UNISON ECHO®

Title 24-2016 Application Guide

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ETC®

About ETC

ETC is a global leader in the manufacture of award-winning lighting-control systems, backed by our renowned 24/7/365 support. ETC offers complete solutions for any indoor or outdoor application, including office buildings, houses of worship, retail spaces, hospitality, and more. Our products lines include all the equipment necessary to meet stringent environmental codes, including occupancy and vacancy sensors, dual tech sensors, atomic and daytime clocks, centralized and distributed systems, wired and wireless controls, LED fixtures, power-control systems, and emergency lighting.

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About Title 24

Title 24, California's energy code, lays down stringent requirements for new buildings in the state. The rigorous standards are developed with an eye towards increasing energy efficiency as well as reducing environmental impact. To comply with the code designers need to incorporate the use of advanced lighting controls like daylight and occupancy/vacancy sensors as well as multi-level control demand response capability. In order to continue to reap the benefits of conservation, California updates Title 24 every three years.

About this guide

ETC developed this guide as a way to help designers quickly and easily create systems that fulfill all the requirements of Title 24. Its illustrations are meant to be a useful reference guide to standard ETC installations that designers can use as templates to help their project reach compliance. Designers, engineers and contractors can also take advantage of ETC's world-renowned customer service to receive help and guidance no matter what stage the product is in: design, submittal, or installation. To find out more, please contact your local ETC representative.

About Echo

The Unison Echo® control system offers flexible, scalable, and environmentally-friendly control – simply. Echo's intelligent daylight and occupancy/vacancy sensors easily control lighting output while its topology free, two-wire infrastructure means it's easy to install anywhere and adhere to your budget. Simple and powerful, Unison Echo ensures you get the most from a system with the least amount of hassle.

CODE REQUIREMENTS for common building spaces

	Control Requirement	Code Provision	Space Type							
			Office <250 sq. ft.	Open Office >250 sq. ft.	Conference, Meeting, Multiuse Room	Classroom, Lecture Hall, Training Room	Stairwell	Lobby	Restroom	Corridor
On-Off Control	Local Override Switch	130.1(a)	✓	✓	✓	✓	✓	✓	✓	✓
	Programmable Timeclock	130.1(c)1		✓ or			✓ or	✓ or	✓ or	✓ or
	Automatic Full-Off via Occupancy Sensor	130.1(c)5	✓	✓	✓	✓	✓	✓	✓	✓
	Automatic Partial-Off via Occupancy Sensor	130.1(c)6 & 7					✓			✓
Light Level Control	Multi-Level Lighting Controls	130.1(b)	✓	✓	✓	✓	✓	✓	✓	✓
	Automatic Multi-Level Daylight Controls	130.1(d)	✓	✓	✓	✓	✓	✓	✓	✓
Additional Controls	Demand Response (buildings larger than 10,000 sq.ft.)	130.1(e)	✓	✓	✓	✓	✓	✓	✓	✓
	Receptacle (i.e., Plug Load Control)	130.5(d)	✓	✓	✓	✓		✓		

OFFICE: < 250 sq. ft., no Windows, 0-10V Dimming Fixtures

SUPPORTS THE FOLLOWING REQUIREMENTS:

- Local Switch (Section 130.1[a])
- Multi-Level Lighting (Dimming) Control (Section 130.1[b])
- Automatic Full-Off via Occupancy Sensors (Section 130.1[c])
- Plug-Load Control (Section 130.5[d])
- Automatic Demand Response (ADR) ready (Section 130.1[e])

OPERATION DETAILS:

Lights:
- All lights are dimmable
- All fixtures controlled together
- Maximum level can be limited (i.e., task tuned) to 80%

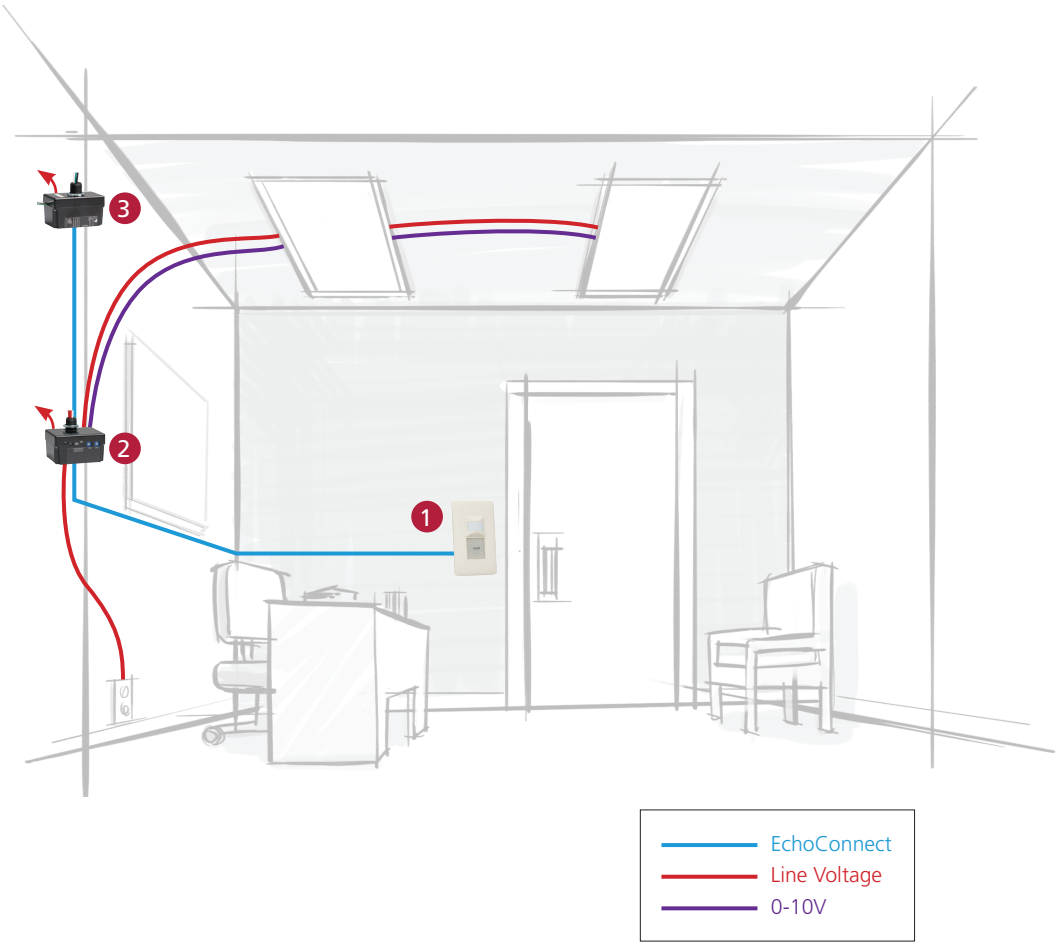
Occupancy Control:
- Partial-On: Occupancy Sensors automatically activate between 50-70 percent of controlled lighting power or fixtures must be turned on manually
- Plug-load turns on automatically with occupancy
- Lights and plug-load turn off when room becomes vacant

Daylight Control:
- Not required for rooms with < 24 sq. ft. of glazing or lighting load < 120W, in the skylit and the sidelit daylit zone

Manual Control:
- On/off & raise/lower control of lights

ADDITIONAL OPTIONS

- Echo Dual Tech sensors are available in wall-, ceiling-, and switch-mount options
- Echo dimming controllers support manual-on, auto-on, and 50%-on from a single model
- Unison Echo supports seamless connection to Paradigm control systems for facility-wide control and monitoring.
- A complete range of UL924 and UL1008 emergency solutions are available
- Occupancy sensors support HVAC integrations using interfaces as required



BILL OF MATERIALS

PRODUCT	QTY	MODEL NUMBER	DESCRIPTION
1 	1	E-DOC-SM_	Echo Dual Tech Switch-Mount Sensor
2 	1	EDLD	Echo Dual-Channel 0-10V Controller
3 	1	E-SPS	Echo Station Power Supply

OFFICE: < 250 sq. ft., Windows, 0-10V Dimming Fixtures

SUPPORTS THE FOLLOWING REQUIREMENTS:

- Local Switch (Section 130.1[a])
- Multi-Level Lighting (Dimming) Control (Section 130.1[b])
- Automatic Full-Off via Occupancy Sensors (Section 130.1[c])
- Areas with less than 120W in the primary Daylight zone do not require automatic daylight harvesting (Section 130.1[d])
- Plug-Load Control (Section 130.5[d])
- Automatic Demand Response (ADR) ready (Section 130.1[e])

OPERATION DETAILS:

Lights:
- All lights are dimmable
- All lights can be controlled together
- Maximum level can be limited (i.e., task tuned) to 80%

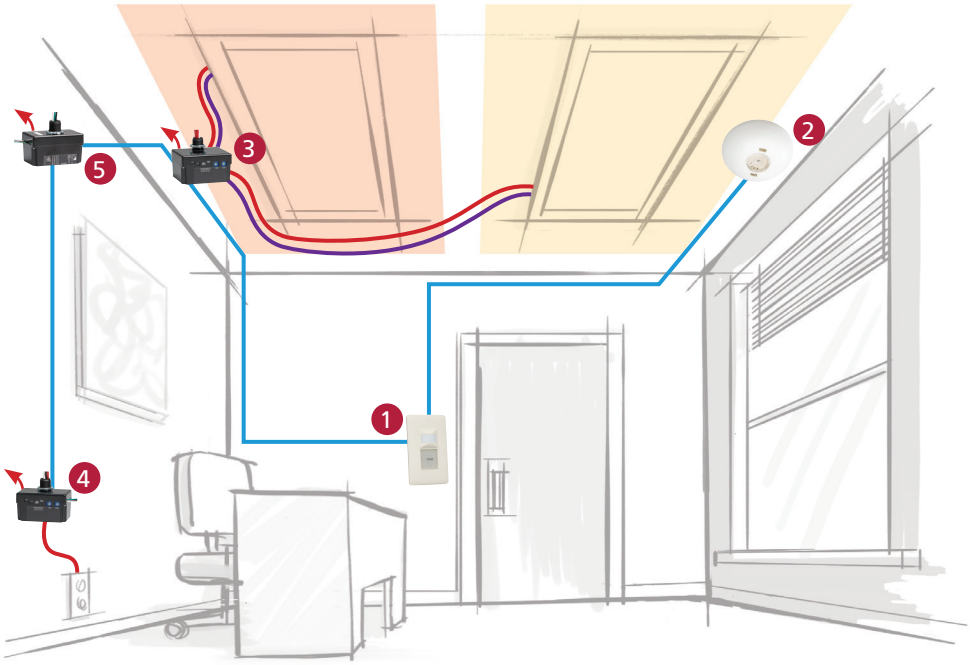
Occupancy Control:
- Partial-On: Occupancy Sensors automatically activate between 50-70 percent of controlled lighting power or fixtures must be turned on manually
- Plug-load turns on automatically
- Lights and plug-load automatically turn off when room becomes vacant

Daylight Control:
- Continuous dimming daylight harvesting
- Not required if room has < 24 sq. ft. of glazing or general lighting load < 120W, in the skylit and the sidelit daylit zone

Manual Control:
- On/off & raise/lower control of lights

ADDITIONAL OPTIONS

- Echo Dual Tech sensors are available in wall-, ceiling-, and switch-mount options
- Echo dimming controllers support manual-on, auto-on, and 50%-on from a single model
- Unison Echo supports seamless connection to Paradigm control systems for facility-wide control and monitoring
- A complete range of UL924 and UL1008 emergency solutions are available
- Occupancy sensors support HVAC integrations using interfaces as required



Primary Daylight Zone
Secondary Daylight Zone

EchoConnect
Line Voltage
0-10V

BILL OF MATERIALS

PRODUCT	QTY	MODEL NUMBER	DESCRIPTION
1 	1	E-DOC-SM_	Echo Dual Tech Switch-Mount Sensor
2 	1	ELS	Echo Ceiling-Mount Light Sensor
3 	1	EDLD	Echo Dual-Channel 0-10V Controller
4 	1	ERC	Echo Single-Zone Relay Controller
5 	1	E-SPS	Echo Station Power Supply

OPEN OFFICE: 0-10V Dimming Fixtures

SUPPORTS THE FOLLOWING REQUIREMENTS:

- Local Switch (Section 130.1[a])
- Multi-Level Lighting (Dimming) Control (Section 130.1[b])
- Automatic Full-Off via Occupancy Sensors (Section 130.1[c])
- Areas with less than 120W in the primary Daylight zone do not require automatic daylight harvesting (Section 130.1[d])
- Plug-Load Control (Section 130.5[d])
- Automatic Demand Response (ADR) ready (Section 130.1[e])

OPERATION DETAILS:

Lights:
- All lights are dimmable
- Support for individual fixture control
- Maximum level can be limited (i.e., task tuned) to 80%
- Optional automatic lumen maintenance

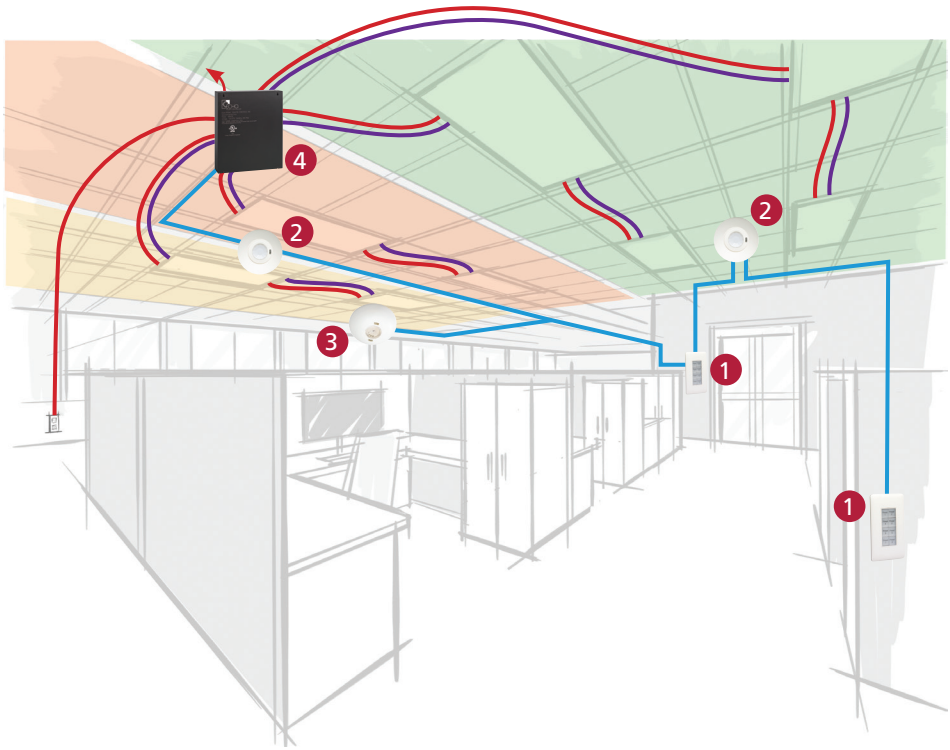
Occupancy Control:
- Plug-load turns on automatically
- Lights and plug-load automatically turn off when room becomes vacant

Daylight Control:
- Smooth continuous dimming
- Custom grouping of fixtures into separate daylight zones (max. number of zones = number of fixtures)

Manual Control:
- Master on/off & raise/lower control of entire room
- Individual row control

ADDITIONAL OPTIONS

- Echo Dual Tech sensors are available in wall-, ceiling-, and switch-mount options
- Echo dimming controllers support manual-on, auto-on, and 50%-on from a single model
- Unison Echo supports seamless connection to Paradigm control systems for facility-wide control and monitoring
- Occupancy sensors support HVAC integrations using interfaces as required
- A complete range of UL924 and UL1008 emergency solutions are available



Primary Daylight Zone
Secondary Daylight Zone
General Lighting

EchoConnect
Line Voltage
0-10V

BILL OF MATERIALS

PRODUCT	QTY	MODEL NUMBER	DESCRIPTION
1 	2	E100_	Echo Inspire Button Control Station
2 	2	E-DVAC-C	Echo Dual Tech Ceiling-Mount Vacancy Sensor
3 	1	ELS	Echo Ceiling-Mount Light Sensor
4 	1	ERMC8	Echo Room Controller

CONFERENCE ROOM: 0-10V Fixtures

SUPPORTS THE FOLLOWING REQUIREMENTS:

- Local Switch (Section 130.1[a])
- Multi-Level Lighting (Dimming) Control (Section 130.1[b])
- Automatic Full-Off via Occupancy Sensors (Section 130.1[c])
- Areas with less than 120W in the primary Daylight zone do not require automatic daylight harvesting (Section 130.1[d])
- Plug-Load Control (Section 130.5[d])
- Automatic Demand Response (ADR) ready (Section 130.1[e])

OPERATION DETAILS:

Lights:

- All lights are dimmable
- Each row controlled independently
- Maximum level can be limited (i.e., task tuned) to 80%
- Optional automatic lumen compensation

Occupancy Control:

- Partial-On: Occupancy Sensors automatically activate between 50-70 percent of controlled lighting power or fixtures must be turned on manually
- Plug-load turns on automatically
- Lights and plug-load automatically turn off when room becomes vacant

Daylight Control:

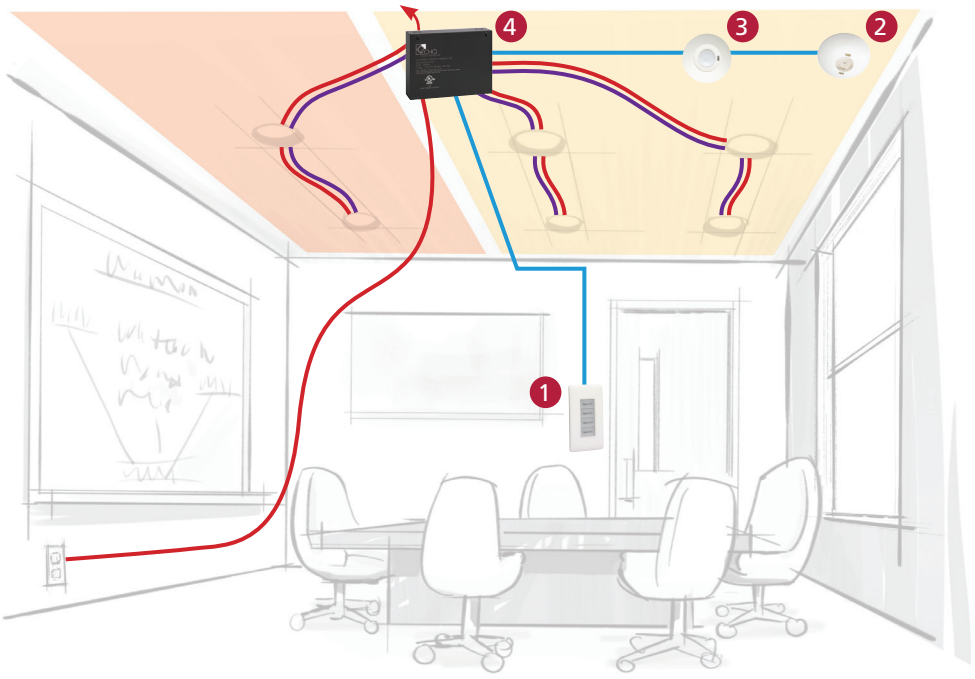
- Smooth continuous dimming
- Daylight zones defined by rows
- Not required if room has < 24 sq. ft. of glazing or lighting loads < 120W, in the skylit and the sidelit daylit zone

Manual Control:

- On/off & raise/lower control of each row of lights

ADDITIONAL OPTIONS

- Echo Dual Tech sensors are available in wall-, ceiling-, and switch-mount options
- Echo dimming controllers support manual-on, auto-on, and 50%-on from a single model
- Unison Echo supports seamless connection to Paradigm control systems for facility-wide control and monitoring
- A complete range of UL924 and UL1008 emergency solutions are available
- Occupancy sensors support HVAC integrations using interfaces as required



BILL OF MATERIALS

PRODUCT	QTY	MODEL NUMBER	DESCRIPTION
1 	1	E1004	Echo Inspire 4-Button Control Station
2 	1	ELS	Echo Ceiling-Mount Light Sensor
3 	1	E-DVAC-C	Echo Dual Tech Ceiling-Mount Vacancy Sensor
4 	1	ERMC4	Echo Room Controller

CLASSROOM: 0-10V Dimming Fixtures (Distributed Relays)

SUPPORTS THE FOLLOWING REQUIREMENTS:

- Local Switch (Section 130.1[a])
- Multi-Level Lighting (Dimming) Control (Section 130.1[b])
- Automatic Full-Off via Occupancy Sensors (Section 130.1[c])
- Areas with less than 120W in the primary Daylight zone do not require automatic daylight harvesting (Section 130.1[d])
- Automatic Demand Response (ADR) ready (Section 130.1[e])

OPERATION DETAILS:

Lights:
- All lights are dimmable
- Each row controlled independently
- Maximum level can be limited (i.e., task tuned) to 80%

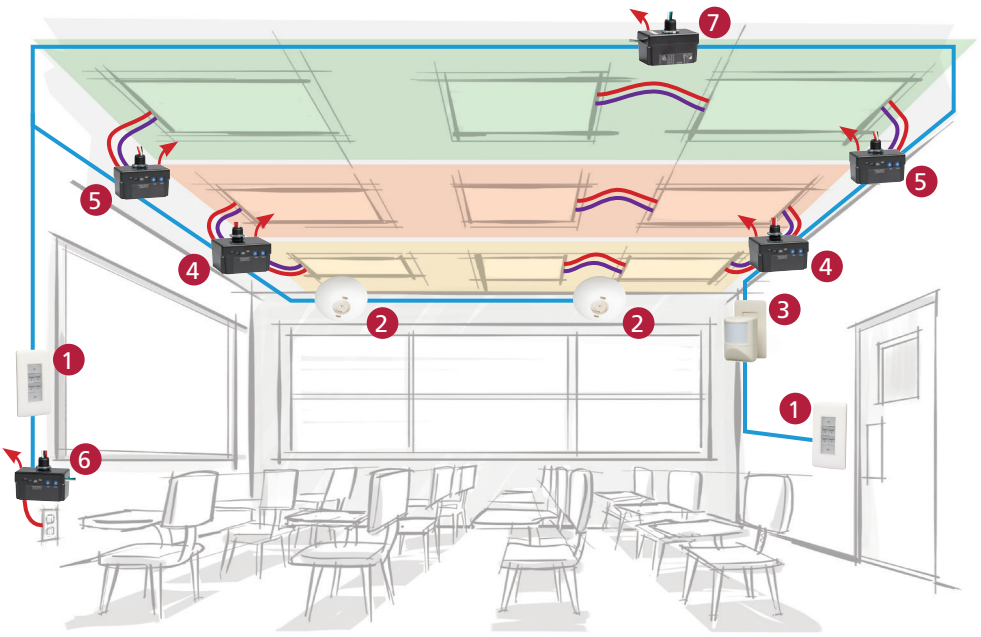
Occupancy Control:
- Partial-On: Occupancy Sensors automatically activate between 50-70 percent of controlled lighting power or fixtures must be turned on manually
- Lights automatically turn off when room becomes vacant

Daylight Control:
- Provides up to three daylight zones, each controlled independently

Manual Control:
- Master on/off & raise/lower control of entire room
- Optional scene control

ADDITIONAL OPTIONS

- Echo Dual Tech sensors are available in wall-, ceiling-, and switch-mount options
- Echo dimming controllers support manual-on, auto-on, and 50%-on from a single model
- Unison Echo supports seamless connection to Paradigm control systems for facility-wide control and monitoring
- Occupancy sensors support HVAC integrations using interfaces as required
- A complete range of UL924 and UL1008 emergency solutions are available



BILL OF MATERIALS

PRODUCT	QTY	MODEL NUMBER	DESCRIPTION
1 	2	E1006	Echo Inspire 6-Button Control Station
2 	2	ELS	Echo Ceiling-Mount Light Sensor
3 	1	E-DVAC-W	Echo Dual Tech Wall-Mount Vacancy Sensor
4 	2	EDLD	Echo Dual-Channel 0-10V Controller
5 	2	ELD	Echo Single-Channel 0-10V Controller
6 	1	ERC	Echo Single-Zone Relay Controller
7 	1	E-SPS	Echo Station Power Supply

SUPPORTS THE FOLLOWING REQUIREMENTS:

- Automatic Full-Off via Occupancy Sensors (Section 130.1[c])
- Automatic Off via Programmable Timeclock (see pg. 16) (Section 130.1[c])
- Automatic Demand Response (ADR) ready (Section 130.1[e])

OPERATION DETAILS:

Lights:
- All lights are dimmable
- Maximum level can be limited (i.e., task tuned) to 80%
- Auto-Off Control: Lights automatically turn off when the space becomes vacant or can be shut-off via timeclock (see pg. 16 for programmable timeclock)

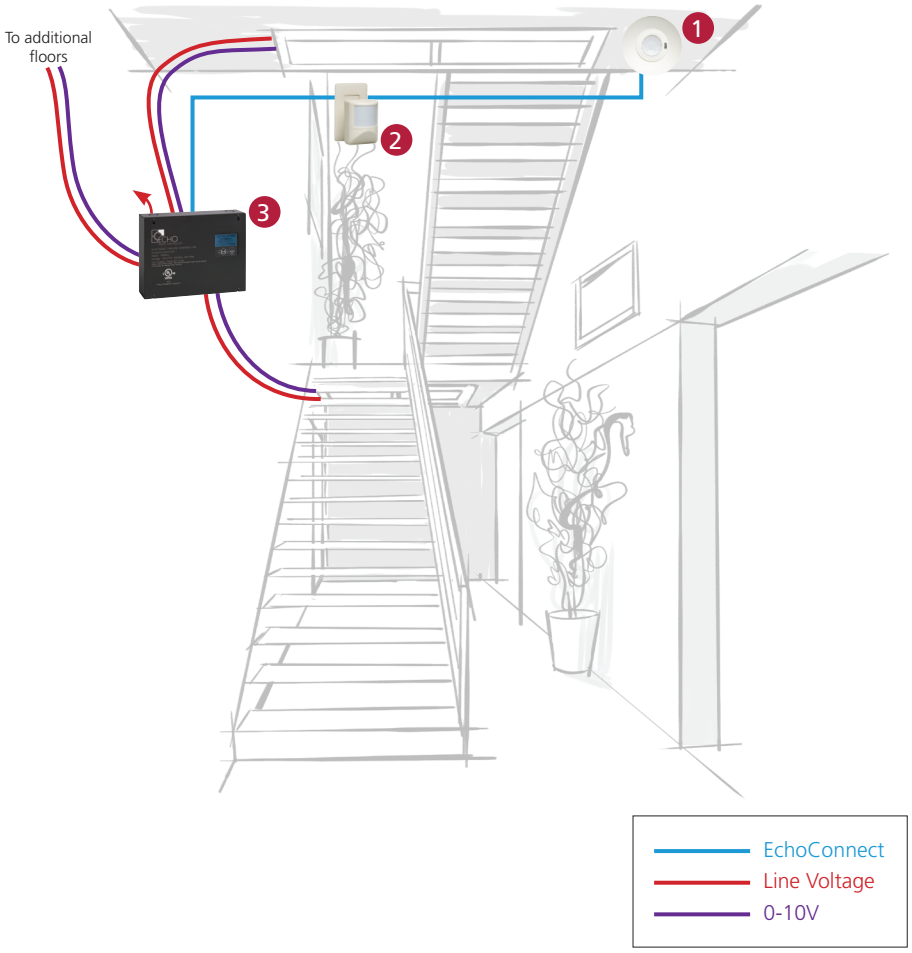
Occupancy Control:
- Lights automatically turn on to full when occupant enters
- Lights automatically drop to 50% (or lower) when space becomes vacant

Daylight Control:
- Not required unless room has > 24 sq. ft. of glazing and lighting load > 120W, in the skylit and the sidelit daylit zone

Manual Control:
- Master on/off

ADDITIONAL OPTIONS

- Echo Dual Tech sensors are available in wall-, ceiling-, and switch-mount options
- Time-based control available via TimeClock (see pg. 16 for more info).
- Unison Echo supports seamless connection to Paradigm control systems for facility-wide control and monitoring
- A complete range of UL924 and UL1008 emergency solutions are available
- Occupancy sensors support HVAC integrations using interfaces as required



BILL OF MATERIALS

PRODUCT	QTY	MODEL NUMBER	DESCRIPTION
1 	1	E-DVAC-C	Echo Dual Tech Ceiling-Mount Vacancy Sensor
2 	1	E-DVAC-W	Echo Dual Tech Wall-Mount Vacancy Sensor
3 	1	ERMC4-TC	Echo Room Controller with TimeClock

LOBBY: 0-10V Dimming Fixtures

SUPPORTS THE FOLLOWING REQUIREMENTS:

- Local Switch (Section 130.1[a])
- Multi-Level Lighting (Dimming) Control (Section 130.1[b])
- Automatic Full-Off via Occupancy Sensors (Section 130.1[c])
- Plug-Load Control (Section 130.5[d])
- Automatic Demand Response (ADR) ready (Section 130.1[e])

OPERATION DETAILS:

Lights:
- All lights are dimmable
- All lights are controlled together
- Maximum level can be limited (i.e., task tuned) to 80%

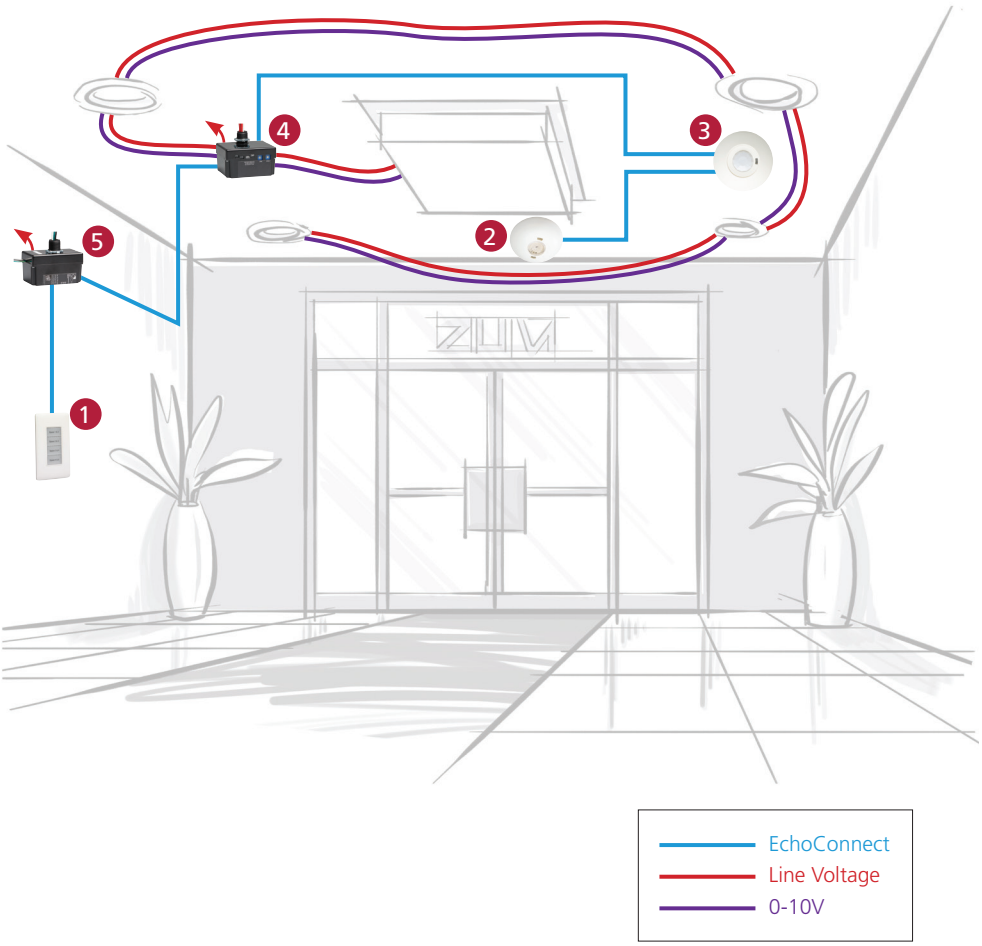
Occupancy Control:
- Lights automatically turn on to full when occupant enters (recommended), or optionally can be configured to manual on or to come on automatically to 50%
- Lights automatically turn off when room becomes vacant

Daylight Control:
- Smooth continuous dimming
- Daylight zones defined by rows
- Not required if space has < 24 sq. ft. of glazing or lighting loads < 120W, in the skylit and the sidelit daylit zone

Manual Control:
- Master on/off & raise/lower control of entire space

ADDITIONAL OPTIONS

- Echo Dual Tech sensors are available in wall-, ceiling-, and switch-mount options
- Echo dimming controllers support manual-on, auto-on, and 50%-on from a single model
- Unison Echo supports seamless connection to Paradigm control systems for facility-wide control and monitoring
- A complete range of UL924 and UL1008 emergency solutions are available
- Occupancy sensors support HVAC integrations using interfaces as required



BILL OF MATERIALS

PRODUCT	QTY	MODEL NUMBER	DESCRIPTION
1 	1	E1004	Echo Inspire 4-Button Control Station
2 	1	ELS	Echo Ceiling-Mount Light Sensor
3 	1	E-DOC-C	Echo Dual Tech Ceiling-Mount Occupancy Sensor
4 	1	EDLD	Echo Dual-Channel 0-10V Controller
5 	1	E-SPS	Echo Station Power Supply

SUPPORTS THE FOLLOWING REQUIREMENTS:

- Local Switch (Section 130.1[a])
- Automatic Full-Off via Occupancy Sensors (Section 130.1[c])

OPERATION DETAILS:

Lights:
- Light(s) on/off switched only
- Multi-level (dimming) required if >100 sq. ft. and > 1 fixture

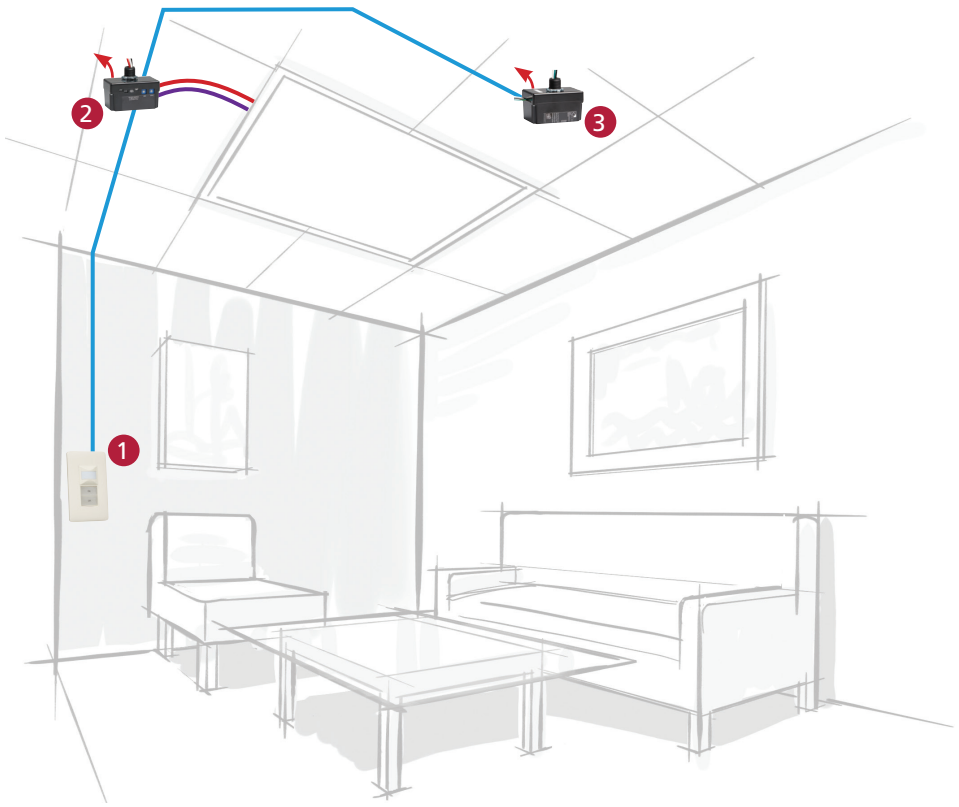
Occupancy Control:
- Lights automatically turn on to full when occupant enters (recommended), or optionally can be configured to manual on
- Lights automatically turn off when room becomes vacant

Daylight Control:
- Not required unless room has > 24 sq. ft. of glazing and total lighting load > 120W, in the skylit and the sidelit daylit zone

Manual Control:
- Master on/off control

ADDITIONAL OPTIONS

- Echo Dual Tech sensors are available in wall-, ceiling-, and switch-mount options
- Echo dimming controllers support manual-on, auto-on, and 50%-on from a single model
- Unison Echo supports seamless connection to Paradigm control systems for facility-wide control and monitoring
- A complete range of UL924 and UL1008 emergency solutions are available
- Occupancy sensors support HVAC integrations using interfaces as required



BILL OF MATERIALS

PRODUCT	QTY	MODEL NUMBER	DESCRIPTION
1 	1	E-DOC-SM2	Echo Dual Tech Switch-Mount Sensor
2 	1	ELD	Echo Single-Channel 0-10V Dimmer
3 	1	E-SPS	Echo Station Power Supply

PUBLIC RESTROOM: 0-10V Dimming Fixtures

SUPPORTS THE FOLLOWING REQUIREMENTS:

- Local Switch (Section 130.1[a])*
- Multi-Level Lighting (Dimming) Control (Section 130.1[b])
- Automatic Full-Off via Occupancy Sensors (Section 130.1[c])

** Local switch can be inaccessible to the public*

OPERATION DETAILS:

Lights:
- All lights are dimmable
- All lights are controlled together (per room)
- Maximum level can be limited (i.e., task tuned) to 80%

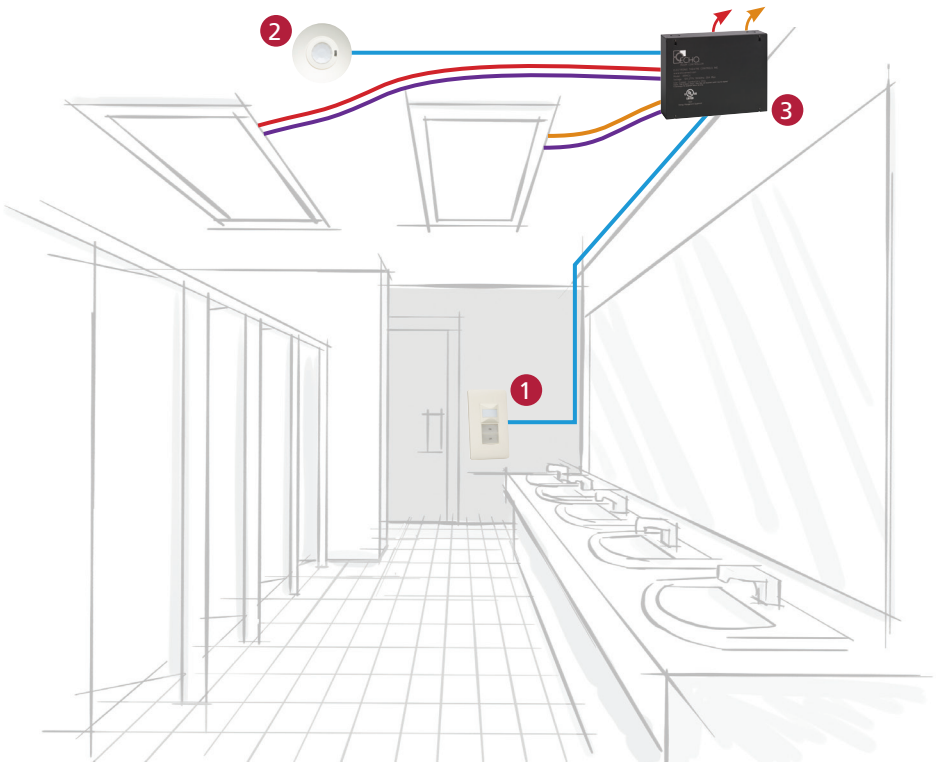
Occupancy Control:
- Lights automatically turn on to full when occupant enters (recommended), or optionally can be configured to manual on or to come on automatically to 50%
- Lights automatically turn off when room becomes vacant

Daylight Control:
- Not required unless room has > 24 sq. ft. of glazing and total lighting load > 120W, in the skylit and the sidelit daylit zone

Manual Control:
- Master on/off control & raise/lower control

ADDITIONAL OPTIONS

- Echo Dual Tech sensors are available in wall-, ceiling-, and switch-mount options
- Echo dimming controllers support manual-on, auto-on, and 50%-on from a single model
- Unison Echo supports seamless connection to Paradigm control systems for facility-wide control and monitoring
- A complete range of UL924 and UL1008 emergency solutions are available
- Occupancy sensors support HVAC integrations using interfaces as required



BILL OF MATERIALS

PRODUCT	QTY	MODEL NUMBER	DESCRIPTION
1 	1	E-DOC-SM2	Echo Dual Tech Switch-Mount Sensor
2 	1	E-DVAC-C	Echo Dual Tech Ceiling-Mount Vacancy Sensor
3 	1	ERMC4	Echo Room Controller

SUPPORTS THE FOLLOWING REQUIREMENTS:

- Local Switch (Section 130.1[a])
- Automatic Full-Off via Occupancy Sensors (Section 130.1[c])
- Automatic Off via Programmable Timeclock (see pg. 16) (Section 130.1[c])

OPERATION DETAILS:

Lights:
- All lights are dimmable
- All fixtures controlled together
- Maximum level can be limited (i.e., task tuned) to 80%
- Auto-Off Control: Lights automatically turn off when the space becomes vacant or can be shut-off via timeclock (see pg. 16 for programmable timeclock)

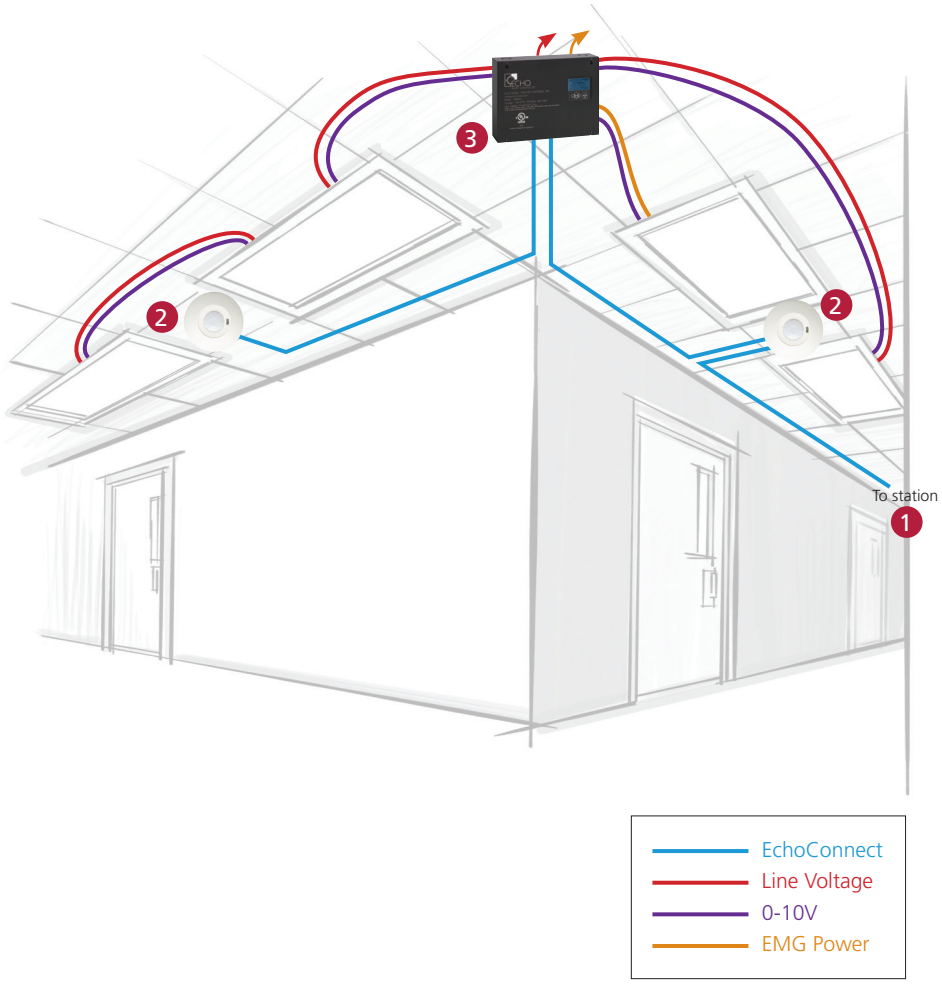
Occupancy Control:
- Lights automatically turn fully on when occupant enters
- Lights automatically drop to 50% (or lower) when space becomes vacant

Daylight Control:
- Not required unless space has > 24 sq. ft. of glazing and lighting load > 120W, in the skylit and the sidelit daylit zone

Manual Control:
- Master on/off

ADDITIONAL OPTIONS

- Echo Dual Tech sensors are available in wall-, ceiling-, and switch-mount options
- Time-based control available via TimeClock (see pg. 16 for more info).
- Unison Echo supports seamless connection to Paradigm control systems for facility-wide control and monitoring
- A complete range of UL924 and UL1008 emergency solutions are available
- Lights automatically dropping to 50% (or lower) when the space becomes vacant with automatic shut-off via a timeclock is also code compliant. More info on the Echo TimeClock on pg. 16
- Occupancy sensors support HVAC integrations using interfaces as required



BILL OF MATERIALS

PRODUCT	QTY	MODEL NUMBER	DESCRIPTION
1 	1	E1001	Echo Inspire 1-Button Control Station
2 	2	E-DOC-C	Echo Dual Tech Ceiling-Mount Occupancy Sensor
3 	1	ERMC4-TC	Echo Room Controller with TimeClock

ADVANCED UNISON ECHO CONTROL OPTIONS

PROGRAMMABLE TIMECLOCK CONTROL

Although not included in each of the room design risers, every Echo Zone can be controlled with a TimeClock, assuring your system meets the requirements of CA Title 24 automatic time-switch and demand response provisions (Sections 130.1(c)1 and 130.1(e), respectively. The Echo TimeClock offers time-of-day and astronomical control as well as manual control via hold, override and event-recurrence modes, like "everyday," "weekday," "weekend," and "daily," as well as fully-configurable Daylight Saving Time, holiday schedules and special-event override.

ECHOACCESS™ APP

EchoAccess releases the full potential of your Echo system, offering custom control and configuration from an iOS or Android™ smartphone. The app connects to your Echo network via a Bluetooth connection with the EchoAccess interface.

In the app, users can set lighting levels, combine spaces, and control zones directly – as well as record, activate and deactivate presets, plus much more. Add an Echo DMX Scene Controller to your system, and the EchoAccess app can adjust DMX-controlled luminaires' hue, saturation, and intensity.

EchoAccess connects to any Echo system via the simple, two-wire Echo bus, and melds neatly in your design using the same stylish Inspire® faceplates.

ECHO RELAY PANEL MAINS FEED

The Echo Relay Panel Mains Feed features relay and line dimming control, switching with integral breakers, and options for low-voltage control. Its built-in power supply supports up to six stations and six power controllers.

- Supports 10A, 15A, or 20A breakers
- 28 circuit panel with support for 24 relays/ dimmers and 4 hot circuits
- 20A mechanically-held air-gap relays
- Optional 300-watt dimmer available per circuit
- Optional 0-10V or DALI output
- Optional network interface
- Astronomical and Real-time clock

ECHO RELAY PANEL FEEDTHROUGH

The Echo Relay Panel Feedthrough offers creative power distribution for all load types with relay switching for multiple voltages in a single panel. Its built-in power supply supports up to six stations and power controllers.

- 120V and 277V power control
- Up to 48 relay outputs
- Optional 0-10V or DALI output
- Astronomical and Real-time clock

SENSOR IQ INTELLIGENT BREAKER PANEL

The Sensor IQ Intelligent Breaker Panel is a 120V mains-fed power panel that provides switching, 0-10V dimming, and DALI control.

- Relay control for one-, two-, and three-pole circuits
- Supports 15- and 30-amp breakers
- 12, 24, or 48 circuits panel options
- Direct connection for up to six Zone and Room Controllers and six Inspire Stations or Responsive Controls
- 120V or 277V options available
- Astronomical and Real-time clock

APPENDIX: Requirements Overview

	Control Requirement	Code Provision	Code Summary	Recommendations for Compliance
On-Off Control	Area Control	130.1(a)	All lighting within an enclosed space requires readily accessible manually switched or dimmed lighting controls.	All room system designs should include manual control switches or stations.
	Programmable Timeclock	130.1(c) 1	All installed indoor lighting requires automated control via timeclock or occupancy sensors that are capable of shutting off all lighting when a space is typically unoccupied.	TimeClocks maximize energy efficiency by supporting astronomical, real-time and manual control events across multiple spaces from a single device.
	Automatic Full-Off via Sensor	130.1(c) 5	Spaces vacant for more than 30 minutes (maximum) require automatic shut off of lighting via occupancy or vacancy sensor.	Use vacancy sensors in all spaces.
	Automatic Partial-Off via Sensor	130.1(c)6 & 7	Spaces vacant for more than 30 minutes (maximum) require automatic reduction of power consumption by at least 50%.	Use sensors in all designs and sensors in all applications with configuration to set dimmed fixtures to 50% on vacancy.
Light Level Control	Multi-Level / Dimming Controls	130.1(b)	Enclosed spaces 100 square feet or larger are required to be controllable through a minimum number of control steps based on the type of lighting load. Spaces with a lighting power density of .5W/sq. ft. are exempt.	Use continuously dimmable LED fixtures and manual dimming controls.
	Multi-Level Daylight Controls	130.1(d)	Daylight-responsive controls with a minimum number of steps are required in daylight zones. Zones with less than 24 sq.ft. of glazing or total lighting loads of less than 120 watts within the daylight zones are exempt.	Use light sensors and continuously dimmable fixtures in all daylit spaces.
Additional Controls	Receptacle (i.e. Plug Load Control)	130.5(d)	120V circuits feeding controlled receptacles shall be equipped with automatic shut-off controls when area is not occupied.	Implement properly-rated relay controllers to switch applicable plug loads.

	ETC Product Solutions	
	Inspire Control Stations	Preset Stations
		
	Inspire stations can be easily programmed for preset lighting looks and offer the capability of setting zone- and space-combine functions. They can be installed anywhere they're needed throughout a space, for maximum convenience.	Echo Preset Stations - available in two sizes and a variety of colors - provide easy access to lighting scenes with just the simple touch of a button.
	TimeClock	
		
	Echo TimeClock features an intuitive six-button interface and large backlit display that allow for simple set-it-and-forget-it operation. In addition to time based events, manual control via hold, override and event-recurrence modes, like "everyday," "weekday," "weekend," and "daily," as well as fully-configurable Daylight Saving Time, holiday schedules and special-event override make the TimeClock station adaptable to any application.	
	Echo PIR Vacancy Sensors	Dual Tech Occupancy/Vacancy Sensors
		
	Vacancy Sensors use passive infrared detection to ensure lights automatically turn off when a space is empty, in areas up to 2,000 square feet.	Dual Tech Sensors couple passive infrared (PIR) detection with acoustic detection to insure a space is empty before turning off lights. Dual Tech Sensors offer ceiling-, wall-, or switch-mount installation.
	Phase-Adaptive Dimmer	Relay Controller w/ 0-10V dimming
		
	The Echo Phase-Adaptive Dimmer provides reverse- or forward-phase dimming for loads up to 600 watts. It is compatible with all Echo control products, including daylight and occupancy sensors and manual control stations, providing flexibility and energy savings.	Unison Echo 0-10V Dimming Controllers offer fully-rated 20-amp relays coupled with 0-10V dimming for direct control of compatible LED drivers and fluorescent dimming ballasts. Controllers are available for single- or dual-zone configurations, allowing for added flexibility in your installation.
	Unison Echo Light Sensor	Unison Echo Light Sensor - Remote Head
		
	Unison Echo Light Sensors are able to detect and measure the amount of natural light in an area, and raise or lower the output of lighting fixtures accordingly, to maintain a consistent lighting level. Echo Light Sensors have a single head option for interior, exterior, and atrium use. They also support two-sensor averaging, so if you have a large space, you can locate sensors in different locations to light the entire area evenly. The head of the Sensors can be detached and located apart from the controller, allowing you the most flexibility for your facility.	
	Echo Relay Controller	
		
	All Echo Relay controllers are rated for 20A loads and may be used for lighting or plug load control as required within a project. Offering a single relay option simplifies installation by utilizing a single product across all applications.	

ADDITIONAL RESOURCES

2016 Title 24 Building Energy Efficiency Standards and Related Documents
energy.ca.gov/title24/2016standards
Visit the Energy Commission website to download the 2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings.

Energy Standards Hotline
Toll-free in California: (800) 772-3300
Title24@energy.ca.gov
The Energy Standards Hotline is a resource for any questions regarding the Energy Standards.

California Energy Commission Modernized Appliance Efficiency Database System
cacertappliances.energy.ca.gov/Login.aspx
This online database features Quick Search and Advanced Search options that allow users to easily verify if lighting products have been certified to the Energy Commission as meeting applicable efficiency standards.

Title 20 Appliance Efficiency Regulations
energy.ca.gov/appliances
Energy efficiency and performance standards for appliances, including ballasts, lamps, luminaires, and lighting controls, are detailed in the 2016 Appliance Efficiency Regulations.

Energy Code Ace
energycodeace.com
This site developed by the California Statewide Codes & Standards Program provides free tools, trainings and resources to help users meet the latest Title 24, Part 6 requirements.

California Lighting Technology Center
cltc.ucdavis.edu/ title24
CLTC develops and tests state-of-the-art, energy-saving lighting and daylighting innovations. CLTC also offers training and educational programs on energy-efficient lighting.

Use the following sections of the Title 24 Code as reference:
Section 100.1 – Definitions and rules of construction
Section 110.9 – Mandatory requirements for lighting control devices and systems, ballasts and luminaires
Section 130.0 – Lighting controls and equipment – general
Section 130.1 – Indoor lighting controls that shall be installed
Section 130.2 – Outdoor lighting controls and equipment
Section 130.4 – Lighting control acceptance and installation certificate requirements
Section 130.5 – Electrical power distribution systems
Section 140.3 – Prescriptive requirements for building envelopes
Section 140.6 – Prescriptive requirements for indoor lighting

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