

MGE UPS SYSTEMS
EPS 6000 SINGLE MODULE UPS (300 / 375 kVA)
Three Phase In - Three Phase Out

GUIDE SPECIFICATIONS

1.0 GENERAL

1.1 SUMMARY

This specification describes a three phase continuous duty on-line, solid state Uninterruptible Power System, hereafter referred to as the UPS. The UPS shall operate in conjunction with the existing building electrical system to provide power conditioning, back-up power protection and distribution for electronic equipment loads. The system shall consist of a solid state inverter, rectifier/battery charger, a 100% rated for continuous duty static switch, an internal maintenance bypass switch, an internally assembled battery cabinet, synchronization control circuitry, connection control circuitry, disconnection control circuitry, system metering, system status indicators, system alarm annunciation circuitry, and accessories as specified herein.

1.2 STANDARDS

The UPS shall meet the requirements of the following standards:

- A. UL listed under 1778, Standards for Uninterruptible Power Supply Equipment
- B. UL Canada (cUL)
- C. FCC rules and regulations of Part 15, Subpart J, Class A
- D. IEEE 587-1980/ANSI C62.41 1980 Standards for Surge Withstand Ability
- E. ISO 9001 Quality Standard
- F. The UPS shall be designed in accordance with the applicable sections of the documents published by:
 - National Fire Protection Association (NFPA)/National Electric Code (NEC)
 - National Electrical Manufacturer's Association (NEMA)
 - Occupational Safety & Health Administration (OSHA)

1.3 SUBMITTALS

Submittals shall contain the following documentation:

- A. **Installation Package:** Complete electrical characteristics and connection requirements. Provide detailed equipment outlines with cabinet dimensions and spacing requirements; location of conduit entry/exit paths; location of floor/seismic mounting; available battery types/sizes; all cabinet weights; heat rejection and air flow requirements; single-line diagram; control, and external wiring.
- B. **Product Data:** Provide catalog sheets and technical data sheets to indicate physical data and electrical performance, electrical characteristics, and connection requirements.
- C. **Manufacturer's Installation Instructions:** Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product. Include equipment installation

outline, connection diagram for external cabling, internal wiring diagram, and written instruction for installation.

1.4 FINAL SUBMITTALS

Upon delivery of the UPS system, the following submittals shall be included:

- A. A complete set of installation drawings showing all the information stated in section 1.3.
- B. An installation and users manual showing safe and correct operation of all UPS functions.

1.5 QUALIFICATIONS & QUALITY ASSURANCE

- A. **Manufacturer's Certification:** The manufacturer shall specialize in manufacturing of on-line, double conversion three phase UPS modules specified in this document with a minimum of twenty years documented experience, and with a nationwide first party service organization. The manufacturer shall be ISO 9001 certified and shall design to internationally accepted standards.
- B. **Factory Testing:** Prior to shipment the manufacturer shall complete a documented test procedure to test all functions of the UPS module and batteries (via a discharge test), when supplied by the UPS manufacturer, and guarantee compliance with the specification. The factory test shall be performed in the presence of the customer providing the manufacturer receives adequate prior notice. The manufacturer shall provide a copy of the test report upon request.
- C. **Materials and Assemblies:** All materials and parts comprising the UPS shall be new, of current manufacture, and shall not have been in prior service, except as required during factory testing. All active electronic devices shall be solid state and not exceed the manufacturer's recommended tolerances for temperature or current to ensure maximum reliability. All semiconductor devices shall be sealed. All relays shall be provided with dust covers. The manufacturer shall conduct inspections on incoming parts, modular assemblies and final products.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. All products shall be packaged in a manner to prevent penetration by debris and to allow safe delivery by all modes of ground transportation and air transportation where specified.
- B. Prior to shipping all products shall be inspected at the factory for damage.
- C. Equipment shall be protected against extreme temperature and humidity and shall be stored in a conditioned or protected environment.
- D. Equipment containing batteries shall not be stored for a period exceeding three months without powering up the equipment for a period of eight hours to recharge the batteries.

1.7 ENVIRONMENTAL REQUIREMENTS

The UPS shall operate under the following environmental conditions:

- A. **Temperature:**

UPS Module Operating:	0° to 40°C (32°F to 104°F)
Non-Operating:	-25°C to +70°C (-13°F to 158°F)

- Battery System:** -20°C to +45°C (-4°F to 113°F)
- B. **Relative humidity (operating):** 0 to 90% non-condensing
- C. **Barometric Pressure:** Up to 1000 meters above sea level (up to 2000 meters with ambient temperature less than 28°C)
- Non-Operating:** Up to 12,000 meters above sea level
- D. **Audible Noise:** 72 dB "A" weighing when measured 5 feet in front of the unit

1.8 WARRANTY

- A. **UPS Module:** The UPS shall be covered by a full parts and labor warranty from the manufacturer for a period of twelve (12) months from date of installation or acceptance by customer or eighteen (18) months from date of shipment from the manufacturer, whichever occurs first.
- B. **Battery:** The battery manufacturer's warranty shall be passed through to the final customer and shall have a minimum period of one year.

1.9 SERVICE AND SPARE PARTS

The manufacturer shall, upon request, provide spare parts kits for the UPS module in a timely manner; as well as provide access to qualified factory trained first party service personnel to provide preventative maintenance and service on the UPS module when required.

1.10 MAINTENANCE, ACCESSIBILITY, AND SELF DIAGNOSTICS

All UPS subassemblies, as well as the battery, shall be accessible from the front. UPS design shall provide maximum reliability and minimum MTTR (mean time to repair). To that end, the UPS shall be equipped with a self-test function to verify correct system operation. The self-test function shall identify the subassembly requiring repair in the event of a fault. The electronic UPS control and monitoring assembly shall therefore be fully microprocessor based, thus doing away with all potentiometer settings. This shall allow:

- Auto-compensation of component drift;
- Self-adjustment of replaced subassemblies;
- Extensive acquisition of information vital for computer-aided diagnostics (local or remote);
- Socket connection to interface with computer-aided diagnostics system.

The UPS shall be repairable by replacing standard subassemblies requiring no adjustments. Communication via a modem with a remote maintenance system shall be possible.

2.0 PRODUCT DESCRIPTION

2.1 APPROVED MANUFACTURERS AND PRODUCT DESCRIPTION

- A. **Approved Manufacturer(s):** The specified equipment will be manufactured by MGE UPS SYSTEMS or approved manufacturer in compliance with specifications.
- B. **Product Description:** This specification describes a three phase continuous duty on-line, solid state Uninterruptible Power System, hereafter referred to as the UPS. The UPS shall operate in conjunction with the existing building electrical system to provide power conditioning, back-up power

protection and distribution for electronic equipment loads. The system shall consist of a solid state inverter, rectifier/battery charger, a 100% rated for continuous duty static switch, an internal maintenance bypass switch, an internally assembled battery cabinet, synchronization control circuitry, connection control circuitry, disconnection control circuitry, system metering, system status indicators, system alarm annunciation circuitry, and accessories as specified herein.

2.2 SYSTEM DESCRIPTION

A. UPS Design Requirements

1. **Output Power Continuous Rating:** The continuous output power rating of the UPS shall be [] kVA at a 0.8 lagging power factor.
2. **Input Voltage:** [] VAC, +10/-15%, 3 phase, 3 or 4 wire plus ground
3. **Output Voltage:** [] VAC, $\pm 5\%$, 3 phase, 3 or 4 wire plus ground
4. **Battery Autonomy:** The UPS shall be capable of operating at full load for [] minutes at 0.8 PF output at a temperature of 25°C on battery power.
5. **Battery Type:** Sealed, high rate discharge, flame retardant, valve regulated lead acid (VRLA)

B. AC Input Characteristics

1. **Voltage:** 208, 480 or 600 VAC, +10/-15%, 3 phase, 3 wire plus ground or 3 phase, 4 wire plus ground
2. **Frequency:** 60 Hz $\pm 10\%$
3. **Power Factor:** Up to .9 lagging
4. **Total Harmonic Distortion:** At nominal input voltage - 30% typical. With optional filter - 7% typical.
5. **Power Walk-In:** 0 to 100% over a 10 second period
6. **Inrush Current:** 600% of nominal input current for less than one cycle, highest expandable kVA size
7. **Reactive Current:** < 20% of nominal input current at all load levels

C. AC Output Characteristics

1. **Voltage:** 208, 480, or 600 VAC (adjustable $\pm 5\%$), 3 phase, 3 wire plus ground or 3 phase, 4 wire plus ground
2. **Frequency:** 60 Hz ± 2.0 Hz synchronized with bypass (selectable in 0.25 Hz increments), 60 Hz $\pm 0.1\%$ free running
3. **Voltage Regulation:** $\pm 0.5\%$ for balanced load
 $\pm 2.5\%$ for 100% unbalanced load
4. **Voltage Distortion:** Maximum 2% total (THD) and 1% on any single harmonic when the UPS is connected to 100% linear loads

5. **Voltage Transient (Step Load) Response:** $\pm 5\%$ for 100% step load change
 $\pm 3\%$ for 50% step load change
 $\pm 1\%$ for loss or return of AC input power
 $\pm 1\%$ for manual transfer at full load
6. **Voltage Recovery Time:** Return to within $\pm 0.5\%$ of nominal voltage within 16.67 milliseconds (one cycle)
7. **Phase Angle Displacement:** $120^\circ \pm 1^\circ$ for balanced load, $120^\circ \pm 3^\circ$ for 100% unbalanced load
8. **Non-Linear Load Capability:** Output voltage total harmonic distortion shall be less than 4% when connected to a 100% non-linear load with a crest factor not to exceed 3.5.
9. **Slew Rate:** 1 Hz/second maximum (selectable in 0.5 Hz increments up to 2.0 Hz)
10. **Power Factor:** Unity up to the kW output rating, 0.8 up to the kVA rating
11. **Inverter Overload Capability:** 125% of rated load for 10 minutes
150% of rated load for 1 minute
212% current limit if bypass is not available

D. Battery

1. **Battery Voltage:** Range is 400-545 VDC, 480 VDC nominal
2. **Maximum DC Current:** Maximum DC current at the cutoff voltage shall be [] A.
3. **DC Cutoff Voltage:** Maximum 1.67V per cell
4. **DC Ripple:** Maximum 1% of DC voltage
5. **Low Battery Protection:** At a pre-set battery voltage value or 2 hours after the UPS has shutdown on a DC undervoltage condition (battery cut off voltage), the battery circuit breaker shall open in order to prevent excessive battery discharge.

2.3 MODES OF OPERATION

The UPS shall be designed to operate as an on-line reverse transfer system in the following modes:

- A. **Normal:** The inverter shall continuously supply power to the critical load. The rectifier/battery charger shall derive power from the utility AC source and supply DC power to the inverter while simultaneously float charging the battery.
- B. **Emergency:** Upon failure of the utility AC power source, the critical load shall be supplied by the inverter, which, without any switching, shall obtain its power from the battery.
- C. **Recharge:** Upon restoration of the utility AC power source (prior to complete battery discharge), the rectifier/battery charger shall power the inverter and simultaneously recharge the battery.
- D. **Bypass Mode:** The static bypass transfer switch shall be used to transfer the load to the bypass without interruption to the critical power load. This shall be accomplished by turning the

inverter off. Automatic re-transfer or forward transfer of the load shall be accomplished by turning the inverter on.

- E. **Maintenance Bypass/Test Mode:** An optional manual make before break maintenance bypass switch shall be provided to isolate the UPS inverter output and static bypass transfer switch for maintenance. This shall allow the UPS to be tested or repaired without affecting load operation.

2.4 COMPONENT DESCRIPTION

- A. **Rectifier/Battery Charger:** A 6-pulse, solid-state full-wave bridge rectifier shall convert the incoming AC power to regulated DC voltage, which shall be subsequently filtered to provide power for the inverter and battery charging functions. The rectifier/battery charger shall have sufficient capacity to support a fully loaded inverter and recharge the battery to 95% of its full capacity within 10 times the discharge time. The rectifier/battery charger assembly shall be constructed of modular plug-ins to facilitate maintenance.

1. **Input Protection:** The rectifier/battery charger shall be protected by an AC input circuit breaker and input fuses.
2. **Input Current Limiting:** Input current limit shall be set at 150% of nominal input current. A programmable second step input current limit, allowing a further limit of the input current, shall be activated by a dry contact input.
3. **Battery Charge Current Limiting:** Maximum recharge current is limited to 10% of maximum DC discharge current. DC current limit settings are customer programmable up to 1000 amps. A second step battery charge current limit shall be provided, activated by a customer provided dry contact input.
4. **Operating Modes:**
 - a) **Automatic Charge Sequence:** The rectifier battery charger shall automatically charge the batteries at an elevated voltage after an outage of a set (selectable between 0-255 seconds) duration.
 - b) **Float Service:** Nominal DC bus voltage (programmable) provided under nominal operating conditions.
 - c) **Manual Charge Service:** The rectifier/battery charger output voltage shall be selectable to a voltage slightly higher than the normal float voltage setting, normally the maximum float voltage setting specified by the battery manufacturer.
 - d) **Equalize/Commissioning Service:** A high charge rate of DC voltage capable of being set at 2.5 volts per cell at a user selected time period.

B. Inverter

The UPS output shall be derived from an IGBT Pulse Width Modulated (PWM) variable frequency and variable pulse width, transistorized-type inverter design. The inverter shall be capable of providing the specified precise output power characteristics (specified in paragraph 2.2.C.1 and 2.2.C.3) while operating over the battery voltage range (2.2.D.1). The inverter assembly shall be constructed of modular rack out assemblies to facilitate maintenance.

C. Static Bypass

The static bypass transfer switch shall be solid-state, rated for continuous duty and shall operate under the following conditions:

1. **Uninterrupted Transfer:** The static bypass transfer switch shall automatically cause the bypass source to assume the critical load without interruption after the logic senses one of the following conditions:
 - a) Inverter overload exceeds unit's rating
 - b) Battery protection period expired and bypass available
 - c) Inverter failure
2. **Interrupted Transfer:** If the bypass source is beyond the conditions stated below, interrupted transfer (not less than 0.2 seconds in duration) shall be made upon detection of a fault condition.
 - a) Bypass voltage greater than $\pm 10\%$ from the UPS rated output voltage.
 - b) Bypass frequency greater than ± 2 Hz (selectable in .25 Hz increments) from the UPS rated output frequency.
3. **Automatic Uninterrupted Forward Transfer:** The static bypass transfer switch shall automatically forward transfer, without interruption, after (1) the UPS inverter is turned "ON", or (2) after an instantaneous overload-induced reverse transfer has occurred and the load current returns to less than the unit's 100% rating.
4. **Manual Transfer:** A manual static transfer shall be initiated from the System Status and Control Panel by turning the UPS inverter off.
5. **Overload Ratings:** The static bypass transfer switch shall have the following overload characteristics:
 - a) 1000% of UPS output rating for 0.016 seconds (one cycle)
 - b) 150% of UPS output rating for 1 minute
 - c) 125% of UPS output rating for 10 minutes

D. Microprocessor Controlled Logic

The full UPS operation shall be provided through the use of microprocessor controlled logic. All operations and parameters are firmware controlled, thus eliminating the need for manual adjustments or potentiometers. The logic shall include a self-test and diagnostic circuitry such that a fault can be isolated down to the printed circuit assembly or plug-in power assembly level. Every printed circuit assembly or plug-in power assembly shall be monitored. Diagnostics shall be performed via a PC through the local diagnostics port on the unit, or via a modem through the RS232 communication port.

3.0 SYSTEM CONTROLS AND INDICATORS

- A. The UPS module shall be provided with a system status and control panel that controls, monitors, and displays system operation and parameters. The display shall utilize a combination of front panel steady state and flashing LED's, a 40-character x 2-line backlit LCD display, and keypad. The display/keypad shall incorporate multiple menus (listed below), which provide step-by-step procedures for system operation, display metering functions (listed below), and display more than 40 normal and alarmed conditions (listed below). The front panel display shall be selectable in five languages (English, French, Spanish, Dutch and Italian).

1. **The LCD display shall provide the following menus and instructions:**

- Inverter On/Off commands
- Alarm Display
- Display Contrast
- Voltage Measurements
- Communication Options
- Language Selection
- Battery Capacity
- Frequency & Power Measurements
- Current Measurements

2. **The following controls shall be provided:**

- Internal input circuit breaker
- Inverter output contactor
- UPS isolation circuit breaker
- Control circuitry
- Output circuit breaker (in SSC).
- Maintenance bypass circuit breaker

3. **Front Panel (push buttons) shall include:**

- Inverter ON
- Emergency power off (EPO)
- Inverter OFF

Note: The EPO push button includes a protective cover to prevent unintentional operation.

4. **Hidden Panel (push buttons) shall include:**

- Settings
- Volt
- Watt/Hz- Battery
- Alarms
- * (Asterisk)
- Battery charge cycle
- Security key
- Forced inverter to bypass
- Audible alarm reset.
- > (scroll arrow)
- Amp
- ON/OFF
- Clear fault
- Return to float
- Bypass AC input non-synchronization
- Forced bypass to inverter

5. **System Parameters Monitored:** The visual display shall display the following system parameters based on true RMS metering:

- UPS module input voltage (L-L). Three phase simultaneously.
- UPS module input current/phase. Three phase simultaneously.
- UPS module and bypass input voltage (L-L/L-N). Three phase simultaneously.
- UPS module and system bypass input frequency.
- UPS module and system output voltage (L-L /L-N). Three phase simultaneously.
- UPS module and system output current/phase. Three phase simultaneously.
- UPS module and system output, bypass and input frequency.
- UPS module and system output % load.
- UPS module and system output power factor.
- UPS module and system output kVA and kW.
- DC voltage
- UPS module and system crest factor per phase
- Battery current (charge/discharge)
- Time remaining on battery and available battery time
- Battery cabinet temperature can be monitored via the optional Graphical User Interface (GUI)

6. **Alarm/Status conditions displayed on LED's shall indicate:**

- a) Front Panel LED's:
 - Load protected
 - Operating problem
 - Battery operation
 - Load not protected

- b) Hidden Panel LED's:
 - Emergency shutdown
 - Rectifier/Charger ON
 - Inverter fault
 - Transfer function fault
 - Overload
 - Maintenance position
 - Battery discharged
 - Main AC input outside tolerance
 - Rectifier/Charger fault
 - Inverter desynchronized
 - Bypass AC input outside
 - Battery charging (vented type)
 - Battery Cabinet temperature outside

7. UPS status and operating instructions displayed on the LCD shall include:

- UPS operation is normal
- Load is protected
- Load on Bypass
- UPS on overload
- Circuit breakers in open position
- Buzzer ON
- Electronic power supply fault
- Emergency shutdown, REPO ON
- UPS input failure
- Input problem, check frequency
- Input has single phase condition
- Input fuse blown
- Charger module alarm
- Charger fault, call service
- Input over/under voltage
- Charger over-temperature
- UPS low battery, shutdown imminent
- Available battery time
- Battery circuit breaker open
- Bypass input wrong phase rotation
- Bypass and Inverter are Out-of-Sync
- Bypass problem, check voltage
- Bypass input over/under voltage
- Phase shift problem, check bypass
- Static switch overload, emergency off
- Start Inverter
- Inverter fault, call service
- Inverter OFF
- Inverter fuse blown
- Inverter current limit
- UPS overload shutdown
- Inverter leg 1 over temperature
- Inverter leg 3 over temperature
- Inverter leg 1 trans. out of saturation
- Inverter leg 2 trans. out of saturation
- Inverter leg 3 trans. out of saturation
- Load on UPS (UPS is on Line)
- Load on Battery
- Load on Maintenance Bypass (MBS)
- UPS overload shutdown
- Contactor in open position
- Fan failure
- Environmental problem
- UPS alarm, call
- Input problem, check voltage
- Input has wrong phase rotation
- Input circuit breaker tripped
- Charger OFF
- Charger shutdown
- Charger current sensor fault
- Input over/under frequency
- Maximum battery voltage
- Battery under voltage shutdown
- Remaining battery time
- Static switch over temperature
- Bypass input has single phase
- Bypass input RC filter fuse blown
- Bypass problem, check frequency
- Bypass input over/under-frequency
- Transfer problem, call
- Bypass transfer
- Stop Inverter
- Inverter overload (check P.F./ KW)
- Inverter output contactor
- Inverter output over/under
- Inverter current sensor fault
- Operating on internal
- Inverter leg 2 over temperature
- Inverter transformer over temperature
- Inverter leg 1 power supply fault
- Inverter leg 2 power supply fault
- Inverter leg 3 power supply fault.

B. Audible Alarm Reset Touch Pad: Shall be used to silence the audible alarm. If a new alarm is sensed after the original alarm has been silenced, it shall reactivate the audible alarm.

C. **Emergency Power Off (EPO):** When the EPO is pressed, it shall cause the AC input, bypass input contactor and battery circuit breakers to open, thereby shutting down the UPS and the load. The EPO function shall be capable of being initiated by an externally provided isolated dry contact (REPO).

D. **Dry Contacts:** Eleven (11) alarm dry contacts shall be available for external connection. Each alarm shall include two form C contacts. These contacts shall indicate:

- UPS on line
- Overload
- UPS on battery
- Low battery shutdown imminent
- Summary alarm
- UPS on Bypass
- Inverter fault
- Rectifier/charger on
- Rectifier/charger fault
- Bypass out of tolerance
- Static switch fault

The contacts shall change state to indicate the operating status. Contacts rated 5 amp @ 250 volts.

E. **Customer Provided Dry Contacts:** Nine (9) inputs shall be available to control the UPS operation. Upon receipt of a closed dry contact, the UPS shall perform the operations listed below (all inputs are normally open unless noted):

- Remote EPO (Normally closed)
- Bypass transfer prohibited
- Break transfer prohibited
- Progressive stop of rectifier/charger
- Second step battery charge limit
- Second step input current limit
- Remote UPS on
- Remote UPS off
- Inverter non-synch with bypass

F. **Serial Communications:** A standard serial communication port shall be provided to remotely monitor the UPS (see NOTE below). All alarms messages and standard measurements shall be available on the local port. The port shall be configurable for RS-232 or RS-485 communications. The port shall use an open J-BUS (subset of ModBus) protocol with all UPS status information (86 parameters) available remotely via Hayes compatible modem.

NOTE: If purchased, the Graphical Command Center (GCC) option occupies this port. Purchase Serial Port Adder (Comm+2) option to add additional ports.

3.1 MECHANICAL DESIGN AND VENTILATION

A. **Enclosure:** The UPS shall be housed in a free standing enclosure with dead front construction. The cabinet shall be painted an off-white (RAL 9002) color. The UPS is available in an electrical room or computer room version. The computer version can accommodate bottom entry cables, while the electrical room version can accommodate both bottom and top entry cables. Front access only shall be required for installation and maintenance.

The UPS module enclosure dimensions shall be 74.6" high, 32.8" deep x []" wide. The weight of the enclosure shall be [] lbs.

B. **Ventilation and Heat Rejection:** The UPS shall be designed for forced air cooling. Air inlets shall be provided from the front bottom of the UPS enclosure. Air exhaust shall be from the top rear portion of the unit. Air filters shall be provided as standard. All fans shall be redundant.

1. **Airflow:** Air flow shall be 2,500 CFM per UPS module.

2. **Heat Rejection:** Maximum heat rejection per UPS module at full load shall be 112,000 BTUs per hour.

4.0 ACCESSORIES

- A. **Battery Pac Assembly:** The Battery Pac Assembly shall be furnished in a matching cabinet to the UPS. The Battery Pac Assembly shall include a battery disconnect that shall provide a positive means of isolating the battery from the rest of the system for maintenance. The Battery Pac Assembly shall be designed to allow for checking the torque on all battery connections in the battery system as well as providing sufficient access for preventative maintenance.
- B. **Low kVAR Input Filter:** An optional low KVAR input filter shall be available to limit input current harmonic distortion to less than 7% THD and improve input power factor to 0.95. The low kVAR filter shall also limit reactive current / kVAR to under 20% of the nominal input current at all load levels to ensure optimum generator compatibility. The input filter shall not utilize any electromechanical contactors and shall never disengage the capacitor bank.
- C. **Shunt Inductor Input Filter:** An optional Shunt Inductor input filter shall be available to limit input current harmonic distortion to 5% THD and improve input power factor to .95. The Shunt Inductor input filter shall maintain a lagging or unity input power factor under all load levels to ensure optimum generator compatibility.
- D. **Remote Alarm Status Panel:** A wall mounted panel, 17.5"Hx12"Wx4"D, with twelve (12) indicating LED's shall display UPS status and any active alarms. The alarms shall be a latching type, such that if an alarm is triggered, the LED will stay ON (latch) even if the alarm is corrected. This feature will provide the operator the chance to verify the occurrence of the alarm. The parameters monitored and controls provided on the RASP panel include:
1. UPS on line (Green LED)
 2. UPS on battery (Yellow LED)
 3. Load on bypass (Yellow LED)
 4. UPS summary alarm (Red LED)
 5. Low Battery shutdown
 6. Charger on
 7. Inverter fault
 8. Overload
 9. Charger fault

The Remote Alarm Status Panel shall also be equipped with:

- ▶ Alarm Test/Reset push-button: (white LED) to reset the latching alarm
- ▶ Audible Alarm: for alarm annunciation
- ▶ Audible Alarm reset push-button: (white LED) to silence the audible alarm

The RASP door shall be equipped with a key lock. The recommended maximum distance from the UPS module shall be 500 feet.

- E. **Remote Summary Alarm Panel:** A wall mounted panel with five (5) indicating LED's shall display UPS status and any active alarms. The alarms shall be a latching type, such that if an alarm is triggered, the LED will stay ON (latch) even if the alarm is corrected. This feature will provide the operator the chance to verify the occurrence of the alarm. The parameters monitored and controls provided on the RSAP panel include:

1. UPS summary alarm (Red LED)
2. UPS on battery (Yellow LED)

The Remote Summary Alarm Panel shall also be equipped with:

- ▶ Alarm Test/Reset push-button: (white LED) to reset the latching alarm
- ▶ Audible Alarm: for alarm annunciation
- ▶ Audible Alarm reset push-button: (white LED) to silence the audible alarm

The RSAP door shall be equipped with a key lock. The recommended maximum distance from the UPS module shall be 500 feet.

- F. **Output Distribution Circuit Breaker(s)**: Up to four output circuit breakers may be provided on all 208 output models. On 480 output models, an additional auxiliary cabinet is required. Each of the four distribution circuit breakers may be sized up to 400 amps and shall include auxiliary contacts and shunt trip.
- G. **Input Isolation Transformer**: An input isolation transformer can be provided to isolate the rectifier input and DC bus.
- H. **External Wrap Around Maintenance Bypass**: The maintenance bypass option provides for two additional circuit breakers mounted inside the UPS cabinet for UPS isolation and UPS maintenance bypass. Maintenance bypass transfers shall be without interruption and electronically interlocked to protect the UPS from damage in the event of out of sequence transfers. The maintenance bypass circuit breakers shall be housed in an isolated compartment within the UPS enclosure in such a way that service personnel will not be exposed to any electrically live parts while maintaining the unit.
- I. **External Control and Communications Devices**

Two communication slots shall be provided for customer use. The communication port options are listed as follows:

1. **RS232 U-Talk or Dry Contacts (66060)**: The U-Talk protocol shall be used with Solution-Pac 2 for remote monitoring or graceful shutdown for most popular file servers. The dry contacts will close on predefined conditions to monitor UPS operations. A MultiSlot is required. The dry contacts will close on the conditions listed below, but shall be user programmable to close on preset thresholds of other user UPS parameters:
 - UPS on Line
 - Load on Bypass
 - UPS on Battery
 - Low Battery Warning
 - Battery Fault
 - General Alarm

Two (2) dry contact inputs shall also be provided to turn the UPS inverter on and off remotely upon closure of the contacts. This feature may also be disabled if required.

2. **High Voltage 6 Alarm Relays Card (66069)**: Six (6) normally open dry contact outputs rated at 2.0 A (250 VDC / 30 VDC) shall be available to monitor UPS operation. A MultiSlot is required. The dry contacts will close on the conditions listed below, but shall be user programmable to close on preset thresholds of other user UPS parameters:
 - UPS on Line
 - Load on Bypass
 - UPS on Battery

- Low Battery Warning
- Battery Fault
- General Alarm

Two (2) dry contact inputs shall also be provided to turn the UPS inverter on and off remotely upon closure of the contacts. This feature may also be disabled if required.

3. **Network Management Card (66074):** The Network Management Card (NMC) shall provide a web interface, SNMP (Simple Network Management Protocol), logging, and email capabilities. The NMC shall be used for remote monitoring or graceful shutdown for most popular file servers. A MultiSlot is required.
4. **IBM AS/400 Volt-Free Contact/Remote Power Off Card (66068):** The UPS shall interface with an IBM® AS400-UPS signal interface providing the following signals via dry contacts (a MultiSlot is required):
 - load on battery
 - load on bypass
 - low battery shutdown warning
 - load powered by UPS
5. **Network Management Link:** The MultiSlot shall provide three additional communication slots. The Network Management Card (NMC) shall be installed in one or all three slots for monitoring and graceful shutdown for most popular file servers. The NMC provides a web interface, SNMP, logging and email capabilities. Requires one communication slot and network cabling (provided by customer). The basic network connection requires the MultiSlot (66071), U-Talk Acquisition Card (66063), Network Management Card (66074), and RS232 U-Talk or JBus/Modbus board configured for U-Talk.
6. **Serial Port Adder (COMM+2):** The standard UPS has one available serial port, which may be used by the GCC. The COMM+2 option adds two additional serial ports for use as RS232 or RS485, allowing the UPS to have a total of three serial ports (one port may be used by GCC). GT2Z card and cable included.
7. **MultiSlot Communications Card Expander (66071):** The MultiSlot shall provide three additional communication slots. The U-Talk Acquisition Card (66063) is included.

J. Network Based Power Management Software:

1. **Solution-Pac 2** software shall facilitate the management of the UPS over any point in a wide area network (WAN) or local area network (LAN). The software shall use a distributed, TCP/IP based architecture and must be SNMP manageable. To reduce the volume of network traffic, the software will employ trap reception acknowledgement. The software must be capable of graceful server shutdown of individual or multiple servers from any point on the network for up to 50 servers per card.
2. **Enterprise Power Manager** software shall facilitate the management of the UPS and servers over any point in a wide area network (WAN) or local area network (LAN). The software shall provide an overall, consolidated view of the main operating parameters of all power devices on the network. The information shall be accessible from any workstation using a standard web browser. The software shall use Secure Sockets Layer (SSL) and several levels of password protection for complete security. MGE network device required.

K. **Critical BUS Synchronization:** Critical Bus Synchronization module (CBS) shall be required to keep the outputs of all three (3) separate and independent UPS systems in sync during all operating conditions including when:

1. Bypass power of one or both UPS systems is not available
2. Bypass power is available but they are out of sync
3. UPS systems are operating on battery

The CBS shall be a parallel-connected circuit that monitors the bypass and system output of all UPS systems and it shall activate a sync signal under pre-determined and specific conditions. The CBS shall not affect the standard and specified performance of the UPS system detailed in the specifications.

The CBS shall be a wall-mounted enclosure and shall contain the following indications:

1. **SYS 1,2 BYPASS AVAIL** - Green Light. When lit it, indicates that the bypass power to UPS system #1 is available and it is within allowed tolerance (nominal voltage +/- 10%).
2. **BYPASS 1, 2 IN SYNC** - Green Light. When lit, it indicates that the bypass sources of UPS system #1 and UPS system #2 are in sync and within the selected and programmed phase angle.
3. **SYSTEMS IN SYNC** - Green Light. When lit, it indicates that the UPS outputs of both systems (1 and 2) are in sync and within the allowed limits. This indication is derived from comparing the output of the second UPS system to the output of the selected MASTER system.
4. **SYNC CKT ACTIVATED** - Amber Light. When lit, it indicates that the CBS is activated and the UPS systems outputs are no longer tracking their respective bypasses but instead they are synchronized to the selected "MASTER".
5. **SYNC CKT INHIBITED** - Red Light. When lit, it indicates that the CBS is not active due to one or more of the following conditions:
 - a) SYNC MODE SELECT is in the OFF position
 - b) One of the UPS systems is on maintenance bypass.
 - c) All systems are on static bypass.
6. **SYNC MODE SELECT (OFF or AUTO)** – Selector switch:
 - a. OFF – When selected, the CBS is inactive and out of operation. The "SYNC CKT INHIBITED" light will be lit.
 - b. AUTO – When selected (normal mode of operation), the CBS is in operation and should the bypass inputs go out of the sync, the CBS will be activated.
7. **MASTER SELECT (SYS 1 or SYS 2)** – Selector switch:
8. **LAMP TEST** - When pressed it will turn ON all lights as a functional test.

The CBS shall operate under the following conditions:

1. **Normal Operation:** Under normal operation, both UPS systems are in full operation feeding their respective loads. Their bypass power is available and they are in sync. The Outputs of both systems are in sync and the CBS is in AUTO mode but not active.

2. **Bypass Power Failure:** Should the bypass power fail the CBS shall automatically activated (SYNC CKT ACTIVATED light is lit) after a preset time delay and the outputs of the UPS systems shall remain in sync. The signal from the CBS shall be sent to “slave” and Master UPS systems inhibiting them from manual or automatic transfer to bypass. The Master UPS system is also inhibited from transferring to bypass.

This condition shall remain until the bypass power is re-applied. Upon application of bypass power, the selected master UPS system shall automatically track its bypass source. The slave UPS system shall continue to track the selected master UPS system. When the bypass sources are in sync, the CBS shall de-activated after a preset time delay and the UPS system shall track its respective bypass source. De-activating the CBS shall also de-activate the transfer to bypass inhibit signal. Normal operation shall resume.

3. **Bypass power of one UPS system failure:** Should the bypass power fail on one UPS system, the CBS shall automatically activated (SYNC CKT ACTIVATED light is lit) after a preset time delay and the outputs of the two UPS systems shall remain in sync. A signal from the CBS shall be sent to the UPS system with the failed bypass source inhibiting it from manual or automatic transfer to bypass.

This condition shall remain until the bypass power is re-applied. When the bypass sources are in sync, the CBS shall de-activate after a preset time delay and each UPS system will track its respective bypass source. De-activating the CBS shall also de-activate the transfer to bypass inhibit signal. Normal operation shall resume.

4. **Bypass power available but out of sync:** Should the bypass power on UPS systems is available but they are out of sync or outside the selected and preset phase angle, the CBS shall automatically activated (SYNC CKT ACTIVATED light is lit) after a preset time delay and the outputs of the two UPS systems are in sync.

This condition shall remain until the bypass sources are in sync, the CBS shall de-activated after a preset time delay and each UPS system will track its respective bypass source. De-activating the CBS shall also de-activate the transfer to bypass inhibit signal. Normal operation shall resume.

5. **UPS on bypass or maintenance bypass:**

- a) Should one UPS system transfer to bypass, this system shall become the master regardless of the position of the MASTER SELECT switch. The systems shall synchronize to the MASTER system after the preset time delay should the UPS outputs go out of sync.
- b) Should one UPS system transfer to maintenance bypass, the CBS shall be inhibited (SYNC CKT INHIBITED light is lit) and each UPS system will synchronize to its own bypass source.

The Circuit Breaker Switch shall be housed in an adjacent matching enclosure. The Circuit Breaker Switch enclosure shall increase the overall width of the UPS by 14.5”.

- L. **Graphical User Interface:** The UPS module shall be equipped with a Graphical Command Center / Graphical User Interface (GUI) with a 12.0” daylight viewable TFT LCD color monitor with touch screen operation. The GUI shall utilize an industrial operating system with a static flash disk drive storage medium. The GUI shall provide detailed system level and module level operating information. An animated, color coded single line diagram shall illustrate module and system level current flow, major UPS component status, breaker position and module and system operating status. Individual screens shall indicate operating conditions

and electrical measurements for all specific UPS module(s) including the rectifier and bypass input, inverter, rectifier, individual battery banks, and the critical load output.

The GUI shall have a clear menu leading to operator instructions for all major UPS operating procedures. All alarms and events shall be recorded, time and date stamped and stored on a rolling log. Major alarms shall be indicated on any screen so that the operator may browse at any time. The GUI shall also have the capability to trend key parameters on a variable scale graph.

The GUI shall facilitate the unique naming of all circuit breakers. Software updates to the GUI shall be possible via exchange of flash chips or over the network but shall not require the removal of the device. Failure of the GUI shall not compromise UPS operation. All key status and operating information shall remain visible on the primary UPS display regardless of the GUI operating status. All GUI screens shall be accessible and navigable using a conventional browser. No additional network or server hardware shall be required.

5.0 FIELD QUALITY CONTROL & SERVICE ORGANIZATION

5.1 FIELD SERVICE ENGINEER QUALIFICATIONS

The manufacturer must employ a 7 X 24 nationwide (international where applicable) field service organization with rapid access to all regions of the nation. The responding service professionals must be factory-trained engineers with an accredited and proven competence to service three phase UPS.

5.2 SPARE PARTS

Field Engineers must have immediate access to recommended spare parts with additional parts storage located in regional depots. Additional spare parts shall be accessible on a 7 x 24 basis from the national depot and must be expedited on a next available flight basis or via direct courier (whichever mode is quickest).

5.3 MAINTENANCE TRAINING

The manufacturer shall make available to the customer various levels of training ranging from basic UPS operation to UPS maintenance.

5.4 MAINTENANCE & SERVICE CONTRACTS

The manufacturer shall offer additional preventative maintenance and service contracts covering both the UPS and the battery bank. Accredited professional service engineers employed exclusively in the field of critical power systems service shall perform all maintenance and service. The manufacturer shall also offer extended warranty contracts.

END OF SECTION

SPECIFICATION KEY

2.2.A.1 Power Ratings

300 kVA/240 kW
375 kVA/300 kW

Input Currents

kVA	300	375
Current @ 208	900	1100
Current @ 480	400	490
Current @ 600	293	367

2.2.B.4 Input Current Harmonic Distortion

No input filter: 30% typical
Optional Low kVAR filter: 7% typical
Optional Shunt Inductor Filter: 5% typical

UPS Efficiency

% Load	300 208/208	300 480/208	300 480/480	375 208/208	375 480/208	375 480/480
50	91.0	92.0	93.0	91.0	92.0	93.0
75	92.5	93.0	94.0	92.5	93.0	94.0
100	92.5	93.0	94.0	92.5	93.0	94.0

2.2.D.2 Maximum DC Current

kVA	300	375
ADC	647	809

3.1.A UPS Weights and Dimensions

UPS WIDTH (inches)

INPUT/OUTPUT VOLTAGE	300 kVA	375 kVA
208/208	162	162
480/208	113	113
480/480	63.5*	63.5*
600/208	162	162

The electrical room version of all 480/480 300/375 kVA models require an additional 18" side cabinet.

UPS WEIGHT (lbs)

INPUT/OUTPUT VOLTAGE	300 kVA	375 kVA
208/208	9,815	10,440
480/208	8,379	8,836
480/480	5,543	5,612
600/208	9,815	10,440

3.1.B UPS Heat Rejection

BTU/HR AT FULL LOAD

INPUT/OUTPUT VOLTAGE	300 kVA	375 kVA
208/208	66,396	82,995
480/208	61,636	77,045
480/480	52,269	65,336
600/208	66,396	82,995