GAMATRONIC

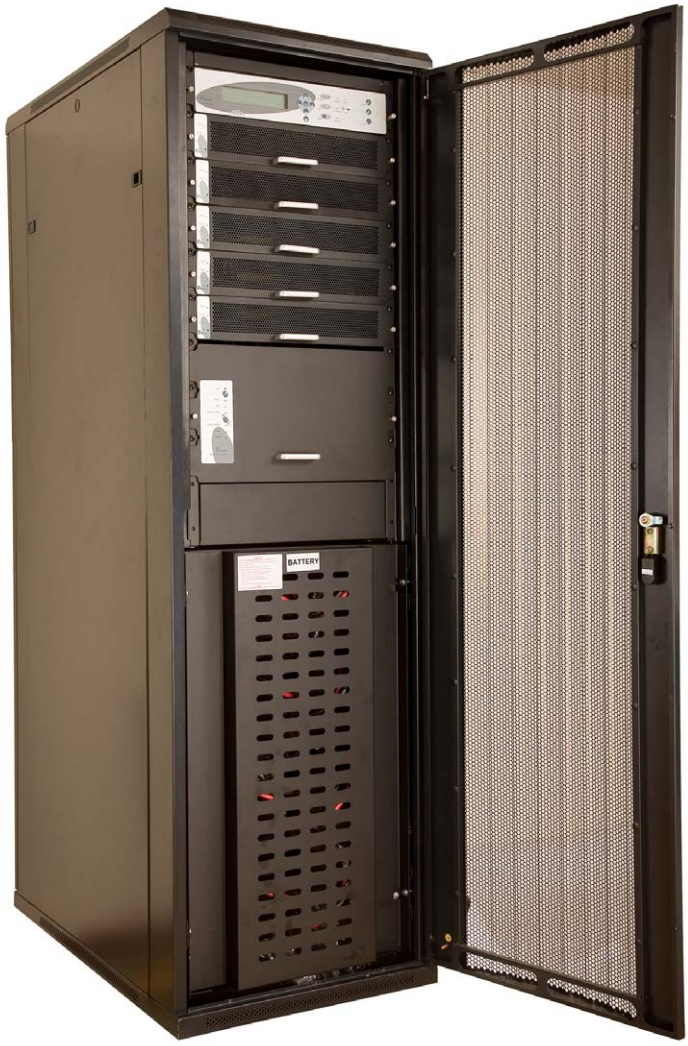
Our power, your confidence.

POWER+

MODULAR UPS SYSTEM

RM 50 kVA NORTH AMERICAN STANDARD

User Guide



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The equipment described in this document is not intended to be used in connection with any application requiring fail-safe performance, unless the application design includes appropriate redundancy. This exclusion includes, but is not limited to, the direct operation of any life support system or any other system whose failure could lead to serious injury, death, environmental damage or mass destruction.

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.

SI LA CAPACITÉ DE SORTIE EST AUGMENTÉE AU DELÀ DE LA CONFIGURATION D'ORIGINE, LA PLAQUE INDICATIVE DU PRODUIT DOIT ÊTRE MISE A JOUR AVEC LES NOUVELLES CAPACITÉS.
Cette condition s'applique si de nouvelles modules UPS non redondantes sont ajoutées ou si des modules UPS redondantes sont désignées comme non redondantes.

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.

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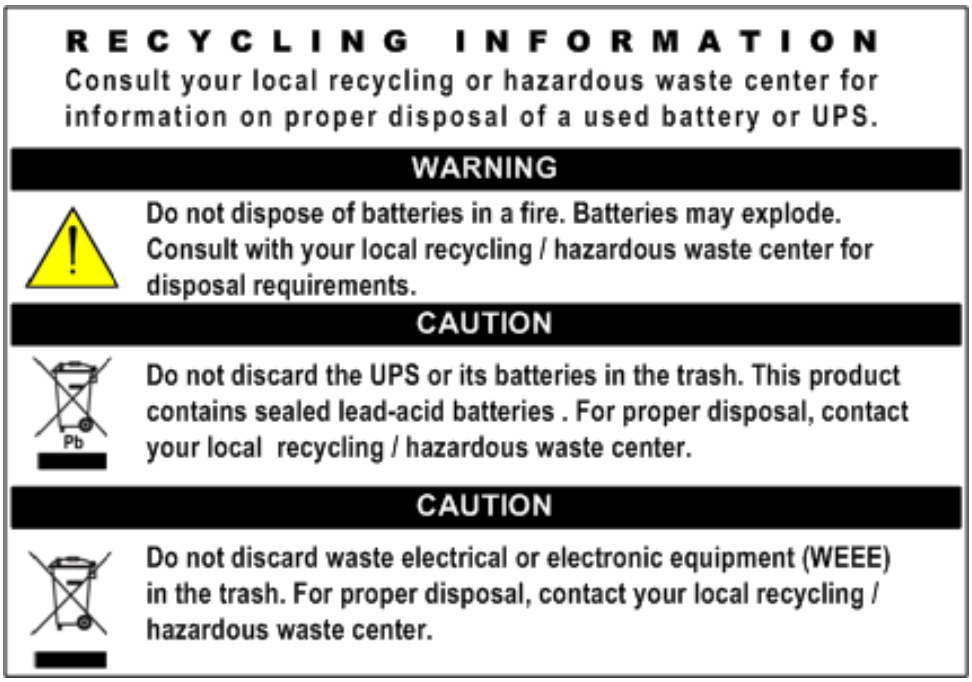


SAFETY CONSIDERATIONS

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.
- 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 module de batterie contient une série de batteries 12-Volt qui fournissent une haute tension et l'énergie dans le corps de l'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 débranchement 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, IL EST STRICTEMENT INTERDIT 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 LE SYSTEME DE FACON PERMANENTE.

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 EST ESSENTIELLE AVANT DE RELIER L'APPROVISIONNEMENT

mettre L'UPS à la terre avant de le relier à l'approvisionnement 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 LE COUVERCLE !

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

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.

The ***POWER+ RM 50 KVA*** model (RM stands for "rack mount") fits into a standard 19” wide enclosure.

1.1 *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 an overall efficiency of up to 96 % and backup efficiency of 98%.
- ***POWER+*** is light and small, a 10 kVA module weighs only 9 Kg.

The ***POWER***$^{+}$ RM 50 North American Standard model is comprised of the following sub-assemblies.

- System Controller
- From 1 to 5 UPS modules × 10 kVA
- Static Switch Module

POWER^{+} *System - 10 to 50 kVA in a 19" rack*
- small enough to fit in a 4-passenger elevator

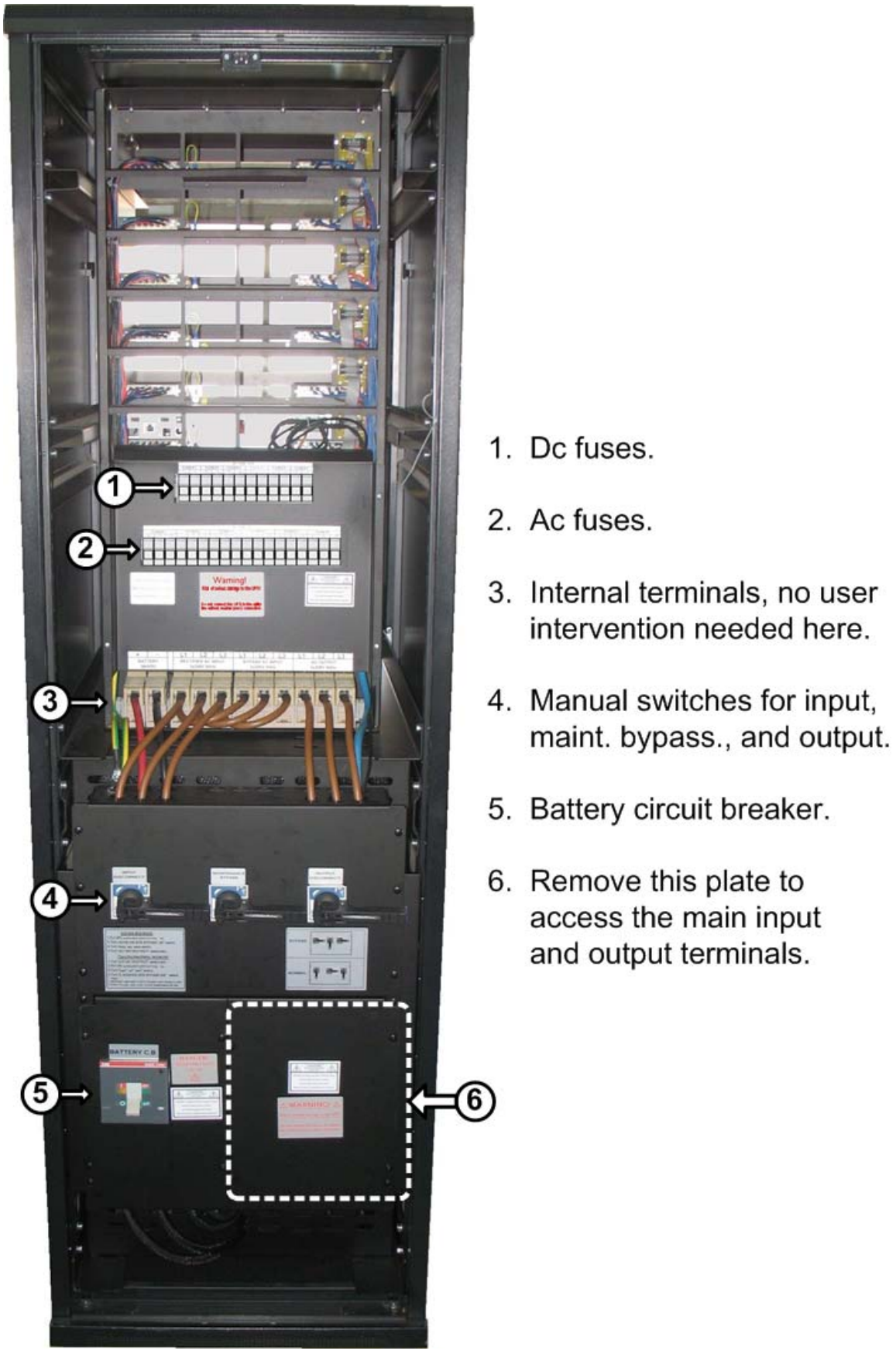


Figure 1: Power+ RM with bypass maint. switch & internal batt. – rear view

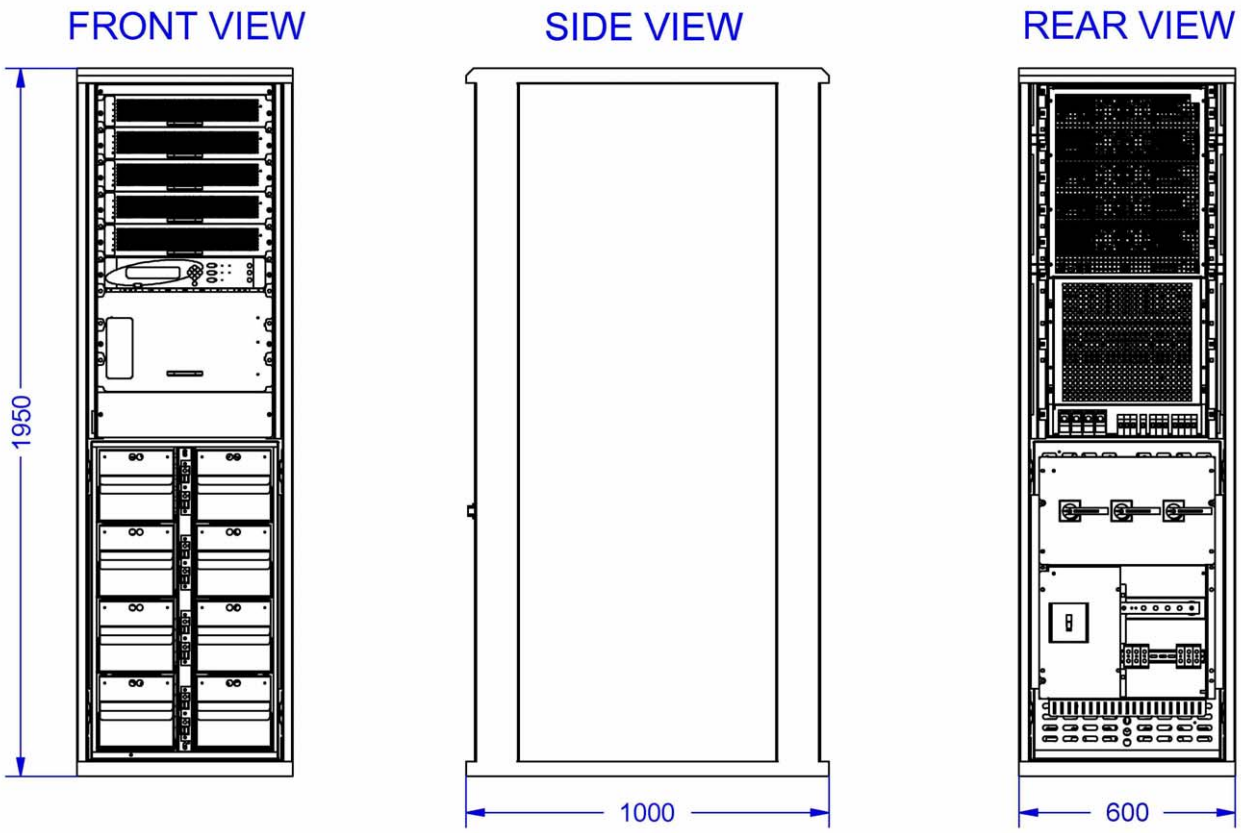


Figure 2: Cabinet external dimensions (approximate)

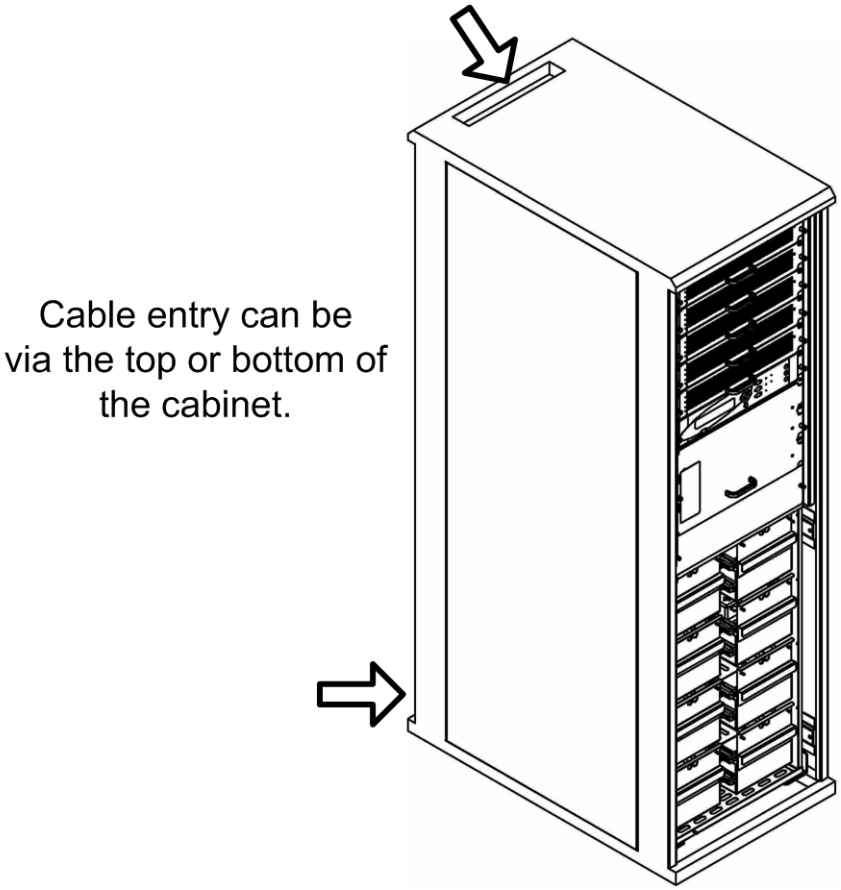


Figure 3: Cabinet permits top and bottom entry of main cables

1.2 Ac input/output main terminals

The main input and output terminals are located at the lower rear of the unit. The exact location and arrangement of the main input and output terminals depends on whether your system includes the optional maintenance bypass switch.are used to connect the AC input and bypass inputs, the battery, and the AC output. See Figure 1 above.

1.3 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.

1.4 UPS module (10 kVA / 8 kW)

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 PFC[1] and a 3-phase PWM inverter connected to batteries by a classic DC link. Each module is plug-in and weighs a mere 9kg.

1.5 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] 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 reactive 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.

1.6 Battery

The ***POWER+*** battery bank is used as a backup in the event that the utility AC input fails. Depending on customer preference, batteries may or may not have been supplied with your system.

The batteries are usually housed internally; however, for sites where a longer backup duration is required, the batteries can be housed in an external cabinet or cabinets next to the ***POWER+*** cabinet.

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

Free air circulation around the batteries is extremely important for proper battery safety. If the Power+ is installed in a cabinet, the cabinet must have sufficient ventilation openings to permit free air circulation around the batteries.

This means that solid glass or acrylic-type door panels are not suitable for a cabinet housing the Power+, not for the front cabinet door nor for the rear door.

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

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

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.*

Veuillez 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 !

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.*

Figure 4: Built-in battery cabinet

Figure 5: Matching battery cabinet for extended-duration backup

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 Maintenance bypass (option)

Maintenance bypass is an optional feature. In maintenance bypass mode, the UPS output terminals continue to supply power to the load, but the interior of the UPS is isolated from all power flows. This enables a maintenance technician to safely work on the UPS without any interruption of power to the load.

For more information on the maintenance bypass feature, see section 11.

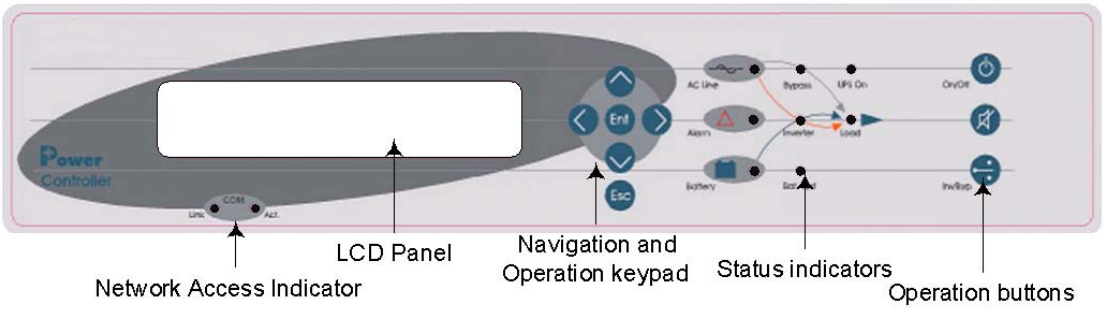
3. USER INTERFACE

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

3.1 Control Panel

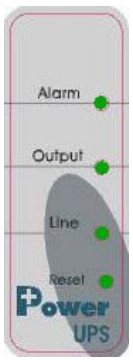
The ***POWER+*** Control Panel, located on the front of the controller, provides the user with an interface to the ***POWER+*** system. It includes an LCD display, a keypad, buttons and indicators for monitoring and controlling the UPS configuration and functions. The control panel is aimed both at the 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 6 beginning on page 36.



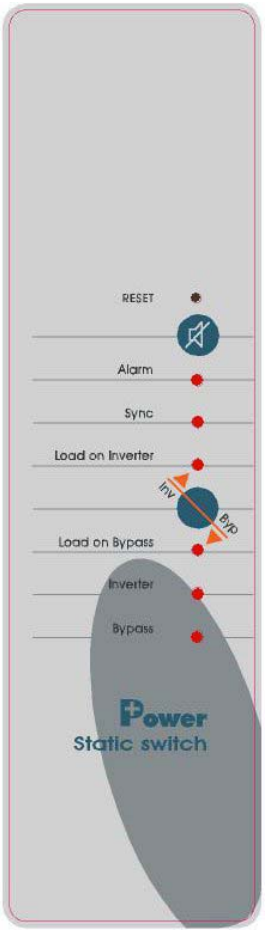
3.2 UPS module panel

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 11.

How to read and understand the ***POWER+*** control screen is described in detail in Chapter control screen is described in Chapter 8 beginning on page 37.

The control screen provides menus and displays all aspects of the ***POWER+*** systems input, output and static switch as well as operational details.Figure 6: Default screen display

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

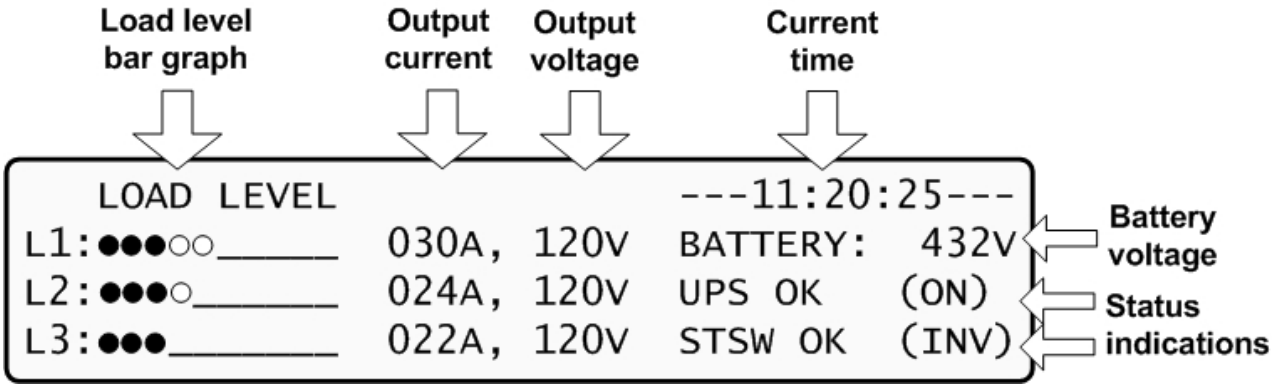


Figure 6: Default screen display

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

3.4.1 Load-level bar graph

The load-level bar graph on the default screen display illustrates the approximate load on each output phase of the UPS, as a percent of the maximum available output for each phase.

The load on each phase is represented by a series of from 1 to 10 dots. Each dot represents about 10 % of the maximum available output per phase.

The dots can be either filled in (black) or clear (white). The number of black dots represent kW, the number of black and white dots together represents kVA.

For example, in Figure 6 above, the load on **Line 2** is 30 % (3 black dots) of the maximum in terms of kW, and 40 % (3 black dots plus 1 white dot) of the maximum in terms of kVA.

To compute the approximate value in kW or kVA of each dot:

1. Compute the maximum load per phase =

$$\frac{\text{10 kVA [or 8 kw]}}{\text{3 phases}} \text{ x (Total \# of modules – redundant modules)}$$

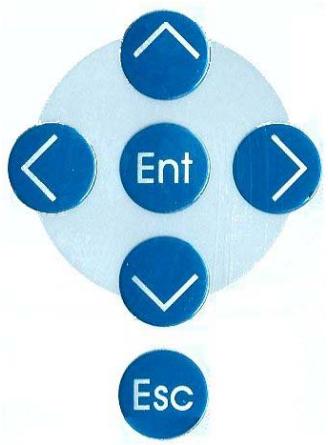
2. Dividing the maximum load per phase by 10 gives you the value of 1 dot.

Example: Assume a system with 10 modules, 2 of which are redundant.

10 kva / 3 x (10-2) = 3.33 x 8 = maximum load per phase = 26.67 kVA. 26.67 / 10 = 2.67 kVA, the approximate value of each dot.

3.4.2 Navigation and operation keypad

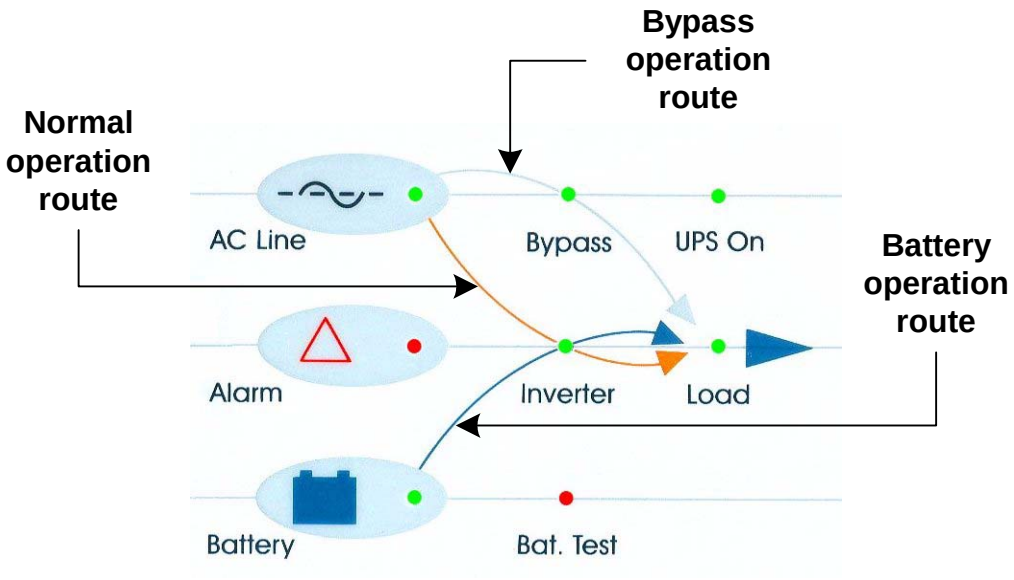
The navigation and operation keypad works in conjunction with the control screen. It allows you to navigate through the available menus using the ◀ ▲ ▶ ▼ direction arrow buttons and the Enter (Ent) and Escape (Esc) buttons to select or quit, respectively.



3.4.3 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	**Blinking Red** – Shows that a battery test is in progress **Steady Red** – Battery test failure
UPS On	**Green** – Indicates that the UPS is running
Load	**Green** – Indicates that AC voltage is available at the output

3.4.4 Operation buttons

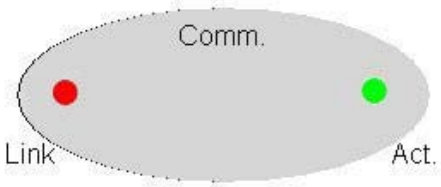
The operation buttons illustrated below are “soft” switches.

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

	UPS ON/OFF switch
	Alarm silence
	Inverter/Bypass manual switch over

3.4.5 Network access indicator

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



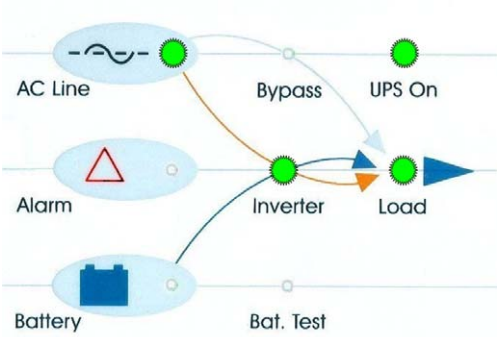
Link	Red – Indicates the presence of a network connection link
Act	Green – Indicates that the network is active

3.5 *POWER+* operation modes

3.5.1 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.



3.5.2 Battery operation

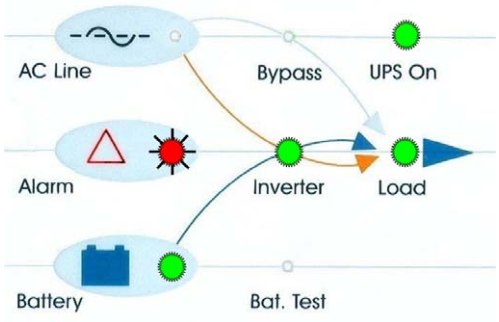
AC failed for the past 5 minutes

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

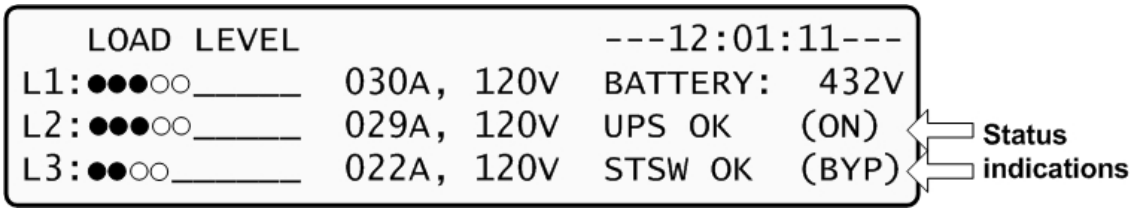
Status indications

During Battery Operation, the battery supplies DC to the inverter which then provides AC to the load.

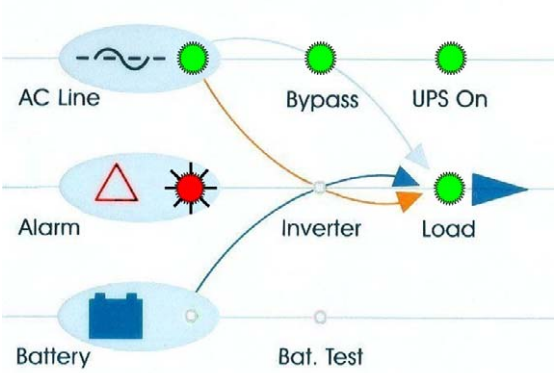
The red alarm flashes to indicate the abnormal status.



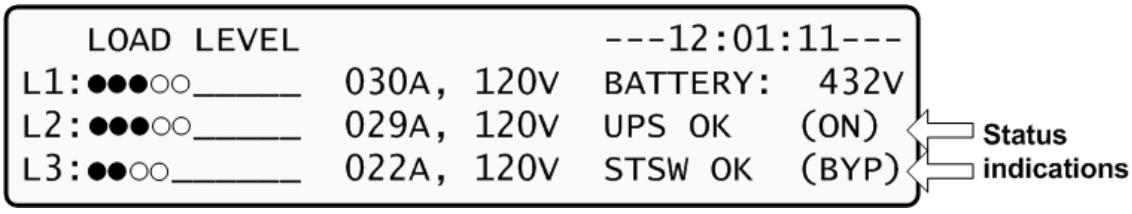
3.5.3 Bypass operation (automatic)



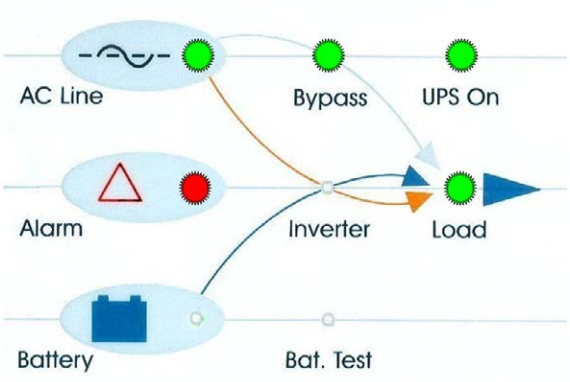
During Bypass operation, the AC feeds the load via the bypass static switch. The red alarm flashes to indicate the abnormal status.



3.5.4 Bypass operation (manual)



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.



3.5.5 Emergency Power Off - EPO (manual)

An external Emergency Power Off (EPO) switch may be used to cut 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.O.-type.

4. SYSTEM INSTALLATION

4.1 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.

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

EMPLOYEZ LE CABLAGE REQUIS 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.

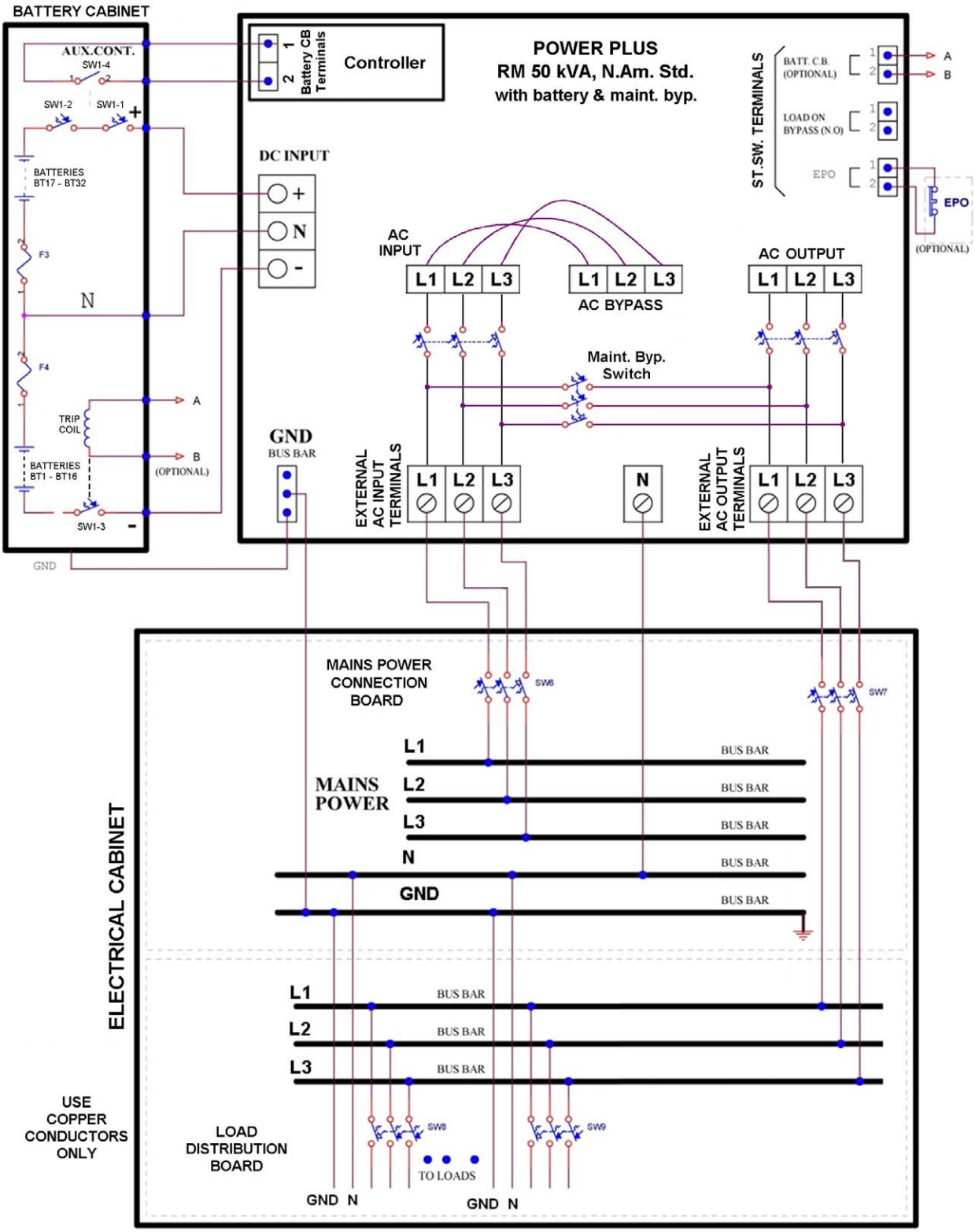


Figure 7: Connection diagram

4.2 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

POWER+ *output capacity*	*Line*	*Maximum over-current protection*
10 kVA	*Ac input*	*35 A*
	Load	
	Battery dc input	*30 A*
20 kVA	*Ac input*	*70 A*
	Load	
	Battery dc input	*60 A*
30 kVA	*Ac input*	*110 A*
	Load	
	Battery dc input	*90 A*
40 kVA	*Ac input*	*150 A*
	Load	
	Battery dc input	*125 A*
50 kVA	*Ac input*	*175 A*
	Load	
	Battery dc input	*150 A*

4.3 **Fuses**

Ac and dc fuses are located on the rear panel of the UPS, above the internal terminal blocks (see Figure 1 on page 3) and are described in the following two subsections.

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.

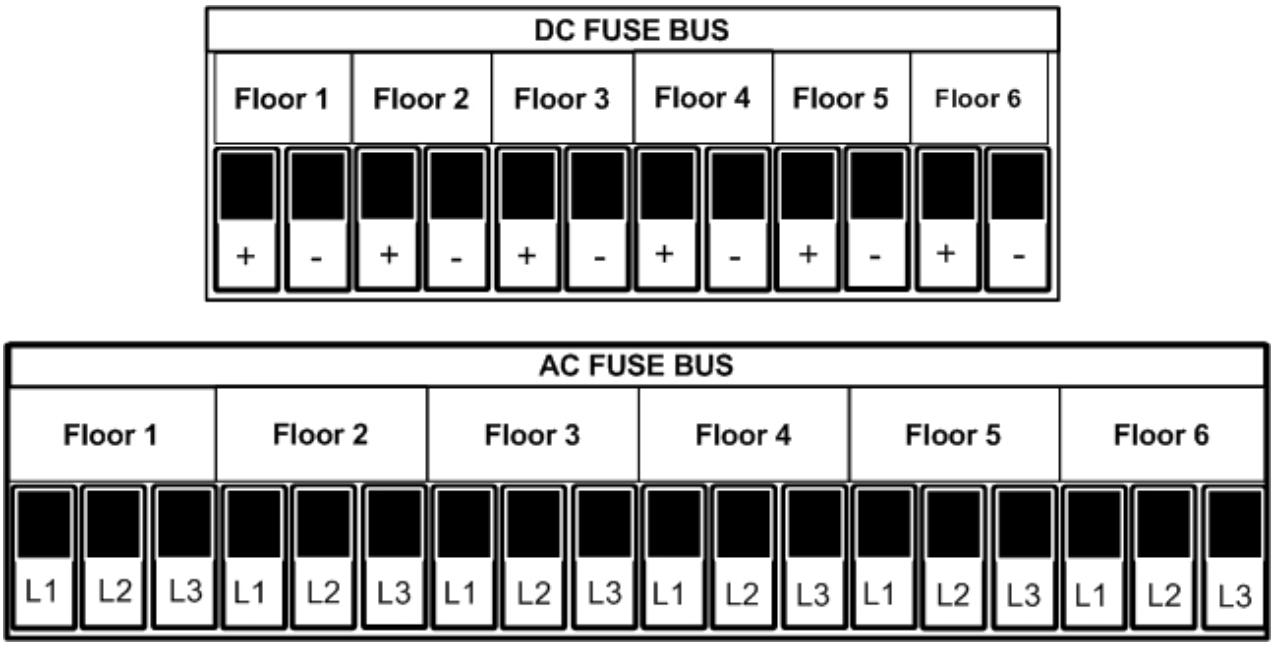


Figure 8: Layout of dc and ac fuses)

4.4 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 module slot or "floor" – one fuse for the positive line and one for the negative line. Figure 8 above show the fuse assignments.

4.5 Ac input fuses

Verify that the appropriate ac fuses are present.

In the ac distribution module, the input for each module slot or "floor" is protected by a 32 A fuse for each phase, so that each module, including the controller, has 3 fuses (one each for the L1, L2, and L3 phases). The ac fuse receptacles are numbered from left to right, i.e. the 3 fuses on the far left protect floor 1. Figure 8 above show the fuse assignments.

4.5.1 Input and output terminals

The location and arrangement of the main input and output terminals of the UPS depend on whether the system includes the optional maintenance bypass switch. If the maintenance bypass switch is present, there will be three large manual switches in the middle of the UPS rear panel, as shown in item 4 in Figure 1 on page 3.

On systems without the maintenance bypass switch, the terminals are located as shown by item 3 in Figure 1 on page 3. A close-up of these terminals are shown in Figure 9 below

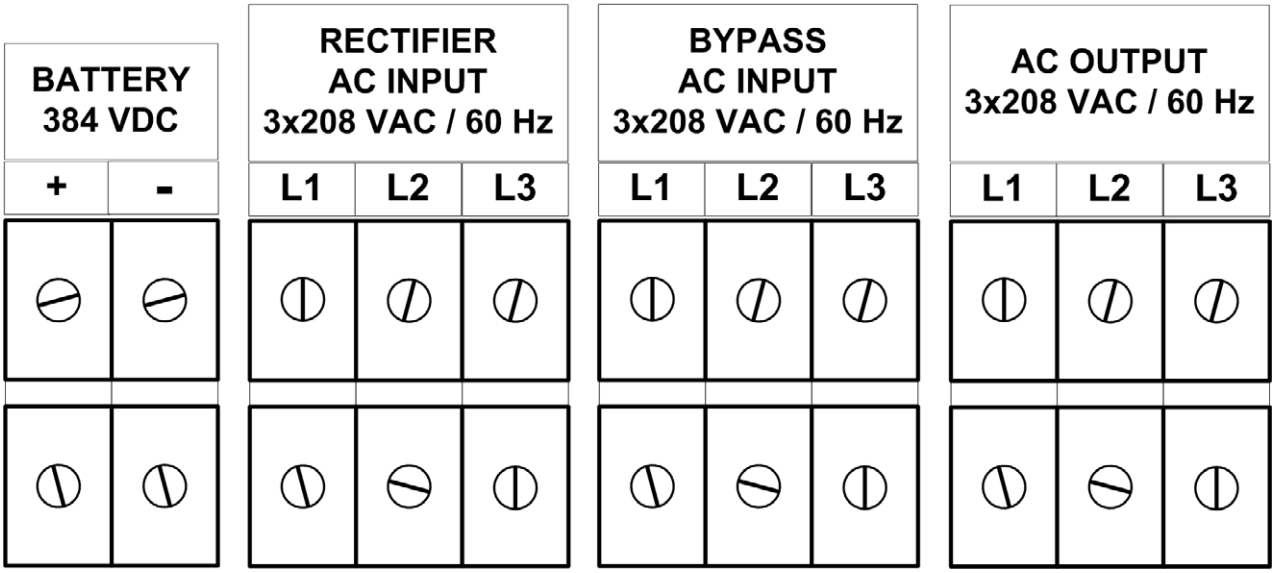


Figure 9: Main terminals on systems without the main. bypass switch

For systems with the maintenance bypass switches, the terminal layout is as shown in Figure 10.

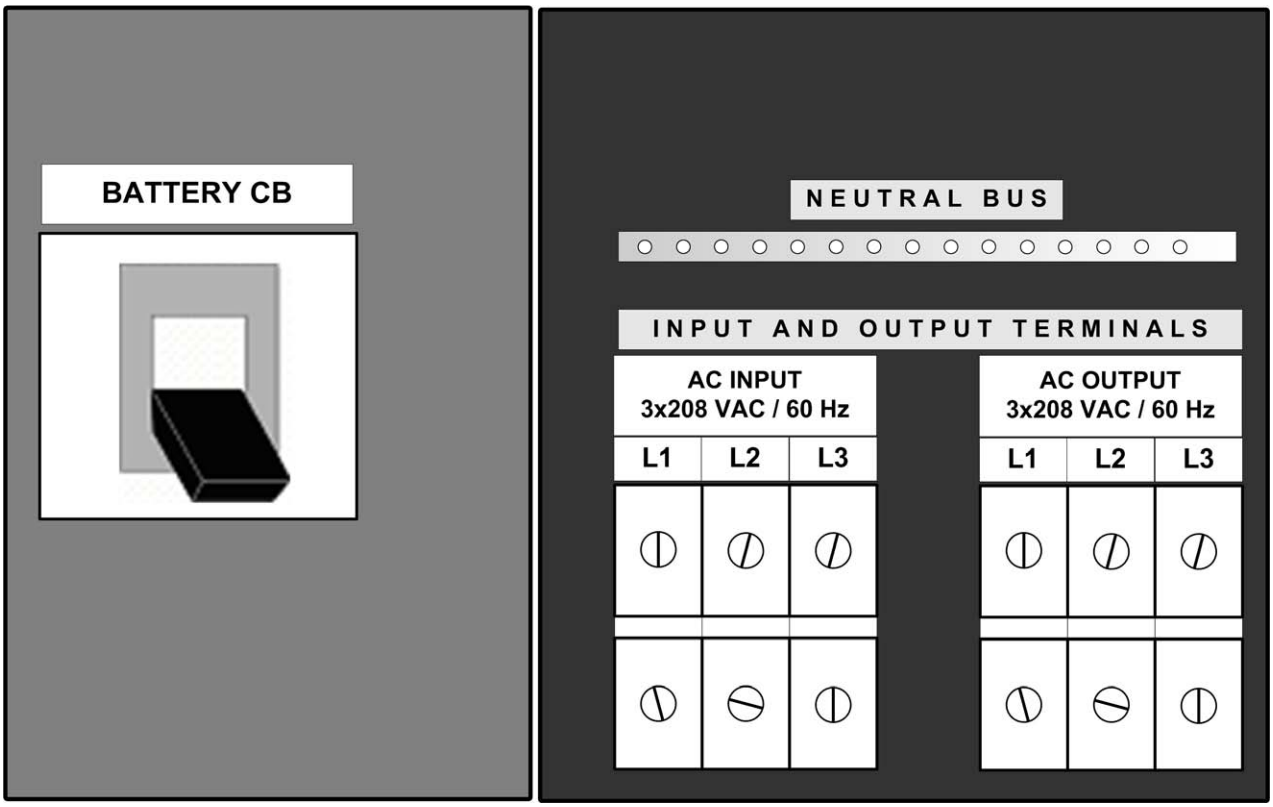


Figure 10: Main terminals on systems with maint. bypass switch

4.6 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 36 in. (91 cm) clearance at rear for access to cable connections and fuses, and 39 in. (100 cm) clearance at front for user access and service.	
6.	Circuit breakers on the electrical board supplying the system	Must be in accordance with Gamatronic.'s system specifications and connection schematic	
7.	Diameter of input and output power cable connections, PE (Gnd) and neutral lines.	Must comply with local and international 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	Phase-to-Phase: 3x208* Vac, +15 %, -25 %	L1-L2 L2-L3 L3-L1
		Phase-to-Neutral: 120* Vac, +10 %, -15 %	L1 L2 L3
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.'s system specifications and this User Guide	

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

4.7 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. Verify correct phase sequence between board and UPS
2.	Connect ground lines to busses according to markings as shown in the connection diagram (Figure 7 on page 21). Verify secure connections.
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. Verify correct polarity of the connections (+ / N / -) 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: 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. 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.
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 4.8 "First-time Startup" which begins on page 28.

4.8 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. The control panel displays the sequence of screens illustrated below, while the system performs a series of self-tests. (The precise screen details may vary.)

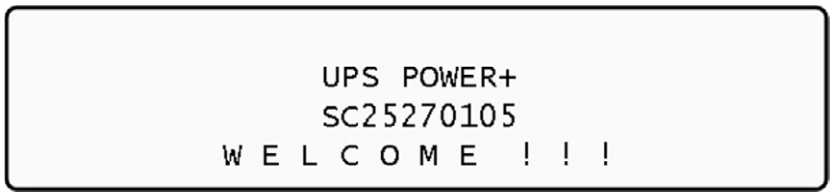


Figure 11: Start-up screen 1

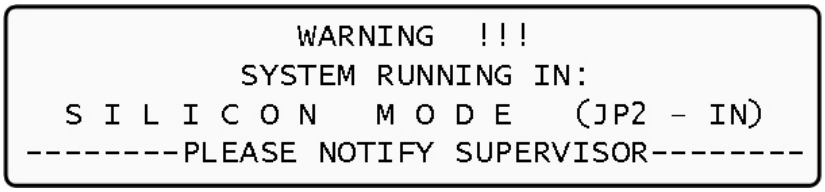


Figure 12: Start-up screen 2

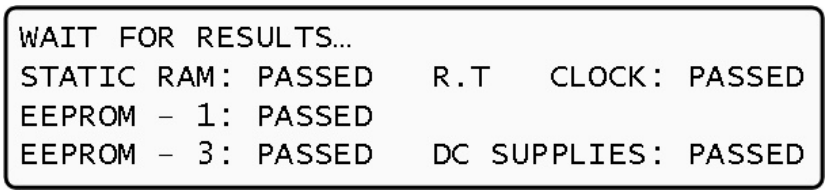


Figure 13: Start-up screen 3

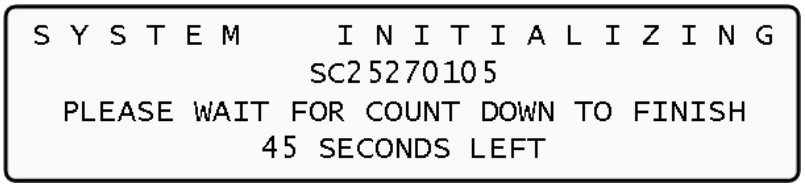


Figure 14: Start-up screen 4

During this step, the LEDs are also checked sequentially.

4. Finally the normal default screen is displayed as in Figure 15. Verify that the correct number of phases are displayed:

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

Figure 15: Default screen, with no load, for 3-phase output

5. **IMPORTANT NOTE: Your POWER+ System has been delivered to you with the output voltage set to 120 Vac (phase-to-neutral), and the frequency set to 60 Hz. If the voltage or frequency of your local power mains is different, you must now adjust the POWER+ output voltage and/or frequency to match your local environment.**
(If 120 Vac / 60 Hz is your standard local voltage and frequency, continue with section 4.8.3 below.)

4.8.1 Changing the Power+ output voltage

1. Press the Enter key to display the main menu.
2. Select the "Setup" option.
3. Enter the password. (The default password is pressing the "left-arrow" key eight times. Then press the Enter key.
4. Select the "Module configuration" option.
5. Select the "Module/s voltage" option. The following screen is displayed.

```
Module/s voltage    4: 125V
1: 110V  (selected) 5: 130V
2: 115V             6: 135V
3: 120V             7: 140V
```

6. Use the up/down arrow keys to move the blinking cursor to the desired voltage value, then press "Enter". The characters "(selected)" appear to the right of your choice.
7. Press "Esc".

If you need to change the frequency from the default 60 Hz, continue with section 4.8.2; otherwise, continue with section 4.8.3.

4.8.2 Changing the Power+ output frequency

1. Press the Enter key to display the main menu.
2. Select the "Setup" option.
3. Enter the password. (The default password is pressing the "left-arrow" key eight times. Then press the Enter key.
4. Select the "Module configuration" option.
5. Select the "Module/s frequency" option.

```
---       SET MODULE/S FREQUENCY      ---
SELECT - 1 HARD (DIP DEPEND.)
SELECT - 2 SET 60Hz             (SELECTED)
SELECT - 3 SET 50Hz
```

6. Use the up/down arrow keys to move the blinking cursor to
   option 2 (60 Hz) or
   option 3 (50 Hz),
   then press "Enter". The characters "(selected)" appear to the right of your choice.
   (Do not choose option 1 – Hard).

7. Press "Esc".

4.8.3 Continue first-time startup

1. Switch all battery switches "ON" – on the UPS and on all battery cabinets, if any.

2. You can now turn on the load devices.

3. After turning on the load devices, verify that you have a normal reading on the display screen. The display will look like that in Figure 16 but of course your readings will be different.

Figure 6: Default screen display

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

Figure 16: Normal display, system under load

Continue with section 4.9 on page 31.

4.9 Checks to be performed following initial startup

	TYPE OF CHECK	REQUIREMENT	RESULT
1.	Ac input voltage during operation under load. Take measurements on the input terminals of the system.	Phase-to-phase: Not less than 2 % below no-load values measured in item 5 below.	L1-L2 L2-L3 L3-L1
		Phase to Neutral: Not less than 2 % below no-load values measured in item 5 below.	L1 L2 L3
2.	With no load on the system, measure current circulation between the units.	Irst 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 On the input terminals of the system	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.

TO COMPLETE THIS INSTALLATION CHECKLIST, PLEASE SKETCH ON THE FOLLOWING PAGE A DIAGRAM OF YOUR SYSTEM'S CONNECTIONS, OR INCLUDE A FORMAL CONNECTION SCHEMATIC, AND FAX PAGES 24, 27, 31, AND 32 TO YOUR VENDOR.

4.10 Connection Diagram

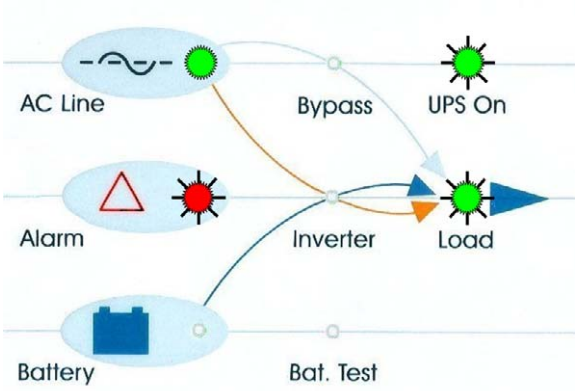
5. *POWER+ ROUTINE START-UP*

5.1 Start-up after shutdown

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)
L3:__________  000A, 120V  STSW OK  (INV)
```

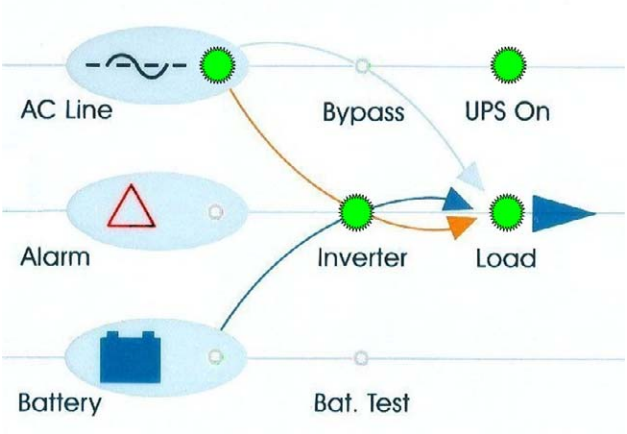
Status indications

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

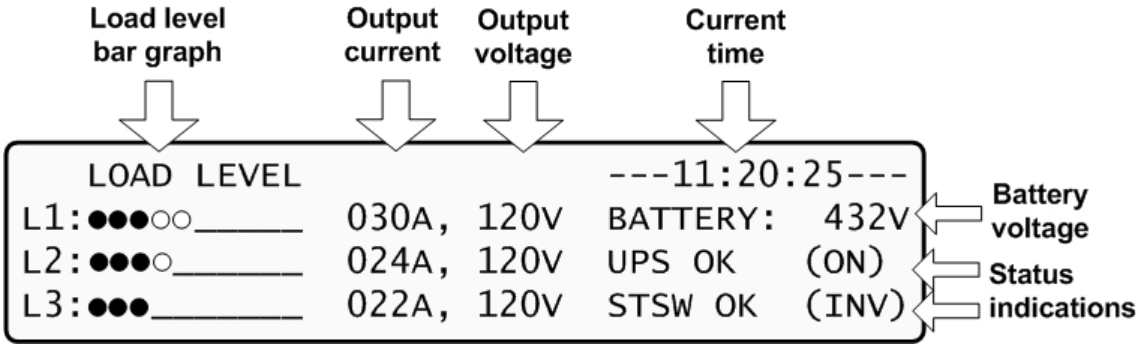
If the display continues to indicate BYP, check on the Static Switch panel, that the inverter is running.

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.

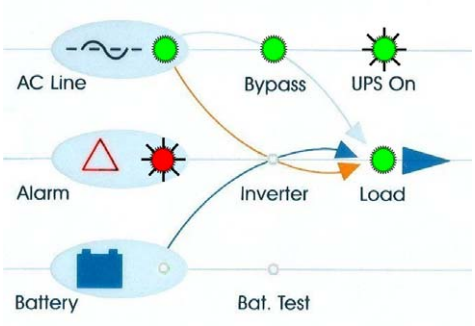
POWER+ start-up is now complete.

5.2 *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).

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

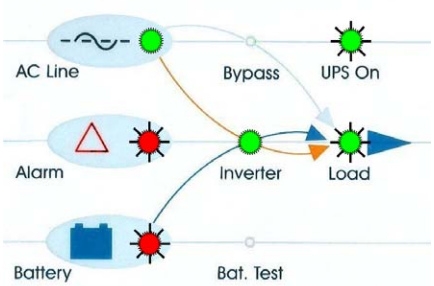
Note: *This does NOT switch the entire* ***POWER+*** *OFF. Power is still delivered to the load but in bypass.*



5.3 *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                    ---09:10:02---
L1:__________  000A, 120V  BATTERY:  000V
L2:__________  000A, 120V  UPS OK    (OFF)
L3:__________  000A, 120V  STSW warning !
```



6. *POWER+ CONTROL PANEL*

The user manages the ***POWER+*** system via a touch-pad control panel and an LCM (LCD) display on the front panel of the controller. 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.

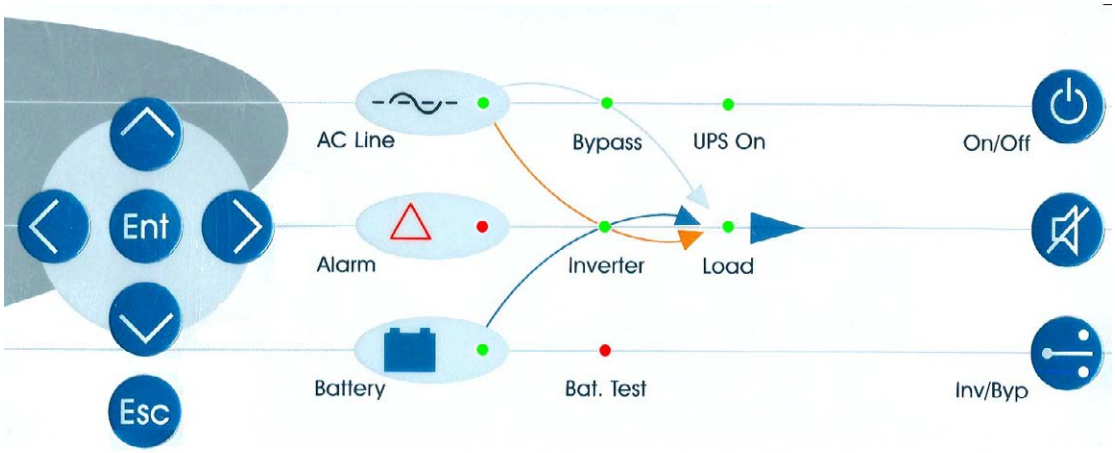


Figure 17: Control panel

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 37 illustrates in detail the functions available through the *POWER+* control menus.

6.1 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.

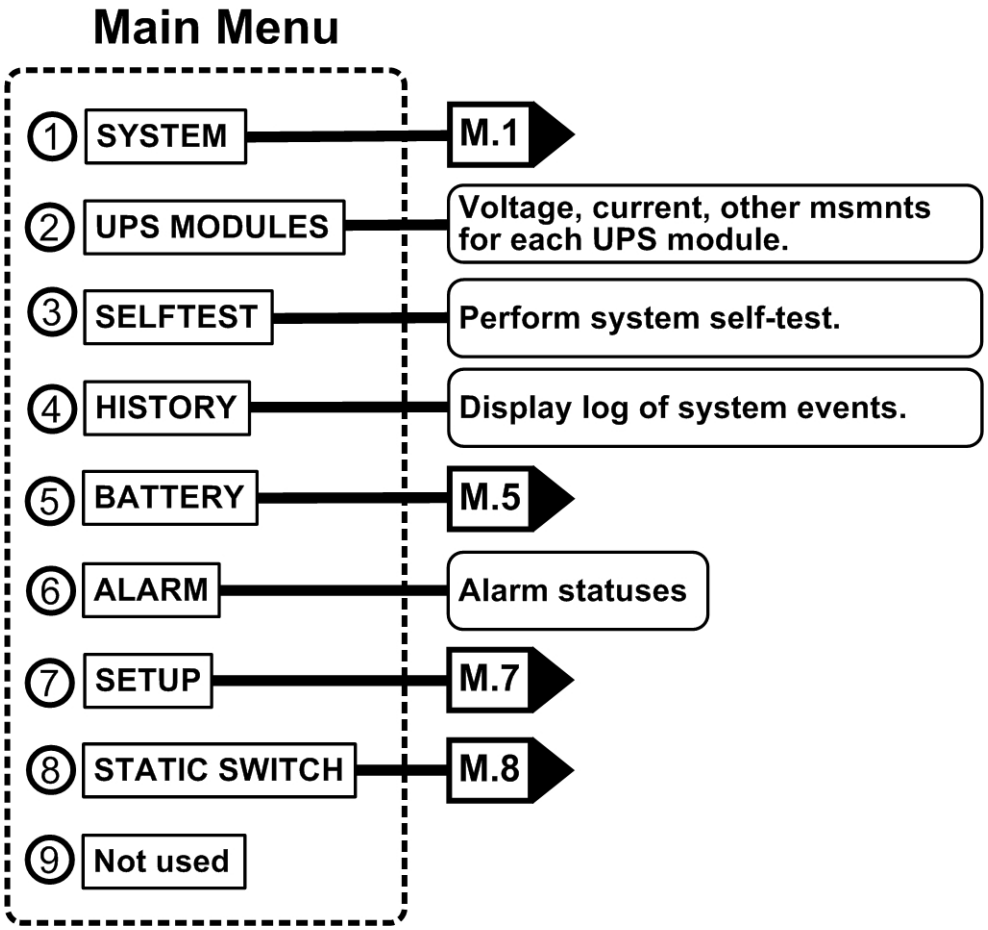


Figure 18: Flowchart: Main Menu

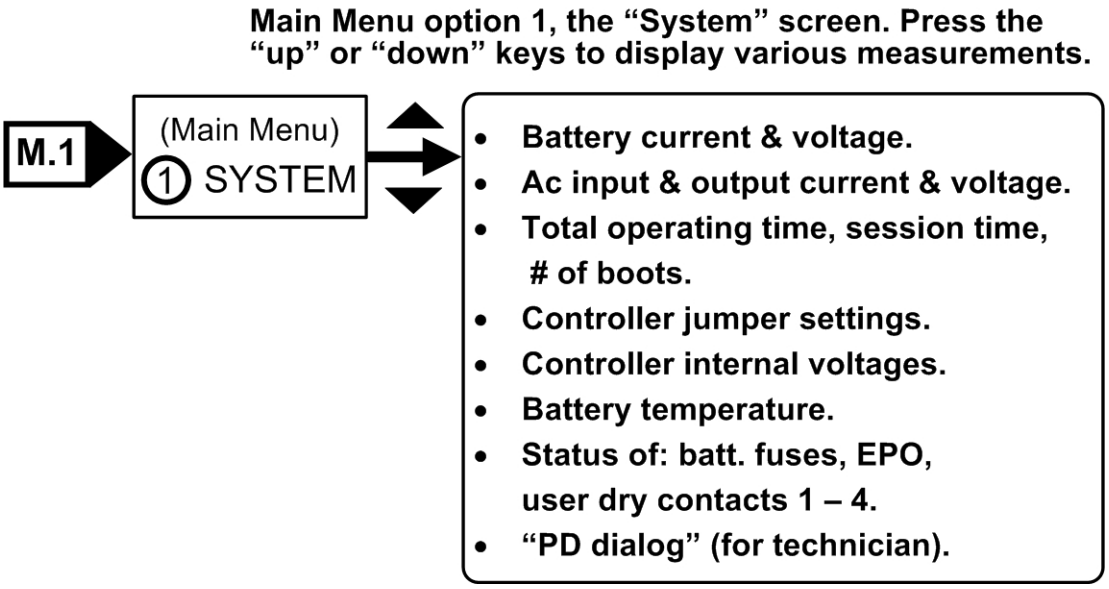


Figure 19: Flowchart: "System" option on main menu

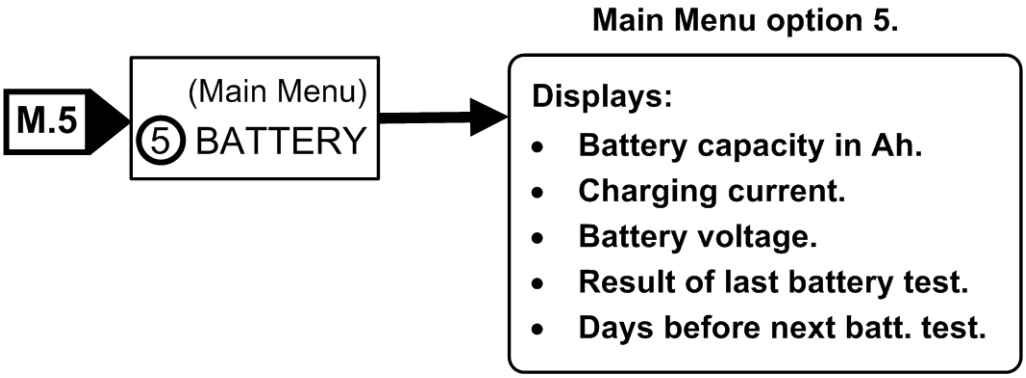


Figure 20: Flowchart: "Battery" option on main menu

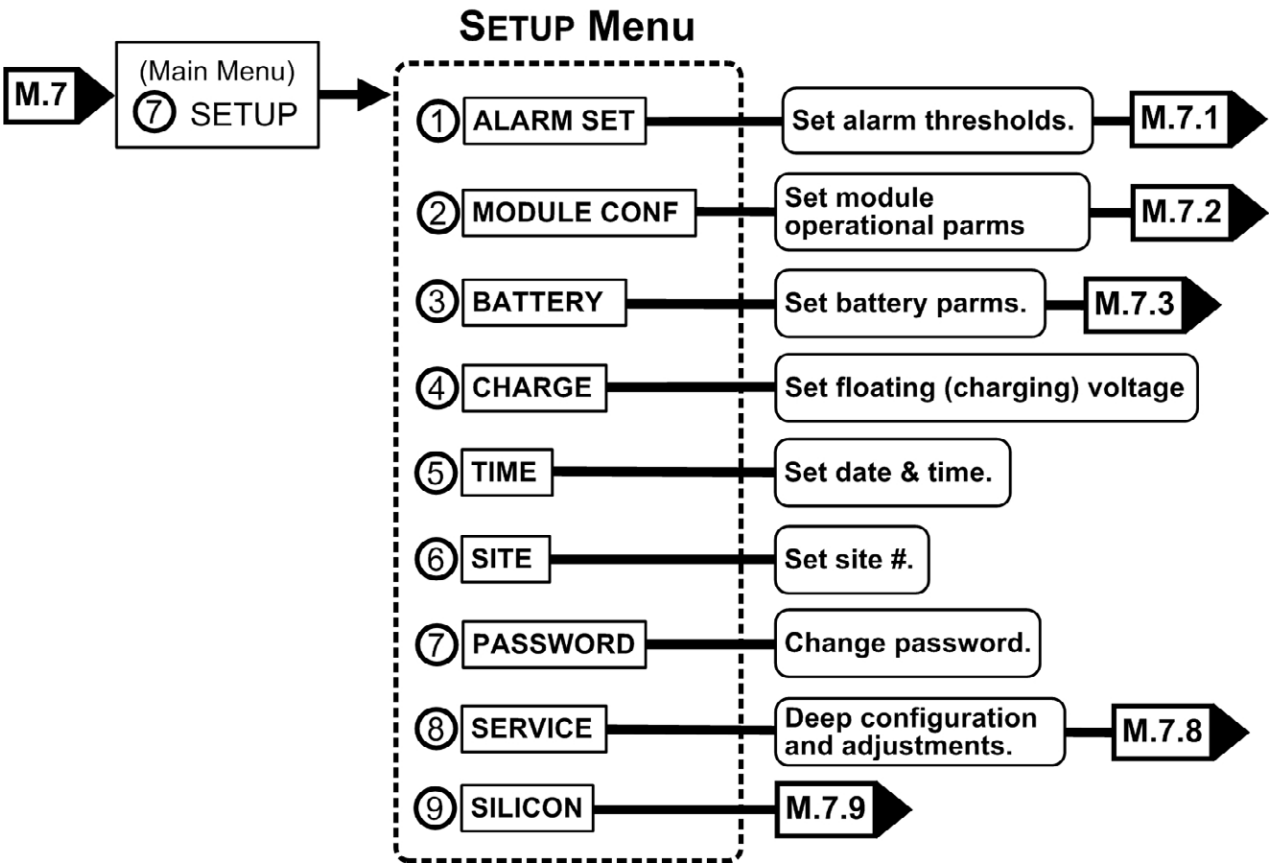


Figure 21: "Setup" menu

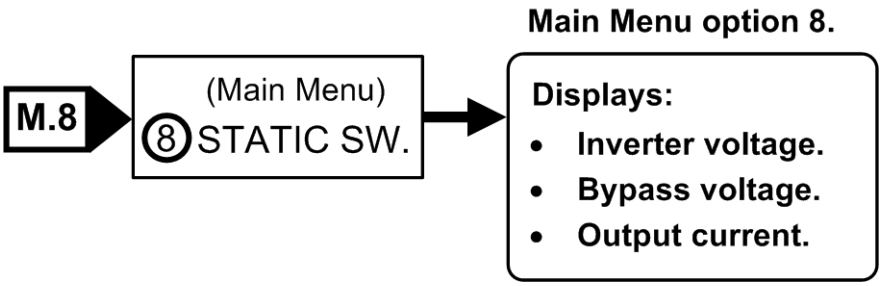


Figure 22: "Static Switch" option on main menu

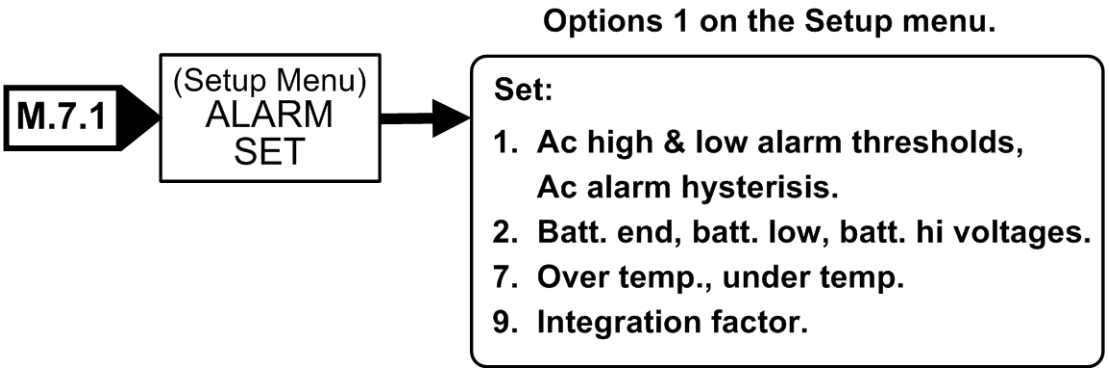


Figure 23: Flowchart: set alarm parameters

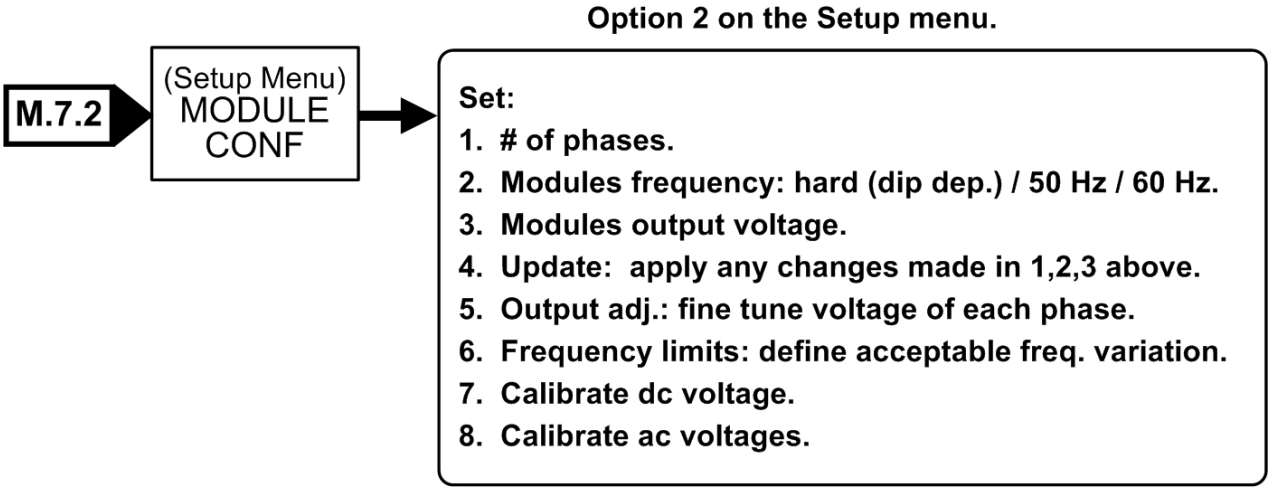


Figure 24: Flowchart: configure the power modules

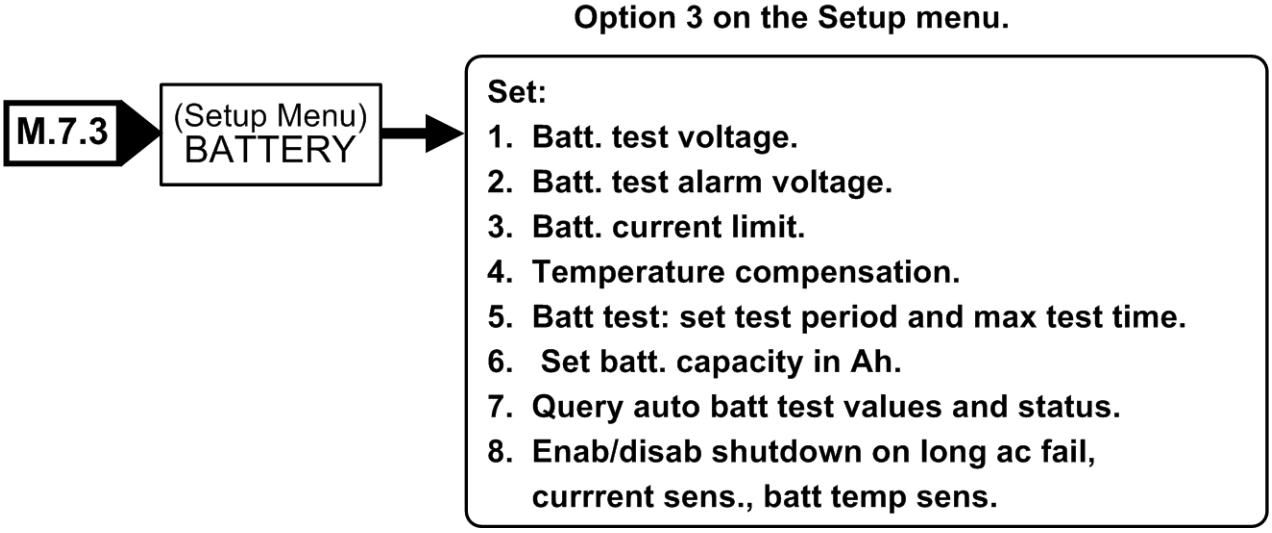


Figure 25: Flowchart: battery parameters

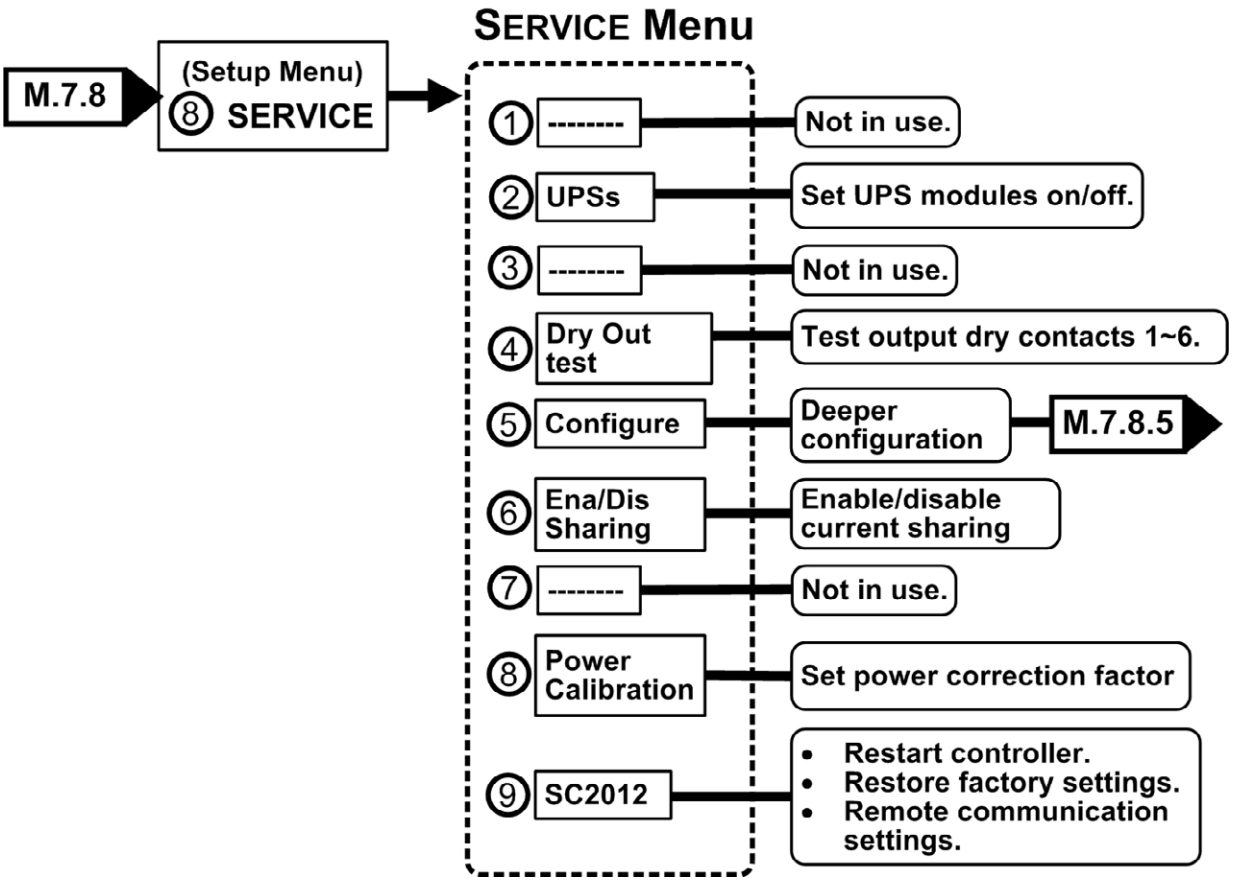


Figure 26: Flowchart: Service menu

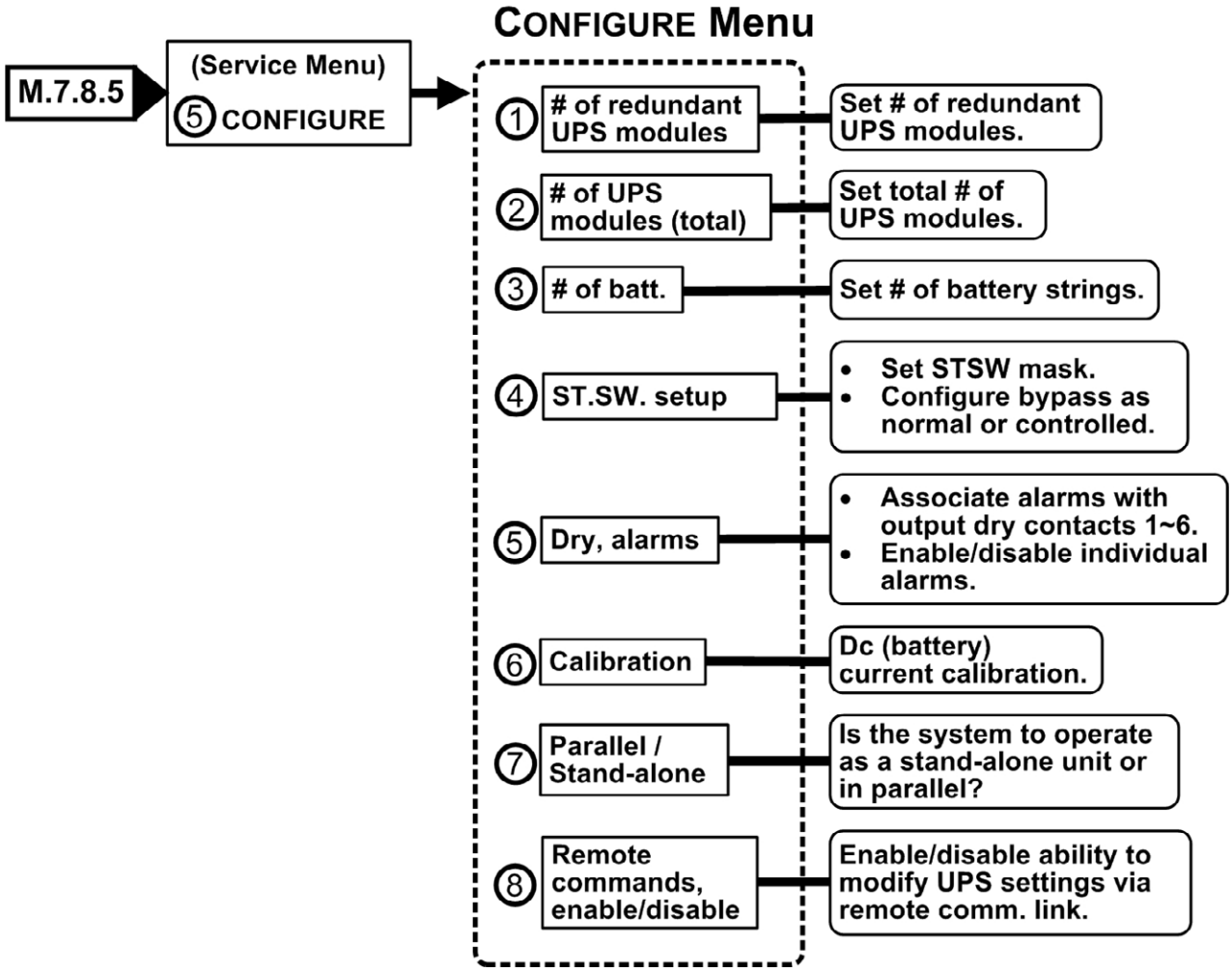


Figure 27: Flowchart: Configuration menu

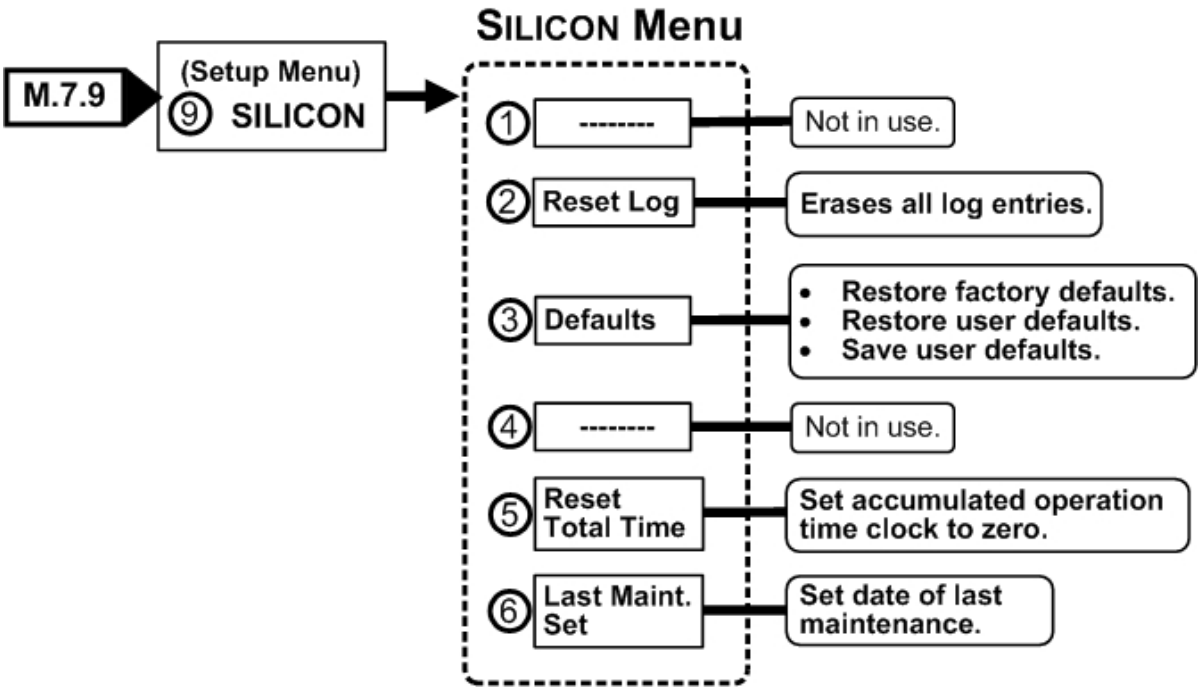


Figure 28: Flowchart: "Silicon" menu

7. POWER+ MENU FUNCTIONS IN DETAIL

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

7.1 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.*

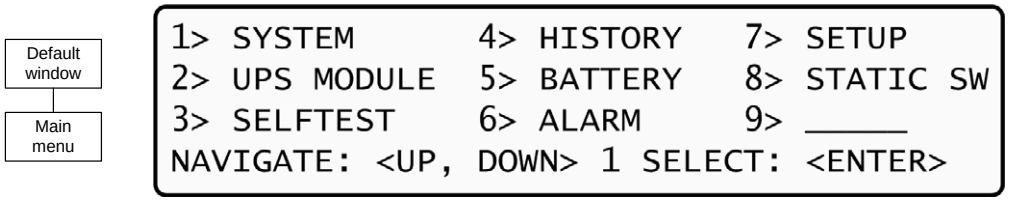


Figure 29: Main menu

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

7.1.1 System

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

Main menu → Option 1

```
BATT CURR: -----→TOTAL +053.0A
BATT POS.: 216V   BATT  +053.2A (0531)
BATT NEG.: 216V
BATT VOLT: 432V
```

Figure 30: System DC voltages

Note: *The example shown in Figure 30 illustrates only 1 battery installed.*

Press the ► key to view the results of power factor 0.[2]

System menu → Option 1

OUTPUT	PH1	PH2	PH3	TOTAL
KVA	000.4	000.2	000.2	000.8
KW	000.0	000.0	000.0	000.0
P.F.	0.00	0.00	0.00	0.00

Figure 31: Power factor 0

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

System menu → Option 1

OUTPUT	PH1	PH2	PH3	TOTAL
KVA	003.2	002.8	002.8	008.8
KW	001.6	001.6	001.6	004.8
P.F.	0.50	0.59	0.58	0.55

Figure 32: Power factor 0.5

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

System menu → Option 1

OUTPUT	PH1	PH2	PH3	TOTAL
KVA	001.5	001.5	001.5	004.5
KW	001.5	001.5	001.5	004.5
P.F.	1.00	1.00	1.00	1.00

Figure 33: Power factor 1

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

Select System (1).

Press the ▼ key to view the next windows, shown in Figure 34 through Figure 42.

[2] 1KVA 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 1000VA 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 1, on page 6.

System menu
Option 1

```
PHASE:  -L1--       -L2--       -L3-
IN:  121V/022.0A 119V/022.0A 120V/021.0A
OUT: 120V/021.0A 120V/021.0A 120V/021.0A
----- TOTAL UPS IN/OUT MEASUREMENTS ----
```

Figure 34: Overall phase voltages/currents

System menu
Option 1

```
TOTAL    TIME: 00004 HOURS
CURRENT SESS.: 00004 HOURS
BOOTS  SO FAR: 00001 TIMES
```

Figure 35: 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. JP3:      ON  9. JP9:     ON
```

Figure 36: 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. JP3:      ON  9. JP9:     ON
```

Figure 37: Jumper settings WITH remote panel

Note: *In Figure 38 and Figure 39, "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: 0941V                    VOLTAGES
5VP  : GOOD
5V2  : GOOD          -12VDC: GOOD
```

Figure 38: Controller – internal voltages

System menu
Option 1

```
BATTERY CHARGE LEVEL:    010Ah    050%
WHILE TOTAL CAPACITY:    020Ah
REMAINING BACKUP:        0010   MINUTES
BATTERY TEMPERATURE:     12°C
```

Figure 39: Battery temperature

Note: *The data displayed in Figure 39 depend on the options installed and configured. See Figure 80 on page 58 and Figure 97 on page 61.*

System menu
Option 1

```
BATT FUSE:  BAD      EMERGENCY:  OPEN
USER-1:     OPEN     USER-4:     OPEN
USER-2:     OPEN     7:          OPEN
USER-3:     OPEN     8:          OPEN
```

Figure 40: Status of batt. fuse and input dry contacs

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 41: 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 42: Communication with inverter – receive

7.1.2 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 43.
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 44 and Figure 45 below show parameters of the first module of 4 modules (UPS: #01/04).

Main menu
Option 2

```
  Next screens show data on all UPSs.
Use up, down arrow keys to select a UPS.
      Use left, right arrow keys
   to view different UPS parameters.
```

Figure 43: Instructions

Main menu
Option 2

```
PHASE:  -L1--       -L2--       -L3-
IN:  121V/012.0A 119V/011.3A 120V/010.1A
OUT: 120V/015.0A 120V/000.0A 120V/005.0A
UPS:# 01/04
```

Figure 44: Module phase voltages/currents for module 1 of 4

System menu
Option 2

```
BATT   VOLT  I-ACTIVE
BATT+: 216V  L1   000
BATT-: 216V  L2   000
UPS: #01/04  L3   000
```

Figure 45: Battery voltages for module 1 of 4

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

7.1.3 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 46. 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.

Main menu
Option 3

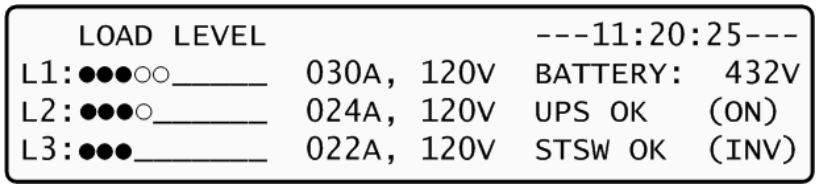


Figure 46: Result screen from self-test

7.1.4 History (logs)

From the main menu select option 4 (HISTORY) to display the window shown in Figure 47. The last 255 events reserved in the LOG are displayed, as shown in Figure 48.

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

Main menu
Option 4

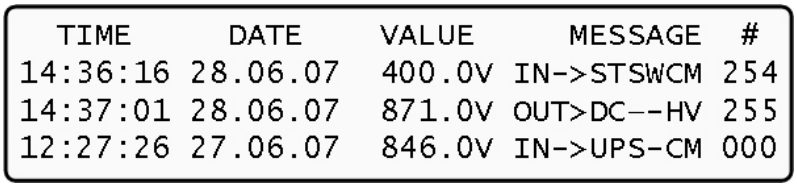


Figure 47: History logs

Navigate the LOG by scrolling using the ◄ and ► keys.

Main menu
Option 4

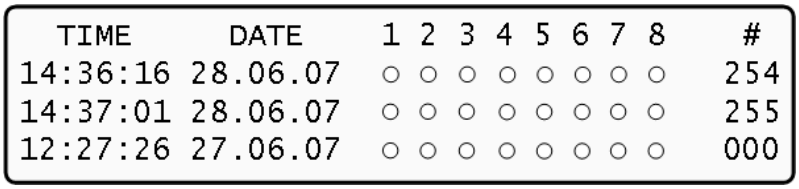


Figure 48: History log scroll

Table 3 below itemizes the log messages that appear on the controller panel.

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 51 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.

7.1.5 Battery

From the main menu select option 5 (Battery) to display the window shown in Figure 49.

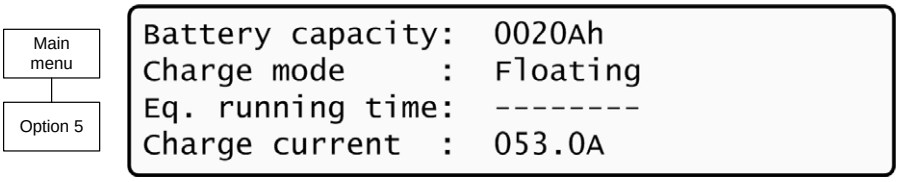


Figure 49: Battery status

Press the ▼ key to view the next window.

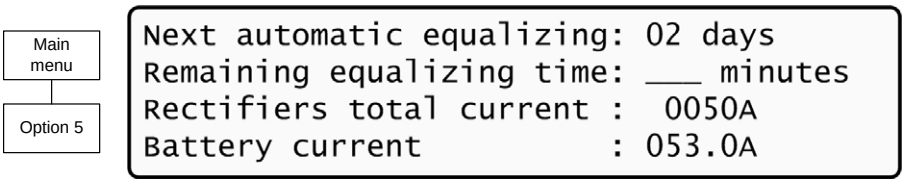


Figure 50: Battery equalizing

Press the ▼ key to view the next window.

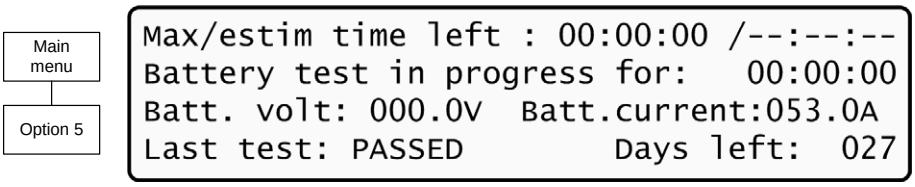


Figure 51: Time left

Note: *Figure 52 through Figure 54 show the individual batteries on the left and the overall total on the right. In the examples shown, only one battery is installed.*

Press the ▼ key to view the next window.

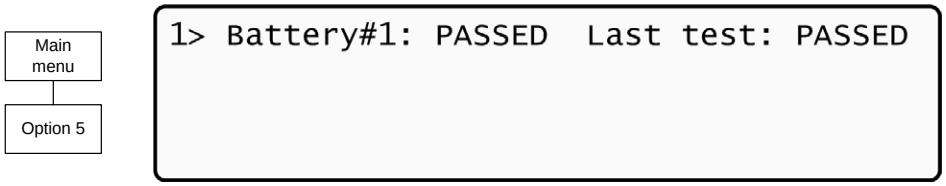


Figure 52: Last test

Press the ▼ key to view the next window.

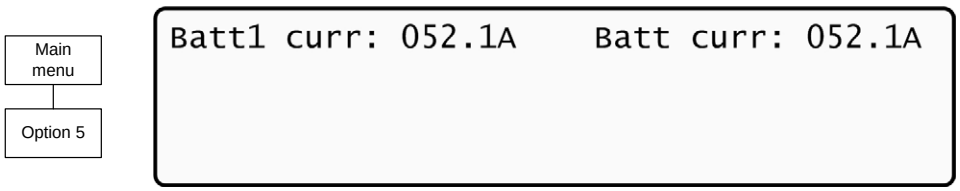


Figure 53: Battery current

Press the ▼ key to view the next window.

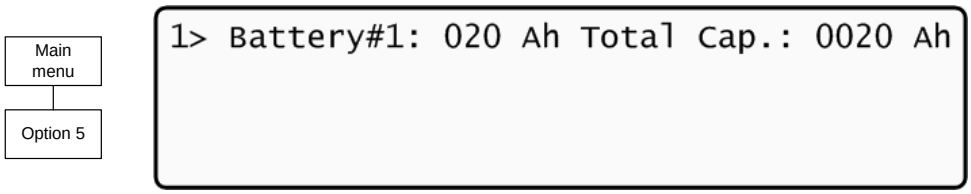


Figure 54: Battery capacity

Press the ▼ key to view the next window.

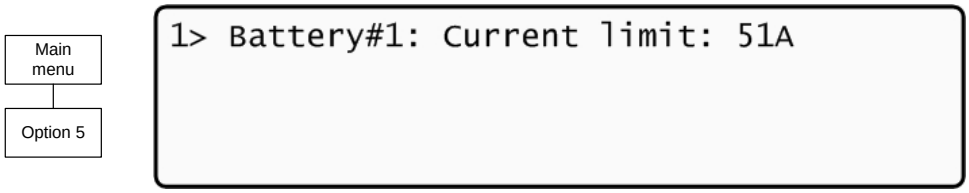


Figure 55: Battery current limit

7.1.6 Alarm

From the main menu select option 6 (Alarm) to display the window shown in Figure 56.

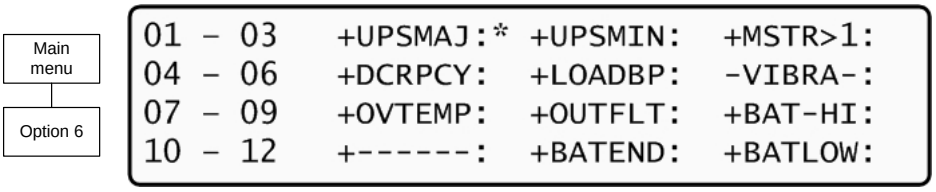


Figure 56: Alarms 01-12

Press the ▼ key to view the next window.

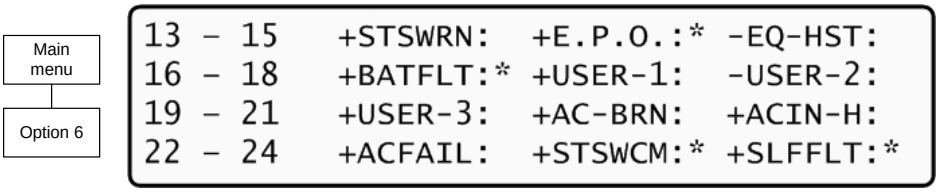


Figure 57: Alarms 13-24

Press the ▼ key to view the next window.

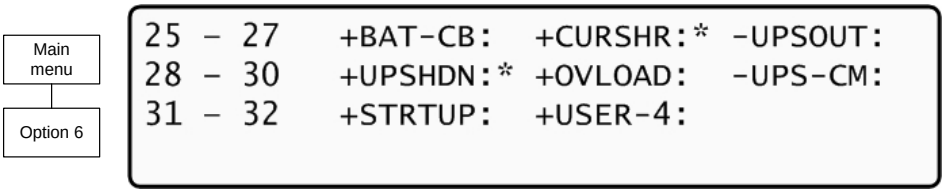


Figure 58: Alarms 25-32

7.1.7 Setup menu

From the main menu select option 7 (Setup) to display the window shown in Figure 59.

Main menu → Option 7

```
          POWER+ System Setup
Type in Level-1 PASSWORD, THEN - ENTER
Your privilege will expire after 15 min.
PASSWORD:_________
```

Figure 59: Level 1 password access

Using the keypad, type the password and press the Ent button. The setup main menu will show up on the panel as shown in Figure 60.

Press the ▼ key to view the next window.

Main menu → Option 7

```
1> Alarm set    5> Time     9> Silicon
2> Module conf. 6> Site
3> Battery      7> Password #1
4> Charge       8> Service
```

Figure 60: Setup menu

Setup menu → Option 1

```
1> AC VOLT      5> --------- 9>INTEGRAT.
2> FLOAT VOLT   6> ---------
3> ---------    7> TEMPERATURE
4> ---------    8> ---------
```

Figure 61: Setting AC voltage alarm thresholds

Alarm set menu → Option 1

```
1> SET AC HIGH & LOW ALARM LEVELS
2> SET AC ALARMS HYSTERESIS

PLEASE SELECT                    1
```

Figure 62: Setting AC voltage levels

Alarm AC voltages → Option 1

```
AC VOLT SETUP:  NOMINAL    220/230 VAC
       ----  AC ALARM SETUP ----
     AC-LOW                AC-HIGH
      185V                   286V
```

Figure 63: AC voltage alarm setup

Alarm AC voltages → Option 2

```
SET AC VOLT ALARMS HYSTERESIS VALUE
            (1 - 20) VOLT

                 05
```

Figure 64: AC voltage hysteresis

Alarm set menu → Option 2

```
1> BATEND
2> BATLOW
3> ------
4> BAT-HI              SELECT ITEM:1
```

Figure 65: Battery parameters for alarm

Alarm set menu → Option 2

```
FLOATING CHARGE SETUP

VOLTAGE SETTING: 340.0V
```

Figure 66: Battery floating charge setup for alarm

Alarm set menu → Option 7

```
1> OVER TEMPERATURE
2> UNDER TEMPERATURE

PLEASE SELECT
```

Figure 67: Alarm battery temperature menu

Alarm temp. → Option 1

```
SET OVER TEMPERATURE ALARM VALUE
            ( 2 - 99)DEGREES
```

Figure 68: Alarm battery maximum temperature setting

Alarm temp. → Option 2

```
SET UNDER TEMPERATURE ALARM VALUE
            ( 1 - 98)DEGREES

                 01
```

Figure 69: Alarm battery minimum temperature setting

Alarm set menu
Option 9

```
SET INTEGRATION FACTOR
              (1 - 30)

ENTER = ACCEPT    05        ESC = DISCARD
```

Figure 70: Alarm integration factor setting

The Alarm Integration Factor determines the number of times that the controller polls and retries to determine the USP 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.

Setup menu
Option 2

```
 --- MODULE CONFIGURATION SETTINGS ---
1. NUM OF PHASE       4.UPDATE VOLT/FREQ
2. MODULE/S FREQUENCY 5.OUTPUT ADJUST
3. MODULE/S VOLTAGE   6.FREQUENCY LIMITS
```

Figure 71: Line configuration menu

Module config menu
Option 1

```
 --- MANUAL/AUTO NUM OF PHASE SETUP ---1
SELECT-1: FORCE 3 PHASE       (SELECTED)
SELECT-2: AUTO
SELECT-3: FORCE 1 PHASE
```

Figure 72: Setting number of phases

Module config menu
Option 2

```
---      SET MODULE/S FREQUENCY     ---
SELECT - 1 HARD (DIP DEPEND.)
SELECT - 2 SET 60HZ           (SELECTED)
SELECT - 3 SET 50HZ
```

Figure 73: Setting the sine wave frequency

Module config menu
Option 3

```
Module/s voltage    4: 118V
1: 110V             5: 120V
2: 113V             6: 125V
3: 115V  (selected) 5: 130V
```

Figure 74: Setting the module voltage

Module config menu
Option 4

```
      Nominal Voltage & Frequency
    have been sent to all modules.
Please verify all modules were updated!
    Exit this mode by pressing Esc.
```

Figure 75: Setting confirmation

Module config menu

Option 5

```
 -----  Select a phase to adjust  -----
Select – 1: Phase # 1
Select – 2: Phase # 2
Select – 3: Phase # 3
```

Figure 76: Output fine-tuning adjustment – select phase

Module config menu

Option 5

```
 ----  Select a module to adjust  ----

                    01
 ---- Use Up/Down, Enter, or Esc. ----
```

Figure 77: Output fine-tuning – select module

Module config menu
Option 5

```
------  Set a value to adjust   ------
                              Phase:   1
                    00        Module: 01
---- Use Up/Down, Enter, or Esc. ----
```

Figure 78: Output fine-tuning – select value

Module config menu
Option 6

```
 ---     Set frequency limits      ---
1: No Change         4: +/- 3Hz
2: +/- 1Hz  (slctd) 5: +/- 4Hz
3: +/- 2Hz           6: +/- 0.5Hz
```

Figure 79: Output fine-tuning – set frequency limits

Setup menu
Option 1

```
1> TEST-VOLTAGE     5> BATTERY TEST…
2> TEST ALARM       6> CAPACITY 0020 AH)
3> CURRENT-LIMIT    7> 'AUTO' TEST
4> TEMP COMPENSAT.  8> enable/dis options
```

Figure 80: Battery settings menu

Battery menu
Option 1

```
BATTERY (TEST) VOLTAGE SETUP

VOLTAGE SETTING: 352.0V
```

Figure 81: Battery Test Voltage Setup

Battery menu
Option 2

```
BATTERY (TEST) VOLTAGE ALARM     360.0 V
```

Figure 82: Battery test voltage alarm setup

Battery menu
Option 3

```
1> Current limit value setup
2> Enable current limit          (  ON )
                                   1
Press '2' to toggle enable/disable
```

Figure 83: Current limit setup menu

Curr. limit menu
Option 1

```
1> Set c. limit of battery #1   (50A)
```

Figure 84: Battery current limit setup

Curr. limit menu
Option 2

```
Charge current limit setup

Current   limit:  50A
```

Figure 85: Charge current limit setup

Battery menu
Option 4

```
1> Temperature compensation value setup
2> Enable temp. compensation     (  OFF)
3> Set absolute max & min voltages    1
Press '2' to toggle enable / disable
```

Figure 86: Temperature compensation menu (disabled)

Temp comp.
Option 1

```
1> Temperature compensation value setup
2> Disable temp. compensation   (2.0 mV)
3> Set absolute max & min voltages    1
Press '2' to toggle enable / disable
```

Figure 87: Temperature compensation menu (enabled)

Battery menu
Option 5

```
1> Set absolute minimum output voltage
2> Set absolute maximum output voltage
--== Active in floating mode only ==--
Please select.                        1
```

Figure 88: Battery Test – Setting floating mode voltages

Floating mode
Option 1

```
Absolute minimum voltage while cmpensat.

Voltage setting: 400.0V
```

Figure 89: Battery Test – Set min. compensation voltage

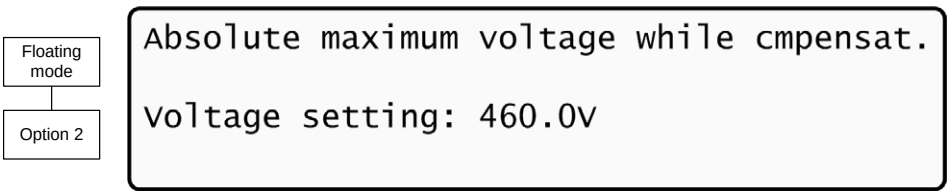


Figure 90: Battery Test – Set max. compensation voltage

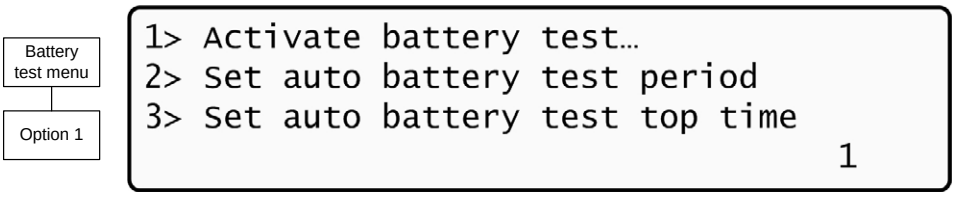


Figure 91: Battery test – settings

Batt. test options
Option 1

```
Max/estim. Time left: 05:27:00 /--:--:--
Battery test in progress for:   00:00:00
Batt. volt: 432V  Batt. Current: ---
Press 'Enter' to start.
```

Figure 92: Battery testing

Batt. test options
Option 2

```
Set batt test period
                (1 – 50) weeks

                  --
```

Figure 93: Battery test – setting test period

Batt. test options
Option 3

```
Set top time for battery test
                (1 – 9) hours

Enter = accept    05       Esc = discard
```

Figure 94: Battery test – setting maximum time

Setup menu
Option 4

```
1> -----
2> Floating parameters setup.
3> -----                          (Eq:off)
4> -----                             1
```

Figure 95: Setup – setting equalizing/floating parameters

Equalizing menu
Option 2

```
Floating charge setup

Voltage setting: 864.0V
```

Figure 96: Setup – setting floating voltage

Battery submenu
Option 5

```
1> Disable shutdown by long ac fail(on )
2> Enable current sensors          (off)
3> Enable batt temperature sensor  (off)
Select & press to toggle enable/disable
```

Figure 97: 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.

Setup menu
Option 5

```
Set real time

Year   Month   Day   Hour   Min   Sec
2011   09      30    23     58    00
```

Figure 98: Setup - setting real Time

Setup menu
Option 6

```
Site number: 013271
```

Figure 99: Setup - configuring the site number

Setup menu
Option 7

```
Change password

            --------
      Press Esc to abort
```

Figure 100: Setup - changing the password

Setup menu
Option 8

```
1> ---------- 4> Dryout test 7> --------
2> UPSs       5> Configure   8> --------
3> ---------- 6> ----------- 9> SC2012
Select, then Enter
```

Figure 101: Setup - service menu

Service menu
Option 2

```
1234
++++
SET UPSs   (UP= ON<+>, DOWN= OFF<->)
Enter =  Execute            Esc= Go back
```

Figure 102: Service – selecting the UPS

Service menu
Option 4

```
Relay status:
Press 'UP' and repeat for relay test(04)
123456                      Contacts 1-6
●●○○●○                      ●=ON,   ○=OFF
```

Figure 103: Service – setting alarm contacts

Service menu
Option 5

```
1> # of UPSs (Redundancy) 5> Dry, Alarms
2> # of UPSs (Total)      6> Calibration
3> # of Batt.     7> Parallel/StandAlone
4> Static Switch Setup       Select 1
```

Figure 104: Service – configuration menu

Service menu
Option 5

```
   Set number of UPSs (Total)


                  04    (01 redundant)
```

Figure 105: Service – setting redundancy

Service menu
Option 9

```
1> Restart controller 3> Network…
2> Factory settings   4> Reset MBX
Your selection: 1     5> --------------
Enter if you are sure (else press Esc.!)
```

Figure 106: Service – SC2012 controller reset menu

Option 1 resets the controller.

Option 2 resets to the configuration to factory default settings.

SC2012 NW menu
Option 3

```
1> Set IP ADDRESS      157.211.000.253
2> Set GATEWAY         157.211.000.251
3> Set MASK            255.255.255.000
4> Store    5> SNMP factor   Select:1
```

Figure 107: Service – SC2012 network setup menu

NW setup menu
Option 1

```
Set IP ADDRESS

              157.211.000.252
```

Figure 108: Service – setting IP address

NW setup menu
Option 5

```
Set SNMP no comm factor value
              (10 - 99)

                  5
```

Figure 109: Service – configuring SNMP

7.1.8 Static Switch

From the main menu select option 8 (Static Switch) to display the window shown in Figure 110.

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 110: 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 111: Static Switch status

7.1.9 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 112: 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 113: Dry Contacts/alarms association – example

7.1.10 Calibration

Configure menu → Option 6

```
1> -----                  5> -----
2> dc-i offset removal    6> -----
3> dc-i calibration       7> -----
4> -----                       Select
```

Figure 114: Calibration

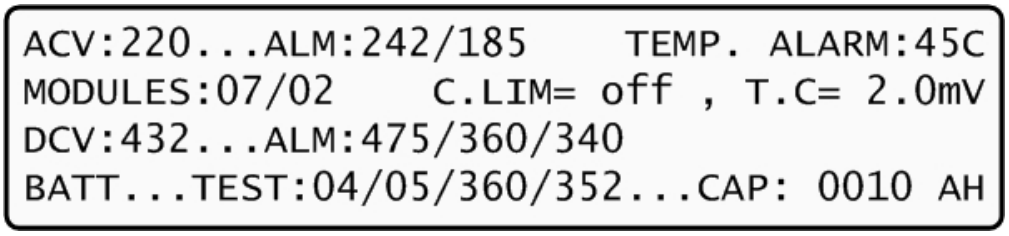
7.2 System controller setup verification

The process described in this section lets you check the controller settings. This verification procedure is available for software versions beginning from 050106.

7.2.1 ACCESS

Press ESCAPE key and hold it for 3S. Using ARROW UP/DOWN key, select GENERAL (8) and press ENTER. **Screen 1** is presented.

7.2.1.1 SCREEN 1



a) ACV: nominal value of the input/output AC voltage (220 for 2x32 batteries ; 110 for 2x16 batteries).

b) ALM: input AC voltage alarm HIGH/LOW

c) TEMP.ALARM: high temperature limit for external thermosensor

d) MODULES: QUANTITY/REDUNDANCY – 07/02 in the screen means that 7 modules are presented in the system, 2 modules are reserve (full load is 10KVA*(7-2)=50KVA/40KW)

e) C.LIM.=off (VALUE)- battery current limit function is de-activated (off) or max. battery current value in Amps. In C.LIM is activated, the system must be equipped with optional battery current sensor.

f) T.C.=2.0mV – negative temperature coefficient of the battery DC voltage in mV per ºC per battery cell. Nominal temperature is 25ºC. For DC nominal voltage 432V , temperature 35ºC, 32 batteries of 6 cells, T.C.=2mV, the voltage is 432- 2*6*32*(35-25)~=428V. NOTE. For most applications T.C. must be 0 (off).

g) DCV: DC nominal voltage for both positive and negative battery sets. For 32 batteries in the set DCV=432V, for 16 batteries 216V.

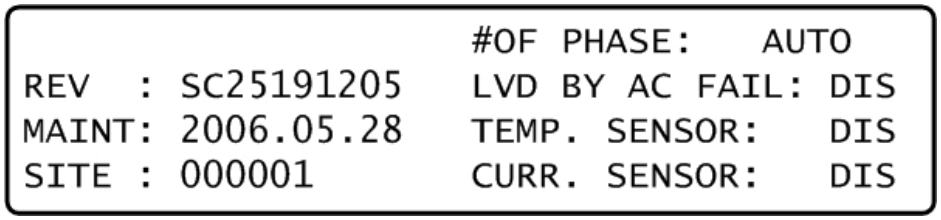
h) DCV …ALM: DC voltage alarms HIGH/LOW/SHUTDOWN. SHUTDOWN alarm is DC voltage value when the unit is stopped due to battery discharge.

i) BATT….TEST: PERIOD IN WEEKS/MAX.DURATION IN HOURS/ALARM VOLTAGE/CHARGER DERATED VOLTAGE. In the screen: the test is performed automatically once per 4 weeks, max. test duration is 5 Hours, if battery voltage drops below 360V alarm Battery Low is given, the chargers of the modules continue to supply voltage 352V to prevent shutdown if battery is faulty.

j) CAP: CAPACITY in Amp-Hours. Used to calculate estimated back-up time of the system and battery test duration.

7.2.1.2 SCREEN 2

To access **SCREEN 2** press the key ARROW RIGHT when SCREEN 1 is selected.



a) #OF PHASE: FORCE 3 for 3 phase output, FORCE 1 for single phase output or AUTO when the mode is defined by DIP SWITCH of the modules.

b) REV: revision of system controller's (SC) software

c) LVD BY AC FAIL: DIS (disabled) or EN (enabled). This function, if enabled, performs system shutdown after 3 Hours of AC failure to prevent deep battery discharge by low current. In most application the function must be DIS.

d) MAINT: YEAR.MONTH.DAY: date of last maintenance

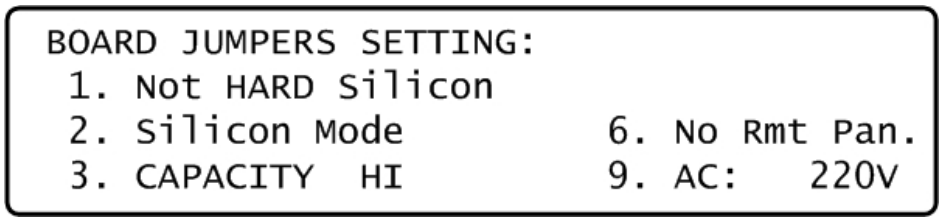
e) TEMP. SENSOR: DIS or EN . External thermosensor is disabled/ enabled. In most applications must be DIS.

f) SITE: the site identification number. Is used in network applications.

g) CURR.SENSOR: DIS or EN. Optional battery current sensor is disabled/ enabled. In most applications must be DIS.

7.2.1.3 SCREEN 3

To access **SCREEN 3** press the key ARROW RIGHT when SCREEN 2 is selected.
The screen presents status of controller board's jumpers.



a) Not HARD Silicon. Must be HARD only initially, during first activation of non-configured controller. After production should be Not HARD Silicon.

b) Silicon Mode. Regular mode allowing setups change. The setups are saved in EEPROM chip.

c) CAPACITY HI (LO). High/low battery capacity mode when battery capacity is more/less than 100AH to achieve optimal resolution of battery current displayed value.

d) No/Yes Rmt Pan. Outputs of SC are not configured/ configured for optional remote panel connection.

e) AC: 220V. Nominal AC input voltage: 220V for 2x32 batteries, 110V for 2x16 batteries in series.

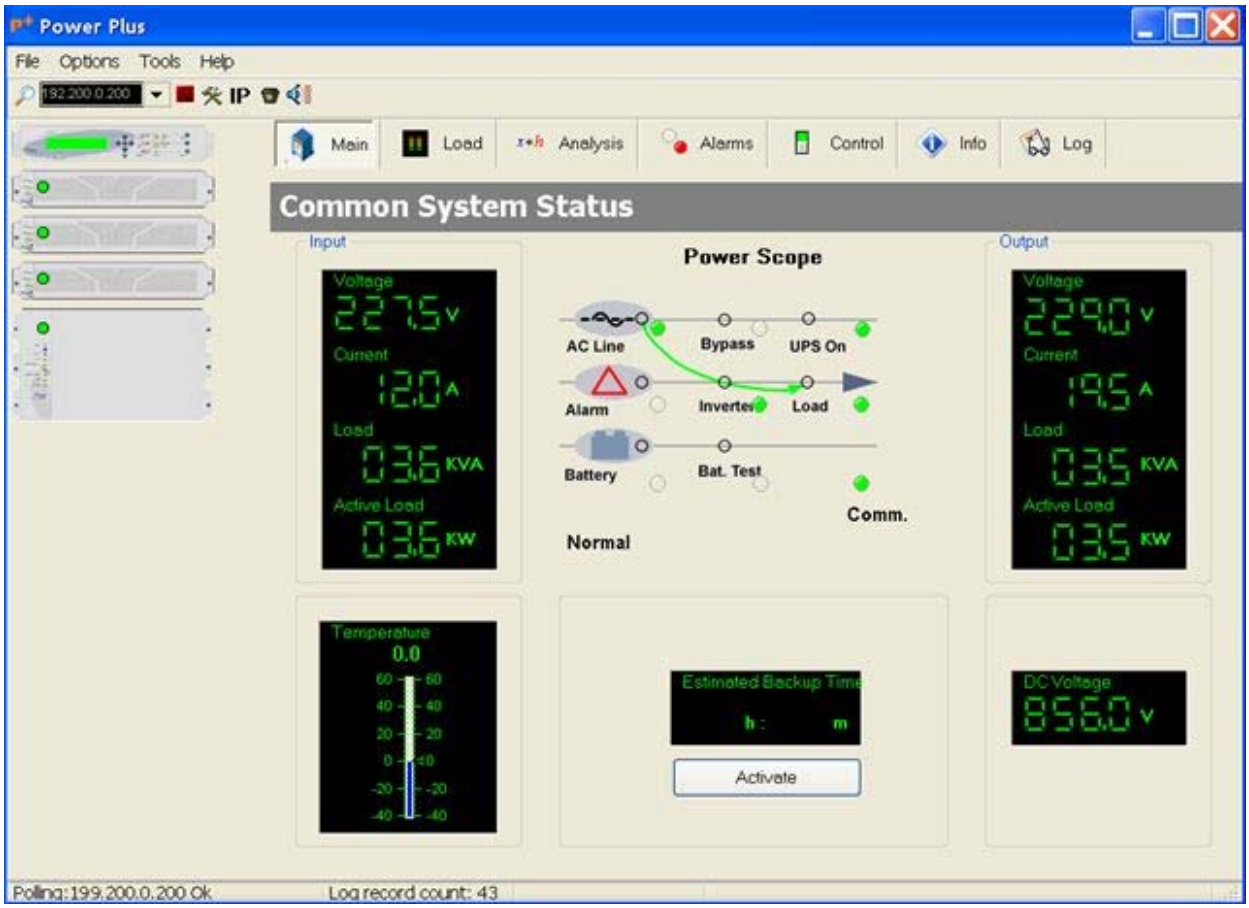
8. SNMP AGENT (OPTION)

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*

9. WING: WIRELESS CONTROL (OPTION)

The ***POWER+*** system includes an option for wireless control and management, using Gamatronic's **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).

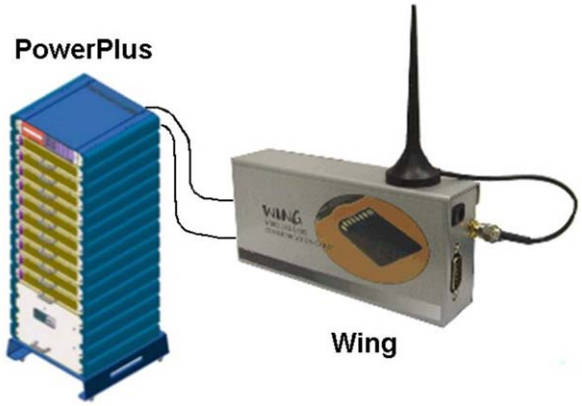


Figure 115: A Wing unit connected to the PowerPlus

9.1 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.

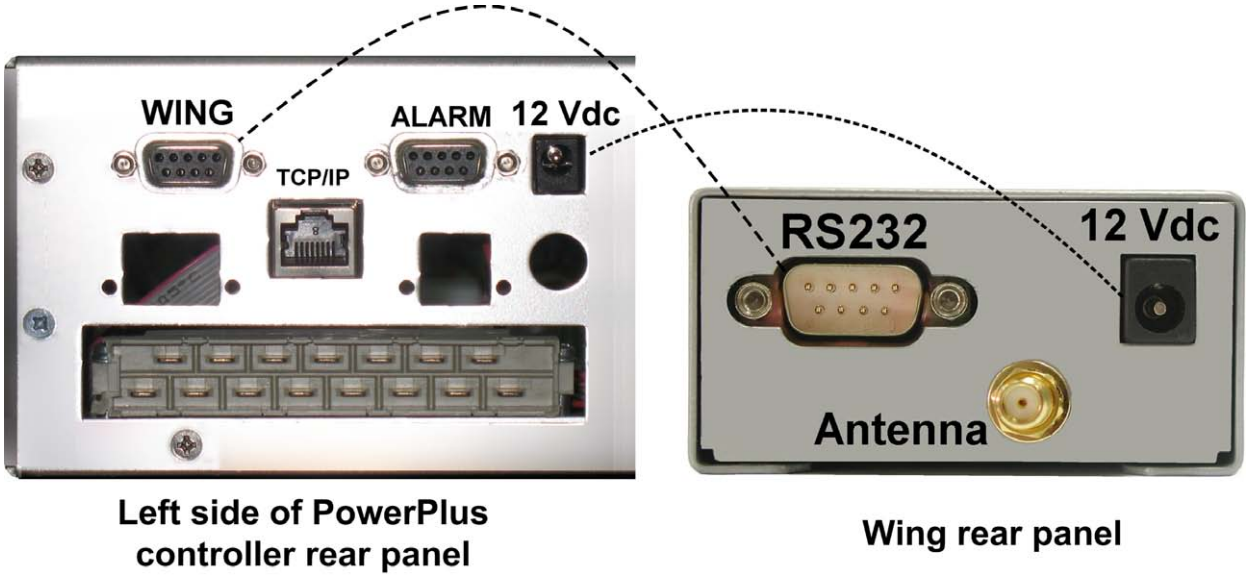


Figure 116: Connections betweent the Power+ controller and the Wing

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.

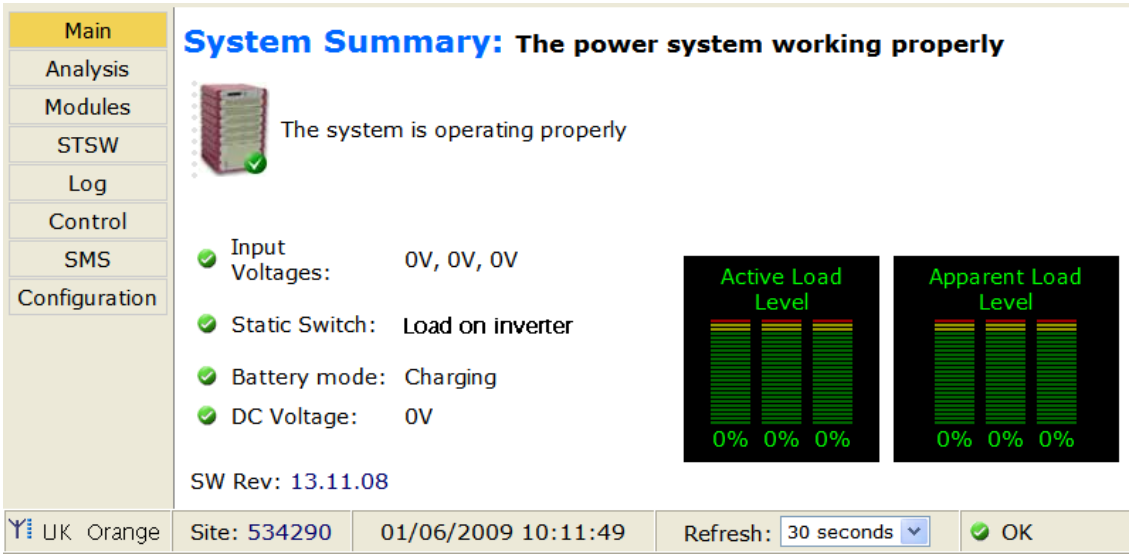


Figure 117: Home screen of the Power+ web interface

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.

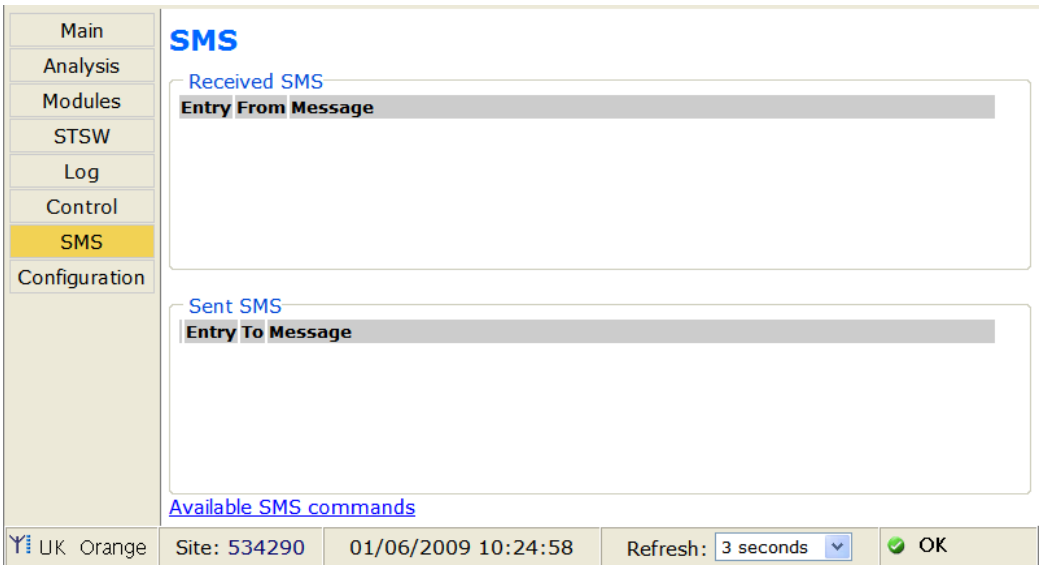


Figure 118: The SMS screen on the Power+ web interface

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

10. RELATED PRODUCTS

10.1 G4

The G4 adds value to your Power+:

- Option to connect external temperatures sensors.
- Input dry contacts available for on/off external sensors.
- Output dry contacts for control of external devices.
- Supports TCP/IP and SNMPv2.
- Controlled shutdown of servers on ac mains power failure, with user-defined time-delay. (*)
- Auto-wake-up of servers on restoration of ac power, after user-defined time-delay. (*),(**)
- Include internal GSM modem (quad-band) for an additional remote control and management link without LAN dependency.
- Bi-directional control via simple SMS commands.
- Automatic response to sensed events. For example, the G4 can be programmed to turn on an air conditioner when it senses that the room temperature has exceeded a user-defined level.
- Notifies designated targets of alarm conditions via email, SMS, and SNMP traps.
- Quick installation.

(*) Not all operating systems supported.

(**) Auto-wake-up requires "wake-on-LAN" BIOS feature on target computers. Not all operating systems supported.

Note: G4 requires disconnection of the Power+ internal network card. Consult Gamatronic's support team before ordering.

10.2 G-Eye

G-Eye adds value to your Power+:

- Option to connect external temperatures sensors, humidity sensors, and frequency sensors.
- Inputs for ac/dc current and voltage measurements through Gamatronic sensors.
- When the measured value moves outside a user-defined range, G-Eye immediately informs pre-selected targets of the alarm condition.
- One 4~20 mA input.
- Input dry contacts available for on/off external sensors.
- Output dry contacts for control of external devices.
- Supports TCP/IP and SNMPv2.
- Controlled shutdown of servers on ac mains power failure, with user-defined time-delay. (*)
- Auto-wake-up of servers on restoration of ac power, after user-defined time-delay. (*), (**)
- Include internal GSM modem (quad-band) for additional backup/control/management without LAN dependency.
- Bi-directional control via simple SMS commands.
- Automatic response to sensed events. For example, the G4 can be programmed to turn on an air conditioner when it senses that the room temperature has exceeded a user-defined level.
- Notifies designated targets of alarm conditions via email, SMS, and SNMP traps.
- Double power feed for reliability.
- Internal battery backup.
- Quick installation.

(*) Not all operating systems supported.

(**) Auto-wake-up requires "wake-on_LAN" BIOS feature on target computers. Not all operating systems supported.

Note: G4 requires disconnection of the Power+ internal network card. Consult Gamatronic's support team before ordering.

11. THE POWER+ BUILT-IN WEB INTERFACE

The Power+ Web interface enables you to control your Power+ unit from a distance over an Ethernet network, using an HTML browser interface.

11.1.1 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:

   a. **Setup >** (enter your password, then press Ent; default password is 8 left arrows) **> Service > SC2012 > Network.**

   b. From the Network menu, choose **IP Address** and enter the assigned IP address.

   c. From the Network menu, choose **Gateway** and enter the assigned Gateway address.

   d. From the Network menu, choose **Mask** and set the assigned subnet mask.

   e. 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 119 below.

Figure 119: 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 120 below).

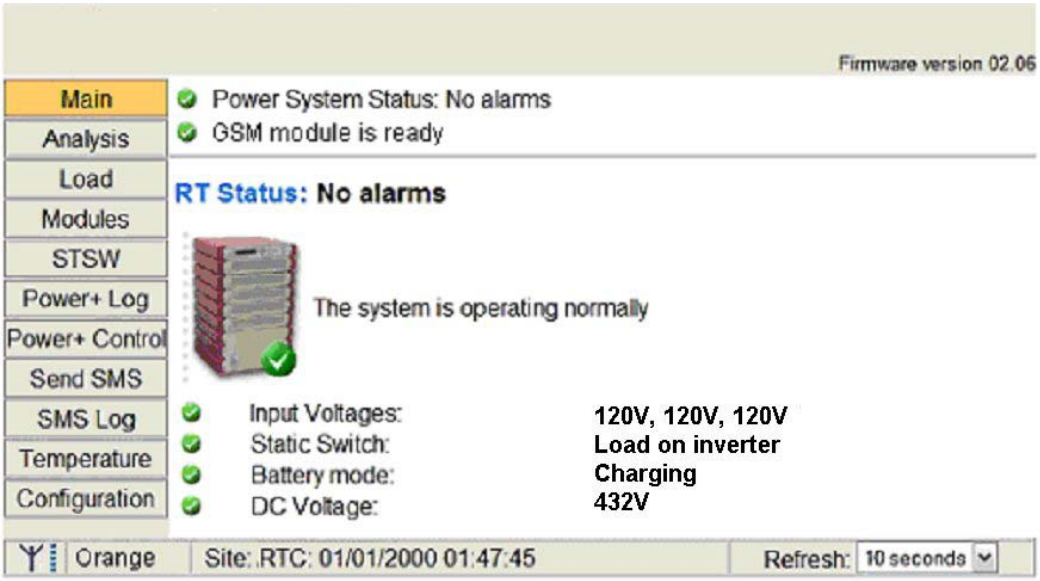


Figure 120: Main Screen of the Power+ Web interface

11.2 Main Screen

The Main Screen (see Figure 120 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)

ITEM	DESCRIPTION		
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 120 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.

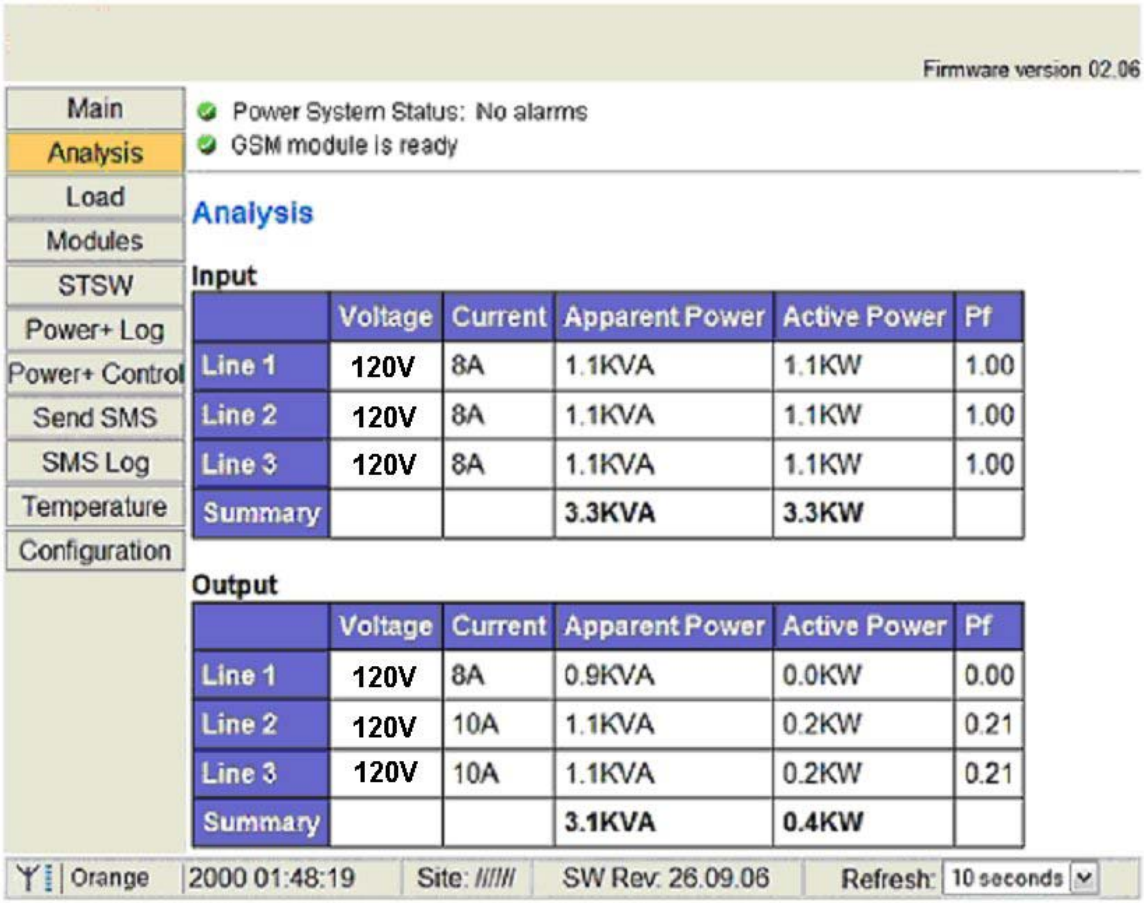
Table 7: Main Menu options

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 Manu 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.



Input

	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	

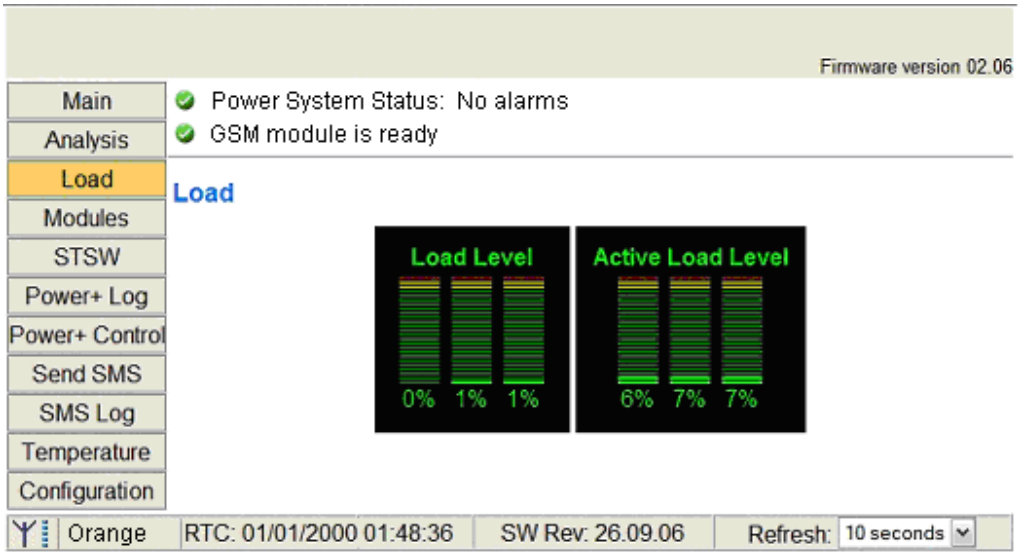
Output

	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	

Figure 121: 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.

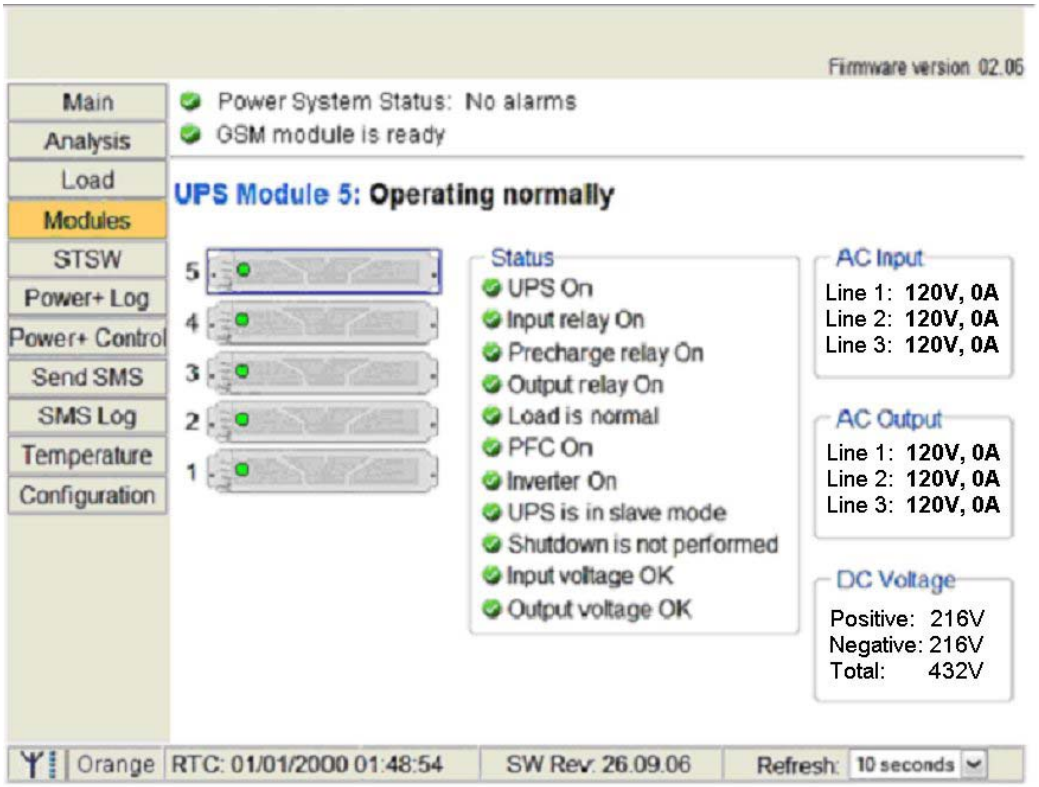


Figure 122: Modules measurements and status display

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 123 below.

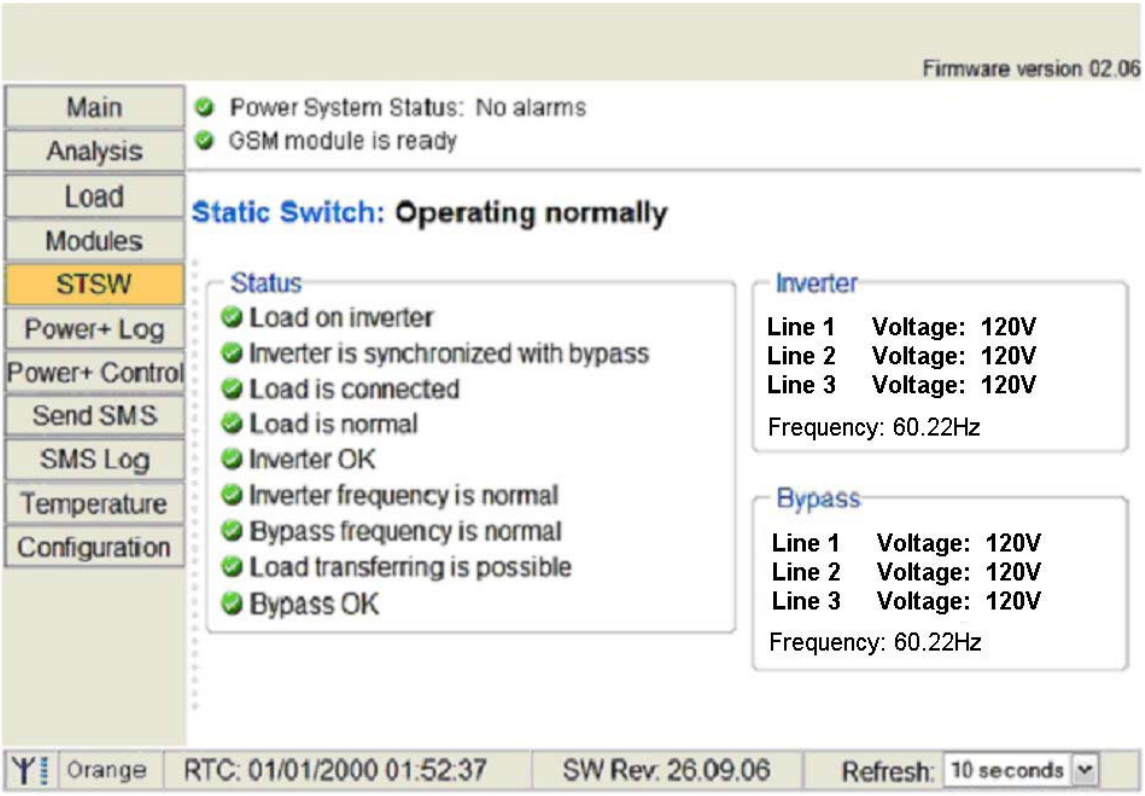


Figure 123: Static Switch data and status display

11.3.5 "Power+ Log" main menu option

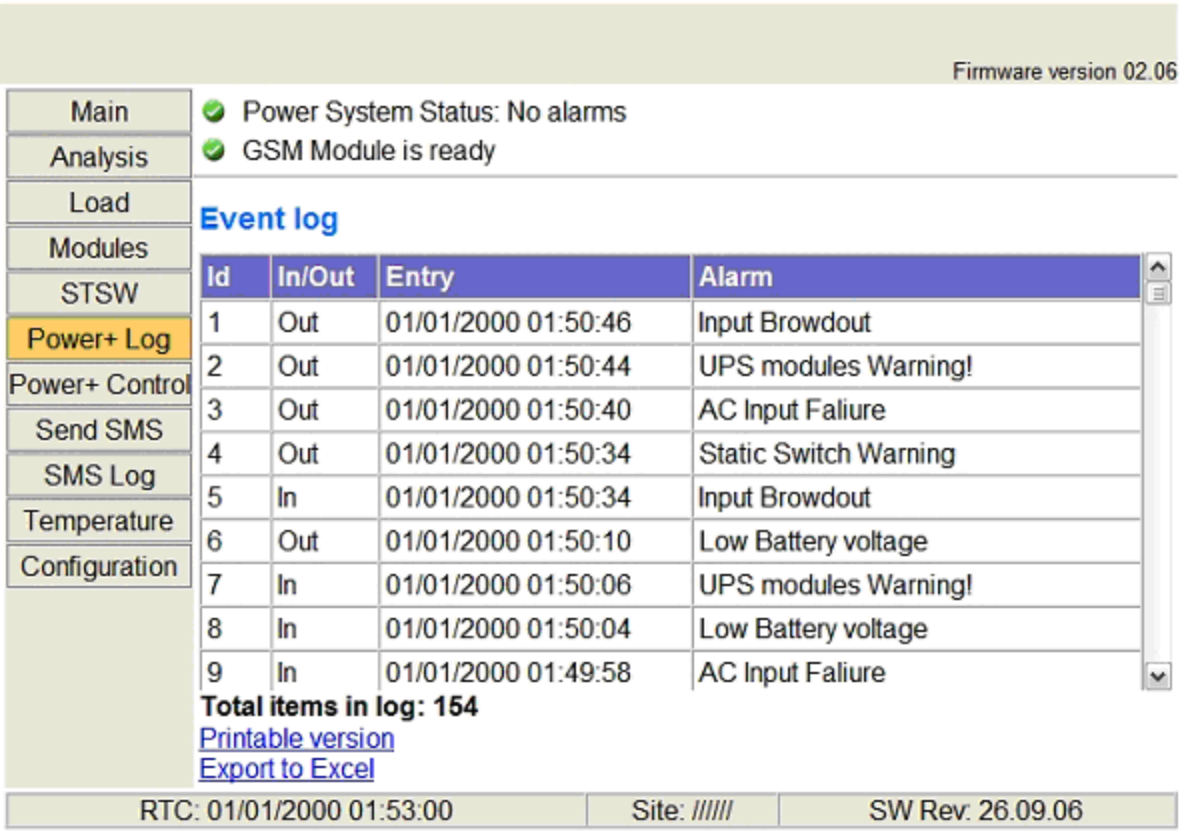


Figure 124: Listing the log entries

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 50 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.

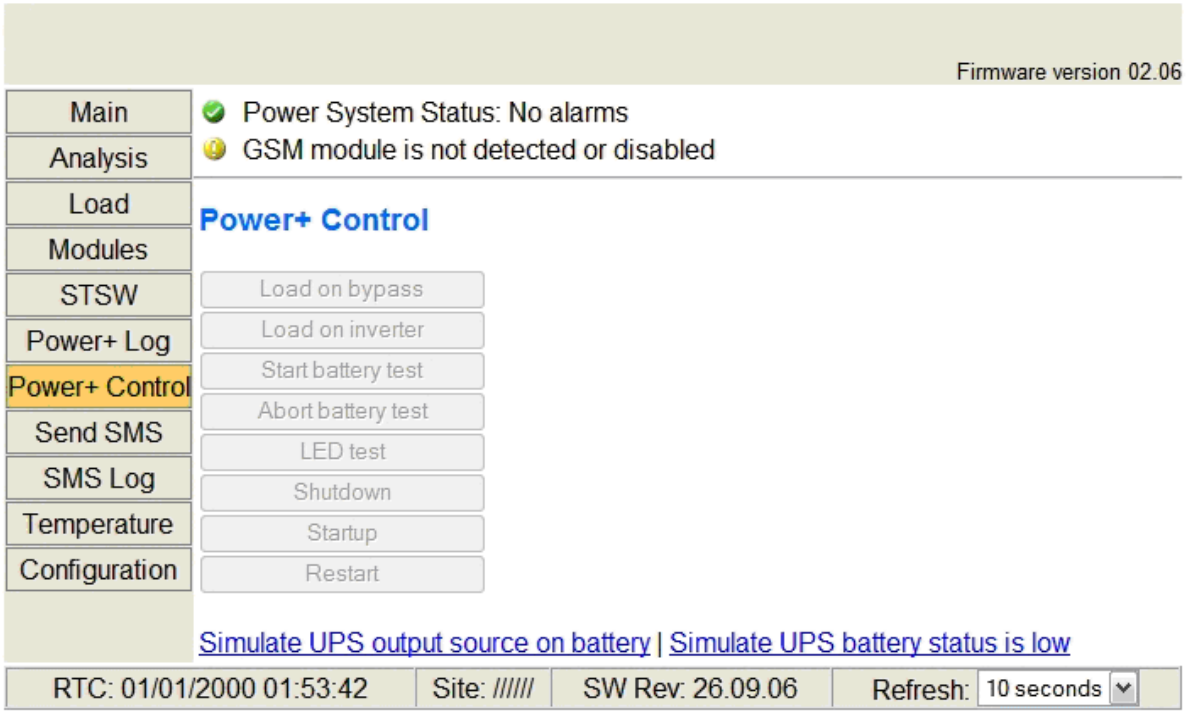


Figure 125: The "Control" main menu option screen

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.

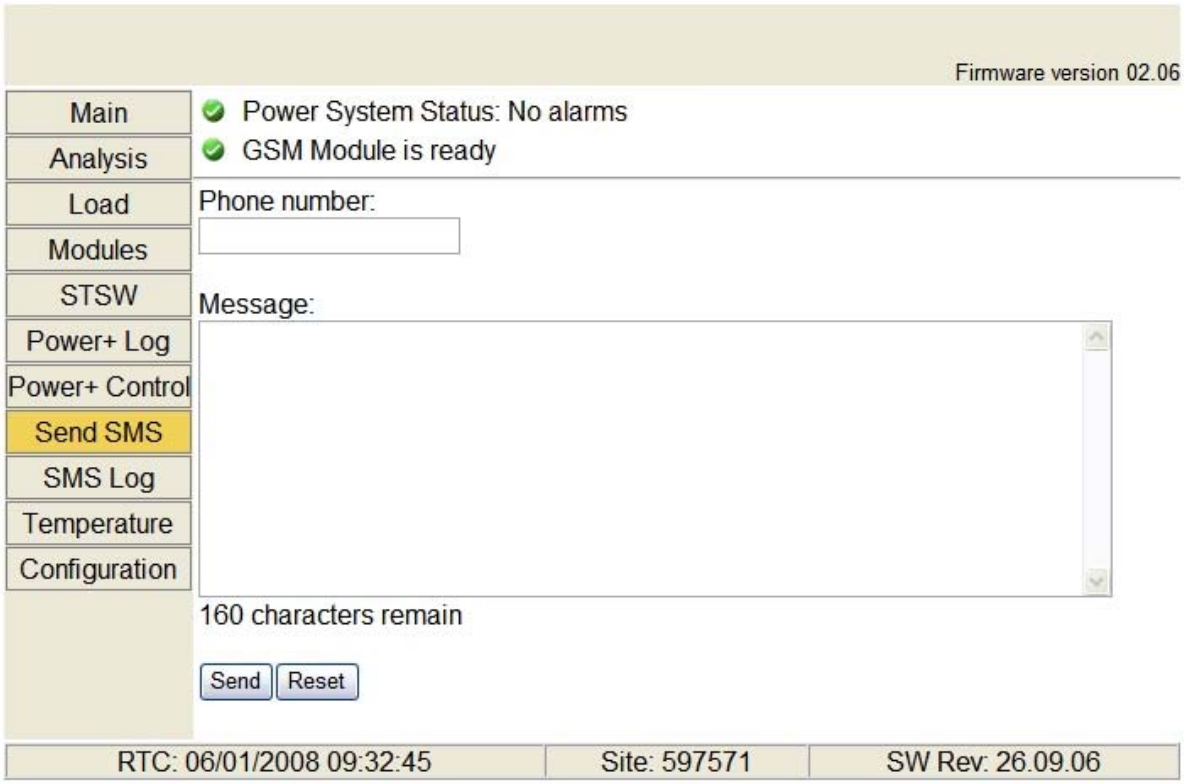
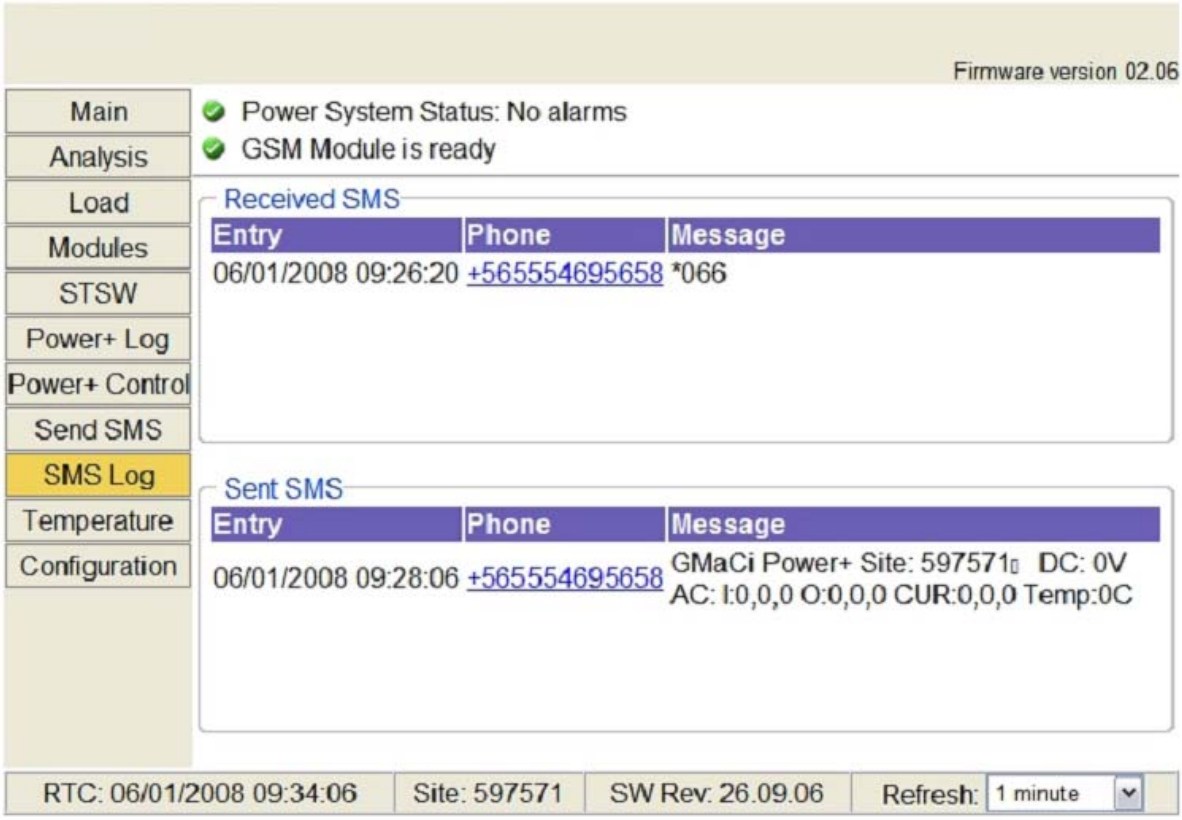


Figure 126: "Send SMS" screen

11.3.8 “SMS Log” main menu option

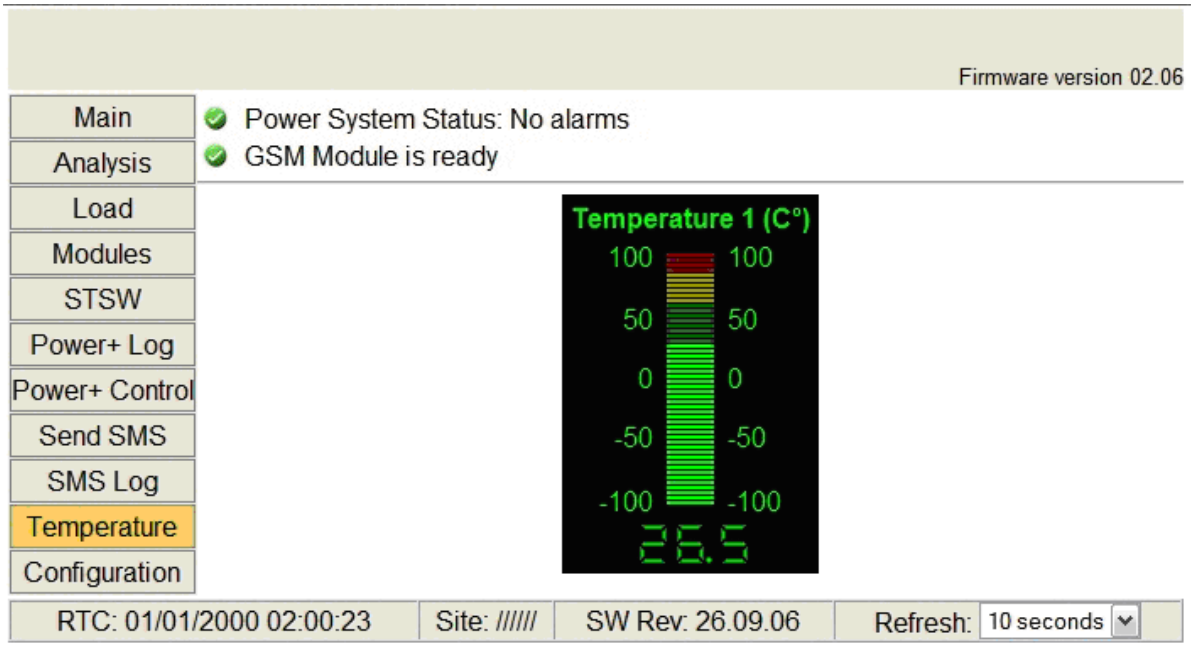
On Power+ units equipped with the optional GSM cellular communications module, the “SMS Log” main menu option enables the user to display latest 256 SMS



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.



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.

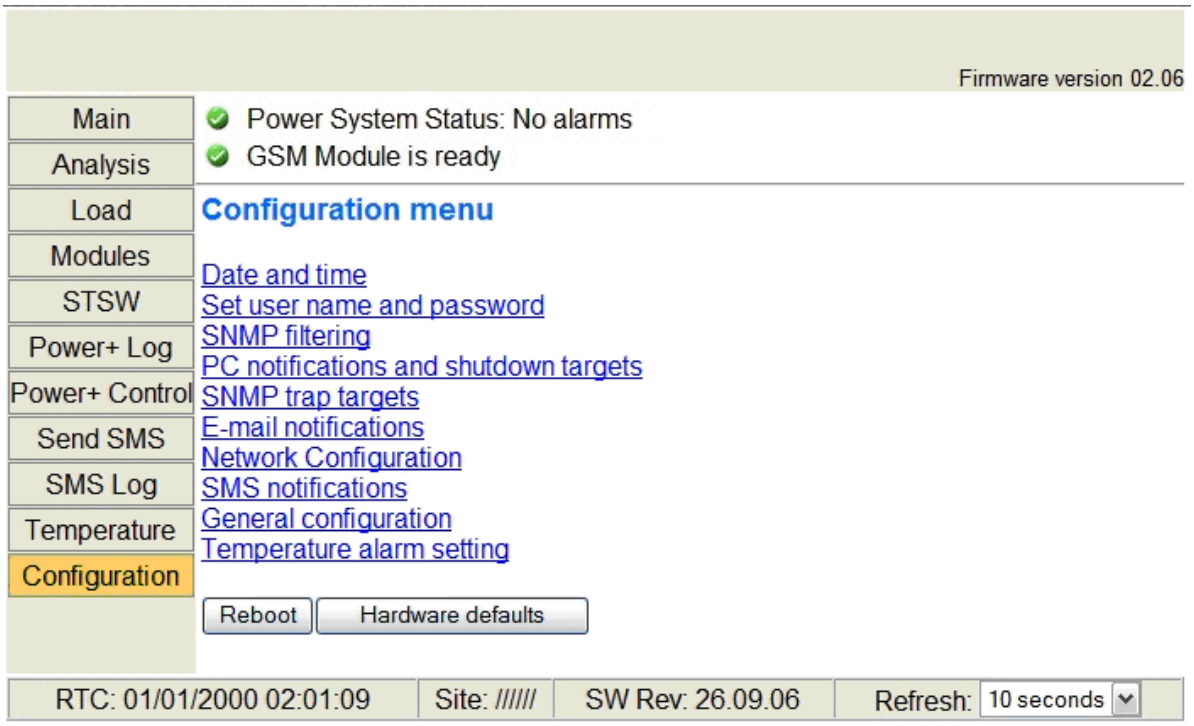


Figure 127: Configuration menu

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.

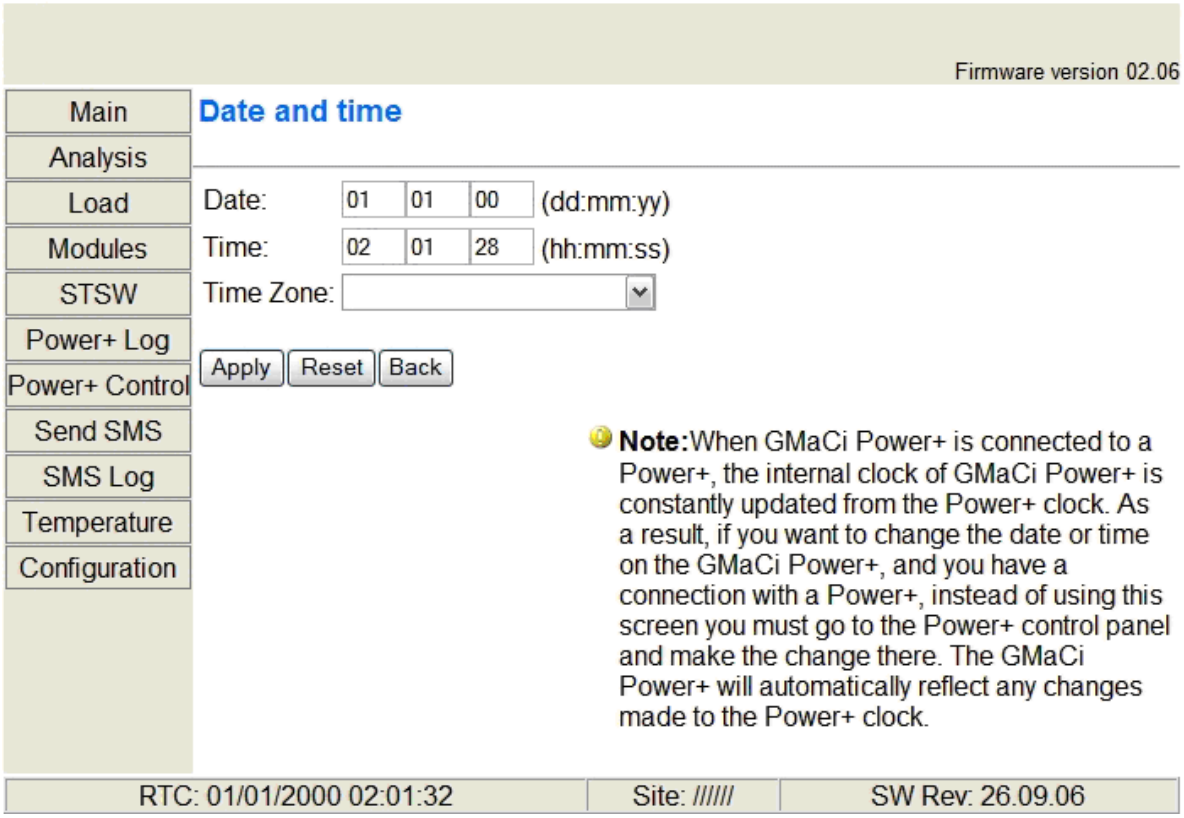


Figure 128: Setting the Power+ internal date and time

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.

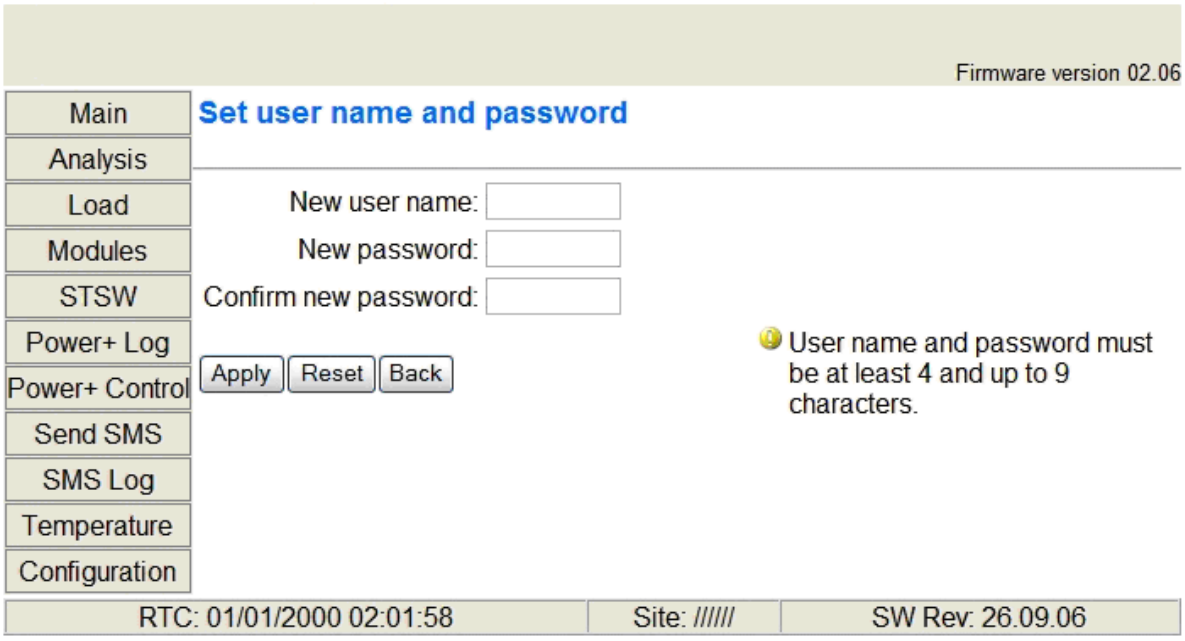


Figure 129: Changing username and password of the Web interface

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.

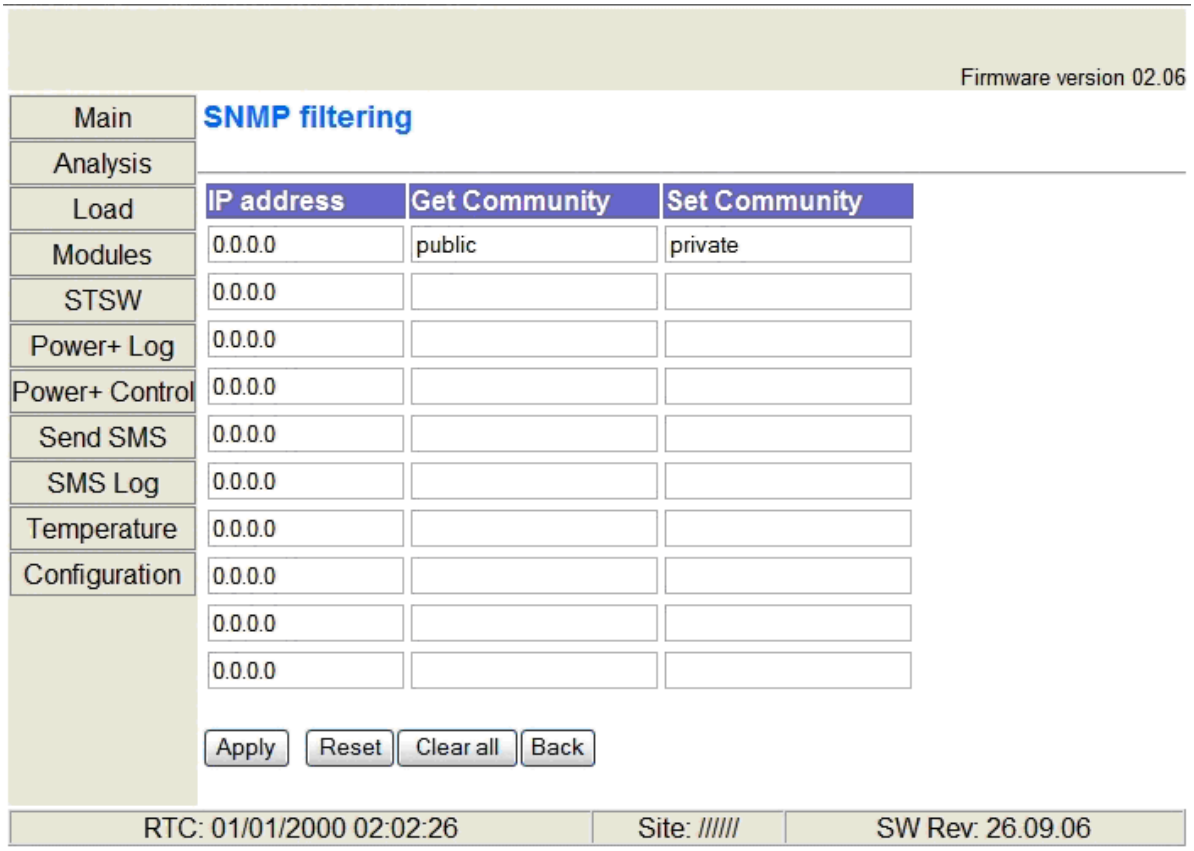


Figure 130: Define SNMP permissions

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 is delivered on a compact disk (CD) that accompanies the UPS.

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 8 on page 67).

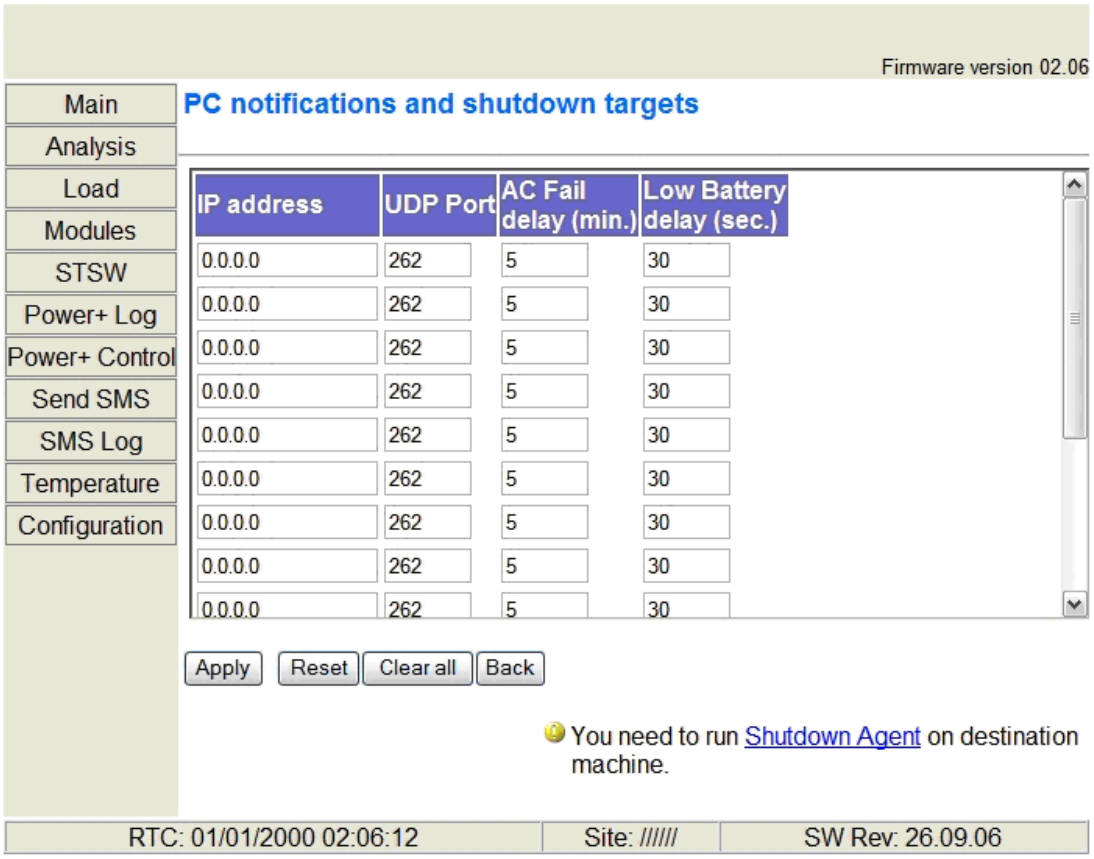


Figure 131: Define computers for auto-shutdown

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.

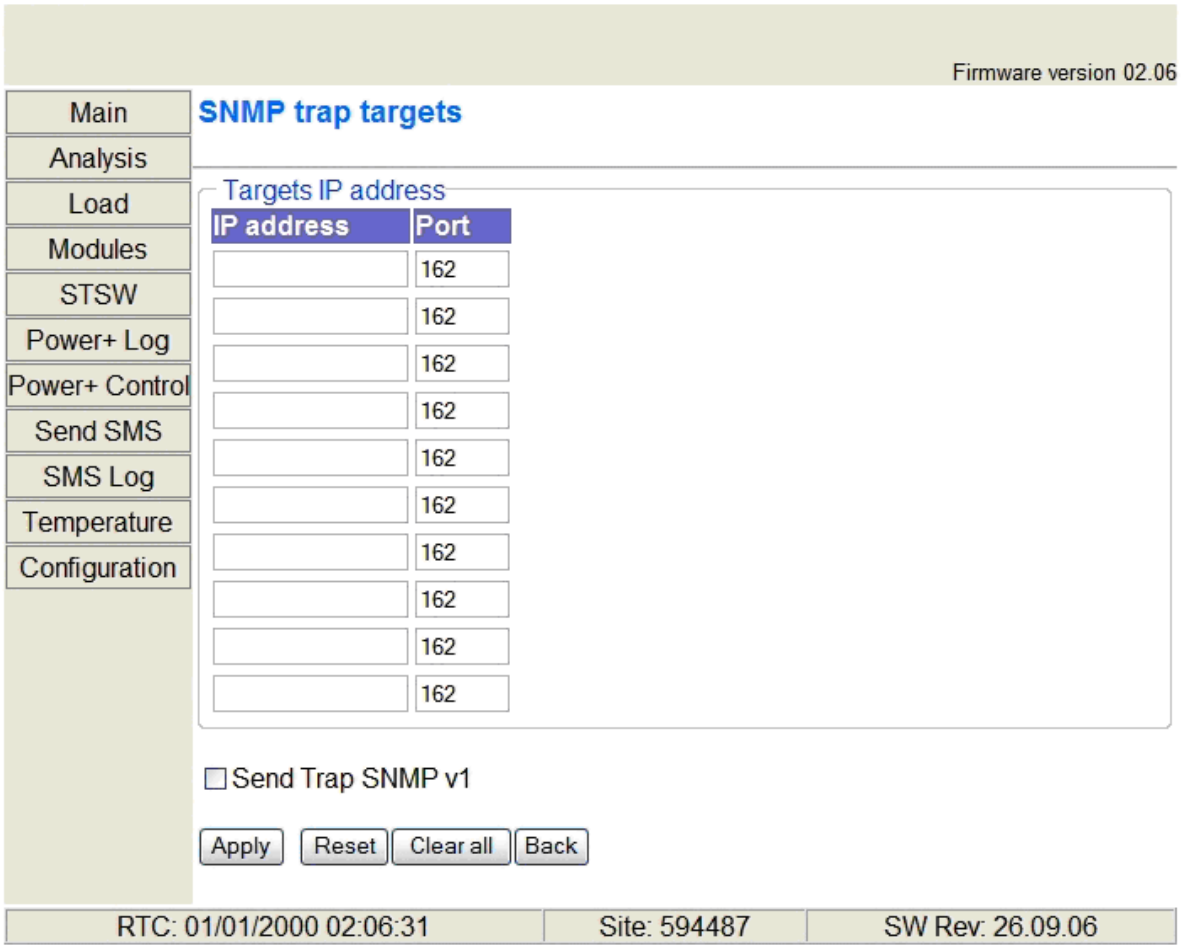


Figure 132: Defining SNMP trap targets

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..

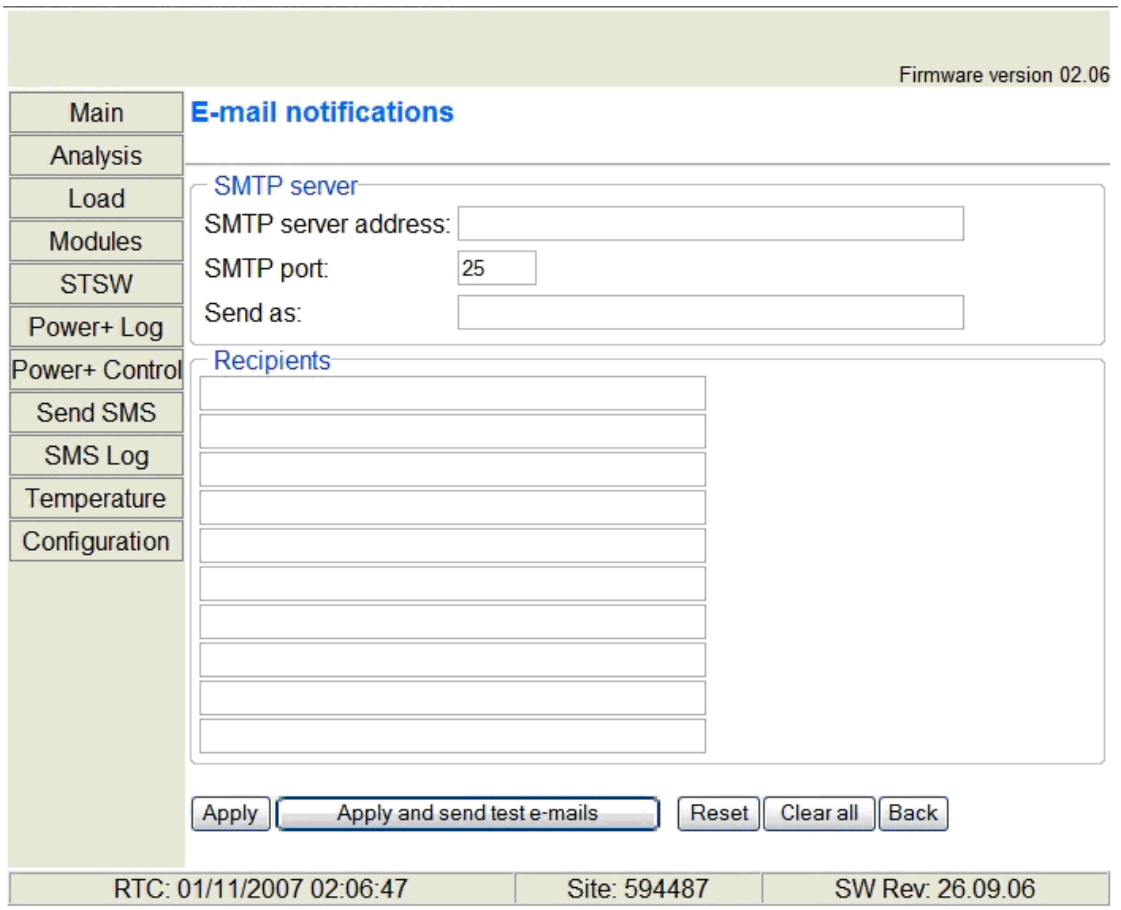


Figure 133: Defining email notification targets

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.

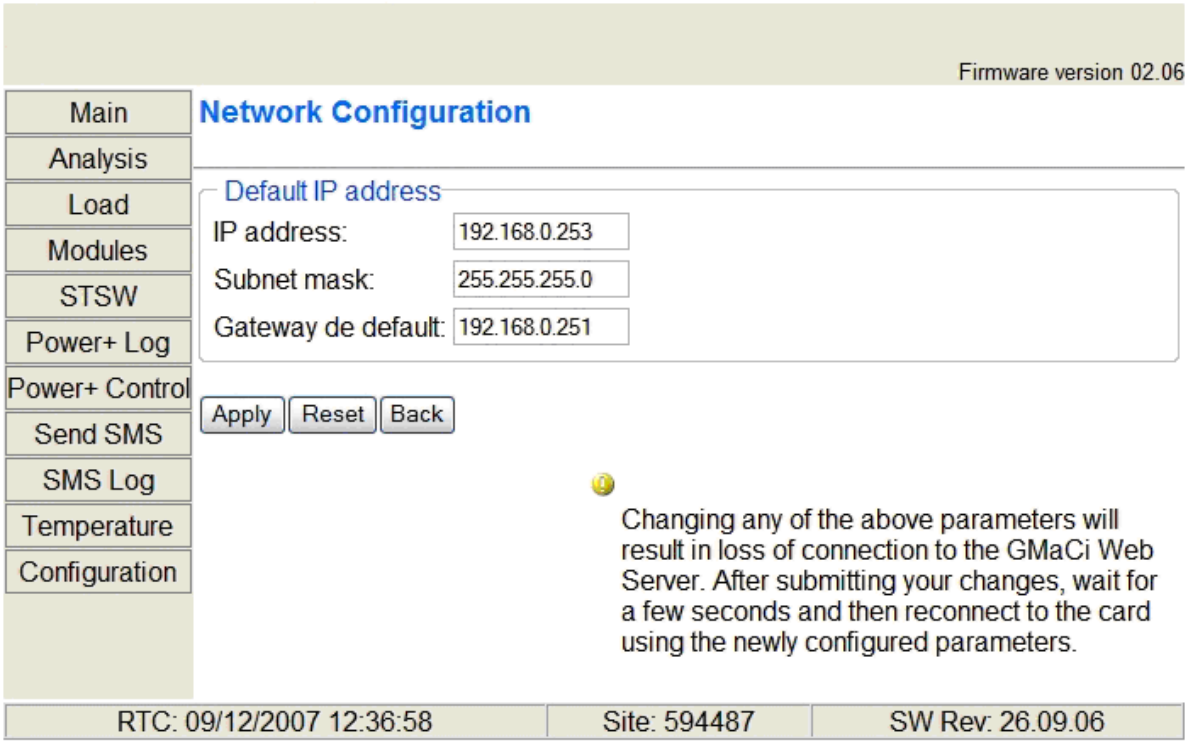


Figure 134: Configuring network communication parameters

11.3.10.8 Defining SMS notification targets

The “SMS notifications” option of the configuration menu enables you to define telephone numbers that are to receive notification via SMS in the event of specific alarm conditions on the Power+.

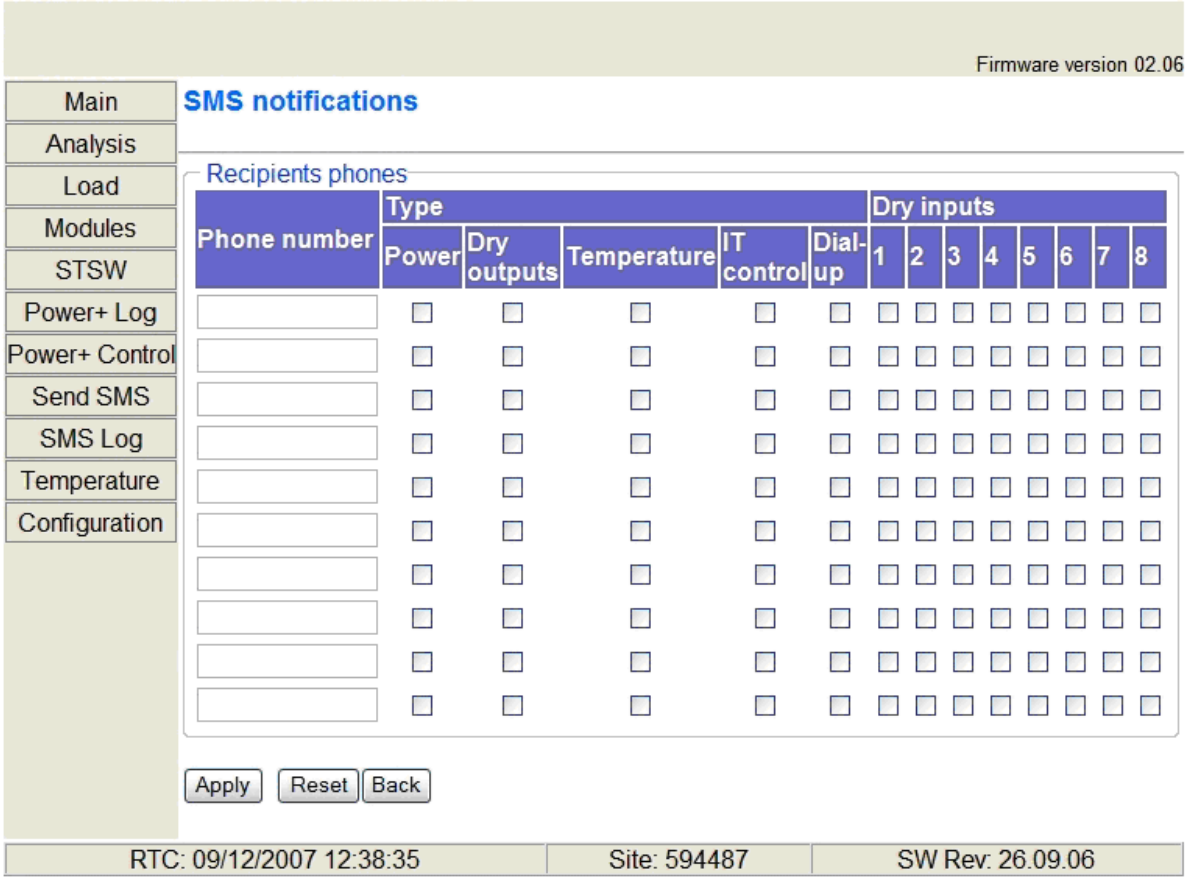


Figure 135: Defining SMS notification targets

Table 12: Fields in the SMS notification target definition screen

FIELD	DESCRIPTION
Phone number	Specify the phone number to which the SMS notification will be sent. The notification includes an indication of the type of alarm.

The remaining fields (the checkboxes) in the screen currently have no effect and are ignored by the system

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 136 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 system specifications in section 14.

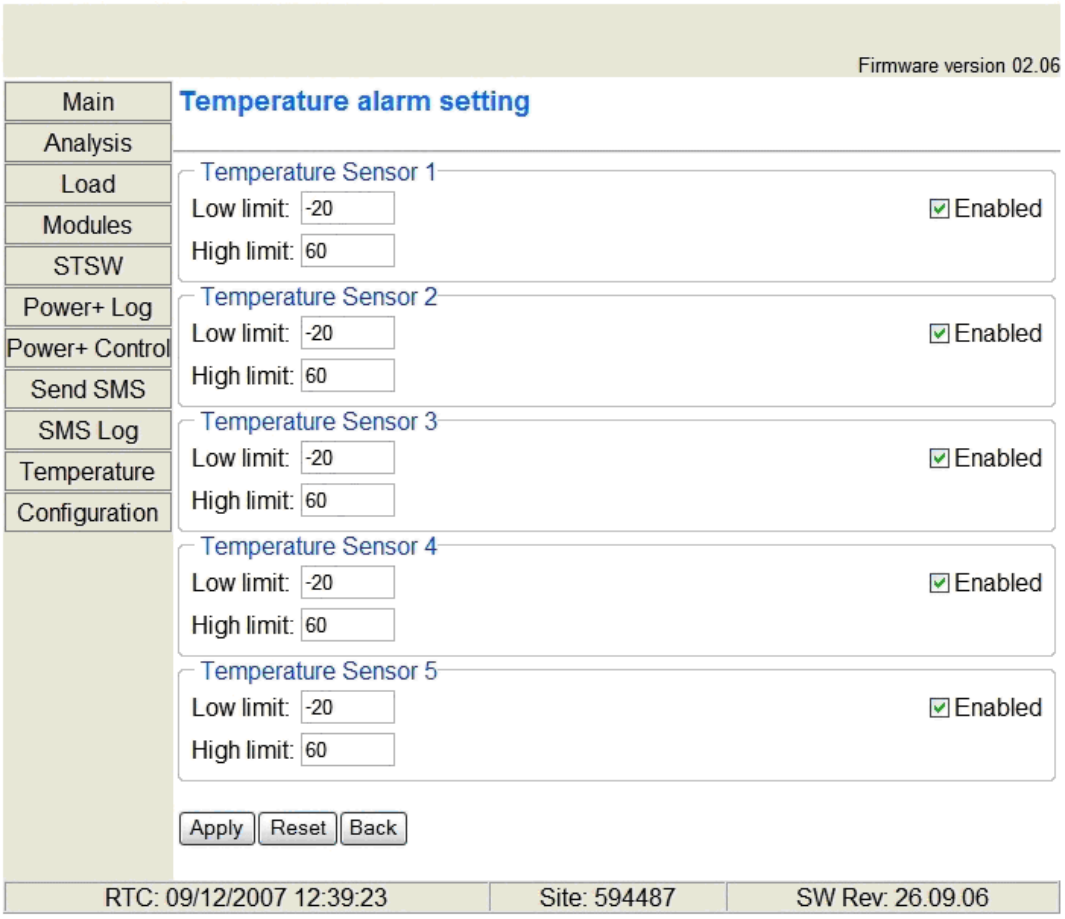


Figure 136: Set temperature alarm threshold

12. OPERATING THE MAINTENANCE BYPASS SWITCH

Maintenance bypass is an optional feature. In maintenance bypass mode, the UPS output terminals continue to supply power to the load, but the interior of the UPS is isolated from all power flows. This enables a technician to safely work on the UPS (after turning off the battery circuit breaker or disconnecting the battery fuse) without any interruption of power to the load.

12.1 Putting the UPS in maintenance bypass mode

In normal operation, the maintenance bypass switches are positioned as shown in Figure 137.

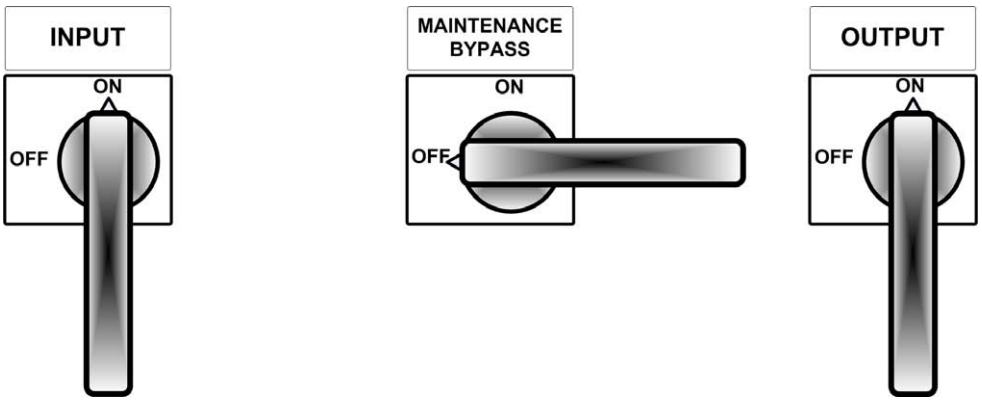


Figure 137: Normal position of the maint. bypass switches

To put the system in maintenance bypass mode:

1. On the system's front panel, press the INV/BYP button twice to put the UPS in bypass mode.

Then, using the three maintenance bypass switches on the UPS rear:

2. Turn ON the maintenance bypass switch (the middle switch).

3. Turn OFF the OUTPUT switch (the right-side switch).

4. Turn OFF the INPUT switch (the left-side switch).

The switches are now positioned as shown in Figure 138

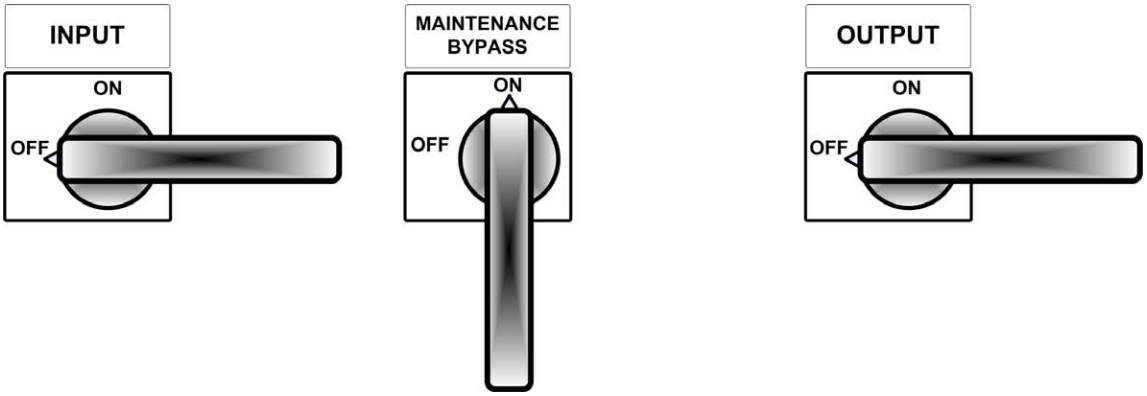


Figure 138: Switch positions in maint. bypass mode

5. Turn OFF the battery circuit breaker on the UPS rear panel.

The system is now in maintenance bypass mode.

12.2 Returning the UPS to normal operation

To move the system from maintenance bypass mode to normal operation mode:

1. Turn on the battery circuit breaker.

Then, using the three maintenance bypass switches on the UPS rear panel:

2. Turn ON the INPUT switch (the left-side switch).

3. Turn ON the OUTPUT switch (the right-side switch).

4. Turn OFF the MAINTENANCE BYPASS switch (the middle switch).

5. On the UPS front panel, press the INV/BYP button twice to put the UPS in inverter mode.

The UPS is now in normal operation mode.

13. TECHNICAL SPECIFICATIONS

Table 13: Specifications for the RM 50 kVA N.Am. Std. model

POWER+ TECHNICAL DATA	
Topology	True On-line Battery, Double Conversion, VFI
Construction	Modular parallel hot-plugged modules
Operation	Continuous
Input	
Voltage	
Voltage range	+15 % and -25 %
Current	28 A per module – no inrush current at startup
Frequency	47 Hz – 63 Hz
Power walk-in	< 60 s
Power Factor	0.99
THDI	5 %
Output	
Rated power for 3-3 configuration:	10 kVA / 8 kW to 50 kVA / 40 kW
Frequency tracking range	±2 Hz
Slew rate	1 Hz / sec
Voltage	3 × 208 V + N (3x120 V)
Static Regulation	±1 %
Regulation for unbalanced load	±1 % for 100 % unbalanced load
Dynamic resp. to 100% load step	±2 %
Overload	110 % for 10 min., 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	±160 V to ±216 V
Quantity: In optional external cabinet	32 × 12 V (40 Ah) 2 x 32 x 12 V (40 Ah)
Type	Sealed, lead acid, rechargeable
Typical battery runtime: with 100 % load: with 50 % load:	 4.5 min. 17 min.
General	
Maximum power dissipation (Po=8KW)	N*510W (N*998 BTU)
Ambient temperature operation: storage:	 +14 to +104 °F (-10 to +40 °C) -4 to +140 °F (-20 to +60 °C)
Relative humidity	95 % max., non-condensing
Altitude	1500 m 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

All specifications are subject to change without notice.

UPS capacity	10 kVA	20 kVA	30 kVA	40 kVA	50 kVA
Dimensions (U.S. measurements) incl. exterior cabinet, excl. batteries					
Height	42U / 80 in (including cabinet legs)				
Width	24 in				
Depth	39.4 in				
Weight (lbs)	766	788	811	833	856
Dimensions (metric measurements) incl. exterior cabinet, excl. batteries					
Height	42U / 2020 mm (including cabinet legs)				
Width	600 mm				
Depth	1000 mm				
Weight (kg)	347.4	357.6	367.8	378.0	388.2
Acoustic Noise					
Noise (dBA) with half load	48	52	53	54	55
Noise (dBA) with full load	51	54	55	57	58

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
Digital input channels	8
Real Time Clock (RTC)	Yes, with backup
Power meter	kVA, kW, PF
Volt-free outputs (dry contacts)	6 outputs, rated 50V/1A
RS232 user port	Yes, isolated
Optional 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, 15W

For a full company profile, please visit out 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
- Frequency Changers
- Battery Chargers
- Power Management Solutions

Headquarters and Factory 14 Hartom Street, Har Hotzvim Industries Park, POB 45029, Jerusalem 91450, Israel Tel: +972-2-588-8222 Fax: +972-2-582-8875

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