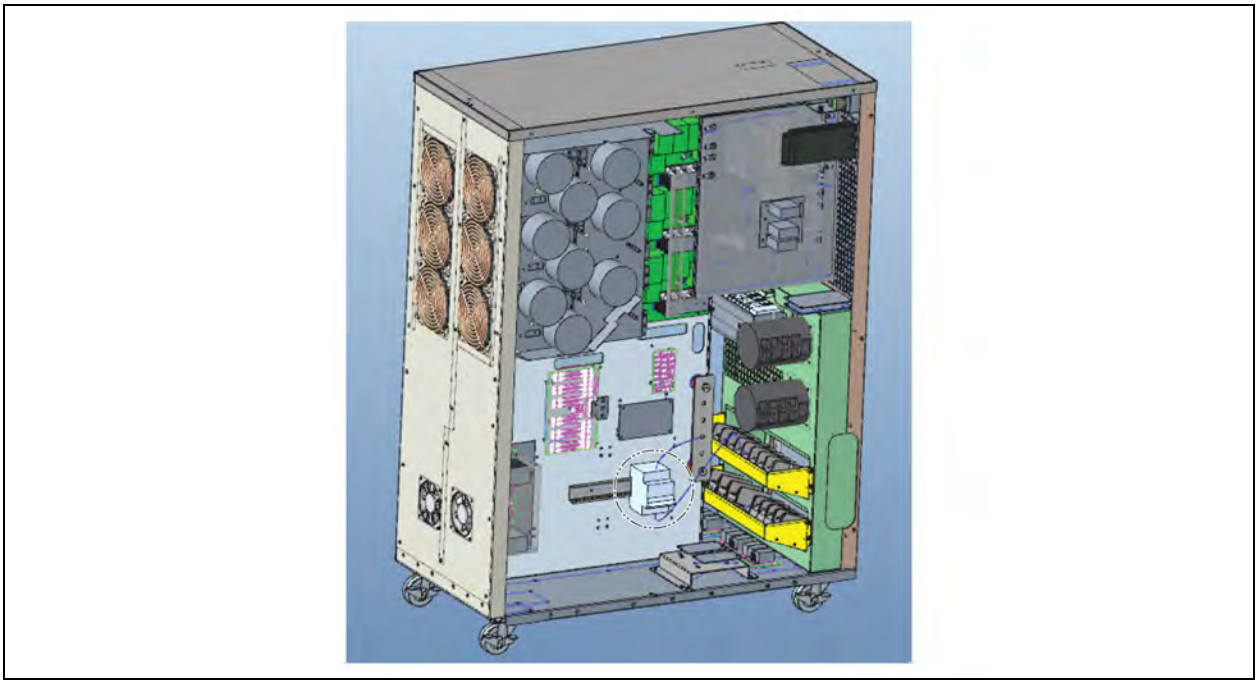


Figure 3.64 Breaker for Vertiv 80k Input Disconnect N



Transfer from Maintenance Bypass Mode to Line Mode:

1. Put in ON position the Line input breaker, the Bypass input breaker and the Output switch. The fans and the LCD will switch ON and the LCD will shown that the UPS is in Bypass Mode.

2. Verify on the Home page of the display that the UPS is in Bypass Mode.
3. Put the Maintenance Bypass Switch in OFF position. The load is still supplied in Bypass mode.
4. Mount back the Maintenance Bypass metallic cover.
5. Go to CONTROL page and select UPS on/off icon. The screen will show Turn on UPS?. Select Yes.
6. In a few seconds, the UPS will turn On and enter into Line mode.

3.5 Parallel Operation

1. Parallel system initial startup

   Make sure that all the running UPSs are parallel models and have the same configuration.

   a. Turn on each UPS in AC mode respectively. Then, measure the inverter output voltage of each phase for each UPS with a multi-meter. Calibrate the inverter output voltage by configuring inverter voltage adjustment (Refer to SETTING→Advance→Maintainer→VOL CALI→Inverter CALI screen) in LCD menu until the inverter output voltage difference of each UPS is within 1V or less.
   b. Turn off each UPS. Then, follow the wiring procedure in UPS Installation for Parallel System on page 22 .
   c. Remove the cover of parallel share current cable port on the UPS, connect each UPS one by one with the parallel cable and share current cable, and then replace the cover.

NOTE: The parallel connection can be realized by connecting the parallel cables in daisy chain or in a closed loop configuration (for higher reliability).

2. Turn on the parallel system in AC mode according to the correct output configuration:

   In case of 3-In 3-Out configuration:

   a. Turn ON the line input breaker and bypass input breaker of each UPS. After all UPS enters into bypass mode, measure the Input voltage and bypass voltage between two UPSs for the same phase to make sure the phase sequence is correct. If these two voltage differences are near to zero, that means all connections are met. Otherwise, check if the wirings are connected correctly.
   b. Go to INFO Sub menu (page 2) and verify that the UPS have automatically set PAR state as Parallel and PAR ID with a different number among the different UPS.
   c. Turn ON the output breaker of each UPS.
   d. Turn ON each UPS from the control page of its own display.
   e. After that all the UPS have received the Turn ON command, they will Turn ON simultaneously.

   In case of 3-In 1-Out configuration (single phase output):

   a. Measure the input voltage and bypass voltage between two UPS for the same phase to make sure the phase sequence is correct. If these two voltage differences are near to zero, that means all connections are met.
   b. Turn on the output input breaker and bypass input breaker of each UPS in this order.
   c. Go to INFO sub menu (page 2) and verify that the UPS have automatically set PAR state as Parallel and PAR ID with a different number among the different UPS.
   d. Turn ON the line input breaker of each UPS.
   e. Turn ON each UPS from the control page of its own display.
   f. After that all the UPS have received the Turn ON command, they will Turn ON simultaneously.

NOTE: If you would like to have more information regarding the parallel operation, contact supplier or service center for detail parallel operation instruction.

3. Remove units from the parallel system:
    a. Go to the CONTROL Page of the Display of the Unit that you would like to remove from the Parallel System and press Exit Parallel. Then press Yes.
    b. At this moment the Inverter of that UPS will be switched OFF. The load will still be supplied from the other UPSs in the Parallel system in Line Mode.
    c. Put in OFF position the Output switch, Bypass Input Breaker and Line Input Breaker of the UPS to be removed from the Parallel system.
4. How to transfer the Parallel System from Line Mode to External Maintenance Bypass:
    a. Go to CONTROL page of each UPS and select UPS on/off icon. The screen will show Turn off UPS?. Select Yes on each UPS.
    b. After that the command has been given to all the UPSs, they will transfer to Bypass Mode simultaneously.
    c. Put in ON position the External Maintenance Bypass Breaker.
    d. You can put in OFF position the Output switch, Bypass Input breaker and Line Input breaker of all the UPSs. The load is supplied from the External Maintenance Bypass.
5. How to transfer the Parallel System from External Maintenance Bypass to Line Mode:
    a. Put in ON position the Line Input breaker, Bypass breaker and Output switch of all the UPSs in parallel. The fans will start running and the LCD Display will be turned ON.
    b. Verify on each UPS that they are running in Bypass Mode.
    c. Put in OFF position the External Maintenance Bypass.
    d. Go to CONTROL page of each UPS and select UPS on/off icon. The screen will show Turn on UPS?. Select Yes on each UPS.
    e. After that all the UPSs have received the Turn ON command, they will Turn ON simultaneously.

Following warnings are applicable only for the Parallel System:

WARNING! Before turning on the parallel system to activate inverter, make sure that all unit's maintenance switch are in off position.

WARNING! When the parallel system is turned on, do not operate the maintenance switch of any unit. But use an external maintenance bypass.

WARNING! The parallel system DOES NOT support ECO mode. Therefore, DO NOT enable ECO mode in any unit.

3.6 Fault Code

Fault Code	Fault Event	Fault Code	Fault Event
01	Bus start failure	45	Charger fault
02	Bus over	46	Incorrect UPS setting
03	Bus under	47	MCU communication failure
04	Bus unbalance	49	Phase error on input and output
06	Converter over current	61	Bypass SCR short circuited
11	Inverter soft start failure	62	Bypass SCR open circuited
12	High inverter voltage	63	Voltage waveform abnormal in L1 phase
13	Low inverter voltage	64	Voltage waveform abnormal in L2 phase
14	Inverter L1 output(line to neutral) short circuited	65	Voltage waveform abnormal in L3 phase
15	Inverter L2 output(line to neutral) short circuited	67	Bypass O/P short circuited
16	Inverter L3 output(line to neutral) short circuited	68	Bypass O/P line to line short circuited
17	Inverter L1-L2 output (line to line) short circuited	69	Inverter SCR short circuited
18	Inverter L2-L3 output (line to line) short circuited	6C	BUS voltage drops too fast
19	Inverter L3-L1 output (line to line) short circuited	6D	Current sampling error value
1A	Inverter L1 negative power fault	6E	SPS power error
1B	Inverter L2 negative power fault	6F	Battery polarity reverse
1C	Inverter L3 negative power fault	71	PFC IGBT over-current in L1 phase
21	Battery SCR short circuited	72	PFC IGBT over-current in L2 phase
23	Inverter relay open circuited	73	PFC IGBT over-current in L3 phase
25	Line wiring fault	74	INV IGBT over-current in L1 phase
31	Parallel communication failure	75	INV IGBT over-current in L2 phase
41	Over temperature	76	INV IGBT over-current in L3 phase
42	DSP communication failure	77	ISO Over temperature fault
43	Overload	78	LCD & MCU communication failure

3.7 Warning Code

Warning Code	Warning Event	Warning Code	Warning Event
01	Battery unconnected	22	Bypass situations are different in parallel system
02	IP Neutral loss	24	Unbalanced load in parallel system
04	IP phase abnormal	33	Locked in bypass after overload 3 times in 30 minutes
05	Bypass phase abnormal	34	Unbalanced converter current

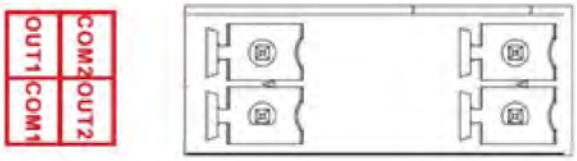
Warning Code	Warning Event	Warning Code	Warning Event
07	Over charge	36	Unbalanced inverter current
08	Low battery	3A	Cover of maintain switch is open
09	Overload	3C	Utility extremely unbalanced
0A	Fan failure	3D	Bypass is unstable
0B	EPO enable	3E	Battery voltage too high
0D	Over temperature	3F	Unbalanced battery voltage
0E	Charger failure	40	Charger short circuited
42	ISO over temperature	41	Bypass loss
21	Line situations are different in parallel system	43	Bus soft start error

3.8 Dry Contact Port

3.8.1 Dry Contacts Output

There are two Output Dry Contacts on MTP 20-40-80kVA.

Figure 3.65 Two Output Dry Contacts



Both of them have programmable function.

The complete list of available functions is the following:

Function	Message	Description
1	Load on inverter	The UPS is working normally.
2	Load on bypass	The UPS is in Bypass mode.
3	Load on Battery	The UPS is in Battery mode.
4	Low battery	The battery voltage is low.
5	Bypass input abnormal	The bypass voltage or frequency is abnormal.
6	Battery test failure	Performs the battery test. The battery test fails.
7	Communication failure	DSP and MCU stop communication
8	Back feed	Back feed feature
9	Output overload warning/shutdown	Connected load is over rated output of the UPS.
10	UPS fault	Ups is in fault

Function	Message	Description
11	UPS warning	UPS is warning, but the UPS can still function normally
12	EPO Active	Urgently power off the UPS.
13	Maintain Bypass	The UPS transfers to Maintain bypass mode.
14	Over temperature warning/shutdown	The temperature is too high.
15	Over Charger	The battery is overcharge
16	Charger Fail	The Charger is in failure
17	Fan Lock	The Fan of ups is in failure
18	Line AC fail	Power failure
19	Inverter Short	UPS output is short
20	Negative Power	There's energy being pumped back into the UPS
21	Summary Alarm	Bypass mode/battery mode/bat open/bypass loss/fault/warning/line fail

The default settings are:

- Out 1: Back feed protection (Function #8)
- Out 2: Summary alarm (Function #21)

Out 1 by default is NO (Normally Open): Normally the contact is open, and when its function is active the pins OUT1 and COM1 will be internally connected.

OUT 2 by default is NO (Normally Open): Normally the contact is open, and when its function is active the pins OUT2 and COM2 will be internally connected.

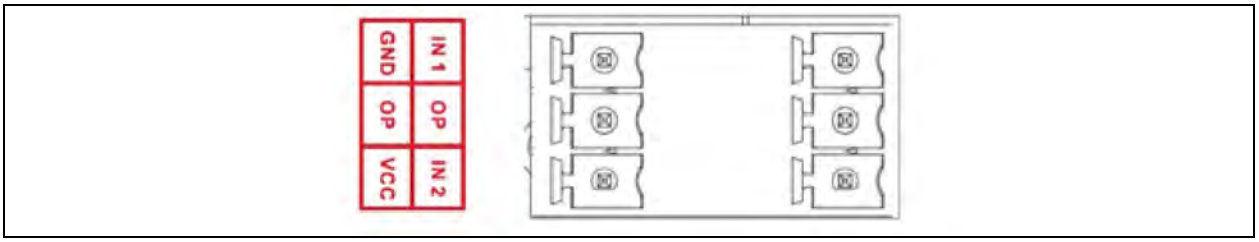
The output dry contacts are rated for max 60V DC and 1 A.

If needed, it is possible to convert the Output Dry Contacts into NC (Normally Closed) and to modify the function assigned to each Output Port. Contact the dealer.

3.8.2 Dry Contacts Input

There are two Input Dry Contacts on MTP 20-40-80kVA.

Figure 3.66 Two Input Dry Contacts



Both of them have fixed function. In particular:

Table 3.1 Definition

Contact	Message	Description
1	BATCB	When battery breaker or switch is disconnected, show an alarm(46).
2	GENERATOR DETECTION	Generator input, give a sign to ups to adapting.

To activate one of these functions it is necessary to connect the “IN” port with the “OP” port and to supply power to this circuit. It is possible to use an External Power Supply (at 5V, 12V or 24V) or the Internal Power Supply provided through VCC and GND. The max input current is 20 mA. When the “External action signal” is closed, the function will be activated.

Choose one the following solutions according to your specific requirements.

Figure 3.67 External Power Supply Solution

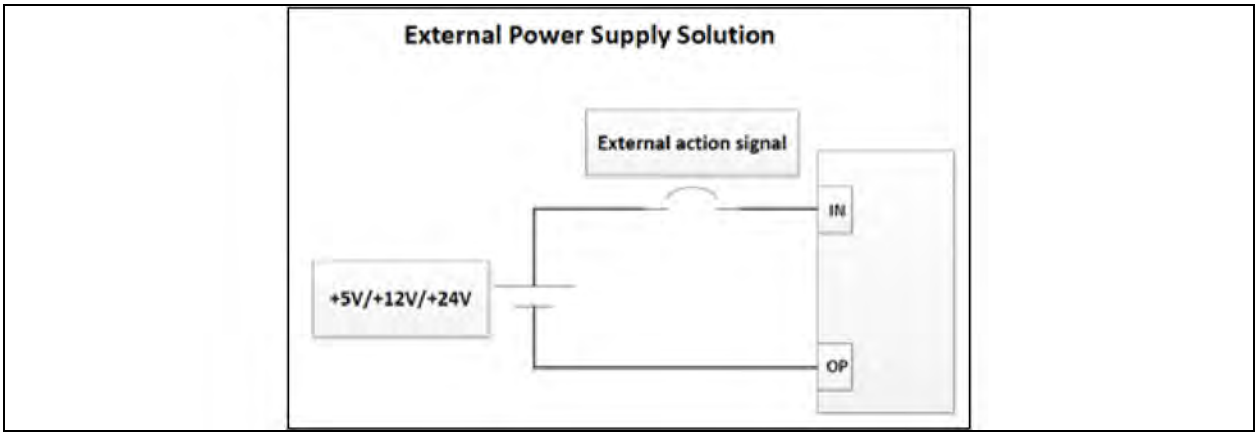
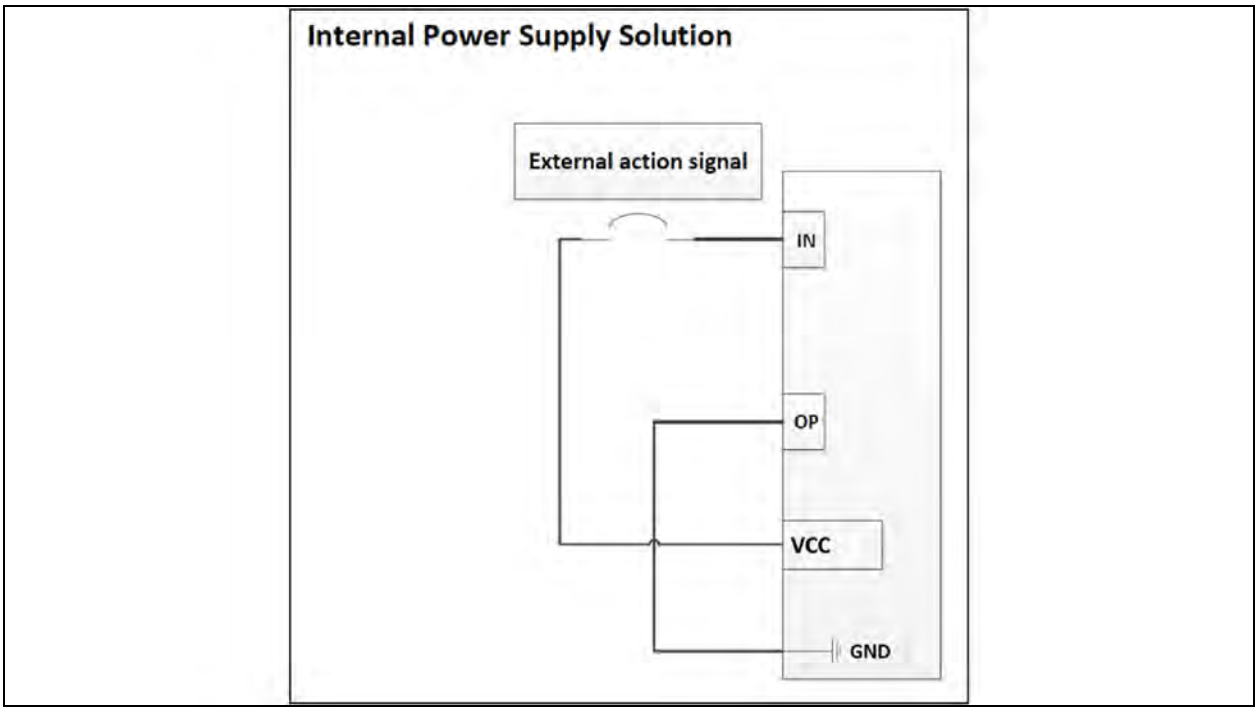


Figure 3.68 Internal Power Supply Solution



4 Troubleshooting

If the UPS system does not operate correctly, solve the problem by using the Table 4.1 below .

Table 4.1 Symptom, Possible Causes and Remedy

Symptom	Possible cause	Remedy
No indication and alarm in the front display panel even though the mains is normal.	The AC input power is not connected well.	Check if input cable firmly connected to the mains.
The warning code 0B.	EPO function is activated. At this time, the EPO switch is in “OFF” status or the jumper is open.	Set the circuit in closed position to disable the EPO function.
The warning code 01.	The external or internal battery is incorrectly connected.	Check if all batteries are connected well.
The warning code 09.	UPS is overload.	Remove excess loads from UPS output.
	UPS is overloaded. Devices connected to the UPS are fed directly by the electrical network via the Bypass.	Remove excess loads from UPS output.
	After repetitive overloads, the UPS is locked in the Bypass mode. Connected devices are fed directly by the mains.	Remove excess loads from UPS output first. Then shut down the UPS and restart it.
Fault code is shown as 43.	UPS is overload too long and becomes fault. Then UPS shut down automatically.	Remove excess loads from UPS output and restart it.
Fault code is shown as 14, 15, 16, 17, 18 or 19,	The UPS shut down automatically because short circuit occurs on the UPS output.	Check output wiring and if connected devices are in short circuit status.
Other fau codes are shown on LCD display and alarm beeps continuously.	A UPS internal fau has occurred.	Contact the dealer
Battery backup time is shorter than nominal value.	Batteries are not fully charged.	Charge the batteries for at least 7 hours and then check capacity. If the problem still persists, consult with dealer.
	Batteries defect	Contact the dealer to replace the battery.
The warning code 0A.	Fan is locked or not working. Or the UPS temperature is too high.	Check fans and notify dealer.
The warning code 02.	The input neutral wire is disconnected.	Check and correct the input neutral connection. If the connection is ok and the warning is still displaying, enter LCD setting menu →ADVANCE→User→Electronic. Then, select “CHE” in Neutral Line Check item and restart the UPS.

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5 Storage and Maintenance

5.1 Storage

Before storage, charge the UPS minimum for 7 hours. Store the UPS covered and upright position in a cool, dry location. During storage, recharge the battery in accordance with the Table 5.1 below .

Table 5.1 Storage Conditions

Storage Temperature	Recharge Frequency	Charging Duration
-25°C to +40°C	Every 3 months	1-2 hours

5.2 Maintenance

WARNING! Risk of electrical shock and hazardous voltage. Can cause damage to the equipment, injury or death to personnel. Extreme caution is required when performing maintenance/repair. Be constantly aware that the UPS system operates with hazardous voltages.

CAUTION: Risk of hazardous voltage. Can cause equipment damage, injury or death to personnel. Extreme precaution is required when working with the UPS system as it is connected to the battery packs even after the UPS system is disconnected from the main connection.

WARNING! Risk of electric shock and hazardous voltage. Can cause equipment damage, injury or death to personnel. Disconnect the batteries before conducting any kind of service or maintenance and verify that no current is present and hazardous voltage in the high capability capacitor terminal such as BUS-capacitors.

WARNING! Risk of electric shock and hazardous voltage. Can cause equipment damage, injury or death to personnel. Servicing of batteries should be performed or supervised by personnel experienced with the batteries and with the required precautions. Keep unauthorized personnel away from the batteries.

WARNING! Risk of hazardous voltage. Verify that no voltage between the battery terminals and the ground is present before maintenance or repair. In this product, the battery circuit is not isolated from the input voltage. Hazardous voltages may occur between the battery terminals and the grounding/earthing.

WARNING! Risk of electric shock and high short-circuit current. It can cause damage to the property and injury or death to personnel. Remove wristwatches, rings, and other metal objects before installation and maintenance or repair. Use tools with insulated handles. Wear rubber gloves and boots during installation and maintenance or repair.

CAUTION: Risk of replacing incorrect type of battery. It can cause damage to the equipment and injury or death to personnel. Replace the batteries with the same number, manufacturer, and type or equivalent. (Contact Vertiv representative for a list of approved batteries).

WARNING! Risk of battery explosion. Do not dispose of batteries in a fire. An explosion can cause injury or death to personnel. Dispose of used batteries according to the local environmental regulations.

WARNING! Risk of injury. Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes. It is toxic. (Need to give some precautions like need to remove watched, rings, metal objects, wear rubber gloves etc.)

CAUTION: Risk of fire and damage to the equipment. Replace the fuse only if it is the same type and amperage.

NOTE: Do not disassemble the UPS system.

Refer to Neutral Disconnection on page 71 for how to transfer on bypass mode in safest way.

6 Specifications

Table 6.1 Specifications

MODEL		10kVA	15kVA	20kVA	30kVA	40kVA	80kVA
CAPACITY*		20kVA / 20KW			40kVA / 40KW		80kVA / 80KW
Input							
Voltage Range	Low Line Loss	110 VAC(Ph-N) ± 3 % at 50% Load; 176 VAC (Ph-N) ± 3 % at 100% Load					
	Low Line Comeback	Low Line Loss Voltage + 10V					
	High Line Loss	300 VAC(L-N) ± 3 % at 50% Load; 276 VAC(L-N) ± 3 % at 100% Load					
	High Line Comeback	High Line Loss Voltage - 10V					
Frequency Range		46Hz ~ 54Hz at 50Hz system 56Hz ~ 64Hz at 60Hz system					
Phase		3 Phase with Neutral					
Power Factor		≧ 0.99 at 100% Load					
Output							
Phase		3 Phase with Neutral					
Output voltage		360 VAC/380 VAC/400 VAC/415VAC (Ph-Ph)					
		208* VAC/220 VAC/230 VAC/240VAC (Ph-N)					
AC Voltage Regulation		± 1%					
Frequency Range (Synchronized Range)		46Hz ~ 54Hz at 50Hz system; 56Hz ~ 64Hz at 60Hz system					
Frequency Range (Batt. Mode)		50Hz ± 0.1Hz or 60Hz ± 0.1Hz					
Overload	AC mode	100%~110%: 60 min; 110%~125%: 10 min; 125%~150%:1 min;>150% : immediately					
	Battery mode	100%~110%: 60 min; 110%~125%: 10 min; 125%~150%:1 min;>150% : immediately					
Current Crest Ratio		3:1 max					
Harmonic Distortion		≦ 2% at 100% Linear Load; ≦ 5% at 100% Non-linear Load					
Transfer Time	Line ←→ Battery	0 ms					
	Inverter ←→ Bypass	0 ms (When phase lock fails, <4 ms interruption occurs from inverter to bypass)					
	Inverter ←→ ECO	<10 ms					
Efficiency							
AC mode		95.5%					
Battery Mode		94.5%					
Battery							

Table 6.1 Specifications (continued)

MODEL		10kVA	15kVA	20kVA	30kVA	40kVA	80kVA
CAPACITY*		20kVA / 20KW			40kVA / 40KW		80kVA / 80KW
Standard Model	Type	12V / 9 Ah			12V / 9 Ah		N/A
	Numbers	(16+16) pcs			(16+16) pcs x 2 strings		
	Recharge Time	9 hours recover to 90% capacity					
	Charging Current (max)	1.0 A ± 10% (Recommended)			2.0 A ± 10% (Adjustable)		
	Charging Voltage	+/-218VDC ± 1%					
Physical							
Standard Model	Dimension, D X W X H (mm)	626 x 250 x 826			780 x 300 x 1000		N/A
	Net Weight (kgs)	139/141			250/260		
Environment							
Operation Temperature		0 ~ 40°C (the battery life will down when > 25°C)					
Operation Humidity		<95 % and non-condensing					
Operation Altitude**		<1000 m**					
Acoustic Noise Level		Less than 62 dB at 1 Meter			Less than 70 dB at 1 Meter		Less than 75 dB at 1 Meter
Management							
Smart RS-232 or USB		Supports Windows® 2000/2003/XP/Vista/2008/7/8/10, Linux, Unix, and MAC					
Optional SNMP		Power management from SNMP manager and web browser					
* Derate capacity to 90% when the output voltage is adjusted to 208VAC.							
** If the UPS is installed or used in a place where the altitude is above than 1000 m, the output power must be derated 1% per 100 m.							
*** Product specifications are subject to change without further notice.							

Appendices

Appendix A: Technical Support and Contacts

A.1 Technical Support/Service in the United States

Vertiv Group Corporation

24x7 dispatch of technicians for all products.

1-800-543-2378

Liebert® Thermal Management Products

1-800-543-2378

Liebert® Channel Products

1-800-222-5877

Liebert® AC and DC Power Products

1-800-543-2378

A.2 Locations

United States

Vertiv Headquarters

505 N Cleveland Ave

Westerville, OH 43082

Europe

Via Leonardo Da Vinci 8 Zona Industriale Tognana

35028 Piove Di Sacco (PD) Italy

Asia

7/F, Dah Sing Financial Centre

3108 Gloucester Road, Wanchai

Hong Kong

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SL-70976_REVC_04-24