

RN-171-XV 802.11 b/g Wireless LAN Module

Features

- Drop-in Wi-Fi solution for existing systems that currently use 802.15.4 modules
- Based on Roving Networks' robust RN-171 Wi-Fi module
- Based on a pseudo-standard footprint
- On-board TCP/IP stack provides Internet access to every node
- No custom profiles needed
- Ultra-low power: 4-uA sleep, 40-mA Rx, 180-mA Tx at 10 dBm
- Configurable transmit power: 0 to +12 dBm
- Hardware interface: TTL UART
- Data rate: 464 Kbps using hardware flow control
- Through-hole board simplifies system integration
- 8 general purpose digital I/O pins
- 3 analog sensor interfaces
- Real-time clock for wakeup and time stamping
- Complete TCP/IP networking stack
- Wi-Fi Alliance certified for WEP, WPA, and WPA2-PSK
- WPS mode for easy configuration
- FCC/CE/ICS certified and RoHS compliant

Applications

- Industrial metering
- HVAC control
- Room temperature sensors
- Pump configuration and control
- Telemetry
- PV/solar controllers
- Robotics



Description

The RN-171-XV is a 802.11 b/g solution especially designed for designers who want to migrate their existing 802.15.4 architecture to a more standard TCP/IP-based platform without redesigning their existing hardware.

Based on a pseudo standard footprint often found in embedded applications, the Roving Networks' RN-171-XV module provides Wi-Fi connectivity using 802.11 b/g standards in legacy and existing designs that may have been based upon the 802.15.4 standard.

The RN-171-XV module is based on Roving Networks' robust RN-171 Wi-Fi module and incorporates an 802.11 b/g radio, a 32-bit SPARC processor, a TCP/IP stack, a real-time clock, a crypto accelerator, power management unit, and an analog sensor interface.

The module offers additional functionality through its on-board programmable GPIO pins (10) and ADCs (8). The ADCs provide 14-bit resolution while the GPIOs can be configured to provide standard functionality or status signaling to a host microcontroller, reducing the need for serial polling between the Wi-Fi module and host microcontroller.

The module is pre-loaded with firmware to simplify integration and minimize applications development time. In the simplest configuration, the hardware only requires four connections (PWR, TX, RX, and GND) to create a wireless data connection.

OVERVIEW

- Host data rates up to 460 Kbps over the UART
- Intelligent built-in power management with programmable wakeup 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
- Supports over the air firmware upgrade via FTP
- Secure Wi-Fi authentication via WEP, WPA-PSK (TKIP), and WPA2-PSK
- Built-in networking applications: DHCP, DNS, ARP, ICMP UDP, Telnet, FTP client, and HTML client
- Configurable transmit power of 0 to 12 dBm
- WPS mode for easy and secure wireless setup
- Built-in HTML web client to send GPIO, UART, and sensor data to remote web servers

The module's size is:

- *Size*—0.96" x 1.15"
- *Weight*—5.5 g

Tables 1 through 5 provide detailed specifications for the module.

Table 1. Environmental Conditions

Parameter	RN-171-XV
Temperature Range (Operating)	-40 °C ~ +85 °C
Temperature Range (Storage)	-40 °C ~ +85 °C
Relative Humidity (Operating)	≤90%
Relative Humidity (Storage)	≤90%

Table 2. Electrical Characteristics

Supply Voltage	Min	Typ.	Max.	Units
Input Power	3.0	3.3	3.7	V
Power Consumption				
Sleep		4		uA
Standby (doze)		15		mA
Connected (idle, RX)		40		mA
Connected (TX)		180 at 10 dBm		mA

Table 3. Analog Sensor Inputs

Parameter	Value
Sensor 0, 1, 2, 3 wakeup detect threshold	500 mV
A/D sensor 0 - 4 measurement range	0 - 400 mV
Precision	14 bits = 12 uV
Accuracy	5% un-calibrated, .01% calibrated
Minimum conversion time	35 uS (5 kHz over Wi-Fi)
Sensor power (pin 33) output resistance 3.3 V	10 ohms, maximum 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 (Class 1)	0 to +12 dBm (software configurable)

Table 5. Transmit Power

Output Power	802.11b (2 Mbps) Current in mA Note (1)	802.11g (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

Note:

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

Table 6 describes the LED indicators.

Table 6. RN-171-XV Evaluation Board LED Indicators

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

TYPICAL APPLICATION SCHEMATIC

Figure 1 shows a typical application schematic. RN-171-XV connector pins 13, 15, 18, and 19 can be configured as GPIO pins or sensor inputs, depending on the installed resistors. When configured as GPIO pins, you should ONLY install column 1 resistors. When configured as sensor inputs, ONLY stuff column 2 and column 3 resistors. The default configuration is:

- *Sensor inputs*—Pins 19 and 20
- *GPIO*—Pins 13, 15, and 18

The diagram illustrates the internal architecture of the RN171M0D module, which is based on the RN171M0D IC. The module is powered by a 3V3 supply (VDD_3V3) and includes a 1.8V supply (VDD_1V8) for the logic core. The IC is connected to a WIRE ANTENNA via SMA connectors (J4, J1) and a UFL connector. The module also features a 3V3 REG_CTRL pin connected to a 3V3 supply. The IC pins are connected to various external components, including resistors (R1-R22) and capacitors (C1-C4). The module is connected to a host system via a 40-pin connector (M1) and a 40-pin connector (M2). The host system provides signals for TXD, RXD, GPIO 8, RESET_N, GPIO 7, GPIO 9, and GPIO1. The module also includes a 3V3 supply (VDD_3V3) and a 1.8V supply (VDD_1V8) for the logic core.

Internal Components and Connections:

- IC Pins:** 1-47 (Left), 1-20 (Right).
- Power:** VDD_3V3, VDD_1V8, 3V3 REG_CTRL.
- Antenna:** WIRE ANTENNA, SMA connectors (J4, J1), UFL connector.
- GPIOs:** GPIO1, GPIO2, GPIO3, GPIO4, GPIO5, GPIO6, GPIO7, GPIO8, GPIO9.
- Other Signals:** CTS, RXD, SEN2, SEN3, SEN4, SEN5, SEN6, SEN7, TXD, RESET_N, GPIO 8, GPIO 7, GPIO 9, GPIO1.

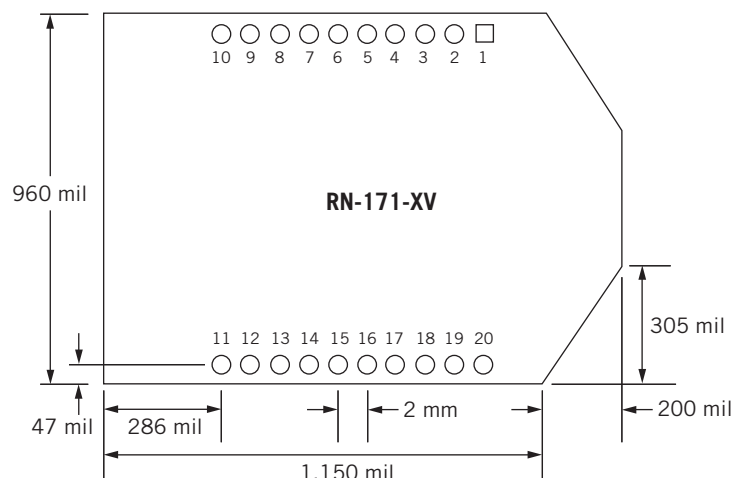
External Circuitry:

- Resistors:** R1 (470k), R2 (100k), R3 (470k), R4 (100k), R6 (470k), R7 (100k), R8 (0R), R9 (470k), R10 (100k), R11 (0R), R12 (470k), R13 (100k), R15 (470k), R16 (100k), R17 (0R), R18 (470k), R19 (100k), R20 (0R), R21 (470k), R22 (100k).
- Capacitors:** C1 (100nF), C2 (100nF), C3 (100nF), C4 (100nF).

Host System Connections:

- TXD:** Connected to TXD pin (45).
- RXD:** Connected to RXD pin (44).
- GPIO 8:** Connected to GPIO_8 pin (7).
- RESET_N:** Connected to RESET_N pin (40).
- GPIO 7:** Connected to GPIO_7 pin (6).
- GPIO 9:** Connected to GPIO_9 pin (8).
- GPIO1:** Connected to GPIO1 pin (13).

Figure 2 shows the pin pads and dimensions. Table 7 describes the pins.

Figure 2. Pin Pads & Dimensions


1 mil = 0.0254 mm

Table 7. Pin Description

Pad Number	Signal Name	Description	Optional Function	Direction
1	VDD_3V3	3.3-V regulated power input to the module.		Power
2	UART_TX	UART TX, 8-mA drive, 3.3-V tolerant.		OUT →
3	UART_RX	UART RX, 3.3-V tolerant.		IN ←
4	GPIO8	GPIO, 24-mA drive, 3.3-V tolerant. The RN-171-XV drives GPIO8 HIGH on powerup, which overrides software configured powerup values, such as set sys value 0x0000 on GPIO8.		I/O
5	RESET	<i>Optional</i> module reset signal (active low), 100-k pull up, apply pulse of at least 160 us, 3.3-V tolerant.		Input
6	GPIO5	GPIO, 24-mA drive, 3.3-V tolerant.	Data TX/RX	OUT →
7	GPIO7	GPIO, 24-mA drive, 3.3-V tolerant.		I/O
8	GPIO9	Enable ad-hoc mode, restore factory defaults, 8 mA drive, 3.3-V tolerant.		I/O
9	GPIO1	GPIO, 8-mA drive, 3.3-V tolerant.		I/O
10	GND	Ground.		Ground
11	GPIO14	GPIO, 8-mA drive, 3.3-V tolerant.		I/O
12	UART_RTS	UART RTS flow control, 8-mA drive, 3.3-V tolerant.		OUT →
13	GPIO4/sensor 6	GPIO, 24-mA drive, 3.3-V tolerant/ADC input, (3.3-V tolerant) . Defaults to GPIO4. <i>Note (1)</i>		I/O
14	Not Used			No Connect
15	GPIO6/ sensor 7	GPIO, 24-mA drive, 3.3-V tolerant/ADC input, (3.3-V tolerant) . Defaults to GPIO6. <i>Note (1)</i>		Power
16	UART_CTS	UART CTS flow control, 3.3-V tolerant.		IN ←
17	Sensor 5	Sensor interface, analog input to module, (3.3-V tolerant) .		Input
18	GPIO3/ sensor 4	GPIO, 8-mA drive, 3.3-V tolerant/ADC input (3.3-V tolerant) . Defaults to GPIO3.		I/O
19	GPIO2/ sensor 3	GPIO, 8-mA drive, 3.3-V tolerant/ADC input (3.3-V tolerant) . Defaults to sensor 3.		I/O
20	Sensor 2	Sensor interface, analog input to module, 3.3-V tolerant .		Input

Note:

- For information on alternate I/O functions, refer to the WiFly advanced user manual.

DESIGN CONCERNS

The following sections provide information on designing with the RN-171-XV module.

Powering the Module

Apply ONLY 3.3 V $\pm$ 10% regulated power to pin 1 (VDD) and pin 10 (ground). The module does not have an on-board voltage regulator and MUST be powered from a regulated 3.3-V power supply.

Antenna

The RN-171-XV ships with a wire antenna. Custom antenna configurations such as chip, U.FL., and reverse polarity SMA connectors are available with extended lead times.

ORDERING INFORMATION

Table 7 provides ordering information. Table 8 provides information on related products.

Table 7. Ordering Information

Part Number	Description
RN-171-XV-W	Standard configuration, industrial temperature (-40 °C to +85 °C) 802.15.4 replacement solution with ¼ inch wire antenna.
RN-171-XV-U	Custom configuration, industrial temperature (-40 °C to +85 °C) 802.15.4 replacement solution with U.FL. connector.
RN-171-XV-S	Custom configuration, industrial temperature (-40 °C to +85 °C) 802.15.4 replacement solution with a reverse polarity SMA connector.

Table 8. Related Products

Part Number	Description
RN-XV-RD2	Two-relay evaluation board for the RN-171-XV.
RN-XV-RD1	One-relay evaluation board for the RN-171-XV.

Go to <http://www.rovingnetworks.com> for current pricing and a list of distributors carrying Roving Networks products.

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