Atim Cloud Wireless

LoRaWAN repeater on Orange network

User Guide

Concerned models:

ACW/LW8-EXT-PWR

ACW/LW8-EXT-SLR

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This user guide deals with the bellow references

Product reference	Product Version
ACW/LW8-EXT-PWR	A.0
ACW/LW8-EXT-SLR	A.0

Document version history

Version	Date	Description	Author
1.0	11/07/2019	Created document	SM
1.1	16/07/2019	Solar panel version addition	SM
1.2	26/07/2019	URL backend modification	SM
1.3	08/01/2021	Modification with addition of CP PROD	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

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.

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, under any circumstances, be submerged.

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.

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 authorisation required) for industrial, scientific and medical applications.

Prelude

This user guide describes the ATIM ACW-EXT product functionalities. It explains operating, configuration and installation modes in function of different use cases.

The LoRaWAN Extender has been developed in partnership with Orange to repeat LoRaWAN devices located in low network coverage sites like basements parking lots, boiler room in subsoils or industrial facilities.
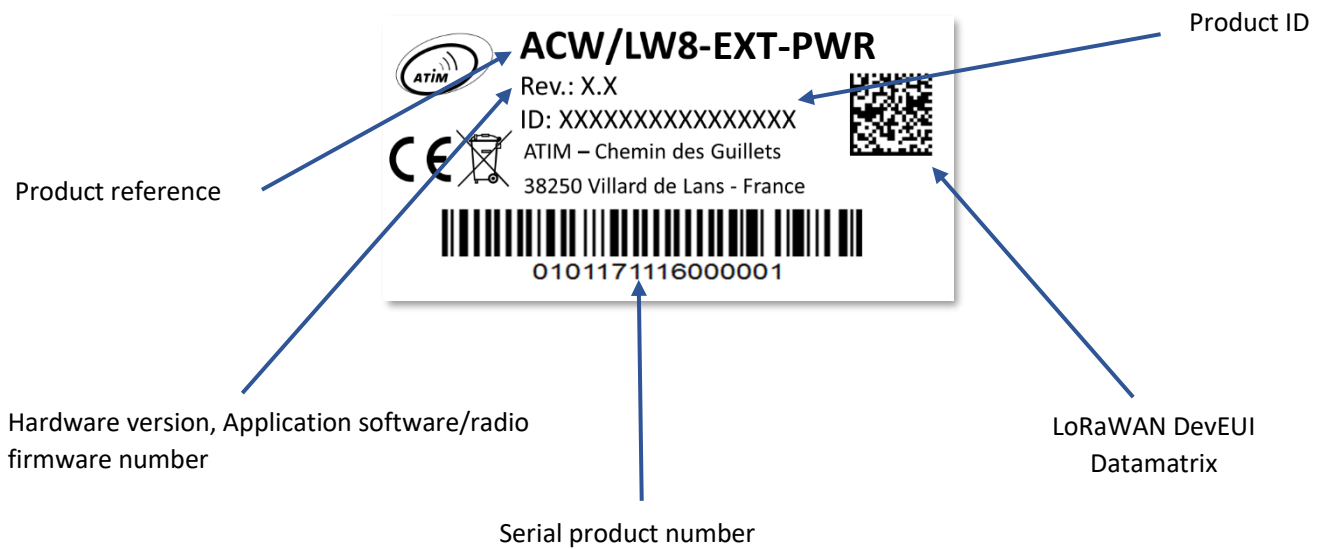
This modem can repeat uplink and downlink frames in a transparent way regarding the network.

Technical specifications

General	
Dimensions	177 x 55 x 55 mm
Antenna	Integrated (¼ of wave)
Temperature	-20°C to +55°C (operating mode)
	-40°C to +70°C (storage)
Mounts to	Wall, tube, DIN-rail
Casing	IP 65
Weight	210 g

Power supply	
ACW/LW8-EXT-PWR	220 V
ACW/LW8-EXT-SLR	Integrated solar panel
Consumption	3.3V
Tx mode	50 mA
Rx mode	20 mA

Radio features on repeater mode	

End device interface – Uplink frames

Frequency	LoRaWAN Channel 2 – 868.3MHz
Sensibility	-140 dBm
Rate	SF12

End device interface – Downlink frames

Frequency	869.525 MHz
Power	25 mW (14dBm)
Rate	SF12

Network interface – Uplink frames

Frequency	863 – 870 MHz
Power	25 mW (14dBm)
Rate	SF9 to SF7

Network interface – Downlink frames

Frequency	868 – 870 MHz (Rx1) / 869.525 (Rx2)
Sensibility	Max: -140 dBm
Rate	SF9 to SF7 (Rx1) / SF12 (Rx2)

Product Identification

The product identifier is visible on the exterior label on the back of the device:

Product ID

Product reference

Hardware version, Application software/radio firmware number

LoRaWAN DevEUI Datamatrix

Serial product number

Every ACW Product Line devices carries a QR Code located on the flank or on the front of the device.

This QR Code can be easily read with any smartphone 2D reading app.

QR Code reading shows the following information:

- ATIM|ACW/LW8-EXT-PWR|A.0|190716|1|1.0|1.2|70B3D59BA00003A4
- ATIM|ACW/LW8-EXT-SLR|A.0|190716|1|1.0|1.2|70B3D59BA00003A4

Meaning

ATIM	ACW/LW8-EXT-PWR Or ACW/LW8-EXT-SLR	A.0	190716	1	1.0	1.2	70B3D59BA00003A4
Manufacturer Name	Product Reference	Revision version	Manufactoring date (AAMMJJ)	Manufactoring location	Hardware Version	Applicative firmware Version	Sigfox IDs Or DevEUI LoRaWAN

1. Operating mode

The ACW/LW8-EXT is a LoRaWAN repeater available for ORANGE network. It allows to repeat uplink and downlink frames from linked devices.

Its integration in the network is transparent as the uplink and downlink frames repeated by the smart Extender are directly available on the Orange's Live Objects interface with the repeated devices' DEV-EUI. Downlink frames latency towards repeated devices is greater than non-repeated devices due to the 8 seconds reception window's gap.

The smart Extender only requires a power supply to be operative. Once, the devices' list is configured within the Extender and after that the devices to repeat have realized their respective join phase with the Extender, the repeating mode is active.

When the list of sensors (White List) is configured in the Extender by the operator via the Back End and the sensors to be repeated have completed a Join phase with the Extender and have considered the Mac Command Link_Adr_Req, the retransmission is activated.

Note 1

The Join Request will only be considered when it is transmitted on LC2 SF12 (single channel listening to the Extender).

Note 2

At the end of the Join phase, the MAC Link_Adr_Request command is sent to the sensor to configure and freeze the listening and the transmission of the device on LC2, SF12.

The Extender can repeat up to 8 different LoRaWAN devices.
It is compatible with Class A LoRaWAN 1.0, 1.0.1, 1.0.2 devices.

a) Monitoring

The Extender has a proper DEV-EUI and release periodically a keep alive frame, still called monitoring message. This frame is read by the *Extenders monitoring Interface* and allows to visualize the following information:

- SNR and RSSI levels of downlink frames toward the Extender in the Keep Alive Frame LoRaWAN cycle
- SNR and RSSI sensors levels read by the Extender

The monitoring frame is used to download the repeater parameters and collect the repeating devices states data. The following parametrization functionalities are available on the Extender:

- Réglage de la périodicité de transmission de la trame de supervision ;
- Add/Delete a device to repeat ;
- Collect the repeating devices states data:
    - Last sensor's emission
    - RSSI and SNR levels read by the Extender for this sensor.
    - Number of received and missing frames

(Information not available on the *Extenders monitoring Interface*)
- o Counting of uplink and downlink frames
  (Information not available on the *Extenders monitoring Interface*)
- o Device Address assigned to the devices by the Extender.
  (Information not available on the *Extenders monitoring Interface*)
- Recovery of the Extender state (active or inactive)

All these functionalities are directly done by the *Extenders monitoring Interface* except for the mentioned ones.

b) Repeating mode

By default, when the Extender is not emitting neither receiving monitoring frames, it is listening on 868.3 MHz channel permanently. Please note that devices under Extender are configured by itself to minimize their frequency plan to this unique channel.

- **Join phase**

If a sensor is part of an equipment list to repeat and it has not been Join with the Extender yet, its frames will not be repeated.

A sensor mandatorily needs to realize a Join with the Extender in order to enter in the repeating phase.

Note 1

The sensor generates these Join requests on the 3 used frequencies for LoRaWAN sensors (868.1MHz, 868.3MHz, 868.5MHz) and with the Spreading Factor of its own choice. To Join the Extender, you must wait for the sensor to have emitted the Join request on the 868.3 MHz frequency using Spreading Factor 12.

Note 2

Once the Join with the Extender has succeeded, it will ask the sensor to keep on the 868.3MHz frequency at Spreading Factor 12. This request will be done on the next uplink frame sent by the sensor (at an 868.3MHz frequency and Spreading Factor 12) and received by the Extender. Please take note that the aggregation of the Join and the reception of the first uplink frame may be very long and completely depends on the sensor's strategy as a certain number of frames will be lost.

Note 3

The sensor must not be registered on any network for the Join with the Extender to work correctly. It musts be exclusively registered on the smart Extender (and only on one unique Extender).

- **Repeating phase**

If a sensor is part of an equipment list to repeat and that he realized its Join with the Extender, it is in the repeating phase. Every new uplink frame received is sent to Orange network. When the network receives a frame from the sensor and the frame from the repeater, the network server will delete the duplicate and will keep one and unique frame.

Downlink frames received by the Extender are sent toward the sensor within the reception window indicated to the sensor during the Join.

The Extender is transparent regarding the frames that it repeats. The frames formatting remains the same. Frequencies and Spreading factors used are different between initial frames and repeated ones.

Frames received by sensors which are not included into the equipment list to repeat will be rejected.

c) Extenders monitoring Interface

The interface allows for the fleet of repeaters deployed:

- addition/deletion of an Extender on the client account of the *Extenders monitoring Interface*
- addition/deletion of the sensors to repeat for the smart Extender

The *Extenders monitoring Interface* is accessible on the following URL:
https://backend-smartExtender-prod.noprod-b.kmt.orange.com/

Note

Les identifiants pour se connecter à *L'interface de gestion des Extenders* sont les mêmes que ceux du compte Live Object.

d) Live Objects Interface

Live Objects Interface remains the point of interface with the sensor. It provides sensors data reading and relay information to the sensor through downlink frames.

The connexion URL to the Live Object portal is: https://liveobjects.orange-business.com/#/dashboar
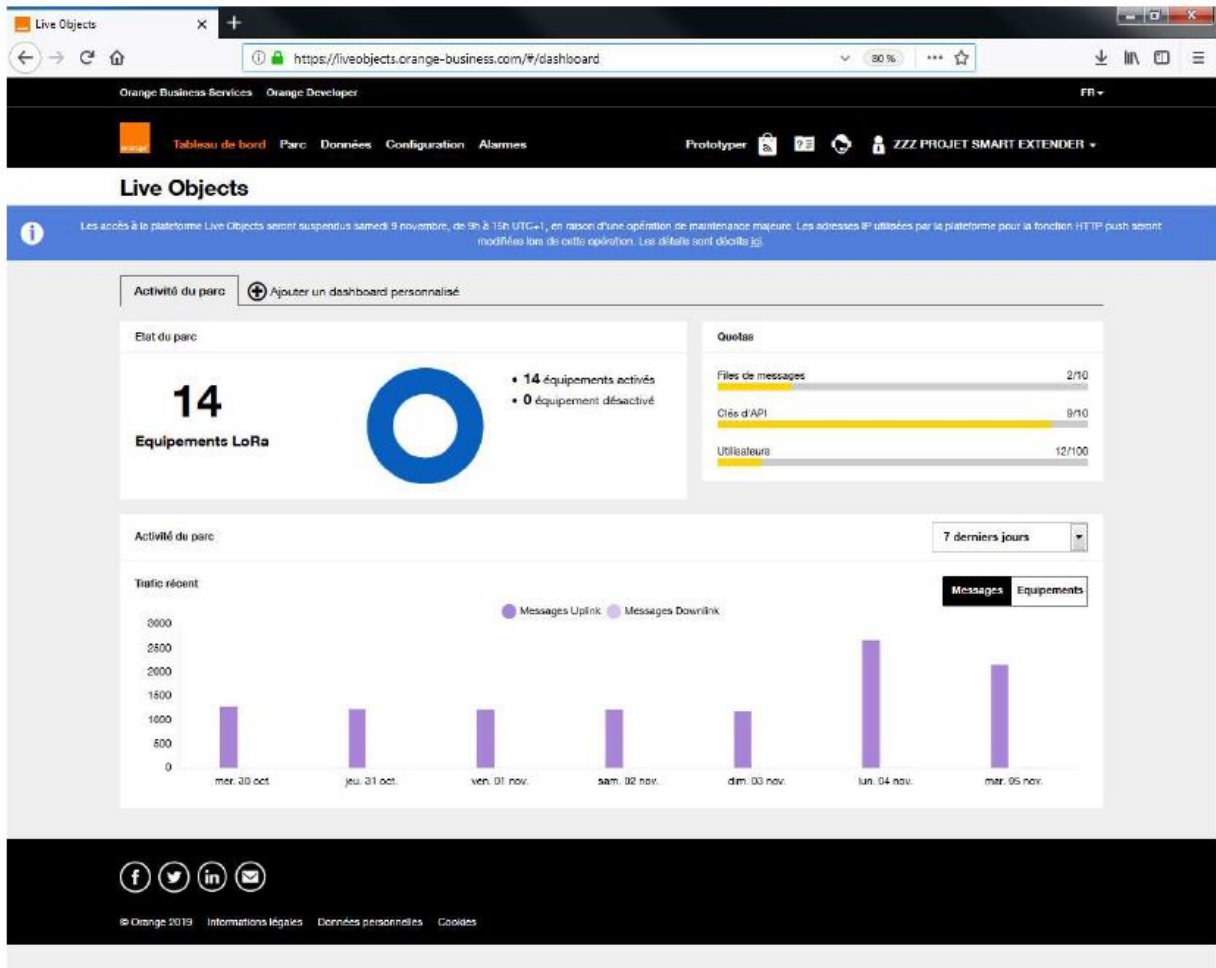
e) Solar panel specifications

The solar panel version is equipped with a battery continuously recharged by the solar panel. An automatic cut-off device stops the repeater when the battery charge level is insufficient.

On restart, the repetition cycles automatically resume, there is no new Join phase to the network (unless the Extender has never joined the network). A new Join phase can be forced if necessary. This requires opening the case.

The switch of the card must be placed on OFF for a period of 30 seconds then returned to ON. On shutdown and restart (and provided that the network has been previously joined), a life frame (supervision message) is sent to indicate the shutdown and activation of the Extender.

On the latest versions ON / OFF can be done approaching a magnet close to the interrupter (on the side of the REED sensor's casing)
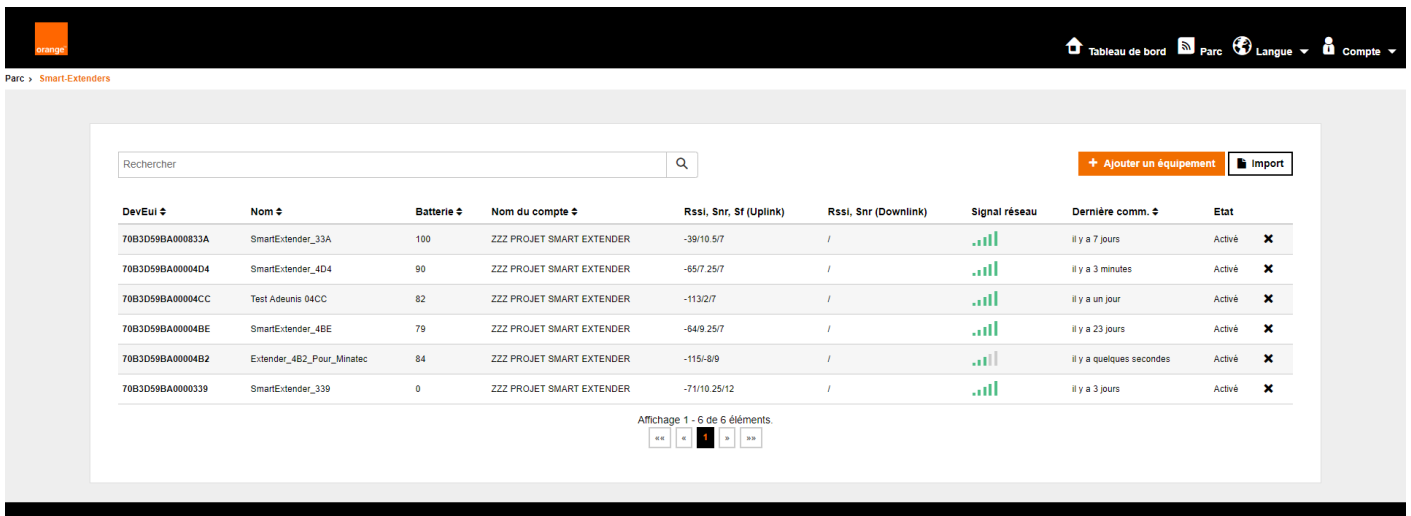
2. ACW/LW8-EXT Installation

Commissioning procedure of the Extender requires the following steps:

- Registration of the Extender on the Orange network;
- Registration of sensors on the Extender;
- Installation of the Extender on the field;
- Sensors restart

a) Network provisioning on the ORANGE of the Extender
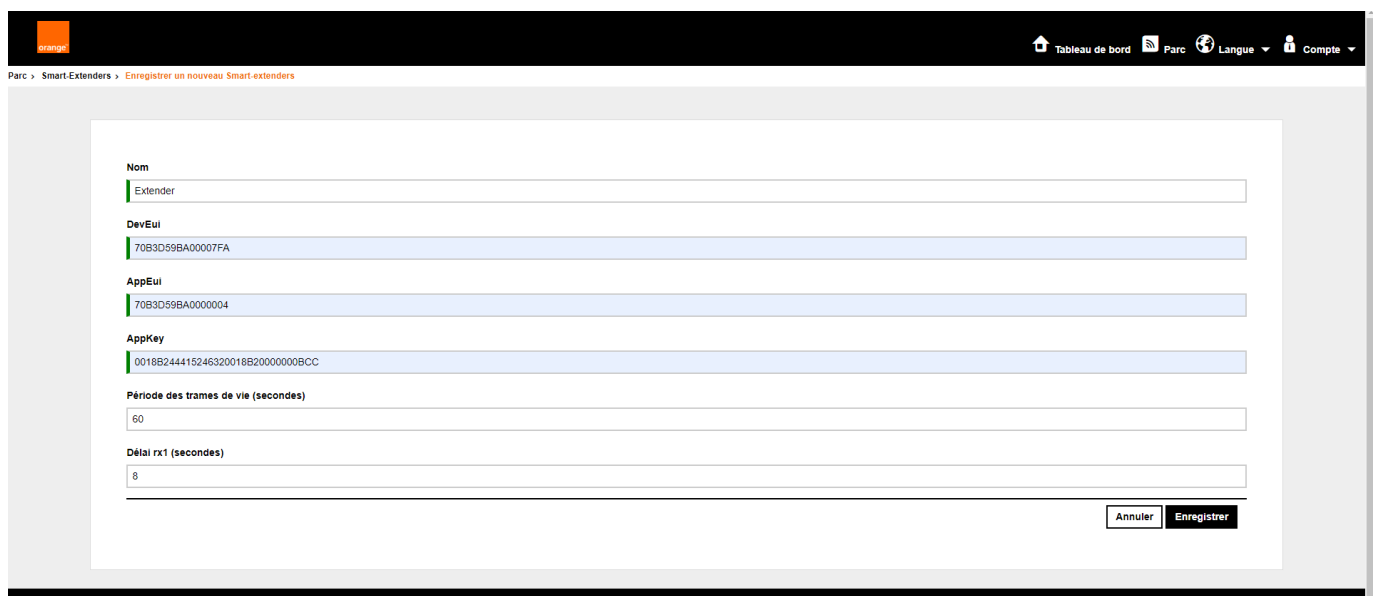
Unplug the power cable of the Extender and connect on the *Extenders monitoring Interface* URL. On the « Park » window, select « Add an equipment ».

On the Adding window, fulfill the DEV-EUI, APP-EUI and APP-KEY parameters provided by ATIM. The « Name » field is free. We advise you to keep a 1-minute period for the keep alive frame (monitoring frame) to ease the Extender parametrization. The Rx1 delay must be kept at 8 seconds.

Click on Save. When you return to the home page, the Extender is now visible and has the registered status.

Start the Extender. It will switch to "Activated" state when it reached the network.

Note

For the solar panel version, the product must be positioned for several hours in the sun to be properly charged. When the load is sufficient, the product will perform its Join phase with the network. If the product is already loaded, the Join phase may take more than an hour.
The Join phase can then last more than 1 hour if the charge has not been operated beforehand.

b) Sensors provisioning on the Extender

- **Adding a sensor / Migration of sensor**

During this phase, the Extender is connected to the Orange network. The keep alive frame (monitoring frame) period has to be fixed at 1-minute. The Extender must be placed in a well-covered zone.

The access to sensors is not required. This phase will be ideally realized before the deployment on site.

On the « Park » window, select the Extender and then reach the « Equipment » window.

Select the « Migration from Live Objects » button if the sensor was already commissioned on Live Objects or « Add an equipment » if the sensor has never been commissioned.

In case of a migration, the APP-KEY will be required. Click on the « Migration from Live Objects » and select the equipment to migrate in the list.

Enter its APP-KEY:

In this case of adding, the whole sensor parameters are required (DEV-EUI, APP-EUI, APP-KEY). Click on the « Add an equipment » button and enter these parameters:

The new equipment is added to the equipment list and will appear « commissioning in process » on the smart Extender. This commissioning phase will take a few minutes (if the keep alive frame is set on 1-minute).

The equipment is effectively registered when the state switches to « registered on the smart Extender ».

If after 20 minutes or so, the equipment does still not appear as registered, we recommend you to force the deletion of the equipment and restart the operation.

- **Deletion / Migration of a sensor**

During this phase, the smart Extender is connected to the Orange network. The keep alive frame (monitoring frame) period must be fixed at 1-minute. The smart Extender must be placed in a well-covered zone. The access to the sensors is not required.

Note

The sensor will have to be restarted to be connected to the new network.

c) On site installation of the Extender

The localization of the Extender must be chosen to have a comfortable Orange network coverage to repeat that network correctly. **During this phase, the keep alive frame (monitoring frame) period must be fixed at 1-minute to ease the installation.**

An access to Live Objects and to the *Extenders monitoring Interface* will allow you to visualize the reception signal levels and to check the correct repetition of the sensors.

When a good localization has been found, the Extender can be started. Once, it has connected to the Orange Network, keep alive frames (monitoring messages) will be sent periodically. We can visualize on Live Objects the RSSI and SNR levels as well as the Spreading factor (SF) of keep alive frames of the Extender (a couple of frames need to be analyzed to get a good vision of the network quality). The SF could be in between SF7 and SF9. If the SF is fixed on SF9, the SNR and RSSI levels need to be checked. A positive SNR will show a good reception quality. If the SF is lower than SF9, the quality of transmission should also be good.

Once, the localization of the Extender is fixed, a restart must be done on the sensors to repeat.
These ones will progressively Join the Extender, but this operation may be long and depends completely on the equipment Join's strategy. Depending on the sensors, this operation can last from a few minutes to several hours.

We can follow the sensors' Join to the Extender on the *Extenders monitoring Interface* under the « Journal » Extender tab. The messages « Advertise Join reception » show that a sensor has done its Join with the Extender. The « Equipment » Extender tab allows to visualize the sensor reception levels from the Extender (RSSI and SNR from the Extender) as well as the last message. The sensor switches to « active » state from the first reception frames repeated by the Extender.

Note

Once the installation is done, the periodicity of the keep alive frame (monitoring frame) needs to be minimized. We advise to reduce the configuration to a daily frame to allow a permanent listening of the sensors to repeat.

d) Keep alive frame periodicity setting

The « Configuration » Extender tab allows to modify the setting of the periodicity.

In the « Parameters » section, click on the « modify » button and enter the new target field.

This value will be applied from the emission of the next keep alive frame. To apply other settings on the Extender, we advise you to modify this value to reset for an emission every minute.

3. Technical Support

For any information or technical issue, you can contact our technical support team through the following webpage: https://www.atim.com/en/technical-support/