WN4401C 1-ZZ

IEEE 802.11b/g single chip miniPCI

V 0.1

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Subject to Change without Notices

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Revision History

Edition #		*Reason for revision*	*Issue date*	*Written by*
V 0.1	♦	Initial Document	Sep. 23, 2004	Jason Lee
	♦			

Chapter 1 Introduction

1. Introduction

WN4401C is an industrial miniPCI Card which enables wireless networking systems to attain data transmission speeds at least up to 54 megabits-per-second (Mbps), while remaining backward compatible to the existing installed base of over 15 million Wi-Fi systems worldwide. It supports operation to both the IEEE 802.11b and IEEE 802.11g standards. WN4401C will enable a next generation of high-data-rate platforms for operation in the 2.4 GHz band that deliver a five-fold speed increase. It is fully IEEE 802.11g standard compliant, and uses prioritization algorithms and enhanced protection mechanisms to significantly increase pure 802.11g as well as mixed-mode network performance. The cost and performance advantages will make it an ideal solution for high bandwidth enterprise applications, such as wireless video conferencing and large file transfers, as well as advanced home networking applications such as multi-channel CD-quality audio and DVD-quality video streaming. WN4401C incorporates the 802.11g Standard's mandatory modulation schemes—Complementary Code Keying (CCK), which is used in 802.11b, and Orthogonal Frequency Division Multiplexing (OFDM), used in 802.11g. Using CCK ensures backward-compatibility with the installed Wi-Fi 802.11b base, while OFDM provides the speed required for today's high-bandwidth applications.

1.1 Product Features

- High speed for wireless LAN connection, up to 54 Mbps data rate.
- **Extended Range feature supported**
- Backward compatible to the existing IEEE 802.11b WLAN infrastructure.
- An user-friendly utility to configure SSID, security setup and site survey.
- Wireless data encryption using WEP 64, 128-bit encryption for security.
- Support for WPA and Wi-Fi, WPA2 upgradeable
- Built-in Hirose antenna connectors.
- Firmware upgrade-able by only changing driver.

1.2 Applications

- Home networking for device sharing.
- Wireless multimedia.
- Wireless office for extension Ethernet range.
- Mobile networking for notebook PC, PDA, Web Pad or Wireless Gateway Built-in Application.

Chapter 2 Hardware

2.1 General Overview

- Power: 3.3V, DC input.
- Antenna connector: Two Hirose, FL-R-SMT (01) coaxial connectors.

2.2 Hardware Architecture

2.3 Main Chipset Information

2.3.1 **AR2413:** An IEEE 802.11g MAC + Baseband processor, AES Hardware accelerator, on-chip SRAM memory and MiniPCI/PCI bus interface. Radio-on-Chip (RoC). A zero-IF direct down conversion transceiver. a 2.4GHz power amplifier, 5GHz SiGe monolithic VCO.

Chapter 3 Software

3.1 Operating System Supported

- Windows 98SE, Windows ME, Windows 2000, Windows XP and Linux.

3.2 Security

- Wired Equivalent Privacy (WEP) supports 64, and 128 bit keys.
- Support WPA, WPA2 upgradeable

3.3 Configuration Utility

- A Utility to set SSID, WEP key and dynamically view configuration and receiving signal quality.
- Support worldwide country channel selection.

Chapter 4 Specifications

- Frequency Band:

  802.11g Radio: 2.4 GHz

  802.11b Radio: 2.4 GHz

USA – FCC	2412~2462MHz (Ch1~Ch11)
Canada – IC	2412~2462MHz (Ch1~Ch11)
Europe – ETSI	2412~2472MHz (Ch1~Ch13)
Spain	2412~2472MHz (Ch1~Ch13)
France	2457~2472MHz (Ch10~Ch13)
Japan – STD-T66	2412~2472MHz (Ch1~Ch13)

- Modulation TYPE:

DSSS	BPSK, QPSK, CCK
OFDM	BPSK, QPSK, 16QAM, 64QAM

- Operating Channels:

  IEEE 802.11b compliant:

  11 channels (US, Canada)
  13 channels (ETSI)
  13 Channels (Spain)
  4 Channels (France)
  13 channels (Japan)

  IEEE 802.11g compliant:

  11 channels (US, Canada)
  13 channels (ETSI)
  13 Channels (Spain)
  4 Channels (France)
  13 channels (Japan)

- Security: 64/128-bit WEP/TKIP/AES-CCM/AES-OCB/ 802.1x, and WPA
- Operating Voltage: 3.15V ~ 3.45V
- Transmitted Power: *See Table 1*
- Rates/Sensitivity/Allowable Path Loss: *See the Table 2*
- Mechanical specification:
  - MiniPCI Type 3B
- Regulatory compliance:
  - Power Limit: FCC 15.247
  - ETSI, CE
- Current consumption: TX:480 mA Max; RX: 420mA Max; Power Saving: 20mA

- Operating Temperature: 0 ~ 55 ^{o}C ambient
- Storage Temperature: -20 ~ 75 ^{o}C ambient
- Humidity: 5 ~ 90% and must be non-condensing
- ESD: EN61000-4-2, which specifies 4kV contact and 8kV air discharge.

Table 1: Modulation Scheme and Transmit Power

Modulation Rate	Output Power 2.4-2.5GHz (dBm)
802.11b – 1Mbps	17
802.11b – 2Mbps	17
802.11b – 5.5Mbps	17
802.11b – 11Mbps	17

Modulation Rate	Output Power 2.4-2.5GHz (dBm)
802.11g – 6Mbps	16
802.11g – 9Mbps	16
802.11g – 12Mbps	16
802.11g – 18Mbps	16
802.11g– 24Mbps	15
802.11g – 36Mbps	15
802.11g– 48Mbps	13
802.11g – 54Mbps	13

Table 2: Typical Range at Which Frame (1000 Bytes PDUs) Packet Error Rate < 10%

Modulation Rate	Receiver Sensitivity (dBm) 2.412 ~ 2.484 GHz
802.11b – 1Mbps	-90
802.11b – 2Mbps	-88
802.11b – 5.5Mbps	-85
802.11b– 11Mbps	-82

Modulation Rate	Receiver Sensitivity Typical (dBm)
802.11g – 6Mbps	-88
802.11g – 9Mbps	-87
802.11g – 12Mbps	-84
802.11g – 18Mbps	-82
802.11g– 24Mbps	-79
802.11g – 36Mbps	-75
802.11g– 48Mbps	-68
802.11g – 54Mbps	-68

References

- **IEEE 802.11b Standard Specification**
- **IEEE 802.11g Draft Specification D8.2**

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

IMPORTANT NOTE:

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

IEEE 802.11b or 802.11g operation of this product in the U.S.A. is firmware-limited to channels 1 through 11.

This device is intended only for OEM integrators under the following conditions:

The antenna must be installed such that 20 cm is maintained between the antenna and users, and
The transmitter module may not be co-located with any other transmitter or antenna.
As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

IMPORTANT NOTE: *In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.*

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users (for example : laptop). The final end product must be labeled in a visible area with the following: "Contains TX FCC ID: RAXWN4401C1".

Manual Information That Must be Included

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the users manual of the end product which integrate this module. The users manual for OEM integrators must include the following information in a prominent location " IMPORTANT NOTE: To comply with FCC RF exposure compliance requirements, the antenna used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or *operating in conjunction with any other antenna or transmitter.*

Industry Canada Statement

Operation is subject to the following two conditions:

1) this device may not cause interference and

2) this device must accept any interference, including interference that may cause undesired operation of the device

This device has been designed to operate with an antenna having a maximum gain of 2.54 dBi.

Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the EIRP is not more than required for successful communication.