Installation and Maintenance Manual Long Range IoT Station (Lora Station) (868MHz version)

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Destination List

Name	Company / Service	Place	Commentry

Document history

Version	Modification	Author	Date
V0.1	Preliminary version	LLO	27/01/2014
V0.2	Adding of some precisions on the following contents: • Internet cabling and cable type • Cable gland dimensions • Auxiliary power supply • GPS and GSM considerations	SNI	06/05/2014
V0.3	Safety recommendations adding	SNI	02/06/2014
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V0.5	Safety recommendations adding	SNI	23/07/2014
V0.6	Recommended additional lightning protections	SNI	29/09/2014

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3 Glossary

Keyword	Description
ADC	Analog to Digital Converter
AMR	Automatic Meter Reading
AP	Access Point
APC	Automated Power Control
API	Application Programming Interface
CAN	Control Area Network
CPU	Central Processing Unit
DAC	Digital to Analog Converter
DDRAM	Double Data Rate RAM
DHCP	Dynamic Host Configuration Protocol
DOTA	Download Over The Air
FTP	File Transfer Protocol
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile communication
HTTP	HyperText Transfer Protocol
IK	Mechanical Impact
IO	In / Out
IP	Internet Protocol or Ingress Protection
KLK	Kerlink
KNET	Kerlink M2M network
LoRa	Long Range
M2M	Machine to Machine

MIPS	Millions of Instructions Per Second
NFS	Network File System
NMEA	National Marine Electronics Association
PCB	Printed Circuit Board
PU	Polyurethane
RAM	Random Access Memory
RF	Radio Frequency
RSSI	Received Signal Strength Indicator
SI	Système d'Information
SIM	Subscriber Identity Module
SMA	SubMiniature version A
SSH	Secure Shell
TBD	To Be Defined
TCP	Transmission Control Protocol
USB	Universal Serial Bus
UV	UltraViolet
WAN	Wide Area Network
WLAN	Wireless Local Area Network
VHF	Very High Frequency

4 Introduction

The LoRa IoT Station is part of the global Long Range Radio fix network to provide M2M connectivity link between low power end-point and Internet Access.

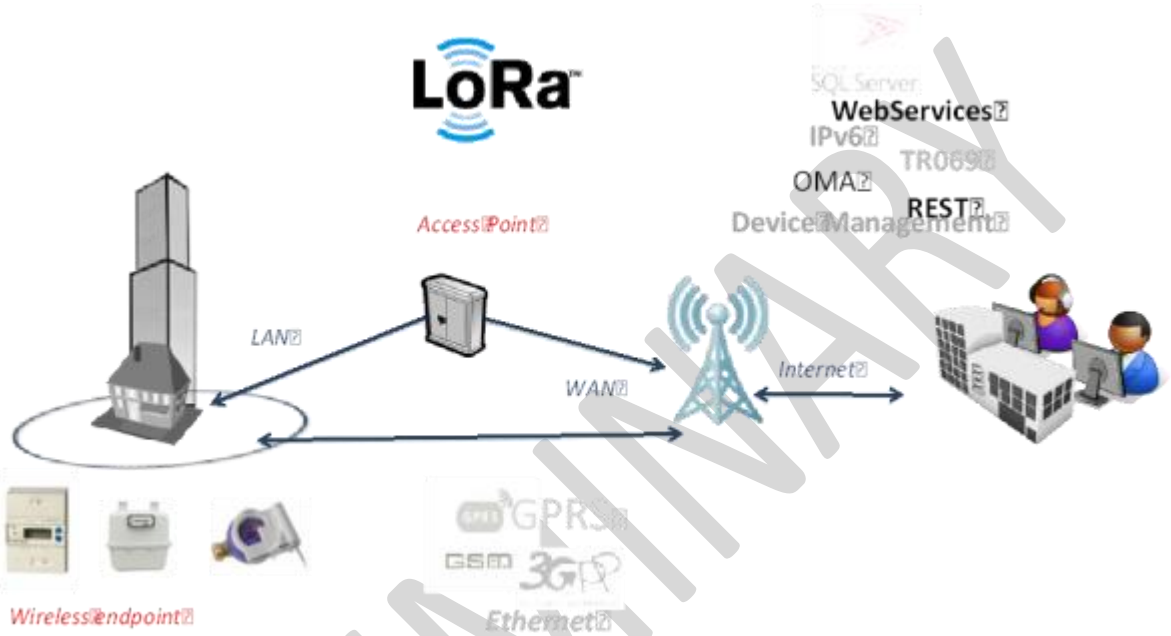


Figure 1: LoRa Network topology

The product is based on LoRa technology provided by Semtech Company.

5 Description of the Long Range IoT Station

5.1 Block Diagram

The following figure describes the functional architecture:

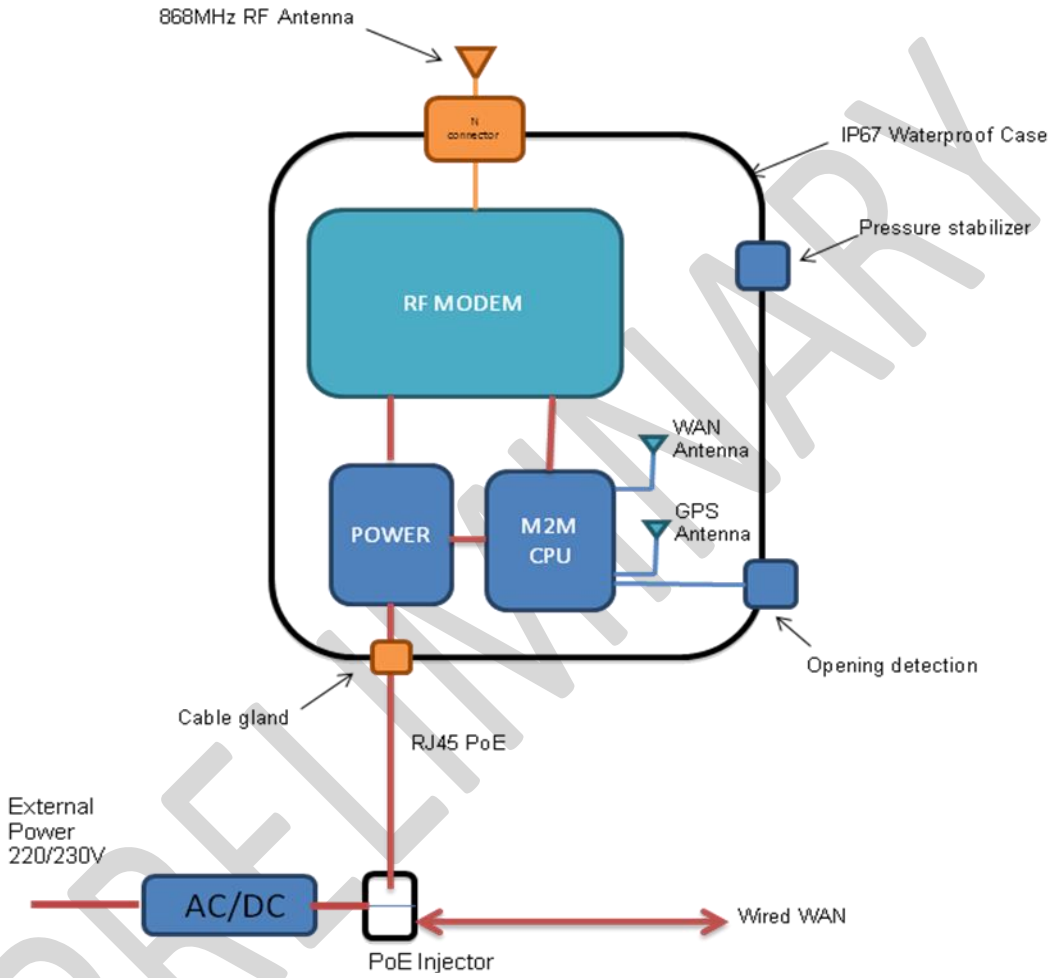


Figure 2: LoRa IoT Station Block diagram

5.2 Mechanical implementation

The LoRa IoT Station is based on a high impact resistant polycarbonate wall mounting cabinet that withstand harsh industrial and outdoor environments.
It offers excellent flammability rating, good UV resistance and also good chemical resistance.
The dimensions are 231 mm x 125 mm x 60 mm. It is rated IP67.
The opening system is simple: clipping (screwing is optional)

Figure 3 : LoRa IoT Station casing - external view

Figure 4 : POE injector (example)

Figure 5 : LoRa IoT Station casing - internal view (temporary image)

The LoRa IoT Station is composed of:

- The enclosure itself including:
  - The casing (item 1)
  - 1 cable gland for RJ45 POE (item 2). The LoRa IoT Station is delivered without RJ45 POE cable (Ethernet cable).
  - 1 N connector (item 3) to connect LoRa antenna
  - 1 pressure stabilizer for protection against condensation (item 4)
- LoRa RF antenna connection with N connector (item 5) and its cable
- A POE injector (item 7) and its power supply cable.
- The internal shielding (item 8)
- A mounting kit (item 6) designed to answer different installation configurations:
  - Pole mounting by U-bolt (delivered by default)
  - Wall mounting
  - Metallic strapping mounting (tube, pipe, flue...)

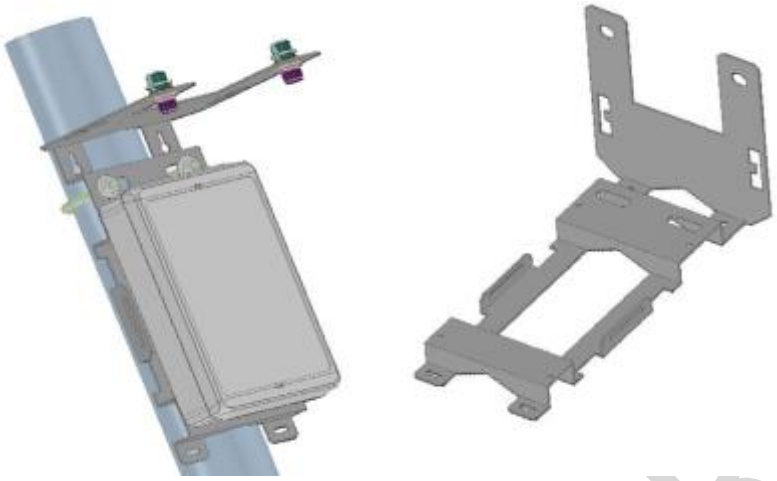


Figure 6 : Mounting kit

5.3 Stickers

The LoRa IoT Station has stickers placed inside the casing:

- A sticker on the door including LoRa IoT Station serial number, regulatory markings and electrical information (item 9)
- A white sticker explaining the LEDs behaviour (item 10)

6 Installation procedure

6.1 Installation topology

6.1.1 Single station installation

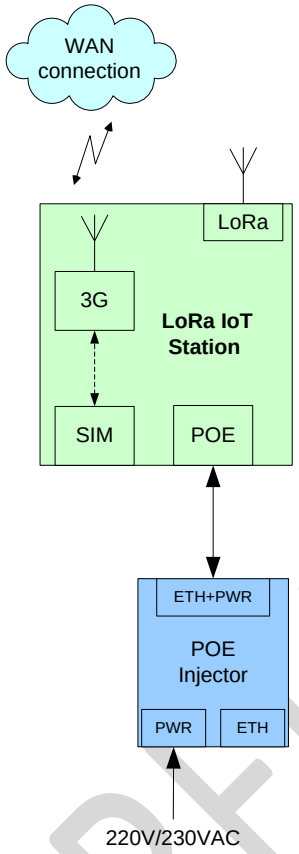


Figure 7 : Single station installation (with SIM)

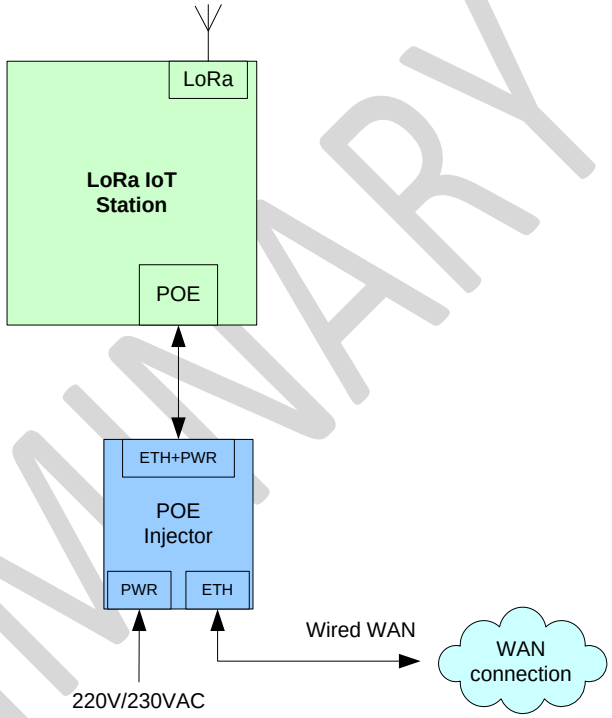


Figure 8 : Single station installation (No SIM)

6.1.2 Multi-station installation

6.1.2.1 With SIM Subscription

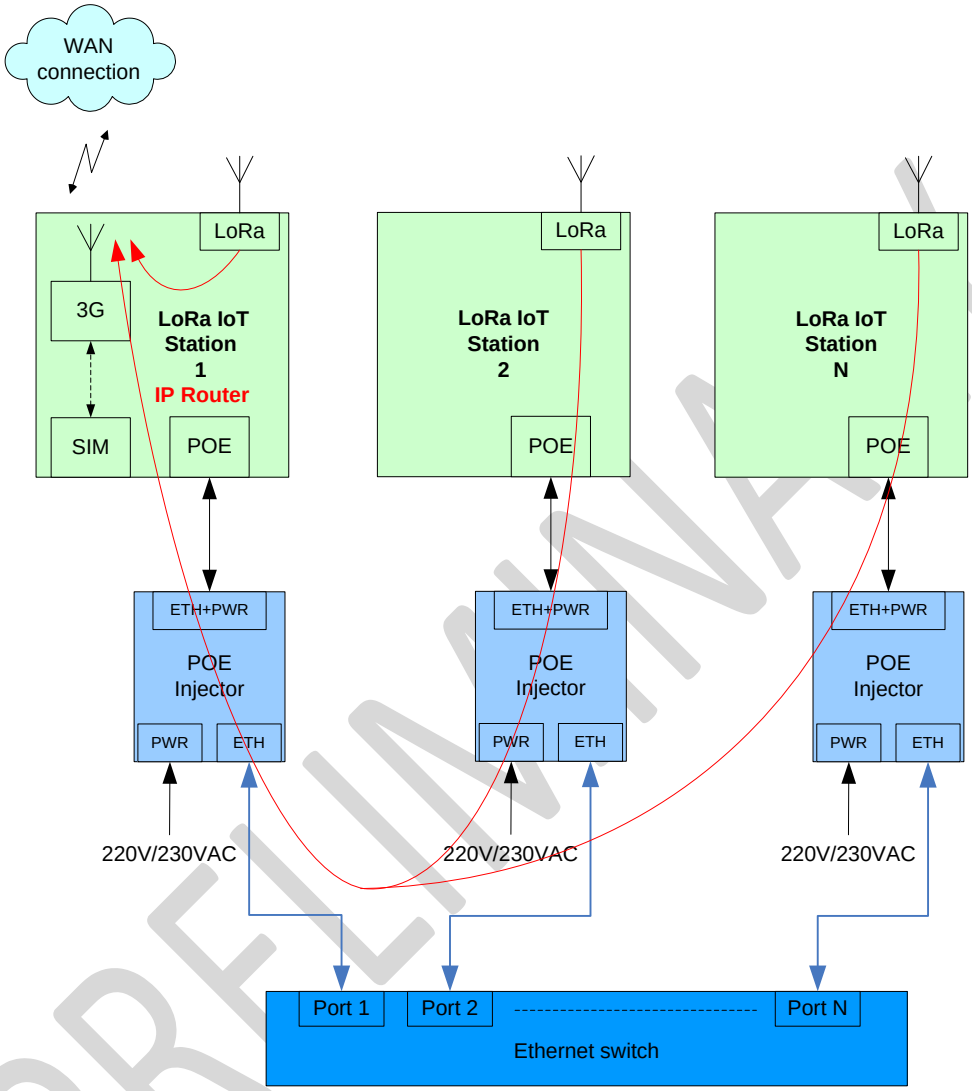


Figure 9 : Multi-station installation (with SIM)

6.1.2.2 Without SIM Subscription

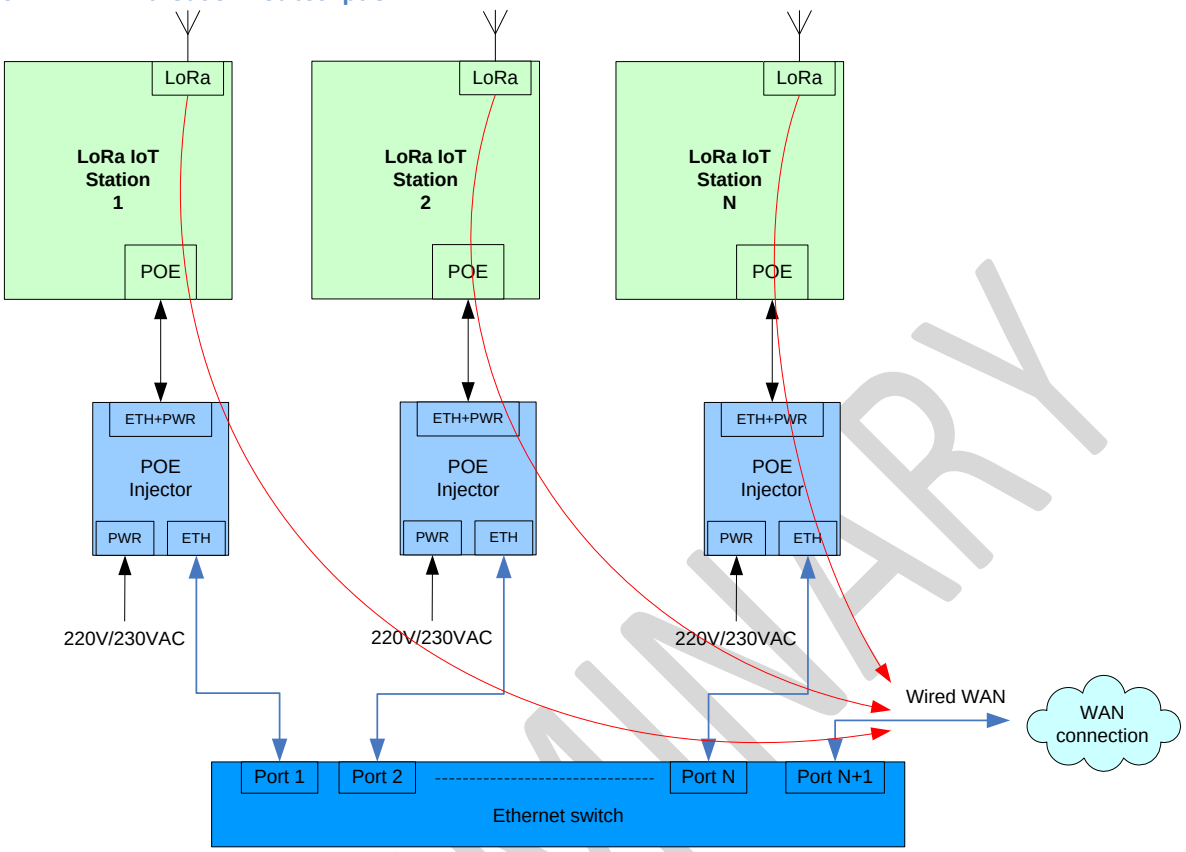


Figure 10 : Multi-station installation (No SIM)

6.2 Electric distribution to the LoRa IoT Station

6.2.1 Safety standard

The installation must conformed to EN 60728-11 (Cabled distribution systems standard).

6.2.2 Power-Over-Ethernet (POE) power supply

The LoRa IoT Station is supplied through Ethernet cable: POE 48V class 0(Max: 15Watts)
The nominal current is about 70mA in Lora Rx mode with the GSM in a network attached mode.

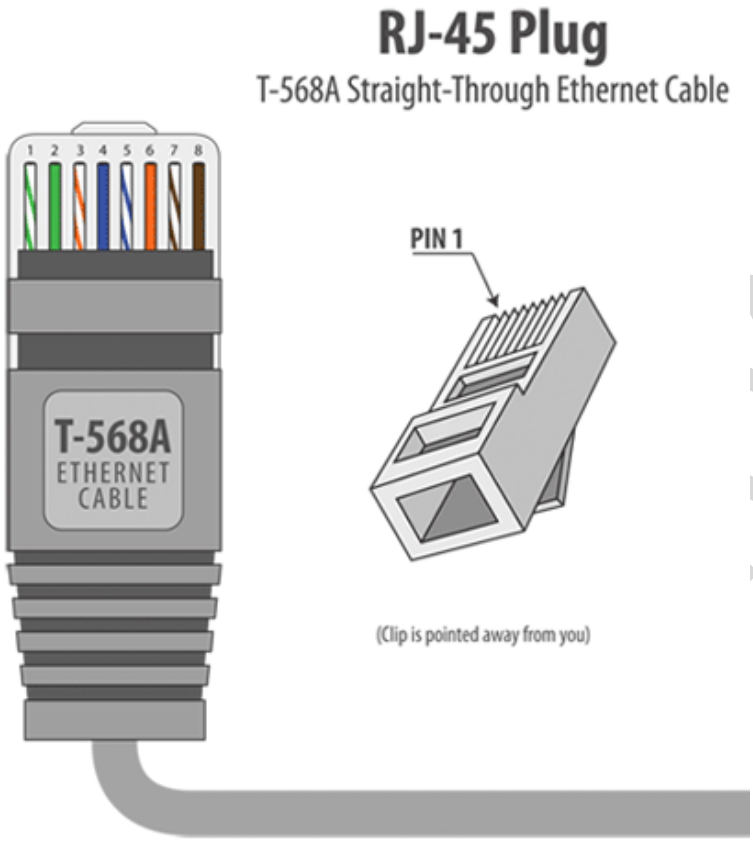
Kerlink recommends a CAT6 SSTP standard Ethernet cable.
The maximum cable length is 100m.

On LoRa IoT Station side, the Ethernet cable must be firstly inserted through the cable gland. Then, the shield of the cable must be clamp like in the following picture to get a good earth shielding.
The internal wires have to be connected to the terminal block as described on the picture below:

Figure 11 : Ethernet connection

The cable gland allows external cable diameter from 4mm to 8 mm.

On the other side of the POE cable, RJ45 connector must be inserted into POE injector. This POE injector is connected to 230VAC.
The POE injector must be installed in accordance to its own specifications.



6.2.3 Solar power supply

The LoRa IoT Station can be also supply with a DC power supply as a solar panel. The input voltage range is 11 to 30VDC.
The power supply must be qualified as a limited power source.
The maximum power is 13W.
The nominal current for a 12V power supply is about 250mA in Lora Rx Mode with the GSM in a network attached mode.

After insertion through the cable gland, a 2-wire cable can be connected to the dedicated terminal block as described on the figure below:

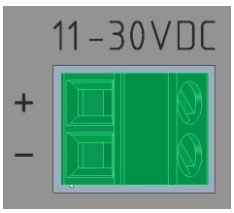


Figure 12 : DC power supply connection (temporary image)

The cable gland allows external cable diameter from 4mm to 8 mm.

6.3 Mounting of the enclosure

6.3.1 GPS and GSM considerations

The Wirgrid Station owns a GPS and a GSM integrated solutions. Those both technologies need to install the product in an open environment to get acceptable performances.

6.3.2 General considerations

The LoRa IoT Station must be mounted on any concrete pedestal, concrete wall or any non-flammable surface (UL94-V0).
It must not be mounted on a flammable surface.
The mounting kit delivered with the LoRa IoT Station allows fixing the product in different ways.

Figure 13 : mounting kit dimensions

6.3.3 Pole mounting by U-bolt

By default, the LoRa IoT Station is delivered with a U-bolt to be mounted on a pole of a maximum diameter of 60mm.
To fix the U-bolt, it is recommended to use nuts and washers provided in the mounting kit.

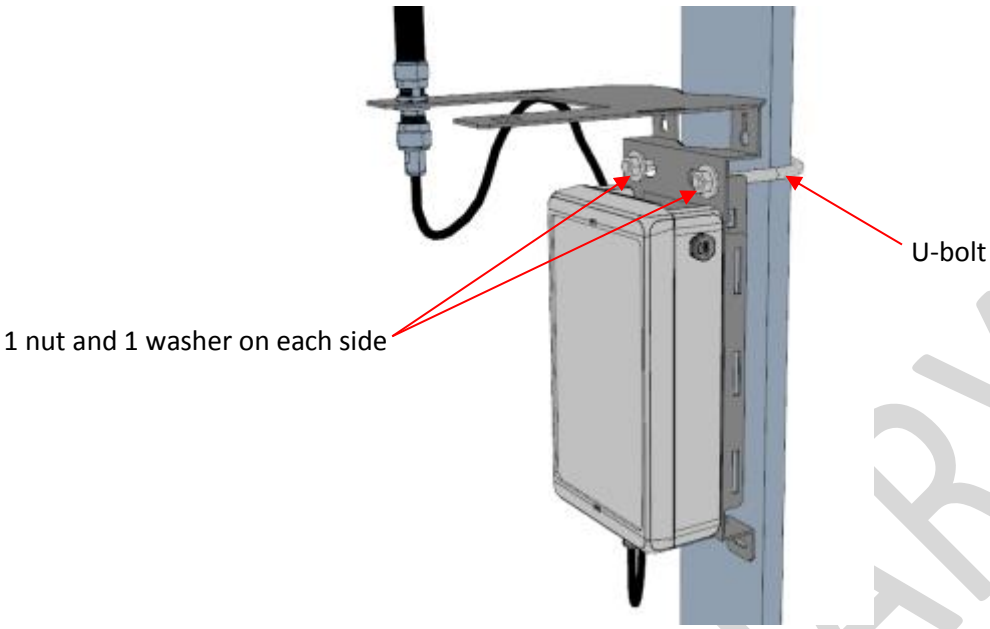


Figure 14 : Pole mount set on the enclosure

Figure 15 : Another view of the pole mounting using U-bolt (no pole represented)

For safety reason, the metallic mounting kit must own a good earth connection. This may be ensured by a good earth connection on the metallic pole since the U-bolt is conductive.

6.3.4 Wall mounting

The LoRa IoT Station can be also mounted on a wall with M4 screws (not delivered with the mounting kit).

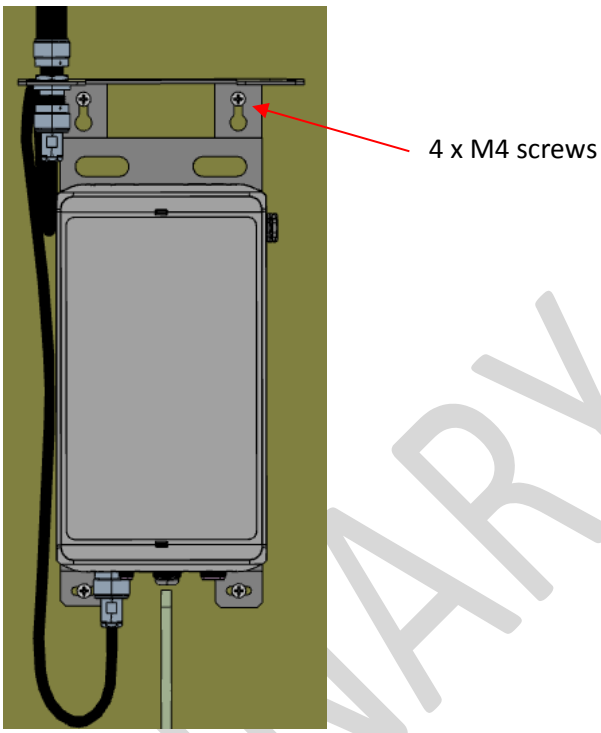


Figure 16 : Wall mount on the enclosure (front side)

For safety reason, the metallic mounting kit must own a good earth connection. This may be ensured by a good earth connection on the metallic pole since the U-bolt is conductive.

6.3.5 Metallic strapping mounting

The LoRa IoT Station can be also mounted on a pole by strapping. The maximum acceptable width of the strapping is 25mm. It is recommended to use 2 metallic strappings as described on the figure below:

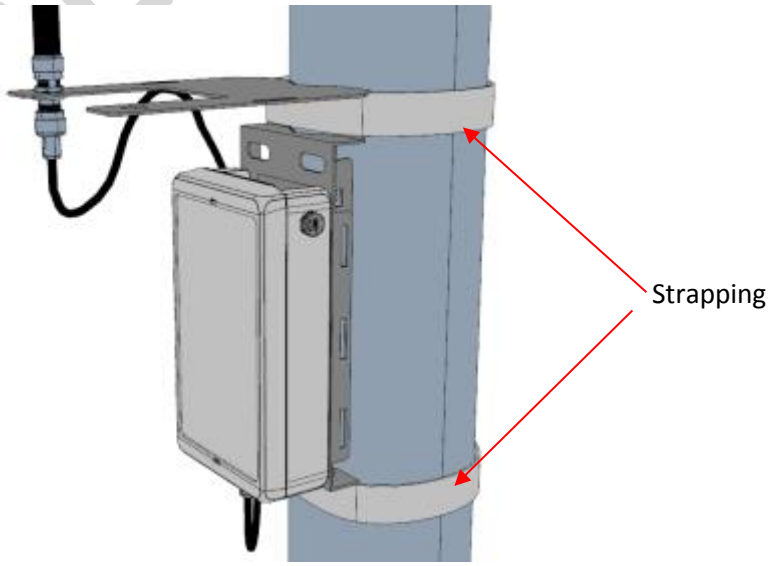


Figure 17 : Pole mount set using strapping

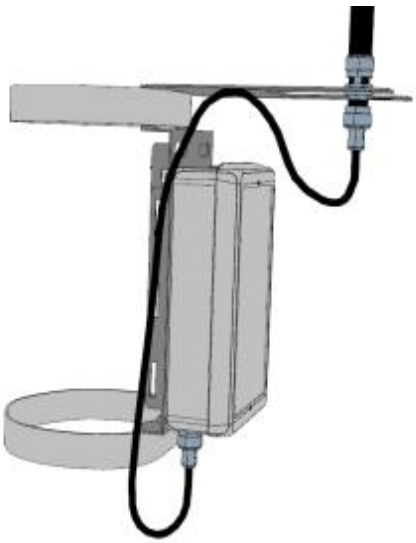


Figure 18 : Another view of the pole mounting using strapping (no pole represented)

For safety reason, the metallic mounting kit must own a good earth connection. This may be ensured by a good earth connection on the metallic pole if strappings are conductive.

6.4 Setting connections

6.4.1 Ethernet connection

Before connecting the Ethernet wires, ensure that the POE injector is not connected to 230VAC.
The Ethernet wires must be connected as described in §6.2.1.

6.4.2 LoRa RF Antenna connection

LoRa IoT Station is delivered with a 868MHz antenna: specifications to be added.

First, fix the RF antenna on the mounting set:

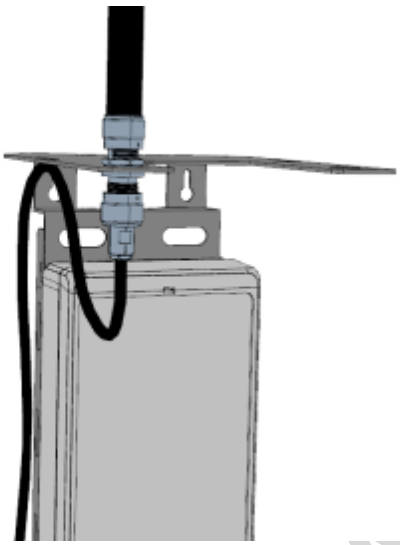


Figure 19 : attachment of the antenna on the mounting set

Once the RF antenna is fixed, connect the N connector of the antenna cable on the connector based on the bottom of the casing as described on the figure below.

For safety reason, the power supply of the product must be disconnected before plugging the N connector.

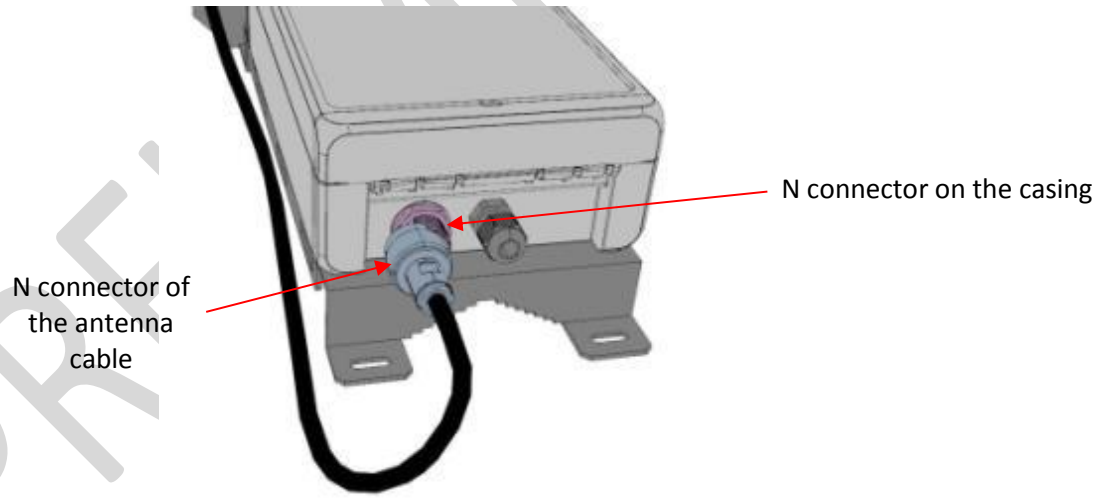


Figure 20 : connection of LoRa RF antenna (bottom view)

To improve the durability of the RF connections against environmental aggression (moisture, pollution, …), Kerlink recommends to recover connectors with an insulating tape like the reference 130C from 3M.

To fix the antenna cable, it is possible to fix it with cable clamp, using spaces provided for this purpose:

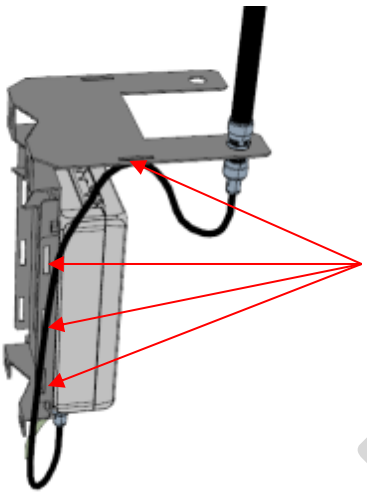


Figure 21 : attachment of the RF antenna

It is possible to order other antenna as an option: specifications to be added.

6.5 Commissioning

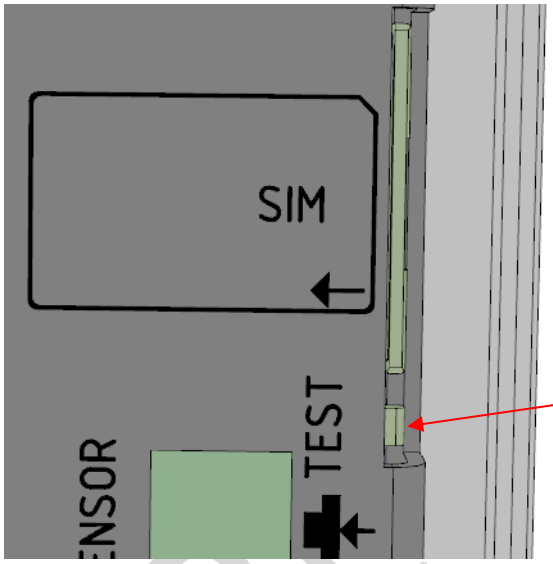
6.5.1 SIM card

The SIM card is mandatory to establish the 3G/GPRS communications.

Before inserting the SIM card, pay attention that the LoRa IoT Station is unpowered by checking the 2 LEDs PWR are OFF.

Then, to insert a SIM card in the Access Point:

- Open the LoRa IoT Station casing
- Open the internal door of the cabinet
- Then, you can remove the SIM card holder of the Lora IoT Station by pressing with a little screwdriver, the extraction button (as shown below)
- Place the SIM card in the SIM card holder
- Insert carefully the SIM card holder with the SIM card in the LoRa IoT Station



In case of replacement of the SIM card, the power supply must be firstly switched off by disconnecting Ethernet wires or disconnecting the POE injector. For few seconds, the LoRa IoT Station is still powered-on due to the internal backup battery. Wait and check the 2 LEDs PWR are switched off before extract the SIM card.
After inserting the new SIM card as described above, the Lora IoT Station can be re-powered on.

In case of change of mobile operator, APN and login/password must be updated. For more details, contact Kerlink at support@kerlink.fr.

6.5.2 Power on

Once the RF antenna and the Ethernet wires are connected and the SIM card is inserted, the Lora IoT Station can be powered on.
To POWER ON the LoRa IoT Station, connect the POE injector on the 230VAC main power supply.

6.5.3 Functional check

To ensure the LoRa IoT Station is started up, check the 2 PWR LEDS: they should be switched ON. After some seconds, the LEDs switch off.

Then, to check and analyse the status of the Lora IoT Station, the TEST button must be pressed briefly in order to activate the LEDs functionality during 1 minute. This operation can be repeated indefinitely.

Status of the Lora IoT Station:

Name	Color	Mode	Details
PWR (Station)	Green	Continuous	Station power indicator
PWR (Modem)	Green	Continuous	Modem power indicator
GSM1	Green	Continuous	GSM quality level Most Significant Bit
GSM2	Green	Continuous	GSM quality level Least Significant Bit
WAN	Green	Continuous	WAN IT System connection OK

WAN quality level :

GSM1	GSM2	Status
0	0	SIM Card error
0	1	No network connection
1	0	RSSI Level < 17
1	1	RSSI Level >18

The behaviour of the other LEDs depends on the application software downloaded in the LoRa IoT Station. Only Station LEDS (WAN, MOD1 and MOD2) can be controlled by the application.

Figure 22 : LEDs indicators

6.6 Lightning protections

In harsh environment, additional protections may be used to improve lightning immunity.

6.6.1 Antenna link

For the antenna link, Kerlink recommends the P8AX series from CITEL.
Protections must be installed in accordance to its own specifications.

6.6.2 Ethernet link

For the Ethernet link, Kerlink recommends the CITEL MJ8-POE-B reference from CITEL.
Protections must be installed in accordance to its own specifications.

7 Maintenance of the Access point

7.1 Simple checks

7.1.1 LoRa IoT Station enclosure

Check the robustness of the installation:

- Screwing of the LoRa IoT Station on the mounting set
- Screwing of the mounting set (depends on the configuration)

Check the Ingress Protection of the enclosure:

- No trace of water inside the enclosure
- Tightening of the cable gland
- Tightening of the pressure stabiliser
- PU gasket on the door

7.1.2 Cables

Check:

- The LoRa RF antenna N connectors are well fixed on the casing and on the mounting set.
- Screwing of Ethernet wires
- Ensure that the POE injector is correctly installed (RJ45 and power supply cable).

7.1.3 LED

Make sure the LoRa IoT Station is working properly according to LEDs indications
See §6.5.3.

7.2 Interfaces for debug or maintenance purposes

7.2.1 Proprietary debug interface

The LoRa IOT Station has a proprietary debug interface:

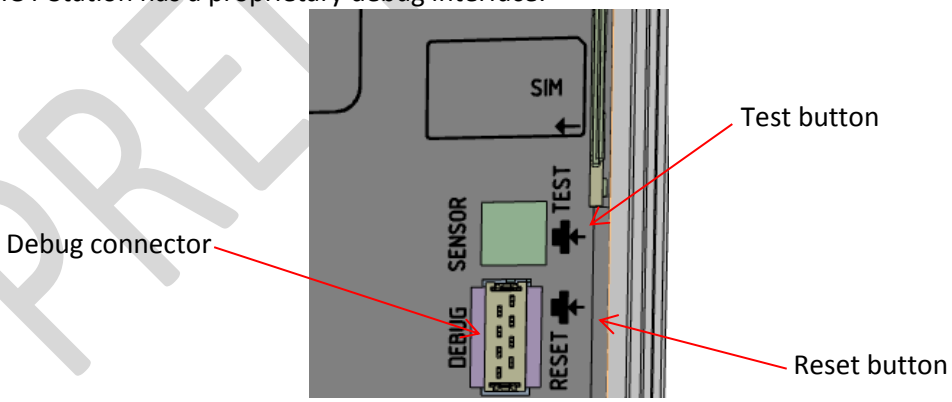


Figure 23 : Proprietary debug interface of the LoRa IoT Station

This debug interface is intended to be used by authorized and qualified personnel only.
Be careful: Only specific equipment developed by Kerlink must be connected to this interface.

7.2.2 USB and Ethernet interface

By using a USB/NET dongle, it also possible to access to the debug interface of the LoRa IoT Station via the USB type A connector below:

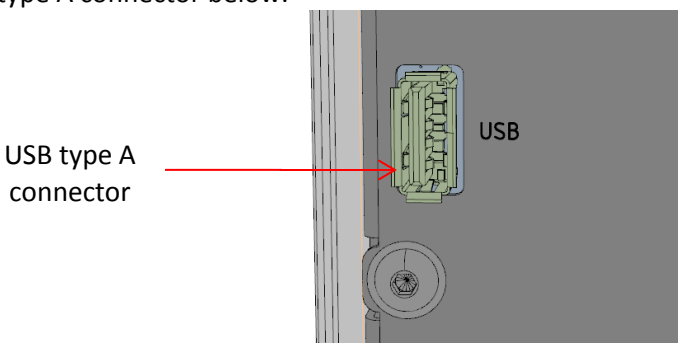


Figure 24 : USB connector of the LoRa IoT Station

This debug interface is intended to be used by authorized and qualified personnel only.

It is also possible to access to the debug interface by Ethernet connection by connecting directly to the POE injector or the Ethernet switch (depending on the installation topology).

Firmware update can be performed with a USB key.

7.2.3 TEST and RESET buttons

Test and reset button are small buttons present on the left side as shown in Figure 23.
It is recommended to take precaution by using a small screw-driver to push one of the buttons.

RESET button is intended to reinitialize the LoRa IOT Station.

TEST button has 2 functions:

- Short Press : LEDs functionality is activated during 1 minute
- Long Press : Activation of an auto-test sequence defined by the application software

8 Kerlink support

The LoRa IoT Station must be installed and maintained by authorized and qualified personnel only.
In case of defect or breakdown, make sure the above recommendations detailed in this document are met.
If an issue is not addressed in this document, contact Kerlink at support@kerlink.fr.

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