SECTION 26 09 43.13

Digital-Network Lighting Controls

Equipment Specified in this section:

C2N-CBD-P

CRESNET-HP-NP

CRESNET-NP

CRESNET-P

DIN-AP3

DIN-DALI-2

GLA-DMX512

GLA-PWS-50

GLD-LV-LED

GLE-FT-\_x\_

GLE-MLO-\_x\_-\_\_\_-\_\_

GLEX-FT-XX

GLR-HD-1P

GLR-HD-2P

GLS-LEXT

GLS-ODT-C-CN

GLS-PART

GLS-PLS-120/277

GLS-SIM

GLX-DIM6

GLX-DIMFLV8

GLXP-DIMFLV8

GLXP-HSW-\_\_

GLXP-SW-\_\_

GLXX-2DIM8

IPAC-GL1

TPMC-V15-TILT

TSW-1050

TSW-750

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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. Automation control processor
			2. Keypad controls.
			3. Touch screen controls.
			4. Window treatment controls.
			5. Remote occupancy sensors.
			6. Lighting load shedding.
			7. Timed room lighting.
			8. Daylight compensating lighting controls.
			9. Communication interface to facility-wide room management system.
			10. Communication interface to building automation system gateway/interface.
		3. Unified System Integration – Automation control processor 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. 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. DIMMING SYSTEM TYPE 1
		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 dimming 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. System utilizes electronic dimming modules incorporating mechanically latching relays for dimming and on-off switching; an automation control system that interprets input signals and issues output signals to devices effecting a change in state; and a built-in hub that provides 8 isolated segments, each supporting up to 3000 feet of cabling, and up to 25 networked devices on each segment.
		3. NETWORK LIGHTING CONTROL PANELS

Specifier: Crestron GLPX Green Light Network lighting control panels are expandable from 8, 24, and 56 circuits and are available with feed-through type connections requiring separate branch circuit protection.

Retain panel types required for project.

* + - 1. Feed-Through Network Lighting Control Panel: Feed-through Type, No Branch Circuit Protection.
				1. Basis of Design Product: Crestron GLPX Panel Model GLEX-FT-XX.
				2. Panel shall be capable of switching normal and emergency circuits in single panel enclosure.
				3. Branch Circuit Protection: Pass through type utilizing separate branch circuit protection indicated on Drawings.
				4. Dimming types: **[**Incandescent, Magnetic Low-Voltage, Electronic Low-Voltage, Neon/Cold Cathode, Fluorescent Lamp Ballast, LED Driver, High-Intensity Discharge, or Motors**]** **[**0-10 Volt 4-Wire Dimmable Fluorescent Ballast**]**.
				5. Switching Relay Types: Arc-less high inrush, lifetime rated minimum 1,000,000 on/off cycles, with air gap off protection.
				6. Emergency Override: Remote override capability.
			2. Dimming Module, 0 – 10V Dimmable Fluorescent Ballast or Driver Load Dimming Module:
				1. Basis of Design Product: Crestron Electronic power switching module Model No. GLXP-DIMFLV8.
				2. Channels of Switching: 8 channel high inrush switching.
				3. Module shall support local load control from front panel of module.
				4. Maximum Nondimmable Load:

Incandescent, HID, magnetic low voltage (MLV), electronic low voltage (ELV), neon/cold cathode, fluorescent ballasts, and LED ballast or driver: 16A per channel.

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

* + - * 1. Maximum Dimmable Load:

0 - 10V dimmable fluorescent or LED ballast or driver: 16A per channel at 100-277 VAC, 50/60Hz for

* + - 1. Dimming and Switching Module: Incandescent, magnetic low voltage, neon/cold or 2 and 3-wire fluorescent dimming module.
				1. Basis of Design Product: Crestron Dimmer Module Model GLXX-2DIM8.
				2. Module Description: Field replaceable dimming modules include incandescent, magnetic low voltage, and 2 and 3-wire fluorescent dimming. Module features individual circuit load indicator, mechanical and emergency override and manual line test features. Emergency signal from phase loss sensor overrides the preset state of the dimming control; and changes it to the preprogrammed emergency condition.
				3. Channels of Switching: 8 channels of dimming with high inrush, zero-cross arcless, magnetic latching air gap off relays rated for 1,000,000 on/off lifetime cycles of switching.
				4. Maximum Load.

Lighting: 16A per Group (2 Groups); 16A per channel max..

Motor: per Group (2 Groups); **[**1HP at 120V**]** **[**2HP at 230/277V**]** per channel.

* 1. DIMMING SYSTEM TYPE 2
		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 dimming 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. System utilizes electronic dimming modules incorporating mechanically latching relays for dimming and on-off switching; an automation control system that interprets input signals and issues output signals to devices effecting a change in state; and a built-in hub that provides 8 isolated segments, each supporting up to 3000 feet of cabling, and up to 25 networked devices on each segment.
		3. NETWORK LIGHTING CONTROL PANELS

Specifier: Crestron Green Light Network lighting control panels are expandable from 30, 42 and 60 circuits and are available with main disconnect and branch circuit protection, lug only mains and branch circuit protection, or feed-through type requiring separate branch circuit protection.

Retain panel types required for project.

* + - 1. Circuit Protected Network Lighting Control Panel: Main Lugs or Main Circuit Protected and Branch Circuit Protected.
				1. Basis of Design Product: Crestron, GLPD Panel Model **[**GLE-MLO-\_X\_-\_\_\_-\_\_**]**.
				2. Main Circuit: **[**Main Lugs Only**]** **[**60 amp main circuit breaker**]** **[**80 amp main circuit breaker**]** **[**100 amp main circuit breaker**]** **[**125 amp main circuit breaker**]**.
				3. Branch Circuit Protection: 120/277 20 amp thermal magnetic type.
				4. Electronic Dimming Load Types: **[**Incandescent, Magnetic Low-Voltage, Electronic Low-Voltage, Neon/Cold Cathode, Fluorescent Lamp Ballast, High-Intensity Discharge, or Motors**]** **[**0-10 Volt 4-Wire Dimmable Fluorescent Ballast**]**.
				5. Switching Relay Rating: Arc-less high inrush, lifetime rated minimum 1,000,000 on/off cycles with air gap off protection.
			2. Feed-Through Network Lighting Control Panel: Feed-through Type, No Branch Circuit Protection.
				1. Basis of Design Product: Crestron GLPD Panel Model GLE-FT-\_X\_.
				2. Branch Circuit Protection: Pass through type utilizing separate branch circuit protection indicated on Drawings.
				3. Electronic Dimming types: **[**Incandescent, Magnetic Low-Voltage, Electronic Low-Voltage, Neon/Cold Cathode, Fluorescent Lamp Ballast, High-Intensity Discharge, or Motors**]** **[**0-10 Volt 4-Wire Dimmable Fluorescent Ballast**]**.
				4. Switching Relay Types: Arc-less high inrush, lifetime rated minimum 1,000,000 on/off cycles, with air gap off protection.
				5. Emergency Override: Remote override capability.
		1. DIMMING AND SWITCHING MODULES
			1. Dimming and Switching Module: Incandescent, magnetic low voltage, neon/cold or 2 and 3-wire fluorescent dimming module.
				1. Basis of Design Product: Crestron Dimmer Module Model GLX-DIM6.
				2. Module Description: Field replaceable dimming modules include incandescent, magnetic low voltage, and 2 and 3-wire fluorescent dimming, with high inrush, zero-cross arcless, magnetic latching, and air gap off relays rated for 1,000,000 on/off lifetime cycles of switching. Module features individual circuit load indicator, mechanical and emergency override and manual line test features. Emergency signal from phase loss sensor overrides the preset state of the dimming control; and changes it to the preprogrammed emergency condition. Phase-synchronous Detection Circuitry eliminates lamp flicker.
				3. Channels of Switching: 6 channels of dimming with high inrush, zero-cross arcless, magnetic latching air gap off relays rated for 1,000,000 on/off lifetime cycles of switching.
				4. Maximum Load.

Lighting: 16A per channel.

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

* + - 1. Dimming and Switching Module: 0–10V fluorescent ballast dimming module.
				1. Basis of Design Product: Crestron Electronic Power Switching Module Model GLX-DIMFLV8.
				2. Module Description: Field replaceable 0-10V fluorescent ballast dimming modules include 8 channels of 4-wire, fluorescent dimming with high inrush, zero-cross arcless, mechanical latching, air gap off relays rated for 1,000,000 on/off lifetime cycles of switching. Module features individual circuit load indicator, mechanical and emergency override and manual line test features. Emergency signal from phase loss sensor overrides the preset state of the dimming control; and changes it to the preprogrammed emergency condition. Phase-synchronous Detection Circuitry eliminates lamp flicker.
				3. Channels of Switching: 8 channel of dimming with switching relays.
				4. Maximum Dimmable Load.

0-10V Fluorescent Lighting: 16A per channel.

Motor: **[**0.5HP at 120V**]** **[**1HP at 230/277V**]** per channel.

* + - 1. Switching Module, High Inrush:
				1. Basis of Design Product: Crestron Electronic Power Switching Module Model GLX-HSW8.
				2. Channels of Switching: 8channel high inrush switching.
				3. Maximum Load.

Lighting: 16A per channel.

Motor: **[**0.5HP at 120V**]** **[**1HP at 230/277V**]** per channel.

Relay Lifetime: 1,000,000 operations at full electronic ballast load.

* 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 GLPS Network lighting control panels are expandable from 8 to 42 circuits and are available with main lug only mains.

* + - 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).

Specifier: Retain panel types required for project.

* + - 1. Network Lighting Control Panel
				1. Basis of Design Product: Crestron, Green Light Standard Breaker Cabinet Network Lighting Control panel Model GLEP.
				2. Main Circuit: **[**Main circuit breaker as indicated**]** **[**Main Lugs Only**]** **[**60 amp main circuit breaker**]** **[**80 amp main circuit breaker**]** **[**100 amp main circuit breaker**]** **[**125 amp main circuit breaker**]**.
				3. Branch Circuit Protection: **[**120/208**] [**277/480**]** 20 amp thermal magnetic type.
				4. Switching Module Types:

Arc-less high inrush

Standard high inrush

Modular high inrush

0-10V Dimmable

* + - * 1. Cabinet Capacity: **[**12 circuits**]** **[**30 circuits**]** **[**42 circuits**]** As required for circuits indicated.
		1. POWER SWITCHING MODULES
			1. Switching Module, High Inrush:
				1. Basis of Design Product: Crestron Electronic Power Switching Module Model No. GLXP-SW-\_\_.
				2. Channels of Switching: **[**10**]** **[**16**]** channel high inrush switching.
				3. Maximum Load.

Lighting: 16A per channel.

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

* + - 1. Switching Module, High Inrush:
				1. Basis of Design Product: Crestron Electronic Power Switching Module Model No. GLXP-HSW-\_\_.
				2. Channels of Switching: **[**8**]** **[**12**]** channel high inrush switching.
				3. Maximum Load.

Lighting: 16A per channel.

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

* + - 1. Switching Module, 0 – 10V Dimmable Fluorescent Ballast Load Switching Module:
				1. Basis of Design Product: Crestron Electronic power switching module Model No. GLXP-DIMFLV8.
				2. Channels of Switching: 8 channel high inrush switching.
				3. Maximum Non-dimmable Load:

Incandescent, HID, magnetic low voltage (MLV), electronic low voltage (ELV), neon/cold cathode, and fluorescent ballasts: 16A per channel.

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

* + - * 1. Maximum Dimmable Load:

Lighting: 0 - 10V dimmable fluorescent ballasts.

* + - 1. Switching Module, Heavy Duty:
				1. Basis of Design Product: Crestron Electronic Power Switching Module Model GLXX-HDSW\_.
				2. Channels of Switching: **[**8**]** **[**16**]** channel high inrush switching.
				3. Maximum Load.

Lighting: 20A per channel.

Up to 480V

Motor: **[**1.5HP at 120V**]** **[**2HP at 230/277V**]** per channel.

* + - * 1. Power Switching Relay, Single Pole.

Basis of Design Product: Crestron Model No. GLR-HD-1P.

* + - * 1. Power Switching Relay, Double Pole.

Basis of Design Product: Crestron Model No. GLR-HD-2P.

* 1. ACCESSORIES
		1. PANEL ACCESSORIES
			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.
	2. DALI 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. NETWORK LIGHTING CONTROLS
			1. 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.
			2. 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.
			3. 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.
		3. SIGNAL PROCESSORS
			1. 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:

DALI 1 and 2: Two 2 pin terminals.

Computer: USB female USB 1.1 computer console port.

Override Ports: Two 2 pin paralleled terminal blocks.

LAN Power over Ethernet: One 8 wire RJ-45 connector.

NET: Two 4 pin terminal blocks.

* + - * 1. DALI Integrated Power: Selectable internal or external.
				2. Mounting: DIN 43880 form factor occupying not more than 9 DIN modules.
				3. Firmware: Upgradeable, Windows-based.
				4. Commissioning Software: PC based, providing step by step configuration of ballast properties, groups and scenes.
	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-GL1.
		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**]**.
		1. Touch Screen Type 3:
			1. 15.3 inch active-matrix touch screen display
				1. Basis of Design Product: Crestron TPMC-V15-TILT
			2. Touch screen Minimum Characteristics:
				1. 15.3 inch active-matrix touch screen display
				2. 1280 by 768 WXGA display resolution.
				3. 24-bit color graphics.
				4. Video display: Scalable display on device screen.
			3. User Interface buttons:
				1. Button Controls: programmable button functions.
				2. Customizable WAV file audible button press feedback.
			4. Communication:
				1. Ethernet: 10/100 Mbps, auto-switching, auto-negotiating, auto-discovery, full/half duplex, and DHCP
				2. Control bus: slave mode for control and console
			5. Analog video input:
				1. Composite video

NTSC

PAL

* + - * 1. Resolution

480i

576i

* + - 1. Streaming Video:
				1. H.264
				2. MJPEG
				3. Windows Media Player supported formats
			2. Audio
				1. Built-in microphone and speaker.
				2. Intercom:

Compatible with IP intercom capable devices from same manufacturer.

* + - 1. Embedded Software Applications:
				1. Microsoft Internet Explorer.
				2. Microsoft Media Player.
				3. Microsoft Powerpoint.
				4. Microsoft Word.
				5. Microsoft Excel.
				6. Adobe Acrobat.
			2. Power:
				1. 24 VDC, 35 Watts
			3. Stand:
				1. Tabletop tilt stand

0° to 35° adjustable screen tilt, optional swivel mount sold separately

* + - 1. Operating Modes:
				1. Control user interface.

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

* + 1. KEYPAD:
			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-P 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 Dual Technology Occupancy Sensor 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., 2000 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-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. Outdoor Photo Sensor:
			1. Sensor shall continually monitors the total ambient light level and can adjust the lighting as necessary to reach the desired light level. The sensitivity is adjustable so that a 10V signal matches full daylight and 0V matches total darkness. A built in visor provides more consistent readings by blocking direct sunlight, and also protects the lens from the elements.
			2. Basis of Design: **Crestron Photocell Model GLS-LEXT**
			3. Light Sensitivity 5 to 750 foot-candles
			4. Power: 24 VDC
			5. Mounting: surface mount
		2. Partition Sensor:
			1. Sensor shall be a surface mount device with dry contact closure output.
			2. Basis of Design: **Crestron Model GLS-PART**
			3. Method of detection: Diffuse Reflective
			4. Power: 24 VDC
			5. Mounting: surface mount
		3. 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. DMX CONTROL INTERFACE
		1. Interface General Requirements
			1. Basis of Design Product: Crestron, GLA-DMX512 DMX-512 Interface.
			2. The DMX Control Interface shall be a microprocessor based lighting system designed specifically as a multi-purpose lighting and show playback controller for entertainment and architectural applications. A personal computer running emulation software shall not be acceptable.
			3. The DMX Control Interface shall be an integrated device that combines DMX-based lighting playback with architectural control features, scripting capability, and web-based control.
			4. The DMX Control Interface shall store all of its programming data in non-volitale flash memory, including built-in flash memory and/or a removable flash memory card and can be transferred to/from a remote personal computer via Ethernet.
			5. The DMX Control Interface shall have an internal real-time clock and calendar that operates from an internal lithium battery even in the absence of external power and be able to trigger shows and other events based on time of day, sunrise, sunset, day of week, day of year and/or a combination of these events.
			6. The DMX Control Interface shall be capable of synchronizing its operation with and/or remotely controlling other DMX Control Interfaces of the same kind across an Ethernet network.
			7. The DMX Control Interface shall support standard theatrical lighting playback models including direct channel control, fixture level control, groups, channel parking, scaling, disabling, offsets, transparency, tracking and overrides, which can be used to create submasters and grandmaster control, partitioning, zones and other control setups.
		2. SYSTEM CAPACITY
			1. The DMX Control Interface shall support:
				1. Up to 2000 cues.
				2. Up to 200 macros.
				3. Up to 100 groups.
				4. Up to 100 timer events.
				5. Up to 500 timecode event triggers.
				6. Up to 256 DMX input triggers.
				7. Up to 512 button station buttons.
				8. Up to 512 contact closures.
				9. Up to 16 TCP/UDP packet triggers.
				10. Reception of 512 DMX input levels.
			2. Processing of 512 DMX output levels.
				1. Additional DMX outputs may be supported by networking multiple DMX control interfaces together via Ethernet.
	3. LED DRIVERS
		1. Interface shall provide 0 to 10 Volt DC control signal
			1. Basis of design Product: **Crestron GLD-LV-LED**
			2. Driver supports single-channel dimming, and are compatible with both current sink and current source controls.
		2. Driver Certifications:
			1. CE; UL: Recognized Component for US and Canada according to UL1310 and UL8750; US: Class 2 output; Canada: Non-Class 2 output; IEC 61347-1, IEC 61347-2-13, IEC 62384 + A1, EN 55015 + A1, EN 55022 + A1, IEC 61000-3-2, IE 61547 + A1, IEC 62386-101/102/207; FCC: Title 47CFR Part 15 Class B
	4. 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. Dynamic Scene Settings
			8. 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

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