EPS 6000 UPS Uninterruptible Power Systems Installation Manual

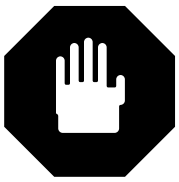
MGE
UPS SYSTEMS

IMPORTANT SAFETY INSTRUCTION

SAVE THESE INSTRUCTIONS — This manual contains important instructions for EPS 6000 inverters that must be followed during installation, operation and maintenance of the equipment.

WARNING

OPENING ENCLOSURES EXPOSES 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.

This manual is a controlled document; pages should not individually be removed from this binder.

NOTE

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 his own expense.

EPS 6000

Uninterruptible Power System

Installation Manual

For service call
1-800-438-7373

86-130035-00 B00 11/96

MGE UPS Systems
1660 Scenic Avenue
Costa Mesa, CA 92626
(714) 557-1636

MGE
UPS SYSTEMS

EPS 6000
Uninterruptible Power System
Installation Manual

Warranty

Seller warrants to the Ultimate Purchaser (the purchaser who buys for use, and not for resale) that all products furnished under this order and which are manufactured by Seller will conform to final specifications, drawings, samples and other written descriptions approved in writing by Seller, and will be free from defects in materials and workmanship. These warranties shall remain in effect for period of twelve (12) months after delivery to the Ultimate Purchaser. But if the Seller installs the equipment or supplies technical direction of installation by contract, said one year shall run from the completion of installation, provided installation is not unreasonably delayed by Ultimate Purchaser. Parts replaced or repaired in the warrant period shall carry the unexpired portion of the original warranty. A unit placed with the Purchaser on consignment and then later purchased will be warranted for twelve (12) months from the time the Seller receives notification of the Purchaser's intent to purchase said consigned item. The foregoing in its entirety is subject to the provision that in no case will the total warranty period extend beyond 18 months from date Seller ships equipment from point of manufacture.

The liability of Seller hereunder is limited to replacing or repairing at Seller's factory or on the job site at Seller's option, any part or parts which have been returned to the Seller and which are defective or do not conform to such specifications, drawings or other written descriptions; provided that such part or parts are returned by the Ultimate Purchaser within ninety (90) days after such defect is discovered. The Seller shall have the sole right to determine if the parts are to be repaired at the job site or whether they are to be returned to the factory for repair or replacement. All items returned to Seller for repair or replacement must be sent freight prepaid to its factory. Purchaser must obtain Seller's Return Goods Authorization prior to returning items. The above conditions must be met if warranty is to be valid. Seller will not be liable for any damage done by unauthorized repair work, unauthorized replacement parts, from any misapplication of the item, or for damage due to accident, abuse, or Act of God.

In no event shall the Seller be liable for loss, damage, or expense directly or indirectly arising from the use of the units, or from any other cause, except as expressly stated in this warranty. Seller makes no warranties, express or implied, including any warranty as to merchantability or fitness for a particular purpose or use. Seller is not liable for and Purchaser waives any right of action it has or may have against Seller for any consequential or special damages arising out of any breach of warranty, and for any damages Purchaser may claim for damage to any property or injury or death to any person arising out of its purchase of the use, operation or maintenance of the product. Seller will not be liable for any labor subcontracted or performed by Purchaser for preparation of warranted item for return to Seller's factory or for preparation work for field repair or replacement. Invoicing of Seller for labor either performed or subcontracted by Purchaser will not be considered as a liability by the Seller.

This warranty shall be exclusive of any and all other warranties express or implied and may be modified only by a writing signed by an officer of the Seller. This warranty shall extend to the Ultimate Purchaser but to no one else. Accessories supplied by Seller, but manufactured by others, carry any warranty the manufacturers have made to Seller and which can be passed on to Ultimate Purchaser.

Seller makes no warranty with respect to whether the products sold hereunder infringe any patent, U.S. or foreign, and Buyer represents that any specially ordered products do not infringe any patent. Buyer agrees to indemnify and hold Seller harmless from any liability by virtue of any patent claims where Buyer has ordered a product conforming to Buyer's specifications, or conforming to Buyer's specific design.

Buyer has not relied and shall not rely on any oral representation regarding the Product sold hereunder and any oral representation shall not bind Seller and shall not be part of any warranty.

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Service and Factory Repair - Call 1 - 800 - 438 - 7373

Direct questions about the operation, repair, or servicing of this equipment to MGE UPS Systems, Inc. Customer Support Services. Include the part number, assembly number, and serial number of the unit in any correspondence. Should you require factory service for your equipment, contact MGE UPS Systems, Inc. Customer Support Services and obtain a Return Goods Authorization (RGA) prior to shipping your unit. Never ship equipment to MGE UPS Systems, Inc. without first obtaining an RGA.

Proprietary Rights Statement

Revision History

EPS 6000 Uninteruptible Power System Installation Manual
86-130035-00

Revision: B00 02/97

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Section III Installation, Shared Systems

Section IV Maintenance

Illustrations

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How to use this manual

This manual is designed for ease of use and easy location of information.

To quickly find the meaning of terms used within the text, look in the Glossary.

This manual uses Noteboxes to convey important information. Noteboxes come in four varieties:

WARNING

A WARNING notebox indicates information provided to protect the user and service personnel against safety hazards and/or possible equipment damage

CAUTION

A CAUTION notebox indicates information provided to protect the user and service personnel against possible equipment damage.

IMPORTANT

An IMPORTANT notebox indicates information provided as an operating instruction, or as an operating tip.

NOTE

A NOTE notebox indicates information provided as an operating tip or an equipment feature.

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Introduction

1.0 Scope

This manual provides technical information required for installation and maintenance of the EPS 6000 uninterruptible power system (UPS). Please read this manual before installing the EPS 6000 equipment. Please retain this manual for future reference.

The manual is divided into four sections:

Section I — General Description

This section introduces the EPS 6000 family of uninterruptible power systems, including a general description of the system and its internal components, a description of available options, and system specifications.

Section II — Installation, Single-Module Systems

This section describes installation of EPS 6000 UPS single-module systems, including receiving, handling, and storage procedures; installation procedures; and start-up procedures.

Section III — Installation, Shared Systems

This section describes installation of EPS 6000 UPS shared systems, including receiving, handling, and storage procedures; installation procedures; and start-up procedures.

Section IV — Maintenance

This section describes maintenance of the EPS 6000 UPS, including safety instructions, preventive maintenance, and information about replacement parts.

A Glossary in the rear of this manual provides definitions of terms used within the text.

A separate manual, EPS 6000 UPS User's Guide (MGE part number 86-130033-00) provides detailed operating instructions for single-module systems; the EPS 6000 User's Guide, Shared Systems (MGE part number 86-130034-00) provides detailed operating instructions for shared systems.

1.1 General Description

EPS 6000 is a family of compact, high-efficiency uninterruptible power systems. Standard power ratings for single-module systems range from 150 to 750 kVA, while standard shared systems are rated up to 1,500 kVA. EPS 6000 UPS are optimized for compatibility with non-linear computer-type loads. Computer-aided UPS diagnostics and modular construction assures that any required service on the UPS can be identified and completed rapidly. Remote system monitoring, remote annunciation of UPS performance signals, and telecommunication capabilities allow total control of the UPS by the user.

The EPS 6000 UPS family is rated for 480 VAC input and output. When different input and/or output voltages are specified, external transformers are used to provide the step-up and/or step-down functions as required. These transformers are housed in auxiliary cabinets, which may also house additional filtering, output distribution circuit breakers, or other options as specified.

The EPS 6000 UPS, SSC, battery, and all auxiliary equipment is listed for safety by Underwriter's Laboratories, Inc. (UL) under UL Standard 1778 and under Canadian Standards Association (CSA) standard C22.107.

Major components of the EPS 6000 UPS family include:

- EPS 6000 UPS module
- EPS 6000 SSC static switch cabinet
- EPS 6000 SSC maintenance bypass cabinet
- EPS 6000 auxiliary cabinet
- EPS 6000 battery cabinet

Each of these cabinets is described below. Figure 1-1 and 1-3 show an EPS 6000 single-module UPS. Figure 1-2 and 1-4 show single-line diagrams of typical single-module installations (one UPS module, and one battery). Figure 1-5 shows a 750 kVA EPS 6000 UPS. Figure 1-6 shows a single-line diagram of a typical 750 kVA system installation. Table 1-1 identifies single-module EPS 6000 UPS model numbers.

Figure 1-7 shows a typical shared UPS installation, consisting of one static switch cabinet (SSC), two UPS modules, and two adjacent battery cabinets. Figure 1-8 shows a single-line diagram of the same shared UPS installation. Table 1-2 identifies EPS 6000 UPS model numbers for modules used in shared systems, and Table 1-3 identifies EPS 6000 SSC model numbers.

Figure 1-1 **EPS 6000 UPS 150 - 375 kVA Pictorial**

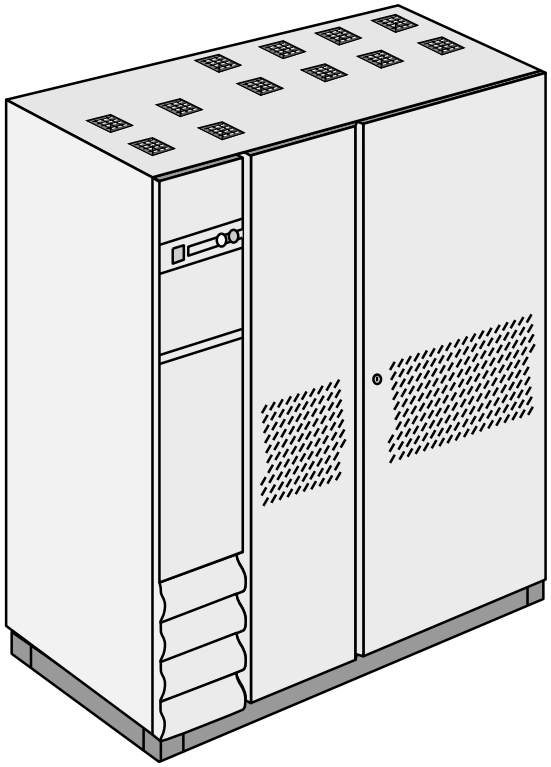


Figure 1-2 **Typical Single-Line Diagram: EPS 6000 480 VAC Input/Output Single-Module 150 to 375 kVA UPS With Battery Cabinet**

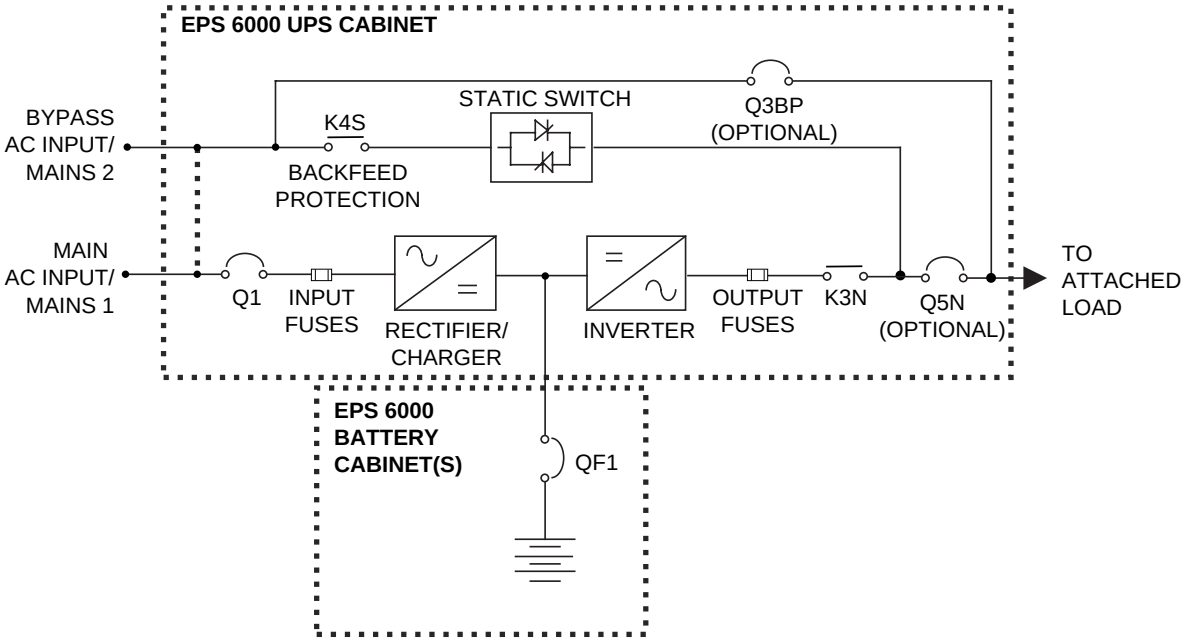


Figure 1-3 **EPS 6000 UPS 500 kVA Pictorial**

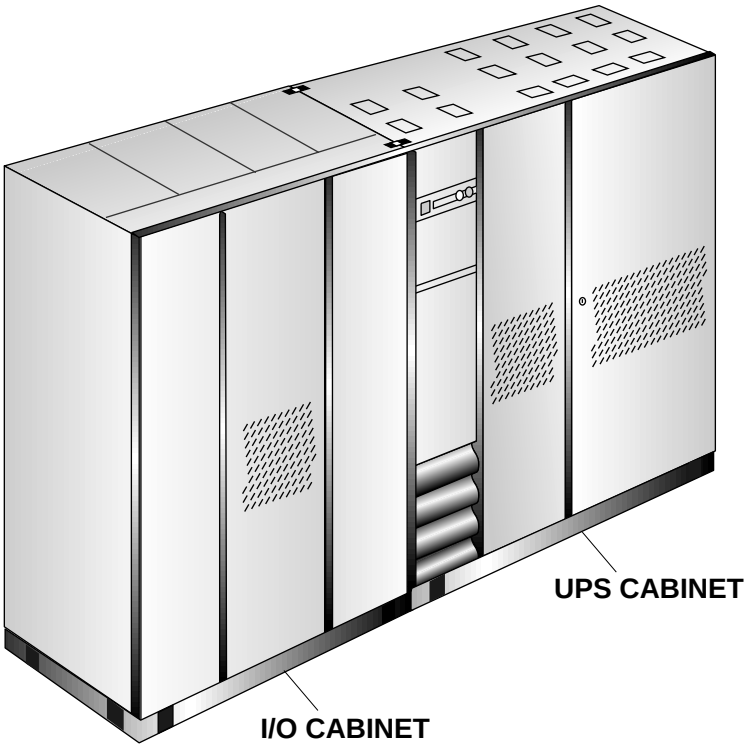


Figure 1-4 **Typical Single-Line Diagram (EPS 6000 480 VAC Input/Output Single Module 500 kVA UPS With Battery Cabinet)**

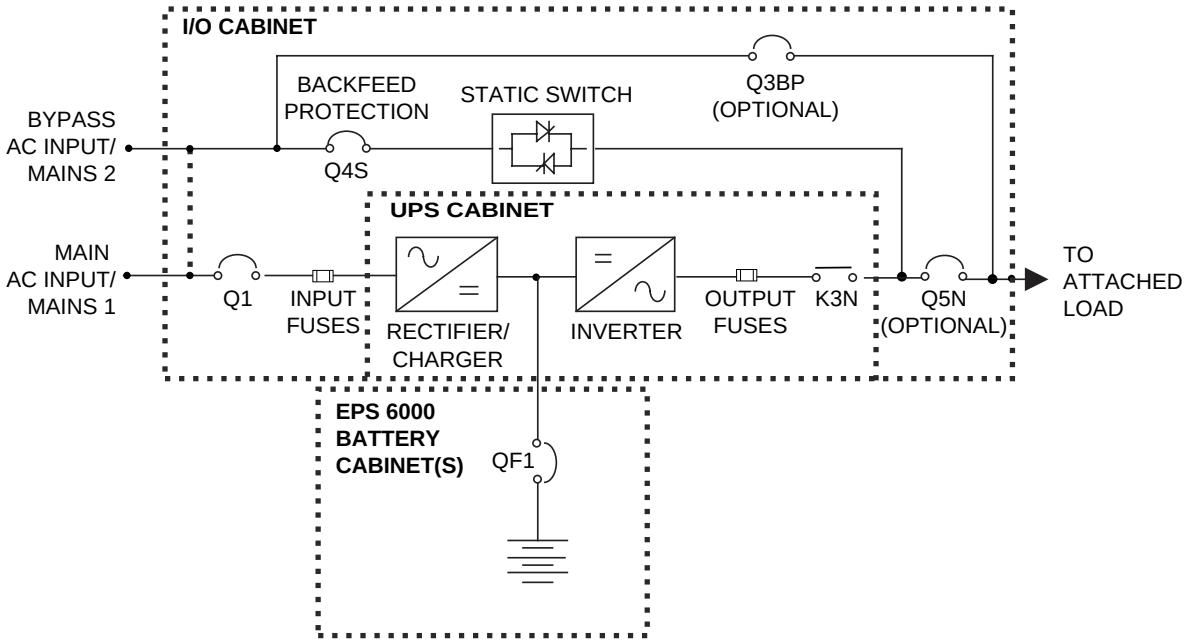


Figure 1-5 **EPS 6000 UPS 750 kVA Pictorial**

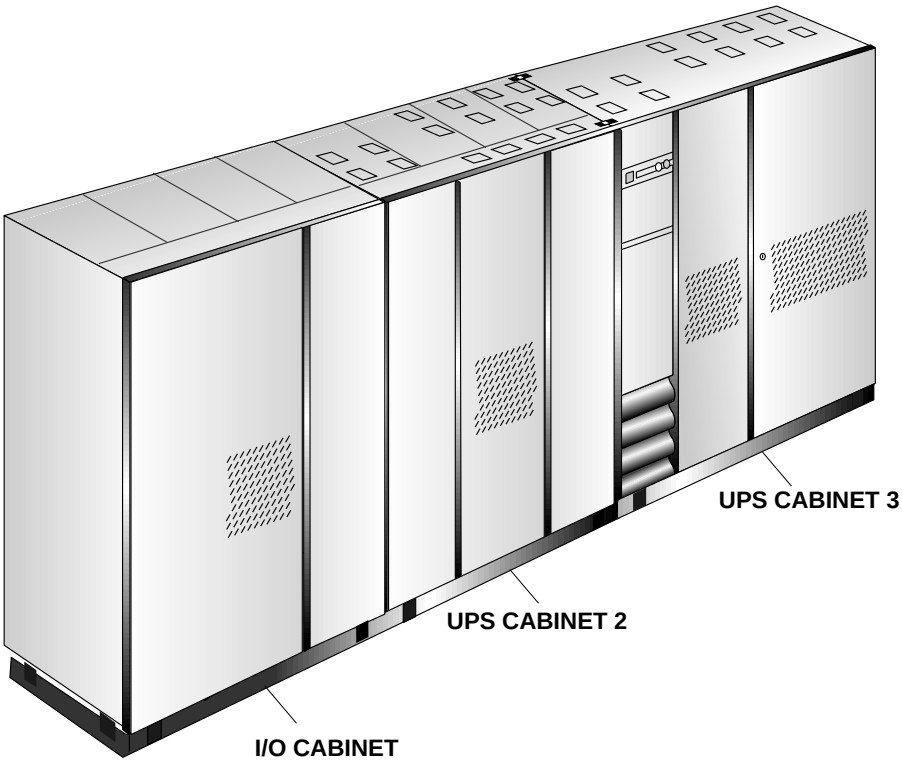


Figure 1-6 **Typical Single-Line Diagram (EPS 6000 480 VAC Input/Output Single Module 750 kVA UPS With Battery Cabinet)**

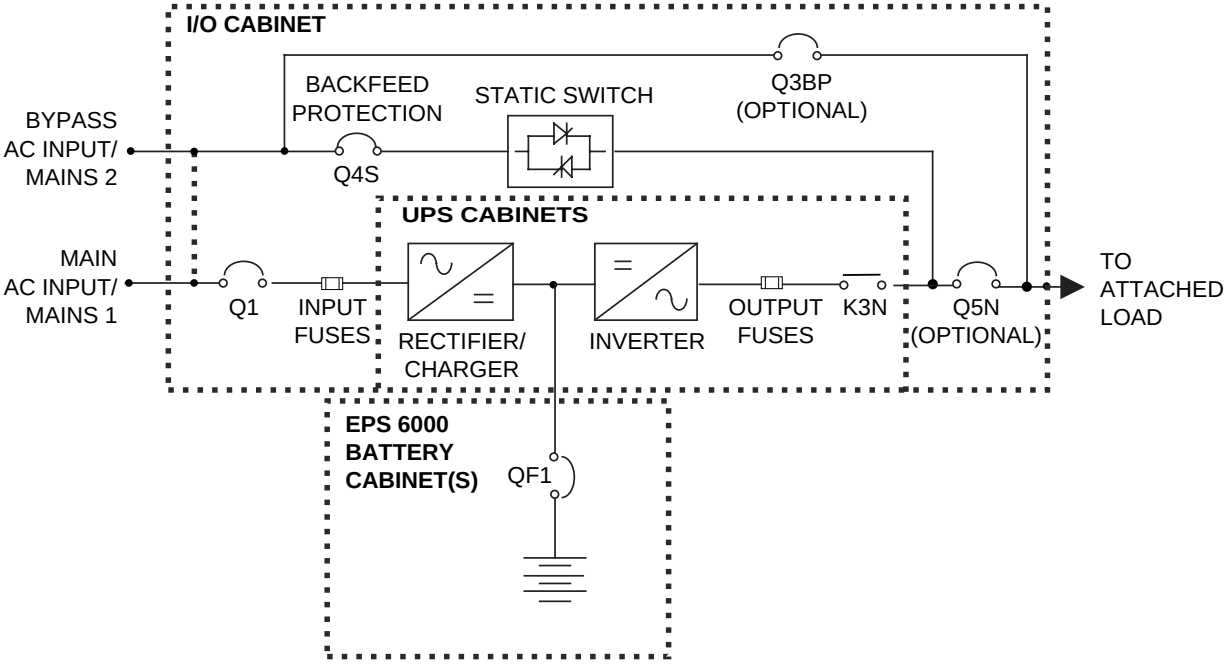


Table 1-1 EPS 6000 Model Numbers, Single UPS Modules

MODEL NUMBER	INPUT VOLTAGE (VAC)	OUTPUT VOLTAGE (VAC)	OUTPUT RATING (kVA/kW)	INPUT CB (Amps)	TOTAL WIDTH (mm/in)	TOTAL WEIGHT (kg/lb)	HEAT LOSS (Btu/hr)	AIR FLOW (CFM/m³/mm)
EPS 6150								
EPS-6150/22,66	208	208	150/120	400	3,325/131	3,013/6,644	40,494	2500/70
EPS-6150/42,66	480	208	150/120	400	2,460/97	2,664/4,876	30,818	2500/70
EPS-6150/44,66	480	480	150/120	400	1,610/63.5	2,044/4,508	25,603	2500/70
EPS 6225								
EPS-6225/22,66	208	208	225/180	400	3,325/131	3,013/6,644	49,797	2500/70
EPS-6225/42,66	480	208	225/180	400	2,460/97	2,665/5,876	46,227	2500/70
EPS-6225/44,66	480	480	225/180	400	1,610/63.5	2,044/4,508	39,202	2500/70
EPS 6300								
EPS-6300/22,66	208	208	300/240	600	4,115/162	4,451/9,815	66,396	2500/70
EPS-6300/42,66	480	208	300/240	600	2,870/113	3,800/8,379	61,636	2500/70
EPS-6300/44,66	480	480	300/240	600	1,610/63.5	2,514/5,543	52,269	2500/70
EPS 6375								
EPS-6375/22,66	208	208	375/300	700	4,115/162	4,736/10,440	82,995	2500/70
EPS-6375/42,66	480	208	375/300	700	2,870/113	4,007/8,836	77,045	2500/70
EPS-6375/44,66	480	480	375/300	700	1,610/63.5	2,545/5,612	65,336	2500/70
EPS 6500								
EPS-6500/44,66	480	480	500/400	1000	2,565/113	4,244/7,211	79,453	3400/95
EPS 6750								
EPS-6750/44,66	480	480	750/600	1600	4,950/195	6,200/13,600	13,1000	5900/165

NOTES:

1. Total width, weight, and heat loss are for system line-up including auxiliary cabinets but excluding pallets.
2. Data does not include battery data; refer to the installation drawings supplied with your equipment.
3. Information provided is for standard configurations; data may change with optional equipment. Consult the installation drawings provided with your equipment.

Figure 1-7 **Pictorial, Typical EPS 6000 UPS Shared Installation (Shown With Two 375 kVA UPS Modules)**

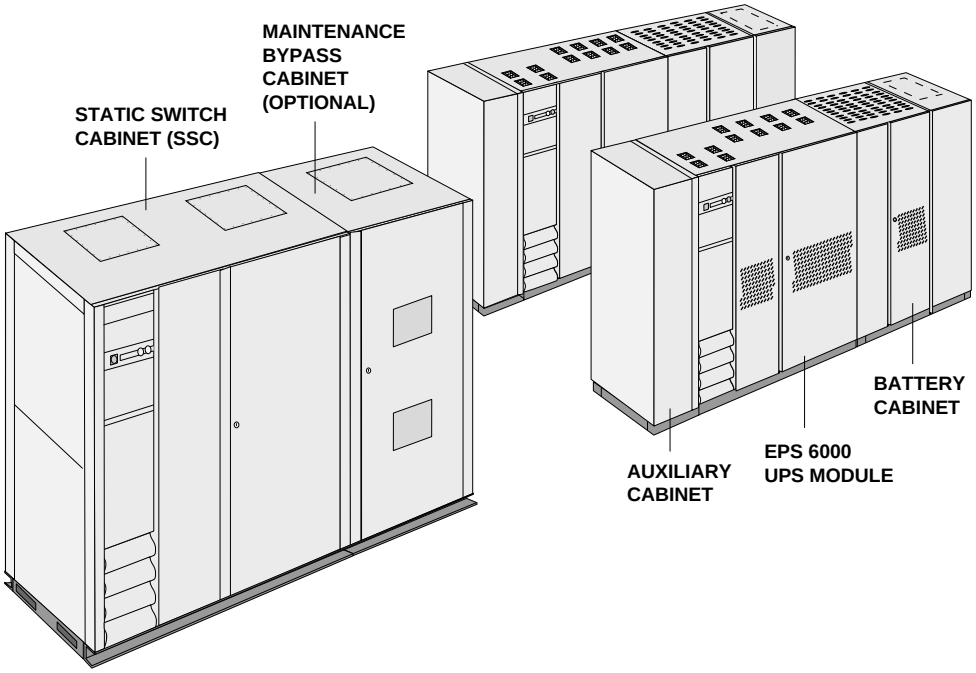


Figure 1-8 **Single-Line Diagram, Typical EPS 6000 UPS Shared Installation**

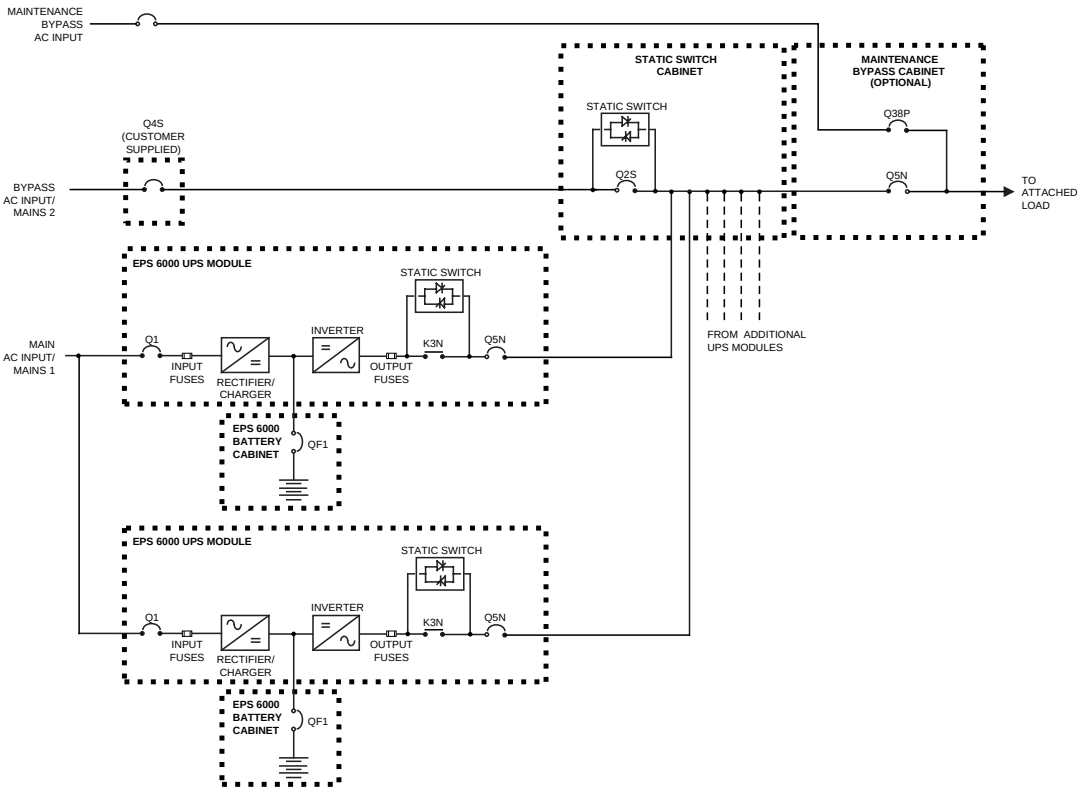


Table 1-2 EPS 6000 Model Numbers, Shared System UPS Modules

MODEL NUMBER	INPUT VOLTAGE (VAC)	OUTPUT VOLTAGE (VAC)	OUTPUT RATING (kVA/kW)	INPUT CB (Amps)	TOTAL WIDTH (mm/in)	TOTAL WEIGHT (kg/lb)	HEAT LOSS (Btu/hr)	AIR FLOW (CFM/m^3/mm)
EPS-6150/44,66P	480	480	150/120	400	2,010/81.5	2,044/4,508	30,818	2500/70
EPS-6225/44,66P	480	480	225/180	400	2,010/81.5	2,044/4,508	39,202	2500/70
EPS-6300/44,66P	480	480	300/240	600	2010/81.5	2,514/5,543	52,269	2500/70
EPS-6375/44,66P	480	480	375/300	700	2,010/81.5	2,545/5,612	65,336	2500/95
EPS-6500/44,66P	480	480	500/400	1000	2,865/113	4244/7211	79,453	3400/95
EPS-6750/44,66P	480	480	750/600	1600	4,950/195	6,000/13,200	131,000	5900/165

NOTES:

1. Total width, weight, and heat loss are for system line-up including auxiliary cabinets but excluding pallets.
2. Data does not include battery data; refer to the installation drawings supplied with your equipment.
3. Information provided is for standard configurations; data may change with optional equipment. Consult the installation drawings provided with your equipment.

Table 1-3 EPS 6000 Model Numbers, Static Switch Cabinets (SSC)

MODEL NUMBER	INPUT VOLTAGE (VAC)	OUTPUT VOLTAGE (VAC)	OUTPUT RATING kVA/kW	INPUT CB (Amperes)	TOTAL WIDTH (mm/in)	TOTAL WEIGHT (kg/lb)	HEAT LOSS (Btu/hr)
SSC1000	480	480	831/665	1000	1829/36	1829/2900	(Negligible)
SSC1500	480	480	1500/1200	2000	1829/72	1829/2900	(Negligible)

Figure 1-9 **EPS 6000 Major Internal Components, Single-Module UPS 150 - 225 kVA**

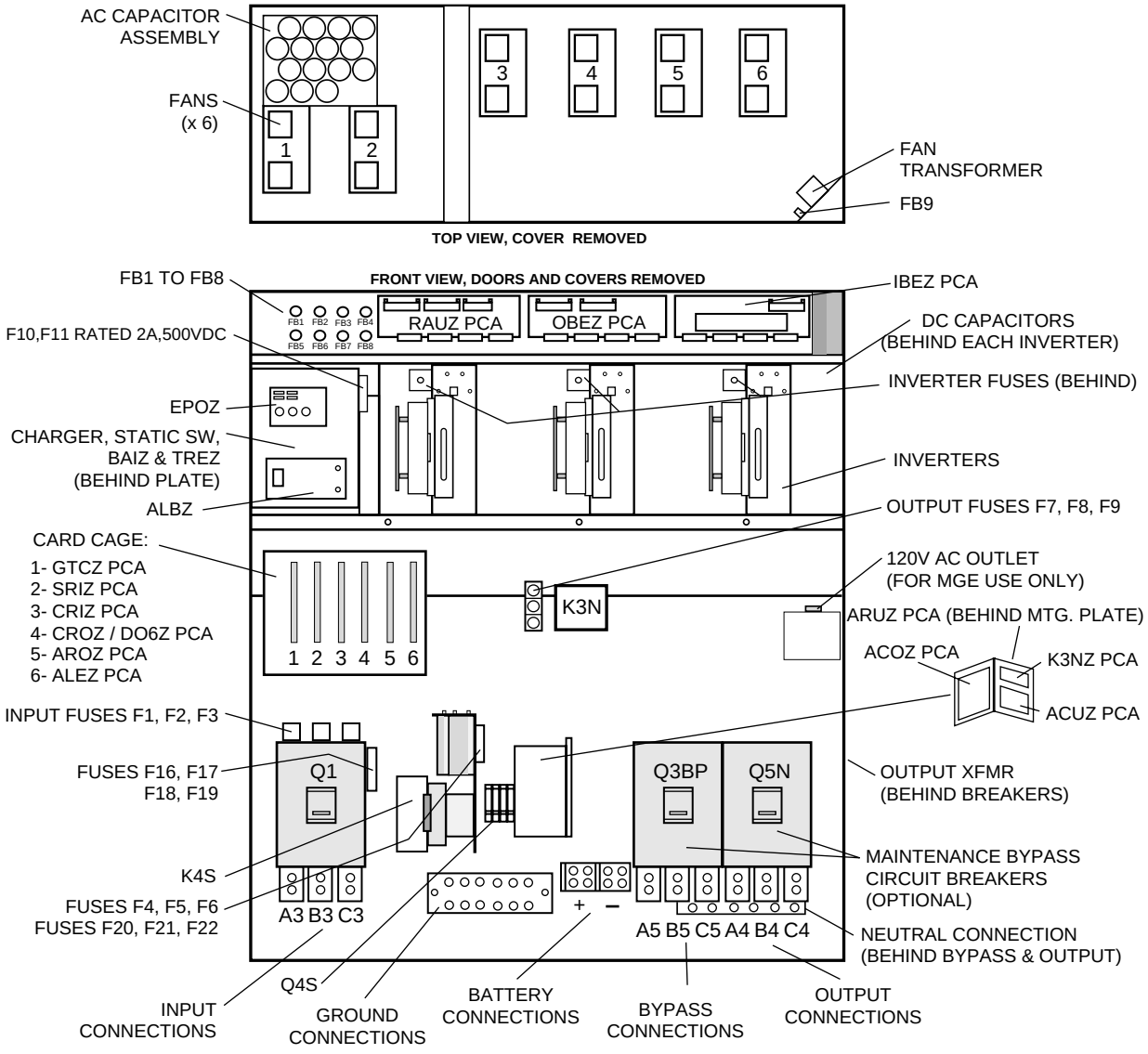


Figure 1-10 **EPS 6000 Major Internal Components, Shared System UPS 150 - 225 kVA**

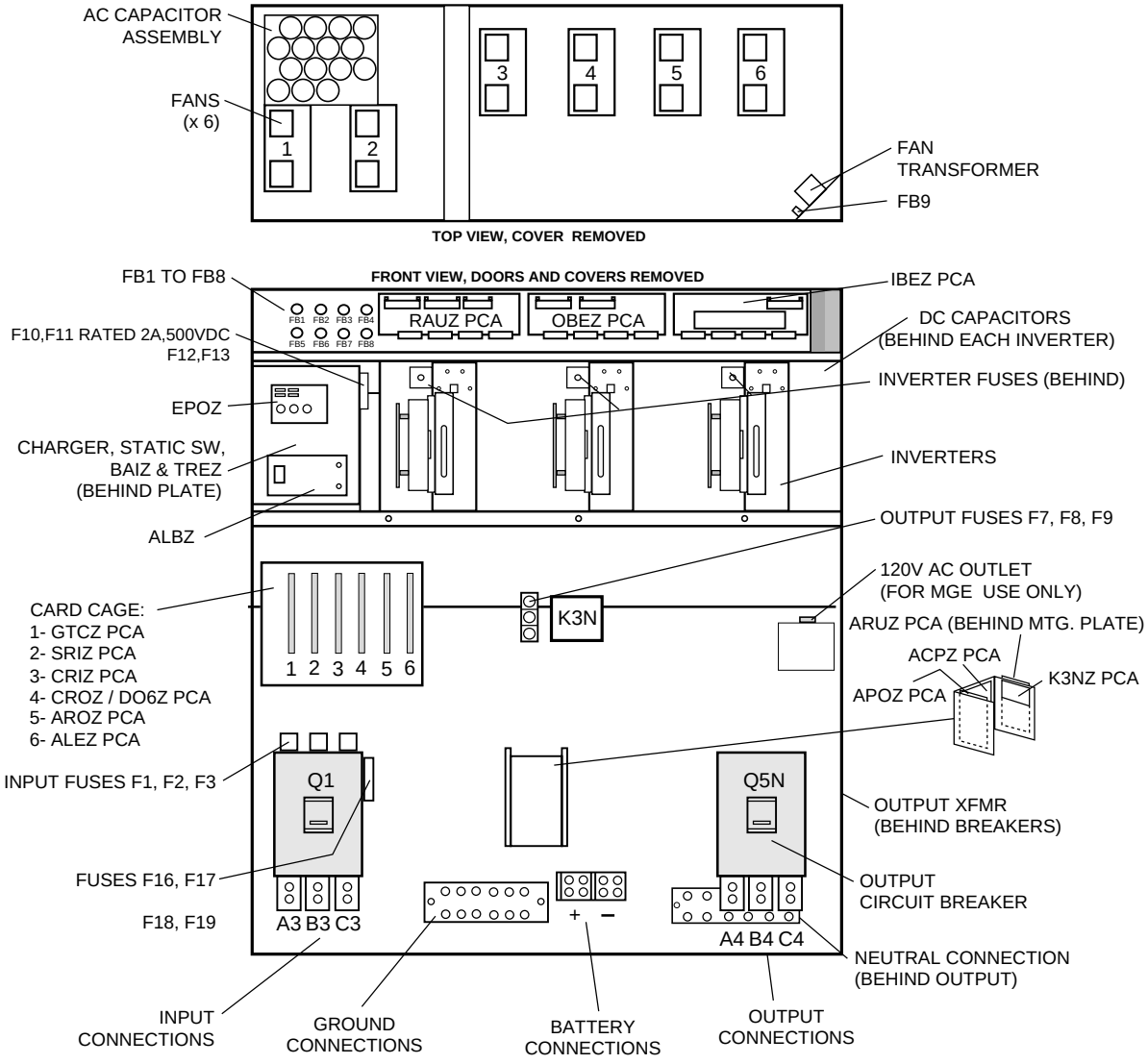


Figure 1-11 **EPS 6000 Major Internal Components, Single-Module UPS 300 - 375 kVA**

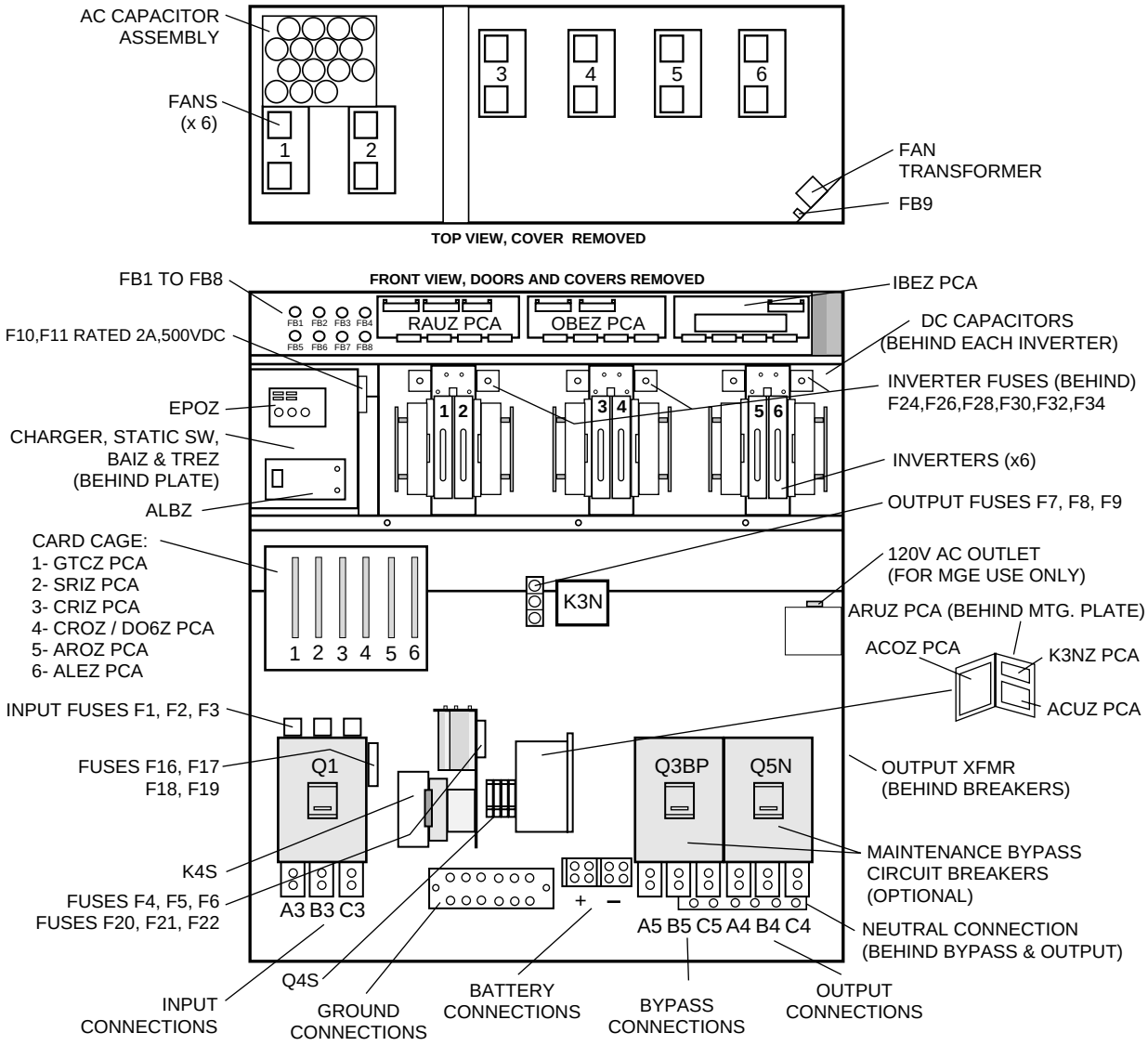


Figure 1-12 **EPS 6000 Major Internal Components, Shared System UPS Module 300 - 375 kVA**

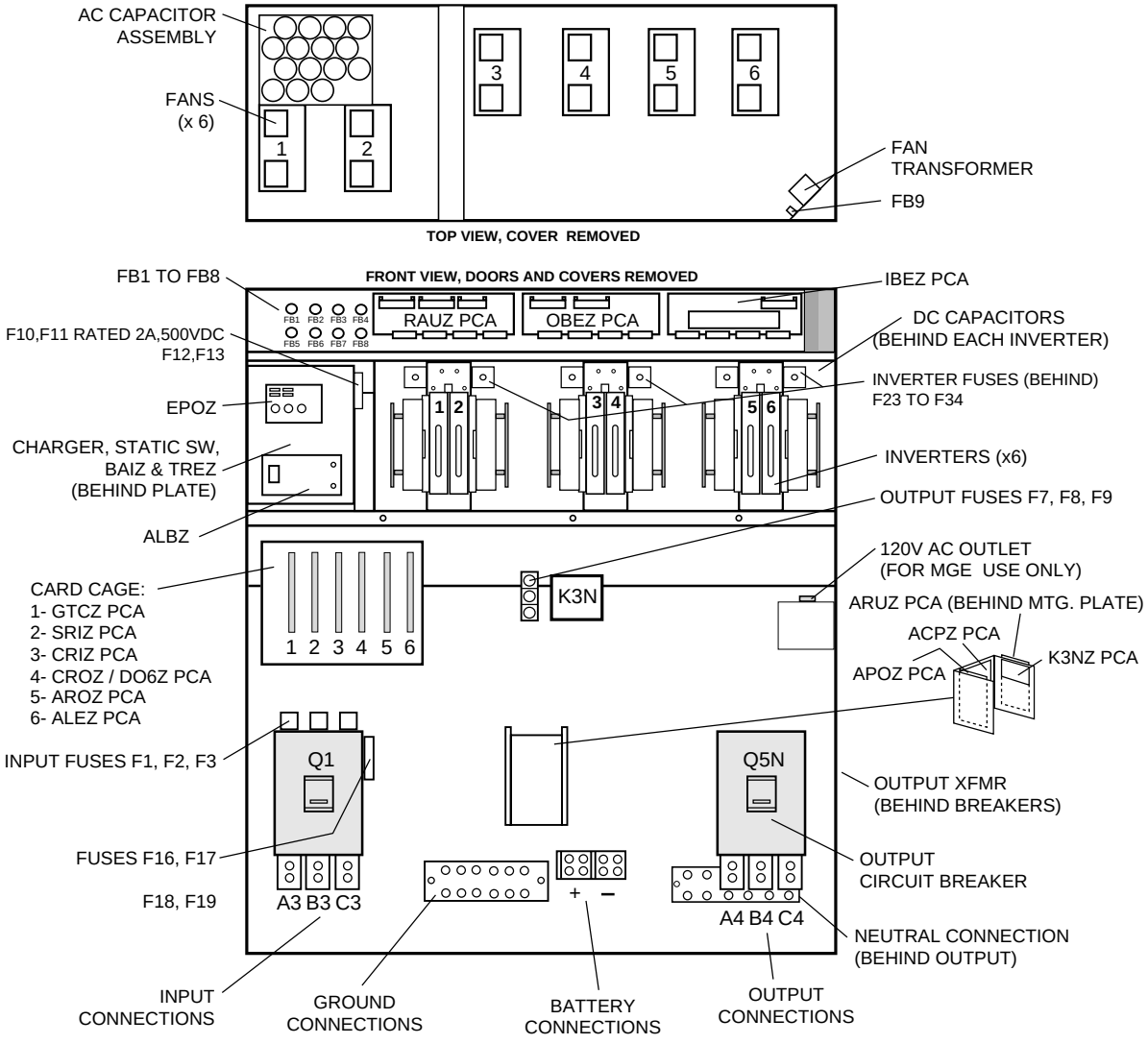


Figure 1-13 **EPS 6000 Major Internal Components, Single-Module 500 kVA UPS, I/O Cabinet**

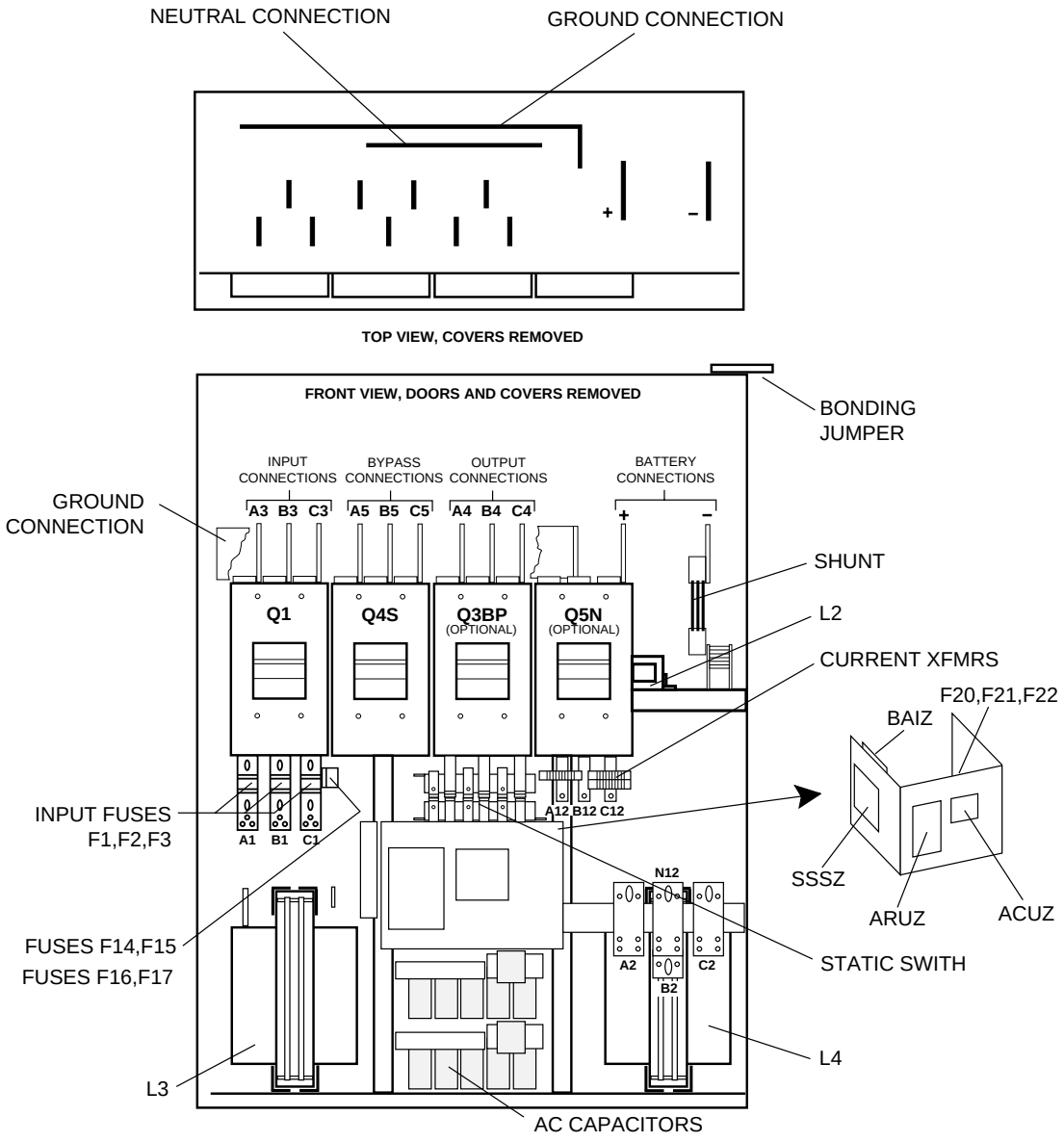


Figure 1-14 **EPS 6000 Major Internal Components, Single-Module 500 kVA UPS, UPS Cabinet**

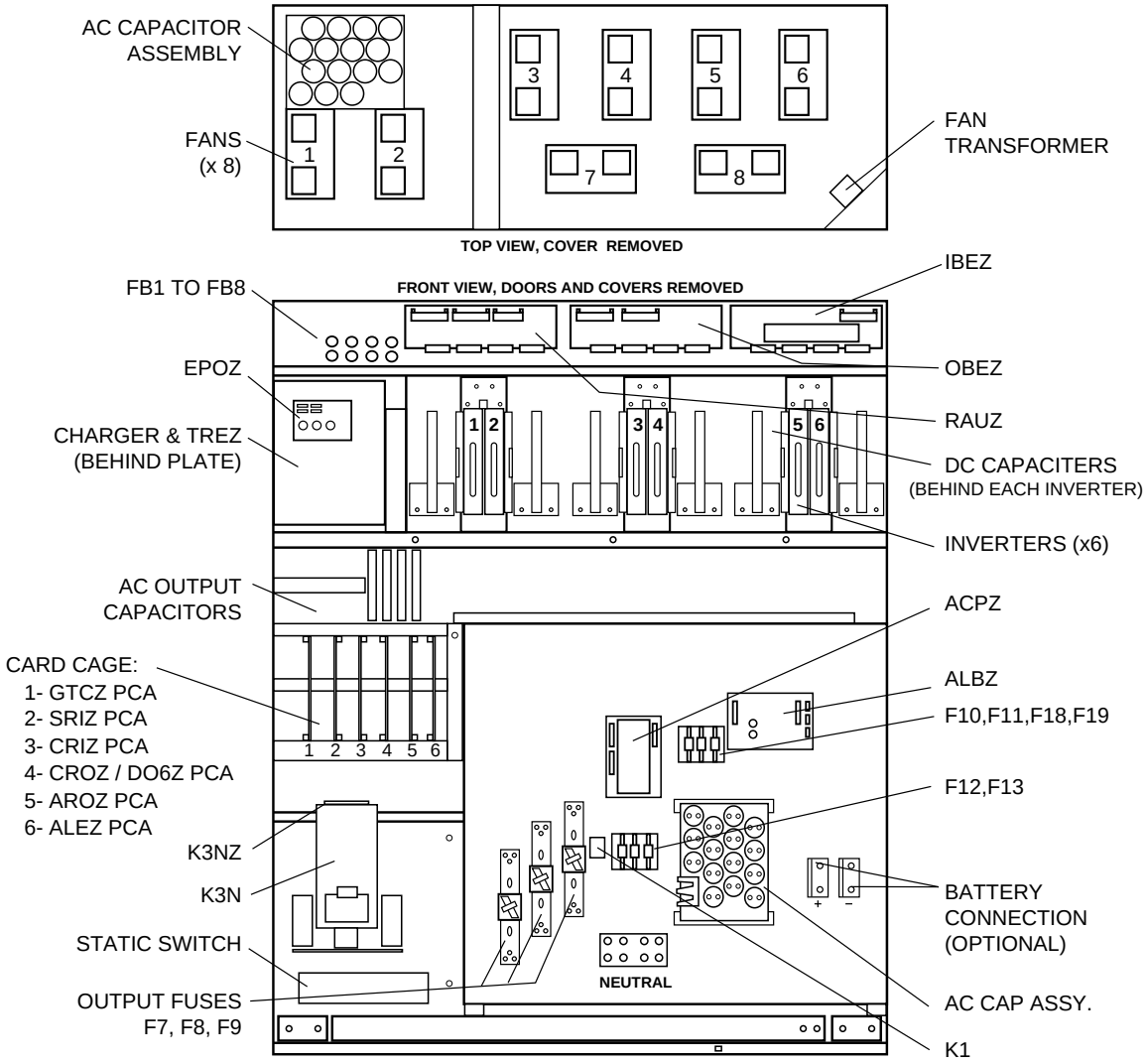


Figure 1-15 **EPS 6000 Major Internal Components, Shared 500 kVA UPS Module, I/O Cabinet**

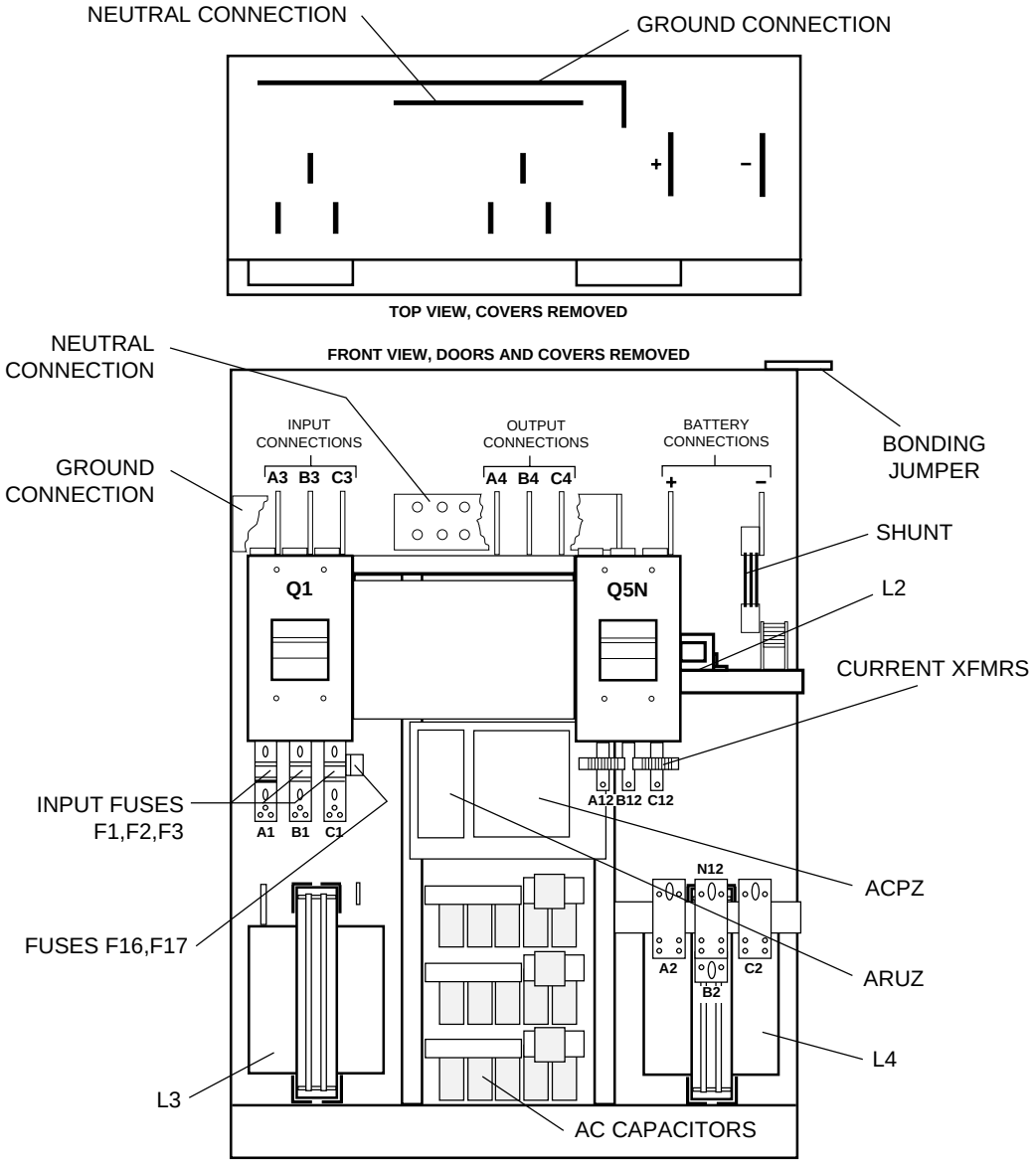


Figure 1-16 **EPS 6000 Major Internal Components, Shared 500 kVA UPS Module, UPS Cabinet**

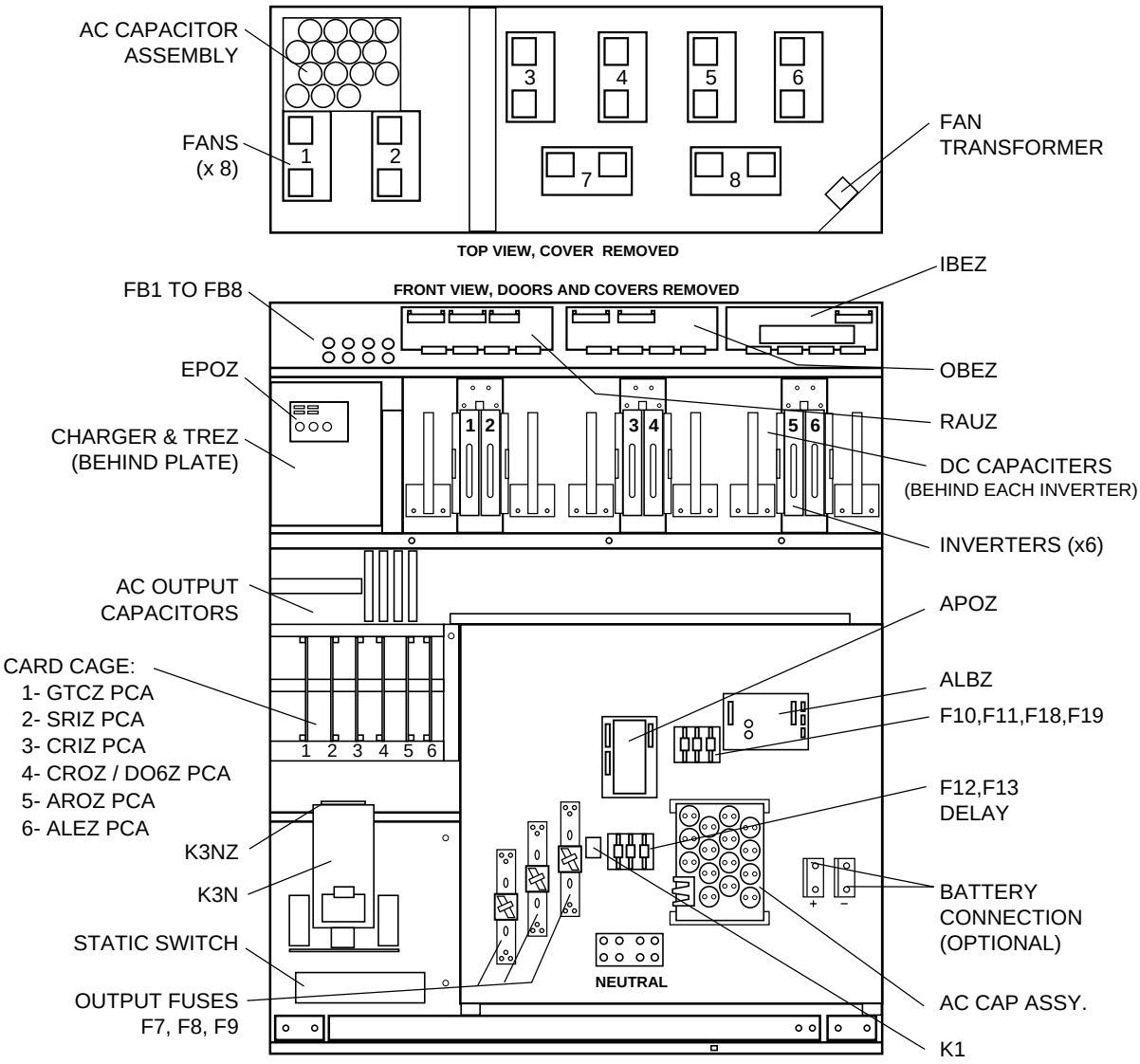


Figure 1-17 **EPS 6000 Major Internal Components, Single Module 750 kVA UPS, Cabinet 1**

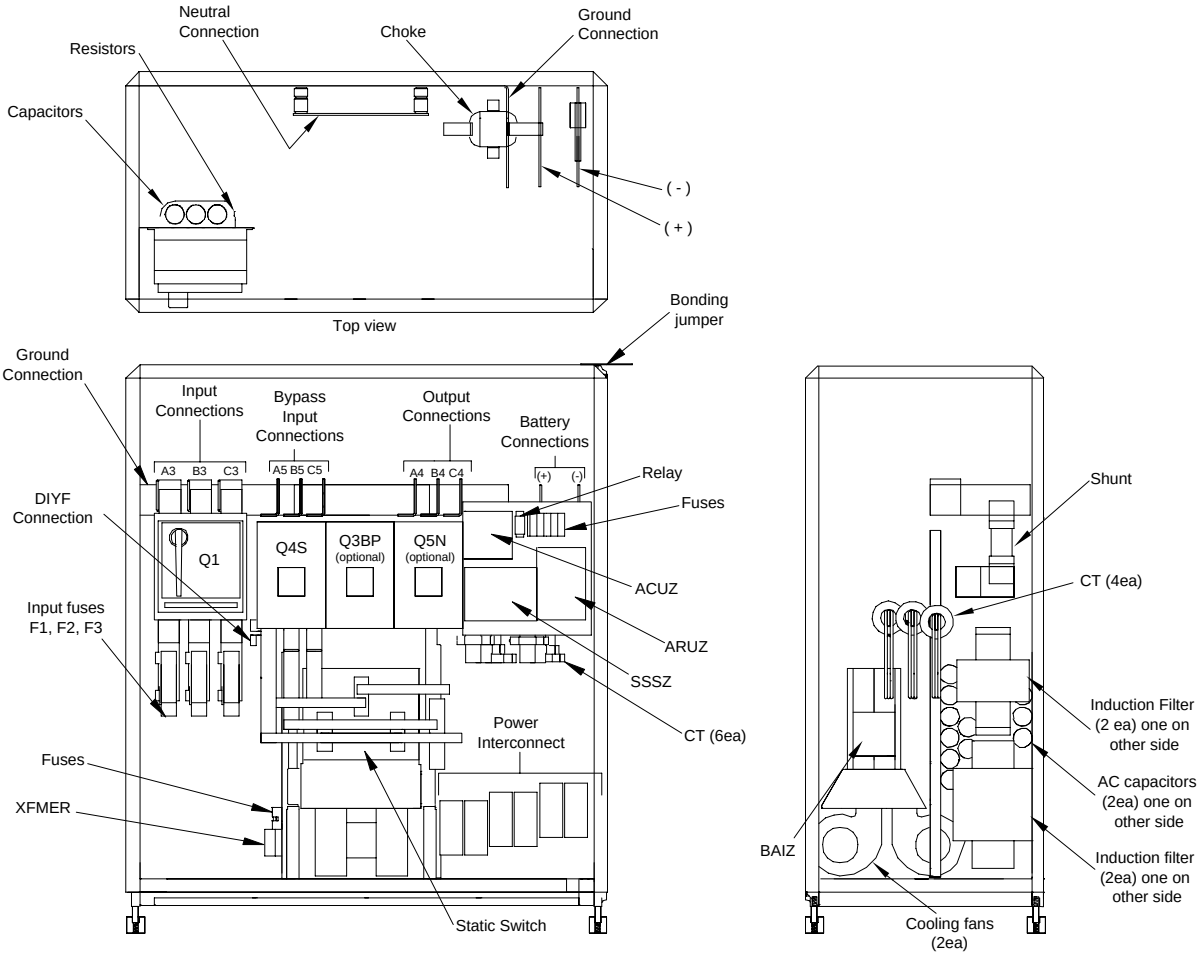


Figure 1-18 **EPS 6000 Major Internal Components, Single Module 750 kVA UPS, Cabinet 2**

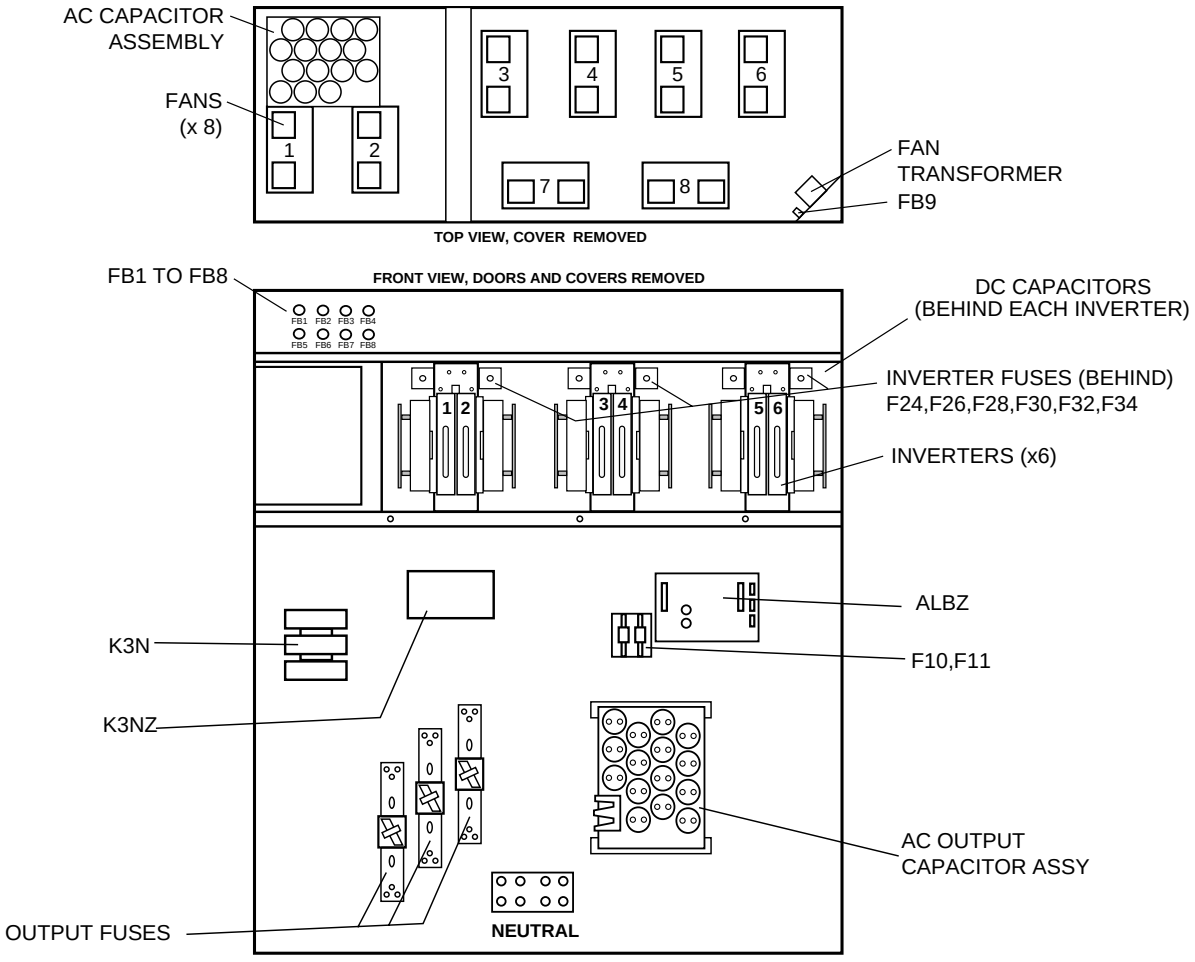


Figure 1-19 **EPS 6000 Major Internal Components, Single Module 750 kVA UPS, Cabinet 3**

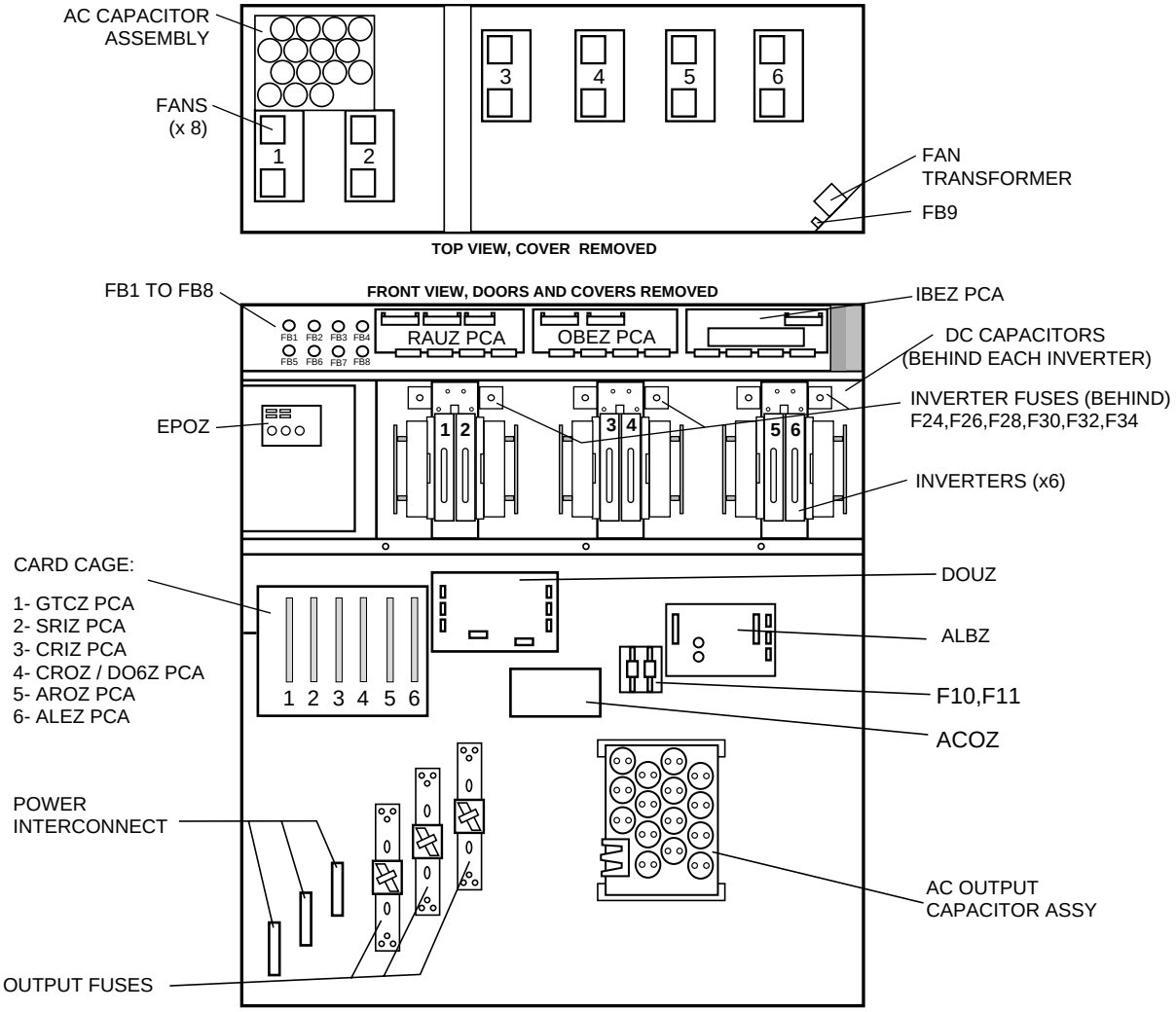


Figure 1-20 **EPS 6000 Major Internal Components, Shared System 750 kVA UPS, Cabinet 1**

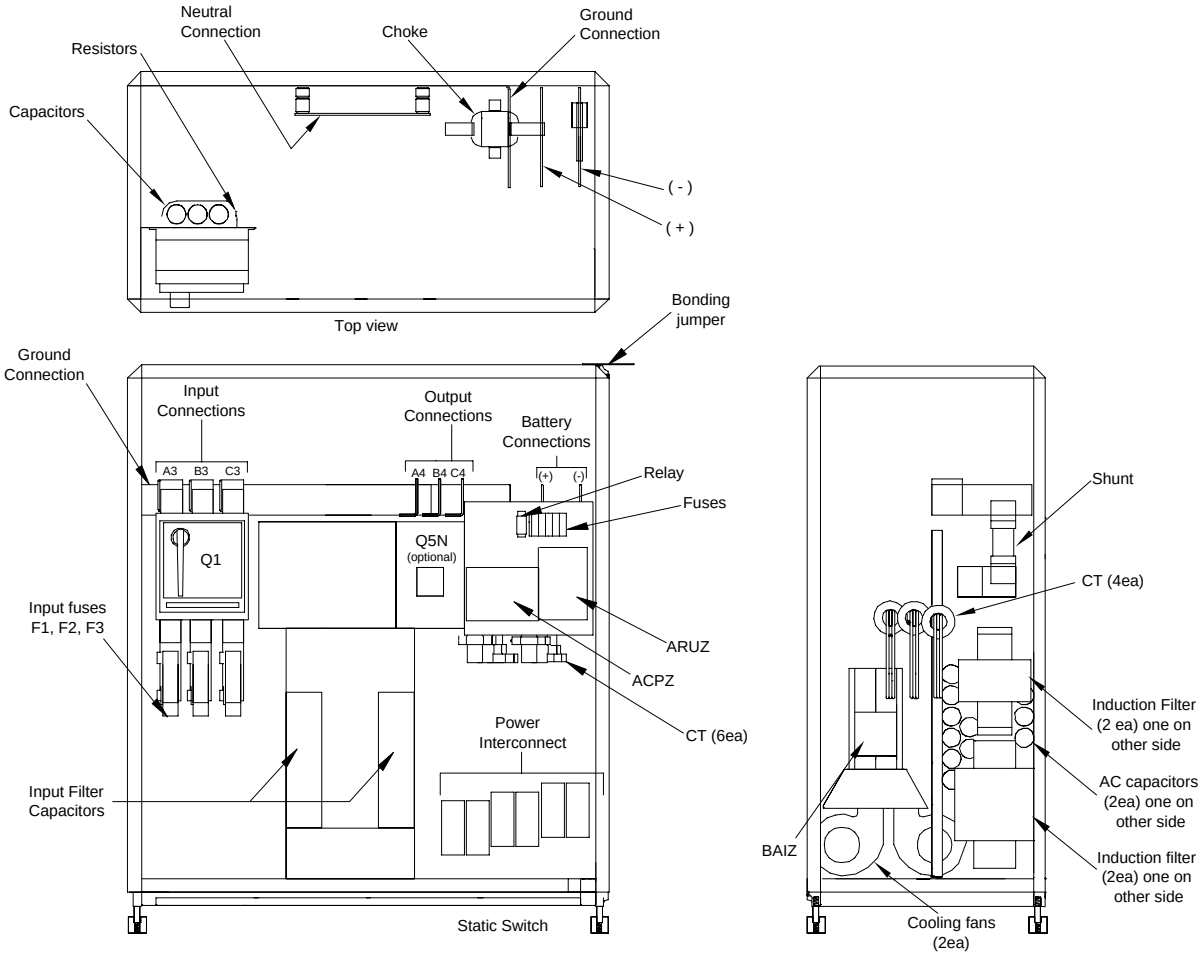


Figure 1-21 **EPS 6000 Major Internal Components, Shared System 750 kVA UPS, Cabinet 2**

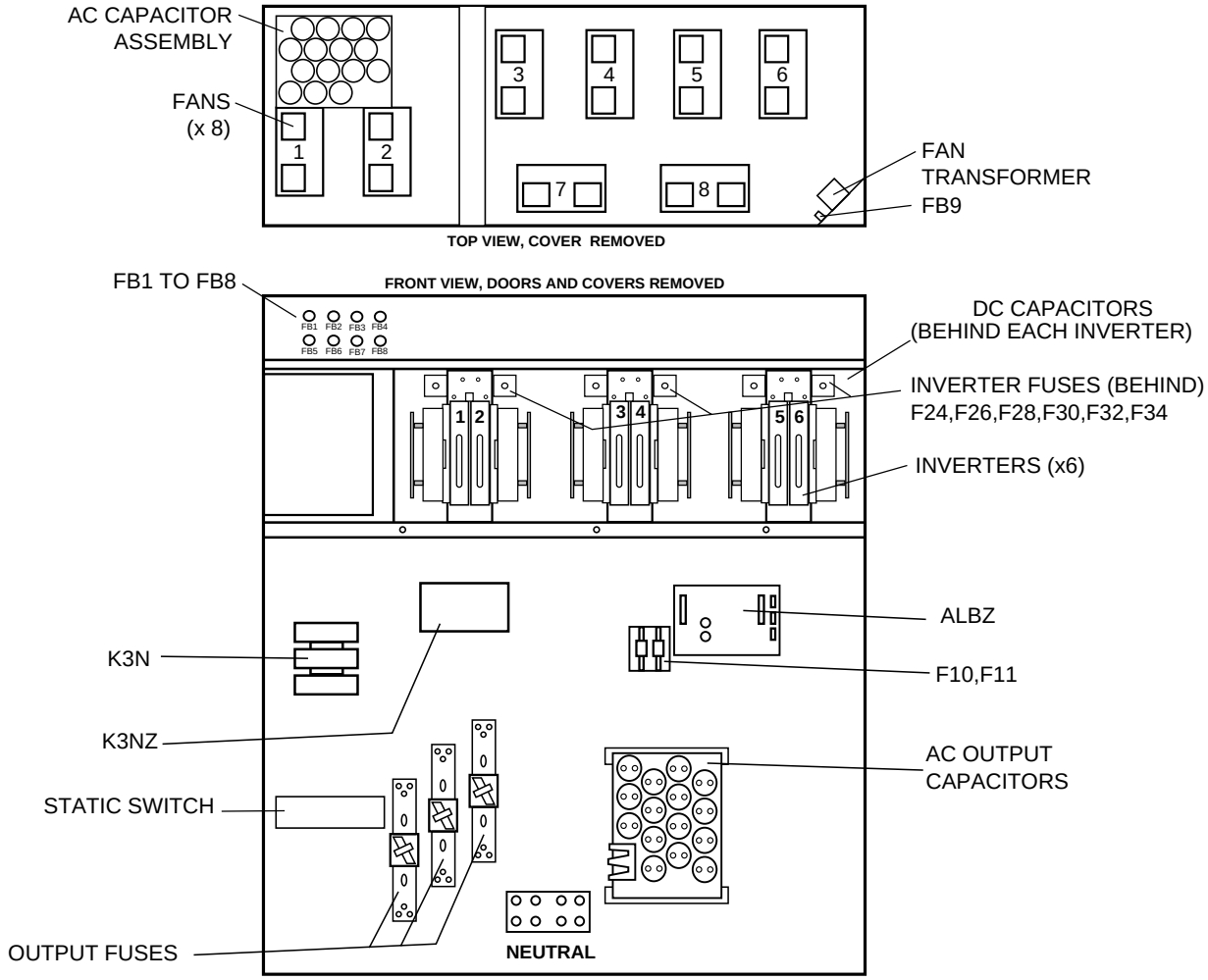


Figure 1-22 **EPS 6000 Major Internal Components, Single Module 750 kVA UPS, Cabinet 3**

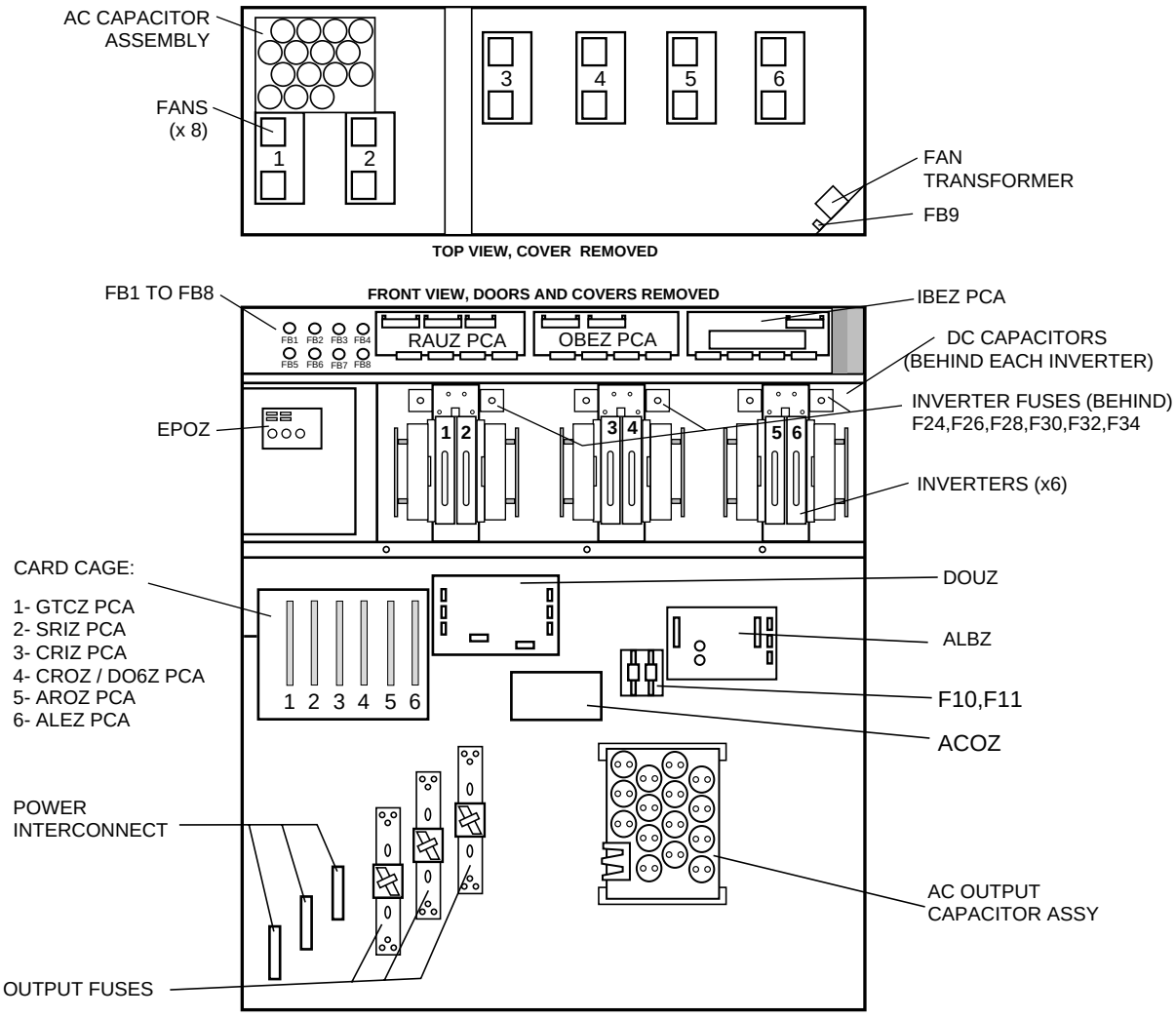
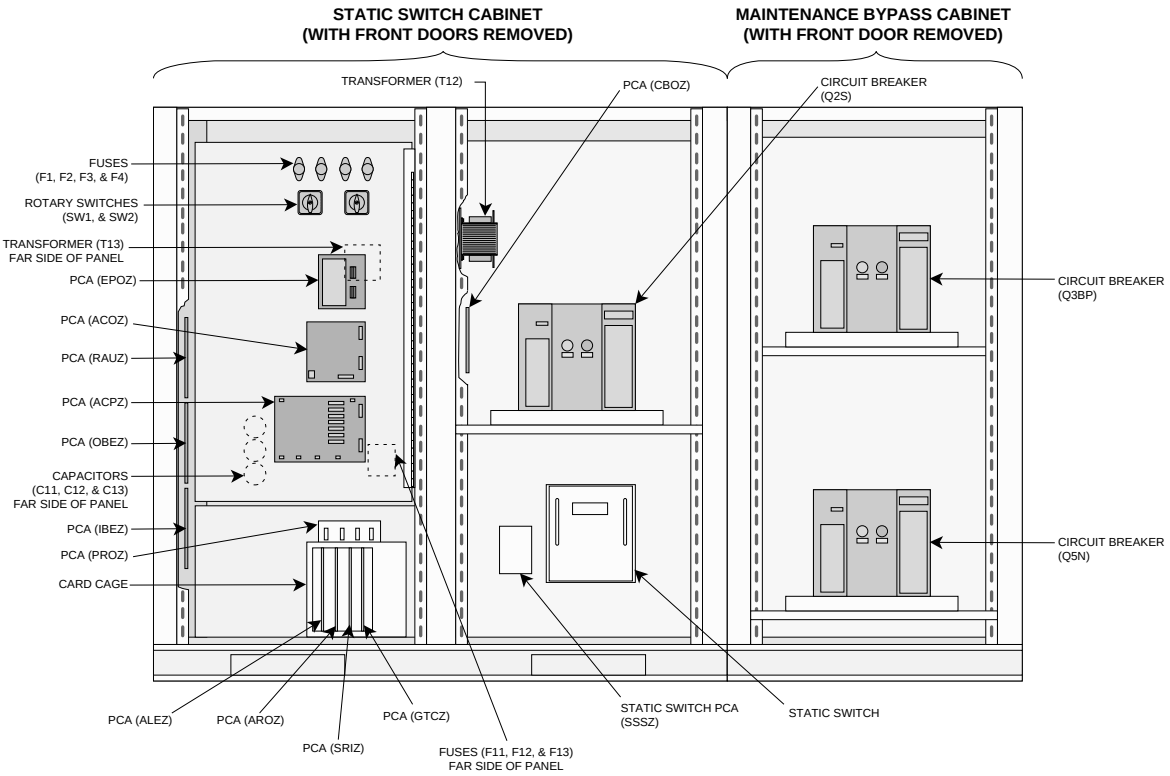


Figure 1-23 **EPS 6000 Major Internal Components, 1500 kVA Static Switch Cabinet (SSC)**



1.2 Description of UPS Module Major Internal Components

Following is a description of the EPS 6000 UPS major internal components. Refer to the single-line diagrams provided in Figures 1-2, 1-4, 1-6 and 1-8, and the component locators provided in Figures 1-9 to 1-23.

UPS modules utilized in shared configurations are slightly different than single-module configurations (as noted), since the functions of the single-module configuration are split between the shared UPS modules and the SSC.

1.2.1 Rectifier/Battery Charger

The rectifier/battery charger converts the AC input voltage from the utility source into a DC voltage, supplying the inverter and regulating the charge of the battery system. A capacitor bank filters the DC voltage.

1.2.2 Inverter

The inverter chops the DC voltage supplied from either the rectifier/battery charger or the battery system into a three-phase AC voltage. An AC output filter is used to achieve a computer-grade sinewave output voltage waveform, with a total harmonic distortion of less than 2% under linear-load conditions.

1.2.3 Inverter Transformer

During normal operation, the inverter transformer provides complete electrical isolation between the UPS output to the attached load and the utility power source input as well as the UPS battery source.

The static switch transfers the load between the inverter output and the bypass AC source without interrupting the supply of power to the load, allowing the load to continue operation while the UPS is being maintained, or in the event of a UPS fault. The static switch circuit assures that voltage from the UPS output cannot feed back to the utility input lines.

1.2.5 Battery System

The battery system stores energy for use by the inverter. The stored energy is utilized in the event that the AC input power from the utility source fails, or falls outside of acceptable tolerance.

The battery system may be an MGE battery cabinet designed for operation with the EPS 6000 UPS, or a customer-supplied battery installation.

MGE-supplied EPS 6000 battery cabinets may be a provided as stand-alone enclosures, or as enclosures designed to be mounted adjacent to the EPS 6000 UPS module.

The EPS 6000 battery cabinet comes with a special battery ambient temperature sensor which allows the optimization of the DC voltage level as a function of the temperature, ensuring that the battery is properly charged to preserve its longevity.

1.3 Description of SSC Major Internal Components

The static switch cabinet (SSC) provides an electrical path between the output of the UPS modules and the load. When the UPS modules are off, the SSC provides power to the load from the bypass AC input source (mains 2). Up to six (6) modules can be connected to the SSC, supporting loads as great as 1,500 kVA. UPS modules may be turned off individually for maintenance, provided that the remaining modules can support the load.

The SSC incorporates a static bypass switch and a wrap-around circuit breaker (Q2S); they connect the load to the bypass AC input source when the UPS modules are off-line. Optionally, the SSC can be provided with its own maintenance bypass circuit, allowing the SSC and/or any attached UPS module to be serviced while the load is supplied via the maintenance bypass AC input source.

1.4 Options

This section describes options available for the EPS 6000 UPS. Some configurations do not support some options. Most options must be specified at the time of equipment order; some options can be installed in the field. Contact your MGE dealer for complete information.

Electrical room package

The electrical room package option allows configuration of all input and output cables, or selected cables, through the top of the enclosures. It features separate main AC input (mains 1) and bypass AC input (mains 2) feeder support. The electrical room package is standard on all EPS 6000 modules configured for shared systems.

Computer room package

The computer room package option allows configuration of the EPS 6000 UPS using a single utility AC source for both main AC input (mains 1) and bypass AC input voltage (mains 2). The computer room option includes additional filtering, making the EPS 6000 UPS fully compliant with the requirements of FCC part 15, subpart J, class A, and the National Electrical Code (NEC) article 645, Electronic Computer/Data Processing Equipment.

Additional battery cabinets

Up to a maximum of four battery cabinets can be supplied for a single EPS 6000 UPS module, making additional back-up time available during power outages.

Input filter

An input harmonic current filter is standard on 500 and 750 kVA units, and is available for other EPS 6000 UPSs. For some power levels, the input filter is installed within the UPS enclosure. For others, the input filter is installed in an auxiliary cabinet.

Input or output transformers

The single-module EPS 6000 UPS can be equipped with an isolation or autotransformer on both the input and output. The transformer provides battery isolation or voltage step-up or step-down as required for the particular installation.

The shared system EPS 6000 UPS can be equipped with isolation or autotransformers, but only on the input.

High interrupting capacity circuit breakers

375 kVA EPS 6000 UPS modules are equipped with circuit breakers rated at 30 kAIC. Standard on 500 kVA and 750 kVA systems, and available as an option on others, are circuit breakers with a rating of 65 kAIC.

Maintenance bypass

For single module EPS 6000 systems, the maintenance bypass option provides a direct bypass AC input source (mains 2) that can be used to supply the load while the UPS module is being serviced.

For shared EPS 6000 UPS modules, maintenance bypass is provided by the SSC, allowing any or all attached UPS modules to be taken off-line while the SSC supports the attached load from its bypass source. As an option, the SSC can be equipped with its own maintenance bypass, allowing the SSC as well as any/all attached UPS modules to be serviced while the load is supported by the maintenance bypass AC input source.

Output distribution cabinet

Some single-module EPS 6000 systems can be provided with a output distribution cabinet, with up to four output circuit breakers.

Remote alarm status panel (RASP)

For single-module systems, a remote alarm status panel (RASP) is available. The RASP

allows the following status indications to be viewed from a remote location:

- UPS on line
- UPS on battery
- UPS on bypass
- UPS on maintenance bypass
- Low battery shutdown
- Charger on
- Overload
- Charger fault
- Inverter fault
- Transfer lockout
- Summary alarm

Additionally, the RASP contains an audible alarm and two pushbuttons:

- UPS test/reset pushbutton
- Audio reset pushbutton

Remote summary alarm panel (RSAP)

For single-module systems, a remote summary alarm panel (RSAP) is available. The RSAP allows the following status indications to be viewed from a remote location:

- UPS summary alarm
- UPS on battery

Additionally, the RSAP contains an audible alarm and two pushbuttons:

- Alarm test/reset pushbutton
- Audio reset pushbutton

ES/9000 interface

For single-module systems, an interface to an IBM ES/9000 mainframe computer is available. This option provides four (4) sets of normally-open, isolated dry contacts, connected to a 9-pin DB-9 female connector, located on the inside cable entry point of the EPS 6000 UPS enclosure. The four sets of contacts indicate:

- UPS on line
- UPS on bypass
- UPS on battery
- Low battery, shutdown imminent

The interface is provided with a 15-foot long 9-pin cable that connects the EPS 6000 to the IBM ES/9000 computer.

Active RS-232/RS-485

A communications port is available that allows the UPS module or the SSC to be monitored from a remote terminal or computer. For detailed information on the communication features, contact your MGE dealer.

1.5 Specifications, UPS Modules

Specifications provided refer to an EPS 6000 UPS module and any required auxiliary cabinets.

1.5.1 Electrical

AC input ratings

Voltage:	208 or 480 VAC, +10%, -15%
Frequency:	60 Hz, ± 10%
Phases:	3 Ø (phase sequence must be A, B, C)
Wires:	3 or 4 wires plus ground

Current:

rating in kVA	150	225	300	375	500	750
Amperes @ 208 VAC	460	680	900	1100	N/A	N/A
Amperes @ 480 VAC	200	300	400	490	702	980

Power factor: Up to 0.9 lagging; 0.95 with optional input harmonic filter

AC output ratings

Voltage:	480 VAC ± 0.5% (steady-state conditions) 480 VAC ± 5% (transient conditions from 0% to 100% or 100% to 0%)
Frequency:	60 Hz ± 0.1% (free-running)
Phases:	3 Ø (phase sequence must be A, B, C)
Wires:	4 wires plus ground

Current:

rating in kVA	150	225	300	375	500	750
Amperes @ 208 VAC	416	625	833	1041	N/A	N/A
Amperes @ 480 VAC	108	271	361	451	601	902

Power factor:	0.8 lagging
Total harmonic distortion (THD):	< 2% (linear load) < 4% (for 100% non-linear load with a crest factor of up to 3.5)
Dynamic regulation:	± 0.5% for balanced load ± 2.5% for 100% unbalanced load
Dynamic response:	± 5% for 100% step load change
Overload:	125% of rated load for 10 minutes 150% of rated load for 1 minute

DC ratings

Battery voltage: 545 VDC float
480 VDC nominal
390 VDC minimum

rating in kVA	150	225	300	375	500	750
Maximum battery current at cut-off voltage (ADC)	323	485	647	809	1,074	1,620

1.5.2 Mechanical

Height: 1,905 mm (75”)
Depth: 815 mm (32”)
Width: See Table 1-1 and Table 1-2
Weight: See Table 1-1 and Table 1-2
Finish: MGE light gray

1.5.3 Environmental

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 40° C (32° to 104° F.) except battery
Storage: -20° to 50° C (-4° to 122° F.)
Humidity: up to 90% non-condensing (operating)
Altitude: sea level to 1,000 meters (sea level to 3,280 feet) without derating; 1,000 to 2,000 meters (3,280 to 6,560 feet): derate operating temperature to a maximum of 28° C (82° F)

Accoustic noise:

rating in kVA	150	225	300	375	500	750
Accoustic noise at rated load in dBA at 5 feet from the front of the UPS module	72	72	72	72	75	78

1.6 Specifications, Static Switch Cabinet

1.6.1 Electrical

AC input ratings

Voltage:	480 VAC, ± 15%
Frequency:	60 Hz, ± 10%
Phases:	3 Ø (phase sequence must be A, B, C)
Wires:	3 or 4 wires plus ground
Current:	2,000 Amperes

AC output ratings

Voltage:	480 VAC
Frequency:	60 Hz
Phases:	3 Ø
Wires:	4 wires plus ground
Current:	2,000 Amperes
Power factor:	0.8 lagging

1.6.2 Mechanical

Height:	1,981 mm/78 in.
Depth:	1,219 mm/48 in.
Width:	1,829 mm/72 in.
Weight:	1,310 kg/2,900 lbs. (SSC) 1,091 kg/2,000 lbs. (MBC)
Finish:	MGE light gray

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Installation, Single-Module Systems

2.0 Scope

This section describes installation of the single EPS 6000 UPS, including receiving, handling, and storage procedures; prerequisites to the installation; installation procedures; and start-up procedures.

2.1 Receiving

Before accepting the shipment from the freight carrier, inspect the exterior surfaces of all shipping containers or packaging used, and the equipment, for damage that may have occurred during transit. If the shipping containers or equipment show evidence of damage, note the damage on the receiving document (bill of lading) prior to signing for receipt of equipment.

The equipment should be unpacked immediately after receipt, and inspected again to determine if any internal shipping damage (broken components, disconnected wiring, loose connections, etc.) has occurred. Verify that the equipment nameplate(s) correspond with the equipment ordered.

Damage claims should be filed directly with the carrier. Replacements for damaged components should be ordered through MGE Customer Support Services at 1-800-438-7373.

2.2 Handling

Carefully follow the handling instructions attached to the shipping materials. EPS 6000 enclosures are shipped on a shipping pallet for protection. Do not move the enclosures more than a few feet without their pallets. Generally, EPS 6000 cabinets can be forklifted, roll-a-lifted, slinged; carefully follow the handling instructions for restrictions/precautions.

2.3 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.

IMPORTANT

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.

2.4 Prerequisites to Installation

An efficient EPS 6000 UPS installation depends on careful planning and site preparation. Installation of UPS equipment must be handled by skilled technicians and electricians familiar with the special requirements of high-energy electrical equipment. The installation must comply with the requirements of the National Electrical Code (NEC, ANSI/NFPA 70, latest issue) and with local codes and requirements as applicable.

Before installation, the following environmental, mechanical, and electrical prerequisites must be fulfilled.

Carefully review the installation drawings supplied with the system and follow their instructions.

2.4.1 Environmental Considerations

The EPS 6000 is intended for use in an environment where control of temperature and humidity is provided. The maximum operating and recommended environmental parameters are provided in Section1.5.3, Environmental conditions.

The EPS 6000 UPS generates heat and exhaust air through the top portion of its enclosures. Heat loss and air flow data is provided in Table 1-1.

2.4.2 Mechanical Considerations

The EPS 6000 UPS can be mounted on a raised floor, or flush-mounted on a concrete floor. All floors must be level. On a raised floor, the conduits can be run below the floor, with cut-outs made in the floor tiles as shown on the installation drawing.

Battery cabinet(s) may be placed adjacent to the UPS module on the right side (when viewed standing in front and facing the module), or may be installed as stand-alone cabinets. Auxiliary cabinet(s) are placed to the left of the UPS module.

Floor loading must be considered when installing an EPS 6000 system on a raised floor or on an upper story of a multiple-story building. Floor loading data is provided on the installation drawings supplied with the equipment. Consult a structural engineer while planning your EPS 6000 UPS installation.

After installation, the EPS 6000 UPS module requires a minimum of 1 meter (36 inches) front clearance for normal maintenance. Side or rear access is not required. A minimum of 710 millimeters (28 inches) is required for top ventilation.

2.4.3 Electrical Considerations

Electrical service for the EPS 6000 UPS system should be supplied on its own dedicated branch circuit. Main input cables, upstream protective devices, and downstream protective devices must be provided and sized per the National Electrical Code (NEC) requirements, per local codes as applicable, and as appropriate for your load and distribution requirements. Recommended cable sizes are provided on the installation drawings. The EPS 6000 UPS is a separately-derived source.

WARNING

Some adjacent cabinets are joined mechanically using copper straps, which also provide the electrical ground path between cabinets. Proper alignment of adjacent cabinets and proper installation of these straps in compliance with the installation drawings is critical to a safe installation.

2.5 Installation Procedures

The steps to be followed are:

- Identification of all installation drawings.
- Placement of the UPS module and applicable battery and auxiliary cabinet(s).
- Connection of input power, output power, and inter-cabinet control and power cables.
- Start-up of the system.

Installation of UPS equipment must be handled by skilled technicians and electricians familiar with the special requirements of high-energy electrical equipment. The installation must comply with the requirements of the National Electrical Code (NEC, ANSI/NFPA 70, latest issue) and with local codes and requirements as applicable.

2.5.1 Placement

Move the EPS 6000 UPS module, battery cabinet(s) (if any), and auxiliary cabinet(s) (if any), to their final location, as described in the Mechanical considerations section. For cabinets installed adjacent to each other, alignment is critical to properly install the spacers and cabinet interconnects. Refer to the installation drawings for handling, removing the cabinet from the pallet, placement, alignment, and mechanical connections.

Remove the packing materials and lift the enclosures to remove the pallets. Refer to the handling instructions and installation drawings supplied with the equipment for pallet removal procedures.

2.5.2 Connections

Electrical connections and cabinet interconnections will vary depending upon the configuration of your EPS 6000 UPS system. Refer to the installation drawings supplied with your equipment. General information follows.

Before making any electrical connections, verify that the UPS circuit breakers Q1, Q4S, and optional Q3BP and Q5N are in the OFF (open) position. The battery disconnect circuit breaker QF1 should be in the OFF (open) position (if there is more than one, all should be in the OFF

position). Optional distribution circuit breakers should be in the OFF (open) position. Customer-supplied downstream protective devices and distribution circuits should be OFF (open).

The lugs used to secure the cables should be torqued as per the recommendation listed in "Cable preparation for field wiring," MGE document 9-00038-00.

2.5.2.1 Main AC Input (Mains 1) Customer Connections

The connections to be made are the three phase and ground cables from the utility AC power source to the UPS module. Complete wiring instructions for your installation are provided on the installation drawings supplied with the equipment.

For 480 VAC systems without input isolation, the input power connections will terminate at the busbars leading to circuit breaker Q1. For input voltages other than 480 VAC or systems with input isolation, the input power connection will be made to an isolation, step-up or step-down transformer.

2.5.2.2 Bypass AC Input (Mains 2) Customer Connections

The connections to be made are the three phase, ground, and optional neutral cables from the bypass AC input (mains 2) power source to the UPS enclosure.

In a computer room configuration or for voltages other than 480V, where a single AC input source is used to supply both main AC input (mains 1) and bypass AC input (mains 2) connections, the bypass AC input is derived from the main AC input by a set of jumpers. These jumpers are installed at the factory.

2.5.2.3 Battery Connections

The connections to be made are the positive (+), negative (–), and enclosure ground connections between the battery cabinet and the UPS module. Additionally, control connections between the battery temperature sensor and the UPS module must be installed. Refer to the installation drawings supplied with the UPS, the battery cabinet, and the battery temperature sensor.

2.5.2.4 Power Connections, Inter-Cabinet

The connections to be made vary depending on your system configuration. Typically, EPS 6000 systems are designed to make interconnection easy to complete and verify; however, always follow the installation drawings provided with the system.

Most inter-cabinet cables and hardware are provided by MGE; the customer is responsible for installing these cables. Some cabling must be supplied and installed by the customer. The installation drawings supplied with the system give complete details.

Figure 2-1 **Busbars, Circuit Breakers, and Conduit Landing Panel, UPS Module (Viewed from the Bottom), 375 kVA Model**

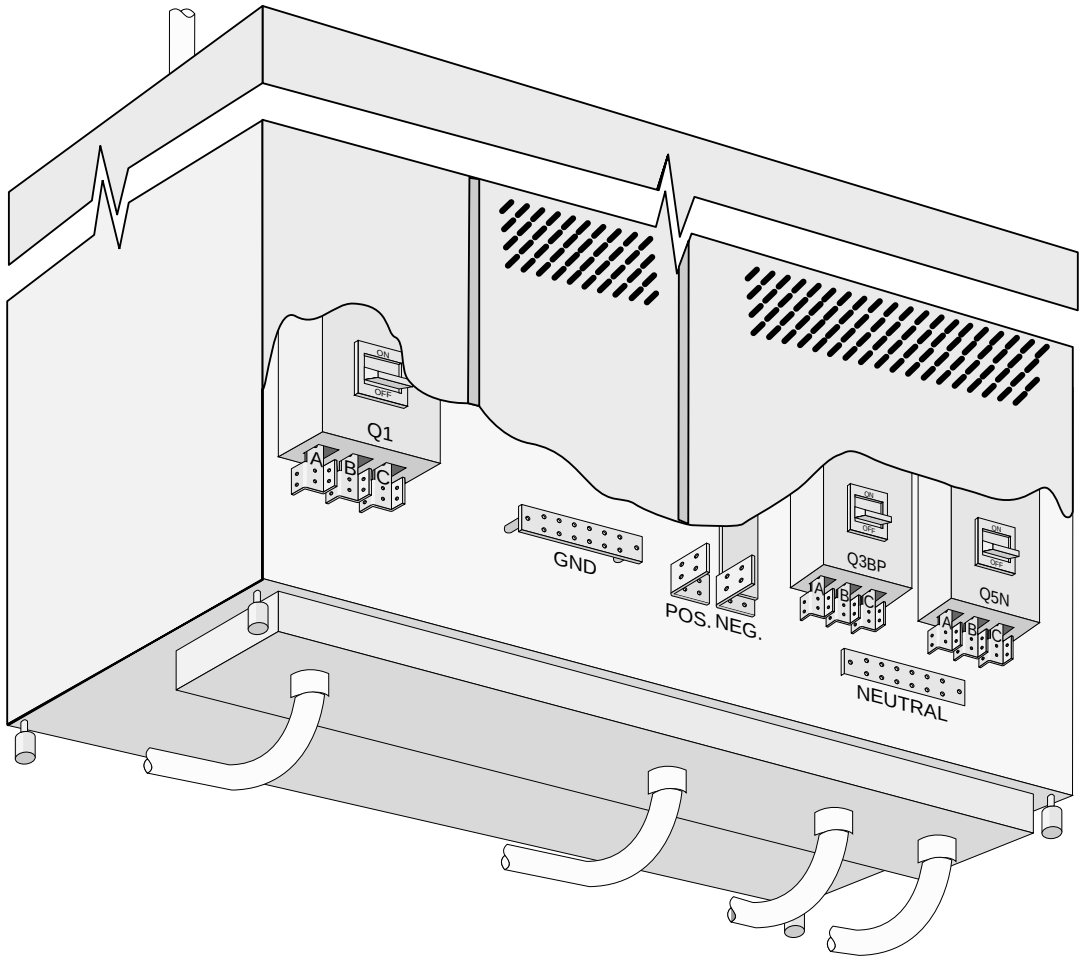
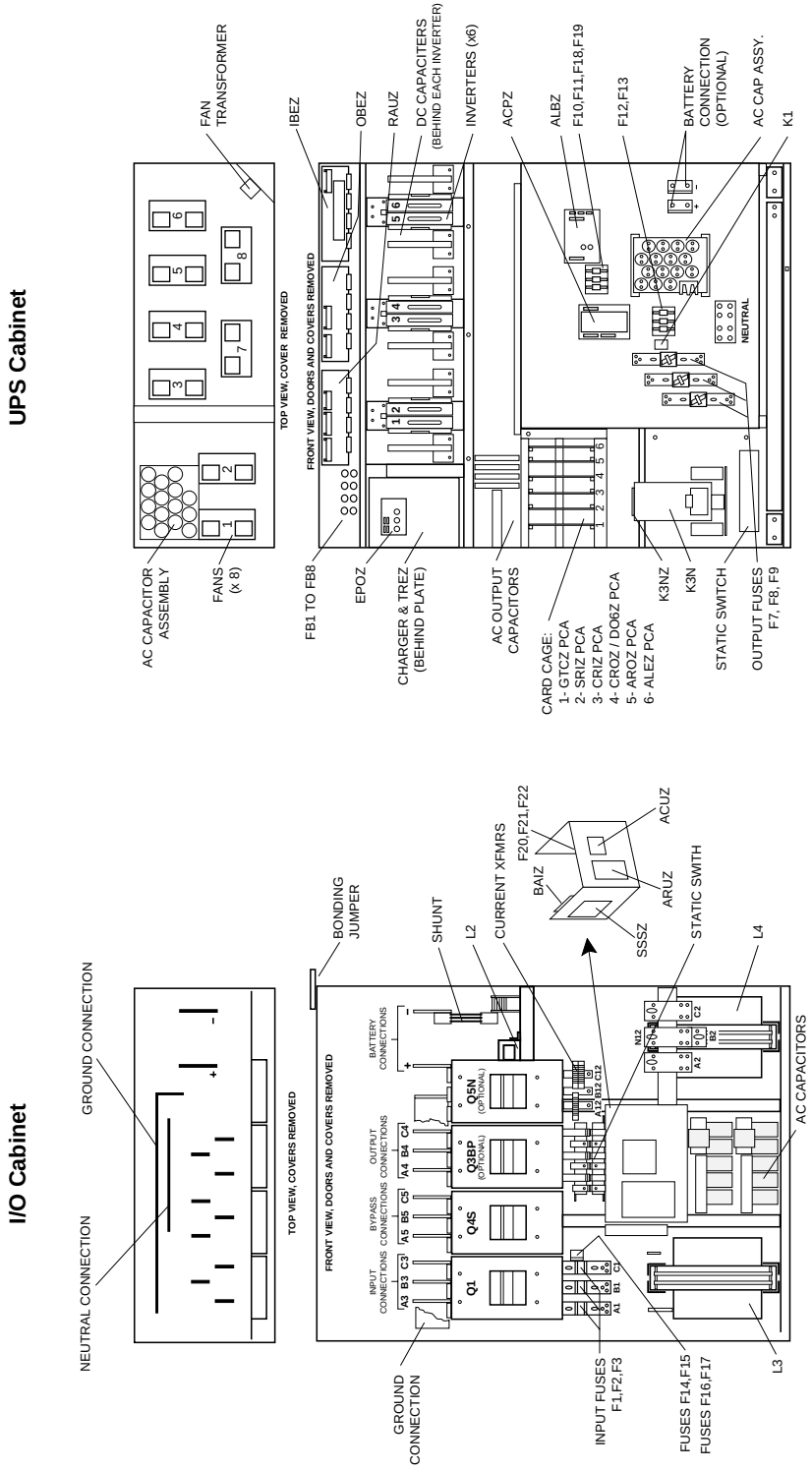


Figure 2-2 **Busbars, Circuit Breakers, and Conduit Landing Panel, 500 kVA UPS Module**



2.5.2.5 AC Output Customer Connections

The connections to be made are the three phases, ground, and optional neutral cables. When the required output voltage is other than 480 VAC, a step-up or step-down transformer is used to provide the required voltage level. This transformer is housed in a separate auxiliary cabinet. The output from the UPS is fed to the primary of the transformer; the secondary provides the AC output.

If optional output distribution circuit breakers are included, these should be wired as shown in the installation drawings.

The customer is responsible for supplying downstream distribution circuits and protective devices as appropriate to the installation and distribution requirements; cable sizing data is provided on the installation drawings.

2.5.2.6 Customer Control Connections

Control, communication, and remote annunciation connections are made at the auxiliary contacts at the circuit boards located in the upper right portion of the UPS module. Printed circuit assemblies IBEZ and OBEZ provide a dry contact interface. Printed circuit assembly RAUZ provides telecommunication capability. Refer to the UPS installation drawings for contact information. For detailed information on the communication features, contact your MGE dealer.

2.5.3 Finishing the Installation

Once all connections have been completed, install the kick plates at the base of all enclosures, as appropriate to your installation. Side plates must be installed first, then back and front plates. For installations flush-mounted against back or side walls, those kick plates can be left off.

2.6 Start-up

This section presents the procedure to be used for initial power-up of the EPS 6000 UPS, and the sequence to follow any time that the UPS is restarted after having been shut completely down (rectifier/battery charger and inverter both off), and placed on maintenance bypass. Use this section in conjunction with the EPS 6000 UPS User's Guide (MGE part number 86-130033-00), which details the procedures, controls, and indicators utilized during start-up.

It is best to contract MGE Customer Support Services for start-up of the EPS 6000 UPS. Do not allow unqualified personnel to handle or operate the EPS 6000 UPS.

2.6.1 Checks Before Start-up

Before starting the EPS 6000 UPS, read thoroughly the EPS 6000 User's Guide (MGE part number 86-130033-00). Be certain that you fully understand the operation of the indicators, controls, and operational sequences.

Before starting the EPS 6000 UPS, make certain that these conditions exist (as applicable to xour installation):

- All power and control wires have been properly connected and securely tightened.
- The upstream and downstream protective devices are not tripped, and have been sized properly for the UPS and load requirements.

- The input voltage is the same as indicated on the UPS nameplate, located inside the right door of the EPS 6000 UPS module.
- The air filters located inside each EPS 6000 UPS module front door are properly installed and free of dust, dirt, and debris. Make certain that no objects block the air intake at the front bottom of the enclosures, and that the air exhaust at the top rear of the enclosures is free of obstructions.
- The UPS module input isolation circuit breaker Q1 is in the OFF (open) position.
- The bypass circuit breaker Q4S is in the OFF (open) position.
- The optional maintenance bypass circuit breaker Q3BP (if present) is in the OFF (open) position.
- The optional UPS isolation circuit breaker Q5N (if present) is in the OFF (open) position.
- The battery disconnect circuit breaker QF1 is in the OFF (open) position.

2.6.2 Initial Start-up Procedure

IMPORTANT

Do not operate the EPS 6000 UPS until you are familiar with the basic indicators, controls, and operational sequences, as described in the EPS 6000 UPS User's Guide (MGE part number 86–130033–00).

The following start-up procedure should be performed during the initial start-up following installation of the system, and this sequence should be followed any time that the EPS 6000 UPS is being restarted from an off condition (i.e., after the UPS has been powered down by removing the upstream AC input power and opening all the circuit breakers of the system).

a. Apply power to Q4S by closing the upstream circuit breaker supplying Q4S.

b. Apply power to the UPS input by closing the upstream circuit breaker supplying the main AC input (mains 1).

c. Close the optional maintenance bypass circuit breaker Q3BP (if present). Power is now available at the UPS output (the load is energized) via the bypass source.

d. Close the control or bypass circuit breaker Q4S. The static switch will come on-line; the fans will start.

e. Close the output isolation circuit breaker Q5N (if present).

f. Open the maintenance bypass circuit breaker Q3BP (if present). The load is now supplied via the bypass source.

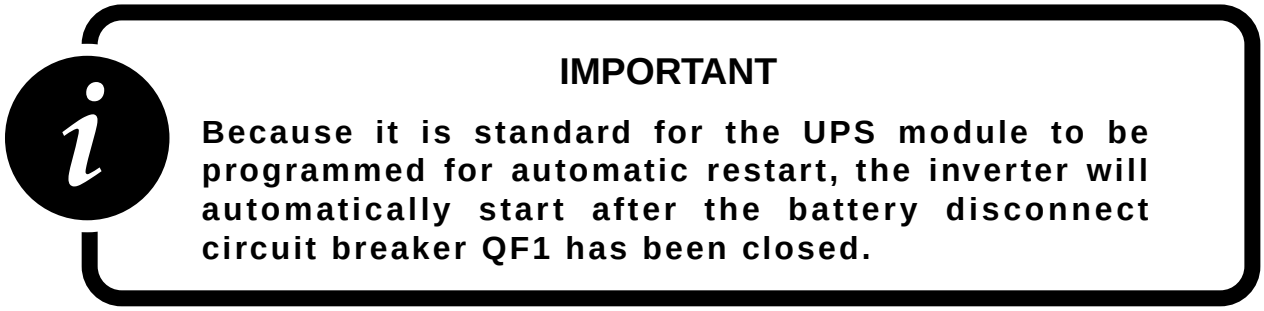
   Note that if your UPS configuration does not include the maintenance bypass option, start-up requires only closing Q4S to supply the bypass source to the attached load.

g. Close the input isolation circuit breaker Q1.
   Verify that the following conditions exist:

   - The red “load not protected” LED is on
   - The rectifier/battery charger automatically starts

   If either condition is not present, there is a fault. Open Q1 and contact MGE Customer Support Services.

h. Close the battery disconnect circuit breaker QF1. The batteries are now connected to the rectifier/battery charger, and have begun charging.



i. If the UPS is not programmed for automatic restart, press the “inverter on” pushbutton. The green “load protected” LED will flash for about 3 seconds, indicating that the inverter is starting.

j. The UPS will automatically transfer the load to the UPS inverter output . The green “load protected” LED will turn on and remain on.

k. Close the optional output distribution circuit breakers (if present).

2.6.3 Checks After Start-up

After initial start-up of the system, normal operation should be tested. At the minimum, the following tests should be performed (refer to the EPS 6000 UPS User’s Guide, MGE part number 86-130033-00, for procedures), as applicable to your installation:

- Emergency power off (EPO) test.
- Remote emergency power off (REPO) test (if applicable).
- Inverter start and stop.
- Battery transfer test.
- Maintenance bypass procedure.

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Installation, Shared Systems

3.0 Scope

This section describes installation of EPS 6000 shared systems, including receiving, handling, and storage procedures; prerequisites to the installation; installation procedures; and start-up procedures.

3.1 Receiving

Before accepting the shipment from the freight carrier, inspect the exterior surfaces of all shipping containers or packaging used, and the equipment, for damage that may have occurred during transit. If the shipping containers or equipment show evidence of damage, note the damage on the receiving document (bill of lading) prior to signing for receipt of equipment.

The equipment should be unpacked immediately after receipt, and inspected again to determine if any internal shipping damage (broken components, disconnected wiring, loose connections, etc.) has occurred. Verify that the equipment nameplate(s) correspond with the equipment ordered.

Damage claims should be filed directly with the carrier. Replacements for damaged components should be ordered through MGE Customer Support Services.

3.2 Handling

Carefully follow the handling instructions attached to the shipping materials. EPS 6000 enclosures are shipped on a shipping pallet for protection. Do not move the enclosures more than a few feet without their pallets. Generally, EPS 6000 cabinets can be forklifted, roll-a-lifted, slinged; carefully follow the handling instructions for restrictions/precautions.

3.3 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.

IMPORTANT

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.

3.4 Prerequisites to Installation

An efficient EPS 6000 UPS installation depends on careful planning and site preparation.

Installation of UPS equipment must be handled by skilled

technicians and electricians familiar with the special requirements of high-energy electrical equipment. The installation must comply with the requirements of the National Electrical Code (NEC, ANSI/NFPA 70, latest issue) and with local codes and requirements as applicable.

Before installation, the following environmental, mechanical, and electrical prerequisites must be fulfilled.

Carefully review the installation drawings supplied with the system and follow their instructions.

3.4.1 Environmental Considerations

The EPS 6000 is intended for use in an environment where control of temperature and humidity is provided. The maximum operating and recommended environmental parameters are provided in Section1.5.3, Environmental conditions.

The EPS 6000 UPS generates heat and exhaust air through the top portion of its enclosures. Heat loss and air flow data is provided in Table 1-2.

Heat generated by the static switch cabinet (SSC) is negligible.

3.4.2 Mechanical Considerations

EPS 6000 shared UPS systems are designed for top cable entry. They are intended to be mounted flush against a floor. All floors must be level.

Battery cabinet(s) may be placed adjacent to each UPS module on the right side (when viewed standing in front and facing the module), or may be installed as stand-alone cabinets. Auxiliary cabinet(s) are placed to the left of each UPS module.

Floor loading must be considered when installing an EPS 6000 system on a raised floor or on an upper story of a multiple-story building. Floor loading data is provided on the installation drawings supplied with the equipment. Consult a structural engineer while planning your EPS 6000 UPS installation.

After installation, the EPS 6000 UPS modules and the SSC require a minimum of 1 meter (36 inches) front clearance for normal maintenance. Side or rear access is not required. A minimum of 710 millimeters (28 inches) is required for top ventilation.

3.4.3 Electrical Considerations

Electrical service for the EPS 6000 UPS system should be supplied on its own dedicated branch circuit. Main input cables, upstream protective devices, and downstream protective devices must be provided and sized per the National Electrical Code (NEC) requirements, per local codes as applicable, and as appropriate for your load and distribution requirements. Cable sizing data is provided on the installation drawings. The EPS 6000 UPS is a separately-derived source.

WARNING

Some adjacent cabinets are joined mechanically using copper straps, which also provide the electrical ground path between cabinets. Proper alignment of adjacent cabinets and proper installation of these straps in compliance with the installation drawings is critical to a safe installation.

For backfeed protection, an upstream protective device, marked Q4S on the installation drawings, must be supplied by the customer. Q4S, which will supply the SSC, must be equipped with a 24 VDC shunt trip and a normally open auxiliary switch.

3.5 Installation Procedure

The steps to be followed are:

- Identification of all installation drawings.
- Placement of the static switch cabinet (SSC), UPS modules, and applicable battery and auxiliary cabinet(s).
- Connection of input power, output power, and inter-cabinet control and power cables.
- Start-up of the system.

Installation of UPS equipment must be handled by skilled technicians and electricians familiar with the special requirements of high-energy electrical equipment. The installation must comply with the requirements of the National Electrical Code (NEC, ANSI/NFPA 70, latest issue) and with local codes and requirements as applicable.

3.5.1 Placement

Move the EPS 6000 UPS module, battery cabinet(s) (if any), and auxiliary cabinet(s) (if any), to their final location, as described in the Mechanical considerations section. For cabinets installed adjacent to each other, alignment is critical to properly install the spacers and cabinet interconnects. Refer to the installation drawings for handling, removing the cabinet from the pallet, placement, alignment, and mechanical connections.

Remove the packing materials and lift the enclosures to remove the pallets. Refer to the handling instructions and installation drawings supplied with the equipment for pallet removal procedures.

3.5.2 Connection

Electrical connections and cabinet interconnections will vary depending upon the configuration of your EPS 6000 shared UPS system. Refer to the installation drawings supplied with your equipment. General information follows.

Before making any electrical connection, verify that the SSC's circuit breakers and switches Q5N, Q3BP, SW1, and SW2 are in the OFF (open) position. For each UPS module, verify that the main AC input circuit breaker Q1, the UPS module isolation circuit breaker Q5N, and all the battery disconnect circuit breakers QF1 are in the OFF (open) position. Customer-supplied upstream (Q4S) and downstream protective devices and distribution circuits should be OFF (open).

The lugs used to secure the cables should be torqued as per the recommendation listed in "Cable preparation for field wiring," MGE document 9-00038-00.

3.5.2.1 Main AC Input (Mains 1) Customer Connections

The connections to be made are the three phase and ground cables from the utility AC power source to each UPS module. Complete wiring instructions for your installation are provided on the installation drawings supplied with the equipment.

For systems without input isolation, the input power connections will terminate at the busbars leading to circuit breaker Q1. In systems with input isolation, the input power connection will be made to an isolation transformer.

3.5.2.2 Bypass AC Input (Mains 2) Customer Connections

The bypass AC input source is connected to the SSC. The connections to be made are the three phases, optional neutral, and ground connections. Termination of these connections within the SSC are marked on the installation drawings supplied with the equipment.

If the maintenance bypass option is included, the maintenance bypass AC input source is connected to the MBC. The connections to be made are the three phases, optional neutral, and ground connections. Termination of these connections within the MBP are marked on the installation drawings supplied with the equipment.

Figure 3-1 **Busbars, Circuit Breakers, and Conduit Landing Panel, 375 kVA UPS Module (Viewed From the Bottom)**

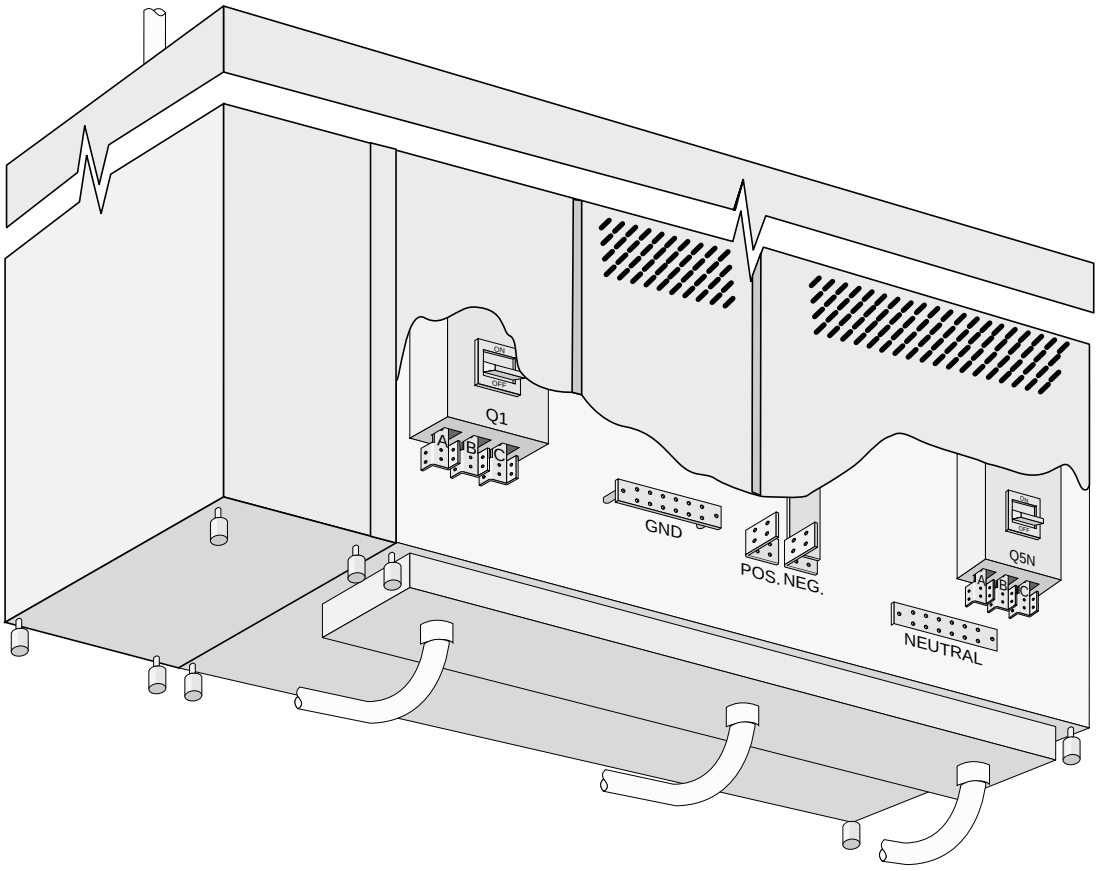
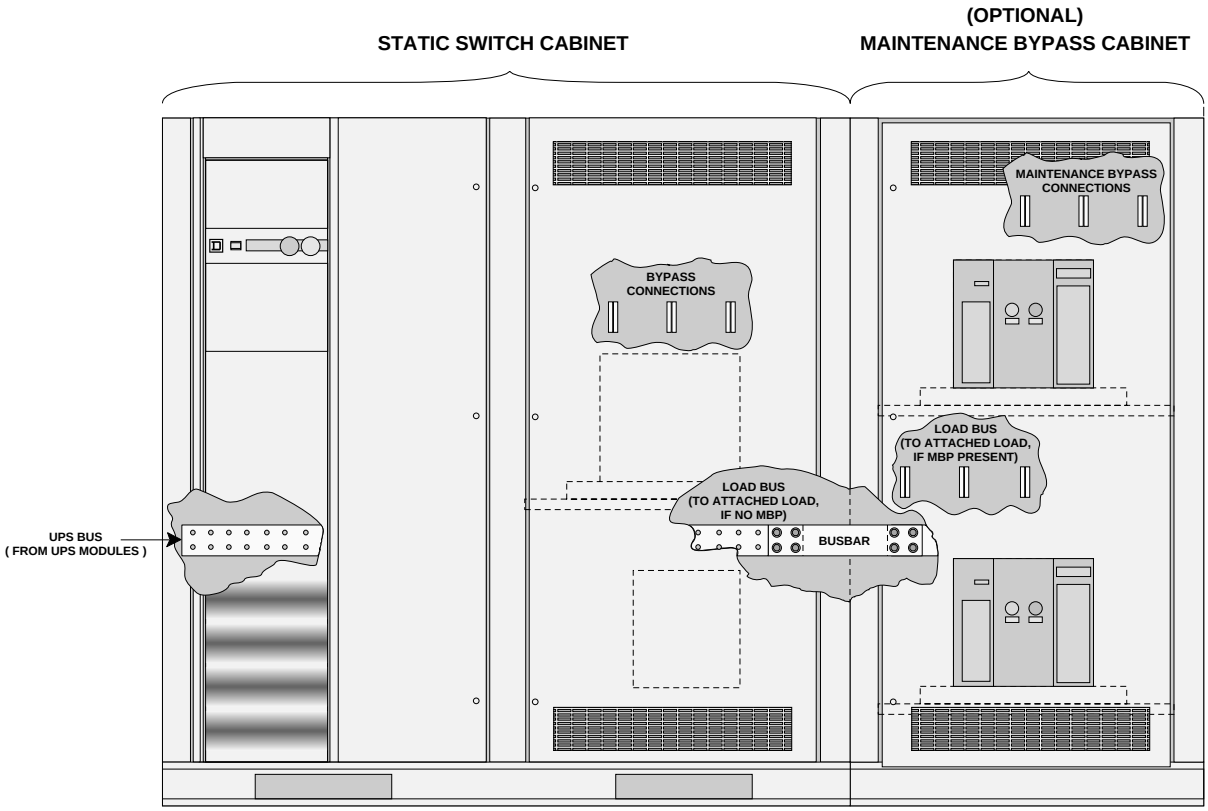


Figure 3-2 **Busbars, Circuit Breakers, and Conduit Landing Panel, SSC**



3.5.2.3 Battery Connections

The connections to be made are the positive (+), negative (–), and enclosure ground connections between the battery cabinet and the UPS module. Additionally, control connections between the battery temperature sensor and the UPS module must be installed. Refer to the installation drawings supplied with the UPS, the battery cabinet and the battery temperature sensor.

3.5.2.4 Power Connections, Inter-Cabinet

The connections to be made vary depending on your system configuration. Typically, EPS 6000 systems are designed to make interconnection easy to complete and verify; however, always follow the installation drawings provided with the system.

Most inter-cabinet cables and hardware are provided by MGE; the customer is responsible for installing these cables. Some cabling must be supplied and installed by the customer. The installation drawings supplied with the system give complete details.

3.5.2.5 AC Output Customer Connections

The connections to be made are the three phases, ground, and optional neutral cables between the SSC output and the load to be supplied. Cables may be routed through the top or bottom of the SSC and optional MBC enclosures.

The customer is responsible for supplying downstream distribution circuits and protective devices as appropriate to the installation and distribution requirements; cable sizing data is provided on the installation drawings.

3.5.2.6 Customer Control Connections

Control, communication, and remote annunciation connections are made at the auxiliary contacts at the circuit boards located in the upper right portion of the UPS module. Printed circuit assemblies IBEZ and OBEZ provide a dry contact interface. Printed circuit assembly RAUZ provides telecommunication capability. Refer to the UPS installation drawings for contact information. For detailed information on the communication features, contact your MGE dealer.

3.5.2.7 Control Connections, Inter–Cabinet

Three sets of control cabling must be connected between the UPS modules and the SSC. The cables and hardware are supplied by MGE. Requirements vary according to the system configuration; general information follows.

The display connections are daisy-chained from the RAUZ PCA in the SSC to the RAUZ PCA in each UPS module.

Control signals for synchronization, transfer, and emergency power off (EPO) commands are connected between the UPS modules and the SSC. The control signals form a star connection from the ACPZ PCA in the SSC to the ACPZ PCA in each UPS module.

Current sharing control signals allow load sharing by the UPS modules. These cables are in a loop-type configuration, from the APOZ PCA in the first UPS module, continuing to the APOZ PCA in the last UPS module, then back to the APOZ PCA in the first UPS module.

3.5.3 Finishing the Installation

Once all connections have been completed, install the kick plates at the base of all enclosures (except the SSC), as appropriate to your installation. Side plates must be installed first, then back and front plates. For installations flush-mounted against back or side walls, those kick plates may be left off.

3.6 Start-up

This section presents the procedure to be used for initial power-up of the EPS 6000 UPS, and the sequence to follow any time that the UPS is restarted after having been shut completely down (rectifier/battery charger and inverter both off) and placed on maintenance bypass. Use this section in conjunction with the EPS 6000 UPS User's Guide, Shared Systems (MGE part number 86-130034-00), which details the procedures, controls, and indicators used during start-up.

It is best to contract MGE Customer Support Services for start-up of the EPS 6000 UPS. Do not allow unqualified personnel to handle or operate the EPS 6000 UPS.

3.6.1 Checks Before Start-up

Before starting the EPS 6000 UPS, read thoroughly the EPS 6000 User's Guide, Shared Systems (MGE part number 86-130034-00). Be certain that you fully understand the operation of the indicators, controls, and operational sequences.

Before starting the EPS 6000 UPS, make certain that these conditions exist (as applicable to your installation):

- All power and control wires have been properly connected and securely tightened.
- The upstream and downstream protective devices are not tripped, and have been sized properly for the UPS and load requirements.
- The voltage at each main AC input circuit breaker Q1 and at the bypass input circuit breaker Q4S is the same as indicated on the UPS nameplate, located inside the right door of the EPS 6000 UPS module.
- The air filters located inside each EPS 6000 UPS module front door are properly installed and free of dust, dirt, and debris. Make certain that no objects block the air intake at the front bottom of the enclosures, and that the air exhaust at the top rear of the enclosures is free of obstructions.

In the individual UPS modules:

- Input isolation circuit breaker Q1 is in the OFF (open) position.
- Battery disconnect circuit breaker QF1 is in the OFF (open) position.
- Output isolation circuit breaker Q5N is in the OFF (open) position.

In the SSC:

- System maintenance bypass circuit breaker Q3BP is in the OFF (open) position (if present).
- System output isolation circuit breaker Q5N is in the OFF (open) position (if present).
- Input power supply switches SW1 and SW2 are in the ON (closed) position.
- The upstream bypass AC input (mains 2) circuit breaker (Q4S, customer-supplied) is in the OFF (open) position.
- If present, the upstream maintenance bypass circuit breaker (customer-supplied) is in the OFF (open) position.

3.6.2 Initial Start-up Procedure

IMPORTANT

Do not operate the EPS 6000 UPS until you are familiar with the basic indicators, contols, and operational sequences, as descried in the EPS 6000 UPS User's Guide, Shared Systems (MGE part number 86–130034–00).

The following start-up procedure should be performed during the initial start-up following installation of the system, and this sequence should be followed any time that the EPS 6000 UPS system is being restarted from an off condition (i.e., after the UPS has been powered down by removing the upstream AC input power and opening all the circuit breakers of the UPS system).

a. Apply power to Q4S by closing the upstream circuit breaker supplying Q4S, and the upstream circuit breaker supplying the optional maintenance bypass input (if present).

b. Apply power to the UPS modules by closing the upstream circuit breaker(s) supplying the main AC input (mains 1).

c. Start the SSC:

   1. Close the optional system maintenance bypass circuit breaker Q3BP (if present, in the maintenance bypass cabinet). Power is now available at the SSC output (the load is energized) via the maintenance bypass source.
   2. Close the upstream circuit breaker Q4S that supplies the bypass input to the SSC. The SSC will come on-line; after about ten (10) seconds, the wrap-around circuit breaker Q2S will automatically close.
   3. Close the optional system isolation circuit breaker Q5N (if present, in the maintenance bypass cabinet).
   4. Open the optional system maintenance bypass circuit breaker Q3BP (if present). The SSC is now on-line and the load is supplied via the bypass source.

Note that if your SSC configuration does not include the maintenance bypass option, start-up requires only closing Q4S to supply the bypass source to the SSC. All other functions are fully automatic.

d. Start the UPS modules:

   1. For each module, close the input isolation circuit breaker Q1. Verify that the following conditions exist:

- The red “load not protected” LED is on.
- The rectifier/battery charger automatically starts.

If either condition is not present, there is a fault. Open Q1 and contact MGE Customer Support Services.

2. For each module, close the UPS isolation circuit breaker Q5N. The fans in the UPS module will start.
3. For each module, close the battery disconnect circuit breaker QF1. The batteries are now connected to the rectifier/battery charger, and have begun charging.

IMPORTANT

Because it is standard for the UPS module to be programmed for automatic restart, the inverter will automatically start after the battery disconnect circuit breaker QF1 has been closed.

4. If the modules are not programmed for automatic restart, for each module, press the “inverter on” pushbutton. The green “load protected” LED will flash for about 3 seconds, indicating that the inverter is starting.
5. As soon as a sufficient number of UPS modules have been started, the SSC will automatically transfer the load to the UPS module output. On each module, the green “load protected” LED will turn on and remain on. On the SSC, the green “load protected” LED will turn on.
6. As the remaining UPS modules are turned on (per step 4 above), their respective green “load protected” LEDs flash for three seconds, then remain on as the modules connect to the load . The load is equally shared between modules.

3.6.3 Checks after Start–up

After initial start-up of the system, normal operation should be tested. At the minimum, the following tests should be performed (refer to the EPS 6000 UPS User’s Guide, Shared Systems, MGE part number 86-130034-00, for procedures), as applicable to your installation:

- Emergency power off (EPO) test from each UPS module, and from the SSC.
- Remote emergency power off (REPO) test (if applicable).
- Inverter start and stop (for each module).
- Battery transfer test.
- Maintenance bypass procedure.

Maintenance

4.0 Scope

This section describes maintenance of the EPS 6000 UPS, including safety instructions, preventive maintenance, and descriptions of replacement parts kits.

4.1 Safety Instructions

IMPORTANT SAFETY INSTRUCTIONS FOR SERVICING BATTERIES

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

B. When replacing batteries, use the same model and manufacturer of batteries.

C. CAUTION — Do not dispose of battery or batteries in a fire. The battery may explode.

D. CAUTION — Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.

E. CAUTION — A battery can present a risk of electrical shock and high short-circuit current. The following precautions should be observed when working with batteries:

1. Remove watches, rings, or other metal objects.
2. Use tools with insulated handles.
3. Wear rubber gloves and boots.
4. Do not lay tools or metal parts on top of batteries.
5. Disconnect charging source prior to connecting or disconnecting battery terminals.
6. Determine if the battery is inadvertently grounded. If inadvertently grounded, remove the source of ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock will be reduced if such grounds are removed during installation and maintenance.

4.2 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 EPS 6000 UPS 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 the EPS 6000 UPS User's Guide (MGE part number 86-130033-00) or the EPS

6000 UPS User's Guide, Shared Systems (MGE part number 86-130034-00), and be familiar with the indicators, controls, and operation of the UPS.

a. Isolate and de-energize all EPS 6000 UPS equipment for all maintenance operations.
b. Ensure that all equipment is clean and free of loose dust, dirt, and debris. The exterior of the enclosures may be cleaned with a mild solution of soap and water, lightly applied with a lint-free cloth.
c. 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.
d. The EPS 6000 UPS 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.
e. Initiate the start-up procedure, as described in the User's guide.
f. Test the main operating sequences as applicable to your equipment configuration and installation.

4.3 Replacement Parts

There are no user replaceable parts inside the EPS 6000 UPS.

Three levels of replacement parts are available for the EPS 6000 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 by MGE at no charge. Contact MGE 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.

Glossary

Symbols

¶	Used to reference paragraph headings that are listed in the table of contents.
/	Used to represent “and/or.”
%	Percent; of each hundred.
° F.	Degrees Fahrenheit.
° C	Degrees Celsius.
@	At.
±	Plus or minus.
#	Number.
Ø	Phase.
Ω	Ohms.
2nd	Second.
A, B, C	Normal sequence of phases (clockwise) in three-phase power.
AC or ac	Alternating current.
Alphanumeric display	The LCD display above the hidden panel (behind the drop-down cover) on the UPS module and the SSC.
Ambient air temperature	The temperature of the surrounding air.
Ambient noise	The noise level of the environment.
Attached load	The load attached to the UPS output, such as a computer system or manufacturing system.
Audible alarm	A buzzer, located behind the front panel on the UPS module and the SSC, that sounds when alarm conditions occur.
AWG	American Wire Gauge, formerly Brown & Sharp gauge.

B or BAT. or BATT.	Battery.
Breaker	Circuit breaker.
British Thermal Unit	A unit of heat equal to 252 calories (see BTU).
BTU or Btu	British thermal unit. Defined as the amount of energy required to raise the temperature of 1 pound of water by 1° F.
BYP	Bypass.
BYPASS	Maintenance bypass; wrap-around manual maintenance bypass using the optional bypass circuit breaker Q3BP in conjunction with circuit breaker Q4S and isolation circuit breaker Q5N.
Bypass AC input	Mains 2.
Calorie	A unit of heat. One calorie is the amount of energy required to raise the temperature of one gram of water by one degree Celsius.
Carrier	The company or individual responsible for delivering goods from one area to another.
CB	Circuit breaker.
Conduit	A flexible or rigid tube surrounding electrical conductors.
C.S.S.	Customer Support Services.
CT	Current transformer.
Curr.	Current.
Current rating	The maximum current that a piece of electrical equipment is designed to carry.
DC or dc	Direct current.
Earth ground	A ground circuit that has contact with the earth.
Electrician	Refers to an installation electrician qualified to install heavy-duty electrical components in accordance with local codes and regulations. Not necessarily qualified to maintain or repair electrical or electronic equipment. Compare to technician.
EPO	Emergency power off.

Free running	Indicates that the inverter frequency is stable and independent of the bypass AC input (mains 2) frequency.
FREQ	Frequency.
Fusible	Capable of being melted with heat.
GND	Ground
Hz	Hertz, a measure of frequency; one cycle per second equals one Hertz.
I	Current.
Input branch circuit	The input circuit from the building power panel to the equipment.
Inverter	An electrical circuit that generates an AC sinewave output from a DC input.
kVA	Kilovolt-Ampere; a measure of apparent power.
kW	Kilowatt; a measure of real power.
LCD	Liquid-crystal display.
LED	Light-emitting diode.
LEG or Leg	Inverter leg.
Load protected	The attached load is being supplied by the UPS module inverter output, and the battery is available in the event that incoming (utility) power is lost.
Load not protected	The attached load is being supplied, but the battery system is unavailable.
Low battery shutdown	The battery has reached the lowest permitted operating voltage, and the inverter has shut down (disconnecting the load) to protect the battery from damage due to further discharge.
Mains or mains 1	Main AC input source.
Mains 2	Bypass AC input source.
MAX	Maximum.
MBC	Optional maintenance bypass cabinet that attaches to the SSC (in shared systems).

MCM	Thousand circular mil; standard wire sizes for multiple stranded conductors over 4/0 AWG in diameter. M is from the Roman numeral system; it is the symbol for 1,000.
MG	Motor-generator set.
MGE	MGE UPS Systems, Inc.
module	Refers to an EPS 6000 UPS module (rectifier/battery charger, inverter, and attached battery cabinet).
MOV	Metal-oxide varistor.
NEC	National electrical code.
NFPA	National fire protection association.
NO. or No.	Part number.
OSHA	Occupational safety and health act.
OF	Over-frequency.
On-battery operation	The attached load is being supplied by the stored energy in the battery system.
OV	Over-voltage.
Packing list	The list of articles included in a given shipment.
P.F.	Power factor.
Q1	UPS input isolation circuit breaker.
Q3BP	Optional maintenance bypass circuit breaker (in single-module UPS system); optional maintenance bypass circuit breaker in MBC cabinet (in shared systems).
Q4S	Control or bypass circuit breaker (in single-module UPS systems); user-supplied bypass AC input circuit breaker supplying the SSC (in shared systems).
Q5N	Optional UPS isolation circuit breaker (in single-module UPS systems); UPS module isolation circuit breaker (in shared systems); optional SSC isolation circuit breaker (in MBC).
QF1	Battery disconnect circuit breaker.

Remote emergency power off	A switch used for shutting down electrical equipment from a location away from the equipment.
REPO	Remote emergency power off.
SCR	Silicon-controlled rectifier.
Security bypass (key)	Pushbutton on the hidden panel (UPS modules and SSC) allowing forced transfers and other commands to be issued. The security key pushbutton must be held down while the desired function is executed.
SEQ	Sequence.
Shipping damage	Any damage done to an article while it is in transit.
Shipping pallet	A platform on which articles are fixed for shipping.
Specific gravity	The ratio of the weight of a given volume of substance (such as electrolyte) to that of an equal volume of another substance (such as water) used as a reference.
SSC	Static switch cabinet (in shared systems).
Sync or synch	Synchronization.
Technician	Refers to an electronic technician qualified to maintain and repair electronic equipment. Not necessarily qualified to install electrical wiring. Compare with electrician.
Test connector	DB-9 type connector on the hidden panel (UPS modules and SSC) allowing an EPE Customer Support Services technician to access programmable and diagnostic features of the system.
U	Voltage.
UF	Under frequency.
UL	Underwriters Laboratories, Inc.
UPS	Uninterruptible power system.
UV	Under voltage.
VAC	Volts of alternating current.
Vb	Battery voltage (in volts DC).

VDC	Volts of direct current.
Via	By way of.
VPC	Volts per cell, the measure of the electrical potential of a storage cell, such as a battery.
XFMR	Transformer.

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