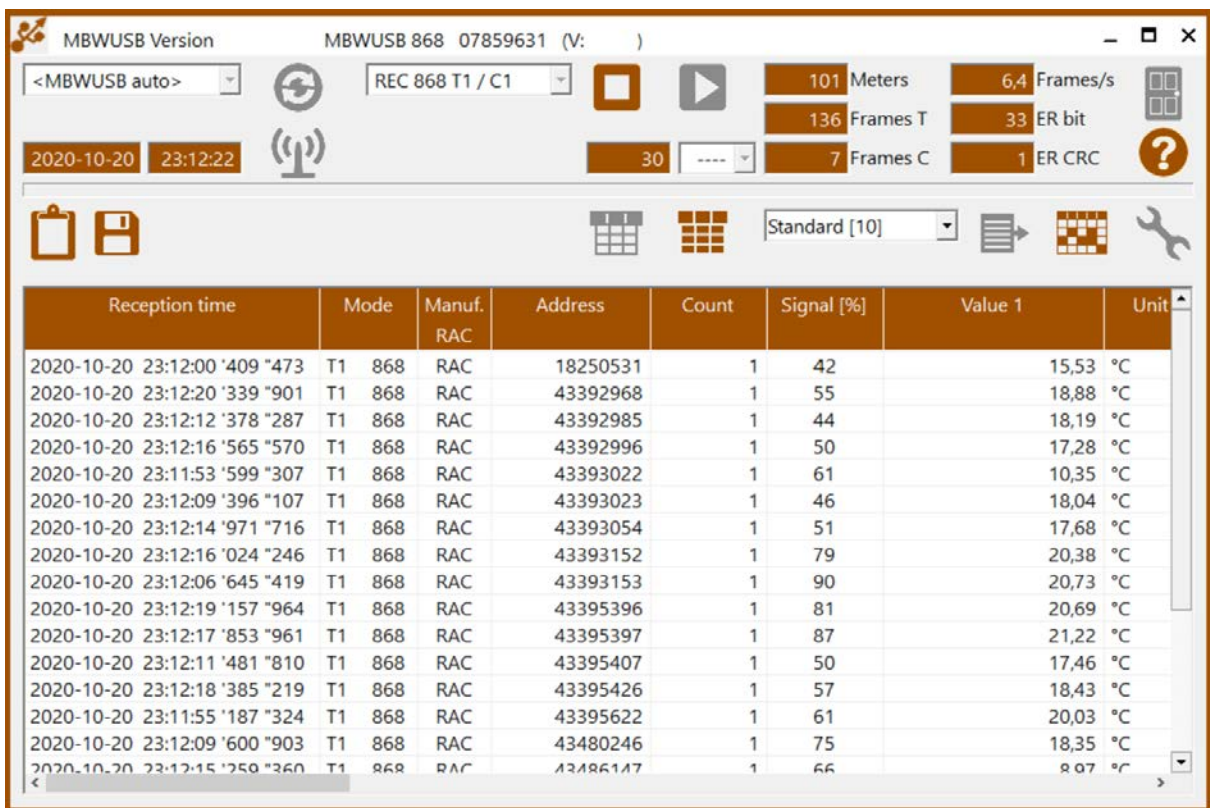


MBWUSB Software



The screenshot displays the MBWUSB software interface. At the top, the window title is "MBWUSB Version" and the device ID is "MBWUSB 868 07859631 (V:)". The interface includes a control panel with a dropdown menu set to "<MBWUSB auto>", a refresh button, a mode selector set to "REC 868 T1 / C1", a play button, and several status indicators: "101 Meters", "6,4 Frames/s", "136 Frames T", "33 ER bit", "30" (likely a frequency), "7 Frames C", and "1 ER CRC". Below the control panel is a toolbar with icons for clipboard, save, grid, and a dropdown menu set to "Standard [10]". The main area is a data table with the following columns: Reception time, Mode, Manuf., Address, Count, Signal [%], Value 1, and Unit. The table contains 15 rows of data, all with a count of 1 and a unit of °C.

Reception time	Mode	Manuf.	Address	Count	Signal [%]	Value 1	Unit
2020-10-20 23:12:00 '409 '473	T1	868 RAC	18250531	1	42	15,53	°C
2020-10-20 23:12:20 '339 '901	T1	868 RAC	43392968	1	55	18,88	°C
2020-10-20 23:12:12 '378 '287	T1	868 RAC	43392985	1	44	18,19	°C
2020-10-20 23:12:16 '565 '570	T1	868 RAC	43392996	1	50	17,28	°C
2020-10-20 23:11:53 '599 '307	T1	868 RAC	43393022	1	61	10,35	°C
2020-10-20 23:12:09 '396 '107	T1	868 RAC	43393023	1	46	18,04	°C
2020-10-20 23:12:14 '971 '716	T1	868 RAC	43393054	1	51	17,68	°C
2020-10-20 23:12:16 '024 '246	T1	868 RAC	43393152	1	79	20,38	°C
2020-10-20 23:12:06 '645 '419	T1	868 RAC	43393153	1	90	20,73	°C
2020-10-20 23:12:19 '157 '964	T1	868 RAC	43395396	1	81	20,69	°C
2020-10-20 23:12:17 '853 '961	T1	868 RAC	43395397	1	87	21,22	°C
2020-10-20 23:12:11 '481 '810	T1	868 RAC	43395407	1	50	17,46	°C
2020-10-20 23:12:18 '385 '219	T1	868 RAC	43395426	1	57	18,43	°C
2020-10-20 23:11:55 '187 '324	T1	868 RAC	43395622	1	61	20,03	°C
2020-10-20 23:12:09 '600 '903	T1	868 RAC	43480246	1	75	18,35	°C
2020-10-20 23:12:15 '259 '360	T1	868 RAC	43486117	1	66	8,97	°C

User Manual

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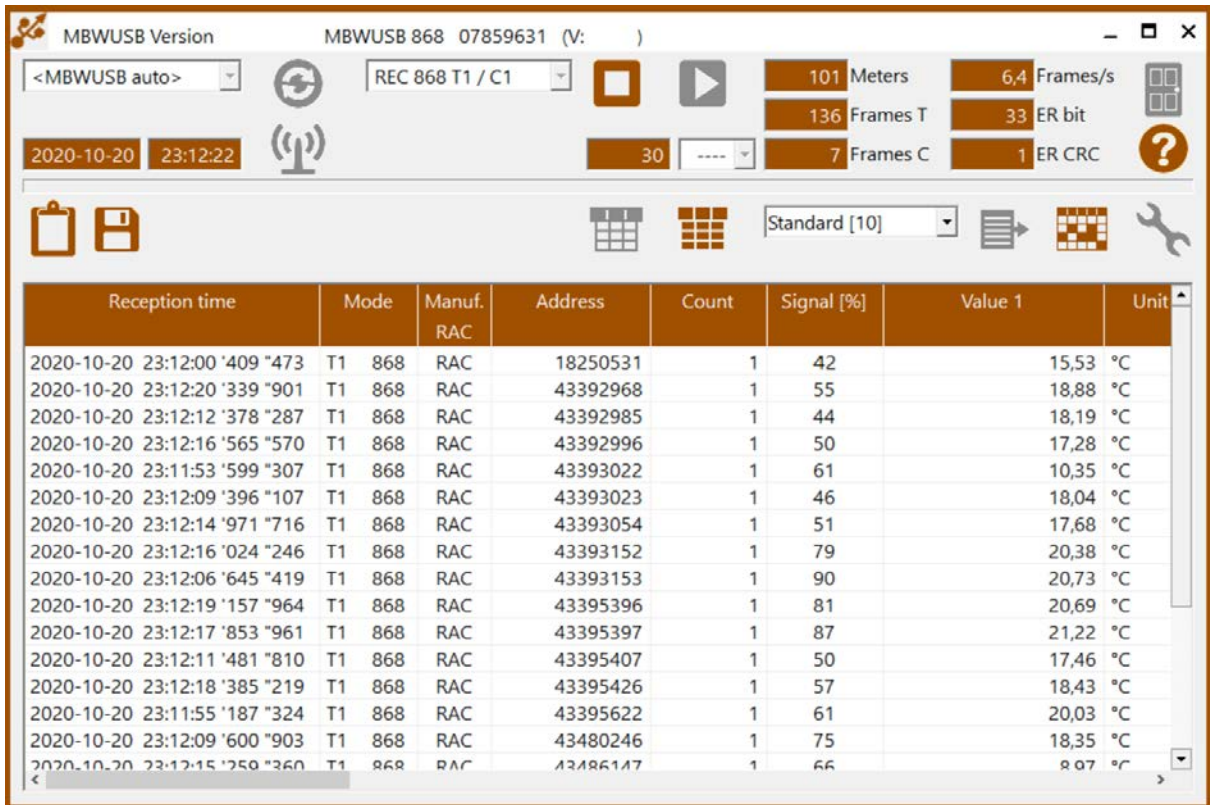
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English version

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MBWUSB Software User Manual (English)



The screenshot displays the MBWUSB software interface. At the top, it shows the version 'MBWUSB Version' and the device ID 'MBWUSB 868 07859631 (V:)'. Below this, there are several status indicators: a dropdown menu set to '<MBWUSB auto>', a refresh button, a dropdown menu set to 'REC 868 T1 / C1', a stop button, a play button, and several numerical readouts: '101 Meters', '6,4 Frames/s', '136 Frames T', '33 ER bit', '2020-10-20 23:12:22', '30', '7 Frames C', and '1 ER CRC'. There are also icons for a clipboard, a save button, a grid, a dropdown menu set to 'Standard [10]', a list icon, a grid icon, and a wrench icon. The main part of the interface is a table with the following data:

Reception time	Mode	Manuf. RAC	Address	Count	Signal [%]	Value 1	Unit
2020-10-20 23:12:00 '409 "473	T1	868	RAC	18250531	1	42	15,53 °C
2020-10-20 23:12:20 '339 "901	T1	868	RAC	43392968	1	55	18,88 °C
2020-10-20 23:12:12 '378 "287	T1	868	RAC	43392985	1	44	18,19 °C
2020-10-20 23:12:16 '565 "570	T1	868	RAC	43392996	1	50	17,28 °C
2020-10-20 23:11:53 '599 "307	T1	868	RAC	43393022	1	61	10,35 °C
2020-10-20 23:12:09 '396 "107	T1	868	RAC	43393023	1	46	18,04 °C
2020-10-20 23:12:14 '971 "716	T1	868	RAC	43393054	1	51	17,68 °C
2020-10-20 23:12:16 '024 "246	T1	868	RAC	43393152	1	79	20,38 °C
2020-10-20 23:12:06 '645 "419	T1	868	RAC	43393153	1	90	20,73 °C
2020-10-20 23:12:19 '157 "964	T1	868	RAC	43395396	1	81	20,69 °C
2020-10-20 23:12:17 '853 "961	T1	868	RAC	43395397	1	87	21,22 °C
2020-10-20 23:12:11 '481 "810	T1	868	RAC	43395407	1	50	17,46 °C
2020-10-20 23:12:18 '385 "219	T1	868	RAC	43395426	1	57	18,43 °C
2020-10-20 23:11:55 '187 "324	T1	868	RAC	43395622	1	61	20,03 °C
2020-10-20 23:12:09 '600 "903	T1	868	RAC	43480246	1	75	18,35 °C
2020-10-20 23:12:15 '258 "360	T1	868	RAC	43486147	1	66	8,97 °C

Introduction

The MBWUSB is an USB stick format radio receiver for wireless M-Bus mode T, C and S consumption meters. In general it is used for mobile reading and radio meter testing purposes.

This software is used for simple readout of radio meters. It provides receiving, deciphering and decoding of radio frames which are compatible to the Open Metering Specifications (OMS, <https://oms-group.org/>).

Explanations to special terms and abbreviations used for radio frame elements can be found in EN13757-4, EN13757-7 and especially in OMS specification volume 2 "Primary Communication".

System Requirements

Before installing the MBWUSB software, please check if your PC complies with the minimum requirements:

- Windows 8, 8.1 or 10 operating system (updated to the latest version)
- 1 GHz processor
- 1 GB memory
- 20 MB free hard disk space
- 1 free USB port
- Internet connection (for installing the USB driver and getting software updates)

Installation

Installation of the MBWUSB Software

The installation file **MBWUSB2_Setup.exe** has to be started on your PC. If possible use the standard installation path:

c:\Program Files (x86)\Michael Rac GmbH\MBWUSB2

Installation of the MBWUSB USB Hardware Driver

The MBWUSB uses an USB standard driver, which is already installed on most Windows PC. If this is not the case the automatic driver search mechanism of Windows is downloading the current USB driver. However, an internet connection is necessary in this case.

If the automatic driver installation is disabled on your PC and the respective driver is not already on your PC you have to execute the file **CDM21228_Setup.exe** which can be found on the installation CD or on internet.

Automatic Software Update

With an internet connection the software checks at startup time if there is a new version available. If this is the case the new version is automatically installed.

Automatic Device Firmware Update

On connecting an MBWUSB device the software is checking if there is a new firmware version available for the device. If this is the case the MBWBUS device is updated automatically.


Starting up the MBWUSB Software

The MBWUSB software is started by double-clicking the program icon on your desktop or by selecting its entry at the Windows start menu:



Having installed the software for the first time, the following dialog for selecting the program language appears (English, French or German).



Note: You may change the language afterwards using the settings dialog .

General Elements



Ends the program



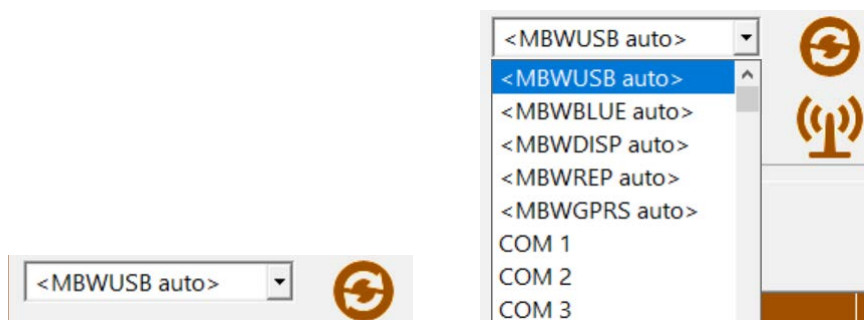
Opens this manual (equivalent to pressing the F1 key). A PDF document reader must be installed.

2020-10-21 14:47:02

Current date and time of the PC.

Connecting a Device

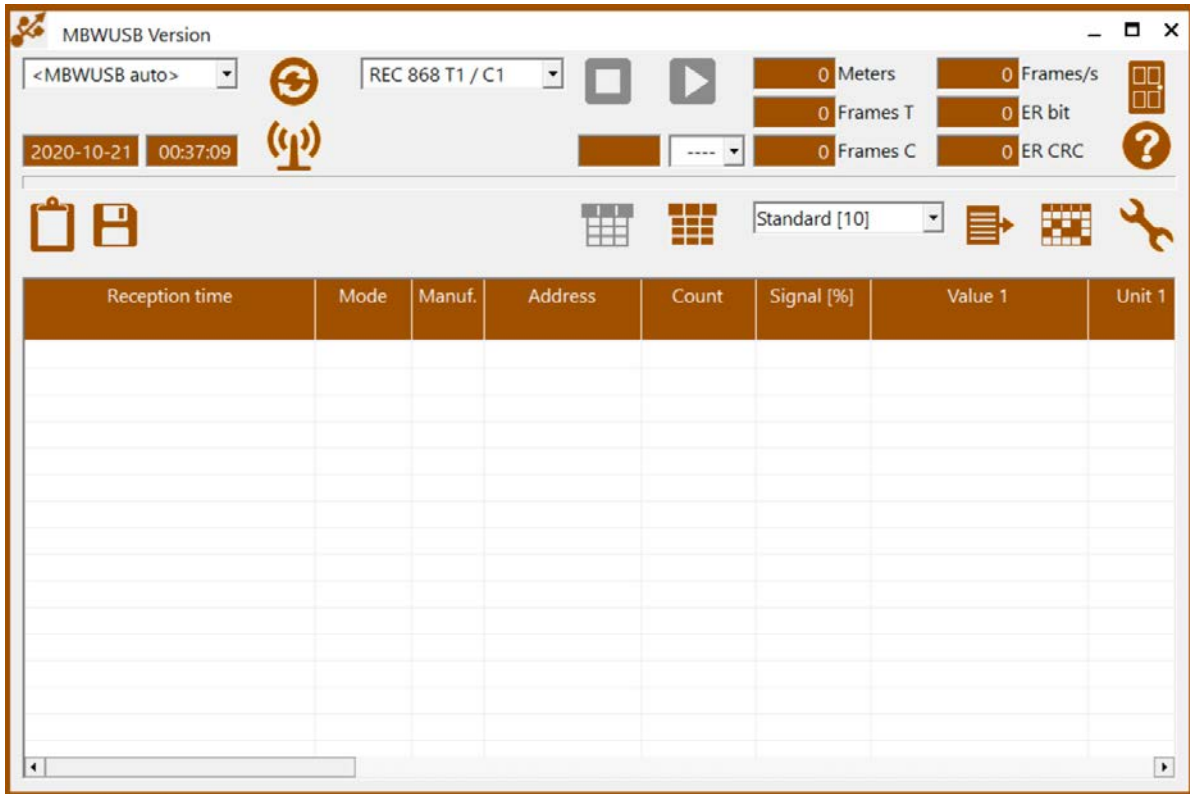
The software is capable of working with different devices of the MBWxxx family of products like MBWUSB, MBWBLUE or MBWGPRS. Most devices are working with an USB interface. In this case it is only necessary to select the correct device type from the drop down list and connect the device which is then automatically detected.



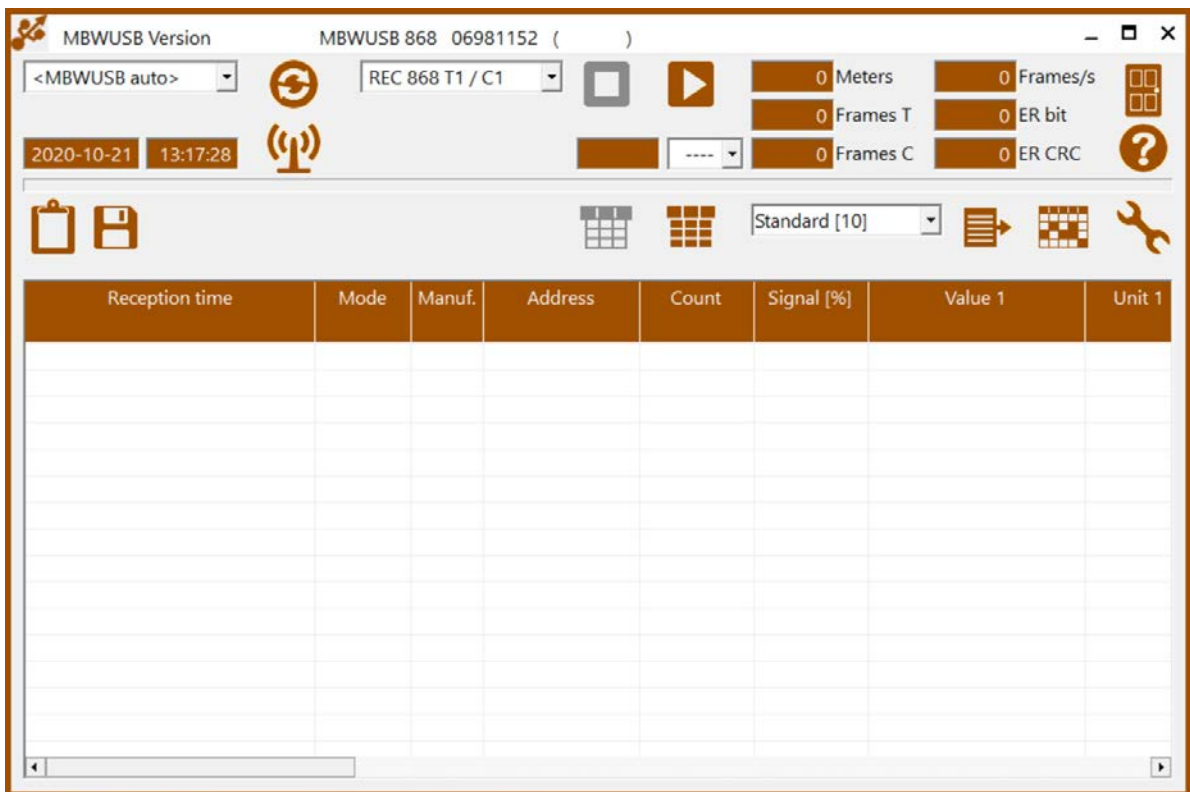
If the detection does not work automatically disconnect and reconnect the device and / or press the refresh button . If the problem persists you can try another USB port or use another USB hub.


The MBWBLUE has a Bluetooth interface. Here it is necessary to pair the MBWBLUE with the PC using the Windows Bluetooth manager. Afterwards the software is also capable to detect the MBWBLUE device automatically if <MBWBLUE auto> is selected. In case of a problem press the refresh button . For MBWBLUE devices it is also possible to work with the virtual COM port provided by the Windows Bluetooth manager. In this case select the respective COM port number from the drop down list.

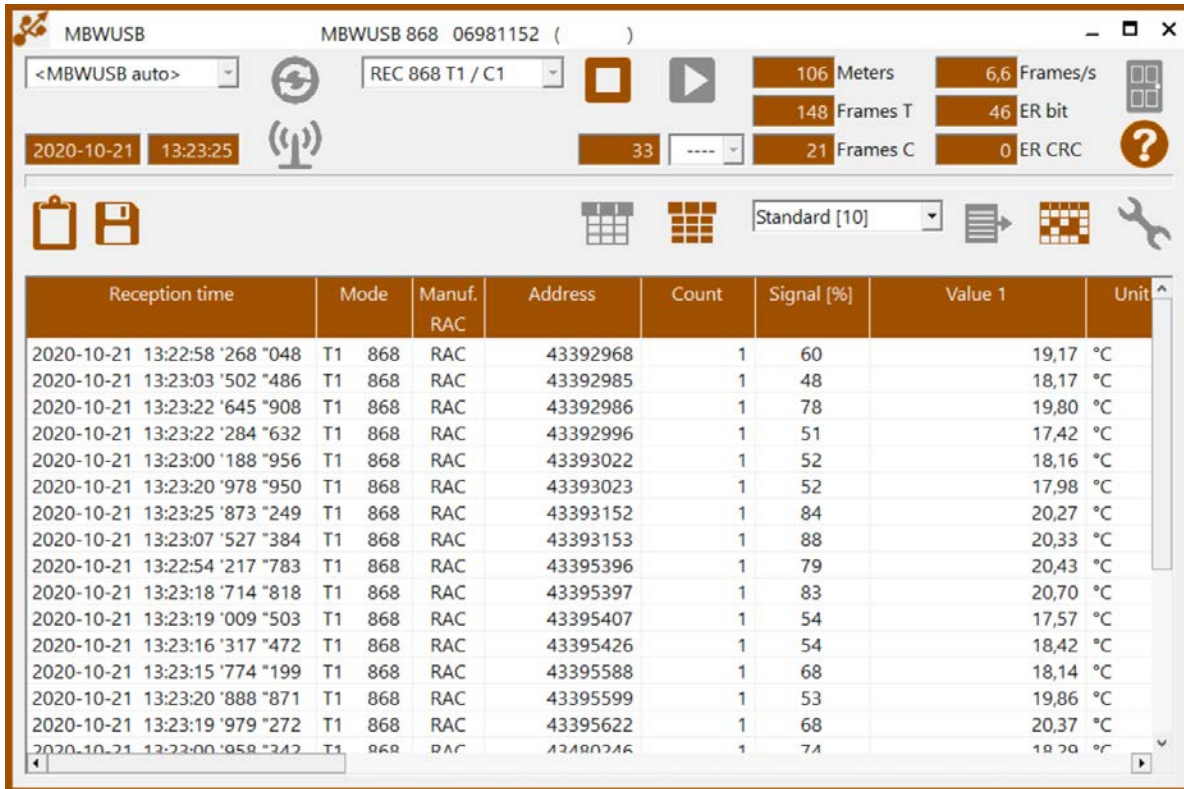
If there is no MBWUSB or other device connected the software looks like in the picture below.



If the software detects the connection of an MBWUSB or other device the appearance of the main window changes:



The header line of the windows shows the device name and its firmware version. Additionally, the start reception button  is unblocked. By clicking this button the radio reception starts and received radio frames are shown in the list.



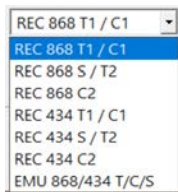
The screenshot shows the MBWUSB software interface. The title bar reads "MBWUSB MBWUSB 868 06981152 ()". The interface includes a control panel with a dropdown menu set to "<MBWUSB auto>", a radio icon, and a "REC 868 T1 / C1" dropdown. A play button is visible and active. Statistics are displayed: 106 Meters, 6,6 Frames/s, 148 Frames T, 46 ER bit, 33 (with a dropdown), 21 Frames C, and 0 ER CRC. A date and time stamp shows "2020-10-21 13:23:25". Below the control panel is a toolbar with icons for clipboard, save, grid, and a dropdown menu set to "Standard [10]".

Reception time	Mode	Manuf. RAC	Address	Count	Signal [%]	Value 1	Unit
2020-10-21 13:22:58 '268 "048	T1	868	RAC	43392968	1	60	19,17 °C
2020-10-21 13:23:03 '502 "486	T1	868	RAC	43392985	1	48	18,17 °C
2020-10-21 13:23:22 '645 "908	T1	868	RAC	43392986	1	78	19,80 °C
2020-10-21 13:23:22 '284 "632	T1	868	RAC	43392996	1	51	17,42 °C
2020-10-21 13:23:00 '188 "956	T1	868	RAC	43393022	1	52	18,16 °C
2020-10-21 13:23:20 '978 "950	T1	868	RAC	43393023	1	52	17,98 °C
2020-10-21 13:23:25 '873 "249	T1	868	RAC	43393152	1	84	20,27 °C
2020-10-21 13:23:07 '527 "384	T1	868	RAC	43393153	1	88	20,33 °C
2020-10-21 13:22:54 '217 "783	T1	868	RAC	43395396	1	79	20,43 °C
2020-10-21 13:23:18 '714 "818	T1	868	RAC	43395397	1	83	20,70 °C
2020-10-21 13:23:19 '009 "503	T1	868	RAC	43395407	1	54	17,57 °C
2020-10-21 13:23:16 '317 "472	T1	868	RAC	43395426	1	54	18,42 °C
2020-10-21 13:23:15 '774 "199	T1	868	RAC	43395588	1	68	18,14 °C
2020-10-21 13:23:20 '888 "871	T1	868	RAC	43395599	1	53	19,86 °C
2020-10-21 13:23:19 '979 "272	T1	868	RAC	43395622	1	68	20,37 °C
2020-10-21 13:23:00 '958 "342	T1	868	RAC	43395246	1	74	19,20 °C

Radio Reception



The elements of the radio reception are explained beneath:



Selects the reception mode:

- 868 MHz or 434 MHz
- T1/C1, S/T2 or C2

Note: an 868 MHz device can also be used to receive in 434 MHz mode and vice versa but the receiver sensitivity is very poor. Only radio devices close by are captured. However, in many cases this is sufficient for e.g. verifying the radio protocol of a device.



This button starts the radio reception in the selected mode. It is only enabled if an MBWUSB or other device is connected and there is no radio reception running, currently.



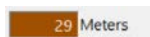
This button stops the radio reception. It is only enabled if the radio reception is currently running. If not, it is disabled (grayed).



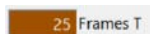
It is possible to preset a time period for receiving radio frames (between 1 minute and 24 hours). The radio reception stops automatically if the time has run out. The field to the left hand side shows the remaining seconds.



For continuous reception without a time limit use this setting. The field to the left hand side shows the elapsed seconds.



Number of different meters received



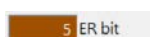
Number of T mode radio frames received



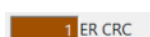
Number of C mode radio frames received



Number of radio frames received per second




Number of frames with bit error(s) received



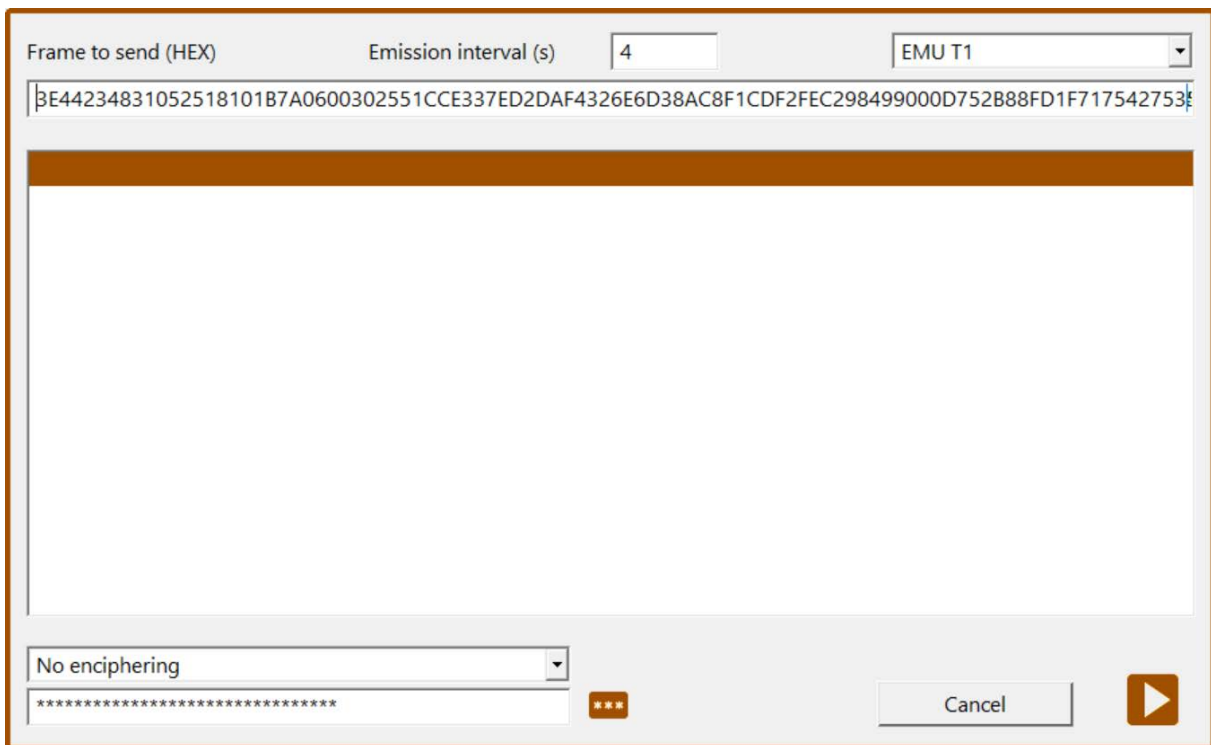
Number of frames with CRC error(s) received

Emulation Mode



The MBWUSB device is also able to send predefined radio frames to e.g. emulate a radio meter. By selecting the above option and pressing the start reception button  the dialog beneath appears.

Note: Currently only 868 MHz and modes T and C1 format A or B are available.



Frame to send (HEX)
3E44234831052518101B7A0600302551CCE337ED2DAF4326E6D38AC8F1CDF2FEC298499000D752B88FD1F717542753E

You have to enter the radio frame to send in hexadecimal format without CRC. CRC are added automatically according to the radio mode:

- T1: CRC format A
- C1A: CRC format A
- C1B: CRC format B

Emission interval (s) 4

The time interval to send the radio frame (e.g. every 4 seconds).




Selection of the radio mode.

No enciphering

If the radio frame entered is not ciphered it is possible to encipher it automatically using OMS mode 5 or OMS mode 7. The corresponding radio key has to be entered in the lower line.

*** Make radio key visible

By clicking the start button  the MBWUSB device starts sending the radio frame in the given time interval. The stop button  on the main screen ends the emission of the radio frame.

Radio Frame Sending to Meter




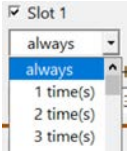
<input checked="" type="checkbox"/> Slot 1	Link layer address (HEX)	Response delay	Delay adjust	Ignore bit B	Add CRC
<input type="checkbox"/> Slot 2					
<input type="checkbox"/> Slot 3					
<input type="checkbox"/> Slot 4					
<input type="checkbox"/> Slot 5					

Frame to send (HEX)
 3E44234897533993101B7A5A0000002F2F04655E0A000004FB1B380000000468C603000004FD74010800000AFD0E5

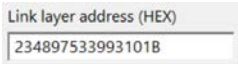
OK Cancel

The MBWUSB is also capable to send radio frames to bidirectional radio meters.

By clicking on the bidirection settings button  the user is able to predefine up to five different radio frames (slot 1 to slot 5) to send to five different link layer addresses. By enabling the respective slot and starting radio reception afterwards the MBWUSB is sending the radio frame every time it is receiving a radio frame from the given link layer address.

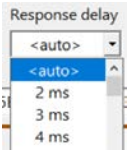


How often the radio frame should be sent (always or only a predefined number of times).



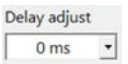
The complete link layer address to send the radio frame to. If a radio frame from this link layer address is received the predefined radio frame is sent.

It is possible to use the character 'F' as wildcard within the link layer address, e.g. 'FFFFFFFFFFFFFFFF' as link layer address means that the radio frame is sent to all meters.

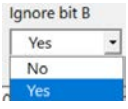


The response delay to use. The response delay is counted from the last chip of the postamble of the received radio frame to the first chip of the preamble of the sent radio frame.

<auto>	2.5 ms	mode T
	10 ms	mode S
	100 ms	mode C delay bit set
	1000 ms	mode C delay bit not set



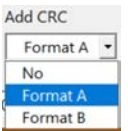
It is possible to adjust the response delay (should usually be set to 0 ms).



Specifies if the B-bit (bidirectional bit) of the configuration field of the meter radio frames should be taken into account or not:

No: the B-bit must be set within the meter radio frame to send the MBWUSB radio frame (default, correct behavior).

Yes: the presence and the setting of the B-bit within the meter radio frame is ignored, the MBWUSB radio frame is always sent (only for testing).

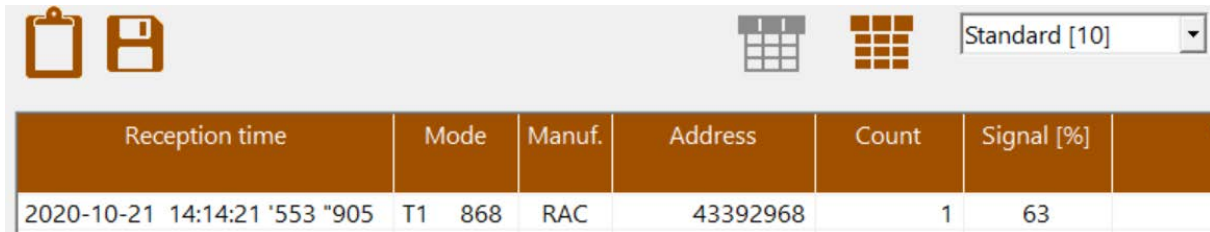


Specifies if the frame to send already contains CRC or if CRC should be added using format A or format B.

Frame to send (HEX)
3E4423483105251810

The radio frame to send in hexadecimal format.

Reception List



Reception time	Mode	Manuf.	Address	Count	Signal [%]	
2020-10-21 14:14:21 '553 '905	T1	868	RAC	43392968	1	63

If a radio reception is started all received radio frames are written to the reception list. There are two ways of displaying the reception list:

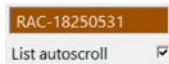


<radio meter mode>

For each radio meter received there is one line with the latest received radio frame of the respective meter. The reception list is sorted by manufacturer code first and radio meter address second. If a new radio frame is received the existing meter entry is replaced by the new radio frame.



<radio frame mode>



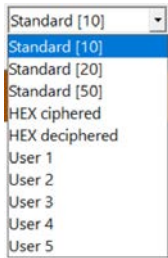
By double-clicking on an entry of the reception list or by selecting an entry of the reception list and clicking on the respective button the list changes to displaying all received radio frames of the selected meter. In this case the list is sorted by reception time. Additionally, the entry field on the right hand side of the buttons shows the currently selected meter and the user may select if the list should scroll automatically with every radio frame received or not.

Use the respective button or double-click again on the list to get back to radio meter mode.



Reception time	Mode	Manuf.	Address
		RAC	637

If the list is in radio meter mode it is possible to introduce column filters. Left-clicking on the empty space below the column headlines opens a field for entering a filter (e.g. manufacturer code RAC and address starting with 637 as in the example above). To clear a filter you can open the entry field again and delete the content. To clear all filters at once you right-click on the list headline.




If the list is in radio meter mode it is possible to select the columns to display. There are five predefined column settings and additionally, there are five user definable column settings:

Standard [10]: Reception time
Radio mode
Manufacturer code
Address
Count (number of frames from one meter)
Signal
First 10 values with physical units


Standard [20]: same as Standard [10] but with the first 20 values with physical units

Standard [50]: same as Standard [10] but with the first 50 values with physical units

Hex ciphered Reception time
Radio mode
Manufacturer code
Address
Radio frame in hexadecimal format (not deciphered)

Hex deciphered Reception time
Radio mode
Manufacturer code
Address
Radio frame in hexadecimal format (deciphered if the correct radio key was available, see settings )


User 1
User 2
User 3
User 4
User 5

User definable list column settings. See next chapter  for more details.

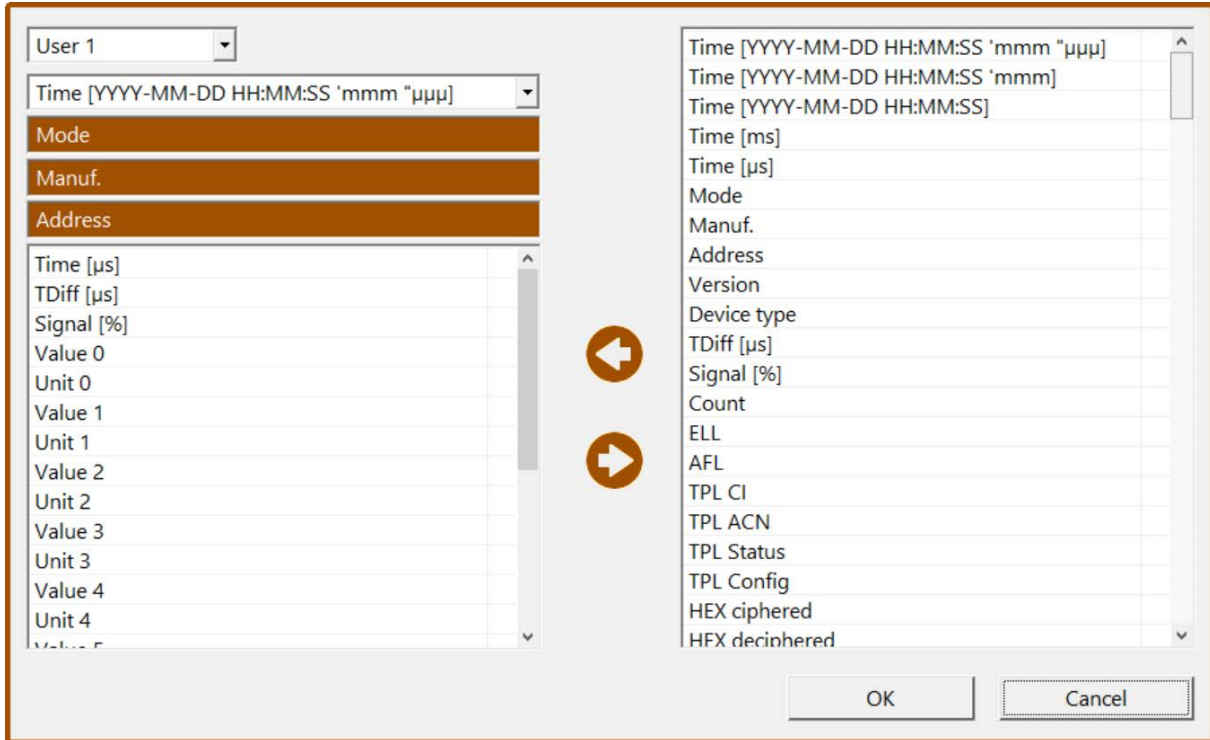


Copy only **selected** entries of the list to the Windows clipboard. Multiple selection using SHIFT or CTRL is possible.



Write the **complete** list to a file of CSV format (see settings  for CSV formats).

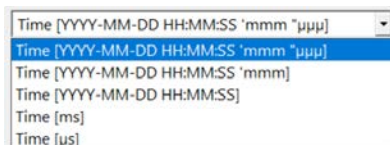
User Definable Column Settings



There are five user definable column settings available named User 1 to User 5. This dialog defines the columns.

On the left hand side there is the currently selected setting (User 1 in the example above).



On the right hand side are the available columns to add to the reception list.



The first column contains always the reception time, however, the user may select which format to display.

The contents of the three following columns are always fixed:

Mode	Radio mode of the received frame
Manuf.	Manufacturer code of the received frame
Address	Address of the received frame

The additional columns are user definable. By mouse dragging and droppig of one or multiple entries from one list to the other the user selects the columns of his reception list. Additionally, it is possible to use the two arrow buttons  .

List of possible reception list columns:

Time	Reception time in different formats
Mode	Radio mode of the received frame
Manuf.	Manufacturer code of the received frame
Address	Address of the received frame
Version	Version field of the received frame
Device type	Device type field of the received frame
TDiff	Time difference between the current radio frame and the last radio frame of one meter
Signal	Received signal strength
Count	Number of received radio frames of one meter
ELL	Extended link layer (hexadecimal format)
AFL	Authentication and fragmentation layer (hexadecimal format)
TPL CI	Transport layer control information field
TPL ACN	Transport layer access number
TPL Status	Transport layer status
TPL Config	Transport layer configuration field
HEX ciphered	Ciphered radio frame (hexadecimal format)
HEX deciphered	Deciphered radio frame (hexadecimal format, if radio key was available)
Value X	Value number X of the radio frame
Unit X	Physical unit of value number X of the radio frame
VIB X	Value information block of value number X of the radio frame

Automatic Radio Frame Logging



C:\temp\MBWUSB2.csv

Log all radio frames

Log active

Log active

Log active

Log active

Log active

Log active

Log active

Log active


Log active

Log active

Log active

Manufacturer	Address
RAC	87389050

Cancel

It is possible to automatically log received radio frames of one, multiple or all receiveable radio meters to a file of CSV format (see settings  for CSV formats). The currently selected reception list column setting is used for export, therefore, you should not change the reception list format during automatic radio frame logging.

Select the directory and filename of the file to write the log to.

Check this option if you want to log all received radio frames of all meters

or

Select up to 10 different radio meters to log



Click the start button to start radio reception with radio frame logging.

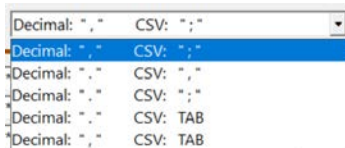
Program Settings



This dialog contains several program options to set.



Select the program language



Select the decimal separator for displaying numbers (e.g. 1234.567 or 1234,567) and the separator for CSV files (‘;’ or ‘,’ or tabulator).



If the software should also be able to decipher and interpret radio frames the user has to provide the respective keys. A maximum of three different 64 bit keys (left hand side) and six different 128 bit keys (AES 128, e.g. for OMS, right hand side) may be entered, respectively. The software will try all three / six keys until a radio frame is deciphered. To gain processing speed during radio frame reception you should set unused key entry fields to “FFFFFFFF...” which means the respective key is invalid and, therefore, not used.



Toggles the readability of the radio keys

Additionally, it is possible to enter a list of meter specific radio keys. For that purpose the user has to enter meter address and radio key of one specific meter. If the meter with the respective address is received the stored radio key is used for deciphering. This function is only available with AES128 radio keys.



Add a new meter address with radio key



Remove the selected meter addresses and radio keys from the list



Edit the selected meter address and radio key



Import a list of meter addresses and radio keys from a file



Export the list of meter addresses and radio keys to a file



Import one or multiple KEM files with meter address and radio key