Radiocrafts
Embedded Wireless Solutions

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 for the Netherlands, and we are planning to extend the RC1180-MBUS platform with a new feature set to support OMS and MUC compliance according to the German standardisation work in progress.

Compact module with embedded protocol

- Embedded Wireless M-Bus protocol supporting EN 13757-4:2005 mode S, T and R2
- 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
- Conforms with EU R&TTE directive (EN 300 220, EN 301 489, EN 60950)
- Designed for EX compliance

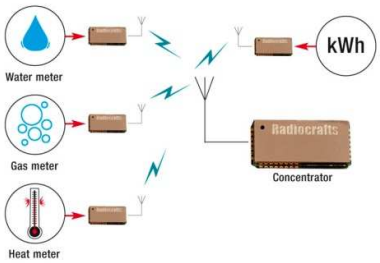
Parameter	RC1180-MBUS	Unit
Frequency bands	868.0 – 870.0	MHz
Number of channels	12	
Data rate	4.8, 32.768, 100	kchip/s
Max output power	9	dBm
Sensitivity, R/S/T	-106/-102/-101	dBm
Supply voltage	2.0 – 3.6	Volt
Current consumption, RX / TX	24 / 37	mA
Current consumption, SLEEP	Typ 0.3	uA
Temperature range (S and T mode)	-40 to +85	°C

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 according to the standard in the Netherlands.

RC1180-MBUS1 Basic Wireless M-Bus EN 13757-4:2005
Supports S, T and R2 modes
No acknowledge or encryption

RC1180-MBUS2 Wireless M-Bus with NTA 8130 feature set
Two-way communication with
automatic acknowledge and AES-128 encryption



Feature List	Feature set	
	RC1180-MBUS1	RC1180-MBUS2
General	Basic Wireless M-Bus functions	Added features for NTA 8130 compliance (the Netherlands)
Network role	Master or Slave	Master or Slave
Modes	S1, S2, T1, T2, R2	S1, S2, T1, T2, R2
Encryption	No, must be handled externally	AES-128 according to NTA8130
Installation mode	No, must be handled externally	Yes, according to NTA 8130
Filter function	No, receives any M-Bus packet. Filtering must be handled externally	Master receives only messages from installed/registered meters
Automatic acknowledge in T2	No, must be handled externally	Yes, according to NTA 8131

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 feature set integrated in an off-the shelf module, the time to market for NTA 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.

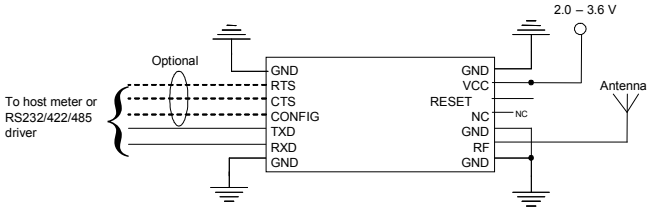
RC1180-MBUS2 NTA 8130 Feature Set

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.

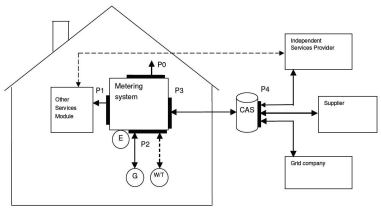
This module also supports all other modes S1/S2 and R2.

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.



T2 mode according to NTA 8130 P2 interface



The RC1180-MBUS2 module has full support for the T2 mode according to the existing NTA 8130 P2 interface in the Netherlands. The module has a fully functioning firmware embedded which is adapted to work according to the NTA 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 if you would like to start implementing with the T2 mode for your meter application. Radiocrafts will later release firmware according to the standardization work being done by OMS in Germany.

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 for purchasing information and software download.

FlashPro-CC connected to RC1180DB-USB

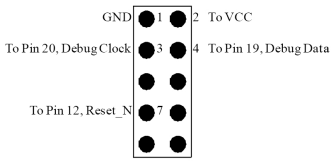
FlashPro-CC software

The FlashPro-CC software from Elprotronic can be downloaded from: http://www.elprotronic.com/download.html

Download the version valid for CCxx/RCxxxx series devices. FlashPro-CC Revision 1.32 or newer supports the RC1180-MBUS module from Radiocrafts (RC11xx-32k).

Customer PCB design

To be able to firmware-upgrade the module with customized and tailored firmware, and to meet local adaptations of EN13757-4:2005 and future versions of this specification, it is advised that a 2x5 pins programming connector is connected to the modules programming pins. The connector should be a 2.54 mm pitch pin-row (same pitch in both directions), SMD or through-hole version. We strongly advice all customers to implement this Programming Interface with the connector described in the Data Sheet.

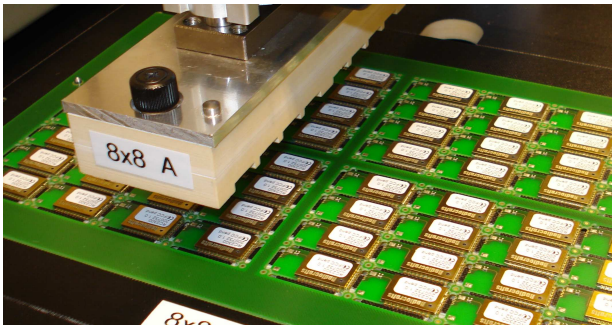


RC1180-MBUS Experimental Shipment Customer Waiver

Please contact sales@radiocrafts.com for more details and how to attend the upgrade program. You will receive a Firmware License Agreement and a Waiver which needs to be signed in advance before Hex code upgrades can be shipped.

High Speed Flashing and Testing

Radiocrafts has implemented a unique solution for high speed volume production. This is an innovative test system for high 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 ATS – Automatic Test Station – module boards

Spurious measurements – important vs CE qualification

We have experienced customers and competition who 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 SoCs. This is one of the reasons why we ALWAYS test our radio modules 100% before shipping to customers.

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.

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

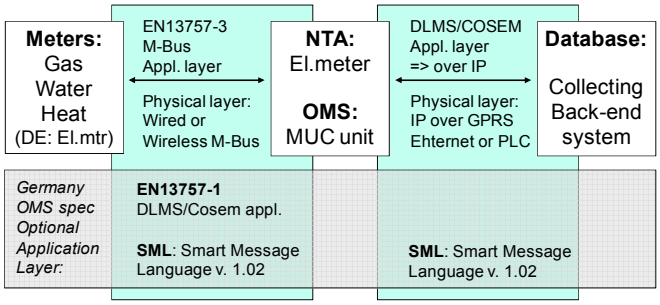
Metering application layer NTA and OMS

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.

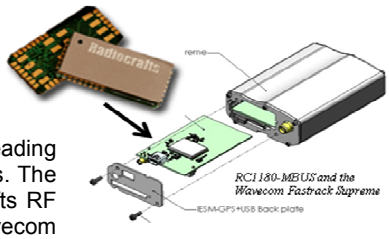


From the OMS standard regarding application layers:

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……

Radiocrafts RF + Wavecom Fastrack GSM

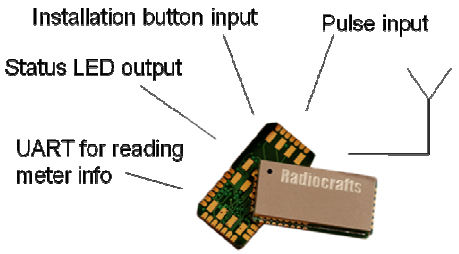
www.wavecom.com



We have developed a slot-in-card for the Wavecom Fastrack Supreme GPRS/GSM unit. Wavecom is the leading provider of M2M modems. The combination of Radiocrafts RF modules and Wavecom GSM/GPRS unit makes an easy to use out-of-the-box Gateway solution. The Wavecom Fastrack directly connects to Radiocrafts I/O on the internal IESM card. Wavecom Open AT IDE is easy to use and the development tools are free of charge. It is extensive application support on 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.

RC1180-MBUS Customer specific Feature set

Based on the standard feature set Radiocrafts also offers customer specific feature sets. Features in addition to MBUS1 and MBUS2 might include, but are not limited to:



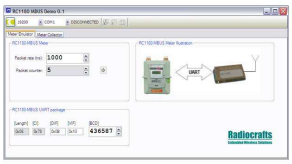
- Reading of pulse input
- Storing main index
- Reading meter data via serial interface
- Handling application layer of wireless M-Bus standard.
- Tampering alarm
- Low Battery alarm
- Accurate event timing with internal RTC
- Installation
- Wired M-Bus link protocol

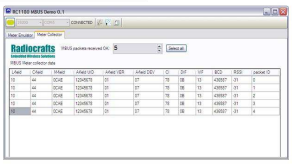
Technical Support - support@radiocrafts.com

Radiocrafts offers extensive support to all customers who start designing with Radiocrafts modules. This will ensure best possible radio performance. Many customers make mistakes when designing the antenna layout. Highly skilled engineers at Radiocrafts will review schematics and the PCB layout for our customers. Radiocrafts offers this service for free as part of the support to achieve maximum performance from the modules.

FREE review of schematics and PCB layout - FREE support for optimum antenna design - QUICK support response time

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-MBUSs as a meter sending 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. 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 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.

About Radiocrafts

Radiocrafts offers standard RF modules for operation in the license-free ISM bands at 315 / 433 / 429 / 868 / 915 / 2450 MHz. We provide compact modules that are easy to integrate and easy to use, for shortest possible time-to-market.

Radiocrafts designs, produces and markets high performance, high quality and cost-effective standard RF modules for use in a variety of wireless short-range applications. The company also provides customer and application specific design and manufacturing services for high volume products.

Our technology and developments are based on nearly 20 years of solid experience in the art of wireless communication.

Our experience covers solutions that are used worldwide in a large number of successful products in the consumer, industrial and automotive markets.

RF design is our speciality. We consider it to be a craft, learned through long experience and by deep knowledge in the subject. Hence we are proud to call ourselves Radiocrafts.

If you want to stay in the forefront of an ever-changing world, go with Radiocrafts.

Radiocrafts is a member of TI's Third Party Program and the ZigBee Alliance.

TI Developer Network Low-Power RF

ZigBee™ Alliance
Wireless Control That Simply Works