Wireless Solutions

ISM Band Communication by RADIOCRAFTS

M-Bus, zigbee, Tinymesh, KNX, sigfox
GLYN Wireless Solutions

For more than 17 years GLYN is actively supporting customers in the selection and development of wireless products.

During this time we have assisted you to enhance your products with wireless M2M communication quickly and smoothly.

The wealth of knowledge we have collected in more than 28,000 hours is invaluable. We gladly share this experience with you by providing our expertise in active design-in support. This is GLYN First-Class PREMIUM Support.

Use our experience in wireless M2M communication and benefit from professional consulting and intensive technical support to enjoy short development times for your products and a faster time-to-market.

Because time is money…

SUPPORT IS RED!

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ISM Band Wireless Solutions

Radiocrafts
Embedded Wireless Solutions

RADIOCRAFTS mission is to make Embedded Wireless easy to use.

They design, produce and market high performance, high quality and cost-effective standard RF modules. These modules provide wireless short-range connectivity to a variety of applications. The Ease of Use of these modules will help you to reduce development time and accelerate production ramp-up. This will increase your market success while reducing investments and risk.

RADIOCRAFTS was founded in 2003 by experienced RF engineers. Their technology and developments are based on more than 15 years of experience in wireless communication.

RADIOCRAFTS modules share a common form factor and pin-compatible layout. They can be easily exchanged to adapt your application to specific requirements. Multiple variants are available supporting different frequency bands for markets in Europe, America, Asia and even worldwide operation. As applications have different needs for wireless communication, RADIOCRAFTS provide radio protocols for specific uses. These range from simple cable replacement to full mesh networking. Also industry standard protocols like ZigBee, Wireless M-Bus or Sigfox are supported.

RADIOCRAFTS is an active member in industry standard associations, including OMS-Group, ZigBee Alliance and KNX Association. They contribute actively to the development of standards for wireless communication.

ISM Band / Short Range Radio

Radio communication using ISM band frequencies adds a lot of flexibility for wireless connectivity of your application. The radio parameters and protocols can be tailored to your specific requirements. Different frequency bands are available for local, regional and even worldwide operation. You can use proprietary solutions or select an industry standard protocol as needed. There are protocols designed for specific applications like Wireless M-Bus for metering or KNX for home and building automation.
ISM Band Wireless Modules

There are some important points to consider when choosing a wireless solution for your system:

► Fast development and short time to market
► Flexibility to adapt your application to different requirements
► Easy to use connectivity
► Certifications and approvals for worldwide use

If you want to achieve these goals, RADIOCRAFTS modules will be your first choice.

Reduce development time and cost with modules

With a fully developed and pre-certified module you can reduce development time significantly. All essential components are already included on the module. The RF performance is proven and standard RF protocols ensure reliable communication. All this will help you to get your application to market faster.

Compatible modules add flexibility

All RADIOCRAFTS modules have the same footprint and form factor. Thanks to this, you can easily swap frequency bands and radio protocols. You can open new markets for your application. Just change the module to fit the new needs.

Easy to use interfaces

To run the module, just connect antenna, power supply and UART. Even a small microcontroller can control the device, because the module includes the radio stack. Communication functions are configured with simple commands and automatically stored in internal non-volatile memory.

Module certifications and approvals enable worldwide use

Wireless modules from RADIOCRAFTS are already certified and approved for international standards like CE/RED, FCC and many more. These will help you to deploy your applications on worldwide markets easily.

► Compact shielded modules 12.7 × 25.4 mm
► Different ISM band frequencies from 169 MHz up to 2.45 GHz
► Selection of radio protocols for different application requirements
► Fully tested modules with software stack preloaded
► Pin-compatible high power (HP) variants for extended range
RC232

Simple and effective Cable Replacement

RC232 is an easy-to-use and effective cable replacement and networking protocol. Using a transparent data protocol, it can carry any kind of application data. A UART interface is used for serial communication and configuration. RC232 supports different network topologies including point to point, point to multi-point or peer to peer. A multi-hop option is also supported. This makes RC232 an ideal solution for simple and robust wireless connections or networks.

RC232 modules are compact, surface mounted modules with embedded radio stack. They are completely shielded and pre-certified for operation in license free bands from 169 MHz to 2.4 GHz. Module variants cover different application requirements from low cost to narrowband industrial grade or high power for long range. They are compliant with local radio regulations worldwide, including Europe (CE), USA and Canada (FCC), Brazil, India, Japan, Korea, China, Australia and New Zealand.

► Point to point, point to multipoint protocol, multi-hop (RC232)
► Frequency bands from 169 to 2450 MHz
► Transparent UART data interface (UART in – RF out)
► High power modules for extended range
► Compact and shielded 12.7 × 25.4 × 3.5 mm
► Pin-compatible variants for EU, US, India, worldwide
► No external components: power supply and antenna only

Module families for RC232 protocol

► RC11xx: 433 – 915 MHz, cost-efficient wideband radio
► RC12xx: 419 – 915 MHz, ultra-narrowband radio
► RC17xx: 169 – 868 MHz, high performance, ultra-narrowband radio
► RC2500: 2450 MHz, worldwide operation
TinyMesh

Powerful Multi-hop Mesh Networking

TinyMesh is a powerful multi-hop mesh protocol with bidirectional wireless communication. The compact modules provide a self-configuring and self-healing mesh network. This can cover a large area for your application. Individual nodes can be easily controlled and monitored. RADIOCRAFTS TinyMesh modules are used for applications like smart metering networks, street lighting and industrial sensor systems.

TinyMesh modules are compact surface-mounted high performance wireless modules. They feature a fully embedded TinyMesh™ application and network stack. Module variants for low power, high power and ultra narrow band are available. The completely shielded modules are pre-certified for operation in license free bands from 169 MHz to 2.4 GHz.

- Multi-hop mesh network protocol
- Self-forming, self-healing and self-optimizing
- Bidirectional with acknowledge and retransmissions
- Configurable analog and digital input/output
- Transparent serial or packet mode communication
- Individual, Group or Broadcast addressing
- Available 169 – 2450 MHz, wideband and narrowband
- Standard form factor (12.7 × 25.4 × 3.3 mm)
- AES 128 encryption
- LBT (Listen Before Talk)
- Sleep mode and End Device (battery) operation
- Seamless integration with cloud service

Module families for TinyMesh protocol

- **RC11xx**: 433 – 915 MHz, cost-efficient wideband radio
- **RC17xx**: 169 – 868 MHz, high performance, ultra-narrowband radio
- **RC2500**: 2450 MHz, worldwide operation
Wireless M-Bus

Metering Applications

Wireless M-Bus is a standardized solution for wireless meter reading (EN 13757). It was designed to provide very robust and power-efficient communication. Low power modes allow long-lasting battery-powered operation. For metering applications, a high level of security is also required. These features also make wMBUS a good solution for industrial applications that need secure, robust and low power communication.

RADIOCRAFTS actively participate in the standardization work in both CEN and OMS. This keeps their modules compatible with latest additions of the standards.

Wireless M-Bus modules offer high performance with embedded Wireless M-Bus protocol in a compact SMD package. In the EU, mainly 169 and 868 MHz are used for Wireless M-Bus. Module variants for other frequency bands and markets are also available.

The modules can be configured as slave, master or repeater mode. An easy to use UART interface is used for serial communication and configuration. With a quarter wave antenna connected to the RF pin, a LOS range of over 800 meters can be achieved at 868 MHz and several km at 169 MHz. Ultra-low power mode extends battery lifetime for the application.

The MPC1 (M-Bus Pulse Counter) variant contains an autonomous application for pulse counting. Alarm supervision and automatic transmission schedules can be configured. The module also supports over-the-air configuration and installation.

- Full feature embedded Wireless M-Bus stack EN13757
- 868 MHz (C,R,S,T modes) and 169 MHz (N mode) for EU
- 433, 865, 869, 915, 923 MHz for non-EU operation
- Master module up to 256 slaves
- AES-128 hardware encryption
- Designed for Open Meter Reading (OMS) specification
- Designed for NTA8130/DSMR/SMR
- Special support for CIG (Italy) TS 11291-11-4
- UART interface for communication and configuration
- Pulse counter and automatically scheduled transmissions (MPC1 variant)
- Ultra-low power modes for battery lifetime > 15 years
- High power option (27/30 dBm) in same footprint
- Compact shielded module 12.7 × 25.4 × 3.3 mm for SMD mounting

Module families for Wireless M-Bus protocol

- **RC11xx**: 433 – 868 MHz, cost-efficient wideband radio
- **RC1701**: 169 MHz, ultra-narrowband radio
KNX RF

Home Automation

KNX is an international standard and communication protocol for building automation. Wireless modules with KNX RF Multi stack allow easy extension of a wired KNX system with wireless technology.

RADIOCRAFTS is a long standing member of the KNX association and participated in development of the KNX RF Multi standard. This ensures interoperability and a short time to market for KNX RF devices.

KNX RF modules from RADIOCRAFTS include the KNX RF Multiprotocol stack. They are compact and pre-certified high performance modules for easy integration in your device. The module has a UART interface for serial communication and configuration. It supports fast link acknowledgement of up to 64 receivers. Listen before talk function and automatic retransmission ensure reliable communication.

The module offers high performance radio function. With a quarter-wave antenna a line-of-sight range of 600-800 meters can be achieved. The physical layer complies with the relevant parts of the EN 50090 (ISO/IEC 14543-3).

- Embedded KNX-RF Multi protocol
- Frequency agility – 5 channels
- Fast link acknowledgement
- Listen before talk & automatic retransmission
- Multi-hop re-transmitters
- Backward compliant with KNX-RF v1.1 and KNX Ready
- Supports unidirectional and bidirectional devices
- Ultra-low power modes for extended battery lifetime

Module for KNX RF protocol

- RC1180: 868 MHz, cost-efficient wideband radio
ZigBee

Standard Mesh Networking

ZigBee® is a standard mass market communication protocol for home automation, sensor networks and energy management systems. A large ecosystem of interoperable products is available. The radio protocol is based on IEEE 802.15.4 industry standard. Operation at 2.45 GHz makes it a truly global solution. The mesh network ensures good in-house coverage.

RADIOCRAFTS modules feature the ZNM network stack for interoperability with ZigBee® devices. Connection to the host CPU is done using a UART interface with serial protocol. This allows easy development of a system to use any ZigBee® application profile.

There are module variants with low power consumption for battery-operated devices or high power for extended range.

► Compact shielded module
► Conforms with worldwide RF regulations
► High power option in the same footprint
► Supported network topologies: Star, Mesh
► Integrated antenna or RF connector options (RC2411)
► Pin-compatible with other Radiocrafts modules

Modules for ZigBee protocol

► **RC2400**: 2450 MHz, worldwide use
► **RC2411**: 2450 MHz, worldwide use, with chip antenna or U.FL connector
Sigfox

Low Power Wide Area Network

Launched in 2012, Sigfox provides connectivity for Internet-of-Things applications. The Sigfox company is deploying a global network for communication using license free ISM frequency bands. This provides energy efficient and cost effective two-way communication for IoT applications. Low network cost make Sigfox a good solution for applications that need only low data rates.

The RADIOCRAFTS Sigfox solutions are based on RC16xx high performance radio modules. These have very good RF performance that can be used to provide long range communication. For global use cases, two modules with pin-compatible footprint are available. The modules are pre-certified for the Sigfox network as well as local radio regulations.

- Sigfox Ready™ certified module with integrated protocol
- Global support by two footprint compatible modules
- -126 dBm sensitivity, 14/25 dBm output power
- Two-way communication support
- 144 transmissions (12 byte), 4 receptions (8 byte) per day
- UART interface, pin-to-pin compatible to other modules
- Standard form factor (12.7 × 25.4 × 3.5 mm)
- Sigfox Ready™ certified development kit

High performance radio combined with ultra-low power modes extend battery life and assures communication quality.

Modules for Sigfox protocol

- **RC1682-SIG**: 868 MHz, mainly used in Europe
- **RC1692HP-SIG**: 915 MHz for use in USA, Latin America, Australia, New Zealand, Taiwan etc. (pre-certified for FCC)
Customizable Radio Modules

For maximum flexibility, RADIOCRAFTS decided to provide customizable radio modules to their customers.

These enable you to quickly develop and deploy your own custom wireless solution. You benefit from RADIOCRAFTS wireless expertise by using their pre-qualified and pre-assessed hardware. Just like the standard devices, the customizable modules include all components in a complete and tested design. However, you are free to run your own application code and radio protocol stack.

External peripherals can be easily connected using various interfaces such as UART, I2C, SPI or digital and analog I/O. A standard 50 Ohm antenna interface provides easy connection for an antenna.

For wireless connectivity, the customizable module provides industry standard PHY/MAC layers:

- IEEE 802.15.4 is a 2.45 GHz standard also used for protocols like ZigBee or 6LoWPAN
- IEEE 802.15.4g is an amendment for 433, 868 and 915 MHz operation

When development is finished, RADIOCRAFTS can program the modules with your firmware. Using their proven programming and testing processes, high quality and reliability is assured. A unique part number is created for your specific project. To protect your IP, those modules are only sold to authorized customers.

- Complete RF hardware solution supporting industry standard PHY/MAC
- Proven manufacturing and testing with millions of modules shipped
- Pre-certified and pre-assessed to meet regulatory requirements
- Unique part number for each design and fully protected customer IP
- Development tools from Texas Instruments
- Compact SMD module in standard form factor 12.7 × 25.4 × 3.3 mm
- Built in antenna / antenna connector option on the RC2411 series

Module families for customizable hardware platform

- **RC18xx**: 433 – 930 MHz, platform for IEEE 802.15.4g or wireless M-Bus
- **RC2400**: 2450 MHz, platform for IEEE 802.15.4, worldwide use
- **RC2411**: 2450 MHz, platform for IEEE 802.15.4, worldwide use, with chip antenna or U.FL connector on module
Wireless Sensor Modules

Wireless sensor modules simplify and accelerate the system design for an IoT sensor. They combine wireless modem function and configurable sensor interface in one compact module. Basically, only two parts are needed: the module and the sensor. A separate MCU is no longer required.

The Wireless sensor modules are designed for use with a variety of common sensors. Environmental sensors, accelerometers and several others are already supported. The module firmware includes a library of commands for the most common sensors. In addition it can support a customer specific sensor format for others. Various electrical interfaces can be used to connect a sensor, including I2C, SPI, UART, GPIO and ADC. The module will automatically read the sensor values and can do basic signal processing such as filtering. Transmission can be automatic at regular intervals or based on events or trigger values. RADIOCRAFTS sensor modules are available supporting Sigfox (SSM) or wireless M-Bus (MSM) protocol.

► Wireless module with sensor interface
► Easy configuration for different application needs
► Compact solution for IoT sensors
► Wide selection of sensor interfaces available

Module families for Wireless Sensor Modules

► **RC11xx**: 433 / 868 MHz, with wireless M-Bus protocol
► **RC16xx**: 868 / 915 MHz, with Sigfox protocol
► **RC1701**: 169 MHz, with wireless M-Bus protocol
## Product Overview

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● Supported feature
Development Tools

Development kits

► Available for all product and protocol variants
► Include a set of development boards with RADIOCRAFTS module installed
► Antennas, cables and accessories

RADIOCRAFTS RCTools

► Software tool suite for Windows® PCs
► Allows easy configuration and evaluation of RADIOCRAFTS modules

RADIOCRAFTS USB Sticks

► Easy to use for development, prototyping and simple networks
► Complete solution
► Available for different frequencies and protocols

RADIOCRAFTS has also designed USB sticks with their radio modules inside. These provide an easy to use wireless adapter for development, prototyping or simple networks. The USB sticks have a standard USB connector, USB-UART transceiver, a RADIOCRAFTS module and an internal antenna.

<table>
<thead>
<tr>
<th>Product</th>
<th>RF Frequency [MHz]</th>
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<th>Protocol</th>
<th>Market</th>
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<td>TinyMesh</td>
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● Supported feature
Gateway Solutions for Wireless IoT

When you want to connect local wireless devices to “the cloud”, a gateway to the internet is needed. RADIOCRAFTS has designed a series of expansion cards for the SIERRA WIRELESS FX30 Programmable Gateway. This allows quick and easy creation of a gateway device for IoT applications.

SIERRA WIRELESS FX30 Programmable Gateway

The FX30 is the industry’s smallest, most rugged programmable 3G/4G cellular Gateway. It features a dedicated application core with embedded Linux to run customer software.

The FX30 comes with Ethernet or serial interface. It also has an internal “IoT card” slot for custom hardware expansions. This is where the RADIOCRAFTS expansion card is plugged in.

- 3G/4G cellular connectivity
- Dedicated Application core with Legato embedded Linux
- Ethernet or serial RS232/RS485 interface
- Internal IoT card expansion slot

Ready-to-use IoT gateway solution

Creating an IoT gateway for your application has never been easier. No hardware development is needed. Just plug the required RADIOCRAFTS expansion card into the FX30 gateway. You can then create your gateway software running on the embedded Linux core.

This combination of 3G/4G connectivity and RADIOCRAFTS wireless technology provides an easy-to-use and versatile gateway solution for IoT.

- Easy to use gateway solution
- Connect local wireless devices to the cloud services
- IoT Expansion Board for SIERRA WIRELESS FX30 and mangOH board

<table>
<thead>
<tr>
<th>Product</th>
<th>RF</th>
<th>Protocol</th>
<th>Market</th>
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● Available standard product o Available on request
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We will gladly provide you with further products from our manufacturers on request. Please note that in some countries, specific or restrictive agreements have been reached with various manufacturers.

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