

# Wireless M-Bus – Radio module

The Wireless M-Bus module RC1180-MBUS from Radiocrafts, comes with different firmware feature sets, based on one standard hardware platform. The form factor, pin-out and interface are the same for all firmware versions. The MBUS2 feature set is compliant with NTA 8130/DSMR for the Netherlands, and the RC1180-MBUS3 feature set to support OMS and MUC compliance according to the German standardisation work. Custom variation of the module is available on request.

## Compact module with embedded protocol

- Embedded Wireless M-Bus protocol supporting EN 13757-4:2005 mode S, T and R2
- Conforms with EU R&TTE directive (EN 300 220, EN 301 489, EN 60950)
- Easy to use UART interface for communication and configuration
- 12.7 x 25.4 x 3.3 mm compact module for SMD mounting
- Wide supply voltage range, 2.0 – 3.6 V
- Ultra low power modes for extended battery lifetime
- 2 channels (868.3, 868.95 MHz) in mode S and T
- 10 channels in mode R2 (868.03 + n x 0.06 MHz)
- No external components except antenna
- Configurable Manufacturer ID and serial number
- Designed for EX compliance



Parameter	RC1180-MBUS	Unit
Frequency bands	868.0 – 870.0	MHz
Number of channels	12	
Data rate	4.8, 32.768, 100	kchip/s
Max output power	10	dBm
Sensitivity, R/S/T	-106/-102/-101	dBm
Supply voltage	2.0 – 3.6	Volt
Current consumption, RX / TX	24 / 37	mA
Current consumption, SLEEP	Typ 0.3	uA
Temperature range (S and T mode)	-40 to +85	°C

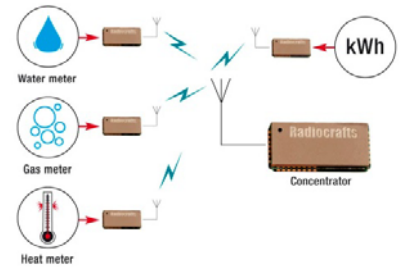
**2 pins for data, 2 pins for power and 1 pin for antenna!**

## RC1180-MBUS module series

RF Module with embedded wireless M-Bus protocol (EN13757-4:2005) and CE marking. Choose between wireless modem software with communication functionality, and a complete embedded solution with support for NTA 8130/DSMR according to the Dutch standard and support for the OMS in Germany.

**RC1180-MBUS1** Basic Wireless M-Bus EN 13757-4:2005  
Supports S, T and R2 modes, flexible solution  
No acknowledgement or encryption embedded

**RC1180-MBUS2/3** Wireless M-Bus with NTA 8130 or OMS feature set  
Two-way communication with automatic acknowledge, AES-128 encryption, easy installation and PC tools.



Feature List	Feature set		
	RC1180-MBUS1	RC1180-MBUS2	RC1180-MBUS3
<b>General</b>	Basic wireless M-bus functions, flexibility.	Added features for NTA8130/DSMR compliance (the Netherlands)	Added features for Open Metering System compliance (Germany)
<b>Network role</b>	Master or Slave	Master or Slave	Master, Slave or Repeater
<b>Modes</b>	S1, S2, T1, T2, R2	T1, T2	S1, S2, T1, T2
<b>Repeater</b>	No	No	Yes, according to OMS spec
<b>Encryption</b>	No, must be handled externally	Yes, AES128 according to NTA8130/DSMR (mode 4 and 5)	Yes, AES128 according to Open Metering System specification (mode 5)
<b>Installation mode</b>	No, Must be handled externally	Yes, according to NTA8130/DSMR. Up to 8 slaves.	Yes, according to Open Metering System specification. Up to 64 slaves.
<b>Features</b>	Receives any MBUS packet. Message filtering must be handled externally	Filter function: Master only receives messages from installed/registered meters	Filter function at master. Automatic access number handling and accessibility check. Autonomous Repeater.
<b>Automatic acknowledge - mailbox</b>	No, must be handled externally	Yes, automatic acknowledge by Master in T2 mode	Yes, automatic message generation and message mailbox in Master for T2/S2.

## Feature sets

The RC1180-MBUS modules are easy to use and significantly reduces time-to-market. All the time-critical operations are handled within the module. With the MBUS2 and MBUS3 feature set integrated in an off-the shelf module, the time to market for NTA8130/DSMR or German OMS compliant equipment is shortened dramatically. The MBUS1 feature set enables customers to implement their own custom variation of the Wireless M-Bus EN 13757-4:2005.



### RC1180-MBUS1: Basic EN 13757-4:2005

This is the basic Wireless M-Bus module with support for all modes in the EN 13757-4:2005 standard. This module also has support for the T1 and T2 modes described in NTA 8130, but does not contain automatic acknowledge or encryption. Developers who are implementing two-way communication with handshake and encryption can do this in an external controller but need to handle all timing externally. This basic feature set makes it possible to make adjustments on the timing and the module has greater flexibility.

### RC1180-MBUS2: NTA 8130/DSMR

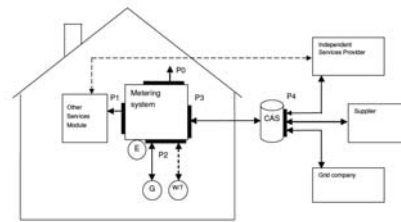
This module has full support for the T1 and T2 mode according to NTA 8130 P2 interface. The two-way communication with acknowledge is done by the firmware included in the RC1180-MBUS2 radio module. All time critical events needed to be compliant with the NTA 8130 are handled internally. An easy to use UART interface make this a complete communication module, handling all radio communication including encryption. This module also supports all other modes S1/S2 and R2.

### RC1180-MBUS3: OMS specification

The new MBUS3 firmware from Radiocrafts is now available, and can be acquired for implementation. Some of the new features to comply with the Open Metering Specification released in Germany are:

- Easy installation support, embedded in the module
- HW encryption in module (Encryption co-processor)
- Full support for 64 slave nodes
- Auto message, standard messages, mailbox, templates
- Auto-message generation for T2 mode within 2-3 ms
- Encryption on the fly, ultra fast message generation
- Automatic MUC status, with RSSI information
- Frame Count Bit (FCB) according to the EN13757-4
- Automatic Access Number handling for each message
- Fully autonomous OMS repeater functionality
- Improved MBUS Demo PC Tool to help developers

### T2 mode according to NTA 8130 P2 interface



The RC1180-MBUS2 module has full support for the T2 mode according to the existing NTA8130/DSMR P2 interface in the Netherlands. The module has a fully functioning firmware

embedded which is adapted to work according to the NTA8130/SDMR standard. The firmware stack is running on the existing RC1180-MBUS hardware platform. It is possible for customers already using the module to get access to upgrades. See details below about the new Appnote on firmware upgrade. Please contact [sales@radiocrafts.com](mailto:sales@radiocrafts.com) if you would like to start implementing with the T2 mode for your meter application.

### OMS Primary communication interface

The OMS primary communication interface is based on the Wireless M-Bus standard (EN 13757-4:2005) and specifies the communication between a Multi Utility Communication (MUC) controller or gateway, and electricity, gas, water and heat meters. The specification is becoming widely accepted in Europe as a basis for new Advanced Metering Infrastructure (AMI) installations. Radiocrafts has participated in the development of the new specification together with leading meter manufacturers and other communication technology providers in Europe.

### M-Bus protocol on 433 MHz

**NEW!** [RC1140-MBUS2](#) for non-European to be used in regions where 868 MHz is not license-free. Identical protocol and pin-out as for the 868 MHz family RC1180-MBUS, just different frequencies.

## Metering application layer NTA8130/DSMR and German Open Metering Specification

There are different options for protocols in the application layer in NTA (NE) and OMS (DE). NTA has defined M-Bus application layer to the electricity meter. OMS has also opening for the DLMS/COSEM and the SML (Smart Message Language v. 1.02) optionally.

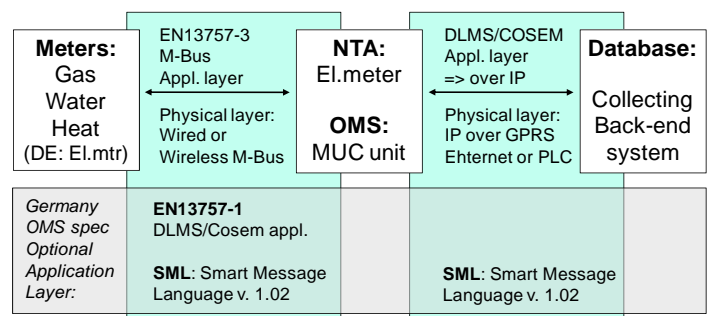
Both NTA and the OMS have defined the DLMS/COSEM from the Electricity meter/MUC to the back-bone system. OMS has also openings for the SML protocol over IP at this interface.

The RC1180-MBUS module supports both M-Bus application layer (EN13757-3) and COSEM/DLMS/SML application layer (EN13757-1). The first is used in the Netherlands (NTA 8130), and the second is an option in Germany (OMS). The CI field, as the first byte in the application layer, distinguishes between these to application layer protocols.

From the OMS standard regarding application layers:

#### 4.1 Overview of application layers

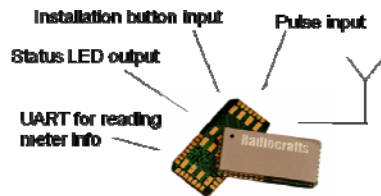
The Application layer has always a fixed frame structure as described in EN13757-3. It may transport either the meter application layer concerning EN13757-3 (M-Bus), or alternatively EN13757-1 (COSEM/DLMS/SML)-type communication (primarily used by electricity meters). Note that the CI field as the first byte of the application layer distinguishes between these two application layer protocol types and frame structure. A MUC or a user display shall be able to handle both application protocol types at least to the extent that it can extract from the telegrams the values required for its function or application.....



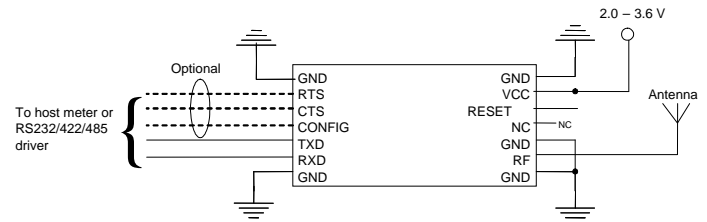
## RC1180-MBUS Customer specific Feature set

Based on the standard feature set Radiocrafts also offers customer specific feature sets. Additional features might include, but are not limited to:

- Reading of pulse input
- Storing main index
- Tampering alarm
- Low Battery alarm
- Installation support
- Wired M-Bus link protocol
- Reading meter data via serial interface
- Accurate event timing with internal RTC
- Handling application layer of wireless M-Bus standard.



## UART interface: Data in – RF out

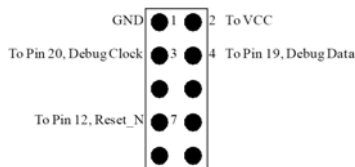


The RC1180-MBUS module has an easy to use UART interface (easily translates to RS232/RS422/RS485/USB). This is a standard interface which enables customers to use an existing external microcontroller to work with the radio module. We have experienced customers who have made a complete Wireless M-Bus compliant meter in less than 3 weeks.

**2 pins for data, 2 pins for power and 1 pin for antenna!**

## RC1180-MBUS Firmware upgrade option

### AN012\_firmware\_upgrading\_the\_rc1180\_mbus\_module\_1\_0



Radiocrafts can now offer customers who have purchased the RC1180-MBUS Demo Kit the option to upgrade the firmware of the module, in order to be updated on the latest developments from Radiocrafts. The RC1180-MBUS Demo Boards include an on board firmware upgrade connector compatible with the flash programming adapter from Elprotronic. The application note describes how to firmware upgrade RC1180-MBUS Demo Boards using the FlashPro-CC tool. Please go to [www.elprotronic.com](http://www.elprotronic.com) for purchasing information and software download.



FlashPro-CC connected to RC1180DB-USB

## Wireless M-Bus packet sniffer with RC1180-MBUS Demo Kits

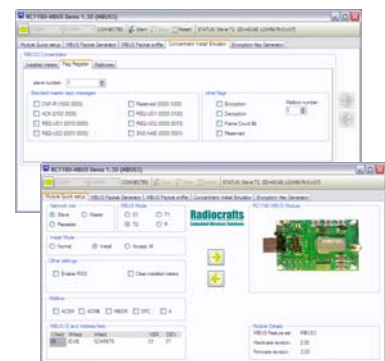
The MBUS-DEMO software is a part of Radiocrafts' RCTools PC suite tailored for use with Radiocrafts' RF Modules. Radiocrafts has developed MBUS-DEMO, which is designed to demonstrate a wireless MBUS system using the RC1180-MBUS module. The program enables you to easily set up a meter emulator and a meter collector.

### Meter Emulator

The Meter Emulator allows you to set up one of the RC1180-MBUS modules as a meter, sending meter status on request or periodically. The UART package from the PC to the RC1180-MBUS is listed, and the message can be changed by the user. The package is received from the meter via the UART interface.

### Meter Collector

The Meter Collector allows you to set up one RC1180-MBUS module as a wireless M-BUS message collector. This board will act as a Wireless M-BUS packet sniffer receiving and listing all incoming Wireless M-BUS packets. All collected data can be selected in order to copy-paste the information to an Excel spreadsheet for further analysis.



## Radiocrafts RF + Sierra Wireless AirLink GSM



Radiocrafts module portfolio is available for the Sierra Wireless AirLink GPRS/GSM/EDGE modem. Sierra Wireless is the leading provider of M2M modems. The combination of Radiocrafts' RF modules and Sierra Wireless GPRS modems makes an easy to use out-of-the-box gateway solution with full TCP/IP capability and processing power for extensive embedded applications. The Xtend directly connects to Radiocrafts I/O on the internal IESM card. The Open AT IDE is easy to use and the development tools are free of charge with extensive application support inside the Open-AT Software Suite. This will give a cost competitive, high performance combination. The slot-in-card works with all types of Radiocrafts modules. From Radiocrafts it is available a free Radio Test Gateway (RTG) software for local connection to the RS232 port of the modem or for enabling transparent GPRS connection via AT-commands.



[www.sierrawireless.com](http://www.sierrawireless.com)

## High Speed Flashing and Testing

Radiocrafts has implemented a unique solution for high speed volume production. This is an innovative test system for high speed volume flashing, RF testing and taping of radio modules.. This machine combines all our experience and expertise in radio modules and have the capacity of testing more than 10k modules per day.

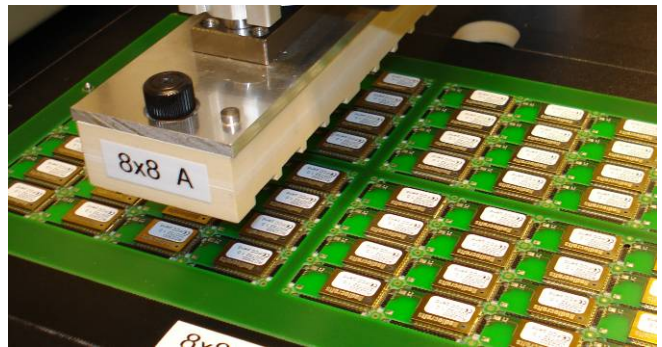
### Radiocrafts is testing the following parameters on the RC1180-MBUS radio module before shipping:

- Freq accuracy (ppm)
- Output power (dBm)
- 2nd harmonic (dBm)
- 3rd harmonic (dBm)
- Spurious emission (freq/max level, dBm)
- RX sensitivity
- TX supply current (mA)
- RX supply current (mA)
- Idle supply current (mA)
- Sleep supply current (uA)
- Program memory verification
- UART communication

Testing of all these parameters will make further detailed testing unnecessary, and only functional testing needs to be done to ensure that the total application is working properly.

### Spurious measurements – important vs CE qualification

We have experienced customers and competition which are making radio solutions with unknown compliance status versus CE regulations. This is often based on a lack of knowledge about the different CE regulations and not enough control of process variation. We know by experience it is difficult to confirm to regulations with certain chips and SoC's. This is one of the reasons why we ALWAYS test our radio modules 100% before shipping to customers.



Radiocrafts ATS – Automatic Test Station – module boards

### Benefits of 100% test coverage:

- Little or no variations on delivered product
- Avoid yield problems, and costs
- Ensure regulations compliancy for every radio module
- No extensive testing needed at later stage

## One form factor – pin compatible – Different radio technologies



Radiocrafts can offer full flexibility for manufacturers who is looking for different radio solutions. It is now possible to make one PCB design and combine several radio technologies, by only changing the radio module and the antenna. Only minor adjustments in the host controller firmware are necessary to swap between different firmware. The footprint compatible wireless M-Bus solution and the new high power IEEE 802.15.4 ZigBee, Smart Energy and RF4CE radio module gives a unique flexibility for metering applications.

	<ul style="list-style-type: none"> <li>• <b>Wireless M-Bus</b></li> <li>• <b>KNX-RF</b></li> <li>• <b>ZigBee Smart Energy</b></li> <li>• <b>6LoWPAN</b></li> <li>• <b>RF4CE</b></li> <li>• <b>2,4GHz Narrowband</b></li> <li>• <b>868MHz 500mW</b></li> <li>• <b>433 MHz</b></li> <li>• <b>915 MHz</b></li> </ul>	<p>Complete embedded solution (RC1180-MBUS)</p> <p>Complete embedded solution (RC1180-KNX)</p> <p>IEEE 802.15.4 platform (RC2400HP)</p> <p>IEEE 802.15.4 platform (RC2400HP)</p> <p>IEEE 802.15.4 platform (RC2400HP)</p> <p>High power, embedded FW (RC2500HP-RC232)</p> <p>Long range, 3+ km range (RC1180HP)</p> <p>Cost effective, embedded FW (RC1140-RC232)</p> <p>USA frequency ISM band (RC1190-RC232)</p>
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### Footprint compatible radio modules

Radiocrafts can offer a wide range of different radio modules which are footprint compatible. The high power IEEE802.15.4 module is platform for ZigBee, Smart Energy, 6LowPAN and RF4CE. The radio module is working with the latest ZigBee Smart Energy profile 1.5 and will also be able to run the new SE 2.0 which is under development. The OMS (Germany) and NTA8130/DSMR compliant Wireless M-Bus radio modules has a complete software stack embedded, making it a complete communication module. Several sub 1GHz frequencies are also available in the same footprint. All modules are pin compatible for full flexibility.

*“Radiocrafts is a clear leader for radio modules dedicated to the metering industry. Their Wireless M-Bus module provides the most complete solution supporting OMS and NTA8130/DSMR on the market. Their new ZigBee platform is ideal for the Smart Energy profile. They have succeeded in combining high RF performance with a compact form factor, achieving a complete RF solution that is easy to use for metering.”*

*Emmanuel Sambuis*

Emmanuel Sambuis,  
General Manager – Metering, Texas Instruments

