Hospitality
Title 24-2016 Solutions

Design Guide

Crestron Electronics, Inc.

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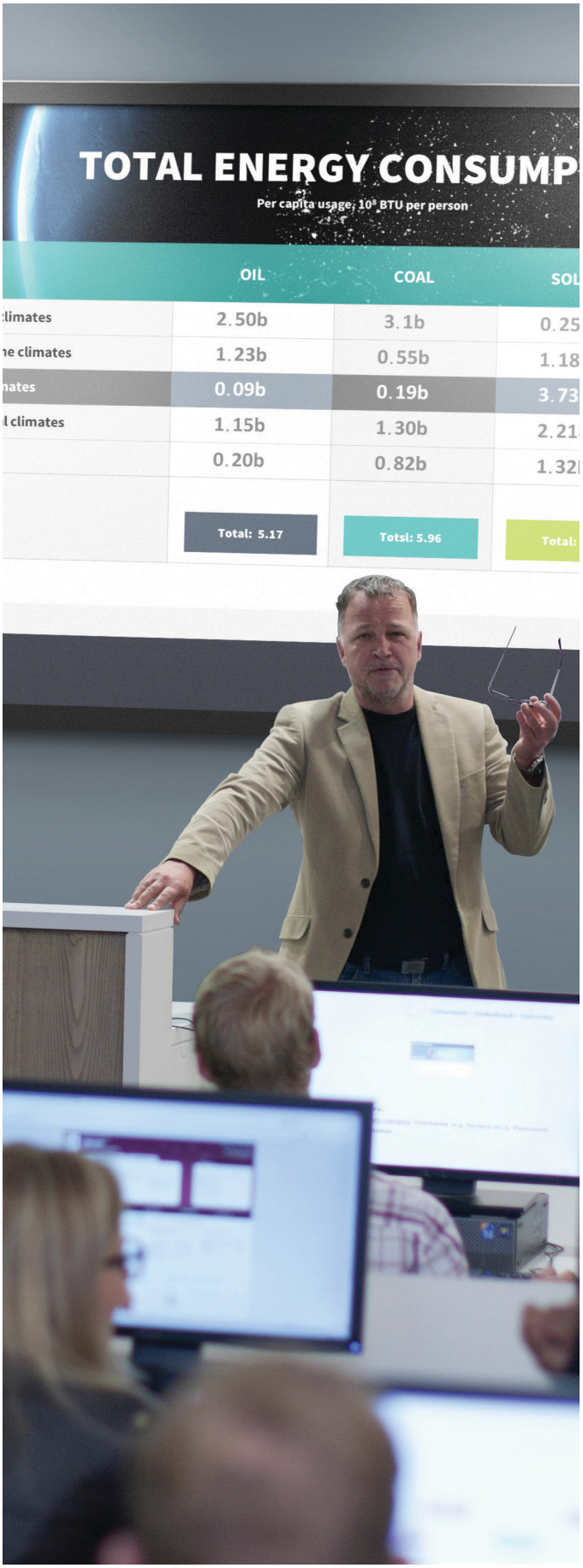


About Title 24-2016

Title 24-2016 is a residential and commercial building energy code that is designed to reduce energy consumption. The goal of this code is to reduce energy consumption by providing design and construction requirements for lighting controls.

Lighting controls such as occupancy status sensors, multi-level controls, and demand response provisions allow you to synchronize indoor light levels with daylight levels in accordance with Title 24-2016.

Design Guide Information

Crestron offers this Design Guide for Hospitality - Title 24-2016 solutions to use as a reference for typical layouts. Use it as guidance to make code compliance quick and easy. The Crestron team is also available to support with detailed design, submittal, and installation requirements. For additional information, please contact your Crestron representative at CLCDesign@crestron.com or (888) 330-1502.

Title 24-2016 Code Standards

Summary

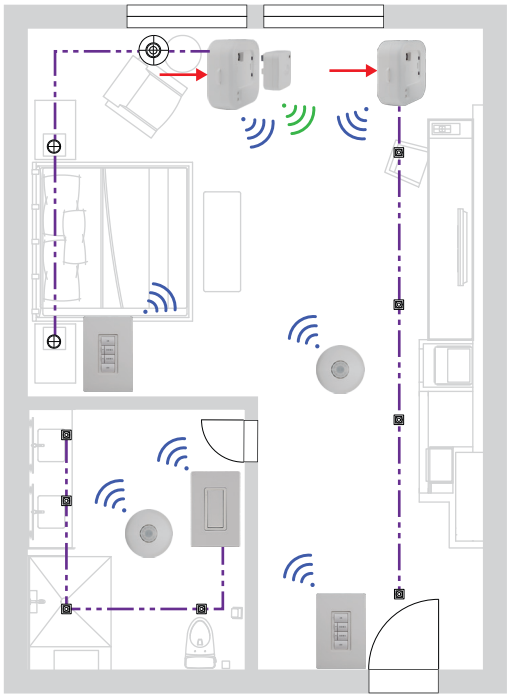
Title 24-2016 Code Standards			
	Code Provision	Minimum Control Requirement	Code Description
ON/OFF CONTROLS	130.1(a)	Local Manual Switch[1]	Luminaires must be controlled with accessible manual on/off local control. Each space and area enclosed by ceiling-height partitions must be independently controlled.
	130.1(b)	Multi-Level Control	Lighting of any enclosed area 100 square feet or larger with more than one luminaire and a load >0.5 W per square foot should provide multi-level lighting control that meets uniformity requirements in accordance with Title24 Table 130.1-A. Lighting control can not override local on/off or any other control requirements.
	130.1(c)	Shut-Off[2]	Lighting must be controlled by either 1) an occupant sensing control, 2) automatic time-switch control with 2 hour maximum override and holiday scheduling, or 3) other control capable of automatically shutting off lighting. Indoor shut-off zones must be separated using ceiling high partitions and can be no larger than one floor with a maximum of 5,000 square feet.
	130.1(c)5/6/7	Sensor Shut-Off	Occupant Sensing Controls are required to shut off all lighting. Full or partial off to at least 50% via occupant sensing controls is required.
LIGHT LEVEL CONTROL	130.1(d)	Daylight Zones[3]	Automatic daylighting controls should be installed and configured in all daylit zones as defined by 130.1(d). Lighting controls should have multilevel functionality to at least the number of control steps defined in Title 24 Table 130.1-A.
	130.1(e)	Demand Response Ready[4]	Buildings >10,000 square feet with a lighting power density ≥0.5 W per square foot are required to receive a standards-based messaging protocol, which automatically reduces lighting power by at least 15% and remains consistent with uniform illumination requirements defined in Title 24 Table 130.1-A.
PLUG LOAD CONTROL	130.5(d)	Controlled Receptacles	50% of receptacles are required to automatically turn off based on occupancy or after a vacancy of 20 minutes or less. Each uncontrolled receptacle must have at least one controlled receptacle within 6 feet.
			Primary Solutions
			Zūm™ Wireless Light Control
			GLPP
			GLPAC

1. General lighting must be separately controlled from all other lighting systems in an area. Floor and wall display, window display, case display, track, ornamental, and special effects lighting should be separately controlled and placed on circuits that are 20 amps or less.
2. Countdown timer switches should not be used to comply with the automatic shut-off control requirements in Section 130.1(c)1, except in single-stall bathrooms and closets that are <70 square feet where the lights must shut off within ten minutes, or in a server aisle/room where the lights must shut off within 30 minutes.
3. The photosensor should be readily accessible to authorized personnel for calibration adjustments. To prevent unauthorized access, the photosensor may be mounted inside a case that is secured with a locking mechanism.
4. Add a networked Crestron control system for demand response (130.5(d)) control. For networked Zūm applications, add a ZUM-FLOOR-HUB and ZUMNET-GATEWAY for demand response.

Space Type				
Public Restroom	Corridor	Lobby	Restaurant Dining Room	Guest Room
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓
	✓			
✓	✓	✓	✓	✓
✓	✓	✓	✓	✓
		✓		✓
✓	✓	✓	✓	✓
✓	✓	✓		
		✓	✓	

Guest Room

Zūm™



Line Voltage | Zūm Mesh Wireless | Zūm Net Wireless | 0-10 V Pwr & Ctrl

- At least 50% of the 120-volt receptacles must be controlled. Electric circuits serving controlled receptacles should have captive card key controls, occupancy sensing controls, or automatic controls so the power is switched off no longer than 30 minutes after the guest room has been vacated.
- The override time may exceed 2 hours in areas where captive-key override is utilized. Hotel and motel guest rooms should have captive card key controls, occupancy sensing controls, or automatic controls so that lighting power is switched off no longer than 30 minutes after the guest room is vacated. Exception to Section 130.1(c)8: One high efficiency luminaire as defined in Title 24 Table 150.0-A that is controlled separately and located within 6 feet of the entry door.

Title 24-2016 Code Compliance:

- Local Manual Switch (130.1(a))
- Multi-Level Control (130.1(b))
- Shut-Off (130.1(c))
- Daylight Zones (130.1(d))
- Demand Response Ready (130.1(e))
- Controlled Receptacle (130.5(d))

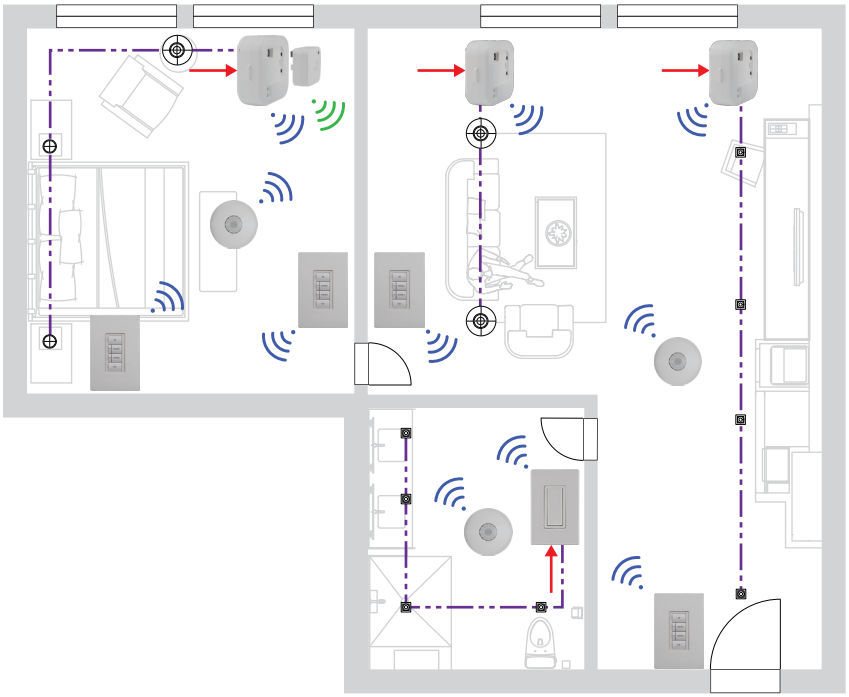
Local Control:

GLZUM-1LV-2JBOX_LV5A-2CKP_BATT-2PIR_BATT-NET

Symbol	Qty.	Product	Description
	2	ZUMMESH-JBOX-5A-LV	Zūm™ Junction Box Zone Controller, 0-10 V Dimming, 5 A
	1	ZUMMESH-5A-LV	Zūm™ Wall-Box Dimmer, 5 A
	1	ZUMMESH-NETBRIDGE	Zūm™ Network Bridge
	2	ZUMMESH-KP10CBATT	6-Button Battery-Powered Keypad
	2	ZUMMESH-PIR-VACANCY-BATT	PIR Vacancy Sensor (AUTO-OFF)

Guest Room Suite

Zūm™



Line Voltage | Zūm Mesh Wireless | Zūm Net Wireless | 0-10 V Pwr & Ctrl

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Title 24-2016 Code Compliance:

- Local Manual Switch (130.1(a))
- Multi-Level Control (130.1(b))
- Shut-Off (130.1(c))
- Daylight Zones (130.1(d))
- Demand Response Ready (130.1(e))
- Controlled Receptacle (130.5(d))

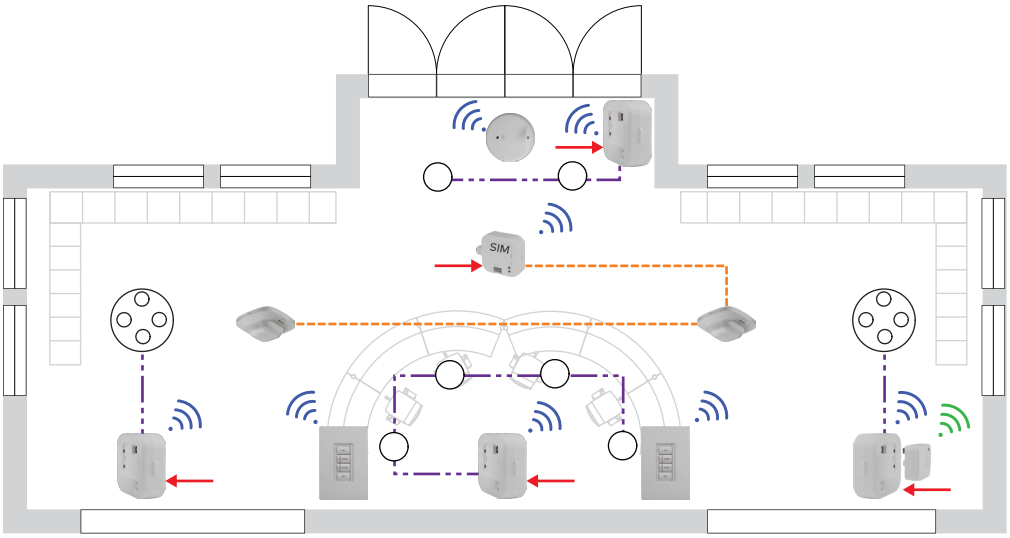
Local Control:

GLZUM-1LV-3JBOX_LV5A-4CKP_BATT-3PIR_BATT-NET

Symbol	Qty.	Product	Description
	3	ZUMMESH-JBOX-5A-LV	Zūm™ Junction Box Zone Controller, 0-10 V Dimming, 5 A
	1	ZUMMESH-5A-LV	Zūm™ Wall-Box Dimmer, 5 A
	1	ZUMMESH-NETBRIDGE	Zūm™ Network Bridge
	4	ZUMMESH-KP10CBATT	6-Button Battery-Powered Keypad
	3	ZUMMESH-PIR-VACANCY-BATT	PIR Vacancy Sensor (AUTO-OFF)

Lobby

Zūm™



Line Voltage | Zūm Net Wireless | Zūm Mesh Wireless | 18/3 Control | 0-10 V Pwr & Ctrl

- Controlled receptacle (130.5(d)) may be required if receptacles are present.

Title 24-2016 Code Compliance:

- Local Manual Switch (130.1(a))
- Multi-Level Control (130.1(b))
- Shut-Off (130.1(c))
- Daylight Zones (130.1(d))
- Demand Response Ready (130.1(e))

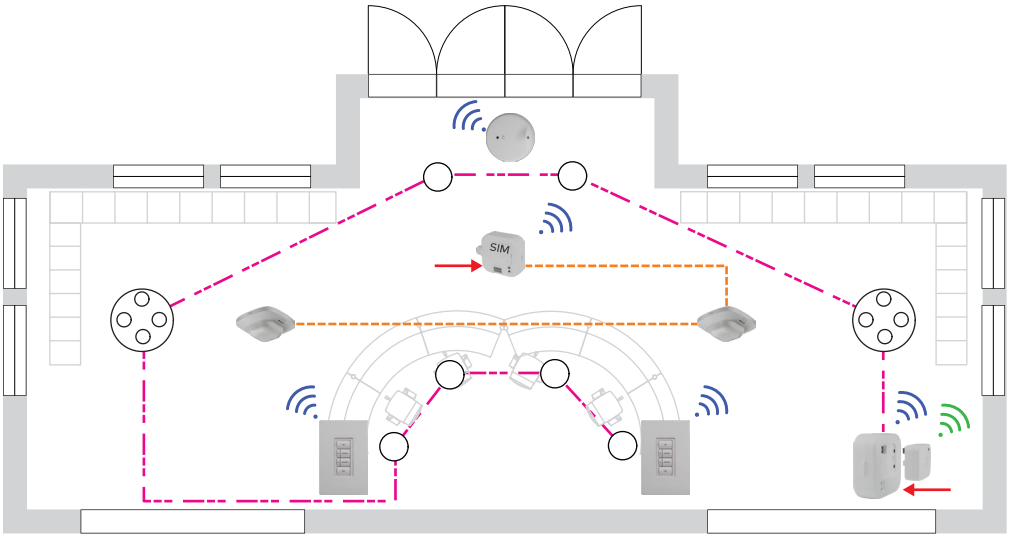
Local Control:

GLZUM-4JBOX_LV5A-2CKP_BATT-2QUAD-LDL-NET

Symbol	Qty.	Product	Description
	4	ZUMMESH-JBOX-5A-LV	Zūm™ Junction Box Zone Controller, 0-10 V Dimming, 5 A
	1	ZUMMESH-JBOX-SIM	Zūm™ Junction Box Sensor Integration Module
	1	ZUMMESH-NETBRIDGE	Zūm™ Network Bridge
	2	ZUMMESH-KP10CBATT	6-Button Battery-Powered Keypad
	2	GLA-IR-QUATTRO-COM1-24	High Definition PIR Presence Detector, Ceiling Mount, Square & Scalable 360° Coverage, 18-24 VAC/VDC
	1	ZUMMESH-OL-PHOTOCELL	Open Loop Daylight Sensor

Lobby

Zūm™ Control for DALI® Lighting



Line Voltage | Zūm Net Wireless | Zūm Mesh Wireless | 18/3 Control | DALI Control

- Controlled receptacle (130.5(d)) may be required if receptacles are present.

Title 24-2016 Code Compliance:

- Local Manual Switch (130.1(a))
- Multi-Level Control (130.1(b))
- Shut-Off (130.1(c))
- Daylight Zones (130.1(d))
- Demand Response Ready (130.1(e))

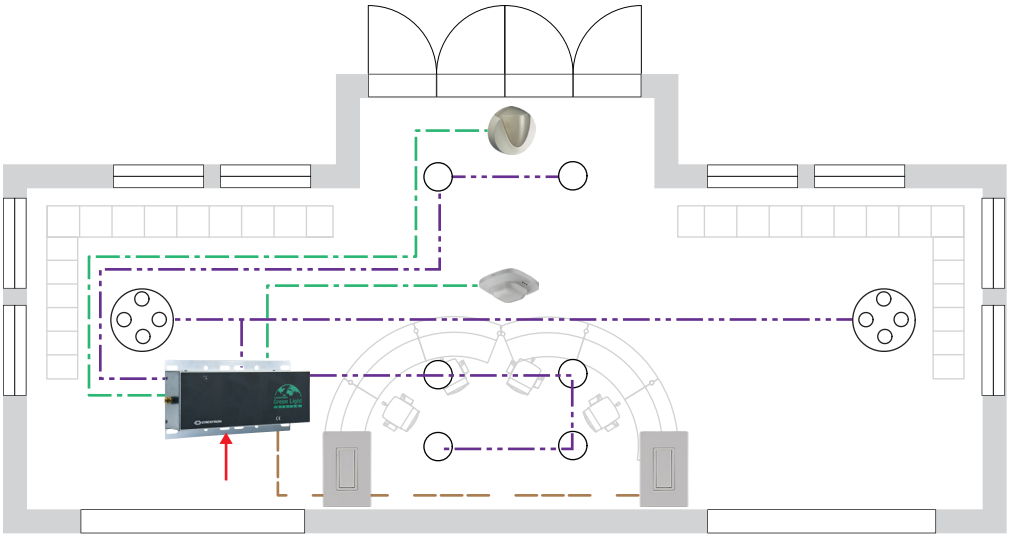
Local Control:

GLZUM-1JBOX_DALI-2CKP_BATT-2QUAD-LDL-NET

Symbol	Qty.	Product	Description
	1	ZUMMESH-JBOX-DALI	Zūm™ Junction Box Zone Controller, DALI™ Control
	1	ZUMMESH-JBOX-SIM	Zūm™ Junction Box Sensor Integration Module
	1	ZUMMESH-NETBRIDGE	Zūm™ Network Bridge
	2	ZUMMESH-KP10CBATT	6-Button Battery-Powered Keypad
	2	GLA-IR-QUATTRO-COM1-24	High Definition PIR Presence Detector, Ceiling Mount, Square & Scalable 360° Coverage, 18-24 VAC/VDC
	1	ZUMMESH-OL-PHOTOCELL	Open Loop Daylight Sensor

Lobby

GLPP



Line Voltage | 0-10 V Pwr & Ctrl | 18/4 Control | 18/2 Control

- Controlled receptacle (130.5(d)) may be required if receptacles are present.

Title 24-2016 Code Compliance:

- Local Manual Switch (130.1(a))
- Multi-Level Control (130.1(b))
- Shut-Off (130.1(c))
- Daylight Zones (130.1(d))
- Demand Response Ready (130.1(e))

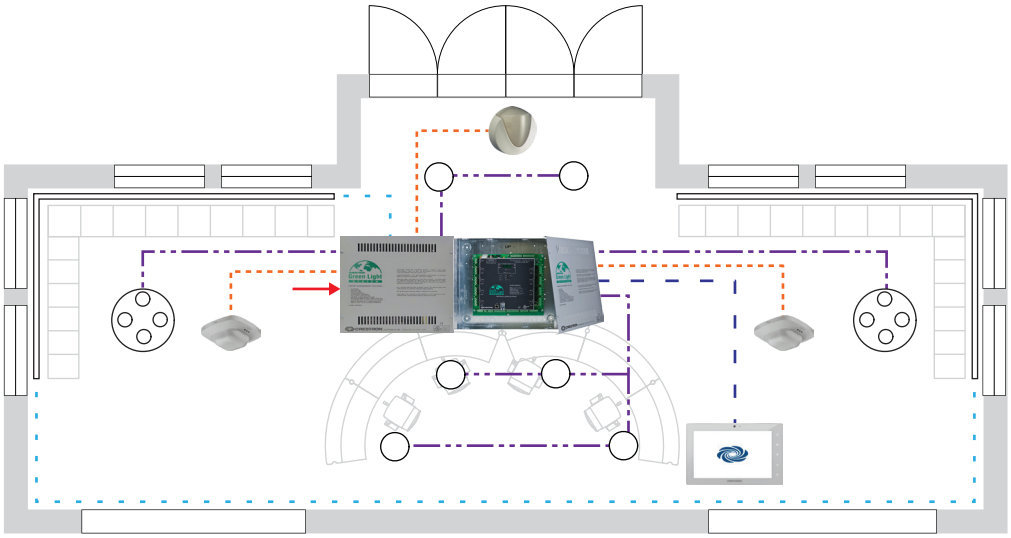
Local Control:

GLPP-13DIM-JKP-JKP-1QUAD-LOL-NET

Product	Qty.	Product	Description
	1	GLPP-1DIMFLV3-CN-PM	3-Ch 0-10 V Dimmer with Cresnet® Control
	2	GLPPA-KP	In-Wall Keypad for GLPP
	1	GLA-IR-QUATTRO-COM1-24	High Definition PIR Presence Detector, Ceiling Mount, Square & Scalable 360° Coverage, 18-24 VAC/VDC
	1	GLS-LOL	Crestron Green Light® Photosensor, Open-Loop

Lobby

GLPAC + DMX



Line Voltage | 0-10 V Pwr & Ctrl | 18/3 Control | DMX Control | Ethernet Control

- Controlled receptacle (130.5(d)) may be required if receptacles are present.

Title 24-2016 Code Compliance:

- Local Manual Switch (130.1(a))
- Multi-Level Control (130.1(b))
- Shut-Off (130.1(c))
- Daylight Zones (130.1(d))
- Demand Response Ready (130.1(e))

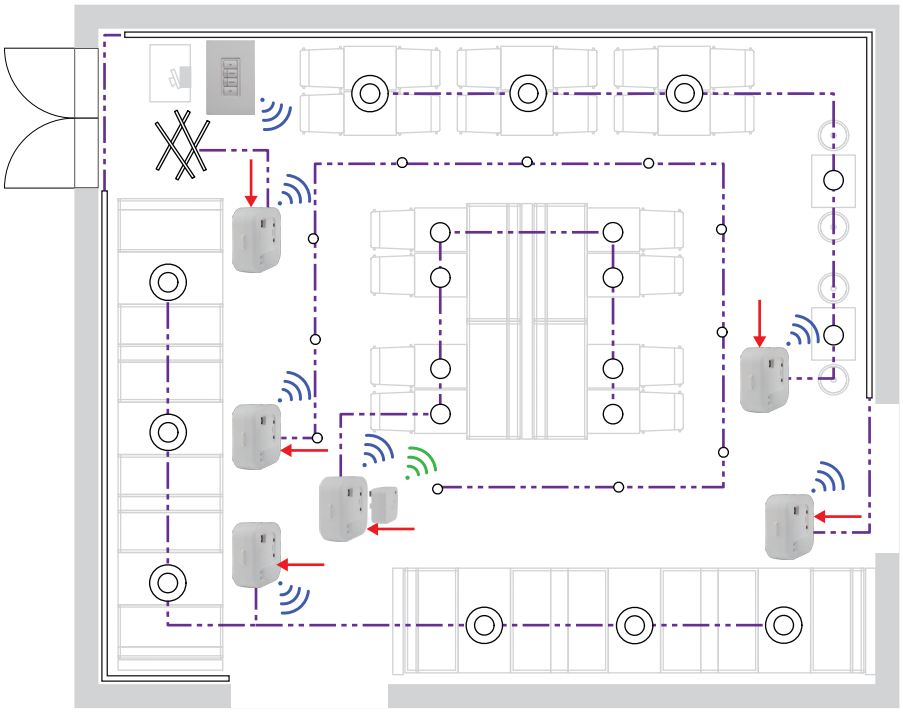
Local Control:

GLPAC4-1QUAD-LOL-TS7+DMX-NET

Product	Qty.	Product	Description
	1	GLPAC-DIMFLV4	Crestron Green Light® Integrated Lighting System, 4-Channel
	1	DMX Expander Kit	Contains a RMC3, a DIN-SCAN-DMX, and a CEN-POE-SW5 in a DIN-EN2X18 cabinet
	1	TSW-760	7 in. Touch Screen
	2	GLA-IR-QUATTRO-COM1-24	High Definition PIR Presence Detector, Ceiling Mount, Square & Scalable 360° Coverage, 18-24 VAC/VDC
	1	GLS-LOL	Crestron Green Light® Photosensor, Open-Loop

Dining Room

Zūm™



Line Voltage | Zūm Net Wireless | Zūm Mesh Wireless | 0-10 V Pwr & Ctrl

- Daylight zones (130.1(d)) may be required if windows are present.
- Dining rooms do not require automatic time-switch control with an automatic holiday shut-off feature.

Title 24-2016 Code Compliance:

- Local Manual Switch (130.1(a))
- Multi-Level Control (130.1(b))
- Shut-Off (130.1(c))
- Demand Response Ready (130.1(e))

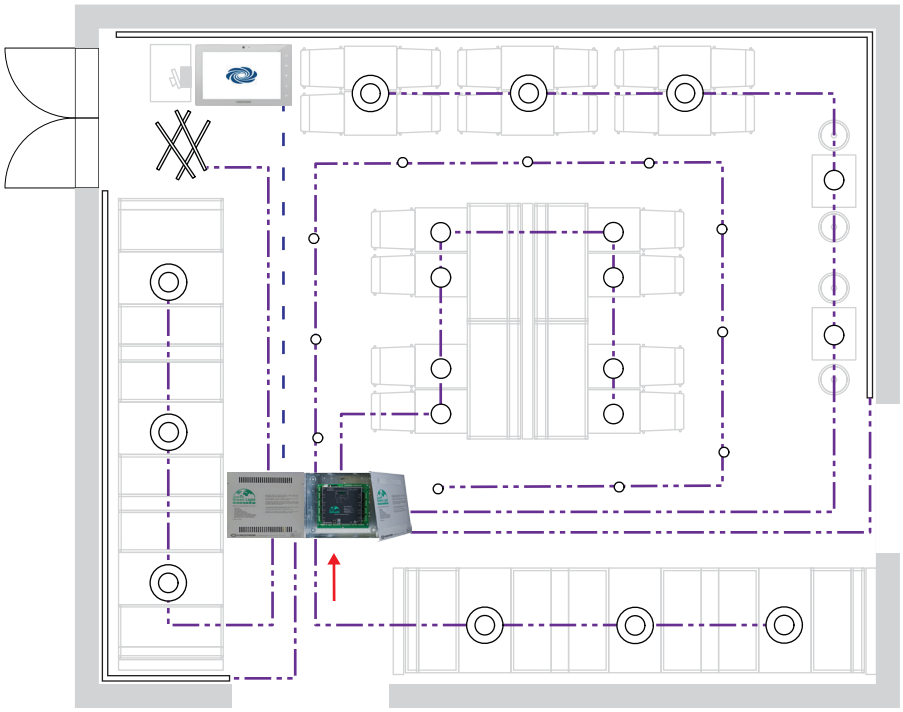
Local Control:

GLZUM-6JBOX_LV5A-1CKP_BATT-NET

Symbol	Qty.	Product	Description
	6	ZUMMESH-JBOX-5A-LV	Zūm™ Junction Box Zone Controller, 0-10 V Dimming, 5 A
	1	ZUMMESH-NETBRIDGE	Zūm™ Network Bridge
	1	ZUMMESH-KP10CBATT	6-Button Battery-Powered Keypad

Dining Room

GLPAC



Line Voltage | 0-10 V Pwr & Ctrl | Ethernet Control

- Daylight zones (130.1(d)) may be required if windows are present.
- Restaurants do not require automatic time-switch control with an automatic holiday shut-off feature.

Title 24-2016 Code Compliance:

- Local Manual Switch (130.1(a))
- Multi-Level Control (130.1(b))
- Shut-Off (130.1(c))
- Demand Response Ready (130.1(e))

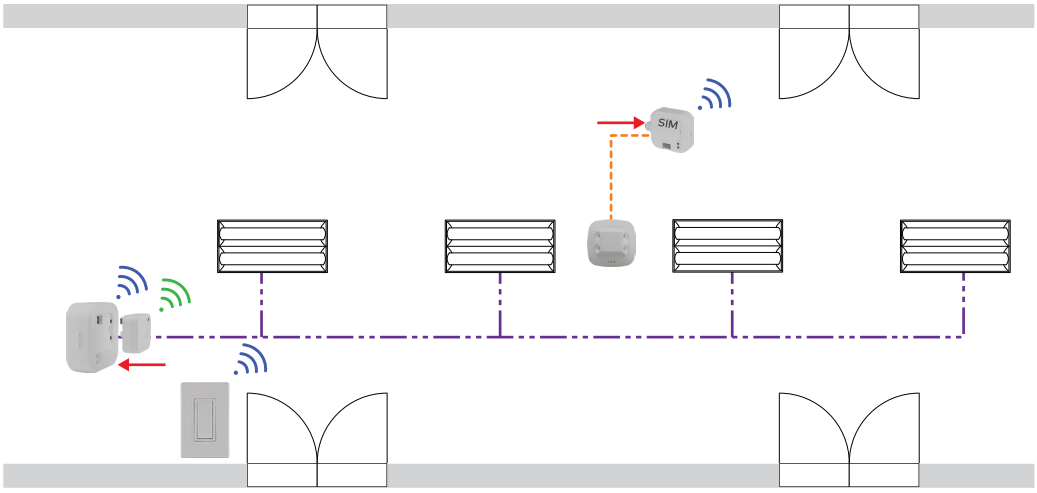
Local Control:

GLPAC4-TS7-NET

Symbol	Qty.	Product	Description
	1	GLPAC-DIMFLV4	Crestron Green Light® Integrated Lighting System, 4-Channel
	1	TSW-760	7 in. Touch Screen
	1	CLP-HUB-SW-POE-5	Contains a DIN-CENCN-2, a DIN-PWS60, and a CEN-SW-POE-5 in a DIN-EN-2X18 cabinet

Corridor

Zūm™



Zūm Mesh Wireless | Zūm Net Wireless | Line Voltage | 0-10 V Pwr & Ctrl | 18/3 Control

- UL924 emergency lighting devices are available for life safety.
- Daylight zones (130.1(d)) may be required if windows are present.
- Lighting installed in a corridor should meet the following requirements in addition to complying with Section 130.1(c)1: The corridor should be controlled by occupant sensing controls that separately reduce the lighting power by at least 50% when the corridor is unoccupied. The occupant sensing controls should be capable of automatically turning the lighting fully on only in the separately controlled corridor, and should be automatically activated from all designed paths of egress.
- Lighting installed in a common area corridor that provides access to guest rooms and dwelling units should comply with 130.1(c)7: Common area corridors must be controlled with occupant sensing controls that automatically reduce lighting power in unoccupied areas by at least 50%. The occupant sensing controls should be capable of automatically turning the lighting fully on only in the separately controlled corridor, and should be automatically activated from all designed paths of egress. When the installed lighting power is 80% or less of the value allowed under the Area Category Method, occupant sensing controls should reduce the power by at least 40%.

Title 24-2016 Code Compliance:

- Local Manual Switch (130.1(a))
- Multi-Level Control (130.1(b))
- Shut-Off (130.1(c))
- Sensor Shut-Off (130.1(c)5/6/7)
- Demand Response Ready (130.1(e))

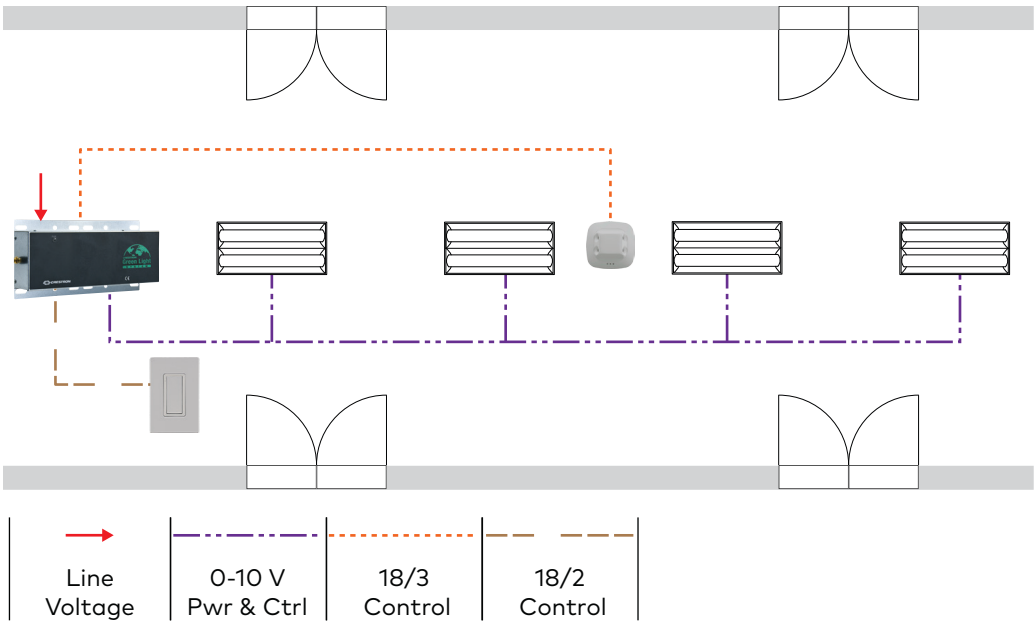
Local Control:

GLZUM-1JBOX_LV5A-1AKP_BATT-HALL_US1-NET

Symbol	Qty.	Product	Description
	1	ZUMMESH-JBOX-5A-LV	Zūm™ Junction Box Zone Controller, 0-10 V Dimming, 5 A
	1	ZUMMESH-JBOX-SIM	Zūm™ Junction Box Sensor Integration Module
	1	ZUMMESH-NETBRIDGE	Zūm™ Network Bridge
	1	ZUMMESH-KP10ABATT	Rocker-Button Battery Powered Keypad
	1	GLA-US-HALLWAY-COM1-24	40 kHz Ultrasonic Presence Detector, Ceiling Mount, Hallway Coverage, 18-24 VAC/VDC

Corridor

GLPP



Title 24-2016 Code Compliance:

- Local Manual Switch (130.1(a))
- Multi-Level Control (130.1(b))
- Shut-Off (130.1(c))
- Sensor Shut-Off (130.1(c)5/6/7)
- Demand Response Ready (130.1(e))

- UL924 emergency lighting devices are available for life safety.
- Daylight zones (130.1(d)) may be required if windows are present.
- Lighting installed in a corridor should meet the following requirements in addition to complying with Section 130.1(c)1: The corridor should be controlled by occupant sensing controls that separately reduce the lighting power by at least 50% when the corridor is unoccupied. The occupant sensing controls should be capable of automatically turning the lighting fully on only in the separately controlled corridor, and should be automatically activated from all designed paths of egress.
- Lighting installed in a common area corridor that provides access to guest rooms and dwelling units should comply with 130.1(c)7: Common area corridors must be controlled with occupant sensing controls that automatically reduce lighting power in unoccupied areas by at least 50%. The occupant sensing controls should be capable of automatically turning the lighting fully on only in the separately controlled corridor, and should be automatically activated from all designed paths of egress. When the installed lighting power is 80% or less of the value allowed under the Area Category Method, occupant sensing controls should reduce the power by at least 40%.

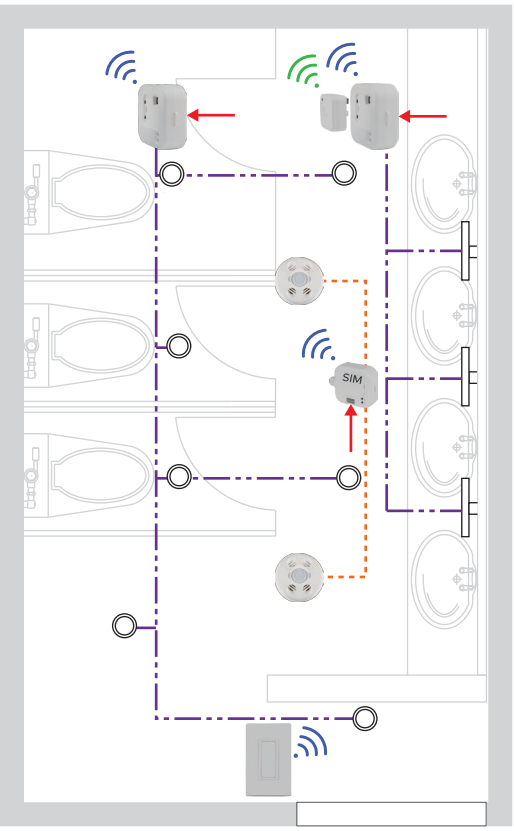
Local Control:

GLPP-1DIM-JKP-HALL_US1-NET

Product	Qty.	Product	Description
	1	GLPP-1DIMFLVCN-PM	1-Ch 0-10 V Dimmer with Cresnet® Control
	1	GLPPA-KP	In-Wall Keypad for GLPP
	1	GLA-US-HALLWAY-COM1-24	40 kHz Ultrasonic Presence Detector, Ceiling Mount, Hallway Coverage, 18-24 VAC/VDC

Public Restroom

Zūm™



Zūm Mesh Wireless | Zūm Net Wireless | Line Voltage | 0-10 V Pwr & Ctrl | 18/3 Control

- Public restrooms with two or more stalls may use a manual control not accessible to unauthorized personnel.
- Daylight zones (130.1(d)) may be required if windows are present.
- Public restrooms should have at least one control step between 30-70% of full rated power.

Title 24-2016 Code Compliance:

- Local Manual Switch (130.1(a))
- Multi-Level Control (130.1(b))
- Shut-Off (130.1(c))
- Daylight Zones (130.1(d))
- Demand Response Ready (130.1(e))

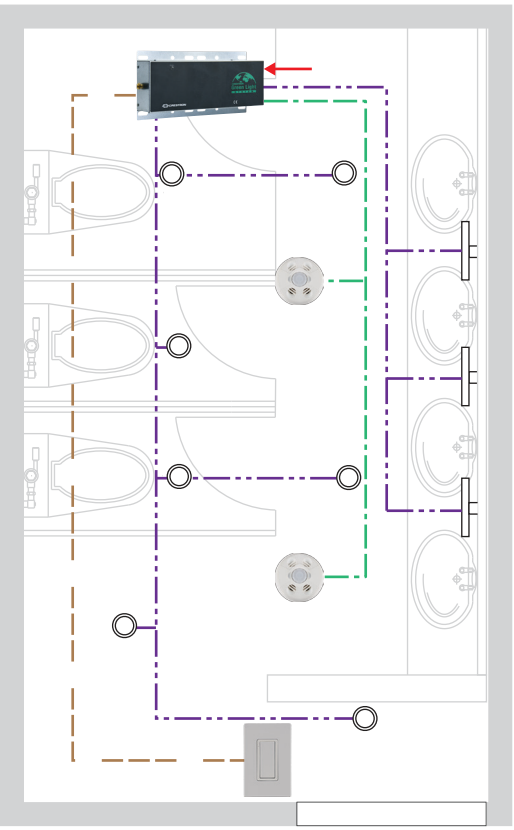
Local Control:

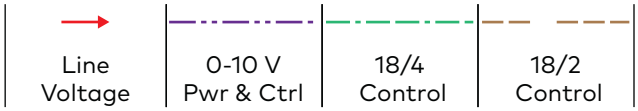
GLZUM-2JBOX_LV5A-AKP_BATT-2OS-NET

Symbol	Qty.	Product	Description
	2	ZUMMESH-JBOX-5A-LV	Zūm™ Junction Box Zone Controller, 0-10 V Dimming, 5 A
	1	ZUMMESH-JBOX-SIM	Zūm™ Junction Box Sensor Integration Module
	1	ZUMMESH-NETBRIDGE	Zūm™ Network Bridge
	1	ZUMMESH-KP10ABATT	Rocker Button Battery Powered Keypad
	2	GLS-ODT-C-NS	Dual-Technology Ceiling Mount Occupancy Sensor

Public Restroom

GLPP





Title 24-2016 Code Compliance:

- Local Manual Switch (130.1(a))
- Multi-Level Control (130.1(b))
- Shut-Off (130.1(c))
- Daylight Zones (130.1(d))
- Demand Response Ready (130.1(e))

Local Control:

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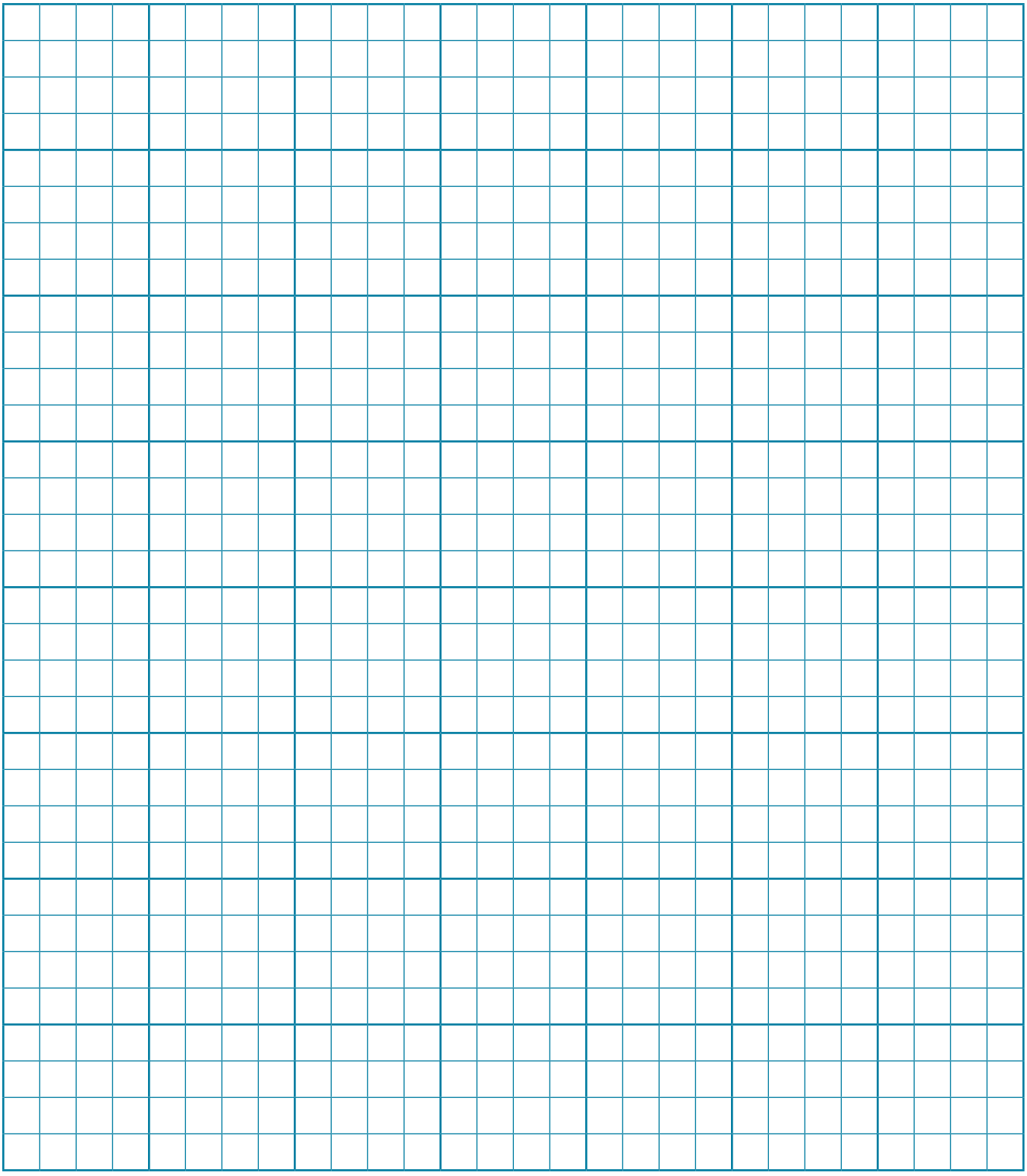
- Daylight zones (130.1(d)) may be required if windows are present.
- Public restrooms should have at least one control step between 30-70% of full rated power.

GLPP-2DIM-JKP-2OS-NET

Product	Qty.	Product	Description
	1	GLPP-1DIMFLV2CN-PM	2-Ch 0-10 V Dimmer with Cresnet® Control
	1	GLPPA-KP	In-Wall Keypad for GLPP
	2	GLS-ODT-C-NS	Dual-Technology Ceiling Mount Occupancy Sensor

Notes



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

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