



SECTION 26 09 43 – NETWORK LIGHTING CONTROL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide a network lighting control system with the following features:
 - 1. Distributed or centralized relay power pack and switching system.
 - 2. Control provided by switches, photocells, occupancy sensors through relay packs and dimming control devices. Provide controls for discrete functions, dimming and scene presets.
 - 3. Provide networking using Cat 5 cabling between devices and through bridging units, routers, and other network interface devices utilizing IP based addressability.
 - 4. Allow user programming for each fixture and zone over a data network.
 - 5. Provide all control software and programming.
 - 6. Provide capability to control individual fixtures and zones from apps for user computers, tablets or smartphones.
 - 7. Provide a system complying with Title 24 Energy Code requirements.

1.2 SUBMITTALS

- A. Shop Drawings: Submit dimensioned drawings of lighting control system and accessories including, but not necessarily limited to, relay panels, switches, DTC, photocells and other interfaces.
- B. Product Data: Submit for approval 6 copies of manufacturer's data on the specific lighting control system and components. Submittal shall be in both electronic and hard copy formats. To prevent departures from approved system operation, electronic file submitted shall be able to be directly downloaded to the specified system at manufacturer facility. Submit a complete bill of materials with part numbers, description and voltage specifications.
- C. Wiring Diagram: Submit a Wiring diagram of the system configuration indicating the type, size and number of conductors between each component. Submittals that show typical riser diagrams are not acceptable. Provide completely filled out control schedules, switch engraving schedules and panel schedules.

1.3 QUALITY ASSURANCE

- A. Manufacturers:
 - 1. **LC&D.**
 - 2. **LUTRON**
 - 3. **nLight.**
- B. Control wiring shall be in accordance with the NEC requirements for Class 2 remote control



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systems, Article 725 and manufacturer specification.

- C. A licensed electrician shall functionally test each system component after installation, verify proper operation and confirm that all relay panel and switch wiring conform to the wiring documentation, and as per manufacturer recommendations.
- D. Comply with NEC and all local and state codes as applicable to electrical wiring work.
- E. Lighting control panels shall be ETL listed to UL 916. LCPs controlling emergency circuits shall be ETL listed to UL 924.
- F. The lighting control system shall also be listed or approved by all national, state and local energy codes to include but not limited to California Title 24 and Los Angeles Building Code.
- G. System shall have open software protocol to interface with BMS and central utility plant monitoring systems. Verify the BMS protocol required with LAWA. This protocol may involve providing a connection to the Central Utility Plant (CUP).
- H. Specifications are based on LC&D system. Lutron or nLight shall comply with the compatibility and functionality to achieve the design intent.

1.4 MAINTENANCE MATERIALS

- A. Execution Requirements: Spare parts and maintenance products.
- B. Provide 8 spare relays per LCP, 4 Micro panels.
- C. Provide extra CD version of manufacturers operating software to include graphical interface software.
- D. Provide 2 extra sets of as-built and operating manuals.

PART 2 - PRODUCTS

2.1 MATERIAL AND COMPONENTS

- A. Provide devices required for complete integrated system.
- B. BMS interface to be provided and coordinated with mechanical controls contractor as required.
- C. Smart Panelboards shall be made up of the following components:
 - 1. NEMA rated enclosure with hinged door, available with main lug or main breaker and in voltages of 120/240, 208Y/120 and 480Y/277. Continuous main current ratings as indicated on the panelboard schedule. Minimum AIC rating to be 10,000. NEMA4 rating for outdoor installation.
 - 2. Control electronics mounted internally to each smart panelboard shall be capable of



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driving up to 42 controllable breakers, control any individual or group of breakers, store all programming in non-volatile memory, after power is restored return system to current state, provide programmable blink warn timers for each breaker and every zone and be able to control a Micro Relay panel located downstream of non-controllable breaker.

3. Lighting control system shall be digital and consist of a Master LCP with up to 31 controllable, Slave LCPs with up to 42 controllable breakers in each panel, a Micro LCP with up to 4 individual relays, digital switches and digital interface cards (see interfaces). One individual bus network each for North Concourse + North Core and South Concourse + South Core. All system components shall connect and be controlled via a single Category 5, 4 twisted pair cable, providing real time two-way communication with each system component. Analog systems are not acceptable.
4. Lighting control system shall have the capability to output 4 independent 0V to 10V signals in a Micro LCP. Micro LCP shall control 4 independent 20a fluorescent lighting circuits. Each circuit shall have an adjustable fade rate and take inputs from a wall device, DTC system controller or a digital photocell.
5. Quantity and rating of breakers as required.
6. 16 AWG steel barrier shall separate the high voltage and low voltage compartments of the panel and separate 120V and 277V.

D. Controllable Breakers

1. Solenoid operated thermal magnetic breakers.
2. Ratings of 120/240 Vac; 15, 20 and 30 Amp; 1- and 2-pole, 277/480 Vac, 15, 20 and 30 amp: 1 and 2-Pole.
3. Rated at 20 Amp, 277 Vac Ballast, Tungsten, HID, 1 HP at 120 Vac, 2 HP at 240 Vac.

E. Standard Output Relays

1. Electrically held, electronically latched SPST relay.
2. Relays shall be individually replaceable. Relay terminal blocks shall be capable of accepting two #10AWG wires on both the line and the load side. Systems that do not allow for individual relay replacement or additions are not acceptable.
3. Rated at 20 Amp, 277 Vac Ballast, Tungsten, HID, 1 HP at 120 Vac, 2 HP at 240 Vac.
4. Relays to be rated for 250,000 operations minimum at 20a lighting load, use Zero Cross circuitry and be Normally Closed (NCZC). All incandescent circuits shall be energized by use of a Normally Closed SoftStart™ (NCSS) relay rated at 100,000 operations at full 20a load. No exceptions.
5. Optional relay types available shall include: Normally Open (NO) relay rated for 100,000 operations, a 600V 2-pole NO and NC and a Single Pole, Double Throw (SPDT) relay.

F. Switches

1. All switches shall be digital and communicate via RS 485. Contact closure style switches shall not be acceptable. Any switch button function shall be able to be changed locally (at the DTC or a PC) or remotely, via modem, Internet or Ethernet.



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2. Switches shall be available in 1 through 6-button version with engraveable buttons, red LED annunciation for each button and a constantly on green LED locator.
 3. Switches may be programmed to be Momentary ON, Momentary OFF, Toggle or Maintained. These functions shall be able to be changed locally (at the DTC or a PC) or remotely, via modem.
 4. Contractor to verify all switch types and quantities per plans and specifications.
 5. Accessories available to include digital key switch and digital key enable switch.
- G. DTC - Digital Electronic Time Clock:
1. A Digital Time Clock (DTC) shall control and program the entire lighting control system and supply all time functions and accept interface inputs.
 2. DTC shall be capable of up to 32 schedules. Each schedule shall consist of one set of On and Off times per day for each day of the week and for each of two holiday lists. The schedules shall apply to any individual relay or group of relays.
 3. The DTC shall be capable of controlling up to 126 digital devices on a single bus and capable of interfacing digitally with other individual busses using manufacturer supplied interface cards.
 4. The DTC shall accept control locally using built in button prompts and use of a 8 line 21-letter display or from a computer or modem via an on-board RS 232 port. All commands shall be in plain English. Help pages shall display on the DTC screen.
 5. The DTC shall be run from non-volatile memory so that all system programming and real time clock functions are maintained for a minimum of 15 years with loss of power.
 6. Software pre-installed to accept standard Unity Graphical Management Software (GMS) pages. GMS software shall provide via local or remote PC a visual representation of each device on the bus, show real time status and the ability to change the status of any individual device, relay or zone.
 7. Pre-Installed modem that allows for remote programming from any location using a PC. Modem to include all necessary software for local or remote control.
 8. DTC shall provide system wide timed overrides. Any relay, group or zoned that is overridden On, before or after hours, shall automatically be swept Off by the DTC a maximum of 2 hours later.
- H. Interfaces: For future expansion capability, system to have available all of the following interfaces. Verify and install only those interfaces indicated on the plans.
1. A dry contact input interface card that provides 14 programmable dry contact closure inputs. Use shielded cable to connect input devices to interface card.
 2. Interface card providing digital communication from one system bus to another system bus, allowing up to 12,000 devices to communicate.
 3. An exterior (PCO) or interior (PCI) photocell that provides readout on the DTC screen in number values analogous to foot-candles. Each photocell shall provide a minimum of 14 trigger points. Each trigger can be programmed to control any relay or zone. Each trigger shall be set through programming only. Photocells which requires the use of setscrews or which must be programmed at the photocell control card shall be not acceptable.



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4. An interface card that allows the DTC to control up to 32 digital XCI brand thermostats. Programming of thermostats to be able to done locally (at the DTC or a PC) or remotely, via modem, Internet or Ethernet.
5. A voice prompted telephone override interface module. Interface module shall accept up to 3 phone lines and allow up to 3 simultaneous phone calls. Voice prompted menu and up to 999 unique pass codes shall be standard with each interface module.
6. Software pre-installed to run Unity GX Graphical Management Software (GMS-GX) pages. GMS-GX software shall provide via local or remote PC a visual representation of a specific area or the total area of the project. GMS full graphic pages shall be designed to the LAWA's specifications. Provide 2 GMS pages.
7. Direct digital interface to Smart Panelboards. Smart Panelboard circuits shall appear on the system software as distinct items and maintain all functions and features of the system software to include GMS pages.
8. Direct digital interface to DMX 512 based systems. Lighting control system shall provide 14 global DMX commands, each of which can be modified locally or remotely using lighting controls manufacturer supplied software. DMX interface shall be integral to the system bus and shall connect and be controlled via a single Category 5, 4 twisted pair cable, providing real time two-way communication between lighting control system and a DMX based system.
9. BMS interface to be provided and coordinated with mechanical controls contractor as required.

2.2 MODES OF OPERATIONS

- A. DTC – Digital Electronic Time Clock: DTC shall control any relay or group of relays by the following modes: ON only, OFF only, Maintained, Maintained with timer and OFF sweep warning (Blink warn), maintained with timer (No blink warning). Timers adjustable from 1 minute to 4 hours. When the scheduled program in the DTC is ON the associated timers are disabled. When the scheduled program in the DTC is off and a relay or zone is overridden, the DTC will put that relay or zone into the timer mode and automatically sweep off at the end of the programmed timer period (Maximum 2-Hour Timed Override). All DTC settings, schedules, photocell trip points, temperature settings, longitude and latitude, time zone offset to sunrise and sunset and any other LAWA settings shall be able to be changed though software locally (at the DTC or a PC) or remotely, via modem, Internet or Ethernet. No exceptions.
- B. Switches: All system switches shall be digital and daisy chained on a single category 5, 4 twisted pair cable with all LCPs. Any switch button shall be able to control any relay or group of relays anywhere on the system in the following modes: ON, OFF, Mixed (Some relays ON some OFF), Toggle (first push ON, next OFF etc.) Maintain. Timer ON with a time set from 1 minute to 4 hours. Timer ON with Off sweep warning, (Blink warning 5 min or as programmed prior to OFF sweep). Timer ON with Horn Warning (Horn output turns ON for the warning 5 min or as programmed prior to OFF sweep). Any switch function shall be able to changed locally (at the DTC or a PC) or remotely, via modem, Internet or Ethernet. Any relay, group or zoned that is overridden On, before or after hours, shall automatically be swept Off by the DTC a maximum of 2 hours later.



PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Mount smart breaker panelboards to wall. Attach to backing or structure similar to standard panelboards. Locate strategically to allow access to low and live voltage compartments. Vacuum all construction debris prior to installing electronics.
- B. Switches: Provide outlet boxes, single or multi-gang, as shown on the plans for the low voltage digital switches. Mount switches as per plans. Supply faceplates per plans and specifications. EC is specifically responsible to supply and install the required low voltage cable, Category 5, 4 twisted pair, with pre-assemble RJ45 connectors and snagless boots (commonly referred to as a Cat 5 patch cable) between all switches and panels. Field-test all Cat 5 patch cable with a recognized cable tester. All low voltage wire to be run in conduit, per local codes.
- C. Wiring
 - 1. Do not mix low voltage and high voltage conductors in the same conduit. No exceptions.
 - 2. Ensure low voltage conduits or control wires do not run parallel to current carrying conduits.
 - 3. Place manufacturer supplied “terminators” at each end of the system bus per manufacturer instructions.
 - 4. Neatly lace and rack wiring in cabinets.
 - 5. Plug in Category 5, 4-twisted pair patch cable that has been field tested with a recognized cable tester at the indicated RJ45 connector provided with each lighting control device, per manufacturer instructions.
 - 6. Use Category 5, 4 twisted pair patch cable for all system low voltage connections. Additional conductors may be required to compensate for voltage drop with specific system designs. Contact LC&D or refer to the GR2400 manual for further information. Use shielded cable for dry contact inputs to lighting control system.
 - 7. Do not exceed 4,000ft-wire length for the system bus.
 - 8. All items on the bus shall be connected in sequence (daisy chained). Star and spur topologies are not acceptable.
 - 9. The specified lighting control system shall be installed by the electrical contractor who shall make all necessary wiring connections to external devices and equipment, to include photocell. EC to wire per manufacturer instructions.

3.2 DOCUMENTATION

- A. Each Smart breaker Panelboard shall have properly filled up directory. Provide a point-to-point wiring diagram for the entire lighting control system. Diagram must indicate exact mounting location of each system device. This accurate “as built” shall indicate the loads controlled by each relay and the identification number for that relay, placement of switches and location of photocell. Original to be given to LAWA, copies placed inside the door of



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each LCP.

3.3 SERVICE AND SUPPORT

- A. Start Up: EC shall contact manufacturer at least 7 days before turnover of project. Manufacturer will remotely dial into the lighting control system, run diagnostics and confirm system programming. EC shall be available at the time of dial in to perform any corrections required. EC is responsible for coordinating with GC and LAWA the installation of a dedicated telephone line or a shared phone line with A/B switch. Phone jack to be mounted within 12” of Master LCP. Label jack with phone number. EC to connect phone line from jack to Master LCP.
- B. Telephone factory support shall be available at no additional cost to the LAWA both during and after the warranty period. Factory to pre-program the lighting control system per plans and approved submittal, to the extent data is available. The specified manufacturer, at no added cost, shall provide additional programming via modem as required by LAWA for the operation life of the system. Manufacturer warrants that the DTC software can be upgraded and monitored remotely. Upon request manufacturer to provide remote dial up software at no added cost to LAWA. No exceptions.
- C. Provide a factory technician for on-site training of the LAWA’s representatives and maintenance personnel. Coordinate timing with General Contractor. Provide 2 days of factory on-site training for a minimum of ten people.
- D. On Call Service
 - 1. Control contractor shall perform monthly system diagnostics (viewing system log files and review of performance/error data logged in the system).
 - 2. Provide one technician for 120 hours total (duration of site visit determined on time required to perform the system review) for a period of six (6) months after final acceptance of the project. Time may also be utilized by LAWA to provide as-needed modifications, troubleshooting, and/or clarifications to the system. Use of time is as the sole discretion of LAWA.

3.4 WARRANTY

- A. Two (2) years parts and labor.
- B. Five (5) years limited parts and labor warranty for repair and replace of defective system components.

END OF SECTION 26 09 43