LANSEN
WIRELESS BUILDING TECHNOLOGY

CONFIGURATION OF REPEATER

Repeater: LAN-WMBUS-R3/R4/RX3/RX4-M/B-(LR)-(X)

Microrepeater: LAN-WMBUS-uR-B

Lansen Configurator 0.5.2.0 – 0.5.6.3

OMS® M-Bus wireless

Table of contents

Introduction

The Lansen repeaters, LAN-WMBUS-R3 and LAN-WMBUS-R4, are advanced and highly configurable repeaters that are used for extending the range between meter(s) and gateway(s). Furthermore, the repeaters can be cascaded and used in a multihop setup with support for up to three (four if software version is higher than 140) repeaters, as shown below.

Furthermore, note that some of the options in this document only is available for repeaters with protocol version 11 and some are restricted for our microrepeaters (LAN-WMBUS-uR-B).

Meter ➔ Repeater ➔ Repeater ➔ Repeater ➔ Gateway

Our repeaters are ready to use right out of the box. If configuration of the repeater is required to fit specific needs, then the repeaters can easily be configured using one of the methods below.

- Using our program, Lansen Configurator, with a Lansen Configuration USB-dongle (LAN-WMBUS-D1-TC)
- Sending out configuration packets using other transmitters, e.g., gateways

In this document, the first method of using our program, Lansen Configurator, is going to be used. This is explained further in chapter **Setup of repeater using Lansen Configurator**. If the second method is preferred, then please contact us directly for more information about this.

Abbreviations

Abbreviations	Meaning
WMBUS	Wireless Meter-bus
GW	Gateway
RX	Receive
TX	Transmit
SW	Software
RSSI	Received Signal Strength Indication

General knowledge

Waking the repeater

A repeater needs to be listening to be able to configure it. To ensure a repeater is listening, a permanent magnet can be held at the serial number label on the repeater. When the repeater senses a magnet, it starts beeping and a red LED will flash once every second. This indicates that the so-called *reed timer* has started.

Note: The red LED can only be seen if the box is open.

When the reed timer has started, a repeater will repeat incoming data and stay in listen mode until the timer is up. The number of minutes in which this mode is active is configurable, as explained in chapter **Magnet reed timer**.

Note: For the first 60 seconds after activating the repeater with a magnet, the repeater will only answer to configuration data and no other data. This can be useful in environments with lots of traffic, where it otherwise might be hard to get in contact with the repeater.

Note: If the parameter *Automatic meter installation* is enabled, then the internal routing list of the repeater will be cleared when the magnet is applied to it.

Clearing the internal routing list

Our repeaters can store up to 932 different meters (100 for LAN-WMBUS-uR-B) in their internal routing list. In other words, up to 932 (100 for LAN-WMBUS-uR-B) unique meters can be retransmitted by a repeater. The internal routing list can be cleared in two ways, either by using a magnet on the repeater or by using Lansen Configurator.

To clear the internal routing list with a magnet, simply follow the instructions in chapter **Waking the repeater**. Note that it is only possible to clear the list with a magnet if the parameter *Automatic meter installation* is enabled.

To clear the internal routing list using Lansen Configurator, see chapter **Delete meter(s)**.

Setup of repeater using Lansen Configurator

Our program, *Lansen Configurator*, can be used to setup different parameters and the program can be downloaded from our website, www.lansensystems.com. The following chapters will describe how to use this tool to connect and configure repeaters. Refer to **Figure 1** for an overview for what Lansen Configurator looks like at startup.

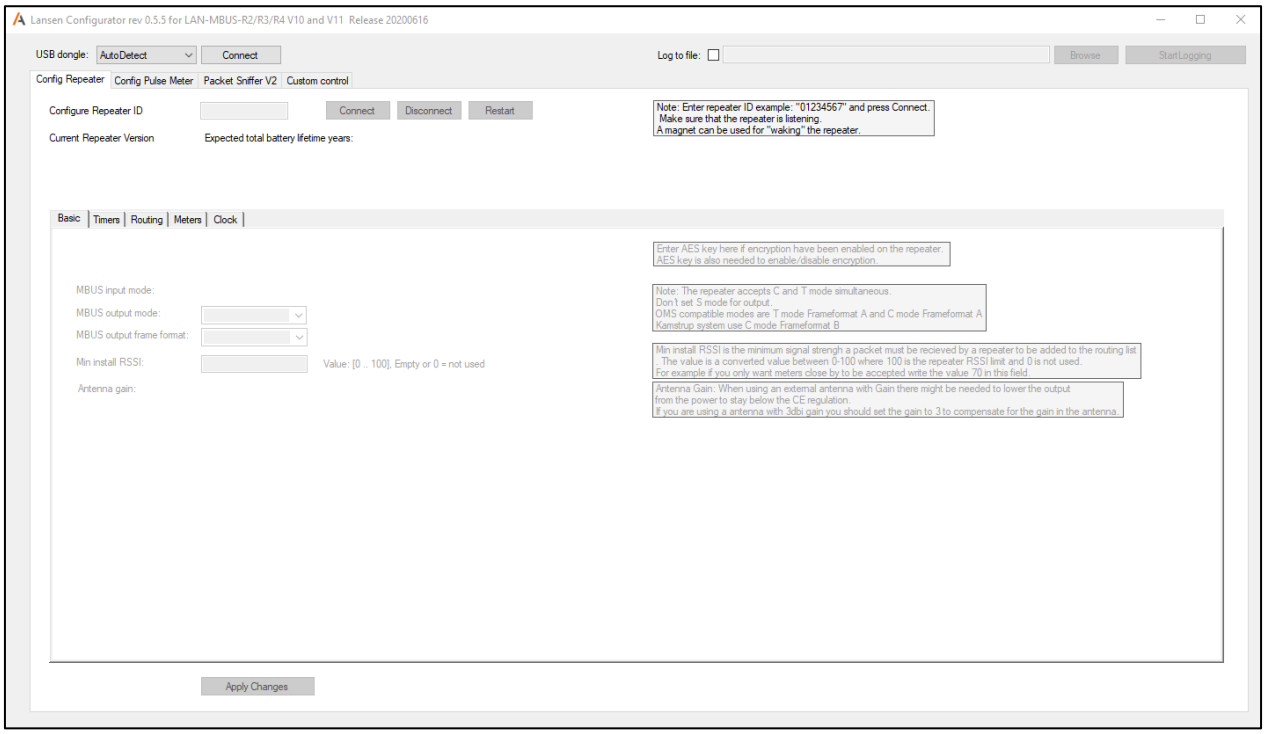


Figure 1: Overview of Lansen Configurator without any repeater connected.

Setup computer tool Lansen Configurator

Step	Action	Troubleshooting
1	Extract the *.zip-file (*LansenConfigurator*) to a folder on your computer.	
2	Open the folder and double-click on the program file called LansenConfigurator to start the program. The program shall open up like **Figure 1.**	
3	In order to configure a repeater, a Lansen Configurator USB-dongle is needed (called LAN-WMBUS-D1-TC). Connect the USB-dongle to a port on your computer. In the upper left corner, select AutoDetect and click on the button Connect. The text "Identified/connected" is shown to the right of the button if the dongle is found.	• The dongle was not found or recognized by your computer. Unplug and plug in the USB, then try again. • AutoDetect does not find the correct COM-port within five minutes. In this case, close and reopen the program and manually select a COM-port, click the button Connect and wait a minute. If a popup with the text "Failed finding dongle on any of the known serial ports" is shown, select the next port and try again. If it isn't found and no popup is shown after two minutes, close and reopen program then select the next COM-port and try again.

Connect to a repeater using Lansen Configurator

Step	Action	Troubleshooting
1	Make sure the program Lansen Configurator is running and that the USB-dongle is connected according to chapter **Setup computer tool Lansen Configurator**.	
2	In the field *Configure Repeater ID*, enter the ID of the repeater that is to be configured. The ID can be found on the label with the text LAS.XXXXXXXX.YY.ZZ, where the numbers marked with X is the ID. The repeater can be forced into listening mode by one of the methods below. When the repeater is activated, it will beep and start blinking with a red LED. • Connect the battery (if not connected) • Use a magnet on the red reed switch (located behind the serial number label) **Note**: It is possible to connect to a repeater if it is already in listening mode withing forcing it into listening mode.	• Battery connection: Check connections on both ends of the battery cable so it is fully connected at both ends • Cable break: Try moving the cable to different positions and check if the cable is faulty • Faulty battery: Try with another battery • The repeater is not in listening mode. Try using a magnet or remove and reinsert the battery again • The repeater is too close to the USB-dongle. Make sure the distance is at least 1m.

3	In the program, press **Connect** and wait up to a minute for all data to be transferred.
	The repeater is fully connected when the fields are filled with numbers.
		• A popup with the text "Timeout awaiting data response" is shown if the program failed to connect to the repeater. Check the following and then try to reconnect:
		  ○ ID is correct
		  ○ Repeater is on (red LED-lamp is blinking)
		  ○ Repeater is within range
		• If the red LED-lamp is not blinking, use a magnet on the red reed switch (located behind the serial number label) to activate it again, or remove and reinsert the battery.

Configure a repeater

Step	Action	Troubleshooting
1	Make sure *Lansen Configurator* is running and that the USB-dongle is connected according to chapter **Setup computer tool Lansen Configurator**.	
2	A repeater must be connected according to chapter **Connect to a repeater using Lansen Configurator**. When a repeater is connected, it looks like **Figure 2.**	
3	For information about each individual parameter, check chapter **Repeater parameters**.	
4	In order to change a parameter, click in the required field and update the value. In order to apply changes, click on the button *Apply Changes*.	• If any error is received after the button *Apply Changes* has been pressed, make sure that the following conditions are met: ○ The repeater is in active mode ○ The repeater is close enough ○ The repeater is more than 1m away from USB-dongle ○ The correct encryption key is entered (if encryption to change the parameters has been enabled on the repeater)
5	After the changes have been successfully transferred to the repeater, the updated fields will turn from red to green.	

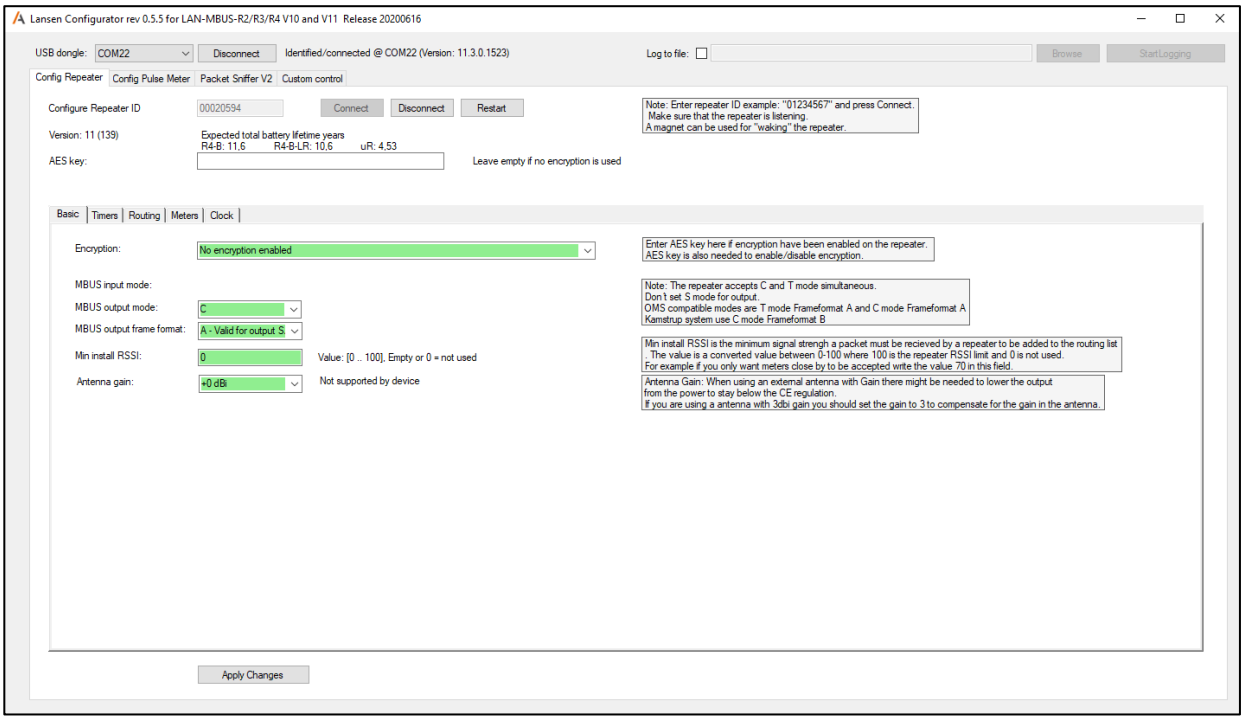


Figure 2: Overview of Lansen Configurator when a repeater is connected. A red field means that the parameter in the program does not match the value read from the repeater. Press "Apply Changes" to transmit the changes to the repeater.

Repeater parameters

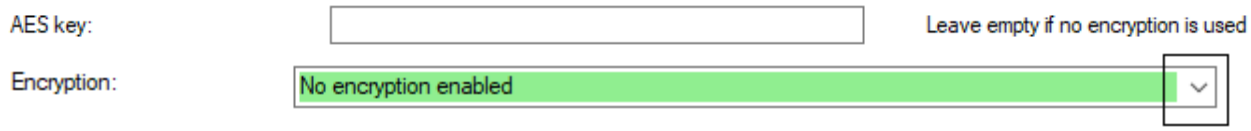
In the following chapters, each tab and all parameter will be explained in greater detail.

Basic-tab

This tab contains the so called “basic” parameters of the repeater.

AES key

This parameter is used to enable/disable the encryption options for a repeater. By default, the repeater is configured to not use encryption. Note that this encryption is NOT used for encrypting incoming data packets from meters, it is only used for packets sent to the repeater for configuration and/or time synchronization.

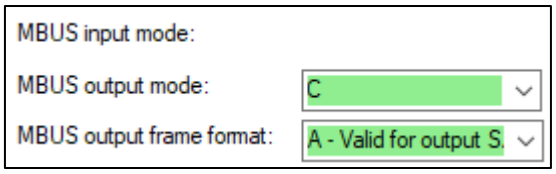


The different encryption options can be seen by clicking on the arrow marked by a box in the picture above. There are four options available, as explained in the table below. To change from one option to another, the correct AES key must be written in the field *AES key*. Contact Lansen to acquire the AES-keys if encryption for the repeater is desired.

Option	**Meaning**
No encryption enabled	Encryption is not enabled. When this option is enabled, the user does not need to write any key in the field *AES key* to change the other parameters for the repeater.
Enabled for configuration	Encryption is enabled. When this option is enabled, then the field *AES key* must contain the correct key for the repeater to apply any parameter changes.
Enabled: OMS time sync	This option enables the OMS time sync. This option needs to be enabled if time synchronization should only be allowed if the time synchronization packet is sent encrypted. This packet is sent from a gateway using the OMS time synchronization format.
Enabled: OMS time sync and configuration	This option combines the two options above, i.e., *Enabled for configuration* and *Enabled: OMS time sync*.

MBUS mode

This parameter is used to set the outgoing communication format from the repeater.



The repeater always accepts incoming data in C- and T-mode but the output mode can be changed to S, C, or T with FrameFormat A or B. Recommended use is *Output=C* and *FrameFormat=A*. The S-mode should generally NOT be used before consulting with Lansen.

Min install RSSI

This parameter is used to ensure only meters with good signal strength is retransmitted by the repeater.

By using this parameter, one can control the minimum signal strength a meter must be heard by the repeater in order to be added to the internal routing list of the repeater. This can be used in an environment where multiple repeaters are deployed. By using this setting, only meters with a good connection to the repeater is handled, thus decreasing the risk for data collision in the air due to less retransmissions by fewer repeaters.

Note: The repeater must be restarted after this parameter has been updated, otherwise the internal routing list will not be changed. A restart can be performed by disconnecting the power/ battery and connecting it again, restarting by clicking on the button *Restart* in Lansen Configurator, or by sending out the command from a gateway.

Antenna gain

This parameter is used if a repeater has an external antenna with a gain connected.

Having a large external antenna is advantageous since it allows a repeater to have a better reception. However, our repeaters are built to send on the maximum allowed output power and using an antenna with gain causes the repeater to transmit with an output power greater than the legal limit.

To counteract the antenna gain when transmitting, set this parameter to the specified gain on the external antenna and the repeater will lower its output power to match the gain, thus transmitting at the legal limit. This allows the repeater to use the full potential of the antenna when receiving and stay at the legal limit when transmitting.

Note: This parameter is only applicable to models which supports ONE external antennas (ending with -X on the label).

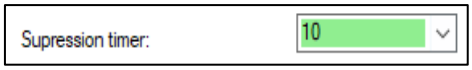
Note: This parameter is not needed for the model LAN-WMBUS-RX3/4-M-LR-X since it uses TWO external antennas; One for receiving and one for transmitting.

Timers-tab

This tab contains parameters for the repeater which are timer-based, such as listen and pause timer. It is also possible to configure if the repeater should wakeup on specific days, e.g., Mondays.

Suppression timer

This parameter is used to reduce how often packets from each meter is retransmitted by the repeater, or in other words, it limits how often a receiver/gateway gets data from each meter. A higher value on this parameter lowers the risk of data collision in the air while making it easier for the repeater to retransmit more meters.



Sometimes meters transmit data very often, e.g., every 15 seconds, while the data itself is typically only needed once every 60 minutes. The suppression timer should typically be set to the needed data time divided by 3-4.

Note: Setting this parameter to zero should always be avoided if not used in small installations or during testing, due to increased risk for data collision in the air.

Example:
If data is needed once every 60 minutes, then the timer should be set between 15-20 minutes (60/3=20 and 60/4=15). In this case, we use 20 minutes. With this setup, data from every meter is retransmitted once every 20 minutes even if the meters transmit more frequently.

Start time

This parameter is used to control at what time and how often a repeater should start listening on selected weekdays.

Every time the repeater wakes up, it will start retransmitting for the duration configured on the parameter *Listen/pause timer* and then goes to sleep until it is time to wake up again. For this feature to work properly, the time in the repeater must be synchronized. Time synchronization is explained further in chapter **Clock-tab**.

To setup this properly, four options are available. From left to right in the picture above, this is what they mean:

- **Checkbox**: Activate/deactivate this parameter
- **Time field**: Define which time the repeater should start listening
- **Period interval**: How often the repeater should start listening
- **Active days**: The repeater will start listening for each checkbox marked

Checkbox

When this checkbox is marked, then this parameter is active. The repeater will then start listening at the times, intervals, and days specified by the next options.

Time field:

The time set in this field indicates what time each day the repeater will wake up and retransmit packets. The time defined in this field must be equal or less than the chosen period interval. Furthermore, the repeater will be listening for the time defined in the parameter *Listen/pause timers*.

Note: On weekdays which has not been selected, the repeater will wake up for 60 seconds on the time set in this field and listen for configuration data. This way, one can reconfigure the device at least once a day.

Period interval:

This option defines how often the repeater will start listening and is added to the time set in the option *Time field*.

Active days:

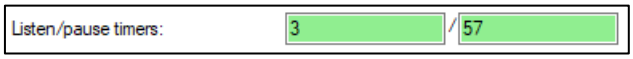
This option controls which days the repeater should be listening on. Simply mark the checkboxes for the days the repeater should be listening on and uncheck the other days. For the unchecked days, the repeater will wake up for 60 seconds at the time defined in option *Time field* and makes it possible to configure it even on inactive days.

Note: If repeaters are used in a multihop setup, then ONLY set this parameter (*Start time*) for the repeater closest to the gateway. The other repeaters will synchronize their listen time with the repeaters closer to the gateway if the parameter *Next Hop Repeater* is used.

Note: For examples on how to configure this parameter, see chapter **Using Start time in a multihop system**.

Listen/pause timers

This parameter sets how many minutes a repeater should be listening (retransmitting packets) and pausing (not retransmitting). The repeater alternates between these states.



The ration between these two settings will affect the lifetime of the battery in the repeater and should be set according to the need for data from meters. Typically, we recommend following settings for the battery driven repeaters:

Device	Listen/pause timers	Expected battery lifetime
R4-B	3/57	5 years
R4-B	3/117	10 years
R4-B-LR	30/690	5 years
R4-B-LR	20/1420	10 years
uR-B	10/1430	5 years

Note: For mains-operated repeaters (LAN-WMBUS-R4-M), this parameter can be set to 1/0 so they are always listening.

Note: This parameter should be the same for all battery-operated repeaters in a multihop setup.

Magnet reed timer

This parameter sets how many minutes a repeater is in forced listening mode when a magnet has been used against it. This can be used, for example, when configuration of a repeater is needed or during installation.

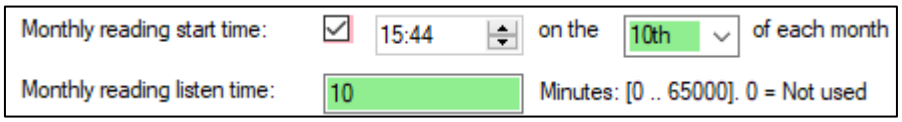
This mode is activated by using a permanent magnet against the serial number label on the box for one second. This mode is successfully activated when a beep is heard, and a red LED is flashing. Note that the LED is only visible when the lid is removed.

For the first minute after using a magnet, the repeater will only listen to configuration packets. This can be used if the repeater is being configured in an area with a lot of packets in the air.

For the rest of the time defined by this parameter, the repeater will retransmit incoming packets as normal with the suppression timer. Once this timer is out, the repeater will go to sleep according to the pause time set on the parameter *Listen/pause timer*.

Monthly reading start time

This parameter is a separate timer which is used to awake the repeater at a specific date and time once a month and is useful in systems where meter data is also needed at a specific date and time every month.

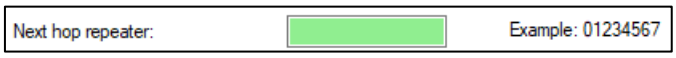


Routing-tab

This tab contains parameters for the repeater which are routing-based.

Next Hop Repeater

This parameter is used in multihop systems so repeaters can synchronize their listen time so all repeaters starting transmitting packets at the same time.

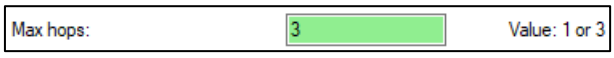


This parameter is used for setting the serial number of the repeater that is closer to the gateway in a multihop setup, as the picture below. If it is the first repeater in a multihop system, that is, the repeater closest to the gateway, then leave this field empty. See the picture below for an example.

Note: Do NOT set this parameter for a battery-operated repeater if the next hop is a mains-operated repeater. A mains-operated repeater is always on so a battery-operated repeater will also always be on, thus draining the battery very quick.

Max hops

Note: Our microrepeaters, LAN-WMBUS-uR-B, does not support multihop. It only retransmits packets coming directly from meters.

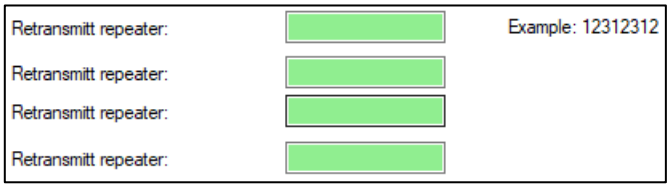


This field must only contain one of the following values:

- 1: **No multihop**: The repeater does not support multihop
- 2: **Dynamic multihop**: All incoming packet retransmitted if hop count of packet is less than two. With this setting, the parameters *Retransmit repeater* does not need to be set.
- 3: **Static multihop**: Retransmits packets coming from repeaters set in parameters *Retransmit repeater* or coming directly from meters. Supports up to three hops.
- 4: **Static multihop**: Same as the option above but supports up to four hops. Note that this value is only supporter on repeater with software version of at least 141.

Retransmit repeater

This parameter is used in multihop setups where repeaters are used to extend the range between meters and gateway(s).
Note: This parameter is not applicable for our microrepeaters, LAN-WMBUS-uR-B, because they do not support multihop. Our microrepeaters only retransmits packets coming directly from meters.



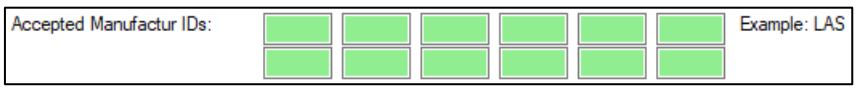
Each repeater can be configured to retransmit packets from up to four other repeater. This allows a repeater to not only forward data from meters but also data sent from repeaters with the specified serial number written in these fields. The serial number of a repeater can be found on the label with the text LAS.XXXXXXXX.YY.ZZ, where the numbers marked with X make up the serial number.

Furthermore, up to three hops (four if repeater has software version 140 or newer) can be made by a data packet. Thus, up to four repeaters can form a chain to extend the range between meters and a gateway, as in the example below.

Note: As a rule of thumb, a repeater needs approximately one second to process a packet. Each added repeater to this parameter limits how many packets it can retransmit directly from meters. We recommend keeping the number or repeaters for this parameter to a minimum.

Accept Manufacturer ID

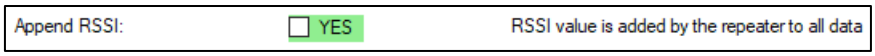
This parameter is used if the repeater should only retransmit packets from meters with a specific manufacturer code.



This setting acts as a filter for the repeater and helps minimizing packets in the air while controlling which meters are retransmitted. This is useful in areas where systems from different companies and manufacturers are installed. If all fields are empty, no filtering is done by the repeater, hence data from any meter will be forwarded.

Append RSSI

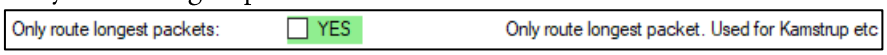
This parameter is used if it is of interest to know the RSSI of the received packet by the repeater from a meter.



If this parameter is enabled, then the repeater will add its serial number and the received RSSI of the packet at the end of the retransmitted packet. By using this option, one can see how good the connection is between a meter and a repeater.

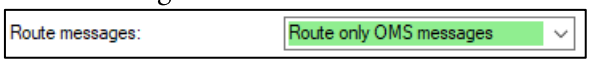
Note: This setting works best with meters that do not use manufacture specific VIF field.

Only route longest packet



If this box is checked, then information regarding the longest packet from each meter is stored. Only packets with this length is retransmitted by the repeater while shorter packets will be ignored. This is useful when communicating with meters that use compact mode and the gateway cannot handle compact mode.

Route messages



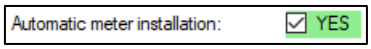
This parameter has two options, as explained below:

- Route only OMS messages: The repeater will only retransmit OMS compatible packets
- Route all messages: The repeater will retransmit both OMS and non-OMS compatible packets

Meters-tab

The parameters and options in this tab have to do with the internal routing list of a repeater. Here, meters can be viewed, added, and removed as explained in each chapter below.

Automatic meter installation



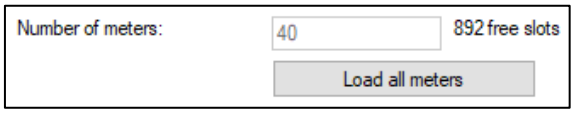
When this checkbox is marked, then the repeater will automatically add received meters to its internal routing list with maximum 932 (100 for microrepeater, LAN-WMBUS-uR-B) unique meters per repeater. If it is not desired to add any more meters, uncheck the checkbox.

Note: It is recommended to uncheck this box for LAN-WMBUS-uR-B and add meters manually (see chapter **Add** meter data) to ensure only needed meters are in the internal routing list.

Note: If this parameter is enabled, then the repeater will clear its internal routing list when a magnet is applied to it. For more information, see chapter **Waking the repeater**.

Note: If this parameter is disabled and no meters are stored in the internal routing list, then no meters will be retransmitted by the repeater. In this case, meters must be added manually (see chapter **Add meter data**).

Number of meters



The field displays how many meters there currently are in the internal routing list of the repeater. On the right-hand side of the field is the currently available number of slots shown.

Note: The currently available numbers shown on the right-hand side are not for LAN-WMBUS-uR-B.

To view all the meters in the internal routing list, click on the button **Load all meters**. This will fill up the list on the right-hand side of the program.

Add meter data

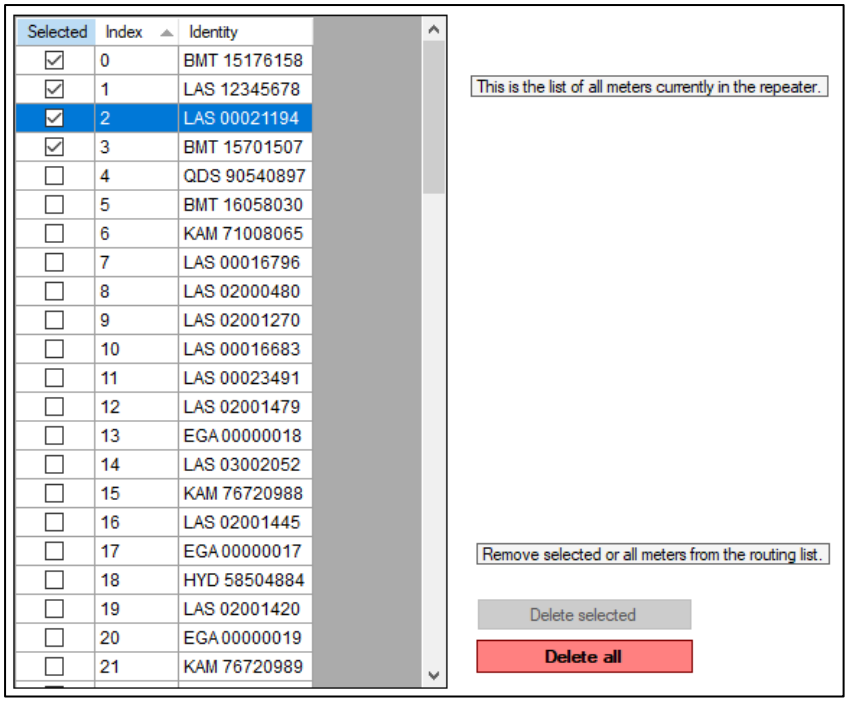
This is where a user can manually add a meter to the internal routing list of a repeater.

To add a meter to the internal routing list, fill in the manufacturer ID (left field) and the serial number (right field) and click on the button **Add meter(s)**. The meter will then be added by the repeater.

Note: Adding meters manually can only be done if the parameter *Automatic meter installation* is disabled.

Delete meter(s)

This is done if one, or several, meter should not be retransmitted by a repeater.

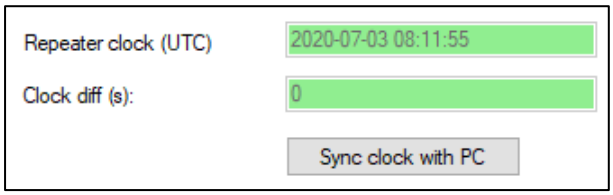


To remove all meters, click on the button **Delete all**. If the parameter *Automatic meter installation* is enabled, then the same function is achieved by applying a magnet to the repeater (see chapter **Waking the repeater**). If only selected meters should be deleted, then use the button **Delete selected**. Simply mark the meters in the list which are not wanted and click on the button **Delete selected** – the repeater will then remove the selected meters from its internal routing list.

Note: The button **Delete selected** is only enabled when the parameter *Automatic meter installation* is disabled.

Clock-tab

This tab shows information about the internal clock of the repeater.



The upper field (*Repeater clock (UTC)*) displays the internal clock of the repeater as UTC-time while the lower field (*Click diff (s)*) shows how many seconds the internal clock of the repeater differs from the current clock on the PC.

To synchronize the repeater clock to the PC, simply click on the button **Sync clock with PC**.

Note: The time transmitted is the PC time converted to UTC. The repeater will NOT adjust for summer- or wintertime.

Note: If a repeater should use another time, then change the PC time before pressing **Sync clock with PC**.

Note: To keep time synchronization in a battery-operated system, it is recommended to transmit time synchronization packets from the GW according to the OMS standard in regular intervals. Note that LAN-WMBUS-R3/R4 has a highly accurate onboard temperature compensated clock for minimum drift and the expected drift is less than 0.5 seconds / day.

Example configurations

In this chapter, different configurations and typical values for the different configurations will be presented. These examples can be used as guidelines during installation of the repeaters.

Testing multihop between repeaters

It is possible to test multihop with repeaters without having to put them at a greater distance between each other. This is done by forcing the repeaters which are closer to the gateway to ignore data from sensors. For this to work, the parameters *Min install RSSI* and *Retransmit repeater* will be adjusted. In this case the meter (S1) and the repeaters (R3, R2, R1) are placed as in **Figure 3**.

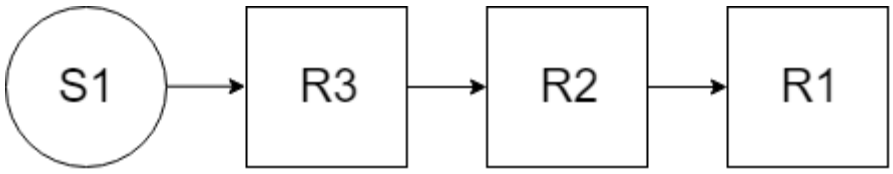


Figure 3: Setup to test multihop. In this setup, the data from the meter (S1) will be transmitted to R3 and retransmitted to R2 and then R1.

The repeaters and their individual parameters can be seen in the table below. Notice how the repeater closest to the meter is missing both *Retransmit repeater* and *Min install RSSI*.

Note: The repeater must be restarted from the program after this parameter has been updated, otherwise the internal routing list will not be changed.

Repeater number	Serial number	Min install RSSI	Retransmit repeater
R3	00020594		
R2	00020593	3	00020594
R1	00020592	3	00020593

Routing between repeaters (multihop)

The repeaters can be used in such a way that they form a transmission chain between meters and a gateway, thus increasing the range between them. See **Figure 4** for how this can be achieved.

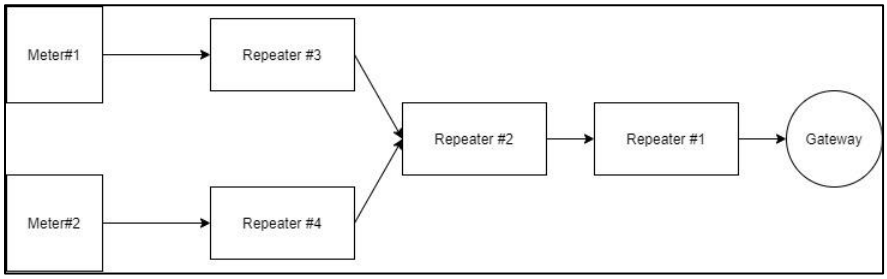


Figure 4: One way to setup the repeaters to increase the range from the meters, Meter#1 and Meter#4, all the way to the gateway. Note that Repeater#2 retransmits from two repeaters.

For this setup to work, there are mainly two different parameters that needs to be updated:

- *Next Hop Repeater*: The serial number for the next repeater which is closer to the gateway. If a gateway is the next hop, then this field is to be left empty.
- *Retransmit Repeater*: The serial number for the repeaters that a repeater will retransmit data from.

To be able for this to work, the repeaters must be configured as in the table below.

Repeater	Next Hop Repeater	Retransmit Repeater
Repeater#4	This field contains the serial number for Repeater#2 since that repeater is closer to the gateway.	Field left empty. There is no repeater before it, only meters.
Repeater#3	This field contains the serial number for Repeater#2 since that repeater is closer to the gateway.	Field left empty. There is no repeater before it, only meters.
Repeater#2	This field contains the serial number of Repeater#1 since this is the repeater closest to the gateway.	Two of the fields for this parameter is filled out: • One with the serial number for Repeater#3 • One with the serial number for Repeater#4
Repeater#1	Field left empty. There is no repeater after this one, only a gateway.	This field contains the serial number for Repeater#2 since that is the one prior to this one.

Note: The parameters *Listen/pause timers* should be the same for all battery-operated repeater in a multihop system.

Note: Do NOT set the parameter *Next Hop Repeater* for battery-operated repeaters if the next hop is a mains-operated repeaters, otherwise the battery-operated repeaters will synchronize its listen timer to the mains-operated repeater, meaning it will always be on and drain the battery quick. Therefore, make sure that the mains-operated repeaters are mounted closest to the gateway.

Note: Only set the parameter *Start time* for the repeater closest to the gateway. The other repeaters will synchronize their listen time with the repeaters closer to the gateway if the parameter *Next hop repeater* is used.

Note: If there are only battery repeaters in a multihop system, we strongly recommend not using more than one *Retransmit repeater* for each repeater in the chain. Otherwise, the last repeater is the chain (repeater closest to the gateway) may be overburdened by packets sent by the other repeaters.

Daily readings with a repeater during a specified time

This configuration can be used if data from meters is needed only during a set interval each day.

In this example, data is needed every 4 hours on Mondays, Wednesdays, and Fridays starting at 02:15. To achieve this, the parameter *Start time* has been configured with the following (see **Figure 5**).

Checkbox: Enabled
Start time: 02:15
Period: 4h
Weekdays: Monday (Mo), Wednesday (We), Friday (Fr)

Next, *Listen/pause timer* needs to be set. This parameter is used to determine how long the repeater is to be active every time is starts listening. In this example, 10 minutes is deemed enough and gives an expected battery lifetime of 10 years. Notice that the second field for *Listen/Pause timer* is greyed out and that it cannot be changed. This is due to *Start time* being enabled and automatically calculates the correct pause time. Furthermore, note that the pause value changes when the parameter *Listen timer* or the period time is changed because it calculates the number of minutes to sleep until the repeater is to be active again.

It is advised to set the parameter *Suppression timer* as well. In this example, the timer is set to 6 minutes, i.e., we will get a reading from each meter every 6 minutes, which gives us a total of 2 readings during each interval.

Note: For this feature to work properly, the clock in the repeater must be synchronized to the real clock, see chapter **Clock-tab** for more information.

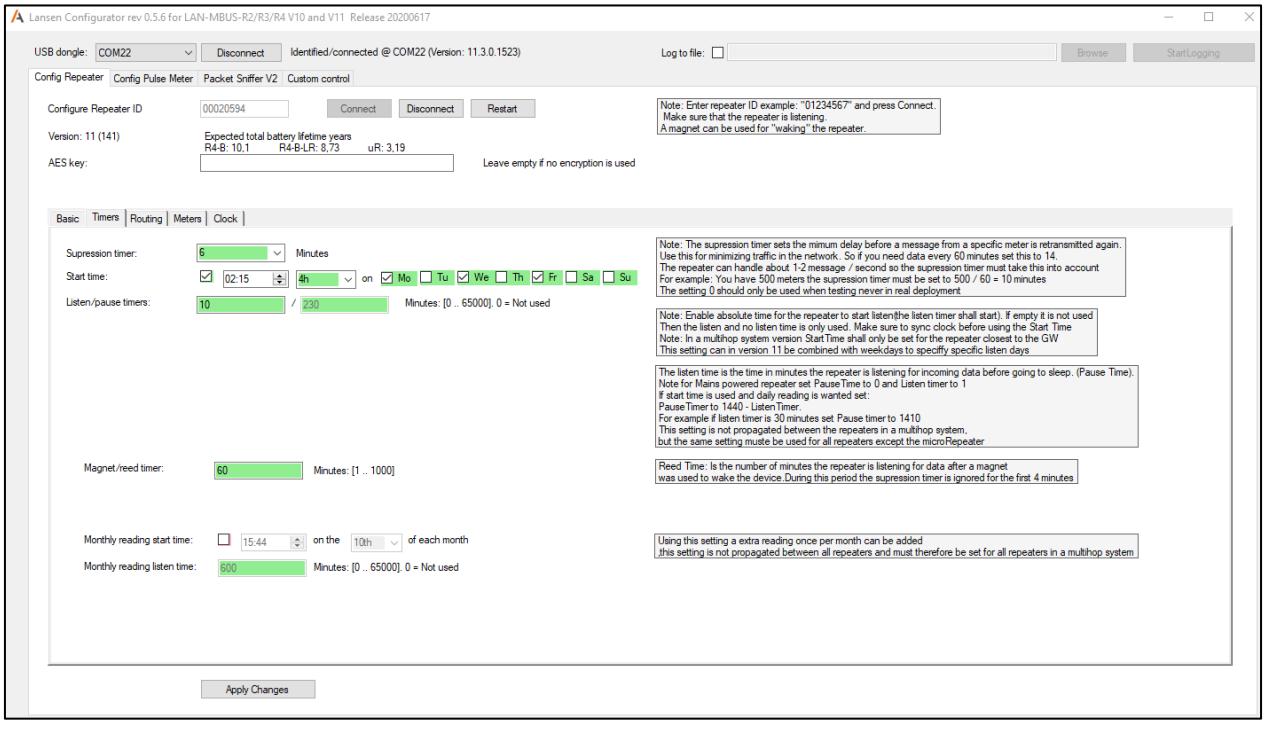
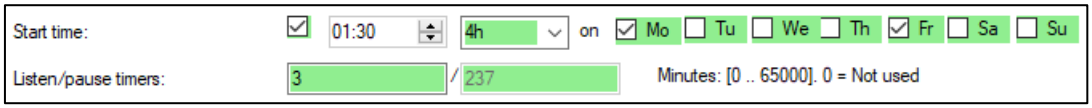


Figure 5: Example of how parameters can be set to use daily readings with a repeater.

Using Start time in a multihop system



When using this parameter in a multihop system, only configure the repeater closest to the gateway. The other repeaters will synchronize their listen time to the next repeater in the chain if they are setup correctly. For more information on how to setup a multihop system, check out chapter **Routing between repeaters (multihop)**.

In the figure above we have the following setup:

Start time:

Set to 01:30. For each weekday marked, the repeater will wake up at 01:30 o'clock plus the period time chosen. The repeater will stay awake for the time set in the first field of parameter *Listen/pause timers*. For each unmarked weekday, the repeater will wake up at 01:30 and stay awake for 60 seconds.

Period time:

This is how often a repeater should wake up, counting from "Start time". In this case, the repeater will wake up every 4 hours from 01:30, that is, 05:30, 09:30, 13:30, 17:30, and 21:30.

Weekdays:

This is which weekdays the repeater should wake up. In the example above, it is set to Mondays (Mo) and Fridays (Fr).

Listen/pause timers:

This is how long the repeater is listening/pausing. With the current configuration, the repeater will be listening for 3 minutes every time it wakes up and then sleep for the reminder of the time (237 minutes). Note that the field for "Pause timer" is grayed out, due to being calculated based on the time set for "Period time".

Typical settings for hourly readings

This configuration is used the most and allows a repeater to transmit data in fixed intervals.

In this example, following constraints apply:

- Data from two different manufacturers are needed
- The two meters come from different manufacturers, MEG and BTM
- There are 600 meters in the building
- We need data once every two hours
- The repeater is battery-operated

With these constraints, we can now configure the repeater to be able to behave properly.

First, we need to consider how many meters the repeater will need to handle. A rule of thumb is that the repeater requires about one second to process each packet. Therefore, the listen timer should reflect on how many meters there are in the expected area. In this case, there are 600 meters in the area and the repeater will need about 600 seconds (6 minutes) to handle at least one packet per meter while listening.

With the information above, we can set an adequate value for *Listen/pause timers* in the Timers-tab. In this case, we use 6 minutes listen and 114 minutes pause (6 minutes + 114 minutes = 120 minutes = 2 hours). In other words, the repeater is retransmitting packets for 6 minutes every two hours. This gives an expected battery lifetime of 5 years.

Next, *Suppression timer* should always be set. This parameter is used to minimize the traffic in the air, which is especially important in a building with many meters. As a rule of thumbs, this value should be set to a value between 3 to 4 times less than how often we require data. Therefore, suppression timer is set to 30 minutes since we need data every two hours.

Lastly, we want to filter out the needed meters. This is done by adding the manufacturer ID, MEG and BTM, to the fields for *Accepter Manufacturer ID* in the Routing-tab.

Check routed messages with Packet Sniffer V2

Our program, Lansen Configurator, also includes a sniffer tab called *Packet Sniffer V2*. This page is seen in **Figure 6**. By using *Packet Sniffer V2*, henceforth called the Sniffer, one can observe all packets sent in the area, both by meters and repeaters.

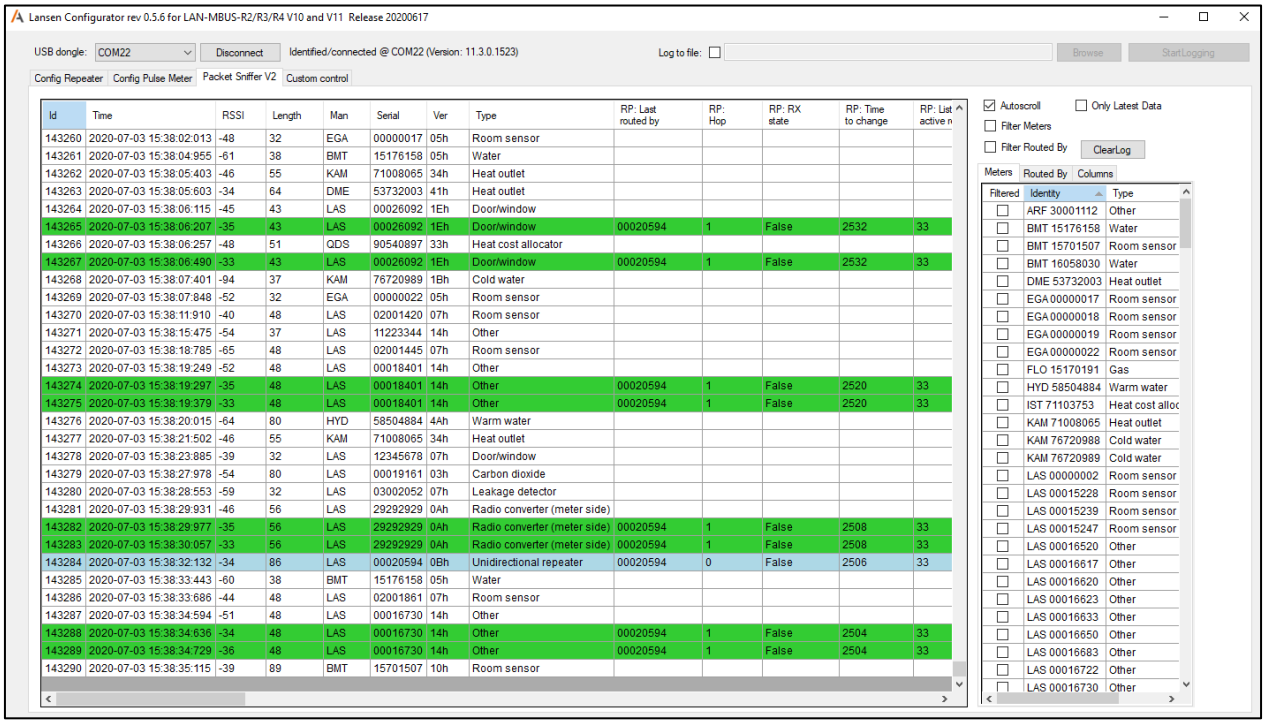


Figure 6: Overview for the page Packet Sniffer V2.

Overview of the Sniffer

The Sniffer-view, as seen in the picture above, contains two lists – *Primary list* (left side) and *secondary list* (right side). The *primary list* shows information about the packets which the USB-dongle picks up while the *secondary list* contains some tabs which change what is shown in the list.

Furthermore, there are a couple of options in **Figure 6**, located in the upper right corner, that can be used to sort out or filter out necessary data in the *primary list*.

Sniffer options

The Sniffer has some options in the upper right corner which can be used to change what is shown in the *primary list*. Each option is explained below in greater detail.

Note: It is advantageous to disconnect the USB-dongle if the options are going to be changed to quicken up the process.

Autoscroll

While active, the Sniffer will automatically scroll down to the bottom of the *primary list* every time a new packet is received. This option can be disabled so the user can scroll up in the *primary list* to observe older packets while still receiving new packets.

Filter Meters

When this option is enabled, then data will be filtered by the devices chosen in the tab *Meters* in the *secondary list*. By using this option, one can see packets from one (or more) specific meter which makes it easy to see if a meter is being retransmitted by a repeater or if packets from a repeater is being retransmitted by another repeater in a multihop setup. Simply mark the checkboxes of the meters which should be filtered in the *secondary list*.

Note: This option filters on the serial numbers visible in the column called **Serial** in the *primary list*.

Filter Routed By

This option is similar to the previous option, *Filter Meters*, but instead of filtering data which has been sent by selected meters, this option filters out data which has been transmitted from the specific repeater chosen in the tab *Routed by* in the *secondary list*.

Note: This option filters on the serial number in the column called **Last Routed By** in the *primary list* in **Figure 6**.

Only Latest Data

By using this option, the latest packet which has been picked up, whether it is a message transmitted from a meter or retransmitted from repeaters, will be shown. For example, if there is one meter and two repeaters in a setup, then there will be three rows in total. The values in the rows is updated whenever the Sniffer picks up a new packet.

This option can be used to minimize the number of rows shown in the program to get a better overview of all meters and repeaters in the area. If all packets need to be displayed in the Sniffer, then this option must be disabled.

ClearLog

This button is used to clear all the packets read so far with the program and will therefore clear the *primary list*.

Primary list

This list, shown on the left side of the program, displays all the packets which has been received so far by the USB-dongle. How the packets and information for each packet is shown depends on the options selected in chapter **Sniffer options** and

Columns. One thing to note in **Figure 6** is that each row is colored, and each color has a meaning. This is described in **Table 1** below. The reception depends on the *RP: RSSI*-column, i.e., how strong the signal is between the repeater and a meter.

It is also possible to sort the rows in this list by clicking on the top row of the columns which is going to be sorted. For example, all meters and repeaters will be sorted by serial number, from low to high, when clicking on **Serial**.

Table 1: Meanings of each color observable in the Sniffer. The reception is measured between repeater and meter.

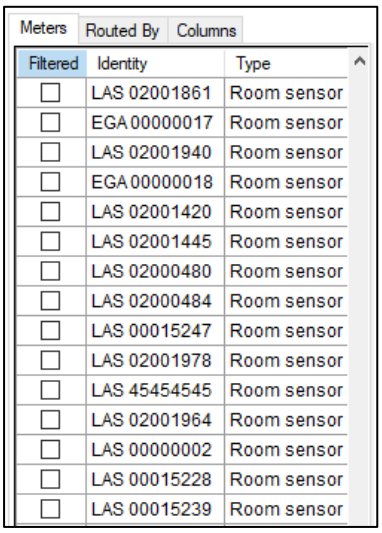
Color meaning	Color
Good reception between meter and repeater	
Okay reception between meter and repeater	
Medium reception between meter and repeater	
Bad reception between meter and repeater	
Really bad reception between meter and repeater	
Meter packet picked up directly by USB-dongle	
Status packet sent by a repeater (not meter data)	

Secondary list

This list is used as a complement to the options in chapter **Sniffer options** and changes what is displayed in the *primary list*. As seen in **Figure 6**, there are three tabs in this list: *Meters*, *Router By*, and *Columns*.

Meters

This tab, as seen by the picture on the right, contains three columns. For each new meter which has been received by the program, a new row is created, and each row contain the meter manufacturer code, serial number, and type.



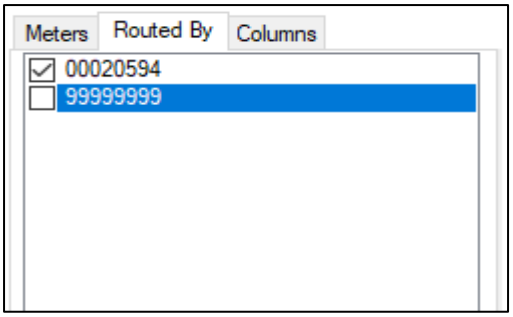
The first columns, *Filtered*, is used together with the option *Filter Meters*. If the option *Filter Meters* is enabled, then only the meters marked in this tab will be displayed in the *primary list*. This is useful if there are a lot of meters in the area and only a couple of meters are of interest.

The next columns, *Identity*, contains the manufacturer code and serial number for each meter received. By clicking on the test *Identity*, the list will be sorted alphabetically (A to Z), and numerically (low to high) for each manufacturer code.

The third column, T*ype*, shows which type of meter it is. This column can also be used to sort the list by clicking on the name *Type* which then will sort the list alphabetically (A to Z).

Routed By

This tab, seen in the picture on the right, only contains a checkbox and a serial number. For each new repeater received by the Sniffer, a new checkbox is created with the corresponding serial number of the received repeater.



This tab is used together with the option *Filter Routed By*. If the option is enabled, then only packets transmitted or retransmitted by the selected repeaters will be shown in the *primary list*.

Columns

This tab is used to change which columns are shown in the *primary list*. Each available option is displayed in the table below.

Column name	Meaning
Id	When a packet is received, it is assigned an ID number. Each time a new packet is received, the ID is incremented by 1.
Time	Timestamp when the packet was received by the computer.
RSSI	Signal strength of the packet sent by a repeater/meter and received by the USB-dongle. Value goes from 0 (strong signal) to larger negative values (weaker signal).
Length	Number of bytes in the received data packet.
Man	Manufacturer ID of the device, either repeater or meter, which sent the packet.
Serial	Serial number of the device, either repeater or meter, which first sent out the packet.
Version	Version of the device, either repeater or meter, which first sent out the packet.
Type	Shows what type of device, either repeater or meter, which first sent out the packet.
RP: Last routed by	Shows the serial number of the repeater which retransmitted the data most recently.
RP: Hops	Number of times the data has been retransmitted by repeaters.
RP: RX state	Shows which transmission state the repeater is currently in. TRUE=Listening and FALSE=Pausing. **Note**: If a magnet has been used to wake up the repeater, then it is possible for the repeater to transmit data even if this column is FALSE.
RP: Time to change	Indicates how many seconds it is left until the repeater changes the RX-state.
RP: Current time	Shows the current time on the repeater.
RP: Start time	Shows the time set for the parameter *Start time* if it is active.
RP: Listen days	Shows the selected weekdays for the parameter *Start time* if it is active.
RP: Microrepeater	Shows if the repeater is a microrepeater (1) or a normal repeater (0).
RP: Mains connected	Shows if it is a mains-operated (1) or battery-operated (0) repeater.
RP: Listen active reason	Shows what the current listening reason is. See **Table 2** for more details. Note that multiple reasons can be active at the same time.
RP: RSSI	Signal strength of the packet sent by a repeater/meter and received by the repeater. Value goes from 0 (strong signal) to larger negative values (weaker signal).
Raw packet	Shows all bytes in the received packet.

Table 2: Description of the different values in columns RP: Listen active reason.

Bit	Meaning
0 (0x01)	Listen timer running
1 (0x02)	Short listen window (60 seconds) for parameter *Start time* is running
2 (0x04)	Long listen window (time set in parameter *Listen/pause timer*) and parameter *Start time* is running
3 (0x08)	Monthly listen timer running
4 (0x10)	NOT USED
5 (0x20)	Magnet/reed timer running

Logging data to file

The Sniffer allows the user to log the received packets in the program onto a file on the computer. To do this, follow the steps below:

1. Click in the checkbox so it is marked. This will enable the button **Browse**.
2. Click on the button **Browse** and navigate to a place on your computer where you want to save the file. Give the file a name in the field called *File name* and click on **Save**. This will activate the button **StartLogging**.
3. Click on the button **Start logging**. The program will now save all packets with all columns shown in the *primary list*.

Revision history

Updated (date)	Revision	Updated by	Comments
2020-05-01	0a	Martin Stanic	Document created.
2020-05-02	0b	Martin Stanic	Updated all chapters according to the new Lansen Configurator (from 5.2.0 and newer).
2020-07-06	1	Martin Stanic	Document released.
2021-07-05	1a	Martin Stanic	Added some information regarding microrepeater.