PART 1 – GENERAL

1.01 *The System*

.1 This specification covers the electrical characteristics and general requirements for a Harmonic Mitigating Remote Panelboard (HMRP) with voltage transformation from 480/277V to 415/240V. The HMRP is designed primarily for distribution of electrical power in a data center or broadcasting studio, but its design shall also permit use wherever sensitive, power electronic non-linear loads are found in abundance. The HMRP integrates an autotransformer and electromagnetic passive harmonic filter with power distribution and optional monitoring and transient voltage surge suppression (TVSS) to substantially reduce energy consumption and protect the power distribution and connected equipment from harmful harmonics generated by non-linear power electronic loads.

1.02 *Applicable Standards, Agency Approval, and References*

The following standards and documents apply to the specified equipment to the extent defined herein:

.1 FCC Part 15 Class A (47 CFR 0-19)
.2 UL 1950 Safety of Information Technology Equipment, including Electrical Business Equipment
.3 CSA Standard 950
.4 NEMA Standard ST-1
.5 NEMA ST20 – Dry-Type Transformers for General Applications
.6 NEMA AB1 – Molded Case Circuit Breakers
.7 NEMA PB1 – Panelboards
.8 NFPA 70 – National Electric Code
.9 UL 1449 2nd Edition, UL 1283 and CSA 22.2 – Transient Voltage Surge Suppression (TVSS)
.10 ISO 9000 – International Organization for Standardization

1.03 *Environmental Conditions*

.1 Temperature:
- Operating: -10°C to +40°C
- Storage: -40°C to +60°C

.2 Relative Humidity: 10% to 90% non-condensing
.3 Altitude (Above Sea Level):
- Operating: -500 to 7,000 feet
- Non-operating: -500 to 25,000 feet

.4 Audible Noise: Max. 42dB at 1 feet from enclosure

1.04 *Electrical Requirements*

.1 The HMRP shall have a full load continuous capacity of 100 amps at 480 VAC..
.2 Input voltage of the HMRP shall be 480/277 VAC, three (3) phase, four (4) wire plus ground.
.3 Output voltage of the HMRP shall be 415/240 VAC, three (3) phase, four (4) wire plus ground.
.4 Frequency shall be 60Hz +/- 5Hz.

1.05 *Harmonic Mitigation Performance*

.1 Total harmonic current distortion (THID) at the input to the HMRP shall be < 15% over the entire load range under 100% non-linear load.
.2 Total harmonic voltage distortion (THVD) shall meet IEEE std 519 limit of < 5%.

1.06 *Warranty*

.1 The HMRP shall be covered by a full parts and labour warranty from the manufacturer. The warranty period shall be for twelve (12) months from date of installation and start-up or eighteen (18) months from date of shipment from the manufacturer, whichever occurs first.

PART 2 – PRODUCT

2.01 *System Description and Operation*

.1 The HMRP shall provide harmonic mitigation and power distribution. Main Input Circuit Breaker shall apply and disconnect ac power to the unit and protect the system in the event of a power overload. When selected a power monitor shall display input metered values for current, voltage and power. Branch ac distribution panels shall distribute power to the loads.

2.02 *Main Input Circuit Breaker*

.1 The HMRP shall include a main input circuit breaker to provide both system protection and a means of disconnecting power from the system. The circuit breaker shall be equipped with internal thermal overcurrent and instantaneous short circuit protection.

.2 The main circuit breaker shall be 125A with an interrupting rating of 35,000 AIC at 480V (optional 65kA IC).

2.03 *HF3579 Passive Harmonic Filter*

.1 As a standard feature, the HMRP shall come equipped with an HF3579-BI-100 combined Electromagnetic Passive Harmonic Filter and autotransformer. The device shall be rated for the continuous duty maximum full load rating of the HMRP.

.2 The HF3579-BI-100 shall be designed to filter out the majority of the 3rd, 5th, 7th and 9th harmonic currents generated by power electronic non-linear loads while provided voltage transformation from 480/277 VAC to 415/240 VAC.

.3 Harmonic mitigation shall be by electromagnetic means only. No capacitors or electronics shall be used.

.4 Non-linear load compatibility: K factor up to 20, Crest factor up to 4.5

.5 Secondary neutral connection rated at 200% of the rated secondary phase current

.6 Three-phase, common core construction.

.7 All copper windings

.8 220°C insulation class system

.9 130° C Temperature rise. Convection air cooled

.10 Filter overtemperature N.O. contact wired to terminals (170°C)

.11 Linear load Efficiency: > 99.2% in the operating range from 35% to 65%.

2.04 *Output Distribution Panelboards*

.1 The HMRP shall be equipped with two (2) output distribution panelboards, each with the following characteristics and/or features:

- .1 Square D Type NF Panelboard, capable of accepting bolt-on circuit breakers.
- .2 30 pole capacity, capable of accepting 1-, 2- or 3-pole circuit breakers up to 100 amps.
- .3 100 Amperes buss rating
- .4 Copper ground bus
- .5 Copper neutral bus rated for 200% of nominal phase current
- .6 Main input circuit breaker with 35,000 AIC interrupting capacity at 480 VAC

2.05 *Cabinet Construction*

.1 The HMRP shall be housed in a free standing NEMA-1 enclosure with dead front construction. The HMRP shall accommodate both bottom feed and top feed cables.

.2 The system monitor panel, input and output circuit breakers, and all customer power and control connection points shall be accessible from the front of the HMRP.

.3 Rear access shall not be required.

.4 All circuit breakers shall be protected with "hinged dead front" panels to prevent access without a tool.

.5 Doors and outside panel color shall be Crinkle Black, textured, dry epoxy finish, designed to resist scratching.

.6 The cabinet shall be mounted on heavy-duty casters with leveling jacks [Optional].

.7 Dimensions: 24” wide, 24” deep and 78” high

.8 The HMRP shall be convection cooled. Air access shall be from the bottom and exhausted from the top.

2.06 *Seismic Bracing [Optional]*

.1 The HMRP shall have provisions to allow for securing to a slab floor. Bracing shall be rated for UBC seismic zone 4.

2.07 *Basic Power Monitor (M1) [Optional]*

.1 The HMRP shall be equipped with a System Power Monitor for metering and digital display of electrical power parameters on the HMRP’s input.

.2 The System Monitor shall be a multi-function, digital instrumentation, data acquisition, and control device. The unit shall be capable of displaying 3-phase volts, 3-phase amps, power and frequency on a 0.75 inch, 3 line LED display.

.3 All metered values shall be "true RMS". The monitor shall include a “smart keypad” for selecting different phases of voltage and current values. The System Monitor capabilities shall include the following:

- .1 Current (Each Phase and Neutral)
- .2 Voltage (Phase-to-Phase and Phase to Neutral)
- .3 kW and kWh (3-phase total)
- .4 Current Demand (3-phase total and per phase)
- .5 kW peak
- .6 Frequency
- .7 Power Factor (3-phase total and per phase)
- .8 kVA, kVAh, kVAR and kVARh per phase and total
- .9 kW, kVA and kVAR Demand
- .10 Voltage THD per phase
- .11 Current THD per phase
- .12 Optional kWh, kVARh and/or kVAh pulsing via two Form A outputs

2.08 *Advanced Power Monitor (M2) [Optional]*

.1 The Advanced Power Monitor shall provide all of the features of the Basic Power Monitor plus the following additions:

.1 Optional RS485 port with standard Modbus RTU for integration with Energy Management Systems

.2 Optional Ethernet TCP/IP

2.09 *Transient Voltage Surge Suppression (TVSS) System [Optional]*

.1 A Transient Voltage Suppression System (TVSS) shall be provided to clip voltage transients phase-to-phase, phase-to-neutral, or phase-to ground. The TVSS shall include self-diagnostics to sound the audible alarm and indicator lights when a critical element has failed and needs replacement.

.1 80 kA / phase surge current rating [Optional 100 kA]

.2 EMI/RFI filtering 40dB at 100kHz

.3 Audible alarm and form C contacts for remote monitoring

.4 Status indicator lights to monitor supply power, surge suppression component status and fusing

.5 Independently tested at lightning laboratories to verify published surge current ratings

2.10 Ground Fault Module (GFM) on Input Circuit Breaker *[Optional]*

.1 A ground fault module to interface with shunt trip on input circuit breaker

.1 Adjustable ground fault pickup levels and time delays

.2 Integral ground fault push-to-test feature and ground fault indicator

2.11 *Approved manufacturer*

.1 The specified equipment shall be manufactured by MIRUS International Inc. or approved equal.

PART 3 – EXECUTION

3.01 *Installation*

.1 The installing contractor shall install the Harmonic Mitigating Remote Panelboard per the manufacturer's recommended installation practices as found in the installation, operation and maintenance manual and comply with all applicable codes.

3.02 *Acceptance*

.1 Manufacturer's representative shall visit site, verify installation, and submit to owner a letter stating equipment and installation meets intent of specification and manufacturer's warranties and guarantees are in effect.

3.03 *Documentation*

.1 The manufacturer shall furnish the owner an instruction manual covering the installation, operation and maintenance of the HMRP.