Introduction

The RAPIX LCD DALI Ethernet Hub (eHub) is a powerful DALI Application Controller with a number of input channels. These can accept smart peripherals such as push-button switches, rotary switches, and some types of sensors. There are also input channels that can accept isolated voltage-free contacts (dry contacts), and connections to 12 V sensors that have a simple switched output.

When general purpose sensors are used on the voltage-free contact or simple input channels, there several considerations to consider, to get a desired behaviour.

This Application Note describes how to use the SensorSwitch CM PDT 9 AU Dual Technology Sensor with the Ozuno eHub.

Sensor Switch CM PDT 9 AU Dual Technology

The SensorSwitch CM PDT 9 AU Dual Technology sensor is a high-quality motion sensor with combined Passive Infra-Red and Microphonic technology.

This sensor uses its PIR part to detect movement and activate an output. Once movement is detected, the PIR part will re-trigger the sensor, keeping the output activated. In cases where there is not a lot of movement, the sensor can also optionally be re-triggered by sound.

On this sensor, sound will not initially trigger the sensor - this only happens by movement detected by the Passive Infra-Red sensor element.

What we want to Achieve:

A typical case for a presence sensor is to detect occupancy of a space, such as a walled office, a corridor, or a portion of an open plan office space.

When an occupant is detected, the lighting should be turned on immediately. And when the occupant leaves the area, the lighting should be held on for a reasonable period and then be turned off.

This period after the space is vacated helps to avoid cases where the space is occupied, but the occupants are not moving and are quiet (no sensor detection).

That period also means the space remains lit during a time when the occupant might suddenly return.

Sometimes this time can also ensure a space (such as a corridor) remains lit to allow safe exit – for example for the last person leaving a space in a building, or locking up at night.

In this example, we would like the following overall behaviour:

- Lighting turned on when a person enters the space;
- Lighting held on during occupancy;
- Dual technology sensing (with microphonic sense) is required;
- Lighting held on for 15 minutes after the space is vacated;
- After the 15 minute period:
    - The lighting should fade to 20% over 4 seconds
    - After the fade there should be a dwell at 20% for 2 minutes
    - After the dwell the lighting should fade to off over 8 seconds.

When the timing is done in the sensor:

A. The available time periods for the lighting to be held on (after the room seems to be empty) are limited to those supported by the sensor:

The sensor has Occupancy Time Delay values of: 30 sec, 2.5 min, 5 min, 7.5 min, 10 min, 12.5 min, 15 min, 17.5 min, 20 min.

B. If the microphonic option is used, it can re-trigger the sensor during that Occupancy Time Delay period.

C. Because the sensor does the major part of the timing, the eHub Vacancy delay should be small – a few seconds.

When the timing is done in the eHub:

A. The available time periods for the lighting to be held on (after the room seems to be empty) are anywhere from a few seconds to many hours.

This is the Vacancy Delay time that is set in the eHub.

B. The sensor needs to have its Occupancy Time Delay set as short as possible (suggested: 30 seconds, lower if possible) so that the eHub timing determines what happens.

The actual time before turn-off begins will be the eHub vacancy time + 30 seconds, because the sensor holds its output signal for 30 seconds after the space seems to be vacant.

C. If the microphonic option is used, it can re-trigger the sensor, but only during the Occupancy Time Delay period ***of the sensor***.

The short Occupancy Time Delay means that the microphonic option might not be very effective.

When the timing is done in the Sensor AND the eHub:

A. The available time periods for the lighting to be held on (after the room seems to be empty) are anywhere from a few seconds to many hours, because this is set by the eHub.

B. But the smallest possible time is set by the sensor Occupancy Time Delay.

C. The actual time the lighting is ON is the SUM of the sensor Occupancy Time Delay and the eHub

D. The Sensor Occupancy Time Delay will determine the effectiveness of the microphonic option (remember: it can only re-trigger the sensor during the Occupancy Time Delay period ***of the sensor)***.

Suggested Settings when Using the Microphonic Option in the Sensor

If the microphonic option is important, then the sensor should do **_most_** of the timing. This allows the microphonic sensor element to re-trigger the timer in the sensor.

A typical case might be a quiet single occupancy office.

In this case, the suggested setup for the sensor is an Occupancy Time Delay of 10 minutes, and an eHub Vacancy Delay of 5 minutes.

> _This means the total time from vacating the space until the lights begin their fade down is 10 minutes (sensor) + 5 minutes (eHub) = 15 minutes (total)_

> _Sounds during the 10 minute sensor Occupancy Time Delay will re-trigger the sensor, and keep the lighting on._

In this case, the SensorSwitch CM PDT 9 AU needs to have the following settings:

|		
Setting #2:	**_Occupancy Time Delay:_**	**_5 Clicks = 10 min_**
Setting #10:	**_Minimum On Time:_**	**_1 Click = 0 min_**
Setting #12:	**_Dual Technology:_**	**_1 Click = Normal_**

The sensor is then connected to one of the two voltage-free / 12 V sensor input channels, and RAPIX Addressing or RAPIX Integrator is used to apply these settings to that channel:

Template:	**_Motion Sensor_**
Voltage-free Input:	**_1 or 2 depending on where the sensor is connected_**
Control type:	**_Occupancy Mode_**
Zone / Members	**_The DALI Short Addresses, Groups, or Broadcast to be controlled by the sensor._**
On Fade Time:	**_The time for lighting to come on when the space is entered. This should be small – either INSTANT, or up to about 1 second._**
Vacancy Delay:	**_Set this to 5 minutes._**
Switch off behaviour:	**_Dwell then Off_**
Dwell Level:	**_Set this to 20% (or close to that)_**
Dwell Duration:	**_Set this to 2 minutes._**
Fade Time:	**_The time to fade to OFF._**
	For this example, set this to 8 seconds.

IMPORTANT:

The Vacancy Delay in RAPIX Addressing, does not tell the full story!

The space needs to be vacated for the time shown in RAPIX Addressing PLUS the Occupancy Time Delay set in the sensor.

Suggested Settings when the Microphonic Option in the Sensor does not matter

If the microphonic option is not important, then the eHub should do all of the timing. This means that the time periods can all be easily found using RAPIX Addressing.

A typical case might be a part of a busy open plan office, or a busy corridor where the PIR sensing element will be continually re-triggered.

In this case, the suggested setup for the sensor is an Occupancy Time Delay of 30 seconds (the smallest possible), and an eHub Vacancy Time of 14.5 minutes (or even 15 minutes).

> *This means the total time from vacating the space until the lights begin their fade down is 30 seconds (sensor) + 14.5 minutes (eHub).*
>
> *Sound is not important and has no effect.*

In this case, the SensorSwitch CM PDT 9 AU needs to have the following settings:

Setting #2:	**Occupancy Time Delay:**	**1 Clicks = 30 sec**
Setting #10:	**Minimum On Time:**	**1 Click = 0 min**
Setting #12:	**Dual Technology:**	**2 Clicks = Off**

The sensor is then connected to one of the two voltage-free / 12 V sensor input channels, and RAPIX Addressing or RAPIX Integrator is used to apply these settings to that channel:

Template:	**Motion Sensor**
Voltage-free Input:	**1 or 2 depending on where the sensor is connected**
Control type:	**Occupancy Mode**
Zone / Members	**The DALI Short Addresses, Groups, or Broadcast to be controlled by the sensor.**
On Fade Time:	**The time for lighting to come on when the space is entered. This should be small – either INSTANT, or up to about 1 second.**
Vacancy Delay:	**Set this to 15 minutes.**
Switch off behaviour:	**Dwell then Off**
Dwell Level:	**Set this to 20% (or close to that)**
Dwell Duration:	**Set this to 2 minutes.**
Fade Time:	**The time to fade to OFF.**
	For this example, set this to 8 seconds.

Wiring the SensorSwitch CM PDT 9 AU

Connect the sensor wiring to the eHub sensor patch lead as follows:

Red: + 12V dc
Black: 0V
White: Occupancy signal
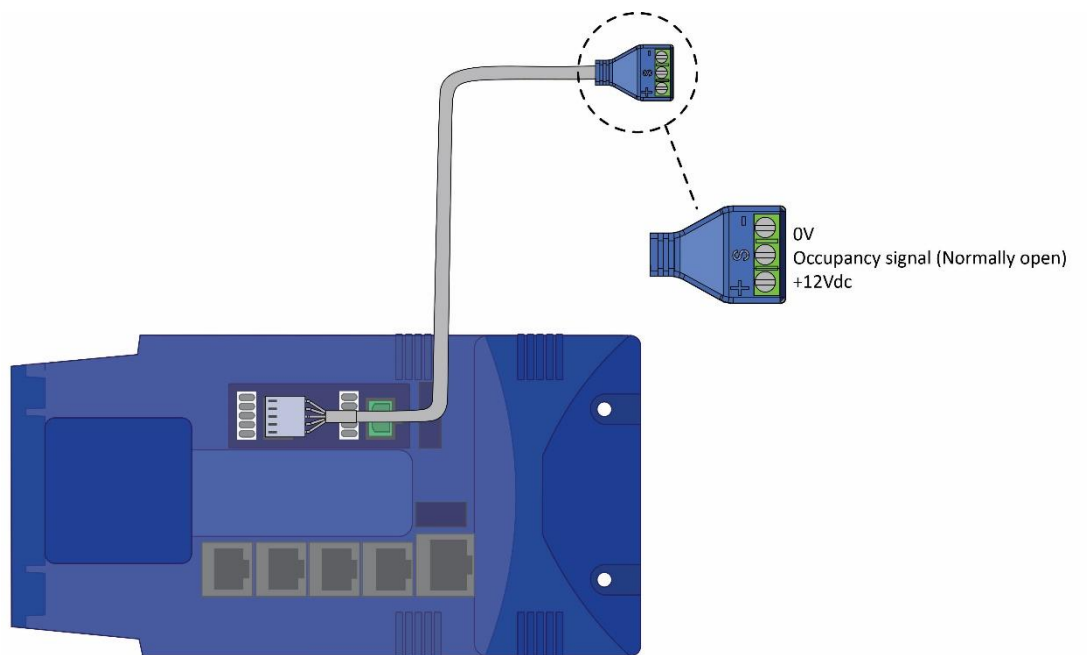
How to change settings in the SensorSwitch CM PDT 9 AU

This product must have power applied before it can have settings changed, so connect it to an eHub using the sensor patch lead, as shown above. Make sure everything is powered up.

To access the programming button, rotate the sensor cover anticlockwise to unlock it, and then remove it. This exposes the programming push button:
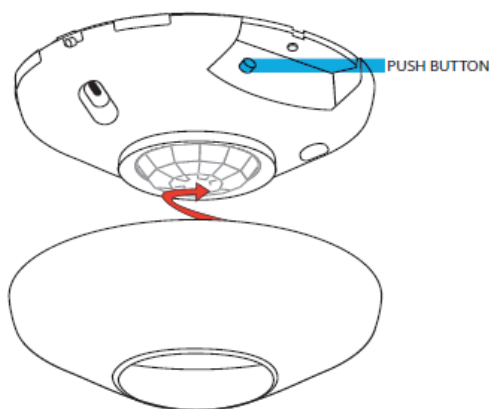
Changing a sensor function:

a. Find the number of presses for the setting you want to change (for example, enable or disable Dual Technology needs 12 presses).

> *Refer to SensorSwitch document IC7 for all settings and detailed programming instructions. This is provided with each product or can be downloaded using a web search with the terms:*
>
> > *SensorSwitch IC7*

b. Quickly press and release the button the number of times corresponding to the setting being changed.

c. After pressing and releasing, a green indicator under the semi-transparent lens will blink back the **current setting** (not the function / setting number).

> *Example: after 12 presses to select Dual Technology option, there would be 1 blink if the dual technology option is set to Normal, 2 blinks if it is disabled, and so on.*
>
> *The blink of the current setting pauses before repeating 3 times.*
>
> *If a setting is not to be changed, wait for the blink of the current setting to repeat 3 times; after the indicator has stopped blinking out the current setting the unit can have a different setting changed.*

d. After the current setting has been blinked, press the button the number of times needed to change the setting.

> *Example: after selecting the Dual Technology option, to set it to normal, press and release the button once. To turn it off, press and release the button twice.*
>
> *After changing the setting, it will be blinked back, 3 times.*
>
> *The setting is saved and the unit is ready to have other settings changed only after the new setting has been blinked back 3 times.*
>
> *After all the settings have been changed, push the sensor cover back into place and gently rotate clockwise to lock it.*

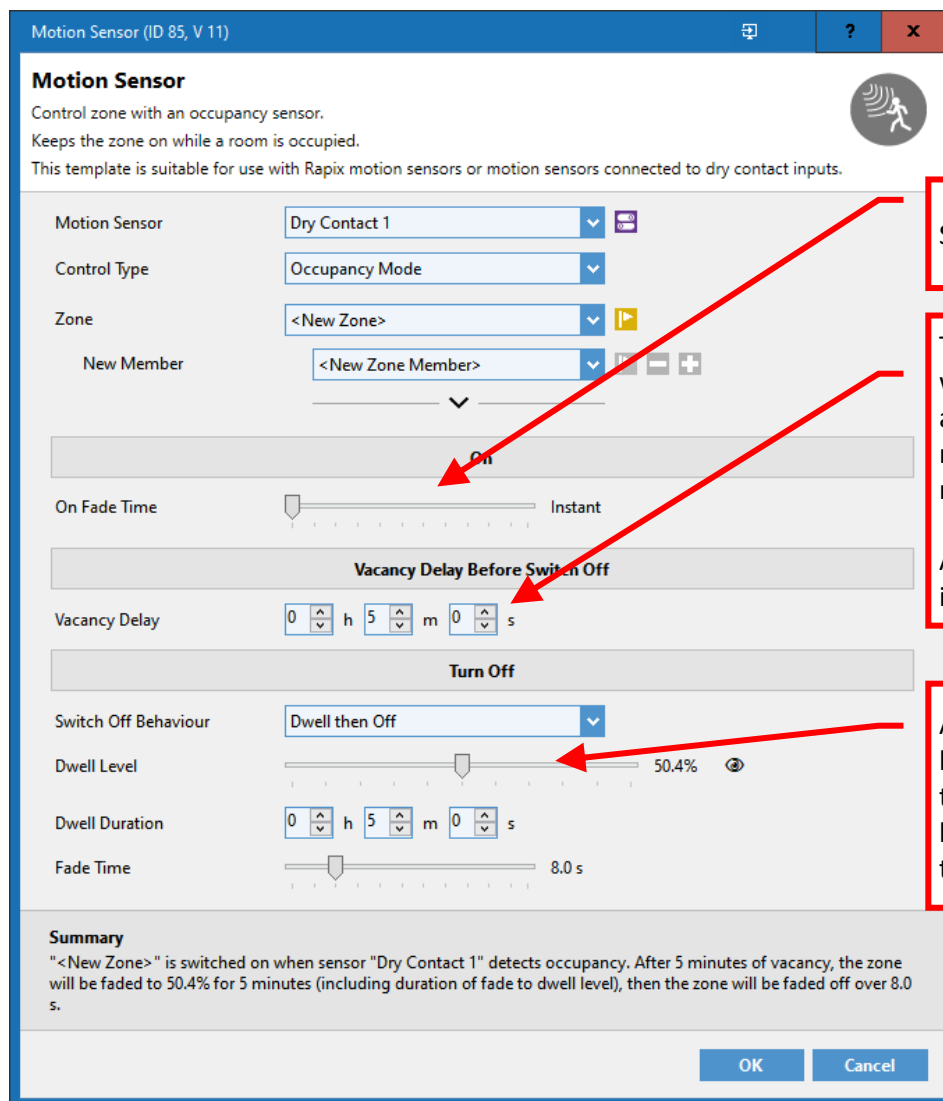## RAPIX Addressing – Voltage-free input settings for sensor

Scan the DALI line, and selecting the eHub to be edited.

Then double click one of the voltage-free (dry contact) inputs, and select the template "Motion Sensor":
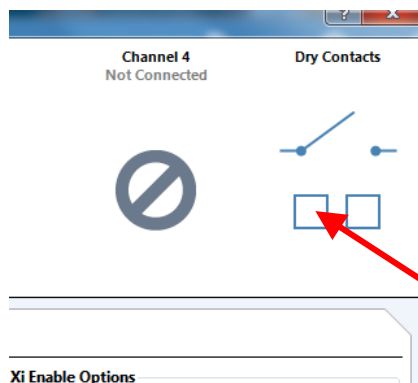
Double click one of the voltage-free inputs.

The settings page will appear allowing the setup of the occupancy sensor:

Set On fade time here

Time that the eHub will hold lighting on after the sensor has not detected any movement.

Adds to any hold time in the sensor.

After timeout the lighting will be faded to the dwell level, and held ther for the dwell time.

Change History

Rev	Date	Updated By	Comment
1	7 Nov 2019	A Quick	First Release

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