

WL-227N

Mini PCI WiFi (comply with 802.11n draft 2.0 and 802.11 a/b/g)

Hardware and Driver Reference

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NOTE: Information in this document is subject to change after this document is made available.

INTRODUCTION

SCOPE

The purpose of this specification is to document the requirements for 802.11 a/b/g/n, it is an iNIC card that not only can be acted as traditional AP/Router but also providing WLAN dual band access capabilities.

ACRONYMS AND DEFINITIONS

Acronym	Description
BBP	Base Band Processor
BER	Bit Error Rate
BPSK	Binary Phase Shift Keying
CCK	Complementary code keying
EVM	Error Vector Magnitude
MAC	Media Access Controller
OFDM	Orthogonal Frequency Division Multiplexing
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying

INTRODUCTION

FEATURES AND SPECIFICATIONS

Features	Description
Network Standard	Fully comply with IEEE 802.11n draft 2.0 and IEEE 802.11 a/b/g standards
Chipset	Highly Integrated MIMO 2T3R MAC/BBP chip (RT2880) with PCI Interface and Single-chip Transceiver (RT2850) with 2.4 GHz (low-band) and 5~6GHz(high-band) ISM bands
Transmitter/Receiver Mechanism	Two Tx transmits from transceiver through external PAs to the antennas. Three Rx act as MIMO coming from the antennas.
Host interface	Mini PCI Type III A, 124 Pin
Dimension	L: 59.8.mm by W:51.8mm
Data Rate	300Mbps Receive PHY Rate, 300Mbps Transmit PHY Rate and supports 2 streams
Modulation	Modulation Technology support Orthogonal Frequency Division Multiplexing (OFDM), DSSS
Operating Frequency	2.4 ~ 2.5GHz and 4.9~5.9GHz
Operating Channels	Ch1~Ch14, CH36~CH48,CH52~CH64,CH149~CH161
Antenna Connectors	3 U.FL I-PEX RF connectors
Security	64-bit/128-bit WEP, TKIP, and AES hardware encryption Wi-Fi alliance WPA, WPA2
Driver Support OS	Linux
Transmitter/Receiver Mechanism	Two Tx transmits from transceiver through an external PA to the antenna. Three Rx act as MIMO coming from the antennas.
Weight NW	14g
Application	This module will be used in a 12 inch or greater laptop.

DRIVER INSTALLATION

Driver installation for Linux

1. Insert USB flash disk & WL-227N NIC before booting
2. Boot Linux system and login
3. Create path [Wireless]: **mkdir /etc/Wireless**
4. Mount USB Hard Disk: **mount /dev/sda1 /mnt**
5. Copy tar file to Linux from USB Hard Disk:
cp /mnt/2008_0812_RT2880_iNIC_v1.1.8.0.tar.bz2 /etc/Wireless/
6. Decompress tar file to /etc/Wireless/, and it will generate a directory [2008_0812_RT2880_iNIC_v1.1.8.0]:
tar -jxvf /etc/Wireless/2008_0812_RT2880_iNIC_v1.1.8.0.tar.bz2
7. Rename directory [2008_0812_RT2880_iNIC_v1.1.8.0] to [RT2880], in other words, the driver's path was /etc/Wireless/RT2880 (default path in Ralink manual): **mv 2008_0812_RT2880_iNIC_v1.1.8.0 RT2880**
8. Now, we can compile driver (basic function):
 - a. Enter [RT2880] directory: **cd RT2880**
 - b. Rename [module-1.1.8.0] to [module]: **mv module-1.1.8.0 module**
 - c. Enter [/etc/Wireless/RT2880/module] directory: **cd module**
 - d. Compile driver: **make**

After make, it will generate five files:
Module.sysmvers
rt2880_iNIC.ko
rt2880_iNIC.mod.c
rt2880_iNIC.mod.o
rt2880_iNIC.o
 - e. Copy iNIC_sta.bin and iNIC_sta_dat to [/etc/Wireless/RT2880/] from [/etc/Wireless/RT2880/firmware]:
 - Enter [/etc/Wireless/RT2880/firmware/]: **cd firmware**
 - Copy **iNIC_sta.bin** and **iNIC_sta_dat** to [/etc/Wireless/RT2880/] from [/etc/Wireless/RT2880/firmware/]: **cp iNIC_sta.* ../..!**

DRIVER INSTALLATION

9. Setup and bootstrap WL-227N NIC:

a. Setup WL-227N NIC:

insmod /etc/Wireless/RT2880/module/rt2880_iNIC.ko mode=sta

- If it shows “**ra0:Ralink iNIC at 0xe0cc0000**(hardware address),
00:43:0c:00:00:00 (MAC address), **IRQ169** (IRQ address)”, the NIC is boot strap successfully.

b. Bootstrap NIC parameters:

- IP address: **ifconfig ra0 inet 192.168.0.11 up**
- If it shows the message as below, it is bootstrap successfully:
Send STARTUP to RT2880
close Firmware file
RACFG_CMD_BOOT_STARTUP
Update MAC(0)=00:11:22:33:44:55

Or, type [ifconfig ra0] configuration. If it shows the message as below, it is bootstrap successfully, too:

```
ra0 Link encap:Ethernet HWaddr 00:11:22:33:44:55  
inet addr:192.168.0.122 Bcast:192.168.0.255 Mask:255.255.255.0  
inet6 addr: fe80::211:22ff:fe33:4455/64 Scope:Link  
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1  
RX packets:2445 errors:0 dropped:0 overruns:0 frame:0  
TX packets:2188 errors:0 dropped:0 overruns:0 carrier:0  
collisions:0 txqueuelen:1000  
RX bytes:2235102 (2.1 MiB) TX bytes:2236428 (2.1 MiB)  
Interrupt:169
```

c. Setup NIC connect function:

Setup NIC frequency band: **iwpriv ra0 set WirelessMode=9**

Setup NIC connect target of AP: **iwpriv ra0 set SSID=dlink**

type [iwconfig ra0] configuration. If it shows the message as below, it is connect successfully:

```
ra0 RT2880 iNIC STA ESSID:"dlink"  
Mode:Managed Frequency:2.412 GHz Access Point: 00:1F:C6:69:BE:95  
Bit Rate:54 Mb/s  
RTS thr:off Fragment thr:off  
Encryption key:off  
Link Quality=91/100 Signal level:-72 dBm Noise level:-71 dBm  
Rx invalid nwid:0 Rx invalid crypt:0 Rx invalid frag:0  
Tx excessive retries:0 Invalid misc:0 Missed beacon:0
```

SAFETY INFORMATION

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.

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.

FOR PRODUCTS AVAILABLE IN USA/CANADA: Only channels 1 to 11 can be operated. Selection of other channels is not possible. This device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter. This device is going to be operated in 5.15GHz to 5.25GHz frequency ranges, it is restricted in indoor environment only.

END PRODUCTS SMALLER THAN 8cm x 10cm: This device complies with Part 15 of 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.

MINIMUM DISTANCE: This module is intended for OEM integrator. The OEM integrator is still responsible for the FCC compliance requirement of the end product, which integrates this module. 20cm minimum distance has to be able to be maintained between the antenna and the users for the host this module is integrated into. Under such configuration, the FCC radiation exposure limits set forth for an population/uncontrolled environment can be satisfied.

END PRODUCT LABEL: Contains TX FCC ID: VUI-WL-227N
