90-NET

Series

CHLORIDE
POWER PROTECTION

THREE PHASE Uninterruptible Power System

Owner's Manual

P/N 10H52171UM01 Rev. 3

User and Operating Manual

CHLORIDE
27944 N. Bradley Rd. • Libertyville • IL • 60048
Toll Free Phone 800-239-2257 • Toll Free Fax 800-833-6829
Phone 847-990-3228 • Fax 847-968-2130
EMERGENCY SERVICE phone 800-388-4234

DECLARATION OF CONFORMITY

The manufacturer: CHLORIDE

Head office at:
27944 North Bradley Road,
Libertyville, IL 60048
USA

HEREBY DECLARES THAT THE PRODUCT: 90-NET

CONFORMS TO THE FOLLOWING REGULATIONS:

ANSI/UL1778
CSA C22.2
FCC PART 15
IEC 60950

IMPORTANT SAFETY INSTRUCTIONS - KEEP IN A SAFE PLACE AFTER USE

THIS MANUAL CONTAINS IMPORTANT INSTALLATION AND MAINTENANCE INSTRUCTIONS FOR 90-NET SERIES UPS, OPTIONS AND ACCESSORIES

1. INTRODUCTION

Who are these operating instructions intended for?

These operating instructions are intended for use by qualified personnel involved in transporting, installing, commissioning, maintaining and operating the 90-NET devices.

Symbols used

The following symbols are used in this handbook:

CAUTION
As defined by these operating instructions and the danger notices on the products. Failure to observe the appropriate safety measures will result in death, severe injury or considerable damage to property.

WARNING
As defined by these operating instructions and the warning notices on the products. Failure to carry out described operations or observe proper precautions may result in death, severe injury or considerable damage to property.

NOTICE
This pictogram draws attention to important information about the product or part of the operating instructions.

Indicates a step that must be carried out.

Terms used

Maintenance bypass
The switch that allows maintenance work to be carried out without interrupting the supply to the load.

Electronic bypass
A thyristor switch which connects the load directly to mains in event of inverter overload; also referred to as a static switch or static bypass.

Qualified personnel
Personnel who are familiar with the installation, assembly, commissioning and operation of the product and are qualified to carry out the respective activities.

Display
An LCD display, providing information about the operating status of the UPS.

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2. SAFETY

Safety Notices

WARNING
Only AUTHORIZED SERVICE PERSONNEL should perform maintenance or service on the UPS or battery system.

Carefully read the following safety notices!

WARNING
This equipment services power from more than one source. UPS present a different safety issue than most electrical equipment because removing input power from the UPS puts it into backup mode. Removing the input power from the UPS does not remove the electrical charge. To ensure that the UPS is off, turn the inverter OFF before removing the input power from the UPS

CAUTION
Operating this equipment without proper grounding may present a risk of electrical shock.

WARNING
Dangerous voltages are present within this unit! There are no user-serviceable parts inside. Any repairs or modifications by the user may result in out-of-warranty repair charges, unsafe electrical conditions, or violation of electrical code. Do not remove the cover. All repairs should be performed by qualified service personnel. Voltages inside the UPS may be lethal. Internal components are powered even when the power switch is in the OFF position. Even with the battery disconnected and the unit unplugged, energy is stored in high voltage capacitors and represents a severe shock hazard.

Other safety considerations

The system is not intended for outdoor use. The operating environment should be maintained within the parameters stated in the manual. Keep the cabinet doors closed and locked to ensure proper cooling airflow and to protect personnel from dangerous voltages inside the unit. The UPS system contains its own power source. Lethal voltages are present even when the UPS is disconnected from utility power.

In case of service or routine maintenance

Ensure all power is disconnected before performing installation or service. Ensure the area around the UPS system is clean and uncluttered. Battery maintenance or battery replacement should be performed only by authorized service personnel.
Observe all DANGER, CAUTION and WARNING notices affixed to the inside and outside of the equipment.

Batteries

CAUTION
In order to operate the battery switch S9, remove the lockout clamp (see Fig. 4 on page 14).
DO NOT operate the switch S9 with the inverter running.
DO NOT switch S9 to "ON" until the rectifier is fully on.

NOTICE
When the useful lifetime of the batteries has expired, they must be replaced by the Customer Service representative, using the same type and number of batteries. Exhausted batteries are classified as "harmful toxic waste" and, as such, must be disposed of in accordance with local/national disposal regulations.

CAUTION
DO NOT attempt to incinerate batteries as they may explode. Do not open or intentionally damage batteries or battery cabinets in any way. Released electrolyte is toxic and harmful to the skin and eyes.

CAUTION

A battery can present a risk of electrical shock and high short-circuit current. The following precautions should be observed when working on batteries;

- Remove watches, rings, or other metal objects
- Use tools with insuleted handles
- Wear rubber gloves and boots
- Do not lay tools or metal parts on top of batteries
- Disconnect charging source prior to connecting or disconnecting battery terminals
- Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock.The likelihood of such shock can be reduced if such grounds are remove during installation and maintenance.

Grounding the unit

WARNING

Interruption of the protective grounding conductor or disconnection of the protective earth terminal presents a potential shock hazard that could result in personal injury and damage to the equipment.

CAUTION

An insulated grounding conductor that is identical in size, insulation material, and thickness to the grounded and ungrounded branch circuit conductors except that it is green with or without one or more yellow stripes is to be installed as part of the branch circuit that supplies the unit or system.

The above grounding conductor must be connected to earth at the service entrance or, if supplied by a separately derived source, at the supply transformer or motor-generator set.

The attachment-plug receptacles in the vicinity of the unit or system are all to be of a grounding type, and the grounding conductors serving these receptacles are to be connected to earth ground at the service entrance.

FCC Compliance

NOTICE

Changes or modifications to this unit not expressly approved by the party responsible in FCC compliance could void the user's authority to operate the equipment. This equipment was tested and complies with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the UPS is operating in a commercial environment. The UPS generates, uses, and can radiate radio frequency energy. If installation and use is not in accordance with the instruction manual, it may cause harmful interference to radio communications.

NOTICE

When this equipment is operated in a residential area it may give rise to harmful radio communications interference. The user is responsible for correcting the interference.

NOTICE

The basic environmental requirements of the UPS system are:

- Ambient Temperature Range: 32 – 104°F (0-40°C)
- Recommended Operating Range: 68 – 77°F (20-25°C)
- Maximum Relative Humidity: 95% (non-condensing).

Danger Areas

CAUTION

For safety reasons the Operator MUST NOT REMOVE the secondary access panel.

If, for any reason, it is necessary to remove this panel, the installation must be switched off and de-energized, otherwise complete safety cannot be guaranteed.

WARNING

When the UPS is opened, parts which carry voltage must not be touched. After removing the protective panels or terminal field covering, the connection terminals and rails, as well as exposed metal parts and other components carrying dangerous voltages are no longer protected against accidental contact!
When working on an open UPS device, the corresponding safety measures must be observed. The following danger is present even with disconnected UPS:

CAUTION

The UPS contains capacitors which continue to store energy for a period of time after the device has been disconnected from the mains supplies and battery. This voltage (> 500 V DC) is present at battery terminals C+ and D-. For this reason, check that the UPS and the external mains separation device are switched off and the battery fuses removed or the circuit breaker opened. Before continuing work, measure the voltage at the battery terminals and at the mains input filter and wait until this has dropped to 0 V. Failure to do this can lead to severe electrical shock and even death.

NOTICE

90-NET has been designed for installation in TN-S and TN-C systems. Please contact your distributer if you are uncertain about your installation.
For installation in permanent IT systems please contact CHLORIDE Technical Support.

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3. DELIVERY AND STORAGE

3.1. Delivery

Inspect the goods immediately upon receipt to ensure that the contents are undamaged. A **SHOCK-*W*ATCH** label has been affixed to the packaging. The purpose of this **SHOCK*W*ATCH** is to give the receiving clerk an immediate indication if the goods had experienced rough handling. If red, note on bill of lading and report immediately to the freight forwarder. If damage is found, keep all packaging materials and shipping documentation.

3.2. Handling

WARNING
Pay attention to the markings indicating the centre of gravity of the device. Use suitable means of transportation and secure the UPS against tipping over when transporting. Improper transportation can result in damage to the UPS and battery cabinet as well as injury to personnel.

The 225 kVA UPS cabinet is delivered on a transport pallet measuring 64" x 44" (1626 x 1118 mm) (w x d). The pallet raises the UPS device by approx. 6.5" (165 mm). The 300, 400 and 500 kVA UPS cabinets are delivered on a transport pallet measuring 82" x 44" (2082 x 1118 mm) (w x d). The pallet raises the UPS device by approx. 6.5" (165 mm). The 750kVA UPS is shipped on two pallets. One 64"x44" (1626 x 1118 mm) (w x d) and one 82"x44" (2082 x 1118 mm) (w x d) as above.

Transport the UPS and battery cabinets to the storage or installation site on the pallet in the original packaging, using a suitable lifting truck (see Fig. 1 and Fig. 2).

3.3. Unpacking

NOTICE
The device should be unpacked at the installation site since the packaging provides additional protection during transportation

UNPACK THE DEVICE AS FOLLOWS:

- Check the UPS and battery cabinet for physical damage and in the event of problems, inform the forwarding agent and if necessary, your CHLORIDE agent.
- Check the nameplates on the UPS and battery cabinet against the delivery papers and your order. The nameplate can be viewed with front door open. It is also attached to the packaging.
- Loosen the fastening screws on the pallet.
- Slowly lift the cabinets from the pallet; depending on the weight 2 or 3 people should be at hand (see Fig. 1 and Fig. 2).
- Keep the pallet for repackaging or transportation at a later date.

Dispose of the remaining packaging material in accordance with local regulations

Figure 1 - Transporting the UPS

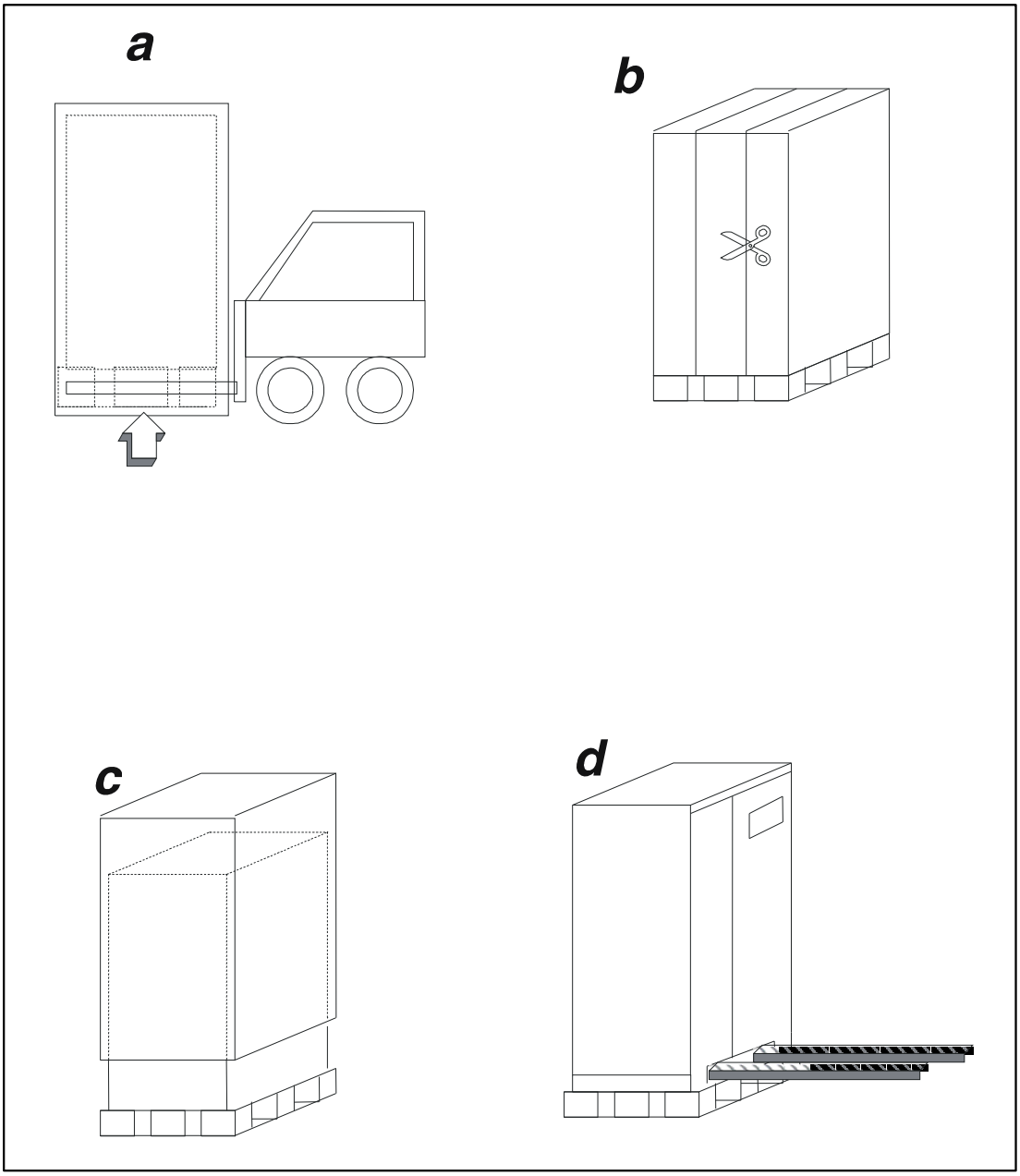

Figure 2 - Width between forks

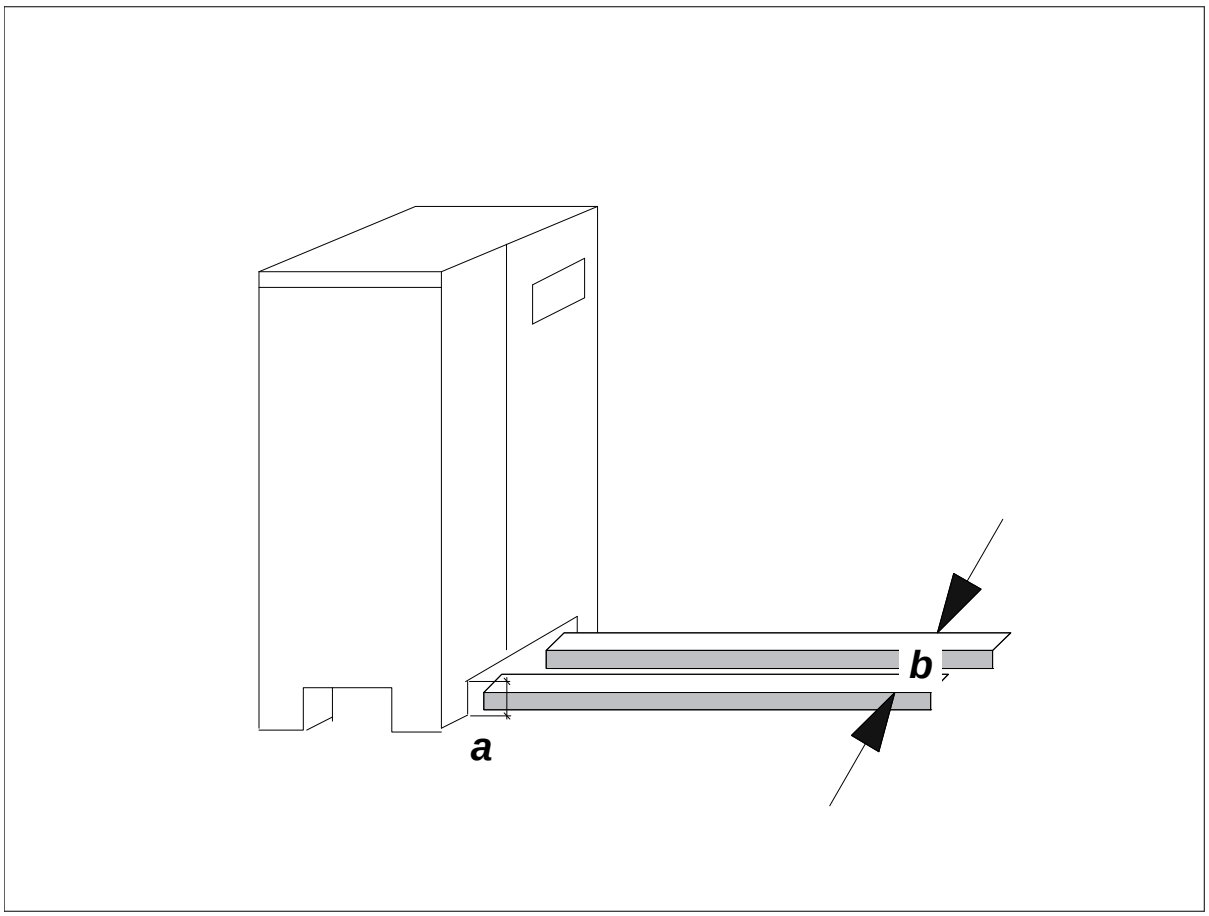

Table 1: Forklift clearance dimensions

max. dimensions of	225 kVA	300 - 500 kVA	750 kVA	
			input cubicle	output cubicle
a in. (mm)	4.0 (100)	4.0 (100)	4.0 (100)	4.0 (100)
b in. (mm)	32.25 (820)	51.0 (1295)	51.0 (1295)	32.25 (820)

3.4. Storage

If the UPS and battery cabinets are not used within seven days of delivery, they may be kept in storage. Pay special attention to the following storage condition requirements:

- Store the UPS and battery cabinets in their original packaging **clean, dry environment, away from extremes of temperature**.
- The UPS may be stored in temperatures ranging from -4°F (-20°C) to 140°F (60°C) at a relative humidity of 0 - 95%; however, batteries should not be exposed to temperatures above 77°F (25°C). Every increase of 15°F (8°C) above 77°F (25°C) reduces expected battery life by 50%. See battery manufacturer's recommendations for further information.
- Batteries must be recharged at least once every three months. Contact CHLORIDE for recommendations if the batteries are to be stored for more than three months before installation.

Pay attention to the times given for recharging the batteries. These values are given on a sticker on the device or on the packaging.

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4. PREPARING FOR INSTALLATION

4.1. Transporting without packaging materials

Once the packaging materials have been removed, the cabinets can easily be moved to their final destinations by using lifting devices. If using a fork lift, ensure that there are no stones or irregularities that could block it, causing the cabinet to tip over if moved too fast.

4.2. Selecting an installation site

Pay attention to the following conditions when selecting an installation site:

4.2.1. Environmental conditions

The UPS and battery cabinets must be installed vertically, on a level and even surface. The UPS and battery cabinets should be protected from extreme temperatures, vibration, water, humidity, and the presence of conductive powder or dust, and corrosive atmospheres. Do not stack units and do not place any objects on top of the unit. Although the functional temperature range of the UPS is 32°F to 104°F (0°C to 40°C), the ideal range is 59°F to 77°F (15°C to 25°C); battery life predictions are based on an ambient temperature of 77°F (25°C) (**unless otherwise stated by the battery manufacturer**), each increment of 15°F above 77°F reduces the expected battery life by 50%. *Refer to battery manufacturer's recommendations for further information.*

Be sure to provide sufficient cooling of the installation room so that the ambient temperature remains within the stated limits and sufficient ventilation for the type of batteries used in the UPS.

4.2.2. Mechanical dimensions

The area must have sufficient space for the installation to be carried out. Access doors must be sufficiently large to permit passage of the unit. The UPS has been designed to provide front and top access for maintenance purposes. *Refer to APPENDIX 1 on page 69 for UPS cubicle drawings.*
Provide the following minimum distances:

- minimum of 12 in (300 mm) between the top of the cabinet and the ceiling to allow space for the fans to be changed if necessary.
- no wall-distance if the cable is run through a double floor, otherwise the wall-distance must be at least equal to the bending radius of the cables in use. The distance between covering parts and floor is 5.9 in (150 mm).
- no limitations on either side of the device

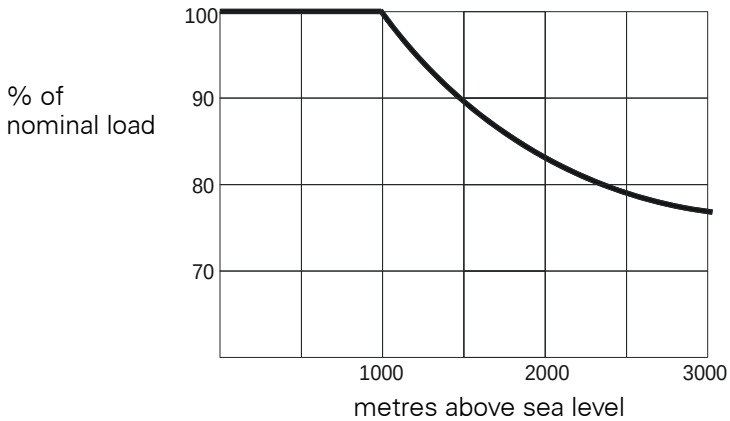
4.2.3. Floor loading

It is necessary that the floor in the chosen location be capable of supporting the weight of the UPS and battery cabinets. *Refer to Table 11 on page 74 for UPS Cubicle weights.*

4.2.4. Installation altitude

When operating the 90-NET UPS at altitudes above 3300 ft (1000m) a.s.l., the load must be reduced in accordance with Fig. 3. If the ambient temperature remains less than + 86°F (30°C), no load reduction is necessary for altitudes up to 6600 ft (2000 m).

Figure 3 - Permissible load dependent on installation altitude



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5. INSTALLATION

WARNING

Dangerous voltages are present within this unit! There are no user-serviceable parts inside. Any repairs or modifications by the user may result in out-of-warranty repair charges, unsafe electrical conditions, or violation of electrical code. Do not remove the cover. All repairs should be performed by qualified service personnel. Voltages inside the UPS may be lethal. Internal components are powered even when the power switch is in the OFF position. Even with the battery disconnected and the unit unplugged, energy is stored in high voltage capacitors and represents a severe shock hazard.

5.1. Installation data

- Ambient temperature ..... 32 - 104°F/(0 - 40°C)
- Relative humidity (w/o condensation) 95%
- Max. altitude (w/o derating) ..... 3300 ft.a.s.l/(1000 m.a.s.l).
- Protection degree (with doors open) IP20
- Cable entry ..... bottom or top
- Air inlet ..... front
- Air outlet ..... top

5.2. Placement and Leveling

The following procedure is for the 90-Net 750KVA, but it is applicable for all 90-NET Units.
Chose location that will maximize the available working space around the unit. Leave enough space to open the largest door completely. There are no minimum distances for the rear and sides, however, some connections would be easier if the rear could be accessed.
The 90-NET 750KVA consist of two cabinets. On the Input Cabinet remove the input and battery cable raceway panels (Fig. 6 on page 16). On the Output Cabinet remove the output and bypass cables raceway panel, output transformer safety panel, switch safety panel and the electronic static switch panel (Fig. 7 on page 17). After placing the Input Cabinet, use a hand truck lift one or the other corner to align the front doors at the top edge when doors closed. This will allow the door latches to work properly. Place the Output Cabinet next to the Input Cabinet on the right side about 2" away. Check to see if the two Cabinets are parallel by checking the separation of the top and bottom of the frame. Adjust the 2 near legs of the two Units if the separation is smaller at the top. Adjust the 2 far legs if the separation is larger at the top. Move the two Cabinets together with fork lift truck to mate the two Cabinets. Connect the two cabinets at "A" and "B" as shown in Fig. 10 on page 20, Fig. 11 on page 21 and Fig. 12 on page 22.

5.3. UPS electrical connections

To access the electrical connections, see Fig. 8 – Fig. 11 starting on the page 18, open the UPS front doors and remove the protection panel, see Fig. 4 - Fig. 7 starting on page 14. The power cables to and from the UPS can be routed through the top or the bottom access plates (top only for the 750KVA), see Fig. 32 – Fig. 35 starting on the page 75.

Figure 4 - Protection panel and raceway 180-225kVA

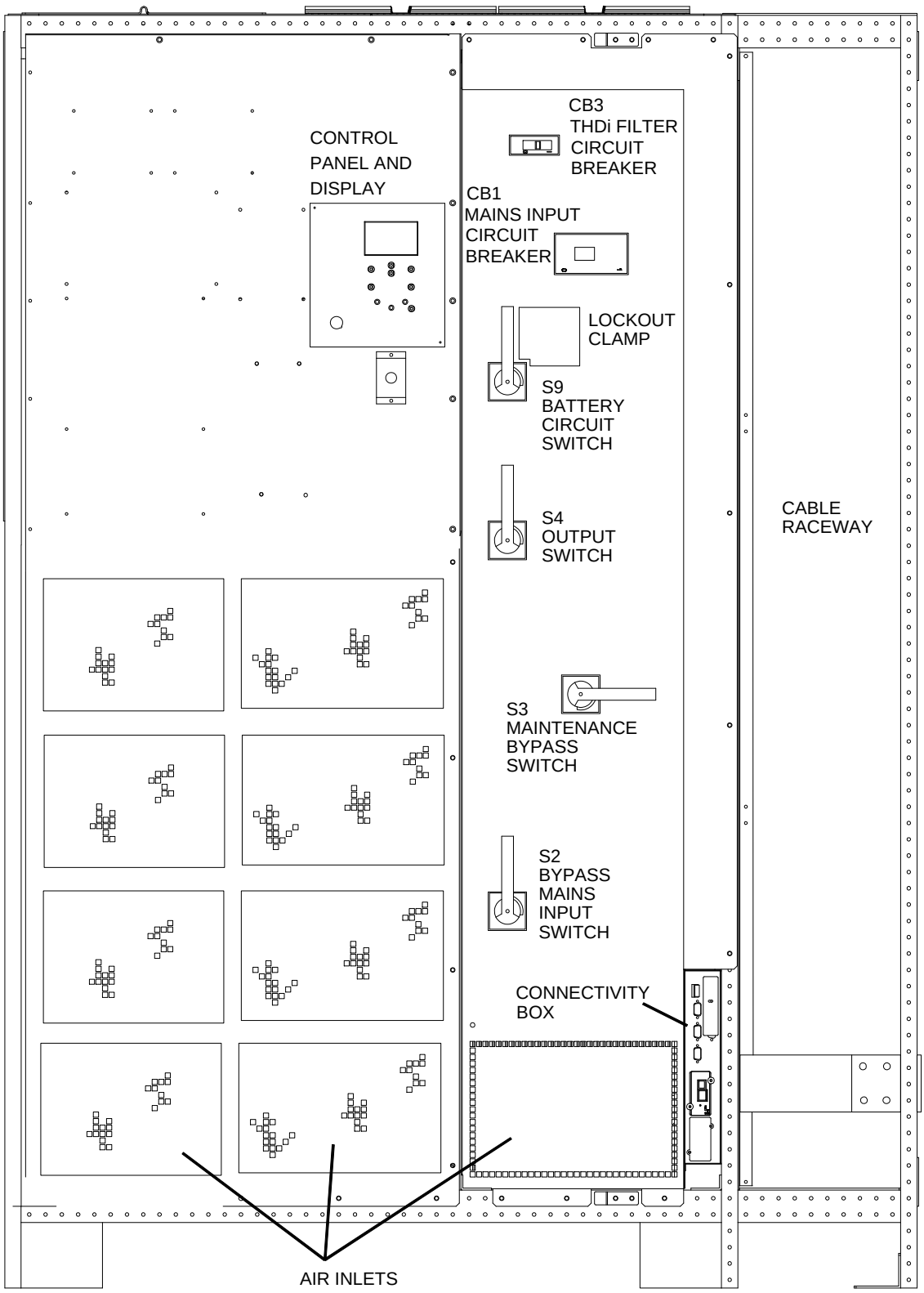


Figure 5 - Protection panel and raceway 300-500kVA

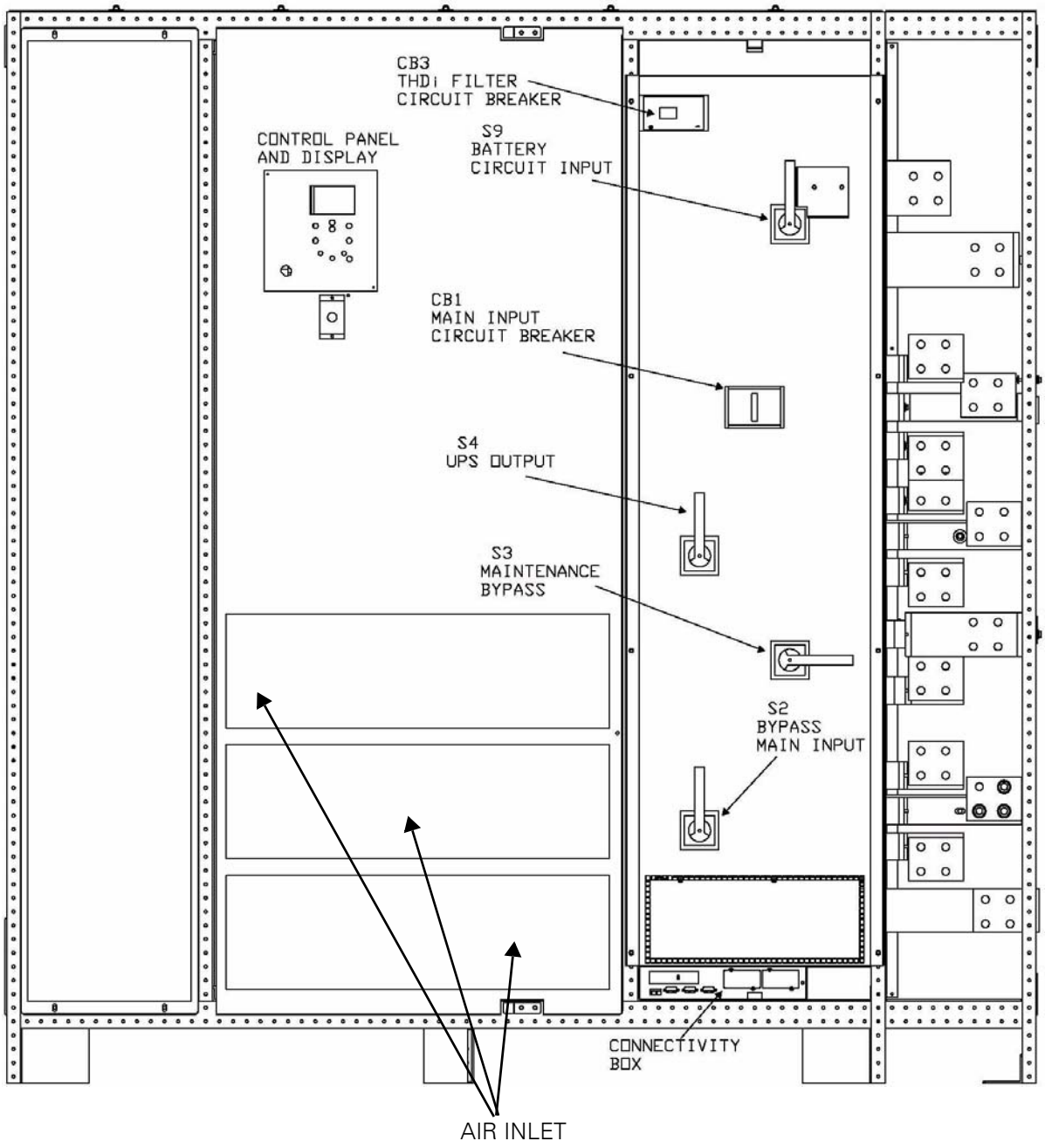
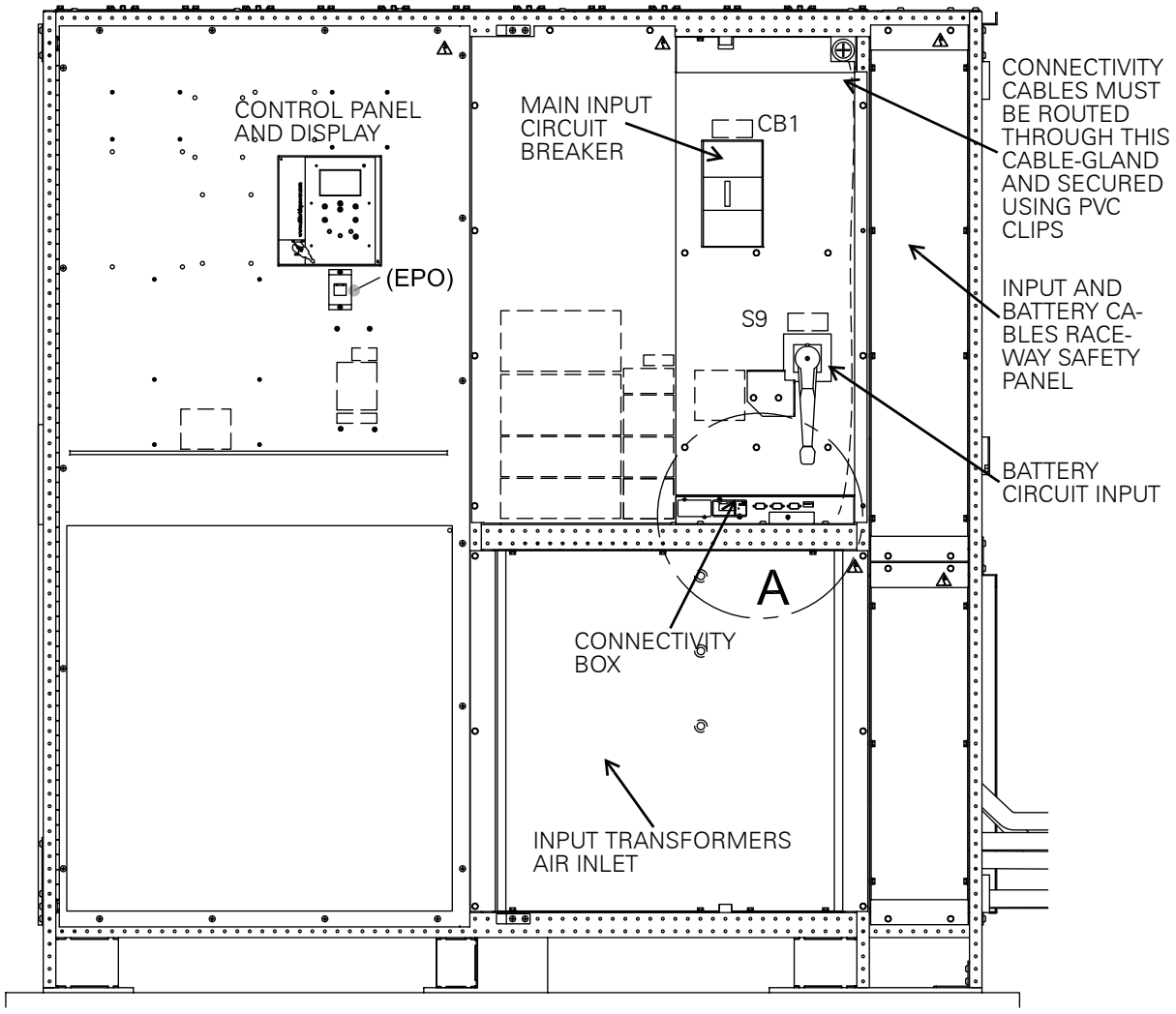


Figure 6 - Input cubicle protection panel and raceway 750kVA



XS3: SLOT 2
XS6: SLOT 1 MODEM OPTION
X6: RS232 Modem / Multi
X3: RS232 Service
X7: Contacts AS400
X8: NC EPO

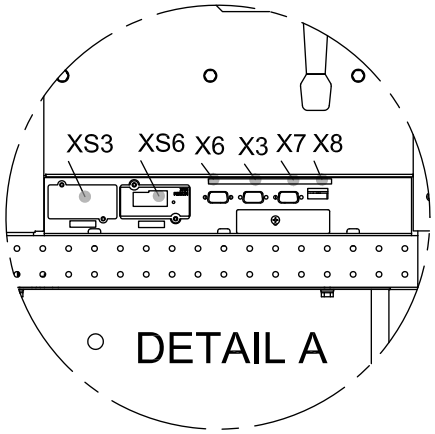
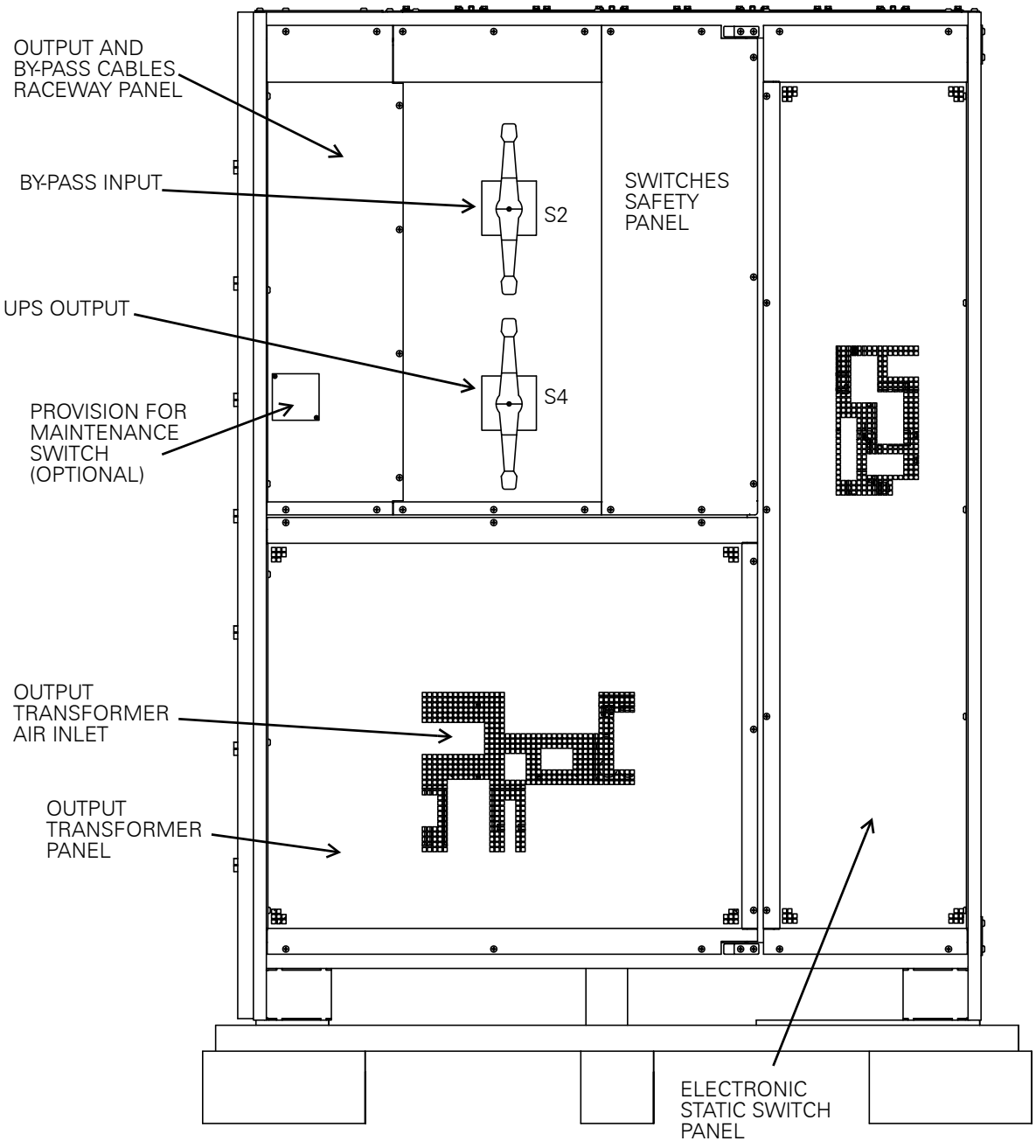


Figure 7 - Output cubicle protection panel and raceway 750kVA



5.4. UPS electrical terminations

Figure 8 - UPS electrical terminations 180-225kVA

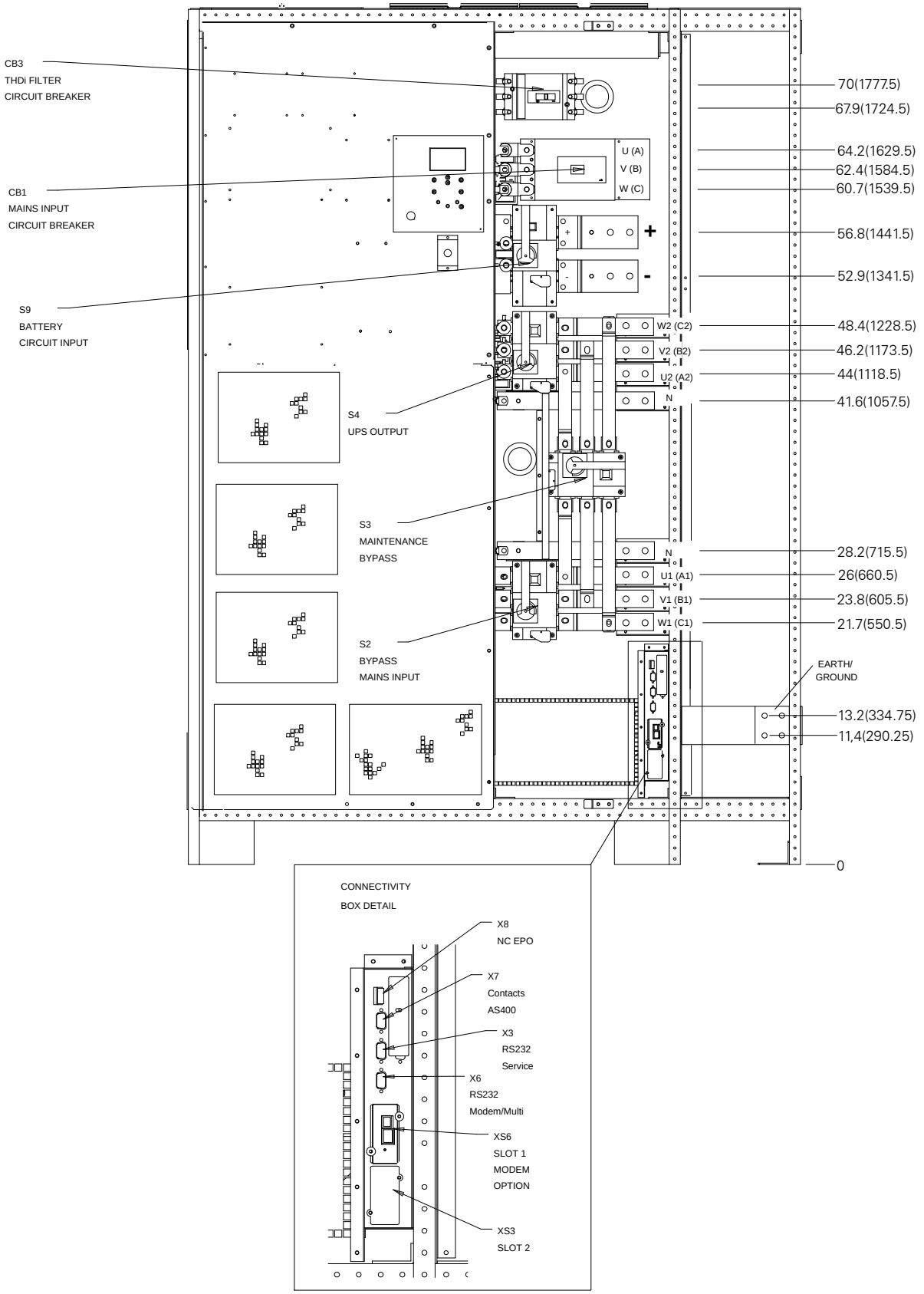


Figure 9 - UPS electrical terminations 300-500kVA

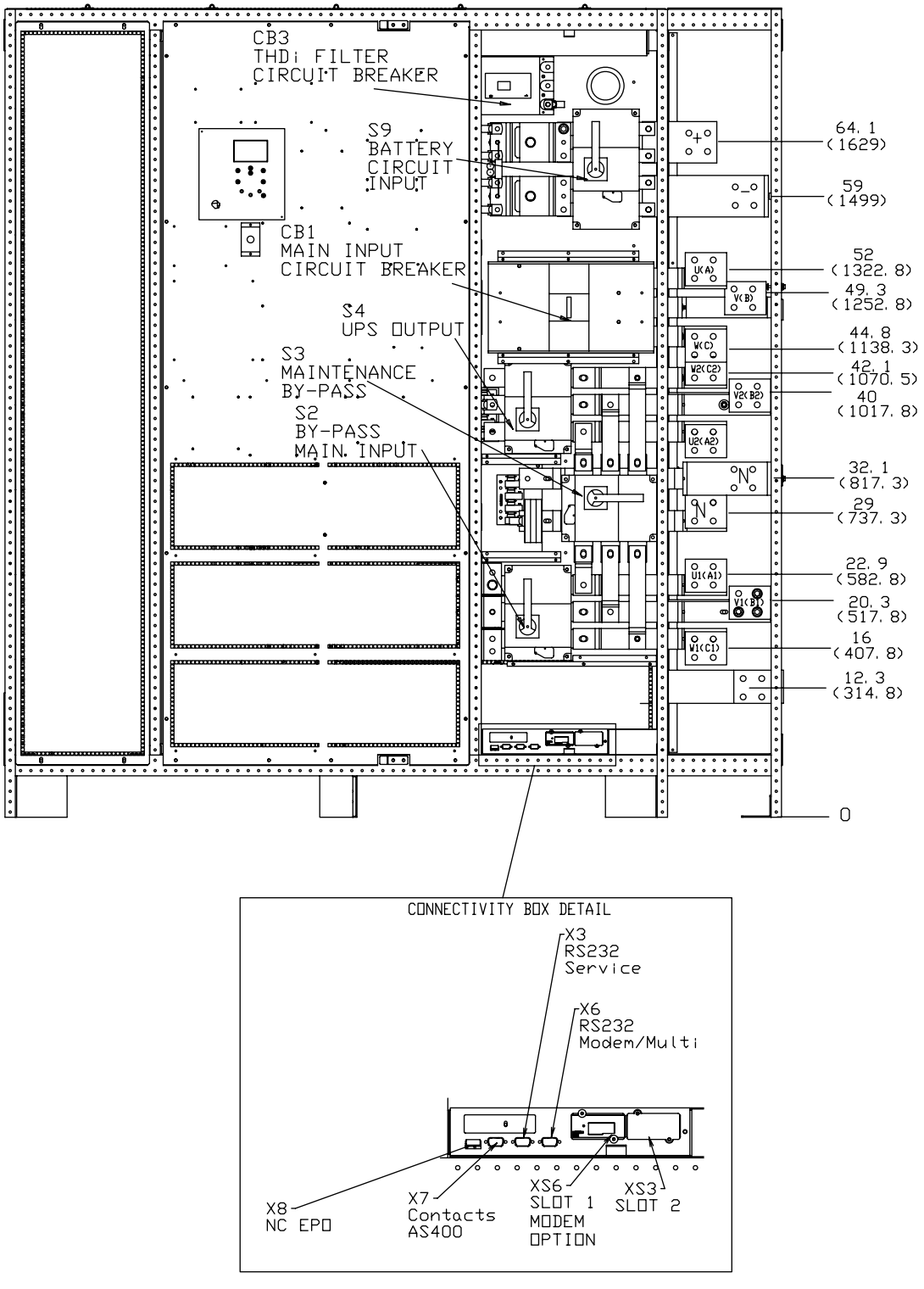


Figure 10 - Input cubicle UPS electrical terminations 750kVA

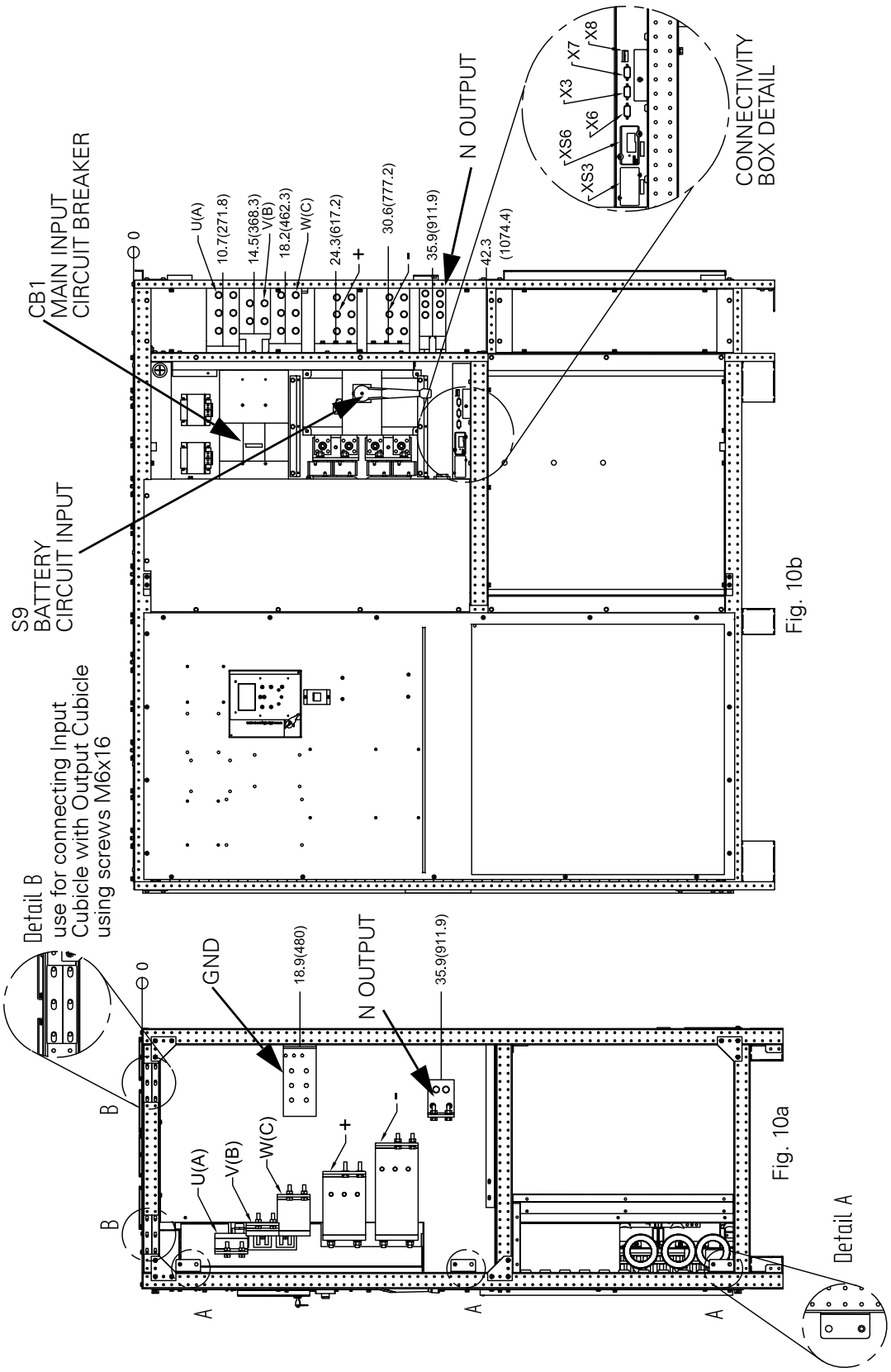


Figure 11 - Output cubicle UPS electrical terminations 750kVA

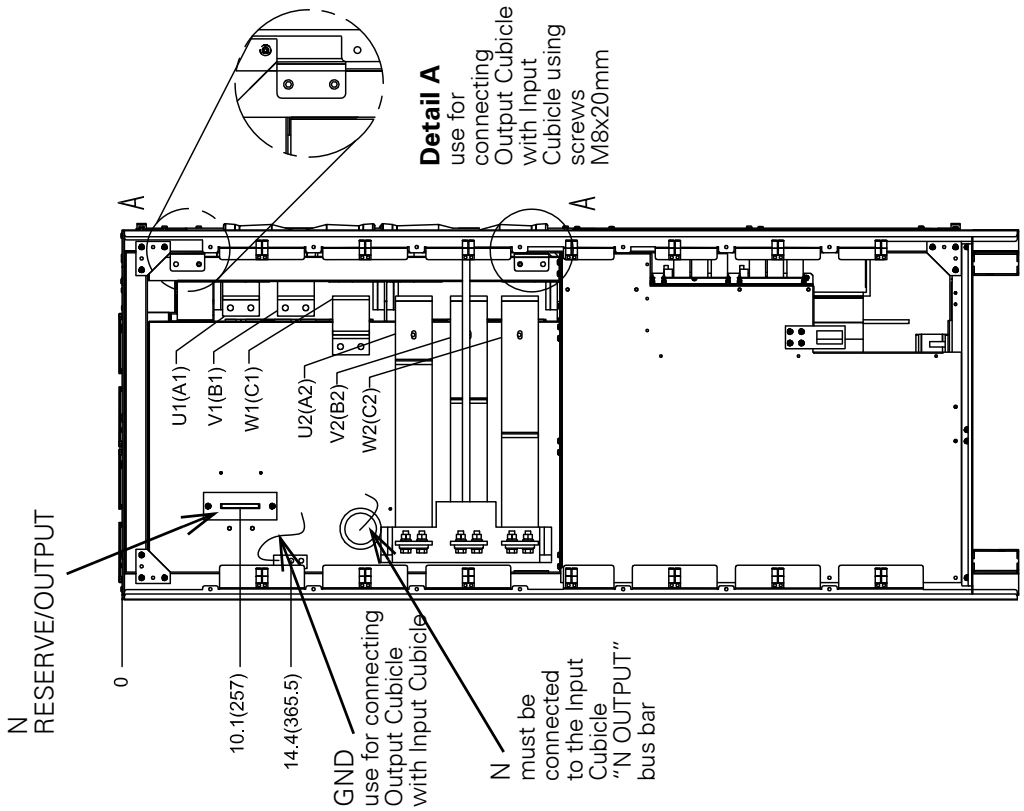


Fig. 11b

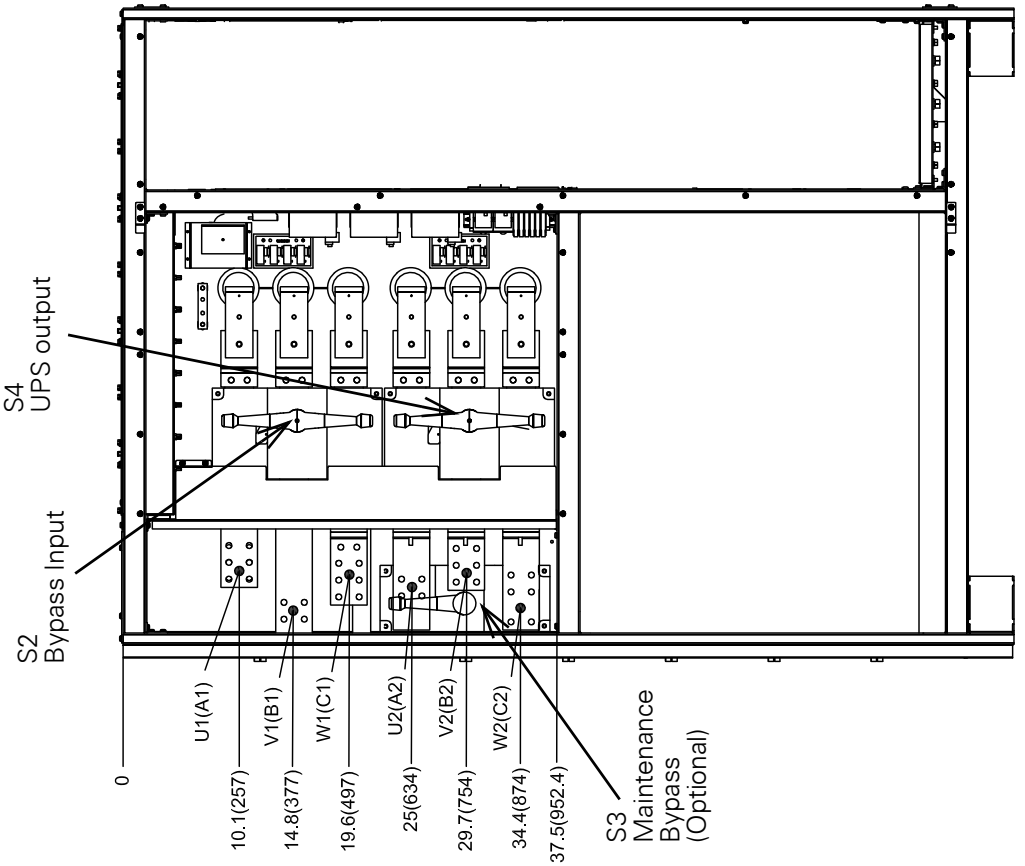
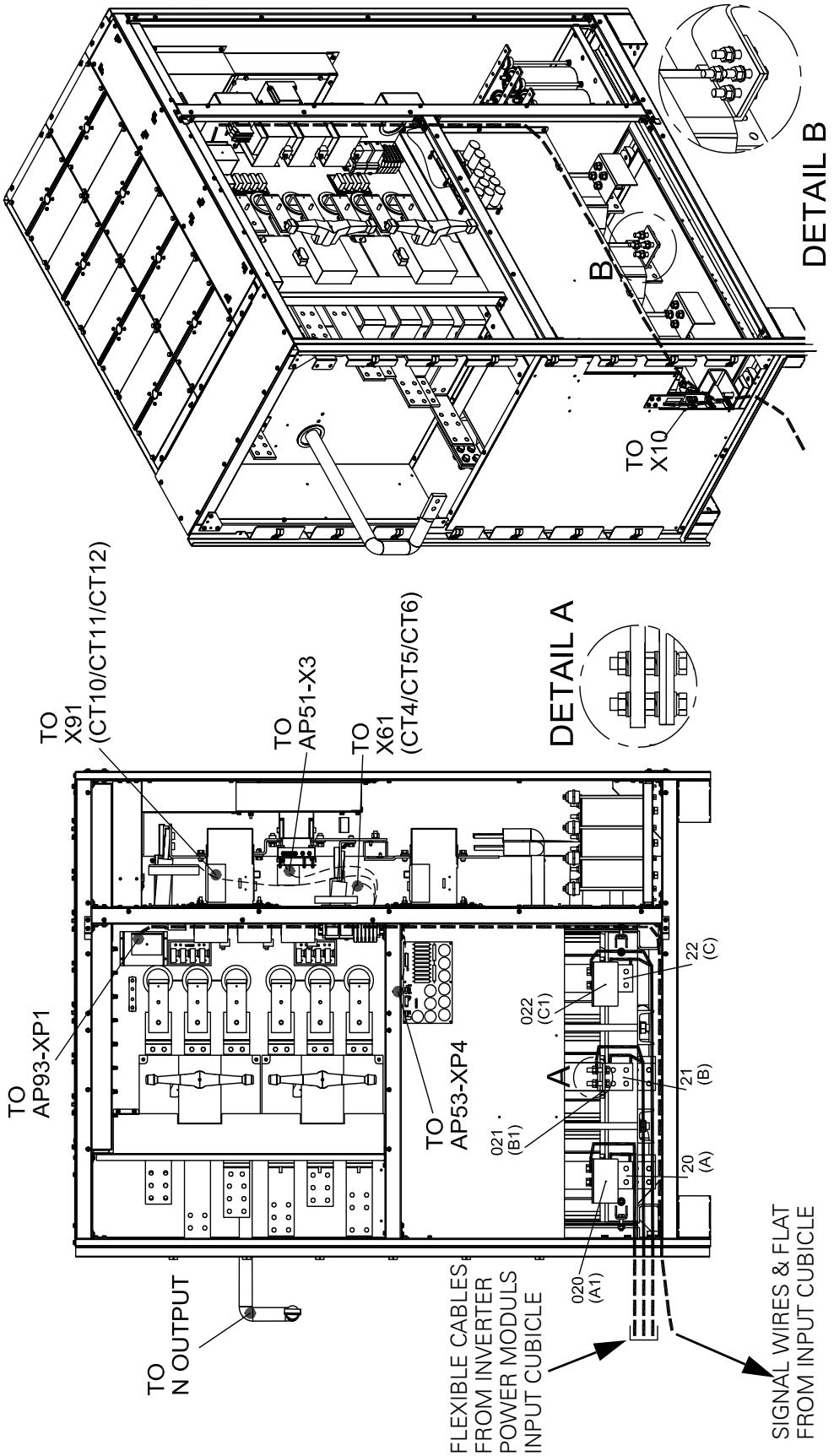


Fig. 11a

Figure 12 - Interconnections from Input cubicle to Output cubicle



5.5. Power connections

DANGER

For safety reasons the Operator MUST NOT REMOVE the secondary access panel. If, for any reason, it is necessary to remove this panel, the installation must be switched off and de-energized, otherwise complete safety cannot be guaranteed.

The UPS is connected to 480 V three-phase mains; DC voltages above 500 V are also present in the battery circuit. Installation must only be carried out by qualified personnel in accordance with these operating instructions and the regulations of the local electricity provider. The UPS devices create a large leakage current; therefore it must be connected to ground prior to commissioning. Improper connection can damage the device and lead to injuries and even death.

DANGER

Mains overvoltage: this UPS must be protected against overvoltages deriving from the feeding mains.The device was developed in accordance with the Standard UL1778, which refers to IEC 60950. Overvoltages must be planned for in the power supply system, including those caused by lightning strikes as well as those produced internally as the result of switching inductive or capacitive loads, such as power transformers or capacitor banks or as the result of short-circuit shutdowns.

NOTICE

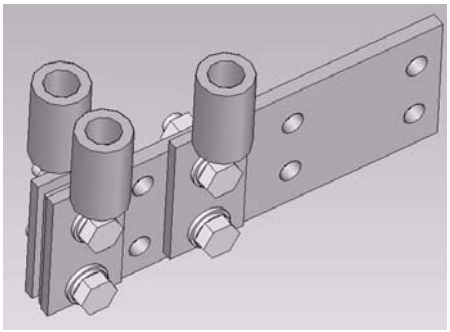
This device is not equipped with its own mains separation device. You are, therefore, required to provide a mains separation device at the installation site. It must be installed near the device and labelled as the mains separation device for the UPS. These mains separation devices and all upstream switchs must be provided with a warning plate on which the following is stated: "ISOLATE THE UNINTERRUPTIBLE POWER SYSTEM (UPS) PRIOR TO OPERATING ON THIS CIRCUIT".

NOTICE

S2 and S4 are used for disconnecting.

The following table gives indications of cable cross sections and protection ratings. Refer to Table 4 on page 27, Table 5 on page 28 and Table 6 on page 29 for power cable terminations.
Connect the ground wire to the Earth/Ground connection, before making any other connection.
The feeds for the rectifier or bypass and service bypass can be supplied from either separate or the same mains supply.
In the case of dual input feeds, connect the mains supply cables to the UPS input terminals U, V, W (A, B, C), and the Bypass input to U1, V1, W1 (A1, B1, C1).
In case of a single input feed, connect the mains and Bypass inputs to the same mains supply.
The load is connected to the output terminals U2, V2, W2 (A2, B2, C2) and N terminals.
Connect the external battery cabinet ground to the EARTH GND terminal; then connect the external battery cabinet positive (+) terminal to the positive (C+) terminal in the UPS and the external battery cabinet negative (-) terminal to the negative (D-) terminal in the UPS.
If it is not possible to fit all the cable lugs on the same side of the bar, connect the first two lugs to the same holes, front and rear, and the third lug to the next but one pair of holes (see Fig. 13 on page 23).

Figure 13 - Connecting cable lugs



Note: It is recommended that the UPS be installed using the ratings for the highest kVA the UPS is capable of operating at to accomodate any future capacity upgrades.

5.5.1. Power connection for the 750kVA version

- *Ground connection between the two Cabinets*. After two Cabinets are bolted together, connect the safety ground wires between the Input Cabinet ground bus bar and the Output ground bus bar with green/yellow wires and supplied hardware.

- *Earth connection*.The main connection between the UPS and earth ground is located in the Input Cabinet (Fig. 10a on page 20).

- *Output transformer primary side connection*. To connect the inverter outputs located in the Input Cabinet, to the transformer primary, located in the Output Cabinet, use the six flexible copper bars located in the bottom of the cable raceway of the Input Cabinet. Important: each bar is marked with a proper symbol (A, A1, B, B1, C, C1) and must be bolted to the transformer terminal marked with the same symbol (Fig. 12a, detail A, on page 22). Sort cables in the order from top to bottom in front of the output transformer. The order should be A, A1, B, B1, C, C1. Remove all hardware from terminals. Note order of disassembly.
Start with cable A going passed the terminal and bending the cable so the cable is connected to the terminal from the right hand side. Connect to the front side of the transformer bus bar (terminal is underneath front terminal A1) with the supplied hardware. Continue with A1 in similar manner. Cable must be in direct contact with transformer bus bar. Once bus bar is tightened, then place plastic guard on the top and secure with hardware. Repeat for phase B and C.

- *Neutral*. The Output neutral from the output transformer (Output Cabinet) must be connected to the neutral terminal (Input Cabinet (see Fig. 10a on page 20). Route cable away from other bus bars.

- *Signal Wires*. Connect the flying connector X10 from the Input Cabinet to the connector X10 on the Output Cabinet (Fig. 12b, page 22). Lay down the remaining signal wires in accordance with Fig. 12 on page 22 then route cable along the bottom of the panel and secure with tie wrap to cable tie base continue routing cable up to middle shelf and sort cables. Connect AP53-XP4 to the power supply at XP4. Pass X61, X91 and AP51-X3 thru rubber grommet to right section. X61 and X91 are connected to flying leads from current transformers. AP51-X3 is connected to PCB between the two contactors. Continue routing wire XP93-XP1 straight up to the top. Connect to the PCB at X3. Use tie wraps to hold added cable to existing cable

Table 2: Input/Output ratings and External Wiring Recommendations for 90-NET 180/225kVA

Terminal function	Description	Units	180 kVA	225 kVA
AC Mains Input	Max. input current (3 Ph, 1 Gnd)	A_{ac}	295	355
	Minimum conductor size (number per phase) a)	AWG or kcmil	3/0(2)	4/0(2)
	GND wire b)	AWG or kcmil	3	2
	Recommended input circuit breaker rating (3 pole) c)	A_{ac}	400	500
	Minimum conduit size (n. of conduit) d) e)	inch.	2.5(2)	2.5(2)
	Number of wires in conduit d)		3	3
AC Bypass Input	Nom. input current (3 Ph, 1 N, 1 Gnd)	A_{ac}	217	271
	Minimum conductor size (number per phase) a)	AWG or kcmil	2/0(2)	3/0(2)
	Recommended input circuit breaker rating c)	3 pole, A_{ac}	300	350
	GND wire b)	AWG or kcmil	4	3
	Minimum Neutral conductor size f) g) a)	AWG	2/0(4)	3/0(4)
	Minimum conduit size (n. of conduit) d) e)	inch.	2.5(2)	2.5(2)
	Number of wires in conduit d)		5	5
AC Output to Load	Nom. output current (3 Ph, 1 N, 1 Gnd)	A_{ac}	217	271
	Minimum conductor size (number per phase) a)	AWG or kcmil	2/0(2)	3/0(2)
	Recommended output circuit breaker rating c)	3 pole, A_{ac}	300	350
	GND wire b)	AWG or kcmil	4	3
	Minimum Neutral conductor size f) g) a)	AWG	2/0(4)	3/0(4)
	Minimum conduit size (n. of conduit) d) e)	inch.	2.5(2)	2.5(2)
	Number of wires in conduit d)		5	5
DC Input	Battery current h)	ADC	395	495
	GND wire b)	AWG or kcmil	3	2
	Minimum conductor size (number per pole) a)	AWG or kcmil	4/0(2)	3/0(3)
	Minimum conduit size (n. of conduit) d) e)	inch.	2(2)	2(3)
	Number of wires in conduit d)		2	2

a) For external wiring use 75° THHW copper wire
b) Ground cables specified are minimum size per Table 250.122 of the National Electric Code
c) Circuit breaker ratings are based on NEMA type (80% rated)
d) Number of current carrying conductors. Conduit is sized to accommodate phase conductors, two neutral wires same size as the phase conductor, if applicable and ground
e) Per NEC article, all three phase conductors must be run in the same conduit. Neutral and ground conductors must be run in the same conduit as the phase conductors
f) If the UPS load requires a neutral and the Bypass neutral is supplied, remove the neutral to ground bonding wire.
If the UPS load is delta-wye and the Bypass neutral is not supplied, install the neutral to ground bonding wire (supplied)
g) On a 4-wire system, where the major portion of the load consists of non linear loads, the neutral conductor shall be considered a current-carrying conductor and rated minimum 1.7x phase conductor
h) Battery current @ 1.8V/cell

Table 3: Input/Output ratings and External Wiring Recommendations for 90-NET 300/400/500/750kVA

Terminal function	Description	Units	300 kVA	400 kVA	500 kVA	750 kVA
AC Mains Input	Max. input current (3 Ph, 1 Gnd)	A_{ac}	466	625	780	1173
	Minimum conductor size (number per phase) a)	AWG or kcmil	250 (2)	400 (2)	300 (3)	600 (3)
	GND wire b)	AWG or kcmil	1	1/0	2/0	4/0
	Recommended input circuit breaker rating (3 pole) c)	A_{ac}	600	800	1000	1500
	Minimum conduit size (n. of conduit) d) e)	inch.	2.5(2)	3(2)	2.5(3)	3.5(3)
	Number of wires in conduit d)		3	3	3	3
AC Bypass Input	Nom. input current (3 Ph, 1 N, 1 Gnd)	A_{ac}	361	481	601	903
	Minimum conductor size (number per phase) a)	AWG or kcmil	250 (2)	350 (2)	300 (3)	600 (3)
	Recommended input circuit breaker rating c)	3 pole, A_{ac}	500	600	800	1200
	GND wire b)	AWG or kcmil	2	1	1/0	3/0
	Minimum Neutral conductor size f) a)	AWG	250(2)	350(2)	300(3)	600(3)
	Minimum conduit size (n. of conduit) d) e)	inch.	2.5(2)	3(2)	2.5(3)	3.5(3)
	Number of wires in conduit d)		4	4	4	4
AC Output to Load	Nom. output current (3 Ph, 1 N, 1 Gnd)	A_{ac}	361	481	601	903
	Minimum conductor size (number per phase) a)	AWG or kcmil	250 (2)	350 (2)	300 (3)	600 (3)
	Recommended output circuit breaker rating c)	3 pole, A_{ac}	500	600	800	1200
	GND wire b)	AWG or kcmil	2	1	1/0	3/0
	Minimum Neutral conductor size f) a)	AWG	250(2)	350(2)	300(3)	600(3)
	Minimum conduit size (n. of conduit) d) e)	inch.	2.5(2)	3(2)	2.5(3)	3.5(3)
	Number of wires in conduit d)		4	4	4	4
DC Input	Battery current g)	A_{DC}	660	880	1100	1485
	GND wire b)	AWG or kcmil	1/0	2/0	3/0	4/0
	Minimum conductor size (number per pole) a)	AWG or kcmil	4/0 (3)	350 (3)	500 (3)	700 (4)
	Minimum conduit size (n. of conduit) d) e)	inch.	2(3)	2.5(3)	2.5(3)	4(2)
	Number of wires in conduit d)		2	2	2	4

a) For external wiring use 90° THHN copper wire
b) Ground cables specified are minimum size per Table 250.122 of the National Electric Code
c) Circuit breaker ratings are based on NEMA type (80% rated)
d) Conduit is sized to accommodate a single neutral wire same size as the phase conductor, if applicable
e) Per NEC article, all three phase conductors must be run in the same conduit. Neutral and ground conductors must be run in the same conduit as the phase conductors.
f) If the UPS load requires a neutral and the Bypass neutral is supplied, remove the neutral to ground bonding wire. If the UPS load is delta-wye and the Bypass neutral is not supplied, install the neutral to ground bonding wire (supplied)
g) Battery current @ 1.8V/cell for 300/400/500kVA, battery current @ 2.0V/cell for 750kVA

Table 4: Input/Output ratings and External Wiring terminations for Chloride Model 90NET - 180/225kVA

Termination	Terminal	Clamp termination wire size	Tightening torque (in.-lbs)	Screw type
Power Cable Terminations - Single Input				
AC Input	U (A)	6AWG-350MCM (2)	275	5/16 Hex
	V (B)	6AWG-350MCM (2)	275	5/16 Hex
	W (C)	6AWG-350MCM (2)	275	5/16 Hex
AC Output to Critical Load	U2 (A2)	6AWG-350MCM (2)	275	5/16 Hex
	V2 (B2)	6AWG-350MCM (2)	275	5/16 Hex
	W2 (C2)	6AWG-350MCM (2)	275	5/16 Hex
Neutral	N	6AWG-350MCM (4)	275	5/16 Hex
Battery	Positive (+)	6AWG-350MCM (2)	275	5/16 Hex
	Negative (-)	6AWG-350MCM (2)	275	5/16 Hex
Customer Ground	Ground (Earth)	2AWG-600MCM (4)	500	1/2 Hex
Power Cable Terminations - Dual Input				
AC Input to UPS Rectifier	U (A)	2/0-350MCM (2)	275	5/16 Hex
	V (B)	2/0-350MCM (2)	275	5/16 Hex
	W (C)	2/0-350MCM (2)	275	5/16 Hex
AC Input to Bypass	U1 (A1)	6AWG-350MCM (2)	275	5/16 Hex
	V1 (B1)	6AWG-350MCM (2)	275	5/16 Hex
	W1 (C1)	6AWG-350MCM (2)	275	5/16 Hex
AC Output to Critical Load	U2 (A2)	6AWG-350MCM (2)	275	5/16 Hex
	V2 (B2)	6AWG-350MCM (2)	275	5/16 Hex
	W2 (C2)	6AWG-350MCM (2)	275	5/16 Hex
Neutral	N	6AWG-350MCM (4)	275	5/16 Hex
Battery	Positive (+)	6AWG-350MCM (2)	275	5/16 Hex
	Negative (-)	6AWG-350MCM (2	275	5/16 Hex
Customer Ground	Ground (Earth)	2AWG-600MCM (4)	500	1/2 Hex

Table 5: Input/Output ratings and External Wiring terminations for Chloride Model 90NET - 300/400/500kVA

Termination	Terminal	Standard Termination	Optional clamp termination wire size	Tightening torque (in.-lbs)	Screw type
Power Cable Terminations - Single Input					
AC Input[a)]	U (A)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
	V (B)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
	W (C)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
AC Output to Critical Load	U2 (A2)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
	V2 (B2)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
	W2 (C2)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
Neutral	N	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
Battery	Positive (+)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
	Negative (-)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
Customer Ground	Ground (Earth)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
Power Cable Terminations - Dual Input					
AC Input to UPS Rectifier	U (A)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
	V (B)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
	W (C)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
AC Input to Bypass	U1 (A1)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
	V1 (B1)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
	W1 (C1)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
AC Output to Critical Load	U2 (A2)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
	V2 (B2)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
	W2 (C2)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
Neutral	N	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
Battery	Positive (+)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
	Negative (-)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex
Customer Ground	Ground (Earth)	1/2″ bolt (4)	2AWG-600MCM (4)	500	1/2 Hex

a) Clamp terminals are already integrated on the Input circuit breaker (CB1)

Table 6: Input/Output ratings and External Wiring terminations for Chloride Model 90NET - 750kVA

Termination	Terminal	Standard Termination
Power Cable Terminations - Single Input		
AC Input	U (A)	1/2″ bolt (4)
	V (B)	1/2″ bolt (4)
	W (C)	1/2″ bolt (4)
AC Output to Critical Load	U2 (A2)	1/2″ bolt (4)
	V2 (B2)	1/2″ bolt (4)
	W2 (C2)	1/2″ bolt (4)
Neutral	N	1/2″ bolt (4)
Battery	Positive (+)	1/2″ bolt (4)
	Negative (-)	1/2″ bolt (4)
Customer Ground	Ground (Earth)	1/2″ bolt (4)
Power Cable Terminations - Dual Input		
AC Input to UPS Rectifier	U (A)	1/2″ bolt (4)
	V (B)	1/2″ bolt (4)
	W (C)	1/2″ bolt (4)
AC Input to Bypass	U1 (A1)	1/2″ bolt (4)
	V1 (B1)	1/2″ bolt (4)
	W1 (C1)	1/2″ bolt (4)
AC Output to Critical Load	U2 (A2)	1/2″ bolt (4)
	V2 (B2)	1/2″ bolt (4)
	W2 (C2)	1/2″ bolt (4)
Neutral	N	1/2″ bolt (4)
Battery	Positive (+)	1/2″ bolt (4)
	Negative (-)	1/2″ bolt (4)
Customer Ground	Ground (Earth)	1/2″ bolt (4)

Refer to the following notes when planning your installation:

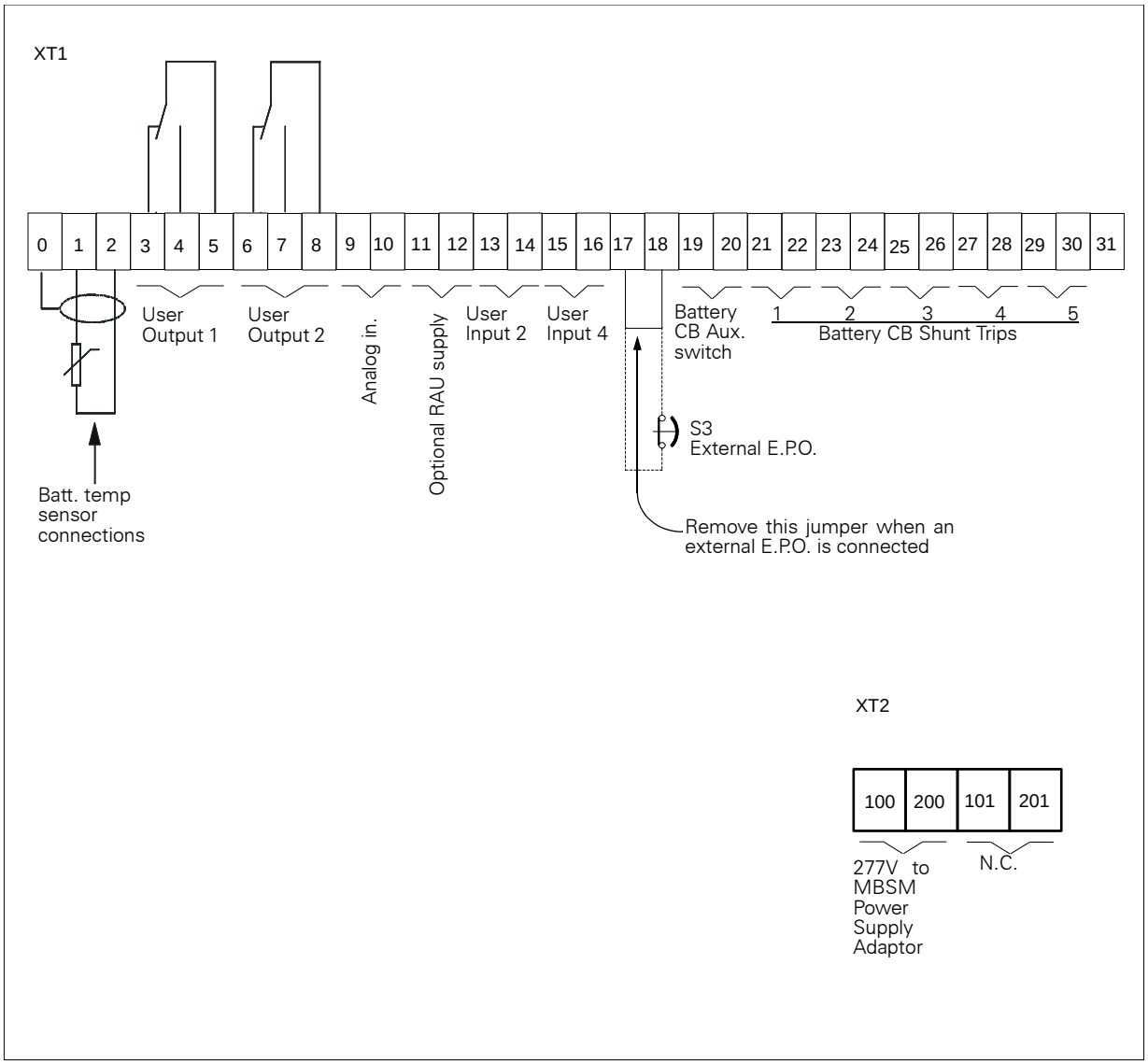
- Power cable dimensions are based on NEC 310-16 for insulated Copper conductors, at an ambient temperature of 40°C (104°F). See rating chart for temperature class of wire.
- Grounding conductors are based on NEC 250-122 for Copper wire.
- UPS Input and Output cables should run in separate conduits.
- Neutral conductors are considered to be current-carrying conductors. Refer to the NEC tables and notes for Neutral conductor and Grounding system requirements. See rating chart for CHLORIDE reccomendation for sizing.
- Should there be any variation in conditions, it will be necessary to verify whether the cable dimensions satisfy the NEC requirements. If cable lengths cause a voltage drop of > 3%, a larger cable dimension should be selected.
- External overcurrent protection is not provided by this product, but is required by Codes. Refer to Table 4 on page 27 for the protection ratings.
- A battery disconnect switch is recommended, and may be required by NEC or local Codes when batteries are remotely located

Note: This UPS may be considered a separately derived source. If this is the case, a jumper will be provided and connected between ground and the neutral terminations. Therefore, in this configuration an input neutral will not be required. The BY-PASS is phase rotation sensitive. Clockwise phase rotation is required for the input and bypass. The neutral requirements for the By-Pass input are solely dependent on the load requirements. If the load requires a Neutral then the Bypass must be supplied with a neutral regardless of a single input or dual input configuration, and the Neutral to GND jumper must be removed. This neutral should be sized for three phase non-linear load conditions. Therefore it is recommended that the neutral be sized for at least 1.7 times that of the phase conductors. If there is a question concerning this option, please contact Chloride technical support.

5.6. Backfeed Protection

This feature prevents any potential risk of electric shock at the UPS bypass input AC terminals in the event of a Bypass static switch SCR failure. An internal protection device disconnects the Bypass Mains supply when a backfeed condition is detected.

5.7. Individual UPS signal connection information



The contacts XT1/17-18 are used for directly switching off the inverter and are located on top of the UPS, see Fig. 32 on page 75.
Terminals XT1.17 and XT1.18 are connected by a jumper when shipped. When setting up an external EPO switch, the jumper must be removed. The External EPO switch connections must satisfy the following requirements:
·length: max. 150 feet
·cross section:min. 18 AWG

5.8. Battery cabinet circuit breaker operation and wiring

One of the UPS functions is to disconnect the battery from the UPS in the following situations:

(1) When the UPS is shut down completely;
(2) When the EPO button is pressed;
(3) At the end of autonomy, when the main power has not been restored, (in this case the UPS disconnects the external battery a few seconds after the Inverter end of autonomy shut down, thus giving LIFE.net the time to transmit the relevant information.

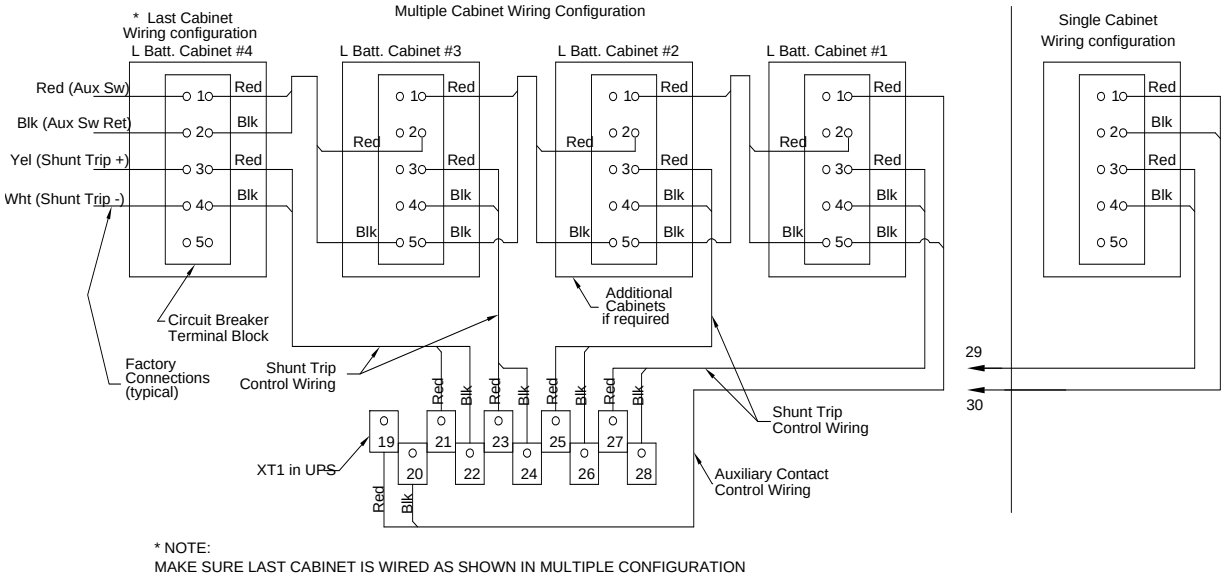
This is accomplished by using a special shunt trip circuit in the line-up and a matching battery cabinet circuit breaker. A processor-controlled signal is sent to the circuit breakers when required, to remove battery power from the UPS.

An auxiliary switch also informs the UPS that one, or more, circuit breakers are open and appears as a warning.

During the start-up procedure, the battery cabinet circuit breaker(s) should be closed just prior to closing the S9 UPS battery switch. This will allow the procedure to go ahead without receiving the error signal that indicates the battery is not present. If any of the circuit breakers in the battery cabinet(s) are open a warning will be sent to the UPS system.

The following figure illustrates the external wiring details for the battery cabinets:

Figure 14 - Battery Cabinet Aux Contact and Shunt Trip Wiring Scheme



6. BATTERY CONNECTIONS

Before connecting the batteries, please read the notice and warning label on the UPS or battery cabinet.

WARNING

In the event of malfunction, voltage may be present on the shelves or chassis of the battery cabinet

NOTICE

If non-Chloride Battery cabinet is supplied, you must ensure that the applicable NEC standard is met. Consult Chloride Service for specification and to enter battery parameter into UPS. The UPS parameters must still be entered by Chloride authorized personnel. When dimensioning your battery cabling, special attention must be paid to the connection to the +/- terminals as per Table 2 on page 25.

The battery cabinet may be installed to either side of the UPS.

NOTICE FOR ALTERNATIVE INSTALLATION

With enhanced battery management, the distance between the UPS and battery cabinet must not exceed 20 meters. The connection line for the battery measurement module must be installed so that it is properly grounded and so that there is no risk of accidental contact or short circuits. The isolation is to be dimensioned for a rated voltage of 480 V.

Connect the batteries as follows:

- All switches must be in the "OFF" position.
- Check that the external battery switch or CB is in the open position.
- Make the ground connections (PE).
- Connect the batteries with cables according to Table 4 on page 27 to terminals C+ (positive pole) and D- (negative pole). See Fig. 8 on page 18 for the location of the battery terminals.
- Connect the other end of the battery connection line to the battery cabinet or cubicle. Make certain that the polarity is correct
- Connect the temperature sensor cable to terminals XT1 - 0, 1 and 2 and to the battery cabinet or cubicle (see Fig. 32 on page 75).

NOTICE

This UPS requires a shunt trip breaker in the battery cabinet to disconnect DC voltage when: 1) EPO is pressed; 2) end of autonomy; 3) UPS is turned off. This feature is standard with Chloride supplied battery cabinets. Customer supplied battery cabinets should include this feature to prevent discharging the batteries below recommended levels. Contact the factory for full details.

6.1.1. Handling the batteries

WARNING

Batteries are a potential source of danger due to their electrical charge and chemical composition. Therefore, observe the battery handling instructions of the manufacturer. These can usually be found in the material which accompanies the shipment.

6.1.2. Recharging batteries

NOTICE

When recharging, observe the instructions on the packaging.

6.1.3. Exchanging batteries

NOTICE

Before exchanging batteries, both the batteries in the battery cabinet, as well as those to be installed must be fully charged.

6.1.4. Connecting batteries

WARNING

If the battery was disconnected and is to be reconnected, the battery isolator may only be reconnected after you have made certain that voltage with the correct polarity is present in the intermediate circuit. If the battery is connected to the intermediate circuit while the circuit is de-energized or with incorrect polarity, the intermediate-circuit capacitors could explode!

6.1.5. Disonnecting, repackaging

DANGER

The UPS contains capacitors which continue to store energy for a period of time after the device has been disconnected from the mains supply and battery. This voltage (> 500 V DC) is present at the battery terminals C+ and D-. Before disconnecting, check that the UPS and the external mains separation device are switched off and the battery fuses removed or circuit breaker tripped.
Measure the voltage at the battery terminals and wait until the voltage has fallen to 0 V or wait at least five minutes. Failure to do this can lead to severe electrical shock and even death

Strip down the UPS in the reverse order of that described in the previous sections. Use the original packaging if possible when repackaging.

7. SYSTEM DESCRIPTION

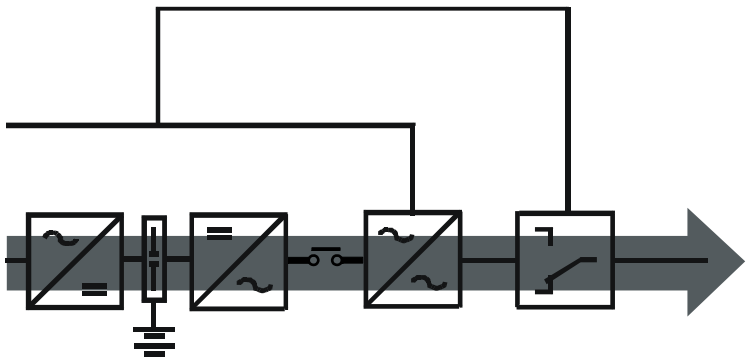
7.1. Function

The 90-NET Uninterruptible Power System (UPS) isolates the load from the AC mains supply, protecting it from voltage drops, spikes, transients, RFI and frequency variations.
In the event of total or partial AC mains power failure, an internal alarm will sound. The 90-NET will continue, without interruption, to provide power to the load from the battery. Duration will depend on battery capacity and output load. The audible alarm and the indication of available autonomy allows the user to shut down the load without haste. When the AC mains supply is restored, the 90-NET automatically recharges the batteries, ready for any power failure emergency. The display panel gives access to extremely detailed information regarding the status of supply and the 90-NET. For further information, consult this manual.
The block diagram (Fig. 16) shows the main features of the 90-NET UPS. The AC three-phase supply is rectified to provide direct current to maintain the battery charge and also to supply energy to the Inverter, which converts DC voltage into AC three-phase voltage.
The load may be powered from two sources: the Inverter or the Bypass input. The Bypass Static Switch and Output contactor allow these inputs to be supplied alternatively from these two independent three-phase sources, thereby increasing system reliability.
In order to effect continuous switching between the Inverter and the Bypass supplies, the Inverter synchronizes its output frequency with the bypass supply frequency. If the bypass supply frequency is out of the limits, the Inverter ceases synchronization with bypass frequency, operating with its own reference control to stabilize frequency output. This feature, in conjunction with the static switch, provides a continuous, reliable load power supply.
Maintenance and checking can be performed on the 90-NET UPS, without interrupting output, by simply switching the load to the bypass supply and then to the maintenance by-pass circuit. This operation should only be carried out by a CHLORIDE service engineer or by CHLORIDE-trained personnel.

7.1.1. On-line Double Conversion operating principle

This UPS operates according to the On-line Double Conversion principle. In On-line Double Conversion operation, the alternating voltage of the mains is converted into DC voltage. This DC voltage is used simultaneously to charge the battery and supply the inverter. The inverter converts the DC voltage into interference-free AC voltage at a fixed frequency and amplitude. The connected loads are supplied by this AC voltage. This protects the load from mains supply disturbances and provides a secure mains supply for electrical loads (PCs, network servers, multi-console systems).
In case of a mains failure, the batteries provide uninterrupted power to the loads via the Inverter.

Figure 15 - UPS On-line Double Conversion operation



7.1.2. Battery management

The battery is charged and discharged, as well as monitored, using microprocessor control. This ensures optimal usage of the batteries' usable lifetimes. For details, see section "Special features".

7.1.3. Overload capacity

In the event of overload (e.g. >150 % of the nominal load) or inverter failure, the load is supplied directly by the mains supply via the automatic bypass. As soon as the system returns to normal operating conditions, it automatically switches back to inverter operation.

7.1.4. Communication

The UPS offers several interfaces for communication with networks and computers. Further information consult section 11. on page 65.

7.2. Special features

7.2.1. Safe and reliable operation

- Real On-line Double Conversion operation, i.e. complete isolation of the load from all irregularities in the mains supply
- Electronic bypass increases the availability of the electrical supply electrical isolation for load protection

7.2.2. Easy installation and operation

- Compact construction.
- Parameters set using PC software by authorized service personnel.
- Easy to follow operating and display concept:
  - presence of operator unnecessary during normal operation
  - the LCD mimic gives a clear indication of the operating condition of the Rectifier/Charger, Battery, Inverter, Bypass supply and Load/Static switch, providing information about the status of each subassembly, any alarms or indications which may be active and a range of measurements, useful for monitoring UPS operation. (See section 8.1. on page 41 for a detailed description).
  - the LCD also provides assisted start-up, shutdown, bypass and return to normal operation routines, along with full access to the UPS operating parameters.
  - the two buttons at the center of the display control the main operation of the UPS (see section 8.1. on page 41 and Fig. 23 on page 41 for more information).
- Event memory for fault analysis - can be downloaded by service personnel.
- Fault display and audible signal (with the facility to shut off the unit).

7.2.3. Battery management

- Automatic battery management ensures maximum battery life
- Automatic battery circuit test
- Temperature-dependent charging

7.2.4. Modern technology

- Interfaces with software for all operating systems
- Digital signal processor and vector control for inverter optimization
- IGBT power transistors
- Highly integrated digital electronics (ASICs)
- Especially well suited for computer loads

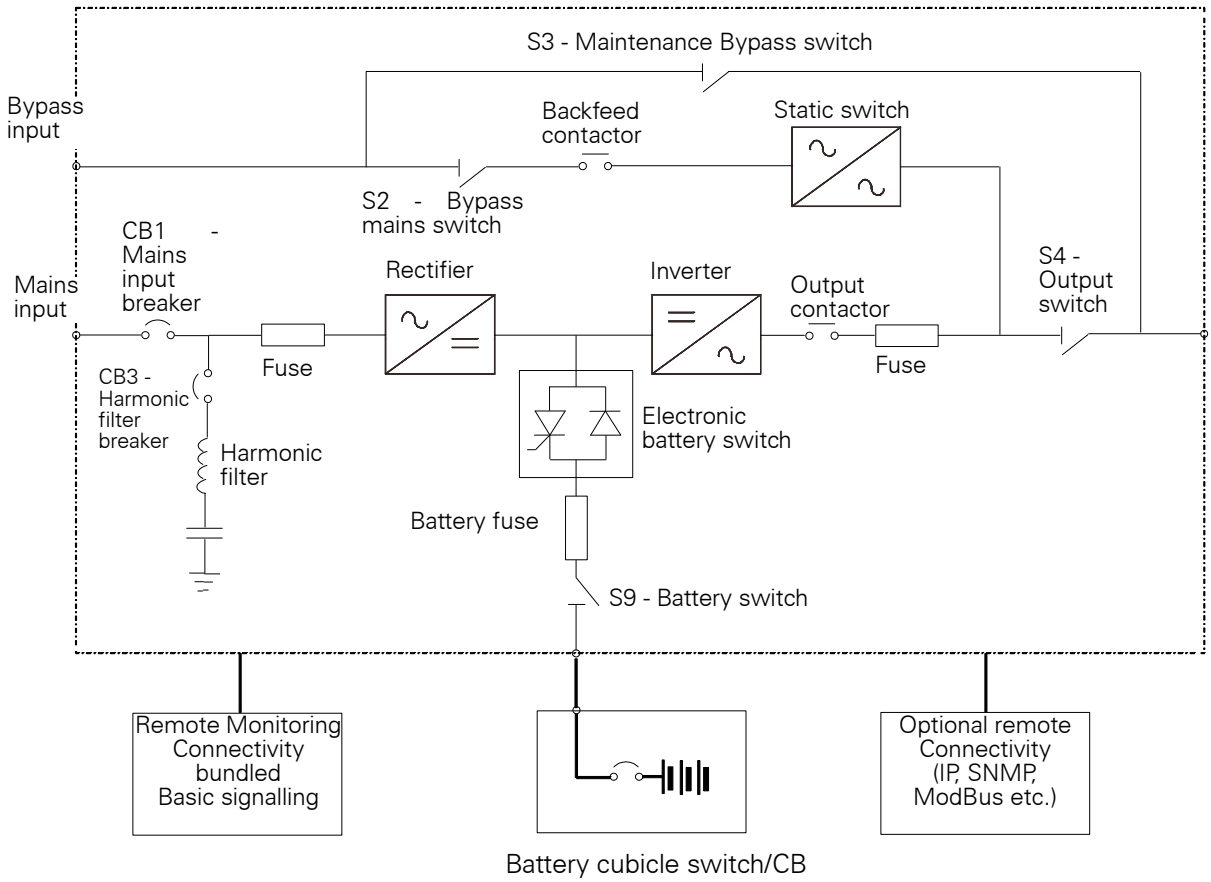
7.3. Block diagram

7.3.1. Components

The UPS consists of the following sub-assemblies

- Input filter
- Rectifier, filter and inverter
- Output transformer with filter for forming the three-phase sinusoidal output voltage
- Electronic static switch
- Maintenance bypass switch allows maintenance work to be carried out without interrupting supply to the load.

Figure 16 - Overview UPS components



7.4. Switch positions and corresponding operating modes

- If CB1, S9, S2 and S4 are switched on and S3 (see Fig. 16) is switched off, the UPS is in "on-line operation". Depending on the mains and load condition, the device can switch automatically between “on-line operation,” "battery operation" and "bypass operation".
- If CB1, S2 and S3 are switched on and S4 is switched off, the UPS is in maintenance bypass operating mode: all UPS components are live. The loads are supplied directly from the mains via the maintenance bypass switch. This setting is designed to test the UPS functions when it is not possible to interrupt the supply to the loads.
- If S3 only is switched on and CB1, S2 and S4 are switched off, the UPS is, again, in maintenance bypass operating mode: if battery isolator S9 is open then the UPS components are free from voltage, so that maintenance work on the UPS can be carried out.

WARNING

Allow approx. 5 minutes for discharging D.C. capacitors after opening CB1, S9, S4 and S2.

7.4.1. Maintenance bypass switch (S3)

The service bypass switch is located inside the UPS (optional for 750kVA).

WARNING

During parallel operation of UPS units, the load switching function of the built-in service bypass (S3) must not be used; an external switching device should be used instead (see section 9.1. on page 59)

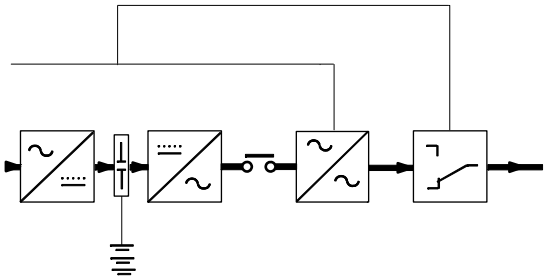
The service bypass switch is required to enable service to be carried out, it is also essential during commissioning and when the device is to be put into, and taken out of service. The supply to the load is not interrupted during switching.

7.5. Operating modes

The UPS has six different operating modes. These are described below.

7.5.1. On-line operation

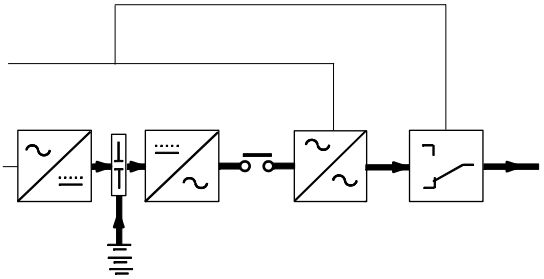
Figure 17 - Power flow in on-line operation



Normal UPS operating mode. The connected loads are supplied from the mains via the Inverter. The batteries are charged as necessary.
The inverter reliably filters mains disturbances and provides a stable, interference-free supply to the load. In this operating mode, if a mains failure occurs, the UPS switches to battery operation. If an overload or short circuit occurs at the UPS output, or if there is a fault in the inverter, the UPS switches to bypass operation.

7.5.2. Battery operation

Figure 18 - Power flow in battery operation



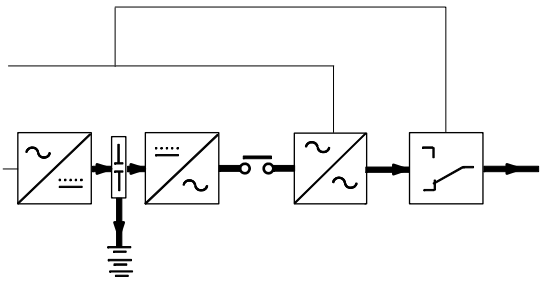
In this mode, the connected load is supplied from the batteries via the inverter.
In the event of power failure, battery operation is automatically activated and supplies the loads interruption free.
If the back-up time has not expired, the UPS automatically returns to on-line operation, once the mains supply returns. If the power failure exceeds battery autonomy, the UPS provides relevant information via its interfaces. Computers can be automatically powered down by means of additional software (optional).

NOTICE

If battery autonomy has been depleted, the UPS output is switched off and the battery cabinet circuit breakers are opened by the UPS shunt trip feature. These breakers must be reset in order to return to normal operation when the utility power is restored.

7.5.3. Recharging

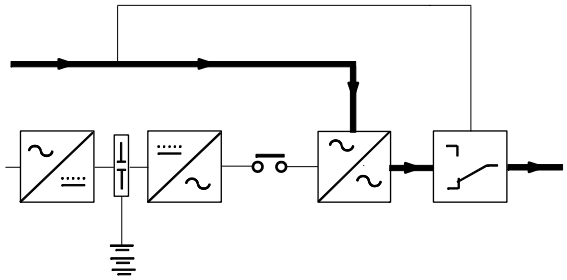
Figure 19 - Recharging the battery



In this mode, the connected loads are supplied from the mains via the Inverter and the batteries are recharged via the rectifier.
In the event of power failure, battery operation is automatically activated and supplies the loads interruption free.

7.5.4. Bypass operation

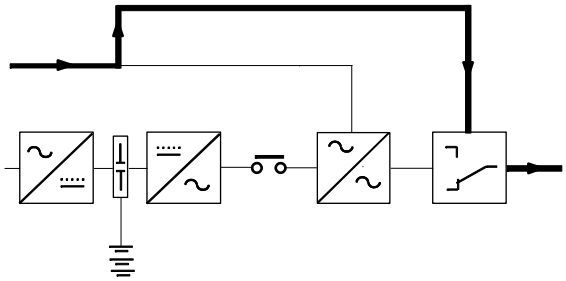
Figure 20 - Power flow in bypass operation



In this mode, the connected loads are supplied from the bypass mains via the electronic bypass.
The electronic bypass serves to further ensure power to the loads. If an overload exceeds the capability of the UPS, it is automatically activated to ensure uninterrupted power supply to the loads.
From this operating mode, the UPS automatically returns to on-line operation after the fault is corrected.

7.5.5. Maintenance bypass

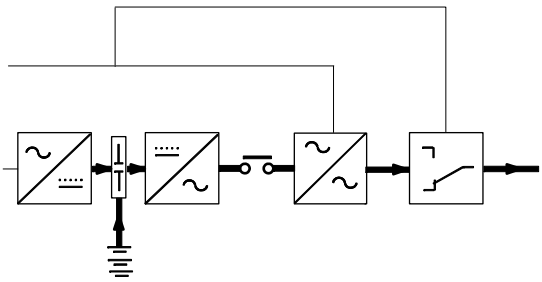
Figure 21 - Power flow in maintenance bypass operation



In this operating mode, the connected loads are supplied directly from the bypass mains supply.
The service bypass is used to supply the connected loads with voltage during maintenance work on the UPS.
In service bypass operation mode, service bypass switch S3 is switched on, S4 is switched off and CB1 and S2 are either switched on or off, depending on whether or not the UPS components should remain under voltage.
By switching on S2 and S4 and switching off S3 the UPS can be switched into bypass operation, without interrupting the load supply.

7.5.6. Battery test

Figure 22 - Power flow during battery test



In on-line operation, during battery test, energy is drawn from the battery. This takes place automatically every 7 days minus 5 hours following the last test or after switching on. The test lasts one minute. However, the test will not be performed within two days of:

- Rectifier mains failure
- Mains switch CB1 open
- Battery discharge
- Rectifier monitoring failure

This prevents the test being carried out on discharged batteries.

8. OPERATION

8.1. Control Panel and display

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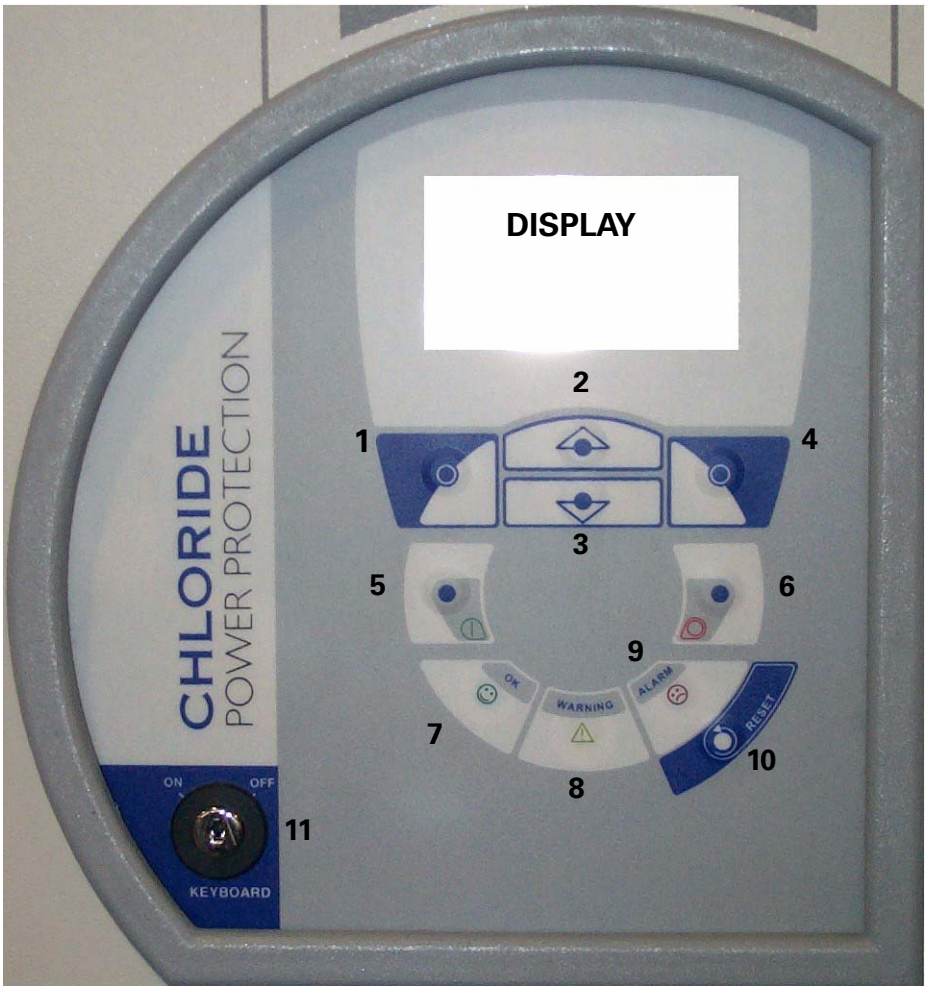


Figure 23 - Control Panel

LEGEND

1	Navigation button - Left soft key	2	Navigation button - Up
3	Navigation button - Down	4	Navigation button - Right soft key
5	Inverter "ON" push button	6	Inverter "OFF" push button
7	System Normal LED	8	Warning LED
9	Alarm LED	10	Reset push button
11	Command keyboard lock		

8.1.1. Description of Control Panel Functions

- ***Start Inverter***

Press the Inverter ON  button for 5 seconds.

- ***Stop Inverter***

Press the Inverter OFF  button for 5 seconds, an audible alarm will sound during this delay period. The UPS can be manually switched between bypass and on-line operation using the keys "Inverter ON" (I) and "Inverter OFF" (O).

- ***Silencing Buzzer***

To silence the Buzzer press the Reset button momentarily

- ***Reset button***

In order to restore normal operation of the UPS following a fault condition, after having corrected the situation causing the fault, press the Reset button for at least one second.
The RESET button also serves as a function control for the control panel LEDs. If a fault occurs, pressing the button mutes the audible signal and, once the fault has been corrected, pressing the button brings the UPS into operation again.

- ***Keyboard lock***

The mimic panel is equipped with a front panel key that disables all the mimic panel commands when the lock is set to "OFF."
In this state, if the operator attempts to perform any of the following actions, the message "COMMANDS DISABLED" appears in the LCD:

Start Inverter	Stop inverter	Reset Fault
Set/reset Battery Test	Set/reset Autonomy Test	Set/reset Boost Charge
Test PFC	Set/reset Service Input	Set/reset I/O configuration
LIFE Manual Call	Reset Delay Call	

- ***General Status LED***

Three LED indicators provide a quick, general understanding of the status of the UPS, as described below:

OK LED (green) **Normal Operation**
When this light is on (not flashing), the system is running normally and neither warnings nor alarms are present. During mains failures (all other conditions at being nominal level), this LED will flash.

Warning LED (yellow) **Warning Condition(s) present**
This indication shall be activated by the presence of anomalous conditions, which could affect the nominal functioning of the UPS. These conditions are not originated with the UPS, but may be caused either by the surrounding environment or by the electrical installation (mains side and load side). It shall be possible to read the description of the active warning(s) by browsing the relevant LCD display menus.

Alarm LED (red) **Alarm Condition**
When this light is on, immediate attention should be given to the severity of the alarm, and service should be called promptly. It shall be possible to read the description of the active alarm(s) by browsing the relevant LCD display menus.

8.2. Display

The Display provides the user with a range of information and functions that can be accessed using the control panel navigation keys 1 to 4 (see Fig. 23 on page 41).
UPS modifications and settings may only be carried out by appropriately qualified technicians. Settings should be tested only if the loads supplied by the UPS are non-critical.

The Main Page dispays a block diagram of the UPS, using standard technical symbols to indicate the current operating state (e.g. on-line operation, battery operation, by-pass operation, etc.), load level, and remaining auonomy. To access the Main Menu page from the Main (default) page, press the Right soft key (key 4 - see Fig. 23 on page 41). From here you can scroll through the various sub-menus by using the Up and Down soft keys (2 and 3). Press the Right soft key to select any menu from the list, and the Left soft key (1) to return to the Main Menu page.
After 30 seconds of inactivity (i.e. without buttons being pressed) the display reverts to the default page. The following table provides a summary of the sub-menus.

Table 7: Display menu summary

Menu	Sub-menus	Information/Functions
Actual values	- Mains Input - Bypass Input - DC Link - UPS Output - Battery	Provides information about the input, bypass and output voltages and frequencies; mains failures; output current and power; DC stage parameters; inverter operation; and battery conditions.
Status	- Synchronization[a)] - Rectifier - Battery - Inverter - Bypass - Load	Provides status information about the main UPS blocks
UPS Settings	- Input contacts - Output contacts - Optional boards - Other	You can use this menu to modify a series of UPS configurations
LIFE.net	- LIFE Status[b)] - LIFE Delayed - LIFE Manual - LIFE Service	Provides status information about LIFE.net, and allows you to reset a delayed call; perform a manual call; and select service mode.
Display settings	- Language - Contrast	Allows you to select the display language from: English; German; French; Italian; Spanish; Portuguese; Chinese; Turkish. You can also adjust the display contrast by pressing the left and right keys (1 and 4) to move the bargraph.
Manual commands	- Battery test - Autonomy Test - Boost charge - Test PFC	You can use this menu to run a series of tests or enable the boost charge function.
Guided procedures	- See para 8.6 on page 50	Select this menu to carry out guided UPS switching procedures.
About	- Manufacturer - Type of UPS - Rating in kVA - Website - Firmware Code/Rev./Date	Provides miscellaneous information about the UPS, including the code, revision and release date for the various firmware versions.

a) Only if the Synchronization option is installed - see Installation Manual 10H52160PUMC.
b) If LIFE.net is not installed/enabled, the message "LIFE is not activated on this UPS!!!" is displayed.

When the UPS is not in normal operating mode, you can access the "Warning and Alarm" summary page directly from the Main (default) page. Warnings and alarms are identified by text strings and codes (see Table 8 on page 44 and Table 9 on page 46).

8.3. Warning and Fault indications

The UPS recognizes and draws attention to a number of events occurring during operation. These events are divided into Warning and Fault indications. Whether the message is a warning or fault can be determined from the number which appears in the Warning/Fault Diagnosis page of the display, and the buzzer signals.

8.3.1. Buzzer

The buzzer has two different patterns, which indicate the type of warning active.

- **Pattern 1: long intervals** - This event is less serious. It is not essential that the cause be rectified immediately, unless otherwise specified in the "Warning indicators" table.
- **Pattern 2: short intervals** - This is a serious event. The cause should be rectified immediately to avoid a fault condition.

The buzzer is silenced automatically as soon as the cause of the event is rectified. It can also be silenced manually by pressing the button TEST/RESET.

8.3.2. Warning indicators

If a warning indication appears, the UPS continues to operate. The yellow LED ALARM illuminates on the control panel. A number between 1 and 31 appears in the display indicating the type of warning.

8.3.2.1. Displayed Warnings

The various possible warning indications are listed in the following table.

Table 8: Warning indicators

Warning indicator- Buzzer pattern	Cause	Corrective steps
1 - 2	Inverter overtemperature	lower temperature (e.g. with ventilation); if necessary, reduce load; ensure ventilation outlets and input filters are unobstructed.
2 - 1	- Bypass line open - Bypass supply failure	
3 - 1	- Input switch open - Input supply failure	
4 - 2	load too high	reduce load
5 - 2	Battery voltage low	
6 - 1	- 90% kW protection - Peak current limitation - Start of kW protection	reduce load
7 - 2	- Res. phase sequence error - Mains phase sequence error	check phase sequence
8 - 1	- Manual bypass switch closed - System bypass switch closed	
9 - 1	Battery operation	
10 - 2	Shutdown imminent *	switch off load immediately
11 - 2	Battery under-voltage **	reduce load
12 - 1	- HW init/Commissioning - Test mode UPS service active - Rectifier HW test	exit operating state after commissioning, initial charging

Table 8: Warning indicators

Warning indicator- Buzzer pattern	Cause	Corrective steps
13 - 1	battery switch open	close battery switch close circuit breaker in battery cabinets
14 - 1	fan lifetime exceeded	replace fan - call customer service
15 - 1	CU-DCB communication lost	call customer service
16	Internal warning 16	
17	DC SW control fault	
18	- Battery recharging - Recharge inhibit	
19	- Batt. temp. sensor fault - Batt. temp. out of range - Batt. user alarm	
20	- Remote inverter stop - Insufficient ventilation - Remote inverter inhibit - I/O conflict - Inlet temp. sensor fault - Inlet temp. out of range - Inlet temp. user alarm - System output switch open - IIC bus error	
23	DCB memory error	
24	- Rectifier not configured - Mains voltage low - Battery SCR over-temperature	
26	- Stop inverter in stand-by - Start inverter in stand-by	
27	Autonomy test	
28	Transfer inhibit	
29	Synchronization fault	
31	- DC voltage high - DC voltage low	
32	Output switch open	
*A power failure will only be indicated when the minimum time has been exceeded. **These messages may also appear if battery data have not been correctly entered. Call customer service.		

Please inform customer service of the indicator number(s) and the illuminated LEDs.

8.3.3. Fault indications

If a fault occurs, the affected UPS component is always switched off, and the UPS automatically switches to the best possible operating mode for supplying the loads; the red FAULT LED illuminates on the control panel. A number between 33 and 84 appears in the Warning/Fault Diagnosis page of the display indicating the type of fault. Fault indicators are also indicated by a continuous tone from the buzzer. If a fault occurs, proceed as follows:

8.3.3.1. Acknowledge horn

First acknowledge the horn by pressing the TEST/RESET button

8.3.3.2. Correct fault

Next correct the fault by following the indications in Table 9 on page 46.
If the fault cannot be corrected:
Call Customer Service: The customer service addresses are given on the last page of this manual.

8.3.3.3. Acknowledge fault

After the fault has been corrected, it must be acknowledged by pressing the TEST/RESET button again.

8.3.3.4. Displayed Faults

The various possible fault indicators are listed in the following table

Table 9: Fault Indications

Fault	Cause	Corrective steps
33	Inverter overtemperature	reduce temperature (e.g. with ventilation); clean or replace filter mats (optional); check load and reduce if necessary; ensure ventilation outlets are unobstructed
34	CU program error	
35	Incorrect power class	
37	Inverter start failed	
39	Inv. DC voltage high	check mains or call customer service (mains voltage too high; voltage peaks in mains; incorrect connection voltage)
40	External quick shutdown	
41	DSP fault	HW defective (CUX) - call customer service
42	Pre-charge fault	HW defective - call customer service
43	Desaturation	
44	overcurrent switch off	check load
46	UPS output out of tolerance	check load or call customer service
47	stop due to overload	check load or call customer service
50	Bypass defect	HW defective (bypass) - call customer service
51	Bypass hardware fault	HW defective (bypass) - call customer service
52	Bypass overload	check load or call customer service
55	CU EEPROM defective	HW defective (EEPROM) - call customer service
57	CU EPROM checksum fault	HW defective (EPROM) - call customer service
58	Inv. temp./res. sensor fault	
59	Optional module	HW defective - call customer service
60	Parallel bypass fault	
61	POB fault	call customer service
62	Output insulation fault	

Table 9: Fault Indications

Fault	Cause	Corrective steps
69	DCB memory error	
70	Rectifier overtemperature	
71	Harmonic input filter	
72	Input insulation fault	
79	Mains sensor fault	
80	DC HW control fault	
81	DC feedback fault	
82	DC SW control fault block	
83	Battery Fault	Battery Test Failed - call customer service
84	Battery SCR fault	Battery Test Failed - call customer service

Please inform customer service of the indicator number(s) and the illuminated LEDs. Fault indicators not listed in the table can only be corrected by customer service.

8.4. Troubleshooting

8.4.1. Rectification of Errors

If, in spite of the high reliability of this device, problems should occur, please check the following points before contacting the responsible customer service representative:
Is the mains voltage present at the UPS input?
Is the input fuse defective or have circuit breakers tripped?
If you contact the responsible customer service representative, please have the following information ready:

- Device information = model, order no., series no. as per nameplate, and serial number of the UPS.
- An exact description of the problem (what loads are being operated, does the problem occur regularly or sporadically etc.)

Problem	Possible cause	Action
No display No alarm (UPS switched off)	Main switch switched off	Switch on main switch
	No mains voltage present	Have mains inspected by qualified electrician
	Input fuse defective or input circuit breaker tripped	Replace with fuse of same type or reset circuit breaker. If the problem persists, contact the responsible customer service representative.
Green “OK” LED does not illuminate, buzzer sounds at intervals	No mains voltage present	UPS operation
Green “OK” LED does not illuminate when mains voltage present, buzzer sounds at intervals	Input fuse defective or input circuit breaker tripped	Replace with fuse of same type or reset circuit breaker. If the problem persists, contact the responsible customer service representative.
ALARM indicator illuminates, buzzer sounds continuously	UPS error	Contact the appropriate customer service representative
	Overheating	Reduce ambient temperature Clean input air filters
Backup time less than that specified	The fuse switch of the battery extension(s) is in "OPEN" position.	Move the fuse switch to the "ON" position.
	Batteries are not completely charged	Charge batteries, and test backup time. If the problem persists, contact the appropriate customer service rep.
	Batteries are defective	Contact customer service
	Charging device is defective	Contact customer service
No communication between UPS and PC	Wrong serial connection cable	Check whether the correct cable has been used (standard modem/null modem cables are not permissible)
	Interface on the PC is being used by another process or is defective.	Check whether other software/service is accessing the interface on the PC; try selecting a different serial interface.
	Interference on the data cable	Lay cable differently.

8.5. Inverter STOP/START procedures

In the course of operating the UPS, it may become necessary to switch off the Inverter, this is done by pressing the Inverter Stop button (see Fig. 23 on page 41) and observing the following procedures:

8.5.1. Single UPS - Bypass normal

In this condition, press, and hold, the Inverter Stop button for five seconds. If the button is released during this period the operation of the UPS is not affected and the Inverter remains on. After five seconds, the Inverter is switched off, the load is supplied by the Bypass and the Inverter Stop button can be released.

8.5.2. Parallel UPS - Start inverter

To switch ON the Inverters of the UPS in a parallel system, press and hold the Inverter Start button on each UPS control panel, one by one, for five seconds. To verify that the Inverter is being started press button # 1, see Fig. 23 and check the List of Warning #W26i2, also see the Table 8 on page 44.

Once the last Inverter Start button has been pressed, all the Inverters in the system switch ON and the Load is supplied from the Inverters.

Until all the Inverters have switched ON the "Inverter start pending" command may be reset on any, or all, of the UPS by pressing and holding the Inverter Stop button on the control panel for a minimum of five seconds.

8.5.3. Parallel UPS - Normal operation - Stop Inverter

To switch off the UPS in a parallel system, press and hold the Inverter Stop button on each UPS control panel, one by one, for five seconds. To verify that the Inverter is being stopped, press button #1, see Fig. 23 and check the List of Warning #W26i1, also see the Table 8 on page 44.

Once the last Inverter Stop button has been pressed for five seconds, all the Inverters in the system switch OFF and the Load is transferred to the Bypass supply.

Until all the Inverters have switched OFF, the "Inverter stop pending" command may be reset on any, or all, of the UPS by pressing and holding the Inverter Start button on the control panel for a minimum of five seconds.

8.6. Guided Procedures

For the following procedures, assume that the UPS is in one of the operating modes listed below:

- Switched off: all input power switches are open (OFF). The load is not supplied.
- Maintenance bypass operation: the UPS is switched off, but the load is connected via the service bypass switch supply line from the unprotected mains.
- Normal operation: all relevant mains and power switches are connected. The load is supplied by the UPS.

NOTICE

Refer to section 8.1. on page 41.

NOTICE

The acoustic alarm may be activated at various times in this procedure. It can be switched off by pressing the "Test/Reset" pushbutton.

NOTICE

Warning messages may appear briefly on the display. However, these may be disregarded.

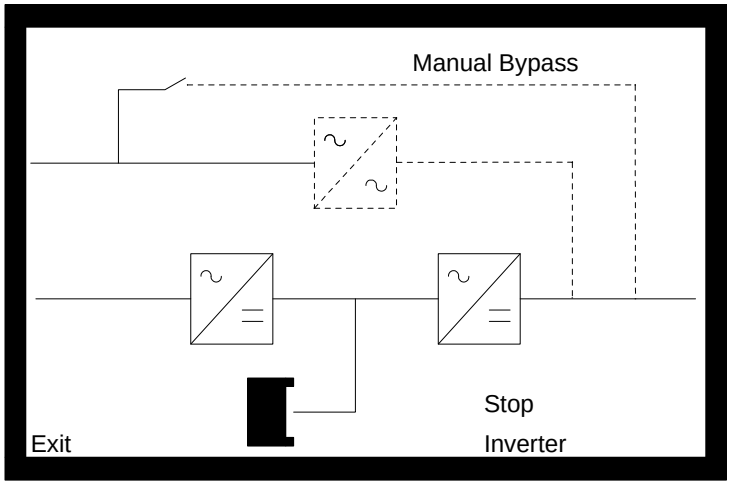
To access the guided procedures select "Guided Procedures" from the display Main Menu (see Table 7 on page 43). The procedures available for the current UPS configuration are displayed. The following table lists the various procedures that can be carried out for each configuration:

Table 10: UPS guided procedures

Single and modular parallel UPS
Manual Bypass
Return from Bypass
Start Up
Shutdown

8.6.1. Sample guided procedure - Manual Bypass

When the desired procedure has been selected from the Guided Procedures menu (in this case the Single UPS Manual Bypass procedure), the following window appears in the display, illustrating the principle UPS components and their current status:



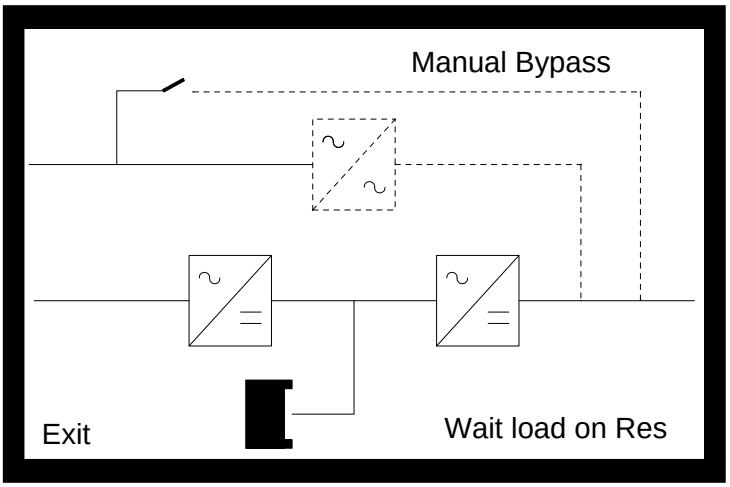
The various UPS switches are also represented - the Service Bypass switch, S3, is shown in the open (OFF) position in the above example - these show the current status of the switches, and flash to indicate the user must open, or close, the corresponding switch.

In the event of a fault, a warning message is displayed (see "Warning messages" on page 54 for full list of warning messages), exit the procedure, correct the fault condition and reset before proceeding. Pressing the button identified by the "Exit" message at any moment interrupts the procedure.

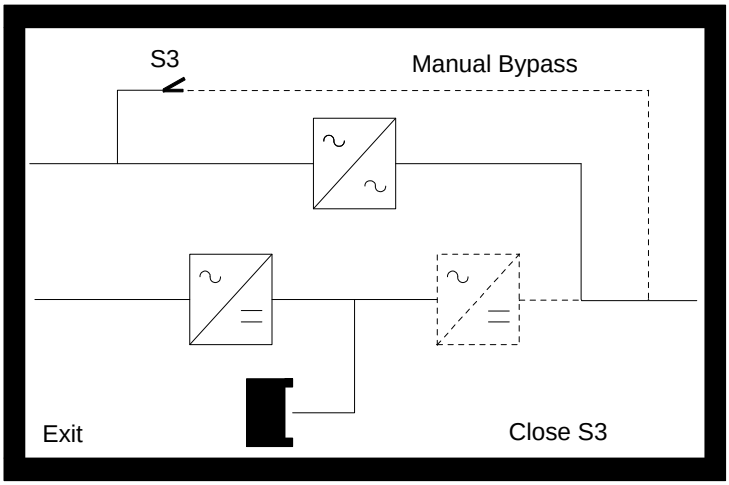
In this case, the message "Stop Inverter" appears in the bottom right of the display, and the Stop symbol flashes over the Inverter, indicating that the user must stop the Inverter by pressing the corresponding button on the "Control Panel" on page 41. (See "Instruction messages" on page 54 for full list of instruction messages).

PROCEDURE:

(1) Press the Stop Inverter button for at least 2 seconds.
(2) The messge "Wait load on Res." is displayed, indicating that the system is waiting for the load to be transferred to the bypass supply.

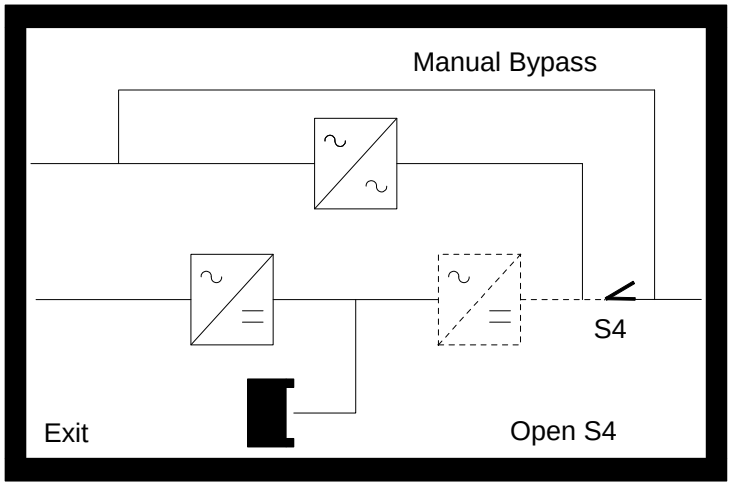


(3) The message "Close S3" is displayed, and the symbol representing S3 on the display begins to flash.

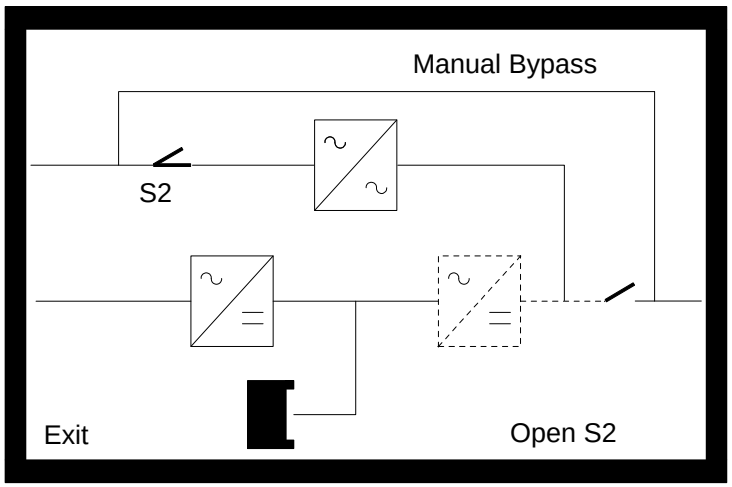


Close S3 (Maintenance Bypass switch)

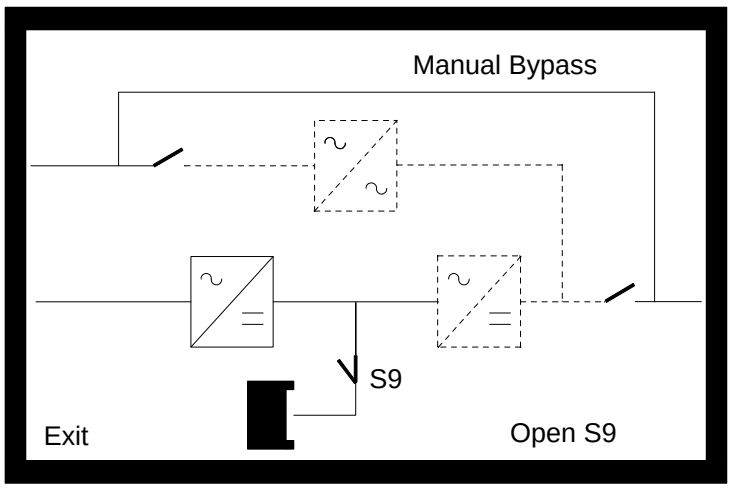
(4) The message “Open S4” is displayed, and the symbol representing S4 on the display begins to flash.



Open S4 (Output switch).
(5) The message “Open S2” is displayed, and the symbol representing S2 on the display begins to flash.

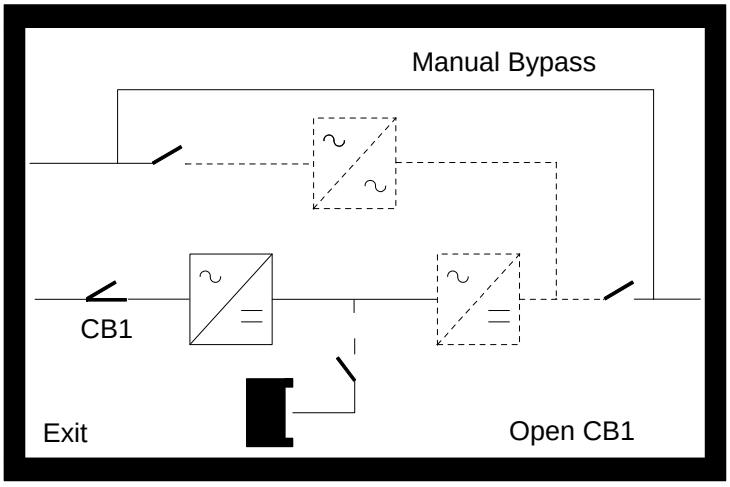


Open S2 (Bypass switch)
(6) The message “Open S9” is displayed, and the symbol representing S9 on the display begins to flash.

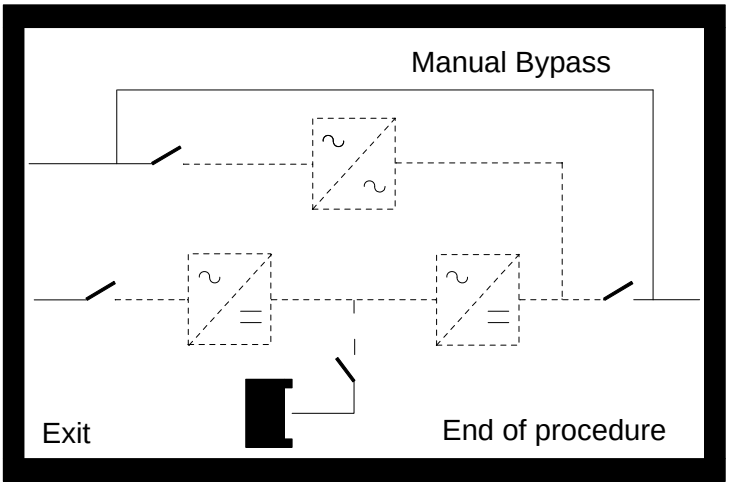


Open S9 (Battery switch)

(7) The message "Open CB1" is displayed, and the symbol representing CB1 on the display begins to flash.



Open CB1 (Input switch).
(8) The message "End of procedure" is displayed.



8.6.1.1. Instruction messages

Stop Inverter	Open CB1	Close CB1
Start Inverter	Open S2	Close S2
Press Exit	Open S3	Close S3
Reset Fault	Open S4	Close S4
	Open S9	Close S9

8.6.1.2. Warning messages

Procedure not OK
Wait Vdc in range
Waiting Bypass ON
Wait Load on Bypass
Wait Load on Invert.

8.7. Parallel operation

Switching to ONLINE operation:

- Switch ON the Inverters of all the UPS, one after the other, by pressing and holding the control panel Inverter Start button for 5 seconds.

Once they are all switched ON, the inverters of the UPS units synchronize and take over the load. The UPS is now in ONLINE operation.

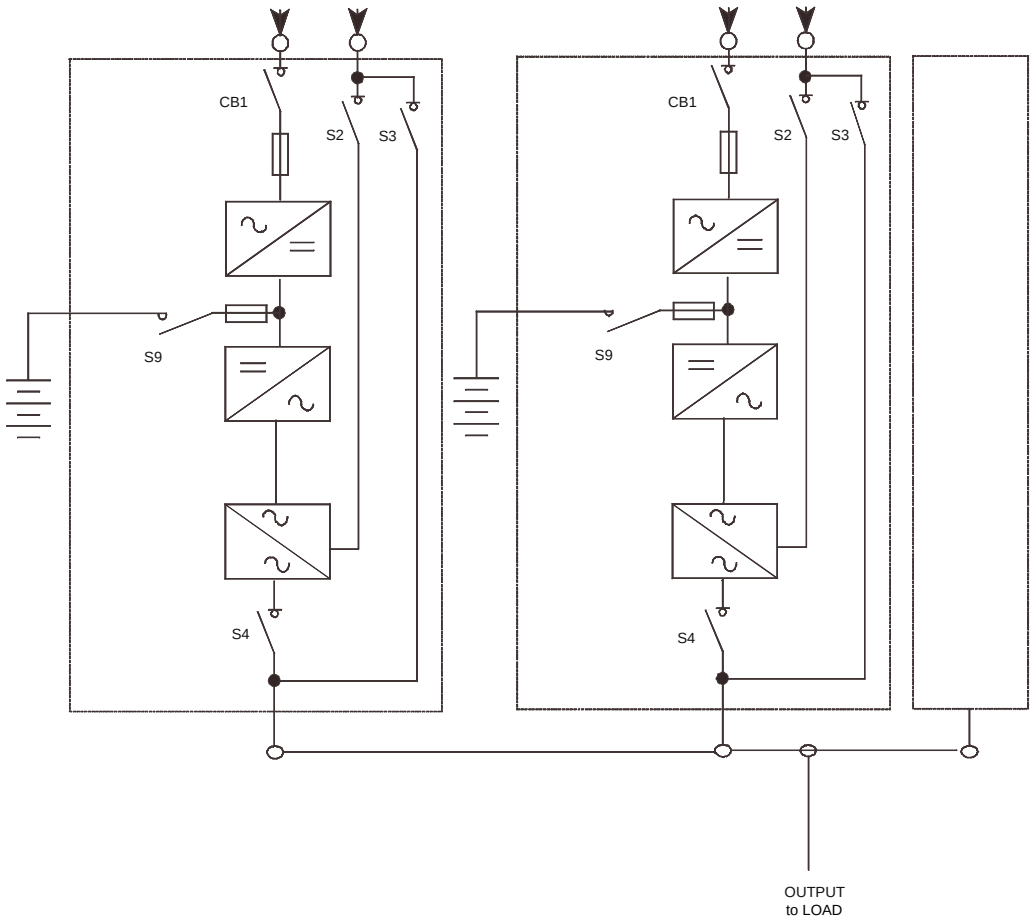
Switching from ONLINE to BYPASS operation:

- Switch OFF the Inverters of all the UPS, one after the other, by pressing and holding the control panel Inverter Stop button for 5 seconds (see section 8.5.2. on page 49).

Once they are all switched to OFF, all inverters switch off and all bypasses switch on.

8.7.1. System configuration

Figure 24 - Connections for modular parallel system



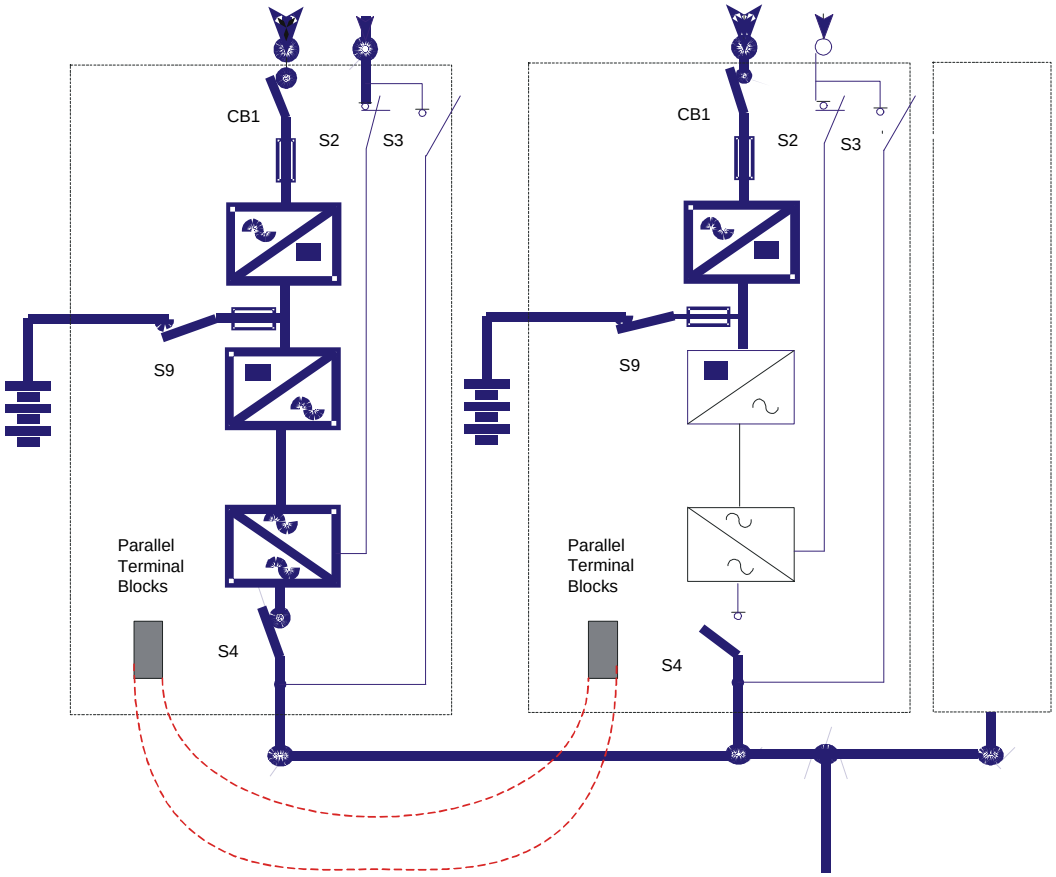
8.8. Procedure for disconnecting an individual UPS from a parallel system

The procedure for disconnecting an uninterruptible power supply from the configuration (for maintenance purposes, for example) is described below. In this example UPS No. B is decoupled, leaving No. A to supply the load.
NOTE: This procedure is valid for redundant parallel systems consisting of 2 UPS only; for more information contact CHLORIDE Technical Support.

Step 1:

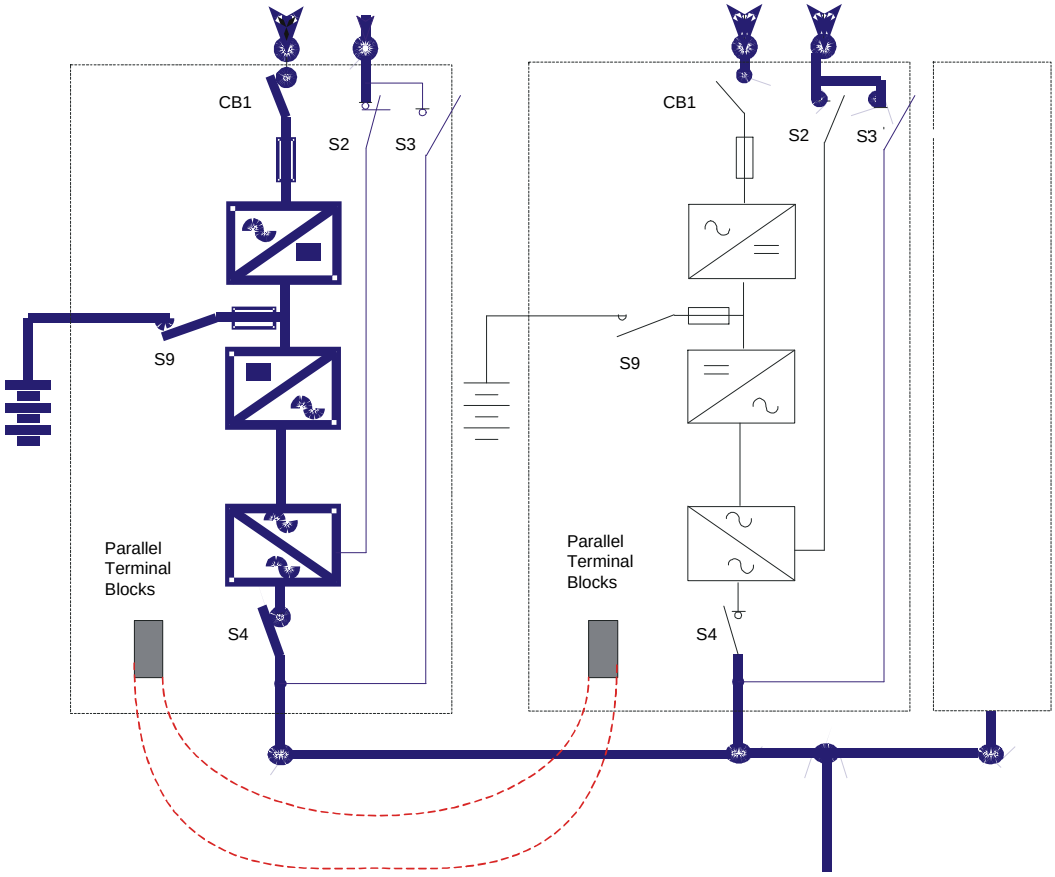
- Open output switch **S4 of UPS B**

The message "**OUTPUT SWITCH OPEN**" is displayed
.



Step 2:

- Open UPS B bypass switch **S2**
- Open UPS B battery isolating switch **S9**
- Open UPS B Input switch **CB1**



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9. PARALLEL OPTION

9.1. Parallel signal connections

Up to 8 UPS of the same rating can be operated in parallel in order to provide either increased power capacity, or additional load security (Redundancy) if equipped with the parallel kit.
A multiple-block system is automatically regulated via the controllers of the individual UPS blocks. The available electronic bypasses of the individual blocks work together, as do the corresponding inverters, to divide the load current between them. All necessary communication for parallel operation is carried out via a shielded 25 conductor cable.
When planning the system and during installation, power cables of similar length must be used between the input distribution and the input terminals to the bypass and rectifier (U(A), V(B), W(C), and U1(A1), V1(B1), W1(C1), N), as well as from the UPS outputs (U2(A2), V2(B2), W2(C2), N) to the parallel connection point on the load side. Length differences of 20 % are allowed for power cable lengths up to 20 m. For longer distances, cable lengths may not vary more than 10 %.

9.1.1. Commissioning

Commissioning of multiple-block systems must be carried out by appropriately trained technicians.

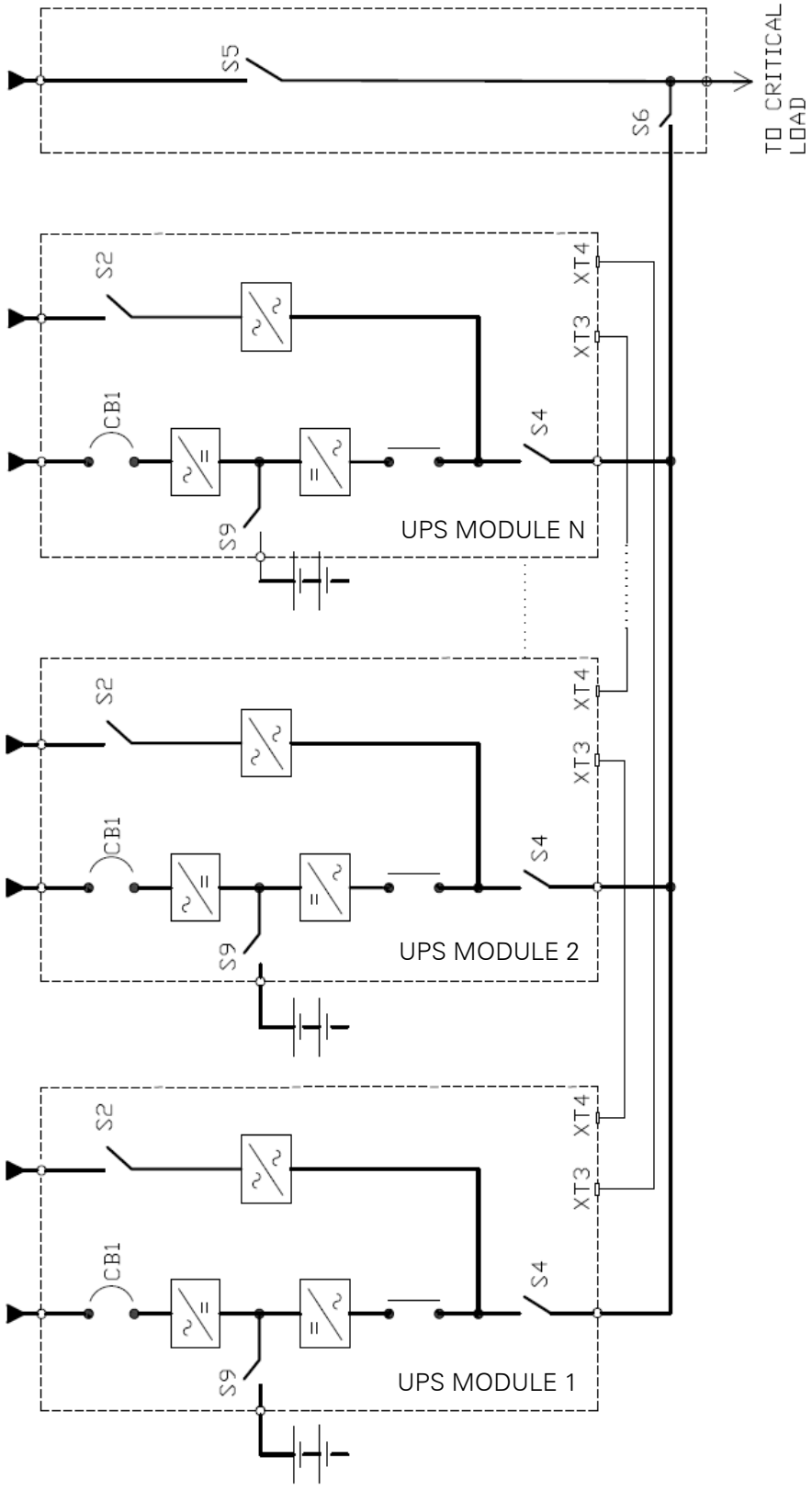
9.1.1.1. Communication between the UPS blocks

UPS units exchange information between each other via the 25 conductor cable. The loop circuit is monitored electronically. The communication cables are shielded and must be routed separately and at a distance from all power cables.

The parallel option can also be added at a later time and is, therefore, available as an accessory.

9.1.2. Distributed parallel system electrical connections

Figure 25 - Distributed parallel system with external maintenace bypass switch



10. I/O FUNCTIONS

The UPS in the 90-NET series are equipped with a program capable of managing a certain number of factory-installed input/output functions, which allow the User to adapt the UPS to his own needs, taking advantage of the input or output contacts available on the UPS terminal board. For some of these a message is displayed on the LCD. The following is a description of each function together with the number of Input/Outputs used. A series of Input and Output functions can also configured at the interfaces X7 and X8, using PPVis (see section 11. on page 65).

NOTICE

Each function is identified by a letter (A, B etc.) This is necessary since the functions are identified by these letters on the UPS Display.

10.1. List of Individual functions for single and modular parallel UPS

	Function name	Description	Inputs used	Outputs used
A	**Common vented (wet) batteries.**	The controls for battery tests or rapid charging are transmitted or received through three input and three output contacts for UPS that have batteries in common.	2	2
B	**Common VRLA (sealed) batteries.**	The controls for battery tests are transmitted and received through two input and two output contacts for UPS that have batteries in common.	1	1
C	**Harmonic Filter Open (factory fitted)**	This function provides the "HARMONIC FILTER OPEN" alarm message at the rectifier stage.	1	0
E	**Fan (ON-OFF) in battery compartment**	A contact is activated to control a fan in the battery compartment, which operates as follows: 1) Switches on when a set temperature threshold is exceeded (default 40°C) and remains on for a set minimum time (default 1 hour). 2) For batteries with rapid charging function, the contact is activated during this process and will be kept on for an adjustable additional minimum time (default 1 hour).	0	1
F	**Battery fuse monitor**	When the input is active, the message "BATTERY FUSE BLOWN" will appear on the battery alarm page.	1	0
G	**Battery compartment overheated**	A contact is activated when a temperature threshold set by the customer is exceeded. The default setting is 40°C.	0	1
H	**Battery temperature outside tolerance**	A contact is activated when the temperature is outside normal operating limits (0°-40°C)	0	1
I	**Battery earth fault output**	When this alarm is activated, with rectifier off or a UPS included in an isolated system, "INSULATION FAILURE" appears on the battery alarm page and an output contact is activated.	1	1
J	**EPO Input (factory fitted)**	When this alarm is activated the rectifier and inverter are switched off and both bypass and inverter static switches are OPEN – the message "EPO ACTIVE" is displayed in any page. In this condition the load is no longer supplied and the UPS control boards are supplied by the battery.	1	0
K	**EPO Output**	This function copies the EPO Input status onto an output, which can than be used to open an circuit breaker downstream of the UPS to isolate the load.	0	1
L	**Input earth fault**	When this input is activated the message "INSULATION FAILURE" appears on the rectifier alarm page.	1	0
M	**UPS service active**	Detects when the UPS front panel is open. When this input is activated, the message " UPS SERVICE ACTIVE" also appears on the system alarm page.	1	0
O	**Output earth fault**	When this input is activated the message "INSULATION FAILURE" appears on the load alarm page.	1	0

	Function name	Description	Inputs used	Outputs used
P	**Bypass input transformer protection**	When this input is activated the message "RES. TRANSF. PROTECT" appears on the bypass alarm page.	1	0
Q	**Primary input transformer protection**	When this input is activated the message "MAINS TRANSF. PROTECT" appears on the rectifier alarm page.	1	0
S	**Insufficient Ventilation**	When this input is activated the message "INSUFF. VENTILATION" appears on the system alarm page.	1	0
T	**Load on Bypass**	Active when the load is supplied from the Bypass	0	1
V	**Extern Synchronization system fault**	An output contact is activated when an external synchronization system fault is present. The message "SYNCHRONIZAT. FAULT" is displayed on the system alarm page.	0	1
X	**Backfeed Protection**	When this input is activated, the message "BACKFEED PROTECTION ACTIVE" appears on the bypass alarm page.	1	1
Y	**External Battery**	This input controls the external battery breaker when the external battery option is installed. The external breaker modifies the overall battery breaker status in the internal logic.	1	0
Z	**Hydrogen present**	When this alarm is active the battery charger is inhibited and the message "BATT. CHARGE INHIBIT" is displayed in the battery alarm page.	1	0
AA	**Inverter Overload**	This output is active with inverter running, each time the load exceeds the overload threshold defined by the inlet air temperature	0	1
AB	**Load on Inverter**	This output is active when the load is on the conditioned line	0	1
AC	**Inverter synchronized**	This output is active when the inverter is synchronized with the bypass line and there is no delay when switching to the direct line	0	1
AD	**Rectifier running**	This output is active when the rectifier is on (*charger on input* high from the rectifier controller board)	0	1
AE	**Summary alarm**	This output is active when there is an active alarm in the system (WARNING or FAULT)	0	1
AF	**Shutdown imminent**	This output is active when thre is an imminent shutdown warning active on the CU4 (WARNING 10)	0	1
AG	**Battery charging**	This output is activewhen the battery charging current is greater than the parameter **PNU 626-i03** for more than 10s.	0	1
AH	**Recifier fault**	This output is active each time there is a fault on the rectifier	0	1
AI	**Inverter fault**	This output is active each time there is a fault on the inverter	0	1
AJ	**Inverter over-temperatre**	This output is active when the inverter overtemperature threshold is reached (CU FAULT 33)	0	1
AK	**Battery discharging**	This output is active when the battery is not charging and its voltage falls below the parameter **PNU 625-i06**	0	1
AL	**Battery fault**	This output is active when there is a battery fault active	0	1
AM	**Mains failure**	This output is active each time a primary supply fault occurs	0	1
AN	**Service bypass**	This output is active when the service or system bypass switches are closed	0	1
AO	**Inverter off**	This output is active when the inverter is off. "*Inverter off*" is a specific state, and does not include Inverter fault: when there is an inverter fault, the inverter is switched off, but the indicated state is "*Inverter fault*" and not "*Inverter off*"	0	1
AP	**Batt. disconnected**	This output is active when the battery switch is open	0	1
AQ	**Bypass fault**	This output is active when there is a fault on the bypass line	0	1
AR	**Generic input/output**	This output is active when the input is active	1	1

10.2. Electrical specifications of input/output signals

The output terminals are voltage-free; max. rating:
- 4 A/250 V AC,
- 4 A/30 V DC

Contact resistance = 100 mohm.

The Input terminals need simply to be connected to voltage-free contacts.

If the input comes from a relay, the minimum contact current of the latter must be 15 mAmp.

10.3. Table of functions

Below is a table of the functions activated on the individual or parallel UPS.
These tables are given when necessary in the inspection report that accompanies each UPS.
The options must be activated in sequence (i.e., if the options to be activated are G-C-I, activate option C, then option G, and finally option I).
The user inputs and user outputs are assigned to the terminal board using the first free terminal on the left-hand side of the table.
The INPUT polarities must be assigned keeping in mind the type of contact available to the customer and how it is recognized by the UPS software.

The following table illustrates how to set the polarity of an Input:

INPUT STATE	POLARITY	Software CONDITION	Type of CONTACT
CLOSED	POSITIVE	OFF	Normally Closed (NC)
OPEN	POSITIVE	ON	Normally Closed (NC)
CLOSED	NEGATIVE	ON	Normally Open (NO)
OPEN	NEGATIVE	OFF	Normally Open (NO)

The OUTPUT polarities must be assigned keeping in mind what condition it is given by the UPS software and what type of SECURITY the customer desires.

The following table illustrates how to set the polarity of an Input:

Software CONDITION	POLARITY	RELAY STATE	SAFETY TYPE
ON (Alarm active)	POSITIVE	ON	NEGATIVE
OFF (No alarm)	POSITIVE	OFF	
ON (Alarm active)	NEGATIVE	OFF	POSITIVE
OFF (No alarm)	NEGATIVE	ON	

10.3.1. Table of functions activated on individual or parallel UPS

I/O FUNCTIONS (XT1)	USER OUTPUTS 1 (3 4)	USER OUTPUTS 1 (5)	USER OUTPUTS 2 (6 7)	USER OUTPUTS 2 (8)	USER OUTPUTS 3 (30 31)	USER OUTPUTS 3 (32)	USER OUTPUTS 4 (33 34)	USER OUTPUTS 4 (35)
A	N	**P**	**N**	P	N	**P**	N	P
B	N	**P**	N	P	N	P	N	P
C	N	P	N	**P**	N	P	N	P
D	N	P	N	P	N	P	N	P
E	N	P	N	P	N	P	N	P
F	N	P	N	P	N	P	N	P
G	N	P	N	P	N	P	N	P
H	N	P	N	P	N	P	N	P
I	N	P	N	P	N	P	N	P
J	N	P	N	P	N	P	N	P
K	N	P	N	P	N	P	N	P
L	N	P	N	P	N	P	N	P
M	N	P	N	P	N	P	N	P
N	N	P	N	P	N	P	N	P
O	N	P	N	P	N	P	N	P
P	N	P	N	P	N	P	N	P
Q	N	P	N	P	N	P	N	P
R	N	P	N	P	N	P	N	P
S	N	P	N	P	N	P	N	P
T	N	P	N	P	N	P	N	P
U	N	P	N	P	N	P	N	P
V	N	P	N	P	N	P	N	P
W	N	P	N	P	N	P	N	P
X	N	P	N	P	N	P	N	P
Y	N	P	N	P	N	P	N	P
Z	N	P	N	P	N	P	N	P
AA	N	P	N	P	N	P	N	P
→								
AR	N	P	N	P	N	P	N	P

I/O FUNCTIONS (XT1)	USER INPUTS 1 (9)	USER INPUTS 1 (10)	USER INPUTS 2 (13)	USER INPUTS 2 (14)	USER INPUTS 3 (19)	USER INPUTS 3 (20)	USER INPUTS 4 (15)	USER INPUTS 4 (16)	USER INPUTS 5 (17)	USER INPUTS 5 (18)	USER INPUTS 6 (36)	USER INPUTS 6 (37)	USER INPUTS 7 (40)	USER INPUTS 7 (41)	USER INPUTS 8 (38)	USER INPUTS 8 (39)	USER INPUTS 9 (42)	USER INPUTS 9 (43)
A	**N**	P	**N**	P	**N**	P	N	P	N	P	N	P	N	P	N	P	N	P
B	**N**	P	**N**	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
C	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
D	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
E	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
F	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
G	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
H	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
I	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
J	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
K	N	P	N	P	N	P	N	P	N	**P**	N	P	N	P	N	P	N	P
L	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
M	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
N	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
O	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
Q	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
R	N	P	N	P	N	P	N	P	**N**	P	N	P	N	P	N	P	N	P
S	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
T	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
U	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
V	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
W	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
X	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
Y	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
Z	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
AA	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P
→																		
AR	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P

N = Negative Polarity
P = Positive Polarity

NOTICE
The functions on a grey background indicate options with fixed terminal assignment as described previously.

11. INTERFACES

90-NET is equipped with:

- a standard serial interface RS232 COM for data transfer protocol or modem (X6);
- an AS400 contact interface for signal exchange (X7);
- a slot for a SNMP adapter (SMNP as option) (XS3);
- a slot for adapter (e.g. LIFE.net Modem/MUX or MUX boards - See LIFE.net Software and Installation Instructions - 10H52127PAMC) (XS6);
- a Service Interface configured for use with PPVIS (X3);
- Programmable User Input (X8).

These interfaces, which are located on the Connectivity Panel (see below), can be used for:

- Direct communication between UPS and computer
- Integration of the UPS as client into a network with centralized monitoring (SNMP)
- Transfer of operational states to external alarm systems

The necessary communication software packages and interface cables are available as options.

NOTICE

The slots XS6 and XS3 are interconnected with interfaces X6 and X3 respectively, if a modem card is fitted in the slot XS6, the corresponding interface is disabled

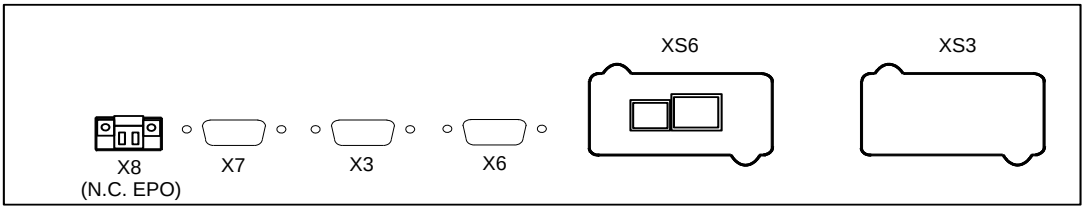


Figure 26 - Connectivity panel

Access the connectivity panel by opening the front panel. For the location of this panel see Fig. 8 on page 18 for 180/225kVA, Fig. 9 on page 19 for 300/500kVA and Fig. 10 on page 20 for 750kVA. For the 750kVA this panel is located in the left (input) cubicle in the middle, right side.

11.1. Standard interface COM - X6

The 9-pole SUB-D male connector (pin contacts) contains the RS 232 signals.

PIN	Signal	Description
2	RxD	Receive RS232 (Rx)
3	TxD	Send RS232 (Tx)
5	Gnd	Signal ground

All interfaces are electrically isolated from all other current circuits.

11.2. Computer Relay Interface - X7

The UPS is equipped with a "D"-type female 9-pole connector comprising potential-free contacts and conforming to the requirements of IBM AS/400 and other computing systems. The contacts are designated NC (Normally Closed) and NO (Normally Open), the table below indicates the state assumed by the contacts when the corresponding condition occurs:

PIN	Signal	Description
1	BYPASS ACTIVE (NC)	Bypass mode: contact between pins 1 and 5 is open
2	LOW BATTERY (NC)	Immediately prior to end of discharge (in battery mode): contact between pins 2 and 5 is open
3	SUMMARY ALARM (NC)	UPS fault, contact between pins 3 and 5 is open
4	AC FAIL (NC)	Mains failure: contact between pins 4 and 5 is open
5	SWITCH COM	Common connection for all floating connections
6	BYPASS ACTIVE (NO)	Bypass mode: contact between pins 6 and 5 is closed
7	LOW BATTERY (NO)	Immediately prior to end of discharge (in battery mode): contact between pins 7 and 5 is closed
8	SUMMARY ALARM (NO)	UPS fault, contact between pins 8 and 5 is closed
9	AC FAIL (NO)	Mains failure: contact between pins 9 and 5 is closed

The nominal rating of the potential-free contacts is 24V, 1A.

11.3. Alternate Interface COM - X3

The 9-pole SUB-D female connector (pin contacts) contains the RS 232 signals.

PIN	Signal	Description
2	RxD	Receive RS232 (Rx)
3	TxD	Send RS232 (Tx)
5	Gnd	Signal ground

All interfaces are electrically isolated from all other current circuits.

NOTICE

The interface cables must be shielded and located away from the power cables (min. 20 cm). The shield must be connected at both ends. Control and power cables must cross at a 90° angle.

12. STANDARD EQUIPMENT

12.1. Battery parameter setting

To adjust the UPS for a specific battery, the following battery parameters can be set:

- use of a temperature probe
- final charging voltage
- charging voltage temperature compensation
- various capacity values
- maximum charging current

The adjustment will be carried out onsite or, if desired, before shipping.

13. MAINTENANCE

13.1. Maintenance intervals

Although there is no need to substitute UPS internal components regularly as a preventative measure at any point during its design life, depending on environmental conditions, specific components, more subject to aging (e.g. electrolytic capacitors, backup batteries, fans etc.), may require replacement on an occasional basis. Therefore, CHLORIDE recommends that regular maintenance checks be carried out on site by an authorized customer service. For further information please contact CHLORIDE technical service dept.
The UPS indicates when the end of a fan's lifetime has expired (see Table 9 on page 46). A replacement fan is recommended.

13.2. Disposal of batteries

When the useful lifetime of the batteries has expired, they must be replaced by an authorized CHLORIDE service technician. Exhausted batteries are classified as "harmful toxic waste" and as such, must be disposed of in accordance with the applicable regulations. CHLORIDE's authorized service technicians are fully equipped to deal with such batteries in accordance with regulations and with the greatest respect for the environment.
The typical useful lifetime of the battery is 3 to 5 years at 25° C ambient temperature; it is, however, dependent on the frequency and duration of mains failures.

13.3. Decommissioning

13.3.1. Taking out of service

Switch to service bypass

- Switch the UPS to Maintenance Bypass operation (see Table 8 on page 44)

Disconnect batteries

- Open the battery isolator or battery switch if other external batteries are used.
- Before continuing work, measure the voltage at the battery terminals and at the mains input and wait until this has dropped to 0 V or wait at least 5 min. Failure to do this can lead to severe electrical shock and possibly death.

The UPS is now in maintenance bypass operating mode. The only voltage present is at the mains and load terminals. Qualified personnel may now carry out maintenance work while observing the corresponding safety measures.

Disconnect mains

If the loads no longer need power, you may now open the external mains separation device for the UPS.

13.4. Service addresses

Contact CHLORIDE Power Protection for Extended Warranties or recommended maintenance plans.

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APPENDIX 1 MECHANICAL INSTALLATION INFORMATION

Figure 27 - UPS External Dimensions - Front and side views 180-225kVA

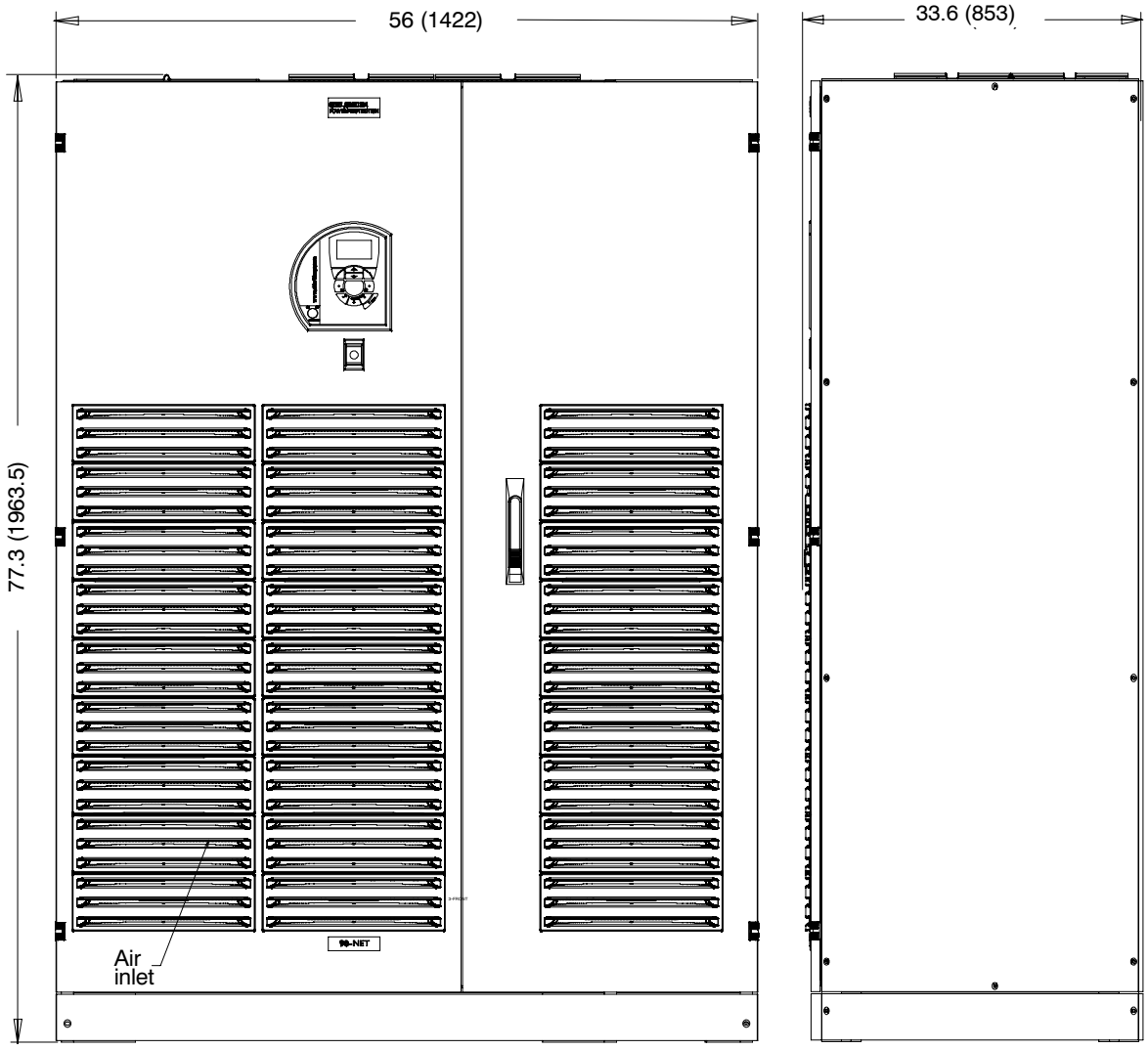
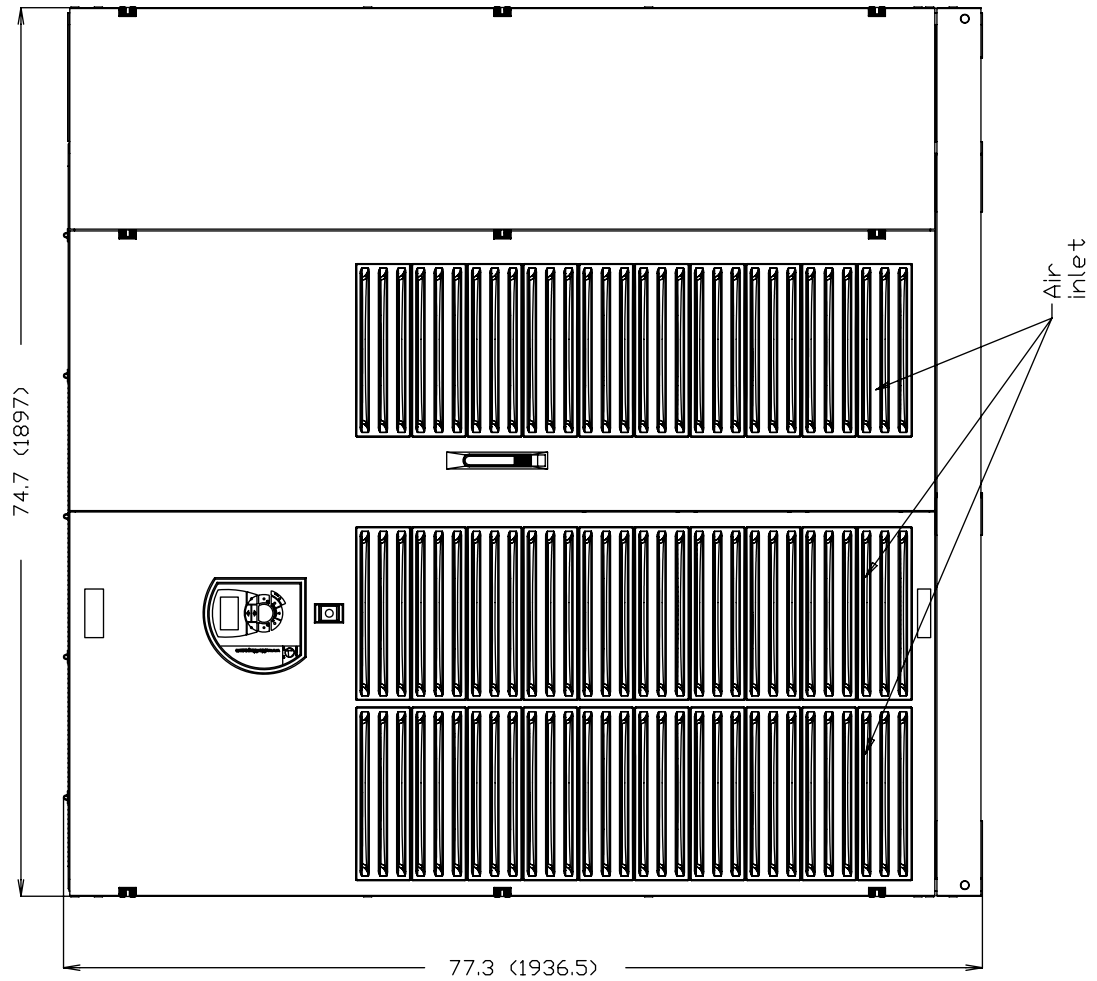


Figure 28 - UPS External Dimensions - Front and side views 300-500kVA



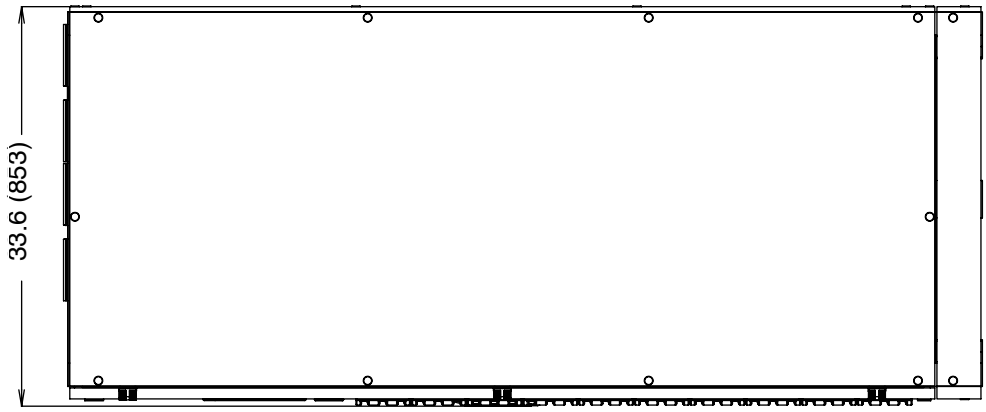


Figure 29 - Input and Output cubicles External Dimensions - Front view 750kVA

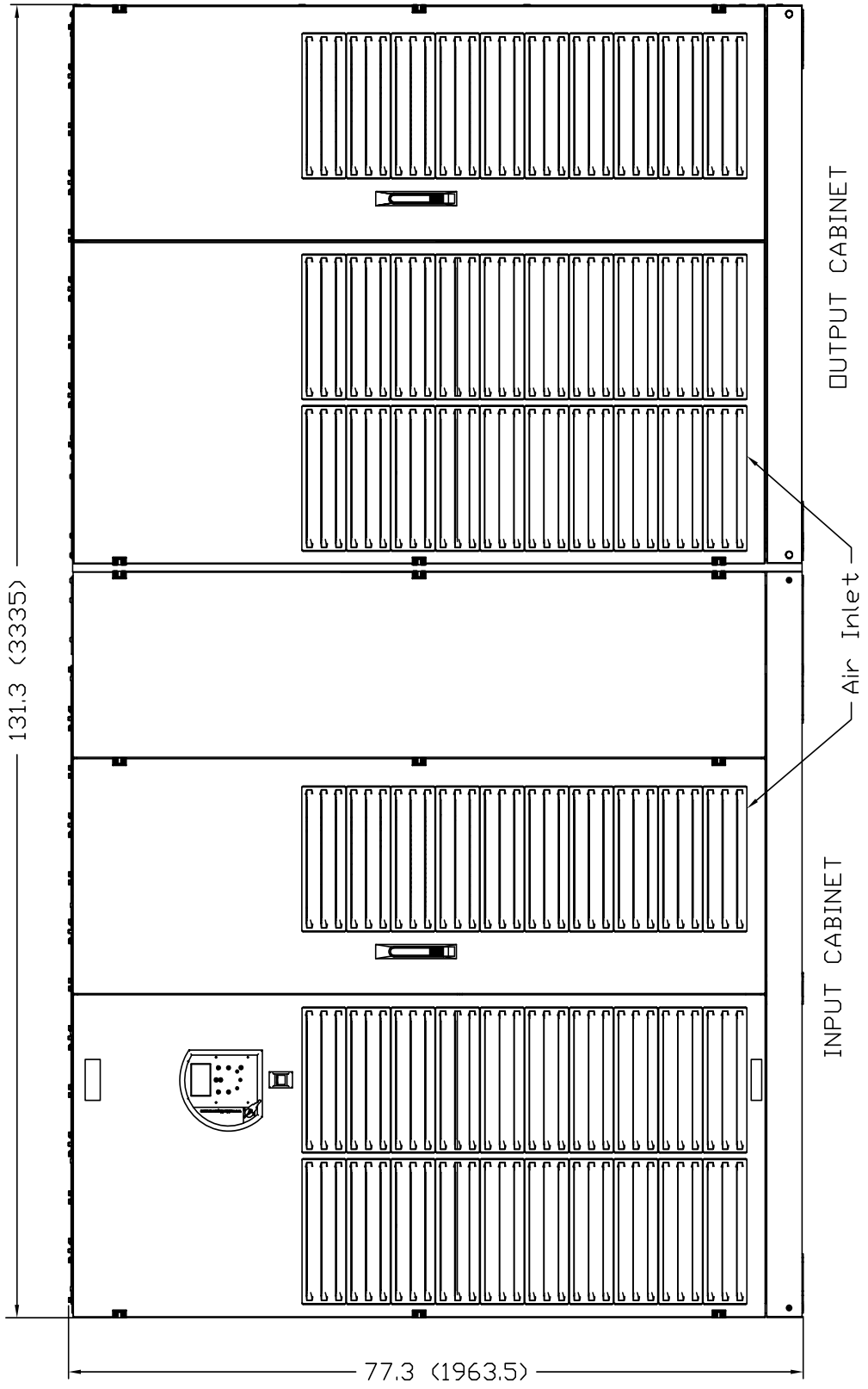


Figure 30 - Input cubicle External Dimensions - Front and side views 750kVA

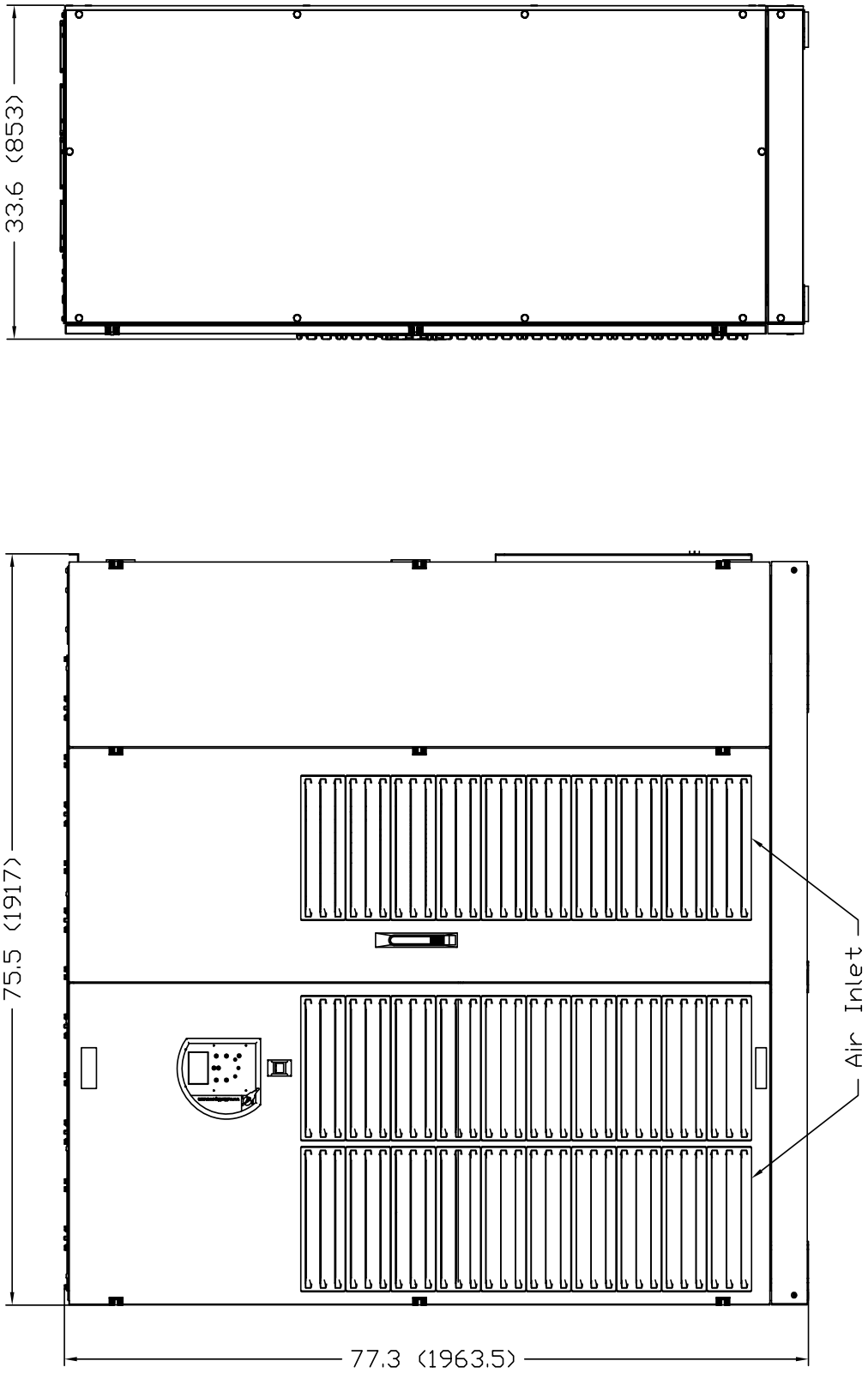


Figure 31 - Output cubicle External Dimensions - Front and side views 750kVA

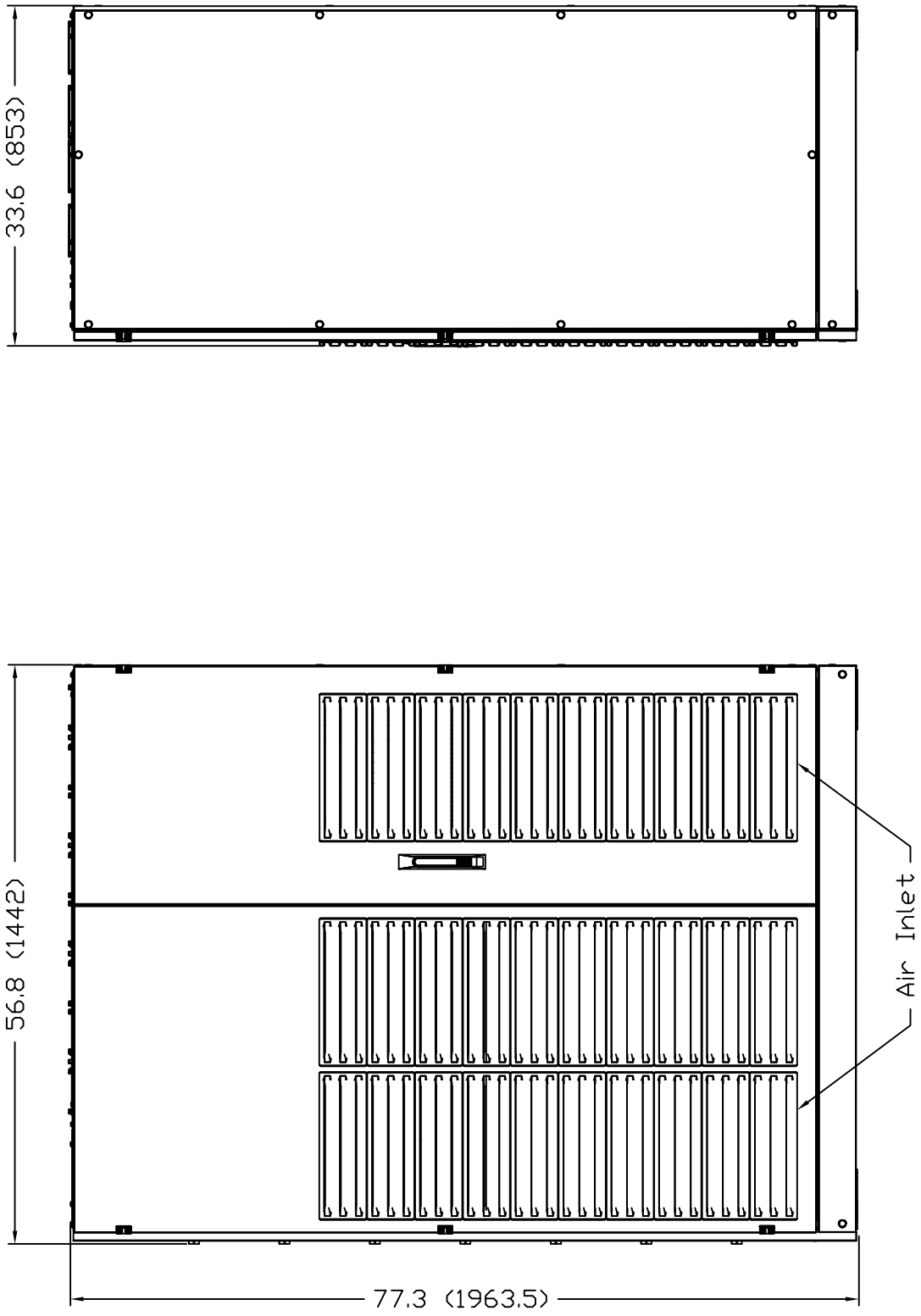


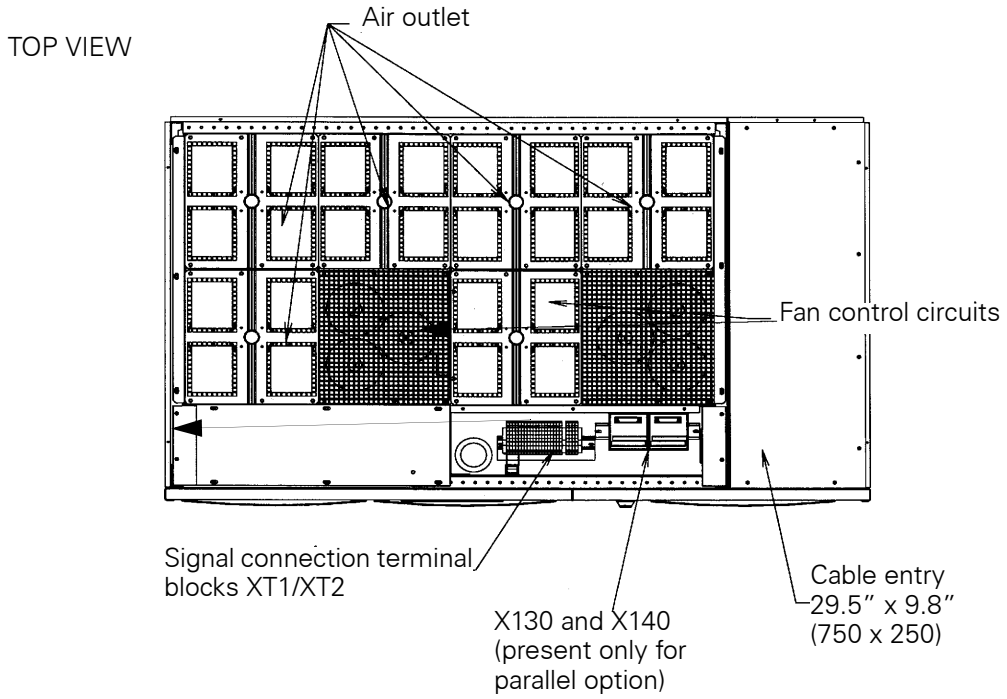
Table 11: UPS Mechanical installation data

Description	U.M.	180 KVA	225 KVA	300 KVA	400 KVA	500 KVA	750KVA input cubicle	750KVA output cubicle
Height	in. (mm)	77.3 (1963.5)						
Width	in. (mm)	56 (1422) 112 (2844) with doors open through 180°		74.7 (1897)			131.3 (3335)	
Depth	in. (mm)	33.6 (854) 63.5 (1612) with front doors open through 90°						
UPS Weight	lb (kg)	2867 (1300)		4515 (2050)		4975 (2257)	5071 (2300)	4300 (1950)
Shipping Weight	lb (kg)	3067 (1391)		4765 (2161)		5225 (2370)	5320 (2413)	4500 (2041)
Floor area	in^2 (m^2)	1881.6 (1.21)		2520 (1.62)			2520 (1.62)	1881.6 (1.21)
Floor loading	lb/in^2 (kg/m^2)	1.523 (1074)		1.792 (1265)		1.974 (1393)	2.0 (1420)	2.28 (1611)
Heat dissipation in Float mode	KBTU/hr (kW)	39.1 (11.45)	48.0 (14.08)	63.1 (18.5)	81.3 (23.8)	101.5 (29.7)	173 (50.8)	
Noise (at 1 meter, as per ISO 3746)	dBA $\pm$ 2 dBA	65		70		72	76	
Protection class	--	IP20 (with doors open)						
Operating Temperature	°F (°C)	32 to 104 (0 to 40)						
Max. average daily temperature	°F (°C)	95 (35) for a period not exceeding 24 hours						
Max. temperature	°F (°C)	104 (40) for a period not exceeding 8 hours						
Max. relative humidity	--	Up to 90% (non condensing)						
Cable entry	--	Top or bottom					Top	
Access	--	Front						
Color	RAL scale	Cubicle - 7035 / Bottom panel - 7035						

NOTE:

- Recommended minimum clearance above the UPS module is 305 mm (12 in)
- Do not tilt cabinets by more than $\pm$ 10° during handling.

Figure 32 - Top panel and footprint 180-225kVA



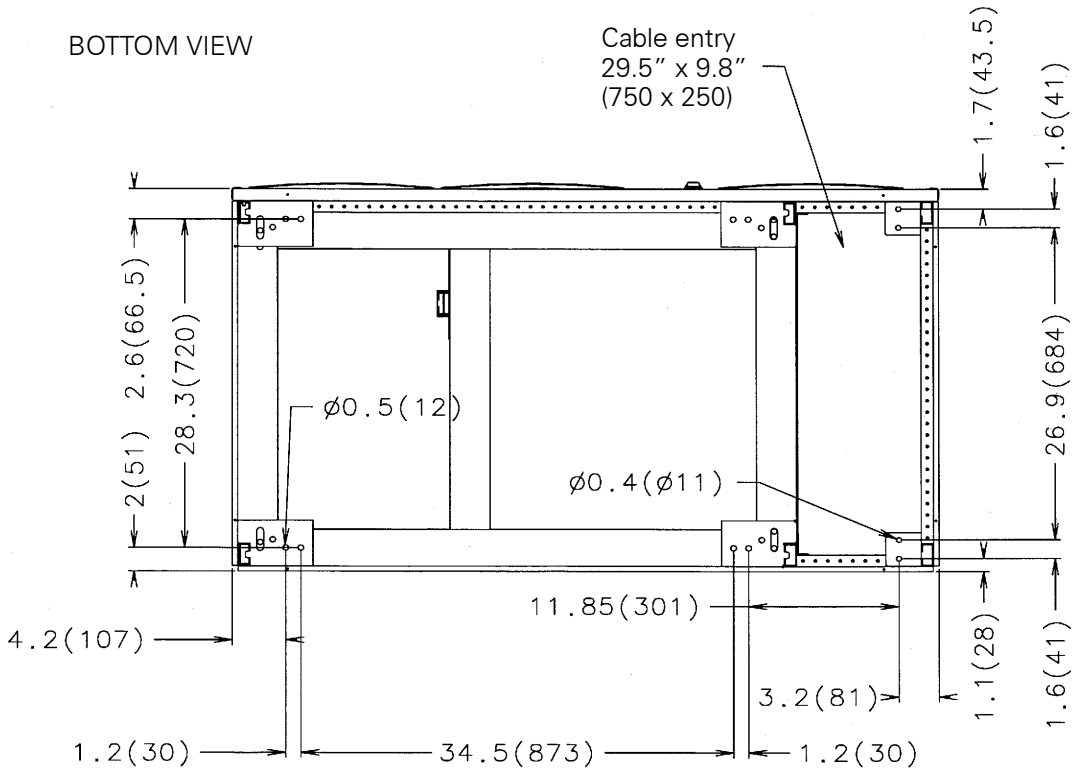


Figure 33 - Top panel and footprint 300-500kVA

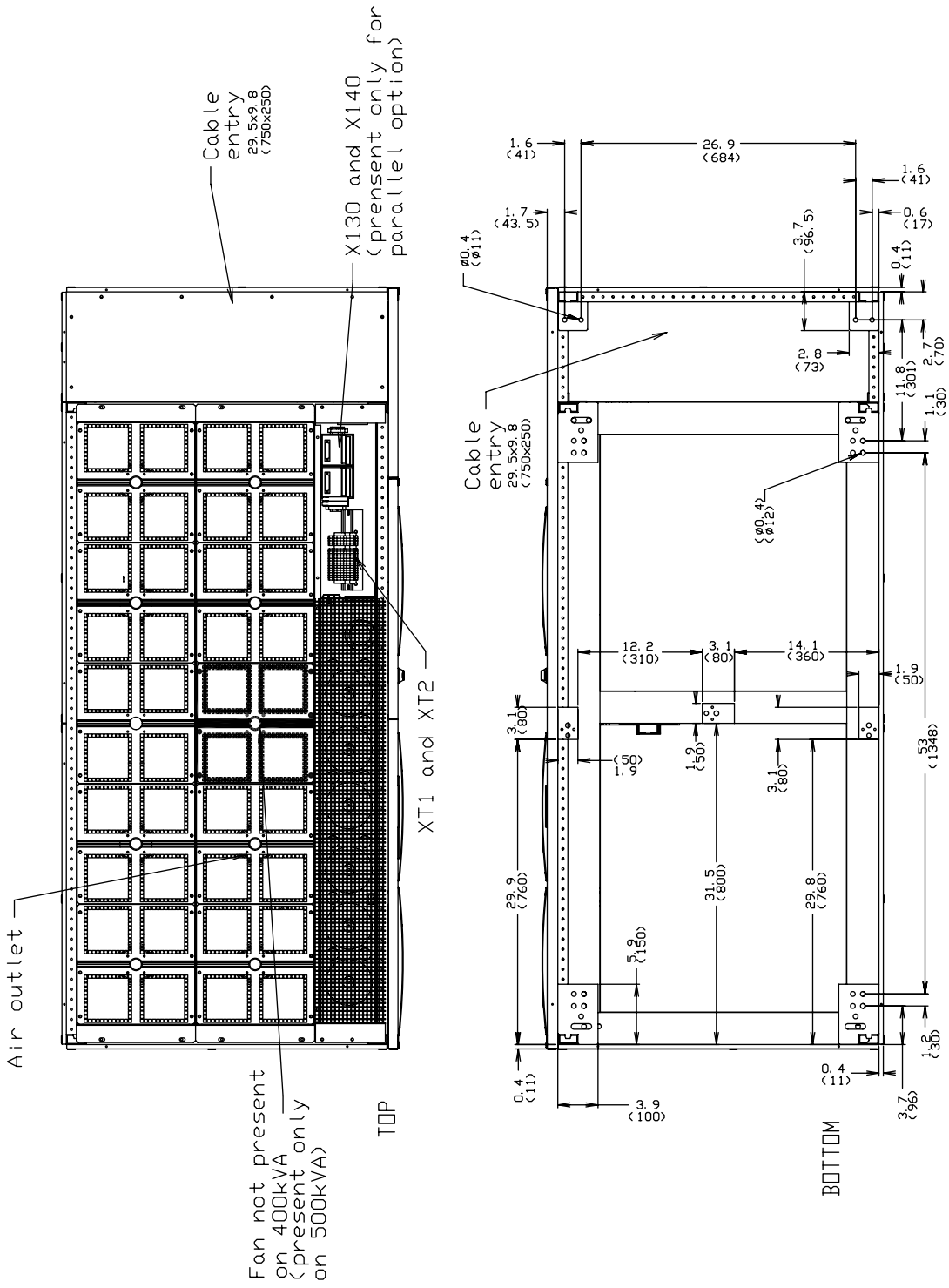


Figure 34 - Input cubicle top and bottom view 750kVA

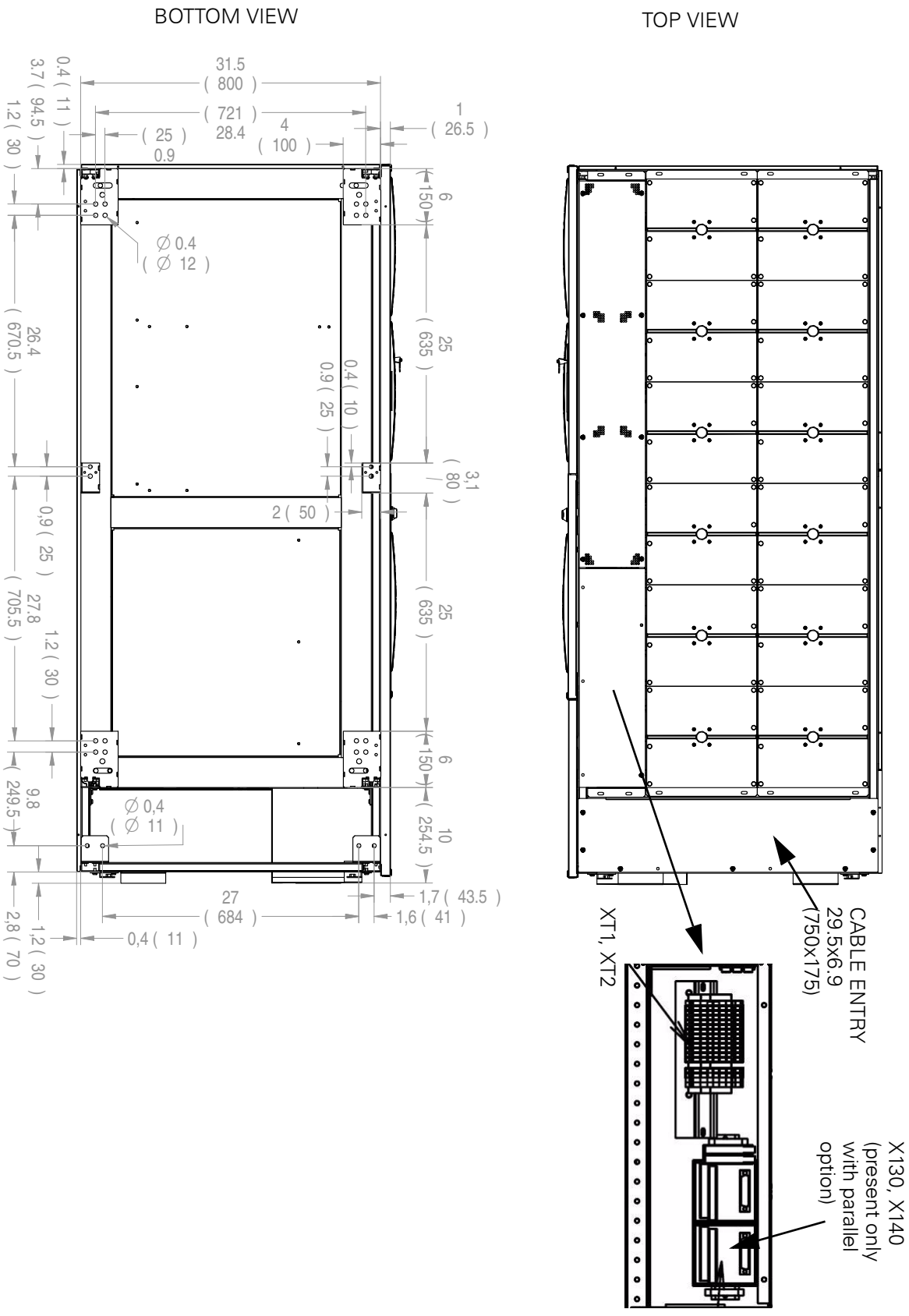
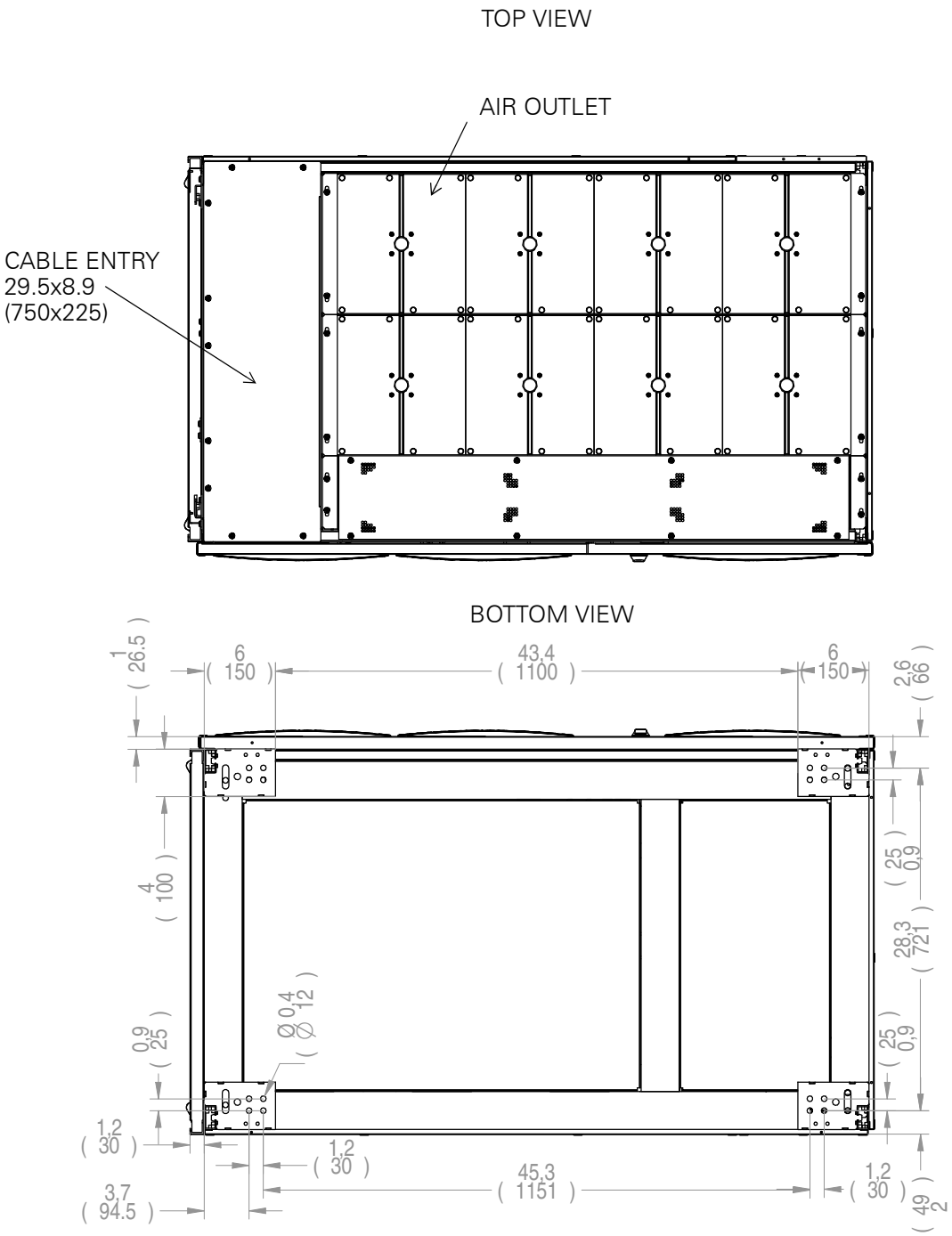


Figure 35 - Output cubicle top and bottom view 750kVA



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APPENDIX 2 OPTIONS

Adding options may change the technical characteristics of the UPS from the standard specifications shown in the technical data tables. When selecting options, make sure that all options selected are compatible on the same UPS. Also note whether the option should be ordered with the UPS and installed at the factory or at the time of commissioning to avoid downtime during installation.

External Maintenance Bypass

(Order and install with UPS System)

External, wrap-around maintenance bypasses are available for all 90-NET UPS's. Choices include two- and three-breaker configurations, Kirk Keys, and solenoid release systems.

Bypass Fuses

(Factory installed-Specify at time of order)

Fuses may be installed in the bypass for additional protection against overload.

Battery Options

(Order with System or Retrofit)

A range of flooded cell and VRLA battery systems are available to provide a range of backup times. Additional battery accessories, such as mounting racks, spill containment kits, hydrogen sensors, and other items are available.

Battery Disconnect Switch

(Order with System-Retrofit may require downtime)

A battery disconnect switch is available to enable the UPS to disconnect battery systems with shunt trip or undervoltage release breaker control. This enables the UPS to disconnect flooded cell strings or third-part battery systems.

Battery Leakage Current Alarm

(Order with System-Retrofit may require downtime)

This monitors the insulation resistance of the DC to alert the user to possible leakage from the battery.

Multiple Bus Synchronization Module

(Order with System-Retrofit may require downtime)

The synchronization kit is used to synchronize multiple UPS systems in order to assure correct operation when an external static switch is used to provide redundancy without load sharing using multiple UPS modules. Up to 6 UPS modules may be synchronized with a single synchronization module

Remote Alarm Unit

(Retrofittable)

A remote alarm unit is available for displaying the most important individual UPS alerts..

CONNECTIVITY OPTIONS

(Retrofittable)

MOPUPS Monitoring and Shutdown Software

MopUPS Software monitors key UPS functions and values from a PC or Server, and triggers automatic graceful shutdown of one or more servers. Additionally, it can provide the following capabilities:
(1) Automatic responses to power failure or other system conditions, including e-mail alerts, network messages, and command file execution;
(2) Logging specified events and data values;
(3) Real-time UPS monitoring and viewing;
(4) Programmed system shutdown;

(5) Transmission of UPS status, alarm, and logged information from connected PC to others on a TCP/IP or Named Pipes network.

MopUPS is available in either a single module (MopUPS Professional) or parallel/redundant (MopUPS Professional P/R) version. MopUPS Professional P/R integrates inputs from multiple UPS modules and displays status of the system as a whole in addition to the individual modules.

MopUPS Professional can be configured to communicate with the UPS either through a direct serial connection or over a network via the ManageUPS adaptor (see below). MOPUPS Professional P/R ONLY communicates via the network, and requires the ManageUPS Adaptor.

ManageUPS Adaptor Upgrades

(Retrofittable, but lower cost if ordered with UPS)

All 90-NET UPS's sold in North America are equipped with a ManageUPS Adaptor as a standard item. This provides a network connection and the capabilities to:

(1) Send SNMP or e-mail alerts
(2) Provide manageability and viewing via SNMP, Telnet, or Web Browser;
(3) Store downloadable logs of events and data values in memory on the adaptor;

Additionally, a higher level ManageUPS Adaptor can incorporate one or more temperature and humidity sensors which also have three dry contact inputs and one dry contact output on each sensor to enable integration of other third party devices, such as hydrogen sensors or TVSS panels into the network monitoring system. This version is STANDARD on the 90-NET 750 kVA but is optional on the 180-500 kVA modules.

MODBUS Adaptor

The ManageUPS adaptor can be ordered so it is compatible with the MODBUS protocol as an option.

ManageUPS CIO

ManageUPS CIO is software that provides a central management system for critical power infrastructure distributed within a building, campus or wide area network environment. A multi-level pin-map feature helps you visualize the location of UPS with alarm conditions. The alarm view lists all devices by type of active alarm.

Another important capability of ManageUPS CIO is to help manage large numbers of alarms caused by a single event. Some incidents such as power or network failure can affect many UPS's at once. ManageUPS CIO reduces these incidents to a single alarm notification summarizing the number and identities of affected UPS, simplifying alarm management.

CIO also allows the user to create Smart Groups, which simplify monitoring, alerting and tracking of specific categories of events. For more information, contact your Chloride Representative.

Note on Connectivity Options

90-NET UPS's incorporate two serial ports, which may be used either by:

Two plug-in cards (for example, LIFE.net and ManageUPS),

OR

One card and one DB9 Connector (for example, LIFE.net and MOPUPS Professional-serial connection).

If two cards are used, then MOPUPS Professional can ONLY be installed in a network mode.

For help as to what combinations of connectivity options are feasible, contact your Chloride representative.

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