	EKHO WIRELESS FIRE ALARM SYSTEM INSTALLATION GUIDE	
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**WIRELESS FIRE ALARM SYSTEM
INSTALLATION GUIDE**

CONTENTS

1 DESIGNING AND INSTALLING THE SYSTEM..... 3

 1.1 INTRODUCTION..... 3

 1.2 WIRELESS DEVICES: A GENERAL DESCRIPTION 3

 1.3 EXAMPLE OF A TYPICAL WIRELESS SYSTEM 4

 1.4 IMPORTANT NOTES TO BE CONSIDERED BEFORE INSTALLATION 5

 1.5 TECHNICAL SPECIFICATIONS OF THE SYSTEM..... 5

 1.6 ANTENNAS IN TRANSLATORS AND EXPANDERS 6

 1.7 EXPANDERS: INSTALLATION GUIDELINES 6

 1.8 FREQUENCY CHANNELS 7

 1.9 WIRELESS SYSTEM IDENTIFICATION 8

 1.10 WIRELESS DEVICES ADDRESSING 8

 1.11 LINKING WIRELESS DEVICES 8

 1.12 WIRELESS SYSTEM IN THE MAIN CONTROL PANEL..... 9

 1.13 COMMUNICATION ALGORITHM 9

 1.14 NETWORK TRAFFIC..... 9

 1.15 PROGRAMMING THE EQUIPMENT 10

 1.16 RECOMMENDATIONS FOR INSTALLING THE WIRELESS SYSTEM 10

2 CONFIGURING THE SYSTEM IN THE EKHO CONFIGURATOR SOFTWARE 12

 2.1 SETTING UP THE SOFTWARE..... 12

 2.2 ESTABLISHING A CONNECTION 12

 2.3 SCANNING FREQUENCY CHANNELS 14

 2.4 CONFIGURING WIRELESS DEVICES 15

 2.5 LINKING WIRELESS DEVICES IN SOFTWARE 16

 2.6 CHANGING THE START ADDRESS OF DEVICES IN THE LOOP 17

3 USING THE SOFTWARE FOR SYSTEM MAINTENANCE 18

 3.1 ANALYZING CONNECTION STRENGTH..... 18

 3.2 INSPECTING SYSTEM EVENTS AND ANALOG VALUES 19

1 DESIGNING AND INSTALLING THE SYSTEM

1.1 INTRODUCTION

The aim of this document is to explain how to install the Ekho wireless fire system.

All the data detailed is only to be used with the Ekho wireless devices that use the Ekho wireless communication protocol for communication.

1.2 WIRELESS DEVICES: A GENERAL DESCRIPTION

A wireless fire alarm system can be composed of a combination of the following wireless devices:

Wireless translator: this device is the core of the wireless system; it communicates continuously with other wireless devices, such as sensors, call points, sounders, etc.

The translator also communicates with the control panel of a fire alarm system.

This device communicates with the control panel through the ESP loop and with all wireless devices via a radio frequency.

The whole system is controlled via a control panel similar to any other fire alarm system; the translator is the interpreter that holds exclusive rights of communication with the wireless devices and makes possible the communication between the control panel and the radio devices: this is why this device is called a translator.

The wireless system general configuration, created by the installer, is stored in this device.

Wireless expanders: The translator communicates with other wireless devices only if they are in a certain range or if communication is not blocked by walls and other obstacles. When wireless area coverage needs to be expanded and/or the environment poses difficulties to radio communication, one or more wireless expanders can be used; these devices act as repeating devices for communication between wireless devices and the translator.

Sensors: these devices are designed to detect smoke and/or heat in the environment. If heat and/or smoke is present and exceed a defined limit, the wireless system triggers an alarm condition.

Call points: These devices provide a manual method for initiating a fire alarm condition.

Sounders: these devices play an audible warning when the wireless fire alarm system is activated.

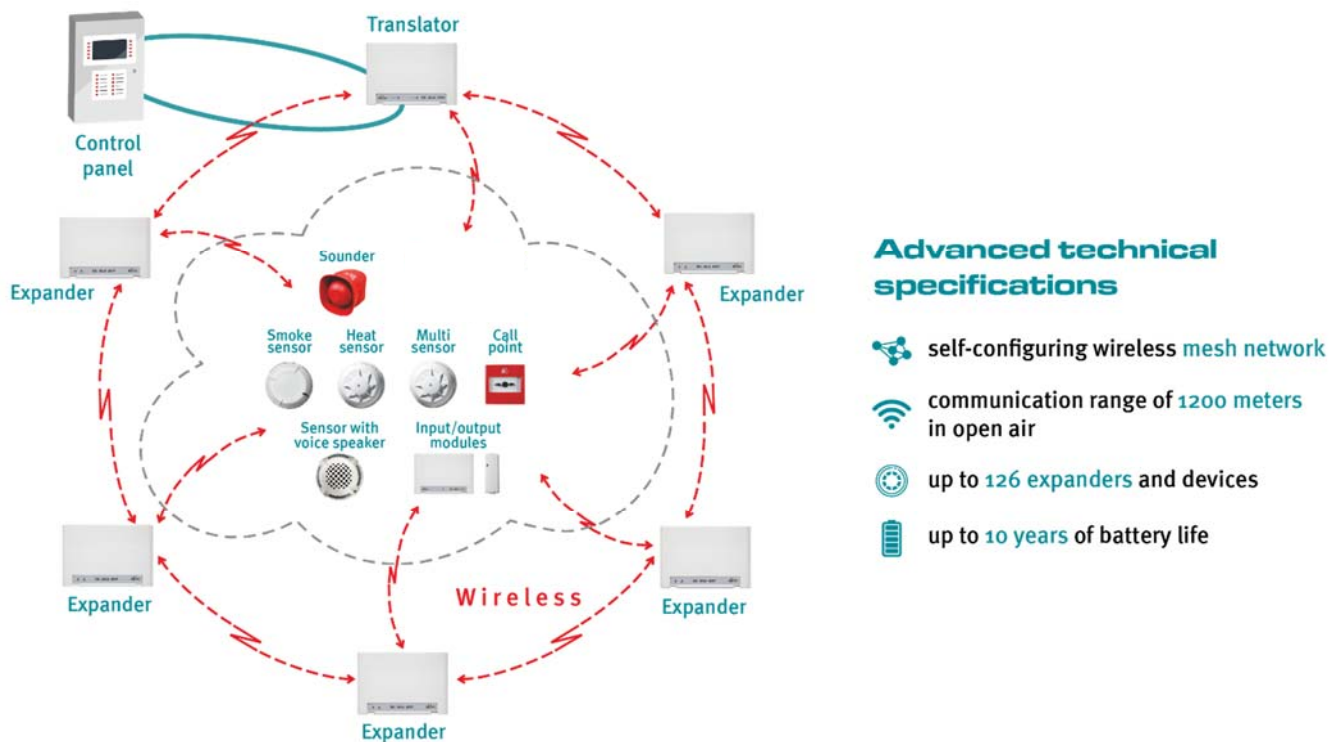
Voice annunciators: In the event of an alarm, voice annunciators broadcast pre-recorded alarm voice messages.

Input modules: receive a signal from wired conventional devices and transmit them to the translator.

Output modules: receive control commands from the translator to open/close the connected circuit. Designed to be used to control the operation / state of external devices or plant such as air conditioning / door release / emergency shut down.

1.3 EXAMPLE OF A TYPICAL WIRELESS SYSTEM

The following illustration describes a typical wireless configuration.



The fire alarm panel controls the alarms and events of the entire system. The wireless translator is connected directly to the wired loop of the fire alarm panel and communicates directly with the wireless devices and the wireless expanders.

The fire alarm panel receives all wireless communications through the wireless translator and transmits back the alarms and events through the wireless translator to the wireless devices.

The wireless system is based on a mesh network, which operates to the following parameters:

- each device automatically chooses its parent expander;
- expanders automatically form a network for delivering information to the main control panel.

Wireless devices do not need to be assigned to a specific expander nor do the expanders need to be specified how to communicate with each other. The wireless devices are simply initialized to the translator and then programmed to the fire control panel.

1.4 IMPORTANT NOTES TO BE CONSIDERED BEFORE INSTALLATION

Prior to installation refer to and follow applicable local standards and national codes of practice for guidance on location and spacing of sensors and general system requirements.

Check compatibility of your control panel with the wireless Ekho system protocol and operating procedures.

1.5 TECHNICAL SPECIFICATIONS OF THE SYSTEM

Before installing the system the following points need to be considered.

- There is a maximum number of devices that can be connected wirelessly to the translator
- The communication range between the translator, expanders and all wireless devices is specified in 'free air'. The range will vary and generally decrease when installed within building structures.
- The translator is connected to a control panel through a wired loop: Check the maximum loop length and current limitations of the control panel.
- It is recommended the preliminary system design is made on paper. Optimum device positioning can be verified during installation and additional expanders can be added if required.
- The number of translators / expanders required is determined by the number of wireless devices connected to the control panel and the communication range between the translators / expanders and wireless devices.

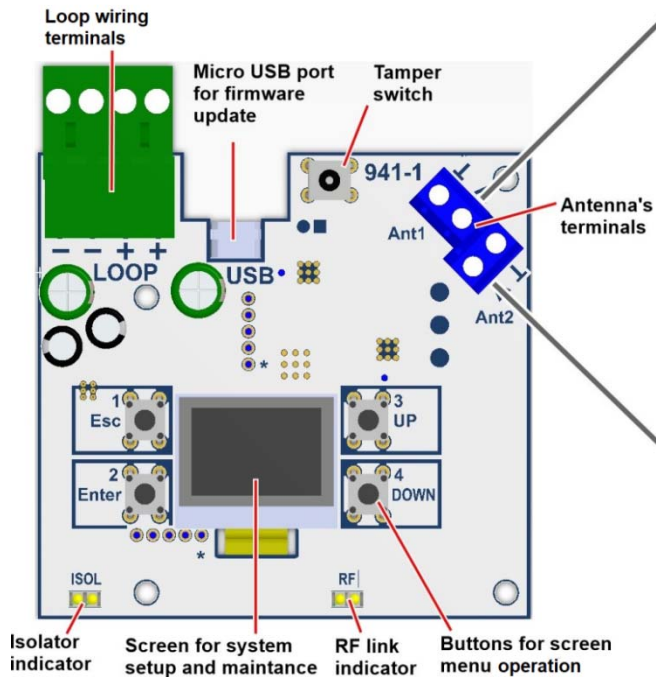
The following table shows the maximum number of devices that may be connected to a translator / expander and the communication distances in 'free air'.

Maximum number of devices programmable on the main control panel	127 devices*	Translators, expanders and devices included
Maximum number of devices programmable on a single translator	126 devices**	
Maximum number of output devices programmable on a single translator	126 devices**	output devices are: sounders, visual alarm devices, output modules
Communication range between a translator and an expander or between an expander and another one	2000 meters	Maximum distance specified in 'free air'
Communication range between a translator or expander and a wireless device	1200 meters	Maximum distance specified in 'free air'
Maximum number of expanders programmable on a single translator	126	mesh network
Maximum number of expanders connected sequentially one after another	10	mesh network
Maximum number of expanders connected to another single one	31	mesh network

* Limited by the capacity of the ESP protocol. The capacity of the original wireless system – 1920 devices in a single system.

** Limited by the capacity of the ESP protocol. The capacity of the translator – 256 devices.

1.6 ANTENNAS IN TRANSLATORS AND EXPANDERS



Both the translator and the expander are equipped with two antennas. One handles primary communication with wireless devices, and the other is used for scanning backup radio channels. This allows the system to automatically switch to a new channel in case of strong radio interference.

In some rare cases, when it is necessary to increase the communication range of a translator/expander, the default antennas can be replaced with more powerful external versions. These antennas have to be compatible with the 868MHz range that is utilized by the system. The equipment should be connected with a 50Ω coaxial cable to the inputs on the board (center core to “ANT” and metallic shield to “_”).

1.7 EXPANDERS: INSTALLATION GUIDELINES

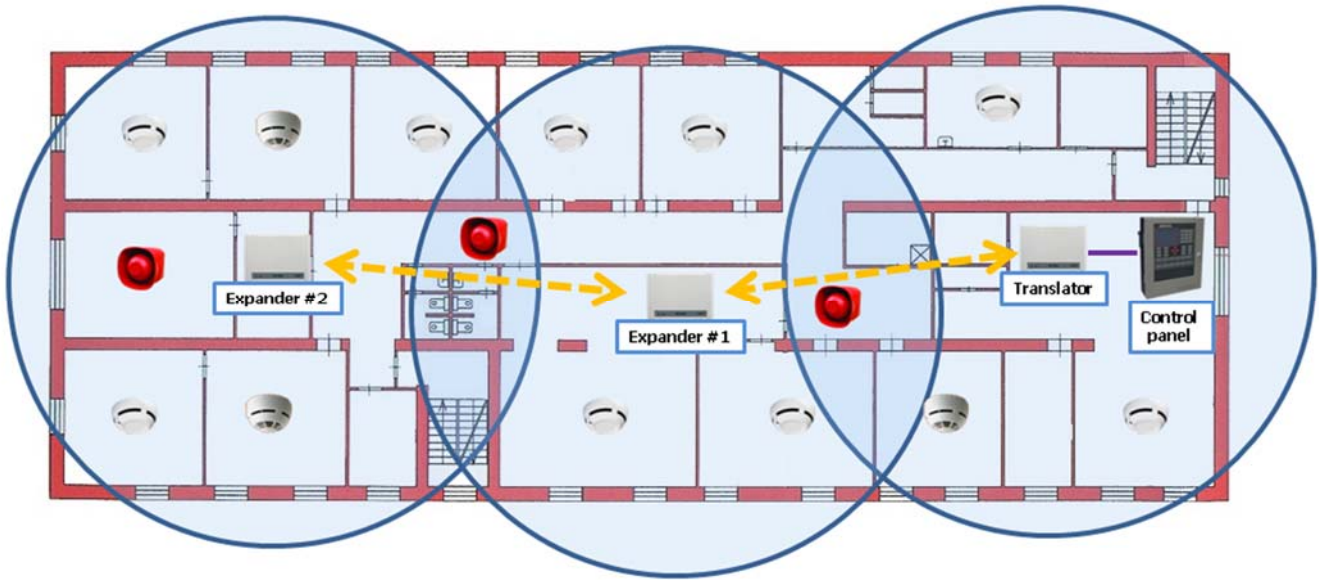
Expanders should be used when

- some wireless devices are too far from the translator
- the translator’s communication range does not cover the necessary territory (e.g. the whole building or one of the floors)
- connection with wireless devices is weakened by external electromagnetic interference
- the building has thick walls, metallic structures or other objects that significantly lower the communication range of the translator and wireless devices
- backup and alternative communication routes need to be provided in the system

The system designer needs to evenly disperse expanders across the premises in order to provide a stable connection to the network in every part of the building. Wireless devices will automatically choose the closest expander that will provide the strongest connection.

When designing a wireless fire alarm system, it is important to keep in mind that the communication range between different wireless devices significantly depends on walls and obstacles that can block radio communication. This is why it is recommended to check the connection strength between different rooms in the building before designing and installing the system.

The following illustration provides an example of how wireless expanders should be installed in a typical building.



Expanders automatically form a wireless network for delivering information to the translator. For example, if an expander can't communicate with the translator directly, it will send the signal through other expanders in the system. This means that each expander also acts as a signal repeater. The primary communication path to the translator is chosen by the expander automatically and will always be the shortest possible (10 expanders maximum). Communication among wireless devices is illustrated in the next picture.

If one of the expanders loses connection, the system will reconfigure itself and use alternative communication routes* for delivering signals. The wireless devices that were previously connected to this expander will also reconnect to another. The more expanders are added to the system the more robust the communication network will be.

***If an expander loses connection and the associated devices or expanders do not have enough signal to communicate through any existing installed expanders/translators, then back up expanders need to be installed.**

1.8 FREQUENCY CHANNELS

Wireless devices can communicate via 6 different frequency channels.

During system commissioning the installer must assess which channel has the lowest noise and interference level and program the wireless system to operate on that channel. This will significantly improve communication between different wireless devices in the system (as opposed to choosing a random frequency channel that may not have the ideal conditions for communication).

Section 2.3 of this manual describes how to scan the frequency channels using the software.

1.9 WIRELESS SYSTEM IDENTIFICATION

A translator and the wireless devices connected to it, make up, from a certain point of view, an “independent” wireless system.

If the fire control panel has several translators connected to it, then it would be possible that some of them will use the same frequency channel.

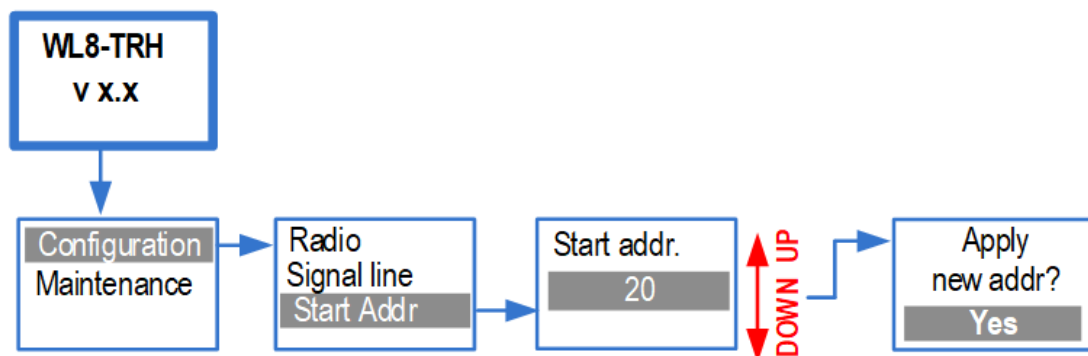
Every wireless network is assigned a unique system code, which prevents communication conflicts between different wireless systems in the above condition.

1.10 WIRELESS DEVICES ADDRESSING

Every wireless device has a unique address (number) that is automatically assigned during configuration of the wireless system.

The wireless protocol uses its own addressing system, separate from the analogue intelligent protocol of the main control panel. The translator will assign and manage the addressing automatically.

The address of the translator must be specified and this data inserted directly using the translator’s built-in display. This address is used only by the main control panel and is indicated as the ‘starting address’.



Each wireless device will also have its own address in the main control panel. The numbering will begin with the starting address of the translator. For example, if the starting address is “1”, the following wireless devices that are added to the system will be given address “2”, “3”, “4”, “5” and so on. If another starting address is specified, for example “34”, the wireless devices will be automatically readdressed with “35”, “36”, “37”, “38” and so on.

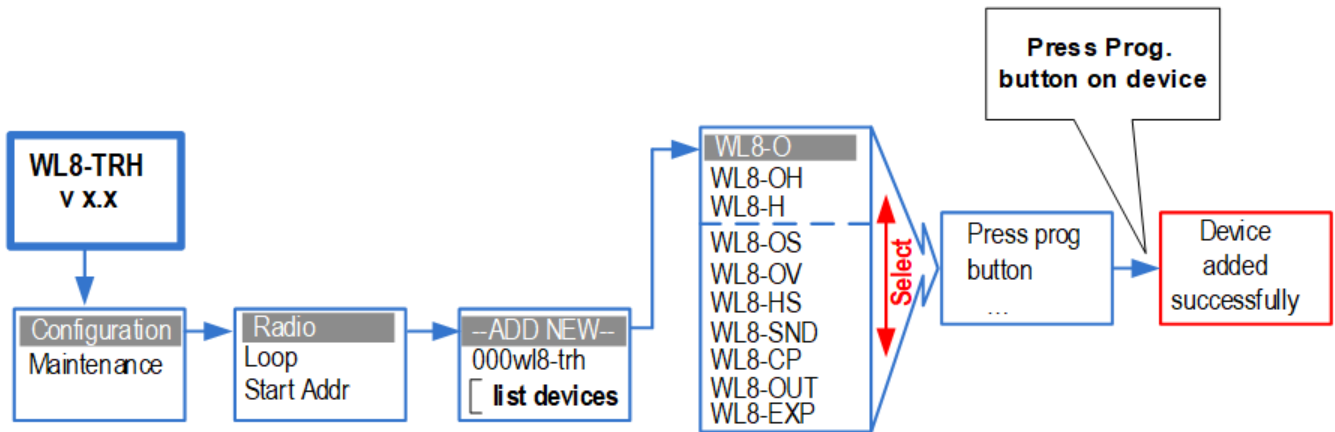
These addresses are the analogue – intelligent protocol addresses used by the control panel and wireless protocol addresses remain unchanged.

1.11 LINKING WIRELESS DEVICES

New wireless devices can’t automatically connect to the network, they have to be linked to the translator (or “initialised in the system”). In order to do that, the translator needs to receive a

special signal from the device, which contains information necessary for creating a wireless link. This signal is transmitted by pressing the 'PROG' button on the device. Wireless devices can be linked using the software or the translator itself.

In order to link a wireless device using the translator, please follow the instructions on the picture:



Full instructions on adding and deleting wireless devices are provided in the **EK-WL8-TRH user manual**.

Section 2.4 of this document describes how to link wireless devices using the software.

1.12 WIRELESS SYSTEM IN THE MAIN CONTROL PANEL

Information about the wireless system has to be transferred to the control panel. Usually, control panels have a specific command that allows to copy the wireless system configuration to the panel's memory. For full instructions, please refer to the control panel user manual.

1.13 COMMUNICATION ALGORITHM

Signals from wireless devices (alarms, faults, etc) are transmitted to expanders/translator instantly, with no delay. Control commands (e.g. sounder activation) are also transmitted and received almost instantly and the delay should not exceed 3 seconds.

Every 2 minutes wireless devices also send a test signal to confirm that they are still connected to the network. If a device is not able to deliver this signal to the system, it will start to retry connection more often and increase the transmission power. If no test signals were received from a device in 15 minutes, then the system concludes that it has lost connection and creates a fault event.

1.14 NETWORK TRAFFIC

The wireless system can be characterized by the amount of traffic in the network. The more devices you have on one channel and the worse the connection strength between devices and expanders/translator, the higher the traffic will be. It is recommended to keep the traffic value

under 5%. If you have more than one translator and the total amount of wireless devices exceeds 126, it is recommended to assign each wireless system (translator) to a different channel so that the systems do not interfere with each other and traffic is distributed evenly across different frequency channels.

1.15 PROGRAMMING THE EQUIPMENT

Wireless devices can be programmed in two different ways:

- Using the built-in display and buttons on **EK-WL8-TRH**
- Using the **Ekho Configurator** software.

The built-in configuration tool on the translator allows you to:

- Add and delete wireless devices
- Inspect the state of the devices (tampering, low battery etc.)
- Check the connection strength with each individual device
- Send control commands (generate an alarm, turn on LED, etc.)
- Change the starting address and view the address of wireless devices in the system.

Please refer to the **EK-WL8-TRH user manual** for full instructions on how to set up a wireless system using only the translator.

The **Ekho Configurator** software provides an additional set of tools for programming and maintaining the system, including:

- Changing properties of wireless devices
- Analysing radio channels (noise and signal levels)
- Analysing the wireless network as a whole, viewing the network topology, backup communication routes, etc.
- Inspecting the analog values sent by wireless devices (smoke level, temperature, battery voltage, etc.)
- Browsing and analysing the event protocol
- Updating equipment firmware

The **Ekho Configurator** program requires a PC connected to the translator module. Working with the software will be described further in this manual.

Changes to the system made with translator's display cannot be viewed in the software. However, any device that you add via the **Ekho Configurator** will be visible on the translator's display.

1.16 RECOMMENDATIONS FOR INSTALLING THE WIRELESS SYSTEM

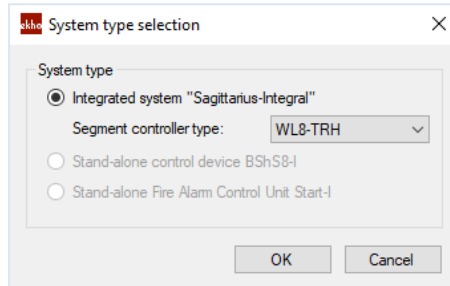
Wireless devices require stable communication and strong connection to the network. To achieve this aim the following recommendations should be followed:

- Select the optimum position for the wireless device to ensure the strongest communication signal* (transmitting and receiving). Connection strength can be viewed via the translator's display or the software.
***It is essential that a radio survey is conducted for every location where a wireless device is required to be installed, to ensure the recommend signal strengths can be achieved.**
- Select a frequency channel that is free or relatively free of interference, and avoid, if possible, channels that are already allocated.
- Avoid installing the wireless devices close to:
 - equipment using large amounts of electrical current
 - large metal objects, structures or metal ceiling structures
 - fluorescent lighting fixings
 - computers, their cabling and network cabling.
- All wireless devices should have a minimum distance between each other of at least 2 meters.
- Translators and expanders should be at least 2 – 2.5 meters from floor level.
- Install all wireless devices, especially translators and expanders, perfectly flat on the wall.
- All wireless devices must operate in a compatible environment: environmental factors like temperature, humidity and so on, must fall in the device's acceptable operating ranges, as specified in their installation instructions.

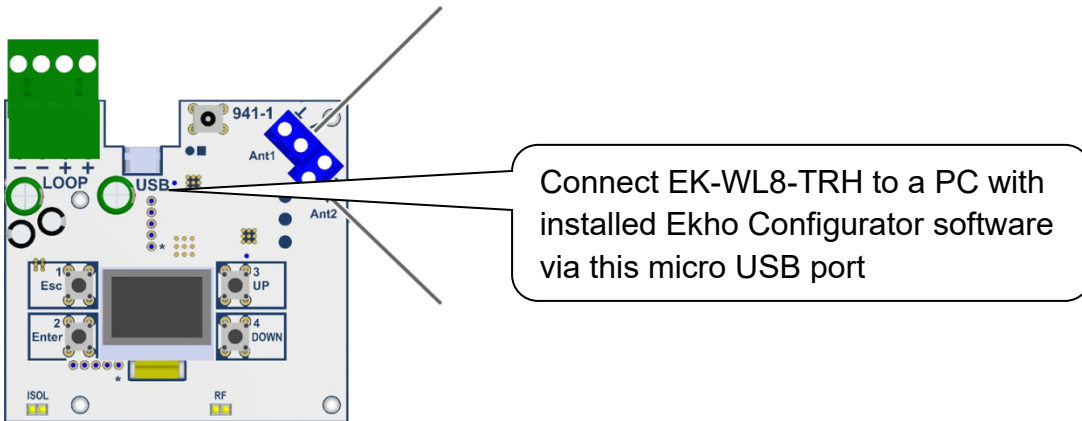
2 CONFIGURING THE SYSTEM IN THE EKHO CONFIGURATOR SOFTWARE

2.1 SETTING UP THE SOFTWARE

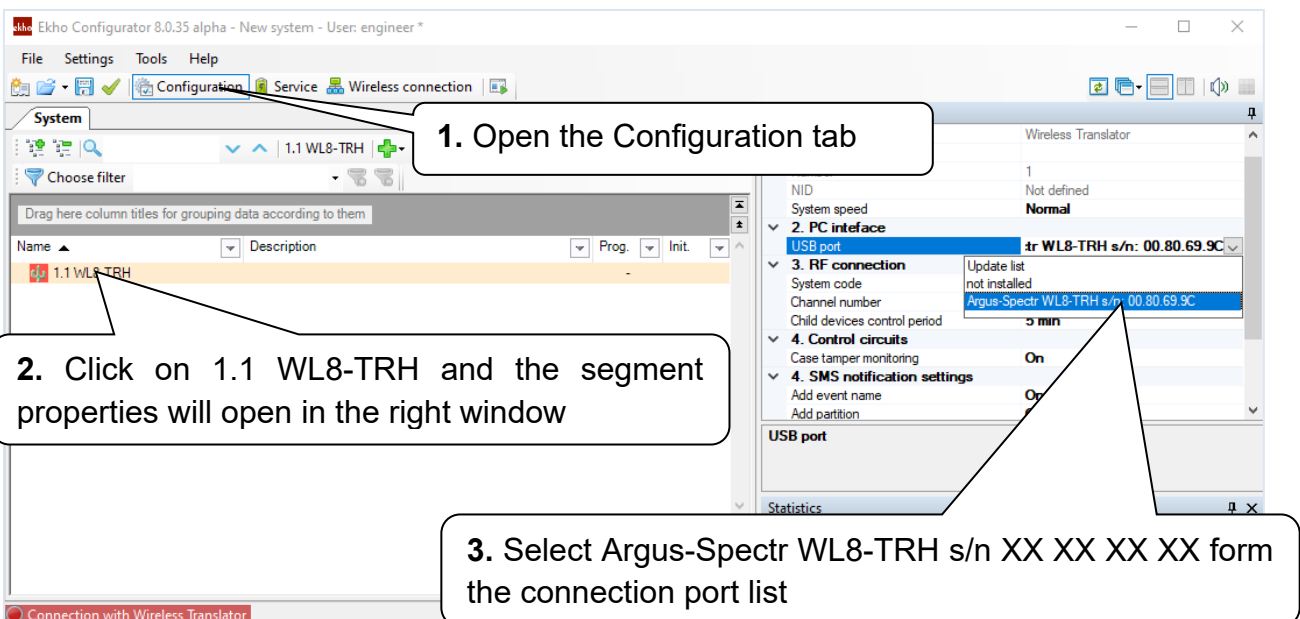
During the initial launch of the Ekho Configurator software, a blank configuration file is created, once the “segment controller type” is chosen. However, if you previously worked with existing configuration files, the program will attempt to open the last file worked on.

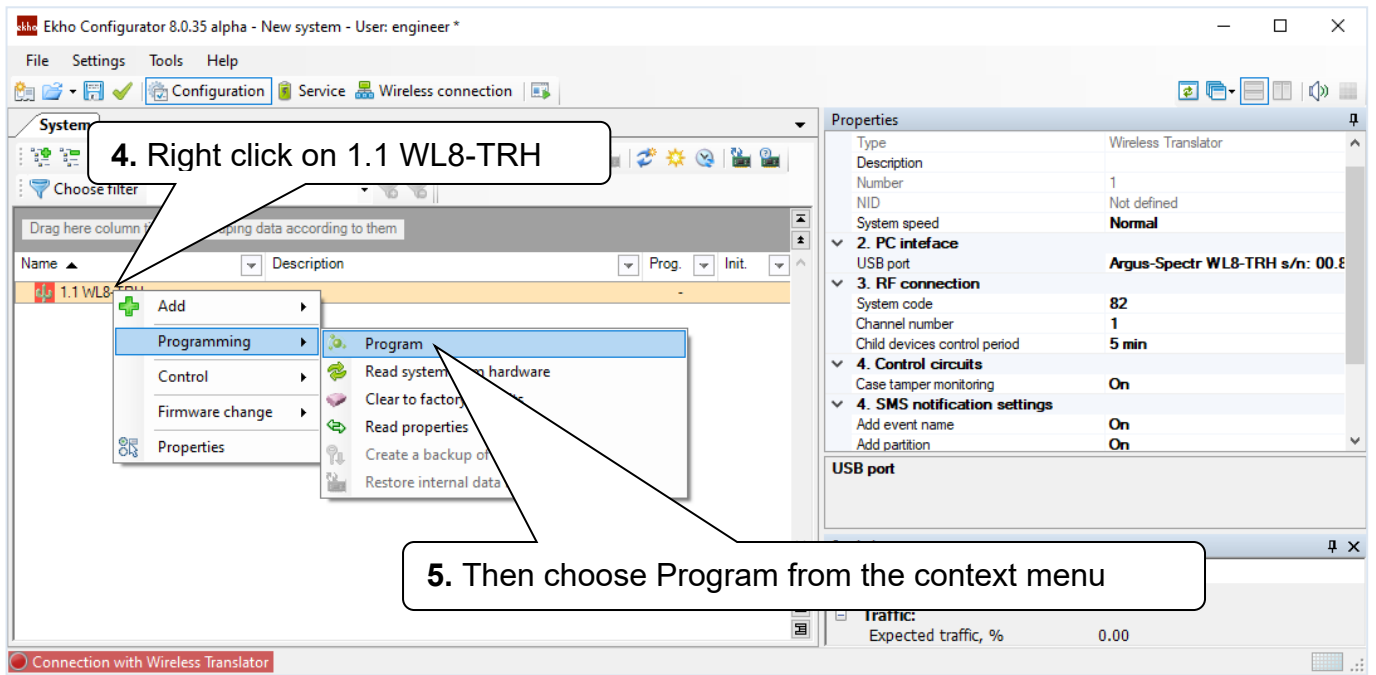


2.2 ESTABLISHING A CONNECTION

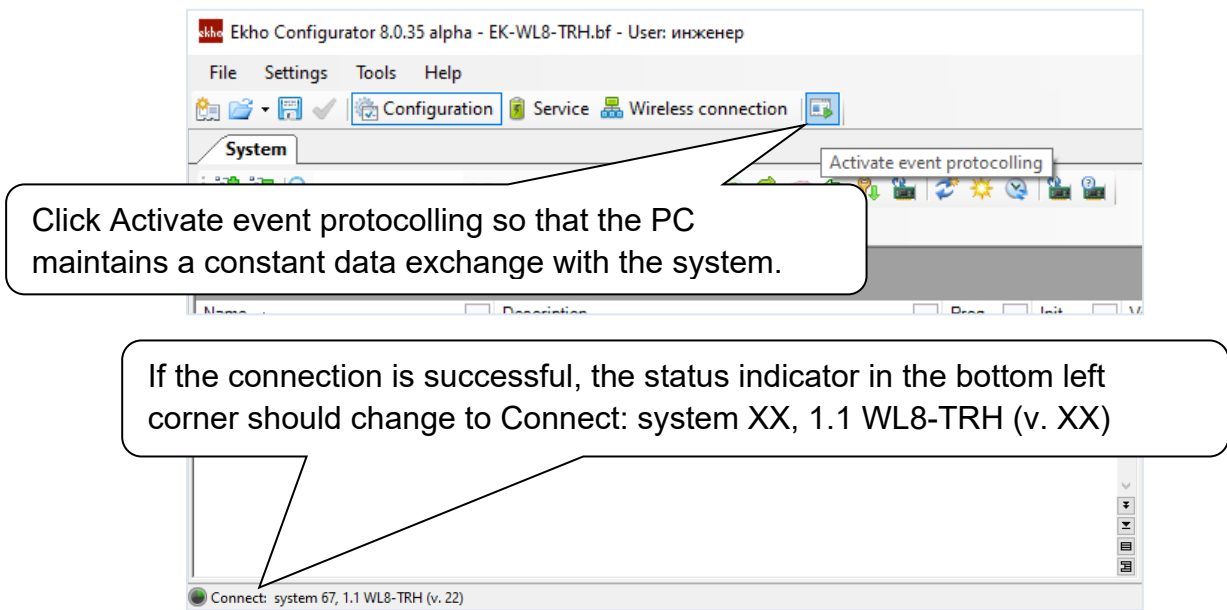


Then program EK-WL8-TRH:





Once the device is programmed, you will be able to add detectors, scanning channels, etc.



2.3 SCANNING FREQUENCY CHANNELS

The screenshot shows the Ekho Configurator 8.0.35 alpha interface. The 'Wireless connection' tab is selected, showing 'Connect to: 1.1 WL8-TRH'. Below this, there are controls for 'Read signal strength data' (On) and 'RF power adjustment' (On). A 'Choose filter' dropdown is set to 'All'. A table with columns 'Sensor', 'Group', 'Parent', 'Actuality', 'Signal', 'Score', and 'Rating' is visible. Below the table is a graph titled 'On-air signal values' showing 'Radio signal, dBm' on the left y-axis (ranging from -140 to -20) and 'Traffic, %' on the right y-axis (ranging from 0 to 60). The x-axis shows time from 16:16:00 to 16:18:00. A blue line represents 'Signal level' and a green line represents 'Traffic'. Below the graph, summary statistics are provided: 'Current signal level -111.0 dBm', 'Average signal level -111.6 dBm', 'Current traffic: normal 0.0 %, high 0.0 %', and 'Average traffic: normal 0.0 %, high 0.0 %'. A 'More...' link is present at the bottom right of the graph area.

Annotations:

- Open the Wireless connection tab
- Click More... to open the window with traffic and signal strength in the radio channel.
- The traffic value is displayed here

The screenshot shows the 'Traffic and signal strength in the radio channel - 1.1 WL8-TRH' window. It displays a detailed graph with 'Signal' on the left y-axis (ranging from -140 to -20) and 'Traffic (%)' on the right y-axis (ranging from 0 to 40). The x-axis shows time from 16:45:17 to 16:52:15. The graph shows multiple signal channels (1-6) and traffic. A legend on the right lists: Signal channel 1 (black), Signal channel 2 (red), Signal channel 3 (cyan), Signal channel 4 (magenta), Signal channel 5 (yellow), Signal channel 6 (grey), Traffic (green), and Average traffic (pink). A table at the bottom provides current and average values for traffic.

	Current value	Average value
Traffic (Normal range), %	0.0	0.1
Traffic (Extended range), %	0.0	0.0
Overall traffic, %	0.0	0.1

Select different frequency channels one by one and try to identify the one with the lowest noise level and the least amount of peaks on the graph (which correspond to radio signals). The number of this channel will need to be specified in **EK-WL8-TRH** properties (described further in this manual).

2.4 CONFIGURING WIRELESS DEVICES

In order to add wireless devices to the configuration, please do the following.

1. Open the Configuration tab

2. Right click on 1.1 WL8-TRH and open Add menu

3. Add a wireless smoke detector WL8-O to the system

Other wireless devices (ors, sounders, etc.) are added from the same menu.

All wireless devices have their own sets of properties:

EK-WL8-EXP

The device has two LEDs to indicate the state of power supply (expanders also have an indicator for wireless connection). If you wish to turn them off, select the appropriate options in the Connection status and Power supply fault parameters.

If you select External DC input in Secondary supply monitoring, the power supply will be monitored via the DC input.

EK-WL8-TRH

The translator has mainly the same properties as the expander, however there's one additional parameter Channel number, which lets you choose the frequency channel with the lowest level of noise and interference (sections 1.8, 1.14 and 2.3)

EK-WL8-O

- If you choose the Increased option in **Initialisation security**, then you would need to enter a password in order to initialise the device. Normally the Standard initialisation security is used.
- **Indication** section includes parameters allowing you to turn on/off LED indication in a normal state, in alarm state or in case of supply fault (low battery).
- Options in **Control circuits** enable or disable protocol events in case of low battery or tampering.

Properties

1. General

Type: Wireless expander module

Description

Number: 1

Device ID: Not defined

Production date: Not defined

S/N: Not defined

Communication control: On

Transmit control signals: Yes

Period of transmitting contro: 120 sec.

System speed: Normal

Initialization security: Standard

2. Indication

Connection status: On

Power supply fault: On

3. Control circuits

Primary supply monitoring: External AC input

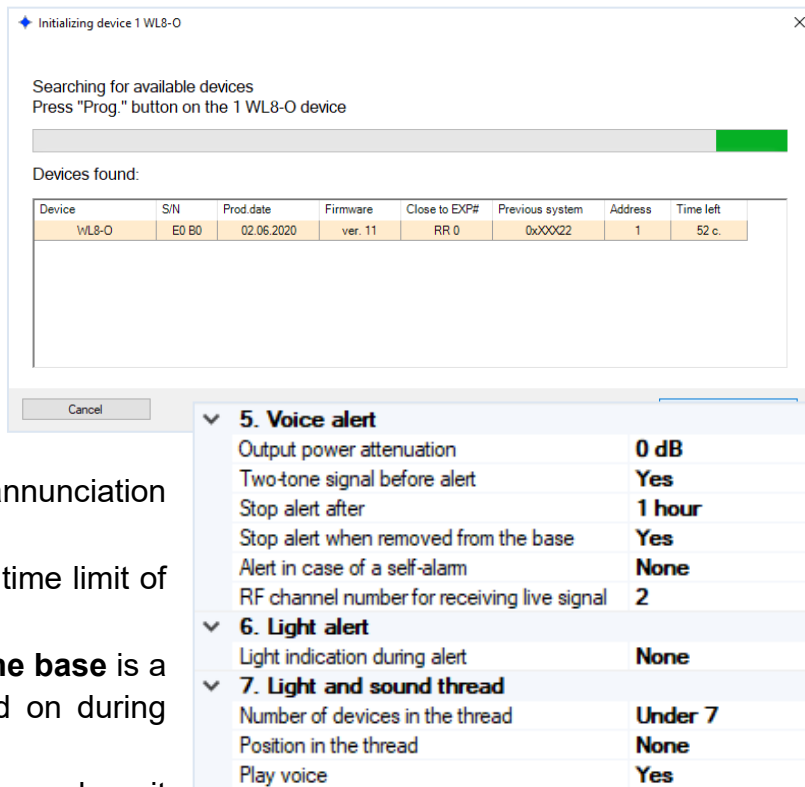
Secondary power supply mc: Off

- **Analysis channels** section allows you to turn off the smoke sensor and set its sensitivity.

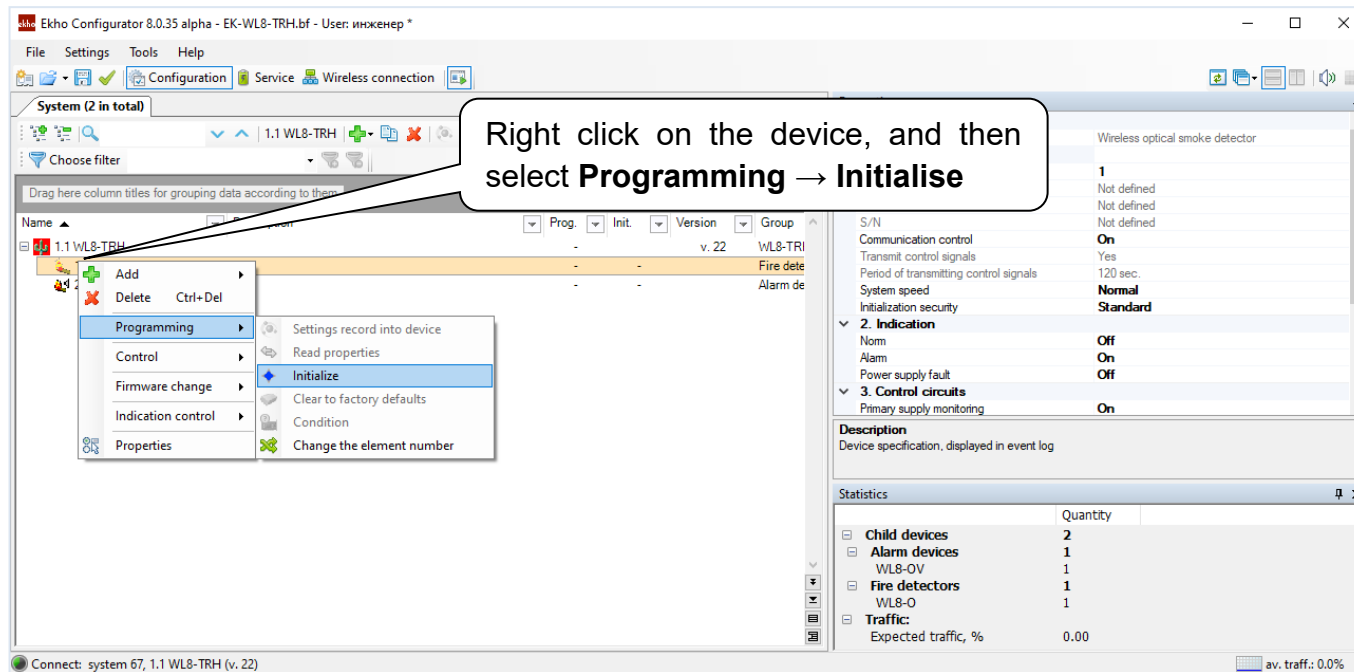
EK-WL8-OV

All of the properties for **EK-WL8-OV** are the same as for **EK-WL8-O**, If the sound signal is too loud, select **-12dB** in the **Output power attenuation** parameter.

- **Two-tone signal** before voice annunciation may be switched off;
- **Stop alert after** is used to set the time limit of alert;
- **Stop alert when removed from the base** is a useful function that can be turned on during system testing;
- **EK-WL8-OV** can start annunciation when it detects smoke even without an activation command from the control panel, thus acting like a standalone fire detector. To activate this function choose the required message in **Alert in case of self alarm** parameter.
- **Light indication during alert** enables in-built LED flashes during voice annunciation;



2.5 LINKING WIRELESS DEVICES IN SOFTWARE

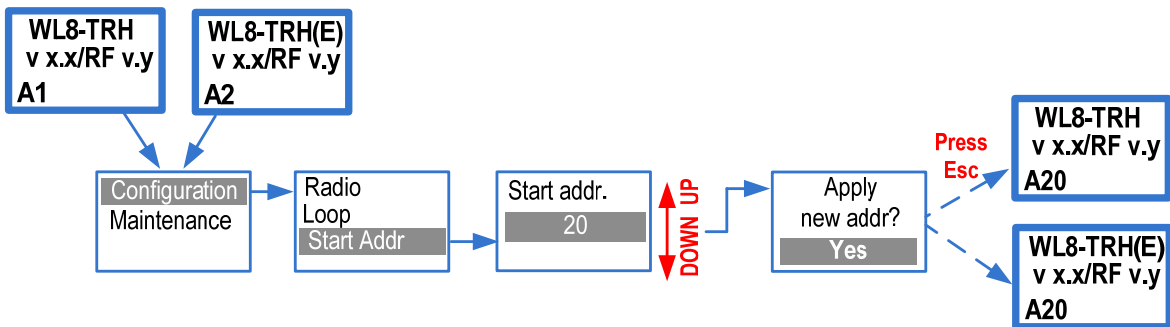


When this window pops up, press the **PROG** button on the device's board and wait for its name and serial number to appear in the devices list. Double click on it to start the process of linking.

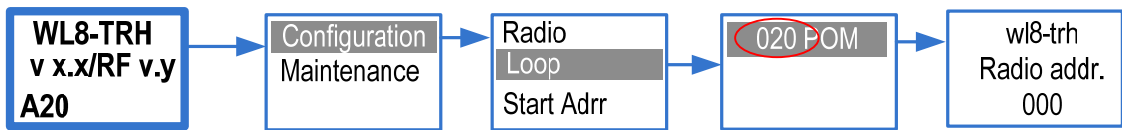
The process of linking is similar for all of the **Ekho** devices. After the device has been linked, you can change its setting and program the device wirelessly, without the need of removing the device and pressing the **PROG** button.

2.6 CHANGING THE START ADDRESS OF DEVICES IN THE LOOP

Wireless devices addressing in the signal line starts from address 1 by default. If the addressable loop has previously connected devices (for example, addresses 1 to 19 are occupied), you must change the start address (available from 1 to 127) to connect the following (wireless) devices. This procedure can be done via EK-WL-TRH display menu:



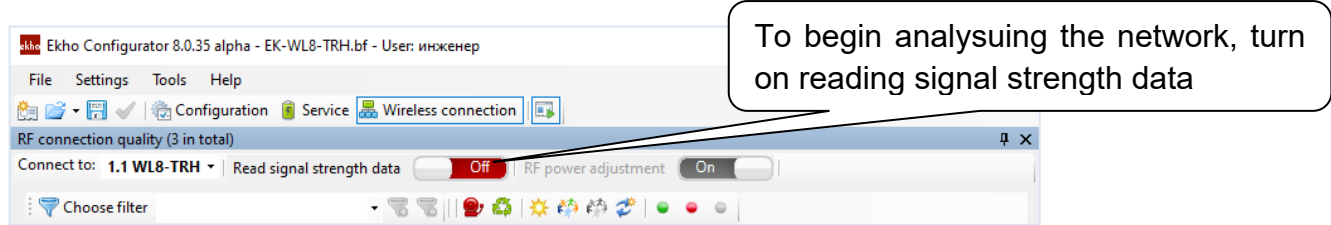
You can check the correct address:



3 USING THE SOFTWARE FOR SYSTEM MAINTENANCE

3.1 ANALYSING CONNECTION STRENGTH

After the system is configured and all of the equipment is fitted, you can analyze the connection strength with wireless devices. To do that, open the **Connection quality** tab.



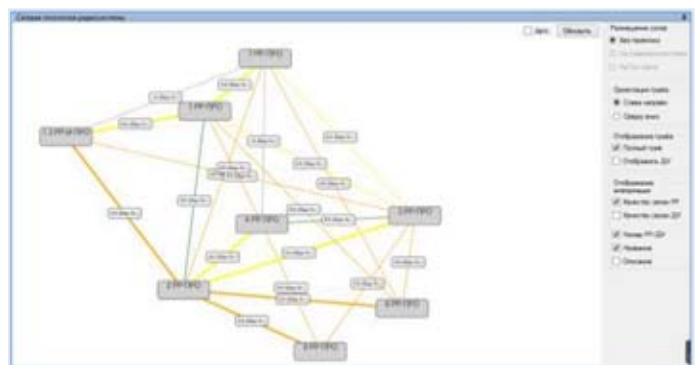
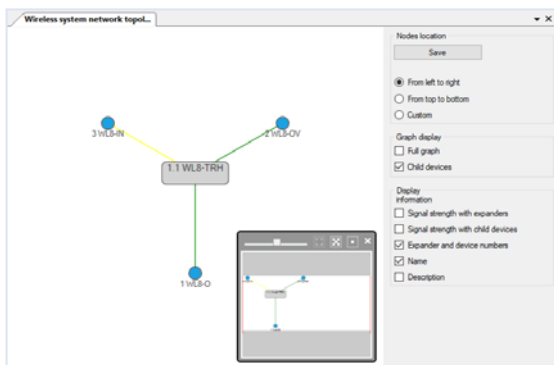
This table allows you to see the connection strength with each device in the system. The **Rating** column shows connectivity levels with the devices on a scale from 2 to 5. It is recommended that connection with all devices is rated at least 4 or 5. The **Actuality** column tells you how much time has passed since the connectivity levels have been updated. By **double-clicking** on a device you can open a plot of connection strength with this device over a certain amount of time.

Sensor	Group	Parent	Actuality	Signal	Score	Rating	Path length
1 WL8-O	Fire detectors	1.1 WL8-T...	8"	57	5		1
2 WL8-OV	Alarm devices	1.1 WL8-T...	8"	59	5		1
3 WL8-IN	Security detectors	1.1 WL8-T...	8"	43	5		1

This plot shows the current **signal strength (higher is better)** and **traffic percentage (lower is better)** in the network.



The **Wireless system network topology** window shows how different expanders and wireless devices are interconnected with each other. In the example on the left, you can see that all four of the devices are connected directly to the translator. The bigger the system is, the more complicated the graph will get.



The colour of the line also represents the connection strength (e.g. **green** is a 5). You can also select the **Full graph** option to inspect backup communication routes.

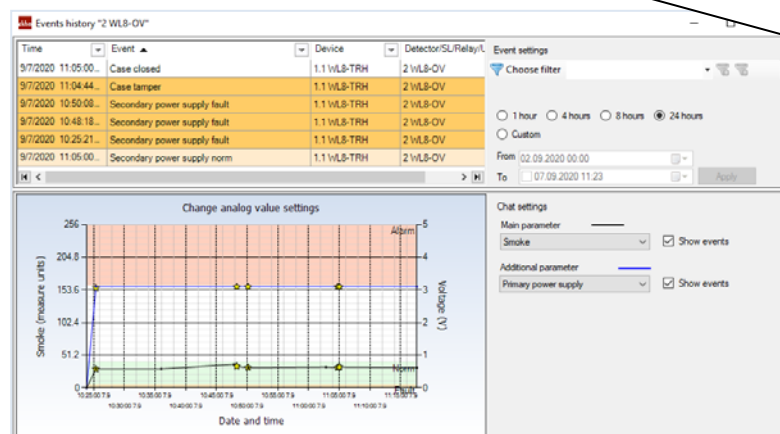
3.2 INSPECTING SYSTEM EVENTS AND ANALOG VALUES

Each device sends analog values that you can see in real time. For example, all wireless devices will send voltage levels for their main and backup battery, and smoke sensors will additionally send the dust level in its chamber. This information can be very useful for performing maintenance activities. To access this analog data, open the **Service** tab.



This table displays analog values along with faults, the number of faults in the last month, approximate temperature, and the time since the last update of the data.

Device	Sensor	Type	Group	Actuality	Prima...	Seco...	Fault	Case	Tempe...	Problems during month	Analog. L...	An. value...
1 Segment	1.1 WLB-TRH	Wireless Translator	WLB-TRH	1' 49"				Closed	25 °C			
1.1 WLB-TRH	1 WLB-O	Wireless optical smoke det.	Fire detectors	1' 49"	3.2 V	3.3 V		Closed	20 °C		Smoke	13
1.1 WLB-TRH	2 WLB-OV	Wireless smoke detector w...	Alarm devices	1' 49"	3.1 V	3.3 V		Closed	20 °C	Instances of low backup battery: 4; T...	Smoke	32
1.1 WLB-TRH	3 WLB-IN	Wireless single input modu...	Security detecto...	1' 49"	3.2 V	3.3 V		Closed	20 °C	Tamperings: 1	Zone input re...	0,00 kOhm



Double-click to see the history of analog values and faults for chosen device

You can **double-click** any device to see the history of analog values and faults for this particular device.

The normal voltage level of a full battery in a wireless detector is 3.2 V. The device will generate a fault event if the voltage is in the range of $2,75 \pm 0,1$ V.

Knowing this information, you can use **Ekho Configurator** to plan battery replacement ahead of time. The same principle applies to dust level. The device goes into a fault state when the value is over 127, however, it is recommended to clean the chamber when the dust level goes beyond 64. By analysing the analog values you can plan cleaning procedures in advance and not risk any potential false alarms.

In the **Event protocol** window below you can see all system events in chronological order.

Click **Read all events** to download all system events from **EK-WL8-TRH** memory

Click **▼** to set filter options on the particular column

Nu..	Time	Event	Device	Detector/SU/Relay/User	Additional
399	9/7/2020 10:25:21 AM	Secondary power supply fault	1.1 WL8-TRH	2 WL8-OV	
400	9/7/2020 10:48:09 AM	Programming device properties	1.1 WL8-TRH		User 2047
401	9/7/2020 10:48:18 AM	Secondary power supply fault	1.1 WL8-TRH	2 WL8-OV	
402	1/1/2020 11:05:00 AM	Device activation			
403	1/1/2020 11:05:00 AM	Device activation			
404	9/7/2020 10:50:08 AM	Secondary power supply fault	1.1 WL8-TRH	2 WL8-OV	
405	9/7/2020 11:04:44 AM	Case tamper	1.1 WL8-TRH	2 WL8-OV	
406	9/7/2020 11:05:00 AM	Case closed	1.1 WL8-TRH	2 WL8-OV	
407	9/7/2020 11:05:00 AM	Secondary power supply norm	1.1 WL8-TRH	2 WL8-OV	

Click **Export to HTML** to save the event protocol as an HTML file

Click **Reports** to use **Reports** tool

Select the boundaries of the analysed time interval

Print the report or export it to a file as needed

Streletz-Integral: Reports

from: 01.09.2020 00:00:00 to: 07.09.2020 12:24:01

Apply Export Print

Choose filter Expand all Collapse all

Nu..	Date and time	Date	Time	Event	Device	Detector/SU/Relay/Us...	Additional
399	9/7/2020 10:25:21 AM	9/7/2020	10:25:21	Secondary power supply fault	1.1 WL8-TRH	2 WL8-OV	
400	9/7/2020 10:48:09 AM	9/7/2020	10:48:09	Programming device properties	1.1 WL8-TRH		User 2047
401	9/7/2020 10:48:18 AM	9/7/2020	10:48:18	Secondary power supply fault	1.1 WL8-TRH	2 WL8-OV	
404	9/7/2020 10:50:08 AM	9/7/2020	10:50:08	Secondary power supply fault	1.1 WL8-TRH	2 WL8-OV	
405	9/7/2020 11:04:44 AM	9/7/2020	11:04:44	Case tamper	1.1 WL8-TRH	2 WL8-OV	
406	9/7/2020 11:05:00 AM	9/7/2020	11:05:00	Case closed	1.1 WL8-TRH	2 WL8-OV	
407	9/7/2020 11:05:00 AM	9/7/2020	11:05:00	Secondary power supply norm	1.1 WL8-TRH	2 WL8-OV	

Drag column titles here for grouping the events according to the type

Filter the report by any column