SBS-T-902

Installation Guide

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Changes description

Version	Description	Author	Date
1.0	Creation	F.AUBINEAU	07 Oct 2013
2.0	Additional information (product specifications, electrical connection)	P.ANTOINE	03 Dec 2013
2.1	Additional FCC and IC Warning statements	P.ANTOINE	28 July 2014
2.2	Modification of specifications	P.ANTOINE	04 Aug 2014
2.3	Additional Warning statement relative to radiofrequency exposure (paragraph 5.1)	P.ANTOINE	29 Aug 2014

Acronyms

Acronym	Description
ETH	Ethernet
LNA	Low Noise Amplifier
PVC	Polyvinyl Chloride
RF	Radio Frequency
SAT	Satellite
TAP	Transfox Access Point
VSWR	Voltage Standing Wave Ratio
UNB	Ultra Narrow Band
EIRP	Equivalent isotropically radiated power

1 Specifications

Radio Interface characteristics	
Standard	SIGFOX UNB Protocol
Frequency range	902 to 928 MHz
Monitored spectrum	192kHz
Radio Mode	Access Point
Receiver Sensitivity	-134dBm @600bps
Transmit Power	Max 4W (+36 dBm) EIRP
Data Rate and Modulation	600bps D-BPSK
Antenna Connector	Type N Female
INTERFACES	
Ethernet	1x10/100BaseT (RJ45)
USB	2xUSB2.0 ports (optional for 3G key and/or external inverter)
Maintenance port	RJ45 socket with specific cable (only for maintenance)
POWER SUPPLY	
Power Consumption	40W typical, 70W max peak (in transmit mode)
Power supply	100-240VAC 50Hz-60Hz -- 12 VDC / 7A max
MECHANICAL & ENVIRONMENTAL	
Product dimensions	480 x 350 x 85 mm (19'' 2U standard format)
Product weight	Ca 8kg (16 lbs)
Operating temperature	-20 to +50°C
Storage temperature	-40°C to +85°C
Maximum altitude operation	2000 m
Pollution degree	2
Overvoltage category	II
Casing material	Aluminum and steel
COMPLIANCE	
compliance	CE (EMC EN 301 489, radio EN 300 220, safety EN60950-1)

2 Warning statements

2.1 FCC warning statement

- This device complies with Part 15 of the FCC Rules.
  Operation is subject to the following two conditions:
  (1) This device may not cause harmful interference, and
  (2) This device must accept any interference received, including interference that may cause undesired operation.

- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

- Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment

2.2 IC warning statement

English

"Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada.
To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication."
"This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device."

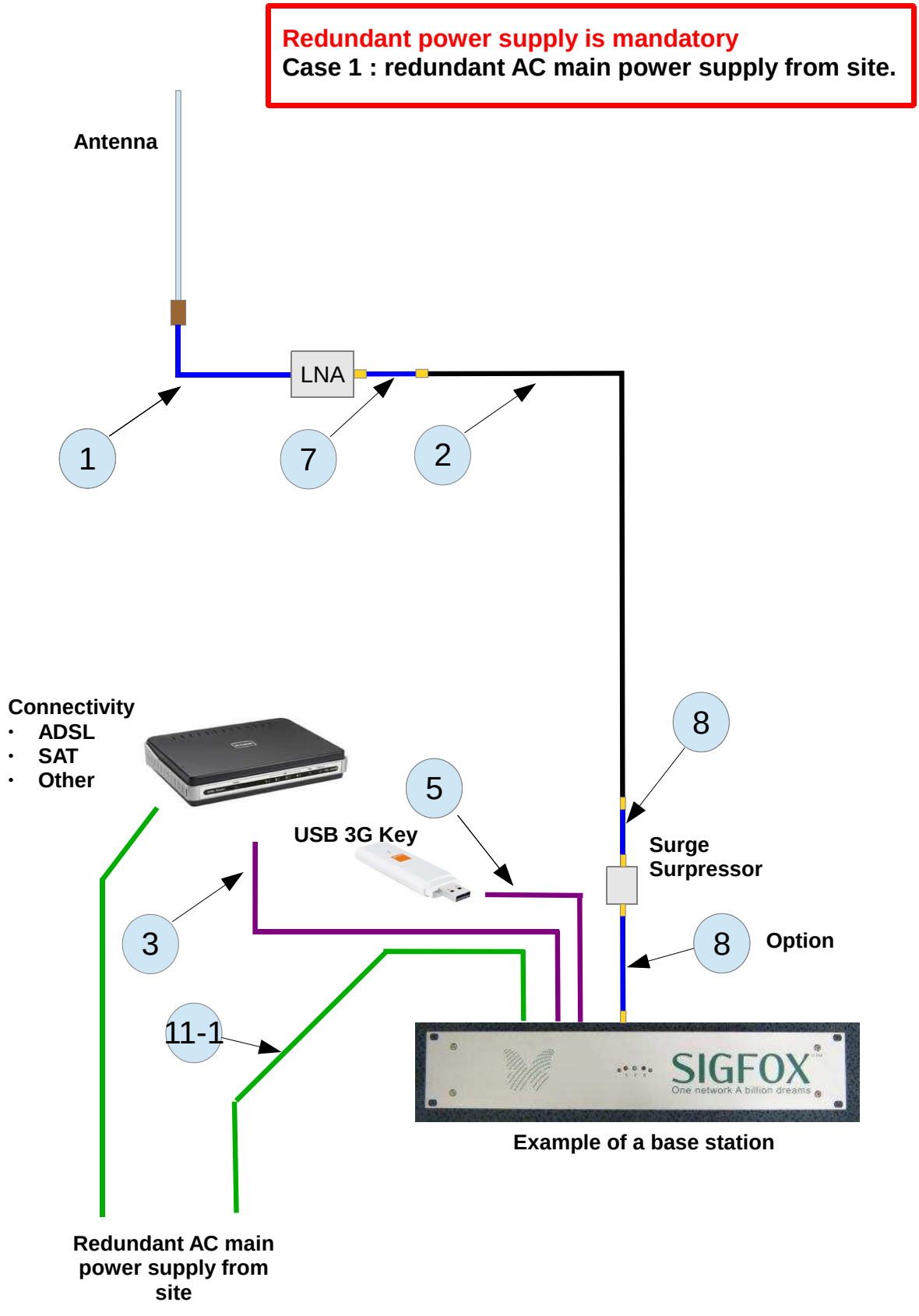
French

"Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada.
Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante."
"Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement."

3 Installation synoptic

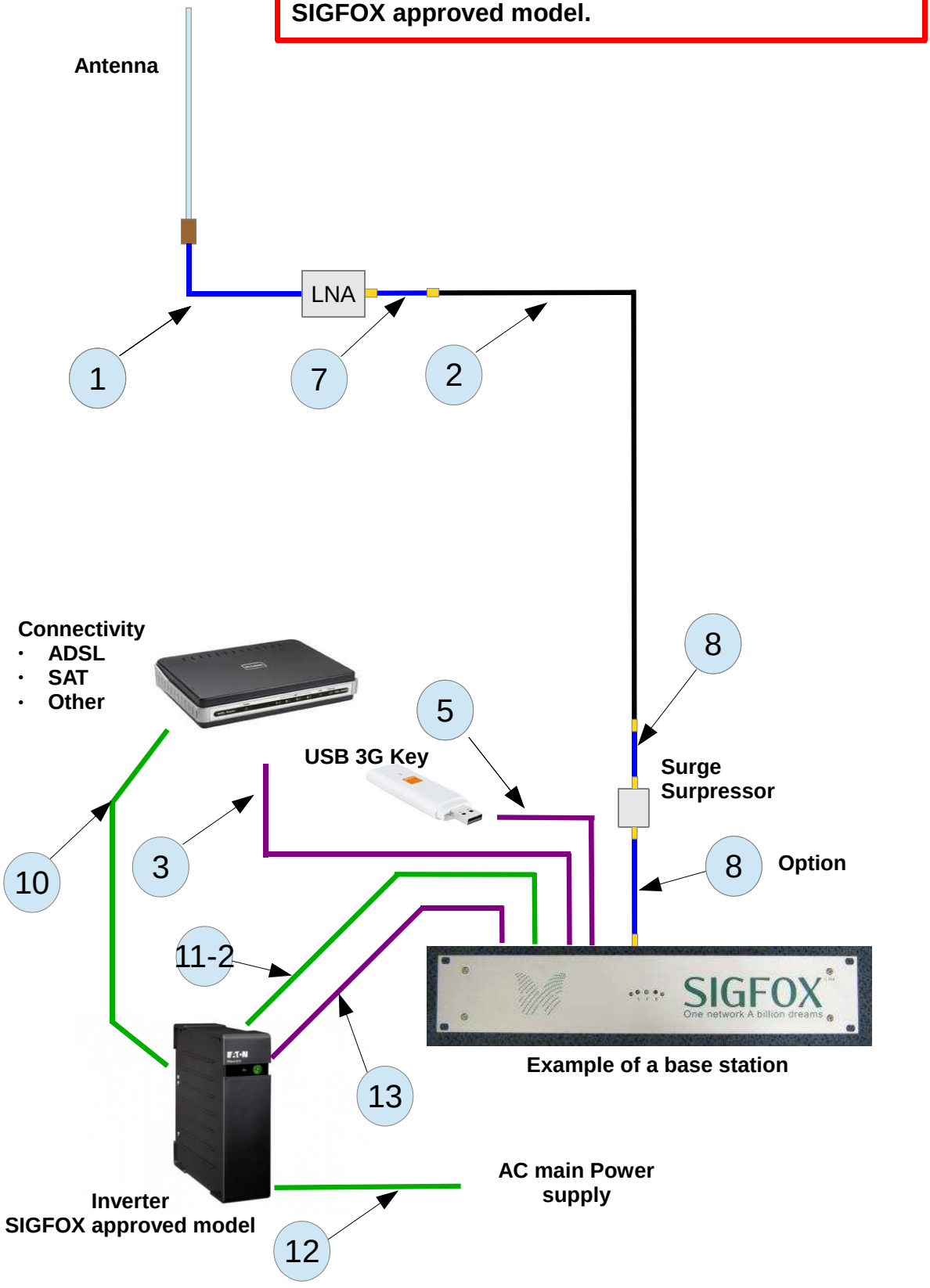
3.1 Redundant AC main power supply from site (power switch time < 10 ms)

Redundant power supply is mandatory
Case 1 : redundant AC main power supply from site.



3.2 Redundant power supply from inverter SIGFOX approved model :

Redundant power supply is mandatory
Case 2 : redundant power supply from inverter SIGFOX approved model.



4 Bill of material

- **Antenna and feeder**

Component	Description	Index	Supplier	Quantity
Antenna	Omnidirectional antenna 2.1m high max	-	SIGFOX	1
Antenna mounting support	Steel bracket between existing support and antenna.	-	DISTRIBUTOR	1
Low Noise Amplifier	SIGFOX Preamp 868	-	SIGFOX	1
LNA V2 mounting plate		-	SIGFOX	1
Feeder cable	1/2" or 7/8'' coaxial cable	2	DISTRIBUTOR	Depends on site configuration
	Jumper cable LMR400 : Ant <-> LNA (L=1.5m) connector Nmale/Nmale	1	DISTRIBUTOR	1 Depends on the Antenna
	Jumper cable LMR400 : LNA <-> feeder 1/2" (L=1.5m max) connector Nmale/Nfemale	7	DISTRIBUTOR	1
	Jumper cable LMR 400 : 1/2" <-> TAP (L=1.5m max) connector Nmale/Nfemale	8	DISTRIBUTOR	1 or 2
Connector	Nmale feeder connector	-	DISTRIBUTOR	2
Surge suppressor	Telegartner 90V J01028A0034	-	DISTRIBUTOR	1
Grounding kit for 1/2" feeder			DISTRIBUTOR	2

- **Power supply – Case 1 :** Redundant AC main power supply from site

Component	Description	Index	Supplier	Quantity
Base station Power cable	220V power cable IEC (plug to fem) to TAP	11-1	SIGFOX	1

- **Power supply – Case 2 -** Redundant power supply from inverter SIGFOX approved model

Component	Description	Index	Supplier	Quantity
Inverter (option if power supply is not redundant)	220V Inverter SIGFOX approved model : INFOSEC X3 500 USB ONDULEUR 500VA & EATON 5 S 550	-	DISTRIBUTOR	1
Control cable Inverter (option if power supply is not redundant)	USB Cable type A to type B (1 ml)	13	DISTRIBUTOR	1
Power cable Inverter (option if power supply is not redundant)	220V power cable IEC (plug to fem) to Inverter	12	SIGFOX	1
Base station Power cable	220V power cable IEC (male to	11-2	DISTRIBUTOR	1

(UPS to TAP)	fem)			
SAT Modem Power cable	220V power cable IEC (male to fem)	10	DISTRIBUTOR	1
X DSL Modem Power cable	220V power cable IEC (Plug to fem)	10	DISTRIBUTOR	1

- **Base station**

Component	Description	Index	Supplier	Quantity
TAP	Tap-868 V2	-	SIGFOX	1

- **Internet connexion**

Component	Description	Index	Supplier	Quantity
Modem	ADSL modem + power cable	-	DISTRIBUTOR	To be confirmed
Ethernet cable	Cable RJ45 1m	3	DISTRIBUTOR	1
USB 3G key	3G key SIGFOX approved model : Huawei E352/K3806	-	DISTRIBUTOR	1
	Standard M2M SIM card without PIN code neither password	-	DISTRIBUTOR	1
	USB cable – 50cm	5	DISTRIBUTOR	1

5 Antenna installation

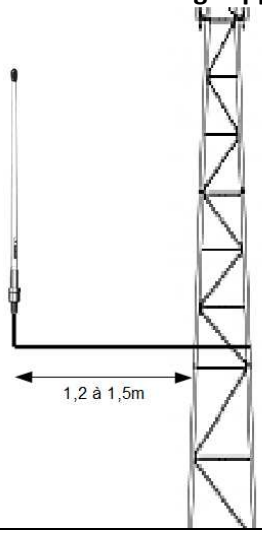
5.1 Warning statement relative to radiofrequency exposure:

The antenna must be installed such that a minimum separation distance of 22cm is maintained between the radiator (antenna) and all persons at all times.

5.2 Installation:

Correct installation	Incorrect installation
	
	The antenna must be fixed at the end of the tube

Antenna mounting support

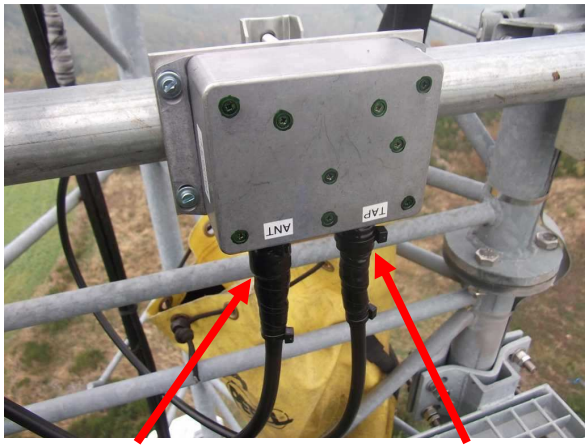


- The distance between antenna and tower must be in the range of 1.2 to 1.5m
- The mounting support diameter must be in the range of 40 to 50mm and be hot deep galvanized inside as well as outside
- The antenna must be fixed by nuts and jam nuts

5.3 Recommendations:

- Ensure the waterproofness (must be 100%) of the connector with a self-vulcanizing scotch-seal (rubber mastic tape) , then with and finally with 2 zip tie-wraps
- The tightening of RF connectors must be made manually.

6 LNA Installation

Correct installation	Wrong installation
 Antenna BS	 The LNA connector must be directed downwards and not upwards

- The LNA must be fixed on a support tube with a diameter between 30 to 50 mm.
- The LNA is fixed on the mounting support 1 m away from the antenna (right or left).
- The RF connectors are type N female.

Installation recommendation

- Ensure the waterproofness (must be 100%) of the connector with a self-vulcanizing scotch-seal (rubber mastic tape) , then with and finally with 2 zip tie-wraps
- **The tightening of RF connectors must be made manually.**

7 Waterproofness

Feeder cable, connectors, and overall cables, performance and lifetime strongly depend on waterproofness level. The main purpose of ensuring waterproofness is to avoid the direct contact with water and thus prevent oxidation of the connectors and also protect against steam, salt and dust,

- The N connectors must be waterproofed self-vulcanizing scotch-seal (rubber mastic tape) , then with and finally with 2 zip tie-wraps (at the top and at the bottom connector).

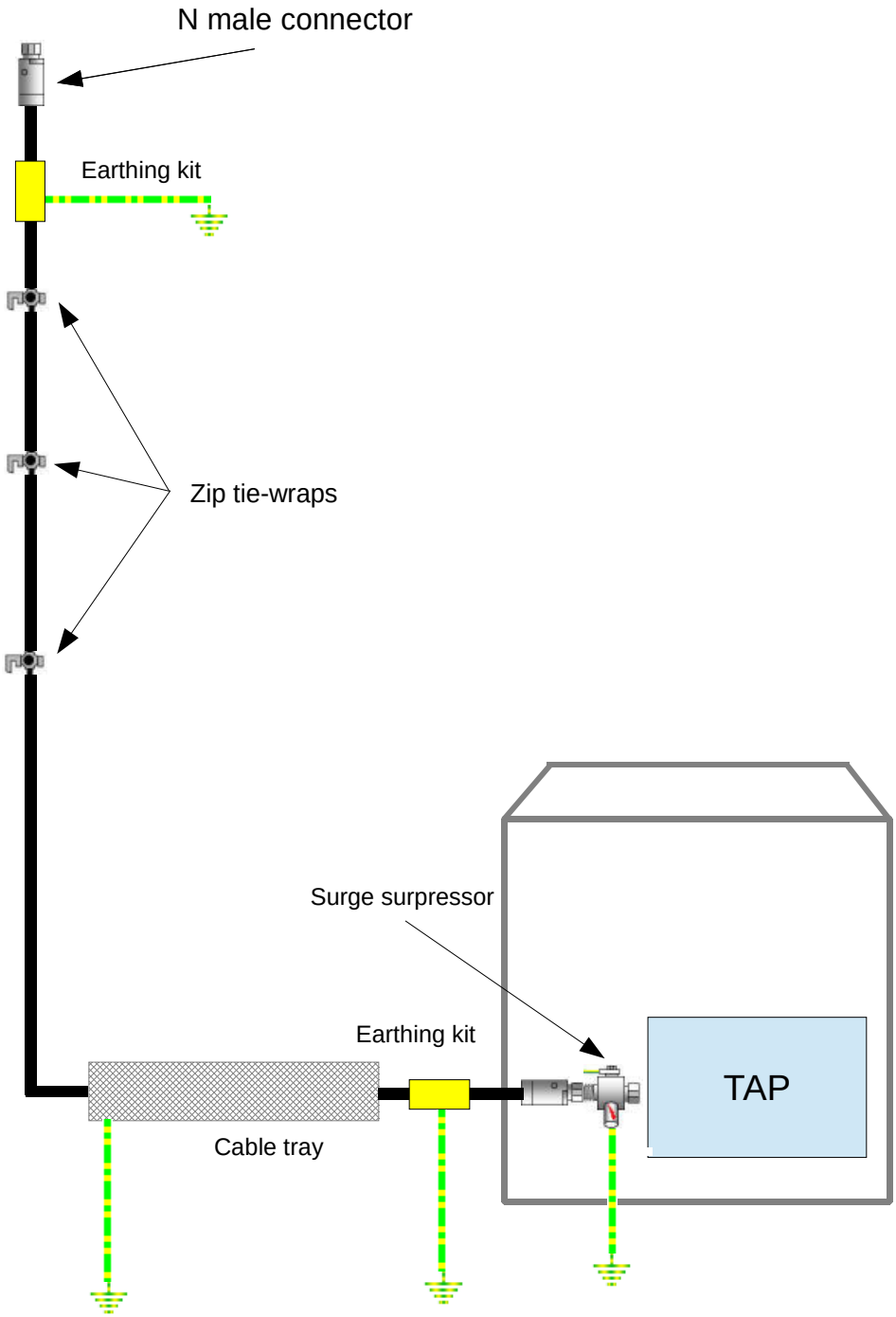
8 Earthing of coaxial cable and routing

- *Earthing*

Earthing all components is extremely important. The reasons are:

- Protection against lightning strikes;
- Evacuation of static electricity in the cables and equipment.

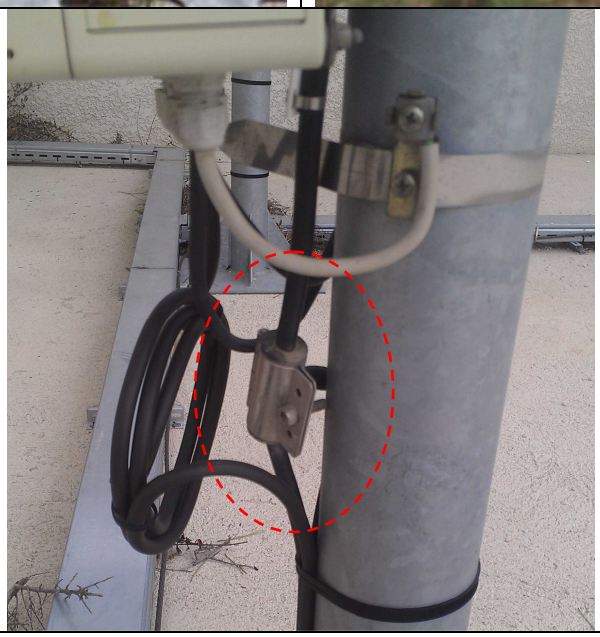
The coaxial cable must be connected to ground of the tower by at least two earthing kits (in line with the coaxial cable) at two locations on the tower at the top and bottom.



- *Coaxial routing*

  - The bending radius recommended by the cable manufacturer must be complied with.
  - The cables must be attached with zip tie-wraps every 0.8m to 1m.

- **Example**



9 Feeders measurement

This measure aims at checking the cable characteristics at 916 MHz and the quality of the installation.

- Type of measurements :
  - VSWR
  - Loss
  - Length

The main feeder measures must not exceed the following:

- VSWR : < 1.2 or 21dB Return loss @ 916 MHz
- Loss : < 6dB max @ 916 MHz

The coaxial jumper cable measures must not exceed the following:

- VSWR : < 1.2 or 21dB Return loss @ 916 MHz
- Loss : < 0.6dB max @ 916 MHz

Maximum cable length depending on cable type:

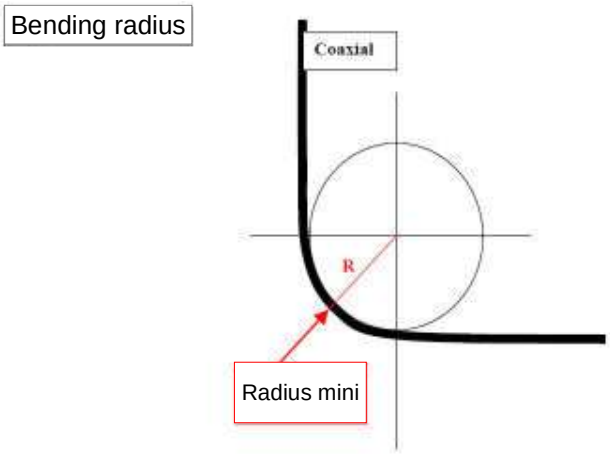
LMR 400 → max 35m
1/2" LDF4-50 → max 80m
7/8" LDF5-50 → max 125m

The main cable measurement must be performed once it installed in the cable tray. The connection to the LNA will be performed after the measurement.

10 Coaxial Bending Radius

Static mode:

- LMR 400 → Radius mini 4cm
- 1/2" LDF4-50 → Radius mini 15cm
- 7/8" LDF5-50 → Radius mini 25cm



11 Key risks

The list below gives the main hotspots during the antenna installation.

- Connector installation procedure must be strictly followed in order to avoid specific problems VSWR on cables and to maximize the efficiency and lifetime of connections.

- Specific attention must also be paid to: jumper cable installation, earthing, ensure waterproofness and labeling.

12 Base Station Installation

The Base station can be installed in two ways:

- 19'' bay
- Case mounting

19'' Bay

Example of a base station

- The location for the base station must be 2U and 400mm depth.
- The base station and 19" bay must be connected to the earth

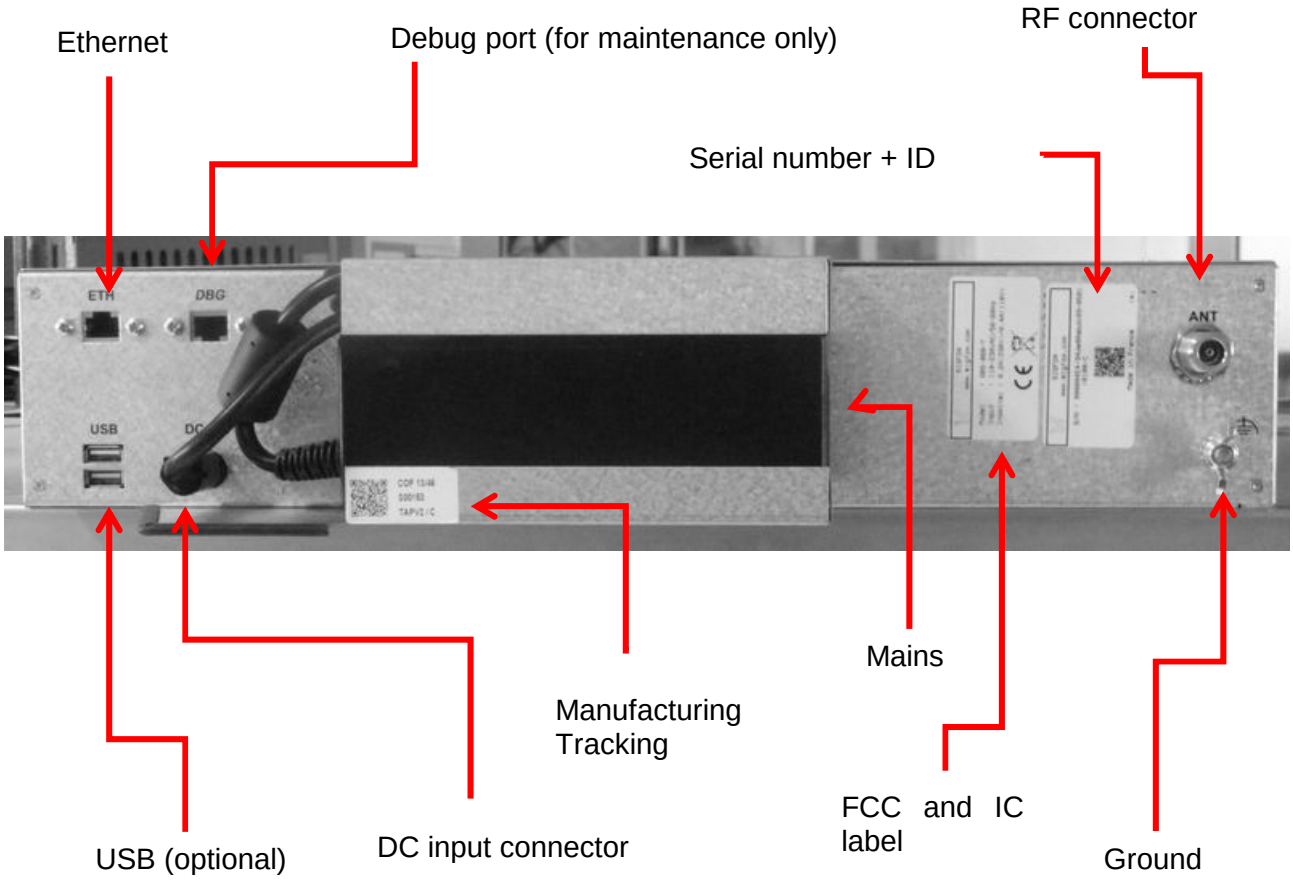
Case mounting

Example of a base station

- The wall surface needed is 0.85 square meter
- The base station must be connected to the earth

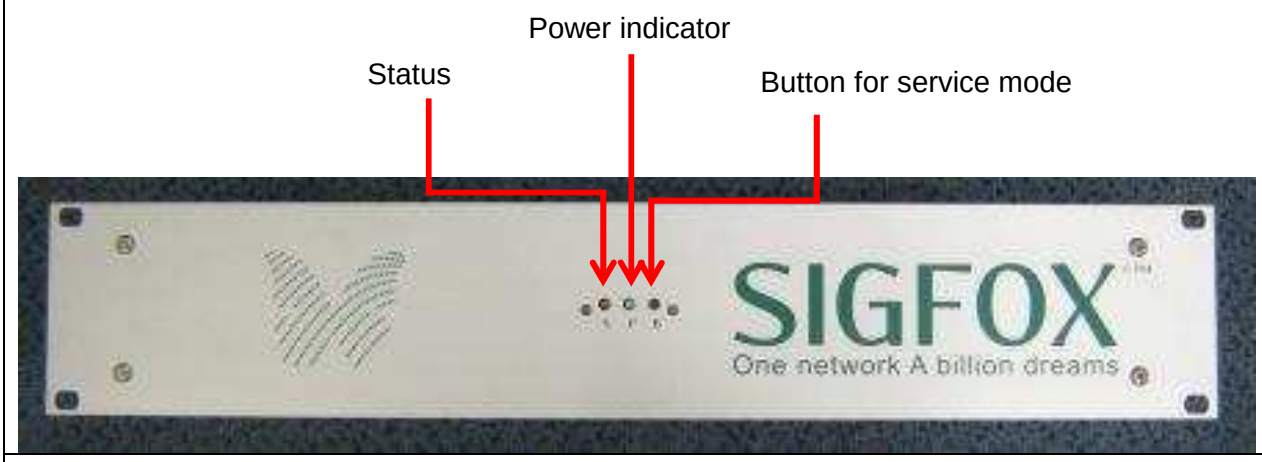
The airing on the sides of the base station must always remain open and not be blocked or encumbered

- **Electrical connection on the rear panel**



Example of a base station

- **Front panel**



Example of a base station

Green Led « **P**ower » :

- Green Led lights => The base station is ON (TRANSFOX and PC are ON).
- Green Led Off => The base station is OFF (TRANSFOX and PC are OFF).
- Green Led Fflach => The base station will restart or shutdown (after 60 sec max).

Red Led « **S**tatus »:

- Red Led lights => TAP software
- Red Led Off => TAP software
- Red Led Flash => TAP software

Push button:

- Base station ON : long presses on the push button (>5sec until or flashing green LED) => Shutdown the base station after 60sec maximum
- Base station ON : short presses on the push button => Reboot the base station after 60 sec
- Base station OFF : short presses on the push button => Instant start base station

13 Electrical connection

The base station must be installed with a power point with the electrical protection according to the standards.

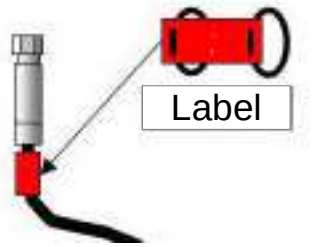
In case the Base station is connected to mains by its electrical cable, the electrical plug must be easily reachable in order to remove the cable.

In case the electrical plug is not easily reachable it is mandatory to have a circuit breaker system easily accessible for any technician in order to switch off completely the installation.

14 Labeling

14.1 Installation:

- Coaxial cables must be clearly marked closed to the base station with a label : SIGFOX – 868
- Tables, electrical circuit breakers must be clearly marked with a label : SIGFOX
- When connections are made and waterproofness has been made and checked, final labeling can be implemented. All labels must be easily legible.
- No hidden label in the cable tray.



14.2 Identification number:

15 Connectivity

15.1 Via ADSL (primary)

Please refer to your provider manual
The base station **only** accepts the dynamic host configuration protocol (DHCP) on the ETH interface

15.2 Via Satellite connection (primary)

Please refer to your provider manual
The base station **only** accepts the dynamic host configuration protocol (DHCP) on the ETH interface

15.3 Via the 3G network (secondary)

The 3G key is connected via an extension cable to the rear base station

It must be kept away from metallic masses or parts.

The indicator (DEL) on the 3G key will blink for a few minutes and then should stop. At this point color must be blue or green. The blinking green or blue means: research network.

Blue → fixed connection to 3G networks (depends on the material)
Green → fixed connection to 2G networks (depends on the material)

16 Base station « switching on » procedure

- **How to switch the base station on:**

Switching must occur only once all cables are connected to the TAP
See § 12Base Station Installation

- **ADSL connectivity checks :**

DSL and internet lights must be green (depends on the material)