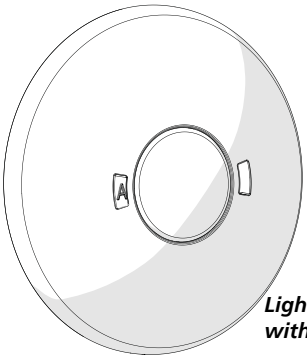
ETC Installation Guide

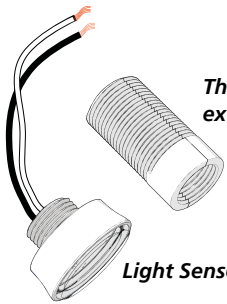
Unison Echo® Light Sensor

Overview

The Echo Light Sensor provides light level measurement and lighting control for the connected Echo control system. The sensor measures lighting conditions to maintain a programmed lighting output in both dimmed and switched systems.



Light Sensor Head with Controller



Thread extender

Light Sensor Head

Light Sensors are available in three models:

- E-LS - Light Sensor head with controller
- E-LSC - Light Sensor controller only
- E-LSH - Light Sensor head only

Each controller supports one or two Light Sensor heads and is available in white or black finish. A Light Sensor head may be installed within the controller or installed remotely, using up to 1,000 feet (304m) of 16 AWG (1.3mm^2) wire per controller. When using a pair of Light Sensor heads, both sensor heads transmit their light readings to a single Light Sensor controller. The controller averages the levels and uses them to control lighting within the space.

Custom Configuration

This document guides you through the installation and local configuration of the Echo Light Sensor. For more detailed information about the custom configuration options available for the Echo Light Sensor using EchoAccess, reference the EchoAccess Mobile App integrated help system.

Note: *To use the configuration settings applied using EchoAccess, DIP switch 2 must be enabled. Reference DIP Switch Settings on page 8.*

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Wire Specification

Controller

The Light Sensor controller utilizes EchoConnect for power and for data communications with an Echo control system.

EchoConnect is a bidirectional protocol that uses one pair of wires (data + and data -) for both data and power. ETC recommends using Belden 8471 (or approved equal) Class II wire. The total combined length of an EchoConnect wire run (using Belden 8471 or equal) may not exceed 1,640 feet (500m).

Note: *All control wiring should be installed and terminated by a qualified installer and should follow standard wiring installation practices.*

Leave approximately 10 inches (25.4cm) of wiring in the back box to allow slack for future service needs.

Note: *ETC requires all Light Sensors be grounded. Pull an additional 14 AWG (1.5mm^2) wire for grounding when control wires are not installed in grounded metal conduit.*

Note: *When using Category5 (or equivalent) cable on the EchoConnect communication bus, please note the following:*

- Not all topologies are supported using Cat5; careful planning is required to ensure the proper termination kits are available and the wire is pulled appropriately.

- Cat5 wiring must be terminated using EchoConnect Cat5 Termination Kit, and it must be installed using a bus topology. Refer to the installation guide provided with the Cat5 Termination Kit (7186A1207) for information to terminate Cat5 wiring.

Remoting the Light Sensor Head

The Light Sensor controller provides termination for up to two remote Light Sensor heads. Each Light Sensor head must be separately wired to the controller using no more than 1000 feet (304m) of 16 AWG (1.3mm^2) wire total per controller. These wire runs must remain separate from EchoConnect wiring. ETC recommends using Belden 8471 (or equivalent) wire.

Installation Environment

The Light Sensor controller is intended for installation to a finished ceiling surface, soft ceiling tile, or attached to a round junction box or single-gang RACO junction box. The controller operates in ambient temperatures of 0°C to 70°C, non-condensing humidity.

The Light Sensor head can be mounted directly into the controller, installed to a 1/2" conduit knockout, or installed into a soft ceiling tile using the provided thread extender. The Light Sensor head can be installed outdoors only when mounted into a weatherproof enclosure. The sensor in this weatherproof installation scenario operates in ambient temperatures of -25°C to 70°C.

Parts and Supplies

The following parts and supplies are included with the specific Light Sensor assembly ordered:

Parts and Supplies	*Light Sensor head with controller (E-LS)*	*Light Sensor head (E-LSH)*	*Light Sensor controller (E-LSC)*
Soft ceiling tile adaptor	*X*		*X*
EchoConnect and ground wire pigtails	*X*		*X*
Light Sensor head thread extender	*X*	*X*	
1 each nuts and washers 3/4" and 1"	*X*	*X*	
2 each screws 6-32 x 3/4" and 1 3/4"	*X*		*X*
Blank sensor head	*X*		*X*

Note: *- Follow all local code requirements for terminating wire.*
- Use appropriately sized wire nuts (not provided) to secure each termination.

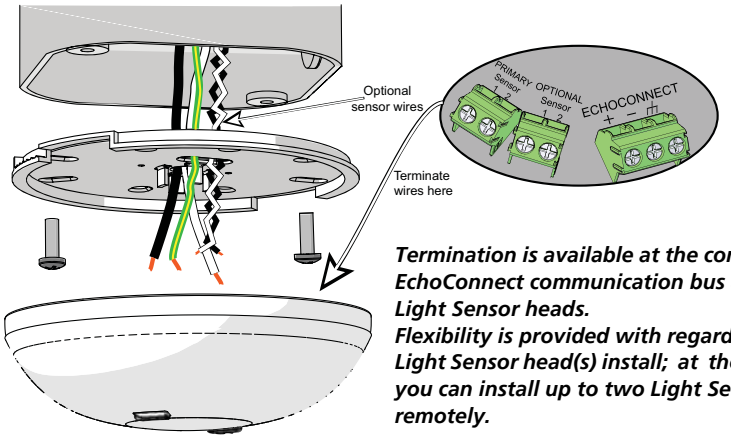
Installation

The Light Sensor controller is provided with a twist-lock mounting plate that can be mounted to a finished ceiling, junction box, or soft ceiling tile. Determine the installation method and follow the specific instructions detailed.

- *Install in Junction Box* on *page 4*
- *Soft Ceiling Tile Installation* on *page 5*
- *Installing Heads Remotely (optional)* on *page 7*

Note: *The EchoConnect pigtail is only required when the sensor and controller are installed in series with other sensors. If you are not continuing the data run, direct termination to the sensor control board is recommended.*

Install in Junction Box



Termination is available at the controller for the EchoConnect communication bus and up to two Light Sensor heads.
Flexibility is provided with regards to how the Light Sensor head(s) install; at the controller, or you can install up to two Light Sensor heads remotely.

Step 1: Pull Belden 8471 (or equivalent) and 14 AWG (2.5mm^2) ground wire to the junction box.

Step 2: ***If you are installing the controller in series*** (continuing the data run) to other sensors, sensor controllers, or stations, use the provided EchoConnect pigtail and ESD ground pigtail to make the terminations. ***If you are not continuing the data run***, the pigtails are not required, proceed to Step 3.

Note: *Primary Sensor and Optional Sensor wires should terminate directly to the terminals located on the controller.* *See "Installing Heads Remotely (optional)" on page 7.*

a: Strip each wire to the appropriate length, depending on the wire nut or other termination used (wire nuts are not provided).

b: Twist the data - (typically black) EchoConnect wire, the black lead from the EchoConnect pigtail, and any continuing EchoConnect (typically black) wire together and secure with the wire nut.

c: Repeat the above steps for the data + (typically white) EchoConnect wires, and for the ESD ground wires.

Step 3: ***If you are installing the Primary and/or Optional (second) Light Sensor Head remotely*** from the controller, reference *Installing Heads Remotely (optional)* on *page 7*, then return to these instructions. If you are not remoting a Light Sensor Head, proceed to Step 4.

Step 4: Orient the smooth side of the mounting plate to the junction box. Pull the following wires from the junction box through the provided holes of the mounting plate:

- EchoConnect bus wires or EchoConnect pigtail and ESD ground wires depending on the installation.
- Remote Light Sensor Head wires (if remotely mounting Light Sensor Heads).

Step 5: Secure the mounting plate to the junction box using the screws provided (both short and long screws are included for convenience).

Step 6: Strip each wire 5/16" (8mm) and terminate the EchoConnect (white and black wires) and ground wire (green/yellow) to the EchoConnect terminal block located on the sensor controller. Torque each termination to 3.1-3.5 in-lb.

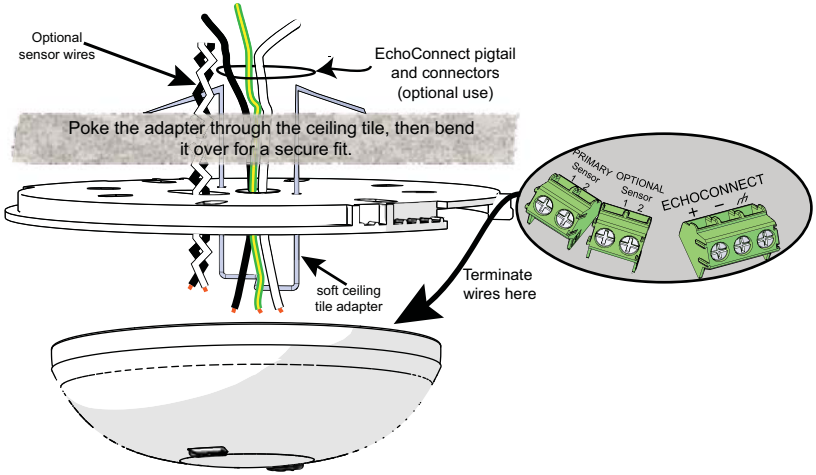
a: Terminate the white incoming wire to the data + terminal.

b: Terminate the black incoming wire to the data - terminal.

c: Terminate the green/yellow (ground) wire to the labeled ground terminal.

Step 7: To terminate remote Light Sensor Heads, *See "Terminating Remote Light Sensor Head Control Wiring" on page 7.*

Soft Ceiling Tile Installation



Step 1: Pull the Belden 8471 (or equivalent) and 14 AWG (2.5mm^2) ground wire to the installation location.

Step 2: ***If you are installing the sensor in series*** (continuing the data run) to other sensors, sensor controllers, or stations, use the provided EchoConnect pigtail and ESD ground pigtail to make the terminations. ***If you are not continuing the data run***, the pigtails are not required, proceed to Step 3.

a: Strip each wire to the appropriate length, depending on the wire nut or other termination used (wire nuts are not provided).

b: Twist the data - (typically black) EchoConnect wire, the black lead from the EchoConnect pigtail, and any continuing EchoConnect (typically black) wire together and secure with the wire nut

c: Repeat the above steps for the data + (typically white) EchoConnect wires, and for the ESD ground wires.

Step 3: ***If you are installing the primary and/or optional (second) Light Sensor Head remotely*** from the controller, reference *Installing Heads Remotely (optional)* on *page 7*, then return to these instructions. If you are not remoting a Light Sensor Head, proceed to Step 4.

Step 4: Create a hole for wire pass-through in the ceiling tile by poking through the center hole or oblong hole of the mounting plate, then pull the wires through.

Step 5: Orient the smooth side of the mounting plate to the ceiling tile. Pull the following wires from the junction box through the provided holes of the mounting plate:

- EchoConnect bus wires or EchoConnect pigtail and ESD ground wires depending on the installation.
- Remote Light Sensor Head wires (if remotely mounting Light Sensor Heads).

Step 6: Align and insert the soft ceiling tile adapter through the holes provided on the mounting plate, poke the tines of the adapter through the ceiling tile, then bend each tine over in opposite directions for a secure fit on the back side of the ceiling tile.

Step 7: Strip each wire 5/16" (8mm) and terminate the EchoConnect (white and black wires) and ground wire (green/yellow) to the EchoConnect terminal block located on the sensor controller. Torque each termination to 3.1-3.5 in-lb.

a: Terminate the incoming white wire (typical) to the data + terminal.

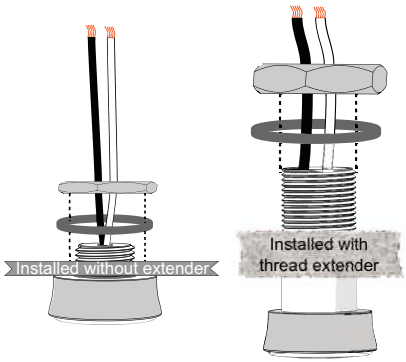
b: Terminate the incoming black wire (typical) to the data - terminal.

c: Terminate the green/yellow wire (typical) to the labeled ground terminal.

Installing Heads Remotely (optional)

Two Light Sensor heads may be connected to the controller and installed remotely.

Each Light Sensor head must be separately wired to the controller using no more than 1000 feet (304m) of 16 AWG wire total per controller. These wire runs must remain separate from EchoConnect wiring. ETC recommends using Belden 8471 (or equivalent) wire.



Step 1: Prepare a hole in the installation location (3/4" hole without adapter or 1" with adapter).

Step 2: Run Belden 8471 (or equivalent) between the controller and the Light Sensor head installation location.

Step 3: ***For a Soft ceiling tile installation***, pull the Light Sensor head wire leads through the thread extender, then attach the thread extender onto the head.

Step 4: Insert the head through the finished side of the installation location to the unfinished side (ceiling).

Step 5: Thread the appropriate washer and nut (two sizes included) onto either the head or the extension adaptor (if used), securing it in place.

Terminating Remote Light Sensor Head Control Wiring

Termination is available at the controller for up to two Light Sensor heads (labeled "Primary Sensor" and "Optional Sensor"). When the heads are installed, follow these instructions to terminate the control wiring at both the Light Sensor head and the controller.

Step 1: Terminate the incoming wire ***from the controller to the head leads*** using wire nuts or other wire termination (not provided).

- a: Strip each wire to the appropriate length, depending on the wire nut or other wire termination used (wire nuts are not provided).
- b: Twist the installed (typically black) Belden 8471 incoming wire and the black lead from the head together and secure using a wire nut or other wire termination.
- c: Repeat for the installed (typically white) Belden 8471 wire and remaining wire lead.

Step 2: Terminate the incoming wire pairs ***from the remote Light Sensor head(s) to the controller***.

a: At the controller, strip 5/8" (9-10mm) of insulation from the ends of each installed head wire.

b: Using a small 1/8" (3,35mm) flat blade or #1 Phillips screwdriver, loosen the terminals on the "Primary Sensor" and "Optional Sensor" connectors found on the Light Sensor controller.

c: Insert the black (typical) wire from the first Light Sensor head wire pair into terminal "1" of the "Primary Sensor" connector.

d: Insert the white (typical) wire from the first Light Sensor head wire pair into terminal "2" of the "Primary Sensor" connector.

e: Repeat this process for the second wire pair, if installed, to the "Optional Sensor" connector.

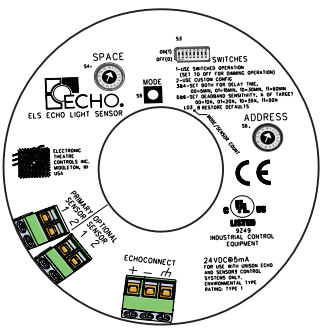
Sensor Configuration

The Echo Light Sensor participates in an Echo system using the configured Space and Address, which are selectable using the rotary switches on the rear panel of the sensor.

Additional DIP switches and the [***Mode***] button, also located on the rear panel, set the sensor functionality and the sensor function with dark and bright actions.

Set Space and Address

Two rotary switches on the rear panel of the controller provide for assignment of the sensor Space and Address. By default, these switches are set to Space 1, Address 1.



Do not duplicate a device Address within the same Space.

Commands are shared by all devices within a space.

DIP Switch Settings

DIP switches on the rear panel of the Light Sensor controller provide for additional configuration options including deadband sensitivity, delay time, and the ability to restore the sensor to its factory defaults.

DIP Switch 1

DIP switch position 1 determines whether the sensor will use a Dimming operation (Off) or a Switched operation (On). The default setting is Dimming operation. Reference *Sensor Operation* on *page 12*.

DIP Switch 2

DIP switch 2 enables "Custom Config" which instructs the sensor to use settings that are configured using the EchoAccess Mobile App. This setting is "Off" by default.

- When "Custom Config" is set to "Off", the default position, local DIP switch settings for the "Dark" and "Bright" actions are used. Sensor actions can be adjusted using the program ***[MODE]*** button.
- When "Custom Config" is set to "On" the local DIP switch settings are ignored. Instead, the Delay Time, Deadband Sensitivity, Switched or Dimming operation setting, Dark or Bright event settings, and Dimming Raise and Lower Event settings made in the EchoAccess Mobile App will be used.

DIP Switch 3&4

DIP switches 3 & 4 set the "Delay Time". Supported times are in minutes.

- 5 min = Switches 3 and 4 are "Off" (default)
- 15 min = Switches 3 is "Off" and 4 is "On"
- 30 min = Switches 3 is "On" and 4 is "Off"
- 60 min = Switches 3 and 4 are "On"

DIP Switch 5&6

DIP switches 5 & 6 set the deadband sensitivity, which corresponds to 10%, 20%, 35%, and 50% as a percentage of the Target Lux. The ***low*** measured light threshold is ***Target -*** (Target x Deadband%) / 100. *See "Record Target" on page 11.* The ***high*** measured light threshold is ***Target +*** (Target x Deadband%) / 100.

- 10% = Switches 5 and 6 are "Off"
- 20% = Switch 5 is "Off" and 6 is "On"
- 35% = Switch 5 is "On" and 6 is "Off"
- 50% = Switches 5 and 6 are "On"

DIP Switch 7

DIP switch 7 is not used in this product.

DIP Switch 8

DIP switch 8 provides a "restore defaults at boot" function. The factory defaults are restored by setting this DIP switch "On" and cycling power to the sensor.

Power Up and Final Installation

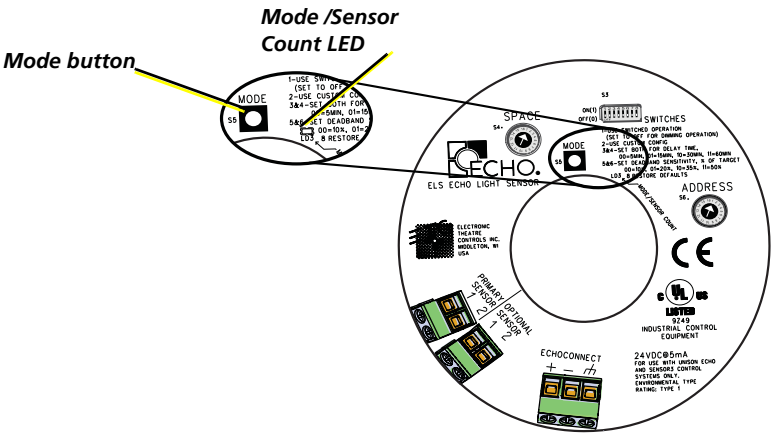
Power Up

All EchoConnect terminations in the system must be made before applying power to the system and sensor.

Sensor Count

The controller includes an LED, labeled "Mode/Sensor Count" that blinks green according to the number of remote Light Sensor heads connected to the controller. As needed, refer to this LED to ensure the system has been wired properly and the controller has properly detected the correct number of connected remote heads. If the Mode/Sensor Count LED is solid red, the controller does not detect any sensors. Check your system wiring first, then contact ETC Technical Services if additional troubleshooting assistance is required. A maximum of two heads are allowed per controller.

Configure Preset



When in Basic config mode (DIP switch 2 is set to Off), holding the ***[Mode]*** button sets the sensor into program mode. Program mode only affects switched operation and is used to adjust the preset controlled by the "Dark" action when measured light levels are below the target threshold setting. The "Bright" action is "Off," and occurs when measured light levels are above the target threshold. This is not configurable through Program mode.

Step 1: Press and hold the ***[MODE]*** button for 3 seconds. The Mode/Sensor Count LED will turn solid amber and the "A" (Auxiliary) button on the

front of the Light Sensor controller will begin to blink the number of times that corresponds to the preset number used for the "Dark" action.

Step 2: Press the "A" button the desired number of times to set a new preset for recall. The "A" button LED will blink to indicate the number of the preset that will be used for the "Dark" action.

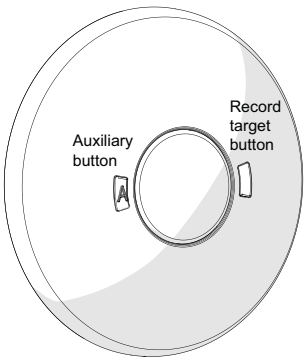
Step 3: Press the ***[MODE]*** button to save the current setting.The Mode/Sensor Count LED will turn off and the "A" button LED will blink to indicate the saved preset value.

Attach Sensor

Attach the sensor to the mounting plate by aligning the tabs on the sensor with the slots on the mounting plate, then twist clockwise until the two are locked into place.

Record Target

The "Record Target" button takes a snapshot of the current light (lux) settings, which determines the amount of light the sensor should maintain.



Step 1: Push the "Record Target" button.
A 10 second timer begins and a green LED illuminates, indicating the record process.

- Once the 10 second timer finishes, the current measured lux value records as the target (threshold) value.
- The LED will blink twice when the target (threshold) value is successfully recorded.
- Pressing "Record Target" again during the 10 second timer will cancel the record process.

Sensor Operation

Dimming and Switched Photo Sensor operation settings only apply in Basic config mode (DIP switch 2 is set to Off). When in Custom config mode (DIP switch 2 is set to On) settings applied from EchoAccess are used instead.

Dimming Photo Sensor Operation

When the DIP switch 1 is set to Dimming operation, the sensor executes space raise and space lower commands until the sensor measures the target amount of light, or until it reaches the extents of the artificial lighting control.

- The "Record Target" button records the amount of light (lux) the sensor will try to maintain. The sensor raises or lowers light after the measured light is respectively above or below the target thresholds for the configured delay time (calculated as target +/- the amount of percent deadband sensitivity) until the target amount of light is achieved or it reaches the extents of the raise/lower commands.
    - Example: Assume the recorded target has been set to 1500 lux, and deadband sensitivity is set to 20%. When measurements drop below 1200 lux, the sensor will attempt to raise lighting. When measurements rise above 1800 lux, the sensor will attempt to lower lighting.
    - The ***low*** measured light threshold is ***Target -*** (Target x Deadband%) / 100.
    - The ***high*** measured light threshold is ***Target +*** (Target x Deadband%) / 100.
    - To ensure a smooth transition, the Dimming operation does not exceed a fade rate greater than one second per percent dimmed.

Switched Photo Sensor Operation

When DIP switch 1 is set to Switched operation, the sensor by default performs threshold based activation of both a "Dark" and a "Bright" condition, which are determined by the lux threshold settings. Lighting actions occur after measurements have been maintained for the configured delay time.

- By default, the "Dark" action activates Preset 1 in the device's space, and the "Bright" action executes the space "Off" command.
- When used in a space with manual wall station controls, the "Dark" action cannot be allowed anytime the space is in the "Off" state. Also when used in the same space with Occupancy/Vacancy sensors, the "Dark" action is only allowed when there is occupancy.
- Even in Automatic-On operation (no Inspire or preset station manual controls were detected), the sensor is prohibited from turning on lights after the space off command has been given by another device. However, if the sensor itself issues the "Off" command (due to bright conditions), it will turn on lighting if conditions become too dark.