Modular UPS System

M2U NP - 20 kW up to 140 kW

Installation manual

SUMMARY

GLOSSARY OF ACRONYMS

ACRONYM	ITEM	DESCRIPTION
M2U	**Multi Power 2 208V**	*UPS Modular family name – 2nd generation 208V*
BTC	**Battery Cabinet**	*Any battery cabinet*
BU	**Battery Unit**	*Battery backup intelligent unit*
M2U 68 CBC 6	**Combo Cabinet 68 kW M2U**	*Combo Cabinet with 3 slots to place 3 x M2U 34 (or 3 x M2U 20 or 3 x M2U 25) PM + 200A BM + SMU + MCU + 24 x BU + SWBATT*
M2U 140 PC0	**Power Cabinet 140 kW M2U**	*Power Cabinet with 5 slots to place 5 x M2U 34 (or 5 x M2U 20 or 5 x M2U 25) PM + 500A BM + SMU + MCU*
PM	**Power Module**	*Power Module unit*
M2U 20 PM BLUE	**Power Module 20 kW M2U 3U – BLUE**	*20 kW 3U Power Module unit SIC components - 208V IN/OUT*
M2U 25 PM BLUE	**Power Module 25 kW M2U 3U – BLUE**	*25 kW 3U Power Module unit SIC components - 208V IN/OUT*
M2U 34 PM BLUE	**Power Module 34 kW M2U 3U – BLUE**	*34 kW 3U Power Module unit SIC components - 208V IN/OUT*
BM	**Bypass Module**	*Solid state transfer device module (Acronym used to indicate any BM)*
200AMP BM	**Bypass Module 200A**	*200A Solid state transfer device module*
500AMP BM	**Bypass Module 500A**	*500A Solid state transfer device module*
SMU	**System Monitoring Unit**	*Item for: bypass control, system Control, switches status, ext. I/O and EPO control, communication ports, display port, slots*
MCU	**Main Communication Unit**	*Display - Synoptic*
SLOT	**Slots**	*Slot to accommodate communication cards*
PIB	**Parallel Interface board**	*Parallel interface board*
SA	**Service Access Port**	*Port interface to connect service maintenance tools*

SWBATT	**Switch Battery**	***Battery breaker***
B+	-	*Positive battery voltage/current/temp.*
B-	-	*Negative battery voltage/current/temp.*

IMPORTANT SAFETY INFORMATION

ALL OPERATIONS DESCRIBED IN THIS SECTION MUST BE PERFORMED BY QUALIFIED AND TRAINED PERSONNEL ONLY.

READ "SAFETY MANUAL" BEFORE STARTING
THE MODULAR UPS POWER CABINET INSTALLATION

Our Company assumes no liability for damages caused by incorrect connections or operations not contained in this manual.

The following operations have to be performed with the UPS disconnected from the power mains, off and with all equipment switches open.
Before making the connection, open all switches and verify that the UPS is completely isolated from power sources: battery and AC power line. In particular, check that:
- the UPS input line is completely disconnected
- the UPS bypass line is completely disconnected
- the external UPS battery line switch/fuses are open
- all UPS switches are in the open position
- check with a multimeter that there are no dangerous voltages

SAVE THIS INSTRUCTIONS: This manual contains important instruction to properly install the UPS unit.
Read safety manual before starting UPS installation.

The first connection to be made is the protective conductor (earth wire), this must be connected to the bar marked as PE.
The UPS must operate while connected to the earthing system.

The input Neutral must always be connected.

WARNING: a 4-wire three-phase distribution system is required.
The UPS must be connected to a power supply source providing 3-phase + neutral + PE (protective earth) of a TT, TN or IT type. The phase rotation must be correct.
In the IT system a 4-pole thermal-magnetic circuit breaker is mandatory.

Install the line protection devices (fuse, magneto-thermal and differential switches) as indicated in the chapters "POWER CONNECTION INFORMATION" and "SYSTEM PROTECTIONS INFORMATION"

Read the User Manual before using this product.

Read the Battery Cabinet manual before connecting the batteries.

The SWBATT included in the Combo Cabinet disconnects only the internal batteries.

Check that the total battery voltage meets the requirements of the UPS (refer to the Battery Cabinet nameplate).

ATTENTION: the maximum length of the connection cables to the battery is 20 meters. Furthermore, the two battery cables (+, -) must be placed close to each other in order to avoid loops.

ATTENTION: After the installation operation is complete, refit the cabinet protection panels using the appropriate screws.

ATTENTION: If "AUTORESTART OPTION" is set, when the mains supply returns the system will automatically switch ON and the load will be powered.

WARNING: this uninterruptible power supply (UPS) conforms to all binding safety and electromagnetic compatibility regulations applicable to this type of product. Compliance with these regulations has been certified by accredited third-party bodies.
In addition to that prescribed in the directives, during the design phase our company made every effort to assess and eliminate or minimize all risks deriving both from correct use and possible reasonably foreseeable incorrect operations. Civil society and the institutions place special emphasis on protecting certain categories of people (pregnant women, minors, people with cognitive and/or motor disabilities, people wearing pacemakers).
That being said, despite the fact that the UPS is a product reserved for professional and non-domestic use, the above-mentioned people must not access the areas where the UPS is installed.
Moreover, the UPS must be installed in an area that cannot be accessed by domestic animals or where the latter cannot station in.

BATTERY ROOM VENTILATION
The room in where the battery is located must have enough ventilation to ensure the concentration of hydrogen produced is within safe limits.

The room should preferably be ventilated naturally; if it cannot be, forced ventilation may be employed.

PERSONAL PROTECTIVE EQUIPMENT (PPE)
No maintenance operations must be carried out on the device without wearing the Personal Protective Equipment (PPE) described below.
Personnel involved in the installation or maintenance of the equipment must not wear clothes with wide sleeves or laces, belts, bracelets or other items that may be dangerous, especially if they are metallic.
Long hairs must be tied in such a way as to ensure that they are not a hazard.
The following symbols show the protective equipment that should be worn. The various items of PPE must be selected and sized according to the nature of the hazard (particularly electrical) posed by the equipment.

Protective footwear
Use: always

Protective eyewear
Use: always

Protective clothing
Use: always

Helmet
Use: when overhead structured are present.

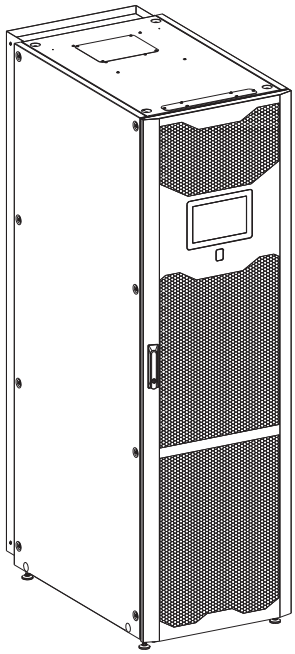
Work gloves
Use: always

Dust mask
Use: Always

Some images contained in this document are for information purposes only and may not faithfully demonstrate the parts of the product they represent.

COMBO CABINET M2U 68 CBC 6

PRELIMINARY INFORMATION FOR INSTALLATION



INSTALLATION ENVIRONMENT

When choosing the site in which to install the UPS and the Battery Cabinet, the following points should be taken into consideration:

- Avoid dusty environments.
- Avoid rooms with conductive, inflammable and corrosive items.
- Check that the floor is level and capable of withstanding the weight of the UPS and the Battery Cabinet.
- Avoid cramped environments that could impede the normal maintenance activities.
- The relative humidity should not exceed 95%, non-condensing.
- Avoid installing the equipment in places exposed to the direct sunlight or hot air.
- This equipment is intended for use in a controlled environment, hence the temperature must be regulated within a range between 0 and 40°C.

The UPS may be operated within an ambient temperature of between 0 to 40°C. The recommended working temperature for the UPS and batteries is between 20 to 25°C. Please note, if the battery has an average life of 5 years at a working temperature of 20°C, the life is halved if the working temperature is increased to 30°C.

To maintain the temperature of the installation room to within the range indicated above, there must be a system for eliminating the dissipated heat (the UPS kW / kcal/h / B.T.U./h dissipation values are shown in the table below). The methods that may be used are:

- *Natural ventilation.*
- *Forced ventilation*, recommended if the outside temperature is less (e.g. 20°C) than the temperature at which the UPS or Battery Cabinet is to be operated (e.g. 25°C).
- *Air-conditioning system*, recommended if the outside temperature is higher (e.g. 30°C) than the temperature at which the UPS or Battery Cabinet is to be operated (e.g. 25°C).

AMBIENT AND DIMENSION DETAIL	*Table 1*
Ambient temperature for the UPS	0 - 40°C
Recommended temperature for battery life	20 - 25°C
Range of relative Humidity	5 - 95% (without condensing)
Maximum Operating Altitude (according with IEC/EN 62040-3)	Full power up to 1000 m a.s.l. (power derating of 0.5% for each 100 m between 1000 and 4000 m)
Storage Temperature	UPS: -25°C ÷ +60°C
Isolation protection	IP20
Colour	RAL 9005
Ventilation	Forced, front to rear (Air filter door is standard)
Cable entry	TOP (1) and BOTTOM, on the rear
Pollution degree	PD2
Vibration resistance	1 m/s^2
Overvoltage category / Protective class	OVC II / class I
Cabinet Dimension (WxDxH) [in / mm]	23.6 x 41.3 x 78.5 600 x 1050 x 1995
Shipping Dimension (WxDxH) [in / mm]	27.4 x 43.3 x 84.1 750 x 1150 x 2135
Shipping Weight Power Cabinet [lb / kg]	622 lb / 282 kg
Net Weight without power modules / Bypass module Included [kg]	591 lb / 268 kg
TOTAL Net Weight with power modules / Bypass module Included [kg]	836 lb / 379kg

(1) *Top cable entry is not allowed with Vertical Exhaust kit installed*

ELECTRICAL INFORMATION TABLE *Table 2*	
	68 kVA
Power [kVA / kW]	68/68
V Input [V]	208 ± 20% (3PH + N)
Frequency Input [Hz]	50 - 60
V Output [V]	208-220 (3PH + N)
Frequency Output [Hz]	50 / 60
Max Leakage Current [mA] (1)	30
Power dissipated @ 100% three-phase load (2)	2.55 kW 2193 kCal/h 8700 B.T.U./h (3)
Flow rate of the fans for removing the heat from the installation room (4)	1360 m^3/h

(1) *The load leakage current is added to the one of the UPS on the ground protection conductor.*

(2) *Fully charged batteries.*

(3) *3.97 BTU / h = 1 kcal / h.*

(4) *To calculate the air flow rate, the following formula may be used: Q [m3/h] = 3.1 x Pdiss [W] / (ta - te) [°C]*
Pdiss is the power expressed in W dissipated by all the devices installed in the installation environment.
ta= ambient temperature, te=outside temperature. To take leaks into account, the value obtained should be increased by 10%.
The table shows an example of a flow rate with (ta - te)=5°C and a rated resistive load (pf=1).
(Note: This formula is only applicable when ta>te, if the UPS installation does not require an air-conditioning system).

ELECTROMAGNETIC COMPATIBILITY

This UPS complies with Part 15 of the FCC rules (Class A). It may cause radio interference in the home environment. The user may have to adopt supplementary measures.
This product is for professional use in industrial and commercial environments. Connections to USB must be made with the cable provided.

OPERATIVE PROCEDURES

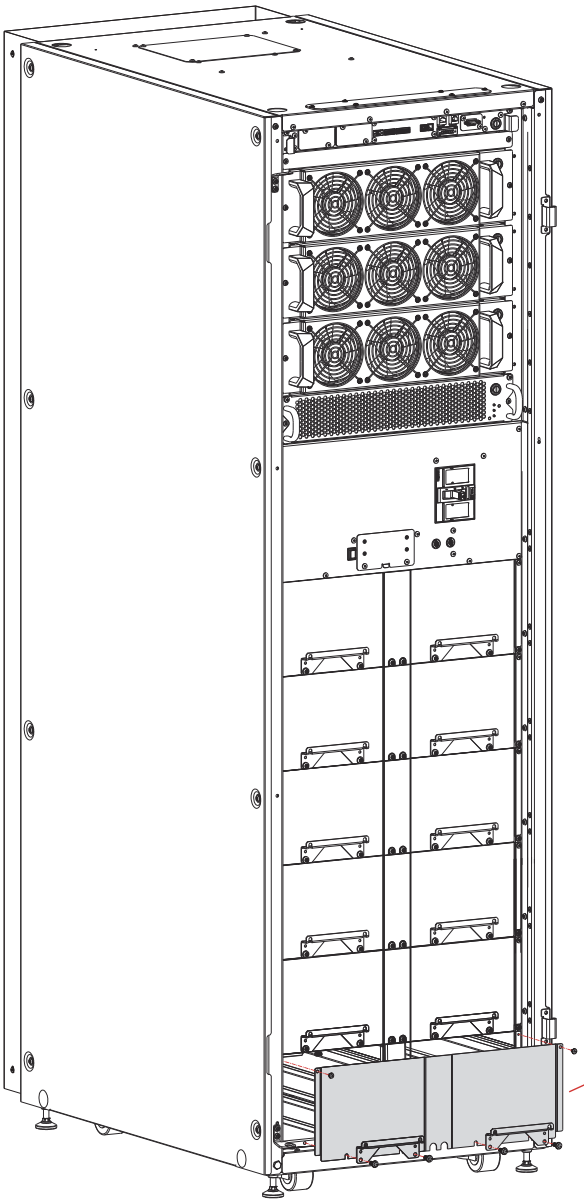
For the correct procedures to switch on/off the system, refer to the User Manual.

OVERVOLTAGE PROTECTION

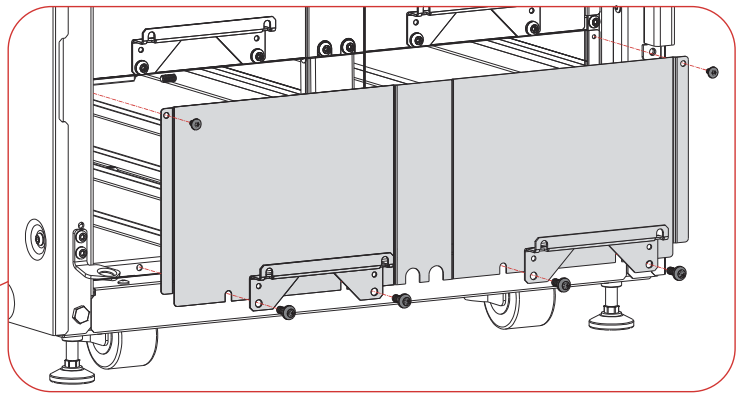
The UPS has been designed to be powered by an AC mains supply with category 2 voltage spikes. If it is connected to an AC supply with different characteristics or if it is potentially subject to transitory overvoltage, external protection equipment must be installed to it.

BATTERY UNITS INSTALLATION DETAILS

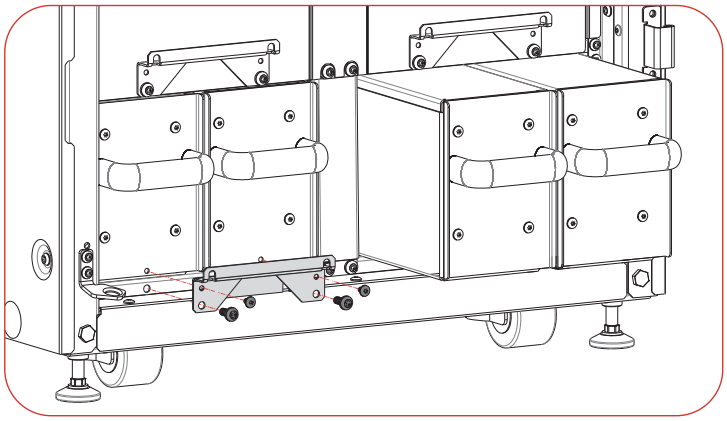
WARNING!
To improve the stability of the UPS, install the BU arrays starting from the lower empty slots (refer to images below)



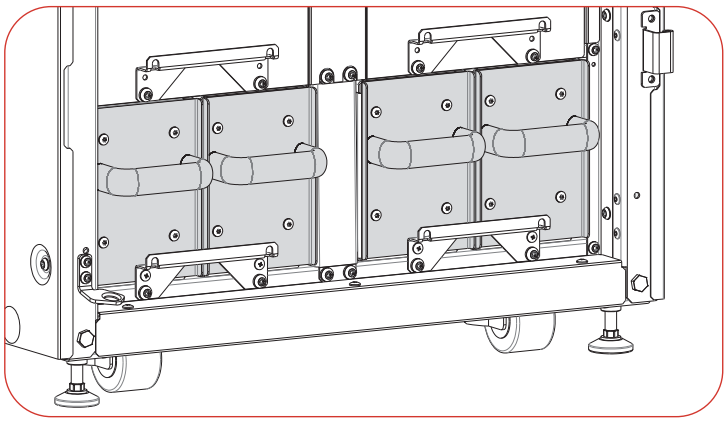
REMOVE THE BATTERY COVER PANEL

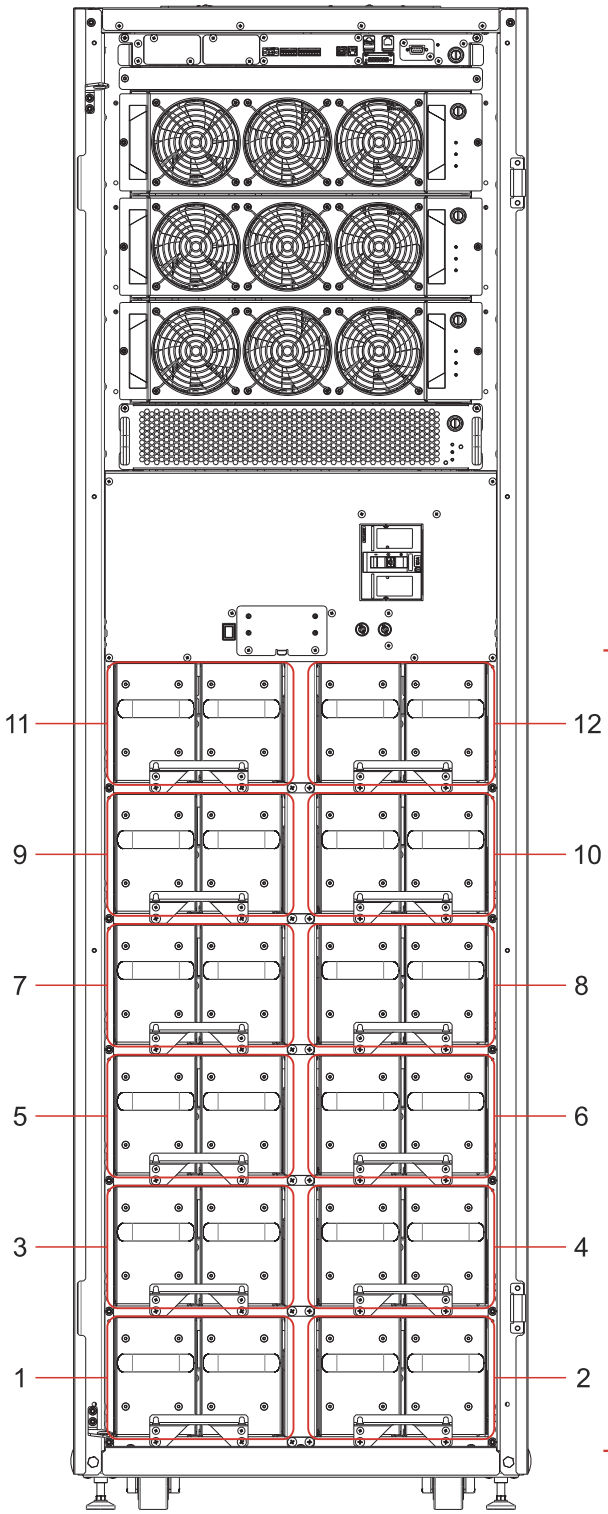


INSERT THE BATTERY UNITS AND SECURE THEM USING THEIR LOCKING BRACKET



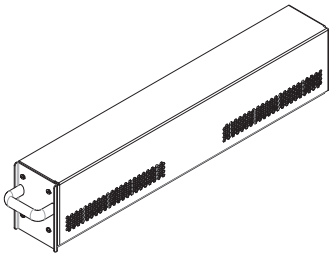
EXAMPLE OF BATTERY UNITS CORRECTLY INSTALLED



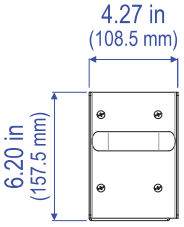


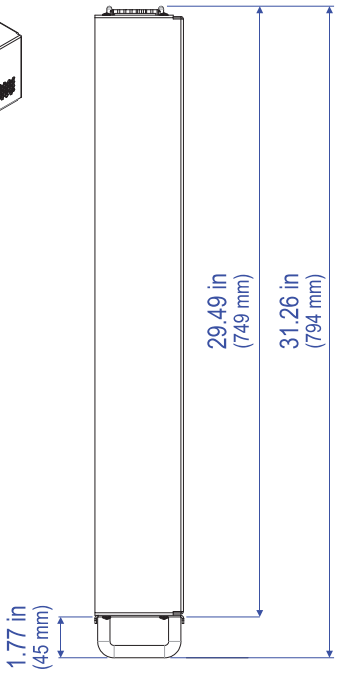
CAUTION!
Two people are required to lift the battery units

BATTERY UNITS



Net Weight 32 Kg





Battery available configuration		
N Battery Unit Array	Capacity [Ah]	Nominal Voltage [V]
1	9	240
2	18	
3	27	
4	36	
5	45	
6	54	
7	63	
8	72	
9	81	
10	90	
11	99	
12	108	

Battery String Parameters	
Part	BATTERY STRING
Battery Unit [n.]	2
Battery Block [n.]	20
Battery Type	VRLA (1)
Capacity [Ah]	9
Nominal Voltage [V]	240

(1) **WARNING!**
Use only the battery type indicated below at the paragraph “INTERNAL BATTERIES”.

INTERNAL BATTERIES

SWBATT disconnects only the internal batteries.

CAUTION: If the UPS has INTERNAL BATTERIES, <u>follow all the *PRECAUTIONS AND SAFETY RULES*</u> listed below.

- The UPS has HAZARDOUS electrical voltages inside it, even when the input and/or battery switches are off. The inside of the UPS is protected by safety panels which should not be removed by untrained personnel. All installation and maintenance or operations involving access inside the UPS require the use of tools and may ONLY be performed by trained personnel.
- The UPS contains an internal source of energy: batteries. All terminals and sockets may be live even without connecting the UPS to the mains supply.
- The total battery voltage may be potentially dangerous: it may generate an electric shock. The battery compartment is protected by safety panels which should not be removed by untrained personnel. All installation and maintenance of the batteries involve access inside the UPS and require the use of tools: such operations may ONLY be performed by trained personnel.
- Replaced batteries must be considered TOXIC WASTE and treated accordingly. Do not dispose of batteries in a fire: they may explode. Do not attempt to open the batteries: they are maintenance-free. In addition, the electrolyte is harmful to the skin and eyes and can be toxic.
- Do not turn on the UPS if it is leaking fluid or if you see a residual white powder.
- Do not allow water, liquids in general and/or other foreign objects to get inside the UPS.
- Do not open the battery breaker while the UPS is powering the load because if there is no mains power, the energy to power the load is provided by the batteries, therefore disconnecting the battery would cause the shutdown of the load.
- Follow these recommendations when working on the batteries:
  - Remove wristwatches, rings and other metal objects
  - Use tools with insulated handles
  - Wear rubber shoes and gloves
  - Do not lay tools or metal objects on top of the batteries
  - Disconnect the charging source before connecting or disconnecting the battery terminals
  - Determine if battery is either intentionally or inadvertently grounded. Contact with any part of a grounded battery can result in electric shock and burns by high short-circuit current. The risk of such hazards can be reduced if grounds are removed during installation and maintenance by trained personnel.
- For battery maintenance refer to the User Manual

ALLOWED BATTERY MODELS

Risk of explosion if batteries are replaced by an incorrect type.
Refer to the following table to identify the correct quantities and models:
Replace only with the same type and number of batteries or battery packs.
Do not combine different battery types within the same system.

Battery Type	*12V* *Valve regulated sealed lead-acid rechargeable*
Maximum number of batteries	*240*
Total rated battery voltage	*240 VDC*

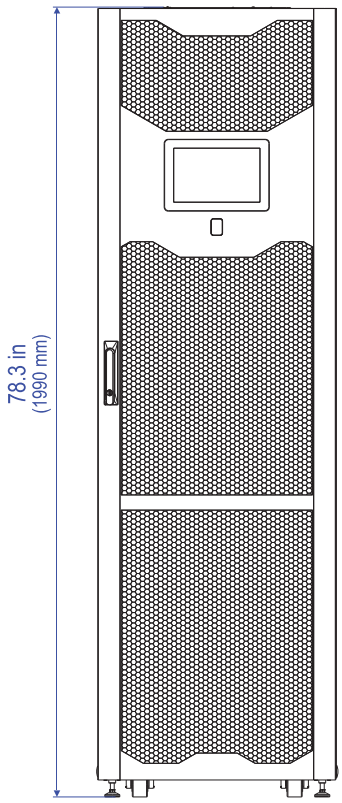
Manufacturer	Type	Computer room installation permitted
Hitachi Chemical Energy Technology Co Ltd (MH14533)	UPS 12460 F2 UPS 12460 FRF2 HRL 1234W F2 HRL 1234W FRF2 HR 1234W F2 HR 1234W FRF2 UPS 12360 7 F2 UPS 12360 7 FRF2 UPS 12580 F2 UPS 12580 FRF2	N Y N Y N Y N Y N Y
Fabit Enertech Co Ltd (MH27960) Note: trademark “FIAMM”	12FGH36	N
GS Yuasa International Ltd (MH12970)	NPW45-12 NPW45-12 FR	N Y
Taiwan Yuasa Battery Co Ltd (MH28947)	NPW45-12 NPW45-12FR	N Y
Yuasa Battery (Guangdong) Co Ltd (MH29616)	NPW45-12 NPW45-12FR	N Y

ATTENTION: If the installed batteries are less than V-2 flame class, the Ups is considered *not for use in a computer room* as defined in the Standard for the Protection of Electronic Computer/Data Processing Equipment, ANSI/NFPA 75. Please refer to the table above.

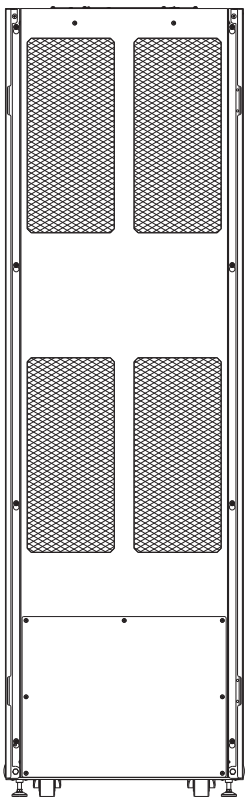
For correct interconnection of the batteries, refer to the wiring diagrams available to service personnel only or to the battery kit installation manual.

Refer to the User Manual to configure the battery strings.

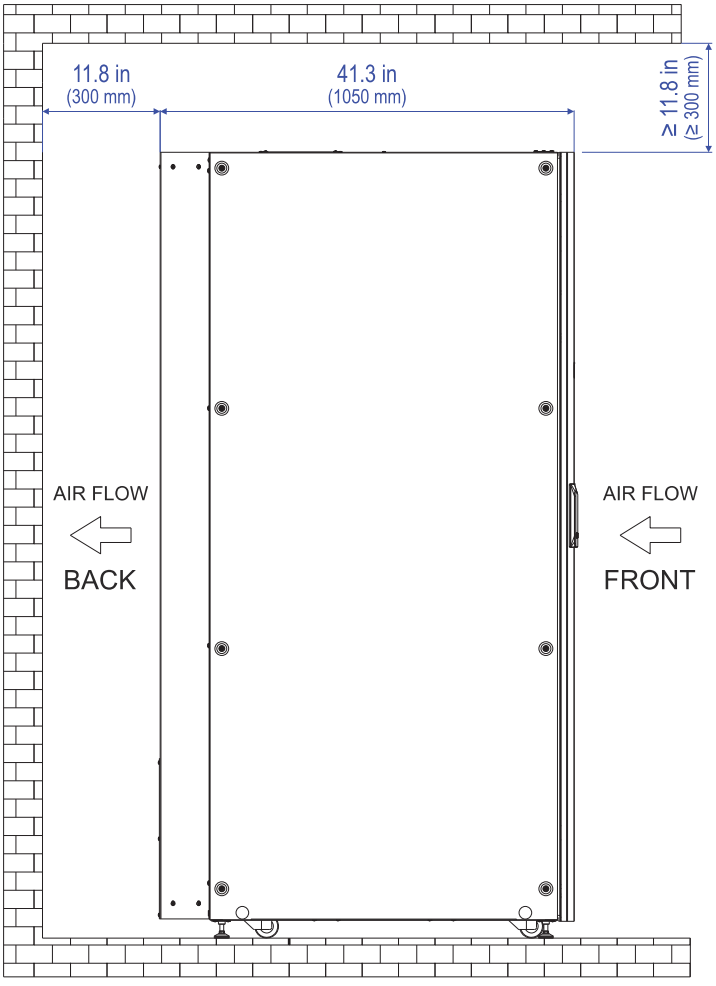
POSITIONING INFORMATION



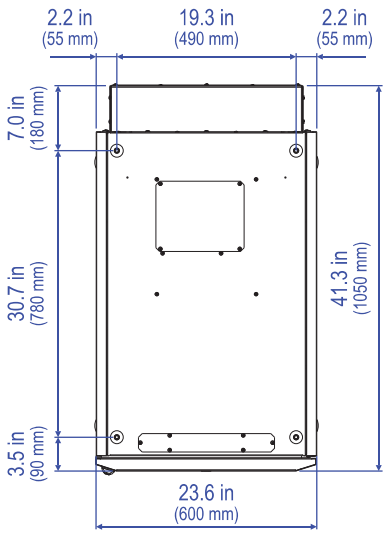
FRONT VIEW



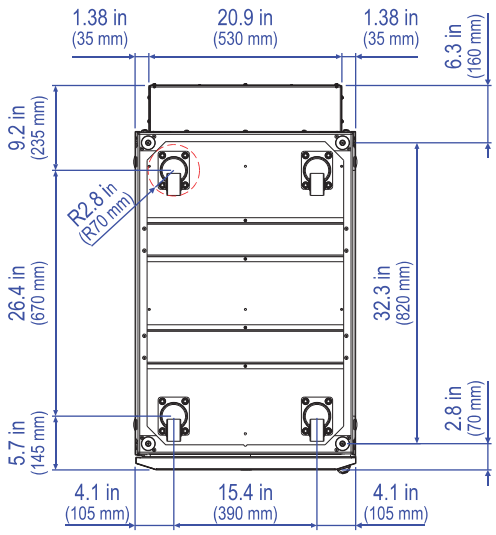
REAR VIEW



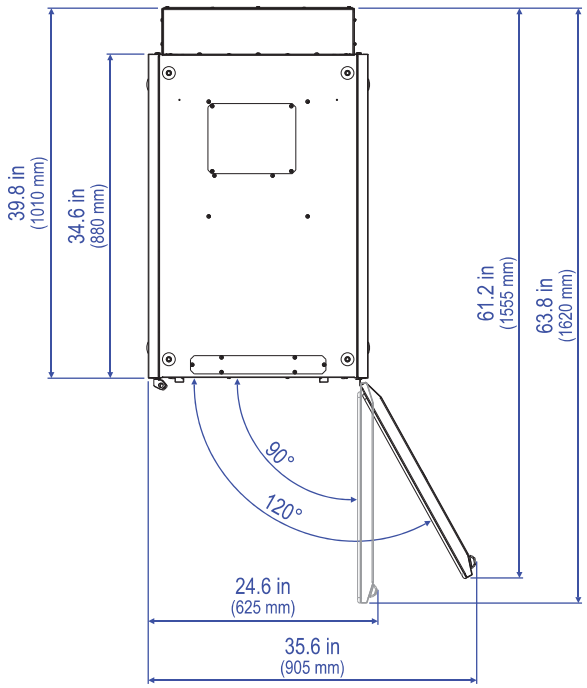
SIDE VIEW



TOP VIEW



BOTTOM VIEW

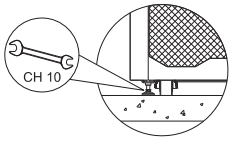


CABINET POSITIONING

Warning! The cabinet cannot be moved and/or delivered to site with the Power Modules inserted.

When positioning, take into account that:
- the cabinet must be positioned without the Power Modules inserted; the Power Modules can only be inserted once the cabinet feet have been lowered.
- The wheels are to be used for final positioning only. Specialist moving equipment must be used to transport the UPS near to the final position.
- Plastic parts and the door are not able to act as pushing points or handles.
- You will need to ensure at least enough free space in front of the cabinet for user operation and maintenance (≈1.2 m).
- Do not place any objects on the top. Do not climb up on the Cabinet. The chassis isn't designed to hold up the weight of a person.

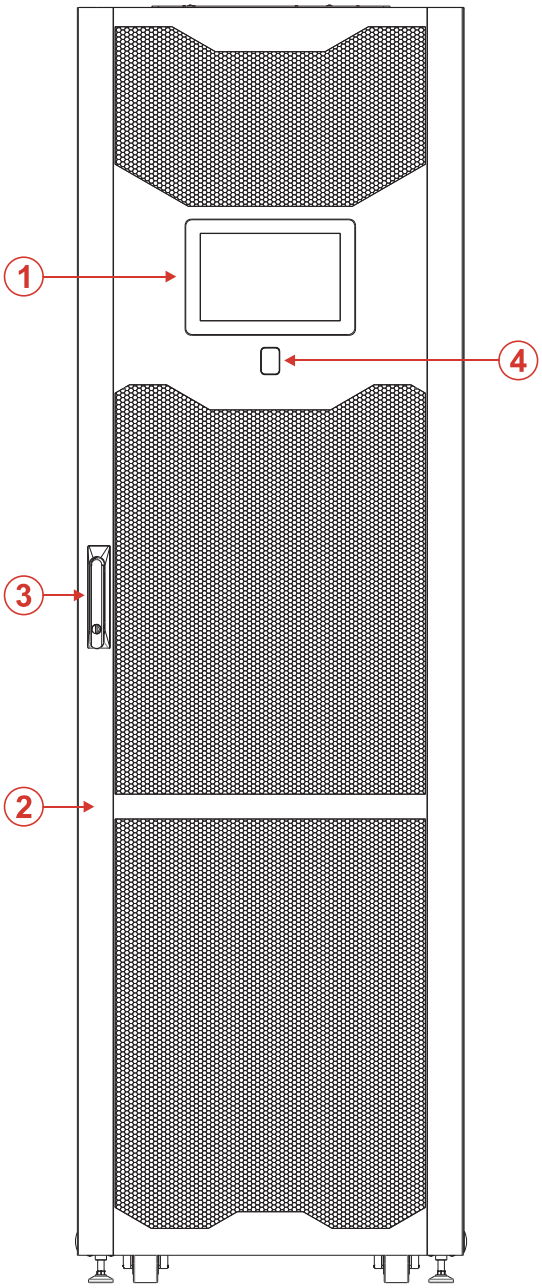
Warning! The cabinet must be positioned on a level floor.
Ensure that the floor can support the total weight of the system.
The weight of the Combo Cabinet full of Power Modules and batteries is 2529 lb (1147 kg).

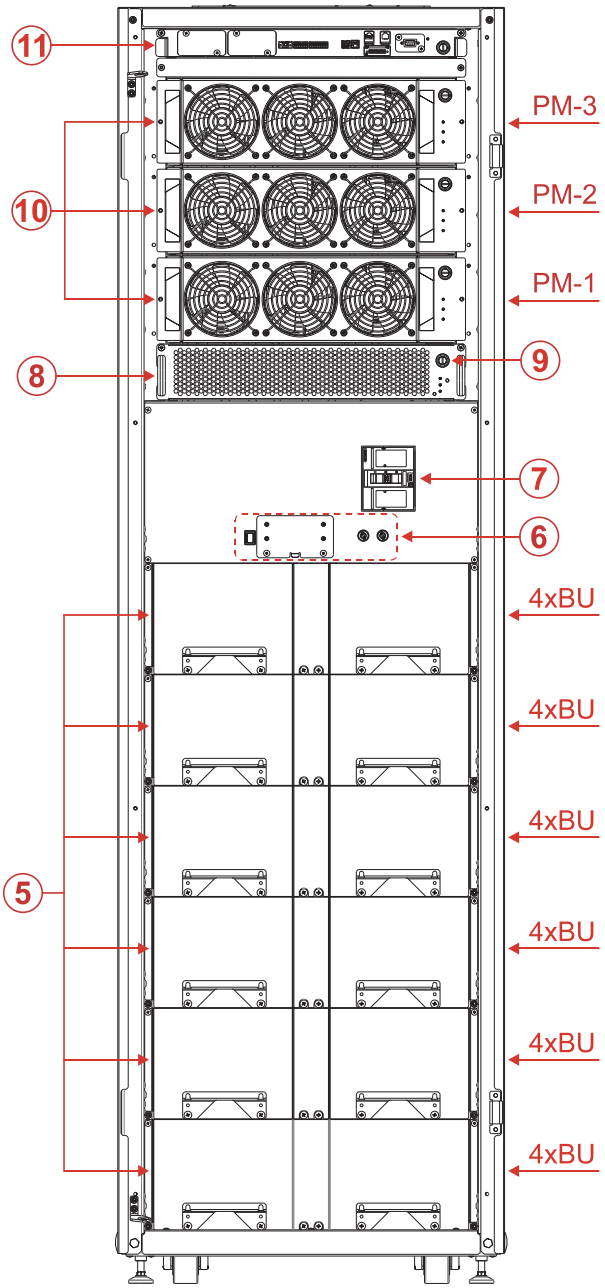


After positioning, lower the four feet to the floor, using an appropriate spanner.
Ensure that the total weight of the cabinet is supported by the feet only (the revolving wheels must be lifted from floor).
Ensure that the Combo Cabinet is level.

It is advisable to reuse the pallet fastening brackets to anchor the Combo Cabinet to the floor.

UPS PARTS AND MODULES





1. Display (MCU)
2. Door with air filter
3. Handle
4. UPS status LED
5. Battery Section (BU)
6. Cold Start section
7. Battery switch (SWBATT)
8. Bypass Module (BM)
9. Switch Lock
(locking system present on all modules)
10. Power Module (PM)
11. Connectivity panel

WARNING! The cabinet cannot be moved and/or delivered on site with Power Modules inserted.

POWER CONNECTION INFORMATION

PM 20 MODULE

Input AC Line Connection 3PH + N + PE (Single / Dual Mains)								
N module	Max Power [kW-kVA]	Max current [1] [A]	Max admitted neutral current [A]	Size of line protection device (plant) [A]	Terminal IN1, IN2, IN3, N / PE		Wire IN1, IN2, IN3, N / PE [4],[5]	
					Type	Bolt	Type	Size [N x AWG or kcmil]
1	20	72	97	100	Al BAR / Steel bolt (PE)	1 x M10 (PH IN) 300 lb-in (35 Nm) / 2 x M10 (NEUTRAL) 300 lb-in (35 Nm) / 1 x M8 (PE) 175 lb-in (20 Nm)	90°C copper wire	1 x 250 (PH IN) / 2 x AWG 2/0 (NEUTRAL) / 1 x AWG 4 (PE)
2	40	145	193	200				
3	60	217	289	300				

BYPASS AC Line Connection 3PH + N + PE (Dual Mains)							
Max Power [kW-kVA]	Max nominal current [A]	Max admitted neutral current [A]	Size of line protection device (plant) [A]	Terminal BYP1, BYP2, BYP3, N / PE		Wire BYP1, BYP2, BYP3, N / PE [4],[5]	
				Type	Bolt	Type	Size [N x AWG or kcmil]
60	167	289	250	Al BAR / Steel bolt (PE)	1 x M10 (PH BYP) 300 lb-in (35 Nm) / 2 x M10 (NEUTRAL) 300 lb-in (35 Nm) / 1 x M8 (PE) 175 lb-in (20 Nm)	90°C copper wire	1 x 250 (PH BYP) / 2 x AWG 2/0 (NEUTRAL) / 1 x AWG 4 (PE)

Output AC Line Connection 3PH + N + PE									
N module	Max Power [kW-kVA]	Max nominal current [2] In [A]	Max admitted neutral current [A]	Terminal OUT1, OUT2, OUT3, N / PE		Wire OUT1, OUT2, OUT3, N / PE[5]		Output line protection (recommended values for selectivity)	
				Type	Bolt	Type	Size [N x AWG or kcmil]	Normal Fuses (gL - gG)	Thermal magnetic switches (C curve)
1	20	56	97	Al BAR / Steel bolt (PE)	1 x M10 (PH OUT) 300 lb-in (35 Nm) / 2 x M10 (NEUTRAL) 300 lb-in (35 Nm) / 1 x M8 (PE) 175 lb-in (20 Nm)	90°C copper wire	1 x 250 (PH OUT) / 2 x AWG 2/0 (NEUTRAL) / 1 x AWG 4 (PE)	In/4	In/4
2	40	111	193						
3	60	167	289						

Input Battery DC Line Connection BATT+, BATT-, PE								
N module	Max Power [kW-kVA]	Rated Current [A] [3]		Sized of battery line protection device [A]	Terminal BATT +, BATT - / PE		Wire BATT +, BATT / PE [4],[5]	
		@nominal battery voltage	@end of discharge voltage		Type	Bolt	Type	Size [N x AWG or kcmil]
1	20	87	105	180	Al BAR / Steel bolt (PE)	2 x M10 (BATT+, BATT-) 300 lb-in (35 Nm) / 1 x M8 (PE) 175lb-in (20 Nm)	90°C copper wire	2 x AWG 2/0 (BATT+, BATT-) / 1 x AWG 4 (PE)
2	40	175	210	400				
3	60	262	314	400				

PM 25 MODULE

Input AC Line Connection 3PH + N + PE (Single / Dual Mains)								
N module	Max Power [kW-kVA]	Max current [1] [A]	Max admitted neutral current [A]	Size of line protection device (plant) [A]	Terminal IN1, IN2, IN3, N / PE		Wire IN1, IN2, IN3, N / PE [4],[5]	
					Type	Bolt	Type	Size [N x AWG or kcmil]
1	25	91	120	150	Al BAR / Steel bolt (PE)	1 x M10 (PH IN) 300 lb-in (35 Nm) / 2 x M10 (NEUTRAL) 300 lb-in (35 Nm) / 1 x M8 (PE) 175 lb-in (20 Nm)	90°C copper wire	1 x 250 (PH IN) / 2 x AWG 2/0 (NEUTRAL) / 1 x AWG 4 (PE)
2	50	182	240	225				
3	68	245	330	300				

BYPASS AC Line Connection 3PH + N + PE (Dual Mains)							
Max Power [kW-kVA]	Max nominal current [A]	Max admitted neutral current [A]	Size of line protection device (plant) [A]	Terminal BYP1, BYP2, BYP3, N / PE		Wire BYP1, BYP2, BYP3, N / PE [4],[5]	
				Type	Bolt	Type	Size [N x AWG or kcmil]
68	197	330	250	Al BAR / Steel bolt (PE)	1 x M10 (PH BYP) 300 lb-in (35 Nm) / 2 x M10 (NEUTRAL) 300 lb-in (35 Nm) / 1 x M8 (PE) 175 lb-in (20 Nm)	90°C copper wire	1 x 250 (PH BYP) / 2 x AWG 2/0 (NEUTRAL) / 1 x AWG 4 (PE)

Output AC Line Connection 3PH + N + PE									
N module	Max Power [kW-kVA]	Max nominal current [2] In [A]	Max admitted neutral current [A]	Terminal OUT1, OUT2, OUT3, N / PE		Wire OUT1, OUT2, OUT3, N / PE[5]		Output line protection (recommended values for selectivity)	
				Type	Bolt	Type	Size [N x AWG or kcmil]	Normal Fuses (gL - gG)	Thermal magnetic switches (C curve)
1	25	70	120	Al BAR / Steel bolt (PE)	1 x M10 (PH OUT) 300 lb-in (35 Nm) / 2 x M10 (NEUTRAL) 300 lb-in (35 Nm) / 1 x M8 (PE) 175 lb-in (20 Nm)	90°C copper wire	1 x 250 (PH OUT) / 2 x AWG 2/0 (NEUTRAL) / 1 x AWG 4 (PE)	In/4	In/4
2	50	140	240						
3	68	190	330						

Input Battery DC Line Connection BATT+, BATT-, PE								
N module	Max Power [kW-kVA]	Rated Current [A] [3]		Sized of battery line protection device [A]	Terminal BATT +, BATT - / PE		Wire BATT +, BATT / PE [4],[5]	
		@nominal battery voltage	@end of discharge voltage		Type	Bolt	Type	Size [N x AWG or kcmil]
1	25	109	130	200	Al BAR / Steel bolt (PE)	2 x M10 (BATT+, BATT-) 300 lb-in (35 Nm) / 1 x M8 (PE) 175lb-in (20 Nm)	90°C copper wire	2 x AWG 2/0 (BATT+, BATT-) / 1 x AWG 3 (PE)
2	50	218	260	300				
3	68	296	356	400				

PM 34 MODULE

Input AC Line Connection 3PH + N + PE (Single / Dual Mains)								
N module	Max Power [kW-kVA]	Max current (1) [A]	Max admitted neutral current [A]	Size of line protection device (plant) [A]	Terminal IN1, IN2, IN3, N / PE		Wire IN1, IN2, IN3, N / PE (4),(5)	
					Type	Bolt	Type	Size [N x AWG or kcmil]
1	34	123	165	175	Al BAR / Steel bolt (PE)	1 x M10 (PH IN) 300 lb-in (35 Nm) / 2 x M10 (NEUTRAL) 300 lb-in (35 Nm) / 1 x M8 (PE) 175 lb-in (20 Nm)	90°C copper wire	1 x 250 (PH IN) / 2 x AWG 2/0 (NEUTRAL) / 1 x AWG 4 (PE)
2	68	245	330	300				
3	68	245	330	300				

BYPASS AC Line Connection 3PH + N + PE (Dual Mains)							
Max Power [kW-kVA]	Max nominal current [A]	Max admitted neutral current [A]	Size of line protection device (plant) [A]	Terminal BYP1, BYP2, BYP3, N / PE		Wire BYP1, BYP2, BYP3, N / PE (4),(5)	
				Type	Bolt	Type	Size [N x AWG or kcmil]
68	197	330	250	Al BAR / Steel bolt (PE)	1 x M10 (PH BYP) 300 lb-in (35 Nm) / 2 x M10 (NEUTRAL) 300 lb-in (35 Nm) / 1 x M8 (PE) 175 lb-in (20 Nm)	90°C copper wire	1 x 250 (PH BYP) / 2 x AWG 2/0 (NEUTRAL) / 1 x AWG 4 (PE)

Output AC Line Connection 3PH + N + PE									
N module	Max Power [kW-kVA]	Max nominal current (2) In [A]	Max admitted neutral current [A]	Terminal OUT1, OUT2, OUT3, N / PE		Wire OUT1, OUT2, OUT3, N / PE(5)		Output line protection (recommended values for selectivity)	
				Type	Bolt	Type	Size [N x AWG or kcmil]	Normal Fuses (gL - gG)	Thermal magnetic switches (C curve)
1	34	95	165	Al BAR / Steel bolt (PE)	1 x M10 (PH OUT) 300 lb-in (35 Nm) / 2 x M10 (NEUTRAL) 300 lb-in (35 Nm) / 1 x M8 (PE) 175 lb-in (20 Nm)	90°C copper wire	1 x 250 (PH OUT) / 2 x AWG 2/0 (NEUTRAL) / 1 x AWG 4 (PE)	In/4	In/4
2	68	190	330						
3	68	190	330						

Input Battery DC Line Connection BATT+, BATT-, PE								
N module	Max Power [kW-kVA]	Rated Current [A] (3)		Sized of battery line protection device [A]	Terminal BATT +, BATT - / PE		Wire BATT +, BATT / PE (4),(5)	
		@nominal battery voltage	@end of discharge voltage		Type	Bolt	Type	Size [N x AWG or kcmil]
1	34	148	178	180	Al BAR / Steel bolt (PE)	2 x M10 (BATT+, BATT-) 300 lb-in (35 Nm) / 1 x M8 (PE) 175lb-in (20 Nm)	90°C copper wire	2 x AWG 2/0 (BATT+, BATT-) / 1 x AWG 3 (PE)
2	68	296	356	400				
3	68	296	356	400				

(1) Input voltage at 96 V and battery charger off

(2) Output voltage 208 V

(3) Nominal voltage 240 V

(4) To be compliant with CE standards, the PE conductor cross section shall be minimum 70mmq or 2/0 AWG

(5) The suggested wire size refers to 90°C copper wire rated cables with an ambient temperature of 30°C. If different cables are used, or installed at an higher ambient temperature, the cable size need to be reviewed according to the National Electric Code (Table 310.16)

SYSTEM PROTECTIONS INFORMATION

THE INPUT, OUTPUT AND PROTECTIVE EARTHING CONDUCTORS MUST BE SIZED FOLLOWING THE RATED VOLTAGE AND CURRENT, AS SHOWN IN THE TABLES AND ALSO COMPLY WITH LOCAL AND NATIONAL REGULATION FOR MAXIMUM POWER RATING.

WARNING **THE PROTECTIVE EARTHING CONDUCTOR (PE) MUST BE CONNECTED PRIOR TO CONNECTING ANY INPUT / OUTPUT CABLES.**

INPUT LINE PROTECTION

Install a line protective device upstream the UPS. Refer to section “Power Connection Information” to set the right size. In case an automatic circuit breaker is used, a 5-10xIn magnetic trip threshold is recommended.
If the device interrupts the neutral wire, it must also interrupt all of the phase wires at the same time.
The disconnect device shall have a contact separation of at least 3 mm

SHORT CIRCUIT PROTECTION

If a failure at the output occurs, the UPS protects itself by limiting the value and duration of the output current (short-circuit current). These values also depend on the operating status of the UPS at the time of the failure; there are two different scenarios:

- UPS in NORMAL OPERATION with the bypass input available: the load is instantly switched to the bypass line; the input line is connected to the output via static switch limited by the internal protection (pre-arcing fuse bypass I^2t = 12000A^2s) and blocked after t > 500ms.
- UPS in BATTERY OPERATION or in NORMAL OPERATION without a bypass supply: the UPS protects itself by supplying 2.5 times the nominal current to the output for the first 100ms, which is then reduced to 1.5 times nominal for 400 ms. After this time (500 ms) it switches off.

SHORT-CIRCUIT WITHSTANDING

Icc = 65kA (current limited by internal fuses).

BACKFEED PROTECTION

The UPS has an internal protection against backfeed. This protection acts by means of a sensing circuit which turns the inverter off if a fault within the static switch is detected. During this condition, to avoid interrupting the supply to the connected load, the UPS switches to the bypass line.
If this fault occurs during battery operation, the inverter is stopped.
A volt free contact can be configured to drive a disconnecting device to be installed upstream the bypass input to the UPS, in this case when a backfeed fault occurs, the system opens the external disconnecting device, hence avoiding the requirement to stop the inverter (refer to the advanced configuration manual to configure this option).
The current rating of the disconnecting device must comply with the instruction outlined in the “Power Connection Information” section.

GFCI DEVICE (GROUND FAULT CIRCUIT INTERRUPTER)

WARNING: risk of electric shock from high leakage current.
The earth leakage current of this UPS may exceed 3.5 mA.
A proper earth connection must be provided.

Basing on the electrical system adopted and on the local regulations, a Ground Fault Circuit Interrupter or a Residual Current Device may be requested.

Transient and steady-state earth leakage currents, which may occur when starting the equipment, and the additional leakage current of the load should be taken into account when selecting instantaneous RCD or GFCI devices.

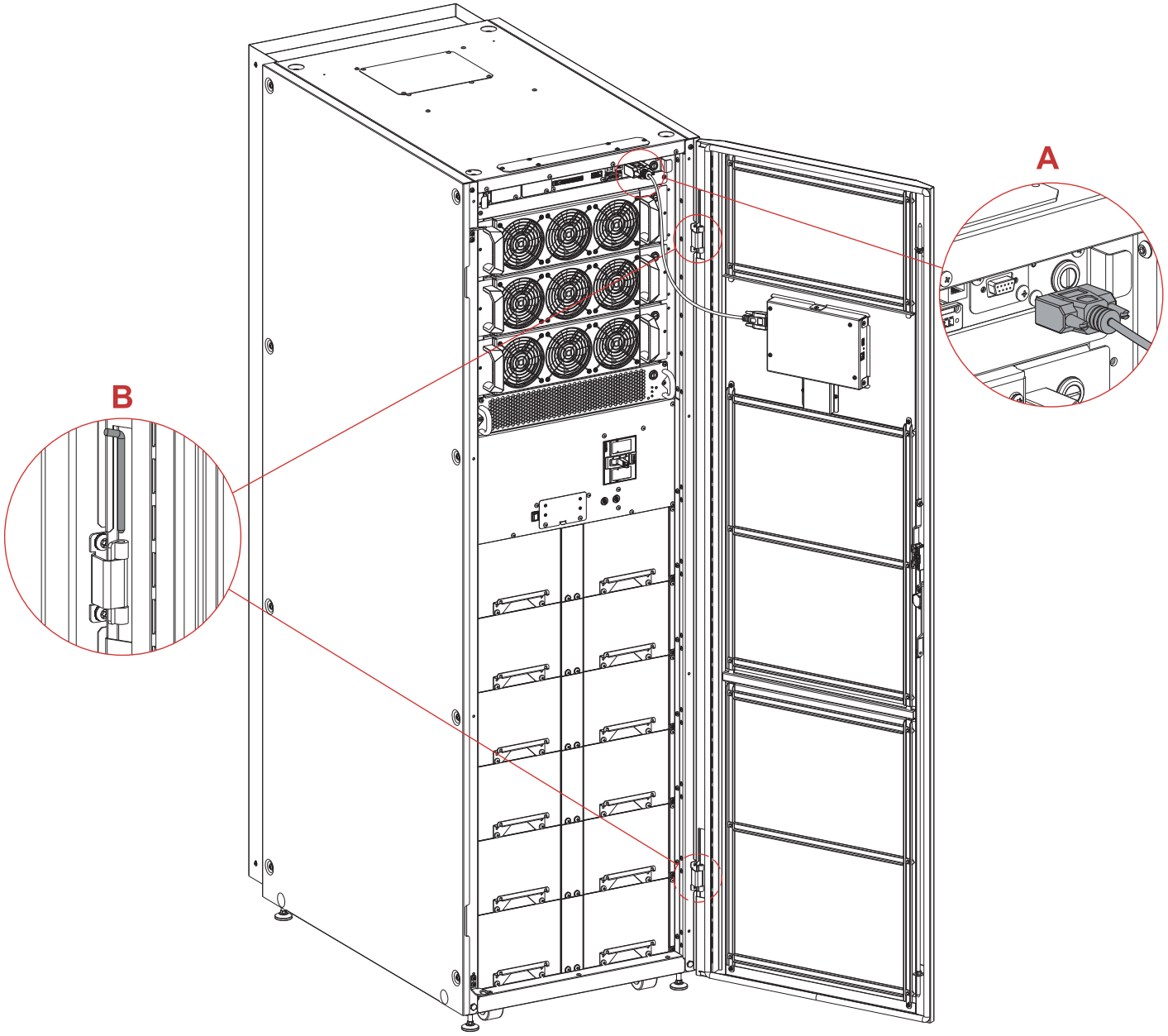
During normal operation, when the mains supply is present, a RCD breaker at the input of the UPS will activate if a fault occurs at the output side, since the output circuit is not isolated from the input.
In any case, other RCD breakers may still be installed at the output, preferably in coordination with those present at the input.

Residual current devices must be selected sensitive to DC unidirectional pulses and insensitive to transient current pulses.

NOTE for DUAL INPUT connection:

1. A single RCD/GFCI device must be installed upstream at the point where the sources divide to supply the standard input and the bypass input of the UPS.
2. If the standard input and the bypass input are supplied from two separated sources, then it is required to use a dedicated RCD/GFCI device for each source.

REMOVING DOOR



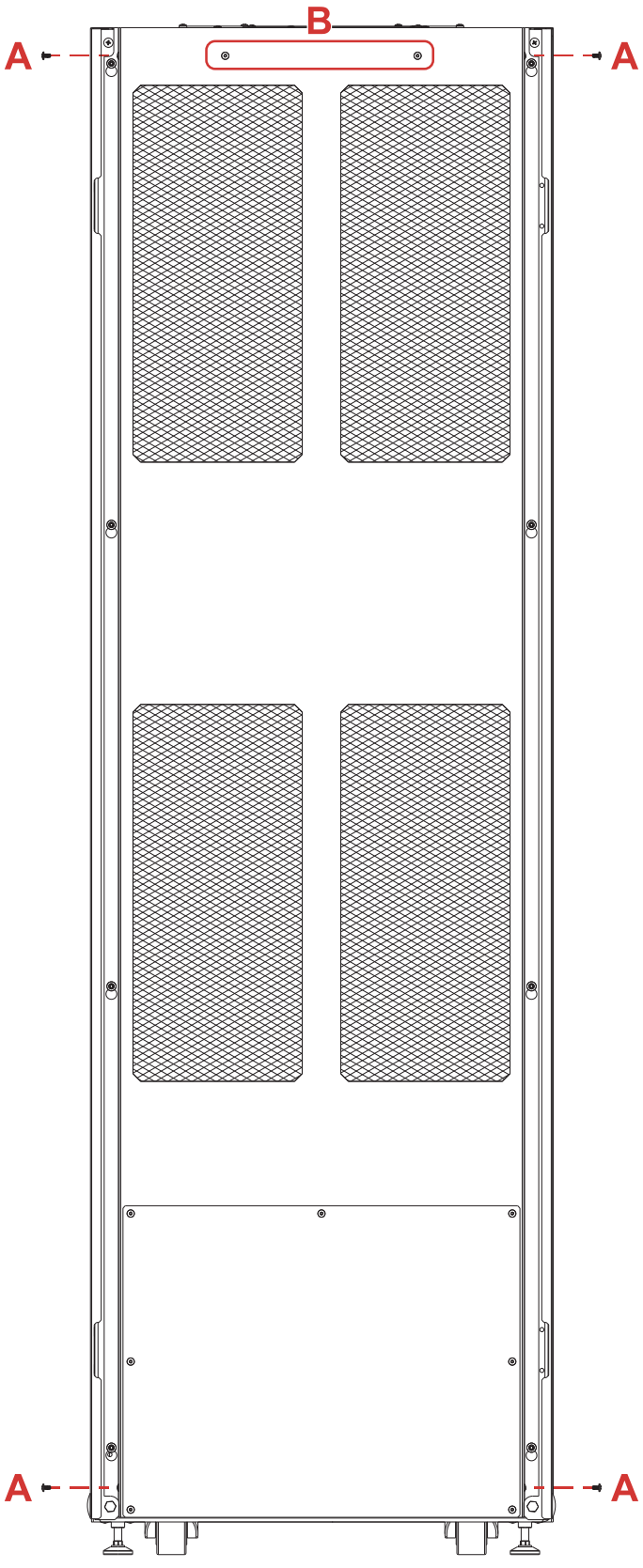
A. Disconnect display cable

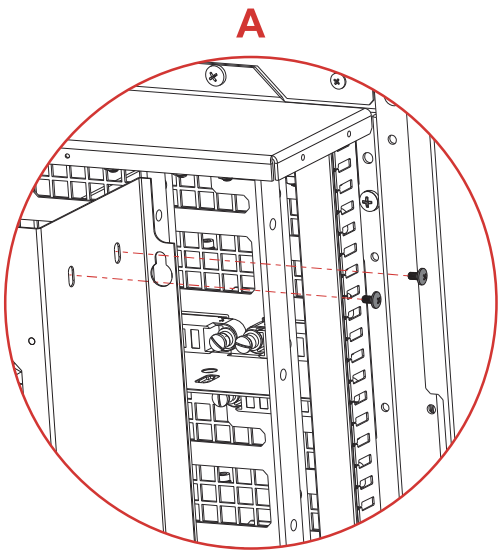
B. Remove hinge pins

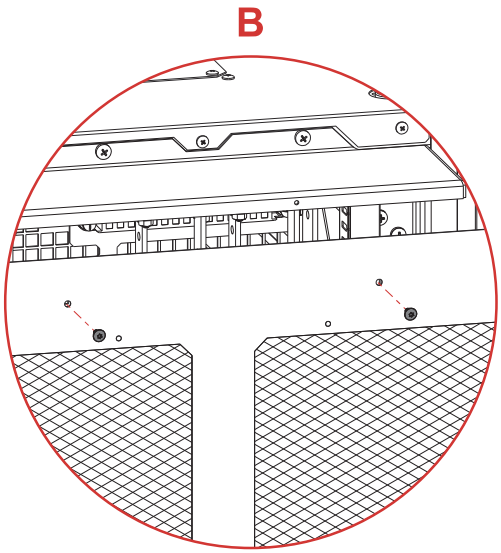
POWER CONNECTION DETAIL

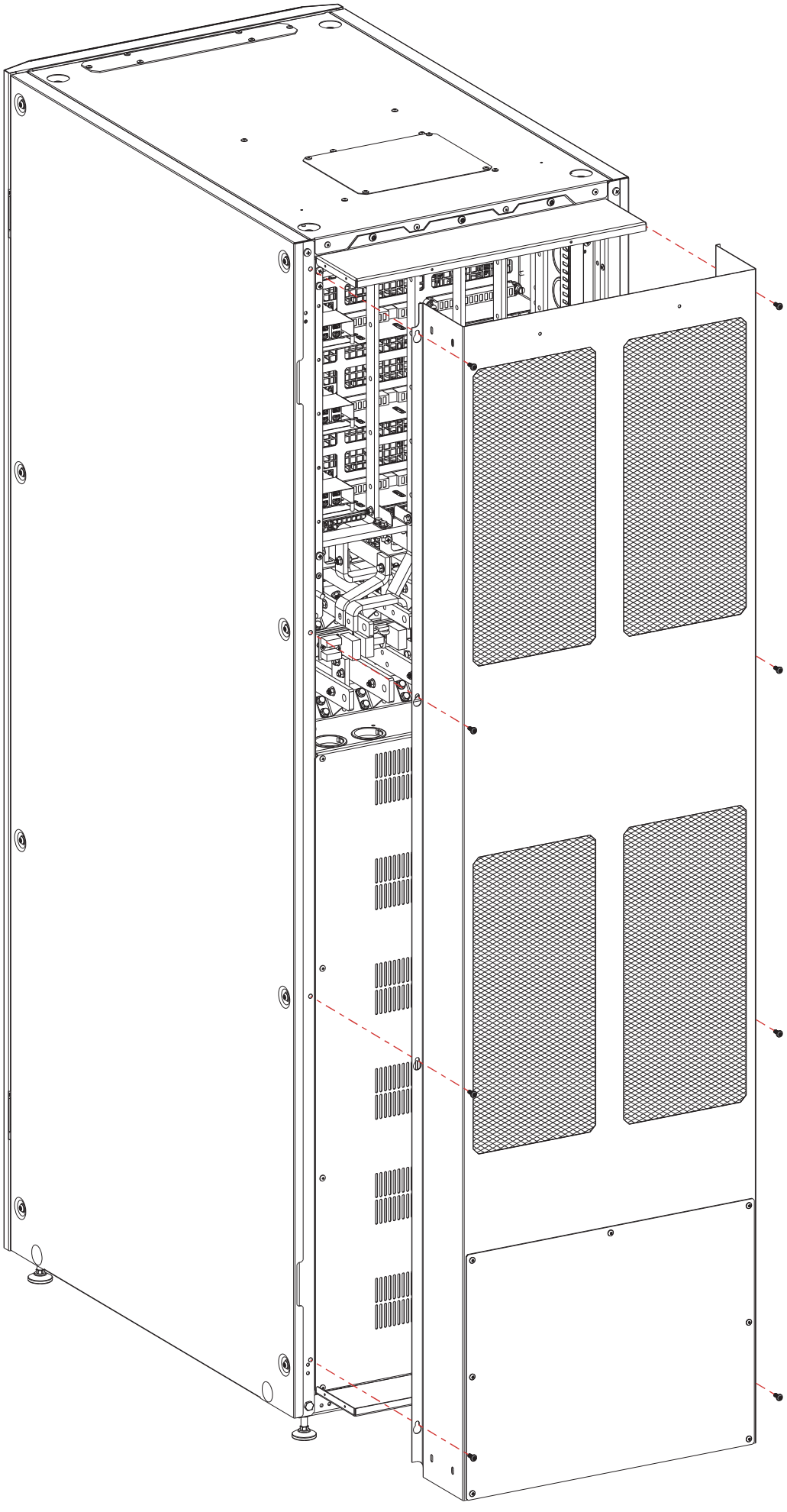
REMOVING REAR TERMINAL CONNECTION PROTECTION COVERS
BEFORE REMOVING THEM, THE SYSTEM MUST BE COMPLETELY ISOLATED FROM ALL POWER SOURCES.

Remove the terminal connection protection covers as shown in the figures below.

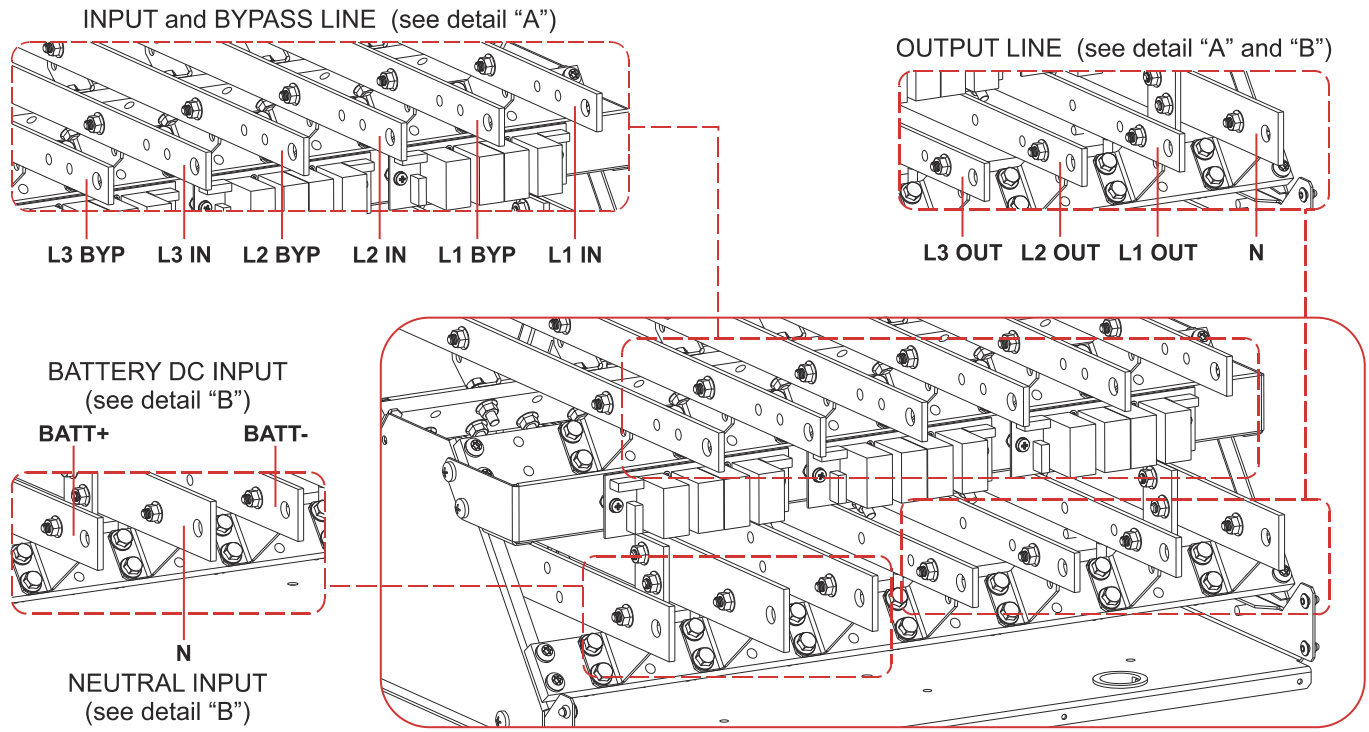




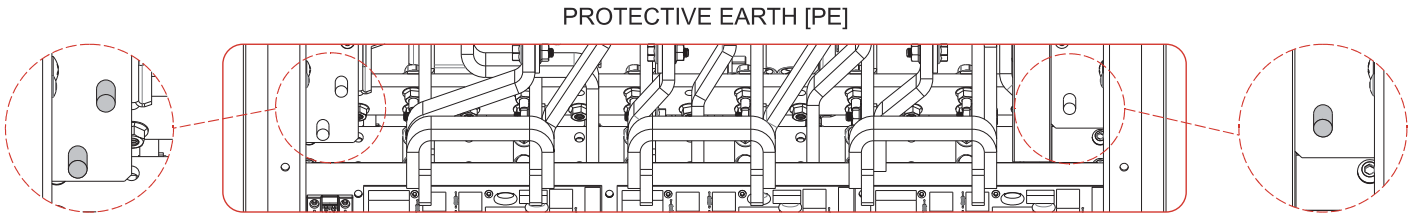




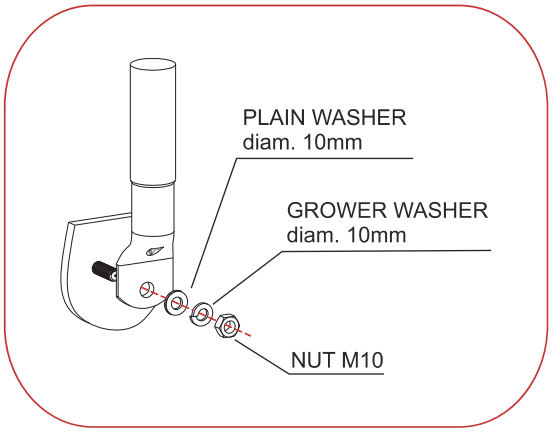
ATTENTION: CONNECT THE WIRES IN THE CORRECT POSITION.
Wrong connections can cause damage to the UPS or the loads.
Do not reverse the polarity of the batteries.
Refer to the operative procedures section within the User manual.



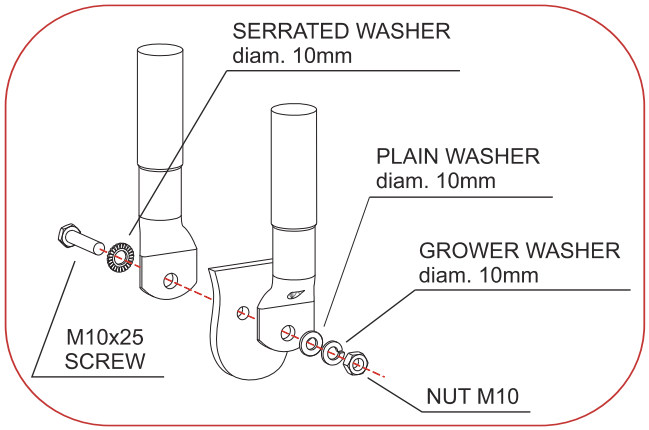
WARNING! This UPS does not need battery central point. Only connect + and – battery terminals to the relative bars.



DETAIL “A”
INPUT, BYPASS, OUTPUT connection cables
Torque 300 lb-in (35 Nm)



DETAIL “B”
NEUTRAL and BATTERY connection cables
Torque 300 lb-in (35 Nm)

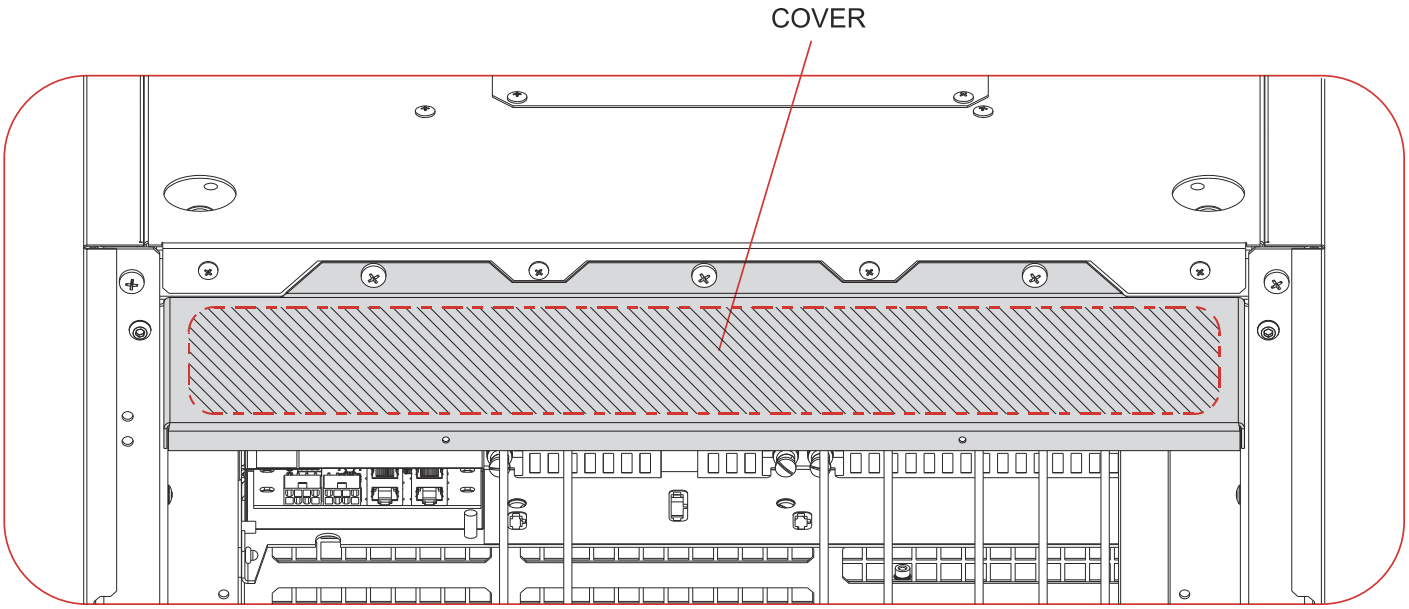


The image above shown an example of top cable entry connection.

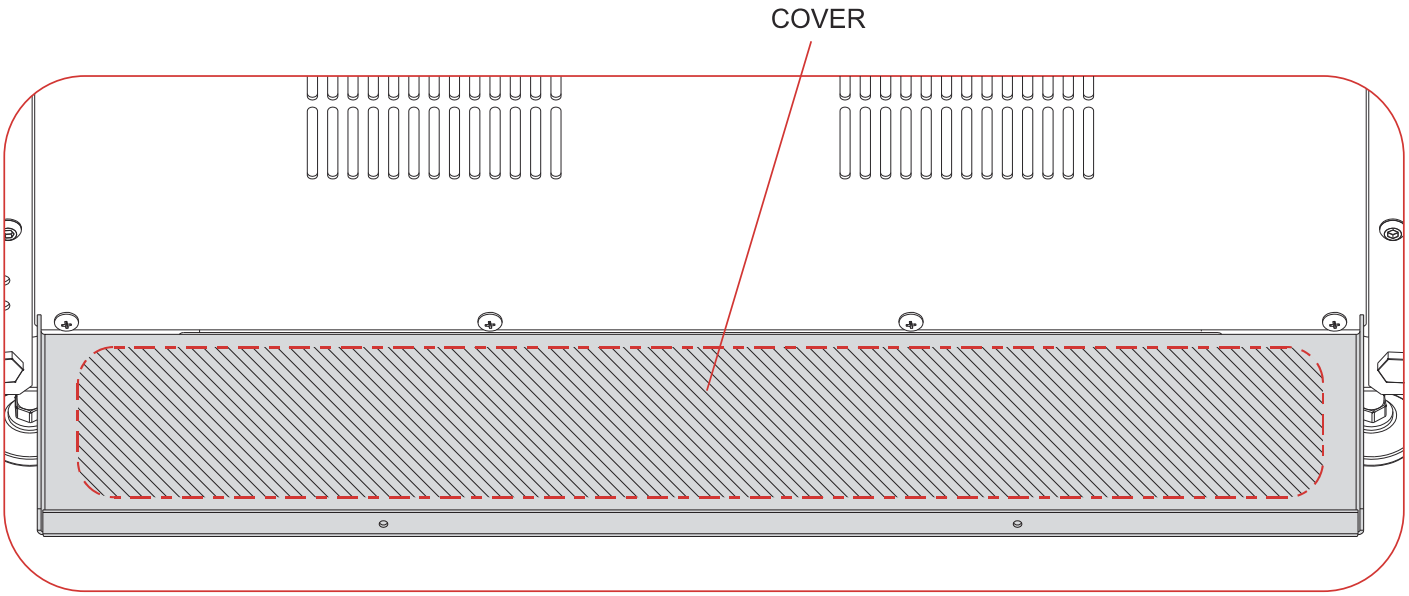
TOP AND BOTTOM CABLE ENTRY

DRILLABLE COVER

1. Drill holes for the cables in the top cover (for the top cable entry) or in the bottom cover (for the bottom cable entry). See figures below.
2. To comply with IP20 protection degree, make sure that the holes size is slightly larger than the wires diameter.
3. Insert conduits (if applicable) or ensure that any sharp edges, which could possibility damage cables, have been removed.

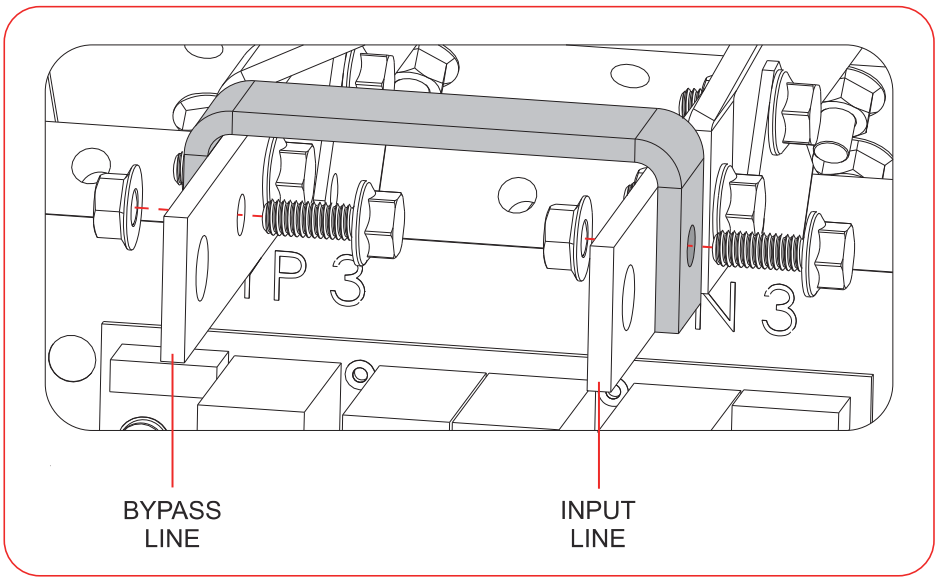


TOP CABLE ENTRY



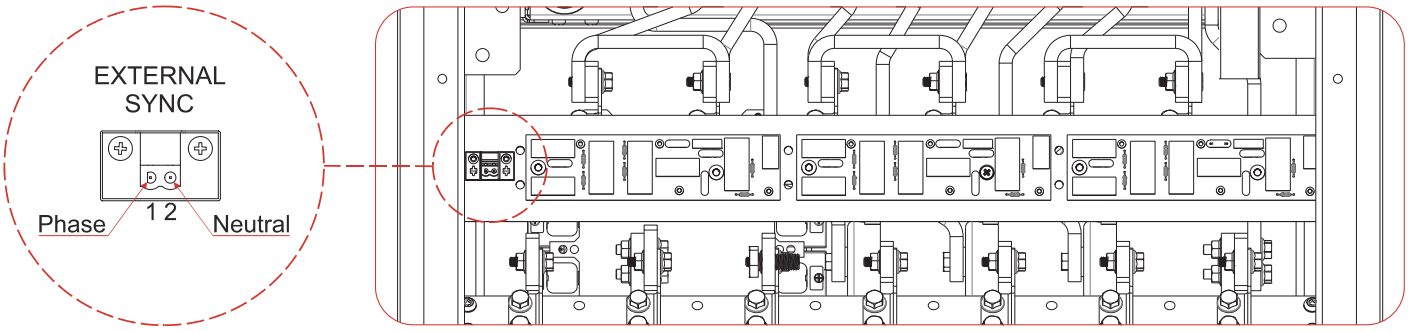
BOTTOM CABLE ENTRY

JUMPER REMOVAL FOR DUAL INPUT



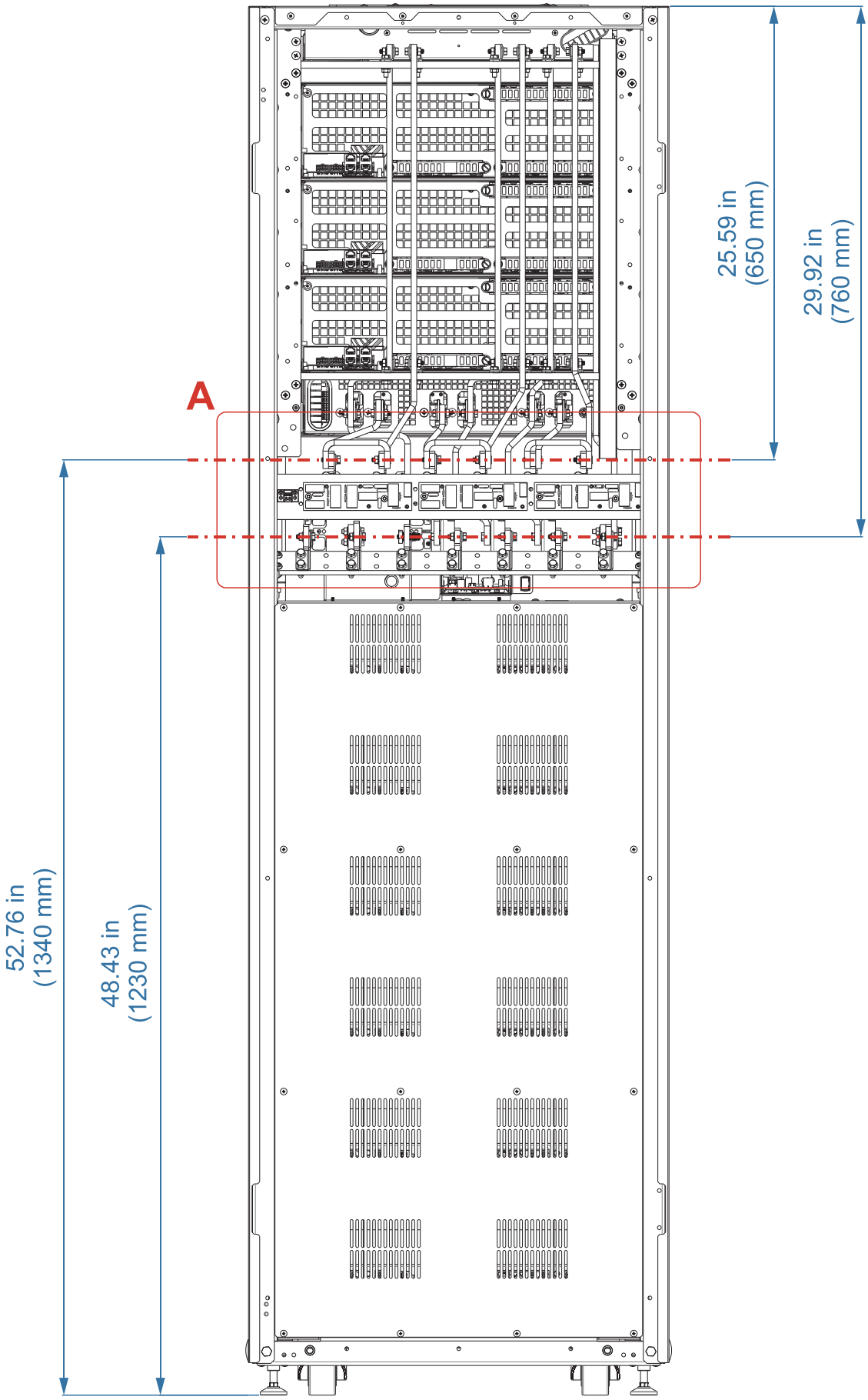
EXTERNAL SYNC

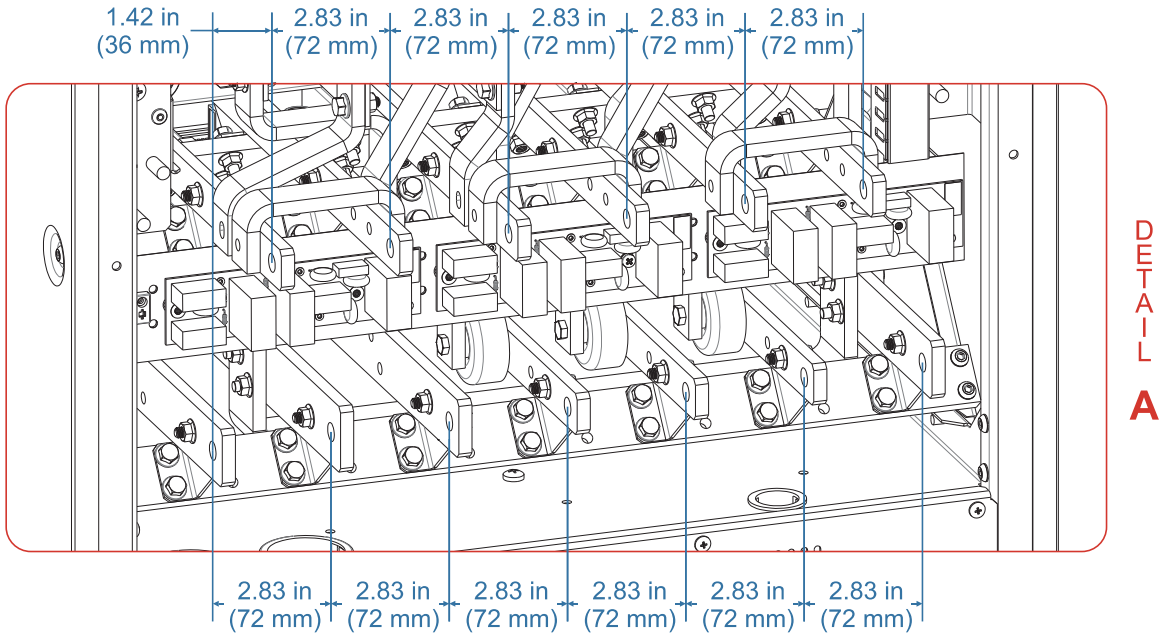
Insulated input to synchronize the output of the UPS to an external source. Use the service configuration software to enable and set the external sync function.
Input parameters: Phase – Neutral max. 120 Vac ± 10%
Connection wires: 15AWG double insulation



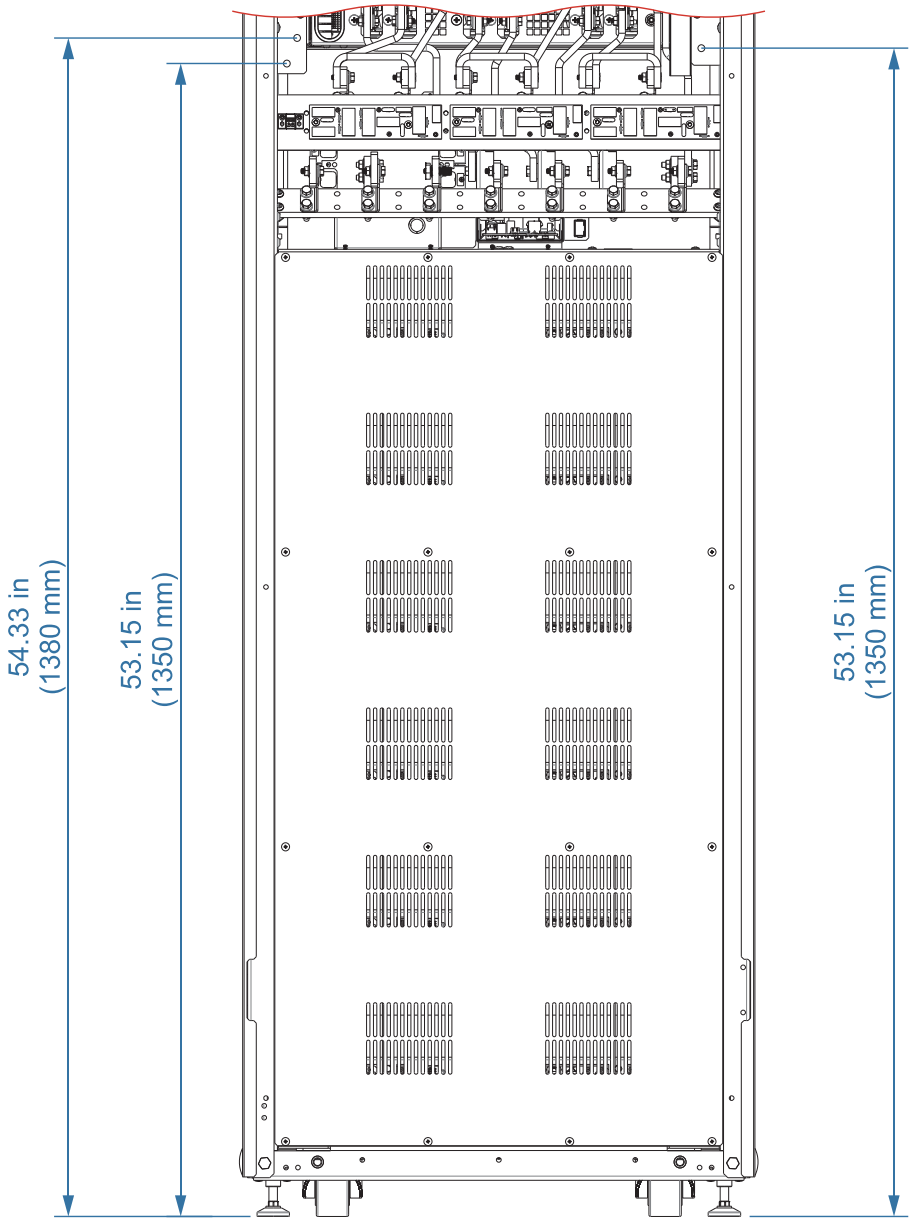
The phase 1 inverter output of the UPS will be synchronised with the connected external source

POWER CONNECTION POSITIONS



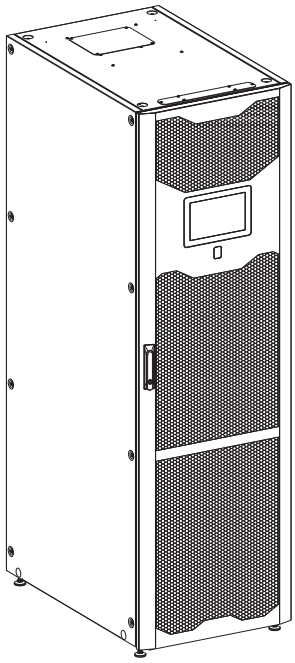


EARTH CONNECTION POSITION



POWER CABINET M2U 140 PC0

PRELIMINARY INFORMATION FOR INSTALLATION



INSTALLATION ENVIRONMENT

When choosing the site in which to install the UPS and the Battery Cabinet, the following points should be taken into consideration:

- Avoid dusty environments.
- Avoid rooms with conductive, inflammable and corrosive items.
- Check that the floor is level and capable of withstanding the weight of the UPS and the Battery Cabinet.
- Avoid cramped environments that could impede the normal maintenance activities.
- The relative humidity should not exceed 95%, non-condensing.
- Avoid installing the equipment in places exposed to the direct sunlight or hot air.
- This equipment is intended for use in a controlled environment; hence the temperature must be regulated within a range between 0 and 40°C.

The UPS may be operated within an ambient temperature of between 0 to 40°C. The recommended working temperature for the UPS and batteries is between 20 to 25°C. Please note, if the battery has an average life of 5 years at a working temperature of 20°C, the life is halved if the working temperature is increased to 30°C.

To maintain the temperature of the installation room to within the range indicated above, there must be a system for eliminating the dissipated heat (the UPS kW / kcal/h / B.T.U./h dissipation values are shown in the table below). The methods that may be used are:

- *Natural ventilation.*
- *Forced ventilation*, recommended if the outside temperature is less (e.g. 20°C) than the temperature at which the UPS or Battery Cabinet is to be operated (e.g. 25°C).
- *Air-conditioning system*, recommended if the outside temperature is higher (e.g. 30°C) than the temperature at which the UPS or Battery Cabinet is to be operated (e.g. 25°C).

AMBIENT AND DIMENSION DETAIL	*Table 3*
Ambient temperature for the UPS	0 - 40°C
Recommended temperature for battery life	20 - 25°C
Range of relative Humidity	5 - 95% (without condensing)
Maximum Operating Altitude (according with IEC/EN 62040-3)	Full power up to 1000 m a.s.l. (power derating of 0.5% for each 100 m between 1000 and 4000 m)
Storage Temperature	UPS: -25°C ÷ +60°C
Isolation protection	IP20
Colour	RAL 9005
Ventilation	Forced, front to rear (Air filter door is standard)
Cable entry	Bottom or rear (Top with optional side cabinet)
Pollution degree	PD2
Vibration resistance	1 m/s^2
Overvoltage category / Protective class	OVC II / class I
Cabinet Dimension (WxDxH)	23.6 x 37 x 78.5 in 600 x 940 x 1995 mm
Shipping Dimension (WxDxH)	27.4 x 43.3 x 84.1 in 750 x 1150 x 2135 mm
Shipping Weight Power Cabinet	556 lb / 252 kg
Net Weight without power modules / Bypass module Included	525 lb / 238 kg
TOTAL Net Weight with 5 power modules / Bypass module Included	933 lb / 423 kg

ELECTRICAL INFORMATION TABLE *Table 4*	
	136 kVA
Power [kVA / kW]	136 / 136
V Input [V]	208 ± 20% (3PH + N)
Frequency Input [Hz]	50 - 60
V Output [V]	208-220 (3PH + N)
Frequency Output [Hz]	50 / 60
Max Leakage Current [mA] (1)	30
Power dissipated @ 100% three-phase load (2)	5.48 kW 4715 kCal/h 18700 B.T.U./h (3)
Flow rate of the fans for removing the heat from the installation room (4)	2923 m^3/h

(1) *The load leakage current is added to the one of the UPS on the ground protection conductor.*

(2) *Fully charged batteries.*

(3) *3.97 BTU / h = 1 kcal / h.*

(4) *To calculate the air flow rate, the following formula may be used: Q [m3/h] = 3.1 x Pdiss [W] / (ta - te) [°C]*
Pdiss is the power expressed in W dissipated by all the devices installed in the installation environment.
ta= ambient temperature, te=outside temperature. To take leaks into account, the value obtained should be increased by 10%.
The table shows an example of a flow rate with (ta - te)=5°C and a rated resistive load (pf=1).
(Note: This formula is applicable if ta>te, only; if the UPS installation does not require an air-conditioning system).

ELECTROMAGNETIC COMPATIBILITY

This UPS complies with Part 15 of the FCC rules (Class A). It may cause radio interference in the home environment. The user may have to adopt supplementary measures.
This product is for professional use in industrial and commercial environments. Connections to USB must be made with the cable provided.

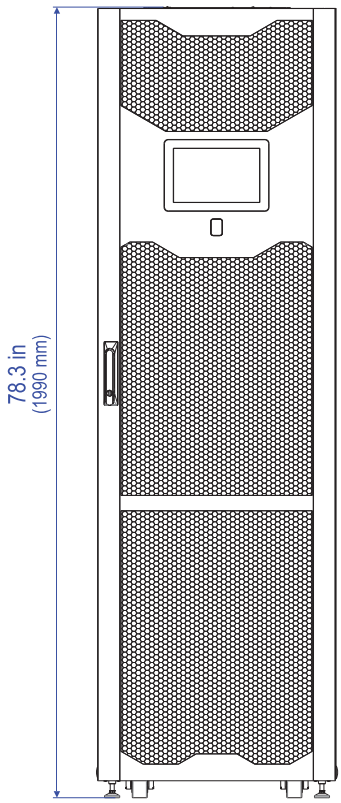
OPERATIVE PROCEDURES

For the correct procedures to switch on/off the system, refer to the User Manual.

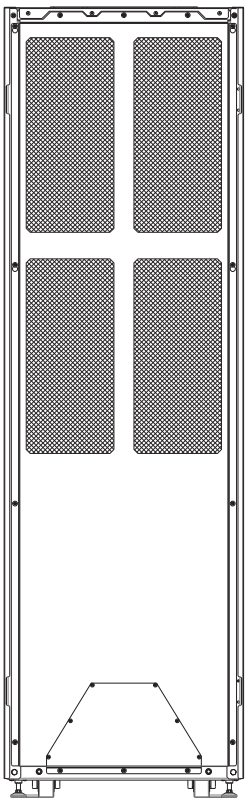
OVERVOLTAGE PROTECTION

The UPS has been designed to be powered by an AC mains supply with category 2 voltage spikes. If it is connected to an AC supply with different characteristics or if it is potentially subject to transitory overvoltage, external protection equipment must be installed to it.

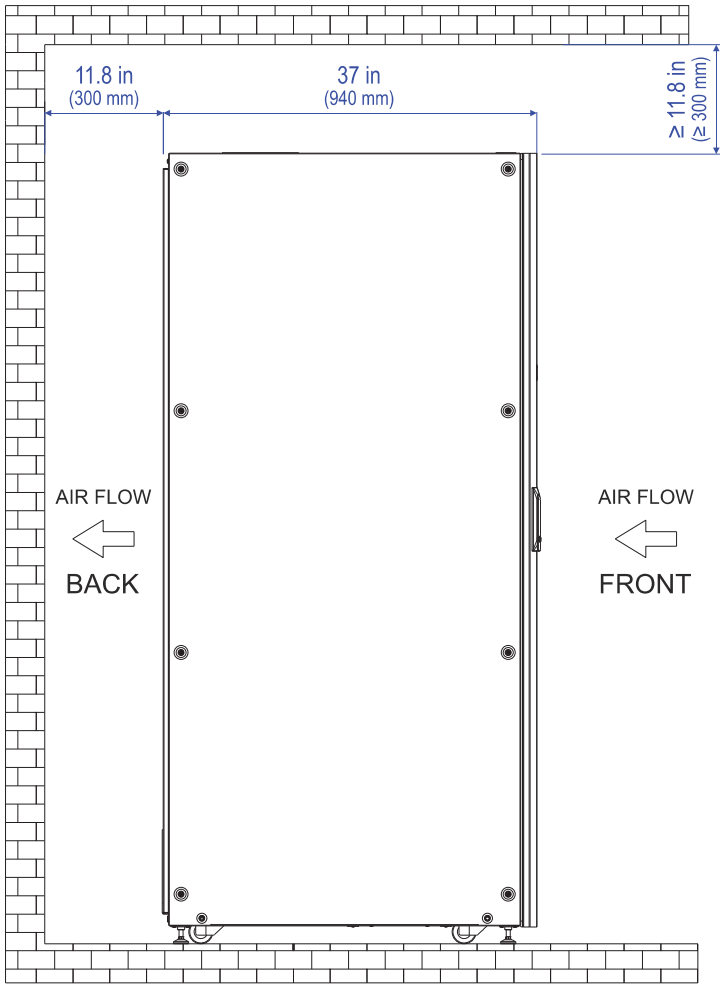
POSITIONING INFORMATION



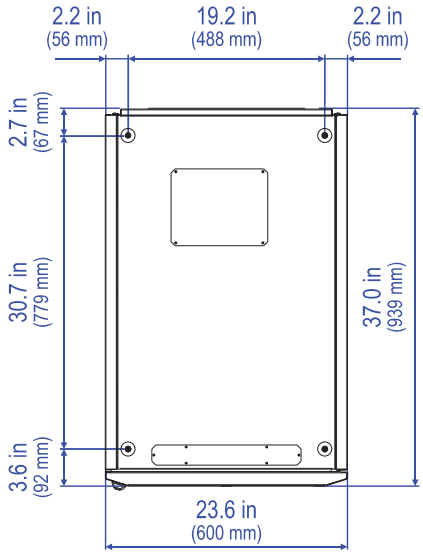
FRONT VIEW



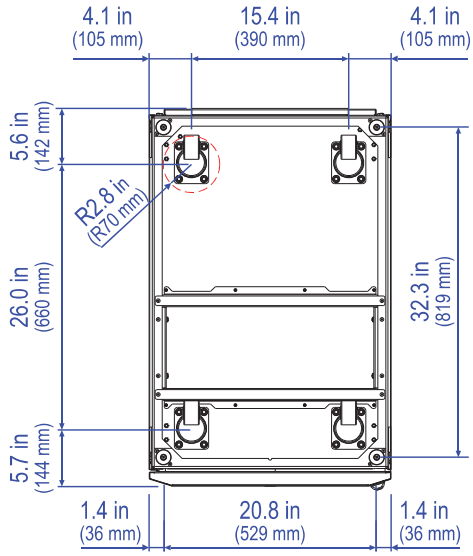
REAR VIEW



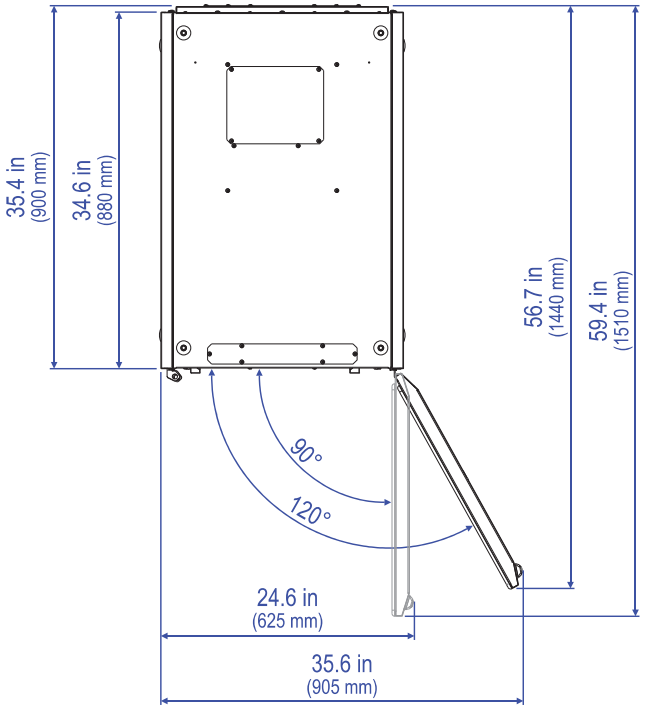
SIDE VIEW



TOP VIEW



BOTTOM VIEW

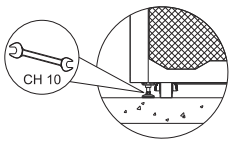


CABINET POSITIONING

Warning! The cabinet cannot be moved and/or delivered to site with the Power Modules inserted.

When positioning, take into account that:
- the cabinet must be positioned without the Power Modules inserted; the Power Modules can only be inserted once the cabinet feet have been lowered.
- The wheels are to be used for final positioning only. Specialist moving equipment must be used to transport the UPS near to the final position.
- Plastic parts and the door are not able to act as pushing points or handles.
- You will need to ensure at least enough free space in front of the cabinet for user operation and maintenance (≈1.2 m).
- Do not place any objects on the top. Do not climb up on the Cabinet. The chassis isn't designed to hold up the weight of a person.

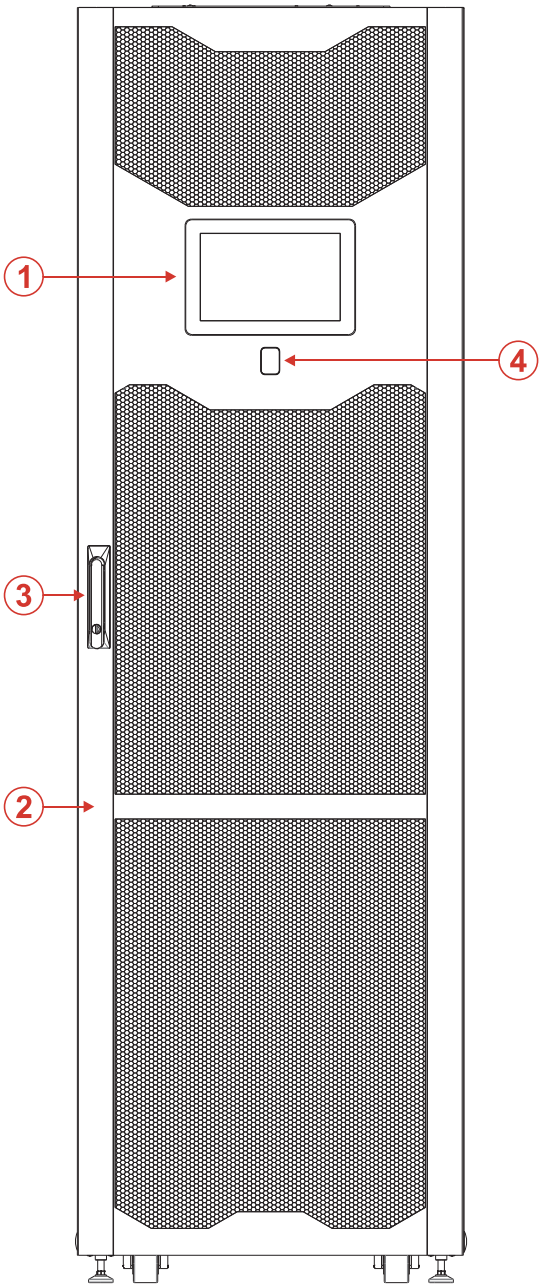
Warning! The cabinet must be positioned on a level floor.
Ensure that the floor can support the total weight of the system.
The weight of the Power Cabinet full of Power Modules is 933lb (423 kg).

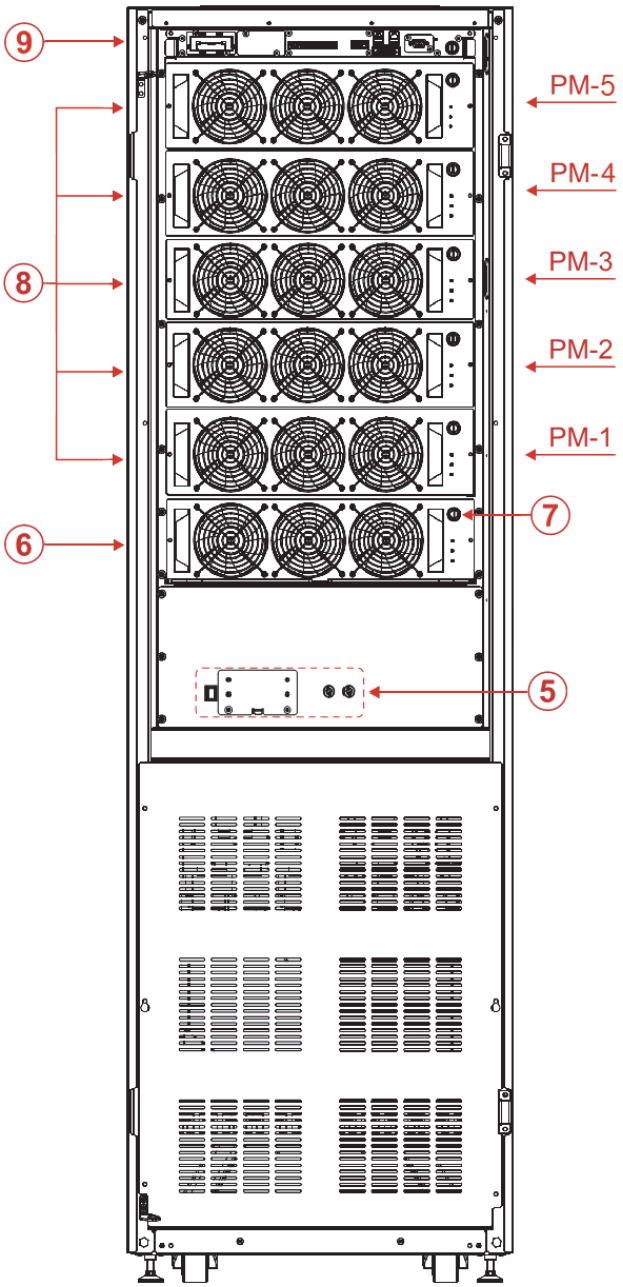


After positioning, lower the four feet to the floor, using an appropriate spanner.
Ensure that the total weight of the cabinet is supported by the feet only (the revolving wheels must be lifted from floor).
Ensure that the Power Cabinet is level.

It is advisable to reuse the pallet fastening brackets to anchor the Power Cabinet to the floor.

UPS PARTS AND MODULES





1. Display (MCU)
2. Door with air filter
3. Handle
4. UPS status LED
5. Cold Start section
6. Bypass Module (BM)
7. Switch Lock
(locking system present on all modules)
8. Power Module (PM)
9. Connectivity panel

WARNING! The cabinet cannot be moved and/or delivered on site with Power Modules inserted.

POWER CONNECTION INFORMATION

PM 20 MODULE

Input AC Line Connection 3PH + N + PE (Single / Dual Mains)								
N module	Max Power [kW-kVA]	Max current [1] [A]	Max admitted neutral current [A]	Size of line protection device (plant) [A]	Terminal IN1, IN2, IN3, N / PE		Wire IN1, IN2, IN3, N / PE [4],[5]	
					Type	Bolt	Type	Size [N x AWG or kcmil]
1	20	72	97	100	Al BAR / Steel bolt (PE)	2 x M10 (PH IN) 300 lb-in (35 Nm) / 2 x M10 (NEUTRAL) 300 lb-in (35 Nm) / 1 x M8 (PE) 175 lb-in (20 Nm)	90°C copper wire	2 x AWG 3/0 (PH IN) / 2 x 300 (NEUTRAL) / 1 x AWG 2 (PE)
2	40	145	193	200				
3	60	217	289	300				
4	80	289	385	400				
5	100	361	482	500				

BYPASS AC Line Connection 3PH + N + PE (Dual Mains)							
Max Power [kW-kVA]	Max nominal current [A]	Max admitted neutral current [A]	Size of line protection device (plant) [A]	Terminal BYP1, BYP2, BYP3, N / PE		Wire BYP1, BYP2, BYP3, N / PE [4],[5]	
				Type	Bolt	Type	Size [N x AWG or kcmil]
100	277	480	400	Al BAR / Steel bolt (PE)	2 x M10 (PH BYP) 300 lb-in (35 Nm) / 2 x M10 (NEUTRAL) 300 lb-in (35 Nm) / 1 x M8 (PE) 175 lb-in (20 Nm)	90°C copper wire	2 x AWG 2/0 (PH BYP) / 2 x 300 (NEUTRAL) / 1 x AWG 3 (PE)

Output AC Line Connection 3PH + N + PE									
N module	Max Power [kW-kVA]	Max nominal current [2] In [A]	Max admitted neutral current [A]	Terminal OUT1, OUT2, OUT3, N / PE		Wire OUT1, OUT2, OUT3, N / PE[5]		Output line protection (recommended values for selectivity)	
				Type	Bolt	Type	Size [N x AWG or kcmil]	Normal Fuses (gL - gG)	Thermal magnetic switches (C curve)
1	20	56	96	Al BAR / Steel bolt (PE)	2 x M10 (PH OUT) 300 lb-in (35 Nm) / 2 x M10 (NEUTRAL) 300 lb-in (35 Nm) / 1 x M8 (PE) 175 lb-in (20 Nm)	90°C copper wire	2 x AWG 2/0 (PH OUT) / 2 x 300 (NEUTRAL) / 1 x AWG 3 (PE)	In/4	In/4
2	40	111	192						
3	60	167	288						
4	80	224	384						
5	100	280	480						

Input Battery DC Line Connection BATT+, BATT-, PE								
N module	Max Power [kW-kVA]	Rated Current [A] [3]		Size of battery line protection device [A]	Terminal BATT +, BATT - / PE		Wire BATT +, BATT / PE [4],[5]	
		@nominal battery voltage	@end of discharge voltage		Type	Bolt	Type	Size [N x AWG or kcmil]
1	20	87	105	180	Al BAR / Steel bolt (PE)	2 x M10 (BATT+, BATT-) 300 lb-in (35 Nm) / 1 x M8 (PE) 175lb-in (20 Nm)	90°C copper wire	2 x 350 (BATT+, BATT-) / 1 x AWG 1 (PE)
2	40	175	210	300				
3	60	262	314	400				
4	80	348	420	500				
5	100	435	525	600				

PM 25 MODULE

Input AC Line Connection 3PH + N + PE (Single / Dual Mains)								
N module	Max Power [kW-kVA]	Max current (1) [A]	Max admitted neutral current [A]	Size of line protection device (plant) [A]	Terminal IN1, IN2, IN3, N / PE		Wire IN1, IN2, IN3, N / PE (4),(5)	
					Type	Bolt	Type	Size [N x AWG or kcmil]
1	25	91	120	150	Al BAR / Steel bolt (PE)	2 x M10 (PH IN) 300 lb-in (35 Nm) / 2 x M10 (NEUTRAL) 300 lb-in (35 Nm) / 1 x M8 (PE) 175 lb-in (20 Nm)	90°C copper wire	2 x 250 (PH IN) / 2 x 400 (NEUTRAL) / 1 x AWG 1 (PE)
2	50	182	240	225				
3	75	273	360	400				
4	100	364	480	500				
5	125	455	600	600				

BYPASS AC Line Connection 3PH + N + PE (Dual Mains)							
Max Power [kW-kVA]	Max nominal current [A]	Max admitted neutral current [A]	Size of line protection device (plant) [A]	Terminal BYP1, BYP2, BYP3, N / PE		Wire BYP1, BYP2, BYP3, N / PE (4),(5)	
				Type	Bolt	Type	Size [N x AWG or kcmil]
125	362	627	500	Al BAR / Steel bolt (PE)	2 x M10 (PH BYP) 300 lb-in (35 Nm) / 2 x M10 (NEUTRAL) 300 lb-in (35 Nm) / 1 x M8 (PE) 175 lb-in (20 Nm)	90°C copper wire	2 x AWG 3/0 (PH BYP) / 2 x 500 (NEUTRAL) / 1 x AWG 2 (PE)

Output AC Line Connection 3PH + N + PE									
N module	Max Power [kW-kVA]	Max nominal current (2) In [A]	Max admitted neutral current [A]	Terminal OUT1, OUT2, OUT3, N / PE		Wire OUT1, OUT2, OUT3, N / PE(5)		Output line protection (recommended values for selectivity)	
				Type	Bolt	Type	Size [N x AWG or kcmil]	Normal Fuses (gL - gG)	Thermal magnetic switches (C curve)
1	25	70	120	Al BAR / Steel bolt (PE)	2 x M10 (PH OUT) 300 lb-in (35 Nm) / 2 x M10 (NEUTRAL) 300 lb-in (35 Nm) / 1 x M8 (PE) 175 lb-in (20 Nm)	90°C copper wire	2 x AWG 3/0 (PH OUT) / 2 x 400 (NEUTRAL) / 1 x AWG 1 (PE)	In/4	In/4
2	50	140	240						
3	75	210	260						
4	100	280	480						
5	125	350	600						

Input Battery DC Line Connection BATT+, BATT-, PE								
N module	Max Power [kW-kVA]	Rated Current [A] (3)		Size of battery line protection device [A]	Terminal BATT +, BATT - / PE		Wire BATT +, BATT / PE (4),(5)	
		@nominal battery voltage	@end of discharge voltage		Type	Bolt	Type	Size [N x AWG or kcmil]
1	25	109	130	200	Al BAR / Steel bolt (PE)	2 x M10 (BATT+, BATT-) 300 lb-in (35 Nm) / 1 x M8 (PE) 175lb-in (20 Nm)	90°C copper wire	2 x 350 (BATT+, BATT-) / 1 x AWG 1/0 (PE)
2	50	218	260	300				
3	75	327	330	400				
4	100	436	520	600				
5	125	545	650	700				

PM 34 MODULE

Input AC Line Connection 3PH + N + PE (Single / Dual Mains)								
N module	Max Power [kW-kVA]	Max current (1) [A]	Max admitted neutral current [A]	Size of line protection device (plant) [A]	Terminal IN1, IN2, IN3, N / PE		Wire IN1, IN2, IN3, N / PE (4),(5)	
					Type	Bolt	Type	Size [N x AWG or kcmil]
1	34	123	165	175	Al BAR / Steel bolt (PE)	2 x M10 (PH IN) 300 lb-in (35 Nm) / 2 x M10 (NEUTRAL) 300 lb-in (35 Nm) / 1 x M8 (PE) 175 lb-in (20 Nm)	90°C copper wire	2 x 300 (PH IN) / 2 x 500 (NEUTRAL) / 1 x AWG 1 (PE)
2	68	245	330	300				
3	102	369	495	500				
4	136	492	660	600				
5	136	492	660	600				

BYPASS AC Line Connection 3PH + N + PE (Dual Mains)							
Max Power [kW-kVA]	Max nominal current [A]	Max admitted neutral current [A]	Size of line protection device (plant) [A]	Terminal BYP1, BYP2, BYP3, N / PE		Wire BYP1, BYP2, BYP3, N / PE (4),(5)	
				Type	Bolt	Type	Size [N x AWG or kcmil]
136	378	660	500	Al BAR / Steel bolt (PE)	2 x M10 (PH BYP) 300 lb-in (35 Nm) / 2 x M10 (NEUTRAL) 300 lb-in (35 Nm) / 1 x M8 (PE) 175 lb-in (20 Nm)	90°C copper wire	2 x AWG 4/0 (PH BYP) / 2 x 500 (NEUTRAL) / 1 x AWG 2 (PE)

Output AC Line Connection 3PH + N + PE									
N module	Max Power [kW-kVA]	Max nominal current (2) In [A]	Max admitted neutral current [A]	Terminal OUT1, OUT2, OUT3, N / PE		Wire OUT1, OUT2, OUT3, N / PE(5)		Output line protection (recommended values for selectivity)	
				Type	Bolt	Type	Size [N x AWG or kcmil]	Normal Fuses (gL - gG)	Thermal magnetic switches (C curve)
1	34	95	165	Al BAR / Steel bolt (PE)	2 x M10 (PH OUT) 300 lb-in (35 Nm) / 2 x M10 (NEUTRAL) 300 lb-in (35 Nm) / 1 x M8 (PE) 175 lb-in (20 Nm)	90°C copper wire	2 x AWG 4/0 (PH OUT) / 2 x 500 (NEUTRAL) / 1 x AWG 2 (PE)	In/4	In/4
2	68	190	330						
3	102	283	495						
4	136	378	660						
5	136	378	660						

Input Battery DC Line Connection BATT+, BATT-, PE								
N module	Max Power [kW-kVA]	Rated Current [A] (3)		Size of battery line protection device [A]	Terminal BATT +, BATT - / PE		Wire BATT +, BATT / PE (4),(5)	
		@nominal battery voltage	@end of discharge voltage		Type	Bolt	Type	Size [N x AWG or kcmil]
1	34	148	178	180	Al BAR / Steel bolt (PE)	2 x M10 (BATT+, BATT-) 300 lb-in (35 Nm) / 1 x M8 (PE) 175lb-in (20 Nm)	90°C copper wire	2 x 600 (BATT+, BATT-) / 1 x AWG 1/0 (PE)
2	68	296	356	400				
3	102	444	534	600				
4	136	592	712	800				
5	136	592	712	800				

(1) Input voltage at 96 V and battery charger off

(2) Output voltage 208 V

(3) Nominal voltage 240 V

(4) To be compliant with CE standards, the PE conductor cross section shall be minimum 120mmq

(5) The suggested wire size refers to 90°C copper wire rated cables with an ambient temperature of 30°C. If different cables are used, or installed at an higher ambient temperature, the cable size need to be reviewed according to the National Electric Code (Table 310.16)

SYSTEM PROTECTIONS INFORMATION

THE INPUT, OUTPUT AND PROTECTIVE EARTHING CONDUCTORS MUST BE SIZED FOLLOWING THE RATED VOLTAGE AND CURRENT, AS SHOWN IN THE TABLES AND ALSO COMPLY WITH LOCAL AND NATIONAL REGULATION FOR MAXIMUM POWER RATING.

WARNING **THE PROTECTIVE EARTHING CONDUCTOR (PE) MUST BE CONNECTED PRIOR TO CONNECTING ANY INPUT / OUTPUT CABLES.**

INPUT LINE PROTECTION

Install a line protective device upstream the UPS. Refer to section “Power Connection Information” to set the right size. In case an automatic circuit breaker is used, a 5-10xIn magnetic trip threshold is recommended.
If the device interrupts the neutral wire, it must also interrupt all of the phase wires at the same time.
The disconnect device shall have a contact separation of at least 3 mm

SHORT CIRCUIT PROTECTION

If a failure at the output occurs, the UPS protects itself by limiting the value and duration of the output current (short-circuit current). These values also depend on the operating status of the UPS at the time of the failure; there are two different scenarios:

- UPS in NORMAL OPERATION with the bypass input available: the load is instantly switched to the bypass line; the input line is connected to the output via static switch limited by the internal protection (pre-arcing fuse bypass $I^2t = 25000A^2s$) and blocked after t > 500ms.
- UPS in BATTERY OPERATION or in NORMAL OPERATION without a bypass supply: the UPS protects itself by supplying 2.5 times the nominal current to the output for the first 100ms, which is then reduced to 1.5 times nominal for 400 ms. After this time (500 ms) it switches off.

SHORT-CIRCUIT WITHSTANDING

Icc = 100kA (current limited by internal fuses). Refers to the single UPS.

BACKFEED PROTECTION

The UPS has an internal protection against backfeed. This protection acts by means of a sensing circuit which turns the inverter off if a fault within the static switch is detected. During this condition, to avoid interrupting the supply to the connected load, the UPS switches to the bypass line.
If this fault occurs during battery operation, the inverter is stopped.
A volt free contact can be configured to drive a disconnecting device to be installed upstream the bypass input to the UPS, in this case when a backfeed fault occurs, the system opens the external disconnecting device, hence avoiding the requirement to stop the inverter (refer to the advanced configuration manual to configure this option).
The current rating of the disconnecting device must comply with the instruction outlined in the “Power Connection Information” section.

GFCI DEVICE (GROUND FAULT CIRCUIT INTERRUPTER)

WARNING: risk of electric shock from high leakage current.
The earth leakage current of this UPS may exceed 3.5 mA.
A proper earth connection must be provided.

Basing on the electrical system adopted and on the local regulations, a Ground Fault Circuit Interrupter or a Residual Current Device may be requested.

Transient and steady-state earth leakage currents, which may occur when starting the equipment, and the additional leakage current of the load should be taken into account when selecting instantaneous RCD or GFCI devices.

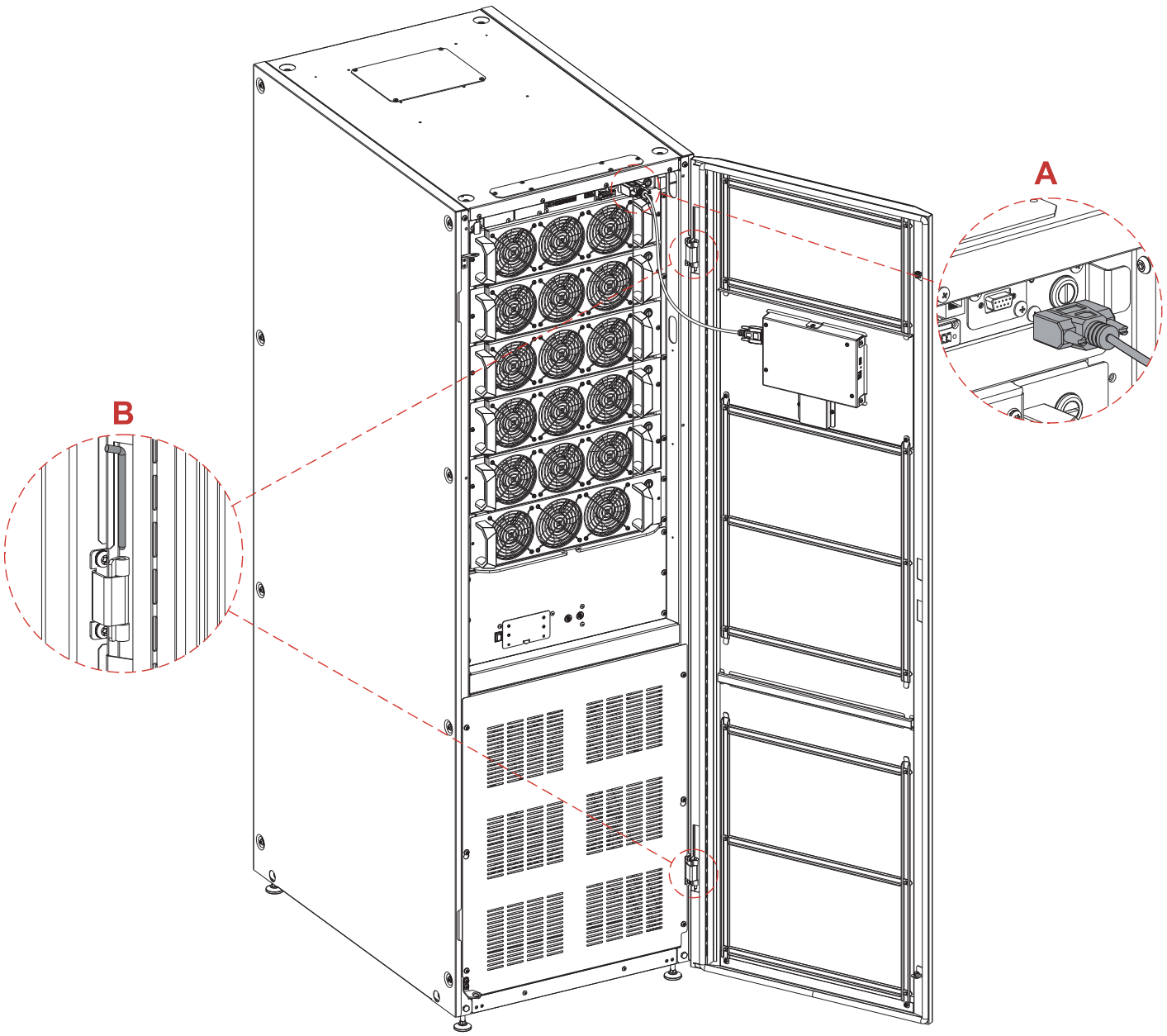
During normal operation, when the mains supply is present, a RCD breaker at the input of the UPS will activate if a fault occurs at the output side, since the output circuit is not isolated from the input.
In any case, other RCD breakers may still be installed at the output, preferably in coordination with those present at the input.

Residual current devices must be selected sensitive to DC unidirectional pulses and insensitive to transient current pulses.

NOTE for DUAL INPUT connection:

1. A single RCD/GFCI device must be installed upstream at the point where the sources divide to supply the standard input and the bypass input of the UPS.
2. If the standard input and the bypass input are supplied from two separated sources, then it is required to use a dedicated RCD/GFCI device for each source.

REMOVING DOOR



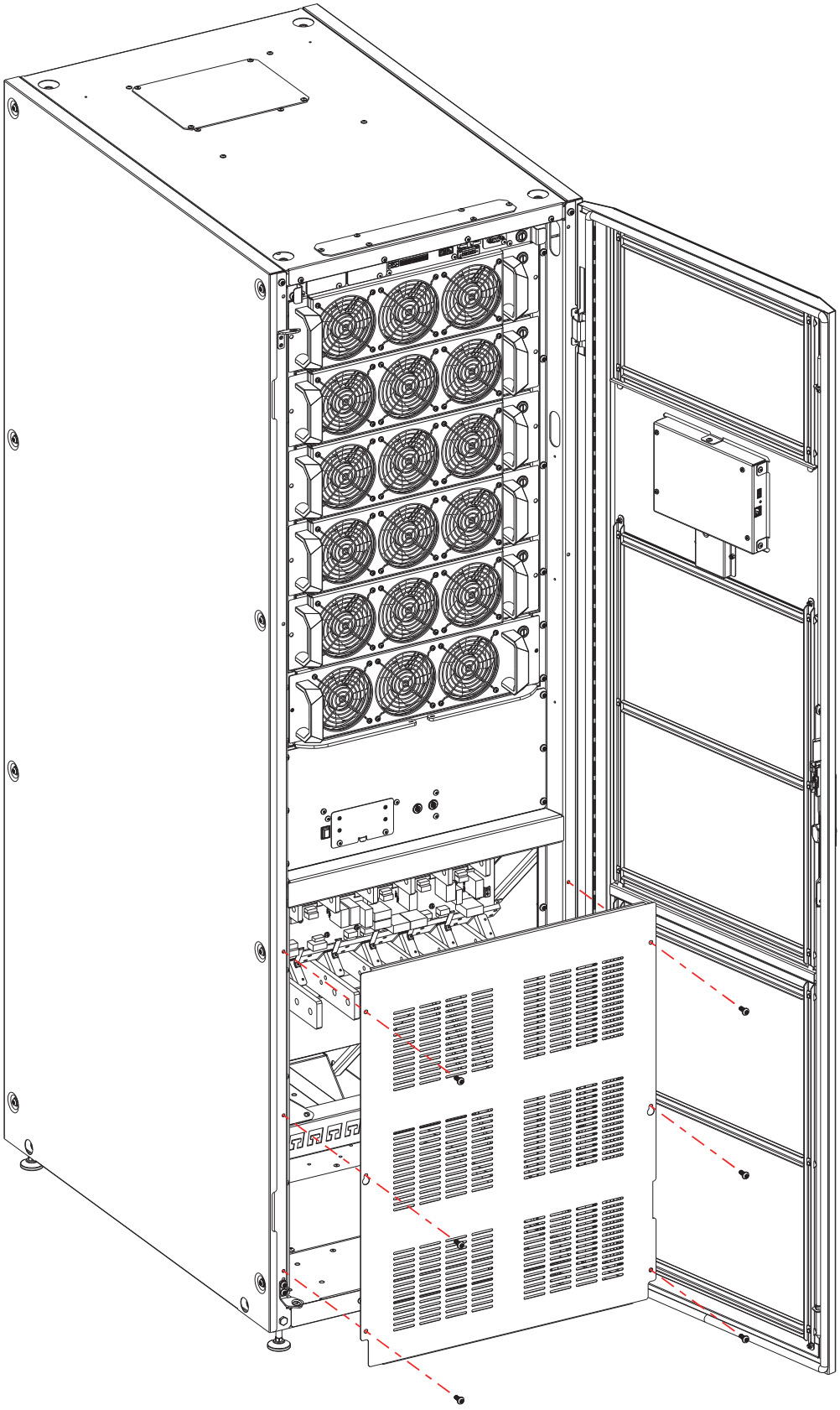
A. Disconnect display cable

B. Remove hinge pins

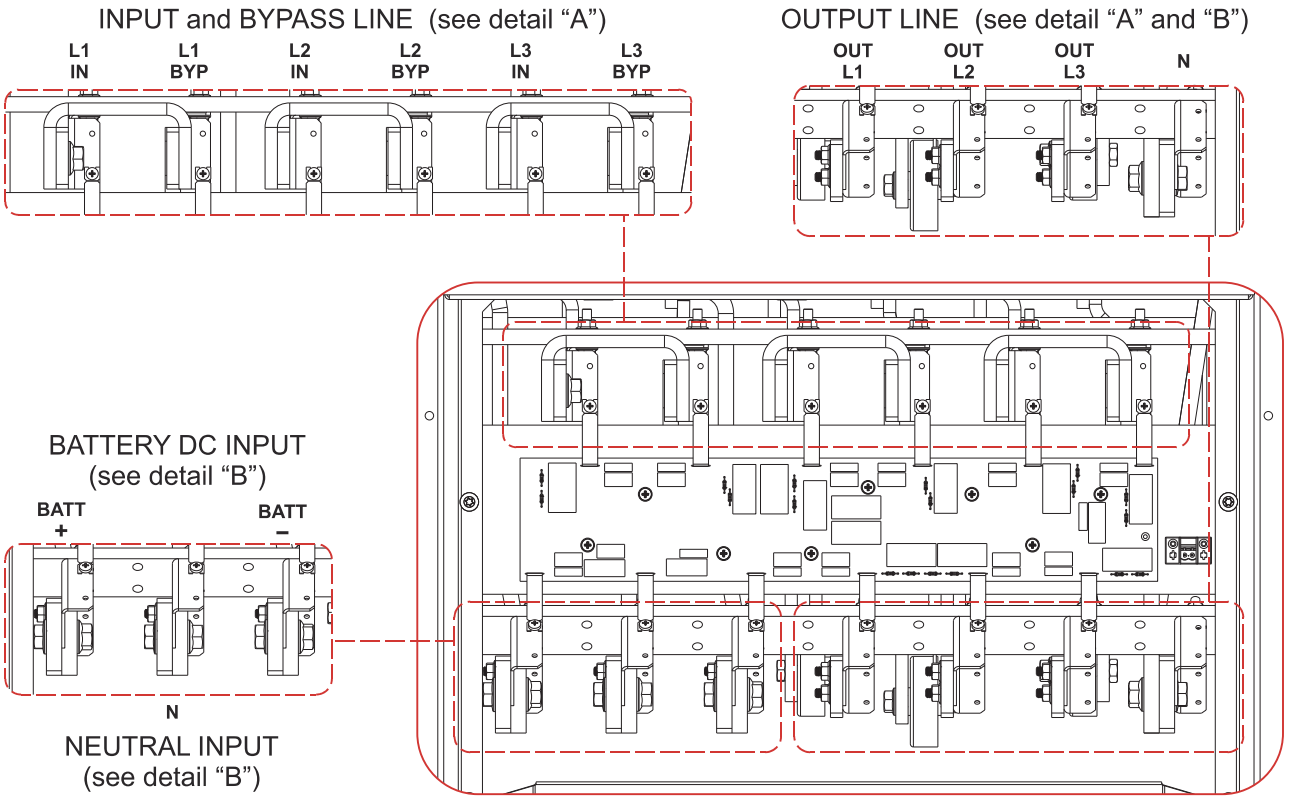
POWER CONNECTION DETAIL

REMOVING TERMINAL CONNECTION PROTECTION COVERS
BEFORE REMOVING THEM, THE SYSTEM MUST BE COMPLETELY ISOLATED FROM ALL POWER SOURCES.

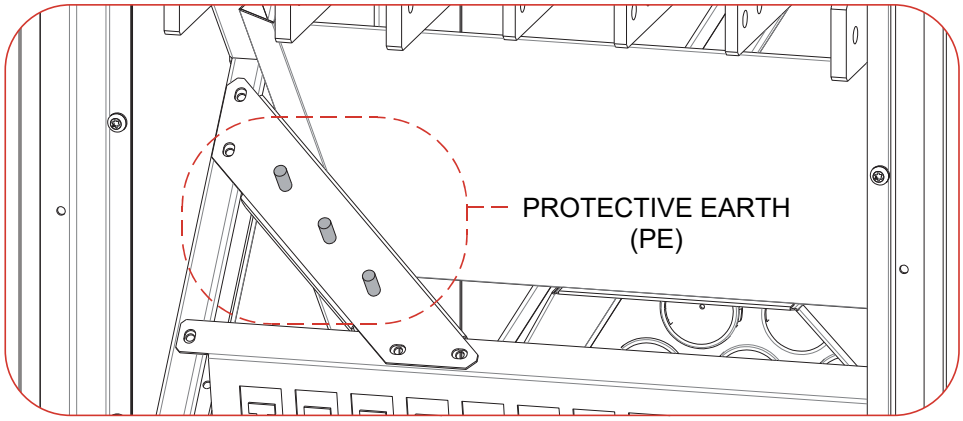
Remove the terminal connection protection covers as shown in the figures below.



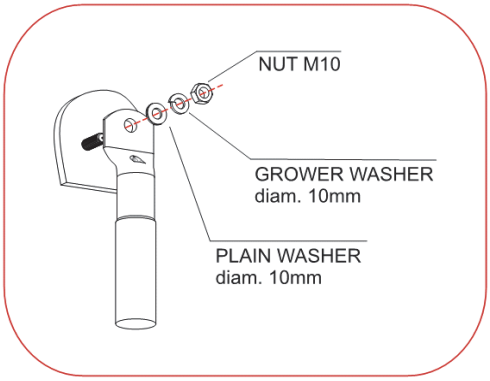
ATTENTION: CONNECT THE WIRES IN THE CORRECT POSITION.
Wrong connections can cause damage to the UPS or the loads.
Do not reverse the polarity of the batteries.
Refer to the operative procedures section within the User manual.



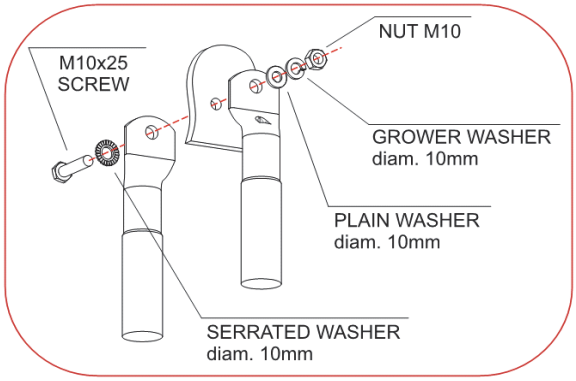
WARNING! This UPS does not need battery central point. Only connect + and – battery terminals to the relative bars.



DETAIL "A"
INPUT, BYPASS, OUTPUT connection cables
Torque 300 lb-in (35 Nm)



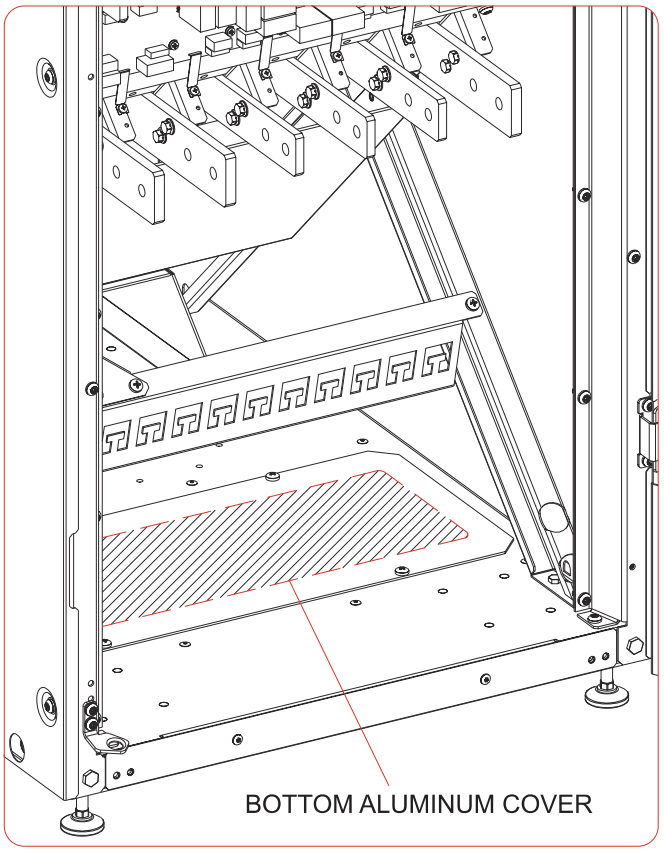
DETAIL "B"
NEUTRAL and BATTERY connection cables
Torque 300 lb-in (35 Nm)

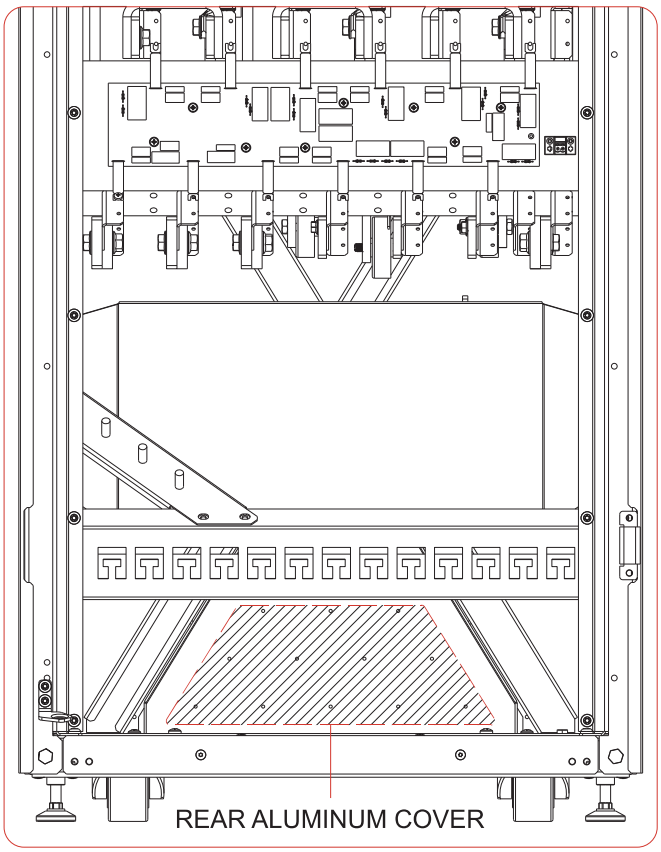


BOTTOM CABLE ENTRY

1. Drill holes for the cables in the bottom aluminum cover (e.g. in case of floating floors) or in the rear aluminum cover (in case of floor-level cable ducts). See figures below.
2. To comply with IP20 protection degree, make sure that the holes size is slightly larger than the wires diameter.
3. Insert conduits (if applicable) or ensure that any sharp edges, which could possibility damage cables, have been removed.

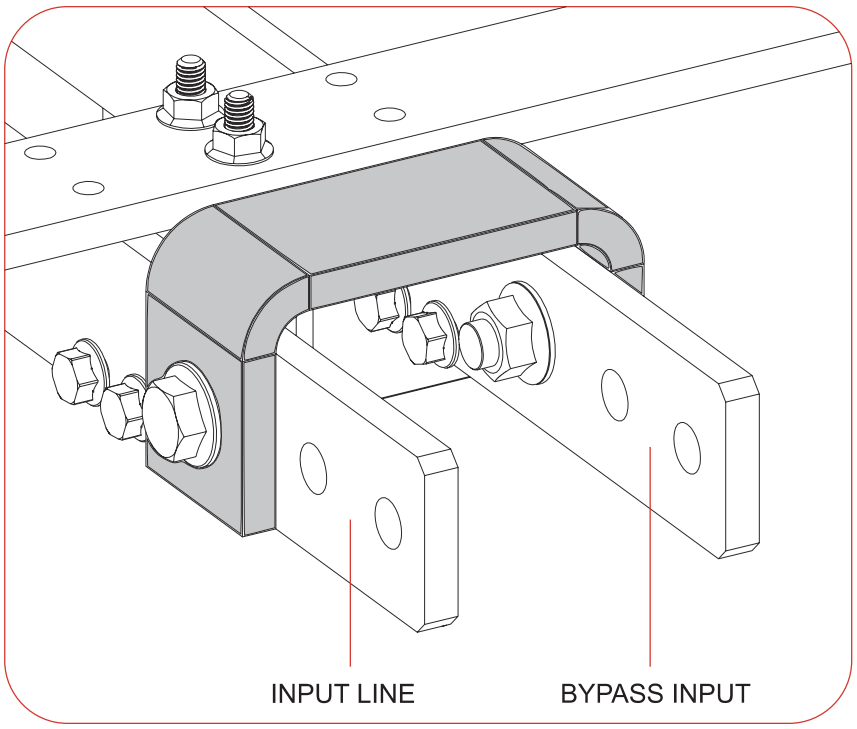
Cable entry for floating floors





Cable entry for floor-level cable duct

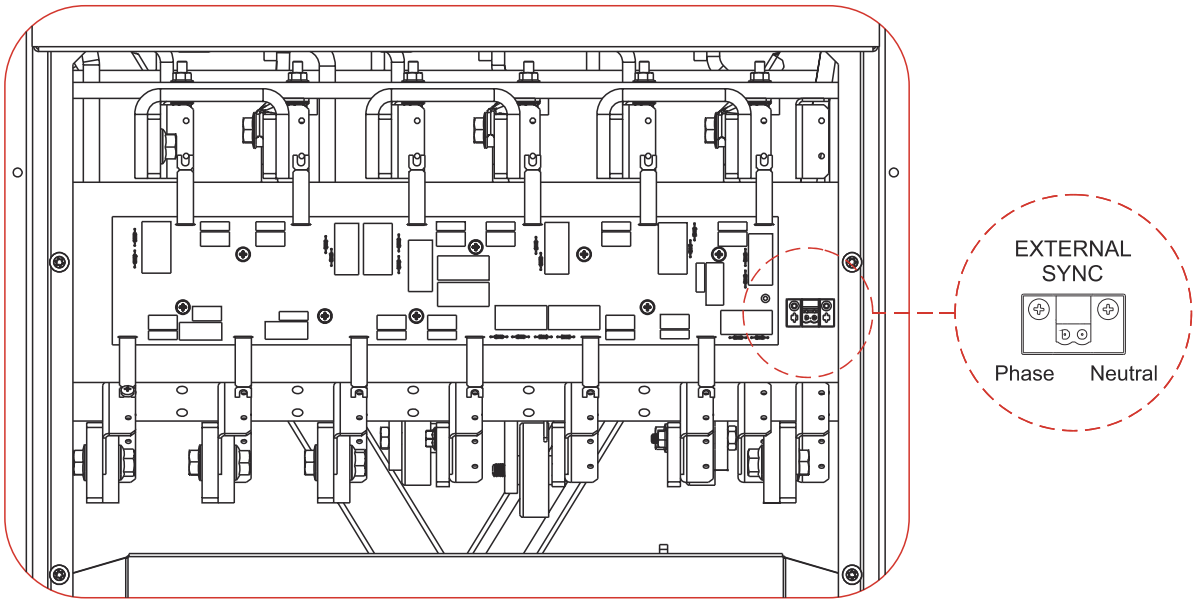
JUMPER REMOVAL FOR DUAL INPUT



To remove the single-input connection jumpers, unscrew the two M10 bolts and extract the “U” shaped bars that join bypass and input lines for each one of the three phases.

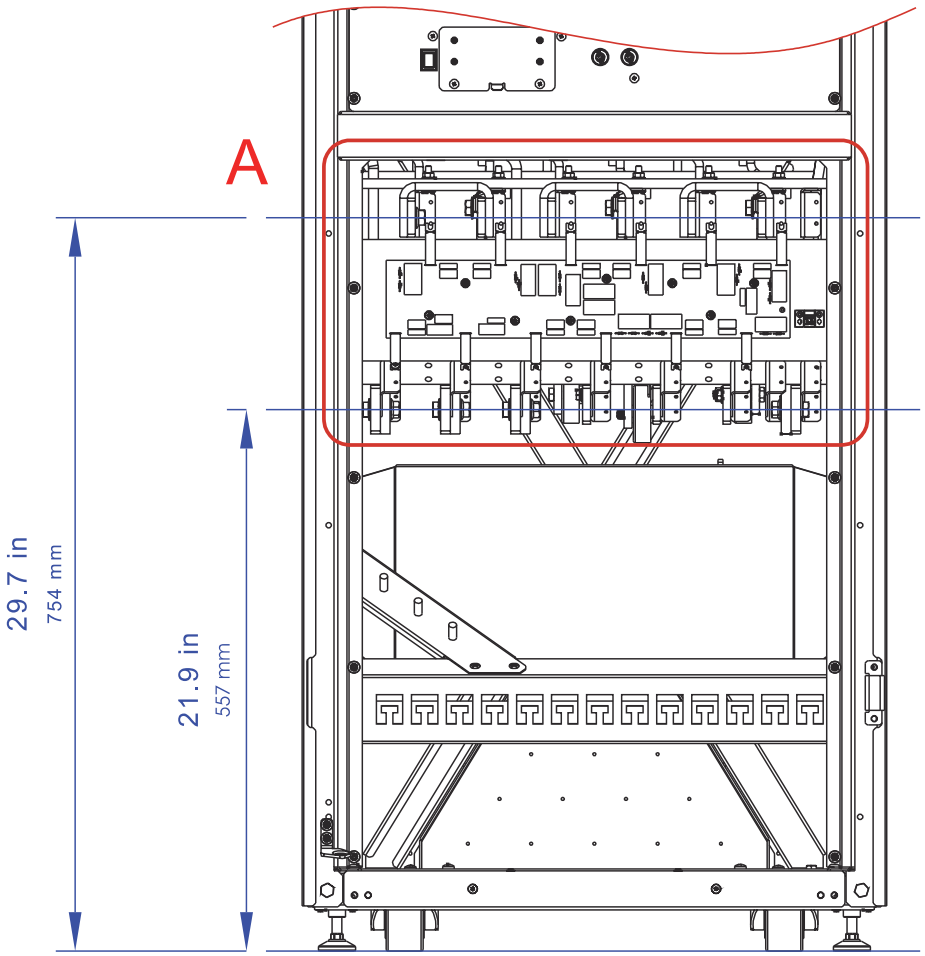
EXTERNAL SYNC

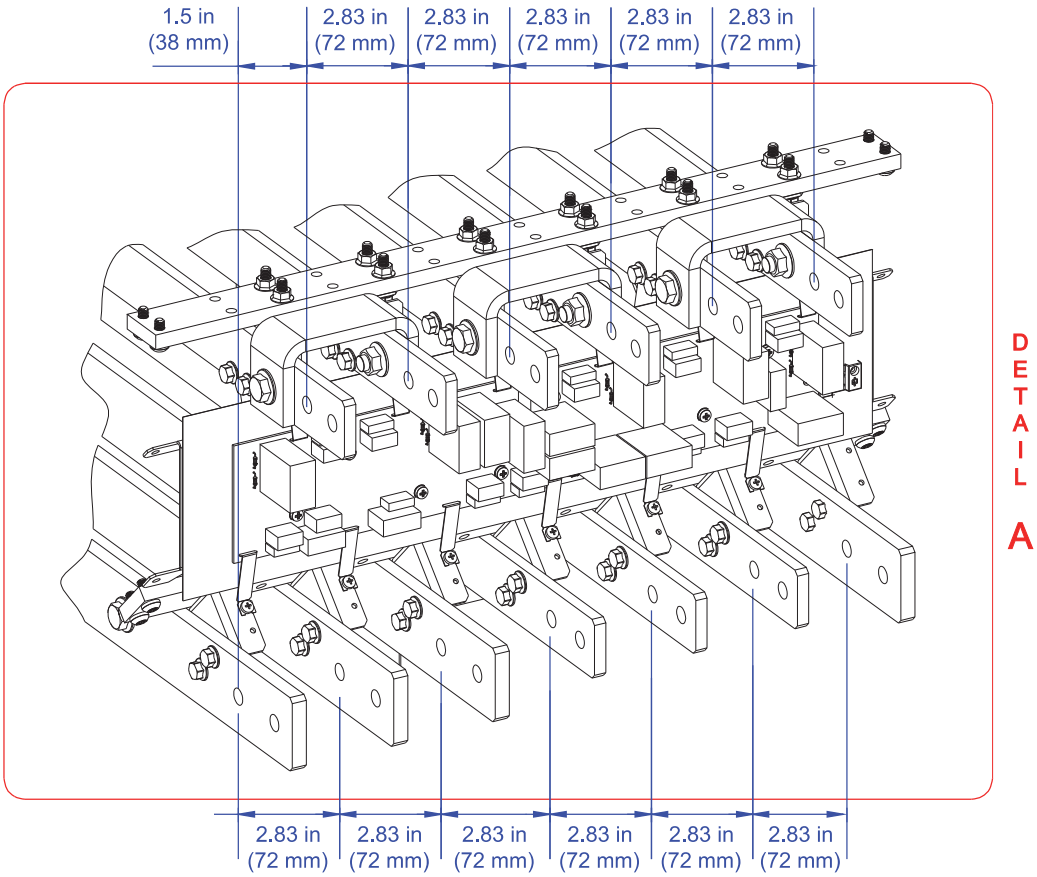
Insulated input to synchronize the output of the UPS to an external source. Use the service configuration software to enable and set the external sync function.
Input parameters: Phase – Neutral max. 120 Vac ± 10%
Connection wires: 15AWG double insulation



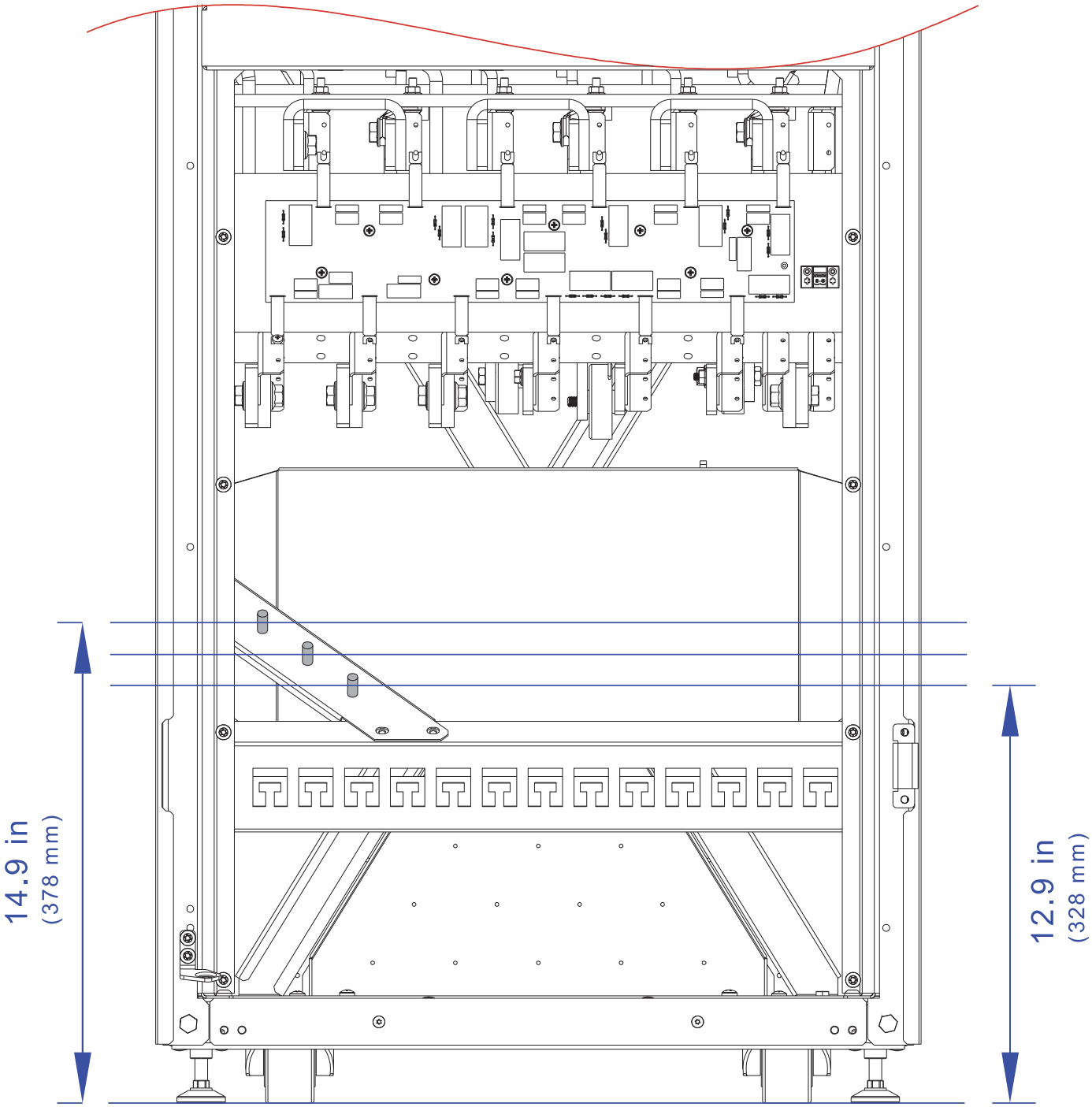
The phase 1 inverter output of the UPS will be synchronised with the connected external source

POWER CONNECTION POSITIONS



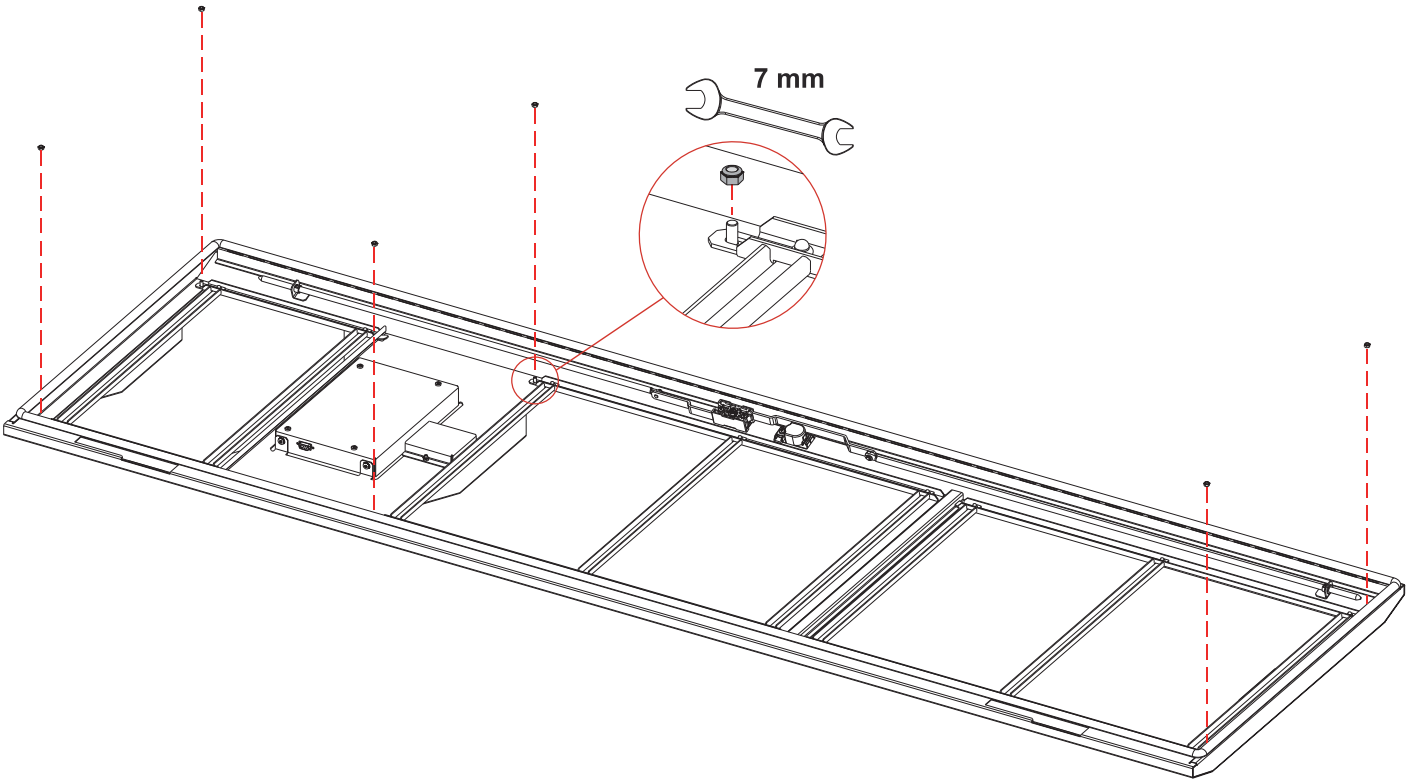


EARTH CONNECTION POSITION

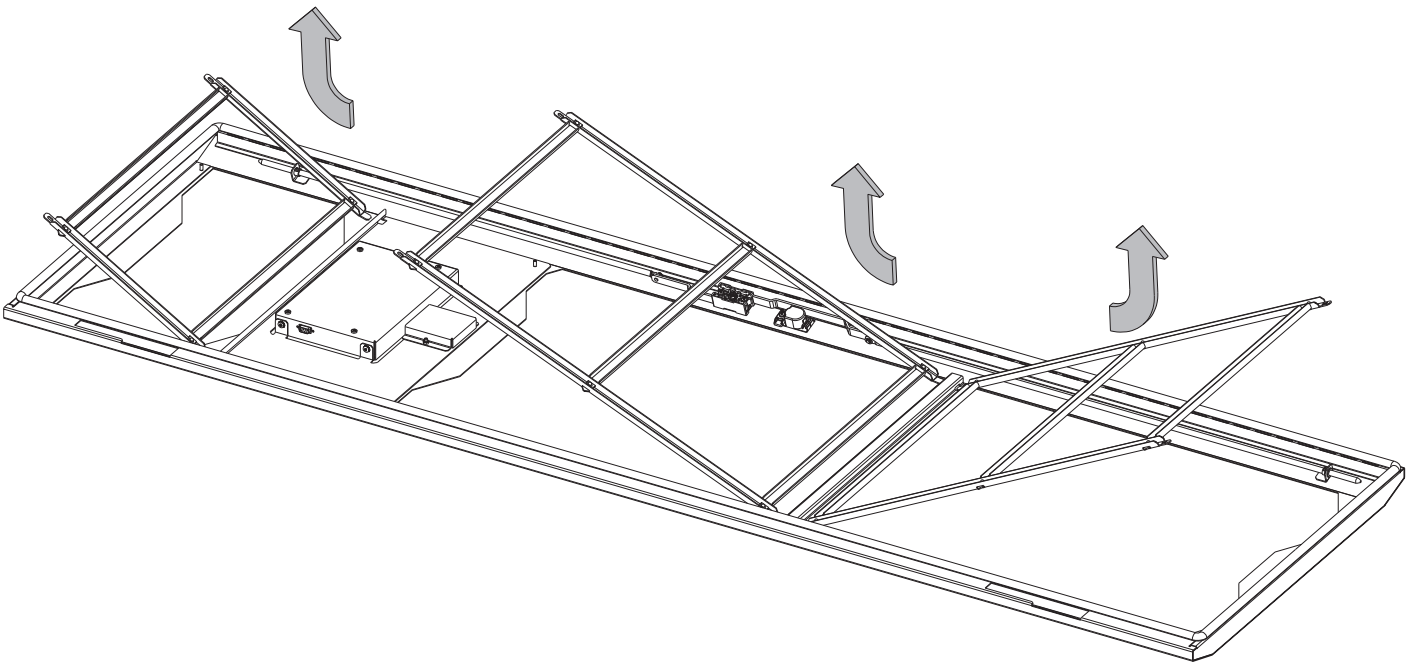


REPLACING DOOR AIR FILTER

1. Remove the locking nuts as shown in the figure below and store them.



2. Remove the air filter frames by lifting them up as shown in the following figure.

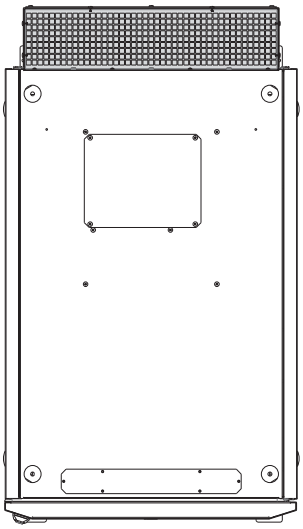


3. After replacing the filters, follow the above procedure in reverse to reassemble the frames.

VERTICAL EXHAUST (OPTIONAL)

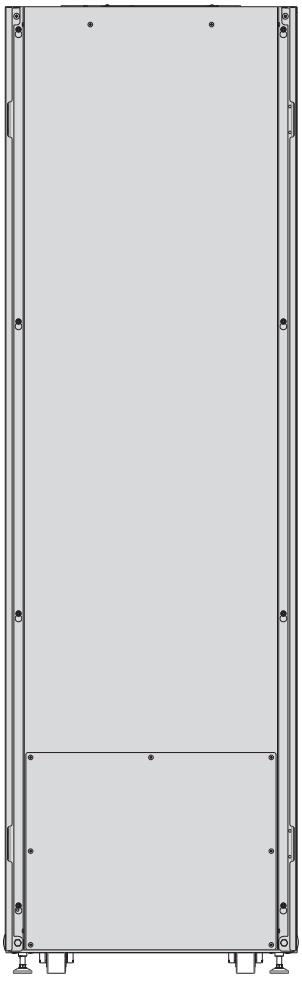
Through the "Vertical Exhaust" option, it is possible to modify the air expulsion flow (from the top of the UPS rather than from the back).

Below, the Vertical Exhaust is highlighted and the differences in size and positioning from the standard model are reported.

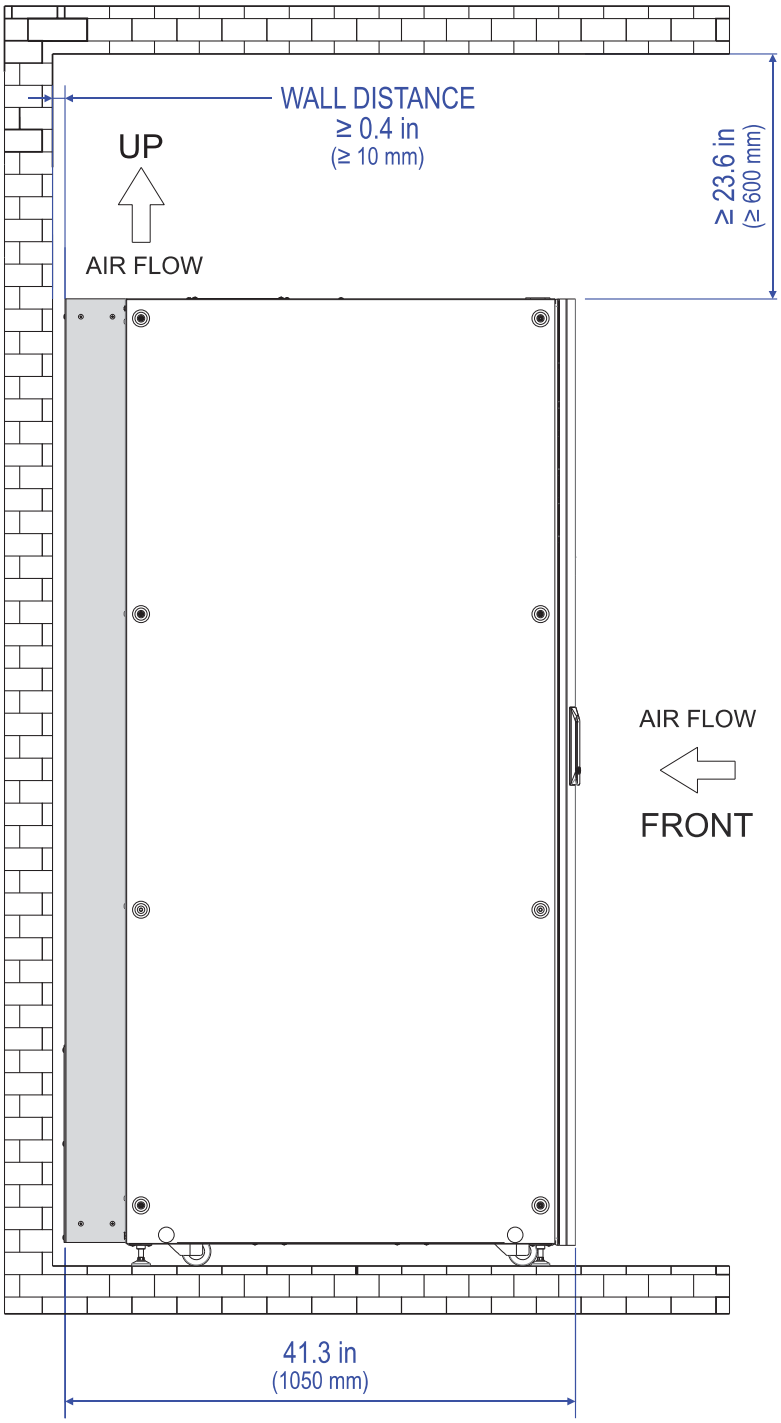


FRONT

TOP VIEW



REAR VIEW

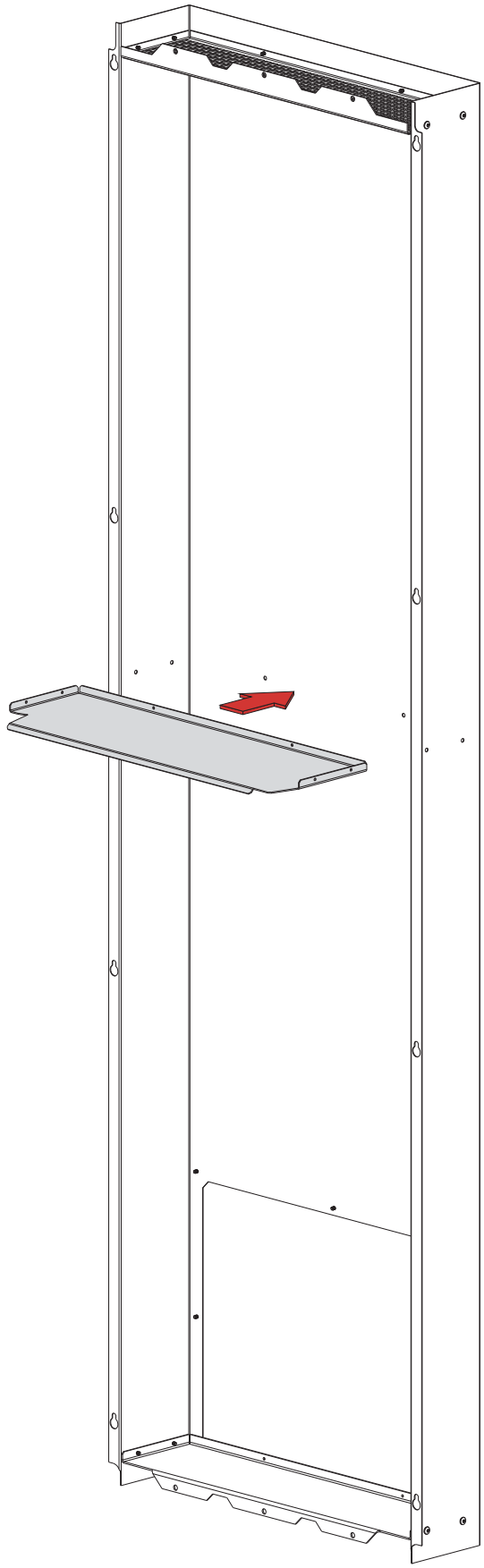


SIDE VIEW

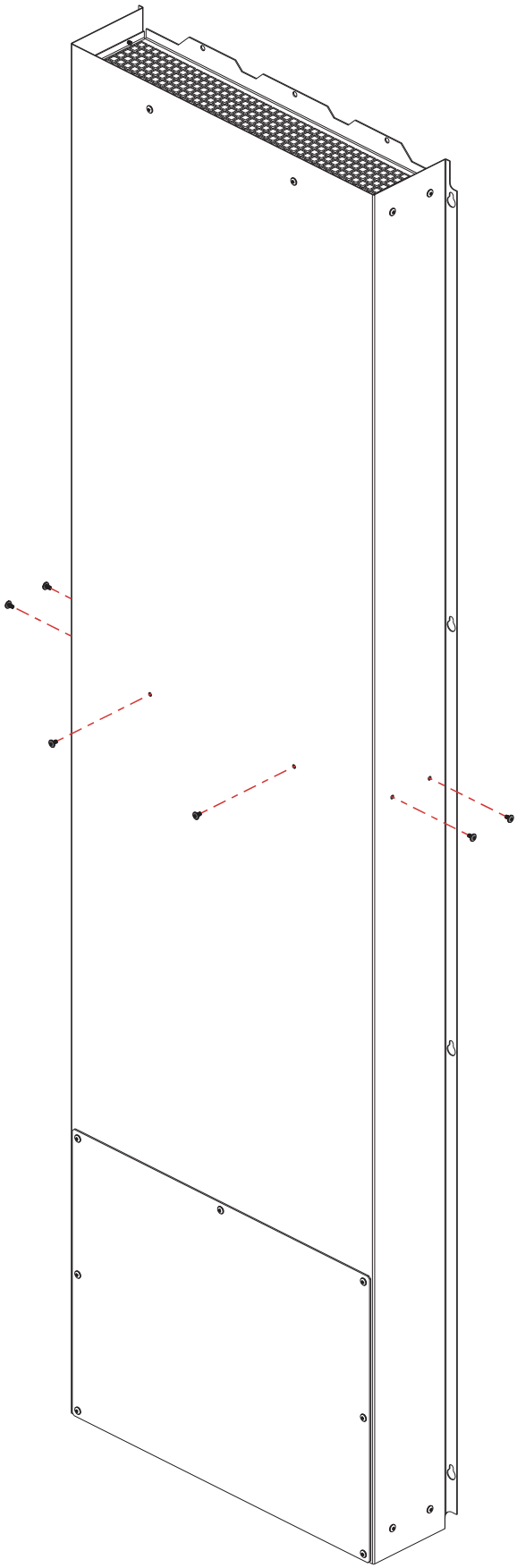
CENTRAL BRACKET FIXING

Only for the UPS M2U 140 PC0, before installing the Vertical Exhaust kit, the central bracket must be fixed in the rear part of the UPS. To install the central bracket, follow the steps listed below:

1. Insert the central bracket into the rear panel of Vertical Exhaust kit and position it in correspondence of the central holes



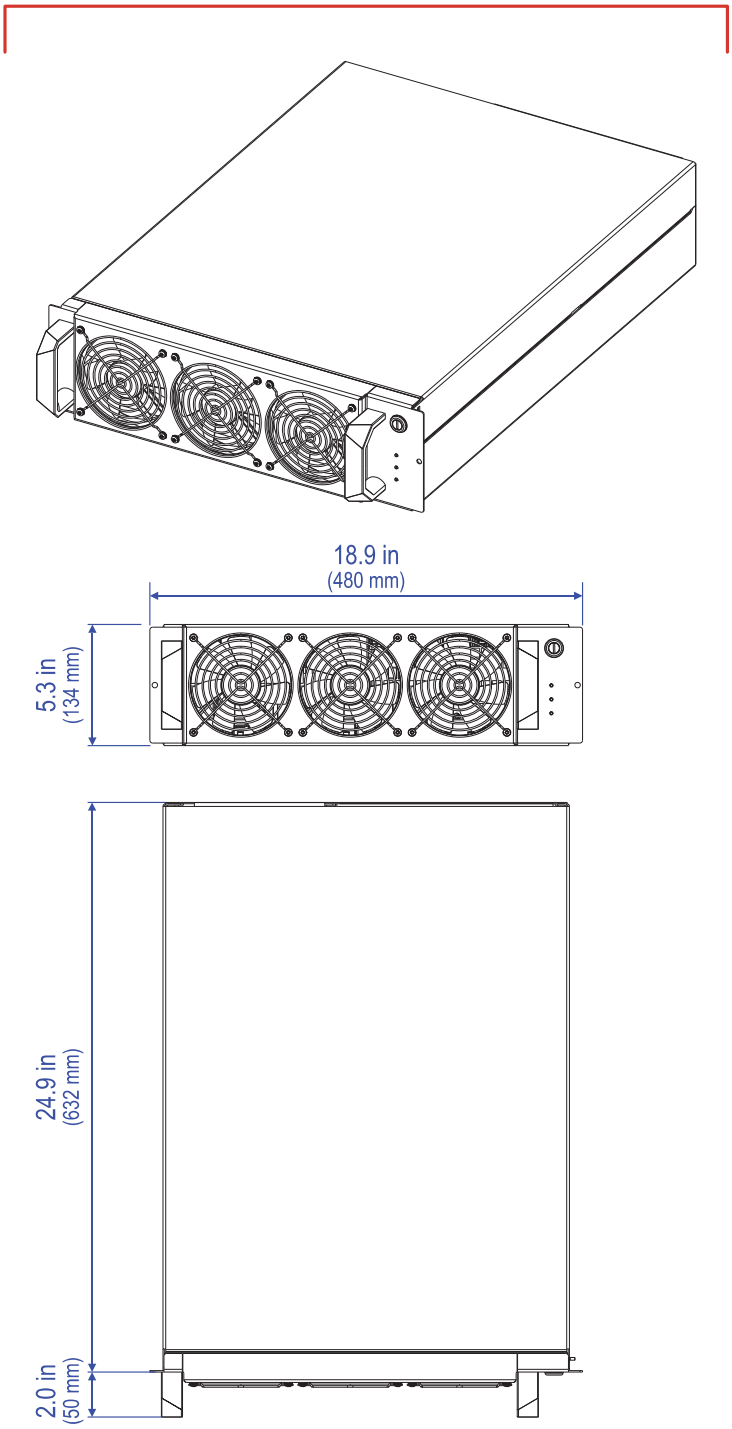
2. Fix the bracket using the screws supplied with the kit



INSERTION/EXTRACTION MODULES AND UNITS PROCEDURE

POWER MODULE (PM)

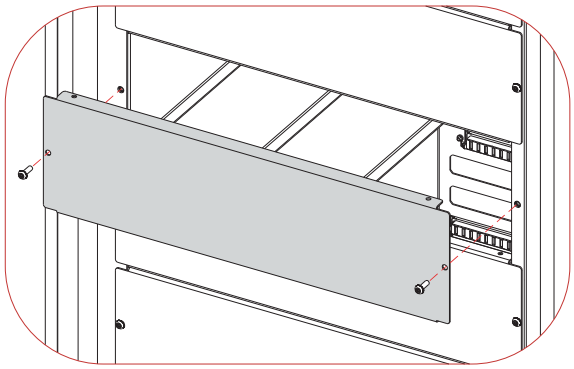
POWER MODULE 20kW (PM20) - Net weight 79.4 lb (36 Kg)
POWER MODULE 25kW (PM25) - Net weight 81.6 lb (37 Kg)
POWER MODULE 34kW (PM34) - Net weight 81.6 lb (37 Kg)



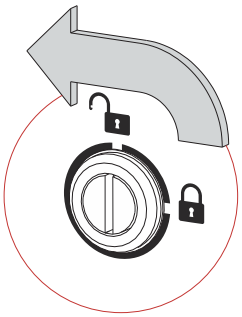
The following operations must only be performed by skilled and specifically trained personnel.
When the PM is not inserted, uncovered parts with dangerous voltage are present within the corresponding backplane.
Use Personal Protective Equipment (see "Important safety information" section).
The PM, due to its weight, must be handled by at least two persons.
Strictly comply with the instructions as listed below.

INSERTION

1. **Note: the PM must be inserted in the slot of a previously removed one or, <u>in case of first installation, in the first free dedicated slot of the cabinet, starting from the bottom slot.</u>** If present, remove the protection cover and store it together with the fastening screws.

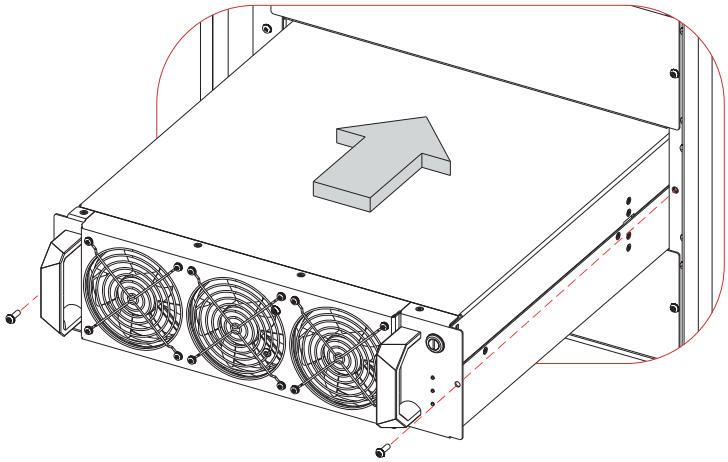


2. Check that the Switch Lock of the PM module to be inserted is in the open position (see figure alongside).

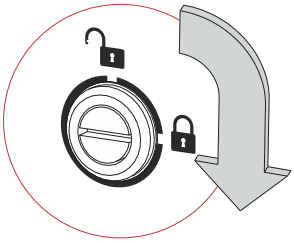


WARNING! ***Check that all the LEDs are off.***

3. Carefully insert the PM into the cabinet (requires two persons) and fasten it using the supplied screws, as shown in the figure.



4. Turn the Switch Lock 90° clockwise to the closed position (see figure alongside).



5. Switch on the PM using the display.

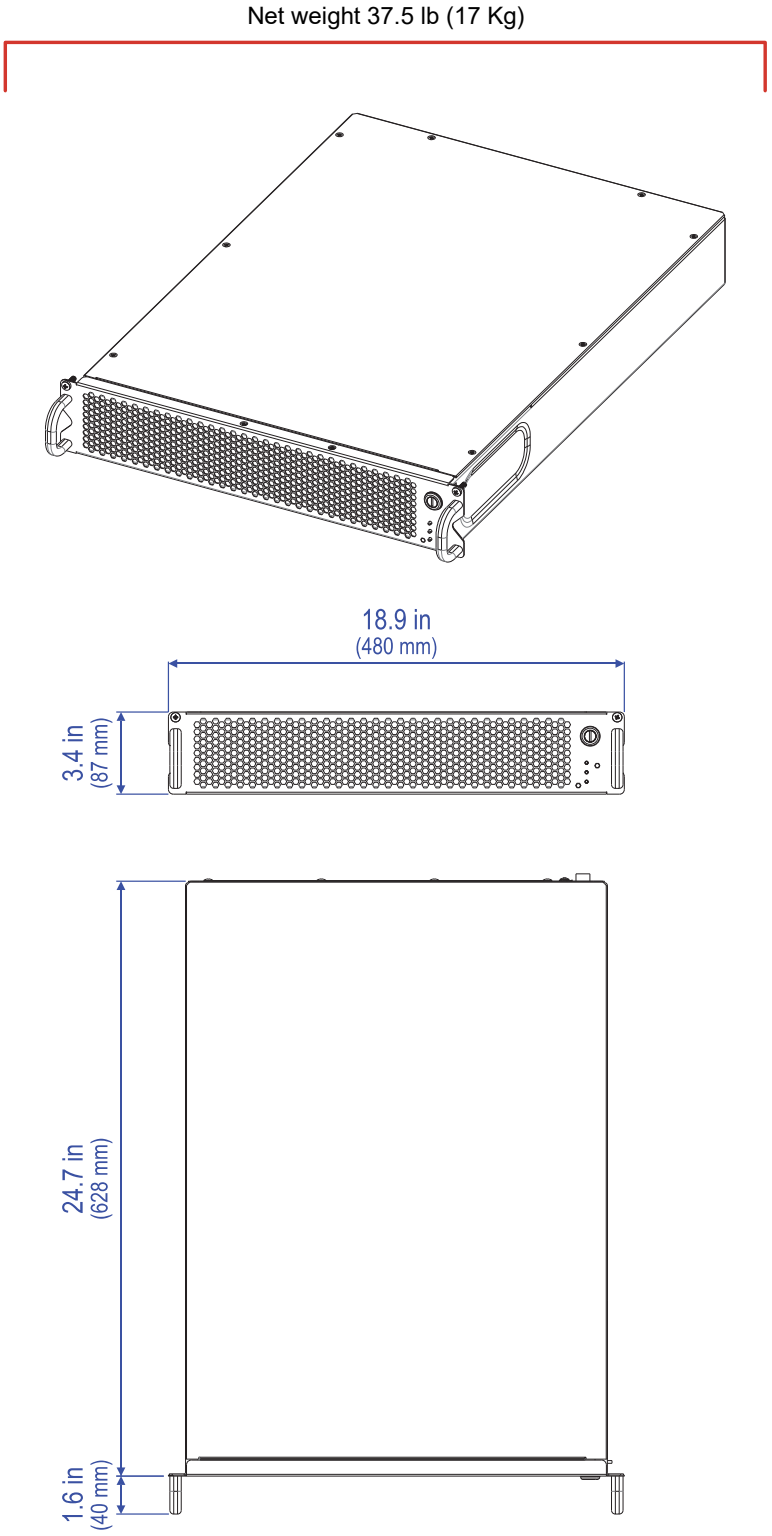
EXTRACTION

Note: before extracting any PM, please ensure that the remaining PMs are capable of supporting the full load.

To extract the PM from the cabinet, reverse the procedure described above. In brief:

1. Switch off the PM using the display.
2. Turn the Switch Lock 90° counterclockwise to the open position .
3. Check that the module is in the off state.
4. Remove the two side fastening screws and store them.
5. Using the handles, carefully extract the PM from its housing. This operation requires two persons.
6. **<u>Caution</u>**: when the PM is not inserted, uncovered parts with dangerous voltage are present on the corresponding backplane. Therefore, in the case where a new PM is not immediately inserted, install the supplied protection cover using the dedicated screws.

BYPASS MODULE 200AMP (BM)



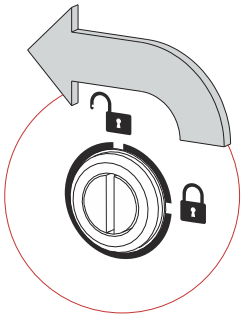
The following operations must only be performed by skilled and specifically trained personnel.
When the BM is not inserted, uncovered parts with dangerous voltage are present within the corresponding backplane.
Use Personal Protective Equipment (see "Important safety information" section).
Due to its weight, the BM must be handled by two people.
The BM is pre-installed by the manufacturer, extract it only in case of maintenance or replacement.
Strictly comply with the instructions as listed below.

EXTRACTION

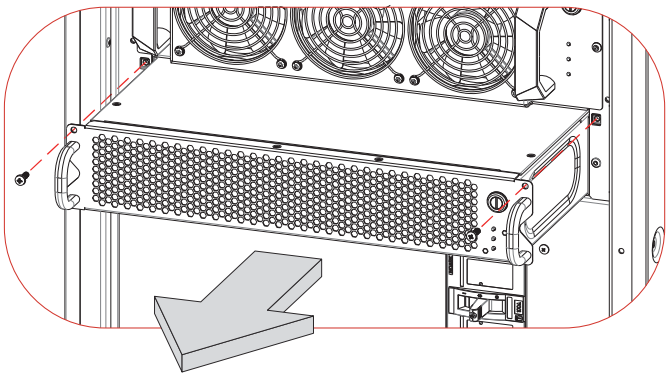
WARNING: Before performing the operations below, ensure that the shutting down of the BM does not lead to the loss of the connected load.

WARNING: the operations below must be done only in Service Bypass Mode and by performed by skilled and specifically trained personnel.

1. Switch the System to Service Bypass Mode:
   a. Switch the System to Static Bypass Mode.
      If this operation is not possible, go to point “b” directly.
   b. Close the **external** Manual Bypass switch.
   c. Open the external Input/Bypass switch.
   d. Open the external Output switch.
   e. Open the external Battery switch.
2. Turn the Switch Lock 90° counterclockwise to the open position (see figure alongside).



3. Remove the two side fastening screws and store them.
4. Carefully extract the BM from its housing using the appropriate handles.

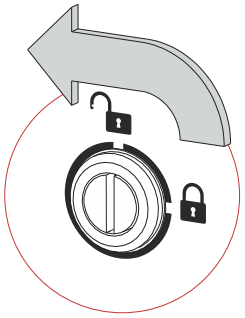


5. **Caution:** in Normal Mode Operation, when the BM is not inserted, uncovered parts with dangerous voltage are present in the backplane. After removing the module, a new BM must immediately inserted. See below the Insertion Instructions.

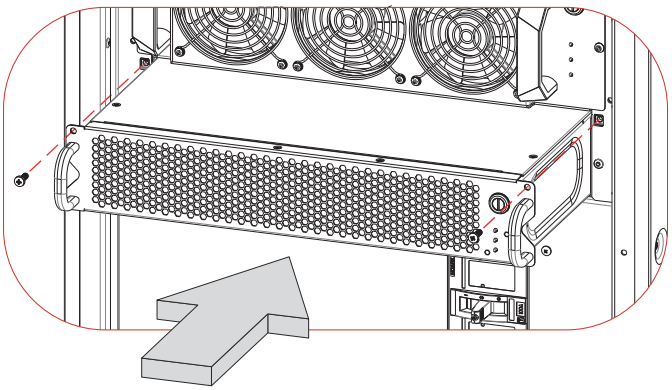
INSERTION

To insert the BM into the cabinet, use the following procedure:

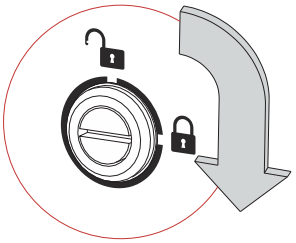
1. Make sure that the System is in Service Bypass Mode, with:
   a. External Manual Bypass switch closed.
   b. External Input/Bypass switch opened.
   c. External Output switch opened.
   d. External Battery switch opened.
2. Check that the Switch Lock is in open position (see figure alongside).



3. Carefully insert the BM into the cabinet (requires two persons).
4. Fasten the BM using the supplied screws.



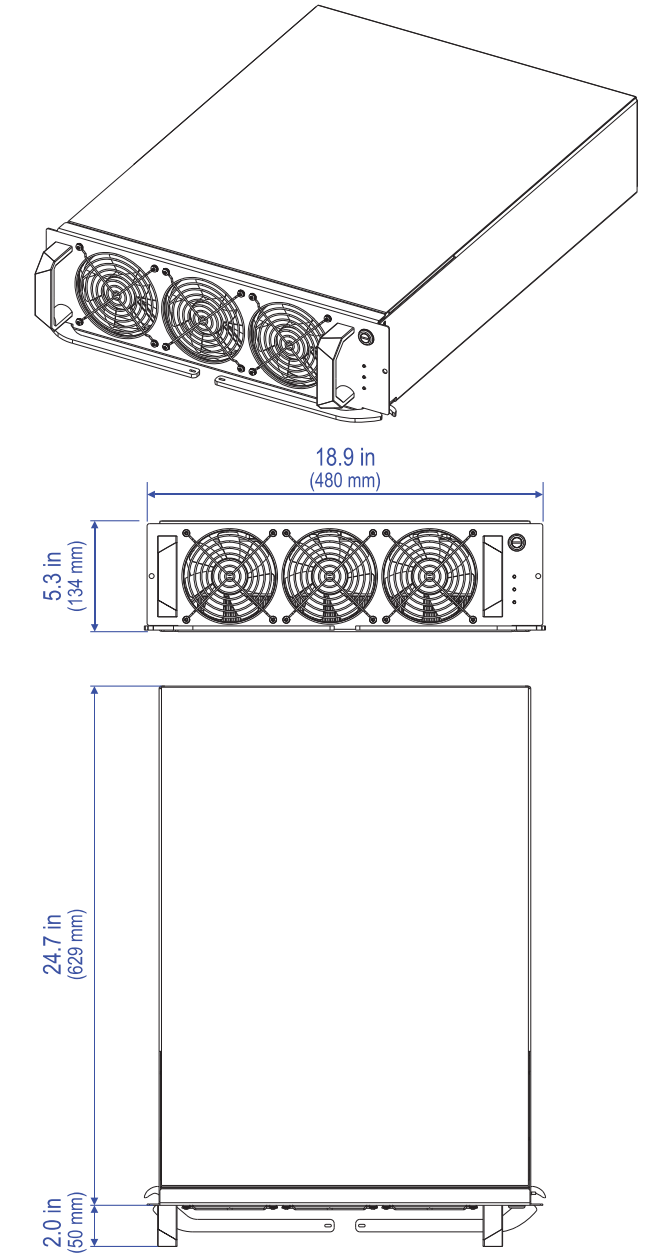
5. Turn the Switch Lock 90° clockwise to the closed position (see figure alongside).



6. Switch the system to Normal Mode Operation.

BYPASS MODULE 500AMP (BM)

Net weight 75 lb (34 Kg)



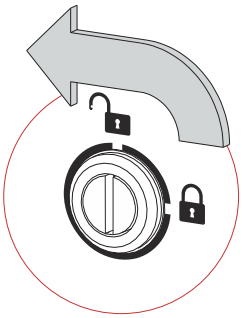
The following operations must only be performed by skilled and specifically trained personnel.
When the BM is not inserted, uncovered parts with dangerous voltage are present within the corresponding backplane.
Use Personal Protective Equipment (see "Important safety information" section).
Due to its weight, the BM must be handled by two people.
The BM is pre-installed by the manufacturer, extract it only in case of maintenance or replacement.
Strictly comply with the instructions as listed below.

EXTRACTION

WARNING: Before performing the operations below, ensure that the shutting down of the BM does not lead to the loss of the connected load.

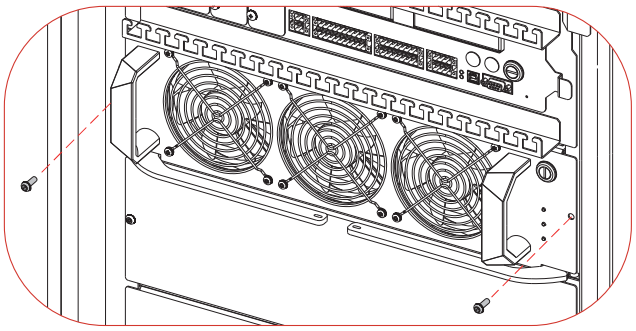
WARNING: the operations below must be done only in Service Bypass Mode and performed by skilled and specifically trained personnel.

1. Switch the System to Service Bypass Mode:
   a. Switch the System to Static Bypass Mode. If this operation is not possible, go to point “b” directly.
   b. Close the **external** Manual Bypass switch.
   c. Open the external Input/Bypass switch.
   d. Open the external Output switch.
   e. Open the external Battery switch.

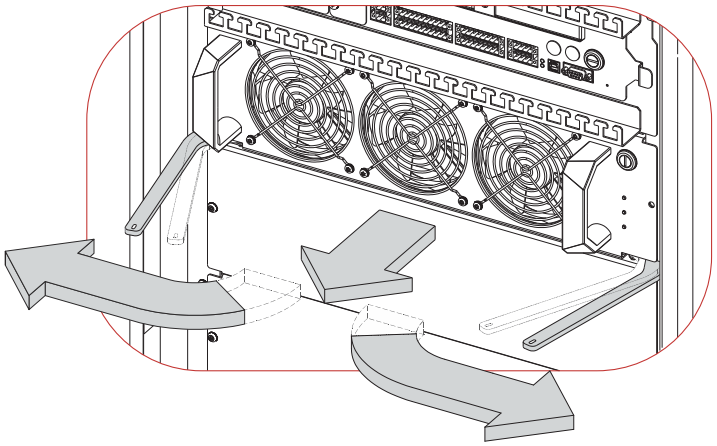


2. Turn the Switch Lock 90° anticlockwise to the open position (see figure alongside).

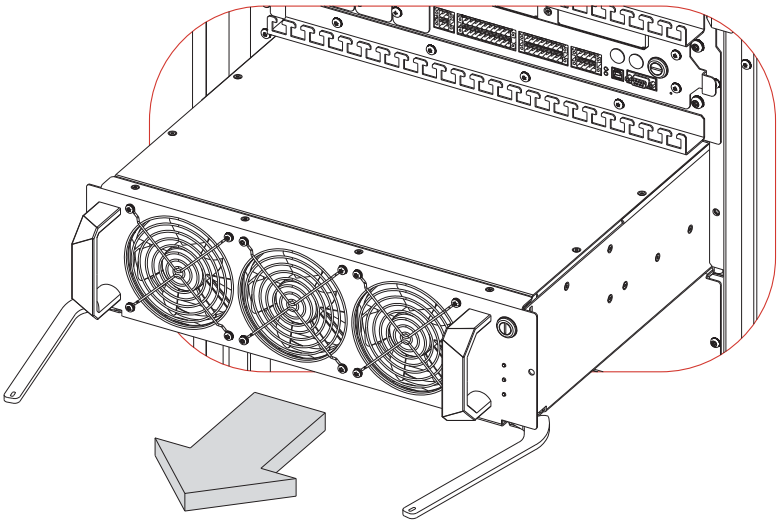
3. Remove the two side fastening screws and store them.



4. To extract the BM, use the levers as shown in the figure to the side.



5. Carefully extract the BM from its housing using the appropriate handles.
   This operation requires two persons.

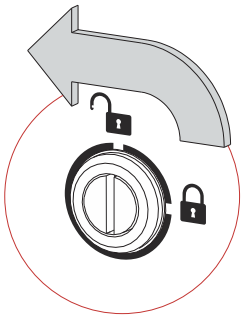


6. **Caution:** in Normal Mode Operation, when the BM is not inserted, uncovered parts with dangerous voltage are present in the backplane. After removing the module, a new BM must immediately inserted. See below the Insertion Instructions.

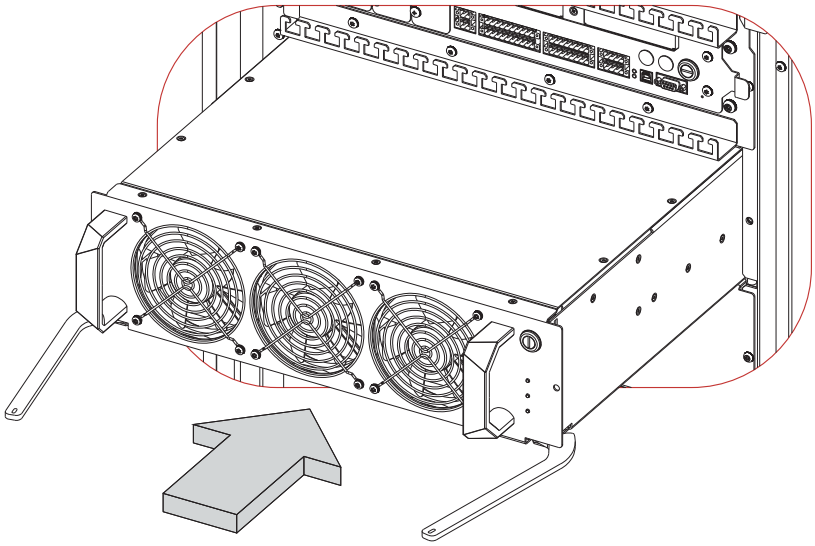
INSERTION

To insert the BM into the cabinet, use the following procedure:

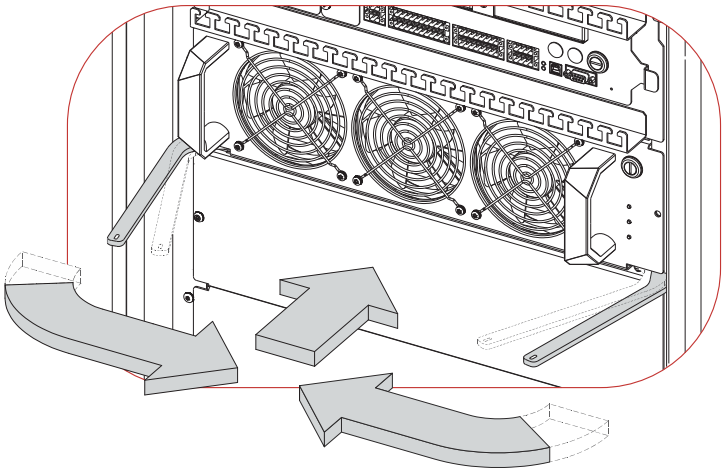
1. Make sure that the System is in Service Bypass Mode, with:
   a. External Manual Bypass switch closed.
   b. External Input/Bypass switch opened.
   c. External Output switch opened.
   d. External Battery switch opened.



2. Check that the Switch Lock is in open position (see figure alongside).

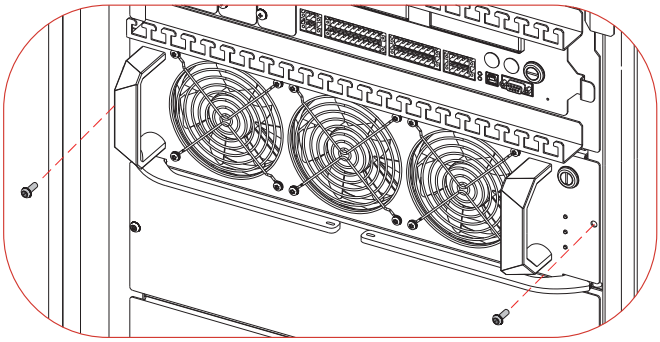


3. Carefully insert the BM into the cabinet (requires two persons). Make sure that the levers are open.

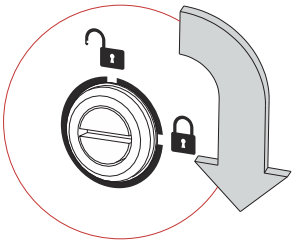


4. Close the levers to insert the BM until the end as shown in the figure.

5. Fasten the BM using the supplied screws.



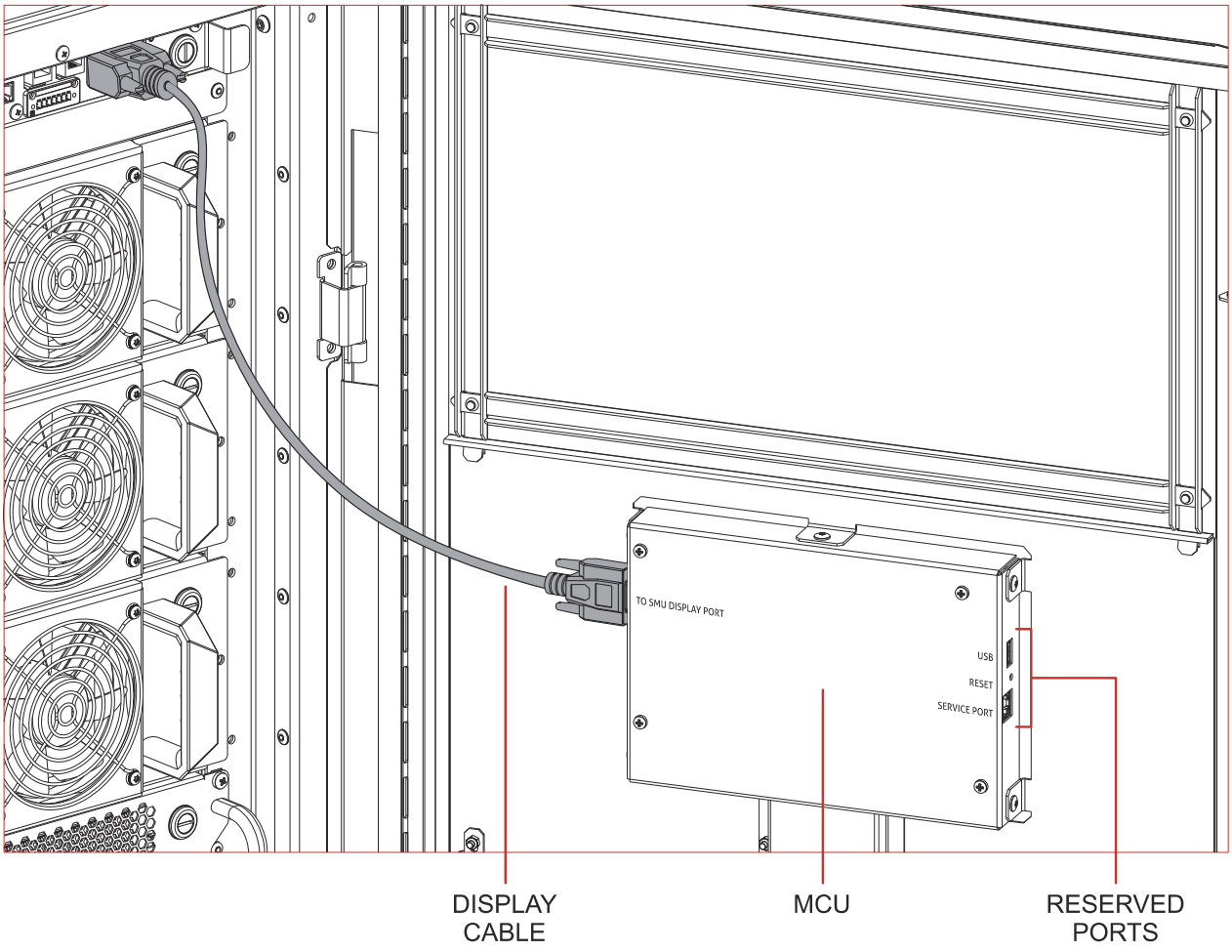
6. Turn the Switch Lock 90° clockwise to the closed position (see figure alongside).



7. Switch the system to Normal Mode Operation.

MAIN COMMUNICATION UNIT (MCU)

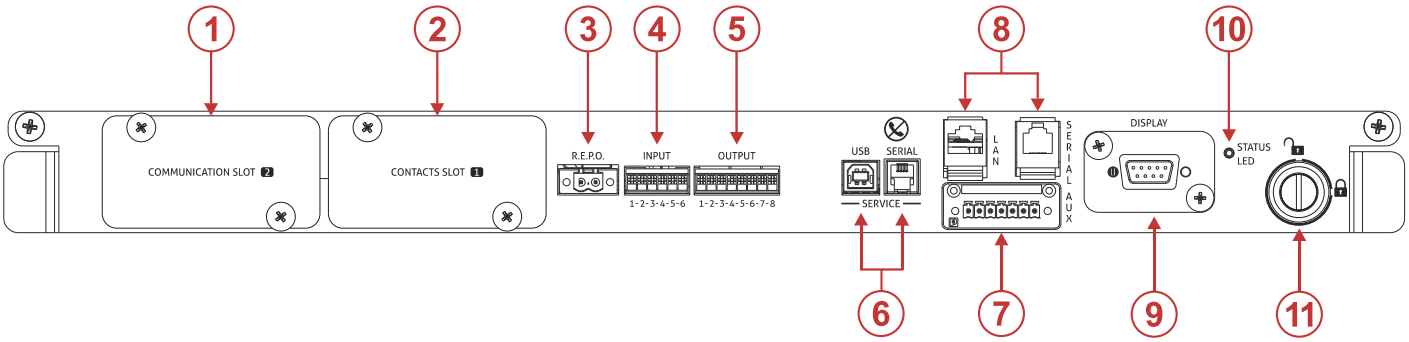
MCU WITH OPEN DOOR



CONNECTIVITY PANEL (CP)

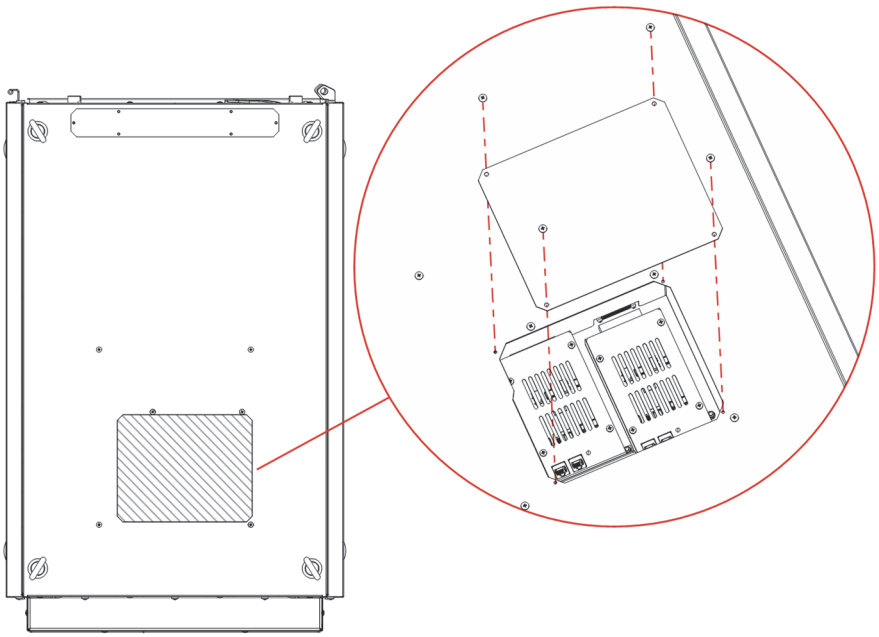
SYSTEM MONITORING UNIT (SMU)

ATTENTION: connect to the SMU only non-hazardous low voltage signals

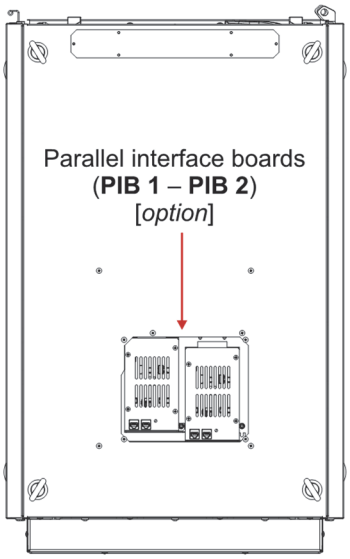


1. Communication Slot (SLOT 2)
2. Contacts Slot (SLOT 1)
3. R.E.P.O.
4. Signal input
5. Signal output
6. Service ports
7. Signal AUX
8. NETMAN port
9. Display port
10. SMU status LEDs
11. Switch Lock

PARALLEL INTERFACE BOARD (PIB)



REAR
TOP VIEW



REAR
TOP VIEW

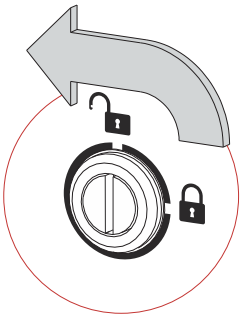
SMU (SYSTEM MONITORING UNIT)

The following operations must only be performed by skilled and specifically trained personnel.
Use Personal Protective Equipment (see "Important safety information" section).
When the SMU is not inserted, uncovered parts with dangerous voltage are present on the corresponding backplane.
ATTENTION: connect to the SMU only non-hazardous low voltage signals.

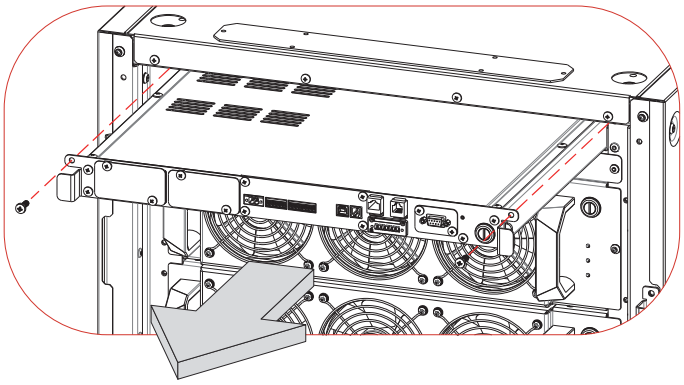
The SMU is pre-installed by the manufacturer. Remove the SMU only in case of maintenance or replacement.
Strictly comply with the instructions as listed below.
ATTENTION: when the SMU is extracted, the R.E.P.O. is disabled but only for the time necessary to insert a new SMU (60 minutes). If after 60 minutes the SMU has not been inserted, the system moves to Emergency Power OFF.

EXTRACTION

1. Turn the Switch Lock 90° counterclockwise to the open position (see figure alongside).



2. Remove the two side fastening screws and store them.
3. Using the handles, carefully pull and remove the SMU.



INSERTION

To insert the SMU into the cabinet, reverse the procedure described above. In brief:

1. Check that the Switch Lock is in open position .
2. Using the handles, carefully insert the SMU into the dedicated slot.
3. Fasten the SMU using the supplied screws.
4. Turn the Switch Lock 90° clockwise to the closed position

COMMUNICATION INTERFACE - SMU

ATTENTION: this part is accessible and touchable, therefore connect only non-hazardous low voltage signals

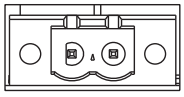
R.E.P.O.

This isolated input is used to turn the UPS off remotely in case of an emergency.
The UPS is supplied from the factory with two “Remote Emergency Power Off” (R.E.P.O.) inputs terminals short-circuited. If R.E.P.O. is to be installed, remove the pre-installed short-circuit and connect to the normally closed contact of the stop device using a double insulated cable (17AWG – 15AWG with crimp terminal).

In case of emergency, by activating the stop device, the R.E.P.O. control is opened, and the UPS will shut-down and the load will be powered off completely.

The R.E.P.O. circuit is self-powered using a SELV type circuit. No external power supply voltage is therefore required. When it is closed (normal condition), a maximum current of 15 mA is present.

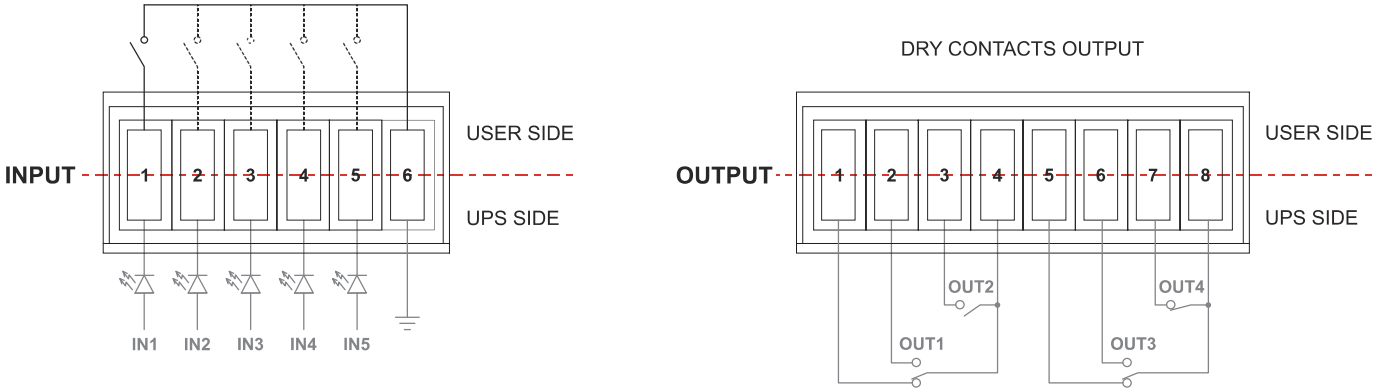
NOTE: In case of more than one UPS is to be connected within the same R.E.P.O system. Each UPS must be provided with its own dedicated separate set of contacts. Please refer to “Parallel UPSs Signal Connections” section for further details.



Connection wires: 14AWG max
(max cross section acceptable)

PROGRAMMABLE IN – OUT SIGNALS

The IN-OUT signals (refer to "UPS DETAILS” ref. 7) have a standard factory configuration.
For further information refer to the “User Manual”.
Moreover all the signals can be programmed using the service configuration software reserved to service personnel only.



Connection wires: 16AWG (max cross section acceptable)

FACTORY DEFAULT SETTING

INPUT	FUNCTION
IN 1 #	
IN 2 #	CB OFF
IN 3 #	Battery test
IN 4 #	Position of the External SWBAT
IN 5 #	Position of the External SWMB

These inputs must be enabled from the display panel

FACTORY DEFAULT SETTING:

OUTPUT	FUNCTION
OUT 1	Load on Bypass
OUT 2	Battery working
OUT 3	Battery low
OUT 4	Fault or Lock (F+L)

The output dry contacts are rated to:
1A @ 24Vdc or 1A @ 30Vac

NOTE: In case of an external maintenance bypass or Battery Cabinet installation, the relative switch auxiliary contacts must be connected to these inputs and programmed.

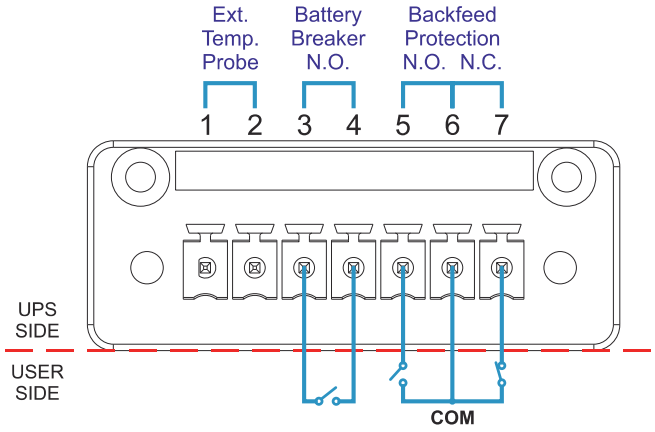
AUXILIARY SIGNALS

Insulated auxiliary signals:

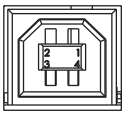
EXTERNAL TEMPERATURE PROBE
Input to connect the external probe to measure the battery temperature. Please refer to the optional kit.

EXTERNAL BATTERY BREAKER
Output (default N.O.) for controlling the external battery breaker trip. The contact closes upon pressing the remote EPO or in the event of other fault conditions.
This dry contact is rated for: 1A @ 24Vdc or 1A @ 30Vac.

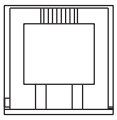
BACKFEED PROTECTION
Output (N.O. or N.C.) to manage the opening of an external disconnector switch in case of a backfeed fault occurs.
This dry contact is rated to: 1A @ 24Vdc or 1A @ 30Vac.



USB AND SERIAL (SERVICE PORT)



USB



SERIAL RS232

Use these ports to connect the UPS to a server or PC for remote monitoring, service configuration or firmware update.

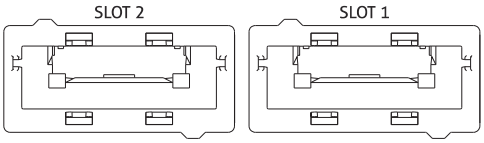
These two ports cannot be used simultaneously. The USB port is to be used as an alternative to the RS232 serial port.
USB port function is only guaranteed with a cable length of no more than 1.5m. Where a longer cable is required it is recommended that the RS232 serial interface is used.

COMMUNICATION SLOTS

The UPS is provided with three communication slots which can be used to host optional communications cards. The slots are not interchangeable.

SLOT 1 –Contact Slot
Slot hosting the contact/relay expansion card.

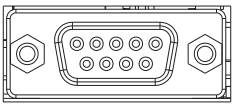
SLOT 2 - Communication Slot
Slot hosting the additional communication card (default configuration).



Please refer to the related manual for further information.

DISPLAY PORT

Use this port to connect the DISPLAY CABLE.



DISPLAY

WARNING!

IN A PARALLEL SYSTEM IT IS MANDATORY TO ONLY CONNECT UPSs OF THE SAME TYPE.

IT IS NOT POSSIBLE TO CONNECT UPSs WITH DIFFERENT TYPES OF BYPASS MODULES IN PARALLEL.

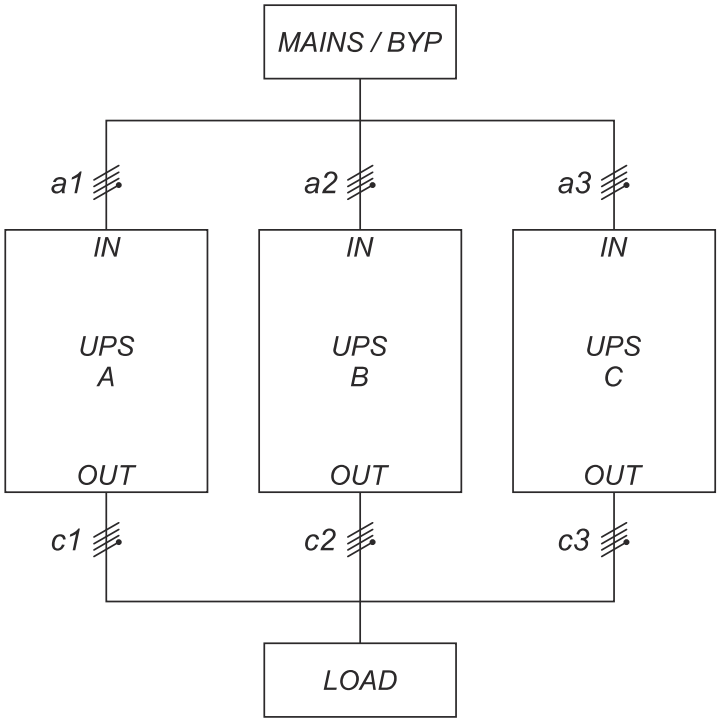
IT IS NOT POSSIBLE TO CONNECT UPSs WITH DIFFERENT TYPES OF POWER MODULES IN PARALLEL.

CABLES LENGTH INFORMATION

A MAXIMUM NUMBER OF 4 UPSs IS PERMITTED IN A PARALLEL SYSTEM.

IN ORDER TO CHOOSE THE CABLE SECTION FOR EACH UPS, REFER TO THE SECTION “POWER CONNECTION INFORMATION”.

- CONNECT THE POWER L1, L2, L3 AND N TO THE INPUT TERMINALS IN1, IN2, IN3 AND N OF EACH UPS.
- CONNECT THE LOAD CABLES L1, L2, L3 AND N TO THE OUTPUT TERMINALS OUT1, OUT2, OUT3 AND N OF EACH UPS.



Example of parallel connection of three UPSs

INPUT TERMINALS:	**IN**
OUTPUT TERMINALS:	**OUT**
INPUT CABLES LENGHT:	**a1, a2, a3**
OUTPUT CABLES LENGHT:	**c1, c2, c3**

WHEN CONNECTING POWER TO THE UPSs THE INSTRUCTIONS BELOW MUST BE FOLLOWED TO ENSURE A GOOD LOAD SHARE WHEN OPERATING FROM BYPASS:

- SUPPLY CABLE LENGTHS MUST BE EQUAL: a1 = a2 = a3
- OUTPUT CABLE LENGTHS MUST BE EQUAL: c1 = c2 = c3
- a1, a2, a3, c1, c2, c3 MUST HAVE A MINIMUM LENGTH GREATER THAN 3m (9,8ft).

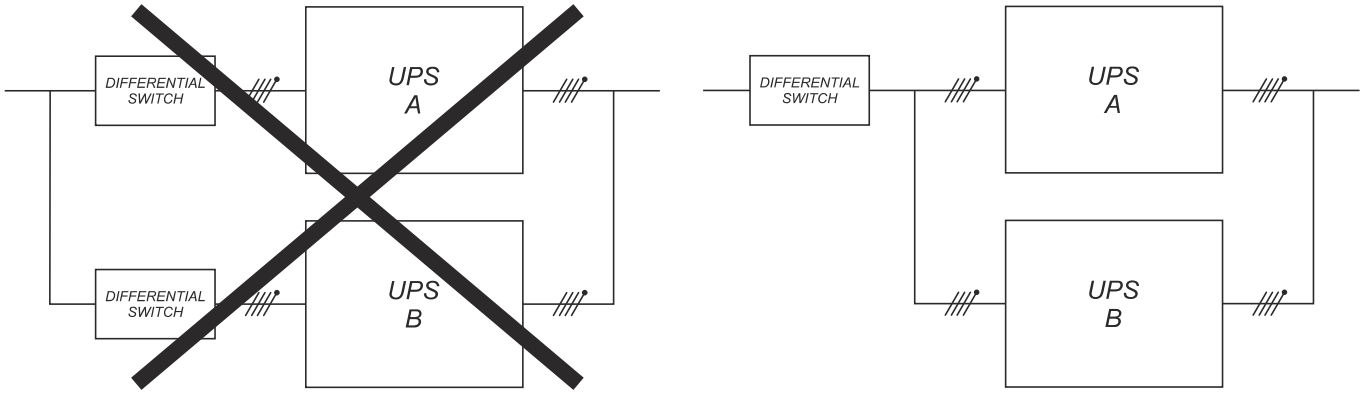
SYSTEM PROTECTION INFORMATION

INPUT OVERCURRENT PROTECTION:

TO PREVENT A SYSTEM FAILURE FROM IMPACTING ALL OF THE UPSs PRESENT, IT IS MANDATORY TO PROTECT THE INPUT OF EACH UPS WITH AN INDIVIDUAL (OVERCURRENT PROTECTION DEVICE). EACH ONE MUST BE INSTALLED UPSTREAM TO THE UPS (REFER TO THE CHAPTER “POWER CONNECTION INFORMATION” FORPROTECTION DEVICE SIZING).

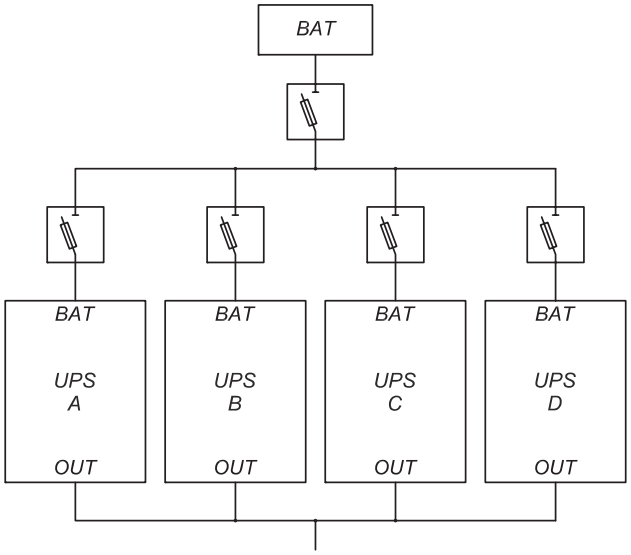
GFCI DEVICE (GROUND FAULT CIRCUIT INTERRUPTER):

BASING ON THE ELECTRICAL SYSTEM ADOPTED AND THE LOCAL REGULATIONS, A GROUND FAULT CIRCUIT INTERRUPTED OR A RESIDUAL CURRENT DEVICE MAY BE REQUESTED.
TO AVOID A FALSE DETECTION, ONE SINGLE DIFFERENTIAL SWITCH UPSTREAM TO THE ENTIRE SYSTEM MUST BE INSTALLED AS INDICATED IN THE FIGURE BELOW.

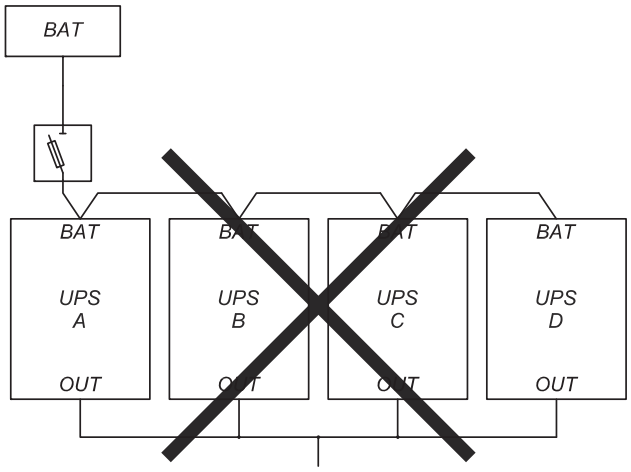


Example of parallel connection of two UPSs

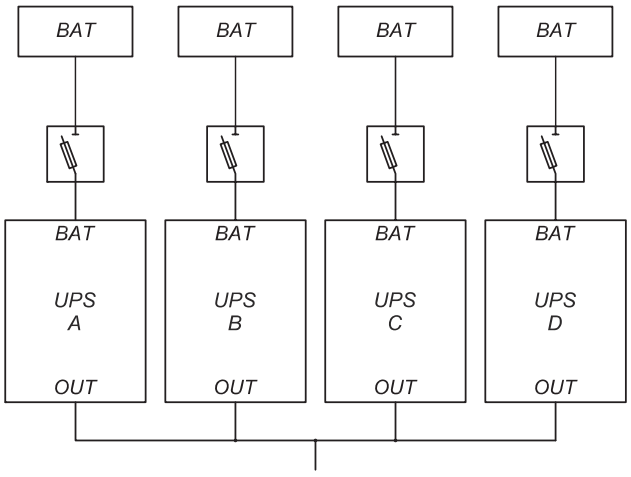
PARALLEL UPSS POWER CONNECTIONS (COMMON/SEPARATED/PAIR)



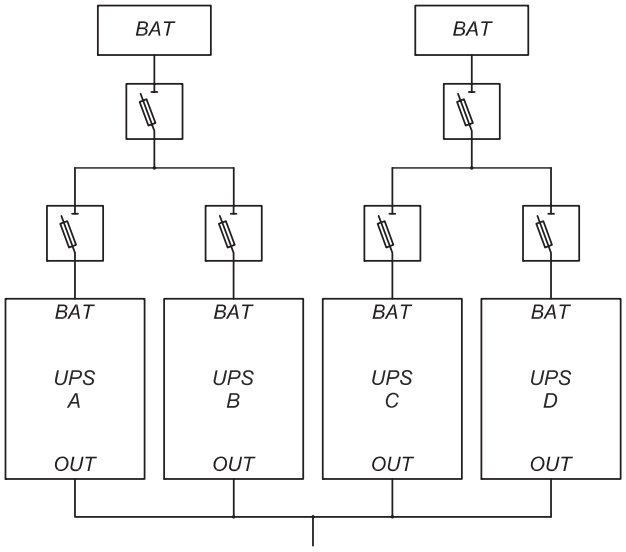
COMMON BATTERIES
-
STAR CONNECTION *



COMMON BATTERIES
-
CASCADING CONNECTION IS NOT ALLOWED



SEPARATED BATTERIES *



PAIR *

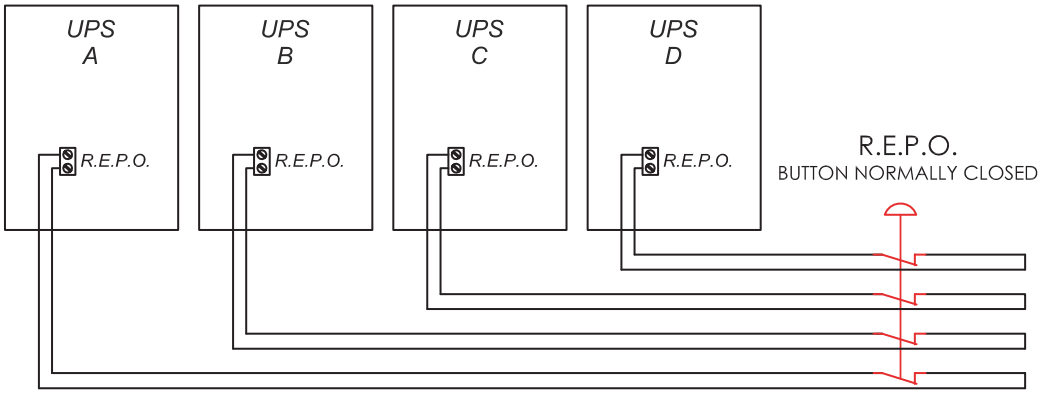
The SWBATT included in the Combo Cabinet disconnects only the internal batteries.

NOTE:

Examples with four UPSs

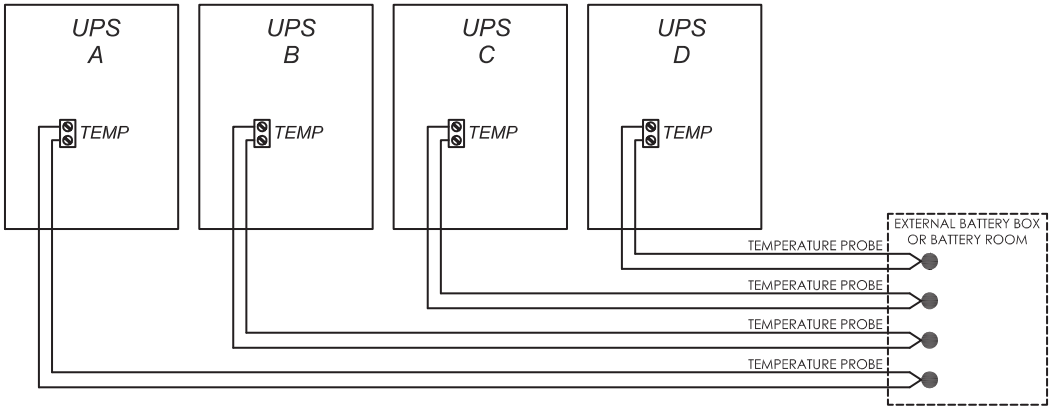
** The selected battery arrangement must be properly configured via the dedicated display menu in accordance with the instructions listed within the User Manual.*

PARALLEL UPSS SIGNAL CONNECTIONS (REPO/EXTTEMP/EXTSYNC)



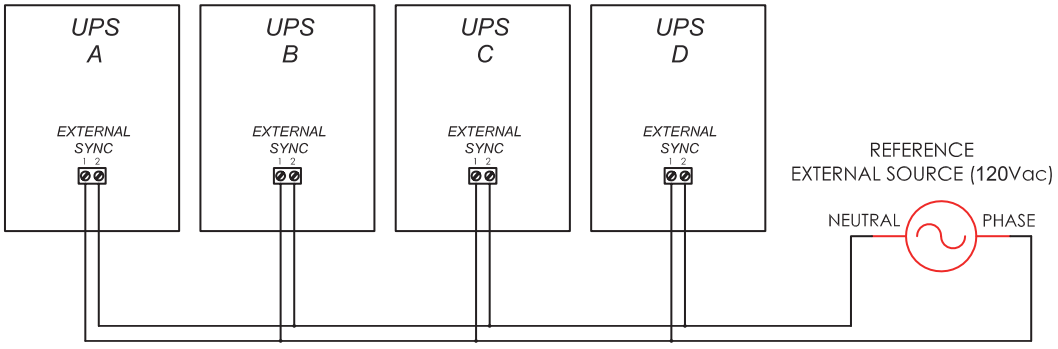
REMOTE EMERGENCY POWER OFF COMMAND (R.E.P.O.) CONNECTION:

TO CONTROL ANY UPSs WITH THE SAME EMERGENCY R.E.P.O. BUTTON, IN THE CASE OF A PARALLEL SYSTEM, YOU MUST USE AN EMERGENCY BUTTON WITH AS MANY SEPARATE CONTACTS AS THERE ARE UPSs PRESENT WITHIN THE SYSTEM. EACH INDIVIDUAL CONTACT MUST BE CONNECTED TO THE TERMINAL AS SHOWN IN THE EXAMPLE.
IT IS MANDATORY TO USE A NORMALLY CLOSE PUSHBUTTON AND A DOUBLE INSULATED CABLE WITH A CROSS SECTION OF AWG 16.



EXTERNAL TEMPERATURE PROBE (OPTIONAL):

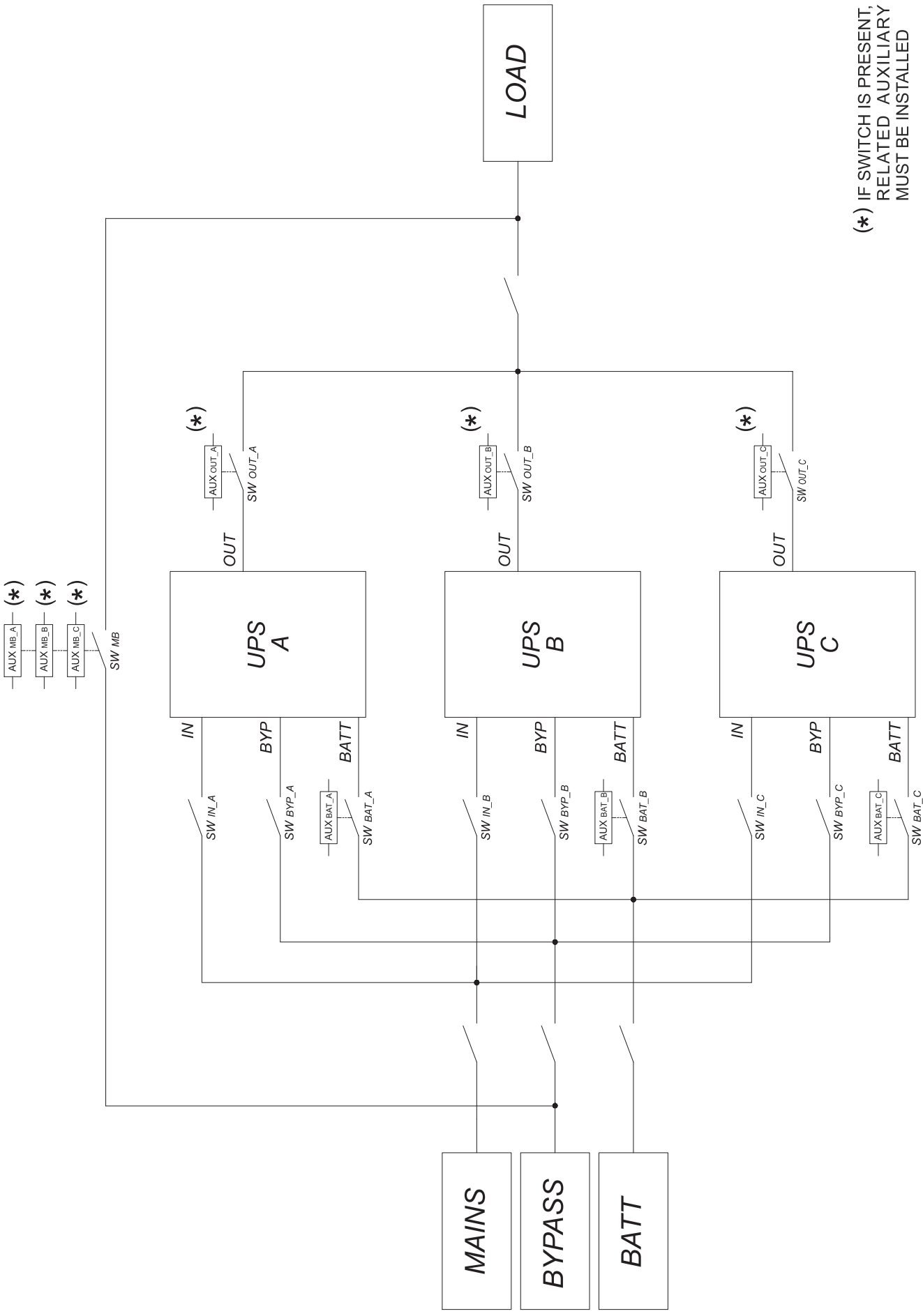
WARNING! REFER TO RELATED MANUAL TO INSTALL THE EXTERNAL TEMPERATURE PROBE, MAXIMUM LENGTH 25 METERS (82 FEET). THE SYSTEM ONLY CONSIDERS THE MAXIMUM TEMPERATURE MEASURED BETWEEN ALL SENSORS.



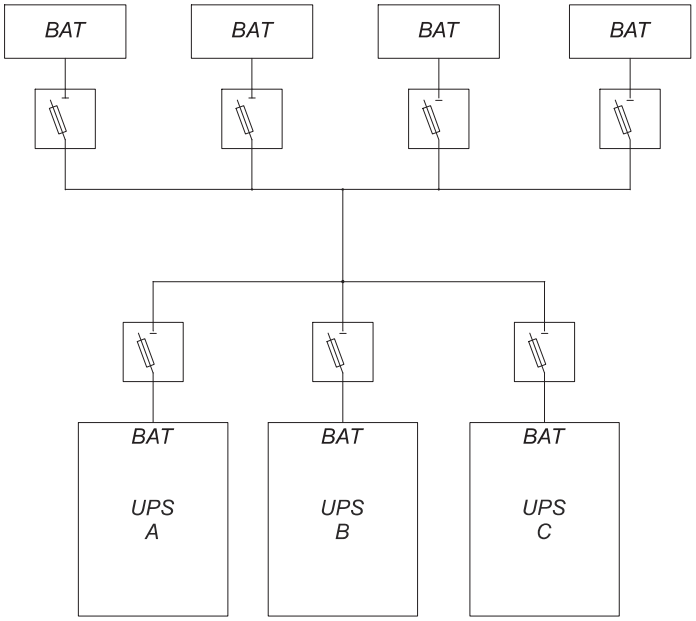
UPSs SYNCHRONISATION TO AN EXTERNAL SYNC SIGNAL:

THE UPSs ARE EQUIPPED WITH AN ISOLATED INPUT THAT CAN BE USED TO SYNCHRONISE THE INVERTERS TO A SYNC SIGNAL FROM AN EXTERNAL 120Vac SOURCE. IN CASE OF PARALLEL SYSTEM, THE SYNC SIGNAL MUST BE CONNECTED ON EACH UPS INDIVIDUALLY. MAKE THE CONNECTION AS INDICATED IN THE EXAMPLE, PAYING ATTENTION TO THE SIGNAL POLARITY.
CONNECT THE 120Vac EXTERNAL SOURCE TO THE UPSs ACCORDING TO THE FIGURE BELOW USING A DOUBLE INSULATED CABLE WITH A CROSS SECTION OF AWG 16.

TYPICAL AUXILIARY SWITCH INSTALLATION

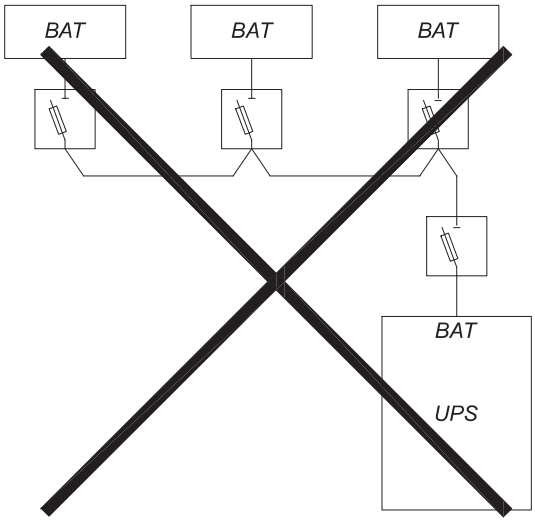


BATTERY CABINET POWER CONNECTIONS



STAR CONNECTION

Example of connection of four battery cabinets and three UPSs.



CASCADING CONNECTION IS NOT ALLOWED

Example of parallel connection of three battery cabinets

The SWBATT included in the Combo Cabinet disconnects only the internal batteries.