



POWER⁺ 3x208 V

10 TO 100 kVA

MODULAR UPS SYSTEM

User Guide



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STANDARDS AND CONVENTIONS

This manual contains diagrams which include images of the LCD 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.



IN THE EVENT THAT SYSTEM OUTPUT CAPACITY IS INCREASED ABOVE THE ORIGINAL FACTORY CONFIGURATION, THE SYSTEM NAMEPLATE MUST BE UPDATED TO INDICATE THE NEW POWER AND CURRENT CAPACITY. This condition applies when new, non-redundant power modules are added to the system or when formerly redundant modules are designated as non-redundant.

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SAFETY CONSIDERATIONS

The **POWER+** UPS system is designed for industrial applications and harsh environments. Nevertheless the **POWER+** UPS system is a sophisticated power system and should be handled with appropriate care, following these guidelines.

Do's

- READ THIS MANUAL CAREFULLY before starting installation and operation of the UPS.
- SAVE THESE INSTRUCTIONS. This manual contains important instructions that must be followed during installation and maintenance of the UPS and batteries.
- REVIEW THE SAFETY PRECAUTIONS described below to avoid injury to users or damaging equipment.
- All power connections must be completed by a licensed electrician who is experienced in wiring this type of equipment, and who is knowledgeable about all federal, state, and local electrical codes and regulations. **Improper wiring may cause damage to the equipment or injury to personnel.**
- Pay attention to the warning signs, labels and marks on the unit. A warning sign signals the presence of a possibly serious, life-threatening condition.
- Keep the surroundings clean, uncluttered and free from excess moisture.
- 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.



CAUTION - WARNING - RISK OF LETHAL ELECTRIC SHOCK:

The battery drawer contains a series of 12-Volt batteries that provide high voltage and energy in the UPS body even when the UPS is not connected to the ac input. Appropriate precautions should be taken during installation, inspection and servicing.



CAUTION - WARNING - RISK OF LETHAL ELECTRIC SHOCK:

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



ATTENTION - AVERTISSEMENT - RISQUE DE DÉCHARGE ÉLECTRIQUE MORTELLE :

Le tiroir de batterie contient une série de batteries 12-Volt qui fournissent la haute tension et l'énergie dans le corps D'UPS même lorsque L'UPS n'est pas relié à l'entrée à A.C. Des précautions appropriées devraient être prises pendant l'installation, l'inspection et l'entretien.



ATTENTION - AVERTISSEMENT - RISQUE DE DÉCHARGE ÉLECTRIQUE MORTELLE :

L'UPS reçoit la puissance de plus d'une source. Le débranchage de toutes les sources à A.C. et source de D.C est exigé pour désactiver cette unité avant l'entretien.

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 next to any gas or electrical heaters. A restricted location is recommended in order to prevent access by unauthorized personnel.



WARNING: RISK OF SEVERE DAMAGE TO THE UPS!!!



THIS SYSTEM USES THE NEUTRAL LINE FOR OPERATION. THEREFORE, IT IS STRICTLY FORBIDDEN TO CONNECT THIS SYSTEM TO THE AC POWER SOURCE WITHOUT A NEUTRAL (NULL) CONDUCTOR!!



FAILURE TO USE A NEUTRAL CONDUCTOR MAY CAUSE PERMANENT DAMAGE TO THE SYSTEM.



**AVERTISSEMENT : RISQUE DE
DOMMAGES GRAVES À L'UPS !!!**



CE SYSTÈME EMPLOIE LA LIGNE NEUTRE POUR L'OPÉRATION. PAR CONSÉQUENT, ON INTERDIT STRICTEMENT DE RELIER CE SYSTÈME A LA SOURCE (AC) DE COURANT ALTERNATIF SANS CONDUCTEUR (NUL) NEUTRE !!



L'ÉCHEC À L'UTILISATION D'Un CONDUCTEUR NEUTRE PEUT ENDOMMAGER EN PERMANENCE LE SYSTÈME.



CAUTION - GROUND CONNECTION ESSENTIAL BEFORE CONNECTING SUPPLY

Connect the UPS to ground before connecting it to the ac supply.



ATTENTION - la PRISE DE TERRE AU SOL ESSENTIELLE AVANT DE RELIER L'APPROVISIONNEMENT

mettre L'UPS à la terre avant de le relier à l'alimentation à A.C.



CAUTION - WARNING - RISK OF ELECTRIC SHOCK! DO NOT REMOVE COVER!

Do not remove the UPS cover. There are no user serviceable parts inside. Refer servicing to qualified service personnel.




**ATTENTION - AVERTISSEMENT - RISQUE DE DÉCHARGE ÉLECTRIQUE !
N'ENLEVEZ PAS LA COUVERTURE !**


N'enlevez pas la couverture D'UPS. Il n'y a aucune pièce utile d'utilisateur à l'intérieur. Référez-vous l'entretien au personnel de service qualifié.

RECYCLING INFORMATION
Consult your local recycling or hazardous waste center for information on proper disposal of a used battery or UPS.


WARNING

 Do not dispose of batteries in a fire. Batteries may explode. Consult with your local recycling / hazardous waste center for disposal requirements.

CAUTION

 Do not discard the UPS or its batteries in the trash. This product contains sealed lead-acid batteries. For proper disposal, contact your local recycling / hazardous waste center.

CAUTION

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

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1. INTRODUCTION

Thank you for purchasing a **POWER+** UPS system. **POWER+** is the most sophisticated UPS on the market today.

In general, an Uninterruptible Power Supply (UPS) provides backup power for use when the utility ac electric power mains fail or drop to an unacceptable voltage level. **POWER+** is a whole lot more.

POWER+ is designed to protect your data and equipment and minimize downtime and other adverse effects normally incurred by power irregularities and failures.

POWER+ continually eliminates surges, spikes and sags that are inherent in commercial utility power. Over time, these irregularities shorten the life of equipment and components. The efficiency of **POWER+** thus helps to extend the life of your equipment, even through normal use when the input power system is constant and continuous.

POWER+ requires very little attention or intervention during normal operation; however, you should read and understand the procedures described in this manual to ensure trouble-free operation.

POWER+ is a parallel redundant UPS and is flexible in structure, allowing it to be easily extended by adding modules as required. The UPS modules are designed for hot swapping, making many different configurations possible.

POWER+ has many unique features:

- **POWER+** is reliable thanks to its N+ 1 parallel redundancy.
- **POWER+** is both flexible and modular; it may include from one to ten modules.
- **POWER+** is a true on-line battery design according to IEC62040-3.
- **POWER+** is a "green" power solution thanks to THD of 5 % at the input, and provides "clean" power to your loads.
- **POWER+** employs active current sharing at the input / output.
- **POWER+** has ac-to-ac efficiency of up to 94 %, dc-to-ac of 97 %.
- **POWER+** is light and small, a 10 kVA / 8 kW module weighs only 20 lbs (9 kg).



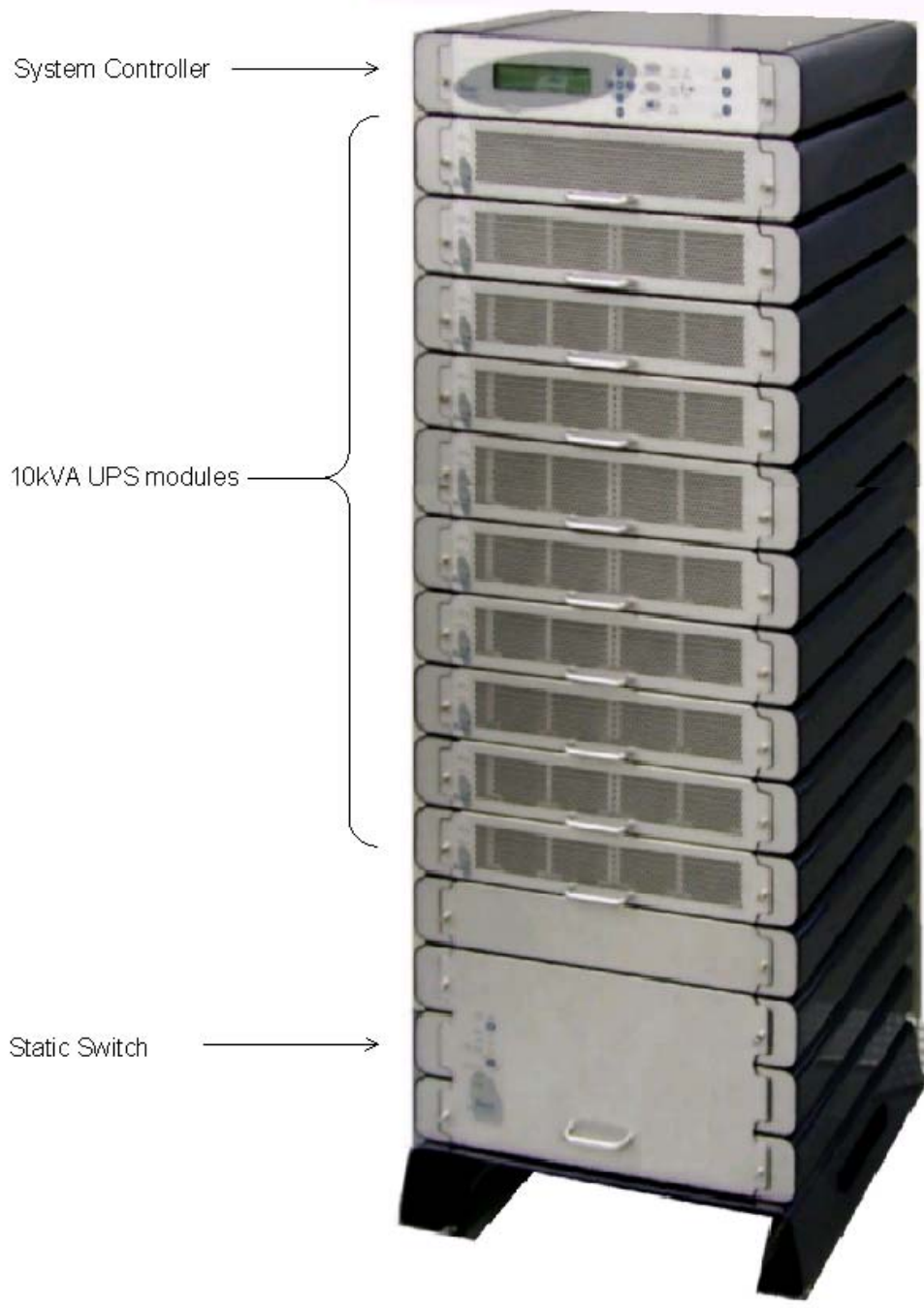
40 kVA Configuration



100 kVA – Small enough to fit in a 4-passenger elevator

The **POWER+** is comprised of the following sub-assemblies.

- System Controller
- 1-10 UPS modules × 10 kVA
- Static Switch Module



POWER+ System - Full Complement

1.1 System Controller

The **POWER+** system controller has three purposes:

- to allow the user to manage and control the UPS as well as monitor the parameters of all sections of the **POWER+** via the control panel
- to collect and summarize data from all sections of the UPS
- communication with external computers for data transfer and operation

The **POWER+** can work without the system controller but with reduced functionality.

1.2 UPS Module (10 kVA / 8 kW)¹

The UPS module is the core of the **POWER+**, which consists of from one to ten identical modules in parallel depending on capacity requirements.

Each module includes a 3-phase charger with PFC² and a 3-phase PWM inverter connected to batteries by a classic dc link. Each module is plug-in and weighs a mere 20 lbs (9 kg).

1.3 Static Switch (ST/SW) Module

The centralized hybrid Static Switch enables an automatic transfer of the load from the output of the inverters to an alternate source whenever the inverter can no longer supply power to the load. The static switch can transfer high currents at high speed.

1.4 Battery

The **POWER+** battery bank is used as a backup in the event that the utility ac input fails.

For systems from 10 kVA through 20 kVA, the batteries may be housed internally (on battery trays); however, for systems from 30 kVA through 100 kVA, or for sites where a longer backup duration is required, the batteries are housed in an external cabinet next to the **POWER+** cabinet.

For **POWER+** units equipped with internal batteries (battery trays), do not use excessive force when sliding the battery tray into place. The battery tray must be slid into place gently to avoid damaging the electrical connection on its rear panel.

Batteries are charged by the rectifier which supplies both the inverter and the battery charger.

¹ The kVA and kW per module given here is for 3-3 configuration.

² PFC is a feature included that reduces the amount of generated reactive power. Reactive power operates at right angles to true power and energizes the magnetic field. Reactive power has no real value for an electronic device, but electric companies charge for both true and reactive power resulting in unnecessary charges.

In power factor correction, the power factor (represented as "k") is the ratio of true power (kWatts) divided by apparent power (kVA). The power factor value is between 0.0 and 1.00. If the power factor is above 0.8, the device is using power efficiently. A standard power supply has a power factor of 0.70-0.75, and a power supply with PFC has a power factor of 0.95-0.99.

Please refer to the battery manufacturer's installation manual for battery installation and maintenance instructions.

When replacing batteries, replace with the same number and type!

BATTERY MANUFACTURER	PART NUMBER
DiaMec Battery Co. Ltd.	DMC12-7, rated V-2 min.
NOTE: EQUIVALENT TYPE BATTERIES MAY BE USED. PLEASE CONSULT GAMATRONIC.	



CAUTION - RISK OF ELECTRIC SHOCK!

Servicing of batteries should be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.



CAUTION - WARNING - RISK OF ELECTRIC SHOCK!

Do not touch uninsulated battery terminals.



CAUTION

Do not dispose of battery or batteries in a fire. The battery may explode. For proper disposal, contact your local recycling / hazardous waste center.



CAUTION

Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes, and is toxic.



CAUTION

Batteries are heavy. Move them with care. Dropping a battery can result in injury and may damage the battery.

CAUTION: A BATTERY CAN PRESENT A RISK OF ELECTRICAL SHOCK AND HIGH SHORT-CIRCUIT CURRENT. THE FOLLOWING PRECAUTIONS SHOULD BE OBSERVED WHEN WORKING ON BATTERIES.

1. Remove watches, rings, and other exposed metal objects from the body.
2. Use tools with insulated handles.
3. Wear rubber gloves and boots.
4. Do not lay tools or metal parts on top of the batteries.
5. Disconnect the charging source before connecting or disconnecting battery terminals.

Veillez se référer au manuel de l'installation du fabricant de batterie pour des instructions d'installation et d'entretien de batterie. En remplaçant des batteries, remplacez avec le mêmes nombre et type !

FABRICANT DE BATTERIE	NUMÉRO DE LA PIÈCE
DiaMec Battery Co. Ltd.	DMC12-7, V-2 évalué minute.
NOTE : LE TYPE ÉQUIVALENT BATTERIES PEUT ÊTRE EMPLOYÉ. VEUILLEZ CONSULTER GAMATRONIC.	



ATTENTION - RISQUE DE DÉCHARGE ÉLECTRIQUE ! L'entretien des batteries devrait être assuré ou dirigé par le personnel bien informé des batteries et des précautions exigées. Personnel non autorisé de subsistance loin des batteries.



ATTENTION - AVERTISSEMENT - RISQUE DE DÉCHARGE ÉLECTRIQUE !

Ne touchez pas les bornes non isolées de batterie.



ATTENTION

Ne vous débarrassez pas de la batterie ou des batteries dans un feu. La batterie peut éclater. Pour la disposition appropriée, entrez en contact avec votre centre de recyclage de gens du pays/perte dangereuse.



ATTENTION

N'ouvrez pas ou ne mutilez pas la batterie ou les batteries.
L'électrolyte libéré est nocif à la peau et aux yeux, et est toxique.



ATTENTION

Les batteries sont lourdes. Déplacez-les avec soin. La chute d'une batterie peut avoir comme conséquence les dommages et peut endommager la batterie.

ATTENTION : UNE BATTERIE PEUT PRÉSENTER UN RISQUE DE CHOC ÉLECTRIQUE ET DE COURANT ÉLEVÉ DE SHORT-CIRCUIT. ON DEVRAIT OBSERVER LES PRÉCAUTIONS SUIVANTES EN TRAVAILLANT AVEC LES BATTERIES.

1. Enlevez les montres, les anneaux, et d'autres objets exposés en métal du corps.
2. Utilisez les outils avec les poignées isolées.
3. Portez les gants et les initialisations en caoutchouc.
4. N'étendez pas les outils ou les pièces en métal sur les batteries.
5. Débranchez la source de remplissage avant de relier ou débrancher des bornes de batterie.

2. OPERATING MODES

The **POWER+** UPS functions to supply ac electrical power to your load.

While using the **POWER+**, three modes of operation are possible:

- Normal operation
- Battery operation
- Bypass operation

2.1 Normal Operation

The UPS is almost always in normal operation mode. The load receives its power from the inverters that supply stabilized voltage, protected from spikes and irregularities in the ac input. The ac input system feeds the charger which supplies dc power to the inverter, while concurrently charging the batteries.

2.2 Battery Operation

During battery operation, the load continues to receive power from the inverters, but the dc input to the inverter is taken from the batteries, instead of from the rectifier.

The batteries are galvanically connected by dc link to the inverter and the charger. The dc inherently remains constant when the ac input supply drops out, without any switching devices.

The duration of the battery operation is determined by the load demand and the battery capacity.

2.3 Bypass Operation

During bypass operation, the load receives power directly from the ac input via the static switch.

Whenever the inverters cannot provide power to the load, either due to an overload or a short-circuit in the load, transfer to the ac input is automatic. As soon as the problem is corrected, the load is transferred back to the inverter.

2.4 How It Works

All three operation modes are encountered during normal UPS use in order to constantly provide a regulated supply to the load.

During normal use, the UPS provides total power protection to the load.

Using bypass, the load is transferred to power directly from the ac input, bypassing the inverter. Using this route, there is no protection, but it can be used in the short term. When power is restored, the UPS returns to normal operation.

In addition to these three operation modes that are negotiated automatically by the UPS, there are 2 other modes that can only be invoked with manual intervention, either by the user or the technician:

- Maintenance bypass
- Emergency Power Off (EPO)

2.4.1 Maintenance Bypass

The maintenance bypass switch allows for connecting the load directly to the utility ac supply, not via the UPS, to enable UPS service and maintenance without disrupting supply to the load. This switch is only to be used by the service engineer.

2.4.2 Emergency Power Off

An external Emergency Power Off (EPO) switch may be installed by the customer. The EPO switch cuts power to the load in emergency situations. Once switched off by the EPO, the POWER+ must be restarted manually.

The EPO switch must be an N.C.-type, rated 120 Vac. Connect the EPO switch to the two EPO terminals on the UPS.

In the event that the POWER+ UPS is used in a computer room, installation of the EPO switch is mandatory. It is also **required** in this case that activating the EPO switch should disconnect the dc power supply from the batteries. The battery CB terminals on the POWER+ must be connected to the trip coil terminals on the battery cabinet.

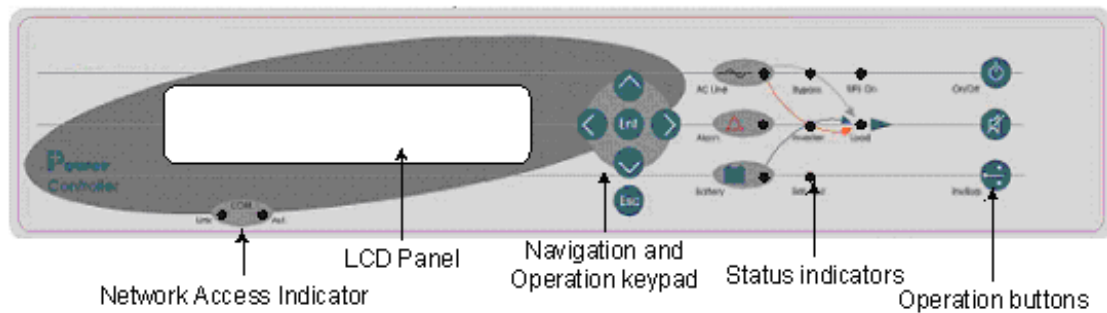
3. USER INTERFACE

This section describes the buttons and indicators used to operate the **POWER+**.

3.1 Control Panel

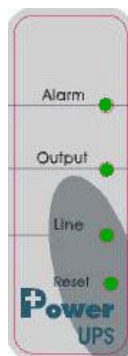
The **POWER+** Control Panel, located on the front of the controller, provides the user with an interface to the **POWER+** system. It includes an LCD display, a keypad, buttons and indicators for monitoring and controlling the UPS configuration and functions. The control panel is aimed both at the end-user as well as the service engineer. All of the **POWER+** parameters can be viewed on the control panel.

Use of the **POWER+** Control Panel is described in detail in Chapter 7 beginning on page 43



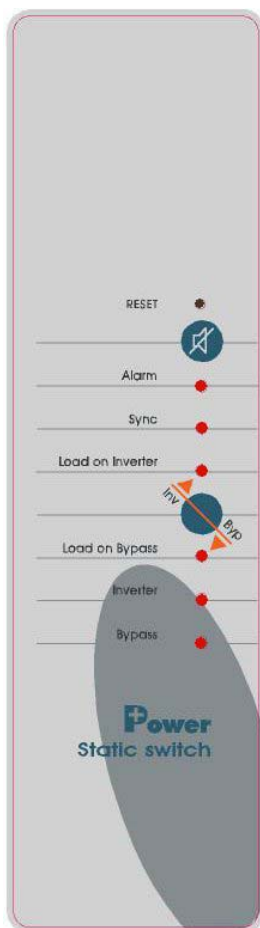
3.2 UPS Module Panel

The UPS module panel, located on the front of each UPS module, provides the user with the status of that module



3.3 Static Switch Panel

The static switch panel, located on the front of static switch module, provides the user with the status of the static switch module. All the functions and indications are available on the **POWER+** Control Panel.



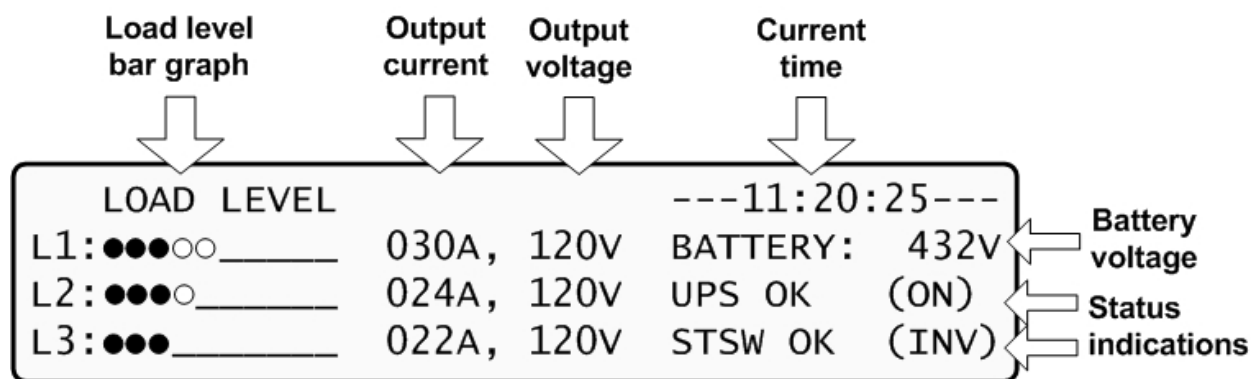
3.4 **POWER+** Control screen

The **POWER+** control screen is illustrated below. It is part of the control panel described on page 10.

How to read and understand the **POWER+** control screen is described in detail in Chapter control screen is described in Chapter 7 beginning on page 43







The control screen provides menus and displays all aspects of the **POWER+** systems input, output and static switch as well as operational details.

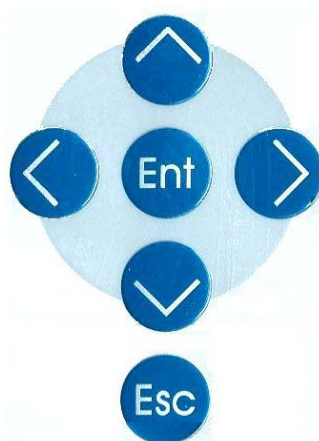
The figure below shows the **POWER+** 3-phase display.



This is how the control screen appears while the UPS is running normally.

3.5 Navigation and Operation Keypad

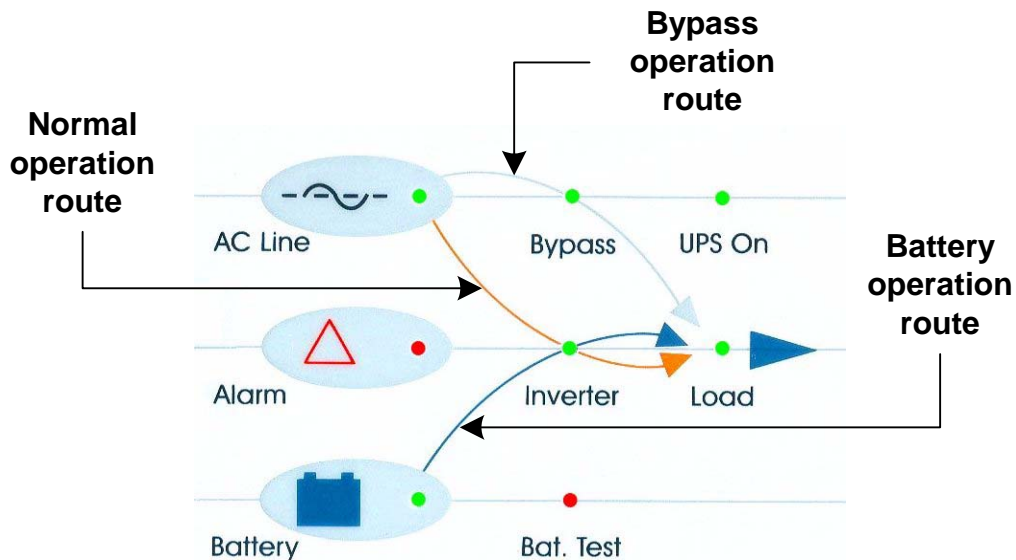
The navigation and operation keypad works in conjunction with the control screen. It allows you to navigate through the available menus using the     direction arrow buttons and the Enter  and Escape  buttons to select or quit, respectively.



3.6 Status Indicators

The status indicators show precisely what is running and how the UPS is providing power to the load.

The diagram below shows the power source and destination routes in use for each of the 3 automated operation modes.






Ac Line	Green – Shows that the ac input is present and within range
Alarm	Red – Flashes to indicate general alarm condition
Battery	Green – Shows that the battery is in discharge mode
Bypass	Green – Shows that the load is supplied from the ac input
Inverter	Green - Shows that the inverter is supplying power to the load
Bat. Test	Red – Shows that a battery test is in progress
UPS On	Green – Indicates that the UPS is running
Load	Green – Indicates that ac voltage is available at the output

3.7 Operation Buttons

The operation buttons illustrated below are “soft” switches.

- On/Off resets the entire UPS
- Alarm silence shuts the alarm sounder
- Inv/Byp allows the maintenance engineer to manually change the operation mode

 On/Off	UPS ON/OFF switch
	Alarm silence
 Inv/Byp	Inverter/Bypass manual switch over

3.8 Network Access Indicator

The network access indicator shows whether the network connection is available and whether it is active.



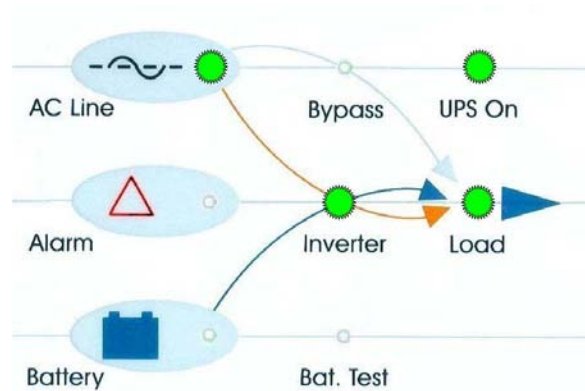
Link	Red – Indicates the presence of a network connection link
Act	Green – Indicates that the network is active

3.9 POWER+ Operation Modes

3.9.1 Normal Operation

LOAD LEVEL		---11:20:25---	
L1: ●●●○○	030A, 120V	BATTERY: 432V	
L2: ●●●○	024A, 120V	UPS OK (ON)	
L3: ●●●	022A, 120V	STSW OK (INV)	

During normal operation, the UPS draws power from the ac line, feeds dc to the inverter which provides ac to the load.



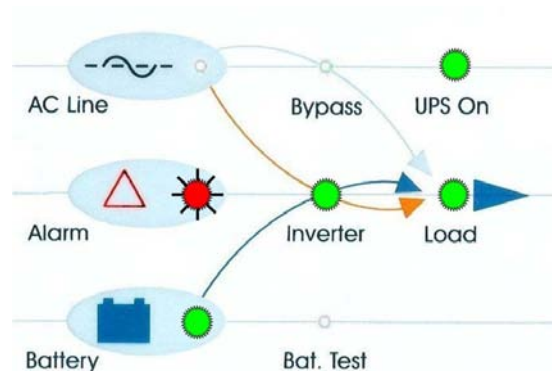
3.9.2 Battery Operation

AC failed for the past 5 minutes

LOAD LEVEL		no ac 005m	---11:20:25---
L1: ●●●○○	030A, 120V	BATTERY: 432V	Status indications
L2: ●●○○	022A, 120V	UPS OK (ON)	
L3: ●●●○○○	034A, 120V	STSW OK (INV)	

During Battery Operation, the battery supplies dc to the inverter which then provides ac to the load.

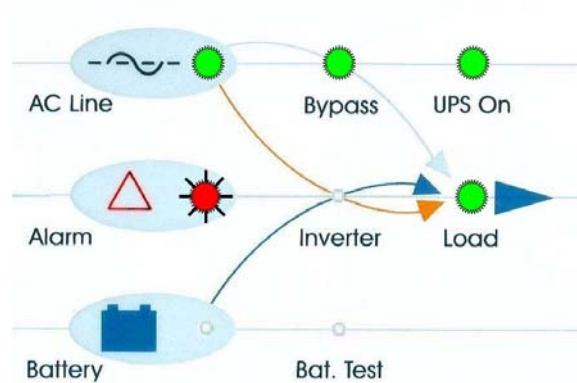
The red alarm flashes to indicate the abnormal status.



3.9.3 Bypass Operation (Automatic)

LOAD LEVEL		---11:20:25---	
L1: ●●●○○	030A, 120V	BATTERY: 432V	← Status indications
L2: ●●○○	024A, 120V	UPS OK (OFF)	
L3: ●●○	022A, 120V	STSW warning	

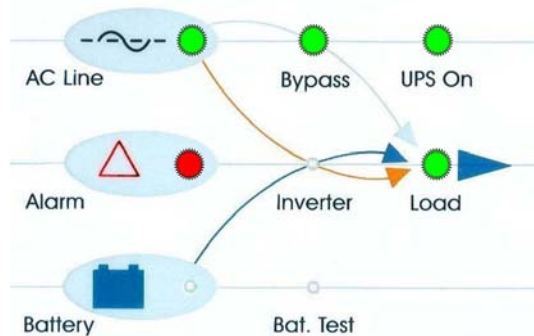
During Bypass operation, the AC feeds the load via the bypass static switch. The red alarm flashes to indicate the abnormal status.



3.9.4 Bypass Operation (Manual)

LOAD LEVEL		---12:01:11---	
L1: ●●●○○	030A, 120V	BATTERY: 432V	← Status indications
L2: ●●●○○	029A, 120V	UPS OK (ON)	
L3: ●●○○	022A, 120V	STSW OK (BYP)	

If the Power+ is manually switched to bypass operation by pressing the Inv/ByP button, the load is transferred to the mains AC input line. Transfer back to normal operation must be performed manually. The red alarm indicator will be lit but will not flash.



3.9.5 Emergency Power Off - EPO (Manual)

The EPO button is for use by the user, in emergency situations only. The EPO button cuts the supply to the load with immediate effect and cannot be reset. Once switched OFF by the EPO, the **POWER+** must be restarted manually.

4. INSTALLATION PREPARATIONS

This is where you begin when preparing for initial installation of the **POWER+**.

4.1 Ac Input/Output Main Terminals

The main terminals are critical for **POWER+** installation. The terminals are used to connect the ac input and bypass inputs and the ac output. When connecting cables to the terminals, use a torque wrench to tighten the terminals to 270 lbs./in.

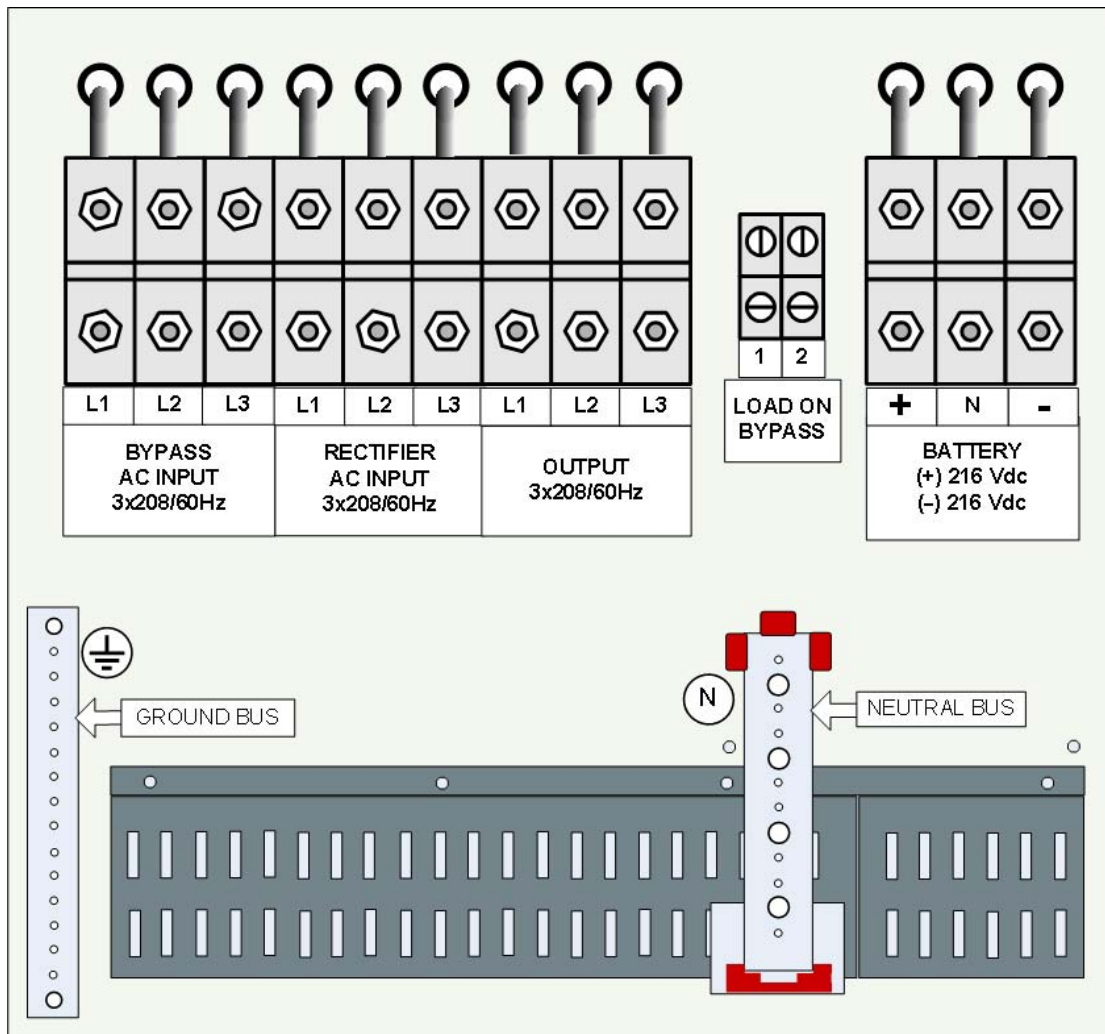
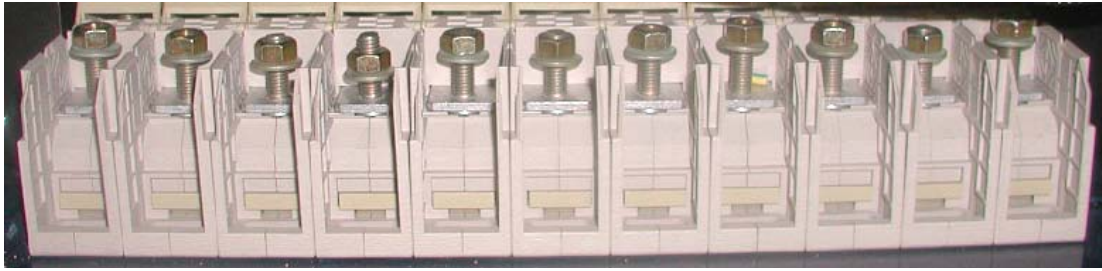


Figure 1: Terminals on 60 kVA – 100 kVA models

USE COPPER CONDUCTORS ONLY.

UTILISEZ LES CONDUCTEURS DE CUIVRE SEULEMENT.



L1	L2	L3	N	L1	L2	L3	N	L1	L2	L3
AC INPUT BYPASS 3 X 208, 60 Hz				AC INPUT UPS 3 X 208, 60 Hz				OUTPUT 3 X 208, 60 Hz		

Figure 2: Terminals on the 10 kVA - 50 kVA models

USE COPPER CONDUCTORS ONLY.

UTILISEZ LES CONDUCTEURS DE CUIVRE SEULEMENT.

4.2 Preparation

1. Prepare the proper infrastructure for the **POWER+** with adequate cables and connections.
2. Prepare the **POWER+** for installation. Ensure all components and modules are complete and securely fastened to their shelves.
3. Verify that utility ac power is disconnected, that the battery is disconnected, and that all switches are OFF.
4. If you have installed a maintenance bypass switch for your system, ensure that the maintenance bypass switch is set to NORMAL (OFF).
5. Connect the ac lines to the **POWER+** AC INPUT terminals.
Do not connect the ac lines to the **bypass input** at this time.
Do not connect any lines to the UPS **output** terminals or to the UPS **battery** terminals at this time.
6. Turn on the ac input circuit breakers.
7. Wait for the UPS to power up. The power-up process takes about a minute and 15 seconds. Several different screens are displayed on the UPS LCD panel during the power-up process. When you see the default, "Load Level" screen (Figure 3), the power-up process has completed.

LOAD LEVEL		---	23:14:40	---
L1: _____	000A, 120V	BATTERY:	432V	
L2: _____	000A, 120V	UPS OK	(OFF)	
L3: _____	000A, 120V	STSW Warning !		

Figure 3: System default display, after preparatory power-up

4.3 The Power+ always requires a neutral line

During both installation and operation of the Power +, a neutral line must always be connected to the UPS. This neutral line shall be connected during the entire period that the UPS is working, and shall 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. That may result in system defining its own reference voltage, which will be set by the load distribution between the three phases. ***This can result in serious damage to the UPS.***

4.3.1 A 4-pole switch might disconnect the neutral line

WARNING! If you have a mains-to-generator **four-pole** 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, we strongly recommend that, if you use a four-pole mains-to-generator switching system, you install an isolation transformer that will constantly provide the UPS with a neutral line.

Figure 4 on page 21 illustrates the wrong way to connect the UPS with a grounded-neutral generator.

Figure 5 on page 22 illustrates an acceptable connection solution if you already have a grounded-neutral generator.

Figure 6 on page 23 shows the preferred generator (neutralized, not grounded) and the preferred connection (three-pole).

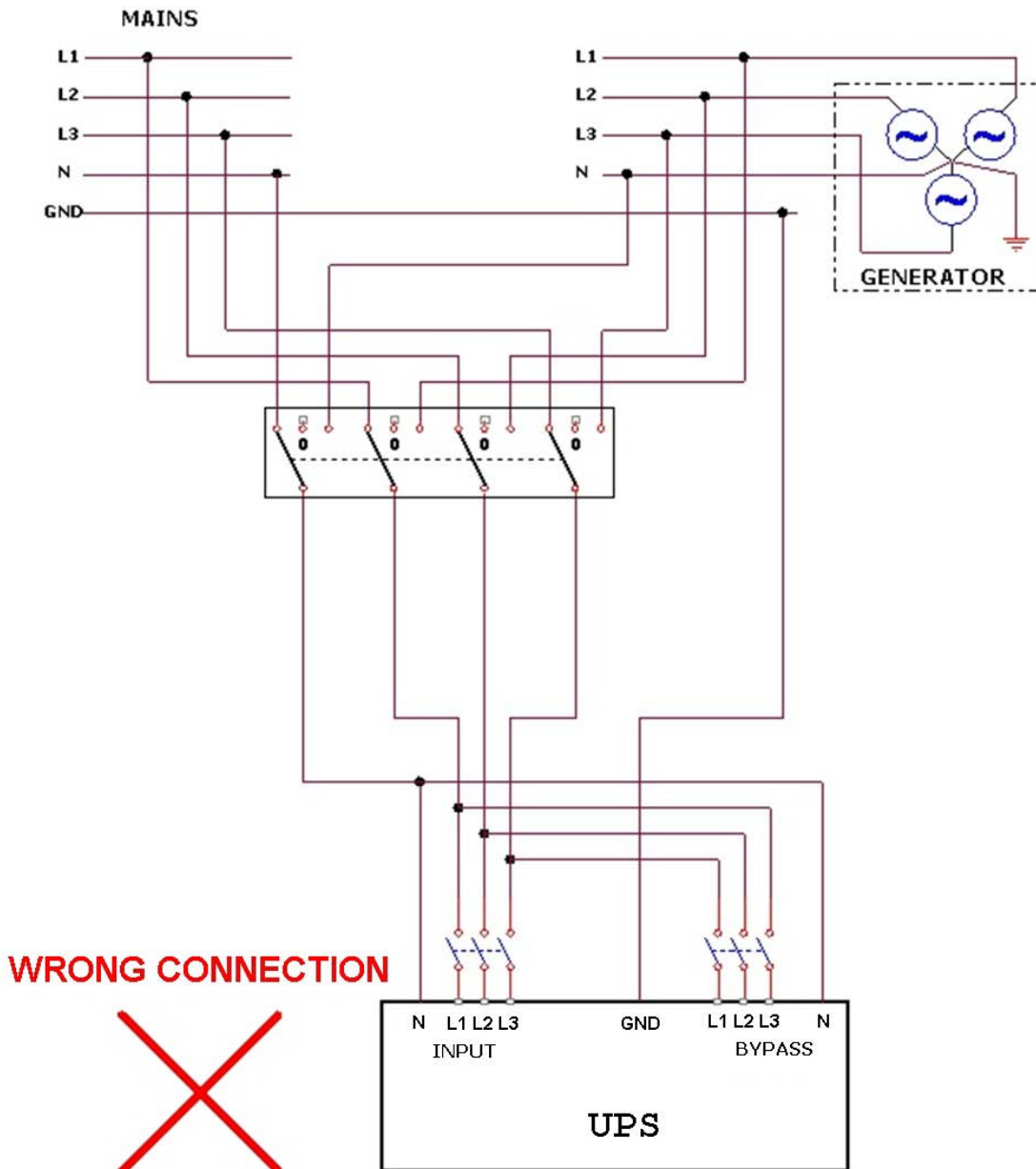


Figure 4: Wrong way to connect UPS with four-pole switch

WARNING!
 A 4-pole switch may disconnect the neutral line
 if improperly connected!

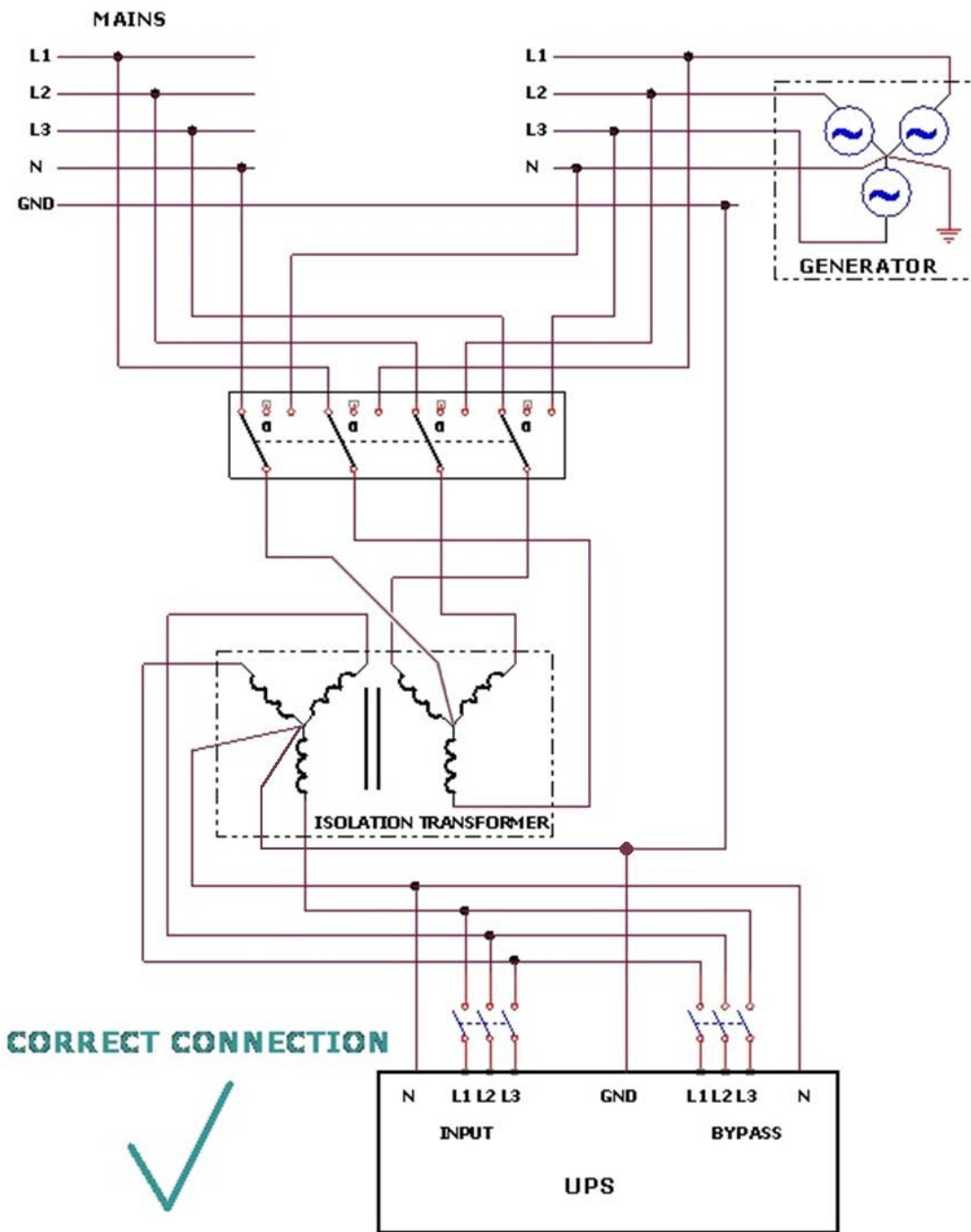


Figure 5: Acceptable connection for grounded generator and 4-pole switch

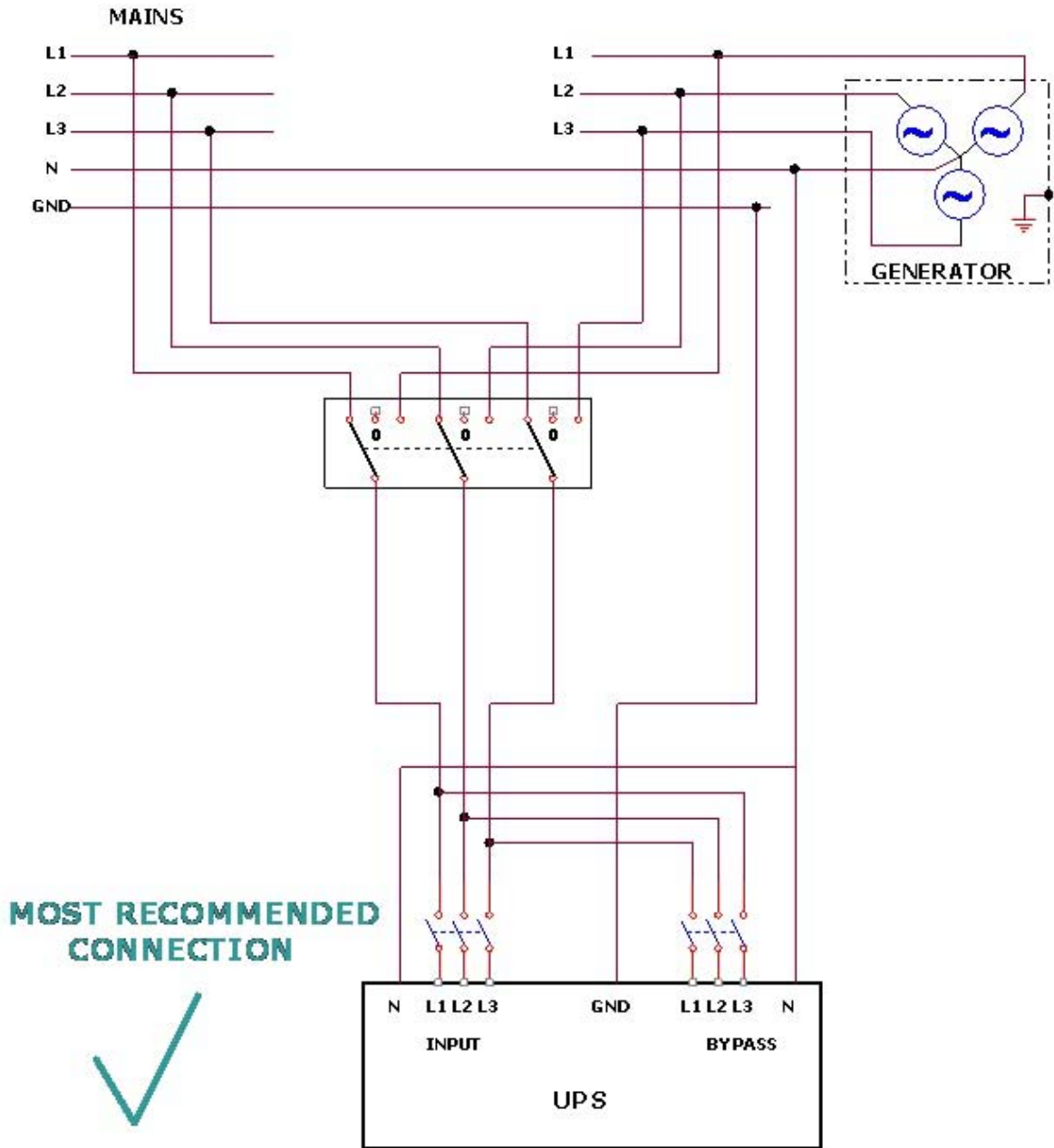


Figure 6: Preferred generator (neutralized) and connection (3-pole)

Continue with chapter 5, "System Installation".

5. SYSTEM INSTALLATION

5.1 Cabling



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

USE REQUIRED WIRING SIZE ACCORDING TO THE NATIONAL ELECTRIC CODE, NSI/NFPA 70.

FOR 10 TO 50 KVA SYSTEMS: 0 AWG MAXIMUM 600 V, 380 A, 75 °C COPPER WIRE.

FOR 60 TO 100 KVA SYSTEMS: 500 KCMILS MAXIMUM, 600 V, 380 A, 75 °C COPPER WIRE.



AVERTISSEMENT ! RISQUE DE CHOC ÉLECTRIQUE OU DE DOMMAGES ! L'INSTALLATION PEUT ÊTRE EFFECTUÉE PAR LE TECHNICIEN QUALIFIÉ SEULEMENT !

EMPLOYEZ REQUIS EN CÂBLANT LA TAILLE SELON LE CODE ÉLECTRIQUE NATIONAL, NSI/NFPA 70.

POUR DES SYSTÈMES DE 10 À 50 KVA : 0 MAXIMUM 600 V, 380 A, D'A.W.G. FIL 75 °C DE CUIVRE.

POUR 60 À 100 SYSTÈMES DE KVA : 500 KCMILS MAXIMUM, 600 V, 380 A, FIL 75 °C DE CUIVRE

Figure 7 (3-3 configuration), Figure 8 (3-2 configuration), and Figure 9 (2-2 configuration) below illustrate the cabling of the POWER+ system to the mains electricity cabinet.

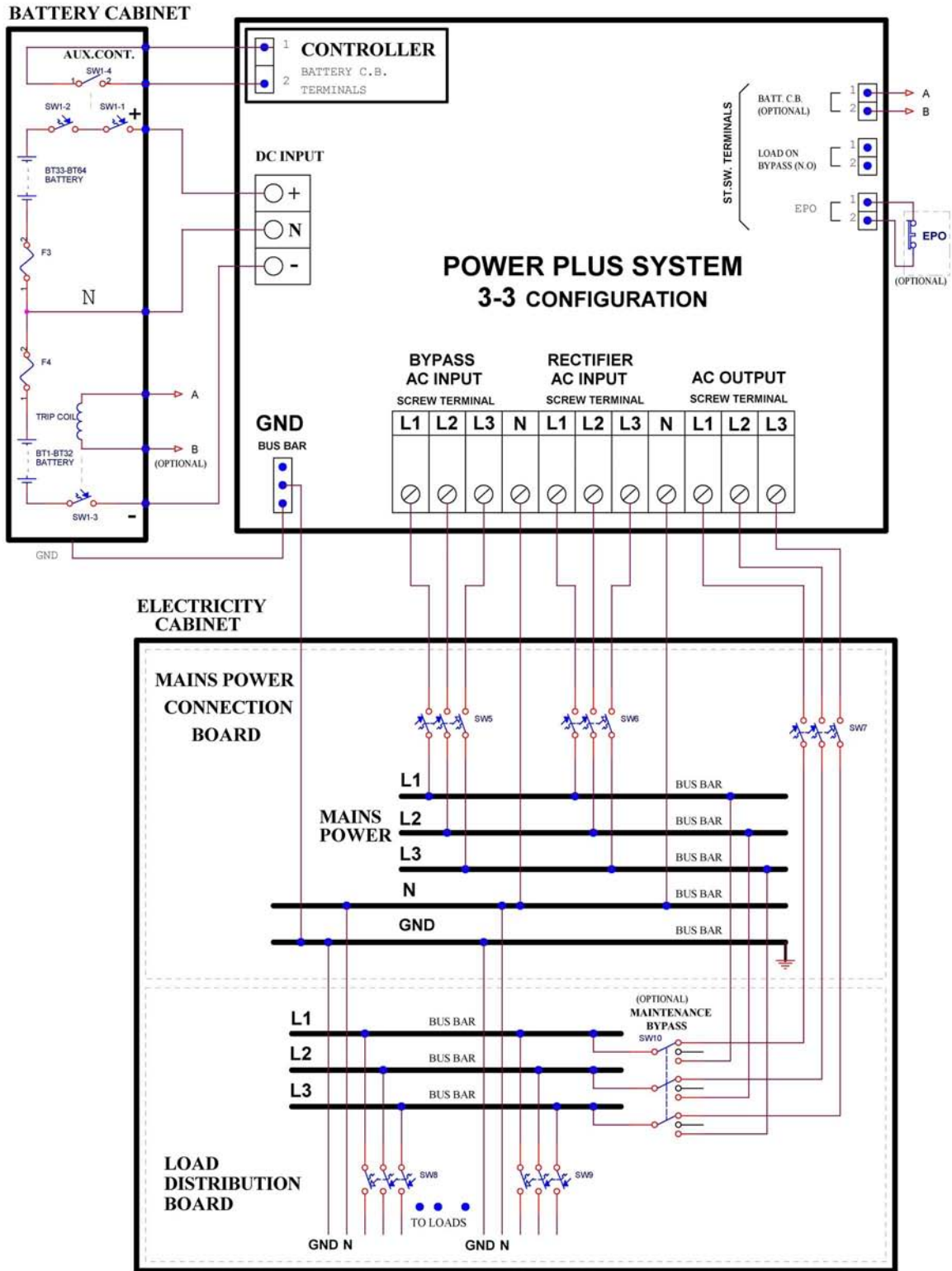


Figure 7: Connection diagram for 3-3 configuration

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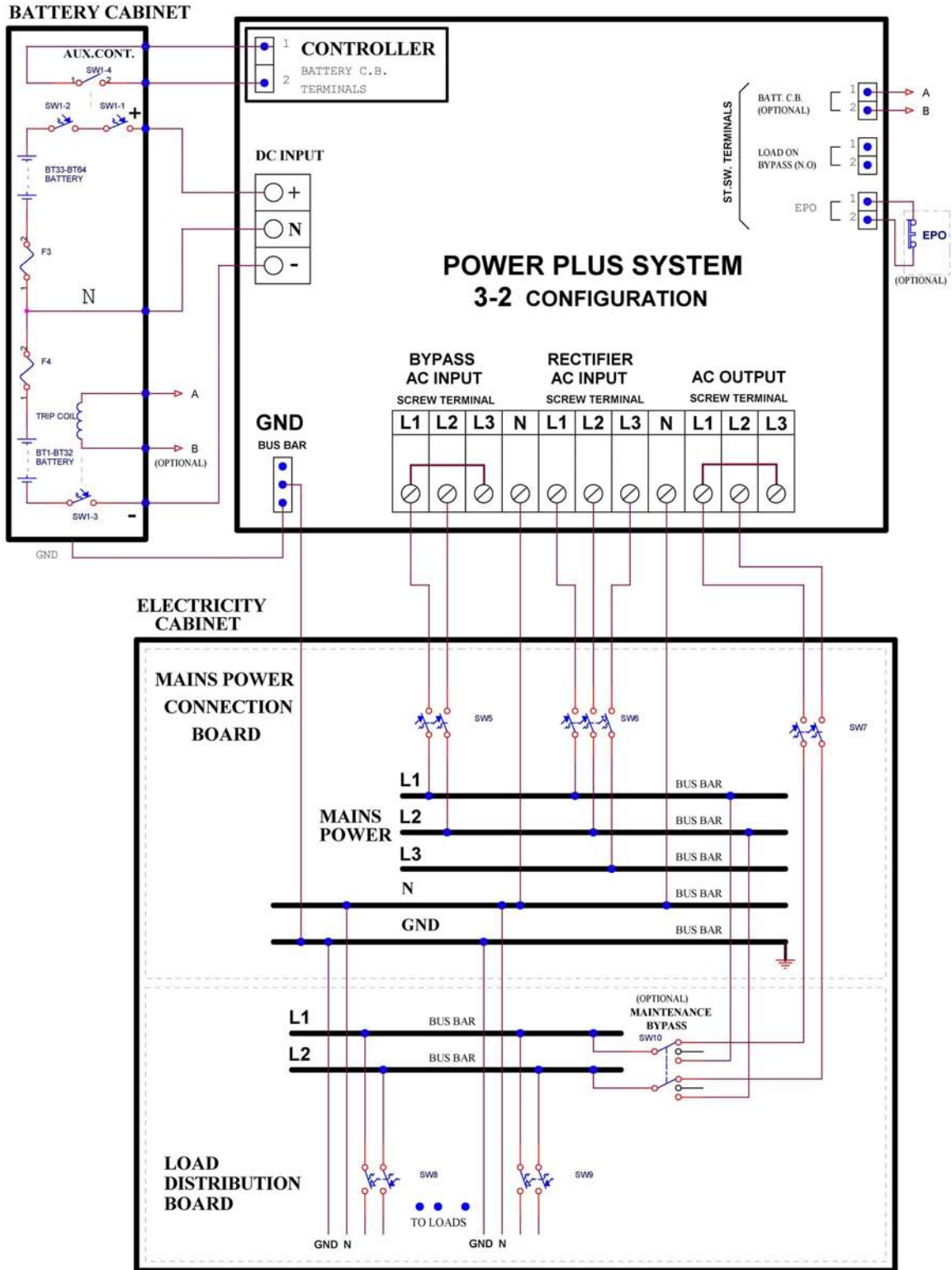


Figure 8: Connection diagram for 3-2 configuration

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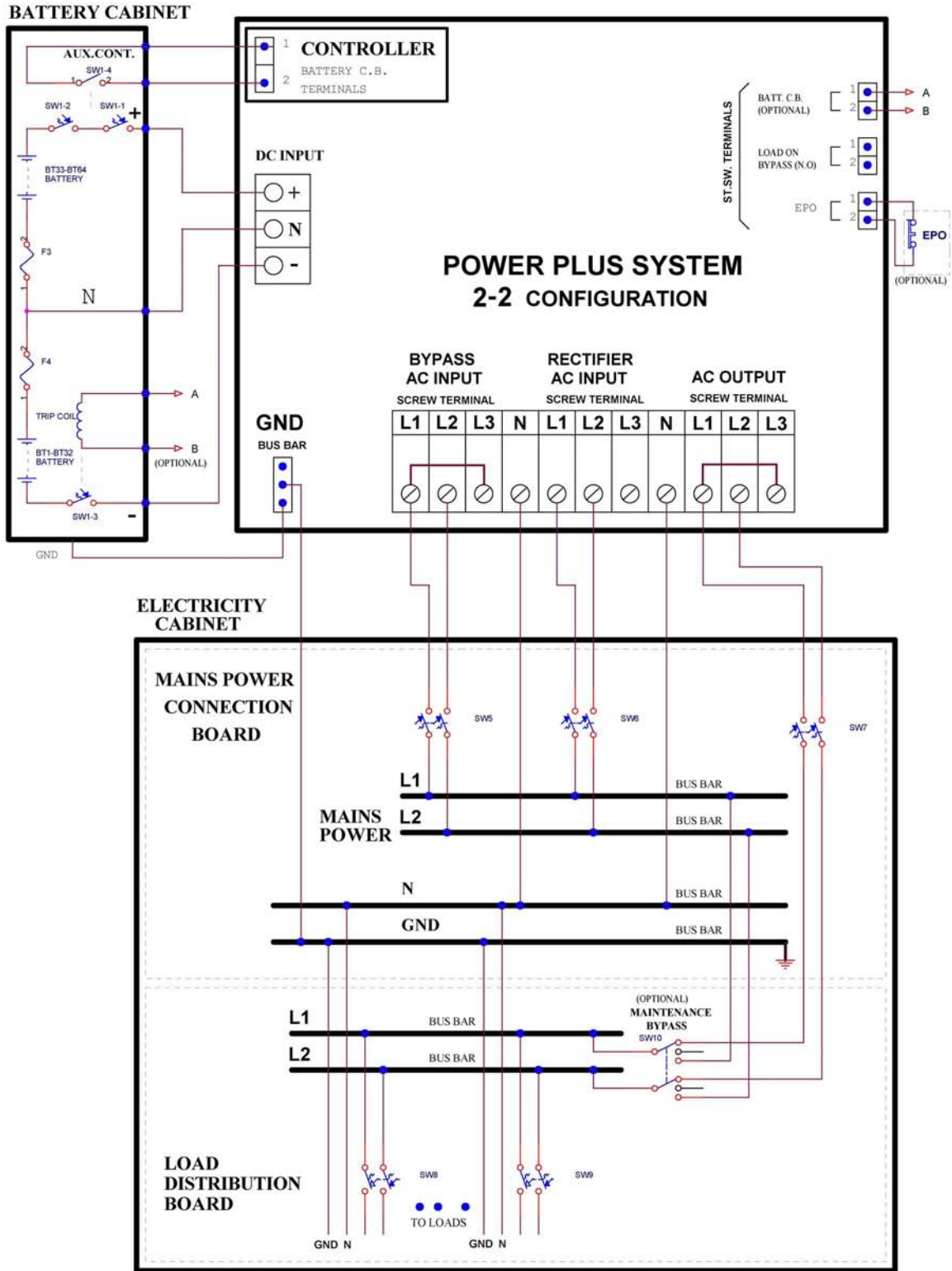


Figure 9: Connection diagram for 2-2 configuration

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5.2 Over-Voltage Protection



CAUTION!

To reduce the risk of fire, connect the UPS only to a circuit provided with maximum branch circuit over-current protection as indicated in Table 1, in accordance with the National Electric Code, NSI/NFPA 70.



ATTENTION !

Pour réduire le risque du feu, reliez L'UPS seulement à un circuit équipé de protection maximum de surintensité de circuit de branche comme indiqué au tableau 1, selon le code électrique national, au NSI/NFPA 70.


Ensure that the lines into and out of the UPS have protective circuit breakers installed in accordance with the ratings listed in *Table 1* for your Power+ model.

Table 1: Required over-current protection


<i>POWER+</i> Model	Line	Maximum over-current protection
10 kVA	Ac input	35 A
	Ac input bypass	
	Load	
	Battery dc input	30 A
20 kVA	Ac input	70 A
	Ac input bypass	
	Load	
	Battery dc input	60 A
30 kVA	Ac input	110 A
	Ac input bypass	
	Load	
	Battery dc input	90 A
40 kVA	Ac input	150 A
	Ac input bypass	
	Load	
	Battery dc input	125 A
50 kVA	Ac input	175 A
	Ac input bypass	
	Load	
	Battery dc input	150 A

<i>POWER+</i> Model	Line	Maximum over-current protection
60 kVA	Ac input	225 A
	Ac input bypass	
	Load	
	Battery dc input	200 A
70 kVA	Ac input	250 A
	Ac input bypass	
	Load	
	Battery dc input	225 A
80 kVA	Ac input	280 A
	Ac input bypass	
	Load	
	Battery dc input	250 A
90 kVA	Ac input	350 A
	Ac input bypass	
	Load	
	Battery dc input	300 A
100 kVA	Ac input	350 A
	Ac input bypass	
	Load	
	Battery dc input	300 A

5.3 Fuses



WARNING!
To reduce the risk of fire, replacement fuses must be of the same type and rating as the original.



AVERTISSEMENT !
Pour réduire le risque du feu, les fusibles de rechange doivent être du mêmes type et estimation que l'original.

5.3.1 AC INPUT FUSES

Verify that the appropriate ac fuses are present.

In the ac distribution module, the input for each UPS module is protected by a 32A fuse for each phase, so that each module, including the controller, has 3 fuses (one each for the L1, L2, and L3 phases). Ten modules plus the controller would require 33 fuses, as illustrated in Figure 11. Fuse receptacles are numbered from right to left, i.e. the 3 fuses on the far right protect UPS module 1.

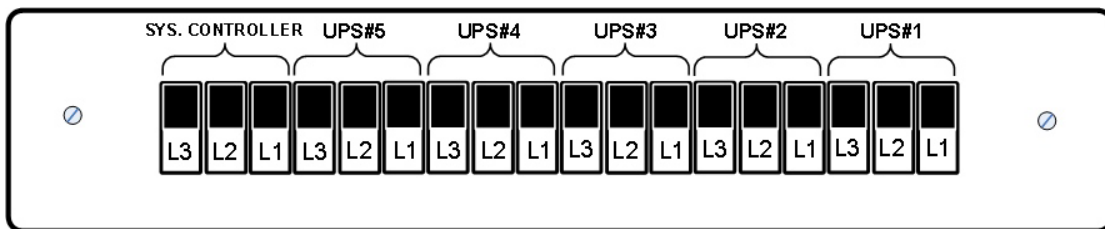


Figure 10: Ac input fuse assignments (50 kVA model)

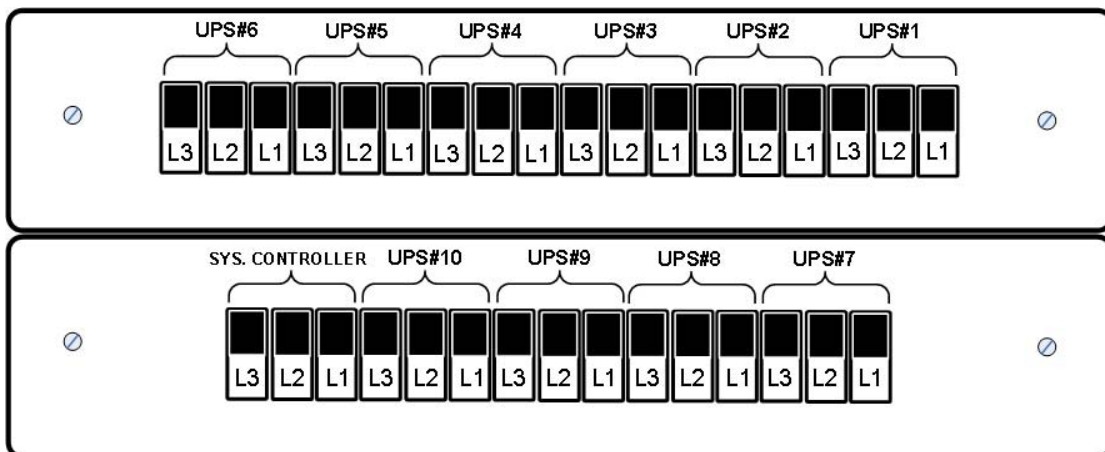


Figure 11: Ac input fuses (100 kVA model)

5.3.2 DC DISTRIBUTION FUSES

Verify that the appropriate dc fuses are present.

All dc fuses are located on the opposite side (the front side) of the dc distribution panel. There are two fuses for each power module and for the controller – one for the positive line and one for the negative line. Figure 12 show the assignments for the 100 kVA model; Figure 13 for the 50 kVA module.

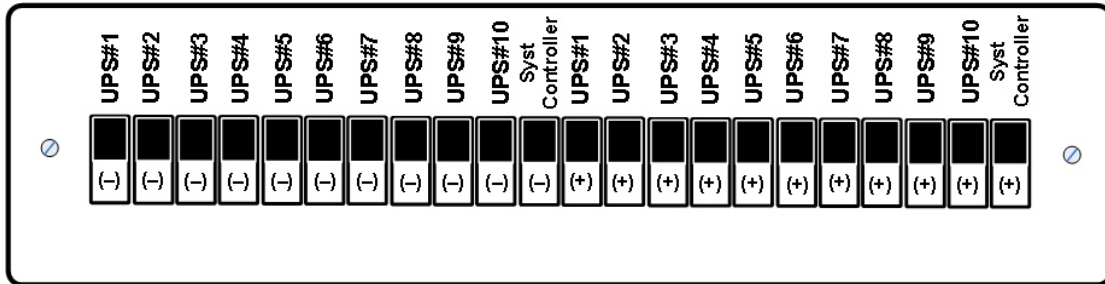


Figure 12: Dc distribution fuse assignment (100 kVA model)

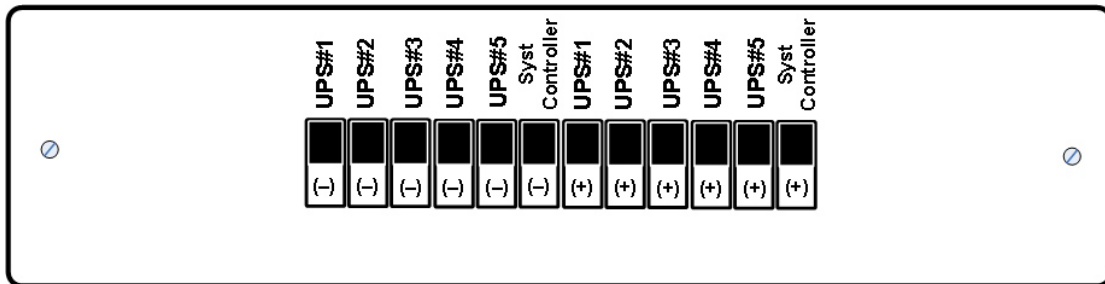


Figure 13: Dc distribution fuse assignment (50 kVA model)

5.4 Inspections to be performed prior to installation

	TYPE OF CHECK		REQUIREMENT	VALUE / VERIFICATION
1.	Ambient temperature in the immediate location of the equipment		Recommended: between +59 ° F and +77 ° F (+15 °C and +25 °C)	
			Required: between +14 °F and +104 °F (-10 °C and +40 °C)	
2.	Humidity and condensation		Verify that there is no water condensation or dampness within the installation site	
3.	Ventilation		Verify that sufficient airflow or forced ventilation is provided for battery cabinets location	
4.	Foundation and route to installation site		Verification of adequate structure, space and clearance for dimensions and weights of the UPS units and their battery cabinets	
5.	When planning the location of the UPS units, room for access to battery cabinets and electrical boards is critical.		Verify 16 in. (40 cm) clearance at rear for cable connections and 39 in. (100 cm) at front for user access and service	
6.	Circuit breakers on the electrical board supplying the system		Must be in accordance with Gamatronic system specifications, connection schematic, and local and national codes.	
7.	Diameter of input and output power cable connections, PE (Gnd) and neutral lines.		Must comply with local and national codes, and be appropriate for the circuit breakers protecting them. Refer to connections schematic.	
8.	Lightning / Voltage surge protection on electrical board supplying the system.		Voltage surge suppressors type B are recommended to be installed between each phase and the neutral line: Ratings: 150 Vac for 110-120 Vac mains.	
9.	Ac input voltage	3-3 and 3-2 configuration	Phase-to-Phase: 3x208* Vac, +15 %, -25 %	L1-L2 L2-L3 L3-L1
			Phase-to-Neutral: 120* Vac, +10 %, -15 %	L1 L2 L3
		2-2 configuration	Phase-to-Phase: 3x208* Vac Wye, +15 %, -25 %	L1-L2
			Phase-to-Neutral: 120* Vac, +10 %, -15 %	L1 L2
10.	Voltage between neutral and ground		0 – 2 Vac	
11.	System installation and start-up		Must be performed only by authorized personnel in accordance with connection schematic, Gamatronic system specifications and this User Guide	

* Or other, according to nominal voltage rating of local power mains.

5.5 Installation Procedure

OPERATION	
1.	Remove rear covers and connect ac input and output power cables to terminals according to markings as shown in this User Guide and according to connection schematic. <u>Verify correct phase sequence</u> between board and UPS
2.	Consult the appropriate connection diagram, depending on the phase configuration of the UPS: <ul style="list-style-type: none"> • For 3-3 configuration, see Figure 7 on page 25. • For 3-2 configuration, see Figure 8 on page 27. • For 2-2 configuration, see Figure 9 on page 29. Connect ground lines to busses according to markings as shown in the connection diagram. <u>Verify secure connections.</u>
3.	Connect the dc power cables of the battery cabinets to the UPS terminals according to markings as shown in the connection diagram (see step 2 above). Connect neutral and ground lines to busses as per the connection diagram. <u>Verify correct polarity of the connections (+ / N / -)</u> Between the Battery Cabinets C.B.s / Terminals and the UPS terminals. Auxiliary contacts of Battery C.B.s are connected to UPS Controller inputs "Bat CB" and "Com" as marked.
4.	If an external battery cabinet is being used, before turning on the battery cabinet circuit breaker perform the following two checks: <p>4.1) Measure the voltage between the (+) and (-) terminals on the battery cabinet. The voltage must be within the range of 384–432 Vdc. If the voltage is not within this range, determine what the problem is and resolve it before continuing with system start-up.</p> <p>4.2) On the battery cabinet, measure the voltage between the (+) terminal and the Neutral terminal, and between the (-) terminal and the Neutral terminal. Both measurements should be within the range of 196–216 Vdc. If a reading outside of that range is obtained, determine what the problem is and resolve it before continuing with system startup.</p>
5.	An external dual-pole / N.C. EPO switch may be connected according to connection schematic. EPO wiring and switch rating must be rated for at least 5A / 120 Vac.
6.	Before connecting power to each system verify again that all connections are secure and are according to instructions and schematics.
7.	Follow the instructions in section 5.6 "First-time Startup" which begins on page 37.

5.6 First-time Startup

This section describes the procedure for starting up the Power+ for the first time, after having completed the installation process described in the previous chapter.

1. Ensure that the maintenance bypass switch is set to NORMAL (OFF), and that no load devices are connected to the UPS.
2. Turn the AC input and AC bypass switch ON and wait (for about 2 minutes) for the **POWER+** to initialize.

When applying power to the **POWER+**, the system automatically runs the startup process without a need to press the On/Off button.

3. The start-up sequence begins and the control panel displays the following sequence. (The details may vary, depending on your application.)
4. Turn the AC input and AC bypass switch ON and wait (for about 2 minutes) for the **POWER+** to initialize.
5. The start-up sequence will begin and the control panel will show the following sequence. (The details of the display may vary from what is shown in the illustrations below, depending on your system's particulars.)

```

                UPS POWER+
                SC25270105
          W E L C O M E ! ! !
  
```

Figure 14: Start-up screen 1

```

          WARNING !!!
          SYSTEM RUNNING IN:
    S I L I C O N   M O D E   (JP2 - IN)
    -----PLEASE NOTIFY SUPERVISOR-----
  
```

Figure 15: Start-up screen 2

```

WAIT FOR RESULTS...
STATIC RAM: PASSED   R.T   CLOCK: PASSED
EEPROM - 1: PASSED
EEPROM - 3: PASSED   DC SUPPLIES: PASSED
  
```

Figure 16: Start-up screen 3

```

    S Y S T E M   I N I T I A L I Z I N G
                SC25270105
    PLEASE WAIT FOR COUNT DOWN TO FINISH
                45 SECONDS LEFT
  
```

Figure 17: Start-up screen 4

During this step, the LEDs are also checked sequentially.

6. Finally the normal default screen is displayed. Verify that the correct number of phases are displayed:
 - for 3-3 configuration, under the LOAD LEVEL heading, you should see a line for L1, L2, and L3 as in Figure 18.
 - For 3-2 or 2-2 configuration you should lines for L1 and L2 only, as in Figure 19.

LOAD LEVEL	---11:20:25---
L1: _____ 000A, 120V	BATTERY: 000V
L2: _____ 000A, 120V	UPS OK (ON)
L3: _____ 000A, 120V	STSW OK (INV)

Figure 18: Default screen, with no load, for 3-phase output

LOAD LEVEL	---11:20:25---
L1: _____ 000A, 120V	BATTERY: 000V
L2: _____ 000A, 120V	UPS OK (ON)
	STSW OK (INV)

Figure 19: Default screen, with no load, for 2-phase output

7. Switch all battery switches "ON" on all battery cabinets.
8. You can now turn on the load devices.
9. After turning on the load devices, verify that you have a normal reading on the display screen.
 - For 3-3 configuration, the display shows readings for L1, L2, and L3 as in Figure 20 below, but of course your readings will be different.
 - For 3-2 and 2-2 configuration, the display shows readings for L1 and L2 only, as in Figure 21.

LOAD LEVEL	---11:20:25---
L1: ●●●○○_____ 030A, 120V	BATTERY: 432V
L2: ●●●○_____ 024A, 120V	UPS OK (ON)
L3: ●●●_____ 022A, 120V	STSW OK (INV)

Figure 20: Normal display, system under load (3-phase output)

LOAD LEVEL	---11:20:25---
L1: ●●●○○_____ 030A, 120V	BATTERY: 432V
L2: ●●●○_____ 024A, 120V	UPS OK (ON)
	STSW OK (INV)

Figure 21: Normal display, system under load (2-phase output)

5.7 Checks to be performed following initial startup

	TYPE OF CHECK	REQUIREMENT	RESULT
1.	Ac input voltage during operation under load. <u>Take measurements on the input terminals of the system</u>	Phase-to-phase: Not less than 2 % below no-load values measured in item 5 below.	3-3 and 3-2 configuration L1-L2 L2-L3 L3-L1
			2-2 configuration L1-L2
		Phase to Neutral: Not less than 2 % below no-load values measured in item 5 below.	3-3 and 3-2 configuration L1 L2 L3
			2-2 configuration L1 L2
2.	With no load on the system, measure current circulation between the units.	I_{rst} should be <30 A	
3.	With no load on the system, measure the dc voltage of the system.	Total dc voltage between + and – terminals should be between 384 V and 432 V.	(+) – (-)
4.	Voltage between neutral and ground during operation under load <u>On the input terminals of the system</u>	0–2 Vac	
5.	System output voltage	120 V +/- 2 % or other according to system specifications	
6.	Total system load / output current	Verify that the system is not overloaded in relation to system specifications	
7.	Correct and orderly operation	Verify that the UPS is operating normally in accordance with this User Guide and that no alarms or fault indications are evident	

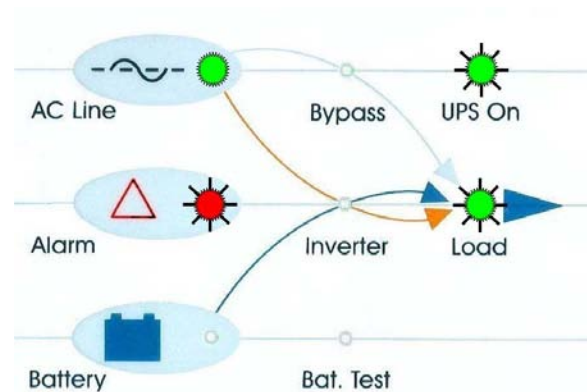
NOTE: It is the responsibility of the customer to notify Gamatronic Electronic Industries Ltd. and receive approval for any deviations from these requirements.

6. POWER+ ROUTINE START-UP

This section describes the start-up procedures for the operator after a **POWER+** shutdown.

LOAD LEVEL		---	22:21:18	---
L1: _____	000A, 120V	BATTERY:	432V	
L2: _____	000A, 120V	UPS OK	(OFF)	
L3: _____	000A, 120V	STSW OK	(BYP)	

After shutdown, the **UPS on**, **Alarm** and **Load** indicators will flash.



1. Press twice on the On/Off button on the upper right of the system controller panel.
2. Wait about 2 minutes for the **POWER+** to start up.

The following screen is displayed:

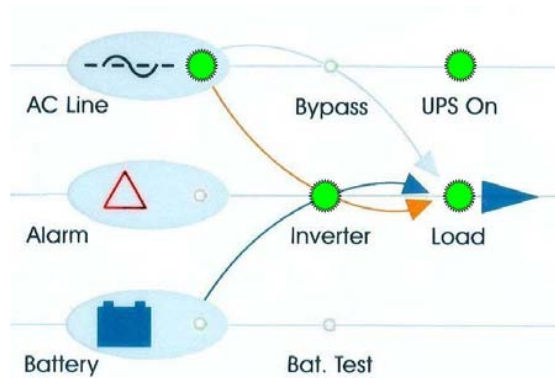
LOAD LEVEL		---	22:21:18	---
L1: _____	000A, 120V	BATTERY:	432V	
L2: _____	000A, 120V	UPS OK	(ON)	← Status indications
L3: _____	000A, 120V	STSW OK	(INV)	

Observe that UPS OK indication is now ON and the STSW OK now indicates INV.

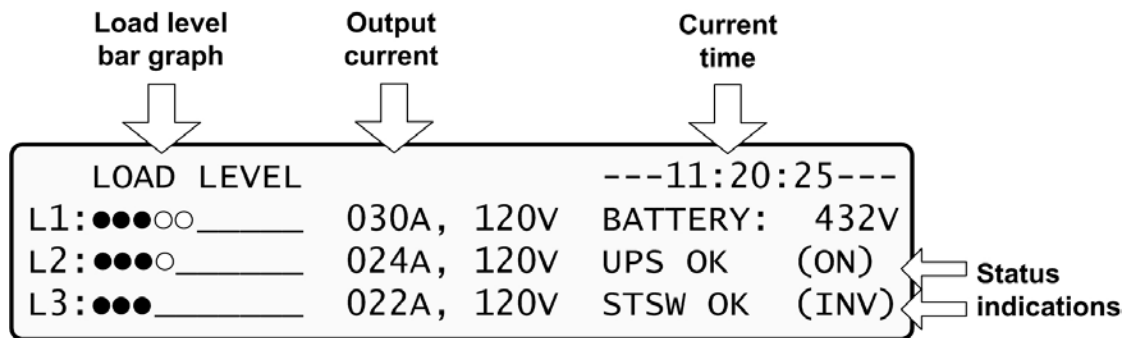
If the display continues to indicate BYP, check on the Static Switch panel, that the inverter is running.

If the inverter indicator on the Static Switch panel is OFF:

- Press the Inv/Byp button on the static switch panel to switch the inverter ON and wait for the indicator to light.
- Press the Inv/Byp button on the lower right of the control panel.



3. Connect the load and observe the results on the display.

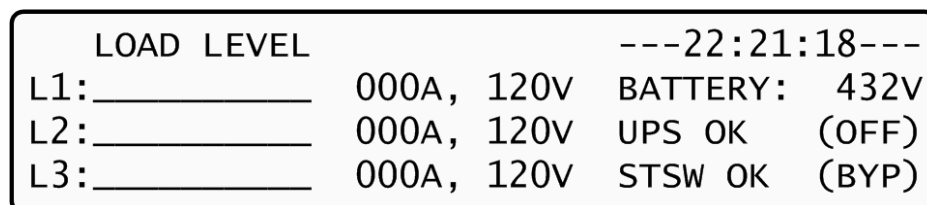


4. Observe that the “dot” bar graph now indicates the load presence and relative power consumption. Filled dots indicate kW; empty dots indicate kVA.

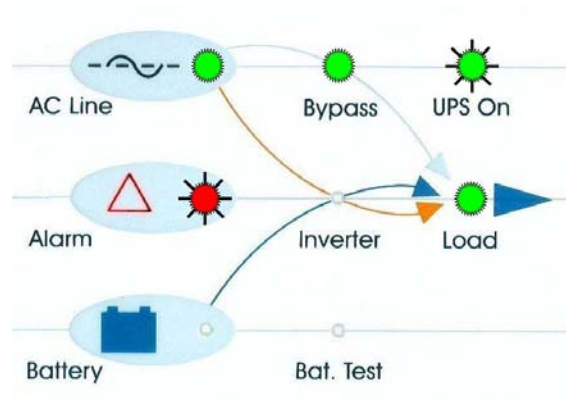
POWER+ start-up is now complete.

6.1 POWER+ Shutdown (Switching to Bypass)

1. Switch the load OFF.
2. Press twice on the On/Off button.
3. Wait 2 minutes for the **POWER+** to shut down. The control screen will indicate UPS OK (OFF).



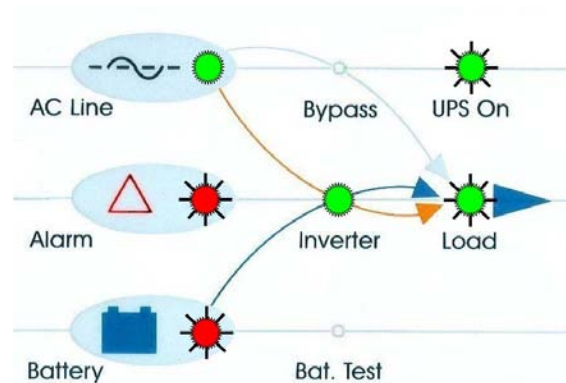
Note: This does NOT switch the entire **POWER+** OFF. Power is still delivered to the load but in bypass.



6.2 POWER+ Total Shutdown (No Ac Output)

1. Switch the load OFF.
2. Press and hold the On/Off button for 10 seconds.
3. The control screen will indicate UPS OK (OFF).

LOAD LEVEL		---23:14:40---
L1: _____	000A, 120V	BATTERY: 432V
L2: _____	000A, 120V	UPS OK (OFF)
L3: _____	000A, 120V	STSW Warning !



7. **POWER+** CONTROL PANEL

The **POWER+** system is equipped with an LCM display (LCD) and touch pad control panel that enables the user to effectively manage the UPS system. Once **POWER+** is installed, the control panel serves as the user's primary interface with the system. Messages, warnings, and error conditions are relayed to the user through the display, LEDs and audible alarms.

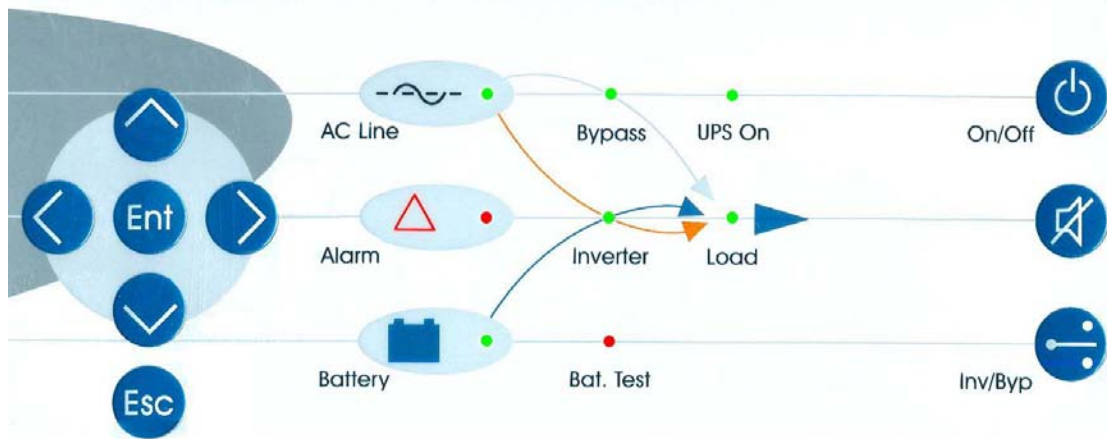


Figure 22: Control Panel

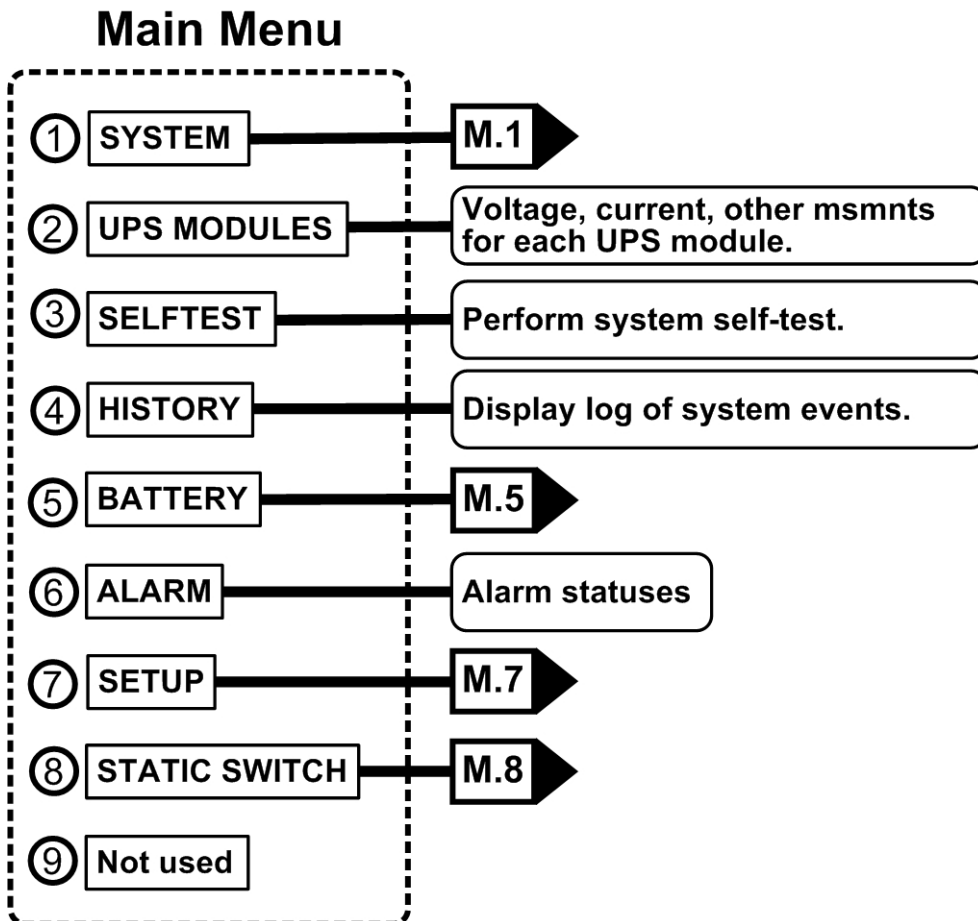
The remainder of the current chapter contains a quick-reference summary of the functions available through the **POWER+** control menus.

Chapter 8 beginning on page 49 illustrates in detail the functions available through the **POWER+ control menus.**

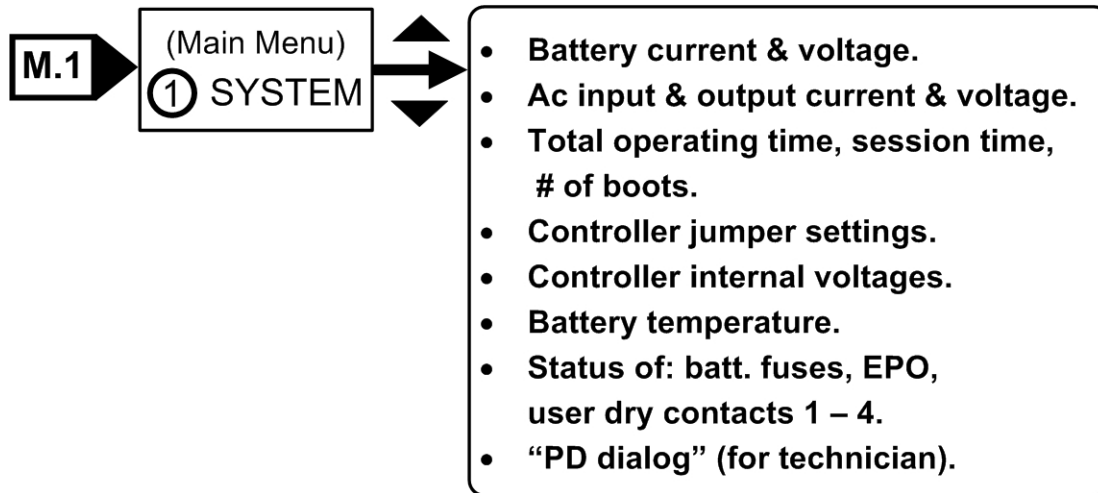
Quick-Reference Summary of Power+ Menu Functions

The following flowcharts detail the structure of the PowerPlus menus.

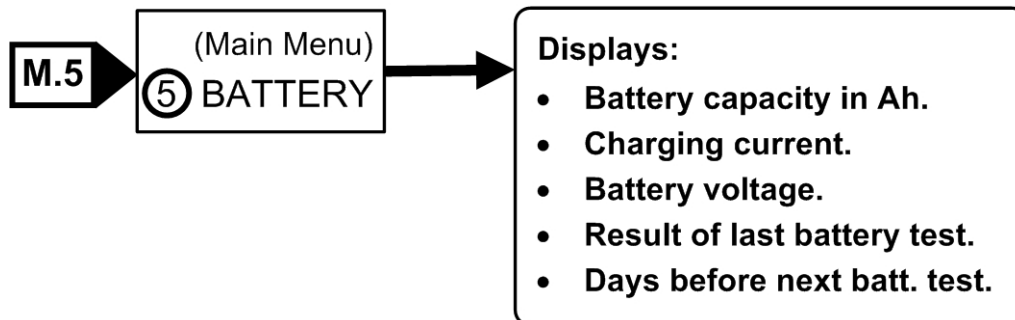
The symbol **X.Y** directs you to a following chart. For example, **M.7.3** means "go to the diagram labeled M.7.3. Diagram M.7.3 illustrates sub-option 3 of Main Menu option 7.

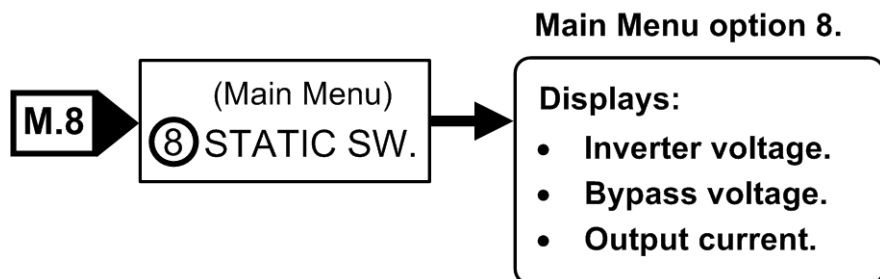
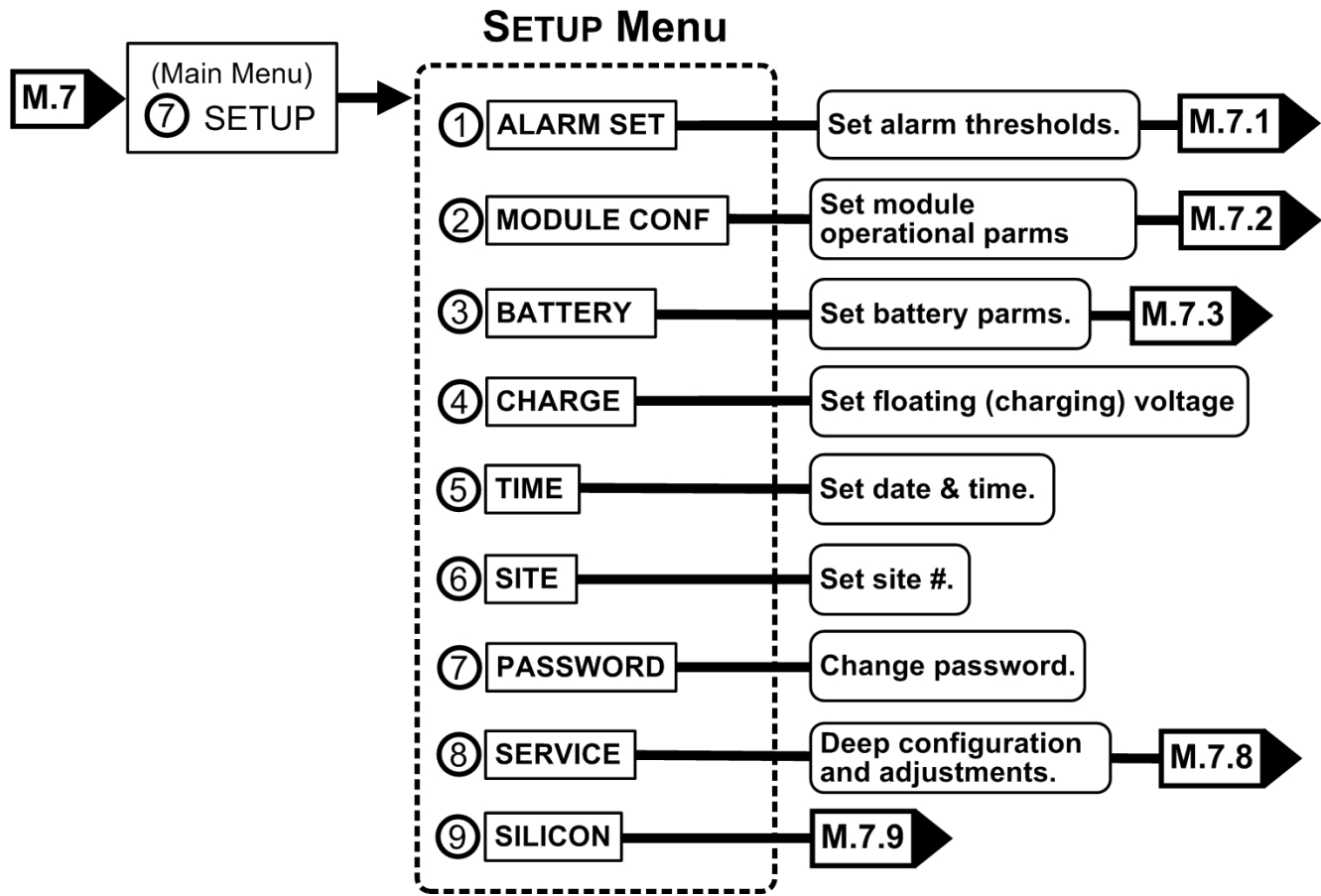


Main Menu option 1, the “System” screen. Press the “up” or “down” keys to display various measurements.

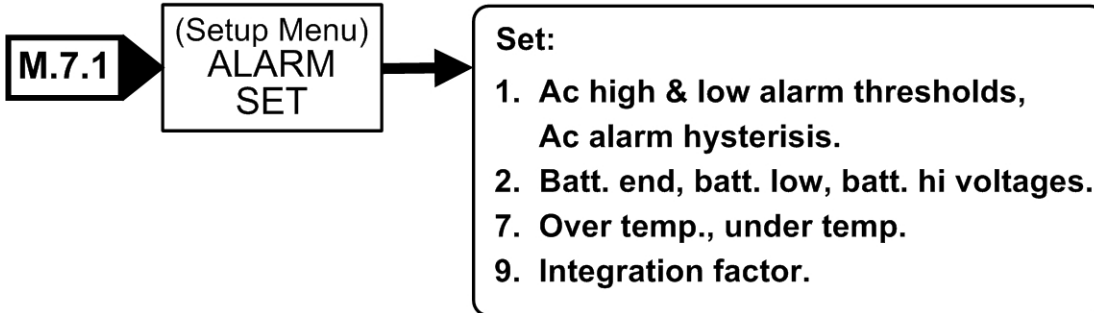


Main Menu option 5.

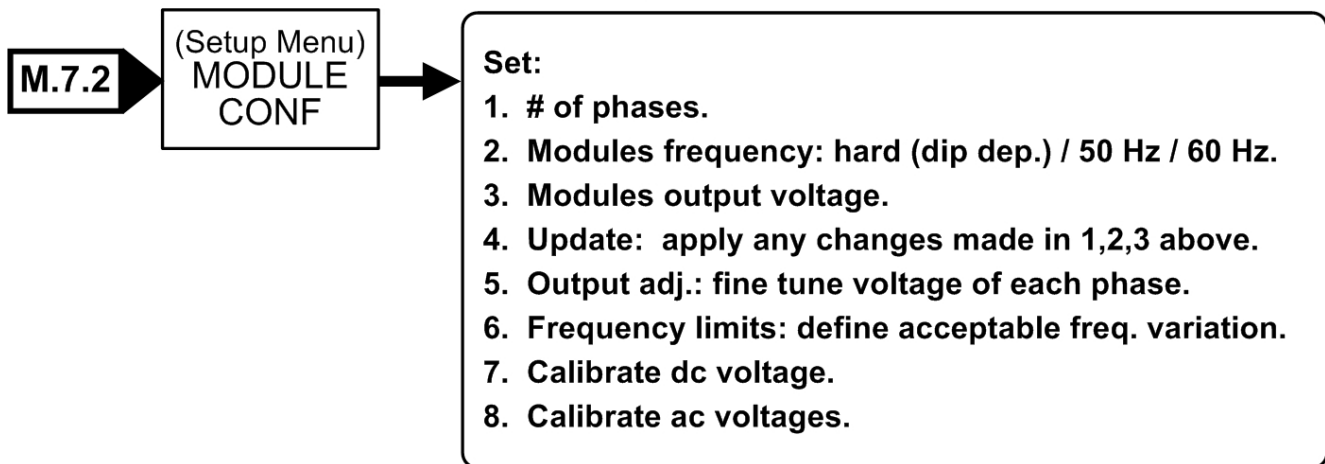




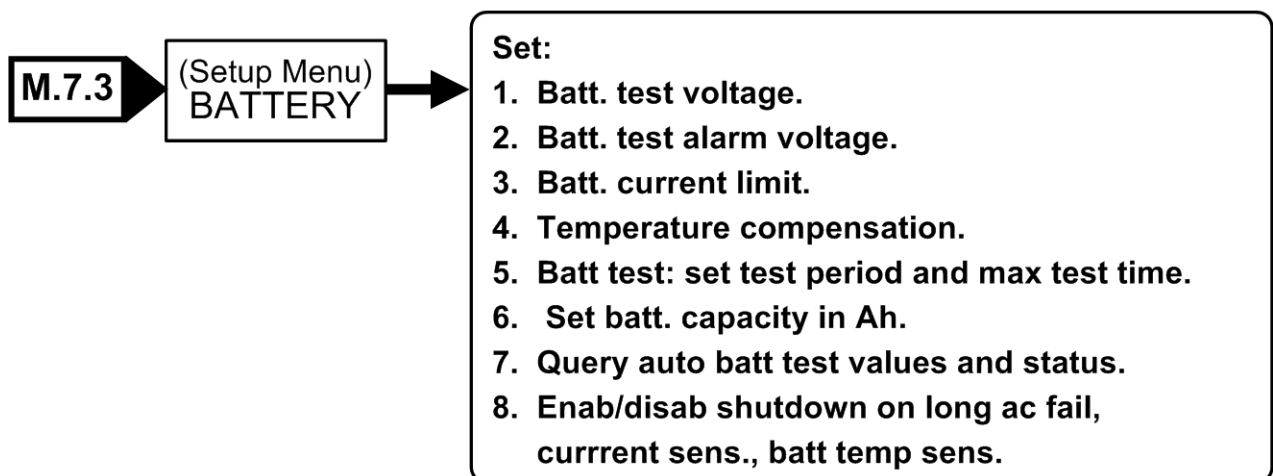
Options 1 on the Setup menu.

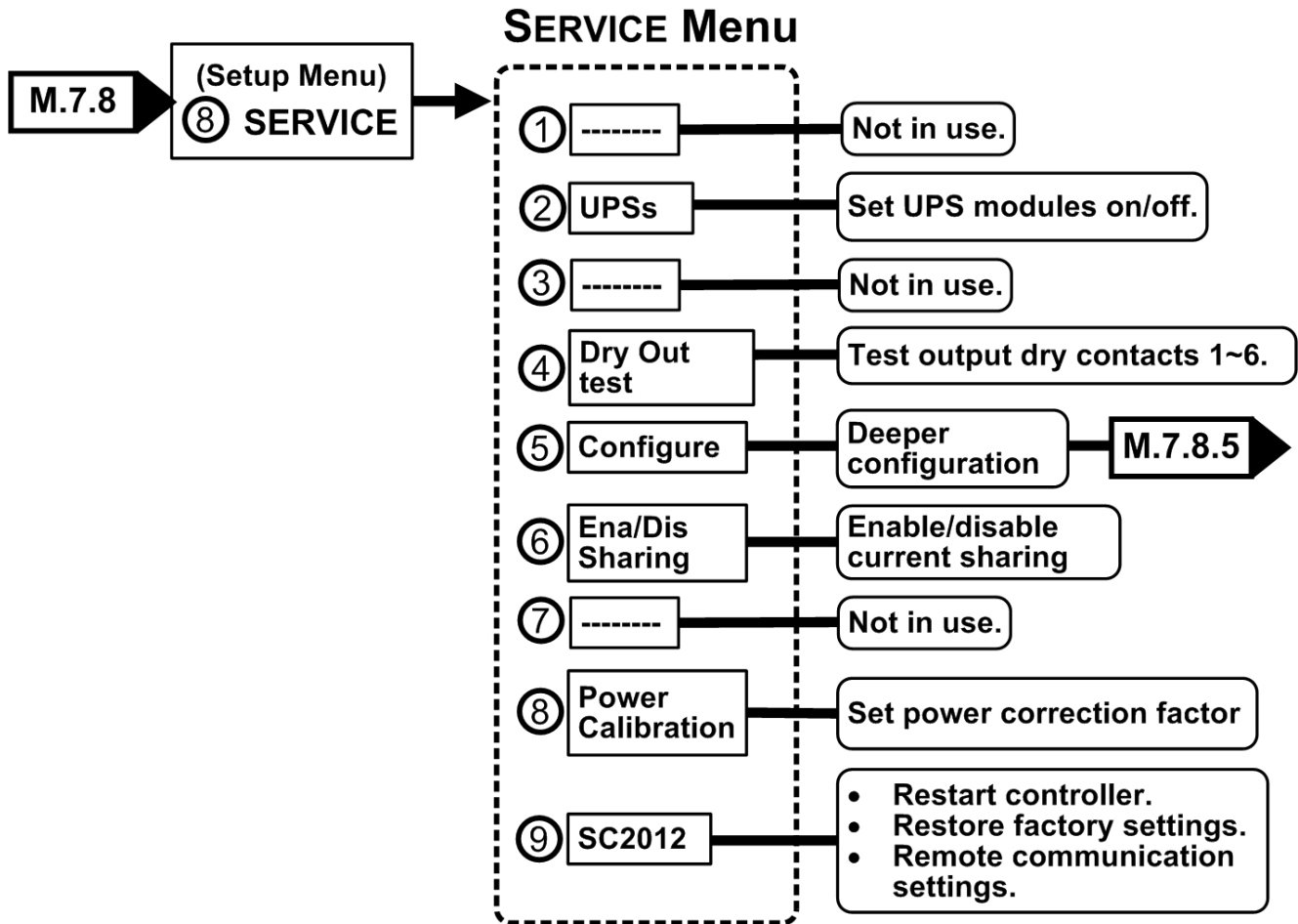


Option 2 on the Setup menu.



Option 3 on the Setup menu.





8. POWER+ MENU FUNCTIONS IN DETAIL

This chapter describes the functions available through the **POWER+** Main Menu and its submenus.

8.1 Main Menu

Press the Enter button to display the main menu.

Note: To return to the main menu at any time, press the Escape button and then the Enter button.

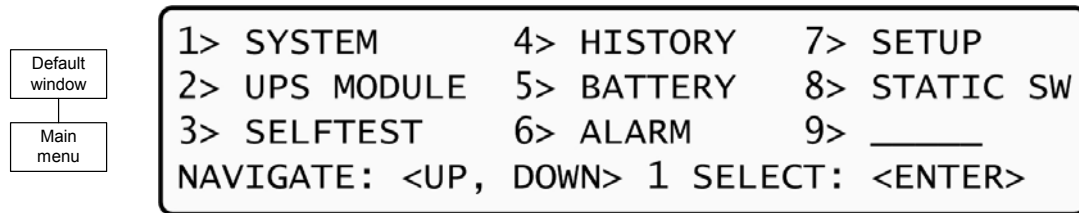


Figure 23: Main menu

Table 2: Main Menu Options

1>	SYSTEM	General information such as voltages, currents etc.
2>	UPS MODULE	Information for a specific UPS module.
3>	SELFTEST	Self checking of the Controller's components (supply, RTC, memory).
4>	HISTORY	History log events (last 255 events, dated and timed).
5>	BATTERY	Charging / discharging voltages and currents, battery test etc.
6>	ALARM	Detailed alarm status.
7>	SETUP	Configuring the system (number of modules, alarm, time etc.).
8>	STATIC SW	Static Switch data.
9>	----	Not used.

8.1.1 System

From the main menu select option 1 (System) to show the dc voltages (positive, negative and summary):

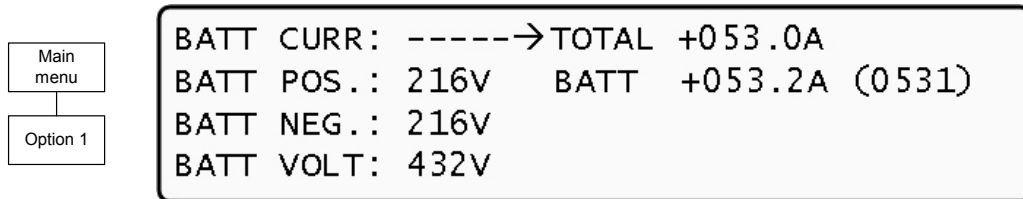


Figure 24: System dc voltages

Note: The example shown in Figure 24 illustrates only 1 battery installed.

Press the ► key to view the results of power factor 0³.

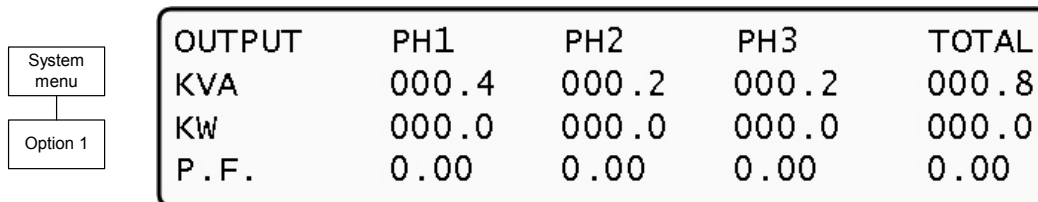


Figure 25 : Power factor 0

Press the ► key again to view the results of power factor 0.5

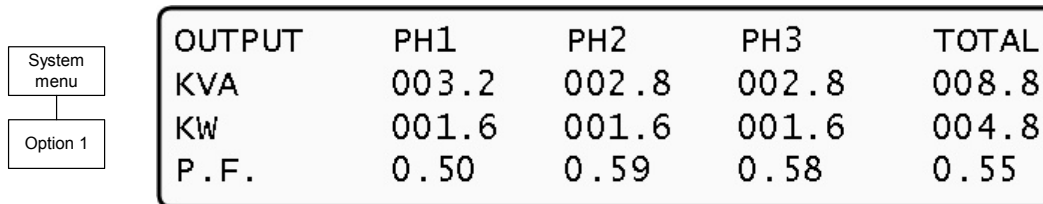


Figure 26: Power factor 0.5

Press the ► key again to view the results of power factor 1.0

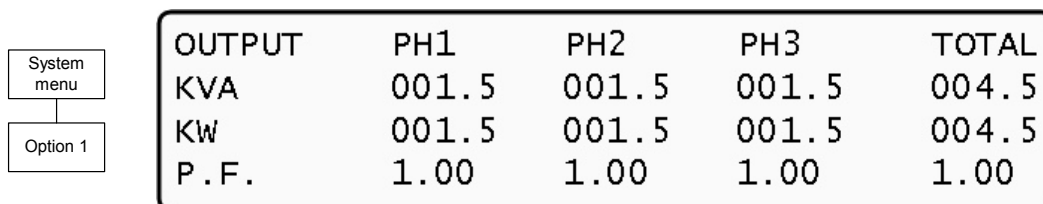


Figure 27: Power factor 1

Click Esc and then the Enter button again to return to the main menu.

³ 1 kVA is 1000 VA. Apparent power is measured in VA which is a reactive (i.e. a mix of both capacitive and inductive) load's RMS voltage multiplied the RMS current. True power is VA multiplied by the power factor, and the power factor is the cosine of the phase angle between voltage and current. A reactive load that draws an apparent power of 1000 VA and has a 0.5 power factor is consuming 500 watts of power. If a device were purely inductive, it would have a power factor 0. See also footnote 2, on page 4.

Select System (1).

Press the ▼ key to view the next windows, shown in Figure 29: through Figure 36.

```

System menu
└── Option 1
    └── phase:  --r--      --s--      --t--
        in:   121v/088.0a 122v/088.0a 122v/084.0a
        out:  120v/086.0a 120v/084.0a 121v/084.0a
        ---- total ups in/out measurements ----
  
```

Figure 28: Overall phase voltages/currents

```

System menu
└── Option 1
    └── total time: 00004 hours
        current sess.: 00004 hours
        boots so far: 00001 times
  
```

Figure 29: Elapsed time

```

System menu
└── Option 1
    └── jmp:   jmp1, jmp2, jmp3, jmp6 and jmp9
        ●=IN  1. not hard silicon
        ○●●●● 2. silicon mode 6. no rmt pan.
        12369 3. j3:      on 9. j9:      on
  
```

Figure 30: Jumper settings WITHOUT remote panel

```

System menu
└── Option 1
    └── jmp:   jmp1, jmp2, jmp3, jmp6 and jmp9
        ●=IN  1. not hard silicon
        ○●●○● 2. silicon mode 6. remote pan.
        12369 3. j3:      on 9. j9:      on
  
```

Figure 31: Jumper settings WITH remote panel

Note: In Figure 30 and Figure 31, “Silicon Mode” indicates that the configuration jumper is installed, thus allowing for modifications. “Hard Silicon” indicates that the factory defaults hard reset jumper is installed. This is required only at the factory or whenever software reset fails.

```

System menu
└── Option 1
    └── 5vdc : 5.19V          controller internal
        12vdc: 09.41V          voltages
        5vP  : good
        5v2  : good          -12vdc: good
  
```

Figure 32: Controller – internal voltages

```

System menu
└── Option 1
    └── battery charge level: 010ah 050%
        while, total capacity: 020aH
        remaining backup: 0010 minutes
        battery temperature: 04`C
  
```

Figure 33: Battery temperature

Note: The data displayed in Figure 33 depend on the options installed and configured. See Figure 76 on page 63 and Figure 93 on page 66.

```
System menu
Option 1

batt fuse: bad emergency: open
2: open 6: open
3: open 7: open
4: off 8: open
```

Figure 34: Fuse status

```
System menu
Option 1

pd dialog: ups #01
t>c0 42 00 00 d8 00 00 00 00 00 00 00 00
00 00 00 00 00 00 aa
```

Figure 35: Communication with inverter – transmit

```
System menu
Option 1

r<e0e0 0900 0003 0003 0003 e874 1074
1074 2f37 5362 0000 0200 0100 0310
f077 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 52 52
```

Figure 36: Communication with inverter – receive

8.1.2 UPS Module

1. From the main menu, select option 2 (UPS MODULE) and press the Enter button to display the instructions window shown in Figure 37.
2. Press the ▼ key to view information about the UPS modules of the system.
3. Scroll ► and ◀ keys to view additional information for the specific module chosen.

Figure 38 and Figure 39 below show parameters of the first module of 4 modules (UPS: #01/04).

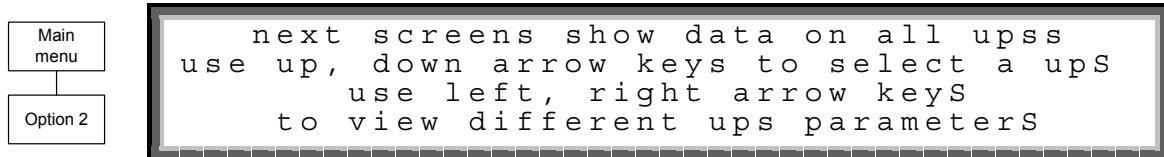


Figure 37: Instructions

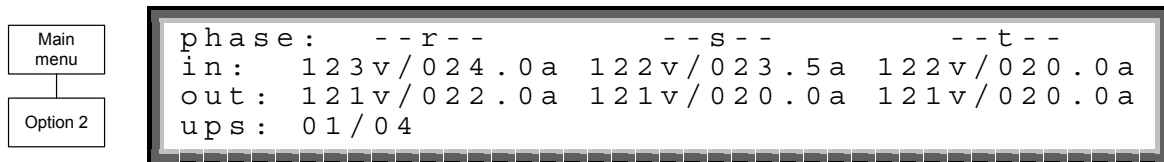


Figure 38: Module phase voltages/currents for module 1 of 4

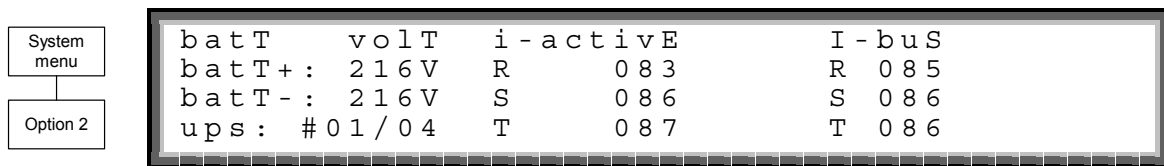
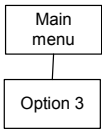


Figure 39: Battery voltages for module 1 of 4

Click Esc and then the Enter button again to return to the main menu.

8.1.3 Self-Test



From the main menu select option 3 (SELF TEST) to run a self-test of the **POWER+**. The self-test displays the window shown in Figure 40. You can run a self-test at any time without interfering in the normal operation of the **POWER+**. A self-test is also initiated by the **POWER+** itself each day at midnight.

The failure of a self-test sets on the self-test alarm. The self-test alarm can only be cleared by a subsequent successful self test, or it can be cleared manually by a maintenance technician. Powering the **POWER+** down and up, for example, does not clear the self-test alarm. This is because the failure of a self-test is considered a serious event that should not be “forgotten”. A self-test failure is also recorded in the alarm log.

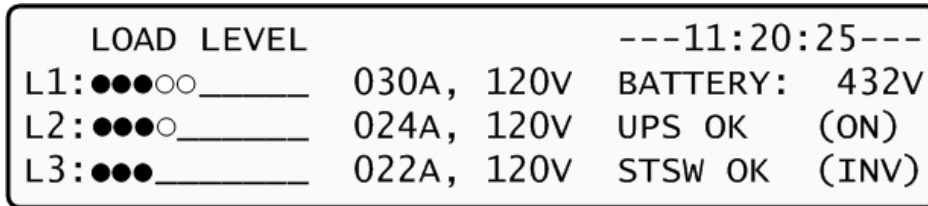


Figure 40: Result screen from self-test

8.1.4 History (Logs)

From the main menu select option 4 (HISTORY) to display the log file. The last 255 events reserved in the LOG are displayed.

Navigate the LOG by scrolling using the ▲ and ▼ keys.

Main menu	TIME	DATE	Value	MESSAGE	#
Option 4	16:14:56	05.01.03	436.0V	IN->DC--HV	254
	16:14:58	05.01.03	435.0V	OUT>DC--HV	255
	12:27:26	05.01.01	423.0V	IN->UPS-CM	000

Figure 41: History logs

Navigate the LOG by scrolling using the ◀ and ▶ keys.

Main menu	TIME	DATE	1	2	3	4	5	6	7	8	#
Option 4	16:14:56	05.01.03	○	○	○	○	○	○	○	○	254
	16:14:58	05.01.03	○	○	○	○	○	○	○	○	255
	12:27:26	05.01.01	○	○	○	○	○	○	○	○	000

Figure 42: History log scroll

Table 3 on page 56 explains the abbreviations used in the log file.

Table 3: Log Messages

#	Message	Explanation
01	UPSMAJ	More than 1 UPS Module is sending an alarm or fault warning
02	UPSMIN	Single UPS Module is sending an alarm or fault warning
03	-----	N.A.
04	-----	N.A.
05	LOADBP	Load is now running on bypass. See Table 4 on page 57 to interpret the LOADBP value.
06	VIBRA_	Alarm(s) vibrating. Alarm is frequently raised and lowered. Ignore to avoid loading the log filling up.
07	OVTEMP	Excess temperature
08	OUTFLT	No AC output to load
09	BAT-HI	Excessive battery voltage
10	-----	N.A.
11	BATEND	End of battery backup. Battery is discharged to shutdown limit
12	BATLOW	Low battery voltage
13	STSWRN	Static Switch Warning or alarm
14	E.P.O.	Emergency Power Off is active
15	EQ-HST	Battery is currently charging in equalizing mode, dc voltage is temporarily increased
16	BATFLT	Batteries failed last test
17	USER-1	User 1 input open
18	USER-2	User 2 input open
19	USER-3	User 3 input open
20	AC-BRN	Input AC supply Brown Out
21	ACIN_H	AC input excessive
22	ACFAIL	AC input failure
23	STSWCM	Static Switch does not respond
24	SLFFLT	Last controller self-test failed
25	BAT-CB	Battery Circuit Breaker Open
26	CURSHR	Current Sharing fault, load current is not equally divided between modules
27	UPSOUT	Fault (no current) in 1 or more output stage
28	UPSHDN	UPS shutdown by EPO, Battery Discharge, ON/OFF pressed
29	OVLOAD	Load current is high

#	Message	Explanation
30	UPS-CM	One or more UPS's not responding
31	STRTUP	Startup time-stamp
32	-----	N.A.

Each message is formatted as follows:

Time – HH:MM:SS

Date – YY:MM:DD

Data – DC voltage between + and – terminals for all events except LOADBP and STSW status for LOADBP events. (See below.)

Even start (IN) and end (OUT)

Description – (See Table 3 above)

Event number – 0 through 255, 255 being the most recent

Example:

11:23:56 05.01.28 865 IN -> E.P.O. 254

This message means that at 11:23:56 on January 28th 2005, Emergency Power Off alarm was registered as event 254; dc voltage at the time was 865 V being a sum of (V+ -N) and (V- -N).

Table 4: Interpreting the Static Switch transfer code (LOADBP)

The STSW transfer code, given as a decimal, is the sum of the eight components listed in this table. Each component has its own weight if detected, and a weight of zero if not detected.	
COMPONENT WEIGHT	CONDITION DESCRIPTION
1	Inverter voltage blackout for >3 ms.
2	Inverter peak voltage low (brownout) (<185 V for 3x400 V, <92.5 V for 3x208 V).
4	Inverter peak voltage high (>400 V for 3x400 V, >200 V for 3x208 V).
8	Frequency beyond limits (45-65 Hz).
16	Inverter average voltage low (<185 V for 3x400 V, <92.5 V for 3x208 V).
32	Inverter average voltage high (>260 V for 3x400 V, >130 V for 3x208 V)..
64	Load transfer command received from the controller (not manual).
128	Load transfer command received from the Static Switch (manual key press).

Example: If LOADBP data = 67 = (64+2+1), this means that three conditions were present:

- (64) Instruction to transfer the load was issued by the controller.
- (2) Low peak voltage detected.
- (1) Voltage blackout encountered.

8.1.5 Battery

From the main menu select option 5 (Battery) to display the window shown in Figure 43.

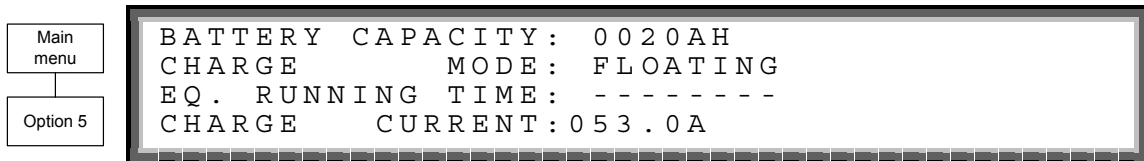


Figure 43: Battery status

Press the ▼ key to view the next window.

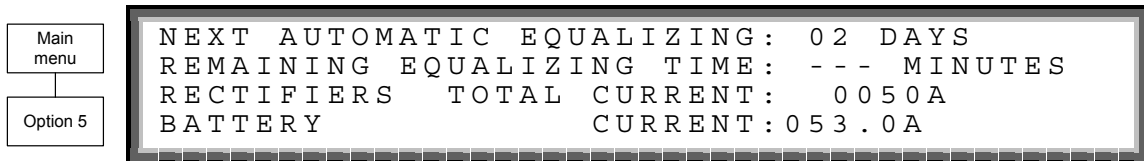


Figure 44: Battery equalizing

Press the ▼ key to view the next window.

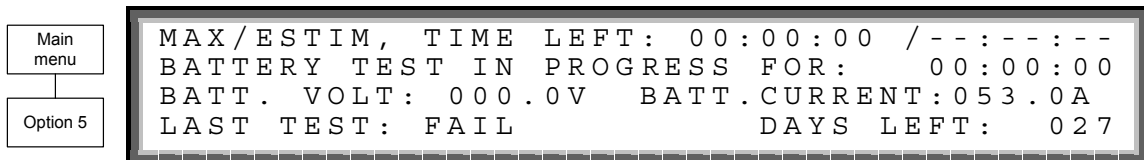


Figure 45: Time left

Press the ▼ key to view the next window.

Note: Figure 47, Figure 48, and Figure 48 show the individual batteries on the left and the overall total on the right. In the examples shown below, only one battery is installed.



Figure 46: Last test

Press the ▼ key to view the next window.

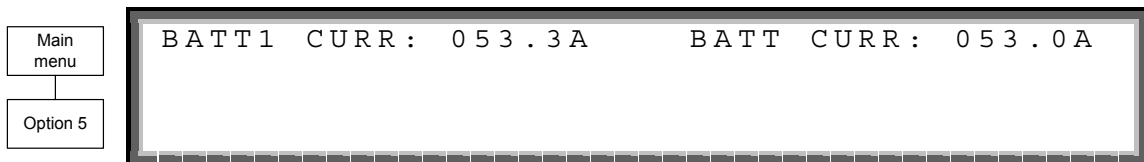


Figure 47: Battery current

Press the ▼ key to view the next window.

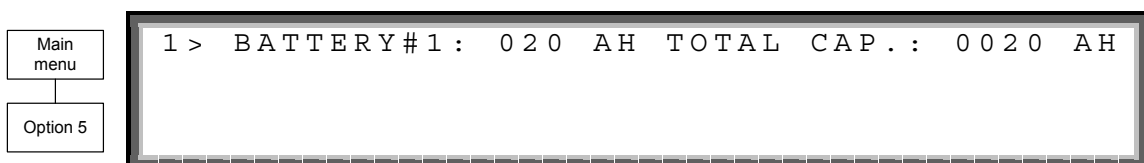


Figure 48: Battery capacity

Press the ▼ key to view the next window.

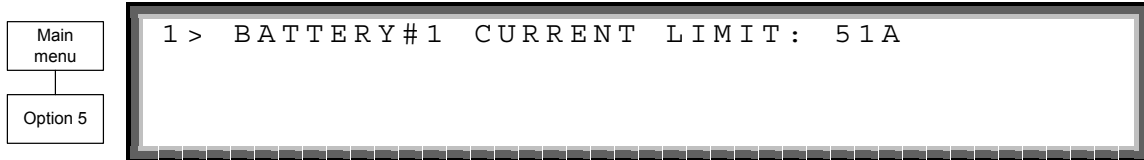


Figure 49: Battery current limit

8.1.6 Alarm

From the main menu select option 6 (Alarm) to display the window shown in Figure 50.

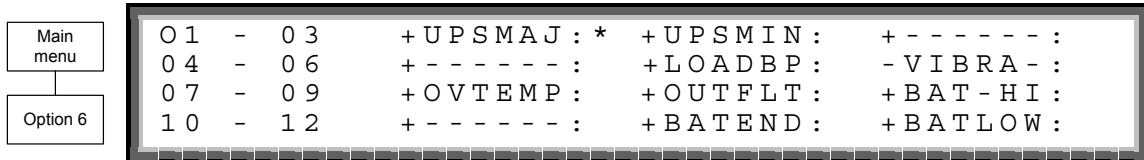


Figure 50: Alarms 01-12

Press the ▼ key to view the next window.

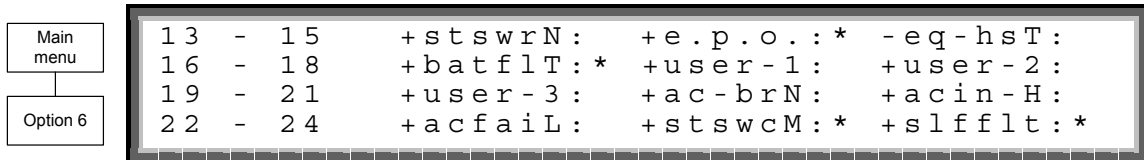


Figure 51: Alarms 13-24

Press the ▼ key to view the next window.

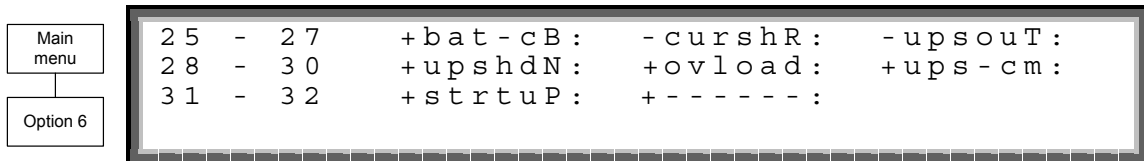


Figure 52: Alarms 25-32

8.1.7 Setup Menu

From the main menu select option 7 (Setup) to display the window shown in Figure 53.

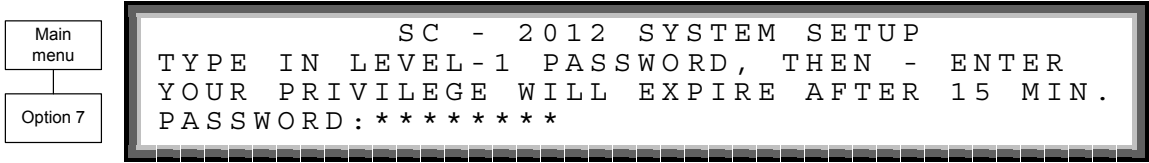


Figure 53: Level 1 password access

Using the keypad, type the password and press the Ent button. The setup menu is displayed (Figure 54).

Choose option 1 to view the alarm setup menu.

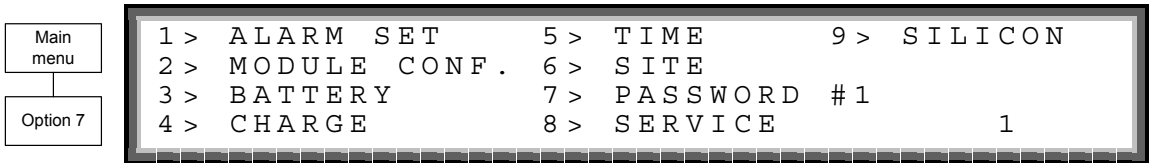


Figure 54: Setup menu

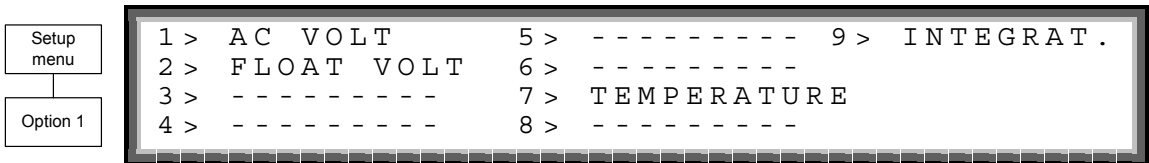


Figure 55: Setting ac voltage alarm thresholds

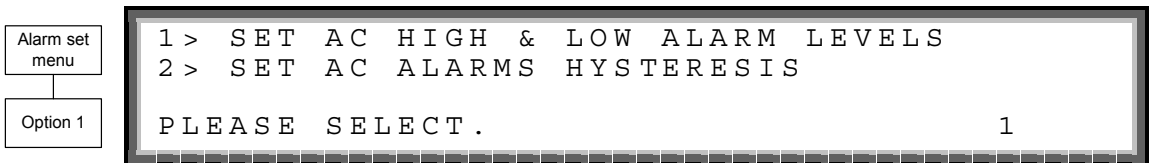


Figure 56: Setting ac voltage levels

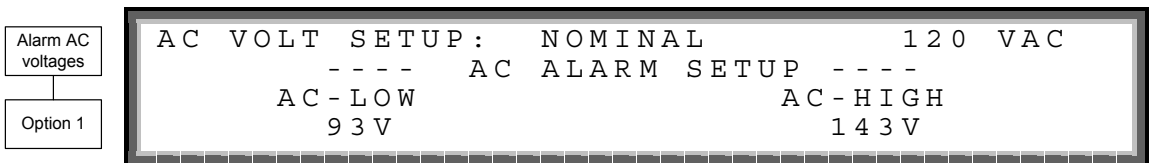


Figure 57: Ac voltage alarm setup

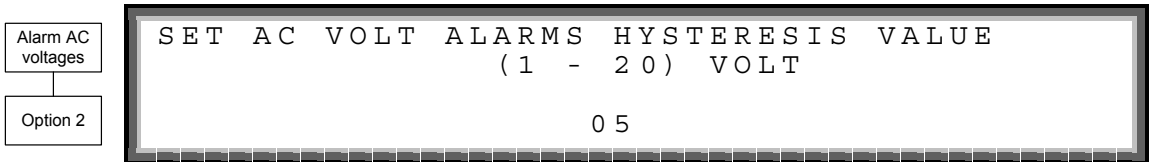


Figure 58: Ac voltage hysteresis



Figure 59: Battery parameters for alarm

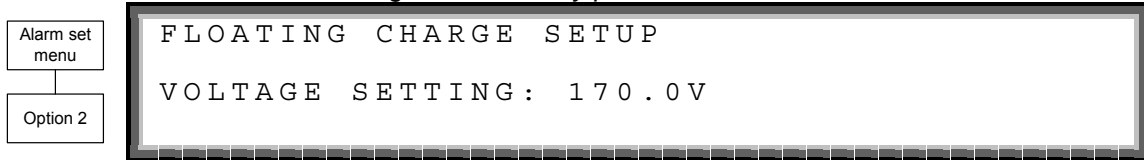


Figure 60: Battery floating charge setup for alarm



Figure 61: Alarm battery temperature menu

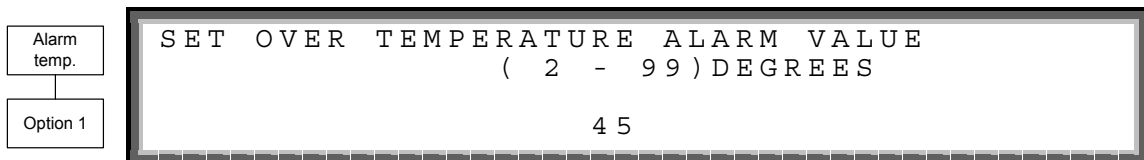


Figure 62: Alarm battery maximum temperature setting

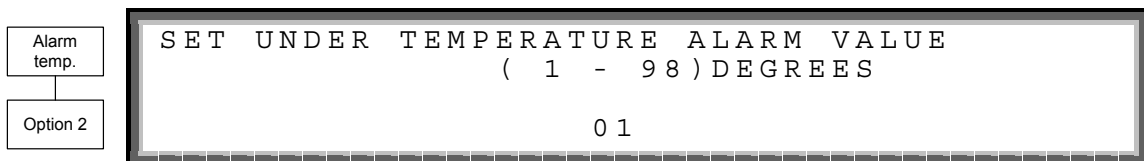


Figure 63: Alarm battery minimum temperature setting

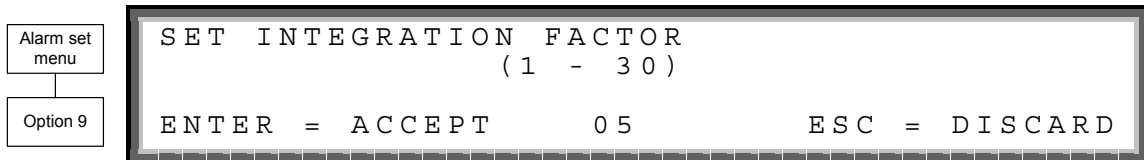


Figure 64: Alarm integration factor setting

The *Alarm Integration Factor* determines the number of times that the controller polls and retries to determine the UPS status before deciding on an error status. Setting the alarm integration factor too low will cause spurious alarms to be generated; conversely, setting the alarm integration factor too high may result in an alarm only being raised when it is already too late to take corrective action.

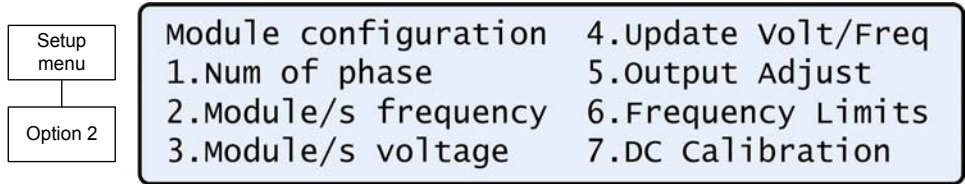


Figure 65: Line configuration menu

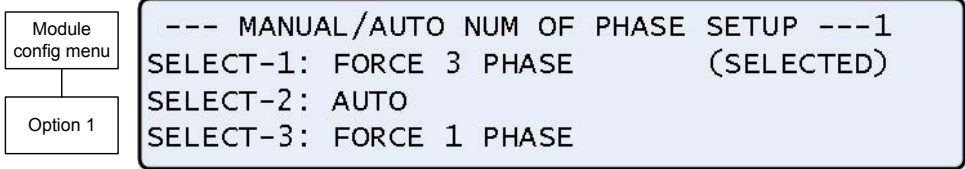


Figure 66: Setting number of phases



Figure 67: Setting the sine wave frequency

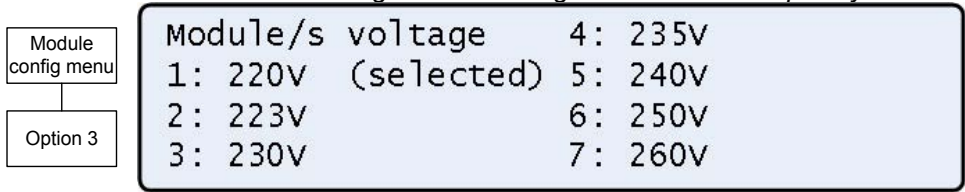


Figure 68: Setting the module voltage

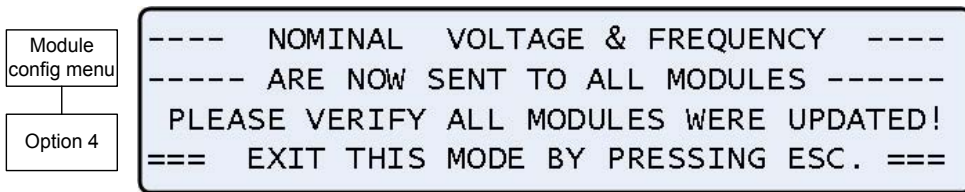


Figure 69: Setting confirmation

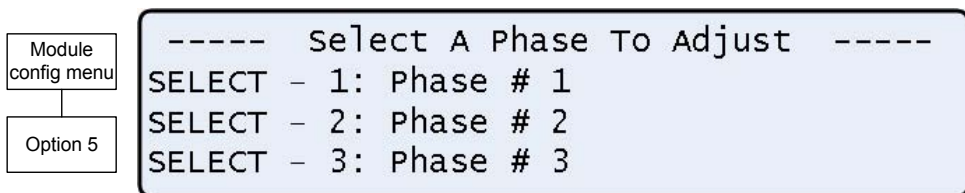


Figure 70: Output fine-tuning adjustment – select phase

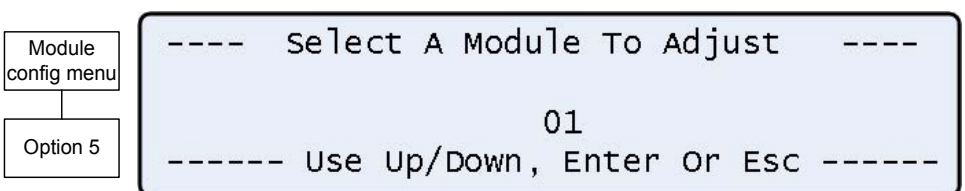


Figure 71: Output fine-tuning – select module



Figure 72: Output fine-tuning – select value

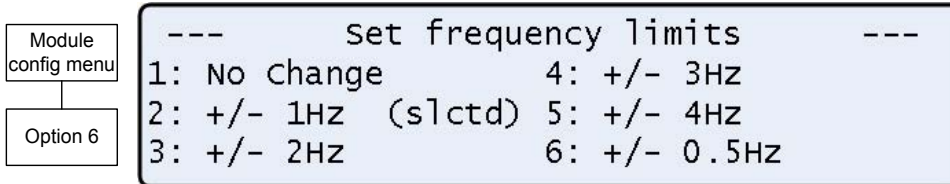


Figure 73: Output fine-tuning – set frequency limits

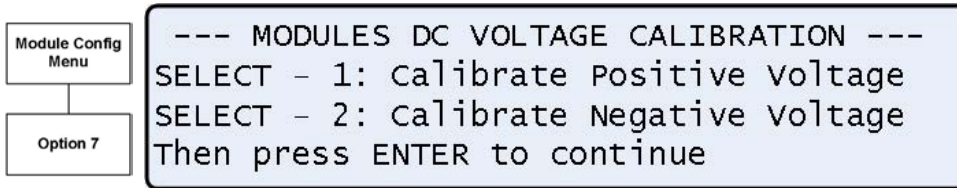


Figure 74: Voltage calibration submenu



Figure 75: Enter measured value

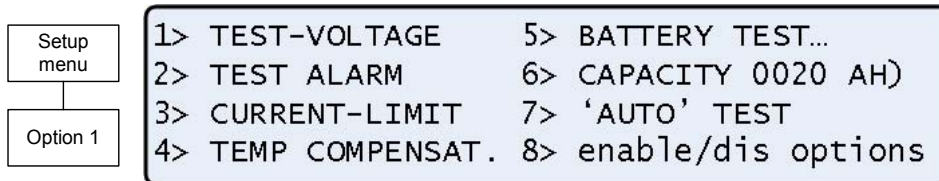


Figure 76: Battery settings menu

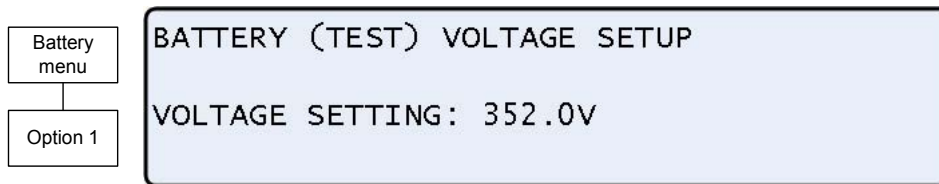


Figure 77: Battery test voltage setup

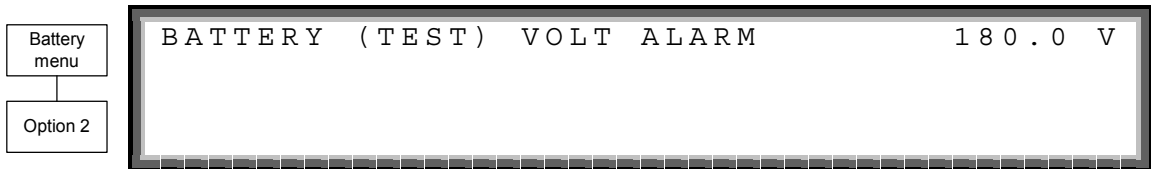


Figure 78: Battery test voltage alarm setup

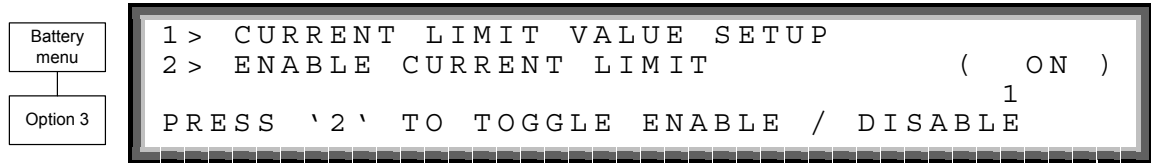


Figure 79: Current limit setup menu

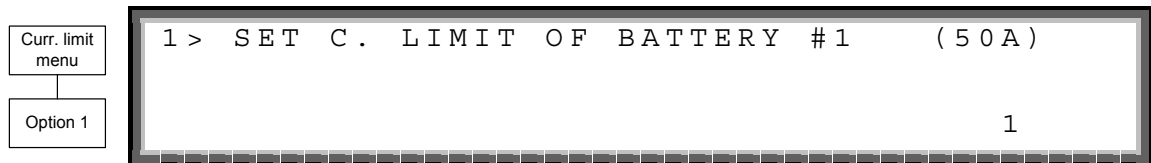


Figure 80: Battery current limit setup

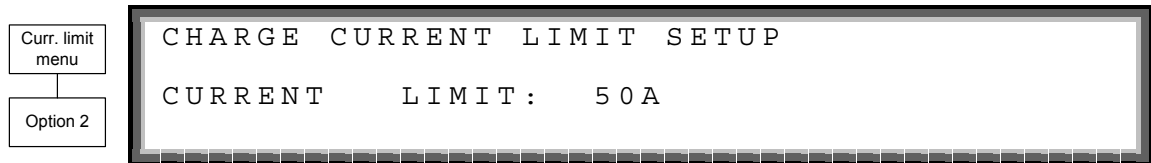


Figure 81: Charge current limit setup

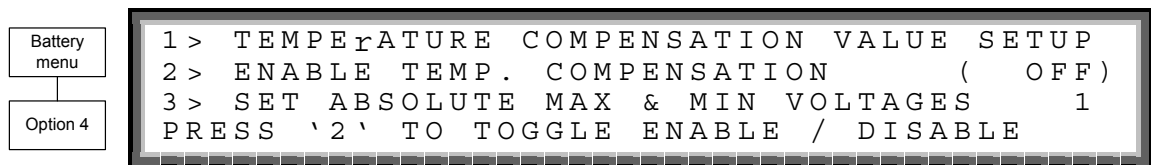


Figure 82: Temperature compensation menu (disabled)

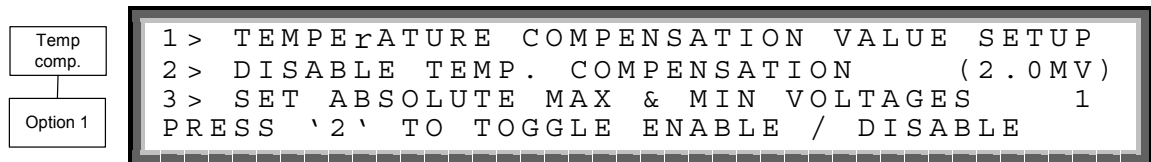


Figure 83: Temperature compensation menu (enabled)

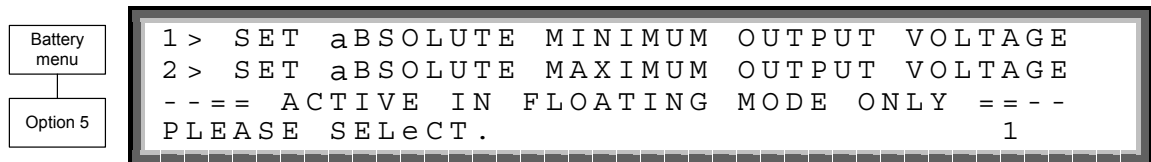


Figure 84: Battery Test – Setting floating mode voltages

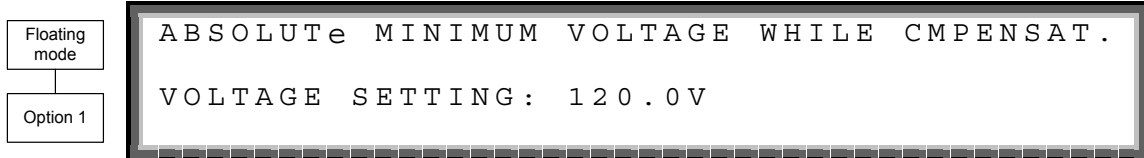


Figure 85: Battery Test – Setting compensation minimum voltage

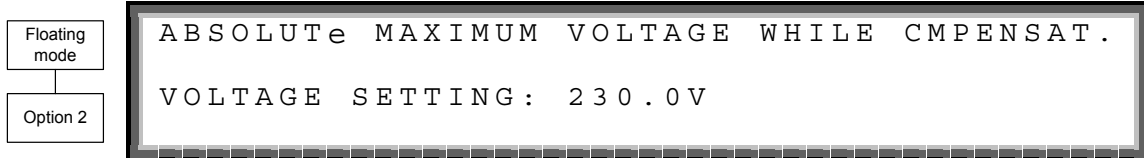


Figure 86: Battery Test – Setting compensation maximum voltage

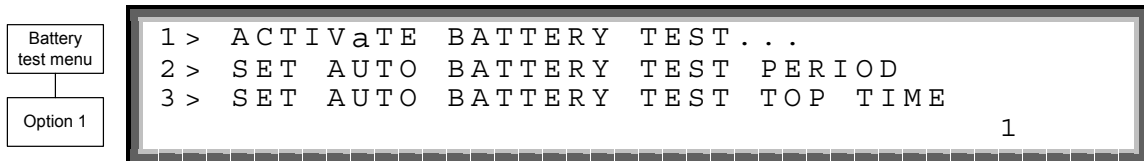


Figure 87: Battery test – settings

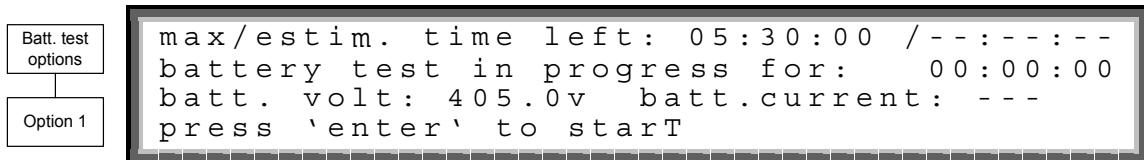


Figure 88: Battery testing

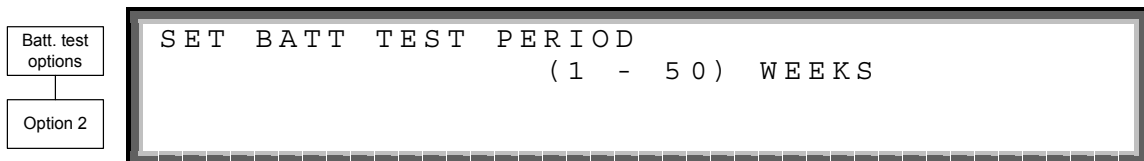


Figure 89: Battery test – setting test period

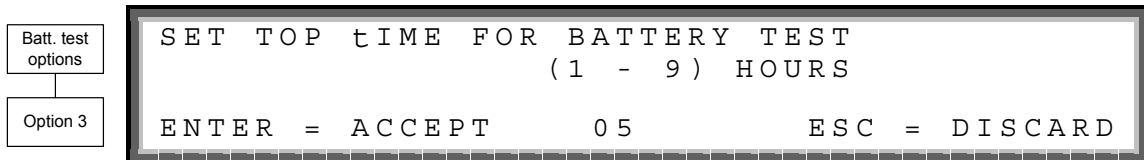


Figure 90: Battery test – setting maximum time



Figure 91: Setup – setting equalizing/floating parameters

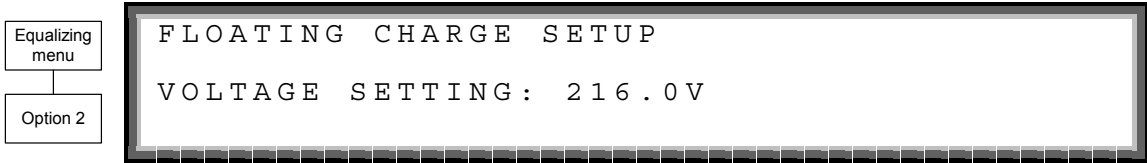


Figure 92: Setup – setting floating voltage

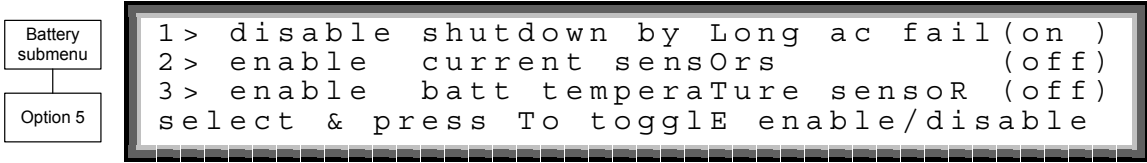


Figure 93: Battery menu, enable/disable options

Option 1 allows the user to enforce shutdown after a given length of input ac failure, even when the batteries are still fully charged.

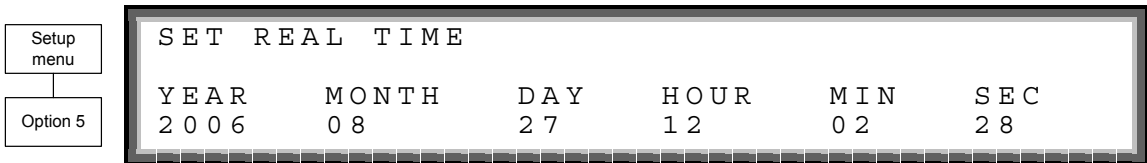


Figure 94: Setup - setting real Time

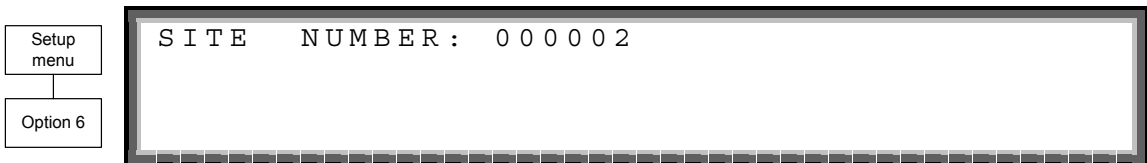


Figure 95: Setup - configuring the site number

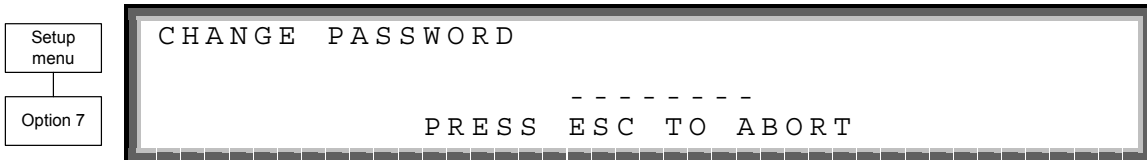


Figure 96: Setup - changing the password

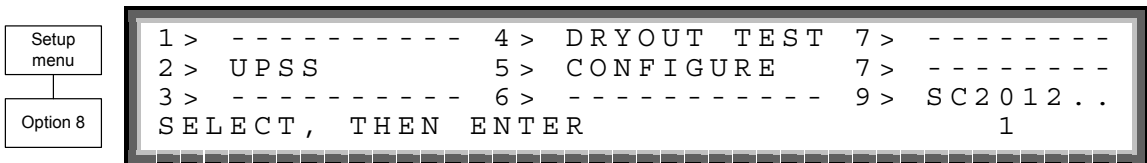


Figure 97: Setup - service menu

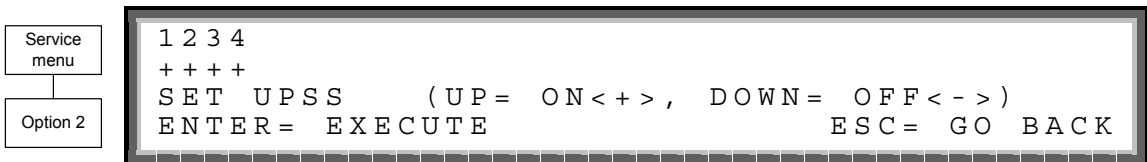


Figure 98: Service – selecting the UPS



Figure 99: Service – setting alarm contacts

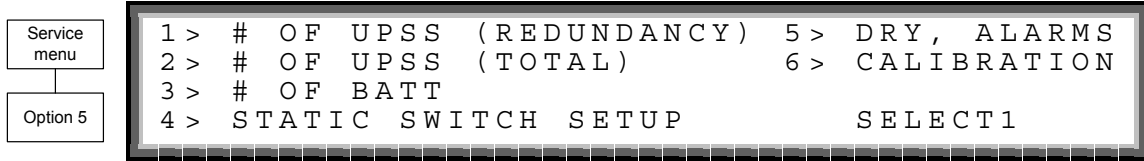


Figure 100: Service – configuration menu

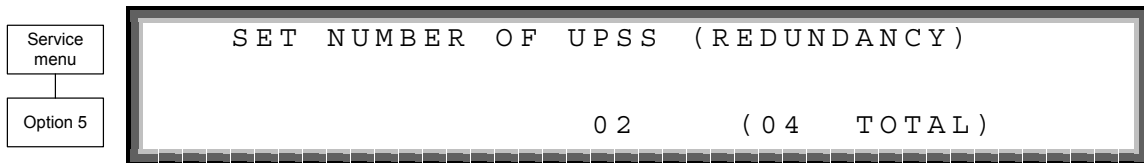


Figure 101: Service – setting redundancy

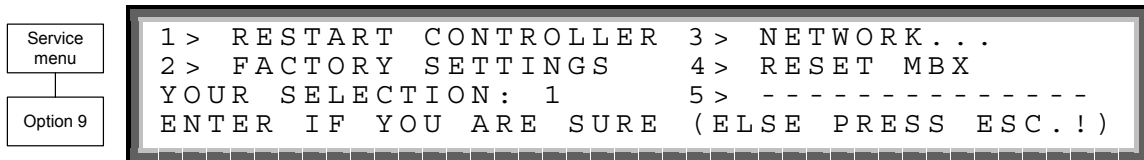


Figure 102: Service – SC2012 controller reset menu

Option 1 resets the controller.

Option resets to the configuration to factory default settings.

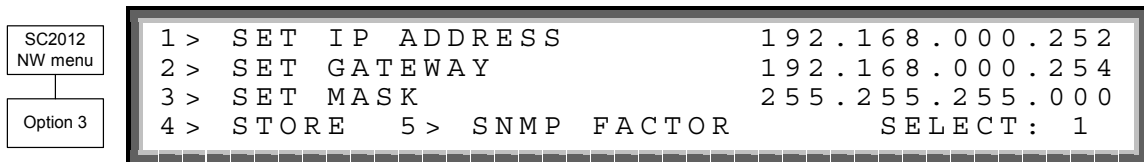


Figure 103: Service – SC2012 network setup menu

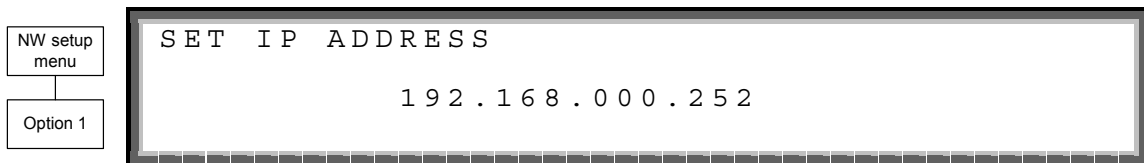


Figure 104: Service – setting IP address

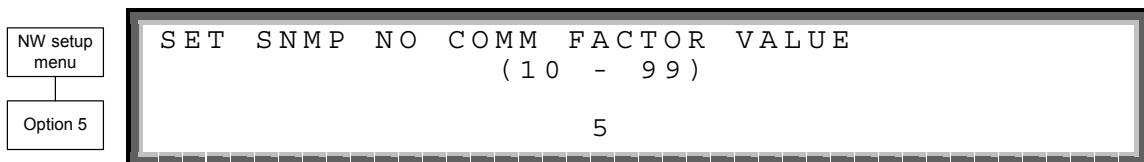


Figure 105: Service – configuring SNMP

8.1.8 Static Switch (ST.SW.)

From the main menu select option 8 (Static Switch) to display the Static Switch data screen (Figure 106).

```

Main menu
|
Option 8
|
SSW          VOLTAGE          FREQ
INVERTER:   R-120V, S-120V, T-120V  60 HZ
BYPASS:     R-120V, S-120V, T-120V  60 HZ
IOUT:       050          050          050
    
```

Figure 106: Static Switch voltage and frequency

View the current messaging status by using the ◀ and ▶ keys.

```

Main menu
|
Option 8
|
M<-----B3----->L      M<-----B4----->L
1 2 3 4 5 6 7 8      9 10 11 12 13 14 15 16
0 0 0 0 0 0 0 0      0 0 0 0 0 0 0 0
SSW STATUS
    
```

Figure 107: Static Switch status

8.1.9 Alarm Dry Contacts

```

Configure menu
|
Option 5
|
1> dry1 association      4> dry4 association
2> dry2 association      5> dry5 association
3> dry3 association      6> dry6 association
7> enable / disable alarms
    
```

Figure 108: Dry Contacts/alarms association

```

Configure menu
|
Option 5
|
associate dry contact #01 with alarm/s
0 0 1 1 2 2 3 3 0-deL
1...5...0...5...0...5...0.2 1-adD
-----●-----●----- alm#01
    
```

Figure 109: Dry Contacts/alarms association – example

8.1.10 Calibration

```

Configure menu
|
Option 6
|
1> ----- 5> -----
2> dc-i offset removal 6> -----
3> dc-i calibration 7> -----
4> ----- select
    
```

Figure 110: Calibration

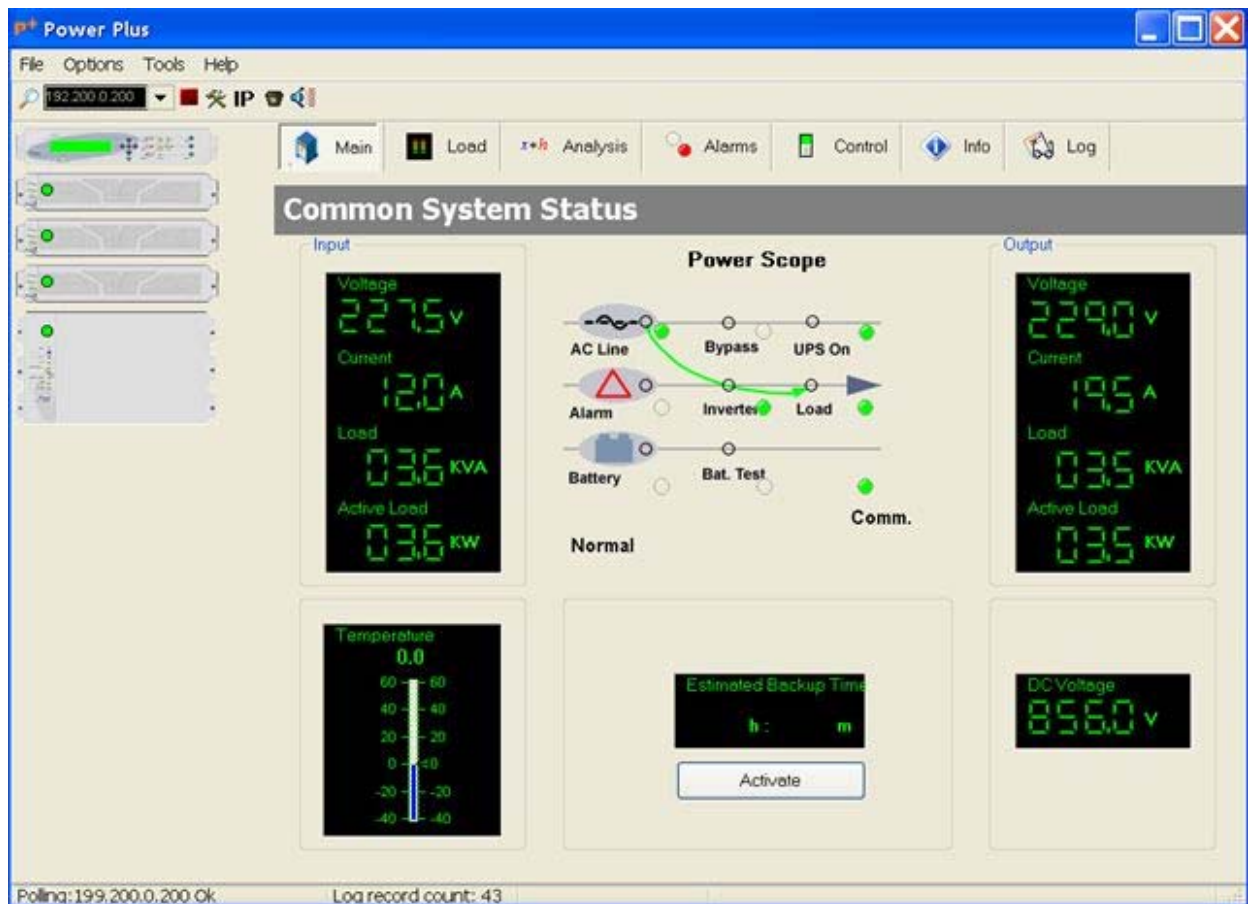
9. SNMP AGENT (OPTION)

The SNMP agent is an optional, internal card which enables the user to monitor and control the **POWER+** system from a PC. The SNMP agent enables monitoring, management, control, and orderly shutdown of the UPS via the Internet protocol SNMP. The SNMP agent provides connectivity between the UPS and external UPS management software such as Gamatronic's **POWER+ PSM-AC**.

During normal operation, the SNMP agent transmits information about present operating conditions; for example: input and output voltage, current, and frequency. In the event of a power outage, the SNMP agent can perform an automatic, orderly shut down of a computer system before the batteries of the back-up power system (UPS) run out. The SNMP agent also provides real-time notification of UPS events in several modalities; for example, via email or SMS.

Use of an SNMP agent disables the RS232 interface of the UPS.

The SNMP agent is intended for use with a UPS management software application such as **POWER+ PSM-AC**, a sophisticated software suite for managing multiple power supply and UPS systems. The systems can be controlled both locally and from a remote location.



POWER+ PSM-AC lets you monitor and control your **POWER+** UPS

10. WING: WIRELESS CONTROL (OPTION)

The **POWER+** system includes an option for wireless control and management, using the Gamatronic Wing.

The **Wing** allows real-time detection of power system faults and immediately notifies selected recipients (control center, technician, etc.) detailing the faults.

The **Wing** consists of:

- Wing board.
- SIM board.
- Antenna.
- D9-D9 cable (for RS232 between the Power+ and the Wing).
- Dc power cable (banana plugs on both ends).

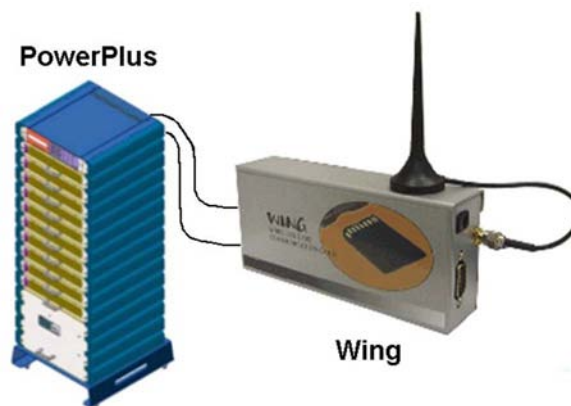


Figure 111: A Wing unit connected to the PowerPlus

10.1 Installing the Wing

Note: The instructions in this section are for a Wing unit that has been ordered specifically for use with a Power+ system. If your Wing was ordered for use with another type of system, it does not contain the appropriate software for use with a Power+ system and you should contact your Gamatronic representative if you wish to convert it for Power+ use.

To install a Wing unit for use with a Power+ system:

1. Take the Wing and press the button on the left side of the SIM slot to unlock the SIM card holder; remove the SIM card holder from the Wing.
2. Place your SIM card (which you obtained from your cellular service provider) in the SIM card holder and slide the SIM card holder gently and firmly back into the Wing.
3. Attach the supplied cellular antenna to the Wing.
4. Connect the Wing to the D9 socket labeled "Wing" on the left rear side of the controller using the supplied D9-D9 cable.

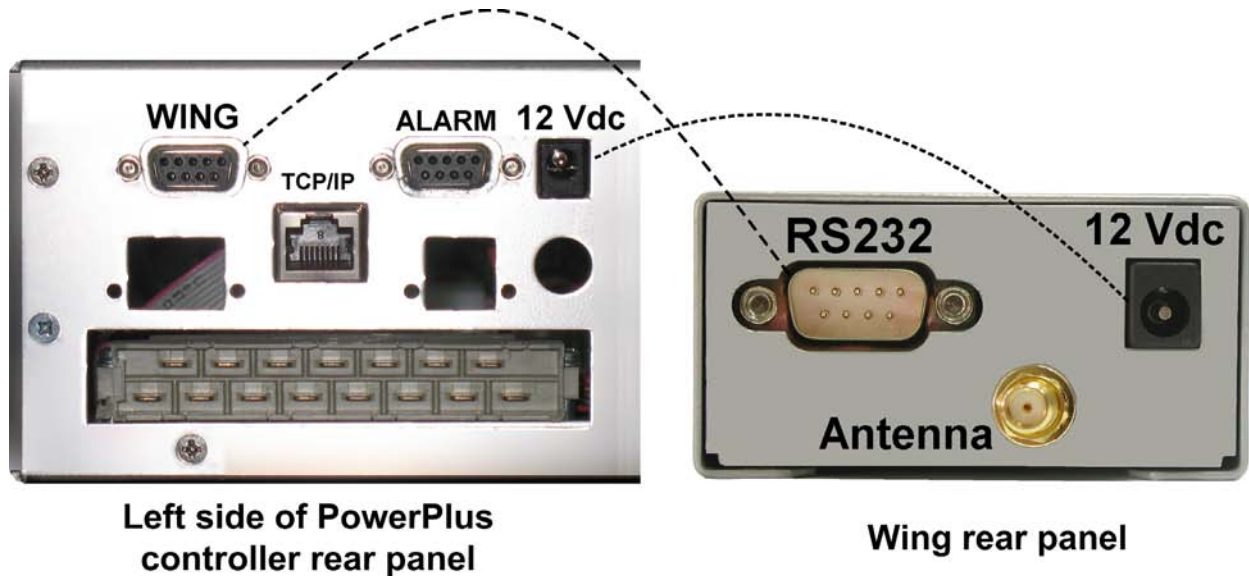


Figure 112: Connections between the Power+ controller and the Wing

5. Connect the supplied power cable between the 12 Vdc socket on the left side of the controller rear panel and the Wing.
6. On a computer that is connected to the same network as the Power+, open a web browser, type the IP address of the Power+ into the URL bar, and press Enter. The home page of the Power+ web interface is displayed.

(If you do not know the Power+'s IP address, you can see it by pressing and holding the Esc button for 2 or 3 seconds and then choosing "Network" on the displayed menu.)

Verify that an antenna symbol resembling a trident appears in the lower left corner of the browser window. This indicates that the Wing has a cellular connection.

Main

Analysis

Modules

STSW

Log

Control

SMS

Configuration

System Summary: The power system working properly

The system is operating properly

Input Voltages: 0V, 0V, 0V

Static Switch: Load on inverter

Battery mode: Charging

DC Voltage: 0V

SW Rev: 13.11.08

UK Orange Site: 534290 01/06/2009 10:11:49 Refresh: 30 seconds OK

Figure 113: Home screen of the Power+ web interface

7. From the Wing home page, navigate to **Configuration > SMS notifications**.
8. Enter the telephone numbers to which you want to have alarm notifications sent.
9. Commands and queries can be sent to the Wing from any cellular telephone.

To see a log of the incoming and outgoing SMS messages, choose **SMS** in the menu column at the left side of the web page.

To see a list of the available SMS commands, on the SMS screen select the "Available SMS commands" link at the bottom of the SMS notifications screen. The available SMS commands are also listed here in continuation.



Figure 114: The SMS screen on the Power+ web interface

Table 5: List of SMS commands

Command	Description
?	Commands are: ? help alarms status target pass reboot
help	Commands are: ? help alarms status target pass reboot
alarms	Get all active alarms
status	Get the system real time values
target	USAGE: target (index) (phone) (---) (password) Example: sms 1 +7123456789 admin
pass	USAGE: pass (new password) (old password) Example: pass abcd admin
reboot	Restart the system and network controller USAGE: reboot (password) Example: reboot admin

11. THE POWER+ BUILT-IN WEB INTERFACE

If your Power+ has the remote management software card installed (PC575), you can use the Power+ Web interface and control your Power+ unit from a distance over an Ethernet network.

Note: The built-in Web interface is compatible with **Microsoft's Windows** operating systems only. For Web access using other computer operating systems, inquire about the *PSM-AC for Power+* software product (see section 9 on page 69).

11.1 Preliminaries to use of the Web interface

To enable the Power+ Web interface:

- 1 Consult with your Network Administrator to obtain an IP address for your Power+, and the appropriate mask and gateway address.
- 2 Configure the Power+ with the IP address. This is done from the Power+ main menu as follows:
 - 2.1 **Setup** > (enter your password, then press Ent; default password is 8 left arrows) > **Service** > **SC2012** > **Network**.
 - 2.2 From the Network menu, choose **IP Address** and enter the assigned IP address.
 - 2.3 From the Network menu, choose **Gateway** and enter the assigned Gateway address.
 - 2.4 From the Network menu, choose **Mask** and set the assigned subnet mask.
 - 2.5 From the Network menu choose **Store** to save the information just entered.
- 3 Connect the Power+ to the local Ethernet network using the Ethernet (RJ45) port on the rear panel of the Power+ controller. This is the port labeled "TCP/IP Port" on the left side of the controller rear panel in Figure 115 below.



Figure 115: Power+ controller rear panel

- 4 On a computer terminal that has connectivity to the Power+ IP address, open a Web browser and enter the Power+ IP address in the URL bar. For example: `//192.102.2.130` (without quotation marks), and press Enter. You should see the Web interface main screen (see Figure 116 below).

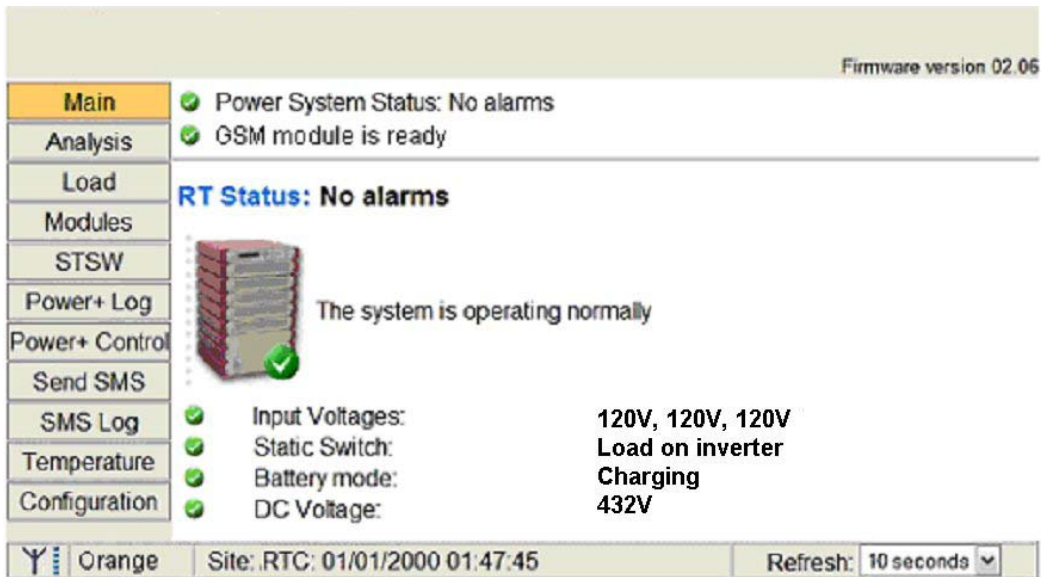


Figure 116: Main Screen of the Power+ Web interface





11.2 Main Screen

The Main Screen (see Figure 116 above) is the first screen you see when connecting to the GMaCi software.

The column on the left side of the screen is the Main Menu. The Main The first option in the Main Menu brings you to the Main Screen when you are not already there.

The items in the rest of the Main Screen to the right of the menu column are described in Table 6.

Table 6: Main Screen features

ITEM	DESCRIPTION		
Power System status	Alarm status ( No alarms present /  Alarms present)		
GSM module status	Cellular (GSM) communication is Available / Not available. A signal-strength indicator is displayed along with the service provider name. Cellular communication requires the WING module.		
RT Status:	Alarm status (No alarms / Alarms)		
UPS image	-	No active alarms at this time.	One or more alarms are active.
Input voltages	The voltage of each input phase is listed.	All input voltages are within range.	One or more of the input phases has a voltage outside of the permitted range.
Static Switch	Load on: Inverter (checkmark) / Bypass ("x")	Load on inverter.	Load on bypass.
Battery mode:	Charging (checkmark) / Discharging ("x")	Battery charged or charging.	Battery discharging or discharged.
Dc voltage	Current battery / charging voltage (Vdc).	Battery voltage in range.	Battery voltage out of range.

11.3 The Main Menu and its options

The Main Menu of Power+'s built-in remote management software consists of a column of option buttons on the left side of the Main Screen (see Figure 116 on page 75).

Table 7 below lists the options in the Main Menu column on the Main Screen, and describes each option briefly. Each option is described in greater detail in the subsequent sections.

Table 7: Main Menu options

MENU OPTION	DESCRIPTION
Main	Displays a condensed system status: Alarm status and basic readings.
Analysis	Shows real-time readings for each input and output phase: voltage, current, kVA, kW, power factor.
Load	Shows current load level (0 ~ 110 %) for each input and output phase.
Modules	Displays status of an individual UPS module, shows input and output ac voltages and current, dc voltage, active alarms if any.
STSW	Displays status of Static Switch, including inverter output voltages and frequency, bypass voltages and frequency, active alarms if any.
Power+ Log	Displays system log, data can be printed or exported to an Excel file.
Power+ Control	From this screen, the following system commands can be executed: Move load to bypass, move load to inverter, start battery test, abort battery test, LEDs test, shutdown, startup, restart, simulate load on battery condition, simulate battery status is low. Use of this option is disabled by factory default. To enable (or disable), from the Power+ console main menu choose the following: (7) Setup > (8) Service > (5) Config > (8) Rem Command
Send SMS	Send SMS messages from this screen (WING module must be present).
SMS Log	View SMS message log (WING module must be present).
Temperature	Displays reading from optional temperature sensor (connected to the two temperature sensor terminals on the rear of the controller module).
Configuration	Configure the settings of the remote management software.

The Main Menu options are described in more detail below.

11.3.1 “Analysis” main menu option

The main menu’s “Analysis” option lists current values for voltage, current, apparent power (kVA), active power (kW), and power factor, for each input and output phase.

Firmware version 02.06

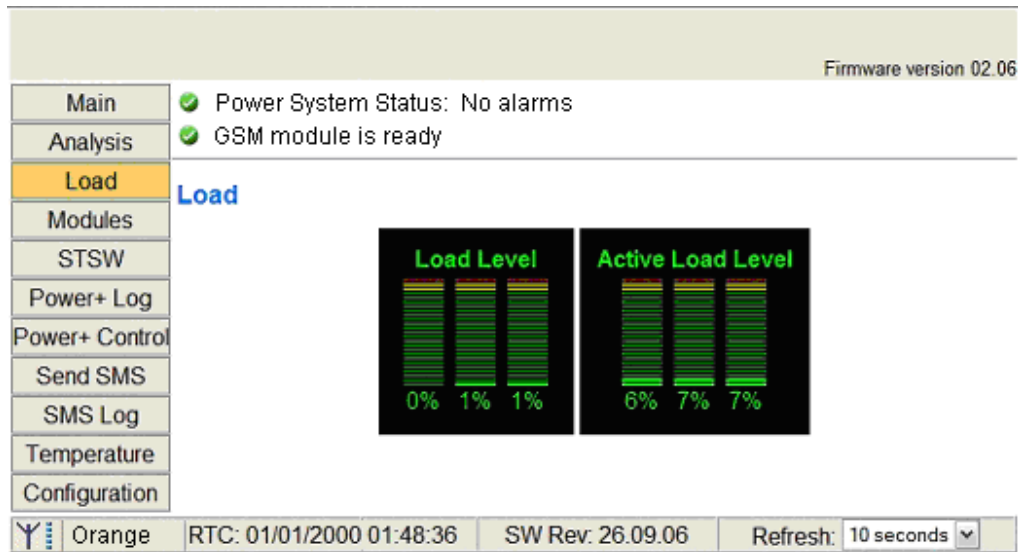
Main	✔ Power System Status: No alarms																																																												
Analysis	✔ GSM module is ready																																																												
Load	Analysis Input <table border="1"> <thead> <tr> <th></th> <th>Voltage</th> <th>Current</th> <th>Apparent Power</th> <th>Active Power</th> <th>Pf</th> </tr> </thead> <tbody> <tr> <td>Line 1</td> <td>120V</td> <td>8A</td> <td>1.1KVA</td> <td>1.1KW</td> <td>1.00</td> </tr> <tr> <td>Line 2</td> <td>120V</td> <td>8A</td> <td>1.1KVA</td> <td>1.1KW</td> <td>1.00</td> </tr> <tr> <td>Line 3</td> <td>120V</td> <td>8A</td> <td>1.1KVA</td> <td>1.1KW</td> <td>1.00</td> </tr> <tr> <td>Summary</td> <td></td> <td></td> <td>3.3KVA</td> <td>3.3KW</td> <td></td> </tr> </tbody> </table> Output <table border="1"> <thead> <tr> <th></th> <th>Voltage</th> <th>Current</th> <th>Apparent Power</th> <th>Active Power</th> <th>Pf</th> </tr> </thead> <tbody> <tr> <td>Line 1</td> <td>120V</td> <td>8A</td> <td>0.9KVA</td> <td>0.0KW</td> <td>0.00</td> </tr> <tr> <td>Line 2</td> <td>120V</td> <td>10A</td> <td>1.1KVA</td> <td>0.2KW</td> <td>0.21</td> </tr> <tr> <td>Line 3</td> <td>120V</td> <td>10A</td> <td>1.1KVA</td> <td>0.2KW</td> <td>0.21</td> </tr> <tr> <td>Summary</td> <td></td> <td></td> <td>3.1KVA</td> <td>0.4KW</td> <td></td> </tr> </tbody> </table>		Voltage	Current	Apparent Power	Active Power	Pf	Line 1	120V	8A	1.1KVA	1.1KW	1.00	Line 2	120V	8A	1.1KVA	1.1KW	1.00	Line 3	120V	8A	1.1KVA	1.1KW	1.00	Summary			3.3KVA	3.3KW			Voltage	Current	Apparent Power	Active Power	Pf	Line 1	120V	8A	0.9KVA	0.0KW	0.00	Line 2	120V	10A	1.1KVA	0.2KW	0.21	Line 3	120V	10A	1.1KVA	0.2KW	0.21	Summary			3.1KVA	0.4KW	
		Voltage	Current	Apparent Power	Active Power	Pf																																																							
Line 1		120V	8A	1.1KVA	1.1KW	1.00																																																							
Line 2		120V	8A	1.1KVA	1.1KW	1.00																																																							
Line 3		120V	8A	1.1KVA	1.1KW	1.00																																																							
Summary				3.3KVA	3.3KW																																																								
		Voltage	Current	Apparent Power	Active Power	Pf																																																							
Line 1		120V	8A	0.9KVA	0.0KW	0.00																																																							
Line 2		120V	10A	1.1KVA	0.2KW	0.21																																																							
Line 3		120V	10A	1.1KVA	0.2KW	0.21																																																							
Summary			3.1KVA	0.4KW																																																									
Modules																																																													
STSW																																																													
Power+ Log																																																													
Power+ Control																																																													
Send SMS																																																													
SMS Log																																																													
Temperature																																																													
Configuration																																																													

Y | Orange | 2000 01:48:19 | Site: // // // | SW Rev. 26.09.06 | Refresh: 10 seconds

Figure 117: Analysis of system input and output voltages and power

11.3.2 “Load” main menu option

The “Load” main menu option provides a graphic display of the load on each output phase. The display shows the apparent and active load on each output phase as a percent (between 0 and 110 %) of the Power+’s rated capacity for the phase.



11.3.3 “Modules” main menu option

The “Modules” main menu option enables you to see readings for an individual UPS module. To see the readings for a particular module, click on the correspondingly numbered image of the UPS module.

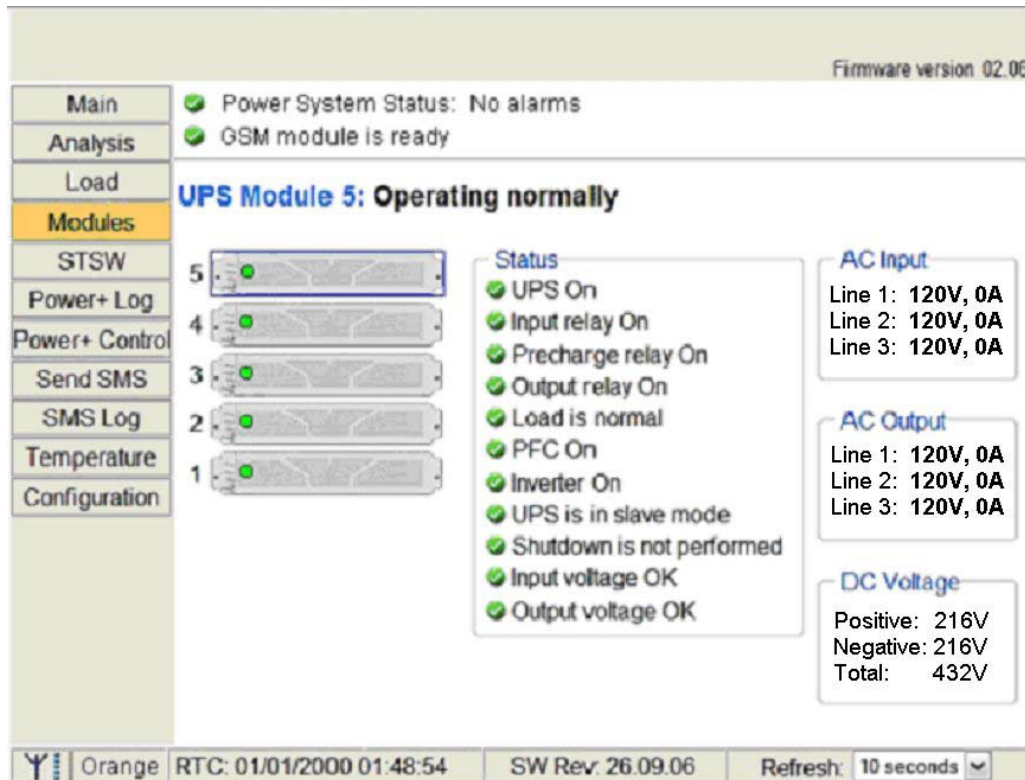


Figure 118: Modules measurements and status display

11.3.4 “STSW” (Static Switch) main menu option

The “STSW” (Static Switch) option on the main menu displays the real-time voltage and frequency measurements for the inverter output voltage and the bypass voltage. This screen also displays a wealth of additional information about the status of the Static Switch, as can be seen in Figure 119 below.

The screenshot displays the STSW (Static Switch) main menu option. The interface includes a sidebar menu on the left with options: Main, Analysis, Load, Modules, **STSW** (highlighted), Power+ Log, Power+ Control, Send SMS, SMS Log, Temperature, and Configuration. The main content area shows the following information:

Firmware version 02.06

Main ✓ Power System Status: No alarms
Analysis ✓ GSM module is ready

Static Switch: Operating normally

Status

- ✓ Load on inverter
- ✓ Inverter is synchronized with bypass
- ✓ Load is connected
- ✓ Load is normal
- ✓ Inverter OK
- ✓ Inverter frequency is normal
- ✓ Bypass frequency is normal
- ✓ Load transferring is possible
- ✓ Bypass OK

Inverter

Line 1 Voltage: 120V
 Line 2 Voltage: 120V
 Line 3 Voltage: 120V
 Frequency: 60.22Hz

Bypass

Line 1 Voltage: 120V
 Line 2 Voltage: 120V
 Line 3 Voltage: 120V
 Frequency: 60.22Hz

Y Orange RTC: 01/01/2000 01:52:37 SW Rev. 26.09.06 Refresh: 10 seconds ▼

Figure 119: Static Switch data and status display

11.3.5 “Power+ Log” main menu option

Firmware version 02.06

Main	✔ Power System Status: No alarms
Analysis	✔ GSM Module is ready
Load	
Modules	Event log
STSW	
Power+ Log	
Power+ Control	
Send SMS	
SMS Log	
Temperature	
Configuration	

Id	In/Out	Entry	Alarm
1	Out	01/01/2000 01:50:46	Input Browndout
2	Out	01/01/2000 01:50:44	UPS modules Warning!
3	Out	01/01/2000 01:50:40	AC Input Faliure
4	Out	01/01/2000 01:50:34	Static Switch Warning
5	In	01/01/2000 01:50:34	Input Browndout
6	Out	01/01/2000 01:50:10	Low Battery voltage
7	In	01/01/2000 01:50:06	UPS modules Warning!
8	In	01/01/2000 01:50:04	Low Battery voltage
9	In	01/01/2000 01:49:58	AC Input Faliure

Total items in log: 154
[Printable version](#)
[Export to Excel](#)

RTC: 01/01/2000 01:53:00	Site: // // // //	SW Rev: 26.09.06
--------------------------	-------------------	------------------

Figure 120: Listing the log entries

Table 8: Data items on the event log screen

MENU OPTION	DESCRIPTION
ID	This is simply a line number.
In / Out	“In” indicates the start of an alarm condition. “Out” indicates the end of an alarm condition.
Entry	Timestamp in the format dd/mm/yyyy hh/mm/ss
Alarm	Alarm message. See Table 9.

Table 9: Alarm message text in Web interface log display
 (Use the alarm number in this table to reference "Table 3: Log Messages" on page 56 for a fuller explanation of the alarm condition.)

LOG MESSAGES, IN ALPHABETICAL ORDER	ALARM NO.
"AC Input Failure"	22
"AC Input high"	21
"An alarm/s is vibrating"	6
"Battery Circuit Breaker is open"	25
"Communication lost"	0
"Communication lost"	32
"Emergency Power Off Activated"	14
"End of Backup"	11
"Equalizing mode"	15
"HIGH Battery voltage"	9
"Input Brownout"	20
"Last battery test"	16
"Last self test fail"	24
"Load current high"	29
"Load on BYPASS"	5
"Low Battery voltage"	12
"N.A."	3
"N.A."	4
"N.A."	10
"No AC output to load"	8
"One UPS module Warning!"	2
"Over temperature"	7
"Startup time-stamp"	31
"Static Switch Warning"	13
"STSW Not responding"	23
"Suspect a fault output stage"	27
"Suspect fault current sharing"	26
"UPS modules Warning!"	1
"UPS or more not responding"	30
"UPS Shut Down"	28
"User 1 input open"	17
"User 2 input open"	18
"User 3 input open"	19

11.3.6 “Power+ Control” main menu option

The “Power+ Control” main menu option enables the user to initiate any of a number of UPS processes. The commands available are described in Table 10 below.

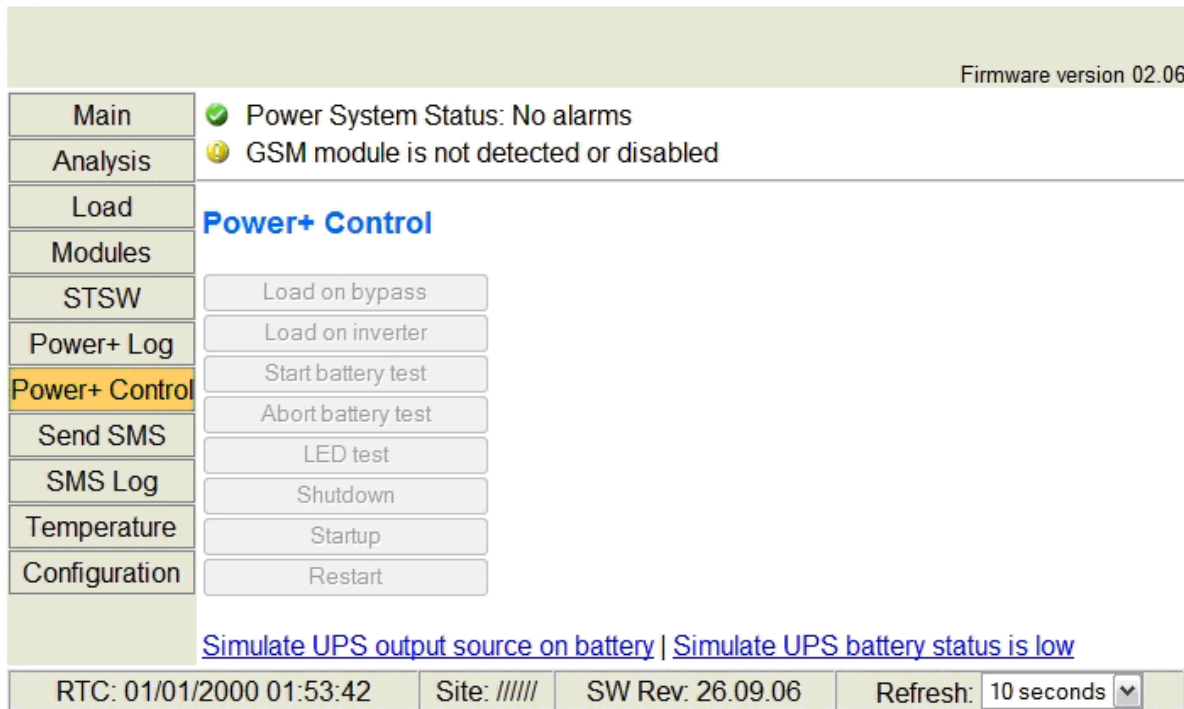


Figure 121: The "Control" main menu option screen

Table 10: Commands available on the “Power+ Control” screen

MENU OPTION	DESCRIPTION
Load on bypass	Transfers the load to the bypass voltage.
Load on inverter	Transfers the load to the inverter.
Start battery test	Initiates a battery test. Note: it is recommended that a battery test not be initiated when the when the UPS is operating near 100 % capacity and at the same time the battery is known to be not fully charged or not connected or otherwise faulty.
Abort battery test	Stop a battery test immediately.
LED test	The UPS beeps briefly and all of the LEDs on the control panel light up, to reveal any faulty LEDs.
Shutdown	Shuts down the Power+. Power will continue to be available to the loads from the bypass voltage.
Startup	Starts up the Power+ when it is in an “OFF” condition.
Restart	When the Power+ is “ON”, this command initiates a shutdown of the Power+ followed by a startup.

At the bottom of the “Power+ Control” screen are two links:

Simulate UPS output source on battery: clicking on this link simulates the conditions in effect during an ac power failure –a signal is sent via SNMP to any connected computers informing them of an ac power failure. (In actuality, the load continues to be supplied from the inverter). If the computers are configured for automatic shutdown on ac power failure, they begin their shutdown countdown. This option is useful for testing the auto-shutdown configuration on a computer. The simulation can be ended by the user at will. If the countdown continues to completion, the designated shutdown targets (see section 11.3.10.4 on page 90) **will be shut down!**

Simulate UPS battery status is low: clicking on this link simulates the conditions in effect after an extended ac power failure –a signal is sent via SNMP to any connected computers informing them of a “low battery condition” (actually non-existent). If the computers are configured for automatic shutdown on low battery, they begin their shutdown countdown. This option useful for testing the auto-shutdown configuration on a computer. The simulation can be ended by the user at will.

Warning: The low-battery countdown is configured in seconds, so computer shutdown will occur relatively quickly.

11.3.7 “Send SMS” main menu option

On Power+ units equipped with the optional GSM cellular communications module, the “Send SMS” main menu option enables the user to send an SMS message to any cellular telephone.

Firmware version 02.06				
Main	✔ Power System Status: No alarms			
Analysis	✔ GSM Module is ready			
Load	Phone number:			
Modules	<input type="text"/>			
STSW	Message:			
Power+ Log	<input type="text"/>			
Power+ Control				
Send SMS				
SMS Log				
Temperature				
Configuration				
160 characters remain				
<input type="button" value="Send"/> <input type="button" value="Reset"/>				
<table border="1" style="width: 100%;"> <tr> <td style="width: 33%;">RTC: 06/01/2008 09:32:45</td> <td style="width: 33%;">Site: 597571</td> <td style="width: 33%;">SW Rev: 26.09.06</td> </tr> </table>		RTC: 06/01/2008 09:32:45	Site: 597571	SW Rev: 26.09.06
RTC: 06/01/2008 09:32:45	Site: 597571	SW Rev: 26.09.06		

Figure 122: “Send SMS” screen

11.3.8 “SMS Log” main menu option

On Power+ units equipped with the optional GSM cellular communications module, the “SMS Log” main menu option enables the user to display latest 256 SMS

Firmware version 02.06

Main	✔ Power System Status: No alarms						
Analysis	✔ GSM Module is ready						
Load	Received SMS						
Modules	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a4a8a; color: white;"> <th style="width: 25%;">Entry</th> <th style="width: 25%;">Phone</th> <th style="width: 50%;">Message</th> </tr> </thead> <tbody> <tr> <td>06/01/2008 09:26:20</td> <td>+565554695658</td> <td>*066</td> </tr> </tbody> </table>	Entry	Phone	Message	06/01/2008 09:26:20	+565554695658	*066
Entry	Phone	Message					
06/01/2008 09:26:20	+565554695658	*066					
STSW							
Power+ Log							
Power+ Control							
Send SMS							
SMS Log	Sent SMS						
Temperature	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4a4a8a; color: white;"> <th style="width: 25%;">Entry</th> <th style="width: 25%;">Phone</th> <th style="width: 50%;">Message</th> </tr> </thead> <tbody> <tr> <td>06/01/2008 09:28:06</td> <td>+565554695658</td> <td>GMaCi Power+ Site: 597571Ⓜ DC: 0V AC: I:0,0,0 O:0,0,0 CUR:0,0,0 Temp:0C</td> </tr> </tbody> </table>	Entry	Phone	Message	06/01/2008 09:28:06	+565554695658	GMaCi Power+ Site: 597571Ⓜ DC: 0V AC: I:0,0,0 O:0,0,0 CUR:0,0,0 Temp:0C
Entry	Phone	Message					
06/01/2008 09:28:06	+565554695658	GMaCi Power+ Site: 597571Ⓜ DC: 0V AC: I:0,0,0 O:0,0,0 CUR:0,0,0 Temp:0C					
Configuration							

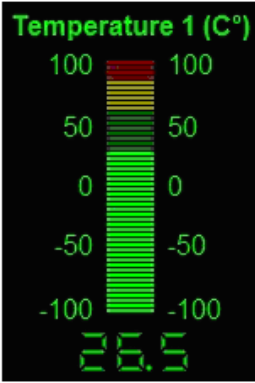
RTC: 06/01/2008 09:34:06	Site: 597571	SW Rev: 26.09.06	Refresh: 1 minute ▼
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11.3.9 “Temperature” main menu option

A temperature sensor can be attached to the rear panel of the Power+ controller. The temperature sensor itself can be placed wherever the user wants. Because of the importance of avoiding elevated battery temperature, many users place the sensor near the batteries. In addition, if the temperature sensor measures the battery temperature, the battery temperature compensation feature can be enabled.

When a temperature sensor is connected to the UPS, the “Temperature” main menu option provides a graphic, real-time display of the current sensor reading in degrees C.

Firmware version 02.06

Main	✔ Power System Status: No alarms	
Analysis	✔ GSM Module is ready	
Load		
Modules		
STSW		
Power+ Log		
Power+ Control		
Send SMS		
SMS Log		
Temperature		
Configuration		

RTC: 01/01/2000 02:00:23
Site: /////
SW Rev: 26.09.06
Refresh: 10 seconds ▼

11.3.10 “Configuration” main menu option

Choosing the “Configuration” option on the Web interface’s main menu displays the Configuration (sub)menu is displayed. Though this menu various important UPS settings can be modified. The options in the Configuration menu are described below.

Firmware version 02.06	
Main	✔ Power System Status: No alarms
Analysis	✔ GSM Module is ready
Load	Configuration menu
Modules	Date and time
STSW	Set user name and password
Power+ Log	SNMP filtering
Power+ Control	PC notifications and shutdown targets
Send SMS	SNMP trap targets
SMS Log	E-mail notifications
Temperature	Network Configuration
Configuration	SMS notifications
	General configuration
	Temperature alarm setting
	<input type="button" value="Reboot"/> <input type="button" value="Hardware defaults"/>
RTC: 01/01/2000 02:01:09	Site: / / / / / / / /
SW Rev: 26.09.06	Refresh: 10 seconds ▼

Figure 123: Configuration menu

Selecting any of the options in the Configuration menu causes the Web interface to prompt for a user-ID and password. The factory default user-ID is **admin**, and the factory-default password is also **admin**. These default values for the user-ID and password can be changed, as is explained below in section 11.3.10.2 on page 88.

After entering the correct user-ID and password and pressing Enter, the requested screen is displayed.

The user-ID and password are only requested once per session, on the first entry into any of the Configuration menu options.

Warning: When an IP address or addresses are specified for a given community, only the specified addresses have access to the community. All other users will be shut out from the defined community.

11.3.10.1 “Date and time” – setting the calendar and clock

The “Date and time” option on the Configuration submenu is used to set the date and time of the Power+ internal calendar and clock. The date and time settings are important, for they are used to timestamp entries in the Power+ log.

The date and time are kept current by the Power+, including when the system is in the “off” state.

Click the Back button to return to the Configuration menu.

Firmware version 02.06

Main	Date and time
Analysis	
Load	Date: <input type="text" value="01"/> <input type="text" value="01"/> <input type="text" value="00"/> (dd:mm:yy)
Modules	Time: <input type="text" value="02"/> <input type="text" value="01"/> <input type="text" value="28"/> (hh:mm:ss)
STSW	Time Zone: <input type="text" value=""/> ▼
Power+ Log	<input type="button" value="Apply"/> <input type="button" value="Reset"/> <input type="button" value="Back"/>
Power+ Control	
Send SMS	<p>Note: When GMaCi Power+ is connected to a Power+, the internal clock of GMaCi Power+ is constantly updated from the Power+ clock. As a result, if you want to change the date or time on the GMaCi Power+, and you have a connection with a Power+, instead of using this screen you must go to the Power+ control panel and make the change there. The GMaCi Power+ will automatically reflect any changes made to the Power+ clock.</p>
SMS Log	
Temperature	
Configuration	

RTC: 01/01/2000 02:01:32
Site: /////
SW Rev: 26.09.06

Figure 124: Setting the Power+ internal date and time

11.3.10.2 Set user name and password

The “Set user name and password” on the Configuration submenu enables you to change the user-ID and password used for entry into the options on the Web interface’s Configuration submenu..

The factory default user-ID and password are **admin** and **admin**. The new user-ID and password must each have a minimum of four characters and up to a maximum of nine characters. If entered, the new user-ID and password are effective immediately.

Click the Back button to return to the Configuration submenu.


		Firmware version 02.06
Main	Set user name and password	
Analysis		
Load	New user name: <input type="text"/>	
Modules	New password: <input type="text"/>	
STSW	Confirm new password: <input type="text"/>	
Power+ Log	<input type="button" value="Apply"/> <input type="button" value="Reset"/> <input type="button" value="Back"/>	
Power+ Control		 User name and password must be at least 4 and up to 9 characters.
Send SMS		
SMS Log		
Temperature		
Configuration		
RTC: 01/01/2000 02:01:58		Site: // // // //
		SW Rev: 26.09.06

Figure 125: Changing username and password of the Web interface

11.3.10.3 SNMP filtering

The SNMP filtering screen is where you define the SNMP communities that will have access to the Power+, and whether that access will be “read only” (requests for data – a “Get”) or “read-write” (includes the ability to modify G4 settings – a “Set”).

You also have the capability of limiting the IP addresses from which the G4 will accept SNMP packets. If the IP address has 4 segments of zero, this means that all users in the community will have the designated access.

Firmware version 02.06

Main	SNMP filtering		
Analysis			
Load	IP address	Get Community	Set Community
Modules	0.0.0.0	public	private
STSW	0.0.0.0		
Power+ Log	0.0.0.0		
Power+ Control	0.0.0.0		
Send SMS	0.0.0.0		
SMS Log	0.0.0.0		
Temperature	0.0.0.0		
Configuration	0.0.0.0		
	0.0.0.0		
	0.0.0.0		

RTC: 01/01/2000 02:02:26	Site: // // // //	SW Rev: 26.09.06
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Figure 126: Define SNMP permissions

11.3.10.4 PC notification and shutdown targets

The “PC notification and shutdown targets” option of the Configuration menu is where you record the IP address of the computers which you want to have perform an orderly shutdown in the event of an ac mains power outage.

To use this option, the computer in question must have a Shutdown Agent installed on it. The Shutdown Agent is available as a self-installing “setup.exe” file intended to be run on the target computer. The install file can be downloaded from Gamatronic’s website by clicking on the “Shutdown Agent” link in the bottom right of the “PC notifications and shutdown targets” screen.

Note: The built-in Web interface supports a maximum of 15 shutdown targets. Customers requiring a larger number of shutdown targets should inquire about the *PSM-AC for Power+* software product (see section 9 on page 69).

Firmware version 02.06

IP address	UDP Port	AC Fail delay (min.)	Low Battery delay (sec.)
0.0.0.0	262	5	30
0.0.0.0	262	5	30
0.0.0.0	262	5	30
0.0.0.0	262	5	30
0.0.0.0	262	5	30
0.0.0.0	262	5	30
0.0.0.0	262	5	30
0.0.0.0	262	5	30
0.0.0.0	262	5	30
0.0.0.0	262	5	30

Apply Reset Clear all Back

⚠ You need to run [Shutdown Agent](#) on destination machine.

RTC: 01/01/2000 02:06:12 Site: // // // // SW Rev: 26.09.06

Figure 127: Define computers for auto-shutdown

FIELD	DESCRIPTION
IP address	IP address of the computer to be automatically shut down in the event of a power failure.
UDP port	Preferred UPD port, if any.
Ac fail delay (minutes)	Delay in minutes between ac failure and initiation of the automatic shutdown.
Low battery delay (seconds)	Delay in seconds between low-battery alarm and initiation of the automatic shutdown.

11.3.10.4.1 How auto-shutdown works:

In the event of an ac power mains failure, the Power+ sends a notification to the IP addresses defined in the PC notification and shutdown screen. This generates a pop-up message on the computer screen advising of the ac fail condition, and starts a countdown. The countdown for each computer lasts for the number of minutes specified in the “Ac fail delay” field. If this countdown is exhausted before ac power returns, the Shutdown Agent saves and closes any open datasets on the computer and then shuts the computer down.

If during the countdown, the Power+ battery falls below a preset voltage (the low-battery voltage threshold, defined via the Power+ controller), the Power+ notifies the defined computers of the low-battery condition. This starts another countdown, that lasts for the number of seconds defined in the “Low battery delay” field and also cancels any other active shutdown countdown. When this latest countdown is exhausted, the Shutdown Agent saves and closes any open datasets on the computer and then shuts the computer down. This takes place even if the “Ac fail delay” countdown was not yet finished.

11.3.10.5 SNMP trap targets

An SNMP trap is a destination to which the G4 will send alarm notifications using the SNMP protocol. For each destination, an IP address and a port must be specified.

Firmware version 02.06

Main	SNMP trap targets
Analysis	
Load	
Modules	
STSW	
Power+ Log	
Power+ Control	
Send SMS	
SMS Log	
Temperature	
Configuration	

Targets IP address

IP address	Port
<input type="text"/>	162
<input type="text"/>	162
<input type="text"/>	162
<input type="text"/>	162
<input type="text"/>	162
<input type="text"/>	162
<input type="text"/>	162
<input type="text"/>	162
<input type="text"/>	162
<input type="text"/>	162
<input type="text"/>	162
<input type="text"/>	162
<input type="text"/>	162

Send Trap SNMP v1

RTC: 01/01/2000 02:06:31	Site: 594487	SW Rev: 26.09.06
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Figure 128: Defining SNMP trap targets

11.3.10.6 Defining email notification targets

The Web interface enables you to have notifications of system alarm conditions sent by email. To use this feature, the outgoing email server must be defined in the “E-mail notifications screen”, accessible from the Configuration menu..

Figure 129: Defining email notification targets

Table 11: Fields in the email notifications screen

FIELD	DESCRIPTION
SMTP server address	DNS name or IP address of the outgoing email server. The Power+ must be defined to the email server as NOT requiring a login.
SMTP port	Predefined SMTP port for the notification messages
Send as:	The “from” address in the outgoing email. Note: some email servers have an anti-spam feature that requires the “from” address to be a valid, existing address.
Recipients	In each line under the “Recipients” header a single email address can be entered in standard format. For example: “PeterSmyth@networx.com” (without the quotes). A single email address representing a list of addresses can also be entered.

11.3.10.7 Network configuration

The “Network configuration” option on the Configuration menu is equivalent to navigating to **Setup > Service > SC2012 > Network** on the Power+ physical control panel. Here you define the parameters needed to communicate with the Power+ over an intranet or over the Internet. Consult your local network administrator for the proper IP address, subnet mask, and Gateway address.

Firmware version 02.06

Main	Network Configuration
Analysis	
Load	
Modules	
STSW	
Power+ Log	
Power+ Control	
Send SMS	
SMS Log	
Temperature	
Configuration	

Default IP address

IP address:

Subnet mask:

Gateway de default:

Changing any of the above parameters will result in loss of connection to the GMaCi Web Server. After submitting your changes, wait for a few seconds and then reconnect to the card using the newly configured parameters.

RTC: 09/12/2007 12:36:58	Site: 594487	SW Rev. 26.09.06
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Figure 130: Configuring network communication parameters

11.3.10.9 Temperature alarm settings

A single temperature sensor can be connected to the Power+. The “Temperature” option in the menu column enables you to set the normal temperature range, outside of which an alarm will be generated.

The temperature alarm setting screen is shown in Figure 132 below. Only the “Temperature Sensor 1” settings are read by the Power+; the data fields for sensors 2 – 5 are ignored. It is recommended to set the low and high temperature limits close to the Power+ recommended operating temperature range, as listed in the system specifications on page 97.

Firmware version 02.06	
Main	Temperature alarm setting
Analysis	
Load	Temperature Sensor 1
Modules	Low limit: <input type="text" value="-20"/> <input checked="" type="checkbox"/> Enabled
STSW	High limit: <input type="text" value="60"/>
Power+ Log	Temperature Sensor 2
Power+ Control	Low limit: <input type="text" value="-20"/> <input checked="" type="checkbox"/> Enabled
Send SMS	High limit: <input type="text" value="60"/>
SMS Log	Temperature Sensor 3
Temperature	Low limit: <input type="text" value="-20"/> <input checked="" type="checkbox"/> Enabled
Configuration	High limit: <input type="text" value="60"/>
	Temperature Sensor 4
	Low limit: <input type="text" value="-20"/> <input checked="" type="checkbox"/> Enabled
	High limit: <input type="text" value="60"/>
	Temperature Sensor 5
	Low limit: <input type="text" value="-20"/> <input checked="" type="checkbox"/> Enabled
	High limit: <input type="text" value="60"/>
	<input type="button" value="Apply"/> <input type="button" value="Reset"/> <input type="button" value="Back"/>
RTC: 09/12/2007 12:39:23 Site: 594487 SW Rev: 26.09.06	

Figure 132: Set temperature alarm threshold

12. POWER+ SPECIFICATIONS

Table 13: Specifications

POWER+ TECHNICAL DATA	
Topology	True On-line Battery, Double Conversion, VFI
Construction	Modular parallel hot-plugged modules
Operation	Continuous
Input	
Voltage (V)	3 × 208+ N (3x120 V)
Voltage range (%)	+ 15 and – 25
Current (A)	28 A per module – no inrush current at startup
Frequency (Hz)	47-63
Power walk-in (sec)	> 60
Power Factor	0.99
THDI (%)	5
Output	
Rated Power	10 kVA / 8 kW to 100 kVA / 80 kW
Frequency tracking range (Hz)	±2
Slew rate	1 Hz / sec
Voltage (V)	3 × 208+ N (3x120 V)
Static Regulation %	±1
Regulation for unbalanced load %	±1 for 100% unbalanced load
Dynamic response to 100% load step %	±2
Overload	110 % for 10 minutes, 125 % for 60 sec. 1000 % for 1 cycle
Waveform	Sinusoidal
THD (%)	Less than 2 for linear load
Load CF	4:1
Ac-Ac efficiency (nominal) %	Up to 94 at full load
Dc-Ac efficiency (nominal) %	Up to 97 at full load
Batteries	
Dc-Link Voltage (V)	±160 to ±216
Quantity	32 × 12 V
Type	Sealed, lead acid, rechargeable
General	
Maximum power dissipation (Po=8KW)	N*510W (N*998 BTU)
Ambient temperature operation: °F (°C) storage: °F (°C)	+14 to +104 (-10 to +40) -4 to +140 (-20 to +60)
Relative humidity (%)	95 max non-condensing
Altitude (m)	1500 without derating
Enclosure	IP20
Cooling system	Multi-Fan with speed control (forced)
Standards	
EMC emissions	IEC 62040-2; FCC part 15/B
Safety	UL1778; IEC 62040-1-1
Design	IEC 62040-3
Low magnetic field radiation	EMF as per ICNIRP

(continued...)

Dimensions (U.S. measurements)										
UPS type	10 kVA	20 kVA	30 kVA	40 kVA	50 kVA	60 kVA	70 kVA	80 kVA	90 kVA	100 kVA
Height (in)	27.2	31.1	34.6	38.2	42.1	49.6	53.2	56.7	60.6	64.6
Width (in)	23.6									
Depth (in)	27.2					39.0				
Weight (lbs)	223	258	291	326	359	428	463	496	531	564
Dimensions (metric measurements)										
UPS type	10 kVA	20 kVA	30 kVA	40 kVA	50 kVA	60 kVA	70 kVA	80 kVA	90 kVA	100 kVA
Height (cm)	69	79	88	97	107	126	135	144	154	164
Width (cm)	60									
Depth (cm)	69					99				
Weight (kg)	101	117	132	148	163	194	210	225	241	256
Acoustic Noise										
Noise (dBA) with half load	48	52	53	54	55	55.8	56.4	57	57.5	58
Noise (dBA) with full load	51	54	55	57	58	58.8	59.4	60	60.5	61

All specifications are subject to change without notice.

SYSTEM CONTROLLER – TECHNICAL DATA	
Micro Controller core	16 bit
Display	4 × 40 characters LCD with backlight
Other indicators	8 LEDs, buzzer
Analog input channels	4 input dry contacts (N.C.)
Real Time Clock (RTC)	Yes, with backup
Power meter	kVA, kW, PF
Volt-free outputs (dry contacts)	6 outputs, rated 50 V / 1 A
Communication	TCP/IP, GPRS/SMS wireless communications (optional)
Communications with system modules	Serial, isolated
Events log	255 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
Alarms	Ac failure, dc failure, UPS module(s) failure, load on bypass, battery test failure, over/under temperature, overload (contacts rated max. 48 V 1 A)
RTC operation without power	2 weeks
Power requirements	3 × 208 Vac / ±216 Vdc 15 W

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



Gamatronic Building, Jerusalem, Israel

Gamatronic's product range:

- ▶ UPS Systems
- ▶ Power systems for Telecom
- ▶ Dc-to-Ac Inverters
- ▶ Dc-to-Dc Converters
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