230 V

The New
Standard in
Integrated
Lighting
Control

LIGHTING DESIGN GUIDE

CRESTRON

Crestron, the Crestron logo, Cresnet, D3 Pro, Fusion RV, iLux, infiNET EX, and RoomView are either trademarks or registered trademarks of Crestron Electronics, Inc. in the United States and/or other countries. Outlook is either a trademark or registered trademark of Microsoft Corporation in the United States and/or other countries. UL and the UL logo are either trademarks or registered trademarks of Underwriters Laboratories, Inc. in the United States and/or other countries. Other trademarks, registered trademarks, and trade names may be used in this document to refer to either the entities claiming the marks and names or their products. Crestron disclaims any proprietary interest in the marks and names of others. *Crestron is not responsible for errors in typography or photography.*

This document was written by the Technical Publications department at Crestron.
©2014 Crestron Electronics, Inc.

Contents

Introduction..1

Design Requirements 4

Applied Control Strategies.. 4
Static and Dynamic Elements 4
New and Existing Construction.. 4
Lighting and Automation System Design Types 5

Lighting Product Features...8

CAEN Automation Enclosures and Accessories 8
CAENIB Enclosures and Terminal Blocks 12
CLTIBN Terminal Blocks 16
Lighting Control Modules 19
PAC2 Lighting Control Processor 26
PAC2M Professional Automation Mini Control System 30
iLux 37
Shade and Drape Controllers 47

User Interface Selection.. 51

Keypads.. 51
Touch Screen Interfaces.. 52

Specifying a Lighting System..54

Load Schedule.. 54
Wiring Plan 57

Crestron Lighting Software 58

D3 Pro 58
RoomView Express 60
Fusion RV 61

Ordering a Crestron Lighting Control System 62

Hardware.. 62
Crestron Control Cable.. 62
Programming.. 62

Appendix A: Load Schedule with Panel Terminations.............65

Appendix B: General Lighting Design Considerations 66
Task Lighting for Specific Work Areas.. 66
Lighting for Mood and Highlights 67

Appendix C: Glossary of Terms... 68

Introduction

Each lighting control system is unique; therefore, designing and constructing a lighting and automation system to fill the requirements of the client is challenging. Crestron® offers the equipment and flexibility of design required for every one-of-a-kind solution.

The World's Most Powerful Lighting Control Solution

Crestron is the world's leading manufacturer of advanced control technologies. Crestron's developments in combining touch screen technology with lighting control applications were the very first of its kind setting the pace that the rest of the industry follows. Only Crestron brings the most comprehensive line of user-interfaces to commercial lighting and dimming control, plus the ability to remotely monitor, manage, and control buildings over standard IP networks.

Implementing Crestron means managing lighting, audio, video, HVAC, and a multitude of other management controls in ways that keep homes and facilities running effectively and efficiently.

Crestron streamlines and simplifies all the technology in a home, school, or business by offering the ultimate in comfort and convenience. Whether from an easy-to-use color touch screen remote or a customized keypad, Crestron eliminates the need to walk from room to room to adjust drapery, lights, temperature, and audio/video components so that total control is easily accessible.

Crestron for Home

A single touch dims the lights, closes shades and drapery, and turns on the TV. Window treatments can be programmed to adjust at preset times to reduce glare and protect delicate fabrics and fine art from harmful direct sunlight. Automatically illuminate the hallway lights at night for safety using photocell sensors.

Crestron for Education

Enjoy the benefits of technology in the classroom by using DVDs, document cameras, Internet, streaming media, and PC applications to present curriculum. Control the AV equipment, lights, drapes, and screens from an intuitive easy-to-use touch screen.

Crestron has been serving the educational market for more than three decades and truly understands the unique requirements of the academic community. Top colleges across the nation make the grade by embracing Crestron technology to control, automate, monitor, and manage their campuses. Several Ivy League universities use Crestron control solutions in their classrooms, labs, conference rooms, and auditoriums.

Crestron for Business

Simplify and streamline the technology in boardrooms, conference rooms, or throughout a facility. Integrated solutions from Crestron simplify installation and practical usage, as well as maintenance and scalability.

Unmatched Design and Control Flexibility

Cresnet® low-voltage wiring and RF control can be used throughout a wide range of system design possibilities, including traditional wiring with local intelligence or distributed, high-voltage wiring with centralized and distributed intelligence systems. The wide range of Crestron multifunction user interfaces replace large banks of traditional switches, dimmers, and timers. In addition to lighting, these user interfaces can also control security, HVAC, and audio/video systems. Only Crestron provides a single control wiring bus to all of its components, simplifying installation and connection.

Crestron D3 Pro® software is a comprehensive design and development tool that provides a programming environment for all lighting, HVAC, and security needs. It contains many features to facilitate a successful installation, including an astronomical clock that allows the scheduling of events based on time of day or sunrise and sunset. User interfaces are easily designed and programmed, and the standardized communication among Crestron control equipment and devices simplifies installation and provides an infinite range of possibilities.

Architects, engineers, designers, and contractors know that customers who choose Crestron are guaranteed the quality, innovation, and service that every project deserves.

Efficiency and Security

Modern lighting design can be a powerful and versatile tool where technology and style combine in a vast array of choices.

Energy efficient lighting made possible through control presents designers with a greater variety of attractive styles than ever before. This variety is an important advantage in meeting the demands of today's discerning consumer.

Security and landscape lighting is used as a preventative and corrective measure against intrusions. Security lighting is also the interior safety guide inside a home or building. Crestron interfaces provide manual and automatic controls: turning on exterior lights based on an astronomical clock, providing a single button press to turn all lights on, illuminating safe exits in case of emergency, and many other lighting possibilities.

Change and Convenience

Crestron products allow the designer to continually expand and change the lighting system. Crestron RF devices provide a simple retrofit solution to expand an existing system. Because there is no limit to the number or types of devices, the system can grow as needed to accommodate any last minute changes or new additions.

Touch screens and keypads provide instant access to all areas. These controls can provide the precise lighting levels for every mood or activity with a single button press.

Every Crestron lighting system is completely modular and scalable, allowing virtually unlimited configuration and expansion flexibility.

The Crestron Green Initiative

As the global leader in advanced control and automation technology for commercial and residential solutions, Crestron announces that its products and automation solutions meet American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) and Leadership in Energy and Environmental Design (LEED) standards, providing additional credits toward Green Certification. Additionally, Crestron products are in compliance with the European Union (EU) Directive 202/95/EC Restriction of Hazardous Substances (RoHS). Several Crestron products including CLXI-Series and iLux® lighting systems, CHV-TSTAT thermostats, C2N-SDC shade controls, and 2-Series control systems are designed to operate efficiently, replacing several products and drawing less power.

A Crestron solution offers significant energy savings by providing daylight harvesting and automating lights, shades and drapery, thermostats, sprinklers, and fountains based on daylight, time, motion, occupancy, temperature, humidity, and other conditions. By integrating the disparate environmental systems, efficiencies are increased exponentially. Using RoomView® remote management software, AV components, lights, and thermostats may be monitored and controlled remotely from any computer.

Crestron lighting systems, such as iLux CLSI-C6, is also compliant with ASHRAE Standard 90.1-2004, Energy Standard for Buildings, and specifically the Mandatory Provisions 9.4.1.1 (b) and (c) regarding the use of an occupancy sensor that turns the lights off within 30 minutes after leaving the space and a control system that indicates that an area is unoccupied. iLux also complies with Provision 9.4.1.4, which pertains to the control of display, accent, task, and demonstration lighting.

Compliance with EU Directives

The Restriction of Hazardous Substances Directive (RoHS) 2002/95/EC was adopted in February 2003 by the European Union. This directive restricts the use of six hazardous materials in the manufacture of electronic and electrical equipment. It is closely linked with the Waste Electrical and Electronic Equipment Directive (WEEE) 2002/96/EC, which sets collection, recycling, and recovery targets for electrical goods.

The CE Mark is a requirement for products sold to the European Market. The CE Mark identifies a product as complying with the health and safety requirements spelled out in European legislation and is mandatory for equipment operating in the European Union.

All Crestron products are in full compliance with these directives, in addition to UL and ULC standards.

Design Requirements

Applied Control Strategies

The applied lighting control strategy determines the basic methods used to control the environment. When formulating an overall strategy there are some basic considerations:

- Light level control is achieved through dimming controls and daylight controls, where applicable, to adjust the lighting to the appropriate level for different occupant activities.
- Occupancy sensing is used to switch the lighting on and off independent of time intervals or scheduled periods. This allows the space to be responsive to individual use and conserves energy.
- Scheduled lighting is determined by time of day, day of week, vacation, outdoor lighting, and safety lighting requirements. An astronomical clock (programmed with sunrise and sunset information) is often used to provide natural lighting transitions.
- In commercial applications, load shedding, or reducing a facility's lighting load to achieve an overall reduction in demand at peak usage times, provides a considerable economic benefit by minimizing load demand charges.
- Daylighting management systems have some of the most complex energy requirements. These systems take input from light level sensors, occupancy sensors, and solar angle tracking software to control the position of motorized blinds, skylights, and window shades, optimizing the use of natural lighting and reducing consumption of electric lighting.
- HVAC control should also be part of the overall control strategy, permitting additional economic, and convenience benefits.

Static and Dynamic Elements

The first step in implementing the lighting design is to define the building envelope, electric lighting, façade features, and other static elements that affect lighting. Window placement and glazing, floor layout, building orientation, and fixture placement are all static elements that define the building space and lighting environment.

Crestron control is required for dynamic elements (the elements that change in response to environmental and human variables). These static and dynamic elements are fully integrated in a complete lighting design.

New and Existing Construction

Crestron offers design solutions for every situation. Selecting the proper equipment often depends on the kind of installation. New construction, major renovation, or minor renovation each present different challenges:

- New construction and major renovations provide the opportunity to easily run communication and control cables from user interfaces to the control processor when the walls are open.
- Existing construction or minor renovation may make the task of running cables more difficult, time consuming, expensive, or even impossible (in historic landmarks, etc.). In this case, the customer may choose to install a partial or completely wireless system.

Lighting and Automation System Design Types

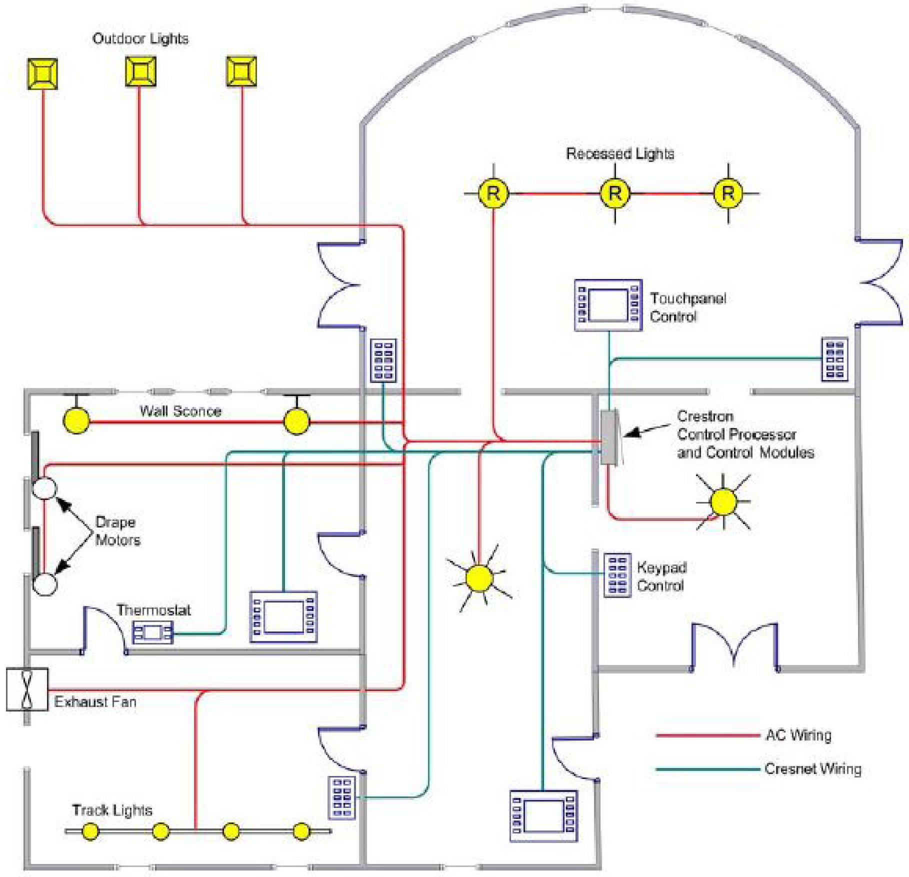
There are many ways in which a lighting control system can be organized. Construction type, client requirements, architectural restrictions, and many other factors determine the best solution. In general, retaining control design flexibility produces the most reliable results.

Centralized Systems

A centralized system is one in which all the high-voltage circuits are terminated within a Crestron home automation enclosure and operate under a central control system. In a centralized design, the high-voltage lighting, fans, motors, and switch circuits are individually wired directly to the control modules in the Crestron home automation enclosure. The modules are controlled by low voltage or RF user interfaces in the living area. This simplifies the high-voltage wiring and creates a flexible and efficient design.

A central processor, connected via a local area network to the lighting modules and the user interfaces, is dedicated to lighting, fans, motors, HVAC, and security. Other processors that are dedicated to other home control systems can communicate via Ethernet, RS-232, or RS-422 to the lighting processor and eliminate the need for additional controls for other home systems. Separating home safety and life support systems from information and entertainment systems provides a flexible design solution and a fully integrated home control.

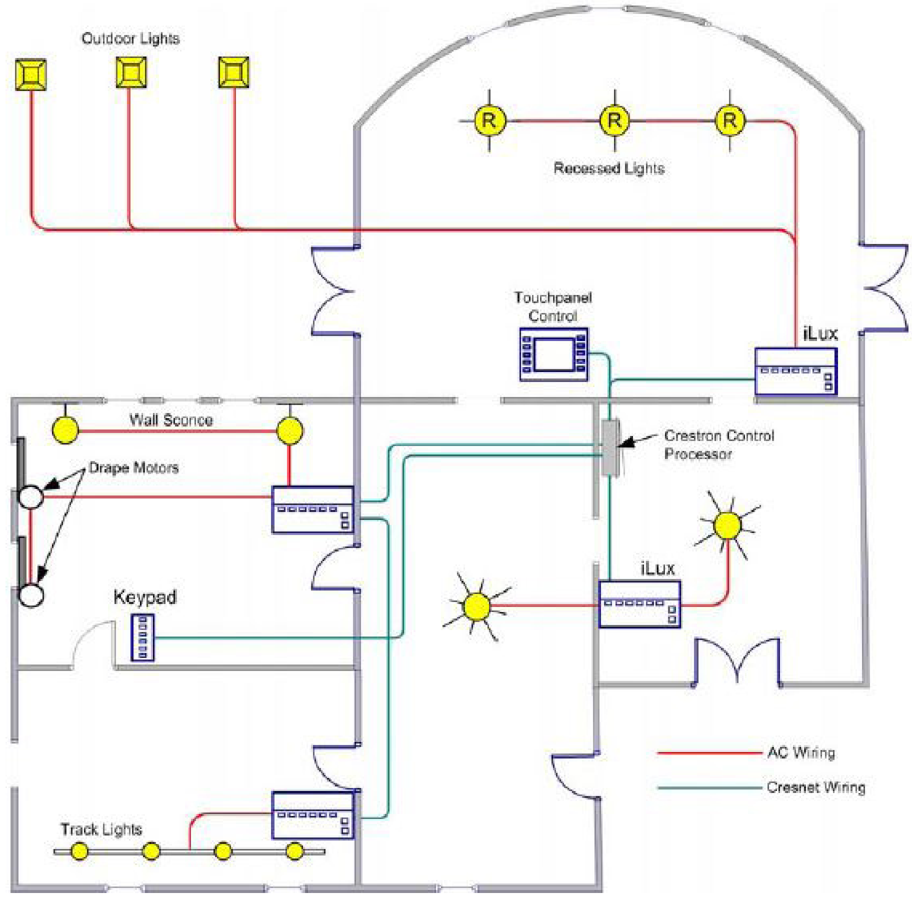
Centralized System Example


Outdoor Lights
Recessed Lights
R
R
R
Touchpanel Control
Wall Sconce
Crestron Control Processor and Control Modules
Drape Motors
Keypad Control
Thermostat
Exhaust Fan
Track Lights
AC Wiring
Cresnet Wiring

Decentralized Systems

A decentralized system is the traditional wiring system of individual lighting circuits with local control. Crestron iLux devices provide the power and flexibility of automated control combined with local control.

Decentralized System Example

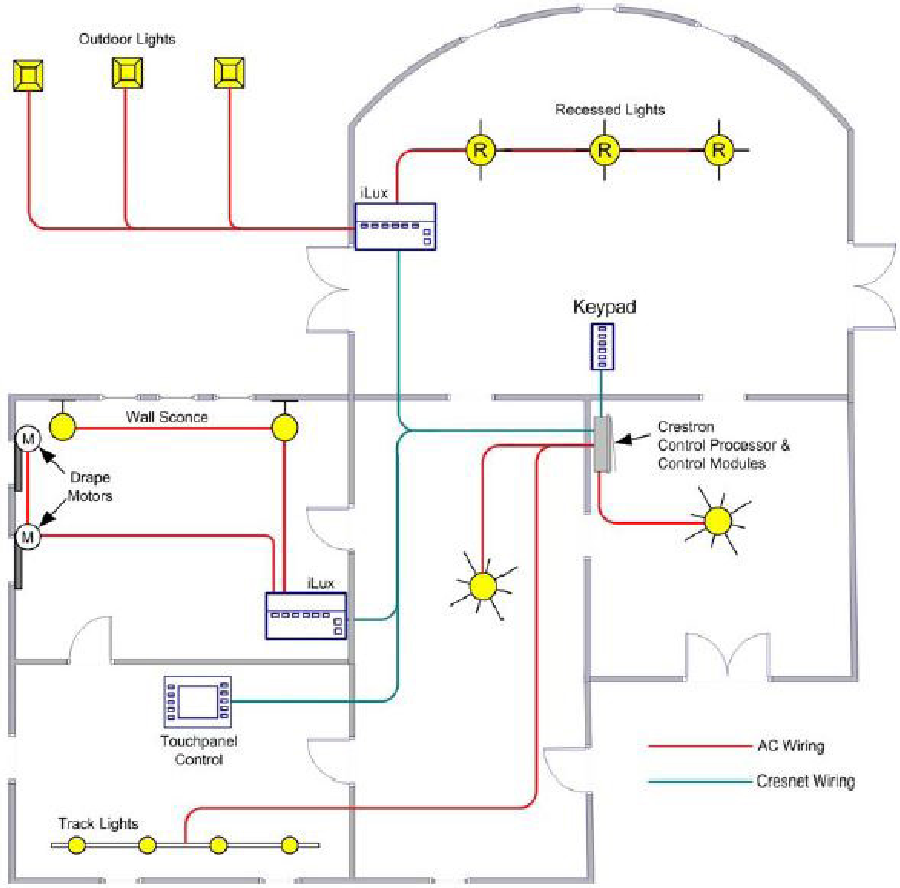

Outdoor Lights
R
R
R
Recessed Lights
Touchpanel Control
iLux
Wall Sconce
Drape Motors
Crestron Control Processor
iLux
Keypad
Track Lights
AC Wiring
Cresnet Wiring

Hybrid Systems

The most efficient and attractive lighting system designs are a hybrid of centralized processing and distributed dimmers. This provides the reliability of local control along with sophisticated central control, and limits the amount of wall clutter created by too many different controls. A complete Crestron design is a blend of distributed and centralized design in which central control intelligence and distributed local dimmers form a reliable whole house lighting control solution.

Large rooms, stairways, and frequently used rooms are often remotely controlled using the astronomical time clock or whole-house presets. This level of control requires connection to a central dimming controller. Each room is equipped with a low voltage or wireless keypad for preset selection and audio/video integration. All of the dimmers in the system (grouped into the central controller for wiring convenience) communicate with each other through the Crestron control system, providing a complete, integrated Crestron home design.

Hybrid System Example

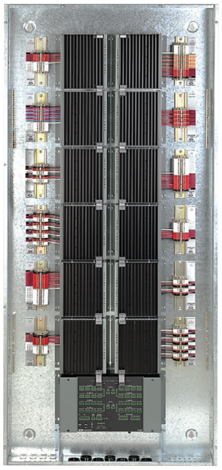

Outdoor Lights
Recessed Lights
R
R
R
iLux
Keypad
Wall Sconce
M
Drape Motors
M
Crestron Control Processor & Control Modules
iLux
Touchpanel Control
Track Lights
AC Wiring
Cresnet Wiring

Lighting Product Features

Crestron provides the ultimate lighting control solution for any application with dimming, switched control, and sensor activated control for daylight harvesting or security. Timed control can be combined with the ability to remotely manage or monitor any location securely and efficiently.

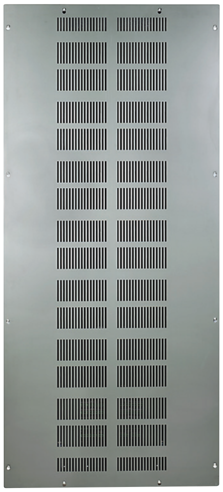
Integrating lighting with A/V controls, shade control, security systems, and building management solutions through a single system has never been easier. Controlling the lighting system with state-of-the-art touch screens and keypads provides a user-friendly interface along with substantial cost savings. Crestron eliminates all system integration problems by providing the world's finest single point control solution and widest selection of control devices.

CAEN Automation Enclosures and Accessories



The CAEN Series automation enclosures are designed to house Crestron's CLX-Series lighting control modules and PAC2 or PAC2M control systems. CAEN enclosures are available in an assortment of sizes, suitable for surface or flush wall mount installation. Each model has been engineered to provide a clean and manageable installation with abundant provisions for wire termination and electrical knockouts.

CAEN automation enclosures are designed to use space efficiently, supporting over a hundred possible circuits in the largest model. Both centralized and distributed configurations are possible. A single PAC2 control system installed in a central enclosure can support numerous satellite extension enclosures distributed throughout a residence or commercial facility. Interconnection of the complete network of enclosures requires just one circulating Cresnet cable. Dozens of keypads, touch screens, wall box dimmers, shade controllers, and other peripherals can also be terminated within an enclosure, with separate compartments provided for high and low voltage wiring.



Crestron lighting and automation systems are completely convection cooled for silent and reliable operation. A vented front cover is included with every enclosure. All models are constructed of 16-gauge galvanized steel and are pre-drilled for mounting of the PAC2, PAC2M, CLX modules, CLT terminal blocks, power supplies, and CAEN-BLOCK terminal block. Additional non-CLX lighting modules and third-party contactors may be installed using Crestron's CAEN-UMP universal mounting plates. Grounding blocks and low-voltage partitions are included.

CAEN enclosures are also well suited for all types of Class 2 and Class 3 applications including voice and data structured wiring, security, and RF signal distribution (as permitted by applicable codes).

AEN enclosures are UL and C-UL listed. If a complete UL Listed panel is required, Crestron offers this service through its UL Listed panel shop, providing complete in-factory system configuration and assembly.

CAEN Installation

The enclosure must be mounted by a licensed electrician in accordance with all national and local codes.

When choosing components to place in the enclosure, refer to the table below to ensure that the maximum weight capacity is not exceeded. Refer to the module product page on the Crestron website for module weight.

CAUTION: These enclosures house equipment that needs to be air-cooled. Therefore, mount in a well-ventilated area. The ambient temperature range should be 32° F to 104° F (0° C to 40° C). The relative humidity should range from 0% to 90% (non-condensing). Furthermore, allow adequate clearance in front of the vented cover for servicing and ventilation.

NOTES:

- Unless otherwise indicated, the lighting system specified in this guide is modular, requiring assembly in the field by a licensed electrician, in accordance with all national and local codes. If a UL Listed panel is required, Crestron offers this service through its UL Listed panel shop. This includes complete in factory system configuration and assembly by Crestron for an additional fee.
- Install modules into the lowest available spaces and continue toward the top of the enclosure.
- Enclosures are intended for indoor use only.
- When flush mounting, 5/8 inch drywall is preferred.

Wiring

CAUTION: All power feeds must be protected by 15 or 20 amp circuit breakers.

NOTES:

- Use copper conductors only rated 60° C.
- All wiring must be installed in accordance with all local and national electrical codes.
- Two snap bushings are supplied. If required, insert into knockouts at the bottom of the enclosure to prevent damage to low voltage wiring.

Class 1 and Class 2 field wires must be kept separate.

Tighten all CLT-Series terminal block screws and grounding terminal block screws to the torque specified in the table below.

CAUTION: Failure to properly tighten the screws may result in poor electrical connection and overheating of the terminals.

Torque Data Table

	CLT Terminal Blocks	**Grounding Terminal Blocks**		
Wire Range	22-10	14-10	8	6-4
Torque (in lbs.)	9	35	40	45

CAEN-UMP - Universal Mounting Plates

Crestron Universal Mounting Plates (CAEN-UMP Series) are a complete line of accessory plates, which allow mounting of non-Crestron equipment to any Crestron Automation Enclosure (CAEN-Series).

Third-party products such as phone and alarm systems can be mounted to these plates within an enclosure. The advantage to using the CAEN-UMP is that a variety of sizes are available and each plate occupies the same area as one, two, or four Crestron lighting modules (CLX-Series). The size corresponds to the number of module spaces and their arrangement within the enclosure. For example, CAEN-UMP2x2 occupies four module positions and CAEN-UMP1x1 occupies one module position. The others (CAEN-UMP2x1 and CAEN-UMP1x2) occupy two module positions.

Installation

The CAEN-UMP must be mounted in accordance with all national and local codes.

NOTES:

- Adhere to Class 1 wiring requirements when considering the equipment attached to the CAEN-UMPs in an enclosure.
- Third-party equipment attached to a CAEN-UMP within a Crestron Automated Enclosure should not be considered part of the Crestron system.

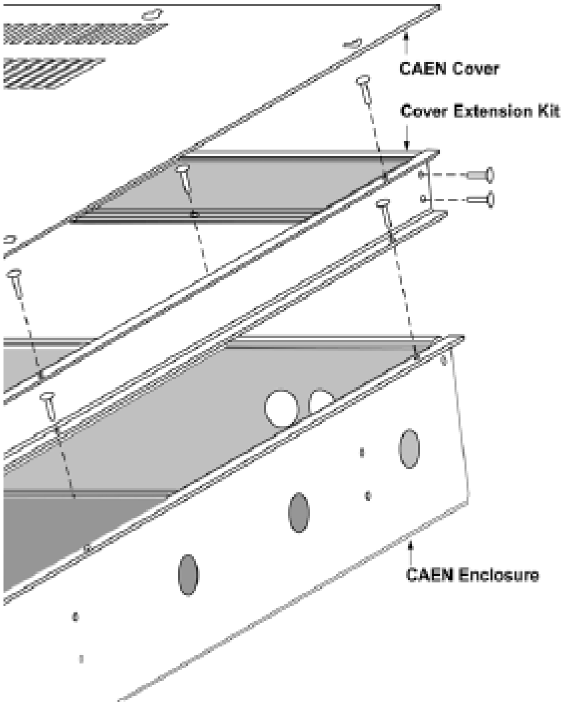
Use the four screws (8B x 1/4 inch, supplied) to attach a CAEN-UMP to an enclosure. Crestron recommends that the keyholes on the plates be located toward the outer edges of the enclosure. As a result, the flanges of the plates do not overlap each other when positioning any combination of CAEN-UMP2x1s, CAEN-UMP1x1s, or lighting modules side-by-side in an enclosure.

Refer to the CAEN-UMP product page on the Crestron website for more information.

Cover Extension Kits

CAEN-CK Cover Kits are designed to extend the depth of the Crestron CAEN and CAENIB automation enclosures, affording 1 1/2 inch (39 mm) additional depth to accommodate excess wiring and third-party devices.

Cover Extension Kit Installation Example


CAEN Cover
Cover Extension Kit
CAEN Enclosure

CAENIB Enclosures and Terminal Blocks

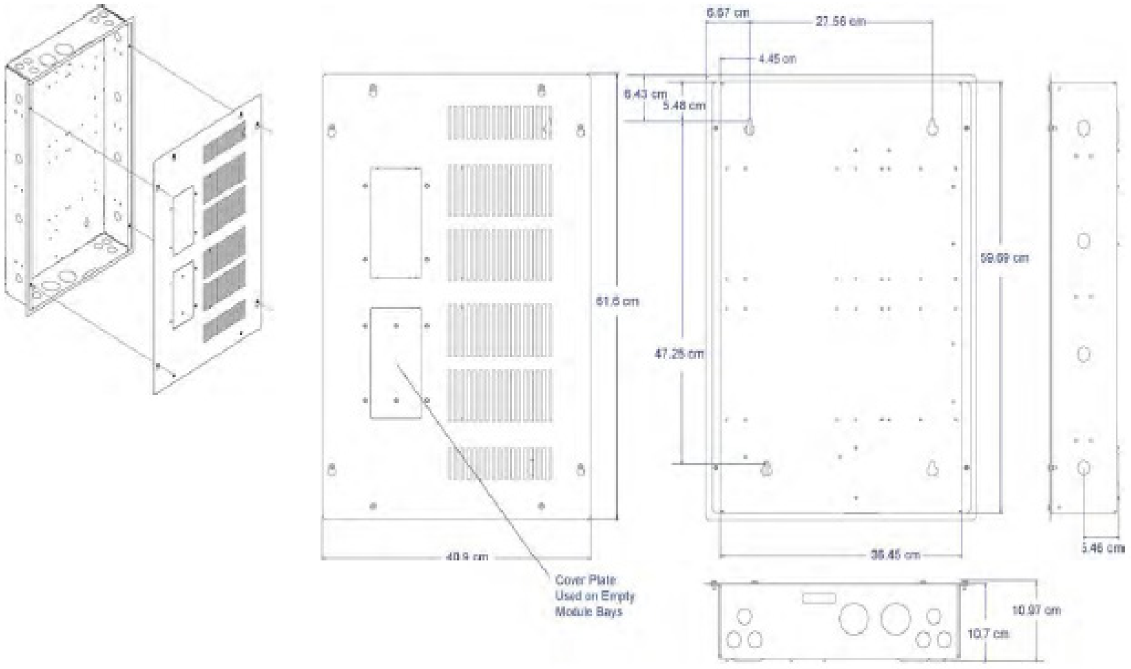
The CAENIB Series automation enclosures are designed to house Crestron CLXI-Series lighting control modules accompanied by load-side circuit breakers, with space for a PAC2 or PAC2M control system. CAENIB enclosures are available in an assortment of sizes, suitable for surface or flush wall mount installation. Each model has been engineered to provide a clean and manageable installation with abundant provisions for wire termination and electrical knockouts. CAENIB automation enclosures are designed to use space efficiently supporting over a hundred possible circuits in the largest model. Both centralized and distributed configurations are possible.

A single PAC2 control system installed in a central enclosure can support numerous satellite extension enclosures distributed throughout a residence or commercial facility. Interconnection of the complete network of enclosures requires just one circulating Cresnet cable. Dozens of keypads, touch screens, wall box dimmers, shade controllers, and other peripherals can also be terminated within an enclosure, with separate compartments provided for high and low voltage wiring.

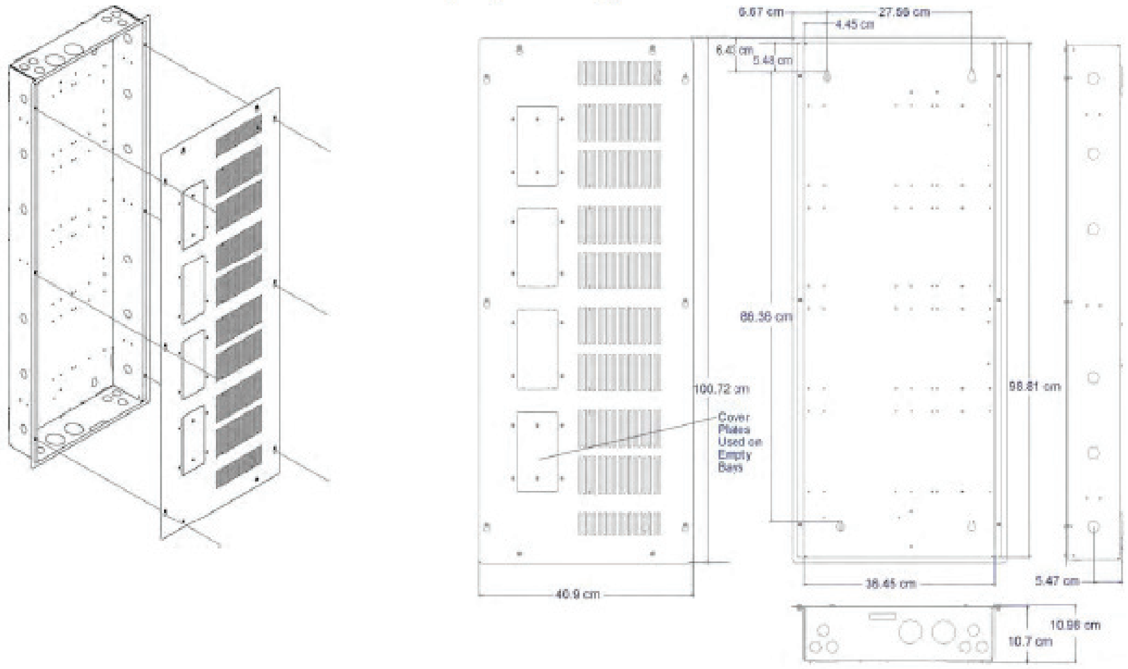
Crestron lighting and automation systems are completely convection cooled for silent and reliable operation. Each enclosure includes a vented front cover featuring individual access doors for each group of circuit breakers. All models are constructed of 16-gauge galvanized steel and are pre-drilled for mounting of the PAC2, PAC2M, CLXI modules, CLTIBN circuit breaker terminal blocks, CLTI terminal blocks, power supplies, and CAEN-BLOCK terminal block. Additional non-CLXI lighting modules and third-party contactors may be installed using the Crestron CAEN-UMP universal mounting plates. Grounding blocks and low-voltage partitions are included.

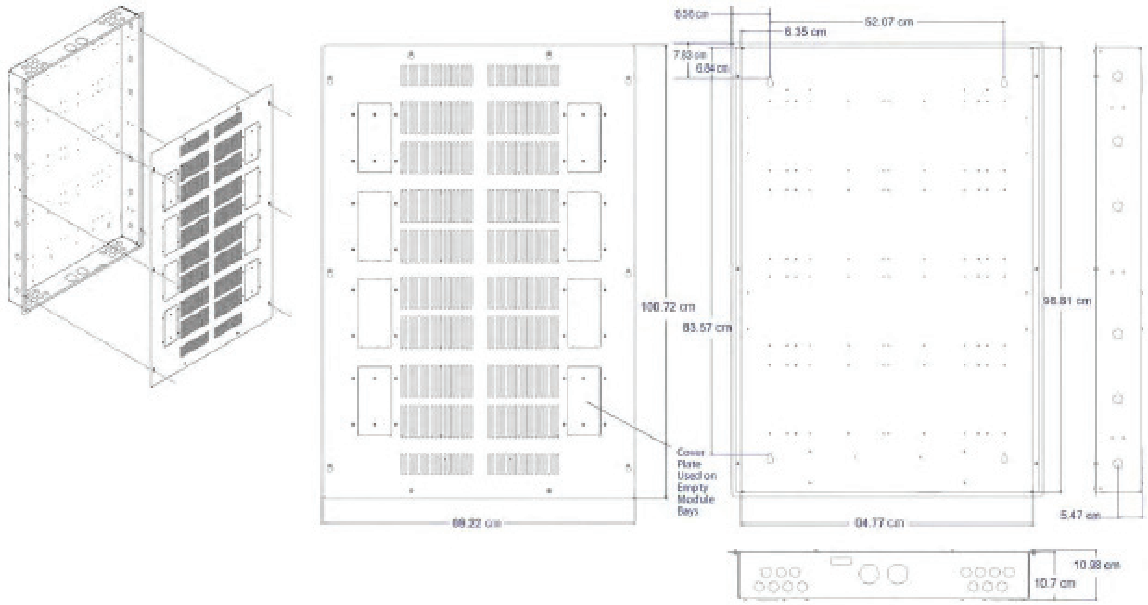
CAENIB Enclosure Dimensions

CAENIB-2X1

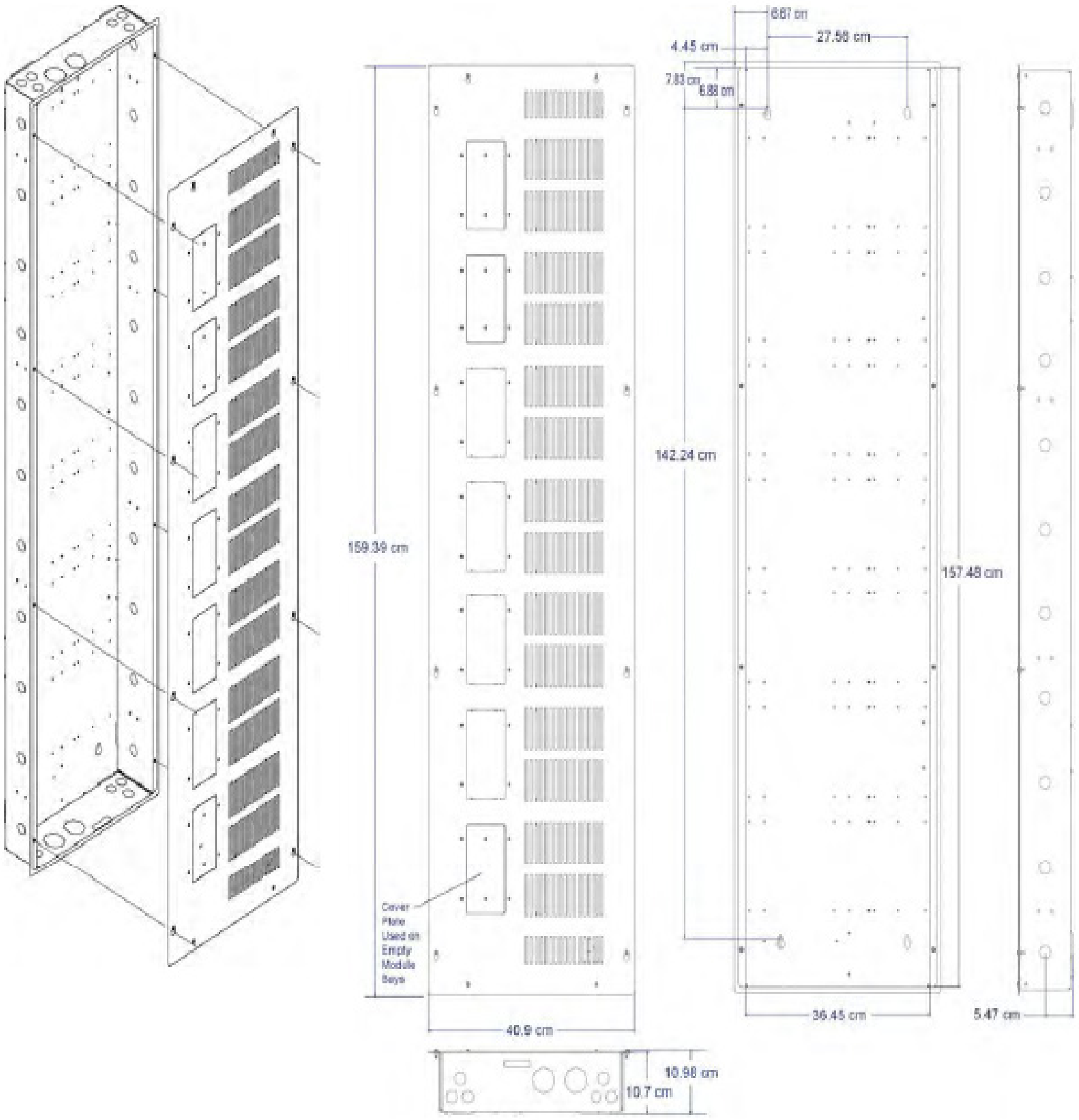


CAENIB-4X1 and CAENIB-4X2

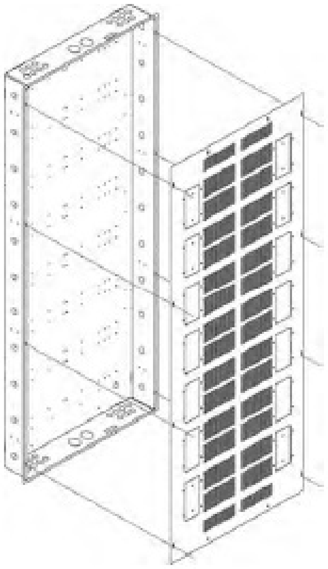

6.67 cm
4.45 cm
27.59 cm
6.40 cm
5.48 cm
86.36 cm
100.72 cm
98.81 cm
Cover Plates Used on Empty Bays
40.9 cm
36.45 cm
5.47 cm
10.98 cm
10.7 cm

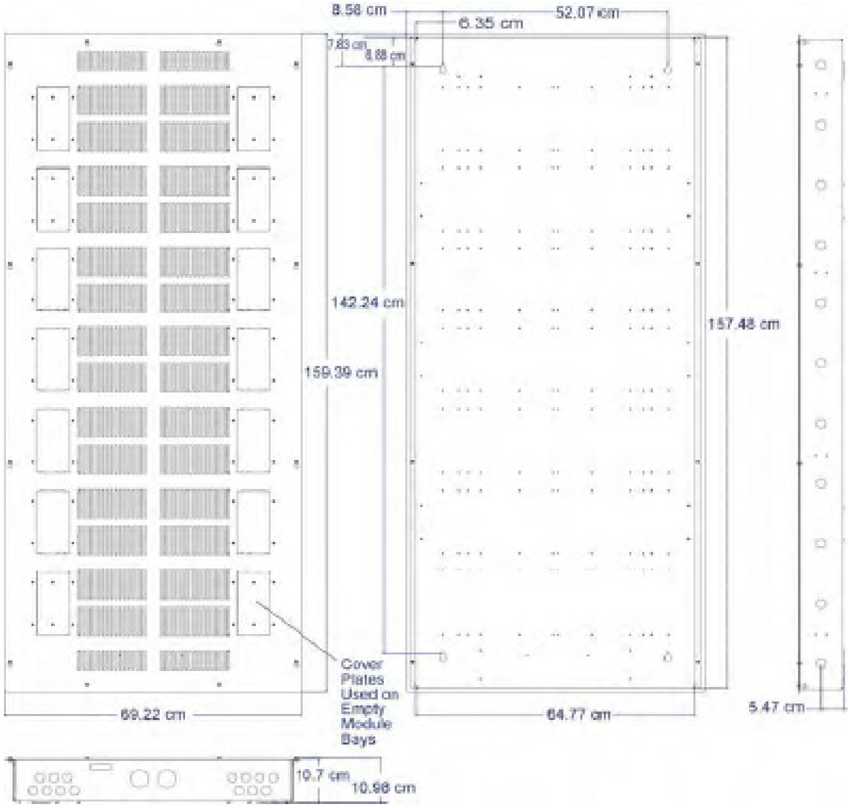

8.58 cm
6.35 cm
52.07 cm
7.63 cm
6.84 cm
100.72 cm
83.57 cm
98.81 cm
Cover Plate Used on Empty Module Bays
69.22 cm
64.77 cm
5.47 cm
10.98 cm
10.7 cm

CAENIB-7X1


6.67 cm
4.45 cm
27.58 cm
7.83 cm
6.88 cm
142.24 cm
159.39 cm
157.48 cm
Cover Plate Used on Empty Module Bays
40.9 cm
36.45 cm
5.47 cm
10.98 cm
10.7 cm

CAENIB-7X2



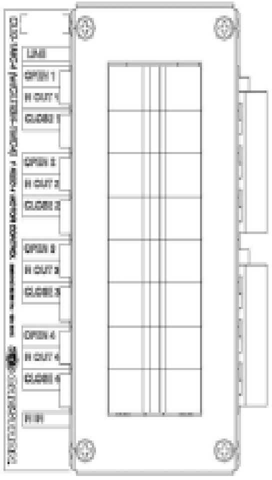

8.58 cm
6.35 cm
52.07 cm
7.83 cm
8.88 cm
142.24 cm
159.39 cm
157.48 cm
69.22 cm
64.77 cm
5.47 cm
Cover Plates Used on Empty Module Bays
10.7 cm
10.98 cm

CLTIBN Terminal Blocks

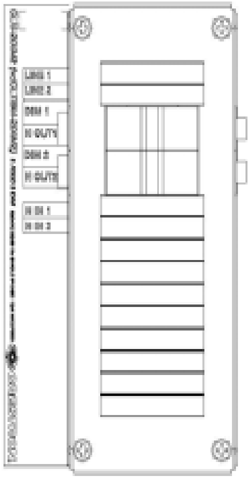
CLTIBN series of terminal blocks with breakers provide an additional option when installing Crestron CLXI-series modules in a Crestron CAENIB automation enclosure. CLTIBN terminal blocks feature inline circuit protection to protect Crestron CLXI modules. CLTIBN terminal blocks ship separately to permit termination of the field wiring to the CLTIBN prior to installation of the corresponding CLXI lighting module. Every CLTIBN includes a door kit to be installed on the cover of the CAEN enclosure. This door kit allows access to the circuit breakers located on the CLTIBN without removing the cover of the CAEN enclosure.

CLTIBN Terminal Blocks, Rails, and Labels (Left Side Units)

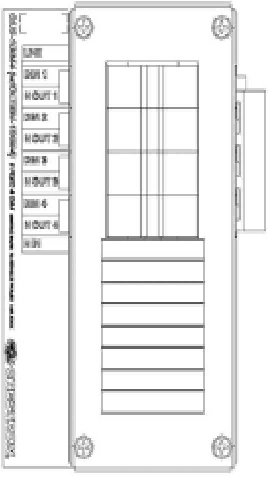
CLTIBN-1MC4



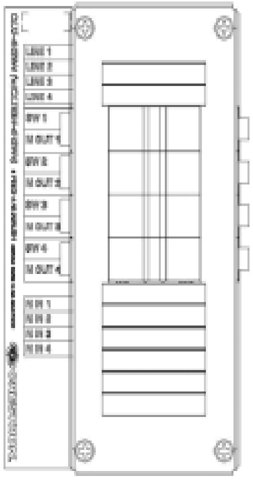
CLTIBN-2DIM2



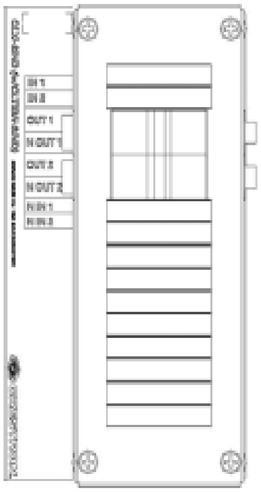
CLTIBN-1DIM4



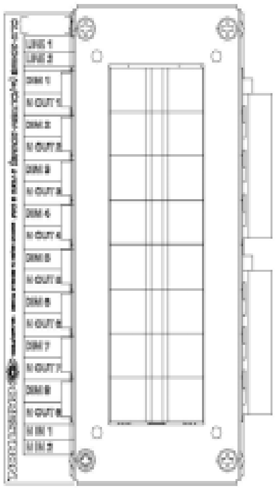
CLTIBN-4HSW4



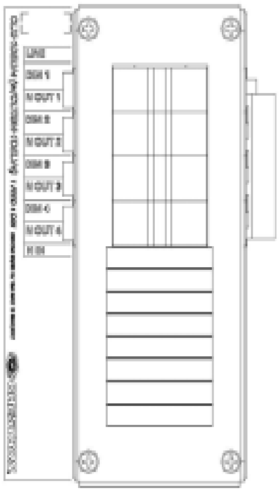
CLTIBN-2IND



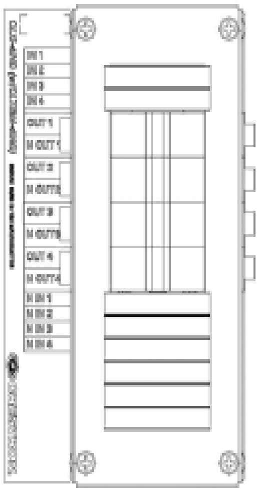
CLTIBN-2DIM8



CLTNIBN-1DELV4



CLTIBN-4IND



NOTE: The CLTIBN-BLANK allows the installation of branch circuit breakers directly inside the CAENIB cabinets, as opposed to putting them in a separate breaker cabinet (provided by others). Typically, the CLTBN-BLANK is used at the top of the CAENIB cabinet and does not have a module installed next to it (these module spaces remain unused). No circuit breakers are supplied with the CLTIBN-BLANK, permitting the installation of up to eight branch circuit breakers.

CLTIBN Terminal Block Installation

CAUTION:

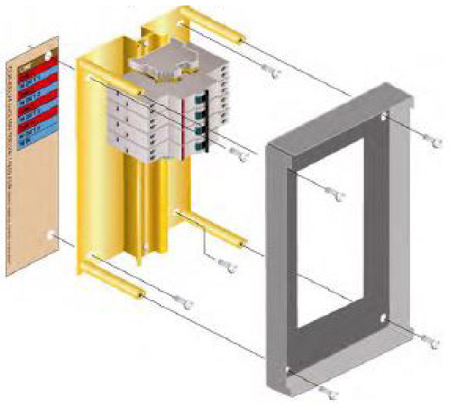
- RISK OF ELECTRIC SHOCK—MORE THAN ONE DISCONNECT SWITCH MAY BE REQUIRED TO DE-ENERGIZE THE EQUIPMENT BEFORE SERVICING.
- This equipment is for indoor use only and needs to be air-cooled. Mount in a well-ventilated area. The ambient temperature must be 0° C to 40° C. The relative humidity must be 0% to 90% (non-condensing).

Terminal blocks are installed along the left side of single-wide enclosures and along the outside edges (left and right sides) of double-wide enclosures. Modules are installed along the right side of single-wide enclosures and side-by-side in the center of double-wide enclosures. When installing modules and terminal blocks in a double-wide enclosure, be sure to invert units on the right side so that they can be properly wired.

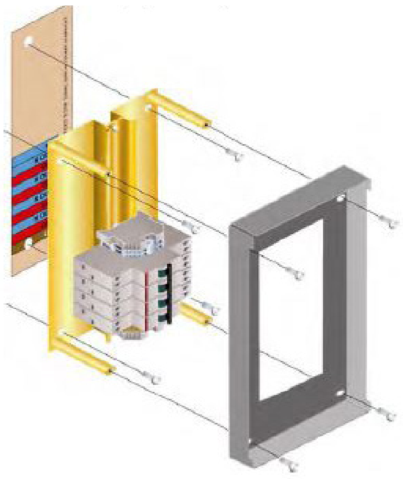
NOTES:

- A licensed electrician, in accordance with all national and local codes, must mount terminal blocks and modules in a Crestron Automation Enclosure.
- To ensure proper fit, terminal blocks and modules must be installed as indicated in the CAENIB Installation Guide (Doc. 6562) on the Crestron website.
- Modules and terminal blocks must be installed into the lowest available spaces and continue toward the top of the enclosure.
- Both left side and right side adhesive wiring labels are provided. The left-side labels are used in both single and double-wide enclosures. The right-side labels are only used in double-wide enclosures.
- CLTI-4IND and CLTI-2IND terminal blocks should be installed at the top of a CAENIB enclosure and grouped with other CLTI-4IND and CLTI-2IND terminal blocks.
- Use copper conductors only—rated 75° C.
- LINE and NEUTRAL lines can be jumped to other terminal blocks in the enclosure.

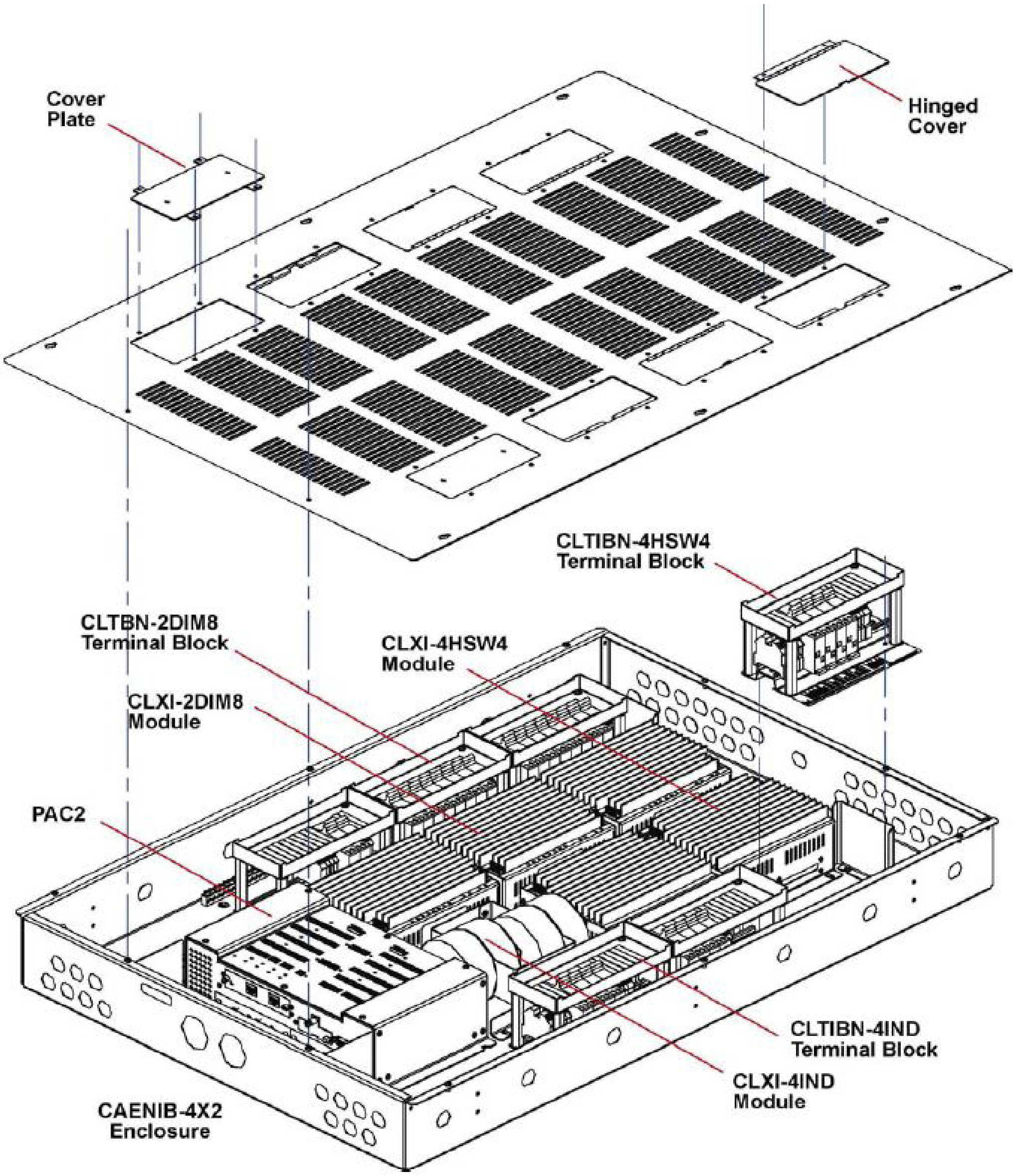
CLTIBN-1DELV4 (Left Side Unit)



CLTIBN-1DELV4 (Right Side Unit)



CAENIB Component Mounting Example

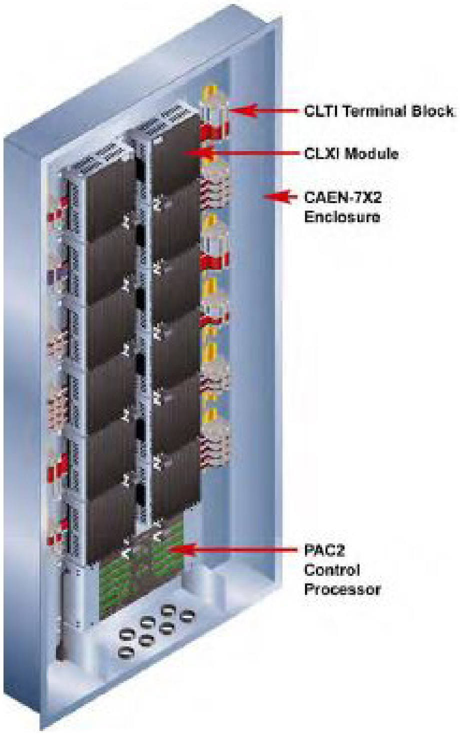

Cover Plate
Hinged Cover
CLTIBN-4HSW4 Terminal Block
CLTBN-2DIM8 Terminal Block
CLXI-4HSW4 Module
CLXI-2DIM8 Module
PAC2
CLTIBN-4IND Terminal Block
CLXI-4IND Module
CAENIB-4X2 Enclosure

Lighting Control Modules

Concealed in Crestron automation cabinets, the CLXI-Series devices are rigorously built using oversized heat sinks for ultimate reliability.

- Split-bobbin transformers and ground-referenced electronics deliver superior performance.
- Lamp flicker is minimized through the innovative Crestron zero-crossing detection technique, backed by proprietary firmware.
- Low-maintenance convection cooling assures quiet and trouble-free operation.
- Noise suppression inductors are available.
- LEDs on the modules indicate communication to a Cresnet network, input power to the module, and output power to the load.
- A five-pin ribbon cable interconnects modules and the processor.

CLXI-Series Device

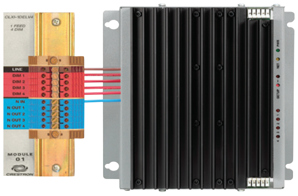
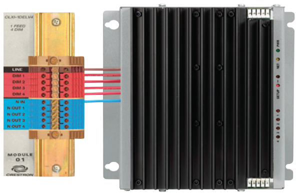
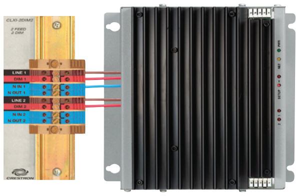
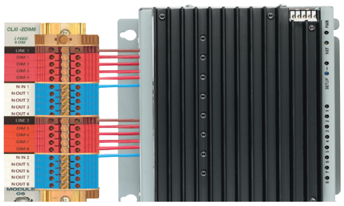
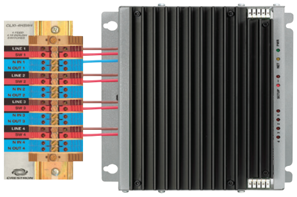
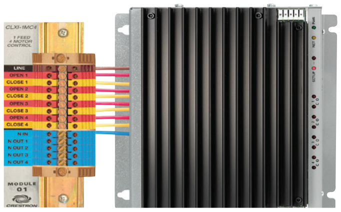


NOTE: CLXI modules and their associated CLTI (BN) terminal blocks must be installed into the lowest available spaces and continue toward the top of the enclosure.

CAUTION: A bypass jumper is provided to allow testing and to protect the module during installation. When properly secured by nine screws, the jumper on the black and red section of the terminal block shorts the line to the output so that the circuit is energized. Do not remove the bypass jumper until all feed and load wiring has been completed, the circuit has been tested for electrical faults, and the module has been installed. The jumper on the white section of the terminal block ties the NEUTRAL IN to the neutral outputs.

230 V Lighting Control Modules

Air-gap relays are provided on every channel output allowing individual circuits to be serviced without disabling the entire module. Terminal blocks are sold separately to enable termination of the wiring anytime prior to installing the module.

Model	Load	Rating	
CLXI-1DELV4	Four channels of dimming for electronic low-voltage and incandecent loads	Each channel is rated for 2300 watts with local module rating of 2990 watts	
CLXI-1DIM4	Four channels of dimming for incandecent, magnetic low-voltage, neon/cold cathode, and dimmable 2-wire fluorescent loads	Each channel is rated for 2300 watts with a total module rating of 2990 watts	
CLXI-2DIM2	Two independent channels of dimming for incandescent magnetic low-voltage, neon/ cold cathode, and dimmable 2-wire fluorescent loads	Each channel is rated for 2300 watts with local module rating of 4600 watts when fed from two separate 16 amp feeds	
CLXI-2DIM8	Eight channels of dimming for incandescent, magnetic low-voltage, neon/cold cathode, and dimmable 2-wire fluorsecent loads, actually composed of two independent four-channel dimmers in a single module	Each channel is rated for 2300 watts with local module rating of 5980 watts when fed from two separate 16 amp feeds	
CLXI-4HSW4	Four independent channels of switching for high-inrush loads such as motors, HID lighting and fluorescent ballasts as well as incandescent, low-voltage and neon/cold cathode lighting	Each channel is rated for 16 amps or 1 hp, with a total module rating of 64 amps when fed from four separate 16 amp feeds	
CLXI-1MC4	Control of up to 4 bidirectional motors for drapery, blinds, projection screens, lifts, etc.	Each channel is rated for 8 amps or 1 hp, with a total rating of 13 amps	

Terminal Blocks and Modules for CAEN Enclosures

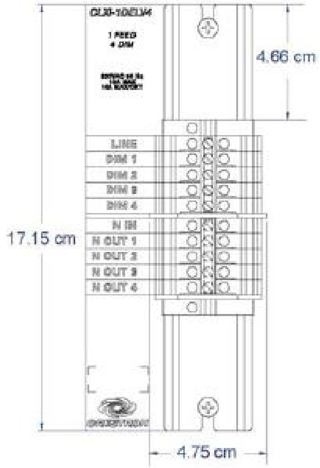
The Crestron CLTI Terminal Blocks and Modules are considered a single entity and must be used together. They ship separately to permit termination of the field wiring to the terminal block prior to the installation of the module, and are mounted in any Crestron Automation Enclosure (CAEN-Series Enclosures). The terminal block is designed to terminate the circuit feed (HOT and NEUTRAL) and distribute the controlled circuit (LOAD) to the fixtures. The module connects to the terminal block and performs dimming or switching control of the loads.

NOTES:

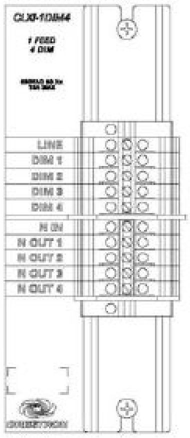
- When connecting dimming loads to an arc fault breaker, the load should not exceed 1000 watts.
- Each terminal block includes a terminal rail for mounting the terminal block in the enclosure. Terminal rails and blocks do not occupy a module space within an enclosure.

Terminal Blocks, Rails, and Labels (Left Side Units)

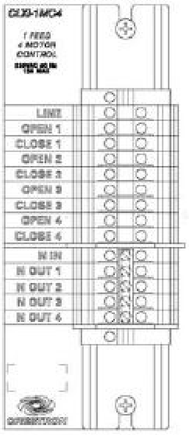
CLTI-1DELV4


4.66 cm
17.15 cm
4.75 cm
LINE
DIM 1
DIM 2
DIM 3
DIM 4
N IN
N OUT 1
N OUT 2
N OUT 3
N OUT 4

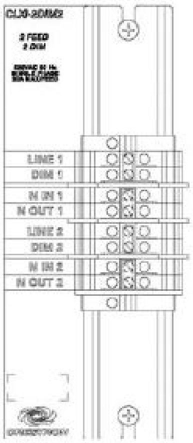
CLTI-1DIM4


LINE
DIM 1
DIM 2
DIM 3
DIM 4
N IN
N OUT 1
N OUT 2
N OUT 3
N OUT 4

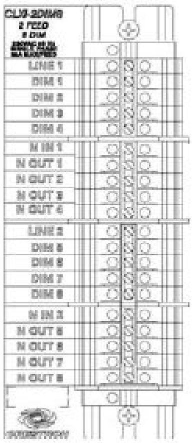
CLTI-1MC4


LINE
OPEN 1
CLOSE 1
OPEN 2
CLOSE 2
OPEN 3
CLOSE 3
OPEN 4
CLOSE 4
N IN
N OUT 1
N OUT 2
N OUT 3
N OUT 4

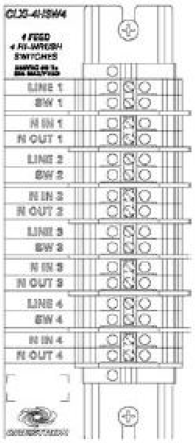
CLTI-2DIM2


LINE 1
DIM 1
N IN 1
N OUT 1
LINE 2
DIM 2
N IN 2
N OUT 2

CLTI-2DIM8


LINE 1
DIM 1
DIM 2
DIM 3
DIM 4
N IN 1
N OUT 1
N OUT 2
N OUT 3
N OUT 4
LINE 2
DIM 5
DIM 6
DIM 7
DIM 8
N IN 2
N OUT 5
N OUT 6
N OUT 7
N OUT 8

CLTI-4HSW4


LINE 1
SW 1
N IN 1
N OUT 1
LINE 2
SW 2
N IN 2
N OUT 2
LINE 3
SW 3
N IN 3
N OUT 3
LINE 4
SW 4
N IN 4
N OUT 4

Module Installation

A licensed electrician, in accordance with all national and local codes, must mount the terminal blocks and modules in a Crestron Automation Enclosure.

Terminal blocks are installed along the left side of single-wide enclosures and along the outside edges (left and right sides) of double-wide enclosures. Modules are installed along the right side of single-wide enclosures and side-by-side in the center of double-wide enclosures. When installing modules and terminal blocks in a double-wide enclosure, invert units on the right side so that they can be properly wired. Refer to the illustrations when considering the location of terminal blocks and modules within an enclosure.

CAUTION:

- This equipment is for indoor use only and needs to be air cooled. Mount in a well-ventilated area. The ambient temperature must be 0° C to 40° C. The relative humidity must be 0% to 90% (non-condensing).
- Modules contains electrostatic sensitive devices (ESDs); unit must be handled from metal chassis–do not touch PC board or components.

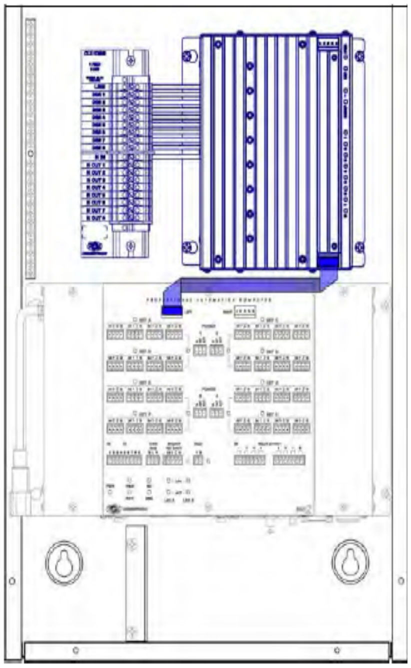
NOTES:

- Modules and terminal block must be installed into the lowest available spaces and continue toward the top of the enclosure.
- Modules are installed after the enclosure has been completely wired.

Single Width Enclosure Mounting

Module and associated terminal blocks are installed in single width enclosure. The PAC2 processor occupies the lowest module position.

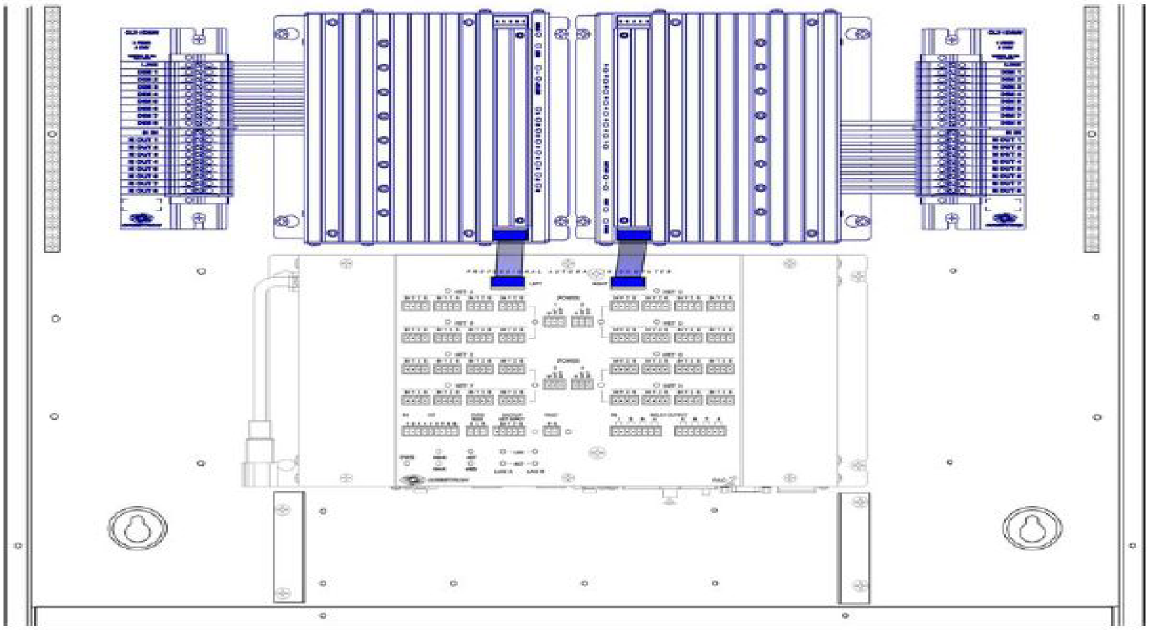
PAC2 Processor in Single Width Enclosure Mount



Double Width Enclosure Mounting

The module and associated terminal block are installed in a double width enclosure. The PAC2 processor occupies the lowest module position.

PAC2 Processor in Double Width Enclosure Mount



Module Bypass Jumpers

CAUTION: A bypass jumper is provided to allow testing and to protect the module during installation. When properly secured by nine screws, the jumper on the black and red section of the terminal block shorts the line to the output so that the circuit is energized. Do not remove the bypass jumper until all feed and load wiring has been completed, the circuit has been tested for electrical faults, and the module has been installed. The jumper on the white section of the terminal block ties the neutral in to the neutral outs. This jumper should never be removed.

NOTE: Use copper conductors only—rated 75° C.

Cresnet Terminal Block for CAEN Automation Enclosures

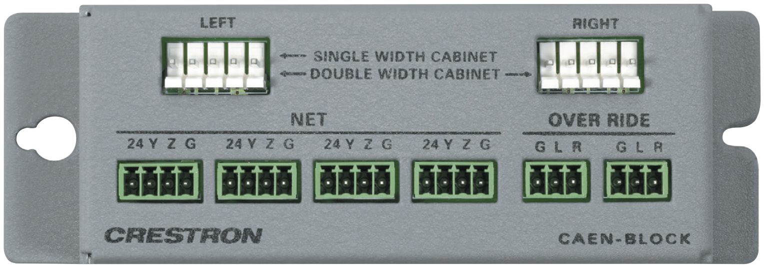
The CAEN-BLOCK is a Cresnet terminal block designed specifically for Crestron lighting and automation systems to link extension enclosures and satellite enclosures to the central PAC2 or PAC2M control system. The CAEN-BLOCK mounts at the bottom of each CAEN enclosure that does not contain a control system to provide Cresnet and Override signal connectivity for CLXI-Series lighting control modules within. The CAEN-BLOCK serves as a parallel distribution block for multiple Cresnet cables, and provides for connection of the Cresnet and override signal cables from the central control system.

Crestron Network Block (CAEN-BLOCK) provides four termination ports for Cresnet wiring. The unit also has two 5-pin connections that provide communication to the modules. The contact closure override signals that produce an emergency override of the modules are also sent through these connections. The override connector provides external dry contact closure inputs directly to the 5-position Cresnet interconnect connectors, LEFT and RIGHT.

When a switch contact closure is received between the G connections and the L or R connection (R is used in a double-wide enclosure only) on the CAEN BLOCK, the respective left or right column of modules will set the lights to the programmed emergency over-ride state. The override connector is rated at 5 volts, 10 mA maximum.

The CAEN-BLOCK unit is a pass-through device with a Cresnet power factor of zero.

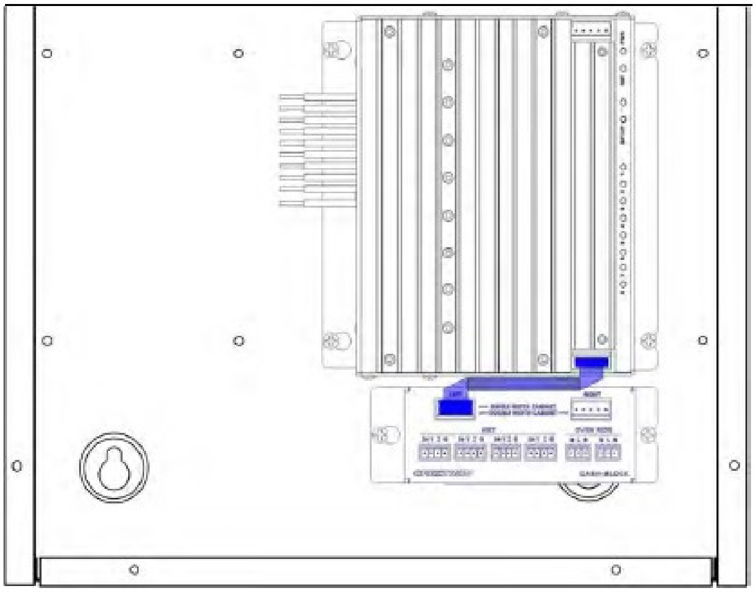
CAEN-BLOCK


LEFT
RIGHT
SINGLE WIDTH CABINET
DOUBLE WIDTH CABINET
NET
24 Y Z G
24 Y Z G
24 Y Z G
24 Y Z G
OVER RIDE
G L R
G L R
CRESTRON
CAEN-BLOCK

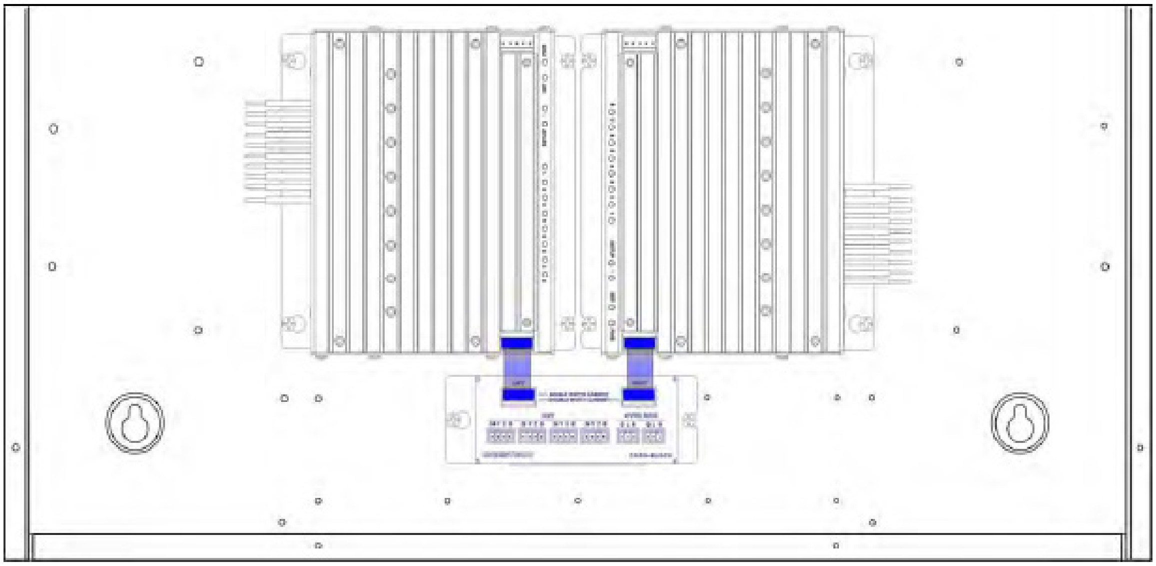
Network Block Dimensions and Weight

Height	Width	Depth	Weight
5.08 cm	15.24 cm	4.45 cm	1.54 kg

CAEN-BLOCK Location and Orientation within a Single-Wide Enclosure



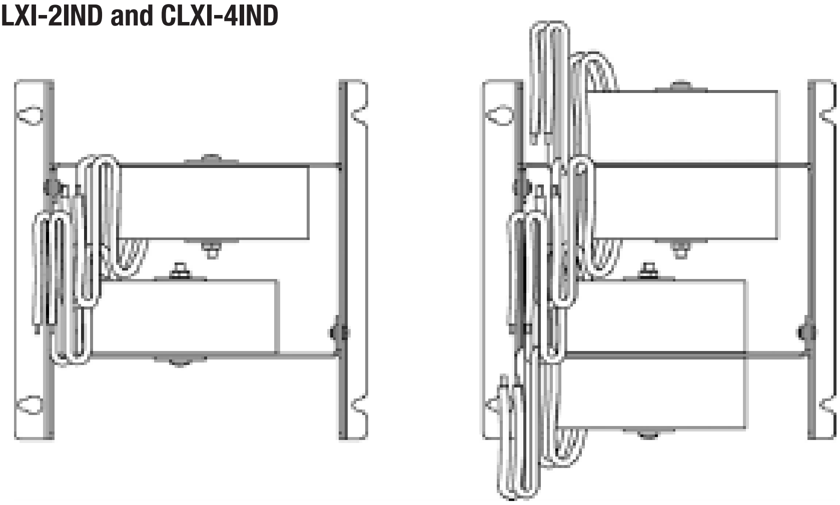
CAEN-BLOCK Location and Orientation in a Double-Wide Enclosure



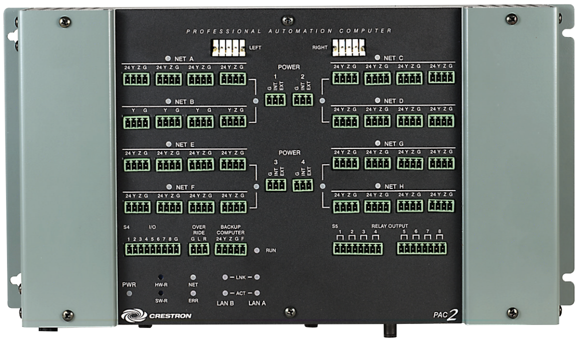
Two and Four Channel Inductor Modules

The CLXI-2IND is a 2-inductor terminal block and module kit. The CLXI-4IND is a 4-inductor terminal block and module kit. Inductor modules reduce hum from incandescent lamps that are connected to dimmer modules in a Crestron lighting system. These kits are mounted in any Crestron Automation Enclosure (CAEN-Series and CAENIB-Series Enclosures). The terminal block connects wires into and out of the inductor module. The inductor is wired in series between the output of the dimmer module and the load. The maximum load for any inductor in the module is 16 amps. Each terminal block and module kit is considered a single entity and must be used together. The terminal blocks (CLTI-2IND, CLTIBN-2IND, CLTI-4IND, and CLTIBN-4IND) are shipped separately from their respective modules (CLXI-2IND and CLXI-4IND) to permit termination of the field wiring to the terminal block prior to installation of the module.

CLXI-2IND and CLXI-4IND



PAC2 Lighting Control Processor



- The PAC2 enables efficient control of lighting and other systems such as HVAC and security.
- The PAC2 has been specifically designed for the Crestron automation enclosure and the Crestron lighting system, although other Crestron processors can also be used.
- The PAC2 occupies one module space in single-width enclosures and two module spaces in double-width enclosures.

NOTE: Crestron recommends that the control processor be mounted within a separate CAEN enclosure to create a simplified low-voltage wiring center.

Cresnet Distribution

The built-in Cresnet hub serves as a repeater, splitter, and wiring block for large Cresnet networks. The hub allows for 256 or more devices (touch screens, keypads, etc.) at 32 per segment (A-H) and distribution up to 914.4 m per segment. There are eight independent segments, each with four Cresnet connectors wired in parallel. Each segment has a dedicated driver/receiver for Cresnet communication. In addition, there is a master NET port on the front panel. The eight NET (A-H) activity LEDs illuminate when a device on the respective segment transmits data. When powered by the internal power supply, a maximum of 50 watts (dc) is available for all connected network devices. The LEDs indicate communication on the Cresnet link. The on-board 36 MB memory is enhanced with a 4 GB expansion slot that supports off-the-shelf Type II compact flash memory. The hard disk drive provides on-board storage of program and touch screens files, room and equipment profiles, upgrades, databases, and schedules.

The unique Crestron dual bus system, with its high-speed I/O bus architecture, provides blazing fast throughput, system wide. The two 40 Mb/s Y-BUS expansion slots offer the option of installing any of the CNX-series cards and all C2-series control cards listed in the Crestron product catalog. The 300 Mb/s Z-BUS expansion slot is designed for super high-speed control card applications such as 10/100 Ethernet, available via the Crestron single-port C2ENET-1 and dual-port C2ENET-2 Ethernet cards.

The PAC2 also provides true secure network communications, which is required for today's corporate networks, automated residence systems, and the Internet. The Dual Port 10/100BaseT Ethernet card (C2ENET-2) supports dynamic and static IP addressing and full duplex TCP/IP and UDP/IP. It offers a WAN port for Internet and remote-location communications and a LAN port for local in-home use. A built-in firewall delivers network security with the Network Address Translator (NAT) and router functions. The built-in web server uses memory storage on a compact flash card for remote access and control.

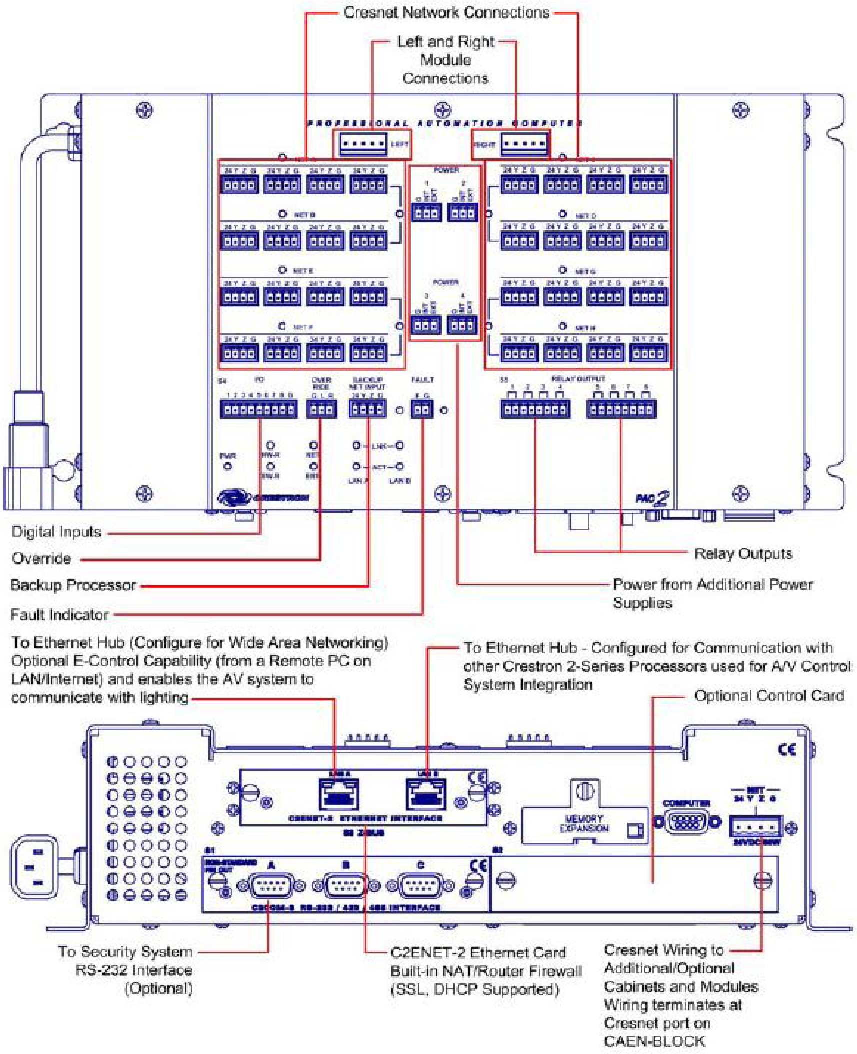
PAC2 Connections

The PAC2 provides external connections for both a back-up processor and emergency override closure signals. In the absence of Cresnet or in case of a power failure, a signal is generated to switch power and communication of the Cresnet system to a back-up processor. When the override connection receives a contact closure, a signal is passed to the lighting modules via the fifth wire of the interconnect cable, and the lights are turned on at a pre-programmed emergency level. They remain at this level until that contact closure is opened.

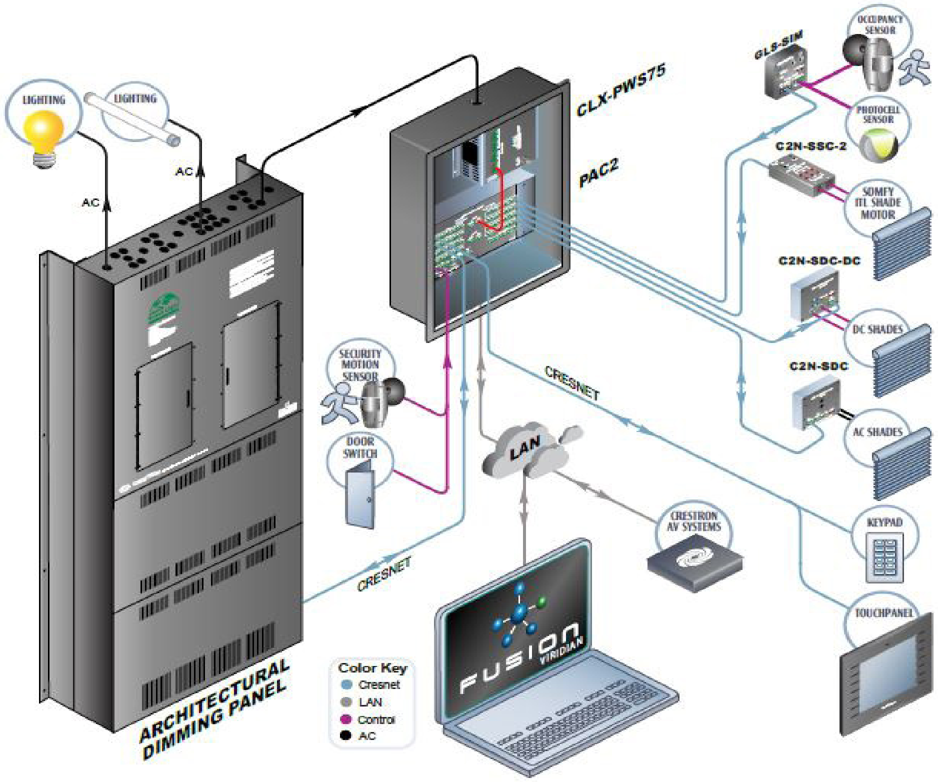
The backup net input connector allows a backup control system to automatically take control of the Cresnet network in the unlikely event of an internal processor failure. The built-in Cresnet watchdog switches over when the CPU fails.

The fault connector provides a dry contact closure fault signal to notify an external control system when the PAC2 has a system fault. This output may be connected to a digital input of the backup computer. A fault is defined as the CPU not interacting with Cresnet for 10 seconds. The watchdog switches back if the backup computer Cresnet is inactive for 10 seconds. The PAC2 offers eight programmable analog and digital inputs as well as digital outputs. There are eight normally open relays, isolated with MOV suppression.

PAC2 Connection Example


Cresnet Network Connections
Left and Right Module Connections
PROFESSIONAL AUTOMATION COMPUTER
PAC2
Digital Inputs
Override
Backup Processor
Fault Indicator
Relay Outputs
Power from Additional Power Supplies
To Ethernet Hub (Configure for Wide Area Networking) Optional E-Control Capability (from a Remote PC on LAN/Internet) and enables the AV system to communicate with lighting
To Ethernet Hub - Configured for Communication with other Crestron 2-Series Processors used for A/V Control System Integration
Optional Control Card
MEMORY EXPANSION
COMPUTER
C2ENET-2 ETHERNET INTERFACE
C2COM-3 RS-232 / 422 / 485 INTERFACE
To Security System RS-232 Interface (Optional)
C2ENET-2 Ethernet Card Built-in NAT/Router Firewall (SSL, DHCP Supported)
Cresnet Wiring to Additional/Optional Cabinets and Modules Wiring terminates at Cresnet port on CAEN-BLOCK

PAC2 Application Example


LIGHTING
LIGHTING
AC
AC
CLX-PWS75
PAC2
GLS-SIM
OCCUPANCY SENSOR
PHOTOCELL SENSOR
C2N-SSC-2
SOMFY ILT SHADE MOTOR
C2N-SDC-DC
DC SHADES
C2N-SDC
AC SHADES
SECURITY MOTION SENSOR
DOOR SWITCH
CRESNET
LAN
CRESTRON AV SYSTEMS
KEYPAD
TOUCHPANEL
CRESNET
FUSION VIRIDIAN
ARCHITECTURAL DIMMING PANEL
Color Key
● Cresnet
● LAN
● Control
● AC

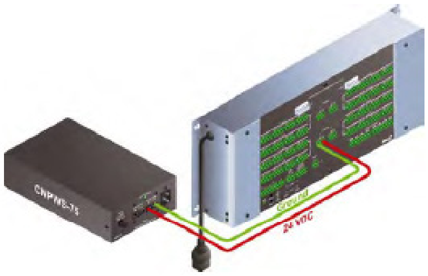
PAC2 Power Management

When power requirements exceed 50 watts, additional power supplies may be added. For example, each keypad in the CNX-B series uses 3 watts; therefore, only 15 keypads (allowing for a margin of safety) can be connected without adding an additional power supply.

To ensure sufficient power to accommodate all the Cresnet devices (keypads, touch screens, shade/drapery controllers, thermostats, sensors, and other interfaces) and to include voltage drops and wire runs, Crestron recommends the CLX-PWS75 75 watt Cresnet power supply module, or the C2N-SPWS300 300 watt system power supply.

The 75 watt power supply is designed to mount in a CAEN Automation Enclosure. A single CLX-PWS75 can be installed in any single-width enclosure, or up to two may be installed side-by-side in a double-width enclosure. Four Cresnet power ports are provided on the CLX-PWS75, which may be used to supply power directly to Cresnet devices or to connect to the external power input ports of a PAC2 or PAC2M.

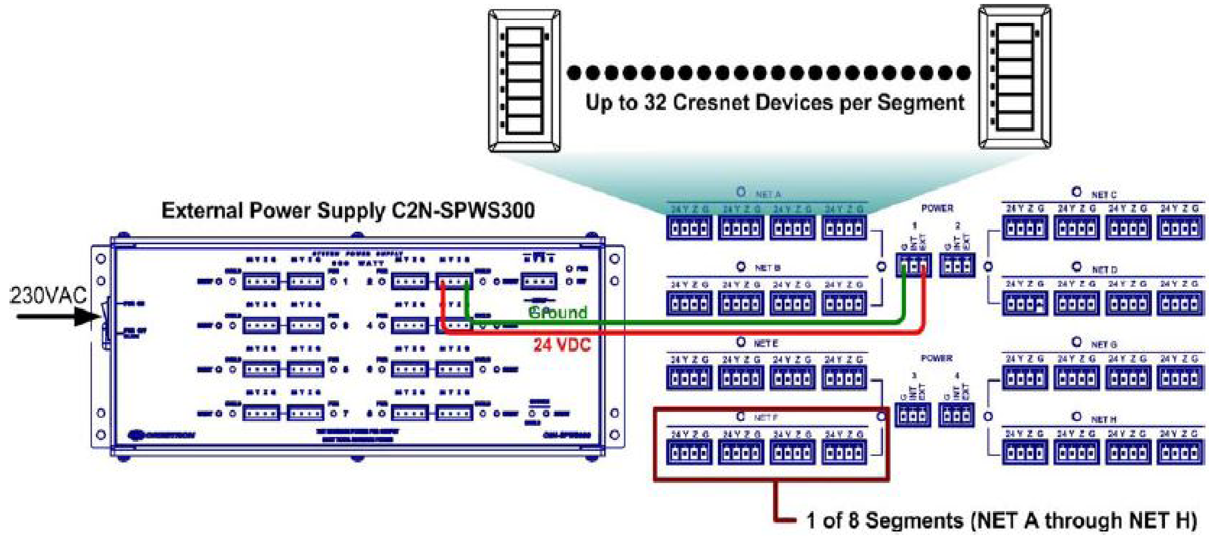
The 300 watt power supply, specifically designed for large Cresnet control systems, operates with an input of 100 to 240 Vac, 4 amps (maximum), and a noise rating less than 150 mV. The C2N-SPWS300 provides regulated 24 Vdc, 300 watt to Cresnet system components. The C2N-SPWS300 is capable of delivering a nominal 75 watts of power at 24 Vdc on any of its eight channels.


CNPWS-75
Cresnet
24 VDC

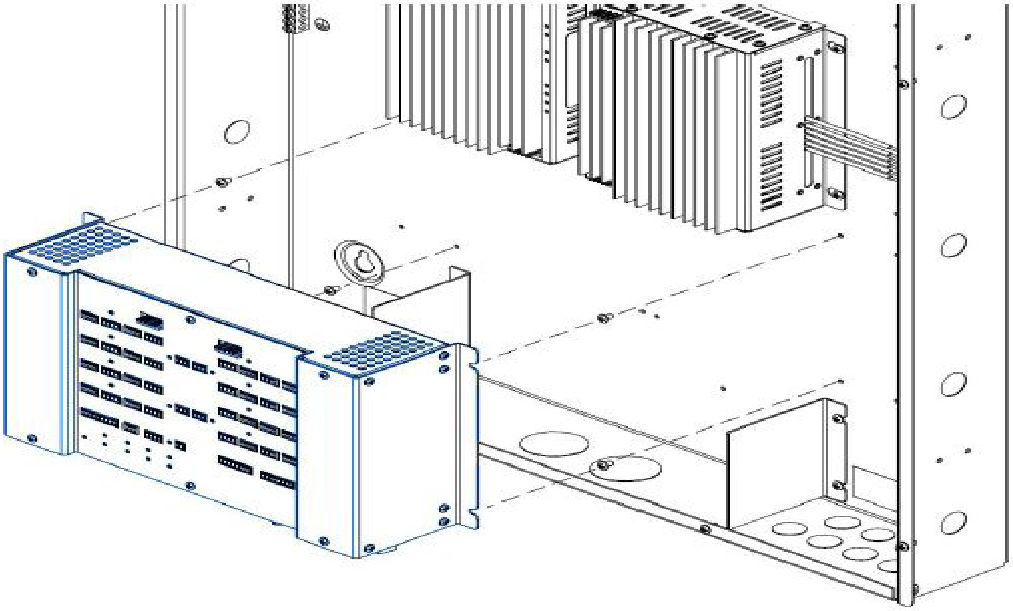
Additional power supplies should not be mounted on CAEN-UMP plates in an enclosure that contains dimmer units because this introduces low-voltage in the high-voltage section of the enclosure. If required, an extra power supply, attached to a CAEN-UMP plate, can be added to a separate CAEN enclosure. Refer to the PAC2 Operations Guide (Doc. 5941) on the Crestron website for more information.

CAUTION: Use only Crestron power supplies for Crestron equipment. Failure to do so may cause equipment damage or void the Crestron warranty.

External Power Supply Example


Up to 32 Cresnet Devices per Segment
External Power Supply C2N-SPWS300
230VAC
Ground
24 VDC
NET A
NET B
NET C
NET D
NET E
NET F
NET G
NET H
POWER
24 Y Z G
1 of 8 Segments (NET A through NET H)

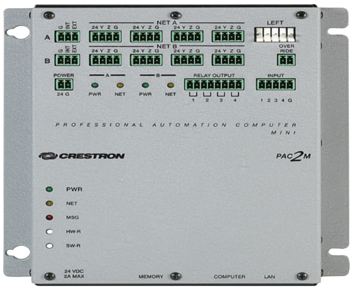
PAC2 Mounting in Double-Wide Enclosure Example



PAC2M Professional Automation Mini Control System

The PAC2M is a compact, low-cost alternative to the PAC2. The PAC2M was designed for small lighting and automation applications and is half the size of a PAC2. Its smaller size makes it a perfect choice for apartments and smaller homes as well as individual meeting rooms, lecture halls, and MDU applications.

PAC2M Front View



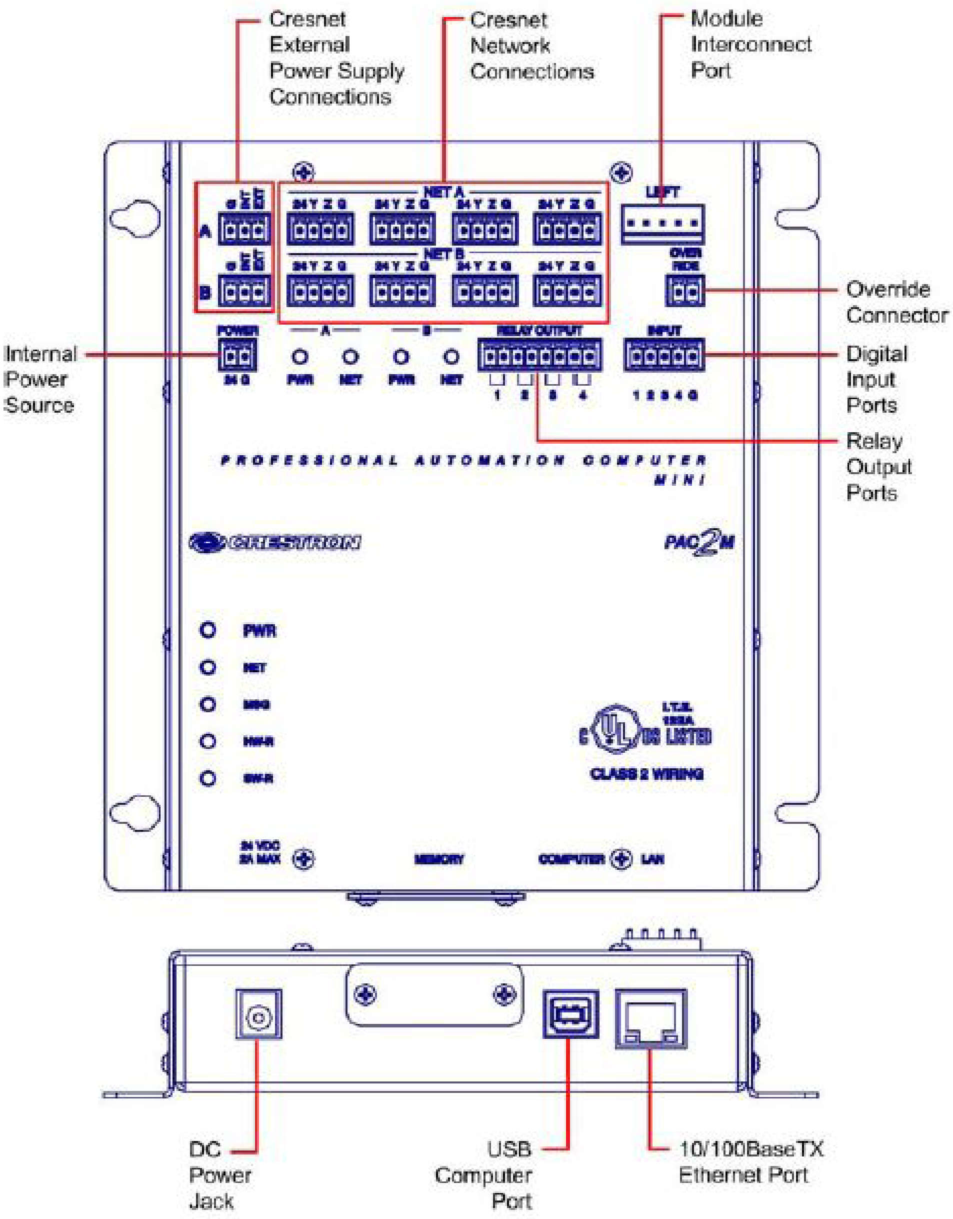
PAC2M Left Angle View

Built upon the reliable Crestron 2-Series control engine, the PAC2M is extensively programmable using the Crestron suite of powerful development software and vast database of drivers and software modules. The PAC2M works seamlessly with the entire Crestron line of lighting dimmers and shade controls, keypads and touch screens, thermostats, wireless gateways, and expansion modules.

The PAC2M provides for the integration of non-Crestron devices and subsystems through a host of control interfaces. Four isolated relays and four digital input ports are built in to accommodate motion sensors, contactors, door strikes, and other low-voltage controls. Additional relays, I/O ports, serial COM ports, DTMF interfaces, and shade controllers can be added using Crestron expansion modules at any location throughout a residence or commercial facility.

The PAC2M is designed to install in a CAEN automation enclosure and provide a direct bus to a cabinet full of CLXI-Series lighting control modules. The PAC2M can also be mounted directly to a suitable surface without an enclosure where allowed.

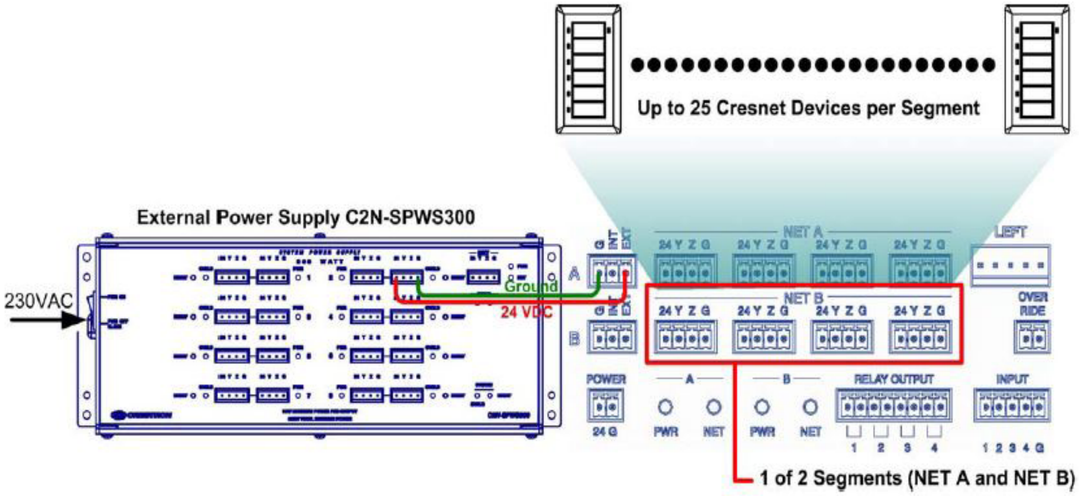
PAC2M Connections Example


Cresnet External Power Supply Connections
Cresnet Network Connections
Module Interconnect Port
Override Connector
Digital Input Ports
Relay Output Ports
Internal Power Source
NET A
NET B
LEFT
OVER RIDE
POWER
RELAY OUTPUT
INPUT
PROFESSIONAL AUTOMATION COMPUTER MINI
CRESTRON
PAC2M
PWR
NET
MSG
HW-R
SW-R
CLASS 2 WIRING
24 VDC 2A MAX
MEMORY
COMPUTER
LAN
DC Power Jack
USB Computer Port
10/100BaseTX Ethernet Port

Cresnet Distribution

Cresnet is the communications backbone for Crestron lighting modules, wall box dimmers, thermostats, keypads, and many other devices. This flexible 4-wire bus streamlines the wiring of a complete Crestron lighting system. The PAC2M provides connectivity for numerous Cresnet devices on multiple homeruns via eight separate Cresnet ports. Its built-in Cresnet hub provides two isolated segments, each supporting 900 m of cabling and approximately 25 Cresnet devices. The Cresnet ports are arranged into two separate power groups providing a clean, flexible 24 Vdc power distribution solution. An external power supply is required (sold separately).

Cresnet Distribution Example



Crestron XPanel

Crestron XPanel controls anything in the home, office, or classroom using a laptop or desktop computer. XPanel works on any computer platform and any screen size using a mouse, touch screen monitor, or other pointing device. It can be installed and run as a desktop application, or launch it like a website using any web browser. Use XPanel as a low-cost control solution for a small classroom AV system, to monitor a home from an office, as an interactive kiosk in a lobby or museum exhibit, or to enable centralized control of lighting and climate control in an office building or conference center. For virtually any application, XPanel can provide a robust and scalable IP based control solution.

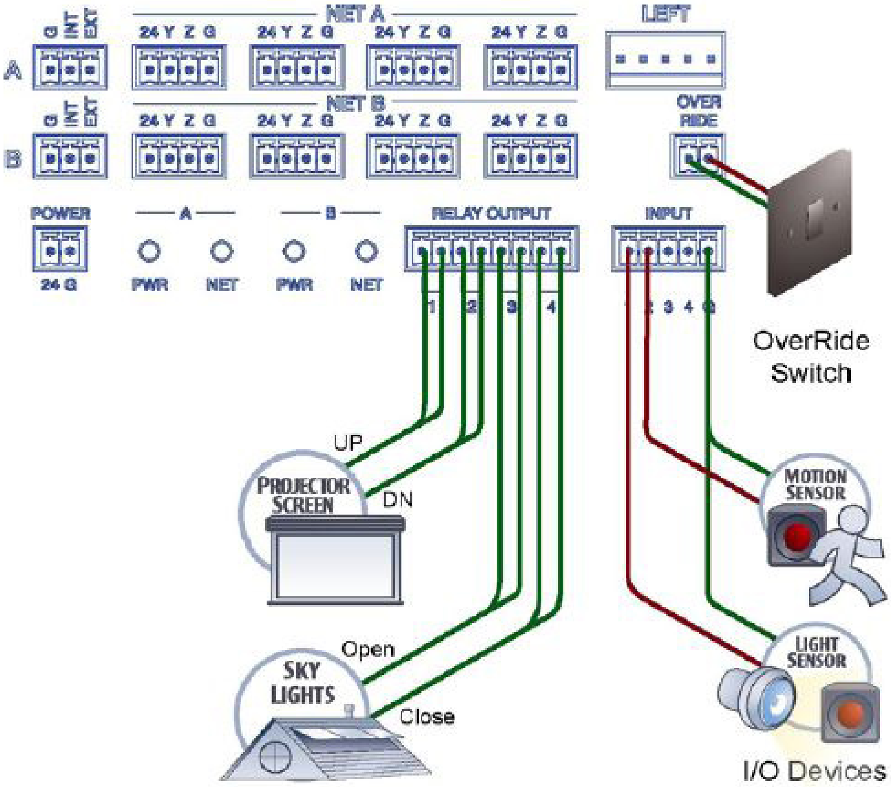
RoomView and SNMP

For large facilities utilizing multiple PAC2M and other control systems, the exclusive Crestron RoomView Help Desk software delivers a comprehensive solution for remote monitoring and asset management. Also, built-in SNMP support enables similar capability using third-party network management software, allowing full control and monitoring from the IT Help Desk or NOC in a format that is familiar to IT personnel.

Override Input

An override input is provided to allow an external contact closure to bypass the PAC2M and activate a preset override state in each connected lighting module.

Override Input Example


NET A
G INT EXT
24 Y Z G
24 Y Z G
24 Y Z G
24 Y Z G
LEFT
A
NET B
G INT EXT
24 Y Z G
24 Y Z G
24 Y Z G
24 Y Z G
OVER RIDE
B
POWER
24 G
A
PWR
NET
B
PWR
NET
RELAY OUTPUT
1 2 3 4
INPUT
1 2 3 4 G
OverRide Switch
UP
PROJECTOR SCREEN
DN
MOTION SENSOR
Open
SKY LIGHTS
Close
LIGHT SENSOR
I/O Devices

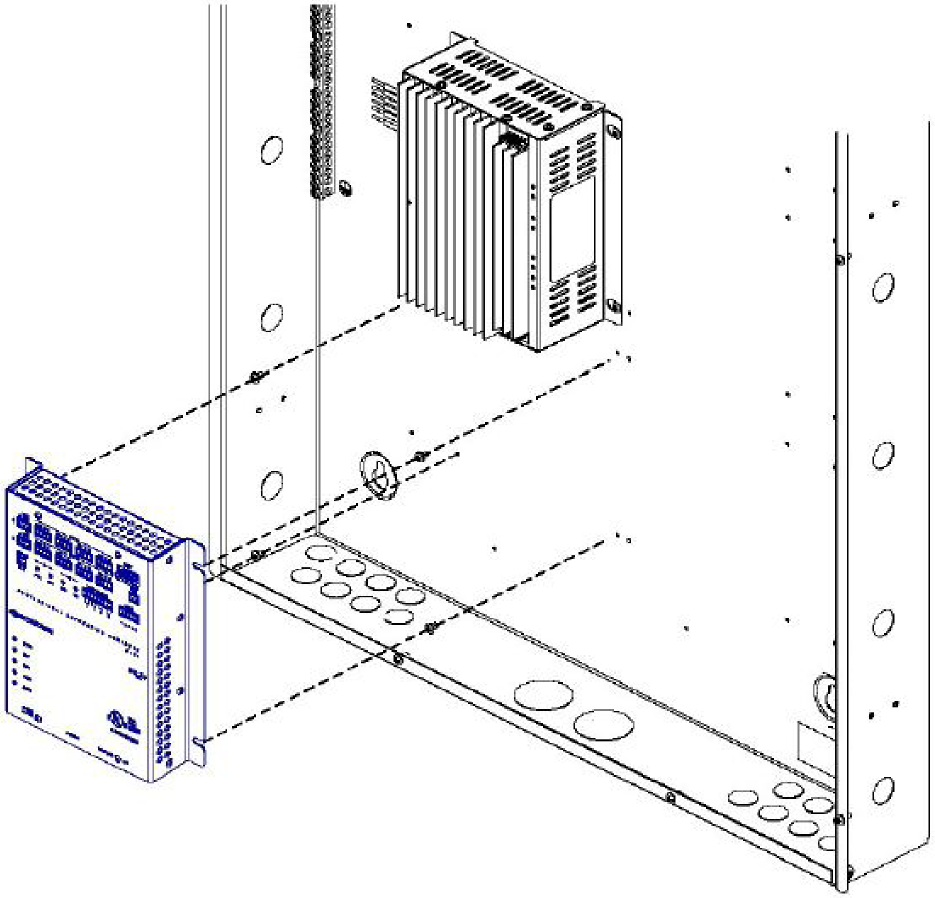
Memory Expansion

A memory card slot allows for easy expansion of the PAC2M internal memory using any MMC-compatible memory card up to 1 GB.

Double Width Enclosure Mounting

The module and associated terminal block are installed in a double width enclosure. The PAC2M processor occupies the lowest module position in either the single or double enclosure. Refer to the PAC2M Operations Guide (Doc. 6507) on the Crestron website for more information.

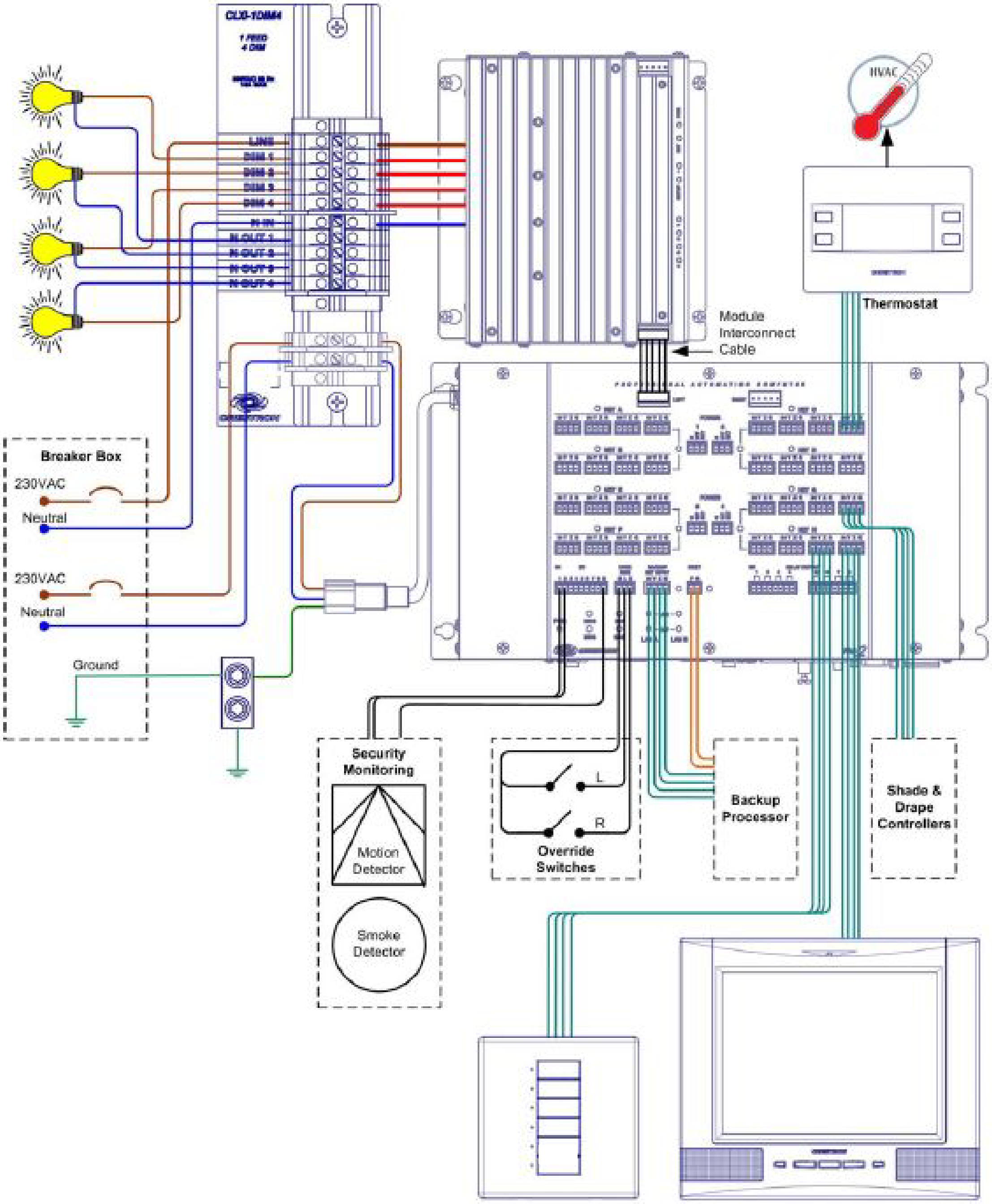
Double Width Enclosure Mounting Example



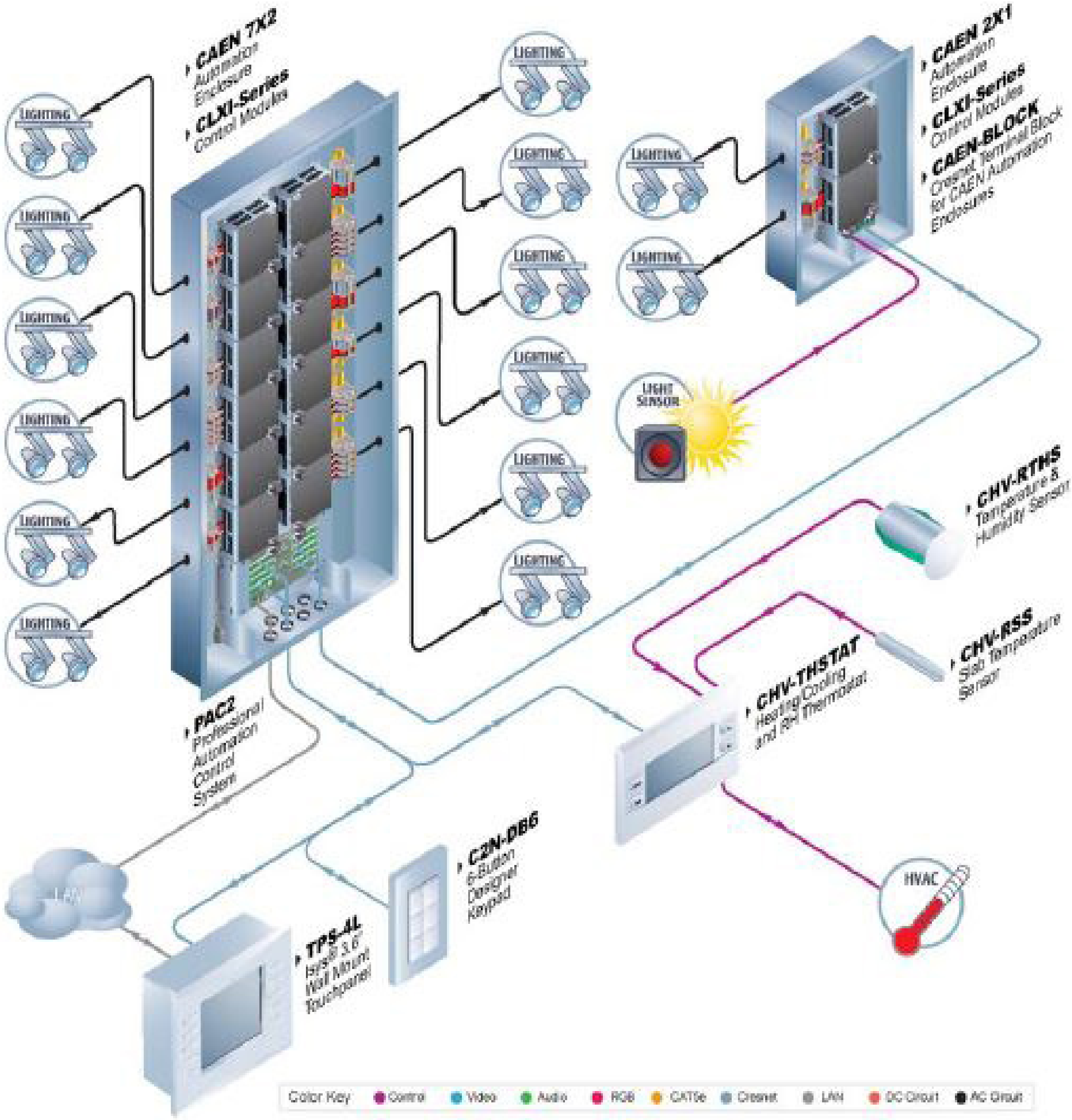
Basic Lighting System Interconnections

An example of a Crestron lighting system that includes thermostat, security, shade and drapery control, and interfaces is shown below.

Crestron Lighting System Interconnection Example


CLX-1DIM4
1 FEED
4 DIM
LINE
DIM 1
DIM 2
DIM 3
DIM 4
N IN
N OUT 1
N OUT 2
N OUT 3
N OUT 4
HVAC
Thermostat
Module
Interconnect
Cable
Breaker Box
230VAC
Neutral
230VAC
Neutral
Ground
Security
Monitoring
Motion
Detector
Smoke
Detector
L
R
Override
Switches
Backup
Processor
Shade &
Drape
Controllers

CLXI-Series Application Example


CAEN 7X2 Automation Enclosure
CLXI-Series Control Modules
CAEN 2X1 Automation Enclosure
CLXI-Series Control Modules
CAEN-BLOCK Cresnet Terminal Block for CAEN Automation Enclosures
LIGHTING
LIGHTING
LIGHTING
LIGHTING
LIGHTING
LIGHTING
LIGHTING
LIGHTING
LIGHTING
LIGHTING
LIGHTING
LIGHTING
LIGHTING
LIGHTING
LIGHT SENSOR
CHV-RTHS Temperature & Humidity Sensor
CHV-RSS Slab Temperature Sensor
CHV-THSTAT Heating/Cooling and RH Thermostat
HVAC
PAC2 Professional Automation Control System
C2N-DB6 6-Button Designer Keypad
TPS-4L Isys® 3.6" Wall Mount Touchpanel
LAN
Color Key
● Control
● Video
● Audio
● RGB
● CAT5e
● Cresnet
● LAN
● DC Circuit
● AC Circuit

NOTES:

- A module terminal block (CLTI-Series device) must also be ordered for each module. The corresponding CLTI terminal block is installed in the enclosure for high voltage wire termination. Each terminal block includes a terminal rail for mounting the terminal block in the enclosure. Terminal rails and blocks do not occupy a module space within an enclosure.
- CAEN-Series enclosures are required to install CLXI-Series lighting modules.

iLux

iLux is a complete, integrated lighting system designed for wall mount installation in boardrooms, auditoriums, home theaters, or anywhere versatile and cost-effective control of lighting and shades is required. The Crestron reputation for innovation and reliability, combined with high-quality integrated dimming, native shade control, configurable rocker buttons, extensive integration ability, and many other advanced features make iLux the ideal choice for all types of room lighting and shade control applications.

Crestron products and automation solutions meet ASHRAE (American Society of Heating, Refrigeration, and Air-Conditioning Engineers) and LEED (Leadership in Energy and Environmental Design) standards, providing additional credits toward Green Certification. Additionally, Crestron products are in compliance with the European Union (EU) Directive 202/95/EC Restriction of Hazardous Substances (RoHS). Several Crestron products including CLXI-Series and iLux lighting systems, CHV-TSTAT thermostats, C2N-SDC shade controls and 2-Series control systems are designed to operate efficiently, replacing several products and drawing less power. iLux is also compliant with ASHRAE Standard 90.1-2004, Energy Standard for Buildings, and specifically the Mandatory Provisions 9.4.1.1 (b) and (c) regarding the use of an occupant sensor that turns the lights off within 30 minutes after leaving the space, and a control system that indicates that an area is unoccupied. iLux also complies with Provision 9.4.1.4, which pertains to the control of display, accent, task, and demonstration lighting.

CLSI-C6M with Built-in Motion Detection

Six channels of dimming are available for incandescent, magnetic low-voltage, neon/cold cathode, and 2-wire dimmable fluorescent loads. On and off switching of many non-dimmable lighting loads is also possible.

- Maximum load per channel: 800 W/VA (3.5 amps @ 230 Vac)
- Minimum load per channel: 25 W/VA (0.108 amps @ 230 Vac)
- Maximum load per unit: 2300 W/VA (10 amps @ 230 Vac)

Each channel handles up to 800 watts individually, with a total rating of 2300 watts for the complete unit. Larger loads and additional load types can also be supported using add-on lighting expansion modules (sold separately).

Using the Crestron networked shade and drape controllers (sold separately), the iLux devices enable versatile control of a roomful of motorized window treatments, screens, and lifts in up to six shade groups. Shade and drapery control do not use a lighting control channel.

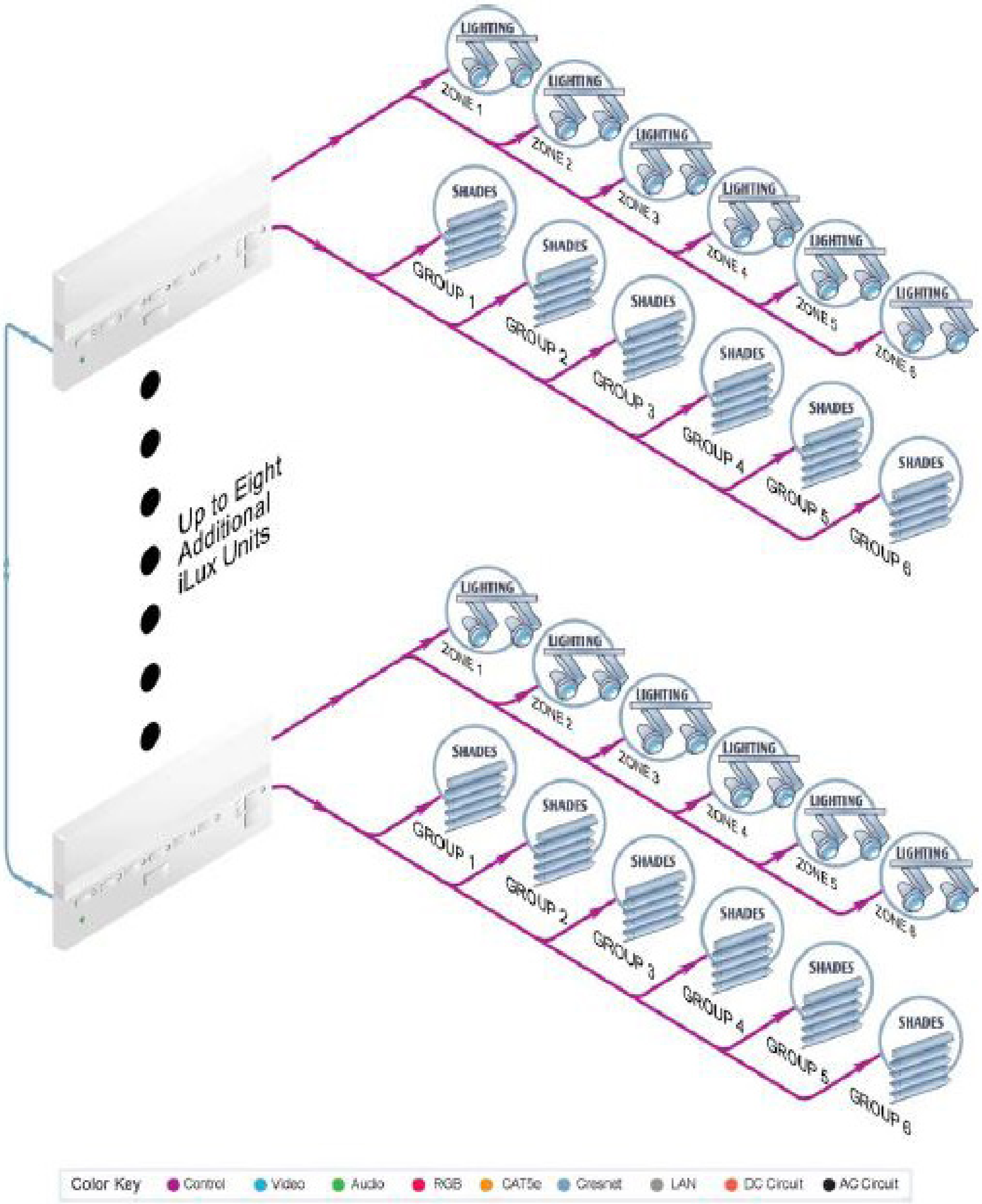
CLSI-C6M

1
2
3
4
5
6
1.5
Min
Sec
Lights
Shades
Save
Cancel
Meeting
Lecture
Notes
Presentation
Night
Morning
ON
OFF
CRESTRON

Multi-Unit Expansion

One CLSI-C6 master supports up to eight additional CLSI-C6 (or CLSI-C6M) units, enabling systems of up to 54 lighting zones and 54 shade groups. Commands for typical functions like scene recall, scene off, master dimming, and occupancy status are shared between the CLSI-C6 units. Each individual unit can still support a complete assortment of local devices including keypads, shade controllers, and motion detectors.

Multi-Unit Expansion Example

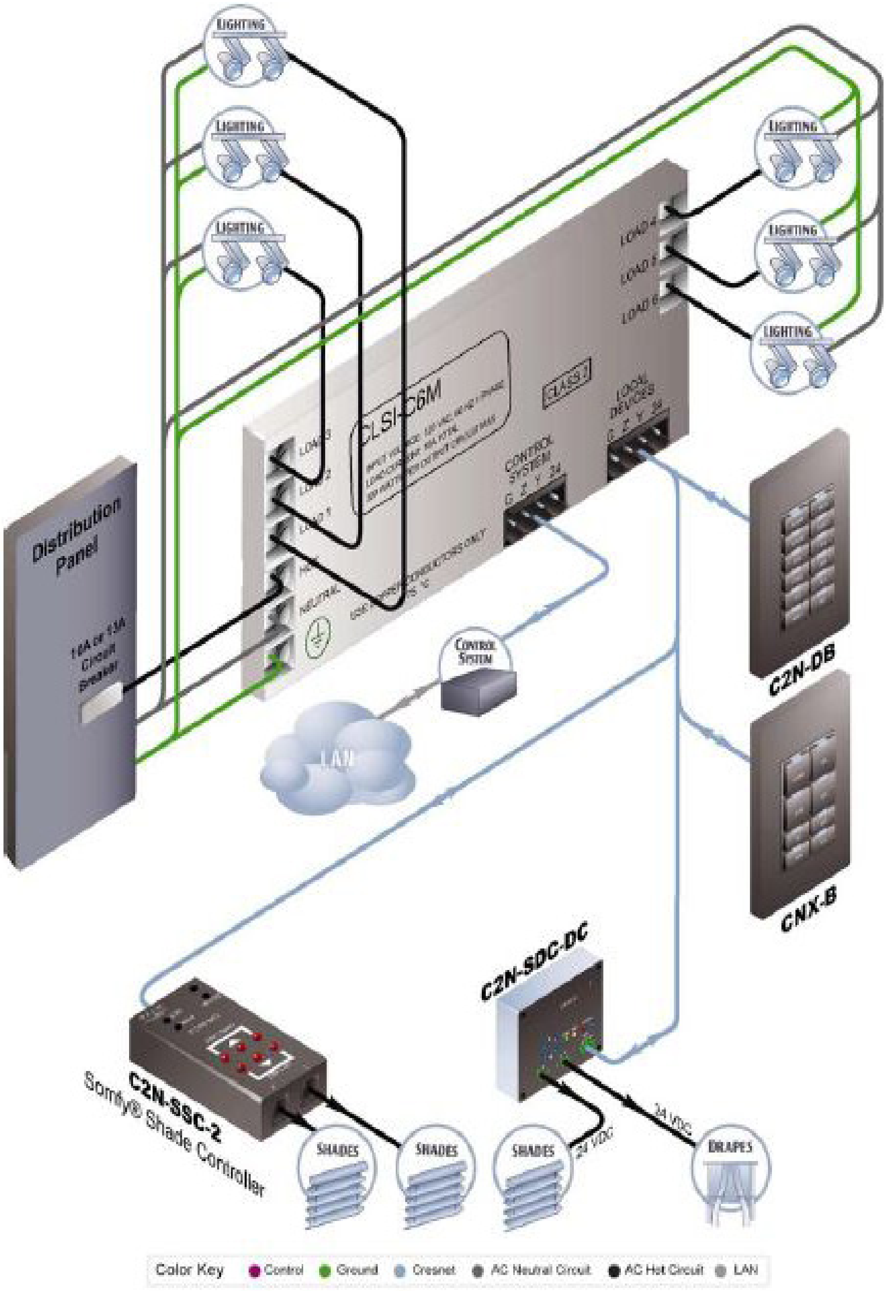

LIGHTING
ZONE 1
LIGHTING
ZONE 2
LIGHTING
ZONE 3
LIGHTING
ZONE 4
LIGHTING
ZONE 5
LIGHTING
ZONE 6
SHADES
GROUP 1
SHADES
GROUP 2
SHADES
GROUP 3
SHADES
GROUP 4
SHADES
GROUP 5
SHADES
GROUP 6
Up to Eight Additional iLux Units
LIGHTING
ZONE 1
LIGHTING
ZONE 2
LIGHTING
ZONE 3
LIGHTING
ZONE 4
LIGHTING
ZONE 5
LIGHTING
ZONE 6
SHADES
GROUP 1
SHADES
GROUP 2
SHADES
GROUP 3
SHADES
GROUP 4
SHADES
GROUP 5
SHADES
GROUP 6
Color Key
● Control
● Video
● Audio
● RGB
● CAT5e
● Cresnet
● LAN
● DC Circuit
● AC Circuit

NOTE: Shade groups are independent of lighting control zones.

Control System Integration

The CLSI-C6 features two separate Cresnet control networks, one for local devices and one for connection to a 2-Series control system. Connecting the CLSI-C6 to a control system allows its functions to be controlled from touch screens, RF wireless remotes, and even computers. The control system interface also enables extensive flexibility for integration with other systems such as security, HVAC, and energy management, plus remote monitoring via SNMP and Crestron RoomView applications. Built-in motion detection (CLSI-C6M) is also available.

Control System Integration Example


LIGHTING
LIGHTING
LIGHTING
LIGHTING
LIGHTING
LIGHTING
LOAD 4
LOAD 5
LOAD 6
CLSI-C6M
CLASS 2
LOCAL DEVICES
G Z Y 24
CONTROL SYSTEM
G Z Y 24
LOAD 3
LOAD 2
LOAD 1
NEUTRAL
USE COPPER CONDUCTORS ONLY
Distribution Panel
10A or 13A Circuit Breaker
CONTROL SYSTEM
LAN
C2N-DB
CNX-B
C2N-SDC-DC
C2N-SSC-2
Somfy® Shade Controller
24 VDC
24 VDC
SHADES
SHADES
SHADES
DRAPES
Color Key
● Control
● Ground
● Cresnet
● AC Neutral Circuit
● AC Hot Circuit
● LAN

Wireless iLux Remote

The CLS-IRHT8 is a compact IR wireless remote designed specifically for use with the Crestron iLux Integrated Lighting Systems. The CLS-IRHT8 provides buttons for master up/down control, plus activation of scenes 1-4, ON, and OFF. The CLS-IRHT8 is non-programmable and operates on two AA batteries (included).

Preset Scenes
1
2
3
4
OFF
ON
CRESTRON
iLux

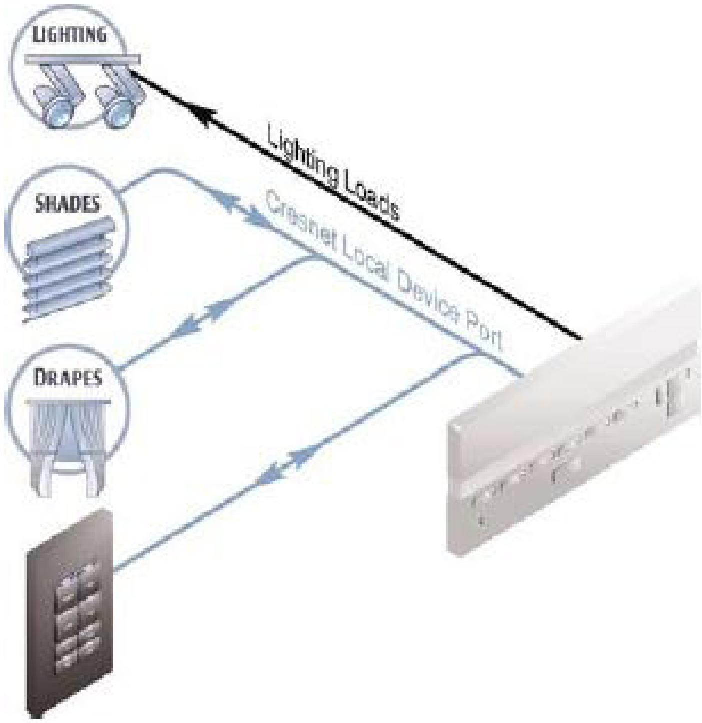
CLS-IRHT8

iLux Application Diagrams

Application 1: Standalone

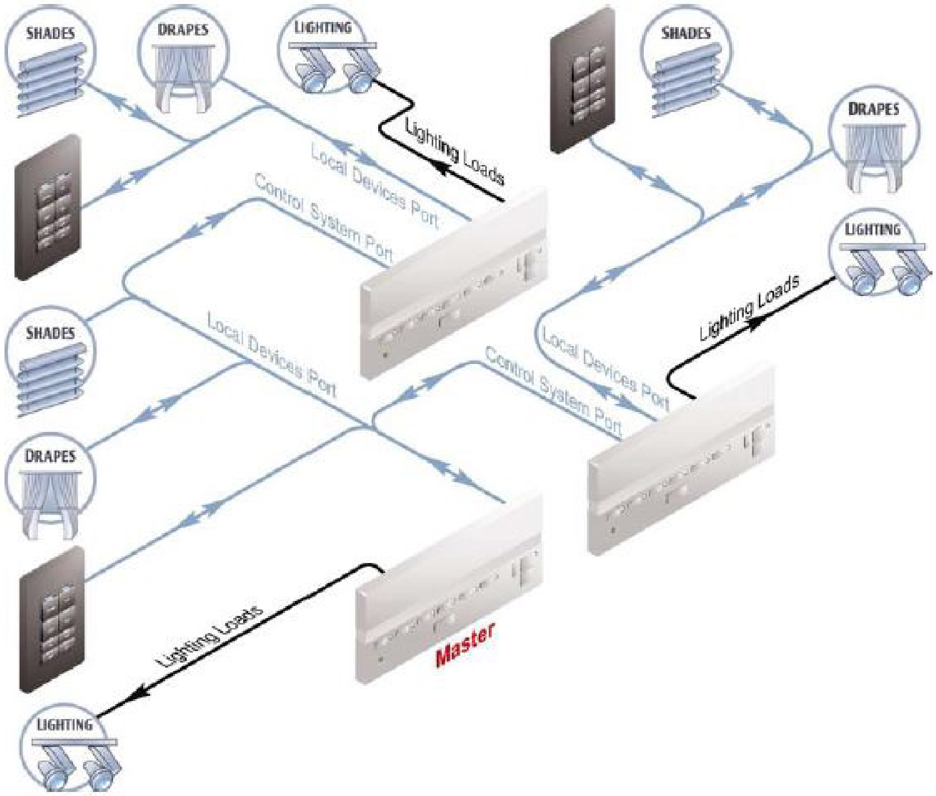
Simple control of up to six lighting loads and six shade control groups. No external control system required.

NOTE: Shade and drapery control requires additional hardware.


LIGHTING
SHADES
DRAPES
Lighting Loads
Cresnet Local Device Port

Application 2: Primary iLux Control with Secondary iLux Controls, for Large Rooms with More Than Six Lighting Loads

Up to eight additional iLux controls, each with up to six lighting loads and six shade control groups. Scene recall and master dimmers affect the entire room. Each circuit can be adjusted individually. No external control system required.


SHADES
DRAPES
LIGHTING
Lighting Loads
Local Devices Port
Control System Port
SHADES
DRAPES
LIGHTING
Lighting Loads
Local Devices Port
Control System Port
SHADES
DRAPES
Local Devices Port
Lighting Loads
Master
LIGHTING

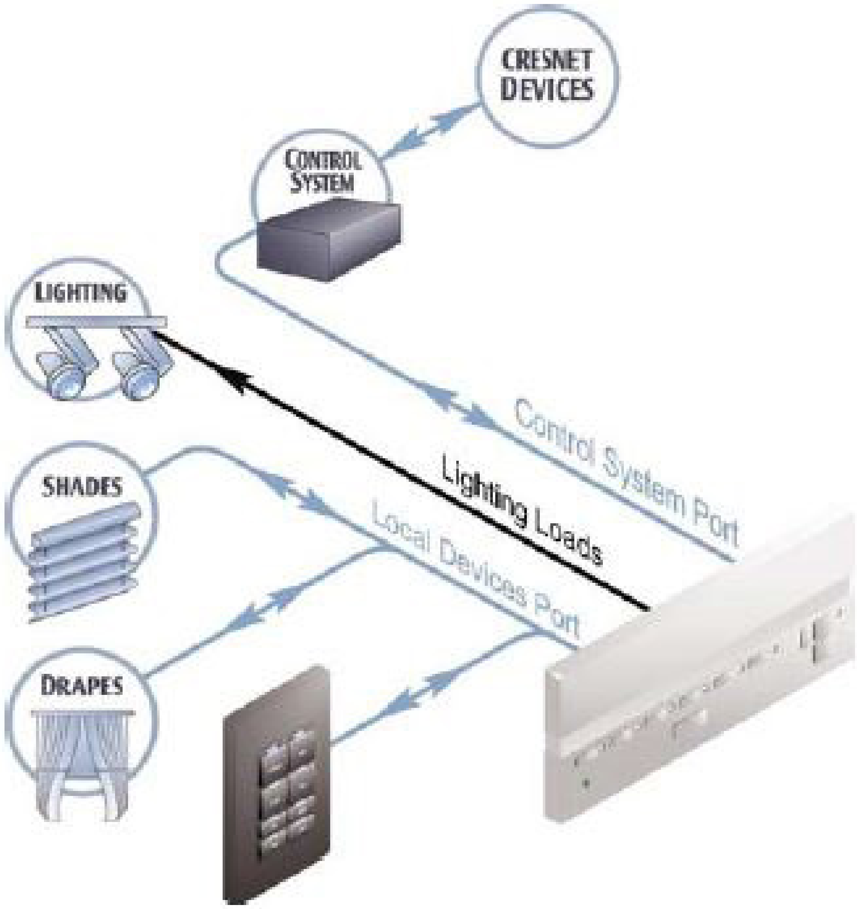
NOTES:

- Shade and drapery control requires additional hardware.
- Additional power supplies may be required if using more than four devices (12 Cresnet watts).

Application 3: Primary iLux Control with Secondary iLux Controls and 2-Series Control System

The control system can monitor and control the operation of the entire lighting system. Lighting scenes can be triggered from touch screens, RF wireless remotes, computers, or a real-time clock. The control system also enables alternate button functions for iLux devices. The lighting system operates independently if the control system is not running.

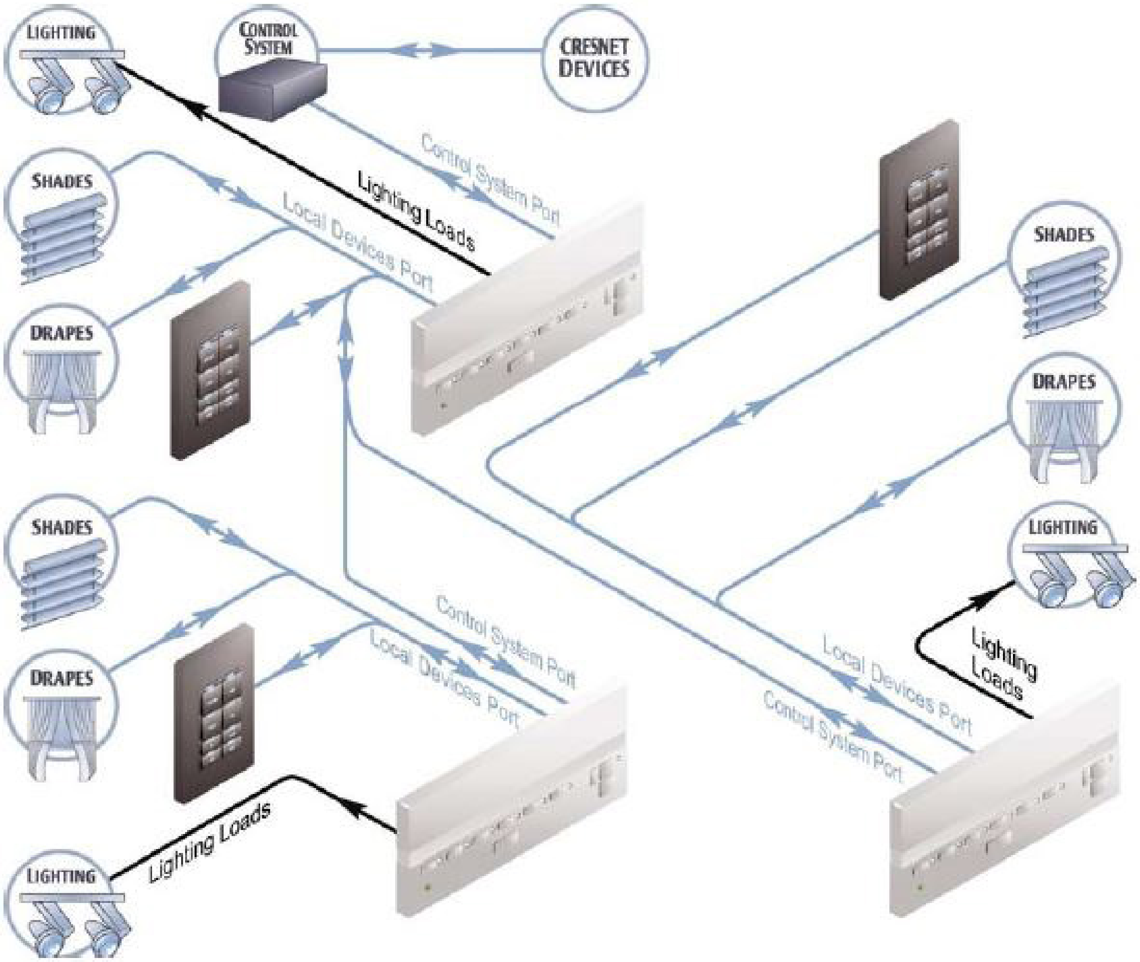
NOTE: Shade and drapery control requires additional hardware.


CRESNET DEVICES
CONTROL SYSTEM
LIGHTING
SHADES
DRAPES
Control System Port
Lighting Loads
Local Devices Port

Application 4: Primary iLux Control with Secondary iLux Controls and 2-Series Control System for Large Rooms of More Than Six Lighting Loads

The control system can monitor and control the operation of the entire lighting system. Lighting scenes can be triggered from touch screens, RF wireless remotes, computers, or a real-time clock. The control system also enables alternate button functions for iLux devices. The lighting system operates independently if the control system is not running.

NOTE: Shade and drapery control requires additional hardware.

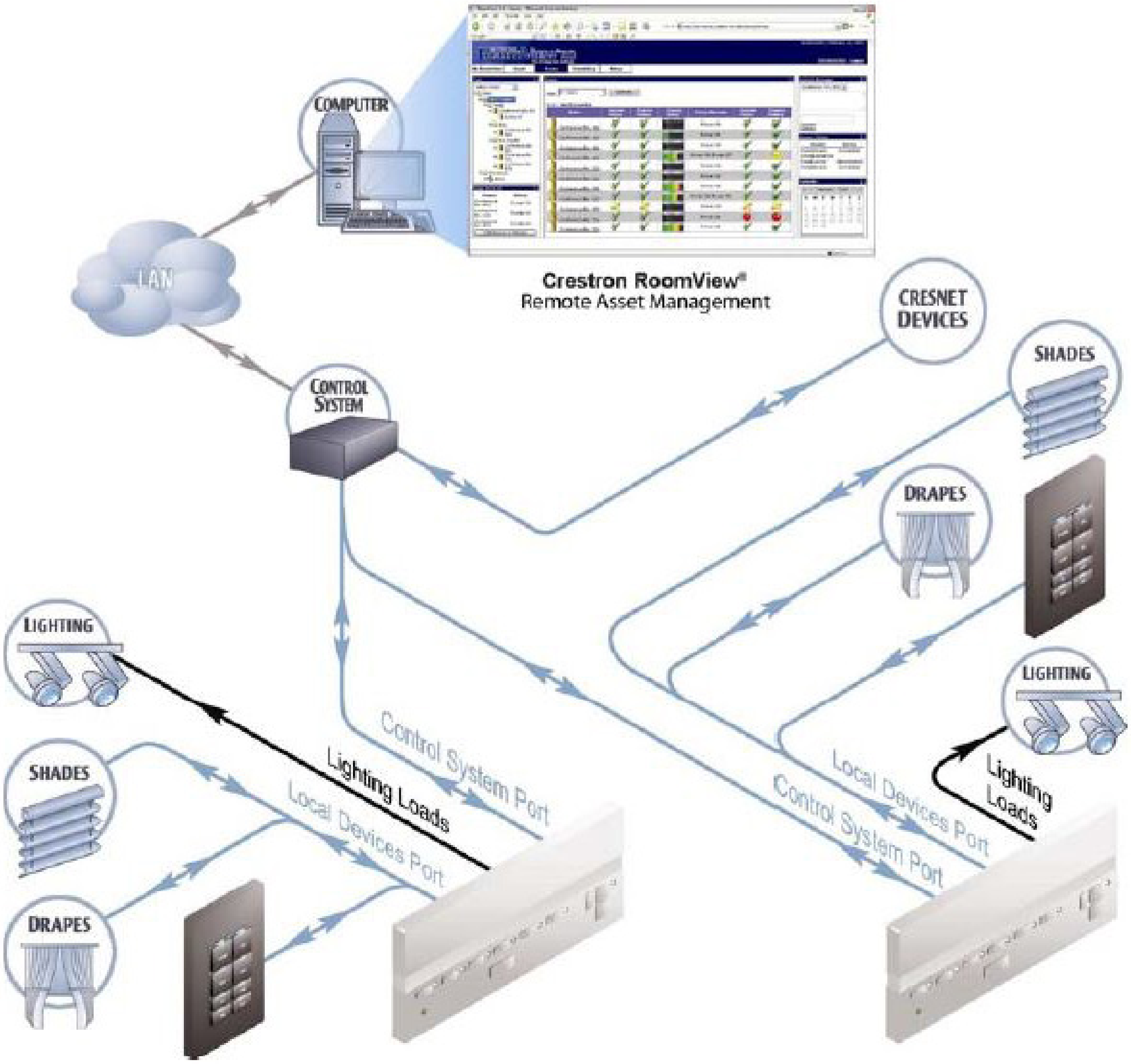

LIGHTING
CONTROL SYSTEM
CRESNET DEVICES
SHADES
DRAPES
Lighting Loads
Control System Port
Local Devices Port
SHADES
DRAPES
Control System Port
Local Devices Port
SHADES
DRAPES
LIGHTING
Lighting Loads
Local Devices Port
Control System Port
Lighting Loads
LIGHTING

Application 5: 2-Series Control System with Multiple iLux Devices on Main Cresnet Network

Monitor and control lighting in multiple independent rooms. Combine rooms in any arrangement under program control. Each individual iLux device can operate without a control system, with a control system, and even with RoomView remote asset management.

NOTES:

- Shade and drapery control requires additional hardware.
- The CLSI-C6 and CLSI-C6M units require a neutral wire for operation. If no neutral wire is present, contact a licensed electrician for installation.


COMPUTER
LAN
Crestron RoomView®
Remote Asset Management
CRESNET DEVICES
SHADES
DRAPES
CONTROL SYSTEM
LIGHTING
LIGHTING
SHADES
DRAPES
Lighting Loads
Control System Port
Local Devices Port
Local Devices Port
Control System Port
Lighting Loads

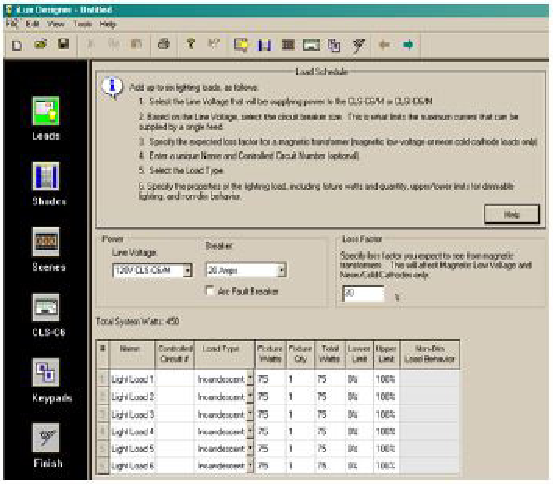
iLux Designer

The Crestron iLux Designer provides all the tools necessary to quickly program a complete 6-zone lighting and shade control solution based on the iLux CLSI-C6 and CLSI-C6M models.

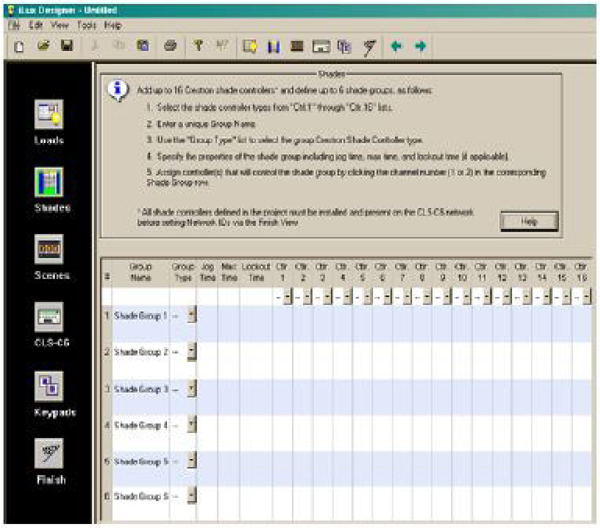
The iLux Designer provides easy programming of all front panel button functions and keypads, including scene recalls, scene toggles, fade times, ramp rate, master dim control, master shade control, and scene programming based on occupancy status. The iLux Designer also provides an interface to the Crestron Engraver for creating engraving orders.

The iLux Designer features an easy-to-use interface arranged into 6 views.

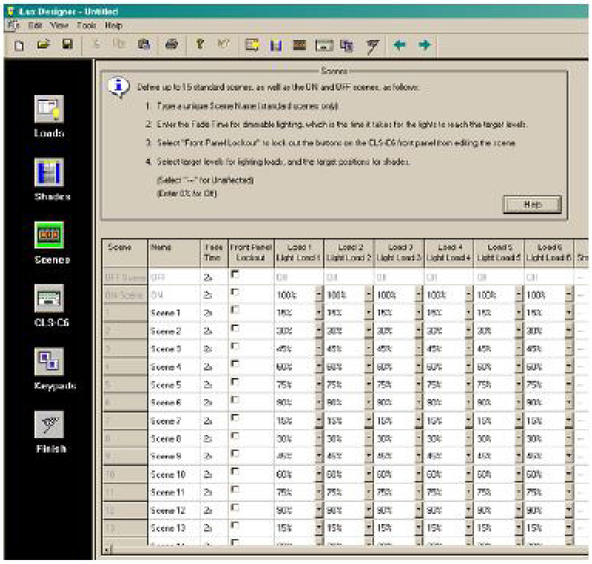
Load Schedule View - add up to six lighting loads and set load properties such as fade time, fixture quantity, and fixture watts


iLux Designer - Untitled
File
Edit
View
Tools
Help
Loads
Shades
Scenes
CLS-C6
Keypads
Finish
Load Schedule
Help

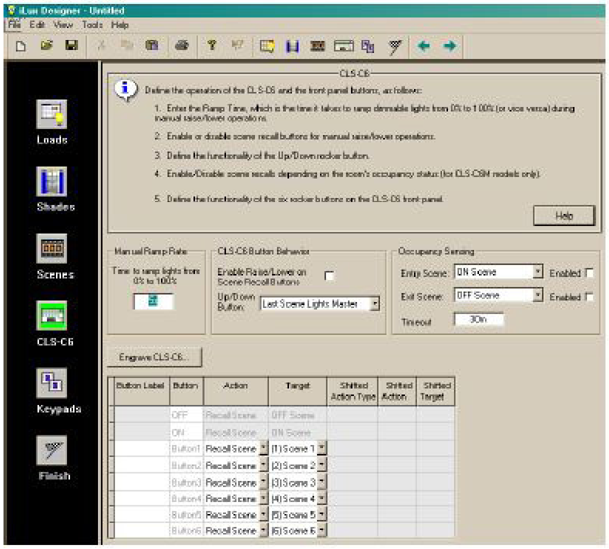
Shades View - add up to 16 shade controllers and configure up to 6 shade groups


iLux Designer - Untitled
File
Edit
View
Tools
Help
Loads
Shades
Scenes
CLS-C6
Keypads
Finish
Shades
Help

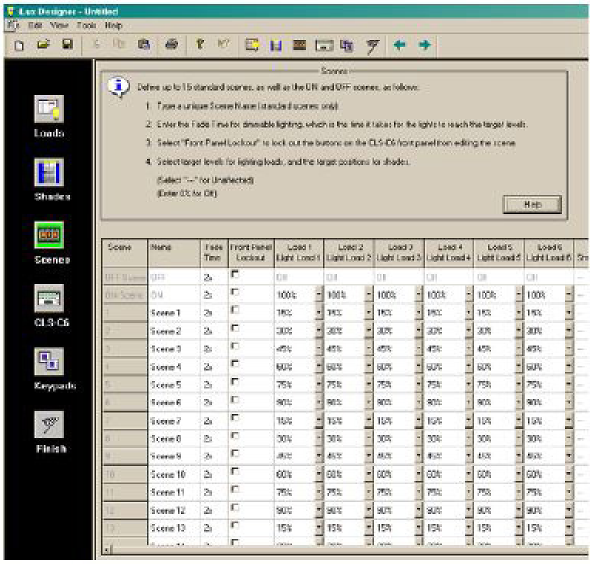
Scenes View - define up to 15 discrete scenes, as well as the ON and OFF scenes


iLux Designer - Untitled
File
Edit
View
Tools
Help
Loads
Shades
Scenes
CLS-C6
Keypads
Finish
Scenes
Help

CLSI-C6 View - assign functions to all the front panel buttons


iLux Designer - Untitled
File
Edit
View
Tools
Help
Loads
Shades
Scenes
CLS-C6
Keypads
Finish
CLS-C6
Help

Keypads View - add up to 16 keypads to the local CLSI-C6 network, and assign functions to the keypad buttons.



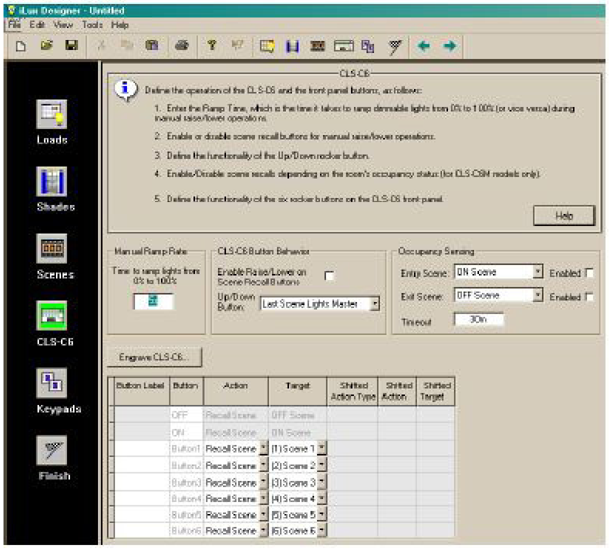
Define up to 15 standard scenes, as well as the ON and OFF scenes, as follows:

1. Type a unique Scene Name (standard scenes only)
2. Enter the Fade Time for dimmable lighting, which is the time it takes for the lights to reach the target levels.
3. Select "Front Panel Lockout" to lock out the buttons on the CLS-C6 front panel from editing the scene.
4. Select target levels for lighting loads, and the target positions for shades.

(Select "--" for Unaffected)
(Enter 0% for Off)

Scene	Name	Fade Time	Front Panel Lockout	Load 1 Light Load 1	Load 2 Light Load 2	Load 3 Light Load 3	Load 4 Light Load 4	Load 5 Light Load 5	Load 6 Light Load 6
OFF Scene	OFF	2s	☐	Off	Off	Off	Off	Off	Off
ON Scene	ON	2s	☐	100%	100%	100%	100%	100%	100%
1	Scene 1	2s	☐	15%	15%	15%	15%	15%	15%
2	Scene 2	2s	☐	30%	30%	30%	30%	30%	30%
3	Scene 3	2s	☐	45%	45%	45%	45%	45%	45%
4	Scene 4	2s	☐	60%	60%	60%	60%	60%	60%
5	Scene 5	2s	☐	75%	75%	75%	75%	75%	75%
6	Scene 6	2s	☐	90%	90%	90%	90%	90%	90%
7	Scene 7	2s	☐	15%	15%	15%	15%	15%	15%
8	Scene 8	2s	☐	30%	30%	30%	30%	30%	30%
9	Scene 9	2s	☐	45%	45%	45%	45%	45%	45%
10	Scene 10	2s	☐	60%	60%	60%	60%	60%	60%
11	Scene 11	2s	☐	75%	75%	75%	75%	75%	75%
12	Scene 12	2s	☐	90%	90%	90%	90%	90%	90%
13	Scene 13	2s	☐	15%	15%	15%	15%	15%	15%

Finish View - send the project to the CLSI-C6, set network IDs, retrieves local settings from the CLSI-C6, and print reports.



Define the operation of the CLS-C6 and the front panel buttons, as follows:

1. Enter the Ramp Time, which is the time it takes to ramp dimmable lights from 0% to 100% (or vice versa) during manual raise/lower operations.
2. Enable or disable scene recall buttons for manual raise/lower operations.
3. Define the functionality of the Up/Down rocker button.
4. Enable/Disable scene recalls depending on the room's occupancy status (for CLS-C6M models only).
5. Define the functionality of the six rocker buttons on the CLS-C6 front panel.

Manual Ramp Rate
Time to ramp lights from 0% to 100%: [illegible]

CLS-C6 Button Behavior
Enable Raise/Lower on Scene Recall Buttons ☐
Up/Down Button: Last Scene Lights Master

Occupancy Sensing
Entry Scene: ON Scene Enabled ☐
Exit Scene: OFF Scene Enabled ☐
Timeout: 30m

Button Label	Button	Action	Target	Shifted Action Type	Shifted Action	Shifted Target
	OFF	Recall Scene	OFF Scene			
	ON	Recall Scene	ON Scene			
	Button1	Recall Scene	(1) Scene 1			
	Button2	Recall Scene	(2) Scene 2			
	Button3	Recall Scene	(3) Scene 3			
	Button4	Recall Scene	(4) Scene 4			
	Button5	Recall Scene	(5) Scene 5			
	Button6	Recall Scene	(6) Scene 6			

Shade and Drape Controllers

C2N-SDC-DC

The C2N-SDC-DC is a 2-channel shade and drapery controller designed to provide a convenient and cost-effective solution for controlling 24 Vdc motorized shades and drapes. The C2N-SDC-DC is a Cresnet device with two independently controlled 24 Vdc outputs, each designed to provide standard up and down or open and close control of a conventional two-wire bidirectional type motor.

The C2N-SDC-DC mounts in the wall or ceiling using an off-the-shelf 4 inch square or 2-gang electrical box. Push buttons on the front of the unit allow for manual operation of the motors during installation and setup.

C2N-SDC

The C2N-SDC is a 2-channel shade and drapery controller designed to provide a convenient and cost-effective solution for controlling a variety of motorized window treatments as well as motorized doors, sunroofs, lifts, and projection screens. The C2N-SDC is a Cresnet device with two independently controlled 120 Vac outputs. Each output provides up/down or open/close control of a conventional three-wire bidirectional type motor. Built-in timing and interlock logic make it easy to program the C2N-SDC for failsafe operation.

The C2N-SDC mounts in the wall or ceiling using an off-the-shelf 4 inch square or 2-gang electrical box. Push buttons on the front of the unit allow for manual operation of the motors during installation and setup.

Refer to the C2N-SDC-DC and C2N-SDC product pages on the Crestron website for application diagram examples.

Heat/Cool Systems

- Radiant heat is a form of hydronic (hot water) heat that circulates hot water through pipes (baseboard radiation systems) or special tubing and installs on the perimeter of the house or underneath floors.
- In a ducted heating and cooling system, a large fan (blower) forces heated air from the furnace into the ducts and enters the rooms through a register or grill in the floor or wall.
- Unlike traditional furnaces that turn on and run at full capacity with each demand for heating, two-stage furnaces operate like two separate furnaces. The unit begins to run in its first stage and operates at a fraction of its heating capacity. This reduced capacity is sufficient on mild winter days. On very cold days, the furnace adjusts to full capacity (second stage) to meet the demand for heat.

Heat Pump Systems

A heat pump extracts available heat from one area and transfers it to another. Even cold air contains some heat. Heat pumps can extract heat from the outside air on a cold day and transfer it indoors to maintain a comfortable temperature. A heat pump also works in reverse during the summer, extracting heat from indoors and transferring it outdoors.

- A dual fuel system combines an energy-efficient air-source heat pump with a new or existing oil, gas, or propane furnace. The furnace runs in place of the heat pump in cold weather.
- When the a heat pump can no longer efficiently transfer heat from the outside air, the thermostat automatically turns on a secondary heat source, such as electric resistive heat.

Slab Systems

Slab heating works from the ground up. The heating components are installed below the floor or are embedded in a concrete slab. Heat radiates from the floor to warm the space above. The CHV-TSTAT and CHV-THSTAT support seven variations of slab heat systems.

SLAB 1: Floor warming only. Operates the slab heat to maintain a particular slab temperature. System mode is enabled/disabled with Floor Warming Heat and OFF inputs. Slab is maintained at the slab setpoint temperature value. Connection to the slab output relay is terminal W1.

SLAB 2: One stage space heat with slab maximum. Maintains a particular air temperature using the slab to heat the space and does not heat over the slab maximum temperature even if this results in the space being under-heated. Connection to the slab output relay is terminal W1.

SLAB 3: One stage space heat with slab maximum and slab minimum. Performs the same operation as SLAB 2 and also keeps the slab at least as warm as slab setpoint. This may result in the space being overheated to maintain the slab minimum temperature. Connection to the slab output relay is terminal W1.

SLAB 4A: Two-stage space heat with slab maximum and one stage cool. Maintains the air temperature using the slab for heat, up to the slab maximum. Augments the air heating by using a second stage of heat (generally a forced air system). Allows the second stage to operate by itself should the slab reach its maximum temperature and shut off. Cools the space with cooling call. Intended for heat-cool type forced air systems, with relay output connections to terminal W1 for slab, terminal W2 for 2nd stage heat, and terminal Y1 for cooling. Off sets the space control modes and Floor Warming HEAT/OFF.

SLAB 4B: Same operation as SLAB 4A, but intended for a heat pump type second stage. Relay output connections are terminal W1 for slab heat, with heat pump-type connections on terminals Y1/O/G for cooling and heating calls. Auxiliary heat is on terminal W2.

SLAB 5A: One stage space heat and cool with floor warming. Combines the operation of a space heating/cooling thermostat with a floor-warming thermostat. Maintains the slab at slab setpoint and maintains the space at the heat, cool, or auto setpoints. Systems effectively operate independently. Heat/Cool/Auto/ sets the slab mode. Intended for heat-cool style systems, with slab connection on terminal W1, space heat on terminal W2, and space cool on terminal Y1.

SLAB 5B: Same as SLAB 5A, but for heat pump space systems, with slab heat on terminal W1, and space heat/cool on terminals Y1/O/G. Auxiliary heat is on terminal W2.

Sensor Products

CHV-RTHS

The CHV-RTHS is a wall-mounted remote temperature and relative humidity sensor designed for use with select Crestron thermostats. Using CAT5 or similar low-capacitance wire, the remote sensor may be mounted up to 500 ft from the thermostat. One-piece mounting and a single non-polarized twisted-pair connection make the CHV-RTHS simple to install. The 1 1/2 inch diameter face protrudes just 1/8 inch from the wall surface and is easily painted or wallpapered to blend into the wall surface. Up to two CHV-RTHS sensors may be connected to a single CHV-THSTAT, CHV-TSTAT, or CHV-TSTATEX thermostat.

CHV-RTS

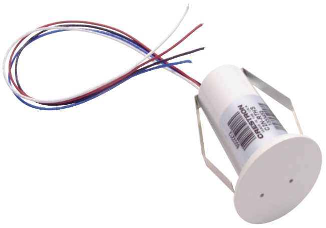
The CHV-RTS is a wall-mounted remote temperature sensor designed for use with select Crestron thermostats. The 1 1/2 inch diameter face of the CHV-RTS protrudes just 1/8 inch from the wall surface and is easily painted or wallpapered to blend into the wall surface.

CHV-RSS

The CHV-RSS is a remote temperature sensor designed for use with select Crestron thermostats. Ideally suited for concrete slab, under floor, or any outdoor installation, the CHV-RSS is an extremely accurate temperature sensor potted within a rugged waterproof stainless steel sleeve.

C2N-RTHS

The C2N-RTHS is a wall-mounted temperature and relative humidity sensor that communicates directly with any 2-Series control system via the Cresnet control network. One-piece mounting makes the C2N-RTHS simple to install. The 1 1/2 inch diameter face protrudes just 1/8 inch from the wall surface and is easily painted or wallpapered to blend into the wall surface.



Sensor Mounting for the CHV-RTS and CHV-RTHS

NOTE: Crestron strongly recommends low-capacitance twisted pair wire such as CAT3 (up to 76 m) or CAT5 (up to 152 m) network cable when using remote sensors.

The maximum distance from sensor to thermostat is 150 m. If multiconductor cables are used, the leftover conductors must NOT be used for other purposes and must be left unconnected at both ends.

In situations where ordinary two-conductor thermostat wire has been installed, it may be used for runs up to 30 m. This is not a preferred method of installation. Other cable types are satisfactory, provided the total capacitance is less than 7000 pF.

NOTE: The face of the sensor may be painted or wallpapered to match the wall. However, keep the small gap around the outer edge clear of any obstructions.

Refer to the CHV-RTS and CHV-RTHS product pages on the Crestron website for installation instructions.

Sensor Mounting for the CHV-RSS

Crestron recommends that the sensor be placed inside a 1.27 cm Electrical Metallic Tubing (EMT) conduit. This allows future sensor replacement, if required. The radius of the bend at the wall should be approximately 20 cm, to allow for removal and replacement of the sensor.

NOTE: Mount in a location out of direct sunlight. Refer to the CHV-RSS product page on the Crestron website for installation instructions.

The rugged waterproof construction, stainless steel housing, and high degree of accuracy make this sensor ideal for outdoor use. The sensors are connected to the remote sensor terminals RS1, RS2, and a common connection RSR on the rear plastic housing of the thermostat. Separate the thermostat from its backplate. The thermostat terminal blocks mate to pins protruding out of the front thermostat assembly.

CHV-TSTATEX Wireless Thermostat

The CHV-TSTATEX is a wireless thermostat featuring infiNET EX® technology. The CHV-TSTATEX installs just like a conventional thermostat because no extra wires are needed to connect to the control system. Although functional as a standalone thermostat, the CHV-TSTATEX delivers enhanced functionality as part of a complete Crestron automation system. Integrating HVAC with a Crestron system can help lower energy bills and increase user friendliness.

MODE
HOLD
FAN
72
68
°F
OFF
AUTO
CRESTRON

User Interface Selection

User interfaces (keypads, dimmers, switches, and touch screens) provide the link between the control devices in the enclosure and the user. Typically these interfaces are prominently and strategically located throughout a lighting design.

The lighting designer or integration contractor specifies the type of user interface required for each location, based on function and user preference.

Keypads, touch screens, dimmers, and switches are available in a wide variety of choices, including number of buttons, color of trim, color of the buttons, back lighting, and even custom engraving on each button.

NOTE: Due to the variety of touch screens, dimmers, switches, and keypads, specifications for each type are not provided as part of this guide. Refer to the Crestron website for the most up-to-date information on user interfaces.

Keypads

The comprehensive line of Crestron keypads takes the world's most basic control device to the highest levels of function and style. A wide array of elegant designer keypads for home, education, and corporate environments provides a cost-effective and versatile approach to controlling audio and video devices, lighting and shades, climate, security, and more.

Cameo Keypads

Both versatile and stylish, these wall mount keypads feature customizable buttons, auto-dimmable backlit text, enhanced LED feedback, and control ports. Choose Cresnet wired or infiNET EX wireless communication.

Decorator Keypads

Decorator keypads are clean, retro styled keypads that offer simple, versatile push button control. Designed for installation using standard electrical boxes and decorator-style faceplates.

Designer Keypads

Designer keypads feature large buttons, optional backlighting, built-in audio feedback, and temperature sensing.

Touch Screen Interfaces

Control any room, the entire home or facility, conveniently from any of the beautiful, stylish touch screen or remote control. With such a wide selection to choose from, Crestron provides the perfect piece to meet the needs of the customer and complement any space. Refer to the Crestron website for a complete list of current touch screen models.

V24R-WALL-C-B

Large Format HD Video Touch Screens

A larger screen allows the user do more from one convenient location. The brilliant, high-resolution touch screens provide ample space to watch HD video content and control a space, all from one point. A Digital Graphics Engine (DGE) eliminates the need for multiple displays on the table, counter or desk. Use smart graphics to deliver web browsing, gestures navigation, animations, and H.264 video beautifully. Native DigitalMedia connectivity distributes true high-definition video to every location complete with 2-way IP voice communication and available in flush in-wall, lectern, or VESA style mounting.

Large Format Streaming Touch Screens

A bigger screen allows the user to see entire building floorplans and view multiple IP camera feeds. Touch screens are the perfect size for board room, presentation, and whole home control with access to streaming video. TPMC V-Panels have control features such as, smart graphic compatibility, web browsing, gestures navigation, animations and H.264 video complete with 2-way IP voice communication for control of any multimedia or multiroom control application such as VTC rooms, auditoriums, NOCs, in the kitchen, game room, or home theater.

TPMC-V15

TSW-1050

TSW Capacitive Touch Screens

The TSW-1050 delivers the ultimate touch screen experience in an unobtrusive, space-saving design featuring a brilliant, high-definition 10.1 inch capacitive touch screen display and 5 soft-touch buttons. PoE connectivity and a range of mounting options make installation a breeze for both new and retrofit applications.

Scheduling Panels

Network scheduling via Outlook® on Crestron touch screens connects the right people, spaces, and technology so meetings go smoothly. Room status is clearly displayed on the panel. Complete connectivity is provided through a single high-speed Ethernet connection, containing all control and power signals within a single wire.

TODAY
DAY ◂
DAY ▸
TIME ▴
TIME ▾
CLOSE
MORE
SELECT
February 23, 2009
08:30 AM
Conference Room 100
Available
Meeting Info
Day View
Reserve Now
Available Rooms
CRESTRON

TPMC-4SM-FD

Smaller Format Touch Screens

POWER
MEDIA
MUTE
VOL ▴
VOL ▾
LIGHT ON
LIGHT OFF
RAISE
LOWER
CLIMATE
Lighting
KITCHEN
DINING ROOM
ON/OFF
ON/OFF
Lighting Controls
Lighting Presets
CRESTRON

TPMC-4SMD

Small format touch screens access all the features within a very small footprint. Use the 4.3 inch touch screen in places other touch screens just fit. Crestron provides the choice of mounting to a standard electrical box or to virtually any flat surface such as glass, granite, or marble. Featuring power and control over Ethernet, streaming video and control, these low-profile touch screens deliver amazing new network and graphics capabilities.

Handheld Touch Screens

Enjoy seamless, wireless interaction between all technology used. Each of these features a brilliant touch screen for intuitive control.

TPMC-8X-GA

Specifying a Lighting System

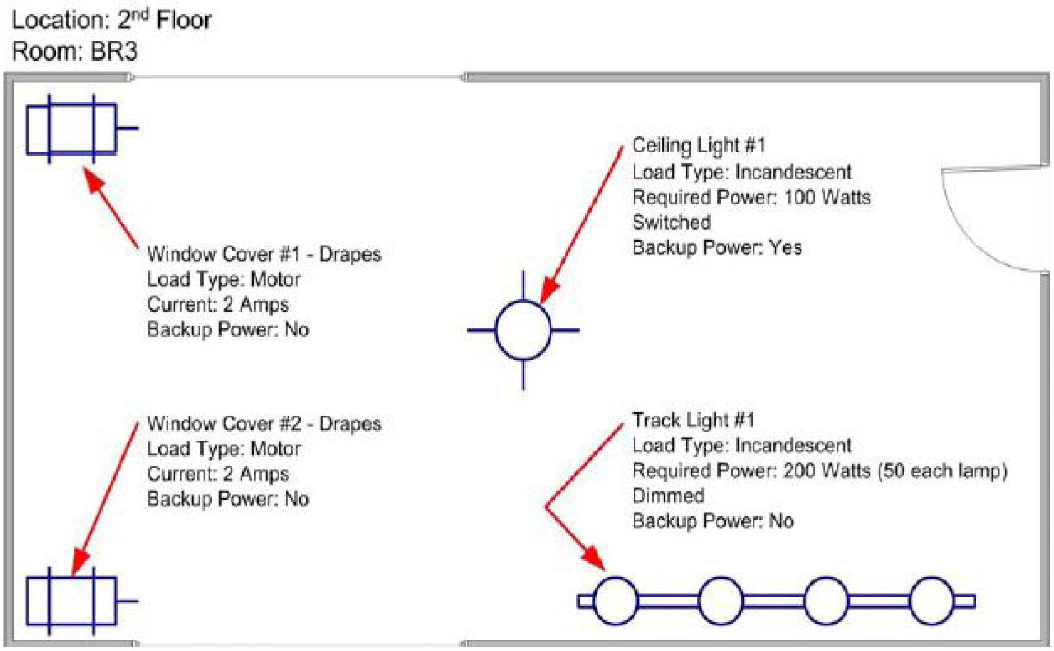
Load Schedule

A lighting system design begins with a collection of complete information. This includes a detailed floor plan identifying all the required elements. The first element of design, the load schedule, is developed from the floor plan. Refer to "Appendix A: Load Schedule with Panel Terminations" on page 65 for a blank load schedule.

The load schedule lists the information on each electrical load connected to every circuit in an electrical panel. This primary source of information determines all of the overall requirements:

- The lighting types, required voltage and current, dimmed or switched, circuit number, and locations
- The location and types of user interfaces used (i.e., dimmers, switches, keypads, iLux, and touch screens)
- The control processor details (larger systems should use a dedicated lighting control processor)
- The window treatment details, which include shade/blind motors and relay control (consult the window treatment manufacturer for control details)

Simplified Room Specifications


Location: 2nd Floor
Room: BR3
Ceiling Light #1
Load Type: Incandescent
Required Power: 100 Watts
Switched
Backup Power: Yes
Window Cover #1 - Drapes
Load Type: Motor
Current: 2 Amps
Backup Power: No
Window Cover #2 - Drapes
Load Type: Motor
Current: 2 Amps
Backup Power: No
Track Light #1
Load Type: Incandescent
Required Power: 200 Watts (50 each lamp)
Dimmed
Backup Power: No

Load Schedule Example

The numbered items in the load schedule example below correspond to and are explained in the numbered list that follows.

1	2		3			4	5	6	7	8	9
Control Zone	**Area**	**Room**	**Controlled Circuit Name**	**Controlled Circuit Number**	**Fixture Type**	**Load Type**	**DIM**	**Backup Power**	**Fixture Wattage & Voltage**	**Fixture Quantity**	**Total Wattage**
1	Floor 2	BR3	Ceiling	1	Ceiling Light	Incandescent	N	Yes	100 W / 230 V	1	100
			Track	2	Track Light	Incandescent	Y	No	50 W / 230 V	4	200
			Drapery Motor 1	4	Drapery Motor 1	3-wire Motor	N	No	240 W / 230 V	1	240
			Drapery Motor 2	5	Drapery Motor 2	3-wire Motor	N	No	240 W / 230 V	1	240
										Total Wattage for Floor 2 BR3	780

1. Controlled circuits that do not need to be physically wired together, but always operate in tandem. For example, perimeter lights, sconce lights, and overhead lights all operating together.
2. Location of controlled lighting zone, relevant to building site/drawings, floor designation, and room name.
3. Fixture and/or lamp type of controlled lighting zone, including any information describing custom fixtures, undetermined fixtures, dimmable transformers or fluorescent ballasts, and circuit breaker numbers. This information can also contain the number assigned to the controlled circuit.
4. Load type of the controlled lighting zone. Load types include incandescent, magnetic low voltage, electronic low voltage, neon/cold cathode, HID, dimmable/non-dimmable fluorescent ballast, ceiling fans, and switched 3-wire motor circuits. This information is especially important for selecting the correct Crestron module power rating and type.
5. Dimming requirement for the controlled lighting zone (i.e., whether the lighting level of the loads/fixtures needs to be ramped up/down or switched on/off).
6. Backup power designation for the controlled lighting zone (i.e., when a load also needs to be assigned to a separate emergency power feed). These items are assigned to their own separate dimmer, so it can be fed with backup power.
7. Watts or power rating per fixture regarding the controlled lighting zone. This is used to determine the number of fixtures that can be powered per each Crestron dimmer module channel, in order not to overload the dimmer beyond its own power rating. Volts rating for the controlled lighting zone tells the designer the voltage of the electrical feeds required for that zone, and hence the required rating for the associated Crestron module. It is recommended, due to electrical codes, to avoid mixing different voltages in a single enclosure.
8. Quantity of fixtures for the controlled lighting zone. This is useful, along with item #6, in calculating the total power rating (watts) for that particular controlled circuit (item #9).
9. Total wattage or power rating of the controlled lighting zone. This is required in order to determine the total number of Crestron lighting module channels required for that particular zone, especially if the load of the total number of fixtures exceeds the rating of a single module channel.

   NOTE: National and local electrical codes and the functionality of each user-interface must be taken into consideration. Always install electrical devices according to the National Electrical Code (NEC), local codes, and with safety in mind.

Equipment List Specification

The equipment list is based on the requirements collected for the lighting system in the load schedule. This is a sequential step-by-step process. The information gathered in previous steps is required to complete following steps. Once all the steps are completed, a complete Bill of Materials (BOM) for the system is created:

- Module selection is based on the number and type of loads.
- Automation Enclosure selection is based on the number of modules and the available space in the enclosure.
- User interface selection is based on the user control requirements.
- Wiring plan is based on the previous steps and the layout of the environment.
- Control processor is based on the size of the system (large systems should have a dedicated processor).
- Network block selection is based on the layout and distribution of the loads and user interfaces.
- Accessories selection is based on the required accessories (telephone and alarm systems, HVAC control, intercom systems, occupancy sensors, etc.).

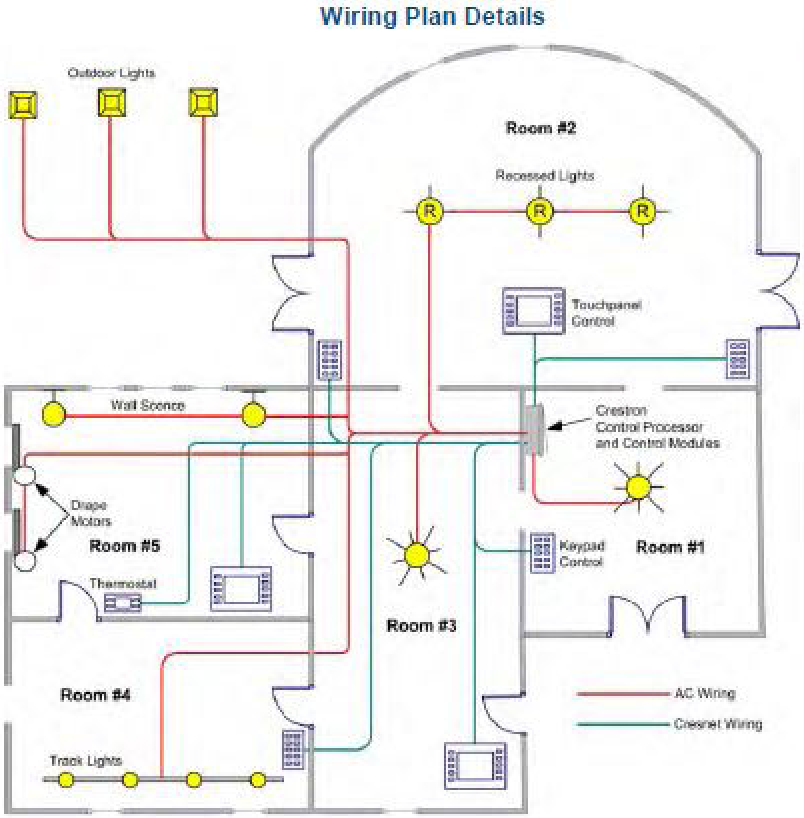
NOTE: Crestron D3 Pro software is the ideal tool for specifying an equipment list. A fully documented help file supports the easy-to-use screens and views. It offers the designer a starting place for determining modules and enclosures. The Crestron D3 Pro software can also generate a load schedule report. Refer to the Crestron website for detailed information about D3 Pro.

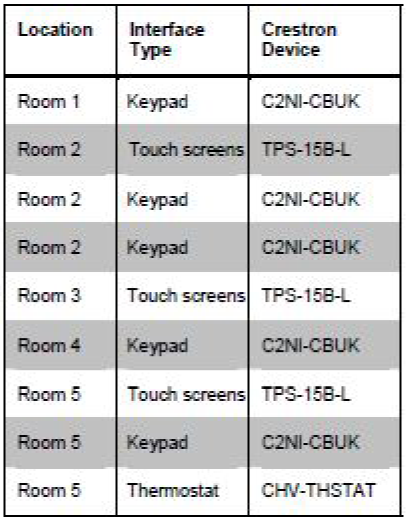
Wiring Plan

The wiring plan includes all enclosures and the interconnecting wiring.

The designer determines the location of the enclosure(s), the route of keypad and touch screens connections to the enclosure(s), the route of the interconnecting cable from the processor to the other enclosure(s), and the high voltage load routes to the enclosure or dimmer.

Ensure there are enough connectors and power (PAC2 offers 50 W) in the main enclosure for all the user interfaces. Each additional enclosure filled with dimmers is connected to the main enclosure and processor using low voltage wire. Dimmer enclosures are distributed as needed.


Wiring Plan Details
Outdoor Lights
Room #2
Recessed Lights
R
R
R
Touchpanel Control
Wall Sconce
Crestron Control Processor and Control Modules
Drape Motors
Room #5
Thermostat
Keypad Control
Room #1
Room #3
Room #4
AC Wiring
Cresnet Wiring
Track Lights



Location	Interface Type	Crestron Device
Room 1	Keypad	C2NI-CBUK
Room 2	Touch screens	TPS-15B-L
Room 2	Keypad	C2NI-CBUK
Room 2	Keypad	C2NI-CBUK
Room 3	Touch screens	TPS-15B-L
Room 4	Keypad	C2NI-CBUK
Room 5	Touch screens	TPS-15B-L
Room 5	Keypad	C2NI-CBUK
Room 5	Thermostat	CHV-THSTAT

Crestron Lighting Software

D3 Pro

Crestron D3 Pro software offers design, development, and documentation for a complete residential lighting system, with additional support for auxiliary devices such as security systems, motion detectors, and shades. Programming is accomplished through a series of simple but powerful system views designed for lighting professionals. After the design is complete, D3 Pro automatically creates, compiles, and uploads the system, including VisionTools Pro-e touch screen projects and control system logic.

The design aspect of D3 Pro allows programmers to organize each lighting system into areas and rooms, add Crestron touch screens, keypads, select lighting, motor, and fan circuits as dictated by the load schedule. A built-in module assignement wizard automatically creates the appropriate lighting hardware to control the loads, or this hardware can be added manually.

The development aspect allows programmers to determine what actions occur when the user presses a button on a keypad, remote, or touch screen. Features include a vacation scheduler that samples and plays back lighting scenes, an astronomical clock that triggers actions based on the time of day or sunrise/sunset, customizable button modeling, real-time adjustment of lighting levels, global presets, communication with remote AV control systems, and much more.

D3 Pro documents the lighting project by creating attractive and easy-to-read reports. These reports are generated in HTML, meaning that they can easily be sent via e-mail or imported into another application.

D3 Pro Templates

Application templates are pre-designed VisionTools Pro-e projects that consist of pages for controlling all types of devices, which are copied as needed in order to create custom projects for each interface in a D3 Pro system. Some interface types have more than one template available, allowing for different styles and/or panel layouts to best suit the designer’s needs.

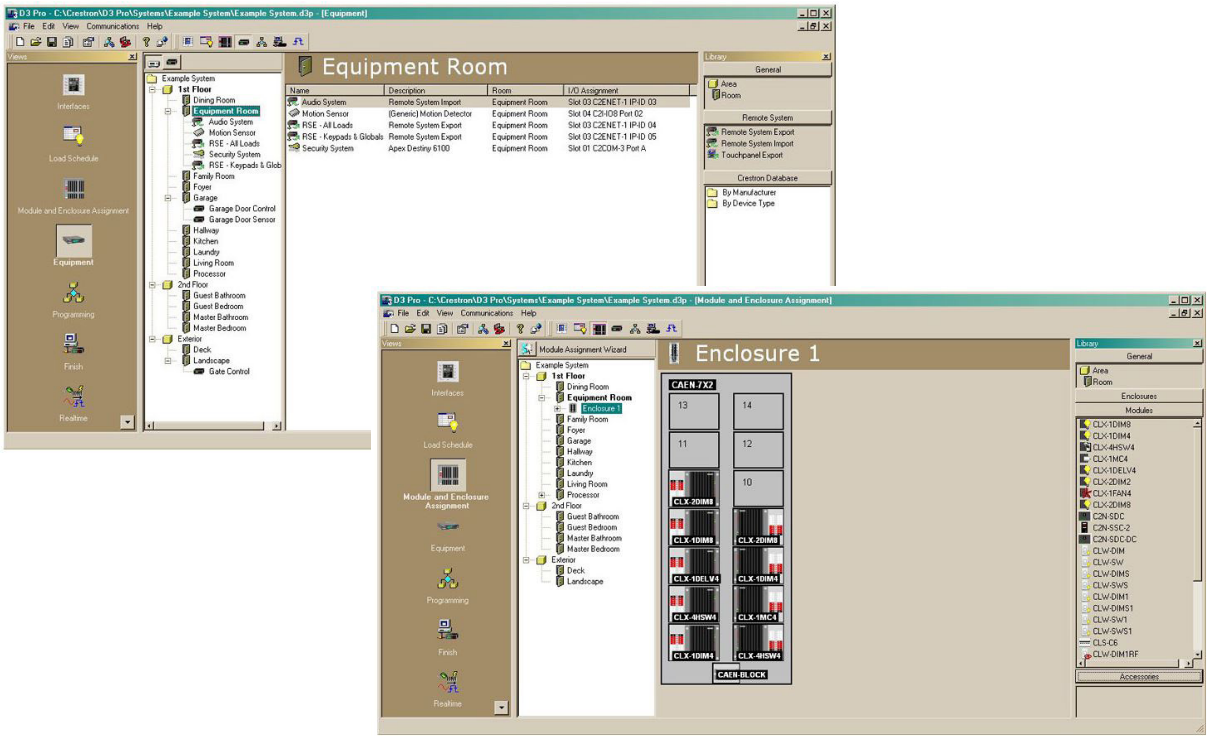
iLux Designer

The Crestron iLux Designer provides all the tools necessary to quickly program a complete 6-zone lighting and shade control solution based on the CLS-C6 and CLS-C6M iLux Integrated Lighting Systems. The CLS-C6 system is capable of controlling up to six lighting loads, 16 shade controllers, and 16 keypads. The CLS-C6M system additionally provides built-in motion detection.

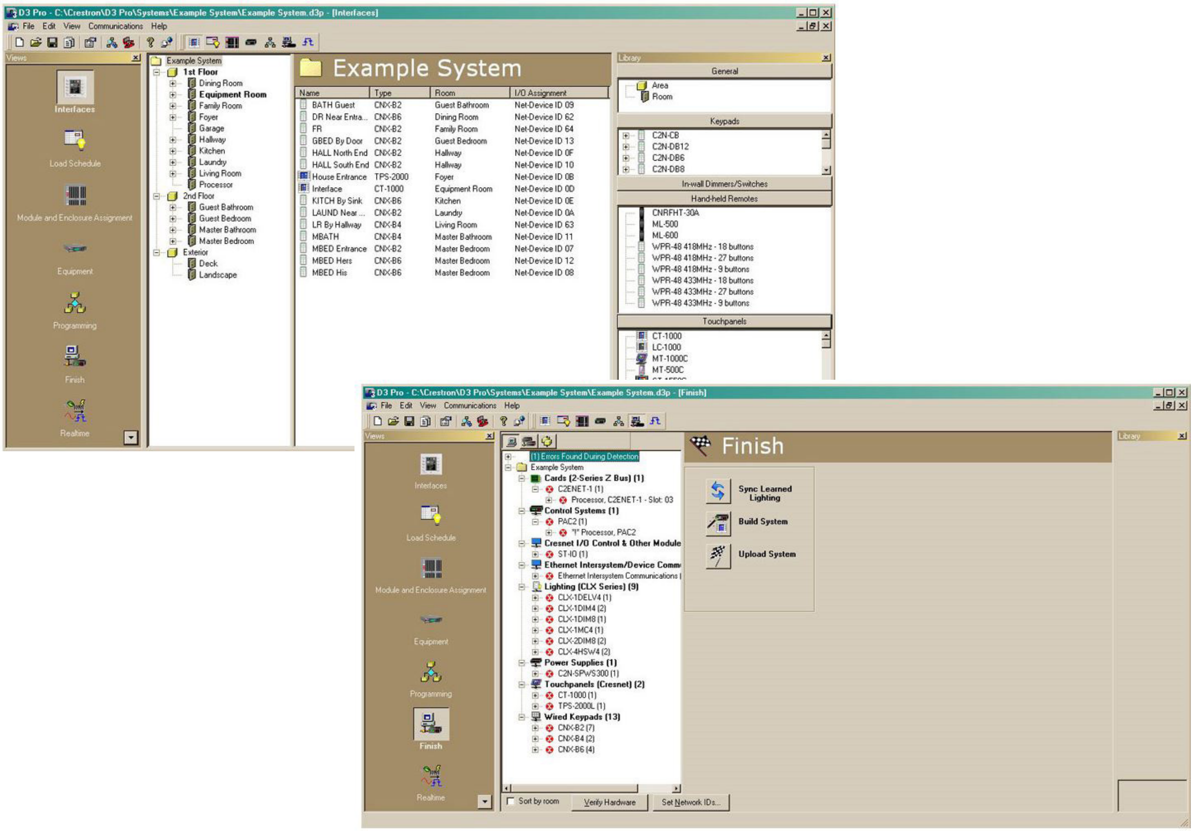
The iLux Designer permits easy programming of all front panel button functions and keypads, including scene recalls, scene toggles, fade times, ramp rate, master dim control, master shade control, and scene programming based on occupancy status. The iLux Designer also provides an interface to the Crestron Engraver for creating engraving orders.

The iLux Designer features an easy-to-use interface arranged into six views that include a load schedule, a shades view, and a scenes view. iLux Designer assigns functions to buttons, adjusts lighting ramp time, and adds up to 16 keypads to the local CLS-C6 network. The finish view permits sending the project to the CLS-C6, setting network IDs, retrieving local settings from the CLS-C6, and printing reports.The iLux Designer also requires other Crestron software to operate. The Crestron Live Update feature automatically informs the user if new versions of the software become available.

iLux Designer Screen Examples


D3 Pro - C:\Crestron\D3 Pro\Systems\Example System\Example System.d3p - [Equipment]
File Edit View Communications Help
Views
Interfaces
Load Schedule
Module and Enclosure Assignment
Equipment
Programming
Finish
Realtime
Example System
1st Floor
Dining Room
Equipment Room
Audio System
Motion Sensor
RSE - All Loads
Security System
RSE - Keypads & Glob
Family Room
Foyer
Garage
Garage Door Control
Garage Door Sensor
Hallway
Kitchen
Laundry
Living Room
Processor
2nd Floor
Guest Bathroom
Guest Bedroom
Master Bathroom
Master Bedroom
Exterior
Deck
Landscape
Gate Control
Equipment Room
Library
General
Area
Room
Remote System
Remote System Export
Remote System Import
Touchpanel Export
Crestron Database
By Manufacturer
By Device Type
D3 Pro - C:\Crestron\D3 Pro\Systems\Example System\Example System.d3p - [Module and Enclosure Assignment]
Module Assignment Wizard
Enclosure 1
CAEN-7X2
13
14
11
12
10
CLX-2DIM8
CLX-1DIM8
CLX-2DIM8
CLX-1DELV4
CLX-1DIM4
CLX-4HSW4
CLX-1MC4
CLX-1DIM4
CLX-4HSW4
CAEN-BLOCK
Enclosures
Modules
CLX-1DIM8
CLX-1DIM4
CLX-4HSW4
CLX-1MC4
CLX-1DELV4
CLX-2DIM2
CLX-1FAN4
CLX-2DIM8
C2N-SDC
C2N-SSC-2
C2N-SDC-DC
CLW-DIM
CLW-SW
CLW-DIMS
CLW-SWS
CLW-DIM1
CLW-DIMS1
CLW-SW1
CLW-SWS1
CLS-C6
CLW-DIM1RF
Accessories

Name	Description	Room	I/O Assignment
Audio System	Remote System Import	Equipment Room	Slot 03 C2ENET-1 IP-ID 03
Motion Sensor	(Generic) Motion Detector	Equipment Room	Slot 04 C2I-IO8 Port 02
RSE - All Loads	Remote System Export	Equipment Room	Slot 03 C2ENET-1 IP-ID 04
RSE - Keypads & Globals	Remote System Export	Equipment Room	Slot 03 C2ENET-1 IP-ID 05
Security System	Apex Destiny 6100	Equipment Room	Slot 01 C2COM-3 Port A

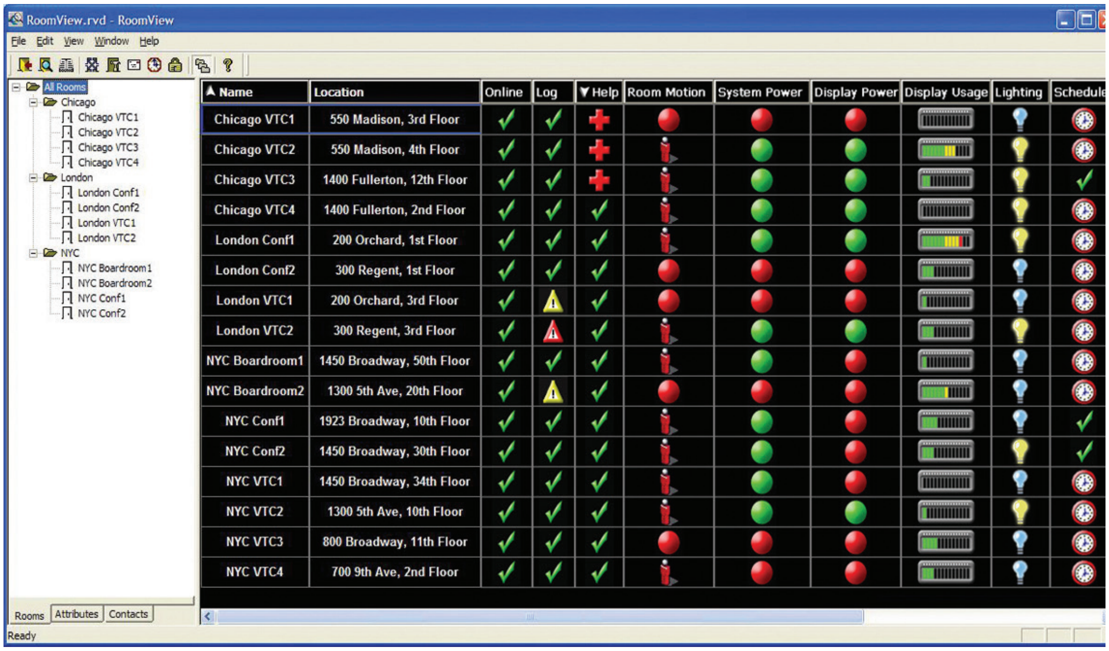

D3 Pro - C:\Crestron\D3 Pro\Systems\Example System\Example System.d3p - [Interfaces]
File Edit View Communications Help
Views
Interfaces
Load Schedule
Module and Enclosure Assignment
Equipment
Programming
Finish
Realtime
Example System
Library
General
Area
Room
Keypads
C2N-CB
C2N-DB12
C2N-DB6
C2N-DB8
In-wall Dimmers/Switches
Hand-held Remotes
CNRFHT-30A
ML-500
ML-600
WPR-48 418MHz - 18 buttons
WPR-48 418MHz - 27 buttons
WPR-48 418MHz - 9 buttons
WPR-48 433MHz - 18 buttons
WPR-48 433MHz - 27 buttons
WPR-48 433MHz - 9 buttons
Touchpanels
CT-1000
LC-1000
MT-1000C
MT-500C
D3 Pro - C:\Crestron\D3 Pro\Systems\Example System\Example System.d3p - [Finish]
(1) Errors Found During Detection
Cards (2-Series Z Bus) (1)
C2ENET-1 (1)
Processor, C2ENET-1 - Slot: 03
Control Systems (1)
PAC2 (1)
"" Processor, PAC2
Cresnet I/O Control & Other Module
ST-IO (1)
Ethernet Intersystem/Device Comm
Ethernet Intersystem Communications
Lighting (CLX Series) (9)
CLX-1DELV4 (1)
CLX-1DIM4 (2)
CLX-1DIM8 (1)
CLX-1MC4 (1)
CLX-2DIM8 (2)
CLX-4HSW4 (2)
Power Supplies (1)
C2N-SPWS300 (1)
Touchpanels (Cresnet) (2)
CT-1000 (1)
TPS-2000L (1)
Wired Keypads (13)
CNX-B2 (7)
CNX-B4 (2)
CNX-B6 (4)
☐ Sort by room
Verify Hardware
Set Network IDs...
Finish
Sync Learned Lighting
Build System
Upload System

Name	Type	Room	I/O Assignment
BATH Guest	CNX-B2	Guest Bathroom	Net-Device ID 09
DR Near Entra...	CNX-B6	Dining Room	Net-Device ID 62
FR	CNX-B2	Family Room	Net-Device ID 64
GBED By Door	CNX-B2	Guest Bedroom	Net-Device ID 13
HALL North End	CNX-B2	Hallway	Net-Device ID 0F
HALL South End	CNX-B2	Hallway	Net-Device ID 10
House Entrance	TPS-2000	Foyer	Net-Device ID 0B
Interface	CT-1000	Equipment Room	Net-Device ID 0D
KITCH By Sink	CNX-B6	Kitchen	Net-Device ID 0E
LAUND Near ...	CNX-B2	Laundry	Net-Device ID 0A
LR By Hallway	CNX-B4	Living Room	Net-Device ID 63
MBATH	CNX-B4	Master Bathroom	Net-Device ID 11
MBED Entrance	CNX-B2	Master Bedroom	Net-Device ID 07
MBED Hers	CNX-B6	Master Bedroom	Net-Device ID 12
MBED His	CNX-B6	Master Bedroom	Net-Device ID 08

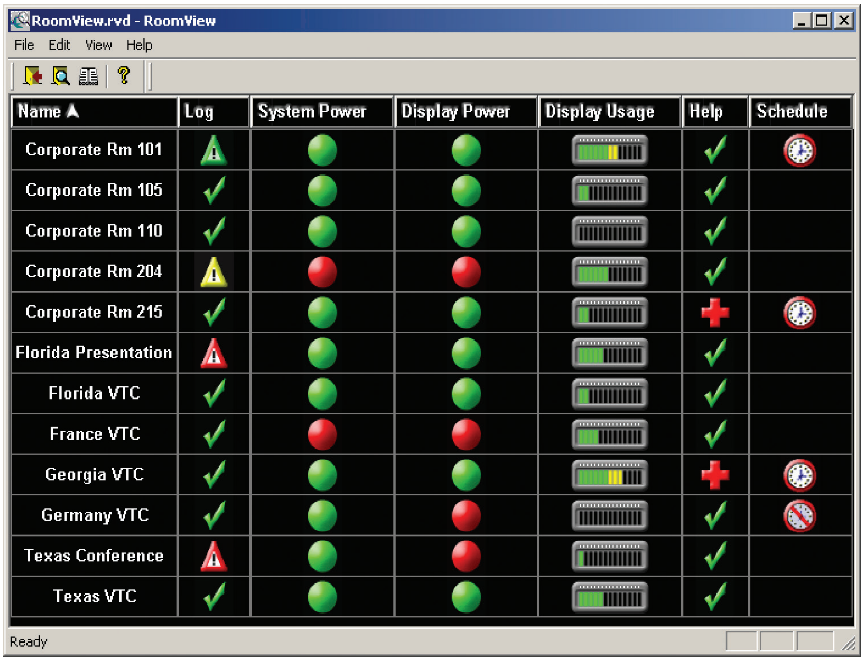
RoomView Express

Crestron RoomView Express is a powerful AV asset management software that allows the user to keep track of all the rooms in the facility. While connected to each room, RoomView displays system and projector power status, lamp life, alerts, and other vital statistics. This graphic-rich interface empowers AV managers to intelligently manage and support every room. Without RoomView, support staff must roam hallways to check room status, manually view and record projector lamp life, provide in-person help to users, and turn off systems one by one at the end of each day.

RoomView Express Screen Examples


RoomView.rvd - RoomView
File Edit View Window Help
All Rooms
Chicago
Chicago VTC1
Chicago VTC2
Chicago VTC3
Chicago VTC4
London
London Conf1
London Conf2
London VTC1
London VTC2
NYC
NYC Boardroom1
NYC Boardroom2
NYC Conf1
NYC Conf2
Rooms
Attributes
Contacts
Ready

Name	Location	Online	Log	Help	Room Motion	System Power	Display Power	Display Usage	Lighting	Schedule
Chicago VTC1	550 Madison, 3rd Floor	✓	✓	✚	🔴	🔴	🔴	▥	💡	🕒
Chicago VTC2	550 Madison, 4th Floor	✓	✓	✚	🚶	🟢	🟢	▥	💡	🕒
Chicago VTC3	1400 Fullerton, 12th Floor	✓	✓	✚	🚶	🟢	🟢	▥	💡	✓
Chicago VTC4	1400 Fullerton, 2nd Floor	✓	✓	✓	🚶	🟢	🟢	▥	💡	🕒
London Conf1	200 Orchard, 1st Floor	✓	✓	✓	🚶	🟢	🟢	▥	💡	🕒
London Conf2	300 Regent, 1st Floor	✓	✓	✓	🔴	🔴	🔴	▥	💡	🕒
London VTC1	200 Orchard, 3rd Floor	✓	⚠	✓	🔴	🔴	🔴	▥	💡	🕒
London VTC2	300 Regent, 3rd Floor	✓	⚠	✓	🚶	🟢	🟢	▥	💡	🕒
NYC Boardroom1	1450 Broadway, 50th Floor	✓	✓	✓	🚶	🟢	🔴	▥	💡	🕒
NYC Boardroom2	1300 5th Ave, 20th Floor	✓	⚠	✓	🔴	🔴	🔴	▥	💡	🕒
NYC Conf1	1923 Broadway, 10th Floor	✓	✓	✓	🚶	🟢	🔴	▥	💡	✓
NYC Conf2	1450 Broadway, 30th Floor	✓	✓	✓	🚶	🟢	🔴	▥	💡	✓
NYC VTC1	1450 Broadway, 34th Floor	✓	✓	✓	🚶	🟢	🔴	▥	💡	🕒
NYC VTC2	1300 5th Ave, 10th Floor	✓	✓	✓	🚶	🟢	🟢	▥	💡	🕒
NYC VTC3	800 Broadway, 11th Floor	✓	✓	✓	🔴	🔴	🔴	▥	💡	🕒
NYC VTC4	700 9th Ave, 2nd Floor	✓	✓	✓	🚶	🔴	🔴	▥	💡	🕒

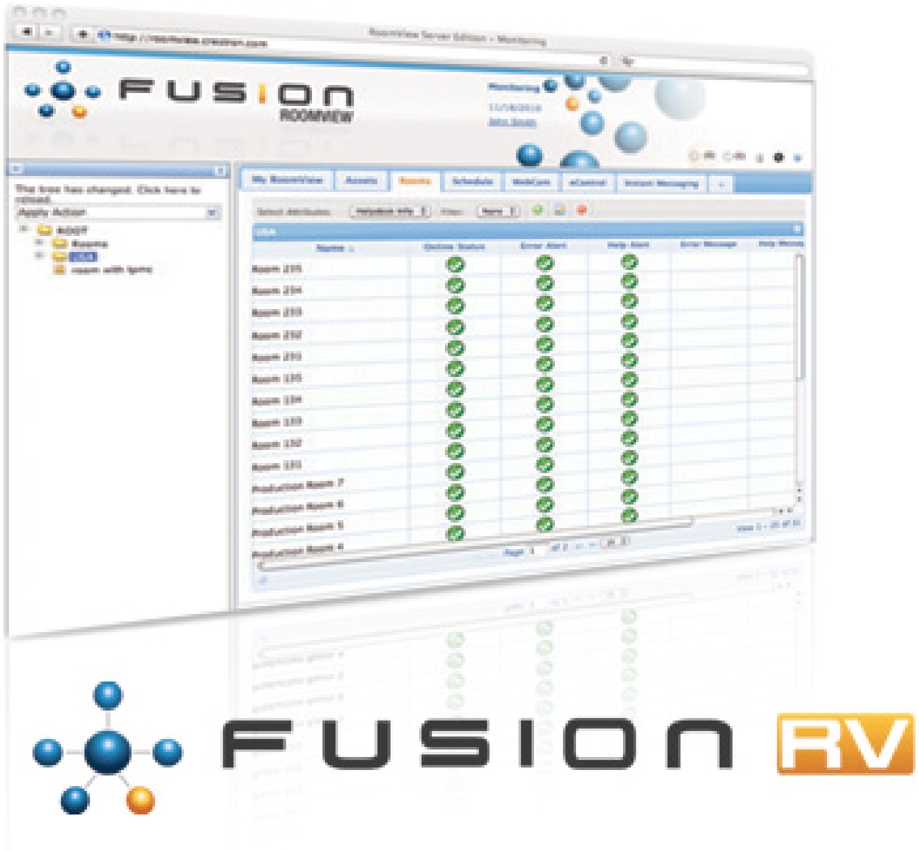

RoomView.rvd - RoomView
File Edit View Help
Ready

Name	Log	System Power	Display Power	Display Usage	Help	Schedule
Corporate Rm 101	⚠	🟢	🟢	▥	✓	🕒
Corporate Rm 105	✓	🟢	🟢	▥	✓	
Corporate Rm 110	✓	🟢	🟢	▥	✓	
Corporate Rm 204	⚠	🔴	🔴	▥	✓	
Corporate Rm 215	✓	🟢	🟢	▥	✚	🕒
Florida Presentation	⚠	🟢	🟢	▥	✓	
Florida VTC	✓	🟢	🟢	▥	✓	
France VTC	✓	🔴	🔴	▥	✓	
Georgia VTC	✓	🟢	🟢	▥	✚	🕒
Germany VTC	✓	🟢	🔴	▥	✓	🚫
Texas Conference	⚠	🟢	🔴	▥	✓	
Texas VTC	✓	🟢	🟢	▥	✓	

Fusion RV

Fusion RV® is the AV and technology management component of Crestron Fusion. View room status, track maintenance on devices, schedule end-of-day shutdown, book meetings in rooms, provide remote help desk assistance, capture and distribute multimedia presentations, and more—all from the web-based interface.

Fusion RV Screen Example



Ordering a Crestron Lighting Control System

Hardware

These are the steps for ordering a Crestron lighting control system, regardless of the size. Each system and module contains the appropriate installation literature and operation guide.

Order a lighting system by following the steps below:

STEP 1: Survey all controlled lights and loads.

STEP 2: Determine the number and types of control modules and terminal blocks needed to control lights and loads based on the load schedule and wiring plan.

STEP 3: Determine the number and type of automation enclosures required.

STEP 4: Determine the number of control processors and related accessories required.

STEP 5: Determine the number and types of keypads, wall panels, iLux devices, infiNET wireless devices, shade/drape controllers, and touch screens.

STEP 6: Determine the wiring accessories, cabling and power supplies required.

STEP 7: Place an order for Crestron items as identified

Crestron ships all items to the job site for assembly and wiring.

NOTE: If engraving is desired on infiNET devices, IT MUST BE SPECIFIED UPON ORDER. Due to UL restrictions, the button caps cannot be replaced in the field. Therefore, only new units may be engraved before they leave the Crestron factory.

Crestron Control Cable

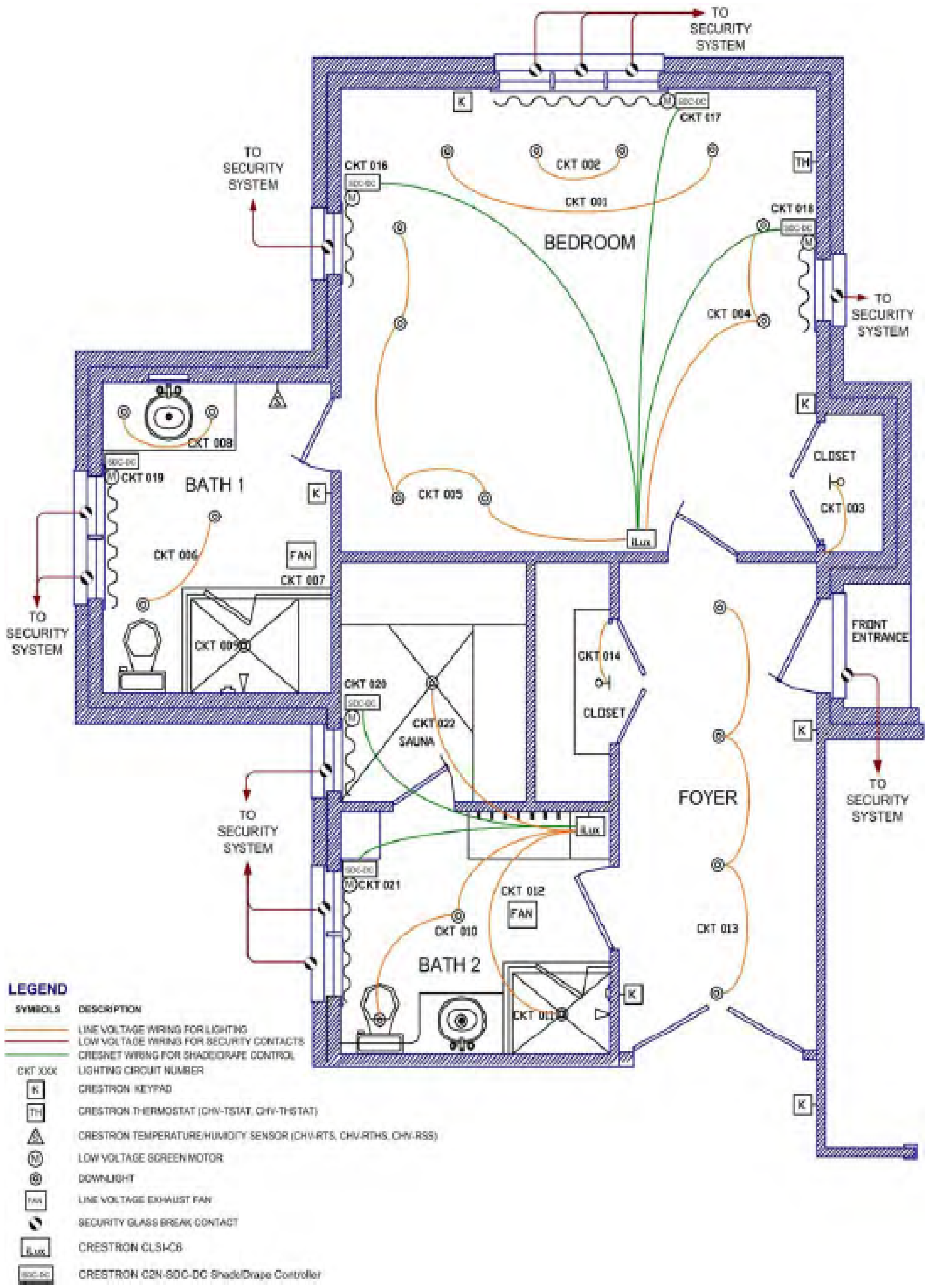
The Cresnet bus is the communications backbone for Crestron touch screens, keypads, expansion modules, tuners, and more. Cresnet is a simple, yet flexible 4-wire network that provides bidirectional communication and 24 volts power for Cresnet devices. With cable lengths up to 1524 m, the Cresnet wiring topology allows almost limitless wiring configurations.

Crestron offers Cresnet control cable in three variations. Within a single jacket, Cresnet and Cresnet-P furnish one pair 1.02 mm for 24 Vdc and GND, and one twisted pair 0.644 mm with shield for control data. Cresnet-DM is designed specifically for use with Crestron CLW-series wall box dimmers and switches, providing one twisted pair 0.644 mm with shield for data only (no power).

Programming

The lighting system designer finalizes the implementation of the lighting control system with the Crestron D3 Pro System Programming software package or with SIMPL Windows for the more advanced programmers. Crestron D3 Pro Software provides all the tools necessary to create a complete Crestron Lighting System for residential applications. The lighting system includes the control system program, touch screens screens and keypad programming, documentation, and real-time lighting adjustment capabilities. As with all Crestron software, the D3 Pro software provides extensive right-click and drag-and-drop functionality, in addition to convenient keyboard shortcuts for frequently used functions and commands. Refer to the Crestron website for more information on D3 Pro.

Lighting System Example


TO SECURITY SYSTEM
K
CKT 017
CKT 016
CKT 002
CKT 001
TH
BEDROOM
CKT 018
CKT 004
TO SECURITY SYSTEM
TO SECURITY SYSTEM
CKT 008
SDC-DC
CKT 019
BATH 1
K
CKT 005
K
CLOSET
CKT 003
iLux
CKT 006
FAN
CKT 007
TO SECURITY SYSTEM
CKT 009
CKT 020
CKT 022
SAUNA
CKT 014
CLOSET
FRONT ENTRANCE
K
FOYER
TO SECURITY SYSTEM
TO SECURITY SYSTEM
CKT 021
CKT 012
FAN
CKT 010
CKT 013
BATH 2
CKT 011
K
K
LEGEND
SYMBOLS
DESCRIPTION
LINE VOLTAGE WIRING FOR LIGHTING
LOW VOLTAGE WIRING FOR SECURITY CONTACTS
CRESNET WIRING FOR SHADE/DRAPE CONTROL
CKT XXX
LIGHTING CIRCUIT NUMBER
K
CRESTRON KEYPAD
TH
CRESTRON THERMOSTAT (CHV-TSTAT, CHV-THSTAT)
CRESTRON TEMPERATURE/HUMIDITY SENSOR (CHV-RTS, CHV-RTHS, CHV-RSS)
M
LOW VOLTAGE SCREEN MOTOR
DOWNLIGHT
FAN
LINE VOLTAGE EXHAUST FAN
SECURITY GLASS BREAK CONTACT
iLux
CRESTRON CLSI-C6
SDC-DC
CRESTRON C2N-SDC-DC Shade/Drape Controller

Bedroom

Circuit Number	Load	Dim?	Interface	Module
001	Downlights	Yes	Keypad	CLXI-1DIM8 CKT DIM 1
002	Downlights	Yes	Keypad	CLXI-1DIM8 CKT DIM2
003	Closet	Yes	Keypad	CLXI-1DIM8 CKT DIM3
004	Downlights	Yes	iLUX	CLSI-C6
005	Downlights	Yes	iLUX	CLSI-C6
016	Drapery Motors	N/A	iLUX	C2N-SDC-DC
017	Drapery Motors	N/A	iLUX	C2N-SDC-DC
018	Drapery Motors	N/A	iLUX	C2N-SDC-DC

Bath 1

Circuit Number	Load	Dim?	Interface	Module
006	Downlights	Yes	Keypad	CLXI-1DIM8 CKT DIM 4
007	Fan Motor	No	Keypad	CLXI-1MC4
008	Downlights	Yes	Keypad	CLXI-1DIM8 CKT DIM5
009	Downlights	Yes	Keypad	CLXI-1DIM8 CKT DIM6
022	Drapery Motors	N/A	Keypad	C2N-SDC-DC

Bath 2 and Sauna

Circuit Number	Load	Dim?	Interface	Module
010	Downlights	Yes	iLUX	CLSI-C6
011	Downlights	Yes	iLUX	CLSI-C6
012	Fan Motor	No	Keypad	CLXI-1MC4
021	Drapery Motors	N/A	iLUX	C2N-SDC-DC
020	Drapery Motors	N/A	iLUX	C2N-SDC-DC
019	Downlights	N/A	iLUX	CLSI-C6

Foyer

Circuit Number	Load	Dim?	Interface	Module
013	Downlights	Yes	Keypad	CLXI-1DIM8 CKT DIM 7
014	Closet	Yes	Keypad	CLXI-1DIM8 CKT DIM 8

Appendix A: Load Schedule with Panel Terminations

Project

Dealer

Creator

Description

Date

Page of

System Number

Area	Room	Zone	Voltage	Cabinet	Module	Module #	Output	CKT #	Fixture	Load Type	Dim	Total Watts

Appendix B: General Lighting Design Considerations

Crestron provides many options for illumination control. The following general lighting design information can help formulate a complete, energy efficient lighting design plan.

Light plays an essential role in the ability to perceive the world, playing a critical role in how space is perceived. Lighting can affect performance, mood, morale, safety, security, and decisions.

The first step in producing the right lighting design is to define the use of the space. The lighting designer can then determine quantity of light, color quality, brightness, direction, and placement.

There are two aspects to lighting design that go hand in hand, the qualitative or aesthetic aspect and the quantitative or engineering aspect. The qualitative aspect has to do with ensuring that the space has a pleasing feel and ambiance, the artistic interspersing of light and shadow, illumination and darkness, figure and form.

The quantitative aspect ensures adequate light for the task at hand. The Illuminating Engineering Society publishes guidelines of light levels based on the nature of the task, activities performed in the space, the size of objects handled, the detail required, the average age of the people in that space and so on. For example, a typical office is lit to an illumination of 30 to 100 footcandles. Light levels can also be expressed in the metric unit lux; 1 footcandle is approximately 10 lux.

The rate of energy consumption is called power and is measured in watts. A 200 watt lamp is consuming energy at twice the rate of a 100 watt lamp. The electric company charges consumers for the total amount of energy they consume. This is measured in kilowatt-hours or kwh. A 200 watt lamp burning for 5 hours consumes 1,000 watts hours of energy, which is called a kilowatt-hour. Note that burning a thousand watt lamp for one hour costs the same as burning a hundred watt lamp for ten hours.

In some rooms, one lighting fixture or a group of fixtures provides all the illumination. These rooms include closets, storage rooms, utility rooms, and garages. In these areas, the functionality of the fixtures outweighs style consideration. The greatest energy efficiency is achieved with compact fluorescent downlights. The best performing systems use a 32 watt triple tube downlight, providing more light than a 100 watt incandescent lamp while consuming 1/3 the amount of energy.

For many spaces, such as garages and closets, a simple lighting solution is the most appropriate. In storage rooms, basements, and other places, only basic lighting is needed. These are excellent opportunities for energy efficient lighting fixtures, especially if lights are left on for extended periods of time.

Task Lighting for Specific Work Areas

Task lights minimize reliance on overhead lighting and provide directed lighting for countertop work in kitchens, workshop, office, etc. Energy efficient CFL recessed lights or reflectorized CFLs are recommended for this application. Recessed downlights are located over task locations, especially in the kitchen, bath, shower, or at a desk. One recessed light may be all that is needed in a shower stall or tub, but in a kitchen, a group of downlights often provides more flexible task lighting. It is best to locate downlights directly over a task, but in the kitchen keep in mind that the downlight must also illuminate into the base cabinets, making fixture locations over the center of the room equally important.

Under-cabinet lights are used whenever there is an overhead cabinet above a counter, such as in a kitchen, laundry room, or home office. Fluorescent under-cabinet lights produce significantly more light than incandescent strips and use much less energy.

Lighting for Mood and Highlights

There are several different types of mood lighting as described in the sections that follow.

Ambient Lighting

Ambient light is the general, overall light that fills in shadows, reduces contrast, and lights vertical lighting sets a dramatic or subtle mood within a living space. Use ambient lights to illuminate hallways, entryways, artwork and architectural highlights in the home. The nature and quality of ambient lighting determines the overall room ambience. Even if the design produces the right amount of light for each task and display, sometimes more ambient light is needed. Ambient light is intentionally not very obvious, and can be difficult to determine when more is necessary. Often the best way to provide ambient light is with hidden lights.

Ambient light is a primary concern in the kitchen, where table lamps and floor lamps are not welcome because they get in the way. Some common ways to introduce ambient light in the kitchen are as follows:

- Fluorescent uplights on top of cabinets
- Central fluorescent lights on the ceiling
- Wall sconces, especially those with uplight
- Decorative lights with an open top that place most of the light on the ceiling

In other rooms, such as bedrooms or living rooms, ambient light can be introduced by portable lighting fixtures such as torchieres, floor lamps, or table lamps.

Decorative Lighting

Decorative lighting includes chandeliers, sconces and table lamps, and is usually chosen based upon its style and appearance. Generally, decorative lights produce only modest amounts of illumination. A lighting design begins with architecture, style and décor. Some things just look right, feel right, and fit well with the overall design of the room. Decorative lighting such as chandeliers, sconces, and table lamps provide at least some portion of the light needed for certain tasks. As a general rule, designers should choose the decorative lighting that fits the space. Traditional locations include a chandelier over the dining room table, a pendant light over the breakfast table, a lamp on a side table in the living room, or a lantern by the front door. Keep in mind that other lighting may also be needed to illuminate tasks or displays. Accent lighting is what gives the space a third dimension, adding to the quality of the space.

Focal and Display Lighting

Focal, or display lighting illuminates art, architecture, collections, and other displays. Determine whether to highlight objects of art, memorabilia, or bookcases. The fireplace mantel and the wall above the mantel are primary locations for display items.

Mount the focal light 53.4 cm from the wall with a 2.44 m ceiling, 68.6 cm from the wall with a 2.75 m ceiling, 86.4 cm from the wall with a 3.1 m ceiling, and so on. One accent light illuminates anything from a small object (with a 10-15 degree spot lamp) to a painting up to 1 m wide (with a 35-35 degree flood lamp). Add a second light for every meter of width of the object that is being lite.

Appendix C: Glossary of Terms

A

AMPERE: The standard unit of measurement for electric current that is equal to one coulomb per second. It defines the quantity of electrons moving past a given point in a circuit during a specific period, abbreviated amp.

ANSI: Abbreviation for American National Standards Institute.

ARC TUBE: A tube enclosed by the outer glass envelope of an HID lamp and made of clear quartz or ceramic that contains the arc stream.

ASHRAE: Abbreviation for the American Society of Heating, Refrigerating, and Air-Conditioning Engineers.

B

BAFFLE: A single opaque or translucent element used to control light distribution at certain angles.

BALLAST: A device used to operate fluorescent and HID lamps. The ballast provides the necessary starting voltage, while limiting and regulating the lamp current during operation.

BALLAST CYCLING: Undesirable condition under which the ballast turns lamps on and off (cycles) due to the overheating of the thermal switch inside the ballast. This may be due to incorrect lamps, improper voltage being supplied, high ambient temperature around the fixture, or the early stage of ballast failure.

BALLAST EFFICIENCY FACTOR (BEF): The ballast efficiency factor is the ballast factor divided by the input power of the ballast. The higher the BEF (within the same lamp-ballast type) the more efficient the ballast.

BALLAST FACTOR (BF): The ballast factor for a specific lamp-ballast combination represents the percentage of the rated lamp lumens produced by the combination.

C

CANDELA: Unit of luminous intensity, describing the intensity of a light source in a specific direction.

CANDELA DISTRIBUTION: A curve, often on polar coordinates, illustrating the variation of luminous intensity of a lamp or luminaire in a plane through the light center.

CANDLEPOWER: A measure of luminous intensity of a light source in a specific direction, measured in candelas.

CBM: Abbreviation for Certified Ballast Manufacturers Association.

CEC: Abbreviation for California Energy Commission.

COEFFICIENT OF UTILIZATION (CU): The ratio of lumens from a luminaire received on the work plane to the lumens produced by the lamps alone.

COLOR RENDERING INDEX (CRI): A scale of the effect of a light source on the color appearance of an object compared to its color appearance under a reference light source. Expressed on a scale of 1 to 100, where 100 indicates no color shift. A low CRI rating suggests that the colors of objects appear unnatural under that particular light source.

C

COLOR RENDITION: The appearance of colors when illuminated by a light source. Color rendition is generally considered to be a more important lighting quality than color temperature. Most objects are not a single color, but a combination of many colors. Light sources that are deficient in certain colors can change the apparent color of an object. The Color Rendition Index (CRI) is a 1–100 scale that measures a light source's ability to render colors the same way sunlight does. The top value of the CRI scale (100) is based on illumination by a 100 watt incandescent light bulb. A light source with a CRI of 80 or higher is considered acceptable for most indoor residential applications.

COLOR TEMPERATURE: The specification of the color appearance of a light source, relating the color to a reference source heated to a particular temperature, measured by the thermal unit Kelvin. The measurement can also be described as the warmth or coolness of a light source. Generally, sources below 3200 K are considered warm, while those above 4000 K are considered cool sources.

COMPACT FLUORESCENT: A small fluorescent lamp that is often used as an alternative to incandescent lighting. The lamp life is about 10 times longer than incandescent lamps and is 3-4 times more efficacious. Also called PL, Twin-Tube, CFL, or BIAX lamps.

CONSTANT WATTAGE (CW) BALLAST: A premium type of HID ballast in which the primary and secondary coils are isolated. It is considered a high performance, high loss ballast featuring excellent output regulation.

CONSTANT WATTAGE AUTOTRANSFORMER (CWA) BALLAST: A popular type of HID ballast in which the primary and secondary coils are electrically connected. Considered an appropriate balance between cost and performance.

CONTRAST: The relationship between the luminance of an object and its background.

CUT-OFF ANGLE: The angle from a fixture's vertical axis at which a reflector, louver, or other shielding device cuts off direct visibility of a lamp. It is the complementary angle of the shielding angle.

D

DAYLIGHT COMPENSATION: A dimming system controlled by a photocell that reduces the output of the lamps when daylight is present. As daylight levels increase, lamp intensity decreases. An energy-saving technique used in areas with significant daylight contribution.

DERATING: Components can be treated in such a way as to enhance their life expectancy. Derating is the name normally given to operating a component well inside its normal operating limits to extend the life of a component, and is a practical means of reducing failures. The National Electrical Code and local electrical codes determine the amount of available current based on a derating factor. A derating factor improves reliability by reducing the upper limit of current carrying capacity to compensate for electrical, mechanical and thermal stress.

DIFFUSE: Term describing dispersed light distribution. Refers to the scattering or softening of light.

DIFFUSER: A translucent piece of glass or plastic sheet that shields the light source in a fixture. The light transmitted throughout the diffuser is redirected and scattered.

DIRECT GLARE: Glare produced by a direct view of light sources. Often the result of insufficiently shielded light sources. (See GLARE)

DOWNLIGHT: A type of ceiling luminaire, usually fully recessed, where most of the light is directed downward. May feature an open reflector and/or shielding device.

E

EFFICACY: A metric used to compare light output to energy consumption. Efficacy is measured in lumens per watt. Efficacy is similar to efficiency, but is expressed in dissimilar units. For example, if a 100-watt source produces 9000 lumens, then the efficacy is 90 lumens per watt.

ELECTROLUMINESCENT: A light source technology used in exit signs that provides uniform brightness, long lamp life (approximately eight years), while consuming very little energy (less than one watt per lamp).

ELECTRONIC BALLAST: A ballast that uses semi-conductor components to increase the frequency of fluorescent lamp operation (typically in the 20-40 kHz range). Smaller inductive components provide the lamp current control. Fluorescent system efficiency is increased due to high frequency lamp operation.

ELECTRONIC DIMMING BALLAST: A variable output electronic fluorescent ballast.

EMI: Abbreviation for electromagnetic interference. EMI is the high frequency interference (electrical noise) caused by electronic components or fluorescent lamps that interferes with the operation of electrical equipment. EMI is measured in micro-volts, and can be controlled by filters. Because EMI can interfere with communication devices, the Federal Communication Commission (FCC) has established limits for EMI.

ENERGY-SAVING BALLAST: A type of magnetic ballast designed so that the components operate more efficiently, cooler and longer than a standard magnetic ballast. By US law, standard magnetic ballasts can no longer be manufactured.

ENERGY-SAVING LAMP: A lower wattage lamp, generally producing fewer lumens.

F

FILL LIGHT: A fill light can either be directional or diffused. For example, a directional light can be shined on the object in the opposite direction of a key light, softening or eliminating shadows, depending on the strength of the fill light relative to the strength of the key light. Fill light sources can be placed behind an object to light the entire room evenly.

FLUORESCENT LAMP: A light source consisting of a tube filled with argon, along with krypton or other inert gas. When electrical current is applied, the resulting arc emits ultraviolet radiation that excites the phosphors inside the lamp wall, causing them to radiate visible light.

FOOTCANDLE (FC): The English unit of measurement of the illuminance (or light level) on a surface. One footcandle is equal to one lumen per square foot.

FOOTLAMBERT: An English unit of luminance. One footlambert is equal to 1/p candelas per square foot.

G

GLARE: The effect of brightness or differences in brightness within the visual field sufficiently high to cause annoyance, discomfort, or loss of visual performance.

H

HARMONIC DISTORTION: A harmonic is a sinusoidal component of a periodic wave having a frequency that is a multiple of the fundamental frequency. Harmonic distortion from lighting equipment can interfere with other appliances and the operation of electric power networks. The total harmonic distortion (THD) is usually expressed as a percentage of the fundamental line current. THD for 4-foot fluorescent ballasts usually range from 20% to 40%. For compact fluorescent ballasts, THD levels greater than 50% are not uncommon.

H

HID: Abbreviation for high intensity discharge. Generic term describing mercury vapor, metal halide, high-pressure sodium, and (informally) low-pressure sodium light sources and luminaires.

HIGH BAY: Pertains to the type of lighting in an industrial application where the ceiling is 20 feet or higher. Also describes the application itself.

HIGH OUTPUT (HO): A lamp or ballast designed to operate at higher currents (800 mA) and produce more light.

HIGH POWER FACTOR: Ballast with a 0.9 or higher rated power factor, which is achieved by using a capacitor.

HIGH PRESSURE SODIUM LAMP: A high intensity discharge (HID) lamp whose light is produced by radiation from sodium vapor (and mercury).

HOT RESTART or HOT RESTRIKE: The phenomenon of re-striking the arc in an HID light source after a momentary power loss. Hot restart occurs when the arc tube has cooled a sufficient amount.

I

IESNA: Abbreviation for Illuminating Engineering Society of North America.

ILLUMINANCE: A photometric term that quantifies light incident on a surface or plane. Illuminance is commonly called light level. It is expressed as lumens per square foot (footcandles), or lumens per square meter (lux).

INDIRECT GLARE: Glare produced from a reflective surface.

INSTANT START: A fluorescent circuit that ignites the lamp instantly with a very high starting voltage from the ballast. Instant start lamps have single-pin bases.

K

KEY LIGHT: When a light is shined on an object from a single point source of light it is called key light. It highlights contours on the object and creates shadows. The exact effect depends on the angle of the beam of light. The light source may be best placed in front of and to the side of the object at an angle.

NOTE: For ac circuits, PF must be included.

L

LAMP CURRENT CREST FACTOR (LCCF): The peak lamp current divided by the RMS (average) lamp current. Lamp manufacturers require <1.7 for best lamp life. An LCCF of 1.414 is a perfect sine wave.

LAMP LUMEN DEPRECIATION FACTOR (LLD): A factor that represents the reduction of lumen output over time. The factor is commonly used as a multiplier to the initial lumen rating in illumination calculations, which compensates for the lumen depreciation. The LLD factor is a dimensionless value between 0 and 1.

LAY-IN-TROFFER: A fluorescent fixture. Usually a 2 ft x 4 ft fixture that sets or lays into a specific ceiling grid.

LED: Abbreviation for light emitting diode. An illumination technology used for exit signs. Consumes low wattage and has a rated life of greater than 80 years.

LENS: Transparent or translucent medium that alters the directional characteristics of light passing through it. Usually made of glass or acrylic.

L

LIGHT LOSS FACTOR (LLF): Factors that allow for a lighting system's operation at less than initial conditions. These factors are used to calculate maintained light levels. LLFs are divided into two categories, recoverable and non-recoverable. Examples are lamp lumen depreciation and luminaire surface depreciation.

LIFE-CYCLE COST: The total costs associated with purchasing, operating, and maintaining a system over the life of that system.

LOUVER: Grid type of optical assembly used to control light distribution from a fixture. Can range from small-cell plastic to the large-cell anodized aluminum louvers used in parabolic fluorescent fixtures.

LOW POWER FACTOR: Essentially, an uncorrected ballast power factor of less than 0.9 (See NPF).

LOW-PRESSURE SODIUM: A low-pressure discharge lamp in which light is produced by radiation from sodium vapor. Considered a monochromatic light source (most colors are rendered as gray).

LOW-VOLTAGE LAMP: A lamp (typically compact halogen) that provides both intensity and good color rendition. Lamp operates at 12 V and requires the use of a transformer. Popular lamps are MR11, MR16, and PAR36.

LOW-VOLTAGE SWITCH: A relay (magnetically-operated switch) that allows local and remote control of lights, including centralized time clock or computer control.

LUMEN: A unit of light flow, or luminous flux. The lumen rating of a lamp is a measure of the total light output of the lamp.

LUMINAIRE: A complete lighting unit consisting of a lamp or lamps, along with the parts designed to distribute the light, hold the lamps, and connect the lamps to a power source. Also called a fixture.

LUMINAIRE EFFICIENCY: The ratio of total lumen output of a luminaire and the lumen output of the lamps, expressed as a percentage. For example, if two luminaires use the same lamps, more light is emitted from the fixture with the higher efficiency.

LUMINANCE: A photometric term that quantifies brightness of a light source or of an illuminated surface that reflects light. It is expressed as footlamberts (English units) or candelas per square meter (Metric units).

LUX (LX): The metric unit of measure for illuminance of a surface. One lux is equal to one lumen per square meter. One lux equals 0.093 footcandles.

M

MAINTAINED ILLUMINANCE: Refers to light levels of a space at other than initial or rated conditions. This term considers light loss factors such as lamp lumen depreciation, luminaire dirt depreciation, and room surface dirt depreciation.

MERCURY VAPOR LAMP: A type of high intensity discharge (HID) lamp in which most of the light is produced by radiation from mercury vapor. Emits a blue-green cast of light. Available in clear and phosphor-coated lamps.

METAL HALIDE: A type of high intensity discharge (HID) lamp in which most of the light is produced by radiation of metal halide and mercury vapors in the arc tube. Available in clear and phosphor-coated lamps.

MR-16: A low-voltage quartz reflector lamp, only 2 inch diameter. Typically the lamp and reflector are one unit, which directs a sharp, precise beam of light.

N

NADIR: A reference direction directly below a luminaire, or straight down (0 degree angle).

NPF (NORMAL POWER FACTOR): A ballast/lamp combination in which no components (e.g., capacitors) have been added to correct the power factor, making it normal (essentially low, typically 0.5 or 50%).

O

OCCUPANCY SENSOR: Control device that turns lights off after the space becomes unoccupied. May be ultrasonic, infrared, or other type.

OPTICS: A term referring to the components of a light fixture (such as reflectors, refractors, lenses, or louvers) or to the light emitting or light-controlling performance of a fixture.

P

PAR LAMP: A parabolic aluminized reflector (PAR) lamp. An incandescent, metal halide, or compact fluorescent lamp used to redirect light from the source using a parabolic reflector. Lamps are available with flood or spot distributions.

PAR 36: A PAR lamp that is 36 1/8 inch in diameter with a parabolic shaped reflector (See PAR LAMP).

PARABOLIC LUMINAIRE: A popular type of fluorescent fixture that has a louver composed of aluminum baffles curved in a parabolic shape. The resultant light distribution produced by this shape provides reduced glare, better light control, and is considered to have greater aesthetic appeal.

PARACUBE: A metallic coated plastic louver made up of small squares. Often used to replace the lens in an installed troffer to enhance its appearance. The paracube is visually comfortable, but the luminaire efficiency is lowered.

PARABOLIC LUMINAIRE: A popular type of fluorescent fixture that has a louver composed of aluminum baffles curved in a parabolic shape. The resultant light distribution produced by this shape provides reduced glare, better light control, and is considered to have greater aesthetic appeal.

PARACUBE: A metallic coated plastic louver made up of small squares. Often used to replace the lens in an installed troffer to enhance its appearance. The paracube is visually comfortable, but the luminaire efficiency is lowered. Also used in rooms with computer screens because of their glare-reducing qualities.

PHOTOCELL: A light sensing device used to control luminaires and dimmers in response to detected light levels.

PHOTOMETRIC REPORT: A photometric report is a set of printed data describing the light distribution, efficiency, and zonal lumen output of a luminaire. This report is generated from laboratory testing.

POWER FACTOR: The ratio of the Vac x amps through a device to the ac wattage of the device. A device such as a ballast that measures 120 volts, 1 amps, and 60 W has a power factor of 50% (volts x amps = 120 VA, therefore 60 W/120 VA = 0.5). Some utilities charge customers for low power factor systems.

PREHEAT: A type of ballast/lamp circuit that uses a separate starter to heat up a fluorescent lamp before high voltage is applied to start the lamp.

Q

QUAD-TUBE LAMP: A compact fluorescent lamp with a double twin tube configuration.

R

RADIO FREQUENCY INTERFERENCE (RFI): Interference to the radio frequency band caused by other high frequency equipment or devices in the immediate area. Fluorescent lighting systems generate RFI.

RAPID START (RS): The most popular fluorescent lamp/ballast combination used today. This ballast quickly and efficiently preheats lamp cathodes to start the lamp. Uses a bi-pin base.

ROOM CAVITY RATIO (RCR): A ratio of room dimensions used to quantify how light interacts with room surfaces. A factor used in illuminance calculations.

REFLECTANCE: The ratio of light reflected from a surface to the light incident on the surface. Reflectances are often used for lighting calculations. The reflectance of a dark carpet is around 20%, and a clean white wall is roughly 50% to 60%.

REFLECTOR: The part of a light fixture that shrouds the lamps and redirects some light emitted from the lamp.

REFRACTOR: A device used to redirect the light output from a source, primarily by bending the waves of light.

RECESSED: The term used to describe the doorframe of a troffer where the lens or louver lies above the surface of the ceiling.

REGULATION: The ability of a ballast to hold constant (or nearly constant) the output watts (light output) during fluctuations in the voltage feeding of the ballast. Normally specified as +/- percent change in output compared to +/- percent change in input.

RELAY: A device that switches an electrical load on or off based on small changes in current or voltage. Examples include low voltage relay and solid state relay.

RETROFIT: Refers to upgrading a fixture, room, or building by installing new parts or equipment.

S

SELF-LUMINOUS EXIT SIGN: An illumination technology using phosphor-coated glass tubes filled with radioactive tritium gas. The exit sign uses no electricity and thus does not need to be hardwired.

SEMI-SPECULAR: Term describing the light reflection characteristics of a material. Some light is reflected directionally, with some amount of scatter.

SHIELDING ANGLE: The angle measured from the ceiling plane to the line of sight where the bare lamp in a luminaire becomes visible. Higher shielding angles reduce direct glare. It is the complementary angle of the cutoff angle. (See CUTOFF ANGLE).

SPACING CRITERION: A maximum distance that interior fixtures may be spaced that ensures uniform illumination on the work plane. The luminaire height above the work plane multiplied by the spacing criterion equals the center-to-center luminaire spacing.

SPECULAR: Mirrored or polished surface. The angle of reflection is equal to the angle of incidence. This word describes the finish of the material used in some louvers and reflectors.

STARTER: A device used with a ballast to start (preheat) fluorescent lamps.

STROBOSCOPIC EFFECT: Condition where rotating machinery or other rapidly moving objects appear to be standing still due to the alternating current supplied to light sources. Sometimes called strobe effect.

T

T12 LAMP: Industry standard for a fluorescent lamp that is 12 1/8 inch (1 inch, 2.55 cm) in diameter. Other sizes are T10 and T8 lamps.

TANDEM WIRING: A wiring option in which a ballast is shared by two or more luminaires. This reduces labor, materials, and energy costs. Also called master-slave wiring.

THERMAL FACTOR: A factor used in lighting calculations that compensates for the change in light output of a fluorescent lamp due to a change in bulb wall temperature. It is applied when the lamp/ballast combination under consideration is different from that used in the photometric tests.

TRIGGER START: Type of ballast commonly used with 15 watts and 20 watts straight fluorescent lamps.

TROFFER: The term used to refer to a recessed fluorescent light fixture (combination of trough and coffer).

TUNGSTEN HALOGEN LAMP: A gas-filled tungsten filament incandescent lamp with a lamp envelope made of quartz to withstand the high temperature. This lamp contains some halogens (namely iodine, chlorine, bromine, and fluorine), which slow the evaporation of the tungsten. Also, commonly called a quartz lamp.

U

ULTRA VIOLET (UV): Invisible radiation that is shorter in wavelength and higher in frequency than visible violet light (literally beyond the violet light).

UNDERWRITERS' LABORATORIES (UL): An independent organization whose responsibilities include rigorous testing of electrical products. When products pass these tests, they can be labeled (and advertised) as UL listed. UL tests for product safety only.

V

VANDAL-RESISTANT: Fixtures with rugged housings, break-resistant type shielding, and tamper-proof screws.

VCP: Abbreviation for visual comfort probability. VCP is a rating system for evaluating direct discomfort glare. This method is a subjective evaluation of visual comfort expressed as the percent of occupants of a space bothered by direct glare. VCP allows for several factors: luminaire luminances at different angles of view, luminaire size, room size, luminaire mounting height, illuminance, and room surface reflectivity. VCP tables are often provided as part of photometric reports.

VERY HIGH OUTPUT (VHO): A fluorescent lamp that operates at a very high current (1500 mA), producing more light output than a high output lamp (800 mA) or standard output lamp (430 mA).

VOLT: The standard unit of measurement for electrical potential. It defines the electromotive force of electricity.

VOLTAGE: The difference in electrical potential between two points of an electrical circuit.

W

WALLWASHER: Describes luminaires that illuminate vertical surfaces.

WATT: The unit for measuring electrical power. It defines the rate of energy consumption by an electrical device when it is in operation. The energy cost of operating an electrical device is calculated as its wattage times the hours of use. In single-phase circuits, it is related to volts and amps by the formula: volts x amps x PF = watts.

NOTE: For ac circuits, PF must be included.

W

WORK PLANE: The level at which work is done and at which illuminance is specified and measured. For office applications, this is typically a horizontal plane 76 cm above the floor (desk height).

Z

ZENITH: The direction directly above the luminaire (180° angle).

This page intentionally left blank.

Crestron World Headquarters
15 Volvo Drive
Rockleigh, NJ 07647
Tel: 888.CRESTRON
Fax: 201.767.7576
crestron.com

Refer to the listing of Crestron worldwide offices on the Crestron website (www.crestron.com/offices) for assistance within a particular geographic region.