



Healthcare ASHRAE 90.1-2016 Solutions

Design Guide

Crestron Electronics, Inc.

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TOTAL ENERGY CONSUMPTION

Per capita usage; 10⁹ BTU per person

	OIL	COAL	SOLAR
Temperate climates	2.50b	3.1b	0.25
Subtropical climates	1.23b	0.55b	1.18
Hot climates	0.09b	0.19b	3.73
Cold climates	1.15b	1.30b	2.21
	0.20b	0.82b	1.32
	Total: 5.17	Total: 5.96	Total: 5.17



About ASHRAE 90.1-2016

ASHRAE 90.1-2016 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 ASHRAE 90.1-2016.

Design Guide Information

Crestron® offers this Design Guide for Healthcare - ASHRAE 90.1-2016 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.

ASHRAE 90.1-2016 Code Standards

Summary

ASHRAE 90.1-2016 Code Standards

	Code Provision	Minimum Control Requirement	Code Description
ON/OFF CONTROLS	9.4.1.1	Automatic Full On (Occupancy Sensing Mode)	Lighting is permitted to automatically turn to full on.
	9.4.1.1.a	Local Control	There should be one or more readily accessible manual lighting controls in each space.
	9.4.1.1.b/c	Manual On / Partial Auto On (Vacancy Sensing Mode)	The general lighting can be manually turned on or automatically turned on up to 50%.
	9.4.1.1.g	Automatic Partial Off	Lighting power should be automatically reduced by at least 50% within 20 minutes of vacancy.
	9.4.1.1.h	Automatic Full Off	All lighting must be shut off within 20 minutes of vacancy.
	9.4.1.1.i	Scheduled Shutoff (Programmable Timeclock)	All lighting should be automatically shut off during periods when the space is scheduled to be unoccupied using a programmable timeclock or signal from another control device (i.e. security system).
LIGHT LEVEL CONTROL	9.4.1.4	Exterior Lighting Control (Timeclock, Photocontrol)	Exterior lighting should be controlled as a function of the astronomical time clock (dusk, dawn, opening, closing) and photocontrols.
	9.4.1.1.d	Bi-level Control (0-10v dimming)	The general lighting should use continuous dimming or have at least one intermediate step between 30-70% power in addition to full on and full off.
	9.4.1.1.e/f	Automatic Daylight Control (Photocontrol)	In primary side daylight general lighting zones using more than 150W (or using more than 300W within the primary and secondary daylight zones), daylight must be harvested using photocontrols. In top daylight general lighting zones using more than 150W, daylight must be harvested using photocontrols.
	9.4.1.2.b	Automatic Vacancy Dimming	Lighting power should be automatically reduced by a minimum of 30% when no activity is detected after 20 minutes. Lighting zones cannot exceed 3,600 sq.ft.
	9.4.1.2.c	Automatic Sunrise / Sunset Dimming	Lighting for covered vehicle entrances and exits should be automatically reduced by 50% from sunrise to sunset.
PLUG LOAD CONTROL	8.4.2	Automatic Receptacle Control	50% of all receptacles and 25% of modular furniture feeders must be turned off 20 minutes after vacancy.

Primary Solutions

Zūm™ Wireless Light Control

GLPP

GLDALI

GLPAC

* Only required if there is a life-saving statute that applies.

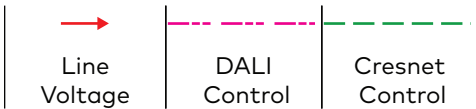
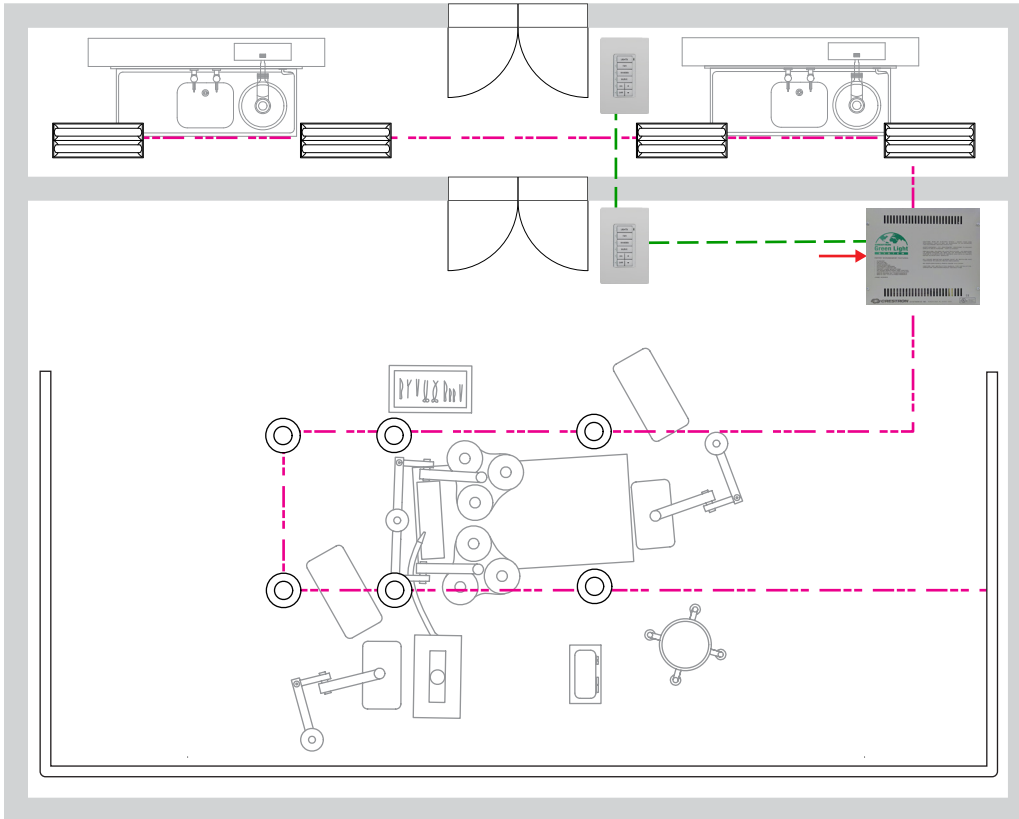
** Optional

*** Select 9.4.1.1.g, 9.4.1.1.h, or 9.4.1.1.i for compliance in corridors.

Space Type							
Patient / Exam Room	Operating Room	Private Office ≤250 sq. ft.	Corridor	Lobby	Restroom	Site Lighting	Parking Garage
✓*	✓*		✓	✓	✓		
✓	✓	✓	✓	✓	✓**		
		✓					
			✓****	✓			
✓	✓	✓	✓****	✓	✓		
or	or		or	or			
✓	✓		✓****	✓			
						✓	
✓	✓	✓					
✓		✓	✓	✓	✓		
							✓
							✓
		✓					
		✓	✓	✓	✓		
		✓	✓	✓	✓		
✓	✓						
✓	✓			✓		✓	✓

Operating Room

GLDALI

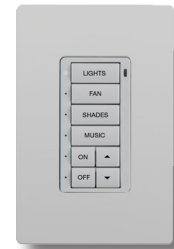




- ▶ Automatic full on (9.4.1.1) is only required if there is a life-saving statute that applies

ASHRAE 90.1-2016 Code Compliance:

- ▶ Automatic Full On (Occupancy Sensing Mode) (9.4.1.1)
- ▶ Local Control (9.4.1.1.a)
- ▶ Scheduled Shutoff (Programmable Timeclock) (9.4.1.1.i)
- ▶ Bi-level Control (9.4.1.1.d)

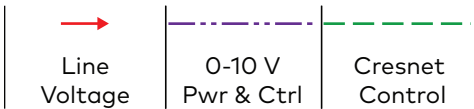
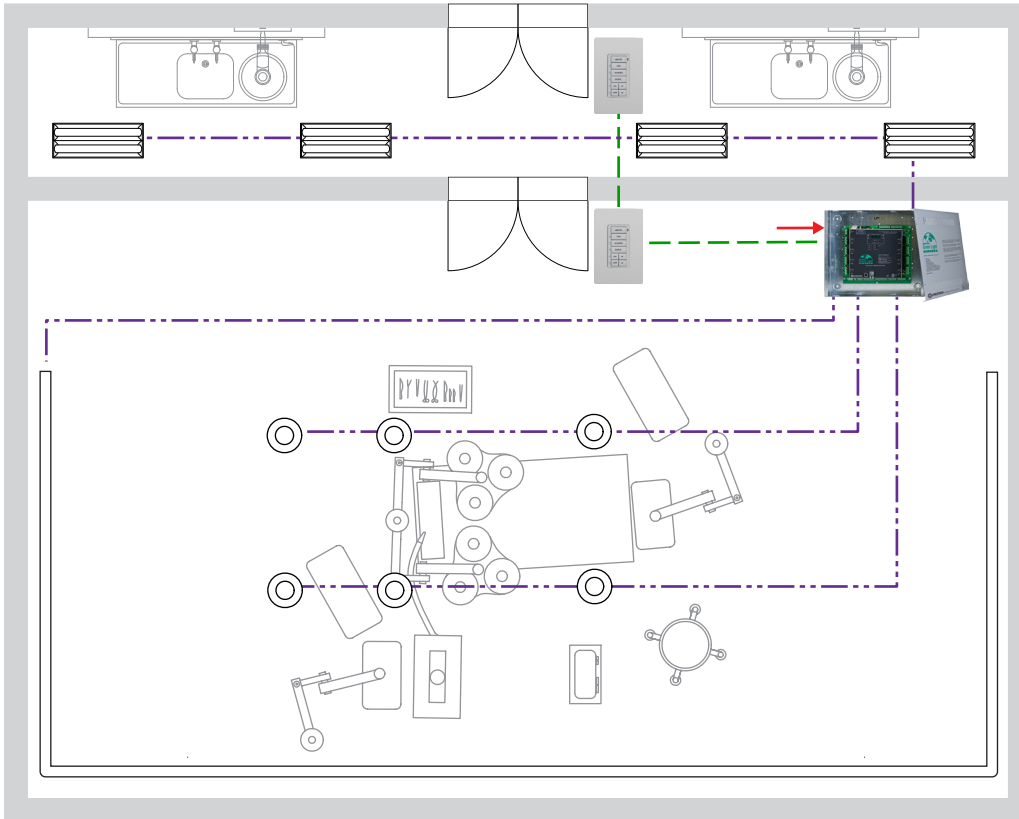
Local Control:



Symbol	Qty.	Product	Description
	1	GLDALI	DIN-EN-3x18, RMC3, DIN-DALI-2, DIN-BLOCK, DIN-PWS60, CEN-SW-POE-5
	2	C2N-CBD-P	Cameo® Keypad, Standard Mount

Operating Room

GLPAC





- ▶ Automatic full on (9.4.1.1) is only required if there is a life-saving statute that applies

ASHRAE 90.1-2016 Code Compliance:

- ▶ Automatic Full On (Occupancy Sensing Mode) (9.4.1.1)
- ▶ Local Control (9.4.1.1.a)
- ▶ Scheduled Shutoff (Programmable Timeclock) (9.4.1.1.i)
- ▶ Bi-level Control (0-10v dimming) (9.4.1.1.d)

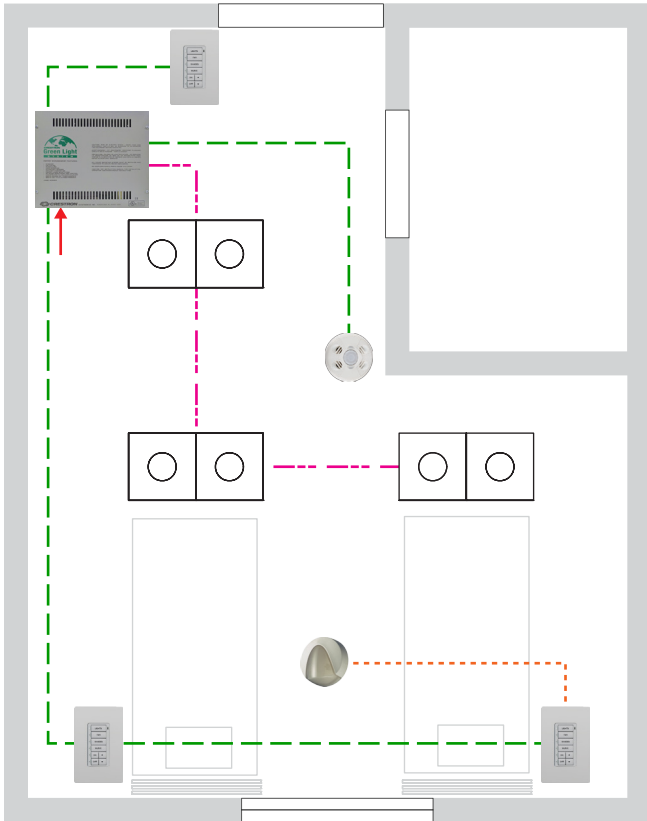
Local Control:



Symbol	Qty.	Product	Description
	1	GLPAC-DIMFLV8-4E	Green Light Integrated Lighting System, 2 Isolated 4-Channel Outputs, UL924 Listed
	2	C2N-CBD-P	Cameo® Keypad, Standard Mount

Patient Room / Exam Room

GLDALI

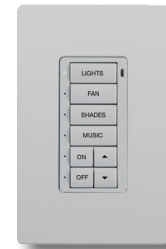





- ▶ Automatic full on (9.4.1.1) is only required if there is a life-saving statute that applies
- ▶ Motion sensing or time clock can be used to shut the lights off.

ASHRAE 90.1-2016 Code Compliance:

- ▶ Automatic Full On (Occupancy Sensing Mode) (9.4.1.1)
- ▶ Local Control (9.4.1.1.a)
- ▶ Automatic Full Off (9.4.1.1.h)
- ▶ Scheduled Shutoff (Programmable Timeclock) (9.4.1.1.i)
- ▶ Bi-level Control (9.4.1.1.d)
- ▶ Automatic Daylight Control (Photocontrol) (9.4.1.1.e/f)

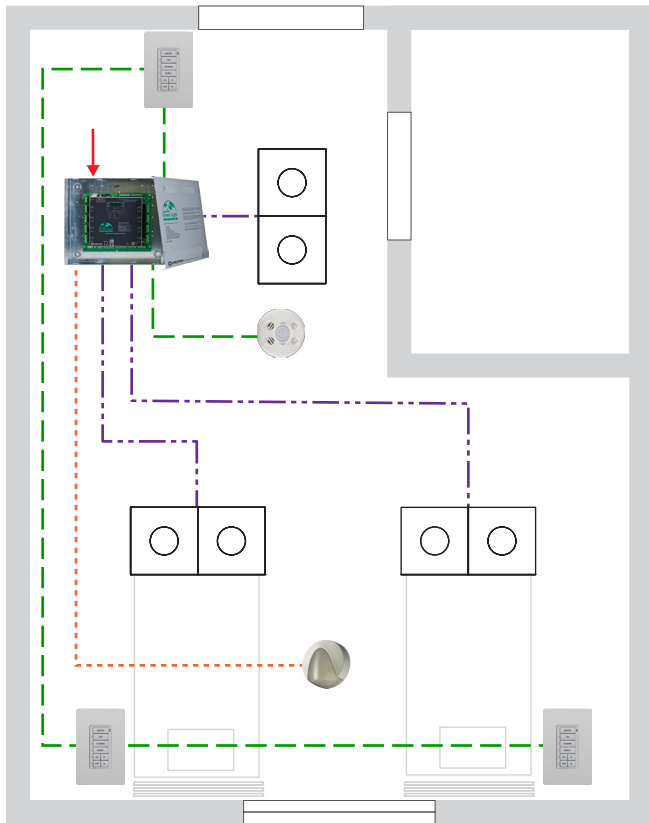
Local Control:



Symbol	Qty.	Product	Description
	1	GLDALI	DIN-EN-3x18, RMC3, DIN-DALI-2, DIN-BLOCK, DIN-PWS60, CEN-SW-POE-5
	3	C2N-CBD-P	Cameo® Keypad, Standard Mount
	1	GLS-LOL	Crestron Green Light® Photosensor, Open-Loop

Patient Room / Exam Room

GLPAC






- ▶ Automatic full on (9.4.1.1) is only required if there is a life-saving statute that applies
- ▶ Motion sensing or time clock can be used to shut the lights off.

ASHRAE 90.1-2016 Code Compliance:

- ▶ Automatic Full On (Occupancy Sensing Mode) (9.4.1.1)
- ▶ Local Control (9.4.1.1.a)
- ▶ Automatic Full Off (9.4.1.1.h)
- ▶ Scheduled Shutoff (Programmable Timeclock) (9.4.1.1.i)
- ▶ Bi-level Control (0-10v Dimming) (9.4.1.1.d)
- ▶ Automatic Daylight Control (Photocontrol) (9.4.1.1.e/f)

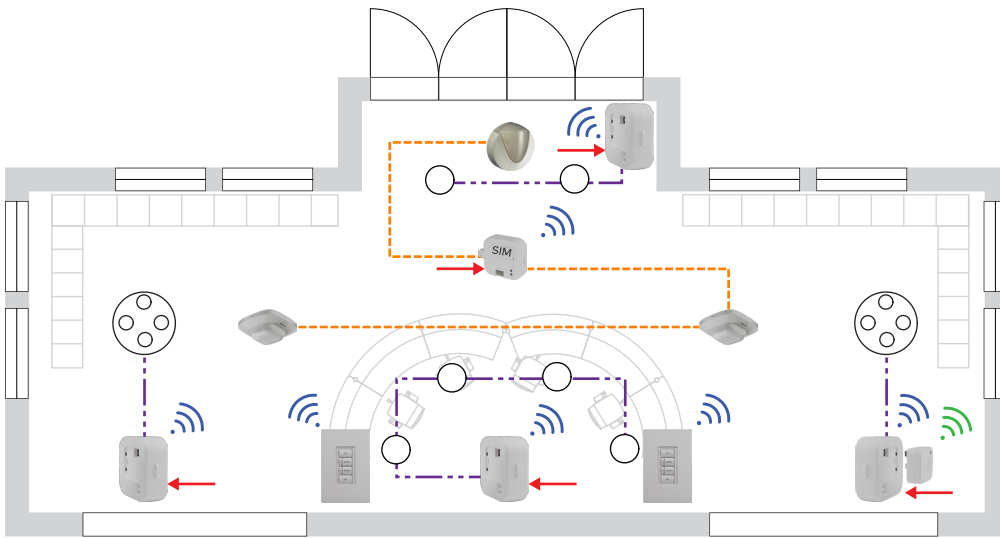
Local Control:



Symbol	Qty.	Product	Description
	1	GLPAC-DIMFLV8-4E	Green Light Integrated Lighting System, 2 Isolated 4-Channel Outputs, UL924 Listed
	3	C2N-CBD-P	Cameo® Keypad, Standard Mount
	1	GLS-LOL	Crestron Green Light® Photosensor, Open-Loop

Lobby

Züm



- ▶ Add a ZUM-FLOOR-HUB and ZUMNET-GATEWAY for scheduled shutoff (9.4.1.1.i).

ASHRAE 90.1-2016 Code Compliance:

- ▶ Automatic Full On (Occupancy Sensing Mode) (9.4.1.1)
- ▶ Local Control (9.4.1.1.a)
- ▶ Automatic Partial Off (9.4.1.1.g)
- ▶ Automatic Full Off (9.4.1.1.h)
- ▶ Automatic Daylight Control (Photocontrol) (9.4.1.1.e/f)

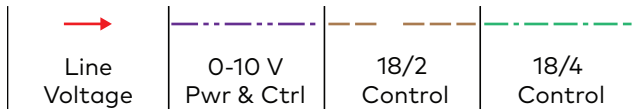
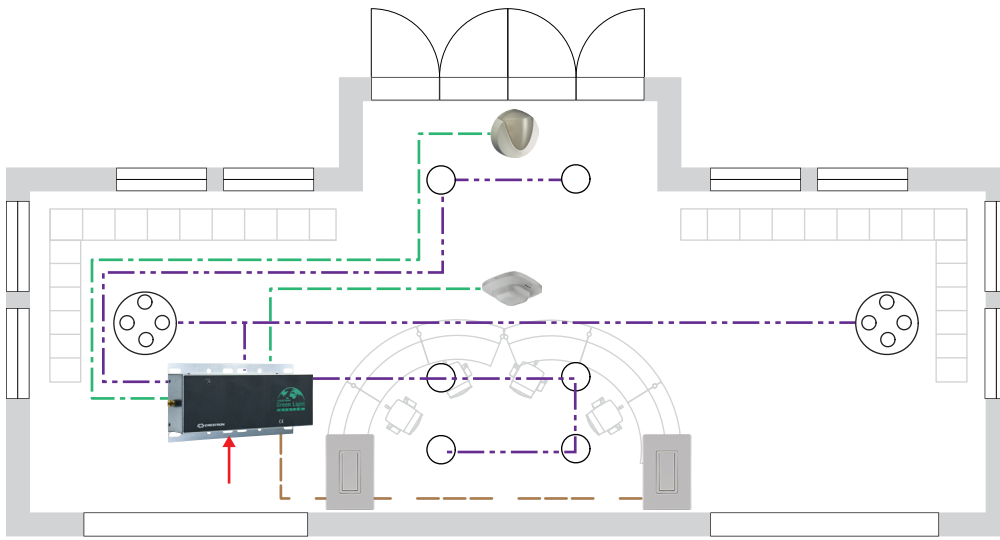
Local Control:



Symbol	Qty.	Product	Description
	4	ZUMMESH-JBOX-5A-LV	Junction Box Zone Controller, 0-10V Dimming, 5A
	1	ZUMMESH-JBOX-SIM	Züm™ Junction Box Sensor Integration Module
	1	ZUMMESH-NETBRIDGE	Züm™ 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	GLS-LOL	Crestron Green Light® Photosensor, Open-Loop

Lobby

GLPP







ASHRAE 90.1-2016 Code Compliance:

- ▶ Automatic Full On (Occupancy Sensing Mode) (9.4.1.1)
- ▶ Local Control (9.4.1.1.a)
- ▶ Automatic Partial Off (9.4.1.1.g)
- ▶ Automatic Full Off (9.4.1.1.h)
- ▶ Automatic Daylight Control (Photocontrol) (9.4.1.1.e/f)

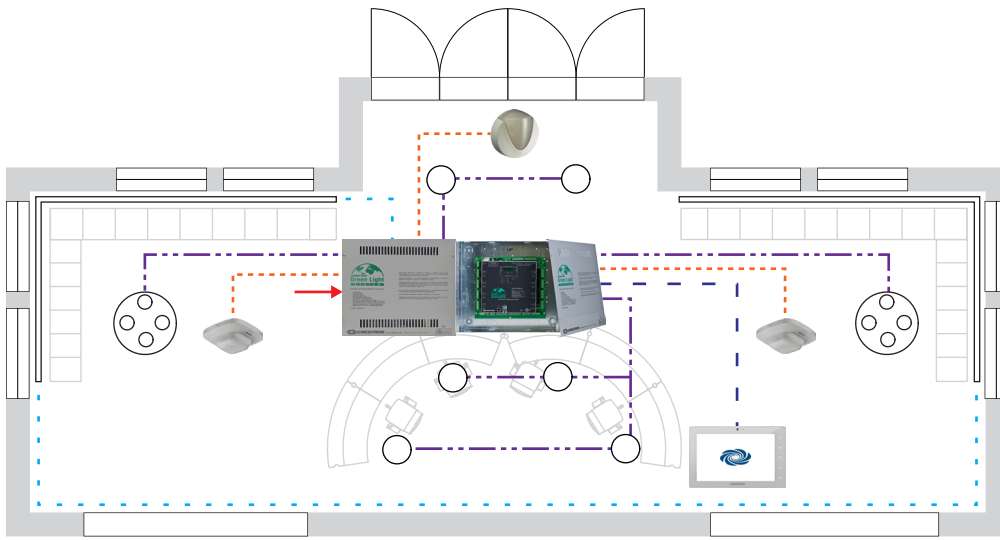
Local Control:



Product	Qty.	Product	Description
	1	GLPP-1DIMFLV3-CN-PM	3-Ch 0-10V Dimmer with Cresnet®
	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	Creston Green Light® Photosensor, Open-Loop

Lobby

GLPAC + DMX








ASHRAE 90.1-2016 Code Compliance:

- ▶ Automatic Full On (Occupancy Sensing Mode) (9.4.1.1)
- ▶ Local Control (9.4.1.1.a)
- ▶ Automatic Partial Off (9.4.1.1.g)
- ▶ Automatic Full Off (9.4.1.1.h)
- ▶ Scheduled Shutoff (Programmable Timeclock) (9.4.1.1.i)
- ▶ Automatic Daylight Control (Photocontrol) (9.4.1.1.e/f)

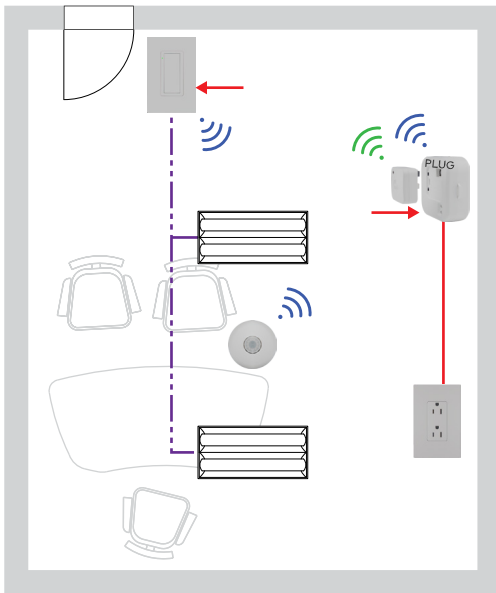
Local Control:



Product	Qty.	Product	Description
	1	GLPAC-DIMFLV4	Green Light Integrated Lighting System, 4-Channel
	1	DIN-EN2x18	RMC3, DIN-SCAN-DMX, CEN-POE-SW5
	1	TSW-760	7" 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

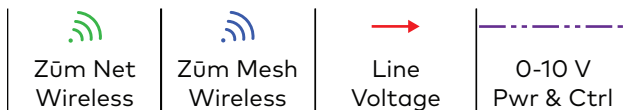
Private Office

Zūm



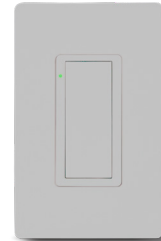
ASHRAE 90.1-2016 Code Compliance:





- ▶ Local Control (9.4.1.1.a)
- ▶ Manual On / Partial Auto On (Vacancy Sensing Mode) (9.4.1.1.b/c)
- ▶ Automatic Full Off (9.4.1.1.h)
- ▶ Bi-level Control (0-10v Dimming) (9.4.1.1.d)
- ▶ Automatic Receptacle Control (8.4.2)



- ▶ Automatic daylight control (photocontrol) (9.4.1.1.e/f) may be required if windows are present.

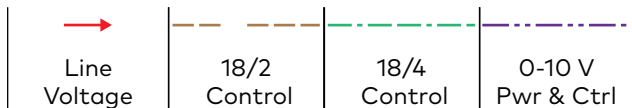
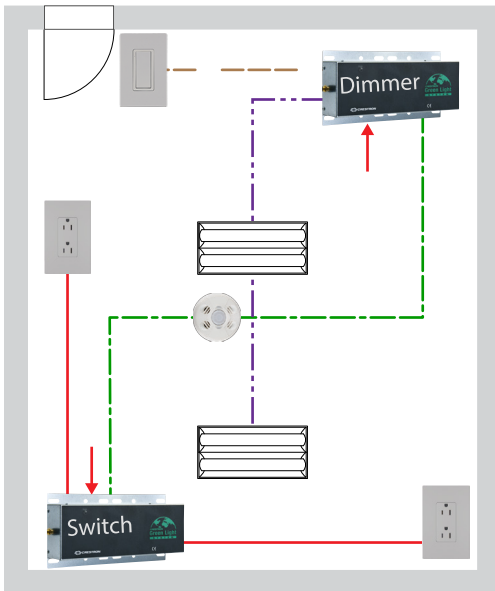
Local Control:



Symbol	Qty.	Product	Description
	1	ZUMMESH-5A-LV	Zūm™ Wall-Box Dimmer, 5A
	1	ZUMMESH-JBOX-20A-PLUG	Zūm™ J-Box Load Controller, Plug Load Switch
	1	ZUMMESH-NETBRIDGE	Zūm™ Network Bridge
	1	ZUMMESH-PIR-VACANCY-BATT	PIR Vacancy Sensor (AUTO-OFF)

Private Office

GLPP



▶ Automatic daylight control (photocontrol) (9.4.1.1.e/f) may be required if windows are present.

ASHRAE 90.1-2016 Code Compliance:

- ▶ Local Control (9.4.1.1.a)
- ▶ Manual On / Partial Auto On (Vacancy Sensing Mode) (9.4.1.1.b/c)
- ▶ Automatic Full Off (9.4.1.1.h)
- ▶ Bi-level Control (0-10v Dimming) (9.4.1.1.d)
- ▶ Automatic Receptacle Control (8.4.2)

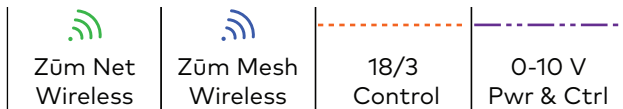
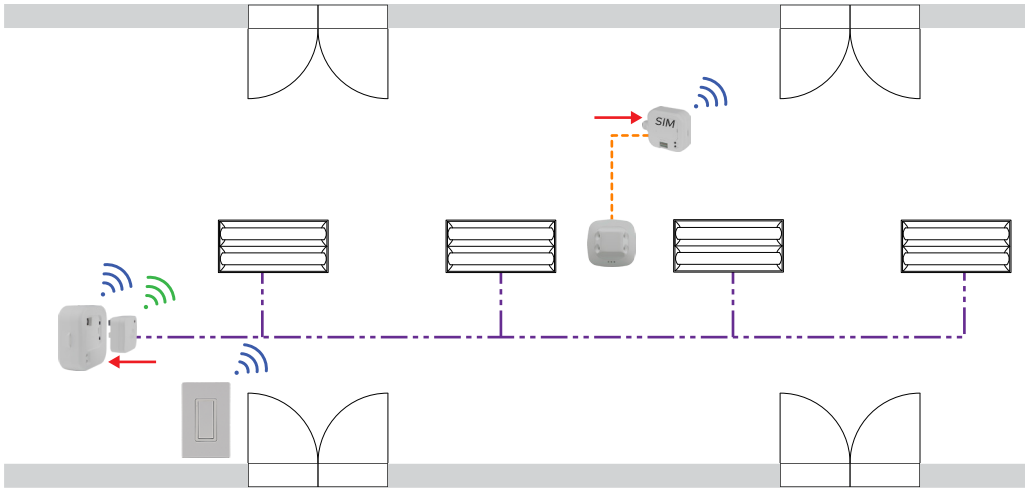
Local Control:



Symbol	Qty.	Product	Description
	1	GLPP-DIMFLVCN-PM	1-Ch 0-10V Dimmer with Cresnet® Control
	1	GLPP-SWCN	Crestron Green Light® Power Pack, 1-Channel Switch with Cresnet® Control
	1	GLPPA-KP	In-Wall Keypad for GLPP
	1	GLS-ODT-C-NS	Dual-Technology Ceiling Mount Occupancy Sensor, 2000 sq. ft.

Corridor

Zūm

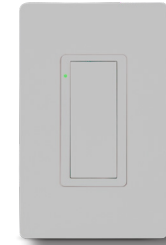







- ▶ UL924 emergency lighting devices are available for life safety.
- ▶ Automatic daylight control (photocontrol) (9.4.1.1.e/f) may be required if windows are present.
- ▶ Select 9.4.1.1.g, 9.4.1.1.h, or 9.4.1.1.i for compliance in corridors.
- ▶ Add a ZUM-FLOOR-HUB and ZUMNET-GATEWAY for scheduled shutoff (9.4.1.1.i).

ASHRAE 90.1-2016 Code Compliance:

- ▶ Automatic Full On (Occupancy Sensing Mode) (9.4.1.1)
- ▶ Local Control (9.4.1.1.a)
- ▶ Automatic Partial Off (9.4.1.1.g)
- ▶ Automatic Full Off (9.4.1.1.h)

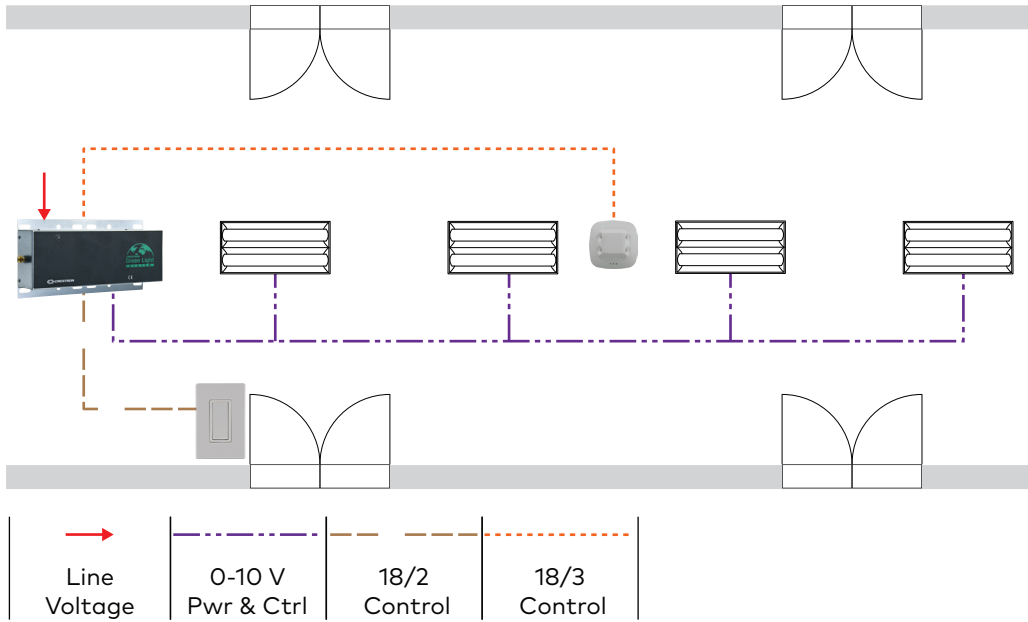
Local Control:



Symbol	Qty.	Product	Description
	1	ZUMMESH-JBOX-5A-LV	Junction Box Zone Controller, 0-10V Dimming, 5A
	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, 33 ft corridor coverage, up to 8 hallway sensors per SIM

Corridor

GLPP






ASHRAE 90.1-2016 Code Compliance:

- ▶ Automatic Full On (Occupancy Sensing Mode) (9.4.1.1)
- ▶ Local Control (9.4.1.1.a)
- ▶ Automatic Partial Off (9.4.1.1.g)
- ▶ Automatic Full Off (9.4.1.1.h)

- ▶ UL924 emergency lighting devices are available for life safety.
- ▶ Automatic daylight control (photocontrol) (9.4.1.1.e/f) may be required if windows are present.
- ▶ Select 9.4.1.1.g, 9.4.1.1.h, or 9.4.1.1.i for compliance in corridors.

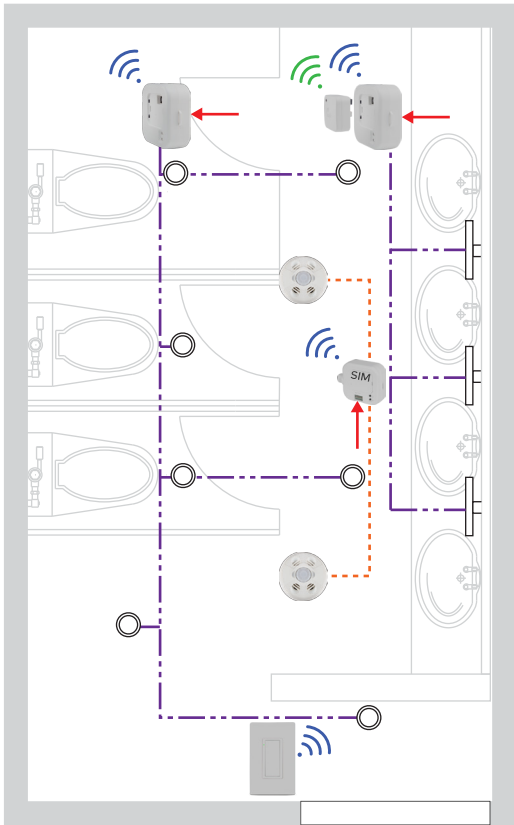
Local Control:



Product	Qty.	Product	Description
	1	GLPP-1DIMFLVCN-PM	1-Ch 0-10V Dimmer with Cresnet®
	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

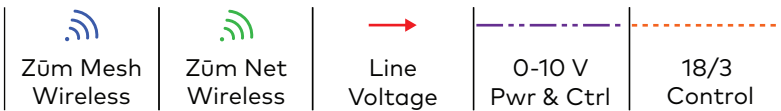
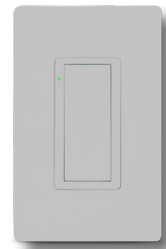
Zūm








ASHRAE 90.1-2016 Code Compliance:

- ▶ Automatic Full On (Occupancy Sensing Mode) (9.4.1.1)
- ▶ Local Control (9.4.1.1.a)
- ▶ Automatic Full Off (9.4.1.1.h)

Local Control:

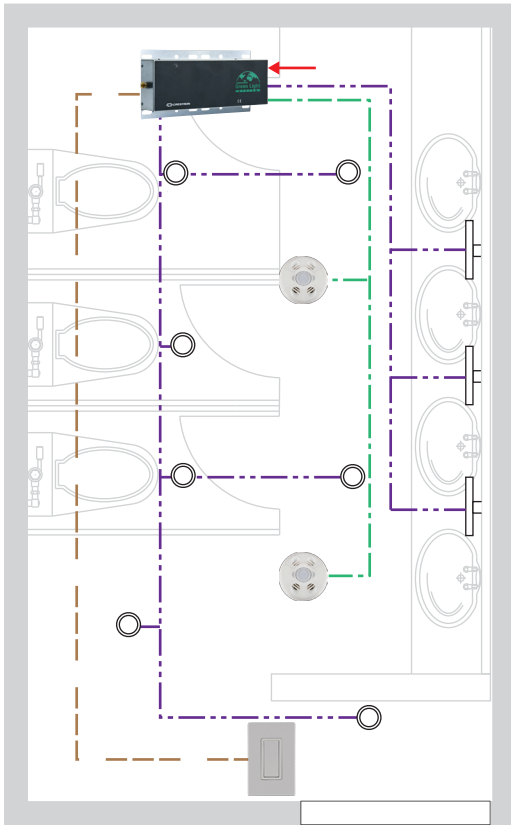


- ▶ Local control (9.4.1.1.a) is optional.
- ▶ Automatic daylight control (photocontrol) (9.4.1.1.e/f) may be required if windows are present.

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

Public Restroom

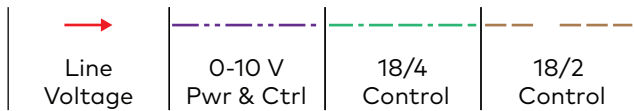
GLPP






ASHRAE 90.1-2016 Code Compliance:

- ▶ Local Control (9.4.1.1.a)
- ▶ Automatic Full Off (9.4.1.1.h)
- ▶ Bi-level Control (0-10v Dimming) (9.4.1.1.d)

Local Control:

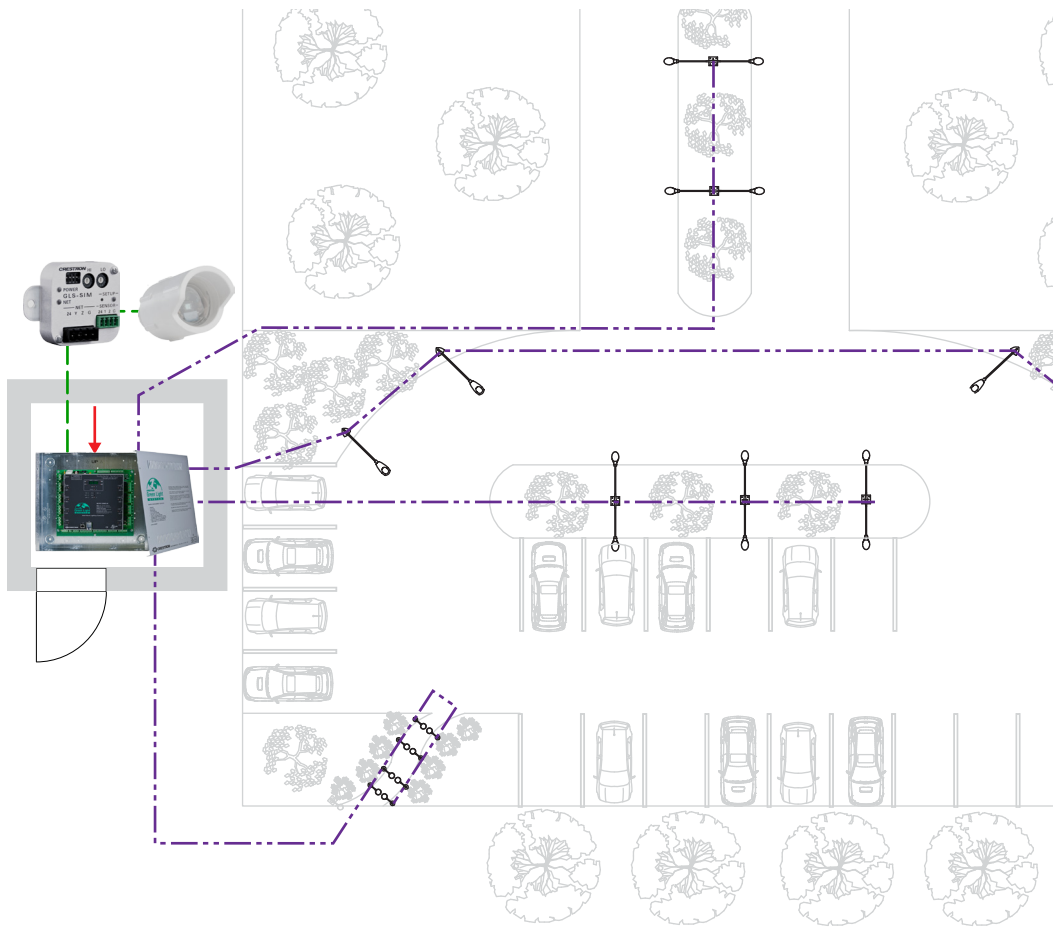


- ▶ Local control (9.4.1.1.a) is optional.
- ▶ Automatic daylight control (photocontrol) (9.4.1.1.e/f) may be required if windows are present.

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

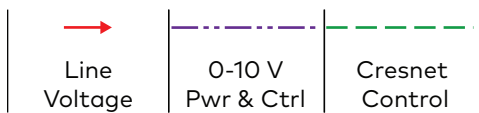
Site Lighting




GLPAC



ASHRAE 90.1-2016 Code Compliance:

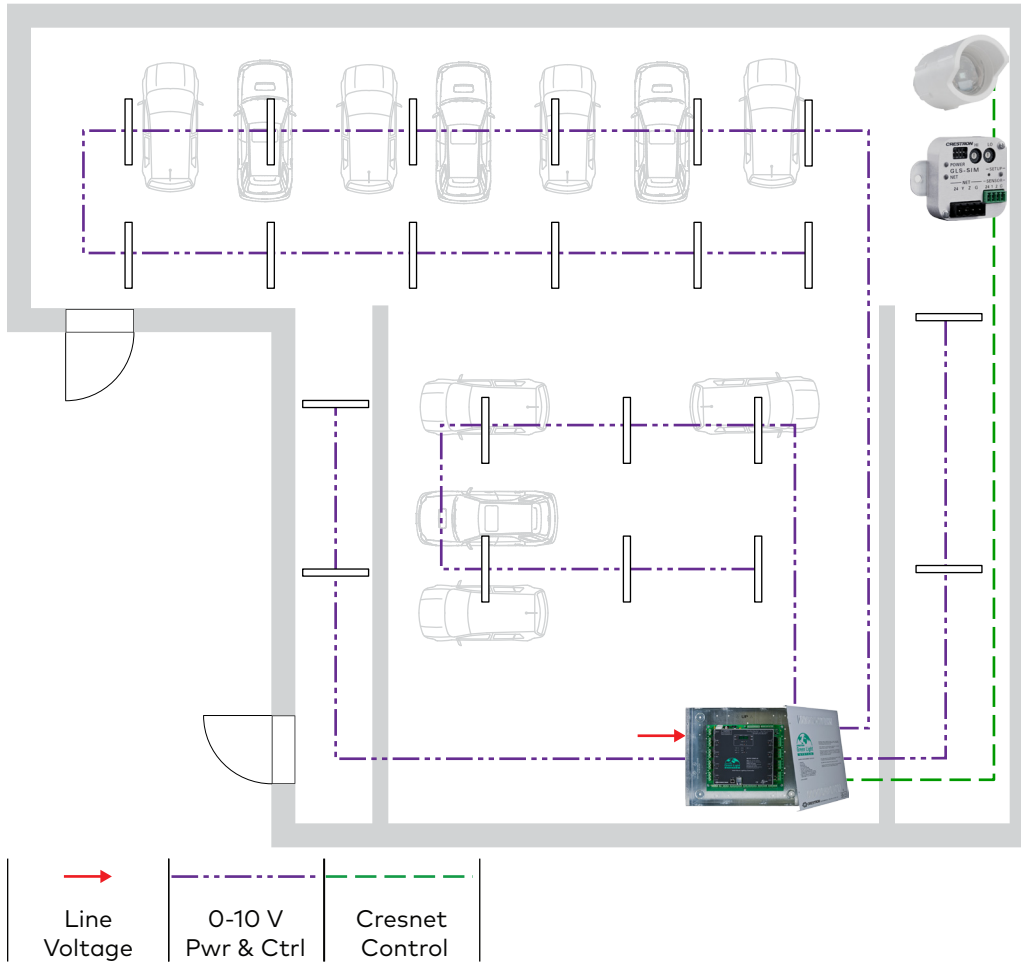
- ▶ Exterior Lighting Control (Timeclock, Photocontrol) (9.4.1.4)



Symbol	Qty.	Product	Description
	1	GLPAC-DIMFLV4	Green Light Integrated Lighting System, 4-Channel
	1	GLS-LEXT	Crestron Green Light® Photosensor, Outdoor
	1	GLS-SIM	Crestron Green Light® Sensor Integration Module




Parking Garage

GLPAC

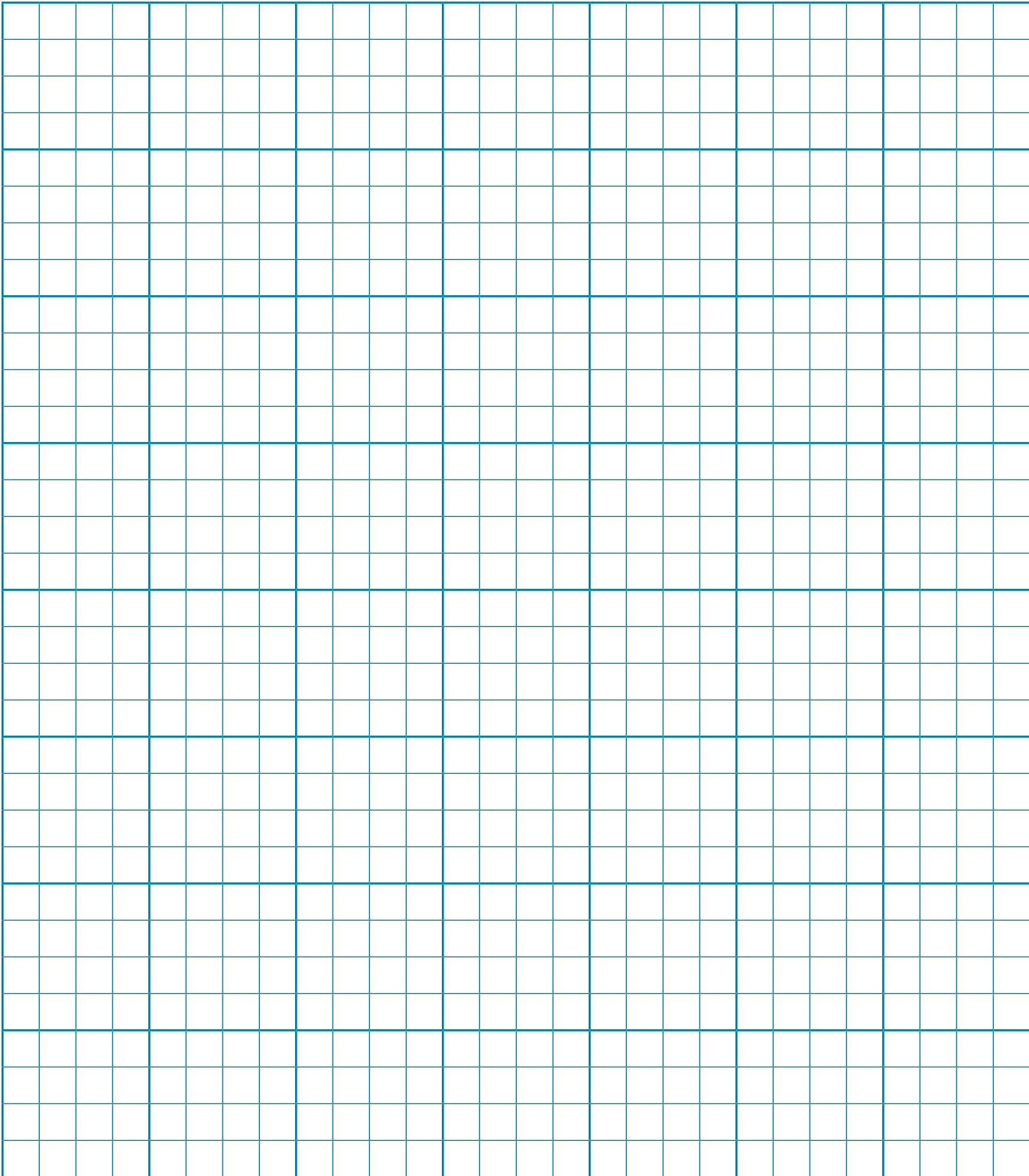


ASHRAE 90.1-2016 Code Compliance:

- ▶ Automatic Vacancy Dimming (9.4.1.2.b)
- ▶ Automatic Sunrise / Sunset Dimming (9.4.1.2.c)

Symbol	Qty.	Product	Description
	1	GLPAC-DIMFLV4	Green Light Integrated Lighting System, 4-Channel
	1	GLS-SIM	Crestron Green Light® Sensor Integration Module
	1	GLS-LEXT	Crestron Green Light® Photosensor, Outdoor

Notes



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