RN-174 WiFly Super Module

Features

- Evaluation board for the RN-171 module
- Supports chip antenna (RN-174-C), PCB trace antenna (RN-174-P), wire antenna (RN-174-W), and U.FL connector for an external antenna (RN-174-U)
- Ultra-low power: 4-uA sleep, 30-mA Rx, 180-mA Tx at 10 dBm
- Configurable transmit power: 0 to +12 dBm
- RS-232 and TTL UART hardware interfaces
- Up to 1 Mbps data rate over UART
- Through-hole board simplifies system integration
- Powered by 3.3 to 16-V DC (input voltage can go down to 2 V DC when using boost regulator)
- Jumpers for setting ad hoc mode and enabling the battery boost circuit
- 10 general-purpose digital I/O pins
- 8 analog sensor interfaces; configurable sensor power outputs 0 to 3.3-V DC
- Real-time clock for wakeup and time stamping
- Complete TCP/IP networking stack
- Wi-Fi Alliance certified for WPA2-PSK
- FCC / CE/ ICS certified and RoHS compliant

Applications

- Wireless serial connections
- Remote sensors
- Telemetry
- Security
- Industrial sensors and controls
- Home automation

Description

The RN-174 evaluation board is a field-ready, Wi-Fi Alliance certified, 802.11 b/g prototyping platform for the RN-171 module. The board has the flexibility to connect directly to embedded processors via a standard RS-232 interface or through the TTL UART interface. The RN-174 contains a battery boost circuit, which makes it possible to power the board using two AA batteries (the input voltage can go down to down to 2.0 V DC when using the battery boost circuit). The battery boost circuit makes the RN-174 perfect for battery-powered applications such as sensors, data acquisition systems, controllers, etc. The status LEDs and jumpers enable rapid prototyping and integration into existing systems.

The RN-174 is based on the Roving Networks RN-171 module. The RN-171 module incorporates a 2.4-GHz radio, processor, full TCP/IP stack, real-time clock, and supports the FTP, DHCP, DNS, and HTML client protocols. The RN-171 is the smallest, lowest power 802.11 b/g module available. The module supports ad hoc and infrastructure networking modes.

The analog sensor interface provides direct connections to send temperature, acceleration, and other analog data without requiring an external microprocessor. The RN-171 module is programmed and controlled with a simple ASCII command language. Once the configuration is set up, the module can automatically scan to find an access point, associate, authenticate, and connect over any Wi-Fi network. Additionally, the module can automatically send data to a remote host and go back to a low-power sleep state once the data transmission completes.

OVERVIEW

- Host data rates up to 921 Kbps TX, 500 Kbps RX for UART
- Intelligent, built-in power management with programmable wake-up events (timers and I/O)
- Real-time clock for time stamping, auto-sleep, and auto-wakeup modes
- Configuration over Wi-Fi or UART using simple ASCII commands
- Over the air firmware upgrade via FTP
- Secure Wi-Fi authentication: WEP-128, WPA-PSK (TKIP), and WPA2-PSK (AES)
- Built-in networking applications: DHCP, DNS, ARP, ICMP UDP, Telnet, FTP, and HTML client
- 802.11 b/g power save and roaming functions
- Supports WPS push-button mode for easy network configuration

The evaluation board's size and weight are:

- *Size*—2" x 1.1" x 0.45"
- *Weight*—0.35 oz

Tables 1 through 5 provide detailed specifications for the evaluation board.

Table 1. Environmental Conditions

Parameter	Value
Temperature range (operating)	-45°C ~ 85°C
Temperature range (storage)	-45°C ~ 85°C
Relative humidity (operating)	≤90%
Relative humidity (storage)	≤90%

Table 2. Electrical Characteristics

Supply Voltage, *Note (1)*	Min	Typ.	Max.	Unit
Power connector (J7)	2.0 *(1)*	3.3	16 *(1)*	V
UART interface (J8)	3.0	3.3	3.6	V
RS-232 interface (J3)	5.0		16	V
Power consumption				
Sleep		4		uA
Standby (doze)	-	15	-	mA
Connected (idle, RX)		40		mA
Connected (TX)		180 at 10 dBm		mA

Notes:

1. Supply voltage range varies depending upon the header used. See "Design Concerns" on page 6 for more details.

Table 3. Analog Sensor Inputs

Parameter	Value
Sensor 0, 1, 2, and 3 wake-up detection threshold	500 mV
AD sensor 0 - 7 measurement range	0 - 400 mV
Precision	14 bits = 12 uV
Accuracy	5% uncalibrated, .01% calibrated
Minimum conversion time	35 uS (5 kHz over Wi-Fi)
Sensor power (pin 33) output resistance 3.3 V	10 ohms, maximim current = 50 mA

Table 4. Radio Characteristics

Parameter	Specifications
Frequency	2,402 ~ 2,480 MHz
Modulation	802.11b compatibility: DSSS (CCK-11, CCK-5.5, DQPSK-2, and DBPSK-1) 802.11g: OFDM (default)
Channel intervals	5 MHz
Channels	1 - 14
Transmission rate (over the air)	1 – 11 Mbps for 802.11b / 6 – 54 Mbps for 802.11g
Receive sensitivity	-83 dBm typical
Output level (Class1)	0 to +12 dBm (software configurable)

Table 5. Transmit Power

Output Power	802.11 b (2 Mbps) Current in mA *Note (1)*	802.11 g (24 Mbps) Current in mA *Note (1)*
0	120	135
2	130	150
4	170	190
6	175	200
8	180	210
10	185	225
12	190	240

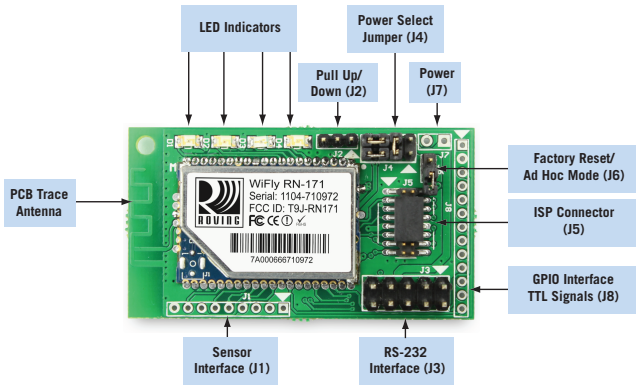
Notes:

1. Measured at 3.3-V DC input. The power consumption is the average power, active during actual power consumption.

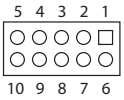
BOARD DESCRIPTION

Figure 1 describes the evaluation board's connectors and interfaces. Table 6 describes the LED indicators.

Figure 1. RN-174 Evaluation Board (Part 1 of 2)



RS-232 Interface (J3)

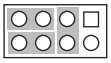


RX - input to evaluation board
TX - output from evaluation board

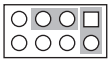
Pin	Description
1	No connect
2	RS-232 TX
3	RS-232 RX
4	No connect
5	GND
6	No connect
7	RS-232 RTS
8	RS-232 CTS
9	4 to 16 VDC input
10	No connect

Power Select Jumper (J4)

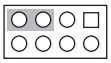
High-Voltage Mode (Default). The board is powered by a source up to 16 V DC.



Low-Voltage Mode. The board is powered by 2.0- to 3.3-V DC only.



External Power Mode. Used when powering the board with regulated 3.3-V DC power.

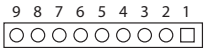


GPIO Interface TTL Signals (J8)

RX - input to evaluation board
TX - output from evaluation board

Pin	Description
1	3.3 VDD
2	GND
3	UART RX
4	UART TX
5	GPIO4
6	GPIO5
7	GPIO6
8	GPIO7
9	GPIO8
10	GPIO9
11	UART CTS
12	UART RTS
13	RESET

Sensors (J1)



Pin	Description
1	Sensor PWR
2	Sensor 4 (3.3-V tolerant)
3	Sensor 5 (3.3-V tolerant)
4	Sensor 7 (1.2 V only)
5	Sensor 5 (1.2 V only)
6	Sensor 4 (1.2 V only)
7	Sensor 6 (1.2 V only)
8	Sensor 3 (1.2 V only)
9	GND

WARNING: Voltage on pins marked *1.2 V Only* should not exceed 1.2 V or permanent damage will occur.

Power (J7)

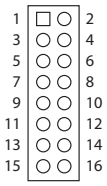
Pin	Description
1	5 to 12 VDC
2	GND

Pull Up/Down (J2)

Ad Hoc Mode/Factory Reset (J6)

Figure 2. RN-174 Evaluation Board (Part 2 of 2)

ISP Connector (J5)



Pin	Description
1	GND
2	3.3 VDD
3	DMA UART TX
4	UART RX
5	FORCE AWAKE
6	RESET
7	DMA UART RX
8	UART TX
9	3.3 VDD
10	GND
11	GPIO9
12	GPIO4
13	GPIO5
14	GPIO6
15	GPIO8
16	Not Used

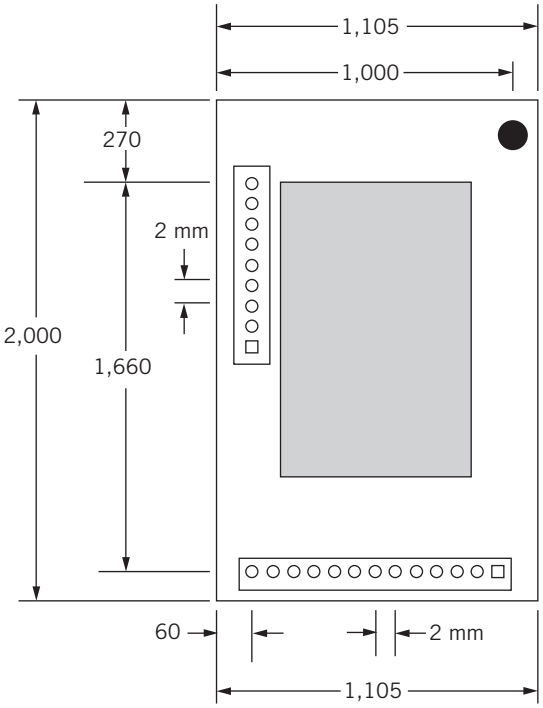
Table 6. RN-174 Evaluation Board LED Indicators

Condition	Blue LED	Red LED	Yellow LED	Green LED
On solid	Not used	-	-	Connected over TCP
Fast blink	Not used	Not associated	Rx/Tx data transfer	No IP address
Slow blink	Not used	Associated, no Internet	-	IP address OK
Off	Not used	Associated, Internet OK	-	-

PHYSICAL DIMENSIONS

Figure 2 shows the evaluation board's physical dimensions.

Figure 2. RN-174 Physical Dimensions



All Dimensions Are in Mils, Unless Otherwise Specified

DESIGN CONCERNS

This section provides design information, such as powering the evaluation board, sensor interface settings, ad hoc mode, and restoring factory settings.

Powering the Module

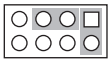
You can power the RN-174 evaluation board from the RS-232 header, the UART interface, or the power connector. You should only provide power on one of the three power connectors.

Figure 3 shows the jumper settings for the different power modes.

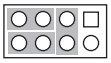
- If powered from the RS-232 header (J3), apply 5 to 16 V DC power on pin 9 and ground to pin 5 of the RS-232 header.
- If powered from the UART header (J8), apply 3.3 V DC power on pin 1 and ground on pin 2 of the UART interface.
- If powered from the power connector (J7), apply 4 to 16 V DC power, depending upon the jumper configuration of the power select jumpers (J4).

Figure 3. Jumper Settings for Powering the Evaluation Board

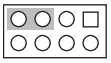
Low-Voltage Mode



High-Voltage Mode (Default)



External Power Mode



- *Low-Voltage Mode (Battery Boost Enabled)*—When the board is configured in low-voltage mode, it MUST be powered by 2.0 - 3.3 V DC power ONLY on the power connector (J7) or on the RS-232 header (J3). In low-power mode, the battery boost circuit is enabled, which allows the input voltage to drop down to 2.0 V DC.

  NOTE: Applying a voltage greater than 3.7 V DC when the board is configured in low-voltage mode will permanently damage the RN-171 module on the board, causing it to malfunction.

- *High-Voltage Mode (Battery Boost Disabled)*—Default. When shipped, the board is set up to use this mode. When configured in high-voltage mode (4-16V DC), you must apply power on the power connector (J7) or on the RS-232 header (J3). The battery boost circuit is disabled in this mode.

- *External Power Mode*—This mode is used when powering the module from a regulated 3.3-V power supply to the UART header (J8) or if you are using the RN-G2ISP to power the module. In this mode, the module cannot be powered from the RS-232 header (J8) or the power connector (J7).

Configuring the Module for Low-Current Consumption

The RN-171 module draws only 4 uA when it is in a sleep state. To achieve this low current consumption:

- GPIO pins 4, 5, 6, 7, and 8 must be pulled to ground using the pull up/down jumper (J2).
- You should remove the RS-232 chip from the board or pull RTS and CTS to GND on the UART header (J8) (optional).

NOTE: If the RS-232 chip is installed, the current consumption will be around 88 uA when the 10-pin serial cable is disconnected and 160 uA when the cable is connected to the RS-232 device.

Sensor Interfaces

The sensor inputs must not exceed 1.2 V. The ADC saturates at 400 mV. Roving Networks recommends that you use the sensor power output to drive any analog devices that are attached to the sensor pins.

NOTE: Sensor pins 2 and 3 have a resistor network in front of sensors 4 and 5, respectively, so these pins can be driven with up to 5 V DC.

Ad Hoc & Restoring Factory Settings

Jumper J6 on the jumper header is connected to GPIO9. When this jumper is in place, the module powers up in ad hoc mode. If the jumper is then toggled 5 times, the module is restored to the initial factory default configuration. This setting is useful for cases in which the module is misconfigured and is no longer responding.

ORDERING INFORMATION

Table 7 provides ordering information for the RN-174 evaluation board.

Table 7. Ordering Information

Part Number	Description
RN-174-P	RN-174 board with PCB trace antenna, standard firmware
RN-174-W	RN-174 board with wire antenna, standard firmware, *Note (1)*
RN-174-U	RN-174 board with U.FL. connector, standard firmware, *Note (1)*
RN-174-C	RN-174 board with chip antenna, standard firmware, *Note (1)*
RN-174-K	Development Kit (Includes the RN-174 board and accessory cables)
RN-UFL-SMA6	6 inch cable with U.FL connector on one end and SMA on the other
RN-SMA4-RP	4" external antenna with reverse polarity SMA connector. Used with RN-UFL-SMA6
For other configurations, contact Roving Networks directly.	

Notes:

1. For these non-standard configurations, please contact Roving Networks directly at info@rovingnetworks.com.

Visit http://www.rovingnetworks.com for current pricing and a list of distributors carrying our products.

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