TAP-21

Task Ambient Photo Sensor

Installation Guide

Overview

This guide covers all models of TAP-21 sensor.
The TAP-21 product family includes:

- TAP-21U Photo Sensor with 902 MHz radio
- TAP-21Y Photo Sensor with 868 MHz radio
- TAP-21J Photo Sensor with 928 MHz radio

The package includes the photo sensor and installation guide.

TAP-21 Sensor Description

The 21 series TAP Task Ambient Photo sensor (also referred to as the sensor in this guide) is a wireless, energy harvesting sensor that monitors light levels within interior spaces and transmits the value to lighting controllers.

The sensor measures ambient light in two ranges: 0-510 lux (0 - 50 foot candles) and 0-1024 lux (0 - 100 fc) and is intended for indoor use only.

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 receiver/controller, the device should be exposed to a good light source for a minimum of 5 minutes or install a start assist battery.

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Sensor Operation

The Task Ambient Photo (TAP) sensor monitors interior light levels. 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 (250 - 500 lux or 25-50 fc) on a daily basis.

The sensor transmits telegrams containing the light level and storage capacitor voltage level. The sensor must be within range of any linked receivers or controllers, installed within 24m (80') of each other. For applications exceeding 24m (80') range, telegram repeaters may be needed to extend the reception range.

The photo sensor supports the following Sensor profile:

EEP A5-06-02: Light Sensor

DB_1: 0 lux - 1024 lux

DB_2: 0 lux - 512 lux

DB_3: Supply Voltage 0…5.1V, linear n=0…255

Daylight Harvesting

The sensor will repeatedly broadcast a telegram on a timer (heart beat timer). The time period adjusts automatically to the ambient light levels and energy charge stored on the radio.

Light Level	Timer
< 50 lux (5 fc)	100 seconds
> 50 lux (5 fc)	linear ramp from 60 to 10 seconds (as device approaches full charge)

Mounting the Sensor

The sensor can be mounted on any surface; ceiling, wall, desk, cubicle wall, etc.

The mounting location of the sensor is important as this will directly affect the receivers reception of the telegrams. Before installing, refer to the sections in the guide detailing the installation of wireless devices, layout tips and test operation modes.

TIP: To get feedback on the light level where the sensor is mounted, refer to sections "Test Operating Modes" and 'Light Level Test".

TIP: For range verification between the sensor and controller, refer to sections "Test Operating Modes" and 'Installing Wireless Devices".

The sensor should be placed so there is direct exposure to a window. 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 receiving lighting controller is operating the light fixtures. See the sections on light level test and range confirmation* to aid in optimal placement. * -(requires F series Echoflex controller)

The sensor can be mounted using screws (not supplied) through the back plate or using double-sided tape or Velcro™ (not supplied).

Linking a Sensor to a Lighting Controller or Receiver

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

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

Selecting the Light Range on the TAP sensor

1. Using a fingernail or small flat head screwdriver, pop the rear mounting plate off the sensor to reveal the range slide switch.
2. Slide the switch to the range setting required, 512 lux (50 foot-candles) or 1024 lux (100 foot-candles). The factory default is 512 lux.
3. Press the rear mounting plate back into position.

Installing or Replacing the Start Assist Battery

The battery is not required for normal operation. The battery may be useful for installation purposes (when using the Range Confirmation test and Daylight Harvesting test mode, which depletes the energy stores of the TAP quickly.)

1. Using a fingernail or small flat head screwdriver, pop the rear mounting plate off the sensor.
2. To remove old battery: Using a small flat head screwdriver or pen as a lever, insert pointed end under the battery's edge and pop out of the holder.
3. Install or replace the battery in the clip with a new CR2032 coin cell battery insuring the battery edge is under the retaining clip and positive side (+) is facing up.
4. Press on the rear mounting plate until it snaps back into position.

Test Operating Modes

The following tests can be selected when in test mode.

1. Light level test
2. Range confirmation test
3. Daylight harvesting test mode

Teach Button

Light Level Test: This test provides visual feedback of the immediate energy produced by the solar panels.

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, see tables below.

At 510 Lux (50 fc) range (default)

blinks	lux	foot candles	time to fully charge	discharge time
0	< 50	<5	below operating level	n/a
1	< 142	<14	48.0 hours	67.0 hours
2	< 234	<23	26.5 hours	82.5 hours
3	< 326	<33	18.0 hours	86.75 hours
4	< 418	<42	13.25 hours	88.75 hours
5	>418	>42	11.0 hours	90.0 hours

At 1024 Lux (100 fc) range (switch selectable)

blinks	lux	foot candles	time to fully charge	discharge time
0	< 50	<5	below operating level	n/a
1	< 244	<24	26.0 hours	82.5 hours
2	< 438	<44	12.5 hours	89.25 hours
3	< 632	<63	10.0 hours	90.75 hours
4	< 826	<83	9.5 hours	91.0 hours
5	> 826	>83	9.0 hours	91.25 hours

The time to fully charge is based on the storage capacitor charging from a non-operational condition. Discharge time indicates how long a fully charged sensor will operate in the dark. 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: This test provides visual feedback of the sensors signal strength by a linked receiver with range confirmation capability.

Note:

- Range Confirmation only available with “F series” Echoflex Controllers.
- The TAP must be at full charge and/or have the battery installed for Range Confirmation Tests energy requirements.
- Only one receiver can be linked to the sensor for proper operation of the test.
- Disable repeaters in range for proper test operation.

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

5

the LED indicators. When the amber 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 (for 1 second) in this test mode, then if the sensor receives a range confirmation telegram, the sensor displays the linked signal strength status for 2.5 seconds, see table below.

LED	Signal Strength
Green - blinking 2.5 sec	-41 to -70 dBm
Amber - blinking 2.5 sec	-70 to -80 dBm
Red - blinking 2.5 sec	-80 to -95 dBm
No LED	No linked receivers detected

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 time period between transmissions of the current light level to every 10 seconds, for a duration of 5 minutes (regardless of amount of energy stored - See "Daylight Harvesting" above). This test requires a start assist battery to be installed for the duration of the 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.

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

Installing Wireless Devices

Careful planning is needed when locating the receivers and transmitters based on the construction materials in the space and possibility of tenant's furniture disrupting the transmissions.

The sensor should be installed in the space where the receiver is mounted. The signal will travel through some material barriers.

Refer to the tables below for range considerations with building materials that reduce the radio signal power.

Material	Attenuation
Wood	0 - 10%
Plaster	0 - 10%
Glass	0 - 10%
Brick	5 - 35%
MDF	5 - 35%
Ferro concrete	10 - 90%
Metal	90 - 100%
Aluminum	90 - 100%

Material	Range Typical
Line of sight	80' (24m) corridors
Line of sight	330' (100m) open halls
Plasterboard	80' (24m) through 3 walls
Brick	33' (10m) through 1 wall
Ferro concrete	33' (10m) through 1 wall
Ceiling	Not Recommended

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.

Agency Listings and Compliance

CEC Title 24 Compliant

Built in an ISO9001 certified facility

FCC Part 15.231 (902 MHz models only)

Contains FCC ID: TCM300U

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)

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)

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