PTX33/SP with DMP Operating Manual

The PTX33/SP with DMP Operating Manual consists of the following documents:

Safety Instructions

SAFETY INSTRUCTIONS

The unit must be used as intended. Follow the instructions given in the Operating Manual.

Dangerous voltages are present inside the unit.

Installation and use of this equipment must comply to all national and local regulations and procedures.

To prevent overheating do not obstruct the flow of air for ventilation openings to the unit.

The components inside the unit are not repairable by the user. The user must not open the UPS cabinet or auxiliary cabinets or remove any protective covers from inside the UPS cabinet.

This equipment must be installed and serviced by qualified personnel.

The unit contains Lead-Acid batteries which must be disposed of correctly, in compliance with the local regulations.

To completely isolate the equipment, the switches IRP, IRE, IBY,IUG and IB must be switched off, the input supply and the battery supply must be isolated from the UPS and the output isolated from other modules if the unit is part of a multi-module system. For 10-30kVA units with an internal battery, intermediate links must be removed in order to isolate the battery in sections of a safe working voltage.

High leakage current: connect protective earth before power supply cables.

Safety Instructions

Earth leakage protection: this device has a high leakage current towards protective earthing. The maximum earth leakage current is 300 mA. When setting the threshold of the earth leakage circuit breaker installed upstream from this equipment consider this amount of current and that due to the loads.

All primary power switches installed downstream of the UPS must be labelled as follows: "Isolate UPS (Uninterruptible Power Supply) before working on this circuit."

During electrolysis, batteries release hydrogen gas. There is a risk of an explosion if the amount of hydrogen in the battery room becomes too high. Ensure appropriate ventilation of the battery room according to the standard EN50091-1, to prevent the risk of an explosion.

PTX33/SP with DMP - General System Descrip.

Chapters

Figures

1 UPS Assembly

1 UPS ASSEMBLY

1.1 Features

CE

This equipment complies to the essential requirements of European Directives 89/336/EEC and 73/23/EEC, and complies to EN50091-2 (1995) and EN50091-1 (1991) standards.

UPS Function

The uninterruptible power supply (UPS) is connected between the consumer's critical equipment (the load) and supply mains. Its function is to guarantee a continuous and conditioned power supply to the load. Even in the case of a total blackout it will supply the load for a predetermined time (autonomy time). In addition, the UPS provides the following advantages in comparison with conventional supply systems (mains, motor generator sets, etc.):

Better Output Power Characteristics

The UPS output voltage control of frequency and amplitude guarantees consistent and stabilised output power. Mains voltage fluctuations and frequency changes that are usually present in electricity supply systems do not affect the UPS output voltage.

Uncoupling from Mains Distortion

By using double energy conversion from ac to dc and back to ac and using an isolation transformer in the inverter output, all mains distortions are filtered out. Therefore, all loads connected to the UPS system are protected against mains disturbances that can be present in industrial electricity supply systems. This is especially important for sensitive electronic devices, e.g. computer systems, control systems, medical equipment.

Complete Protection against Mains Failures

During long term or short term ac mains supply interruption, the UPS system guarantees continuous supply to the connected loads by means of a battery. The battery is connected to the rectifier output and the inverter input of the UPS system. In normal operation the inverter (which feeds the load) is fed by the rectifier. In case of a mains failure, the connected battery automatically feeds the inverter. Thus the load is supplied without interruption. However, the load can only be supplied by the battery for a certain time (autonomy time, see chapter 1.4 "Battery"). If longer autonomy times are required, we recommend the use of a Diesel Generator Set. In this case the battery autonomy time only has to be sufficient for the time span between mains failure and full operating capacity of the Diesel-Generator-Set.

This is a class A product.

In a domestic environment, this product may cause radio interference, in which case, the user may be required to take additional measures.

1 UPS Assembly

1.2 UPS System Structure

FIG. 1.1 - UPS Block-Diagram

The basic PTX33/SP power supply unit is an ac/dc/ac converter; the block diagram: Figure 1.1 illustrates six essential functional components:

- Rectifier/battery charger (6 pulse) (RECT.)
- Battery (BATT.)
- Inverter (INV.)
- Static inverter switch (SSI)
- Static bypass (SSB)
- Maintenance bypass (IBY)

All components are located in a single housing. They are explained in detail on the following pages.The control electronics of the rectifier, inverter and static bypass sections are completely independent of each other. i.e. a failure in any one section will not cause a failure in another section.

1.3 Rectifier/Battery Charger

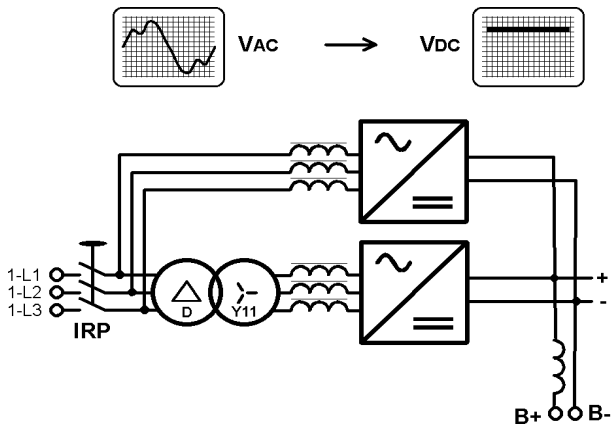
FIG. 1.2 - Rectifier Block-Diagram

In the standard configuration the charger is a three phase/6 pulse rectifier that converts ac voltage to dc voltage. No isolation transformer is used and the rectifier is connected to the mains via the commutation chokes which reduce the mains distortion created by the rectifier. The dc output of the rectifier feeds the inverter and the battery. The battery is connected to the rectifier through a saturation choke which reduces ac ripple current to the battery, thus ensuring the maximum battery life-time.

The rectifier is designed to feed both the inverter at maximum load conditions and simultaneously the battery with maximum charging current. Normally, the battery voltage is constantly regulated at 432 V dc (floating charge, maintenance-free lead battery, 2.25 volts per cell). The rectifier's recharge characteristic is of the I/U type. This means that the recharging current limitation is accomplished by reduction of the dc voltage, thus assuring that the batteries will not be damaged by excessive charging currents.

A 12-pulse rectifier is optional and requires the addition of a second rectifier bridge inside the UPS cabinet and a phase shifting transformer in a separate cabinet.

FIG. 1.3 - 12-pulse Rectifier Block-Diagram



1.4 Battery (Accumulator)

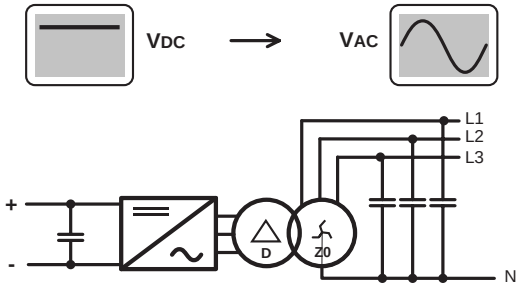
The battery supplies power in case of a short interruption or a total breakdown of the ac mains supply. In case of a rectifier failure (no dc voltage output), the load will be fed by the battery.

The battery is only capable of feeding the load for a certain time (autonomy time), depending on battery capacity and actual load.

The number of cells within the battery depends on the battery type and may also vary due to specific customer requirements. The standard number is 192 cells for lead-acid batteries and 300 cells for NiCd batteries. The battery capacity (Ah) depends on the UPS output power and the required autonomy time. The battery of 10-30kVA units is installed inside the UPS cabinet as standard. For 40-120kVA units (or 10-30kVA units with extended battery autonomy), batteries are installed in external battery cabinets.

1.5 Inverter

FIG. 1.4 - Inverter Block-Diagram



The inverter converts dc voltage supplied by the rectifier or battery to ac voltage of a precisely stabilised amplitude and frequency that is suitable for power supply to most sophisticated electrical equipment.

The inverter output voltage is generated by sinusoidal pulse width modulation (PWM). The use of a high carrier frequency for the PWM and a dedicated ac filter circuit consisting of the transformer and capacitors, ensure a very low distortion of the output voltage (THD<1% on linear loads).

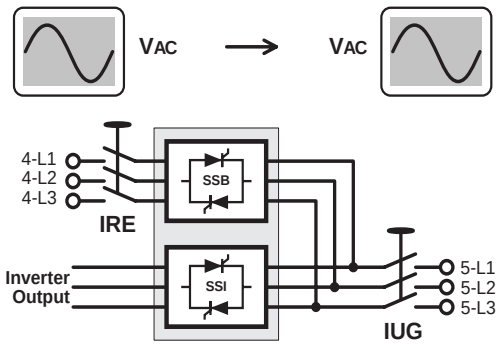
Every phase voltage of the inverter output is controlled separately, thus ensuring constant and equal UPS output voltages even with highly unbalanced loads.

The inverter is designed specifically for the application of today's loads i.e. The output harmonic distortion will be maintained at low levels due to a unique adaptive correction technique, even with the application of highly distorted loads.

The inverter control logic restricts the maximum output current to 150% of the nominal current in case of a short circuit. In case of overload (up to 125% of the nominal current), the output voltage is maintained constant. For higher currents the output voltage is reduced, however, this will only occur if the bypass supply is not available. Otherwise the UPS will switch to bypass operation for currents higher than 110% of the nominal current.

The inverter IGBT transistors are fully protected from severe short circuits by means of a desaturation monitor or "electronic fuse".

FIG. 1.5 - Static Switches Block-Diagram



1.6 Static Switches

The block diagram illustrates the two static switch sections that use thyristors as switching elements. During normal UPS operation, SSI is closed and SSB is open, thus connecting the load to the inverter output.

1 UPS Assembly

During overload or inverter failure conditions, SSI is switched off and SSB is switched on, providing power supply from a backup source (mains, output of another UPS system, diesel generator set....). By always actuating both switches together for a short period, an uninterrupted power supply during the switching is ensured. This is an essential condition to reliably meet all power supply requirements for connected sensitive equipment.

The control for each static switch (SSB and SSI) is performed totally independently of each other, thus ensuring that a failure in one static switch does not affect the other.

Switching Conditions, Inverter - Bypass

The voltage and frequency of the bypass line have to be within set tolerance limits, and the inverters have to be synchronised with the bypass line.

Under inverter failure conditions:

(i) the UPS switches to bypass operation, for a **single unit**. (SSB switches on, and SSI off).

(ii) for **hot-standby units**, the load is commutated to the second inverter, and will switch to bypass only when no inverter is ready to take the load.

(iii) in **parallel systems**, all units switch to bypass operation together only if the load is more than the rated value for the remaining on-line units.

If the conditions above for the bypass line and synchronisation are not met:

- the inverter will continue to operate with reduced output voltage under overload conditions, or
- the inverter will stop if an inverter failure occurs.

  In this second case, the system will:

  (i) commutate to a second standby-inverter in the case of a hot-standby system

  (ii) the remaining inverters will take the load in the case of a parallel-redundant system or,

  (iii) the UPS will commutate to the bypass supply with a very short interruption of 10msec if the supplies are not synchronised, for the case of a single UPS unit.

Under overload conditions, all UPS modules present will switch to the bypass supply, and remain in bypass until the overload is removed.

Switching Conditions, Bypass - Inverter

a) The UPS switches automatically back to inverter operation when inverter voltage and frequency are within tolerance limits, the overload has been removed and the inverter is synchronised with the bypass line (SSI switches on and SSB off).

b) If the UPS unsuccessfully attempts five times within 3 minutes to switch to inverter operation, the UPS remains in bypass operation and signals an alarm. After pressing the reset-button once to reset the audible alarm, it should be pressed a second time to automatically switch back to inverter operation.

c) If the UPS remains blocked on bypass operation and a mains failure occurs, the UPS will switch automatically to inverter operation if the inverter voltage and frequency are within tolerance and the inverter is synchronised to the mains.

1.7 Maintenance Bypass

The maintenance bypass function is to supply power directly to the connected load during UPS maintenance. The bypass consists essentially of one switch IBY.

With PTX33/SP series UPS systems, switching from different operating modes to maintenance bypass can be performed without interruption. With the maintenance bypass on, the UPS system may be completely switched off, thus permitting maintenance work to be carried out safely (there will only be voltage at the input and output terminals and their connections to the circuit-breakers).

In order to prevent erraneous switching of the maintenance bypass switch IBY that could possibly cause parallel connection of the bypass line and the inverter line, IBY is electronically interconnected with the static inverter switch SSI. Thus, during actuation of IBY, switch SSB will be closed and switch SSI opened automatically, preventing parallel operation of the maintenance bypass network and the inverter.

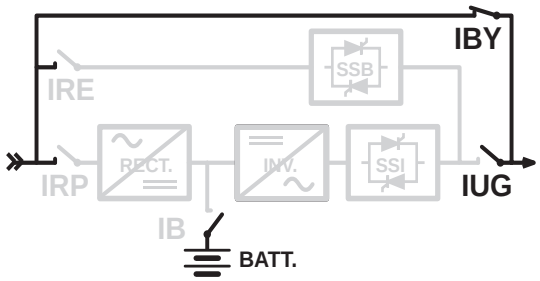


FIG.1.6 Maintenance Bypass Block-Diagram

As an option, an external wall-mounted no-break maintenance bypass switch (see FIG. 1.6.1) may be supplied by Powertronix. This switch provides simple one-step transfer to maintenance bypass (version 1) without the possibility of erraneous switching and without interruption to the load. For the version 2 type maintenance bypass, an additional position is provided in order to completely isolate the UPS with the one bypass switch. In this way, the UPS may be isolated totally from all supply by switching off the input supply to the UPS.

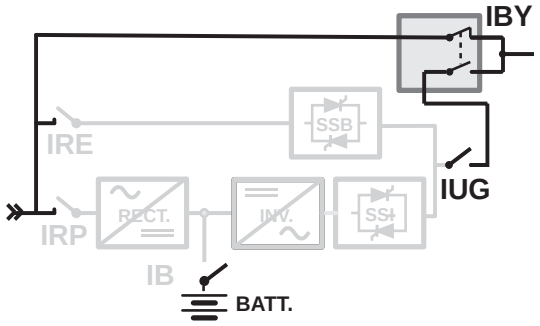


FIG. 1.6.1 Wall-mounted Maintenance Bypass

1.8 Hot-Standby Systems

A hot-standby UPS system basically consists of two (or more) single UPS units which operate independently of each other. Any one unit can be feeding the load at any time.

- All units are continuously in operation; but only one is supplying the load, at any one time.
- In case of a failure in the unit currently supplying the load, another unit is ready to takeover the load without an interruption on the output side. i.e. the load is still supplied with conditioned and stabilised power.
- The load is supplied by the static bypass, only if there is no inverter ready in the system to takeover the load.

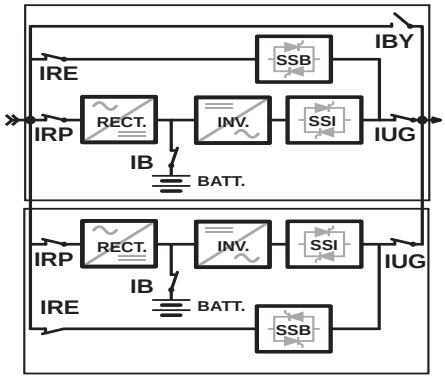


FIG. 1.7 - Hot-Standby Operation - Block Diagram

1 UPS Assembly

1.9 Parallel-Redundant Systems

A parallel UPS system consists of 2 to 8 single UPS units connected in parallel, sharing the load current equally. Each unit has an individual static bypass, thus ensuring also redundancy of the static bypasses in a redundant system, i.e. if one static bypass should fail, the bypass system will still be available.

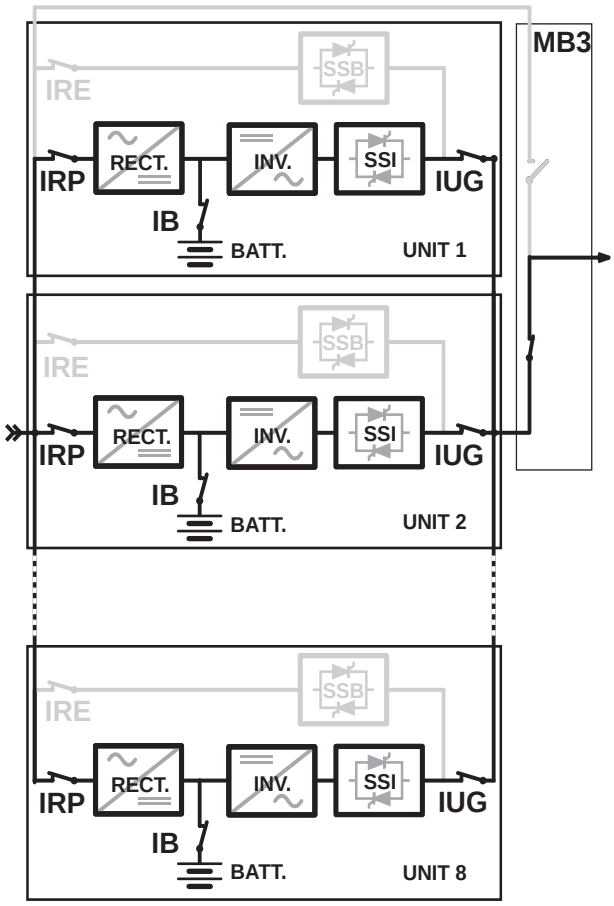
There is no common electronic device for the parallel system. Each unit has its own parallel-operation electronics that controls all of its functions, thus ensuring perfect redundancy.

1.10 Parallel Systems

This is identical to the configuration in section 1.9 except that the rated load is normally equal to the rating of the UPS and there is therefore no redundant unit. UPS units of different kVA ratings may be connected in parallel in this configuration, proportionally sharing the load.

Note that the parallel configuration is identical to the parallel-redundant configuration if the load is reduced to a value such that the system minus one (or more) units is capable of supplying the reduced load. Therefore one (or more) units become redundant and the control is identical.

FIG. 1.8 - Parallel Operation - Block Diagram



2 Operating Panel

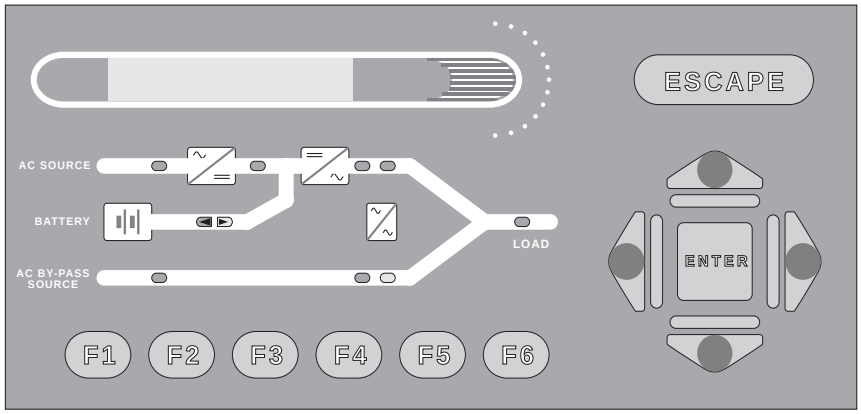
2 OPERATING PANEL

2.1 Functional Description

The Data Monitor Panel (DMP) is the user-interface of UPS. It is a microprocessor controlled panel with alphanumeric display and provides:

- Dialog-controlled operation of the UPS (start-up and shut-down)
- Indication of important values (currents, voltages, frequencies)
- Indication of the UPS status
- Alarm messages
- Remote control by up to 4 remote panels
- Communication with a computer through RS232 interface.

The Data Monitor Panel (DMP) consists of three functional sections:



1 Two-line alphanumeric display

2 Mimic diagram with status LEDs

3 Push-buttons

FIG. 2.1 - S4000 Data Monitor Panel

2.2 Remote Monitoring / Connectivity

The operating panel provides an option to communicate with a computer through RS232 and RS485 interfaces. The RS232 serial interface communicates with a PC or mainframe computer, using a protocol from System Enhancement Corp. (SEC) for the use of off-the-shelf software and can be interfaced with an SNMP adapter. A second communication protocol is available which is compatible with dedicated in-house software from Ptx. With the RS485 interface it is possible to transmit all necessary data up to a distance of 400m or to connect a remote monitoring panel.

2.3 Menus

The operation of the UPS is controlled and monitored by a MAIN MENU and various SUB MENUs.

2 Operating Panel

MAIN MENU

- The MAIN MENU lets the user choose the various functions of the Data Monitor Panel
- In the MAIN MENU the first line of the display always shows the current operating mode of the UPS (see JUE401216 "Operation with DMP").
- A bell-symbol on the right hand side of the first line indicates that an alarm has been activated and is still present.
- The second line always shows the SUB MENU that can be activated by pressing ENTER.

SUB MENUS

- There are 7 SUB MENUS for stand-alone units or 9 SUB MENUS for multi-module systems.
- SUB MENUS can only be activated from the MAIN MENU by pressing ENTER.
- Pressing ESCAPE always de-activates the SUB MENU and reactivates the MAIN MENU.
- In SUB MENUS 1-3 (measurements)
  - The first line of the display shows which measurements are made
  - The second line of the display shows the measured value.
- In SUB MENU 4 (alarm messages)
  - The first line of the display always shows the alarm number (First, Second or last alarm)
  - The second line of the display shows the ALARM message.
- SUB MENUS 5 and 6 (stand-alone units) or SUB MENUS 5, 6, 7 and 8 (multi-module systems) are for operation of the UPS
- SUB MENU 5 "SYSTEM START-UP" is a menu-guided procedure directing the operator on how to correctly start-up the UPS system.
- SUB MENU 6 "SYSTEM SHUTDOWN" for stand-alone units or SUB MENU 7 for multi-module systems is a menu-guided procedure directing the operator on how to correctly shutdown the UPS system (to maintenance bypass).
- SUB MENU 6 "MODULE START-UP" (multi-module systems only) is a menu-guided procedure directing the operator on how to correctly start-up one module only within a multi-module system.
- SUB MENU 8 "MODULE SHUTDOWN" for multi-module systems only is a menu-guided procedure directing the operator on how to correctly shutdown one UPS module only within the system.
- SUB MENU 7 for stand-alone units (or SUB MENU 9 for multi-module systems) "TEST" gives access to internal settings. This access is restricted by a password. This SUB MENU is used for troubleshooting and testing purposes.

2 Operating Panel

2.4 Status Indication

The mimic diagram with integrated LEDs gives an indication of the UPS operating status. In normal operation the green LEDs 1-8 are illuminated and the yellow LEDs 9 and 10 are off.

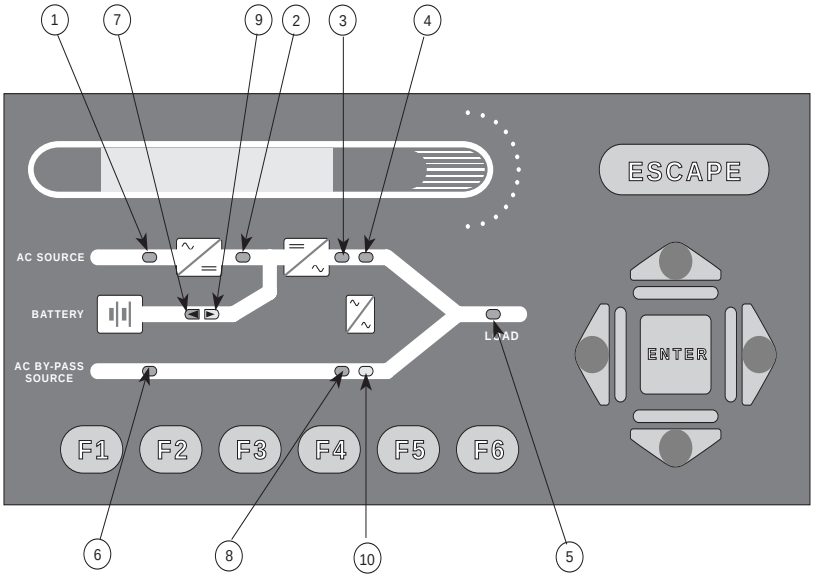


FIG 2.4 -S4000 Status Indication

Illumination of LEDs means:

LED 1 MAINS SUPPLY OK (RECTIFIER)
LED 2 RECTIFIER OK
LED 3 INVERTER OK
LED 4 LOAD FED by INVERTER
LED 5 LOAD IS SUPPLIED
LED 6 BYPASS POWER SUPPLY OK
LED 7 BATTERY CHARGING
LED 8 BYPASS AVAILABLE (ALL CONDITIONS IN ORDER FOR A NO-BREAK TRANSFER)
LED 9 BATTERY DISCHARGING
LED 10 LOAD FED by the BYPASS POWER SUPPLY

2 Operating Panel

2.5 Alarms

The Data Monitor Panel is constantly monitoring the UPS status.

- If a fault occurs in the UPS system, an alarm is activated.
- After a set delay, the UPS and connected Remote Panels activate an audible alarm.
- Pressing F6 at the Data Monitor Panel or by pressing F2 at a connected Remote Panel silences the alarm. However the alarm may be still active. In this case, a bell sign will be shown on the right hand side of the display.
- Alarm message(s) can be read in the respective SUB MENU.
- Alarms are automatically deactivated when the corresponding condition returns to normal.
- Date and time of the last 100 transitions of the monitored alarms (including short transitions where no alarm has been activated) are stored in the RAM of the Data Monitor Panel. This list of alarms can be read in the alarm menu or with a connected PC.

For further details on the Data Monitor Panel refer to the document JUE401216 "Operation with DMP" or for a full technical description: JUE400988 "Technical Description of the Data Monitor Panel".

PTX33/SP with DMP - Install. and Initial Start-Up

Chapters

Figures

PTX33/SP - Install. and Initial Start-Up

Figures (continued)

Tables

1 Installation

1 INSTALLATION

1.1 Mechanical Installation

Equipment Delivery and Storage

After delivery, check equipment for any damage that may have occurred during shipment. The shipper and your Powertronix agency must be notified in writing about damages due to shipment, including a detailed description of visual defects. If you do not wish to install the equipment immediately, please observe the following storage recommendations:

- Store equipment in a vertical position in a well conditioned room, protected against humidity. Do not store the equipment in close proximity to frequently used passageways and keep it away from movable parts.
- If the UPS system is already unpacked, please ensure storage in a clean environment protected from dust, away from heat sources.

Handling the UPS System

The UPS can be simply lifted and moved by means of a lifting truck or a fork lifter for 80-120kVA units. For 10-60kVA units, remove the front side and rear side base sheets and attach two angle irons with 8MA bolts to the right front and rear side of the UPS. The UPS can now be moved with a lifting fork. Remove the angle irons when the UPS is set in the correct position.

Caution: **Secure equipment against being knocked over**

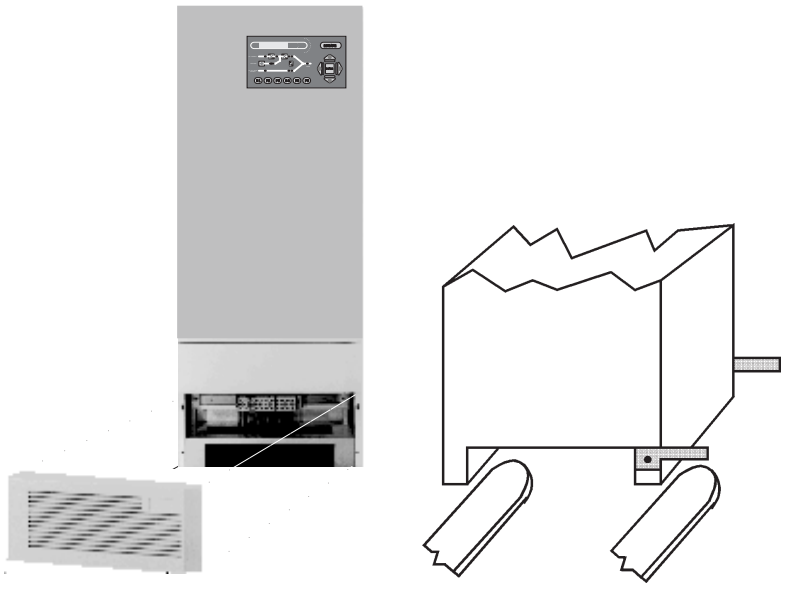


FIG. 1.1.1 Moving the UPS (10-60 kVA units)

Setting Up

The UPS system should be installed in a dry, clean and lockable room. Provisions have to be made to remove heat created by the system. Under all installation conditions, the unrestricted flow of cooling air must be assured.

1 Installation

Weight

Type	Weight without Battery [kg]	Weight with Battery [kg]	Static Load - [kg/m²]
10	310	597	1277(*)
15	310	597	1277(*)
20	335	622	1330(*)
30	350	637	1362(*)
40	480	-	1026
60	520	-	1112
80	810	-	1176
100	840	-	1219
120	870	-	1263

TAB. 1.1.1 UPS weight

Floor Space Required

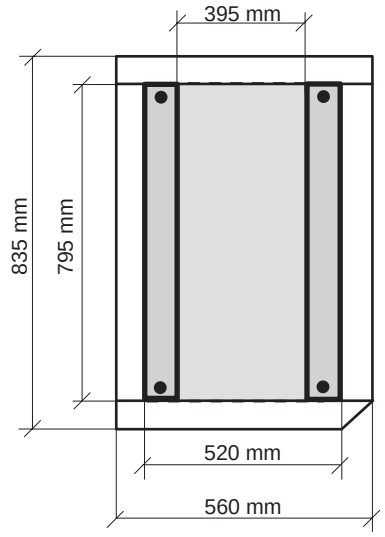


FIG. 1.1.2 10-60kVA UPS floor space

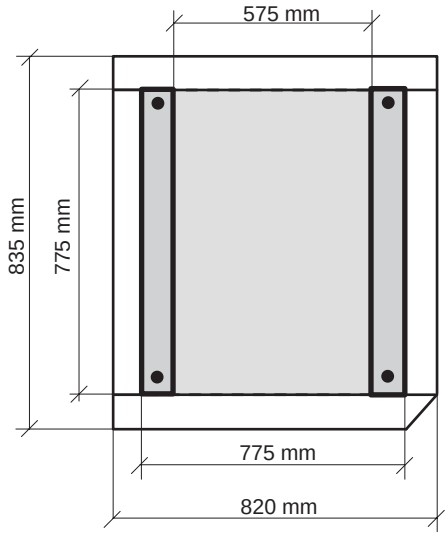


FIG. 1.1.3 80-120kVA UPS floor space

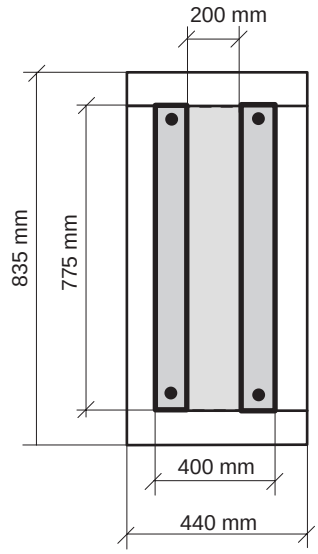


FIG. 1.1.4 AC001 transformer cabinet

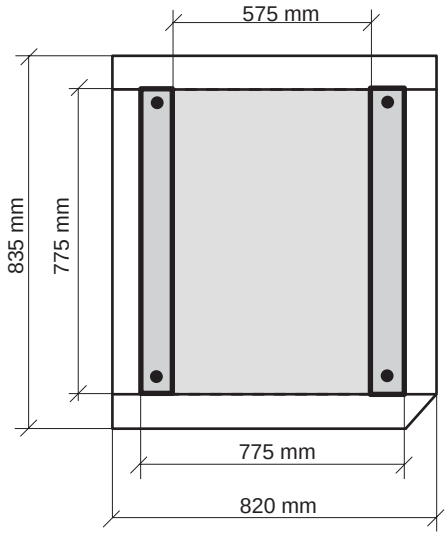
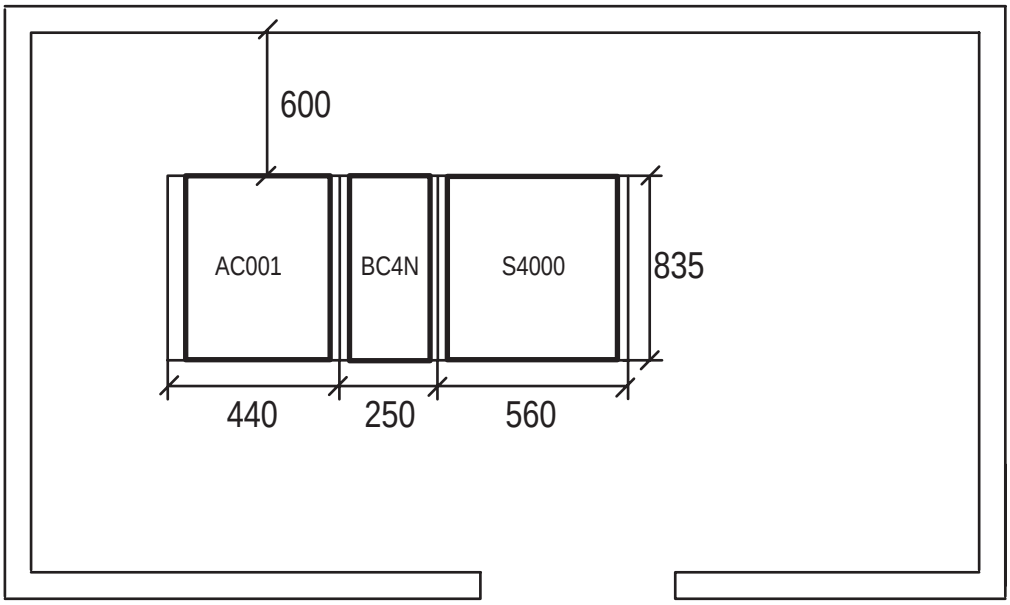


FIG. 1.1.5 AC002 transformer cabinet

(*) Note: With internal battery.

1 Installation

Room Size for 10-30 kVA UPS units when using BC4N battery cabinet



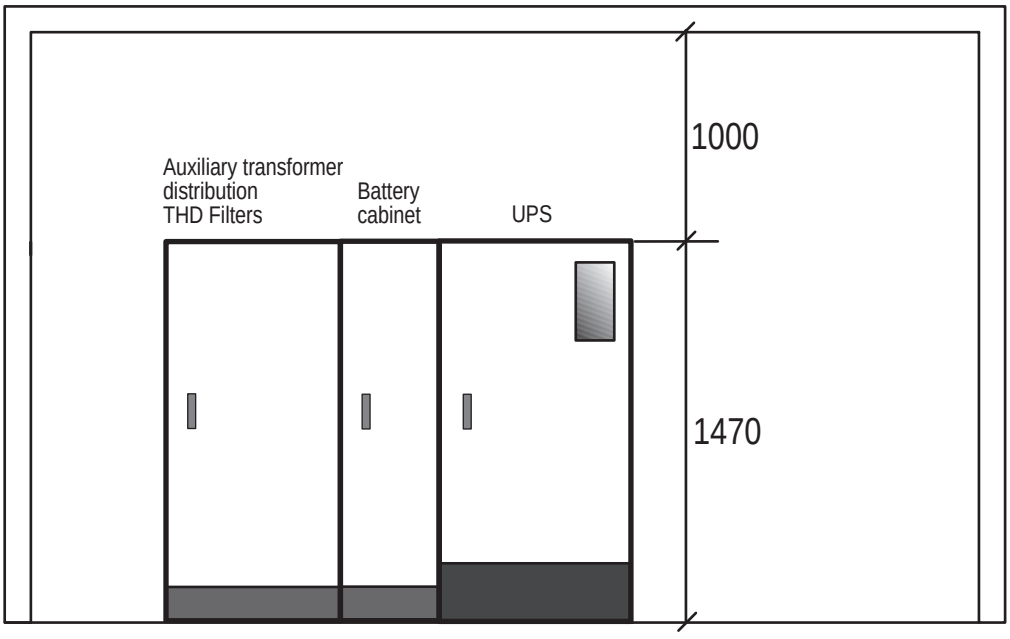
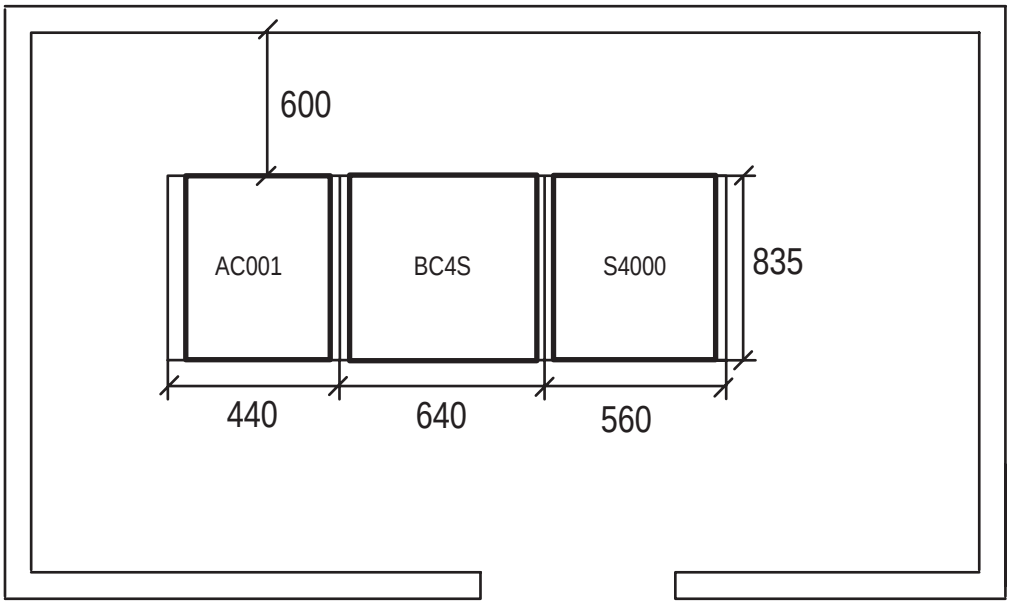


FIG. 1.1.6 Room size for 10-30kVA UPS units when using BC4N battery cabinet

1 Installation

Room Size for 10-30 kVA UPS units when using BC4S battery cabinet



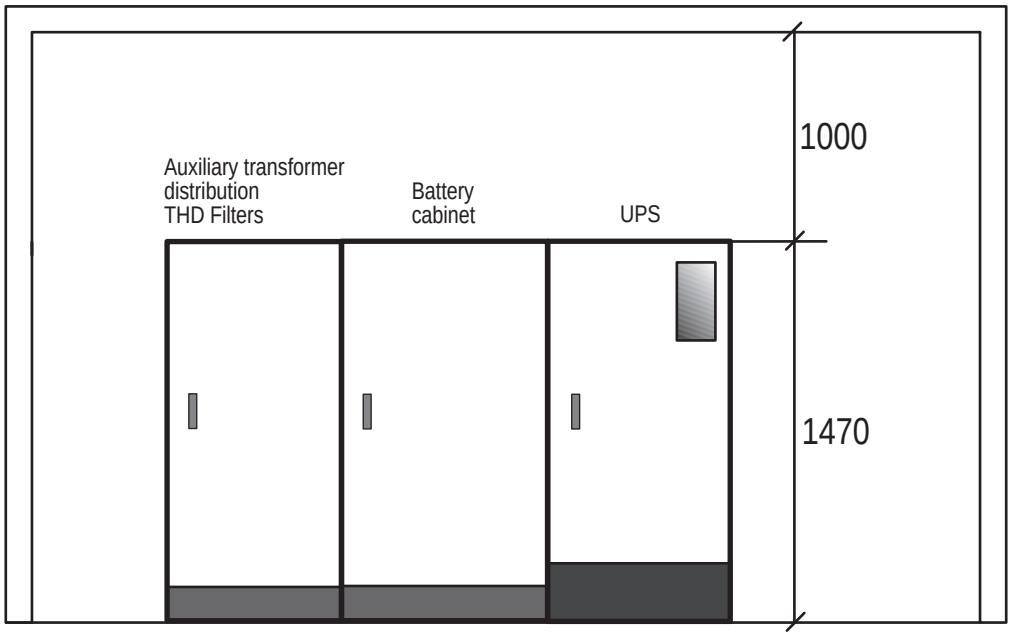
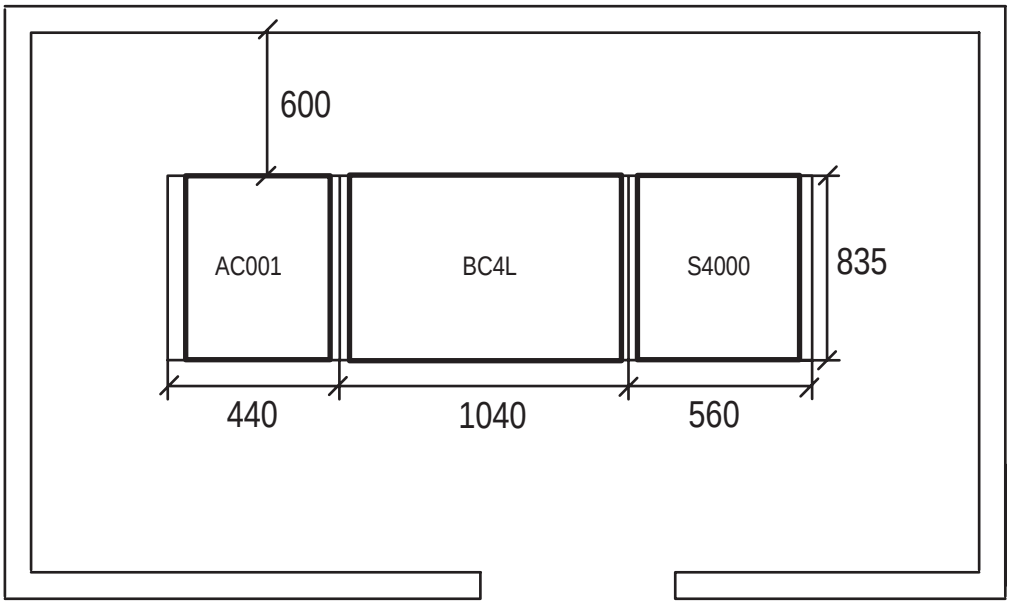


FIG. 1.1.7 Room size for 10-30kVA UPS units when using BC4S battery cabinet

1 Installation

Room Size for 10-30 kVA UPS units when using BC4L battery cabinet



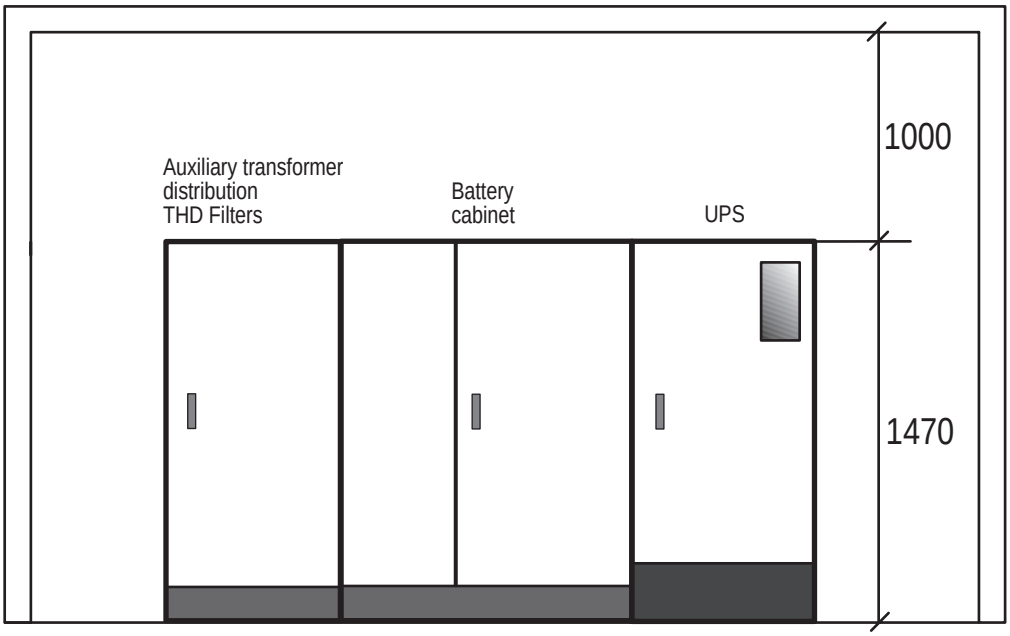
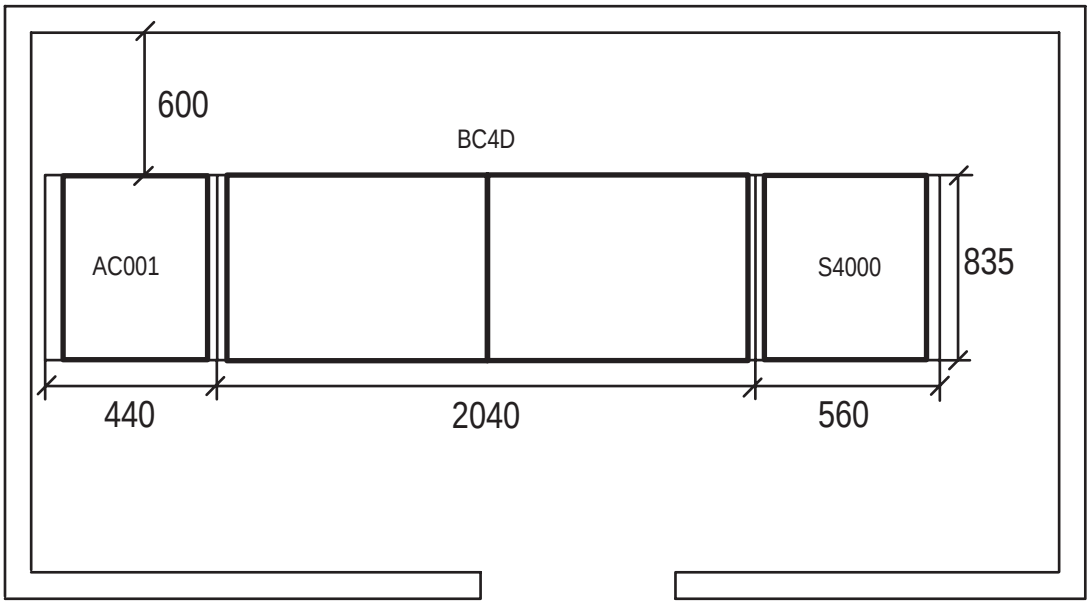


FIG. 1.1.8 Room size for 10-30kVA UPS units when using BC4L battery cabinet

1 Installation

Room Size for 10-30 kVA UPS units when using BC4D battery cabinet



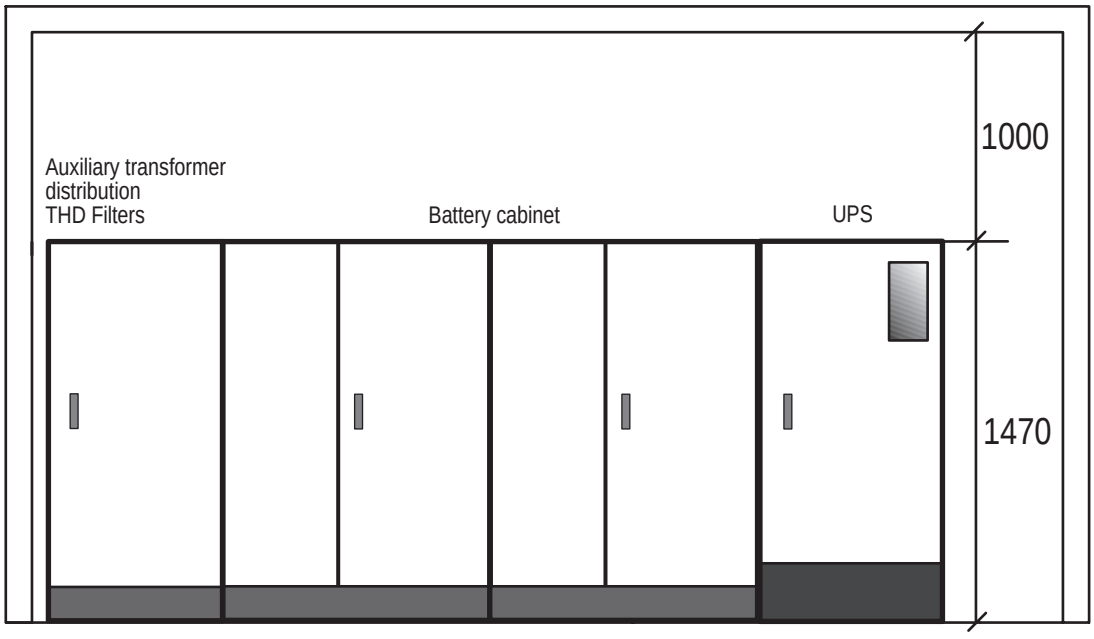


FIG. 1.1.9 Room size for 10-30kVA UPS units when using BC4D battery cabinet

1 Installation

Note: For 10-30kVA UPS units with fans on the top and with BC4N / BC4S / BC4L / BC4D battery cabinet the room size is shown below (see fig. 1.1.10; fig. 1.1.11; fig. 1.1.12 and fig. 1.1.13).

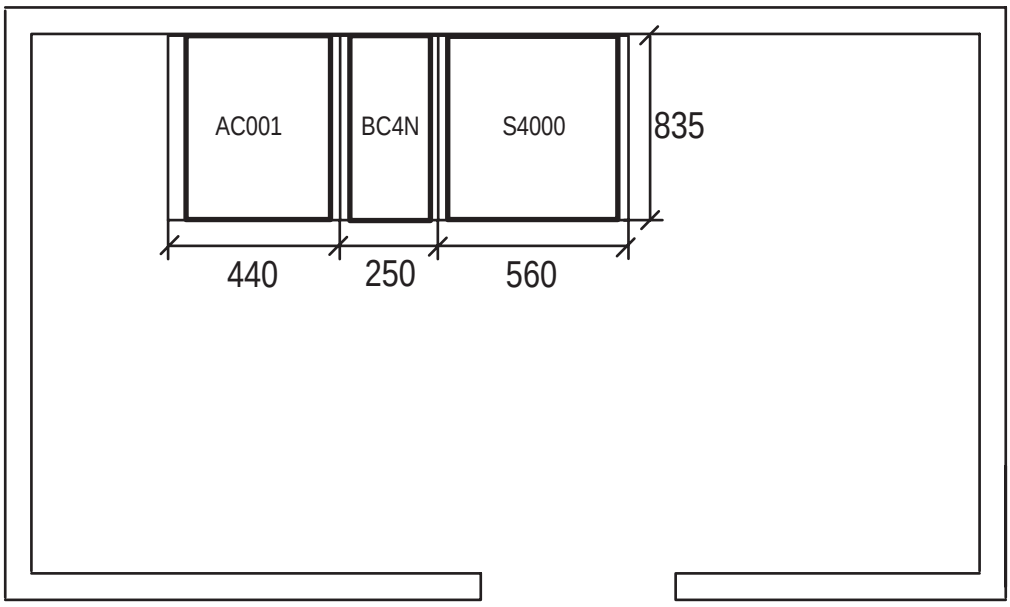


FIG. 1.1.10 Room size for 10-30kVA UPS units with fans on the top and BC4N battery cabinet

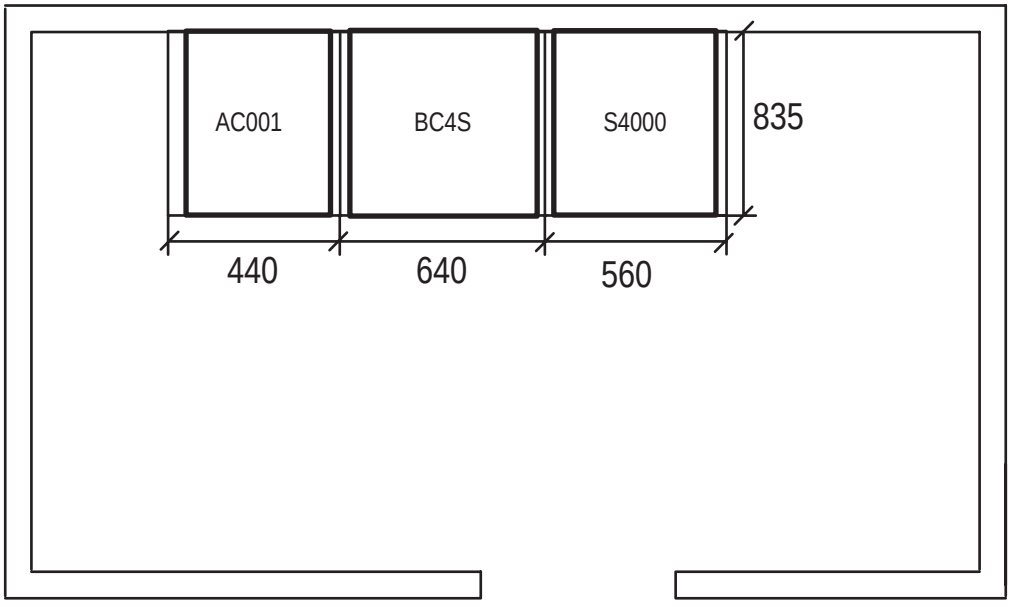


FIG. 1.1.11 Room size for 10-30kVA UPS units with fans on the top and BC4S battery cabinet

1 Installation

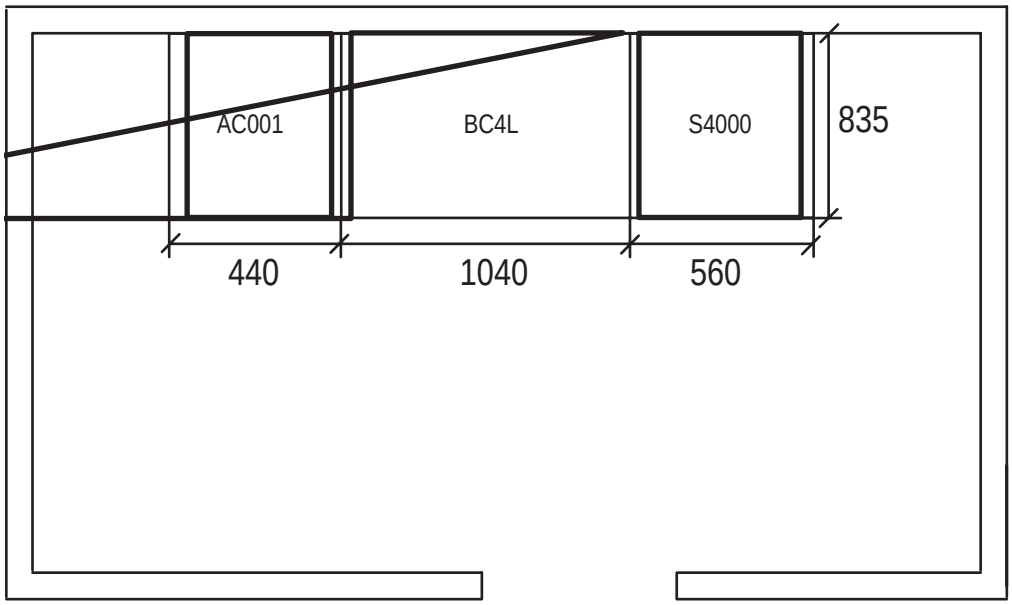


FIG. 1.1.12 Room size for 10-30kVA UPS units with fans on the top and BC4L battery cabinet

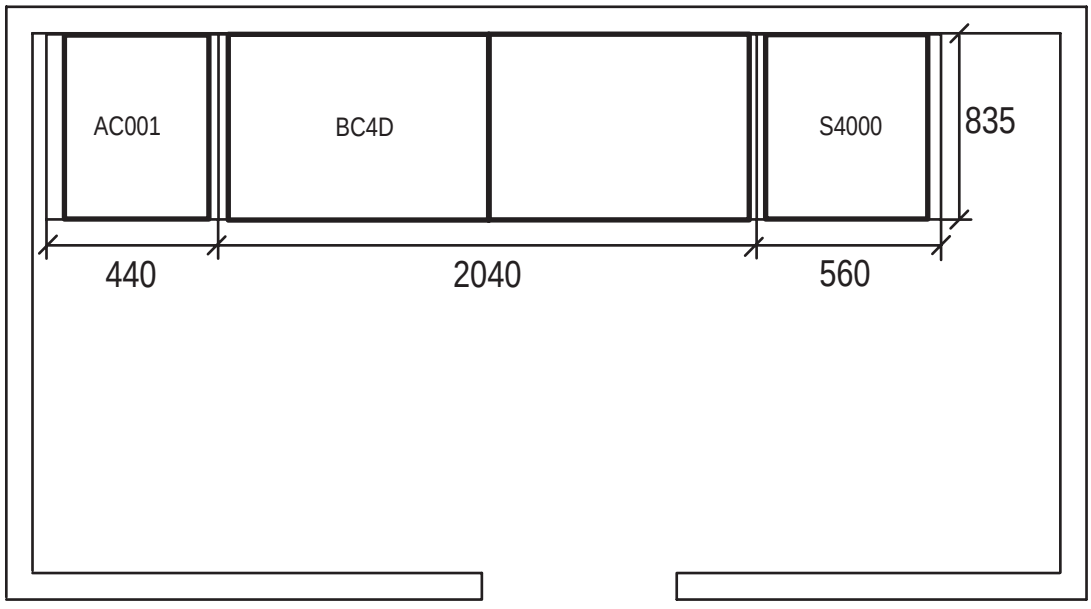
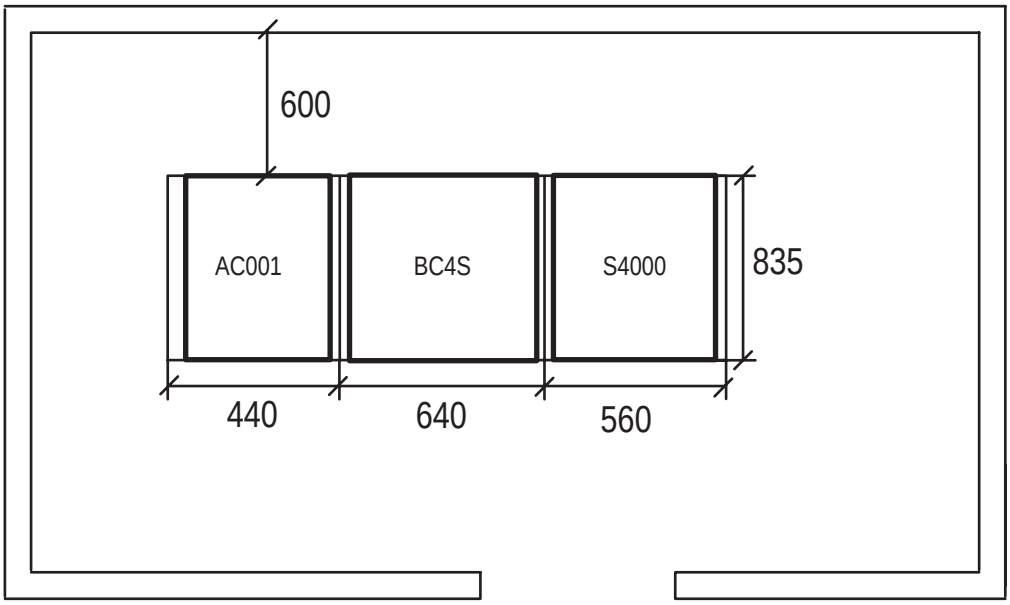


FIG. 1.1.13 Room size for 10-30kVA UPS units with fans on the top and BC4D battery cabinet

1 Installation

Room Size for 40-60 kVA UPS units when using BC4S battery cabinet



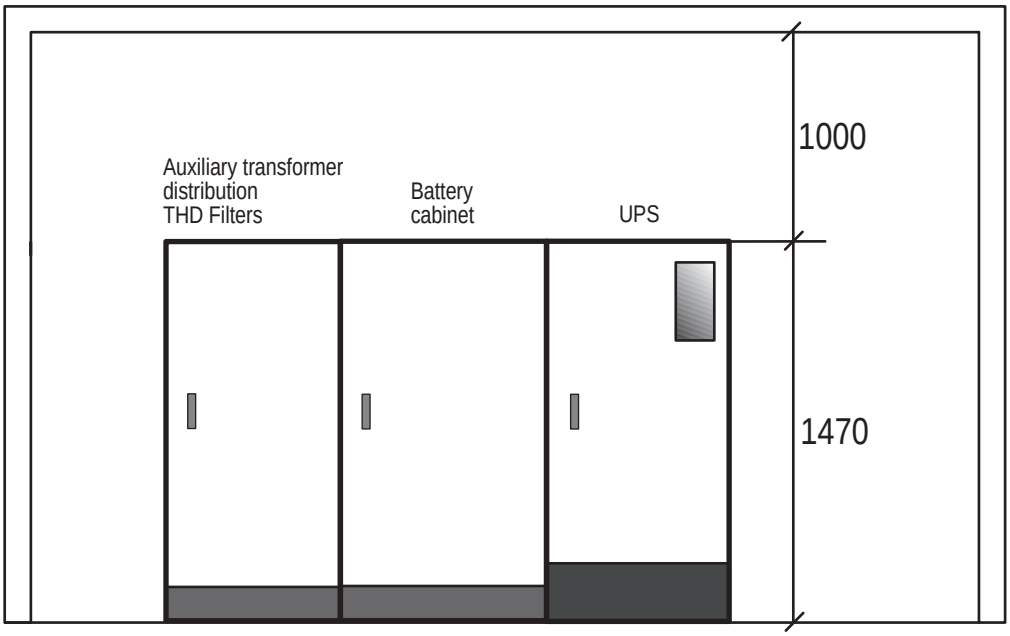
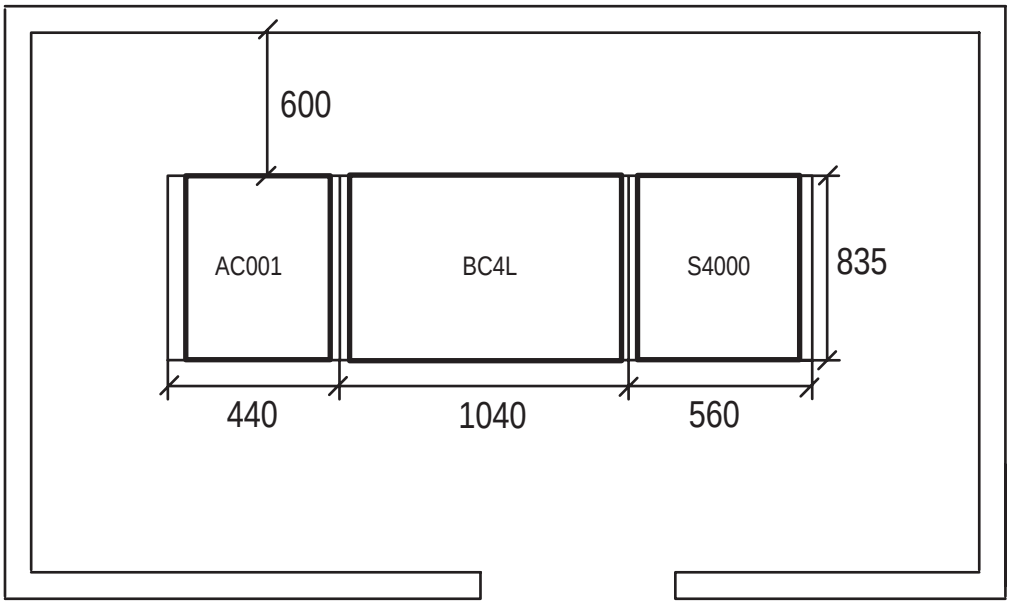


FIG. 1.1.14 Room size for 40-60kVA UPS units when using BC4S battery cabinet

1 Installation

Room Size for 40-60 kVA UPS units when using BC4L battery cabinet



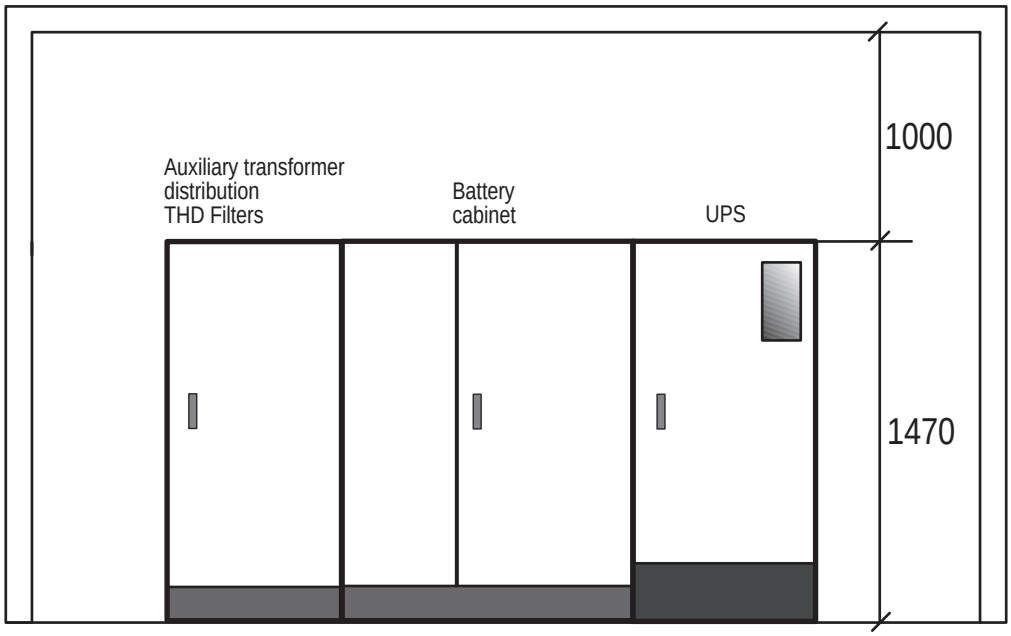
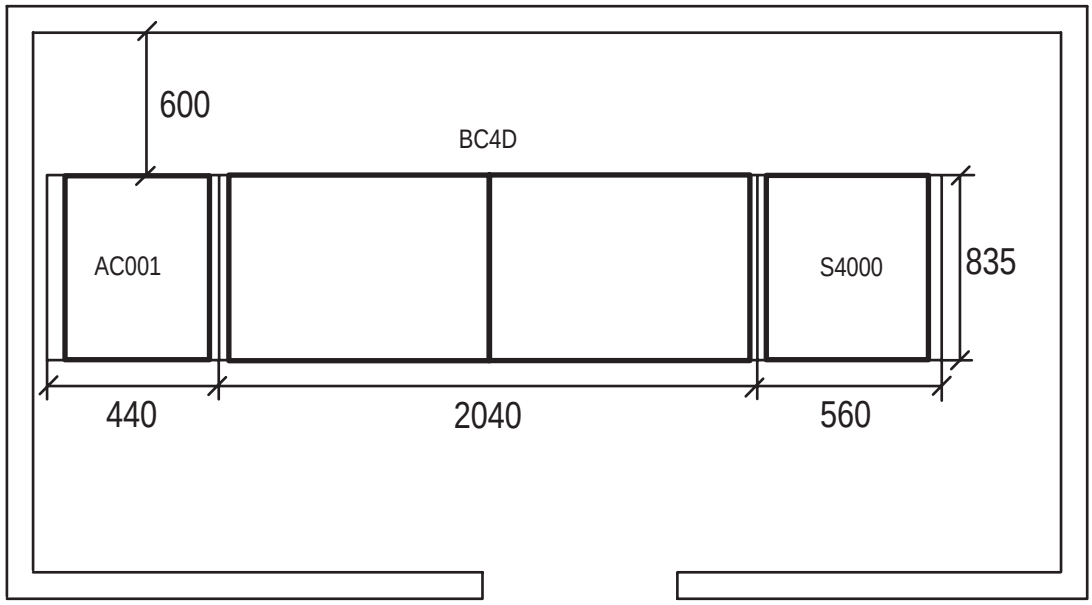


FIG. 1.1.15 Room size for 40-60kVA UPS units when using BC4L battery cabinet

1 Installation

Room Size for 40-60 kVA UPS units when using BC4D battery cabinet



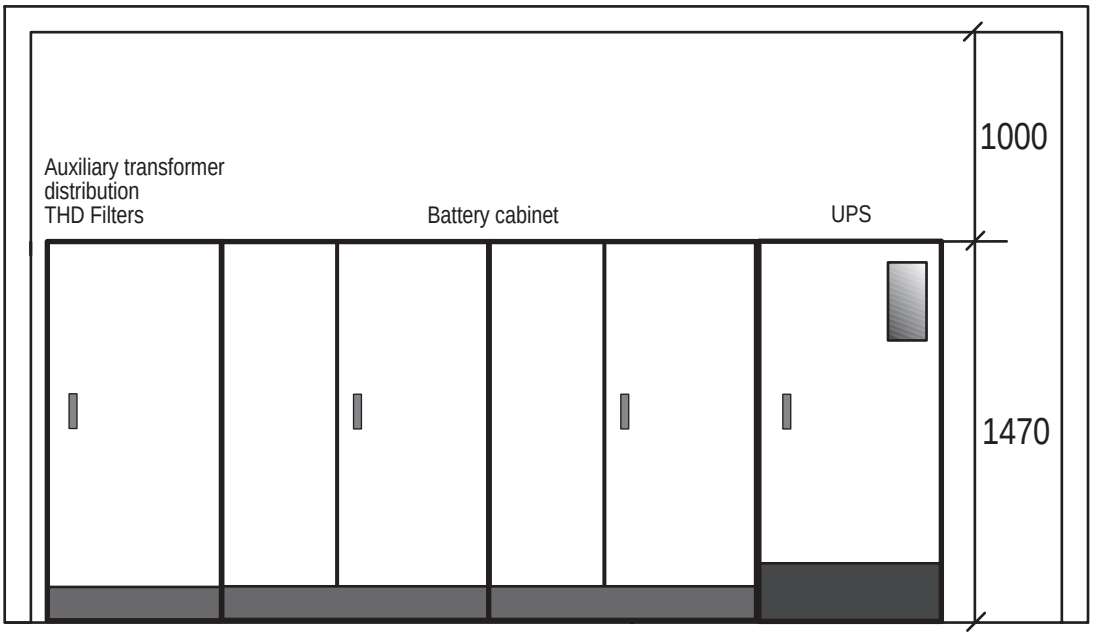
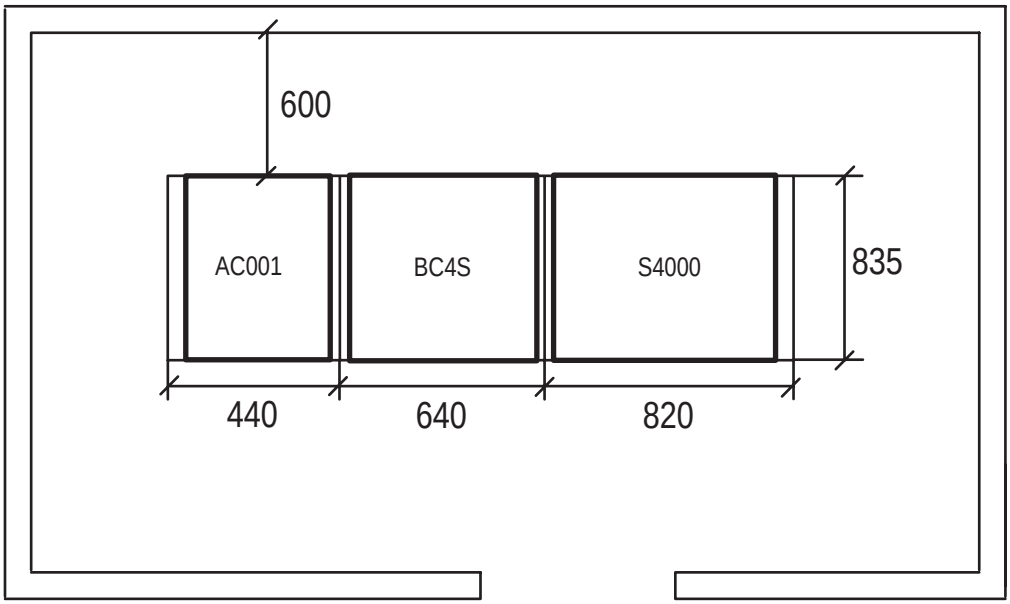


FIG. 1.1.16 Room size for 40-60kVA UPS units when using BC4D battery cabinet

1 Installation

Room Size for 80-120 kVA UPS units with auxiliary AC001 cabinet when using BC4S, BC4L and BC4D battery cabinets

AC001 cabinets are used for PTX33/SP units with 12 pulse chargers without galvanic separation and with THD Filters.



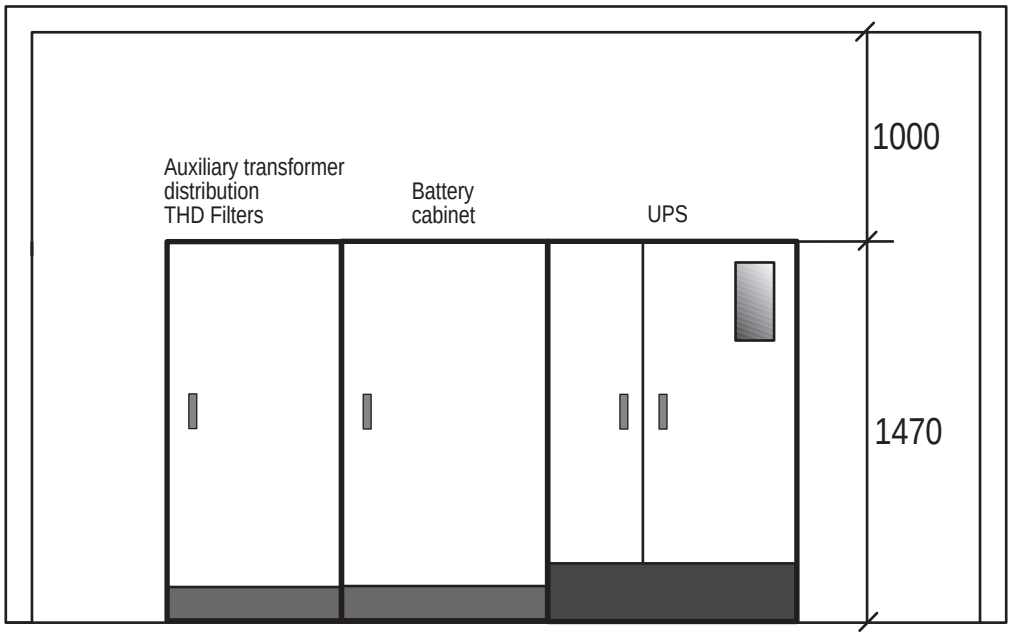
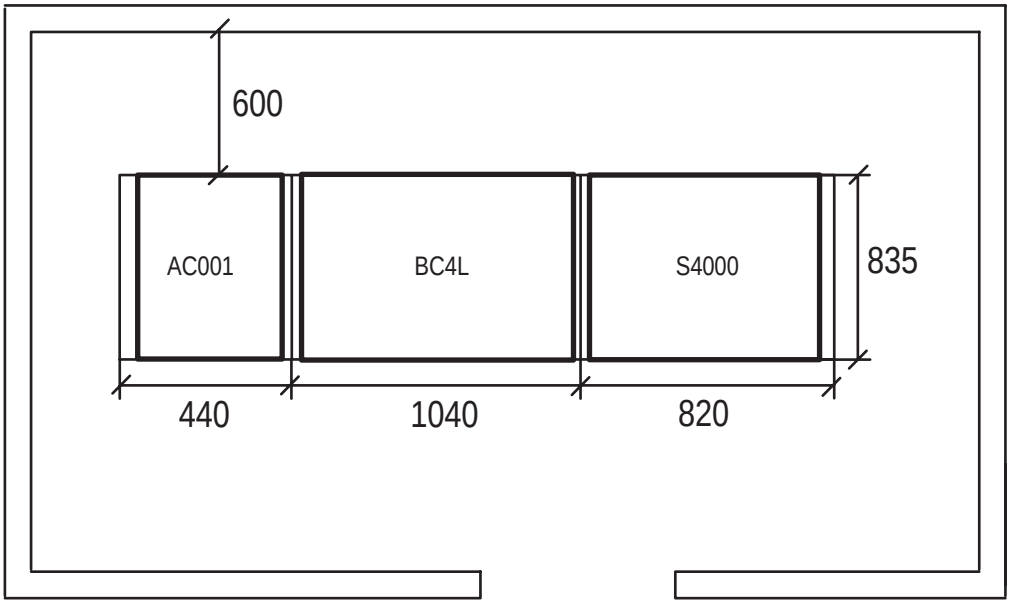


FIG. 1.1.17 Room size for 80-120kVA UPS units when using BC4S battery cabinet

1 Installation



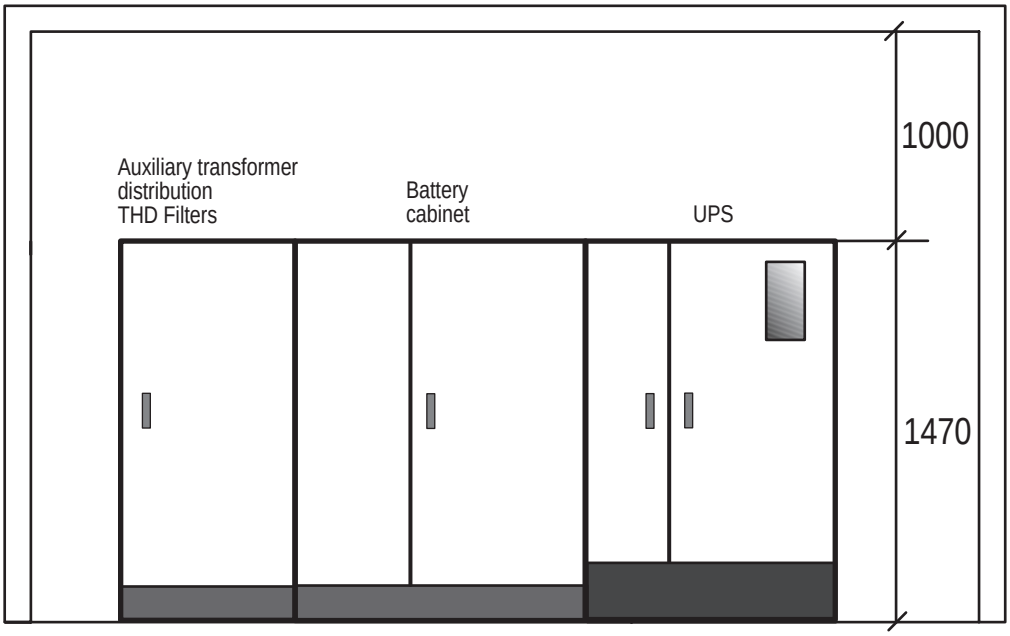
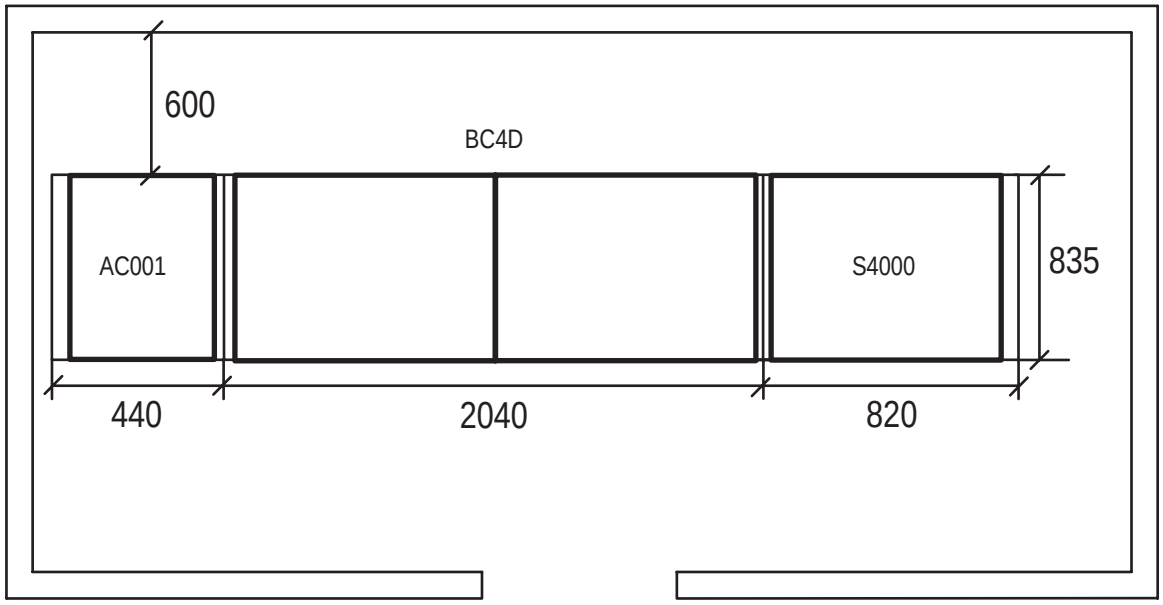


FIG. 1.1.18 Room size for 80-120kVA UPS units when using BC4L battery cabinet

1 Installation



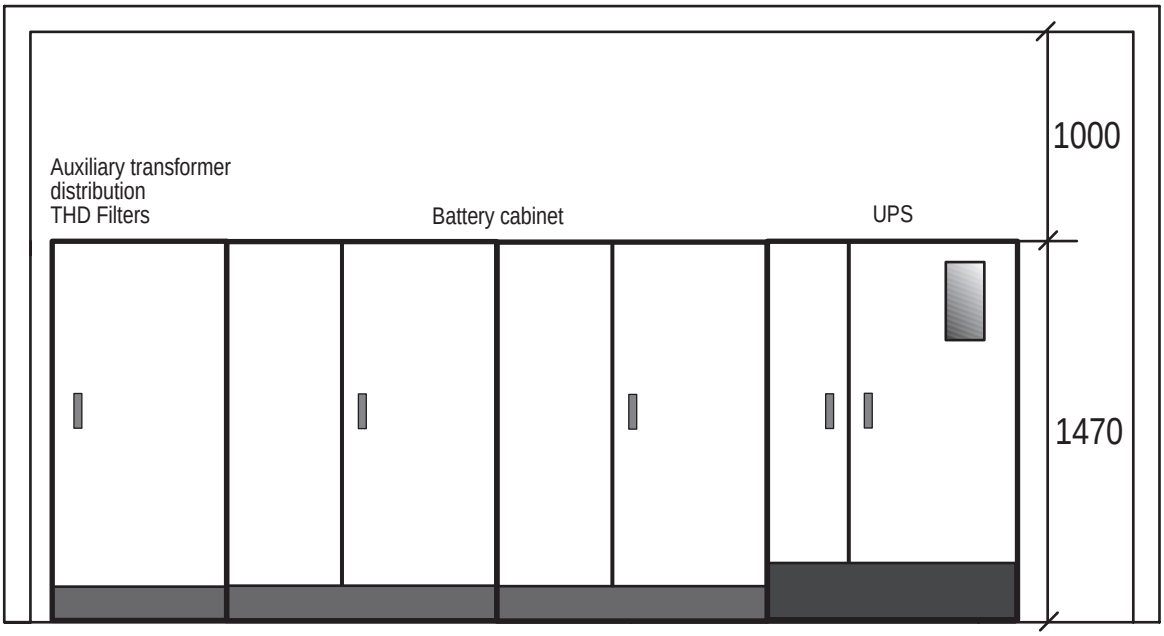
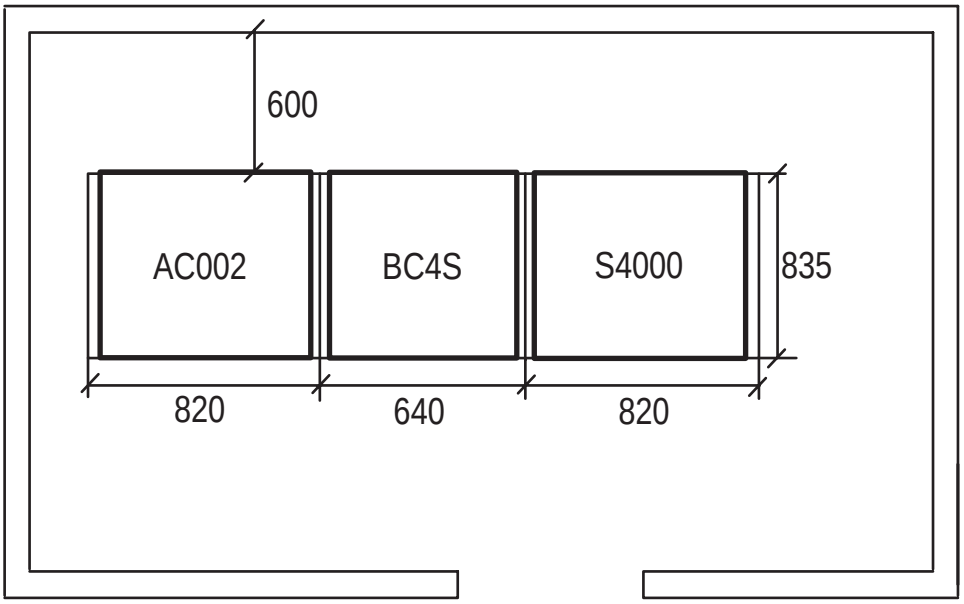


FIG. 1.1.19 Room size for 80-120kVA UPS units when using BC4D battery cabinet

1 Installation

Room Size for 80-120 kVA UPS units with auxiliary AC002 cabinet when using BC4S, BC4L and BC4D battery cabinets

AC002 cabinets are used for PTX33/SP units with 12 pulse chargers with galvanic separation and with auxiliary transformers.



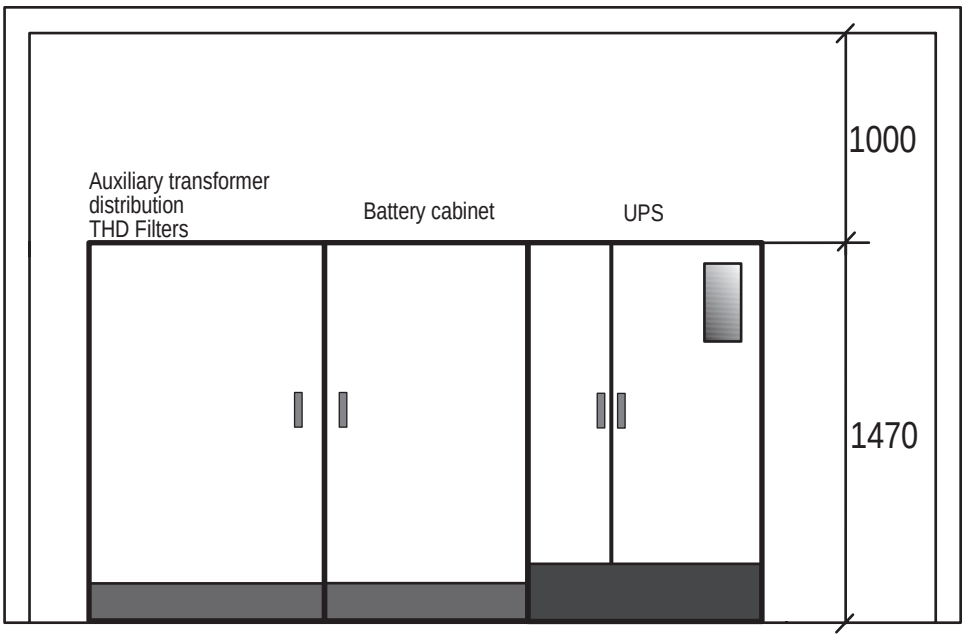
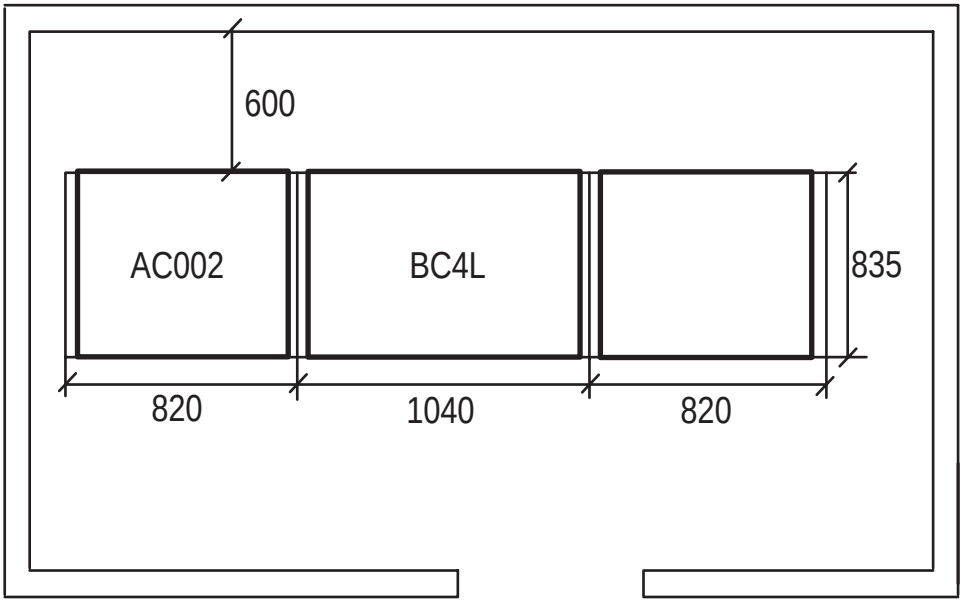


FIG. 1.1.20 Room size for 80-120kVA UPS units when using BC4S battery cabinet

1 Installation



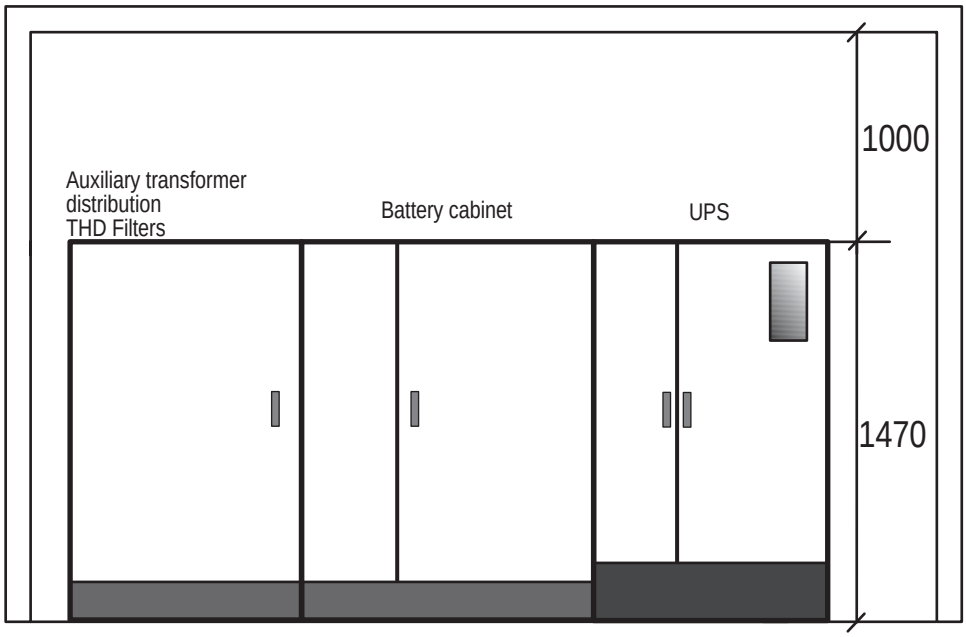
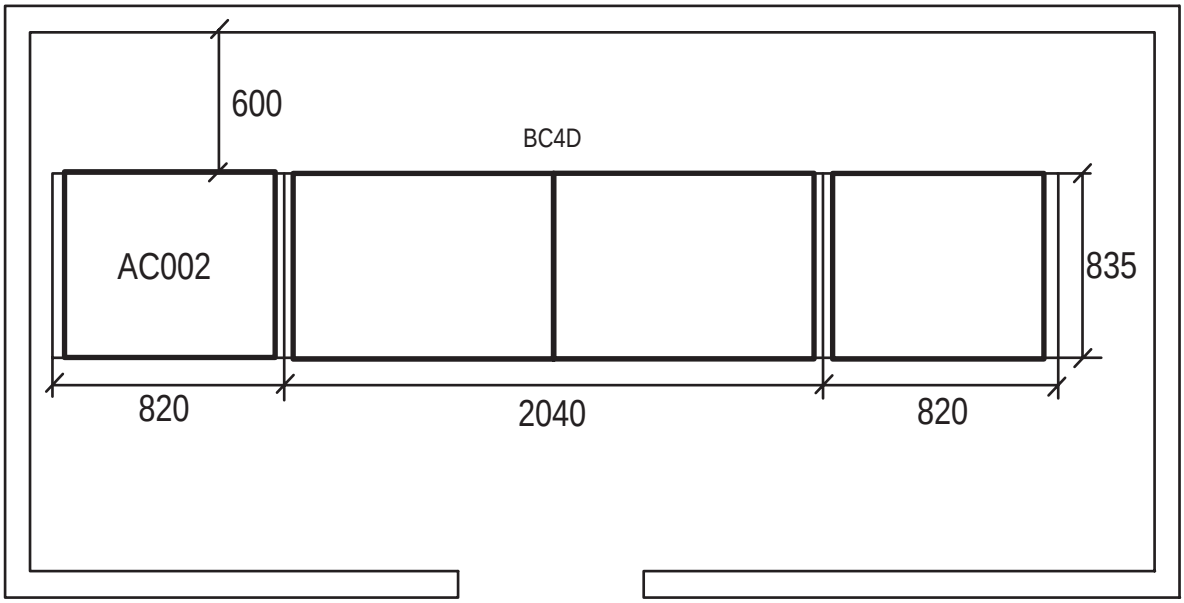


FIG. 1.1.21 Room size for 80-120kVA UPS units when using BC4L battery cabinet

1 Installation



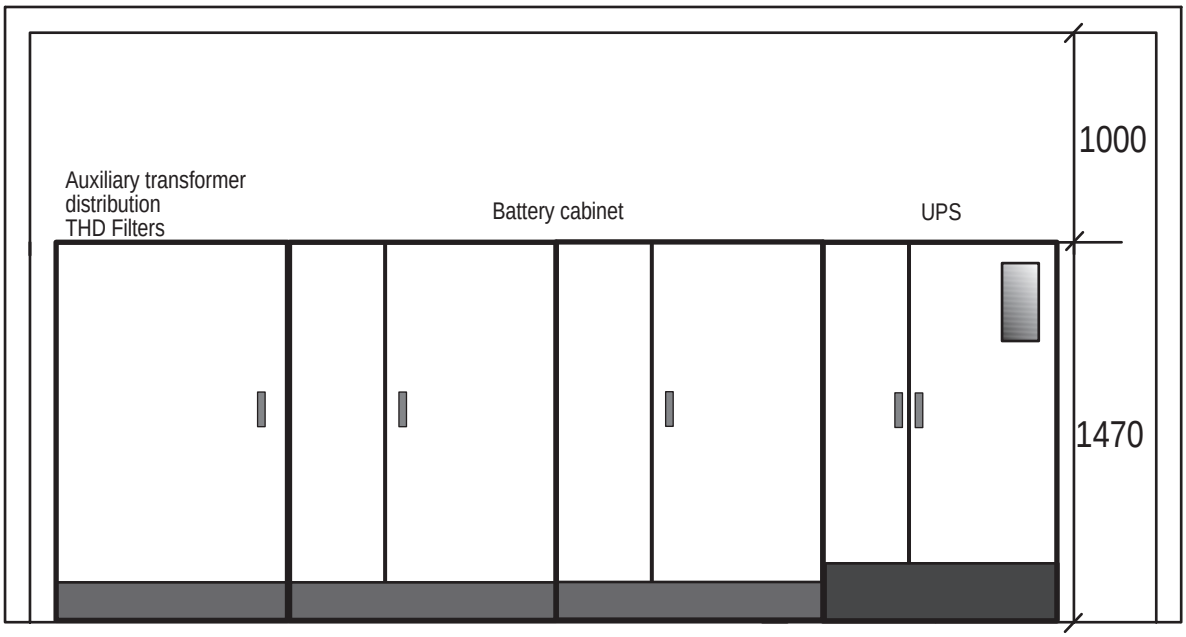


FIG. 1.1.22 Room size for 80-120kVA UPS units when using BC4D battery cabinet

1 Installation

1.2 Electrical Installation

This equipment must be installed by qualified service personnel.

Switch off IRP, IRE, IB, IUG, IBY circuit breakers to completely isolate the equipment.

Earth leakage protection: this device has high leakage current towards protective earthing. Earth leakage circuit breakers shouldn't be installed upstream from this equipment or a correct threshold should be set.

High leakage current - it is essential to connect the protective earth before connecting the power supply.

All primary power switches installed remotely from the UPS area must be fitted with the following label: **"*Isolate uninterruptible power supply (UPS) before working on this circuit*"**.

General

All electrical connections must be made in accordance with local standards and all input terminals (1-L1, 1-L2, 1-L3 and, if existing, 4-L1, 4-L2, 4-L3) must be protected by external fuses. The tables give recommended values for fuse sizes and cable cross-sections. These may vary, depending on local standards. They are valid for voltages 380/220 V, 400/230 V and 415/240 V. Ensure clockwise connection of conductors L1, L2 and L3 at input and output terminals.

If possible, install battery cables separately from other power cables in order to avoid possible RF interference. Before wiring, open all system switches (IRP, IRE, IBY, IUG) plus the battery switch (IB).

Warning: The external battery cabinet must be equipped with overcurrent protection device depending on battery short-circuit current and battery voltage.

1 Installation

Version 1 PTX33/SP with Common Input for Rectifier and Bypass

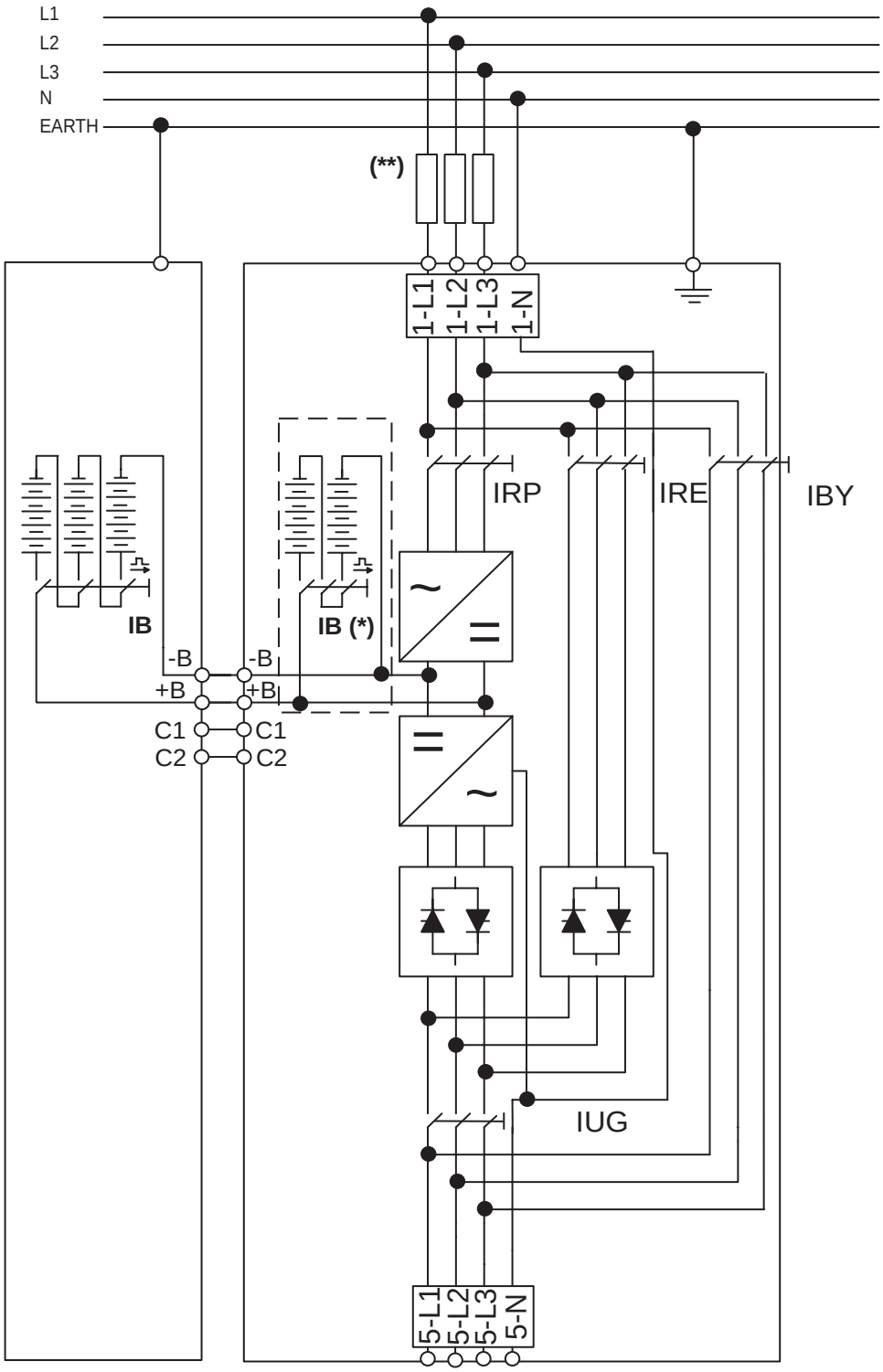


FIG. 1.2.1 UPS connection diagram, version 1

(*) Note: Internal Battery only for 10-30kVA units
(**) Note: Customer supplied input fuses - see table 1.2.1

1 Installation

Version 1 PTX33/SP with Common Input for Rectifier and Bypass

Input Cables / Fuses

Type	Input cables [mm²]	Input fuses [A]	earth cable [mm²]
10	4x10	25	16
15	4x10	35	16
20	4x16	50	16
30	4x25	63	25
40	4x35	100	25
60	4x35	125	25
80	4x70	160	50
100	4x70	200	50
120	4x120	250	70

TAB.1.2.1 UPS input cables and fuses, version 1

Output / Battery Cables and Max. Current Ratings for Battery Overcurr. protection

Type	Battery cables [mm²]	Output cables [mm²]	Max. inv. input current (Vdc=320V)
10	2x16	4x10	25
15	2x16	4x10	40
20	2x25	4x16	50
30	2x25	4x35	75
40	2x35	4x35	100
60	2x50	4x35	150
80	2x70	4x50	200
100	2x95	4x70	250
120	2x120	4 x120	300

UPS output cables and fuses, version 1

1 Installation

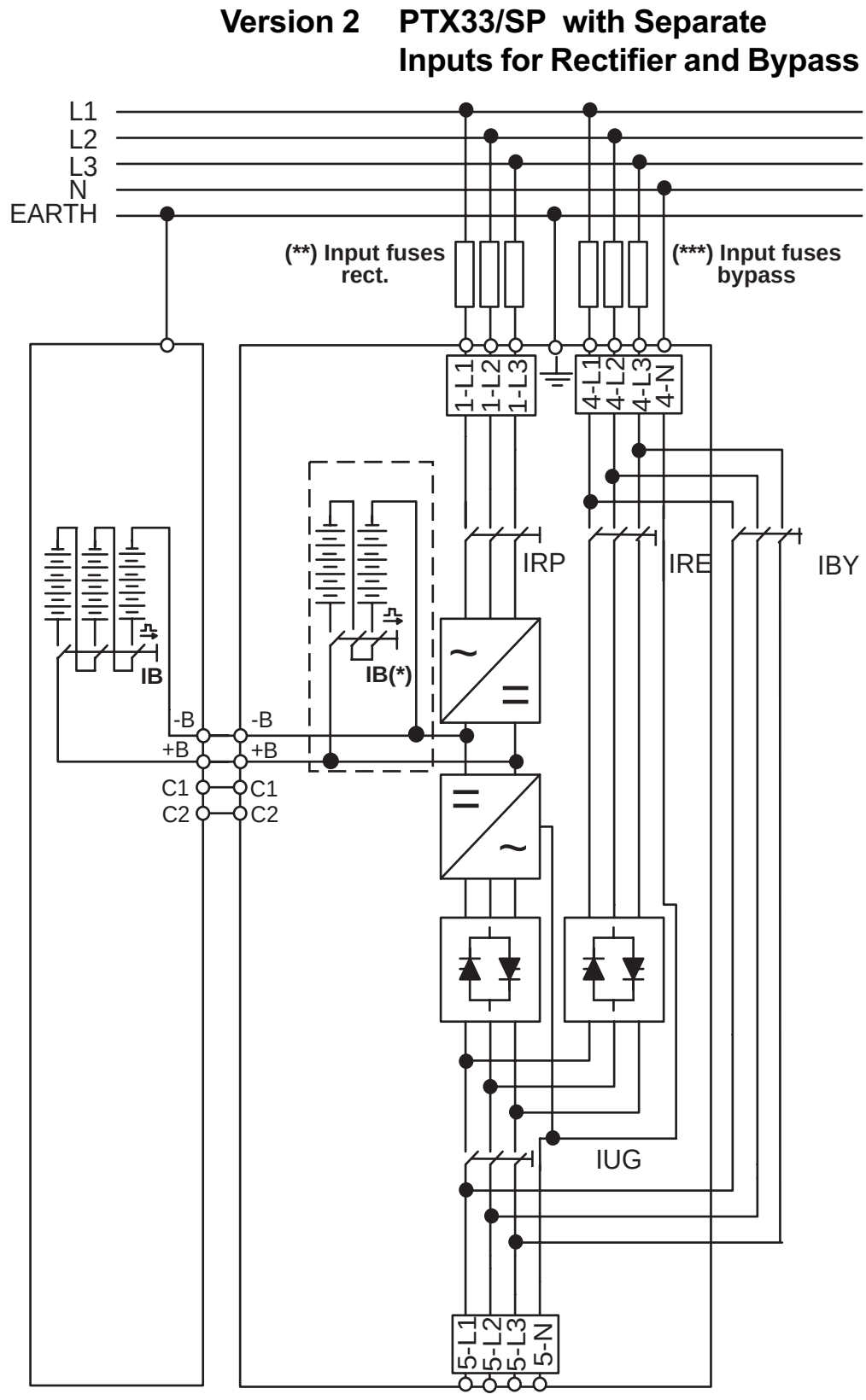


FIG. 1.2.2 UPS connection diagram, version 2

(*) Note: Internal Battery only for 10-30kVA units
(**) Note: Customer supplied rectifier input fuses - see table 1.2.5
(***) Note: Customer supplied bypass input fuses - see table 1.2.5

1 Installation

Version 2 PTX33/SP with Separate Inputs for Rectifier and Bypass

Input Cables

Type	Rect. cables [mm²]	Bypass cables [mm²]	earth cable [mm²]
10	3x10	4x10	16
15	3x10	4x10	16
20	3x16	4x16	16
30	3x25	4x25	25
40	3x25	4x25	25
60	3x35	4x35	25
80	3x50	4x50	50
100	3x70	4x70	50
120	3x120	4x120	70

TAB. 1.2.3 UPS input cables, version 2

Input Fuses

Type	Rect. Fuses [A]	Bypass Fuses [A]
10	25	25
15	35	35
20	50	50
30	63	63
40	100	100
60	100	125
80	125	160
100	160	200
120	200	250

TAB. 1.2.4 UPS input fuses, version 2

Output / Battery Cables

Type	Battery cables [mm²]	Output cables [mm²]	Max. inv. input current (Vdc=320V)
10	2x16	4x10	25
15	2x16	4x10	40
20	2x25	4x16	50
30	2x25	4x35	75
40	2x35	4x35	100
60	2x50	4x35	150
80	2x70	4x50	200
100	2x95	4x70	250
120	2x120	4 x120	300

TAB. 1.2.5 UPS output cables and fuses, version 2

1 Installation

1.3 Installation of additional optional cabinets

PTX33/SP with input and output transformers for voltage adaption

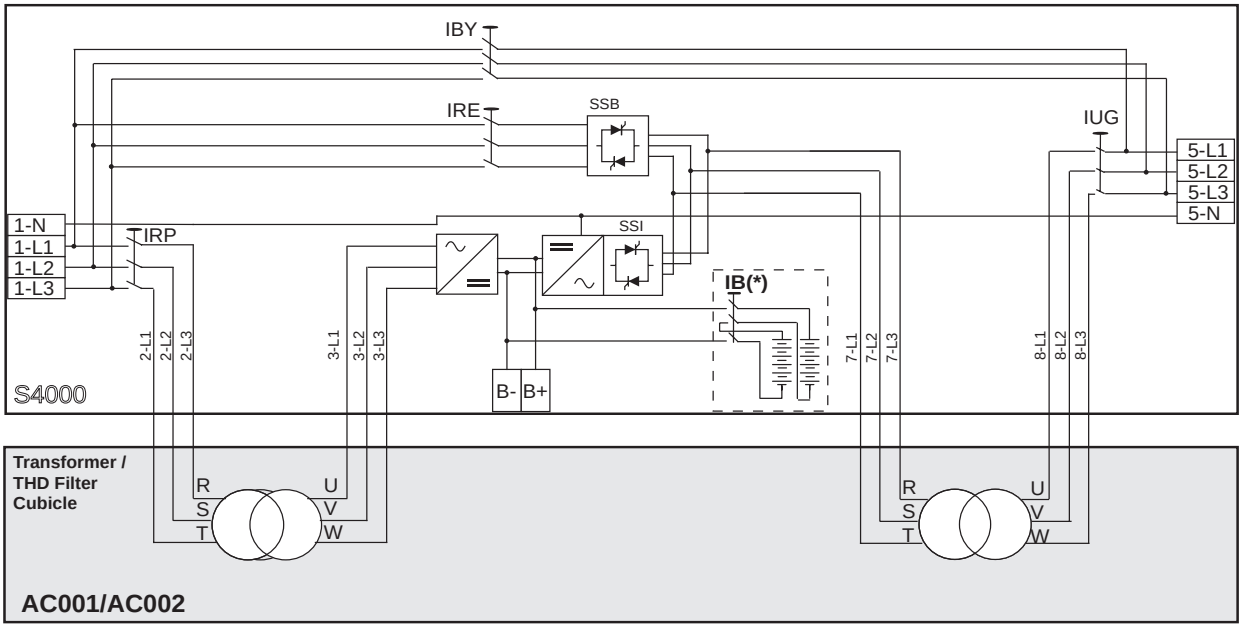


FIG. 1.3.1 UPS connection diagram, with input and output transformers to adapt the UPS to the on-site voltage.

PTX33/SP with isolation transformer of the bypass supply

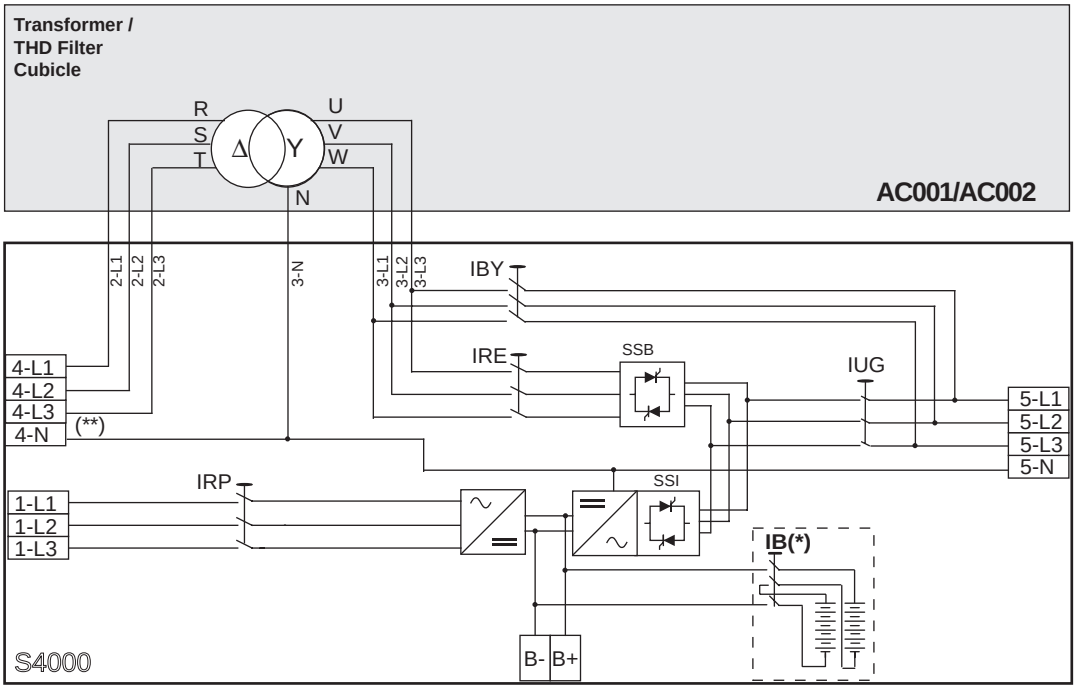


FIG. 1.3.2 UPS connection diagram, with bypass input transformer to isolate the neutral line (** 4-N may be connected to the supply neutral or earth or left disconnected.)

(*) Note: Internal Battery only for 10-30kVA units

1 Installation

PTX33/SP with THD filters

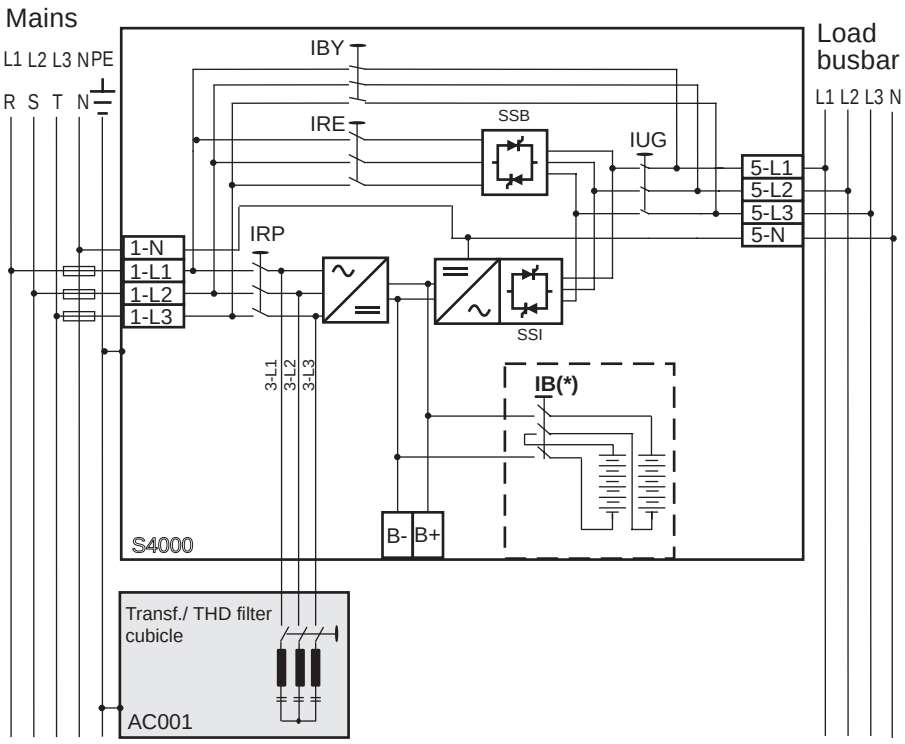


FIG. 1.3.3 UPS connection diagram, with THD filters

(*) Note: Internal Battery only for 10-30kVA units

1 Installation

PTX33/SP with 12-pulse charger / rectifier

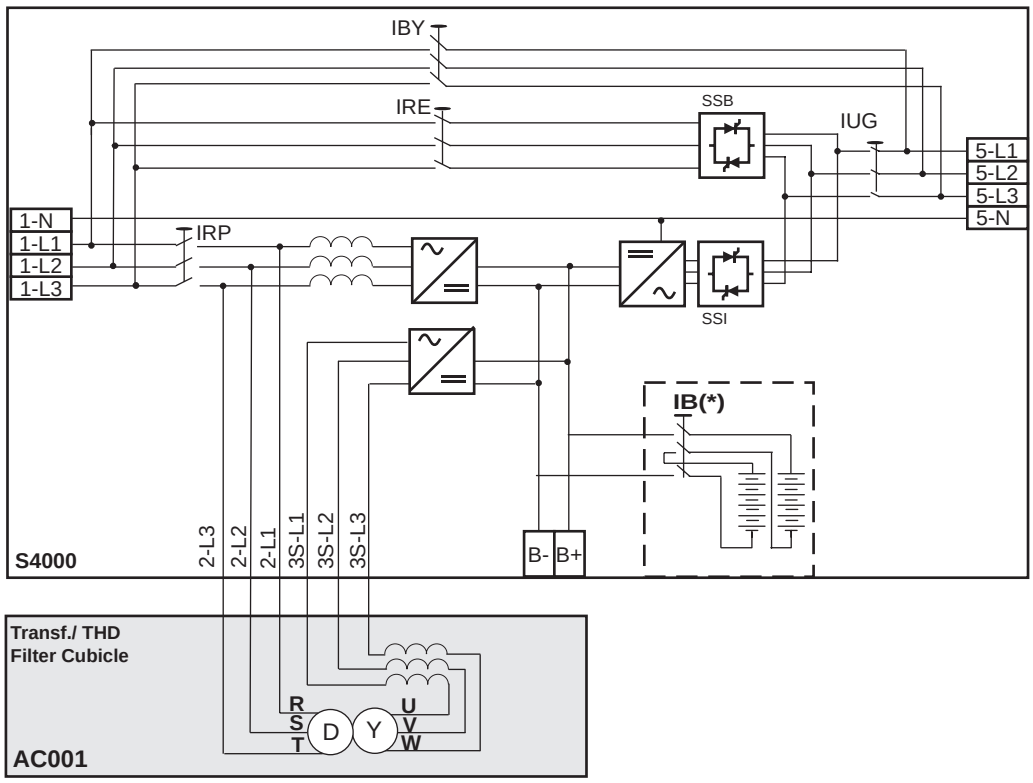


FIG. 1.3.4 Installation of 12-pulse units without galvanic isolation

with 12-pulse charger / rectifier and galvanic isolation of the input supply.

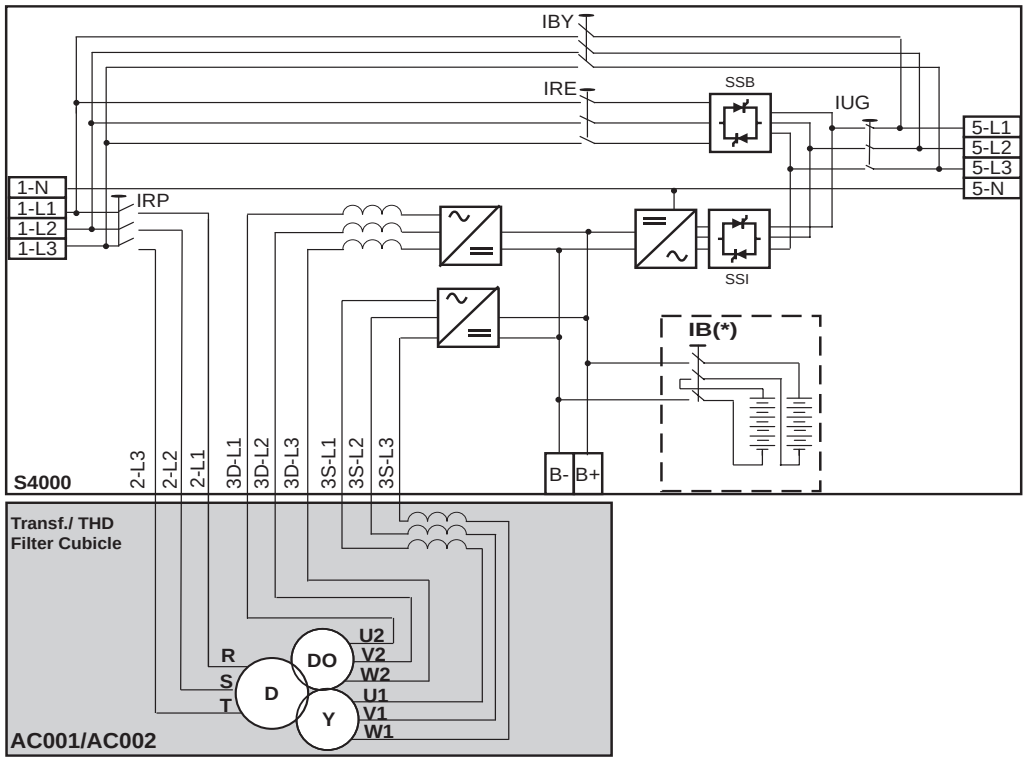


FIG. 1.3.5 Installation of 12-pulse units with galvanic isolation

(*) Note: Internal Battery only for 10-30kVA units

1 Installation

1.4 Installation of an External Maintenance Bypass

When an external maintenance bypass is installed, a normally open, voltage free contact must be available. This contact must be connected to the connector M4, Pin1 and Pin 2 at the top left hand corner of the mother board for the inverter/bypass electronics (IBYBP-CP see figure 1.10.3).

If the standard Powertronix no-break wall-mounted maintenance bypass switch is used (optional) in the MB3 cabinet, a normally open contact is provided.For the version 2 maintenance bypass (3 position), an additional contact is provided which automatically isolates the UPS system (EPO) when switched to the "UPS ISO-LATED" position (see FIG 1.4.2).

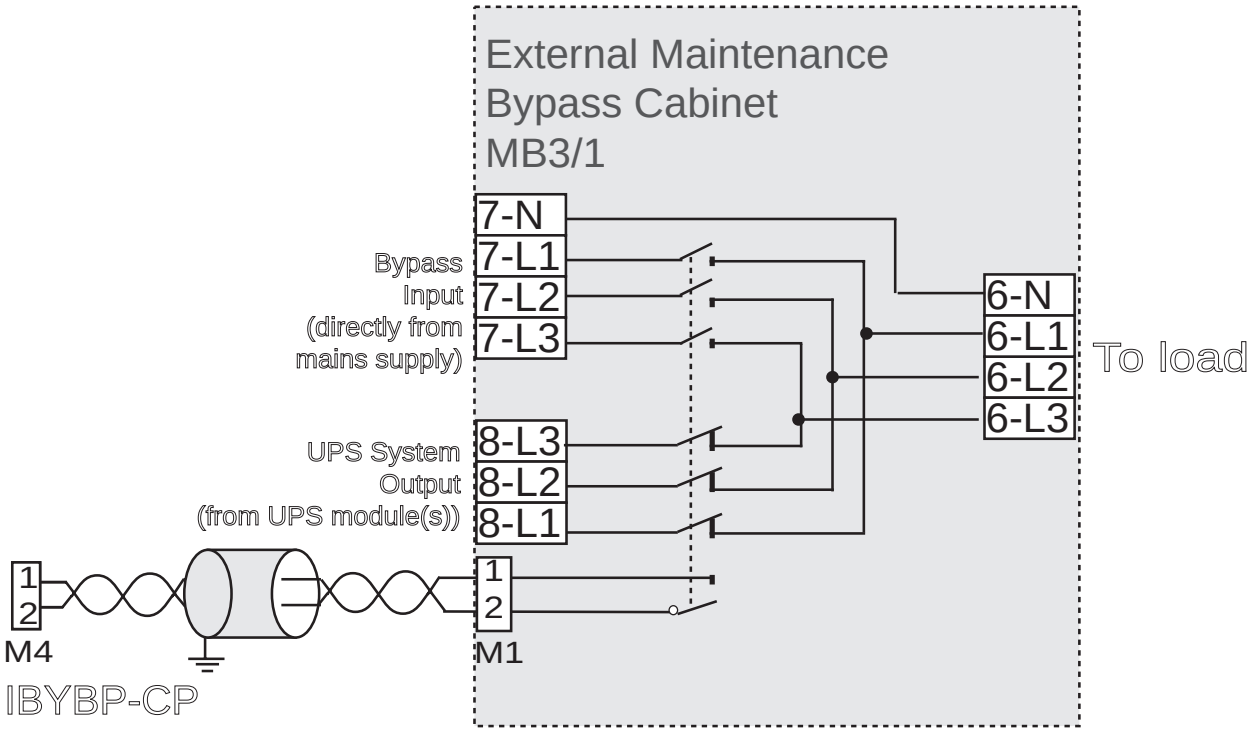


FIG.1.4.1 External Maintenance Bypass Switch Version 1 (2 position)

1 Installation

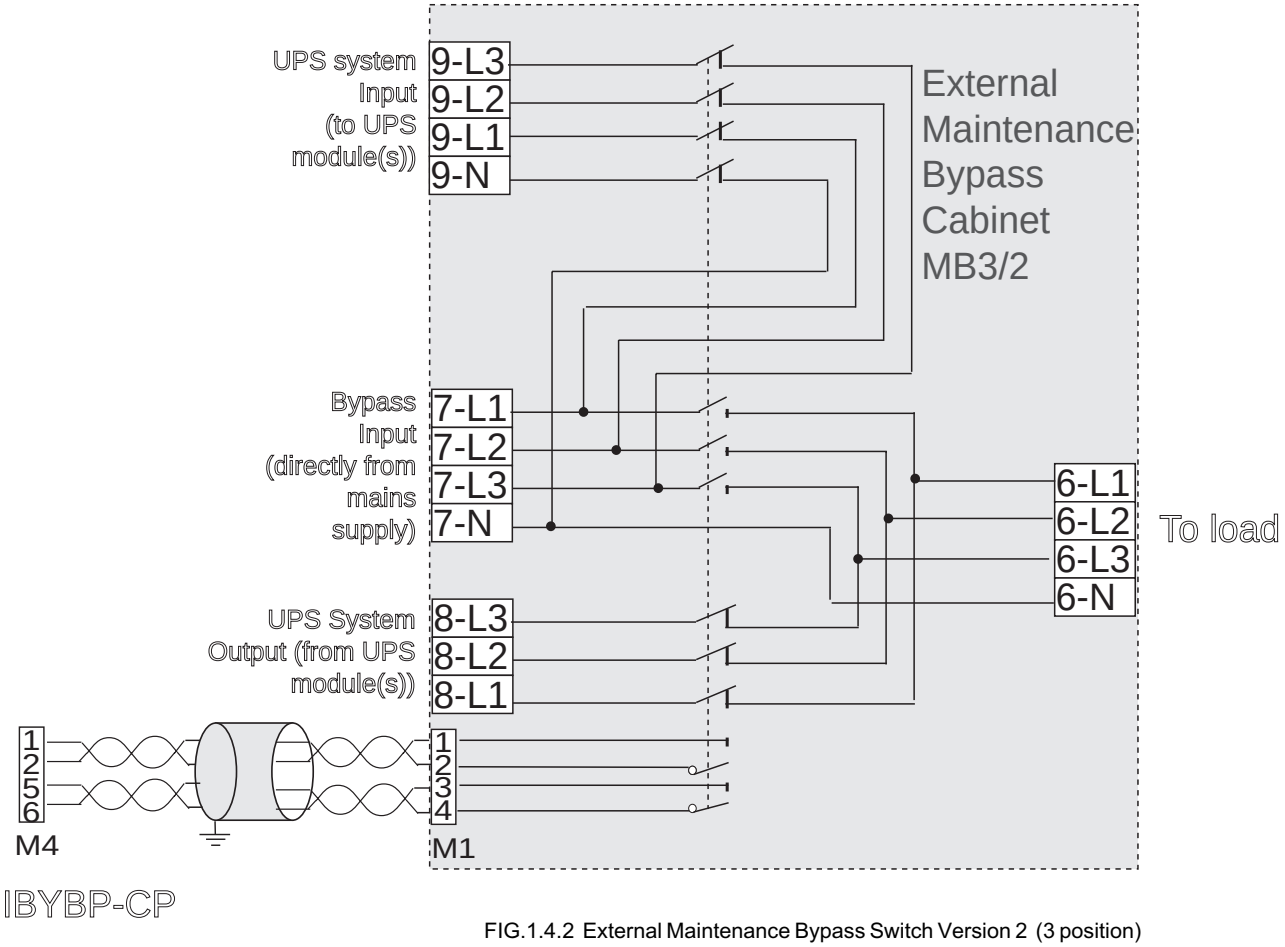


FIG.1.4.2 External Maintenance Bypass Switch Version 2 (3 position)

Note1: For Hot-Standby or parallel systems, it is sufficient to feed one contact into one unit only, however they may be connected in parallel at M4 (of IBYBP-CP) Pin1 and Pin 2 for all units. In this case separate terminals may be provided within the MB3 cabinet (see FIG. 1.9.2 and 1.10.2)

Note2: The cable used must be twisted pair, with a total shield. This shield must be grounded at one end (the cabinet of the UPS may be used).

1 Installation

1.5 Remote Emergency Power off

A Remote Emergency Power Off may be connected to the system. The connection terminals are M4 Pin 5 and Pin 6, using a normally-open, voltage-free contact as a pushbutton. (See FIG. 1.5.1. and FIG. 1.5.2.)

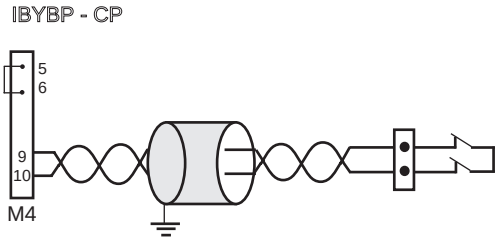


FIG. 1.5.1 Connection of Remote EPO with N.C. contact

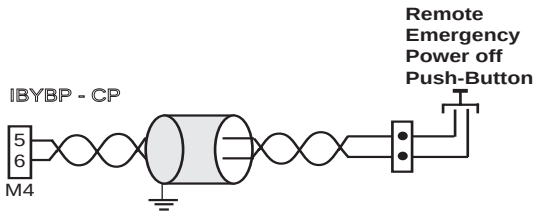


FIG. 1.5.2 Connection of Remote EPO with N.O. contact

Note 1: The cable used must be twisted pair, with a total shield. This shield must be grounded at one end (the cabinet of the UPS may be used).

Note 2: For Hot-Standby or parallel systems, it is sufficient to feed one contact into one unit only, however they may be connected in parallel at M4 (of IBYBP-CP) Pin5 and Pin 6 for all units (N/O) only or series for (N/C).

Note 3: The remote EPO function when activated will switch off all inverters in the system and the UPS output. The rectifiers will remain on, charging the battery. If it is necessary to isolate all supply from the UPS, separate contacts must be provided in order to trip external input and battery circuit breakers.

Note 4: The N.C. contact can only be used for IBYBP-CP motherboards in rev. 0A and following.

1 Installation

1.6 Diesel - Generator Operation

During diesel generator operation, if the frequency of the diesel-generator, with UPS and load connected, is unstable, it is advisable to disconnect the synchronisation of the inverter. This is achieved with a normally-open, voltage-free contact (which closes during diesel-generator operation) and is connected to the connector M4 Pin 7 and Pin 8 as follows:

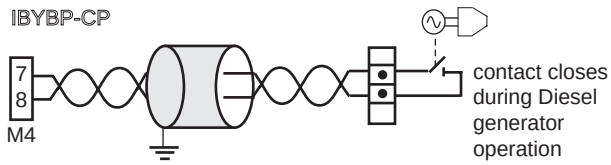


FIG. 1.6.1 Connection for Diesel Generator Operation (connector M4) - synchronisation disable.

Note1: For Hot-Standby or parallel systems, it is sufficient to feed one contact into one unit only, however they may be connected in parallel at M4 Pin7 and Pin 8 for all units

If it is necessary to reduce the current supplied by the diesel-generator, then a second voltage-free contact (again normally open) is required and must to be connected to the connector M8, Pin 1 and Pin 2 on the rectifier electronic mother board (RBPHC16) see FIG.1.6.2

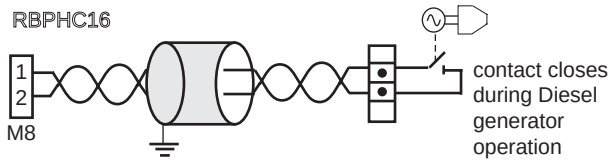


FIG. 1.6.2 Connection for Diesel Generator Operation (connector M8) - second level current limitation.

Note 1: The cable used in both cases must be twisted pair, with a total shield. This shield must be grounded at one end (the cabinet of theUPS may be used).

Note 2: The cable for current limitation must be connected to all units for parallel or hot-standby units, using separate voltage-free contacts.

1 Installation

1.7 Remote Reset

The UPS system may be reset remotely with the connection of contacts (a push-button) to the terminal M4 as shown:

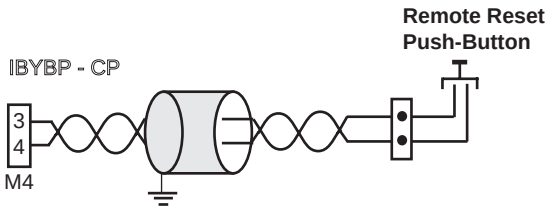


FIG.1.7.1 Connection of Remote Reset

Note: The cable used must be twisted pair, with a total shield. This shield must be grounded at one end (the cabinet of the UPS may be used).

1 Installation

1.8 Installation of Hot-Standby Systems

For hot-standby systems the units must be connected together as shown in the FIG. 1.8.1 or FIG. 1.8.2

Note: The installation for each unit must be performed in accordance to the installation of single units as described in the previous sections. Additionally to this, the outputs must be connected in parallel as shown in FIG. 1.8.1 or in FIG.1.8.2

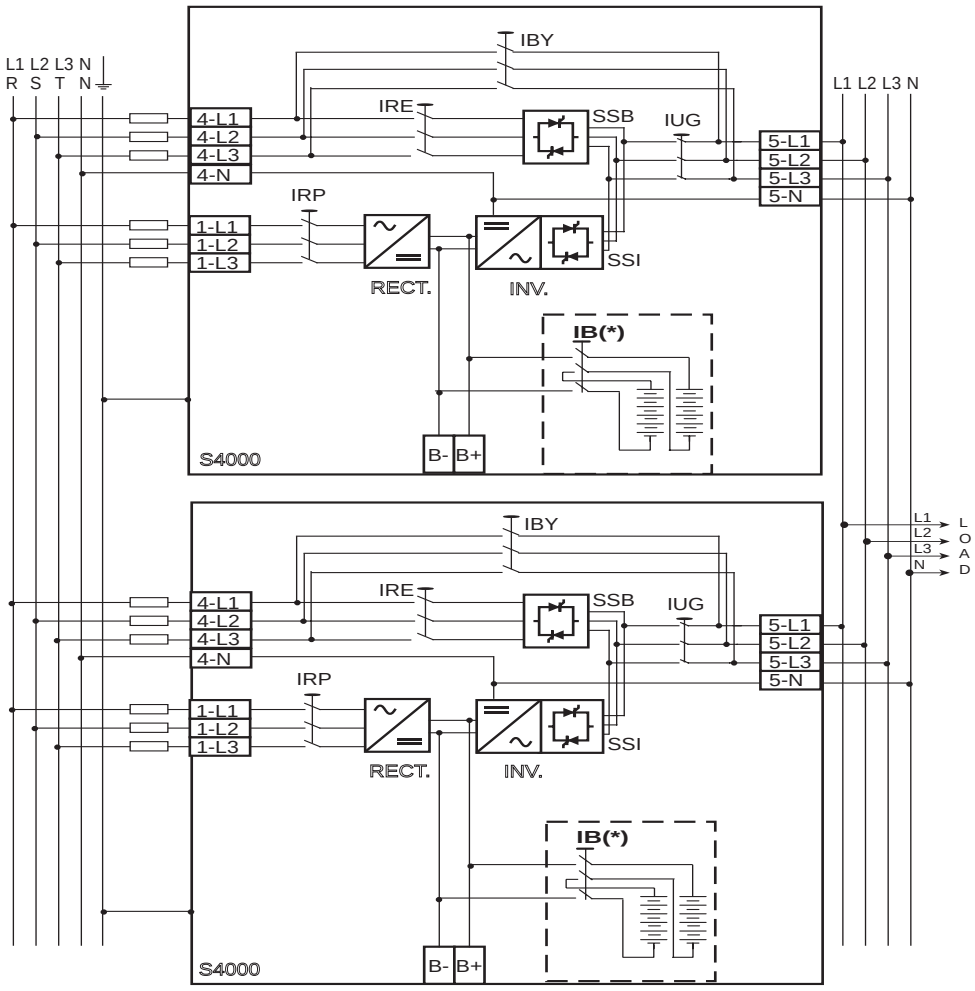


FIG. 1.8.1 Interconnection of hot-standby units with integrated maintenance bypasses and separate bypass terminals.

(*) Note: Internal Battery only for 10-30kVA units

1 Installation

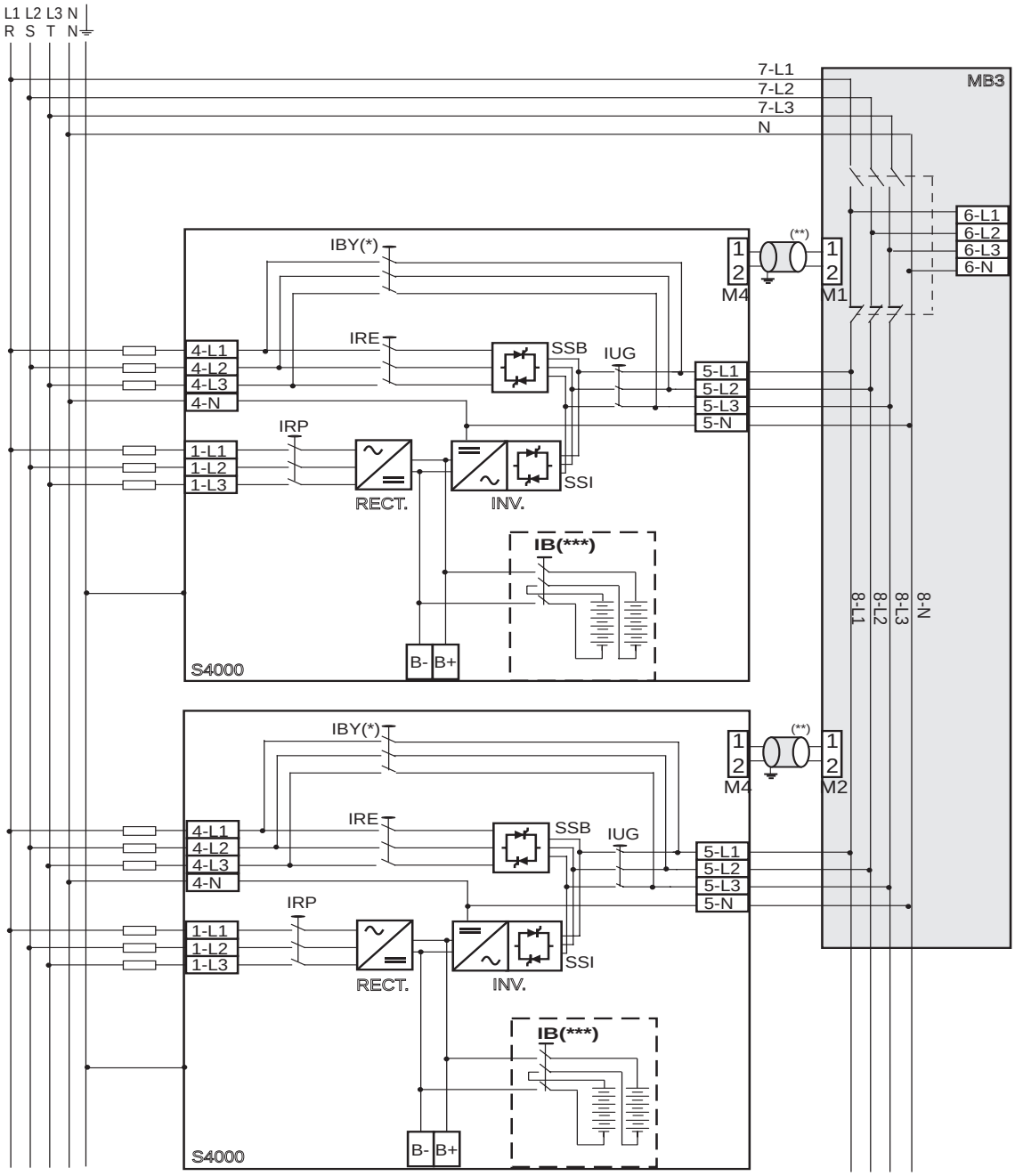


FIG. 1.8.2 Interconnection of hot-standby units with external maintenance bypass and separate bypass terminals.

(*) Note: The internal maintenance bypass (IBY) may or may not be installed in this configuration.

(**) Note: This cable must be twisted pair, total shield (refer. to section 1.4)

(***) Note: Internal Battery only for 10-30kVA units

1 Installation

1.8.1 Installation of the Interconnection Cable

The supplied cable must be connected between the units within the system. This must be connected at either of the connectors CN12 or CN13 on the mother-board of the Inverter/Bypass electronics (IBYBP-CP) and the other end of the cable is connected to either CN12 or CN13 on the mother-board of the Inverter/Bypass electronics (IBYBP-CP) of the other unit(s).

Note: If the unit is to be added to one already installed stand-alone unit which has not been previously tested in a hot-standby configuration, the supports and mounting screws to mount the cable to the p.c.b are supplied with the cable. They must be mounted at both sides of the selected connector in order to fix the cable securely to the connector with the supplied screws.

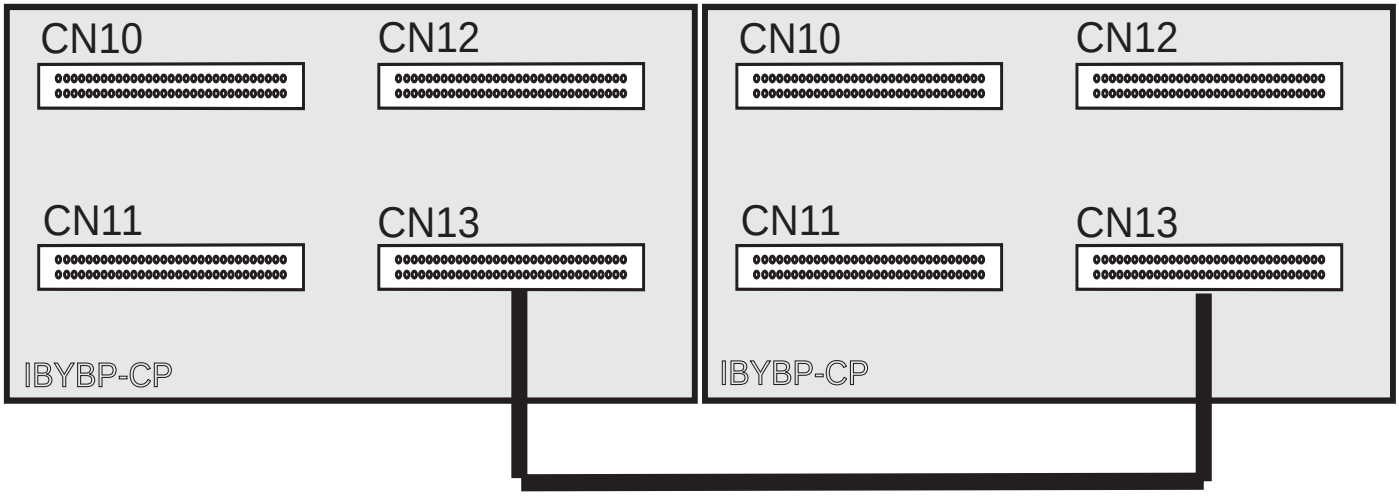


FIG. 1.8.3 Interconnection of control BUS cable for hot-standby units

1 Installation

1.9 Installation of Parallel Systems

Up to a total of 8 units may be installed together in the one parallel system.

Note: The installation for each unit must be performed in accordance to the installation of single units as described in the previous sections. Additionally to this, the outputs must be connected in parallel as shown in FIG. 1.9.1 or in FIG.1.9.2

Care must be taken with the installation of the bypass line and in particular, that the cables from the point of common coupling of the input supply to the terminals 1-L1, 1-L2, 1-L3 (or 4-L1, 4-L2, 4-L3, 4-N if an optional separate bypass input is installed), are of equal length. Likewise, the output cables from the output terminals (5-L1, 5-L2, 5-L3, 5-N) to the point of common coupling on the load side must be of equal length.

1 Installation

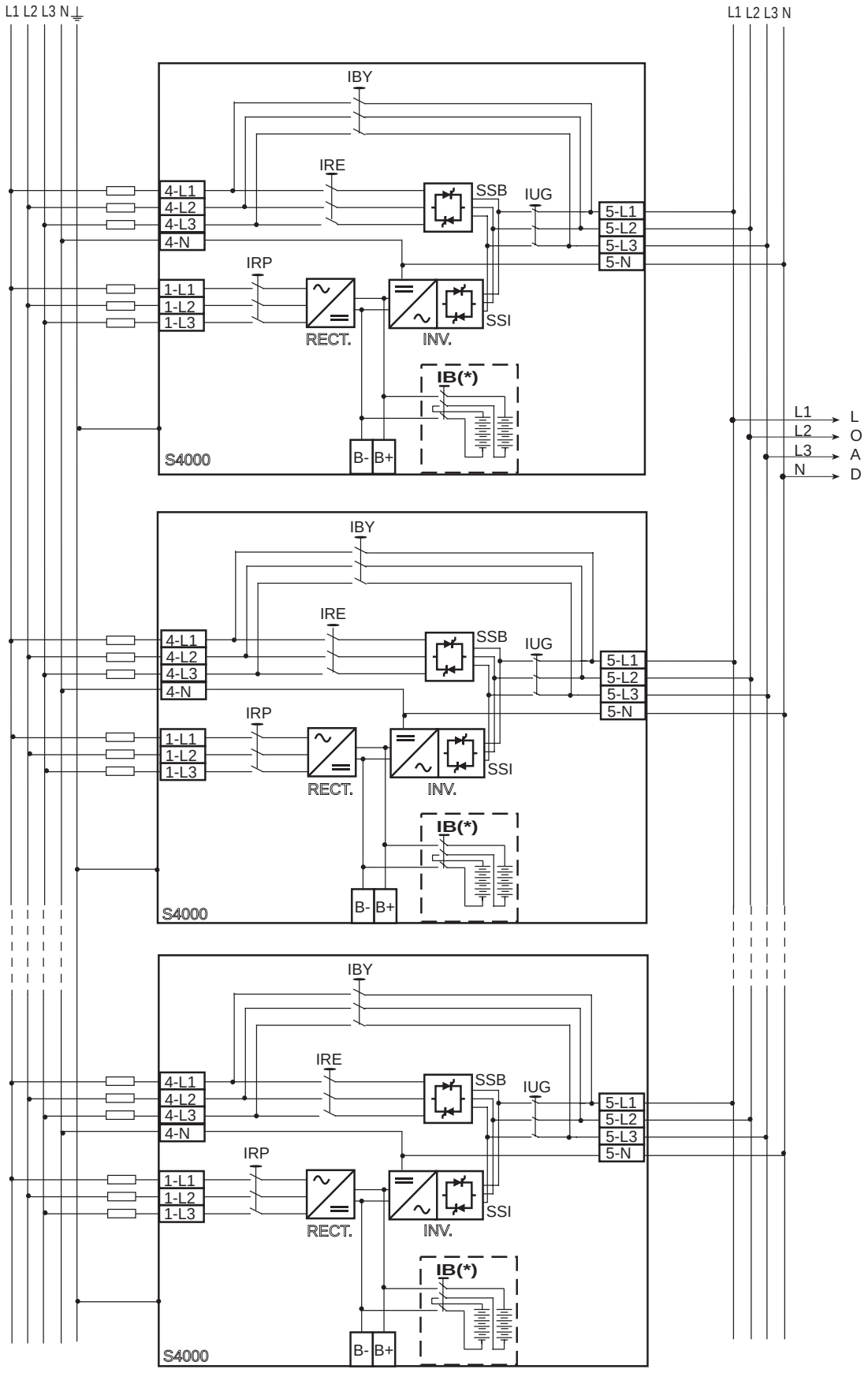


FIG. 1.9.1 Interconnection of parallel units with integrated maintenance bypasses and separate bypass terminals.

(*) Note: Internal Battery only for 10-30kVA units

1 Installation

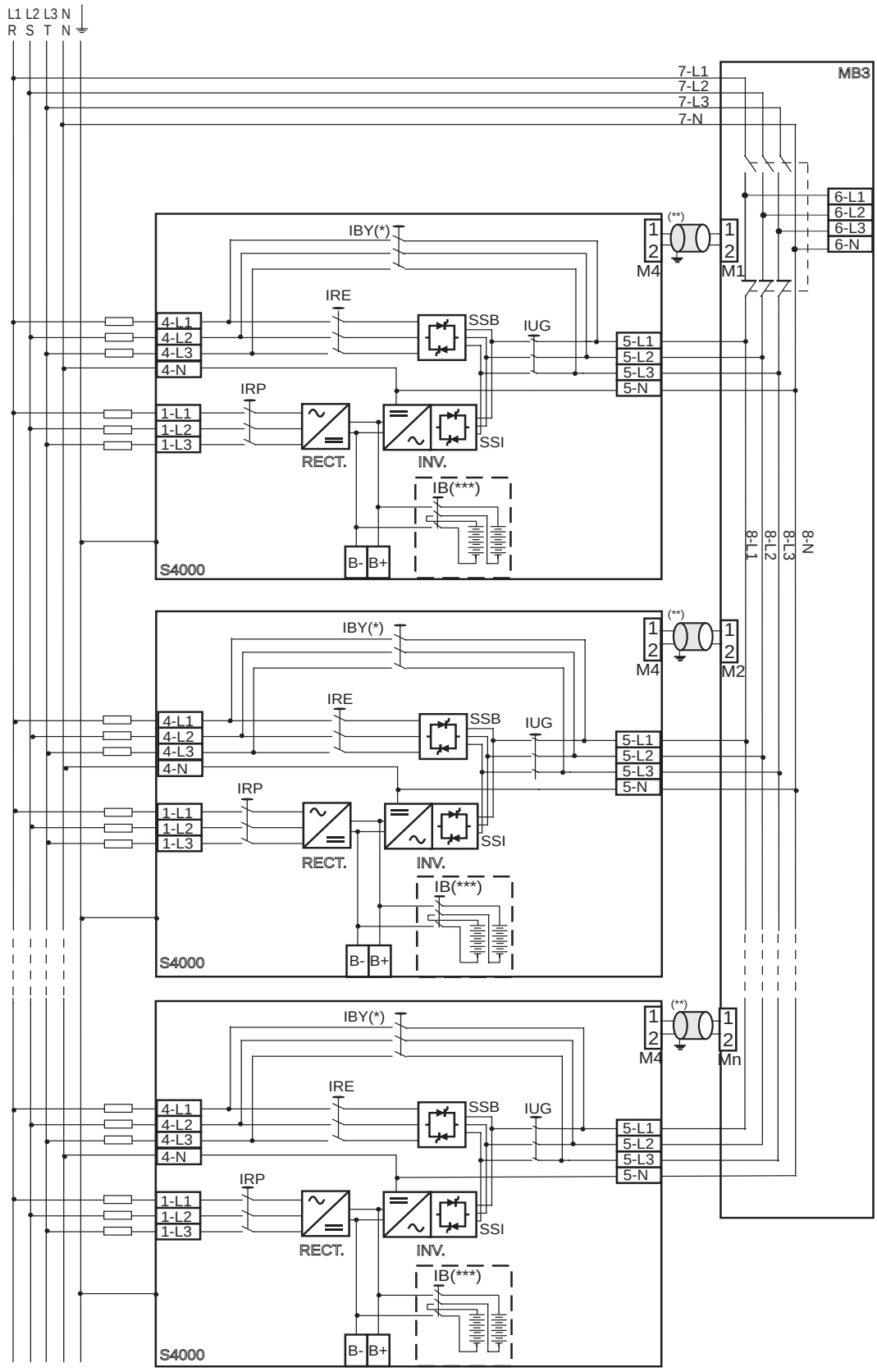


FIG. 1.9.2 Interconnection of parallel units with common maintenance bypass and separate bypass terminals.

(*) Note: The internal maintenance bypass may or may not be installed in this configuration.

(**) Note: This cable must be twisted pair, total shield (refer to section 1.4)

(***) Note: Internal Battery only for 10-30kVA units

1 Installation

1.9.1 Installation of the Interconnection Cables

There are two interconnection cables supplied with the units for each additional unit to the first unit. These cables must be connected between the units as shown in FIG. 1.9.4 One cable is connected to either CN12 or CN13 (the other end being connected to the corresponding connector of another unit), and the other cable is connected to either of CN10 or CN11, again with the other end connected to the corresponding connector of another unit. In this way, all units will be interconnected by two cables in a BUS-Communication system (Daisy-chain connection).

Note: If the unit is to be added to one already installed stand-alone unit which has not been previously tested in a parallel configuration, the supports and mounting screws to mount the cable to the p.c.b are supplied with the cables. They must be mounted at both sides of the selected connectors in order to fix the cables securely to the connectors with the supplied screws.

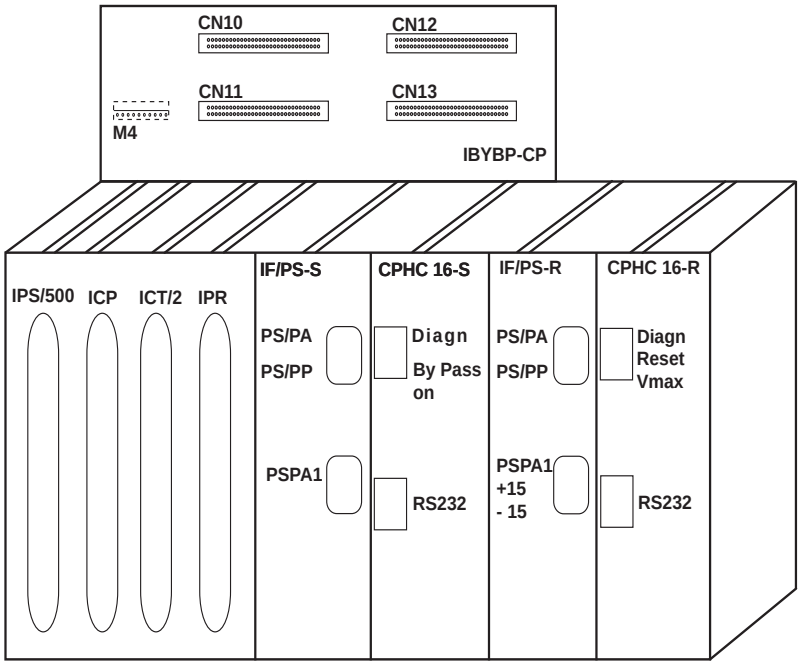


FIG. 1.9.3 Location of connectors on the IBYBP-CP pcb.

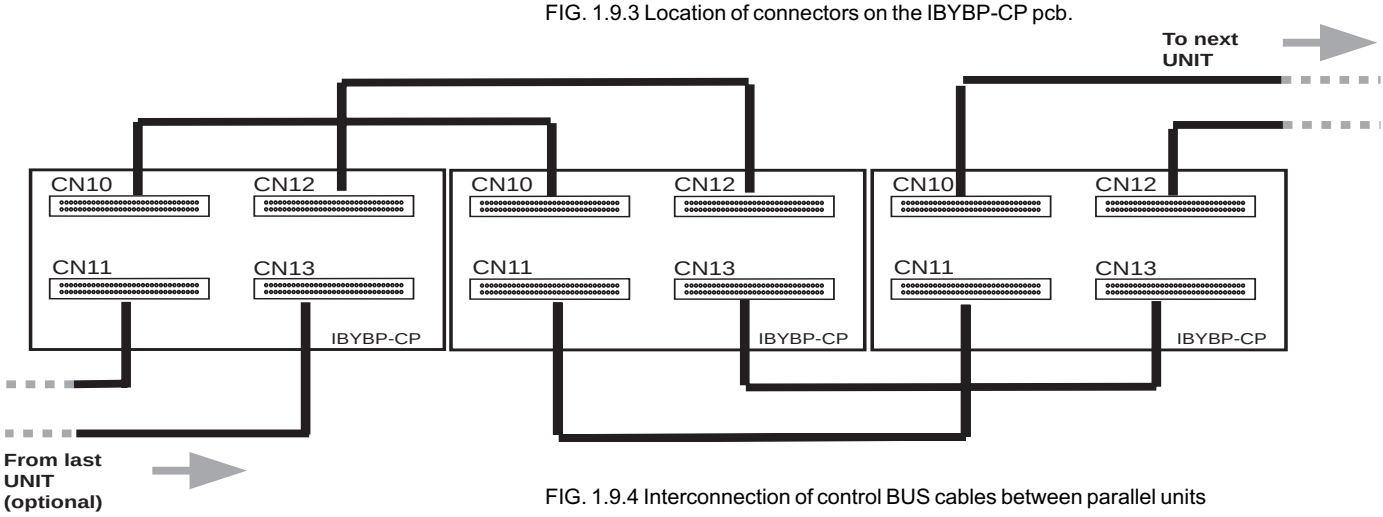


FIG. 1.9.4 Interconnection of control BUS cables between parallel units

1 Installation

1.10 Battery Installation

Battery Installation must be in accordance with local safety standards.

General The batteries are charged. The installation should only be made by appropriately qualified personnel. The screw connections between the batteries should be tightened with a torque wrench (max. 7 Nm).

1.10.1 Installation of Internal batteries PTX33/SP (10-30kVA)

Internal Battery (24Ah) Installation

- Place five battery blocks on the tray of the first level.
- Place nine battery blocks on the trays of the second, third and fourth level.
- Interconnect the blocks in series (see FIG.1.10.1 for YUASA NP battery type or FIG.1.10.2 for YUASA NPI battery type)

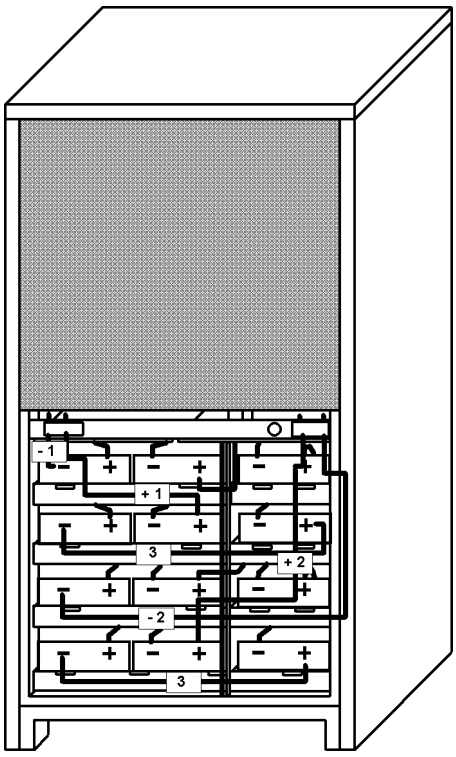
Warning: after assembly there is a voltage of 67,5 V on the first level, and 121,5 V on the second, third and fourth levels.

1° LEVEL

2° LEVEL

3° LEVEL

4° LEVEL



S4000 rear view

Warning: Open switch IB before connecting the cables

1 Installation

Internal Electrical Connections for YUASA NP Battery Type

Cable (1) n° 3; L = 280 mm; diameter 16 mm^2

Cable (2) n° 8; L = 420 mm; diameter 16 mm^2

Cable (3) n° 4; L = 490 mm; diameter 16 mm^2

Cable (4) n° 2; L = 650 mm; diameter 16 mm^2

Support (CA1) n° 4; See Fig. CA1

Support (CA2) n° 9; See Fig. CA2

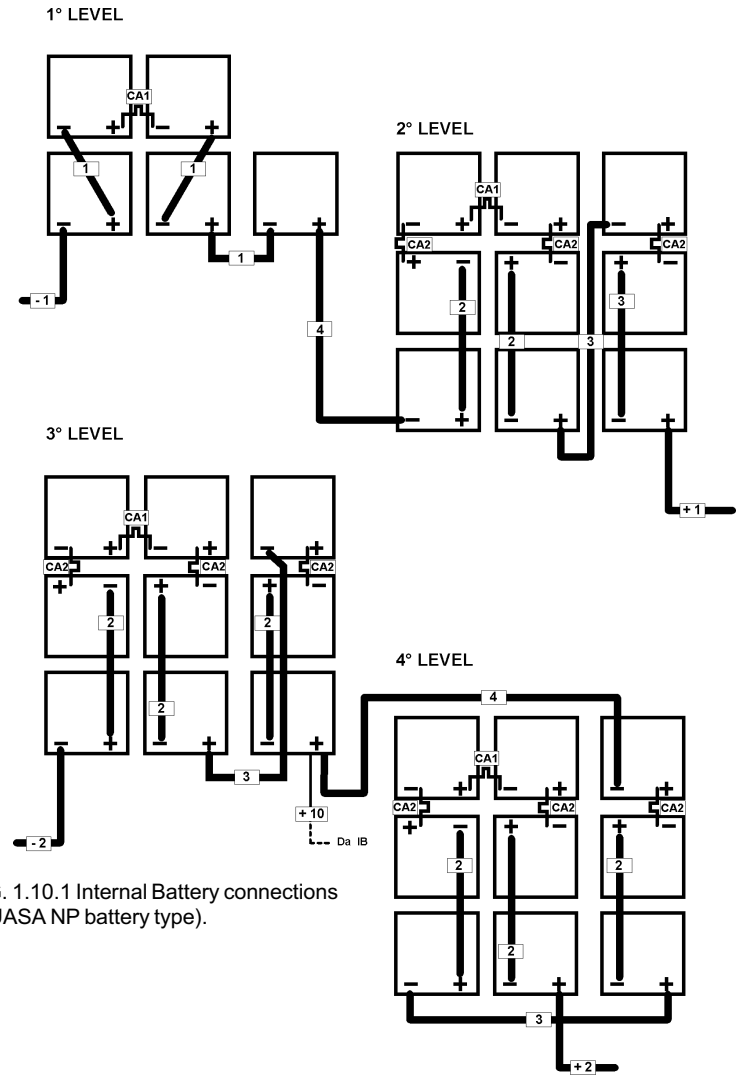
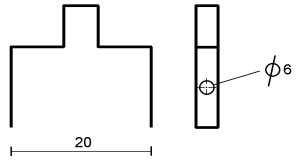


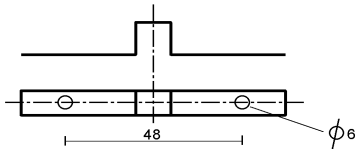
FIG. 1.10.1 Internal Battery connections (YUASA NP battery type).

Copper bars for battery connection Two copper plates diam. 0,5 mm. are used.

CA1



CA2



1 Installation

Internal Electrical Connections for YUASA NPI Battery Type

Cable (1) n° 3; L = 280 mm; diameter 16 mm^2

Cable (2) n° 8; L = 420 mm; diameter 16 mm^2

Cable (3) n° 4; L = 490 mm; diameter 16 mm^2

Cable (4) n° 2; L = 650 mm; diameter 16 mm^2

Support (CA3) n° 4; See Fig. CA3

Support (CA4) n° 9; See Fig. CA4

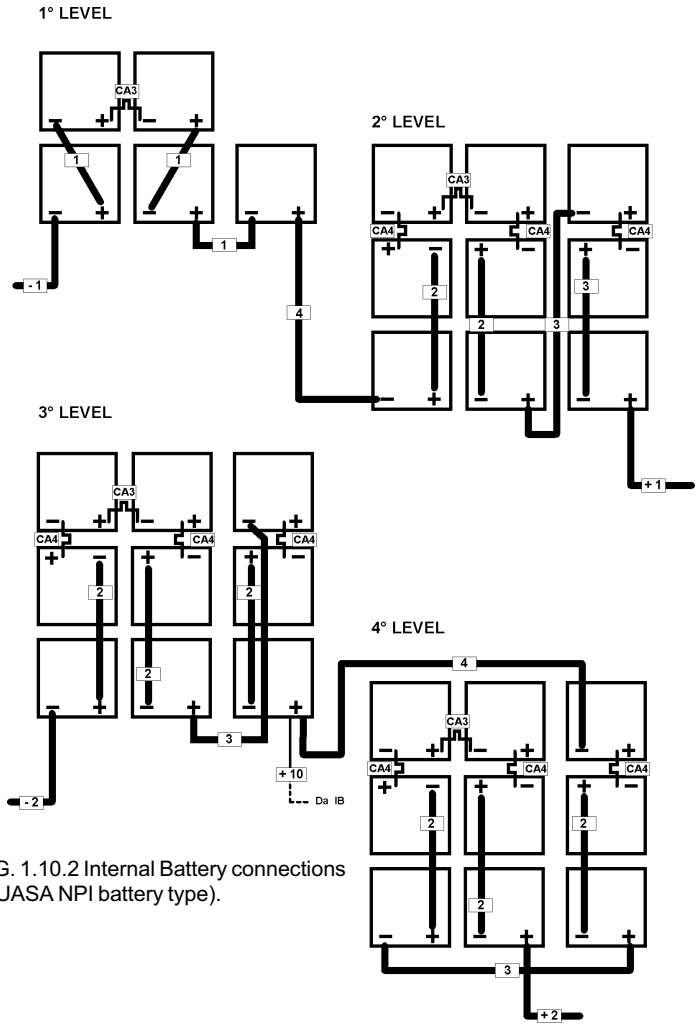
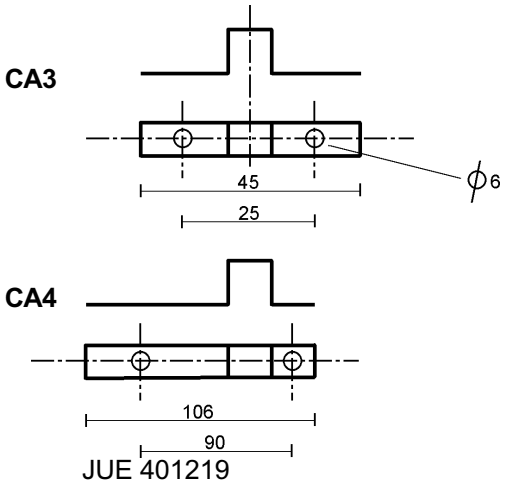


FIG. 1.10.2 Internal Battery connections (YUASA NPI battery type).

Copper bars for battery connection Two copper plates diam. 0,5 mm. are used.



1 Installation

1.10.2 Installation of External Batteries

There are seven types of external battery cabinets to be used for PTX33/SP UPS.

- **BC4S/125** equipped with 125A 3-pole automatic circuit breaker
- **BC4S/250** equipped with 250A 3-pole automatic circuit breaker
- **BC4L/125** equipped with 125A 3-pole automatic circuit breaker
- **BC4L/250** equipped with 250A 3-pole automatic circuit breaker
- **BC4L/400** equipped with 400A 3-pole automatic circuit breaker
- **BC4D/250** equipped with 250A 3-pole automatic circuit breaker
- **BC4D/400** equipped with 400A 3-pole automatic circuit breaker

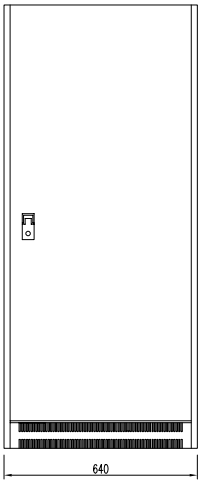
Table 1.10.2.1 gives the detailed indication on the types of batteries used within each battery cabinet.

	YUASA	JOHNSON CONTROLS	POWER BATTERIES
BC4N	32 x 24Ah	/	/
BC4S/125 BC4S/250	32 x 24Ah	32 x 12-100	32 x 1225
	32 x 38 Ah	32 x 12-140	32 x 1230
	/	32 x 12-170	32 x 1235
	/	32 x 12-200	32 x 1250
	/	32 x 12-270	32 x 1265
	/	/	32 x 1280
	/	/	32 x 1290
BC4L/125 BC4L/250 BC4L/400	32 x 65Ah	32 x 12-310	32 x 12100
	/	32 x 12-370	32 x 12110
	/	32 x 12-475	32 x 12120
	/	/	32 x 12150
BC4D/250 BC4D/400	/	64 x 6-620	/

Table 1.10.2.1: List of battery types used within each battery cabinet

1 Installation

BC4S External Battery Cabinet Installation



To assemble the battery cabinet:

- Place eight battery blocks on the trays of the first, second, third and fourth level.
- Interconnect the blocks in series (block 1 / negative pole ==> block 2 / positive pole,....).

Warning: after assembly there is a voltage of 96V on each level.

- Insert the trays into the battery cabinet.

Important: Open battery switch IB before connecting the cables.

- Place the trays with the batteries on the corresponding levels in the UPS.
- Connect the battery blocks of the various levels to the battery switch IB, and IB to the terminals, as shown in fig. 1.10.3

Ensure appropriate ventilation of the battery room according to the standard EN50091-1, to prevent the risk of an explosion.

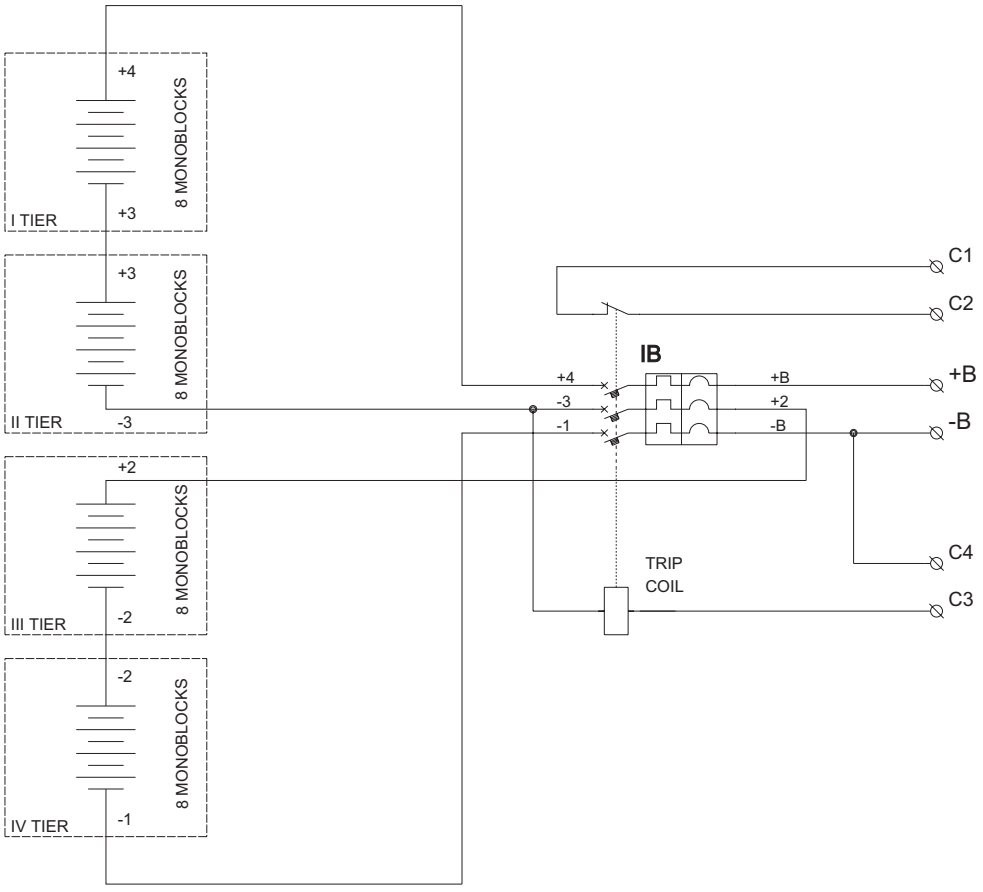
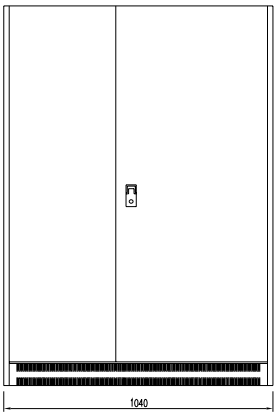


FIG. 1.10.3 BC4S internal electrical connections

1 Installation

BC4L External Battery Cabinet Installation



To assemble the battery cabinet:

- Place ten battery blocks on the trays of the first, second and third level.
- Place two battery blocks on the tray of the fourth level.
- Interconnect the blocks in series (block 1 / negative pole ==> block 2 / positive pole,....).

Warning: after assembly there is a voltage of 120V on the first, second and third level and 24V on fourth level.

- Insert the trays into the battery cabinet.

Important: Open battery switch IB before connecting the cables.

- Place the trays with the batteries on the corresponding levels in the UPS.
- Connect the battery blocks of the various levels to the battery switch IB, and IB to the terminals, as shown in fig. 1.10.4

Ensure appropriate ventilation of the battery room according to the standard EN50091-1, to prevent the risk of an explosion.

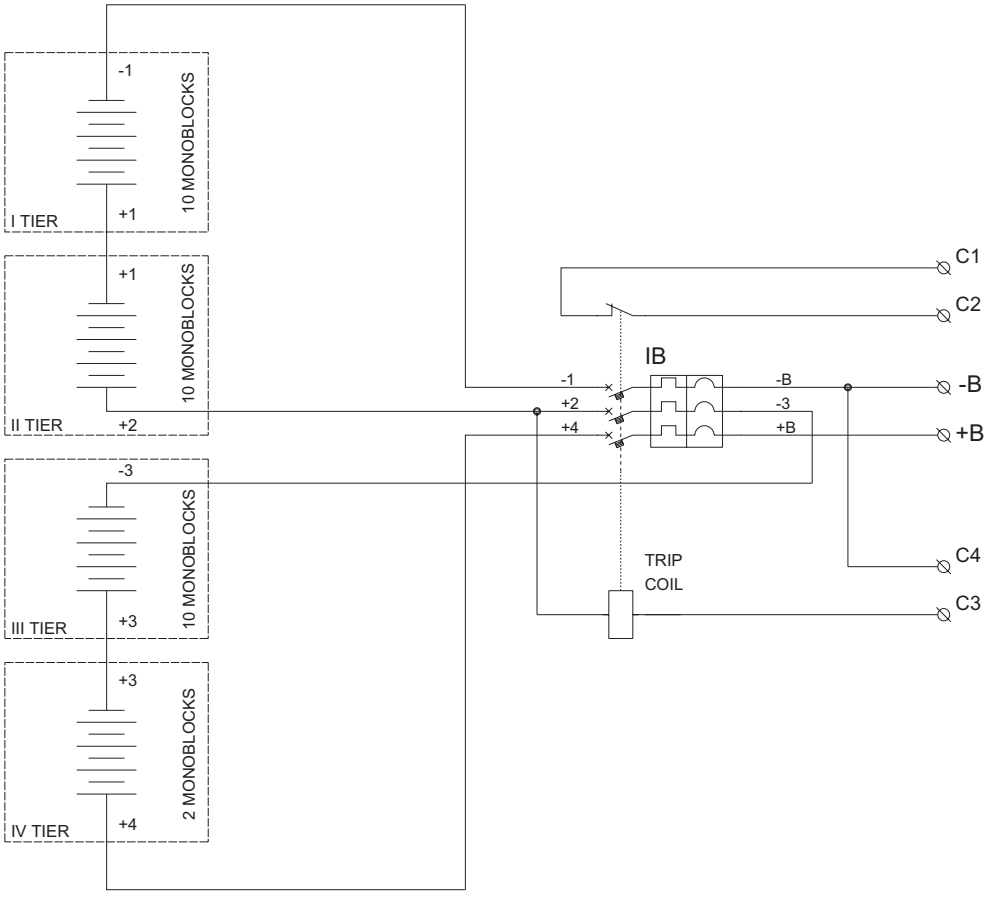


FIG. 1.10.4 BC4L internal electrical connections

1 Installation

BC4D External Battery Cabinet Installation

To assemble the battery cabinets:

- Place ten battery blocks on the trays of the first, second and third level.
- Place two battery blocks on the tray of the fourth level.
- Interconnect the blocks in series (block 1 / negative pole ==> block 2 / positive pole,....).

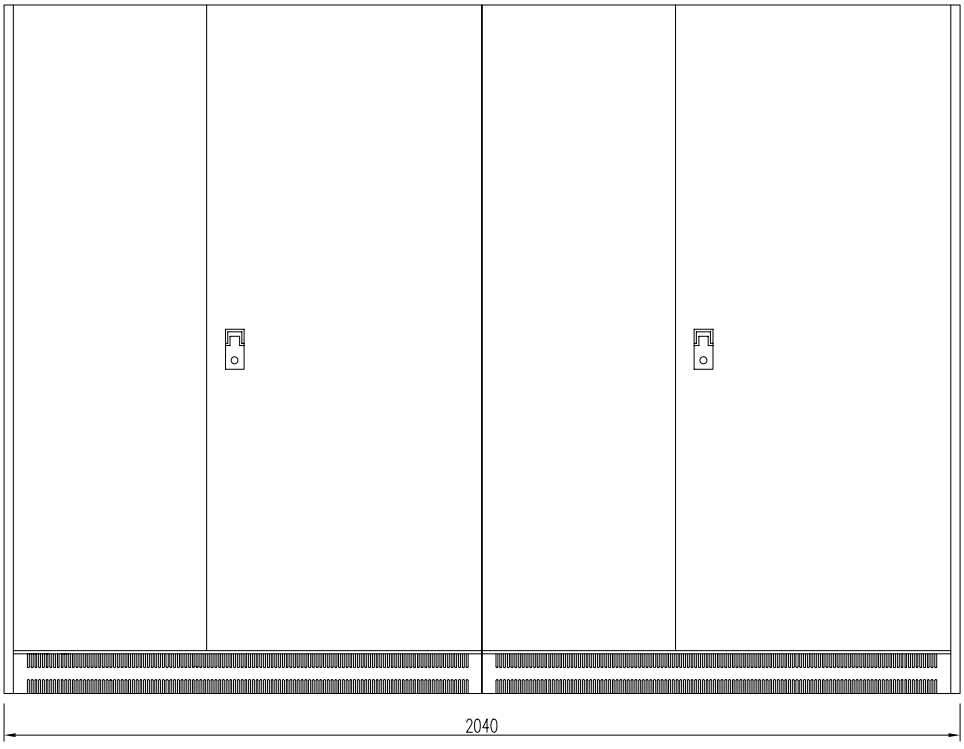
Warning: after assembly there is a voltage of 120V on the first, second and third level and 24V on fourth level.

- Insert the trays into the battery cabinets.

Important: Open battery switch IB before connecting the cables.

- Place the trays with the batteries on the corresponding levels in the UPS.
- Connect the battery blocks of the various levels to the battery switch IB, and IB to the terminals, as shown in fig. 1.10.5

Ensure appropriate ventilation of the battery room according to the standard EN50091-1, to prevent the risk of an explosion.



1 Installation

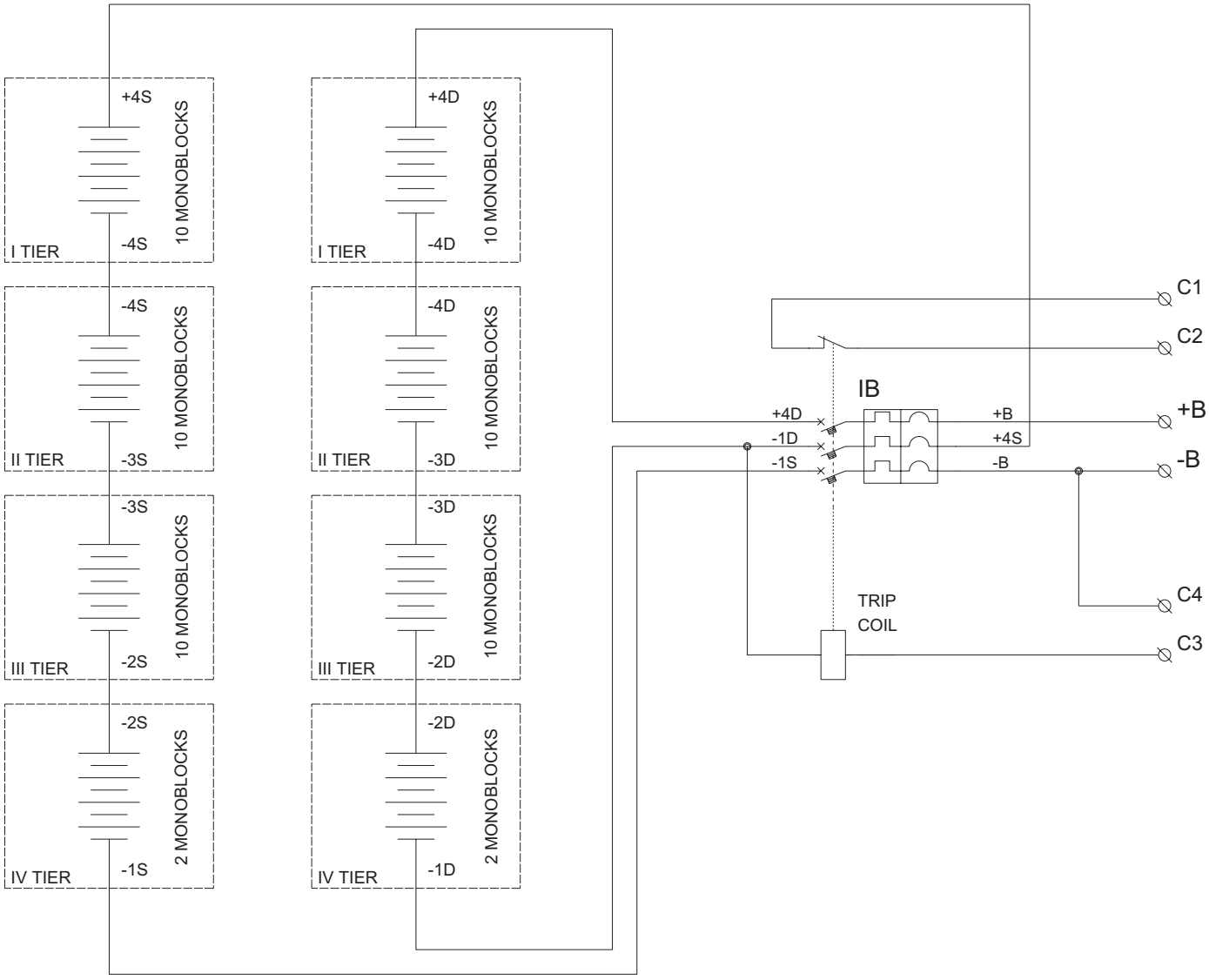


FIG. 1.10.5 BC4D internal electrical connections

1 Installation

Connection Between UPS and Additional Battery Cabinets

Important: Open all battery switches **IB** before connecting the cables. Observe the indicated wiring polarity.

- For UPS systems with external batteries: connect the external batteries as shown in FIG. 1.10.6
- After wiring, check that the external battery is connected with correct polarity.

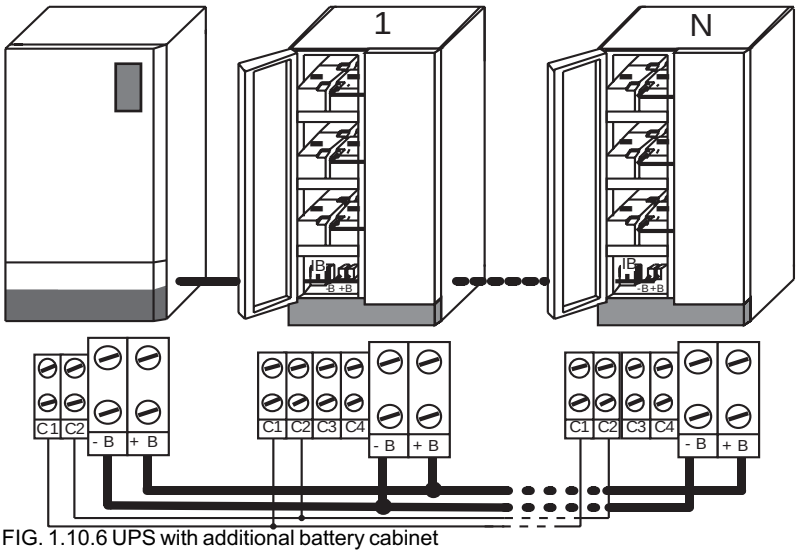


FIG. 1.10.6 UPS with additional battery cabinet

Connection of Auxiliary Contacts

For the standard battery cabinet, the terminals C1 and C2 are connected to the corresponding terminals in the UPS cabinet as in FIG. 1.10.6.

If a battery is installed without standard cabinet(s), then a voltage-free auxiliary contact (normally closed) should be provided, which is connected to the terminals C1 and C2.

2 Initial Start-Up

2.1 Initial Start Up Procedure

General

With the Start Up procedure the correct installation of the UPS according to the previous section is checked. It must be carried out by specialised personnel.

Safety precautions according to the appropriate local safety standards must be applied.

Should problems arise during the Start Up Procedure, call for service assistance.

Preparation

For carrying out the Start Up Procedure, a 3 1/2 digit voltmeter with 1% accuracy, an AC/DC clip-on ammeter and a small screwdriver for potentiometers are needed.

The installation of the UPS must have been carried out according to the previous section.

- Check that the ventilation system of the UPS room is ready to operate.
- Check that all switches IRP, IRE, IUG, IBY, IB are open and the load is off.

A: Rectifier Power Supply Check

- Switch on the external mains supply to the UPS.
- Check that the supply voltage at terminals 1-L1, 1-L2, 1-L3 is within ±10% of the UPS rated voltage.
- Close **IRP**.

? *Does the display on the **CPHC16 -R** pcb for the rectifier give the indication **"P"**?*

yes The phase rotation at the input is incorrect.

- Open **IRP,** switch off the external mains supply and exchange any two of the cables at input terminals 1-L1, 1-L2, 1-L3.
- Return to **A**.

no The rectifier input voltage is o.k. and the rectifier will automatically start to operate.

- Wait until the Data Monitor Panel is illuminated
- Go to the test menu on the operating panel:
  Enter the password 8031.Select the submenu "INV/RECT ON/OFF" and press F1.The inverter will start and after approximately 10s the green led "INV ok" will be permanently lit.
- Press the push-button PB3 on the bottom of ICP card:
  after few seconds the three green leds on SS/FY card will be lit.

NOTE: If the battery switch indication is not on then the connections to C1 and C2 in the battery cabinet are not correct. Refer to the section "Installation".

2 Initial Start-Up

B: Inverter Voltage Adjustment

- On the SS/FY pcb, measure the voltage at the screws Inverter R, Inverter S, Inverter T with respect to the neutral terminal 5-N.

? *Does this voltage correspond to the desired voltage?*

no

- Adjust the voltage to the desired value individually for each phase using P3, P4 and P5 on the ICT-2 pcb.

  NOTE: If the inverter output voltage is changed, the value at TP1 (adjusted with P1) on the ICP pcb should be checked. (6V corresponds to nominal voltage). Note also that for parallel systems, if the voltage is changed here, the current sharing will also be affected. Therefore, change voltage settings **ONLY IF ABSOLUTELY NECESSARY**. Small variations of the voltage will not affect system performance. The UPS is already pre-calibrated in the factory with nominal load.

yes

- Continue with C

C: Inverter free-run frequency check

- Insert a pin d=2mm in the red test point S1 on the ICP pcb. The red LED LD3 on the ICP pcb must be permanently lit. The inverter frequency is now free-running without the internal oscillator.
- On the SS/FY pcb, measure the inverter frequency on the screws Inverter R, S or T with respect to neutral.
- Check that the frequency is set at the required value (50/60 Hz +/- 0,1 Hz). It can be adjusted with P1 on the ICT-2 pcb. Remove the pin from S1. The inverter now synchronises with the internal oscillator.

D: Battery Installation Check

- Make sure that the batteries have been installed according to the instructions for installation.

With an external battery cabinet BC4S:

- Measure the battery voltage in the battery cabinet at the battery switch between cables:
  - -1 (-) and +2 (+)
  - -3 (-) and +4 (+)

With an external battery cabinet BC4L:

- Measure the battery voltage in the battery cabinet at the battery switch between cables:
  - +4 (+) and -3 (-)
  - +2 (+) and -1 (-)

With an external battery cabinet BC4D:

- Measure the battery voltage in the battery cabinet at the battery switch between cables:
  - -1S (-) and +4S (+)
  - -1D (-) and +4D (+)

? *Does this voltage have positive polarity?*

no

- Open **IRP, wait for 5-10 minutes,** and then reconnect the battery cables at the terminals which lead to the switch(es) where the wrong polarity was detected.
- Return to **D**.

2 Initial Start-Up

yes

- Check the voltage between the battery terminals B+ and B-.

The value of this voltage should be already set according to the amount of batteries installed.

- Close battery switch **IB**.

The alarm "battery switch open" stops.

E: Bypass Power Supply Check

- If your unit has separate supplies for rectifier and bypass (terminals 4-L1, 4-L2, 4-L3, 4-N), switch on the external supply for the bypass. Check that the bypass supply voltage at terminals 4-L1, 4-L2, 4-L3, 4-N is within ±10% of the nominal input voltage.

  If there are no separate input terminals then the bypass input is the same as that checked previously for the rectifier input.
- Close **IUG**.
- Close **IRE**.

? *Does the display on the **CPHC16 -S** pcb for the bypass give the indication **"P"**?*

yes

- Open **IRE** and exchange any two of the cables at the bypass input terminals 4-L1, 4-L2, 4-L3.
- Return to E.

no

- Are the status LEDs (green) for the bypass line on the operating panel continuously on?

  no: Check that the mains frequency is in tolerance.

  OK?

  yes: Is the pcb CPHC16 -S for the bypass correctly functioning? The display should be rotating clockwise.

  no: Call for service assistance.

  yes: Check again the input supply. Check that it is in accordance with the UPS rating label.

  no: The mains frequency must be within tolerance in order for the bypass to be available

  yes: Continue with **F**.

F: Synchronisation Check

- Check that the green LED LD1 on the ICT-2 pcb is permanently lit and there is no **"S"** indication on the bypass electronics.
- On the SS/FY pcb, measure the voltage between the screws Bypass R and Inverter R. Then repeat for the other two phases.

? *Are the voltages < 25Vac?*

no

2 Initial Start-Up

• If the voltage is continuously fluctuating from 0 to 400V there is a synchronisation problem. Switch off IRE and call for service assistance.

If the voltage is slightly higher but relatively constant and the default values have been re-entered using the serial interface on the CPHC16 -S p.c.b., then the synchronisation may need to be re-adjusted. This can be easily confirmed by comparing the two sinewaves for a possible phase difference.

Are the two waveforms phase-shifted?

yes: The synchronisation must be re-adjusted using the serial interface of the CPHC16 -S pcb and the PSRS232 and a portable computer.

no: The difference is probably due to distortion of the mains voltage (the inverter voltage is an almost perfect sinewave)

Continue with **G**

yes: Continue with **G**

G: Static Switch Commutation Check

• **COMMUTATION TO THE BYPASS**

Press the pushbutton on the CPHC16 pcb for the bypass. The static switch SSB will switch on and SSI will switch off, as indicated on the front panel and on the SS/FY pcb (red LEDs).

• **COMMUTATION TO INVERTER**

Press the pushbutton PB3 at the bottom of the ICP pcb. The static switch SSI will switch on and SSB will switch off, as indicated on the front panel and the SS/FY pcb (green LEDs).

Commutations to/from bypass and inverter may also be performed using the Test Menu of the Data Monitor Panel.

H: Battery Charging Current Limitation Check

• Connect the load and open **IRP.**

The load is now supplied only by the batteries.

• Discharge the batteries for about 2 minutes at nominal UPS load or longer if the connected load is smaller than nominal UPS load

• Close **IRP** again.

• After 30 seconds, measure the battery voltage.

? *Is the battery voltage lower than the set floating charge voltage?*

no The rectifier is not yet in battery current limitation. In order to check the battery current limitation you must discharge the batteries for a longer period.

• Return to **H**.

yes The battery current limitation can now be checked according to the battery installed. Standard setting is 10% of the battery capacity.

2 Initial Start-Up

- Measure the battery recharging current with a dc clip-on ammeter.

? *Is this approximately 10% of the battery Ah capacity?*

yes **THE START-UP PROCEDURE FOR A STAND-ALONE UNIT HAS BEEN SUCCESSFULLY COMPLETED NOW.**

no Check the settings of the dipswitch S1 on the CPHC16 -R pcb for the rectifier according to JUE400899 programming of PCBs (V2.0 or later). Otherwise the battery charging current may need to be adjusted using the RS232 connector on the CPHC16-R pcb and a portable computer. This must be performed by first discharging the battery by switching off IRP, connecting the PC and adjusting the charging current. **The battery must remain connected throughout the procedure.**

• Return to **H**.

3 Additional Start-Up Proced. for Multi-unit Systems

3.1 Additional Start Up Procedure for hot - standby Systems

Repeat the procedure of section 2 for the second unit in the system (with the first unit off).

Ensure that the interconnecting BUS cable is connected according to section 1.8.1 and FIG 1.8.3.

J

- Switch off the inverter at the second unit with PB2 at the top of the ICP pcb. The unit will transfer to the bypass supply.
- Switch on IRP of the first unit.
- Ensure that the switch IUG of this unit is off.
- Switch on IRE of the first unit.

After approx. 10 seconds the display will flash with a "U" indication and the static bypass switch SSB will be closed.

- Measure across the output switch IUG from input to output of each phase.

? *Is this voltage less than 2V a.c for all three phases?*

no The output power interconnections are incorrect and must be reconnected correctly. Switch off both units and the mains supply and recheck the connections.Return to **J**

yes Continue

- Close IUG of the first unit. The two static bypasses (SSB) are now connected in parallel.
- Close the battery switch of the first unit.
- Use the "Module Start-up" procedure to start the unit .

The unit will transfer the inverter to the output (SSI closes and both SSB switches switch off).

- Repeat the "Module Start-up" for the the second unit.

The inverter will start and become ready (check that the green LED LD6 on the ICP pcb is illuminated) but the static switch SSI will not close.

- Check the commutation of the inverters by pressing PB2 at the top of the ICP pcb on the unit currently with SSI closed.
- Restart the inverters (with PB2 on ICP or using the Test Menu).

THE SYSTEM IS NOW IN NORMAL OPERATION AND THE **HOT-STANDBY** STARTUP HAS BEEN SUCCESSFULLY **COMPLETED.**

3 Additional Start-Up Proced. for Multi-unit Systems

3.2 Additional Startup Procedure for Parallel Systems

Repeat the procedure of section 2 individually for all units in the system, with the the other units off.

Ensure that the interconnecting BUS cables are connected according to section 1.9.1 and FIG 1.9.4.

- Open IRP, IRE, IB and IUG of the last unit checked with the procedure in section 2.

K

- Ensure that no load is connected to the system output.
- Ensure that all IUG switches are open.
- Switch on the IRE switches of all units. Wait until all units give a flashing "U" indication on the display of the CPHC16-S pcb.
- Close IUG on one unit only.
- At each unit in turn:

  Measure across the output switch IUG from input to output of each phase.

? *Is this voltage less than 2V.a.c for all three phases for every unit?*

no The output power interconnections are incorrect and must be reconnected correctly. Switch off all units and the mains supply and recheck the connections.

Return to **K**

yes Continue.

- Close the IUG switches on all units, after the step in K has been checked on that unit. The static bypasses (SSB) will now be connected in parallel for all units.
- Close IRP of all units.
- When the front operating panel is energised on all units, close the battery switches of the respective units.
- Use the "Module Start-up" procedure to start any one unit in the system. The inverter will start and when synchronised to the bypass supply, transfer to the system output and all static bypass switches (SSB) will open.
- Use the "Module Start-up" procedure to start each successive unit in the system, each time checking that the SSI closes on the unit and that the system operates in parallel operation.
- Commutations to the bypass/inverter supplies may be checked by pressing the pushbutton on the CPH16 -S pcb and PB3 at the bottom of the ICP pcb or using the "Test Menu" of the Data Monitor Panel.
- Apply a load to the UPS system and check for correct sharing of the load currents on each phase. If stand-alone units have been converted for parallel operation, the current sharing needs to be checked and is best performed with a load as close as

3 Additional Start-Up Proced. for Multi-unit Systems

possible to the nominal load. Measure the currents at the output of each module on phase T. If this current varies by more than ± 1% for this module, fine adjustment can be made with P1 on the IPR pcb.

Check the currents at the output of each module on phase S. These currents must be balanced to within ± 1% by finely adjusting the inverter voltage of phase S (P4 on ICT-2). i.e. If the module is supplying more current than the system average, the inverter voltage of this module must be reduced slightly.

Repeat for phase R currents by finely adjusting the R phase inverter voltage of this module with P3 on the ICT-2 pcb until the currents on the phase R of all modules are equal to within ± 1%.

- THE **SYSTEM START-UP** HAS NOW BEEN S**UCCESSFULLY COMPLETED.**

PTX33/SP with DMP - Operation with DMP

Chapters

1 Operating Modes

1 OPERATING MODES

1.1 General

There are four different operating modes of the standard stand-alone on-line UPS-system (5 for hot-standby and 6 for parallel systems), ensuring uninterrupted power supply of the load under all conditions. Transitions between these operating modes are performed without interruption of the power supply to the load.

Security concept

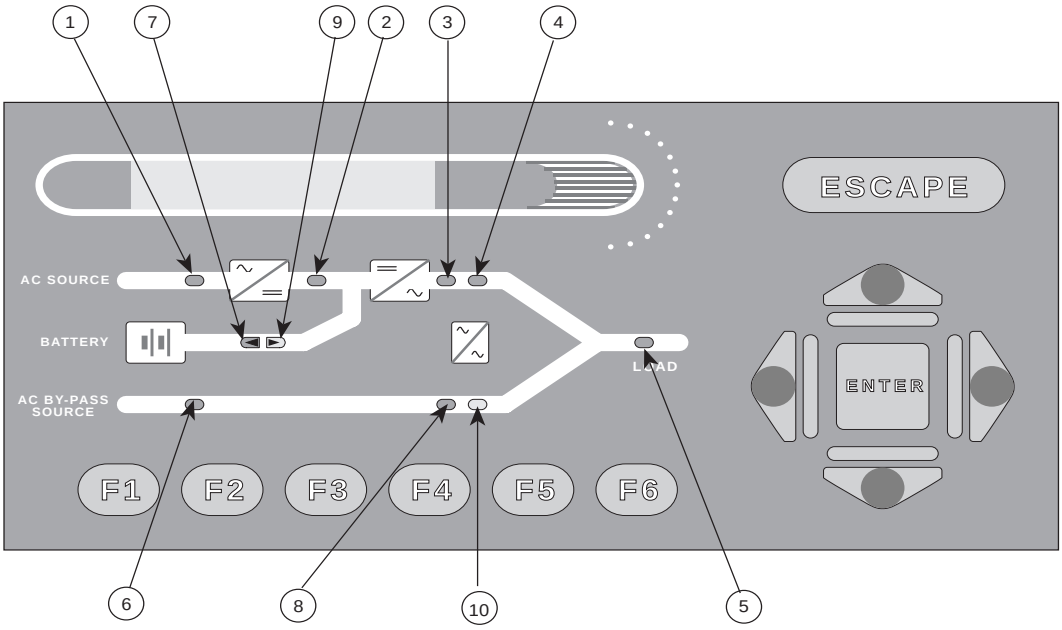
- In "Normal Operation" any failure, internal or external, will transfer the UPS system either to "battery operation", to "bypass operation" for a stand-alone UPS or to "operation with an inverter failure" for parallel and hot-standby systems.
- In "Battery Operation" or "Bypass Operation", with a stand-alone UPS system, an additional failure may interrupt the power supply to the load, depending on the kind of failure. In both operating modes the UPS signals a failure condition (audible and visual alarm) to indicate that any additional failure bears the risk of interrupting the power supply to the load.
- As additional security, a second UPS unit may be added and connected in parallel with the original unit, in a hot-standby configuration. Therefore, in the case of a failure of one inverter, the second inverter will take over the load. This system requires the occurrence of 3 or 4 simultaneous failures (the bypass can be also redundant) before the load is interrupted. Any number of units can be connected together in this way, the addition of each unit providing the addition of 1 or 2 additional security factors. The interconnection of the PTX33/SP in this way requires a special cable available from your local distributor.
- Parallel Operation is used to provide redundancy in the same way as for hot-standby units above and / or an increased capacity to supply the load, the parallel units exactly sharing the load requirement.
- "Maintenance Bypass Operation" is used to supply the load directly from mains during maintenance or repair work.

Warning: Even in case of a total blackout, the UPS will continue to supply power to the load, therefore all necessary precautions against direct and indirect accidental contact as specified in national and local safety standards must be followed.

1 Operating Modes

1.2 LED Indication

The block diagram of the UPS, with integrated LEDs, allows a quick check of the UPS operating status.



LED 1 MAINS SUPPLY OK (RECTIFIER)
LED 2 RECTIFIER OK
LED 3 INVERTER OK
LED 4 LOAD FED by INVERTER
LED 5 LOAD IS SUPPLIED
LED 6 BYPASS POWER SUPPLY OK
LED 7 BATTERY CHARGING
LED 8 BYPASS AVAILABLE (ALL CONDITIONS IN ORDER FOR A NO-BREAK TRANSFER)
LED 9 BATTERY DISCHARGING
LED 10 LOAD FED by the BYPASS POWER SUPPLY

2 Operating Modes Stand-alone Unit

2 OPERATING MODES STAND-ALONE UNIT

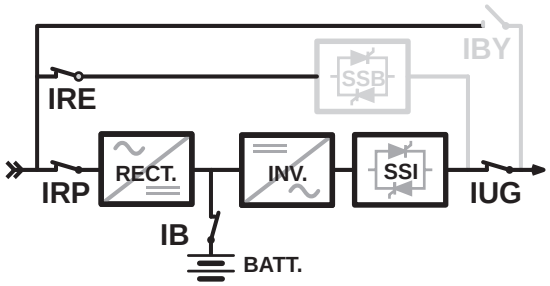


FIG. 2.1 - Normal Operation

2.1 Normal Operation

"Normal Operation" is the standard operating mode of the UPS

- Mains power is present.
- The rectifier converts ac power to dc power which charges the batteries and feeds the inverter.
- The inverter converts this dc power to ac power used to feed the connected load.

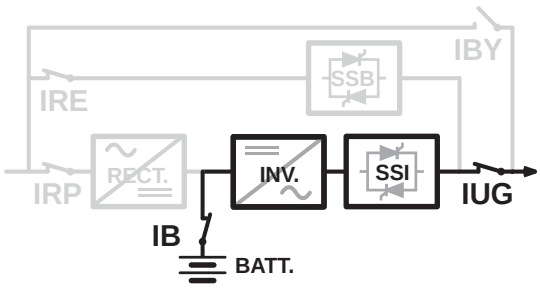


FIG. 2.2 - Battery Operation

2.2 Battery Operation

The "Battery Operation" mode is activated by a mains failure or rectifier failure

- The rectifier supplies no power.
- The battery supplies the required dc power to the inverter.
- The inverter supplies ac power to the load as described above.
- Power will only be supplied to the load for a certain period of time depending on the battery capacity and the amount of load applied.

2 Operating Modes Stand-alone Unit

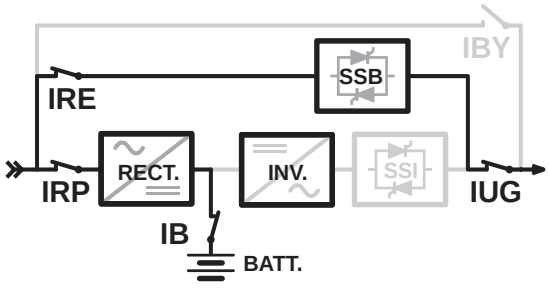


FIG. 2.3 - Bypass Operation

2.3 Bypass Operation

The "Bypass Operation" mode is activated by an inverter failure or an overload

- The rectifier supplies dc power only to the battery.
- The static inverter switch SSI opens automatically after the static bypass switch SSB is closed.
- The load is supplied directly from the mains through the static bypass line.

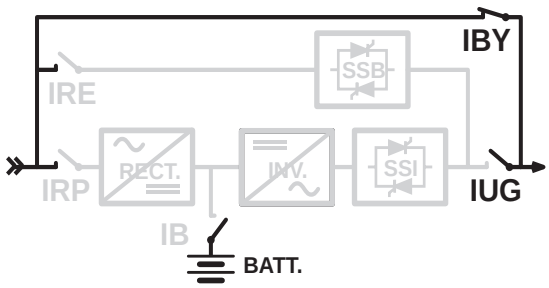


FIG. 2.4 - Maintenance Bypass Operation

2.4 Maintenance Bypass Operation

The "Maintenance Bypass Operation" mode is used to supply the load directly from the mains during maintenance or repair work.

- In this mode, the individual functional components are completely separated from the load.
- Power for the load is supplied directly from the mains through the switch IBY.

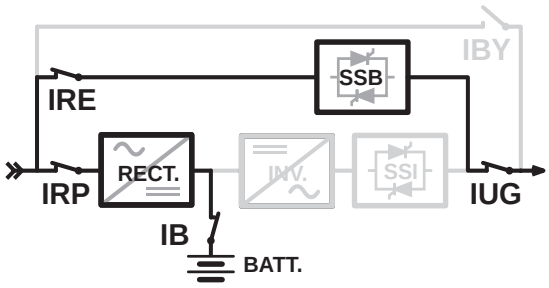


FIG. 2.5 - Standby Operation

2.5 Standby Operation

If an appropriately programmmed IPR pcb is inserted in the control electronic of the stand-alone unit, as an option, this mode of operation is possible.

- If the load is completely switched off, the inverter and the inverter static switch SSI, switch off and the UPS commutates to the bypass supply (SSB closes), thus saving power when the UPS is not needed.
- When the load is again switched on, the inverter automatically switches on and the inverter static switch SSI will commutate the load to the protected inverter supply.

3 Operating Modes Hot-Standby Operation

3 OPERATING MODES HOT-STANDBY OPERATION

3.1 Normal Operation

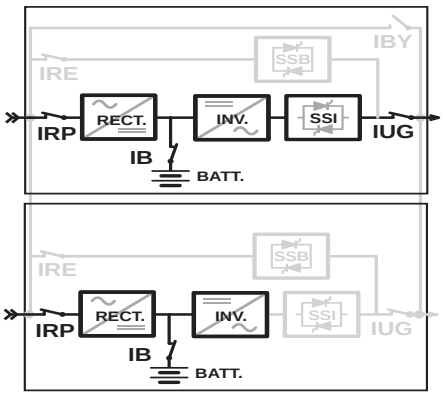


FIG. 3.1 - Normal Operation

"Normal Operation" is the standard operating mode of the hot-standby system.

- Mains power is present.
- The rectifiers of all units convert ac power to dc power which charges the batteries and feeds the inverters.
- The inverters convert this dc power to ac power.
- The inverter of one unit feeds the connected load.
- The inverter of the other unit(s) is working in standby mode, ready to takeover the load if there is a failure in the unit supplying the load.
- All units in the system are identical and operate completely independently of each other.

3.2 Operation with an Inverter Failure

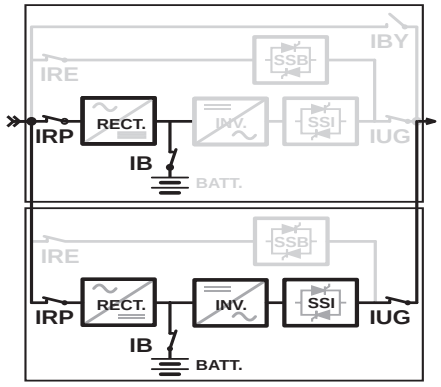


FIG. 3.2 - Operation with an inverter failure

"Operation with an Inverter Failure" is the operating mode of the hot-standby system after a failure has occurred in one unit.

- Mains power is present.
- The static inverter switch of the failed unit opens automatically and the static inverter switch of an other unit is closed.
- The rectifier of that unit converts ac power to dc power which charges the battery and feeds the inverter. The inverter then converts this dc power to ac power used to feed the connected load.
- The static bypasses within all units remain ready to supply the load in case of any additional failure(s) or overload.

3.3 Battery Operation

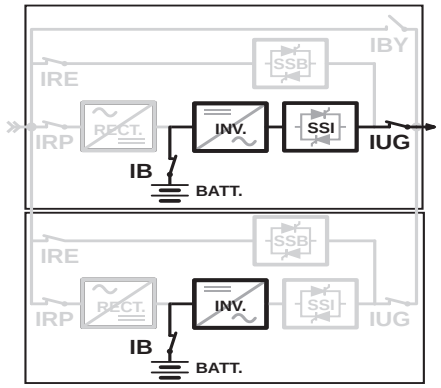


FIG. 3.3 - Battery Operation

The "Battery Operation" mode is activated by a mains failure or rectifier failure.

- The rectifiers of all units supply no power.
- The batteries of all units supply the required dc power to the inverter of each unit.
- The inverter of one unit continues to supply ac power to the load.
- The inverter(s) of the other unit(s) are operating in standby mode, ready to takeover the load, without interruption.

3 Operating Modes Hot-Standby Operation

- If an additional failure in the first unit occurs, or when the battery of that unit is exhausted, the inverter of another unit will takeover the load, continuing in battery operation until the mains returns or the second battery is exhausted.

3.4 Bypass Operation

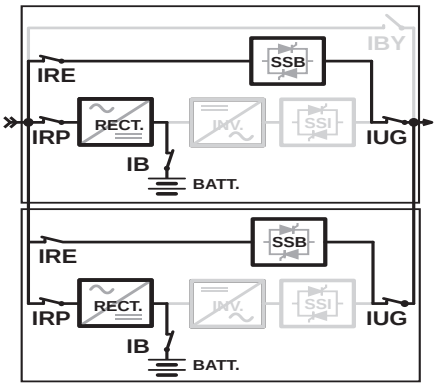


FIG. 3.4 - Bypass Operation

The "Bypass Operation" mode is activated by an overload or by inverter failures in all units or by a manual commutation.

- The rectifiers supply dc power only to the batteries.
- The static inverter switch SSI of the unit supplying the load opens automatically after the static bypass switch SSB is closed.
- The load is supplied directly from the mains through the static bypass.
- If the transition to "Bypass Operation" was caused by a temporary overload, the UPS system returns automatically to "Normal Operation", any inverter may takeover the load, when the load returns to within tolerance.

3.5 Maintenance Bypass Operation

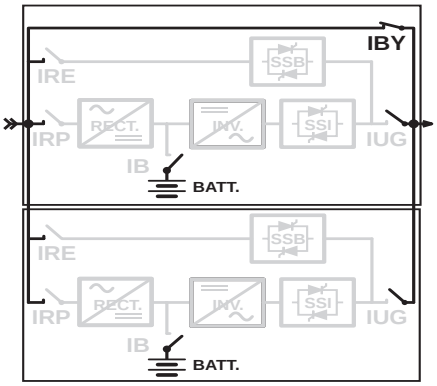


FIG. 3.5 - Maintenance Bypass Operation

"Maintenance Bypass Operation" is used to supply the load directly from mains during maintenance or repair work.

- In this mode, the individual functional components of all units are completely separated from the load.
- Power for the load is supplied directly from the mains through the switch IBY.

4 Operating Modes Parallel and Parallel/Redundant Operation

4 OPERATING MODES PARALLEL AND PARALLEL/REDUNDANT OPERATION

4.1 Normal Operation

"Normal Operation" is the standard operating mode of the UPS if the system load is at its nominal value or the system is programmed in a way that all units remain on-line. Otherwise see section 4.2.

- Mains power is present
- The rectifiers convert a.c. power to d.c. power used to charge the batteries and feed the inverters
- The inverters convert this d.c. power to a.c. power used to feed the connected load
- All units are sharing the load current uniformly. This is accomplished by means of the optional parallel-operation-electronic pcb (IPR).
- All units operate completely independently of each other, each unit supplying its respective share of the load.

FIG. 4.1 - Normal Operation

4.2 Partial Load Operation

Single inverters that are not needed to supply the load can be switched off automatically, thus saving energy and increasing system efficiency.

- The load is supplied by the remaining inverters
- All rectifiers will continue to operate, charging also the batteries of the units whose inverters have been switched off
- The system can be easily programmed for the minimum number of units which must supply the load at any time.
- When the load is reduced, the units will individually decide which one is to switch off automatically.
- The system may be programmed so that there will always be one redundant unit on-line.
- If the load is again increased, or in the case of an inverter failure, the unit(s) which have been switched off will automatically switch on again to share the load.
- If the mains supply fails, all inverters will switch on and connect to the load in parallel operation in order to maximise the battery autonomy time, (see section 4.3)

FIG. 4.2 - Partial Load Operation

4 Operating Modes Parallel and Parallel/Redundant Operation

4.3 Battery Operation

The "Battery Operation" mode is activated by a mains failure or rectifier failure

- The rectifiers supply no power
- The batteries supply the required d.c. power to the inverters
- The inverters supply a.c. power to the load as described in 4.1
- Power will only be supplied to the load for a certain period of time depending on the battery capacity
- If there were stand-by units switched off at the time of the mains failure, all units will automatically switch ON in order to extend the battery autonomy time.

FIG. 4.3 - Battery Operation

4.4 Operation with an Inverter Failure

This operating mode is activated by a failure in one or more inverters.

- As long as the load is not too great for the remaining units, the parallel system will stay in UPS (inverter) operation mode, otherwise see 4.5.
- The static inverter-switch(es) (SSI) of the defective unit(s) will open automatically, separating them from the load-busbar
- The rectifier(s) of the defective unit(s) will supply d.c. power to the battery (batteries) only if the respective rectifier is not defective.

FIG. 4.4 - Operation with an Inverter Failure

4 Operating Modes Parallel and Parallel/Redundant Operation

4.5 Bypass Operation

The "Bypass Operation" mode is activated by a multiple inverter failure or overload

- If the load is greater than 110% of the load capacity of all available inverters, the static bypasses of all individual units will connect the load with the mains directly
- All inverter output switches (SSI) will open, inverters may continue to operate
- The rectifiers continue to charge the batteries
- If the load is reduced to 100% or less of the load capacity of all available inverters, the system switches automatically back to normal operation
- All bypasses always switch on together.
- If a standby unit was off at the time of the inverter failure/ overload, it will automatically switch ON and all units take-over the load.The operation then becomes as in paragraph 4.1 (when there was an overload) or as in paragraph 4.4 (when an inverter failure occurred).

FIG. 4.5 - Bypass Operation

4.6 Maintenance Bypass Operation

The "Maintenance Bypass Operation" mode is used to supply the load directly from mains during maintenance or repair work.

- During this mode, the individual functional components are completely separated from the load (e.g. for maintenance work)
- Power for the load will be supplied directly from mains through internal or external power switch(es) (IBY)

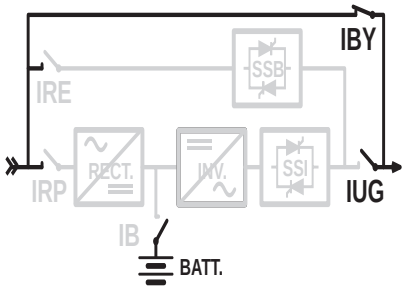
Note: If the 3-position maintenance bypass cabinet MB3/2 is installed, the UPS system may be totally isolated from all supply by switching to the 3rd position "UPS ISOLATED". Again the load will be supplied through the maintenance bypass switch.

FIG. 4.6 - Maintenance Bypass Operation

5 Operating Instructions

5 OPERATING INSTRUCTIONS

5.1 Switching On the PTX33/SP UPS System.



Initial Operating Mode:

The PTX33/SP is switched off, the load is not supplied, and all power switches are open.

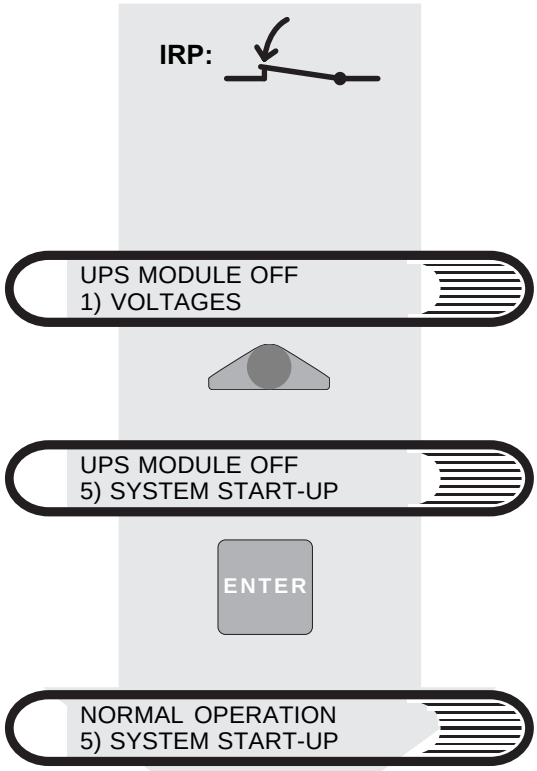
Operating Steps:

- Switch on the external mains supply of the PTX33/SP (both for the rectifier and the bypass if separate supplies are installed).
- Open the front door of the PTX33/SP or the part necessary to gain access to the switches IRP, IRE, IUG and IBY.
- Close the **IRP** switch.

The unit performs a self-test and the rectifier starts automatically.

- Wait until the data monitor panel is illuminated.
- Repeat for all units within the system (parallel and hot-standby systems).

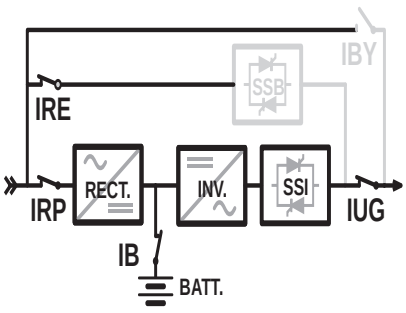
The display(s) show:



- On the Data Monitor Panel(s) press four times the "up" arrow, then the display(s) show:

- Press ENTER and then follow the instructions given on the displays of all units being switched on.

At the end of the "SYSTEM START-UP" procedure the display(s) must show:



Final Operating Mode:

The PTX33/SP is now in "Normal Operation", all green status LEDs on the Data Monitor Panel must be illuminated, the yellow ones must be off.

5 Operating Instructions

5.2 Switching Off The PTX33/SP UPS Sys.

Initial Operating Mode:

The PTX33/SP is in any operating mode described in either of the sections 5,6 or 7 except "Maintenance Bypass Operation". All power switches except IBY are closed, and the load is fed either through the inverter or the static bypass.

Operating Steps:

- On the Data Monitor Panel of all units in the system, select from the Main Menu "System Shutdown" by pressing ESCAPE (if you are in a Sub Menu) and the "up" or "down" arrows several times.

The display(s) must show:

- Press ENTER and then follow the instructions given on the display(s).

At the end of the "SYSTEM SHUTDOWN" the display(s) must show:

After opening the IRP switch(es) the control electronics are only powered by the DC capacitors: The display will fade out within a few minutes.

Final Operating Mode:

The UPS system is in "Maintenance Bypass Operation". The single unit(s) are now completely de-energized. The load is supplied by the maintenance bypass(es) IBY.

Attention! Although all power switches (except IBY) are opened, there is still voltage at the inputs of the power switches IRP, IRE, IBY and IB and at the respective terminals.

5 Operating Instructions

5.3 Switching On any One Module within a System (Parallel and Hot-standby Systems).

Initial Operating Mode:

The PTX33/SP UPS system is in "Partial load Operation" or "Operation with an Inverter Failure". Any unit that was switched off shall be switched on to share the load equally with the other units (parallel systems) or to become available as a stand-by unit (hot-standby systems).

Operating Steps:

- Open the front door of the unit to be switched on.
- Close the **IRP** switch of this unit.

The unit performs a self-test and the rectifier starts automatically.

- Wait until the operating panel is illuminated.

The display shows:

- Press five times the "up" arrow, then the display shows:

- Press ENTER and then follow the instructions given on the display.

At the end of the "MODULE START-UP" procedure the display must show:

Ensure that the switch S1 on the IPR pcb (if present) is set to the position AUTO.

Final Operating Mode:

The PTX33/SP UPS system is now in "Normal Operation", all green status LEDs on the Data Monitor Panel must be illuminated, the yellow ones must be off.
Should problems arise during the Module Start-Up, please follow the instructions in JUE 401219 "Initial Start-up".

5 Operating Instructions

5.4 Switching Off any One Module within a System (Parallel and Hot-Standby Systems)

Initial Operating Mode:

The PTX33/SP is in "Normal Operation" mode. All power switches except IBY are closed, and the load is fed through the inverters. One of the units is to be switched off, e.g. for maintenance work.

Operating Steps:

- Open the front door of the unit to be switched off and at the bottom of the IPR pcb (if present), inside the unit, switch the microswitch S1 to the manual position, otherwise (when not present), continue.

- Select on the Data Monitor Panel the Main Menu point 8 "Module Shutdown") by pressing ESCAPE (if you are in a Sub Menu) and the "up" or "down" arrows several times.

The display must show:

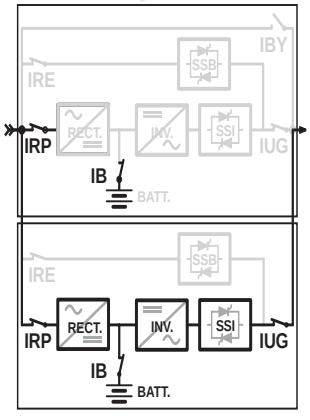
NORMAL OPERATION
8) MODULE SHUTDOWN

- Press ENTER and then follow the instructions given on the display.

At the end of the "MODULE SHUTDOWN" procedure the display must show:

UPS MODULE OFF
8) MODULE SHUTDOWN

After opening the IRP switch the control electronics is only powered by the DC capacitors: The display will fade out within a few minutes.



Final Operating Mode:

The UPS system is now in "Partial load operation", section 4.2 (parallel systems) or "Operation with an Inverter Failure", section 3.2 (hot-standby systems). The load is supplied by the remaining unit(s).

Note: If any one module is to be left switched off for any extended period of time, the battery should remain on charge, i.e. the switches IRP and IB must remain closed.

Attention! Although all power switches of the unit are opened, there is still voltage at the inputs of the power switches IRP, IRE, IBY and IB and at the respective terminals.

5 Operating Instructions

5.5 System check

Either of the start-up procedures (see sections 5.1 or 5.3 of this document) can be entered at any time. Entering a start-up procedure during normal operation will perform a check on the UPS module and any abnormal condition will be indicated on the display.

When the UPS status is normal the indications should be as follows:

- Rectifier check has been performed

- DC voltage check has been performed (This may read BOOST CHARGE if the rectifier is boost charging the battery).

- Inverter check has been performed

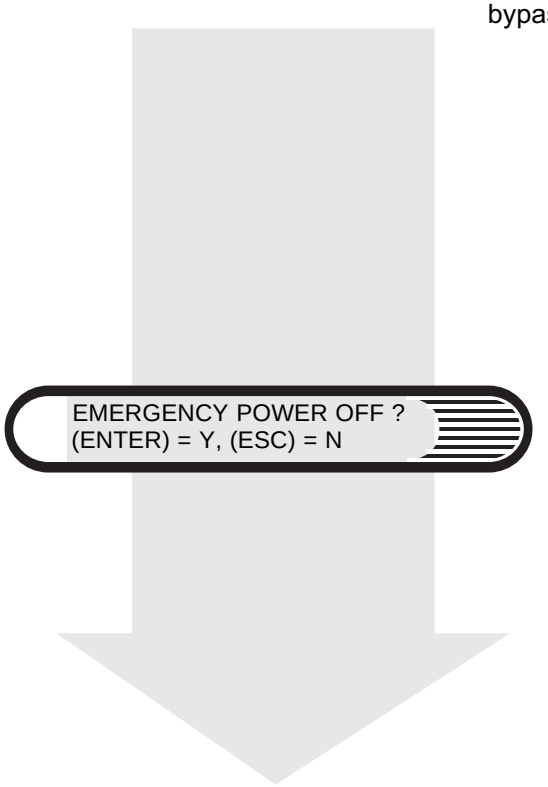
- UPS check has been completed

5 Operating Instructions

5.6 Emergency Power off

An emergency power off may be activated on the panel by pressing in succession the pushbuttons F5, F1 followed by ENTER.

This action will switch off the UPS output, the inverter and the bypass, interrupting the supply to the load.



6 Data Monitor Panel

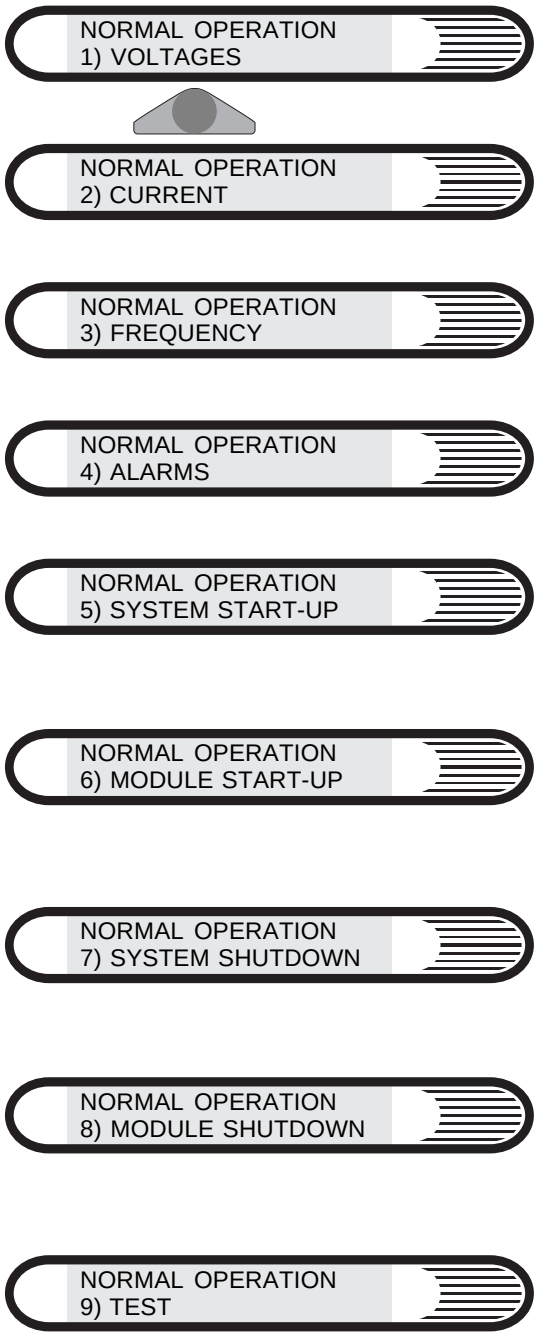
6.1 Main Menu Overview

In the MAIN MENU the first line of the display always shows the operation mode of the UPS.

The second line of the display shows the sub menu that can be activated by pressing "ENTER".

MAIN MENU
Scrolling in the MAIN MENU by pressing "up " or "down"

SUB MENUS
Activating the SUB MENUS by pressing "ENTER"



- SUB MENU 1: Voltage Measurement, see section 6.2
- SUB MENU 2: Current Measurement, see section 6.3
- SUB MENU 3: Frequency Measurement, see section 6.4
- SUB MENU 4: Alarm Messages, see section 6.5
- SUB MENU 5: System Switching On, see section 6.6
- SUB MENU 6: Module Switching On, see section 6.7 (only active for parallel and hot-standby systems)
- SUB MENU 7: Switching Off, see section 6.8
  (SUB MENU 6 for stand-alone units)
- SUB MENU 8: Switching Off, see section 6.9 (only active for parallel and hot-standby systems).
- SUB MENU 9: Adjustments, see section 7
  (SUB MENU 7 for stand-alone units)

Note: If the panel is not used, after 5 min. the display is automatically set to SUB MENU 2 and shows either the BATTERY AUTONOMY or the UPS OUTPUT POWER, depending on the system configuration.

6 Data Monitor Panel

6.2 SUB MENU 1: Voltage Measurement

All values are given directly in Volts. If you want to adjust the measurements, consult section 6.10.1

- XXX = voltage R-S, YYY = voltage S-T, ZZZ = voltage T-R

- BBB = battery voltage

- XXX = voltage R-S, YYY = voltage S-T, ZZZ = voltage T-R

The UPS input voltages can be measured. This is only active when the option for mains measurement is installed.

- XXX = voltage R-S, YYY = voltage S-T, ZZZ = voltage T-R

6.3 SUB MENU 2: Current Measurement

In this sub menu the values of various UPS currents are shown.

The Data Monitor Panel also provides the calculation of important values as Thermal Image and Battery Autonomy which are described below:

BATTERY AUTONOMY is an optional function which gives the user an approximate value for the available autonomy time under actual load conditions. If activated in Test Menu 6) ALARMS ON/OFF (see section 7.4), the remaining autonomy time of the battery will be continually calculated and updated and displayed in this sub menu.

Alarm threshold, battery autonomy at full load and battery capacity have to be set correctly in Test Menu 5) PARAMETER SETTING (see section 6.10.2).

However, the correct function of this alarm cannot be guaranteed, as its activation is calculated by an algorithm that assumes fully functional batteries.

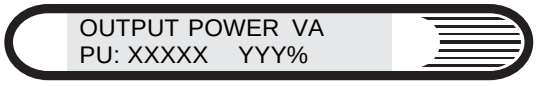
The BATTERY AUTONOMY calculation can be activated and deactivated in Test Menu 6) ALARMS ON/OFF (see section 7.4).

6 Data Monitor Panel

THERMAL IMAGE is an optional function (normally deactived) which is activated in the case of an overload. On the basis of the actual overload, it calculates continually the length of time for which the UPS can withstand the overload without being damaged. When the value of ACTUAL OUTPUT reaches 100%, the inverter will be switched off and the system will switch over to the bypass if all inverters are equally overloaded.

If the overload condition is terminated before the UPS switches to bypass, the value ZZZ% for the actual output is not set to zero immediately, but counted back to zero in 1% steps in 20 seconds.

THERMAL IMAGE can be activated and de-activated in Test Menu 6) ALARMS ON/OFF (see section 7.4).



- XXXXXX = output power (VA), YYY = output power in % of rated power

- XXXX = rectifier output current (A)

- XXXX = battery current (A)

- XXX = output current (A)

- MMM = battery autonomy (min)

- ZZZ = percentage of calculated overload time already elapsed (only shown when activated in the test menu)

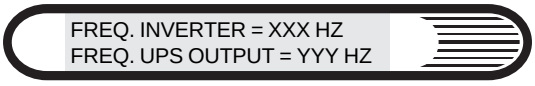
The UPS input current, phase R can be measured. This is only active when the option for mains measurement is installed.

- XXX=current, phase R (A)

6 Data Monitor Panel

6.4 SUB MENU 3: Frequency Measurement

If the option for input parameters is installed, the inverter freq. is not measured, but rather the INPUT FREQUENCY.



- XXX = frequency in Hz, measured at the input of the static inverter switch
- YYY = frequency in Hz, measured at the input of IUG

6.5 SUB MENU 4: Alarm Messages

- If no alarm is activated, the display shows:

- If alarms are activated, the display shows the first alarm message:
- Pressing “up” at the indication of ALARM MESSAGE 1 will show the message FIRST ALARM for two seconds and then automatically return to the indication of ALARM MESSAGE 1.
- Instead of “ALARM MESSAGE 1” the actual message is shown, e.g. BYPASS FEEDING LOAD. All *actual* alarm messages can be displayed subsequently by pressing “up” or “down”.

- Pressing “down” at the indication of ALARM MESSAGE n will show the message LAST ALARM for two seconds and then automatically return to the indication of ALARM MESSAGE N.

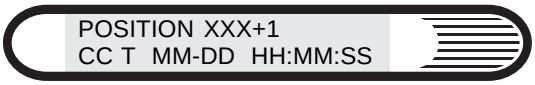
6 Data Monitor Panel

Alarm Messages / Alarm Memory

The memory is organised as **F**irst **I**n **F**irst **O**ut, storing new data in position one and shifting older data to the next position. If 100 events are stored, storage of a new event will always delete the oldest event, stored in position 100.

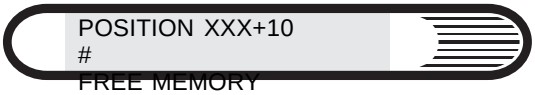
- The *last* 100 alarm messages can be displayed by pressing F2 and F4 subsequently. Then the Display shows:

- XXX: position-number of the alarm in the memory.



- CC: Alarm code, only for service purposes.

- T: indicates activation or deactivation of this alarm: S: start; E: end.



- MM: month, DD: day, HH: hour, MM: minute, SS: second

Scrolling through the various positions is achieved by pressing “up” or “down”:

- normally, pressing once increases or reduces the actual position by 1.
- this can be accelerated by pressing F5: the symbol “#” appears on the upper right edge of the display and the position is increased or decreased by 10 when “up” or “down” is pressed.
- pressing F5 again disables the acceleration

At any time you can leave this menu by pressing ESCAPE.

Alarms are also indicated in the main menu by a bell symbol on the right hand side of the first line of the display.

Pressing F6 shows the actual alarm message to the respective alarm code for two seconds on the display. Then the previous message is automatically shown again.

6 Data Monitor Panel

Alarms

Rectifier Failure The Rectifier mains is in order but a failure is present within the rectifier.

Inverter Failure The inverter is ON but the inverter voltage or inverter conditions are not in order.

Battery Switch Open The battery switch is OFF

Retransfer blocked The inverter has attempted unsuccesfully to take over the load at least 5 times within 3 minutes.

To reset, press "ENTER" when instructed.

Note:If the UPS is unattended and the alarm **Retransfer blocked** occurs, after 1-2 min, the UPS module will automatically reset and attempt a further 5 times to retransfer the load to the inverter. This procedure will be repeated 3 times and if not successful, the UPS retransfer will remain blocked, the UPS must be reset manually by pressing ENTER.

Pressing ESCAPE will exit the routine and the UPS can only be retransfered by using one of the START-UP routines.

Overtemperature The inverter/rectifier components are operating at an excessive temperature. This can be due to extreme environmental conditions or a failure within the inverter or rectifier sections.

If the bypass is available the UPS transfers immediately to the bypass supply (in the case of a hot-standby system, the second unit takes over the load, in the case of a parallel system the remaining inverters take over the load). If the bypass or another inverter is not available then the UPS will continue to supply the load for a further 10 minutes before shutting down.

Mains Failure The mains is not present or not within the specified voltage and frequency tolerances.

Inverter not Feeding The inverter is not feeding the load and the bypass static switch, SSB is OFF.

Battery Discharging The mains or rectifier has failed and the batteries are discharging.This alarm is activated at a battery voltage of approx. 360Vdc.

Warning: Battery Low The remaining battery capacity during discharge has been calculated to be less than programmed value for Autonomy Alarm threshold (see section 6.10.2).

Paralleling Fault The inverter has failed to regulate correctly in parallel operation with another inverter (parallel systems only).

Bypass not Available The bypass mains supply is OK but the bypass is not available to take the load if the inverter fails (the inverter is not synchronised or is blocked externally).

6 Data Monitor Panel

For systems with multiple static bypasses (hot-standby and parallel/redundant), if the bypass of this unit is available, but the bypass system is not available, the UPS system cannot transfer to the bypass supply, due to the fact that there may be insufficient bypasses available within the system.

Inverter Overload The Inverter is overloaded by more than the nominal output load current

Rectifier Overload The Rectifier is overloaded by more than the nominal output load current and the battery charging current.

Load on Bypass The UPS system load is being supplied by the bypass supply.

Inverter not synchr The inverter is not synchronised to the bypass supply.

Auxiliary Alarm This alarm consists of a series of system alarms and includes the following:

- **Oscillator failure**

  A failure has occurred in the oscillator circuit or a loss of synchronism with another oscillator of another unit within the system.
- **IUG monitoring failure**

  An error has occurred within the monitoring circuit of the output switch (disabled for single units).
- **Static switch failure (SSI)**

  A failure has occurred within the monitoring circuit of the inverter output static switch.
- **Static switch failure (SSB)**

  A failure has occurred within the monitoring circuit of the bypass static switch.
- **Missing or incorrect bypass trip signal** (parallel and hot-standby systems)

  An indifference has occurred within the bypass trip logic of this unit and the remainder of the system.
- **System not redundant** (parallel /redundant systems)

  If the inverter of the unit signalling this alarm fails, the system must transfer to the bypass supply.
- **SSI-ON generator failure** (parallel/redundant systems)

  A failure or loss of synchronism has occurred with the SSI ON pulse generator on IPR pcb and may occur during start-up of a unit in a parallel system. To reset press "PB3" and then "PB2" on the ICP pcb.

To determine which of the alarm(s) are present refer to the section "PCB Description" JUE 401069.

Thermal Image The calculated load for the unit is too large and the inverter has switched off. See section 6.3

Output Switch Open The output switch is open.

6 Data Monitor Panel

6.6 SUB MENU 5: Switching On the UPS System.

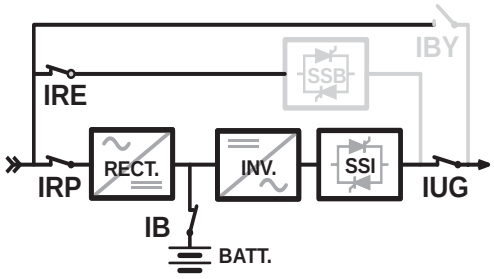
UPS MODULE OFF
5) SYSTEM START-UP

- Press "ENTER" and then follow the instructions given on the display.

The start-up procedure is intelligent, i.e. every action of the user and the corresponding UPS status are monitored.

- You can exit the start-up procedure at any time by pressing "ESCAPE".

NORMAL OPERATION
5) SYSTEM START-UP



After carrying out all steps correctly, the UPS system is in normal operation - the load is supplied by the inverters, the static bypass system is available.

6.7 SUB MENU 6: Switching Off the UPS System. (SUB MENU 7 for multi-unit systems)

NORMAL OPERATION
6) SYSTEM SHUTDOWN

- Press "ENTER" and then follow the instructions given on the display.

The shutdown procedure is intelligent, i.e. every action of the user and the corresponding UPS status are monitored.

- You can exit the shutdown procedure at any time by pressing "ESCAPE".

UPS MODULE OFF
6) SYSTEM SHUTDOWN

After carrying out all steps correctly, the UPS is in service bypass operation. The UPS is now completely de-energised. The load is supplied by the service bypass IBY.

Attention! Although all power switches (except IBY) are opened, there is still voltage at the inputs of the power switches IRP, IRE, IBY and IB and at the respective terminals.

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6.8 SUB MENU 6: Switching On any One Module within a Multi-Unit System (not activated for single units).

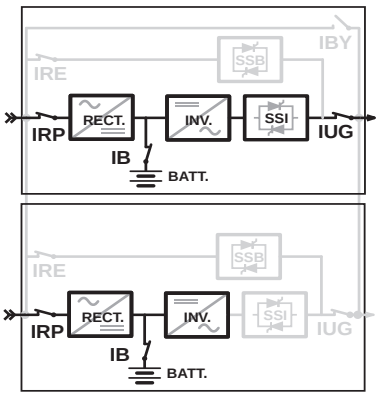
UPS MODULE OFF
6) MODULE START-UP

- Press "ENTER" and then follow the instructions given on the display.

The start-up procedure is intelligent, i.e. every action of the user and the corresponding UPS status are monitored.

- You can exit the start-up procedure at any time by pressing "ESCAPE".

NORMAL OPERATION
6) MODULE START-UP



After carrying out all steps correctly, the UPS module is in inverter operation - the load is supplied by the inverter, (or any one inverter in the case of a hot-standby system) the static bypass is available.

6 Data Monitor Panel

6.9 SUB MENU 8: Switching Off any One Module within a Multi-Unit System (not activated for single units).

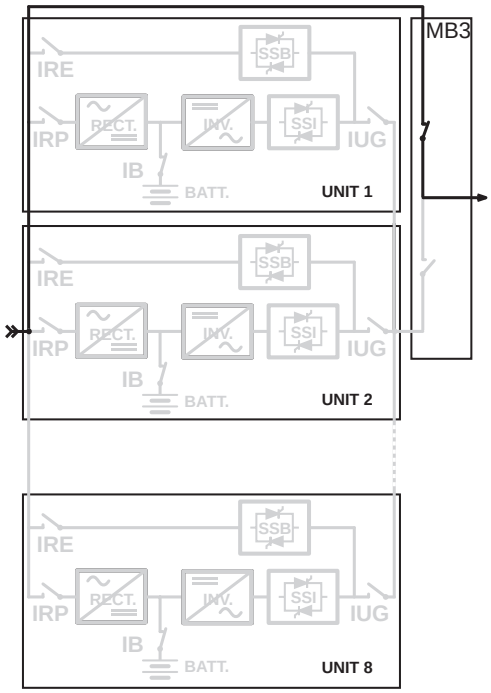
NORMAL OPERATION
8) MODULE SHUTDOWN

- Press "ENTER" and then follow the instructions given on the display.

The shutdown procedure is intelligent, i.e. every action of the user and the corresponding UPS status are monitored.

- You can exit the shutdown procedure at any time by pressing "ESCAPE".

UPS MODULE OFF
8) MODULE SHUTDOWN



After carrying out all steps correctly, the UPS module is switched off. The load is still supplied by the remaining units.

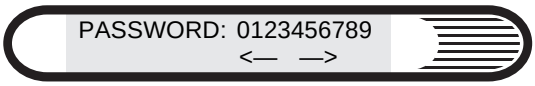
Attention! Although all power switches are opened, there is still voltage at the inputs of the power switches IRP, IRE, IB,at the output of IBY and IUG and at the respective terminals.

6 Data Monitor Panel

6.10 TEST MENU OVERVIEW

The Test Menu is used to adjust internal settings of the Data Monitor Panel . It is protected by a password. After pressing ENTER the input of the password is requested.

A cursor indicates which number can be entered. The cursor can be moved with the “>” and the “<“ key. The password is always 8031.



The various sub-menus can be activated in the same way as in the main menu.

Sub-menus 1 and 3 are not explained here, as their use is reserved to service personnel.

- Adjusting the measured values, see section 6.10.1

- Installation-specific adjustments, see section 6.10.2

- Choosing special functions, see section 6.10.3

- Manual Rectifier and Inverter Activation, see section 6.10.4

- Setting the internal clock, see section 6.10.5

- Clock speed adjustment, see section 6.10.6

- Leaving the test procedure, see section 6.10.7

6 Data Monitor Panel

6.10.1 Sub menu 2: Adjusting the measured values

This sub-menu is used to adjust the measured values of the Data Monitor Panel. The indication of the measured values reacts much faster than in the main-menu which facilitates the adjustments. The CHANNEL-number indicates which VALUE is measured at the moment.

As there are d.c. and a.c. values to be measured, the measuring MODE can be adjusted by pressing F1. Twelve channels can be selected with the cursor keys *">"* and *"<"*, another four channels can be selected when the optioin for mains measurement is installed.

The VALUEs for voltage measurements are given directly in V, for amperage measurements they have to be divided by a factor. This factor depends on the setting of the jumpers A and B on the back of the Data Monitor Panel. These jumpers define the measurement range for the currents. They are needed for the use of the Data Monitor Panel with different UPS power ranges. The table shows the jumper setting, the corresponding divisor for the Value (VALUE/divisor=current in A) and the corresponding measurement range.

Jumper		Divisor	Measurement range		
A	B		Channel 6,7,8,15(Option)	Channel 9	Channel 10
1	1	/1	0A to +999A	-1999A to +1999A	0A to +1999A
1	0	/2.5	0A to +399A	-799A to +799A	0A to +799A
0	1	/10	0A to +99A	-199A to +199A	0A to +199A
0	0	/20	0A to +49A	-99A to +99A	0A to +99A

0:open, 1:closed

Zero offset compensations:

For all a.c. values, the zero offset is adjusted by RV14. Select channel 0, inverter off, I_{RE} off, and adjust with RV14 to VALUE=0. Make sure that MODUS = AC is set!

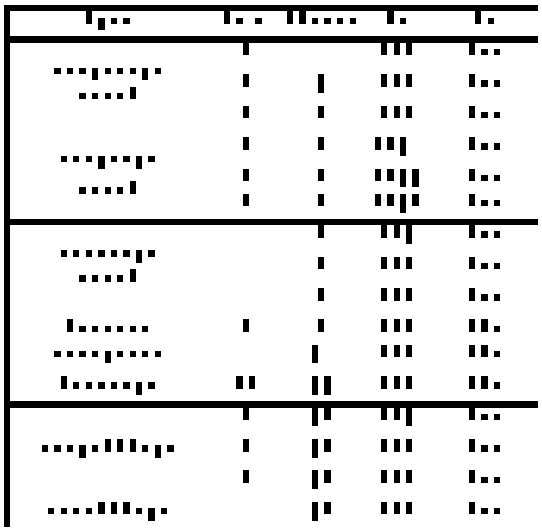
For the battery current: I_B off, unplug M2 on pcb PC 136-3 (actual value pcb connected to the Data Monitor Panel), short-circuit M2 on the pcb, select channel 9, adjust VALUE = 0 with RV18 . Make sure that MODUS = DC is set. Before reconnecting M2, remove the short circuit.

For the rectifier current: switch off the inverter and open I_B, this ensures that the rectifier output current is close to 0A. Select channel 10, and set VALUE = 0 with RV19. Make sure that MODUS = DC is set.

Range adjustment:

For channels 0 to 5, and 11 (and 12 to 14 when the option for mains measurement is installed): switch on the inverter, select the desired channel. Using a 3½-digits digital voltmeter with 1% accuracy, measure the voltage between the respective phases (channel 11: battery voltage) and then adjust the display to the measured value using the corresponding potentiometer.

For channels 6 to 10 (and 15 when the option for mains measurement is installed): switch on the inverter, connect rated load (or, if rated load is not available, any other high load) to the output, close I_{UG}, select the desired channel. Using a clip-on ampmeter, measure the load current and adjust the display to the measured value with the corresponding potentiometer. Channel 9 must be adjusted with the battery discharging.



* on an optional PCB

6 Data Monitor Panel

6.10.2 Sub menu 4: Installation-Specific Adjustments

After pressing ENTER, the individual values to be adjusted can be displayed by pressing “up” or “down”.

The values can be changed with the arrow buttons "<" or ">":

- Press F1, to change the first digit (units)
- Press F2, to change the second digit (10's)
- Press F3, to change the third digit (100's)
- Press F4, to change the fourth digit (1000's)

To store the changed values:

- Press "ENTER"

To exit the sub menu without storing the changes:

- Press "ESCAPE"

- Press F1 to set the following parameters: UPS MANUFACTURER, UPS MODEL and UPS OUTPUT KVA

- Press F1 to set the following parameters: NOMINAL INPUT VOLTAGE, NOMINAL INPUT FREQUENCY, NOMINAL OUTPUT VOLTAGE, NOMINAL OUTPUT FREQUENCY

- XXXX = Capacity of the installed battery (Ah)
- Y = 1,2,3 or 4, to specify the digit to be changed

- XXX = alarm threshold time (min)
- Y = 1,2,3 or 4, to specify the digit to be changed

- XXX = autonomy time with charged battery (min)
- Y = 1,2,3 or 4, to specify the digit to be changed

Battery autonomy

This is the rated autonomy time of the battery at nominal UPS load. The values given in section 1, FIG. 1.4 can be used here as a guide.

Autonomy alarm threshold

The autonomy alarm threshold is the time span between activation of the “WARNING: BATTERY LOW” alarm and the end of the **calculated** autonomy time. This calculation can only give an approximate value, as the **actual** autonomy time depends on the charging status (which is based on 9 hours recharging time) and the condition of the battery (which cannot be calculated at all).

6 Data Monitor Panel

Note:

- After initial start-up, a time period of at least 9 hours is required before the batteries are considered to be fully charged. After this time, the value given for "Battery autonomy" in sub menu 2 will be the nominal value for the present load.
- Even after a total shutdown of the UPS the above settings will remain stored

6.10.3 Sub menu 5: Choosing special functions

After pressing ENTER, the individual functions to be activated / deactivated can be displayed by pressing “up” or “down”.

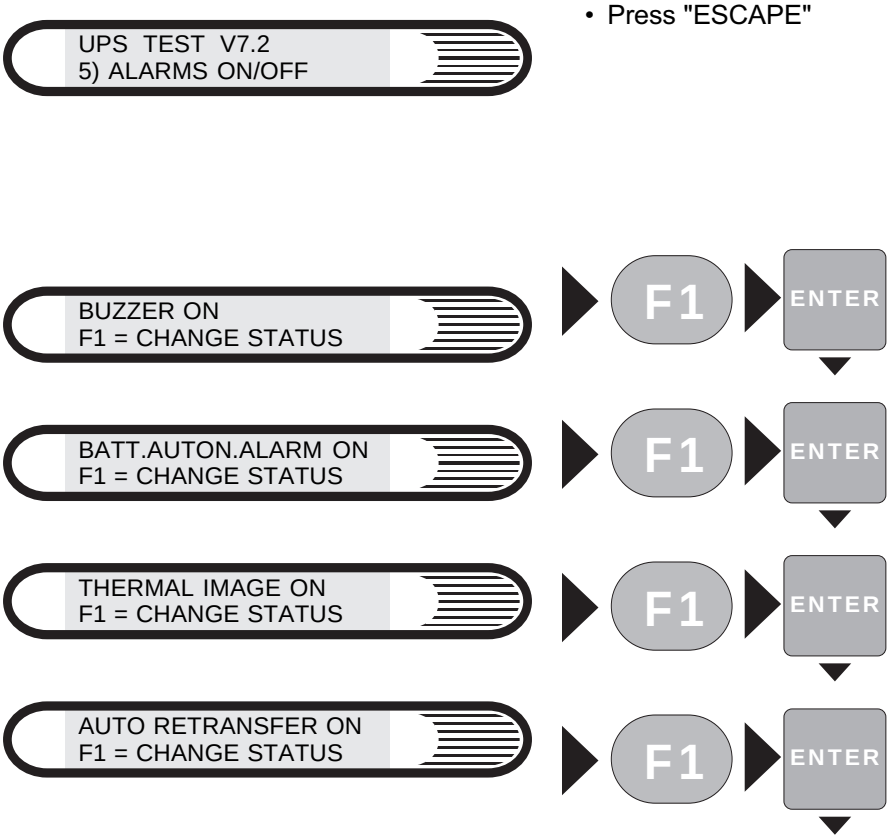
The first line of the display always shows whether the special function is activated or not.

To change the status (activate / deactivate the function):

- Press F1, followed by "ENTER"

To exit the sub menu:

- Press "ESCAPE"



BUZZER ON

This is the standard setting, every change of an internal signal will create an audible alarm. For service purposes it may be desired to suppress the audible alarms, which is done by pressing F1, the display then shows BUZZER OFF.

BATT.AUTON.ALARM ON

This activates the calculation for the battery autonomy and will display the remaining autonomy time of the battery for the actual load. The alarm "WARNING:BATTERY LOW" will be activated.

THERMAL IMAGE ON

This activates the calculation of the possible overload-time and switching-off of the inverter at the end of it. If this function is set on OFF, also the thermal image in sub-menu 2) CURRENTS is not displayed.

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AUTO RETRANSFER ON

When activated, if the inverter is blocked due to five unsuccessful attempts to retransfer the load to the inverter, the alarm "RETRANSFER BLOCKED" will appear on the display and if no action is taken by the operator, the panel will automatically reset the UPS system in order to attempt a further 5 times. This cycle will repeat 3 times.

In this way, without intervention from an operator, the UPS will attempt a retransfer 5 times within 3 minutes, wait 1 minute and the reattempt to retransfer the load to the inverter 5 times within 3 minutes, wait a further 1 minute and reattempt for a third time, 5 retransfers within 3 minutes until the UPS is blocked on the bypass supply (or other modules supplying the load in the case of parallel systems).

Note: Even after a total shutdown of the UPS the above settings will remain stored

6 Data Monitor Panel

6.10.4 Sub menu 6: Manual Rectifier and Inverter switching

After pressing ENTER, the function to be activated / deactivated can be displayed by pressing “up” or “down”.

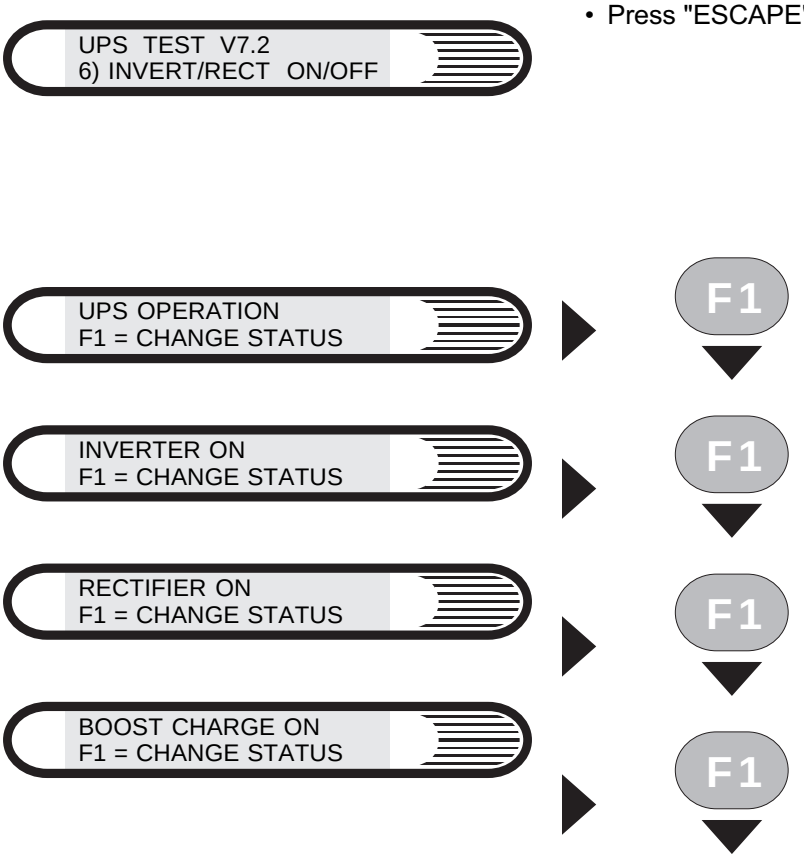
The first line of the display always shows whether the special function is activated or not.

To change the status (activate / deactivate the function):

- Press F1

To exit the sub menu without storing the changes:

- Press "ESCAPE"



INVERTER ON/OFF

The inverter can be switched ON or OFF.

UPS OPERATION / BYPASS OPERATION

The static switch of the inverter is on (SSI), the inverter feeds the load (UPS OPERATION) or the static switch at the bypass is on (SSB), the load is fed by the bypass supply (BYPASS OPERATION).

RECTIFIER ON/OFF

The rectifier can be switched ON or OFF

BOOST CHARGE ON/OFF

The boost charge can be switched ON or OFF manually with this submenu.

Note: This function is only active when the CPHC16-R is programmed for boost charging.

6 Data Monitor Panel

6.10.5 Sub menu 7: Setting the Internal Clock

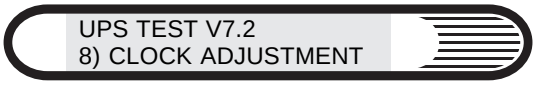
In this sub-menu the date and time can be adjusted.

The date format is day-month-year, and the time format is hour-minutes-seconds. When no change is desired, return to the test menu by pressing ESCAPE.

The setting procedure is started by pressing any other key, the date and time are blocked and a blinking cursor appears on the day display. The values displayed can be changed stepwise by pressing “up” or “down”; the cursor is moved by “<“ or “>”. By pressing ESCAPE, you can leave the setting procedure at any time without storing the changed values. They can be stored at any time by pressing ENTER.

6.10.6 Sub menu 8: Clock adjustment

In this sub-menu, the speed of the clock can be adjusted.



If the clock should be too slow or too fast, this can be adjusted by varying the given value. Standard setting is 100, increasing this value reduces the clock speed and vice-versa.

6 Data Monitor Panel

6.10.7 Sub menu 9: Leaving the Test Procedure

By pressing ENTER, one returns to the main menu.

PTX33/SP - PCB Description

Chapters

Figures

1 UPS Control Logic

1 UPS CONTROL LOGIC

1.0 UPS Control Logic

The UPS Control logic is situated in the centre of the front part of the UPS. It consists of one rack with 7-8 PCBs (depending on the system configuration). On the covers of the rack, the various potentiometers, test points and LEDs are briefly labelled.

A more detailed explanation is given in this chapter.

1.1 Legend of symbols used

	**LED (light emitting diode)**	- GREEN: normal condition - RED: alarm condition. - YELLOW: warning
	**Potentiometer**	- For adjustment (only for qualified personnel)
	**Test Point**	- Requires a pin 2mm for measurement.
	**Test point/switch**	- Insertion of a 2mm Pin disables the described function
	**Pushbutton**	- Performs a reset or switching operation
	**Micro switch**	- Switch from manual to auto matic mode

1 UPS Control Logic

1.2 Rectifier

The rectifier control logic consists of two PCBs.

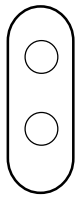
IF/PS - R Rectifier electronic power supply

- input voltage sensing
- rectifier electronics power supply

CPHC16 - R Rectifier control and regulation

- rectifier output voltage regulation
- rectifier output current limitation
- soft-start control
- battery charging current limitation
- generation of the thyristor firing pulses
- input voltage monitoring (phase rotation, mains failure)
- control for parallel rectifiers (with a common battery)
- 12-pulse rectifier control
- Second level current limitation for diesel-generators.
- Boost charging according to DIN 41773.
- Thermal compensation.

IF/PS - R Front View FIG. 1.1 illustrates the LEDs of the IF/PS - R PCB which are accessible from the front.

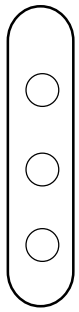


PSPA

- + 12V analog circuits power supply OK

PSPP

- + 16V microprocessor power supply unregulated



PSPA1

- + 12V interfaces power supply

+ 15

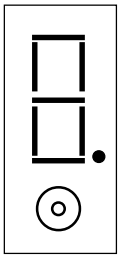
- + 15V auxiliary LEM power supply (illuminated only for 12 pulse configuration)

- 15

- - 15V auxiliary LEM power supply (illuminated only for 12 pulse configuration)

1 UPS Control Logic

CPHC16 - R Front View FIG. 1.2 illustrates the display, switches and connectors of the CPHC16 - R PCB which are accessible from the front.



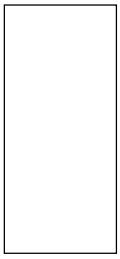
DIAGNOSTICS

- 7 segment display for diagnostics (see table below)

RESET MAX. Vdc

- Reset max. Vdc pushbutton: press when the character "4" is displayed or the central segment is blinking.
- Reset Boost Charge Alarm
- Reset after EPO (V2.1)

- RV1 Manual adjustment of the DC voltage (adjustment possible only with Dip 3 of dipswitch S1 in position OFF)



RS 232

- RS232 connector (male)

Priority	Indication	Diagnostics
1	8	E²PROM failure
2	2	Fuse blown
3	C	Mains not OK
4	P	Wrong phase rotation
5	3	Overtemperature
6	4	Overvoltage
7	Ø	Pulse release missing
8	9	Rectifier failure
9	6	Fan failure
10	L	Overload
	--	Boost charge
	"--"	(when blinking) Has left the boost charge due to a given time limit but the battery was not completely charged. Reset with "RESET max. Vdc" above.

In normal condition the display shows a red segment rotating clockwise. During the starting phase, a blinking central segment "-" is displayed. During parameter acquisition through the serial interface, the character "A" is displayed. If more than one alarm is present, only the one with the higher priority is displayed.

1 UPS Control Logic

1.3 Inverter

The inverter control logic consists of three PCBs (four for parallel systems).

ICP Inverter control

- control for the inverter static switch (SSI)
- temperature monitoring
- inverter monitoring and protection
- hot-standby control
- quartz oscillator
- fan monitoring
- inverter electronic power supply monitor

ICT-2 Inverter regulation

- inverter output voltage regulation
- inverter output current limitation
- short-circuit protection
- inverter soft start control
- inverter-bypass synchronisation
- inverter-oscillator synchronisation
- synchronisation monitor:

IPS - 500 Inverter electronic power supply

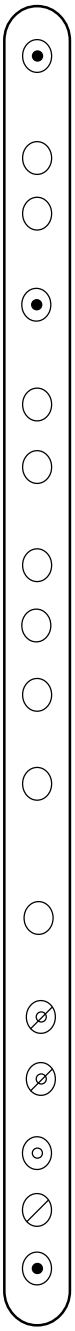
- inverter electronic power supply
- inverter input voltage monitoring
- generation of the battery-discharging alarm

IPR Inverter control and regulation (parallel configuration)

- parallel regulation of up to 8 inverters
- system control for up to 8 inverters (together with ICP pcb)
- cold-standby control
- load monitoring
- redundancy monitoring

1 UPS Control Logic

ICP Front View FIG. 1.3 illustrates the LEDs and switches of the ICP PCB which are accessible from the front.



PB2 Inv. ON / OFF - Push to switch the inverter ON/OFF

LD1 PSP OK - Inv. electronic power supply in order: green LED is illuminated

LD3 Osc. Failure - Defect in the internal quartz oscillator: red LED is illuminated

PB1 Reset - RESET

LD9 Inverter OK - Inverter in order: green LED is illuminated

LD8 Inverter volts OK - Inv. voltage within tolerance (within +/- 10% of Vnom): green LED is illuminated

LD2 Retr. blocked - Retransfer to inv. operation is blocked after 5 attempts within 3 minutes: red LED is illuminated

LD4 Overtemperature - Overtemperature within the inv. section: red LED is illuminated

LD5 SSI failure - The inverter static switch has failed to switch ON/OFF: red LED is illuminated

LD6 Inverter ready - All conditions are in order for a retransfer of the load to the inv. (for hot-standby units, the inv. is ready in case of a failure to the on-line inv.): green LED is illuminated

LD7 IUG failure - A failure within the monitoring of the output switch: red LED is illuminated

S1 Osc. Block. - Disable the quartz oscillator

S2 Inverter Monit. Block. - Disable inverter voltage monitoring

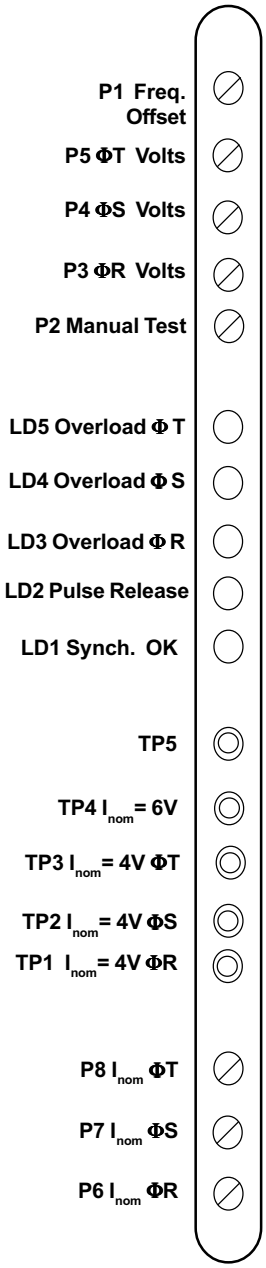
TP1 INV. Volts Vnom=6V - Proportional to the inv. voltage. 6V ≡ nominal inverter voltage

P1 INV. Volts tol.adjust - Inv. voltage tolerance adjust for 6V at TP1 with nom. voltage

PB3 SSI ON - Push to switch ON the inverter output static switch (SSI)

1 UPS Control Logic

ICT-2 Front View FIG. 1.4 illustrates the potentiometers, LEDs and test points of the ICT-2 PCB which are accessible from the front.

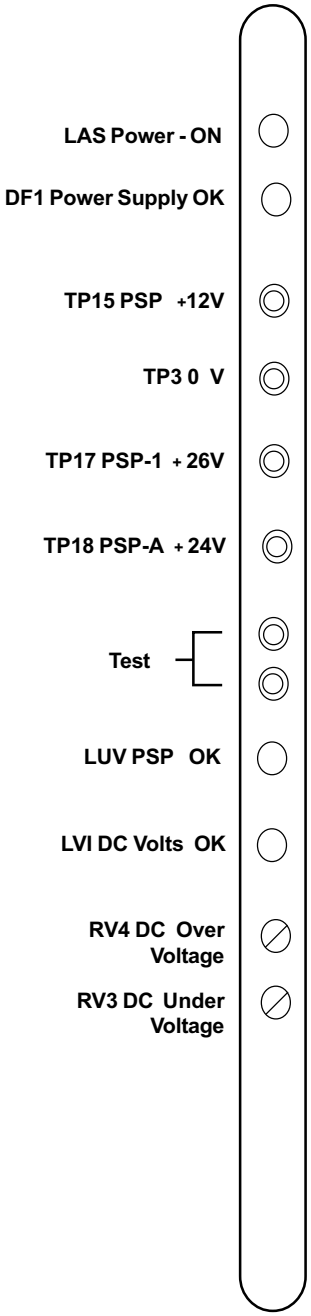


- Frequency offset adjustment (when synchronisation is blocked at TP5)
- Inverter voltage adjustment phase T
- Inverter voltage adjustment phase S
- Inverter voltage adjustment phase R
- Inverter voltage adjustment during test operation (jumpers JP1, JP2, JP3 in position 2,3)
- Overload on phase T: red LED is illuminated
- Overload on phase S: red LED is illuminated
- Overload on phase R: red LED is illuminated
- Pulse release: green LED is illuminated
- Synchronisation OK: green LED is illuminated
- Synchronisation block
- Test point: test voltage = 6Vdc at full load
- Test point: test voltage = 4Vdc at full load on phase T
- Test point: test voltage = 4Vdc at full load on phase S
- Test point: test voltage = 4Vdc at full load on phase R
- Current limitation adjustment phase T. Adjust for 4Vdc at TP3
- Current limitation adjustment phase S. Adjust for 4Vdc at TP2

1 UPS Control Logic

IPS-500 Front View

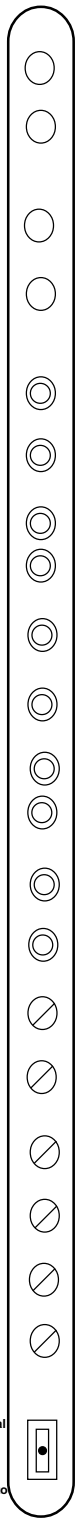
FIG. 1.5 illustrates the potentiometers, LEDs and test points of the IPS-500 which are accessible from the front.



- Current limitation adjustment phase R. Adjust for 4Vdc at TP1
- Power ON:green LED is illuminated
- Power supply OK: green LED is illuminated
- Electronics supply voltage +12V
- Electronics ground
- Electronics supply voltage +26V
- Electronics supply voltage +24V
- Jumper for test operation (suppression of inverter input voltage monitoring signal)
- Power supply OK: green LED is illuminated
- Inv. input voltage in tolerance: green LED is illuminated otherwise blinking
- Adjustment of overvoltage monitoring threshold for the inverter input voltage.
- Adjustment of undervoltage monitoring threshold for the inverter input voltage.

1 UPS Control Logic

IPR front view FIG. 1.6 illustrates the LEDs, potentiometers, switches and test sleeves of the IPR pcb that are accessible from the front.



LD1 Parall.Operat - Parallel Operation On: This inverter is connected with another or more inverters to the output in parallel.

LD2 Red not ok - Redundancy Not OK: Redundant units only.The load has increased or an inverter is off so that if this unit fails, the system must transfer to the bypass supply.

LD3 Parallel Fault - Parallel Fault: A fault has occurred with the regulation of the inverter in parallel with another inverter.

LD4 Pulse gen. Fail - SSI pulse generator failure: A failure or loss of synchronism has occurred within the SSI ON pulse generator. To reset press PB3 and then PB1 on the ICP pcb.

TP1 I_{ref}= 6V_{rms} - Reference current for parallel regulation 6Vrms = nominal current of the system (0.8 p.f.).

TP2 I_{out}=6V_{rms} - Inverter output current for parallel regulation 6Vrms = nominal current of this unit (0.8 p.f.).

TP3 I_{error} - Difference current for parallel regulation

TP4 I_{load}= 8V - Output current of this unit. 8Vdc = nominal load current of this unit (0,8 p.f.)

TP5 I_{syst}= 8V - System output current. 8Vdc = nominal load current on the system (0.8 p.f.)

TP6 I_{red} - Redundancy current. 8Vdc = nominal load current on the remainder of the system (without this unit, 0.8 p.f.)

TP7 P_{out}=6V - Power of this unit. 6Vdc = nominal load power on this unit

TP8 P_{syst}= 6V - Power of the system. 6Vdc = nominal load power on the system

TP9 - Output voltage phase T

TP10 - Output voltage phase R-S

P1 I_{ref} - Adjust for 6Vrms at TP1 with nominal load current (0.8 p.f.)

P2 I_{out} - Adjust for 6Vrms at TP2 with nominal load current (0.8 p.f.)

P3 I_{load} - Adjust for 8Vdc at TP4 with nominal load current (0.8 p.f.)

P4 I_{syst} - Adjust for 8Vdc at TP5 with nominal load current (0.8 p.f.)

P5 P_{out} - Adjust for 6Vdc at TP7 with nominal load

P6 P_{syst} - Adjust for 6Vdc at TP8 with nominal load

Manual
S1
Auto
- Manual: manual switching on/off of the inverter permitted
- Auto: inverter will automatically switch on/off depending on the load applied and the internal programming of IPR pcb.

1 UPS Control Logic

1.4 Bypass

The bypass static switch control logic consists of two PCBs.

IF/PS - S Bypass monitoring and power supply

- bypass electronic power supply
- mains voltage sensing

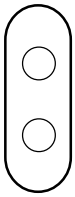
CPHC16 - S Bypass control

- switching control of the static bypass switch SSB
- interface with the inverter or multiple inverters
- mains frequency monitoring
- mains voltage and phase rotation monitoring
- generation of synchronisation signal
- interface with multiple static bypasses
- UPS output voltage monitoring
- majority control for multiple static bypasses (parallel and hot standby systems)
- synchronisation monitor: mains - UPS output

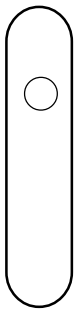
1 UPS Control Logic

IF/PS - S Front View

FIG. 1.7 illustrates the LEDs of the IF/PS - S PCB which are accessible from the front.



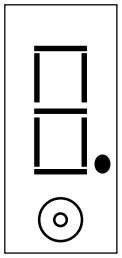
- +12V analog circuits power supply OK: green LED is illuminated
- +16V microprocessor power supply OK: green LED is illuminated



- +12V interfaces power supply OK: green LED is illuminated

1 UPS Control Logic

CPHC16 - S Front View FIG. 1.8 illustrates the display, switches and connectors of the CPHC16 - S PCB which are accessible from the front.

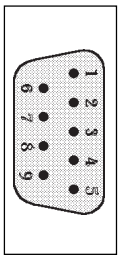


DIAGNOSTICS

- 7 segment display for diagnostics (see table below)

Bypass

- Manual transfer to bypass pushbutton
- Not used



RS 232

- RS232 connector (male)

Priority	Indication	Diagnostics
1	8	E²PROM failure
2	F	Bypass Fuses Blown or IRE open
3	C	Phase failure
4	P	Incorrect phase rotation
5	●	Bypass square wave generation error
6	O	Output out of tolerance
7	L	Overload
8	4	Mains frequency out of tolerance
9	H	Mains voltage out of tolerance
10	6	Auxiliary power supply failure on the SS/FY pcb
11	b	Bypass blocked
12	S	Bypass not synchronised
13	d	SSB failure
14	E	Bypass system not available
15	9	Missing or false bypass trip signal
16	7	EPO activated
17	U	IUG open
18	--	SSB on

In normal condition the display shows a red segment rotating clockwise.If more than one alarm is present, only the one with the higher priority is displayed.

PTX33/SP - Technical Data

Figures

1 System Data

Technical Data / System Data									
	10	15	20	30	40	60	80	100	120
System configuration	On-line (double conversion)								
Nominal input voltage	3Ph+N x 380 ÷ 415 V Tolerance: ± 15%; - 10% for Vnom=380V								
Nominal input frequency	50 / 60 Hz Tolerance: ± 10%								
Nominal output voltage	380 / 400 / 415 Vac (adjustable)								
Nominal output frequency	50 / 60 Hz								
Output voltage distortion (THD) linear load non linear load at 100% of Pn and C.F. = 3	< 1% < 4%								
Output voltage regulation with load between 0 and 100%	± 1% (balanced or unbalanced)								
Output frequency regulation - synchronisation with mains - free running	± 0,5 / 1 / 2 Hz (selectable with software) ± 0,01 %								
Rated output power, power factor = 0.8 [kVA]	10	15	20	30	40	60	80	100	120
Rated output power, power factor = 1 [kW]	8	12	16	24	32	48	64	80	96
Efficiency - 50% load [%] - 100% load [%]	 > 88 > 90	 > 88 > 90	 > 88 > 90	 > 88 > 90	 > 90 > 91	 > 90 > 91	 > 90 > 91	 > 90 > 91	 > 90 > 91
Losses at nominal load, charged battery <= [kW] Losses at nominal load, charged battery <= [kcal/h]	0,8 693	1,2 1037	1,6 1380	2,4 2071	3,2 2762	4,8 4142	6,4 5523	8 6904	9,6 8285
Overload capacity - Inverter three-phase - Inverter one-phase - Static bypass switch (SSB)	125 % 10 minutes, 150 % 1 minute 175 % 10 minutes, 200 % 1 minute 2000 % 20 msec, 200 % 1 minute, 150 % 30 minutes, 130% continuous								
Permissible inverter output voltage variation for bypass switching	± 10%								
Design standards	IEC 146-4, EN50091-1, IEC 950								
Insulation test for 60s	2,0 kV								
Cabinet protection	IP 20 acc. to IEC 529, IEC 944 (excl. air exit)								
Ambient temperature - operating temperature - storage temperature	 0 .. 40 °C 0 .. 85 °C (excluding battery)								
Permissible relative humidity	< 95 % UR (non condensing)								
Maximum altitude above sea level at full load	< 2000 m. Higher altitudes require power derating or increased cooling								
RFI suppression	EMC standard satisfied with EN50091-2 (1995) class A - IEC801-2 - IEC801-3 - IEC801-4								
Audible noise level at 1 meter <= (dBA)	58	58	58	58	60	60	61	61	62

FIG. 1.1 - System Data

2 Rectifier Data

Technical Data / Rectifier Data									
	10	15	20	30	40	60	80	100	120
Input voltage Tolerance with reduced output (DC) voltage	refer to system data refer to system data -20 %								
Input frequency Tolerance	refer to system data ± 10 %								
Rated input power with charged battery [kVA]	10,8	16	21,3	32	42,7	64,1	84,8	106	127,4
Rated input current with charged battery (380 V) [A]	16,4	24,6	32,7	49,2	65	97,5	128,5	160,7	193
Maximum input power [kVA]	13,5	20	26,9	39,8	53,5	80	105	132	158
Maximum input current, input voltage = 380 V [A]	20,5	30,8	40,8	61,2	81,5	122	160,5	201	241
Input power factor (nom. load, input voltage = 380V)	~ 0,83 lag.								
Output control characteristics	I/U characteristic, boost charge possible								
Rated output voltage - Lead-Acid batteries - Ni-Cd batteries	432 V/DC 436 V/DC (depending on number of cells)								
Soft start	~ 10 sec.								
Floating voltage regulation with load between 0 and 100%	1 %								
Output voltage ripple with battery disconnected Battery current ripple limitation with saturation choke	RMS 1 %								
Max. batt. recharging current with nom. load [A]	5	7,5	10	15	20	30	40	50	60
Battery charging current limitation	Complies with battery manufacturer's recommendations, standard setting approximately 10% of rated battery capacity								

FIG. 2.1 - Rectifier Data

3 Battery Data

Technical Data / Battery Data	Charger input voltage								
	10	15	20	30	40	60	80	100	120
	Input charging voltage								
	3 x 380 V			3 x 400 V			3 x 415 V		
Number of cells (standard) Lead-Acid open Lead-Acid maintenance free Ni-Cd	192 192 300			192 192 300			192 192 300		
Floating-voltage Lead-Acid open 2,25 V/Cell [VDC] Lead-Acid mainten. free** 2,25 V/Cell [VDC] Ni-Cd 1,42 V/Cell [VDC]	432 432 426			432 432 426			432 432 426		
Boost charge voltage Lead-Acid open 2,4 V/Cell [VDC] Ni-Cd 1,54 V/Cell*** [VDC] Lead-Acid maintenance free (no boost charge)	462 462			462 462			462 462		
Minimum battery voltage Lead-Acid 1,69 V/Cell [VDC]	325			325			325		
Recommended charging current (adjustable)	10 % of rated battery capacity								
Protection	- Batt. protection disconnector switch**** - Automatic shutdown of the inverter at min. DC voltage								
Permissible DC voltage range [VDC]	min. 320V . . . . . max. 462V								
Maximum battery discharging current (Vdc=320V, nominal load)	27	40	54	80	107,5	161,2	212,5	266	319
Environmental temperature	follow battery manufacturer's instruction								

** At 20° C room temperature
*** Maximum voltage/cell
**** Battery disconnector fuse for free standing battery optional

FIG. 3.1 - Battery Data

4 Inverter Data

Technical Data / Inverter Data									
	10	15	20	30	40	60	80	100	120
Permissible input DC voltage range	320 - 480 V/DC								
Input power at rated load - [kW]	8,7	13	12,4	26	35,1	52,7	70,3	87,9	105,5
Inverter input current at 320 Vdc and rated load [A]	27	40	54	80	107,5	161,2	212,5	266	319
Nominal output current at rated load (380V, cos phi = 0,8) [A]	15,2	22,7	30,3	45,5	60,8	91,3	121,7	152,1	182,1
Nominal output current (380V, cos phi = 1,0) - [A]	12,1	18,1	24,2	36,4	48,6	73	97,4	122	146
Efficiency at 80% load - [%]	> 92	> 92	> 92	> 92	> 92	> 93	> 93	> 93	> 93
Load power factor range	0 - 0,8 ind. (without derating) 0 - 1 cap. (0,8 to 0,6 derating) 0,8 - 1 ind. (1 to 0,8 derating)								
Output voltage	refer to system data								
Output voltage distortion (THD)	refer to system data								
Output voltage adjustment range	± 10% of programmable nominal value								
Phase displacement - balanced load - 100 % unbalanced load	 120° ± 1% 120° ± 1%								
Voltage tolerances - static, balanced load - static, 100% unbalanced load - dynamic, 50% load step - dynamic, 100% load step	 ± 1 % ± 1 % ± 4 % ± 5 %								
Voltage transient recovery time	<= 50 ms within ± 2% of nominal voltage								
Short circuit current	150 % of nominal current continually, 200 % for 100 msec for three-phase 200 % continually, 300 % for 100 msec for one-phase								
Max. freq. range for synchr. of the inv. with the mains	± 2,5 Hz								
Max. frequency variation during synchronisation	± 1 Hz/sec.								

FIG. 4.1 - Inverter Data