

Introduction

The RAPIX eHub provides a variety of options for using third-party motion / occupancy sensors.

This Application Note provides details of the requirements for sensors and the means of connecting them to an eHub.

eHub Behaviour

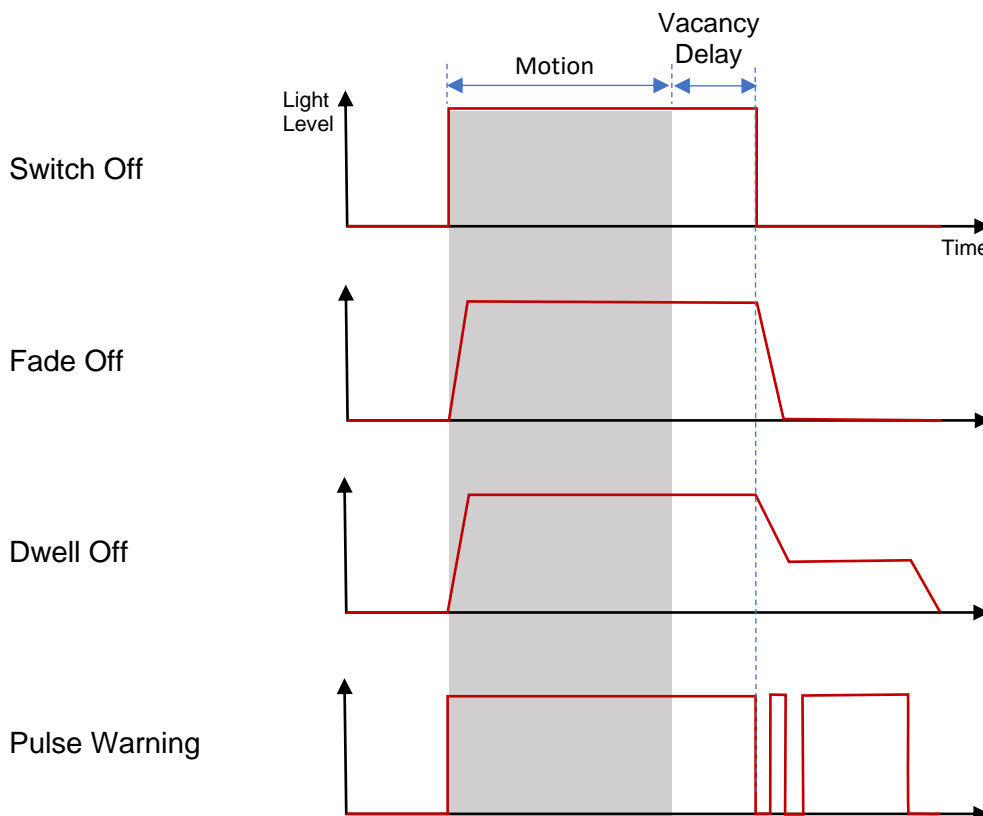
The RAPIX eHub accepts motion/occupancy messages from sensors and uses them to control lights or other loads. The behaviour is determined by the eHub template used and the template options selected.

The two main means of control are:

Occupancy Mode: When motion is detected, the eHub switches the lights on. When there has been no motion for a period of time, the lights are switched off.

Vacancy Mode: When there has been no motion for a period of time, the lights are switched off. Something else is responsible for switching the lights on.

The typical turn-off behaviour options are shown below:



All sensor types (RAPIX or third-party) are commissioned the same way using the RAPIX Addressing or RAPIX Integrator software.

Sensor Types

Any type of motion/occupancy sensors can be used (subject to the requirements listed elsewhere in this document):

- PIR
- Microwave
- Ultrasonic
- Pressure switch, magnetic reed switch, hotel key-card slot
- Vibration
- Area reflection (active IR)
- Tomographic (radio waves) / RADAR
- Video
- Audio detection
- Hybrid / dual technology

The RAPIX eHub requires sensors that have a "pulse" output:

- Sensor with voltage-free output: normally-open (closed = "occupied")
- Sensor with voltage output: high (> 2V) = "occupied"

Sensor Timing

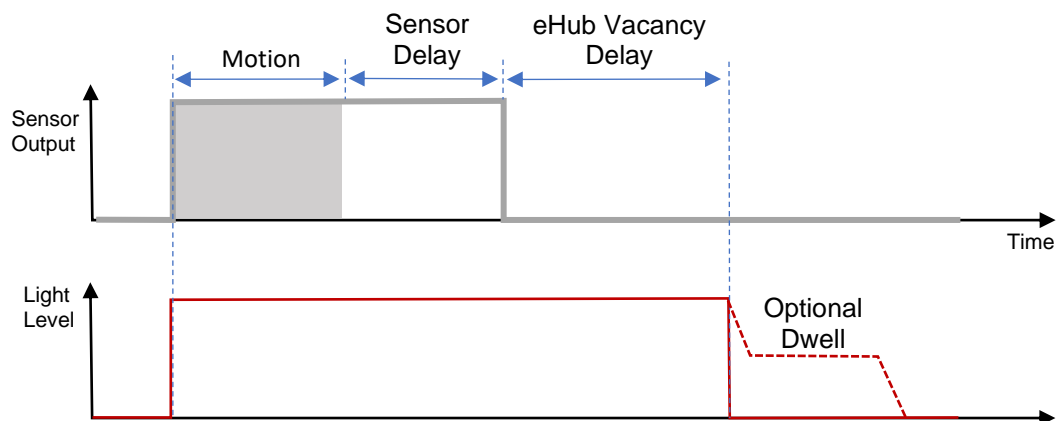
Some sensors have user settings for sensitivity, mode of operation and time-out duration and behaviour.

Vacancy Delays

A sensor has a delay from when it ceases detecting motion to when it switches off its output.

The eHub also has a "vacancy delay". This is the time between the sensor reporting vacancy to when the eHub switches off the lights.

The overall delay between motion finishing and the lights being switched off is the sum of these two:



Timing Options

There are several possible options:

- a. Do all of the timing operations in the eHub; or
- b. Use the sensor to do the occupancy timing, and the eHub to only do any dwell timing; or
- c. Some combination of the two options above.

When the timing is done in the eHub (the preferred option):

- The available time periods for the lighting to be held on (after the room seems to be empty) are anywhere from a few minutes to many hours.
- This is the Vacancy Delay time that is set in the eHub.
- The sensor needs to have its Occupancy Time Delay set as short as possible (suggested: 5 to 30 seconds) so that the eHub timing determines what happens.

(This option is strongly preferred)

When the timing is done in the sensor:

- The available time periods for the lighting to be held on (after the room is vacant) are limited to those supported by the sensor.
- Because the sensor does the major part of the timing, the eHub Vacancy Delay should be small.

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

- The available time periods for the lighting to be held on (after the room is vacant) are limited to those supported by the sensor.
- The smallest possible time is set by the sensor Occupancy Time Delay.
- The actual time the lighting is ON is the sum of the sensor Sensor Delay and the eHub Vacancy Delay.

eHub Connection Types

The eHub has two channels that support sensor connection, these are labelled SEN1 and SEN2.

Each channel is made up of a parallel connected Sensor Input and a Voltage-Free (also known as Dry Contact) input, so on each channel, only one of those connections can be used at a time:

Voltage-free Input: 2 way green removable screw terminal, isolated

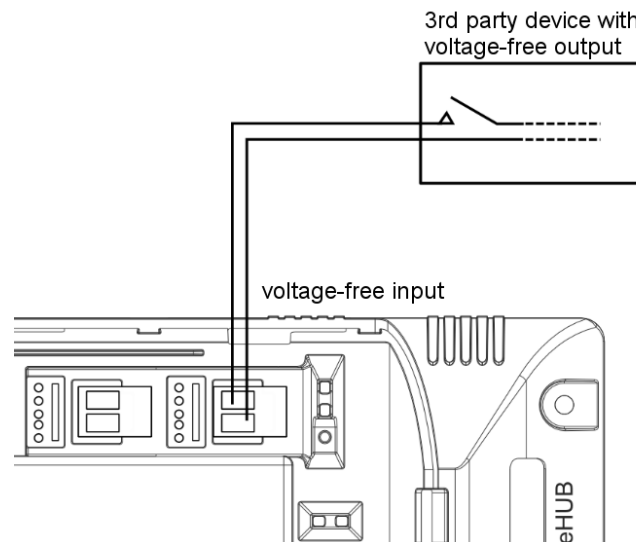
Sensor connection: 5 pin white flat style connector, non-isolated

The eHub also has four Smart Channels, each capable of connecting to three sensors when used with the optional Sensor Multiplexor.

An eHub can therefore be used with a maximum of 14 motion sensors: 3 per smart channel and 2 direct connected to the eHub.

Voltage-Free Contact

Sensors with a voltage-free relay output can be connected directly to either of the two eHub green Voltage-Free inputs:



Sensor Requirements

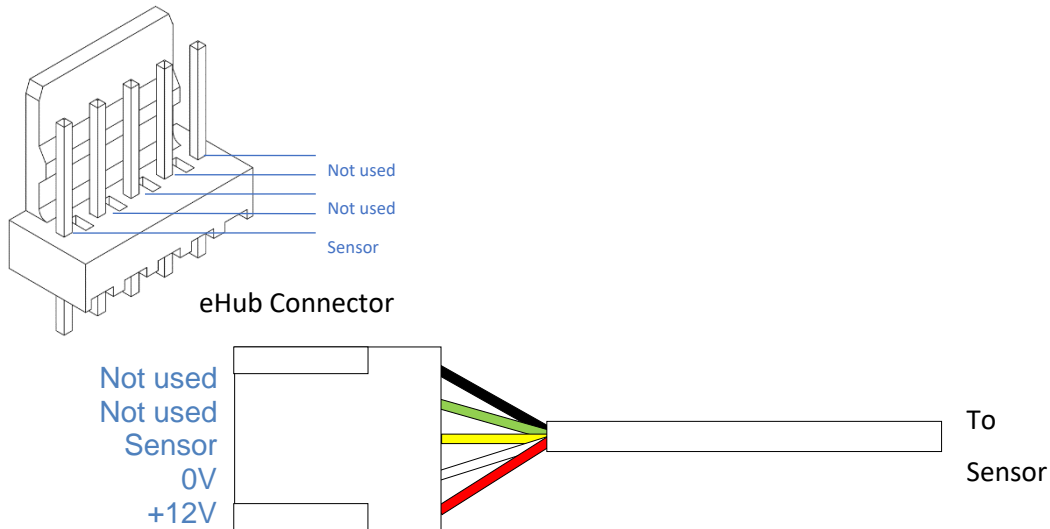
Sensors that connect to the eHub Voltage-Free Inputs need to meet these requirements:

Power	Powered Externally	(cannot source power from the eHub)
Output	Voltage-free:	yes (isolated)
	Open Collector:	no
	Voltage:	no
Cable type	Twisted	(e.g. Cat-3, Cat-5, Cat-5e, Cat-6)
Max. Cable length	25m	(from eHub to sensor)
Status LED	No	

Sensor Connection

Sensors with a voltage output can be connected to either of the two eHub white 5 pin flat Sensor Inputs:

A sensor connection cable can be made using the pin-out shown below:



Molex part numbers: 0022012055, 0022012056, 0022013057
(or equivalent)

Sensor Requirements

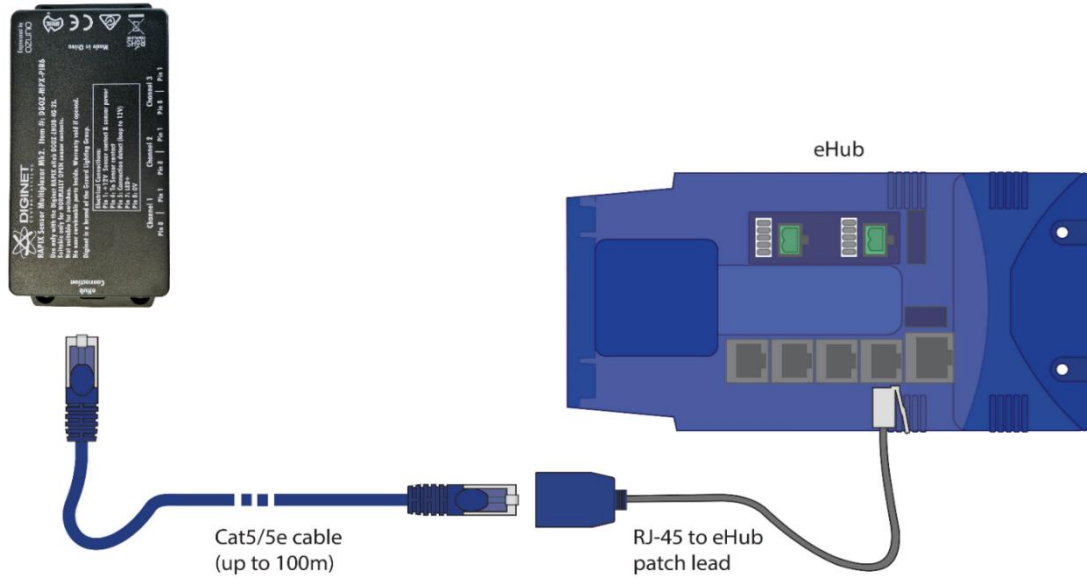
Sensors that connect to the eHub Sensor Inputs need to meet these requirements:

Power Output	12V DC, 100mA max.	(limited by eHub plug-pack)
	Voltage-free:	yes (connected from signal to +12V)
	Open Collector:	no
Cable type	Voltage:	yes (threshold is 2V)
	Twisted	(e.g. Cat-3, Cat-5, Cat-5e, Cat-6)
Max. Cable length	25m	(from eHub to sensor)
Status LED	No	

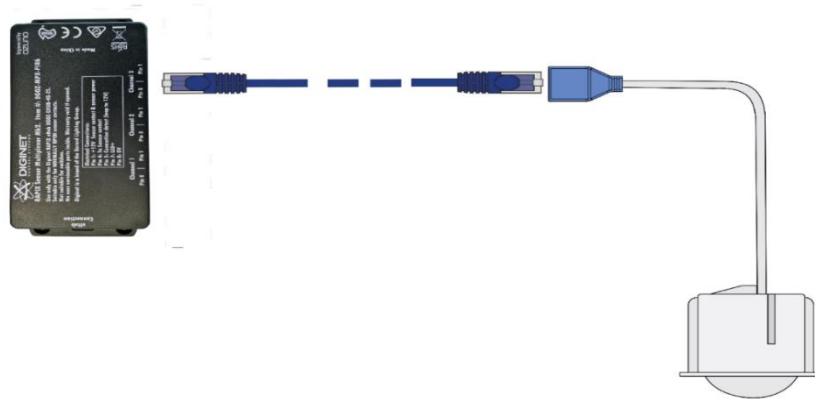
Sensor Multiplexor Mark 2

The Sensor Multiplexor Mk2 allows 3 motion sensors to be connected to a single eHub Smart Channel.

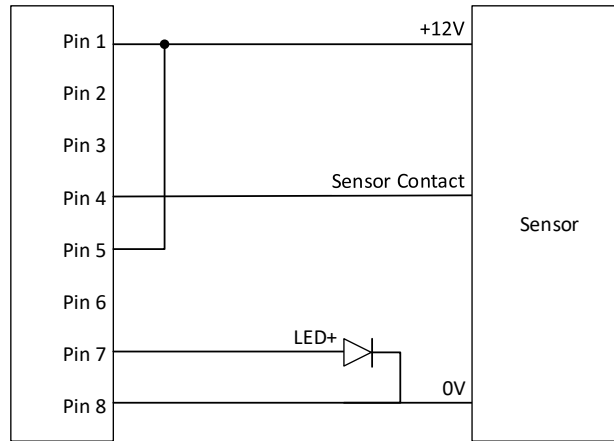
A patch lead is provided to connect the Multiplexor Mk2 to the eHub as shown below:



Motion sensors are available with an RJ45 connector, allowing a direct connected to the Multiplexor Mk2 as shown below:



Alternatively, any sensor that runs from 12V dc can be used. The wiring is shown on the Multiplexor Mk2 case. The LED output has an internal current limit resistor allowing a status LED to be directly connected.



Sensor Requirements

Sensors that connect to the Multiplexor Mk2 need to meet these requirements:

Power	12V DC, 50mA max.	(when powered from eHub)
Output	Voltage-free:	yes (connected from signal to +12V)
	Open Collector:	no
	Voltage:	yes (threshold is 2V)
Cable type	Twisted	(e.g. Cat-3, Cat-5, Cat-5e, Cat-6)
Max. Cable length	20m	(from Multiplexor Mk2 to sensor)
Status LED	Yes	(optional)

Inverting the Signal

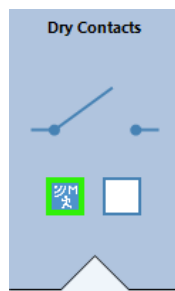
Some sensors may use an inverted signal: They are normally-closed and change to open when motion is detected.

This setting is handled by the configuration of the Dry Contact or Sensor Input on the eHub, by selecting **invert toggle sense** in the configuration.

NOTE: The Multiplexor Mk2 does not support normally-closed sensor types.

To select invert toggle sense for normally-closed sensor types:

1. Edit the eHub in RAPIX Addressing or RAPIX Integrator.
2. Select the input by clicking it:



3. Check the "Invert Toggle Sense" option:

Dry Contact Input Properties		
1	Dry Contact 1	Open
2	Dry Contact 2	Open

Name:

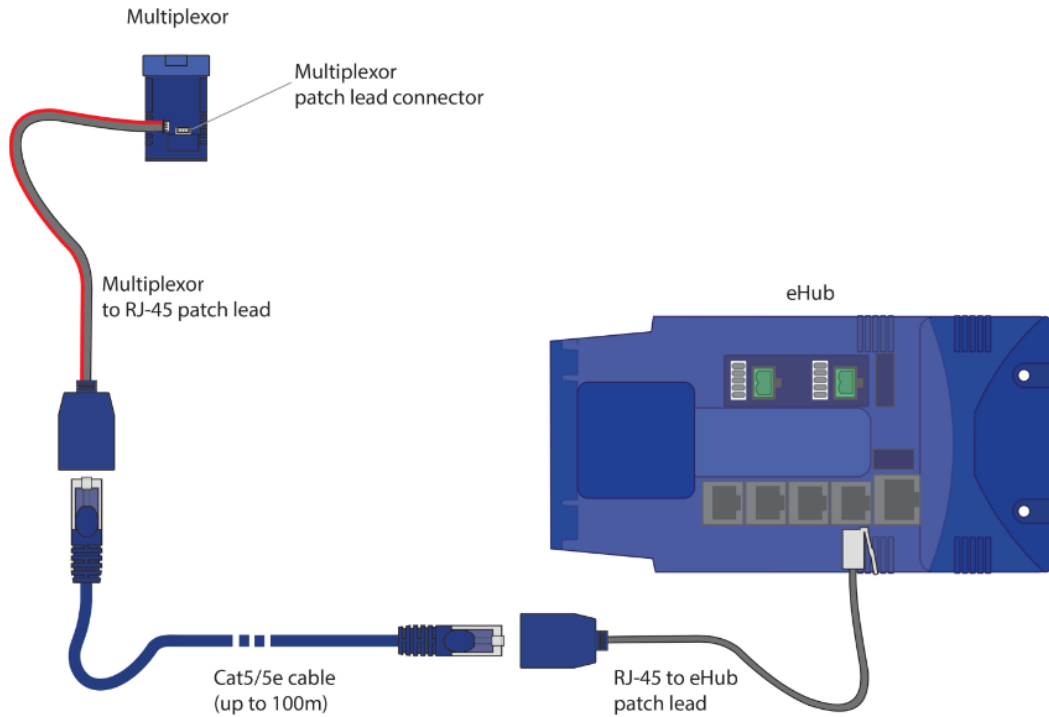
Invert Toggle Sense

4. Save the changes to the eHub.

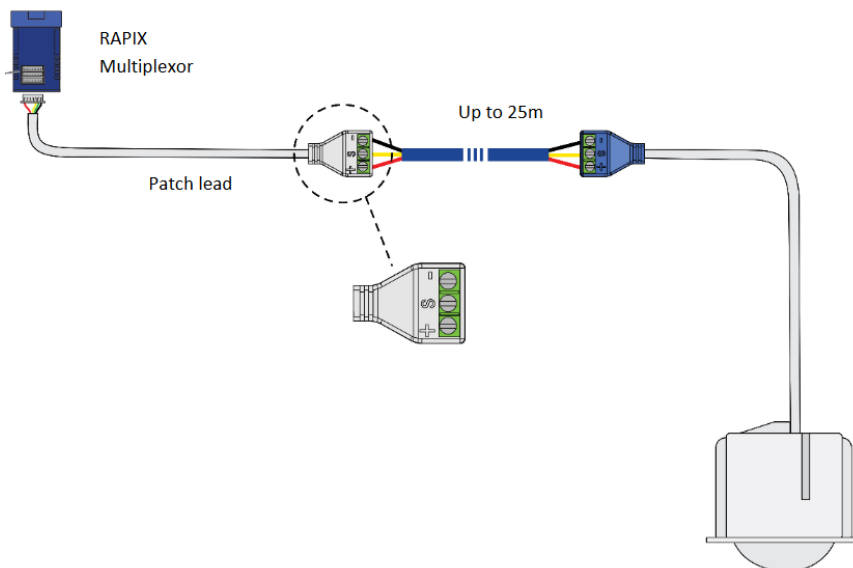
(Obsolete) Sensor Multiplexor Mark 1

The Sensor Multiplexor Mark 1 is obsolete. This information is presented for those sites that still use this device.

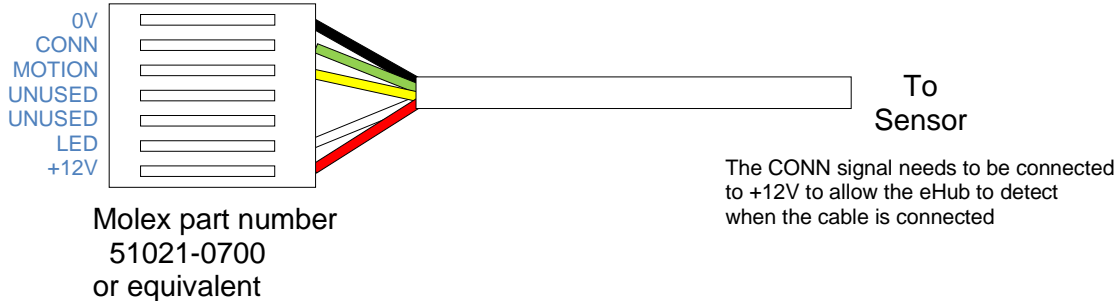
The Sensor Multiplexor Mk1 allows 3 motion sensors to be connected to a single eHub “smart” channel. A patch lead is provided to connect the Multiplexor Mk1 to the eHub as shown below.



Motion sensors are connected to the Multiplexor Mk1 as shown below:



An equivalent cable can be made using the pin-out shown below:



Sensor Requirements

Sensors that connect to the Multiplexor Mk1 need to meet these requirements:

Power	12V DC, 50mA max.	(when powered from eHub)
Output	Voltage-free:	yes (connected from signal to +12V)
	Open Collector:	no
Cable type	Voltage:	yes (threshold is 2V)
	Twisted	(e.g. Cat-3, Cat-5, Cat-5e, Cat-6)
Max. Cable length	25m	(from Multiplexor Mk1 to sensor)
Status LED	Yes	(optional)

Change History

Rev	Date	Updated By	Comment
1	7 Nov 2019	D. S.	First Release

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