SECTION 26 09 43.13

Digital-Network Lighting Controls

Table of Contents

SECTION 26 09 43.13 1

Digital-Network Lighting Controls 1

Table of Contents 1

SECTION 26 09 43.13 2

Digital-Network Lighting Controls 2

PART 1 GENERAL 2

1.1 SUMMARY 2

1.2 REFERENCES 3

1.3 SYSTEM DESCRIPTION 3

1.4 ACTION SUBMITTALS 4

1.5 INFORMATIONAL SUBMITTALS 4

1.6 CLOSEOUT SUBMITTALS 4

1.7 QUALITY ASSURANCE 4

1.8 COORDINATION 5

1.9 PROJECT CONDITIONS 5

1.10 WARRANTY 6

PART 2 PRODUCTS 6

2.1 SWITCHING SYSTEM 6

2.2 AUTOMATION CONTROL PROCESSORS 7

2.3 CONTROL PROCESSOR TYPE 1 7

2.4 CONTROL PROCESSOR TYPE 2 10

2.5 USER INTERFACES 12

2.6 SENSORS 14

2.7 CONDUCTORS AND CABLING 15

2.8 SYSTEM FUNCTIONS AND SEQUENCES 16

2.9 USER INTERFACE CONTROL FUNCTIONS 16

2.10 PROGRAMMING AND CONFIGURATION SOFTWARE 17

PART 3 EXECUTION 17

3.1 EXAMINATION 17

3.2 INSTALLATION 17

3.3 SYSTEM OPERATING SOFTWARE 18

3.4 SYSTEM STARTUP 18

3.5 ADJUSTING 18

3.6 DEMONSTRATION 18

3.7 CLOSEOUT ACTIVITIES 18

SECTION 26 09 43.13

Digital-Network Lighting Controls

Specifier: The Specifier/Design Professional is responsible for the accuracy of all project specifications, including system application and coordination with related sections. This guide specification is provided as a convenience and requires editing to match actual project requirements. CRESTRON ELECTRONICS, INC. SHALL NOT BE LIABLE FOR ANY DAMAGES ARISING OUT OF THE USE OF ANY OF ITS GUIDE SPECIFICATIONS. For Crestron design assistance and design review please contact Sales Support Services Department at 800.237.2041 or techsales@crestron.com.

1. GENERAL
	1. SUMMARY
		1. Section Includes:
			1. Networked Central Lighting Control systems. Systems are composed of:
				1. Network integrated power switching systems.
				2. Network integrated dimming systems.
				3. DALI-compliant network integrated lighting controller.
				4. Automation control processors.
				5. Sensors
				6. User Interfaces:

Keypad

Touch screen

Virtual touch screen

* + - 1. System Functions and Sequences
		1. Related Requirements:
			1. Section 12 24 13 Roller Window Shades

Specifier: User interfaces in this section are capable of controlling compatible motorized shades and drapes. Coordination of specifications and scope of work is required, i.e. lighting systems and shade systems share user interfaces and control processors.

* + - 1. Section 25 08 00 Commissioning of Integrated Automation
			2. Section 25 10 00 Integrated Automation Network Equipment
			3. Section 25 11 13 Integrated Automation Network Servers
			4. Section 25 13 13 Integrated Automation Control and Monitoring Network Supervisory Control
			5. Section 25 13 19 Integrated Automation Control and Monitoring Network Interoperability
			6. Section 25 15 16 Integrated Automation Software for Control and Monitoring Networks
			7. Section 26 05 00 Common Work Results For Electrical
			8. Section 26 27 26 Wiring Devices
			9. Section 26 51 00 Interior Lighting
			10. Section 27 15 00 Communications Horizontal Cabling
			11. Section 27 41 00 Audio-Video Systems

Audio-Visual user interfaces with advanced control capability of Div. 26 Systems.

* 1. REFERENCES

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

* + 1. Definitions
			1. Control: Effecting a change in state by one PC program onto a microprocessor or device.
			2. Scene: Predetermined light level of a single fixture of group of fixtures.
			3. DALI: Digital addressable lighting interface.
			4. RS-485: A serial network protocol complying with TIA-485-A.
			5. UTP: Unshielded twisted pair.
		2. Reference Standards
			1. 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.
			2. National Fire Protection Association (NFPA):
				1. NFPA 70 - National Electrical Code.
			3. Underwriters Laboratories (UL)
				1. UL 508 – Industrial Control Equipment
	1. SYSTEM DESCRIPTION

Specifier: Edit description below to correspond to Project requirements.

* + 1. Web Accessible, network connected, lighting control system utilizing preset control software, central signal microprocessor, lighting control panel including integrated branch circuit protection, and **[**power switching modules and relays**] [**Dimming Modules**] [**DALI Control Modules**] [**Sensors**] [**User Interfaces**]**.
		2. System Components: System includes the following addressable components:
			1. Keypad controls.
			2. Touch screen controls.
			3. Window treatment controls.
			4. Remote occupancy sensors.
			5. Lighting load shedding.
			6. Timed room lighting.
			7. Daylight compensating lighting controls.
			8. Communication interface to facility-wide room management system.
			9. Communication interface to building automation system gateway/interface.
	1. ACTION SUBMITTALS

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

* + 1. Product Data: For each type of product required for complete network lighting control system, demonstrating compliance with requirements.
		2. 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. INFORMATIONAL SUBMITTALS

Specifier: Informational submittals require review, but not response, by A/E or Owner.

* + 1. CEC CCR Title 24 appliance efficiency listing certification.
		2. Sample of manufacturer's warranty.
		3. Load Measurement Report: Submit field test report of completed installation.
	1. CLOSEOUT SUBMITTALS
		1. Operating and maintenance instructions.
	2. QUALITY ASSURANCE
		1. Manufacturer Qualification: Manufacturer of network lighting controls with minimum **[**five**]** years record of satisfactory manufacturing and support of components comparable to basis of design system.
		2. Source Requirements: Provide Network Lighting System through a single source from a single manufacturer.

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

* + 1. 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:
				1. Product data, including certified independent test data indicating compliance with requirements.
				2. Samples of each component.
				3. Sample submittal from similar project.
				4. Project references: Minimum of 5 installations not less than 5 years old, with Owner and Architect contact information.
				5. 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.
		2. Electrical Components, Devices, and Accessories: UL listed and labeled per NFPA 70.

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

* + 1. California Appliance Efficiency Listing: Provide products that comply with provisions of CEC CCR Title 24, Part 6.
	1. COORDINATION

Specifer: Edit list below to reference sections integrated with lighting system(s) 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.

* + 1. Coordinate integrated lighting and 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 "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 27 Section “Audio-Video Systems”
			11. Division 28 Section "Electronic Access Control and Intrusion Detection".
	1. PROJECT CONDITIONS
		1. Environmental Conditions Range:
			1. Temperature: 32 – 104 deg F (0 - 40 deg C).
			2. Relative Humidity: 10 – 90 percent, noncondensing.
	2. WARRANTY
		1. 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.
		2. Manufacturer's Extended Support Service: Extended telephone support: Unlimited period.
1. PRODUCTS
	1. SWITCHING SYSTEM
		1. MANUFACTURERS
			1. 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](http://www.crestron.com) **[**or comparable products from a single manufacturer approved by Architect prior to bidding**]**, with the following components and characteristics.
		2. SYSTEM CHARACTERISTICS
			1. Web-accessible, network-connected programmable lighting control system that receives digital or analog signals from addressable input devices, assembles signals at central signal processor, and distributes operating signals to addressable control devices that effect a change in state.
				1. Electronic power switching modules and relays process signals and effect circuit on-off switching, emergency switching, and 0 – 10V fluorescent dimming where indicated. Emergency switching overrides preset state and puts each circuit to the programmed emergency condition. Buttons on the module provide manual disconnect and manual circuit testing.
		3. NETWORK LIGHTING CONTROL PANELS

Specifier: Crestron Green Light GLPX Network lighting control panels are feed-through type panels expandable from 8 to 56 circuits (separate branch circuit protection required.)

* + - 1. Control Panels, General: Comply with NEMA PB 1 and UL 50 (CAN/CSA C22.2, No. 94), UL 67 (CSA C22.2, No. 29), UL 489 (CAN/CSA C22.2, No. 65), and UL 916 (CSA C22.2, No. 205).
			2. Feed-Through Network Lighting Control Panels: Standard high inrush.
				1. Basis of Design Product: Crestron Green Light Express Power Switching Network Lighting Control panel Model GLPX-SW-FT.
				2. Branch Circuit Protection: Pass through type utilizing separate branch circuit protection indicated on Drawings.
				3. Switching Relay Types: Standard high inrush, lifetime rated minimum 10,000 on/off cycles, with air gap off protection.
				4. Cabinet Capacity: **[**8 circuits**]** **[**24 circuits**]** **[**56 circuits**]** **[**As required for circuits indicated**]**.
		1. POWER SWITCHING ACCESSORIES
			1. Switching Module, High Inrush:
				1. Basis of Design Product: Crestron Electronic Power Switching Module Model No. GLXP-SW- series.
				2. Channels of Switching: **[**8**]** **[**16**]** channel high inrush switching.
				3. Maximum Load.

Lighting: 16A per channel.

Motor: **[**1HP at 120V**]** **[**2HP at 230/277V**]** per channel.

* + - 1. Emergency Phase Loss Sensor: 120/277V, tripping transfer to emergency state.
				1. Basis of Design Product: Crestron Model No. GLS-PLS-120/277.
			2. Power Supply: 50W, 24 V regulated power supply with two 4-pin network connectors, fuse-protected.
				1. Basis of Design: Crestron Cresnet Power Supply Model GLA-PWS-50.
	1. AUTOMATION CONTROL PROCESSORS
		1. Manufacturers
			1. 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](http://www.crestron.com) **[**or comparable products from a single manufacturer approved by Architect prior to bidding**]**, with the following components and characteristics.

Specifier: Select control processor from 3 models listed below according to project requirements.

The **Crestron DIN-AP3** is a compact, DIN rail mounted control processor. Additional DIN rail mounted connectivity and control hardware is available. The DIN-AP3 can be used as a custom programmed control processor supporting virtually any functionality imaginable. It works seamlessly with Crestron's entire line of touchpanels, wireless remotes, lighting dimmers, shade controllers, thermostats, and more. It can also interface with third-party devices and systems such as security and access controls, surveillance cameras, and HVAC for a fully integrated solution.

* 1. CONTROL PROCESSOR TYPE 1

The DIN-AP3 includes native support for the BACnet/IP communication protocol providing a direct interface to third-party building management systems over Ethernet, simplifying integration with HVAC, security, fire & life safety, voice & data, lighting, shades, and other systems. Using BACnet/IP, each system runs independently with the ability to communicate together on one platform.

* + 1. Control Processor: DIN-rail mounted programmable control processor for lighting and automation applications.
			1. Basis of Design Product: Crestron, DIN-AP3 Automation Controller.
		2. Minimum Characteristics:
			1. Operating System:
				1. Modular architecture supports multiple simultaneous running programs.

Number of simultaneously running user programs: 10

* + - * 1. Real-time, preemptive multithreaded/multitasking kernel.
				2. Vector floating point coprocessor.
				3. Utilize a real time, event driven, multi-tasking, multi-threaded operating system.
			1. Communication:
				1. Control Processor shall support direct communication with the following devices:

Connected Ethernet devices.

Devices connected to built-in control ports.

Proprietary control network devices.

BACnet IP devices.

Control processors of same type.

* + - 1. Native BACnet/IP

Specifier:

A free license for 50 BACnet objects is available for the DIN-AP3. The DIN-AP3 processor may be upgraded to support additional BACnet IP objects.

* + - * 1. Number of BACnet objects supported: 500
			1. File Structure:
				1. Transaction-safe extended FAT32 file system
			2. Memory:
				1. RAM:

256 MB

* + - * 1. Flash:

Built-In: 2 GB

MMC slot: up to 2 GB

* + - 1. Network:
				1. Built-in 10/100BaseT Ethernet port.
				2. Built-In Web Server: IIS v.6.0
				3. SNMP remote management.
				4. Active Directory support.
				5. IPv6 ready.
				6. TCP/IP Communications
				7. DHCP and DNS Support
				8. Native Email Client
				9. Remote Diagnostics
				10. Remote Program Loading and Administration
				11. SSL security plug in
				12. Support user assigned or dynamic IP address.
		1. External Ports

The control system shall be equipped with the following external connection ports:

* + - 1. Connections:
				1. I/O 1 – 8: One 9-pin terminal block with 8 digital input/output or analog input ports.
				2. Relays: One 8-pin terminal block with four normally open isolated relays.
				3. Computer: One USB female 1.1 computer console port.
				4. LAN: One 8-wire RJ-45 connector.
				5. NET: Two 4-pin terminal blocks paralleled.
				6. Com 1 – 2: Two 5-pin terminal blocks.
				7. IR/Serial 1 – 4: One 8-pin terminal block with four IR/Serial output ports.
		1. BACnet Protocol Implementation:
			1. BACnet Standardized Device Profile:
				1. Application Specific Controller (B-ASC)
			2. BACnet Interoperability Building Blocks Supported:
				1. Data Sharing-ReadProperty-A (DS-RP-A)
				2. Data Sharing-ReadProperty-B (DS-RP-B)
				3. Data Sharing - ReadProperty Multiple - A (DS-RPM-A)
				4. Data Sharing - ReadProperty Multiple - B (DS-RPM-B)
				5. Data Sharing-WriteProperty-A (DS-WP-A)
				6. Data Sharing-WriteProperty-B (DS-WP-B)
				7. Data Sharing – COV – A (DS-COV-A)
				8. Data Sharing – COV – B (DS-COV-B)
				9. Device Management-Dynamic Device Binding-A (DM-DDB-A)
				10. Device Management-Dynamic Device Binding-B (DM-DDB-B)
				11. Device Management-Dynamic Object Binding-B (DM-DOB-B)
				12. Device Management-DeviceCommunicationControl-B (DM-DCC-B)
			3. Standard Object Types Supported:
				1. Device Object
				2. Analog Input Object
				3. Analog Value Object
				4. Binary Input Object
				5. Binary Value Object
				6. Multi-State Input
				7. Multi-State Value
			4. Data Link Layer Options:
				1. BACnet IP
				2. BACnet IP, Foreign Device
			5. Network Options:
				1. BACnet/IP Broadcast Management Device (BBMD)

Supports registration by foreign devices.

* + - 1. Character Set Supported:
				1. ANSI X3.4
			2. System Clock: Firmware-based internal clock.
		1. Power Requirements:
			1. Power Supply: External.
				1. Power Requirement: 8 Watts (0.33 amps at 24VDC).

The **Crestron IPAC-GL1** can be used as a pre-programmed or custom programmed control processor supporting virtually any functionality imaginable. It works seamlessly with Crestron's entire line of touchpanels, wireless remotes, lighting dimmers, shade controllers, thermostats, and more. It can also interface with third-party devices and systems such as security and access controls, surveillance cameras, and HVAC for a fully integrated solution.

* 1. CONTROL PROCESSOR TYPE 2
		1. Wall-mounted lighting control processor enabling user system programming via LCD front panel or PC software, integrating occupancy sensing, daylight harvesting, and remote management.
			1. Mounting: **[**Room wall mounted, in standard 3-gang box**]** **[**Table top kit**]** **[**Table top kit with swivel**]**.
			2. Face Color: **[**Black**]** **[**White**]**.
		2. Basis of Design Product:
			1. Crestron IPAC-GL.
		3. Minimum Characteristics:
			1. Utilize a real time, event driven, multi-tasking, multi-threaded operating system. Processor shall communicate directly with Ethernet, and control ports.
			2. Control System shall support:
				1. 10/100 BaseT Ethernet
				2. TCP/IP Communications
				3. DHCP Support
				4. SMTP Email Client
				5. SNMP Support
				6. Built-In Web Server
				7. SSL security
				8. IPv4
				9. Support user assigned or dynamic IP address.
		4. External Ports

The control system shall be equipped with the following external connection ports:

* + - 1. Digital Input
				1. Five captive screw terminals;

Comprised of 4 programmable digital inputs.

Rated for 0-24 Volts DC, referenced to GND.

Input Impedance: 2.2k ohms with pull-up resistor.

Logic Threshold: 2greater than or equal to 3 volt DC active/high, less than or equal to 1.8 volts DC inactive /low.

* + - 1. Relay
				1. Six captive screw terminals;

Comprised of 4 normally open, isolated relays.

Rated 1 Amp, 30 Volts AC/DC.

MOV arc suppression across contacts.

* + - 1. Serial Communication Port
				1. Five captive screw terminals;

One bidirectional RS-232 port.

Software and hardware handshaking for communication with serial devices.

Up to 115.2k baud.

* + - 1. Serial Communication Port
				1. Three captive screw terminals;

One bidirectional RS-232 port.

Software handshaking for communication with serial devices..

Up to 115.2k baud, software handshaking support for communication with serial devices.

* + - 1. Ethernet
				1. One 8-wire RJ45.

10/100 BaseT Ethernet port.

IEEE 802.3af PoE compliant

LED status and activity indicators.

* + 1. User Interface
			1. LCD display with adjustable LED backlight
			2. Selection knob and enter button.
			3. 4 Soft keys.
			4. 7 custom programmable pushbuttons with backlit labeling.
			5. 7 programmable red LEDs.
			6. Home, back, cancel and help buttons.
		2. Sensors
			1. Front panel light sensor.
			2. Front panel IR receiver.
		3. Mounting
			1. 3-gang standard electrical box.
	1. USER INTERFACES
		1. Touch Screen Type 1: Controls lighting and AV settings along with other modular dimming controller functions.
			1. 7 inch TFT active-matrix color LCD touch screen 800 by 480 WVGA resolution display.
				1. Basis of design: Crestron TSW-750 Touch Screen.
			2. 18-bit 262k colors, 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. Hard keys: 5 pushbuttons.
			4. Communication:
				1. Bidirectional 10/100 Mbps Ethernet communication.
			5. Streaming Video:
				1. H.264
				2. MJPEG
			6. Audio
				1. Built-in microphone and speaker.
				2. Intercom:

Compatible with SIP capable devices from same manufacturer.

* + - 1. Power:
				1. IEEE 802.3af Class 3 PoE Powered Device
			2. Mounting:
				1. Surface mount over 2-gang or 3-gang electrical box.
			3. Color: **[**Black**]** **[**White**]**.
		1. Touch Screen Type 2: Controls lighting and AV settings along with other modular dimming controller functions.
			1. 10.1 inch TFT active-matrix color LCD touch screen 1280 by 800 WXGA resolution display.
				1. Basis of design: Crestron TSW-1050 Touch Screen.
			2. 24-bit 16.7M colors.
			3. Hard keys: 5 pushbuttons.
			4. Communication:
				1. Bidirectional 10/100 Mbps Ethernet communication.
			5. Streaming Video:
				1. H.264
				2. MJPEG
			6. Audio
				1. Built-in microphone and speaker.
				2. Intercom:

Compatible with SIP capable devices from same manufacturer.

* + - 1. Power:
				1. IEEE 802.3af Class 3 PoE Powered Device
			2. Mounting:
				1. Surface mount over 2-gang or 3-gang electrical box.
			3. Color: **[**Black**]** **[**White**]**.

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

* + 1. 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-CBD Series.
			2. Color: As selected from manufacturer's full range of minimum 12 colors.
			3. Faceplates: **[**Insert faceplate description**]**.
	1. SENSORS

Specifier: The **Crestron GLS-ODT-C-CN** series sensors are low-profile ceiling mount occupancy sensors designed for large areas up to 2000 square feet to detect when the room is occupied. Advanced self-adaptive, dual-technology motion sensing and a built-in photocell for ambient light recognition affords extreme reliability for control of lighting, climate control and other devices in the room.

Requires use of control processor specified above in AUTOMATION CONTROL PROCESSORS.

* + 1. Remote Occupancy Sensor: Detects movement within space while reducing false triggering or shutoffs while space is occupied. 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 control bus;
			1. Basis of Design: **Crestron Photocell Model GLS-ODT-C-CN**
			2. Photocell: Built-in ambient light photocell
			3. Additional Interfacing: includes connection port for additional photocell.
			4. Coverage: 360 deg., 1000 sq. ft.
			5. Set-up and commissioning: parameters shall be configurable via a handheld wireless remote.
			6. Mounting: 3” octagon box

Specifier: The **Crestron 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 above in AUTOMATION CONTROL PROCESSORS.

* + 1. 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: The **Crestron 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 above in AUTOMATION CONTROL PROCESSORS.

* + 1. 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**]**.

Specifier: The **Crestron GLS-SIM** is a compact interface device designed to allow Crestron Green Light® sensors to be connected directly to a Cresnet control network. Cresnet is the communications backbone for Crestron sensors, dimmers, keypads, touchpanels, shade controllers, thermostats, and many other devices. This flexible 4-wire bus provides data communications and 24 Volts DC power for all of the devices on the Cresnet network. The GLS-SIM installs easily at the sensor location, mounting conveniently inside the electrical box or exposed above the ceiling. Wiring connections to the network and sensor are facilitated using miniature screw terminals.

* + 1. Occupancy Sensor Interface Device: Integrates occupancy sensors and related sensors with control network. In separate enclosure. 4-wire bus providing 24 VDC power to network devices, with two independent sensing inputs.
			1. Basis of Design: Crestron Sensor Integration Module Model GLS-SIM.
	1. CONDUCTORS AND CABLING
		1. Power Supply Side of Remote-Control Power Sources: Comply with requirements of Division 26 Section "Low-Voltage Electrical Power Conductors."
		2. 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.
				1. 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.
				1. 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.
				1. Basis of Design Product: **Crestron CRESNET-HP-NP**.
	2. SYSTEM FUNCTIONS AND SEQUENCES

Specifier: Add or remove basic system required control functions based on project requirements. These are the required capabilities of the system not a particular control interface, (control interface requirements follows in the next article(s). All advanced sequences, and integrated functions should be specified in: Division 25, Division 27 with the AV control system and User interfaces, or in this section if the project does not require integration of lighting control with other systems.

* + 1. System Control Functions: The system shall be capable of the following lighting control functions:
			1. Scene Creation: store levels of selected fixture circuits in preset groups.
			2. Scene Recall: recall previously stored scenes.
			3. Off: all zones off.
			4. Dim up/down: raise/lower level of all zones.
			5. Password Entry: enter password to enable touch screen control access.
			6. Room/Zone Selection: select room, zone or area to be controlled.
			7. Shade Control: raise or lower room shades.
			8. Event Scheduler: select times for scenes to be automatically recalled.
	1. USER INTERFACE CONTROL FUNCTIONS

Specifier: Add or remove basic required User Interface control functions based on project requirements. All advanced sequences, and integrated functions should be specified in: Division 25, Division 27 with the AV control system and User interfaces, or in this section if the project does not require integration of lighting control with other systems. The following list should be a subset of the above article, SYSTEM FUNCTIONS AND SEQUENCES.

* + 1. Remote Keypad: The Keypad interface shall be capable of the following system control functions:
			1. Scene Recall
			2. Off
			3. Dim up/down
		2. Touch Screen and Virtual Touch Screen: Touch Screen and Virtual Touch Screen interfaces shall be capable of the following system control functions:
			1. Password Entry
			2. Room/Zone Selection
			3. Scene Recall
			4. Dim up/down
			5. Shade Control
			6. Scene Recall
			7. Event Scheduler
		3. Integrated System Control
			1. Integrated Audio-Visual system and Lighting system control: See Division 27.
			2. Automation and Management Systems: Section 25 13 13
			3. Control and Monitoring Systems: Section 25 15 16
	1. PROGRAMMING AND CONFIGURATION SOFTWARE
		1. Lighting system configuration software shall allow custom programming of embedded operating systems for control of lighting system.
		2. Lighting system configuration software shall Provide a graphical symbol based programming and development environment.
		3. Custom Software Control Interface Module – The Lighting System Configuration software shall generate Custom Software Control Interface Modules for communication with compatible remote integrated systems.
		4. The Custom Software Control Interface shall include the following control data:
			1. Complete lighting system control functions.
			2. System specific control sets for sub systems and supervisory systems.
		5. The Custom Software Control Interface shall be capable of communicating the following data types:
			1. Bidirectional digital and analog data communication.
			2. Bidirectional serial data communication.
1. EXECUTION
	1. EXAMINATION
		1. Prior to installation, examine work area to verify measurements, and that commencing installation complies with manufacturer's requirements.
	2. INSTALLATION
		1. Comply with requirements of Division 26 Sections "Common Work Results for Electrical."
		2. Do not install network power controls until space is enclosed, HVAC systems are running, and overhead and wet work in space are complete.
		3. Install network power switching controls in accordance with manufacturer's instructions.
		4. Grounding: Provide electrical grounding in accordance with NFPA 70.
		5. Provide panelboard schedule in pocket provided in panel doors.
	3. SYSTEM OPERATING SOFTWARE
		1. Contractor shall furnish media which will contain:
			1. Software and current licenses.
			2. All source code pertaining to the System.
			3. All compiled programs pertaining to the System.
			4. All graphics files pertaining to the System.
			5. Custom Software Control Interface Module(s) for integration with:

Specifier: List all systems requiring User Interface access and control integration with this Lighting System. This refers to Crestron remote system definition files (.RSD files), which enable communication between multiple systems, e.g., lighting system and AV system.

* + - * 1. AV Control Systems: Section 27 41 00
				2. Automation and management systems: Section 25 13 13
				3. Control and monitoring systems: Section 25 15 16
	1. SYSTEM STARTUP
		1. Provide manufacturer's system startup and adjustment.
		2. Switch each load on and off with manual line test feature of the power switching module before installing processors.
		3. Perform operational testing to verify compliance with Specifications. Adjust as required.
	2. ADJUSTING
		1. Within 12 months of the date of Substantial Completion provide onsite service to adjust the system to account for actual occupied conditions.
	3. DEMONSTRATION
		1. Factory authorized service representative to instruct owner's staff to adjust, operate and maintain network power switching systems; and provide instruction using the system software.
	4. CLOSEOUT ACTIVITIES
		1. Demonstration: Schedule demonstration with Owner.
		2. Training: Train Owner's personnel to operate, maintain, and program network power switching systems. Allow for a minimum of 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 43.13