

11Mbps Wireless LAN Module

User Manual

Rev 0.9

Regulatory Compliance

FCC 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 or more 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.

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

IMPORTANT NOTE:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation.

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

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

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) 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 access points, routers, wireless ADSL modems, and similar equipment). The final end product must be labeled in a visible area with the following: "Contains TX FCC ID: PKW-WM11".

Manual Information That Must be Included

The users manual for end users 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.

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Chapter 1

Introduction

Thank you for using the Wireless LAN module. This high-speed Wireless LAN module provides you with an innovative wireless networking solution for your embedded system. The module is easy to set up and use. With this innovative wireless technology, you can share files and printers on the network—without inconvenient wires! Now you can carry the LAN in your pocket!

This module is designed for

1. Wireless LAN Printer Server
2. Wireless LAN Ethernet Adapter
3. Wireless LAN Access Point / Gateway
4. Wireless LAN Router
5. Wireless LAN Broadband Router
6. Wireless LAN Presentation Gateway

Features

- Wire-free access to networked resources from anywhere beyond the desktop
- Low interference & high susceptibility guarantee reliable performance
- Delivers data rate up to 11 Mbps
- Dynamically shifts between 11, 5.5, 2, and 1 Mbps network speed, based on signal strength, for maximum availability and reliability of connection
- Uses 2.4GHz frequency band, which complies with worldwide requirement
- Used on embedded operating systems
- Ensures great security by providing the Wired Equivalent Privacy (WEP) defined in the IEEE 802.11 standard

What is Wireless LAN?

Wireless Local Area Network (WLAN) systems offer a great number of advantages over traditional wired systems. WLANs are flexible and easy to setup and manage. They are also more economical than wired LAN systems.

Using radio frequency (RF) technology, WLANs transmit and receive data through the air. WLANs combine data connectivity with user mobility. For example, users can roam from a conference room to their office without being disconnected from the LAN.

Using WLANs, users can conveniently access shared information, and network administrators can configure and augment networks without installing or moving network cables.

WLAN technology provides users with many convenient and cost saving features:

- **Mobility:** WLANs provide LAN users with access to real-time information anywhere in their organization, providing service opportunities that are impossible with wired networks.
- **Ease of Installation:** Installing is easy for novice and expert users alike, eliminating the need to install network cables in walls and ceilings.
- **Scalability:** WLANs can be configured in a variety of topologies to adapt to specific applications and installations. Configurations are easily changed and range from peer-to-peer networks suitable for a small number of users to full infrastructure networks of thousands of users roaming over a broad area.

LAN Modes

Wireless LANs can be configured in one of two ways:

Ad-hoc Networking	Also known as a peer-to-peer network, an ad-hoc network is one that allows all workstations and computers in the network to act as servers to all other users on the network. Users on the network can share files, print to a shared printer, and access the Internet with a shared modem. However, with ad-hoc networking, users can only communicate with other wireless LAN computers that are in the wireless LAN workgroup, and are within range.
Infrastructure Networking	Infrastructure networking differs from ad-hoc networking in that it includes an access point. Unlike the ad-hoc structure where users on the LAN contend the shared bandwidth, on an infrastructure network the access point can manage the bandwidth to maximize bandwidth utilization. Additionally, the access point enables users on a wireless LAN to access an existing wired network, allowing wireless users to take advantage of the wired networks resources, such as Internet, email, file transfer, and printer sharing. Infrastructure networking has the following advantages over ad-hoc networking: • Extended range: each wireless LAN computer within the range of the access point can communicate with other wireless LAN computers within range of the access point. • Roaming: the access point enables a wireless LAN computer to move through a building and still be connected to the LAN. • Wired to wireless LAN connectivity: the access point bridges the gap between wireless LANs and their wired counterparts.

Notes on wireless LAN configuration

When configuring a wireless LAN (WLAN), be sure to note the following points:

- Optimize the performance of the WLAN by ensuring that the distance between access points is not too far. In most buildings, WLAN cards operate within a range of 100 ~ 300 feet, depending on the thickness and structure of the walls.
- Radio waves can pass through walls and glass but not metal. If there is interference in transmitting through a wall, it may be that the wall has reinforcing metal in its structure. Install another access point to circumvent this problem.
- Floors usually have metal girders and metal reinforcing struts that interfere with WLAN transmission.

Chapter 2

Hardware installation

This chapter covers how to installing the wireless LAN module in your embedded system.

Hardware description

The Wireless LAN Module has a standard PCMCIA 68-pin connector for attaching to the PCMCIA port of embedded system.

And this module has MMCX connector to connect to external antenna.

Status LEDs

The following table describes the meaning of the LEDs:

LED	MEANING
PWR	Indicates that the Card is powered on.
LINK	Indicates link status. It is normally blinking. When blinking, indicates that the card is scanning the channels, and the link is not active. When lit, indicates that the card is locked to a channel, and the link is active.

Chapter 3

Installation for Embedded Linux System

Following is a example to install the module to a embedded Linux system.

installation for Linux

Follow the steps below to install the Wireless LAN card drivers (wlan-ng v0.1.6) for Linux.

Before Installing the Linux Drivers

Before you install the Linux wlan-ng v0.1.6 drivers, you need the PCMCIA module source code. If you do not have the source code, you can get it from the following URL:

<ftp://hyper.stanford.edu/pub/pcmcia>

After you have rebuilt and installed the PCMCIA module, edit /etc/pcmcia/network.opts to enable DHCP. In the DHCP setup, you can leave the fields empty. If there is no DHCP server on your network, you might have to disable DHCP to use a static IP and then fill the fields in /etc/pcmcia/network.opts.

In Linux there is an 802.11b Access Point with which the station can be associated.

Installation Procedure

1. Unpack the `tgz` file by typing the following line at the shell prompt, (assuming the shell prompt is `>`).

```
>gzip -cd wlan-ng-0.1.6.tgz | tar xvf -
```
2. Configure and install `wlan` v0.1.6. Be sure to configure the build as Station (STA)—do not choose Access Point (AP) because there is no firmware available that supports the AP function.

```
>cd wlan-ng-0.1.6
>make config
>make all
>make install
```
3. Edit `/etc/pcmcia/wlan-ng.conf` by adding the following lines to the bottom of the file.

```
card "PCMCIA 11M WLAN"
manfid 0x0274, 0x1601
bind "prism2_cs"
```
4. Edit `/etc/pcmcia/wlan-ng.opts`. The fields to edit are listed below:

```
dot11DesireSSID
APSSID
APCHANNEL
```
5. Restart your computer.

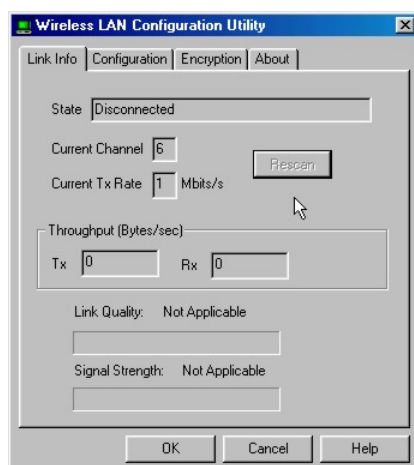
```
>shutdown -r now
```

When Linux is booting up, you will hear two high pitch beeps. This means that the driver has been loaded successfully. If you want to know if the card has connected to an access point, see if the red ACT LED on the card is illuminated. When the ACT LED stops blinking, it means the card/station has been connected to an access point.

This module also come with a wireless utility, following describe how to use the utility.

Configuration Utility

The following table describes the configuration utility:



State: displays the connection status.

Current Channel: displays the channel.

Current Tx Rate: displays the wireless bandwidth in megabits per second.

Throughput: displays the transfer and receive rates in bytes per second.

Link Quality: when connected to the wired LAN, displays the connection integrity.

Signal Strength: when connected to the wired LAN, displays the signal strength.

Note: Link quality and signal strength are not available when using a peer-to-peer connection.

Mode: displays the current LAN mode, either AdHoc or Infrastructure.

SSID: displays a list of Service Set Identifications.

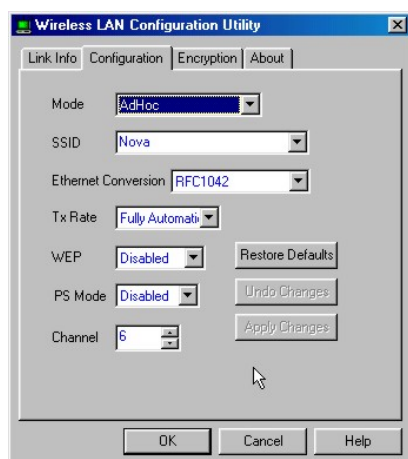
Ethernet Conversion: displays a list of Ethernet conversion protocols.

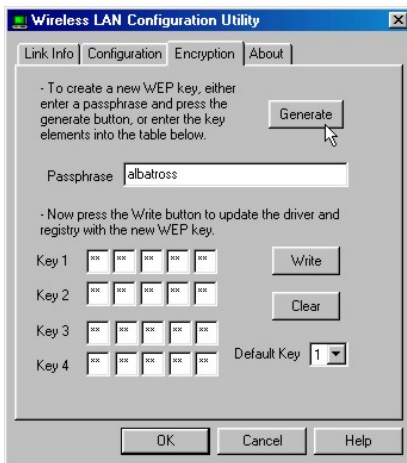
Tx Rate: displays a list of transfer rates.

WEP: allows you to enable or disable Wired Equivalency Privacy (WEP) for encryption, with either 64- or 128-bit encryption.

PS Mode: allows you to enable or disable power saving mode.

Channel: enables you to select a transmission channel.





The Encryption window enables you to create an encryption scheme for Wireless LAN transmissions. Enter a passphrase and press Generate to automatically generate a 64- or 128-bit key (selected from the WEP drop-down menu in the Configuration screen).

You can also manually enter a set of values for each key.

Note: 128-bit encryption requires more system resources than 64-bit encryption. Use 64-bit encryption for better performance.



This screen displays the version number of the Wireless LAN card and the Configuration Utility.

Appendix A

Troubleshooting

Q&A

These guidelines give you tips to deal with some problems you may encounter while using the Wireless LAN module.

Question: Can not connect to one of the clients in the network.

Answer: First of all, make sure that all clients are up and running with a green Wireless Utility icon. And please check your TCP/IP setup is correct for your network.

Specifications

Standards Compliance:	IEEE802.11b WLAN Standard, PCMCIA 2.1 and JEIDA 4.2 Standard
Socket Interface:	68-pin 16-bit PCMCIA socket connector
Card Size:	PCMCIA extended Type II
Frequency:	2.412 to 2.462GHz (Industrial Scientific Medical Band)
Antenna:	Dipole Antenna
Roaming:	802.11 compliant
Data Rate:	11Mbps / 5.5Mbps / 2Mbps / 1Mbps
Modulation Technique:	Direct Sequence Spread Spectrum BPSK / QPSK / CCK
Coverage Area:	Close Space : 45m @ 11Mbps, 150m @ 5.5Mbps or lower
Power:	DC +3.3V /+5V, 220mA (3.3V)
Output Power:	18.5dBm (typical)
Receiver Sensitivity:	-82dBm Min.
Operating Environment:	Temperature: 0° to 55°C Humidity: 10% to 90%