

Theory of Operation

The Radio Module consists of two subsections – an RF Processor and an RF Transceiver. See the Block Diagram on page 2.

RF Processor

The onboard RF Processor is responsible for communicating with the host device that it is plugged into, controlling the RF Transceiver, and controlling the LEDs. The RF Processor communicates with the host device using a UART running at 38.4 kbaud. The host device can set the Radio Module up to be an IEEE 802.15.4 PAN coordinator, send or receive IPv6 application packets, etc.

The RF Processor communicates with the RF Transceiver using a Serial Peripheral Interface (SPI) connection. The RF Processor controls the channel used by the RF Transceiver, the transmit power of the RF Transceiver and the maximum duty cycle of data sent over the RF link.

The RF Processor also controls the LEDs. At this time, only one of the two LEDs is used. If the radio is functioning as a PAN coordinator, the LED will blink fast until the radio establishes a Network (selects a unique channel and PAN ID). It will then blink once per second. If the radio is not a PAN coordinator, the LED will blink fast until it associates with a Network. It will then blink once every three seconds. These flashing patterns may be briefly interrupted when the radios are handling message traffic.

RF Transceiver

The transmitter portion of the RF Transceiver takes serial data and wraps it in a Header and a Frame Check Sequence. It then spreads the data and upconverts it to the transmit frequency using the Phase Shift Modulator and a signal generated by the on-chip Synthesizer. Finally the RF Transceiver sends the signal to a Power Amplifier whose output level is regulated by an on-chip Analog Regulator. In order to limit out-of-band emissions, the RF Processor only allows the Transmitter to operate on channels 11-25 as defined by the 802.15.4 specification.

<Operating Frequency List>

Frequency	Channel	Frequency	Channel	Frequency	Channel
2405 MHz	1	2430 MHz	6	2455 MHz	11
2410 MHz	2	2435 MHz	7	2460 MHz	12
2415 MHz	3	2440 MHz	8	2465 MHz	13
2420 MHz	4	2445 MHz	9	2470 MHz	14
2425 MHz	5	2450 MHz	10	2475 MHz	15