



# MGE Galaxy PW

## 150–225 kVA 480 V

### Operation





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# About This Manual

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This manual is intended for the users of MGE Galaxy PW 150–225 kVA 480 V. It gives an introduction to the display interface and provides information on operation, maintenance, and troubleshooting of the system.

## Companion Manuals

For additional information about the MGE Galaxy PW 150–225 kVA 480 V, see the following documents:

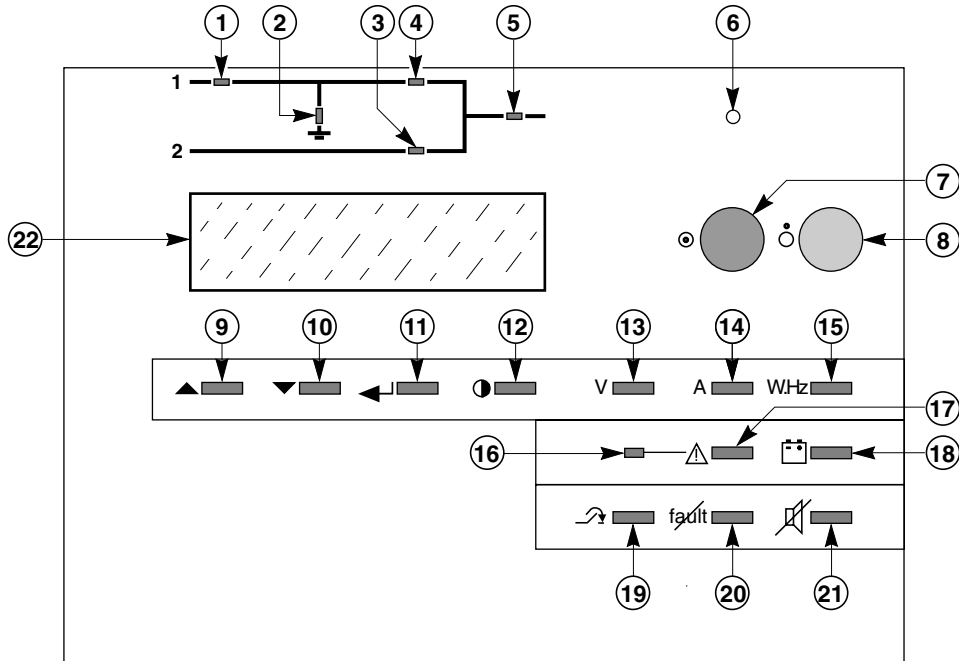
- MGE Galaxy PW 150–225 kVA 480 V Receiving and Unpacking — 990–4220
- MGE Galaxy PW 150–225 kVA 480 V Installation — 990–4219

## Find Updates to this Manual

You can check for updates to this on [www.apc.com](http://www.apc.com).

# Overview

## User Interface

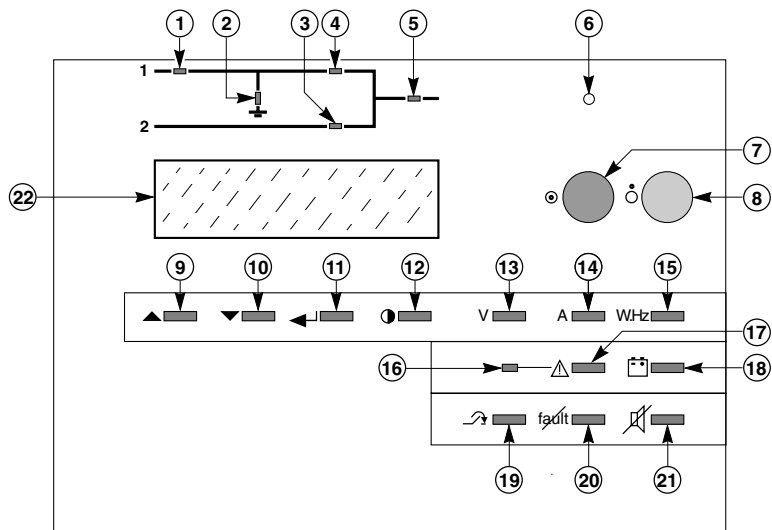


1	Rectifier/charger light	Indicates on/off and charging activity
2	Battery light	Indicates battery status
3	Static-bypass light	Indicates static bypass tolerance status
4	Inverter light	Indicates inverter on/off status
5	Load light	Indicates Load supplied and not supplied
6	Buzzer	The buzzer sounds in load operating situations
7	Inverter ON button	This button is used to start the inverter locally
8	Inverter OFF button	This button turns the inverter off locally
9–10	Up and down keys	These keys are used to select commands in the main menu and access the secondary messages
11	Confirm key	This key is used to validate the choice
12	Main menu key	This key is used to access the main menu: display language, display-contrast setting, sound level of the buzzer, lamp test, date and time settings, inverse-video and event log
13	Voltage key	This key is used to access voltage measurements

14	Currents key	This key is used to access current measurements
15	Measurements key	This key is used to access other measurements
16	Anomaly light	This indicator light indicates the presence of anomalies
17	Primary message key	This key is used to access the primary messages
18	Battery key	This key is used to access battery measurements
19	Forced-transfer	This key is used to voluntarily transfer the load to the inverter or from the inverter to the static bypass (return transfer)
20	Alarm reset	This key is used to reset stored alarms. The system accepts resetting only when alarms have been cleared
21	Buzzer reset	This key is used to stop the buzzer. However, new alarms set the buzzer off again
22	Display	The display continuously indicates the system operating status

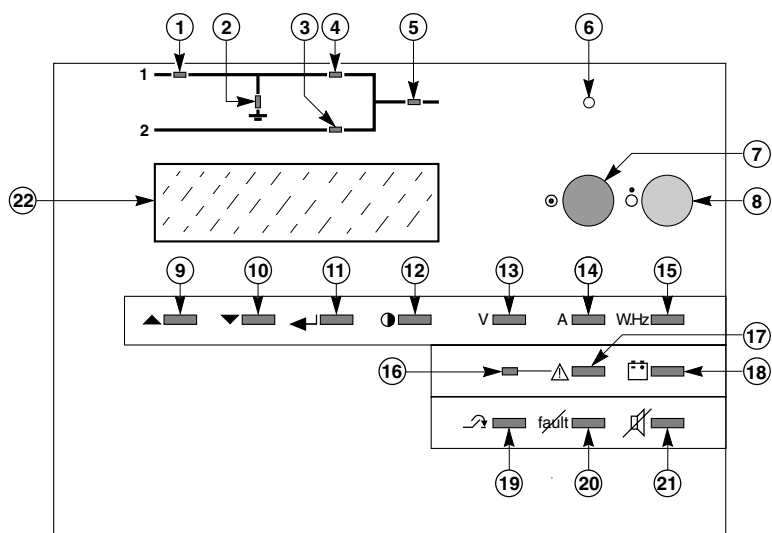
# Configuration

## Select Language



1. Press **Main Menu** key (12) to open Main Menu screen.
2. On the Main Menu screen, select CHOOSE LANGUAGE.
3. Select the preferred language using the **Up** (9) and **Down** (10) keys and confirm your selection using the **Confirm** (11) key.

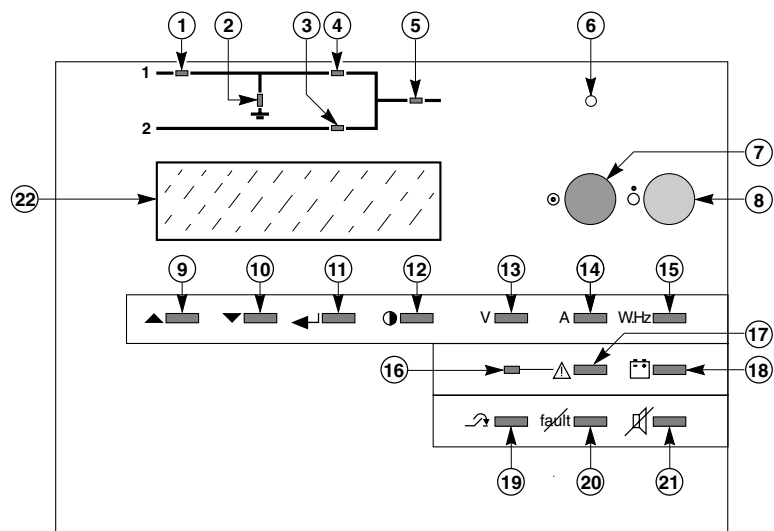
## Set Display Contrast



1. Press **Main Menu** key (12) to open Main Menu screen.
2. On the Main Menu screen, select CONTRAST SETUP.
3. Select the preferred contrast level using the **Up** (9) and **Down** (10) keys and confirm your selection using the **Confirm** (11) key.

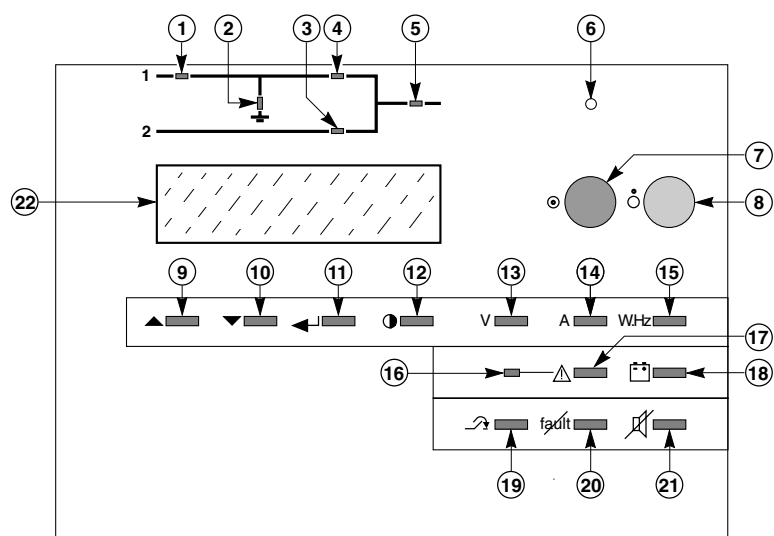


## Set Buzzer Volume



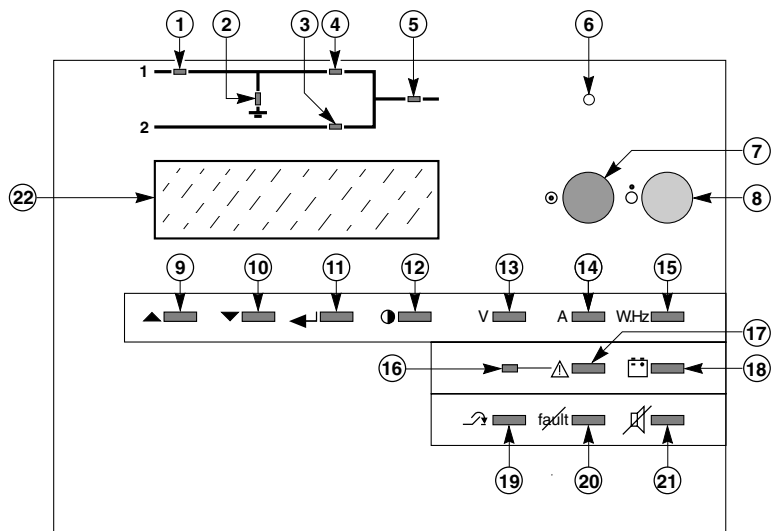
1. Press **Main Menu** key (12) to open Main Menu screen.
2. On the Main Menu screen, select BUZZER SETUP.
3. Select the preferred volume level using the **Up** (9) and **Down** (10) keys and confirm your selection using the **Confirm** (11) key.

## Set Date and Time



1. Press **Main Menu** key (12) to open Main Menu screen.
2. On the Main Menu screen, select DATE AND TIME.
3. Set the date and time using the **Up** (9) and **Down** (10) keys and confirm your selection using the **Confirm** (11) key.

# Inverse Display Color



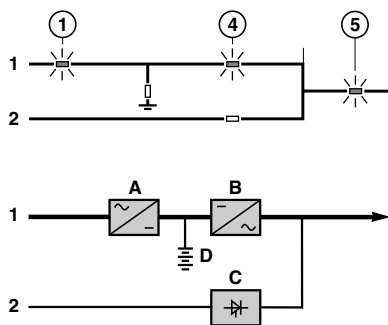
1. Press **Main Menu** key (12) to open Main Menu screen.
2. On the Main Menu screen, select INVERSE VIDEO. When this feature is selected, the text and background colors are inverse (white text on black background or black text on white background).

# Operation Modes

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## Normal Operation

### Normal AC Source Available



- Lights 1, 4, and 5 are green on the control panel
- The power necessary for the load is provided by the normal AC source (1) through the rectifier/charger (A) and the inverter (B). The rectifier/charger (A) also supplies the power to float charge and recharge the battery if any.

The output voltage (DC) is regulated to the supply:

- The float-charging or the recharging voltage for vented lead-acid or Ni/Cd batteries
- a single charge voltage for sealed lead-acid batteries

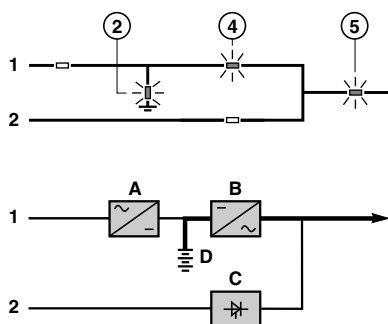
The voltages depend on the number of battery cells and the battery manufacturer. Factory set, they may also be adjusted by support technicians.

An electronic board continuously measures the battery temperature and automatically adjusts the voltages.



**Note:** In parallel Galaxy PW systems, the power drawn by the load is equally shared between the different units.

### Normal AC Source Unavailable



In the event of a normal AC source failure or voltage outside specified tolerances of  $\pm 10\%$  in amplitude ( $\pm 15\%$  optionally), the rectifier/charger (A) stops and the battery (D) supplies the necessary backup power to the load via the inverter (B).

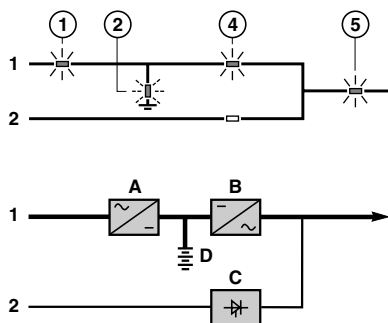
The battery, float-connected between the rectifier/charger and the inverter, discharges during this operating mode:

Lights 2, 4 and 5 are green.

The user is warned of battery operation by the slow beeping of the buzzer 6, and the message "LOAD PROTECTED, BATTERY DISCHARGING", followed by the remaining backup time and the percent load.

This information is also available via volt-free changeover contacts for remote control devices.

## Normal AC Source Restored

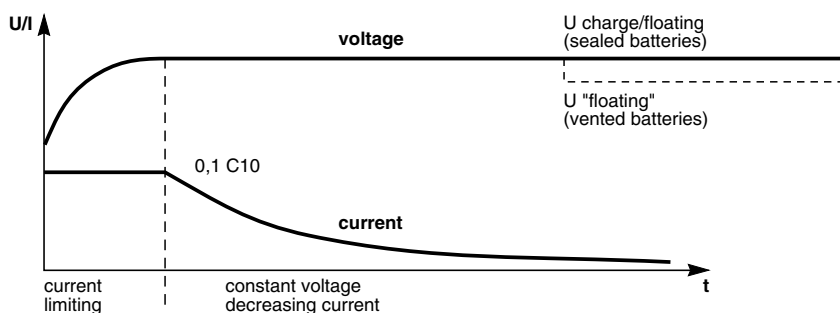


When normal AC source power (1) is restored or its voltage returns to within specified tolerances, the system automatically returns to its normal operating mode described above (on the condition it did not reach the end of battery power). If the end of battery power was reached (with the resulting inverter shutdown), the rectifier/charger (A) restarts automatically, but the inverter (B) must be restarted manually.

The rectifier/charger recharges the battery (D) which was discharged during the mains outage. During battery charging, light 2 flashes green.

The message "BATTERY CHARGING" is displayed, together with the value of the recharging current and battery voltage.

The battery charge cycle takes place in two steps:



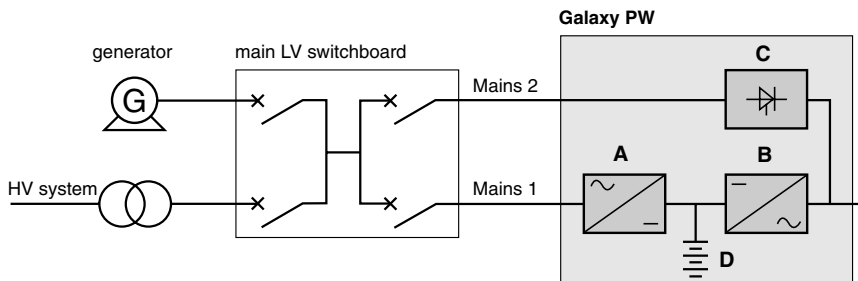
- Step 1: The battery is recharged at a constant current limited to  $0.1C_{10}$  (i.e. 1/10th of the battery capacity specified for a 10 hour discharge). The DC voltage increases with the battery charge until the charge level is reached.
- Step 2: The battery is recharged at constant voltage equal to the charge level. The charging current gradually decreases until reaching a specified low value (floating current).

For vented lead-acid batteries, the rectifier/charger supplies the charging voltage for 0 to 255 hours (parameter defined by the after-sales support department) and then the floating voltage. For sealed lead-acid batteries, the charging and floating voltages are the same.



**Note:** If the normal AC source failure is shorter than 0 to 255 seconds (default value = 30 seconds) (parameter defined by after-sales support department), the charger automatically supplies the floating voltage given the low battery discharge.

## Engine Generator Set Operation



If a stand-by generator is included in the installation, it is generally started automatically in the event of a normal AC source failure and connected to the main low voltage switchboard. It is disconnected when normal AC source power is restored.

With such a system, the required battery time may be reduced to the time necessary for starting and bringing on line the stand-by generator. The battery (D) supplies power to the inverter (B) during the transfers:

- Normal AC source to the generator
- Generator to the normal AC source

The transfer sequences described above (normal AC source ► battery, battery ► generator, generator ► battery, and battery ► normal AC source) are fully automatic. They in no way affect the load and require no manual operation by the user.



### **Note:**

To avoid load surges on the generator, the rectifier/charger is started with a 10 second maximum current consumption walk-in (lasting 3 to 10 seconds, depending on the percent load).

To avoid overloading an undersized engine generator set, it is possible to set a maximum power level drawn by the normal AC input. Any additional power required is supplied by the battery. This modification can be made on site by a Schneider Electric field engineer.

## Battery Operation

### Battery Time

The available battery time during a normal AC source outage depends on the:

- Rated capacity of the battery
- Power consumed by the load
- Temperature of the battery
- Age of the battery

The specified battery time corresponds to a minimum duration at full rated load.

The actual backup time can therefore be greater if the system operates below its full rated load during the normal AC source outage. Operation on battery power can be extended beyond the specified time by reducing the load power consumption (by disconnecting non-critical loads).

A "low battery" warning signal is sent via volt-free changeover contacts for remote control devices when the battery voltage reaches a level slightly above the minimum level. This signal warns the user of the imminent end of battery power. On the device itself, the buzzer beeps rapidly.

The message "LOW-BATTERY SHUTDOWN WARNING" is displayed, followed by the remaining backup time and the percent load. Light 2 turns red and flashes.

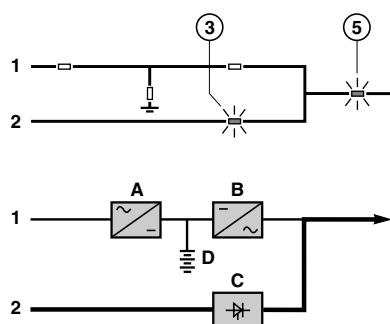
Battery power stops when the voltage supplied by the battery reaches the minimum threshold. This results in inverter shutdown and transfer of the load without interruption to the bypass AC source. Light 2 shines red (not flashing). The message "LOAD NOT PROTECTED, ON-LINE MODE" is displayed and the buzzer sounds continuously.

If the bypass AC source also fails, the load is no longer supplied. The inverter automatically shuts down when the time on battery power exceeds three times the specified backup time.



**Note:** The "low battery shutdown" warning signal can be sent with an adjustable time delay prior to the effective end of battery power.

## Inverter Shutdown or Overload



Systems operating in on-line mode with a Bypass AC source.

## Single UPS Unit

In the event of a UPS shutdown (initiated by the user or by an internal protective device), the load is automatically transferred to the bypass AC source. If transfer conditions are satisfied, transfer takes place instantly, without interruption to the load.



**Note:** Transfer conditions are not satisfied when bypass AC source characteristics are outside tolerances (voltage:  $\pm 10\%$ . frequency as per personalization. phase sync with inverter  $\pm 3^\circ$ ).

In the event of a major transient overload (greater than 1.65 In), immediate transfer takes place as above, without interruption to the load.

The return to the inverter is automatic when the overload disappears if the number of possible returns has not been reached (0 to 255, programmable by personalization). If this number has been reached, the load continues to be supplied by the bypass AC source. This operating mode allows start-up of load devices causing high inrush currents.

This system requires satisfied transfer conditions. If the conditions are not satisfied, the inverter will current limit to 165% of its rated current for 1 second before stopping.

In the event of a small but extended overload (i.e. a continuous level of power exceeding the full rated load), the inverter will continue to supply power for a period depending on the magnitude of the overload (10 minutes for a 125% overload, 1 minute for a 150% overload).

In all the above cases, inverter shutdown and supply of the load via the bypass AC source results in the following on the control panel:

- light 4 goes off
- activation of the buzzer (continuous beep)
- light 3 is green
- the message "LOAD NOT PROTECTED, ON-LINE MODE" is displayed

## Parallel UPS for Increased Capacity

WARNING: During maintenance operation, when CB1 (MBP) is closed and CB2 (UPS isolation) ) is open, each UPS control panel display will show a message "LOAD PROTECTED" when the UPS is placed in ON-LINE MODE. In this mode the critical load is not protected because it is supplied by the maintenance bypass power

The shutdown of one inverter results in overload on the other inverters in operation.

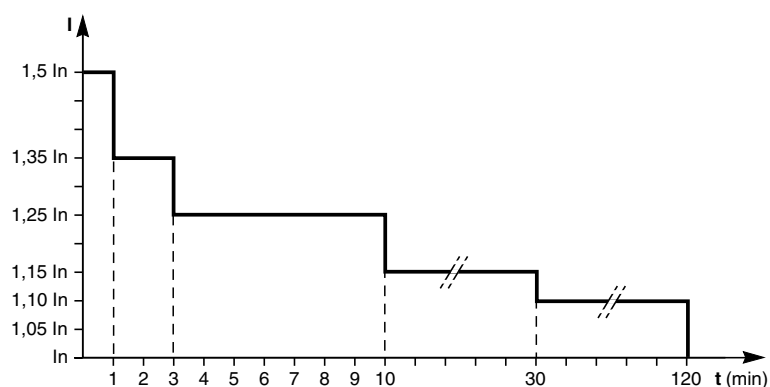
Two cases may then arise:

- If the overload on each remaining inverter is  $>$  than  $1.65 I_n$ , the load is immediately transferred to the bypass AC source
- If the overload is less than  $1.65 I_n$ , the remaining inverters support the overload, and the load is transferred to the bypass AC source.

After this transfer:

- the light 4 goes off
- the buzzer is activated and sounds continuously
- the light 3 goes on and turns green
- the message "LOAD NOT PROTECTED, PARALLEL ON-LINE MODE" is displayed

## Overload current diagram



## Parallel Redundant UPS

The shutdown of one UPS unit is of no consequence for the load. The others each take up an equal amount of load power and the load continues to be supplied normally.

Unit shutdown results in the following on the control panel:

- Lights 4 and 5 go off
- Activation of the buzzer (continuous beep)
- The message "LOAD NOT PROTECTED, PARALLEL ON-LINE MODE" is displayed

In the event of an overload, the system only loses its redundancy as long as the overload is less than the total rated power of the functioning units. If the overload is greater, the operating mode is that previously described for systems without redundancy.

## Output Voltage Quality and Continuity

The output voltage is stable in amplitude and frequency and is free of interruptions or transients outside specified tolerances, irrespective of normal AC source or load disturbances (outages, load step changes, etc.).

### Steady State Voltage Regulation

For stable or slowly varying load conditions, the inverter output voltage is regulated to within  $\pm 0.5\%$  in amplitude.

The frequency of the output voltage can theoretically be regulated to within 0.1% of the rated value, however the output frequency range may be intentionally extended to a maximum of  $\pm 2$  Hz so that the inverter can remain synchronized with the bypass AC source and its inherent frequency fluctuations, thus enabling transfer of the load to the bypass line at any time.

When the bypass AC source frequency returns to within the specified tolerances, the inverter is gradually re-synchronized to the bypass line at a rate of 0.5 Hz to 2 Hz/s (as per the value personalized by the after-sales support department), thus avoiding exposing the load to sudden frequency variations.

### Transient Voltage Regulation

The inverter output voltage is not notably affected by instantaneous major variations in load characteristics.

This is made possible by the PWM (Pulse Width Modulation) chopping technique and the microprocessor-based regulation system that instantly compensates for any variation. In particular, the inverter output voltage remains within  $\pm 2\%$  of the rated voltage for load step changes of 0 to 100% or of 100 to 0%.

The battery charge cycle takes place in two steps:

- Step 1: The battery is recharged at a constant current limited to  $0.1C_{10}$  (i.e. 1/10th of the battery capacity specified for a 10 hour discharge). The DC voltage increases with the battery charge until the charge level is reached.
- Step 2: The battery is recharged at constant voltage equal to the charge level. The charging current gradually decreases until reaching a specified low value (floating current).

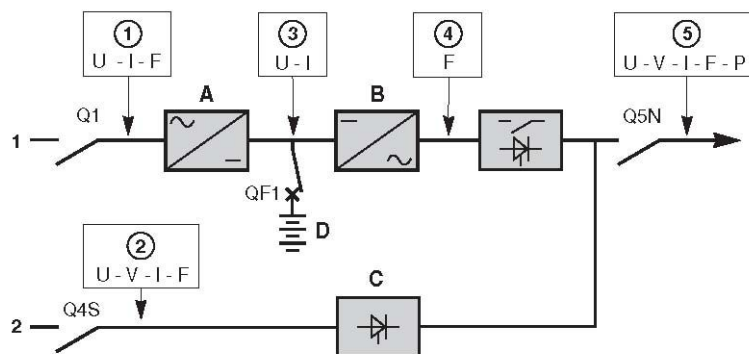
For vented lead-acid batteries, the rectifier/charger supplies the charging voltage for 0 to 255 hours (parameter defined by the after-sales support department) and then the floating voltage. For sealed lead-acid batteries, the charging and floating voltages are the same.



# Operation Procedures

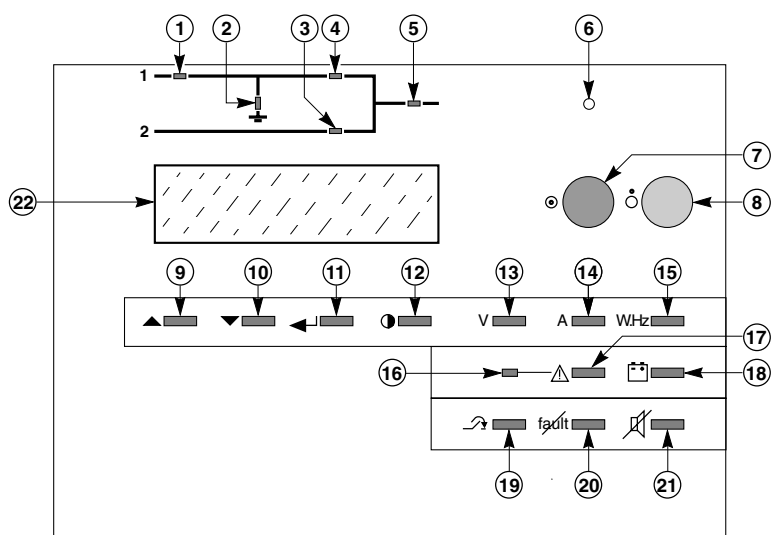
## System Measurements

The display may be used to read a number of input and output measurements made at different points in the system.



1. AC Input Source
2. AC Bypass Source
3. Battery
4. Inverter Output
5. Total Load

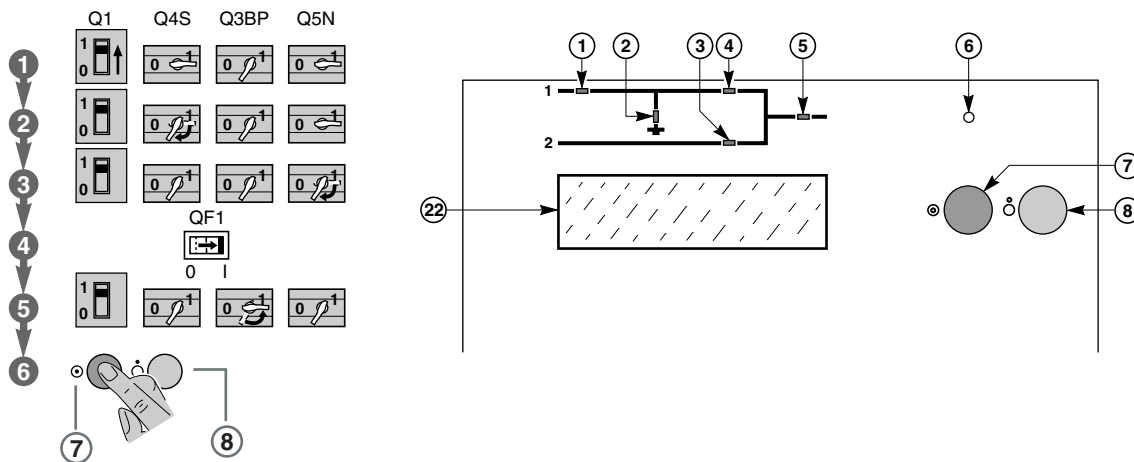
## Access System Measurements



1. Press the **V** key (13) to access voltage measurements.
2. Press the **A** key (14) to access current measurements.
3. Press the **W.Hz** key (15) to access frequency measurements.
4. Press the **battery** key (18) to access the battery measurements.

# Start Up Single UPS or Redundant Parallel UPS

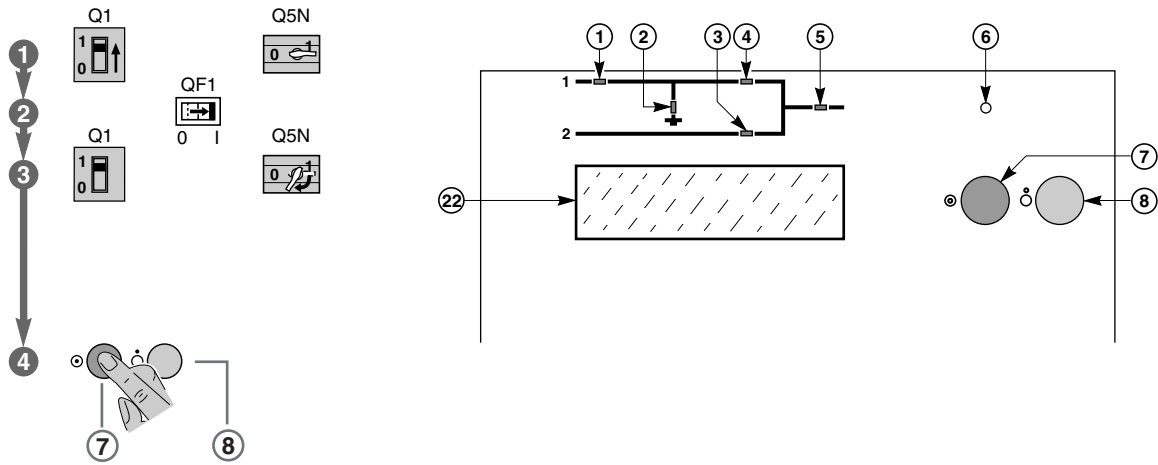
Close the upstream switches supplying normal and bypass AC source power (on the LV switchboard).



1. Close normal AC input switch Q1. The system powers up:
  - the rectifier/charger automatically starts.
  - green light 1 on the control panel goes on.
  - light 2 turns red.
2. Close bypass AC input switch Q4S. The green lights 3 and 5 on the control panel go on.
3. Close inverter output switch Q5N.
4. Close battery circuit breaker QF1. Light 2 goes off.
5. Open maintenance bypass switch Q3BP.
6. Press the "inverter on" button 7 on the control panel.
  - The green "inverter" light 4 flashes.
  - The inverter starts, then, if the bypass AC source transfer conditions are satisfied, the load is transferred to the inverter if the on-line mode is selected.
  - The green "static-bypass" light 3 goes off.
  - The green "inverter" light 4 shines for on-line mode.

# Start Up Parallel UPS for Increased Output

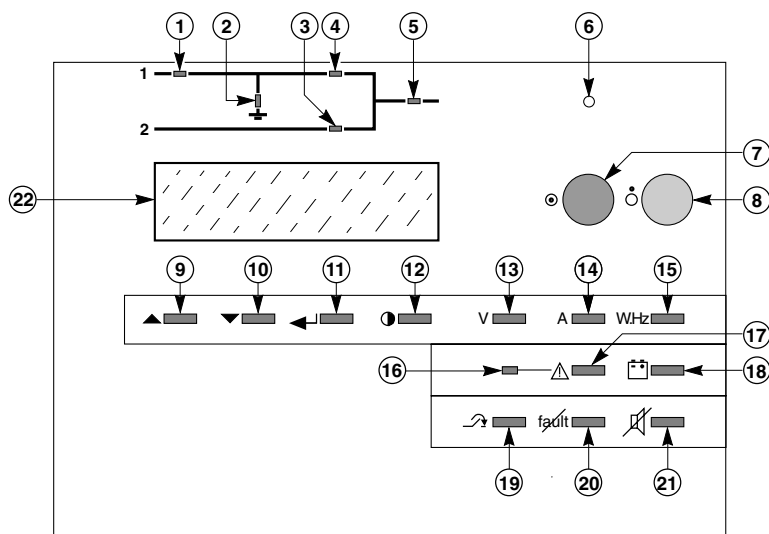
Check that all load devices are off or that the load is disconnected. Close the upstream switch supplying normal AC source power (on the LV switchboard)



1. Close the normal AC input circuit breakers Q1 on the UPS units. The system powers up:
  - the rectifier/charger automatically starts.
  - green light 1 on the control panel goes on.
  - light 2 turns red.
2. Close the battery circuit breakers QF1. Light 2 goes off and the green lights 3 and 5 on the control panel go on.
3. Close main input switches Q4S for the units.
4. Close output switches Q5N for the inverters and in the external bypass unit.
5. Open maintenance bypass switch Q3BP in the external bypass unit.
6. Press the inverter on button 7 on each control panel. The green inverter lights 4 flash.
7. When a sufficient number of inverters are ready, the inverter output contacts close.

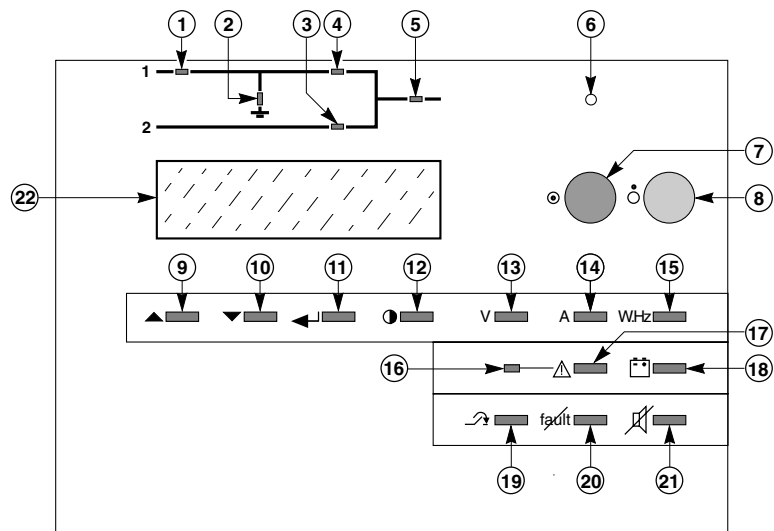
The green inverter lights 4 are lit for on-line mode. The static bypass lights 3 go off.

## Perform Lamp Test



1. Press **Main Menu** key (12) to open Main Menu screen.
2. On the Main Menu screen, select LAMP TEST. When this feature is selected, all the LEDs shine orange for three seconds.

# Perform Battery Test



1. Press **Main Menu** key (12) to open Main Menu screen.
2. On the Main Menu screen, select BATTERY TEST.
3. Use the **Up** (9) and **Down** (10) keys to select MANUAL TEST or AUTOMATIC TEST and confirm your selection using the **Confirm** (11) key. When the battery test is complete, the display will show if the test was OK or NOT OK.

# Maintenance

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## Scope

Maintenance procedures include preventive maintenance, isolation procedures for maintenance, startup for single and parallel units after isolation, functional and visual checks, software options and configurations, and testing scenarios.

## Preventive Maintenance

The following preventive maintenance routines should be considered the minimum requirements; your installation and site may require additional preventive maintenance to assure optimal performance from your installed Galaxy PW™ and associated equipment. These routines should be performed twice a year (more often if required). We strongly recommend contracting MGE Customer Support Services for preventive and remedial maintenance.

The technician or electrician performing preventive maintenance on the UPS must read thoroughly this manual Galaxy PW™ Installation and Users Manual (MGE PN 86-133060-00) and be familiar with the indicators, controls, and operation of the UPS prior to maintenance.

Technician or Engineer checks for preventive maintenance:

- Isolate and de-energize all Galaxy PW™ equipment for all maintenance operations.
- Ensure that all equipment is clean and free of loose dust, dirt, and debris. The exterior of the enclosures must be cleaned with a mild solution of soap and water, lightly applied with a lint-free cloth.
- Inspect the air intake and exhaust plates and clean as required. Verify that air flows freely through the equipment. Clean the air intake and exhaust plates, and the enclosure interior, with a vacuum cleaner.
- The Galaxy PW module is equipped with air filters that should be changed at regular intervals. Inspect the filters regularly to determine how long the filters will last in your installation.
- Initiate the start-up procedure, as described in (XX)
- Test the main operating sequences as applicable to your equipment configuration.

## Replacement Parts

There are no user replaceable parts inside the Galaxy PW.

Three levels of replacement parts are available for the Galaxy PW UPS. The three levels are designated A, B, and C. The level that you should keep on hand for your installation will vary depending on the type of maintenance planned on site, and the configuration of your UPS system. Having the replacement parts on hand will prevent any unacceptable delays (due to time involved obtaining spare parts) during critical periods, such as system start-up.

Any items used during start-up will be replaced at no charge. Contact Customer Support Services for specific recommendations.

A description of each level is provided below:

Level	Description
A	This level of replacement parts consists of consumable items, specifically fuses and air filters. It is recommended to have these items on hand during installation of the UPS systems, including initial start-up.

B	This level of replacement parts is recommended when the user can tolerate short-duration UPS down-time to obtain replacement parts in the event of a major UPS failure. This level of replacement parts consists of consumable items, specifically fuses, air filters, an inverter leg, and the most critical circuit board assemblies.
C	This level of replacement parts is recommended when the user can tolerate only a minimum of down-time in the event of a major UPS failure. This level of replacement parts consists of consumable items, specifically fuses, air filters, an inverter leg, and a complete set of circuit board assemblies.

## Visual Check

Power down the system prior to any maintenance operations.



**Note:** In redundant parallel UPS systems the check may be carried out successively on each UPS unit without interrupting the load. In other configurations, the load must be supplied via the maintenance bypass.

1. Clean the system regularly, particularly the air filter inlet and outlet grills. Check that the air circulates freely in the cabinets. Use a vacuum cleaner if necessary.
2. Check that nothing hinders the ventilation at the top and at the back of the system.

## Functional System Checks

1. Check that lights 1, 2 and 3 on the control panel are not red, to avoid an interruption in the supply of power to the load due to incorrect transfer conditions or a battery problem.
2. Press the **Inverter OFF** button and check that the buzzer and control panel lights function correctly (see the section on operating modes in the introduction).
3. Press the **Inverter ON** button and check again that the control panel lights function correctly.
4. Run a transfer to battery test. With the inverter on, open input circuit breaker Q1. The orange "battery" light on the control panel should light. After two minutes on battery power, close input circuit breaker Q1. The rectifier/charger should automatically restart and the orange "battery" light on the control panel should go off.

## Maintenance Isolation Procedures



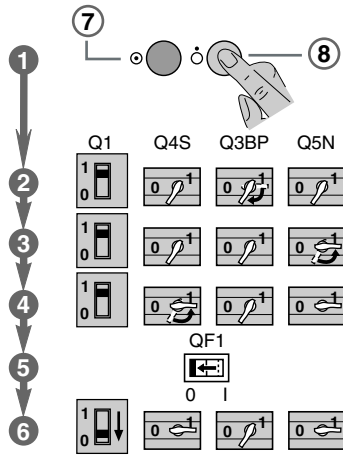
**WARNING:** During maintenance operation, when CB1 (MBP) is closed and CB2 (UPS ISOLATION) is open, each UPS control panel display will show a message "LOAD PROTECTED" when the UPS is placed in normal operation. In this mode the critical load is not protected because it is supplied by the maintenance bypass power.

### Isolate Single UPS Unit

During maintenance, the UPS must be isolated from the normal and bypass AC source, the battery and the load.



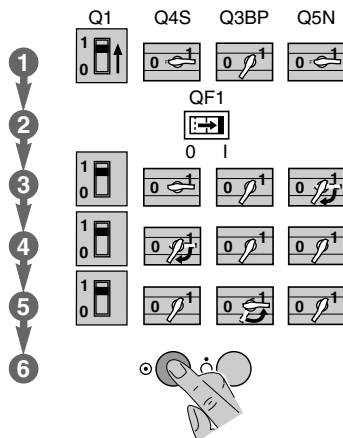
**WARNING:** Work should be carried out in accordance with applicable safety regulations. To avoid interrupting the load, the various switching operations must be carried out in the correct order. Operations are explained in diagrams placed next to the switches. The system cabinet is only partially powered down. The load is still supplied via the bypass AC source and switch Q3BP



1. Shut down the inverter (press the "inverter OFF" button 8 for three seconds).
2. Close bypass switch Q3BP.
3. Open isolating switch Q5N.
4. Open isolating switch Q4S.
5. Open isolating switch QF1.
6. Open isolating switch Q1.

The UPS is powered down once the capacitors have discharged (a few minutes).

## Start-Up Single UPS Unit



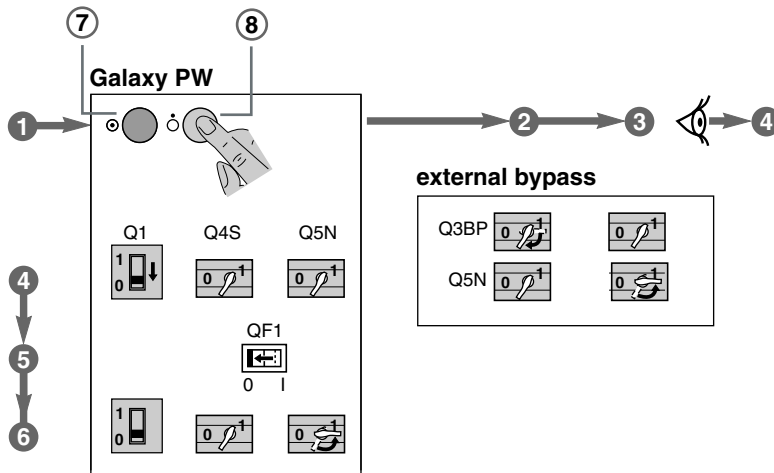
1. Close switch Q1.
2. After approximately ten seconds close switch QF1.
3. Close Q5N.
4. Close Q4S.
5. Open bypass switch Q3BP.
6. Start the inverter (press the "inverter ON" button 7).

## Isolate Parallel System for Increased Output

First isolate all UPSs as described in Isolate Single UPS Unit

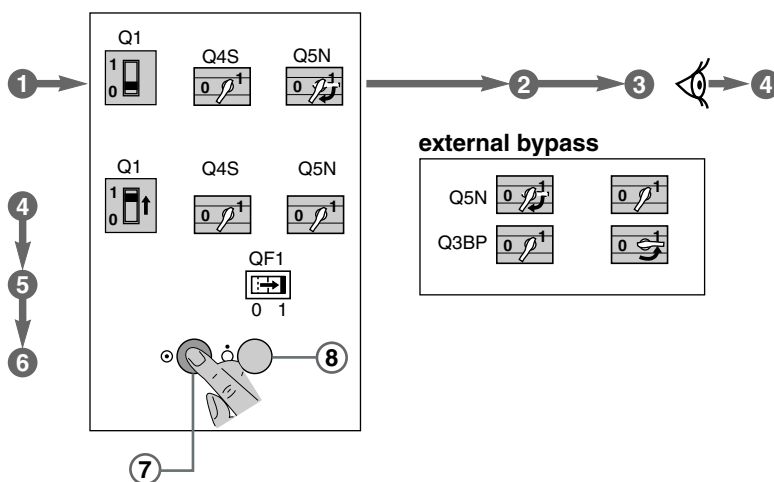


**WARNING:** During maintenance operation, when CB1 (MBP) is closed and CB2 (UPS ISOLATION) is open, each UPS control panel display will show a message “LOAD PROTECTED” when the UPS is placed in normal operation. In this mode the critical load is not protected because it is supplied by the maintenance bypass power.



1. Shut down the inverters (press the "inverter OFF" buttons 8 for three seconds).
2. Close switch Q3BP.
3. Open switch Q5N in the external bypass unit.
4. Open switch Q1 on the UPS units.
5. Open switch QF1 on the UPS units.
6. Open switch Q5N on the UPS units.

## Start-Up Parallel System for Increased Output



1. Close switches Q5N on the UPS units.
2. Close switch Q5N in the external bypass unit.
3. Open switch Q3BP in the external bypass unit.
4. Open switches Q1 on the UPS units.
5. Open switches QF1 on the UPS units.
6. Start the inverters (press the "inverter ON" buttons 7).



# Computer Networks

## Integrated SNMP Agent

This electronic board, installed in the UPS system, enables direct connection to all Ethernet networks using TCP/IP.

The UPSs may then be supervised via the computer network. Furthermore, they can be used to close system files without having to add an external SNMP agent.

This board is fully compatible with "Solution Pac™" software.

The RJ45 connector of the communications option delivers information using the SNMP protocol. The sticker located on the board indicates the UPS MAC address.



- The MAC address is written in the following way: 0080C8 ZZ XX YY.
- The default IP address is 168.8.xx.yy (xx and yy are decimal values of XX and YY).

For example, MAC address 00 80 C8 AB AA 01 is related to IP address 168.8.170.1.

## Two-Channel Network Board

This electronic board comprises two ports, each of which may be user set, either for the U-Talk protocol or as a relay contact.

1. U-Talk is the protocol required to establish contact with the communications software.
2. Relay contacts may be used for specific network applications (IBM AS400, Novell, etc.).

# Troubleshooting

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## Alarms

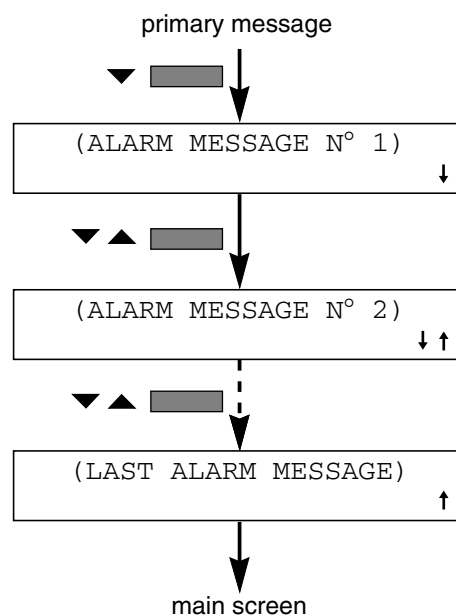
The auto diagnostic system considers any system status other than normal as a problem.

Before taking any action, note down the messages displayed on the control panel.

Certain problems may prevent the control panel from functioning.

In this case, it is strongly recommended to call Schneider Electric.

- If the load is still correctly supplied with power, it has probably been transferred to the bypass AC source (static bypass) and is therefore no longer protected (if the system is in on-line mode).
- If the load is no longer supplied with power, transfer it manually to the maintenance bypass.





## **Worldwide Customer Support**

Customer support for this or any other product is available at no charge:

- Contact the Customer Support Center by telephone or e-mail. For local, country-specific centers: go to [www.apc.com/support/contact](http://www.apc.com/support/contact) for contact information.

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