Quick Start Guide
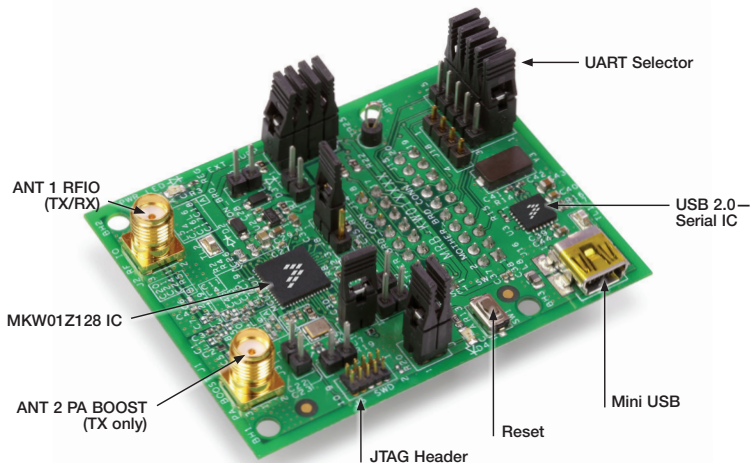
MRB-KW01 Development Platform
Radio Utility Application Demo

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Get to Know the MRB-KW01x Module

ANT 1 RFIO (TX/RX)

UART Selector

USB 2.0 Serial IC

MKW01Z128 IC

ANT 2 PA BOOST (TX only)

JTAG Header

Reset

Mini USB

This document covers the following modules:

- MRB-KW019030JA
- MRB-KW019032EU
- MRB-KW019032NA

MRB-KW01x Features

- 32-bit ARM® Cortex®-M0+ 48 MHz Core

- Programmable 128 KB Flash and 16 KB SRAM

- Programmable output power from −18 dBm to +17 dBm in 1 dB steps

- Two SMA antenna connectors

  o +13 dBm TX/RX or RX port (RFIO antenna)

  o +17 dBm TX-Only (power amplifier drive) output port (PA_BOOST Antenna)

- High sensitivity: down to −120 dBm at 1.2 Kb/s

- Onboard SWD Connector for MCU flash reprogramming and in-circuit hardware debugging

- USB port to interface with PC

- LEDs and switches for demonstration, monitoring and control (when mounted on the optional TWR-RF-MRB. For this configuration, refer to the Appendix section in this Quick Start Guide.)

Step-by-Step Installation Instructions

In this Quick Start Guide, you will learn how to set up the MRB-KW01x module and run the default demonstration. The MRB-KW01x comes programmed with the Radio Utility Application Demonstration that allows the user to test the radio capabilities. This Quick Start Guide will demonstrate how to run Packet Handler.

Note: The radio utility demonstration requires two MRB-KW01x module boards. Boards are certified for conducted measurements with coaxial cable and an attenuator. The graphics in this document show antennas connected to the boards for simplicity. This hardware is certified for conducted measurements only. The user accepts responsibility for standards compliance for radiated measurements with an antenna.

1 Download Software and Tools

Download installation software and documentation under **"Jump Start Your Design"** at **freescale.com/MRB-KW0x**.

Download the appropriate radio utility GUI based on your MRB region. The GUI is programmed to a default operating frequency and modulation. The MRB-KW01 boards are configured for a frequency band and reference oscillator applicable to a specific region.

• MKW01 Radio Utility_JA.exe

• MKW01 Radio Utility_EU.exe

• MKW01 Radio Utility_US.exe

2 Configure the MRB Boards

The MRB-KW01x can operate standalone or be mounted on the TWR-RF-MRB board (for this configuration, refer to Appendix section).

PC-USB to MRB-mini USB connection

J17
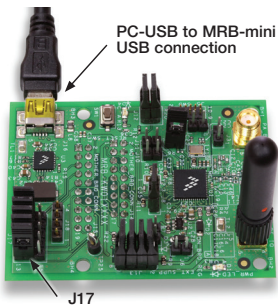
Jumper Settings

The MRB's UART line jumpers must be configured for standalone operation. The MRB comes with this jumper configuration as default, however, verify before powering the board.

To run the board in standalone mode, configure J17 with jumpers: 1–2, 4–5, 7–8, 10–11, 13–14.

Other required jumpers: J3 (optional): 1–2; J7: 1–2; J8 (if not hard wired, install jumper 1-2); J12: 1–2 & 3–4, J13: 1–2, 3–4, 5–6, 7–8.

3 Connect MRB-KW01x to a PC

Connect one of the MRB-KW01x boards to the PC using the mini-USB cable included in the box.

Allow the PC to automatically install the USB drivers if needed. Follow the installation instructions as displayed in the **Found New Hardware** wizard on the PC.

If the drivers do not automatically load, they can be found in the C:\Program Files\Freescale\Drivers directory if they had been previously installed with Freescale's BeeKit or if not, they can be downloaded from freescale.com/USB2SER. Go to the "Software & Tools" tab and download from "Software Development Tools" the corresponding USB2SER drivers.

4 Run the Radio Utility Application

Run the Radio Utility GUI previously downloaded. Wait for the application to appear, now click the **Connect** icon.
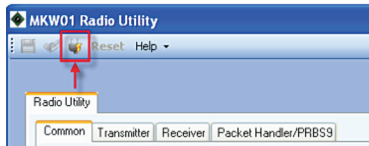
If the connection was successful, a "Connection successful" message appears in the lower left corner of the application.

If the message "Connection could not be established" is displayed, try clicking the **Connect** icon again. If this is not successful: close the application, re-apply power to the board by disconnecting and reconnecting it, now re-open the GUI and try clicking **Connect**.

Note: The Radio Utility GUI automatically detects the COM port to which the board is connected (this port is displayed in the bottom left corner of the application upon a successful connection).

If the application doesn't find a device attached to the port, the message "Connection could not be established" is displayed.

In some cases for some PC operating systems, it may be necessary to click **connect** twice, or to press the **reset** button SW1 on the MRB prior to connecting.

5 Connect the Second MRB-KW01x Board

Repeat steps 3 and 4 for the second MRB-KW01x board. This can be done on the same PC or on a different PC in order to increase the separation distance between the boards. Ensure the USB2SER drivers and Radio Utility GUI are installed on the second PC.
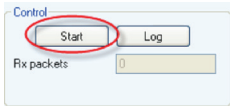
6 Configure the Receiver Board

Click on the **Packet Handler** tab.
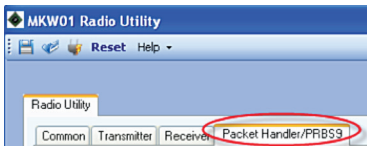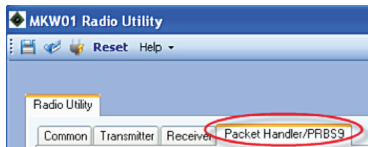
...eiver" button under "Operation Mode."
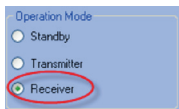
Click the Start button in the control box of the Radio Utility GUI.
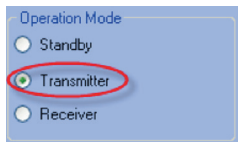

Note: To log the results, click the **Log** button, then click **Browse** and provide a file name and location, click **Save** and then click **Start** to enable logging. After logging is started, you can close the Packet Log dialog box.

7 Configure the Transmitter Board

Click on the **Packet Handler** tab.

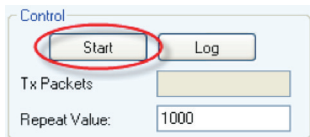Select the "Transmitter" button under "Operation Mode."

Click under the ASCII section in the "Message" box and enter a text value, for example "Hello world."

Note: The message should be at least 4 bytes.

Click the **Start** button in the control box.

Note: This will start transmission of 1000 packets. You can change this default value on the "Repeat Value" field.

8 Complete the Test

The transmitter board will constantly display the number of packets sent in the "TX Packets" field.

The receiver board will show the number of packets successfully received in the "RX Packets" field, as well as the message received in the "Message" section.

When the test is complete (total number of packets sent by the transmitter board), click the **Stop** button on the receiver board.

The received number of packets should be at least 99% of the total number of packets transmitted. (This is at least 990 received packets out of 1000 packets transmitted.)

Note: Optimal transmission and reception will be achieved with antennas connected to J2 of both boards.

View the log file if desired for more details such as packet RSSI and payload text.

9 Radio Utility

For more info on the Radio Utility application example, refer to the Demonstration Application User Guide (MKW01DAUG.pdf).

10 Fine-Tuning the Frequency

Refer to the Appendix section of this Quick Start Guide.

11 Additional Information

For more information on MRB-KW01x hardware and software, refer to the following documents:

- MKW01Z128: MKW01 Data Sheet
- MKW01Z128RM: MKW01 Reference Manual
- KW01DHRM: KW01 Development Hardware Reference Manual
- TWRRFRM: TWR-RF Module Reference Manual

Check freescale.com regularly, as new application notes and other support material will be added from time to time.

Appendix

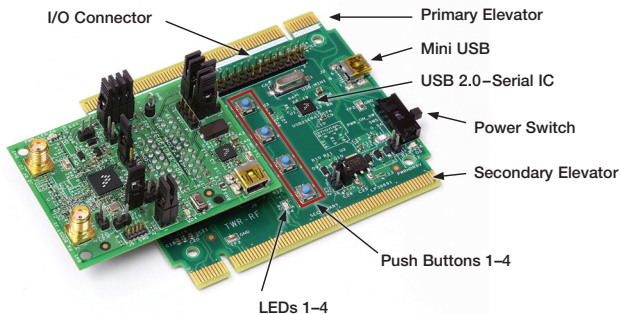## Jumper Settings when Mounting MRB-KW01x on the TWR-RF-MRB

The MRB's UART line jumpers must be re-configured for use on a TWR-RF-MRB.

PC-USB to TWR-RF-MRB
mini USB connection
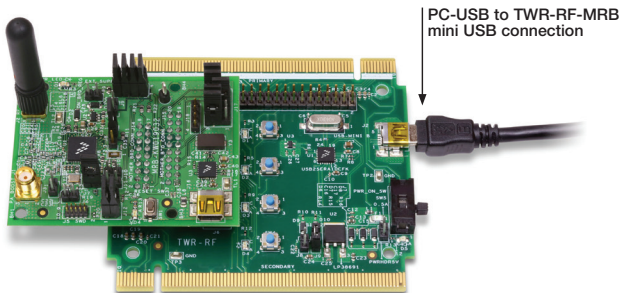
To run the board mounted on TWR-RF-MRB, configure J17 with jumpers: 2–3, 5–6, 7–8–9 (any position), 11–12, 14–15.

Other required jumpers: J3 (optional): 1-2; J7: 1–2; J8 (if not hard wired, install jumper 1-2); J12: 1–2 & 3–4, J13: 1–2, 3–4, 5–6, 7–8.

Mount the MRB on the TWR-RF-MRB such that J4 and J5 of the TWR-RF-MRB mate with J14 and J15 of the MRB as shown in the image below:

- I/O Connector
- Primary Elevator
- Mini USB
- USB 2.0–Serial IC
- Power Switch
- Secondary Elevator
- Push Buttons 1–4
- LEDs 1–4

Connect the TWR-RF-MRB USB connector (J2) to the USB of the PC.

Note: Do not use the USB connector on the MRB.

Fine-Tuning the MRB Frequency

The 32 MHz reference crystal and capacitors on the MRB-KW01x will have some unit-to-unit frequency error within its tolerance. This error will typically be insignificant for wideband modulation, but for narrow-band modulation and receive bandwidths it may help to fine-tune the frequency of each board.

With the "Bit Synchronizer/Data Mode" in ON-Packet Handler, select transmit from the common tab (**not** the Packet Handler tab).

A simple portable frequency counter can be set on the bench next to the MRB-KW01 during transmit with an antenna to pick up the signal, and the RF Frequency tuned until the frequency counter displays the desired frequency, or a spectrum analyzer connected to J2 can be used to observe the signal while adjusting the frequency.
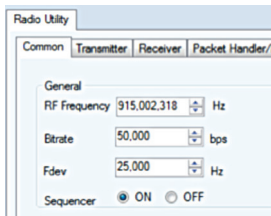
Do this separately to both boards and they will both be on the same correct frequency. (The above image is targeting 915 MHz.)

Support

Visit **freescale.com/support** for a list of phone numbers within your region.

Warranty

Visit **freescale.com/warranty** for complete warranty information.

FCC NOTICE: This kit is designed to allow:
(1) Product developers to evaluate electronic components, circuitry or software associated with the kit to determine whether to incorporate such items in a finished product and
(2) Software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

CE NOTICE: This hardware is certified for conducted measurements only. The user accepts responsibility for standards compliance for radiated measurements with an antenna.

For more information, visit freescale.com/MRB-KW0x or freescale.com/Kinetis/Wseries

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