Radicom Research, Inc.
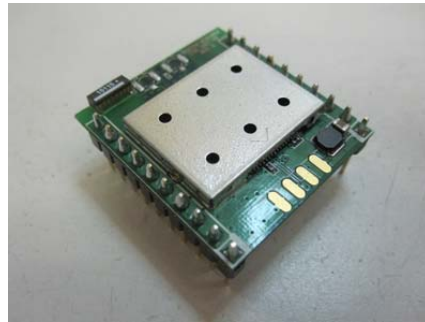
Preliminary
Designers Guide for the

WiFiHU-NE and   WiFiHU

USB WiFi Modules

FC C E   RoHS Compliant

February 17, 2011

Table of Contents

Thanks for purchasing Radicom Research's USB WiFi Module. Radicom is committed to providing quality service and technical support in order to expedite the product development process. The WiFiHU Module requires only a USB (Universal Serial Bus) interface to add state of the art data WiFi wireless operation to any system. It is designed to fully support **IEEE802.11n™** Draft 2.0, **IEEE802.11e™** and **IEEE802.11i™** standards. If further information is required, please contact us and we will provide any additional help needed.

Features

- Compatible with both USB 1.1 and USB 2.0 host controllers
- USB 2.0 Compatible Hot Swappable Interface
- IEEE 802.11b/g/n compatible WLAN
- 1x2 MIMO technology for extended reception robustness and exceptional throughput
- 150Mbps receive PHY rate and 75Mbps transmit PHY rate using 20MHz bandwidth
- 300Mbps receive PHY rate and 150Mbps transmit PHY rate using 40MHz bandwidth
- 20MHz and 40MHz bandwidth transmission
- Operates in 2.4GHz Frequency Range
- Compatible with 802.11n draft 2.0 specification
- Backward compatible with 802.11b/g devices while operating at 802.11n data rates
- Frame aggregation for increased MAC efficiency (A-MSDU, A-MPDU)
- Low latency immediate High-Throughput Block Acknowledgement (HT-BA)
- Long NAV for media reservation with CF-End for NAV release
- PHY-level spoofing to enhance legacy compatibility
- MIMO power saving mechanism
- Channel management and co-existence
- Multiple BSSID feature allows the RTL8191SU-GR to assume multiple MAC identities when used as a wireless bridge
- Supports Wake-On-WLAN via Magic Packet and Wake-up frame
- Transmit Opportunity (TXOP) Short Inter-Frame Spaces (SIFS) bursting for higher multimedia bandwidth
- One Transmit and Two Receive paths (1T2R)
- Short Guard Interval (400ns)
- DSSS with DBPSK and DQPSK, CCK modulation with long and short preamble
- OFDM with BPSK, QPSK, 16QAM, and 64QAM modulation Convolutional Coding Rate: 1/2, 2/3, 3/4, and 5/6
- OFDM receive diversity with MRC using up to 2 receive paths. Switch diversity used for DSSS/CCK
- Hardware antenna diversity
- Selectable digital transmit and receive FIR filters
- Programmable scaling in transmitter and receiver to trade quantization noise against increased probability of clipping
- Fast receiver Automatic Gain Control (AGC)
- RoHS Compliant and CE Marked

Support
- IEEE 802.11b/g/n compatible WLAN
- IEEE 802.11e QoS Enhancement (WMM)
- IEEE 802.11h TPC, Spectrum Measurement
- IEEE 802.11i (WPA, WPA2). Open, shared key, and pair-wise key authentication services
- Cisco Compatible Extensions (CCX4)

Ratings

Parameter	Min	Typical	Max	Units
Maximum Data Rate			300M	bps
Operating Temperature HU	0°		70°	°C
Storage Temperature	0°		125°	°C
Relative Humidity (non-condensing)	5 %		95	%
Current Consumption	152	155	162	mA
Transmit & Receive Level	-84(Rx)		+17 (Tx)	dBm

Block Diagram
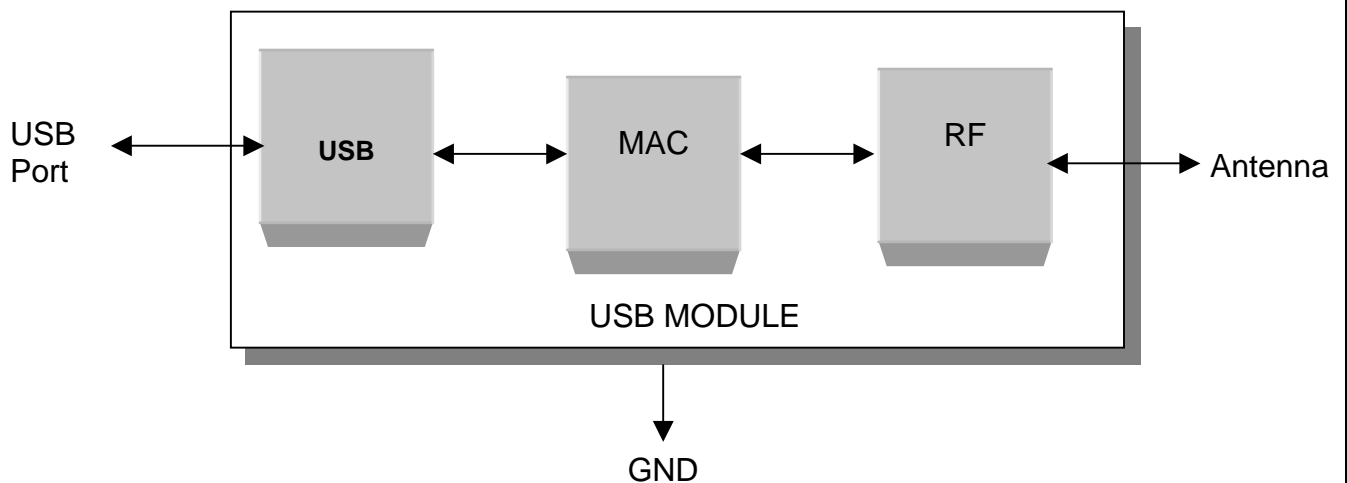
Model and Ordering Information

This versatile WiFiHU USB family of products offers various configuration options to meet the specific system requirements a designer may need to add state of the art WiFi USB operation. The WiFiHU is available as a module, a module with USB Jack and antennae interface, or as a complete external device in an enclosure. The WiFiHU also has three different antennae options.

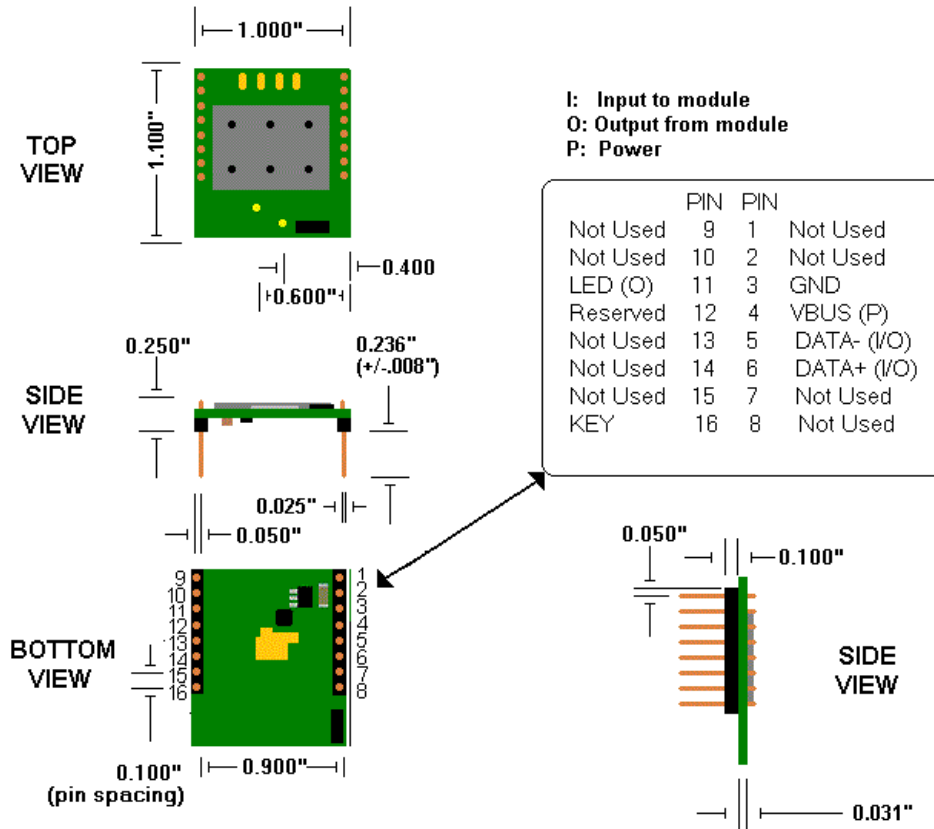| Model	Description	Comments
WiFiHU-a	WiFi USB Module with dual on board chip antennae	Uses onboard chip antennae. Not for use with External Antenna. Allows designer to determine USB Jack placement.
WiFiHU-a-1-NE	WiFiHU-a installed in a WiFiHU-CB1 Carrier Board with on board USB Jack.	Complete WiFi Module with dual chip antennae with USB Jack interface.
WiFiHU-a-1-UE	WiFiHU-a and WiFiHU-CB1 installed in enclosure	Complete WiFi Standalone model with on board dual chip antenna and USB Jack mounted in enclosure.
WiFiHU-c	WiFi USB Module with two SMD Connectors for attaching antenna cable and 2.4GHz 2 dBi Omni-directional antenna	Allows designer to determine USB Jack and antenna placement.
WiFiHU-c-1-NE	WiFiHU-c installed in WiFiHU-CB1 Carrier Board with on board USB Jack.	Complete WiFi Module with cable and antenna with USB Jack interface.
WiFiHU-c-1-UE	WiFiHU-c and WiFiHU-CB1 installed in enclosure	Complete WiFi Standalone model with cable, antenna and USB Jack mounted in enclosure
WiFiHU-c-2-NE	WiFiHU-c installed in WiFiHU-CB2 Carrier Board with on board RPSMA antenna Jack and USB Jack	Complete WiFi Module with Fixed location antenna and USB Jack.
WiFiHU-c-2-UE	Complete WiFi module with antenna installed in a case.	Complete WiFi USB Model with antenna and USB Jack mounted in enclosure.

Connecting the WiFiHU or WiFiHU-NE to Your System

The WiFiHU Modules are designed for easy connection to any standard USB Port and wireless network. Connect one end of the USB cable into the USB connector on the WiFiHU-NE and the other into any available USB receptacle on your computer. The WiFiHU-NE's "Hot Swap-able" interface allows you to plug or unplug the module even when the computer is on. If using Windows, load the provided drivers. The WiFiHU-NE is now ready for use.

If you plan to embed the WiFiHU into your system, the initial evaluation consists of the WiFiHU USB Module mounted onto a USB hub PCB (WiFiHU-NE). To remove the WiFiHU carefully remove it from the two 8 pin headers on the WiFiHU-NE USB interface board. Save this interface board. The WiFiHU can always be reinstalled into the WiFiHU-NE USB interface board and connected to any standard USB port to verify or test the module functions. If you use external antenna, connect one end of Radicom approved antenna to the on board socket.

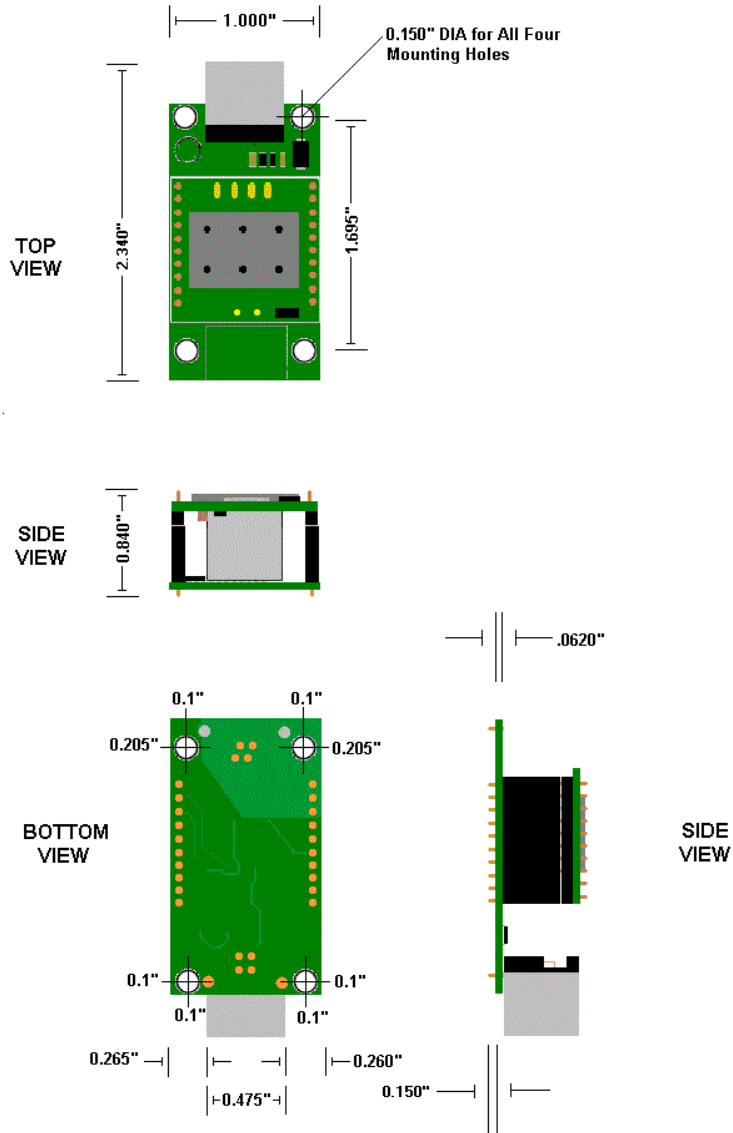# *Mechanical Specification and Pin Orientation for the WiFiHU*

The WiFiHU USB Half Inch Modules are designed for easy connection to any standard USB interface and wireless network. The connection is made through two 8-pin headers, which may be attached to your device via a socket or by individually hardwiring each pin.

I: Input to module
O: Output from module
P: Power

	PIN	PIN	
Not Used	9	1	Not Used
Not Used	10	2	Not Used
LED (O)	11	3	GND
Reserved	12	4	VBUS (P)
Not Used	13	5	DATA- (I/O)
Not Used	14	6	DATA+ (I/O)
Not Used	15	7	Not Used
KEY	16	8	Not Used

Notes:
1. Pin Spacing is 0.100 inch from center to center
2. Dimension of the WiFiHU module – 1.10 x 1.00 x 0.25 inch
3. Suggested mating female connector:
   Samtec P/N. #SSW-110-21-G-S (RoHS Thru-Hole)
   Samtec P/N. #SSW-110-22-G-S-VS (RoHS SMT)
4. Square pins – 0.025 x 0.025 inch

Mechanical Specification for the WiFiHU USB HUB

1.000"

0.150" DIA for All Four
Mounting Holes

TOP
VIEW

2.340"

1.695"

SIDE
VIEW

0.840"

.0620"

0.1"   0.1"

0.205"   0.205"

BOTTOM
VIEW

SIDE
VIEW

0.1"   0.1"

0.1"   0.1"

0.265"   0.260"

0.475"   0.150"

WiFiHU USB Interface Pins

The following shows the I/O Pins required for adding the WiFiHU USB Module to your embedded system.

PIN Number	Name	Type
1	Not Used	
2	Not Used	
3	GND	Ground
4	VBUS	USB Power
5	DATA-	Input / Output
6	DATA+	Input / Output
7	Not Used	
8	Not Used	
9	Not Used	
10	Not Used	
11	LED (O)	Output
12	Reserved	
13	Not Used	
14	Not Used	
15	Not Used	
16	Key	No Pin

Additional Information on the USB Interface Signals

PIN	Name	Definition
1,2	Not used – No Connection can be used for mounting purposes	
3	**GND** – Ground – Connect this pin to the ground of the USB bus	
4	**VBUS** – This is the USB Power Connection. Connect this pin to VBUS	
5	***DATA (-)** - Connect this pin to Data –	
6	***DATA (+)** - Connect this pin to the Data +	
7,8,9,10	Not used – No Connection can be used for mounting purposes	
11	**LED - Link Process**	
12	**Reserved**	
13,14,15	Not used – No Connection can be used for mounting purposes	
16	No Pin – This Pin has been removed. Add a key to the mating connector to prevent the module from being plugged in backwards.	

*Note: D+ (Pin 15) and D- (Pin 16) are the differential data plus and minus signals of the USB port. The two traces should be in parallel and equal in length.

Important Compliance and User Information

Federal Communication Commission (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 and radiates radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. 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 assistance.

Regulation Information:

The WiFiHU USB Client Adapter must be installed and used in strict accordance with the manufacturer's instructions. This device complies with the following radio frequency and safety standards.

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.
   (2) This device must accept any interference received,
        including interference that may cause undesired operation.

FCC RF Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF Exposure compliance.
To comply with the FCC requirements, this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Your device contains a low power transmitter. When this device is operational, use only with supplied, or recommended antenna. Unauthorized antenna, modification, or attachments could damage the transmitter and may violate FCC regulations.

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

Europe – R&TTE Compliance Statement:

Hereby, Radicom Research Inc, declares that this equipment complies with the essential requirements and other relevant provisions of DIRECTIVE 1999/5/CE OF THE EUROPEAN PARLIAMENT AND THE COUNCIL of March 9, 1999 on radio equipment and telecommunication terminal Equipment and the mutual recognition of their conformity (R&TTE).

CE Declaration of Conformity

For the following equipment:

Radicom Research Inc. WiFi USB Modem Module
Model(s): WiFiHU, WiFiHU-NE

is herewith confirmed to comply with the requirements set out in the Council (European parliament) Directive on the Approximation of the Laws of the Member States relating to Electromagnetic Compatibility of Radio and Telecom device (1999/5/CE). For the evaluation regarding this Directive, the following standards were applied:
EN 300 328 V1.7.1
EN 301 489-1 V1.6.1 ; EN 301 489-17 V1.2.1
EN 60950-1:2001

This equipment is marked with the $C\,\epsilon$ 0984① symbol and can be used throughout the European community. Marking by the symbol ① indicates that usage restrictions apply.

France – 2.4GHz for Metropolitan France:
In all Metropolitan departments, wireless LAN frequencies can be used under the following conditions, either for public or private use:
- Indoor use: maximum power (EIRP*) of 100 mW for the entire 2400-2483.5 MHz frequency band
- Outdoor use: maximum power (EIRP*) of 100 mW for the 2400-2454 MHz band and with maximum power (EIRP*) of 10 mW for the 2454-2483 MHz band

Caution: Exposure to Radio Frequency Radiation.
To comply with RF exposure compliance requirements, for mobile configurations, a separation distance of at least 20 cm must be maintained between the antenna of this device and all persons.

This device is intended for use as check in the following European Community countries:

☐ Austria   ☐ Belgium   ☐ Czech Republic   ☐ Austria
☐ Denmark   ☐ Estonia   ☐ France   ☐ Finland
☐ Germany   ☐ Greece   ☐ Hungary   ☐ Ireland
☐ Italy   ☐ Iceland   ☐ Luxemburg   ☐ Latvia
☐ Lithuania   ☐ Malta   ☐ Norway   ☐ Netherlands
☐ Portugal   ☐ Poland   ☐ Spain   ☐ Sweden
☐ Slovakia   ☐ Slovenia   ☐ United Kingdom

The channel identifiers, channel center frequencies, and regulatory domains of each 22-MHz-wide channel are shown in following table.

Channel Identifier	Frequency (MHZ)	Regulatory Domains					
		Japan	ETSI	North America	Israel	France Outdoor	Mexico
1	2412	˅	˅	˅		˅	
2	2417	˅	˅	˅		˅	
3	2422	˅	˅	˅	˅	˅	
4	2427	˅	˅	˅	˅	˅	
5	2432	˅	˅	˅	˅	˅	
6	2437	˅	˅	˅	˅	˅	
7	2442	˅	˅	˅	˅	˅	
8	2447	˅	˅	˅	˅	˅	
9	2452	˅	˅	˅	˅	˅	
10	2457	˅	˅	˅			˅
11	2462	˅	˅	˅			˅
12	2467	˅	˅				
13	2472	˅	˅				
14	2484	˅					

Driver Installation Guide For Windows XP/2K

1.0 Insert the installation disc into CD-ROM.

1.1 Select your language from the Choose Setup Language drop-down list.

1.2 Click **NEXT**.

2. Click **NEXT** to continue.

3. Click **Install** to begin the installation.

REALTEK 11n USB Wireless LAN Driver and Utility

REALTEK 11n USB Wireless LAN Driver and Utility

Click Install to begin the installation.

If you want to review or change any of your installation settings, click Back. Click Cancel to exit the wizard.

InstallShield

< Back   Install   Cancel

Installing…

REALTEK 11n USB Wireless LAN Driver and Utility

Setup Status

The InstallShield Wizard is installing REALTEK 11n USB Wireless LAN Driver and Utility

InstallShield

Cancel
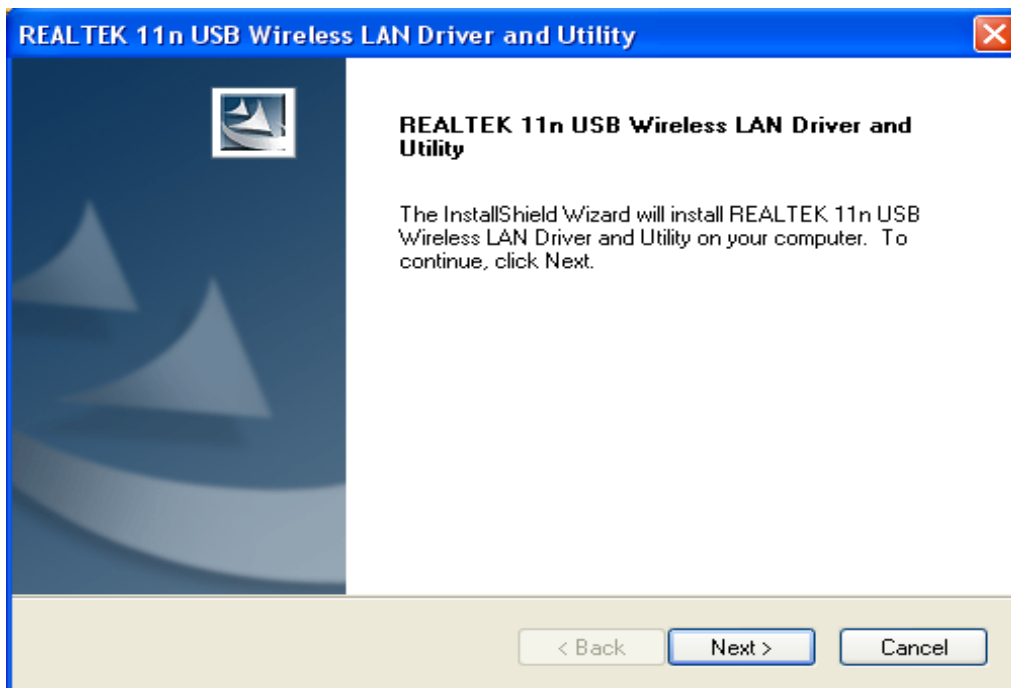
4. Click **Finish** to complete the installation.

5.0 Plug the device into the USB port.

5.1 Windows will automatically begin the installation for the device.

5.2 Click **NEXT**.

6. Click **NEXT** to begin the installation.
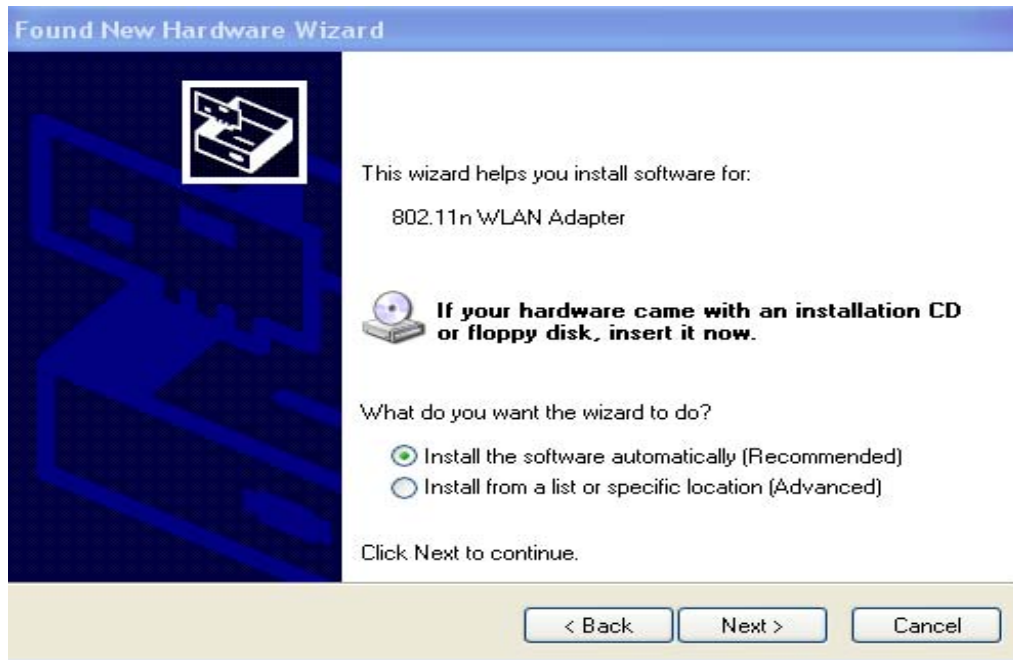
7. Windows will search for the software for the device.
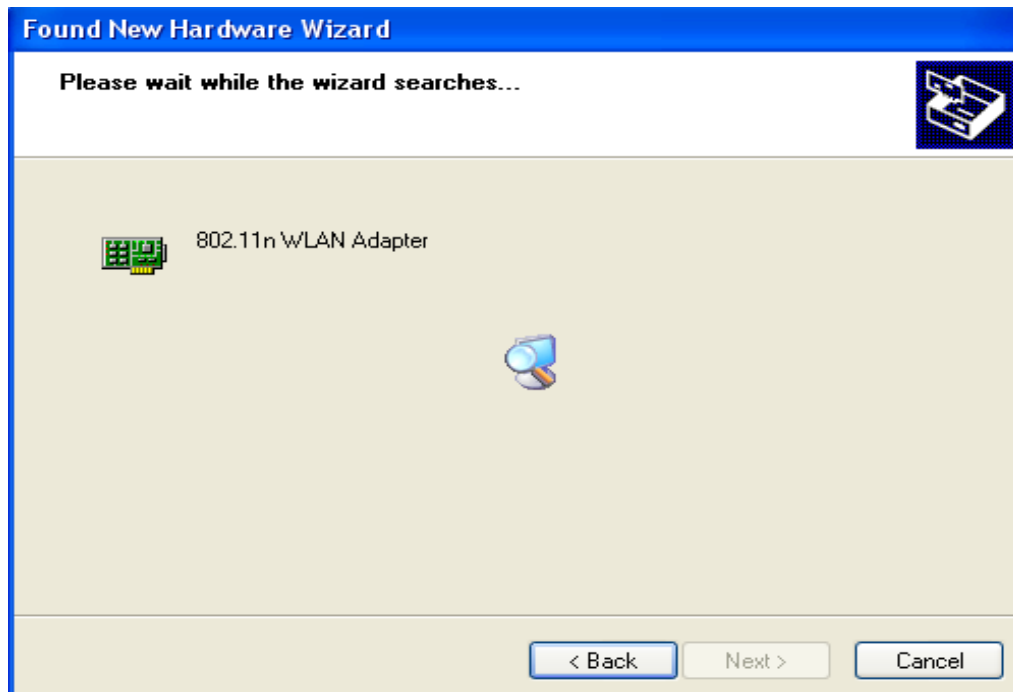
8. Click **Continue Anyway**.

Installing…
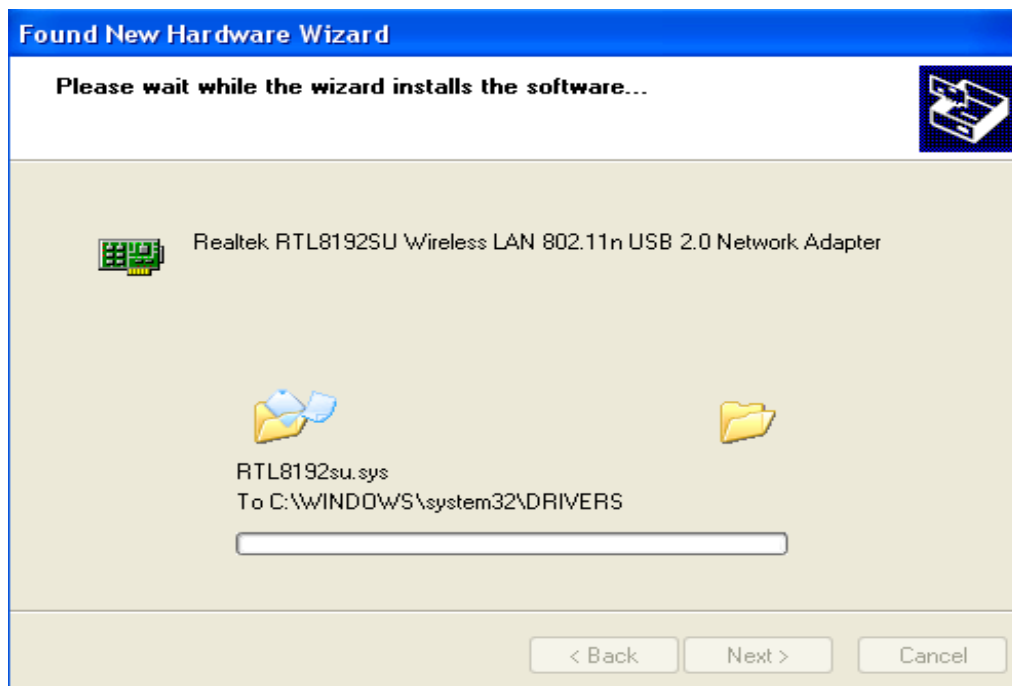
9. Driver installation is completed. Click **Finish** to close the wizard.

10.0 Right click the **Network Connection** icon on the right side of System Tray.

10.1 Select **View Available Wireless Networks**.

11. Choose a wireless network from the list and double click to connect.
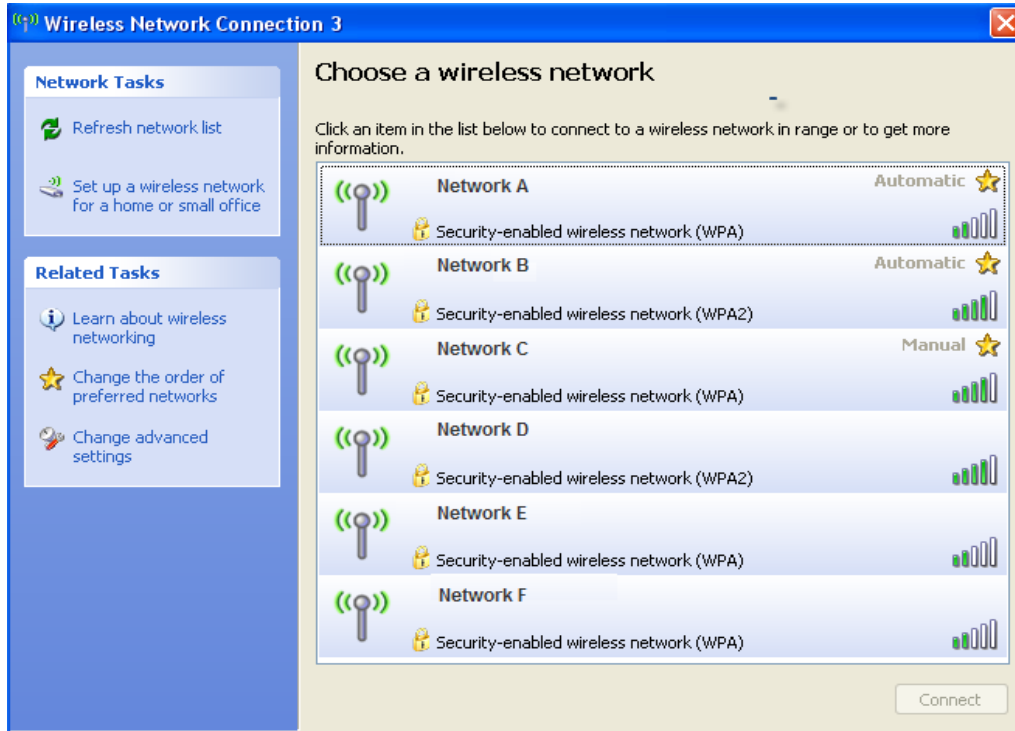
12.0 The network will require a password.

12.1 Enter the password then click **Connect**.
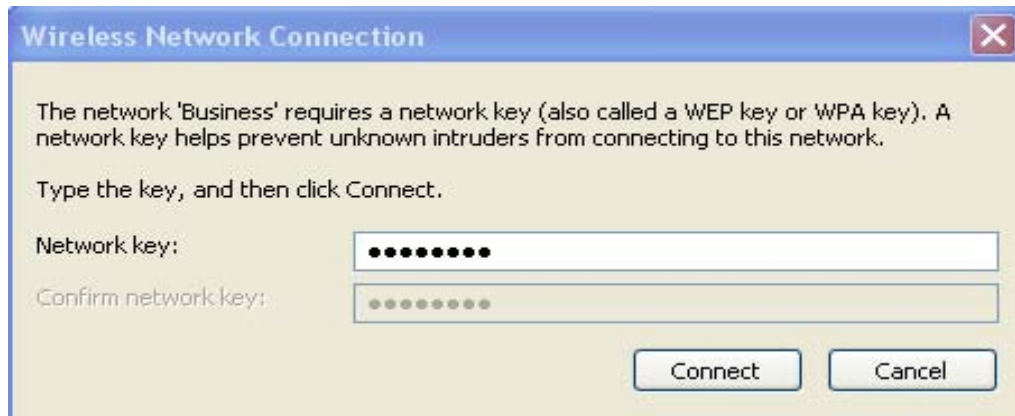
Connecting…
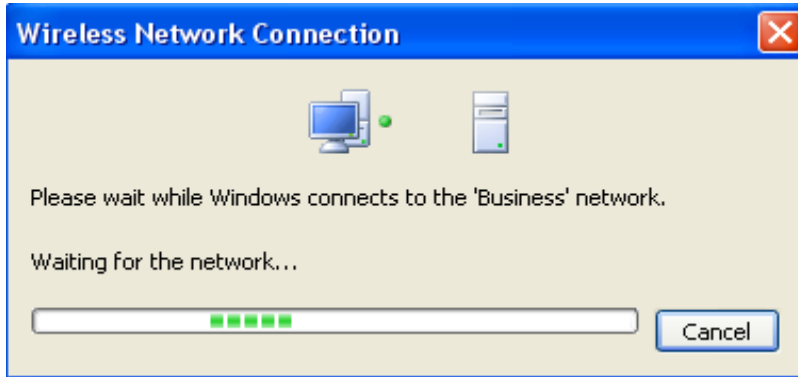
13.0 Network will appear as "Automatic" if the password entered is incorrect.

13.1 Network will appear as "Limited or no connectivity" if the password is correct but the IP address is incorrect.
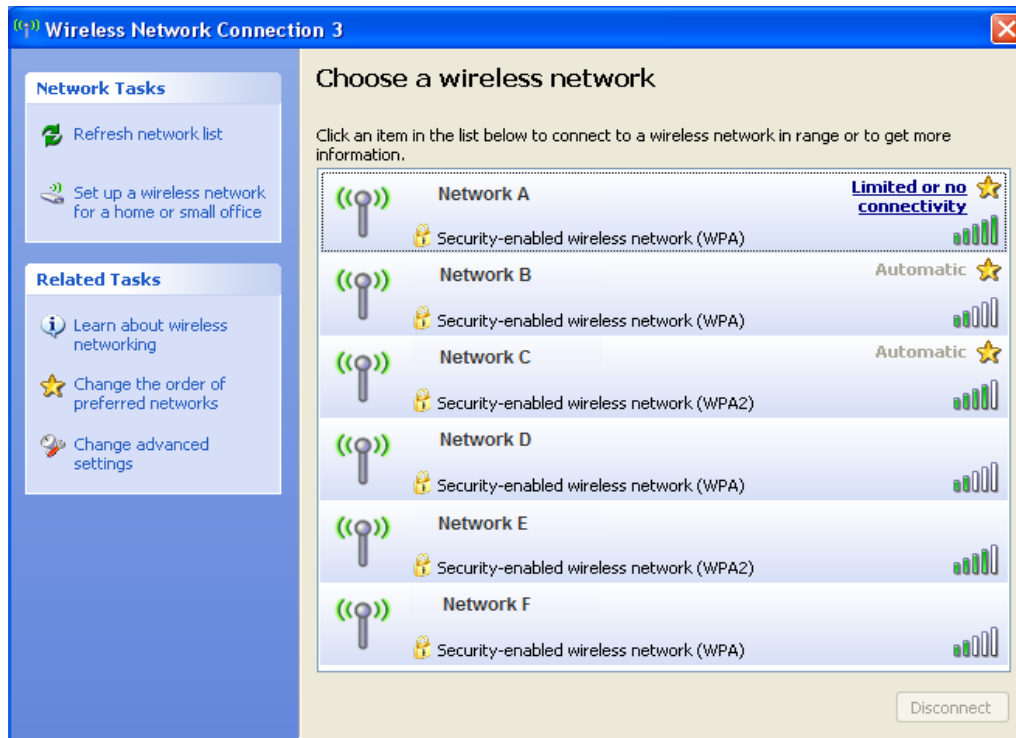
14. Go to Start Menu and select **Control Panel**.
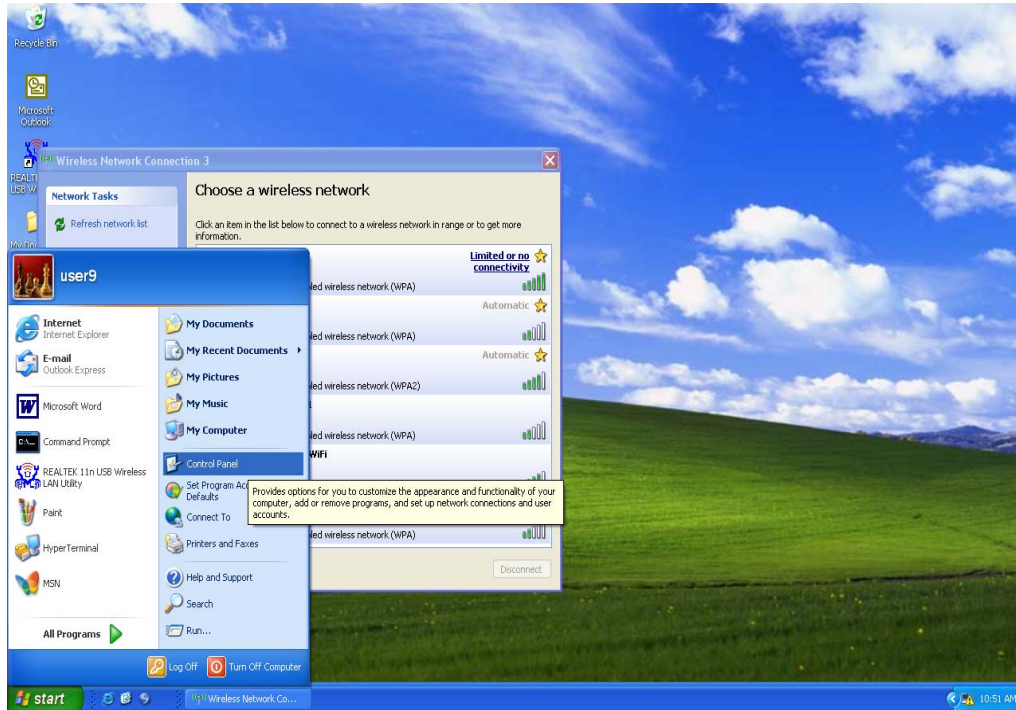
15. Double click **Network Connections** icon in Control Panel.
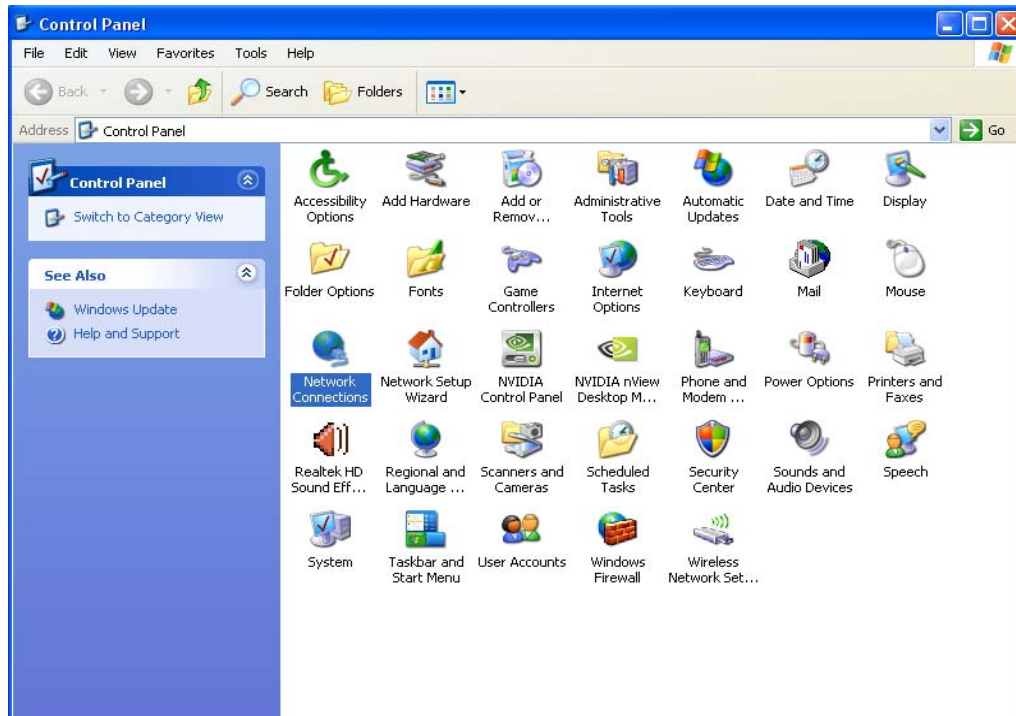
16.0 In Network Connections you will find Wireless Network Connection with "Limited or no connectivity" status.

16.1 Right click and select **Properties**.
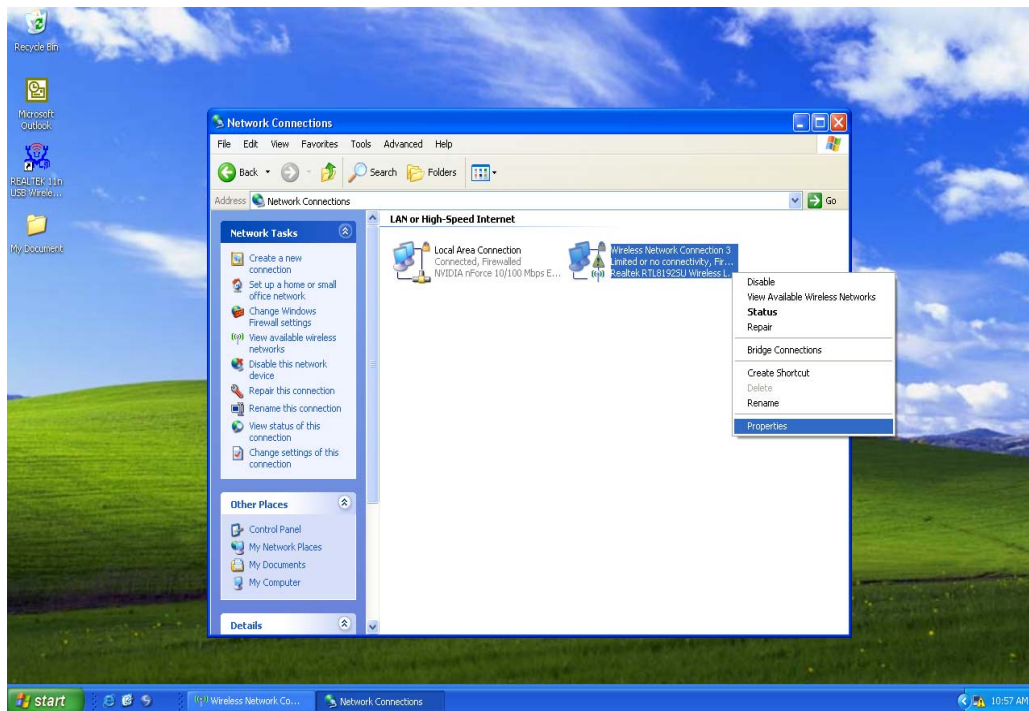
17. Double click **Internet Protocol (TCP/IP)** from the drop down list.
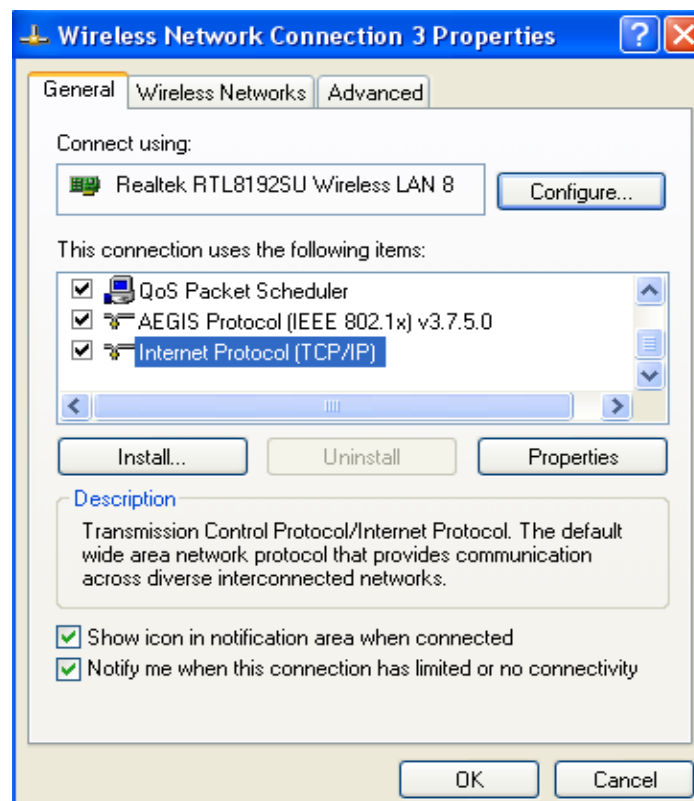
18. Type the IP address then click **OK**.
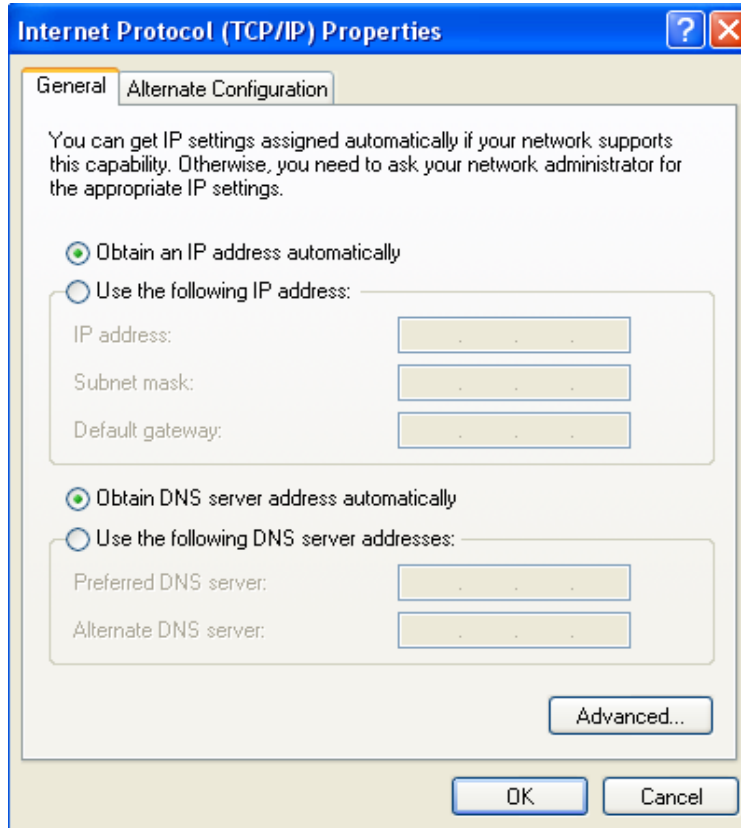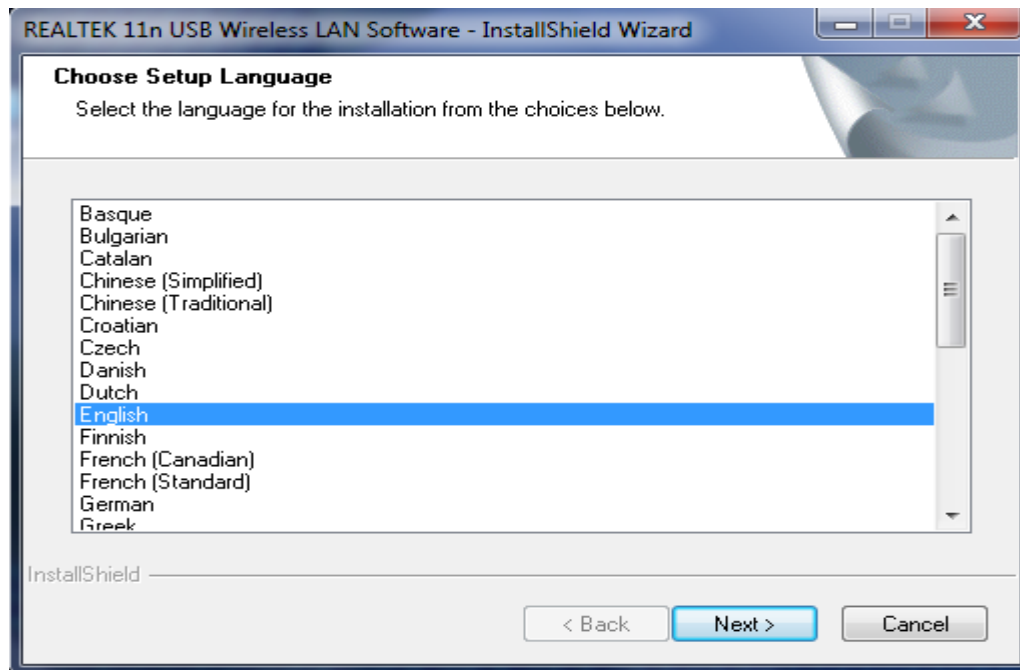

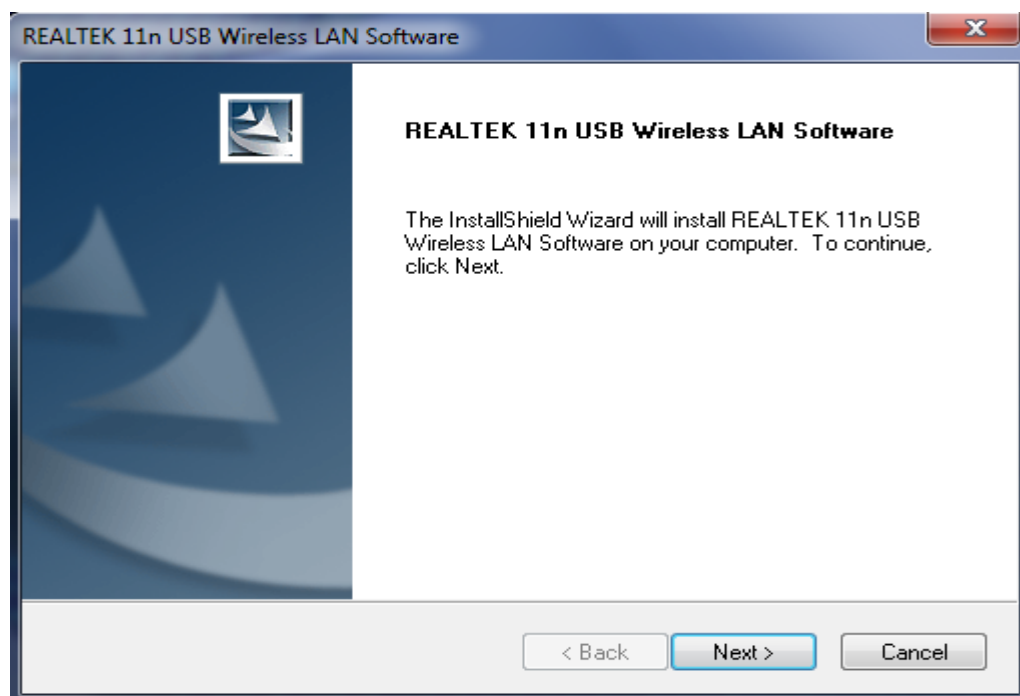19. You are now connected to the wireless network.
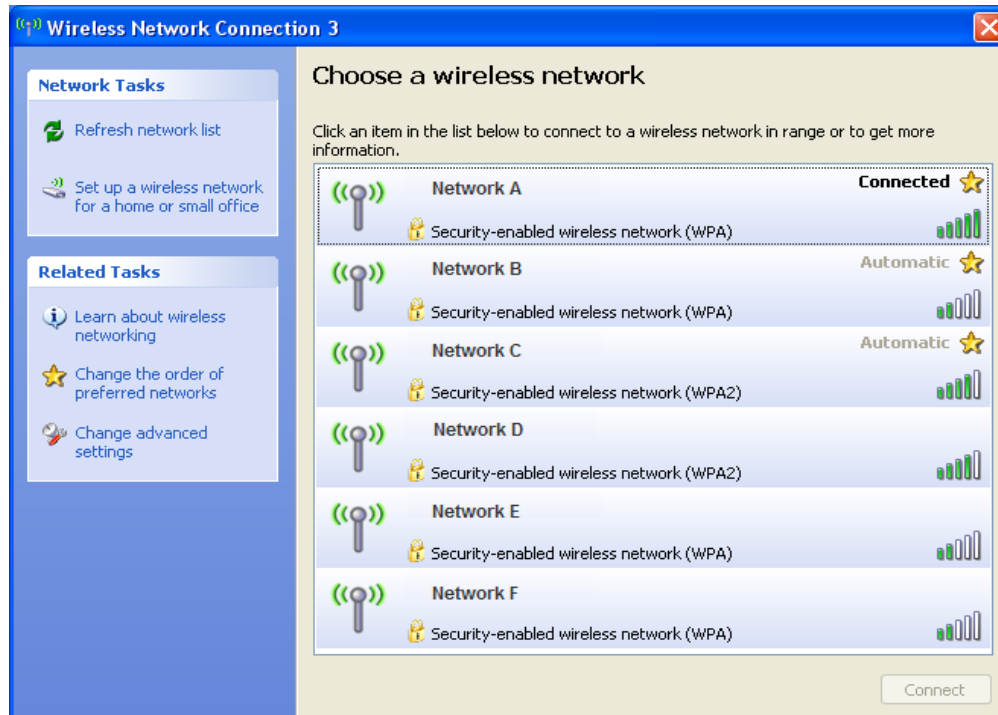
Driver Installation Guide For Windows 7

1.0 Insert the installation disc into CD-ROM.

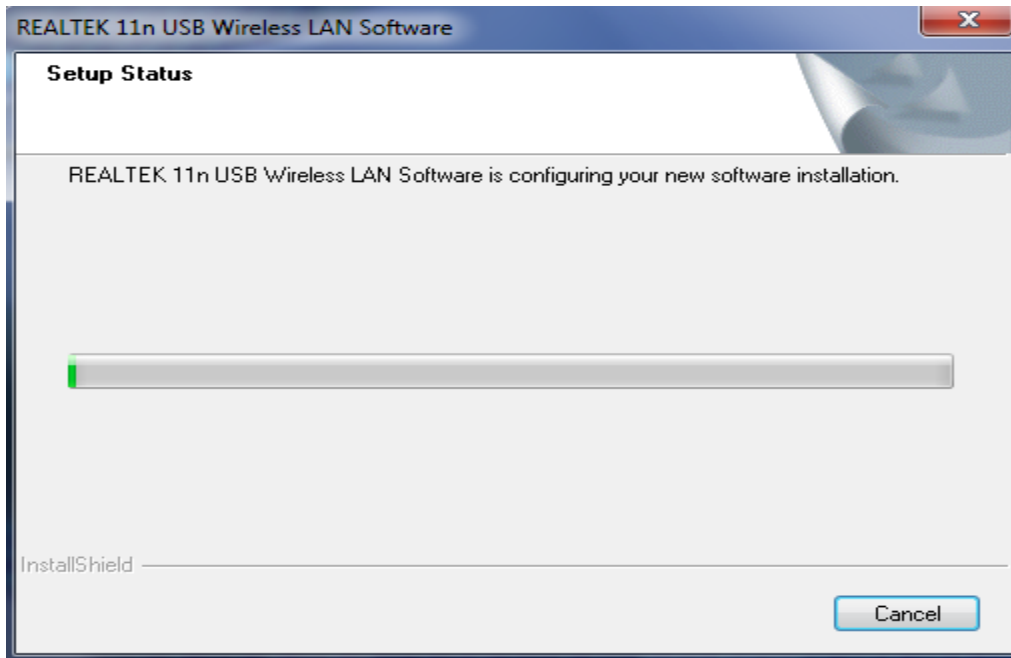1.1 Select your language from the Choose Setup Language drop-down list.
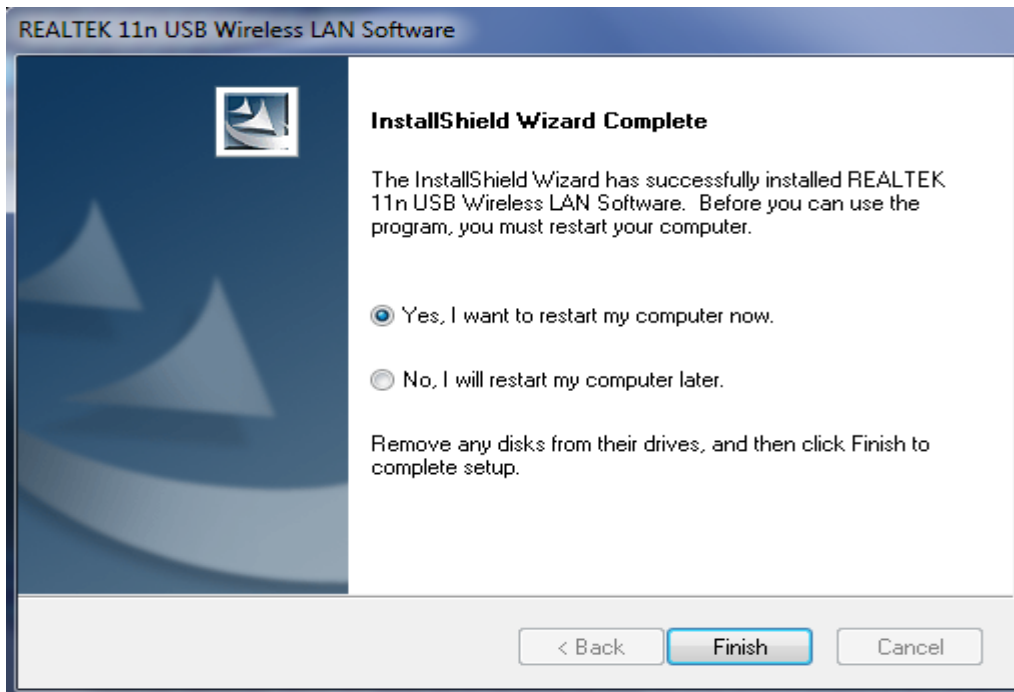
1.2 Click **NEXT**.

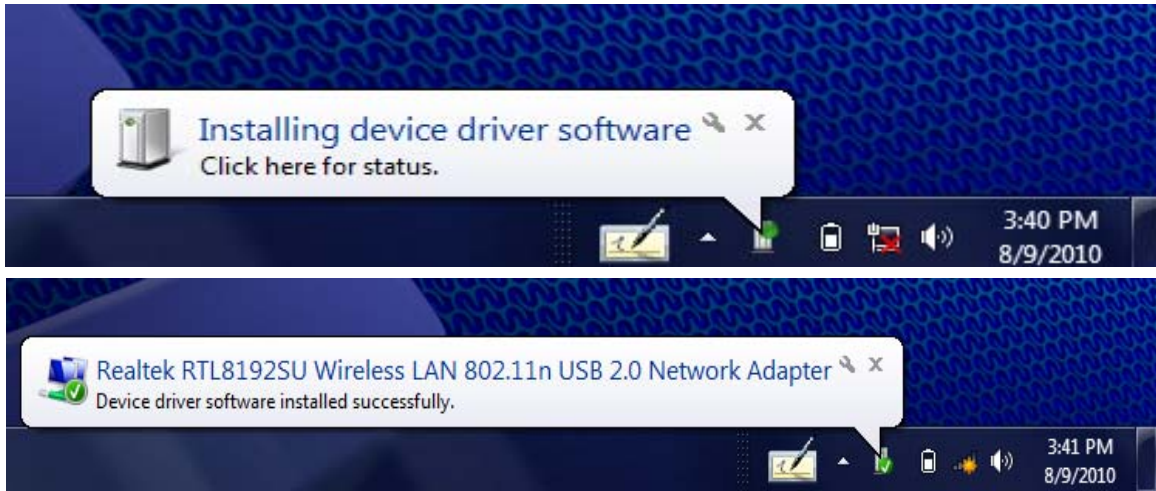2. Click **NEXT** to continue.

Installing…

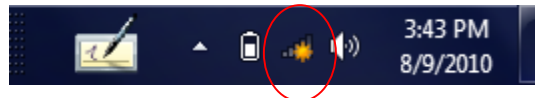3. Click **Finish** to complete the installation.
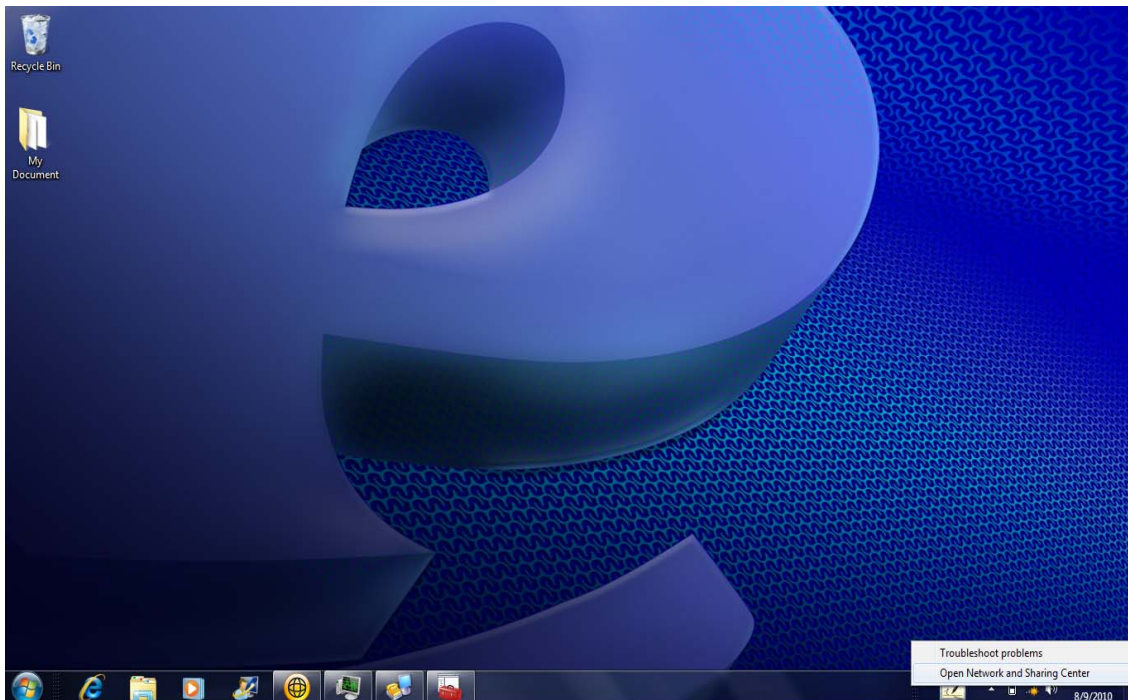
4.0 Plug the device into the USB port.

4.1 Windows will automatically begin the installation for the device.
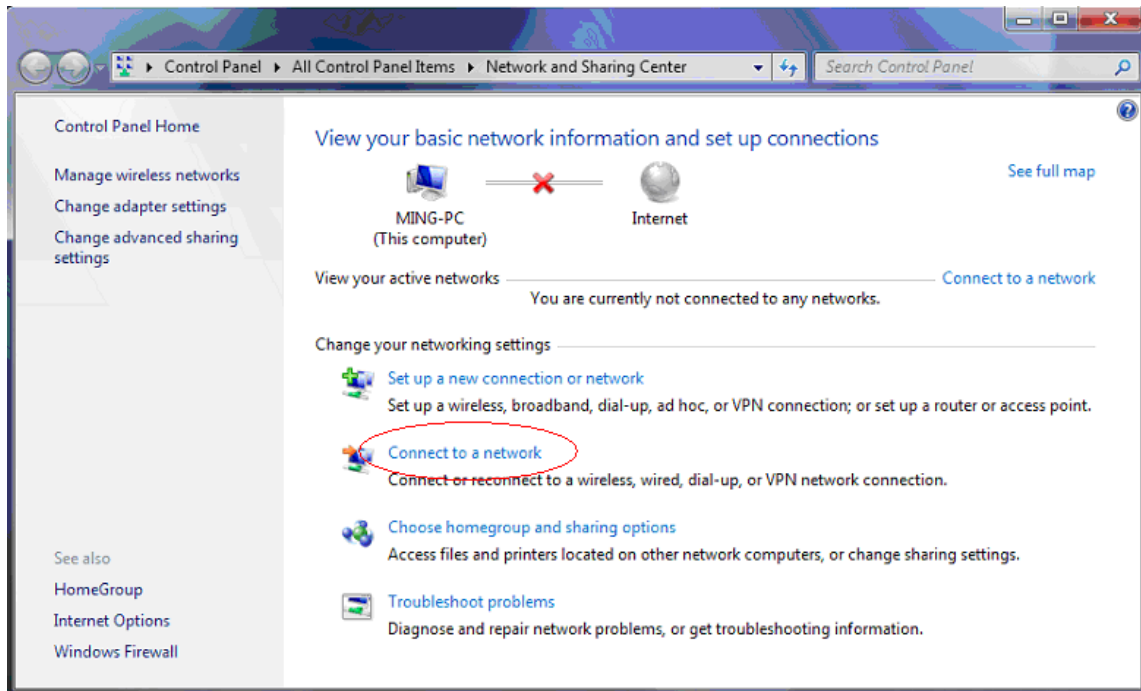

5.0 Right click the Network Connection icon on the right side of System Tray.
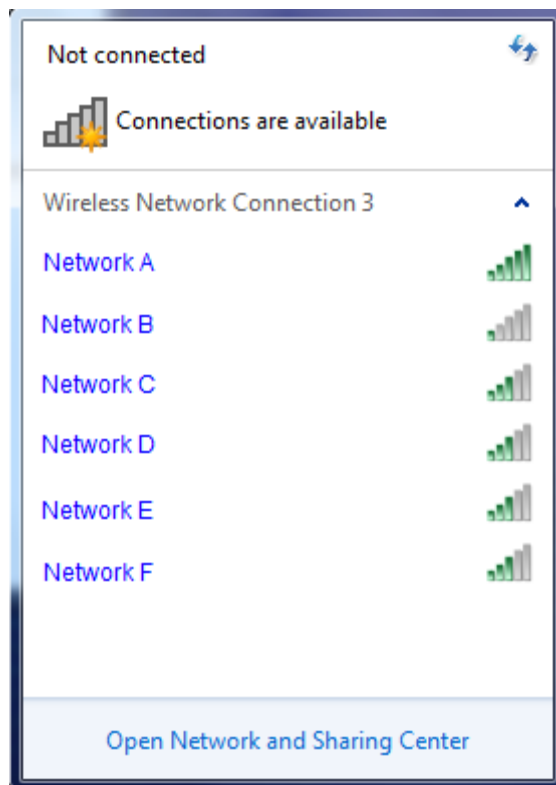

5.1 Select **Open Network and Sharing Center**.
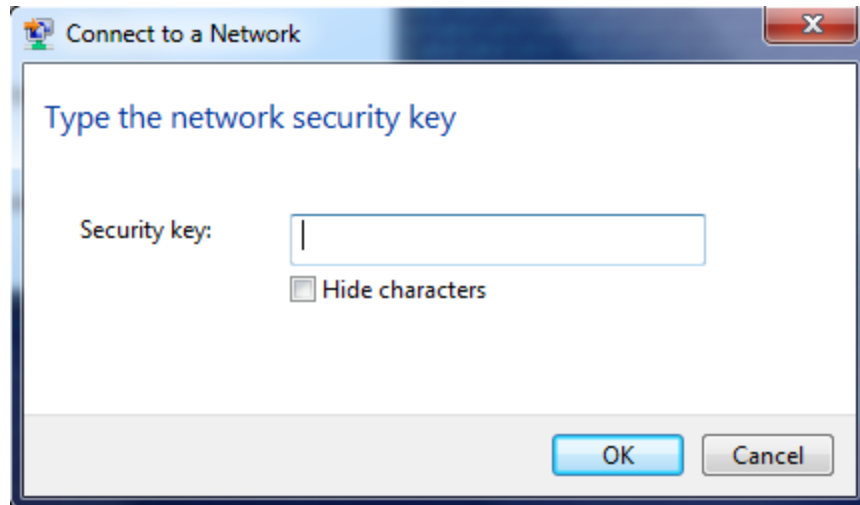
6. Click **Connect to a network**.

7. Choose a wireless network from the list and double click to connect.

8. Enter password then click OK. You are now connected to the wireless network.

Driver Installation Guide For Windows Vista

1.0 Insert the installation disc into CD-ROM.

1.1 Select **Open folder to view files**
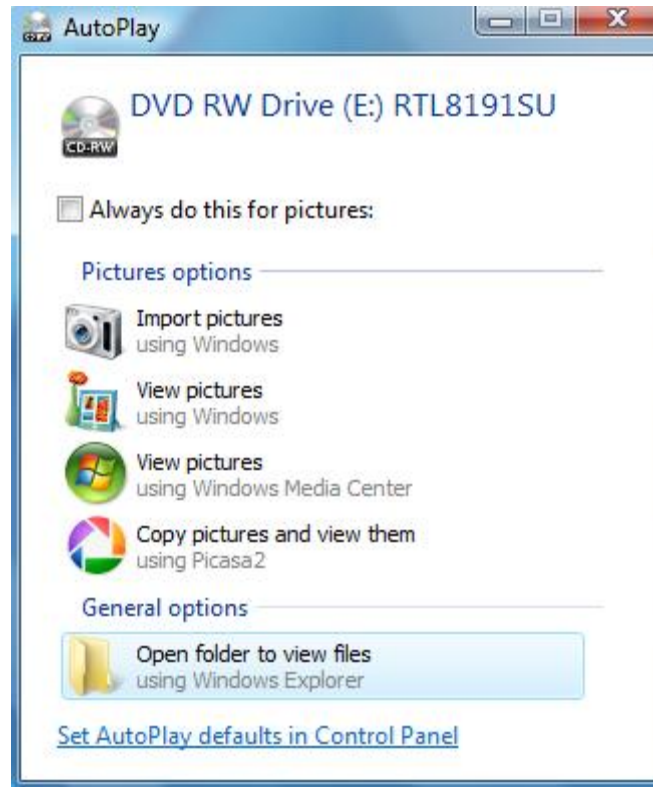
2. Double click to open **Windows** folder.
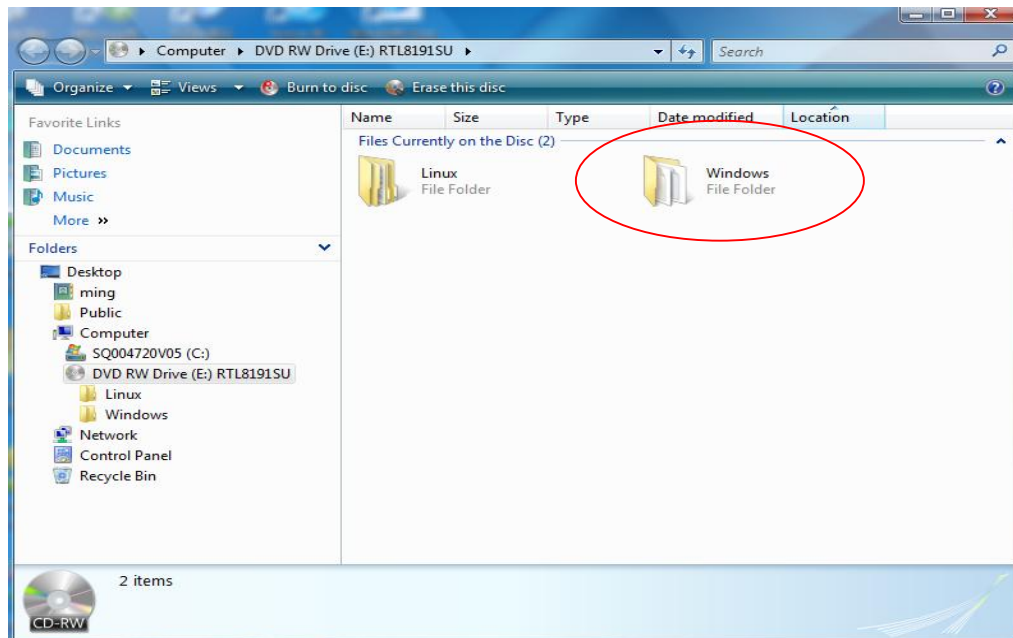
3.0 Double click **Setup** (Setup.exe) icon to run the setup application.

3.1 Windows will ask your permission to start the program. Click **Continue**.
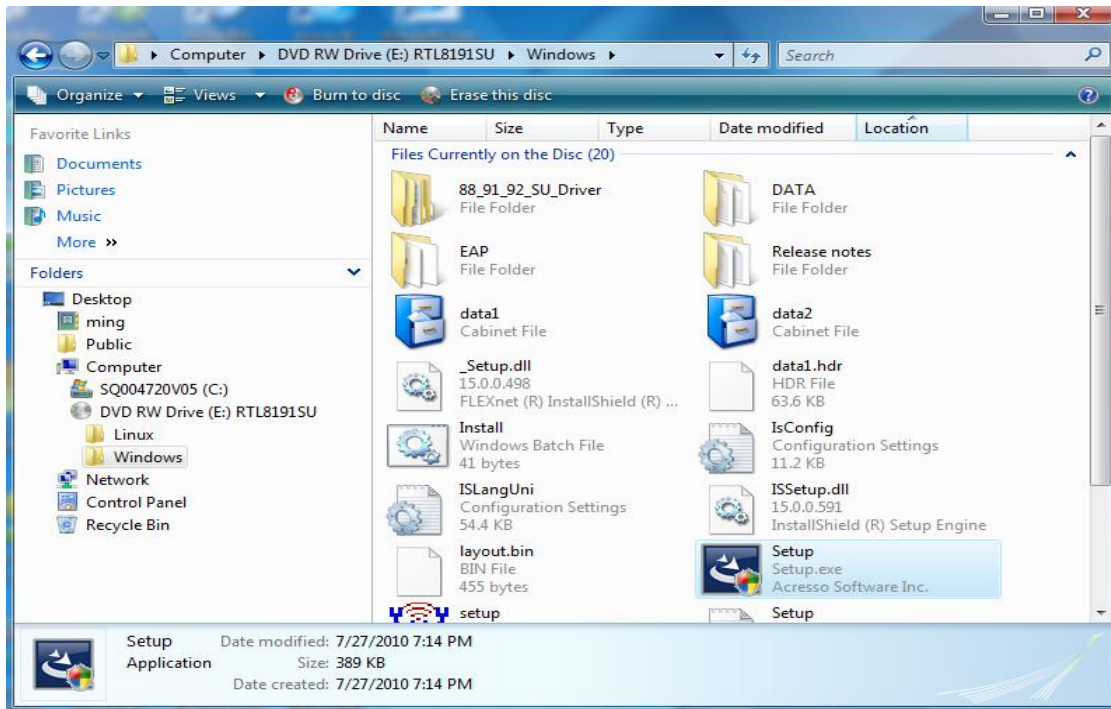
4.0 Select your language from the Choose Setup Language drop-down list.

4.1 Click **NEXT**.
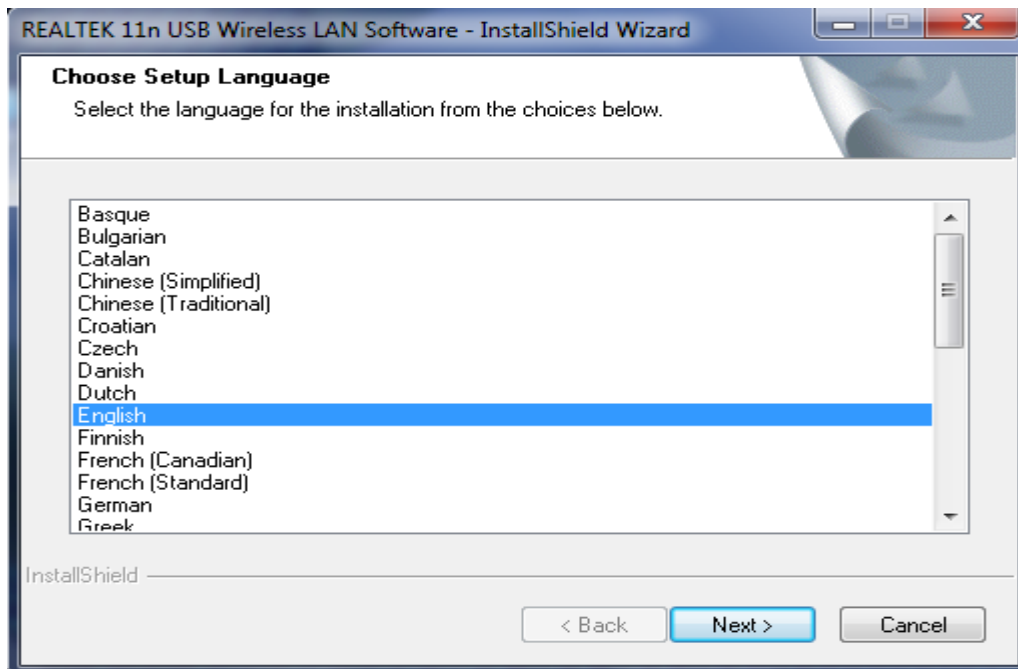
5. Click **NEXT** to continue.
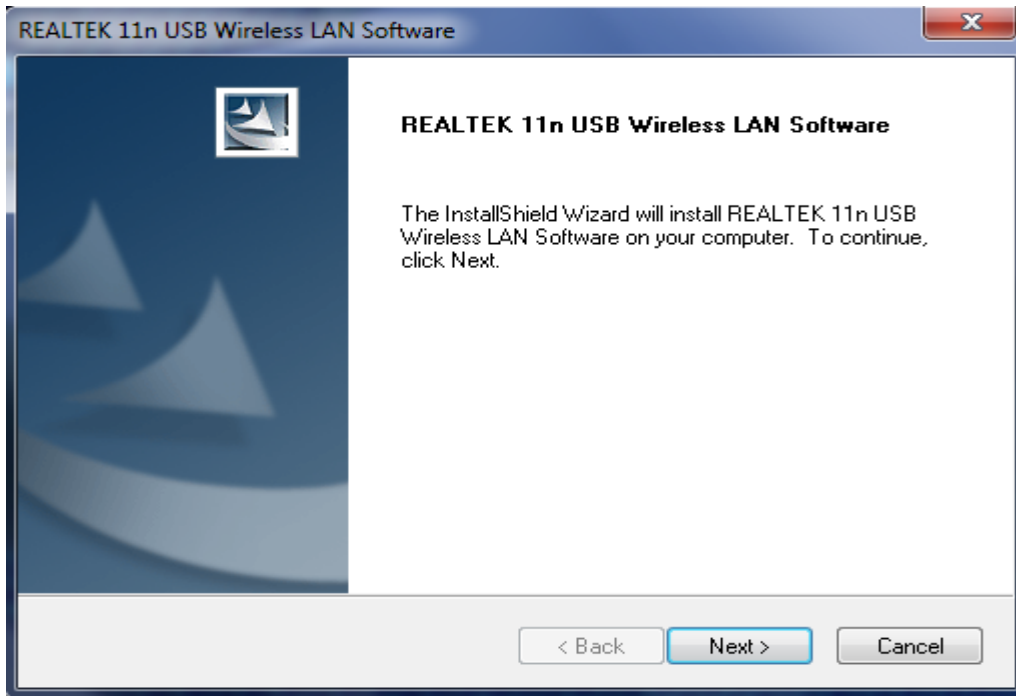
Installing…
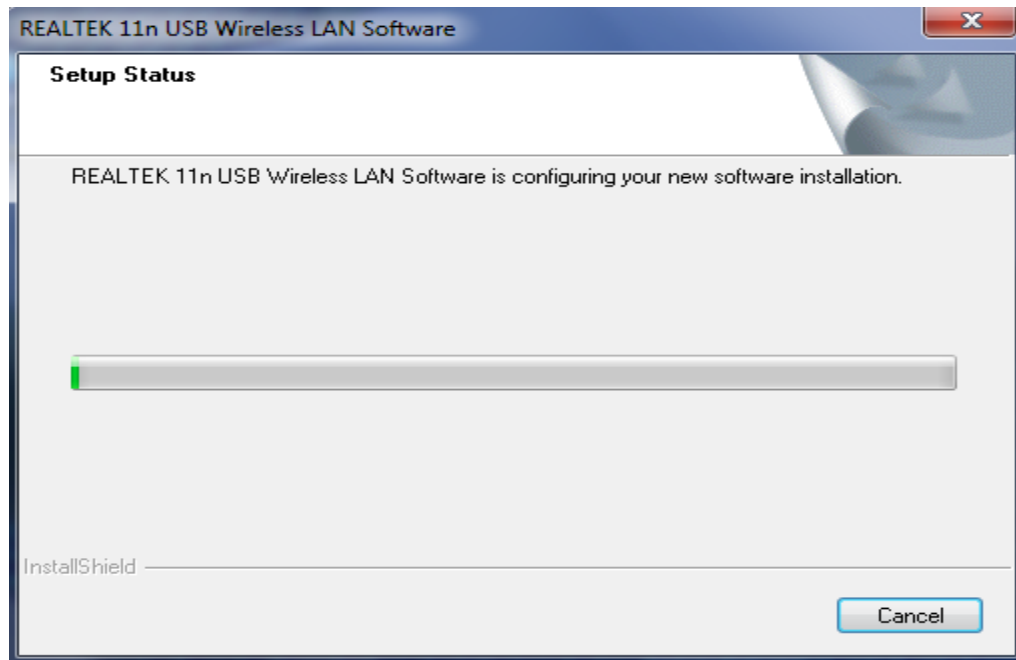
6. If the Windows Security message appears, select **Install this driver software anyway** to continue.
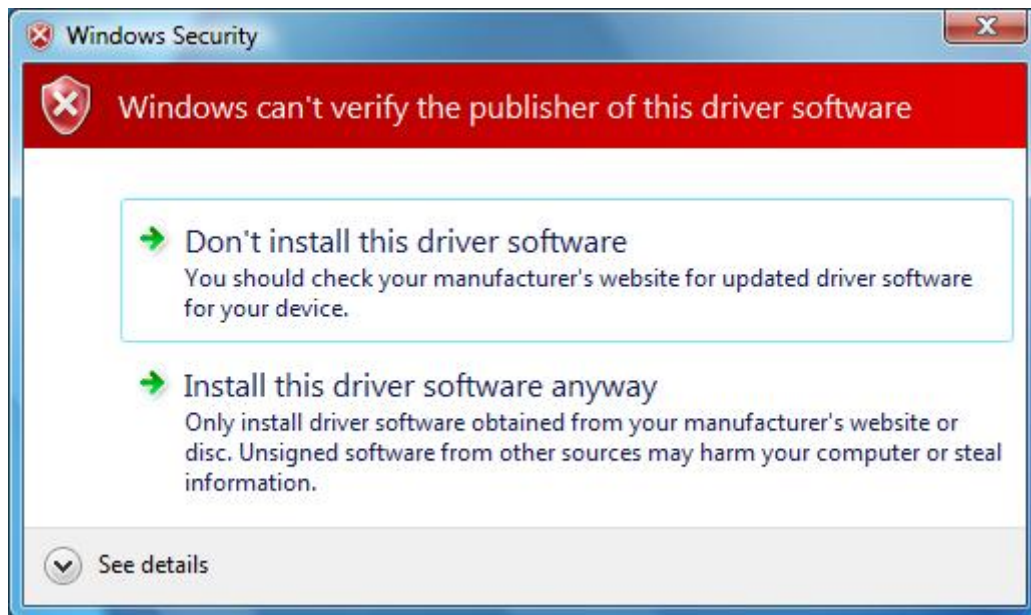
7. Click **Finish** to complete the installation.
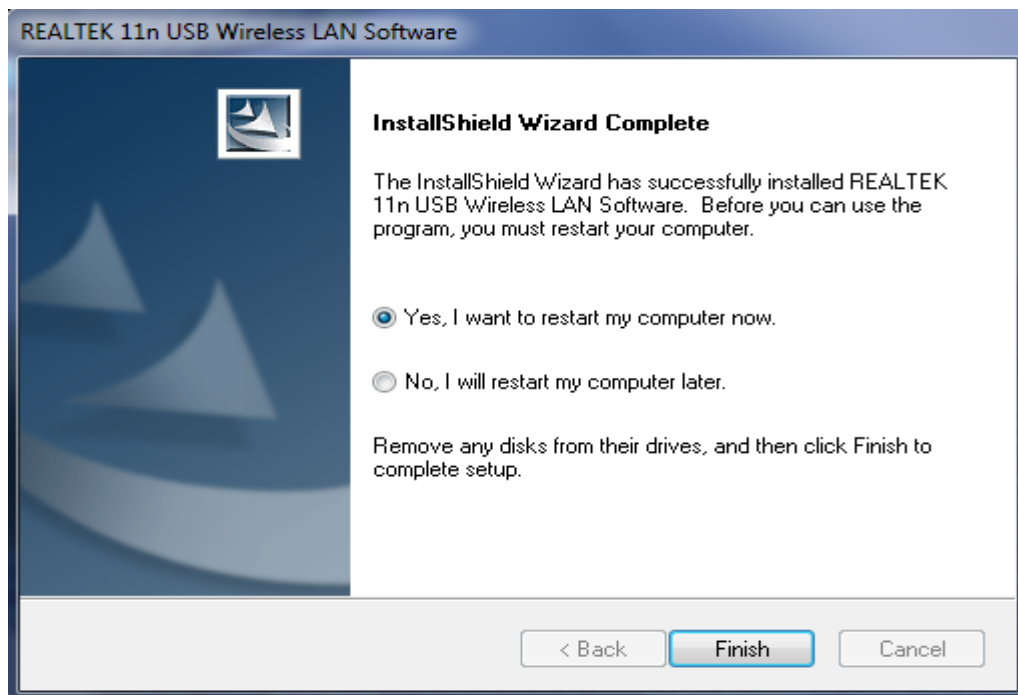
8.0 Plug the device into the USB port.

8.1 Windows will automatically begin the installation for the device.

9.0 Right click the **Network Connection** icon on the right side of System Tray.

9.1 Select **Connect to a network**.
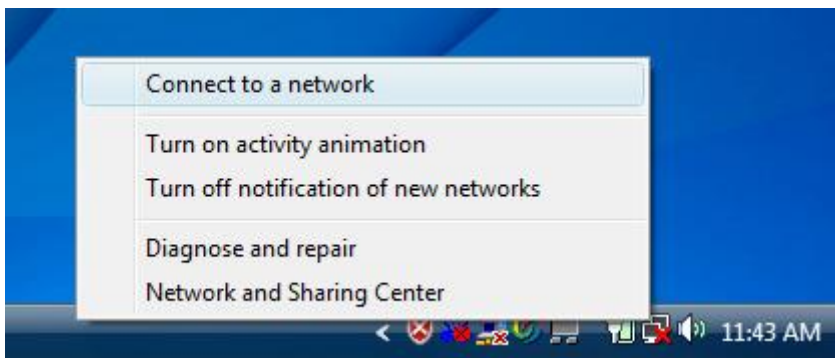
10. Choose a wireless network from the list, then click **Connect**.
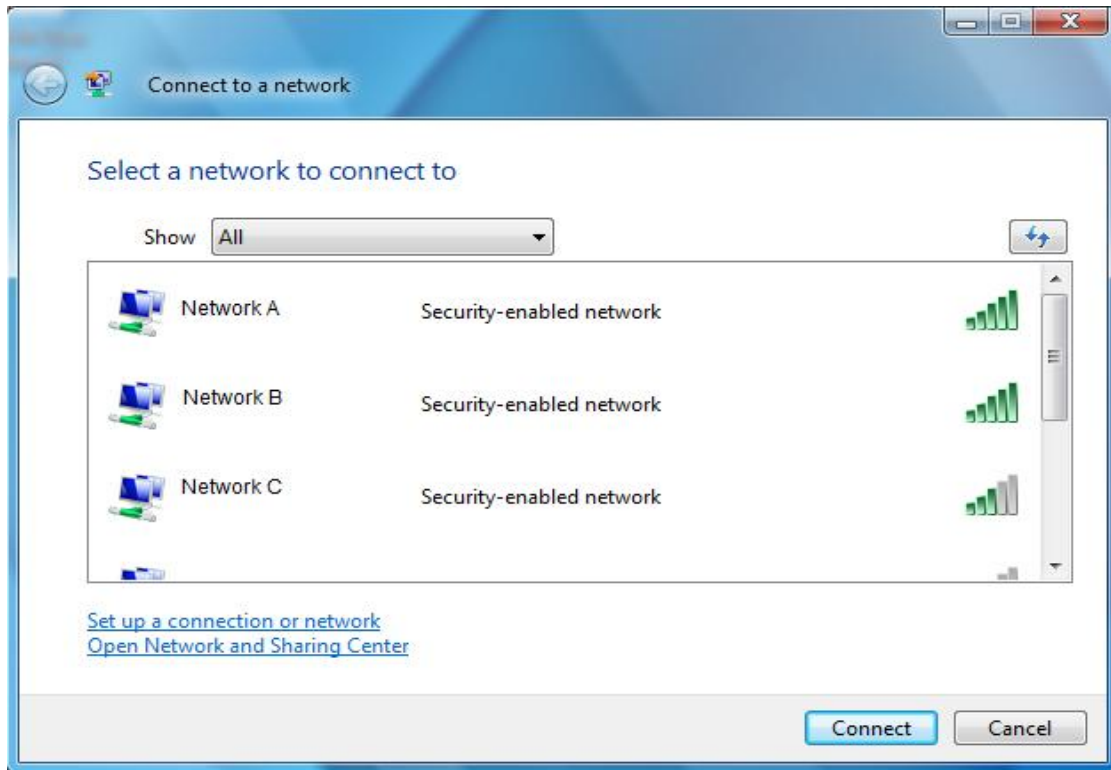
11. Enter password and click **Connect**. You are now connected to the wireless network.

WiFiHU USB Linux Driver Quick Installation Guide

Software Package & Platform requirements:
- The software package contains one WiFiHU Linux driver (source code) that supports Linux kernel version 2.6, and WiFiHU documents.
- Platform requirements: PC-based Linux platform (i386) and WiFiHU Linux driver which supports Linux kernel version 2.6.18 through 2.6.35

The following commands have been verified in Ubuntu 9.04 (Kernel version 2.6.28), Ubuntu 9.10 (Kernel version 2.6.31), Ubuntu 10.04 (Kernel version 2.6.32) and Ubuntu 10.10 (Kernel version 2.6.35).

1. Uncompress driver
>tar zxvf WiFiHU_linux_driver_021611.tar.gz

2. Change to driver directory
>cd rtl8712_8188_8191_8192SU_usb_linux_v2.6.6.0.20101111

3. Make WiFiHU USB driver module
>make

4. Clean the operation environment
>sudo ./clean

5. Insert WiFiHU module
>sudo rmmod 8712u.ko
>sudo insmod 8712u.ko

6. Use ifconfig to set up wireless LAN operation

Limited Warranty

Warranty Coverage and Duration

Radicom Research, Inc. ("RRI") warrants to the original purchaser its RRI-manufactured products ("Product") against defects in material and workmanship under normal use and service for a period of one year from the date of delivery.

During the applicable warranty period, at no charge, RRI will, at its option, either repair, replace or refund the purchase price of this Product, provided it is returned in accordance with the terms of this warranty to RRI.   Repair, at the option of RRI, may include the replacement of parts, boards or other components with functionally equivalent reconditioned or new parts, boards or other components. Replaced parts, boards or other components are warranted for the balance of the original applicable warranty period. All replaced items shall become the property of RRI.

RRI MAKES NO GUARANTEE OR WARRANTY THAT THE PRODUCT WILL PREVENT OCCURRENCES, OR THE CONSEQUENCES THEREOF, WHICH THE PRODUCT IS DESIGNED TO DETECT.

This expressed limited warranty is extended by RRI to the original end-user purchaser only, and is not assignable or transferable to any other party. This is the complete warranty for the Product manufactured by RRI, and RRI assumes no obligation or liability for additions or modifications to this warranty. In no case does RRI warrant the installation, maintenance or service of the Product.

RRI is not responsible in any way for any ancillary equipment not furnished by RRI that is attached to or used in connection with the Product, or for operation of the Product with any ancillary equipment, and all such equipment is expressly excluded from this warranty. Because of wide variations in topographical and atmospheric conditions, which may require availability of repeater stations or of particular radio frequencies, RRI assumes no liability for range, coverage or suitability of the Product for any particular application.   Buyer acknowledges that RRI does not know a particular purpose for which buyer wants the Product, and that buyer is not relying on RRI's skill and judgment to select or furnish suitable goods.

What this Warranty does NOT Cover:

(a) Defects or damage resulting from use of the Product in other than its normal and customary manner.

(b) Defects or damage from misuse, accident or neglect.

(c) Defects of damage from improper testing, operation, maintenance, installation, alteration, modification or adjustment.

(d) Disassembly or repair of the Product in such a manner as to adversely affect performance or prevent adequate inspection and testing to verify any warranty claim.

(e) Any Product that has had its serial number or date code removed or made illegible.

How to Receive Warranty Service:

To obtain warranty service, contact RRI by phone (408) 383 9006 for RMA Department or email to rma@radi.com for an RMA (Return Merchandise Authorization) number. Deliver or send the Product, transportation and insurance prepaid to RRI, with the RMA number clearly marked on the outside of the package.

General Provision

This warranty sets forth the full extent of RRI's responsibilities regarding the Product. Repair, replacement or refund of the purchase price, at RRI's option, is the exclusive remedy.

THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER EXPRESSED WARRANTIES. ANY APPLICABLE IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTY OF MERCHANTABILITY, ARE LIMITED TO THE DURATION OF THIS LIMITED WARRANTY. TO THE FULLEST EXTENT PERMITTED BY LAW, RRI DISCLAIMS ANY LIABILITY FOR DAMAGES IN EXCESS OF THE PURCHASE PRICE OF THE PRODUCT, FOR ANY LOSS OF USE, LOSS OF TIME, INCONVENIENCE, COMMERCIAL LOSS, LOST PROFITS OR SAVING OR OTHER INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE OR FAILURE OF SUCH PRODUCT.

Contacting Radicom Research

If more information or technical support is needed, please contact us:

2148 Bering Drive

San Jose, CA. 95131

Telephone: (408) 383 9006

Fax: (408) 383 9007

or
e-mail: sales@radi.com

http://www.radi.com/

For IC

3.2.1 Labelling Requirements for the Host device. The host device shall be properly labelled to identify the modules within the host device. The Industry Canada certification label of a module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labelled to display the Industry Canada certification number of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as follows: Contains transmitter module IC: 2377A-WIFIHUA and 2377A-WIFIHUC2NE where 2377A-WIFIHUA and 2377A-WIFIHUC2NE are the module's certification number. The applicant for equipment certification of the module shall provide with each unit of the module either a label such as described above, or an explanation and instructions to the user as to the host device labelling requirements.

For FCC

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.   For laptop installations, the antenna must be installed to ensure that the proper spacing is maintained in the event the users places the device in their lap during use (i.e. positioning of antennas must be placed in the upper portion of the LCD panel only to ensure 20 cm will be maintained if the user places the device in their lap for use) and

2) The transmitter module may not be co-located with any other transmitter or antenna.
As long as the 2 conditions above are met, further transmitter testing 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.

<div align="center">End Product Labeling</div>

This transmitter module is authorized only for use in devices where the antenna may be installed such that 20 cm may be maintained between the antenna and users (for example access points, routers, wireless ASDL modems, certain laptop configurations, and similar equipment).   The final end product must be labeled in a visible area with the following: "Contains TX FCC ID: K7T-WIFIHU-A and K7T-WIFIHU-C-2-NE".

<div align="center">RF Exposure Manual Information That Must be Included</div>

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."

<div align="center">Additional Information That Must be Provided to OEM Integrators</div>

The end user should NOT be provided any instructions on how to remove or install the device.