

SECTION 26 09 43.13 DIGITAL NETWORK LIGHTING CONTROLS

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PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
Control and management system for lighting and other peripherals in a commercial interior environment utilizing the EMerge Alliance 24VDC Standard. System includes sensors for monitoring room occupancy, light level, temperature, and humidity. Sensors and other integrated peripherals are monitored by the system control processor and the central energy management server. Same processor and server control lighting, shades and other controllable peripheral devices.

Specifier: Edit paragraph to correspond to components and features required for this Project.

- B. Related Requirements:

Specifier: Related Information paragraph is optional. If retaining, edit and coordinate list of sections below to correspond to Project requirements.

1. Division 09 Section "Acoustical panel ceilings" for DC-power suspension systems.
2. Division 12 Section "Window Treatments" for window treatments controlled by modular dimming control system.
3. Division 25 Section "Integrated Automation Controls" for software and integration hardware for network lighting controls.
4. Division 26 Section "Common Work Results For Electrical".
5. Division 26 Section "Wiring Devices".
6. Division 26 Section "24V DC Power Distribution Systems".
7. Division 26 Section "24V DC Building Wire and Cable".
8. Division 26 Section "Lighting Devices" for occupancy sensors controlled by modular dimming control system.
9. Division 26 Section "Interior Lighting" for light fixtures controlled by modular dimming control system.
10. Division 27 Section "Communications Horizontal Cabling" for communications cabling requirements for modular dimming control system.
11. Division 27 Section "Audio-Visual Communications" for communications and network cabling requirements for lighting systems and over all control systems communications.

12. Division 27 Section "Integrated Audio-Video Systems and Equipment" for integrated AV systems.

1.2 REFERENCES

- A. California Energy Commission (CEC):
 1. CEC CCR Title 24, Part 6: California Energy Efficiency Standards for Residential and Nonresidential Buildings, California's Appliance Efficiency Program: Listed lighting control devices.
- B. National Fire Protection Association (NFPA):
 1. NFPA 70 - National Electrical Code.
- C. Underwriters Laboratories (UL):
 1. UL 508 – Industrial Control Equipment.
- D. National Electrical Code (NEC):
 1. NEC Article 410.134 – Direct Current Equipment.
- E. EMerge Alliance:
 1. EMerge Alliance Occupied Space Standard for Low Voltage DC Power Distribution Systems.
- F. ABBREVIATIONS:
 1. BAS: Building Automation System.
 2. AV: Audio Visual.
 3. RF: Radio Frequency.

1.3 DEFINITIONS

- A. IEEE 802.15.4: A standard which specifies the physical layer and media access control for low rate wireless personal area networks (LR-WPANS)
- B. Radio Frequency (RF): 2-way RF, 2.4 GHz ISM Channels 11-26 (2400 to 2483.6 MHz), IEEE802.15.4 compliant
- C. Scene: A preprogrammed arrangement for lights, shades, drapery or temperature controls that can be recalled by the push of a button on a central control microprocessor.
- D. Peripherals: devices that consume 24VDC delivered by an EMerge System's standard 24VDC power supply module.

1.4 SYSTEM DESCRIPTION

Specifier: Edit description below to correspond to Project requirements.

- A. Control system for lighting and other peripherals in a 24VDC EMerge Alliance compliant system utilizing wireless dimming and switching modules with integrated support for connection of occupancy and photo sensors.

1. Lighting Controller: Fixture mounted, dual channel lighting controller with occupancy and photo sensor inputs, wireless connection to central control processor, local control by standard SPST or momentary wall switch.
2. Lighting controller system with central master control processor integrates the following controls:
 - a. Native communication with building wide Audio Visual Systems.
 - b. Emergency Lighting Control when used with UL 924 devices.
 - c. Multiple Lighting Control Systems.
 - d. Touch panel controls.
 - e. Window treatment controls.
 - f. Room-combining partition sensor.
 - g. Timed room lighting.
 - h. HVAC controls.
 - i. Centralized facility management server:
 - 1) Web-accessible, network-connected, Windows-based lighting management software running on a Microsoft Exchange Server communicating over TCP/IP networks to provide lighting and window shade control, daylight harvesting, load shedding, occupancy sensing, and occupied/unoccupied lighting schedules.
 - 2) Store, evaluate and report power usage data.
 - j. Energy Monitor – Monitor room power usage.
 - k. Building Management Systems Interface – Direct communications through master controller with BACnet, Modbus, LonWorks and Metasys management protocols.
- B. Unified System Integration – Controller supports native communication protocol utilized by the AV control system.
 1. Communication protocol adaptors or translation interfaces between AV control system and lighting control system will not be accepted.

1.5 ACTION SUBMITTALS

Specifier: Action submittals require responsive action by A/E or Owner.

- A. Product Data: For each type of product required for complete modular dimming control system, demonstrating compliance with requirements.
- B. Shop Drawings: Indicate the following:
 1. Schematic diagram of controlled circuits and peripherals and user interfaces.
 2. Circuits and emergency circuits with capacity and phase, control zones, load type and voltage per circuit.

1.6 INFORMATIONAL SUBMITTALS

Specifier: Informational submittals require review, but not response, by A/E or Owner. Edit list below based on project requirements.

- A. Buy American Act certificate.
- B. CEC CCR Title 24 appliance efficiency listing certification.
- C. Sample of manufacturer's warranty.
- D. Load Measurement Report: Submit field test report of finished dimming circuit work.

1.7 CLOSEOUT SUBMITTALS

- A. Operating and maintenance instructions.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualification: Manufacturer of modular controls with minimum [five] years record of satisfactory manufacturing and support of components comparable to basis of design system.
- B. Source Requirements: Provide modular dimming controls hardware and software through a single source from a single manufacturer.
- C. Manufacturer Qualifications: Participating member and manufacturer of products designed, evaluated and registered according to the EMerge Alliance Standard.

Specifier: Retain paragraph below if Owner allows substitutions but requires strict control over qualifying of substitutions.

- 1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:
 - a. Product data indicating compliance with requirements of this Section.
 - b. Samples of each component.
 - c. Sample submittals from similar project.
 - d. Project references: Minimum of 5 completed installations, with Owner and Architect contact information.
 - e. Sample warranty.
- 2. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.
- 3. Approved manufacturers must comply with separate requirements of Submittals Article.
- D. Electrical Components, Devices, and Accessories: UL listed and labeled.
- E. 24VDC Lighting Control Components, and Devices: evaluated and registered according to the EMerge Alliance Standard.
- F. Regulatory Requirements: Provide components and systems that comply with requirements of the following:
 - 1. NFPA 70.
 - 2. Underwriters Laboratory (UL) standards.
 - 3. Applicable codes and regulations.

- G. Buy American Act Certification: Provide products that comply with provisions of the Buy American Act 41 U.S.C 10a – 10d.

Specifier: Retain paragraphs below when Project requirements include compliance with Federal Buy American provisions. Crestron CLC-1DIMFLV2EX-24V components comply with requirement.

- H. California Title 24 Appliance Efficiency Listing: Provide products that comply with provisions of CCR Title 24, Part 6.

Specifier: Retain paragraph below when Project requirements include compliance with California title 24 provisions. Crestron CLC-1DIMFLV2EX-24V components comply with requirement.

1.9 COORDINATION

Specifier: Edit list below to reference sections controlled by lighting controls for Project. Crestron lighting control system is able to integrate with Crestron's Cresnet building-wide automation network, BAS, building security systems, and a variety of equipment and devices.

- A. Coordinate integrated dimming controls with systems and components specified in the following sections:

1. Division 11 Section "Audio-Visual Equipment".
2. Division 12 Section "Window Treatments".
3. Division 23 Section "Instrumentation and Control for HVAC".
4. Division 25 Section "Integrated Automation Control of Electrical Systems".
5. Division 26 Section "Wiring Devices".
6. Division 26 Section "Lighting Devices".
7. Division 26 Section "Interior Lighting".
8. Division 27 Section "Communications Horizontal Cabling".
9. Division 27 Section "Audio-Visual Communications".
10. Division 27 Section "Audio-Video Systems".
11. Division 28 Section "Electronic Access Control and Intrusion Detection".

1.10 PROJECT CONDITIONS

- A. Environmental Conditions Range:

1. Temperature: 32 – 104 deg F (0 - 40 deg C).
2. Relative Humidity: 10 – 90 percent, non-condensing.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of modular dimming controls system the fail in materials or workmanship within the specified warranty period following substantial completion.

1. Warranty Period: Touch screen display and overlay components: 90 days.
2. Warranty Period: Disc drives and other moving parts, pan/tilt heads, and power supplies: 1 year.
3. Warranty Period: Other components, 3 years.

- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of modular dimming controls system that fail in materials or workmanship within the specified warranty period following substantial completion.
- C. Manufacturer's Extended Support Service: Extended telephone support: Unlimited period.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products of Crestron Electronics, Inc., Rockleigh, NJ 07647, Phone (800)237-2041, Fax: (201)767-1903, www.crestron.com[or comparable products from a single manufacturer approved by Architect prior to bidding], with the following components and characteristics.

2.2 LIGHTING CONTROLLER

- A. Lighting Controller: Wireless integrated dimming, and switching control, and sensor interface in ceiling mounted enclosure.
 - 1. Basis of Design Product: Crestron, Green Light CLC-1DIMFLV2EX-24V Wireless In-Ceiling Dimmer.
- B. Lighting Controller Characteristics: Provide lighting controller configured as follows:
 - 1. Controller wirelessly networked to central lighting control processor specified in Division 26 Section "Central Dimming Controls", "Network Lighting Controls" or Division 27 Section "Audio-Video Systems".
- C. Dimmable Load Types: Switched load 2.5A per channel at 24VDC:
 - 1. 0 – 10V Fluorescent.
 - 2. 0 – 10V LED.
- D. Switched Load Types:
 - 1. 24VDC Fluorescent ballast.
 - 2. 24VDC LED.
- E. Power Requirements:
 - 1. Main Power: 24VDC, non-polarized.
- F. Input/Output:
 - 1. All connections: Screw terminals.
- G. Enclosure: Plastic; UL 2043 approved.

2.3 CONTROL INTERFACES:

- A. Direct Connecting:
 - 1. Switch:

- a. SPST type.
- b. Momentary type.

2.4 SENSORS

A. OCCUPANCY SENSOR:

1. Basis of Design Product: Crestron Photocell Model GLS-ODT Series.
2. Remote Occupancy Sensors: Combination of ultrasonic motion detection and passive infrared detection with internal microprocessor. Sensor independently adjustable for installed conditions. Delayed time off adjustment. Walk-through mode. Adjustable built-in photocell for daylight optimization. Equipped with 4-wire interface for direct connection to controller.
3. Coverage: [180 deg., 500 sq. ft.][360 deg., 1000 sq. ft.][360 deg., 2000 sq. ft.][1200 sq. ft.].
4. Mounting: [Ceiling flush mounted][Ceiling surface mounted][Ceiling bracket mounted][Wall flush mounted][Wall surface mounted][Wall bracket mounted][As indicated].

B. PHOTO SENSOR:

Specifier: Crestron Photocell Model GLS-LOL open-loop photocell sensing provides a cost-effective solution for daylight harvesting, allowing multiple lighting zones to be controlled by a single sensor. In a typical office, classroom, or similar space, the photocell is installed on the ceiling near a window, or in the light well of a skylight, directed toward the incoming daylight and away from any electrical lighting fixtures. The system estimates the total amount of ambient lighting in the room according to the light level measured by the photocell. Requires use of control processor specified below.

1. Basis of Design: Crestron Photocell Model GLS-LOL.
2. Photocell Sensor, Open Loop Type: Continually monitors daylight entering window or skylight to enable daylight harvesting applications to provide control of room lighting based on presence of daylight. Equipped with 3-wire interface for direct connection to control system utilizing control processor; 24 VDC power from network control bus.
3. Mounting: [Ceiling flush mounted] [Ceiling surface mounted] [Wall flush mounted] [Wall surface mounted] [As indicated].

2.5 CENTRAL SIGNAL PROCESSOR

- ### A. AUTOMATION CONTROL SYSTEM PROCESSOR: Programmable control processor for audio-visual, lighting and automation applications. real-time, preemptive multi-threaded/multitasking kernel; Transaction-Safe Extended FAT file system; supports up to 10 simultaneously running programs.

Specifier: The Crestron MC3 works seamlessly with Crestron's entire line of lighting dimmers and shade controls, keypads and touch panels, thermostats, wireless gateways, control cards, and expansion modules.

1. Basis of Design: Crestron Automation Controller Model MC3.
2. RF gateway: 2-way RF, 2.4 GHz ISM Channels 11-26 (2400 to 2483.5 MHz), IEEE 802.15.4 compliant.

- B. Control Processor: Network connected dual bus programmable control processor for low voltage controls, devices, and subsystems through multiple control interfaces. SNMP support, with built-in firewall, NAT, and router. 4-wire bus providing 24 VDC power to network devices, with two independent sensing inputs. In separate enclosure.

Specifier: The Crestron PAC2 works seamlessly with Crestron's entire line of lighting dimmers and shade controls, keypads and touch panels, thermostats, wireless gateways, control cards, and expansion modules.

1. Basis of Design: Crestron Professional Automation Control System Model PAC2.
2. Mounting: [Surface-mounted][Modular enclosure-mounted, in array indicated].

- C. Control Processor: Integrates sensors and other low voltage controls, devices, and subsystems through multiple control interfaces with control network. Enables addition of relays, 8 separate I/O ports in 2 isolated segments supporting up to 20 devices each, serial COM ports, DTMF interfaces, and shade controllers. MMC memory expansion card slot. 4-wire bus providing 24 VDC power to network devices, with two independent sensing inputs. Use with separate power supply.

Specifier: The Crestron PAC2M is a compact, low-cost alternative to the PAC2 designed for small lighting and automation applications. At half the size of a PAC2, the PAC2M is perfect for apartments and smaller homes as well as individual meeting rooms and lecture halls.

1. Basis of Design: Crestron Professional Automation Mini-Control System Model PAC2M.
2. Mounting: [Surface-mounted][Modular enclosure-mounted in array indicated].

- D. Control Processor Power Supply: 50W, 24 V regulated power supply with 2: 4-pin network connectors, fuse-protected.

1. Basis of Design: Crestron Cresnet Power Supply Model GLA-PWS-50.
2. Mounting: Surface-mounted over a 4" square or 2-gang electrical box.

2.6 SYSTEM ACCESSORIES

Specifier: Retain and edit accessory paragraphs below as required to match system requirements. Select one of the paragraphs below if touch panel display is part of system controls. Select display size and mounting type for touch panel.

Specifier: Retain and edit accessory paragraphs below as required to match system requirements.

- A. Touch Panel: Controls lighting and AV settings along with other modular dimming controller functions.
1. Basis of design: Crestron Isys TPS-6L Touch Panel.
 2. 5.7 inch active-matrix color LCD touch screen 640 by 480 SVGA resolution display.
 3. 16-bit color graphics, and dual-window HD video, HDTV, and high-resolution RGB streaming multimedia, IP intercom, and web browsing capabilities. Dynamic graphics and text capability. Enables custom control screen programming.
 4. Video display: Scalable display on touch panel screen.
 5. Pushbutton Controls: 12 engraved backlit tactile pushbuttons for volume, channel, and on-screen menu navigation and programmable functions, snap-on front bezel button cover[, and custom engravable button kit].
 6. Mounting Kit: [Wall][Rack][Lectern] mounting kit with power, wired Ethernet and CAT5 video connectivity, with back box and trim ring[, and speaker kit].

7. Powerpack: 24VDC.
 8. Color: [Almond][Black][White].
- B. Touch Panel: Controls lighting and AV settings along with other modular dimming controller functions.
1. Basis of design: Crestron Isys TPS-4L Touch Panel.
 2. 3.6 inch active-matrix compact color LCD touch screen 320 by 240 QVGA resolution display.
 3. 16-bit color graphics, and dual-window HD video, HDTV, and high-resolution RGB streaming multimedia, IP intercom, and web browsing capabilities. Dynamic graphics and text capability. Enables custom control screen programming.
 4. Video display: Scalable display on touch panel screen.
 5. Pushbutton Controls: 10 engraved backlit tactile pushbuttons for volume, channel, and on-screen menu navigation and programmable functions, snap-on front bezel button cover[, and custom engravable button kit].
 6. Mounting Kit: [Flush wall][Lectern] mounting kit with power, wired Ethernet and CAT5 video connectivity, with back box and trim ring[, and speaker kit].
 7. Powerpack: 24VDC.
 8. Color: As selected from manufacturer's full range of minimum 10 colors.

- C. Remote Keypad Controls: Field-configurable remote keypad with auto-adjusting backlight illuminating replaceable, engravable programmable buttons in number indicated, with white LED indicators, configured to fit in standard single-gang box.

Specifier: Cameo Series Keypads are available in 12 designer colors in 2- to 6- button arrays. Faceplates are not furnished by Crestron.

1. Basis of Design: Crestron, Cameo Series Keypad Model C2N-CB (D/F) Series.
2. Color: As selected from manufacturer's full range of minimum 12 colors.
3. Faceplates: [Insert faceplate description].

- D. Remote Keypad Controls: Remote keypad with replaceable, engravable buttons in number indicated, with red LED indicators, 3W, configured to fit in standard single-gang box.

Specifier: Decorator Series Keypads are available with black, white, or ivory buttons in 6, 8, or 12- button arrays. Faceplates are not furnished by Crestron.

1. Basis of Design: Crestron, Decorator Series Keypad Model C2N-DB Series.
2. Faceplates: [Insert faceplate description].

- E. Passive Infrared Occupancy Sensors: Passive infrared detection with internal microprocessor. Sensor independently adjustable for installed conditions. Delayed time off adjustment. Walk-through mode. Adjustable built-in photocell for daylight optimization. Equipped with 3-wire interface for direct connection to control system; 24 VDC power from network control bus.

Specifier: Crestron GLS-OIR Series Occupancy Sensors utilize passive infrared technology to achieve dependable motion detection with superior immunity to false triggering from air currents, inanimate objects, or movement in an adjacent corridor. Advanced self-adaptive, passive infrared motion sensing affords

excellent reliability for control of lighting, climate control and other devices in the room. Sensitivity is adjustable for optimum performance.

1. Basis of Design: Crestron Photocell Model GLS-OIR Series.
 2. Mounting and Coverage: [Low profile ceiling surface mounted, 360 deg., 450 sq. ft.][Low profile ceiling surface mounted, 360 deg., 1500 sq. ft.][Wall bracket mounted, 360 deg., 2500 sq. ft.][Ceiling bracket mounted, 360 deg., 2500 sq. ft.][As indicated].
- F. Photocell Sensor, Closed Loop Type: Continually monitors daylight at work station location to enable daylight harvesting applications to provide control of room lighting based on lighting level at workstation. Equipped with 3-wire interface for direct connection to control system utilizing control processor; 24 VDC power from network control bus.

Specifier: Crestron Photocell GLS-LCL is intended for use with closed-loop type daylight harvesting systems. It continually monitors the total ambient light level from all available light sources, enabling precise control of room lighting and window shades to maintain a consistent level of light throughout the day. The best place to install the GLS-LCL in a typical office or similar space is on the ceiling directly above the primary work area. The sensor measures all light within a 60° cone, which consists predominantly of reflected light, acquiring the most natural approximation of perceived changes in ambient light levels.

1. Basis of Design: Crestron Photocell GLS-LCL.
2. Mounting: [Ceiling flush mounted][Ceiling surface mounted][Wall flush mounted][Wall surface mounted][As indicated].

2.7 CONDUCTORS AND CABLING

- A. Power Supply Side of Remote-Control Power Sources: Comply with requirements of Division 26 Section "Low-Voltage Electrical Power Conductors."
- B. UTP Cable: 100-ohm, UTP. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
1. Communications Control Cable, Non-Plenum Rated: 22 AWG stranded bare copper data pair, and 18 AWG stranded bare copper power pair, Type CM.
 - a. Basis of Design Product: Crestron CRESNET-NP.
 2. Communications Control Cable, Plenum Rated: 22 AWG data pair, stranded bare copper and 18 AWG AWG power pair, stranded bare copper, Type CMP, complying with NFPA 262.
 - a. Basis of Design Product: Crestron CRESNET-P.
 3. Communications High-Power Control Cable, Non-Plenum Rated: 22 AWG stranded bare copper data pair, and 12 AWG stranded bare copper power pair, Type CM.
 - a. Basis of Design Product: Crestron CRESNET-HP-NP.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Prior to installation, examine work area to verify measurements, and that commencing installation complies with manufacturer's requirements.

3.2 INSTALLATION

- A. Comply with requirements of Division 26 Sections "Common Work Results for Electrical."
- B. Do not install dimming controls until space is enclosed, HVAC systems are running, and overhead and wet work in dimming control work space are complete.
- C. Install dimming controls in accordance with manufacturer's instructions.
- D. Grounding: Provide electrical grounding in accordance with NFPA 70.
- E. Perform setup for each lighting scene, window shade controller, and audio-visual equipment component.

3.3 SYSTEM STARTUP

- A. Provide system startup and adjustment to occupied conditions in accordance with manufacturer's recommendations.
- B. Perform operational testing to verify compliance with Specifications. Adjust as required.
- C. Measure and record load on each controlled circuit in each scene. Submit report of load measurements.

3.4 CLOSEOUT ACTIVITIES

Specifier: On projects with more complex installations, consider retaining both demonstration and training by manufacturer's authorized representative. Consult Crestron representative for costs associated with these services.

- A. Demonstration: Schedule dimming controls demonstration with Owner to allow verification that dimming controls function as required.
- B. Training: Train Owner's personnel to operate, maintain, and program modular dimming controls.

END OF SECTION 26 09 43.13