echoflex
an ETC Company

TASK AMBIENT PHOTO SENSOR
Installation Guide

Overview

The package includes the photo sensor and installation guide. This guide covers all models of TAP-31 and TAP-41 sensors.

The TAP product family includes:

TAP-31U Wireless Light Sensor, 902 MHz radio

TAP-31Y Wireless Light Sensor, 868 MHz radio

TAP-31J Wireless Light Sensor, 928 MHz radio

TAP-41U Light Intensity & Color Temperature Sensor, 902 MHz radio

TAP-41Y Light Intensity & Color Temperature Sensor, 868 MHz radio

TAP-41J Light Intensity & Color Temperature Sensor, 928 MHz radio

Sensor Description

The 31/41 series TAP Task Ambient Photo sensor (also referred to as the sensor in this guide) are wireless, energy harvesting sensors that monitor light levels within interior spaces.

The TAP-31 sensor measures ambient light intensity in two ranges: 0-1024 lux (0 - 95 fc) and 0-65535 lux (0-6090 fc). The TAP-31 model uses standard EnOcean profiles.

The TAP-41 sensor incorporates Correlated Color Temperature (CCT) monitoring with light intensity. The TAP-41 monitors exterior light levels up to 100,000 Lux (9,290 fc). Color temperature range is 1,000 to 10,000 degrees Kelvin. The TAP-41 supports standard and generic EnOcean profiles.

The sensors transmit the monitored values in 100 second intervals or upon change.

These sensors are intended for indoor use only.

Sensor Operation

> **Note:** *The TAP is a solar powered device that absorbs solar energy storing it for use during low light periods. Before assigning the TAP device to a controller, the device should be exposed to a good light source for a minimum of 5 minutes or install a start assist battery.*

The TAP sensor is powered by solar energy from natural or artificial light sources. The solar energy is transformed into electrical energy which is then stored, providing a continuous power source for the sensor. The sensor will operate even with a brief exposure to light, however for best results the sensor should be mounted in a location with exposure of 3-6 hours of natural or artificial light (minimum 250 - 500 lux or 25-50 fc) on a daily basis.

The sensor transmits telegrams containing data values. The sensor must be installed within 24m (80') of any linked receivers, gateways or lighting controllers. For applications exceeding this range, telegram repeating may be needed to extend the range. Refer to the controllers documentation for details on enabling telegram repeating.

The TAP-31 photo sensor supports the following standard EnOcean equipment profiles:

EEP A5-06-02: Light sensor	DB_1: 0 - 1,020 lux (0 - 95 fc)
	DB_3: supply voltage 0…5.1V, linear n=0…255
EEP A5-06-04: Curtain Wall Brightness Sensor	DB0.4- DB0.7:Battery Level 0-100%
	DB_1 .. DB_0 - 65,535 lux (6,090 fc)
	DB_3: Temperature, UNUSED

The TAP-41 photo sensor supports the following standard EnOcean equipment profiles:

EEP D2-14-25: Light Sensor and CCT	DB0 .. DB2.0 : 0-100,000 lux
	DB2.1 .. DB3: CCT 0-32,767 degrees Kelvin
Generic Profile Telegram	DB0 .. DB1: CCT 0-10,000 degrees Kelvin
	DB2 .. DB3: 0-100,000 lux
	DB4: Voltage 0-5.5V

Heartbeat and On-Change Behavior

The sensor will sample and record new data values based on current light levels and stored energy level. The sensor will repeatedly transmit the data telegram on a heartbeat timer. In normal operation the heartbeat period is ten times the sample rate. The sensor will also transmit the data telegram on-change when the data value exceeds 12.5% from an averaged value.

For a on-change telegram to be sent by the sensor, there needs to be sufficient power:

- Stored energy must exceed 3.5 v or
- Ambient light level must be above 300 lux or
- Battery is installed

The sensor compares the current sampled value to an averaged reading. If the difference is greater than 12.5%, the sensor transmits the new value immediately.

The averaged reading is derived by using a formula*.

$$LUX\ avg = (3 * LUX\ avg + LUX\ new\ value) / 4$$

The equation insures that if a large step change occurs, the sensor may send out several telegrams at its sample rate before returning to sending heartbeat messages.

If both the averaged lux reading and the current lux reading are less than 50 lux, the on-change behavior will be disabled.

The TAP-31/TAP-41 will change its sample rate depending on current light levels. The sensor uses the greater of the two values, current sample or averaged lux value to generate the sample rate.

Lux Value	Sample Rate	Heartbeat Period
< 10	128 seconds	> 21 minutes
< 50	64 seconds	10.5 minutes
< 100	32 seconds	320 seconds
> 100	16 seconds	160 seconds

* On-change behavior for CCT is determined in a similar way in the TAP-41. If a large step change of the color temperature occurs, the CCT in degrees Kelvin can be smoothed out using a higher sample rate with an average reading determined by a formula.

Mounting the Sensor

The sensor can be mounted on most surfaces; ceiling, wall, desk, cubicle wall, etc. When mounting the sensor on concrete or metal, mount the sensor first on non-metallic material to elevate the sensor from the concrete/metal surface by one half inch (example: 1/2" plywood).

The mounting location of the sensor is important as this will directly affect the receivers reception of the sensor's telegrams. Before installing, refer to the sections in the guide detailing wireless layout tips.

The sensor should be placed so there is direct exposure to a window or skylight. The most common mounting location for photo sensors is ceiling mount, centered with the window, about 4' from the window. The sensor must be installed in the space where the linked lighting controller is operating the light fixtures.

See the sections on light level test and range confirmation* to aid in optimal placement.
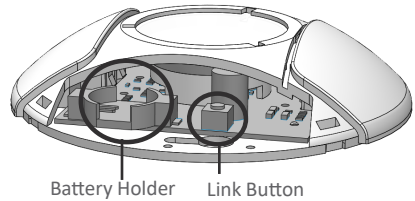
Installation Instructions

1. Remove the cover by using your thumb to press under the white enclosures lip. Gently pull the cover away from the base.

2. Choose a mounting method.

   • With the integrated magnets to a steel T-bar ceiling frame or other metallic surface by placing the sensor on the metal rail.

   • With screws and anchors (not provided) to a wall-board ceiling.

   Wire Mounts

   i. Use a pencil to mark the mounting base keyhole locations and remove the sensor.

   ii. Using a drill, bore the two holes and insert the anchors.

   iii. Install the screws, leaving them loose while you place the sensor.

   iv. Tighten the screws.

   • With the provided wire straps to a soft ceiling tile.

   i. Mark the sensor mounting location on the ceiling tile with a pencil. Remove the ceiling tile from the T-bar frame.

   ii. Insert the soft ceiling tile adapters through the pair of small holes beside both keyholes on the sensors mounting plate.

   iii. Poke the tines through the ceiling tile, then bend each tine over in opposite directions for a secure fit.

   iv. Replace the ceiling tile.

   • With double sided tape or Velcro™, not provided. Cut two lengths of tape and remove the backing. Place on the mounting surface of the sensors back plate, pressing down. Remove the backing from the tape's other side and place the sensor on the ceiling surface, pressing firmly.

3. Refer to the next section titled Linking the Sensor to a Receiver.

4. Once linking is complete, replace the sensor cover. Ensure the cover is fully seated.
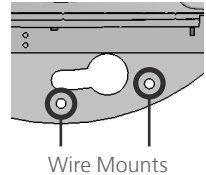
Linking a Sensor to a Lighting Controller or Receiver

This process requires the controller or receiver to be installed, powered and within range of the sensor.

1. Activate LEARN or LINK mode at the receiver/controller, if necessary refer to the manufacturers documentation.
2. Tap the sensors LINK button.
3. Deactivate LEARN mode at the receiver.

Battery Holder   Link Button

Installing or Replacing the Start Assist Battery

The battery is not required for normal operation when the TAP receives adequate natural or artificial light.

1. Remove the cover by using your thumb to press under the white enclosures lip. Gently pull the cover away from the base.
2. To remove an old battery, use a small screwdriver as a lever and insert under the battery. Gently twist the screwdriver so the battery pops out.
3. Install or replace the battery with a new CR1632 coin cell battery insuring the positive side (+) is facing up.
4. Place the battery in the holder and press in place with your thumb.
5. Replace the cover.

Wireless System Layout Hints

• Avoid locating transmitters and receivers on the same wall.
• Avoid locating transmitters and receivers where the telegrams must penetrate walls at acute angles. This increases the material the telegram must pass through reducing the signal power.
• Avoid large metal obstructions as they create radio shadows. Place receivers in alternate locations to avoid the shadow or use repeaters to go around the obstacle.
• Do not locate receivers close to other high frequency transmitters

Test Operating Modes

The following tests or modes can be selected:

1. Light level test
2. Range confirmation test
3. Daylight harvesting commissioning test mode
4. EEP Select Mode

Light Level Test: Run this test before installing so you can select a mounting location that will provide optimum light energy for the sensor.

1. To enter Light Level Test mode, press and hold the teach button until the green LED begins to blink (about 6 seconds - LEDs are located on right hand side of the solar panel).

2. Press and hold the teach button again until the green LED stops blinking, about 6 seconds. The green LED will start blinking faster in accordance to the light level it is detecting. In this mode the unit will indicate how much light is available for charging. The green LED will blink a number of times to indicate the light level available. See table below.

Blinks	Description	Lux	Time to reach full charge (hours)	Hours per day to maintain charge
None	Below operating level	<40	N/A	N/A
1	Min. Level for operation	> 40	N/A	N/A
2	Operational, charging	> 100	30-60	8
3	Operational, charging	> 200	15-30	4
4	Operational, charging	400	7-15	2
5	Operational, charging	1000	3-6	1

The test will repeat every 2 seconds and run for a duration of 100 seconds. You may quit the test at any time by pressing the teach button for 6 seconds.

Range Confirmation Test: Provides visual feedback of the sensors signal strength by a linked Echoflex controller.

> **i** **Note:**
> • The sensor must be at full charge and/or have the battery installed before running this test
> • Disable all repeaters in range
> • The sensor should only be linked to one controller when running the test

1. To enter Range Confirmation Test mode press and hold the teach button until the green LED begins to blink (about 6 seconds)

2. A quick press and release of the button at this point will allow you to select between test modes. Pressing and releasing the test button scrolls through the LED indicators. When the blue LED is blinking, go to step 3

3. Press and hold the test button again for 6 seconds to select Range Confirmation Test

All three LED's will blink on and off quickly for a second followed by a pause, then repeats. When the sensor receives a range confirmation telegram from the linked controller, the sensor displays the signal strength status for 2 seconds, see table below.

LED - blinking	Signal Strength	Status
Green	-41 to -70 dBm	Best
Blue	-70 to -80 dBm	Good
Red	-80 to -95 dBm	Not ideal, try moving sensor closer
None	No linked controllers detected. Move sensor closer or add telegram repeating	

The test will repeat every 10 seconds and run for a duration of 50 seconds. You may quit the test at any time by pressing the test button for 6 seconds.

Commissioning Test Mode: This mode accelerates the heartbeat period for telegrams to 10 seconds for a duration of 5 minutes.

> **i** **Note:** *The sensor must be at full charge and/or have the battery installed before running this test*

1. To enter Commissioning Test Mode, press and hold the teach button until the green LED begins to blink (about 6 seconds).
2. A quick press and release of the button at this point will allow you to select between test modes. Pressing and releasing the test button scrolls through the LED indicators. When the red LED is blinking, go to step 3.
3. Press and hold the test button again for 6 seconds to select Commissioning Test Mode.

EEP Select Mode: EEP select mode allows the operator to change the telegram type. With the TAP-31 you can select between light intensity ranges, either 0-1024 lux (0-95 fc) or 0-65535 lux. The TAP-41 model allows selection between the standard EnOcean profile with light intensity and correlated color temperature or a Generic Profile type that includes the intensity and CCT plus supply voltage.

To enter EEP selection mode,

1. Press and hold the teach button until the green LED begins to blink (about 6 seconds).
2. A quick press and release of the button at this point will allow you to select between test modes. Pressing and releasing the test button scrolls through the LED indicators. When the blue and red LED are blinking, go to step 3.
3. Press and hold the test button again for 6 seconds to select EEP selection mode. The blue and green LEDs will blink between 1 and 4 times depending on the EEP selected.
4. A quick press and release of the button at this point will allow you to

select the EEP mode. Press and hold the test button again for 6 seconds to select.

Mode	EEP Selection - see Sensor Operation section for details	Blue + green LED blinks
1	EEP A5-06-02: Light sensor	1
2	EEP A5-06-04: Curtain Wall Brightness Sensor	2
3	EEP D2-14-25: Light Sensor and CCT	3
4	Generic Profile	4

i **Note:** *Mode 3 and 4 are only available on TAP-41 models*

You may quit EEP select mode at any time by pressing the test button for 6 seconds.

Energy Code Compliance

California Energy Commission Title 24

Washington State Energy Code

ASHRAE 90.1-2013

IECC 2015

The TAP sensor is built in an ISO9001 certified facility and is RoHS compliant

Agency Listings

FCC Part 15.231 (902 MHz models only)

Contains FCC ID: STM300U

The enclosed device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

(I.) this device may not cause harmful interference and

(ii.) this device must accept any interference received, including interference that may cause undesired operation.

IC RSS-210 (902 MHz models only)

Contains IC: 5713A-STM300U

CE (868 MHz models only)

CE Marking

ARIB STDT108 (928MHz models only)

R 206-000372

Complies with the Japanese radio law and is certified according to ARIB STDT108. This device should not be modified (otherwise the granted designation number will become invalid)

End of life: Must be taken apart to recycle: Plastic case - 7 / Remove battery / Remove PCB assembly

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