

SECTION 285010 – PLC, NETWORK, AND UPS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this section.

1.2 DESCRIPTION OF WORK

- A. The security control system shall be comprised of one or more programmable logic controllers and operator interfaces. The system shall include but not limited to, remote I/O, power supplies, input modules, output modules and any other required equipment to provide a fully functional system. The system will receive discrete inputs, and through the use of an internal control logic program, control output relay operations and perform remote control functions via the video graphic user interfaces.
- B. Provide labor, equipment, materials and supervision to install, program, calibrate, adjust, document, and test the total system as required herein, as shown on the drawings and required for the complete integration of the security system.

1.3 CONTROL, MONITORING, AND ANNUNCIATION

- A. The security control system shall control all electrically operated door hardware, monitor all doors position and bolt position limit switches, annunciate all door status and alarms upon violation. Lighting and receptacle control, intercommunication, paging, duress and CCTV control shall be integrated into the security control system. As part of video graphic user interface system, provide an integral security management system that shall record to disk, all occurrences of the system. Provide video graphic user interface terminals and security management system computers at locations as shown on the plans.
- B. The PLC System provides the logic control for the Security Control System. Unless noted otherwise, all user-initiated interfaces to the PLC system is performed through the GUI Stations (reference Section 285020). Critical control functions, such as door control, duress, and utility control are to be executed by the PLC CPU program(s).

PART 2 - PRODUCTS

2.1 PROGRAMMABLE LOGIC CONTROLLER (PLC) SYSTEM

- A. General requirements
 - 1. Provide a Programmable Logic Controller (PLC) system that utilizes logic functions, memory, timing functions, software, I/O points, and communication capabilities for the control and/or monitoring functions of the systems described and shown in the contract documents.
 - 2. Each PLC shall be password protected against unauthorized entry to software.
 - 3. All components of the PLC system shall be by the same manufacturer, no mixing of multiple manufacturers shall be considered.
 - 4. PLC manufacturers must meet all parts of these specifications. Systems that do not utilize a true PLC, or utilize an “equivalent to a PLC” of proprietary nature—either in hardware

- or software—or utilize custom cage-mounted discreet logic cards for the purposes stated herein will not be acceptable.
5. Provide only components that are regularly used in industrial automation applications.
 6. Provide only UL Listed components.
 7. Provide a PLC System that seamlessly integrates the control system to the Local Area Network Hubs.
 8. Provide CPU(s) with a visual status indication of backup battery.
 9. Provide alarm in the event of CPU low battery voltage before battery failure.
 10. Provide 25% spare PLC system capacity at the completion of the project. This includes program memory, I/O memory allocation, register memory, user memory, etc.
 11. Provide programming that utilizes traditional ladder logic format. Controllers utilizing spreadsheet-style programming are unacceptable.
 12. Provide 25% spare PLC I/O module capacity at the completion of the project. Calculate inputs and outputs separately when figuring capacities.
 13. All PLC interposing relays must be fused to protect the relay and field device wiring from over-current caused by shorts or device failure.
 - a. Exception: Whereas the terminal block is in receipt of a dry contact from another system, a fuse isn't required on that portion of wiring.
 14. PLC Central Processor Unit
 - a. Provide expansion chassis and power supply module with each processor assembly
 15. PLC Digital Inputs and Outputs
 - a. Each input or output module shall be a self-contained unit.
 - b. Input and output modules shall be externally/internally fused respectively with "blown fuse" indicators.
 16. It shall be possible to replace any I/O module without disturbing or removing user field wiring.
 17. PLC Remote Inputs and Outputs
 - a. The remote I/O system shall be compatible with all of the modular I/O systems.
 - b. Power will be provided by the I/O rack assembly power supply.
 18. Termination Labeling
 - a. Each wire will be labeled with an industry standard thermal transfer wire marker.
 - b. I/O wire number should reference wiring diagram and Software I/O list.
 - c. Felt tip pen labels are unacceptable.
 19. The control architecture will use distributed control over the Ethernet network.
 20. Local and remote networking shall be via dedicated interface modules providing serial communications at rates, which are selectable from 62.5K to 1M, bits per second. The interface modules shall be capable of I/O drops at distances of up to 7,500 feet and control up to 32 remotes.
 21. The PLC shall have a communications card capable of communicating with an industry standard stand-alone computer.
 22. Communication between the PLC and the computer(s) shall be a peer to peer network; no master station (central hub or server) shall be required.
 23. Communication on the peer to peer network shall be a minimum of 50 K baud of data transmission.

24. There shall be no noticeable delay between any video graphic user interface icon or field device input and the resulting output on the video graphic user interface or in the field.
25. Output modules will be available with Electronic Short Circuit Protection. The diagnostic status of the Electronics Short Circuit Protection (ESCP), for those discrete output modules containing ESCP, shall be indicated by a green LED during normal operation per point and amber during a fault. The fault should be auto-corrective without the need to cycle power.
26. **Door Monitoring and Control: Lock position and door position switches, ~~provided by others~~, (ADDENDUM 04) shall be wired as separate inputs to the PLC. The deadbolt switch will be wired as a separate input to the PLC as well as the door position switch a separate input to the PLC. When the door is locked and secure, the circuits shall provide voltage to the PLC. If the door is a sliding door or overhead door, then the open and close limit switch will be wired as separate inputs to the PLC and will not be part of the sliding or overhead door control circuits.**
 - a. Unless otherwise stated, all electrically controlled and/or monitored doors shall be connected and controlled and monitored by the PLC System.
 - b. All electric locks shall be individually fused using industrial grade fuse holder terminal blocks mounted on DIN rail. The fuse holder shall include blown fuse indicators for both DC and AC powered doors. Provide door control relays with indication light.
 - c. Locks shall be controlled via mechanical interposing relays driven by the PLC. Solid-state relays are not acceptable. Provide all required power to control doors.
 - d. Interlocks shall be implemented via PLC software. Any door shall have the ability to be programmed to become a member of an interlock scheme. The Architect and/or owner shall reserve the right to re-define interlocks during the submittal phase without additional costs to the owner.
 - e. Upon a loss of power, faults or communication failures with PLC input and output modules or PLC CPUs, all electric locks shall de-energize (fail-secure). Sliding and overhead doors shall remain in their present state.

B. PLC Specifications:

1. PLC Central Processor Units
 - a. Maximum 2048 inputs and 2048 outputs I/O capacity
 - b. Maximum 64K word instruction memory
 - c. RS-232 ASCII configurable auxiliary com port
 - d. Bit instruction execution time of 0.80µs max
 - e. Built in real time clock and calendar
 - f. Built in 100Mb or Gigabit Ethernet port
 - g. Battery backed EEPROM memory
 - h. Connectivity via Ethernet, Devicenet, Modbus RTU master/slave over RS-485 and RS-232-C.
 - i. Shock rating, operating – 30.0g (3 pulses, 11 ms)
 - j. Vibration rating – 1.0g @ 5-2000 Hz
 - k. Operating Temperature range – 32 to 140 Degrees F
 - l. Operating Humidity range 5 – 95% RH non-condensing
2. PLC Digital DC Input Modules
 - a. 10 – 30 VDC operating range
 - b. Sourcing or Sinking type modules
 - c. Maximum on/off signal 0.5mS max with selectable 1 or 7mS filter
 - d. Maximum off state current 0.5mA

- e. 32 point modules minimum
- f. Maximum backplane current load – 50mA
- 3. PLC Digital DC Output Modules
 - a. 10.2 - 30 VDC operating range
 - b. Sourcing or Sinking type modules
 - c. Maximum continuous current per output, .5 amp sourcing/1.0 amp sinking
 - d. Maximum continuous current per module, 8 amp sinking or sourcing @ 60 degrees C
 - e. 32 point modules minimum
 - f. Maximum backplane current load – 90mA @ 5 VDC
 - g. Removable terminal blocks
 - h. Gold plated contacts
- 4. PLC Power Supplies
 - a. 120/220 VAC nominal input voltage
 - b. Maximum input power, 27 VA
 - c. Backplane output current, 1.5 amps total
 - d. Operating Temperature range – 0 to 60° C
 - e. Operating Humidity range 5 – 95% RH non-condensing
- 5. Acceptable Manufacturer
 - a. Allen Bradley
 - b. G.E. Fanuc
 - c. Omron
 - d. Or Approved Equal

2.2 LINEAR POWER SUPPLY

- A. Provide linear power supplies as required for control power.
 - 1. Specification
 - a. AC Input: 120 VAC, +10%, -13%
 - b. DC Output: 24 VDC (5A or 10A as required)
 - c. Line Regulation: +/- .05% for a 10% change
 - d. Load Regulation: +/- .05% for a 50% load change
 - e. Output Ripple: 3 mV peak-to-peak maximum.
 - f. Transient Response: 50 microseconds for 50% load change.
 - g. Short Circuit Protection: Automatic current limit/fold back
 - 2. Provide back plates, mounting hardware and all appurtenances required to install the power supplies in the system equipment racks.
 - 3. An individual homerun cable is required to each field device from the power supply. Do not loop-wire or daisy-chain power, or tap power conductors from a junction box. Device power will be part of the control wiring to the device
 - a. Exception: 120 volt continuous power wiring, such as exterior camera power
 - 4. The output of the power supply is to feed a series of fuses rated for the intended load. One each per homerun cable/device load
 - 5. Acceptable Manufacturer
 - a. Phoenix Quint-series
 - b. Sola
 - c. Power One
 - d. Or Approved Equal

2.3 RELAYS AND TERMINALS

A. Relays - General

1. No relay boards manufactured by the electronic security system subcontractor shall be considered acceptable.
2. The relays shall provide actual switching of power to electric locking hardware, lights, etc.
3. All relays shall be of electro-mechanical type and be standard off-the-shelf commercially available components.
4. Relays and terminals for each device shall be grouped together, and each terminal shall be labeled.
5. Relays shall be pluggable with diode protection across coils and LED indication of activated coil circuit.
6. Each relay contact to the control device shall be individually fused externally (complete with a fuse holder).
7. Low voltage wiring in relay cabinet shall be separated from high voltage wiring and all wiring shall be color-coded and marked with approved wire markers.
8. Control wiring shall be routed through plastic wire duct and landed on terminal strips.
9. Relays shall be controlled directly by the PLC.
10. Peripheral interface cards with active circuitry will not be approved.
11. SPST or DPDT as required. The relays will perform the actual switching of the power to the locks. Electric locks shall not be controlled directly by the PLC.
12. Acceptable Manufacturers:
 - a. Idec
 - b. Potter and Brumfield
 - c. Phoenix
 - d. Or Approved Equal

B. General Purpose Relays

1. Specifications
 - a. Switching Capacity: 6 Amp continuous, 8 Amp inrush.
 - b. Duty cycle: 100%
 - c. Termination: Screw Connection
 - d. Operating Indicator Light, Damping diode, polarity protection diode
 - e. Operating Voltage: 24 VDC
 - f. Temperature: -20 C to 55 C
 - g. DIN Rail Mountable Socket

C. Special Purpose Relays (High Power)

1. Specifications:
 - a. Relays contacts shall be U.L. listed for a continuous current of 10 amps (inrush of 16 amps)
 - b. Termination: Screw compression
 - c. Operating Indicator Light
 - d. Coil Rated Current: < 70 ma
 - e. Operating Voltage 24 VDC
 - f. Max. Cont. Applied Volt: 110%
 - g. Drop-out Voltage: 10%

- h. DIN Rail Mountable Socket
 - D. Fuses Terminal Blocks
 - 1. Specifications
 - a. Din Rail mountable IEC style
 - b. Should be dead front safety (ie. touch safe)
 - c. Screw clamp and Spring Clamp are acceptable
 - d. All Fuse terminal blocks will be sized accordingly to the wire gauge and current load required for the application.
 - e. Provide lever disconnect type IEC fuse blocks.
 - 2. Acceptable Manufacturer
 - a. Allen Bradley
 - b. Phoenix Contact
 - c. Square D
 - d. Or Approved Equal
 - E. Modular Terminal Blocks
 - 1. Specifications
 - a. Din Rail mountable IEC style
 - b. Dead front safety (ie. touch safe)
 - c. Screw clamp and Spring Clamp type acceptable
 - d. All terminal blocks will be sized accordingly to the wire gauge and currents load required for the application.
 - e. Safety grounds should be identified with yellow/green color.
 - f. One wire per termination point unless Ferrules are used for special applications
 - g. All ferrules are to be crimped using the manufacturer's recommended crimping tool.
 - 2. Acceptable Manufacturer
 - a. Allen Bradley
 - b. Phoenix Contact
 - c. Square D
 - d. Or Approved Equal
 - F. Input cards shall be optically isolated and designed to accept an input signal of 24 volts AC or DC. These modules shall be rack mounted. Each input point shall have a corresponding red LED indicator on the upper front of the module, which illuminates when the input is read as on by the microprocessor. These modules shall be configured in 16 or 32 inputs.
 - G. Output cards shall be reed relay outputs with isolated commons. These devices shall be rack mounted. Each output shall be fused and be accompanied by a red LED indicator on the upper front of the module, which illuminates when the on-board processor issues a command to energize the output. These cards shall be configured in 16 or 32 outputs.
- 2.4 SECURITY LOCAL AREA NETWORK
- A. **Provide an independent secure Local Area Network (LAN) that shall include ~~redundant~~ (ADDENDUM 04) connections between the PLC system, graphic user interfaces, inter-communications/audio system, CCTV system, card access, and other integration system CPUs.**

- B. The LAN shall be a high speed, fault tolerant, self healing Ethernet industrial communication network. It shall be a tree topology using fiber optic media as required and be in compliance with IEEE 802.3.
- C. The Ethernet Network shall consist of CAT6 UTP cable within the structure for distances less than 100m.
- D. Ethernet UTP shall be run without splice unless terminated through the appropriate patch using RJ-45 connectors or approved punch down blocks.
- E. Fiber Optic shall be used:
 - 1. For the network backbone
 - 2. Between structures
 - 3. Any application beyond the building walls (exterior)
 - 4. Distances over 100m
- F. Network Fiber Optic transceivers shall be integral to the network scheme, utilizing SFP or mini-GBIC technology for the network backbone between switches. Separate converters will not be allowed for Ethernet backbone.
 - 1. Fiber Optic connectors shall conform to the device served without the use of adapters.
 - 2. Terminate all unused fibers in a patch panel using correct and consistent labeling at both ends.

2.5 NETWORK SWITCHES

- A. Provide switches for the IEEE802.3a-f 10/100/1000 BASE-T Local Area Network connectivity and 1 Gigabit minimum uplink capability. Provide stackable switches for faster uplink speeds.
 - 1. 24 RJ-45 ports minimum (Switches shall be sized as required)
 - 2. Auto crossing, auto negotiation
 - 3. LEDS: Link Integrity and Status, Link speed, RPS, PoE
 - 4. PoE (power over Ethernet) capable, with up to 30W per port
 - 5. 370W or 740W fixed power supply option
 - 6. Operating Temp -5°C – 45°C
 - 7. 100 – 240 VAC, 50 to 60Hz, 5A max
 - 8. 19” Rack Mountable
- B. Acceptable Manufacturers
 - 1. Cisco
 - 2. HP
 - 3. Approved Equal

2.6 UNINTERRUPTIBLE POWER SUPPLIES (UPS)

- A. This section defines the electrical and mechanical characteristics and requirements for a continuous-duty single-phase, solid-state, uninterruptible power system. The UPS will provide high-quality AC power for sensitive electronic equipment loads.
- B. Ratings
 - 1. 208Volt Nominal Units, Single Phase
 - 2. UL Standard 1778

3. c-UL
 4. NEMA Type 1 Enclosure
 5. FCC Part 15, Class A
- C. The SCSC shall supply UPS power at each Security Electronics room, sized to provide adequate and protected power for the loads served.
- D. Submit a list of loads showing the ratings (amps, watts, volts) and the time-wattage charts for the UPS. The list shall include a side bar showing the BTU-hr heating effects of the equipment in the control rooms and equipment room. Include the BTU-hr heating effects of the selected UPS.
- E. Provide the size and quantity of UPS units required to support the attached load to be served plus an additional 20% headroom.
- F. Provide a UPS at each rack, cabinet and VGUI. The UPS shall have sufficient battery capacity and charging capacity to operate all security system equipment (to include VGUI(s), SMS, PLC system, all door monitoring, audio system, camera system and digital video recording system) for a period of 5 minutes at full load without degradation to the system. Only rack mounted UPS systems may be used in equipment rack or console locations.
- G. Devices with built in battery backup such as door lock power supplies or card access panels do not require a separate UPS. UPS or battery power is not required for door lock power supplies.
- H. The UPS system shall interface with the PLC System providing indication of "UPS trouble" status of the unit(s). Provide interface to Master Control to monitor both alarm and trouble signals from each UPS.
- I. Where the total number of circuits required for UPS-fed apparatus from any individual UPS unit that feeds a main or remote rack exceeds six circuits, the SCSC shall furnish and install a minimum of a 100 ampere main-breaker panelboard.
1. The panelboard shall be rated for the required load, but at a minimum it shall be 100A bus with 60A Main Breaker, 120/240V, 10K AIC, single phase, three wire, with ground bus, and furnished with a minimum of (8) one-pole 15 or 20 amp bolt-in circuit breakers installed.
- J. All UPS branch circuitry, inclusive of the main distribution panelboard, must be installed by a licensed electrical contractor with journeyman electricians in attendance. If requested, the SCSC must provide proof of expertise.
- K. The UPS is designed to operate as a true on-line double conversion system in the following modes:
1. Normal - During normal operation, utility power provides energy to the UPS. The filters, the power factor correction circuit and the inverter process this power to provide computer-grade power to connected loads. The UPS maintains the batteries in a fully charged state.
 2. Battery - The UPS will enter Battery mode if there is an extreme power surge, extreme power drop, or utility failure. The battery system supplies power through the DC-to-DC converter to the inverter to generate computer-grade power for the connected load.
 3. Recharge - Once utility power is restored, the UPS resumes normal operation and the Battery Charger begins recharging the battery.

4. Bypass - Bypass mode provides an alternate path for utility power to the connected load in the unlikely event of a UPS malfunction, such as overload, overtemperature, or an internal circuit failure.
5. Automatic Restart - Upon restoration of utility / mains AC power, after a utility mains AC power outage and complete battery discharge, the UPS automatically restarts and resumes supplying power to the critical load and the battery charger automatically recharges the battery.

L. Design Requirements

1. Voltage: Will operate at either 120/208V or 120/240V by sensing the utility phase angle and configuring the dual inverters to the same angle: 120 or 240 degrees, (or) 180 degrees. Coordinate power requirements with EC during submittal phase.
2. Nominal input/output voltage specifications of the UPS at rated load are:
 - a. The UPS will operate on voltage ranging from 120/208V, 60/50 Hz, (or) 120/240V, 60/50 Hz without the use of selector switches or voltage taps. Input wiring must be 3-wire (L1, L2, N) -plus-ground. The output voltage is automatically set to match input voltage.
3. Output Load Capacity: Specified output load capacity of the UPS is:
 - a. 6000 VA/4200Watts at 0.70 power factor for 120/208V and 127/220V with all L-N loads
 - b. 5200 VA/4200 Watts at 0.81 power factor for 120/208V and 127/220V with all L-L loads.
4. Internal Battery: Valve regulated, non-spillable, lead acid cells.
5. Reserve Time: 4200W minimum 5 minutes with ambient temperature of 77°F (25°C).
6. Battery Recharge: The UPS contains a battery recharge rate designed to prolong battery life. Recharge time for UPS internal batteries is six (6) hours maximum to 90% capacity after a complete discharge into full load.
7. Input Line Transient Immunity: The UPS withstands input line transients in compliance with IEEE c62.41, Category A and
8. Surge Protection: The UPS utilizes MOV ratings will be 175 Volt, 150 Joules minimum connected L1-N and L2-N; 300 Volt, 150 Joules minimum connected L1-G, L2-G and N-G
9. Battery Mode Neutral Grounding: UL1778 requires each input pole to be disconnected from the source during battery operation. The patented design of the UPS includes a relay to bond the output Neutral to Ground during battery mode operation to prevent a floating output neutral during battery mode operation.

M. Environmental Conditions

1. Ambient Temperature: + 32oF to + 104 oF (0oC to +40oC) for altitudes 0 to 5,000 feet (0 to 1500 meters) above sea level. + 77oF (25 oC) for optimum battery performance.
2. Relative Humidity: 0 to 95% non-condensing.
3. Storage: 0 to 95% non-condensing.
4. Audible Noise: Noise generated by the UPS under normal operation does not exceed 55dBA when measured at 1 meter from the surface of the UPS.
5. Electrostatic Discharge: The UPS is able to withstand an electrostatic discharge compliant to EN61000-4-2, level 4, Criteria A, without damage and will not affect the connected load.

- N. The UPS unit is comprised of the input PFC converter, battery charger, dual-inverter, input filter, automatic bypass circuit, housed in a rack - tower NEMA type 1 enclosure
- O. The UPS shall meet the requirements of IP20.
- P. The UPS is forced air cooled by internally mounted continuous fans. Fan power is provided from the internal DC supply. Air intake is through the front of the unit and exhausted out the rear of the unit.
- Q. Converter: Incoming AC power is converted to a regulated DC output by the input converter for supplying DC power to the inverter. The input converter provides input power factor correction (PFC) and input current distortion reduction.
- R. AC Input Current Limit: The input will use whatever power is needed to power the output overload specification before going to batteries. The UPS does not use electronic input current limiting. The UPS includes a 2-pole switch-type 30A input breaker.
- S. Input Protection: The UPS has built-in protection against undervoltage, overcurrent, and overvoltage conditions including low-energy lightning surges, introduced on the primary AC source. The 208 VAC models can sustain input surges without damage per criteria listed in ANSI C62.41 Cat. A & B.
- T. Battery Recharge: The UPS contains a battery recharge rate designed to prolong battery life. The battery is constant current charged to restore capacity, then shall be constant voltage charged to maintain the battery in a fully charged state. Recharge time for the internal battery shall be six (6) hours maximum to 90% capacity (full load discharge rate). There is DC overvoltage protection so that if the DC voltage exceeds the pre-set limit, the inverter will shut-down automatically and the critical load will be transferred to bypass.
- U. Other General Features:
 - 1. The UPS inverters are a pulse-width-modulated (PWM), IGBT design capable of providing the specified AC output. The inverters convert DC power from the input rectifier output, or the battery, into precise sinewave AC power for supporting the critical AC load.
 - 2. Overload: The inverter is capable of supplying current and voltage for overloads exceeding 100% and up to 201% of full load current. A visual indicator and audible alarm indicates overload operation. For greater currents or longer time duration, the inverter has electronic current-limiting protection to prevent damage to components. The inverter is self-protecting against any magnitude of connected output overload. Inverter control logic senses and disconnects the inverter from the critical AC load without the requirement to clear protective devices.
 - 3. Inverter DC Protection: The inverter is protected by the following DC shutdown levels:
 - a. DC Overvoltage Shutdown
 - b. DC Undervoltage Shutdown (End of Discharge)
 - 4. Output Frequency: An oscillator controls the output frequency of the UPS. The inverter maintains the output frequency to + 0.1 Hz of nominal frequency during battery mode, frequency converter mode, or when otherwise not synchronized to the utility/mains source.
 - 5. Output Protection: The UPS inverter employs electronic current limiting circuitry for protection during normal mode and battery operation, and input circuit breaker protection during bypass mode operation.
- V. Display and Controls

1. General: The UPS is provided with a microprocessor-based control and a status display section designed for convenient and reliable user operation. The monitoring functions such as status and alarm indicators are displayed on a front-panel LED display.
 2. System Indicators: The UPS includes five individual LED status indicators, and three rows of LED's to indicate UPS load and battery capacity. An audible alarm will be used in conjunction with the visual indicators to indicate to the operator a change in UPS operating status.
 3. All audible alarms can be silenced, with the exception of low battery, bypass reminder, and missing batteries at startup alarms. Once silenced, the audible alarm will not sound until a new alarm condition is present. Standard LED indicators are described below:
 - a. Load Level indicators – 10 total: 4 green and 1 amber, for each of the L1 and L2 outputs. The Load Level indicators display the approximate load level at all times.
 - b. Battery Capacity indicators - 5 green LEDs. The Battery Capacity LEDs display the approximate level of battery reserves.
 - c. Fault indicator - 1 red LED. The Fault indicator LED illuminates if the UPS detects an internal problem. One or more of the Battery Capacity indicators may be illuminated to aid in diagnostics.
 - d. AC Input indicator - 1 green LED. The AC Input indicator LED is illuminated when utility power is available and falls within the input specification.
 - e. UPS ON indicator - 1 green LED. The On Inverter indicator LED is illuminated when the UPS inverter is operating and supplying power to connected loads.
 - f. On Bypass indicator - 1 amber LED. The On Bypass indicator LED is illuminated when the bypass source is supplying power to connected loads.
 - g. On Battery indicator - 1 amber LED. The On Battery indicator LED is illuminated when the AC Input is out of the acceptable operating range.
 4. On-Standby-Off Controls: UPS start-up and shutdown operations are accomplished by the "ON" and "STANDBY" push buttons located on the front panel of the UPS. The "ON" push button is a means to turn the UPS on and also serve as a means to manually test the battery. The "STANDBY" push button allows manual transfers of the load from the inverter to bypass power. Pressing the "STANDBY" push button, in bypass mode or battery mode, will completely shut down the UPS and its connected load.
 5. On-Line Battery Test: The UPS features an automatic battery test with the factory default test interval set at every 2 weeks. The battery test will ensure the capability of the battery to supply power to the inverter while loaded. If the battery fails the test, the UPS will display a warning alarm to indicate the internal batteries need replaced and resume operation without disturbing the load. The battery test feature is user accessible by the push button located on the front of the unit.
 6. Provide connection to the Building Automation System (BAS) to send alarm statuses to the RENO (Remote Notification Software) system. The UPS shall send three alarms to the BAS – power lost, power restored, low battery.
- W. Bypass
1. General: A bypass circuit is provided as an integral part of the UPS. The bypass shall have a make-before-break transfer, will have a maximum detect and transfer time of 4-6 milliseconds, and be a double-pole device. The bypass circuit is designed to ensure the simultaneous transfer of the L1 and L2 poles.
 2. The bypass is configured to wrap around the PFC converter, battery charger, DC-DC converter, inverter, and battery. The bypass circuit will use the rear-panel mounted UPS

input circuit breaker and route bypass power through the UPS input filters and surge suppression circuit. The bypass circuit default position is in the bypass mode (utility).

3. Automatic Transfers: The transfer control logic automatically activates the bypass, transferring the critical AC load to the bypass source, after the transfer logic senses one of the following conditions:
 - a. UPS overload
 - b. UPS over temperature
 - c. PFC failure
 - d. Inverter failure
 - e. DC Bus Overvoltage
 4. Once overload condition is reduced, the load is automatically transferred back to inverter power. An over temperature requires manual transfer back to inverter power after cooling.
- X. Maintenance Bypass Switch
1. The unit shall be installed on all UPS units over 4KVA.
 2. Similar units will be required for rack-mounted UPS units of 1.5KVA and 3KVA
 3. The unit allows the ability to take the UPS off-line (transferring to normal power) so the UPS can be serviced.
 4. Unit shall be UL1008 listed
 5. Manually initiated electrical operation
 6. The unit shall have high interrupting ratings, current ratings at 100%, and a solid neutral
 7. Pilot lights will indicate NORMAL or BYPASS
 8. This external maintenance bypass switch is a MBB (Make Before Break) switch with a locking handle. It must be mounted on the wall near the UPS.
- Y. Internal Battery
1. Valve regulated, non-spillable, lead acid cells are used as a stored-energy source for the specified UPS system. The battery kit is internal to the UPS cabinet, and sized to support the inverter at rated load and power factor, with ambient temperature of 77oF (25oC) for a minimum of 5 minutes reserve time. The expected life of the battery shall be 3 - 5 years or a minimum 250 complete discharge cycles at ambient temperature of 77oF (25oC). To promote battery service life and eliminate over-discharge of the battery, the end-of-discharge DC shutdown voltage will be automatically adjusted by the microprocessor based upon the percentage load at the onset of battery operation.
- Z. Output Distribution
1. Output distribution is integral to the UPS cabinet, and located on the rear of the unit. The output distribution shall provide the capability to re-configure the UPS input and output connections via a removable sheetmetal power distribution box. Distribution options shall be available with break-before-make maintenance bypass switch to allow for complete shutdown and isolation of the UPS for service without powering down the connected loads. Maximum transfer time of the maintenance bypass switch shall be 4-6ms
- AA. Communication Options
1. UPS shall have a DB-9 Serial Port (9 pin female) connector on the rear panel to provide UPS status communications. The UPS will communicate via serial communications using Liebert ESP II protocol. The DB9F will also include photo-couplers to signal "on battery" and "low battery" operational status. The UPS will be capable of receiving a signal

from the connected host system to initiate a UPS shutdown, when operating from battery power. This signal will be a +5V to +12V level that must remain for at least a 1.6 second duration.

BB. Intellislot™ Communications

1. The UPS includes one Intellislot communication port to allow the operator to field-install optional Liebert Intellislot communication cards. Intellislot cards may be installed during any state of UPS operation (On, Standby, or Off states). Available Intellislot options are described below.
 - a. OCWEBCARD: The OCWEBCARD option delivers SNMP and Web management to the UPS when connected to any 10 or 100 Mbit Ethernet network. The card supports 10 and 100 Mbit Ethernet and provides for in-the-field upgrade of SNMP firmware. The kit includes the Intellislot card, MIB, configuration cable and installation manual. Once the card is installed, the serial communications is disabled in the DB9F connector; however the photo-coupler signals (on battery, and low battery) will remain active.
 - b. Relay Interface Card: This RELAYCARD-INT option provides contact closures for remote monitoring of alarm conditions in the UPS, delivering signals for On Battery, On Bypass, Low Battery, Summary Alarm, UPS Fault and On UPS. The contacts are rated for 24 volts AC or DC at 1A. Connections are to a DB25F connector with cable provided by the end user.
 - c. USB Adapter Card: The USBCARD option provides a USB interface port for use with Microsoft Windows tm 2000 tm and XP tm Power Management. Kit includes a 6-foot USB cable. When this card is installed in a GXT UPS the serial port on the GXT UPS is disabled.
 - d. MULTIPORT4 Kit: The MULTIPORT4 option splits the UPS photo-coupler signals (on battery, and low battery) into four isolated sets of signals, enabling the user to interface with four servers simultaneously.

CC. Acceptable Manufacturers

1. Liebert
2. Powerware
3. Eaton
4. APC
5. Or Approved Equal

2.7 SURGE/LIGHTNING PROTECTION

A. General

1. All data, power, audio and video signal cables entering the facility from a point exterior to the building shall be equipped with a silicon avalanche diode type of lightning protection.
2. Surge Protection Devices (SPDs) shall be supplied by an ISO 9001:2000 certified company in the business of manufacturing.
3. Product data submittals shall include 8/20μs rated surge capacities, relevant IEEE and IEC specifications, installation instructions, and operating characteristics.
4. Mounting guidelines will be followed as indicated in installation instruction provided by manufacturer.

5. Protector shall be located at the first cabinet through which the cable or conductor passes upon entering the building.
 6. The SPD shall be mounted as close as possible to the equipment or service being protected.
 7. All wiring points and plug connections shall be "touch safe" with no live voltages that can make contact with a misplaced finger in accordance with IEC 529.
 8. The SPDs shall have integral mounting brackets to attach to 35mm DIN rail conforming to DIN EN50022. The mounting bracket of the SPD shall make ground connection to the DIN rail; therefore, minimizing ground impedance connections. The DIN rail and enclosure will be electrically grounded. For installations requiring a high number of SPDs in a single cabinet, a 19" rack mount SPD with provisions for 4 to 24 channels of protection will be acceptable.
- B. Surge Protection Devices For 120v AC Power Circuits
1. 120VAC surge protection devices shall be installed on each non-UPS or emergency circuit feeding security devices.
 2. The SPD shall be UL listed or recognized to UL 1449, 2nd edition.
 3. SPDs for single phase equipment shall be designed to withstand up to a 10kA test current of a 8/20 μ S waveform according to IEC 1024 Application Guide A and IEEE C62.41.1-2002 Category C area.
- C. Surge Protection Devices For Ethernet Data Networks
1. SPDs shall be designed for protection of transmission of Fast Ethernet (100Mbps) over Category 5e cable as a minimum.
 2. The protection circuit shall have fine protection diodes between all the signal wires, as well as coarse protection between shield and ground.
- D. Acceptable Manufacturers
1. Phoenix Contacts
 2. Approved equal

END OF SECTION 285010