

This installation guide is
for product #101SVE6*6.



GAMATRONIC

Our Power, Your Confidence

CENTRIC UPS SYSTEM

3x480 VAc

INSTALLATION GUIDE

for the 120 kW and 240 kW models



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STANDARDS AND CONVENTIONS

This user manual contains diagrams which include images of the display screen of the UPS. Unless otherwise indicated, the readings shown in the screen images are representational only, and are not intended to match the readings on a specific system in a particular environment.

Operation and control of the **Centric** UPS is accomplished through a touch-sensitive LCD display screen. In this manual, when explaining how to navigate the control software via the touch-sensitive screen, the terms "tap", "press", "choose", and "select" may be used interchangeably to indicate selection of a screen option.

RECYCLING INFORMATION

CAUTION



Do not discard waste electrical or electronic equipment (WEEE) or used batteries in the trash. For proper disposal, contact your local recycling or hazardous waste center.

1. Unpacking instructions

1. Inspect the shipping crate for any signs of damage that may have occurred while in transit.



Figure 1: Inspect the shipping crate for signs of damage

2. Inspect the ShockWatch and TiltWatch devices which are adhered to the outside of the wooden packing crate. Verify that their indicators are not red. A red indicator is a sign of rough handling (ShockWatch) or tip-over (TiltWatch).
3. Notify the carrier and your dealer immediately if rough handling of the Centric is suspected or if any damage is found or suspected. Retain the shipping crate and packaging materials for future use.



Figure 2: ShockWatch and TiltWatch devices
(These devices indicate if the package was subject to shock or tip-over.)

4. Using a fork lift, move the shipping crate close to the place in which the Centric will be installed.
5. Cut and remove any straps that are on the shipping crate.
6. Stand on a secure ladder or stool and use an electric screwdriver to remove the screws that are

holding the roof of the shipping crate in place. Then remove the roof.



Figure 3: Remove the roof (use electric screwdriver)

7. Remove the screws that are holding the walls of the crate in place. Then remove the walls themselves. The Centric is left standing on its wooden shipping pallet.



Figure 4: Remove the walls of the crate

8. Cut and remove any straps that are securing the Centric to the shipping pallet.
9. Remove the plastic wrapping and all other packaging material from the UPS. Be careful to avoid scratching the finish of the Centric.
10. Using a fork lift, lift the Centric from the shipping pallet and move it to the location where it will be installed.

2. Safety Precautions

The PowerPlus UPS system is designed for industrial applications and harsh environments. Nevertheless the PowerPlus should be handled with care, according to the following guidelines.

**WARNING! HIGH TOUCH CURRENT!
EARTH CONNECTION ESSENTIAL BEFORE CONNECTING SUPPLY.**

2.1 Do's

- Read this manual carefully before starting installation and operation of the UPS.
- Review the safety precautions described below to avoid injury to users and damage to the equipment.
- **This UPS is intended for installation in a temperature-controlled, indoor area that is free from conductive contaminants.**
- All power connections must be completed by a **licensed electrician who is experienced in wiring this type of equipment**, and who is **familiar with the local electrical codes and regulations. Improper wiring may cause injury to personnel, or death**, or damage to the equipment.
- Ensure all power is disconnected before performing installation or maintenance.
- Leave at least 20 cm of clearance space between the ventilation openings of the UPS and other objects or walls.
- The UPS must be well grounded to the building's grounding system with a conductor that has a current carrying capacity that matches the rating of the UPS.
- Battery installation, battery maintenance, and battery replacement shall be performed only by authorized service personnel.
- Pay attention to all DANGER, CAUTION, and WARNING notices affixed to the inside and outside of the UPS.
- Keep the surroundings clean, uncluttered and free from excess moisture.
- Keep the operating environment within the parameters stated in this document.
- Allow only qualified technicians to service the UPS. There are no user-serviceable components. **Do not try to repair it yourself!**
- Use the UPS only for its intended purpose.
- The batteries should preferably be installed next to the UPS, or as close to it as is practically possible.
- If you remove a UPS module from the Centric while the module is operating, wait five minutes before reinserting the module. This allows the module's capacitors time to discharge.
- FAST FUSES (SEMICONDUCTOR FUSES) must be used between the battery and the Centric, and on the rectifier ac input line. For example, the Ferraz Shawmut A70QS fuse.



WARNING - RISK OF LETHAL ELECTRIC SHOCK:

The battery cabinet contains a series of batteries that provides high voltage and energy in the UPS body even when the UPS is not connected to the ac input.

Take appropriate precautions during installation, inspection and servicing.

2.2 Don'ts

- Do not open the cover of the UPS or the battery cabinets under any circumstances. All UPS panels and doors should be closed.
- Do not insert any objects through the ventilation holes.
- Do not put objects on the UPS.
- Do not move the UPS while it is operating.
- Do not use the UPS outdoors.
- Do not turn the UPS upside down during transportation.
- Do not connect or disconnect the cable to the battery cabinet before the battery circuit breaker is turned OFF.
- Do not turn ON the battery circuit breaker when the battery cabinet is disconnected from the UPS.
- Do not install the UPS next to gas or electrical heaters. A restricted location is recommended in order to prevent access by unauthorized personnel.
- If you remove a UPS module from the Centric while the module is operating, do not reinsert the module immediately. Wait five minutes.



WARNING - RISK OF LETHAL ELECTRIC SHOCK:

This UPS receives power from more than one source!
Disconnection of all ac sources, and of the dc source, is required to de-energize this unit before servicing.



WARNING - RISK OF LETHAL ELECTRIC SHOCK:

Do not touch uninsulated battery terminals.

RECYCLING INFORMATION

CAUTION



Do not discard waste electrical or electronic equipment (WEEE) or used batteries in the trash. For proper disposal, contact your local recycling or hazardous waste center.

3. System structure

The Centric 3x480 Vac UPS is available in two models:

- 240 kVA/kW – holds up to eight UPS modules
- 120 kVA/kW – holds up to four UPS modules

Each UPS module has an output capacity of 30 kVA / 30 kW.

In addition to the UPS modules, each Centric 3x480 Vac UPS includes:

- a system controller
- a static switch
- an LCD control panel
- dc-to-dc voltage converter modules – one for every two UPS modules

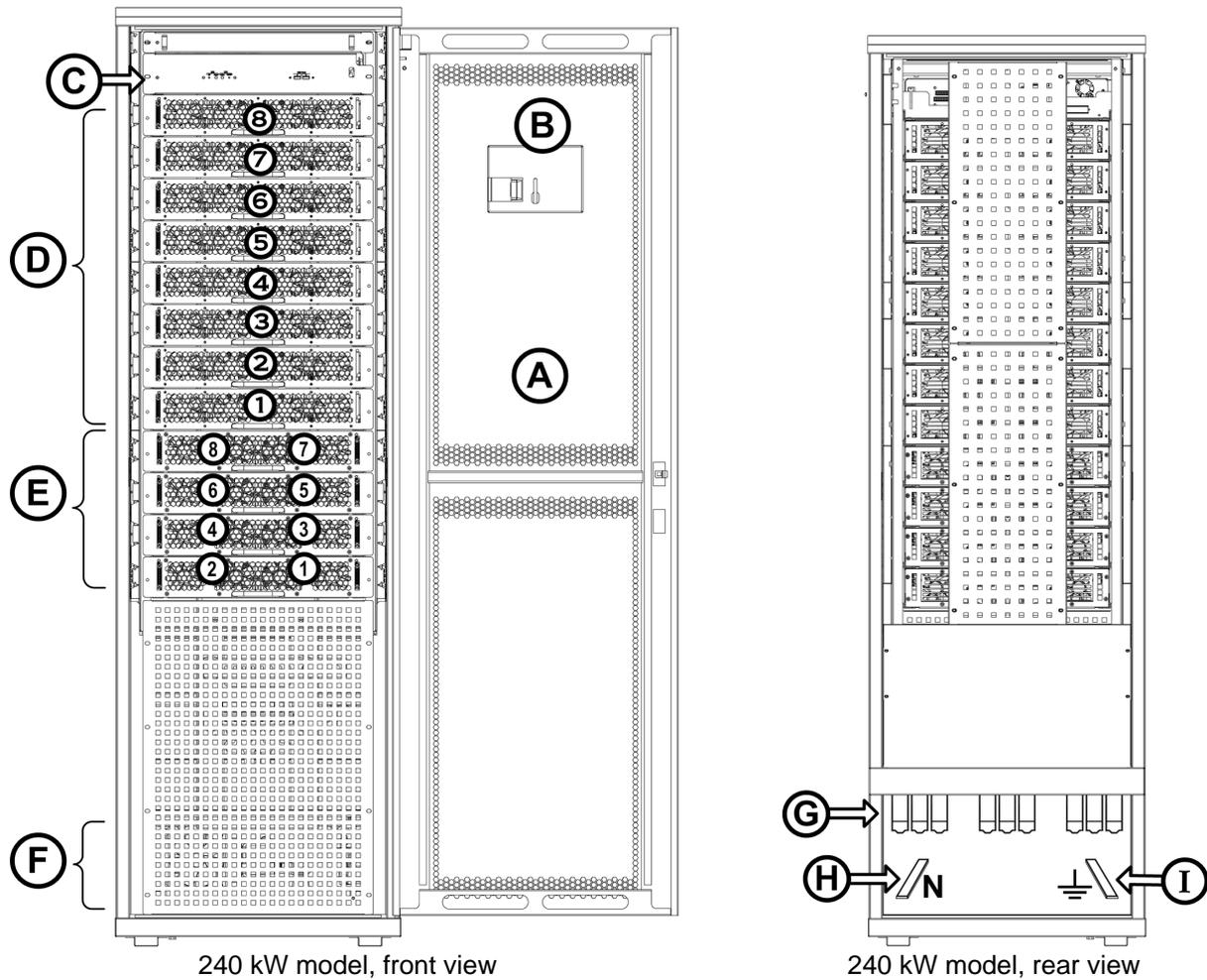
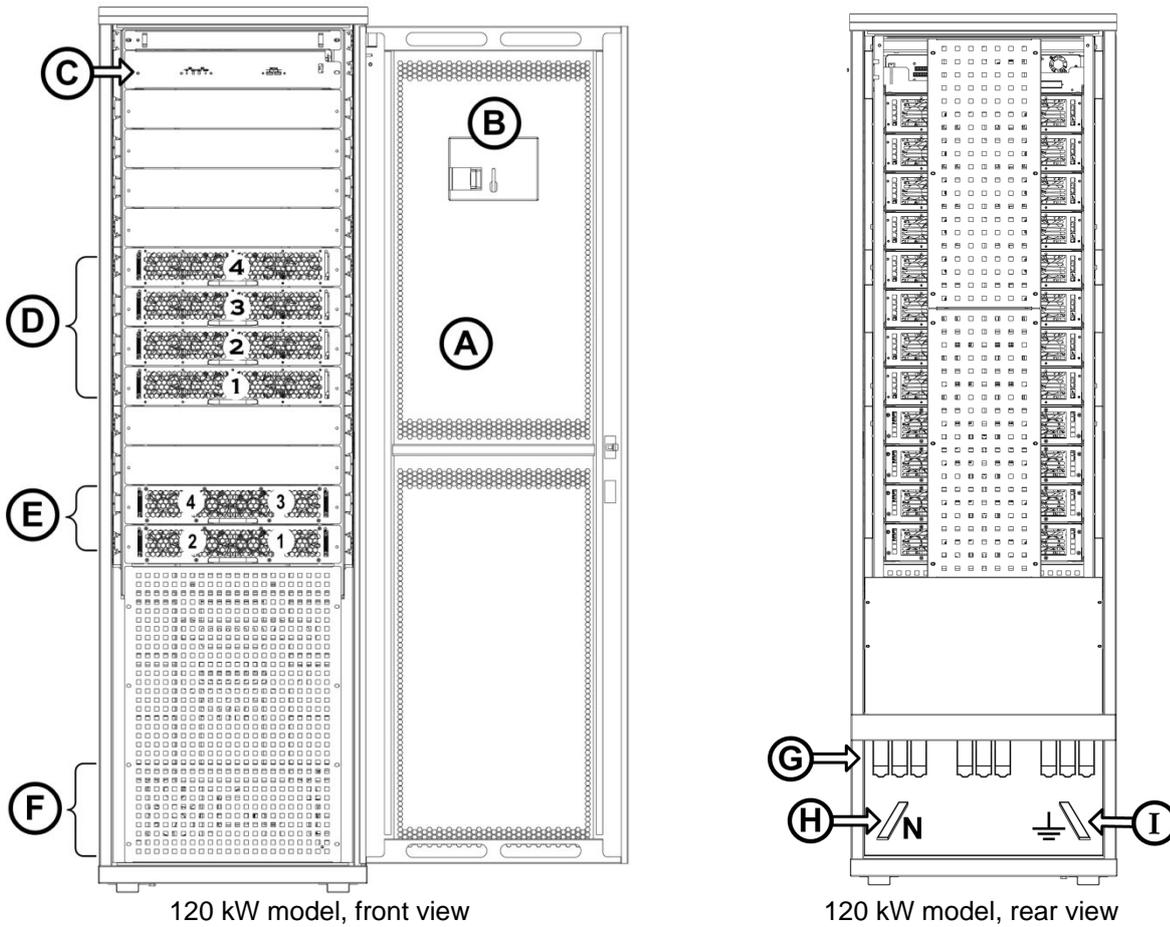


Figure 5: Major components of the Centric 3x480 Vac (240 kW model)

Table 1: Key to Figure 5

ITEM	DESCRIPTION
A	The UPS cabinet's front door
B	Back side of the LCD panel.
C	System controller
D	Shelves for up to 8 UPS modules. Each UPS module supplies 30 kW. The lowest UPS shelf is UPS shelf 1, the next shelf up is shelf 2, and so on.
E	Shelves for up to 4 dc-dc converter modules. The dc-dc modules convert the battery voltage of 270 V to 400 V for the UPS modules. Each dc-dc module contains 2 converter blocks. All of the dc-dc blocks are connected to one-another in parallel, and supply the UPS modules in parallel. The lowest dc-dc shelf is shelf 1; the next shelf up is dc-dc shelf 2, and so on.
F	The static switch is located at this level, inside the UPS. It is not visible from the outside.
G	Main ac terminals. See Figure 9 for details.
H	Neutral bus bar.
I	Protective Earth Ground bus bar



120 kW model, front view

120 kW model, rear view

Figure 6: Major components of the Centric 3x480 Vac (120 kW model)

Table 2: Key to Figure 6

ITEM	DESCRIPTION
A	The UPS cabinet's front door
B	Back side of the LCD panel.
C	System controller
D	Shelves for up to 4 UPS modules. Each UPS module supplies 30 kW. The lowest UPS shelf is UPS shelf 1, the next shelf up is shelf 2, and so on.
E	Shelves for up to 2 dc-dc converter modules. The dc-dc modules convert the battery voltage of 270 V to 400 V for the UPS modules. Each dc-dc module contains 2 converter blocks. All of the dc-dc blocks are connected to one-another in parallel, and supply the UPS modules in parallel. The lowest dc-dc shelf is shelf 1; the next shelf up is dc-dc shelf 2, and so on.
F	The static switch is located at this level, inside the UPS. It is not visible from the outside.
G	Main ac terminals. See Figure 9 for details.
H	Neutral bus bar.
I	Protective Earth Ground bus bar

4. Installation



ALL POWER CONNECTIONS MUST BE COMPLETED BY A **LICENSED ELECTRICIAN WHO IS EXPERIENCED IN WIRING THIS TYPE OF EQUIPMENT, AND WHO IS FAMILIAR WITH THE LOCAL ELECTRICAL CODES AND REGULATIONS.**

IMPROPER WIRING MAY CAUSE INJURY TO PERSONNEL AND/OR DAMAGE TO THE EQUIPMENT.

4.1 Important installation information

Be aware that your Centric 480 has been factory-set to be connected to the mains and the loads in one of two possible line configurations, according to your order:

- **“4-wire + Gnd” (includes Neutral):** In this configuration, the phase-to-neutral voltage is displayed on the status screen. **The Neutral line MUST be connected to the UPS** on the input and output stages of the UPS. The UPS will support phase-to-phase loads and phase-to-Neutral loads. The Neutral line must always remain connected when the UPS is operating.
- **“3-wire + Gnd” (i.e., no Neutral line):** In this configuration the phase-to-phase voltage is displayed on the status screen. **Do NOT connect a Neutral line to the UPS**, and do NOT connect battery Neutral to Ground. In this configuration, the UPS will support phase-to-phase loads only!

Warning: If a “4-wire + Ground” load (includes Neutral) is connected to a Centric that is configured for “3-wire + Ground” loads (no Neutral line), **the load may be damaged** when it is transferred to bypass.

If you want to change the line configuration of your Centric 480, contact Gamatronic or your vendor.

4.2 Installation Checklist

Complete the following checklist as you perform the installation, initialization, configuration, and testing procedures. Refer to the appropriate sections (specified in the **Reference** column) for detailed information about each checklist item.

When the checklist is complete, fax it to your vendor, or to Gamatronic at +972-2-582-8875.

INSTALLATION CHECKLIST FOR THE CENTRIC 3x480 VAC UPS.		
Customer	Address	
Site	Phone	E-mail
Serial numbers: System _____ Static Switch _____		
Modules 1 _____ 2 _____ 3 _____ 4 _____ 5 _____		
6 _____ 7 _____ 8 _____		
Technician Name	Date	Signature

√	Operation	Requirement	Reference
Visual Inspection			
	Verify the physical integrity of the system	No physical damage	4.3.1
Comments on visual inspection: _____			

Site Preparation – Physical			
	Check ambient temperature.	Recommended: betw. +15 °C and +25 °C (+59 °F and +77 ° F) Min/max: –10 °C and +40 °C (+14 °F and +104 °F)	4.3.2 Step 1
	Check humidity and condensation.	No condensation/dampness.	4.3.2 Step 2
	Check ventilation.	Proper airflow to batteries.	4.3.2 Step 3
	Check foundation and access.	Adequate structure and access.	4.3.2 Step 4
	Check for adequate clearances.	See Table 3 and Figure 8.	4.3.2 Step 5
Comments on site preparation – physical: _____			

√	Operation	Requirement	Reference
Site Preparation - Electrical			
	<ul style="list-style-type: none"> When connecting the UPS to “4-wire + Ground” infrastructure, Refer to Figure 10 or Figure 11. When connecting the UPS to “3-wire + Ground” infrastructure, refer to Figure 13 or Figure 14. For maximum amperage values on the rectifier ac input and bypass ac input lines see Table 5. For recommended circuit breaker and fuse ratings see Table 6. Verify that appropriate-sized circuit breakers are present on the electrical boards supplying the Centric. Verify that the proper sized fuse is present on the rectifier ac input line. Read Chapter 8 “Circuit Breaker Selectivity” in this Installation Guide. 	Meet local code and Gamatronic recommendations.	4.3.3
	<ul style="list-style-type: none"> Verify that the cables between the electrical board and the UPS, and between the UPS and its loads, and also the ground/PE cables, are of appropriate size. Use a fast fuse (semiconductor fuse) on the rectifier ac input line – for example, the Ferraz Shawmut A70QS fuse. 	Meet local code and Gamatronic recommendations.	4.3.3
	Verify ac input voltages.	Phase-to-Phase: 3x480 Vac, -10 % / +10 % Phase-to-Neutral: 277 Vac, -10 % / +10 %	4.3.3 Step 3
	Verify the voltage between neutral and ground.	0~2 Vac	4.3.3 Step 4
	Verify dc voltage at battery cabinet switch.	At least +240 V and –240 V	4.3.3 Step 5
	If the UPS is to be operated in “4-wire + Gnd” configuration, verify that the neutral line will always be connected during UPS operation..	Neutral connection will always be unbroken during UPS operation.	4.3.4.1
	Verify that the circuit breakers on the electrical board for the UPS ac input, bypass input and output lines are in the “OFF” position.	Circuit breakers for ac input and output are “OFF”.	4.3.4.2
	Attach ac input, bypass ac input, and output cables to the Centric (refer to Figure 10 or Figure 11).	Ac input, bypass, and output cables are attached.	4.3.4.2
	Assemble and connect the batteries within the battery cabinet, verify proper voltage.	Batteries are assembled and ready for operation or for charging.	4.3.4.4
	Verify that the connection of the battery to the UPS is according to the diagram and instructions in section 4.3.4.4. FAST FUSES (SEMICONDUCTOR FUSES) must be used between the battery and the Centric. For example, the Ferraz Shawmut A70QS fuse.	Batteries are connected according to recommendations and with proper fuse values.	

	Verify that there is a switch or other means to easily and safely disconnect the battery cabinet from the UPS in the event of an emergency or for maintenance.	The batteries can be easily and quickly disconnected from the UPS when necessary.	
	<ul style="list-style-type: none"> • With the battery circuit breaker "OFF" or the battery fuses removed, connect the battery cable to the UPS. Leave the battery circuit breaker "OFF" or leave the battery fuses out, until instructed to turn the battery on in section 4.4.1. • Verify proper polarity of the battery connection to the UPS, and verify proper connection between the two battery Neutral lines and UPS's Neutral bus bar. 	Batteries are connected and OFF.	4.3.4.4
	Power-up the system.	LCD screen is on.	4.3.5
	Perform the initial configuration.	Initial configuration completed.	4.4
	Complete first-time startup.	First-time startup completed.	4.4.1
	If you are using lithium-ion batteries, verify that the battery setup parameters (Setup > Battery) are appropriate for the batteries you have chosen.	Compare the values of the battery setup parameters against the battery manufacturer's data sheet.	User's Guide, "Setup > Battery"
	Before turning on the battery, verify that the LED on the left front of each UPS modules is lit green.		
	Perform post-startup tests.	Tests successfully completed.	4.5
<p>Comments on site preparation – electrical: _____</p> <p>_____</p> <p>_____</p>			

4.3 Installation Procedure

After completing each step in the following installation, go back to the Installation Checklist and place a check mark next to the corresponding item.

The **Centric** comes in various models and configurations. The following installation instructions cover all models and configurations. Any parts of the instructions that apply only to a specific model or configuration are clearly indicated as such. If no such indication is present, the procedure applies to all models and configurations.

4.3.1 Visual Inspection

Perform the inspection described here immediately after unpacking the **Centric**.

1. Inspect the **Centric** from all sides and ensure that there is no visible damage to any portion of the housings or covers.
2. Ascertain that the number of modules delivered is as ordered, and that a system controller module was delivered.

4.3.2 Site Preparation – Physical

Perform the following procedures before connecting any external cables to **Centric**.

1. Ensure that the ambient temperature in the immediate vicinity of **Centric** complies with system requirements:
Minimum/maximum operating temperatures: $-10\text{ °C} / +40\text{ °C}$ ($+14\text{ °F} / +104\text{ °F}$).
Recommended operating temperature: between $+15\text{ °C}$ and $+25\text{ °C}$ ($+59\text{ °F}$ and $+77\text{ °F}$).
2. Verify that there is no water condensation or dampness at the installation site.
3. Ensure that sufficient airflow or forced ventilation is present at the location of the battery cabinets.
4. Verify that the foundation and access routes are adequate for the dimensions and weight of the UPS and battery cabinets.
5. Ensure that there are adequate clearances to allow comfortable access to battery cabinets and electrical boards. Recommended minimum clearances around the **Centric** are provided in Table 3 and Figure 8.
6. It is recommended that the battery cabinets be located as close to the UPS as is practically possible.

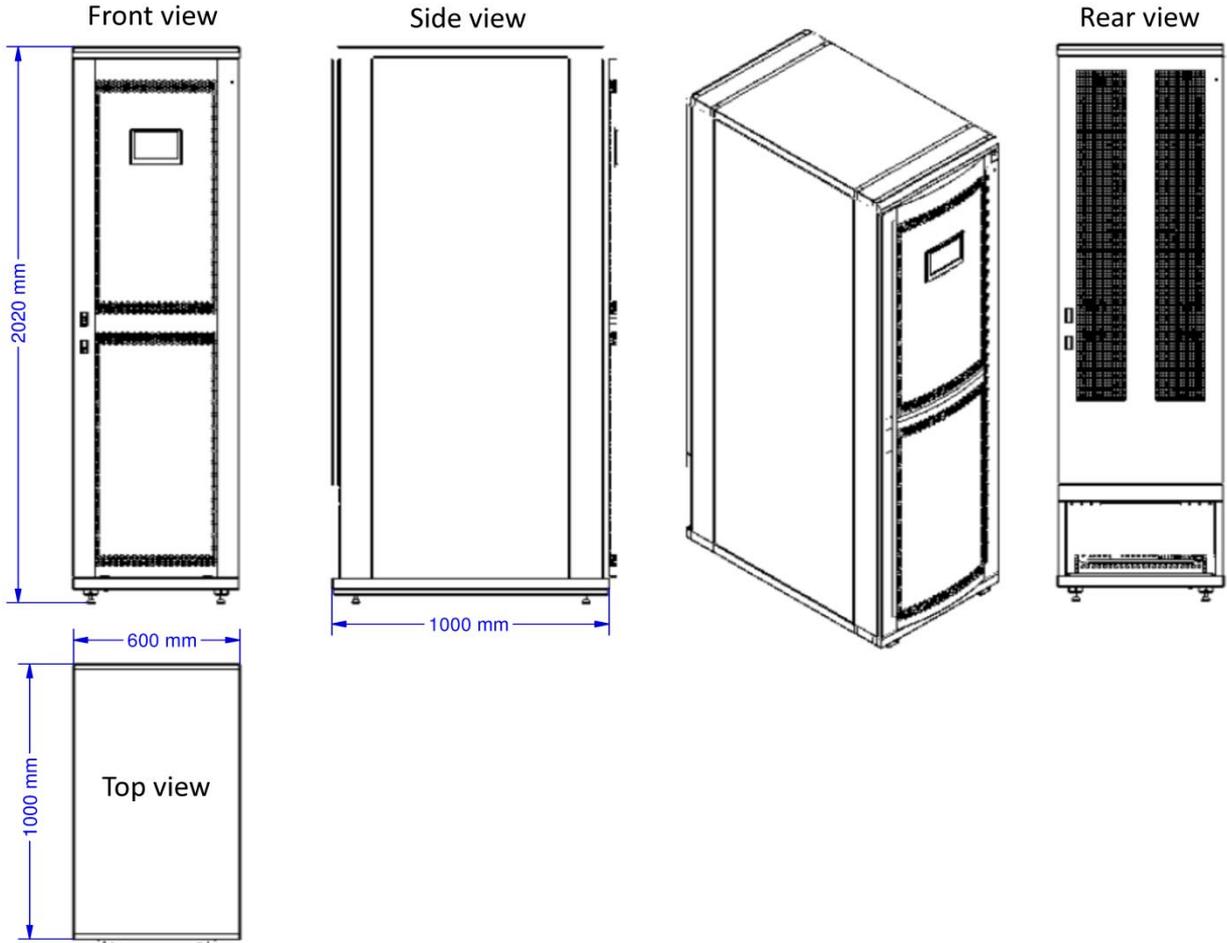


Figure 7: Dimensions of the Centric 3x480 UPS

Table 3: Recommended clearances

RECOMMENDED MINIMUM CLEARANCE AROUND THE CENTRIC 3x480 V		
Front	110 cm (43 in.)	Minimum adequate clearance for user access and service.
Rear	100 cm (39 in.)	Minimum adequate clearance for cable connections.
Sides	--	No minimum clearance, provided that the UPS is not placed next to heat-emitting equipment or other electronic equipment. If the UPS is placed next to heat-emitting equipment or electronic equipment, leave at least 20 cm free space between the UPS and the other equipment. The object here is to avoid subjecting the UPS to additional heat and to protect the UPS from stray electronic signals.

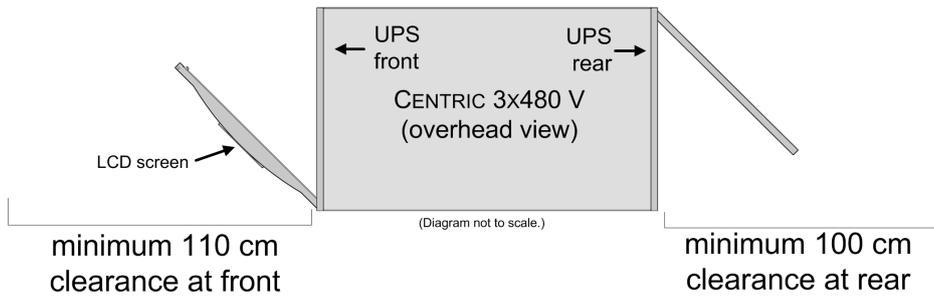


Figure 8: Recommended clearances around the Centric UPS

4.3.3 Site Preparation – Electrical

Perform the following procedures before connecting any external cables to **Centric**.

1. Read Chapter 8 “Circuit breaker selectivity” in this installation guide. That chapter includes considerations regarding the size of the external circuit breakers on the rectifier input and bypass input lines.
2. Verify that circuit breakers on the electrical board that supplies **Centric** are compliant with local and national codes and Gamatronic system specifications. A fast fuse (semiconductor fuse) should be used on the rectifier ac input line – for example, the Ferraz Shawmut A70QS,
3. Verify that the input and output power cable connections, GND, and neutral lines comply with local and national codes and are appropriate for the circuit breakers protecting them.
4. Measure the ac input voltage. Phase-to-phase voltage (measured between L1-L2, L2-L3, and L3-L1) should be 480 Vac $\pm 10\%$. Phase-to-neutral voltage (measured at L1, L2, and L3) should be 277 Vac, $\pm 10\%$.
5. Verify that voltage between neutral and ground is between 0 and +2 Vac.
6. Check the dc voltage at the switch of the battery cable. Measure the voltage between the “plus” side and battery Neutral, and between the “minus” side and battery Neutral. Verify that the readings you get are at least +240 V and -240 V.
7. FAST FUSES (SEMICONDUCTOR FUSES) must be used between the battery and the Centric. For example, the Ferraz Shawmut A70QS fuse.

4.3.4 Cabling

4.3.4.1 NEUTRAL LINE FOR “4-WIRE + GROUND” CONFIGURATION



If your Centric is configured for “4-wire + Ground” infrastructure (see section 4.1), then, when the Centric is operating, a neutral line must be connected at all times and should not be disconnected at any time.

Caution: If at any time the neutral line becomes disconnected, there will be no input or output reference voltage because the input neutral line and the output neutral line are physically linked together. This may result in the system defining its own reference voltage, which will be set by the load distribution between the three phases. ***This may cause damage to the load.***

Caution: A 4-pole switching system can disconnect the neutral line.

Warning: If your Centric is configured for “4-wire + Ground” infrastructure (see section 4.1) and you have a **four-pole** mains-to-generator switching system, you are in danger of having the **neutral line disconnected** when the four-pole switch is operated. This can result in the problems described above.

To avoid these problems, it is strongly recommended that if you use a four-pole mains-to-generator switching system, you install an isolation transformer that constantly provides a neutral line to the UPS.

4.3.4.2 AC INPUT AND OUTPUT CONNECTIONS



WARNING! RISK OF ELECTRICAL SHOCK OR INJURY!
INSTALLATION MAY BE PERFORMED BY QUALIFIED TECHNICIAN ONLY!

**WARNING! HIGH TOUCH CURRENT!
EARTH CONNECTION ESSENTIAL BEFORE CONNECTING SUPPLY.**

Before connecting the main input and output cables to the **Centric** main terminals, verify that the circuit breakers on the feed board are in the OFF position.

Connect the rectifier ac input, bypass ac input, and ac output cables to the **Centric**. Refer to Figure 10 or Figure 11, and to Figure 9 below. The lower rear panel of the Centric must be removed for access to the main terminals.

For “4-wire + Ground” infrastructure: To the electrical board to which the UPS is connected, affix a sign or label with the following warning:



WARNING: There is a UPS attached to this electrical board. To avoid electric shock, DO NOT DISCONNECT THE UPS’S NEUTRAL LINE WHEN THE UPS IS OPERATING.

4.3.4.3 CONNECTING THE CENTRIC TO THE ELECTRICAL BOARD

When connecting the electrical board to the Centric, a **torque of 25 to 30 Nm** is recommended on the Centric side.

Suitably rated circuit breakers must be installed between the **Centric** and the electrical board. A suitably rated fuse must be installed on the rectifier ac input line.

Refer to Figure 10 or Figure 11 for system connections, and Table 5 and Table 6 for circuit breaker recommendations.

See Chapter 7 for a discussion of the issue of circuit breaker selectivity.

Connection of the Centric UPS to the electrical board must be performed only by a licensed electrician experienced with similar systems.



Warning: If your Centric is configured for “4-wire + Ground” infrastructure (see section 4.1) and two separate input lines are used for rectifier and bypass input (as in Figure 10 and Figure 11), the Neutral line must be shared.

Also for “4-wire + Ground” infrastructure, see Figure 12 and the notice about the surge arrestor, on page 19.

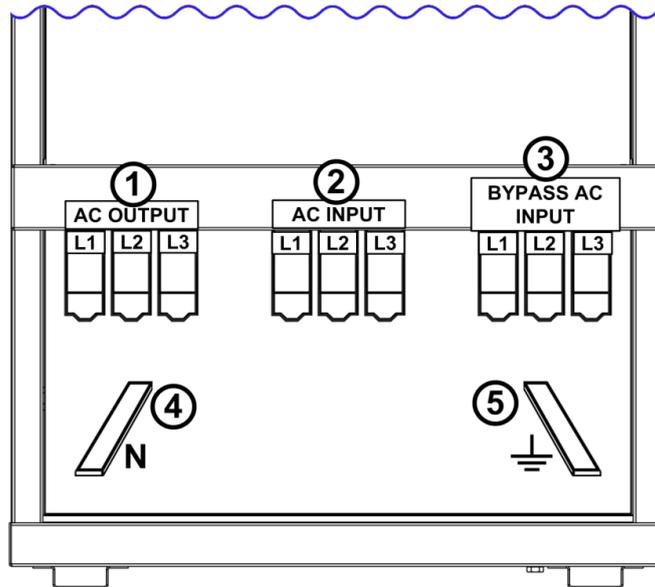


Figure 9: Main power terminals at the bottom rear of the Centric

Table 4: Key to Figure 9

ITEM	DESCRIPTION
1	Ac output terminals (L1, L2, L3).
2	Ac input terminals (L1, L2, L3).
3	Bypass ac input terminals (L1, L2, L3).
4	Neutral bus bar. For all systems , connect battery Midpoint lines here. If your system is configured for a “4-wire + Ground” environment (see section 14.1), also connect the ac Neutral lines here.
5	Protective Earth (Ground) bus bar.

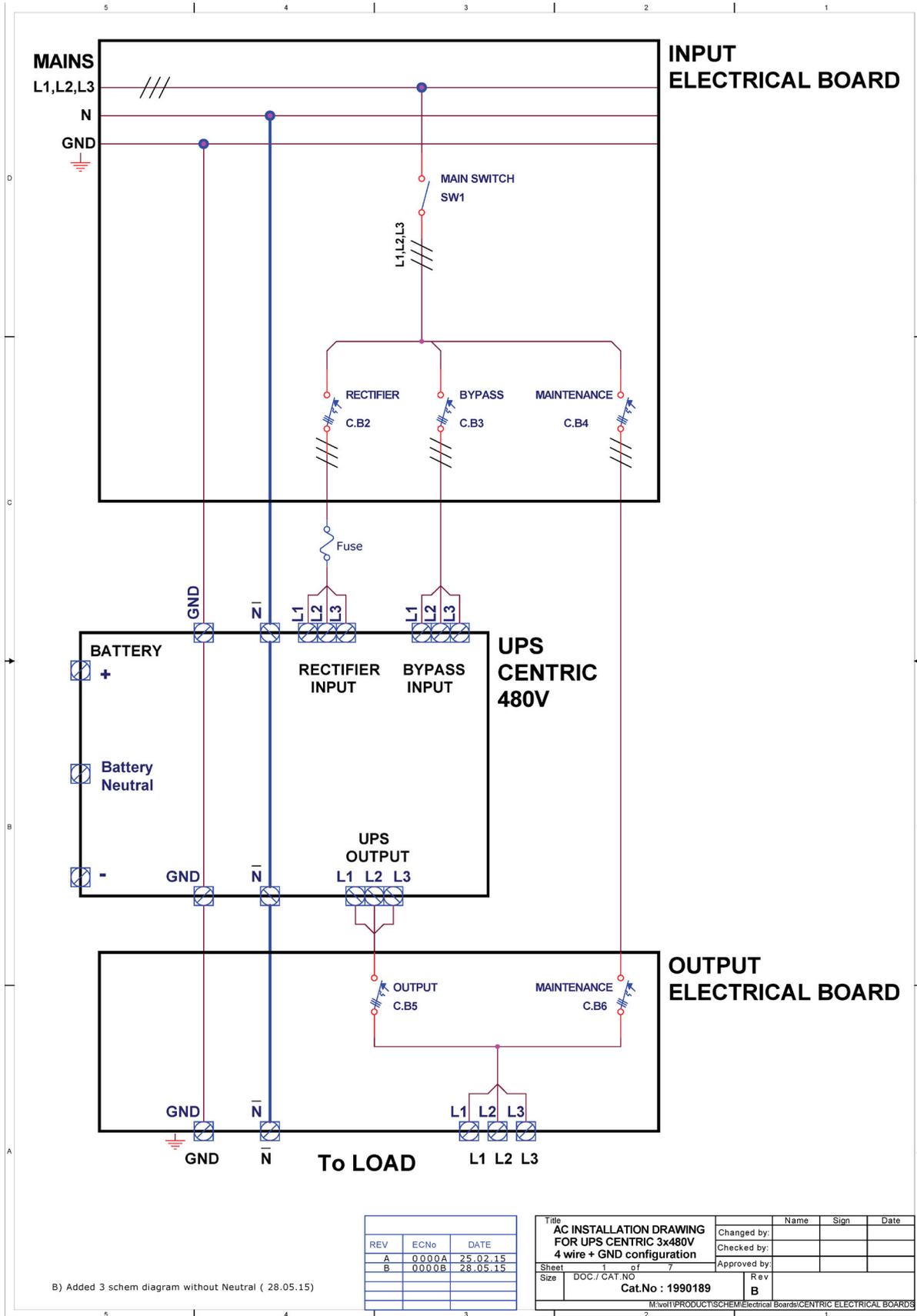


Figure 10: Recommended system connections for “4-wire + Ground” infrastructure
 For recommended circuit breaker and fuse ratings, see Table 5 and Table 6

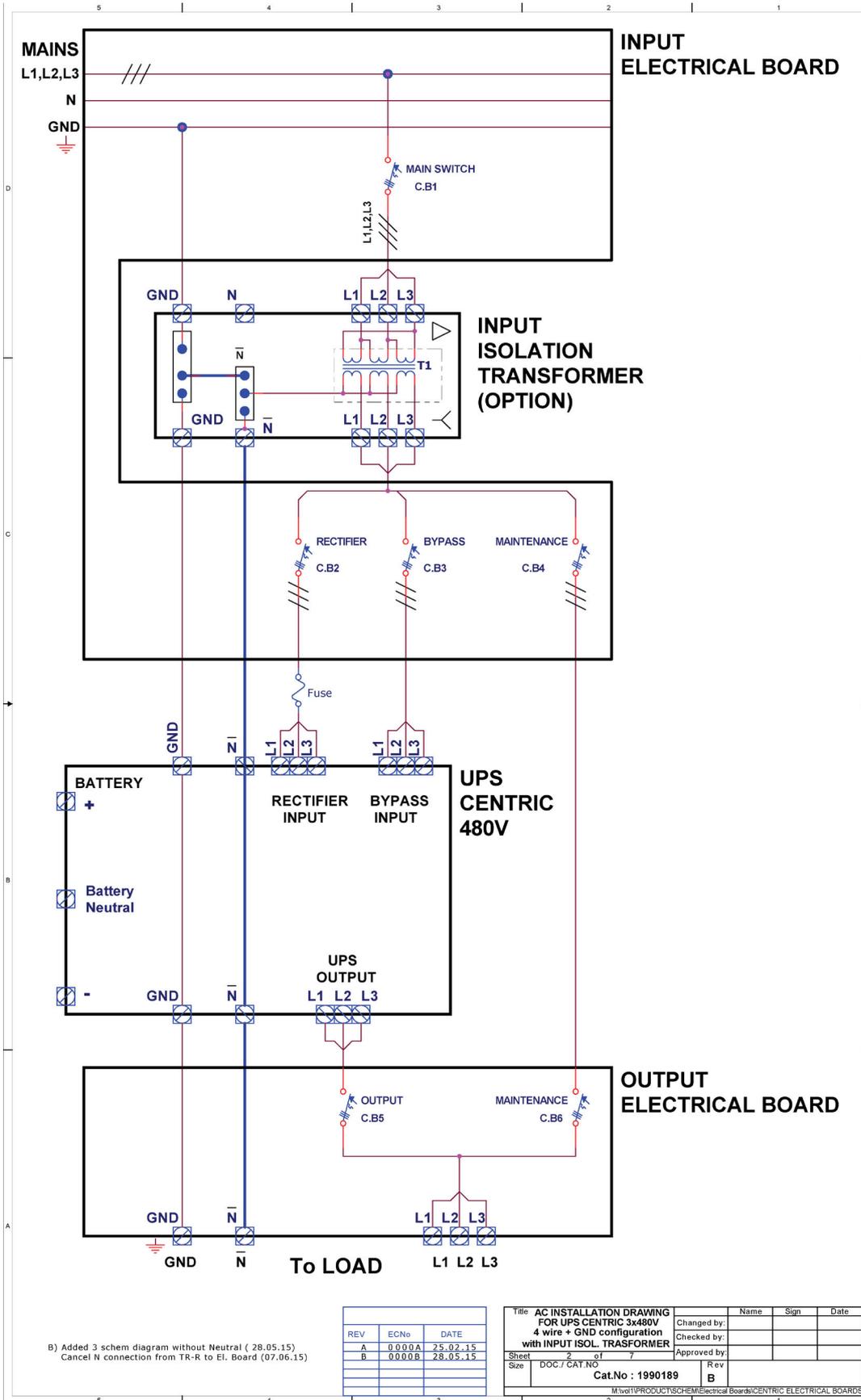


Figure 11: Recommended connections, “4-wire + Ground” config. with input isol. xformer
For recommended circuit breaker and fuse ratings, see Table 5 and Table 6.

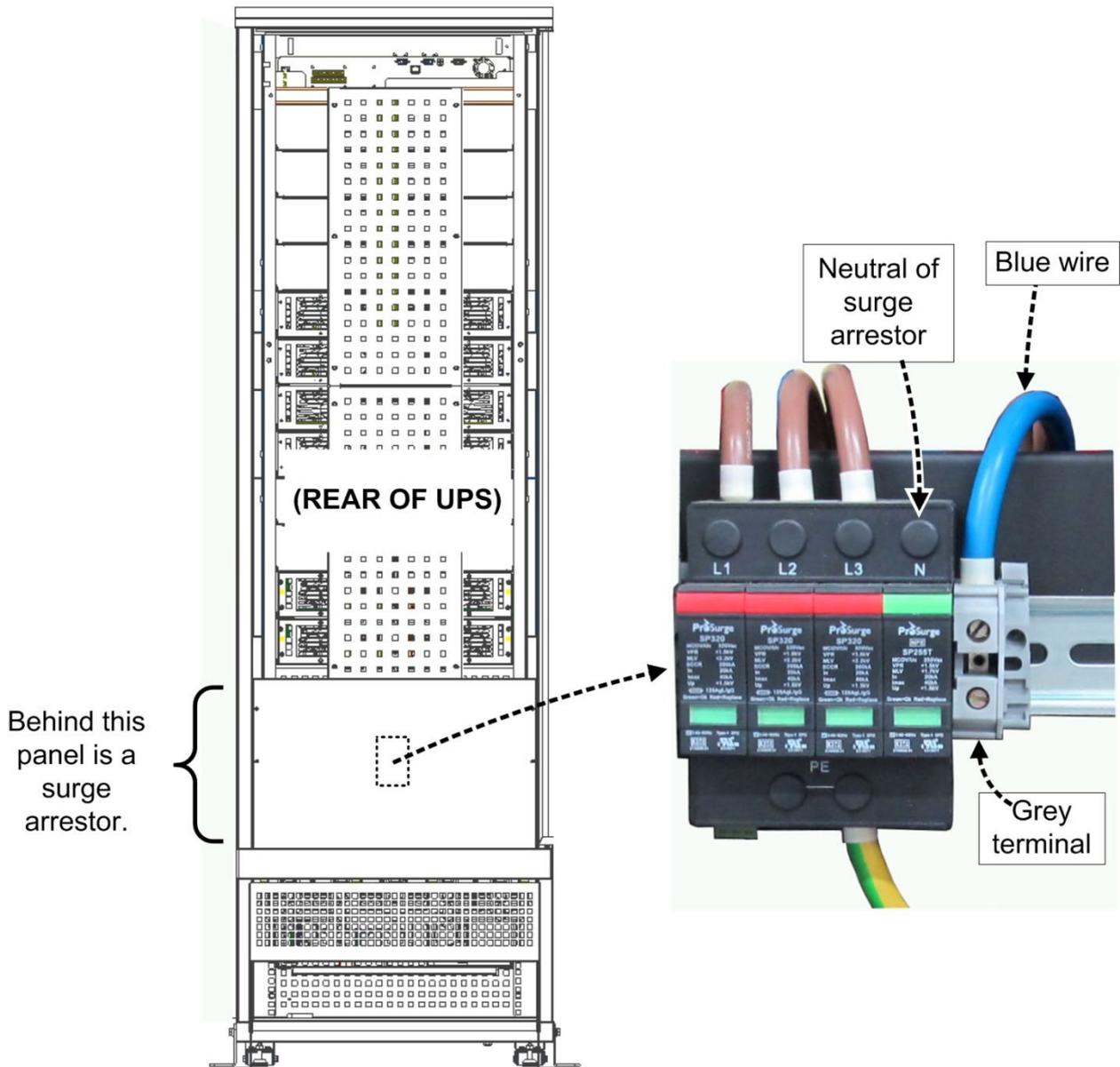


Figure 12: Surge arrester Neutral, for "4-wire + Ground" infrastructure

Attention: There is a surge arrester at the rear of the UPS. It is normally hidden by a large metal panel (see Figure 12).

When connecting the UPS to a "4-wire + Ground" infrastructure, disconnect the blue wire from the grey terminal that is next to the surge arrester, and connect the wire to the Neutral point of the surge arrester.

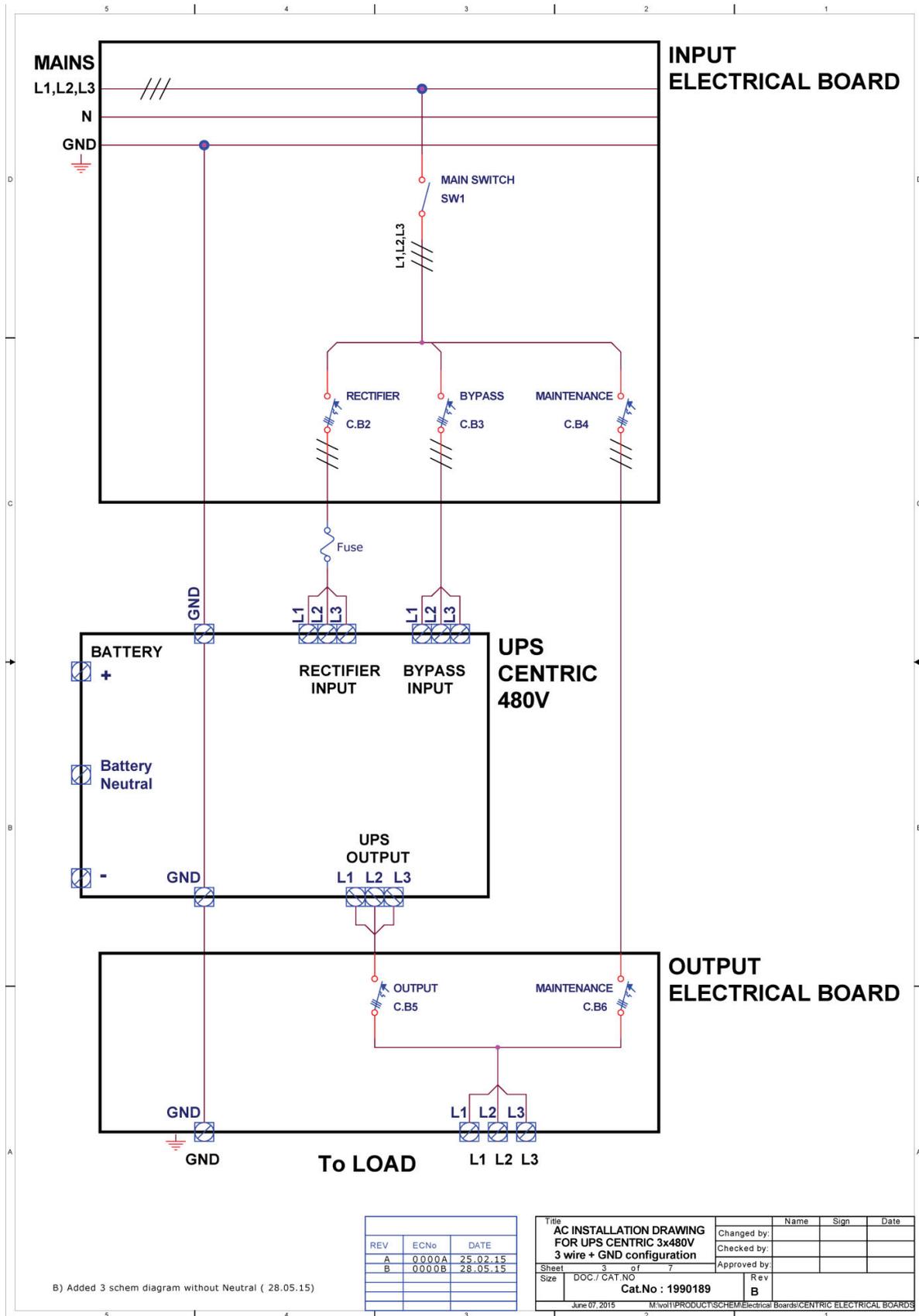


Figure 13: Recommended connections for “3-wire + Gnd” config. (no Neutral).
For recommended circuit breaker and fuse ratings, see Table 5 and Table 6.

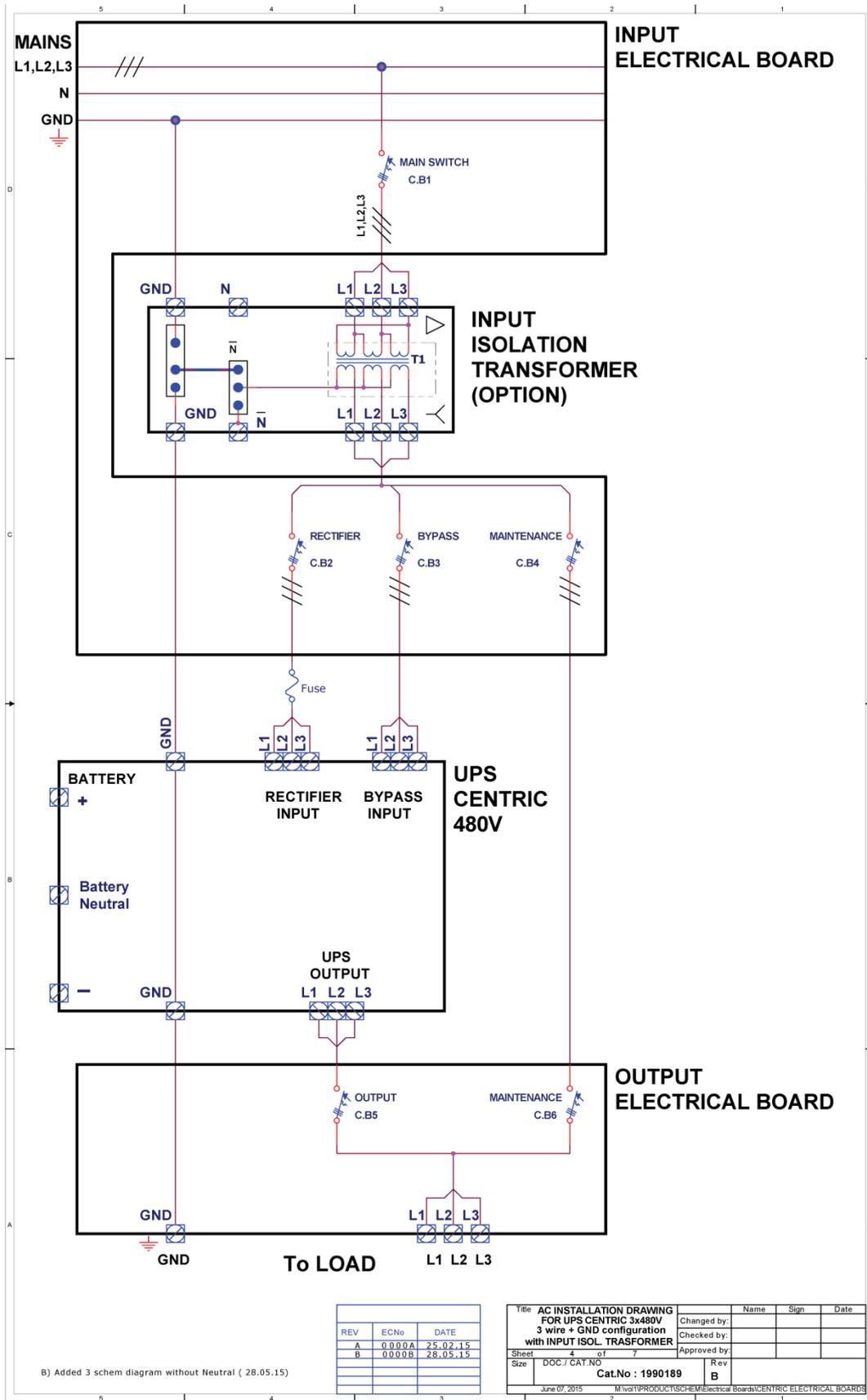


Figure 14: Connections for “3-wire + Gnd” config. (no Neutral) with input isol. xformer
For recommended circuit breaker and fuse ratings, see Table 5 and Table 6.

Table 5: Maximum input currents for Centric 3x480 Vac

Maximum INPUT currents for UPS CENTRIC 3 x 480Vac.

UPS MODEL	Maximum steady-state rectifier input current (A)	Maximum bypass input current (A)
30K	3x40A	3x36A
60K	3x80A	3x70A
90K	3x120A	3x110A
120K	3x160A	3x140A
150K	3x200A	3x180A
180K	3x240A	3x215A
210K	3x280A	3x250A
240K	3x320A	3x280A

REV	ECNo	DATE
A	0000A	25.02.15

Title		Name	Sign	Date
Current table for UPS CENTRIC 3 x 480Vac		Changed by:		
		Checked by:		
		Approved by:		
Sheet	4 of 5			
Size	DOC./ CAT.NO	Rev		
	Cat.No : 1990189	A		
Wednesday, February 25, 2015 M:\vol1\PRODUCT\SCHEM\Electrical Boards\CENTRIC ELECTRICAL BOARDS				

Table 6: Recommended circuit breaker / switch ratings for Centric 3x480 Vac

Installation C.B's /Switch for UPS CENTRIC 3 x 480Vac.

UPS MODEL	* MAIN SWITCH SW1	** MAIN C.B C.B1 (with TRANSFORMER)	RECTIFIER C.B C.B2	BYPASS & OUTPUT C.B C.B3, C.B4, C.B5, C.B6	RECTIFIER FUSE (FAST)
30K	3x63A	3x40A	3x40A	3x40A	50A
60K	3x100A	3x80A	3x80A	3x80A	100A
90K	3x120A	3x120A	3x120A	3x120A	150A
120K	3x160A	3x160A	3x160A	3x140A	200A
150K	3x240A	3x200A	3x200A	3x180A	250A
180K	3x280A	3x240A	3x240A	3x220A	300A
210K	3x300A	3x280A	3x280A	3x250A	350A
240K	3x400A	3x320A	3x320A	3x280A	400A

For installation :

- * - without isolation transformer
- ** - with isolation transformer option only

REV	ECNo	DATE	Title			Name	Sign	Date
A	0000A	25.02.15	Installation C.B /Switch for UPS CENTRIC 3 x 480Vac			Changed by:		
			Sheet 5 of 5			Checked by:		
			Size DOC./ CAT.NO			Approved by:		
			Cat.No : 1990189			Rev	A	
Wednesday, February 25, 2015 M:\vol1\PRODUCT\SCHEME\Electrical Boards\CENTRIC ELECTRICAL BOARDS								

**Note 1: Switch and CB values are based on 10-minute backup time with full load.
If longer backup is required, please consult with your dealer.**

Note 2: If local electrical codes are stricter than the above recommendations, the local codes take priority.

4.3.4.4 ASSEMBLING AND CONNECTING THE BATTERIES

Note: The Centric supports the use of standard lead-acid batteries, and also lithium-ion batteries. If you plan to use lithium-ion batteries, consult with your Centric dealer to be sure that the battery setup parameter values are appropriate for the batteries you will be using.

1. It is recommended that the battery cabinet(s) be located as close to the UPS as is practical.
2. Assemble the batteries within the battery cabinet.
3. Figure 15 shows the recommended connection to the UPS, which includes two fuses inside of each battery cabinet, one on the plus line and one on the minus line. The recommended fuse values for one set of two cabinets of 20 x 12 Vdc each are shown in Figure 15, according to the output capacity of the UPS.
4. Figure 15 assumes that the battery fuses can be easily disconnected when desired.
5. Measure the dc voltage at the main terminals of the battery cabinets. Verify that you obtain values of at least 240 Vdc for each battery cabinet, or at least 480 Vdc across the main battery CB.
6. Connect the battery set to the Centric's positive (“+”) battery bus bar, negative (“-“) battery bus bar, and Neutral bus bar. Refer to Figure 15 and Table 7. **Observe proper polarity!**
7. The fuses between the battery cabinets and the Centric (F1, F2, F3, and F4 in Figure 15 must be **FAST FUSES (SEMICONDUCTOR FUSES)**; for example, the Ferraz Shawmut A70QS fuse.
8. For initial startup to take place the battery must be connected to the UPS and available.

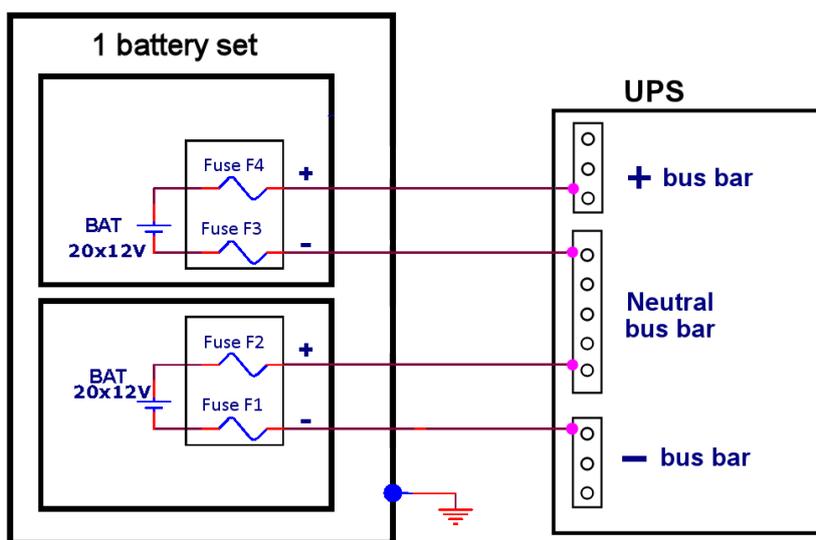


Figure 15: Connecting the battery to the UPS

Note: Fuse values in Table 7 are for fuses F1 through F4 in Figure 15 and Figure 16, and are based on 10-minute backup time at full load. If longer backup time is needed, please consult with your dealer.

Table 7: Suggested fuse and circuit-breaker values

UPS capacity (kW)	30	60	90	120	150	180	210	240
Max. current (A)	80	160	240	320	400	480	560	620
Fast fuse (A)	60	125	200	250	300	400	450	500
Circuit breaker (A)	63-125	125-180	200-250	300-350	350-450	450-525	500-600	550-650

Figure 16 shows another example of how the battery can be connected to the UPS. This example includes two circuit breakers, one for each battery cabinet. Fuses F1 through F4 have the same value as specified in Table 7. The rating of Fuses F5 and F6 depends on the number of battery sets.

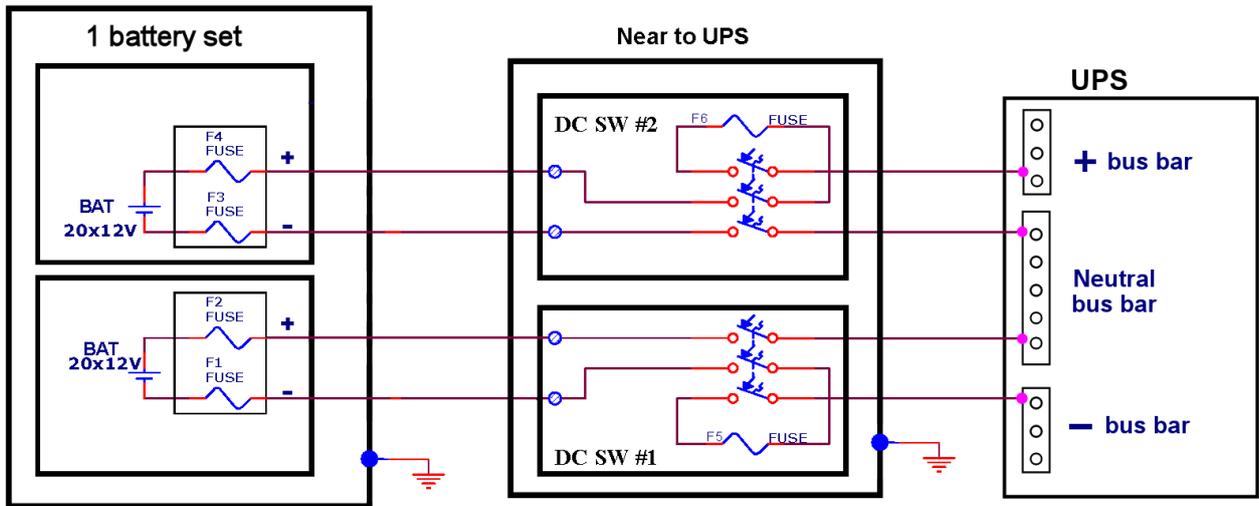


Figure 16: Another battery connection example, this one with circuit breakers

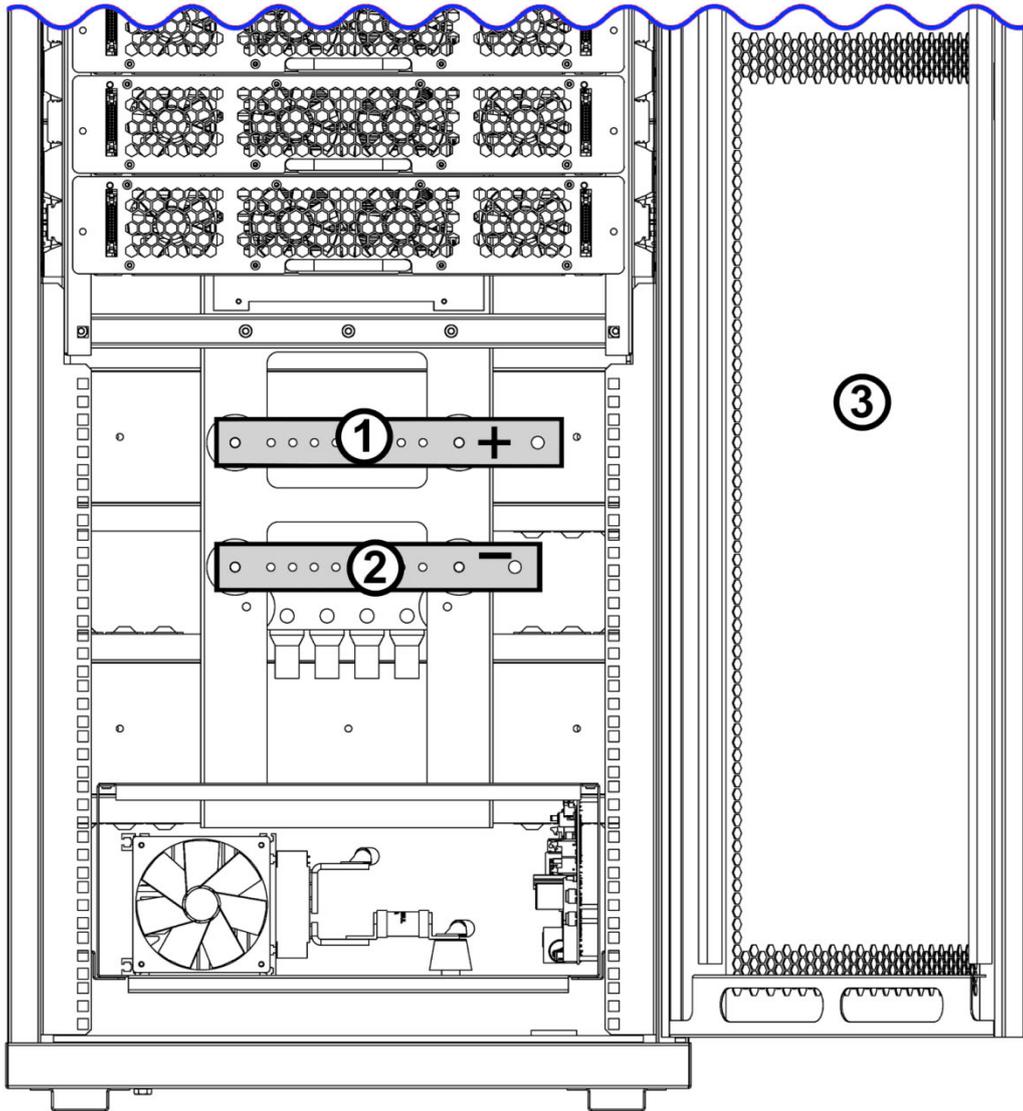


Figure 17: Battery bus bars on lower front of UPS

Table 8: Key to Figure 17

ITEM	DESCRIPTION
1	Positive (+) battery bus bar
2	Negative (-) battery bus bar
3	Front door of the UPS cabinet
<p>Note: The battery Neutral line is to be connected to the Neutral bus bar, which is accessible from the rear of the UPS. See Figure 9.</p>	

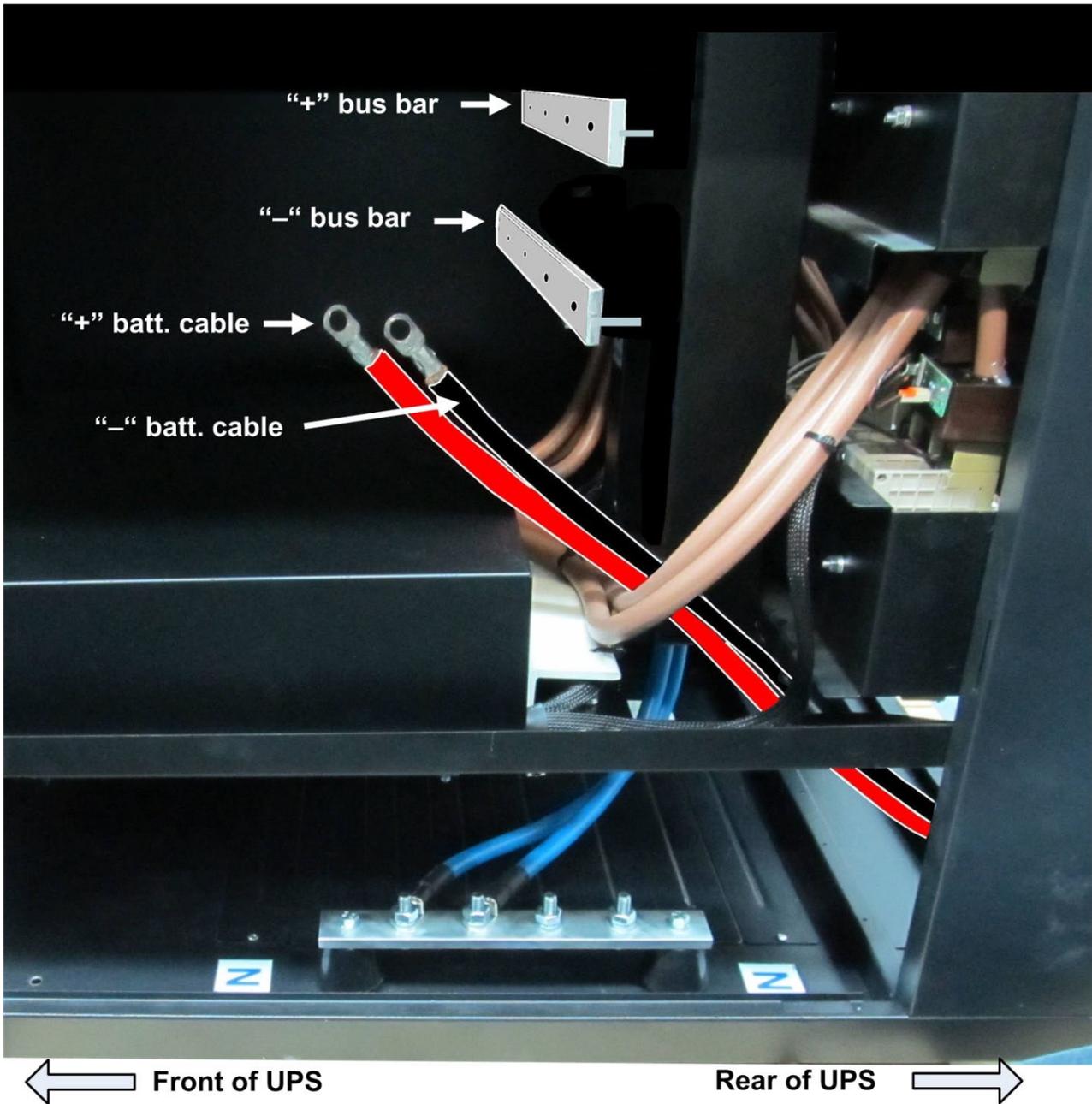


Figure 18: Recommended battery cable entry

The recommended battery cable entry is from the bottom rear of the UPS. See Figure 18.

Protect the batteries from moisture, dampness, and foreign substances.

The temperature of the battery's surroundings influences the batteries' useful lifetime.

Table 9: *Battery lifetime vs environmental temp. (illustrative, as per Eurobat)*

ENVIRONMENTAL TEMPERATURE	ACHIEVABLE PERCENTAGE OF BATTERY'S RATED LIFETIME
20 °C	100 %
30 °C	50 %
40 °C	25 %

4.3.5 Cable tray

A cable tray is available as an option. The cable tray protects the main ac input and output cables and the battery cable at their connection to the UPS's terminals. The cable tray is shown in the following diagrams.

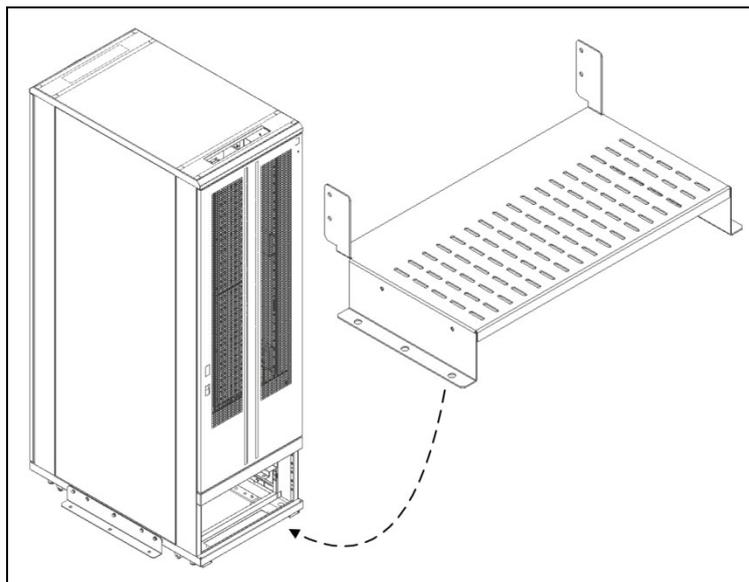


Figure 19: *Bottom portion of the cable tray.*

Note the upright “wing” on each side of the cable tray. Attach the wings to the pre-drilled holes on the inside channel on the left and right side of the rear of the UPS. (See Figure 20)

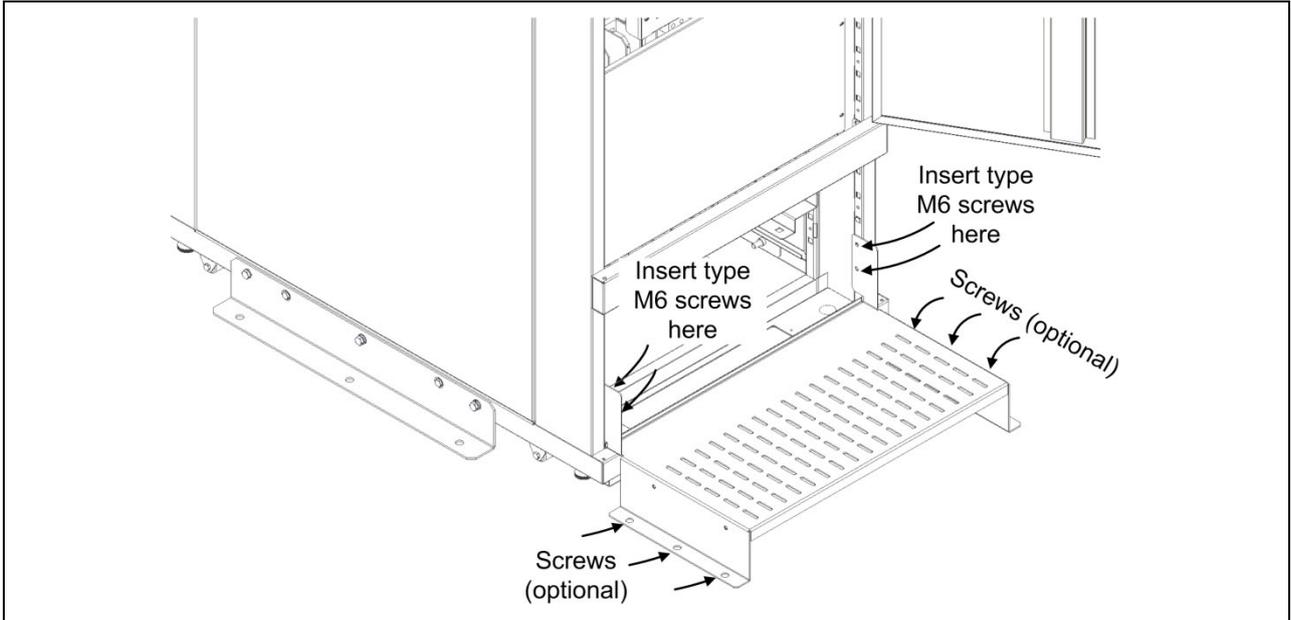


Figure 20: Attaching the lower part of the cable tray

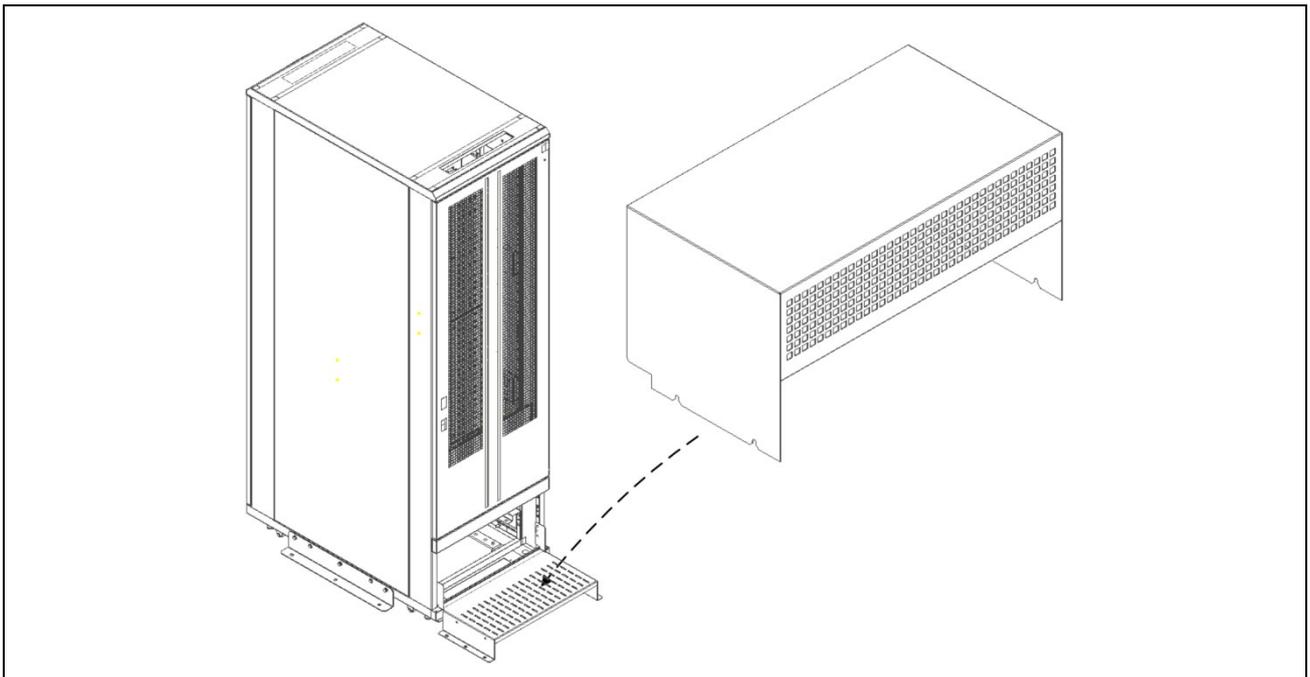


Figure 21: The upper part of the cable tray

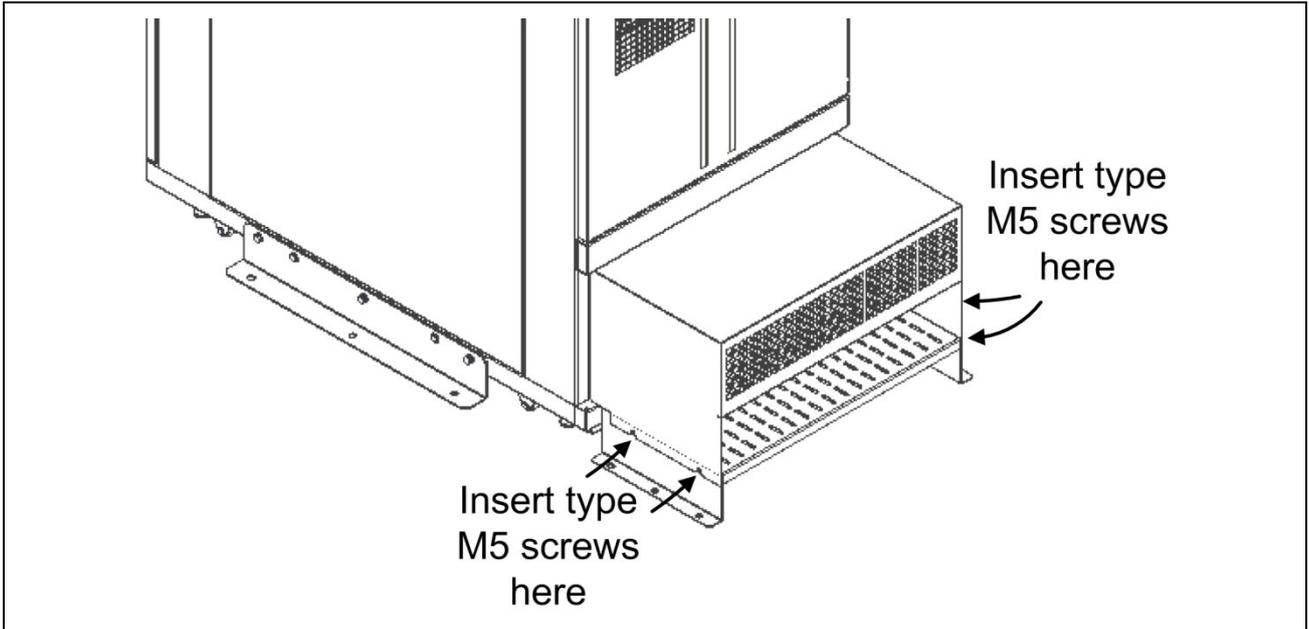


Figure 22: Fastening the upper part of the cable tray

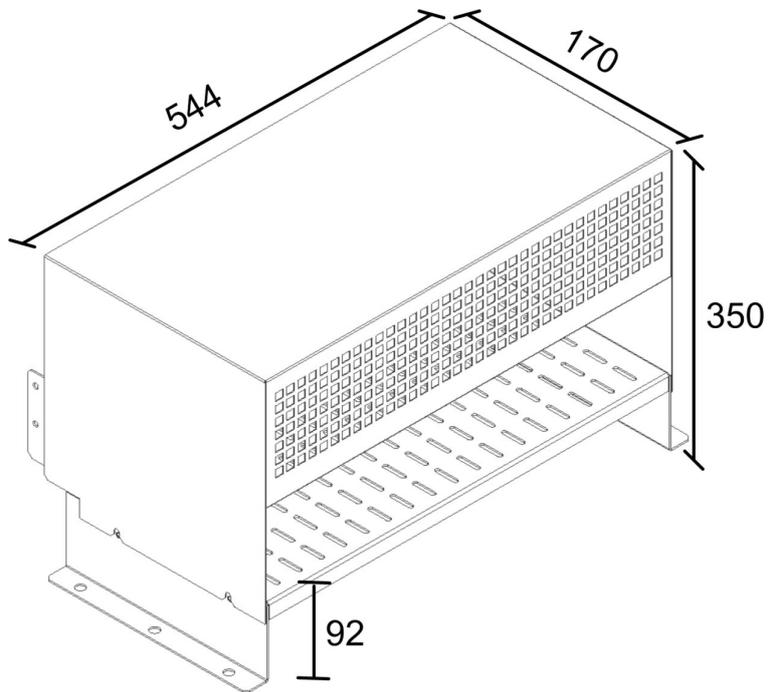


Figure 23: Dimensions of the assembled cable tray, in mm.

4.3.6 Powering-up the system

1. **Read the material in section 6 on page 43, up to and including section 6.2. Perform the instructions in section 6.2 “Insertion of power modules at system installation”.**
2. Switch ON the external bypass input circuit breaker.
3. Switch ON the rectifier ac input circuit breaker.
4. The Centric’s LCD panel should switch ON automatically.
If the screen is dark, it may be that the screen-saver is operating. Touch the screen to see if the display lights up. If not, pressing the on/off button on the LCD panel should switch the screen ON.
5. **Verify** that the batteries have been connected to the Centric with proper polarity, then switch ON the battery circuit breaker (on the battery box).
6. A series of screens are displayed on the control panel to enable you to define the system's initial configuration. To perform the initial configuration, continue with section 4.4 below.

4.4 Initial configuration

On the initial startup of the **Centric**, a series of configuration screens are presented on the display panel. Through these screens you supply the **Centric** with required, basic configuration information to enable initial operation of the **Centric**.

The initial configuration process is described here.

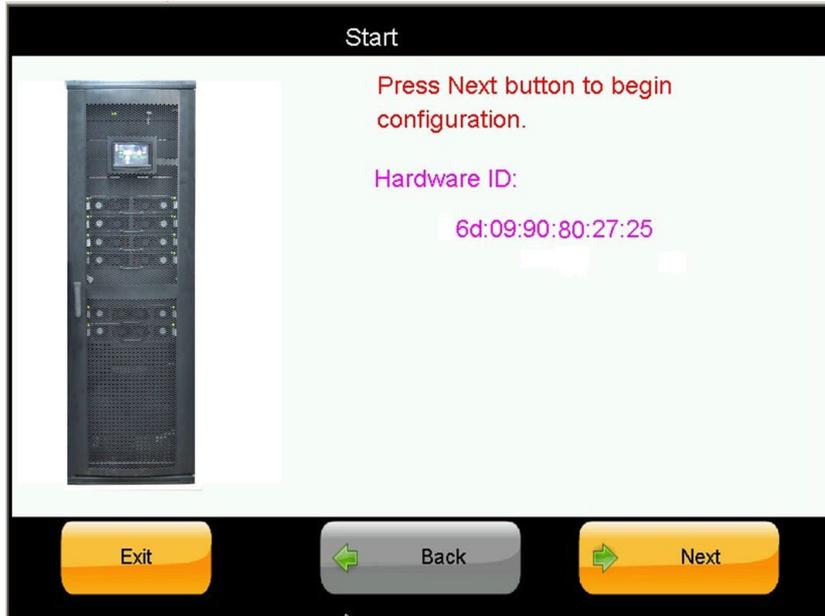


Figure 24: Initial configuration wizard, "Start" screen

1. On the "Start" screen, press "Next".
2. The password screen is displayed. Enter the password provided by your distributor or sales agent and press "OK". Without such a password you cannot continue.



Figure 25: Initial config. wizard: password entry

- On the next screen, indicate the number of battery sets connected to the UPS.
 "Battery cabinet" here means "a set of 40 batteries" ("battery set", for short). A battery set may be housed in one or more physical cabinets. So if you have two cabinets of 20 batteries each, choose "1" on this screen. If you have four cabinets of 20 batteries each, choose "2".

Then press "Next".

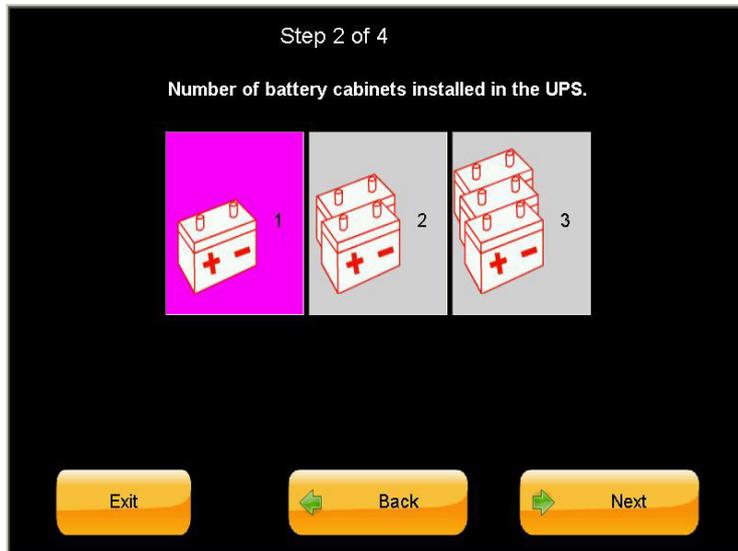


Figure 26: Initial config. wizard: number of battery sets

- Indicate the capacity of the connected batteries in ampere/hours (Ah), then press "Next".
 (This capacity figure is used by the UPS when in battery mode to calculate the amount of backup time remaining.)

If you are not sure of your batteries' Ah capacity, look at one of the batteries in the battery cabinet(s). The Ah rating is usually indicated on the battery's exterior. The Ah rating of a single battery is the same as for the entire cabinet. Enter this number in the wizard screen.



Figure 27: Initial config. wizard: battery capacity in Ah

5. Scroll through the list to find your time zone, select the time zone, then press "Next".



Figure 28: Initial config. wizard: set time zone

6. Press "Finish" to exit the wizard.



Figure 29: Finish configuration wizard

Continue with section 4.4.1 below.

4.4.1 Continuing first-time start-up process

1. If you are using lithium-ion batteries, check the values in the "Setup > Battery" parameters against the information in the battery manufacturer's data sheet. Verify that the parameter values are appropriate for the batteries you have chosen.
2. Verify again that the battery is connected to the UPS and that the battery circuit breaker is in the "ON" position.
3. On the **Centric** main menu, choose "Operation > Turn on/off > System on".
4. Wait until the LED on the left front of each UPS modules is lit green. This takes may take several minutes.
5. The two green LEDs on each dc-to-dc module should now be lit green.
6. Return to the main menu by tapping on the "house" icon in the upper left corner of the **Centric** screen.
7. On the main menu screen, if the alarm symbol (a red circle) is displayed, press the alarm symbol to display the potential problems. Refer to the troubleshooting section of this document to determine the proper response to the alarm indications.



Figure 30: The "alarms" icon indicates alarm conditions

8. Perform a brief battery test to verify that the **Centric** is ready and able to operate in battery mode when needed. To perform a battery test, from the main menu choose: "Operation > Battery test > Test battery". After 1 minute, cancel the test by pressing "Abort the test > OK".
9. Verify that the ac output circuit breakers on the electrical board are OFF. You can now connect a load device to the ac output, then turn ON the ac output circuit breakers on the electrical board.
10. Now you must update the last maintenance date. From the main menu, choose "Setup > Time > Set last maintenance date". Tap on the line that says "Last maintenance date". Press "confirm", and enter the system password if prompted for it.
11. Finally, to save the settings you have defined, from the main menu choose: "Setup > Save and restore > Save settings > OK".

4.4.2 Assigning an IP Address to the Centric

This procedure assigns an IP address to the **Centric**. Assigning an IP address enables you, the user, to remotely monitor the **Centric** over an IP network. If you do not intend to monitor the **Centric** remotely, this step can be skipped. If you decide later to implement remote monitoring, you can perform this process at that time.

The **Centric** supports use of a fixed IP address, and also supports dynamic assignment of IP addresses (DHCP). Consult your IT systems administrator and determine if your IP network supports DHCP, and if there is a preference for using either a fixed IP address or a dynamically assigned IP address for the **Centric**.

To obtain an IP address automatically (your network must support DHCP):

From the Main Menu select Setup > Connectivity > Network Configuration.

Press the button labeled "Obtain an IP address automatically".

The **Centric** software obtains an IP address and then reboots itself.

To assign an IP address manually:

Press the button labeled "Use static IP address".

The IP definition screen is displayed

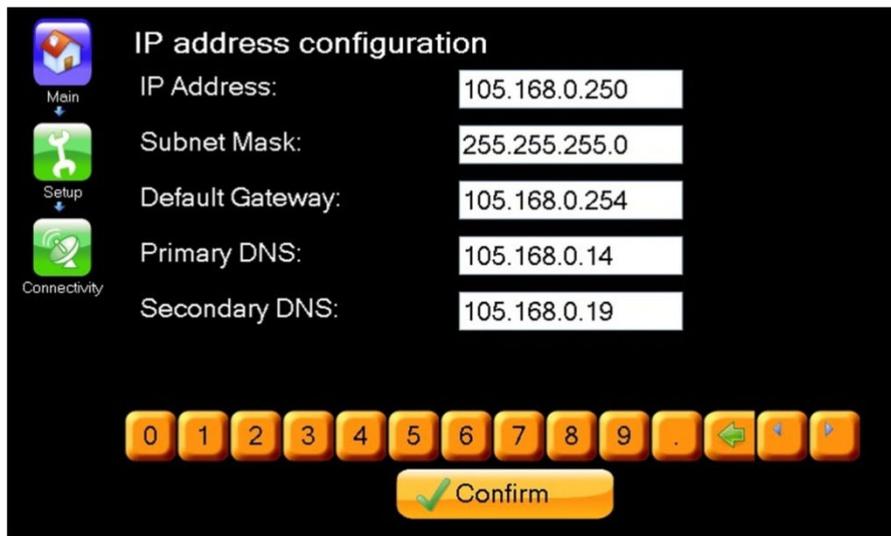


Figure 31: IP address configuration

You will have previously obtained from your network support personnel an IP address for the **Centric**, as well as a subnet mask, a gateway address, a primary DNS address and a secondary DNS address.

Enter these addresses now. To select an address field on the screen, press the field with your finger. (Depending on the particular model of screen on your system, dragging your finger lightly across the field from right to left may yield best results). Use the virtual keyboard on the screen to enter the digits and dots that make up the address. Press the "Confirm" key when you have finished entering all of the addresses. This causes the entered addresses to be saved in the **Centric's** non-volatile memory.

4.5 Testing

Perform the following tests on the **Centric** unit.

4.5.1 Blackout Test

This test is designed to verify the operation of **Centric** in the event of a blackout, when no ac power is supplied to the UPS.

1. Turn all ac input to the system OFF (turn OFF the ac input switches to both Bypass and Rectifier).
2. Test the voltage at the system output between the phases and the neutral. It should be within the specified range.

4.5.2 Test Under Load

This test is designed to verify the operation of **Centric** under load.

1. Connect an average or standard load to the system.
2. Measure the ac input voltage during operation under load. Take the measurements at the output terminals of **Centric** (phase-to-phase between L1-L2, L2-L3, and L3-L1 and phase-to-neutral at L1, L2, and L3).
3. Check and record the total system load (output current) and make sure that **Centric** is not overloaded with respect to system specifications.
4. Verify that **Centric** is operating normally and that no alarms or fault indications are present.

4.5.3 Check IP Communication with Controller

This test is designed to verify that the System Controller is properly configured for communication and that the Web server built into the System Controller is functioning properly. If you do not intend to use remote monitoring of the UPS at this time you can skip this test.

The following procedure is given in general terms; the specifics will vary depending on the operating system of the computer you are using.

1. Use an RJ45-to-RJ45 crossed cable to attach a PC or laptop or other external computer to the Ethernet (RJ45) port on the rear panel of the UPS's system controller.

Configure the network connections of the external computer so that the computer is in the same domain as the UPS – that is, so that the first three nodes of the computer's IP address match the first three nodes of the UPS's IP address.

For example, if the UPS's IP address is "192.212.118.100", define your computer's IP address as "192.212.118.xxx", where "xxx" is a number other than "100" in this case.

2. Define the subnet mask of your computer as "255.255.255.0".
3. Open a browser on the external computer and enter the IP address of the UPS's system controller in the browser's address field to verify that you can reach the Web server on the system controller. You should see the UPS's main menu.

5. Miscellaneous connections

Besides the main power terminals, The Centric 3x480 has a number of small but useful miscellaneous connectors. They are grouped together in what we refer to as “connector group 1”, “connector group 2”, and connector group 3”.

Connector groups 1 and 2 are located on the rear panel of the controller module. The controller module is the Centric’s top-most removable module. The location of connector groups 1 and 2 is shown in Figure 32, and close-up views of the connectors are shown further on in the text where relevant.

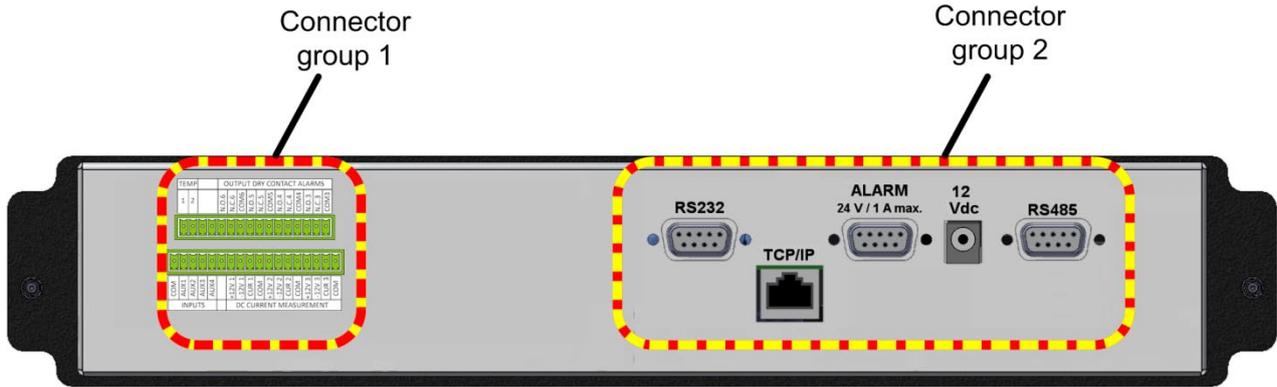


Figure 32: Location of minor connectors on the controller’s rear panel

Connector group 3
at rear upper left of the Centric

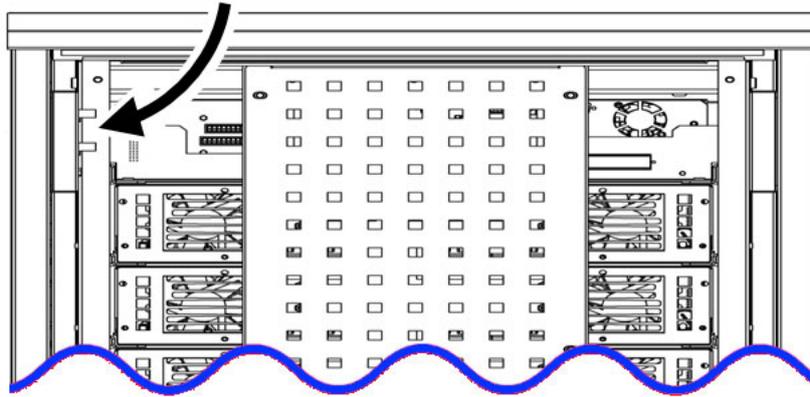


Figure 33: Location of connector group 3

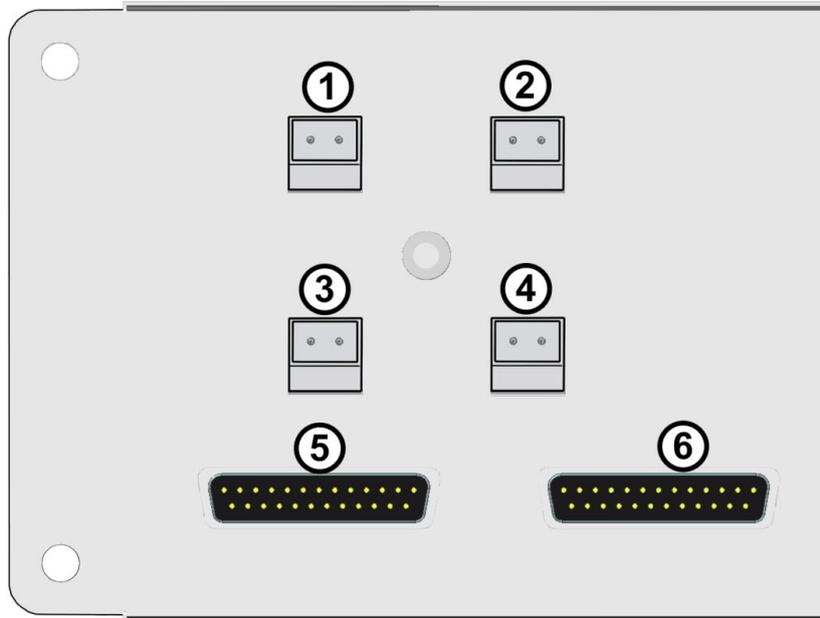


Figure 34: Close-up of connector group 3

Table 10: Key to Figure 34

ITEM	DESCRIPTION
1	Contacts for battery trip coil. Normally Open. See section 5.3.
2	Contacts for Emergency Power-Off (EPO) switch. Normally Open. See section 5.2.
3	Forced Bypass contacts. Normally Open. When these contacts are closed, the UPS immediately goes into bypass mode. These contacts are intended to be used in conjunction with the Maintenance Bypass function. They should be closed by the user's maintenance bypass switch, to ensure that the UPS is in bypass mode before moving to maintenance bypass model.
4	Load on bypass contacts. Normally Open. See section 5.4.
5, 6	Connections for the two parallel communication cables when two or more Centric 480 UPS's are being operated in parallel configuration.

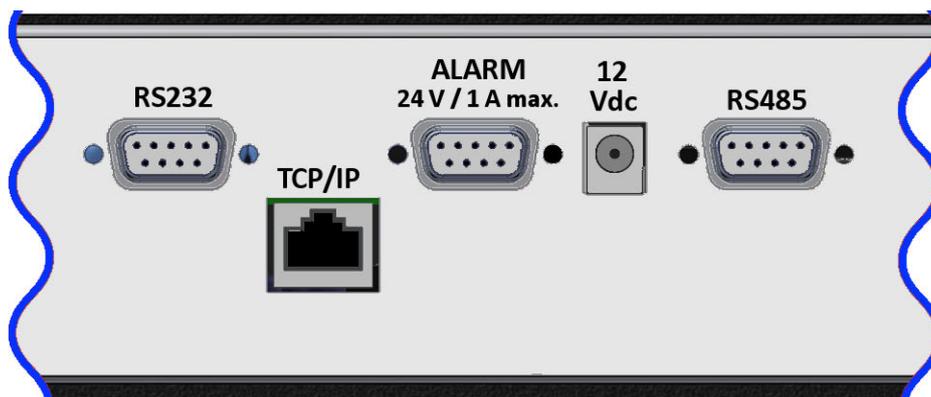


Figure 36: Connector group 2

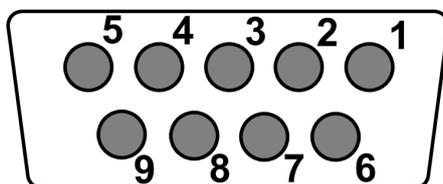


Figure 37: Pin numbers in D9 connectors

Table 11: Pin assignments for D9 connectors

PIN #	ALARM CONNECTOR	RS232 CONNECTOR	RS485 CONNECTOR
1	Input dry contact #5 (AUX5)	RXD, Receive data	RTX-
2	Reserved	TXD, Transmit data	not used
3	Line failure (default; can be reassigned)	not used	RTX+
4	COMMON	GND	not used
5	Low battery (default; can be reassigned)	not used	not used
6-9	Remote panel	not used	not used

5.2 Emergency Power Off – EPO (manual)

An external Emergency Power Off (EPO) switch may be installed on the **Centric** by the customer. The EPO switch cuts power to the load in emergency situations.

The connection point for the EPO switch is a two-pin connector on the lower rear of the system (connector group 3). See Figure 32, and item 1 in Figure 36. The EPO switch must be an N.O.-type, rated for at least 24 Vdc, 1 A. Be sure to perform a continuity test on the EPO switch before connecting it to the UPS.

5.2.1 Restarting the UPS after EPO

After the emergency situation that prompted use of the EPO switch has been resolved, the UPS can be restarted as follows:

1. Reset the EPO switch.
2. Switch off the following circuit breakers: ac input, bypass ac input, battery.

4. Switch on the ac input circuit breaker and the bypass input circuit breaker. DO NOT switch on the battery circuit breaker at this time.
5. On the **Centric** main menu, choose "Operation > Turn on/off > System on".
6. Wait until the LED on the left front of all UPS modules is lit green. This takes about 2 minutes.
7. Now switch ON the battery cabinet circuit breaker.

5.3 Battery circuit breaker trip coil

The **Centric** includes a dry contact that closes when the EPO switch has been activated. This dry contact can be connected to an optional trip coil on the battery box circuit breaker. **This will cause the battery circuit breaker to open when the EPO switch is activated.**

The battery circuit breaker trip coil dry contact is located on the rear of the **Centric** controller, in connector group 3 (see Figure 32), to the right of the EPO connector (see item 2 in Figure 36). It is labeled "Battery CB trip coil". The dry contact is "normally opened" (N.O.), and has two pins. The contact is voltage free; it can accept up to 250 Vdc 2 A.

5.4 Load-on-bypass dry contact

The **Centric** includes a dry contact ("Load on Bypass" dry contact) that closes when the **Centric** goes into bypass mode. This can be used to trigger an external circuit, such as an audible or visual alarm.

The "Load on Bypass" dry contact is located on the rear of the **Centric** controller, in connector group 3 (see Figure 33, and item 4 in Figure 34). This dry contact is normally opened (N.O.), and has two pins. The contact is voltage free; it can accept up to 250 Vac 10 A.

5.5 Surge protector malfunction alarm

The **Centric 3x480** system is equipped with a MOV-type (Metal Oxide Varistor) surge protector. If the surge arrester malfunctions, a system alarm is generated. The MOV surge protector makes use of the input dry contacts AUX2 and COM to transmit the alarm to the **Centric**. This relay is Normally Open, and closes when the surge arrester detects a malfunction.

If your **Centric is configured for "4-wire + Ground" infrastructure see Figure 12 and the notice about the surge arrester, on page 19.**

5.6 Forced bypass for maintenance bypass

The presence of a manual maintenance bypass switch is an optional feature, specified when ordering a **Centric 3x480** system.

The procedure for putting the **Centric** in maintenance bypass mode includes the requirement that the **Centric** be in regular bypass mode before it is switched into maintenance bypass mode. If the operator neglects to put the system in regular bypass mode, damage to the system can result, because the inverter will be exposed to current from the mains.

To avoid this danger, the "forced bypass" contacts can be used to put the **Centric** in regular bypass mode automatically whenever the maintenance bypass switch is operated.

The forced bypass contacts are normally open. Closing them forces the **Centric** into regular bypass mode immediately. So, the forced bypass contacts should be wired so that they will be closed by the user's maintenance bypass switch, to ensure that the UPS is in bypass mode before it is put into maintenance bypass model.

The forced bypass contact is located in connector group 3. See Figure 33 and Figure 34.

6. Inserting and removing power modules

This chapter discusses the physical insertion and addition of modules to the system, the physical removal of power modules from the system, and the related changes to the system configuration.

There are four basic operations that can be performed in this respect:

- First-time insertion of modules at time of system installation.
- Replacement of a module in an installed system.
- Addition of a module to an installed system.
- Removal of a module from an installed system.

Instructions for each type of operation are given below.

Keep in mind that it is desirable that the number of active dc-dc blocks always be equal to (or greater than) the number of active UPS modules. This helps ensure that the system will be able to support the load in battery mode. See Chapter 1 of the *Centric 3x480 User Guide* for more information about the dc-to-dc converter blocks.

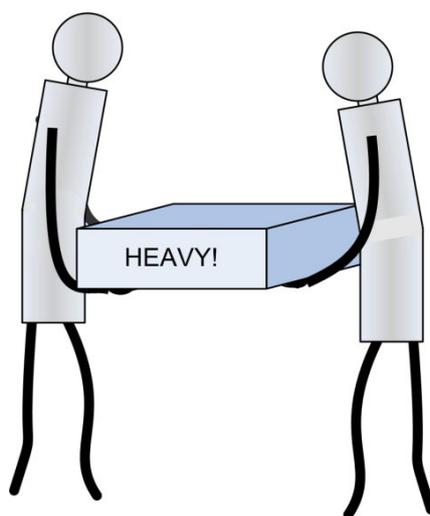
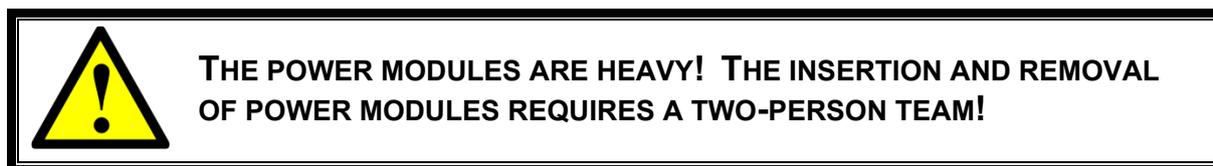


Figure 38: Moving a power module requires two persons

If you remove a UPS module or a dc-to-dc converter module from the Centric when the module is operating, do not re-insert the module immediately. Wait five minutes, to allow the capacitors in the module time to discharge.

6.1 Safety considerations

There are general principles of safety that apply to the insertion and removal of power modules. These principles also reduce the chances of unplanned electrical disturbance to the loads.

1. The ideal situation is where the **Centric** can be turned off before performing the insertion or removal of a power module.
2. Where it is very inconvenient to turn off the **Centric**, the next best procedure is to turn off all loads or disconnect them from the **Centric** while the insertion or removal of the module is in process.
3. Where it is not possible to disconnect or turn off the loads, the next best procedure is to perform the insertion or removal of a module with the system in bypass mode.
4. If none of the above situations can be obtained, the insertion or removal of modules can still be accomplished safely.
5. If you remove a UPS module or a dc-to-dc converter module from the Centric when the module is operating, do not re-insert the module immediately. Wait five minutes, to allow the capacitors in the module time to discharge.
6. Never attach or detach flat cables to/from a UPS module unless the module is completely "OFF" (the two LEDs on the front of the module are "OFF"). Pull the module out about 10 cm (3 inches) to unseat the module's connections before attaching or detaching the flat cables.

6.2 Insertion of power modules at system installation

You can perform the initial system start-up with the UPS modules in place, or you can bring up the system first and then add the UPS modules.

6.2.1 Start-up with UPS modules already in place

If you started up the Centric with the UPS modules already in place in their shelves and with each module's communication cables attached, the UPS modules start up automatically. It takes a few minutes for each module to start up. (You can follow the process by selecting "Status > Modules > DC" and watching as each module's "Precharge" percentage increase from 0 to 100 %).

Wait until all the modules that should be "ON" are marked with a checkmark in the "Status > Modules" screen, then skip to section 6.2.3 "Verify proper module output".

6.2.2 Startup with no modules in place

If you install the modules after UPS startup, the following procedure applies.

1. Verify that the system controller is in place and is operating ("CPU Active" LED to the left of the LCD is lit green). You cannot add or swap modules without the system controller.
2. Verify that there are sufficient dc-dc blocks installed for the number of UPS modules you intend to install. Figure 39 shows the location of the dc-dc blocks.
If you need to install an additional dc-dc module or modules, do so now. The dc-dc module shelves may be covered by a protective blank plate. For each dc-dc shelf that you intend to use, remove the protective plate by removing the two screws that hold it in place. Slide the dc-dc module(s) all the way into the shelf.
3. Now install the UPS modules into the UPS module shelves, in any order, as follows:
(One or more of the UPS module shelves may be covered by a protective blank plate. For each UPS module shelf that you intend to use, remove the protective plate by removing the two screws that hold it in place.)

For each UPS module:

- 3.1 The UPS modules are relatively heavy – about 20 kg (44 lbs) – and may be difficult for one person to handle safely. Have two persons lift the module and slide it most of the way into the shelf. One person shall stand on each side of the shelf (Figure 38).
- 3.2 **Slide the module most of the way into the module shelf, but NOT ALL THE WAY IN.** Leave at least 10 cm (3 inches) exposed, so that the module remains disconnected from the power.

- 3.3 There is a flat cable (ribbon cable) on the front left and front right of the UPS module shelf. Connect these two flat cables to the module.
- 3.4 Now push the UPS module all the way into the module shelf. Push it in gently but firmly to ensure proper seating of the module's rear connectors. Fasten the module to the UPS frame with two screws type M5 conical, one on the left and one on the right of the module face.

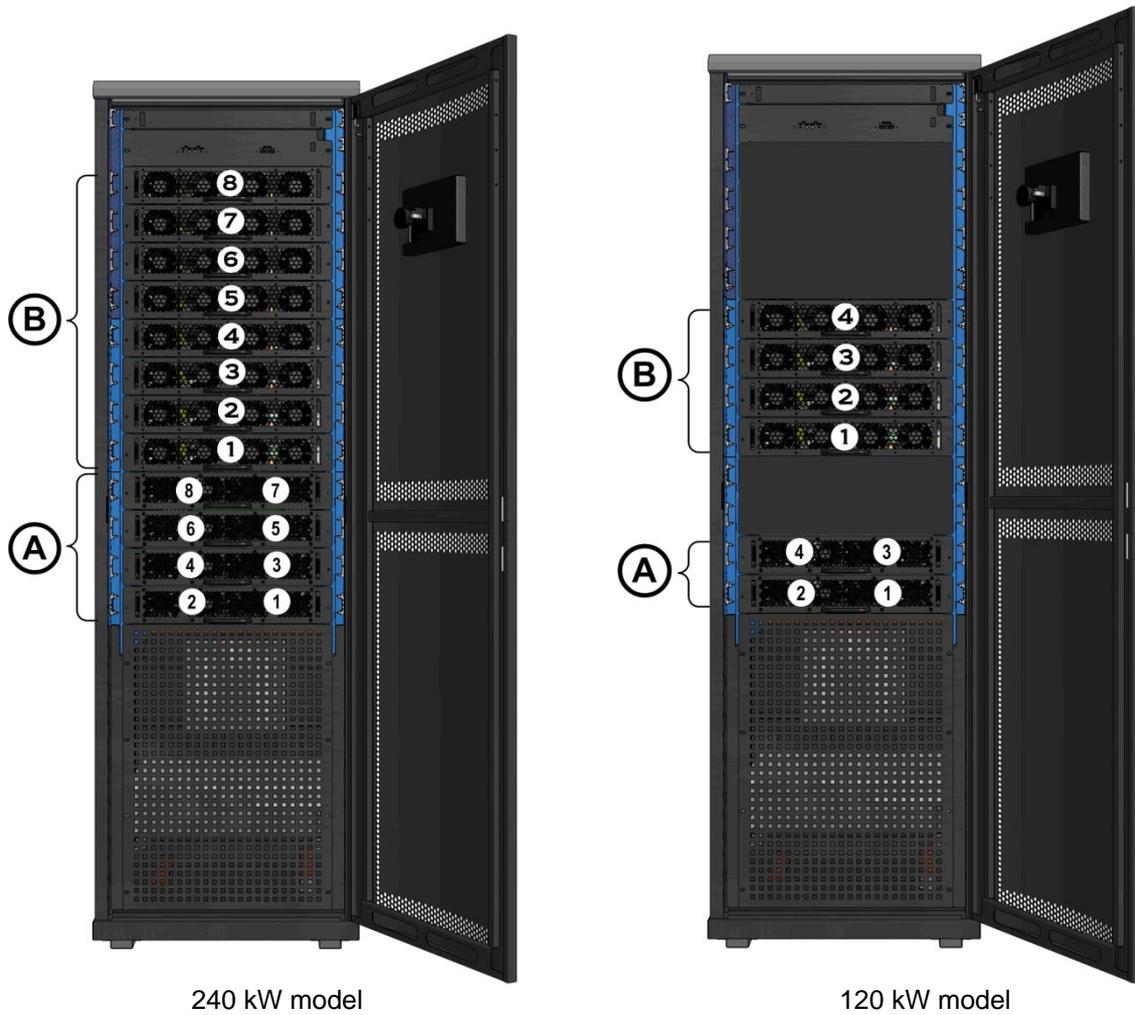


Figure 39: Location of the UPS modules in the 240 kW and 120 kW models

Table 12: Key to Figure 39

ITEM	DESCRIPTION
A	Shelves for up to 4 dc-dc converter modules (240 kW model) or 2 dc-dc converter modules (120 kW model). The dc-dc modules convert the battery voltage of 270 Vdc to 400 Vdc for the UPS modules. The lowest dc-dc shelf is shelf 1; the next shelf up is dc-dc shelf 2, and so on. Each dc-dc module contains 2 converter blocks. All of the dc-dc blocks are connected to one-another in parallel, and supply the UPS modules in parallel.

B	Shelves for up to 8 UPS modules (240 kW model) or up to 4 UPS modules (120 kW model). Each UPS module supplies 30 kW. The lowest UPS shelf is UPS shelf 1, the next shelf up is shelf 2, and so on. When installing the UPS modules, work upward from the lowest shelf.
----------	---

4. Navigate to "Setup > System > Nominal Settings" and tap the Confirm button.
5. Navigate to "Operation > Turn on/off > Modules on". Select the module to be switched "ON" and press "Confirm". (You may be prompted for the system password.)

A message is displayed on the screen: "This will disconnect ac input for all modules. Warning! If batteries cannot support the load UPS will transfer to bypass. Continue?"

If the batteries have a good charge, you can ignore this message and tap "Continue". If you think your batteries might not be able to support the load at this time, you might want to temporarily reduce the load, or press "Cancel" and let your batteries charge before continuing. As a rule of thumb, figure that the battery needs to have a charge sufficient to support the load for 10 minutes.

Wait until all the modules that should be "ON" are marked with a checkmark. (Figure 40). Continue with section 6.2.3

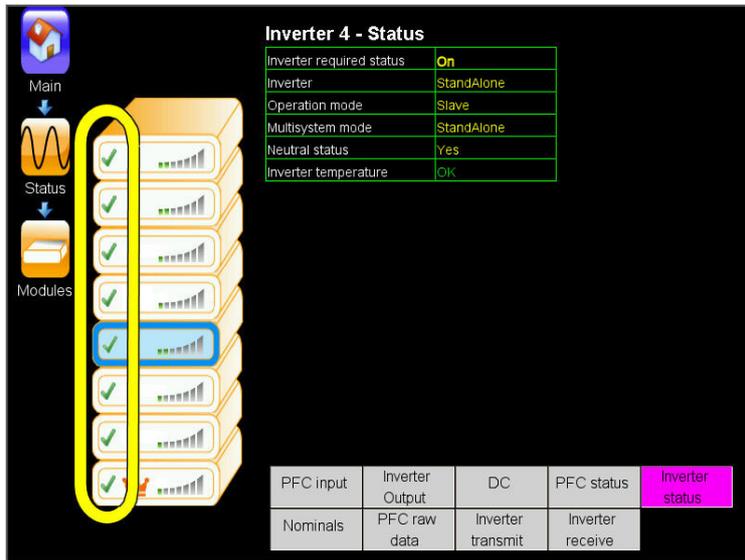


Figure 40: All modules are marked with a checkmark

6.2.3 Verify proper module output

1. On the "Status > Modules" screen, press the Inverter Output button, select the modules one-by-one and verify that the output frequency of each module matches the system nominal value, and that the output voltage of each phase is within 2 % of the system nominal value.

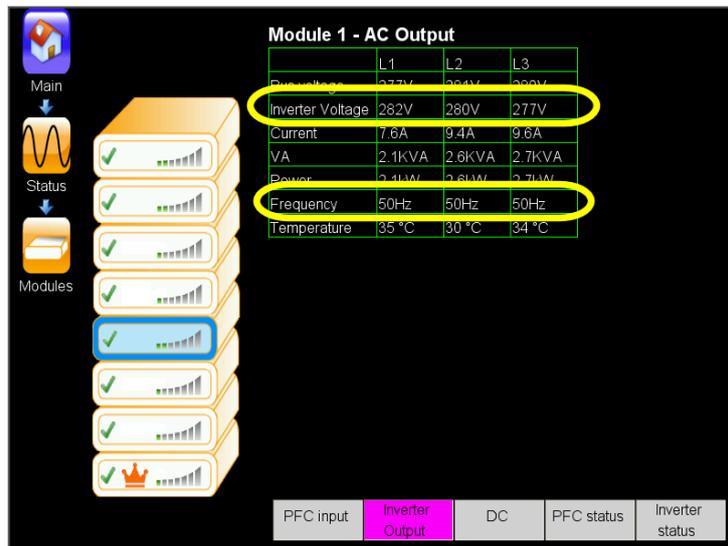


Figure 41: Status > Modules > Output

If the output voltage of one or more phases is **not** within 2 % of the system nominal output voltage, then:

- 1.1 Navigate to "Setup > Modules > Ac output voltage adjustment".
 - 1.2 Select the replacement module, and adjust the problematic phases up or down as required.
 - 1.3 Return to step 1 and repeat the verification and adjustment process until the output voltage of each phase of the replacement module is within 2 % of the system nominal value.
2. Navigate to the main menu screen. If the red, circular alarm indicator is visible, check the alarms and see if any of them are related to the new module. If there are no related alarms, you have successfully replaced the module. You can now resume normal use of the UPS

6.3 Replacement of a module in an installed system

(The LCD screen images in this section are from a 240 kW system, and show eight modules. The screen for a 120 kW system shows four modules.)

To replace a module in an operational system:

1. Refer to section 6.1 "Safety considerations".
2. From the system main menu, choose "Operation > Turn on/off > Modules off".
3. On the screen, choose the module to be replaced. The modules are numbered from bottom to top. The outline of the module you choose becomes highlighted.

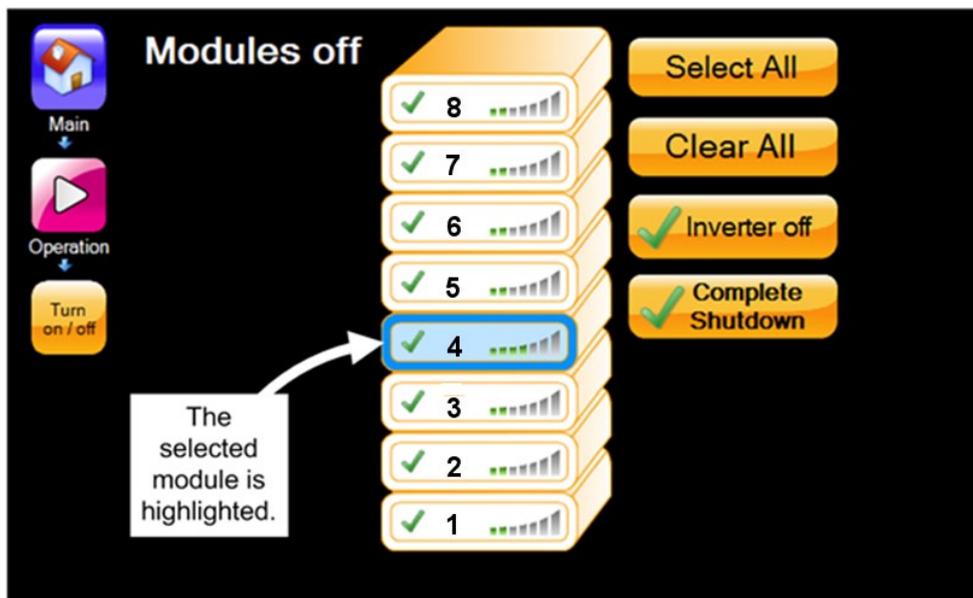


Figure 42: Turning off a module (240 kVA system)

4. Press the "Complete Shutdown" button.
5. To verify that the module has been shut down, navigate to the module status screen ("Main screen > Status > Modules"), press on the icon of the module you just shut down, and verify that the status is "OFF" for PFC (Figure 43) and for the inverter (Figure 44).

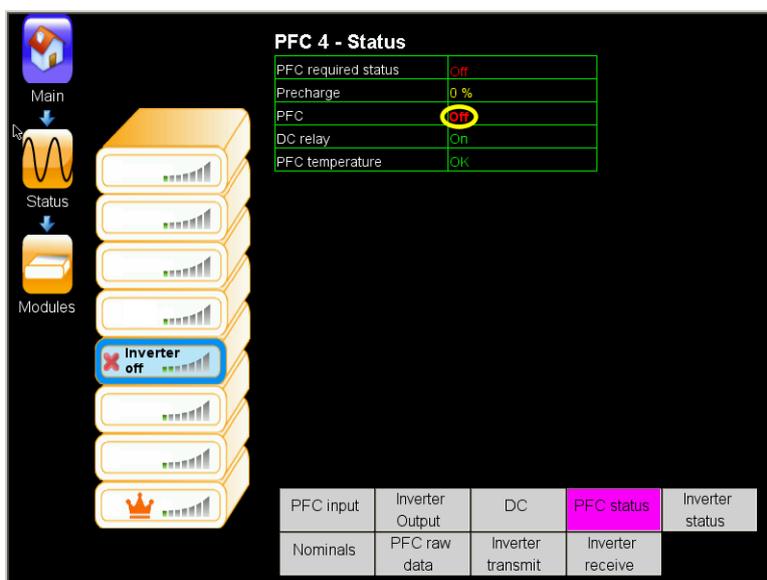


Figure 43: Status > Modules > PFC status for module 4

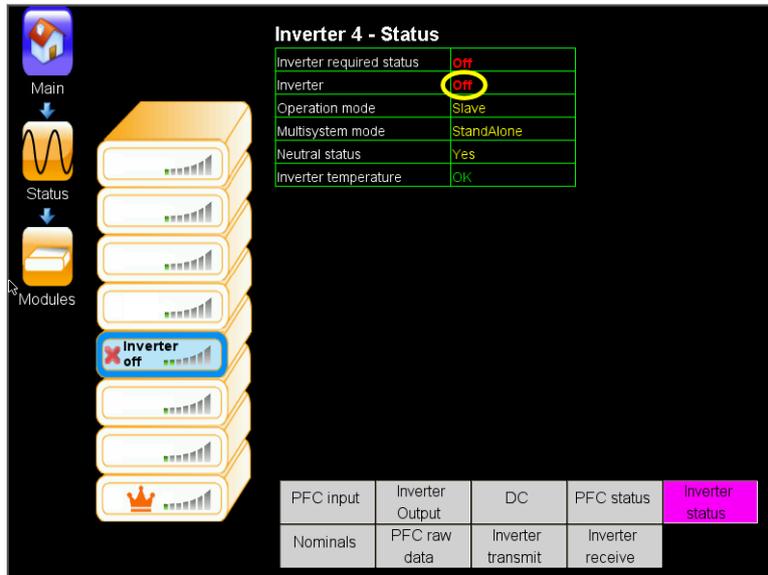


Figure 44: Status > Modules > Inverter status for module 4

6. Unscrew the two screws that secure the module in place – one screw on the left side, one on the right side of the module's front panel.
7. Pull the module out a bit – about 10 cm (3 inches) – enough to disconnect its rear connectors from the UPS. (Don't put the module out too much or you'll break the flat cable!)
8. Disconnect the flat cable (ribbon cable) from each side of UPS module's front panel.
9. Now remove the UPS module entirely. Two persons are required to remove the module. Let one person stand on the left side of the module, the other on the right side of the module. Slowly pull the module out of the shelf. **Be prepared for the fact that when the module is completely pulled out its weight (about 20 kg) will be fully in the hands of the two workers.** (Before you take the module out of the shelf, have a place where to lay it down after it is removed.)
10. Slide the replacement module most of the way in but NOT ALL THE WAY IN. (Don't seat the module's rear connectors.
11. There is a flat cable (ribbon cable) on the front right and left of the shelf. Connect these two flat cables to the UPS module.
12. Now push the replacement module all the way into the module shelf. Push the module inward gently but firmly to ensure proper seating of the module's rear connectors. Fasten the module to the UPS frame with two screws type M5 conical, one on the left and one on the right of the module face.
13. Navigate to "Setup > System > Nominal Settings" and tap the Confirm button.
14. Navigate to "Operation > Turn on/off > Modules on". Select the module to be switched "ON" and press "Confirm". (You may be prompted for the system password.)

A message is displayed on the screen: "This will disconnect ac input for all modules. Warning! If batteries cannot support the load UPS will transfer to bypass. Continue?"

If the batteries have a good charge, you can ignore this message and tap "Continue". If you think your batteries might not be able to support the load at this time, you might want to temporarily reduce the load, or press "Cancel" and let your batteries charge before continuing. As a rule of thumb, figure that the battery needs to have a charge sufficient to support the load for 10 minutes.

Wait until all the modules that should be "ON" are marked with a checkmark. (Figure 47).

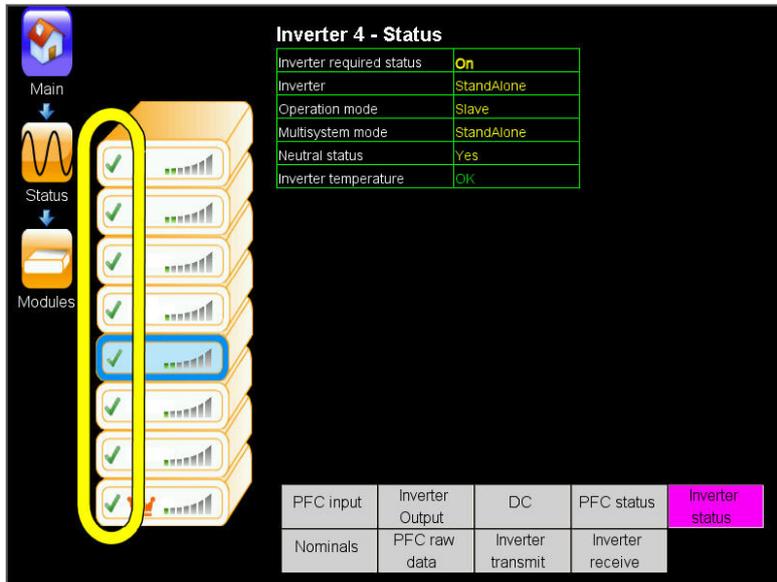


Figure 45: All modules are marked with a checkmark

Figure 46: Verifying status of replacement module

15. On the same screen ("Status > Modules"), press the Inverter Output button, select the replacement module and verify that the output frequency matches the system nominal value, and that the output voltage of each phase is within 2 % of the system nominal value.

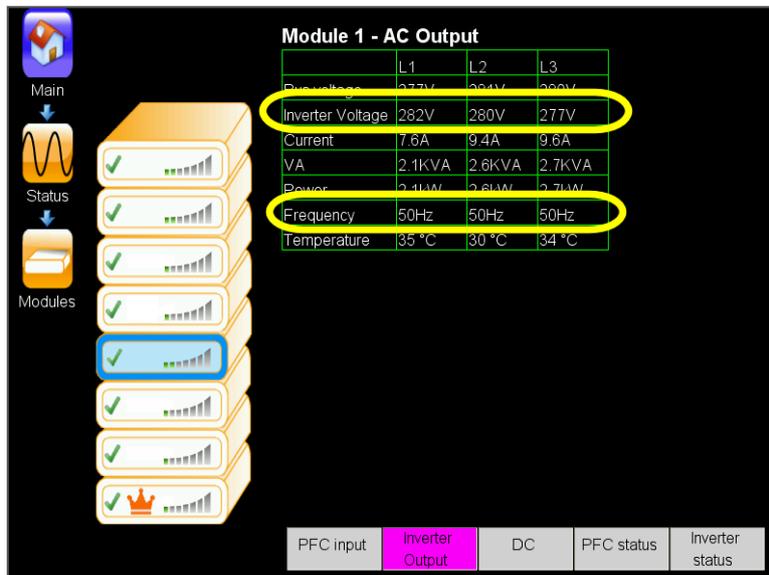


Figure 47: Status > Modules > Output

If the output voltage of one or more phases is **not** within 2 % of the system nominal output voltage, then:

- 15.1 Navigate to "Setup > Modules > Ac output voltage adjustment".
 - 15.2 Select the replacement module, and adjust the problematic phases up or down as required.
 - 15.3 Return to step 15 and repeat the verification and adjustment process until the output voltage of each phase of the replacement module is within 2 % of the system nominal value.
16. Navigate to the main menu screen. If the red, circular alarm indicator is visible, check the alarms and see if any of them are related to the new module. If there are no related alarms, you have successfully replaced the module. You can now resume normal use of the UPS

6.4 Addition of a module in an installed system

The ability to add a module to a system is an option available by special order.

(The LCD screen images in this section are from a 240 kW system, and show eight modules.
The screen for a 120 kW system shows four modules.)

To add a module to an operational system:

1. Refer to section 6.1 "Safety considerations".
2. The **Centric** controller must be informed that you are increasing the capacity of your system. On the LCD control panel, from the main menu navigate to "Setup > System > System type". Increase the maximum capacity of the system by 30 kW times the number of modules added. For example, if you added one module to a 180 kW system, you would choose 210 kW as the new system type (see Figure 48 and Figure 49).

A password is required to perform this function. If you do not have the required password, contact your distributor or sales agent.

There is an exception to this step, and it depends upon the type of license you have. For example, If you have added a 30 kW module to a 180 kW system giving you a 210 kW system, and your license type is defined as "up to 240 kW", then you can skip to the next step. Another example: if you added a 30 kW module to a 60 kW system giving you a 90 kW system, and your license type is "up to 120 kW", skip to the next step.

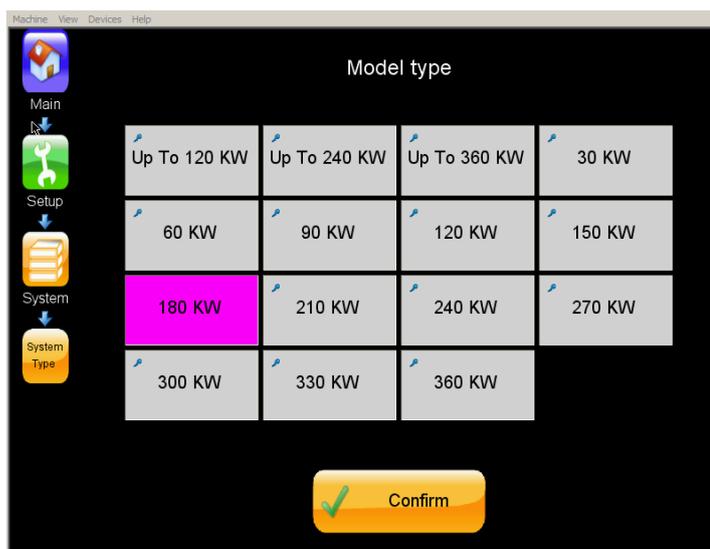


Figure 48: "Model Type" screen for a 180 kW system

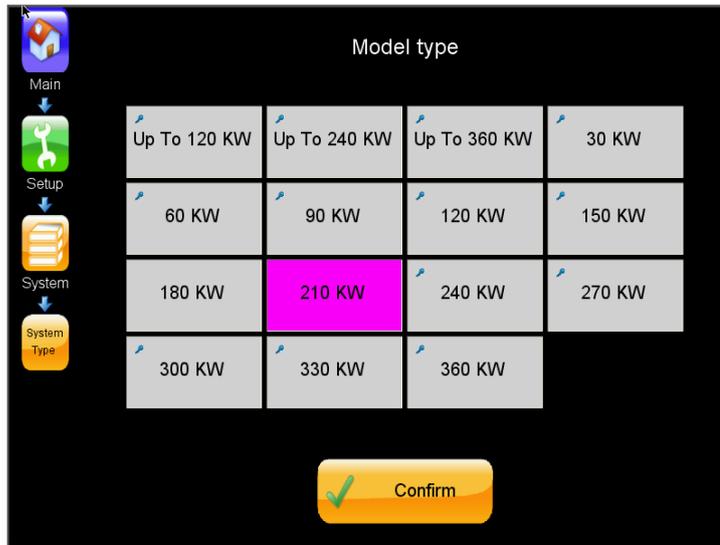


Figure 49: .”Model Type” screen for a 210 kW system

3. Next you must tell the system the new total number of modules, and how many of them (if any) are intended to provide redundancy. On the LDC control panel, navigate to “Setup > System > Number of modules”. Increase the total number of modules as required, and indicate how many of the modules are intended to provide redundancy. The *Centric User Guide* provides more information on redundancy.

A password is required to perform this function. If you do not have the required password, contact your distributor or sales agent.

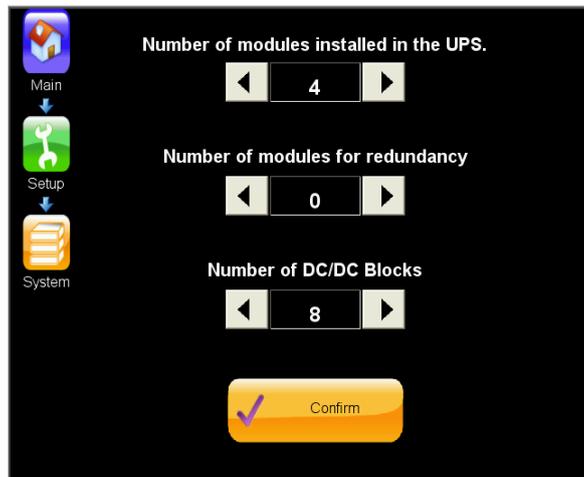


Figure 50: “Number of modules” screen

4. Power-down the shelf where the module is to be added, as follows:
 - 4.1 From the system main menu, choose "Operation > Turn on/off > Modules off".
 - 4.2 On the screen, choose the shelf where the new module will be placed. The modules are numbered from bottom to top. The outline of the module you choose becomes highlighted.

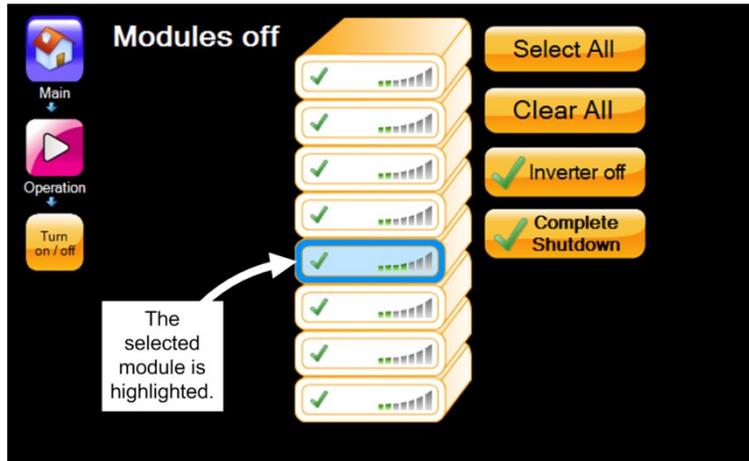


Figure 51: Turning off a module

4.3 Press the "Complete Shutdown" button.

5. The shelf where you intend to install the new module may be covered by a blank protective panel. If so, remove the panel by removing the screws that hold it in place.
17. Slide the replacement module most of the way in but NOT ALL THE WAY IN. (Don't seat the module's rear connectors.)
18. There is a flat cable (ribbon cable) on the front right and left of the shelf. Connect these two flat cables to the UPS module.
19. Now push the replacement module all the way into the module shelf. Push the module inward gently but firmly to ensure proper seating of the module's rear connectors. Fasten the module to the UPS frame with two screws type M5 conical, one on the left and one on the right of the module face.
20. Navigate to "Setup > System > Nominal Settings" and tap the Confirm button.
21. Navigate to "Operation > Turn on/off > Modules on". Select the module to be switched "ON" and press "Confirm". (You may be prompted for the system password.)

A message is displayed on the screen: "This will disconnect ac input for all modules. Warning! If batteries cannot support the load UPS will transfer to bypass. Continue?"

If the batteries have a good charge, you can ignore this message and tap "Continue". If you think your batteries might not be able to support the load at this time, you might want to temporarily reduce the load, or press "Cancel" and let your batteries charge before continuing. As a rule of thumb, figure that the battery needs to have a charge sufficient to support the load for 10 minutes.

Wait until all the modules that should be "ON" are marked with a checkmark. (Figure 52).

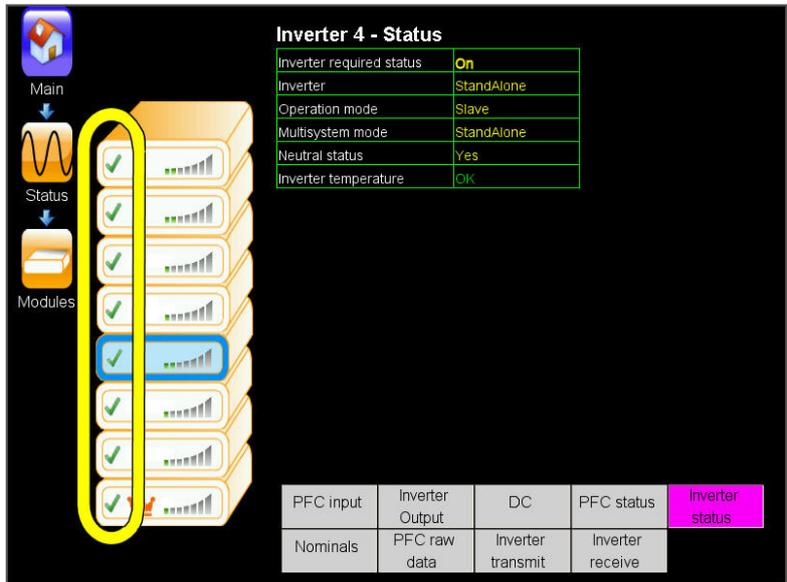


Figure 52: All modules are marked with a checkmark

Figure 53: Verifying status of replacement module

22. On the same screen ("Status > Modules"), press the Inverter Output button, select the replacement module and verify that the output frequency matches the system nominal value, and that the output voltage of each phase is within 2 % of the system nominal value.

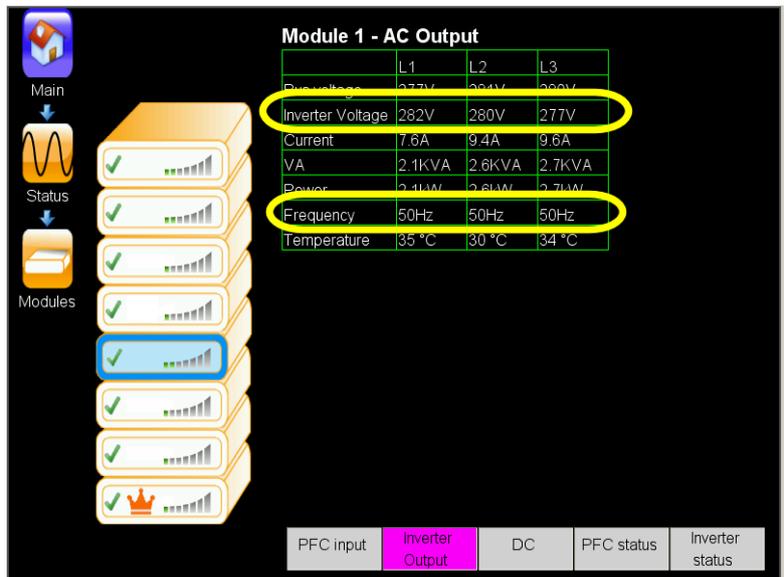


Figure 54: Status > Modules > Output

If the output voltage of one or more phases is **not** within 2 % of the system nominal output voltage, then:

- 22.1 Navigate to "Setup > Modules > Ac output voltage adjustment".
 - 22.2 Select the replacement module, and adjust the problematic phases up or down as required.
 - 22.3 Return to step 22 and repeat the verification and adjustment process until the output voltage of each phase of the replacement module is within 2 % of the system nominal value.
23. Navigate to the main menu screen. If the red, circular alarm indicator is visible, check the alarms and see if any of them are related to the new module. If there are no related alarms, you have successfully replaced the module. You can now resume normal use of the UPS

6.5 Removing a module from an installed system

The ability to permanently reduce the number of modules in the UPS is an option available by special order.

(The LCD screen images in this section are from a 240 kW system, and show eight modules. The screen for a 120 kW system shows four modules.)

To remove a module in an operational system:

1. Refer to section 6.1 “Safety considerations”.
2. The **Centric** controller must be informed of the change in the output capacity of your system. On the LCD control panel, from the main menu navigate to "Setup > System > System type". Determine the new capacity of the system by multiplying the remaining number of modules by 30 kW.

For example, if you remove one module from a 240 kW system (8 modules) you have 7 modules left and should choose 210 kW as the new system type (see Figure 55 and Figure 56).

A password is required to perform this function. If you do not have the required password, contact your distributor or sales agent.

There is an exception to this step, and it depends upon the type of license you have. For example, If you have removed a 30 kW module from a 240 kW system giving you a 210 kW system, and your license type is defined as “up to 240 kW”, then you can skip to the next step. Another example: if you remove a 30 kW module from a 90 kW system giving you a 60 kW system, and your license type is “up to 120 kW”, skip to the next step.

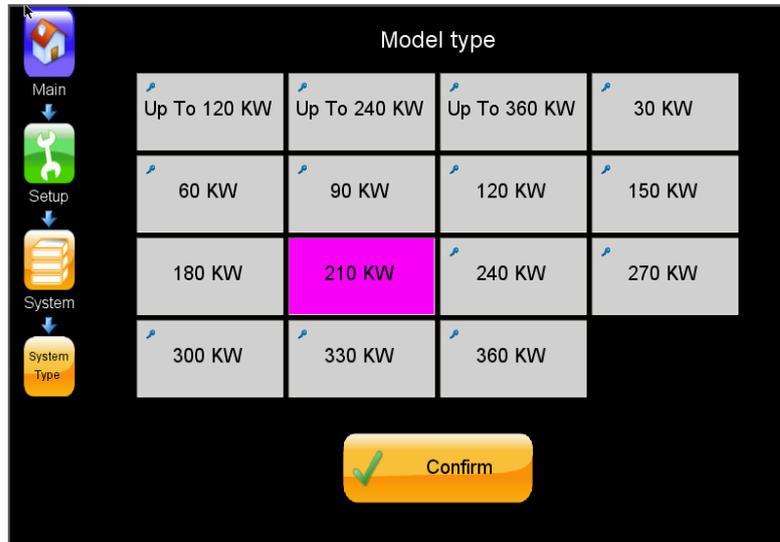


Figure 55: “Model Type” screen for a 210 kW system

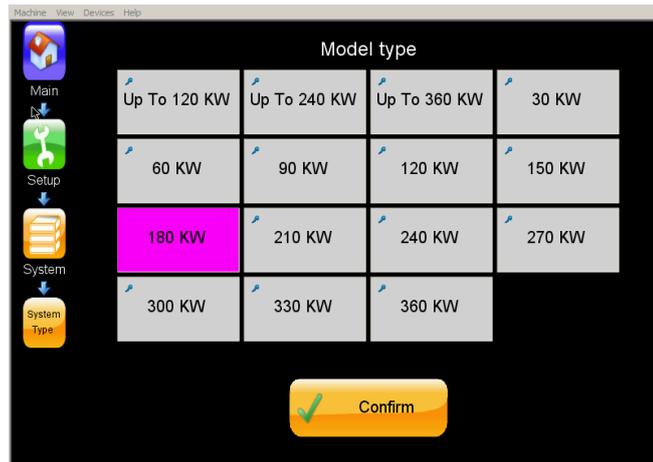


Figure 56: "Model Type" screen for a 180 kW system

- Next you must tell the system the new total number of modules, and how many of them (if any) are intended to provide redundancy. On the LDC control panel, navigate to "Setup > System > Number of modules". Decrease the total number of modules as required, and indicate how many of the modules are intended to provide redundancy. The *Centric User Guide* provides more information on redundancy.

A password is required to perform this function. If you do not have the required password, contact your distributor or sales agent.

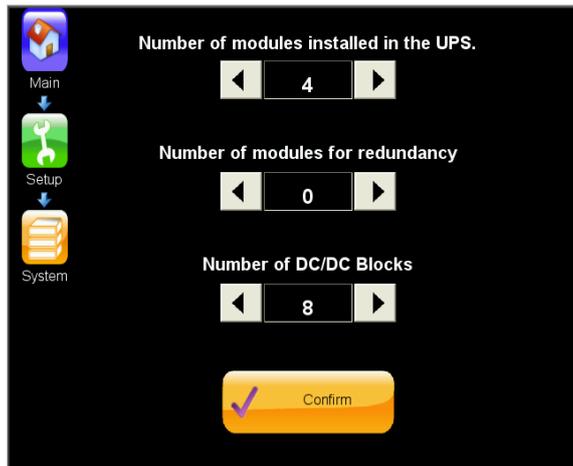


Figure 57: "Number of modules" screen

- From the system main menu, choose "Operation > Turn on/off > Modules off".
- On the screen, choose the module to be removed. The modules are numbered from bottom to top. The outline of the module you choose becomes highlighted.

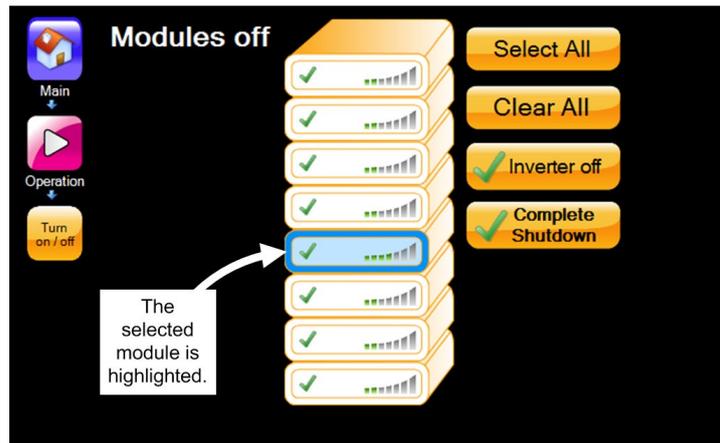


Figure 58: Turning off a module

6. Press the "Complete Shutdown" button.
7. To verify that the module has been shut down, navigate to the module status screen ("Main screen > Status > Modules"), press on the icon of the module you just shut down, and verify that the status is "OFF" for PFC (Figure 59) and for the inverter (Figure 60).

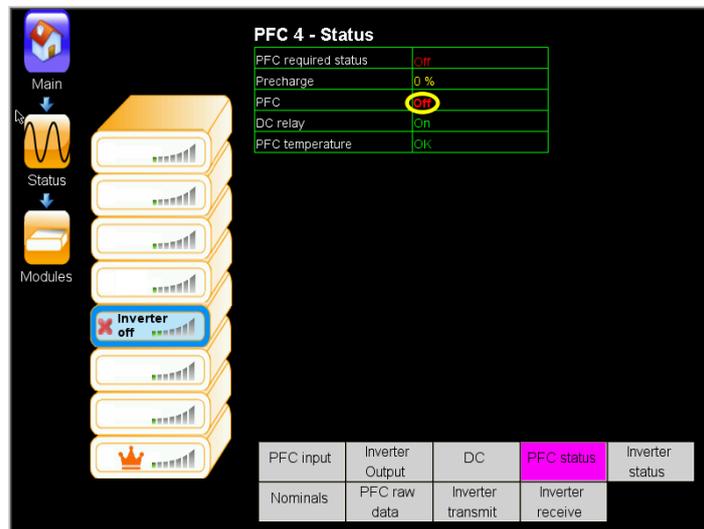


Figure 59: Status > Modules > PFC status for module 4

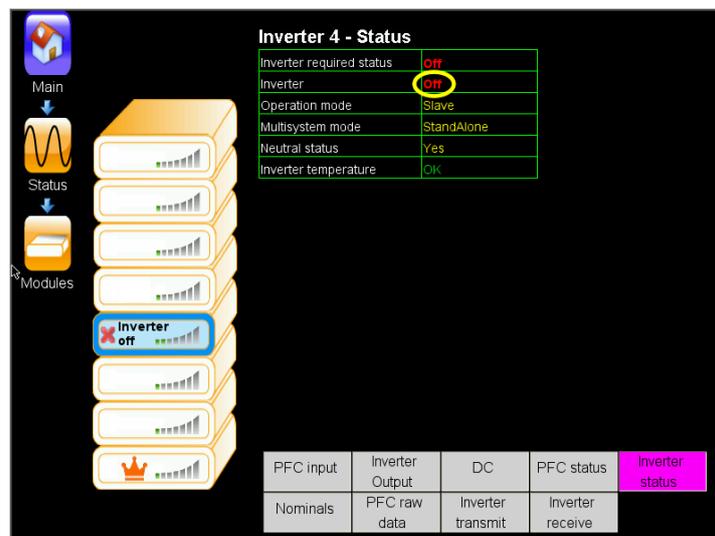


Figure 60: Status > Modules > Inverter status for module 4

8. It is possible that the module shutdown failed, with the following message being displayed:
"Remaining modules could not hold the load. Would you like to transfer the load to bypass?"
You can respond "Confirm" to transfer the load to bypass, or "Cancel" to abort the module shutdown.
You can also reduce the load and try the module shutdown again.
9. Assuming the module shutdown succeeds, unscrew the two screws that secure the module – one on the left side, one on the right side of the front panel.
10. Pull the module out a bit – about 10 cm (3 inches) – enough to disconnect the module's rear connectors from the UPS.
11. Disconnect the flat cables (ribbon cables) from the right and left sides of the module's front panel.
12. Now remove the UPS module entirely. Two persons are required to remove the module. Let one person stand on the left side of the module, the other on the right side of the module. Slowly pull the module out of the shelf. **Be prepared for the fact that when the module is completely pulled out its weight will be fully in the hands of the two workers.** (Before you take the module out of the shelf, have a place where to lay it down after it is removed.)
13. Navigate to the main menu screen. If the yellow, triangular "alarm" indicator is visible, check the alarms and see if any of them are related to the removal of the module. If there are no related alarms, the module has been successfully removed from the system. You can now resume normal use of the UPS.

7. Remote monitoring panel (option)

The remote monitoring panel (Figure 61) enables you to monitor the UPS from a distance. It can be located a maximum distance of 50 m from the UPS. The remote monitoring is connected directly to the UPS with a 4-wire cable via the D9-type Alarm connector on the rear of the controller (Figure 62). It shows you the current status of the LEDs on the UPS.

The remote monitoring panel has only one button – the “Alarm Off” button, which enables you to temporarily silence the audible alarm.

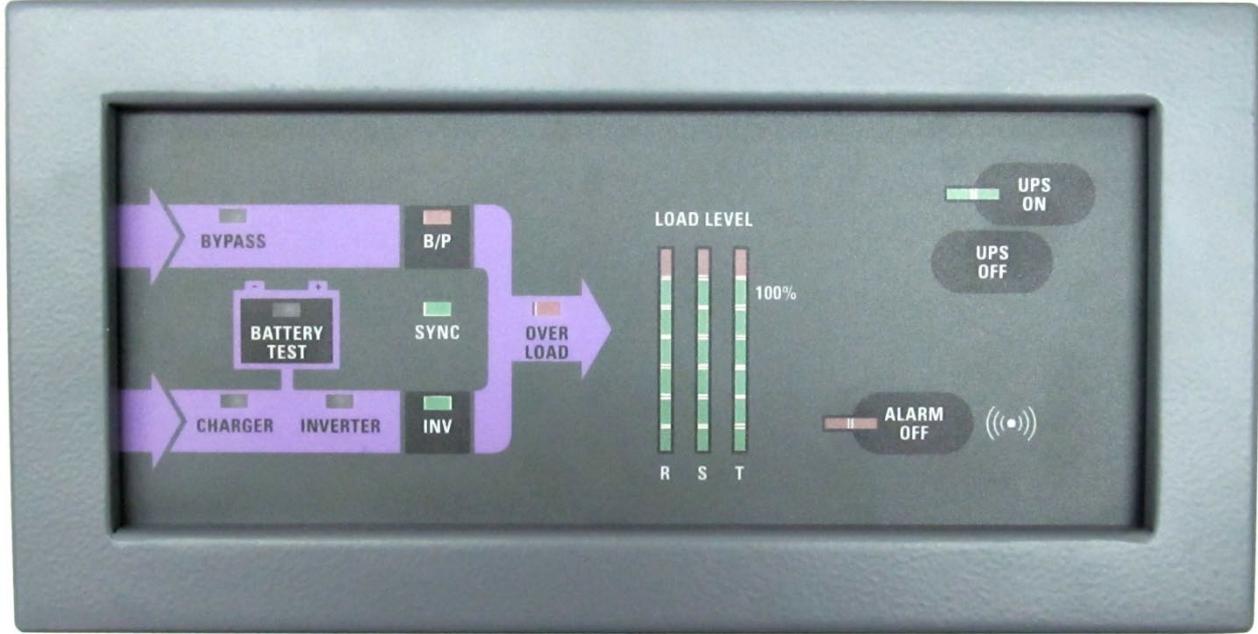


Figure 61: The remote monitoring panel

Table 13: LEDs on the remote monitoring panel

LED INDICATOR	COLOR	MEANING
BYPASS	green	Bypass input is normal
	red	Bypass fault
B/P	red	The load is on the bypass voltage
OVERLOAD	red	Overload, load moved to bypass
BATTERY	red	Battery fault
	green	Battery normal
CHARGER	green	Input voltage is OK
	red	Input voltage not OK
INVERTER	green	Inverter is operating normally
	red	Inverter is faulty
INV	green	The load is on the inverter
LOAD LEVEL	green	Load level normal
	red	Excessive load
UPS ON	green	UPS is operating
ALARM OFF	red	The audible alarm has been muted

P5 is a DB9-type connector on the rear of the controller. It is labeled "Alarm" and is used for certain alarm outputs and for the remote monitoring panel.

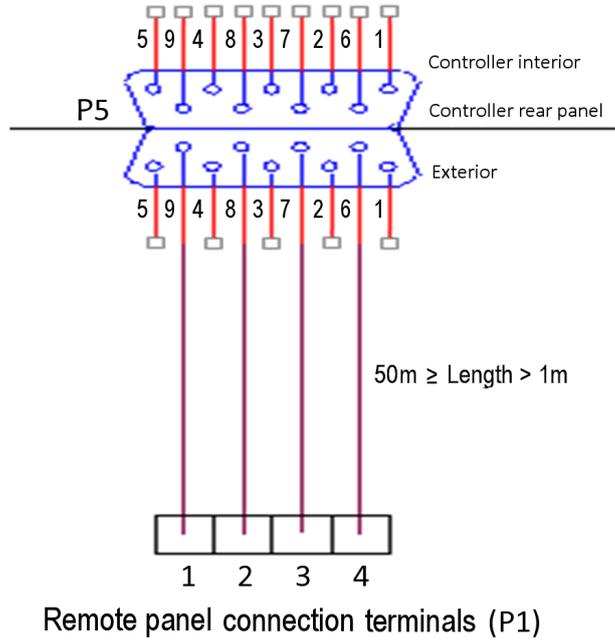


Figure 62: Connecting the remote monitoring panel

8. Circuit breaker selectivity

When discussing power distribution, “selectivity ” (also referred to as “discrimination”) is the selection and arrangement of circuit breakers such that in the event of a short circuit or overload in the line, the circuit breaker closest to the short will be tripped and the upstream circuit breakers remain unaffected.

In a UPS, the electrical circuit of the bypass ac input line includes the main circuit breaker feeding the UPS and the circuit breaker distributing power to the load.

The UPS load is normally fed from the UPS's inverter. When a short circuit occurs, the UPS detects the short circuit and switches the load to the bypass line. During the short circuit, the current flows through the bypass line's main circuit breaker and continues through the other circuit breakers in series to the load that is the source of the short circuit.

A problem that can arise in such a situation is how to prevent the main circuit breaker from tripping before the downstream circuit breaker closest to the load is tripped.

As an example, Figure 63 shows a typical UPS feeding a number of loads. When a short circuit occurs in Load 2, the system switches the load to the bypass line. In the example, the bypass line includes CB01, CB03, and CB05. The problem is how to prevent CB01 and CB03 from tripping open before CB05 trips open.

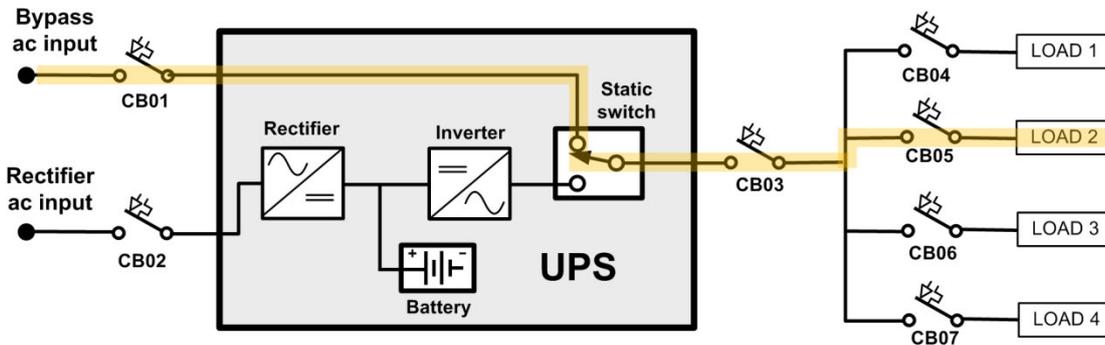


Figure 63: A UPS's bypass circuit

Selection of circuit breakers to achieve discrimination involves the consideration of two factors: thermal tripping and magnetic tripping. Circuit breakers can have one or both of these tripping characteristics.

Magnetic tripping is activated immediately when the current through the circuit breaker exceeds a specific limit. Magnetic tripping can include a deliberate delay, depending on the design of the specific circuit breaker chosen.

Thermal tripping responds, with a delay, to lower-level, longer-term current excesses. Thermal tripping can be useful on circuits that are subject to expected short-term current overload, such as when a load with high-inrush current is turned on. In such a case you would only want the circuit breaker to trip if the current overload continued for an abnormal length of time.

Using Figure 63 as an example, optimal discrimination of circuit breakers in series can be achieved by choosing them in such a way that when a short circuit occurs, the response of circuit breaker feeding the bypass line (CB01) line will be based on thermal (slower-acting) tripping, while the circuit breaker closest to the short circuit (CB05) will respond based on magnetic (instantaneous) tripping. In most cases we would want the intermediate circuit breaker (CB03) to respond thermally to a short in Load 2, but with a shorter delay than that of CB01.

See Table 5 for maximum rectifier input current values and maximum bypass input current values. See Table 6 for recommended circuit breaker ratings.

In order to protect the UPS's bypass contactor and also the main input of the UPS, for all scenarios including short circuit, Gamatronic recommends the following:

- The circuit breaker that feeds the bypass input line and the circuit breaker feeding the main input of UPS shall have no magnetic protection delay, or a maximum magnetic protection delay of 50 msec.

This ensures that the circuit breaker will interrupt the short circuit before any damage can be done to the static switch contactor and the UPS modules.

- **If you choose to use a time-delay circuit breaker on the bypass input line, recommended rating of the breaker is approximately six times the maximum bypass input current.**
- When using a circuit breaker with delayed magnetic protection, the ability of the cables and the rest of the infrastructure to withstand a short circuit must be taken in account.

Where the local electrical code is more stringent than the above recommendations, the local code takes priority.

9. Parallel operation

9.1 Theory

When two or more Centric units are deployed in parallel, they are connected according to the decentralized static switch method (see below). Special technical solutions and control algorithms are implemented to synchronize all units in the system to prevent circulation of energy between them and to isolate a faulty unit from the common power bus. In addition, an active current sharing circuit regulates the output voltage of each UPS to provide optimal load sharing between the units.

One of the parallel UPS systems assumes the role of “Master”. This unit is synchronized to the mains power. The other units operate as “Slaves” and are synchronized to the Master. (The function of Master is assumed by the first system to be switched on during the parallel start-up process. This is transparent to the system operator.)

9.1.1 Decentralized static switch method

Every Centric UPS is equipped with a static switch to ensure that the UPS will continue to supply power to the load (from the mains or from a secondary ac input source) in the event of a problem with the inverter or an overload of the UPS. Thus, the static switch performs a very important function.

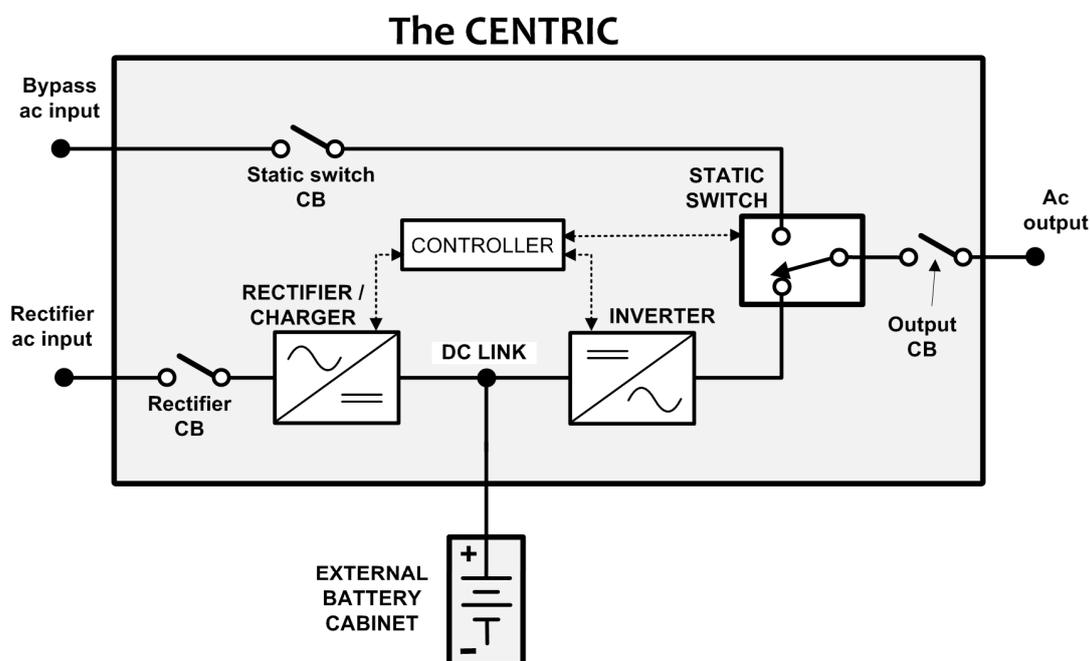


Figure 64: The static switch in context (stand-alone system)

However, when two or more UPSs are configured in parallel mode, the static switch presents a potential problem in that, were one UPS to fail, its static switch would automatically be triggered to go to bypass mode, to supply the load directly from the mains. This would connect the inverters of the other UPSs directly to the mains (through the output bus), which could potentially damage them.

To avoid such a hazard in decentralized mode, the static switches are synchronized by dedicated control communication to ensure that if one unit goes to bypass mode, the rest of the units will also transfer to bypass mode simultaneously.

9.1.2 Parallel communication

When two or more Centric units are operated in parallel, parallel communication must take place between them in a "ring" arrangement. This is accomplished by the use of Gamatronic-provided cables with D25 connectors on each end. Parallel communication keeps the parallel units synchronized with each other, and is used to pass commands and status information between units.

Each Centric UPS has two D25 parallel communication connection terminals.

Figure 65 below shows how to connect the parallel communication terminals for parallel operation of two and three Centric 480 units. When connecting one UPS to the other, it does not matter which of the two D25 terminals you use on each UPS.

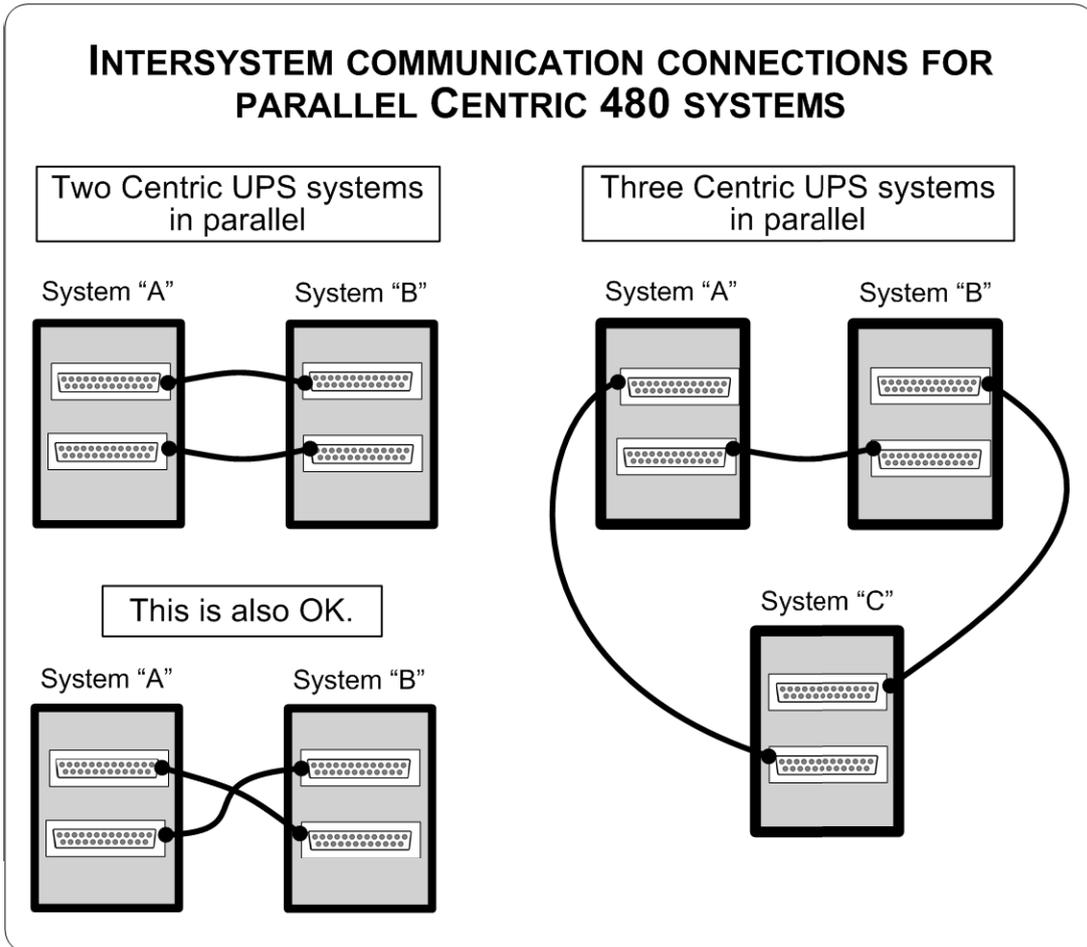


Figure 65: Parallel comm. connections (see Table 15)

Connector group 3
at rear upper left of the Centric

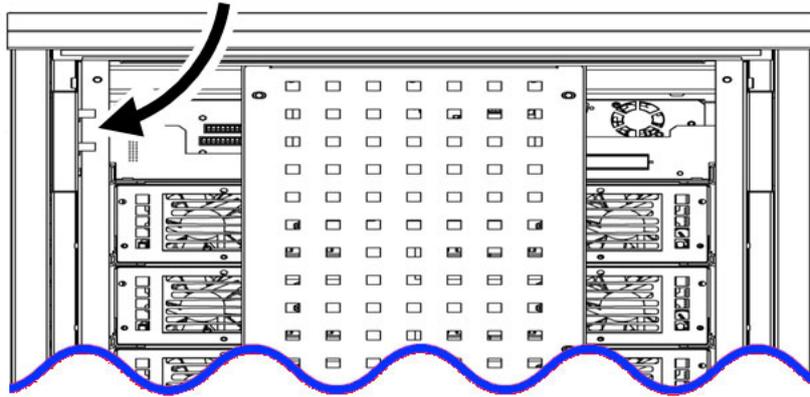


Figure 66: Location of connector group 3

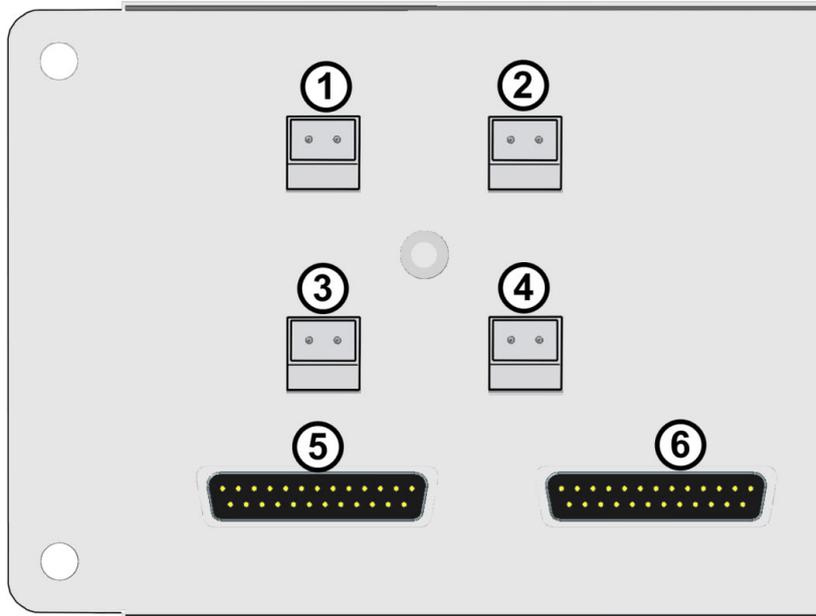


Figure 67: Close-up of connector group 3

Table 14: Key to Figure 34

ITEM	DESCRIPTION
5, 6	Connections for the two parallel communication cables when two or more Centric 480 UPS's are being operated in parallel configuration.. Note that all parallel communication cables (the 25-pin cables) must be housed in appropriate conduits.

9.1.2.1 EPO AND PARALLEL OPERATION

An EPO switch can also be used If you intend to operate multiple Centric units in parallel. An external n-pole / N.O. EPO switch may be connected according to the connection schematic. EPO disconnection of the parallel units **MUST BE SIMULTANEOUS!** EPO wiring and switch rating must be 5 A / 230 Vac.

9.2 Instructions for parallel configuration



In a parallel UPS configuration, the length of the bypass input cable must be the same on all the UPSs, and the bypass input cables must be at least 10 meters long.

When reading this section, refer also to the appropriate connection diagram: **Figure 71, Figure 72, or Figure 73** (for configurations using neutral line) or **Figure 74, Figure 75, or Figure 76** (for configurations NOT using a Neutral line), depending on the number of UPSs to be connected in parallel.

1. The Centric units should be located near to one another. They must be connected to one another in a ring configuration using the supplied 25-pin parallel communication cables. **These cables must be housed in appropriate conduits.**

Table 15: Cable sets for parallel communication between UPSs

DESCRIPTION	QUANTITY	GAMATRONIC CATALOG NO.
25 pins, 5 meter cable	1	GPIN25350
25 pins, 10 meter cable	1	GPIN25410

The supplied parallel communication cables are either 5 or 10 meters long, depending on your order.. Keep this in mind when positioning the UPSs.

2. In a parallel configuration, **the length of the bypass input cable must be the same on all of the UPSs**, and the bypass input cables must be **at least 10 meters** in length.
3. Connect the UPSs in a ring configuration using two 25-pin **parallel communication terminals** on each UPS.



Figure 68: Parallel communication cable with 25-pin connectors

4. **Verify that each UPS's output circuit breaker is in the OFF position** (CB5 in the connection diagrams - Figure 71, Figure 72, Figure 73).
5. Turn on one of the systems. This system will become the "master" system. Wait until the startup procedure is complete – you will see the main menu screen. It should read "UPS ON, Normal mode", and there should be no alarms present. (If there are active alarms, resolve any problems before continuing.)



Figure 69: The main menu screen

6. Put the UPS in multisystem mode:
Main menu > Setup > System > Multisystem mode.
(In the event that this option is blocked, consult your distributor or sales agent to obtain the needed password.)
7. Now turn on the other parallel system or systems. These will be the “slave” systems.

You can have up to four systems in a parallel configuration. Once the master system has completed the start-up process (step 6 above), the remaining systems (slave systems) can be switched on together. Wait until they finish start-up and verify that each system is in “Normal” mode and has no active alarms.

8. Put the slave systems in multisystem mode (Main menu > Setup > System > Multisystem mode).
9. For each slave system, compare the output voltage of each phase to that of the master system. Any voltage difference should be no greater than 2 Vac.

If the difference in output voltage is greater than 2 V for any phase, navigate to the “Main Menu > Status” screen, tap the “Modules” icon, and then tap the “output” button at the bottom of the page. You will see the ac output voltage display, per module. By tapping on each of the module icons on the left side of the screen you can see which modules have an output voltage that is more than ± 2 V different from the master system.

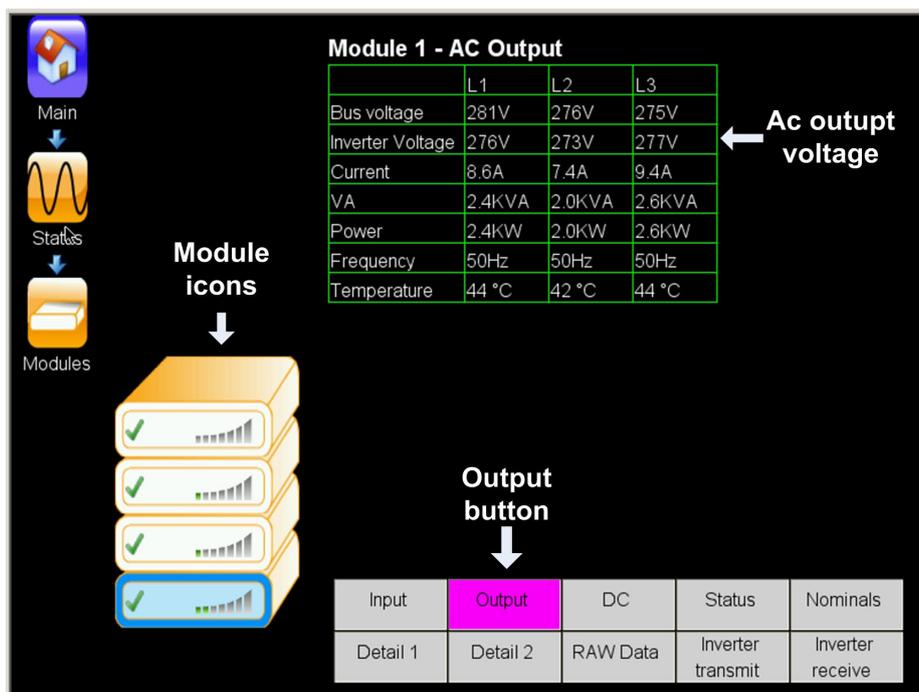


Figure 70: Ac output voltage display, per module

For each module with an “out of range” output voltage, note which module it is, which phase or phases are out of range, and what the voltage is. Then, navigate to “Main menu > Setup > Modules > Ac output voltage adjustment” and change the output voltage for the problematic module phase. You must tap “Confirm” for each module that you update.

10. When you have verified that all of the slave systems have output voltages within ± 2 V of the master system, put each system in bypass mode (Main menu > Operation > Transfer > Transfer load to bypass).
11. For each slave system, compare the output voltage of each phase to that of the master system, as you did above, except that now the systems are in bypass mode. Any voltage difference should be no greater than 2 Vac.
12. Return all of the systems to inverter mode.
13. Move the output circuit breaker of each UPS to the ON position. (CB5 in the connection diagrams - Figure 71, Figure 72, Figure 73).
14. Compare the output current from each pair of systems. Under full load, the difference in output current between any two systems should not exceed ± 10 % of the total system output current.
15. The parallel systems are now ready for use for any loads up to the maximum rated output in kW of the combined systems.

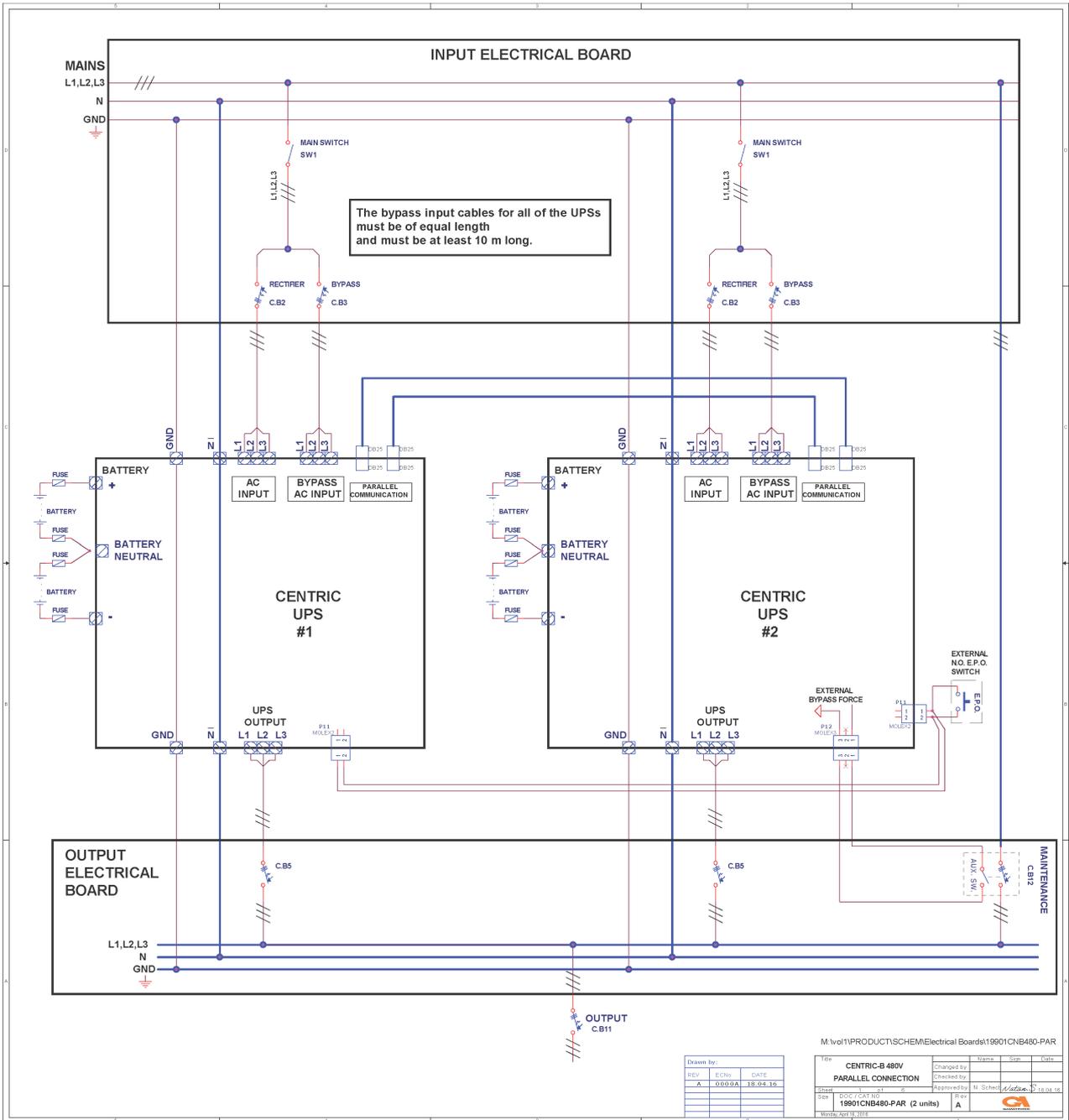


Figure 71: Connection diagram for 2 parallel units (with neutral line)

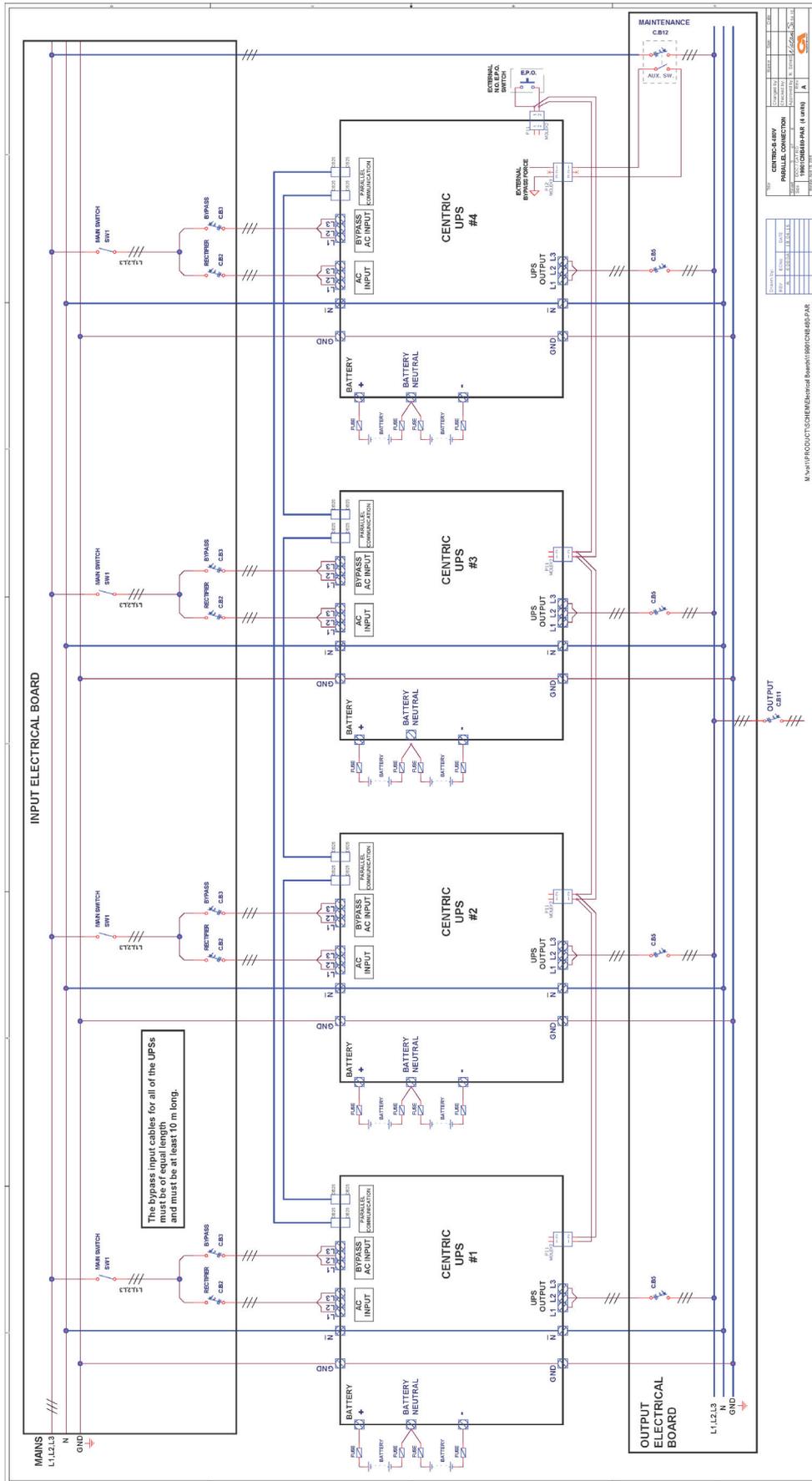


Figure 73: Connection diagram for 4 parallel Centric units (with neutral line)

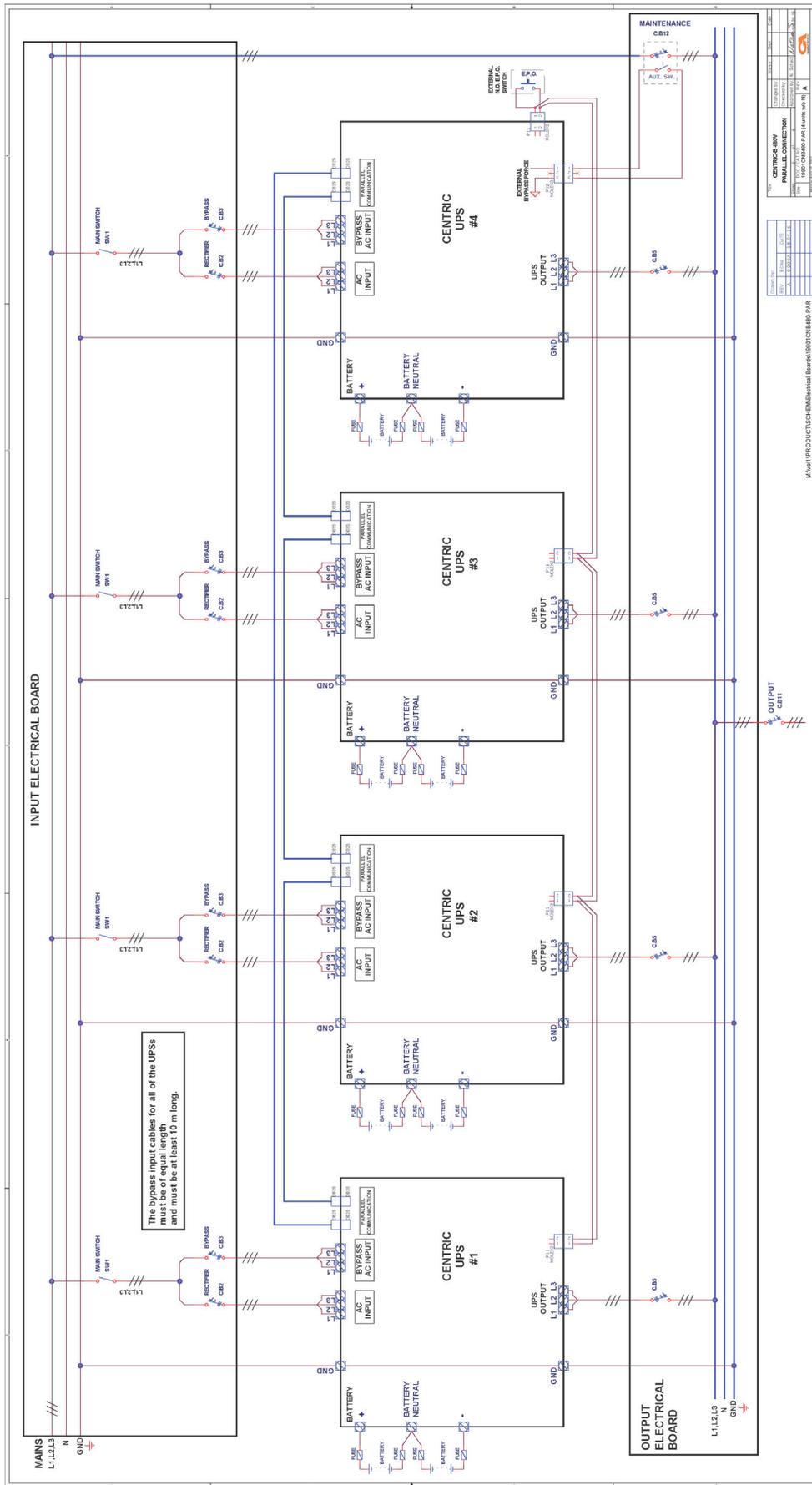


Figure 76: Connection diagram for 4 parallel Centric units (w/o neutral line)

9.2.1 Maintenance bypass for parallel systems

A maintenance bypass switch can be installed to enable a technician to perform maintenance work on the parallel UPSs without impacting the supply of power to the loads. The maintenance bypass switch routes the current around the UPSs, for the safety of the technician.

The optional maintenance bypass switch is shown in the connection schematics for parallel systems.

Note: The rating of circuit breaker CB12 in the connection schematics must be appropriate for the number of parallel UPSs.

Table 16: Rating of CB12 (for maintenance bypass option)

NUMBER OF PARALLEL UPSs	RECOMMENDED RATING FOR CB12 (AMPS)
2	350 ~ 400
3	500
4	600

10. Using the UPS with a generator

10.1 The Automatic Transfer Switch (ATS)

At many sites a generator is used as a reserve source for feeding the UPS during mains power failure. In such cases, the switching between the two sources (the mains and the generator) is performed by an Automatic Transfer Switch (ATS). Because these two sources are not usually synchronized, switching between them requires an interval of at least 10 seconds.

Figure 77 illustrates the timing factors involved when using an ATS. For proper functioning of the UPS, the values used for T3 and T4 must be greater than 10 seconds. The optimum delay times can be revealed with a little testing, and may vary from site to site, depending on the UPS, on the loads, and on the particular ATS being used.

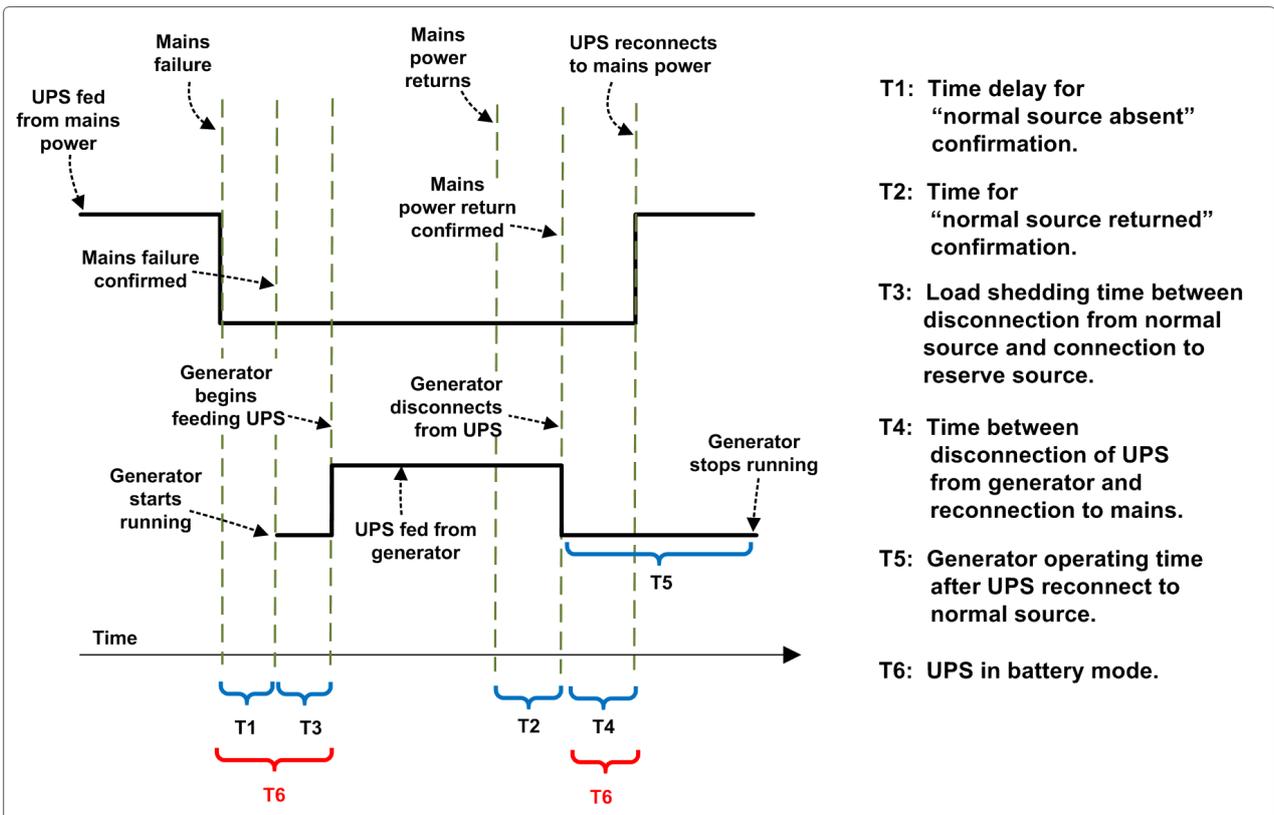


Figure 77: Timing variables when using a generator and an ATS

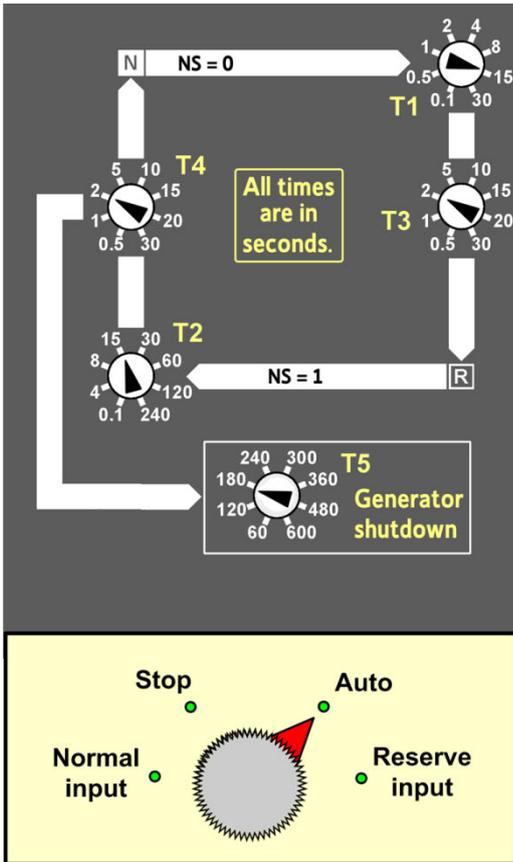


Figure 78 is an example of the control panel of an ATS.

The upper part of the control panel consists of a mimic diagram showing the control flow.

“NS = 0” means the normal source is not available.

“NS = 1” means the normal source is available.

“R” is the reserve source.

The timing variables T1 through T5 are described in Figure 77.

The knob at the bottom of the control panel controls the actions of the ATS:

- The ATS can be set to use the normal source.
- The ATS can be set to use the reserve source.
- The ATS can be set to automatic mode, which will use the normal source and will automatically switch to the reserve source in the event of a failure of the normal source.
- The “Stop” setting opens the ATS’s circuit breakers.

Figure 78: Example of an ATS control panel

11. Periodic preventive maintenance

Technologically advanced electronic systems are the heart of every Gamatronic UPS. These electronic systems are sensitive to environmental conditions. It is important that the operating and storage environments of the UPS be clean and dust-free, free of dampness and excess humidity.

The system's batteries provide back-up power to the UPS when needed. An environmental temperature of 25 °C (77 °F) is ideal for the batteries. Significantly higher temperatures shorten the batteries' lifespan.

The UPS and its batteries both require periodic preventive maintenance inspections. At the least, these inspections should include a visual inspection of the UPS and its batteries, and the tightening of any screws and bolts that have over time become loosened. The owner of the UPS is responsible for ensuring that the preventive maintenance inspections take place. This is done by contacting Gamatronic's service department and arranging a mutually convenient time for a technician to perform the inspection.

It is important that the UPS owner continue to arrange regular preventive maintenance inspections even after the expiration of the initial warrantee period.

Gamatronic bears no liability for damage caused to the UPS due to improper maintenance by third parties, in particular after the expiration of the warrantee or service agreement.

It is the responsibility of the UPS owner to uphold his responsibilities according to the warrantee or service agreement. This includes ensuring that the UPS's environment meets requirements.



These preventive maintenance procedures shall be performed only by a trained and qualified technician!

11.1 Objectives

Periodic preventive maintenance is performed on the **Centric** to verify the following:

- The **Centric** UPS and batteries are in proper electrical and physical condition
- The operation of the UPS and its batteries conform to design specifications
- The UPS and batteries are in compliance with all relevant safety standards and regulations

It is recommended that these checks be performed every three to six months, or in any case at least once annually.

11.2 Recommended Tools

Before proceeding with the periodic maintenance make sure that the following tools are available to you:

- Philips screw driver
- Flat head screw driver
- Oscilloscope
- Air compressor and vacuum (for cleaning)
- Flashlight

11.3 Maintenance Procedures and Report

Record the values of all parameters checked and of measurements taken during the periodic maintenance in the form below. Fax the completed form to Gamatronic at +972-2-582-8875.

1. UPS model and configuration

Company _____ Address _____
 Site _____ Phone _____ E-mail _____
 Centric _____ kW No. of UPS modules: _____ No. of redundant UPS modules, if any: _____
 Type of maintenance: Annual Semi-annual Quarterly
 System S/N (found on external sticker-label): _____
 Technician Name _____ Date _____ Signature _____

2. Visual Inspection of cabinet

OK Not OK Comments _____

3. Environmental Inspection

Environmental temperature _____ °C
 Ventilation OK Not OK
 Air conditioning Yes No
 Comments _____

4. Display Panels

LCD Display OK Not OK Comments _____
 LEDs OK Not OK Comments _____

5. Voltages

Verify that displayed dc voltages, rectifier input voltages, and inverter output voltages are showing proper values. Verify the readings for the UPS as a whole ("Menu option 1, System", or on touch screen "Main menu >Status") and for each module ("Menu option 2, UPS Module" or on touch screen "Main menu > Status > Modules").

Dc voltages (+) _____ (-) _____ (Total) _____
 Rectifier input Volts: _____
 voltages Amperes: _____
 Hertz: _____
 Inverter output Volts: _____
 voltages Amperes: _____
 Hertz: _____

6. Serial Number / Clock and Calendar

Done Verify that the UPS's clock and calendar show the correct date and time. If either the date or time are incorrect, enter the correct information and save.

7. Alarms

Use Alarm Log to display the alarms. List the names of any active alarms: _____

List the names of recent alarms: _____

8. Bypass Test and Module Maintenance

Connect an oscilloscope to UPS output terminals L1 and N. Press the BYPASS button to put the UPS in bypass mode. Verify that the transfer takes place normally, with no interruption of power to the load.

OK Not OK Comments _____

9. Check Front and Rear Fans

Use a flashlight to visually verify that the front fans and rear fans in each module are operating.

Front fans OK Not OK Comments _____

Rear fans OK Not OK Comments _____

10. Clean the Fans and the Fan Grilles

Done Examine and clean the fans and the fans' protective coverings of each module, from the outside, using a vacuum cleaner or an air compressor.

11. UPS Voltage Measurements

The following measurements must be performed when the UPS is unloaded or is connected to a constant, stable load.

Measured value: _____ Measure the voltage between Neutral and Ground at the bypass input. The value should be Vac

Use a calibrated voltmeter to measure the rectifier input voltages. Record the readings in the table below. Compare your readings with the console display of the rectifier input voltage. If the readings differ, the UPS's input voltage measurement may require calibration ("Setup > Module config. > AC CALIBRATION", or on touch screen "Main menu > Setup > Modules > AC INPUT VOLTAGE CALIBRATION").

Location	Phases	Voltmeter reading	Console reading	Readings match?	
				YES	NO
Rectifier input	L1 – N				
	L2 – N				
	L3 – N				

Use a calibrated voltmeter to measure the inverter output voltages according to the table below. Compare your readings with the console display of the inverter input voltage. If the readings differ, the UPS's output voltage measurement may require calibration ("Setup > Module config. > AC CALIBRATION", or on touch screen "Main menu > Setup > Modules > AC OUTPUT VOLTAGE CALIBRATION").

Inverter output	L1 – N				
	L2 – N				
	L3 – N				

12. Input Isolation transformer

For UPS's with an input isolation transformer: does the output of each transformer phase within the expected range?	YES	NO

Perform a visual inspection of the interior and exterior of the input transformer.	DONE

Comments: _____

13. Output Isolation transformer

For UPS's with an output isolation transformer: does the output of each transformer phase within the expected range?	YES	NO

Perform a visual inspection of the interior and exterior of the input transformer.	DONE

Comments: _____

14. Battery Checks

Turn the battery circuit breaker to Off and disconnect all Anderson connectors in the battery set.
Record the requested information in the following table.

Battery manufacturer	Battery model	Rating (Ah)	Number of battery strings (x 30)

Use a power resistor of 0.5 Ω (300 W rating recommended) for the load to check the voltage drop across the terminals of each battery. The voltage measured across the resistor should be no less than 10 Vdc for any battery. Replace any batteries that give a reading less than 10 Vdc.

BATTERY STRING #1					
Batt.no.	Good	Bad	Batt. no.	Good	Bad
1			11		
2			12		
3			13		
4			14		
5			15		
6			16		
7			17		
8			18		
9			19		
10			20		

BATTERY STRING #2					
Batt. no.	Good	Bad	Batt. no.	Good	Bad
1			11		
2			12		
3			13		
4			14		
5			15		
6			16		
7			17		
8			18		
9			19		
10			20		

END OF MAINTENANCE PROCEDURES REPORT

12. Service and repairs

IMPORTANT NOTICES

1. Any company whose technicians have been trained by Gamatronic Israel and has received proper authorization and certification has Gamatronic's permission to apply modifications to our products in North America. Modifications could entail adding or removing modules as well as performing service or maintenance.
2. A UPS kVA rating is a maximum rating; the actual UPS can have fewer power modules, and therefore an output rating less than maximum. However, wiring must always be according to the maximum UPS kVA rating.

Gamatronic maintains a team of service technicians, repair laboratories, and an ample inventory of spare parts, dedicated to the service and repair of our products. When service is required, it will be performed either at the customer's site or in one of our laboratories, according to the judgment of our technician and the specifics of the service agreement between the customer and Gamatronic.

In regards to service, oral agreements have no standing. Service shall be provided gratis during the warrantee period, on the condition that the UPS has been properly maintained and a written record has been kept of any maintenance performed on the system.

The initial warrantee period can be extended by a written service agreement between Gamatronic and the customer. Without a written agreement, Gamatronic is under no obligation to provide service after expiration of the initial warrantee period.

Gamatronic will not be responsible for maintenance or changes to the UPS that are performed by an agent without written authorization from Gamatronic.

13. Centric specifications

Table 17: Technical specifications

System specifications for the CENTRIC 3x480 Vac modular UPS								
Topology	Modular, double-conversion, VFI							
Operation	Continuous							
Input								
Voltage (Vac)	3x480 Vac, 4 wires + Gnd or 3 wires + Gnd							
Voltage range (%)	+10 / -15							
Current (A)	3x38 per module – no inrush current at startup							
Rectifier frequency (Hz)	40 ~ 70							
Power factor correction	>0.99							
THDI (%)	<3							
Inrush current	None							
Bypass voltage tolerance (%)	±10 when synchronized; –10 to –15 when unsynchronized							
Output								
Rated power (kVA / kW)	120 / 120, 240 / 240							
Nominal frequency (Hz)	50/60							
Frequency tracking range (Hz)	±(0.5, 1, 2, 3, 4) selectable							
Frequency tracking slew rate (Hz/sec)	1							
Frequency in free-running mode (Hz)	50/60, ±0.1 %							
Nominal voltage (Vac)	3x480 Vac, 4 wires + Gnd or 3 wires + Gnd							
Static voltage regulation (%)	±1							
Regulation for unbalanced load (%)	±1 for 100 % unbalanced load							
Dynamic response to 100 % load step (%)	±2							
Overload withstand	Inverter mode	110 % : 10 min, 125 % : 60 s, 150 % : 30 s						
	Bypass mode	125 % : 10 min, 1000 % : 1 cycle						
Waveform	Sinusoidal							
THD (%)	Linear load: <2; non-linear load: <6							
Load CF (max)	6:1							
Ac-ac efficiency, nominal	Up to 96							
Batteries								
Nominal voltage (Vdc)	480 (240 pole-to-midpoint)							
Charging voltage (Vdc)	540 (270 pole-to-midpoint)							
Quantity	2 x 20 x 12 Vdc							
Type	Sealed, lead acid, rechargeable, maintenance-free							
General								
Maximum power dissipation (W, Po=30 kW)	N*1217 W (N*4153 BTU/h), where N = # modules							
Ambient temperature	(°C)	-10 ~ +40 (operating), -20 ~ +60 (storage)						
	(°F)	+14 ~ +104 (operating), -4 ~ +140 (storage)						
Relative humidity (%)	95, maximum, non-condensing							
Altitude (m)	1500 without derating							
Enclosure	IP20							
Cooling system	Multi-fan with speed control (forced)							
Design & manufacturing standards								
Safety	UL 1778 (4 th edition), IEC 62040-1							
EMC	FCC part 15/B, IEC 62040-2							
Design classification	IEC 62040-3							
Low magnetic field radiation	EMF as per ICNIRP							
Dimensions								
# of power modules	1	2	3	4	5	6	7	8
Power output (kW)	30	60	90	120	150	180	210	240
Weight (kg)	206.1	224.8	264.5	283.2	322.9	341.6	381.3	400
Height, Width, Depth (mm / in)	H=2015 / 79.4; W=600 / 23.6; D=1000 / 39.5							

All specifications are subject to change without notice.

CENTRIC: TECHNICAL SPECIFICATIONS FOR THE SYSTEM CONTROLLER	
Display	LCD flat panel, touch-sensitive
Other indicators	Audible alarm
Analog input channels	4 input dry contacts (N.O. / N.C.)
Real-time clock (RTC)	Yes, with backup
Power meter	kVA, kW, PF
Volt-free outputs (dry contacts)	6 outputs, rated 48 V / 1 A
Output dry contacts	Ac failure Dc failure UPS module(s) failure Load on bypass Battery test failure Over/under temperature Overload (Each system alarm type can be routed to the dry contact of your choice.)
Communication ports	Serial, Ethernet, USB
Communication protocols	RS232, RS485, TCP/IP, SNMP, Modbus
Communications with system modules	Serial, isolated
Events log	500 events
System operation without controller	Unchanged
On-screen parameters	Load bar-graph 3-phase voltages 3-phase currents Battery voltage Status of each UPS module Static-switch parameters and status Battery sensor temperature
RTC operation without power	Indefinitely
Power requirements	3 x 480 Vac OR 400 Vdc (battery)
Remote indication panel capability	Yes

For a full company profile, please visit our website at www.gamatronic.com.

Gamatronic's product range:

- ▶ UPS Systems
- ▶ Power systems for Telecom
- ▶ Dc-to-Ac Inverters
- ▶ Dc-to-Dc Converters
- ▶ Frequency Converters
- ▶ Battery Chargers
- ▶ Power Management Solutions

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