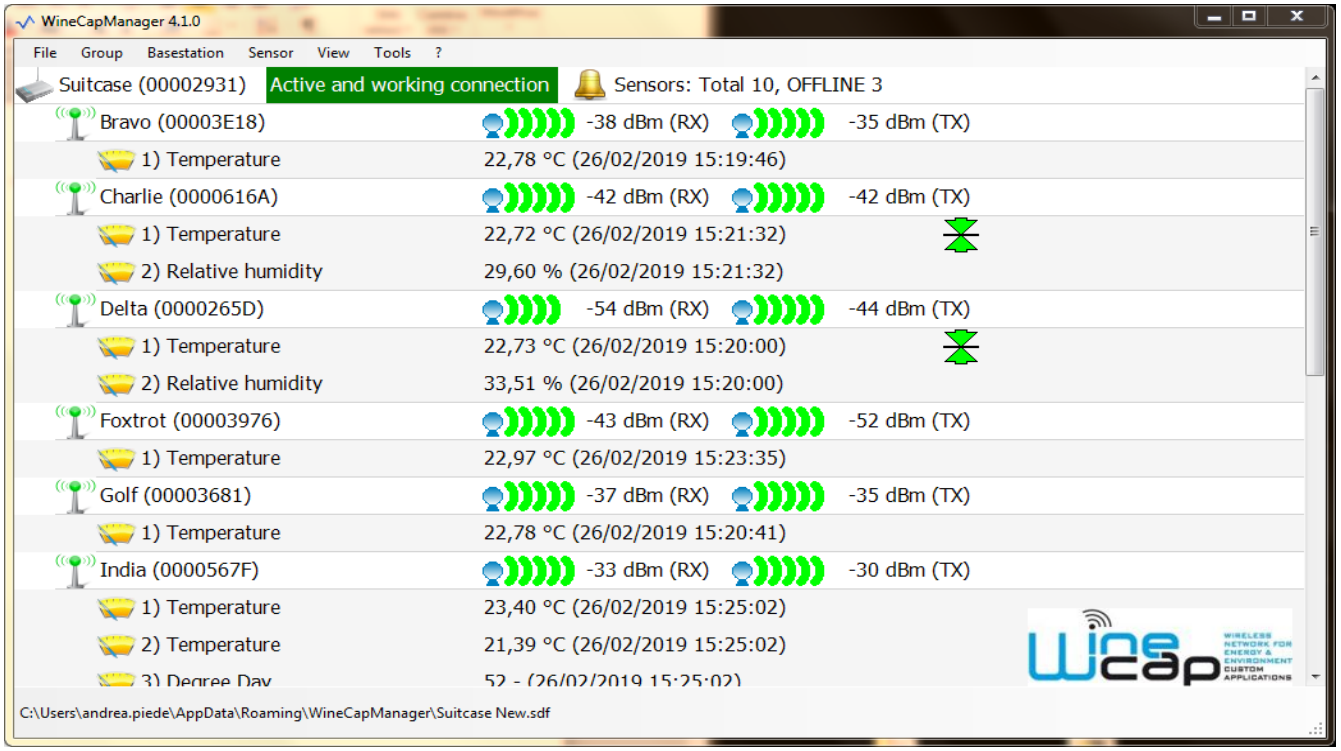
Wireless System

WineCap™

User Manual



CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

Table of Contents.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

1. Winecap™ system – components.

1.1 WineCap™ Basestation.

Picture 1 - MWDG-GSM

Picture 2 - MWDG-MB

Picture 3 - MWDG-ETH

With the word **basestation**, is named the **WSN** wireless sensor network communication and acquisition device, consisting of Wireless Sensors (*Wireless Sensor Network*).

A **basestation** is equipped with internal memory for recording the measurements produced by the system and a **USB** port for connection to the PC, for data configuration and downloading.

There are auxiliary ports for connection to the internet (*GSM / GPRS, LAN*) and to field BUS (*ModBus*).

1.2 Probes and Dataloggers.

Picture 4 - Case IP30

Picture 5 - Case IP65

Probes and/or **dataloggers**, (**Errore. L'origine riferimento non è stata trovata.** *and* ***Errore. L'origine riferimento non è stata trovata.***) depending by models, can measure: temperature, relative humidity, electric energy, linear deformation, etc. (*refer to www.capetti.it for a complete catalogue)*. The sampling and transmission interval of measurements is remotely configurable by user.

Dataloggers are **probes** capable to record measurements acquired on internal memory and ensure the continuity of monitoring even in the case of blackout of the **basestation** or lack of radio signal coverage. Data are automatically aligned with **basestation** when communication is restored.

Dataloggers are equipped with a USB connection, usable to download internal data through the **WineCapManager** software, directly with a supplied USB cable.

Basestations can support up to 50 radio-connected **probes**/**dataloggers** and can export via ModBus up to 40 channels of measurement.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

1.3 WR12 Router.

Picture 6 - WR12 Router

Optional device used to extend wireless radio range of sensor's network.

Must be linked to the network to be extended and automatically provides services to **probe** /**datalogger** with not sufficient radio signal to transmit data to the **basestation**.

Each repeater (*or* ***router***) automatically connects to another repeater if needed.

In a network up to 31 **routers** and up to 16 in in the same path can works.

Provided with IP66 sealing.

1.4 Expansion modules and accessories.

1.4.1 *WineCapKey.*

Picture 7 - WineCapKey

Magnetic key to manually issue commands to **basestation**, **probes**, **dataloggers** and **routers**.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

1.4.2 *Power Supply.*

DIN rail 24Vdc 0.8A power supply (*Picture 8*) for **"MWDG/MWLI"** product line **basestations**.

Picture 8 - MWDG/MWLI power supply

1.4.3 *EXP4IO expansion modules.*

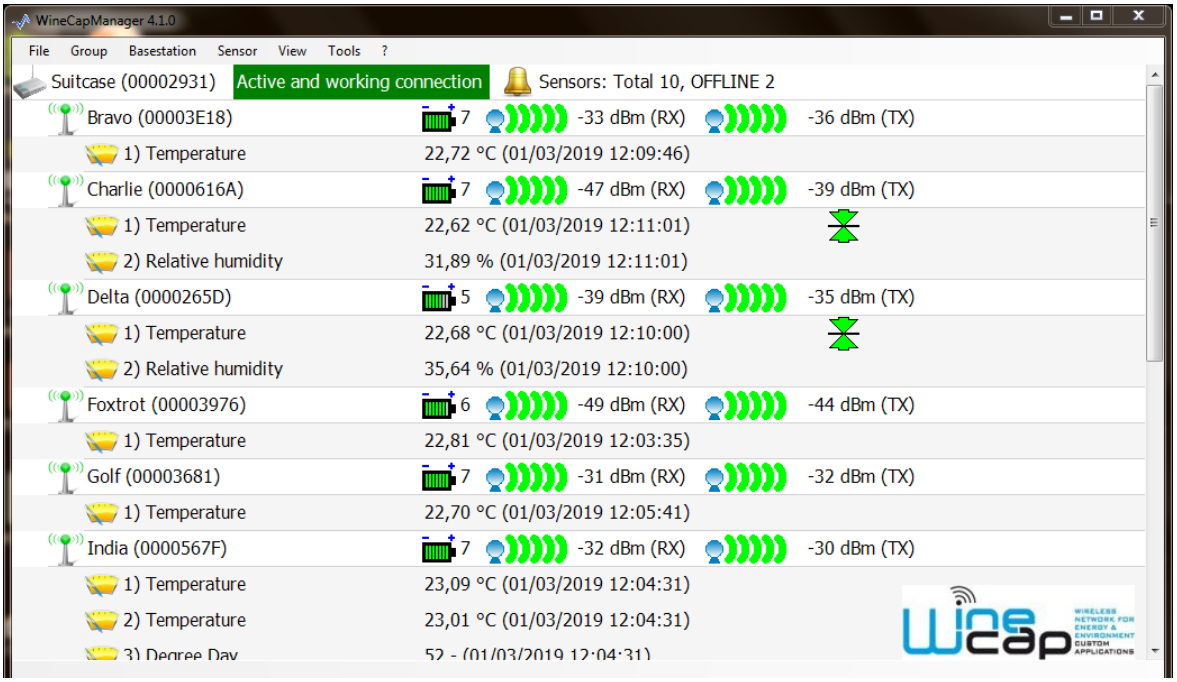
Picture 9 - EXP4IO Module

Basestations can be connected to expansion modules capable to communicate with through the **EXP4IO** communication interface (*Picture 9*). Expansion modules can convert the measurements received from **basestations** into electrical quantities delivered to output to read-out ModBus communication systems (*refer to **www.capetti.it** for full list*).

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

1.5 WineCapManager.

Is the software to manage **basestations**, allowing the **WSN** configuration, reading of measures and **probe**/**datalogger**'s status.



Picture 10 - WineCapManager

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

2. First steps.

2.1 Basestation's connections and start-up.

I. Connect the **WSN** antenna.
II. If present, connect the GSM antenna.
III. Connect the 24V power supply to the **basestation**.
IV. Connect the power supply to the electric network.
V. Connect, using the USB cable, the **basestation** to PC.

2.2 Basestation - Status led meaning.

Basestations mounts on-board 5 status led (*Picture 11*) in order to verify all the function's activities.
Refer to the following reference table to understand each status:

Picture 11 - MWDG front panel

- **SYSTEM**: Power-on led.
  - Normally GREEN flashing once per second to confirm the system is working.
  - When the **basestation** is in "*ongoing association*" or a data reception on the **WSN** is performed, the GREEN flashing is faster.
  - AMBER flashing to notify the approaching of the **WineCapKey** to the sensible area.
  - RED flashing when the power supply is under the minimum threshold or completely absent and the **USB** cable is inserted. May be fixed RED if the last **WineCapKey** association has not been successful.
- **LOGGER STATUS**: shows the measures saving activity on the internal memory, normally off.
- **CCS STATUS**: shows the connection status with the **Service Centre** or with a FTP server.
  - GREEN led on during connection. When the download to remote server is finished, the connection is closed and the led goes off.
  - RED led on in case of malfunction, as an accidental disconnection; the *RED* led goes off when a new connection attempt is done.
  - GREEN flashing: *GSM SIGNAL TEST* function, is activated using the **WineCapKey**. Performs a flash sequence equal as GSM signal "notches"(*5 pulses*=maximum signal, *red pulse*= no signal/signal lost).
- **GSM / COM**: defines the service status of the communication peripheral.
  - **GSM**: GREEN flashing once every four seconds if correctly registered to the GSM network. When the GSM is looking for signal, the flashing frequency is one flash per second.
  - **LAN** or **WIFI**: GREEN led on when connected to the network. RED led on when a SIM card problem (*invalid/absent - wrong PIN*) is detected.
- **WSN STATUS**: shows data reception (*GREEN*) or transmission (*RED*) activities on the **WSN**. Is turned OFF in all other moments of radio inactivity.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

2.3 Basestation user interface.

Is a magnetic interface, a "virtual" button capable to receive different commands coming from the user using the **WineCapKey**.

Approach the **WineCapKey** to the sensible area of the **basestation**. *SYSTEM* led performs an *AMBER* flash. If the **WineCapKey** is kept in this position, flashes continues with a frequency of one *AMBER* flash every 3 seconds.

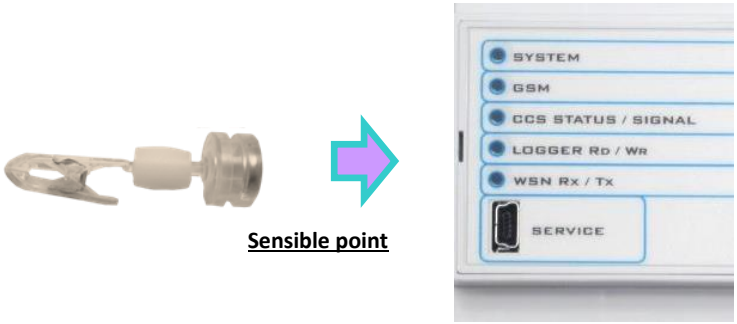
To issue commands following procedure is necessary:

I. position the **WineCapKey** on the sensible point (*Picture 13*);
II. count the number of *AMBER* flashes as the desired command;
III. remove the **WineCapKey** to confirm.

List of **MWDG**/**MWLI** available commands:

Flash count	Command	Description
2 flashes	**TEST**	GSM signal test. Refer to Status led *CCS STATUS*
3 flashes	**PROBE**/**DATALOGGER**/ **WR12 ROUTER ENROLLING**	Put the system in enrolling mode for a new **probe**/**datalogger**. This command must be issued to the **basestation** and immediately after to the **probe**/**datalogger** or **WR12** to be enrolled in order to terminate the operation. **Note: WineCapManager** must not be connected!
4 flashes	**CONNECTION**	Performs immediately an internet connection without waiting for scheduled connections. Useful to verify data download to remote server.
5 flashes	**WR11 ROUTER ENROLLING**	Put the system in enrolling mode for a new **WR11 router**. This command must be issued to the **basestation** and immediately after to the **WR11 router** to be enrolled in order to terminate the operation. **Note: WineCapManager** must not be connected!

Picture 12 - MWDG/MWLI command table



Picture 13 - WineCapKey Interface

2.4 USB driver installation.

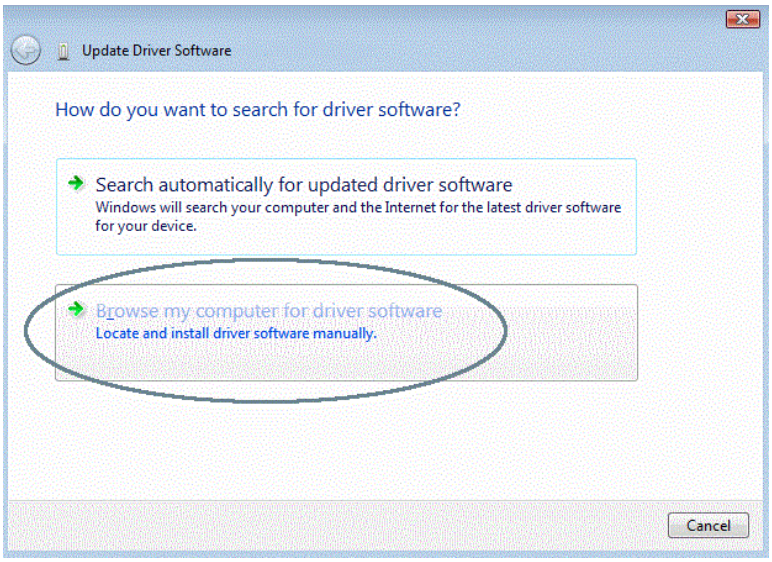
The first time the **basestation** is connected to PC, the device driver must be installed. The installation must be performed MANUALLY:

I. power on the **basestation** and connect the USB cable to PC;
II. access to the "Control Panel → Device Manager";

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

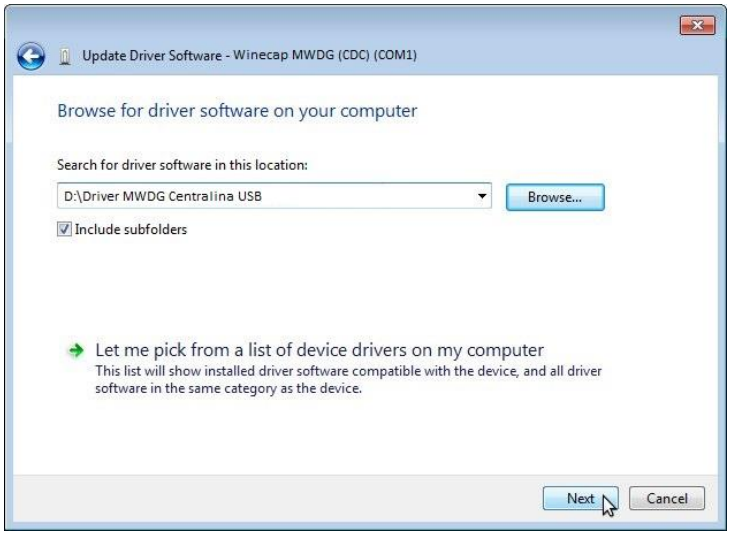
III. click with the mouse's right button on the device with the yellow icon, named FTDI or MWDG depending by hardware type, and select "Update Driver Software";

IV. select "Browse my computer for driver software" (*Picture 14*);



Picture 14 - Driver installation

V. select on provided CD the directory related to the **basestation** to be installed: "**MWDG Driver USB Drive**" (*Picture 15*).

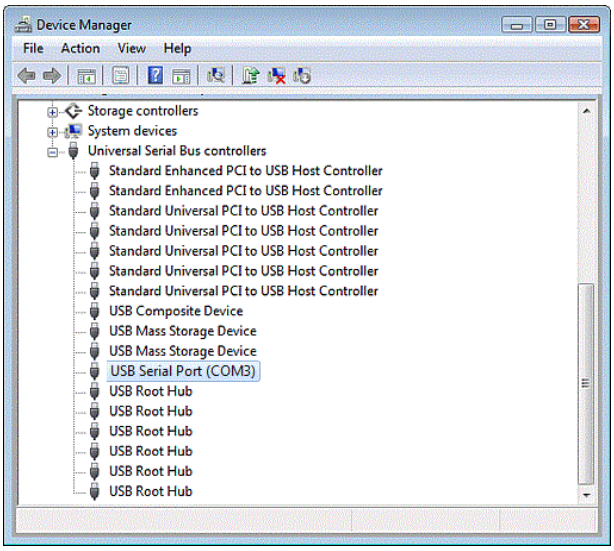


Picture 15 - Driver path

VI. in case of Windows 8.x installation troubles refer to "**Win8.x Installing Drivers USB R01**" manual, located in the "Manuals" folder on the provided CD;

VII. At the end of procedure, on PC must appear a COM port under the "Ports (*COM & LPT*)" list. You can control by selecting "Control Panel" - "Device Manager" (*Picture 16*).

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

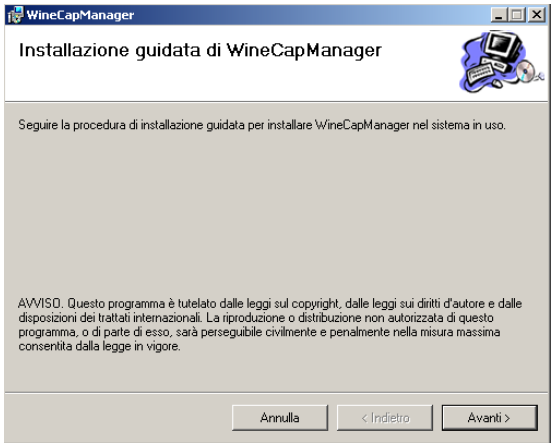


Picture 16 - Successful driver installation

2.5 WineCapManager software installation.

Launch the "**WinecapmanagerX_XX.exe**" application located in the "*WineCapManager*" CD folder.

Some screens will be displayed to drive the user in the installation process. (*Picture 17*).



Picture 17- WineCapManager Installation

A requirement for the **WineCapManager** proper operation, is the previous installation of the *DOT.NET Framework* *version 2.3* or higher.

In case of missing installation of the framework, the setup process will try to download it automatically, so an internet connection is required.

Otherwise, the version 4 can be installed using the "*dotNetFx40_Full_x86_x64.exe*" file located on the *CapNet* directory on the installation CD provided.

In this case aborting the **WineCapManager** installation and previously install DOT.NET framework is suggested.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

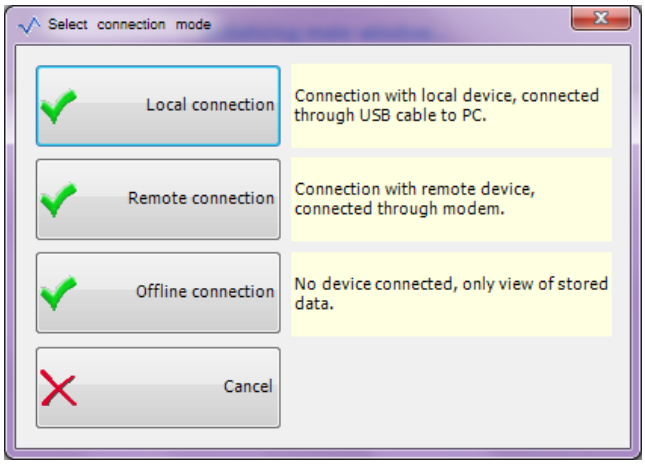
3. WineCapManager management software.

3.1 Executing WineCapManager software.

Click on the icon located on the desktop.

Picture 18 - WineCapManager icon

Starting the software, the type of access must be selected.



Picture 19 - Connection mode selection

There are three **basestation** connection types (*Picture 19*):

- ***LOCAL Connection***: select this option when a USB direct connection between the **basestation** and PC is used. Is the option to be selected also for a USB direct connection with **probes**/**dataloggers**.
- ***REMOTE Connection*****:** this option allows a call to the SIM number inserted into the **basestation** to perform a *point-to-point* remote connection (*Installed PC Modem needed*).
- ***OFFLINE Connection*****:** this option is used to access at stored data without establishing a connection with the **basestation**.

3.1.1 Local Connection System Access.

Selecting the LOCAL connection, the software performs a scan of available COM ports to establish the communication with the connected device; in case of negative outcome, an information box appear, notifying the missed connection as displayed below (*Picture 20*):

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

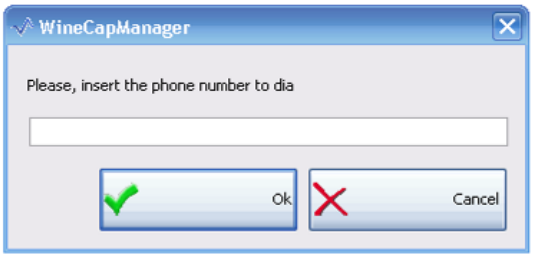
Picture 20 - Connection error

In this case verify:

I. **basestation** power on;
II. USB cable connection;
III. USB driver correct installation. In "*Control Panel / Device Manager*" a "*Virtual USB CDC Port*" on the "*Ports (COM & LPT)*" category must be present (*Picture 16*).

3.1.2 Remote Connection System Access.

The remote connection requires the active link between the PC and the **basestation**, using a direct Machine-To-Machine (*M2M*) GSM call (*Picture 21*) with the remote device.



Picture 21 - Remote basestation dialing

Answer obtained and connection established, software starts to exchange data with the device connected in the same way as the local connection. Answer speed and latency times are defined by the connection speed and by the signal quality.

The generation of big moles of data (*for example the download of all samples*) is not recommended in order to avoid long connections times and potential high costs.

Use this connection type mainly for remote system verify and configuration (*if the **basestations**, is connected with the **Service Centre**, will answer at the second call try*).

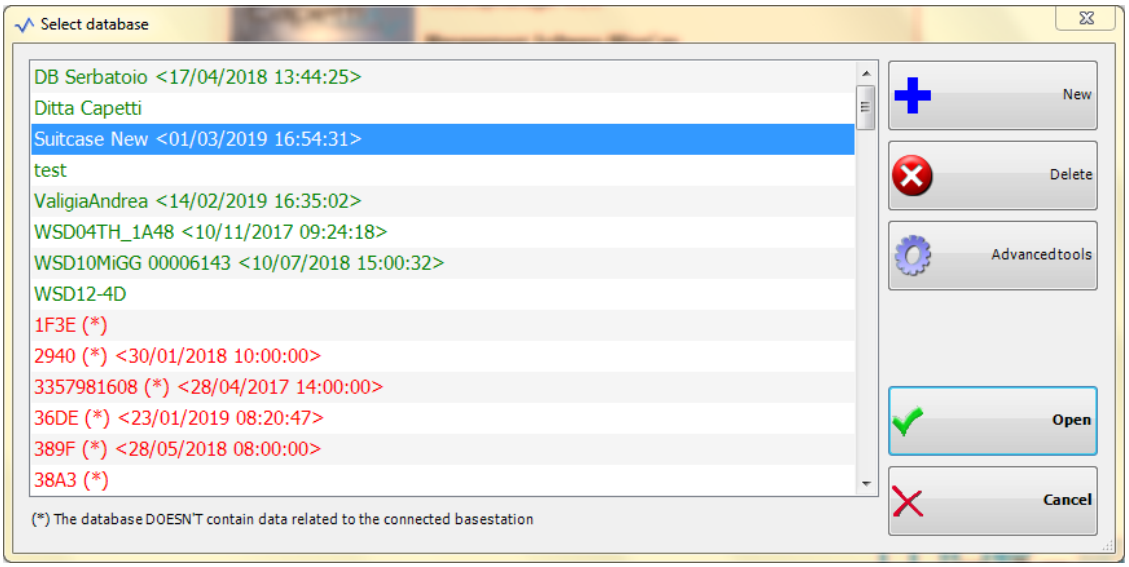
3.1.3 Offline Connection System Access.

This connection type is useful to access data stored on PC, without any kind of link with the device. Don't needs a physical connection but allows data saving and visualization.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

3.2 Database Selection.

As the device is detected or the "*Offline Connection*" is selected, the support database must be selected (*Picture 22*) to allow data and configuration saving.



Picture 22 - Database selection

This feature is useful because:

I. differentiate plants on different databases is possible. Even if each database may manage different **basestations** and consequently different plants, the creation of a database for each new plant is recommended;

II. create backup copies of the whole system. Each database is a file containing updated system data and configuration;

III. exchange plants data between different PC. With the device connected to PC, access to the previous system is granted both in local or in offline mode, as long to exchange the database files.

During the first start, the creation of a NEW database, that will be used to manage plant, is necessary. The database name can be modified in order to be recognized.

This feature is very useful especially if the number of database should increase. The new database is empty, select it and click on "*Open*" to use it.

3.3 Software License.

Each database must be provided with license related to the device to be configured and from which data will be downloaded.

When the connected device has a MAC Address not licensed, the following message is displayed (*Picture 23*):

Picture 23 - Error: device not licensed

where the detected code (*matches to the MAC code in label*) is reported.

The license file is located on the provided CD, in the folder *Licenze WineCapManager*. To activate the license:

I. Select from menu "*Basestation → Insert license*", then select the license file; This file is named as the MAC Address and "*.lic*" as extension.

II. Once acquired the file, the application unlocks, showing on the main page the following picture. (*Picture 24*).

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

Picture 24 - Device correctly licensed

The software may contain more than one license to manage different devices.

Keep the CDs containing the license files if the software should be installed on other PCs.

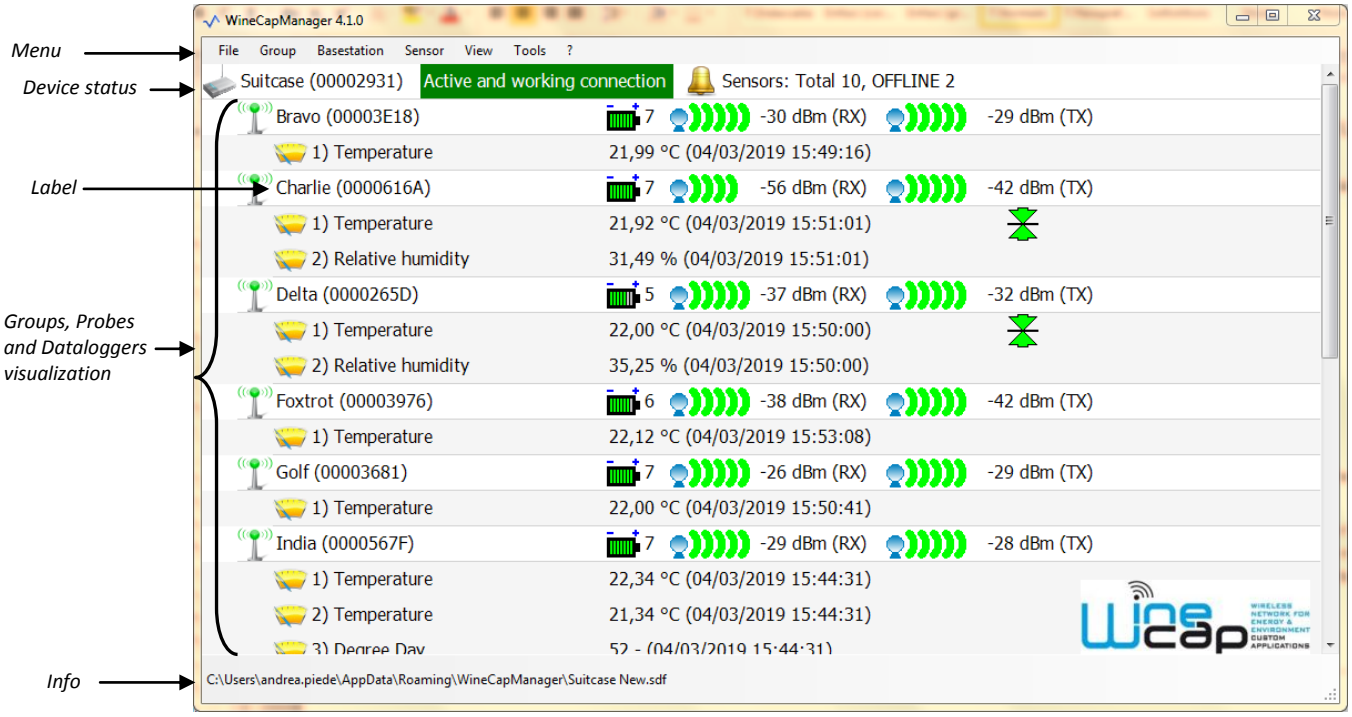
After entering the license, or in case it is already entered before, an automatic PC's database process alignment starts.

This process is necessary to upload the information coming from the **basestation** and align them with ones present on the PC.

For example, a database just created and connected to a preconfigured **basestation** with a group of **probes**/**dataloggers**, will be automatically populated and updated.

3.4 WineCapManager Main Page.

The main page (*Picture 25*) is similar to the following picture.



Picture 25 - WineCapManager: Main window

The window above is composed by:

I. "**Menu**" area: contains the entries for direct access to the application's functions.

II. "**Device Status**" area: contains **basestation name**, its **MAC Address** and information regarding the properly functioning of the connection between the PC and the device.

III. "**Groups, Probes and Dataloggers visualization**" area: contains the tree list of **probes**/**dataloggers** linked to the system;

this section will be empty in case the network still be configured.

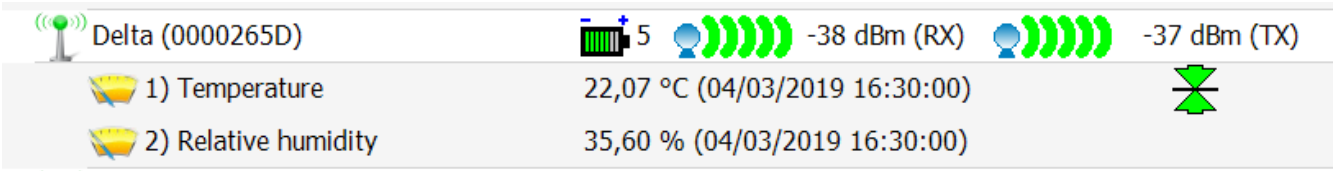
Resumes the most important information regarding all **probes**/**dataloggers**, showing the status and the last samples acquired.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

There are also groups, represented with the directory icon, containing the linked probes/dataloggers.

IV. "**Info**" area: contains additional information regarding the selected item.

In the "**Groups, Probes and Dataloggers visualization**" area there are elements as shown in the following picture (*Picture 26*):



Picture 26 - Plant probe/datalogger detail

following information can be identified:

- Active device identifier: .
- **Probe/datalogger** name "Delta".
- **Probe/datalogger** MAC Address: "0000265D "
- Battery Level (*value between 0 and 7 - 0=low battery 7=battery full*): 7.
- **Probe/datalogger** received signal power (*dBm*): (*RX*).
- Transmitted signal power (***basestation** reception*) in dBm: (*TX*).

Measurement channel information:

- **Probe/datalogger** channel number: 1).
- Measurement type: "*Temperature*".
- Measurement value and unit: "*22.07 °C*".
- Last measurement timestamp: "(*04/03/2019 16.30.00*)".

Additional information on special events:

- Test packages: .
- Threshold enabled and respected: .
- Threshold overcoming: .

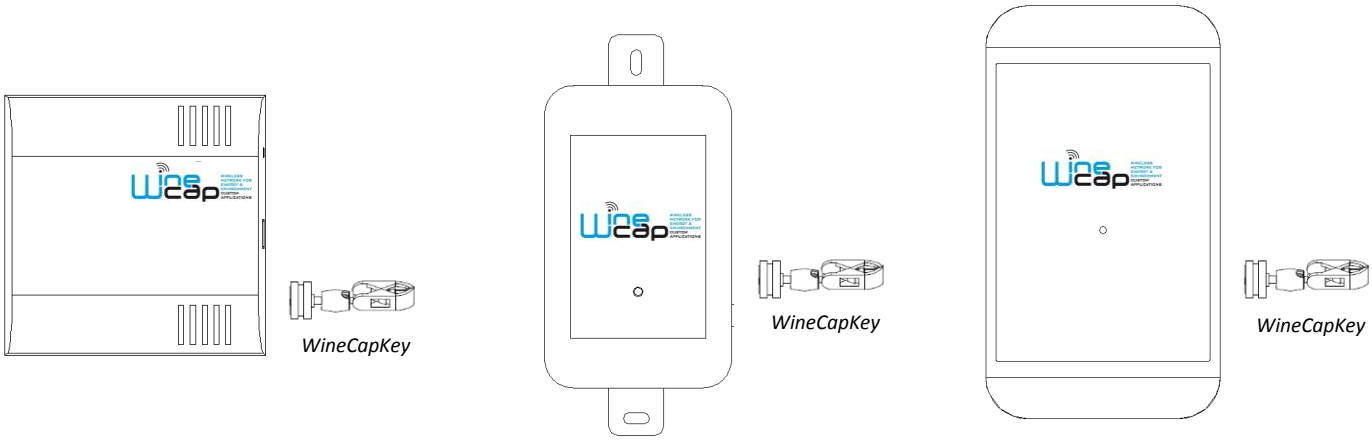
CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

4. Probes/dataloggers/routers WSN network configuration.

4.1 User Interface.

The user interface consists of a "*virtual*" button that can be activated using the **WineCapKey** and of a two-coloured led.

To issue a command, user must approach the **WineCapKey** to the **probe**/**datalogger**'s sensible area and keep it in that position.; the following picture (*Picture 27*) shows **probe**/**datalogger**'s sensible points.



Picture 27 - WineCapKey positioning

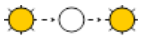
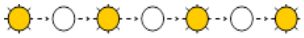
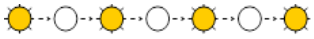
Once the **WineCapKey** is detected, the led periodically emits *AMBER* flashes with a 2 seconds cadence.

For each flash, a different command is associated; to confirm the command the **WineCapKey** must be removed from the sensible area immediately after the number of flashes corresponding at the desired command.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

The following **COMMAND** table describes the available commands:

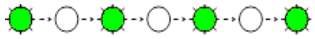
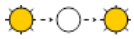
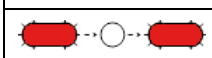
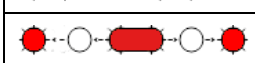
WIRELESS MODE COMMAND Table

Flash count	Command	Description
 1 flash	**STATUS**	Shows the device STATUS. As answer the led perform a flash sequence as reported in the "STATUS" table. If the device is performing the TEST (*refer to TEST command*) this command stops it.
 2 flashes	**TEST**	Enter in TEST mode and transmits status and measurements every 5 seconds. If the device is in STANDBY mode or it is out of radio range, this command forces the connection procedure to the **WSN** and the return to the operative mode. The TEST stops after 120 seconds. During TEST the led continuously shows the STATUS to monitor the received radio signal quality. **CAUTION**: Measures acquired during *TEST* phase are NOT saved.
 3 flashes	**ENROLL**	Association to the network: must be used when the device has not yet been included in a network. This command starts the entry and association procedure to the **basestation** (*refer to Probe / datalogger / WR12 router association procedure.*).
 4 flashes  + 4 flashes	**STANDBY**	Temporary device deactivation: the device is stopped. The sampling process and the radio are turned off losing the connection to the network. To reactivate, a TEST command is necessary. The STANDBY command must be given twice to confirm it: at the first sequence the led flashes alternating RED and GREEN lights, waiting for the second confirm sequence within 15 seconds. At the command execution the led flashes as the STANDBY status (*refer to **WIRELESS MODE STATUS** Table*).
 5 flashes  + 5 flashes	**FACTORY RESET**	The device performs the memory deleting procedure and goes in STOP status. All samples, configuration and wireless network data associated are LOST. To reactivate the device a new association and configuration procedure is necessary (*ENROLL command*). Also in this case, the FACTORY RESET command must be given twice to confirm it. At the command execution the led flashes as the "*PROBE/DATALOGGER NOT ASSOCIATED*" status (*refer to **WIRELESS MODE STATUS** Table*).
 5 flashes  + 3 flashes	**LOGGER NO WSN**	As the previous command, but performs only the **WSN** deleting procedure and disconnect from the **basestation**. The device enter in *LOGGER STAND ALONE* mode: data are kept and the sampling activity CONTINUES with previous setup. Command must be given with 2 sequences: 5 flashes and then 3 flashes. At the command execution, wait for the device reboot. At the STATUS command, "LOGGER" will be the answer (*refer to **STAND ALONE STATUS** Table*). A new association (*ENROLL command*) is possible to a new **basestation**.

Picture 28 - Command table

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

WIRELESS MODE STATUS Table:

FLASH COUNT		STATUS / RADIO SIGNAL QUALITY
	5 green flashes	**ACTIVE/Radio signal: Excellent**
	4 green flashes	**ACTIVE/Radio signal: Good**
	3 green flashes	**ACTIVE/Radio signal: Fair**
	2 amber flashes	**ACTIVE/Radio signal: Sufficient**
	1 red flash	**ACTIVE/Radio signal: Insufficient**
	1 red flash 2" LONG	**ACTIVE/Radio signal: OUT OF RANGE** **Network searching**
	2 red flashes 2" LONG	**STANDBY** **Radio off - no logging**
	Short-long (2")-short red flashes series	**FACTORY RESET** **Device not enrolled - no logging**

Picture 29 - Wireless mode status table

4.2 Preconfigured System - Activation probes/dataloggers in *STANDBY* mode.

In case of a preconfigured system, **probes**/**dataloggers** are already associated to the network and, normally, are placed in *STANDBY* mode.

To be sure, a "*STATUS*" command must be given and the led answer must be verified (*refer to **WIRELESS MODE COMMAND** Table*).

In this condition, after turning on the **basestation** and connected the **WSN** antenna, the command "*TEST*" (*refer to **WIRELESS MODE COMMAND** Table*) given to the **probe**/**datalogger** or **router** is the operation needed to activate and make them visible on the software.

This command forces **probes**/**dataloggers** to search for the **basestation**.

If the software is running and connected, it detects and notify **probes**/**dataloggers** received in the "*Groups, Probes and Dataloggers visualization* " area (*Picture 25*).

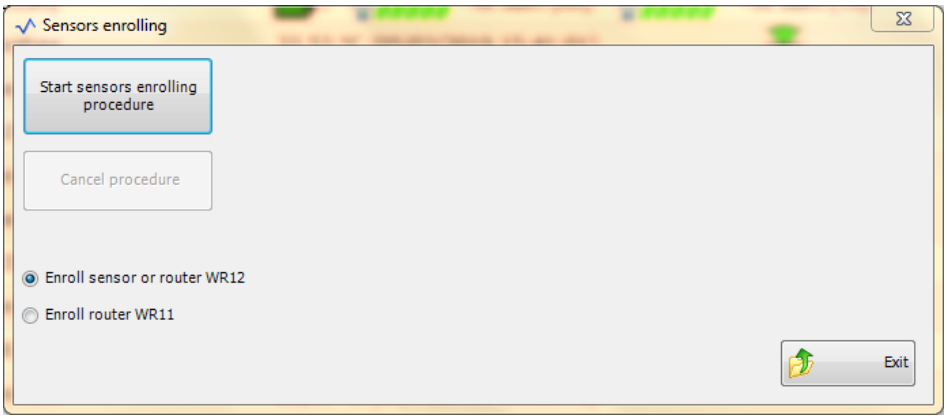
4.3 Not configured System - Probes/dataloggers and routers association.

In case **probes**/**dataloggers** or **routers** shows the *FACTORY RESET* status (*refer to **WIRELESS MODE STATUS** Table*), the association to the system is needed.

The association by the software is performed accessing to the page "*Basestation → Sensor enrolling*".

The following panel will be displayed (*Picture 30*):

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it



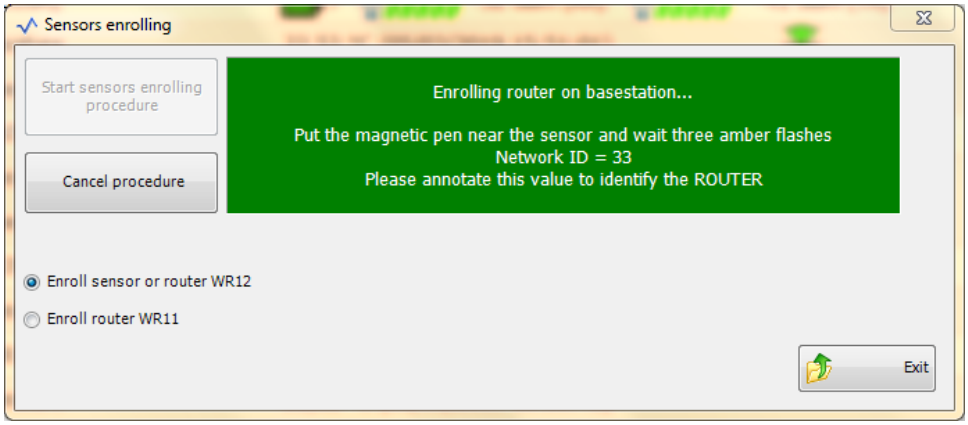
Picture 30 - Device enrolling to basestation

4.3.1 Probe / datalogger / WR12 router association procedure.

Be sure that the enrolling option is set to "*Enroll sensor or router WR12*".

Click on "*Start sensors enrolling procedure*".

Next to the button just pressed, an "*in progress*" association process notify will be displayed as shown in the following picture (*Picture 31*).



Picture 31 - Enrolling probes / datalogger / WR12 routers

During this phase, an *ENROLL* command (*refer to **WIRELESS MODE COMMAND** Table*), using the **WineCapKey**, must be given to the **probe**/**datalogger**/**router**.

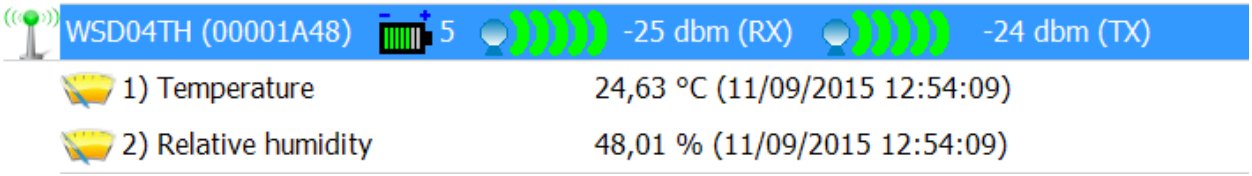
The **probe**/**datalogger**'s led start flashing with a *RED* light, searching for the network; at the recognition of the network the led pass to a *GREEN* light and, at the end of this procedure, turns off.

CAUTION: wait for the end of information exchange process and for the led goes off.

In the software, in the "*Sensor Association Management*" (*Picture 31*) panel, the "*in progress*" association process notify disappear, meanwhile in the "*Groups, Probes and Dataloggers visualization*" area (*Picture 25*), in the software's main page, the new **probe**/**datalogger** appears with its measurement channels.

In the following picture (*Picture 32*) a **probe**/**datalogger** with temperature (*channel 1*) and humidity (*channel 2*) channels.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it



Picture 32 - Probe/datalogger at the end of successful enrolling procedure

4.3.2 WR11 or WR12 in WR11 mode router association procedure.

The **WR11** router **has not measure channels**, so is not visible in the **probes**/**dataloggers** system list.

This feature needs a modification to the initial setup during the enrolling procedure: this procedure is the same, but the check-box "*Enroll router WR11*" must be selected before clicking on "*Start sensor enrolling procedure*" button (*Picture 31*).

Also the **WR12** router can be enrolled in this way.

The result is to **leave a free position** in the probes/dataloggers system list, that can be used for enroll to **WSN** other devices

This result can be useful when the whole number of system devices is quite near to the **basestation** limit and a division of the plant is not intended.

Obviously, this operation sacrifice the functional status control of the **WR12** by the **basestation**.

The **WR12** will continues to send its diagnostic data, but these data will be ignored; only if the **WineCapManager** is working and the **basestation** is connected to PC, these data will be displayed on PC's monitor.

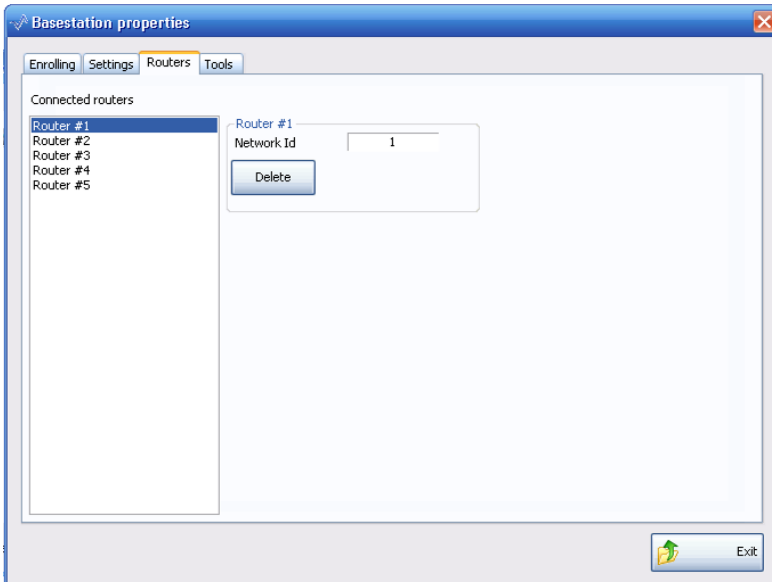
Measures and an element will appear, recognizable only from the **WR12** Mac Address.

Linked **routers** list can be found in the item "*Routers*" of the **basestation** properties window (*Picture 33*). Only **WR11** or **WR12** routers used in **WR11** mode will be displayed in this list. **WR12** routers will be displayed in the main window (*Picture 10*).

CAUTION: if more than one **router** are present in the system, to properly identify a single **router** after its association and detect it during the installation process, the NET ID address, displayed in the *ASSOCIATION* window, must be traced (*Picture 33*).

Each time a new **router** is associated, the related address is automatically fixed and the device is added to the "*Routers*" list (*Picture 33*).

Writing down the address on a label to be placed on the **router**'s case is recommended to avoid confusion with other **routers**.



Picture 33 - Routers list

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

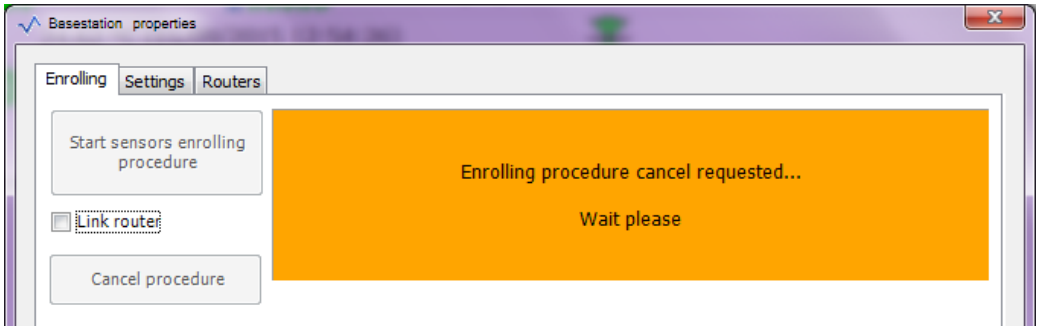
4.3.3 How to cancel an association.

In case an "*in progress*" enrolling procedure must be cancelled, click the button "*Cancel procedure*"; the software will notify the procedure cancelling (*Picture 34*). To issue a new association the cancelling process must be concluded.

If the enrolling procedure has been activated also on the **probe**/**datalogger**, just wait for time-out.

The **probe**/**datalogger** will return to *FACTORY RESET* status *(refer to sopra)*.

In case of accidental connection to the **basestation** a *FACTORY RESET* command (*refer to **WIRELESS MODE COMMAND** Table*) is needed.



Picture 34 - Enrolling procedure canceling

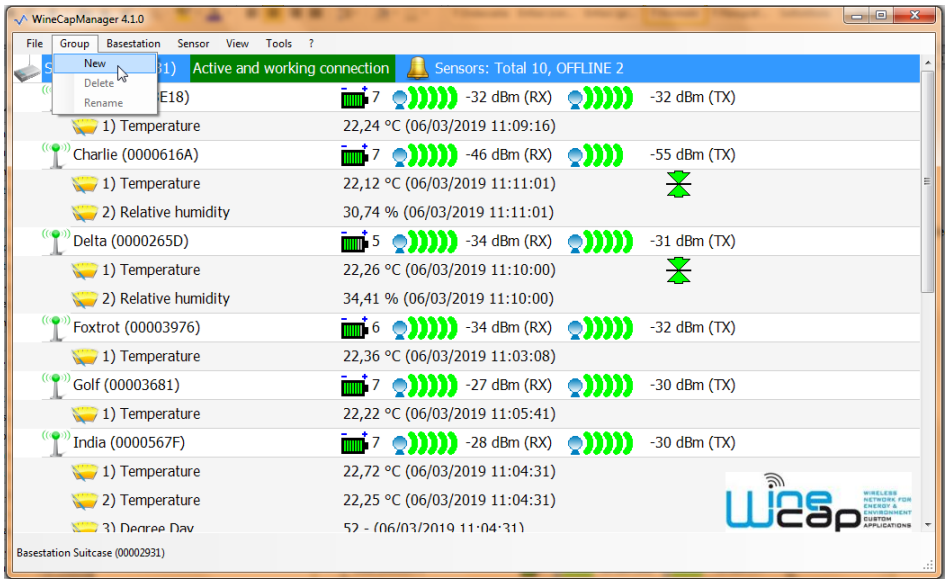
4.4 Probes/dataloggers groups creation.

Using groups is an optional feature; may be useful to divide **probes**/**dataloggers** depending on a specific use or a defined area in the same plant.

This feature is not available for **probes**/**dataloggers** directly connected using USB.

Creating groups before system configuration and **probes**/**dataloggers** associations is recommended.

To create a new group use the menu on the main panel and select the item "*Group → New*" (*Picture 35*).



Picture 35 - Creation of a new group

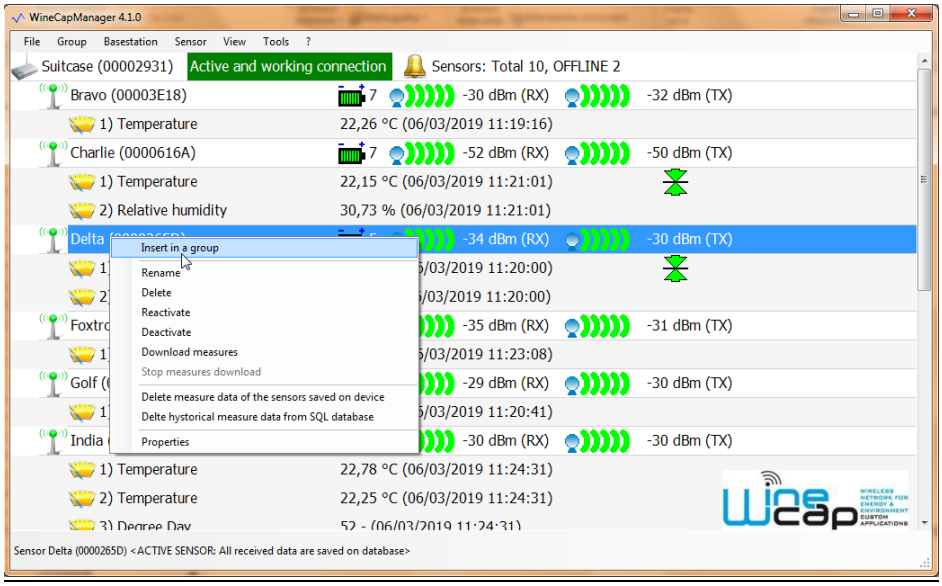
The main window will show the group just created but empty, because **probes**/**datalogger** to be inserted must be selected.

In the following example a group named "CELLAR" has been created (*Picture 36*).

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

Picture 36 - Creation of a new group

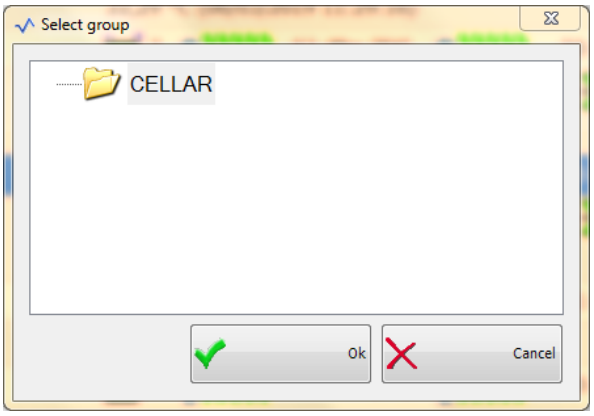
To insert a **probe**/**datalogger** into a group, select it and click with the right mouse's button, then select the item "*Insert in a group*". (*Picture 37*).



Picture 37 - Probe/datalogger group insertion

A window with the group list will appear (*Picture 38*); select the desired group then click "*OK*".

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it



Picture 38 - List of available groups

4.5 Probes/datalogger configuration.

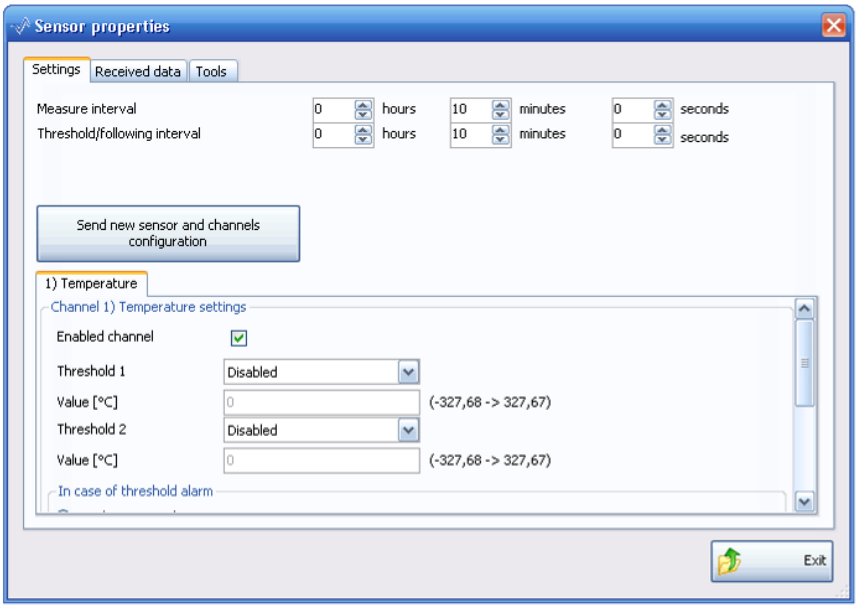
As completed the enrolling procedure of a new **probe**/**datalogger**, its configuration is available.

- **Probe/datalogger label**: to assign a name to a **probe**/**datalogger** click on "*Sensor → Rename*".

  Assigning a name that can highlight the physical position and the **probe**/**datalogger** type, in order to have a clear reference regarding the monitoring in progress even after a long time, can be very helpful (*Maximum characters: 30*).

  To perform this operation, select the desired **probe**/**datalogger** then click the item "*Sensor → Properties*", otherwise click with the right mouse's button directly on the **probe**/**datalogger** and select *Properties*.

  The window is divided in three sections (*Picture 39*):



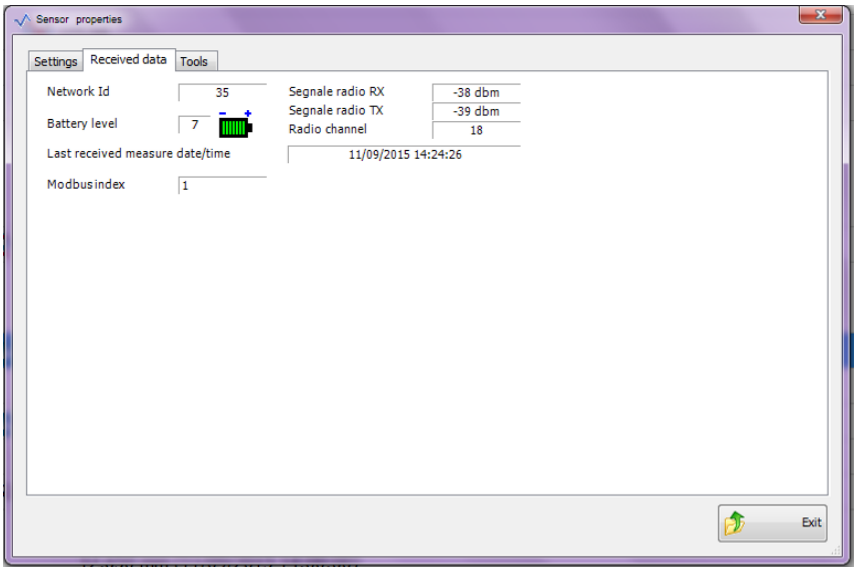
Picture 39 - Probe/datalogger configuration

- **Settings** ➔ regards the general setup of the **probe**/**datalogger**, with following settings:
  - Setup of the sampling interval expressed in hours, minutes and seconds. Intervals lower than one minute are not admitted.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

- Threshold interval setting: is used to verify the overcoming of thresholds expressed in hours, minutes and seconds. Normally must be set as a submultiple of the sampling time in order to automatically verify the value of measurements with higher frequency to anticipate the alarm notify.
- Button "*Send new sensor and channel configuration*": sends parameters to the remote **probe**/**datalogger**. Clicking on this button, a timer starts waiting an answer from the **probe**/**datalogger**. At the reception, a notify of success of the process is displayed.
- Channel list: in the lower side of the window (*Picture 39*) a **probe**/**datalogger**'s channel summary is displayed.
  - Enabling the measurement of the concerned channel.
  - Enabling the concerned channel "Threshold 1" (*Disabled, Upper enabled, Lower enabled*).
  - "Threshold 1" value – if enabled.
  - Enabling the concerned channel "Threshold 2" (*Disabled, Upper enabled, Lower enabled*).
  - "Threshold 2" value – if enabled.
  - Notify of threshold alarms only at event type or all values overcoming thresholds.
  - If present ➔ Enabling measurement tracking: measurement is sampled at the threshold interval and is sent to the **basestation** only if it's changed compared to the last value sent of a quantity higher of the one already set. Positive or negative differences may change.

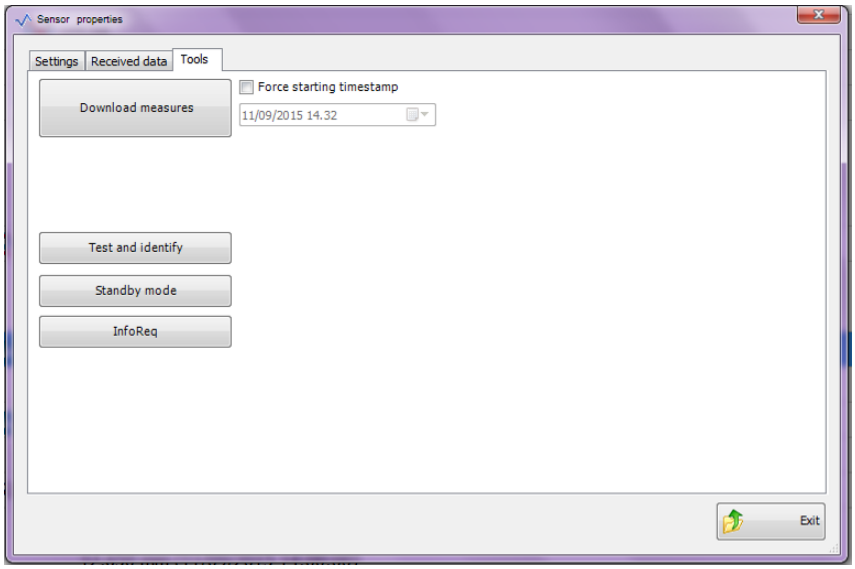
- **Received data** ➔ reports other information as (*Picture 40*):
  - ID network address. Each element of **wireless network** acquires an address during the enrolling process. In **router** case, this address is very important because it's detected and displayed by **radio tester probe**, that declares to which **router** it's linked in an established geographic point of the whole plant;
  - battery level, radio signal quality (*TX and RX*) and radio channel used during last transmission;
  - time reference of the last submitted data;
  - reference index for Modbus reading. This value is useful to "point" ModBus registry set related to **probe**/**datalogger**:



Picture 40 - Received data window

- **Tools:** regards special commands used for administration tasks, debug functions and advanced management (*Picture 41*).

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it



Picture 41 - Tools window

- *Download measures*: the measurement download from the **basestation** to the PC's database. Can be performed starting from a user defined date using the "*Force starting timestamp*" button and setting up the desired date in the properly field.
- *Test and Identify*: this button sends a command (*refer to **WIRELESS MODE COMMAND** Table*) to put the remote **probe**/**datalogger** in *TEST* mode (*same function of the command given using the **WineCapKey***). Useful also to identify a **probe**/**datalogger** verifying its flashing led.
- *StandBy mode*: this button sends a *STANDBY* command (*refer to **WIRELESS MODE COMMAND** Table*) to the remote **probe**/**datalogger**.

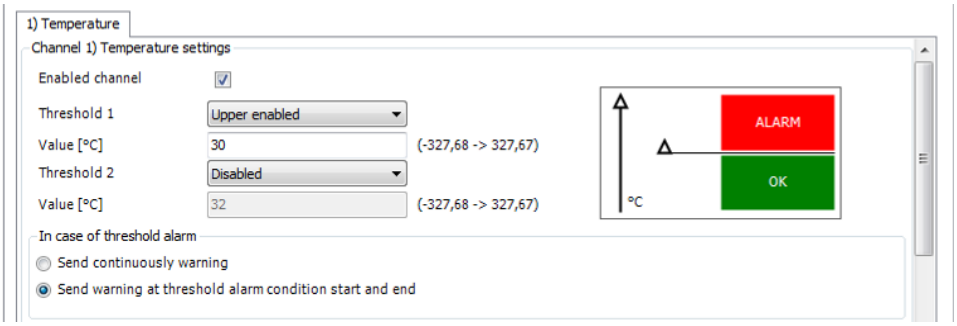
  CAUTION: after this command the **probe**/**datalogger** turns off, will be offline and will no longer be accessible. To reactivate it a manually *TEST* command (*using the **WineCapKey***) is needed (*refer to **WIRELESS MODE COMMAND** Table*).

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

4.6 Thresholds setup.

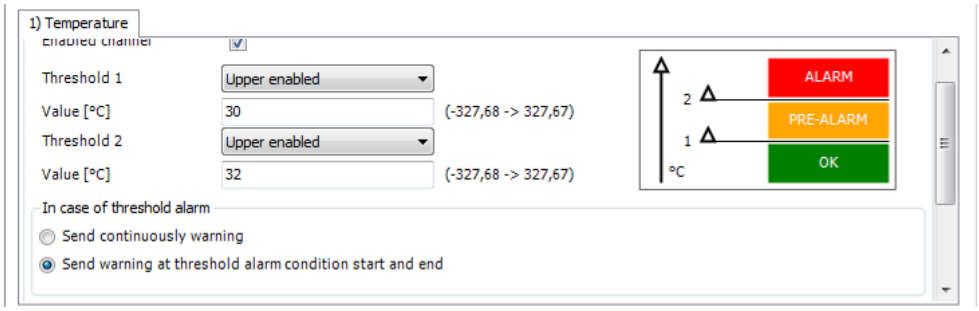
There are three thresholds configuration types:

- ***Single threshold**:* only one upper or lower alarm threshold is set. In case of overcoming an "**ALARM**" is generated. Following an example of an upper threshold setup (*Picture 42*).



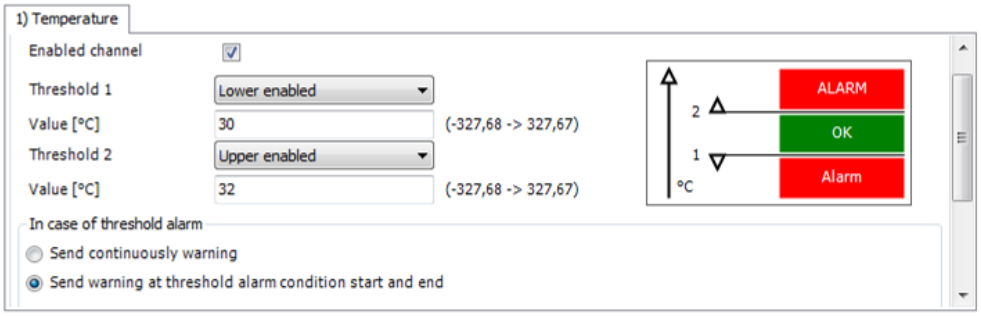
Picture 42 - Single threshold setup

- ***Double threshold**:* two subsequent limits are set (*both lower or upper*). The overcoming of the first threshold generates a "**WARNING**" meanwhile the second overcoming event generates an "**ALARM**". Following an example of two upper threshold setup (*Picture 43*).



Picture 43 - Double threshold setup

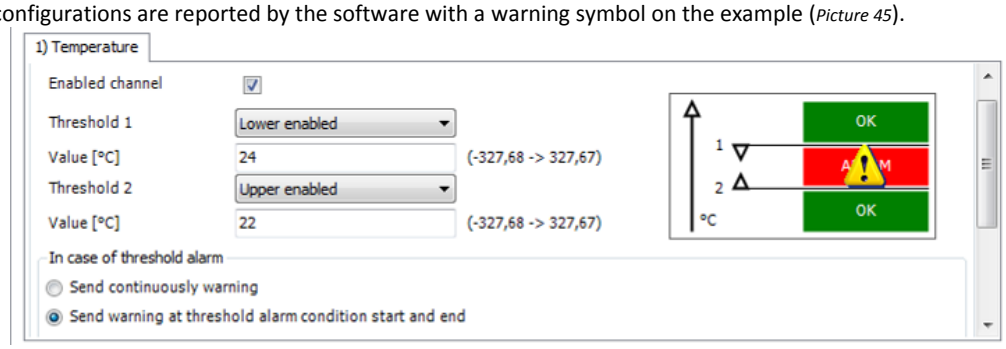
- ***Threshold interval**:* where a lower and a upper limit are set. At the threshold overcome (*upper or lower*) an "**ALARM**" is generated. Following an example of a threshold interval setup (*Picture 44*).



Picture 44 - Threshold interval setup

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

Not allowed configurations are reported by the software with a warning symbol on the example (*Picture 45*).



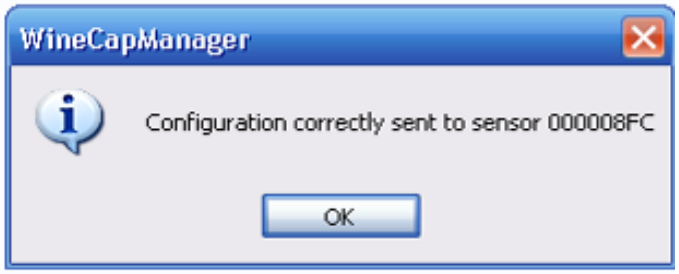
Picture 45 - Configuration not allowed

Once all the configuration parameters are set, a click on the "*Send new sensor and channels configuration*" button is needed; a box asking confirmation for clock synchronization between **probe**/**datalogger** and PC will appear: give positive confirmation if the **probe**/**datalogger** has just been associated.

During the configuration process, on the right side of the "*Send new sensor and channels configuration*" button, a progress bar will defines the ongoing operation (*Picture 46*),

Picture 46 - Configuration packet sending

displaying, at the end, a box like the following (*Picture 47*).



Picture 47 - New configuration correctly sent

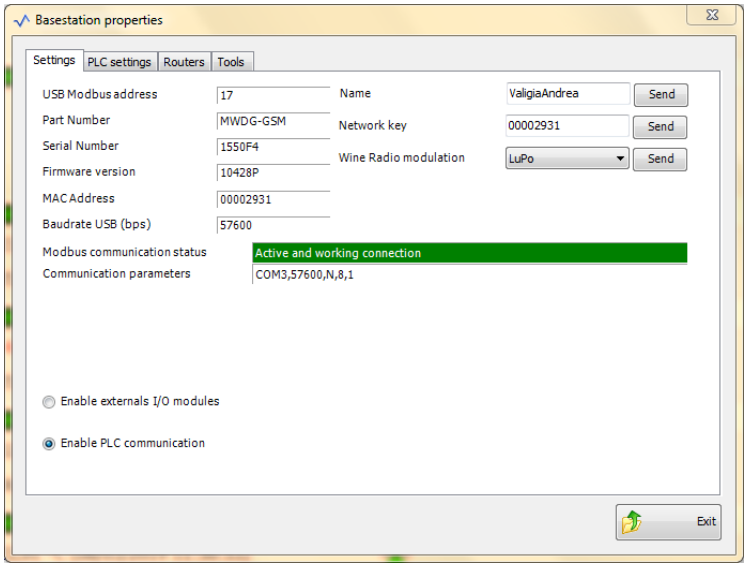
Note: If the **probe**/**datalogger** is not reachable and the configuration process doesn't succeed, the software will automatically send again the configuration as soon as the communication is restored.

The configuration alignment process is monitored by the **basestation** and by the software.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

4.7 Basestation configuration settings.

To view the data on the **basestation** interfaces (*wireless and wired*), the "*Basestation → Properties" w*indow must be open, then the "*Settings*" panel must be selected: (*Picture 48*):



Picture 48 - Basestation setup window

Following information are displayed:

- **USB ModBus Address** (*read only*)**:** shows the device address on USB line.
- **Factory Information** (*read only*)**:** *Part Number*, *Serial Number*, *Firmware Version*, *MAC Address*.
- **Baudrate USB (*bps*)** (*read only*): USB channel transmission baudrate.
- **Name** (*maximum characters: 20*)**:** indicates the name of the **basestation**; can be modified by user if enabled as Administrator. Automatically reported on **Service Centre**.
- **Network Key (*NetKey*)**: is the wireless network password, univocal for all the **WSN** elements and is shared during enrolling procedure.

  This parameter is normally equal to **basestation**'s *MAC Address* in order to be univocal and known.

  When different wireless networks needs to share an area, having different **Network Keys** avoids conflicts, interferences or wrong recipient transmissions.

  NOTE: because of this value is stored also on **probes**/**dataloggers**, changing the **Network Key** value means **TO LOSE** radio link with previously associated **probes**/**dataloggers**.

  To maintain the new value a new association of **probes**/**dataloggers** will be necessary. The **Network Key** is used also in the communication process with **Service Centre**: in case of modify, an update on the main server will be necessary to enable the download process.
- **Wine radio modulation:** this parameter defines wireless network working mode.

  There is a "**Standard**" mode, the historical one that is the only one available for legacy devices, and a "**LuPo**" mode that means long range radio.

  NOTE: also in this case, changing this parameter means **TO LOSE** radio link with previously associated **probes**/**dataloggers**. A new association of **probes**/**dataloggers** is necessary and then **ASSURE** that everyone can use the new mode.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

4.8 LuPo modulation features compared to Standard modulation.

LuPo mode is an acronym for “long range”.

LuPo has improved features in radiofrequency signal management, so radio range, noise immunity are improved and some new network features.

Radio modulations are distinguished in the way in which the **WSN** network uses channels in available band, in which transmission speed and noise sensitivity are used.

Following table compares features between available types:

	STANDARD	LuPo
Radio range in line of Sight	800m	6Km
Hopping channel number	9	11
Band (*around 868MHz*)	1MHz	3MHz
Battery life	around 5 years	around 5 years
External noise sensitivity	medium	low
In case of transmission troubles	intermittent transmission	forced transmission after 6 failed tries
Collisions and crosstalks between WSN elements	medium	low
Packet queuing	low	high

Picture 49 - Comparison between Standard and LuPo

4.9 Standard and LuPo modulation compatibility.

Different radio modulations **ARE NOT** compatible among them.

A **WSN** system can works with **ONLY ONE** modulation per time, so all elements must share the same configuration.

Probes/**dataloggers** and **routers**: new devices, capable to operate in both modulation types, adapts themselves **AUTOMATICALLY** to **basestation** operation mode and the detection occurs during the enrolling procedure.

So **probes** and **dataloggers** are backward compatible with old systems using **Standard** modulation.

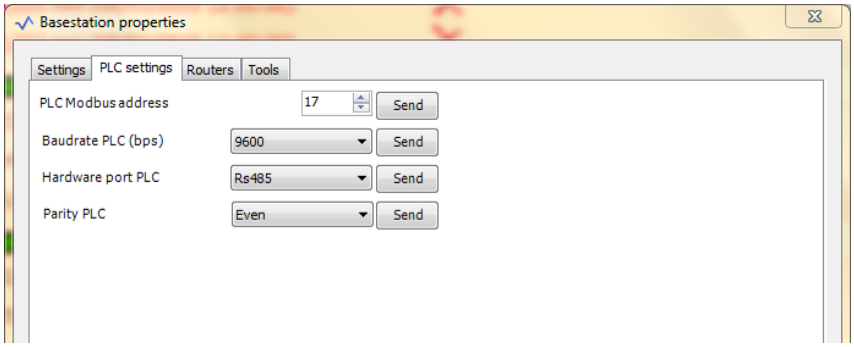
Older devices not capable of backward compatibility, can be enrolled only to **Standard** modulation **basestation**.

Basestations: new basestations are normally configured as **LuPo** modulation devices.

It’s possible to modify operative mode, in order to adapt them to older **probes**/**dataloggers** and/or **routers**, using **WineCapManager** and accessing to *Basestation* drop-down menu and select *Properties.*(*refer to Basestation configuration settings.*)

4.10 PLC Modbus interface configuration.

To display the configuration concerned to serial interface dedicated to PLC connection in Modbus protocol, open the window *Basestation* ➔ *Properties* and select the *PLC settings* sheet



Picture 50 - PLC setup

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

- **PLC ModBus address**: is the address of the device on ModBus line. Can be modified by user clicking on *Send* button. The default value is "17".
- **PLC baudrate**: is the transmission speed of RS485 channel. The default value is "9600".
- **PLC hardware port**: output selection for PLC communication (*RS485*).
- **PLC parity**: selection of parity type to be used on PLC ModBus channel. The default value is "Even"

5. Data management and visualization.

5.1 Data Download to PC.

Inside the PC database data and events coming from **basestation** are recorded. In this mode the connected **basestation** becomes a sort of radio receiver peripheral.

Basestation are capable to log in the internal memory data incoming from **probes**/**dataloggers**. This feature allows the stand-alone **datalogger** use, without any connected PC.

Anyway, when the PC is connected, an alignment procedure, to copy all data in the PC's database, is needed. To start this procedure select the **basestation** then click on the item "*Basestation → Download all measures*".

This procedure automatically looks for the download starting point for each **probe**/**datalogger** and starts the copy process for each sample.

A progress bar next to the **probe**/**datalogger** indicates the remaining time, calculated as difference between the timestamp in samples and the current time. Is a count-down which tends to zero with speed proportional to the number of samples present.

At the end of the alignment process for a **probe**/**datalogger**, the download for the next one is automatically started.

This operation may be performed also on a single **probe**/**datalogger**: select the desired **probe**/**datalogger** and click on "*Sensor → Download measures*". A download and alignment process start with related count-down.

Clicking on "*Sensor → Properties*", in the "*Tools*" menu the same command can be given with the "*Download measures*" button, but, in this case, is possible to set the download starting date to avoid the downloading of useless data. To do this, check the flag "*Force Starting Timestamp*" and set the starting date.

5.2 Local Database Synchronization to Service Centre.

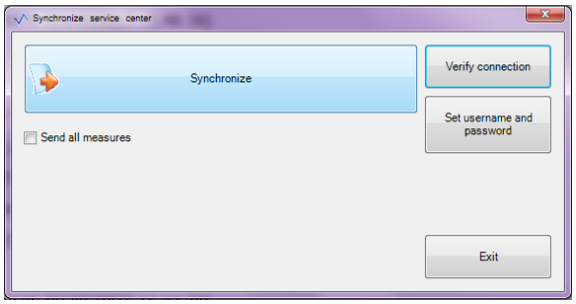
At the end of data download from the **basestation**, the PC can be used as data transmission peripheral to the **Service Centre** central database.

This feature is useful in some circumstances as a **basestation** without internet connection (*even temporarily*) or for transfer on the central database data coming from "**SD**" type **dataloggers** that can download data only to PC using USB port.

In case the **basestation** allows the automatic download to the **Service Centre**, is **STRONGLY NOT RECOMMENDED** using this function to avoid the misalignment of the periodic upload performed by the **basestation** to the central database.

Take note that the upload is differential respect the last data in chronological order inserted on **Service Centre**. Adding values a forward data shifting can be happen leaving data gaps.

To perform the alignment with the **Service Centre** click on "**Tools→Synchronize service center**". A window as the following will appear (*Picture 51*):



Picture 51 - Service Centre Synchronization

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

Set Username and password: enter account details for **Service Centre** access. The account must be valid and enabled (*by the Master profile*) for upload processes.

CAUTION: if different accounts are used, this parameter must be modified **BEFORE** starting the upload.

- **Verify Connection:** with this button a connection test can be performed to verify if the remote server is reachable and the account access information are valid.
- **Send all measures:** selecting this check box, the **basestation** will send all the PC database information to the **Service Centre**. No differential control is performed.
- **Synchronize:** starts the upload process. The PC starts the download process which will last depending on the number of **probes**/**dataloggers** and data to be exchanged. If user isn't enabled to download data from the **basestation** (*Master User managed flag on **Service Centre***) the operation will stops with an error message.

When USB **dataloggers** (*SD product line*) are connected to PC, these may merge under a single scratch database.

When the synchronization occurs, without a referred **basestation**, an available plant list (*existing or virtual*), located on **Service Centre**, will be proposed. User may decide where data will be uploaded.

Virtual plants are manually created by Master User on **Service Centre** and are enabled to data upload.

If, instead, you want to merge data from a **probe**/**datalogger** to a USB system created by a **basestation** connected to it, just select its name.

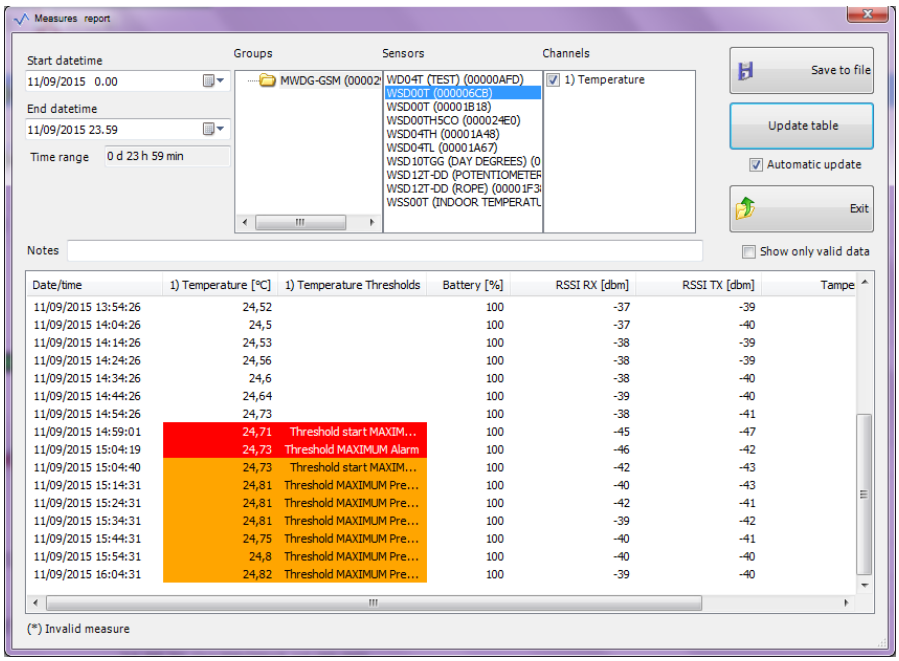
If the scratch database on the PC is already a mixed database, that contains a **basestation** with its wireless **probes**/**datalogger** and also **probes**/**dataloggers** connected via USB, the choice of the system in which upload data is not necessary, because the name of the **basestation** will be used.

These combinations make it possible to manage mixed systems, with wireless **basestations** and USB **probes** and **dataloggers**, placed in the same installation area.

At the end of the operation you can access the **Service Centre** to display the loaded data. Refer to chapter "*Access to Service Centre.*".

5.3 View and Export Table Data.

Use the menu item "*View → Measures report*" on the main panel to view the data stored in the PC. A panel similar to the following will opens (*Picture 52*):



Picture 52 - Measures report

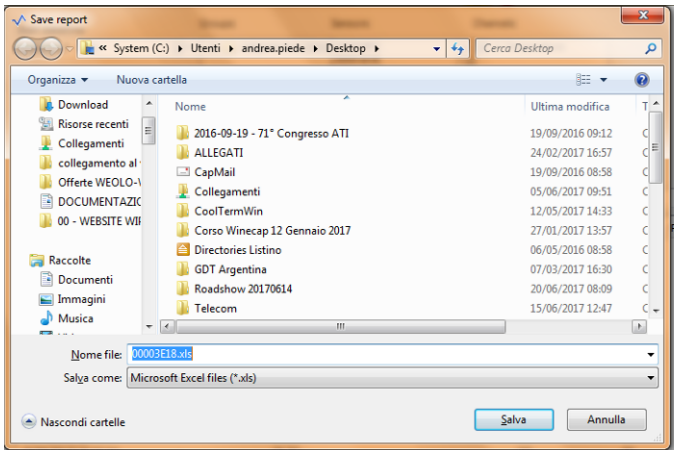
CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

At the top of the window, there are the data visualization's configuration parameters for data located in the database; at the bottom side the corresponding values table.

On the upper left side of the window, time interval of the data to be displayed, probe/datalogger and measurement channels involved can be selected and configured. Finally, there are some commands that allows exporting or updating of the displayed data.

Pressing the "*Update table*" button, the table is re-created, acknowledging the settings provided on the left and any new received data is added. Checking "*Automatic Update*" a function that is performed at regular intervals, enabling the automatic table population when new values incoming is activated.(*Picture 52*)

Exporting measurements acquired in EXCEL, WORD, HTML or CSV files is possible clicking on "*Save to file*". A classic Windows navigation panel as in the following picture, will drive the saving process (*Picture 53*).



Picture 53 - Exporting measurements

Once saved the file, an immediate visualization is proposed, opening it in the appropriate application; for example, a .htm file type will automatically open a HTML pages browser (*Picture 54*).

WineCapManager 2.9.0

Measures report

Start datetime: 11/09/2015 0.00
End datetime: 11/09/2015 23.59
Time range: 0 d 23 h 59 min

Basestation: MWDG-GSM (00002931)

Selected channels

	Sensor	ID	Measure type	Measure unit
<A>	WSD00T (000006CB)	0	Temperature	°C

Date/time	Value <A>	Threshold<A>	Battery [%]	RSSI RX [dbm]	RSSI TX [dbm]	Tampering sensor	OFFLINE
11/09/2015 12:04:19	24,65		100	-37	-39	-	OFFLINE
11/09/2015 12:04:26	25,72		100	-35	-39	-	-
11/09/2015 12:14:26	24,96		100	-38	-40	-	-
11/09/2015 12:24:26	24,73		100	-38	-38	-	-
11/09/2015 12:34:26	24,65		100	-37	-40	-	-
11/09/2015 12:44:26	24,62		100	-38	-37	-	-
11/09/2015 12:54:26	24,62		100	-36	-40	-	-
11/09/2015 13:04:26	24,61		100	-38	-39	-	-
11/09/2015 13:14:26	24,6		100	-37	-39	-	-
11/09/2015 13:24:26	24,55		100	-37	-39	-	-
11/09/2015 13:34:26	24,52		100	-37	-39	-	-
11/09/2015 13:44:26	24,52		100	-37	-39	-	-
11/09/2015 13:54:26	24,52		100	-37	-39	-	-

Picture 54 - Exported measurements display

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

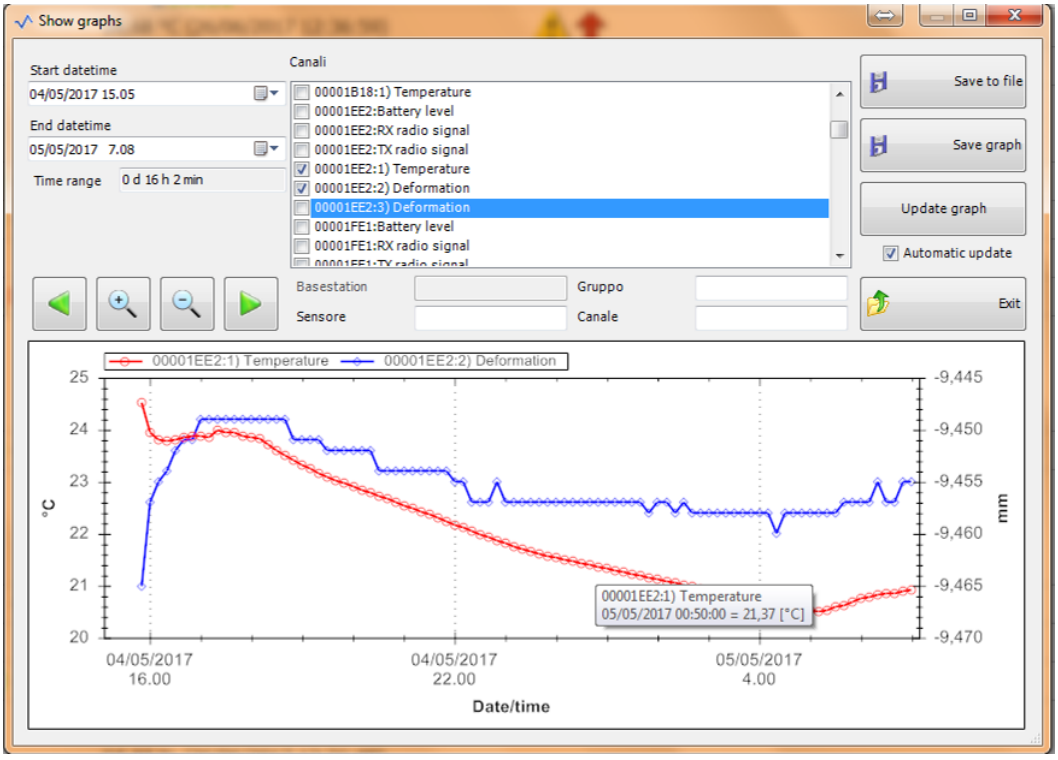
NOTE: The measures that have exceeded a previously set threshold, are highlighted with a background colour according to the type of alarm that occurred (*YELLOW for WARNINGS and RED for ALARMS*) (*Picture 55*).

11/09/2015 14:54:26	24,73	
11/09/2015 14:59:01	24,71	Threshold start MAXIM...
11/09/2015 15:04:19	24,73	Threshold MAXIMUM Alarm
11/09/2015 15:04:40	24,73	Threshold start MAXIM...
11/09/2015 15:14:31	24,81	Threshold MAXIMUM Pre...
11/09/2015 15:24:31	24,81	Threshold MAXIMUM Pre...
11/09/2015 15:34:31	24,81	Threshold MAXIMUM Pre...
11/09/2015 15:44:31	24,75	Threshold MAXIMUM Pre...
11/09/2015 15:54:31	24,8	Threshold MAXIMUM Pre...
11/09/2015 16:04:31	24,82	Threshold MAXIMUM Pre...
11/09/2015 16:14:31	24,84	Threshold MAXIMUM Pre...

Picture 55 - Highlighted measurements for threshold overcoming

5.4 Diagrams Visualization.

To display data in graphical mode select the "*View → Show graphs*" menu item from the main window. This will open a panel similar to the following (*Picture 56*):



Picture 56 - Diagram visualization

Fields in the left upper corner of the window are used to define the time interval of data to be displayed.

To select data to be represented, the desired label in centre page must be selected. The below filters can speed up the operation.

Filters can be applied to:

- **datalogger**'s (*sensor*) name (*Mac address*);

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

- **datalogger**'s group (*if exist*);
- **datalogger**'s channel;

List will be updated with the items that satisfy the filter's values.

Multiple quantities can be simultaneous selected to compare data and, maintaining the mouse pointer on a curve's single point, a tooltip window will shows the timestamp and the value related to the sample measured in that point.

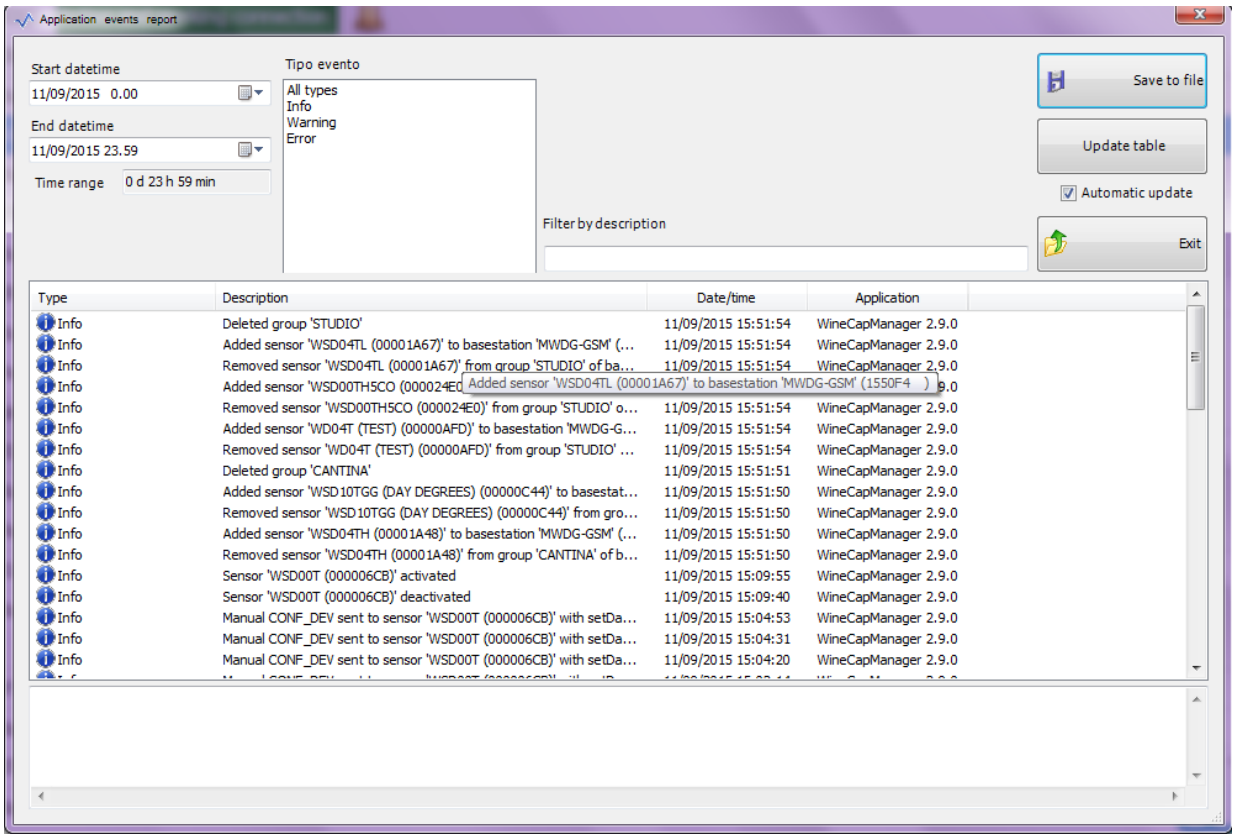
Clicking on "*Save to file*" data can be exported in EXCEL, WORD, HTML or CSV files meanwhile clicking on "*Save graph*" allows a BMP image saving.

"*Zoom +"* and "*Zoom –"* and right/left movement buttons are used to change the display interval quickly.

Same functions are available using mouse moving diagram area (*left/right*) and mouse's wheel to zoom (*forward or backward)*.

5.5 View Event Summary.

A summary of some events registered during software operation (*Picture 57*), regarding network management, devices configuration and any alarms due to communication problems, is available: "*View → Application events report*".



Picture 57 - View event summary

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

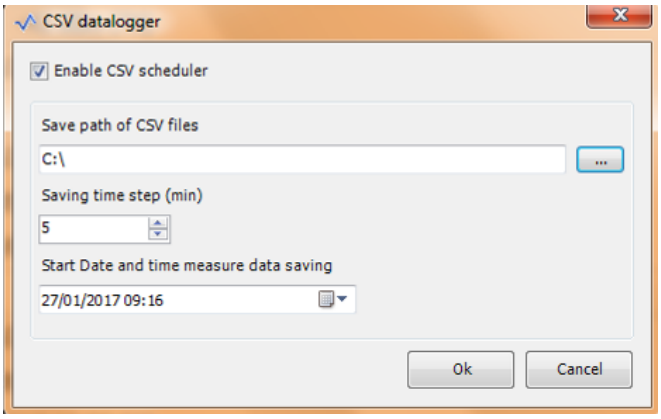
5.6 Automatic Saving Data to Disk.

5.6.1 CSV Scheduler.

The software can trigger an automatic save process to generate a CSV report regarding **probes**/**dataloggers**.

To enable this feature access to "*Tools → CSV datalogger*".

A setup window as following will appear (*Picture 58*):



Picture 58 - CSV scheduler setup

The feature must be enabled with proper checkbox

The folder path where files should be downloaded and the timing of savings in minutes must be chosen.

Clicking on the "*OK*" button the process begins and, periodically (*equal to the time interval previously set*), saves a file for each **probe**/**datalogger** containing data received in the last period.

The file name is recognizable, sortable and is composed as follow:

"***MACAddress_ChannelIndex_SaveTimestamp_ProbeLabel.csv***"

Where:

- *MACAddress* : **probe**/**datalogger** MAC address
- *ChannelIndex* : measurement channel number (*on base 0*)
- *SaveTimestamp* : with yyyyMMddHHmmss format
- *ProbeLabel* : label set on **probe**/**datalogger**, if present.

Inside the file, the format is set as following:

- *Field delimiter : ";"*
- *Record delimiter:* CRLF
- No header line at the beginning of file.

5.6.2 Field list

- Unique ID of the measure, useful to distinguish two measurements and filter out any repetitions
- Sample timestamp in "yyyyMMddHHmmss" format
- Battery level
- Tx radio signal
- Rx radio signal
- Tamper alarm
- Sample, in float format, as shown in report, with decimal separator
- Threshold Level

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

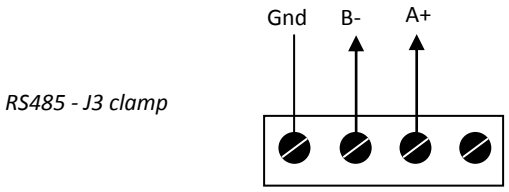
- Threshold transition
- Upper Threshold

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

6. Analog and ModBus connections.

6.1 Basestation ModBus Connections.

Basestations, in addition to the USB port to connect to PC, have a communication line with RS485 ModBus protocol to be interfaced with an independent external PLC.



Picture 59 - RS485 connections

Communication default parameters:

- *Baud rate:* 9600
- *Parity:* pair
- *Data bit:* 8
- *Stop bit:* 1

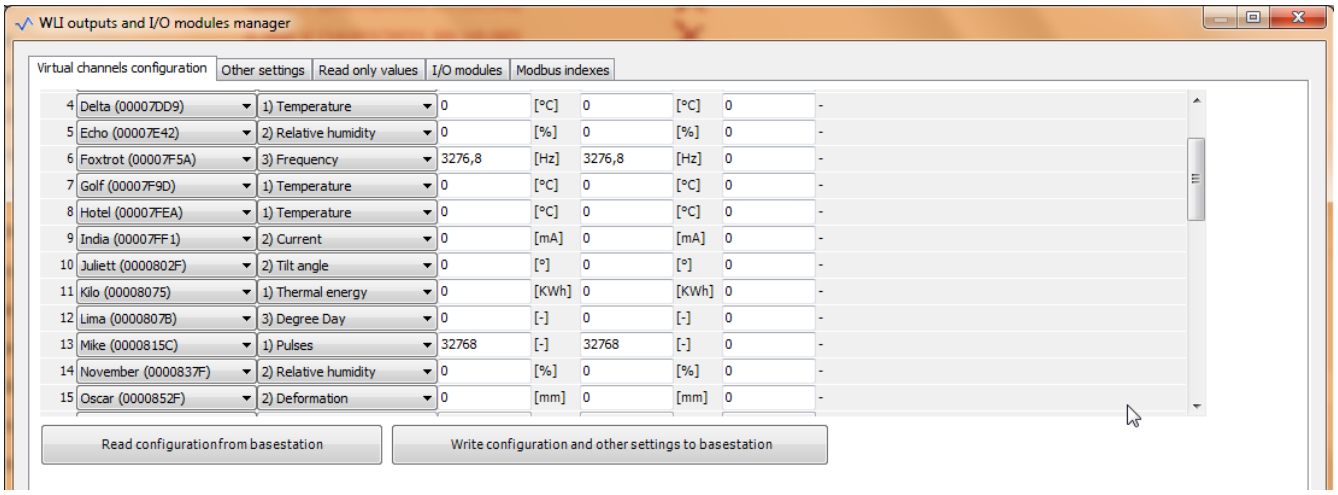
Changing these parameters is done with the PC, refer to "*Basestation configuration settings.*".

After changing this setting, the **basestation** must be restarted. Command "*Basestation → Reset Hardware*" can be used.

6.2 Modbus and Analog Outputs Description.

Modbus and analogue outputs configuration is done using "**WineCapManager**" software, opening the "*Basestation → WLI outputs and I/O modules manager*" panel from the main menu.

The output management panel allows the configuration of up to 40 outputs using a table (*Picture 60*).



Picture 60 - WLI outputs and I/O modules manager

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

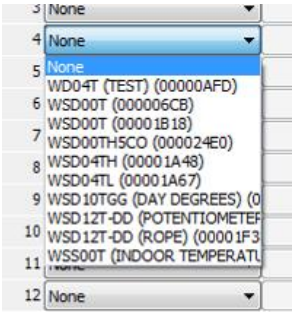
Columns must be set in the following order:

1. "**Sensor**" column (*Picture 61*).

   Is the column that allows the association between the Modbus register number or the analog ouput defined by "**ID**" column, with the corresponding **probe**/**datalogger** defined by its name or MAC Address.

   To create a new association or to change an existing one, click on the selected cell; a drop-down list will appear allowing the **probe**/**datalogger** selection.

   Please note that selecting the item "*None*", the corresponding output will be considered as turned off, so it will give "NULL" value by default.



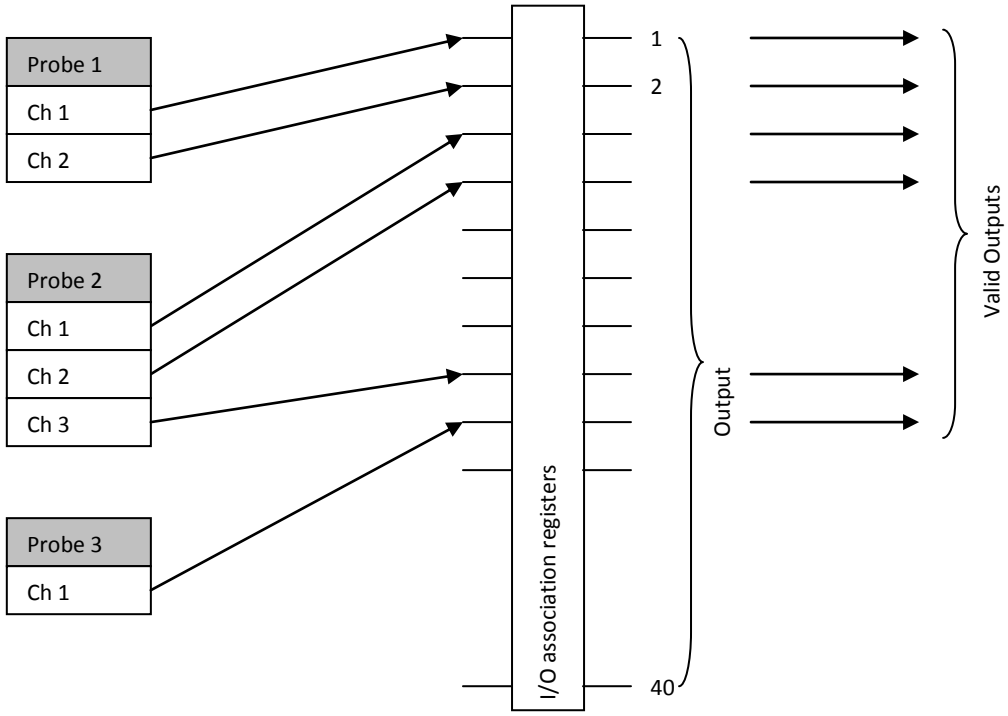
Picture 61 - Probe/datalogger association between Mac address and Modbus register

2. "**Channel**" column.

   Available measurement channels belong to the selected **probe**/**datalogger** in the previous column; selecting the channel, the association is defined therefore between the sample read by the **probe**/**datalogger** and the analogue output.

   The same channel can be repeated on different outputs.

   Following, a diagram (*Picture 62*) representing an hypothetical configuration **probe**/**datalogger** + channel = output.



Picture 62 - Modbus registers configuration example

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

3. "**Min.value**" column.

   Used to define the **probe**/**datalogger**'s reading value corresponding to the minimum output value. For the 0-10V output, defines the sample where the output is 0V.

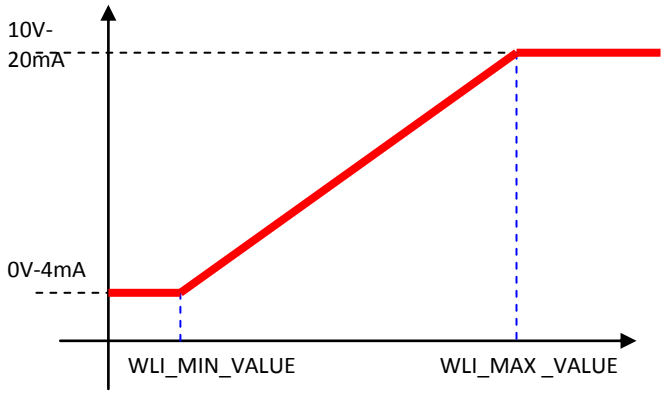
4. "**Max.value**" column. Used to define the **probe**/**datalogger**'s reading value corresponding to the maximum output value.

   For the 0-10V output, defines the sample where the output is 10V.

   The two values must be in ascending order, otherwise the software will automatically correct them.

NOTE: "**Min.value**" and "**Max.value**" columns allows to increase the values precision in the analogue output causing a detriment of overall dynamic (*Picture 63*).

Considering a restricted value range (*for example 15 °C and 30 °C*) it will be distributed in according with output currents and voltages (*0V/4mA for lower values and 10 V/20mA for upper values*).



Picture 63 - Proportionality between Modbus register value and voltage/current

5. "**Group**" column.

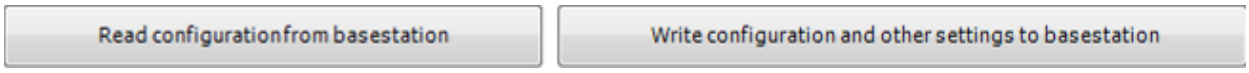
   Allows the bundling of analogue outputs in groups; associating multiple outputs to the same group, means to put in output the average value of all valid measurements coming from **probe**/**dataloggers** belongs to the same group during the state of "**MISSING**".

   The '0' value indicates a channel which not belongs to any group.

   Values published on ModBus aren't affected by this mechanism; the published value is always the last one.

To save outputs configuration click on "*Write configuration and other settings to basestation*" button.

Using the "*Read configuration from basestation*" button, device current configuration can be read and changes not saved can be overwritten. (*Picture 64*).



Picture 64 - Modbus registers configuration read/write buttons

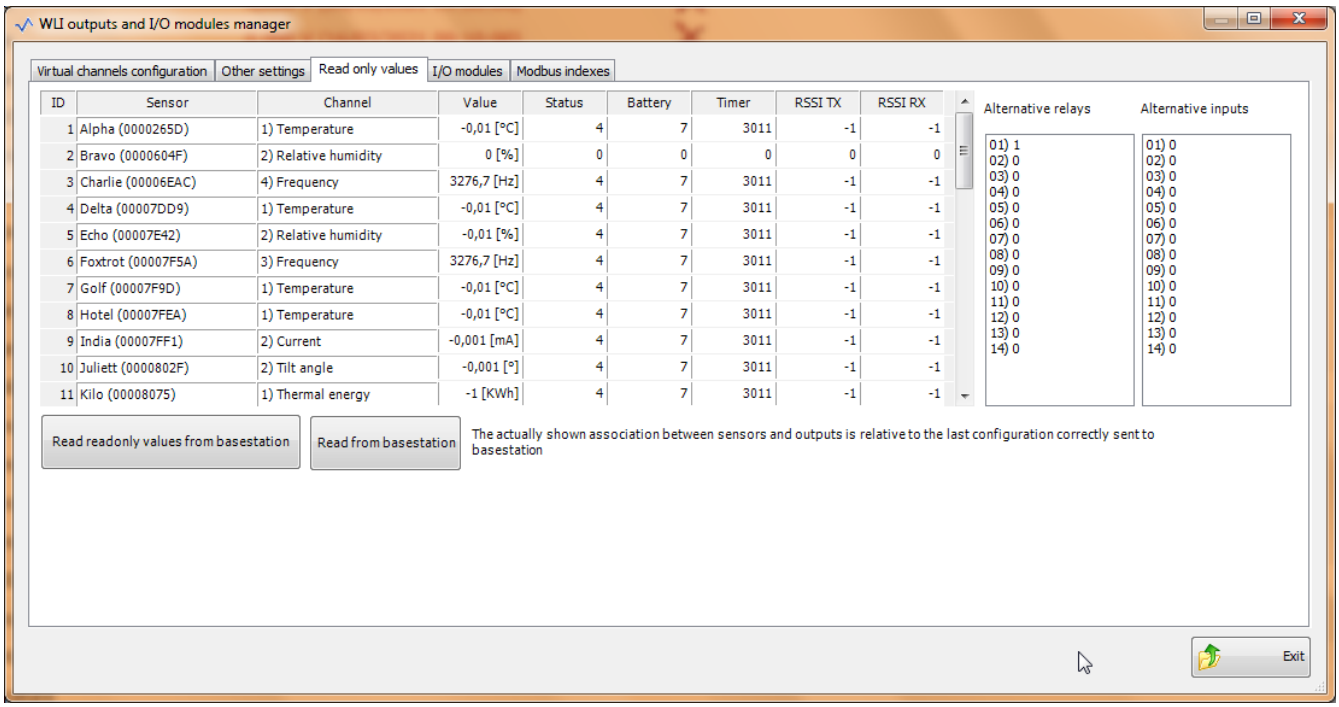
NOTE: After outputs table saving, a device restart is needed. This operation can be done disconnecting the power supply or using the "*Basestation → Reset Hardware*" menu item.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

6.3 Modbus outputs display.

The application is capable to read same values published by serial port using Modbus communication in order to verify the proper system configuration.

Selecting the "*Read only values*" button, the following panel will appear (*Picture 65*):



Picture 65 - Modbus outputs display

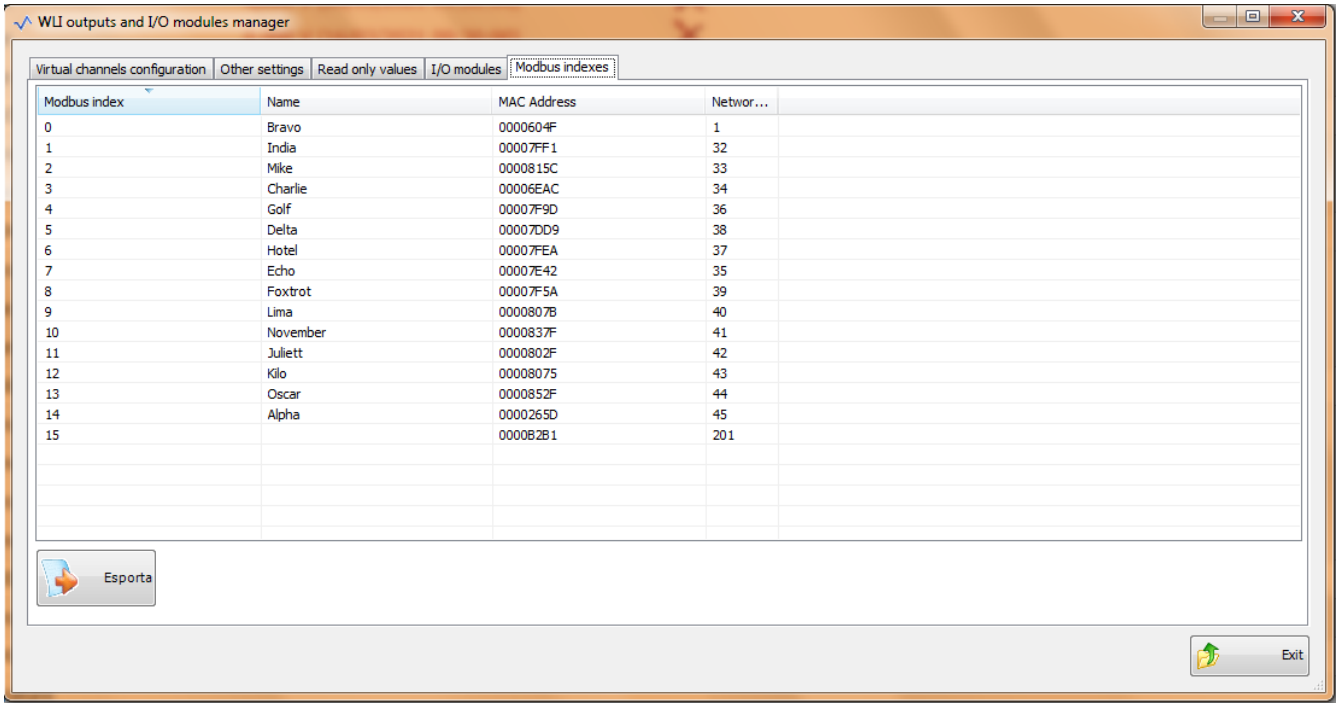
Is a table where rows represents the output channel number (*1-40*), and the following columns:

1. **Sensor**, is the probe/datalogger's MAC Address.
2. **Channel**, is the probe/datalogger's channel with the measurement type specified.
3. **Value**, is the last value acquired which corresponds to the first Modbus register reading.
4. **Status**:
   a. 0 = Reset (*not configured*)
   b. 1 = Init
   c. 2 = Ok
   d. 3 = Missing
   e. 4 = Fail
5. **Battery**, is the last value of the probe/datalogger's battery related to that channel.
6. **Timer**, is the time elapsed since the last successful update; it resets automatically whenever the probe/datalogger sends a new sample. In case of fail time value overcoming, this counter will not be updated but will remain fixed to setup T_f value.
7. **RSSI TX/RX**, are last values on signal power for reception and transmission, referred to the probe/datalogger.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

6.4 Modbus Indexes.

The "*Modbus Indexes*" tab allows to display the list of configured devices on transmission channel, organized by Modbus index (*Picture 66*):



Picture 66 - Modbus indexes

6.5 Values Reading Using Serial Modbus Communication.

To access values using the Modbus line, to let the **basestation** posts these values on the communication channel, the channels setup, as described in previous chapters, must be done.

For tables related to Modbus registers meaning, refer to "*WA5062E_WineCap_-_PLC_ModBus_Specifications_-_Rxx.pdf*" manual located in "*Manuals*" folder in the provided CD or directly on *Post-Sales Support* on www.capetti.it website.

Chapter describing the register set corresponding to the previous setup operations is the "*4.1. Programmable OUTPUT registers*"

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

7. Connectivity.

Basestations are capable to connect or accept connections, to enable a plant's remote management, and can answer to a *Machine-To-Machine* GSM call in order to be connected with a remote PC, or to automatically activate a data session to transfer data acquired and information to an internet server called Service Centre.

7.1 GPRS/LAN Connection.

This is an automatic functionality. At regular intervals, the connection is triggered and the alignment between historical data and central database is performed.

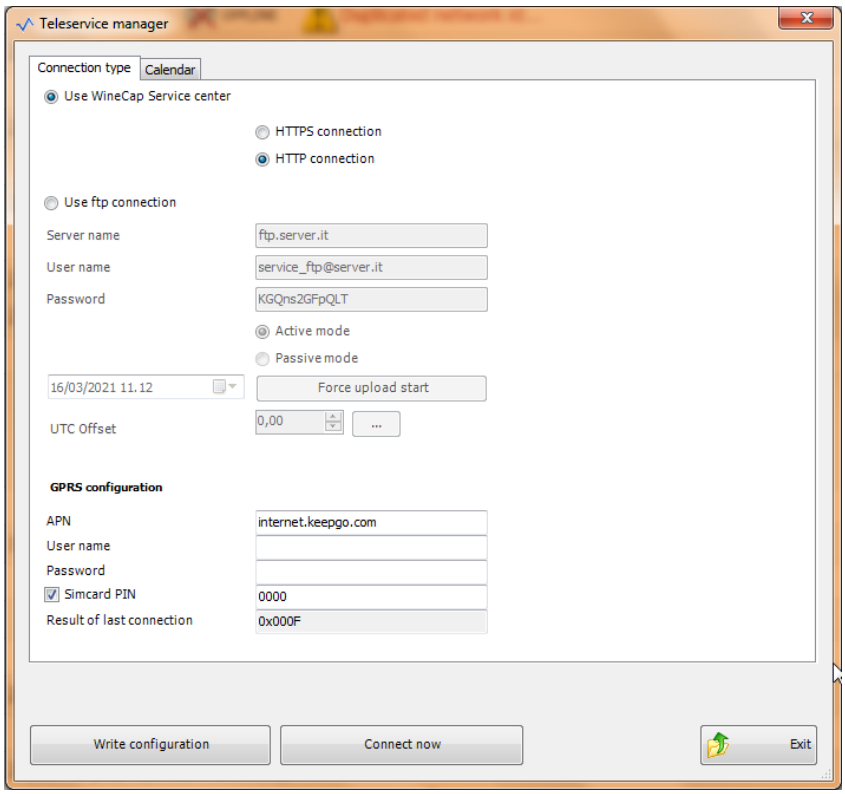
Data amount is compressed to reduce transferred bytes.

At the end of the process, the connection is closed to make modem available for a possible remote call and to reduce connection time, in case of hourly charging.

To setup connection parameters click on "*Basestation → Teleservice manager*".

7.1.1 *Connection Type.*

The "*Connection type*" (*Picture 67*) panel allows the Service Centre connection setup or, as an alternative, to setup the connection parameters for a FTP connection where basestation data will be uploaded.



Picture 67 - Teleservice manager - WineCap Service Centre connection

If the WineCap™ Service Centre will be used, the "HTTP" or the "HTTPS" protocol can be selected. Moreover, the "*Use WineCap Service center*" must be selected.

Basestation is independent and automatically connects, at regular intervals, to the Service Centre to align data.

- **APN**: insert the Access Point Name of the mobile operator used.
- **User name**: needed if requested by mobile operator.

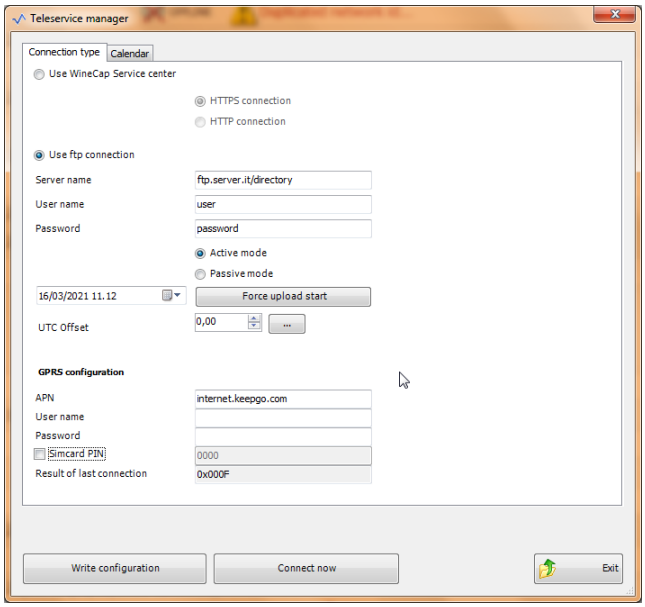
CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

- **Password**: needed if requested by mobile operator. User name and password normally are not requested but, with some operators, may be useful don't leave these fields empty. In case insert "x".
- **Simcard PIN**: enable and insert PIN if requested by the inserted SIM. An anti-lock control prevents to insert PIN if fail tries are done. Always verify the correct PIN and the unlock procedure using a mobile phone.
- **Result of last connection**: shows a code regarding the result of the last connection.

As an alternative, if a connection to an owned FTP is used, the item "*Use ftp connection*" must be selected and the following fields must be set:

- **Server name**: insert the IP address or the URL that univocally identifies the FTP server (*Host name*), including path of directories.

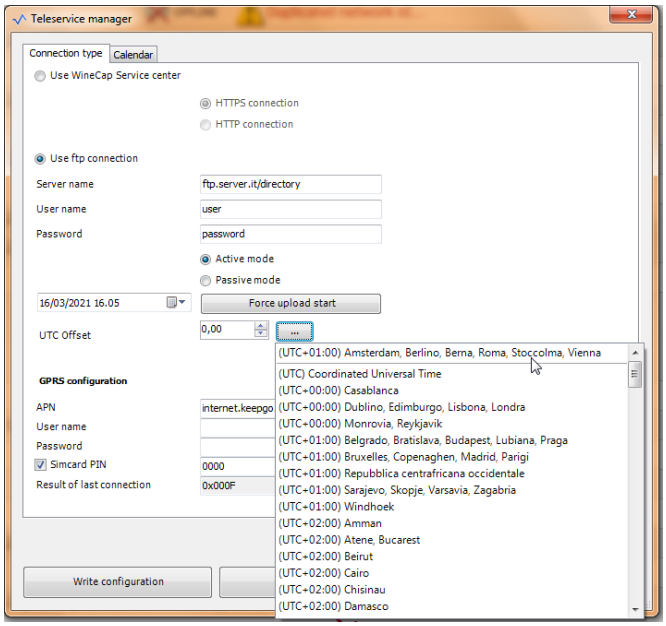
  ATTENTION !! - The maximum lenght of the whole string (*server name and directories*) must not exceed 32 characters.
- **User name**: insert user name.
- **Password:** insert user password.
- **Mode**: active or passive depending by used server.
- Select from drop-down list menu, data logging date and time, then click on "**Force upload start**" to confirm.



Picture 68 - Teleservice manager - FTP configuration

- **Offset UTC**: allows the setup of a time offset that is added to all the dates written on the destination file (*refer to Picture 69*). - **ATTENTION** - the reference is **ALWAYS** Greenwich (*GMT*).

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it



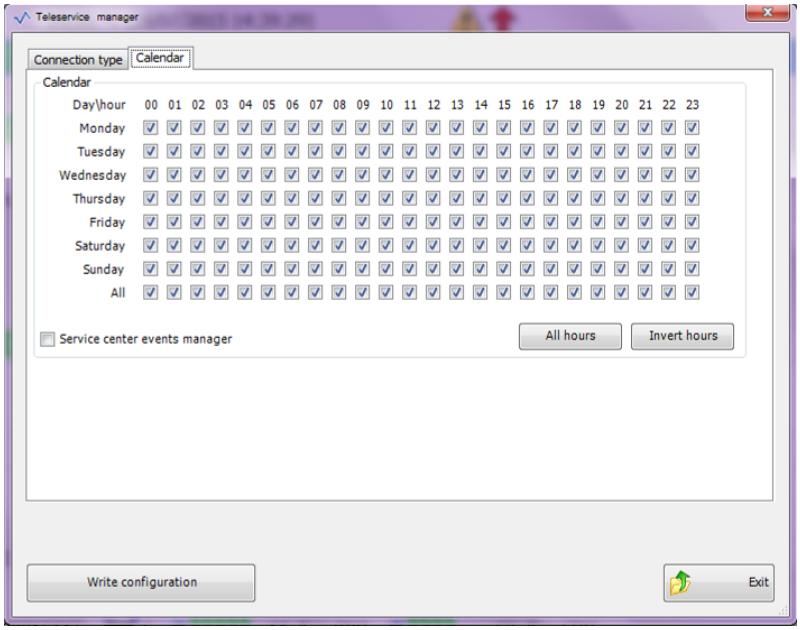
Picture 69 - Teleservice manager - UTC offset

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

The **"Write configuration"** and "**Connect now**" buttons are common for both configurations:

- **"Write configuration"** confirms the configuration set-up. After configuration, a device restart is needed. This operation can be done disconnecting the power supply or using the "*Basestation → Reset Hardware*" menu item.
- "**Connect now**" corresponds to the "*Connection*" command that can be issued using the **WinecapKey** (*refer to Picture 12*) and performs a connection immediately without waiting for the hour deadline.

7.1.2 *Calendar.*



Picture 70 - Teleservice manager - Calendar

This matrix (*Picture 70*) is used to define when the **basestation** must connects to **Service Centre**.

Hours and days of the week are selectable to schedule connections. The maximum frequency is once a hour, meanwhile the minimum frequency is once a week.

The item "*All*" located in the last row, select the same schedule for all days.

- **Service Centre Event Manager**: if selected, this option forces the connection and the alignment to notify of asynchronous events as threshold overcome/return, **probe**/**datalogger** online/offline, **probe**/**datalogger** malfunction.

  Connection frequency can be increased depending by the number of **probes**/**dataloggers** in the system and by records of signals and alarms.
- **All hours**: this button allows the simultaneous selection of all hours for all days of the week.
- **Invert hours**: this button allows to invert the current selection.
- **Write configuration**: confirms the configuration set-up.

During the connection, the *CCS STATUS* led lights in *GREEN*. When the connections stops before the normal end, the led flashes in RED for three minutes, then, automatically, retries the connection. When the final result is positive, communication is closed and led goes off.

To verify the connection to **Service Centre** without waiting for the scheduled time, a manual operation can be performed.

This procedure can be done using the "virtual" button capable to receive different user's commands.

To issue commands to **basestation**, approach the **WineCapKey** to the sensible area and wait for 4 AMBER flashes. (*refer to Basestation user interface.*).

NOTE: The GSM/GPRS modem turns off and **IS NOT USABLE** when the USB port is connected, in order to avoid communication conflicts.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

To verify the radio signal quality after configuration, the USB cable must be unplug and wait for the *GREEN* "GSM" led lights and starts to flash slowly, declaring the SIM correct registration on the mobile network.

7.2 GSM Connection.

To use this feature, an M2M (*Machine-To-Machine*) enabled SIM must be inserted in the **basestation**.

The "GSM"*GREEN* led declares connection status to GSM line:

- 1 flash/second = connection disabled, SIM not inserted, with PIN to be inserted or with reception troubles.
- 1 flash every 4 seconds = GSM network access enabled.
- Led lighted = call in progress.

The connection call starts from PC selecting the remote connection type (*refer to Remote Connection System Access.*), then an automatic answer is given and communication established.

Operative speed is very low, so this mode is not recommended for data download.

If necessary, consider that connection time will be proportional to number of **probes**/**dataloggers** and to setup sample time.

Typical use of the GSM call is remote management and supervision of the **basestation**.

With User Interface (*refer to chapter Basestation user interface.*) a "*GSM SIGNAL TEST*" can be performed*:* modem measures the received signal amplitude and shows it as *CCS* led flashes.

This feature can be useful to know if the mobile operator signal is sufficient and/or if the antenna is correctly placed in order to obtain the best signal quality.

7.3 Access to Service Centre.

To access to **Service Centre** a customer account (*username and password*) is needed.

The website is: http://www.winecap.it

With the account, also the **basestation**'s connection and the data download features are enabled.

The **Network Key** (*refer to Basestation → Properties*) is used as traffic cryptography key to the **Service Centre**.

To modify it, access to **Service Centre** account, to align it and restore the correct data exchange.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

8. SD Dataloggers.

8.1 Main features.

SD type **dataloggers** (*no wireless*) are devices capable to store data and make them available using an USB cable.

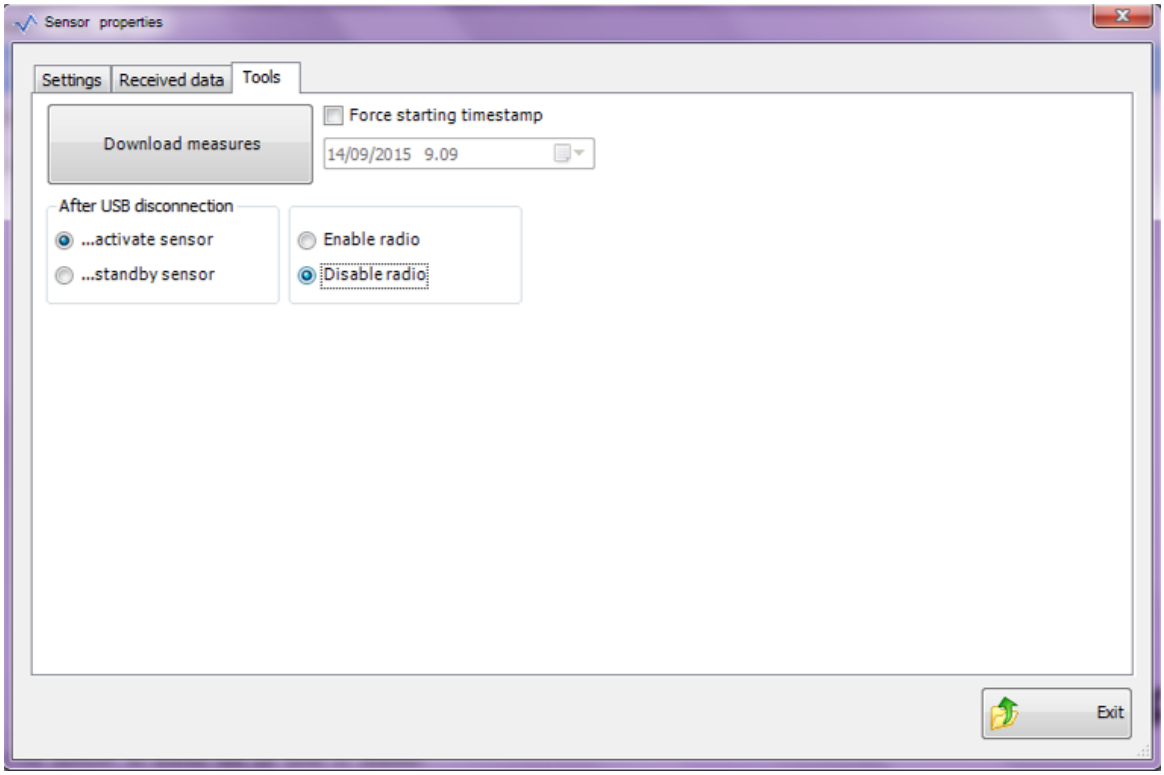
Like **basestations**, their configuration expects the connection with PC using **WineCapManager**.

Start **WineCapManager** and select "*Local connection*".

Let the system recognizes the **datalogger** previously connected with USB cable.

The first control performed by PC is related to the **datalogger**'s internal clock. If the timestamp is different from the PC, an alignment will be necessary.

Clicking on "*Sensor → Properties*", in the "*Settings*" folder, fields needed to setup sample intervals and thresholds will appear, while in the folder "*Tools*" (*Picture 71*), the **datalogger**'s behaviour, when USB cable will be unplugged, is established:



Picture 71 - SD Datalogger - Properties

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

- **activate sensor**: in this case the **datalogger** starts to sample immediately after the USB detachment.
- **standby sensor**: after the USB detachment, the **datalogger** goes in *STAND-BY* mode. The sampling session can be started manually (*refer to **STAND ALONE COMMAND** TABLE***STAND ALONE COMMAND** TABLE).
- **Enable/Disable radio**: this option exists for **WSD** (*wireless*) **dataloggers**.

  Selecting "*Disable radio*" these **dataloggers** can be used as simple **USB loggers**, without connecting with a **basestation**.

  With radio enabled, instead, the **datalogger**'s behaviour, when the USB cable is disconnected, isn't selectable, because already established by wireless connection.

8.1.1 Hybrid Use

Wireless **dataloggers** used as simple **USB loggers**, with disabled radio, allows to enable the radio connection also "in field" during the sampling activity. This operation can be done simply using the association command to the **basestation** (*refer to **STAND ALONE COMMAND** TABLE*).

Since connected to the **basestation**, **dataloggers** also starts to download data previously acquired, so recovery using USB is not needed.

This feature can be useful to advance **datalogger**'s installation against **basestation** installation.

This operation can't be undone: to bring back **dataloggers** to USB mode, a PC connection is needed.

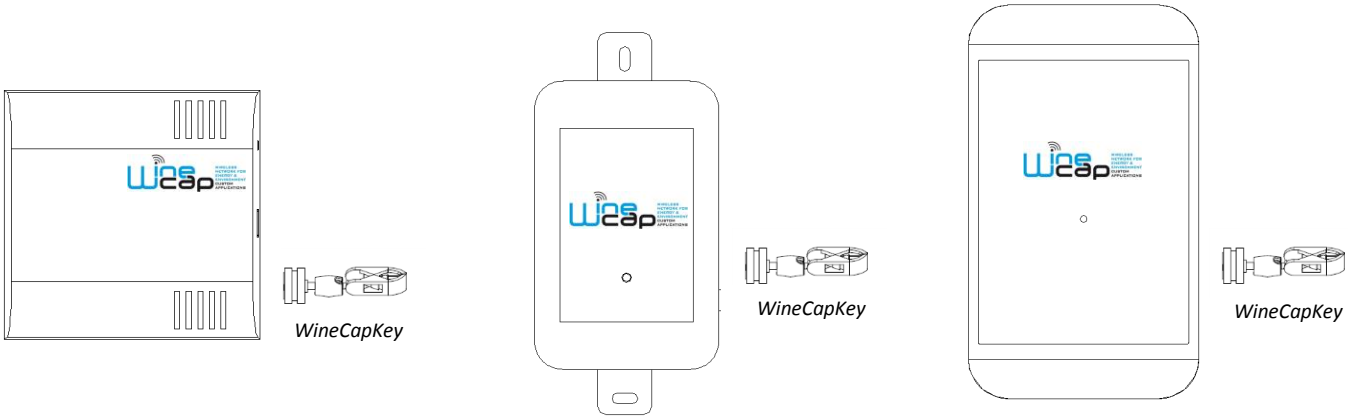
At the end of the sampling session, **datalogger** can be connected to PC and clicking on "*Sensor → Download Measures*" starts samples download to the PC's local database.

After this operation, upload data to **Service Centre** can be performed (*refer to Local Database Synchronization to Service Centre.*).

8.2 SD Datalogger User Interface (*no wireless USB logger*).

No wireless **datalogger**'s user interface (*Picture 72*) has the same way of interaction but with some different commands.

A particular feature is the on-board clock. For this reason is very important to verify its status and, if needed, configure the **datalogger** at least once using software installed on PC.



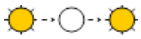
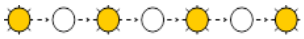
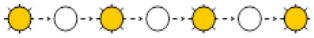
Picture 72- WineCapKey positioning

Once the **WineCapKey** is detected near the sensible point (*Picture 72*), the led periodically emits *AMBER* flashes with a 2 seconds cadence.
For each flash, a different command is associated; to confirm the command the **WineCapKey** must be removed from the sensible area immediately after the number of flashes corresponding at the desired command.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

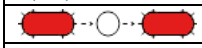
The following COMMAND table describes the available commands:

STAND ALONE COMMAND TABLE

Flash count	Command	Description
 1 flash	**STATUS**	Shows the device STATUS. As answer the led perform a flash sequence as reported in the "STATUS" table.
 2 flashes	**ACTIVATE**	If the device is in *STANDBY* mode, with this command pass in *ACTIVE* mode starts sampling with previously set configuration using software. If the device is already active, the command has no effect. Verify led answers using **"*STAND ALONE STATUS Table*" table.**
 3 flashes		AVAILABLE ONLY for **WIRELESS PROBES/DATALOGGERS** (*refer to Probes/dataloggers/routers WSN network configuration.*)
 4 flashes  + 4 flashes	**STANDBY**	Temporary device deactivation: the device is stopped. The sampling process is turned off. To reactivate, a TEST command is necessary. The STANDBY command must be given twice to confirm it: at the first sequence the led flashes alternating RED and GREEN lights, waiting for the second confirm sequence within 15 seconds. At the command execution the led flashes as the STANDBY status (*refer to **STAND ALONE STATUS** Table*).
 5 flashes  + 5 flashes	**STANDBY + Deleting historical data**	The device performs the memory deleting procedure and goes in STOP status. All samples and configuration data are LOST. Also in this case, command must be given twice to confirm it. At the command execution the led flashes as the "*STANDBY*" status (*refer to **STAND ALONE STATUS** Table*). To reactivate the device an ACTIVATE command is needed

Picture 73 - Stand-alone command table

STAND ALONE STATUS Table:

Flash count		STATUS
	1 green flash, 2 seconds long	**ACTIVE**
	2 red flashes, 2 seconds long	**STANDBY**
	Short red flash, 2 seconds, short red flash series	**FACTORY RESET** **Probe clock INVALID!** **PC connection needed.**

Picture 74 - Stand-alone status table

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

9. Wireless plant installation guide lines.

9.1 Radio Range.

In a wireless network the radio signal coverage may depends from different factors as electromagnetic waves impermeable obstacles, reflections, electromagnetic noises.

Materials which impedes electromagnetic waves propagation are metals, so metal grills, fire doors, pipes, electric cables or dense materials as reinforced concrete, stone walls or embankments.

On the other hand the propagation is very good through glasses (*if not anti-emissive*), drywalls, brick walls, open spaces.

In order to guarantee the communication, is necessary to position the network's elements where the radio signal is better and where a "path" to the **basestation**, free from metal or reinforced concrete obstacles, can be intuited.

9.2 Installing the Basestation.

The radio signal origin and the cornerstone of the network is the **basestation**.

The place of its installation is a critical choice which must take account of various factors:

- It must be as central as possible compared to the hypothetical distribution of measurement points, to reduce distances and use of routers.
- Using a field plan in order to know distances and measurement points distribution related to **basestation**'s position is strongly recommended.
- The **WSN** antenna must not be placed in shielded facilities from shelves, metal cabinets, pipes or reinforced concretes.
- Also sub-basements deep under the surface, blocks the signal propagation. In these cases the antenna can be placed in a better point using cable extension.
- Placing the **basestation** (*or antenna*) in a raised point, away from obstacles and accidental tampering is recommended.
- If remote connection is needed, verify the presence of **GSM** signal.

Before **probes**/**dataloggers** installation, place the **basestation** considering the suggestions above and verify the power supply. This operation will create the network service to host all the devices.

9.3 Installing probes/datalogger.

The position of **probes**/**datalogger** is determined by the point where the measure must be sampled.

Consider that small movements can improve the quality of the radio signal then supply better connection stability.

To verify the measured signal by a **probe**/**datalogger** a *TEST* can be performed (*refer to **WIRELESS MODE COMMAND** Table*).

Panel led flashing indicates the quality of radio signal with updates every 5 seconds.

CAUTION: in case of the **probe**/**datalogger** is in low radio signal conditions to connect with **basestation**, it retries a few times before reporting with led flashing, the absence of radio signal. Normally a timeout of about 20 seconds is necessary to be sure of a good communication.

When the installation point is not directly reachable, **routers** (*or repeaters*) can be used. **Routers** are devices capable of receive and transmits information, so capable to increase the radio coverage.

Can also convey information through other **routers** in the network, optimizing the path to the **basestation**.

The network is formed automatically with a ramification of connections ranging from **probes**/**dataloggers** to the routers and finally to the **basestation**.

A **router** can be intended also as a redundancy element, an alternative path to be used in case the connection between the **probe**/**datalogger** and the **basestation** were missing due to a sudden obstacle or to a **probe**/**datalogger** movement.

9.4 Installing Routers.

Router must be placed in an intermediate position of the connection to be created.

In case as the picture below (*Picture 75*), the **probe**/**datalogger** S1 hardly reach (*1 signal notch*) the **basestation** C, then a **router** R is inserted between C and S1.

The placement of the **router** must be chosen carefully, to make sure to take advantage of the radio coverage also for the benefit of other **probes**/**dataloggers** in the vicinity, creating redundancy.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

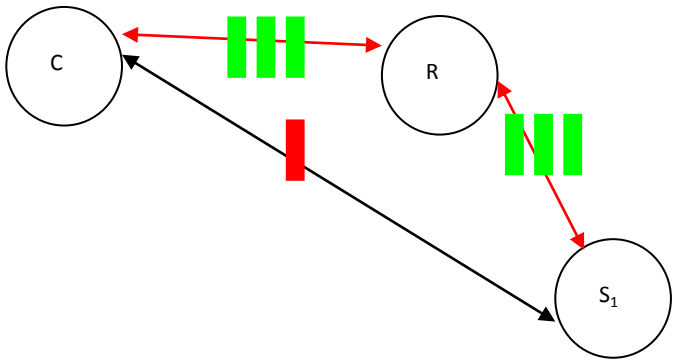
Normally, the most strategic position must be identified using field plans of the installation site consider the positions of the measuring **probes**/**datalogger** to be installed.

The radio coverage of a **router** is to be considered "spherical", and therefore can help communication in both horizontal directions, on the same floor, both vertically, between the planes through the insoles.

In fact it will never be truly spherical, because of shape and variability of the obstacles present in various directions.

Placing the **router** in free points to several directions (*centre long corridors, foyers, stairwells*) allows using of its function as a link between distant points of the network.

To add a **router** to the system, an association procedure using the **basestation** is needed. It's impossible associate **probes**/**dataloggers** or **routers** "in field" using other **routers**, but this procedure must be done in **basestation** proximity (*refer to Not configured System - Probes/dataloggers and routers association.*).



Picture 75 - Router displacement

Executing the "*TEST*" command on the **router**, using the led flashing, the quality of radio signal can be evaluated, going away from the **basestation**.
At the desired installation point, signal must be at least of 2 *YELLOW* flashes to guarantee communication stability.

Now the **router** can become a point of reference for **probe**/**datalogger**'s communication.

Placing **probes**/**dataloggers** in *TEST* mode and turn them away from the **basestation**, beyond the point of minimum signal, they lose the connection with the network and enter a state of signal searching (*OFFLINE*).

In this condition, **probes**/**dataloggers** can detect the **router** presence and establish a connection.

All the data sent by **probes**/**dataloggers** will be received by **router** that will repeat them to the destination (***basestation***).

In most cases, this phenomenon happens automatically, because with a very weak connection, link can be lost and the search for a new connection starts spontaneously.

If the communication is quite stable, this event must be manually forced to immediately appreciate the result.

This operation is performed putting the **probe**/**datalogger** before in *STANDBY* mode (*command 4, 2 times - refer to **WIRELESS MODE COMMAND** Table*), then in *TEST* mode (*command 2 - refer to **WIRELESS MODE COMMAND** Table*) forcing a loss of communication and then a new search where the **router** will be detected.

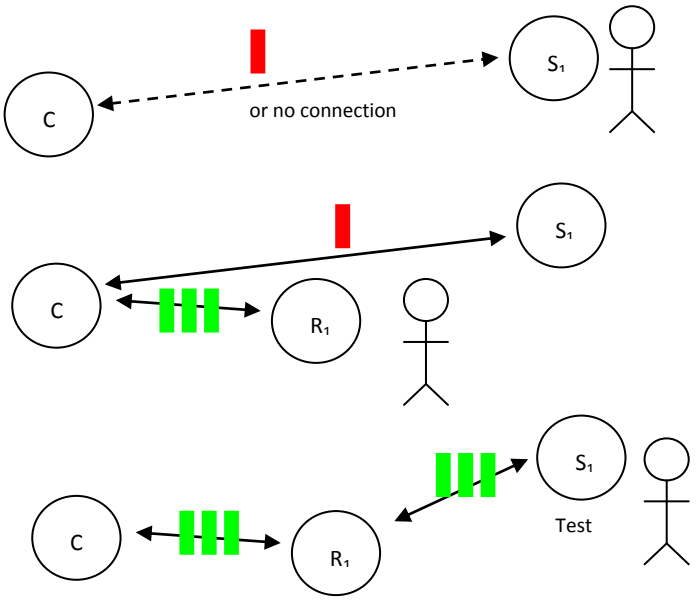
The automatic research mechanism and the choice of the best path, starts automatically when needed (*probe/datalogger placement variations, obstacles adding*), so, the network must be intended normally static but capable of self-adapting changing itself according to environment changes.

An exception may occur if the **basestation** is turned off. This causes a loss of communication that propagates to all elements of the network, as the point of reference and destination of all communications fails.

When the **basestation** is turned on, the network rise up and connections are restored.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

Router insertion example:



Picture 76 - New router addition

9.5 Using Tester Probe.

To facilitate the installation process, the tester **probe** (***WD04T***) use is recommended.

This device is capable to give precise indication of the radio signal quality available in one place and to facilitate the research for the best point or the decision to add a **router** to improve it.

It must be also associated with the system to be installed and then, at the end of the process, if necessary, removed.

It's equipped with a display on which, when placed in the *TEST* through the usual interface with the **WineCapKey**, displays the intensity of read signal in percent or in dBm.

An additional useful information to the installer, is the address of the access point to the network. When the **WD04T** is connected to the **basestation**, it displays the value "0", meanwhile, when the communication is modified and passes through the **router**, displays its Net ID.

It's very important to trace the **router**'s NET address when it's added to the network and also its installation position on the field plan.

In this way, information displayed by the tester **probe** can be better interpreted and used to make decisions such as the addition or movement of a **router**, the positioning of a measuring **probe**/**datalogger**, etc..

CAUTION: the network is normally slow in its evolution so, when using the tester **probe**, this can be misleading, especially in the most critical conditions.

Waiting at least 20 seconds in the desired place to evaluate the reliability and stability of radio signal is recommended.

Even in case of network structure changes, for example during the passage of the tester **probe** from one **router** to another, waiting for some transmissions, to update the new values on the display, are needed.

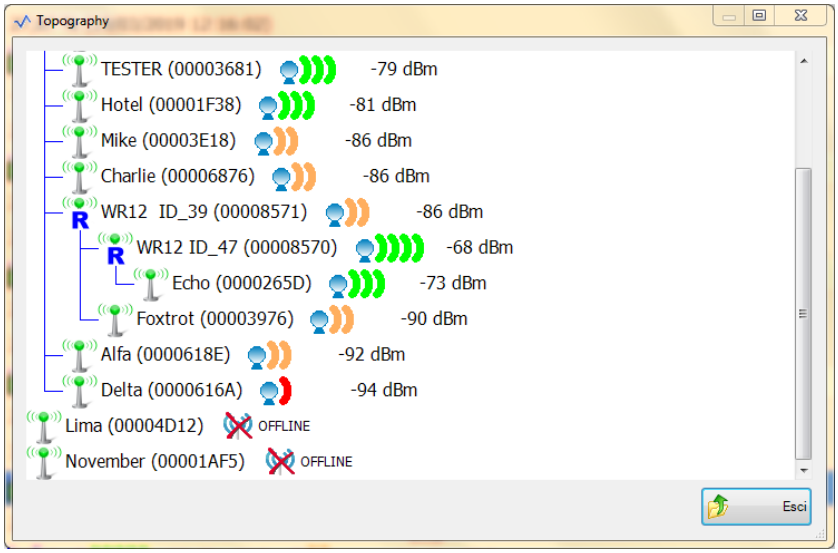
If a **router** has a weak or instable radio signal coming from its reference point can lose the connection at any time. A **probe**/**datalogger** connected to this **router**, consequently, will lose the connection to the network. (*a **router** NOT connected to the network stops to provide service to child nodes*).

9.6 WSN network topography visualization.

On plants with a huge amount of routers, the **WSN** network topography visualization can be useful, showing elements with hierarchical indications.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

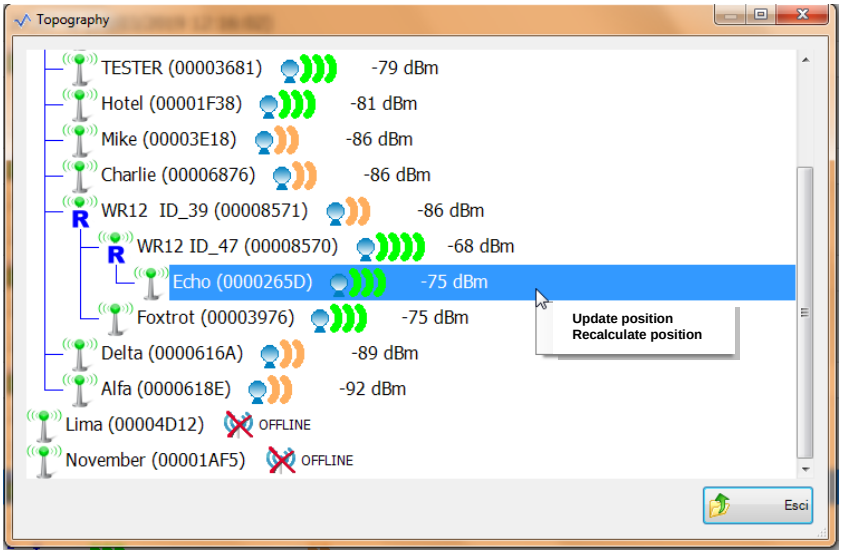
As shown on the following image (*Picture 77*) the element named “Echo” is connected with router “ID_47” that is connected with router “ID_39”.



Picture 77 - Connection between router and probe/datalogger

9.6.1 Topography commands.

There are 2 commands, usable clicking with mouse’s right button on the desired element.



Picture 78 - Topography commands

- **Update position**: with this command, a hierarchical position information REAFFIRM request is sent to the device. Can be useful if there are objects not displayed correctly; with this operation, graphical update is accelerated.
- **Recalculate position**: this command is more invasive. Asks to the device to perform a local radio scan in order to define the best network link point available.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

After a first moment, where the element results "offline", it comes back and automatically updates its position. The effect may be the appearing of this device in a different position of the diagram and probably with a better signal because of a better connection.

Both commands are transmitted without answer control and needs few seconds to be executed.

Normally, all devices must update their topography's position automatically when a new **WSN** event, as signal link or loss, occurs.

So, the visualization is always valid and updated, unless technical intervention that may happen.

10. Wireless basestation expansions.

10.1 Main features.

To improve wireless **basestation**'s functionalities (*analogue and digital input/output*), I/O expansion units, to be directly connected to the expansion bus available on **basestations**, have been developed.

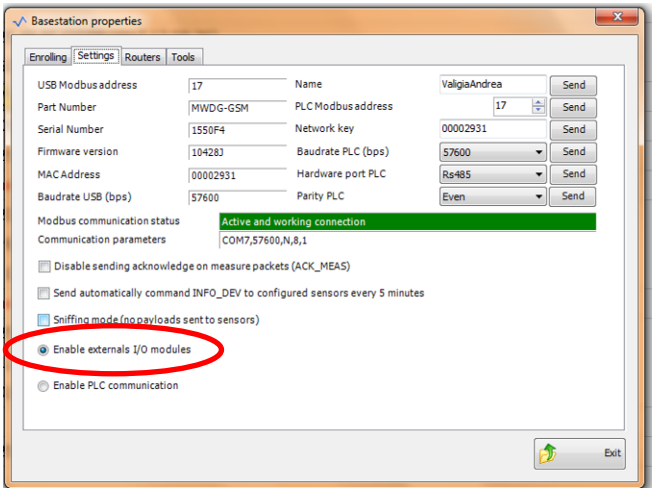
The expansion configuration is performed using the **WineCapManager** software.

10.2 EXP4IO I/O Expansions.

If the **basestation** in use is **NOT** a **MWDG-MB** or a **MWLI-MB** (*in that case the channel is automatically enabled when the module is connected and properly powered)*), to connect **I/O modules**, the RS 485 communication channel between the external port and the internal bus must be modified.

So, using expansion modules, PRECLUDES the simultaneous use of PLC device connected to the RS485 external clamp (*except for **MWDG-MB** or **MWLI-MB** models*).

Access to "*Basestation → Properties*" menu and select "*Settings*" tab.



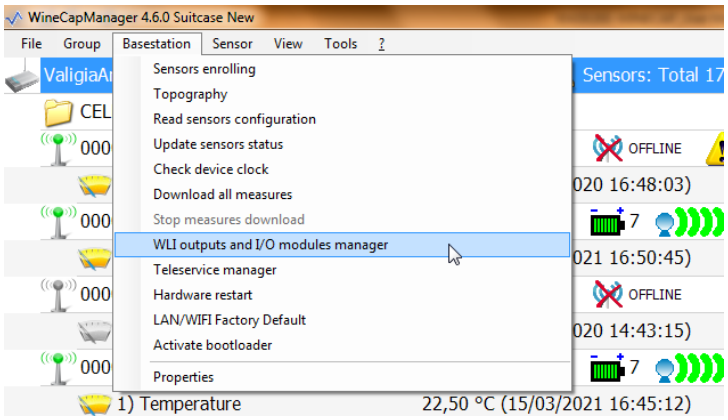
Picture 79 - Enabling EXP4IO expansion module

Select the "*Enable externals I/O modules*" option (*Picture 79*).

After this operation, the identification and the configuration of **expansion modules** connected to the **basestation** is possible.

From the "Basestation" drop-down menu, select the "*WLI outputs and I/O modules manager*" tab (*Picture 80*)

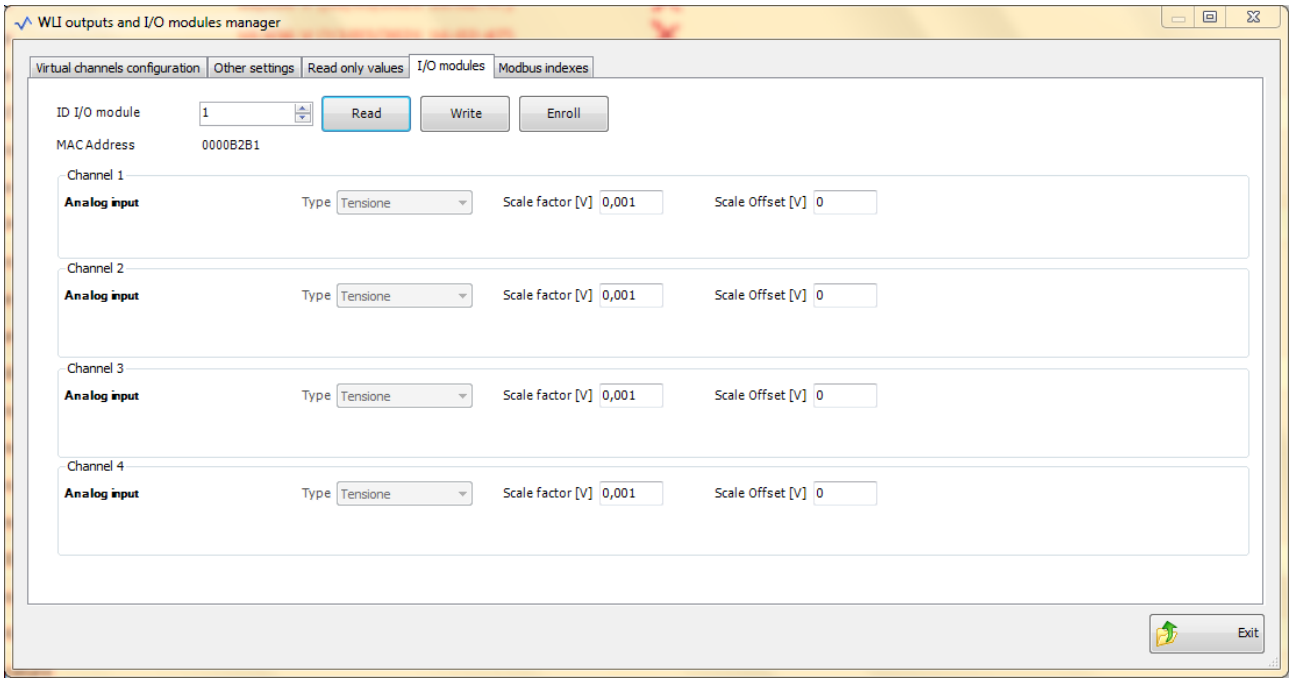
CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it



Picture 80 - EXP4IO expansion module setup

Select the "I/O Modules" sheet and click on the "*Enroll*" button. At the end of the association procedure click on "*Read*" button to display expansion status dell' corresponding to value displayed as "*ID I/O module*".

If necessary proceed with modifies on "*Scale factors*" and the "*Scale Offsets*" for each channel, then click on "*Write*" button to save new configurations (*Picture 81*).



Picture 81 - EXP4IO expansion module channels setup

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

10.3 Hardware limits of a system composed by some EXP4IO modules.

- For each **MWDG** **basestation** up to 4 **I/O expansion modules** (*4 channels each*) can be connected.
- The addresses, selectable by a rotary switch, start from position 1 to position 4. Placing the **I/O expansion modules** in address ascending order is strongly recommended.
- Link between **I/O expansion modules** and the **basestation** must be done using "**WineCapManager**" with release higher than or equal to 2.11.0 *(refer to "EXP4IO - User Manual").*

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

11. Reference standards.

- EN 61010 -1

For the electromagnetic compatibility

- EN 61000 - 3 - 2
- EN 61000 - 3 - 3
- EN 300 220-2 V.2.4.1
- EN 301 489 - 03
- EN 61000 - 6 -1

This symbol indicates that this product is compliant with the European Directive 2011/65/CE that restricts the use of substances in the manufacturing of electronic devices.

RoHs 2011/65/CE

The “WEEE” logo on the label indicates that this product is compliant with the "WEEE" EC Directive. This symbol (valid only in the European Union countries) indicates that the product it is applied to, MUST NOT be discarded with ordinary household or industrial waste, but must be sent to an authorized reception point. The end user should contact the device provider, either the manufacturer or the reseller, in order to agree a collection and disposal process, after having checked the terms and conditions of sale.

IT1902000001116

The features shown may be subject to change without notice.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

Appendix "A" - basestation substitution procedure.

1. WSN plant previously installed.

A **WineCap™** wireless system installed on field needs that all the elements are enrolled to MWDG basestation .

This means:

- probes/dataloggers and **routers** have registered the basestation's **NETWORK KEY**. To this basestation data are sent;
- inside basestation is stored the device list present in the plant and to each one corresponds measures log and event management.

In case a basestation substitution is necessary, a new enrolling process and a new configuration must be performed in order to let the plant back to work.

An alternative procedure is available to DON'T perform a new enrolling procedure.

Following, both procedures will be described. Basestation must be powered on and connected to a PC with WineCapManager working.

2. New enrolling procedure for dataloggers and router to basestation.

2.1. Link termination.

Each device must be unlinked from its basestation in order to be enrolled to a new one.

This operation is performed manually, using the WineCapKey on datalogger/**router**.

Command to be issued is "**LOGGER NO WIRELESS**"

5 flashes

+ 3 flashes

Device prepares itself for a new enrolling procedure but WITHOUT losing previous data and MAINTAINING the current registration for the time necessary to close the operation. Data stored in this condition will be downloaded to the new basestation at the end of the enrolling procedure.

In ALTERNATIVE the "**FACTORY RESET**" command can be used

5 flashes

+ 5 flashes

This operation deletes all data from datalogger's memory and stops the measurement process. For older devices this can be the only way.

2.2. Enrolling

Device enrolling procedure is possible only if a direct wireless point-to-point connection between the device to be enrolled and the basestation is possible.
This means that all the devices must be in radio range. Same condition is necessary for routers because they're not functional to enrolling procedure. If dataloggers are located in remote places, the basestation can be moved closer just for the enrolling operations.

Using WineCapManager, issue the "*Basestation → Sensor enrolling*" command.

Using WineCapKey issue the "**ENROLL**" command to wireless datalogger

3 flashes

The datalogger/**router** links to the basestation and appears on the screen. At the end of this procedure the datalogger's led switch to off and normal operation restarts.

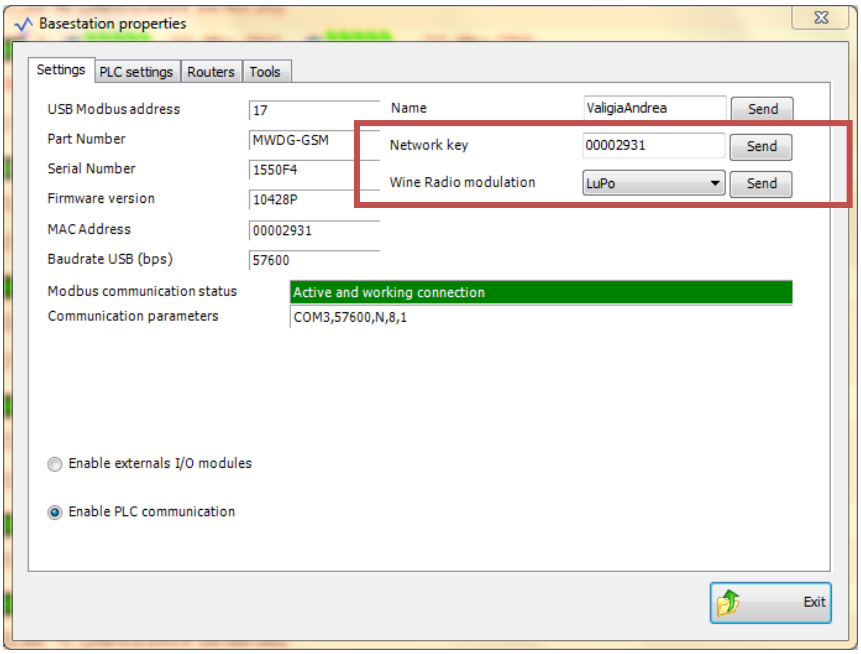
CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

3. Basestation's NETWORK KEY parameter modification.

Alternative procedure consists in a modification of the **NETWORK KEY** available in the **basestation** to be installed. This parameter is stored, during enrolling procedure, by all the devices in the system. Wireless communication is granted thanks to this parameter.

To substitute the **basestation**, **WITHOUT** any intervention on each **datalogger**/**routers,** the **NETWORK KEY** parameter can be modified as the one of older **basestation**.

With the drop-down menu "*Basestation → Properties*" access to this parameter is granted:



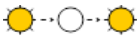
Picture 82 - Network Key modification

- **NETWORK KEY** : normally each **basestation** use a NETWORK KEY with value equal to its MAC code (*reported in label*) so, if it was not previously modified, the value to be inserted corresponds to the MAC Address of the **basestation** to be substituted.
- **Wine Radio Modulation:** modulation type is another communication parameter to be considered. Must be set in the same mode as the **basestation** to be substituted.
  In case of doubts consider that older devices can works **ONLY** in "Standard" modulation, meanwhile newer ones normally works in "LuPo" mode to improve performances.

For both parameters the corresponding "Send" button must be pressed in order to let them works.

When the correct setup is done the devices starts to communicate with the **basestation**. Restore communication time depends by breakdown period previously suffered. Waiting time can reach up to 2 hours.
To speed-up the process, a "**TEST**" command to **dataloggers**/**routers** can be issued.

2 flashes



This reset waiting time and forces the device to search for a radio signal.

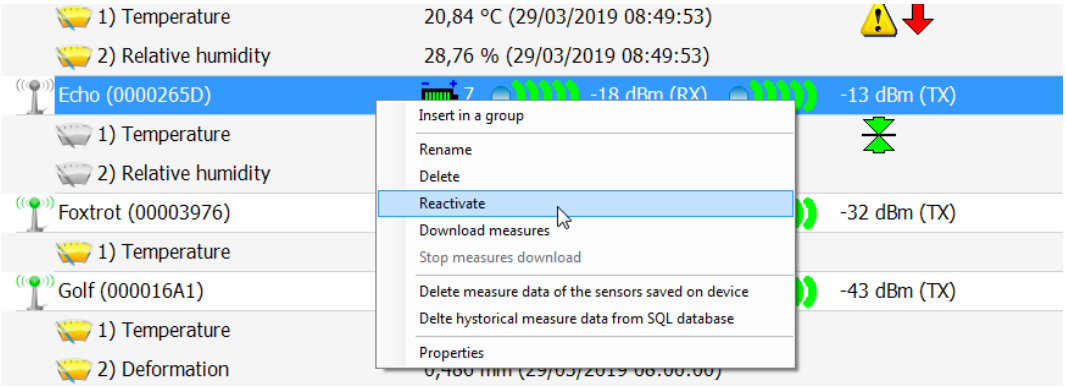
3.1. Reactivation

When a **datalogger** connects, appears on screen with its MAC address and with a *GRAY* icon.

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it

Reactivation procedure must be performed to let the device part of the system and let the **basestation** starts recording values and tracking the status.

Click with right button on MAC and select "*Reactivate*" in the drop-down menu



Picture 83 - Reactivate function

A data synchronization procedure starts through the communication with the device; at the end a *GREEN* icon will be shown and the channel list will be updated with last values.

NOTE: this procedure, as highlighted by the warning window, blocks the connection to the **Service Centre** www.winecap.it, because the Network Key value is used also during the authentication with the remote server.

So, a connection to the portal, using the MASTER account, in the "Network Key" page is necessary, in order to adjust the value of the **basestation** MAC on the corresponding row.

3.2. Plant reconfiguration

At the end of the **basestation** substitution the label of each device can be modified, and restore previous references.

Sampling periods, thresholds, and following configuration has been preserved by **dataloggers**.

All the configurations regarding ModBus communication, internet connection, etc. must be restored manually (*"Basestation → WLI outputs and I/O modules manager"*, *"Basestation → Teleservice manager"*).

CAPETTI ELETTRONICA s.r.l. - Strada Stratta 57
10090 CASTIGLIONE TORINESE - TORINO - ITALY
VAT 04837130014 - Phone 011.981.98.11 - Fax 011.981.98.210
e-mail info@capetti.it - web www.capetti.it