WitLinc

Connected Machines Anywhere Anytime

WL-245N/H-S

High-Power Industrial WiFi

802.11AC/802.11n/802.11a

Version 1.1.0.1 Oct 15, 2017

User Manual

Your Feedback Please

We always want you to feel that you made the right decision to use our products. If you have suggestions about our products, documentation, or support, please write or call us.

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WL-245H-S User Manual

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Important Safety Information

WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.

ATTENTION: This manual is intended for qualified service personnel responsible for setting up and servicing these devices. The user must have previous experience with and a basic understanding of electrical terminology, configuration procedures, required equipment, and safety precautions.

Warning: This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or Non-Hazardous Locations only. EXPLOSION HAZARD - Substitution of Any Components May Impair Suitability for Class I, Division II, Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous. Module must be powered by a Class 2 Power Source.

Warning: The RS-232 serial connector, Ethernet connector and I/O terminal block are not for use in Hazardous Locations; they are only for diagnostics and set-up only.

Warning: When Antenna is installed into ultimate enclosure, it must be threaded to appropriate port to ensure mechanical securement.

Important Notice:

Due to the nature of wireless communications, data transmission and reception can never be guaranteed. Data maybe delayed, corrupted (that is, it may have errors), or be totally lost. Significant delays or losses of data are rare when wireless devices such as Witlinc Technology Wireless products are used in a normal manner with a well-constructed network. Nevertheless, the WL-245H-S should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. Witlinc Technology accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using Witlinc Technology products, or for failure of the (WL-245H-S) to transmit or receive such data.

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1、Start Here

1.1 About WL-245H-S 802.11AC High-Power Industrial WiFi Module

WL-245H-S wireless communication module is specifically designed for industrial application, the maximum transmit power up to 1 W. It can be widely used in oil & gas, coal, mining, steel, water treatment, new energy and other industries. Field PLC, VFD, DCS and instrumentation can communicate to each other via this module

WL-245H-S wireless communication module is designed based on 802.11ac MIMO technology. Each module has 2 802.3 Ethernet ports, 1 WAN port, 1 LAN port. Systems with different IP segments can be connected via WL-245H-S module.

All interface and LEDs in the front and with the DIN-Rail in the back make the module well suited for the industry application. In order to protect against issues caused by ground loop, optical isolation was designed between the Ethernet port and Serial port.

Features:

- Wireless security policy compliant with centralized management (802.11i), controlling data priority through QoS (802.11e)
- Supports 802.11AC seamless roaming (802.11r), switching time is less than 50ms
- Supports country selection (802.11d)
- Supports Dynamic Frequency Selection (DFS) Space Time Block Coding (STBC)
- Wireless transmission distance 8 to 10 kM
- Wireless rate up to 1.3 Gbps (OFDM) multicast, 3x3 MIMO technology
- Two 1000Mpbs Ethernet ports with routing capabilities
- Supports WiFi 802.11a/n/ac based on 5.150GHz-5.875Ghz
- Supports routing function, can set static routing table through web server
- Powerful firewall features, port forwarding, NAT
- Supports simultaneous video surveillance and control system transmission
- -40°C to +70°C industrial outdoor environment, long-term stable operation
- Supports WiVPN

Specifications:

<table>
<tr><th colspan="2">Specifications</th></tr>
<tr><td colspan="2">Wireless</td></tr>
<tr><td>Wireless Standard</td><td>Supports IEEE 802.11n, 802.11h, 802.11i,802.11a, 802.11g,802.11ac (Legacy)</td></tr>
<tr><td>Channel data rate (802.11a/g/n/ac)</td><td>1300,900,300,150,54, 48, 36, 24, 18, 12, 9, 6 Mbps</td></tr>
<tr><td>Frequency band</td><td>5.150 GHz to 5.850 GHz 36 to 165</td></tr>
<tr><td>Transmission Power</td><td>0-30 dBm (802.11ac) adjustable</td></tr>
<tr><td>Receiver Sensitivity</td><td>
<table>
<tr><th colspan="7">RX Specifications</th></tr>
<tr><th></th><th>DataRate</th><th>Sensitivity</th><th></th><th>DataRate</th><th>Sensitivity</th><th>Tolerance</th></tr>
<tr><td rowspan="12">802.11a</td><td>6Mbps</td><td>-94dBm</td><td rowspan="12">5GHz 11n/ac HT20</td><td>MCS 0</td><td>-94dBm</td><td>±2dB</td></tr>
<tr><td>9Mbps</td><td>-94dBm</td><td>MCS 1</td><td>-94dBm</td><td>±2dB</td></tr>
<tr><td>12Mbps</td><td>-94dBm</td><td>MCS 2</td><td>-92dBm</td><td>±2dB</td></tr>
<tr><td>18Mbps</td><td>-92dBm</td><td>MCS 3</td><td>-88dBm</td><td>±2dB</td></tr>
<tr><td>24Mbps</td><td>-89dBm</td><td>MCS 4</td><td>-84dBm</td><td>±2dB</td></tr>
<tr><td>36Mbps</td><td>-86dBm</td><td>MCS 5</td><td>-81dBm</td><td>±2dB</td></tr>
<tr><td>48Mbps</td><td>-82dBm</td><td>MCS 6</td><td>-78dBm</td><td>±2dB</td></tr>
<tr><td>54Mbps</td><td>-80dBm</td><td>MCS 7</td><td>-77dBm</td><td>±2dB</td></tr>
<tr><td></td><td></td><td>MCS 8</td><td>-74dBm</td><td>±2dB</td></tr>
<tr><td></td><td></td><td>MCS 9</td><td>-71dBm</td><td>±2dB</td></tr>
<tr><td rowspan="10">5GHz 11n/ac HT40</td><td>MCS 0</td><td>-93dBm</td><td rowspan="10">5GHz 11ac HT80</td><td>MCS 0</td><td>-89dBm</td><td>±2dB</td></tr>
<tr><td>MCS 1</td><td>-91dBm</td><td>MCS 1</td><td>-88dBm</td><td>±2dB</td></tr>
<tr><td>MCS 2</td><td>-90dBm</td><td>MCS 2</td><td>-85dBm</td><td>±2dB</td></tr>
<tr><td>MCS 3</td><td>-85dBm</td><td>MCS 3</td><td>-81dBm</td><td>±2dB</td></tr>
<tr><td>MCS 4</td><td>-82dBm</td><td>MCS 4</td><td>-79dBm</td><td>±2dB</td></tr>
<tr><td>MCS 5</td><td>-78dBm</td><td>MCS 5</td><td>-75dBm</td><td>±2dB</td></tr>
<tr><td>MCS 6</td><td>-77dBm</td><td>MCS 6</td><td>-74dBm</td><td>±2dB</td></tr>
<tr><td>MCS 7</td><td>-75dBm</td><td>MCS 7</td><td>-72dBm</td><td>±2dB</td></tr>
<tr><td>MCS 8</td><td>-73dBm</td><td>MCS 8</td><td>-70dBm</td><td>±2dB</td></tr>
<tr><td>MCS 9</td><td>-71dBm</td><td>MCS 9</td><td>-68dBm</td><td>±2dB</td></tr>
</table>
</td></tr>
</table>

Transmit Power	

TX Specifications

	Data Rate	TX Power (per chain)	TX Power (3 chains)	Tolerance		Data Rate	TX Power (per chain)	TX Power (3 chains)	Tolerance
802.11a	6Mbps	27dBm	32dBm	±2dB	5GHz 11n/ac HT20	MCS 0	27dBm	32dBm	±2dB
	9Mbps	27dBm	32dBm	±2dB		MCS 1	26dBm	31dBm	±2dB
	12Mbp	27dBm	32dBm	±2dB		MCS 2	26dBm	31dBm	±2dB
	18Mbp	27dBm	32dBm	±2dB		MCS 3	25dBm	30dBm	±2dB
	24Mbp	27dBm	32dBm	±2dB		MCS 4	25dBm	30dBm	±2dB
	36Mbp	25dBm	30dBm	±2dB		MCS 5	25dBm	30dBm	±2dB
	48Mbp	25dBm	30dBm	±2dB		MCS 6	24dBm	29dBm	±2dB
	54Mbp	24dBm	29dBm	±2dB		MCS 7	23dBm	28dBm	±2dB
						MCS 8	23dBm	28dBm	±2dB
						MCS 9	22dBm	27dBm	±2dB
5GHz 11n/ac HT40	MCS 0	27dBm	32dBm	±2dB	5GHz 11ac HT80	MCS 0	27dBm	32dBm	±2dB
	MCS 1	26dBm	31dBm	±2dB		MCS 1	26dBm	31dBm	±2dB
	MCS 2	26dBm	31dBm	±2dB		MCS 2	26dBm	31dBm	±2dB
	MCS 3	25dBm	30dBm	±2dB		MCS 3	26dBm	31dBm	±2dB
	MCS 4	25dBm	30dBm	±2dB		MCS 4	26dBm	31dBm	±2dB
	MCS 5	25dBm	30dBm	±2dB		MCS 5	25dBm	30dBm	±2dB
	MCS 6	24dBm	29dBm	±2dB		MCS 6	25dBm	30dBm	±2dB
	MCS 7	23dBm	28dBm	±2dB		MCS 7	24dBm	29dBm	±2dB
	MCS 8	23dBm	28dBm	±2dB		MCS 8	23dBm	28dBm	±2dB
	MCS 9	22dBm	27dBm	±2dB		MCS 9	22dBm	27dBm	±2dB

Safety	64/128-bit WEP (Wired Equivalent Privacy) WPA & WPA-PSK &WPA2 -PSK(Wi-Fi Protected Access) MAC ID filter
Hardware Datasheet	
Weight	1.2 lbs （543g）
Installation Method	Aluminum DIN rail
Ports	2×RJ45（10/100/1000Mbps）,3×SMA,1×DB9,1×Rs485,2×DO
Temperature	Work: -40℃ - 70℃ / Storage: -40℃ - 85℃
Relative Humidity	95% (without condensation)
Impact	IEC 60068 2-6 (20g, 3-Axis)
Vibration	IEC 60068 2-27 (5g, 10Hz to 150Hz)
Voltage	9-36 VDC
Power	Work: 130mA@24VDC Max: 250mA@24VDC Average: 160mA@12VDC
Certification	CE、RoHS、FCC

802.11 AC Data Rate （Mbit/s）

MCS	Spatial	Modulation	Data rate (in Mbit/s)					
index	Streams	type	20 MHz channels		40 MHz channels		80 MHz channels	
			800 ns GI	400 ns GI	800 ns GI	400 ns GI	800 ns GI	400 ns GI
0	1	BPSK	6.5	7.2	13.5	15	29.3	32.5
1	1	QPSK	13	14.4	27	30	58.5	65
2	1	QPSK	19.5	21.7	40.5	45	87.8	97.5
3	1	16-QAM	26	28.9	54	60	117	130
4	1	16-QAM	39	43.3	81	90	175.5	195
5	1	64-QAM	52	57.8	108	120	234	260
6	1	64-QAM	58.5	65	121.5	135	263.3	292.5
7	1	64-QAM	65	72.2	135	150	292.5	325
8	1	256-QAM	78	86.7	162	180	351	390
9	1	256-QAM	N/A	N/A	180	200	390	433.3
0	2	BPSK	13	14.4	27	30	58.5	65
1	2	QPSK	26	28.9	54	60	117	130
2	2	QPSK	39	43.3	81	90	175.5	195
3	2	16-QAM	52	57.8	108	120	234	260
4	2	16-QAM	78	86.7	162	180	351	390
5	2	64-QAM	104	115.6	216	240	468	520
6	2	64-QAM	117	130.3	243	270	526.5	585
7	2	64-QAM	130	144.4	270	300	585	650
8	2	256-QAM	156	173.3	324	360	702	780
9	2	256-QAM	N/A	N/A	360	400	780	866.7
0	3	BPSK	19.5	21.7	40.5	45	87.8	97.5
1	3	QPSK	39	43.3	81	90	175.5	195

2	3	QPSK	58.5	65	121.5	135	263.3	292.5
3	3	16-QAM	78	86.7	162	180	351	390
4	3	16-QAM	117	130	243	270	526.5	585
5	3	64-QAM	156	173.3	324	360	702	780
6	3	64-QAM	175.5	195	364.5	405	N/A	N/A
7	3	64-QAM	195	216.7	405	450	877.5	975
8	3	256-QAM	234	260	486	540	1053	1170
9	3	256-QAM	260	288.9	540	600	1170	1300

1.2 Package Contents

The following components are included with the WL-245H-S, and are required for installation and configuration.

Important: Before beginning the installation, please verify that all of the following items are present

Qty	Part No.	Part Name	PART DESCRIPTION
1	WL-245H-S	Industrial WiFi Modem	802.11ac Industrial Wireless Router with High Output Power（Max 30dB）
1	WL-2502-O	2.4GHz/5GHz Antenna	2.4GHz/5GHz 2dBi Omni Antenna
1	WL-003T-A	3-pin Power Plug	Mating connector used for attachment to customer's power supply
1	WL-010T-A	6-pin IO Plug	Mating connector used for attachment to customer's IO Signal and Rs485

If any of these components are missing, please contact WitLinc Technology Support for replacement parts.

1.3 System Requirements

The following system requirements are the recommended minimum specifications to successfully install and run:

Software Requirement:

Operating system:

Microsoft Windows XP Professional with Service Pack 1 or 2
Microsoft Windows 7 Professional (32-or 64-bit)
Microsoft Windows 8 Professional/Enterprise
Microsoft Windows 10 Enterprise
Microsoft Windows 2000 Professional with Service Pack 1, 2, or 3
Microsoft Windows Server 2003/2008/2012

Internet Explore

Internet Explorer 6.0
Internet Explorer 8.0
Google Chrome
Mozilla Firefox

Hardware Requirement:

Ethernet hub with standard RJ45 Ethernet cable or Ethernet port with RJ45 crossover cable for direct connection to module
A Computer with RJ45 Ethernet port
128 Mbytes of RAM minimum, 256 Mbytes of RAM recommended
100 Mbytes of free hard disk space (or more based on application requirements)
256-color VGA graphics adapter, 800 x 600 minimum resolution (True Color 1024 x 768 recommended)

1.4 Power Requirements

The WL-245H-S accepts voltages between 9 and 30 VDC, with an average power draw of 9 watts or less. A detachable power connector comes with the radio, as shown below. The connector terminals are labeled + (positive DC connection) GND (ground connection) - (negative DC connection).

The AC-to-DC power supply adapter may be used. DC power wires must be less than 2 meters in length to meet regulatory requirements.

Important: When wiring the power connector, be sure to observe the proper polarity markings on the power connector. Improper connector wiring can cause serious damage to the WL-430T-A which will not be covered under the Witlinc Technology Warranty.

2、Webpage Configuration

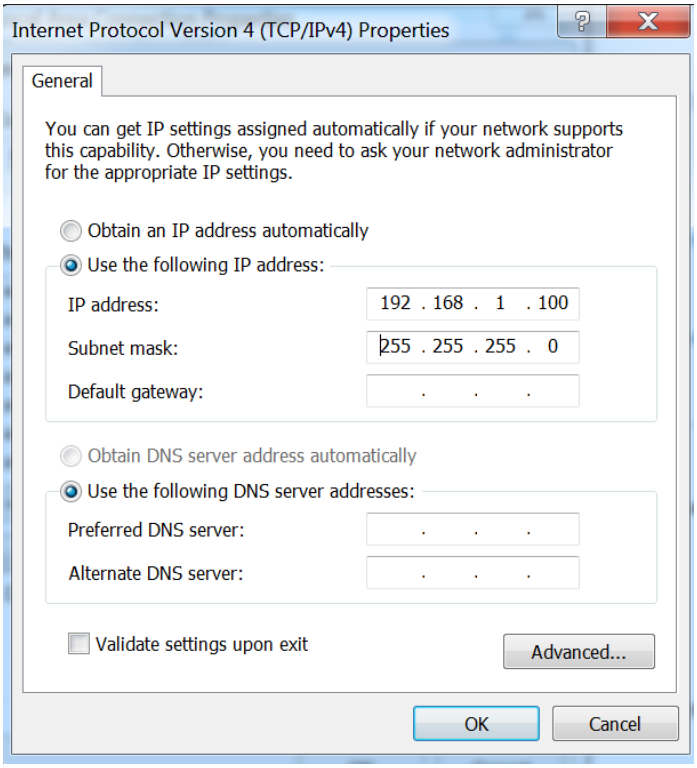
The configuration webpage is used to configure and manage the WL-245H-S. Since the webpage can be accessed remotely as well as local, the WL-245H-S can be configured from any location.

Key benefits of the web based configurator include:

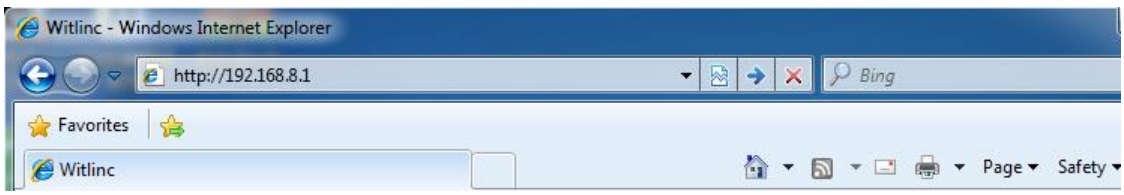
- Login and configure devices parameters
- Connection Status
- Interface Configurations
- Wireless Configurations

2.1 Login Webpage Configuration

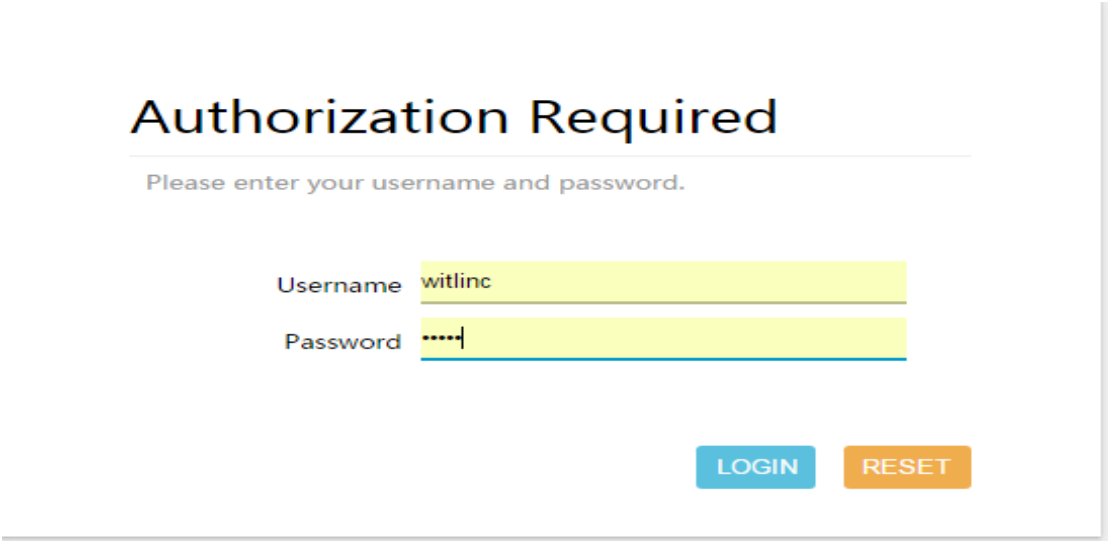
1. The default IP address of the WL-245H-S is 192.168.1.1. And DHCP Server is Enable, normally, your PC will be get an IP address which the modem assigned automatically. If your PC did not receive the IP address, please temporarily set the IP address of your PC to 192.168.1.xxx with a subnet of 255.255.255.0.



2. Open the Internet Explorer and enter the WL-245H-S default IP address of 192.168.1.1

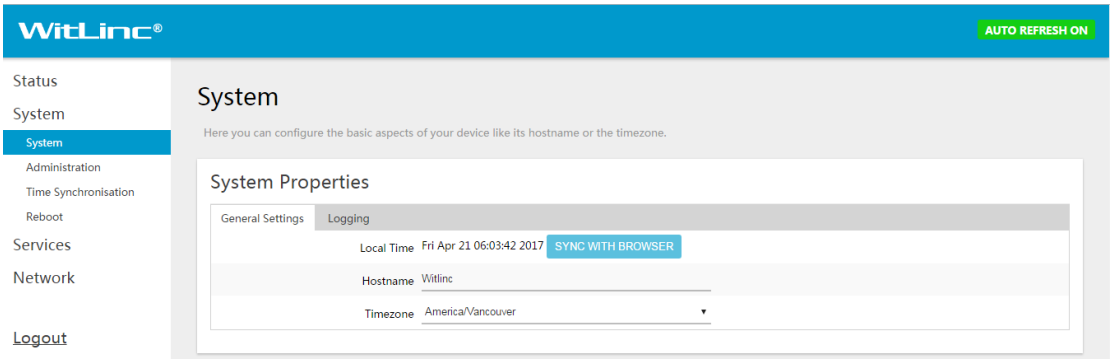


3. Once the WL-245H-S Login Webpage opens, enter the **USERNAME** and **PASSWORD** to login.



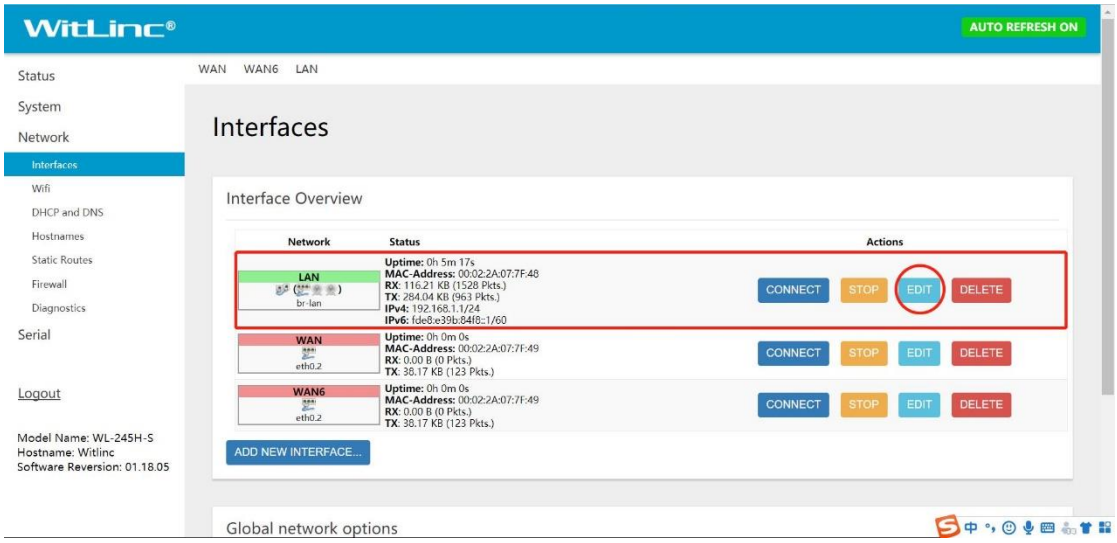
The default Username is "**witlinc**", and the default Password is "**admin**".

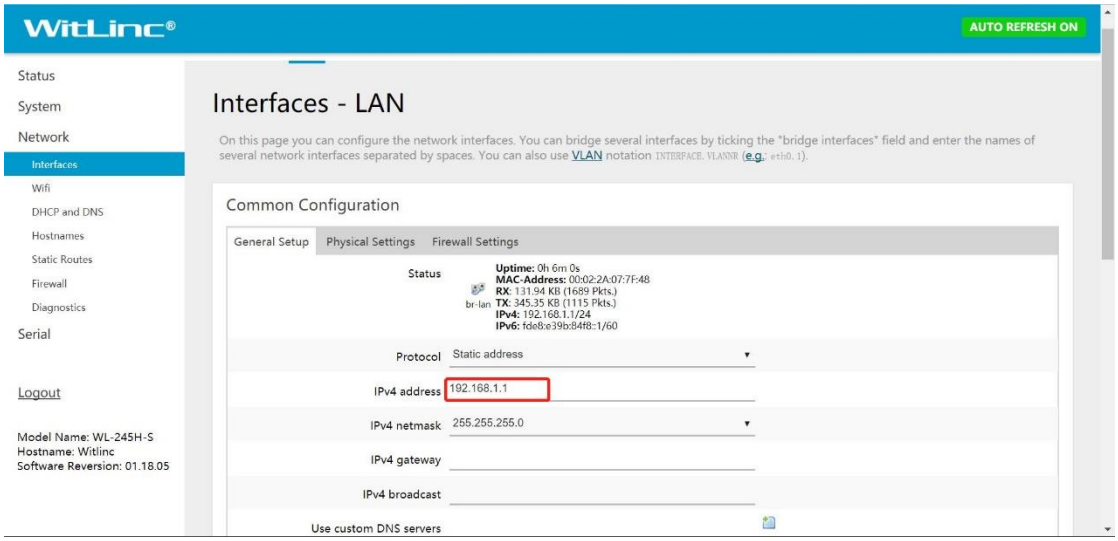
4. After successful login, the main configuration webpage will be displayed.



2.2 Setup the WL-245H-S IP address

1. Scroll down your mouse to the ***Network,Interface*** ,and choose ***LAN,***then click ***EDIT.***





2. Enter the **IPv4 address**, **IPv4 netmask** and **IPv4 gateway** to be assigned to the WL-245H-S. You will not need to edit the **IPv4 broadcast** and **DNS server** of the parameters at this time.

3. Click **Save & Apply**. The module will automatically reboot.

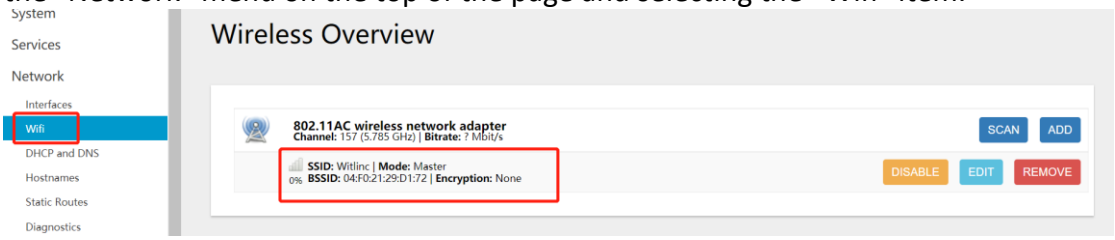
4. Once the reboot is complete, the module's IP address will be changed to the address which you set.

5. Close your browser and open a new session. Enter the new IP address of the WL-245H-S to access the configuration webpage.

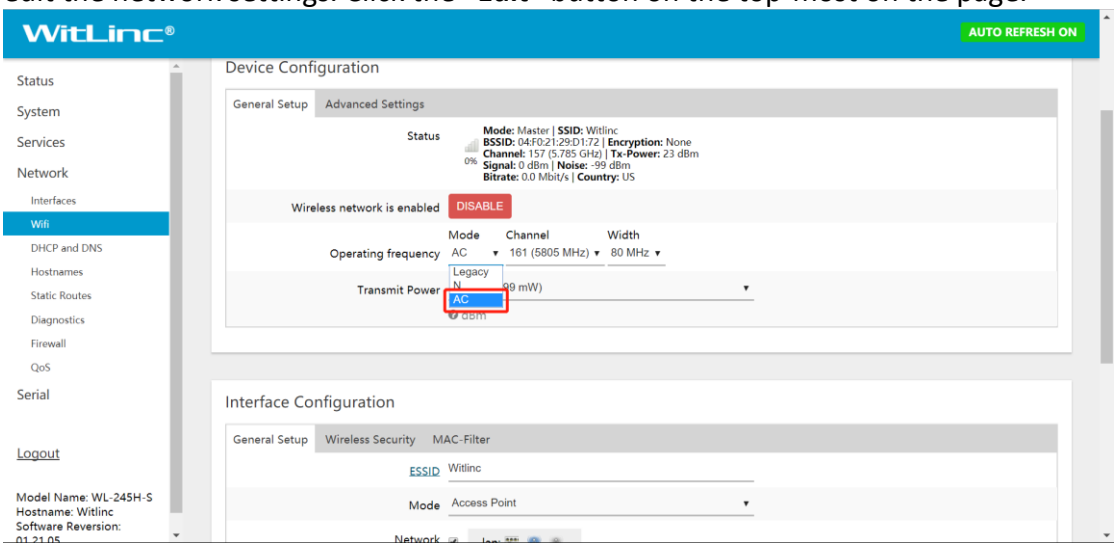
2.3 Setup WL-245H-S as WiFi-Master

2.3.1 Setup the WiFi Device Configuration

To get started let's go to the wifi configuration page. We can get to it by going to the "Network" menu on the top of the page and selecting the "Wifi" item.



After click the Wifi item, the above picture will appear, You'll notice the buttons next to each of the networks. These buttons allow us to enable the network, edit the network's settings or remove the network. In our case, we're going to want to edit the network settings. Click the **"Edit"** button on the top-most on the page.



We're at the configuration page for our wifi network. From this page, you can control advanced settings for the wifi network. Feel free to scan through the settings, they're pretty interesting if you want to learn more about . Most importantly for our purposes, we can set up the security for our wifi network. Additionally at the top you'll see some tabs. Each tab contains the settings for one of the wifi networks on the router. In our case, the first one should be selected.

Now the **device Configuration-General Setup** will be selected.

Enable/disnable: Enable or Disable the Wireless network

Operating Frequency:

Mode: Selects the wireless protocol to use, 802.11AC or 802.11 N, the legacy is only for 802.11a.

802.11ac:IEEE 802.11ac is a wireless networking standard in the 802.11 family (which is marketed under the brand name Wi-Fi), developed in the IEEE Standards Association, providing high-throughput wireless local area networks (WLANs) on the 5 GHz band. Maximum net data rate from 54Mbit/s to 1300Mbit/s, wider RF bandwidth (up to 80 MHz)

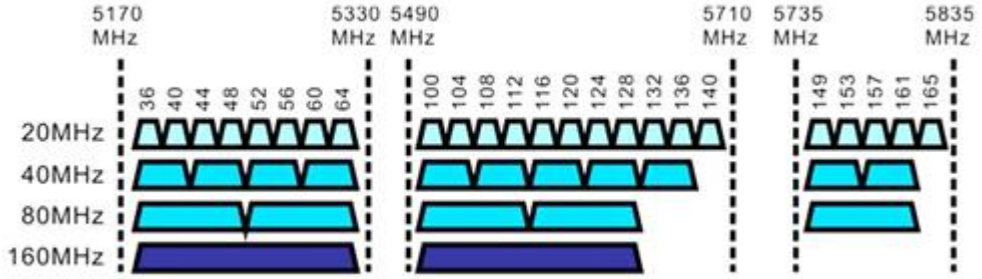
Channel: Based on 5.0GHz – 5.875GHz

802.11n: IEEE 802.11n-2009, commonly shortened to 802.11n, is a wireless-networking standard that uses multiple antennas to increase data rates. Sometimes referred to as MIMO, which stands for "multiple input and multiple output", it is an amendment to the IEEE 802.11-2007 wireless-networking standard. Its purpose is to improve network throughput over the two previous standards—802.11a and 802.11g—with a significant increase in the maximum net data rate from 54 Mbit/s to 600 Mbit/s (slightly higher gross bit rate including for example error-correction codes, and slightly lower maximum throughput) with the use of four spatial streams at a channel width of 40 MHz. 802.11n standardized support for multiple-input multiple-output, frame aggregation, and security improvements, among other features. It can be used in the 2.4 GHz or 5 GHz frequency bands.WL-245H-S only support 5GHz Frequency bands.

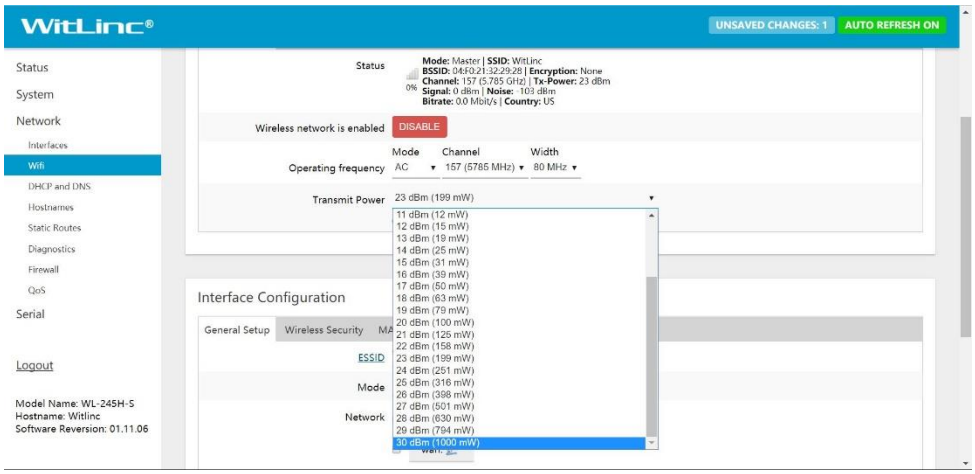
Width: Specifies the channel width in 802.11n and 802.11ac mode,HT20,HT40,HT80

HT80 only for 802.11ac

Channel: Specifies the wireless channel to use. “auto” defaults to the lowest available channel. Use specific channels, when channel is in “auto” mode. This option allows hostapd to select one of the provided channels when a channel should be automatically selected.



Transmit Power: Specifies the transmission power in dBm 0-30dBm (0-1000mw)



Recommended Configuration:

- **High Throughput:**

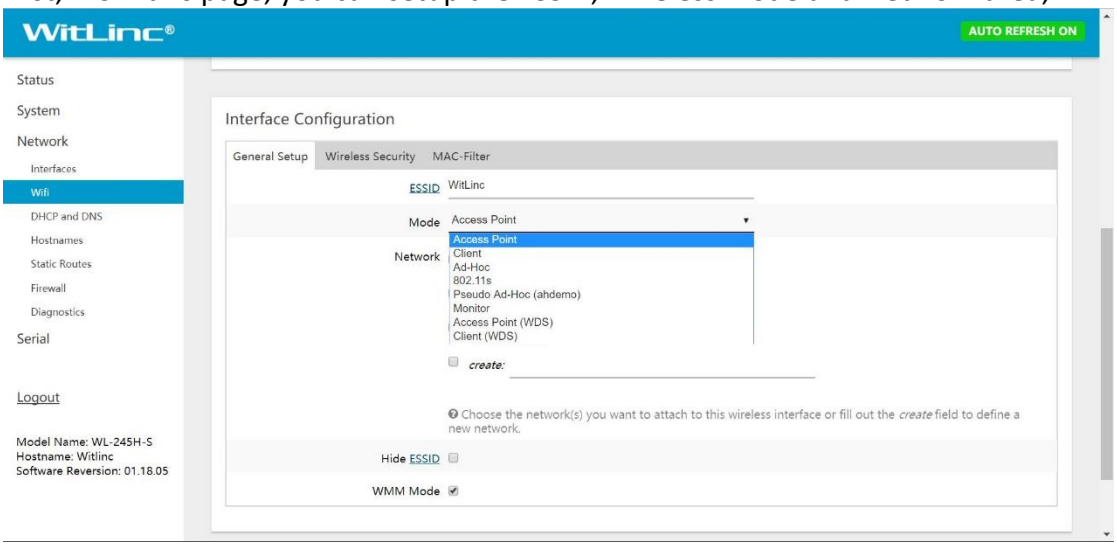
Mode: 801.11ac
Transmit Power: 30dBm
Width:HT80
Channel:149

- **Long-Range > 2km**

Mode:802.11n
Transmit Power: 30dBm
Width:HT20
Channel:36

2.3.2 Setup the WiFi interface Configuration

Finished the Deive Configuration-General Setup, Scroll down the configuration webpage you can see the **interface Configuration**, let us set up the **General Setup** first, From this page, you can setup the ESSID, Wireless mode and Network area;



ESSID: extended service sets (ESS) are logical units of one or more basic service sets on the same logical network segment , In IEEE 802.11 wireless local area networking standards, a service set is a group of wireless network devices that are operating with the same networking parameters. There is formally no such thing as an 'ESSID' in 802.11 standards. In 802.11 standard documents, the logical network (ESS or independent-BSS) service set identifier is simply abbreviated 'SSID', irrespective of whether an SSID identifies an infrastructure-BSS's ESS, or the peer-to-peer network of an independent-BSS. Unlike basic service set identifiers, SSIDs are usually customizable. These SSIDs can be zero to 32 octets (32 bytes) long, and are, for convenience, usually in a natural language, such as English. (i.e Witlinc)

Notice: To associate with a WiFi wireless network, a station must know the network's SSID, and every client must set the same ESSID like the master Access Point(AP).

Mode: if the module is a master station in the wireless network, this item need to be set to Access Point or Access Point(WDS).

Network: Specifies the network interface to attach the wireless to. if the module is a master station,we need to bridge the wireless network to the LAN of the device.

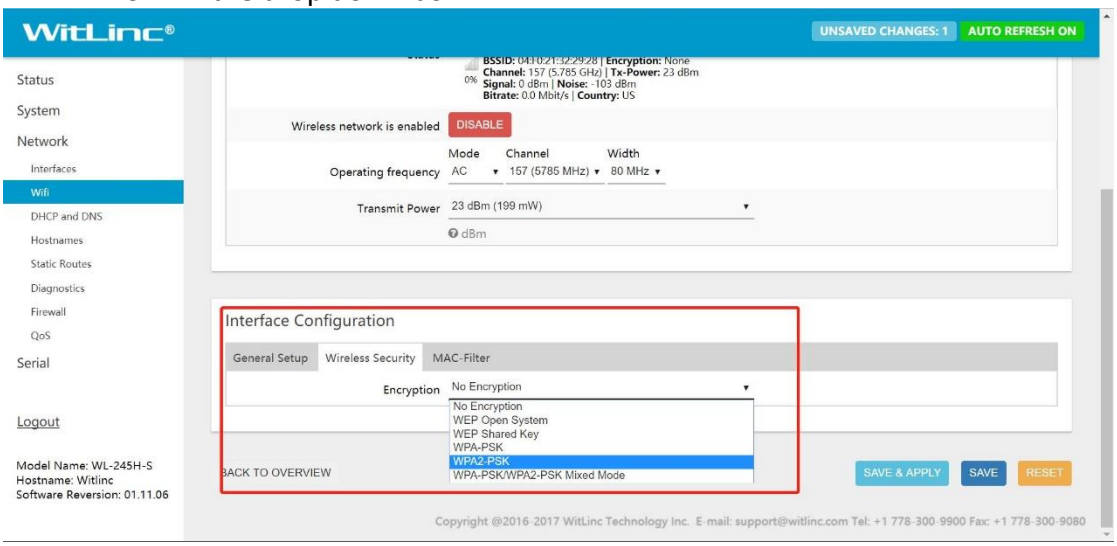
Hide ESSID: if this check box is selected, the other wireless module can not scan the wireless network name of the master station. Turns off SSID broadcasting can improve the security of the WLAN.

WMM Mode: Enables WMM (802.11e) support. Required for 802.11n support.

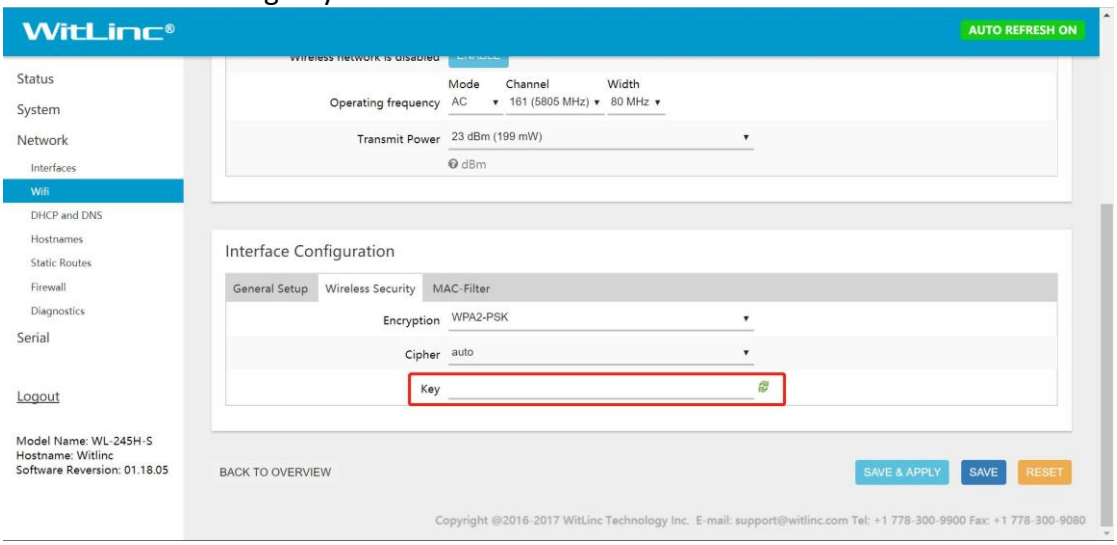
2.3.3 Setup the WiFi Wireless Security

Let's set our wifi password now. The wifi password settings are in **"Wireless Security"** in the **"Interface Configuration"** section about halfway down the page. Click "Wireless Security".

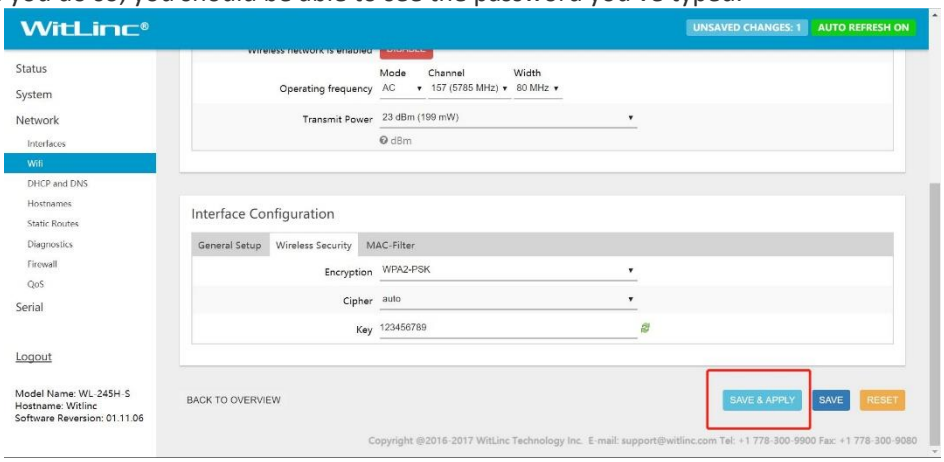
Next you should see a drop down box titled **"Encryption"**. We want to select **"WPA2-PSK"** in the drop down box.



Once you select **"WPA2-PSK"**, two new form fields will pop up: **"cipher"** and **"key".** We don't need to do anything with **"cipher"** so we'll leave that as **"auto"**. The field we really care about **"key"**. **"Key"** is the technical name for the password you'll use when connecting to your wifi network. We'll set that next.



Once you've come up with a password, type it into the the **"key"** box. If you want to make sure you've typed the password correctly, press the green cycle icon next to the password box. Once you do so, you should be able to see the password you've typed.



Now that we've set our password, let's press the **"Save & Apply"** button to finalize the changes on the module. You should be brought back to the top of the page. A set of notifications will update you on the changes being saved and tell you when the changes are done.

After about 15 seconds, the Wifi status should no longer say disabled. Additionally, it should provide additional information about the wifi network. This information includes:

- Network name (SSID)
- The current connection quality for clients. If none are connected, it's normal for this to say 0%.
- Encryption method
- Wifi channel
- Transfer speed. If no clients are connected, this will say 0.0. That's normal!

If you only have one wireless network on your module, you're done setting up networks. You'll know this because near the top of the page, you'll only have one tab for wifi networks. If you have more wireless networks, then you should go to each of them in turn and set them up using the same process. You can do that by clicking on the tab for each of the wireless networks as shown in the screenshot below.

For ease of use, we highly recommend using the same password for every network on your router. There's no real harm in this unless you have a set up that is quite different from the one described in this walkthrough.

Your wifi network is set up! You can connect to the wifi network "WitLinc" with the proper key. You should have access to the wireless network. If you don't normally connect with a network cable to the device you've been using to set up your module, feel free to unplug that.

2.3.4 Setup the WiFi Wireless Security

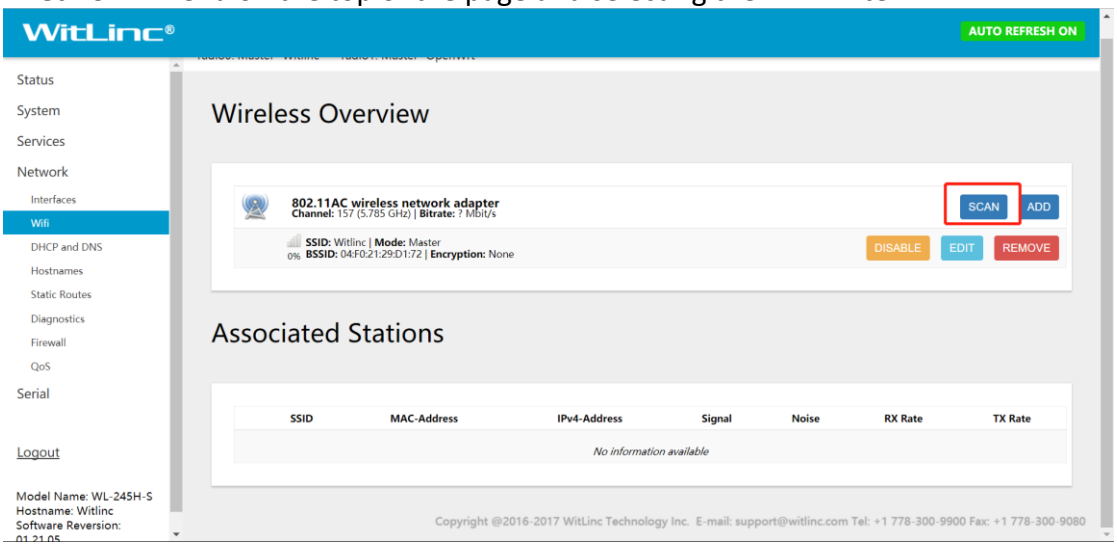
MAC Filter: Specifies the mac filter policy, disable to disable the filter, allow to treat it as whitelist or deny to treat it as blacklist.

Mac list: List of MAC addresses (divided by spaces) to put into the mac filter.

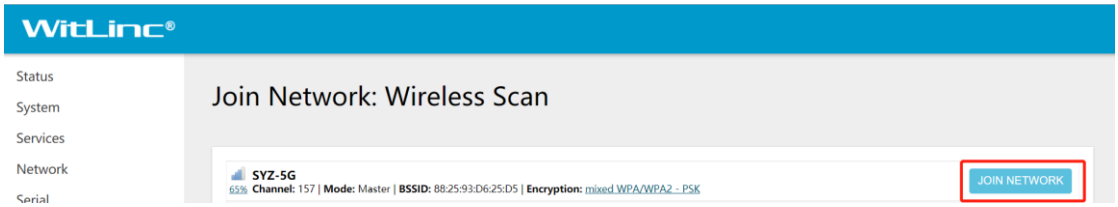
2.4 Setup WL-245H-S as WiFi-Client

1. Change the IP Addess of the device according to the section 2.2, IP Address must be changed into the same segment of the master module.(i.e WiFi-Master IP Address:192.168.1.1 WiFi-Client IP Addess:192.168.1.2)

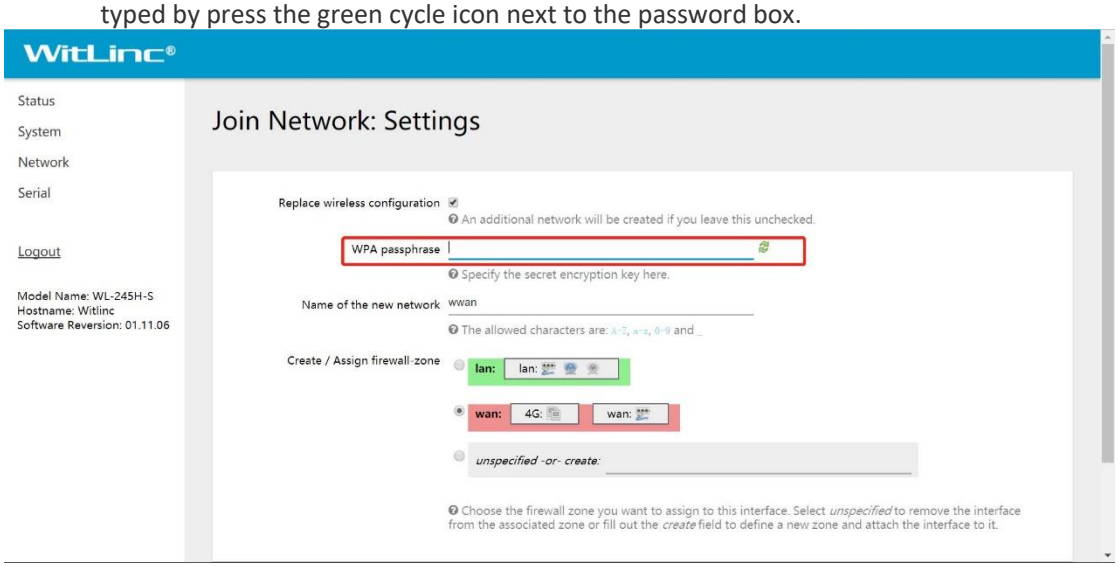
Login to the Configuration Webpage by the new IP address, let's go to the **"Network"** menu on the top of the page and selecting the **"Wifi"** item.



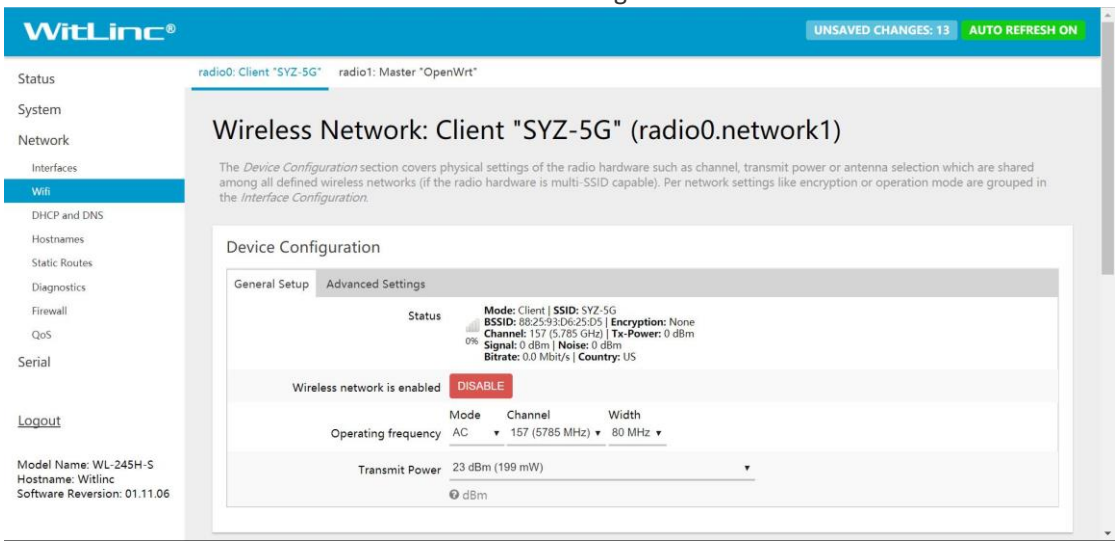
2. Click on the **"SCAN"** button, Wait for a few moments, A WiFi List will appear, let select the network name of the WiFi-Master module, and then click **"JOIN NETWORK"** add to the WiFi network. If there is no list of WiFi Network, please click on the **"REPEAT SCAN"** and scan again.



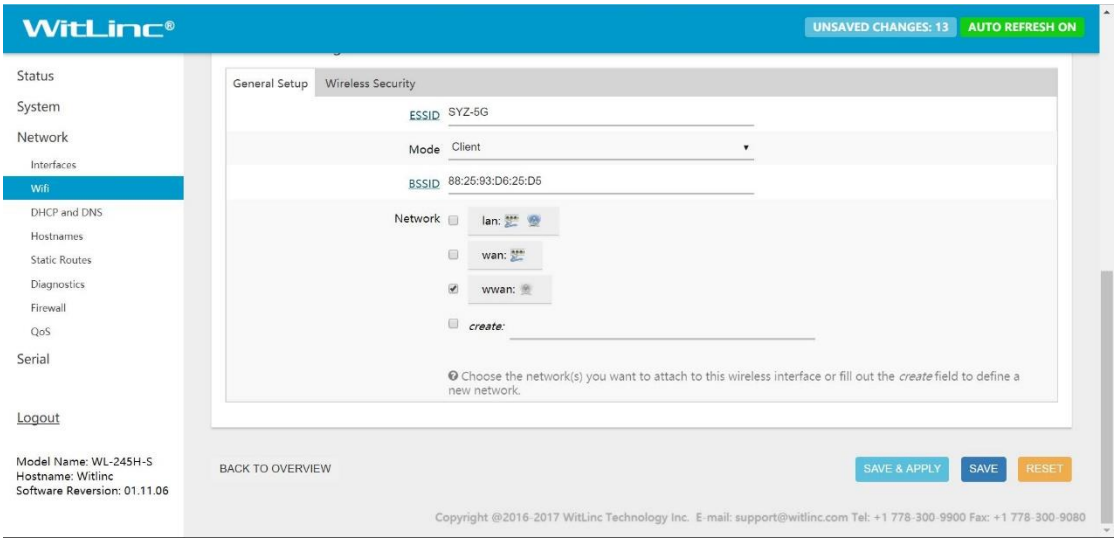
3. After you click the **"JOIN NETWORK"** button we can set the parameter of the Wifi network's password and the Firewall zone. You must set the password same as the master module. Also you should be able to see the password you have typed by press the green cycle icon next to the password box.



4. Next, the "**Name of the new network"** will be set up to WWAN automatically. At the same time we need to change the **"Create/assign firewall zone"** From **"WAN"** to **"LAN".** Then Click **"SUBMIT"** to go to NEXT.



5. Setup the Device Configuration same as the Master Module, Include "Operation Frequency" ande "Transmit Power" these two parameters.



6. The above picture is the WiFi Interface Configuration webpage, after you set up to the Device Configuration； let us select to the **“Interface Configuration”-“General Setup”**, **“ESSID”** is the Network Name which you should Join in. the **“BSSID”** is the MAC address of the master module. We need to change the “**Mode”** into **Client** or **Client(WDS).**
7. let's press the **“Save & Apply”** button to finalize the changes on the module. All the parameter configured completely,and the module will reboot, After the module reboot, the WiFi parameter will be effective.

WiFi	Description
Mode	Configure the WiFi operating frequency
SSID	Assign a network name (SSID) of up to 32 characters. The Module uses this name in all network references. All devices in a network must have the same SSID.
Channel	Select a channel and frequency range for the network or accept the default value. Network channels allow radios to avoid sharing a frequency with other networks in the same location. The channel list indicates the channel number as well as the Frequency.
Encryption	Encryption scrambles data so that only intended viewers can decipher and understand it. Although "none" is an available encryption type, Witlinc Technology strongly recommends encrypting all data sent and received from every radio on your network, to help prevent your data from being intercepted and decoded. **WPA-PSK: Preshare key mode** To use WPA-PSK encryption on packets sent between the modules, select WPA-PSK in the Encryption field. Next, in the **key** phrase field, enter a pass phrase of between eight and 63 normal keyboard characters.
	This phrase automatically generates an encryption key of 128 hexadecimal characters. The default pass phrase is "password" (lower case, no quotes).

	WPA2-PSK: based on IEEE 802.11i Use WPA-PSK encryption on packets send between the modules, select WPA-PSK in the Encryption field.
key	You must enter the password in this field, after set the encryption mode.

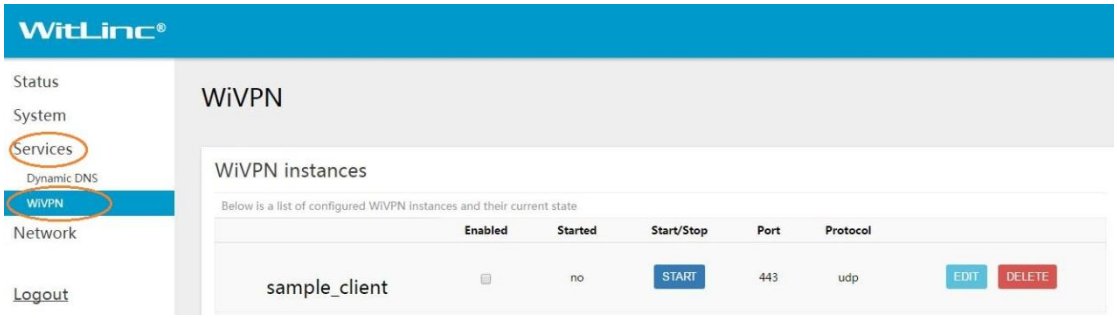
Important: you must assign the same Network SSID and WPA phrase to the other devices which communication to the master module

2.5 Setup the WiVPN Function

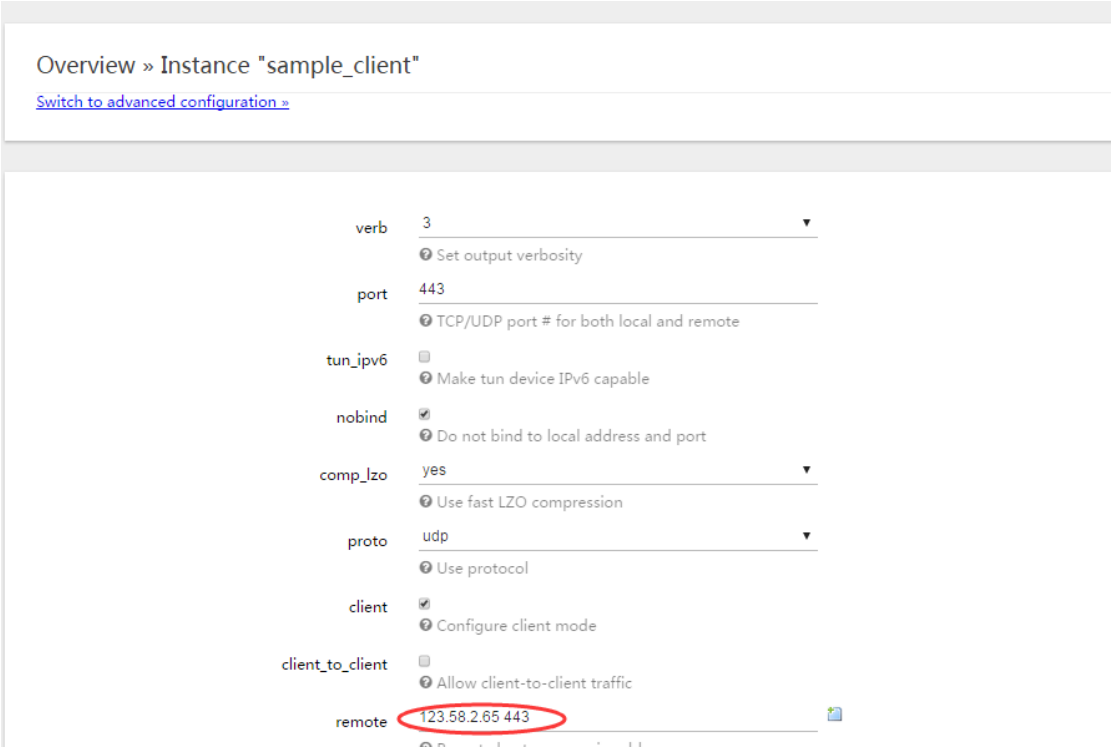
1. While in client site, WiVPN actively makes connection to the server side, if passed the server authentication, a VPN connection would be established.

Below are steps to make connection to a WiVPN server:

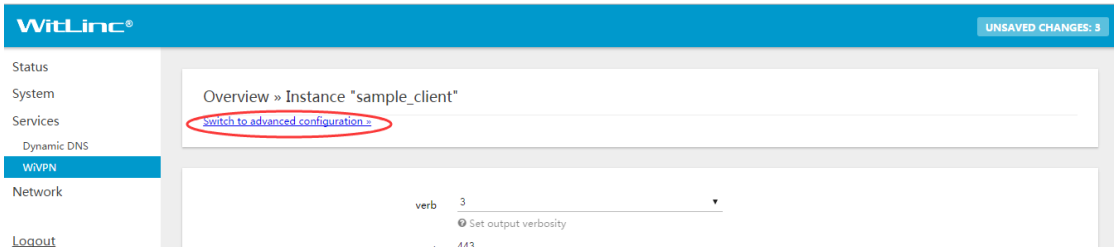
1. Before config WiVPN client, you need to get 3 files from WiVPN server administrator: ca.crt, clientX.crt and clientX.key
2. And ask WiVPN server administrator for parameters about server address, server port and cipher.
3. Through web management interface: ***Services***->***WiVPN***, you can see sample instances as show below.



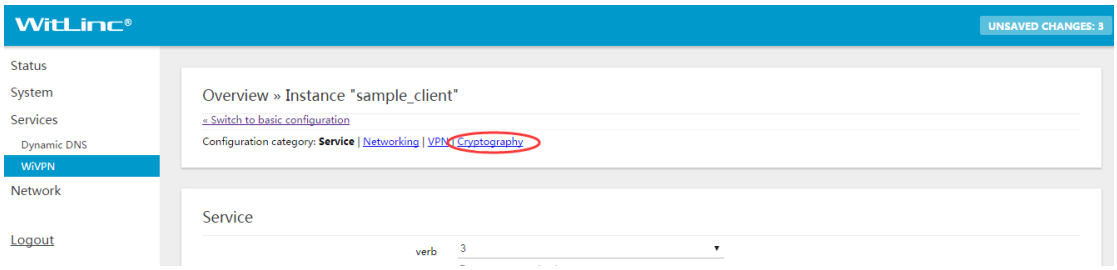
4. Click “EDIT” button corresponded to “sample_client”. And type in WiVPN server address (IP or FQDN) and server port (there must have space between server address and server port). As show below.



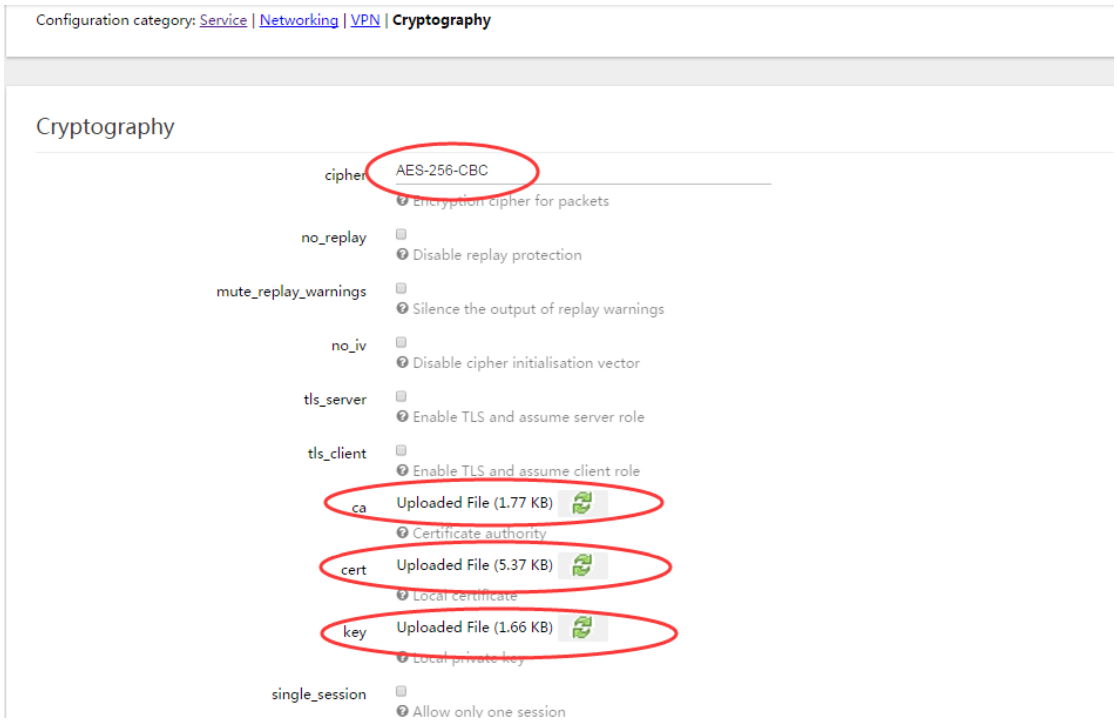
5. Click “***Switch to advanced configuration*** >>” as show below.



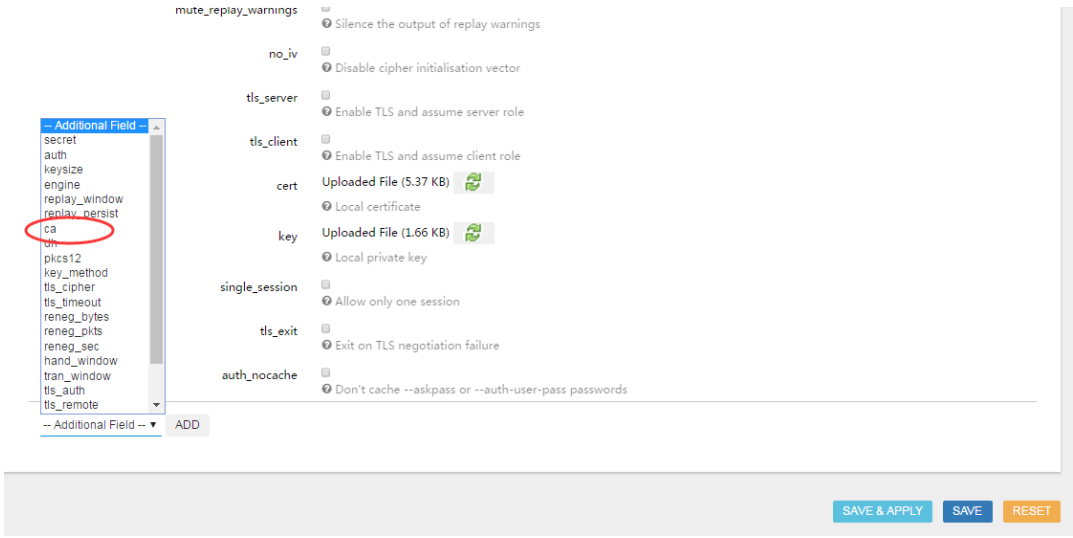
6. Click "***Cryptography***" as show below.



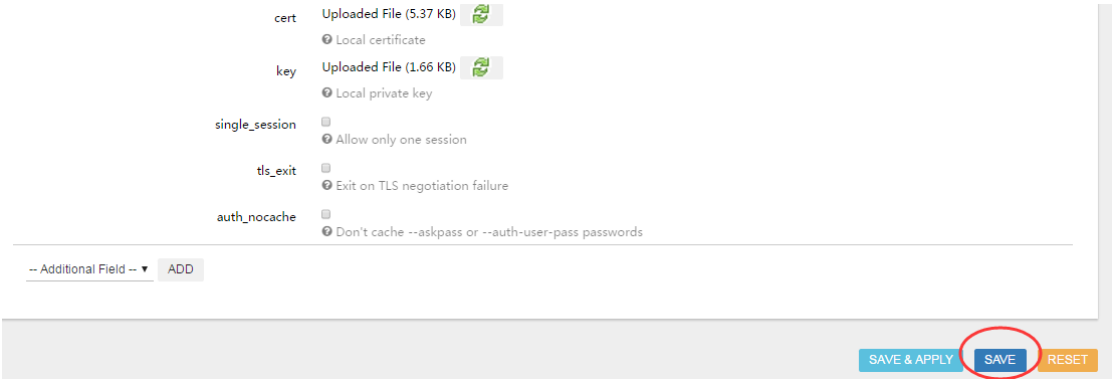
7. Type in cipher, upload ca.crt to ca field, upload clientX.crt to cert field and upload clientX.key to key field. As show below the cipher is "AES-256-CBC".



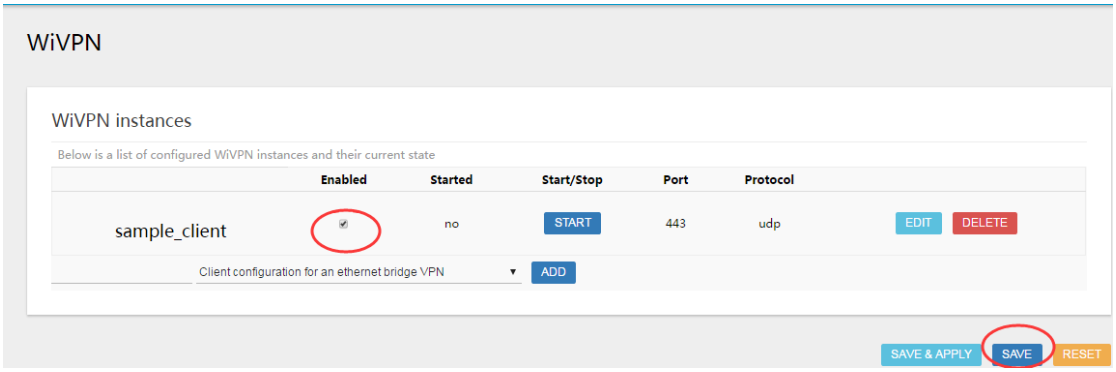
If no corresponded fields exist, scroll down the page and select field from "Additional Field", click "ADD" button to add the field. As show below.



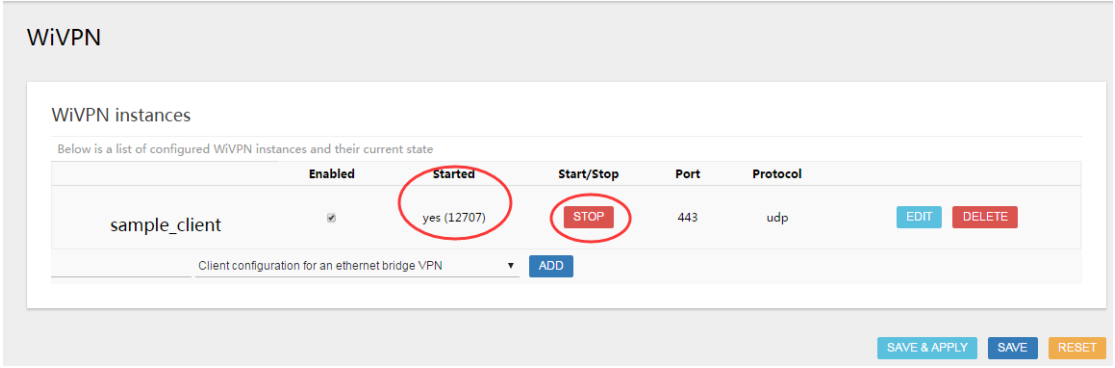
8. Check all your configurations are correct and uploaded the 3 files to corresponded fields, click “SAVE” button as show below.



9. Through web management interface: ***Services***->***WiVPN***, check “***Enabled***” checkbox, and click “***SAVE***” button. As show below.

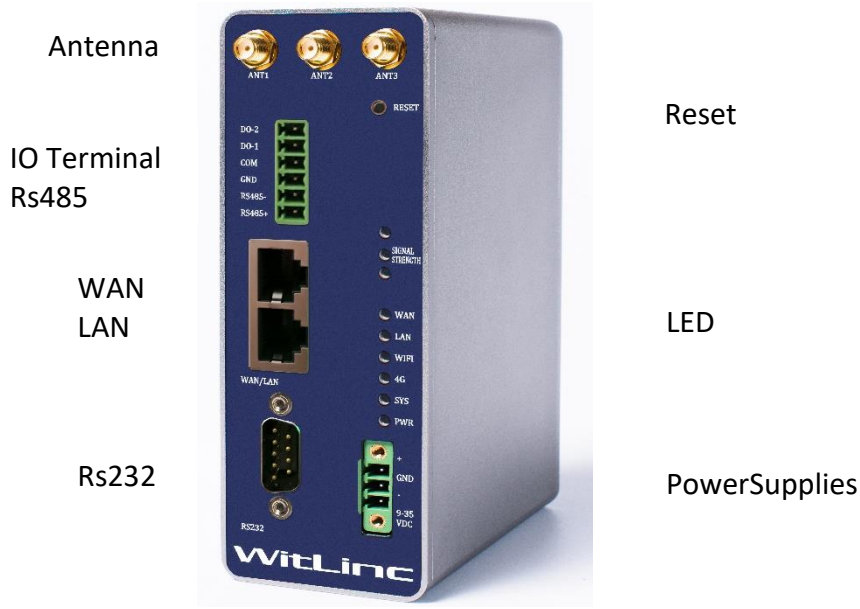


10. Wait a while, you can see the client started, now the VPN connection is established. By clicking “***STOP***” button you can stop WiVPN client. As show below.



3. Hardware Installation

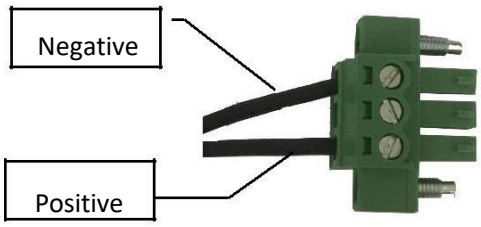
Power Supplies installation
Antenna Installation
IO Terminal Installation
Rs232 Installation
Rs485 Installation
LED indicators



3.1 Power Supplies installation

The WL-245H-S accepts voltages between 9 - 30 VDC, two step complete the power supply wiring.

1. Connect the 24VDC cable to the power terminal, Please be careful don't connect the positive to the negative terminal.



2. Insert the Power Terminal into the module, then tighten the screws.

3.2 Antenna installation

The module designed of 3 antenna ports, 3×3 MIMO Antena, Each module must have 3 antennas connected to antenna port on the WL-245H-S, without the antenna the module will not connect to the network.

1. Small WiFi antennas with a reverse polarity SMA connector can be mounted directly on the radio. Screw the antenna onto the antenna port connector until it is snug. The frequency range must between 5.125GHz – 5.875GHz.

Important: Antennas selected should not exceed a maximum gain of 5 dBi under standard installation configuration. In more complex installations, it is imperative that the installer follow maximum dBi gain guidelines in accordance with the radio communications regulations of the Federal CommunicaCommission (FCC), Industry Canada, or your country's regulatory body (if used outside the Canada).

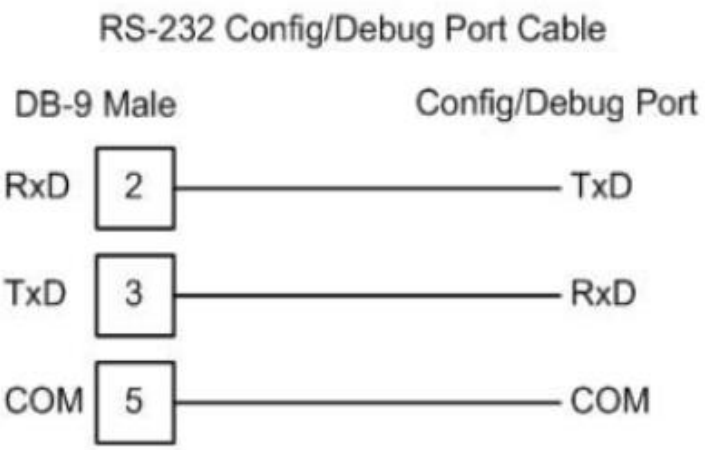
3.3 IO terminal installation

There are two digital input/output and one analog terminals on the module. We can monitor the IO signal by the Serial port. Also the IO signal can be controlled by the serial port.

DO-2	Digital Output Signal No.2 terminal
DO-1	Digital Output Signal No.1 terminal
COM	Digital Output ground terminal
GND	RS485 Ground terminal
Rs485 +	Rs485 positive terminal
Rs485 -	Rs485 Negative terminal

3.4 Rs232 Serial port installation

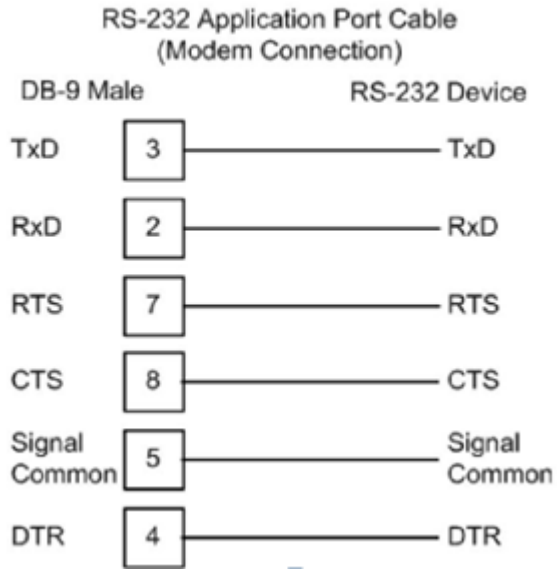
The use of hardware handshaking (control and monitoring of signal lines) depends on the requirements of the networked device. If no hardware handshaking will be used, the cable to connect to the port is as shown below:



With the package there are two serial cable, one cable is RJ45 to DB9 Female connector, and another is the serial Null-Modem cable.

RS-232: Modem Connection (Hardware Handshaking Required)

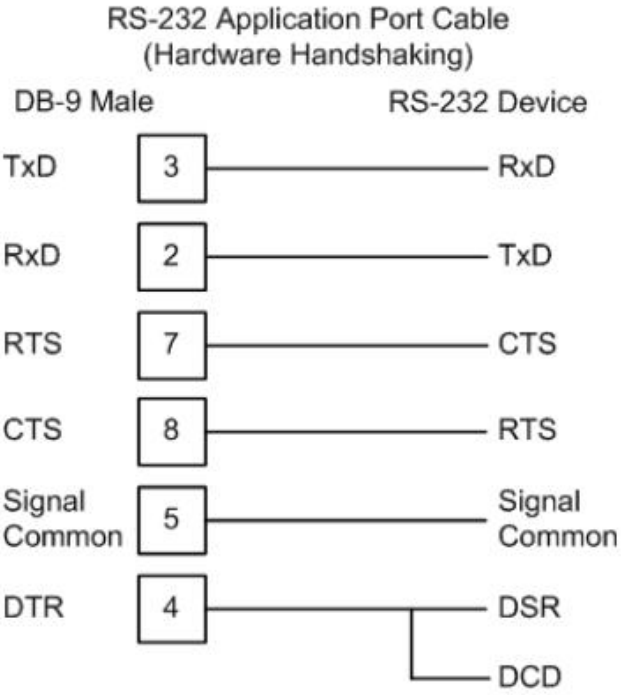
This type of connection is required between the module and a modem or other communication device.



The "Use CTS Line" parameter for the port configuration should be set to 'Y' for most modem applications.

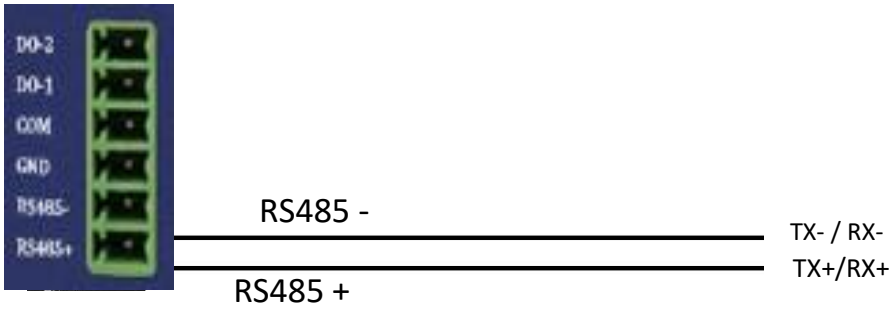
RS-232: Null Modem Connection (Hardware Handshaking)

This type of connection is used when the device connected to the module requires hardware handshaking (control and monitoring of modem signal lines).



3.5 Rs485 Serial port installation

The RS-485 interface requires a single two or three wire cable. The Common connection is optional, depending on the RS-485 network devices used. The cable required for this interface is shown below:



IO Terminal

Note: Terminating resistors are generally not required on the RS-485 network, unless you are experiencing communication problems that can be attributed to signal echoes or reflections. In these cases, installing a 120-ohm terminating resistor between pins Rs485+ and Rs485- on the module connector end of the RS-485 line may improve communication quality.

RS-485 and RS-422 Tip

If communication in the RS-422 or RS-485 mode does not work at first, despite all attempts, try switching termination polarities. Some manufacturers interpret + and -, or A and B, polarities differently.

3.6 LED indicators

LED	Color	Status	Description
Signal Strength	Green	Steady	Signal Quality of the wireless received from the WiFi-master module
		Unlighted	Signal is bad
Lan	Green	Steady	Lan Communication Failed
	Green	Flashing	Lan Communication is successful
		Unlighted	No Ethernet Cable has been detected
WAN	Green	Steady	WAN port Communication Failed
	Green	Flashing	WAN port Communication is ok
		Unlighted	No Ethernet Cable has been detected
WiFi	Green	Steady	WiFi Function is enable
		Unlighted	WiFi Function is disable
4G	Green	Steady	No Used
PWR	Green	Steady	Power supply is normal
SYS	Green	Steady	System has err occurs

4. Support, Service & Warranty

4.1 Contacting Technical Support

WitLinc Technology, Inc. is committed to providing the most efficient and effective support possible. Before calling, please gather the following information to assist in expediting this process:

1 Product Version Number
2 System architecture
3 Network details

If the issue is hardware related, we will also need information regarding: **1** Module configuration
2 Module operation and any unusual behavior
3 Configuration/Debug status information
4 LED patterns
5 Details about the serial, Ethernet or other interfaced to the module.

Note: For technical support calls within the United States, an emergency after-hours answering system allows 24-hour/7-days-a-week pager access to one of our qualified Technical and/or Application Support Engineers. Detailed contact information for all our worldwide locations is available on the following page.

Internet	Web Site: www.witlinc.com/ E-mail address: support@witlinc.com
Tel	+1 778-300-9900
Fax	+1 778-3009080

4.2 Warranty Information

For complete details regarding WitLinc Technology's TERMS & CONDITIONS OF SALE, WARRANTY, SUPPORT, SERVICE AND RETURN MATERIAL AUTHORIZATION INSTRUCTIONS please see the documents on the Product DVD or go to www.witlinc.com

APPENDIX

◆ IEEE 802.11AC

IEEE 802.11ac is a wireless networking standard in the 802.11 family (which is marketed under the brand name Wi-Fi), developed in the IEEE Standards Association, providing high-throughput wireless local area networks (WLANs) on the 5 GHz band. The standard was developed from 2008 (PAR approved 2008-09-26) through 2013 and published in December 2013 (ANSI approved 2013-12-11).

The specification has multi-station throughput of at least 1 gigabit per second and single-link throughput of at least 500 megabits per second (500 Mbit/s). This is accomplished by extending the air-interface concepts embraced by 802.11n: wider RF bandwidth (up to 160 MHz), more MIMO spatial streams (up to eight), downlink multi-user MIMO (up to four clients), and high-density modulation (up to 256-QAM).

The first 802.11ac products from 2013 are referred to as Wave 1, and the newer higher bandwidth products introduced in 2016 are referred to as Wave 2.

New technologies introduced with 802.11ac include the following:

- Extended channel binding
- Optional 160 MHz and mandatory 80 MHz channel bandwidth for stations; cf. 40 MHz maximum in 802.11n.
- More MIMO spatial streams
- Support for up to eight spatial streams (vs. four in 802.11n)
- Downlink multi-user MIMO (MU-MIMO, allows up to four simultaneous downlink MU-MIMO clients)
- Multiple STAs, each with one or more antennas, transmit or receive independent data streams simultaneously.
- Space-division multiple access (SDMA): streams not separated by frequency, but instead resolved spatially, analogous to 11n-style MIMO.
- Downlink MU-MIMO (one transmitting device, multiple receiving devices) included as an optional mode.
- Modulation
- 256-QAM, rate 3/4 and 5/6, added as optional modes (vs. 64-QAM, rate 5/6 maximum in 802.11n).
- Some vendors offer a non-standard 1024-QAM mode, providing 25% higher data rate compared to 256-QAM
- Other elements/features
- Beamforming with standardized sounding and feedback for compatibility between vendors (non-standard in 802.11n made it hard for beamforming to work effectively between different vendor products)
- MAC modifications (mostly to support above changes)

- Coexistence mechanisms for 20, 40, 80, and 160 MHz channels, 11ac and 11a/n devices
- Adds four new fields to the PPDU header identifying the frame as a very high throughput (VHT) frame as opposed to 802.11n's high throughput (HT) or earlier. The first three fields in the header are readable by legacy devices to allow coexistence

Example configurations[edit]

All rates assume 256-QAM, rate 5/6:

Scenario	Typical client form factor	PHY link rate	Aggregate capacity (speed)
One-antenna AP one-antenna STA 80 MHz	Handheld	433 Mbit/s	433 Mbit/s
Two-antenna AP two-antenna STA 80 MHz	Tablet, laptop	867 Mbit/s	867 Mbit/s
Three-antenna AP three-antenna STA 80 MHz	Laptop, PC	1.27 Gbit/s	1.27 Gbit/s