

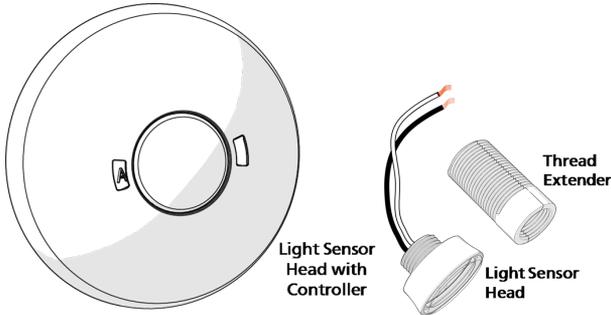
# Echoflex Installation Guide

## Elaho Light Sensor

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### Overview

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



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 up to two Light Sensor heads. One head may be installed within the controller, or both may be installed remotely. When using a pair of Light Sensor heads, each transmits their light readings to a single controller. The controller averages the received light levels and uses the average to control the lighting within the space.

### Custom Configuration

This document guides you through the installation and local DIP switch setup of the sensor. For more detailed information about custom configuration options available using ElahoAccess, see the ElahoAccess App integrated help system.



**Note:** *To use the configuration settings applied using ElahoAccess, DIP switch 2 must be enabled. See [DIP Switch Settings on page 9](#).*

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### Prepare for Installation

Ceiling-mount sensors are intended for installation to a finished ceiling surface, soft ceiling tile mounted, or attached to a round or octagonal fixture junction box. The Light Sensor remote head mounts directly into the controller, to a conduit knockout, or into a soft ceiling tile using the provided thread extender.

### Compliance

- cULus Listed
- CE compliant

For use with Echoflex Elaho Control Systems, powered by an Elaho station power supply.

### Environment

#### Ambient

The controller ambient operating temperature range is 0°C–70°C (32°F–158°F), with a non-condensing humidity. The Sensor head can be installed remotely indoors or onto an outdoor weatherproof enclosure. Ambient operating temperature range is -25°C to 70°C (-13°F to 158°F).

### Wire Specification

The Light Sensor connects to the EchoConnect communication bus. EchoConnect is a bi-directional protocol that uses one pair of wires (data+ and data-) for both data and power. Echoflex recommends using Belden 8471 Class 2 wire (or approved equal – see the Echoflex cable cross database [echoflexsolutions.com/files/Elaho\\_Data\\_Cable\\_Wire\\_Specs](https://echoflexsolutions.com/files/Elaho_Data_Cable_Wire_Specs) for equal alternatives). The total combined length of an EchoConnect wire run using Belden 8471 may not exceed 500 m (1,640 ft), with a maximum distance of 400 m (1,312 ft) between any two devices.



**Note:** All control wiring should be installed and terminated by a qualified installer and should follow standard wiring installation practices. Leave approximately 25.4 cm (10 in) of wiring in the back box for connection and to allow slack for future service needs.



**Note:** Echoflex requires that all stations and devices be grounded for ESD protection. Pull an additional 2.5 mm<sup>2</sup> (14 AWG) wire for grounding when control wires are not installed in grounded metal conduit.

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**Note:** When using Category 5 (or equivalent) cable on the EchoConnect communication bus, please note the following:

- Cat5 wiring must be terminated using EchoConnect Cat5 Termination Kits and must be installed using a bus topology. Refer to the instructions provided with the Cat5 Termination Kit (8186A1207) for information to terminate Cat5 wiring.
  - 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.
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### Light Sensor Head

The controller provides termination for up to two Sensor heads. Each head must be separately wired to the controller using no more than 304 m (1,000 ft) of 1.5 mm<sup>2</sup> (16 AWG ) wire total per controller. These wire runs must remain separate from EchoConnect wiring. Echoflex recommends using Belden 8471 (or equivalent) wire.

### Supplies

Description	Sensor head with controller (E-LS)	Light Sensor head (E-LSH)	Light Sensor controller (E-LSC)
Soft ceiling tile adapter	X		X
EchoConnect and ground wire pigtails	X		X
Light Sensor head thread extender	X	X	
1 each nuts and washers 3/4 in and 1 in	X	X	
2 each screws, 8-32x1-3/4 in	X		X
Blank Light Sensor head	X		X

**Note:** Use appropriately sized wire nuts (not provided) to secure each termination.

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### Installation



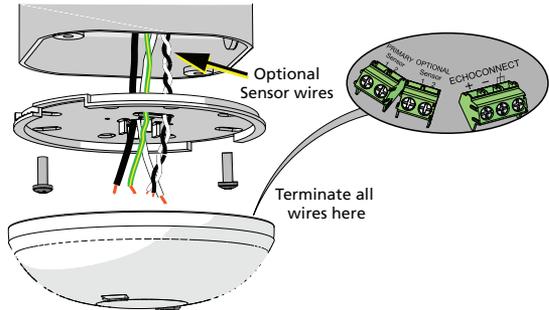
**Note:** Installation must follow all national and local codes for electrical equipment. NEC Class 2 product to be wired in accordance to NEC Article 725 and local jurisdiction requirements.

The ceiling-mount sensor is provided with a mounting plate that can be mounted to a junction box, finished ceiling, or soft ceiling tile. The Light Sensor remote head mounts directly into the controller, to a conduit knockout, or into a soft ceiling tile using the provided thread extender. Determine the installation method and follow the detailed instructions:

- [Junction Box or Surface Installation below](#)
- [Soft Ceiling Tile Installation on the facing page](#)
- [Install Sensor Heads Remotely \(optional\) on page 7](#)

### Junction Box or Surface Installation

1. Pull the Belden 8471 (or equivalent) and one 2.5 mm<sup>2</sup> (14 AWG) ground wire to the mounting location (junction box or finished surface).



2. **If you are installing the sensor in series** with other sensors or stations (continuing the data run), use the provided EchoConnect and ESD ground wire pigtails. Wire termination connectors are not provided. **If you are not continuing the data run**, direct termination to the sensor controller is recommended, skip this step and proceed to step 3.
  - a. Strip each wire to the appropriate length according to the wire nut or other termination used (wire nuts are not provided).
  - b. Twist the incoming data- EchoConnect wire (typically black) and the data- wire (black) from the EchoConnect pigtail as well as any continuing data- EchoConnect wire together and secure with a wire nut.
  - c. Repeat the above step for the data+ EchoConnect wire (typically white) and again for the ESD ground wire (typically green/yellow), using a new wire nut for each termination type.

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## Light Sensor

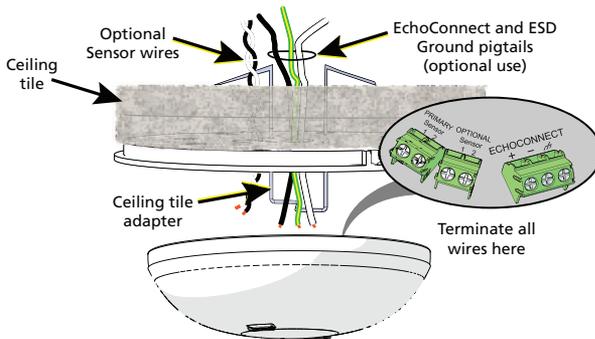
3. If you are installing the primary and/or optional second Sensor head external from the controller, see [Install Sensor Heads Remotely \(optional\) on page 7](#) and then return to these instructions. If you are not installing Sensor heads remotely, proceed with this instruction.



**Note:** All sensor wires must terminate directly to the terminals at the controller.

4. Orient the flat side of the mounting plate to the junction box and pull all incoming wires from the junction box through the provided holes near the center of the mounting plate.
5. Secure the mounting plate to the junction box using the screws provided.
6. Terminate EchoConnect and ESD ground wires to the terminal block on the sensor controller. Torque each terminal 3.1–3.5 in-lb.
  - a. Strip each wire 8 mm (5/16 in).
  - b. Insert the data+ (typically white) EchoConnect wire into the data+ terminal and secure.
  - c. Insert the data– (typically black) EchoConnect wire to the data– terminal and secure.
  - d. Insert the ground (typically green/yellow) wire into the ground terminal and secure.
7. Terminate the remote Sensor head wires to the provided terminals. See [Terminate Sensor Head Wiring on page 8](#).

### Soft Ceiling Tile Installation



1. Pull the Belden 8471 (or equivalent) and 2.5 mm<sup>2</sup> (14 AWG) ground wire to the mounting location. Strip each wire to the appropriate length according to the wire nut or other termination used (wire nuts are not provided).

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2. **If you are installing the sensor in series** with other sensors or stations (continuing the data run), use the provided EchoConnect and ESD ground wire pigtails. Wire termination connectors are not provided. **If you are not continuing the data run**, direct termination to the sensor controller is recommended, skip this step and proceed to step 3.
  - a. Twist the incoming data– EchoConnect wire (typically black) and the data– wire (black) from the EchoConnect pigtail as well as any continuing data– EchoConnect wire together and secure with a wire nut.
  - b. Repeat the above step for the data+ EchoConnect wires (white), and again for the ESD ground wires (green/yellow). Use a new wire nut for each termination type.
3. If you are installing the primary and/or optional second Sensor head external from the controller, see [Install Sensor Heads Remotely \(optional\) on the facing page](#) and then return to these instructions. If you are not installing Sensor heads remotely, proceed with this instruction.



**Note:** *All sensor wires must terminate directly to the terminals at the controller.*

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4. Prepare the ceiling tile.
  - a. Align the flat side of the sensor mounting plate to the finished side of the ceiling tile and mark the center access hole for wire pass-through.
  - b. Align the flat side of the sensor to the finished side of the ceiling tile and mark the center access hole for wire pass-through.
  - c. Remove the ceiling tile material from marked access hole.
  - d. Pull all incoming wires through the access holes of the ceiling tile.
5. Secure the sensor mounting plate in place.
  - a. Insert the soft ceiling tile adapter through the pinholes on the mounting plate.
  - b. Push the adapter through the ceiling tile, and then bend each tine over in opposite directions for a secure fit.

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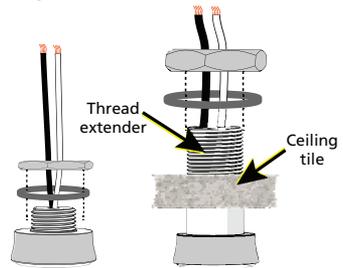
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6. Terminate EchoConnect and ESD ground wires to the terminal block on the sensor controller. Torque each terminal 3.1–3.5 in-lb.
  - a. Strip each wire 8 mm (5/16 in).
  - b. Insert the data+ EchoConnect wire (typically white) into the data+ terminal and secure.
  - c. Insert the data– EchoConnect wire (typically black) to the data– terminal and secure.
  - d. Insert the ESD ground wire (typically green/yellow) into the ground terminal and secure.
7. Terminate the remote Sensor head wires to the provided terminals. See [Terminate Sensor Head Wiring on the next page](#).

### Install Sensor Heads Remotely (optional)

Each Light Sensor head must be separately wired to the controller using no more than 304 m (1,000 ft) of 1.5 mm<sup>2</sup> (16 AWG) wire total per controller.

These wire runs must remain separate from EchoConnect wiring. Echoflex recommends using Belden 8471 (or equivalent) wire.



1. Prepare a hole in the installation location. A 19 mm (0.75 in) hole without the thread extender or 25.4 mm (1 in) with the thread extender.
2. Run the Belden 8471 (or equivalent) wire between the controller and the Sensor head installation location.
3. For a soft ceiling tile installation, pull the Sensor head wire leads through the thread extender, and then attach the thread extender onto the head.
4. Insert the Sensor head wires through the finished side of the installation location to the unfinished side of the ceiling tile.
5. Thread the appropriate washer and nut (two sizes included) onto either the head or the thread extender (if used), securing it in place.

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### Terminate Sensor Head Wiring

1. Terminate the wire set from the Sensor controller to the Sensor head wire 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.
  - b. Twist the installed data- (typically black) incoming wire and the black lead from the Sensor head together and secure using a wire nut.
  - c. Repeat for the installed data+ (typically white) wire and the remaining Sensor head wire lead, and secure using a new wire nut.
2. Terminate the incoming wire pairs from the Sensor head to the terminal block on the Sensor controller. Torque each terminal 3.1–3.5 in-lb.



**Note:** *A Sensor head installed in the controller at the factory is pre-terminated to the Primary Sensor terminals. Any remote Sensor head will terminate to the Optional Sensor terminals. If removing both Sensor heads from the controller, terminate each Sensor head wire pairs to the individual Sensor terminal sets.*

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- a. Strip each wire 8 mm (5/16 in).
- b. Loosen the terminals (Primary Sensor or Optional Sensor) you will terminate the Sensor head wires. Terminate only one Sensor head wire pair per terminal set.
- c. Insert the data+ (typically white) wire into terminal 1, and secure.
- d. Insert the data- (typically black) wire into terminal 2, and secure.

## Sensor Configuration

The Light Sensor participates in an Elaho system using the configured Space and Address, which you set using the rotary switches on the Sensor controller. DIP switches and the **[MODE]** button set the Light Sensor functionality and the sensor operation with *dark* and *bright* actions.

### Basic

A sensor that is set for Basic configuration mode (DIP switch 2 set to Off) can be further configured locally using the other available DIP switch settings, and the **[MODE]** and Auxiliary **[A]** buttons and their associated LEDs. See [Configure Preset on page 10](#).

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### Custom

For more detailed information about custom configuration options available using ElahoAccess, see the ElahoAccess App integrated help system.

### Set Space and Address

Two rotary switches on the sensor electronics provide for Space and Address assignment for the sensor. By default, these switches are set to Space 1, Address 1. Commands are shared by all devices within a given space.

1. Set the Space rotary switch to the desired number (1 through 16) for the space you want the sensor to control.
2. Set the Address rotary switch to desired address (1 through 16) for the sensor identification in the selected space.



**Note:** Do not duplicate a device Address within the same Space.

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### DIP Switch Settings

Use the DIP switches on the Light Sensor controller to locally configure the sensor functions.

Switch #	Use
1	<b>Operation Mode</b> - See <a href="#">Sensor Operation on page 11</a> . Off (default setting) = Dimmed operation (See <a href="#">Dimming Light Sensor Operation on page 12</a> .) On = Switched operation (See <a href="#">Switched Photo Sensor Operation on page 12</a> .)
2	<b>Enable/Disable Custom Config Mode</b> When "Custom Config" is set to On (the default setting), all other local DIP switch settings are ignored. Instead, the settings made by the ElahoAccess App are used. When "Custom Config" is set to Off (also known as Basic configuration mode), local DIP switch settings for the dark and bright actions are used. Sensor actions can be adjusted using the program [MODE] button.
3 and 4	<b>Delay Time</b> 5 min - Switches 3 and 4 are Off (default) 15 min - Switch 3 is Off and Switch 4 is On 30 min - Switch 3 is On and Switch 4 is Off 60 min - Switches 3 and 4 are On

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Switch #	Use
5 and 6	<p><b>Deadband Sensitivity</b> Sensitivity corresponds to a percentage of the Target Lux. See <a href="#">Record Target on the facing page</a>. The low measured light threshold is calculated as <math>\text{Target} - (\text{Target} \times \text{Deadband } \%) / 100</math>. The high measured light threshold is calculated as <math>\text{Target} + (\text{Target} \times \text{Deadband } \%) / 100</math>.</p> <p>10% - Switches 5 and 6 are Off (default)            20% - Switch 5 Off and 6 On            35% - Switch 5 On and 6 Off            60% - Switches 5 and 6 On</p>
7	Unused (leave Off)
8	<p><b>Restore to Defaults at boot</b></p> <p>When set to On and power is cycled to the sensor, the unit restores to its factory default settings.            Off is the default setting.</p>

## Power Up

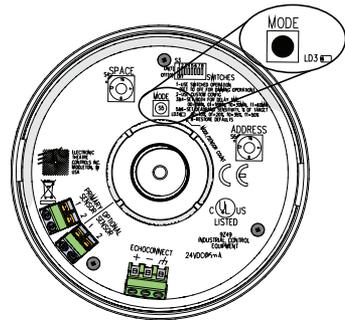
All EchoConnect terminations in the system must be made before applying power to the system and sensor.

## Sensor Count

The Sensor controller includes an LED labeled Mode/Sensor Count that blinks green according to the number of Sensor heads connected to the controller. Check this LED to ensure that the system has been wired properly and that the controller has detected the number of connected sensor heads. If the Mode/Sensor Count LED is solid red, the controller does not detect any sensors. Check your system wiring first, and then contact Echoflex Technical Services if additional troubleshooting assistance is required.

## Configure Preset

When in Basic config mode (DIP switch 2 is set to Off) and the sensor set to Switched operation (DIP switch 1 set to On), use the **[MODE]** and Auxiliary **[A]** buttons to configure the preset that is activated with a *dark* action, meaning when the measured light levels are below the target threshold setting. The *bright* action is Off by default and occurs when measured light levels are above the target threshold. This is not configurable through Program Mode.



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1. Access the Sensor controller and press and hold the **[MODE]** button for three seconds to enter Program Mode. The Mode LED lights in amber to indicate the sensor is in Program Mode and the Auxiliary **[A]** button and LED on the front of the controller flash to indicate the set preset number controlled by the *dark* action. By default, this is Preset 1, therefore the LED will flash one time, pause two seconds and flash again.
2. Press the **[A]** button the desired number of times to set a new preset for recall. The Auxiliary LED will blink to indicate the number of the preset that will be used for the *dark* action.
3. Press and release the **[MODE]** button to save the current setting.

### Attach Sensor

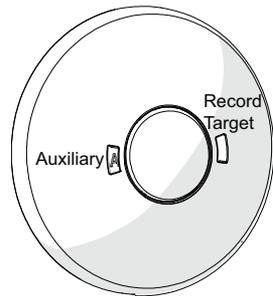
Attach the sensor to the mounting plate by aligning the tabs on the sensor with the slots on the mounting plate, and then twist clockwise until the two are locked into place.

### Record Target

The Record Target button, located on the front of the Light Sensor snapshots the current light (lux) settings in the installed space. This snapshot determines the amount of light the sensor should maintain.

When ready, press the Record Target button. A 10 second timer begins and a red LED illuminates, indicating the record process.

- Once the 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 cancels the record process.



### Sensor Operation

Dimming and Switched Light 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"), all settings applied from ElahoAccess are used instead.

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### Dimming Light Sensor Operation

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

Press the “Record Target” button to record the amount of current light (lux) the Light Sensor will try to maintain. The Light Sensor will raise or lower light levels 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  $\text{Target} - (\text{Target} \times \text{Deadband}\%) / 100$ .
- The **high** measured light threshold is  $\text{Target} + (\text{Target} \times \text{Deadband}\%) / 100$ .
- 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 Light Sensor 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 Light 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*.