atim cloud wireless™
PRODUCT LINE

ATIM Cloud Wireless®

Infrared Presence - PIR

User Guide







Concerned models:

ACW-PIR360-I

ACW-PIR90-I

ACW-PIR180-O

ACW-PIR90-O

ACW-ILB30

ACW-ILB100

sigfox ready

LoRaWAN™

ATIM Radiocommunications
Chemin des Guillets
38250 Villard de Lans

www.atim.com
info@atim.com

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Document version history

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1.1	04/16/2021	Complements update	AJ	
1.2	05/03/2021	Multiple corrections	AJ	
1.3	05/19/2021	LoRa version bugs corrections	AJ	
1.4	06/02/2021	LoRa downlinks corrections	AJ	
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1.7	03/01/2023	Keep alive frames and default mode corrections	MD	
1.8	23/02/2023	Batteries part numbers addition	MD	
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Declaration of compliance

All ACW Atim Cloud Wireless® products comply with the regulatory requirements of the R&TTE Directive (1999/5/EC), article 3:

CE

1 SAFETY (Article 3.1a of the 1999/5/EC Directive)

NF EN60950-1 Ed. 2006/A1:2010/A11:2009/A12:2011 (health)

EN62479: 2010 (power <20mW) or EN62311:2008 (power > 20mW)

2 Electromagnetic compatibility (Article 3.1b of the 1999/5/EC Directive)

EN 301489-3 v1.4.1, EN 301489-1 V1.9.2

3 Efficient use of the radio frequency spectrum (Art.3.2 of the 1999/5/EC Directive)

ETSI EN300 220-2 v2.4.1 and EN300 220-1 v2.4.1

Environmental recommendations

a. Explosive atmosphere

Except for the ACW-ATEX line specifically intended for this purpose, do not use ACW radio modems in the presence of flammable gases or fumes. Using the equipment in such an environment constitutes a safety hazard.

b. Environment

Respect the temperature ranges for storage and operation of all products. Failing to respect these guidelines could disrupt device operation or damage the equipment. ACW products in IP65 water- and dust-resistant housings may be placed outdoors but must not be submerged under any circumstances.

Follow the instructions and warnings provided below to ensure your own safety and that of the environment and to protect your device from any potential damage.



General hazard – Failure to follow the instructions presents a risk of equipment damage.



Electrical hazard – Failure to follow the instructions presents a risk of electrocution and physical injury.



Direct-current symbol



WARNING: do not install this equipment near any source of heat or any source of humidity.



WARNING: for your safety, it is essential that this equipment be switched off and disconnected from mains power before carrying out any technical operation on it.



WARNING: the safe operation of this product is ensured only when it is operated in accordance with its intended use. Maintenance may only be performed by qualified personnel.



Waste disposal by users in private households within the European Union. This symbol appears on a product or its packaging to indicate that the product may not be discarded with another household waste. Rather, it is your responsibility to dispose of this product by bringing it to a designated collection point for the recycling of electrical and electronic devices. Collection and recycling waste separately at the time you dispose of it helps to conserve natural resources and ensure a recycling process that respects human health and the environment. For more information on the recycling centre closest to your home, contact your closest local government office, your local waste management service, or the business from which you purchased the product.

c. Radio

Modems in the ACW line are radio-communication modems that use the ISM (industrial, scientific, and medical) bands, which may be used freely (at no cost and with no authorization required) for industrial, scientific, and medical applications.

General presentation

The ACW-PIR product line deals with 6 infrared presence detectors.

- ACW-PIR360-I: Ceiling indoor version (360° detection radius)
- ACW-PIR90-I: Wall indoor version (90° detection radius)
- ACW-PIR180-O: Wall outdoor version (180° detection radius)
- ACW-PIR90-O: Wall outdoor version (90° detection radius)
- ACW-ILB30: Outdoor detector « barrier type » range of 30m
- ACW-ILB100: Outdoor detector « barrier type » range of 100m

This user guide presents the installation and configuration of the LoRa or Sigfox radio part of the products. For more information on how to install the product or configure the infrared detection part, please refer to the Optex documentation below,

WARNING
On some products, it is possible via switches to configure the default states of the dry contacts (NO / NC / COM). To guarantee the correct operating of the radio part, do not modify these settings.

a. Optex documentations

This documentation completes this user guide, on the configuration of infrared detectors as well as on the installation procedure.

Product	Optex reference	Link
ACW-PIR360-I	FX 360	https://www.optex-europe.com/products/indoor-intrusion-detection/fx-360
ACW-PIR90-I	WNX 40	https://optex-america.sfo2.digitaloceanspaces.com/sensor-downloads/WNX40-manual.pdf
ACW-PIR180-O	WXI-R	https://www.optex-europe.com/products/intrusion-detection/wxi-r
ACW-PIR90-O	QXI-R	https://www.optex-europe.com/products/intrusion-detection/qxi-rdt
ACW-ILB30	SL100TNR	https://www.optex-europe.com/products/intrusion-detection/sl-100tnr
ACW-ILB100	SL350QNR	https://www.optex-europe.com/products/intrusion-detection/sl-350qfr

Technical features

a. Consumption

Product		Standby	Reception	Emission
ACW-PIR360-I	LoRa	15µA	29mA	53mA
	Sigfox	13µA	17mA	24mA
ACW-PIR90-I	LoRa	15µA	28mA	55mA
	Sigfox	11µA	17,5mA	25mA
ACW-PIR180-O	LoRa	19µA	29mA	57mA
	Sigfox	13µA	16mA	26mA
ACW-PIR90-O	LoRa	13µA	29mA	55mA
	Sigfox	10µA	16mA	23mA
ACW-ILB30	LoRa	400µA	30mA	60mA
	Sigfox	400µA	18mA	25mA
ACW-ILB100	LoRa	400µA	30mA	60mA
	Sigfox	400µA	17mA	21mA

b. Power Supply

The indoor (I) and outdoor (O) PIR ranges all use the same lithium battery model: 3v6 format 2 / 3AA.

WARNING
Do not use other models, otherwise the product may be damaged. Also observe the polarity.

Product	Batteries			Mounting
	Quantity	ATIM part number	Generic reference	
ACW-PIR360-I	1	C_PILE_ER17335M	ER17335 3.6V 2/3AA	Indoor support
ACW-PIR90-I	1	C_PILE_ER17335M	ER17335 3.6V 2/3AA	Indoor support
ACW-PIR180-O	2	C_PILE2_ER17505H-CT	ER17505H 3,6V	On terminal block, internal
ACW-PIR90-O	2	C_PILE2_ER17505H-CT	ER17505H 3,6V	On terminal block, internal
ACW-ILB30	1	N/A	LSH20 SAFT 3,6V	Indoor support
ACW-ILB100	1	N/A	LSH20 SAFT 3,6V	Indoor support

Operating modes of the PIR

Each device of the ACW-PIR range can be configured in 2 different radio operating modes. By default, the products are delivered in "alarm" mode.

a. Counting mode

In this mode, the product sends back a periodic frame containing the number of detections made in a time interval. This mode is useful for analyzing the occupancy rate of a room or place during the day, or for counting passages of people or vehicles at a specific location.

WARNING
The methods for detecting presence may change from one product to another. Remember to refer to the corresponding Optex documentation to learn more about the detection method.

Product	Time between 2 detections
ACW-PIR360-I	120s minimum
ACW-PIR90-I	120s minimum
ACW-PIR180-O	5s minimum by default or 120s minimum via timer (configurable, see Optex documentation)
ACW-PIR90-O	5s minimum by default or 120s minimum via timer (configurable, see Optex documentation)
ACW-ILB30	5s minimum by default or 120s minimum via timer (configurable, see Optex documentation)
ACW-ILB100	5s minimum by default or 120s minimum via timer (configurable, see Optex documentation)

From the minimum time between 2 detections T_m and the emission period of the sensor T_e, it is possible to estimate the filling rate of a room over the given period using the formula:

$$T_x = \frac{N_d}{\left(\frac{T_e}{T_m}\right)}$$

T_x the occupation rate in %
N_d the number of detections done within 1 hour
T_m, the minimum time between 2 detections
T_e, the sensor period of emission

EXAMPLE
With a PIR-90-I configured for emissions every hour, which has counted 23 detections within a period.
Then: N_d = 23, T_e = 60min, T_m = 2 min
T_x = 23 / (60 / 2) = 23 / 30 = 0.76 = 76%

WARNING
The more the period T_e is reduced, the more the product consumes, but the more precise we can be on this measurement over time.

b. Alarm mode

In this mode, the product transmits a frame as soon as it detects a presence. This mode is relevant for detecting intrusions and being warned instantly.

A periodic frame can also be configured, to get windows of downlinks more often.

WARNING
The methods for detecting presence may change from one product to another. Remember to refer to the corresponding Optex documentation to learn more about the detection method.

Product	Minimum time between 2 detections
ACW-PIR360-I	2 minutes
ACW-PIR90-I	2 minutes
ACW-PIR180-O	5s minimum / 120s recommanded
ACW-PIR90-O	5s minimum / 120s recommanded
ACW-ILB30	5s minimum / 120s recommanded
ACW-ILB100	5s minimum / 120s recommanded

NOTE
ISM band regulations impose a limit on the daily transmission time (duty-cycle). This usually means limiting the broadcast to one frame every 10 minutes.

In alarm mode, after sending an alert the product can't send anything for the next 10 minutes (dead-time).

In these 2 modes, the PIRs also emit a frame if the case is opened, this allows an alert to be raised if the product is ever torn off, for example.

The products also return a periodic life frame informing about the condition of the battery.

The periodicity of life frames, as well as frames in counting mode can be configured (see **Configuration** section). By default, there is a life frame every day, and a count frame every 60 minutes.

First startup

a. Power up

There is no switch on the PIRs, all you must do is connect the battery to the location provided for this purpose (refer to the **Optex manual of the product concerned** for more details) and close the product.

b. Test frame emission

When powered on for the first time, the product tries to connect to the network. Once it is connected, it starts up directly (in counting mode by default).

To quickly trigger a frame to validate the connection, all you must do is activate the case opening / vandalism sensor, if the product is connected, you will receive an alert frame.

Produxt	Sensor position
ACW-PIR360-I	Internal, on the left of the batteries
ACW-PIR90-I	Internal, on the left of the batteries
ACW-PIR180-O	External, behind the product
ACW-PIR90-O	Internal, front face of the product, on the top left (small black button)
ACW-ILB30	External, behind the product, rubber grey piece
ACW-ILB100	External, behind the product, rubber grey piece

Frame format

a. Lists of the frames

Name of the frame	Description
Keep alive frame	Periodic frame returning the battery status
Counting frame	In all modes, Issued periodically
Alert frame	Only in "alarm" mode. Emitted at each product detection
Casing-opening/antivandal frame	In all modes. Issued as soon as the case of a product is opened, or when it is torn from its wall (outdoor version and barrier only)

The counting, warning and case opening frames contain all the information relating to the state of the detector.

b. Standard frames

Standard frames include alarm, counting and casing-opening frames.

Byte	Possible value	Description
0	0x32	Header
1	0x01	Casing-opening frame
	0x08	Alarm frame
	0x10	Counting frame
2	0x00	Casing-opening sensor, low state (4)
	0x01	Casing-opening sensor, high state (4)
3	0xFF	Unused
4	0x00	DQ sensor: Enable (1)
	0x01	DQ sensor: Disable (1)
	0xFF	Unused
5	0xXX	Counting value (most significant byte) (2)
6	0xYY	Counting value (least significant byte) (2)
7	0xXX	Optional: Temperature value (most significant byte) (3)
8	0xYY	Optional: Temperature value (least significant byte) (3)

(1) : Only on ACW-ILB30 & ACW-ILB100, this is fog detection. If enabled, then alarms may be false positives.

(2) : The value of the counter to be decoded is therefore 0xXXYY**. Automatically returns to 0x000 when incrementing above 0xFFFF**

(3) : The value to be decoded is therefore: 0xXXYY. It corresponds to the temperature sensor voltage in millivolts. See section "Temperature sensor" for more information.

(4) : By default (case closed), the returned state is the low state.

c. Keep alive frame

Byte	Value
0	0x01 (header)
1	Battery tension on standby mode (LSB)
2	Battery tension (MSB)
3	Battery tension on emission mode (MSB)
4	Battery tension on emission mode (LSB)
5	0x64 (unused)

NOTE
It is recommended to change the batteries when the battery voltage in transmission (MSB), byte 3, is lower than 3V. The ACW/PIR works correctly up to a transmission battery voltage (MSB) of 2.7V.

d. Downlink frames

LoRa

In LoRa, all you must do is integrate the data into the Payload and send on port 160.

EXAMPLE
«ATO101=11\r\nATO116=00\r\nATO120=0A\r\nATOS\r\nATR\r\n».

*The \r\n symbol deals with carriage return (= enter key), it is represented by the hexadecimal code **0x0a0d***

EXAMPLE
*We want to send: **ATO120=3C**, **ATOS**, **ATR***

*Then, the following code should be sent: **41544f3132303d3343**0a0d**41544f53**0a0d**415452**0a0d*

Downlink must end with the save commands and a reboot to validate the update.

If an ATM register has been modified, you must therefore add ATMS + carriage return

If an ATO register has been modified, you must therefore add ATOS + carriage return

And end with ATR + carriage return

the frame has been written, all you have to do is convert it into hexadecimal and provision it on the platform.

Sigfox

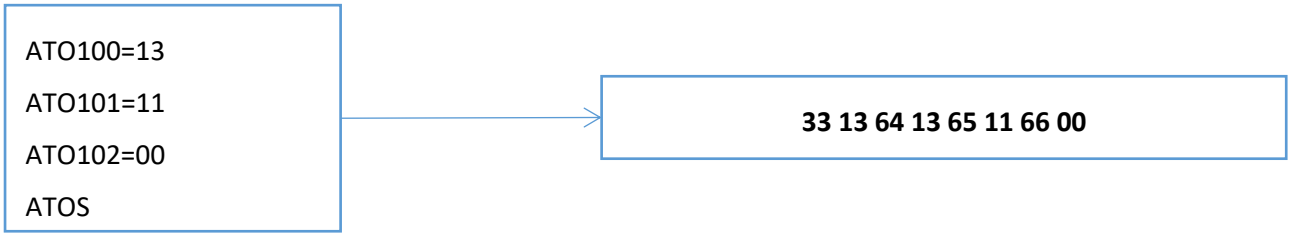
Downlink frame detail

Byte	Value	Detail
0	0x33	Header
1	0x13	ATO register modification
2	0xA1	Address 1 in hexadecimal
3	0xV1	Value 1 in hexadecimal
4	0xA2	Address 2 in hexadecimal
5	0xV2	Value 2 in hexadecimal
6	0xA3	Address 3 in hexadecimal
7	0xV3	Value 3 in hexadecimal

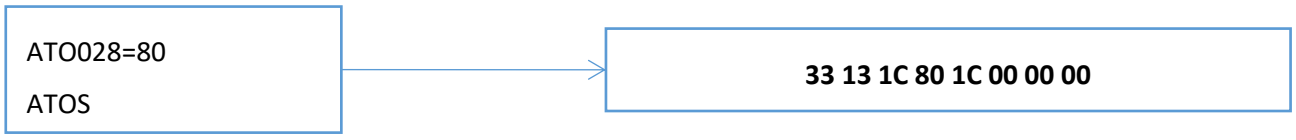
Downlinks are always 8 bytes long and are structured the same way. 3 pairs {address, value} allowing to modify up to 3 ATO registers.

As the Downlinks are necessarily 8 bytes, to record less than 3 registers, you must indicate the same register address a second time in a row where you want to stop. The module understands when it receives an identical address twice in a row that it must stop the reconfiguration there.

Example with 3 registers.



Example with 1 register.



Configuration

Each PIR can be reconfigured via Downlink using AT commands.

a. Change of the operating mode

LoRa

Product	Mode	Registers to modify
ACW-PIR360-I	Counting	ATO101=11 ATO120=XX*
	Alarm	ATO101=19 ATO120=XX*
ACW-PIR90-I	Counting	ATO101=11 ATO120=XX*
	Alarm	ATO101=19 ATO120=XX*
ACW-PIR180-O	Counting	ATO101=01 ATO120=XX*
	Alarm	ATO101=09 ATO120=XX*
ACW-PIR90-O	Counting	ATO101=01 ATO120=XX*
	Alarm	ATO101=09 ATO120=XX*
ACW-ILB30	Counting	ATO101=11 ATO120=XX*
	Alarm	ATO101=19 ATO120=XX*
ACW-ILB100	Counting	ATO101=11 ATO120=XX*
	Alarm	ATO101=1D ATO120=XX*

*** ATO120=XX** *with XX the transmission period in minutes in hexadecimal.*

Example, for a period of 10 minutes: ATO120 = 0A

In alarm mode, a frame can be rewound periodically to return the temperature if a T ° C sensor is integrated into the product, and to obtain Downlink windows.

ATO120 = 0A is recommended for counting mode (one frame every 10 minutes)

ATO120 = 3C is recommended in alarm mode, to have a Downlink window every 60min

Sigfox

Product	Mode	Commands
ACW-PIR360-I	Counting	ATO12=0 ATO16=XX
	Alarm	ATO12=1 ATO16=XX
ACW-PIR90-I	Counting	ATO12=0 ATO16=XX
	Alarm	ATO12=1 ATO16=XX
ACW-PIR180-O	Counting	ATO12=0 ATO16=XX
	Alarm	ATO12=1 ATO16=XX

ACW-PIR90-O	Counting	ATO12=0 ATO16=XX
	Alarm	ATO12=1 ATO16=XX
ACW-ILB30	Counting	ATO12=0 ATO16=XX
	Alarm	ATO12=1 ATO16=XX
ACW-ILB100	Counting	ATO12=0 ATO16=XX
	Alarm	ATO12=1 ATO16=XX

Sigfox

*** ATO16=XX** *with XX the transmission period in minutes in hexadecimal.*

Example, for a period of 10 minutes: ATO16 = 0A

In alarm mode, a frame can be reassembled periodically to return the temperature if a T ° C sensor is integrated into the product, and to obtain Downlink windows.

ATO16 = 0A is recommended for counting mode (one frame every 10 minutes)

ATO16 = 3C is recommended in alarm mode, to have a Downlink window every 60min

b. Commissioning of the device on the Sigfox network

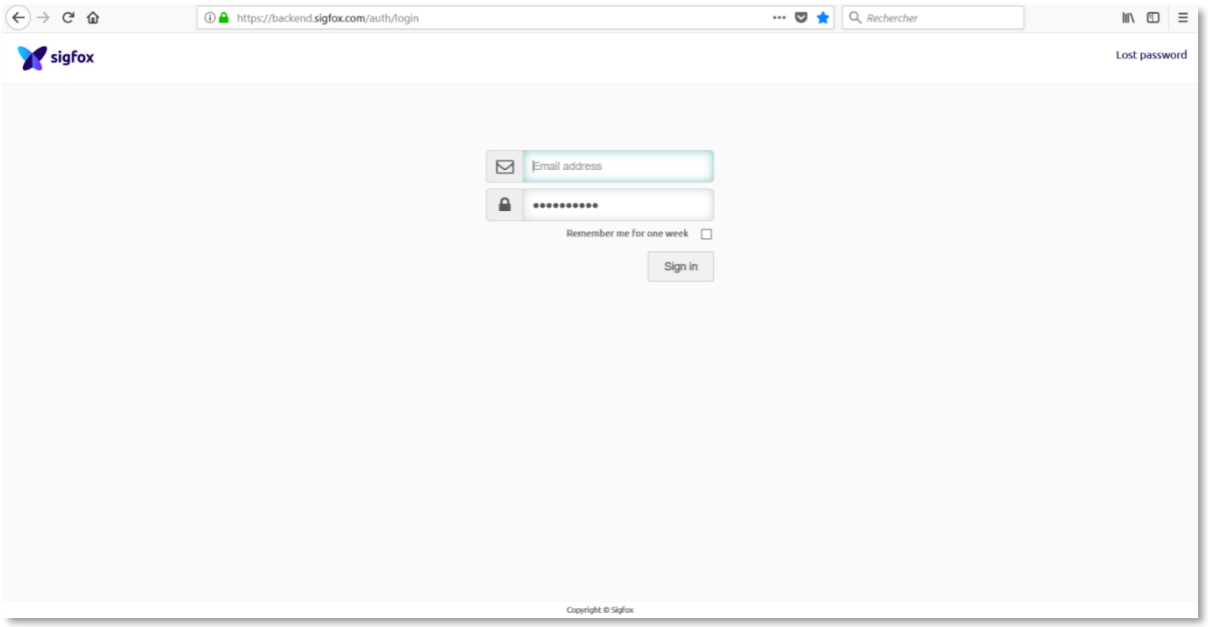
If you have subscribed to the Sigfox network with ATIM, we will take care of registering your modem / probe / sensor on the Sigfox network. On the other hand, if you have subscribed to your subscription with Sigfox, you will have to register your device yourself on the Sigfox online portal.

Here is a quick procedure allowing you to register your product on the Sigfox network.

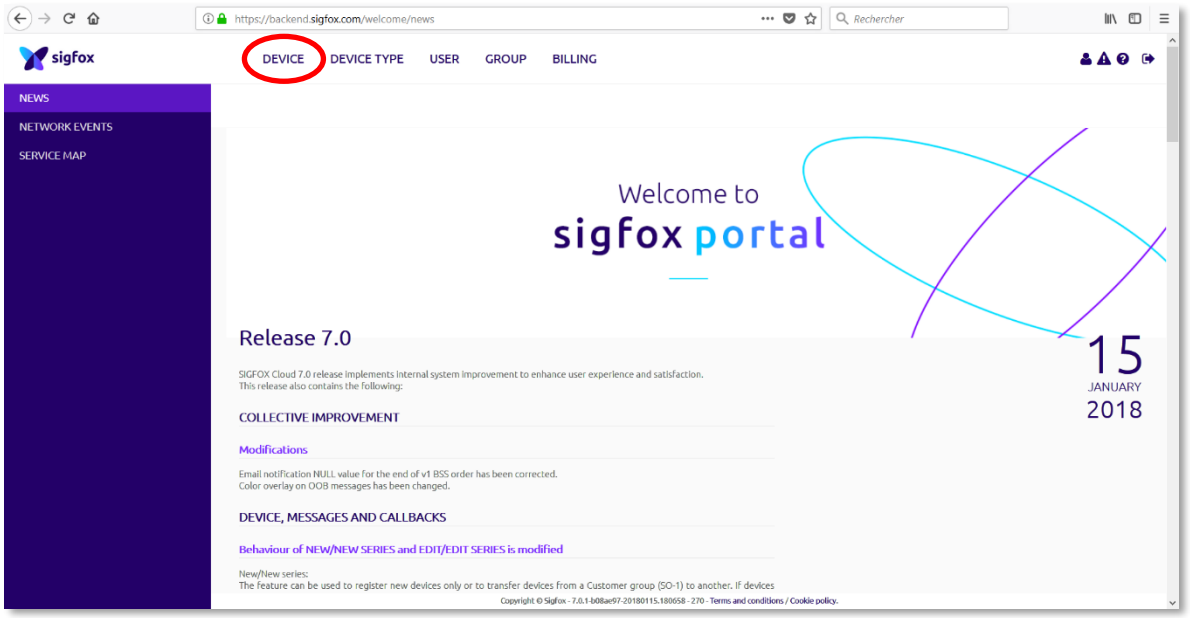
For more details, contact Sigfox customer support directly.

Step 1: Open an Internet browser and go to https://backend.sigfox.com.

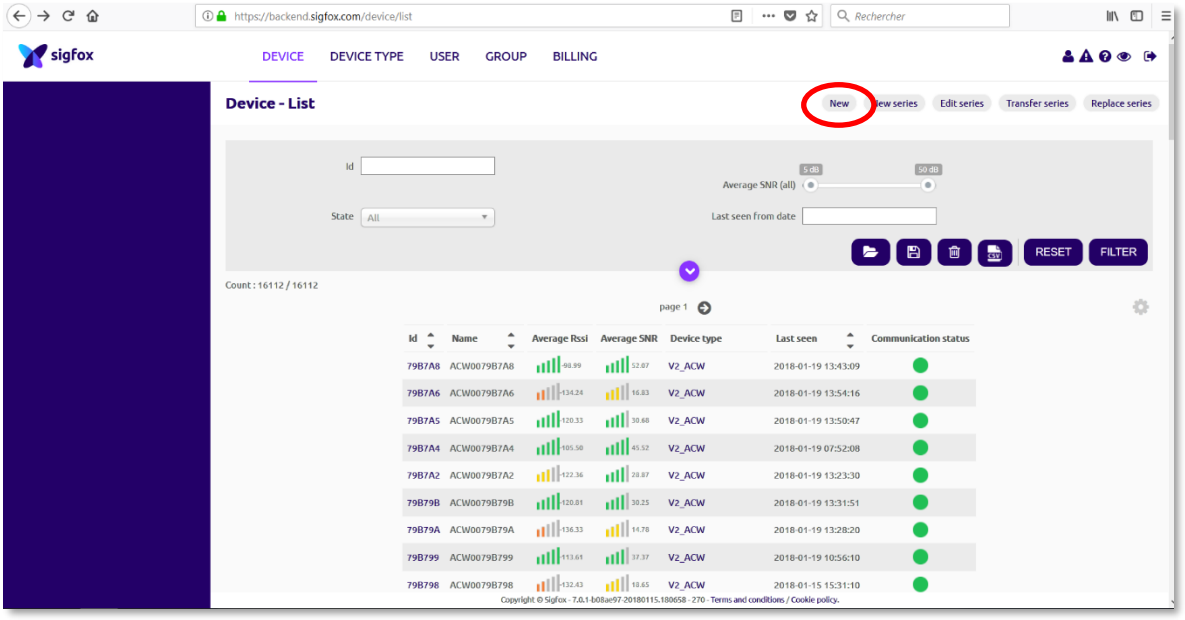
Enter your login and passwords defined when creating your Sigfox customer account:



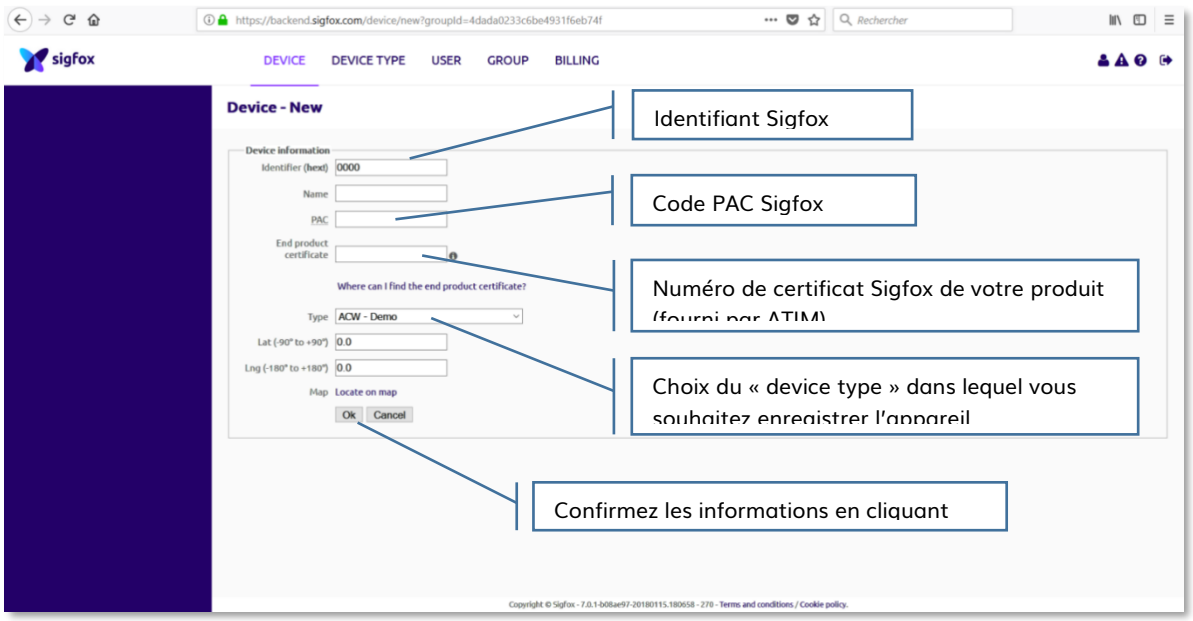
Step 2: Click on « DEVICE » on the top left of the window:



Step 3: On the screen showing your list of devices, click on "New":



Step 4: Fill in the information of the new device you want to register on your Sigfox account:

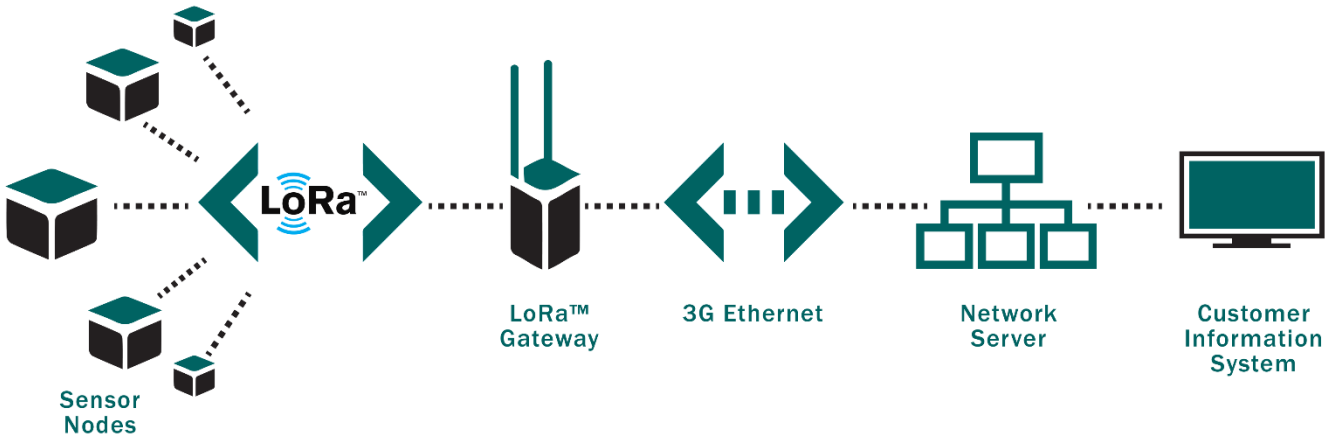


Your product is now being imported into your SIGFOX account. The import can take several hours.

c. Commissioning of the device on the LoRaWAN network

The product operates in OTAA (over the air activation), when the product is powered on, a joining request to a LoRa network is sent. The device must first be provisioned on the required network, at one of the operators (Orange or Objenious for example) or existing private gateways.

A new pairing request can be made by switching the device back on.



Optional: Temperature sensor

The last 2 bytes of standard frames correspond to a temperature value measured by a sensor on board the PIR. From this we can roughly estimate the temperature of a room using the following formula

Figure 10 Relationship between the ratiometric analog voltage output and the measured temperature

$$T\,[^{\circ}C] = -66.875 + 218.75 \cdot \frac{V_T}{V_{DD}} = -45 - \frac{17.5}{0.8} + \frac{175}{0.8} \cdot \frac{V_T}{V_{DD}}$$

$$T\,[^{\circ}F] = -88.375 + 393.75 \cdot \frac{V_T}{V_{DD}} = -49 - \frac{31.5}{0.8} + \frac{315}{0.8} \cdot \frac{V_T}{V_{DD}}$$

With Vt = value of byte 7 and 8 of standard frames
and Vdd = battery voltage raised in the life frames.

This sensor is not systematically wired to the PIRs, it is optional.

Troubleshooting

Radio frames are not received

- Check if the power supply is correctly plugged in
- Check if the device has been commissioned on the network
- Check if the network coverage is good enough for the device to transmit
- Check is the green LED blinks when emissions (LoRa version)

Technical support

For any information or technical problem, you can contact our technical support on this page:
https://www.atim.com/en/technical-support/