

SECTION 260933
CENTRAL DIMMING CONTROLS
Eaton iLumin System

PART 1- GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Central dimming control systems.
- B. Related Sections:
 - 1. Section [262726 - Wiring Devices/Lighting Controls.]
 - 2. Section [265113 - Ballasts:] Fluorescent lighting ballasts controlled by central dimming control system.
 - 3. Section [260923 - Occupancy Sensors:] Occupancy sensors used in conjunction with central dimming control system.

1.2 REFERENCES

- A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE)
 - 1. C62.41-1991 – Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- B. ASTM International (ASTM)
 - 1. D4674 -02a Standard Test Method for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Fluorescent Lighting and Window-Filtered Daylight.
- C. Canadian Standards Association (CSA).
 - 1. CSA C22.2 # 14 Industrial Control Equipment
 - 2. CSA C22.2 # 184 Solid-State Lighting Controls
 - 3. CSA C22.2 # 156 Solid-State Speed Controls
- D. International Electrotechnical Commission.
 - 1. (IEC) 801-2 Electrostatic Discharge Testing Standard.
 - 2. IEC/EN 60669-2-1 Switches for household and similar fixed electrical installations - electronic switches.
- E. International Organization for Standardization (ISO)
 - 1. 9001:2000 – Quality Management Systems.
- F. National Electrical Manufacturers Association (NEMA)
 - 1. WD1 (R2005) - General Color Requirements for Wiring Devices.
- G. Norma Oficial Mexicana (NOM).
 - 1. NOM-003-SCFI Productos eléctricos - Especificaciones de seguridad (Electrical products - Safety Specifications)
- H. Underwriters Laboratories, Inc. (UL):
 - 1. 489 (2002) - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
 - 2. 508 (1999) - Standard for Industrial Control Equipment.
 - 3. 1472 (1996) - Solid-State Dimming Controls.
 - 4. 924 (2003) - Emergency Lighting and Power Equipment.

1.3 SYSTEM DESCRIPTION

- A. Centralized dimming control system
 - 1. Factory assembled dimming and switching panels. [and interfaces and modules]
 - 2. Low voltage wallstations, touchscreens, interfaces, and sensors.

1.4 SUBMITTALS

- A. Submit under provisions of Section [01330.]
- B. Specification Conformance Document: Indicate whether the submitted equipment:
 - 1. Meets specification exactly as stated.
 - 2. Meets specification via an alternate means and indicate the specific methodology used.

- C. Shop Drawings; include:
 - 1. Load schedule indicating actual connected load, load type, and voltage per circuit, circuits and their respective control zones, circuits that are on emergency, and capacity, phase, and corresponding circuit numbers.
 - 2. Schematic of system.
- D. Product Data: Catalog specification sheets with performance specifications demonstrating compliance with specified requirements.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Minimum [10] years experience in manufacture of architectural lighting controls.
- B. Manufacturer's Quality System: Registered to ISO 9001:2000 Quality Standard, including in-house engineering for product design activities.
- C. Central dimming control system:
 - 1. Meets UL, cUL, and/or CSA Standards specifically for the required loads. Provide evidence of compliance upon request.

1.6 PROJECT CONDITIONS

- A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
 - 1. Ambient temperature: 0° to 40° C (32° to 104° F).
 - 2. Relative humidity: Maximum 90 percent, non-condensing.
 - 3. Lighting control system must be protected from dust and sprays during installation.

1.7 WARRANTY

- A. Provide manufacturer's warranty covering 5 year parts to repair and replace defective equipment.
- B. Provide manufacturer's additional warranty options to customer where required.

1.8 COMMISSIONING

- A. Provide factory-certified field service engineer to a site visit to ensure proper system installation and operation under following parameters:
 - 1. Qualifications for factory-certified field service engineer:
 - a. Certified by the equipment manufacturer on the system installed.
 - 2. Make a visit upon completion of installation of central dimming control system:
 - a. Verify connection of power feeds and load circuits.
 - b. Verify connection Wallstation controls.
 - c. Verify proper connection iCAN link.
 - d. Download system panel data to dimming panels.
 - e. Check dimming panel load types and currents and remove by-pass jumpers.
 - f. Verify system operation control by control, circuit by circuit.
 - g. Obtain sign-off on system functions.
 - h. User to be trained on system operation.

1.9 MAINTENANCE

- A. Make ordering spare parts available to end user.
- B. Make new replacement parts available for minimum of ten years from date of manufacture.
- C. Provide factory direct technical support hotline.
- D. Provide on-site service support where required.
- E. Offer renewable service contract on yearly basis, to include parts, factory labor, and annual training visits to customer if desired.

PART 2- PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Eaton Lighting Systems,; iLumin Architectural Control System
- B. Basis of design product: Eaton iLumin system or subject to compliance and prior approval with specified requirements of this section, one of the following:
 - 1. Eaton Lighting Systems iLumin
- C. Substitutions:
 - 1. All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional a minimum of 10 working days prior to the bid date and must be made available to all bidders.
 - 2. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.
 - 3. Any substitutions provided by the contractor shall be reviewed at the contractor's expense by the electrical engineer at a rate of \$200.00 per hour.
 - 4. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring.
 - 5. Provide complete engineered shop drawings (including power wiring) with deviations for the original design highlighted in an alternate color to the engineer for review and approval prior to rough-in.

2.2 GENERAL

- A. Provide system hardware that is designed, tested, manufactured, and warranted by a single manufacturer.
- B. Architectural Lighting Controls: Ten-year operational life while operating continually at any temperature in an ambient temperature range of 0° C (32°F) to 40° C (104°F) and 90 percent non-condensing relative humidity.
- C. Designed and tested to withstand electrostatic discharges up to 12,000 V without impairment per IEC 801-2.

2.3 DIMMING / RELAY PERFORMANCE REQUIREMENTS

- A. Electrolytic capacitors to operate under the component manufacturer's maximum temperature rating when device is under fully-loaded conditions in 40° C (104° F) ambient temperature.
- B. Design and test dimmers/relays to withstand line-side surges without impairment to performance.
 - 1. Panels: Withstand surges without impairment of performance when subjected to surges of 6,000 volts, 3,000 amps per ANSI/IEEE C62.41 and per IEC 61000-4-5 surge requirements.
 - 2. Other power handling devices: Withstand surges without impairment of performance when subjected to surges of 6,000 volts, 200 amps per ANSI/IEEE C62.41.
- C. Utilize air gap off, activated when user selects "off" at any control to disconnect the load from line supply.
- D. Power failure memory and dimmer/relay recovery:
 - 1. When power is interrupted and subsequently returned, lights will automatically return to same levels (dimmed setting, full on, or off) prior to power interruption.
 - 2. In 3 phase panels loss of power to any phase should not effect operation or control dimmers on any other phase.
- E. Dimmers: SC-UN and SC-UN-FT Series
 - 1. Provide real-time cycle-by-cycle compensation for incoming line voltage variations including changes in RMS voltage, frequency shifts, dynamic harmonics, and line noise.
 - 2. Control compatible light sources in smooth and continuous manner. Dimmers with visible steps are not acceptable.
 - 3. Each dimmer to be configurable in the field to provide a proper dimming curve for the specific light source.
 - 4. Minimum and maximum light levels user adjustable on circuit-by-circuit basis.
 - 5. Each individual circuit must include the ability to control the following load types standard, without additional modules or equipment.
 - a. Magnetic Low Voltage (MLV) transformer:
 - 1) Contain circuitry designed to control and provide a symmetrical AC waveform to input of magnetic low voltage transformers per UL 1472, Section 5.11.

- 2) Dimmers using unipolar load current devices (such as FETs or SCRs) to include DC current protection in the event of a single device failure.
- b. Forward Phase Electronic Low Voltage (ELV) transformer:
- c. Dimmer to be approved for use on the specific ELV transformer being used, Dimming equipment manufacturer to offer free testing services to ensure compatibility. Neon and cold cathode transformers:
 - 1) Magnetic transformers: UL listed for use with normal (low) power factor magnetic transformers.
- d. Fluorescent electronic dimming ballast: Refer to Section 16580 for dimming ballast specifications and performance.
- e. Low Voltage Dimming (0-10V); Meet following requirements:
 - 1) Capable of controlling any 0-10V source.
 - 2) 0-10V analog voltage signal.
 - a) Provide isolated 0-10V output signal conforming to IEC 60929.
 - b) Sink current via IEC 60929.
 - c) Source current.
- F. Dimmer: SC-RP and SC-RPB Series
 - a. Up to 24 Low Voltage Dimming (0-10V) channels; Meet following requirements:
 - 1) Capable of controlling any 0-10V source.
 - 2) 0-10V analog voltage signal.
 - a) Provide isolated 0-10V output signal conforming to IEC 60929.
 - b) Sink current via IEC 60929.
 - c) Source current.
- G. Non-dim circuits to meet the following requirements: SC-UN and SC-UN-FT Series
 - 1. Rated life of relay: Minimum 1,000,000 cycles.
 - 2. Load switched in manner so that there is no arcing at mechanical contacts when power is applied to and removed from load circuits.
 - 3. Fully rated output continuous duty for inductive, capacitive, and resistive loads.
- H. Variable Relay Timing Technology: SC-RP and SC-RPB Series
 - 1. Each relay shall provide circuitry that will ensure switching the load at the optimum time to ensure minimum current flow.
 - a. Relay Module shall have the ability to measure voltage, current and frequency of each switched load without additional components.
 - b. Each Relay Module shall constantly monitor the connected load and will adapt to the changing circuit characteristics. Switching times are adjusted to maintain minimum current flow regardless of changing factors such as ballast or lamp life.
 - c. Each Relay Module optimizes its own switching time.

2.4 POWER PANELS

- A. Product: SC Series.
- B. Mechanical:
 - 1. Meets UL, cUL, and/or CSA Standards specifically for the required loads. Provide evidence of compliance upon request.
 - 2. Delivered and installed as a factory assembled panel listed to UL508.
 - 3. Field wiring accessible from front of panel without need to remove dimmer or relay assemblies or other components.
 - 4. Panels passively cooled via free-convection, unaided by fans or other means.
- C. Electrical:
 - 1. Panels contain branch circuit protection for each input circuit unless the panel is a dedicated feed-through type panel or otherwise indicated on the drawings.
 - 2. Branch circuit breakers; meet following performance requirements:
 - a. Listed to UL 489 as molded case circuit breaker for use on lighting circuits.
 - b. Contain visual trip indicator; rated for:

- 1) SC-UN: 10,000 AIC, 120 V Dimming and 14,000 AIC, 277 V Dimming.
- 2) SC-RPB: 25,000 AIC, 120 V and 277 V relays
- c. Thermal-magnetic construction for overload, short-circuit, and over-temperature protection. Use of breakers without thermal protection requires dimmers/relays to have integral thermal protection to prevent failures when overloaded or ambient temperature is above rating of panel.
- d. Replaceable without moving or replacing dimmer/relay assemblies or other components in panel. Breakers shall be designed for use in frequent switching applications (switching duty rated) so that loads can be switched on and off by breakers.
3. Panel to contain 4 line LCD display controller in each panel
 - a. All set up and adjustments of the panel can be made from this device.
 - b. USB, RS485, Ethernet, and DMX connections must be included.
 - c. Include Timeclock standard with control of:
 - 1) Scene selections.
 - 2) Fade zone to a level.
4. Real Time Energy Meter per circuit
 - a. Electrical device to measure voltage and current within each circuit.
 - b. Metered data can be polled via public command string from on board Ethernet input.
- D. SC-UN and SC-UN-FT Series
 1. Each individual circuit dimmers is designed and tested to specifically control incandescent/tungsten, magnetic low voltage, electronic low voltage, neon/cold cathode, fluorescent dimming ballasts, 0-10V low voltage loads, and non-dim loads without additional internal or external modules.
 2. Utilize universal 16A continuous-use dimmer listed to UL508.
 3. Limit current rise time to minimum 350 μ sec as measured from 10-90 percent of load current waveform at full dimmer capacity at a 90 degree conduction angle.
 4. Load faults only affect the given circuit.
 5. Ship panels with each dimmer in mechanical bypass position by means of jumper bar inserted between input and load terminals. Jumpers to carry full rated load current and be reusable at any time without requiring a tool to reinstall them. Mechanical bypass device to allow for switching operation of connected load with dimmer removed by means of circuit breaker.
- E. SC-RP and SC-RPB Series
 1. Replacing relay does not require re-programming of system or processor.
 2. Relays: Include diagnostic LED's to verify proper operation and assist in system troubleshooting.
 3. Relay panels: Include tiered control scheme for dealing with component failure that minimizes loss of control for occupant.
 - a. Failures on the lighting control system network are localized to the failed product. All other lighting control panels continue to fully function without additional action. Systems that have a single point of failure on the network shall not be acceptable.
 4. If lighting control system fails, lights to remain at current level. Individual relay overrides provides local control of lights until system is repaired. Each lighting control panel includes a master override to override the entire lighting panel.

2.5 LOW-VOLTAGE WALL STATIONS

- A. Product: Revio, Ineo, European Style, Architrave, Touchscreens
- B. Electronics:
 1. Use CAN wiring for low voltage communication to ensure reliable data communication in high electrical noise environments.
- C. Functionality:
 1. Upon button press, LEDs to immediately illuminate.
- D. Color:
- E. Provide faceplates with concealed mounting hardware where specified.
- F. Engrave wall stations with appropriate button, zone, and scene descriptions as specified.

- G. Silk-screened borders, logos, and graduations to use graphic process that chemically bonds graphics to faceplate, resistant to removal by scratching and cleaning.

2.6 LOW VOLTAGE CONTROL INTERFACES

- A. Contact Closure Interfaces; Eaton iLumin UIG-NA and UIM-NA:
 - 1. Where contact closures are used to integrate between lighting controls and other systems.
 - 2. The contact closure input device will accept both momentary and maintained contact closures.
- B. RS232 Interface; Eaton iLumin SI-2-NA:
 - 1. SI-2-NA Interface
 - a. Provide ability for bi-direction communication by means of RS232 serial communication to system by means of user-supplied PC, digital audiovisual, or BMS equipment. Control to be located within 50 feet (15 meters) of RS232 source.
 - b. Allow for custom RS-232 command strings to be entered in to software to allow lighting control system to control any other device.
- C. DMX Output Interface; Eaton iLumin SCD96-NA
 - 1. Provide the ability to control standard DMX devices such as RGB fixtures, moving lights, dimmers and effects.
 - 2. Provides 96 DMX channels
 - 3. Provides the ability to map any iLumin wall station button to a DMX channel.
- D. Network Repeater/Bridge; Eaton iLumin BN-2-NA
 - 1. Shall allow the network to extend more than 1000m/3200 feet.
 - 2. Shall permit the connection of multiple networks allowing up to 65,000 devices on one system.
- E. Relay Interface; Eaton iLumin RI-2-NA
 - 1. Provide eight dry contact programmable low power relays to control curtain, shades, AV screens and other equipment.
- F. Infrared Transmitter & Receiver; Eaton iLumin IRTR
 - 1. Provide the ability to sense the presence or absence of partitions.
 - 2. Requires the connection to a UIG-2-NA
- G. Network Access Jack; Eaton iLumin LCNJ
 - 1. Shall allow direct access to the iLumin lighting control network while in the space being modified.
- H. Network Gateway; iLumin EG2-NA
 - 1. Shall allow lighting network to connect to Local Area Network either through Ethernet switch or wireless router
 - 2. Shall act as host for remote applications including iOS (iPhone®/iPod touch®/iPad®)
 - 3. Shall house internal webserver pages accessed through an internet browser with password protection for security
 - 4. Provide ability for bi-direction communication by means of Ethernet communication to system by means of user-supplied PC, digital audiovisual, or BMS equipment. Control to be located on the same Local Area Network.
 - 5. Allow for custom communication command strings to be entered in to software to allow lighting control system to control other devices.
- I. BACnet Interface; Eaton Lighting Systems Model ProtoNode FPC-N34:
 - 1. The iLumin network shall permit data protocol translation through a building automation interface Gateway. The BACnet Gateway shall permit BACnet communication protocol to operate individual areas, scenes or channels and read the status. The iLumin network shall respond efficiently to the requested information from the BACnet network.
 - 2. The ProtoNode provides up to 10,000 points of control and can communicate to multiple panel types.
 - 3. Provide PIC list definition and object model to other system manufacturers.
- J. LonWorks Interface; Eaton Lighting Systems Model FPC-N35:
 - 1. Provide ability to communicate by means of LonWorks FTT-10 communication to centralized lighting system from user-supplied LonWorks FTT-10 twisted pair network.

2. The iLumin network shall permit data protocol translation through a building automation interface Gateway. The LON Gateway shall permit LonWorks communication protocol to operate individual areas, scenes and channels and read the status. The iLumin network shall respond efficiently to the requested information from the LonWorks network.
 3. The ProtoNode provides up to 4,096 points of control and can communicate to multiple panel types.
 4. Provide LonWorks interface object model specification to secondary equipment manufacturers.
- K. Recessed Combination Sensor, Eaton iLumin NC3-C and AXCS01SRJ
1. Shall provide detection of occupancy and daylighting control within a single product
 2. Capable of detection of occupancy at desktop level up to 250 square feet, and gross motion up to 450 square feet.
 3. Capable of sending occupancy status to other areas within the system
 4. Capable of sending a command to turn HVAC on and off.

2.7 SOFTWARE

- A. Graphical Scene Control Software: Eaton iLumin iCanView
1. Shall include with user-friendly software suitable for operation on computer workstations which serve as central control stations for the selection and operation of lighting scenes
 2. All software shall be programed by the vendor and delivered ready to use. This program shall include preparation of all graphics, and displays required as a part of this project.
 3. Clients shall interface with the software via Eaton Lighting Systems iLumin iCANsoft application

2.8 SOURCE QUALITY CONTROL

- A. Perform full-function testing on 100% of all system components and panel assemblies at the factory

PART 3- EXECUTION

3.1 INSTALLATION

- A. Install equipment in accordance with manufacturer's installation instructions.
- B. Provide complete installation of system in accordance with Contract Documents.
- C. Define each dimmer's/relay's load type, assign each load to a zone, and set control functions.
- D. Provide equipment at locations and in quantities indicated on Drawings. Provide any additional equipment required to provide control intent.
- E. 100 digital devices (Source Controllers, User Interfaces, etc) may reside on a single network segment with a network length not to exceed 3000 feet. Additional network segments shall be accomplished by the employment of a network bridge up to 65000 devices. Network segments shall be terminated at the end of each segment.
- F. Devices to be connected via Daisy Chain topology.
- G. Network wire recommended is Belden#1502R or 1502P (plenum) or similar. Wire shall meet color code requirements to insure proper installation of the network polarity.
- H. All panels are "masters" and may be added to the network in any location and any amount as long as network installation guidelines are met.
- I. Panels are designed to function independently from external control devices.

END OF SECTION