WiFi Hound 101 Training

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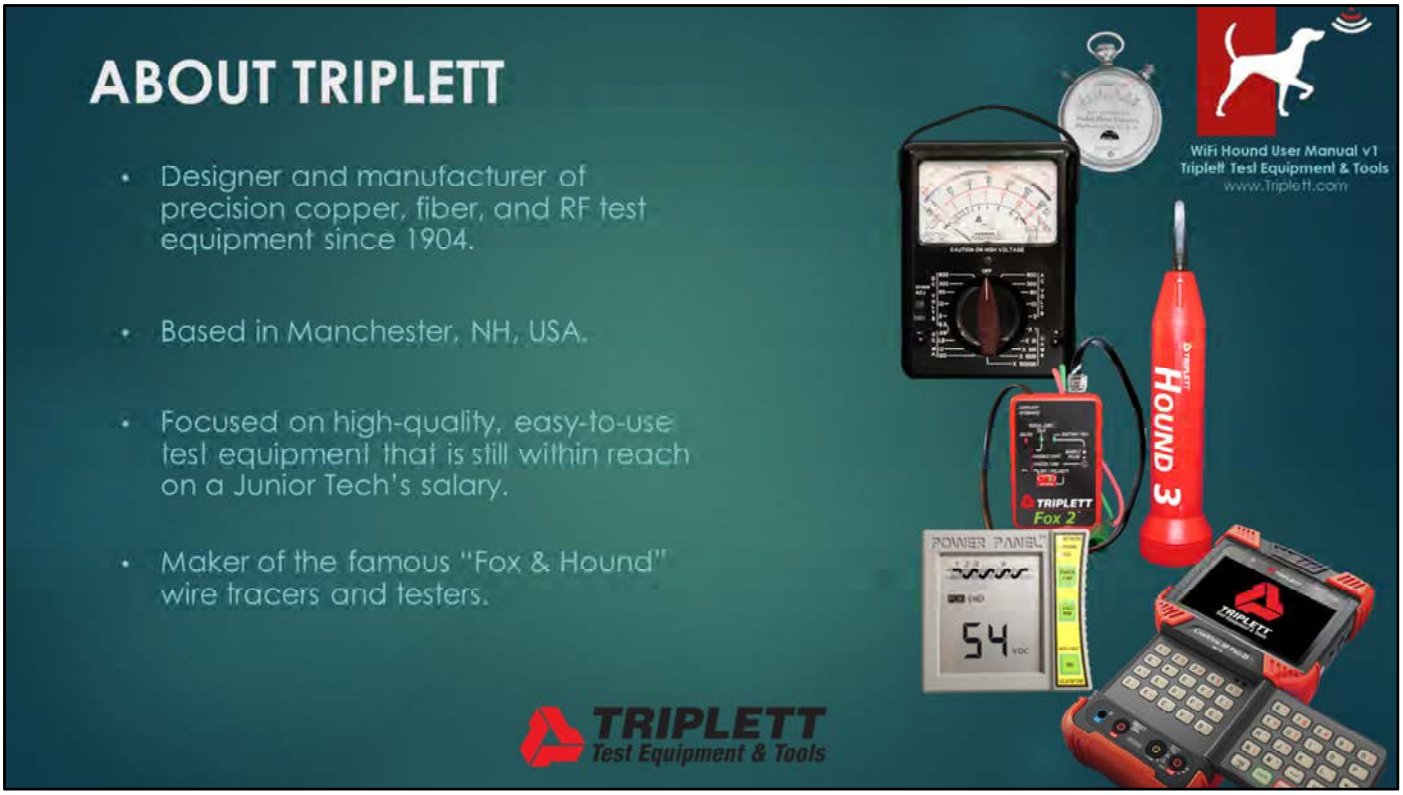

When we were developing the Triplett WiFi Hound, we focused on creating a tester that would let even an inexperienced technician troubleshoot problems with the wireless environment quickly. We also knew how important it was for that same technician to be able to clearly communicate the problems to the 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!

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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.

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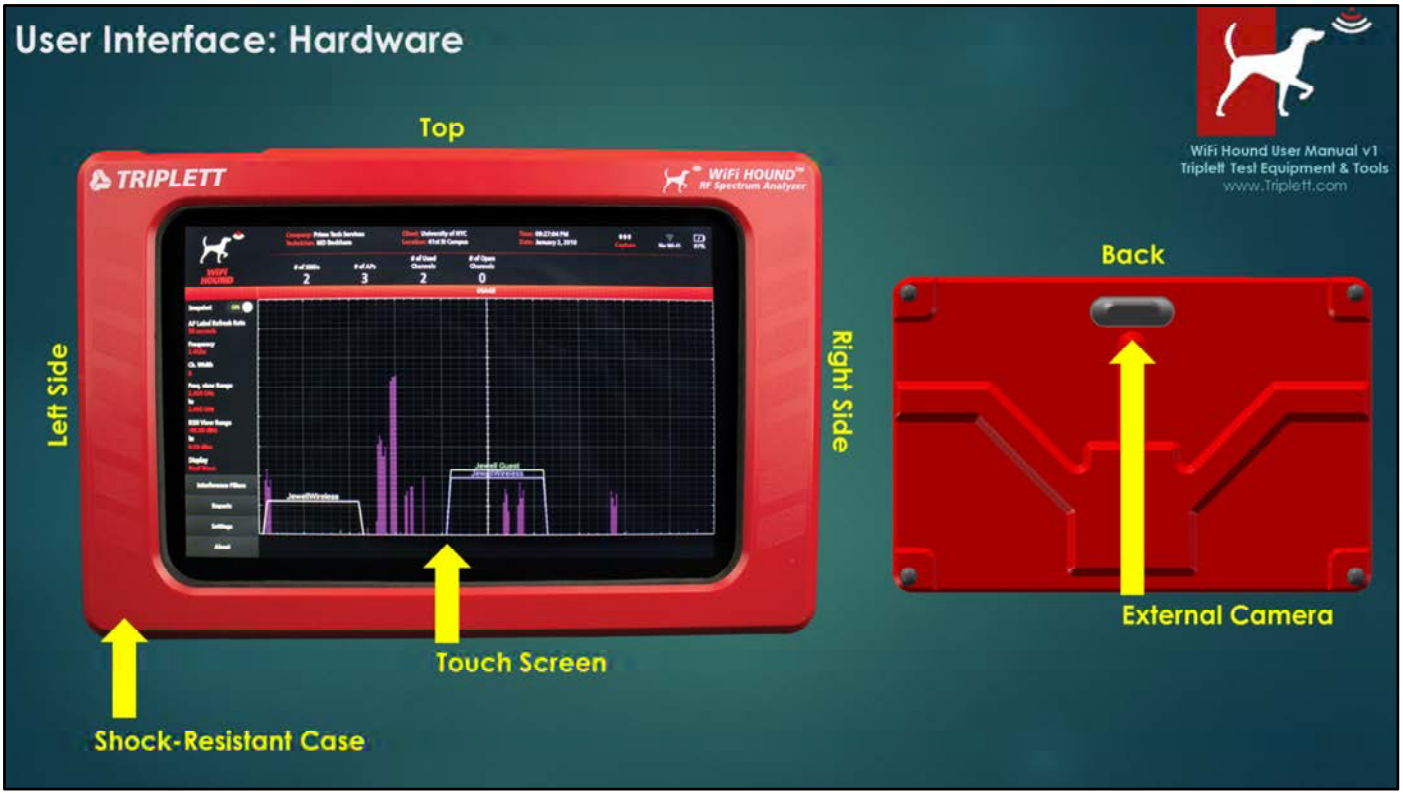

HARDWARE
Android-based tester with custom hardware and shock-resistant case. Many Android features are deliberately disabled, and Bluetooth should always be set to OFF.

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.

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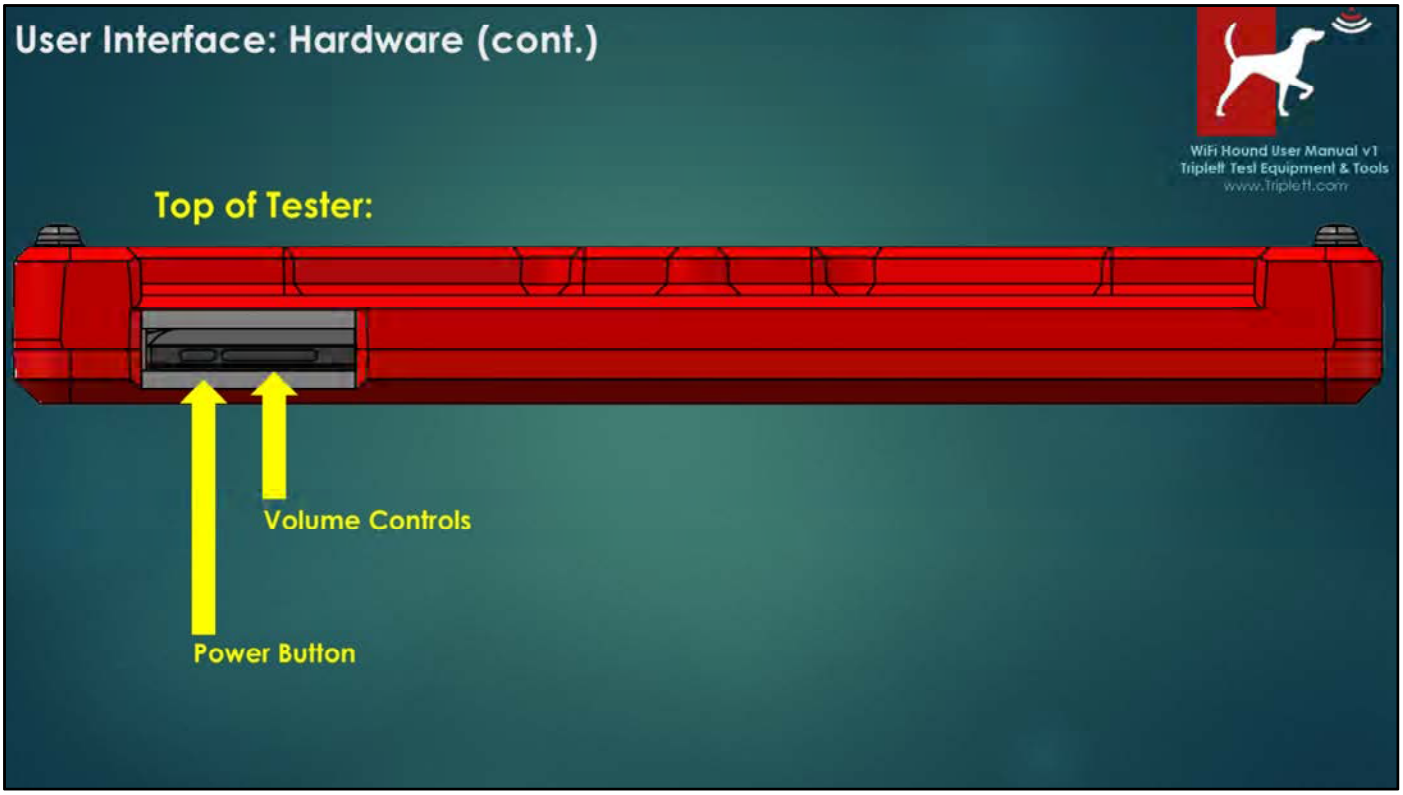

TOP

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!).

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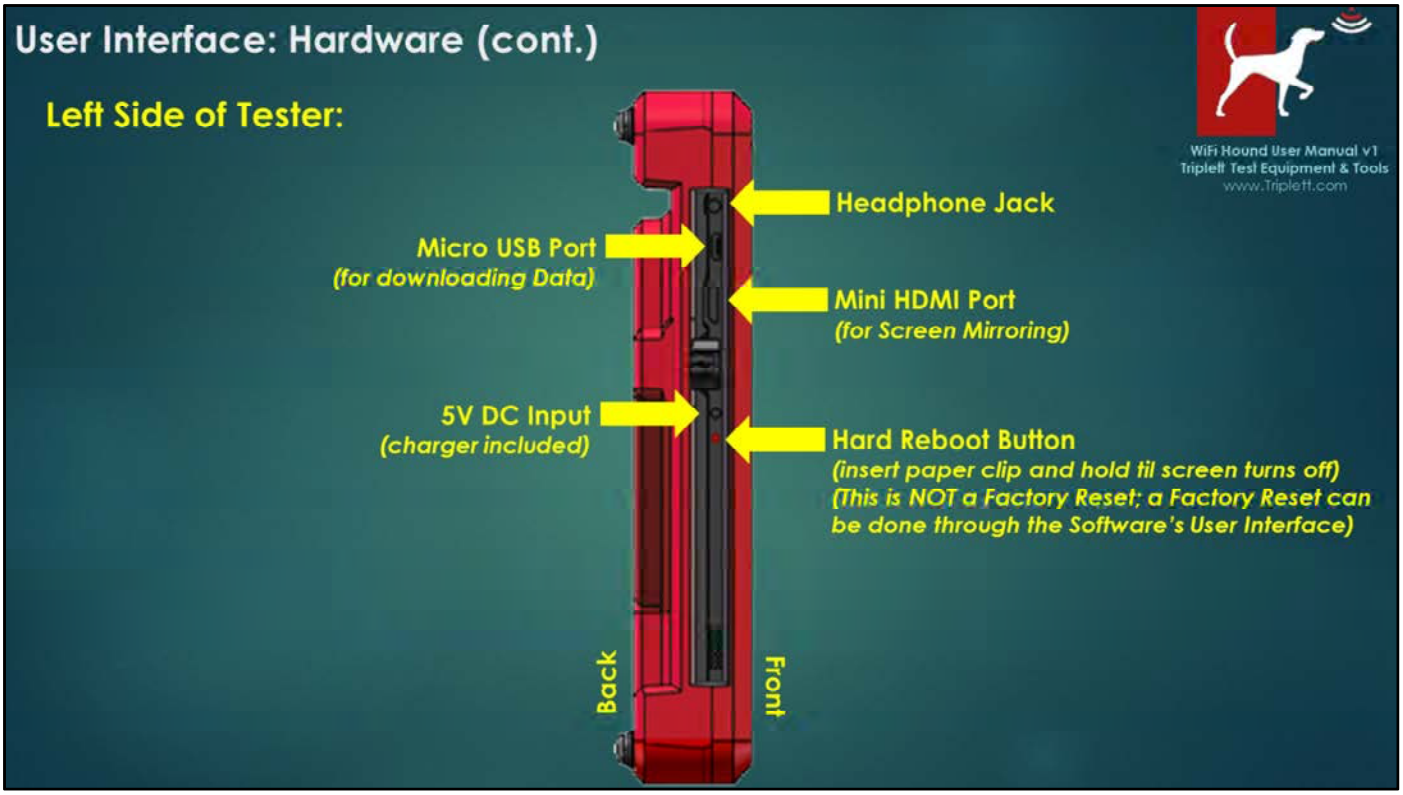

From Top to Bottom:

- 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.

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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.

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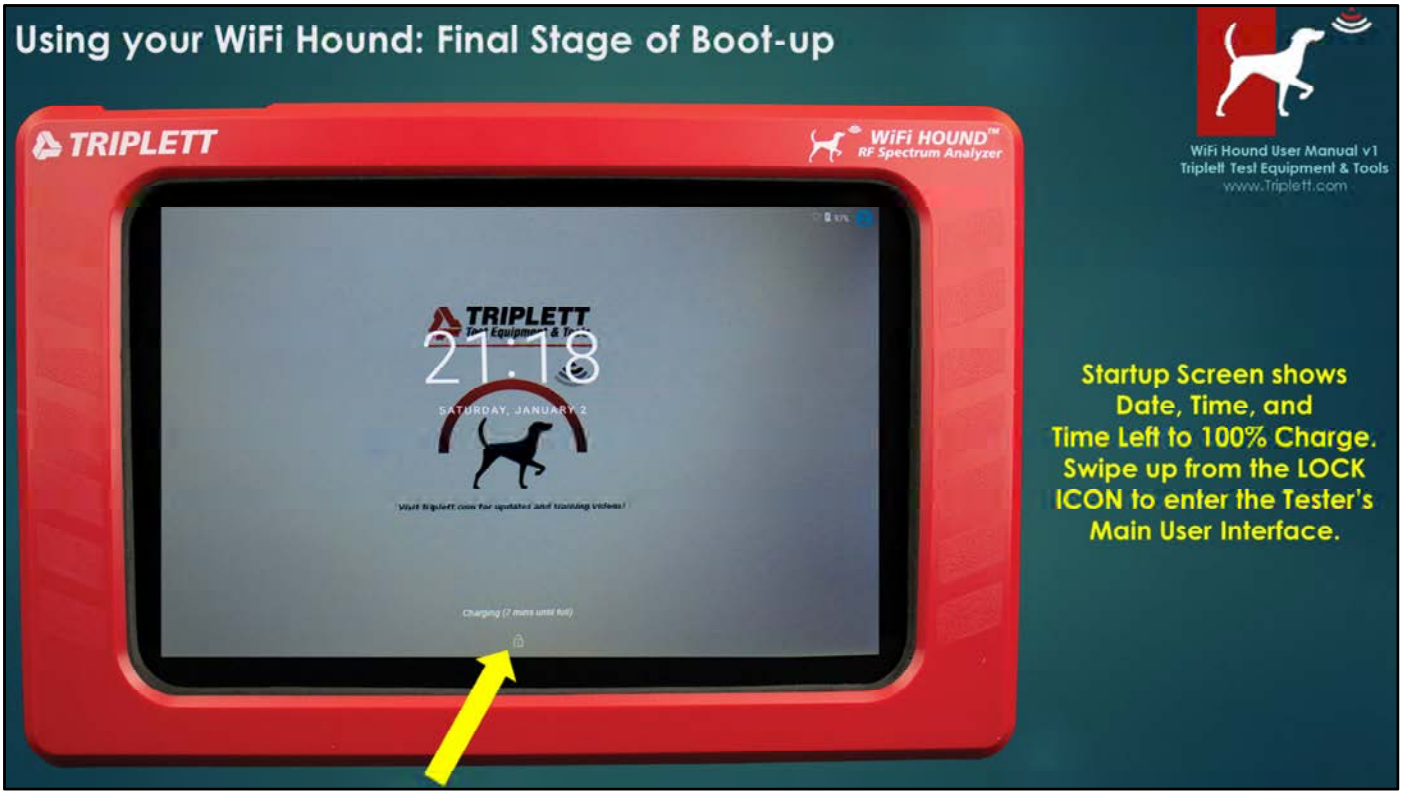

This is the WiFi Hound Startup Screen. This is the screen you will see once the unit has completed its boot-up process. Swipe up from the Lock icon to begin using your Tester.

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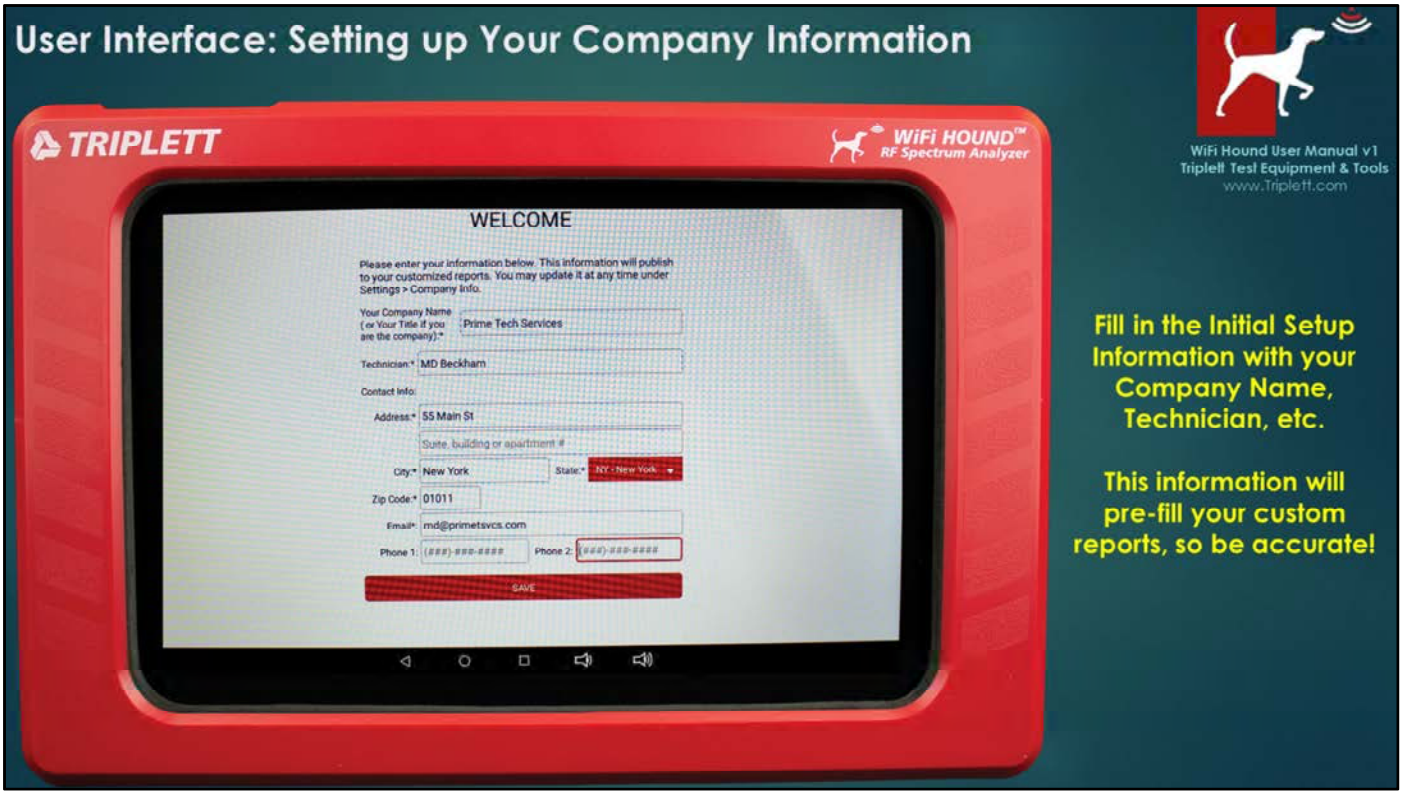

This is the WELCOME SCREEN. You will only need to add this information once. To add more Technicians or select a different Technician, you can go to Settings > Company Info in the Main Screen after you have completed the Initial Setup here.

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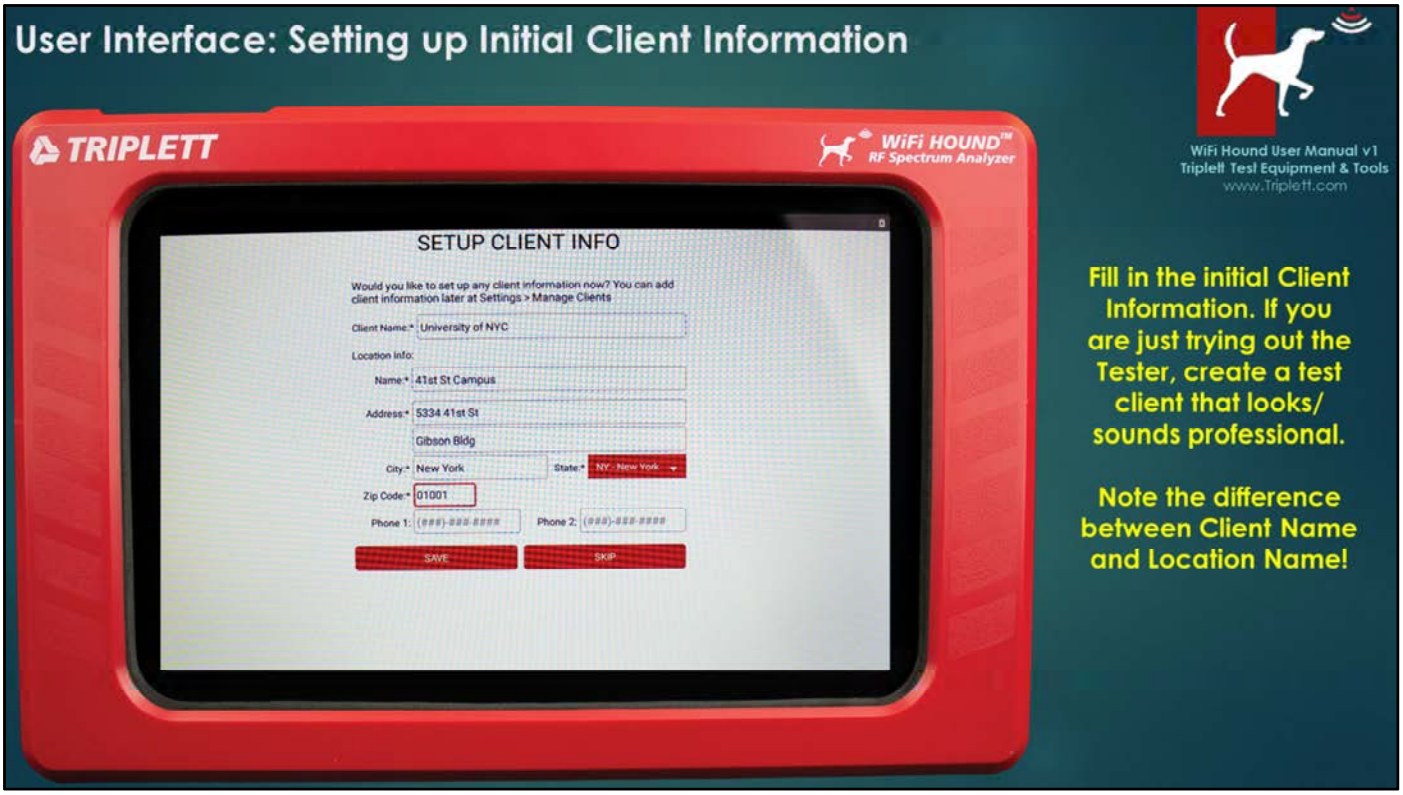

SETUP CLIENT INFO

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.

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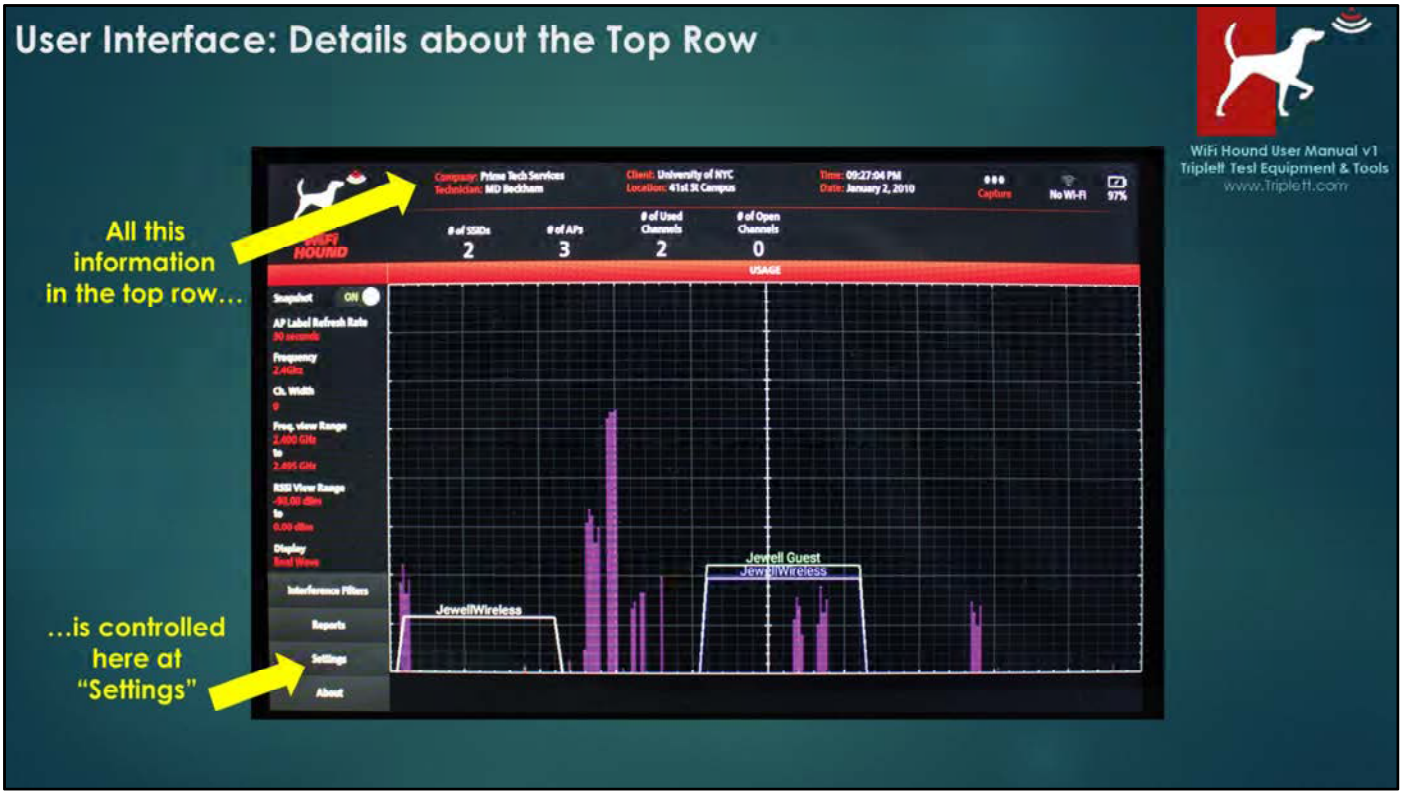

MAIN SCREEN: TOP ROW
Notice the Company and Client information comes out on the Main Screen on the top. This data, along with the Time and Date, and connecting to the local WiFi network, is controlled at "Settings" in the bottom left of the screen.

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.

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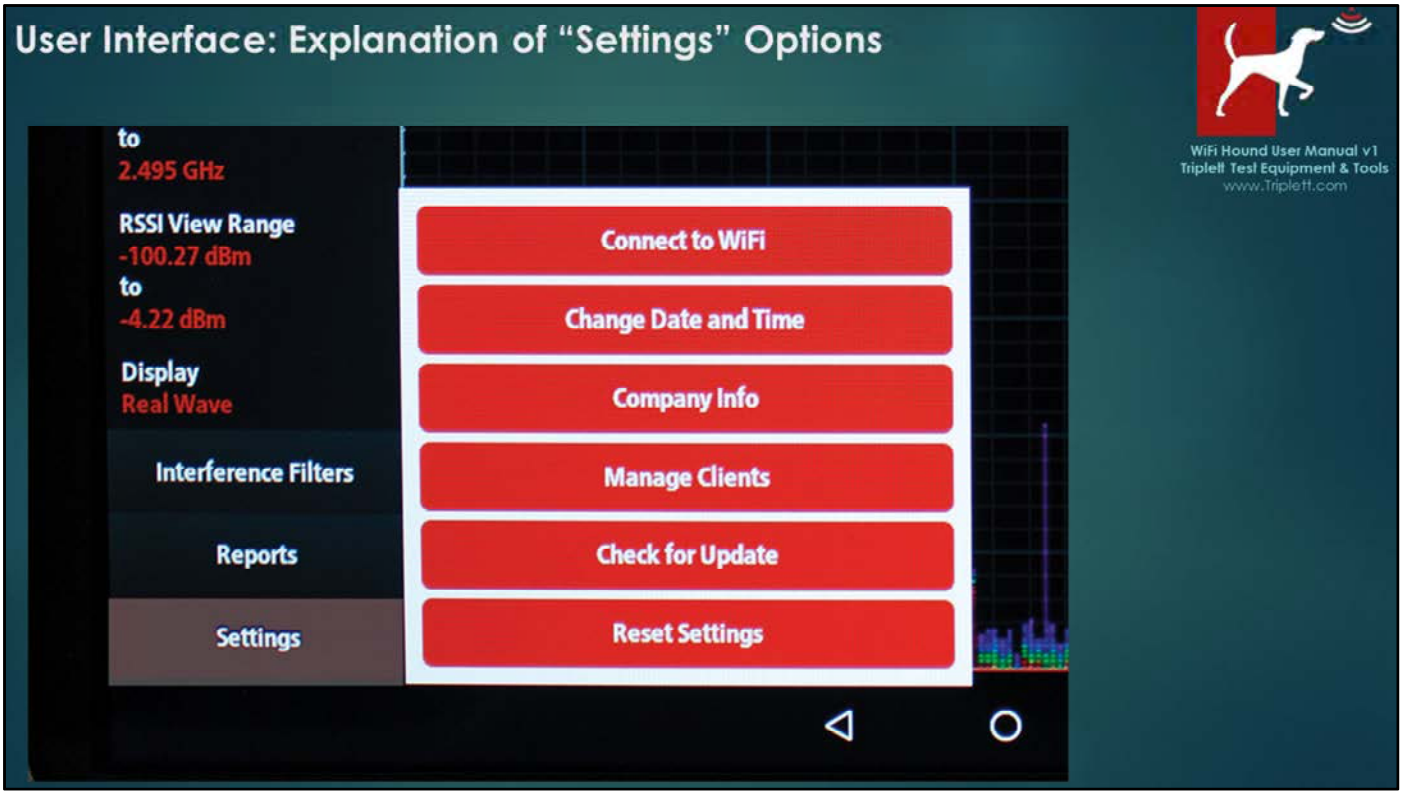

CONNECT TO WIFI
Use this feature to access the Android UI and connect the Tester to the local wireless network. Connecting to the wireless network you are trying to test will also give you a Throughput Speed readout in the upper right part of the display.

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.

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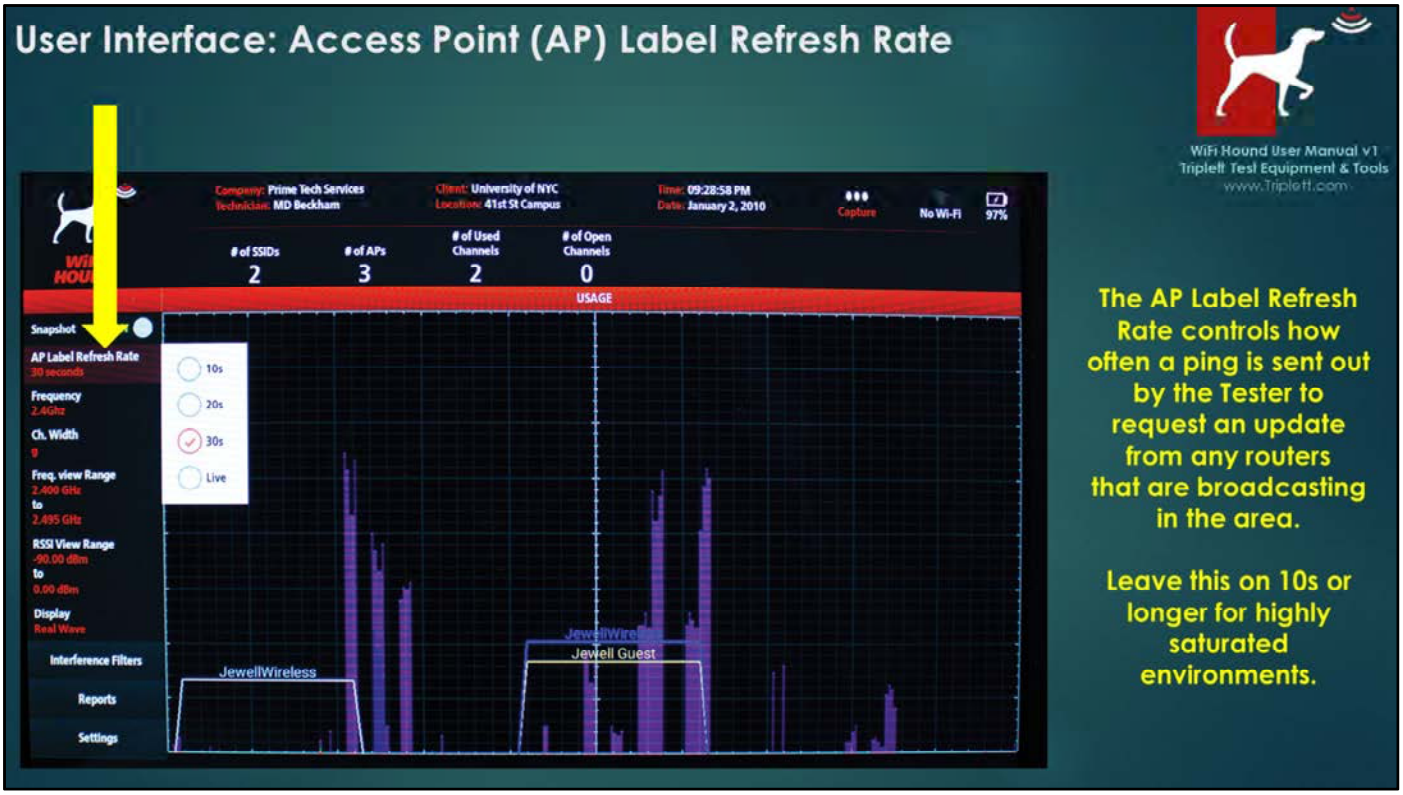

Access Point (AP) Label Refresh Rate

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

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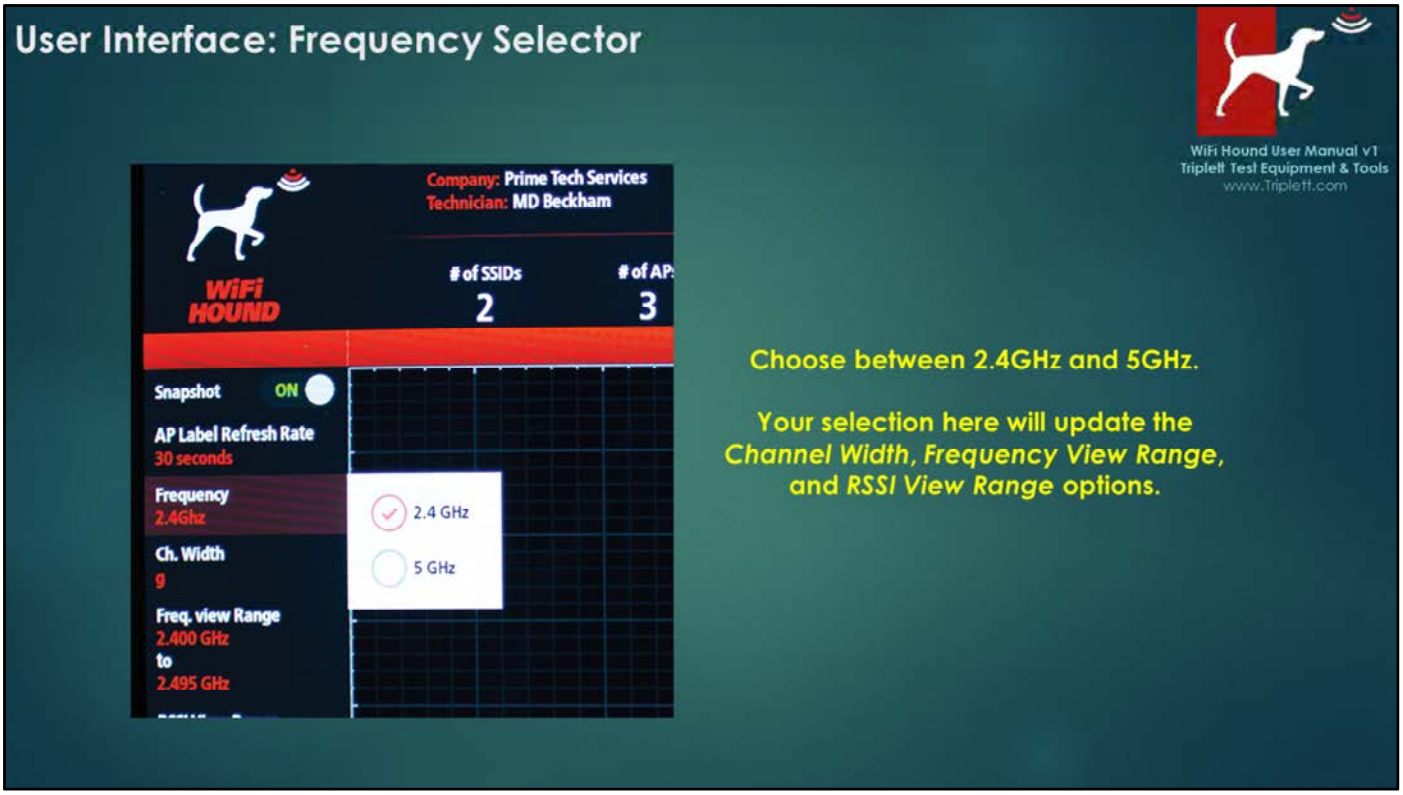

FREQUENCY

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

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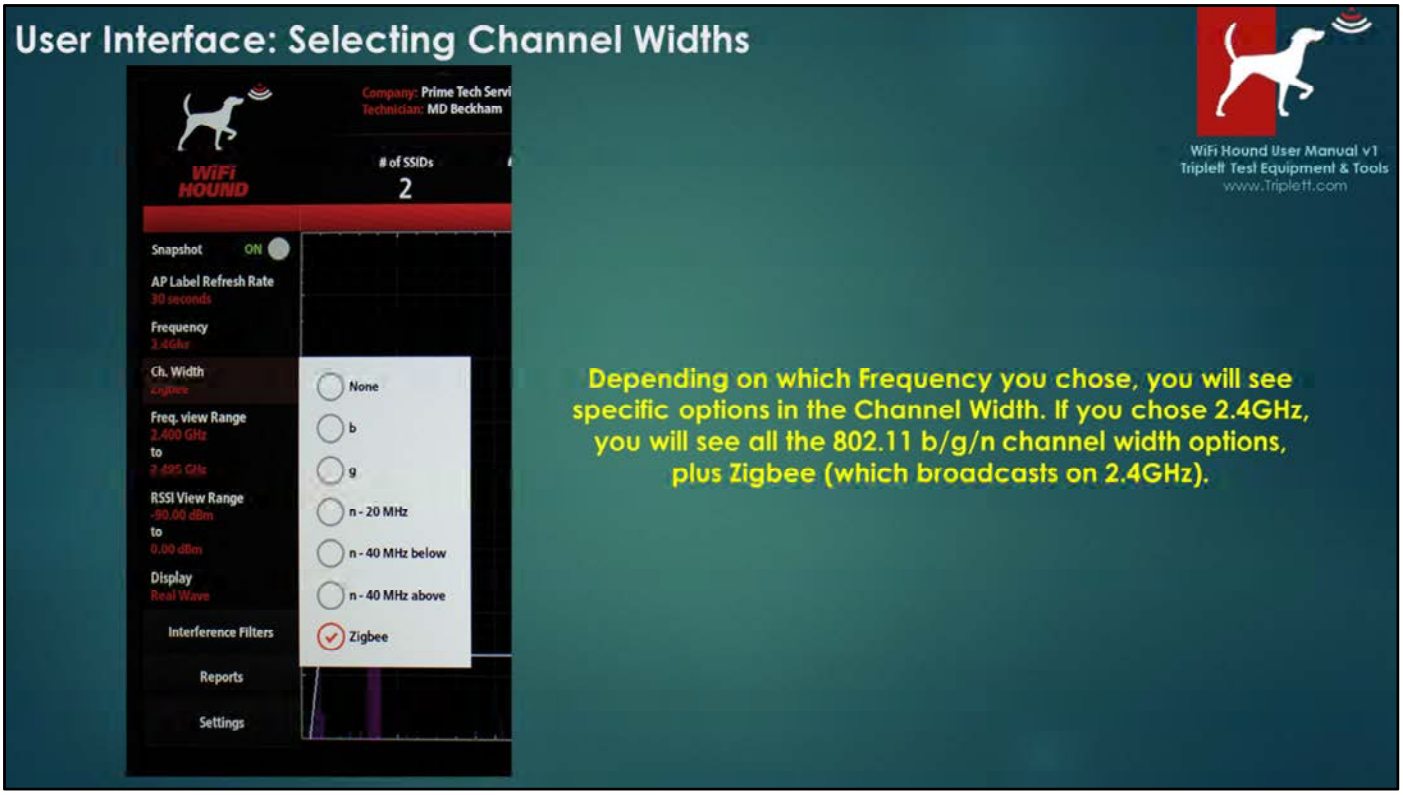

The Channel Width selection is designed to help narrow the viewing range and make it easier for you to troubleshoot saturated wireless environments. You will not see the impact of your selection until you select the next option in the Frequency View Range filter.

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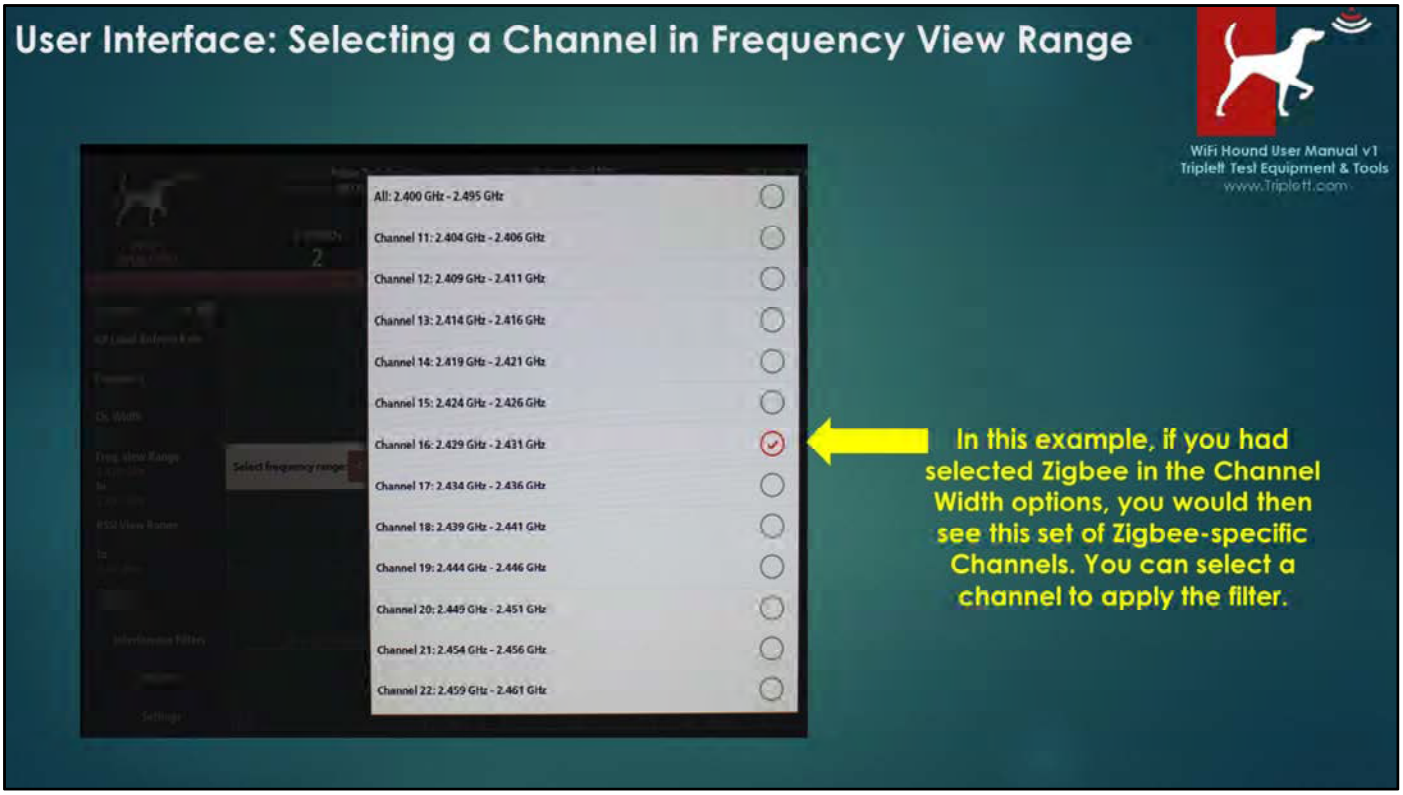

Notice that when you now go into the Frequency View Range, it lists the Zigbee channels. If you had selected b or g, for example, then the corresponding North American channels referring to 802.11b or 802.11g (Channels 1-11) would show instead.

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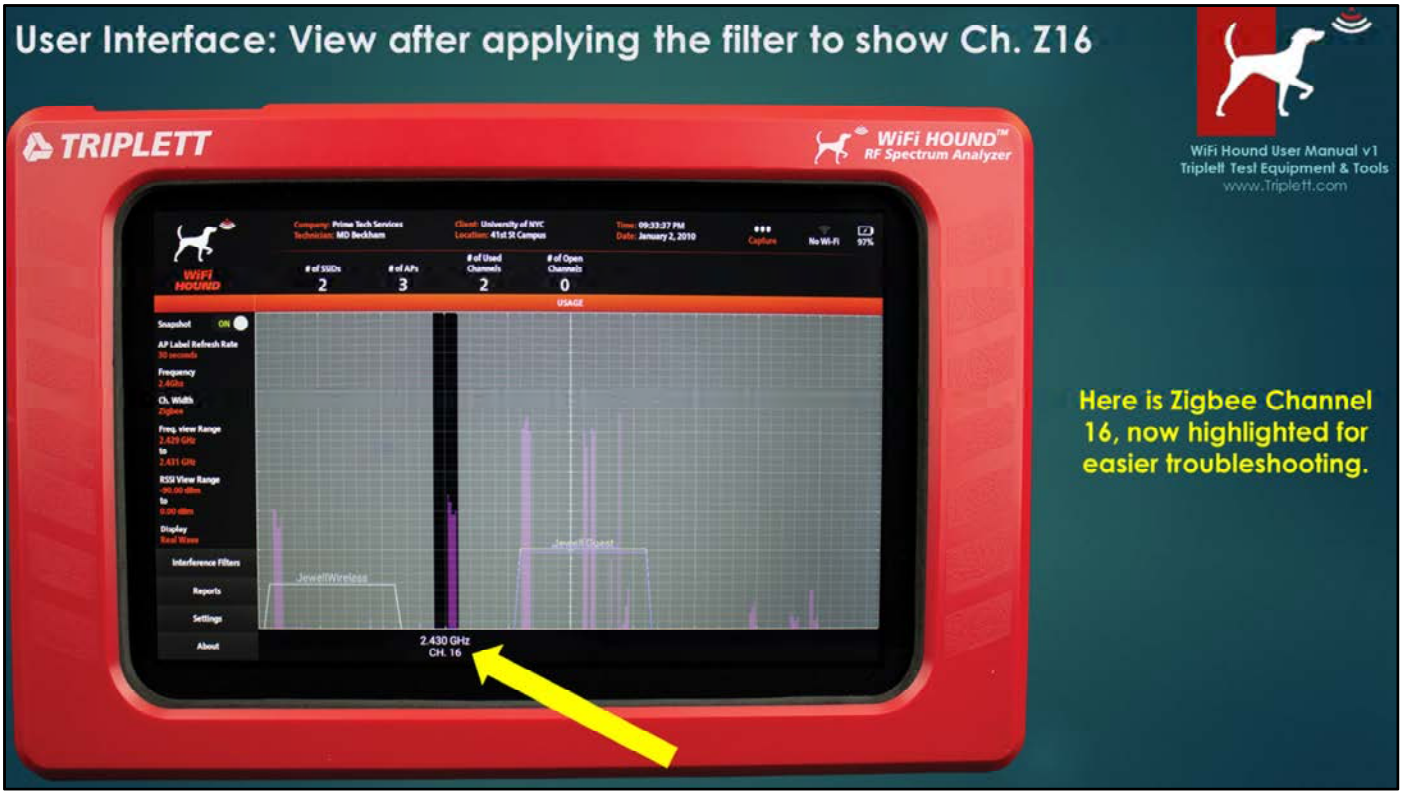

After you are done using the filter, you can then reselect the Frequency View Range filter and change it back to All Channels to change back to the full, unfiltered view.

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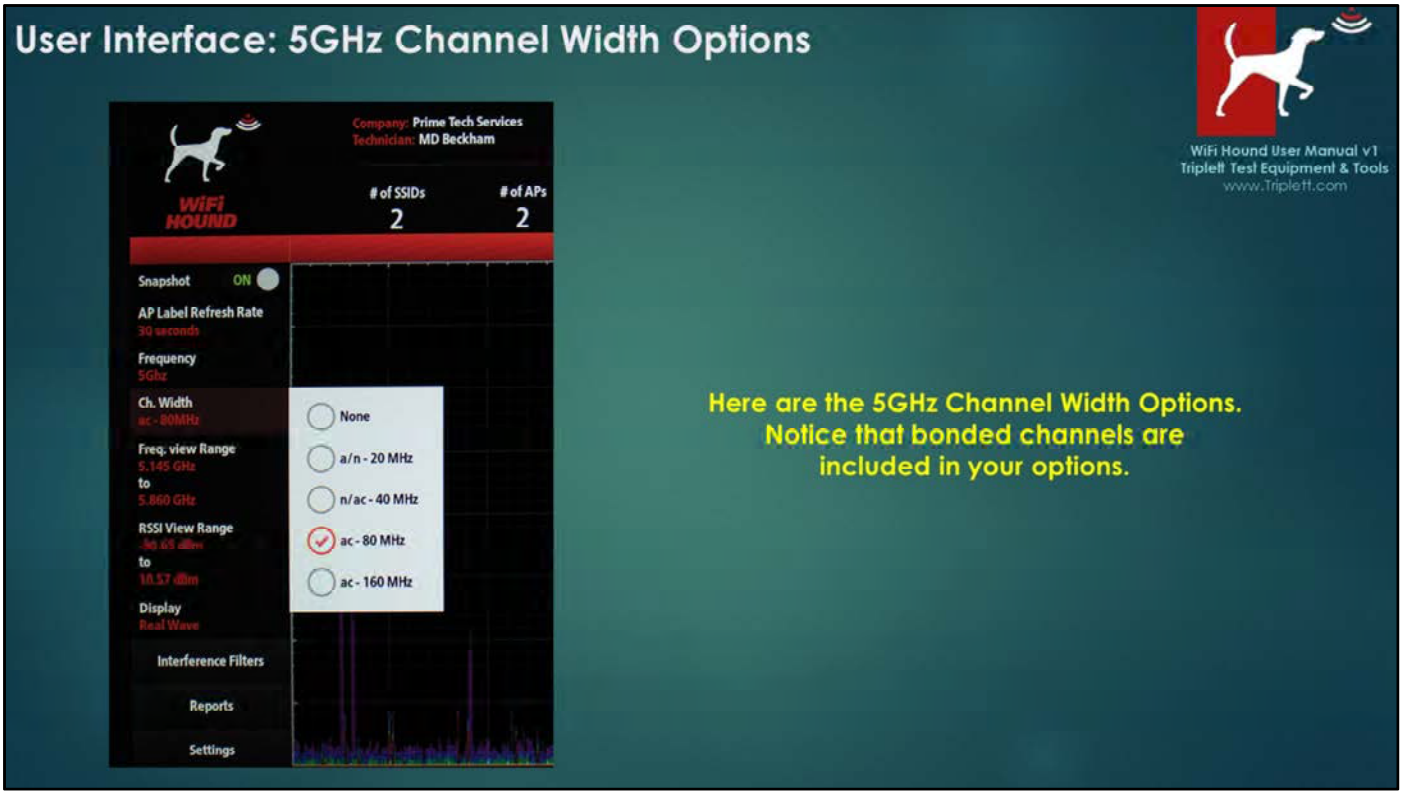

TROUBLESHOOTING NOTE

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.

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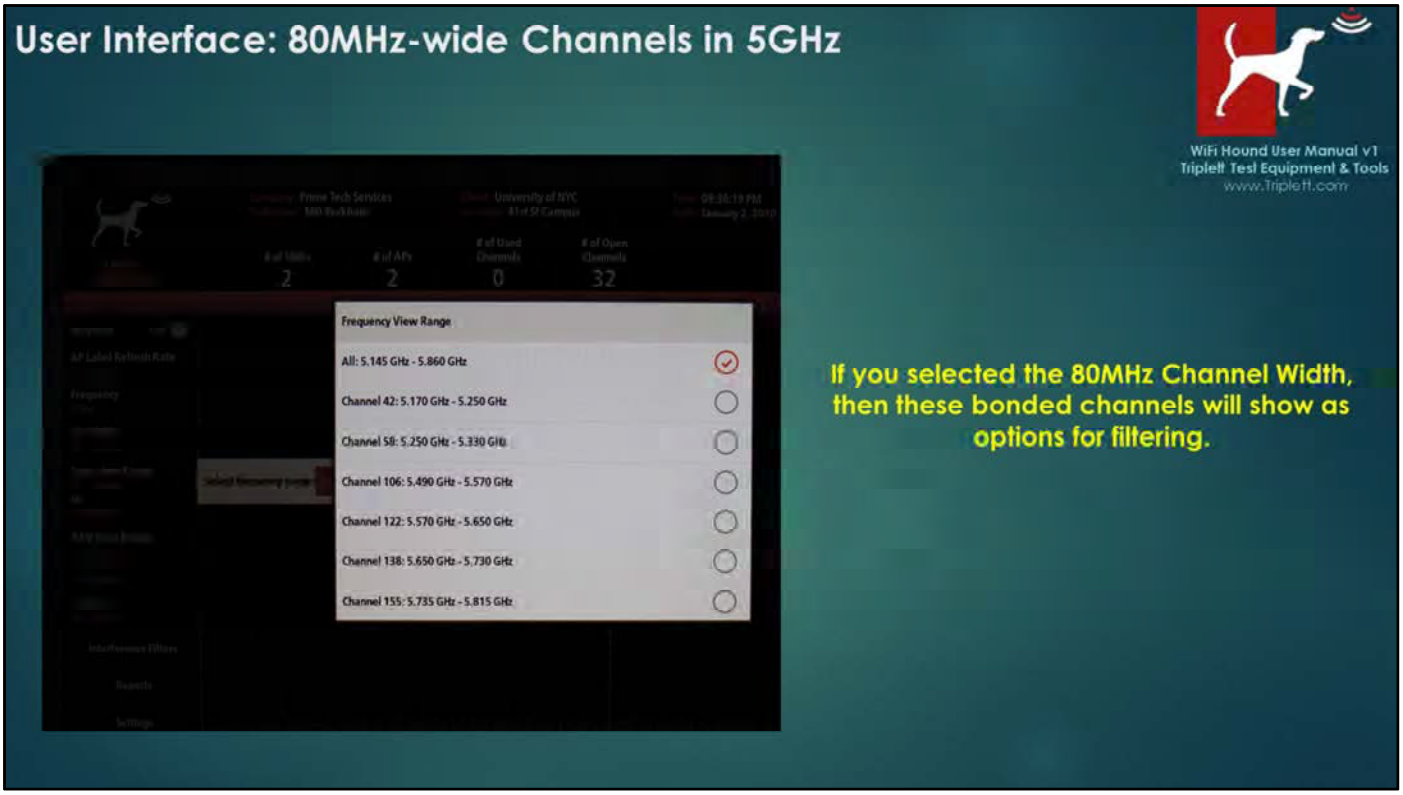

If you had selected 80MHz on the prior option, then you would see the above list of channels.

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

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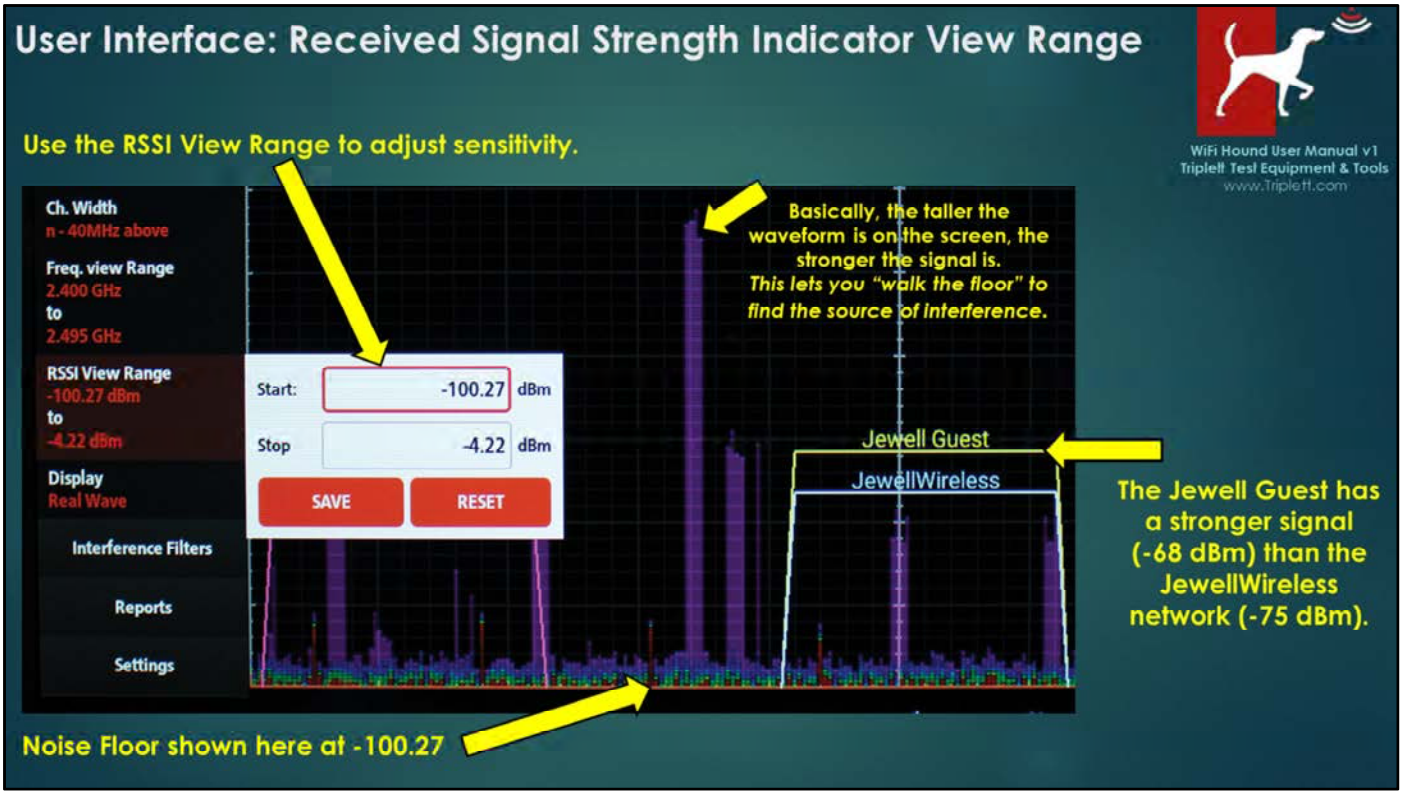

RECEIVED SIGNAL STRENGTH INDICATOR (RSSI) VIEW RANGE

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.

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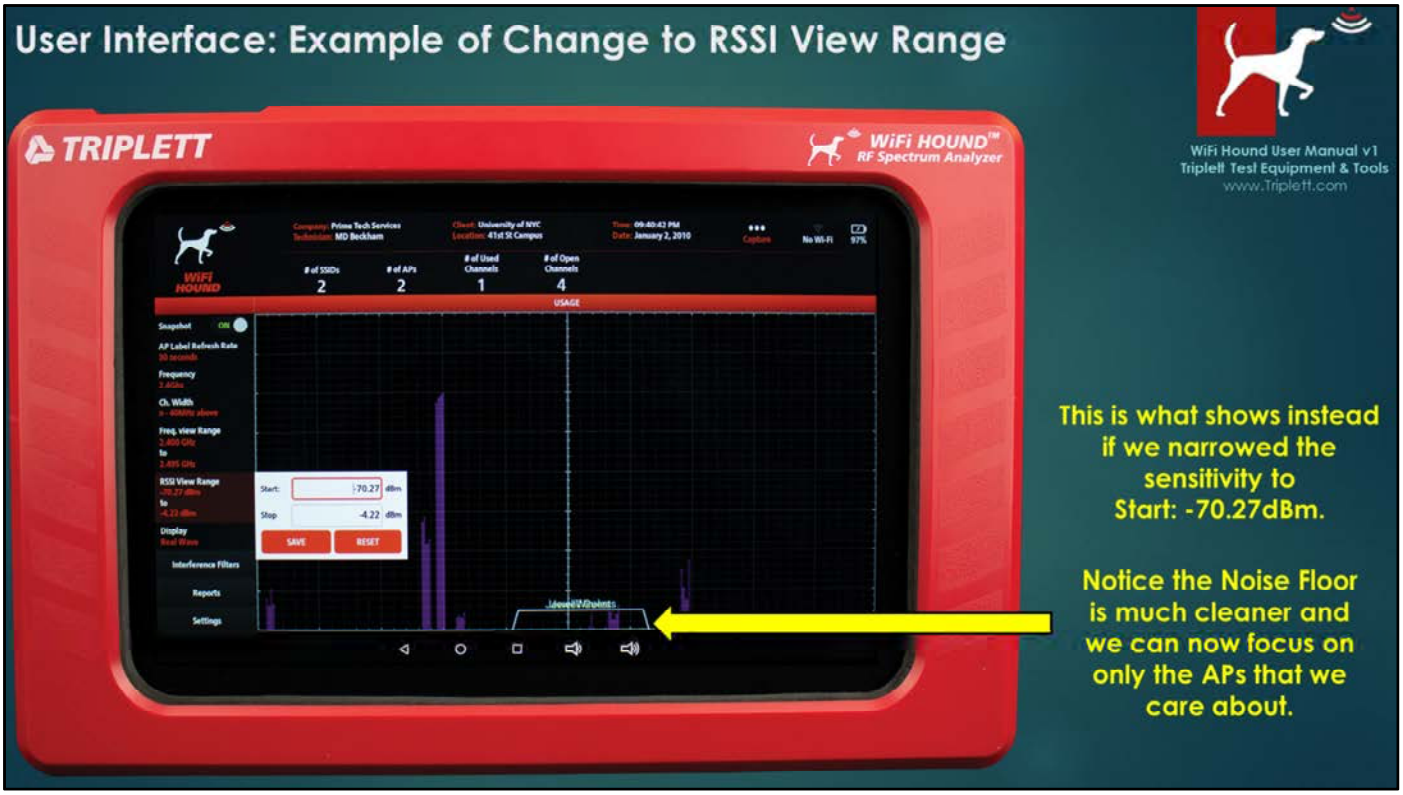

Adjusting the noise floor (i.e., Start number) can help you focus on only those things that have a strong enough signal to potentially cause interference with the wireless network you are troubleshooting. In the above example, you may be troubleshooting the JewellWireless network, but the interference 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.

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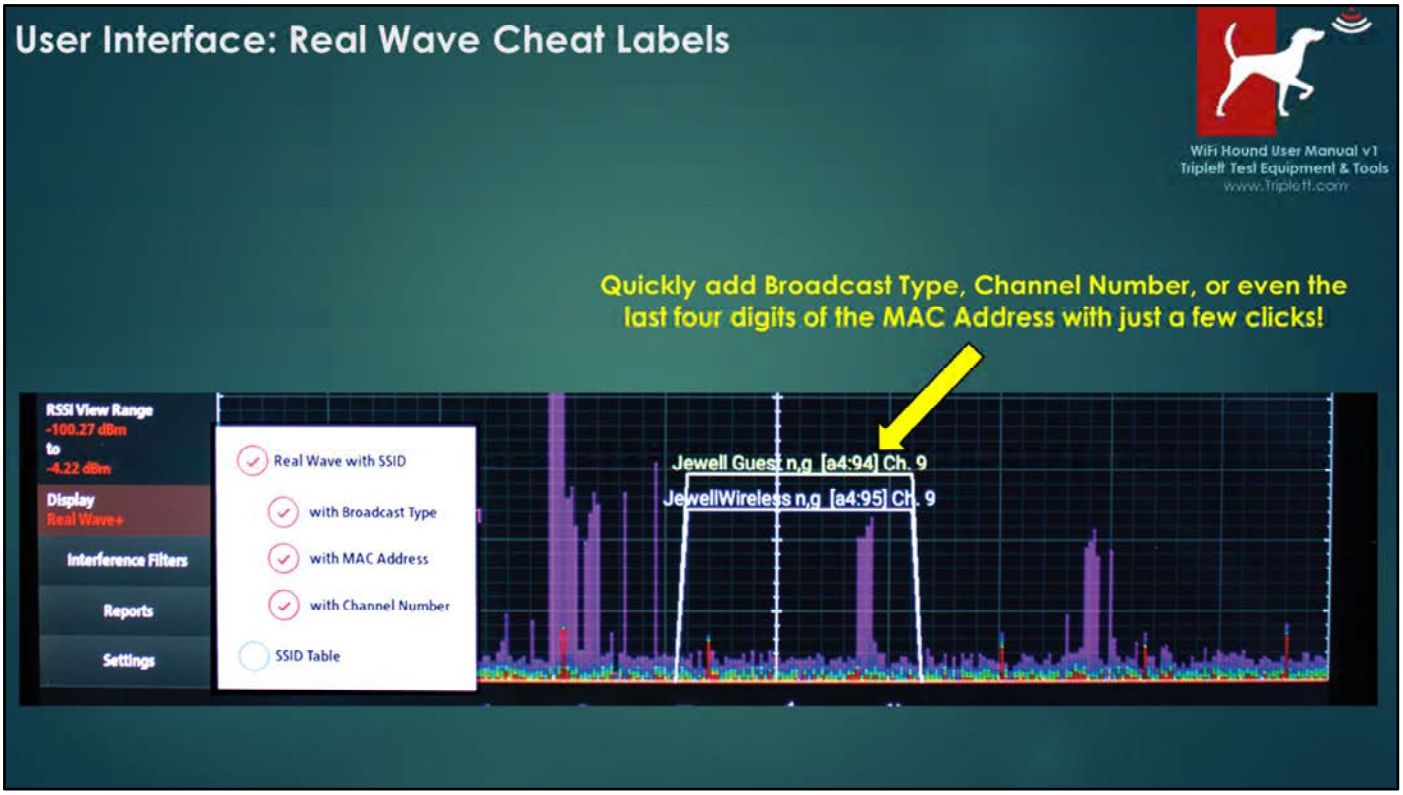

When to use the MAC ADDRESS option

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.

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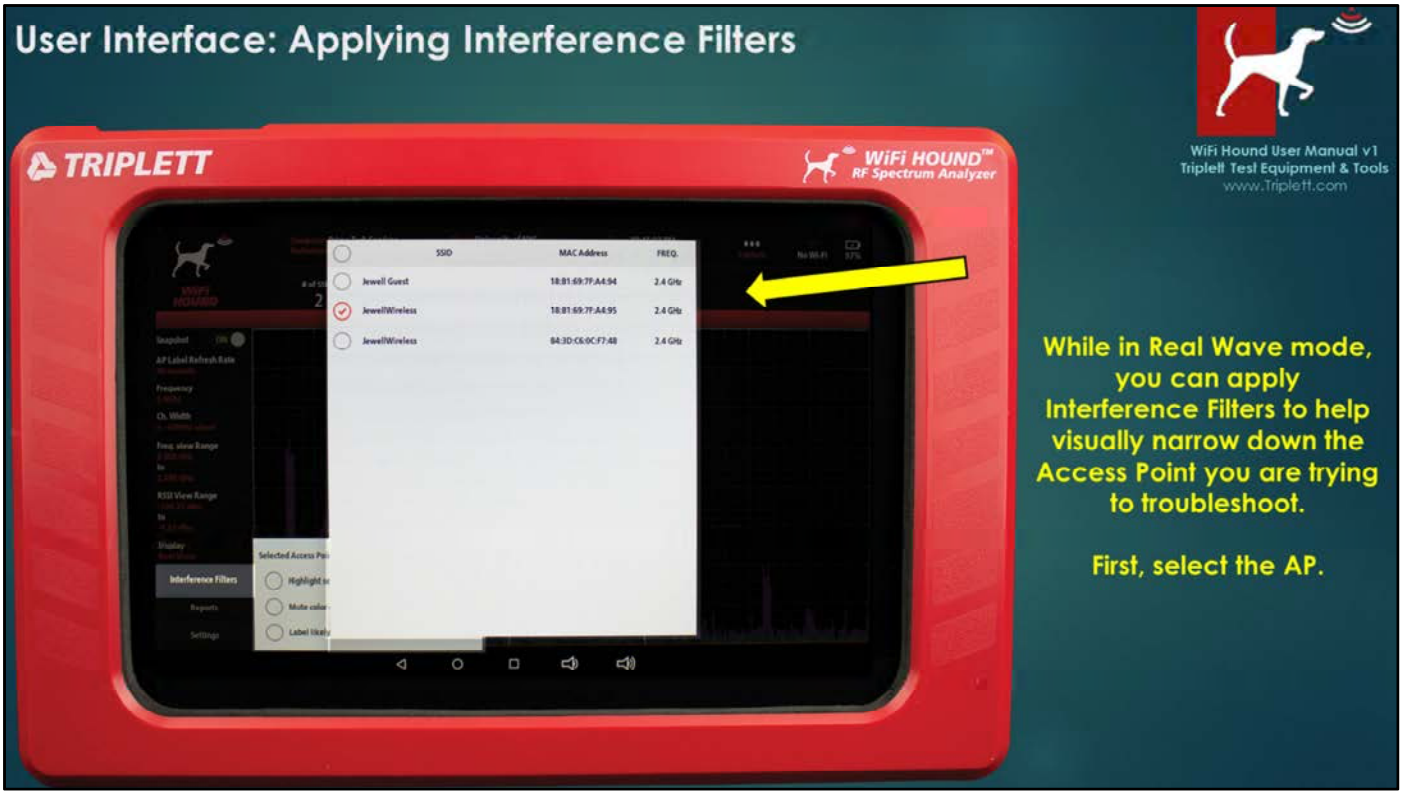
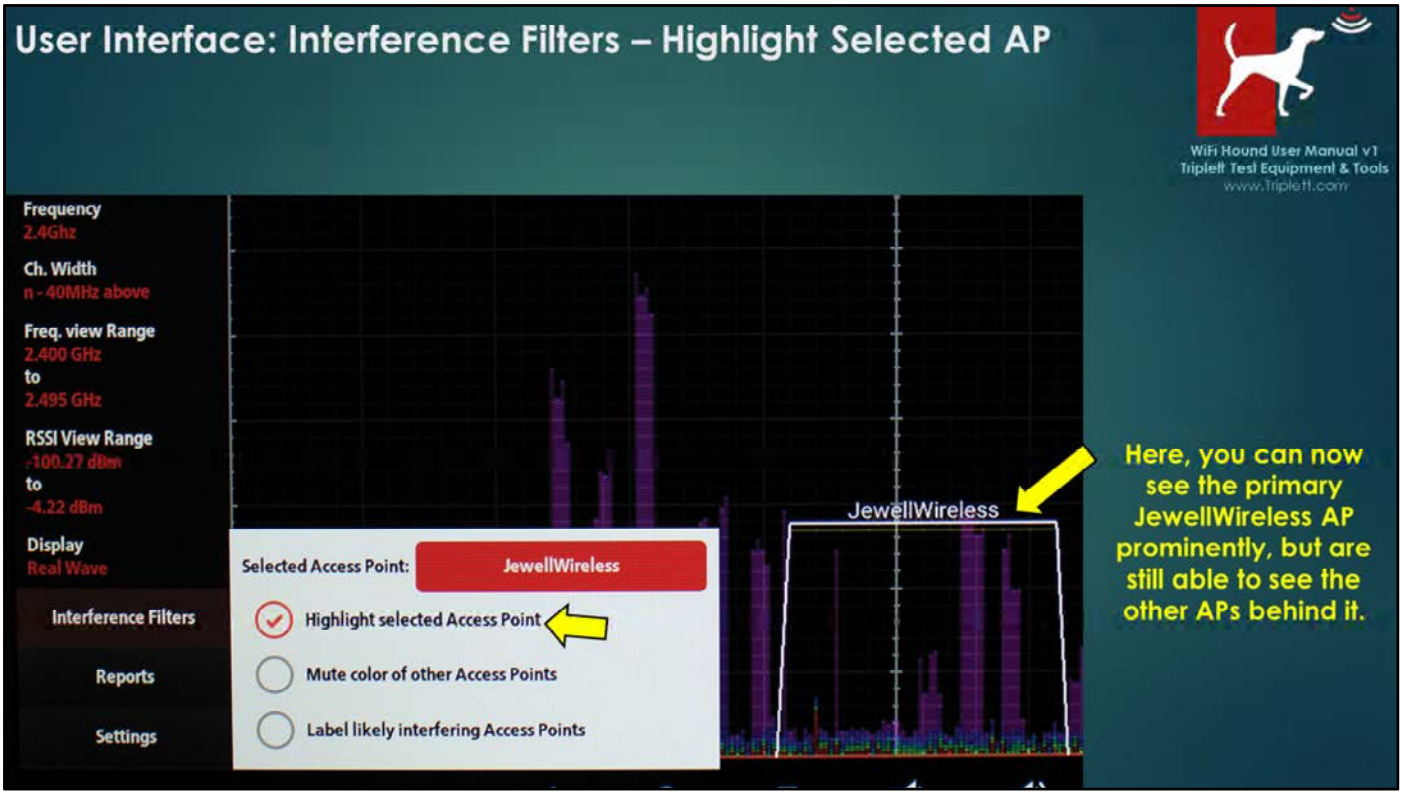


Interference Filters will help you to see your target AP even in a heavily saturated wireless environment.



Deselect the Access Point to reset the filter.

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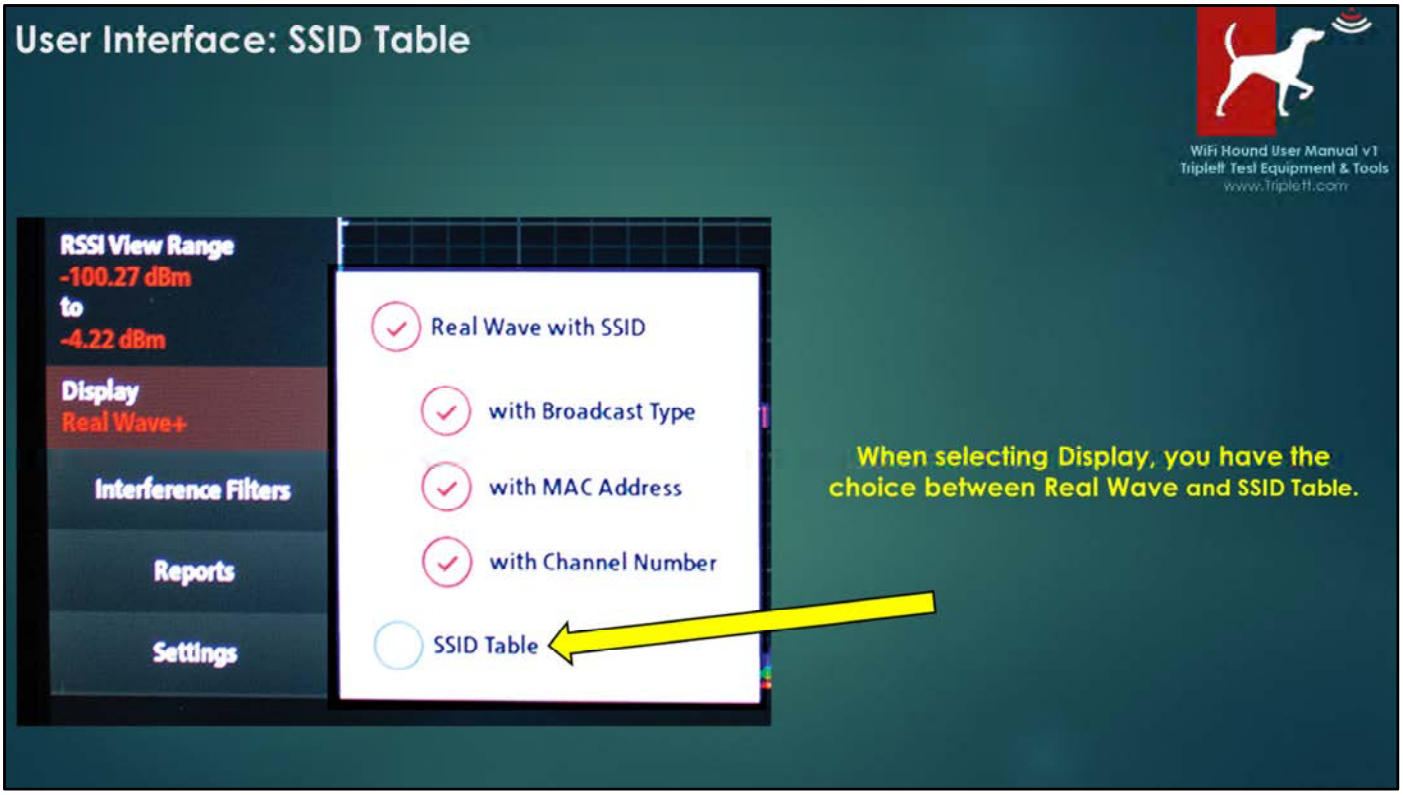

While the Real Wave view will show you everything that is happening in the Wireless Environment (including signals that are in the area that are not created by wireless routers), the Service Set Identifier (SSID) Table will only give you a list of the wireless networks in the area.

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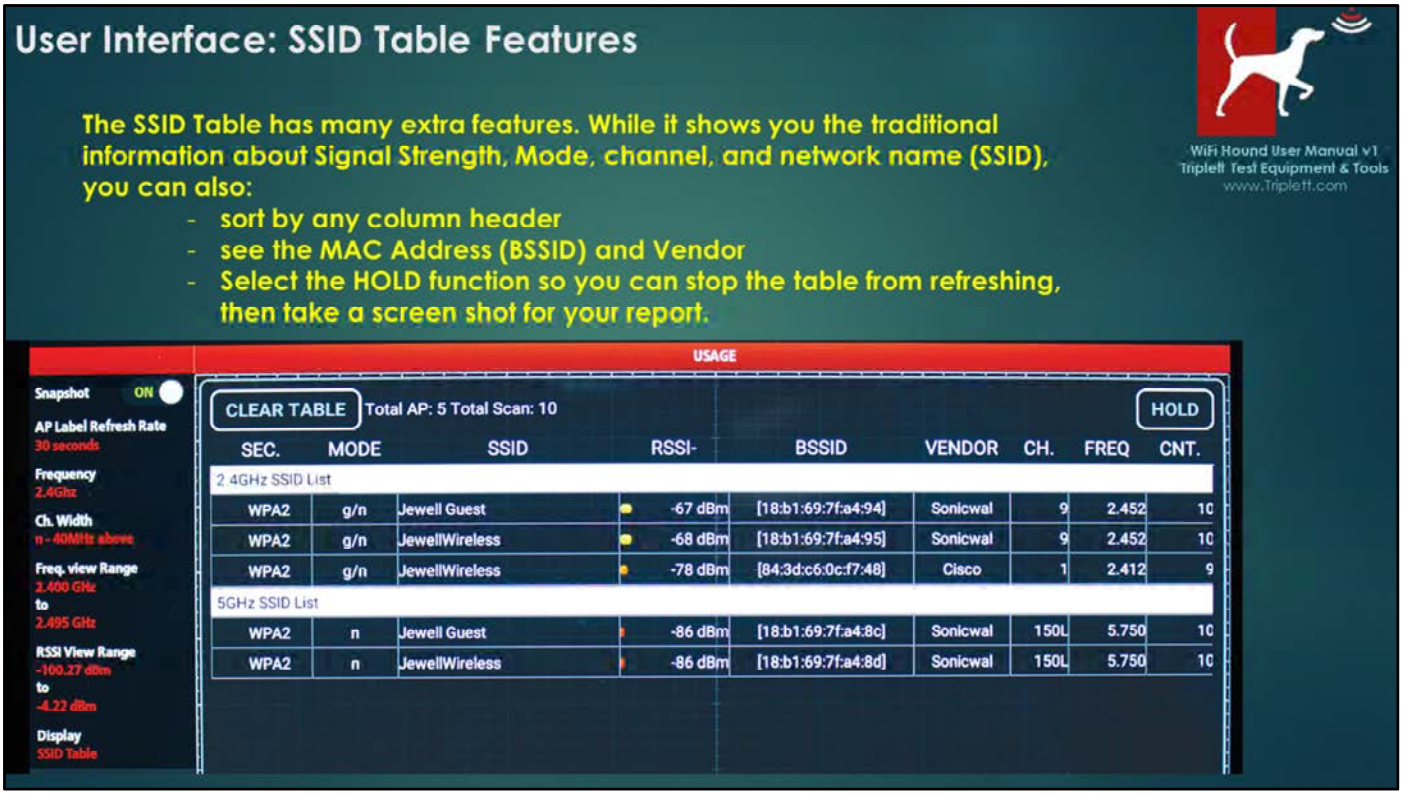

When many people think about troubleshooting wireless networks, they usually think about a free app on their cell phone that gives them signal strength data and a list of the wireless networks and the channels that are in use, similar to the table shown above.

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.

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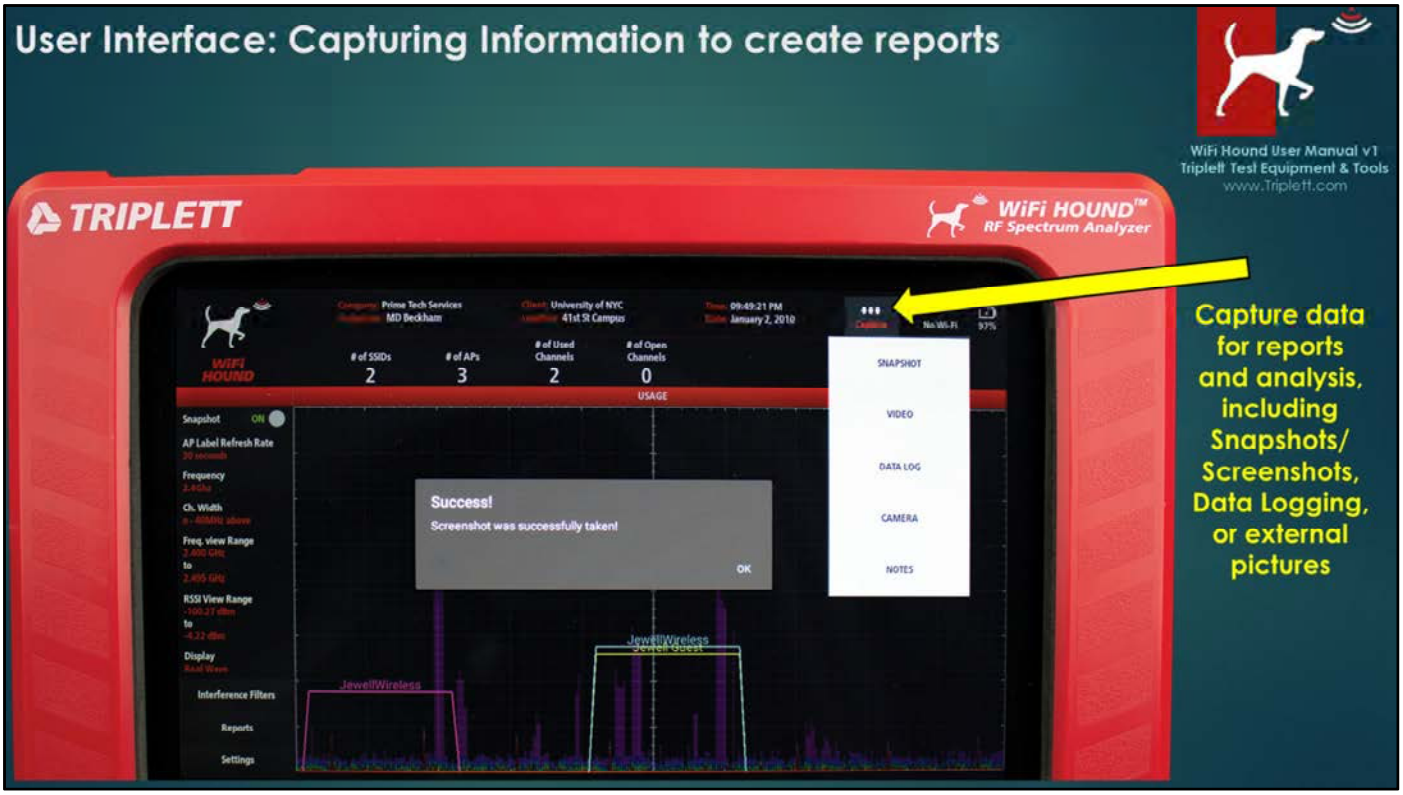

Click CAPTURE and then select from the drop-down menu. Here, the Snapshot feature is shown. A Snapshot will take a screen capture of the entire screen. Be sure to add a Note right after you take a Snapshot, detailing

- 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.

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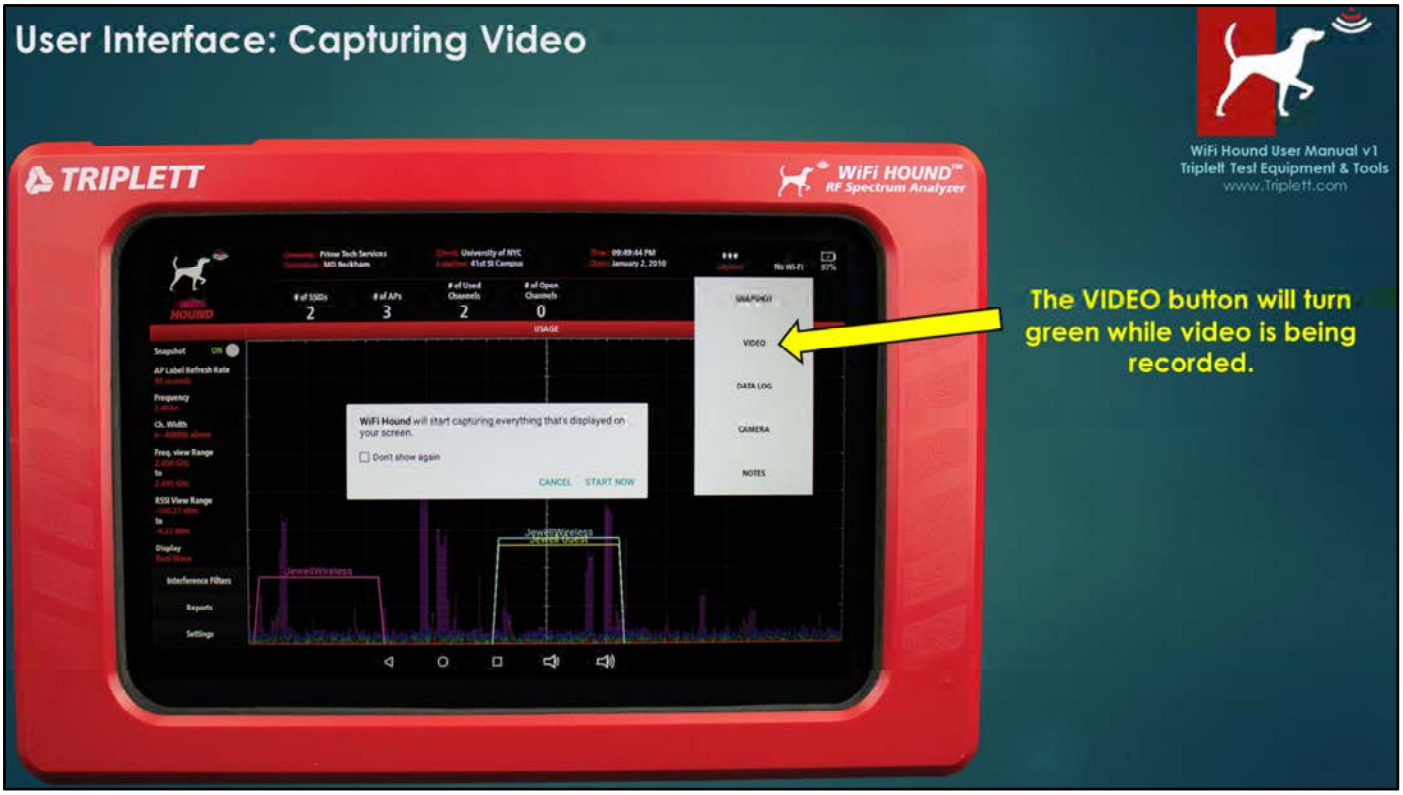

You can record video of the screen by pressing the VIDEO button, then click START NOW. The VIDEO button will turn green while the video is recording. When you want to end the recording, simply press the VIDEO button again.

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.

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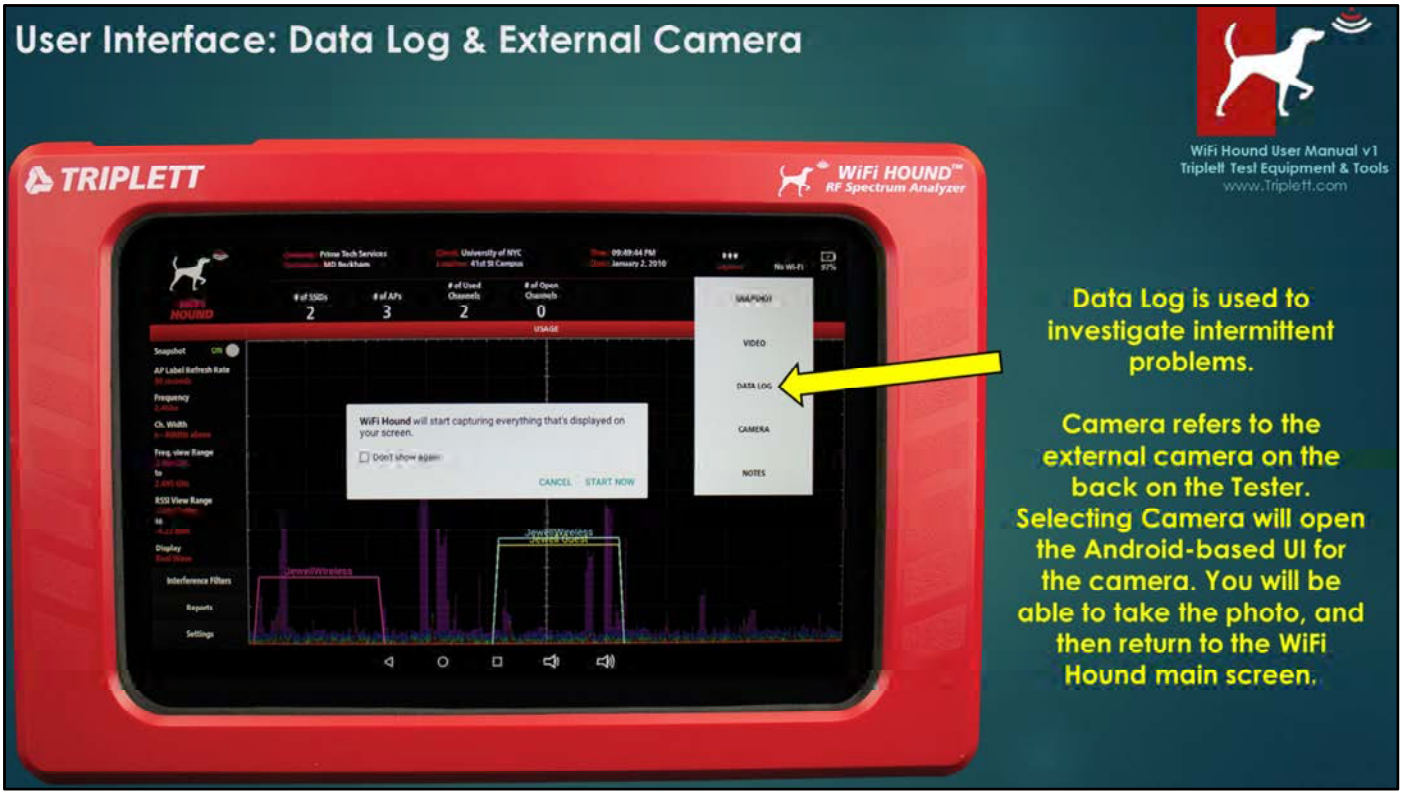

Data Logging currently creates a .csv file that must be interpreted. Future releases of the WiFi Hound software will include a simplified visual timeline instead, so be sure to register your Tester in order to receive the software update!

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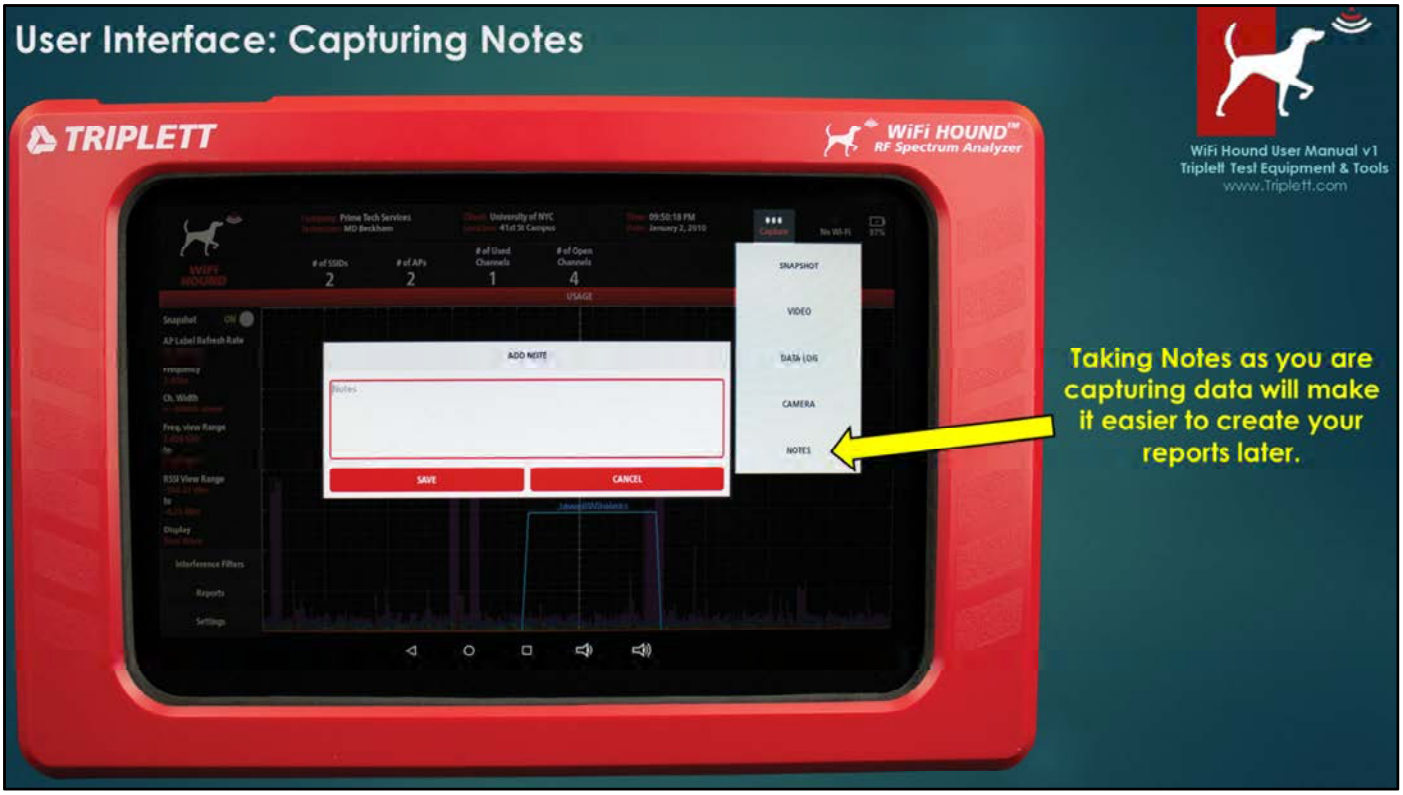

As mentioned before, we recommend that you add a Note after you capture each piece of information (e.g., after each snapshot or video) about what you are seeing and where you are in the client's facility. For example, "Far left corner by window [always work clockwise in a room], notice the 6 competing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

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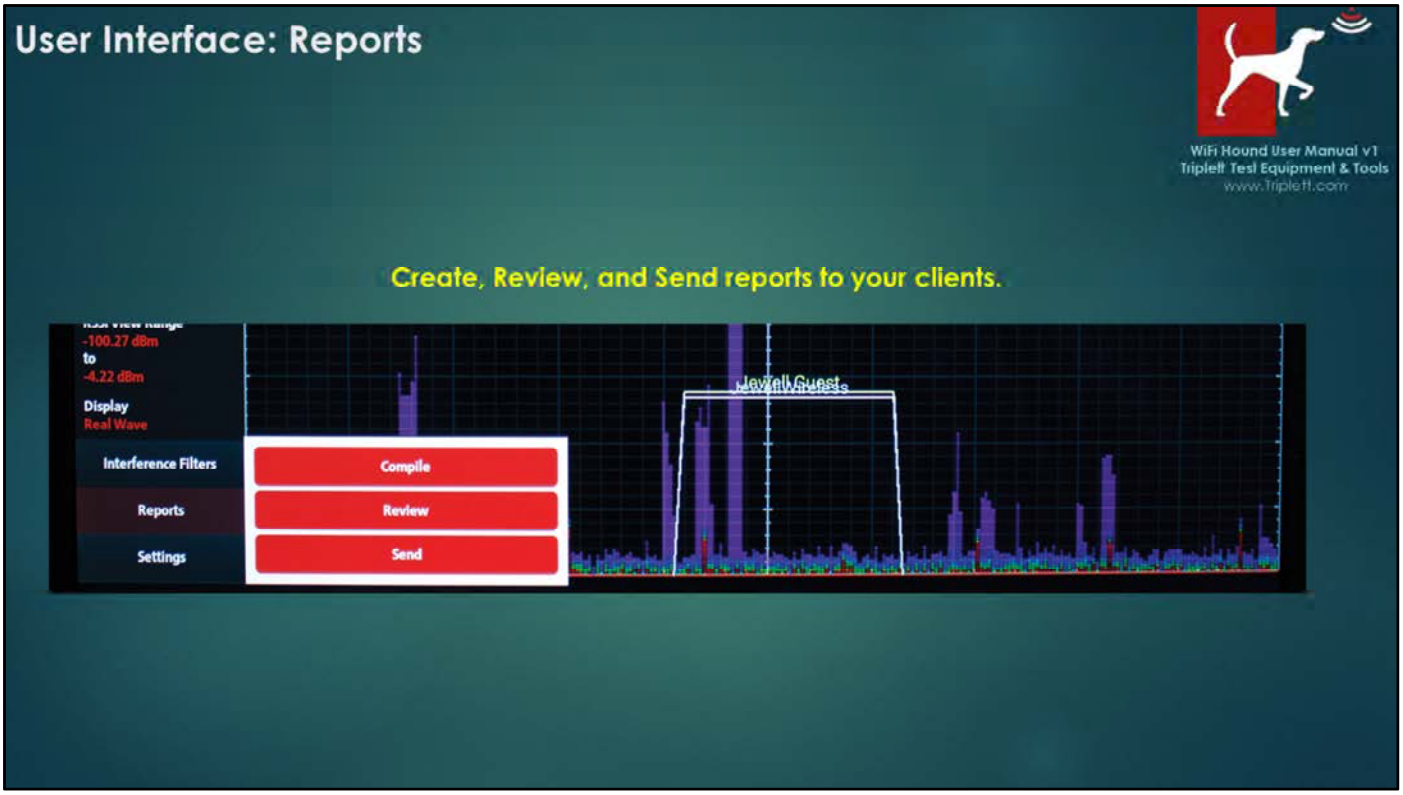

Select Reports > then choose your next step. If you are creating a new report, select COMPILE. If you have already created a report, or want to watch video, go to REVIEW. If you want to email an existing file to your client, select SEND (email must be set up on the Tester, and you must be connected to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

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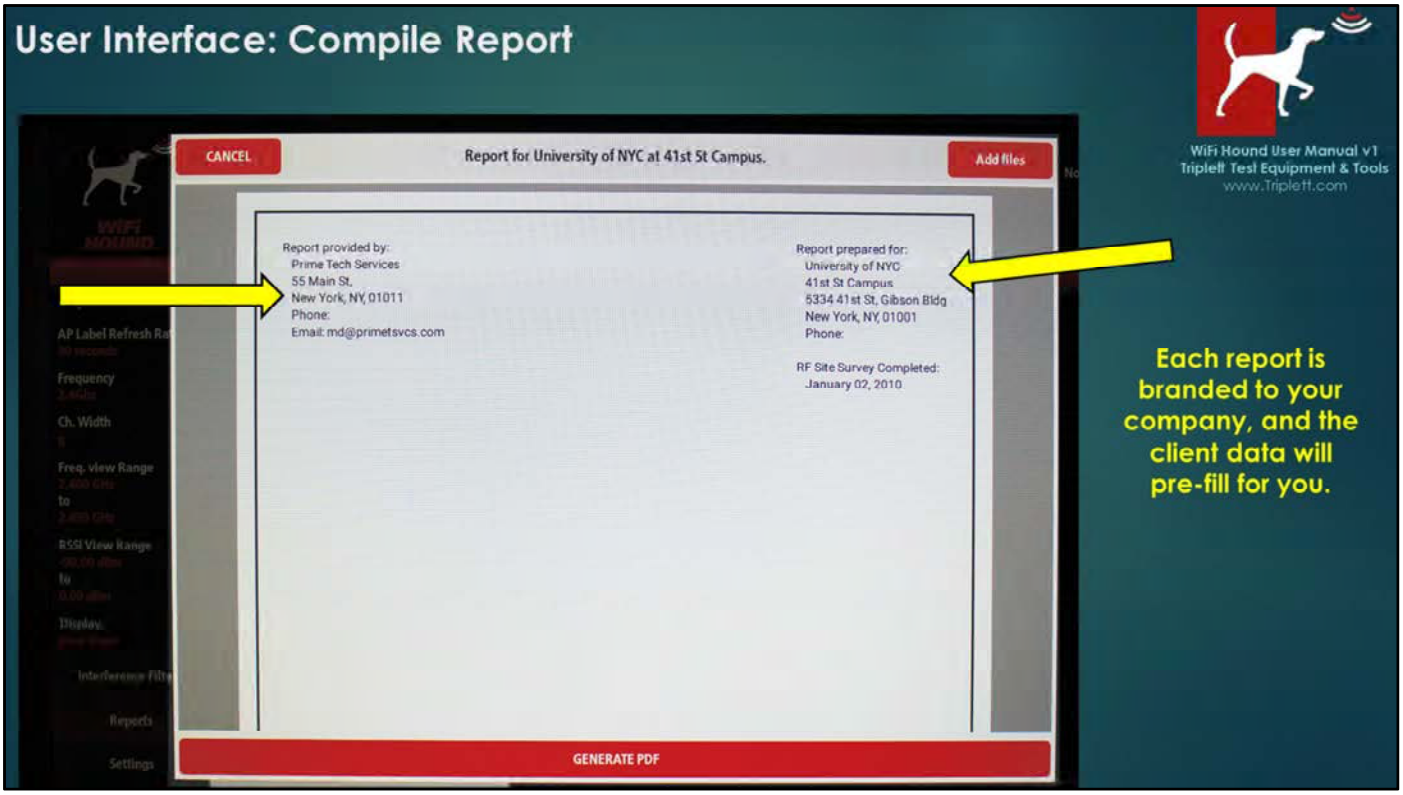
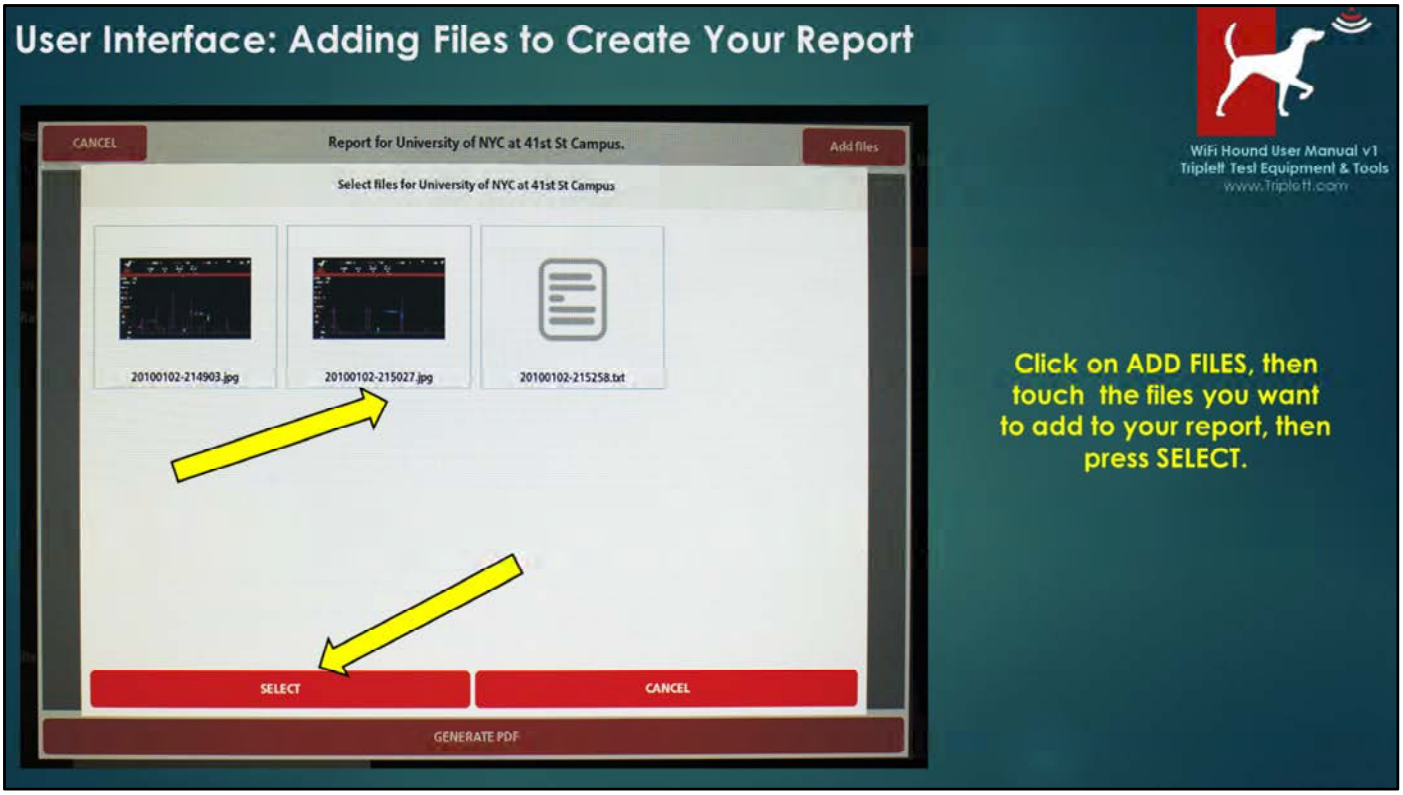
WiFi Hound 101 Training



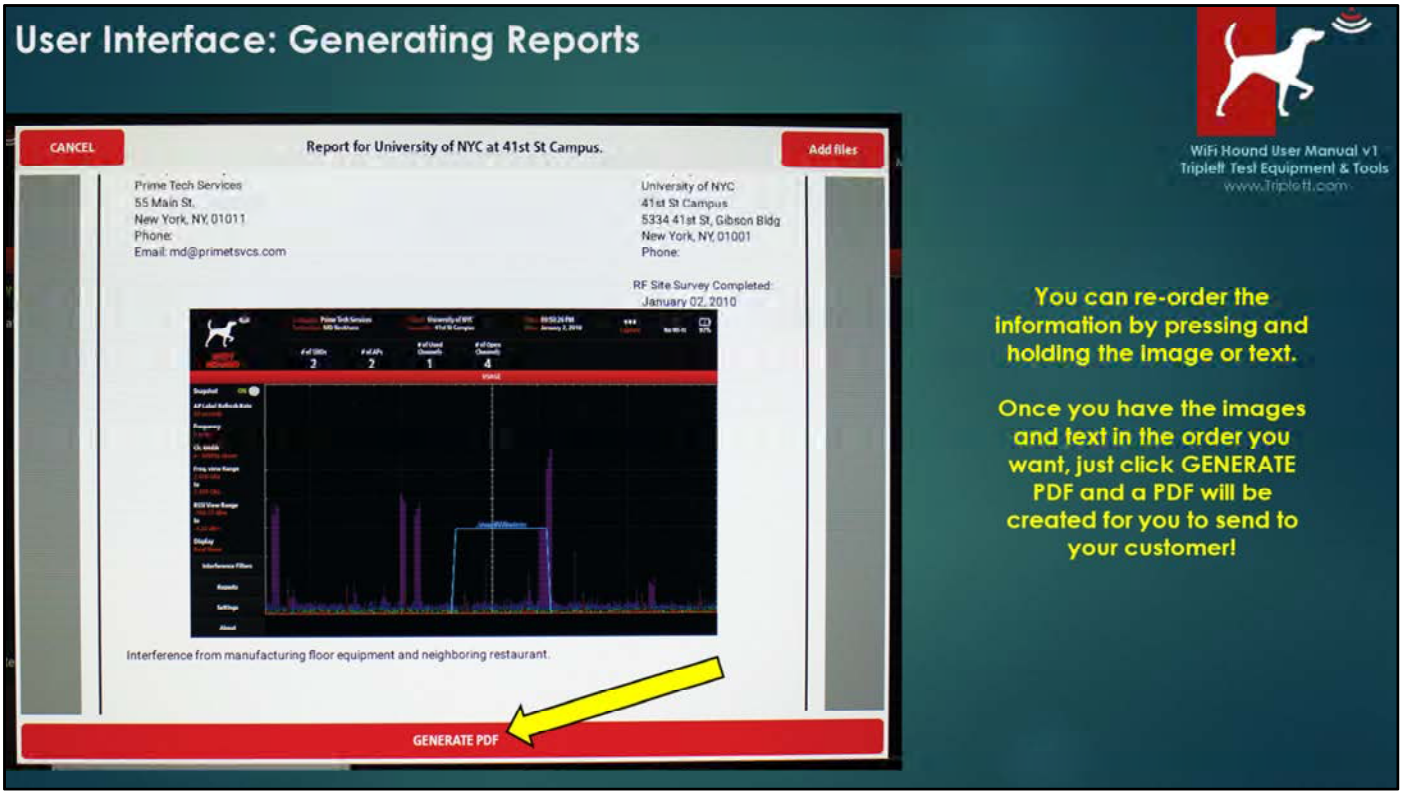
Remember – the pre-filled information on this report is controlled at SETTINGS, so it is very important that you input your company information, and the client's information accurately.

WiFi Hound 101 Training



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

WiFi Hound 101 Training



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.)

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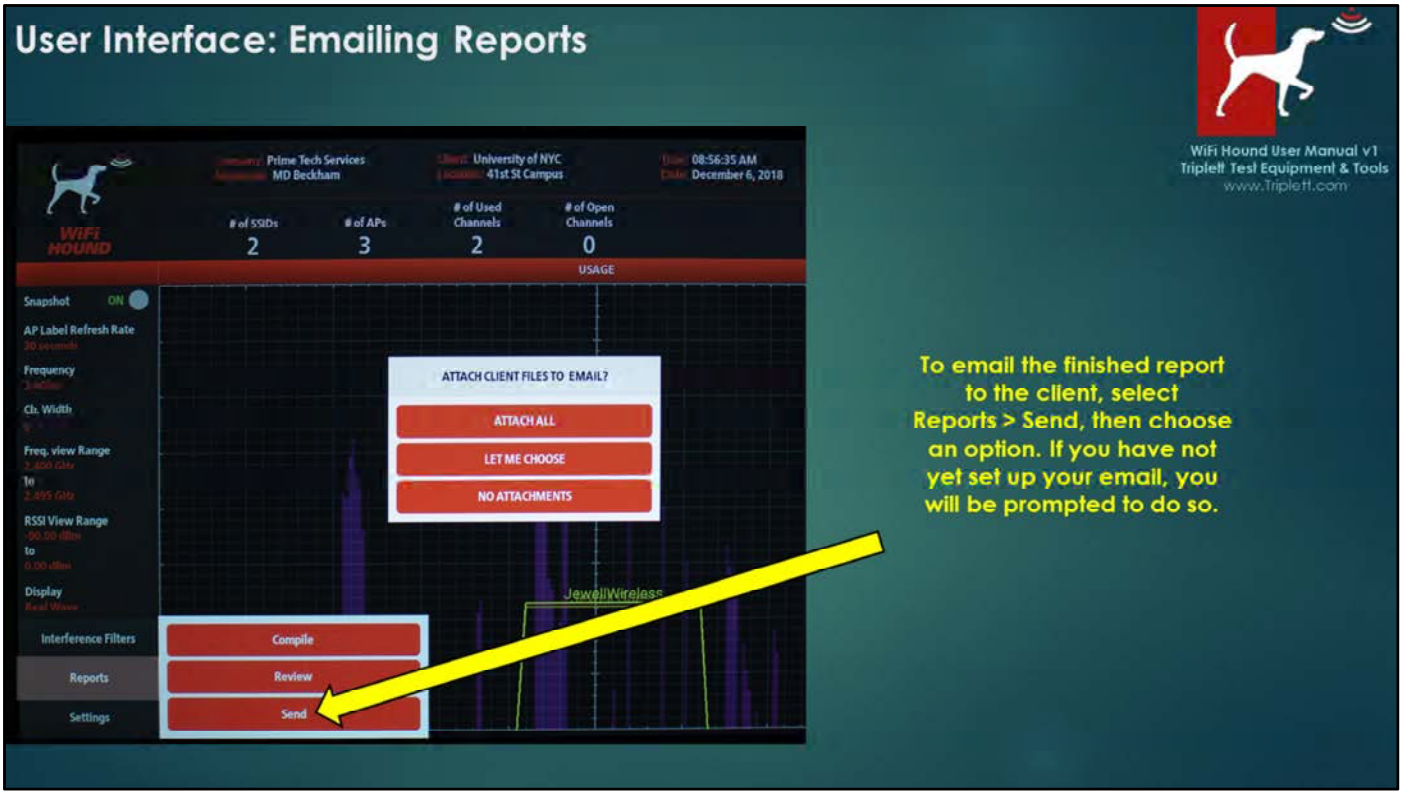
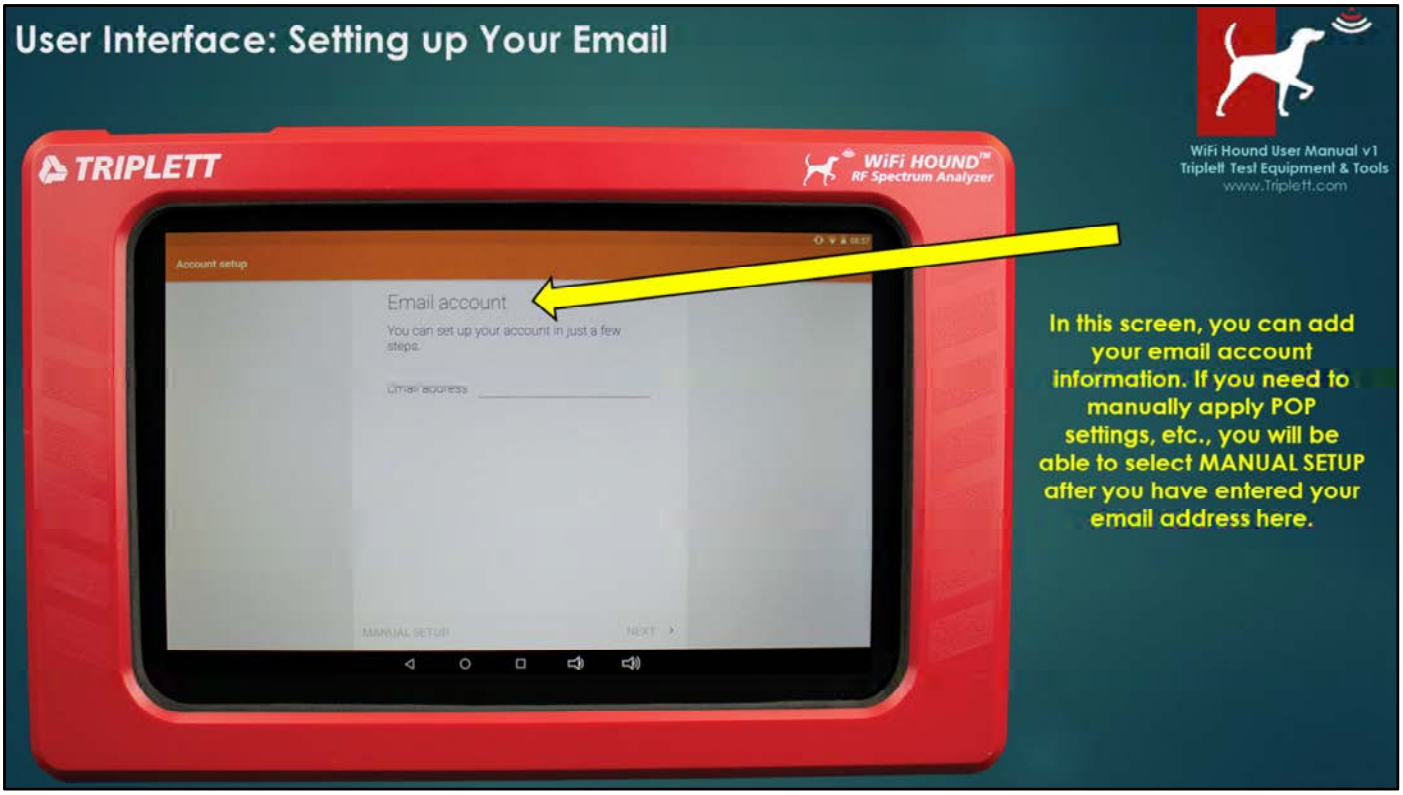


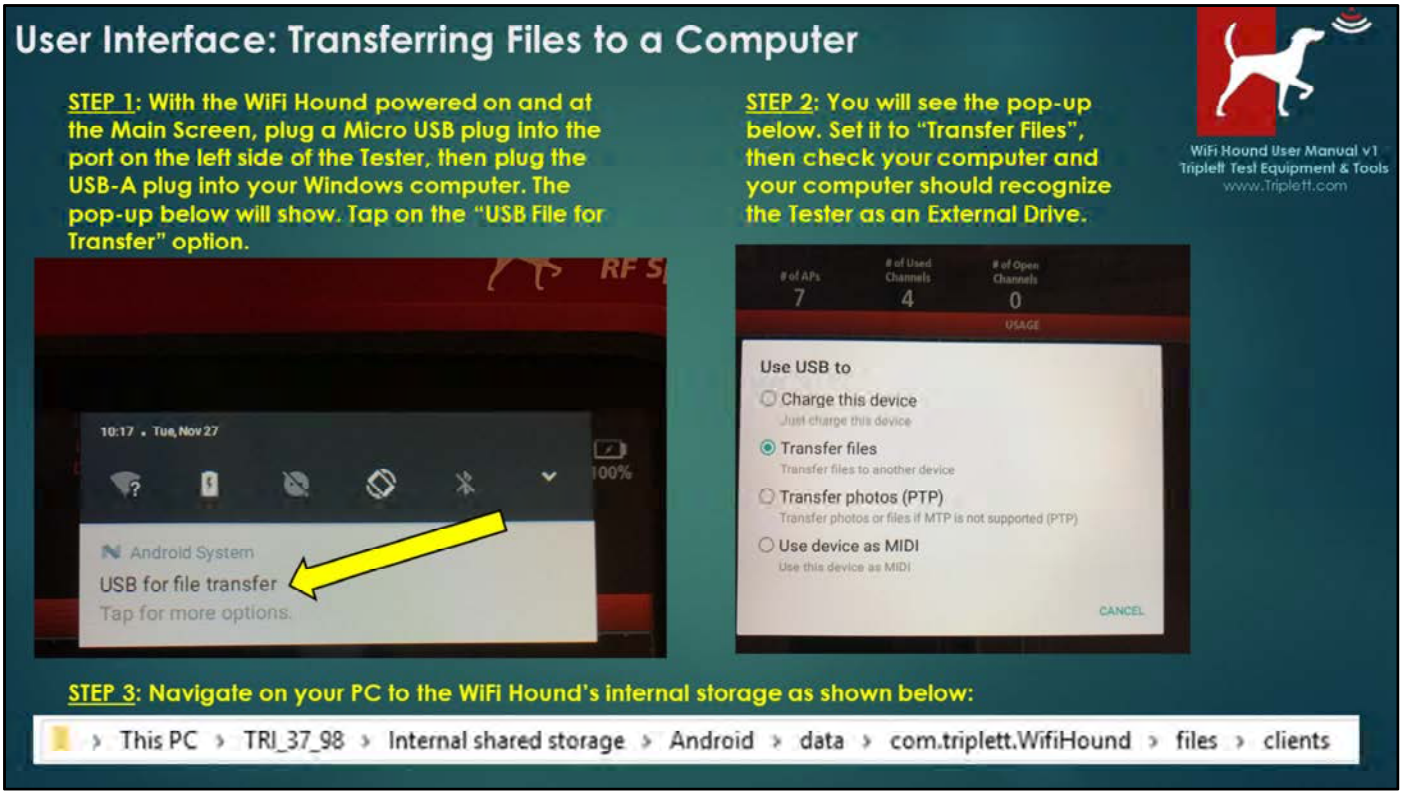
You can either email your files, or connect a computer to the WiFi Hound using the Micro USB port on the left side.

WiFi Hound 101 Training



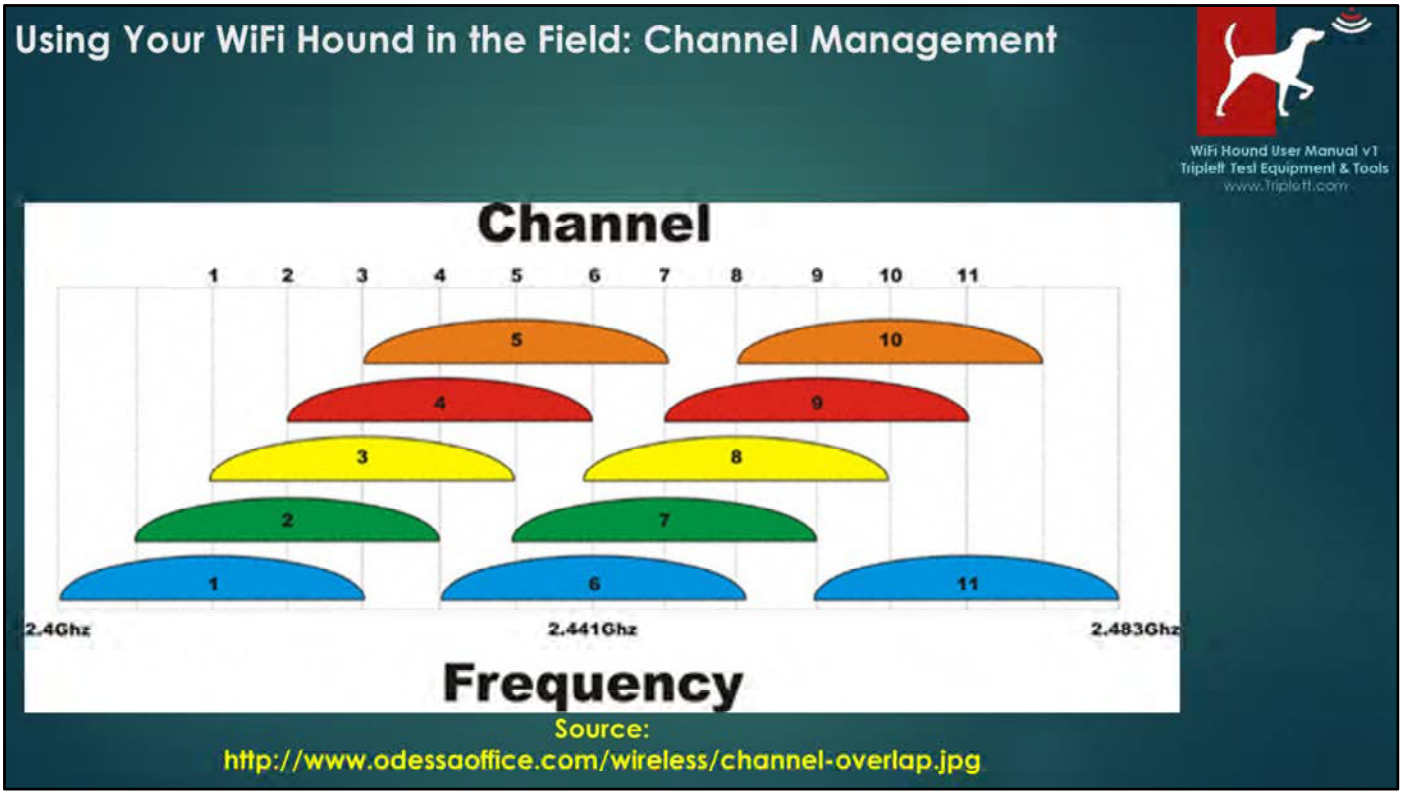
If multiple technicians will be sharing one WiFi Hound, you should set up a single email address that can be used by all of your technicians when emailing completed site surveys. For example, you may want to have your IT department create a dedicated "WiFi_Survey@MyAwesomeCo.com" email for simplicity.

WiFi Hound 101 Training



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

WiFi Hound 101 Training



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

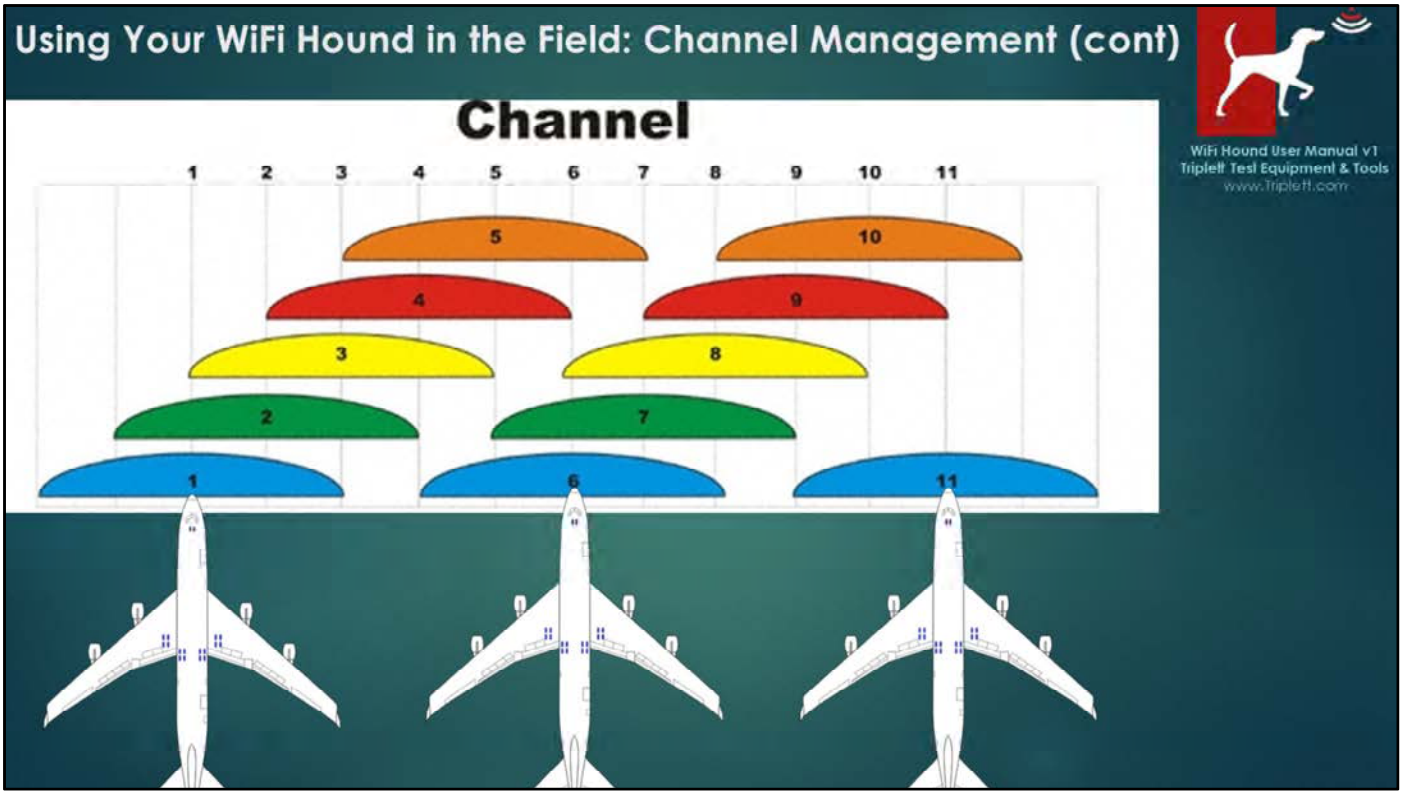
- How many competing wireless networks are in the area
- If all of the competing wireless networks are on non-overlapping channels (i.e., Channels 1, 6, or 11)
- If any competing wireless networks are on channels that overlap with the channel your network is on

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?

WiFi Hound 101 Training



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 eachother 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.

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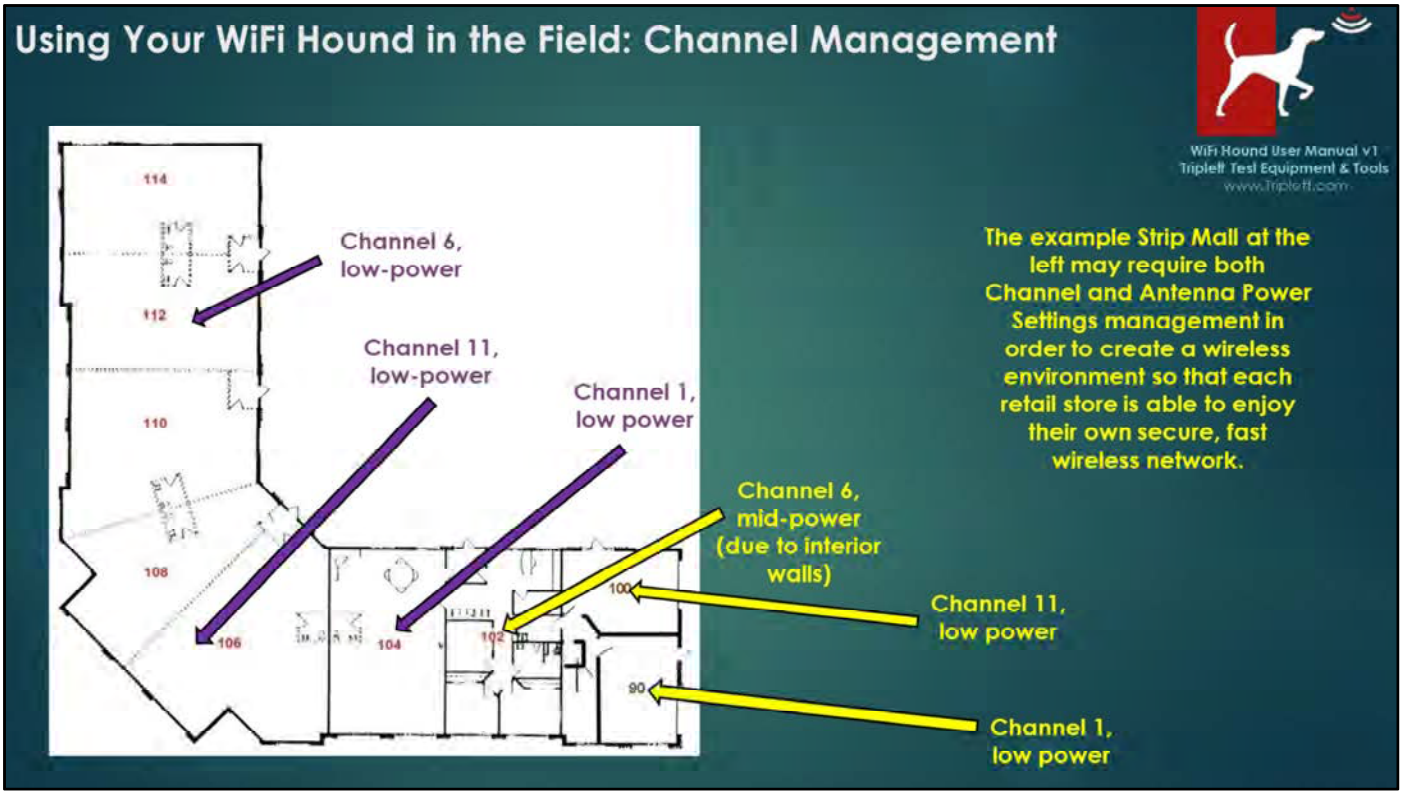

Example Channel and Power Management in a Strip Mall

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).

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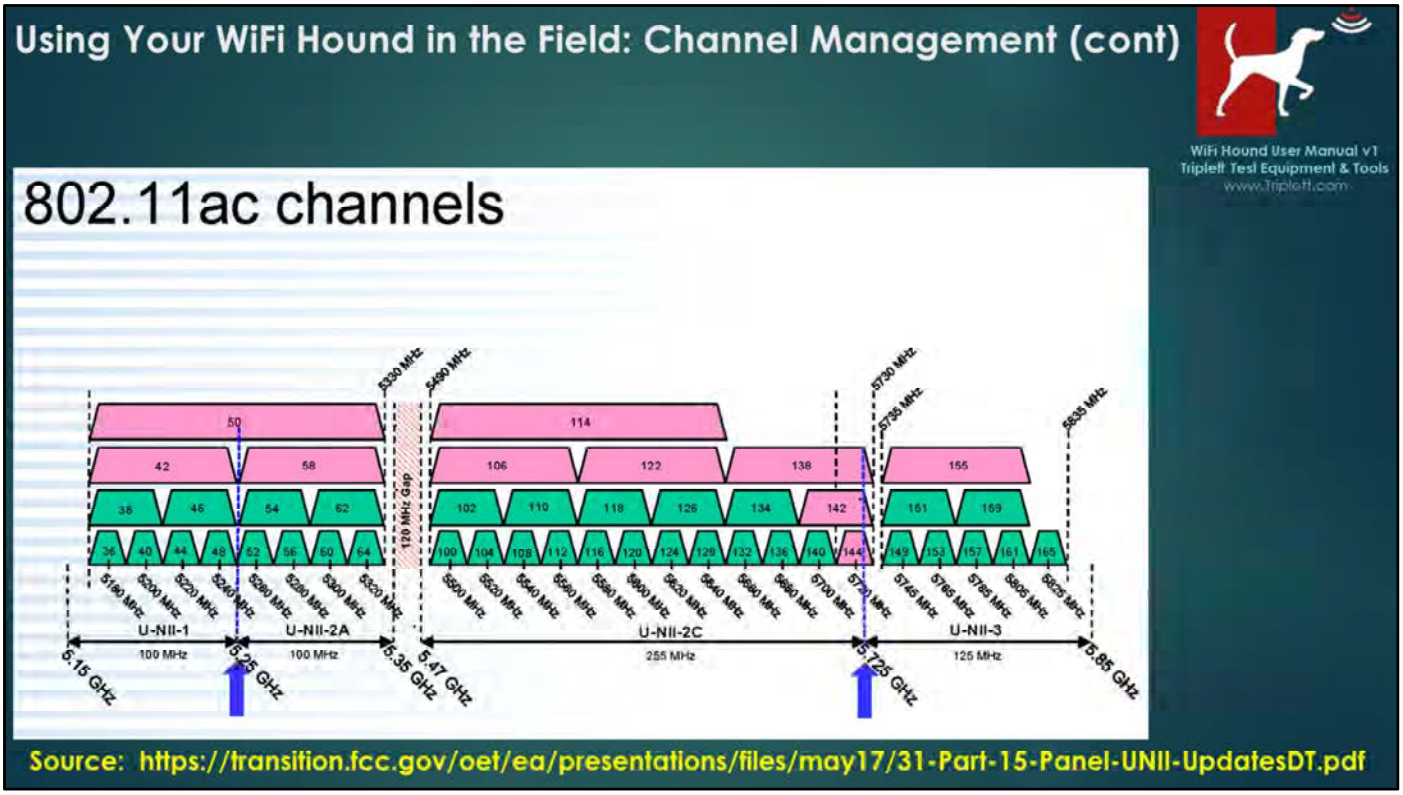
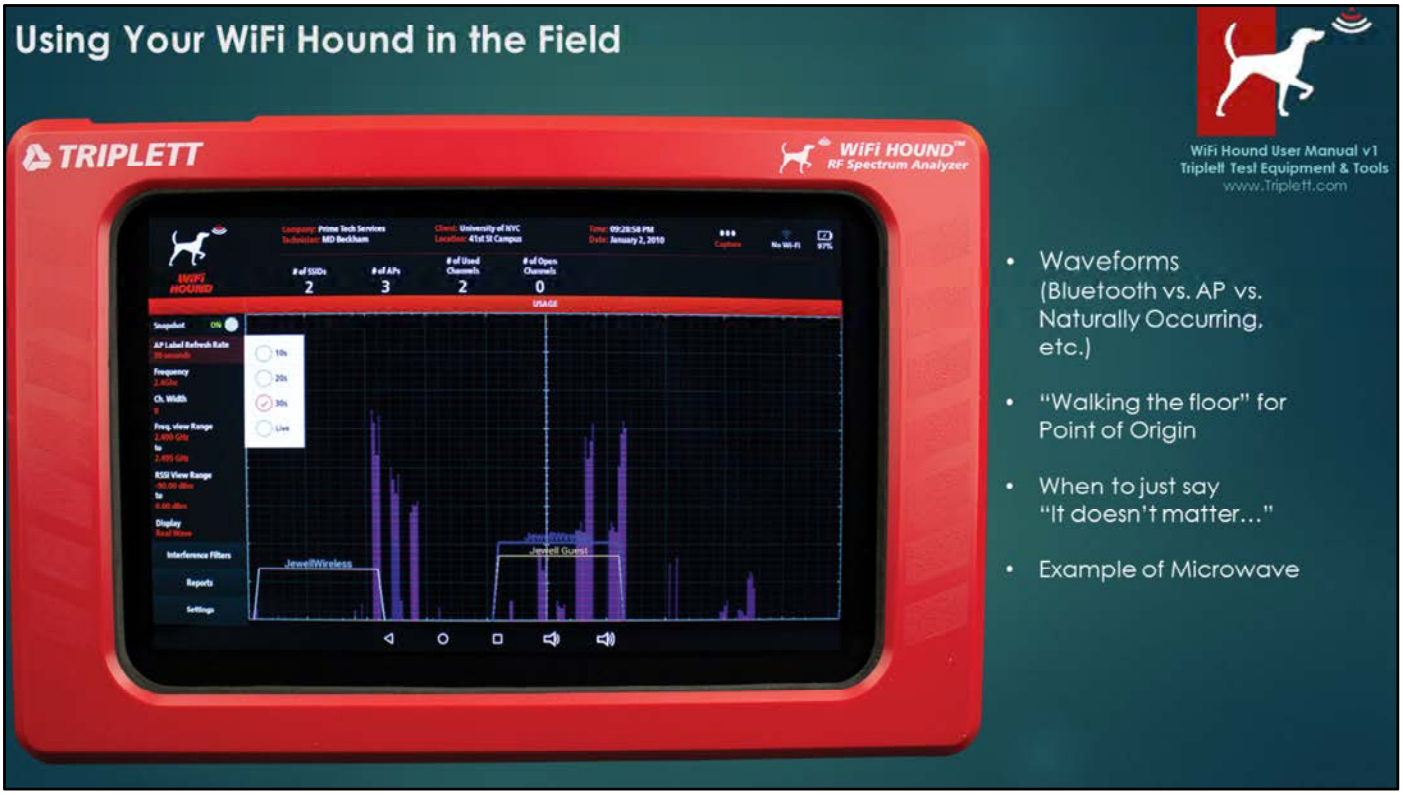
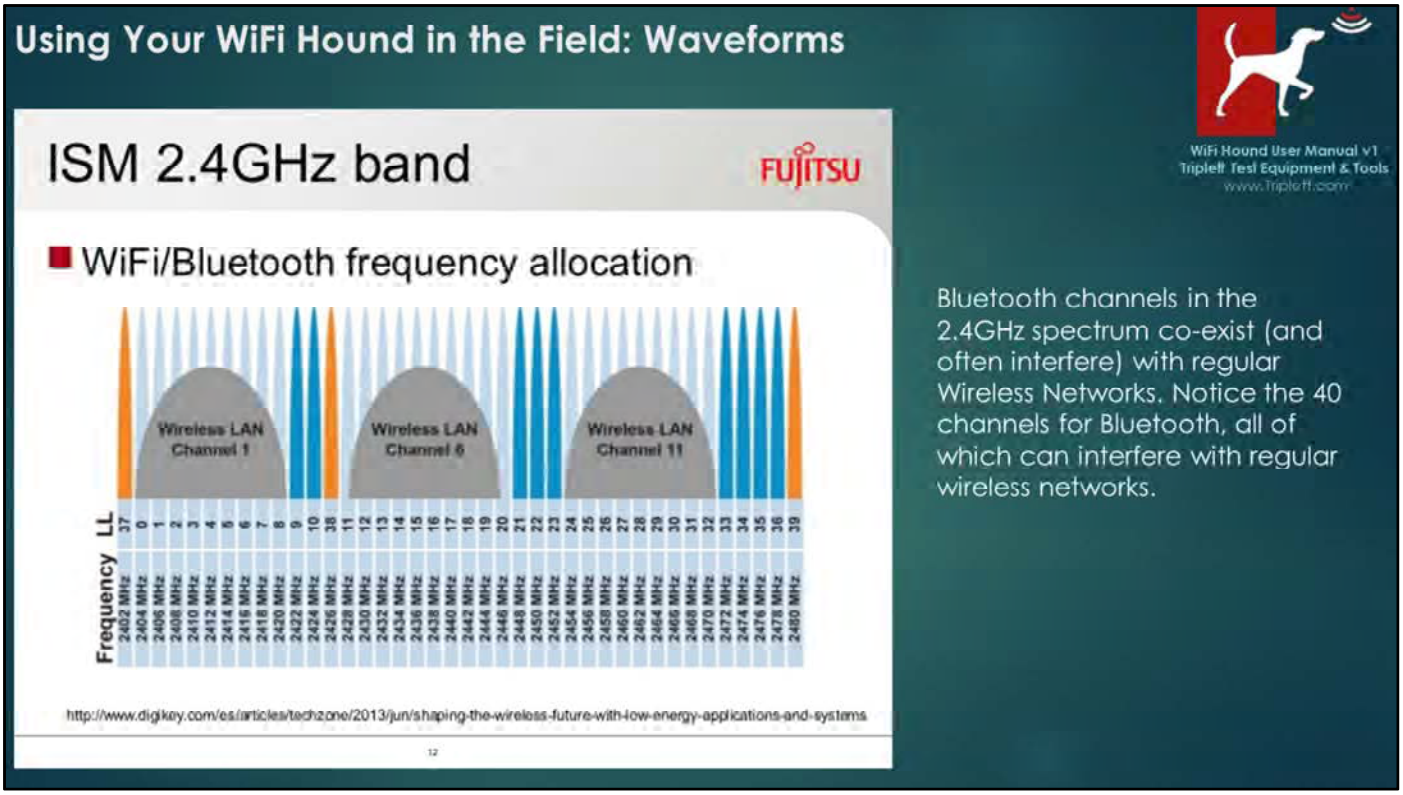


5GHz does not have the same issue with channels as the 2.4GHz spectrum has insofar as NetworkA on Channel 36 will be able to negotiate with NetworkB on Channel 38 for airtime. However, it is important to note that 5GHz does contain Dynamic Frequency Selection (DFS) channels, which are also used by radar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

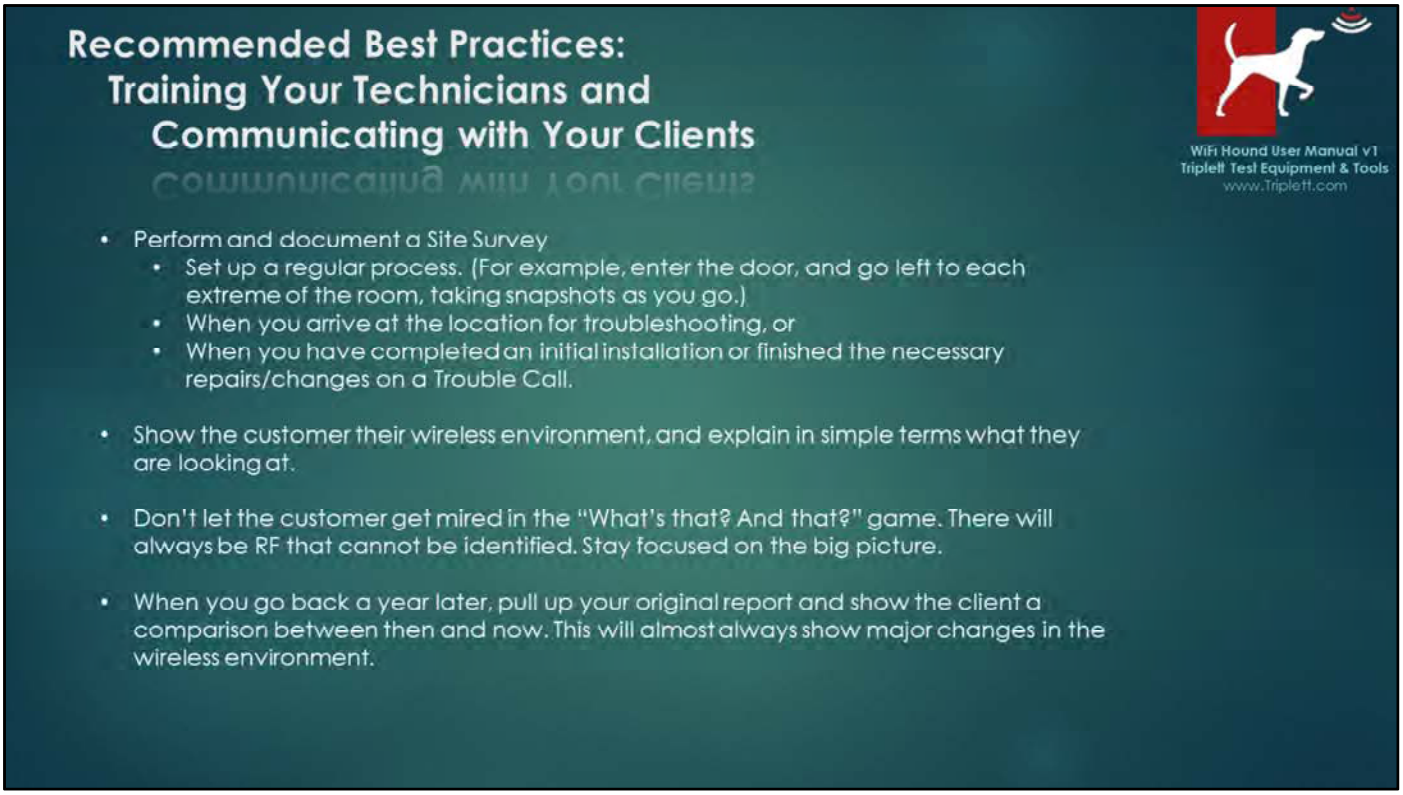
WiFi Hound 101 Training



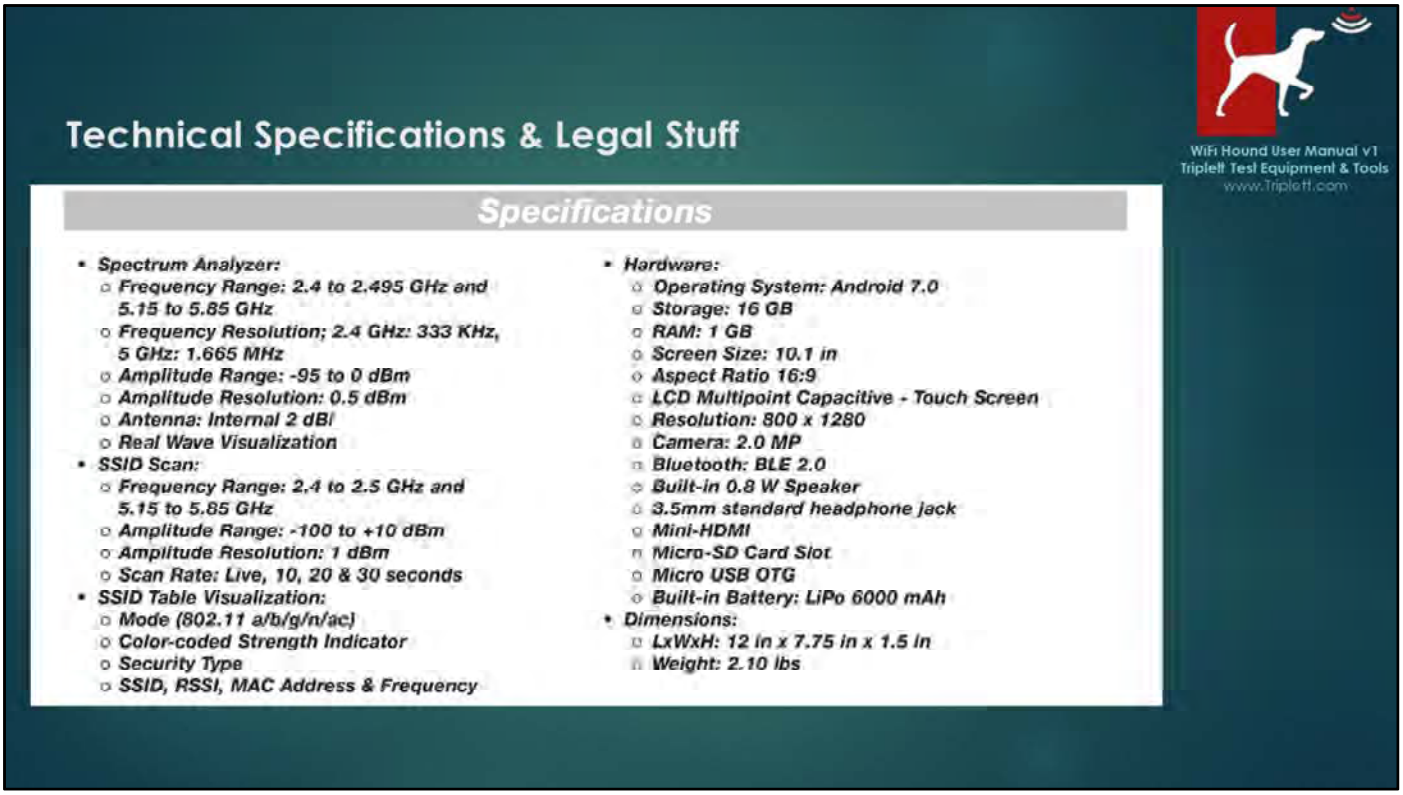
- Take time to learn how to recognize specific **waveforms** (e.g., Bluetooth is tall and skinny, APs are a gradual mountain, and other stuff is sometimes just naturally occurring or not identifiable, etc.).
- **Walking the Floor** – You can use the WiFi Hound to try to find the Point of Origin of a 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 it 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.



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
WiFi Hound User Manual v1
Triplett Test Equipment & Tools
www.Triplett.com
• 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.

WiFi Hound 101 Training



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

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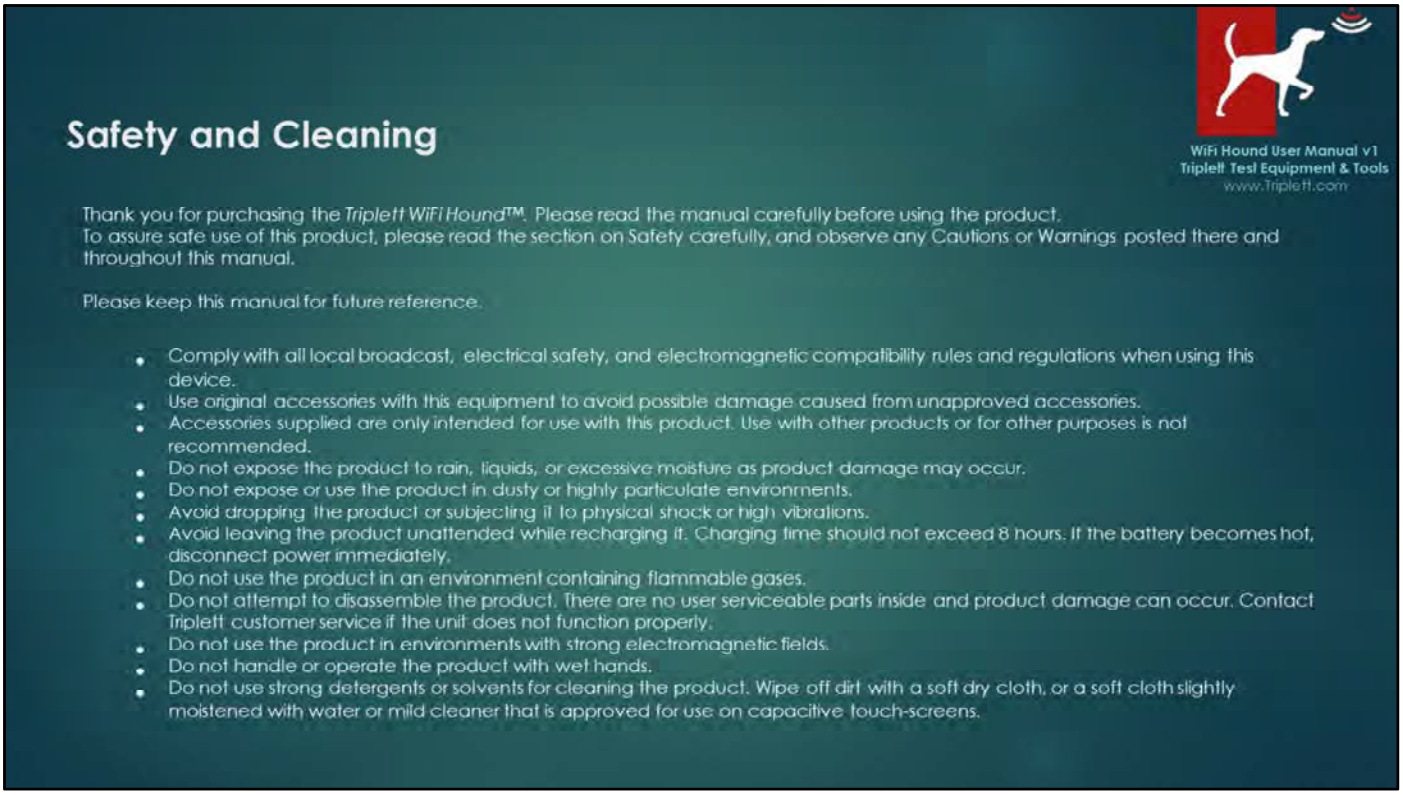

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Triplett / Jewell Instruments extends the following warranty to the original purchaser of these goods for use. Triplett warrants to the original purchaser for use that the products sold by it will be free from defects in workmanship and material for 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.

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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.

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