



WiFi Hound™ 101 Training

Getting to Know Your Tester

ABOUT TRIPLETT

- Designer and manufacturer of precision copper, fiber, and RF test equipment since 1904.
- Based in Manchester, NH, USA.
- Focused on high-quality, easy-to-use test equipment that is still within reach on a Junior Tech's salary.
- Maker of the famous "Fox & Hound" wire tracers and testers.



When we were developing the Triplett WiFi Hound, we focused on creating a tester that would let even an inexperienced technician troubleshoot problems with the wireless environment quickly. We also knew how important it was for that same technician to be able to clearly communicate the problems to the customer. Finally, true to our 100+ year tradition, we wanted to ensure the Tester was affordable for the technician. We hope you enjoy using your WiFi Hound for many years to come!

What the WiFi Hound is NOT:

- This is not a mapping system to tell you where to put your APs.

What the WiFi Hound IS:

- This is a Spectrum Analyzer designed so that even Level 1 Field Technicians can effectively assess and troubleshoot the wireless environment, and communicate those problems (and potential solutions) to the home or business owner.



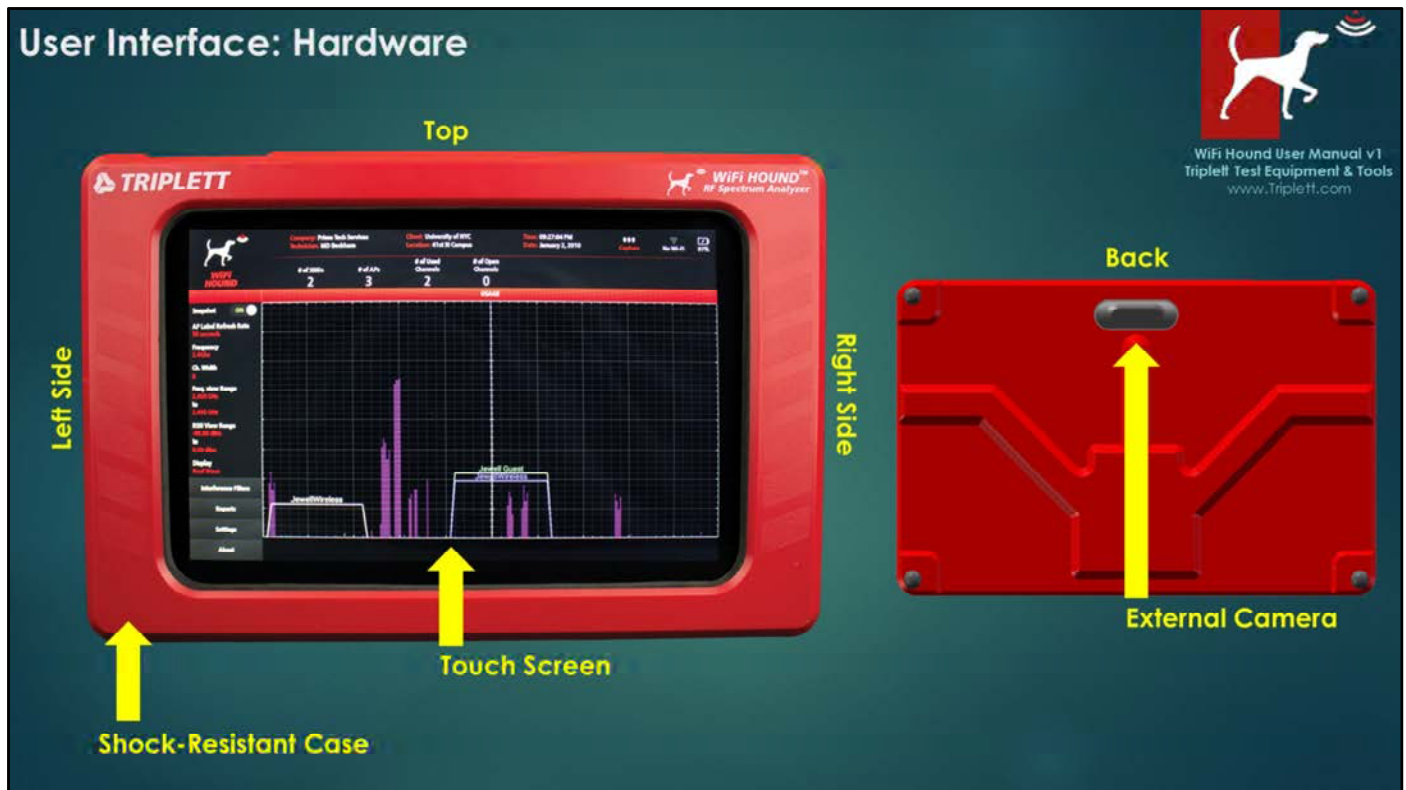
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First, let's discuss what the WiFi Hound is not – it is NOT a mapping system to tell you where to place Access Points in a home or office. It is a spectrum analyzer that allows you to see all of the RF activity that is happening in the environment. This Tester is far more sophisticated than the free apps you get on your smartphone. The WiFi Hound has a full set of features for the Field Technician, which we will get into later.

Some basic information... this model covers both the 2.4GHz and 5GHz wireless spectrum, including Zigbee. Before you ask, yes, we will have another model out soon that will cover Z-Wave. Z-Wave operates in a different part of the wireless spectrum, and thus requires different hardware, so it will be a separate model when it is released.

What is a Spectrum Analyzer vs just the free app on your phone?

A spectrum analyzer shows everything that is happening in the spectrum, regardless of what is creating the signal. You will often see free apps people use on their phone or tablet that show other Access Points that are broadcasting in the area. However, those Apps are not able to show EVERYTHING in the spectrum, and it's all that other stuff that is often causing problems. That is the fundamental difference between those "free" apps and this Tester. Those free apps will only get you so far; they are not true Spectrum Analyzers.



HARDWARE

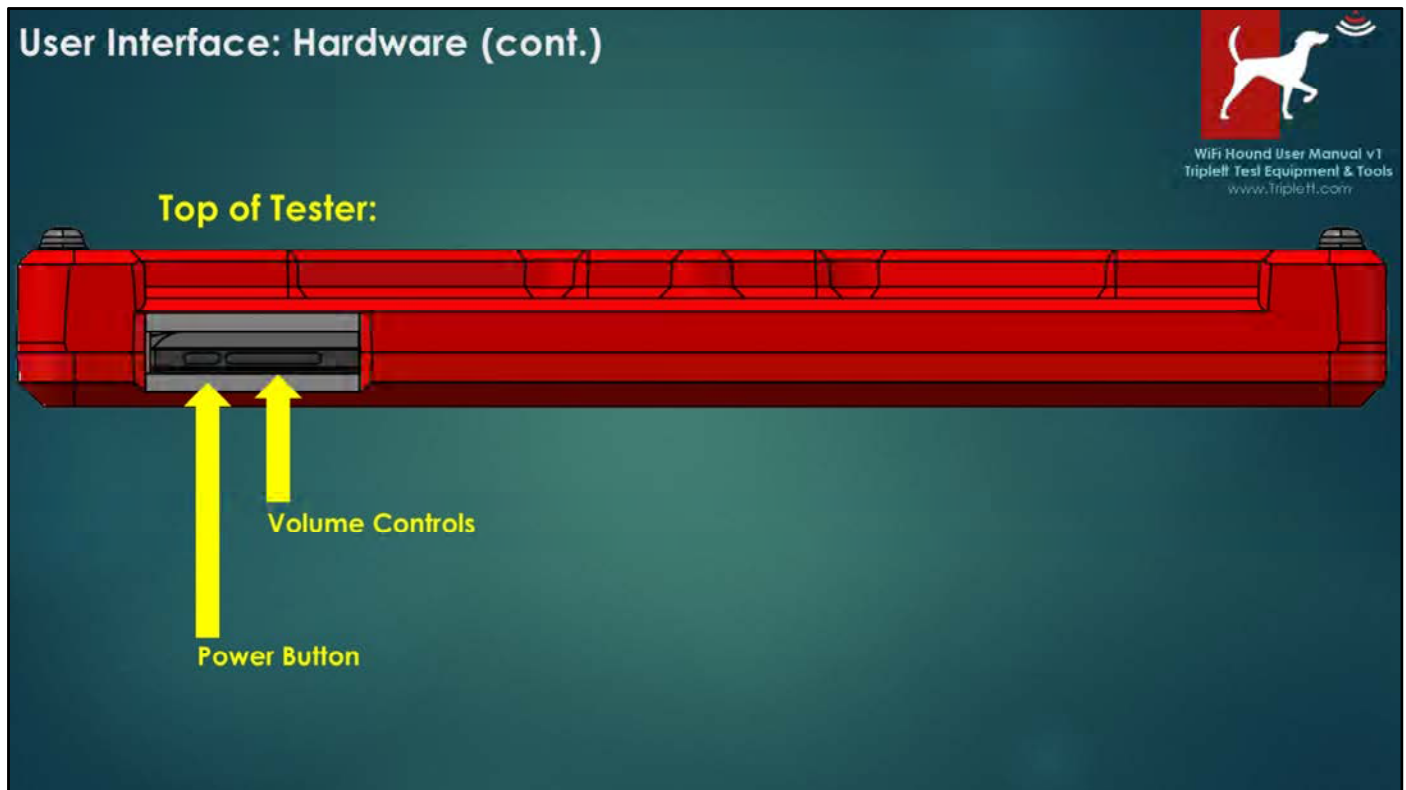
Android-based tester with custom hardware and shock-resistant case. Many Android features are deliberately disabled, and Bluetooth should always be set to OFF.

FRONT

Touch-screen user interface. Keep the screen clean. You can wipe it with a dry cloth, or use a touch-screen-approved mild cleaner. It is a capacitive touch screen, which means that your finger *completes the circuit*. **Do not touch it with a fingernail, or try to press harder to get it to work.** Pressing hard on the screen will cause irreparable damage which is not covered under warranty. If the touch screen is not responsive, it may be due to callouses on your fingers, or oil or debris on your fingers or the screen.

BACK

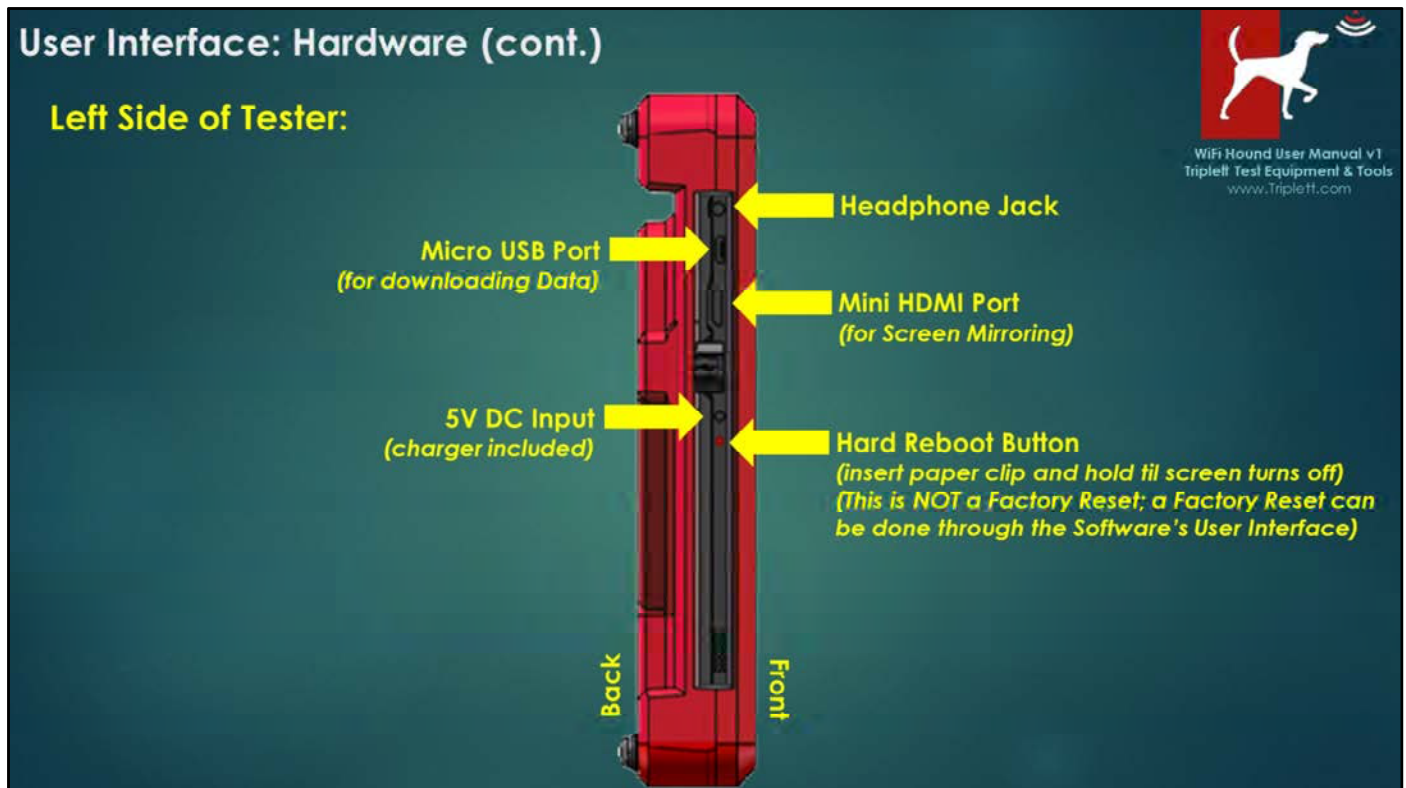
External camera used for taking pictures.



TOP

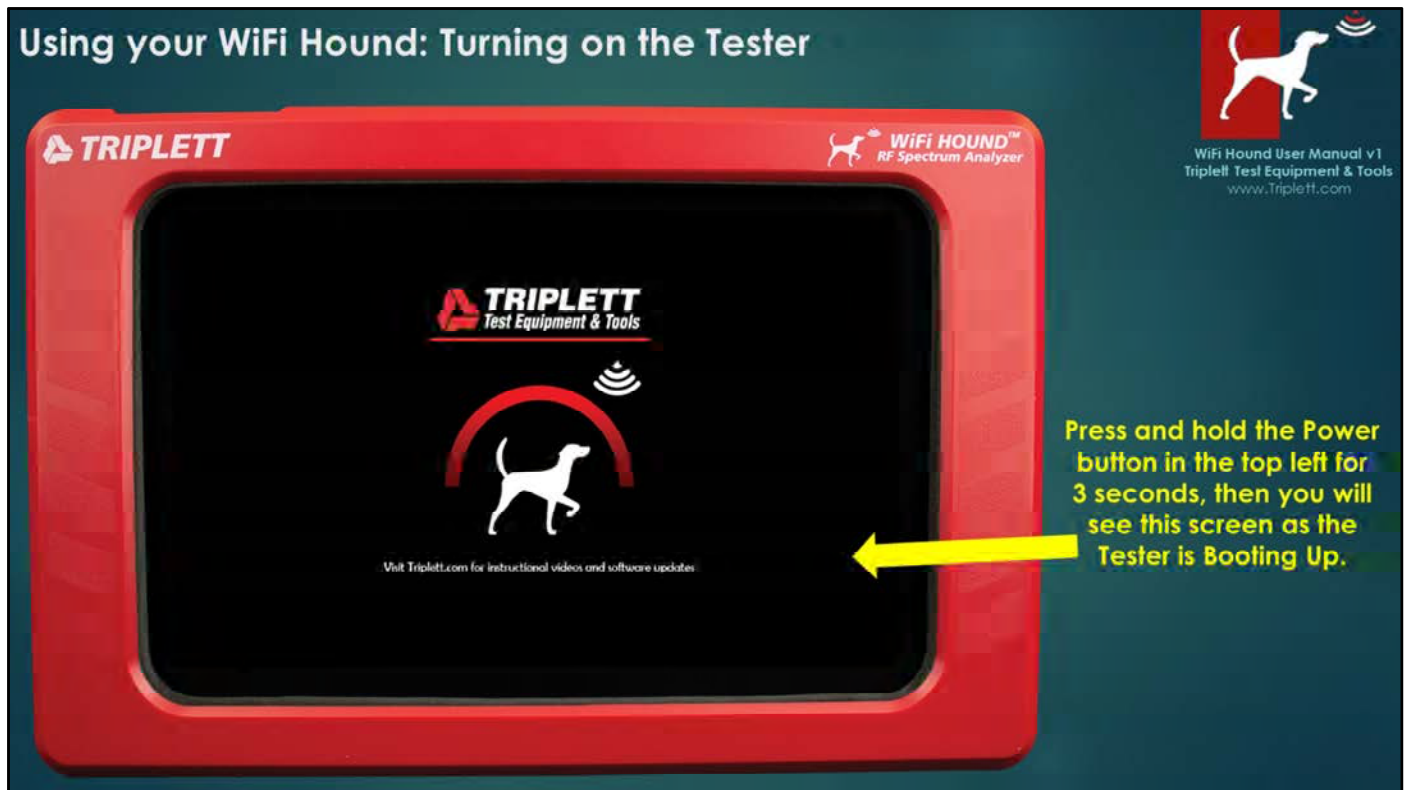
The Power Button is located on the top of the tester, to the far left. Since this is an Android-based piece of equipment, you must **PRESS AND HOLD** the Power button for three seconds then release it to turn on the Tester.

*Caution: If you accidentally press and hold the Power button and the Volume button at the same time, you will accidentally access the Android Operating System programming screen. If this happens, you will have to do a **HARD REBOOT** of the Tester (shown next page), and then power it back on (being careful to avoid pressing the volume button at the same time!).*



From Top to Bottom:

- Headphone Jack
- Micro USB Port – Use for backing up your client files onto your laptop, or clearing old files to free up memory on the Tester.
- Mini HDMI Port – Can be used to mirror the Tester's screen to a larger monitor/HDMI-connectable TV set.
- DC port for charging -- Charger is included with your WiFi Hound. Do not use aftermarket chargers.
- Hard Reboot Inset -- use a paperclip, insert it into the hole and count to 5. This will force the tester to reboot.

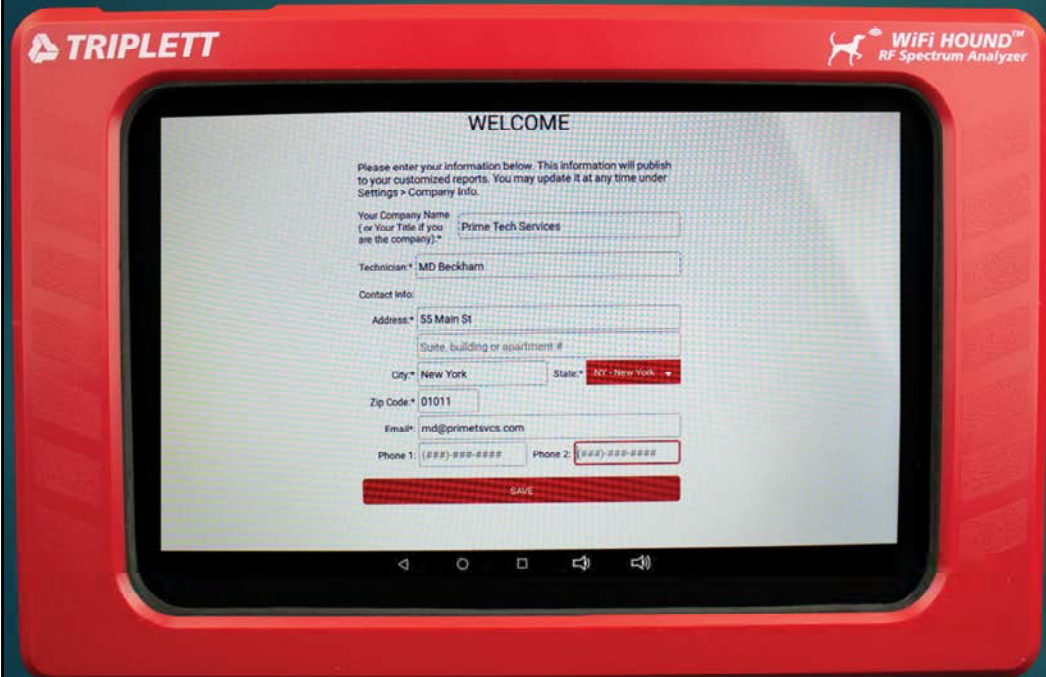


As mentioned earlier, if you press the power button and the Volume control at the same time by accident, you will enter into the Android OS control screen. The only way to get out of that screen is to use a paperclip to do a Hard Reboot. If you press the power button and see the above screen, you are in the correct place. Give the Tester a minute to fully boot up.



This is the WiFi Hound Startup Screen. This is the screen you will see once the unit has completed its boot-up process. Swipe up from the Lock icon to begin using your Tester.

User Interface: Setting up Your Company Information



WELCOME

Please enter your information below. This information will publish to your customized reports. You may update it at any time under Settings > Company Info.

Your Company Name (or Your Title if you are the company): Prime Tech Services

Technician: MD Beckham

Contact Info:

Address: 55 Main St

Suite, building or apartment #

City: New York State: NY - New York

Zip Code: 01011

Email: md@primetechs.com

Phone 1: (###) ###-#### Phone 2: (###) ###-####

SAVE

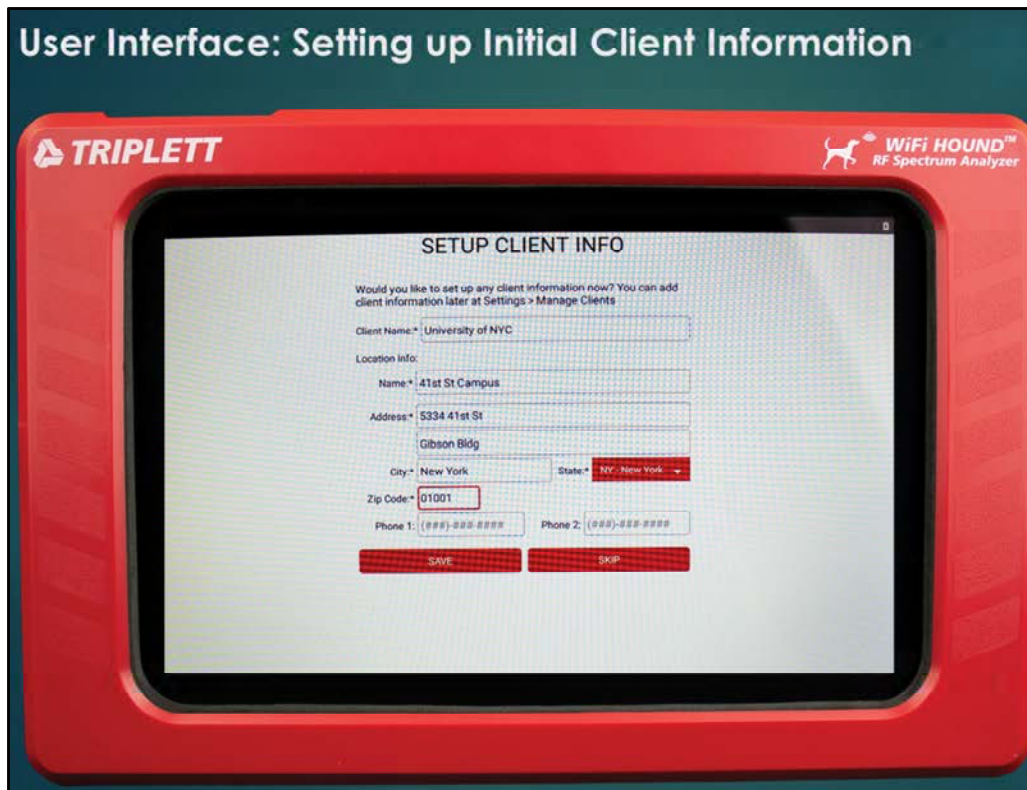
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Fill in the Initial Setup Information with your Company Name, Technician, etc.

This information will pre-fill your custom reports, so be accurate!

This is the WELCOME SCREEN. You will only need to add this information once. To add more Technicians or select a different Technician, you can go to Settings > Company Info in the Main Screen after you have completed the Initial Setup here.

User Interface: Setting up Initial Client Information



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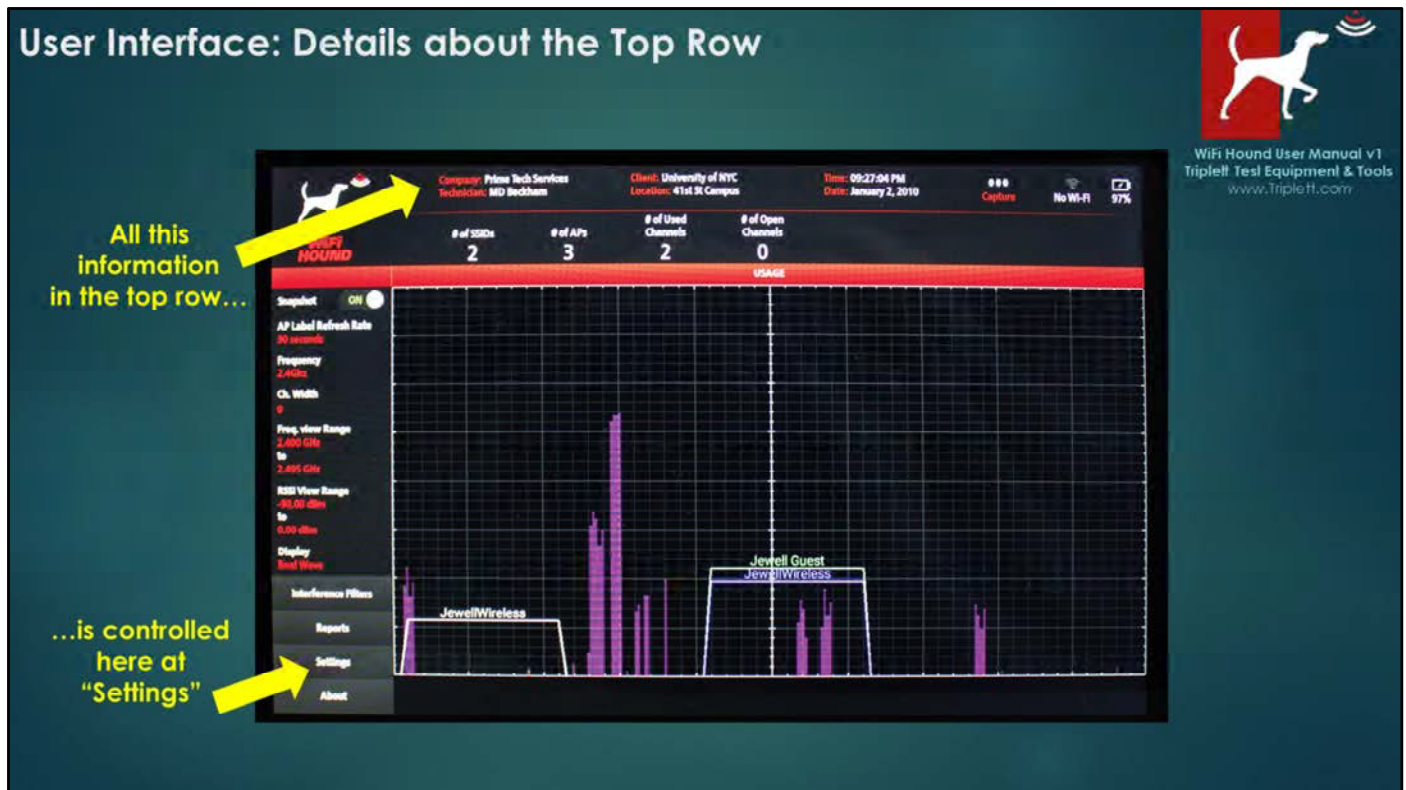
Fill in the initial Client Information. If you are just trying out the Tester, create a test client that looks/sounds professional.

Note the difference between Client Name and Location Name!

SETUP CLIENT INFO

This creates the FOLDER on the tester in which all of that specific client's data is kept. It is important to fill in both the Client Name and Location Name. In this example, the Client Name is University of NYC, and the Location Name would be, for example, a specific campus/building/floor/wing, etc. This will make it easier for you to find historical data on call-backs. You should put some thought into standardizing a naming convention for you and your technicians so everyone knows exactly how to create Client Names and Client Locations.

While you can choose to Skip adding this information at this stage, we recommend you go ahead and add your own personal home or business address instead as your first "client" so you can use it to start capturing data and getting used to the Tester.



MAIN SCREEN: TOP ROW

Notice the Company and Client information comes out on the Main Screen on the top. This data, along with the Time and Date, and connecting to the local WiFi network, is controlled at "Settings" in the bottom left of the screen.

CAPTURE (We will discuss the **CAPTURE** features later.)

WIFI

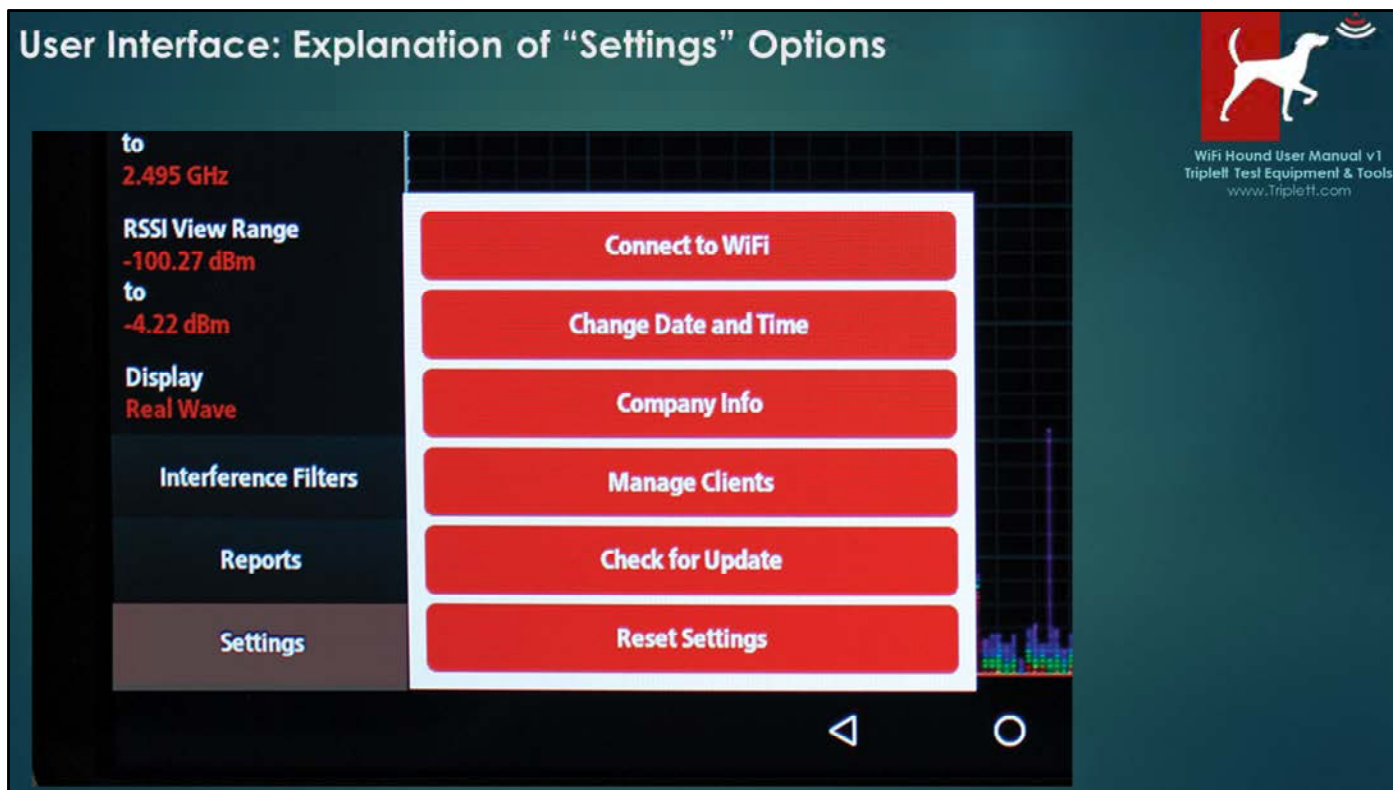
If you are familiar with the Android OS, then you know that swiping down from the top right corner of the device will get you into a Settings screen where you can connect to the local WiFi. **DO NOT USE THAT FEATURE.** Instead, go to Settings > Connect to WiFi. Once you have connected, use the Android Back Arrow to get back to the WiFi Hound Main Screen. You will need to connect to WiFi if you want to send reports directly from the Tester using your generic company email address. (NOTE: as of the time of this training, email addresses cannot be technician-specific.)

BATTERY AND CHARGING STATUS

The lightning bolt indicates the Tester is charging (i.e., the Tester is connected to an AC outlet via the power adapter provided). Only use the adapter that comes with the unit as an aftermarket charger may cause problems. You can also charge the Tester using the Micro USB port, however charging by that method is **EXTREMELY** slow, and the Micro USB port will not charge fast enough to compensate for the power the screen uses. You can power off the screen without powering off the Tester by pressing the Power button for less than 1 second. Press it again for 1 second to turn the screen back on.

NOTE ABOUT STARTUP

Get into the habit of always **selecting the correct Technician and Client** every time you boot up your WiFi Hound. Confirm you have the right Client selected whenever you get on-site, and when you start to Capture data.



CONNECT TO WIFI

Use this feature to access the Android UI and connect the Tester to the local wireless network. Connecting to the wireless network you are trying to test will also give you a Throughput Speed readout in the upper right part of the display.

CHANGE DATE AND TIME

You want to do this as soon as you initially set up your Tester.

COMPANY INFO

This is your own business information. You can manage your Technician list and selection here.

MANAGE CLIENTS

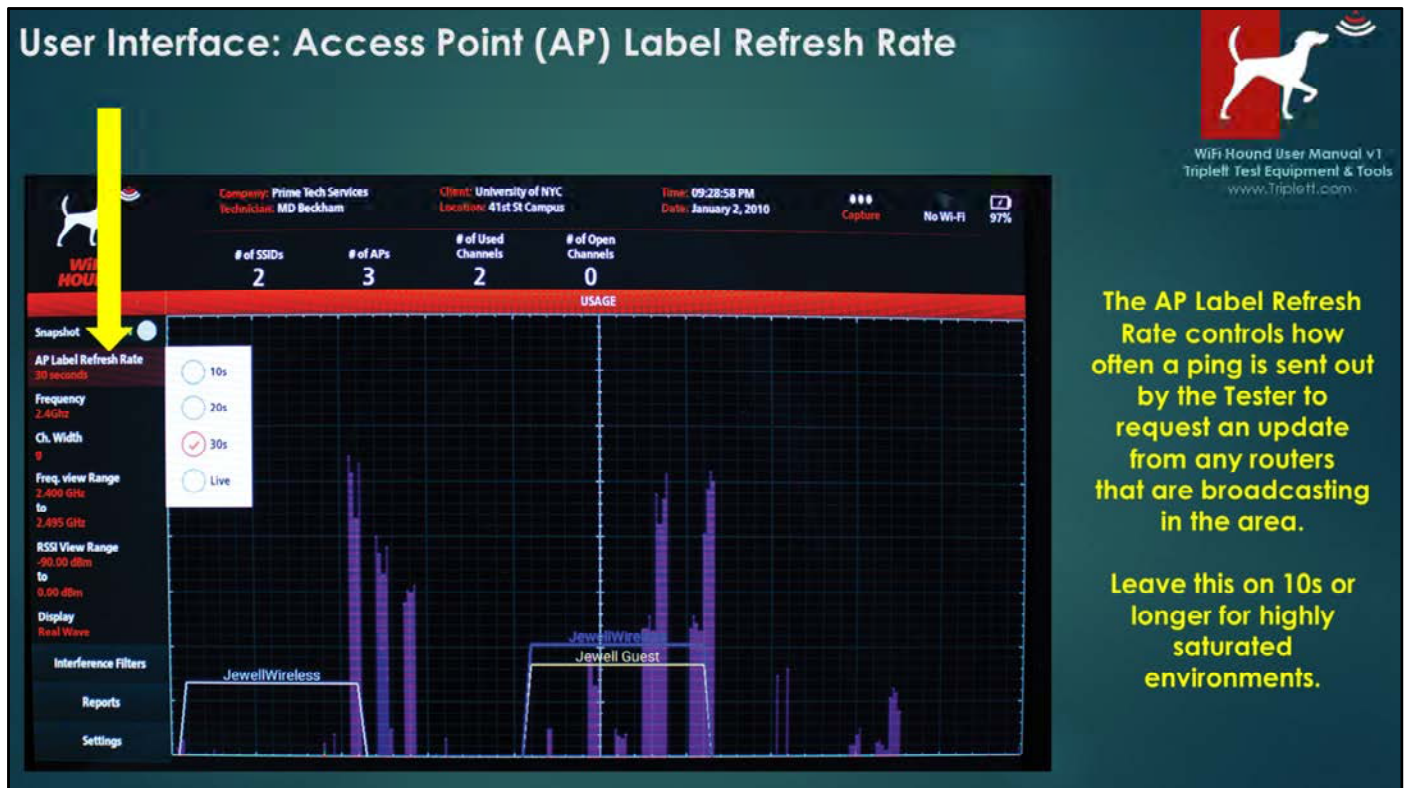
This is where you add client information, add buildings/campus locations, etc.

CHECK FOR UPDATE

This will automatically check for an updated version of the WiFi Hound firmware and install it for you. You must be connected to a WiFi network that has internet access for this to work. We do not recommend doing firmware updates when on a jobsite. A partial download, or the Tester losing power during an update could disable the unit completely, so do not run updates when you are at the jobsite.

RESET SETTINGS

This is the FACTORY RESET. Please call Triplett Technical Support prior to using this feature as doing so will remove all the existing client and business data from your Tester.



Access Point (AP) Label Refresh Rate

Note that the waveforms are LIVE, and are not related to the AP Label Refresh Rate selection.

User Interface: Frequency Selector



Company: Prime Tech Services
Technician: MD Beckham

of SSIDs: 2 # of APs: 3

Snapshot: ON

AP Label Refresh Rate: 30 seconds

Frequency: 2.4GHz

Ch. Width: 9

Freq. view Range: 2.400 GHz to 2.495 GHz

Choose between 2.4GHz and 5GHz.

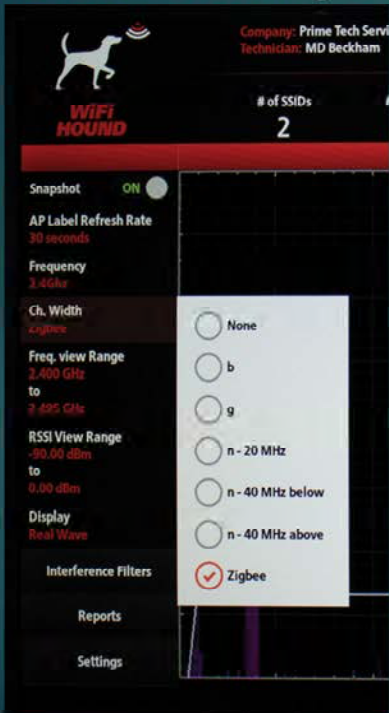
Your selection here will update the Channel Width, Frequency View Range, and RSSI View Range options.

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FREQUENCY

Select between 2.4GHz (802.11 b/g/n/Zigbee) and 5GHz (802.11 n/ac) frequencies.

User Interface: Selecting Channel Widths



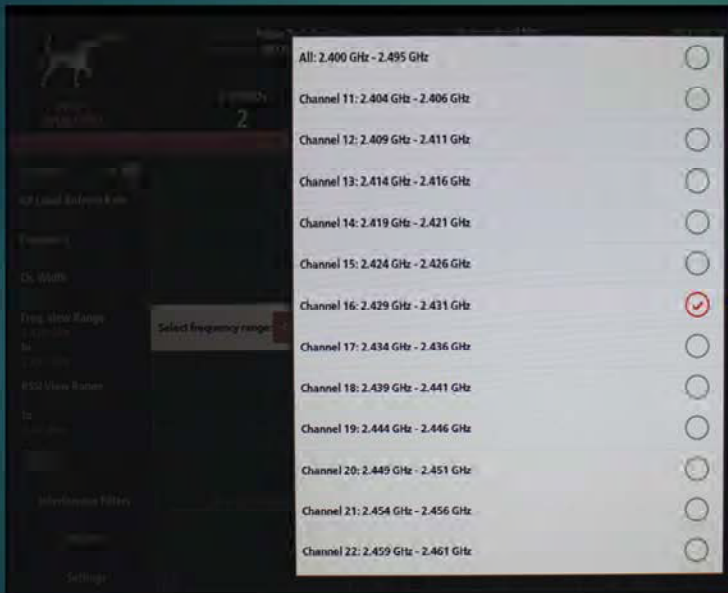
The screenshot shows the WiFi Hound application interface. At the top, it displays the company name 'Prime Tech Serv' and technician 'MD Beckham'. The 'WIFI HOUND' logo is on the left. The 'Ch. Width' menu is open, showing options: None, b, g, n - 20 MHz, n - 40 MHz below, n - 40 MHz above, and Zigbee (which is selected with a red checkmark). The background shows a frequency spectrum view with a peak at 2.4 GHz.

Depending on which Frequency you chose, you will see specific options in the Channel Width. If you chose 2.4GHz, you will see all the 802.11 b/g/n channel width options, plus Zigbee (which broadcasts on 2.4GHz).

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The Channel Width selection is designed to help narrow the viewing range and make it easier for you to troubleshoot saturated wireless environments. You will not see the impact of your selection until you select the next option in the Frequency View Range filter.

User Interface: Selecting a Channel in Frequency View Range



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In this example, if you had selected Zigbee in the Channel Width options, you would then see this set of Zigbee-specific Channels. You can select a channel to apply the filter.

Notice that when you now go into the Frequency View Range, it lists the Zigbee channels. If you had selected b or g, for example, then the corresponding North American channels referring to 802.11b or 802.11g (Channels 1-11) would show instead.

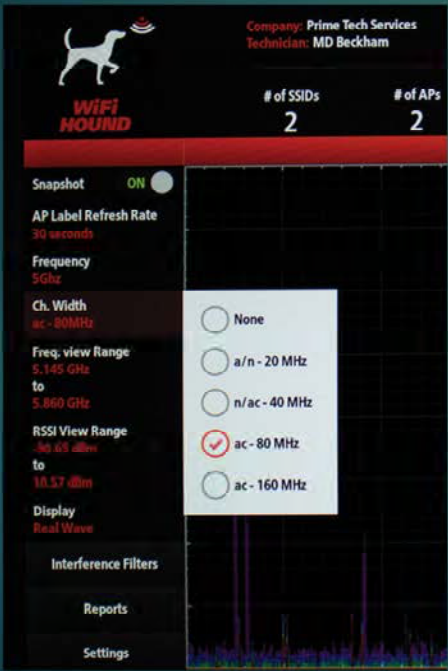
User Interface: View after applying the filter to show Ch. Z16

The screenshot shows the WiFi Hound RF Spectrum Analyzer interface. The top status bar displays: Company: Prime Tech Services, Technician: MD Beckham, Client: University of NYC, Location: 41st St Campus, Time: 09:33:27 PM, Date: January 2, 2019, Capture, No Wi-Fi, and 97% battery. Below the status bar, a summary table shows: # of SSIDs: 2, # of APs: 3, # of Used Channels: 2, and # of Open Channels: 0. The main display is a spectrum analyzer graph with a grid. A vertical yellow bar highlights a specific frequency, labeled '2.430 GHz CH. 16' at the bottom. A yellow arrow points to this label. The left sidebar contains various settings: ScanShot (ON), AP Label Refresh Rate (30 seconds), Frequency (2.4GHz), Ch. Width (20px), Freq View Range (2.425 GHz to 2.431 GHz), RSSI View Range (-90.00 dBm to -100.00 dBm), Display (Real View), Interference Filters, Reports, Settings, and About. The top right corner of the interface shows the WiFi Hound logo and the text 'WiFi Hound User Manual v1 Triplett Test Equipment & Tools www.triplett.com'.

Here is Zigbee Channel 16, now highlighted for easier troubleshooting.

After you are done using the filter, you can then reselect the Frequency View Range filter and change it back to All Channels to change back to the full, unfiltered view.

User Interface: 5GHz Channel Width Options



Company: Prime Tech Services
Technician: MD Beckham

of SSIDs: 2 # of APs: 2

Snapshot: ON

AP Label Refresh Rate: 30 seconds

Frequency: 5GHz

Ch. Width: ac - 80MHz

Freq. view Range: 5.145 GHz to 5.860 GHz

RSSI View Range: -90.0 dBm to -10.57 dBm

Display: Real Wave

Interference Filters

Reports

Settings

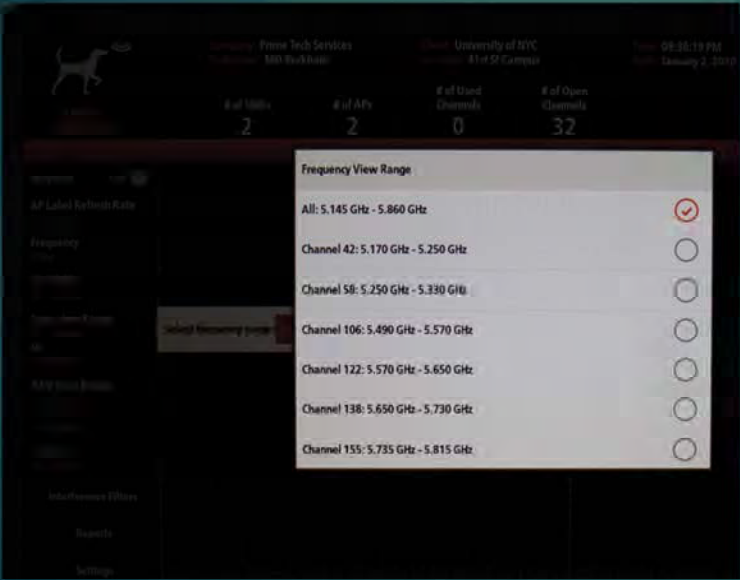
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Here are the 5GHz Channel Width Options.
Notice that bonded channels are included in your options.

TROUBLESHOOTING NOTE

For efficiency and channel management, it is usually best to utilize 20MHz-wide channels for 802.11/b/g/n routers, and either 20MHz-wide or 40MHz-wide channels for 802.11ac routers. Very few commercially available products (i.e., phones and tablets) are capable of taking advantage of bonded channels in either the 2.4GHz spectrum or the 5GHz spectrum. If you encounter a bonded channel in the field, you should question why that person has set up a bonded channel, particularly if it is on the 2.4GHz spectrum (i.e., on the 2.4 GHz spectrum, bonded channels will interfere with any standard channels it happens to overlap with). If that end user is looking for increased speeds but is not using specialized equipment that can take advantage of the bonded channel, or the bonded channel is creating interference for neighboring WiFi networks, the next step would be to recommend the person hardwire their equipment to the network rather than using WiFi.

User Interface: 80MHz-wide Channels in 5GHz



The screenshot shows the WiFi Hound web interface. At the top, there's a header with the company logo and name. Below it, a status bar shows 'Prime Tech Services' and 'University of TPC'. A table displays statistics: '# of APs: 2', '# of APs: 2', '# of Used Channels: 0', and '# of Open Channels: 32'. The main content area is titled 'Frequency View Range' and lists several 80MHz channels with their frequency ranges and selection checkboxes. The 'All' option is selected. A sidebar on the left contains navigation links like 'AP Label Refresh Rate', 'Frequency', 'Scan', 'AP List', 'AP Info', 'AP Settings', 'AP Groups', 'AP Filters', 'AP Reports', 'AP Alerts', 'AP Actions', 'AP Settings', 'AP Groups', 'AP Filters', 'AP Reports', 'AP Alerts', 'AP Actions'. A sidebar on the right contains 'Interference Editor', 'Channels', and 'Settings'.

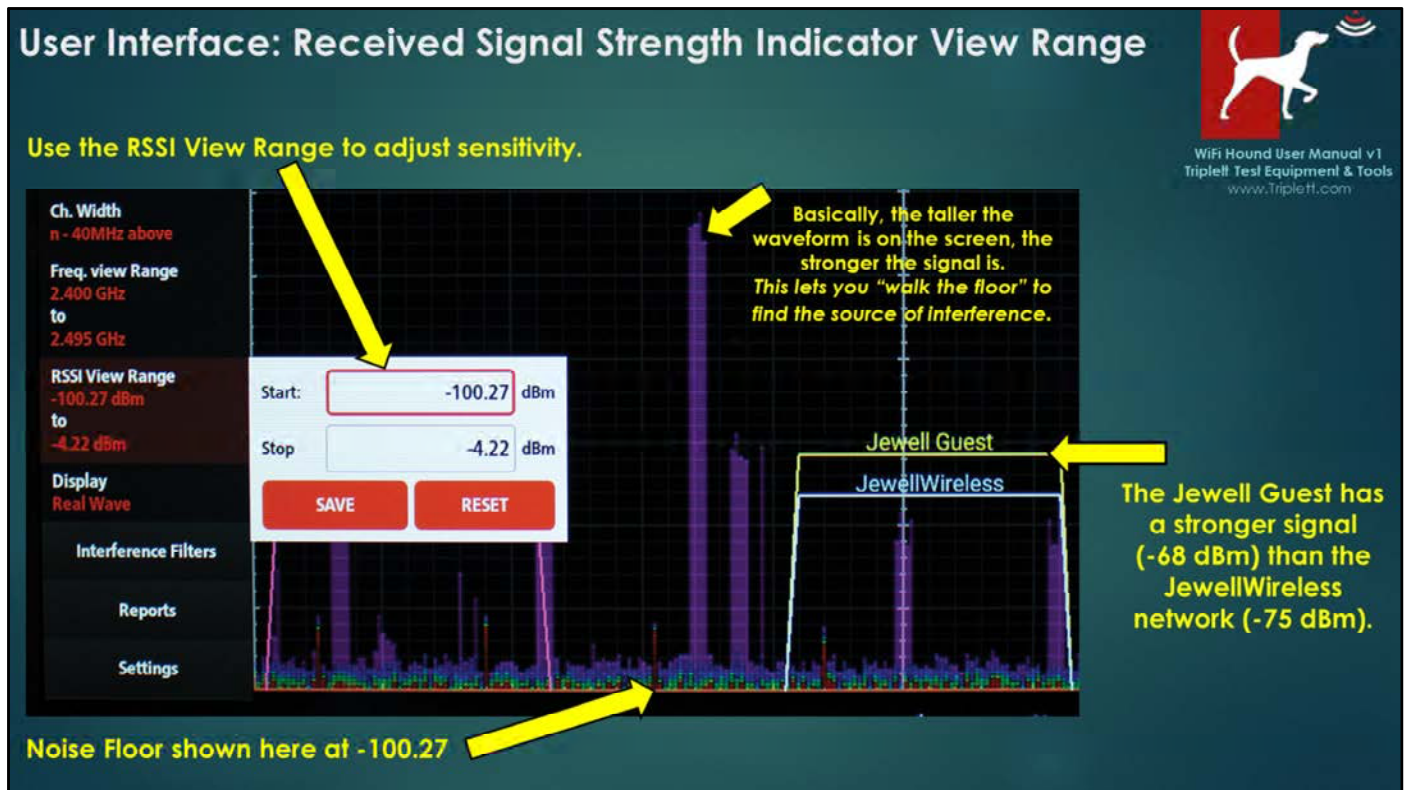
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If you selected the 80MHz Channel Width, then these bonded channels will show as options for filtering.

If you had selected 80MHz on the prior option, then you would see the above list of channels.



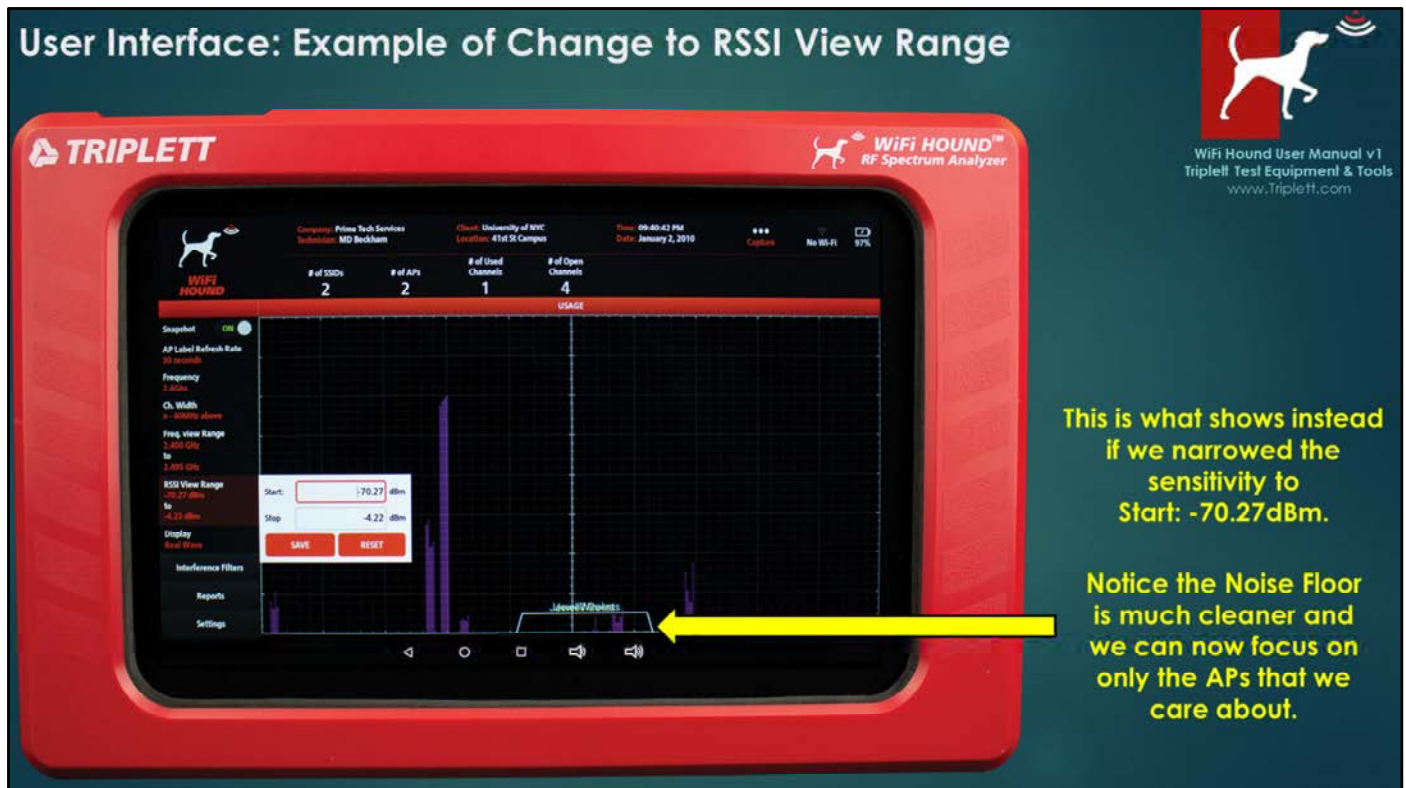
Applying the filter to see Channel 122, which is an 80MHz-wide channel in the 5GHz part of the wireless spectrum.



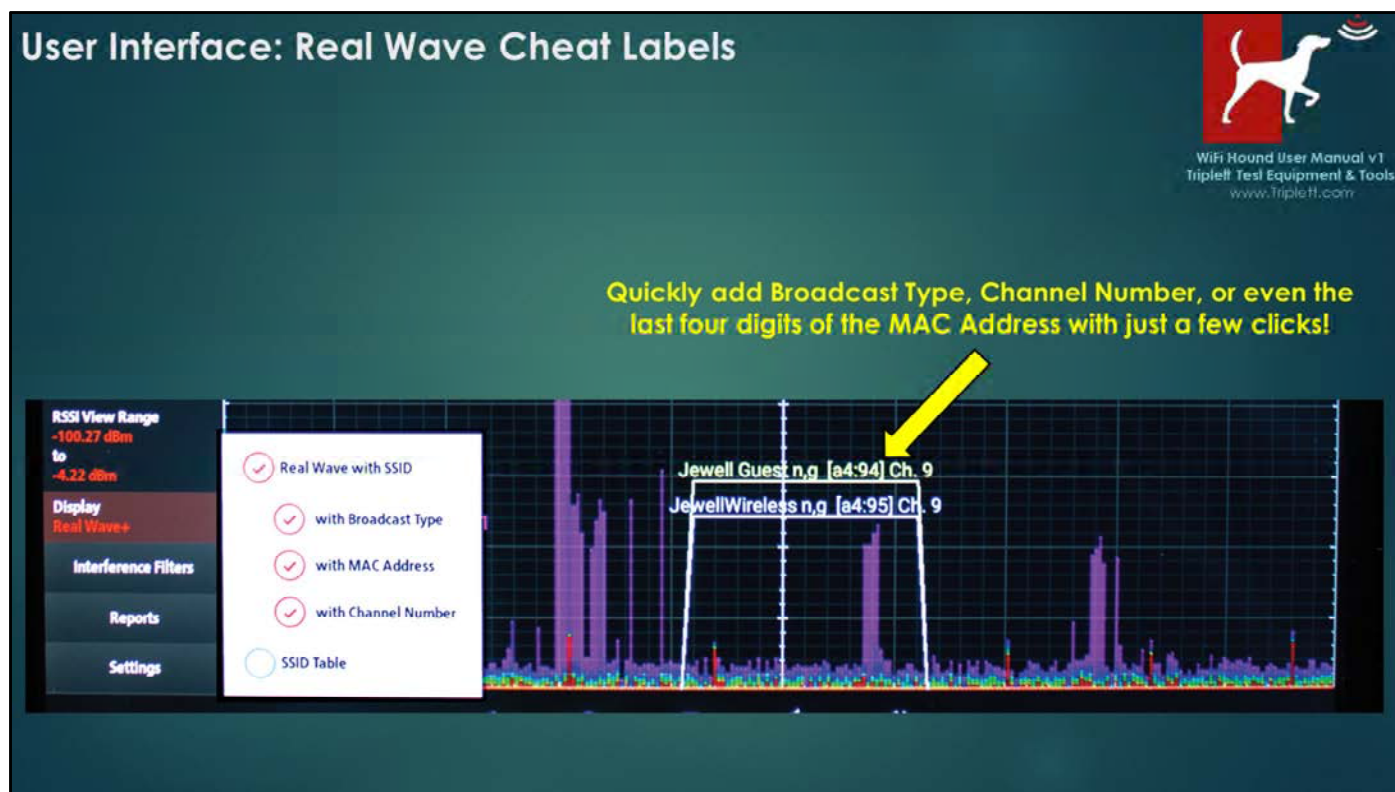
RECEIVED SIGNAL STRENGTH INDICATOR (RSSI) VIEW RANGE

This filter controls the RSSI range that is displayed. A couple notes on this feature:

1. Selecting "Reset" will set the Tester to the maximum dBm of that specific Tester. Due to variances in tolerance, this number may differ slightly from Tester to Tester.
2. The Range as shown is -100.27 "Start" and -4.22 "Stop". WiFi signals are rated on strength in dBm. Therefore your "Start" range is the most sensitive (which will show the Access Points and "noise" in the spectrum that is farthest away); this is often referred to as the "Noise Floor". The "Stop" number is the least sensitive, and therefore the "strongest" signal is what is shown here. We recommend leaving the Stop dBm at whatever the unit's default number is, then adjusting the Start number as needed, although there may be times when you want to adjust both numbers. Whatever you choose must fall within the maximum range of the Tester's hardware, or you will see an error message. For example, you could not select -102 dBm for the Start number on this unit, but you could select -99.



Adjusting the noise floor (i.e., Start number) can help you focus on only those things that have a strong enough signal to potentially cause interference with the wireless network you are troubleshooting. In the above example, you may be troubleshooting the JewellWireless network, but the interference from machinery (i.e., the tall, skinny waveforms to the left of the JewellWireless access point) are not occurring in the same area that the JewellWireless network is broadcasting, so that would not be the cause of the poor WiFi. You would then look for other causes.



When to use the MAC ADDRESS option

When working in a campus environment, there will often be multiple Access Points (APs) that are broadcasting the same SSID. (Imagine being at The Hotel LaGrande, and there is WiFi throughout the enormous, 20-story building. This hotel could have a hundred APs, and all those APs would be broadcasting just one SSID – LaGrande_WiFi.) In order to troubleshoot a specific Access Point, you must determine what the MAC Address is of that AP since the MAC Address is the only unique identifier for an Access Point.

User Interface: Applying Interference Filters



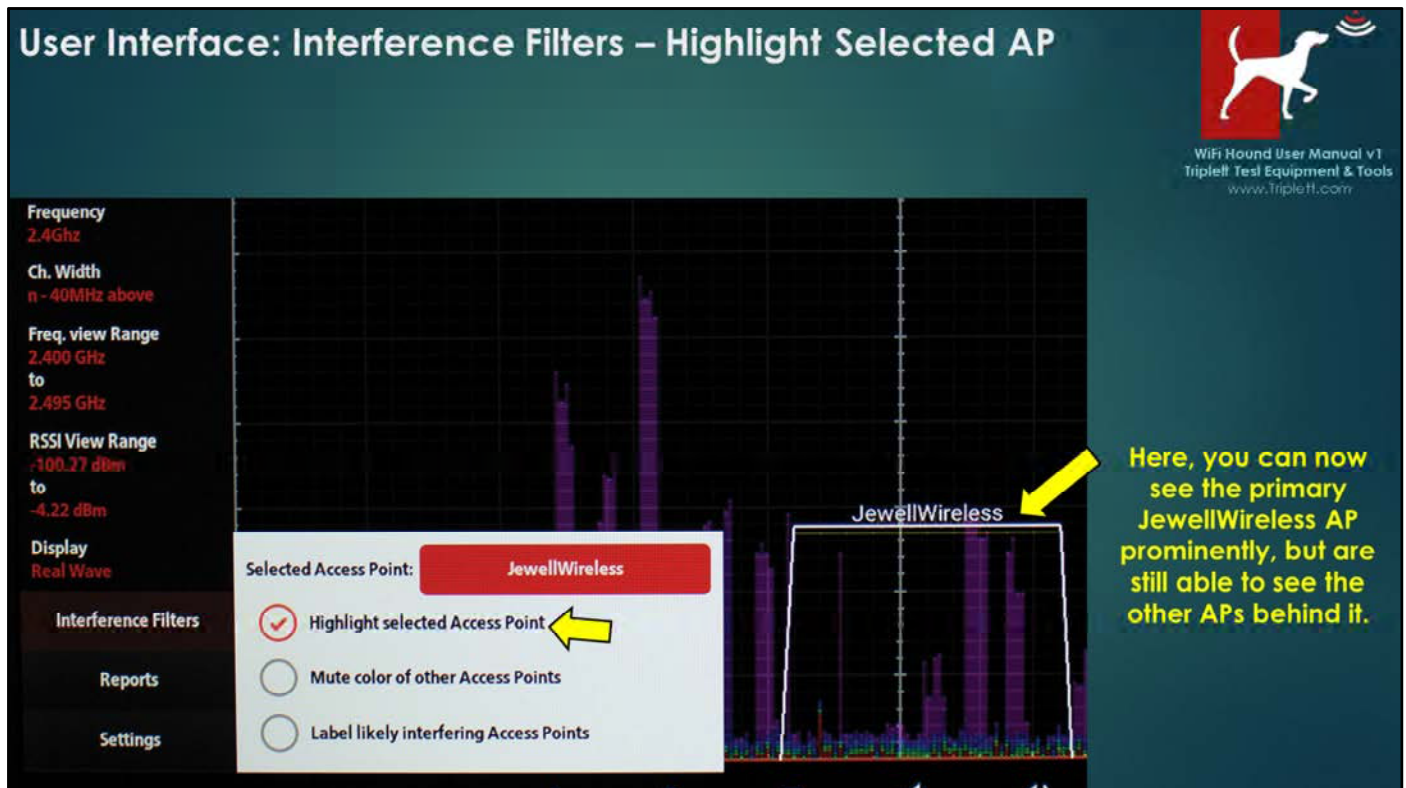
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While in Real Wave mode, you can apply Interference Filters to help visually narrow down the Access Point you are trying to troubleshoot.

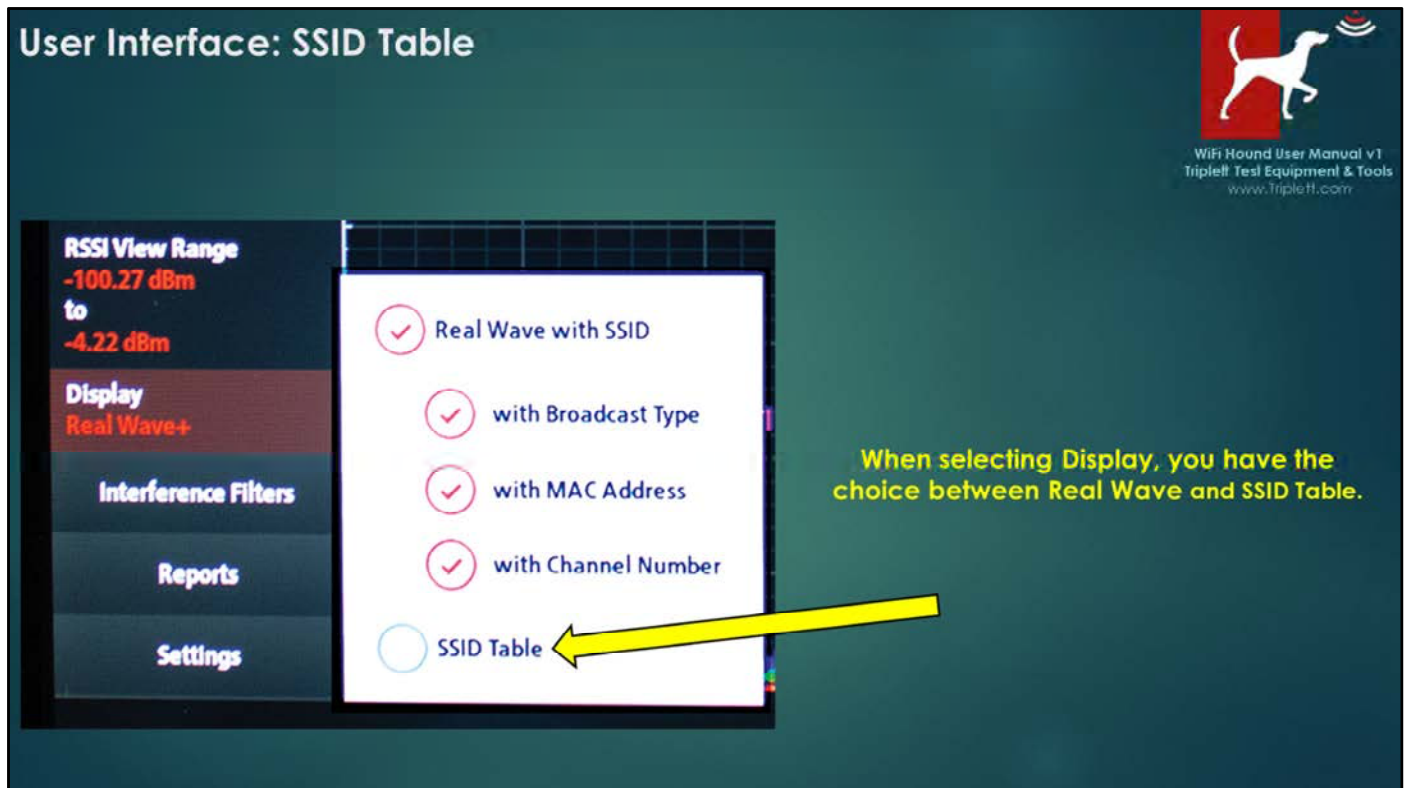
First, select the AP.

SSID	MAC Address	FREQ.
Jewell Guest	18:81:69:7F:A4:94	2.4 GHz
Jewell Wireless	18:81:69:7F:A4:95	2.4 GHz
Jewell Wireless	84:3D:C6:0C:F7:48	2.4 GHz

Interference Filters will help you to see your target AP even in a heavily saturated wireless environment.



Deselect the Access Point to reset the filter.



While the Real Wave view will show you everything that is happening in the Wireless Environment (including signals that are in the area that are not created by wireless routers), the Service Set Identifier (SSID) Table will only give you a list of the wireless networks in the area.

User Interface: SSID Table Features

The SSID Table has many extra features. While it shows you the traditional information about Signal Strength, Mode, channel, and network name (SSID), you can also:

- sort by any column header
- see the MAC Address (BSSID) and Vendor
- Select the HOLD function so you can stop the table from refreshing, then take a screen shot for your report.

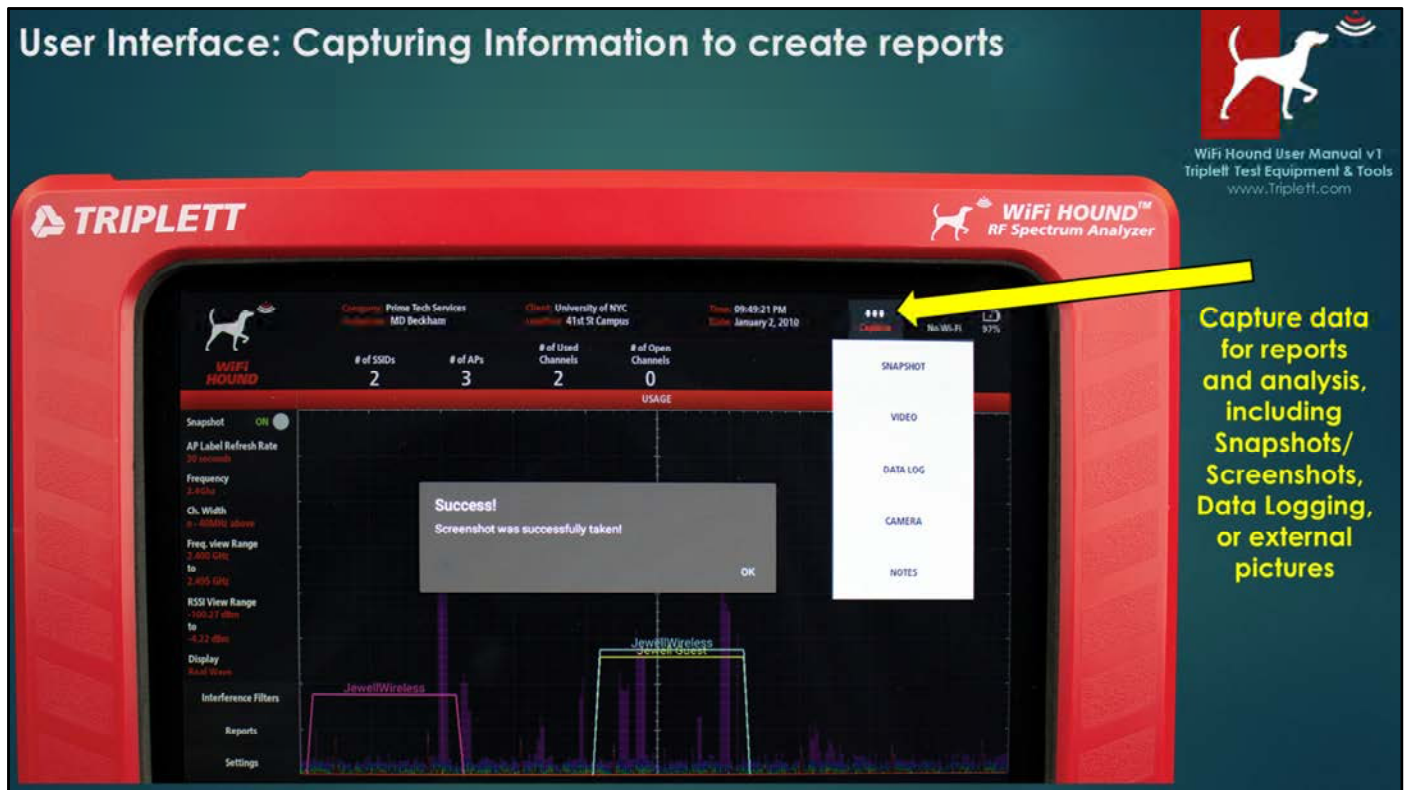


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USAGE									
Snapshot ON AP Label Refresh Rate 30 seconds Frequency 2.4GHz Ch. Width n - 40MHz above Freq. view Range 2.400 GHz to 2.495 GHz RSSI View Range -100.27 dBm to -4.22 dBm Display SSID Table CLEAR TABLE Total AP: 5 Total Scan: 10 HOLD									
SEC.	MODE	SSID		RSSI	BSSID	VENDOR	CH.	FREQ	CNT.
2.4GHz SSID List									
WPA2	g/n	Jewell Guest		-67 dBm	[18:b1:69:7f:a4:94]	Sonicwal	9	2.452	10
WPA2	g/n	JewellWireless		-68 dBm	[18:b1:69:7f:a4:95]	Sonicwal	9	2.452	10
WPA2	g/n	JewellWireless		-78 dBm	[84:3d:c6:0c:f7:48]	Cisco	1	2.412	9
5GHz SSID List									
WPA2	n	Jewell Guest		-86 dBm	[18:b1:69:7f:a4:8c]	Sonicwal	150L	5.750	10
WPA2	n	JewellWireless		-86 dBm	[18:b1:69:7f:a4:8d]	Sonicwal	150L	5.750	10

When many people think about troubleshooting wireless networks, they usually think about a free app on their cell phone that gives them signal strength data and a list of the wireless networks and the channels that are in use, similar to the table shown above.

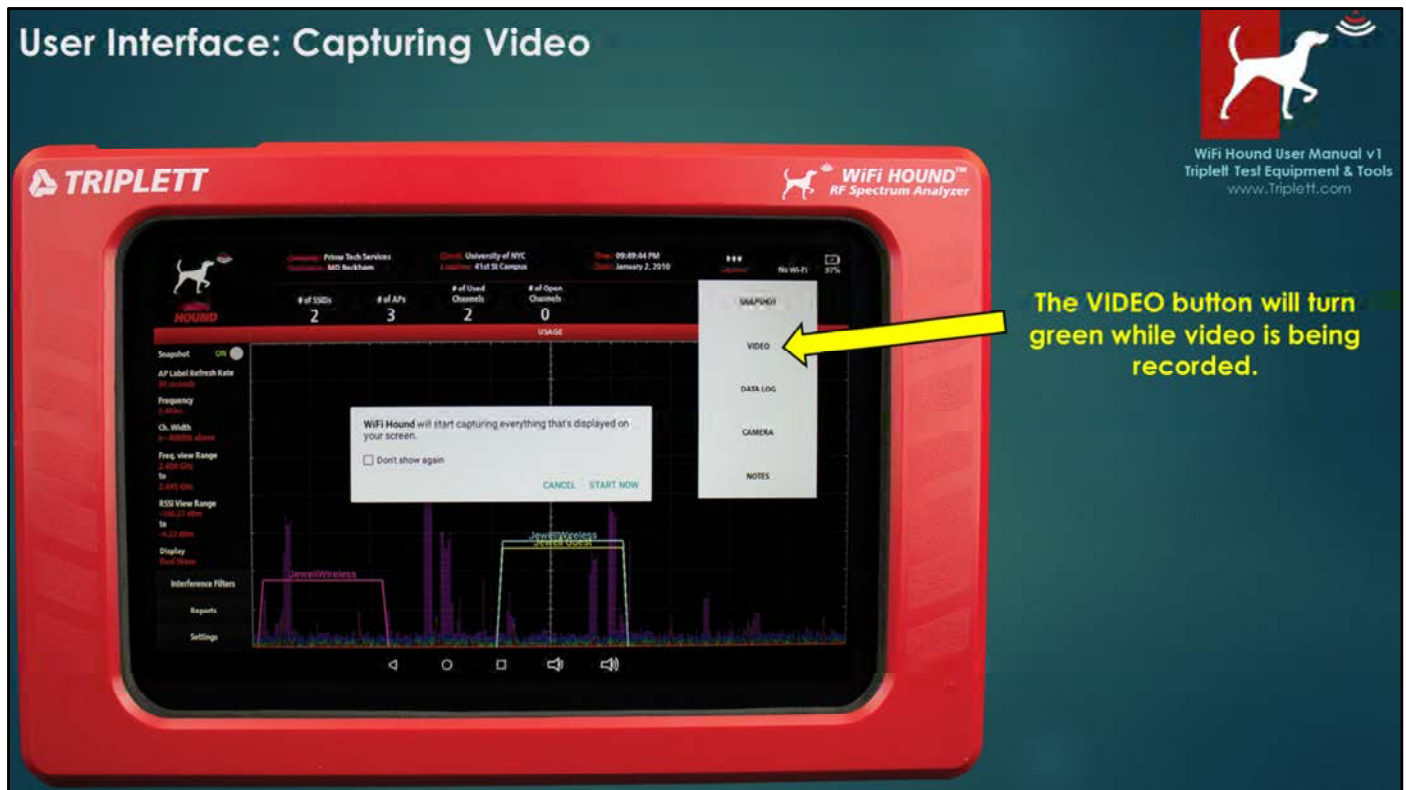
However, do not mistake SIGNAL STRENGTH for SIGNAL QUALITY. And this distinction is where you need a professional Spectrum Analyzer like the WiFi Hound™ in order to properly troubleshoot a wireless environment. You can have very strong signal strength, but incorrect channel management and/or interference which will still cause poor wireless network performance.



Click CAPTURE and then select from the drop-down menu. Here, the Snapshot feature is shown. A Snapshot will take a screen capture of the entire screen. Be sure to add a Note right after you take a Snapshot, detailing

- Where you were located in the client's facility when you took the Snapshot;
- What you saw that was of concern to you, and why it is important; and
- Any recommendations you have for addressing the problem(s).

If you get into the habit of writing a Note after each Snapshot, it will be easier to add the information when you create a report for your client later.



You can record video of the screen by pressing the VIDEO button, then click START NOW. The VIDEO button will turn green while the video is recording. When you want to end the recording, simply press the VIDEO button again.

Due to file sizes, you may not be able to send video via email off the Tester. In that case, you should use the Micro USB plug on the left side of the Tester, and connect the Tester to a Windows computer to access the on-board files and copy them. To free up memory and maintain optimal performance, be sure to delete the files from the Tester if you do not need to keep them on the Tester for future reference.

User Interface: Data Log & External Camera

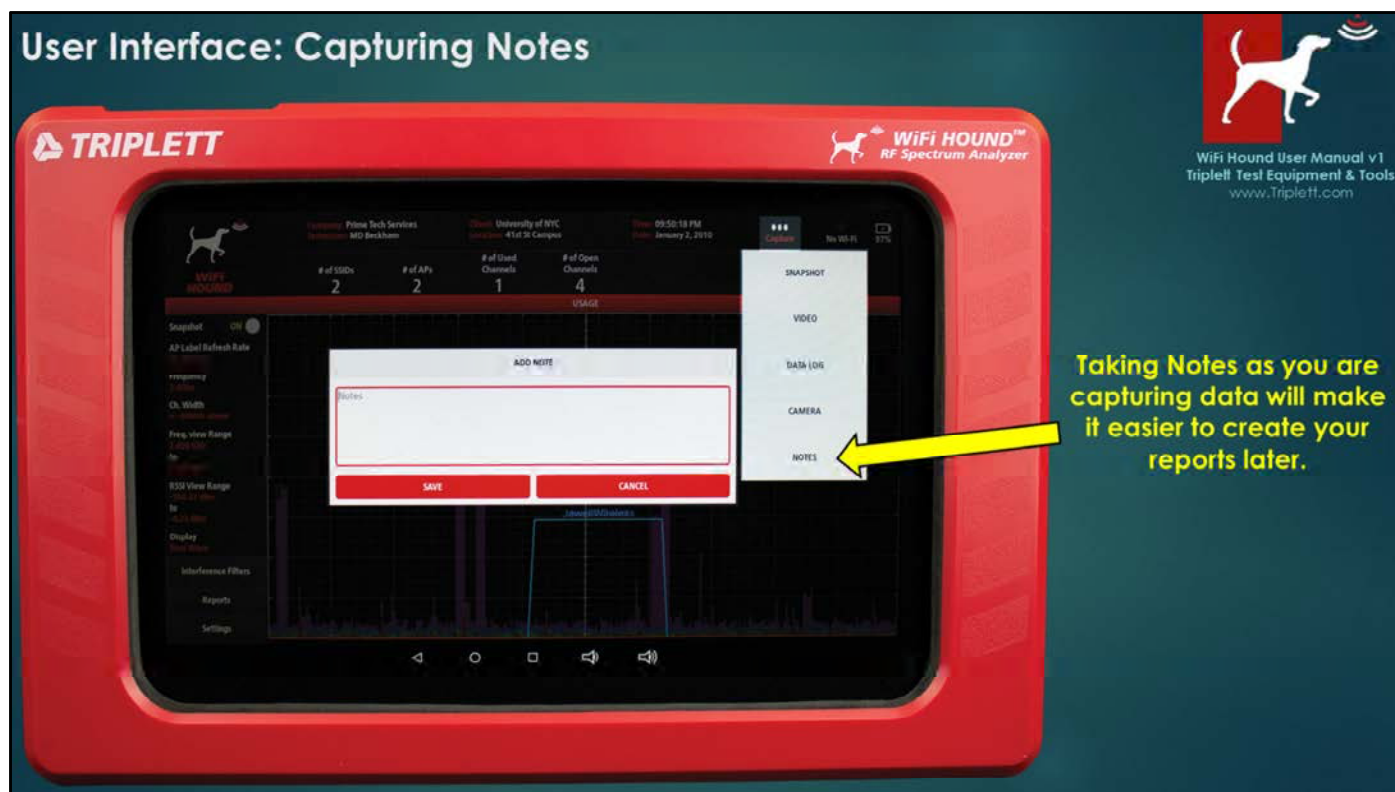
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Data Log is used to investigate intermittent problems.

Camera refers to the external camera on the back on the Tester. Selecting Camera will open the Android-based UI for the camera. You will be able to take the photo, and then return to the WiFi Hound main screen.

Data Logging currently creates a .csv file that must be interpreted. Future releases of the WiFi Hound software will include a simplified visual timeline instead, so be sure to register your Tester in order to receive the software update!

User Interface: Capturing Notes

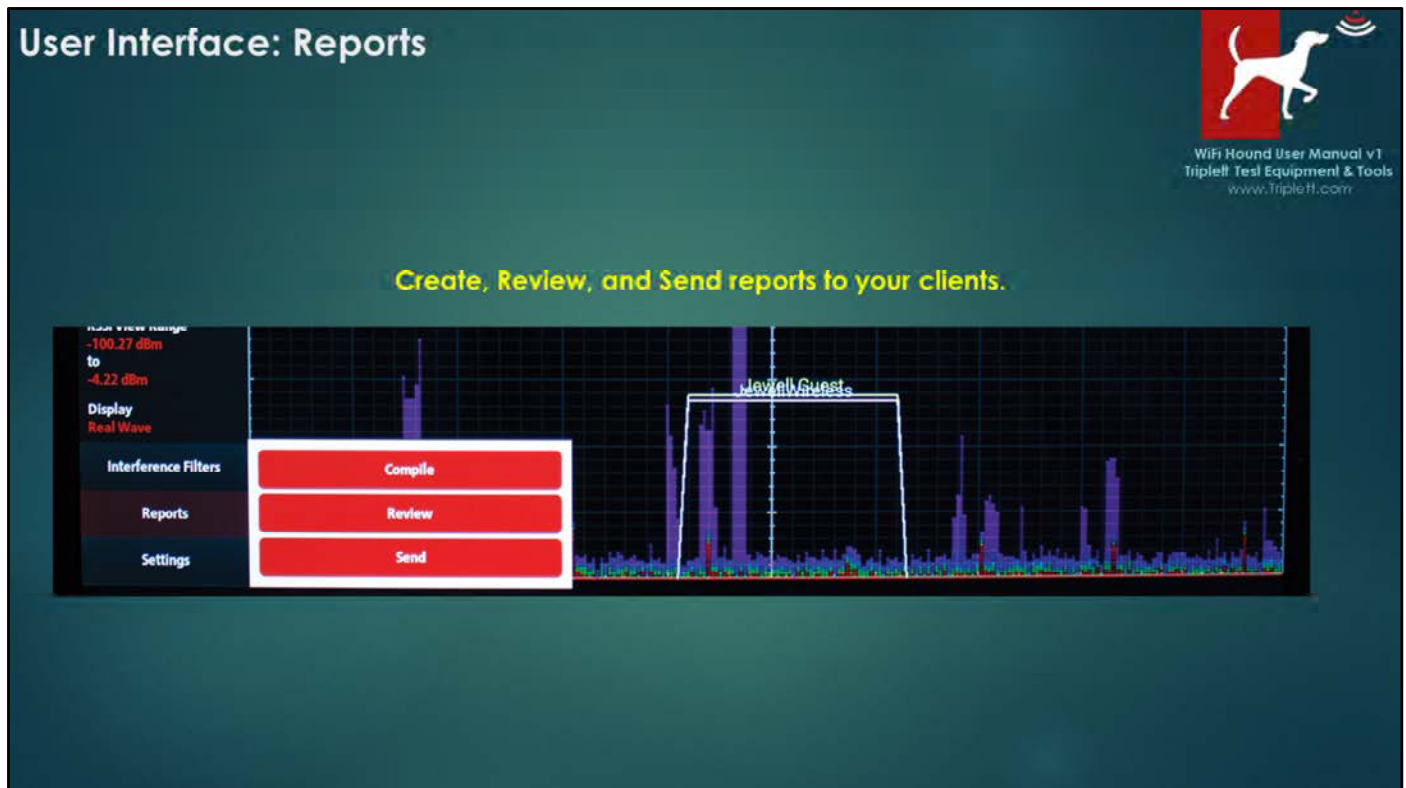


The screenshot shows the WiFi Hound RF Spectrum Analyzer interface. At the top, it displays 'TRIPLETT' and 'WiFi HOUND™ RF Spectrum Analyzer'. The main screen shows a spectrum analyzer graph with a red box highlighting a specific frequency. A dialog box titled 'ADD NOTE' is open, with a text input field and 'SAVE' and 'CANCEL' buttons. A yellow arrow points to the 'NOTES' option in the menu on the right. The menu also includes 'SNAPSHOT', 'VIDEO', 'DATA LOG', and 'CAMERA'. The background of the interface shows various statistics: # of SSIDs: 2, # of APs: 2, # of Used Channels: 1, # of Open Channels: 4, and a signal strength indicator.

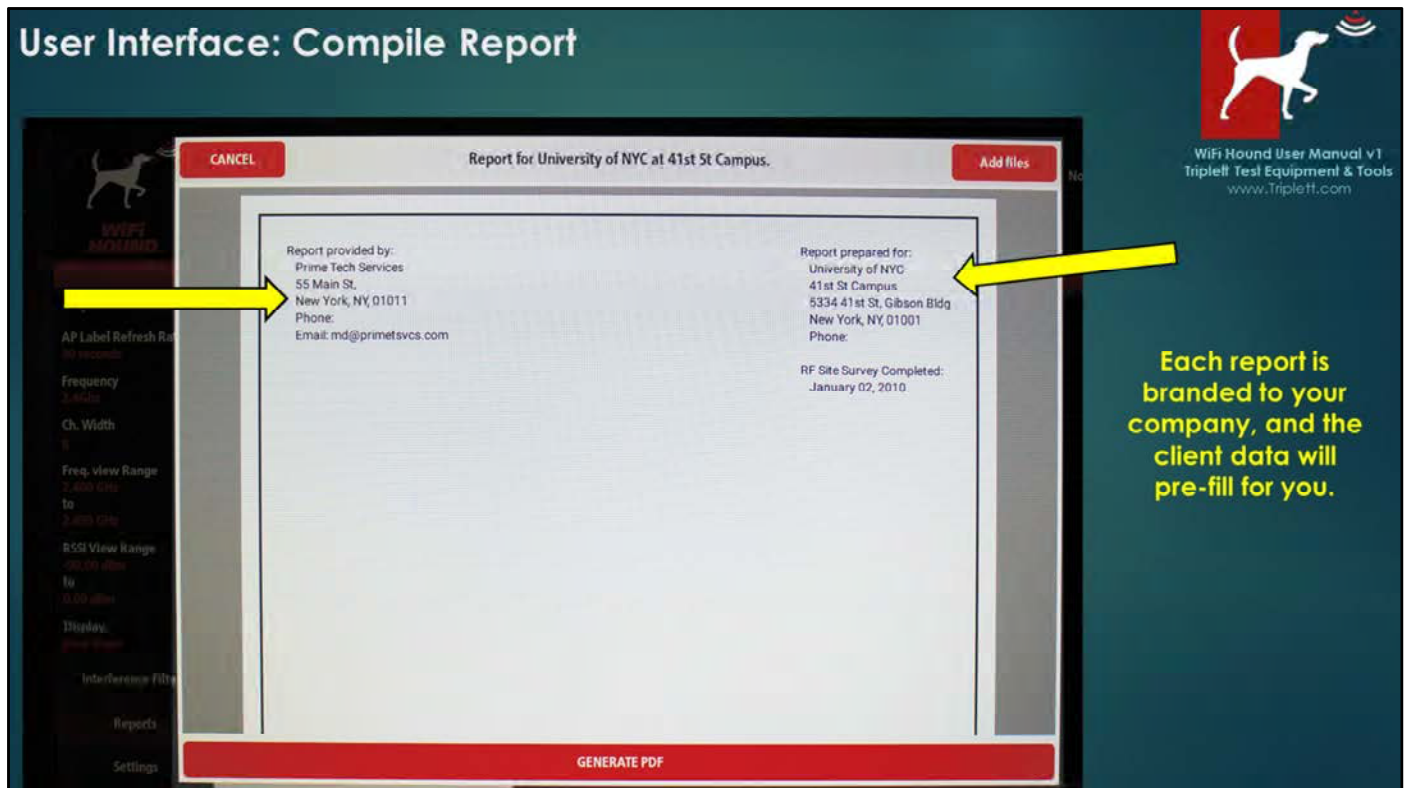
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Taking Notes as you are capturing data will make it easier to create your reports later.

As mentioned before, we recommend that you add a Note after you capture each piece of information (e.g., after each snapshot or video) about what you are seeing and where you are in the client's facility. For example, "Far left corner by window [always work clockwise in a room], notice the 6 competing APs and interference from the neighboring restaurant's microwave ovens."

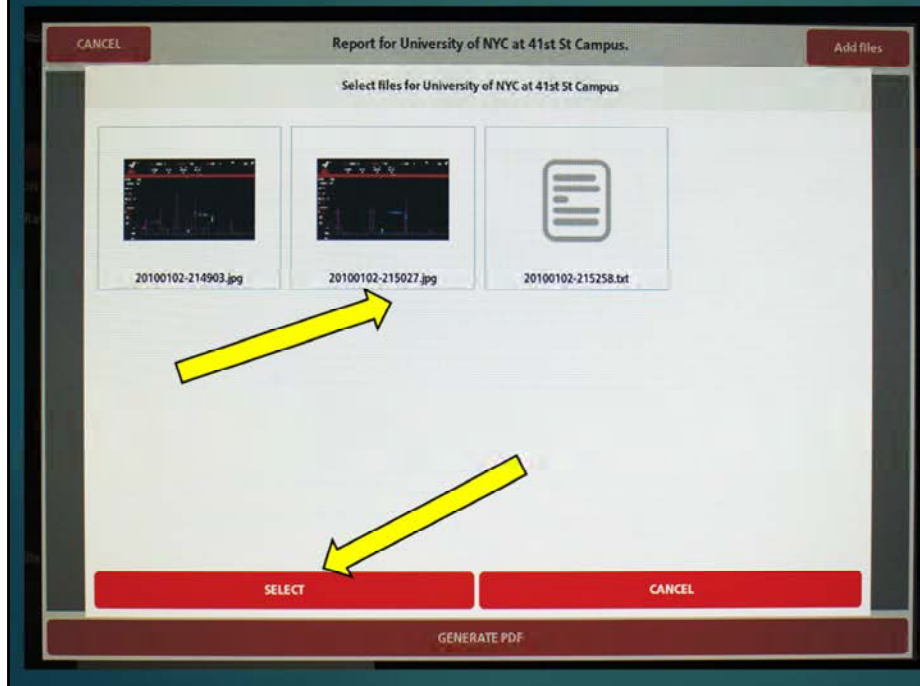


Select Reports > then choose your next step. If you are creating a new report, select COMPILER. If you have already created a report, or want to watch video, go to REVIEW. If you want to email an existing file to your client, select SEND (email must be set up on the Tester, and you must be connected to the internet to send email).



Remember – the pre-filled information on this report is controlled at SETTINGS, so it is very important that you input your company information, and the client's information accurately.

User Interface: Adding Files to Create Your Report



Click on **ADD FILES**, then touch the files you want to add to your report, then press **SELECT**.

Highlight each file you want to add and press **SELECT**. (Note—you can't add video here).

User Interface: Generating Reports

Report for University of NYC at 41st St Campus.

Prime Tech Services
55 Main St.
New York, NY 01011
Phone:
Email: md@primetsvcs.com

University of NYC
41st St Campus
5334 41st St, Gibson Bldg
New York, NY 01001
Phone:

RF Site Survey Completed:
January 02, 2010

GENERATE PDF

Interference from manufacturing floor equipment and neighboring restaurant.

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You can re-order the information by pressing and holding the image or text.

Once you have the images and text in the order you want, just click GENERATE PDF and a PDF will be created for you to send to your customer!

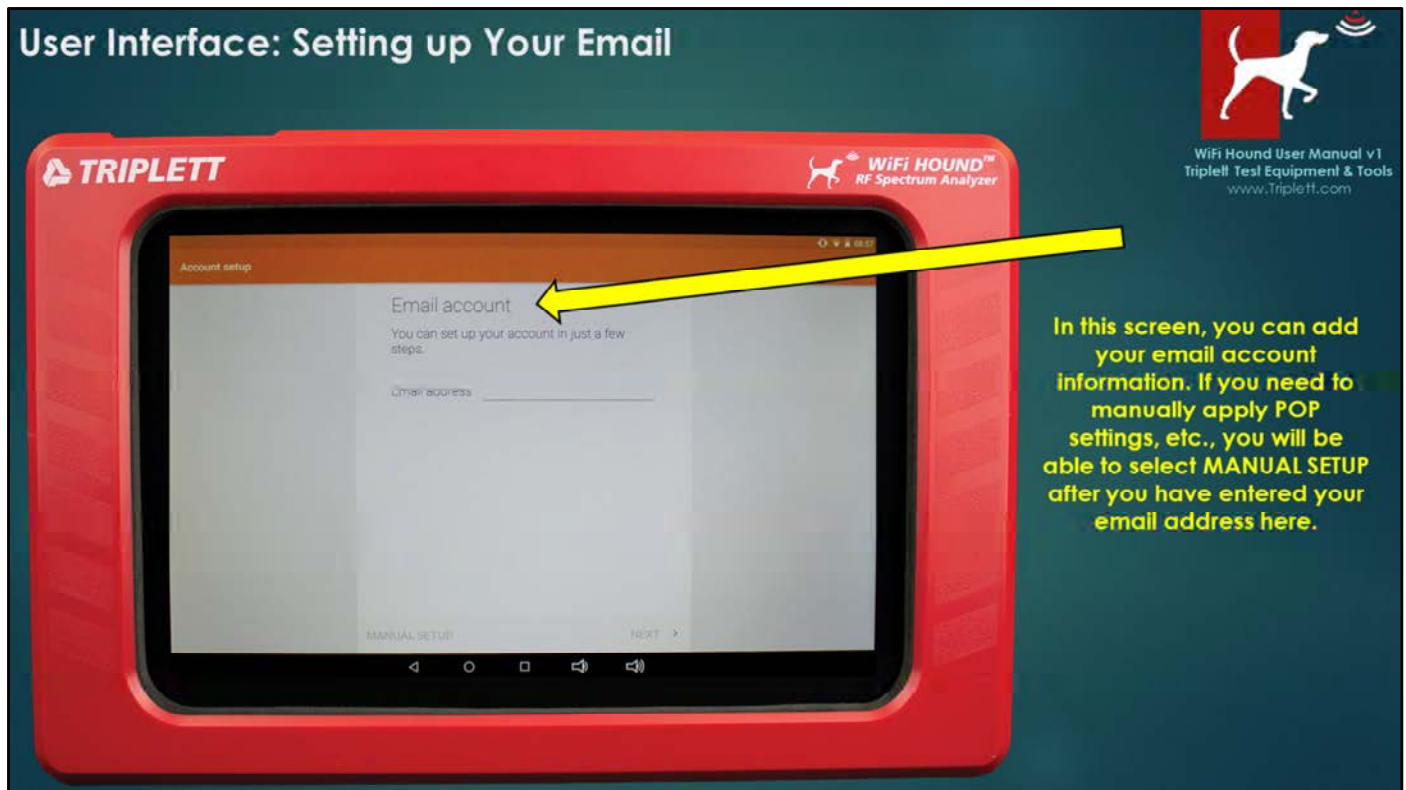
If you want to change the order of the image or text files, you can press the text or image file and hold it until you see a “fly out” image, and then just drag it where you want to place it in the report. (Note – you cannot modify the position of the headers.)

User Interface: Emailing Reports

The screenshot shows the WiFi Hound user interface. At the top, it displays the company name 'Prime Tech Services MD Beckham' and the client 'University of NYC 41st St Campus'. The date and time are '08:56:35 AM December 6, 2018'. The interface includes a sidebar with 'Reports' selected, a main display area with a spectrum graph, and a 'Send' button highlighted with a yellow arrow. A modal dialog asks 'ATTACH CLIENT FILES TO EMAIL?' with options 'ATTACH ALL', 'LET ME CHOOSE', and 'NO ATTACHMENTS'.

To email the finished report to the client, select Reports > Send, then choose an option. If you have not yet set up your email, you will be prompted to do so.

You can either email your files, or connect a computer to the WiFi Hound using the Micro USB port on the left side.

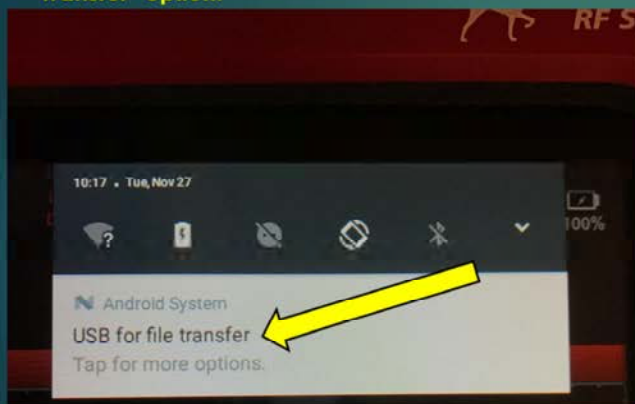
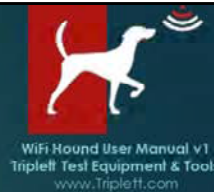


If multiple technicians will be sharing one WiFi Hound, you should set up a single email address that can be used by all of your technicians when emailing completed site surveys. For example, you may want to have your IT department create a dedicated "WiFi_Survey@MyAwesomeCo.com" email for simplicity.

User Interface: Transferring Files to a Computer

STEP 1: With the WiFi Hound powered on and at the Main Screen, plug a Micro USB plug into the port on the left side of the Tester, then plug the USB-A plug into your Windows computer. The pop-up below will show. Tap on the "USB File for Transfer" option.

STEP 2: You will see the pop-up below. Set it to "Transfer Files", then check your computer and your computer should recognize the Tester as an External Drive.



STEP 3: Navigate on your PC to the WiFi Hound's internal storage as shown below:

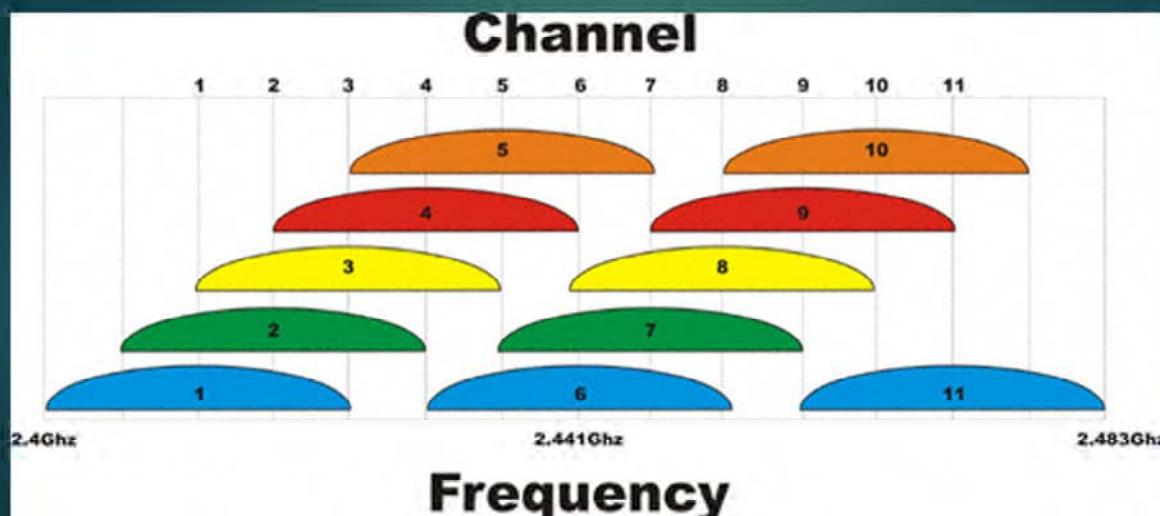
This PC > TRI_37_98 > Internal shared storage > Android > data > com.triplett.WifiHound > files > clients

Follow the instructions above to access the files on the WiFi Hound and back up your client data.

Using Your WiFi Hound in the Field: Channel Management



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Source:

<http://www.odessaoffice.com/wireless/channel-overlap.jpg>

The above graphic shows the Channel Allocation for the 2.4GHz part of the WiFi spectrum. You are likely already familiar with Channels 1-11 if you are trying to troubleshoot a wireless network. A few key things to keep in mind when you are troubleshooting:

Always start with Channel Management

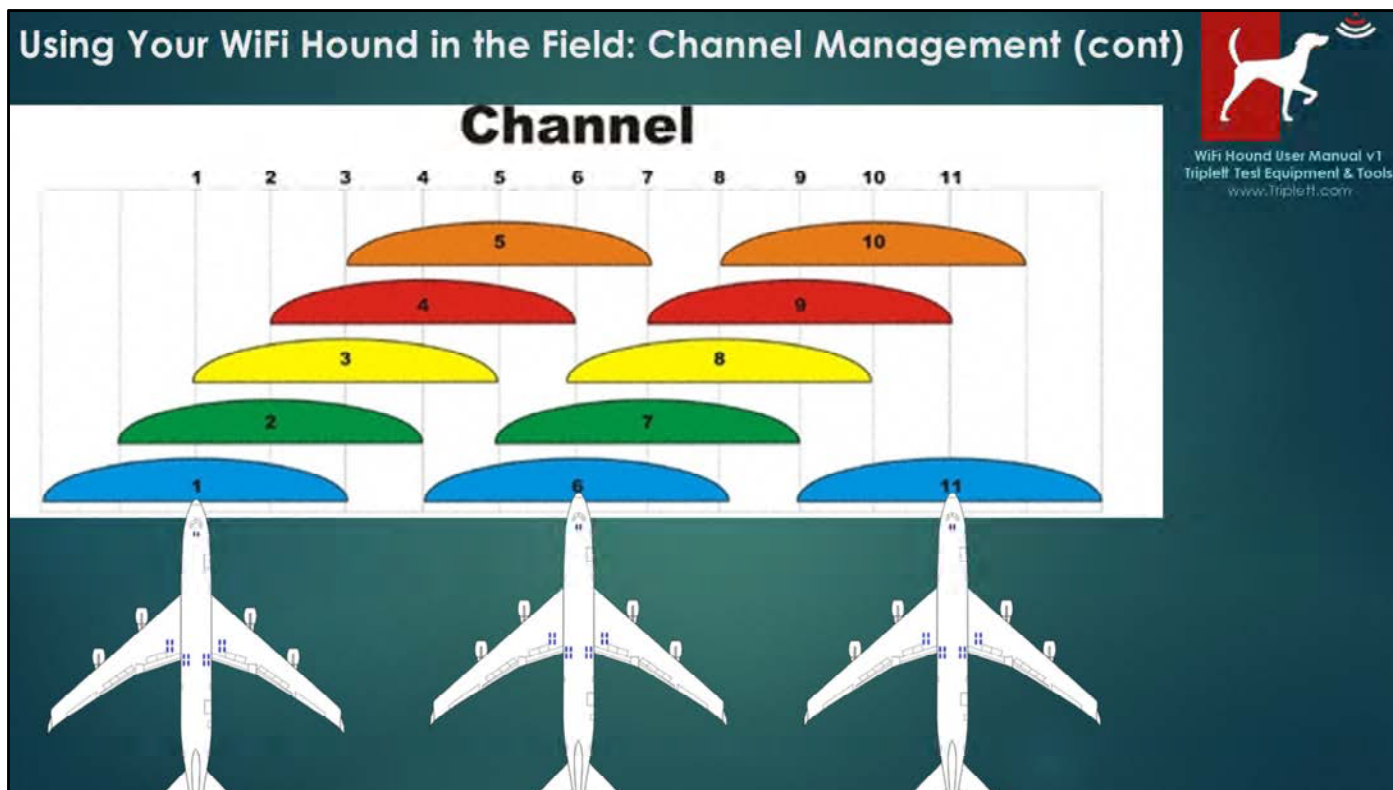
Due to the widespread adoption and use of wireless networks, saturation in the wireless environment is a common problem now. When you are trying to determine why your wireless network may not be working the way you think it should, first look at

- How many competing wireless networks are in the area
- If all of the competing wireless networks are on non-overlapping channels (i.e., Channels 1, 6, or 11)
- If any competing wireless networks are on channels that overlap with the channel your network is on

If there are not many wireless networks in the area, congratulations! You are one of the few people who are experiencing that bliss and can feel free to go to the next page. If there are competing wireless networks, continue reading below.

Picture a 15-lane highway with 3 trucks, side-by-side, that are hauling airplanes

Yup. In the image above, we want you to close your eyes and imagine that the numbers 1, 6, and 11 in the wide blue spheres are trucks, and the blue spheres themselves are airplanes on a flat-bed trailer. It would look something like the next page, right?



Picture a 15-lane highway with 3 trucks, side-by-side, that are hauling airplanes (continued)

Now imagine that the truck driver in Lane 1 (aka, Channel 1) can only see other trucks and their cargo if the other truck is also in Lane 1. If the other truck is in Lane 2, the truck driver in Lane 1 won't even know they are there and may accidentally crash into it.

This is how a wireless network functions on 2.4 GHz. If NetworkA is broadcasting on Channel 1, and NetworkB is also broadcasting on Channel 1, those two routers will negotiate for that space. One router will be quiet while the other router sends its information, then the second router will take its turn. This happens in microseconds, and is therefore unnoticeable to the end user.

However, if NetworkA is on Channel 1, and NetworkB is on Channel 2, then those two routers cannot negotiate with each other for airtime and will instead send signals that will crash into one another, resulting in poor WiFi network performance. This is an inherent limitation with 2.4 GHz routers.

Best Practices

Any router that broadcasts on 2.4GHz should only be set to channels 1, 6, or 11. Do not use other channels.

You may have to get the owners of the surrounding WiFi networks to agree to a building-wide channel management program. This can be difficult, but is often necessary.

Using Your WiFi Hound in the Field: Channel Management

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The example Strip Mall at the left may require both Channel and Antenna Power Settings management in order to create a wireless environment so that each retail store is able to enjoy their own secure, fast wireless network.

Example Channel and Power Management in a Strip Mall

Assuming Bays 114-106 are one open space since they are delineated with dotted lines, and assuming that Bays 104, 102, 100, and 90 are separate retail stores, and assuming no additional interior walls, this is an example of how you might allocate the channels in this location if, for example, your client was in Bay 104.

How many Access Points would be needed is entirely dependent on the location and any mitigating factors (e.g., brick walls, high metal shelving, etc.), so do not assume the above scenario will resolve your specific situation. The above is only for illustrative purposes.

NOTE:

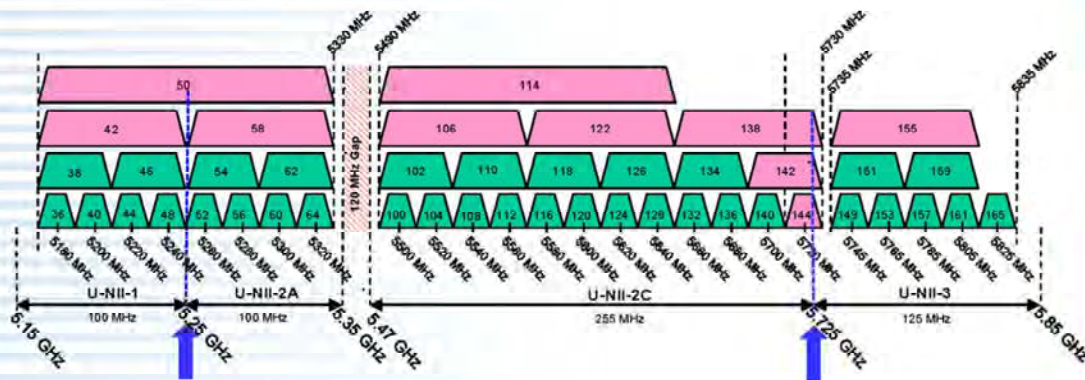
Only use the Low or Mid-power settings on a router/Access Point (AP). Do not apply “high” power on a router/Access Point as the signal from the AP may be received by the user’s equipment, but the user’s equipment is not likely to have enough power to send a response the same distance. Your phone/tablet/computer simply doesn’t have the same power. Setting an AP to High Power is akin to giving a megaphone to a politician so everyone in the stadium can hear them during a campaign speech, and then expecting someone at the far end of the stadium will be heard by the politician (even though they don’t have their own megaphone).

Using Your WiFi Hound in the Field: Channel Management (cont)



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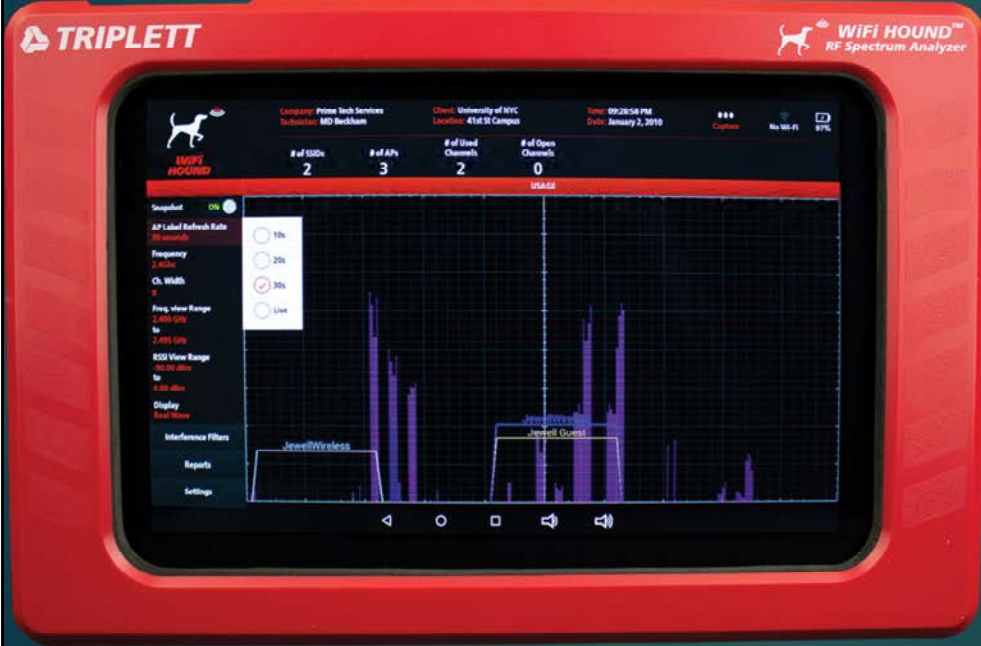
802.11ac channels



Source: <https://transition.fcc.gov/oet/ea/presentations/files/may17/31-Part-15-Panel-UNII-UpdatesDT.pdf>

5GHz does not have the same issue with channels as the 2.4GHz spectrum has insofar as NetworkA on Channel 36 will be able to negotiate with NetworkB on Channel 38 for airtime. However, it is important to note that 5GHz does contain Dynamic Frequency Selection (DFS) channels, which are also used by radar systems.

Using Your WiFi Hound in the Field



- Waveforms (Bluetooth vs. AP vs. Naturally Occurring, etc.)
- "Walking the floor" for Point of Origin
- When to just say "It doesn't matter..."
- Example of Microwave

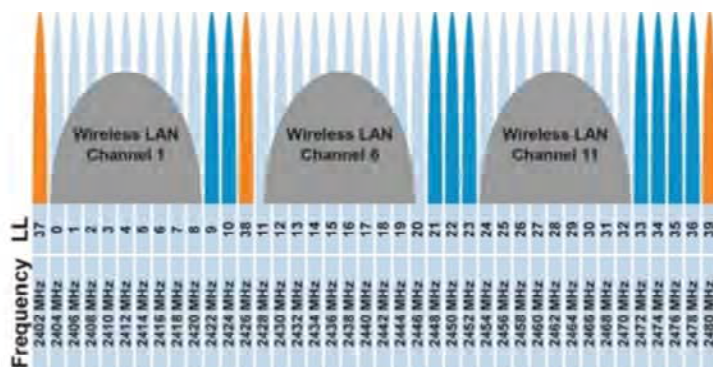
- Take time to learn how to recognize specific **waveforms** (e.g., Bluetooth is tall and skinny, APs are a gradual mountain, and other stuff is sometimes just naturally occurring or not identifiable, etc.).
- **Walking the Floor** – You can use the WiFi Hound to try to find the Point of Origin of a signal by walking the area methodically with the Tester. The closer you get to the source, the taller the waveform will be. Any sort of rhythmic spike is likely originating from a machine, although depending on the environment, it may not be easy to isolate the origin. Remember – radio waves bounce off surfaces, especially metal. Radio waves also have difficulty going through dense materials (e.g., brick).
- **Don't need to know...** -- Sometimes people become mired in "What's this? What's that?" when they are looking at a Spectrum Analyzer. Humans always seek answers and understanding. However, it is important to remember two things – 1) The natural environment produces its own RF sometimes, and 2) certain conditions will allow radio waves to be carried over much longer distances from the source than would be considered "normal". In either case, it is not usually necessary to identify the origin and stop the interference in order to set the client up with a Wireless Network that is stable. The answer may simply be, "We need to move you to a 5GHz AP;" or "This interference could be a neighbor's microwave when they get home at 6pm and are heating their dinner. Here's what we can do to work around that;" or "Let's hardwire your security system to stop it from interfering with the rest of your wireless space;" or "We really need to do a building-wide Channel Management Plan and that will alleviate 90% of the problems all of you are seeing." Stay focused on solving the problem, and don't get distracted by the random popping waveform on the Spectrum Analyzer.

Using Your WiFi Hound in the Field: Waveforms

ISM 2.4GHz band

FUJITSU

WiFi/Bluetooth frequency allocation



<http://www.digkey.com/es/articles/techzone/2013/jun/shaping-the-wireless-future-with-low-energy-applications-and-systems>

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Bluetooth channels in the 2.4GHz spectrum co-exist (and often interfere) with regular Wireless Networks. Notice the 40 channels for Bluetooth, all of which can interfere with regular wireless networks.

Tall, skinny waveforms are typically (but not always!) originating from a Bluetooth-enabled piece of equipment, like a phone, tablet, or IoT product. Zigbee uses slightly wider channels than Bluetooth. Don't get bogged down in identifying every little wave you see in the spectrum, just know that these exist in the wireless environment and you may or may not be able to either isolate the point of origin or stop the offending signal.

Recommended Best Practices: Training Your Technicians and Communicating with Your Clients

COMMUNICATING WITH YOUR CLIENTS

- Perform and document a Site Survey
 - Set up a regular process. (For example, enter the door, and go left to each extreme of the room, taking snapshots as you go.)
 - When you arrive at the location for troubleshooting, or
 - When you have completed an initial installation or finished the necessary repairs/changes on a Trouble Call.
- Show the customer their wireless environment, and explain in simple terms what they are looking at.
- Don't let the customer get mired in the "What's that? And that?" game. There will always be RF that cannot be identified. Stay focused on the big picture.
- When you go back a year later, pull up your original report and show the client a comparison between then and now. This will almost always show major changes in the wireless environment.



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Technical Specifications & Legal Stuff



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Specifications

- **Spectrum Analyzer:**
 - ◊ Frequency Range: 2.4 to 2.495 GHz and 5.15 to 5.85 GHz
 - ◊ Frequency Resolution: 2.4 GHz: 333 KHz, 5 GHz: 1.665 MHz
 - ◊ Amplitude Range: -95 to 0 dBm
 - ◊ Amplitude Resolution: 0.5 dBm
 - ◊ Antenna: Internal 2 dBi
 - ◊ Real Wave Visualization
- **SSID Scan:**
 - ◊ Frequency Range: 2.4 to 2.5 GHz and 5.15 to 5.85 GHz
 - ◊ Amplitude Range: -100 to +10 dBm
 - ◊ Amplitude Resolution: 1 dBm
 - ◊ Scan Rate: Live, 10, 20 & 30 seconds
- **SSID Table Visualization:**
 - ◊ Mode (802.11 a/b/g/n/ac)
 - ◊ Color-coded Strength Indicator
 - ◊ Security Type
 - ◊ SSID, RSSI, MAC Address & Frequency
- **Hardware:**
 - ◊ Operating System: Android 7.0
 - ◊ Storage: 16 GB
 - ◊ RAM: 1 GB
 - ◊ Screen Size: 10.1 in
 - ◊ Aspect Ratio 16:9
 - ◊ LCD Multipoint Capacitive - Touch Screen
 - ◊ Resolution: 800 x 1280
 - ◊ Camera: 2.0 MP
 - ◊ Bluetooth: BLE 2.0
 - ◊ Built-in 0.8 W Speaker
 - ◊ 3.5mm standard headphone jack
 - ◊ Mini-HDMI
 - ◊ Micro-SD Card Slot
 - ◊ Micro USB OTG
 - ◊ Built-in Battery: LiPo 6000 mAh
- **Dimensions:**
 - ◊ LxWxH: 12 in x 7.75 in x 1.5 in
 - ◊ Weight: 2.10 lbs

The WiFi Hound™ complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

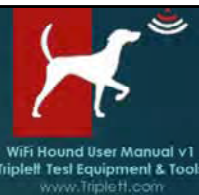
- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

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 when the equipment is operated in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation distance between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

FCC ID: 2ARKJTRI-3798
MODEL: WFHOUND

Safety and Cleaning



Thank you for purchasing the Triplett WiFi Hound™. Please read the manual carefully before using the product. To assure safe use of this product, please read the section on Safety carefully, and observe any Cautions or Warnings posted there and throughout this manual.

Please keep this manual for future reference.

- Comply with all local broadcast, electrical safety, and electromagnetic compatibility rules and regulations when using this device.
- Use original accessories with this equipment to avoid possible damage caused from unapproved accessories.
- Accessories supplied are only intended for use with this product. Use with other products or for other purposes is not recommended.
- Do not expose the product to rain, liquids, or excessive moisture as product damage may occur.
- Do not expose or use the product in dusty or highly particulate environments.
- Avoid dropping the product or subjecting it to physical shock or high vibrations.
- Avoid leaving the product unattended while recharging it. Charging time should not exceed 8 hours. If the battery becomes hot, disconnect power immediately.
- Do not use the product in an environment containing flammable gases.
- Do not attempt to disassemble the product. There are no user serviceable parts inside and product damage can occur. Contact Triplett customer service if the unit does not function properly.
- Do not use the product in environments with strong electromagnetic fields.
- Do not handle or operate the product with wet hands.
- Do not use strong detergents or solvents for cleaning the product. Wipe off dirt with a soft dry cloth, or a soft cloth slightly moistened with water or mild cleaner that is approved for use on capacitive touch-screens.

WARRANTY AND TECHNICAL SUPPORT

Triplett / Jewell Instruments extends the following warranty to the original purchaser of these goods for use. Triplett warrants to the original purchaser for use that the products sold by it will be free from defects in workmanship and material for a period of (1) one year from the date of purchase.

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons in any way or purchased from unauthorized distributors so as, in our sole judgment, to injure their stability or reliability, or which have been subject to misuse, abuse, misapplication, negligence, accident or which have had the serial numbers altered, defaced, or removed. Accessories, including batteries and fuses, are not covered by this warranty.

To register a claim under the provisions of this warranty, please contact the distributor from which you purchased the product from for warranty consideration.

ALL WARRANTIES IMPLIED BY LAW ARE HEREBY LIMITED TO A PERIOD OF THREE YEARS FROM DATE OF PURCHASE, AND THE PROVISIONS OF THE WARRANTY ARE EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES EXPRESSED OR IMPLIED.

The purchaser agrees to assume all liability for any damages and bodily injury which may result from the use or misuse of the product by the purchaser, his employees, or others, and the remedies provided for in this warranty are expressly in lieu of any other liability Triplett may have, including incidental or consequential damages.

Some states (USA ONLY) do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. No representative of Triplett / Byte Brothers or any other person is authorized to extend the liability of Triplett in connection with the sale of its products beyond the terms hereof.

Triplett reserves the right to discontinue models at any time, or change specifications, price or design, without notice and without incurring any obligation.

This warranty gives you specific legal rights, and you may have other rights which vary from state to state.