design and application guide
volume 4

WaveLinx Wired

Wired Solution for Indoor | Outdoor | Industrial

Modular. Scalable. Feature-Rich.

COOPER Lighting Solutions

cooperlighting.com

WAVELINX WIRED

Table of Contents

Modular. Scalable. Simple.

WaveLinx Wired is a single lighting control solution for simple to complex traditional wired control applications.

WaveLinx Wired allows you to meet all energy codes including IECC, ASHRAE 90.1 and Title 24.

- Occupancy/Vacancy sensing
- Scheduling
- Daylighting
- Shade Control
- A/V Integration
- Partitioning
- DMX control
- BMS integration
- and more

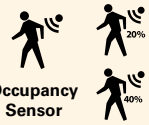
Connected solutions overview

A number of product solutions to meet your code and application requirements. This guide provides information on how WaveLinx can be used to meet or exceed your code and application requirements.

		WaveLinx CORE* (optional)	
		WaveLinx wireless	**WaveLinx** wired
EQUIPMENT	Wired Switches	●	●
	Battery Switches	●	
	Wired Sensors	●	●
	Battery Sensors	●	
	Wireless fixtures	●	
	Sensor integrated fixtures	●	
	Switchpacks	●	●
	Receptacle Control	●	●
	Low-Voltage Power Module	●	
INSTALLATION	Traditional wiring	●	●
	Modular Wiring System	●	●
	Wireless communications	●	
	Two wire communications		●
	Low-Voltage Power Module	●	●
SOFTWARE	AV integration*	●	●
	BACnet*	●	●
	OpenADR*	●	●
	Mobile App	●	●
	Floorplan*	●	
	Alarms & Events*	●	
	Energy Dashboard*	●	
	API Integration*	●	
APPLICATIONS	Office/ Private/ Open	●	●
	Education/ Classroom	●	●
	Industrial/ Warehouse	●	●
	Outdoor Parking Lot	●	●
	Outdoor Area Site	●	●
	Outdoor Parking Garage		●
CODE	ASHRAE 90.1	●	●
	IECC	●	●
	T24	●	●

Built-in energy saving lighting control strategies

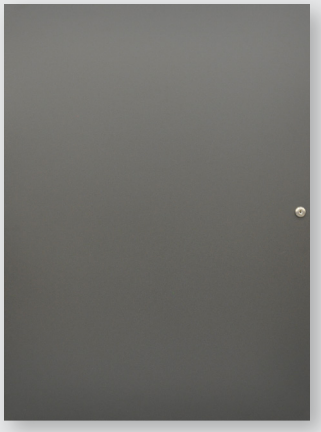
WaveLinx Wired provides these energy saving strategies with a simple configuration app.

STRATEGY	DESCRIPTION	ESTIMATED SAVINGS
 **Manual Dimmer**	Manual/personal dimming control – is one of five alternative methods to meet the multi-level lighting control requirements.	**10-20%**
 **Occupancy Sensor**	Occupancy/vacancy sensing – provides Manual On/Automatic Off or Automatic On/Automatic Off and Partial Off capabilities.	**20-60%**
 **Daylighting Control**	Daylight dimming – provides multiple daylight dimming zones that automatically adjust the lighting based on daylight available in the space, or fixture integrated sensors for completely granular daylighting control.	**20-45%**
 **Receptacle Control**	Plug load control – automatically turns On receptacles upon occupancy regardless of light status. Ensures receptacles are turned Off when the space is vacant.	**15-50% Controlled loads**
 **Task Tuning**	High-end/Task Tuning – lowers the maximum light level for automatic energy savings.	**10-30%**
 **Demand Response**	Demand Response – automatically reduces light level based on signal from 3rd party system.	**10-40%**
 **Remote Signal Control**	BACnet- Coordinate control through BMS Remote Signal Control – Communicates to 3rd party systems via API.	**20%**
 **Outdoor Control**	Outdoor Control - automatically adjust area, site, flood lighting via scheduling or astronomic clock.	**25%**

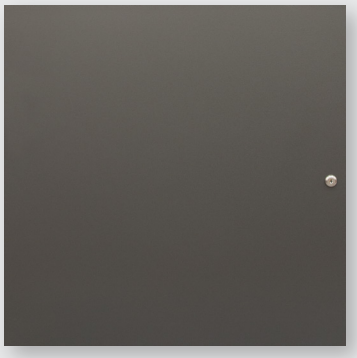
WaveLinx Wired System and Integration

PANELS

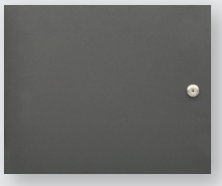
Large panel



Medium panel

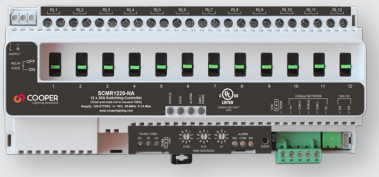


Small panel



MODULES

SCMR1220-NA
12 ea. 20A Relays



SCMH1200-NA
12 ea. 0-10V Outputs

SCMD4-NA
4 ea. DALI buses

EG2-S-NA
Ethernet Gateway

SCUN

Universal dimming panel

SOFTWARE

iCANSoft Suite
System Setup/ Commissioning
Scheduling Control

iLumin Remote
Area control
Zone control
Scene control

KEY

2 wire topology, polarity free device

5 wire bus

INPUT DEVICES

FDW Wallstation

Ineo Wallstation

Touchscreen

AUTOMATIC CONTROLS

Multi-Sensor

2 Wire Sensor Powerpack

Highbay Sensor

Multi-Sensor

Low-Voltage Ceiling Sensor

END DEVICES

0-10V Fixture Control

Relay

Adaptive Dimmer

INTEGRATION

BMS Pro 2 BACnet Interface

TSI-1-NA Touchscreen Interface

EG2-S-NA Ethernet Interface

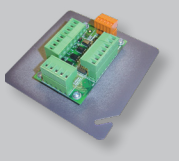
SCD96-NA DMX Interface

BN2-D-NA Network Bridge

S1-2-NA System Integrator

LOW-VOLTAGE INTEGRATION

UIM-NA Partition and Input Interface



UIG-2-NA Partition and Input Interface

IRTR Partition Sensor

EMERGENCY

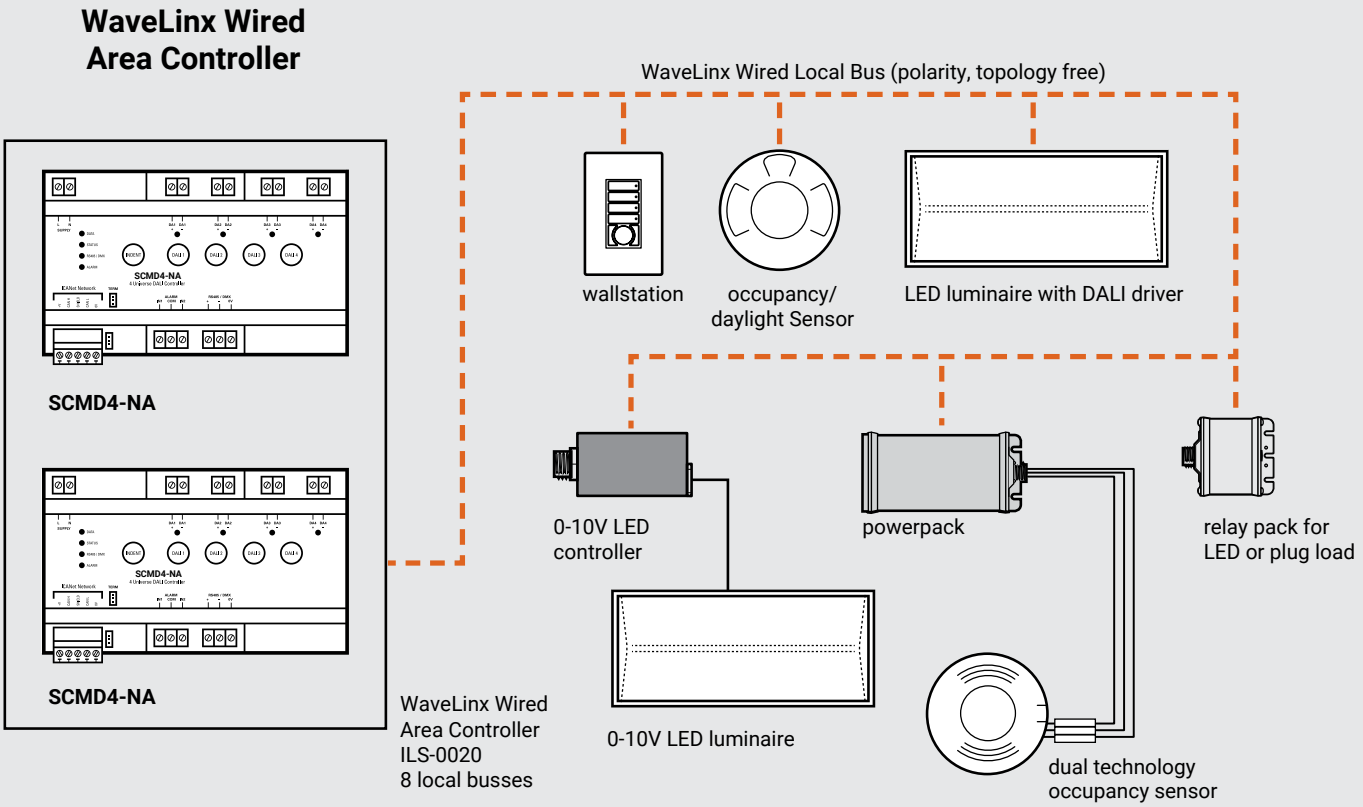
RRU-UNV Emergency Panel Control

CEPC-1-D Emergency Circuit Control

WaveLinx Wired System

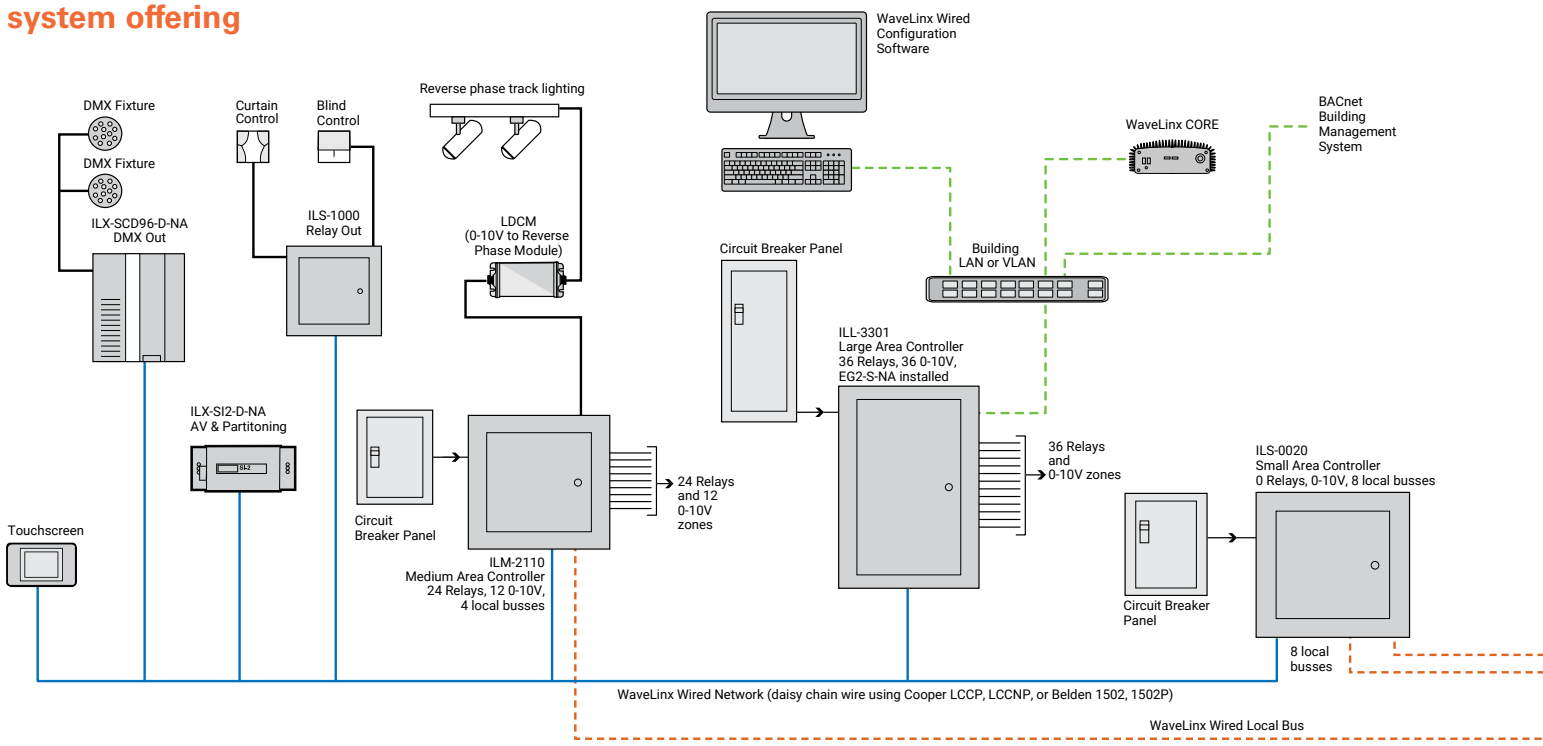
Simplified

controls wiring



Complete

system offering



Benefits

Reduce installation cost and time for sensors, switches and individual fixture control with 2 wire topology, polarity free bus.

Achieve more applications with plenum rated panels that include 25K SCCR

Simplify complete building integration and control with a system that supports sensors, touchscreens, Partitioning, 0-10V, relays, DALI, DMX, BACnet and AV integration

Get smart building ready with internal Ethernet Gateways allowing IoT connectivity

Problems Solved:

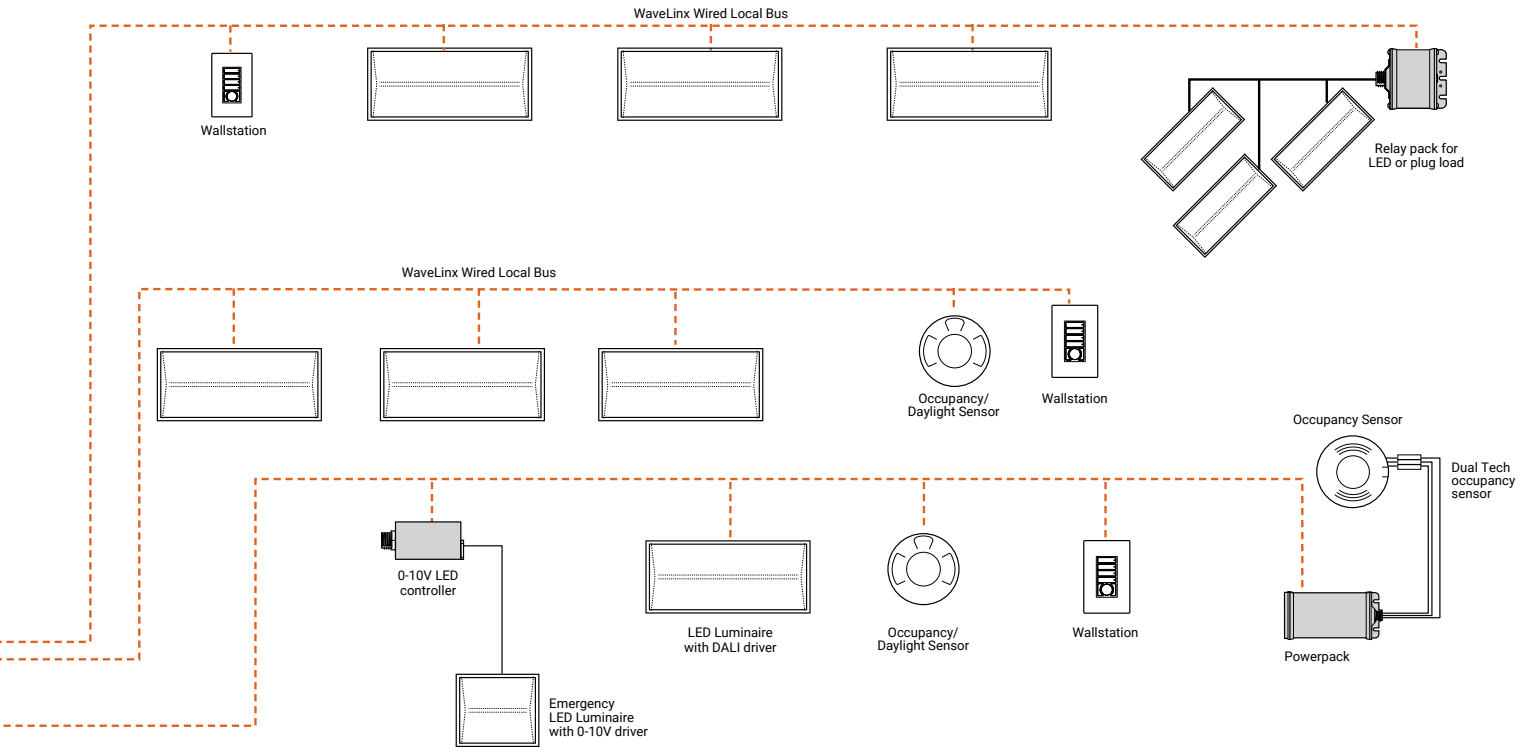
Do you want to control complete building lighting via area (relay), zone (0-10V), individual (DALI) or DMX, all from the same system?

Are you looking for a system that can integrate with commercial AV systems?

Do you need a system that can provide partitioning control of complex spaces?

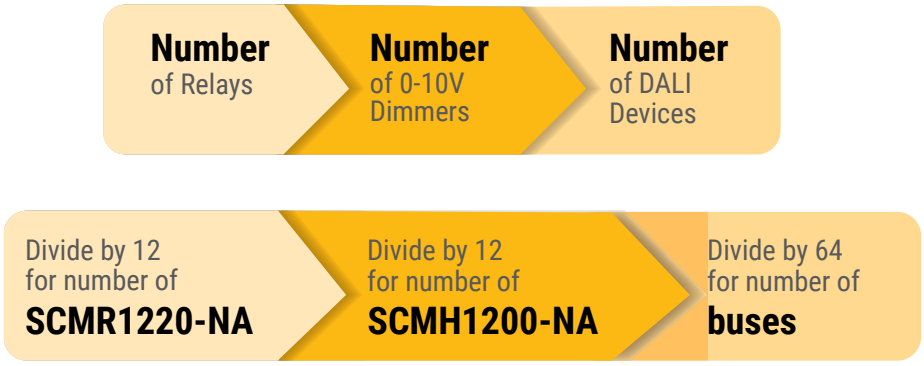
Would you need to connect your system to a BMS or other system to extract value added data and gather data from the system?

Do you need a future proof system that provides simplified control wiring to complete your complex system faster?



A. Selecting the right panel configurations

1. Before selecting the panel configurations, emergency circuits must be identified separately from normal circuits. Initially, use guidelines below keeping normal circuits in mind. Revert back, if you need to, for the emergency circuits once you have determined the emergency scheme.
2. Selecting the correct panel configuration requires that you have determined the total number of relays, 0-10V dimmers and/ or DALI devices (and types) that are needed within your panel. There are rules to be followed to complete this step. Use tables (next page) for reference.
3. Use the formulas below to determine how many of each module is needed.
4. WaveLinx Wired panel configurations are defined with the quantity of each module specified in the product catalog number. See available catalog options below:



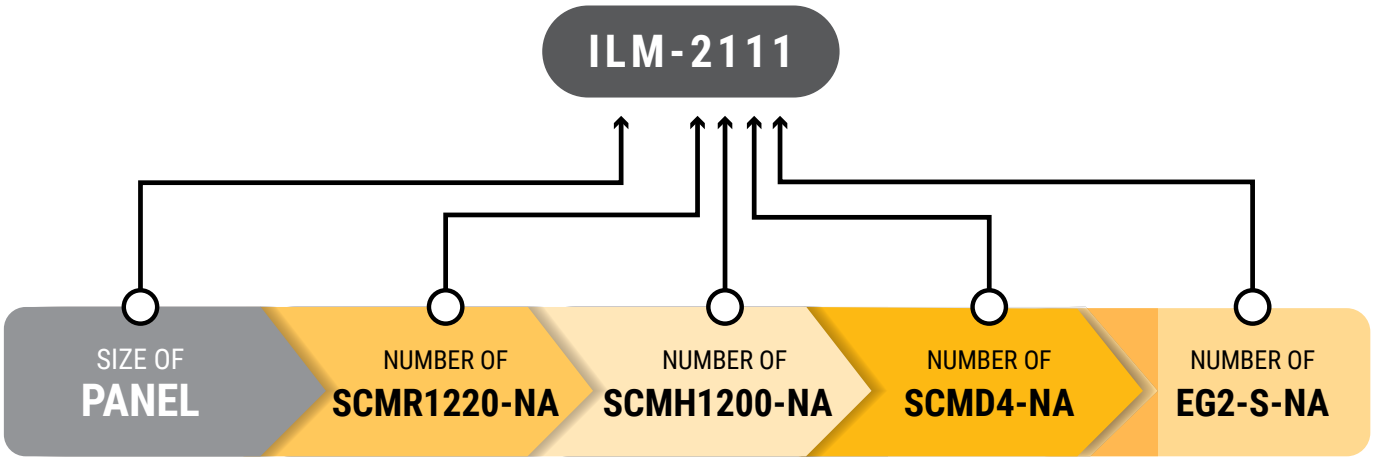
The WaveLinx Wired panel configuration includes place holders within the catalog number to define how many of each module to include within the panel.

Sample WaveLinx Wired panel configuration:

This section of the catalog number defines how many of each module are contained within the panel configuration.

Selecting the right WaveLinx Wired panel configuration:

Using the information provided, select the appropriate configuration from the list of WaveLinx Wired panel configurations below.



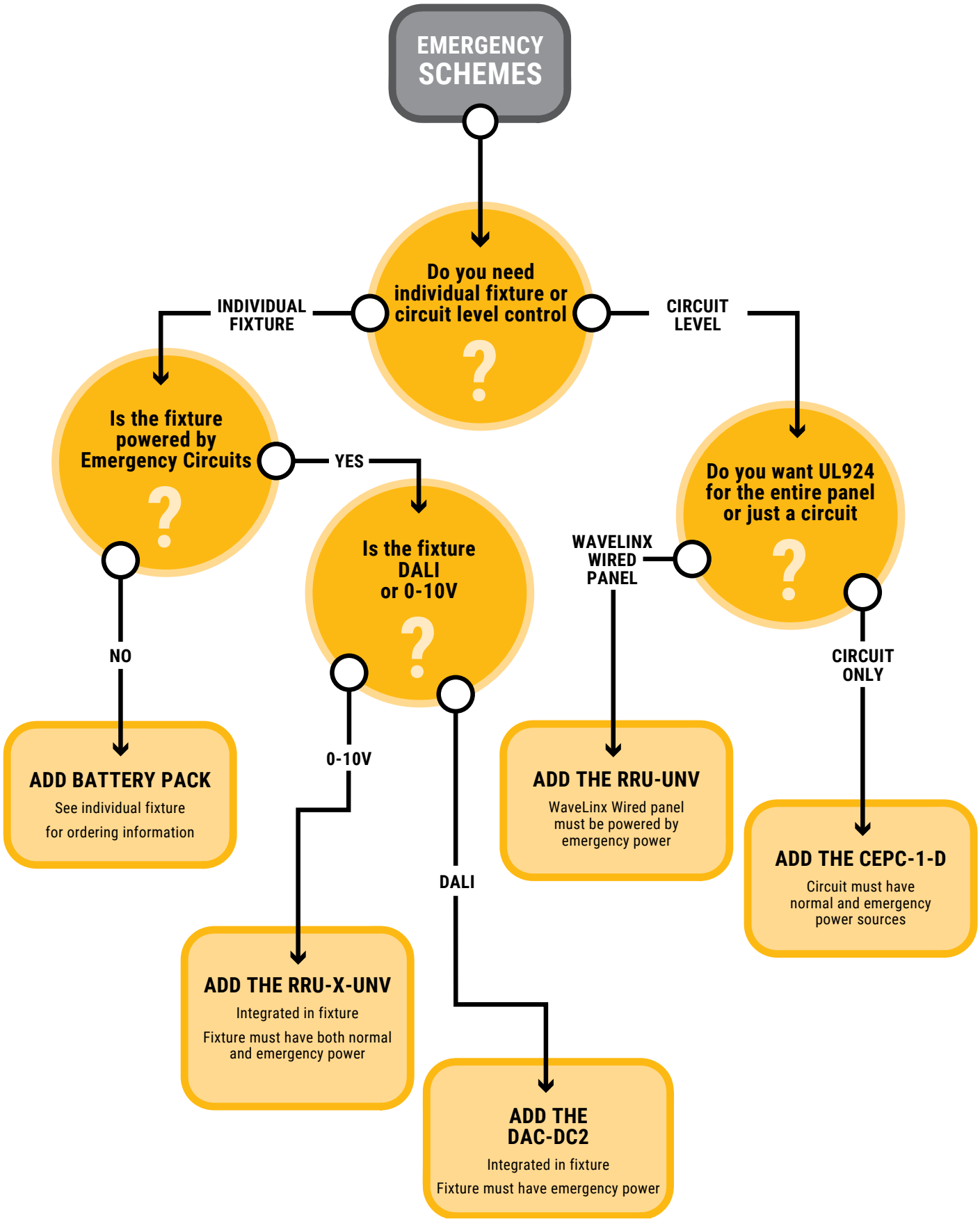
PANEL SIZE	CATALOG NO.	DESCRIPTION
Small	ILS - 0001	Small IL Panel with 1 EG2-S-NA
Small	ILS - 0002	Small IL Panel with 2 EG2-S-NA
Small	ILS - 0010	Small IL Panel with 4 DALI buses
Small	ILS - 1100	Small IL Panel with 12 20A Relays and 12 0-10V dimmers
Small	ILS - 0020	Small IL Panel with 8 DALI buses
Small	ILS - 2000	Small IL Panel with 24 20A Relays
Medium	ILM - 2201 ILM - 2200	Medium IL panel with 24 20A Relays and 24 0-10V dimmers and EG2-S-NA Medium IL panel with 24 20A Relays and 24 0-10V dimmers
Medium	ILM - 2111 ILM - 2110	Medium IL panel with 24 20A Relays and 12 0-10V dimmers, 4 DALI buses, and EG2-S-NA Medium IL panel with 24 20A Relays and 12 0-10V dimmers, 4 DALI buses
Medium	ILM - 0041 ILM - 0040	Medium IL panel with 16 DALI buses and EG2-S-NA Medium IL panel with 16 DALI buses
Medium	ILM - 3001 ILM - 3000	Medium IL panel with 36 20A Relays and EG2-S-NA Medium IL panel with 36 20A Relays
Medium	ILM - 4001 ILM - 4000	Medium IL panel with 48 20A Relays and EG2-S-NA Medium IL panel with 48 20A Relays
Large	ILL- 3301 ILL- 3300	Large IL panel with 36 20A Relays and 36 0-10V dimmers and EG2-S-NA Large IL panel with 36 20A Relays and 36 0-10V dimmers
Large	ILL- 4401 ILL- 4400	Large IL panel with 48 20A Relays and 48 0-10V dimmers and EG2-S-NA Large IL panel with 48 20A Relays and 48 0-10V dimmers

WaveLinx Wired module information:

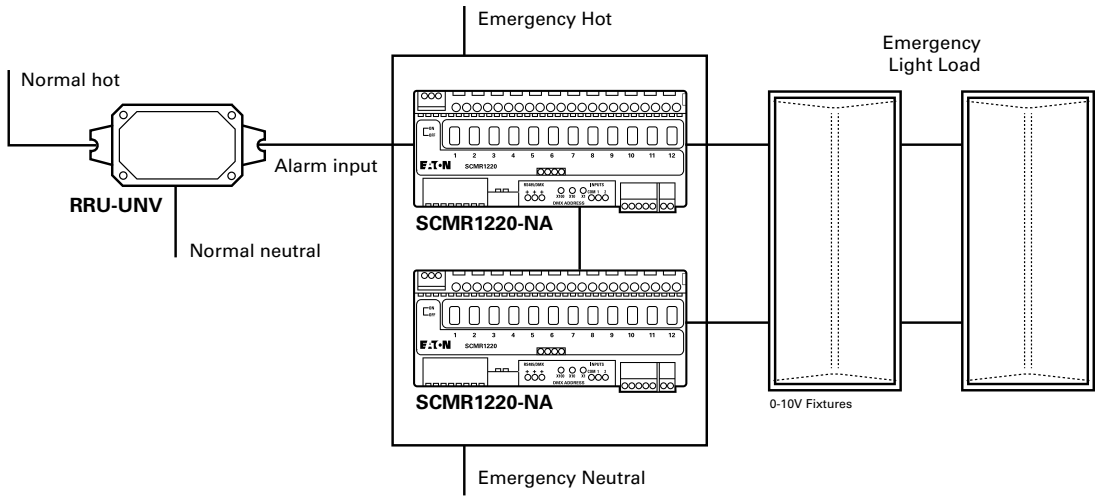
The table below provides information about each module to assist with loading calculations.

	SCMR1220-NA	SCMH1200-NA	SCMD4-NA
Size	8.35"x3.54"x2.28"	8.35"x3.54"x2.28"	4.48"x3.9"x2.20"
# of Loads	12	12	64 * 4
Load types	LED	LED	LED
Voltages	120/230/277VAC	0-10VDC	16V 250mA per loop
Current	20A per relay 192A total per module	80 drivers per channel 500 drivers total per module Assumes 2mA per driver	.2mA per device
Requirements		Requires relay for On/Off control (SCMR1220-NA)	
Notes		For each LDCM* dimmer add 1 SCMH1200 channel	

B. Selecting the right emergency scheme

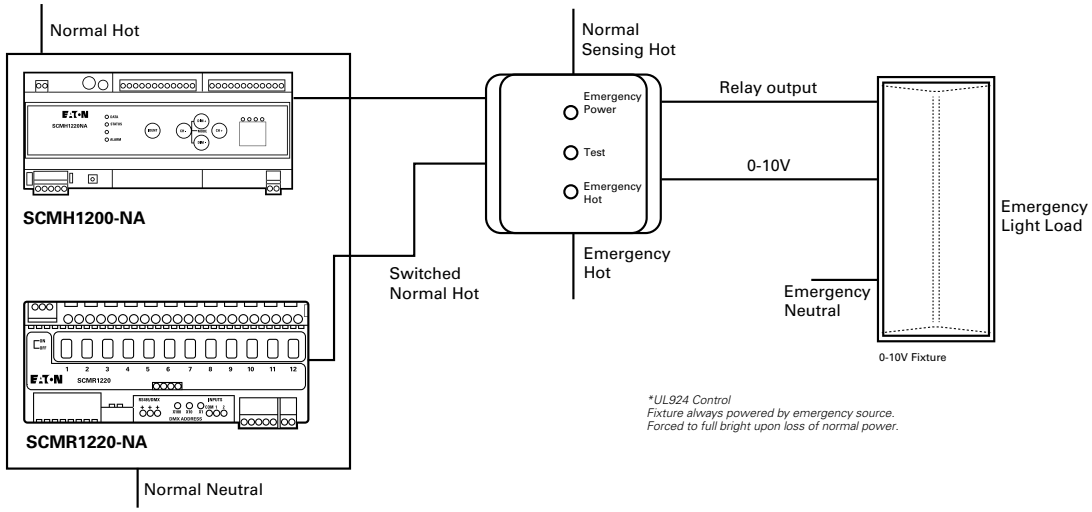


WaveLinx Wired panel with a RRU-UNV for emergency override

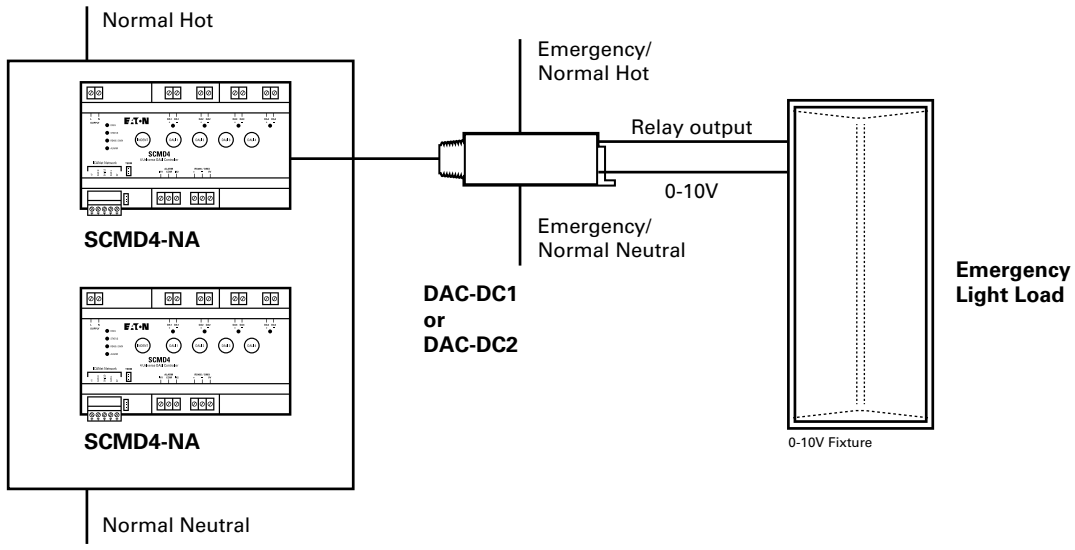


WaveLinx Wired panel must be power by emergency power source.

WaveLinx Wired controlled circuit with CEPC-1-D for emergency override

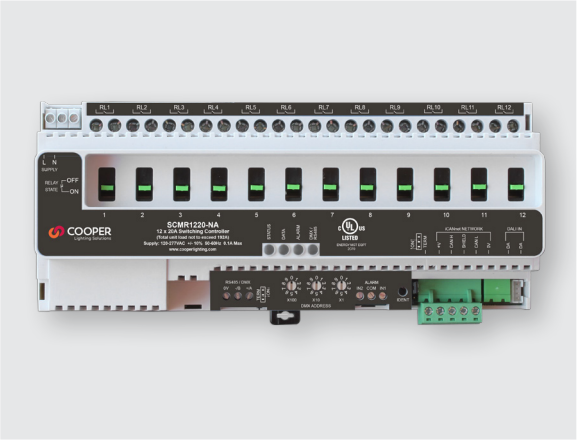


WaveLinx Wired controlled fixture with DAC-DC1 for emergency override



System components

WAVELINX WIRED SYSTEM COMPONENTS



SCMR1220-NA

This feed through relay unit provides outstanding features and performance in a truly competitive and compact package. Each channel is rated for up to 20A and is designed to switch heavy loads including LEDs. Recommend using only 16A per channel due to the overall module max of 192A.

Features

- 12 - 20A feed through relays
- (120/277VAC 50/60Hz)
- Switches resistive, inductive and capacitive lighting loads
- Manual override of loads
- DALI interface (12 address DALI end device)
- DMX512-A interface
- Two ALARM Inputs

SCMH1200-NA

The SCMH1200-NA controls twelve 0-10V outputs that can be programmed to be controlled independent or aligned with relays from the SCMR1220-NA.
Each channel may be configured to provide 1-10V or 0-10V control of luminaires.

Features

- 12 channel 1-10V, 0-10V control device
- iCANnetTM network terminal connections
- Forces 0-10V loads to full bright on power failure
- DALI interface (12 address DALI end device)

SCMD4-NA

The SCMD4-NA is a 4 bus ballast controller enabling dimming and switching of up to 64 individual addressable devices including luminaires. The compact design of SCMD4-NA delivers system flexibility as well as reducing installation costs and space used.

Features

- Simplified 2 wire control bus for input devices
- Includes ability to control and test DALI emergency luminaires
- Up to 64 devices per bus
- Easy installer test button per bus
- DMX512-A Interface

WAVELINX WIRED SYSTEM COMPONENTS

EG2-S-NA

The Ethernet Gateway provides a connection between the lighting control network and the building Ethernet LAN. This allows a user to control and configure the WaveLinx Wired system using iCANsoft over the building LAN or via the internet rather than by connecting directly to an IL Series panel. Where a wireless LAN is in place (or by connecting a wireless router to the Ethernet Gateway) the user can access the network with a Wi-Fi enabled PC running iCANsoft.

Features

- Connects to the building LAN
- Enables internet and Wi-Fi LAN access into the lighting control network
- Required for iLumin App via mobile devices (iPhone®/ iPad®)
- Provides access for API integration via ASCII control strings
- Required for BMSPro 2 BACnet integration

SC-UN

The Universal Source Controller (SC-UN) contains individual control cards that are the industry's only true universal type cards capable of controlling every load type without a separate interface or multiple cards. In addition, each panel has on board Ethernet, A /V interface, Contact Closure, and DMX.

Features

- 6, 12, and 24 circuit variants
- Forward Phase triac slow rise-time dimmer engine

Network devices and accessories

Input Devices

Wallstation

- *Intuitive user control*
- *All device settings programmable*
- *Uses 2 wire polarity, topology free control bus*
- *Requires SCMD4-NA*

(See spec sheet for full list of catalog numbers)

FDW-#TLB-RL-W
FDW-#TSB-RL-W

Ineo Wallstation

- *Scene selection fully programmable*
- *Intuitive user control*
- *Uses a 5 wire daisy chain control bus*
- *Built in IR receiver*

(See spec sheet for full list of catalog numbers)

CLS-#TLB-RL-W
CLS-#TSB-RL-W

5.5" Color Touchscreen

- *PoE touchscreen can be installed virtually anywhere*
- *Customizable graphics*
- *Password protection capabilities*
- *Area, Scene, Zone level control with buttons and/or sliders*
- *Save scene capabilities with password protection*
- *Color picker for white tuning or DMX color changing*

TSE55-B-NA

Automatic Controls

Multi-Sensor

- *Daylight and occupancy detection*
- *All device settings programmable*
- *Uses 2 wire polarity, topology free control bus*
- *Requires SCMD4-NA*

OCS-D-P06
OCS-D-P12

iCANnet Multi-Sensor

- *Daylight and occupancy detection*
- *All device settings programmable*
- *Uses a 5 wire daisy chain control bus*
- *IR receiver for handheld remote*

NS3-C-NA

Automatic Controls

Greengate Low Voltage Sensor

- *Occupancy sensors*
- *MicroSet self-adjusting technology*
- *Standard low voltage input*
- *Works with the following:*
  - *Sensor Powerpack*
  - *UIG-2-NA*
  - *UIM-NA (Mini-UIG)*

OAC-DT-2000-R
OAC-DT-1000-R
OAC-DT-500-R
OAWC-DT-120W-R
OAWC-P-120W-R

Sensor Powerpack

- *Supports up to five (5) Greengate occupancy sensors*
- *Plenum rated*
- *Device identification buzzer*
- *Requires SCMD4-NA*
- *Uses 2 wire polarity, topology free control bus*

FLT-SP-MV-DC2
FLT-SP-240-DC2
FLT-SP-347-DC2

End Devices

0-10V to Reverse Phase

- *Dims ELV with 0-10V control*
- *Auto voltage sensing*
- *Plenum rated*
- *Simple reverse phase control*
- *Requires a 0-10V channel from the SCMH1200-NA*

LDCM-PL-120-277-010V-GR

0-10V Fixture Control

- *Permits control of standard 0-10V luminaires*
- *Available in class 1 and class 2*
- *UL924 listed*
- *Uses 2 wire polarity, topology free control bus*

DAC-DC1
DAC-DC2

Dimming Module

- *Forward phase dimming control*
- *Control wires can be run with power wires*
- *Mounts to standard 4" square box*
- *Uses 2 wire polarity, topology free control bus*

FLT-HPDM-DALI

Relay

- *Universal 120V-347V*
- *Power loss automatically closes relay*
- *Plug load rated*
- *Uses 2 wire polarity, topology free control bus*

FRS-DA

Integration

BACnet Interface

- *Multi-protocol and lighting control system support*
- *Web-based setup*
- *Integrated BACnet explorer*
- *Automatic BACnet point mapping*
- *Connects to the building LAN or VLAN*

**Requires EG2-S-NA-NA for connectivity*

FPA-W34-1130

Integration

Ethernet Interface

- *LAN or VLAN connectivity*
- *Integral web server*
- *Enables mobile control*
- *Enables BACnet or AV control*
- *Bridges LAN connections*

EG2-S-NA-NA

DMX Interface

- *DMX output of 96 channels*
- *DMX control from timeclock, touchscreen, wallstation, or software*
- *Allows control of DMX luminaire*

ILX-SCD96-D-NA

Serial Interface

- *Serial connection for AV integration*
- *Configurable for advanced partition spaces*

ILX-SI2-D-NA

Network Bridge Interface

- *Connect multiple lighting control networks*
- *Expand beyond 100m/3200ft of wired network distance*
- *Simplifies multifloor network wiring*

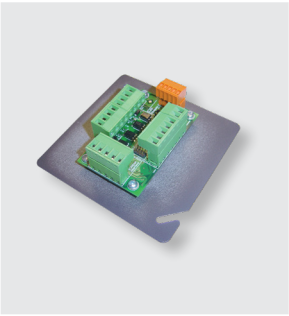
ILX-BN2-D-NA

Low-Voltage Integration

Partition and Input Interface

- *6 digital optically isolated inputs*
- *Programmable network inputs*
- *Provides simple partition control with IRTR*

UIM-NA



Partition and Input Interface

- *4 digital optically isolated inputs*
- *4 analog inputs*
- *Programmable network inputs*
- *Provides simple partition control with IRTR*

UIG-2-NA

Partition Sensor

- *Partition transmit and receiver for all open/close*
- *LED indicator makes sensor alignment simple*
- *Requires power from EXPS-15*

**Requires UIM-NA or UIG-2-NA*

IRTR

Emergency

UL924 Relay Control

- *UL924 listed panel accessory*
- *Detects loss of normal power and provides override signal*

RRU-UNV

UL924 Dimmer Control

- *UL924 listed*
- *Forces 0-10V loads to full bright upon loss of normal power*
- *Integral test switch*
- *Visible status LEDS*

CEPC-2-D

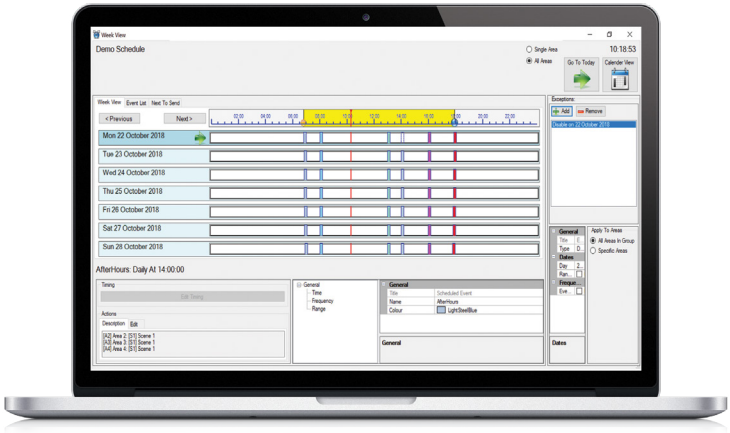
Tools for Facility Managers

iLumin App

- Free downloadable from App store
- Compatible with latest iOS version
- Easily control your lights while walking the floor
- View, modify and select scenes

**Search for iLumin Remote on the Apple store*

Download the iLumin Remote App



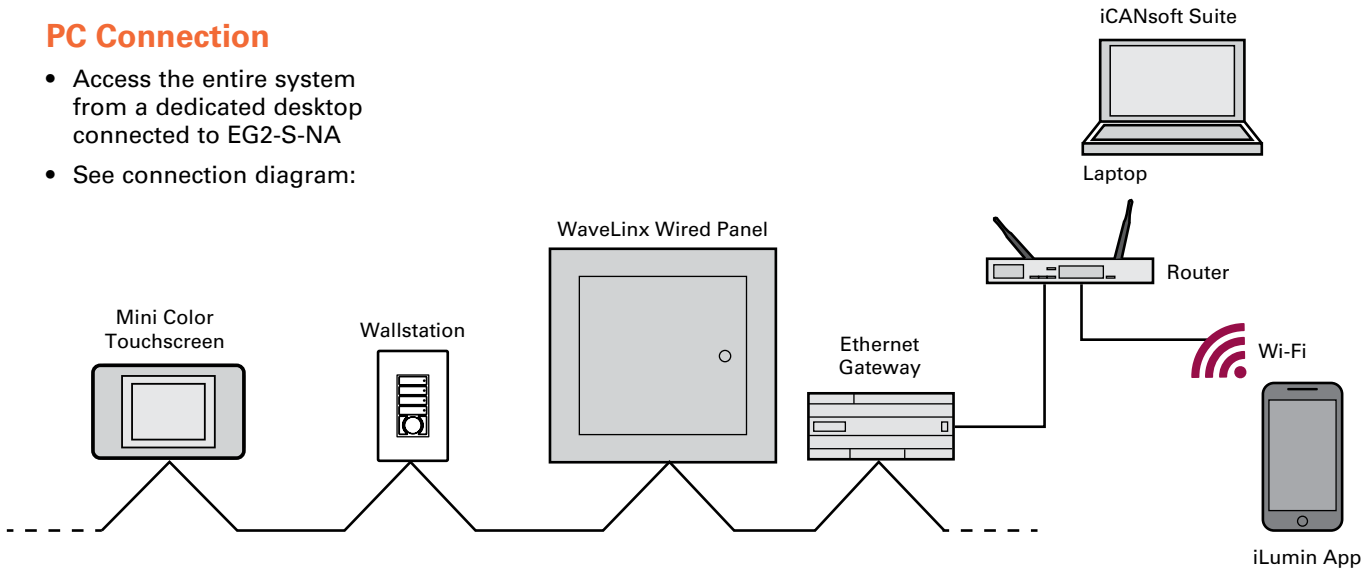
Event Scheduler

- View and manage entire building lighting events and schedules
- Graphical presentation
- Create events and make changes
- Easily create exceptions

iCANsoft_Suite

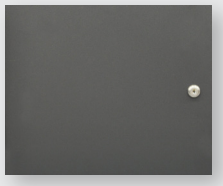
PC Connection

- Access the entire system from a dedicated desktop connected to EG2-S-NA
- See connection diagram:



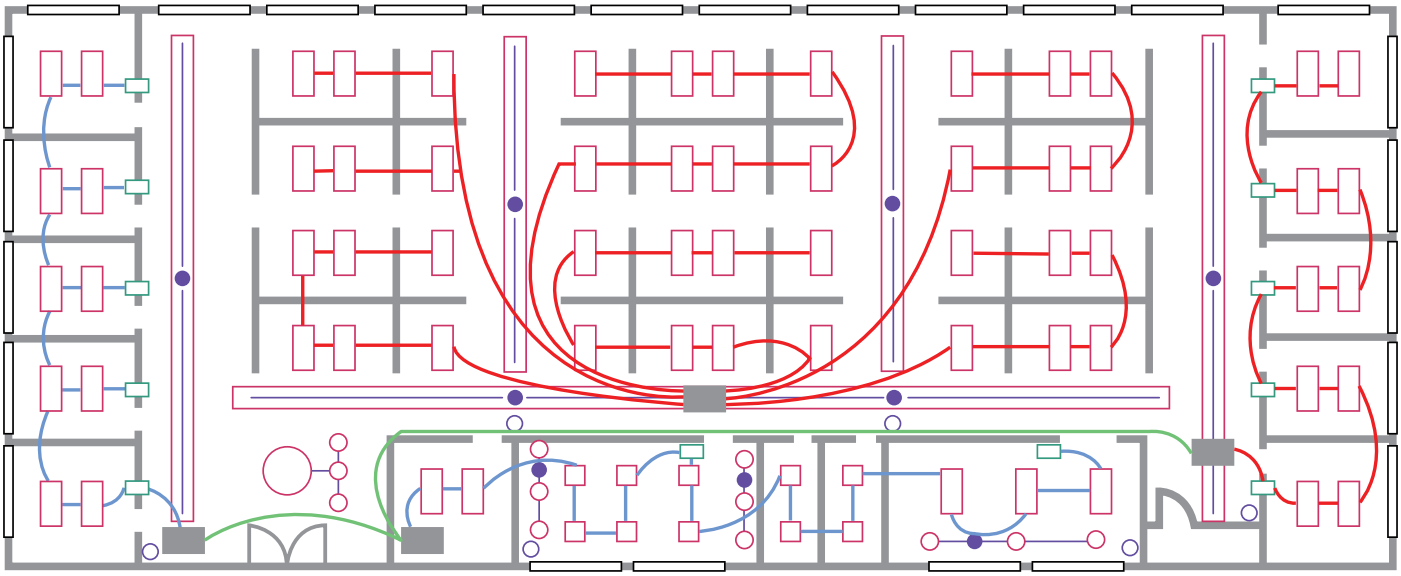
Basic steps to design a WaveLinx Wired System

1. Select and layout
Configured panels



2. Select and layout
Wallstations on 2 wire controls network

3. Select and layout
2 Wire multi sensors



4. Select and layout
Wallstations on 2 wire controls network optional touchscreens

5. Add
Optional lighting network interfaces

- Ethernet
- BACnet
- DMX
- Shade
- A/V
- Partitioning

Scheduling

For a time schedule based control, TC1 is required. Typically a single timeclock is good for the entire project. TC1 sits on the lighting control network and is powered from the network bus. No separate power supply is needed.

Daylighting

For areas that need daylighting in addition to occupancy, use one of the available multi sensors to provide occupancy and daylighting control in the space.

- *For 2 wire networks, choose the* **OCS-D-P12 Multi Sensor** *for daylighting.*
- *For the 5 wire network, choose* **NS3-C-NA Multi Sensor** *for each daylighting sensor required*

Occupancy/Vacancy

Estimate the total no. of Greengate occupancy/vacancy sensors. Each sensor requires an input.
For every 4 inputs, choose 1 UIM-NA (mini-UIG).

- *Note 1: The Greengate sensors do not sit on the lighting control network. The* UIM-NA (mini-UIG) *acts as an interface to connect the GG sensors. Note also, that each Greengate sensor is powered off a Switchpack.*
- *Note 2: The Greengate sensors do not sit on the 2 wire network. Use Sensor Powerpack to connect the Greengate sensor to the 2 wire network.*

Partitioning

If partitioning is required, assess the number of partitioned areas. For each partitioned area, estimate the number of partitions. Based on that choose either a UIG-2-NA or SI-2-NA. See table below:

Number of partitions in a room/area	Device needed
3 or less	UIG-2-NA
>3	SI-2-NA
For any custom partitioning regardless of the no. of partitions, choose SI-2-NA-CP.	

3rd Party Integration

For A/V integration interface, choose the SI-2-NA for serial RS232 interface or EG2-S-NA for Ethernet interface. These products connect to the lighting control network directly.

For BACnet integration, a BMS Pro is required.

- *Typically, one BMS Pro is needed for entire project.*
- *BMS Pro typically is capable of handling up to 10,000 points.*
- *BMSPro requires a dedicated EG2-S-NA or EG2-S-NA-NA for connection between the lighting control network and the building LAN or VLAN.*

For building LAN integration, an EG2-S-NA is required. Many panel configurations have integrated EG2-S-NA option available. Alternatively, a wall mountable EG2-S-NA-NA can be ordered as a separate accessory.

DMX

For DMX fixture control include the SCD96-NA. The SCD96-NA supports 96 DMX output channels that can be controlled by any input on the lighting control network. Multiple SCD96-NA panels can be supported on the lighting control network providing for flexible DMX integration application support.

Phase Dimming

Linear Dimming Control Module Plenum Rated (LDCM-PL) takes a 0-10V dimming signal and converts it to an ELV dimmed output for up to 1000W with a 277V load and 450W on a 120V load. The LDCM-PL is rated to directly mount to a junction box in a plenum space for easier installations and to meet building requirements.

Each LDCM-PL can be connected to any output on the WaveLinx Wired SCMH1200-NA module.

Best practices / FAQs

Is it possible to buy the individual DIN Rail modules mounted inside the panel?

WaveLinx Wired is sold in the form of factory pre configured panels. These panels come in different configurations and sizes. Individual DIN Rail modules are not currently available for sale separately.

Is it possible to customize the panel configurations?

WaveLinx Wired is provided in a wide variety of configurations that should meet most applications. See page 11 for a full list of configurations.

Can we mix 2 wire and 5 wire networks in the same network design?

Yes, this is one of the advantages of the WaveLinx Wired System. The WaveLinx Wired system supports multiple control methods including 2 wire topology free, relay, 0-10V dimming, and DMX. Use this design guide to ensure your system is designed appropriately.

Where should the WaveLinx Wired panels be installed?

Depends on the size of the panel. All medium and large sized panels should be installed in accordance with applicable codes and standards and the installation manual guidelines. Small sized panels are plenum rated and can be mounted in the ceilings.

What sensor technologies work with WaveLinx Wired?

WaveLinx Wired supports multi sensors that provide daylighting and occupancy detection. Additionally a 2 wire powerpack provides a connection for any low voltage occupancy sensor which provides PIR, Ultrasonic or Dual Technology occupancy detection.

Do WaveLinx Wired panels perform phase dimming?

Adding a LDCM module to any 0-10V output in an WaveLinx Wired panel will convert a 0-10V output to a phase dimmed output (reverse phase).

Do WaveLinx Wired panels have integrated astro time clock?

Using the accessory timeclock TC1 that integrates directly with the lighting control network provides time clock capabilities. Typically a single TC1 is all that is required for the entire lighting control network.

When using WaveLinx Wired panels with SCMD4-NA's, is it possible to design my system completely with DALI?

Yes, you would network multiple WaveLinx Wired panels together using the lighting control network, however all inputs and outputs would reside on the 2 wire topology, polarity free DALI bus.

Installation design guidelines

This section is divided into two:

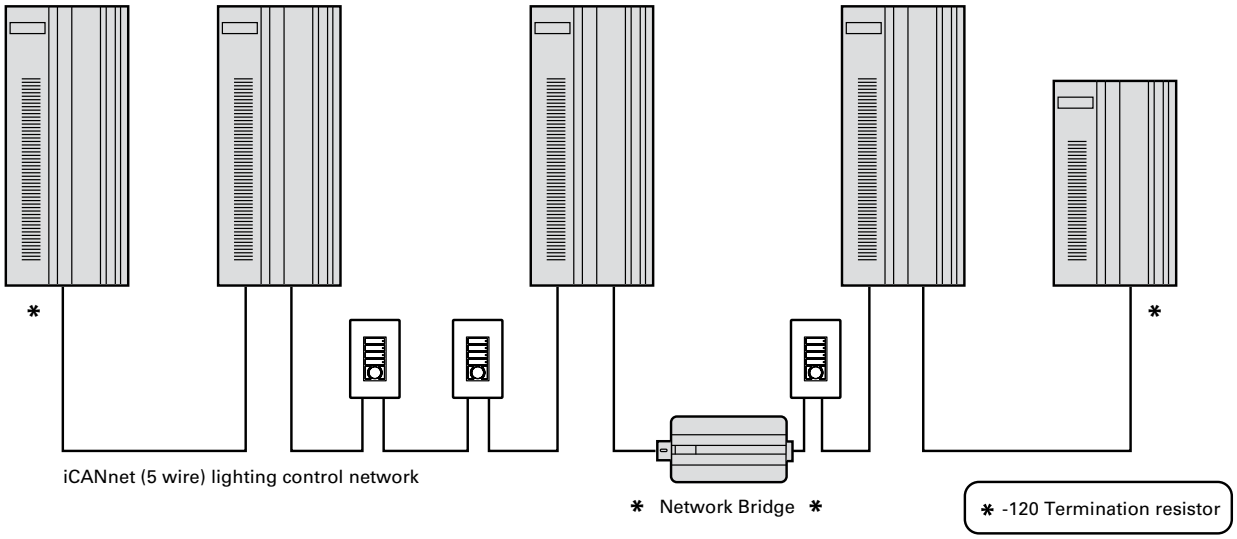
1) iCANnet based installation design guide

2) DALI based installation design guide

The factors that lead to a good network are:

- Quality of the cable used
- Quality of the connections
- Cable length
- Voltage drop

If these are ignored then the problems that arise will consume more time and money than getting it correct from the outset.



iCANnet Based Network Design & Installation Guidelines

Basic Concept of a iCANnet

- iCANnet Bus is a multidrop network on which spurs or stars are not allowed
- A 120Ω Resistor is required at each end of the network.

General iCANnet network requirements

The iCANnet network requires devices to be linked together in a daisy-chain arrangement. A single run of daisy-chained devices is called a Segment.

There are three main constraints for a iCANnet network segment:

- The combined cable lengths of the segment may not exceed 3280 feet (1000 meters)
- No more than 100 devices or nodes may be connected within a single segment.
- Terminate the devices at each end of the segment with a 120- ohm resistor. Leave the remaining devices on the segment un-terminated. See schematic above.

Where more than 100 devices or excessive overall cable lengths are required, it is necessary to use a Bridge device to link two or more segments together. See Accessories page for details on the iCANnet network bridge BN2-NA (also called Network Bridge).

Refer to the panel installation manual for complete instructions on iCANnet wire termination for WaveLinx Wired Systems.

iCANnet Network Loading and Power Requirements

DEVICE	NETWORK LOAD
NS3-C-NA	15 mA
EG2-S-NA	100 mA
Wall-Station / KeyPad	20 mA
BN2-NA	40 mA
UIM-NA (Mini-UIG)	50 mA
UIG-2-NA	50 mA
TC1 Time Clock	140 mA

Available iCANnet Network Power from the Panel

Varies by configuration. Most of the configurations come included with a network Power Supply. See table below

PANEL CONFIGURATION NUMBER	TOTAL BUS CURRENT OUTPUT AVAILABLE	CURRENT FROM ADDITIONAL 15V DC PSU IN THE PANEL
ILS-0010	500 mA	n/a
ILS-1100	600 mA	n/a
ILS-0020	1000 mA	n/a
ILS-2000	200 mA	n/a
ILM-2201 ILM-2200	1000 mA	2000 mA
ILM-2111 ILM-2110	1000 mA	2000 mA
ILM-0041 ILM-0040	1800 mA	2000 mA
ILM-3001 ILM-3000	100 mA	2000 mA
ILM-3301 ILM-3300	1600 mA	2000 mA
ILL-4001 ILL-4000	200 mA	2000 mA
ILL-4401 ILL-4400	2200 mA	2000 mA

Rules for Determining Additional PSU Unit Requirements

- All medium and large panels already include one 15V DC power supply unit. See table above. Each of these panels can power up to 10 Wall-Stations within 1000 ft.
- Besides the PSU, any bus current available (per above table) can be used to power either additional keypads or other devices. Refer to the iCANnet network loads table to see the current draw by different iCANnet device types.
- For devices on the network beyond 1000 ft, deploy an additional 15V DC EXPS power supply. This additional EXPS power supply can be field installed and power 10 additional keypads for another 1000 ft.

DALI Based Network Design & Installation Guidelines

What is DALI?

- DALI is an abbreviation for Digital Addressable Lighting Interface
- DALI is a bi-directional protocol for digital communication between lighting devices
- The DALI standard is now defined in IEC 62386
- Adoption of the DALI standard by many manufacturers has ensured a long term future with expanding capabilities

Key DALI Network Topology Rules

- Maximum of 64 DALI addresses on a DALI network.
- 300 meter network length when using 14 AWG cable. 150 meter when using 18 AWG
- No special cable required
- Network can be open topology, polarity free allowing spurs, stars, and T-taps.
- DALI data is bi-directional allowing for input and output devices

DALI Physical Network Electrical Characteristics

- Maximum current on DALI network is 250mA
- No additional power supplies are allowed.
- No termination resistors are required

DALI Addressable Features

- All DALI devices required to have an address
- Some devices have multiple addresses e.g. RGB drivers
- Maximum number of 64 addresses per DALI network

DALI Network Loading

DEVICE TYPE	DALI CURRENT LOAD	MAX PER LOOP	ADDRESSES
Lighting driver or Ballast	2mA	64	1
2 wire Wallstation	3.75mA	64	1
2 wire Relay	3.75mA	64	1
2 wire Multi Sensor	3.75mA	8	1
2 wire 0-10V fixture control	3.75mA	64	1

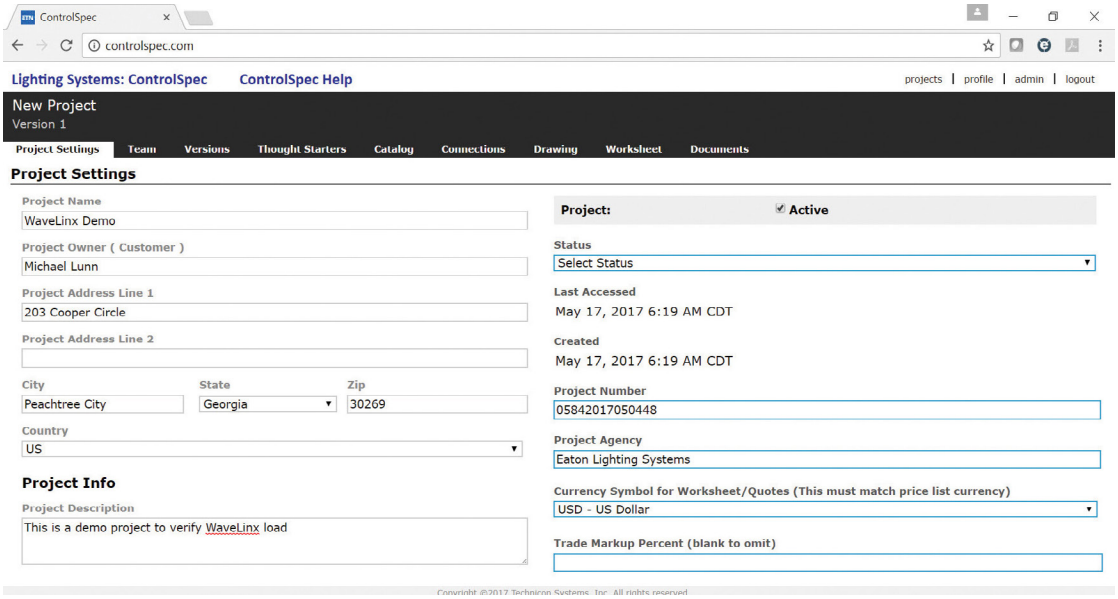
*Note: Max Load is 250 mA on the bus (loop). Max no. of devices is 64 per loop. Max no. of addresses are 64 per loop

Control Spec design tool

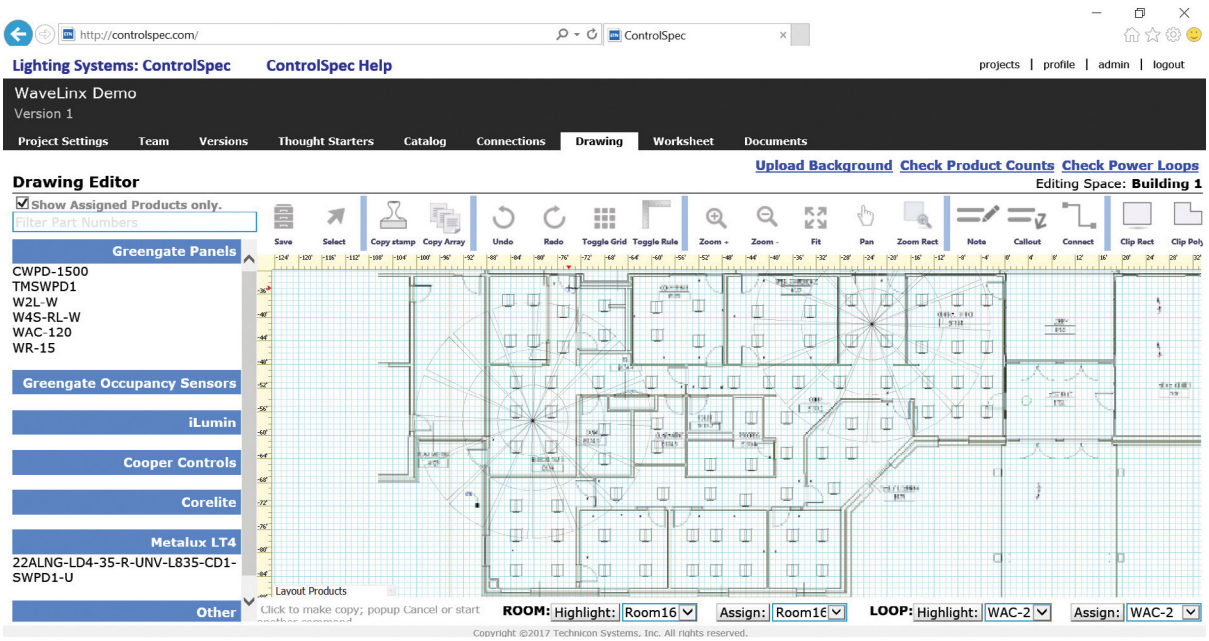
ControlSpec is your design and quote tool of choice, enabling you to layout, quote and submit on a project from within one tool. For the WaveLinx Wired product line all control devices and a large selection of WaveLinx Wired accessories are at your fingertips. Create your project, perform a takeoff, create one-line drawings and price your project. Product pricing is inside ControlSpec reducing your quote time.

ControlSpec value to you:

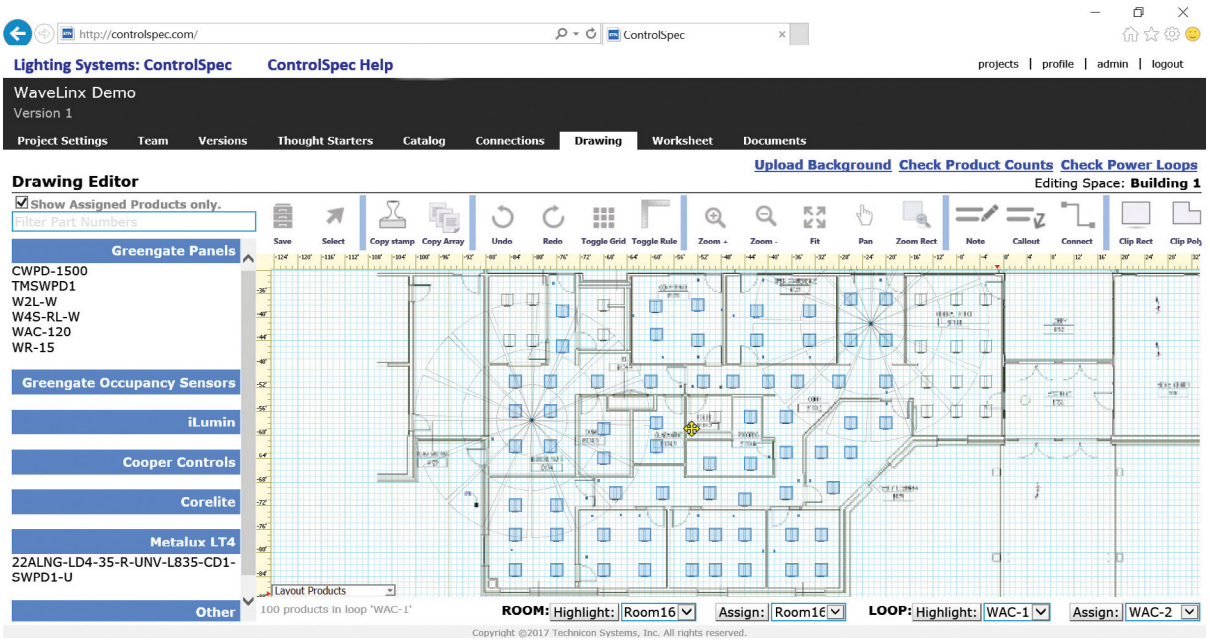
- Create a project
- Perform layout take-off
- Review and adjust pricing
- Create customized one line drawings
- Print quote and submittal documentation
- Product filtering for faster access and selection
- Quick product addition on every screen



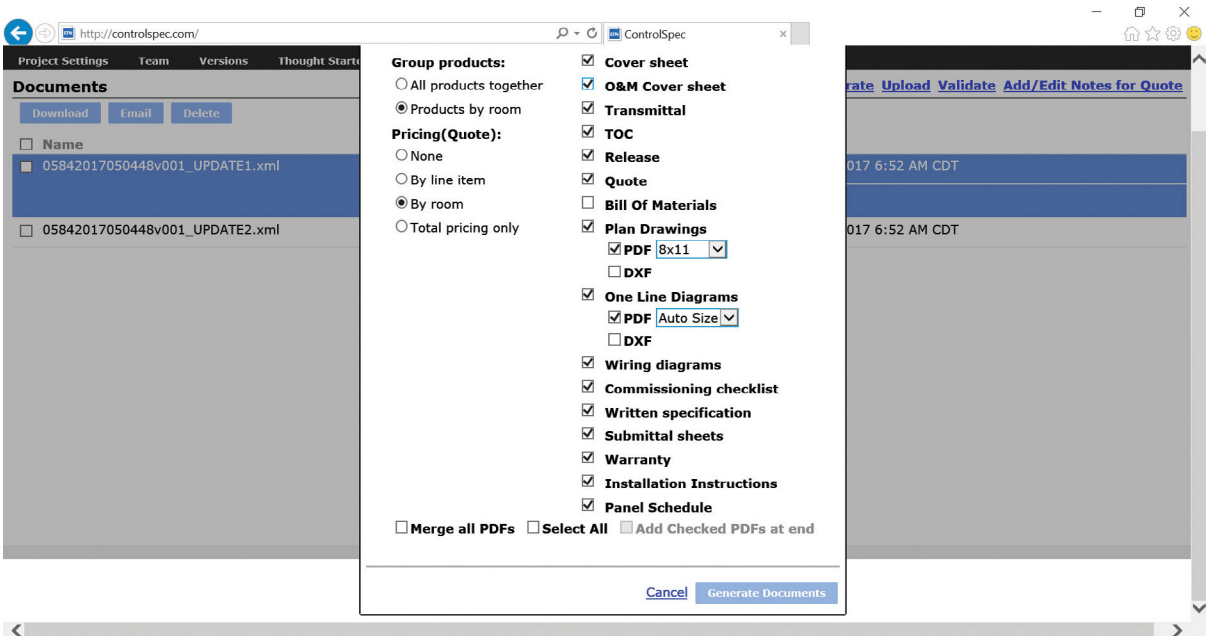
Create a project with customer information and share with other members of the design team.



Use the floorplan tool to layout your project, add luminaires, wallstations, ceiling sensors, relays and lighting panels.



Define rooms, and see occupancy coverage.



Generate a full submittal package, quotation, one lines and floor plan drawings.

Energy Codes application notes

ANSI / ASHRAE / IES Standard 90.1-2019

Energy Standard for Buildings Except Low-Rise Residential Buildings (Standard 90.1-2019) adopted as of March 2018.
This code significantly fine-tunes the design requirements for code-compliant lighting controls systems, mechanical systems, and the building envelope. This application note summarizes the new mandatory lighting control requirements and highlights where they can be used in various spaces. Please note: this document is intended to provide a general reference and design professionals should consult Standard 90.1-2013 and the authority having jurisdiction for project-specific requirements and interpretation.

ASHRAE 90.1 was recognized by the U.S. Department of Energy (DOE) as the national energy reference standard.

Below summarizes changes from 90.1-2016 to 90.1-2019:

- Reduced LPD by ~5%
- Includes DC Low-voltage lighting systems with flexible cabling for plug-in connection
- Step dimming requirements removed in favor of continuous dimming
- Partial off is subject to daylighting

International Energy Conservation Code (IECC) 2018

IECC 2018 establishes minimum energy efficiency requirements for new and renovated buildings. This latest iteration contains dramatic changes to the prescriptive and performance-based criteria that previously defined IECC-compliant lighting and lighting control systems. ASHRAE 90.1 is recognized by the DOE as the national reference standard, however IECC is adopted by many states. Please note: this document is intended to provide a general reference and design professionals should consult IECC 2018 and the authority having jurisdiction for project-specific requirements and interpretation.

Below summarizes changes from 2015 to 2018:

- Use Luminaire level lighting controls (LLLC) to satisfy controls requirements
- Daylighting enhancements
- Expand occupancy sensor requirements to open office
- Reduces Light Power Densities (LPD) for interior and exterior lighting systems

California Title 24

California's Building Energy Efficiency Standards are updated on an approximately three-year cycle. The 2019 Standards will continue to improve upon the 2016 Standards for new construction of, and additions and alterations to, residential
and nonresidential buildings. The effective date of the 2019 Standards is January 1, 2020.

Below summarizes changes from 2016 to 2019:

- Indoor lighting power allowances reduced by 37 percent (complete building method), and 29 percent (area category method)
- Mandatory automatic daylighting control language clarified

Quick Reference Guide Commercial Requirements

IECC (2018), ASHRAE 90.1 (2019), Title 24 (2019), NECB (2017)

	IECC 2018	ASHRAE 90.1 2019	T24 2019	WaveLinx
Automatic Controls				
Occupancy Sensors	C405.2.1	9.4.1.1(h)	130.1(c)	●
Partial Off	C405.2.1.2 (warehouse) C405.2.1.3 (open office)	9.4.1.1(g)	130.1(c)	●
Full Off	C405.2.1.1.1 (20min)			●
Scheduled Off	C405.2.2	9.4.1.1(h)	130.1(c) - (warehouse, corridor, stairwell, library stacks)	●
Plug Load Off	N/A	8.4.2	130.1(d)	●
Manual On/Partial On	C405.2.1.1.2	9.4.1.1(b) - (manual ON) 9.4.1.1(c) - (partial ON)	130.1(c) - (office <250ft^2, classrooms, conference rm)	●
Manual Controls				
Manual On/Partial On	C405.2.1.1.2	9.4.1.1(b) - (manual ON) 9.4.1.1(c) - (partial ON)	130.1(c) - (office <250ft^2, classrooms, conference rm)	●
Manual Light Reduction	C405.2.2.2			●
Area/Local Controls	C405.2.5	9.4.1.1(a)	130.1(b)-(multi-level controls)	●
Daylighting				
Daylight Responsive Control	C405.2.3	9.4.1.1(e) - (>150W sidelighting) 9.4.1.1(e) - (>150W toplighting)	130.1(d) - (>120W with < .5W/ft^2 dimming optional) 130.1(d) - (>120W with > .5W/ft^2 dimming required)	●
Exterior Controls				
Parking Garage Lighting		9.4.1.2		●
Exterior Lighting	C405.2.5	9.4.1.4		●
Special Items				
Specific Application Controls	C405.2.4			●
Additional Efficiency Packages	C406.1			●
Guest Room or Sleeping Units	C405.2.4.3	9.4.1.3(b)		●
Functional Testing	C408.3	9.4.3	130.4	●
Metering			130.5(a)	●
Demand Responsive Controls			130.1(e) - (>10K ft^2 reduce by 15%)	●

Application code compliant sequence best practices

	ASHRAE 90.1 2019	IECC 2018	T24 2019	Atrium	Banking	Classroom / Training / Lecture	Conference / Meeting room
Local Control	9.4.1(a)	C405.2.5	130.1(a), (b)	●	●	●	●
Manual ON	9.4.1(b)	C405.2.5	130.1(a), (b)	○	○	○	○
Partial Automatic ON	9.4.1(c)	C405.2.1.1.2	130.1(b)	○	○	○	○
Bi-level Lighting	9.4.1(d)					●	●
Daylighting Side lighting	9.4.1(e)	C405.2.3.2	130.1(d)	●	●	●	●
Daylighting Top lighting	9.4.1(f)	C405.2.3.3	130.1(d)	●	●	●	●
Automatic Partial OFF	9.4.1(g)	C405.2.1.3	130.1(c).6				
Automatic Full OFF	9.4.1(h)	C405.2.1.1.1	130.1(c).5	○	○	○	○
Scheduled Shutoff	9.4.1(i)	C405.2.2	130.1(c)	○	○	○	○
Receptacle Control	8.4.2	C405.2.4	130.5(d)		●	●	●
Energy Monitoring	8.4.3.2		130.5(b)	○	○	○	○
Parking Garage Lighting Control	9.4.2	C405.2.6	130.1(a), (b)				
Functional Testing	9.4.3	C408.3	130.1(a), (b)	●	●	●	●
Demand Response			130.1(a), (b)	○	○	○	○
Enhanced Digital Lighting Controls		C406.4		○	○	○	○

● Required ○ Choose one ○ Choose one ○ Choose one

Copy / Print room	Corridor	Courtroom	Dining area	Food preparation	Library	Office	Restroom	Sales area	Stairwell
●	●	●	●	●	●	●	●	●	●
○		○	○	○	○	○	○	○	○
○		○	○	○	○	○	○	○	○
●	●	●	●	●	●	●		●	●
●	●	●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	●	●	●
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● Required ○ Choose one ○ Choose one ○ Choose one

WaveLinx Wired

WaveLinx Wired

WaveLinx Wired

For a complete list of compatible products, see:
www.cooperlighting.com

Lighting Brands
Ametrix
AtLite
Corelite
Ephesus
Fail-Safe
HALO
HALO Commercial
Invue
iO
Iris
Lumark
Lumière
McGraw-Edison
Metalux
MWS
Neo-Ray
Portfolio
PrentaLux - 3D Printed Lighting
RSA
Shaper
Streetworks
Sure-Lites
Telensa

Controls Brands
Greengate
Fifth Light
Intelligent Lighting Controls

Connected Lighting Systems and Smart Spaces Platform
WaveLinx

SCAN
for more
WaveLinx Wired
information

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