

Guide Specifications

EGPE2 7/27/02

EGPE2™

**Electronic
Grade
Panelboard
Extension**



1.0 GENERAL.

1.1 SUMMARY. This specification describes the electrical and mechanical requirements for a surge suppression filter system integrating both transient voltage surge suppression (TVSS) and electrical high frequency noise filtering for the protection of electrical panelboards.

The unit shall be designed for parallel connection to the facility's wiring system. The suppression system shall be designed and manufactured in the USA by a qualified manufacturer of suppression filter system equipment. The qualified manufacturer must have been engaged in the design and manufacture of such products for a minimum of five (5) years.

These specifications are based on the Current Technology EGPE2 Electronic Grade Panelboard® Extension suppression system which is designed to be mounted at the top or bottom of a lighting panelboard. EGPE2s are compatible with most GE, Square D, Siemens or Cutler-Hammer/Westinghouse lighting panelboards. Other SPD manufacturers shall provide detailed compliance or exception statements to all provisions of this specification fourteen (14) days prior to bid to allow consideration.

1.2 STANDARDS. The specified unit shall be designed, manufactured, tested and installed in compliance with the following standards:

- ANSI/IEEE C62.41-1991 and C62.45-1992;
- ANSI/IEEE C62.1 and C62.11;
- Canadian Standards; (CUL);
- Federal Information Processing Standards Publication 94 (FIPS PUB 94);
- National Electrical Manufacturers Association (NEMA LS1-1992 Guidelines);
- National Fire Protection Association (NFPA 70 [NEC], 75, and 78);
- Underwriters Laboratories (UL 1449 Second Edition, UL 1283, and UL50);

The Electronic Grade Panelboard Extension (EGPE2) shall be **UL 1449 Second Edition Listed** as a Transient Voltage Surge Suppressor and **UL 1283 Listed** as an Electromagnetic Interference Filter.

1.3 ENVIRONMENTAL REQUIREMENTS.

1.3.1 Storage Temperature. Storage temperature range: -40° to $+85^{\circ}$ C (-40° to $+185^{\circ}$ F).

1.3.2 Operating Temperature. Operating temperature range: -40° to $+60^{\circ}$ C (-40° to $+140^{\circ}$ F).

1.3.3 Relative Humidity. Reliable operation in 5% to 95% non-condensing relative humidity.

1.3.4 Operating Altitude. Capable of operating up to 13,000 feet above sea level.

1.3.5 Audible Noise. The unit shall not generate any audible noise.

1.3.6 Magnetic Fields. No appreciable magnetic fields shall be generated. Unit shall be capable of use in computer rooms without danger to data storage systems or devices.

2.0 ELECTRICAL REQUIREMENTS.

2.1 Unit Operating Voltage. The nominal unit operating voltage and configuration shall be as indicated on the drawings. For voltage configurations not listed, contact factory.

Model Number	Voltage	Poles	Configuration
EGPE2-xxx-120/240-2G-F or S	120/240	2	Split Phase, Grounded Neutral
EGPE2-xxx-120/208-3GY-F or S	120/208	3	Grounded WYE
EGPE2-xxx-220/380-3GY-F or S	220/380	3	Grounded WYE
EGPE2-xxx-277/480-3GY-F or S	277/480	3	Grounded WYE
EGPE2-xxx-347/600-3GY-F or S	347/600	3	Grounded WYE
EGPE2-xxx-120/240-3GHD-F or S	120/240 x 208	3	Grounded "High Leg" DELTA
EGPE2-xxx-240-3DG-F or S	240	3	DELTA
EGPE2-xxx-480-3DG-F or S	480	3	DELTA

NOTES: Choose F for Flush mounting or S for Surface mounting; xxx-60, 80, or 100.

2.2 Maximum Continuous Operating Voltage (MCOV). The MCOV shall be greater than 115% of nominal voltage for all Electronic Grade Panelboard Extension (EGPE2) products. All Current Technology suppression filter system's maximum continuous operating voltages are in compliance with test and evaluation procedures outlined in NEMA LS 1-1992, paragraphs 2.2.6 and 3.6.

2.3 Operating Frequency. Operating frequency range shall be 47 to 63 Hertz.

2.4 Protection Modes. All protected modes are defined per NEMA LS 1-1992, paragraph 2.2.7. Following IEEE Standard 1100-1992, section 9.11.2 recommendations, EGPE2 units shall provide protection in all modes. WYE configured systems shall provide Line-to-Neutral, Line-to-Ground, Line-to-Line and Neutral-to-Ground protection. Line-to-Line and Line-to-Ground protection shall be provided for all DELTA configured systems.

2.5 Rated Single Pulse Surge Current Capacity. The rated single pulse surge current capacity, in amps, for each mode of protection of the unit shall be no less the following:

Rated Single Pulse Surge Current Capacity					
Model	L-N	L-G	N-G	L-L	Per Phase
EGPE2-60	60,000	60,000 A	60,000 A	60,000 A	120,000 A
EGPE2-80	80,000	80,000 A	80,000 A	80,000 A	160,000 A
EGPE2-100	100,000	100,000 A	100,000 A	100,000 A	200,000 A

Note: For Delta configurations L-N and N-G do not apply.

2.6 Tested Single Pulse Surge Current Capacity. In compliance with NEMA LS 1-1992, paragraphs 2.2.9 and 3.9, Current Technology's suppression filter systems are single pulse surge current tested in all modes at rated surge currents by an industry-recognized independent test laboratory. Single pulse surge current capacities are established by single-unit testing of all components within each mode. The test shall include a UL 1449 Second Edition surge defined as a 1.2 X 50 μ sec, 6000V open circuit voltage waveform and an 8 X 20 μ sec, 500A short circuit current waveform to benchmark the unit's suppression voltage, followed by a single pulse surge of maximum rated surge current with an approximated 8 X 20 μ sec waveform. To complete the test, another UL 1449 surge shall be applied to verify the unit's survival. Survival is achieved if the suppression voltage measured from the two UL 1449 surges does not vary by more than $\pm 10\%$.

2.7 Minimum Repetitive Surge Current Capacity. Per ANSI/IEEE C62.41-1991 and ANSI/IEEE C62.45-1992, all Current Technology suppression filter systems are repetitive surge current capacity tested in every mode utilizing a 1.2 x 50 μ sec, 20 KV open circuit voltage, 8 x 20 μ sec, 10 KA short circuit current Category C3 bi-wave at one minute intervals without suffering either performance degradation or more than $\pm 10\%$ deviation of clamping voltage at a specified surge current.

Repetitive Surge Current Capacity-Number of Impulses	
Model	# of Impulses
EGPE2-60	> 3,500
EGPE2-80	> 4,000
EGPE2-100	> 4,500

2.8 NEMA LS 1-1992 Clamping Voltage Data. All Current Technology suppression filter systems clamping voltages are in compliance with test and evaluation procedures outlined in NEMA LS 1-1992, paragraphs 2.2.10 and 3.10. Maximum clamping voltages are shown in the tables following 2.9.

2.9 UL1449 Second Edition Suppressed Voltage Ratings. EGPE2 shall be UL 1449 Second Edition listed and tested as a complete factory-installed surge suppression device. Equipment providing only UL listed and rated modules is unacceptable. UL 1449 Second Edition suppressed voltage ratings are shown in the following tables:

EGPE2 – 60,80					
System Voltage	Mode	B3 Ringwave	B3/C1 Comb. Wave	C3 Comb. Wave	UL 1449 Second Edition
120/240 120/208	L-N	300	400	550	400
	L-G	400	400	600	500
	N-G	325	475	800	400
	L-L	425	725	900	700
277/480	L-N	500	875	1050	800
	L-G	825	825	1025	1000
	N-G	650	875	1200	800
	L-L	700	1625	1825	1500

Note: Consult factory for voltage configurations not shown.

EGPE2-100					
System Voltage	Mode	B3 Ringwave	B3/C1 Comb.	C3 Comb. Wave	UL 1449

			Wave		Second Edition
120/240 120/208	L-N	325	425	625	400
	L-G	400	425	625	500
	N-G	375	475	750	400
	L-L	375	775	975	700
277/480	L-N	525	875	1150	800
	L-G	850	850	1075	900
	N-G	700	900	1200	800
	L-L	675	1675	1950	1500

Note: Consult factory for voltage configurations not shown.

2.10 High Frequency Extended Range Power Filter. All Current Technology EGPE2 suppression filter systems EMI-RFI noise rejection or attenuation values are in compliance with test and evaluation procedures outlined in NEMA LS-1-1992, paragraphs 2.2.11 and 3.11.

Attenuation Frequency	50KHz	100KHz	500KHz	1 MHz	5 MHz	10 MHz	50 MHz	100MHz
EGPE2-60,EGPE2-80	47db	50dB	37db	37dB	37db	38dB	47db	53dB
EGPE2-100	50dB	44dB	34dB	33dB	34dB	36dB	47dB	53dB

NOTE: Standardized insertion loss data obtained utilizing MIL-STD-E220A 50 ohm insertion loss methodology. Noise source path = 100' to model maximum average circuit distance, filter connection distance = 6".

The EGPE2 shall function in conjunction with other suppression filter devices of the same manufacturer with coordinated filters within the facility-wide MasterPLAN® suppression filter system to provide minimum noise attenuation as follows:

Attenuation Frequency	50 KHz	100KHz	500KHz	1 MHz	5 MHz	10 MHz	50 MHz	100MHz
Insertion loss (dB)	85db	83db	68db	68db	68dB	67dB	78dB	84dB

NOTE: Standardized insertion loss data obtained utilizing MIL-STD-E220A 50 ohm insertion loss methodology, based on a minimum of 100 ft. of 4 AWG conductor between the two devices. Noise source = 100' to model maximum average circuit distance, filter connection distance = 6".

2.11 Overcurrent Protection

2.11.1 Each suppression element shall be fused to ensure that the failure of a single component or the operation of a single fuse element remains isolated and does not render the entire mode or product deficient by more than the following percentages:

Model	Maximum Deficiency Percentage
EGPE2-60	<17%
EGPE2-80	<17%
EGPE2-100	<10%

2.11.2 For systems utilizing a hybrid technology, each element type shall be fused.

2.11.3 Every current carrying conductor associated with a component shall be fused to ensure that every fault is isolated at the point of the fault or at the component level.

2.11.4 Fusing shall be present in all modes, including Neutral-to-Ground.

2.11.5 All fault current protection shall be UL-Recognized as a stand-alone fuse.

2.11.6 All fusing must be UL-Recognized and tested at 200kAIC. Testing shall be inclusive of all available product voltages.

2.11.7 All fuses and overcurrent / fault current protection devices shall consist of self-arc-quenching, sand-encapsulated UL-Recognized fuse arrays. Each fuse shall be individually sealed in a manner that eliminates cross arcing.

2.11.8 The device shall be capable of withstanding the full single pulse surge current capacity for every mode without the operation or failure of overcurrent / fault current protection or fuses.

2.9 Transient Conduction Path. All full magnitude transient current shall be conducted on low-impedance solid copper bussing. If printed circuit boards are utilized in surge current paths, no single trace shall be allowed to conduct more than the proportional current share of the connected TVSS component.

3.0 DOCUMENTATION.

3.1 Equipment Manual. The manufacturer shall furnish with the submittal and with each unit delivered an equipment manual that details the installation, operation, and maintenance instructions for the specified unit.

3.2 Drawings. Electrical and mechanical drawings shall be provided by the manufacturer with the submittal and with each unit delivered that shows unit dimensions, weights, mounting provisions, connection details, and layout diagram of the unit.

3.3 UL1449 Second Edition Listing/Clamp Voltages. Manufacturer shall provide data showing UL 1449 Second Edition product listing. Manufacturer shall also submit certified documentation of applicable Location Category Testing in full compliance with NEMA LS 1-1992, paragraphs 2.2.10 and 3.10.

3.4 Single Pulse Surge Current Capacity Testing. Certified documentation of the unit's Single Pulse Surge Current Capacity Testing shall be included in the submittal.

3.5 Minimum Repetitive Surge Current Capacity Testing. Certified documentation of the unit's Minimum Repetitive Surge Current Capacity Testing shall be included in the submittal.

3.6 Diagnostic Signature Card. The unit shall include a Diagnostic Signature Card listing factory-established benchmark suppression voltage values for all modes of protection. The suppression voltage values shall be established during final production line testing utilizing the Diagnostic Test Set. This Diagnostic Signature Card shall provide space for subsequent field testing allowing comparison of the initial factory benchmark testing with subsequent field testing suppression voltage values.

4.0 TESTING

4.1 Single Pulse Surge Current Capacity Testing. In compliance with NEMA LS-1-1992, paragraphs 2.2.9 and 3.9, each design configuration shall have the maximum single pulse surge current capacity per mode verified through testing. The test shall include a UL1449 Second Edition surge defined as a 1.2 X 50 μ sec 6000V open circuit voltage waveform and an 8 X 20 μ sec 500A short circuit current waveform to benchmark the unit's suppression voltage, followed by a single pulse surge of maximum rated surge current magnitude with an approximated 8 X 20 μ sec waveform. To complete the test, another UL1449 surge shall be applied to verify the unit's survival. Survival is achieved if the suppression voltage found from the two UL1449 surges does not vary by more than $\pm 10\%$.

4.2 Minimum Repetitive Surge Current Capacity Testing. Each design configuration shall have a repetitive surge current capacity rating which shall be verified through testing. The test shall include a UL1449 Second Edition surge defined as a 1.2 X 50 μ sec 6000V open circuit voltage waveform and an 8 X 20 μ sec 500A short circuit current waveform to benchmark the unit's suppression voltage, followed by a repetitive number of ANSI/IEEE C62.41-1991 Category C3 surges defined as a 1.2 X 50 μ sec 20,000V open circuit voltage waveform and an 8 X 20 μ sec 10,000A short circuit current waveform. To complete the test, another UL1449 surge shall be applied to verify survival. Survival is achieved if the suppression voltage resulting from the two UL1449 surges do not vary by more than $\pm 10\%$. Proof of such testing shall be the test log generated by the surge generator.

4.3 UL 1449 Second Edition Suppressed Voltage Performance Testing. Each design configuration shall have a UL 1449 Second Edition Suppressed Voltage Rating that has been tested and assigned by Underwriters Laboratories utilizing the following waveforms and procedure. The test shall be initiated with a surge of 6,000V / 500A, using waveshapes defined within ANSI/IEEE C62.41-1991 as a 1.2 X 50 μ sec open circuit voltage waveform and an 8 X 20 μ sec short circuit current waveform, to benchmark the unit's suppression voltage. The unit shall then be subjected to 10 positive polarity and 10 negative polarity 1.2 X 50 μ sec 6,000V open circuit voltage waveforms and an 8 X 20 μ sec 3,000A short circuit current waveforms. For comparison with the initial benchmark voltage reading, another ANSI/IEEE surge defined as 1.2 X 50 μ sec 6000V open circuit voltage waveform and an 8 X 20 μ sec 500A short circuit current waveform shall be applied. Deviation from initial to final clamping value may not exceed $\pm 10\%$. Upon successful completion, an appropriate UL 1449 Second Edition Suppressed Voltage Rating is assigned by Underwriters Laboratories.

4.4 Short Circuit Fuse Testing. Each design configuration shall be short circuit tested in accordance with the type of fusing utilized in the suppression path. Testing shall include application of a sustained overvoltage that causes the unit to enter a bolted fault condition. This bolted fault condition shall occur with the full rated AIC current of the fuse available. The fuse shall fail in a safe manner with no physical or structural damage to the unit and any failure shall be self-contained within the unit.

4.5 Surge Current Fuse Testing. Each design configuration shall be surge tested with fusing in series to verify that a transient of maximum surge current capacity magnitude is fully suppressed without fuse failure, operation, or degradation.

4.6 MCOV (Maximum Continuous Operating Voltage) Testing. Each unit shall be factory tested at the applicable MCOV to assure proper field operation.

4.7 Quality Assurance Testing. Each unit shall be thoroughly factory tested before shipment. Testing of each unit shall include, but shall not be limited to UL manufacturing and production-line tests, quality assurance checks, MCOV, and clamping voltage verification tests.

4.8 Start-Up Testing. Upon completion of installation, a factory authorized local service representative shall provide testing services. The following tests shall be performed: (a) voltage measurements from Line-to-Ground, Line-to-Neutral, Line-to-Line and Neutral-to-Ground (no neutral in DELTA configurations) at the time of the testing procedure, (b) impulse injection to verify the system suppression voltage tolerances for all suppression paths. Impulse testing shall be completed while the unit is off-line to isolate the unit from the distribution system. Test results should be recorded and compared to factory benchmark test parameters supplied with each individual unit. A copy of the start-up test results and the factory benchmark testing results shall be supplied to the engineer and the owner for confirmation of proper suppression filter system function. In addition, the integrity of the neutral-ground bond should be verified through testing and visual inspection. A Seven Year Limited Warranty shall initiate after the owner has accepted the testing results and taken possession of the equipment.

5.0 WARRANTY.

5.1 Seven Year Limited Warranty. The manufacturer shall provide a Seven Year Limited Warranty from date of shipment against failure when installed in compliance with applicable national/local electrical codes and the manufacturer's installation, operation and maintenance instructions.

5.2 MasterPLAN[®] Extended Ten-Year Limited Warranty. When simultaneously installed in a coordinated system consisting of selenium-enhanced product (SEL300 and/or SEL250) located electrically upstream of EGPE2 product(s), the manufacturer shall provide a MasterPLAN Ten-Year Limited Warranty from the date of shipment against failure for the EGPE2 product(s). All products must be installed in compliance with applicable national/local electrical codes and the manufacturer's installation, operation, and maintenance instructions.

6.0 PRODUCT.

6.1 PANELBOARD EXTENSION.

6.2 Trim. The unit shall be constructed with flush- or surface-mounted gray baked enamel sheet metal trim suitable for attachment to the owner's panelboard. Trim for top or bottom-fed panels must be specified at the time the order is placed.

6.3 Box. The unit's box shall be formed of galvanized and chemically cleansed metal and all breaks in galvanizing shall be painted with metallic paint. Minimum size shall be 16" high by 20" wide by 5.75" deep unless otherwise indicated on the submittal drawings.

The unit's box shall have removable top and bottom end-plates to facilitate attachment to the top or bottom of a panelboard (also with removable end-plates) in order to provide a continuous barrier-free volume for routing branch wiring through the extension box. Collar hardware shall be provided to mate the panelboard and the box.

6.4 Field Installation. The unit shall be installed in accordance with applicable national/local electrical codes and the manufacturer's recommended installation instructions.

6.4.1 If an overcurrent protection device is used to connect the phase conductors of the EGPE2 to the panelboard, it is recommended to use breakers in the range of 60 to 100 amps.

6.4.2 For connecting the phases, neutral, and ground between the EGPE2 and the point of connection on the panelboard, it is recommended to use #8 to #2 AWG copper conductors.

6.5 High Performance Suppression System. EGPE2 shall include a factory installed engineered solid-state high performance suppression system, utilizing arrays of non-linear, voltage dependent metal oxide varistors with similar operating characteristics. The suppression system's components shall optimally share surge currents in a seamless, low-stress manner assuring maximum performance and proven reliability. The suppression system shall not utilize gas tubes, spark gaps, silicon avalanche diodes, or other components which might short or crowbar the line, thus leading to interruption of normal power flow to or system upset of connected loads. Components which may degrade performance or long term reliability of the suppression system are neither desirable nor acceptable. The suppression system shall reduce transient levels and provide protection for sensitive electronics susceptible to catastrophic or long-term damage. Clamping voltages are specified in section 2.8 of this specification.

6.6 High Frequency Extended Range Power Filter. EGPE2 shall include a factory installed high frequency extended range power filter and shall be UL 1283 listed as an Electromagnetic Interference Filter. The filter shall reduce fast rise-time, high frequency, error-producing transients and electrical line noise to harmless levels, thus eliminating disturbances, which may lead to electronic system upset. The filter shall provide minimum noise attenuation as specified in section 2.10 of this specification.

7.0 FEATURES / OPTIONS

7.1 PRIMARY Monitoring Option. The EGPE2 product shall be provided with an integral monitoring option as specified below:

7.1.1 Dual Form "C" Dry Contacts. The EGPE2 product with the Primary monitoring option shall be provided with two (2) sets of form "C" dry contacts (normally open and normally closed) to facilitate connection to a building management system or other remote monitoring system. Both the normally open and normally closed contacts shall change state upon failure of the suppression filter system or power loss in any of the phases.

7.2 ADVANCED Monitoring Option. The EGPE2 product shall be provided with an integral monitoring option as specified below:

7.2.1 Dual Form “C” Dry Contacts. The EGPE2 product with the Advanced monitoring option shall be provided with two (2) sets of form “C” dry contacts (normally open and normally closed) to facilitate connection to a building management system or other remote monitoring system. Both the normally open and normally closed contacts shall change state upon failure of the suppression filter system or power loss in any of the phases.

7.2.2 Display Event Counter. The EGPE2 product with the Advanced monitoring option shall be provided with a display event counter that counts the cumulative number of transients to which the device has been subjected. The detection circuitry shall be current sensing to eliminate erroneous counts that may be produced from stray voltages and noise signals, both conducted and radiated.

7.2.3 Battery Powered Audible Alarm and LED Indicators. The EGPE2 product with the Advanced monitoring option shall be provided with a battery powered audible alarm that detects and provides notification of single or multiple phase failure of the suppression filter system. The alarm shall have a silence switch as well as a test switch for ensuring positive function and an alarm LED that illuminates when the alarm is disabled. The monitoring unit shall have an easily replaceable, commonly available battery for backup to ensure audible alarm function in the event of a total power failure. The unit shall have a battery backed-up monitor LED which shall illuminate when battery requires replacement.

7.3 MasterMIND™ Monitoring Option. The EGPE2 product shall be provided with an integral multifunction power monitor analyzer. The monitoring system shall provide realtime product performance data along with distribution system power analysis via multiport visual status indicators (LEDs) and a touchpad accessible LED data display. It shall include the following features:

7.3.1 Enhanced Status Indicators. The EGPE2 product with the MasterMIND monitoring option shall be provided with enhanced status indication allowing for visual inspection of the online status of all hybrid elements: MOVs, and capacitors. Such indication shall be provided for each phase.

7.3.2 Dual Form “C” Dry Contacts. The EGPE2 product with the MasterMIND monitoring option shall be provided with two (2) sets of form “C” dry contacts (normally open and normally closed) to facilitate connection to a building management system or other remote monitoring system. Both the normally open and normally closed contacts shall change state upon failure of the suppression filter system or power loss in any of the phases.

7.3.3 Display Event Counter. The EGPE2 product with the MasterMIND monitoring option shall be provided with a display event counter that makes available the cumulative number of transients to which the device has been subjected. The detection circuitry must be current-sensing to eliminate erroneous counts that may be produced from stray voltages and noise signals, both conducted and radiated.

7.3.4 Battery Powered Audible Alarm. The EGPE2 product with the MasterMIND monitoring option shall be provided with a battery powered audible alarm that detects and provides notification of single or multiple phase failure of the suppression filter system. The alarm shall have a silence switch as well as a test switch to ensure correct operation and an alarm LED that illuminates when the alarm is disabled. The monitoring unit shall have an easily replaceable, commonly available battery for backup to ensure audible alarm function in the event of a total power failure. The unit shall have a “low battery” LED which shall illuminate when battery requires replacement.

7.3.5 % Protection Available. The EGPE2 product with the MasterMIND monitoring option shall provide numeric display of the available surge protection. Sensing each hybrid element's fuse, the microprocessor-based circuitry shall be capable of calculating the amount of protection active in the circuit and displaying it as a percentage.

7.3.6 Neutral-to-Ground Current Sensing. The EGPE2 product with the MasterMIND monitoring option shall detect and digitally indicate current flowing in the neutral-to-ground protection path within the device (WYE, split phase and high leg delta systems only). This indication could mean neutral-ground bonding problems within the distribution system.

7.3.7 Neutral-to-Ground Voltage Sensing. The EGPE2 product with the MasterMIND monitoring option shall provide digital display of the voltage across the neutral and ground. This indication might signal neutral-ground bonding or asymmetrical load problems within the distribution system.

7.3.8 True RMS Voltage Monitor. The EGPE2 product with the MasterMIND monitoring option shall provide true RMS voltage monitoring for all phase to ground voltages (WYE, split phase and high leg delta systems) or phase to phase voltages (Delta systems).

7.3.9 Voltage Sag Detection. The EGPE2 product with the MasterMIND monitoring option shall provide visual indication and count of all voltage sags < 90% of nominal.

7.3.10 Voltage Swell Detection. The EGPE2 product with the MasterMIND monitoring option shall provide visual indication and count of all voltage swells > 110% of nominal.

7.3.11 Power Dropout Detection. The EGPE2 product with the MasterMIND monitoring option shall provide visual indication and count of all power dropouts < 1 cycle.

7.3.12 Power Outage Detection. The EGPE2 product with the MasterMIND monitoring option shall provide visual indication and count of all power outages > 1 cycle.

8.0 APPROVED VENDORS.

8.1 Current Technology

Danaher Power Solutions
5900 Eastport Blvd., Richmond, VA 23231-4453 USA

Telephone: 804.236.3300
Toll-Free: 800.238.5000
Fax: 804.236.4040
Hotline: 888.200.6400 "24x7" Technical Service
Email: info@currenttechnology.com
Web Site: www.currenttechnology.com

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DANAHER POWER SOLUTIONS

Current Technology Products

5900 Eastport Blvd.

Richmond, VA 23231-4453 USA

Telephone: 804.236.3300

Toll-Free: 800.238.5000

Fax: 804.236.4040

Hotline: 888.200-6400 24x7 Technical Service

Web Site: www.currenttechnology.com

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