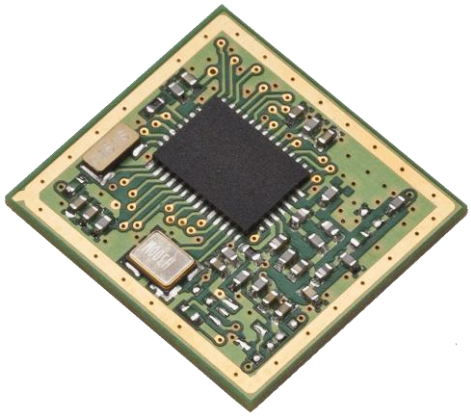
iM871A Wireless M-Bus

User Manual



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0.8	Created, Preliminary Version
1.0	Added chapter USB-Stick
1.1	Added AES encryption
1.2	C-Mode added

Aim of this Document

This document is intended to provide help using the iM871A Wireless M-Bus module. It gives an overview about its features and the Wireless M-Bus Stack. It explains how to control the module by a connected host controller.

This user manual includes the basic hardware specifications and describes how to put the iM871A into operation with the Wireless M-Bus Starter Kit.

Table of Contents

1. General

The iM871A is an ultra-low-power, high-performance, pre-certified Wireless M-Bus module fully compliant with EN 13757 part 4, Wireless M-Bus standard.

The module offers a cost-effective wireless solution for smart metering applications connecting water, heat, electricity and gas meters with data concentrators. It operates in the 868 MHz frequency band and it supports all unidirectional and bidirectional Wireless M-Bus modes (S1, S1-m, S2, T1, T2, R2, C1 and C2).

With a standby current of less than 1 µA, the iM871A is well suited for battery powered devices like water and gas meters. The pre-certified module provides a serial interface as well as analog and digital inputs and outputs and can easily be integrated into a meter. With its integrated Wireless M-Bus protocol stack it will reduce the development time and cost. The iM871A can achieve a link budget up to 123 dB, resulting in exceptional RF range and communication performance.

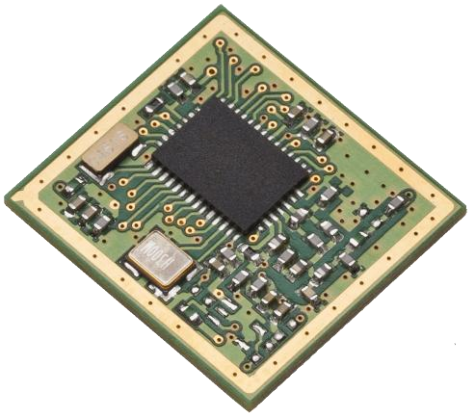

Figure 1-1: iM871A

1.1 Key Features

- Compact module 16.8 x 18.6 x 2 mm for SMD mounting
- Ultra low power modes for extended battery lifetime
- Communication/Configuration via UART, SPI and I²C interface
- Digital inputs and outputs
- Analog inputs
- Supply voltage range from 1.8 to 3.6 V
- RF interface matched to 50 Ω
- Output power level up to +14 dBm
- High link budget up to 123 dB
- Range up to 3000 m (line of sight)
- 64 kByte Flash + 4 kByte RAM Memory

1.2 Applications

The iM871A wireless M-Bus module offers a cost-effective RF solution for smart metering applications connecting water, heat, electricity and gas meters with data concentrators in the 868 MHz frequency band.

- Electricity meters
- Gas, water and heat meters
- Data concentrators and readers
- Automatic meter reading (AMR)

2. General Feature Overview

The iM871A Wireless M-Bus module offers lots of features which gives the user the possibility to save implementing functionalities on the host controller side. With the PC Application Wireless M-Bus Studio the features can easily be explored. The module can either be used as WM-Bus modem or can be taken as stand-alone solution (on request).

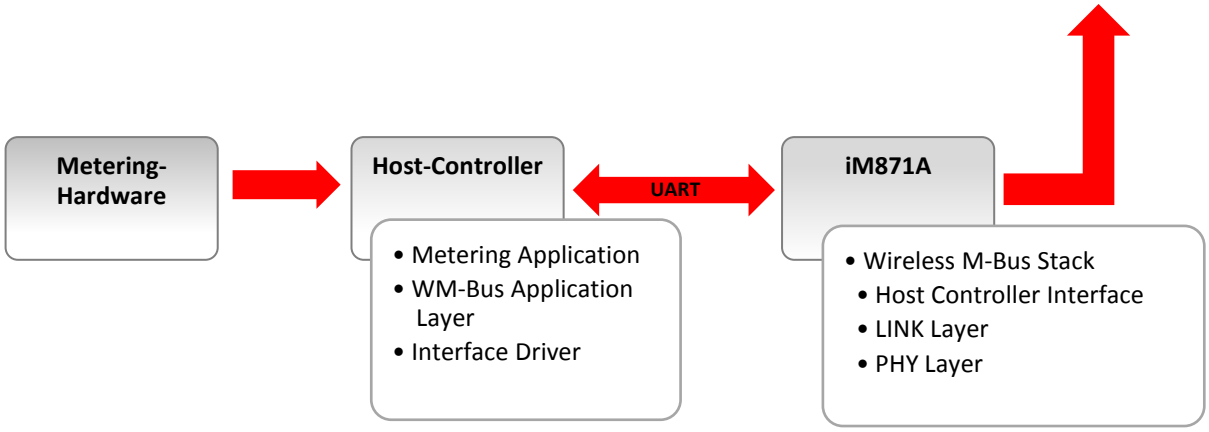

Figure 2-1: iM871A Metering Application Example with Host Controller

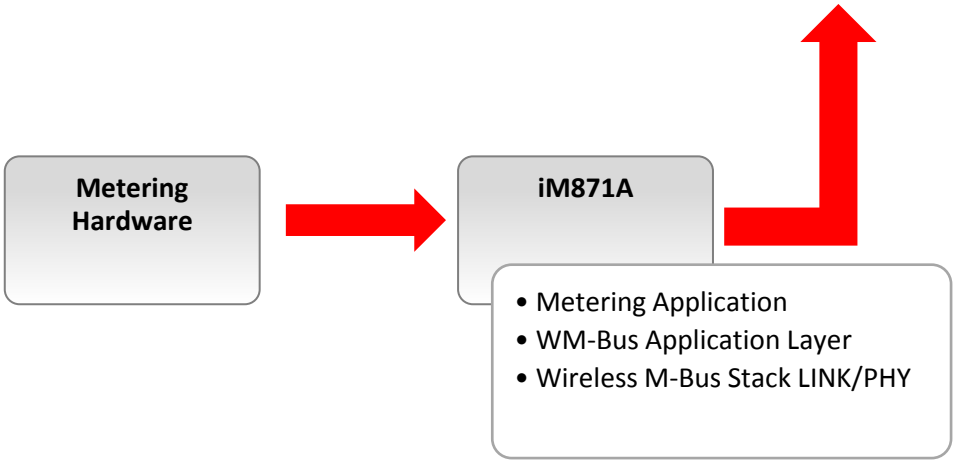

Figure 2-2: iM871A Metering Application Example Stand-Alone

iM871A Features

Host Controller Interface

With a message based serial protocol the user is able to connect the iM871A radio module to a host system. It can be used for configuration, data exchange and device control. Each message to or from the radio module is embedded in a specific message frame. For Windows PC applications a library (DLL) can be used. To connect the radio module to embedded systems example code is available.

Power Management

The iM871A radio module provides two different power saving modes to operate best in battery driven applications:

- Low Power Mode (with RTC running)
- Low Power Mode (with RTC off)

These modes can be called via the Host Controller Interface (HCI). The wakeup can also be done over the serial interface.

Moreover the iM871A provides the opportunity to enter one of the power save modes automatically after a successful WM-Bus packet transmission.

Supported Device Modes

The iM871A is designed for metering applications (*Meter*-Mode), but it also can operate in *Other*-Mode (Concentrator, Data Collector, etc.).

Operation- and State-Indication

When using the iM871A together with WiMOD Demoboard there is the option to indicate the internal states of the module by LEDs.

- *TX Indicator LED*: a WM-Bus packet is transmitted successfully
- *RX Indicator LED*: a WM-Bus packet was received successfully
- *Alive Indicator LED*: The module is awake and ready for operation

The LED indication can be disabled by configuration.

Real Time Clock

The iM871A provides an embedded RTC which can be used for timer controlled operations e.g. automatic transmission of WM-Bus messages at specific times or with a configurable interval (on inquiry).

AES Encryption

The iM871A supports automatic AES-128 encryption and decryption of radio link messages.

Hardware Test

Opportunity to generate a continuous wave signal on all supported channels.

Features in combination with the WM-Bus Studio

Packet Sniffer

With the Wireless M-Bus Studio a packet sniffer functionality for Wireless M-Bus packets is given. An optional data logger can store the air traffic into a log file.

Radio Link Test

The iM871A offers the possibility to evaluate the radio link quality between two devices with the Radio Link Test.

During this test a configurable number of packets including a TX packet counter is sent from a local device which is connected to the WM-Bus Studio to a peer device. The peer device returns the number of received packets back to the sender.

Wireless M-Bus Message Generator

The Message Generator offers the possibility to simulate real Wireless M-Bus packets. The format is conform to the EN13757-4 standard. The content of these packets can be changed. With this function the users is able to test the iM871A radio module against other Wireless M-Bus devices.

3. Module Firmware

3.1 Wireless M-Bus Stack

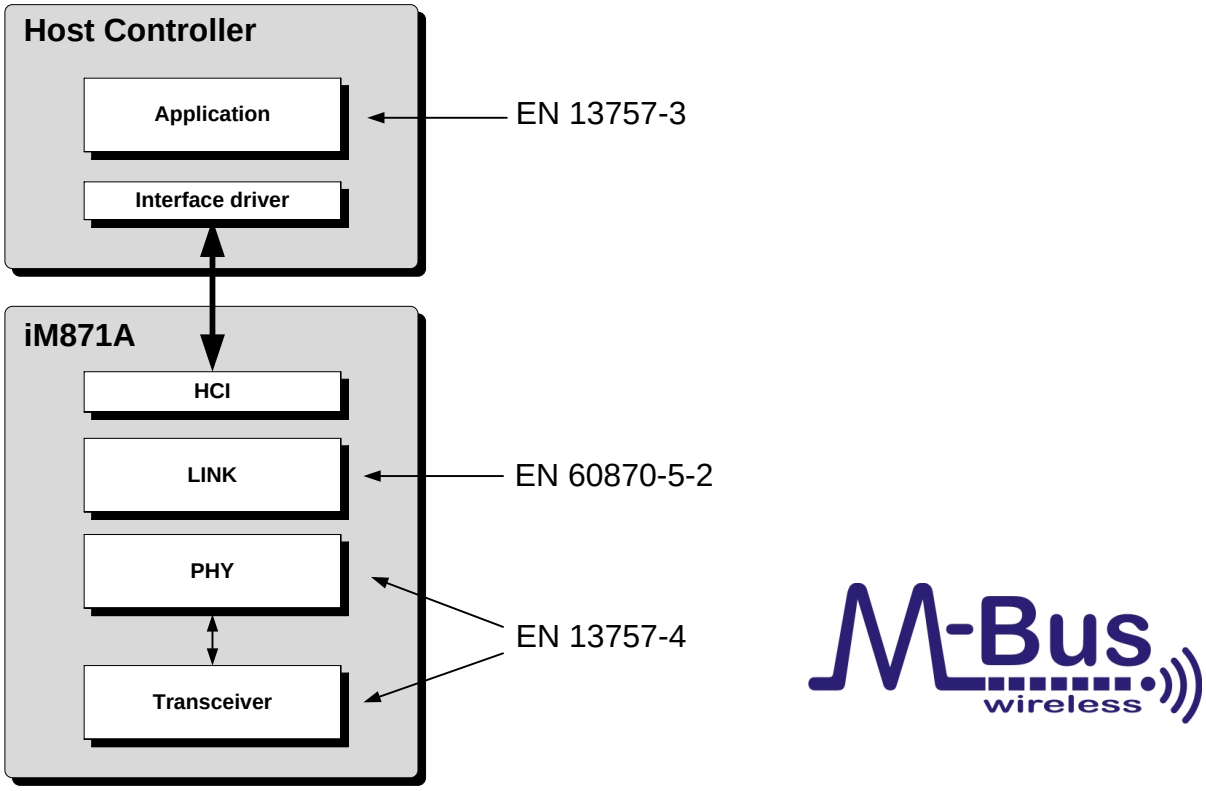

Figure 3-1: iM871A WM-Bus Stack

3.1.1 General

The Wireless M-Bus protocol stack implemented on iM871A is compliant the European standard 13757 part 4: "Communication systems for meters and remote reading of meters" [1]. It describes the wireless communication of water, heat, electricity and gas meters with data concentrators. For sake of convenience in this manual such meter devices are called "meter", the communications partner devices like concentrators are called "other".

3.1.2 WM-Bus Modes

The iM871A supports all link modes according to EN 13757-4: S (stationary), T (frequent transmit), R (frequent receive) and C (compact operation). These four main modes are divided into further sub-modes for dedicated applications. All modes are described from the meters view. Table 3-1 gives an overview over all WM-Bus modes and their physical parameters.

Mode	Direction	Data Rate	Coding	Frequency	Preamble + Synchronization
S1	Meter => Other	32.768 kcps	Manchester	868.3 MHz	582 chips
S1-m	Meter => Other	32.768 kcps	Manchester	868.3 MHz	56 chips
S2	Meter => Other	32.768 kcps	Manchester	868.3 MHz	56 chips
	Other => Meter	32.768 kcps	Manchester	868.3 MHz	56 chips
T1	Meter => Other	100 kcps	3 out of 6	868.95 MHz	56 chips
T2	Meter => Other	100 kcps	3 out of 6	868.95 MHz	56 chips
	Other => Meter	32.768 kcps	Manchester	868.3 MHz	56 chips
R2	Meter => Other	4.8 kcps	Manchester	868.03 MHz + n*60 kHz	104 chips
	Other => Meter	4.8 kcps	Manchester	868.33 MHz	104 chips
C1	Meter => Other	100 kcps	NRZ	868.95 MHz	64 chips
C2	Meter => Other	100 kcps	NRZ	868.95 MHz	64 chips
	Other => Meter	50 kcps	NRZ	869.525 MHz	64 chips

Table 3-1: Wireless M-Bus Modes

WM-Bus Mode S

Stationary mode

Mode S1 transmit only, unidirectional, long preamble

Mode S1-m unidirectional, transmission to mobile data collectors, short preamble

Mode S2 bidirectional, short preamble

Operation at 868.3 MHz, chip rate: 32.768 kcps, encoding: "Manchester"

Telegram Format A

WM-Bus Mode T

Frequent transmit mode

Mode T1 unidirectional, frequent operation

Mode T2 bidirectional, frequent operation

Transmission at 868.95 MHz, chip rate: 100 kcps, encoding: "3 out of 6"

Receiving (meter) at 868.3 MHz, chip rate: 32.768 kcps, decoding: "Manchester"

Telegram Format A

WM-Bus Mode R2

Frequent receive mode

Mode R2 bidirectional, meter always available

Transmission at channel 0-9, chip rate: 4.8 kcps, encoding: "Manchester"

Receiving at 868.33 MHz (channel 5), chiprate 4.8 kcps, decoding: "Manchester"

Once a mode is configured the module firmware configures all required physical parameter automatically according to EM 13757-4.

Telegram Format A

WM-Bus Mode C

Compact mode

Mode C1 unidirectional, compact operation

Mode C2 bidirectional, compact operation

Transmission at 868.95 MHz, chip rate: 100 kcps, encoding: "NRZ"

Receiving (meter) at 869,525 MHz, chip rate: 50 kcps, decoding: "NRZ"

Telegram Format A / Telegram Format B

Note: The iM871A can be used as RF-Adapter for Wireless M-Bus devices. It provides the physical access to the Wireless M-Bus "Network". For complete Wireless M-Bus protocol operation a host controller is needed which is able to generate telegrams which meet the EN13757-3 requirements.

Some M-Bus modes require response times which cannot be fulfilled with an external host controller due to long transmission times on the wired interface. For these cases we can provide customized solutions.

3.1.3 WM-Bus Telegrams

In this section the message format on the air interface is described.

There are two different telegram formats specified in EN13757-4. Telegram Format A and Telegram Format B. The operating modes S, T and R2 use Telegram Format A. The C-mode supports both telegram formats.

Wireless M-Bus Telegram Format A

Preamble-sequence	Sync-word	Block 1	Block 2	Block n -1	Block n	Postamble
specified by mode		12 bytes	18 bytes	18 bytes	18 or less bytes	max. 1 byte

Figure 3-2: Wireless M-Bus Telegram Format A

Every Wireless M-Bus telegram starts with a preamble sequence followed by a synchronization word. The length of these fields is mode-dependent. The implementation is done according to EN13757-4 [1]. The postamble contains normally 8 chips. Only for even packet sizes in T mode (Meter) the postamble consists of four chips.

Block 1:

L-Field	C-Field	M-Field	A-Field	CRC-Field
1 byte	1 byte	2 bytes	6 bytes	2 bytes

Address	Type	Version
4 bytes	1 byte	1 byte

Figure 3-3: Wireless M-Bus Telegram Format A, block1 (header)

The first byte of block 1 is the length byte. It describes the number of the following user bytes including C-Field-, M -Field- and A-Field-Data, but without any CRC byte.

C-Field, M-Field and A-fields can be pre-configured and stored in the non-volatile memory. L-Field and CRC-fields are filled by the firmware at transmission.

Block 2:

CI-Field	Data-Field	CRC-Field
1 byte	15 bytes or, if last block, (((L-9) MOD 16) -1) bytes	2 bytes

Figure 3-4: Wireless M-Bus Telegram Format A, block2

Block 3 to block n (optional blocks):

Data-Field	CRC-Field
16 bytes or, if last block, ((L-9) MOD 16) bytes	2 bytes

Figure 3-5: Wireless M-Bus Telegram Format A, block3 to block n

Wireless M-Bus Telegram Format B

Preamble-sequence	Sync-word	Block 1	Block 2	Block 3	Postamble
specified by mode		10 bytes	115 bytes	126 bytes	max. 1 byte

Figure 3-6: Wireless M-Bus Telegram Format B

Block 1:

L-Field	C-Field	M-Field	A-Field
1 byte	1 byte	2 bytes	6 bytes

Figure 3-7: Wireless M-Bus Telegram Format B, block1 (header)

The first byte of block 1 is the length byte. It describes the number of all following bytes including the CRC bytes.

The block 1 in Telegram Format B is the same as in Telegram Format A, only the CRC Field is missing.

Block 2:

CI-Field	Data-Field	CRC-Field
1 byte	115 bytes or, if last block, (L-12) bytes	2 bytes

Figure 3-8: Wireless M-Bus Telegram Format B, block2

Block 3 (optional block):

Data-Field	CRC-Field
(L-129) bytes	2 bytes

Figure 3-9: Wireless M-Bus Telegram Format B, block3

3.2 Serial Interface

The iM871A can be controlled and configured via serial Interface (UART). On inquiry the module can also be driven by Serial Peripheral Interface (SPI).

3.2.1 Connection Settings

The UART baud rate which is required for communication between host controller and radio module is 57600 baud. Further 8 data bits, 1 stop bit and no parity bit have to be configured.

3.2.2 Host Controller Protocol

The iM871A offers the user a host controller interface (HCI) and uses a specific host controller message protocol With this message based serial protocol the user is able to connect the iM871A radio module to a host system. It can be used for configuration, data exchange and device control. Each message to or from the radio module is embedded in a specific message frame.

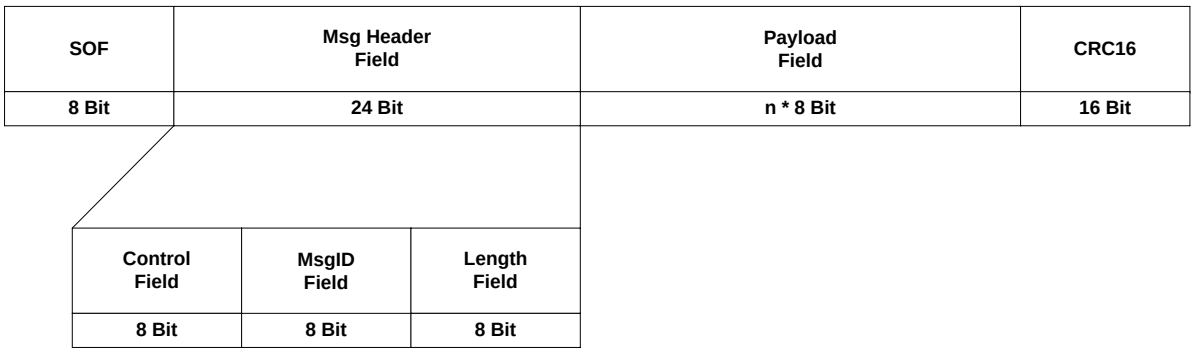

Figure 3-10: Message format on serial interface

Note: In this chapter only a short summary of the serial interface commands is given. For detailed information please refer please refer HCI specification [3].

3.2.3 General Device Functions

- Ping Request

  This function can be used to check the wired communication interface (HCI) and if the connected device is alive. If a "Ping Command" message is received the device answers with a "Ping Response" message.

- Reset Request

  This function can be used to perform a software reset of the iM871A firmware.

- Get Device Info

  For identification purpose the WM-Bus firmware provides a service to readout some information elements e.g. Module Type, Firmware Version. This command returns the basic device information block.

3.2.4 Device Configuration

The WM-Bus Firmware supports several kinds of configurable system parameters which can be stored in a non-volatile parameter memory. The configuration parameters are readout during start-up and used to configure the firmware components and the hardware units. Table 3-2 gives an overview about all changeable parameters.

Parameter	Description	Default
Device Mode	Meter/Other Selection	Other
Link Mode	Wireless M-Bus Mode (S1, S1m, S2, ...)	S2
C-Field (Block 1)	1 byte Control Field	0x00
M-Field (Block 1)	2 byte Manufacturer ID	0x0CAE
	2 byte Manufacturer ID (USB-Stick Variant)	0x25B3
Device ID (Block 1)	4 byte Device Identification (A-Field)	0x12345678
	4 byte Device Identification (A-Field) (USB-Stick Variant)	pre-configured address
Version (Block 1)	1 byte Version (A-Field)	0x01
Device Type (Block 1)	1 byte Device Type (A-Field)	0x00
Radio Channel	R-Mode channel	1
Radio Power Level	Transmission power	13
RX Window	Receive time after transmission in ms (Meter only)	50
Power Saving Mode	Enable / disable automatic power saving after transmission (Meter only)	Off
LED Control	LED indication for TX/RX/Alive	Off
RX Timestamp	Timestamp attachment on HCI message for received messages	Off
RSSI Attachment	RSSI attachment on HCI message for received messages	Off
Real Time Clock	Enable / disable Real Time Clock	Off
Encryption	Enable / disable encryption	Off

Table 3-2: Parameter Overview

When sending a WM-Bus message by HCI command the Block 1 parameters can either be taken from the configuration or can individually be transferred with each message.

For reading and writing the parameters listed in Table 3-2 the following functions can be used.

- Get Device Configuration

  This function can be used to readout all configuration parameters.

- Set Device Configuration

  This function can be used to change several system parameters. The function allows to change parameter directly and to save them in a non-volatile memory. Please get the list of the configurable parameters from the HCI Specification.

- Factory Reset Request

  This function can be used to reset the WM-Bus device configuration to its default factory settings.

  Note: The new configuration gets active after reboot.

3.2.5 Operation Modes

The WM-Bus firmware can operate in different kinds of System Operation Modes. The operation modes enables the device to align its behaviour according to a given use case e.g. test mode, application mode. The system operation mode is determined during firmware start-up and requires a reset to get changed.

- Get System Operation Mode

  This function returns the current System Operation Mode.

- Set System Operation Mode

  The following System Operation Modes are supported:

  - Application Mode
  - Hardware Test Mode

3.2.6 Real Time Clock Support

The iM871A provides an embedded RTC which can be used for timer controlled operations e.g. automatic transmission of WM-Bus messages at specific times or with a configurable interval.

- Get RTC Time

  This function can be used to read the RTC time.

- Set RTC Time

  This function can be used to set the RTC time.

3.2.7 AES-128 Encryption / Decryption

The iM871A supports automatic AES-128 encryption and decryption of radio link messages.

There is the chance to configure up to 16 decryption keys for 16 different devices. The keys can be stored in a RAM table together with the complete WM-Bus device address. For detailed information please refer the WM-Bus Studio User Manual [2].

3.3 Low Power and Wake-up

The *Low Power Mode* can be entered manually by sending a command via the serial interface. The radio part is in shutdown state and the CPU is in sleep mode. Additionally the Real Time Clock can be disabled to reduce the power consumption to the minimum. The module can be woken up again by sending a new HCI command.

3.3.1 Auto Power Saving

For devices which are configured to operate in Meter mode the feature *Auto Power Saving* can be enabled. *Automatic Power Saving* means, that the device enters the configured power saving mode automatically when a WM-Bus message was sent. The next command on the serial interface will wake-up the device.

For devices operation in Other mode power saving is not intended. Other devices are always on and ready to receive Wireless M-Bus packets.

3.4 Port Pin Signaling

The embedded Firmware can be configured to use three port pins of the radio module as follows:

Alive Indicator (module pin 1)

indicates if the module is active (pin 1 high) or sleeping (pin 1 low)

TX Indicator (module pin 3)

toggles every time a message was sent

RX Indicator (module pin 6)

toggles every time a message was received

When using the iM871A in Wireless M-Bus Starter-Kit the indicator pins are connected to LEDs of the Demo Board.

4. Module Specification

4.1 General Radio Settings

In this chapter the possible radio configurations of the iM871A are described.

4.1.1 Channel Setup

Table 4-1 shows the RF channel setup. These channels are available in R-Mode for transmissions from Meter to Other devices. The opposite direction is always done in 868.33 MHz (channel 5).

Channel	Frequency [MHz]
1	868.09
2	868.15
3	868.21
4	868.27
5	868.33
6	868.39
7	868.45
8	868.51

Table 4-1: Possible Frequency Channel Settings in R-Mode

4.1.2 Power Level Setup

Table 4-2 shows the possible power level setup relating to the 50Ω connector (pin ANT).

Power Level	TX power [dBm]	Description
0	-8	Minimum output power
1	-5	
2	-2	
3	+1	
4	+4	
5	+7	
6	+10	
7	+13	Maximum output power
Notes: The TX power values are dependent on the supply voltage of the radio module. These values are valid for 3V supply voltage.		

Table 4-2: Possible Output Power Settings

4.1.3 Data Rate Setup

Table 4-3 shows the used RF data rates setups. They are configured automatically by the module firmware dependent on the selected Wireless M-Bus mode, the Device Mode and the data direction.

RF data rate [kcps]	Description
4.8	chip rate, results in a data rate of 2.4 kbps (Manchester coding)
32.768	chip rate, results in a data rate of 16.384 kbps (Manchester coding)
50	chip rate = data rate (NRZ coding)
100	chip rate, results in a data rate of 66.66 kbps (3 out of 6 coding) chip rate = data rate (NRZ coding)

Table 4-3: Possible RF Data Rates

4.2 System Timing

4.2.1 Wake-up after Low-Power-Mode

Figure 4-1 shows the timing diagram of the transmission of a 42 byte WM-Bus packet in S-Mode. The device is in *Low Power Mode* and is woken up by the edge of the first UART bit that is received from the host controller. After successful RF transmission, the host controller is informed with a status message. Hereafter the metering device is able to receive command messages (e.g. from a data collector) for the configure RX Window (here: 10ms). If no command is received the radio is shutdown and the module returns to *Low Power Mode* again.

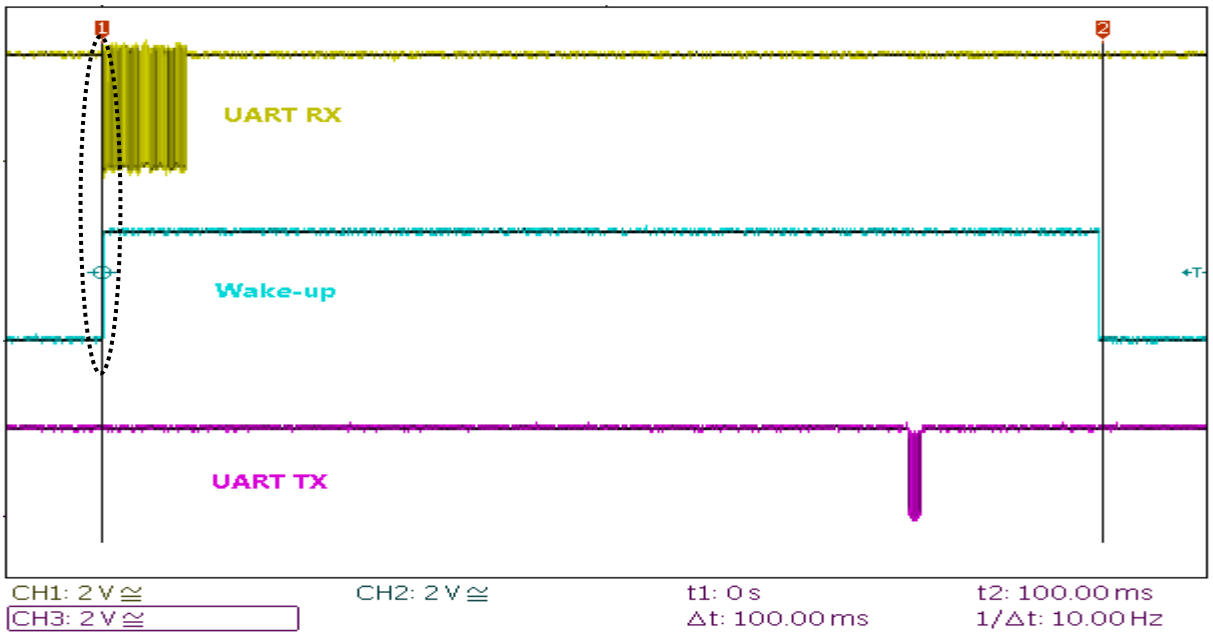

Figure 4-1 Packet Timing after Wake-up

Figure 4-2 shows the time gap between the RX signal and the wake-up indication.

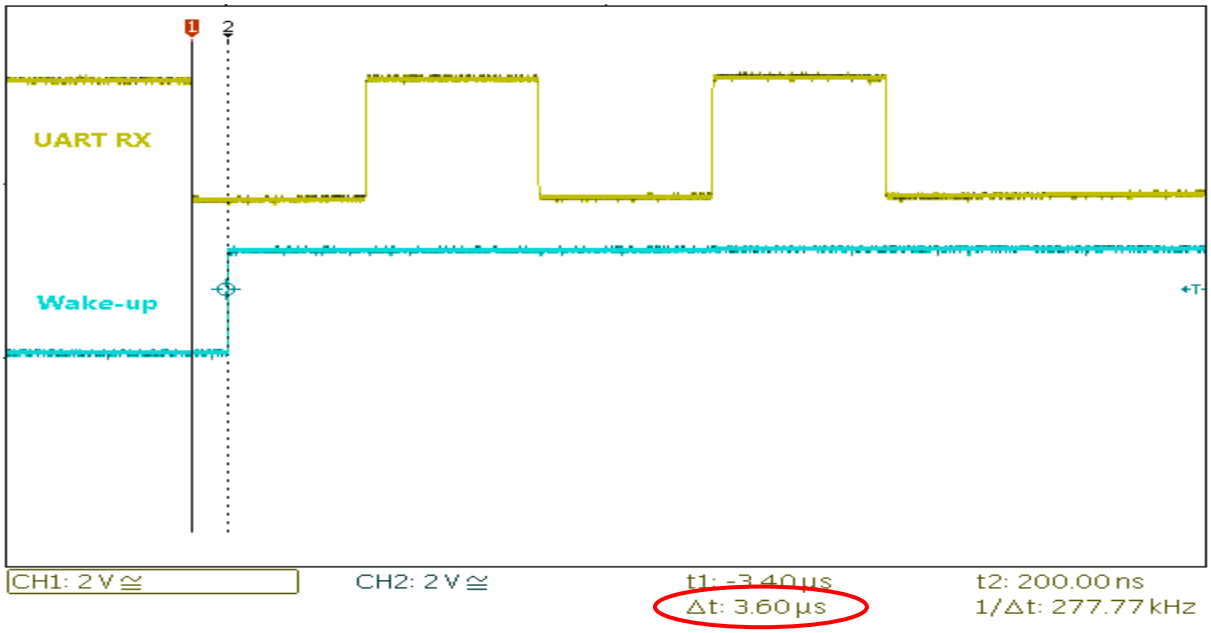

Figure 4-2: Packet Timing after Wake-up, detailed view

4.3 Current Consumption

Figure 4-3 shows schematically the current consumption of a meter device, that is triggered by the host controller to transmit a Wireless M-Bus packet every 2 seconds. After transmission the meter is able to receive commands from a master device (concentrator, data collector, etc.). The rest of the time the meter remains in *Low Power Mode*.

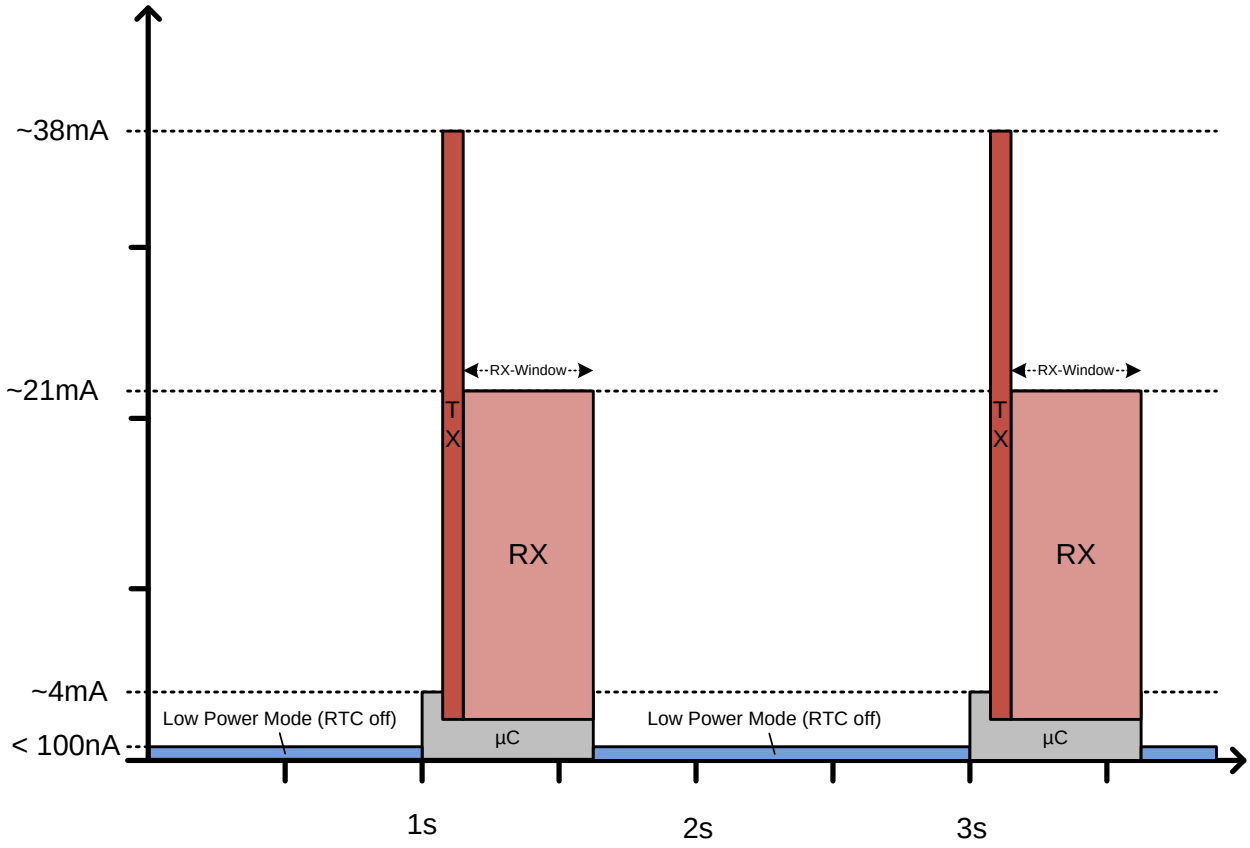

Figure 4-3: Current Consumption

5. Wireless M-Bus Starter-Kit

To explore the features and capabilities of the iM871A Wireless M-Bus radio module a plug & play Starter-Kit solution is available.

5.1 Demo Board

The Starter-Kit usually contains two Demo Boards where the iM871A modules can be mounted on. The Demo Boards offer several often used peripherals like e.g. buttons and LEDs. The module can easily be accessed via the on board FTDI RS232 to USB converter. Figure 5-1 gives an overview of the Demo Board and its peripherals.

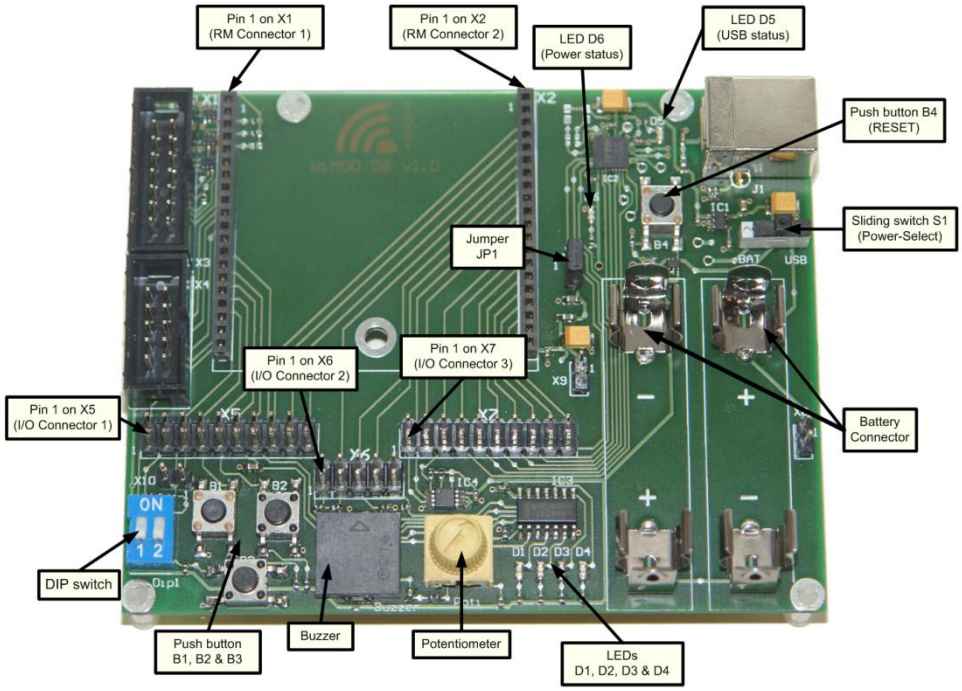

Figure 5-1: Demo Board

Using the Demo Board with the iM871A it must be soldered on its specific adapter board and plugged into X1 and X2. Now all necessary module pins are available on X5, X6, and X7 of the Demo Board.

Table 5-1 shows the used peripherals and its mapping to the radio module iM871A when setting the corresponding jumper on X5, X6 and X7.

Peripheral on the Demo Board	Jumper setting on the Demo Board	Demo Board X1/X2	iM871A pin
LED 1	X5.19 to X5.20	X2.4	1
LED 2	X6.3 to X6.4	X2.5	3
LED 3	X6.5 to X6.6	X2.6	6
LED 4	X6.7 to X6.8	X2.7	7
UART RxD	X7.13 to X7.14	X2.15	19
UART TxD	X7.19 to X7.20	X2.18	18

Table 5-1: Pin mapping to important peripherals of the Demo Board

5.1.1 Power Supply

The Demo Board and the attached radio module may be powered from either two "AAA" size batteries or from the USB bus when connected to a USB port on a PC. The sliding switch S1 toggles between these power sources and must be set according to what power source is used. In position "USB" the USB bus voltage together with a voltage regulator (3 V) is used. In position "BAT" the battery voltage is used directly. LED 6 is turned on when the iM871A is powered on. Additionally LED 5 is turned on if a USB connection to a PC is established. It is recommended either to use the battery or the USB power, thus S1 can be used as on-off-switch.

To supply the radio module with power jumper JP1 must be set.

Power supply of the iM871A (except the USB interface) and the attached radio module is interrupted if push button B4 is pressed. Because the radio module has a Power-On-Reset (POR) functionality B4 serves as the RESET button.

5.1.2 USB Interface

The USB interface of the Demo Board can be used for communication between the attached radio module and a PC. The USB controller (FT232RQ) is turned on once the connection to a PC is established. This is also signalized by LED 5. The USB interface supports "USB 1.1" and "USB 2.0 full speed" modes.

Before the USB interface can be used for the first time, the desired hardware driver for the USB controller must be installed on the PC. If the PC will detect the Demo Board as new hardware please follow the given instructions to install the new virtual COM port.

For more information see http://www.ftdichip.com/Drivers/VCP.htm

5.2 USB-Stick

Figure 5-2: iM871A USB-Stick

For an easy use a compact iM871A USB adapter is available. It covers all the main communication functionalities of the demo board and can be used with the Wireless M-Bus Studio as well. With its internal antenna nothing more is needed as a free USB port on the host system. The iM871A USB-Stick is not part of the Wireless M-Bus Starter-Kit, it has to be ordered separately.

5.2.1 USB Driver

Before the USB interface can be used for the first time, the desired hardware driver for the USB controller must be installed on the PC. If the PC will detect the USB-Stick as new hardware please follow the given instructions to install the new virtual COM port.

The USB-Stick contains the Silabs USB-to-UART-Bridge CP210x. Virtual Com Port (VCP) drivers for Microsoft Windows™, WindowsCE and Linux available.

For more information see

http://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx

5.3 Configuration with WM-Bus Studio

The Wireless M-Bus Studio is a Windows tool which allows to explore the capabilities of the iM871A. The GUI offers a comfortable way to configure and control some features of the embedded Wireless M-Bus Stack like:

- Wireless M-Bus Modes
- RF Message Header Configuration
- Radio Configuration
- Automatic Power Saving
- Embedded Radio Link Test
- RF Message Generator
- Real Time Clock Support
- AES Keys

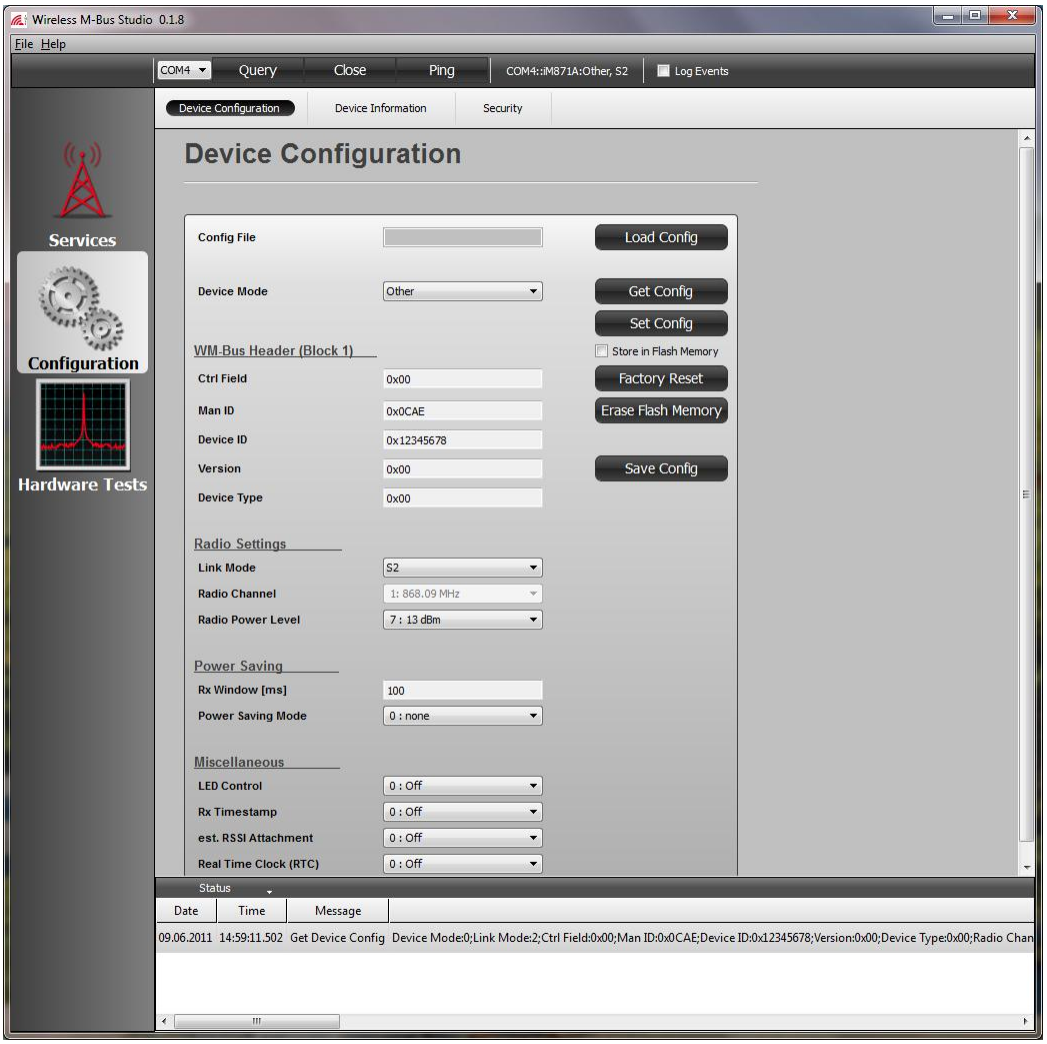

Figure 5-3: Wireless M-Bus Studio

Note: For detailed information please refer the WM-Bus Studio User Manual [2].

6. Ordering information

Ordering Part Number	Description	Distributor
iM871A	Radio module iM871A	wimod@imst.de
SK – iM871A	Starter Kit for the iM871A. See Notes.	wimod@imst.de
AB – iM871A	2x Adapter Board with iM871A	wimod@imst.de
iM871A – USB	USB Stick with module iM871A	wimod@imst.de
Notes: The Starter Kit contains two Demo Boards, two Adapter Boards with iM871A, two antennas, batteries, and a CD with documentation.		

Table 6-1: Ordering Information

7. Appendix

7.1 List of Abbreviations

ADC = Analog-to-Digital Converter

AMR = Automatic Meter Reading

DIO = Digital Input/Output

DLL = Dynamic Link Library

GUI = Graphical User Interface

HCI = Host Controller Interface

MCU = Microcontroller Unit

PCB = Printed Circuit Board

PER = Packet Error Rate

RAM = Random Access Memory

RF = Radio Frequency

RSSI = Received Signal Strength Indication

RTC = Real Time Clock

SMD = Surface-mounted device

SPI = Serial Peripheral Interface

SRD = Short Range Devices

UART = Universal Asynchronous Receiver/Transmitter

USB = Universal Serial Bus

WM-Bus = Wireless M-Bus

7.2 List of Figures

7.3 List of Tables

7.4 References

[1] EN13575-4 : 2011
Communication systems for meters and remote reading of meters

[2] WM-Bus Studio User Manual

[3] iM871A HCI Specification

[4] iM871A Datasheet

8. Regulatory Compliance Information

The use of radio frequencies is limited by national regulations. The radio module has been designed to comply with the European Union's R&TTE (Radio & Telecommunications Terminal Equipment) directive 1999/5/EC and can be used free of charge within the European Union. Nevertheless, restrictions in terms of maximum allowed RF power or duty cycle may apply.

The radio module has been designed to be embedded into other products (referred as "final products"). According to the R&TTE directive, the declaration of compliance with essential requirements of the R&TTE directive is within the responsibility of the manufacturer of the final product. A declaration of conformity for the radio module is available from IMST GmbH on request.

The applicable regulation requirements are subject to change. IMST GmbH does not take any responsibility for the correctness and accuracy of the aforementioned information. National laws and regulations, as well as their interpretation can vary with the country. In case of uncertainty, it is recommended to contact either IMST's accredited Test Center or to consult the local authorities of the relevant countries.

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