

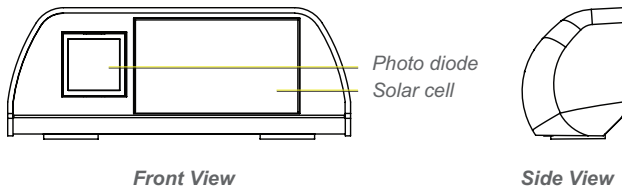
# Echoflex Installation Guide

## Open Loop CCT Sensor FLS-41

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### Overview

The Open Loop CCT Sensor (FLS-41) is a solar-powered sensor that monitors exterior natural light and Correlated Color Temperature (CCT) levels.



It uses wireless messaging to provide controllers sensor data to automatically adjust the tunable white color output and dimming capability of an LED fixture throughout the day.

The sensor can monitor exterior light levels up to 100,000 lux (9,290 fc) and a color temperature range of 2,000 to 7,500 kelvin with a resolution of  $\pm 10$  and an accuracy of  $\pm 100$  kelvin.

This document covers installation, testing, and setup of all FLS-41 models. The product package includes the sensor and incorporated adhesive pads for mounting.

### Prepare for Installation

To ensure optimal function, consider the installation environment and the following guidelines:

- For indoor use only. Operating temperature  $-25^{\circ}\text{C}$  to  $65^{\circ}\text{C}$  ( $-13^{\circ}\text{F}$  to  $149^{\circ}\text{F}$ ), 5%–92% relative humidity (non-condensing).
- High density construction materials and large metal appliances or fixtures in the space may disrupt wireless transmissions.
- Install the sensor within range of linked receivers or controllers, 24 m (80 ft). Consider adding a repeater to extend reception range.
- Before linking the sensor, expose it to a good light source for at least five minutes at 200 lux (19 fc). Install the FLS-41 with the solar cell facing outdoors.



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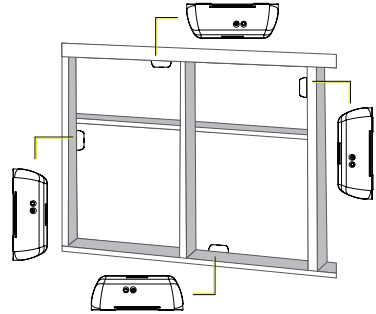
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### Installation

The FLS-41 sensor should be installed on the inside window casing facing out through clean glass. To maximize the sensor's 60° field of view, ensure there are no mullions or overhangs outside the window that block or shadow the sensor.

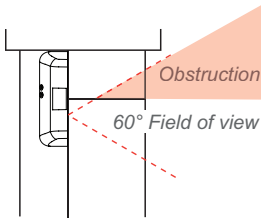
Position the sensor right up against the window to ensure reflections from interior lights do not affect the sensor readings.

The location and position of the sensor directly affects the quality of messages received by the linked controller.

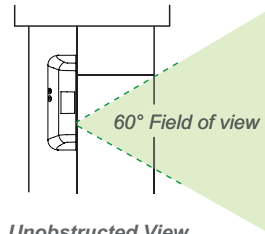


**Note:** Consider linking the FLS-41 while you have access and before replacing the cover. See [Link to a Controller on the facing page](#).

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*Obstructed View*



*Unobstructed View*

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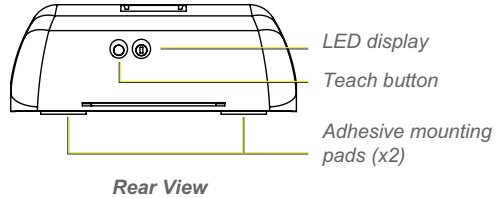
## Open Loop CCT Sensor

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### Mount the Sensor

Use the adhesive pads on the bottom of the sensor to mount it to any suitable surface.

1. Clean the mounting surface with an alcohol wipe and wait for the surface to dry.
2. Remove the protective backing from the adhesive pads on the sensor.
3. Press the sensor in place and hold for 30 seconds.



### Link to a Controller

The compatible target controller must be installed, powered, and within range of the FLS-41.



**Note:** *The linking process can be used both to link a device to a controller and to unlink a linked device from a controller.*

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1. Press the **[Learn]** button on the controller to activate Link mode. If necessary, refer to the controller product documentation.
2. Press the **[Teach]** button on the sensor once to send a link message. An LED blinks to confirm a successful transmission.
3. Deactivate Link mode on the controller before attempting to link to any other controllers.

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### Sensor Operation

The sensor records sample values at a rate based on the current ambient light level and the stored energy in the sensor. The sensor is configured to transmit messages at a heartbeat rate and immediately when daylight levels change more than 12%. During normal operation, the heartbeat rate is 10 times longer than the sample rate.

The table below shows the range of ambient light values that determine the sample rate compared to the heartbeat rate. The sample rate marks the recording of daylight level values used to calculate the percent of change, while the heartbeat rate marks the transmission of a message.

Ambient Light Value Lux (Footcandles)	Sample Rate	Heartbeat Message Rate
< 50 (< 4.6)	128 seconds	> 21 minutes
< 100 (< 9.3)	64 seconds	10 minutes
< 100–200 (< 9.3–18.6)	32 seconds	320 seconds
> 200 (>18.6)	16 seconds	160 seconds

For the sensor to send an on-change message, it needs sufficient power:

- Stored energy above 3.5 V, or
- Ambient light level above 300 lux (27.9 fc)

### On-Change Formula

The sensor compares the current sample value to an average of the last three readings. If the difference is more than 12%, the sensor transmits the value immediately.

The averaged reading ensures that the sensor sends multiple messages if a large change occurs before it returns to sending messages at the default heartbeat transmission rate.

If both the average lux value and the current lux value are less than 50 lux, the on-change transmission behavior is disabled.



**Note:** *On-change behavior for the CCT value is determined in a similar way as the lux level. If a large step change occurs, the CCT in kelvin can be smoothed out using a calculated average reading.*

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## Open Loop CCT Sensor

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### Tests and Settings

Use the **[Teach]** button and color LEDs to navigate the Tests and Settings menu. The **[Teach]** button and LED display are on the back of the sensor.

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**Note:** *The FLS-41 must be fully charged before running any test. Expose the sensor to a strong light source, 200 lux (19 fc), for 15 minutes.*

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- **Light Level Test** (green LED)
- **Range Confirmation** (blue LED)
- **Rapid Response Test** (red LED)
- **EEP Select** (blue and red LEDs)

The menu times out after two minutes of inactivity.

### Light Level Test

The Light Level Test quantifies the amount of energy produced by the solar cells and confirms a good installation location.

1. Press and hold the **[Teach]** button until the green LED is displayed. Release the button to enter the menu and display the first item, the blinking green LED.
2. Press and hold the **[Teach]** button again until the green LED stops blinking. The green LED then repeats a number of blinks according to the detected light level. The sensor reevaluates the light level every two seconds.

Blinks	Ambient Light Lux (Footcandles)	Time to Fully Charge	To Maintain Charge
0	< 80 (< 7.4)	Non-operational	N/A
1	80–200 (7.4–18.6)	Operational	N/A
2	200–400 (18.6–37.2)	30–60 hours	8 hours per day
3	400–800 (37.2–74.3)	15–30 hours	4 hours per day
4	800–2000 (74.3–185.8)	7–15 hours	2 hours per day
5	> 2000 (> 185.8)	3–7 hours	1 hour per day

The test repeats every two seconds and runs for 100 seconds. To exit before the time-out, press and hold the **[Teach]** button for 10 seconds.

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### Range Confirmation

The Range Confirmation test quantifies the strength of the wireless signal to a linked controller that has range confirmation capability.

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**Note:** *Only one controller can be linked to the FLS-41 to run the test properly. Disable repeaters that are in range.*

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1. Press and hold the **[Teach]** button until the green LED is displayed. Release the button to enter the menu and display the first item, the blinking green LED.
2. Press and release the **[Teach]** button to cycle through the menu of color LEDs and stop when the blue LED is blinking.
3. Press and hold the **[Teach]** button until the LED stops blinking to initiate the Range Confirmation test.

After the FLS-41 transmits and receives a Range Confirmation message, the signal strength status is displayed as an LED blink color.

LED Blink	Signal Strength
Green	-41 to -70 dBm (best)
Blue	-70 to -80 dBm (good)
Red	-80 to -95 dBm (poor, move closer)
No LED	No linked controllers detected

The test repeats every five seconds and runs for 50 seconds. To exit before the time-out, press and hold the **[Teach]** button.

### Rapid Response Test

The Rapid Response Test confirms the settings on powered controllers to which the FLS-41 is linked. The test accelerates the sensor's message rate, making the controller respond to light level changes faster. The transmission rate is increased to every 16 seconds for 100 seconds and then returns to normal operation.

1. Press and hold the **[Teach]** button until the green LED is displayed. Release the button to enter the menu and display the first item, the blinking green LED.
2. Press and release the **[Teach]** button to cycle through the menu of color LEDs and stop when the red LED is blinking.
3. Press and hold the **[Teach]** button to initiate the Rapid Response Test.
4. Vary the light level on the sensor to test the dimming and recovery response of the connected light fixture.
5. To exit before time-out, press and hold the **[Teach]** button.

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### EEP Select

The default EEP setting is configured to work with Echoflex controllers. You can configure the sensor to be compatible with controllers that use an alternate profile.

1. Press and hold the **[Teach]** button until the green LED is displayed. Release the button to enter the menu and display the first item, the blinking green LED.
2. Press and release the **[Teach]** button to cycle through the menu of color LEDs and stop when the blue and red LEDs are both blinking.
3. Press and hold the **[Teach]** button until the LEDs stop blinking to select EEP Select. The blue LED blink code displays the current setting.
4. Press and release the **[Teach]** button to navigate the options.

Indication	Setting
1 blue blink	EEP A5-06-04 Curtain Wall Brightness Sensor
2 blue blinks	EEP D2-14-25 Light Sensor and CCT (default)
3 blue blinks	General Profile

5. Press and hold the **[Teach]** button to make a selection.

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### Compliance

For complete regulatory compliance information, see the Open Loop CCT Sensor datasheet at [echoflexsolutions.com](http://echoflexsolutions.com).

#### FCC Compliance

Echoflex Open Loop CCT Sensor

(For any FCC matters):

Echoflex Solutions, Inc.

3031 Pleasant View Road

Middleton, WI 53562

+1 (608) 831-4116

[echoflexsolutions.com](http://echoflexsolutions.com)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received; including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Any modifications or changes to this product not expressly approved by Electronic Theatre Controls, Inc. could void the user's authority to operate the product. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their own expense.

Contains FCC ID: TCM300U

#### ISED Compliance

This device contains a license-exempt transmitter/receiver that complies with Innovation, Science, and Economic Development Canada's license-exempt RSSs. Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Contains IC ID: 5713A-STM300U

#### Conformité ISDE

Cet appareil contient un émetteur/récepteur conforme aux CNR d'Innovation, Sciences et Développement économique Canada (ISDE) applicables aux appareils radio exempt de licence. Son fonctionnement est soumis aux deux conditions suivantes:

1. L'appareil ne doit pas produire d'interférences.
2. L'utilisateur de l'appareil doit accepter toute interférence, même si l'interférence est susceptible d'en compromettre le fonctionnement.

Contient ID IC: 5713A-STM300U