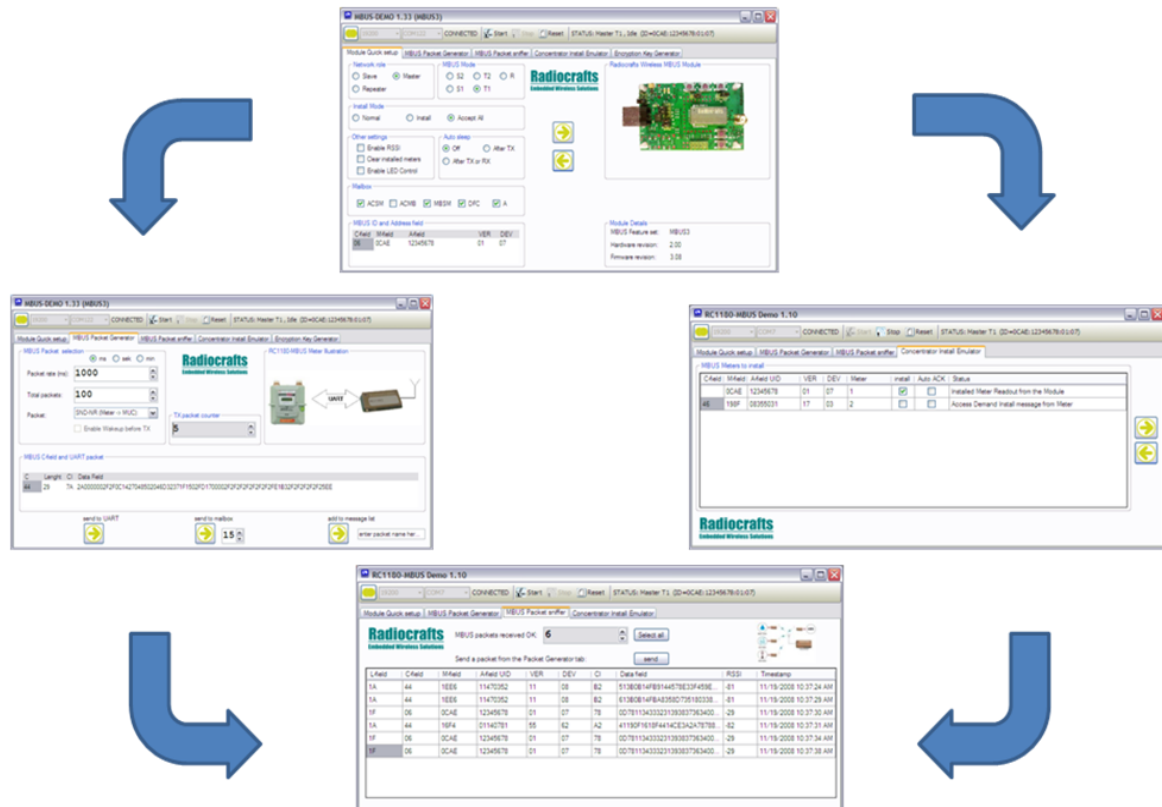


## MBUS/KNX2-DEMO User Manual



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### Installation Guide

The MBUS/KNX2-DEMO is a part of Radiocrafts' RCTools PC suite tailored for use with Radiocrafts' RF Modules. For full installation procedure please read the RCTools Installation Guide available at [www.radiocrafts.com](http://www.radiocrafts.com).

The MBUS-DEMO requires access to the modules UART via an available COM-port. Typically the UART-access is obtained via an UART-to-RS232 or UART-to-USB converter. The Demo Boards (DB) from Radiocrafts contain an on-board level shifter for direct plug-in to a PC and further access to the related COM-port.

For detailed information about the protocol and configuration of the module visit documents available at [www.radiocrafts.com](http://www.radiocrafts.com)

➔ Products -> Wireless M-Bus and then the module with the preferred feature set.

### Screen Settings

It is recommended to run the application with screen size at least 1024x768 and font resolution 96dpi.

### Introduction

**MBUS/KNX2-DEMO**, is designed to demonstrate a Wireless M-Bus system using the Radiocrafts Wireless MBUS module development kit. The program provides Module Quick setup, MBUS Packet generator, MBUS Packet Sniffer and an Installation tool for the MBUS2/MBUS3 feature set. A Radiocrafts MBUS Demo Board is needed for this demo to operate properly.

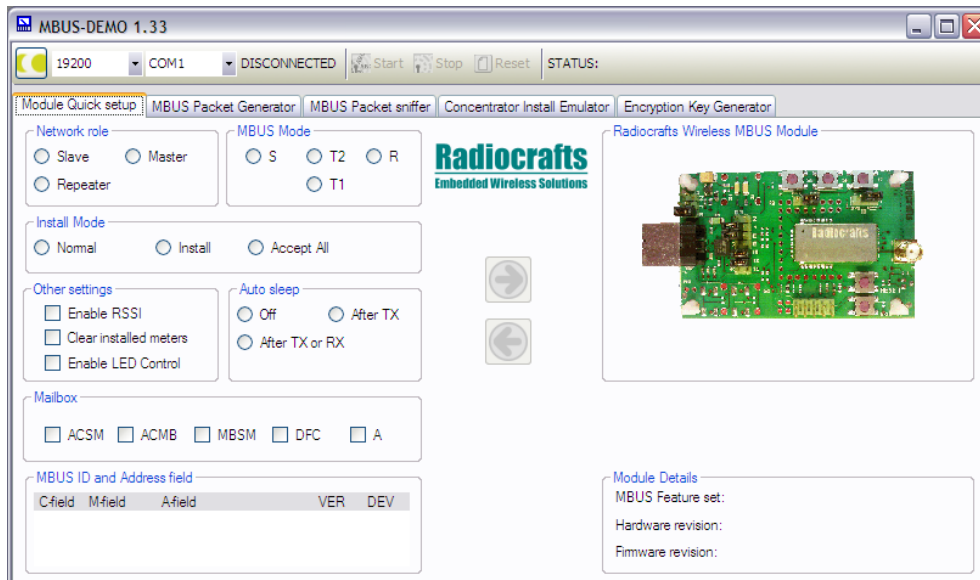


Figure 1. Main window

Start the program, and the MBUS-DEMO main window should look similar to what is shown in Figure 1.

### Connecting to the Module

Before connecting, select the proper settings for your serial port:

- name of an available communication port (COMx)
- baud rate used to communicate with the module

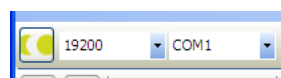


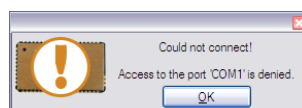
Figure 2. Port settings

To connect to the module you need to press the **connect** button. If your COM port is not listed you can also manually type in the COM port to use.



Figure 3. Connect button

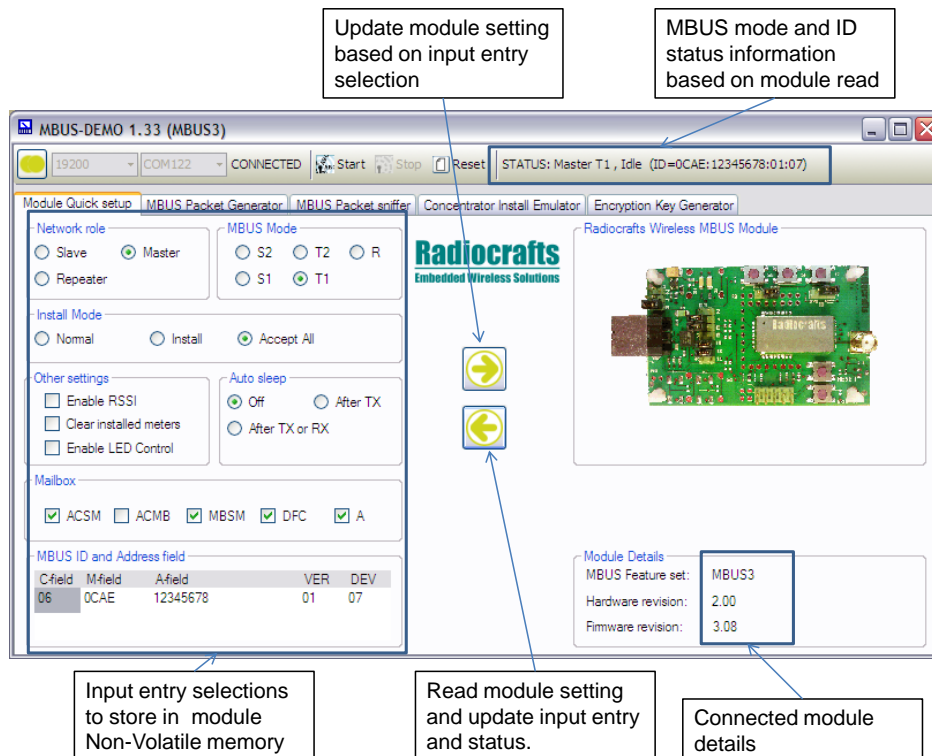
A warning message will pop-up if you try to connect to a port that is already in use. This is illustrated in figure 4.



**Figure 4. COM port conflict message**

### Module Quick Setup Tab

The Module Quick setup Tab allows you to read back and configure basic MBUS configuration parameters on the connected Demo Board. The input entry selections and status information will be updated when you read the configuration from the module. A read-back from the module should be the first thing to do after connect to the COM port. Some of the input entries are not valid for all MBUS feature set, and they will be greyed out or hidden based on the read back information. Figure



**Figure 5. Module Quick Setup after MBUS3 read back**

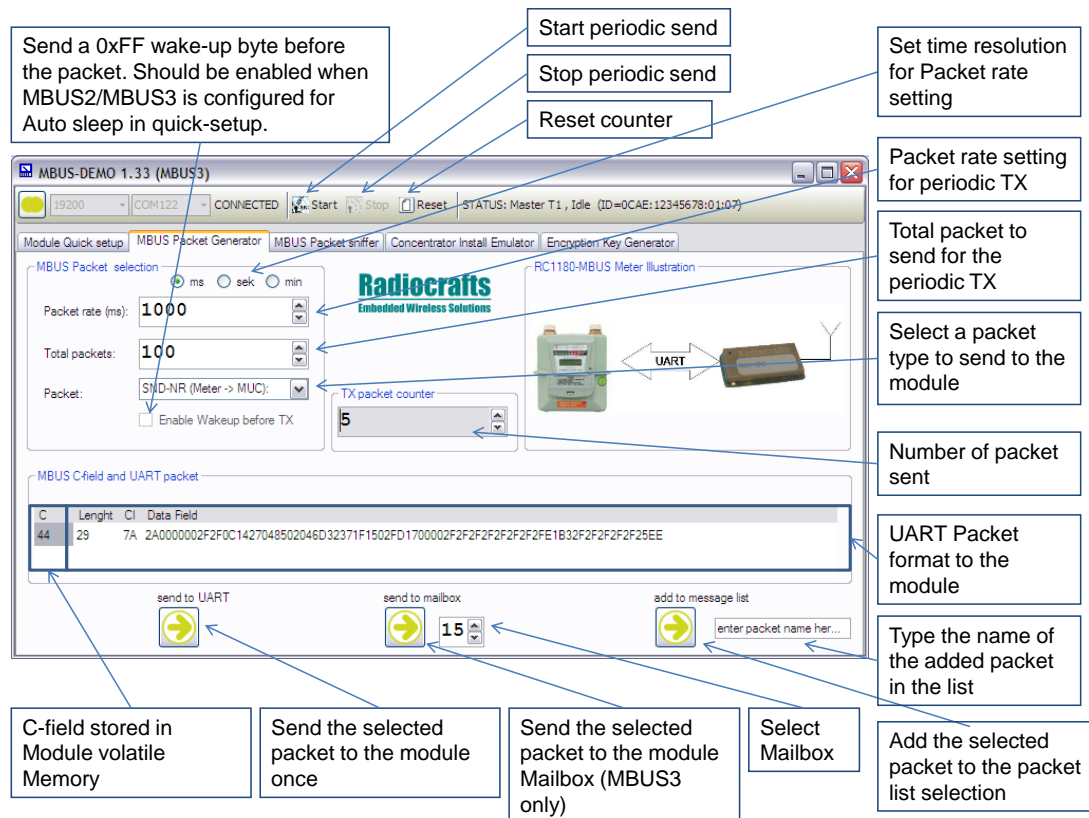
Step-by-step guide for Module Quick Setup:

1. Connect the Radiocrafts MBUS Demo Board to an available COM port
2. Read back configuration settings from the Demo Board
3. Change settings and update the connected Demo Board if needed.

For detailed configuration it is advised to use the more powerful MBUS/KNX2-CCT tool instead of the MBUS/KNX2-DEMO software. You will then get access to all configuration parameter settings of your connected module.

### MBUS Packet Generator Tab

The MBUS Packet Generator Tab allows you to set up one of the RC1180-MBUS modules as a meter that sends meter status on request or periodically. The UART package from the PC to the RC1180-MBUS is listed, and part of the message can be changed by the user. This package is received from the meter via the UART interface directly to the RC1180-MBUS as illustrated in the picture. The user entries for the MBUS Packet Generator window is illustrated in figure 6.



**Figure 6. MBUS Packet Generator**

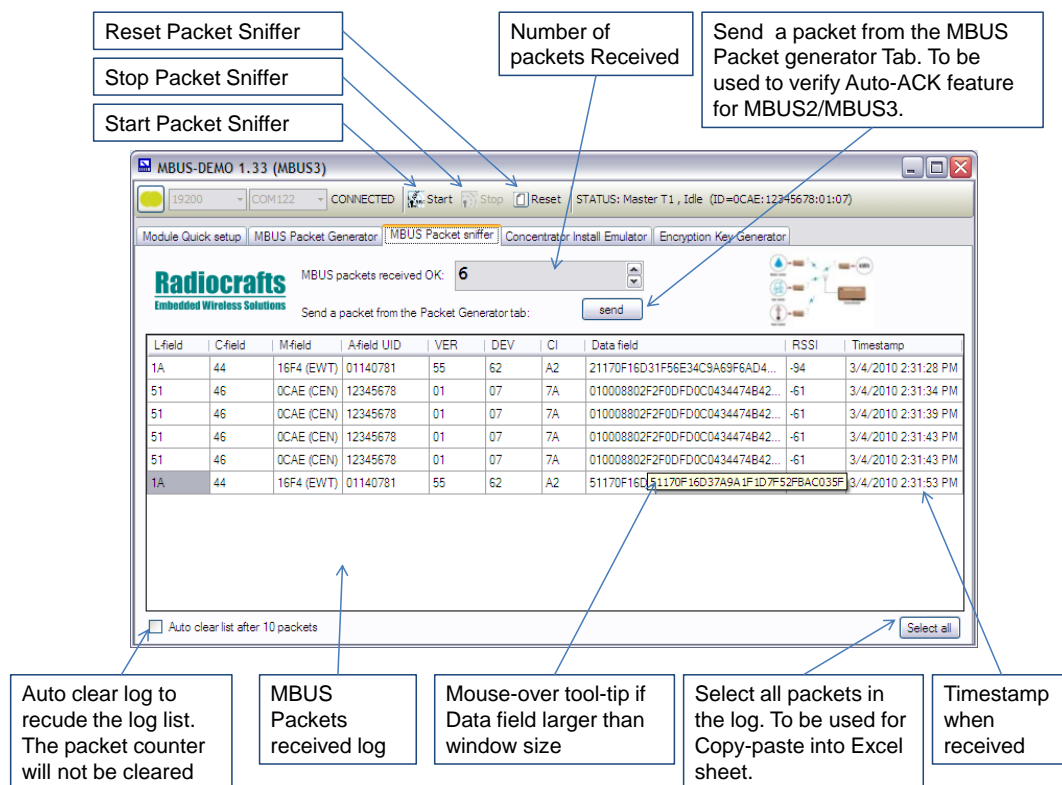
Step-by-step guide for setting up the MBUS Packet Generator in periodic TX mode:

1. Configure the Demo Board as Slave in the Module Quick Setup tab
2. Select the MBUS Packet Generator tab
3. Set the Packet rate that gives the periodical interval in ms (optional)
4. Set the total packets to transmit in the periodic test (optional)
5. Select a packet to transmit.
6. Change the packet payload if needed (optional)
7. Start the periodic transmit from the toolbar start button

The packet counter will now increment and send the UART packet periodically according to the Packet rate until the total packets has been transmitted. The user can stop and reset the periodic transmission from the toolbar.

### MBUS Packet Sniffer Tab

The MBUS Packet Sniffer tab allows you to set up one of the RC1180-MBUS modules as a Wireless M-Bus Collector. This board will act as a Wireless M-Bus packet sniffer, that receives and lists all incoming Wireless M-Bus packets for the selected MBUS mode. The user window for the MBUS Packet Sniffer is illustrated in figure 7.



**Figure 7. MBUS Packet Sniffer**

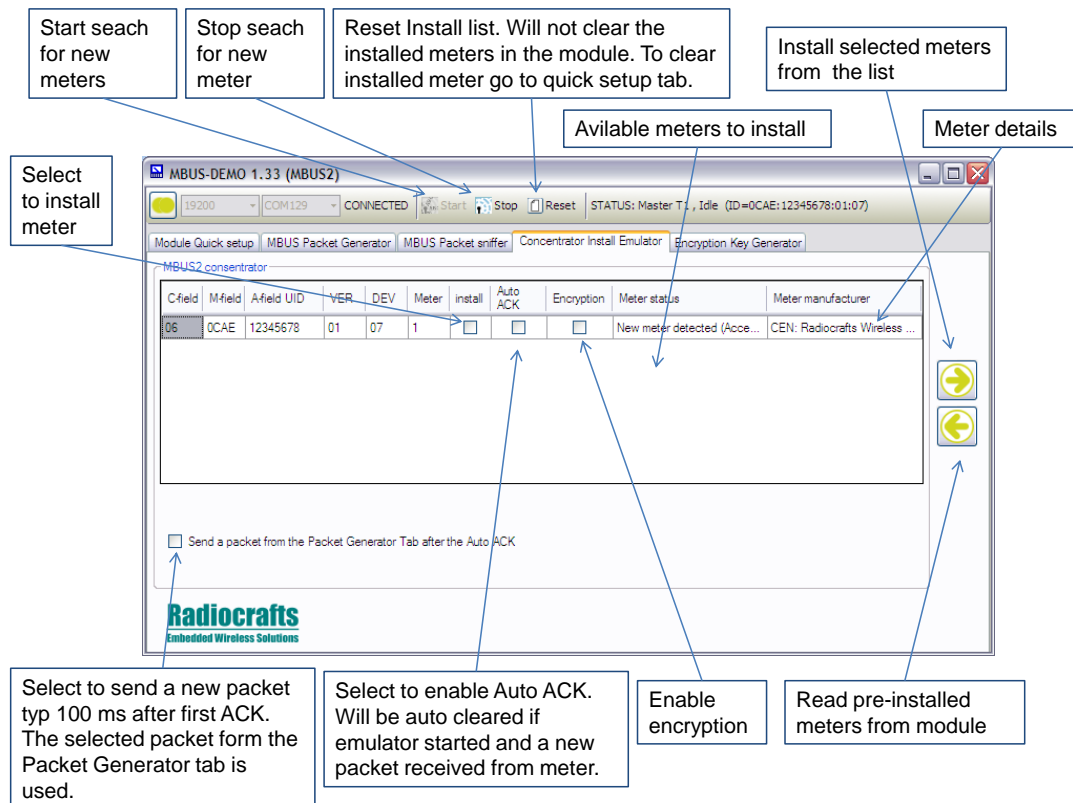
Step-by-step guide for setting up the MBUS Packet Sniffer:

1. Configure the Demo Board as Master, enable accept all messages and include RSSI in the Module Quick Setup tab
2. Select the MBUS Packet Sniffer Tab
3. Start the MBUS Packet Sniffer from the toolbar start button

The MBUS Packet Sniffer will now count the total number of received MBUS packets and list them in the Meter Collector data field including RSSI and packet ID for each new packet. The meter collector will continue to search for MBUS packets until the Sniffer is stopped using the stop button on the toolbar. All collector data can be selected in order to copy-paste the information to an Excel spreadsheet for further analysis. The reset button will empty the logger and set the packet receive counter to zero.

### Concentrator Install Emulator Tab

The Concentrator Install Emulator tab is a tool for installing and binding meters to the RC1180-MBUS module. The module will act as a Wireless M-Bus concentrator that only accepts installed meters. This tab is not in use for MBUS1 and different for MBUS2 and MBUS3. The user window for the Concentrator Install Emulator for MBUS2 is illustrated in figure 8 and the user window for MBUS3 is illustrated in figure 9.



**Figure 8. MBUS2 Concentrator Install Emulator**

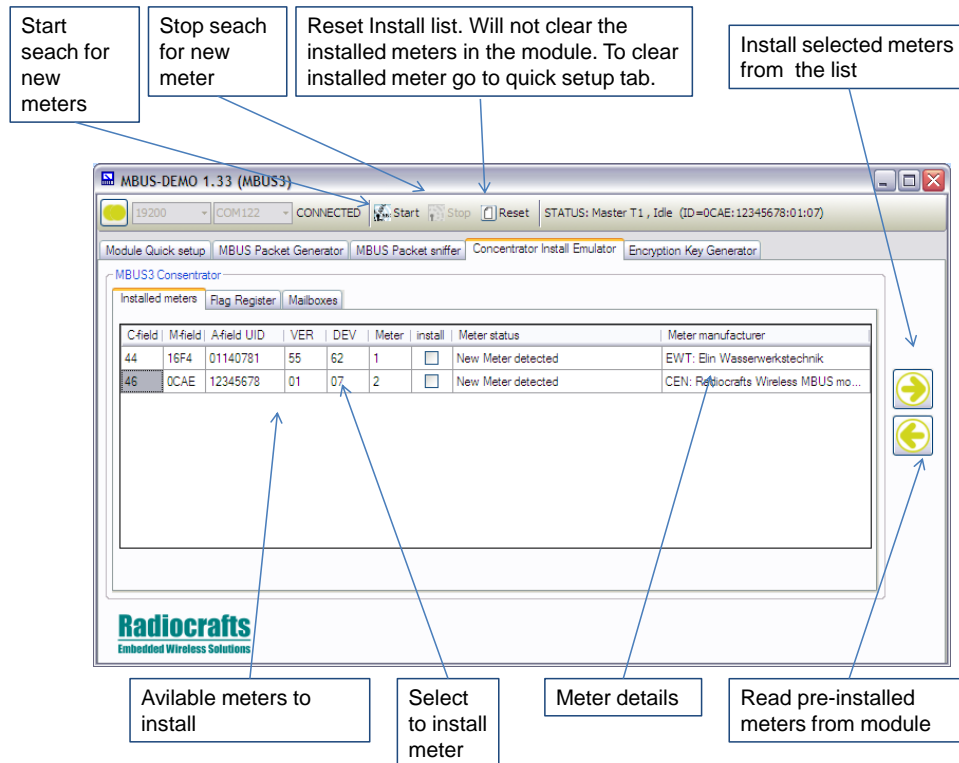
Step-by-step guide for installing a meter to the MBUS2 Concentrator Emulator:

1. Ensure that you have the MBUS2 feature set on the connected module.
2. Configure the Demo Board as Master, enable accept Install messages and include RSSI, in the Module Quick Setup tab.
3. Read pre-installed meters by pressing left-arrow key.
4. Start the search for new install messages pressing the toolbar start button.
5. Wait for the install message from a meter you want to install (or select and send one of the predefined install messages (SND-IR) from a Packet Generator Tab).
6. Select the meters you want to install
7. Click on the right-arrow button to install the selected meter.

If Auto ACK is enabled the Master will automatically send an ACK when receiving a new message from the installed slave. The Auto ACK flag will be cleared after the Master send this ACK. You may also enable to send a packet from the packet Generator tab after this first ACK according to NTA8130.

You can change mode to normal mode and use the packet sniffer to receive messages from installed meters only after the installation is completed. The Install Emulator will only list up new meters even if they send several packets. This will simplify the meter selection and easily inform about available meters to install.

The user window for the Concentrator Install Emulator for MBUS3 is illustrated in figure 9.



**Figure 9. MBUS3 Concentrator Install Emulator**

Step-by-step guide for installing a meter to the MBUS3 Concentrator Emulator:

1. Ensure that you have the MBUS3 feature set on the connected module.
2. Configure the Demo Board as Master, enable accept Install messages and include RSSI, in the Module Quick Setup tab.
3. Read pre-installed meters by pressing left-arrow key.
4. Start the search for new install messages pressing the toolbar start button.
5. Wait for the install message from a meter you want to install (or select and send one of the predefined install messages (SND-IR) from a Packet Generator Tab).
6. Select the meters you want to install
7. Click on the right-arrow button to install the selected meter.

Auto ACK and encryption setting for MBUS3 is available in the Register flag tab. This is illustrated in figure 10 and is only available for MBUS3.



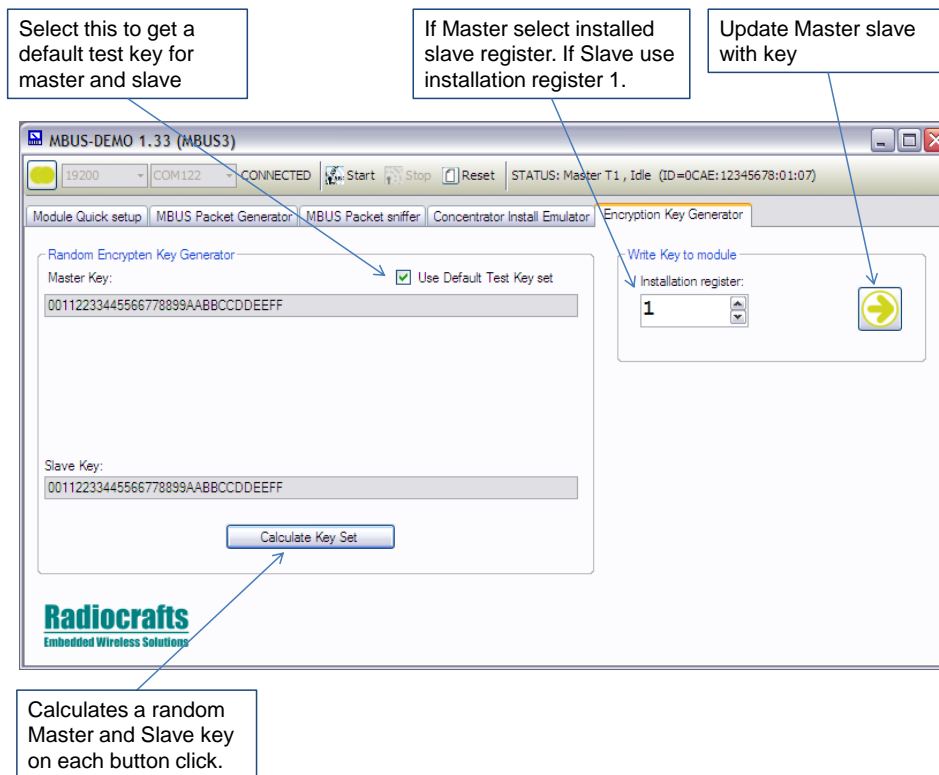
[illegible]

### Figure 11. MBUS3 Mailbox readout

### Encryption Key Generator

The Encryption Key Generator tab is a tool for MBUS2 and MBUS3 to calculate and update the connected module with encryption keys. The view is different for MBUS2 and MBUS3.

Figure 12 shows MBUS3 Encryption key generator Tab.



**Figure 12. MBUS3 Encryption Key Generator**

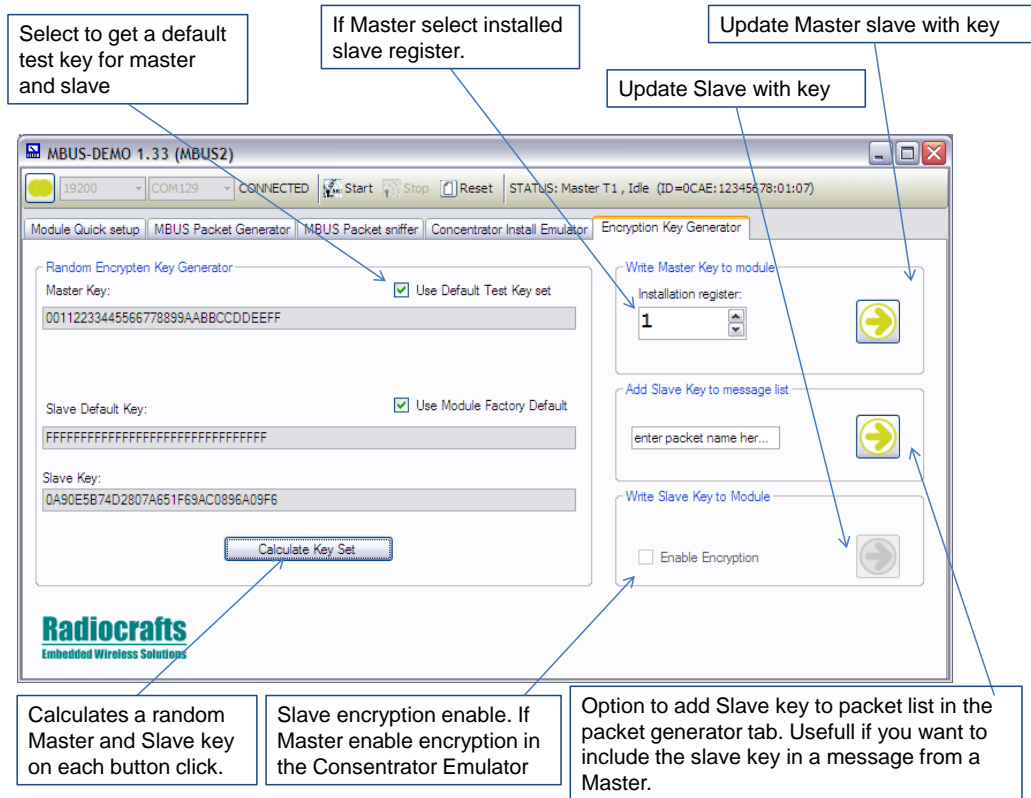
Step-by-step guide for enable Encryption for MBUS3 Master:

1. Install a meter to a register 1-64.
2. Calculate an encryption key and update Master with key to installed slave register.
3. Enable encryption in the Concentrator Install Emulator / Flag Register (see figure 9 )

Step-by-step guide for enable Encryption for MBUS3 Slave:

1. Update Slave with same encryption key as the Master to slave register 1.
2. Enable encryption in the Concentrator Install Emulator / Flag Register 1 (see figure 10 )

Figure 13 shows MBUS2 Encryption key generator Tab.



**Figure 13. MBUS2 Encryption Key Generator**

Step-by-step guide for enable Encryption for MBUS2 Master:

4. Install a meter to a register 1-8.
5. Calculate an encryption key and update Master with key to installed slave register.
6. Enable encryption/decryption in the Concentrator Install Emulator (see figure 8 )

Step-by-step guide for enable Encryption for MBUS2 Slave:

3. Update Slave with the encrypted Master Key.
4. Enable encryption in the Encryption Key Generator tab

After enabling encryption/decryption on both Master and Slave, it is required that exchanged messages between the two have a defined length. When using the Packet Generator Tab, it is mandatory for successful transmissions to select the proper AES-message from the selection list. This is valid both for MBUS2 and MBUS3.

### Acknowledge Tests

See the document MBUS User Manual for reference to automatic acknowledge (MBUS2) and auto-message generator (MBUS3). To test the reception of the acknowledge from the Master to the Slave in modes S2 and T2:

1. Configure both Master and Slave for the preferred MBUS Mode S2 or T2
2. Install the meter to be acknowledged. Encryption is optional. Enter Mode Normal or Accept All on Master after installation is done
3. For MBUS3 Master ensure to deselect (un-tick) all options in Mailbox Tab (disable auto-clearing) and Enable (tick) as preferred after first tests are successful. In Tab

Concentrator Install Emulator, tick for one or more standard master reply message(s) for the correct Slave number (which shall equal installed Meter number in the installed Meters register)

4. For the Slave to monitor the acknowledge: Prepare a valid message to be acknowledged (for instance SND-NR (Meter->MUC)) in the Packet Generator Tab for the Slave. Then go to MBUS Packet sniffer and press "Start". Then press "Send" which will send the prepared message from the Packet Generator Tab. The acknowledge from the Master will now be displayed in the Packet Sniffer Tab.

### Document Revision History

Document Revision	Changes
1.0	New Revision
1.1	Upgraded with MBUS2 feature set functions (MBUS-DEMO rev 1.10)
1.30	Upgrades with MBUS3 features (MBUS-DEMO 1.33)
1.31	Corrected misprints and added clarifications for install messages and acknowledge tests
1.40	Clarified that documentation is valid for KNX2 too.

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