Radicom Research, Inc.

Designers Guide for the

WiFiHU-NE and WiFiHU

RoHS Compliant

USB WiFi Modules

February 13, 2014

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Introduction

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 and increased performance when using dual antennas
- 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
- 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)

Approvals

- FCC Part 15: FCC OET 65 Supplement C (SAR), 47 CFR FCC Part 15 Subpart C 15.247, 47 CFR FCC Part 15 Subpart B 2009 (Class B)
- IC RSS-102, IC ES-003 issue 4, IC RSS-210 issue 8:2010
- RoHS Compliant
- CE Marked: EN 61000-3-2:2006+A2:2009, EN 300 328 V1.7.1, EN 62311: 2008, EN 301 489-1 V1.9.2, EN301 489-17 V2.1.1, EN 61000-3-3:2008, EN 60950-1:2006+A11:2009+A1: 2010+A12:2011

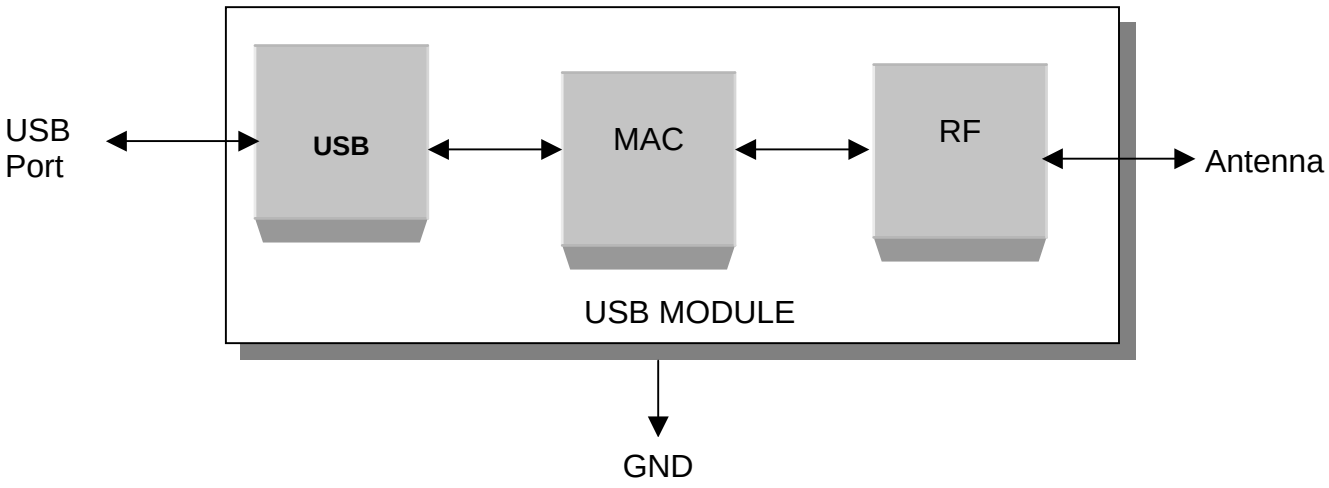
Support

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

Ratings

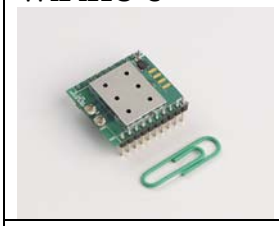
Parameter	Min	Typical	Max	Units
Maximum Data Rate			300M	bps
Operating Temperature HU	-40°		+85°	°C
Relative Humidity (non-condensing)	5 %		95	%
USB Power		5V ± 10%		
Current Consumption	152	155	162	mA
Transmit & Receive Level	-84(Rx)		+17 (Tx)	dBm

Block Diagram

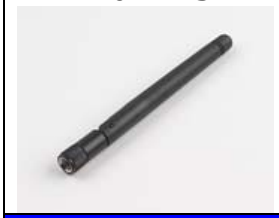


Model and Ordering Information

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 many 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-c * 	**WiFi USB Module with two SMD Connectors for attaching antenna cables and 2.4GHz 2 dBi Omni-directional antennas**	**Allows designer to determine USB Jack and antenna placement. Can use one or two cables and antennas**
WiFiHU-c-1-NE* 	**WiFiHU-c installed in WiFiHU-CB1 Carrier Board with on board USB Jack.**	**Complete WiFi Module for 2 cables and 2 antennas with USB Jack interface.**

***These models can use either one or two cables and antennas. For ultimate performance, we recommend using two antennas to meet MIMO requirement with better adaptability for receiving. If only one antenna is used it MUST be connected to the SMD antenna connector located closest to the metal shield on the top of the WiFiHU module.**

Model	Description	Comments
WiMDK-1001 	**Complete WiFiHU development kits including WiFiHU module installed in Carrier Board with USB jack interface. All kits include 6ft USB cable, and CD with Designers Guide and Drivers. Antennas and Cables are also provided for external antenna models.**	**WiMDK-1001-a Kit for Model WiFiHU-a-1-NE** **WiMDK-1001-c Kit for Model WiFiHU-c-1-NE**
AC6i-RP-SMA 	**6" U.FL. to RP-SMA female connector antenna cable**	**Antenna Cable for models WiFiHU-c and WiFiHU-c-1-NE**
ATN-2d-RP-SMA 	**Replacement antenna, 2.4GHz, 2dBi, RP-SMA, Omni-directional.**	**Antenna for models WiFiHU-c and WiFiHU-c-1-NE**

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.

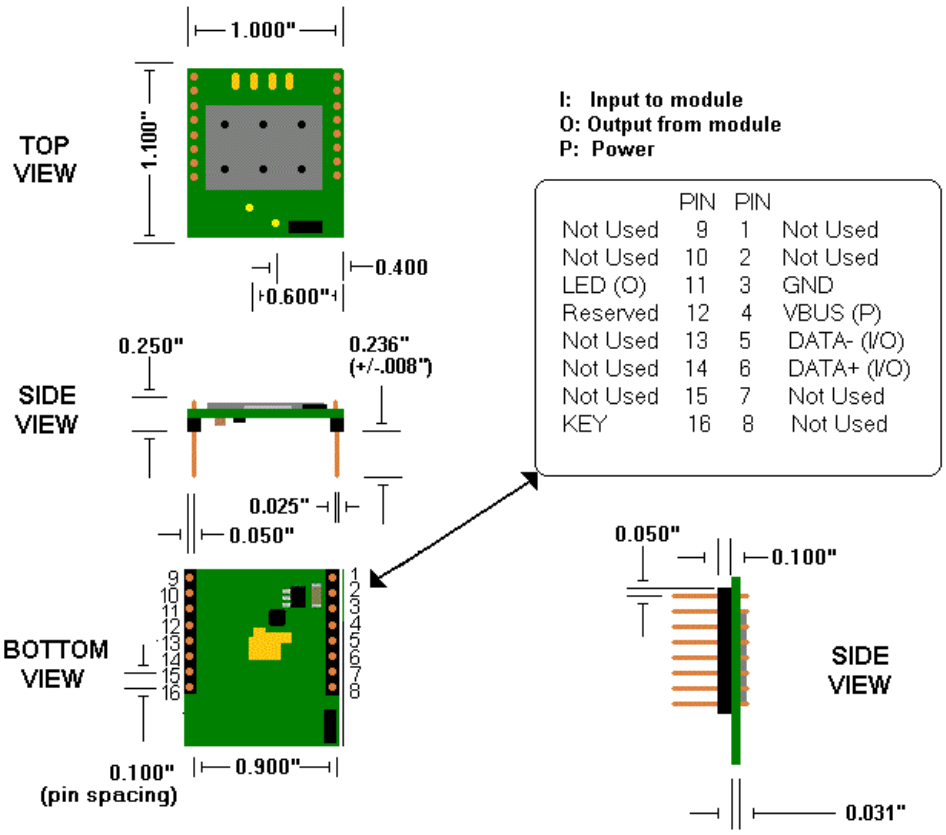
If you plan to embed the WiFiHU into your system, the initial evaluation consists of the WiFiHU USB Module mounted onto a USB hub PCB (WiFiHU-NE). To remove the WiFiHU carefully remove it from the two 8 pin headers on the WiFiHU-NE USB interface board. Save this interface board. The WiFiHU can always 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. For ultimate performance, we recommend using two antennas to meet MIMO requirement with better adaptability for receiving. If only one antenna is used, it MUST be connected to the SMD antenna connector located closest to the metal shield on the top of the WiFiHU module.

To maintain compliance, make sure that you follow all of the requirements described in the compliance section of this document.

Mechanical Specification and Pin Orientation for the WiFiHU

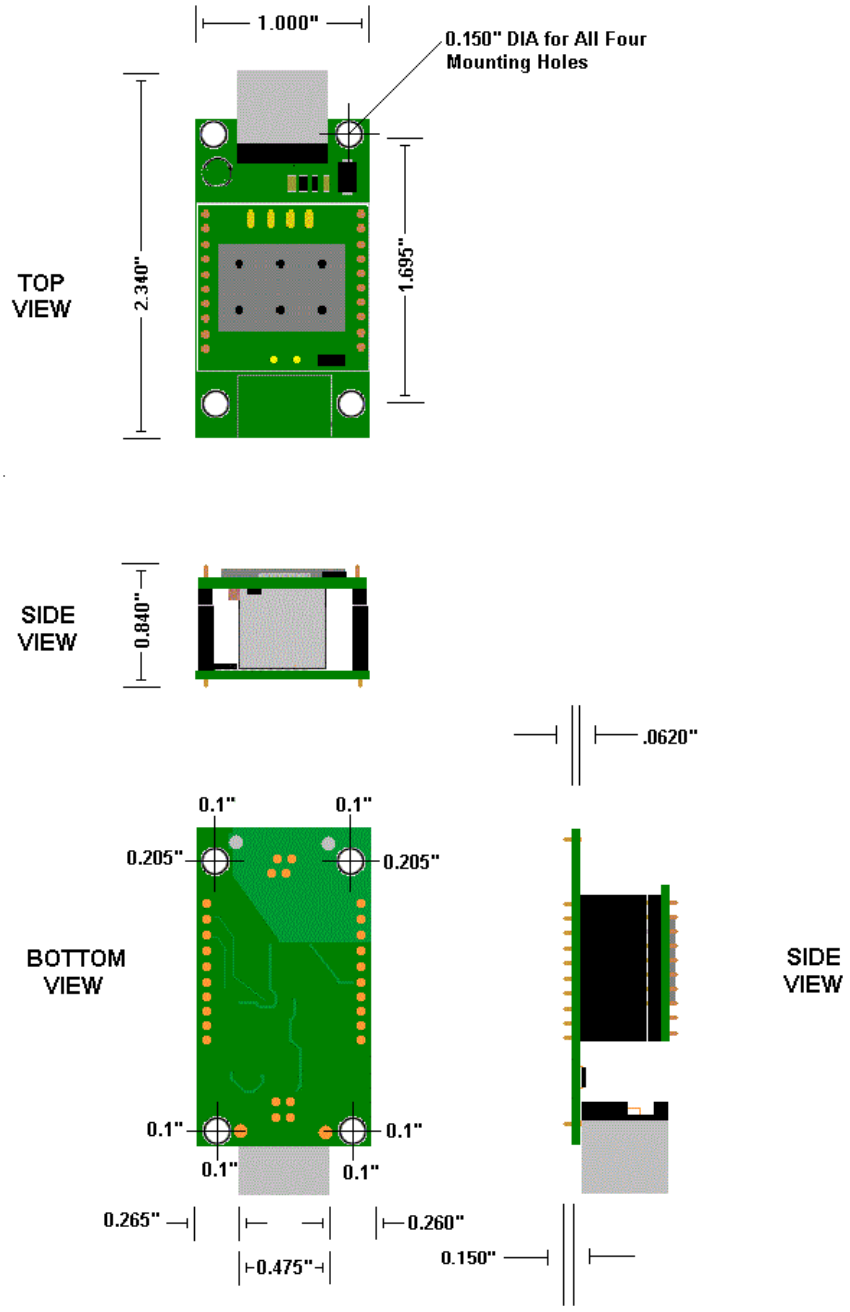
The WiFiHU USB Half Inch Modules are designed for easy connection to any standard USB interface and wireless network. The connection is made through two 8-pin headers, which may be attached to your device via a socket or by individually hardwiring each pin.



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-108-21-G-S (RoHS Thru-Hole)
   Samtec P/N. #SSW-108-22-G-S-VS (RoHS SMT)
4. Square pins – 0.025 x 0.025 inch

Mechanical Specification for the WiFiHU-c-1-NE and WiFiHU-a-1-NE



WiFiHU USB Interface Pins

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

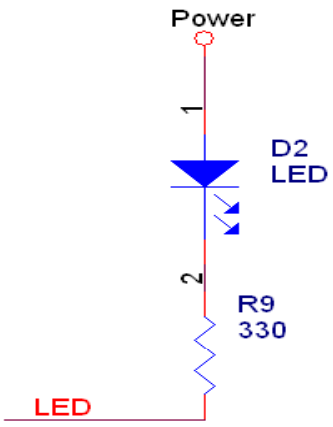
PIN Number	Name	Type
1	Not Used	
2	Not Used	
3	GND	Ground
4	VBUS	USB Power (5V ± 10%)
5	DATA-	Input / Output
6	DATA+	Input / Output
7	Not Used	
8	Not Used	
9	Not Used	
10	Not Used	
11	LED (O)	Connection Established
12	Reserved	
13	Not Used	
14	Not Used	
15	Not Used	
16	Key	No Pin

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** – USB Power Connection. Connect this pin to VBUS (5V ± 10%)	
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** - Connection Established	
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.**

LED Connection



FCC, IC, and CE Label Location and Module Model Identification

The WiFiHU module family is FCC Part 15 and IC (Industry Canada) certified. The WiFiHU2 is also CE marked. The modules are labeled with the WiFiHU module model number and FCC Part 15 ID, IC registration number and CE mark. The label can be found on top of the metal shielding on the WiFiHU Module.

Radicom Research Inc.
Model: WiFiHU-c
FCC ID: K7T-WIFIHU-A
IC: 2377A-WIFIHUA

Radicom Research Inc.
Model: WiFiHU-a-1-NE
FCC ID: K7T-WIFIHU-A
IC: 2377A-WIFIHUA

Radicom Research Inc.
Model: WiFiHU-c-1-NE
FCC ID: K7T-WIFIHU-A
IC: 2377A-WIFIHUA

Radicom Research Inc.
Model: WiFiHU-a
FCC ID: K7T-WIFIHU-A
IC: 2377A-WIFIHUA

Important Regulatory Compliance and User Information

The final product with the modules installed needs to be tested for FCC Part 15, IC (Industry Canada) and CE EMI/RFI compliance. Radicom certification documentation will help streamline the final product approval process. Contact Radicom for more information. To maintain compliance in the finished product, carefully follow guidelines in this section.

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.

2) The transmitter module may not be co-located with any other transmitter or antenna. As long as the two 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 the module installed (for example, digital device emissions, PC peripheral requirements, etc).

3) To comply with ESD requirements, exposure of metal parts of the WiFiHU module to open air is prohibited.

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.

Host (End Product) Labeling Requirements

To maintain compliance, the end product hosting the WiFiHU module must be properly labeled to identify that this module is installed. This transmitter module is authorized only when used in devices where the antenna is installed such that 20 cm is maintained between the antenna and users. The final end product must have a label located in a visible area with the following information:

Contains Transmitter Module
Model: WiFiHU-a
FCC ID: K7T-WIFIHU-A
IC: 2377A-WIFIHUA

CE

Models: **WiFiHU-a, WiFiHU-c, WiFiHU-a-1-NE, WiFiHU-c-1-NE:**

FCC ID: K7T-WIFIHU-A
IC: 2377A-WIFIHUA

The label shall be securely affixed to a permanently attached part of the device, in a location where it is visible or easily accessible to the user, and shall not be readily detachable. The label shall be sufficiently durable to remain fully legible and intact on the device in all normal conditions of use throughout the device's expected lifetime. These requirements may be met either by a separate label or nameplate permanently attached to the device or by permanently imprinting or impressing the label directly onto the device. The label text shall be legible without the aid of magnification, but is not required to be larger than 8-point font size.

End User Information

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. The end user should NOT be provided any instructions on how to remove or install the device. The users manual for end users must include the following information in a prominent location.

FCC RF Radiation Exposure Statement

IMPORTANT NOTE: To comply with the FCC RF exposure compliance requirements, the antenna used on this transmitter must be installed to provide a separation of at least 20 cm from all persons and must not be co-located or operating in conjunction with any antenna or transmitter. This device contains a low power transmitter. When this device is operational, use only with the supplied, or recommended antenna. Unauthorized antenna, modification, or attachments could damage the transmitter and may violate FCC regulations. Changes or modifications not expressly approved by the manufacturer or party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

(1) This device may not cause harmful interference
(2) This device must accept any interference received, including interference that may cause undesired operation.

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.

IC (Industry Canada) Statement:

"This device complies with Industry Canada license-exempt RSS standard(s). 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"

Le present appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de license. L'exploitation est autorisee aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit acceptor tout brouillage radioelectrique subi, meme si le brouillage est susceptible d'en compromettre le fonctionnement.

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-a, WiFiHU-c, WiFiHU-a-1-NE, and WiFiHU-c-1-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 61000-3-2:2006+A2:2009, EN 300 328 V1.7.1, EN 62311: 2008,
EN 301 489-1 V1.9.2, EN301 489-17 V2.1.1, EN 61000-3-3:2008,
EN 60950-1:2006+A11:2009+A1: 2010+A12:2011

This equipment is marked with the CE and can be used throughout the European community.

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.

WiFiHU Regulatory Domain Frequencies

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

Model: WiFiHU2 Family	Frequency (MHZ)	Regulatory Domains					
		Japan	ETSI	North America	Israel	France Outdoor	Mexico
1	2412	v	v	v		v	
2	2417	v	v	v		v	
3	2422	v	v	v	v	v	
4	2427	v	v	v	v	v	
5	2432	v	v	v	v	v	
6	2437	v	v	v	v	v	
7	2442	v	v	v	v	v	
8	2447	v	v	v	v	v	
9	2452	v	v	v	v	v	
10	2457	v	v	v			v
11	2462	v	v	v			v
12	2467	v	v				
13	2472	v	v				
14	2484	v					

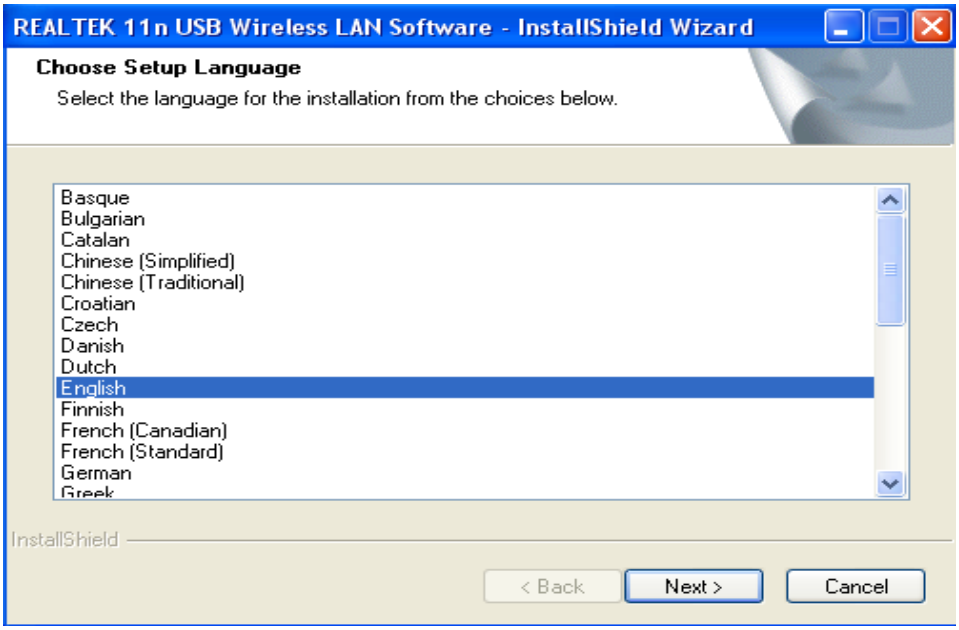
Driver Installation Guide For Windows XP/2K

Do NOT plug the WiFiHU module in until after the PC reboots!

1.0 Insert the installation disc into CD-ROM. Open the Drivers Folder. Open the Windows folder. Select “Setup.exe” file.

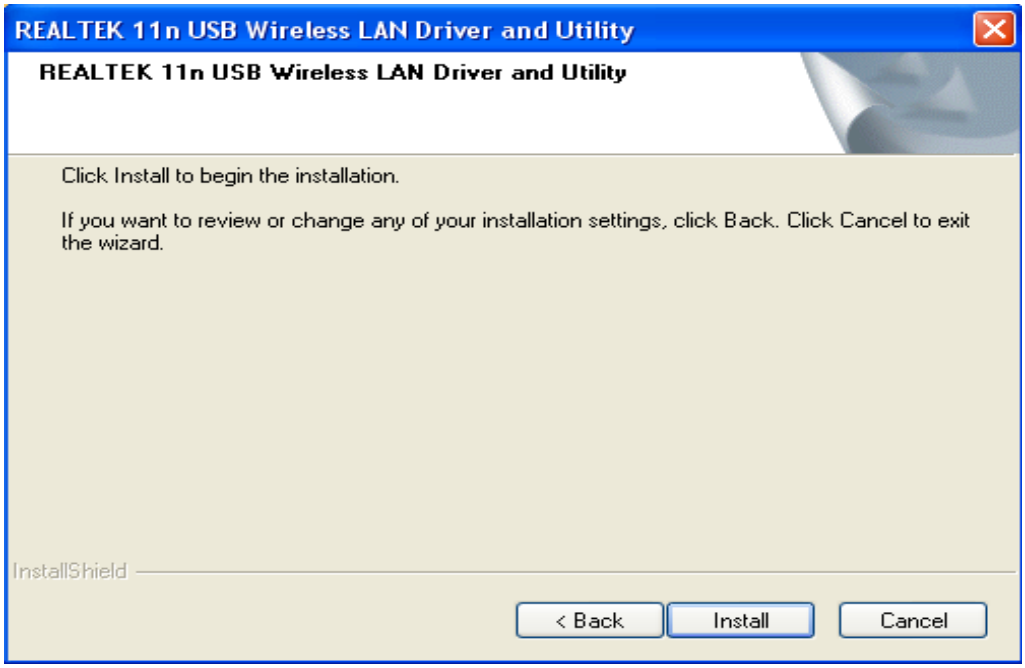
1.1 Select your language from the Choose Setup Language drop-down list.

1.2 Click **NEXT**.

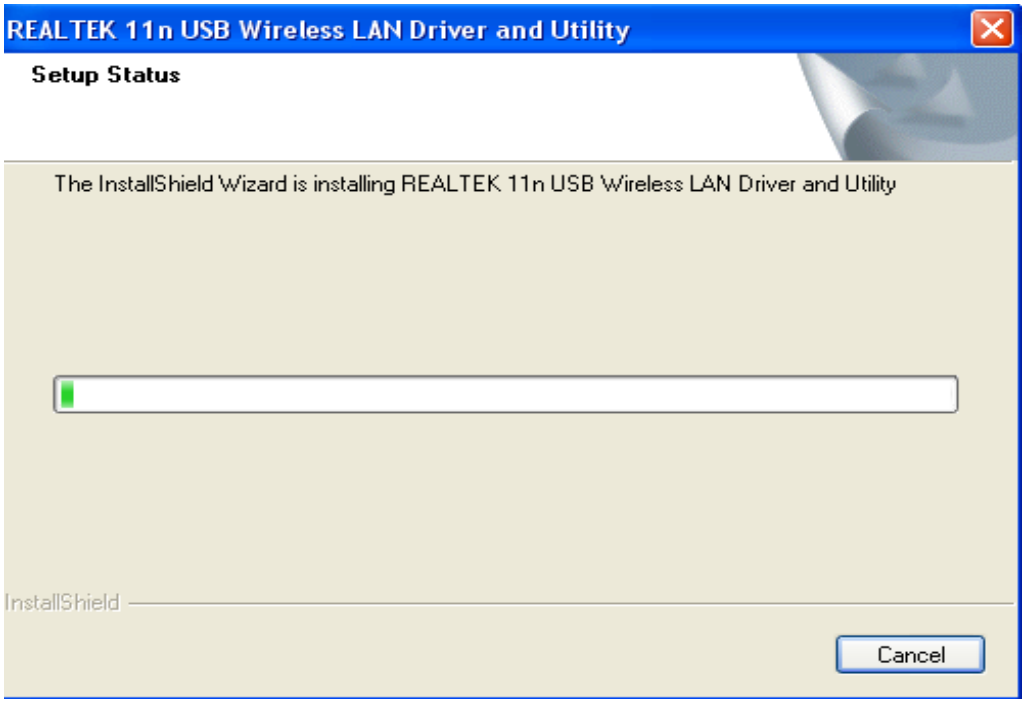


2. Click **NEXT** to continue.

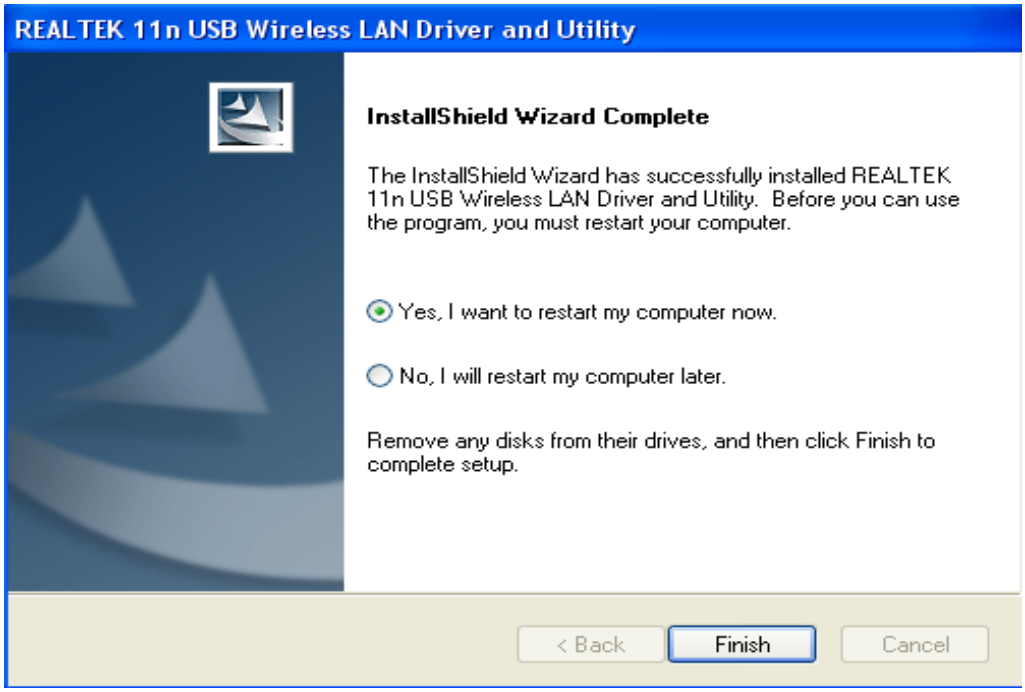
3. Click **Install** to begin the installation.



Installing…



4. Click **Finish** to complete the installation. You may be prompted that this software has not passed Windows Logo testing, Click "Continue Anyway" to continue.

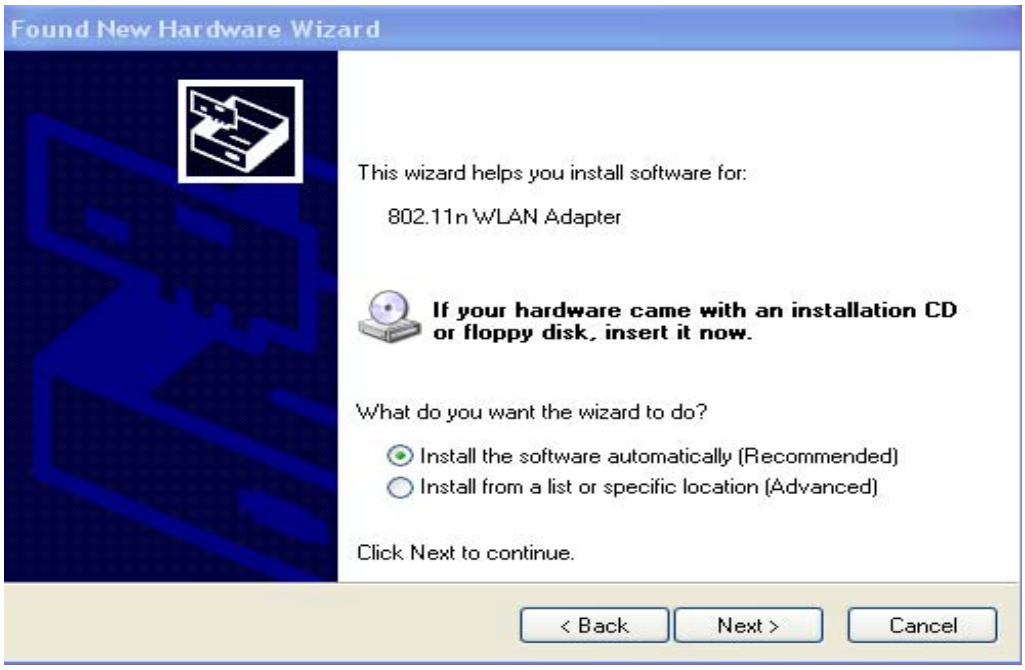


5.0 Windows will now automatically restart you computer. **After the computer reboots, Plug the WiFiHU into an available USB Port.**

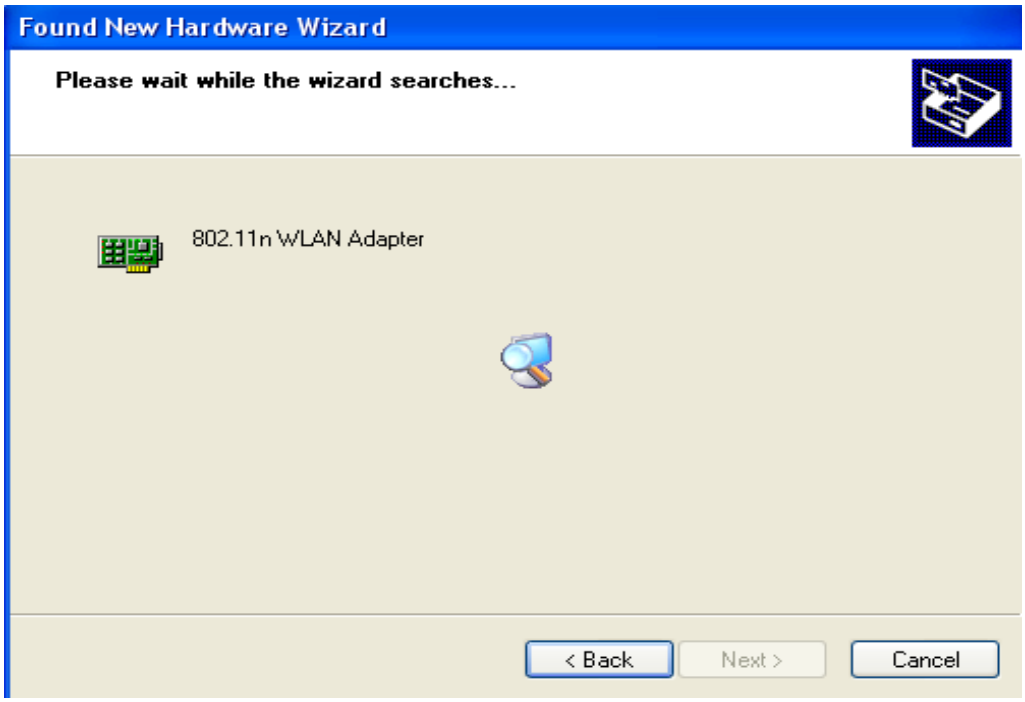
5.1 Windows will automatically begin the installation for the device.

5.2 Select "Yes, this time only" and then Click **NEXT**.

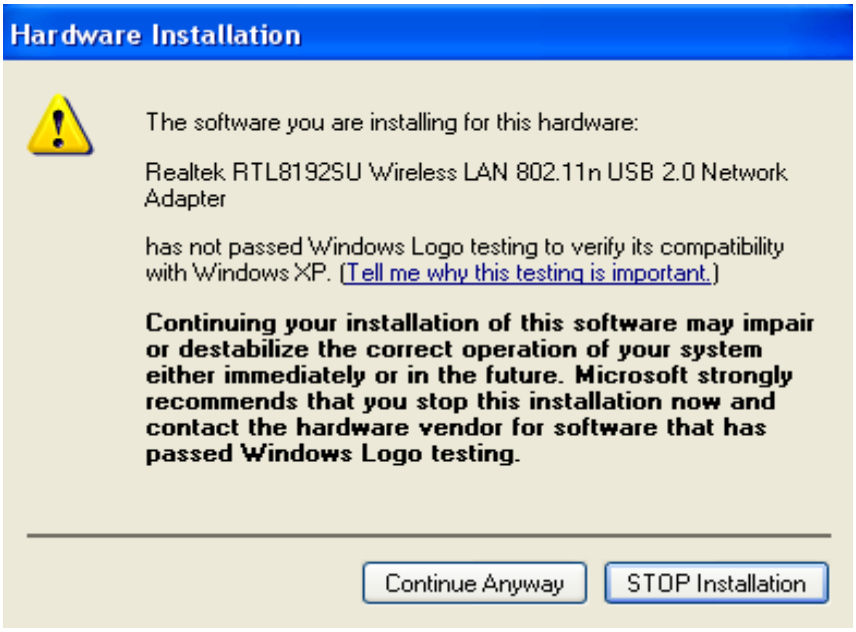
6. Click **NEXT** to begin the installation.



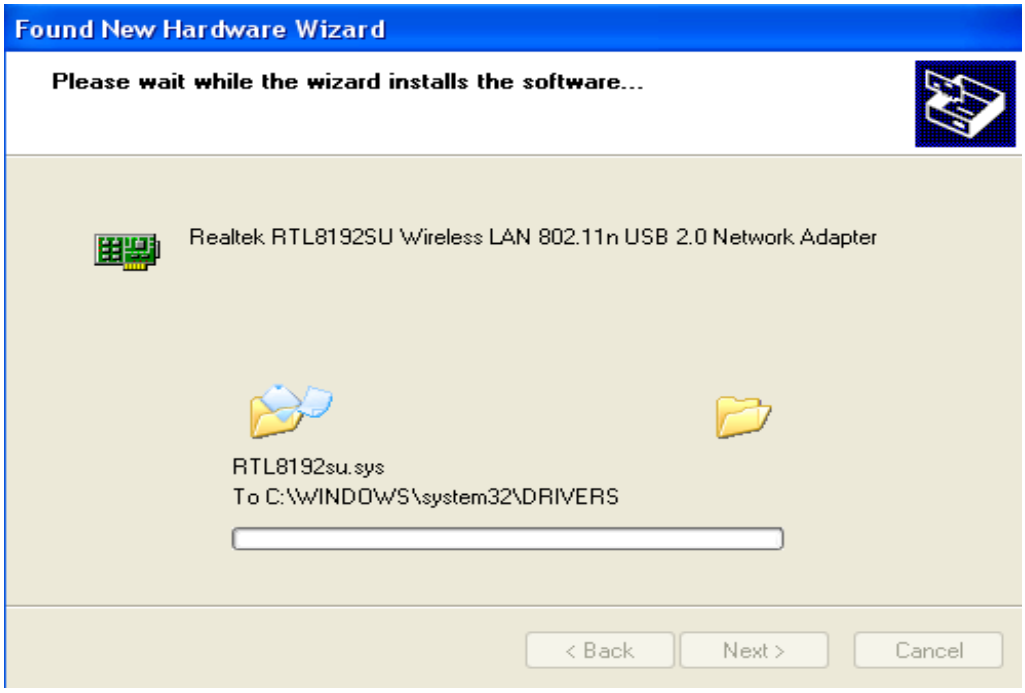
7. Windows will search for the software for the device.



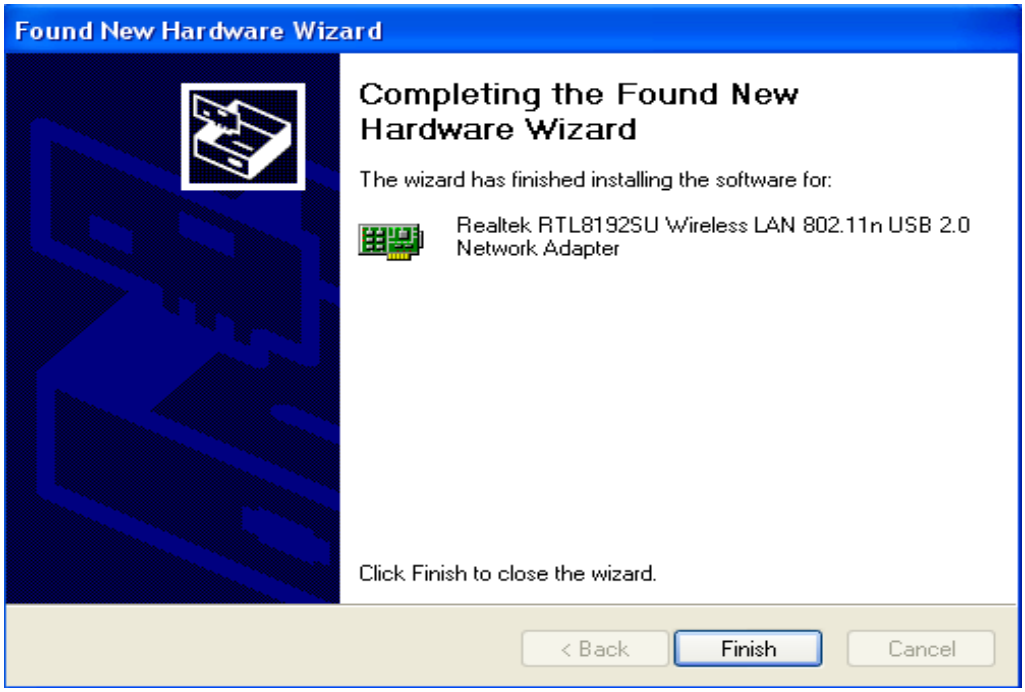
8. If this screen is displayed anytime during the installation process, Click **Continue Anyway**.



Installing…



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

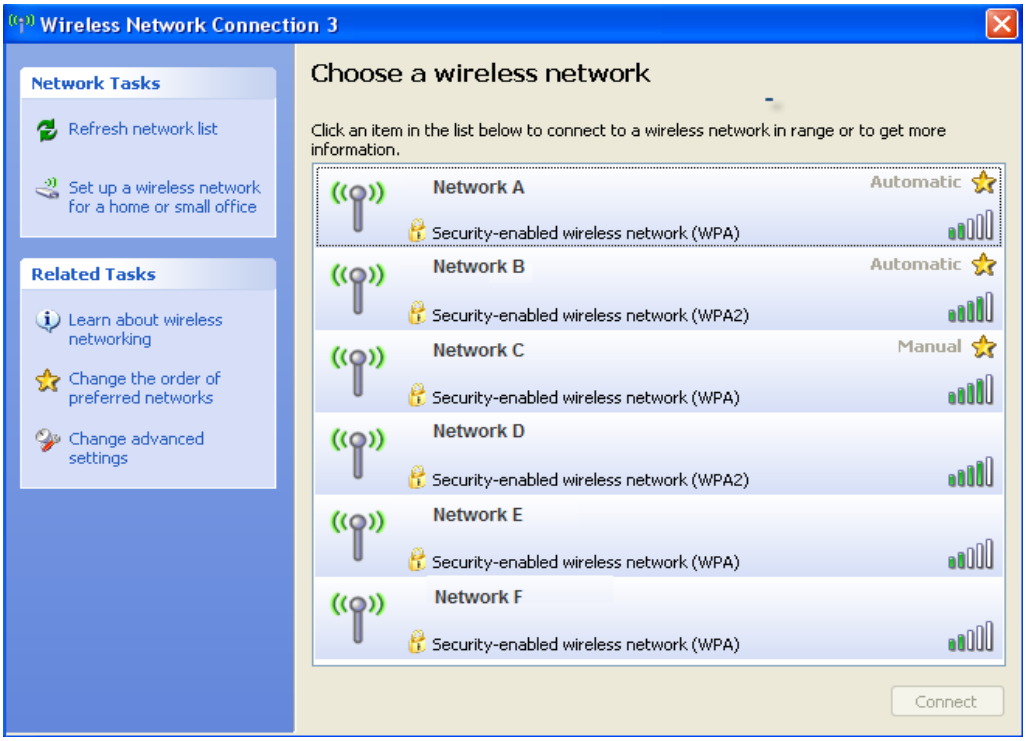


One of the WiFiHU LEDs will now be flashing.

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

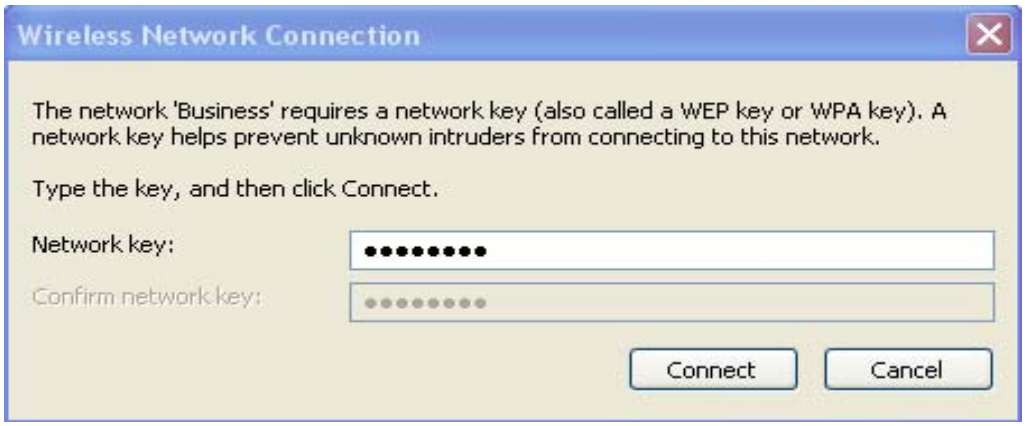
10.1 Select **View Available Wireless Networks**.

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

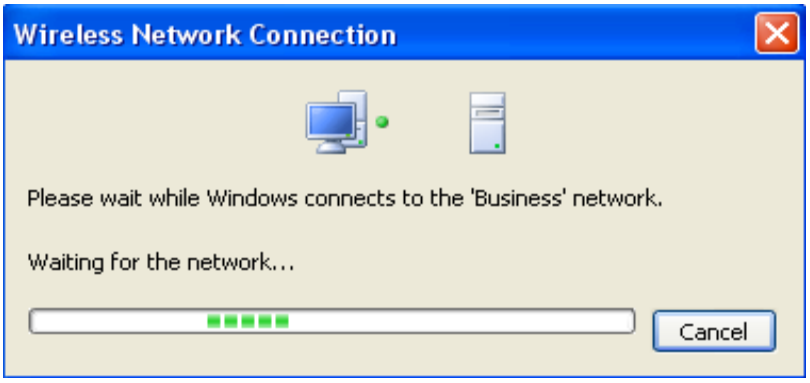


12.0 The network will require a password.

12.1 Enter the password network key, then confirm the network key. Click **Connect**.

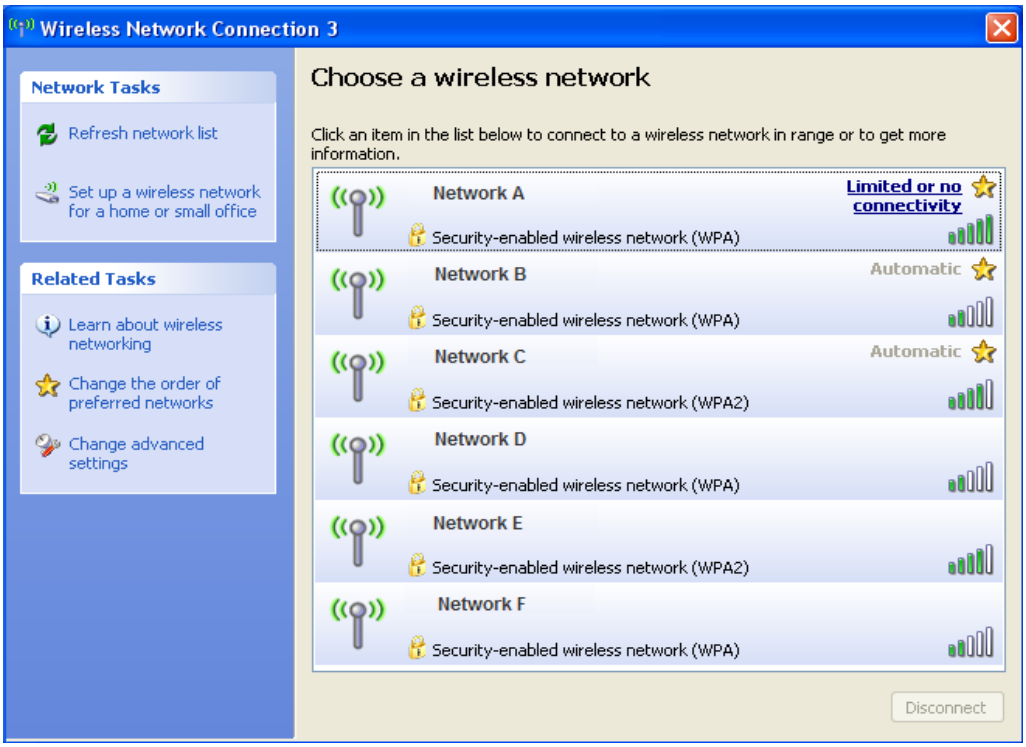


Connecting…

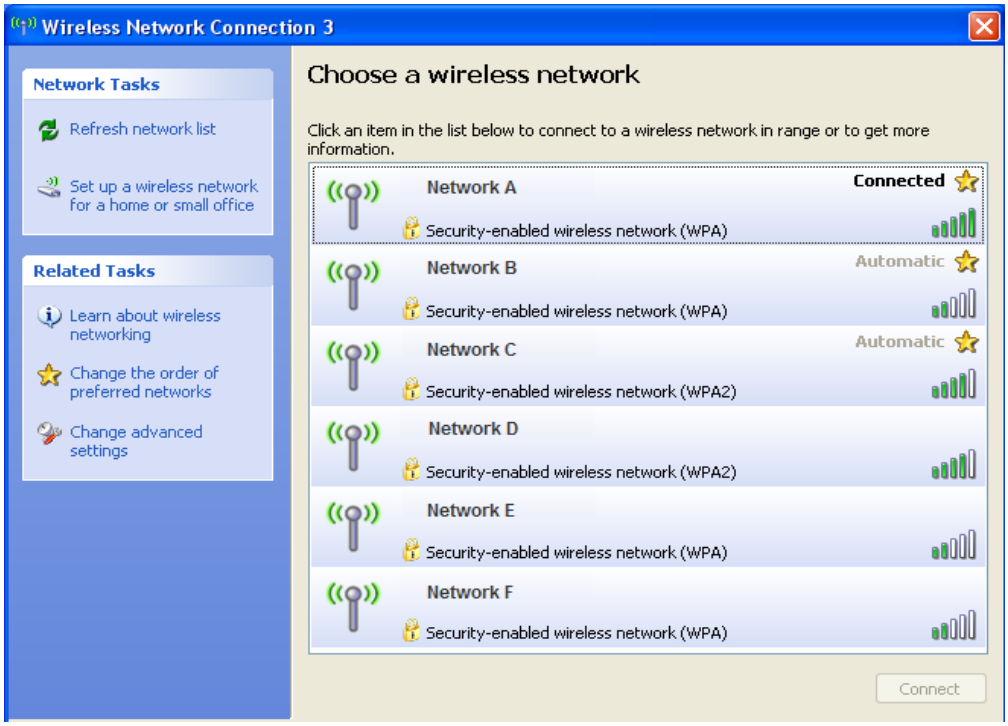


13.0 Network will appear as “Automatic” if the password entered is incorrect.

13.1 Network will appear as “Limited or no connectivity” if the password is correct but the IP address is incorrect.



14.0 You are now connected to the wireless network. One of the LEDs will be solid and the other will be flashing.

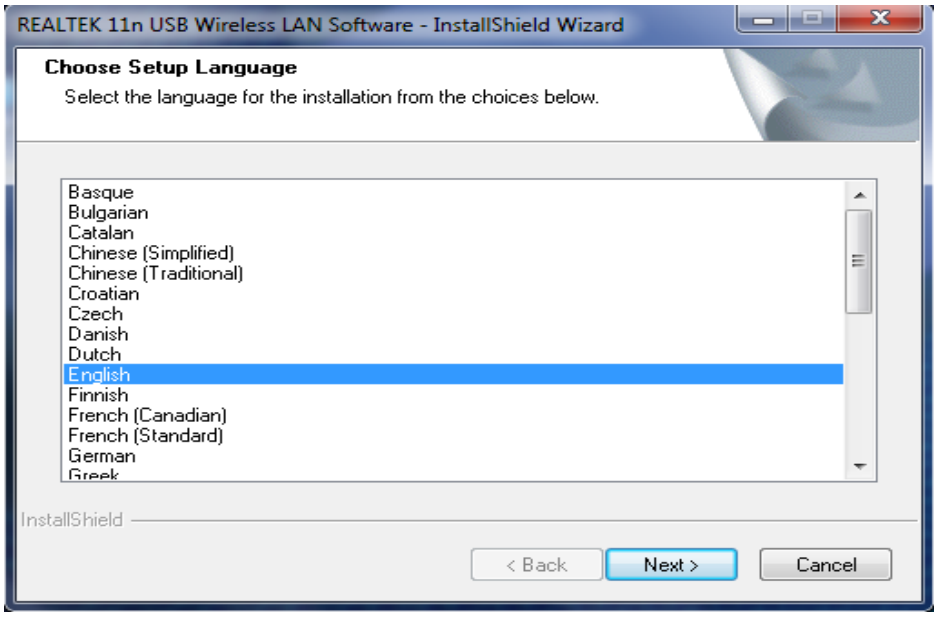


Driver Installation Guide For Windows 7

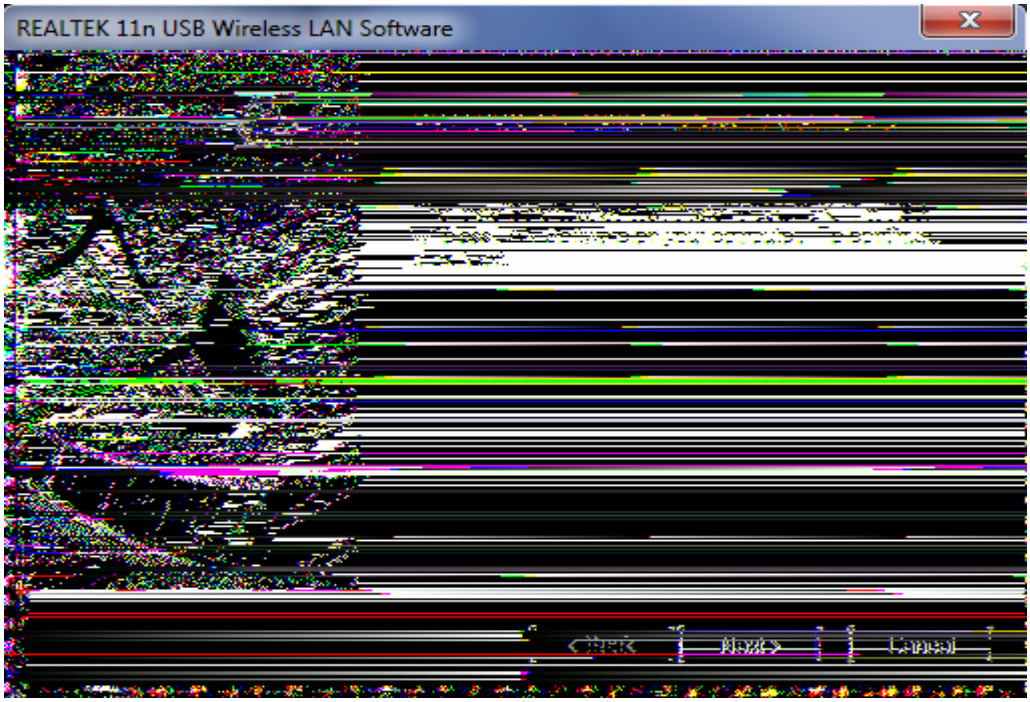
1.0 Insert the installation disc into CD-ROM.

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

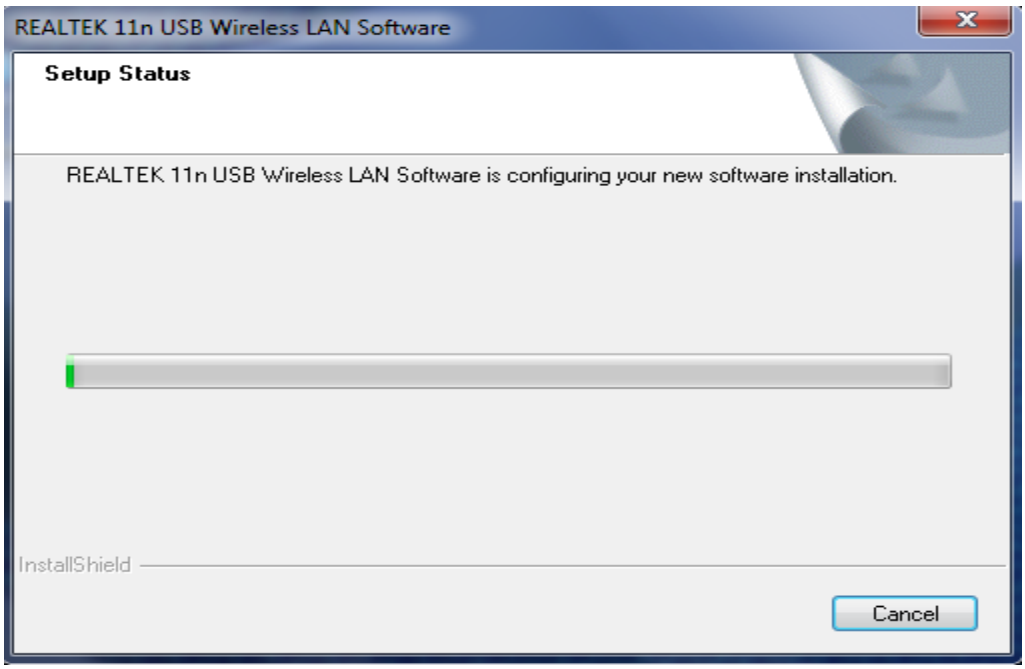
1.2 Click **NEXT**.



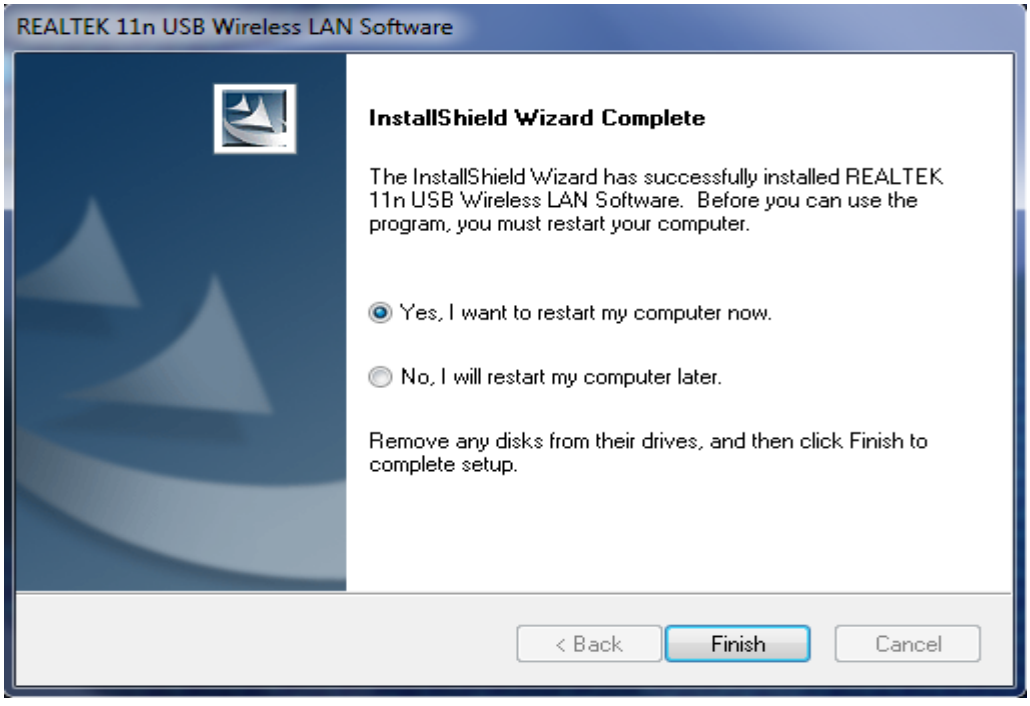
2. Click **NEXT** to continue.



Installing…



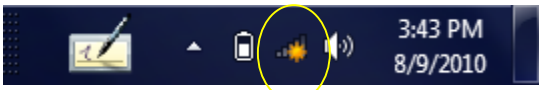
3. Click **Finish** to complete the installation.



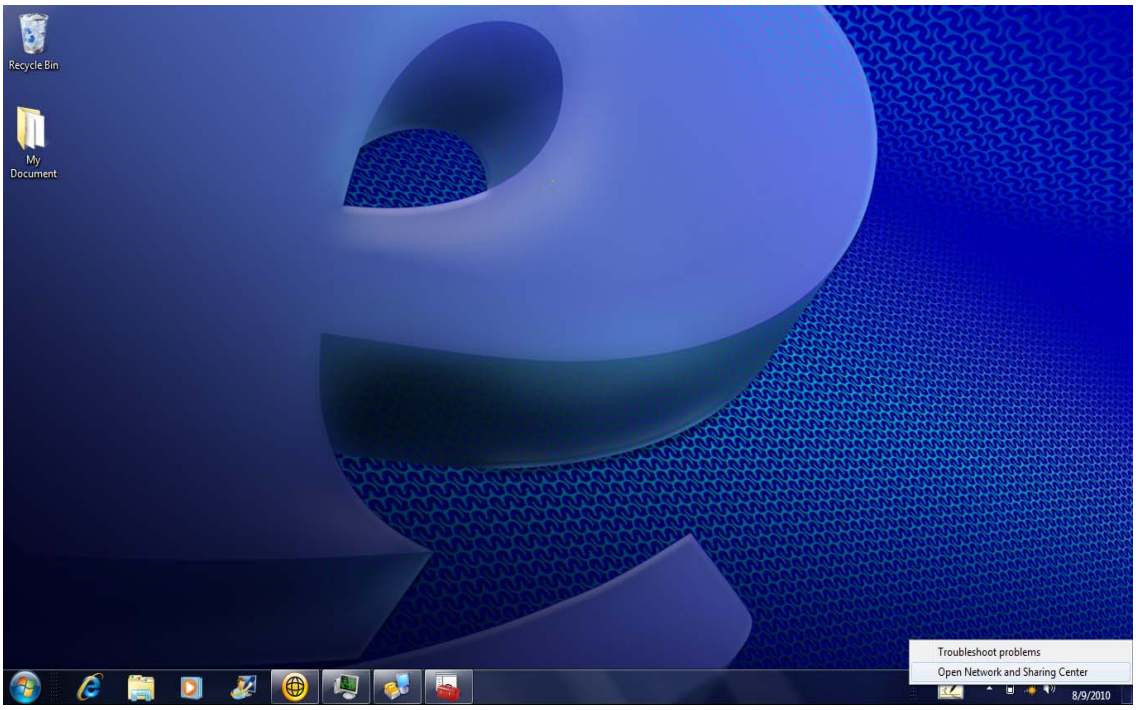
4.0 Plug the device into the USB port.

4.1 Windows will automatically begin the installation for the device.

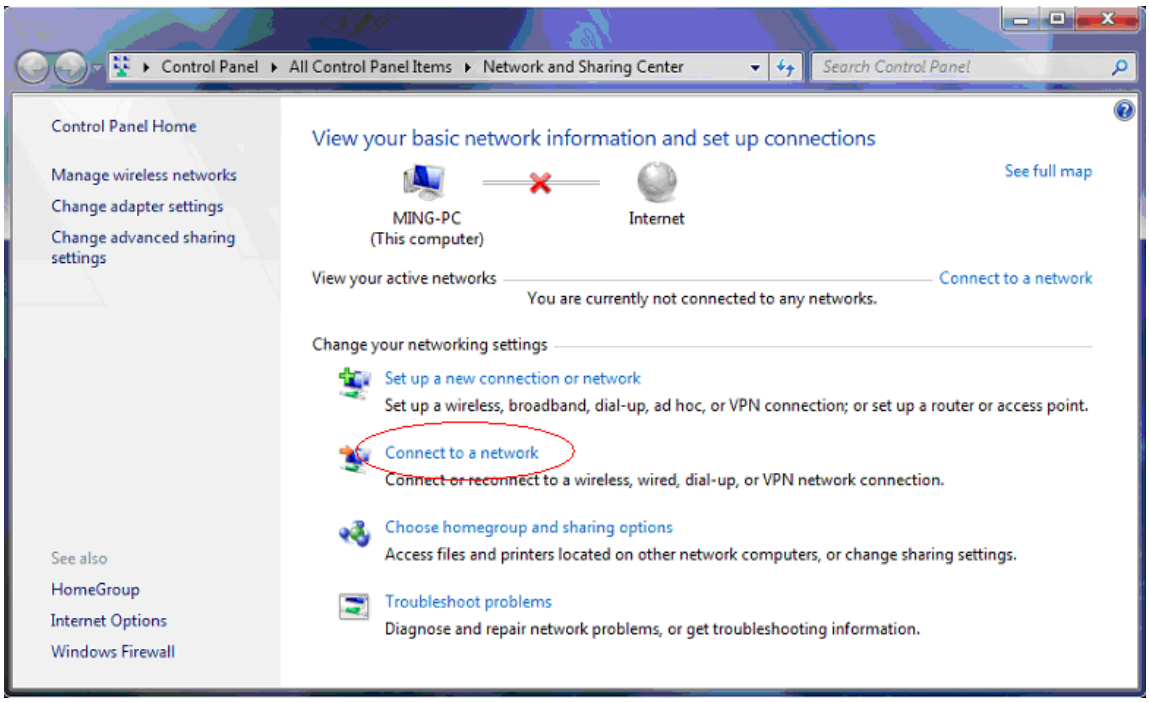
5.0 Right click the Network Connection icon on the right side of System Tray.



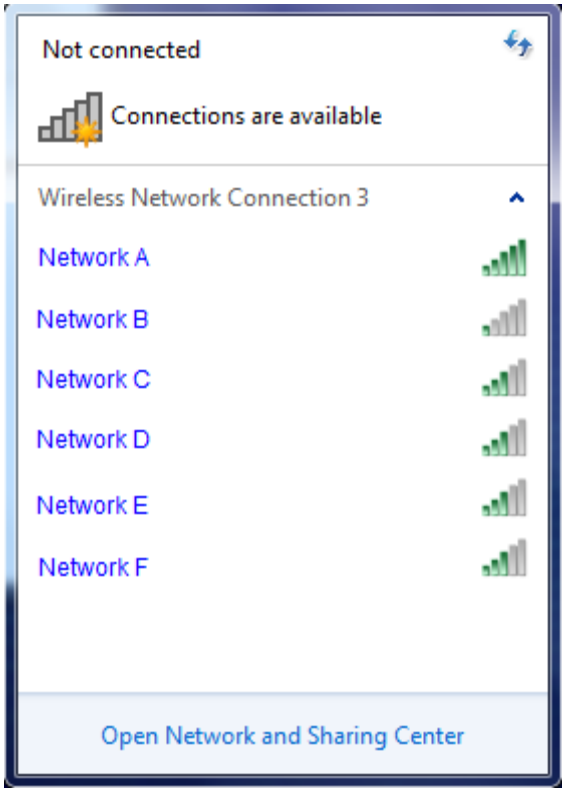
5.1 Select **Open Network and Sharing Center**.



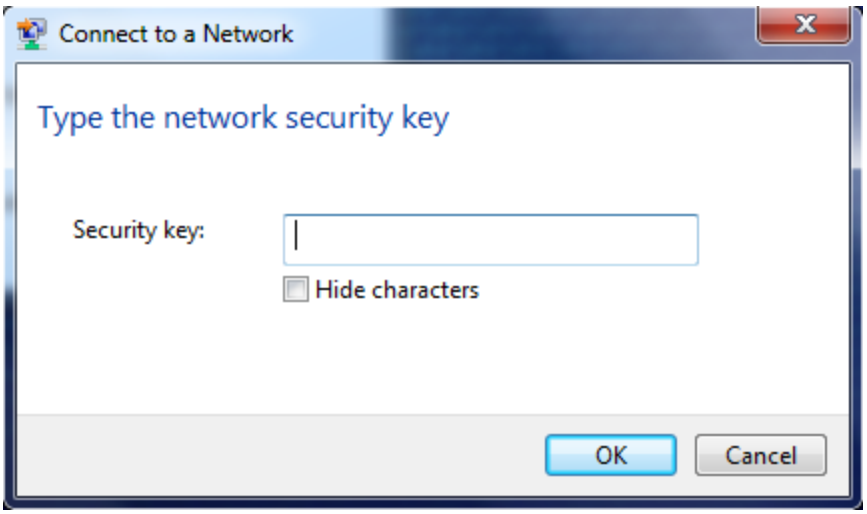
6. Click **Connect to a network**.



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.

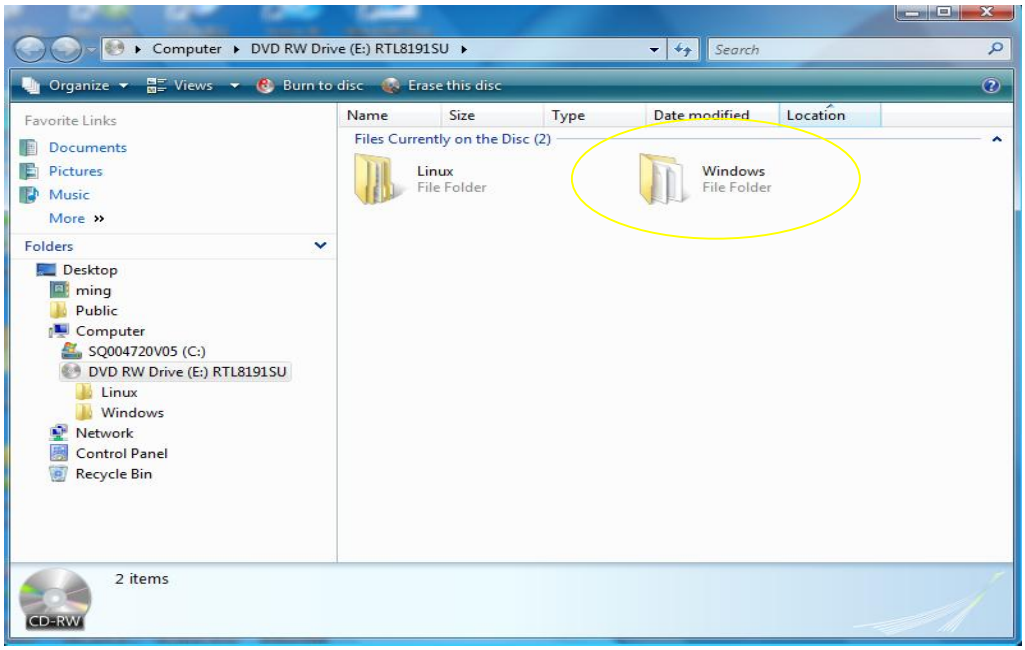


Driver Installation Guide For Windows Vista

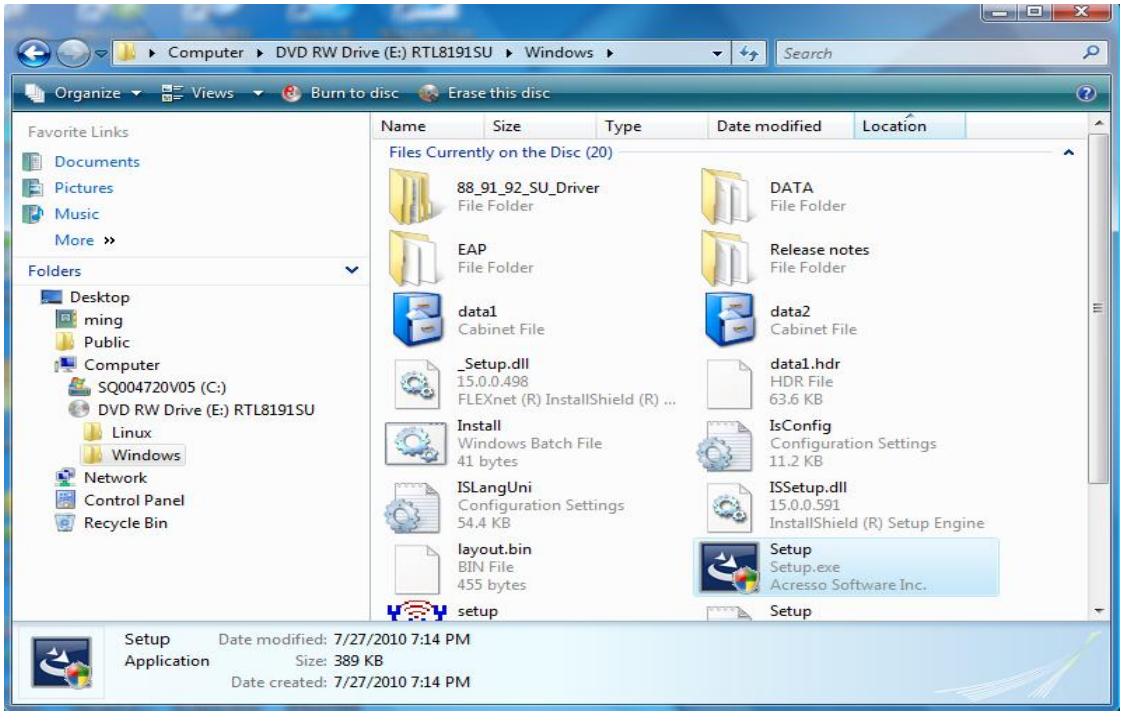
1.0 Insert the installation disc into CD-ROM.

1.1 Select **Open folder to view files**

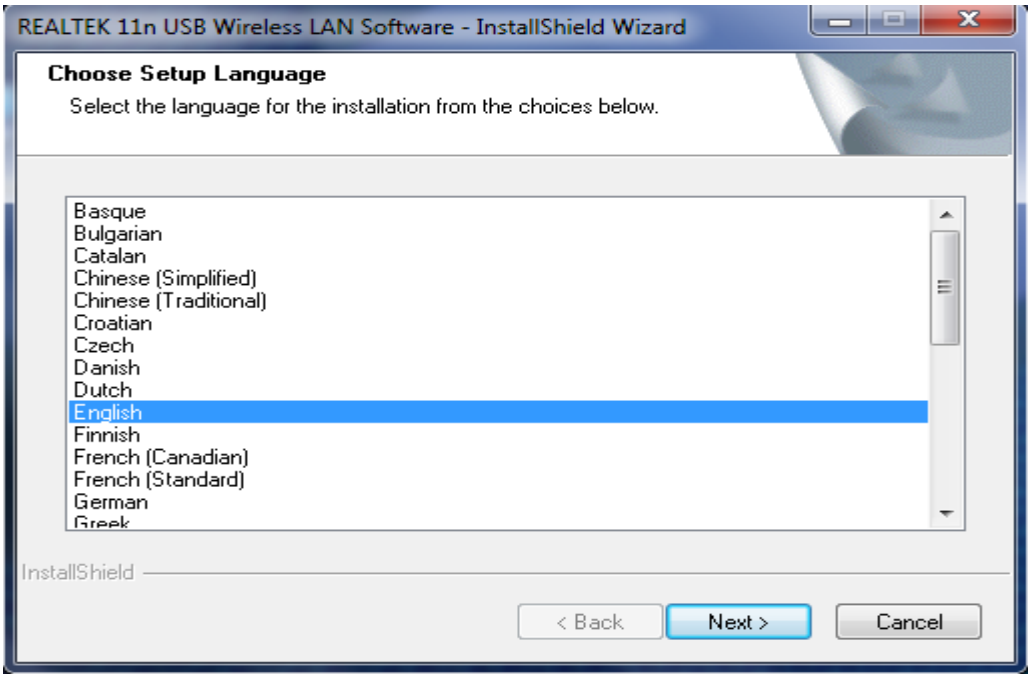
2. Double click to open **Windows** folder.



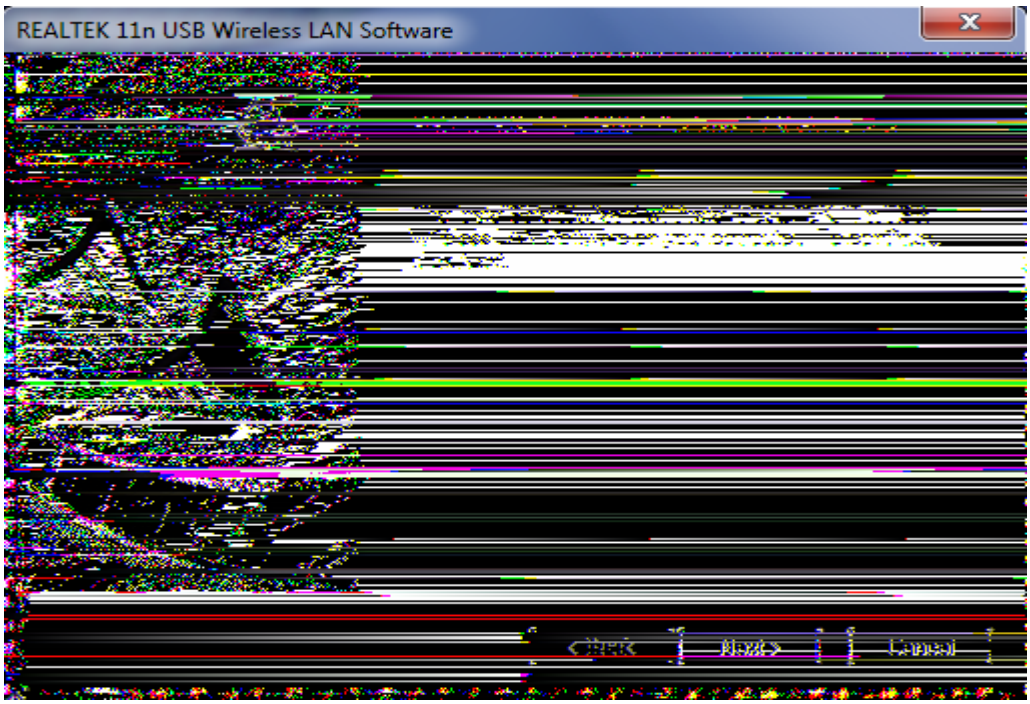
3.0 Double click **Setup** (Setup.exe) icon to run the setup application.
3.1 Windows will ask your permission to start the program. Click **Continue**.



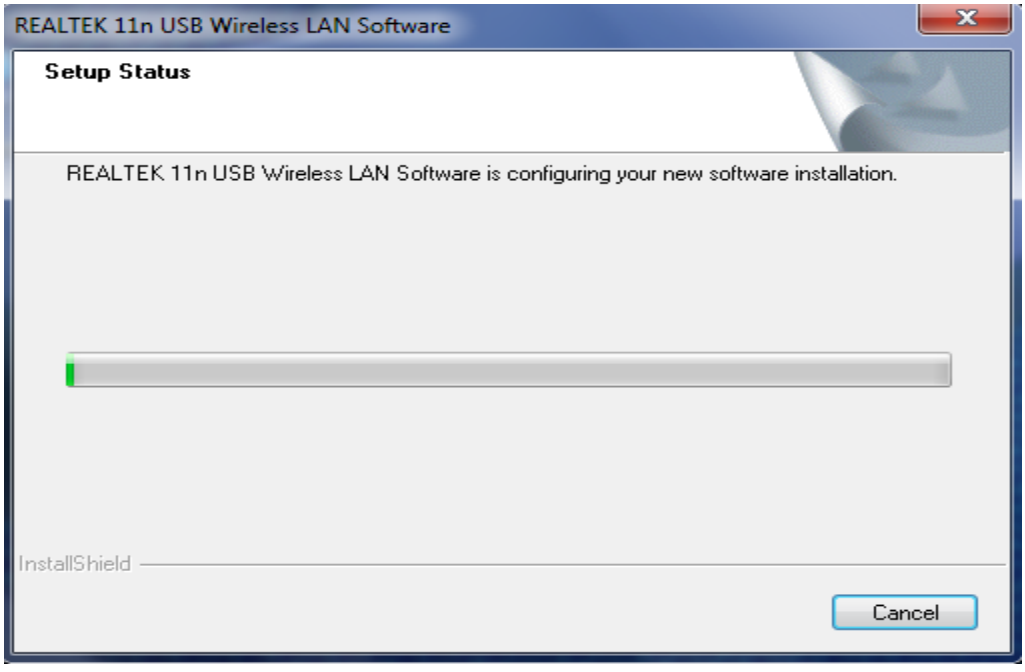
4.0 Select your language from the Choose Setup Language drop-down list.
4.1 Click **NEXT**.



5. Click **NEXT** to continue.

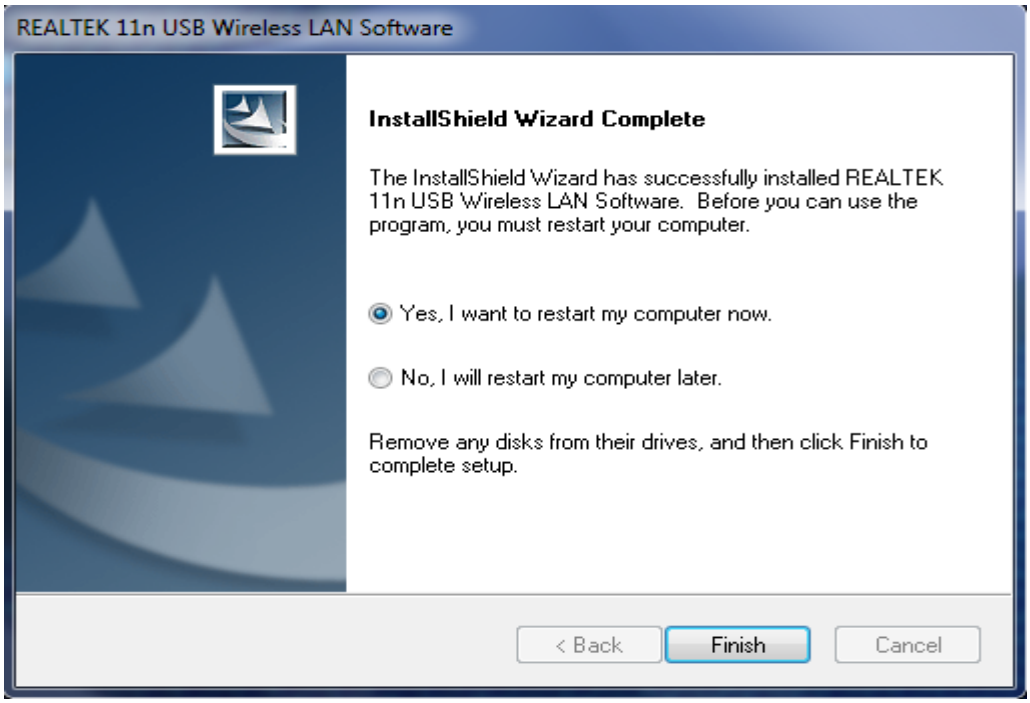


Installing…



6. If the Windows Security message appears, select **Install this driver software anyway** to continue.

7. Click **Finish** to complete the installation.

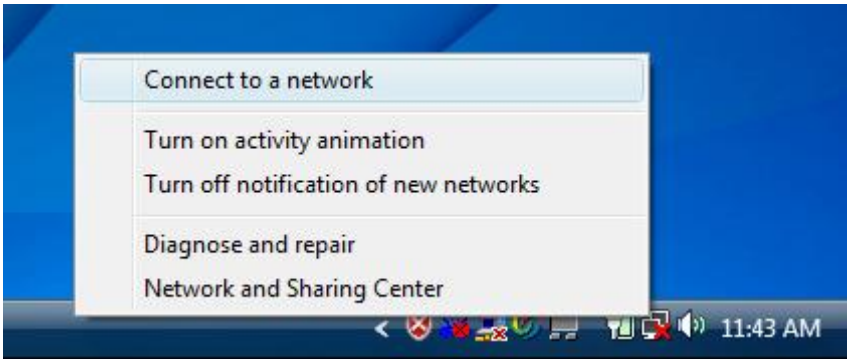


8.0 Plug the device into the USB port.

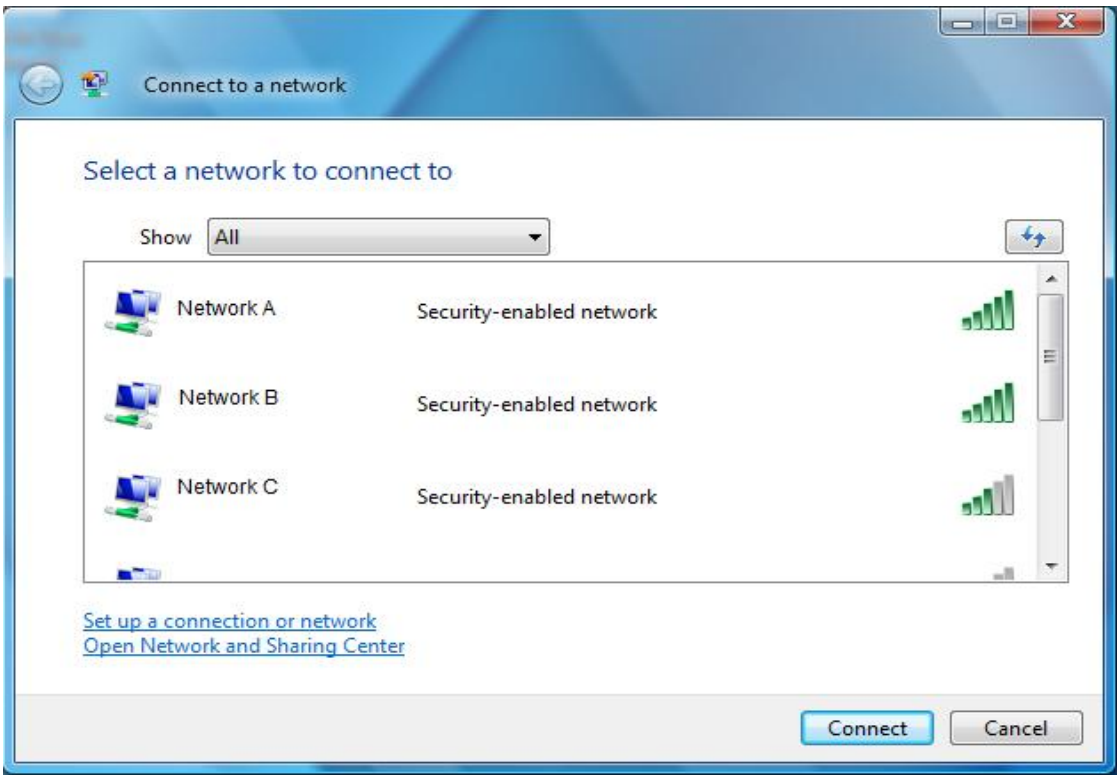
8.1 Windows will automatically begin the installation for the device.

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

Note: The following steps were verified in Fedora 11 with Kernel version 2.6.30-105.2.23,fc11.i686.PAE.Fedora 11. It was installed from Fedora 11 DVD. Choose (1) to Install Installation Repo, then (2) Fedora 11-i386, and (3) Fedora 11-i386 update.

Go to the "root" to setup the Linux environment for the WiFiHU module. To avoid potential conflicts, temporarily disable the "Network Manager" while using the command line method shown below.

1. Create directory for WiFiHU and uncompress "*.tar.gz" file into this directory.
   Issue "tar –zxvf wifihu_usb_linux_v2.6.6.0.20110401A.tar.gz" command.

2. Enter new directory.
   Issue "cd wifihu_usb_linux_v2.6.6.0.20110401A" command.

3. Issue the "make" command. Linux will now set-up WiFiHU environment. This will take a few seconds.

4. Issue "insmod 8712u.ko" command.

5. Insert WiFiHU wireless module into USB port. The WiFiHU LED should come on in a few seconds.

6. To enable wlan interface, Issue "ifconfig wlan0 up" command. The device name for the WiFiHU is "wlan0"

7. Setup WiFiHU IP address
   For example, issue "ifconfig wlan0 192.168.10.101" command.

8. Scan for available AP.
   Issue "iwlist wlan0 scan" command.
   Linux will display the available access points.

9. If want to use NetworkManager, go to top right Network Icon and choose suitable AP (or router) to connect.

10. If want to command only, need to disable NetworkManager and issue network command

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

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

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