CRESTRON® DALI NETWORK LIGHTING CONTROLS

Crestron DIN-DALI-2 computer programmable, network connected DALI-compliant lighting controllers send on-off and dimming instructions to addressable DALI-compliant lighting ballasts and receive ballast and lamp condition reports from the fixture. DALI-compliant ballasts, available for a wide variety of industry lighting products, are self contained on-off and dimming ballasts. The integrated switching and dimming of DALI-compliant ballasts makes it possible to individually control separate ballasts fed from the same line level power source. The Crestron Din-DALI-2 processor sends and receives DALI signals over two independent single wire loops with capacity for 64 DALI ballasts on each loop. Override inputs on the front of the DIN-DALI-2 will sense closure of an external contact and put each ballast into its predetermined system override state. The coupling of a Crestron DIN DALI 2 to a Crestron 2 series control processor expands the versatility of the lighting control system.

The **Crestron DIN-AP2** series control processor is extensively programmable using Crestron's suite of powerful development software and vast database of drivers and software modules. The DIN-AP2 works seamlessly with Crestron's entire line of shade controls, keypads, touchpanels, thermostats, wireless gateways, and expansion modules. The **DIN-AP2** also provides for the integration of non-Crestron devices and subsystems through a host of control interfaces. Four isolated relays and eight Versiport I/O ports are built in to accommodate all kinds of sensors, contactors, door strikes, and other low-voltage controls. Two bidirectional RS-232 COM ports and four IR/serial ports allow for the integration of everything from simple shade controllers to advanced security systems. Additional interfaces and controllers can be added. The **DIN AP2** is a perfect up front automation processor for **DIN-DALI-2** lighting controller.

DALI-compliant lighting control systems are a great choice for upgrading inefficient lighting systems to current energy management standards because it does not require modifications to the existing line wiring; and DALI provides the flexibility of allowing reconfiguring of zones after a system is installed. Power for the Crestron DIN-DALi-2 may be provide by Power over Ethernet or through Cresnet cabling.

RoomView® Server Edition management software allows the user to monitor, manage and control all Crestron connected equipment throughout a global enterprise. Crestron Control Systems can only be accessed with the correct IP address, port number, user name and password.

Crestron control systems, touchpanels, and RoomView enterprise management software have been certified by Cisco and Microsoft Corporations. After rigorous testing, Cisco and Microsoft have standardized on Crestron technology to manage and control AV resources worldwide.

Crestron is the world's leading manufacturer of advanced control and automation systems, innovating technology and reinventing the way people live and work. Offering integrated solutions to control lighting, motors, audio, video, computer, and environmental systems, Crestron streamlines technology, improving the quality of life for people in corporate conference rooms, classrooms, auditoriums, and in their homes.

Contact Crestron Electronics, Inc., Rockleigh, NJ 07647, Phone (800)237-2041, Fax: (201)767-1903, www.crestron.com, email: info@crestron.com.

SECTION 26 09 43
NETWORK LIGHTING CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. DALI-compliant network integrated lighting controls and lighting control devices.

B. Related Information:

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

1. Division 12 Section "Window Treatments" for window treatments controlled by network dimming control system.
2. Division 25 Section "Integrated Automation Control of Electrical Systems" for software and integration hardware for network lighting controls.
3. Division 26 Section "Common Work Results For Electrical".
4. Division 26 Section "Lighting Control Devices" for occupancy sensors, photoelectric sensors.
5. Division 26 Section "Interior Lighting" for light fixtures controlled by DALI-compliant network lighting control systems.
6. Division 27 Section "Communications Horizontal Cabling" for communications cabling requirements for network lighting control systems.
7. Division 27 Section "Audio-Visual Communications" for communications and network cabling requirements for lighting systems and over all control systems communications.

1.2 REFERENCES

Specifier: References Article is optional. If retaining, edit and coordinate list of sections below to correspond to Project requirements.

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.

1.3 DEFINITIONS

A. DALI: Digital addressable lighting interface.

B. RS-485: A serial network protocol, similar to RS-232, complying with TIA-485-A.

C. UTP: Unshielded twisted pair.

1.4 SYSTEM DESCRIPTION

A. Network lighting control systems configured to send and receive operating and maintenance signals from DALI-compliant network addressable lighting ballasts. Windows based firmware and software will perform the full suite of DALI commands and reporting functions. The system will communicate with the DALI ballasts over a single wire Ethernet cable or twisted pair cable.

B. System Components: System includes the following addressable components:

1. Native communication with building wide Audio Visual Systems.
2. Keypad controls.
3. Touch panel controls.
4. Window treatment controls.
5. Light sensors.
6. Remote occupancy sensors.
7. Room-combining partition sensor.
8. Daylight compensating lighting controls.
9. Interface to facility-wide room management.
10. Interface to building automation system interface.

C. System Communication:

1. Native communication with building wide Audio Visual Systems.

D. 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 network lighting control system, demonstrating compliance with requirements.

B. Shop Drawings: Indicated the following:

1. Schematic diagram showing complete network lighting control system and accessories.
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.

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 completed installation.

1.7 CLOSEOUT SUBMITTALS

A. Operating and maintenance instructions.

B. Record drawings of network system.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualification: Manufacturer of DALI-compliant network lighting controls with minimum [five] years record of satisfactory manufacturing and support of components comparable to basis of design system.

B. Source Requirements: Provide DALI-compliant Network Lighting Controls through a single source from a single manufacturer.

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

C. Manufacturer Qualifications: Approved manufacturer of network lighting controls listed in this Section with minimum [five] years record of satisfactory manufacturing and support of components comparable to basis of design system.

1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

   a. Product data, including certified independent test data indicating compliance with requirements.
   b. Samples of each component.
   c. Sample submittal from similar project.
   d. Project references: Minimum of 5 installations not less than 5 years old, 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 separate requirements of Submittals Article.

D. Electrical Components, Devices, and Accessories: UL listed and labeled per NFPA 70.

Specifier: Retain paragraphs below when Project requirements include compliance with Federal Buy American provisions. Crestron components comply with requirement.

E. Buy American Act Certification: Submit documentation certifying that products comply with provisions of the Buy American Act 41 U.S.C 10a – 10d.

Specifier: Retain paragraph below when Project requirements include compliance with California title 24 provisions. Crestron Green Light components comply with requirement.

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

1.9 COORDINATION

Specifier: Edit list below to reference sections controlled by modular dimming controls for Project. Crestron Green Light 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 lighting 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 "Panelboards".
6. Division 26 Section "Wiring Devices".
7. Division 26 Section "Lighting Devices".
8. Division 26 Section "Interior Lighting".
9. Division 27 Section "Communications Horizontal Cabling".
10. 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, noncondensing.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of network lighting control system that 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: Other components, 3 years.

B. Manufacturer's Extended Support Service: Extended telephone support: Unlimited period.

1.12 SOFTWARE AGREEMENT

A. Provide manufacturer' software support for a minimum of five (5) years.

B. Software and Firmware Upgrades: Upgrade firmware and software to current versions for a period of five (5) years.

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 NETWORK LIGHTING CONTROLS

A. General: System Components comply with protocol described in IEC 60929, Annex E, and IEC 62386 for DALI lighting control devices, wiring, and computer hardware and software.

B. System Description: Individually addressable electronic ballasts, dimmers, and manual switches operated from signals received through DALI-compliant bus from variety of digital communication devices. Controlled devices able to report status to digital communication devices via bus.

C. Interoperability: Lighting control shall be configured to allow individual users to control lighting with DALI-compliant, digital-communication devices. Software shall be written for Windows operating system, with the full suite of DALI commands and device parameter settings.

2.3 SIGNAL PROCESSORS

A. DALI Interface Controller: DIN-rail mounted, DALI-compliant interface controller providing for single wire connectivity to minimum 128 DALI ballasts over two independent loops, with integrated power supply.

1. Basis of Design Product: **Crestron, DIN-DALI-2 Interface**.
2. Connectivity:

    a. DALI 1 and 2: Two 2 pin terminals.
    b. Computer: USB female USB 1.1 computer console port.
    c. Override Ports: Two 2 pin paralleled terminal blocks.
    d. LAN Power over Ethernet: One 8 wire RJ-45 connector.
    e. NET: Two 4 pin terminal blocks.

3. DALI Integrated Power: Selectable internal or external.
4. Mounting: DIN 43880 form factor occupying not more than 9 DIN modules.
5. Firmware: Upgradeable, Windows-based.
6. Commissioning Software: PC based, providing step by step configuration of ballast properties, groups and scenes.

B. Automation Processor: DIN-rail mounted, DALI-compliant programmable control processor for lighting and automation applications.

1. Basis of Design Product: **Crestron, DIN-AP2 Automation Controller**.
2. CPU: 32-bit Freescale ColdFire Microprocessor.
3. Connectivity:

    a. System port.
    b. 10/100 Ethernet SSL encryption.

c. 2: Bidirectional RS 232 COM Ports.
d. 4: Infrared/serial ports.
e. 8: Versiport I/O ports.
f. 4: Low voltage relay ports.

4. Connections:

a. I/O 1 – 8: One 9-pin terminal block with 8 digital input/output or analog input ports.
b. Relays: One 8-pin terminal block with four normally open isolated relays.
c. Computer: One USB female 1.1 computer console port.
d. LAN: One 8-wire RJ-45 connector.
e. NET: Two 4-pin terminal blocks paralleled.
f. Com 1 – 2: Two 5-pin terminal blocks.
g. IR/Serial 1 – 4: One 8-pin terminal block with four IR/Serial output ports.
h. Memory: One MMC compatible card slot, 2 GB capacity.

5. Power Supply: External.

a. Power Requirement: 8 Watts (0.33 amps at 24VDC).

6. System Clock: Firmware-based internal clock.

2.4 SYSTEM ACCESSORIES

Specifier: Retain and edit accessory paragraphs below as required to match system requirements. These system accessories are for connection to the Crestron DIN-AP-2

A. Touchpanel: Controls lighting along with other modular dimming controller functions.

1. 5.7 inch active-matrix color LCD touch screen 640 by 480 SVGA resolution display.

a. Basis of design: **Crestron Isys TPS-6L Touchpanel**.

2. 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.
3. Video display: Scalable display on touchpanel screen.
4. 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**]**.
5. Mounting Kit: **[**Wall**] [**Rack**] [**Lectern**]** mounting kit with power, wired Ethernet and CAT5 video connectivity, with back box and trim ring**[**, and speaker kit**]**.
6. Powerpack: 24VDC.
7. Color: **[**Almond**] [**Black**] [**White**]**.

B. Touchpanel: Controls lighting along with other modular dimming controller functions.

1. 3.6 inch active-matrix compact color LCD touch screen 320 by 240 QVGA resolution display.

a. Basis of design: **Crestron Isys TPS-4L Touchpanel**.

2. 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.
3. Video display: Scalable display on touchpanel screen.
4. 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].
5. Mounting Kit: [Flush wall] [Lectern] mounting kit with power, wired Ethernet and CAT5 video connectivity, with back box and trim ring[, and speaker kit].
6. Powerpack: 24VDC.
7. Color: As selected from manufacturer's full range of minimum 10 colors.

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

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.

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].

Specifier: **Designer Series Keypads** are available with backlit black buttons or standard white or ivory buttons in 2, 4, 6, 8, or 12- button arrays. Textured finish integrated faceplates or optional architectural faceplates are available.

D. Remote Keypad Controls: Remote keypad with[backlight illuminating] replaceable, engravable buttons in number indicated, with amber LED indicators, configured to fit in standard single-gang box.

1. Basis of Design: **Crestron, Designer Series Keypad Model CNX- Series**.
2. Faceplates: [As selected from manufacturer's full line] [Insert faceplate description].

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.

E. 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.

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

Specifier: Retain optional IR remote control and remote receiver accessories below if required.

F. Remote Control: Handheld infrared remote control device.

G. Infrared Remote Receiver: Provide integral 36 kHz infrared receiver for use with remote control.

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.

H. 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.

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**]**.

Specifier: **Crestron GLS-ODT Series Occupancy Sensors** offer dual-technology sensing utilizing both ultrasonic and passive infra-red detection with an internal microprocessor to maintain accurate control of lighting systems, reducing energy costs while maintaining user convenience. Sensors detect movement within space while reducing false triggering or shutoffs while space is occupied. Several mounting types and coverage areas are available.

I. 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 3-wire interface for direct connection to control system; 24 VDC power from network control bus.

1. Basis of Design: **Crestron Photocell Model GLS-ODT Series**.
2. Coverage: **[**180 deg., 500 sq. ft.**]** **[**360 deg., 1000 sq. ft.**]** **[**360 deg., 2000 sq. ft.**]** **[**1200 sq. ft.**]**.
3. Mounting: **[**Ceiling flush mounted**]** **[**Ceiling surface mounted**]** **[**Ceiling bracket mounted**]** **[**Wall flush mounted**]** **[**Wall surface mounted**]** **[**Wall bracket mounted**]** **[**As indicated**]**.

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.

J. 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.

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

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 predominately of reflected light, acquiring the most natural approximation of perceived changes in ambient light levels.

Requires use of control processor specified below.

K. 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.

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

2.5 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 data pair stranded bare copper, and 18 AWG power pair stranded bare copper, 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 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 network lighting controls until space is enclosed, HVAC systems are running, and overhead and wet work in space are complete.

C. Install network lighting controls in accordance with manufacturer's instructions.

D. Grounding: Provide electrical grounding in accordance with NFPA 70.

3.3 SOFTWARE

A. Install and program software to meet the Owner's requirements. Provide current licenses. And backup copies of the software for the Owner's use.

3.4 SYSTEM STARTUP

A. Provide manufacturer's system startup and adjustment.

B. Switch each load on and off. Test dimming features. Test system integration to the satisfaction of engineer. Provide a written report of test and outcomes.

C. Perform operational testing to verify compliance with Specifications. Adjust as required.

3.5 ADJUSTING

A. Within 12 months of the date of Substantial Completion provide onsite service to adjust the system to account for actual occupied conditions.

3.6 DEMONSTRATION

A. Factory authorized service representative to instruct owner's staff to adjust, operate and maintain network lighting systems; and provide instruction using the system software.

3.7 CLOSEOUT ACTIVITIES

A. Demonstration: Schedule demonstration with Owner.

B. Training: Train Owner's personnel to operate, maintain, and program network power switching systems. Allow for a minimum of 4 trips to the jobsite to provide additional training as needed.

1. Furnish set of approved submittals and record drawings of actual installation for Owner's personnel in attendance at training session.

END OF SECTION 26 09 43