Digi XBee RR Migration Guide

Zigbee, 802.15.4, DigiMesh

90002536 B

Contents

Introduction

This guide will assist you with migration from the Digi XBee® 3 module to the Digi XBee RR module. While basic functionality and communication are similar and compatible, there are some differences to consider, which we describe in this guide, along with other migration considerations.

MicroPython

The XBee RR RF module does not support MicroPython mode.

Bluetooth

Bluetooth® Low Energy (BLE) is an RF protocol that enables you to connect your XBee device to another device. Both devices must have BLE enabled. For example, you can use your cellphone to connect to your XBee device, and then from your phone, you can configure and program the device.

The XBee RR RF module offers basic BLE support. The XBee RR RF module supports acting as a peripheral device as described in Get started with BLE and BLE reference. BLE on the XBee RR is useful for configuring XBee RR modules remotely via an application. Scanning for and connecting to other peripheral devices is not available (MicroPython needed).

Here's a list of some of the additional things that you can do with Digi XBee RR and BLE:

- Securely configure an XBee RR from a phone or other BLE-capable device.
- Send advertisements from the XBee RR.
- Send custom configuration or data to a host processor using user data relay frames.
- Securely configure one XBee RR from another XBee RR or XBee 3. Note: this requires the use of a host processor.
- Securely send data between XBee RR modems. Note: this requires the use of a host processor.
- Securely bond to the XBee RR GATT server from an external device.

To utilize BLE on the Digi XBee RR, the XBee firmware provides the following mechanisms:

- AT commands (enable, XBee API security configuration, custom advertisement name)
- User data relay frames (BLE to serial)

The following table maps common use cases and the different mechanisms that support them. Note that most of these mechanisms are not mutually exclusive and can be combined to enhance your applications:

Use case	AT commands	Use data relay frames with host processor
AT configuration	✓	✓
XBee RR to XBee RR/XBee 3 configuration		✓
XBee RR to XBee RR/XBee 3 data		✓
Enable/disable	✓	
Scan and send advertisements	✓	
Send custom advertisements	✓ *	

* Customization limited to device name.

File system

The file system works mostly the same on the XBee RR RF module as it does on the XBee 3 except that there is no OTA support — its access is limited to the serial port only. Without MicroPython support, there is currently no use case for the file system on the XBee RR RF module. Almost any other device would be more useful for storing files.

IO and PWM

The DIO10 (PWM0/RSSI indicator) and DIO11 (PWM1) lines are not available on the XBee RR RF module. This means that the P0 and P1 commands are unavailable, as well as any other configuration related to those two lines. Additionally, DIO10 and DIO11 are tied together with a 4.7 kΩ resistor. The internal reference voltage used by the XBee RR RF module is different from that of the XBee 3. This affects the calculation used to determine a voltage from an ADC reading.

Value of AV parameter	XBee RR analog reference	XBee 3 analog reference
0	1.21 V	1.25 V
1	2.42 V	2.5 V
3	VCC	VCC

Compatibility options

The Legacy LQI calculation is now the only option for LQI compatibility. This means that either setting C8 bit 4 or leaving it as default will result in the same behavior. Digi does not recommend setting C8 bit 4, as Digi can't guarantee that the bit won't have a different functionality in the future.

Power consumption

There are variances in the power consumption specifications between the XBee 3 and XBee RR. See the Hardware specifications table for details.

OTA updates

XBee RR firmware images are not compatible with XBee 3 firmware images, and vice-versa. OTA update servers should make sure to use the correct image for the radio they are updating, or the image will be rejected.

An OTA image can be identified by the Image Type field in the OTA file header. The value should be sent by the server in the Image Notify command, and must match the value reported by the target device in the Query Next Image Request (see Create an OTA update server). The image type values for XBee RR and XBee 3 are:

Type	Value
XBee 3	0x0000
XBee RR	0x0001

Configuration

Using Digi® XCTU, you can load the appropriate firmware to fit your current needs within the regulatory guidance of the region of deployment. See the following user guides for more information:

- XBee RR Zigbee User Guide
- XBee RR DigiMesh® 2.4 User Guide
- XBee RR 802.15.4 User Guide

The ZigBee, DigiMesh®, and 802.15.4 protocols all run on the same XBee RR hardware and can be flashed on the modules as needed.

Boot time

The boot time of the XBee RR module may be different than the XBee 3 module. Boot times are subject to change between firmware loads and are not guaranteed. Applications should make the necessary checks of Clear to Send (CTS) or other pin signals to determine the readiness of the module.

Hardware specifications

See the XBee RR RF Module Hardware Reference Manual for more detail.

Low-power (non-PRO) variant

Considerations	XBee 3	XBee RR	Comments
Indoor/urban range	Up to 60 m (200 ft)	Up to 60 m (200 ft)	Same
Outdoor RF line-of sight	Up to 1200 m (4000 ft)	Up to 1200 m (4000 ft)	Same
Transmit power output	6.3 mW (+8 dBm)	6.3 mW (+8 dBm) Channel 26 max power is +3 dBm	Similar
Receive sensitivity	-103 dBm	-103 dBm	Same
Operating current (transmit)	40 mA @ +3.3 V, + 8 dBm	32 mA at 3.3 V, +8 dBm	Improved
Operating current (receive)	17 mA	14 mA	Improved
Sleep current	2 uA	8 uA	Increased
Supply voltage	2.1 – 3.6 V	1.71 - 3.8 V	Improved
GPIO		DIO 10 and 11 are not supported	Decreased
FCC ID	MCQ-XBEE3	MCQ-XBRR	You will need to change the label on the end product to show the appropriate regulatory ID
Industry Canada (IC) ID	1846A-XBEE3	1846A-XBRR	

High-power (PRO) variant

Considerations	XBee 3 PRO	Digi XBee Pro RR	Comments
Indoor/urban range	Up to 90 m (300 ft)	Up to 90 m (300 ft)	Same
Outdoor RF line-of sight	Up to 3200 m (2 mi)	Up to 3200 m (2 mi)	Same
Transmit power output	79 mW (+19 dBm) Channel 26 max power is +8 dBm	79 mW (+19 dBm) Channel 26 max power is +3 dBm	Similar
Receive sensitivity	-103 dBm	-103 dBm	Same
Operating current (transmit)	135 mA @ +3.3 V, +19 dBm	193 mA @ 3.3 V, +19 dBm	Increased
Operating current (receive)	17 mA	14 mA	Improved
Sleep current	2 uA	8 uA	Increased
Supply voltage	2.1 - 3.6 V	1.71 - 3.8 V	Larger voltage range
GPIO		DIO 10 and 11 are not supported	Decreased
FCC ID	MCQ-XBEE3	MCQ-XBPRR	You will need to change the label on the end product to show the appropriate regulatory ID
Industry Canada (IC) ID	1846A-XBEE3	1846A-XBPRR	

XBee RR part number migration

The following table shows which Digi XBee RR module to migrate to depending on which XBee 3/ XBee 3-PRO module you are currently using.

For the latest list of available XBee RR modules, see below:

Part number migration

Current part number	Description	Migrate to
XB3-24ACM	XBee RR PRO, 2.4 GHz, 802.15.4, Chip Ant, MMT	XBRR-24ACM
XB3-24ACM-J	XBee RR, 2.4 GHz, 802.15.4, Chip Ant, MMT	XBRR-24ACM-J
XB3-24DMUM	XBee RR PRO, 2.4 GHz, DigiMesh, U.FL Ant, MMT	XBRR-24DMUM
XB3-24DMRM	XBee RR PRO, 2.4 GHz, DigiMesh, RF Pad Ant, MMT	XBRR-24DMRM
XB3-24Z8CM	XBee RR PRO, 2.4 GHz, Zigbee, Chip Ant, MMT	XBRR-24Z8CM
XB3-24Z8CM-J	XBee RR, 2.4 GHz, Zigbee, Chip Ant, MMT	XBRR-24Z8CM-J
XB3-24Z8PS	XBee RR PRO, 2.4 GHz, Zigbee, PCB Ant, SMT	XBRR-24Z8PS
XB3-24Z8PS-J	XBee RR, 2.4 GHz, Zigbee, PCB Ant, SMT	XBRR-24Z8PS-J
XB3-24Z8PT	XBee RR PRO, 2.4 GHz, Zigbee, PCB Ant,	XBRR-24Z8PT
XB3-24Z8PT-J	XBee RR, 2.4 GHz, Zigbee, PCB Ant,	XBRR-24Z8PT-J
XB3-24Z8RM	XBee RR PRO, 2.4 GHz, Zigbee, RF Pad Ant, MMT	XBRR-24Z8RM
XB3-24Z8RM-J	XBee RR, 2.4 GHz, Zigbee, RF Pad Ant, MMT	XBRR-24Z8RM-J
XB3-24Z8RM-R15	XBee RR PRO, 2.4 GHz, Zigbee, RF Pad Ant, MMT, T&R on 15" reel	XBRR-24Z8RM-R15
XB3-24Z8ST	XBee RR PRO, 2.4 GHz, Zigbee, SMA Ant, Through-hole	XBRR-24Z8ST
XB3-24Z8ST-J	XBee RR, 2.4 GHz, Zigbee, SMA Ant, Through-hole	XBRR-24Z8ST-J
XB3-24Z8UM	XBee RR PRO, 2.4 GHz, Zigbee, U.FL Ant, MMT	XBRR-24Z8UM
XB3-24Z8UM-J	XBee RR, 2.4 GHz, Zigbee, U.FL Ant, MMT	XBRR-24Z8UM-J
XB3-24Z8US	XBee RR PRO, 2.4 GHz, Zigbee, U.FL Ant, SMT	XBRR-24Z8US
XB3-24Z8US-J	XBee RR, 2.4 GHz, Zigbee, U.FL Ant, SMT	XBRR-24Z8US-J
XB3-24Z8UT	XBee RR PRO, 2.4 GHz, Zigbee, U.FL Ant, Through-hole	XBRR-24Z8UT
XB3-24Z8UT-J	XBee RR, 2.4 GHz, Zigbee, U.FL Ant, Through-hole	XBRR-24Z8UT-J