

# MGE Galaxy 4000

**40–75 kVA 208 V**

**Installation**





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# Safety

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## Safety Instructions

This manual contains important instructions for MGE Galaxy 4000 that must be followed during operation and maintenance of the equipment.



**WARNING: Opening enclosures expose hazardous voltages. Always refer service to qualified personnel only.**



**WARNING: As standards, specifications, and designs are subject to change, please ask for confirmation of the information given in this publication.**



**Note:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at user's own expense.



**WARNING: To reduce the risk of fire or electric shock, install in a controlled indoor environment free of conductive contaminants. This equipment is intended only for installations in a RESTRICTED ACCESS LOCATION.**



**WARNING: HIGH LEAKAGE CURRENT. Earth connection essential before connecting supply.**

## Certification Standards — Three Phase UPS

- IEC1004/ANSI C62.41 Standards for Surge Withstand Ability.
- FCC Part 15, Subpart J, Class A.
- UL/CUL 1778, Standards for Uninterruptible Power Supply Equipment.
- NEMA PE 1 - Uninterruptible Power Systems.
- NFPA 70 – National Electrical Code.
- ISO 9001.

## Safety of Persons

- The UPS has its own internal power source (the battery). Consequently, the power terminals may be energized even if the UPS is disconnected from the AC power source.
- The UPS must be properly grounded.
- The battery supplied with the UPS contains small amounts of toxic materials. To avoid accidents, the directives listed below must be observed:
  - Never burn the battery (risk of explosion).
  - Do not attempt to open the battery (the electrolyte is dangerous for the eyes and skin).
  - Comply with all applicable regulations for the disposal of the battery.
  - Batteries constitute a danger (electrical shock, burns). The short-circuit current may be very high.
  - Precautions must be taken for all handling: remove watches, rings, bracelets and any other metal objects, use tools with insulated handles.
  - Do not lay tools or metal parts on top of batteries.

## Product Safety

- Upstream protection must be installed and be easily accessible.
- The UPS can be disconnected from the AC power source by opening the input protective devices.
- The UPS must be connected to a nearby power source that is easily accessible.
- Never block the ventilation openings of the UPS.
- The UPS must be installed in a controlled environment.

## Special Precautions

- The UPS connection instructions and operation described in the manual must be followed in the indicated order.
- Check that the indications on the rating nameplate correspond to your AC powered system and to the actual electrical consumption of all the equipment to be connected to the UPS.
- Before and after the installation, if the UPS remains de-energized for a long period, the UPS must be energized for a period of 24 hours, at least once every 3 months (for a normal storage temperature less than 25°C). This charges the battery, thus avoiding possible irreversible damage.

## Environment

This product has been designed to respect the environment; It does not contain any Chlorofluorocarbon (CFC) or Hydrochlorofluorocarbon (HCFC).

UPS recycling at the end of service life; APC undertakes to recycle, by certified companies and in compliance with all applicable regulations, all UPS products recovered at the end of their service life (contact your APC certified service partner).

Packing; UPS packing materials must be recycled in compliance with all applicable regulations.



**WARNING: This product contains lead-acid batteries. Lead is a dangerous substance for the environment if it is not properly recycled by specialized companies.**

# Specifications

## Environmental Recommendations

Recommended Environment	20° to 25°C (68° to 77°F.); 50% relative humidity; computer room or other temperature, and humidity-controlled environment
Operating Temperature	0° to 30°C (32° to 86°F) except battery
Storage	-20° to 40°C (-4° to 113°F) except battery
Humidity	Up to 90% non-condensing (operating)
Altitude	Sea level to 3,000 feet without derating
Acoustic Noise	69 dBA at rated load as measured 3 feet from the front of the UPS cabinet.

## Electrical Specifications

Output Power Rating (0.8) PF	40 kVA	50 kVA	65 kVA	75 kVA
UPS Voltage (input/output)	208/208	208/208	208/208	208/208
Input/Output Requirements & Frequency	Three phase, Three wire + N + G, 60Hz			
Input Phase Rotation	A,B,C Clockwise			
Input Power Factor	>.98			
Input Current	102A	127A	166A	191A
Maximum Input Current (at low line —15%)	120A	150A	195A	225A
Bypass Current	111A	139A	180A	208A
Output Current	111A	139A	180A	208A
Battery Voltage	198 VDC End Voltage 240VDC Nominal 282VDC Max. Maintenance Voltage			
Max. Battery Current at Nominal Battery Voltage (240 VDC at 100% load)	157A	196A	255A	294A
Max. Battery Current at Nominal End-Voltage (198 VDC at 100% load)	190A	238A	309A	357A
Battery Disconnect Circuit Breaker Rating	250A		400A	
Input, Bypass, and Maintenance Bypass (optional) Switch Rating	150A		250A	
Input Fuse Rating	200A		300A	
Output Isolation Circuit Breaker Rating	175A		300A	
NOTE: Interrupted Transfer to Bypass Source: If the bypass source is beyond the conditions stated below, the UPS will make an interrupted transfer (not more than 100 msec. in duration). 1. Bypass voltage greater than +15%, —15% from the UPS rated output voltage. 2. Bypass frequency greater than ±2 Hz from the UPS rated output frequency.				

# Mechanical Assembly

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## General Description

The MGE Galaxy 4000 is the world's first data center grade Uninterruptible Power Supply system designed specifically for mid-range enterprise level applications. The MGE Galaxy 4000 family consists of units available in power ratings from 40 - 75KVA, and are optimized for compatibility with nonlinear computer-type loads.

By incorporating the Ultra High Availability Topology (UHAT), the MGE Galaxy 4000 family of UPS systems are designed to provide the optimal level of reliability and to react to any power disturbance in an inherently safe way to protect the critical load. The MGE Galaxy 4000 all-in-one design incorporates every feature into one compact cabinet, including a graphical user interface, power factor corrected input, and communication cards that support network based power management.

The MGE Galaxy 4000 UPS and its auxiliary equipment are designed for installation in a room where humidity and temperature can be controlled.

The MGE Galaxy 4000 UPS and auxiliary equipment is listed for safety by Underwriters Laboratories, Inc. (UL) under UL Standard 1778 – Uninterruptible Power Systems; and also listed by Underwriters Laboratories (CUL) under Canadian Standards Association (CSA) standard C22.107.





# Major Components

Rectifier	Converts AC input voltage to DC voltage. The rectifier uses IGBT (Insulated Gate Bipolar Transistor) power transistors and a Pulse Width Modulated (PWM) technique to provide input power factor correction and to minimize any harmonic reflected onto the input power lines.
Inverter	Converts DC voltage from the rectifier or from the batteries into AC output voltage to maintain the attached load. This module uses the IGBT technology to provide digital power quality.
Static Switch	Automatically supplies the attached load from the bypass source when the inverter is off.
Battery System	Stores energy for utilization by the inverter and attached load in the event that utility AC power is lost or is of unacceptable quality.

## Single Line Diagram

During normal operation, the utility power (Main input) is supplied to the UPS rectifier. The rectifier converts the AC power to DC that is supplied to the inverter. The inverter converts the DC voltage to three-phase regulated AC voltage, which is supplied to the attached load.

During power failure conditions, the inverter is supplied by the stored energy in the battery system, and the load is powered continuously with no interruption.

The MGE Galaxy 4000 UPS is designed for internal operation of 208VAC input and output. External batteries, and an output distribution panel may be contained in auxiliary cabinets similar in design to the MGE Galaxy 4000 cabinet. Batteries or external maintenance bypass circuit breakers may also be contained in third party cabinets or wall mounted units.

Refer to Appendix “Single Line Diagram”.

## Standard Cabinets

The MGE Galaxy 4000 individual cabinet dimensions are:

- UPS cabinet: 72.1in (1831mm) H x 33.5in (851mm) W x 35.6in (904mm) D.
- External battery cabinet: 72.1in (1831mm) H x 26.5in (673mm) W x 33.5in (851mm) D OR –
- External battery cabinet: 72.1in (1831mm) H x 33.5in (851mm) W x 33.5in (851mm) D.
- Distribution cabinet: 72.1in (1831mm) H x 19.5in (495mm) W x 33.5in (851mm) D.

The UPS cabinet is designed to provide for top and bottom entry of the utility power feed. An output voltage of 208VAC is standard with the MGE Galaxy 4000 and does not require any additional cabinetry. The complete list of additional cabinets that could be included with your MGE Galaxy 4000 system are: external maintenance bypass wall cabinet, external battery cabinet, and distribution cabinet.

The external battery cabinets are provided in two different cabinet sizes depending upon the battery type selected. Up to four battery cabinets may be provided. The cabinets may be installed adjacent to the UPS or remotely and are designed for top and bottom entry. The distribution cabinet provides a 42 pole panelboard, with an optional submain circuit breaker. The cabinet is designed for top and bottom entry.

# Preparation for Operation

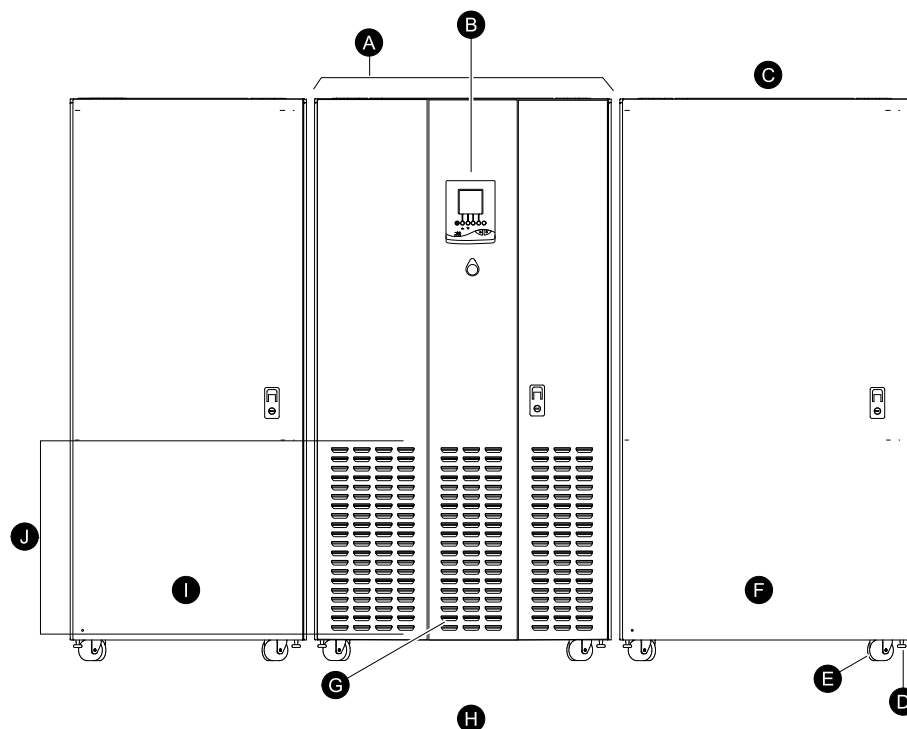
Several items must be considered when preparing the MGE Galaxy 4000 UPS system for operation.

1. The UPS cabinet and its auxiliary cabinets must be arranged in the required configuration to insure that the interconnection cables are located in the correct adjacent cabinets.
2. The cabinets must be in a location that provides for proper air flow and heat rejection.
3. The room in which the MGE Galaxy 4000 UPS system is located must maintain environmental conditions within recommended tolerances.
4. All electrical connections must utilize the top or bottom conduit entries provided.

The following sections discuss these items in more detail.

## Cabinet Placement

The complete UPS system may consist of one to three cabinets depending on the options selected. The UPS cabinet allows system options to be selected based on the application. When facing the MGE Galaxy 4000 UPS from the front, the standard arrangement provides for any external batteries to be located on the right hand side, and the distribution cabinet to be located on the left hand side of the UPS.



A	Air exhaust	F	External battery cabinet (optional)
B	Display panel	G	UPS cabinet MGE Galaxy 4000
C	Allow 36" top clearance for fan exhaust and service maintenance	H	Front view
D	Leveling jacks	I	Distribution cabinet (optional)
E	Casters	J	Air intake

# Heat Rejection

The MGE Galaxy 4000 UPS cabinets generate heat and exhaust air through the top portion of its enclosures. Air intake is through the bottom and front of the cabinet. All other cabinets are convection cooled. To assist you in planning for your HVAC needs, heat rejection data is provided in table below. The cabinet airflow and recommended top clearance are provided in “*Cabinet Placement*” section. The MGE Galaxy 4000 is intended for use in an environment where control of temperature and humidity is provided.

Heat Rejection Data @ 208/208 VAC				
UPS Cabinet	40 kVA	50 kVA	65 kVA	75 kVA
BTU/Hr	14,900	18,700	24,200	28,000



**Note:** To provide for adequate ventilation, a minimum of 36 inches clearance should be maintained above the top of the MGE Galaxy 4000 cabinet.

## Cabinet Clearances

The MGE Galaxy 4000 UPS cabinet top clearance of 36 inches for fan exhaust is recommended. Additionally, adequate space must be included in the front and top of each cabinet (approx. 36 inches) to allow the doors/panels of the cabinet to be opened for service and maintenance procedures.

For an installation where seismic requirements must be met, additional clearance at the side of the cabinet must be included to accommodate the seismic anchors. Contact the Customer Support Center to order.

## Preparation for Storage

If the equipment is to be stored prior to installation, it should be stored in a cool, dry, well-ventilated location that is protected against rain, splashing water, chemical agents, etc. The equipment should be covered with a tarpaulin or plastic wrapper to protect it against dust, dirt, paint, or other foreign materials. See the section of this manual titled "Environmental Recommendations" for recommended storage environmental conditions.

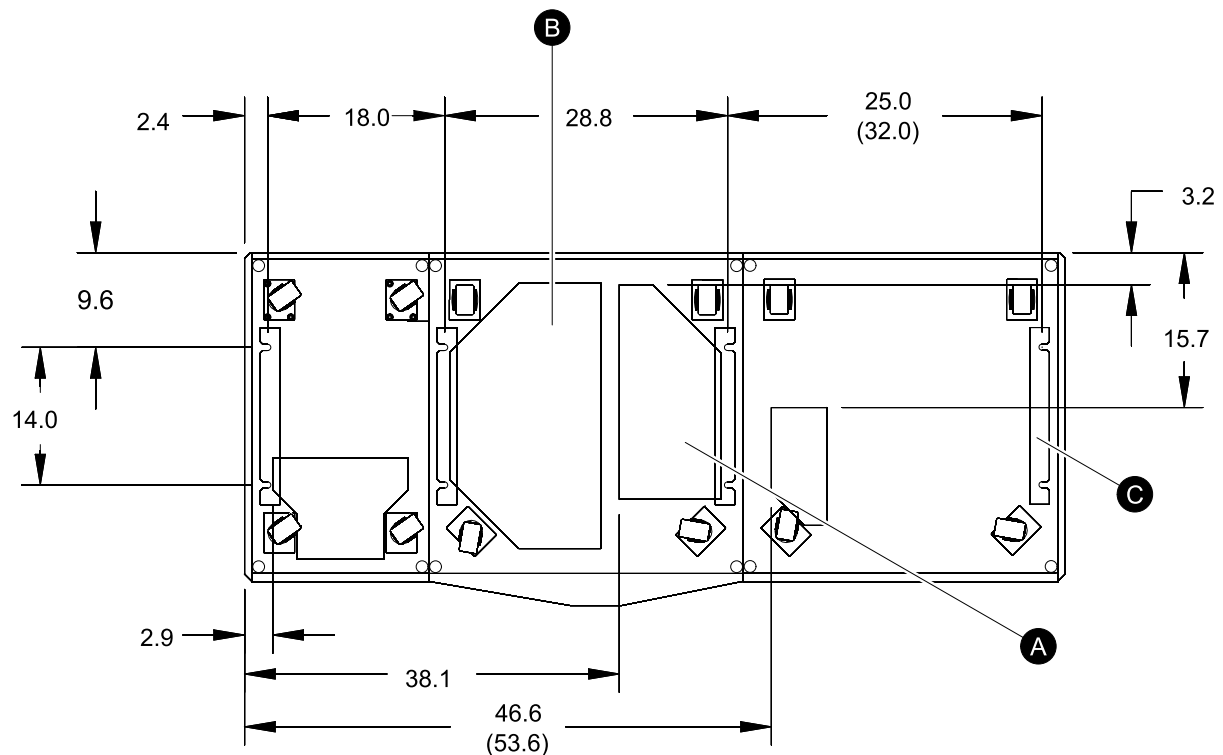


**Note:** Batteries should be stored no longer than three (3) months at 25°C (77°F) or lower prior to recharging. Exceeding the recommended ambient storage temperature will reduce battery back-up time and may adversely affect battery life.

# Prepare the Installation

## Conduit Plate Locations for Bottom Entry

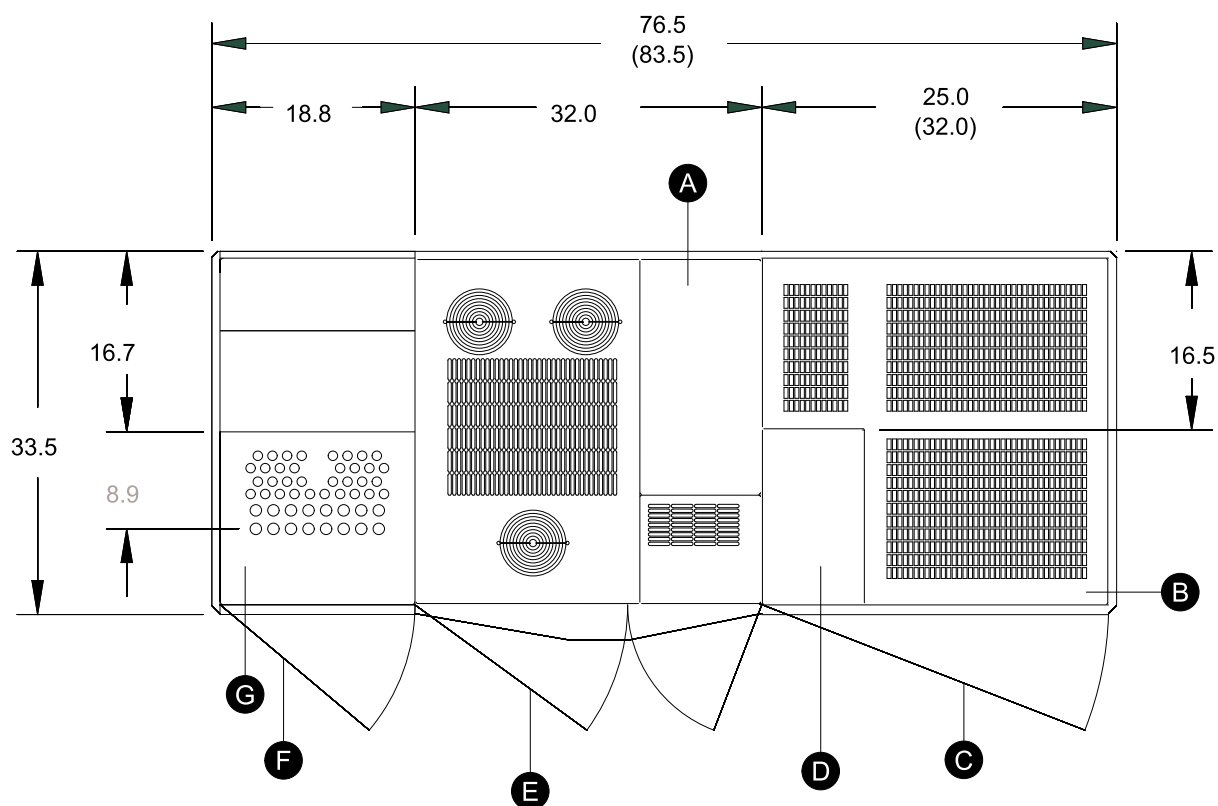
Cable entry through the bottom is the standard preferred design for the MGE Galaxy 4000 UPS cabinet. The bottom entry conduit plate provides space for up to five (5) separate conduit entries. The plate is secured with screws which should be retained for the conduit plate after the power connections are made. See illustration below for the location of the bottom entry conduit plates.



A	Cable entry plate
B	Air intake Do not block
C	Seismic bracket (optional) (4 PLCS)

# Conduit Plate Locations for Top Entry

The UPS cabinet for the MGE Galaxy 4000 is capable of accepting power input and output cables through a top entry. The conduit plate on the top of the cabinet provides provisions for knockouts for conduit and is secured to the cabinet with screws.



A	10 x 20.5 conduit	E	UPS
B	Air exhaust Do not block	F	Distribution
C	26W battery (33W battery)	G	(16) x 1.125 K.O. (34) .857 K.O
D	9 x 20.5 conduit		

# Connect AC Input and Power Cables

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## Installation Steps

APC recommends correct installation verification and unit startup to be performed by an APC certified Service partner.



**Caution:** Scheduling of the APC certified Service partner typically should be done 7 to 10 days before they are required on-site. If the startup of the UPS is critical to maintaining your schedule, please contact the Customer Support Center for assistance.

To insure a successful installation, each of these (5) steps should be followed in their correct sequence. Note that any unauthorized installation may cause damage to the UPS(s).

### First steps by an on-site qualified Technical Engineer

1. Unpack and position the unit.
2. Connect the main (utility) power.
3. Connect the output to the load.

### Final steps by an APC certified Service partner

4. Call APC and wait for the APC certified Service partner to approve the installation.
5. The APC certified Service partner finalizes the installation and the startup process.

## Electrical Connections



**Caution:** Only an authorized electrical professional should access electrical connections. A severe shock hazard exists.

The ONLY user serviceable items in the MGE Galaxy 4000 unit are:

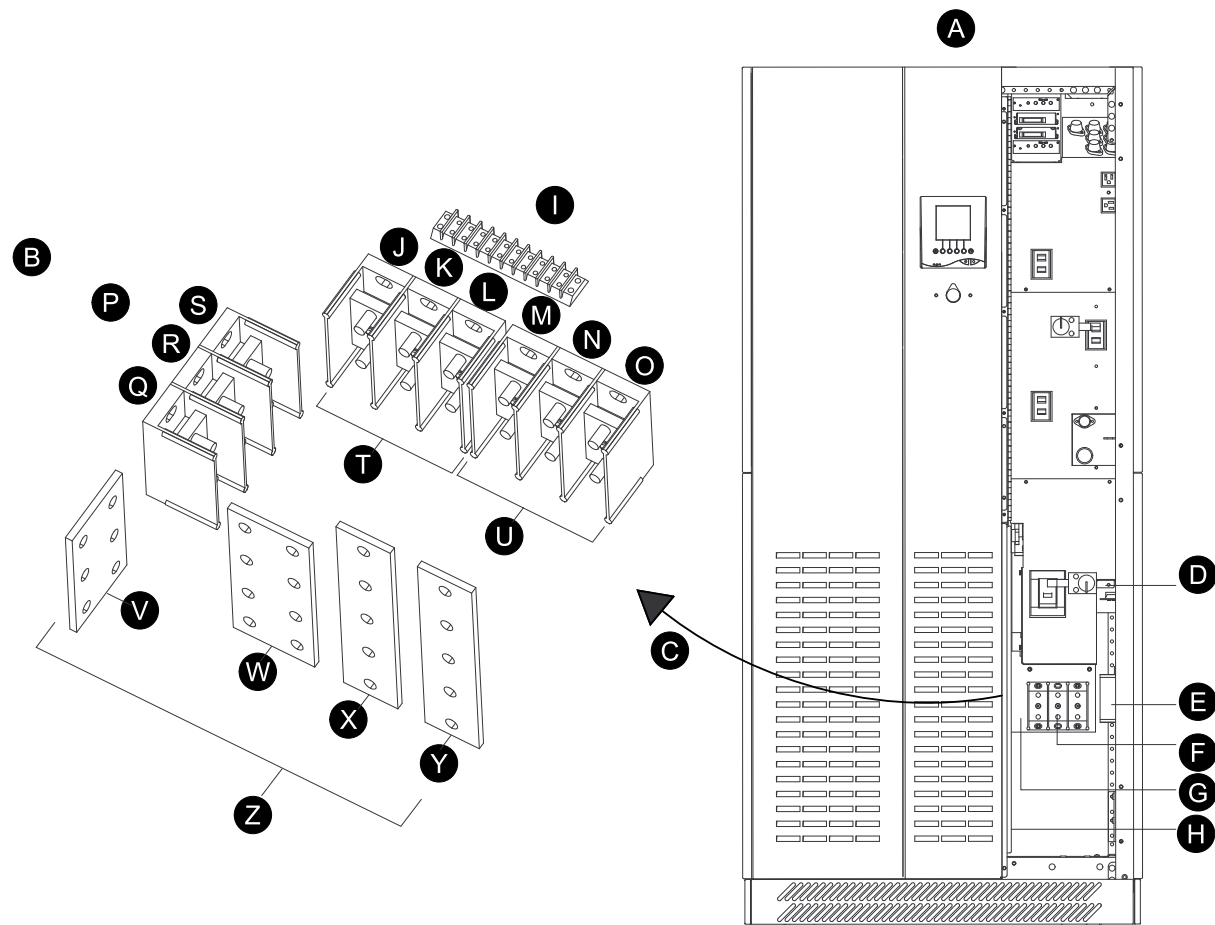
A	The main and bypass power connections.
B	The load connection.
C	Any cable connection to external or auxiliary modules.
D	The communication card options.

The access method for connections made to the communication cards is clearly seen when the front right door to the MGE Galaxy 4000 unit is opened. However, access to the main, bypass and load connections is made through the removal of the safety panel located in the lower right of the MGE Galaxy 4000 (with the right door open). This safety panel is removed by first removing the screws securing the panel. It can then be removed by lifting the safety panel away from the unit.



**Caution:** Before making any electrical connections, verify that all battery disconnect circuit breakers (QF1) are in the "off" position. Customer-supplied upstream protective devices and distribution circuits should be OFF.

## Typical Power Connections



A	Front view	N	B
B	Rear area	O	C
C	Front	P	Output TB2
D	TB4	Q	A
E	TB1	R	B
F	TB2	S	C
G	Ground	T	TB3 Bypass input
H	Neutral Negative Positive Busbars	U	TB1 Main input
I	TB4 Control	V	Ground
J	A	W	Neutral
K	B	X	Battery Positive
L	C	Y	Battery Negative
M	A	Z	Busbars

## UPS Connections

Electrical connections and cabinet interconnection will vary depending upon the configuration and options selected with your MGE Galaxy 4000 UPS system. Refer to the installation drawings supplied with your equipment.

Connecting Power Cable Connections:

To access the connection terminal blocks, open the right door to the MGE Galaxy 4000 UPS. Remove the safety panel located in the lower right hand section of the unit. See *“Typical Power Connections”*.

1. The ground and neutral conductors must be connected to the ground and neutral busbars, respectively. The input and output neutral are connected at the neutral busbar.
2. Connect the three conductors of the main AC source to terminal block TB1.
3. If bypass source is present, connect the conductors of the bypass AC source to terminal block TB3. If bypass source is not present, verify jumpers in place between TB1 and TB3.
4. Connect the three conductors supplying the load to terminal block TB2.
5. Connect the battery conductors to the positive and negative busbars.
6. Secure all cables with cable ties.
7. Put all panels and covers back in place.

## Main AC Input Connections

The connections to be made are the three phases, neutral, and ground cables from the utility AC power source to the UPS. The main AC input cables are terminated at the main input terminal block (TB1). See *“Typical Power Connections”*.



**Note:** For single input (optional configuration), jumper cables are provided from terminal blocks TB1 to TB3.

## Bypass AC Input Connections (optional)

The bypass AC input cables are terminated at the bypass input terminal block (TB3). This option provides a separate AC input source for bypass operation. See *“Typical Power Connections”*.



# Connect Battery Cables

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## Battery Connections

The connections to be made are the positive, negative, and ground cables from the battery cabinet to the UPS. The battery cables are terminated at the positive, negative, and ground busbars. See *“Typical Power Connections”*.

## Battery Control Connections

The battery control connections are made with the battery control cables from the external battery cabinet to the UPS terminal block TB4-1 to TB4-4. See *“Typical Power Connections”*.

# Connect AC Output

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## AC Output Connections

The connections to be made are the three phases, neutral, and ground cables from the load to the UPS. The output cables are terminated at the output terminal block (TB2). See *“Typical Power Connections”*.

## External Maintenance Bypass Control Connections (optional)

The external maintenance bypass (MBP) control connections are made with the MBP control cable from the external MBP to the UPS terminal block TB4-9 to TB4-10. See *“Typical Power Connections”*.



**WARNING:** These wires carry **HIGH VOLTAGE 120VAC**.

## Accessories Outlets

The 120VAC outlets to be used on APC authorized accessories only. The outlets total current not to exceed 2 amps.



**Caution:** Improper use of outlets may cause failure or damage to UPS.

# Connect Remote Emergency Power Off

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## Remote Emergency Power Off Connections

The control connections are available for Remote Emergency Power Off (REPO) through a customer-supplied (normally closed) pushbutton. With REPO connected, the jumper on the REPO terminal blocks must be removed. See *“Typical Power Connections”*.

- A. Remove the jumper from terminal block TB4 located across terminals 7 and 8.
- B. Connect the remote emergency power off NC contact to terminals 7 and 8.



**Caution:** The UPS is also equipped with a local Emergency Power Off (EPO) button on the front of the UPS cabinet. This switches all UPS critical power off. EPO or REPO should be used for emergency only!

# Connect Relay Communication Card

## Relay Communication Card Contacts

The relay communication card contains six programmable dry contact outputs and two programmable dry inputs and is standard on the MGE Galaxy 4000. The inputs and outputs are factory programmed according to functions listed in table below.

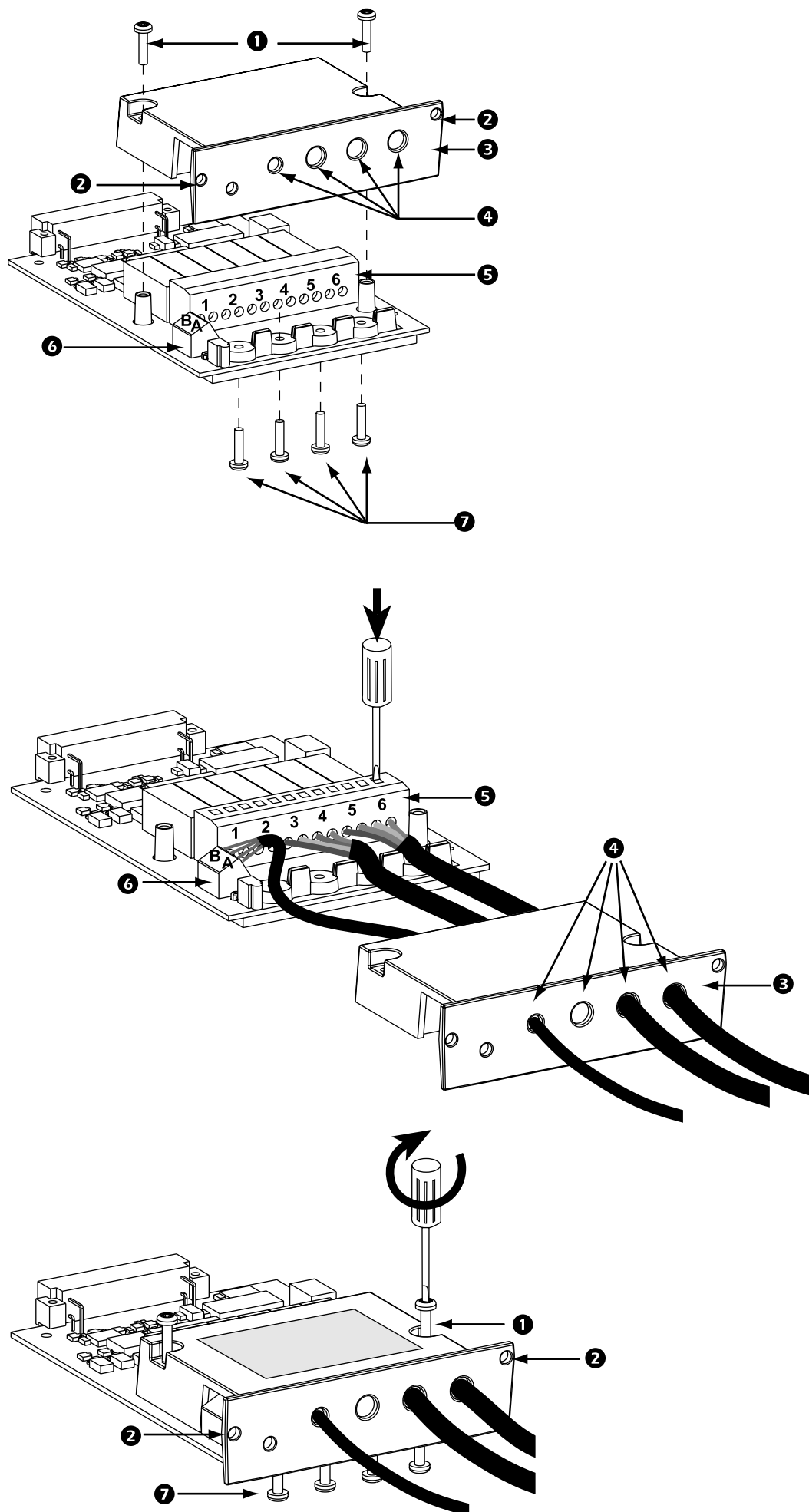
Inputs	Factory Settings	Options (available on both contacts)
1.A	UPS ON	<ul style="list-style-type: none"><li>• Room temperature fault</li><li>• Transfer to bypass disabled</li><li>• Transfer to bypass disabled if bypass AC source out of tolerance</li><li>• Desynchronize UPS from bypass AC source</li></ul>
1.B	UPS OFF	

Outputs	Factory Settings	Options (available on all contacts)
1.1	General alarm	<ul style="list-style-type: none"><li>• Overload</li><li>• PFC Fault</li><li>• Inverter fault</li><li>• Charger fault</li><li>• Automatic bypass fault</li><li>• Bypass AC source out of tolerance</li><li>• Battery-temperature fault</li><li>• Emergency power off activated</li><li>• Battery circuit breaker(s) open</li><li>• Phase-sequence fault on normal or bypass</li><li>• AC source</li><li>• Blown fuse(s)</li><li>• Transfer to bypass AC source disabled</li><li>• Operation in ECO mode</li><li>• UPS on bypass AC source</li></ul>
1.2	Battery fault	
1.3	Load on UPS	
1.4	Load on automatic bypass	
1.5	Load on battery power	
1.6	Low battery warning	

The output contacts numbers for a second relay board installed will be 2.1 to 2.6. Contacts are of the NO (normally open) type. For dry contacts setting see *“MGE Galaxy 4000 40–75 kVA 208 V Operation Manual — User Configuration — Settings Screen”*.



**Caution:** Isolate and lock-out all power sources for this card before making connections. Never connect ELSV (extra low safety voltage) and non-ELSV circuits to the different outputs of the same card.



# Relay Communication Card Connections

Refer to “*Relay Communication Card Contacts*” for relay communication card, cover and hardware details. See “*MGE Galaxy 4000 40–75 kVA 208 V Operation Manual — Operation — Preparing for Startup*” for communication card port location in the unit.

1. Remove the cover “3” secured by the screws “1”.
2. Run the communication cables through the cable entry holes “4”.
3. Connect the conductors to the input “6” and output “5” terminal blocks (refer to “*Relay Communication Card Contacts*” for a connection example.)
4. Put the cover back in place and secure it with the screws “1”.
5. Tighten the screws “7” to clamp the cables.
6. Indicate the locations of the power sources on the labels.
7. Insert the card in its slot.
8. Secure the card with two screws “2”.

## Characteristics of Output Contacts

Relay Type	Normally Open
Max. voltage	250VAC, 30VDC
Max. current	2 A
Cable	4 x 0.93 mm, 6.6 ±0.3 mm

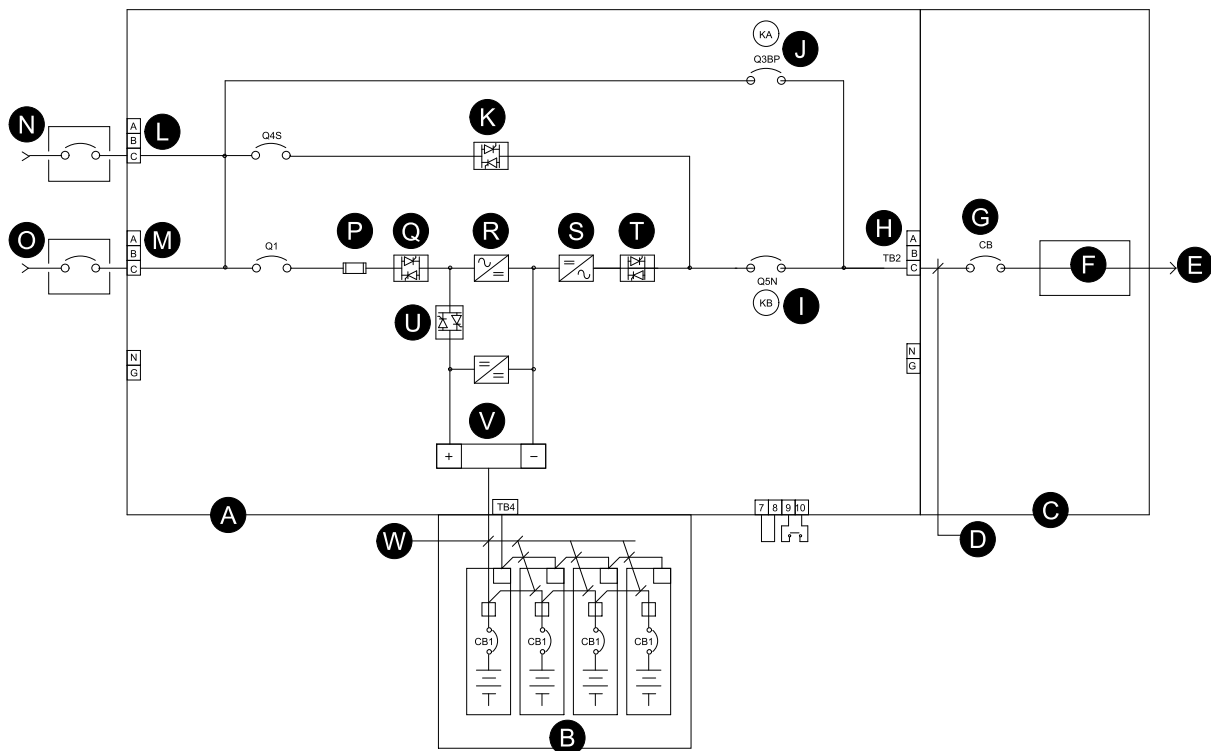
## Characteristics of Input Contacts

Switched voltage	5VDC
Consumption	10 mA
Cable	4 x 0.34 mm, 5 ±0.5 mm

Output alarms are always activated on the conditions stated unless requested by customer to operate on other conditions.

Input contacts are designed for remote UPS operation. Use extreme caution when using these contacts so as not to endanger persons or compromise the UPS load.

# Appendix Single Line Diagram



A	UPS	M	Main Input TB1
B	Battery	N	Optional Bypass Input 208YVAC
C	Distribution	O	Main Input 280YVAC
D	Supplied by MGE & Connected by customer	P	Input Fuses
E	To critical load	Q	Input Static Switch
F	42 Pole Panel board	R	PFC Boost Rectifier
G	Output (optional)	S	Inverter
H	Output	T	Output Static Switch
I	(optional)	U	Battery Static Switch
J	(optional)	V	Battery Charger
K	Bypass Static Switch	W	Supplied by MGE & Connected by customer (adjacent version) Supplied & connected by customer (stand alone version)
L	Bypass Input TB3		

## **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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