CAR PARK 3 OUTDOOR

USER MANUAL

Feb. ’20

Index

Updated version

Content subject to change.
Download the updated version: www.productselection.net

Important notes

This section contains important safety-related information to be followed when installing, operating and maintaining the equipment. We strictly recommend respecting these rules to avoid damages to devices or machinery and injury or death to people. Please read this manual carefully before beginning any installation, maintenance or operational activity.

-  **Electrical components constantly under high voltage**
-  **Important information for safety and to prevent physical damage**
-  **Important information for a proper use of the system**

Glossary

Sensor: Wireless sensor for detecting stationary vehicles.

Parking bay: parking space for vehicles delimited by strips (blue, white, yellow)

IATA: International Air Transport Association (**www.iata.org**)

ISM: Industrial, Scientific, Medical. Acronym indicating free-use frequencies for low-power devices.

Introduction

This manual describes the procedures to install and configure the SBPWSIx wireless sensors to detect cars in the parking bays.

The installation procedure is divided into two parts:

- Sensor assembly
- Sensor installation

This configuration procedure, carried out by using the Sensor Manager software, is explained for the different sensor versions. This part is divided into three parts sessions:

- Sensor Setup: Configuring, Calibrating, Testing the sensors
- Network configuration: Associating the sensor to the relevant concentrator/network
- Integration into CPY Server

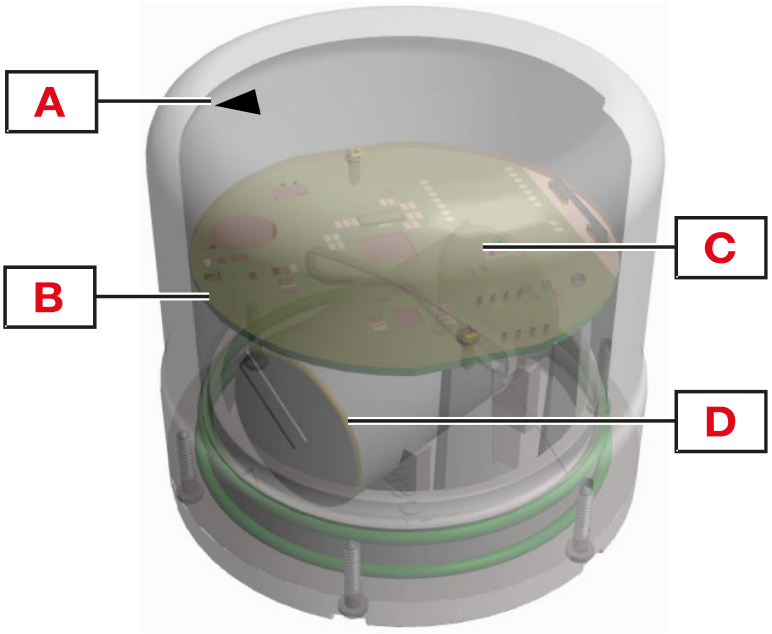
See **"UWP 3.0 Car Park manual"** for further information about the UWP 3.0 car parking system integration

Compliance with and observance of the instructions and recommendations included into this manual will guarantee the proper functioning of the sensors and of the entire system.

General description

The SBPWSIx wireless sensor is part of the Carpark system, which contains other types of sensors, controllers and displays. The SBPWSIx is designed to be buried under the parking bay and it will be completely invisible. It detects the occupied/free status of the parking bay by using the Earth's magnetic field.

We briefly describe the sensor's operation, which will help you to understand how to use the Software according to the type of sensor. The sensor is an electronic device for vehicle detection, and it is composed of four basic elements:



Element	Component	Function
A	Arrow indicator	Indicates the orientation of the sensor to the direction of SBPCWSI1 concentrator or LoRaWAN® and NB-IoT bridges
B	Reed switch	▪ Wakes the sensor up from "deep sleep" mode by using a magnet ▪ Resets the sensor
C	Electronic board	Card with a microcomputer for the management. It contains the three-axis magnetic field sensor, wireless chip and directional antenna for transmitting/receiving data packets
D	Lithium battery	LiSoCl2 lithium battery 3.6V, the capacity is: SBPWSI1: 17.5/19 Ah. SBPWSI2: 13 Ah.

Radio communication

The sensor is equipped with a radio transceiver. The sensor is available in two versions according to the communication protocol:

Model	Radio version
SBPWSI1	Long Range wireless/LoRaWAN® standard
SBPWSI2	NB-IoT

Each model has its own available features and the properly procedures have to be followed to install and configure them.

Sensor's operation

Three-axis magnetometer

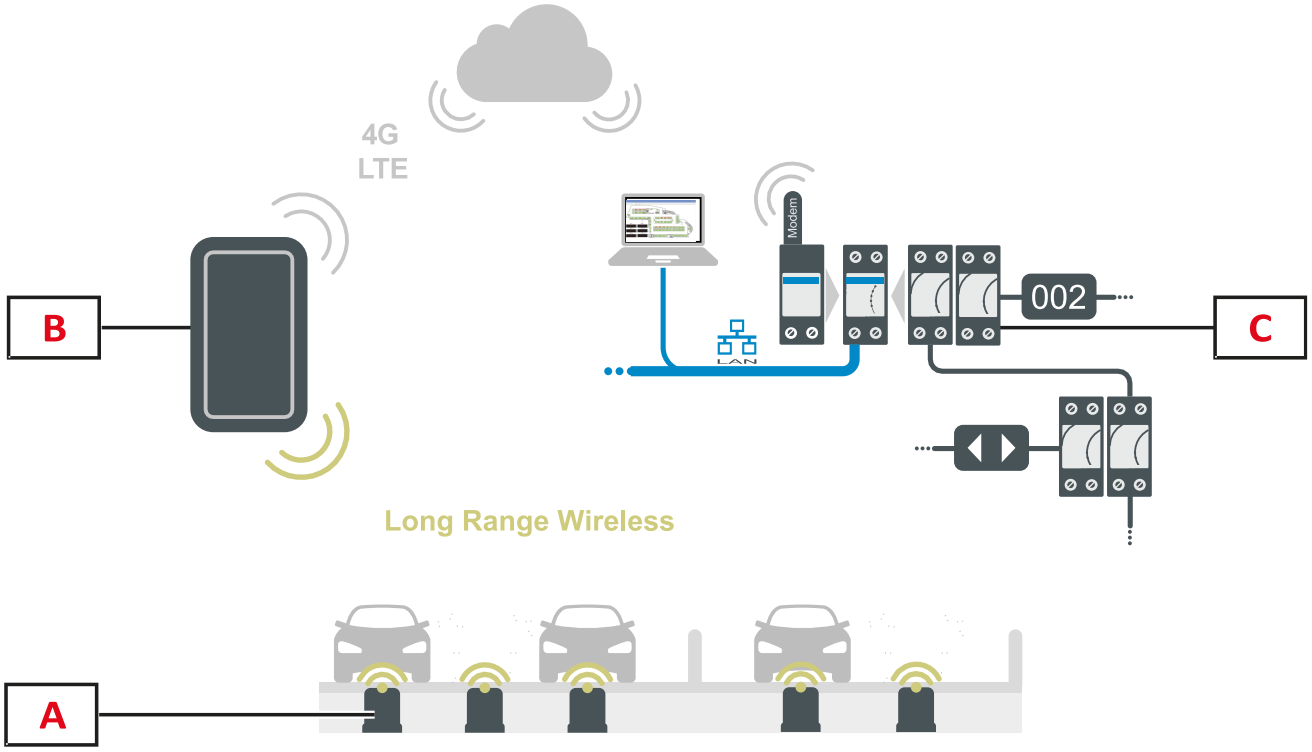
The car detection is performed using a magneto-resistive component. The total value of the magnitude measured by the sensor results from the sum of the value of the three individual axes being surveyed.

In the SBPWSIx sensor two thresholds are present: a low and a high threshold. If the sensor is in a **Vacant** status (below the low threshold), to change state, the total value of the magnitude must be greater than the value of the upper threshold.

If the sensor is in **Occupied** status (above the high threshold), to change state, the total value of the magnitude must be lower than the value of the low threshold.
All changes that are within the two thresholds will not lead to a change in the state of the sensor.

Architecture (private Long Range wireless network)

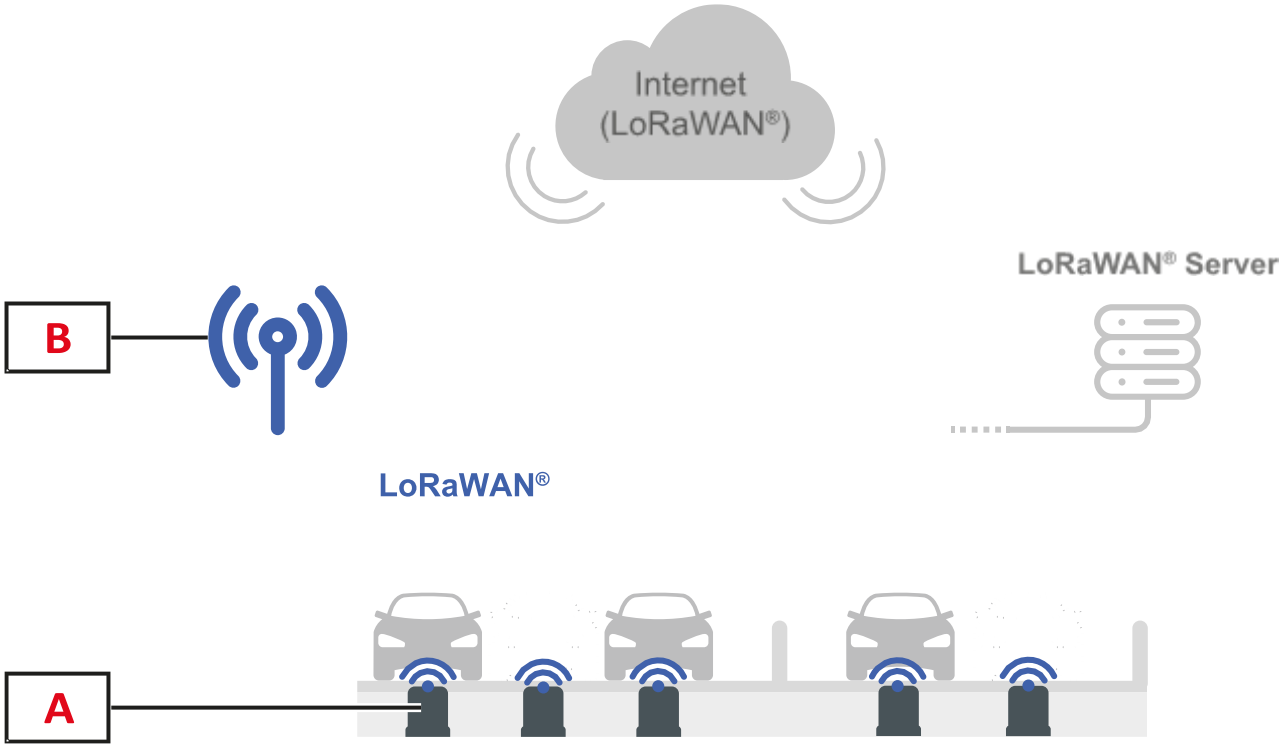
The SBPWSI1 sensor can be configured to transmits the parking bay status to the SBPCWSI1 concentrator using Long Range wireless communication in a private network. The SBPCWSI1 concentrator collects occupancy information from each SBPWSI1 sensor and transmits them, in real-time, to the SBP2CPY24 Server.



Element	Component	Function
A	SBPWSI1 sensor	Detects changes to the earth's magnetic field caused by the presence of ferrous objects (cars).
B	SBPCWSI1 concentrator	Collects via long range wireless the bay status that is sent by each sensor in real-time. It can manage up to 100 sensors and can be positioned up to 500 m far from the sensors.
C	UWP 3.0/SBP2CPY system	Receives via cloud the data collected by SBPCWSI1 concentrators. The bay status is managed in the same way as all the other sensors (ultrasonic, IP camera).

Architecture (LoRaWAN® network)

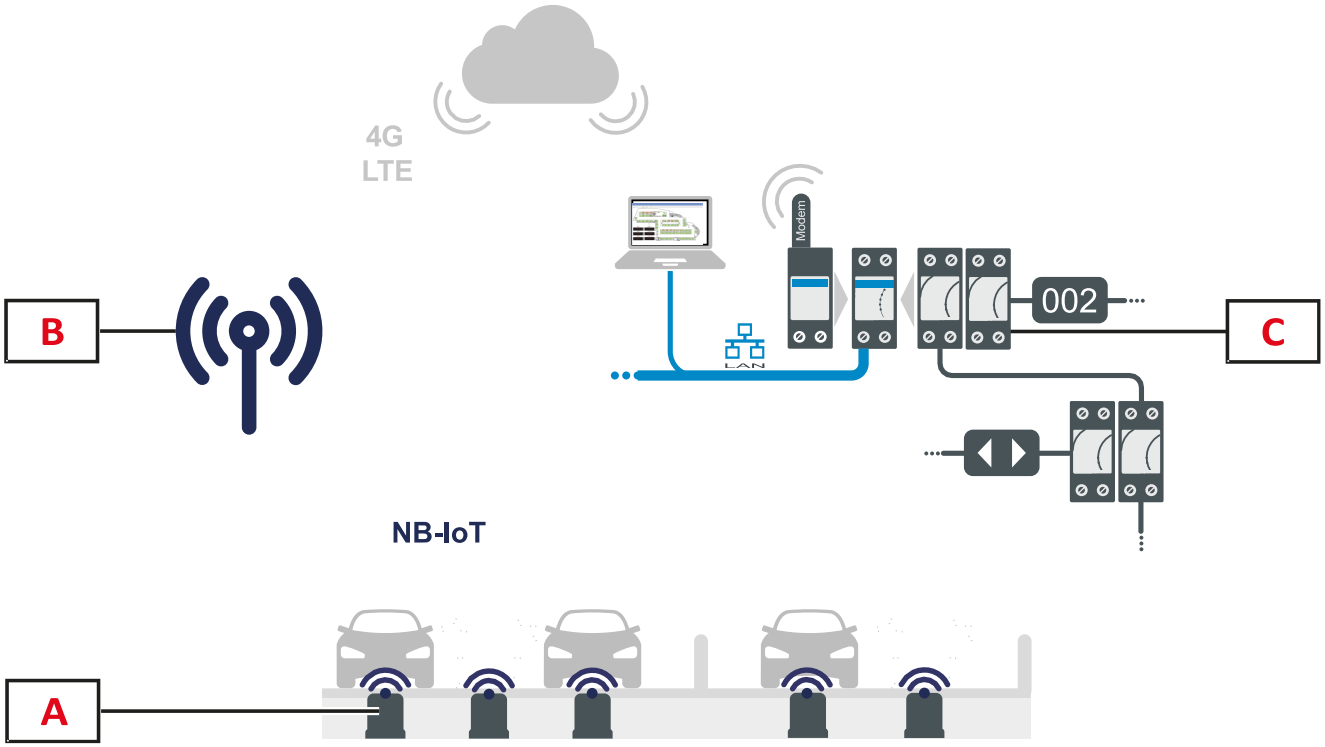
The SBPWSI1 sensor can be configured to transmit the parking bay status directly to a LoRaWAN® gateway or public network. The gateway will then send the information to the proper LoRaWAN® server.



Element	Component	Function
A	SBPWSI1 sensor	Detects changes to the earth's magnetic field caused by the presence of ferrous objects (cars).
B	LoRaWAN® bridges	Collects via standard LoRaWAN® gateways/networks/servers the bay status that is sent by each sensor in real-time.

Architecture (NB-IoT network)

The SBPWSI2 sensor can be configured to transmit the parking bay status directly to a NB-IoT gateway or public network. The gateway will then send the information to the cloud Server and then to the CPY Server.



Element	Component	Function
A	SBPWSI2 sensor	Detects changes to the earth's magnetic field caused by the presence of ferrous objects (cars).
B	NB-IoT bridges	Collects via NB-IoT network the bay status that is sent by each sensor in real-time.
C	UWP 3.0/SBP2CPY system	Receives via cloud the data collected by NB-IoT bridges. The bay status is managed in the same way as all the other sensors (ultrasonic, IP camera).

Safety notes

A correct installation of the sensor is essential to guarantee the safety of pedestrians, cyclists and animals. The SBPWSIx sensor is installed in open and undefined parking lots, to which everyone can access, so that it is necessary that its installation is carried out in the best feasible way. Read carefully the instructions below before performing any operation.

Technical environmental - Pre-requisites

The SBPWSIx sensor must be installed inside a hole made in the existing flooring. Before starting the work, it is necessary to know the physical characteristics of the flooring, such as material, thickness of the layer to be drilled, possible presence of underground utilities within 120 mm from the surface.

The SBPWSIx sensor uses three-axis magnetic sensors to detect vehicles and it is therefore sensitive to electromagnetic fields generated by cable ducts near the sensor. It is advisable to request a map of electrical utilities before starting work. In the event of any passage of a conduit near the chosen installation point, it is advisable to modify the installation point.

How to handle the sensor

The sensor is an electronic device, and, like all electronic components, it must not be subjected to shocks or falls which would damage the internal oscillators and / or interrupt the circuits.

Preventive precautions for installation

All personnel involved in the installation of the sensor must use appropriate PPE (Personal protective equipment) in compliance with Legislative Decree no. 9 April 2008, n. 81 "Consolidated Law on Health and Safety at Work" (text coordinated with Legislative Decree 3 August 2009, No. 106).

All personnel involved in the installation of the sensors or must comply with the recommended limits for lifting and manual transport in compliance with Legislative Decree no. 9 April 2008, n. 81 "Consolidated text on health and safety at work" and technical standard UNI ISO 11228.

In any case and following the failure to comply with the above, Carlo Gavazzi declines all responsibility for any damage caused to persons and / or property during or following the installation of the sensors.

How to store the sensor

The sensor is an electronic device made up of an electronic part and a lithium battery. On some models, a procedure has been implemented to minimize the consumption of the sensor when it is stored. This feature allows the sensor to be stored for very long periods without losing battery capacity and without radio transmissions. Typically, this mode is present on SBPWSI1 sensors, equipped with Long Range wireless/LoRaWAN® type Radio.

The sensor is equipped with a LiSoCl2 high capacity battery (see the battery details at pag.8).

The battery is equipped with the safety protections required by the regulations, which can preserve the connected circuits from damage.

The lithium contained in the batteries is highly flammable and could cause small explosions. Avoid shorting the battery and any contact with liquids.

The storage temperature must not exceed 85°C and must not be less than -40°C. The higher the storage temperature, the higher will be the self-discharge of the lithium battery. The lithium battery cannot and should not exceed a temperature of 85°C.

Assembly

Things to Know

The sensor is delivered partially assembled for safety reasons due to shipping rules. For this reason, the sensor must necessarily have the battery disconnected.

The shipping by air of the sensor is subjected to the IATA shipping rules with reference to the shipment of lithium batteries or devices containing lithium batteries.

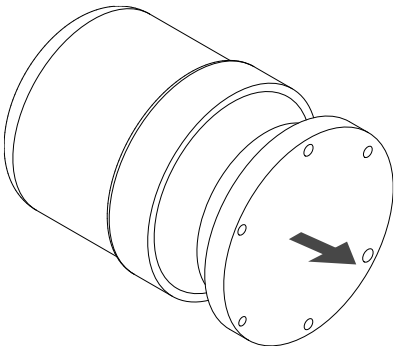
Refer to the www.iata.org website (e.g. webpage) or contact the carrier to obtain all the necessary information.

The shipment by land or by sea, although falling within the category DGR (Dangerous Goods) is less restrictive than the air way.

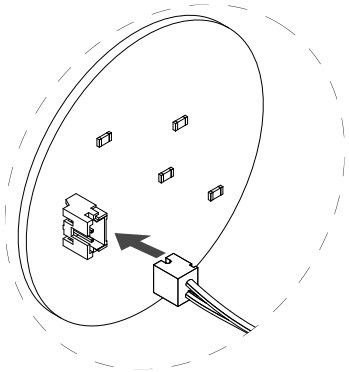
Procedures

SBPWSI1 assembly

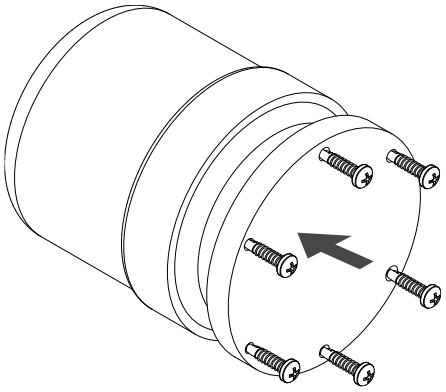
The sensor must be assembled and sealed before installation. It is recommended to follow the procedure in a lab. See the procedure below:



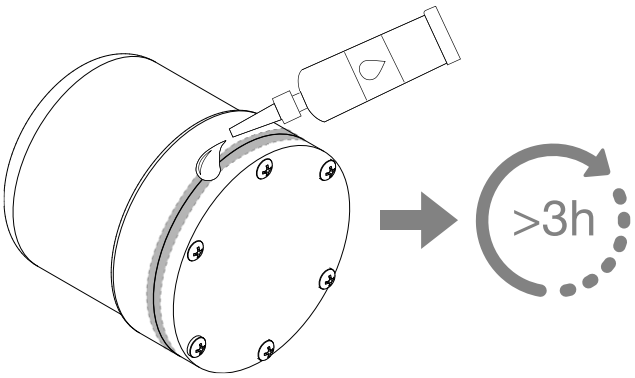
1. Remove the lower cap and extract the sensor equipment



2. Connect the battery to the connector on the electronic board



3. Insert the sensor equipment then fix the lower cap



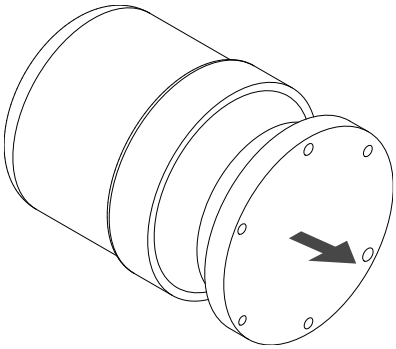
4. Use *Ms Polymer® adhesive* sealant* to seal the sensor

Note:

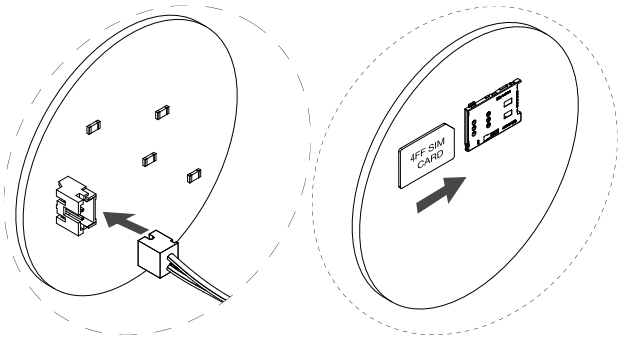
* Please order it separately. Wait at least 3 hours before installing the assembled sensor into the ground.

SBPWSI2 assembly

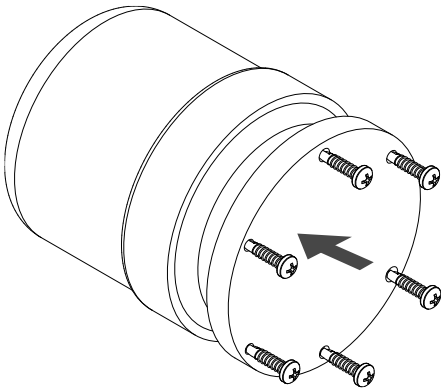
The sensor must be assembled and sealed before installation. It is recommended to follow the procedure in a lab. The SIM CARD must necessarily be inserted before sealing the sensor. See the procedure below:



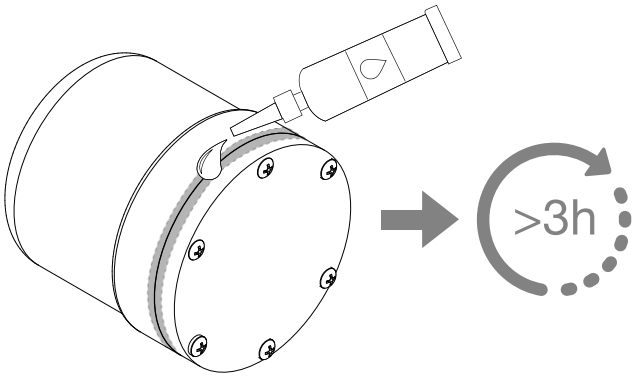
1. Remove the lower cap and extract the sensor equipment



2. a) Connect the battery to the connector on the electronic board -b) Insert the SIM card* into the slot



3. Insert the sensor equipment then fix the lower cap



4. Use *Ms Polymer® adhesive* sealant** to seal the sensor

Notes:

* The SIM card is not included

** Please order it separately. Wait at least 3 hours before installing the assembled sensor into the ground.

Sensor installation

Things to know

The sensor installation procedure involves a series of activities, including work to be carried out on public land, for the realization of the holes where the sensors have to be installed. This activity must be carried out in compliance with local regulations for the safety of workers and strangers (construction site, operational safety plan, signs, fences, etc…).

Laying procedure

Normally, sensor installation operations include the installation of the SBPWSIx sensors and the numbering of the parking bays. The activities to be performed for the installation of the sensors are:

- Preparation of the sensor installation site
- Making holes
- Waste material removal (and subsequent disposal)
- Preparation of the sensor installation site
- Parking bay numbering: write down the association between bay position <-> sensor ID
- Sensor installation
- Sensor configuration (*i.e*. calibration of the sensor magnetic zero, setting of the communication protocol, etc..)

Site verification

The verification of the site where the sensors will be installed is a very important phase; in fact, the environmental and physical conditions of the place of installation must be evaluated to avoid detection problems.
The presence of any electric user drains and cable ducts must be checked at the sensor installation points. The electromagnetic fields generated by the passage of current, in ducts close to the sensors, can in fact distort the detection.

Verification of electric/magnetic fields

The sensor is sensitive to electric and magnetic fields to such an extent that its placement too close, for example, to an electric cable, can distort the reading of the vacant / occupied status, as it may be able to saturate the sensor transducer. Using a magnetometer, it is possible to check the presence of interfering electro-magnetic fields. Moreover, since the SBPWSI1 sensor works with the ISM band of 868 MHz, a frequency free to use, the presence of source of disturbances must be checked on site by means of a spectrum analyser, in order to detect any source of disturbance capable of affecting the correct communication between sensor and concentrator/network.

Paving and hole

The sensors can be installed in different types of flooring. The installer shall evaluate the proper solution for making the hole, such as coring, punching or drilling, according to the type of flooring.

Asphalt: the most common condition and the easiest for both installation and maintenance. When the installation is complete, the highest part of the sensor must be at a height of 15/20 mm lower than the road level. A dept of more than 20 mm may limit the radio range of the sensor. The hole can be made by punching the road surface, using a special tip to be applied to the pneumatic hammer of a medium-small excavator (+/- 1.5 tons). The tip will allow to make the hole the exact dimensions necessary for the installation of the sensor.

Once the sensor has been placed and directed towards the reference concentrator/network/gateway, it must be fixed with sand and then covered with cold asphalt (15/20 mm approx.).

Porphyry / self-blocking pavers: with this surface it is not possible to use the punching tip. If the flooring is laid on a soft base (e.g. sand), it is necessary to manually remove the cubes / tiles until an area compatible with the sensor dimensions is exposed and using a breaker or hand tools to create the properly sized hole. If the laying base is instead compact (cement), you can use a core drill to make the hole.

Once the sensor has been placed and directed towards the reference concentrator/network/gateway, it must be fixed with sand and then covered with cold asphalt (15/20 mm approx.) or with a porphyry tile or other material, with thickness 10 / 15mm and adequate size and then fixed with cement.

Cobblestone-stone: As the previous point, but finishing using cold asphalt or pieces of stone set with cement.

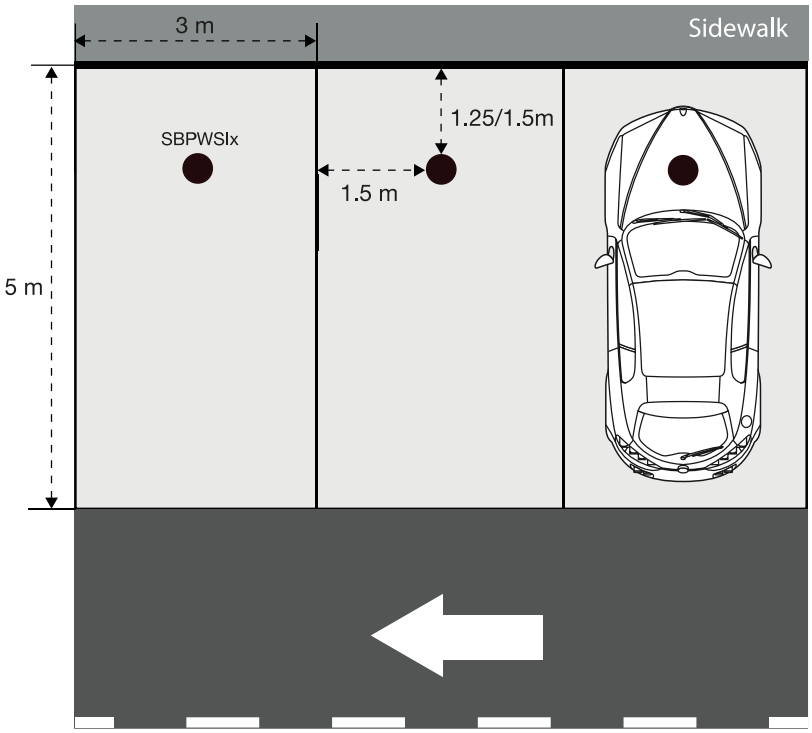
It is not recommended to install the sensors in the presence of non-solid surfaces (beaten grounds, meadows, etc.).

Positioning of sensors

Please follow the suggestion below to define the installation position of the sensor, according to parking bay type.

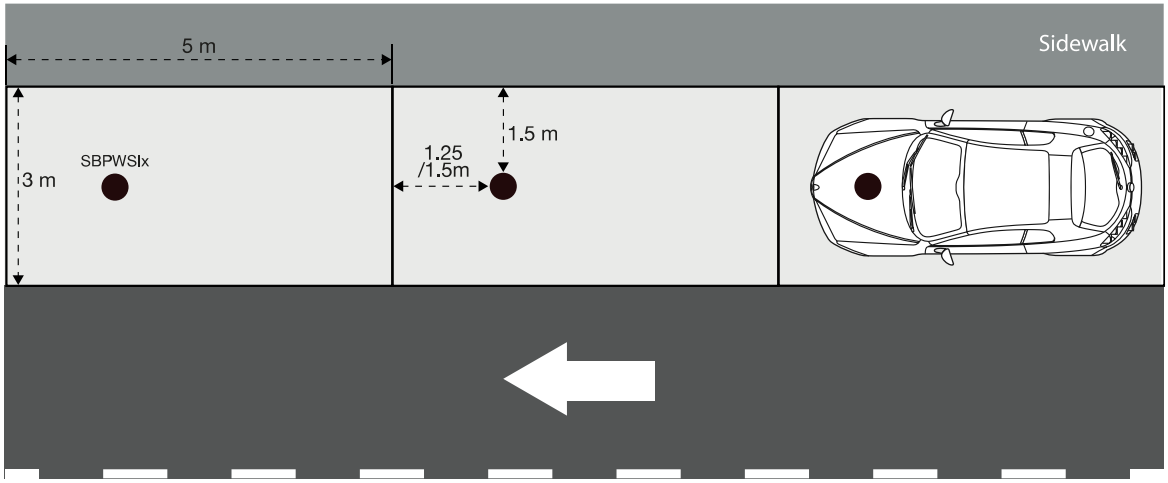
Longitudinal side-by-side parking bays

The sensor should be placed in the median line of the parking bay, at 1.25/1.5 metres from the head of the parking bay.



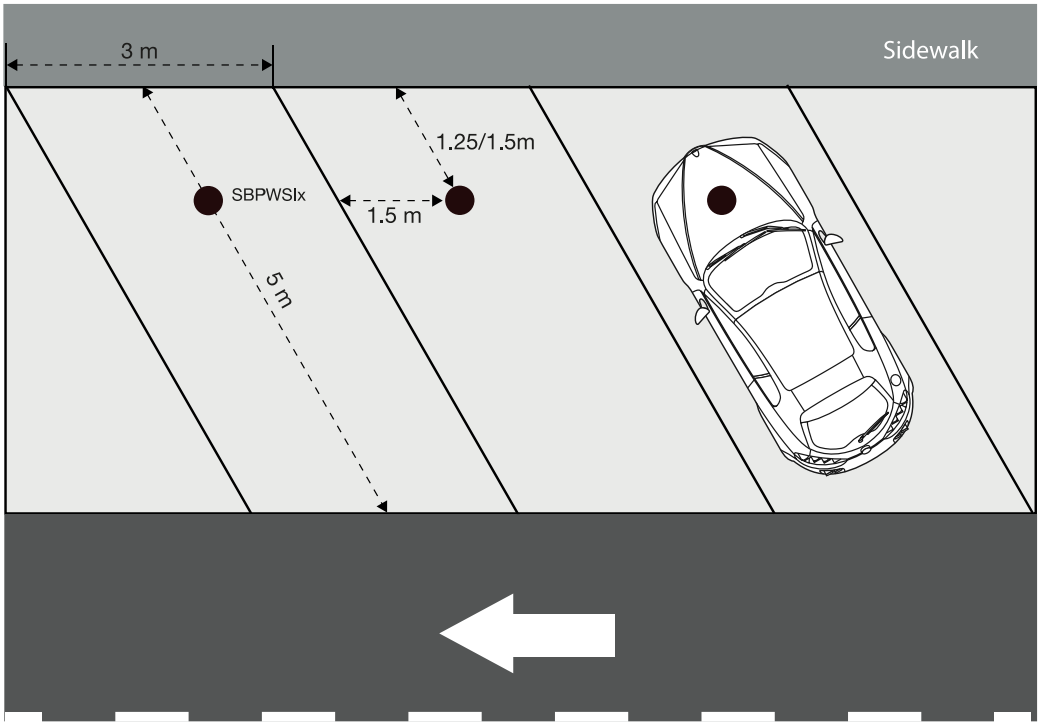
Lineparking bays

The sensor should be placed in the median line of the parking bay, at a distance of 1.25/1.5 metres from the head of the parking bay.

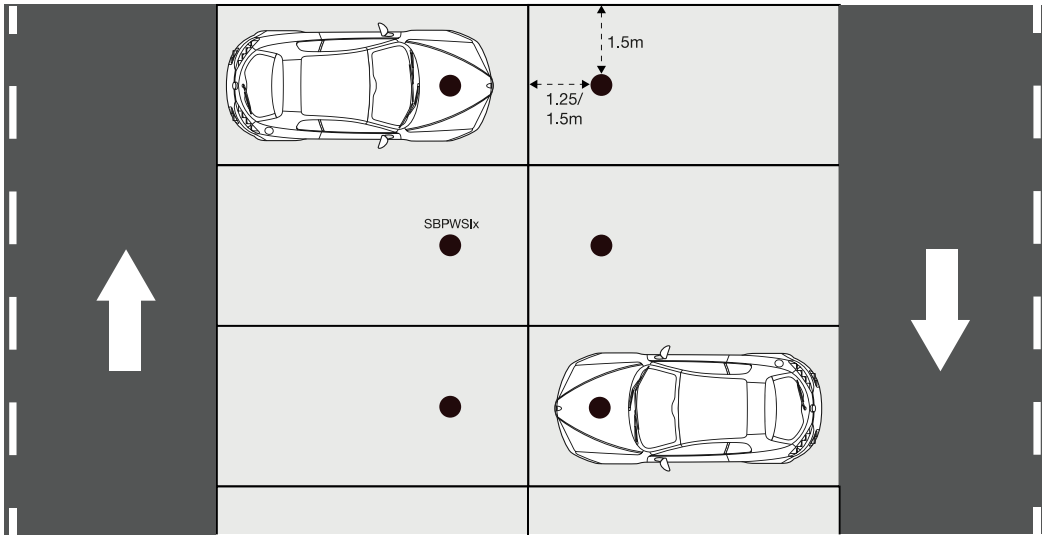


Diagonal side-by-side parking bays

The sensor should be placed in the median line of the parking bay, at a distance of 1.25/1.5 metres from the head of the parking bay.



Opposite parking bays



N.B. In case of other types of parking facility or in case of doubts about the positioning of the sensors, please contact us.

Procedures

Preliminary operation before installing

Do not install the sensors in their final position until you have carefully read the information below

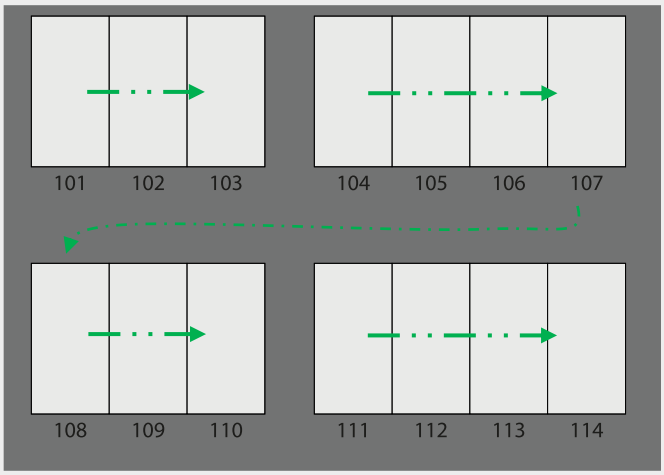
Both the SBPWSIx sensors have a unique ID number pre-provisioned during the production phase. The ID number consists of 5 digits (e.g. 10123) and can be found on the label on top of the sensor. For each SBPWSIx sensor, this number must be changed according to the project and it must correspond to the parking bay number in which it will be installed.

Please see the procedure below to manage the association:

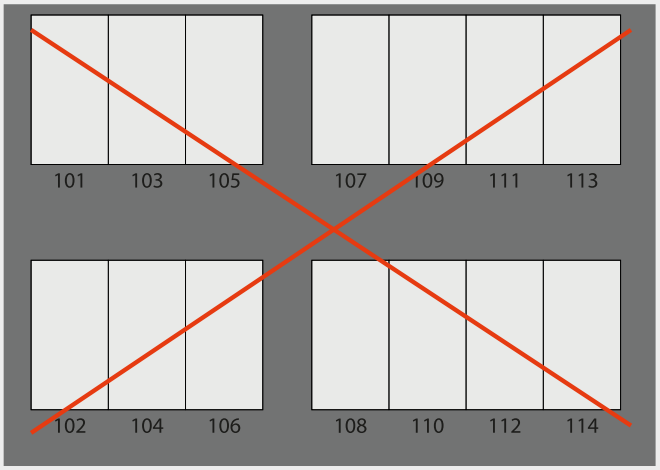
Step	Action
1	Arrange a scaled map of the parking facility and number every parking bay with an individual number. See the indication below to number the parking bays:

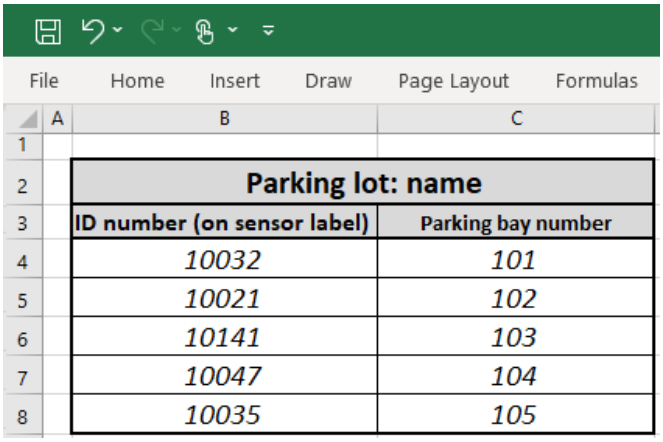
The total number of parking bays is	Start the parking bays numbering with
less than 100	101
between 100 and 1000	1001
higher than 1000	10001

Assign to each parking bay the related number, in line, sequentially as shown below:



Avoid the numbering as below:



	Distribute the SBPWSIx sensors over the map and write down the pre-provisioned ID number on the installation map **matching** them with the parking bays number. You should evaluate the preferred solution. See the example below:
2	

	A	B	C
1			
2		**Parking lot: name**	
3		**ID number (on sensor label)**	**Parking bay number**
4		*10032*	*101*
5		*10021*	*102*
6		*10141*	*103*
7		*10047*	*104*
8		*10035*	*105*

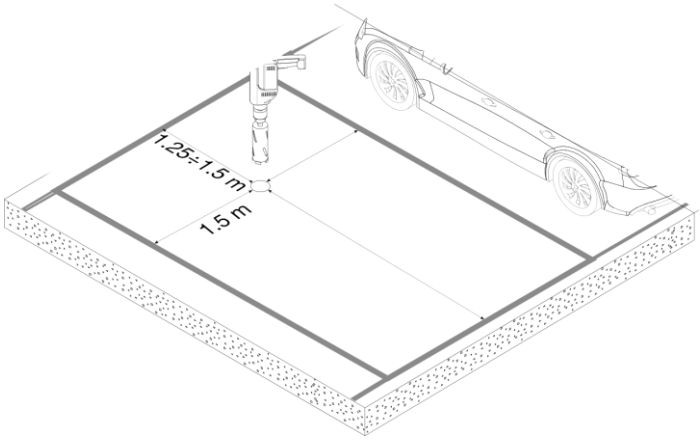
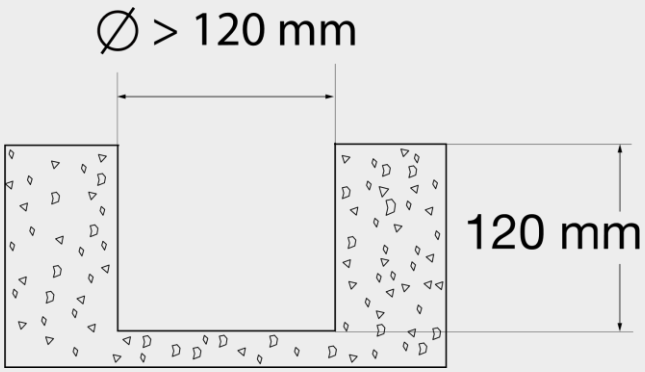
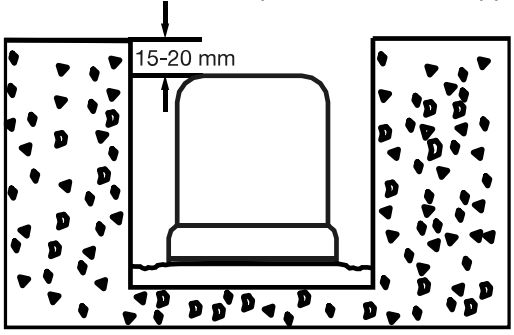
3	Once the association is done, each SBPWSIx sensor must be physically re-addressed by using the Sensor Manager software. The installer should evaluate the preferred procedure, as proposed below on step 4a or 4b.
4a	*This is the recommended procedure* 1- In the lab, use a permanent marker to write down the new address on the label on top of the sensor 2- In the lab, Change the sensor ID. By using the Sensor Manager software, find the Sensor (it appears in the software with the pre-provisioned number) and change the ID according to the new ID that must be assigned. 3- In the field, install the sensor on the final position according to the parking bay number in which it will be installed. 4- In the field, calibrate the sensor and check that the Sensor ID is corresponding to the parking bay number.
4b	1- In the field, install the SBPWSIx sensor in the final position (do not cover it completely, the top of the sensor must be visible) 2- In the field, Change the Sensor ID. By using the Sensor Manager software, find the Sensor (it appears in the software with the pre-provisioned number) and change the ID according to the new ID that must be assigned. Write-down the new address by using a permanent marker. 3- In the field, Calibrate the sensor and check that the Sensor ID is corresponding to the parking bay number

Important: Please pay close attention to the correspondence between the number of the sensor and the number of the parking bay. In the unfortunate event that two or more sensors were reversed, it will be quite problematic to understand the reasons for the failure and take the corrective actions.

Sensor installation

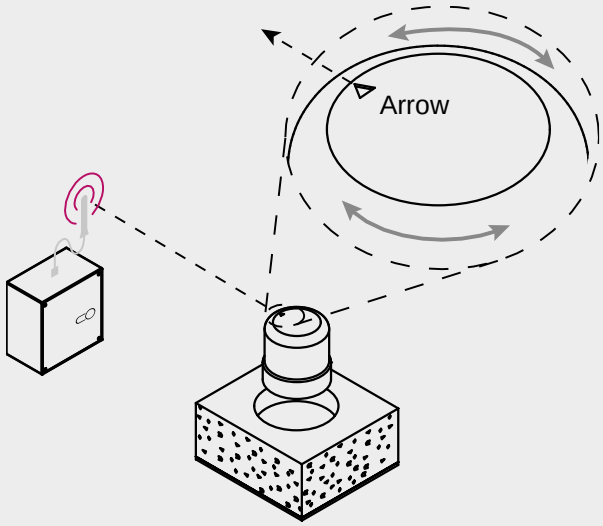
The sensors must be installed into a hole made in the pavement.

The procedure below explains how to correctly install the SBPWSIx sensor under the ground:

Step	Action
1	Identify and mark the spot where the sensor will be installed
2	See the Positioning of the sensors chapter to find the best placing according to the type of parking lot 
3	Use a hole-saw or other dedicated tool to drill a hole into the pavement bigger enough for the sensor enclosure: the hole dimensions must be as follow: 
4	Try to perforate it deep enough to insert the sensor completely, without rising over the surface. Be sure that the enclosure remains under the pavement line at approximately 15-20 mm. 

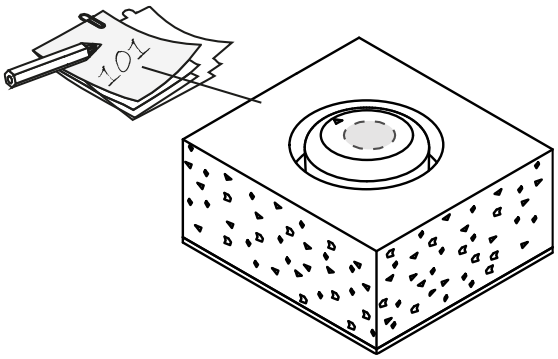
5

Insert the sensor trying to orient the arrow, positioned on the upper edge of the sensor, in the direction of the receiver (concentrator, bridges, repeater).



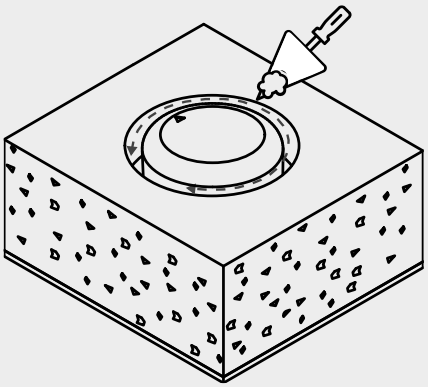
Double-check that the matching between the sensor ID and the parking bay number (see Preliminary operation before installation procedure) is correct.

6



7

Fix the sensor by inserting it in the empty space. Use fine sand / very small stones to cover it completely, up to the top of sensor.



Before burying them completely, these actions must be completed:

- Direct the arrow towards the receiver
- If the sensor has been previously set in sleep mode, it must be woken up by means of a magnet

8

Seal the top of the sensor with the chosen product (cold asphalt, resin, concrete, etc.) and dust the surface with fine sand.

If the pavement is in self-locking tiles or porphyry cubes, it is possible to cover the top of sensor with a little slice (10/15 mm) of the same material, fixed with concrete.

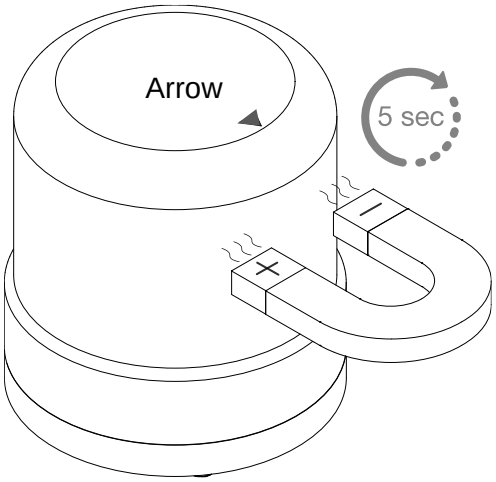
When installation is completed, please refer to the Sensor Manager software chapter in this manual for the calibration and configuration procedures.

How to reset the sensor

If the sensor has been previously set in sleep mode to preserve the battery consumption, the sensor sends a keep-alive packet per day only. This means that the sensor is not able to communicate properly with the calibration device and it does not appear in the Sensor Manager software interface.

To reset the sensor to factory settings, or to wake it up, use a magnet as shown in the image below for around 5 seconds. The sensors will appear in the **Not Filtered** list according to the Sensor ID number.

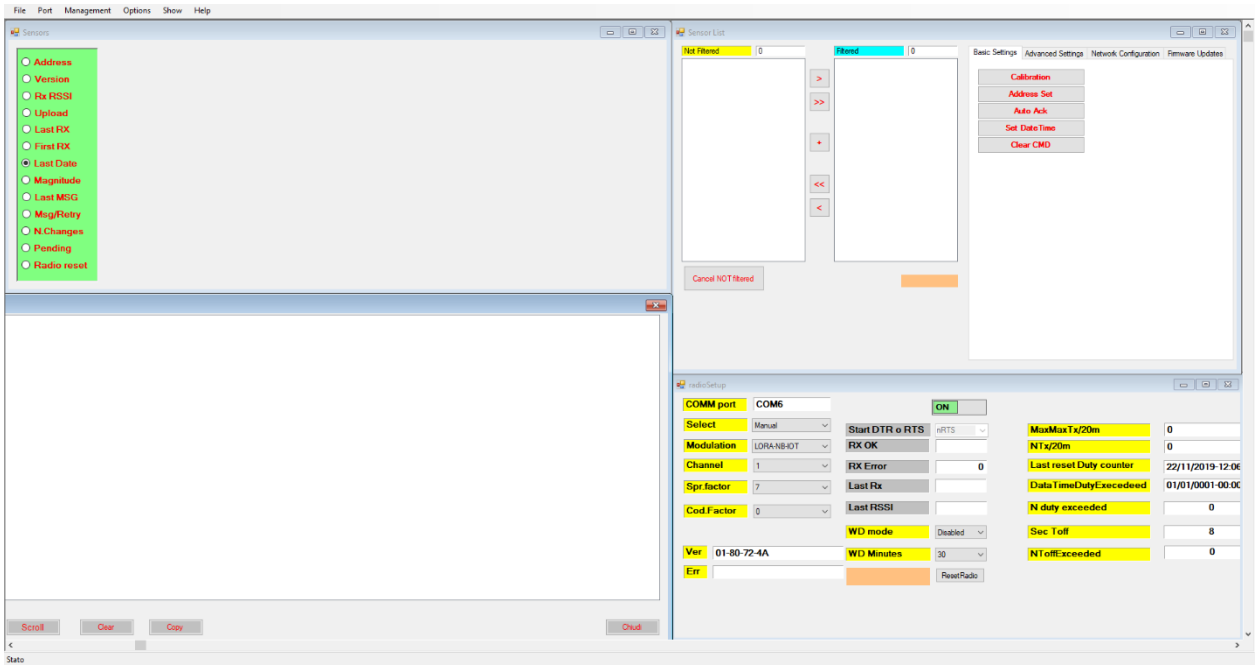
Note: if the pre-provisioned sensor ID has been changed, it will appear with the new ID number that has been assigned.



!!This procedure must be performed before burying the sensor into its final position!!

Sensor Manager Software

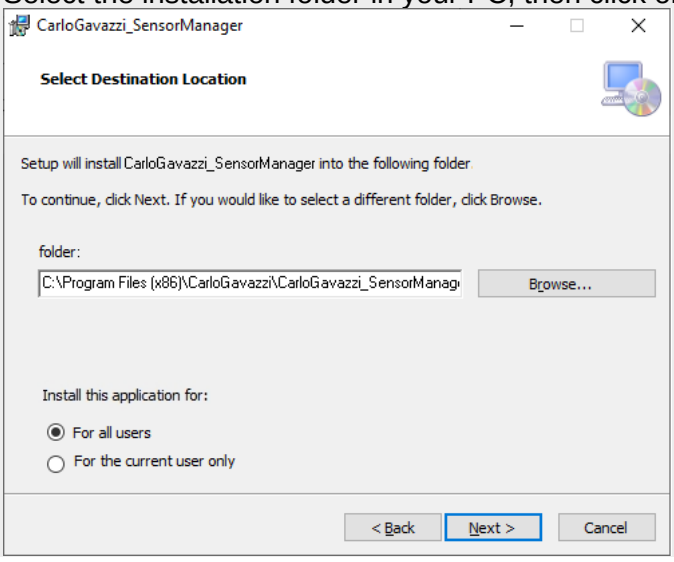
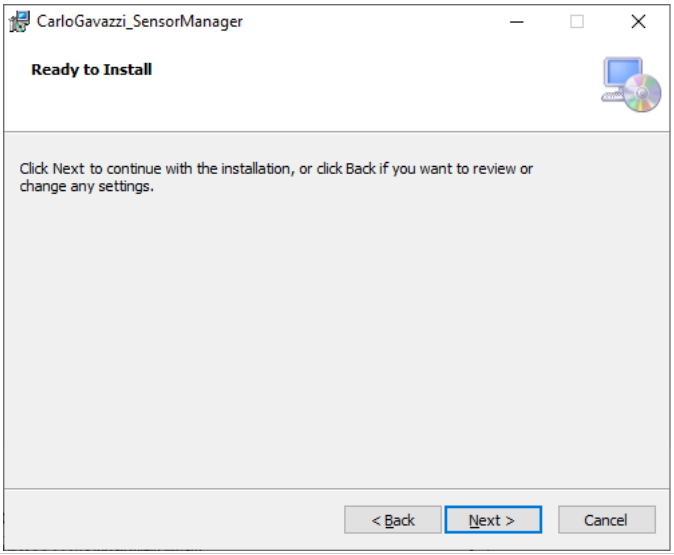
The Sensor Manager software is designed to setup, calibrate and manage the wireless sensor SBPWSI1 and SBPWSI2. During the sensors installation, the software can be executed in any PC (the SBPCAL calibration unit device is required) to communicate with sensors and manage them in group or individually. In addition, also the SBPCWSI1 concentrator has embedded the Sensor Manager software.

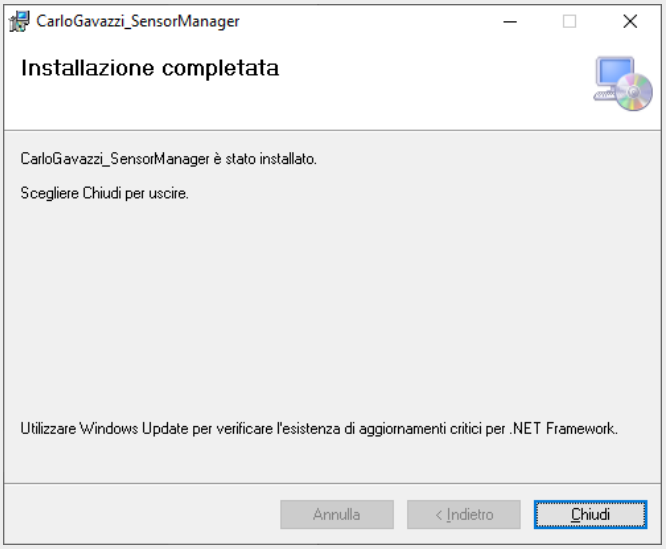


- Free software, compatible with Microsoft Windows® 10/7 PC/Notebook
- The same software for configuring SBPWSI1 and SBPWSI2 sensors
- AES 128 Key management for protecting your private communication between SBPWSI1 sensors and SBPCWSI1 concentrators
- Real time diagnostics and advanced tools
- Configured devices list for an easy integration into a LoRaWAN® and NB-IoT networks

Software installation

Follow this procedure to download and install the software in your computer.

Step	Action
1	Download the Carlo Gavazzi Sensor Manager software from www.productselection.net
2	Launch the **Setup.exe** to start the installation assistant which will guide you
3	Select the installation folder in your PC, then click on **Next >** 
4	Click on **Next** to install the software 

5	Click on **Close** to end the installation procedure 

Configure the SBPCAL device

The SBPCAL is a hand-held device designed to calibrate, test and manage the SBPWSI1 and SBPWSI2 wireless sensors, one by one or in group. It communicates with them via a proprietary Long Range wireless protocol.

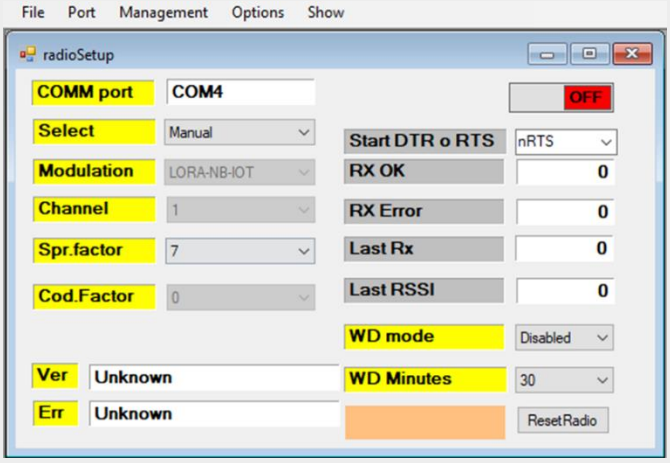
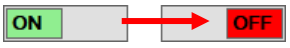
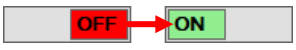
Follow the procedure below to configure and execute the Sensor Manager software:

Step	Action
1	Connect the SBPCAL device to a Microsoft Windows 10 / 7 Computer via a USB port (2.0 or higher).
2	When the device is connected, please check if the system has installed the correct USB-Serial driver: ▪ **Automatic:** the SBPCAL is automatically recognized and configured ▪ **Manually:** Download the driver from the FTDI Internet site and install
3	Launch the Sensor Manager software
4	See the procedure Set COM port

!!! The SBPCAL has to be connected to the PC/Notebook before the application launch

Set COM port

At the software launch, it is necessary to configure the virtual COM port to be used. Follow the procedure below to configure the communication parameter of the connected device:

Step	Action
1	Click on **Port** tab to open the **RadioSetup** window: 
2	In the **COMM port** field select the COM port that has to be used *Note: The COM Port number vary according to the configuration*
3	Set LORA-NB-IOT in the **Modulation** field
4	Set the spreading factor value in the **Spr.Factor** field (default value is 7)
5	Set **Start DTR RTS** (default is blank): when the device is recognized in **Ver** field, you will see a group of 4 byte (e.g. 01-80-72-4A). This means the SBPCAL device is properly set.
6	Should the device not be detected (the **Ver** field is blank): Turn the selector OFF 
7	In the **Start DTR o RTS field** select one of the three options available
8	Turn the selector OFF 
9	Repeat steps 6 to 8 untill in the **Ver**. Field appears
10	You can enable a **WatchDog** (WD) in case the Sensor Manager does not receive any radio packet in the range of time. This will reset the device radio module when the time expires.

Things to know

Start DTR o RTS

The connection of the SBPCAL device to a PC/Notebook depends on how the serial converter is set in the PC, some PC requires to set the DTR option, other PC requires to enable the RTS options and other PC requires to enable nRTS. The user has to try different configurations to find the correct one as shown in the procedure above.

Spreading factor

Like in a standard wireless system, the higher the number of devices and transmitted data, the higher the possibility of interferences is. In that case, you need to extend the transmission interval to guarantee the reliability.

To obtain the maximum distance and the interference resistance, we suggest using the **SF7 spreading factor**. Spreading factors other than SF7 is not suggested and should be evaluated by the installer according to the environmental condition since higher Spreading Factor value should not guarantee the correct data transmission.

Sensor configuration

Once the SBPWSIx sensors have been installed in their final position, they are ready to be configured by means of the Sensor Manager software.

In this chapter are presented the **quick start procedures** to configure the sensors, according to the different communication protocols. These procedures show the steps the installer has to follow to install and configure the sensors properly.

For any additional configuration requirements, the installer can go through the detailed procedures in this manual.

For any type of application other than those shown below, please contact Carlo Gavazzi.

Quick start procedures

Do not bury the sensors completely, until you have carefully read the information below.

1. Before configuring the sensors, read carefully the Sensor Installation chapter on this manual.

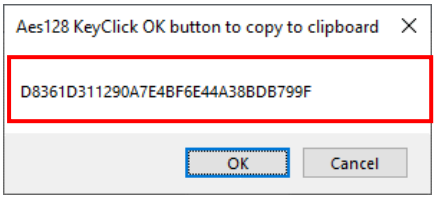
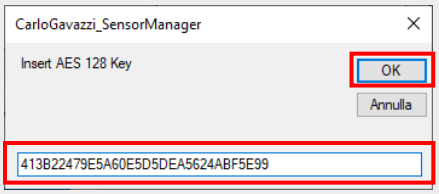
2. The sensors have to be installed in their final position according to the parking bays numbering as defined by the project specifications. This means that the ID number has to be set/changed for each SBPWSI1 sensor according to the numbering position as defined in the project map. See Set/change the sensor ID number procedure for further details.

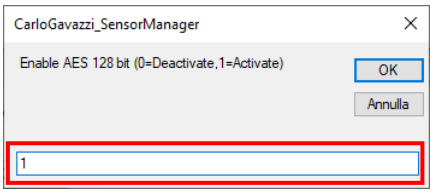
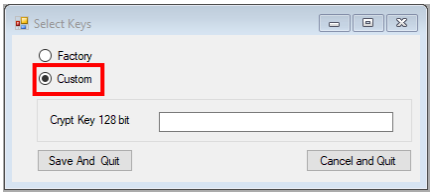
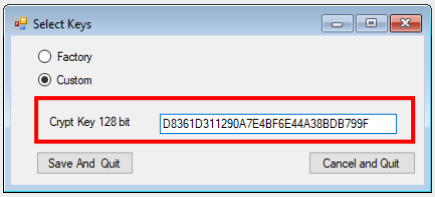
Below, the procedures are explained for the different sensor versions:

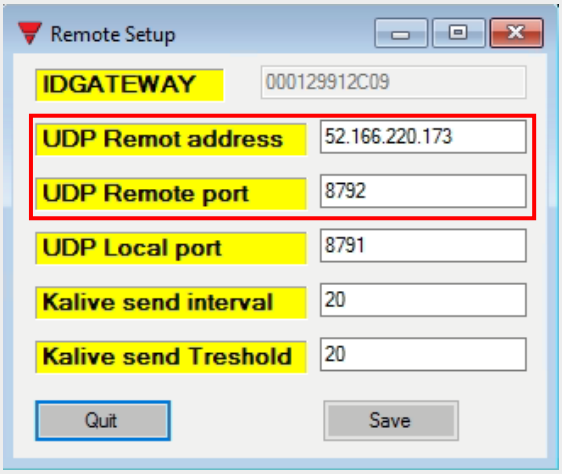
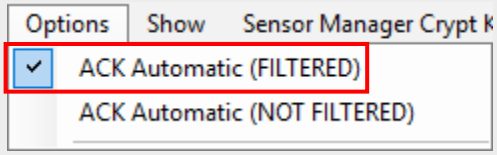
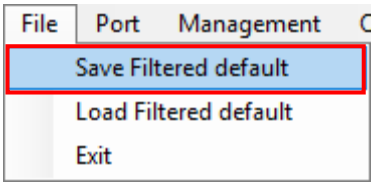
Version	Procedure
SBPWSI1	Long Range Wireless
	LoRaWAN
SBPWSI2	NB-IoT

Set the private Long Range Wireless

To set the SBPWSI1 sensors and the SBPCWSI1 concentrator to communicate using the Long Range wireless protocol, follow the procedure below:

Step	Action
1	Install the SBPCWSI1 concentrator *See the SBPCWSI1xxx Installation manual available on productselection.net for further details.*
2	Place all the SBPWSI1 sensors into their parking bay position. It is recommended to bury them completely only when the entire procedure has been completed. *See the Sensor Installation chapter for further details.*
3	In the **Options** tab of the Sensor Manager software, check that **ACK Automatic (FILTERED)** and **ACK Automatic (NOT FILTERED)** are disabled. *See ACK Automatic OFF for further details.*
4	Wait until all the SBPWSI1 sensors appear in the **Not Filtered** list**.** ***N.B.:** They must appear with their valid ID numbers according to the parking bay numbering defined in the project specifications.*
5	Select the sensors that have to be configured and move them to the **Filtered** list**.**
6	In the **Basic Settings** tab, send the following commands: ▪ **Set Date Time** ▪ **Calibration**
7	By using a metallic object (such as a toolbox, a drill, etc...), check that each sensor changes status (from vacant to occupied). *Note: you can check the sensor status in real-time in the **Show** -> **Status filtered sensor** window.*
8	To set the Long Range wireless protocol, click on **Sensor Manager Crypt key** tab and click on **Create AES128 Key:** a popup will appear with a new generated key:  Click on **OK** button to copy it to the clipboard. ⚠ Please save the generated key in a safe place (e.g. Microsoft Excel file, a database) before proceeding!!
9	In the **Network Configuration** window, click on **Long Range Wireless** button, then click on **Send AES 128 Key button** to insert the generated **AES128 key**.  Click on the **OK** button to save the changes. This operation only stores the value into the sensors.

10	In the **Network Configuration** window, select the **Long Range Wireless** option then click on **Activate AES 128** button**:** in the popup that appears enter the **1** value:  Click on the **OK** button: the AES128 end-to-end communication will be activated as soon as the command is executed (see the Status command window).
11	Once the AES 128 key is enabled in the selected sensors, the communication with the SBPCAL device will be interrupted. **The sensors are ready to be associated to the related SBPCWSI1 concentrator.**
12	Power on the SBPCWSI1 concentrator and access to the system by using the provided TeamViewer / Anydesk ID and password. *N.B: the credentials are provided by Carlo Gavazzi according to the concentrator serial number (each SBPCWSI1xxx unit has dedicated access parameters).*
13	The concentrator has embedded the Sensor Manager software. In the **Options** tab check that **ACK Automatic (FILTERED)** and **ACK Automatic (NOT FILTERED)** are disabled.
14	To enable the end-to-end communication with the sensors, click on **Sensor Manager Crypt key** tab and click on **Set AES128** button. In the **Select Keys** window select **Custom** option: 
15	Insert the previously generated key in the **Crypt Key 128 bit** field: **This must be the same key that has been set in the SBPWSI1 sensors (as shown in the steps 8-9 above).**  Click on **Save and Quit** button: the AES 128 end-to-end communication will be enabled between the sensors and the concentrator.
16	Wait until all the SBPWSI1 sensors appear in the **Not Filtered** list then select them and move to the **Filtered** list**.**

17	In the **Internet** tab, click on **Server Udp setup** option: The **Remote Setup** window appears.  ▪ In the **UDP Remote address** field enter the value **52.166.220.173** (related to Carlo Gavazzi Cloud server) ▪ In the **UDP Remote port** field enter the value **8792** (related to Carlo Gavazzi Cloud server) Click on the **Save** button to store the changes
18	In the **Internet** tab, select the **UDPFlow** option: in the window that appears you can check the communication status to the Cloud server. ***Note: for any communication issue, please contact Carlo Gavazzi***
19	Once the communication is working properly, in the **Options** tab make sure the **ACK Automatic (FILTERED)** option is enabled. *See ACK Automatic ON for further details.* 
20	To complete the setup procedure in the concentrator, in the **File** tab click on the **Save Filtered default** option. 
21	As soon as the Connection to the Cloud server has been established, contact Carlo Gavazzi for the Cloud configuration.
22	You will receive back the parameters to access the Cloud: access the **CPY server** and add the cloud parameters.

ATTENTION!!
The user is responsible for the generation and the store of the encryption key. If the encryption key is lost and/or forgot, it will not be possible to add and make the maintenance of the sensors, and in case of failure of the SBPCWSI1 concentrator, it will not be possible to replace it without the AES128 key. Should this happen, all the sensors must be unburied, reset by means of a magnet and reprogrammed with a new AES 128 key.

Set the LoRaWAN® communication protocol

N.B.: This manual does not describe the configuration of LoRaWAN network servers nor the configuration of LoRaWAN application servers.

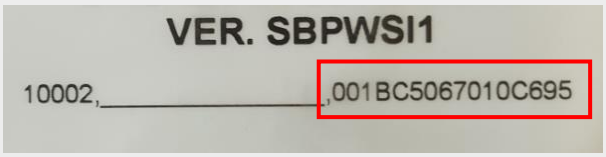
The procedure below delivers the information to configure the SBPWSI1 sensors according to the standard LoRaWAN® gateways.

Things to know

LoRaWAN® is a Low Power Wide Area Network (LPWAN) protocol. It is a spread-spectrum modulation technique at extremely low data-rates, which permits sending data achieving long ranges. As required by LoRaWAN® protocol, an authentication method, such as OOTA or ABP mode, must be set between the SBPWSI1 sensors and LoRaWAN servers. This means that the LoRaWAN® service provider must provide the required information.

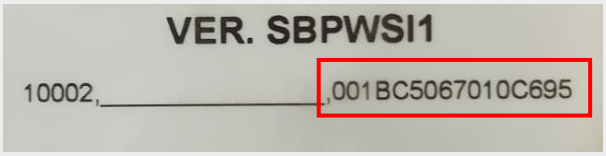
OTAA join mode

Over-the-Air Activation (OTAA) is the preferred and most secure authentication method. Sensors perform a join-procedure with the LoRaWAN® network, during which a dynamic DevAddr is assigned and security keys are negotiated with the device. The following parameters are required by the OTAA join mode:

Parameter	Description
DevEUI	The device EUI of the sensor is pre-provisioned during production and can be found on the printed label on top of the SBPWSI1 sensor. Each sensor has a unique DevEUI. See the example below:  You might communicate the DevEUI of all the SBPWSI1 sensors to the LoRaWAN service provider.
AppKey	The AppKey is provided by the LoRaWAN® service provider. The same AppKey must be set both in the sensors and in the LoRaWAN server.
AppEUI	The AppEUI is provided by the LoRaWAN® server provider. If you have your own AppEUI, you can also add this to your configuration. The same AppEUI must be set both in the sensors and in the LoRaWAN network server.

ABP (Authentication By Personalization)

The following parameters are required by the ABP join mode:

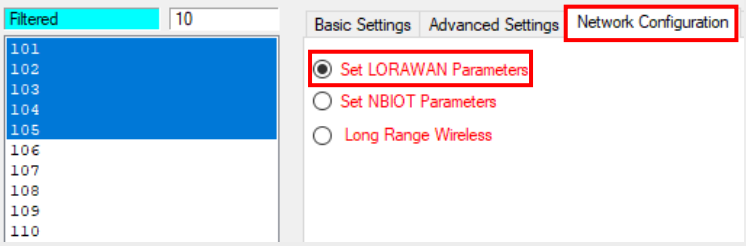
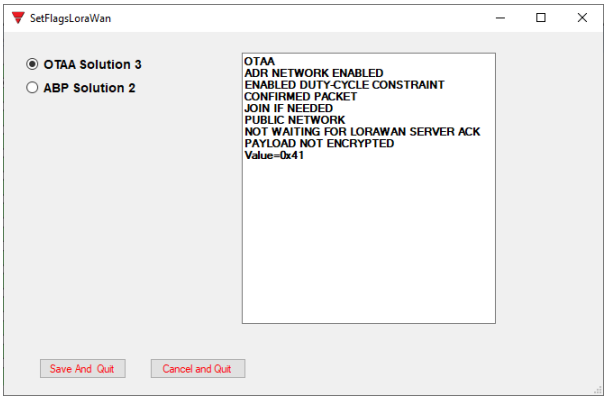
Parameter	Description
DevEUI	The device EUI of the sensor is pre-provisioned during production and can be found on the printed label on top of the sensor. 
DevAddr **NwkSKey** **AppSKey**	These keys are provided by the LoRaWAN® service provider. The same keys must be set both in the sensors and in the LoRaWAN server.

If you are interested in further information about LoRaWAN® specifications, please refer to the LoRa® Alliance specifications document.

Procedures

To set the SBPWSI1 sensors according to the LoRaWAN® communication protocol, follow the procedure below:

Step	Action
1	Place all the SBPWSI1 sensors into their parking bay position. *See the Sensor Installation chapter for further details*
2	In the **Options** tab of the Sensor Manager software (via the SBPCAL device), check that **ACK Automatic (FILTERED)** and **ACK Automatic (NOT FILTERED)** are disabled. *See ACK Automatic OFF for further details.*
3	In the *Sensor Manager software* wait until all the SBPWSI1 sensors appear in the **Not Filtered** list**.** ***N.B.:*** *They must appear with their valid ID numbers according to the parking bay numbering defined in the project specifications.*
4	Select the sensors that have to be configured and move them to the **Filtered** list**.**
5	In the **Basic Settings** tab, send the following commands: ▪ **Set Date Time** ▪ **Calibration**
6	By using a metallic object (such as a toolbox, a drill, etc...), check that each sensor changes status (from vacant to occupied). *Note: you can check the sensor status in real-time in the **Show** -> **Status filtered sensor** window*

7	In the **Network Configuration** window, select the **Set LORAWAN Parameters** option: 
8	In **LoRaWAN Parameters**, click on the **LWan UseCases** button to open the **UseCases** menu: select OTAA or ABP according to the settings of the LoRaWAN® network server you are connecting the sensors to: ▪ OTAA Solution 3 ▪ ABP Solution 2 
9	Click on the **Save and Quit** button to store the changes.
10	Set the parameters according to the selected join methods as required by the LoRaWAN® network server you are connecting the sensors to: **Authentication** / **Then you need to set...** **OTAA Solution 3**: ▪ Click on **the Set AppKey OTAA** button to enter the AppKey provided ▪ Click on **the Set AppEUI** button to set the provided AppEUI. If you do not have your AppEUI, you can enter the value: *0101010101010102* **ABP Solution 2**: ▪ Click on the **Set AppSKey ABP** button ▪ Click on the **Set NwkSKey ABP** button ▪ Click on the **Set DevAddr** button to enter the provided keys **Important note: enter the values without spaces or dashes!**
11	In the **Status Command** window, check that all the sent commands have been executed before activating the LoRaWAN® communication protocol for the selected sensors.
12	After having set all the LoRaWAN® parameters, make sure that all the sensors that have to be activated with the LoRaWAN communication are selected, then click on **Set Long Range wireless/LoRaWAN®** button**:** the communication protocol will be immediately switched to LoRaWAN®. **N.B: They will disappear from the Sensor Manager since they start to communicate to the LoRaWAN® network.** This setting is saved into the memory of the sensor, so it will be restored after a battery disconnection.

Set back to Long Range Wireless

To set the SBPWSI1 sensors back to the Long Range wireless mode, there are two ways:

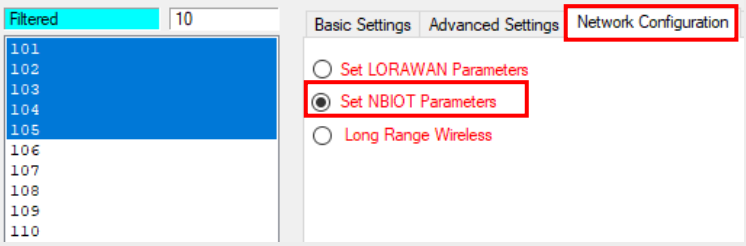
Procedure	Description
a	Disable the ACK message in the LoRaWAN® network: after about 1 hour and 20 minutes, if the sensors do not receive any ACK from the LoRaWAN® network, they will return to the Long Range wireless mode
b	Reset the sensors: Move a magnet close to the reed switch for a few seconds to reset the sensors. After this reset operation, the sensors will restart in Long Range wireless mode. Note: this operation must be done when the sensors are powered.

After a change in the communication protocol, the sensors will appear in the **Not Filtered** list.

Set the NB-IoT communication protocol

To set the SBPWSI2 sensors according to the NB-IoT network parameters, follow the procedure below.

Note: A SIM card must be installed into each SBPWSI2 sensor (see SBPWSI2 assembly), before proceeding with the following procedure.

Step	Action
1	Place all the SBPWSI2 sensors into their parking bay position. *See the Sensor Installation chapter for further details*
2	In the **Options** tab of the Sensor Manager software (via the SBPCAL device), check that **ACK Automatic (FILTERED)** and **ACK Automatic (NOT FILTERED)** are disabled. *See ACK Automatic OFF for further details.*
3	In the *Sensor Manager software,* wait until all the sensors appear in the **Not Filtered** list**.** ***N.B.:** They must appear with their valid ID numbers according to the parking bay numbering defined in the project specifications.*
4	Select the sensors that have to be configured and move them to the **Filtered** list**.**
5	In the **Basic Settings** tab, send the following commands: ▪ **Set Date Time** ▪ **Calibration**
6	By using a metallic object (such as a toolbox, a drill, etc...), check that each sensor changes status (from vacant to occupied) as shown in the **Sensor filtered status** window.
7	In the **Network Configuration** window, select the **Set NBIOT Parameters** option: 
8	In the **Set PLMN (MCC+MCN)** field, set the PLMN of the SIM provider (a 5 digit number). *Example: TIM IT value is 22201*
9	In the **Destination Platform** field enter the value to set the destination platform: **0** – Carlo Gavazzi Cloud server **1** – Other destination server
10	In the **Set IP** field enter: **52.166.220.173** – Carlo Gavazzi Cloud server ***[IP address]*** – Other destination server
11	In the **SET Port** field: **8792** – Carlo Gavazzi Cloud server ***[UDP port]*** – Other destination server

12	In the **APN LOW** field, set the APN of the ISP. *Example: TIM IT APN value is nbiot.tim.it* N.B.: Please verify with the ISP, if the APN is necessary for their NB-IoT solution. It might happen that the operator asks for the APN, but the sensors are not able to register in the network.
13	In the **Set Code City** field, enter the provided value N.B.: if this value is not provided by the ISP, leave it blank.
14	In the **Status Command** window, check that all the sent commands have been executed before activating the NB-IoT communication protocol for the selected sensors.
15	After having set all the NB-IoT parameters, make sure that all the sensors that have to be activated for NB-IoT communication are selected, then click on the **Set Long Range wireless/Nblot mode** button**:** the communication protocol will be immediately switched to NB-IoT network. **N.B: They will disappear from the Sensor Manager since they start to communicate to the NB-IoT network.** This setting is saved in the memory of the sensor, so it will be restored after a battery disconnection.

Set back to maintenance mode

To return the SBPWSI2 sensors to Long Range Wireless, there are two ways:

Procedure	Description
a	Disable the ACK message in the NB-IoT network: after about 1 hour and 20 minutes, if the sensors do not receive any ACK from the NB-IoT network, they will return to the Long Range wireless mode
b	Reset the sensors: move a magnet close to the reed switch for a few seconds to reset the sensors. After this reset operation, the sensors will restart in Long Range wireless mode. Note: this operation must be done when the sensors are powered.

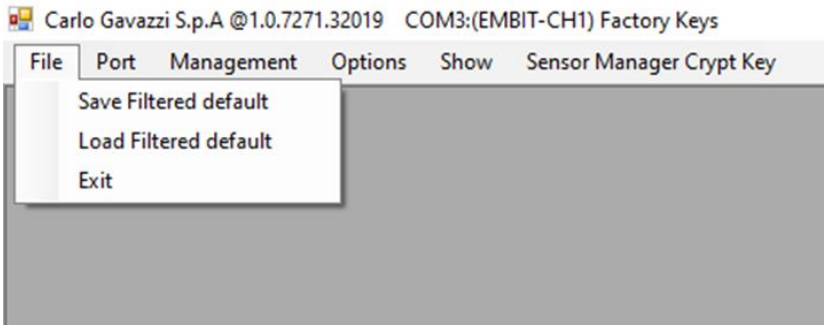
After a change in the communication protocol, the sensors will appear in the **Not Filtered** list.

User interface

In this chapter the different menus and their related procedures are presented.

File tab

In the **File** tab the installer can manage the projects.

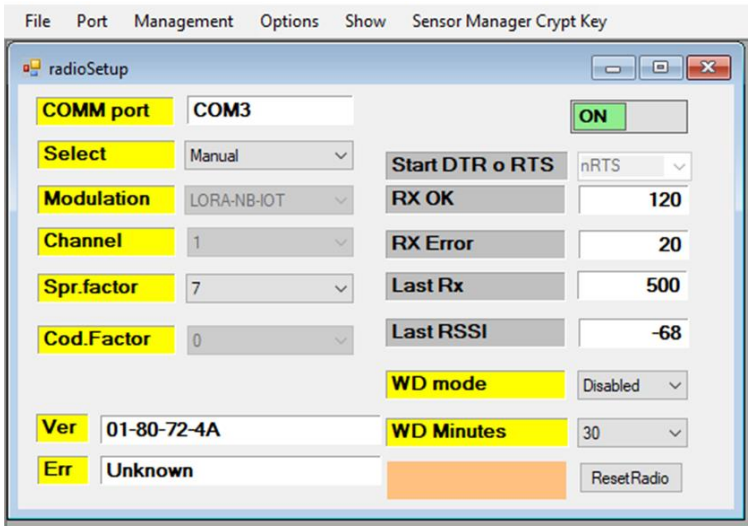


The available fields are the following ones:

Field	Description
Save Filtered default	To save the current configuration of the detected sensors and to propose it to the forthcoming opening of the program
Load Filtered default	To open a saved sensors configuration
Exit	To close the Sensor Manager software

Port tab

This menu shows the parameters for a specific network. The options showed depend on the chosen **Modulation.**

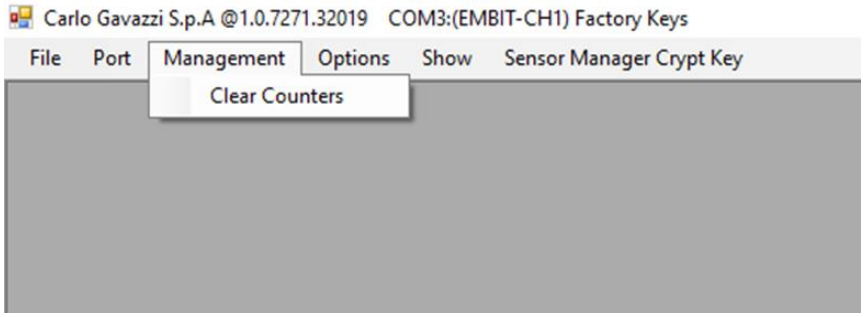


In the picture above, *LORA-NB-IOT* modulation is selected and the parameters are referred to this modulation. The available fields are as follows:

Field	Description
COMM port	Indicates the Serial Port in use
Modulation	Indicates the sensors modulation such as Long Range wireless/NB-IoT
Spr.factor	Selects the Spreading Factor value for *Long Range wireless/LoRaWAN*® modulation
WD mode	Sets Watch Dog. Note: It requires the RTS field set to ON
WD Minutes	After *xx* minutes without any reception activity, the Sensor Manager will be reset
RX OK	Shows the total number of received messages
RX error	Shows the total number of communication errors
Last RX	Shows the last sensor ID received
Last RSSI	Shows the RSSI of the last received frame
Ver	Shows the SBPCAL firmware version
Err	Shows the error messages

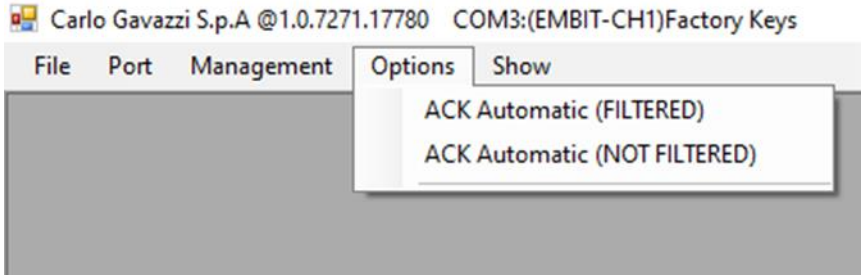
Management tab

In the **Management** menu it is possible to clear all the counters and reset the Sensor Management without exiting the program.



Options tab

In the **Options** menu it is possible to set the following parameters:



The available options are as follows:

Field	Description
ACK Automatic (FILTERED)	If selected, an ACK message is sent to all the sensors present in the table FILTERED, after they have sent a frame.
ACK Automatic (NOT FILTERED)	If selected, an ACK message is sent to all the sensors present in the table NOT FILTERED, after they have sent a frame.

Things to Know

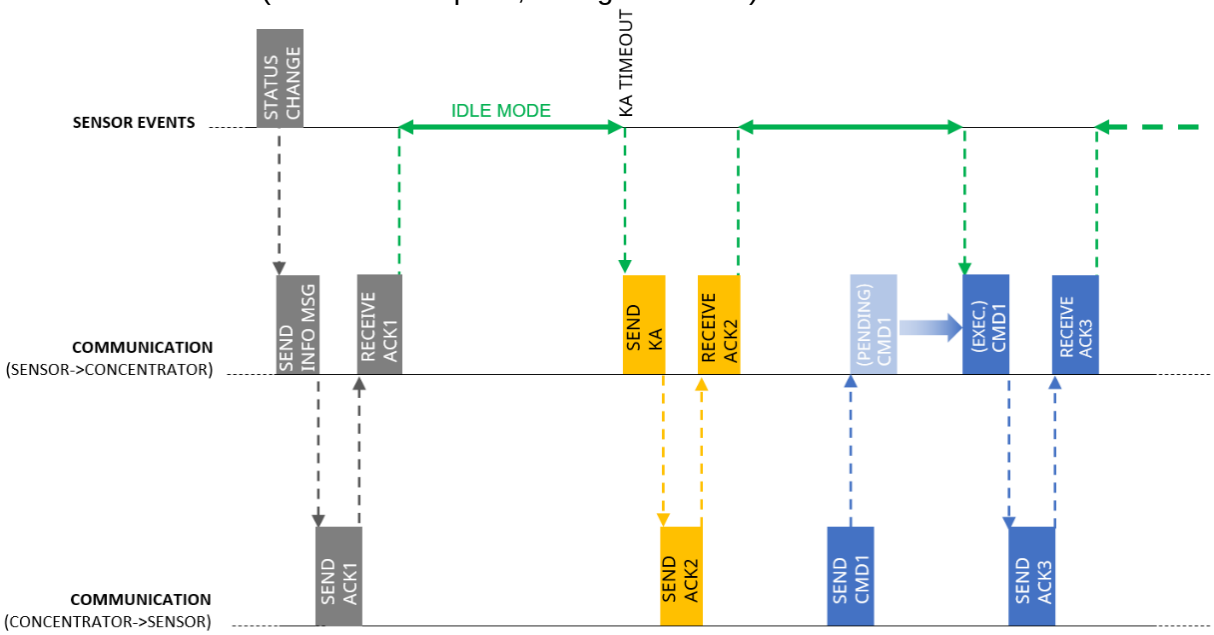
Set…	ACK Automatic ON	ACK Automatic OFF
when…	▪ the sensors and the receiver are properly configured ▪ the system is up and running	▪ the commissioning has to be carried out ▪ the sensors have to be managed
+	Low battery consumption	The commands will be executed immediately
-	The commands will be executed slowly	High battery consumption

ACK Automatic ON

When the *ACK Automatic* option is **ON** → an ACK (acknowledge message) is required by the sensor: this means that the SBPCWSI1 must send back to the sensor an ACK as a receipt of each *received message in the following situations*:

- The bay status changes → the sensor sends an *info message* to the concentrator
- The bay status does not change → the sensor sends a *Keep-Alive message* when the *Keep-Alive* timeout expires

- When the sensor receives the ACK, it will operate in IDLE MODE until the next event to optimize the battery consumption.
  - If the concentrator/calibration unit sends a command to the sensor, it will be executed at the next event (KA timeout expires, change of status).



In IDLE MODE the sensor sends a KA message only when the timeout expires, but it notifies immediately any change detected in the bay status.

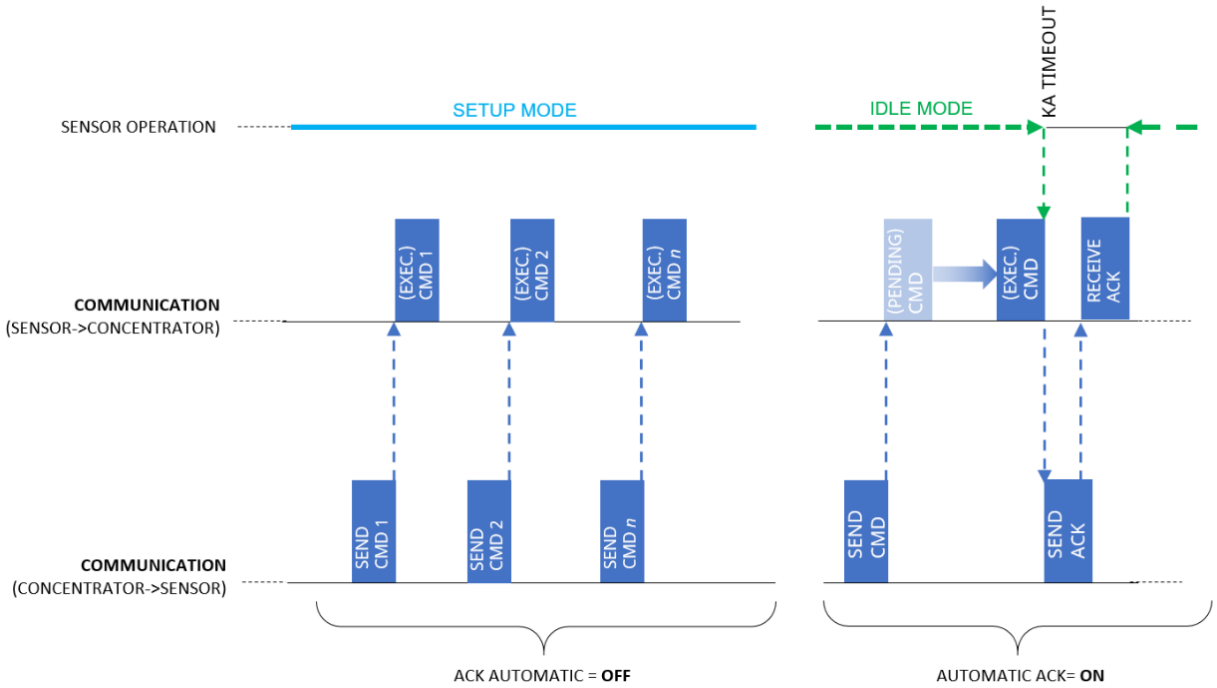
ACK Automatic OFF

During commissioning → the ACK Automatic option must be set to **OFF:** the sensor doesn't expect any ACK, so it immediately reacts to any command (the only delay is due to the *Sample time*).

- The sensor receives a command → this will be executed according to the *Sample time* (default 10 s) instead of the Keep-Alive timeout (default 10 min)

If during commissioning the ACK Automatic is ON**:**

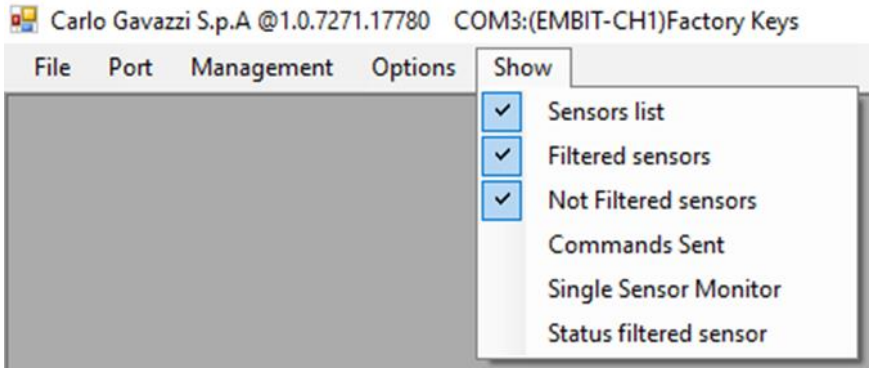
- the command will be executed at the next event (change status detected or KA message forwarding), slowing down the setup operations.



As soon as the commissioning is finished, the **ACK Automatic** options must be set to **ON**.

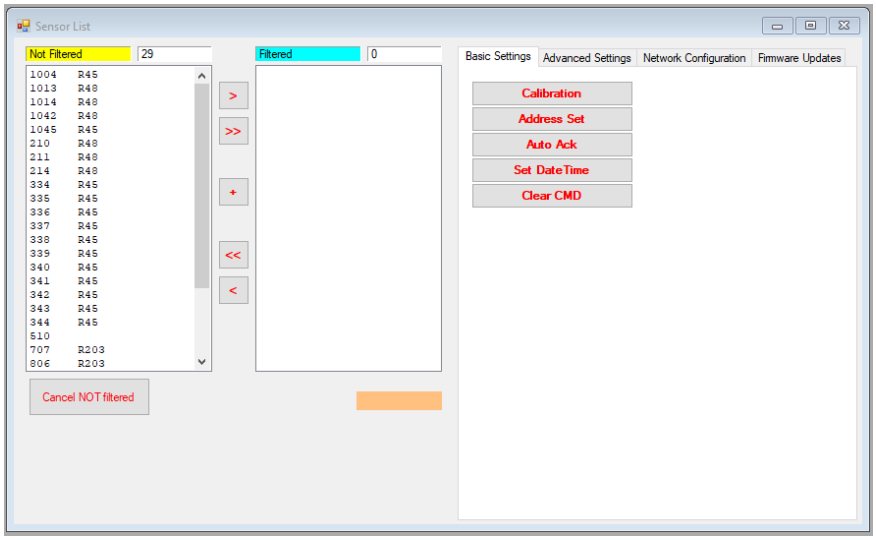
Show tab

In this menu the installer can enable/disable dedicated windows to manage the sensors and their communication, as well as commands and diagnostic information.



Sensors List window

The Sensor List shows all the active sensors received by the SBPCAL/SBPCWS1. From this window the installer can perform the commands to the selected sensors.



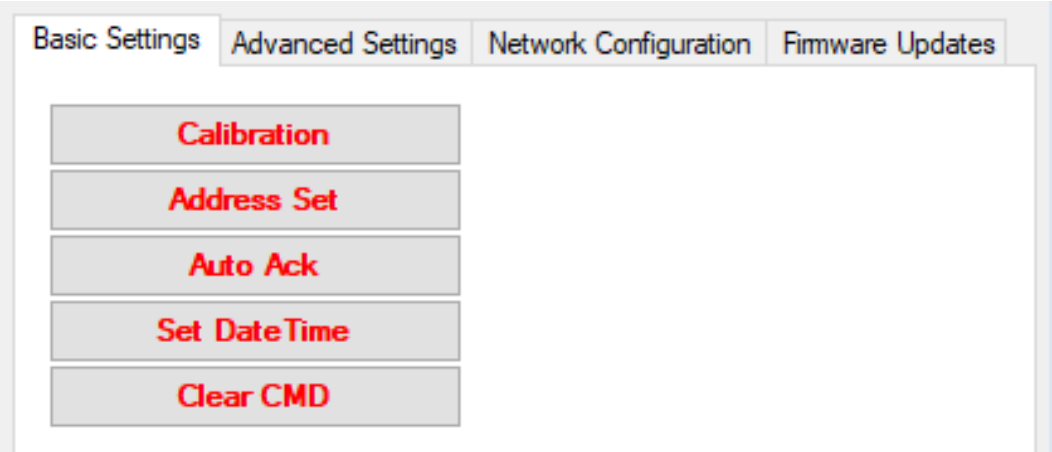
The available areas are as follows:

Area	Description
Not filtered list	In this area all the discovered sensors will be shown.
Filtered list	The installer has to move in the Filtered list all the sensors that have to be managed in the current project.
Commands	Basic Settings
	Advanced Settings
	Network Configuration
	Firmware Updates
Note: Commands can be executed only for sensors that are present in the Filtered list	

Command List

The commands available are grouped in four sub-tabs as follows:

Basic Settings



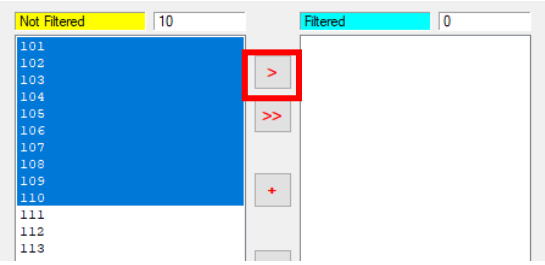
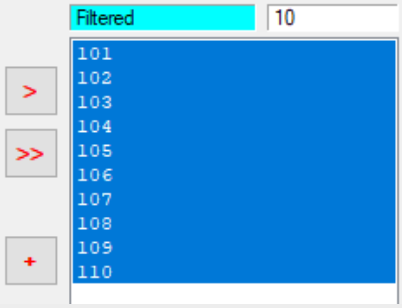
The available field are as follows:

Field	Description
Calibration	To calibrate the magnetic zero of the sensors.
Address Set	To modify the address ID (number) of the sensor.
Auto ACK	To enable the sensors to give themselves an ACK after *n* attempts. This option is useful to prevent the battery lifetime (disabled by default on brand new sensors).
Set Date Time	To send an update of date and time to the sensor, using the PC setting.
Clear CMD	To clear any queued command not executed yet.

Procedures

Select the sensors to be managed

To send commands to one or more sensors, they have to be moved to **Filtered list**. See the procedure below:

Step	Action
1	Connect the SBPCAL device to a PC/Notebook where the Sensor Manager software is up and running.
2	Select the correct radio modulation and the spreading factor value (if it differs from the default one).
3	Open the **Sensor List** window from **Show** tab and wait for the list of sensors to appear in the **Not Filtered** list.
4	From the **Not filtered** list, select the sensors: they will be highlighted in blue. Click on **>** button to move them to **Filtered list.**  *Tip: You can click on **>>** button to move all the available sensors.*
5	From the **Filtered List,** select the sensor(s) to which the commands have to be sent. 
6	Click on *[command] (e.g. Calibration, Address Set)* button to execute it.

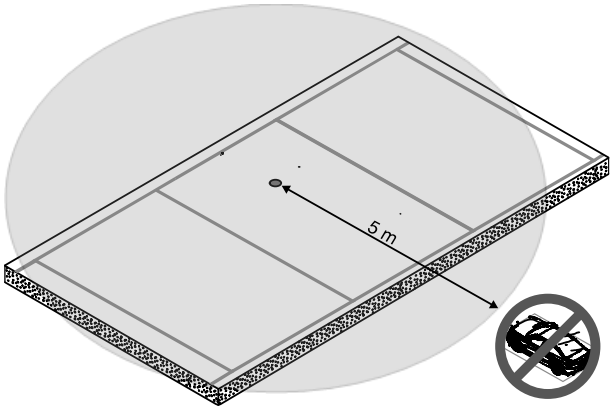
Calibration

The calibration should be performed when the sensor is fully installed and ready for its final use!

Thing to know

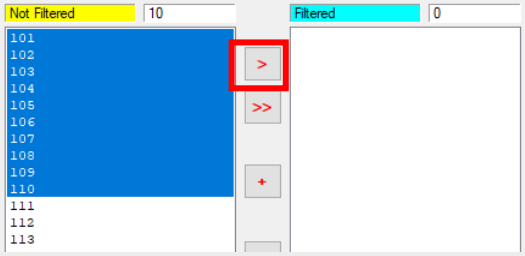
Magnetic Zero Calibration

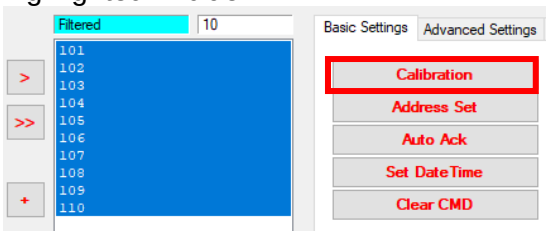
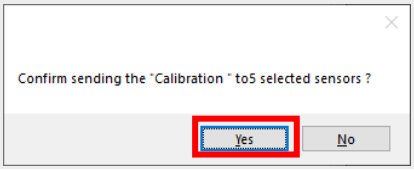
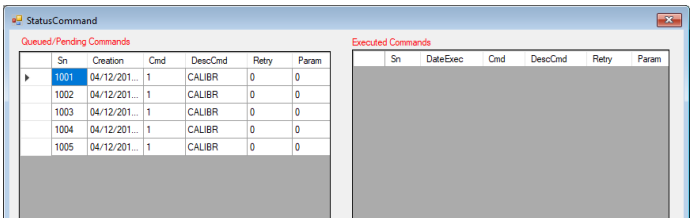
The calibration process must be carried out once the sensors are installed. No cars or other metal objects such as tools or fences must be present in a radius of 5 meters from the sensor (best condition), otherwise the calibration might not be properly done, affecting the detection of cars.



Calibrate the sensors

After you have installed the sensors, and when the area is clear of cars, follow this procedure:

Step	Action
1	Connect the SBPCAL device to a PC/Notebook where the Sensor Manager software is up and running.
2	Select the correct radio modulation and channel (if it differs from the default one).
3	Open the **Sensor List** window from **Show** tab and wait for the list of sensors to appear in the **Not Filtered** column.  *Note: to send/receive commands, such as Calibration, the sensors must be present in the Filtered List.*

4	Move to the **Filtered List** column the sensors which need to be calibrated. They will be highlighted in blue.  Note: please do not select more than 10 sensors at a time
5	Click on **Calibration** button and click on **Yes** button to confirm the operation. 
6	In the **StatusCommand** window that appears, you can check the execution of always the commands:  ▪ On the left, the pending commands are shown together with the sensors information. ▪ On the right, the executed commands are shown.
7	If everything is done according to the procedure, the calibration of a group of 10 sensors require up to 60 seconds.

Set date and time

This command updates the internal clock of the SBPWSIx sensors according to the table below:

Device	Clock
SBPCAL	The PC clock value
SBPCWSI1	The SBPCWSI1 clock value

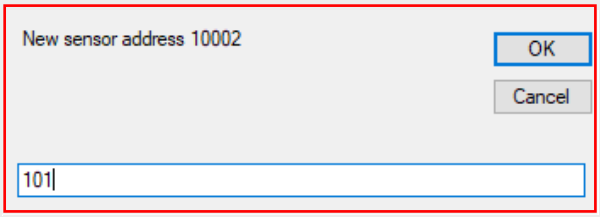
It is important to do this operation **every time** a sensor is installed and calibrated. See the procedure below:

Step	Action
1	From the **Filtered** list, select the sensors: they will be highlighted in blue.
2	Click on button **Set Date Time** in the **Basic Setting** menu.

Set/change the sensor ID number

To set/change the physical address of a sensor, follow the procedure as follows:

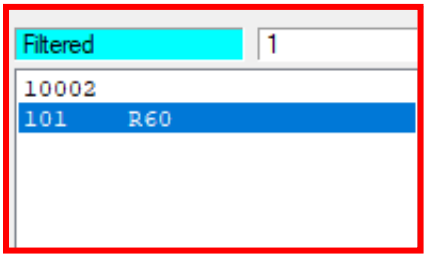
Note: This procedure must be done for one sensor at a time.

Step	Action
1	From the **Filtered** list, select the sensor: it will be highlighted in blue If the sensor is present in the Not Filtered list, move it to the Filtered list
2	Click on **Address Set** button in the **Basic Setting** menu
3	In the window that opens, write the new address number: *e.g.: in the example below the predefined number 10002 is changed to 101*  Click on **OK** button to send the command

As soon as the procedure is finished, the Sensor will appear in the **Filtered list** within the new ID number. At the first packet received with the new id, the FW version will be displayed on the right of the new sensor ID.

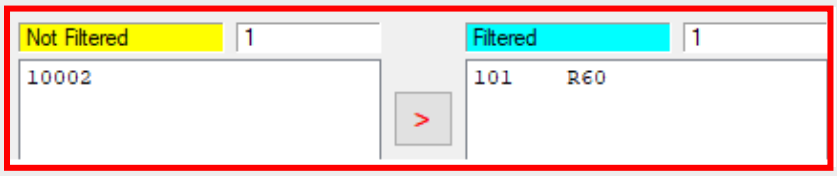
e.g: in the example below, the old ID was 10002 and the sensor is now present with the new ID 101

4



5

The “old” ID is still present in the **Filtered** list. It is recommended to move it from the **Filtered list** to **Not Filtered list**, to avoid confusion.



Clear the commands

If it is necessary to send again the same command to a sensor, it is required to clear the sent/executed command for the selected sensors, by pressing the button **Clear CMD**.

If you need to send again the same command to a sensor or a group of sensors, you must delete the pending commands. Otherwise, the same command will not be added to the Queued/Pending list. Follow the procedure below:

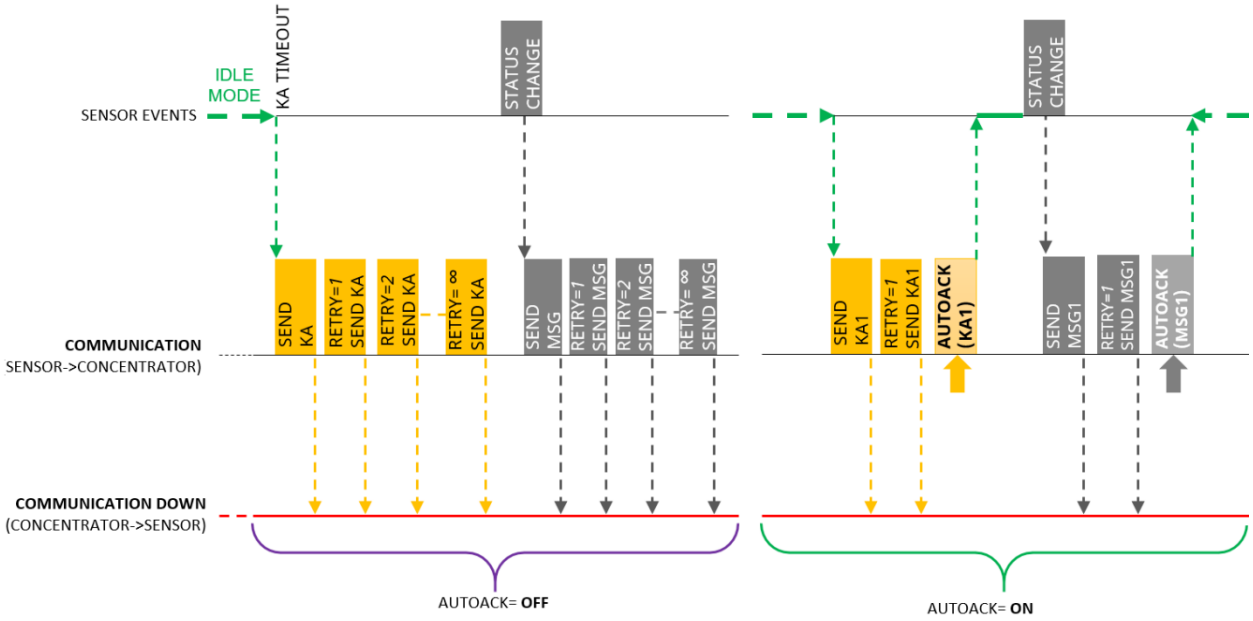
Step	Action
1	From the **Sensors List** window select the SBPWSIx sensor(s) in the **Filtered list**
2	Click Clear CMD from Basic settings menu

Set AutoACK property

Thing to know

N.B: In the example below, the SBPCWSI1 concentrator is set to *ACK Automatic always ON.*

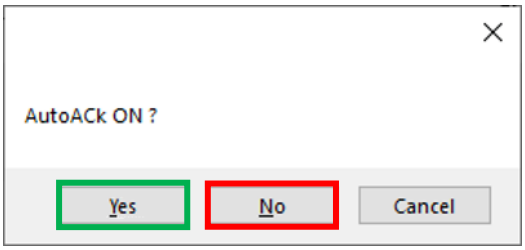
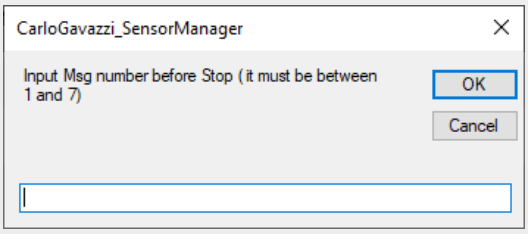
- If the communication between the concentrator and the sensor is momentarily down, the sensor will not receive any ACK message.
  - If the AutoACK parameter is **OFF** → the sensor will continue to retry the transmission until it receives an ACK. Since the sensor is always active, the battery consumption will be very high
  - If the AutoACK parameter is **ON** → the sensor will acknowledge itself after *n replies* (min.1 – max. 7) stopping the continuous transmission to prevent the battery from discharge



When the communication returns up and running, the sensor will receive back the ACK from the concentrator.

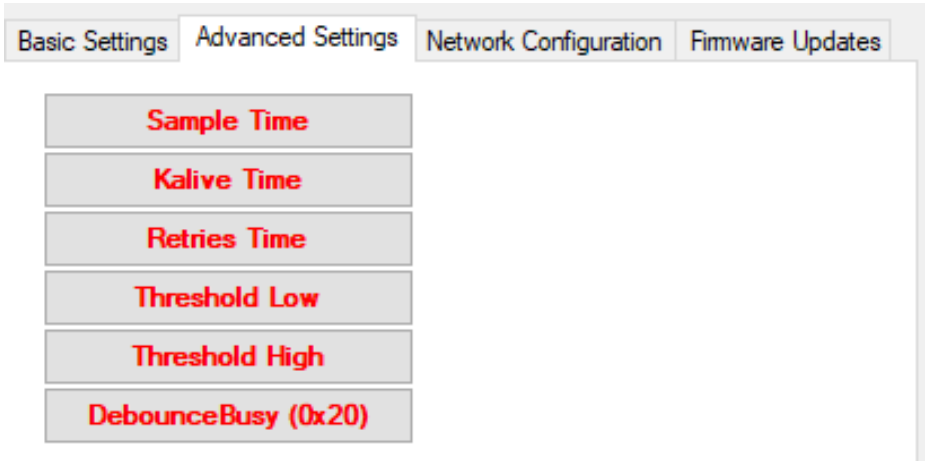
Procedure

To Set the *AutoACK option* in the *Sensor settings*, follow this procedure:

Step	Action
1	In the **Filtered list,** select one or more sensors. They will be highlighted in blue.
2	In the **Basic settings** click on **Auto ACK** button: the following message appears:  Click on **Yes** button to enable Auto ACK functionality. Click on **No** button to disable the Auto ACK functionality.
3	If you have select **Yes**, in the next popup, insert the number of max. retries (min. 1 max. 7):  Click on **OK** button to store the changes.

User Interface

Advanced Settings



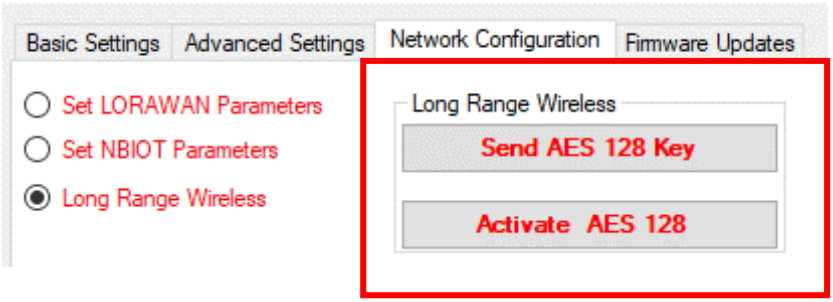
The available fields are as follows:

Field	Description
Sample Time	To set the sampling time of the sensor (factory setting is 10 seconds)
Kalive Time	To set the keep-alive message time in seconds (factory setting 600 seconds – 10 minutes)
Retries Time	To set the retries interval in case the sensor does not receive any ACK (factory setting is 10 seconds)
Threshold Low	To set the threshold below which the sensor returns the **Occupied** status
Threshold High	To set the threshold above which the sensor returns the **Vacant** status
***Debounce Busy**	To set the waiting interval within which the sensor must always detect the **Occupied** status, before sending the message to the server **This feature is useful to prevent the sensor send occupied messages, when a vehicle is only in transit or manoeuvring.*

Network Configuration

Long Range Wireless

In this menu the installer can set the Long Range Wireless parameters to link the SBPWSI1 sensors to the relevant SBPCWSI1 concentrator(s).

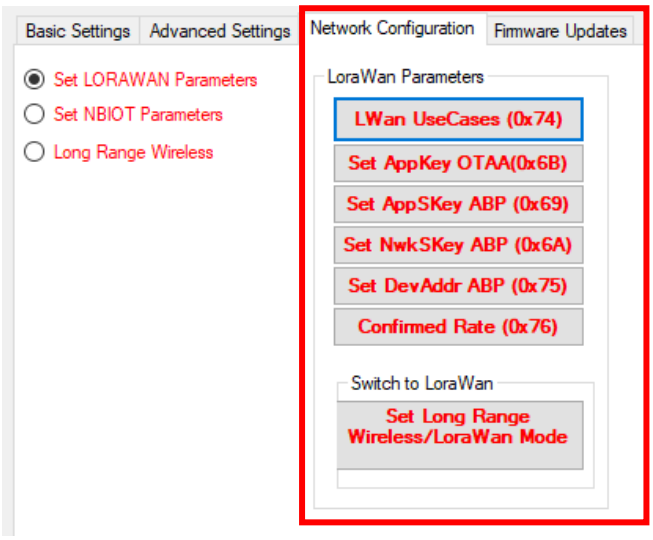


The Long Range Wireless parameters are as follows:

Field	Description
Send AES 128 Key	To set an AES128 key to the selected SBPWSI1 sensors
Activate AES 128	To enable the AES128 end-to-end communication between the selected sensor and their related SBPCWSI1 concentrator

Set LoRaWAN® Parameters

In this menu the installer can set the LoRaWAN® parameters to configure the SBPWSI1 sensors to the relevant LoRaWAN® network.

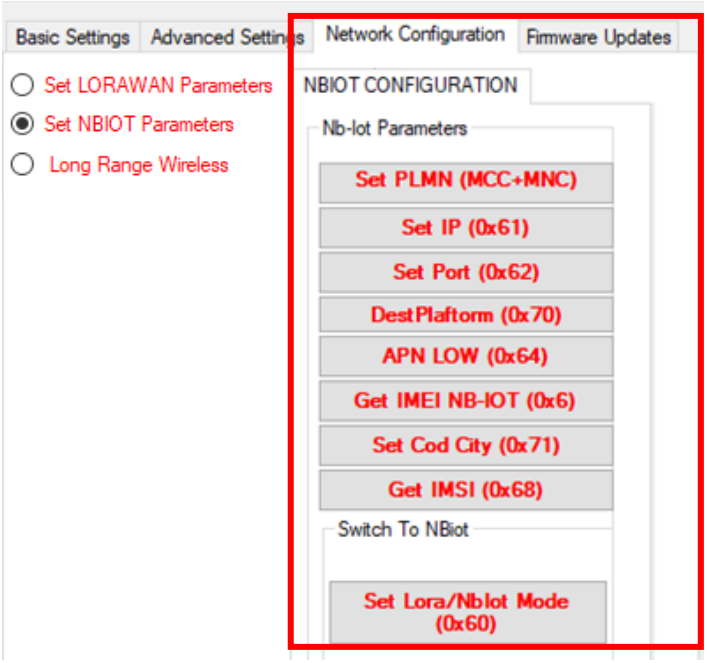


The LoRaWAN® parameters are as follows:

Field	Description
LWan UseCases	To set the join method for a LoRaWAN® network: ▪ OTAA ▪ ABP
Set AppKey	To set the AppKey for OTAA join
Set AppSKey	To set the AppSKey for ABP join
Set NwkSKey	To set the NwkSKey for ABP join
Set DevAddr	To set the DevAddr for ABP join (0x AABBCCDD)
Confirmed Rate	To set the confirmed messages after *n* sent messages (depends on the LoRaWAN® gateway setup) Please refer to the LoRaWAN® service provider
Set AppEUI	To set the AppEUI for OTAA join
Set Long Range wireless /LoRaWAN® Mode	To switch from Long Range wireless (maintenance) to LoRaWAN® radio protocol.

Set NBIOT Parameters

In this menu the installer can set the NB-IoT parameters to configure the SBPWSI2 sensors according to NB-IoT network.

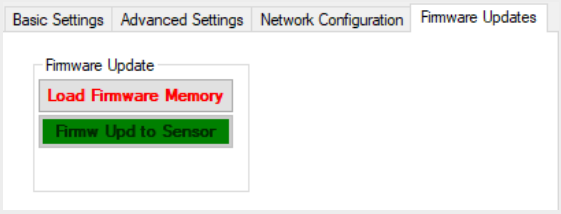


The NB-IoT parameters are as follows:

Field	Description
Set PLMN (MCC+MCN)	To set the 5 digits Operator Code
Set IP	To set the destination IP address of the server
Set Port	To set the destination UDP port in the server
Dest Platform	To set the destination platform: ▪ Carlo Gavazzi Cloud server or; ▪ 3rd party platform
APN LOW	To set the APN of the network
Get IMEI NB-IoT	To receive the IMEI of the SBPWSI2 radio device
Set Code City	To set a different Code City (numeric value) to be sure that the sensors information will be received in the correct platform.
Get IMSI	To receive the IMSI of the SIM of a sensor
Set Long Range wireless/NB-IoT Mode	To switch the sensor from Long Range wireless to NB-IoT network

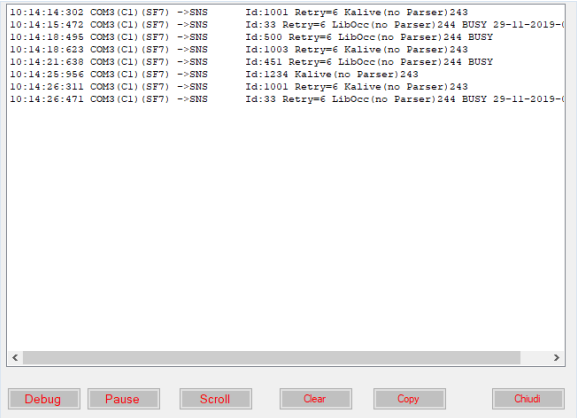
Firmware Updates

With this menu, it is possible to load a new firmware to upgrade a SBPWSIx sensor. To upgrade the firmware, follow this procedure:

Step	Action
1	Click on **Load Firmware Memory** button 
2	Select the firmware file
3	Click on **Firmware Upd to Sensor** button to start the process To avoid radio collisions, since the FW upgrade requires over 1000 packets, we suggest performing the FW upgrade for one or two sensors at the same time.
4	Check in the **Status Filtered Sensor** window the upgrading process.

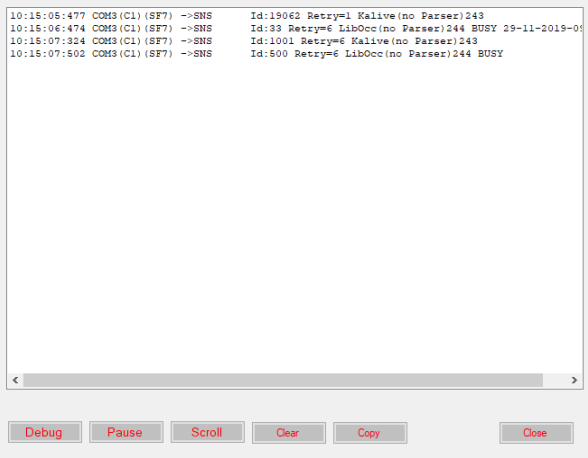
Show -> Filtered Sensors

Select the **Filtered Sensors** option to enable a window to monitor the frames received from the sensors that are present in the **Filtered**.



Show -> Not filtered Sensors

Select the **Not Filtered Sensors** option to enable a window to monitor the frame received from the sensors that are present in the **Not Filtered**.



For both the windows, the available buttons are as follows:

Button	Description
Debug	To enable the view of frames in byte format
Pause	To stop the update of the window
Scroll	To enable the vertical scroll of the window
Clear	To clear the window
Copy	To copy the contents of the window in the clipboard
Close	To close the window

Show -> Commands sent

In this window all the commands are shown , executed and/or aborted from the SBPWSIx sensors. Every command sent to the sensor will open the **Command sent** window, where on the left the pending commands are shown, and on the right the executed commands. In this way it is very simple to understand when a sensor has received a command or a configuration.

The available areas are as follows:

Area	Description
Queued/Pending Commands	It shows the pending commands that have already been sent to the sensors
Executed Commands	It shows the executed commands
Aborted Commands	It shows the aborted commands

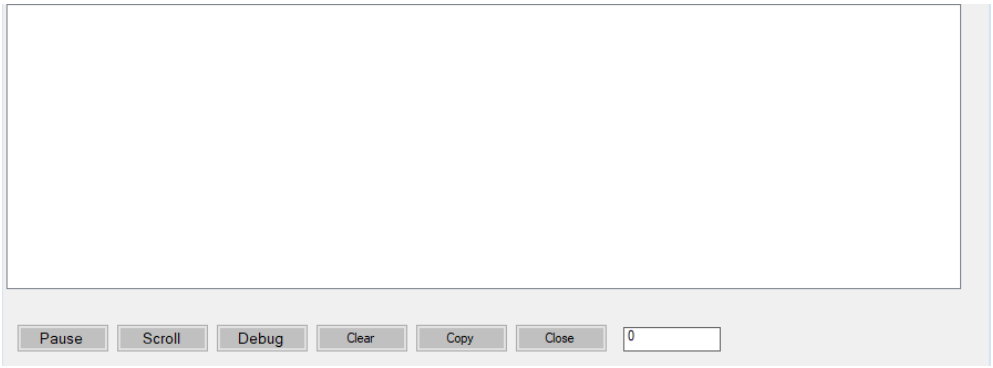
Things to know

Aborted command

If after 10 attempts, a command sent to a SBPWSIx sensor has not been executed, this will be aborted by the Sensor Manager. See Clear commands procedure to send the command again.

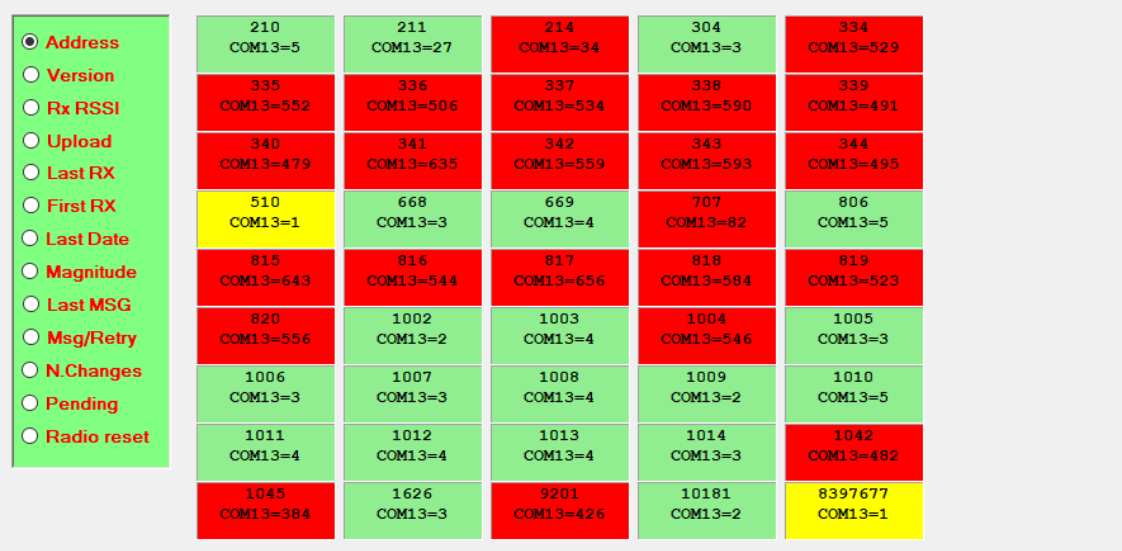
Show -> Single Sensor Monitor

This window shows all the radio communications of a single sensor. Digit the sensor number in the box close to the buttons in the bottom side of the window. The button functions are the same of the **Filtered** and **Not Filtered** windows.



Show -> Status Filtered Sensors

It shows a window where it is possible to select which data the user wants to display for all the sensors that are present in the **Filtered List**.



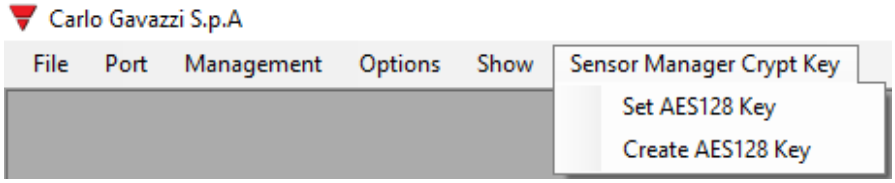
On the left menu it is possible to select the data displayed in each sensor box. The available options are as follows:

Field	Description
Address	It shows the ID number of the sensor
Version	It shows the firmware version
Rx RSSI	It shows the quality of radio signal of the sensor
Upload	In case of FW upgrade, it shows the number of frames left to complete it
Last RX	It shows the TimeStamp of the last sensor frame
First RX	It shows the TimeStamp of the first sensor frame received in the current session
Last Date	It shows the last Date received from the sensor
Magnitudo	It shows the value of the magnitude received from the sensor in the last received frame
Last MSG	It shows the type of the last frame received (Vacant/Occupied/Kalive)
Msg/Retry	It shows the number of frames received in the current session and number of retries (with this data it is simple to understand the quality of the radio coverage, few retries = high quality, many retries = poor quality)
N.Changes	It shows the number of status changes (Free / Busy) received in the current session
Pending	It shows the commands in pending status (in sending queue)
RadioReset	It shows the number of automatic resets done by the sensor

Sensor Manager Crypt Key tab

In this menu the installer can set the AES128 end-to-end key between the SBPWSI1 sensors and the SBPCWSI1 concentrator.

N.B: It is strongly suggested to set the AES128 key prior to complete the full installation process.



The available options are as follows:

Button	Description
Set the AES128 Key	To enable/disable the AES128 end-to-end communication in the SBPWSI1 concentrator: **Option** / **Description** **Factory (default)** — Select this option to set the communication without any key. *Note: this option should not be selected since the communication could not be protected* **Custom** — Select this option to set and enable the AES128 end-to-end communication according to the provided AES 128 key
Create an AES128 key	To randomly generate a new AES128 key to be used between the SBPWSI1 sensors and the SBPCWSI1 concentrator

Important notice

!!! THE GENERATION AND THE STORE OF THE AES 128 KEY IS RESPONSIBILITY OF THE USER !!!

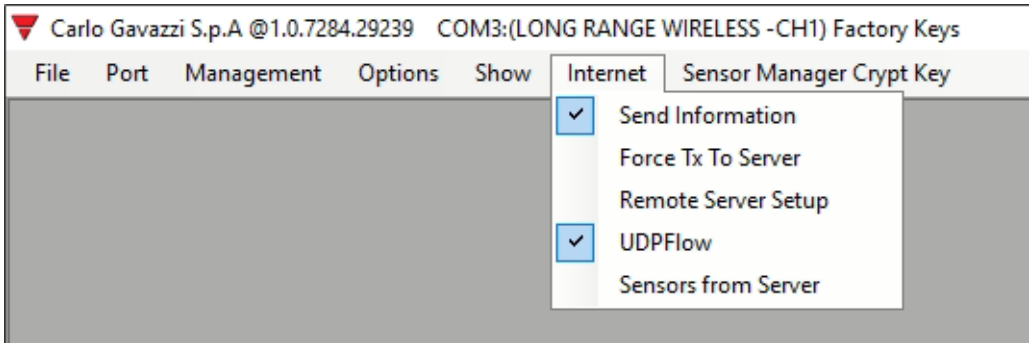
THE SAME AES 128 KEY MUST BE SET IN THE SBPCWSI1 CONCENTRATOR AND IN THE SBPWSIx SENSORS. PLEASE STORE IT IN A PROPER WAY.

For security reasons, the Sensor Manager software does not allow to see or retrieve the AES 128 key in use.

Internet tab

Note: This menu is shown ONLY in the Carlo Gavazzi Sensor Manager software version that is running in the SBPCWSI1 concentrator.

In this menu the installer can configure the parameter related to the Carlo Gavazzi Cloud server to which the SBPCWSI1 concentrator will send the occupancy information collected from the SBPWSI1 sensors.



The available options are as follows:

Field	Description
Send Information	It enables the Sensor Manager to send the occupancy information collected by the sensors to Carlo Gavazzi Cloud server
Force TX to Server	It forces the concentrator to send the information to the Cloud server
Remote Server Setup	It sets the details of the Cloud server: **Field** / **Description** **IDGATEWAY** – It Shows the MAC Address or IMSI of the SBPCWSI1 concentrator **UDP Remote Address** – To set the IP Address of the Carlo Gavazzi Cloud server **UDP Remote port** – To set the UDP Port of the Cloud Server **UDP Local Port** – It shows the standard value. *Note: do not change this value* **Kalive send interval** – Set the keep-alive interval value (default value is 20) **Kalive send Threshold** – Set the keep-alive threshold value (default value is 20)20
UDP Flow	It shows the flow of the communication between the SBPCWSI1 concentrator and the Cloud server. This diagnostic window is useful to test the communication from the concentrator to the Cloud server
Sensor from Server	To enable the Sensor Manager to receive the sensor list from the Server

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