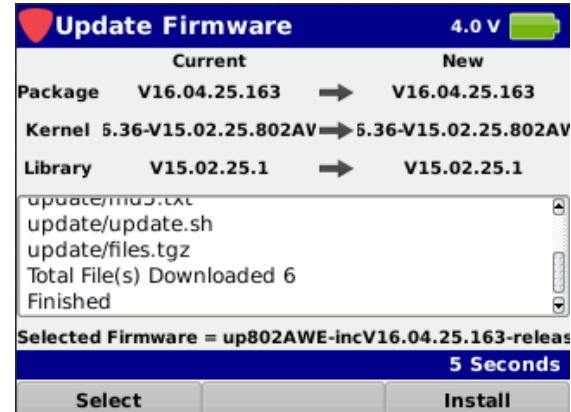


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5. The download progress will be displayed in the activity area of the **Update Firmware** screen as shown in the image to the right.
6. Once the download has finished, the new firmware information will be displayed as shown in the image to the right. Select the **Install** softkey to install the firmware file.
7. Once the installation is finished, the 802 AWE will automatically restart with the new firmware.



Update Firmware from a USB Flash Drive

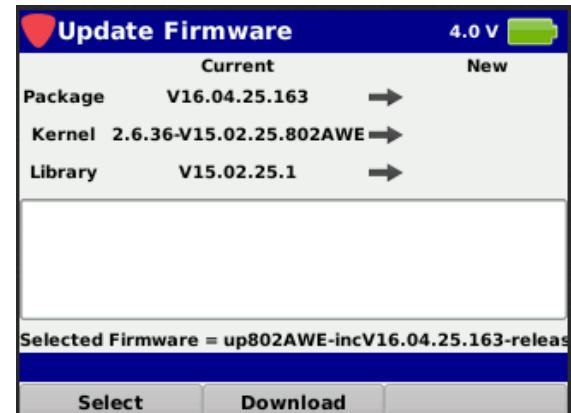
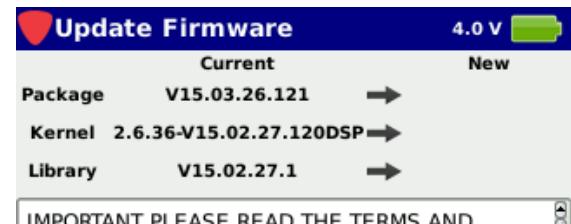

NOTE

Please ensure you have a *USB flash drive that is formatted using the FAT or FAT32 file system and contains no other data.*

For the latest firmware, contact Trilithic Applications Engineering at support@trilithic.com.

Perform the following steps to update the 802 AWE firmware from a USB flash drive:

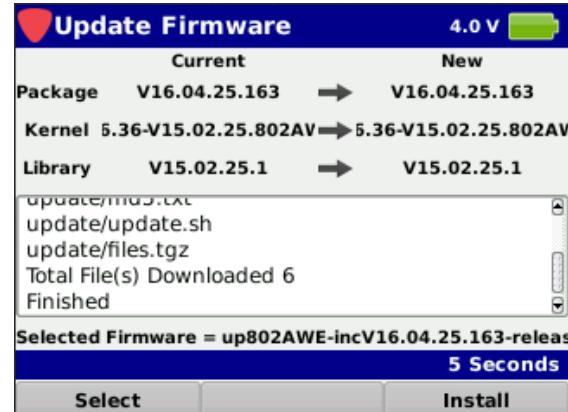
1. Insert the USB flash drive adapter into the USB port of the 802 AWE.
2. Then insert a USB flash drive into the USB flash drive adapter.
3. Select the **Accept** softkey.
4. From the **Accept** pop-up menu, select the **USB Firmware** button as shown in the image to the right.
5. The firmware version will be displayed at the bottom of the screen, as shown in the image to the right. Select the **Download** softkey to transfer the firmware from the USB flash drive to the unit.



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- Once the file has been transferred from the USB flash drive, the new firmware information will be displayed as shown in the image to the right. Select the **Install** softkey to install the firmware file.
- Once the installation is finished, the 802 AWE will automatically restart with the new firmware.



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802 AWE

Advanced Wireless Expert

Section III: Survey Menu



802AWE

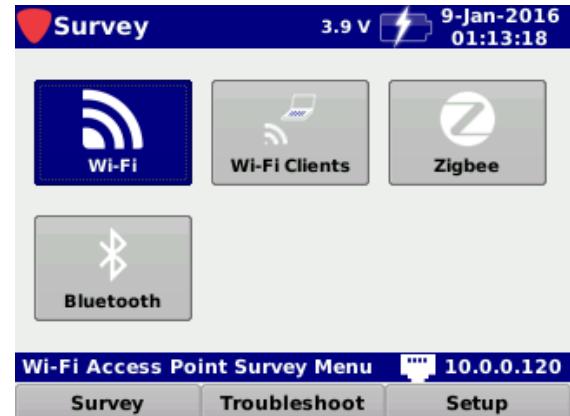
Advanced Wireless Test Set

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Introduction

Select the **Survey** softkey to display the **Survey** menu as shown in the image to the right. This section will provide you with instructions on how to utilize the functions available in the **Survey** menu of the instrument including:

- **Wi-Fi** – This function is used to perform a Wi-Fi survey of all 2.4 & 5 GHz 802.11 (a/b/g/n/ac) access points within range of the 802 AWE.
- **Wi-Fi Clients** – This function is used to perform a Wi-Fi survey of all 2.4 & 5 GHz 802.11 (a/b/g/n/ac) clients within range of the 802 AWE.
- **Zigbee** – This function is used to perform a wireless survey of all Zigbee devices within range of the 802 AWE.
- **Bluetooth** – This function is used to perform a wireless survey of all Bluetooth devices within range of the 802 AWE.



802AWE

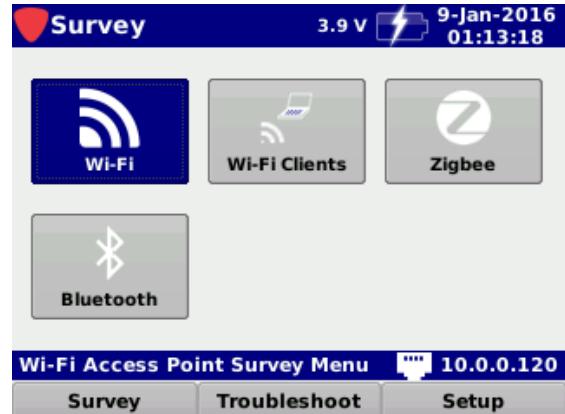
Advanced Wireless Test Set

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Wi-Fi Access Point Survey

Overview

Select the **Wi-Fi** icon as shown in the image to the right to perform a Wi-Fi survey of all 2.4 & 5 GHz 802.11 (a/b/g/n/ac) access points within range of the 802 AWE.



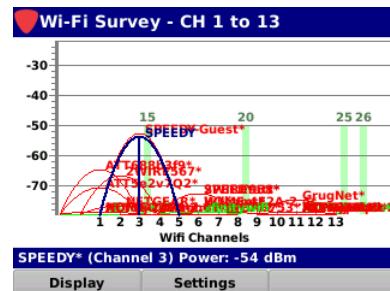
The **Wi-Fi Survey** screen will be displayed as shown in one of the following images based on the settings selected by the user the last time the application was used. Each of these screens allow you to adjust the display settings between the list view, 2.4 GHz graph, and 5 GHz graph.

dBm	SSID	SEC	802.11	CH
-36	SPEEDY-Guest	Open	b g n	3
-49	SPEEDY-5GHz	Open	a n g	153
-51	SPEEDY-Guest	Open	a n g	153
-67	SPEEDYatt	Open	b g n	6
-69	MG Network WAP	Open	b g n	11
-71	ATT5e2v7Q2	Open	b g n	1
-71	(Hidden)	Open		36
-71	MG 2.4 Guest	Open	b g n	11

SPEEDY-5GHz* (Channel 153) Power: -49 dBm

Display Find Sort

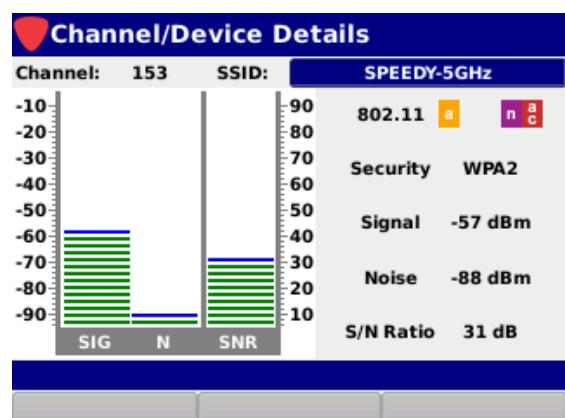
List View



2.4/5 GHz Graph

From within any of the display modes of the **Wi-Fi Survey** screen;

- Use the up/down arrow buttons on the keypad to navigate through the list of wireless access points. The currently selected access point is highlighted in blue.
- The **Message Bar** at the bottom of the screen will display the SSID, channel number, and power of the currently selected access point.
- Press the **Enter** key on the keypad to display the **Channel/Device Details** screen of the selected access point, as shown in the image to the right.



Selecting the Display Mode

Select the **Display** softkey to choose between the following types of display modes:

- **List** – This display mode shows all access points within range of the 802 AWE in the form of a tabular list with rows and columns.
- **2.4 GHz Graph** – This display mode shows all access points using the 2.4 GHz frequency band within range of the 802 AWE in the form of a wireless channel level graph.
- **5 GHz Graph** – This display mode shows all access points using the 5 GHz frequency band within range of the 802 AWE in the form of a wireless channel level graph.



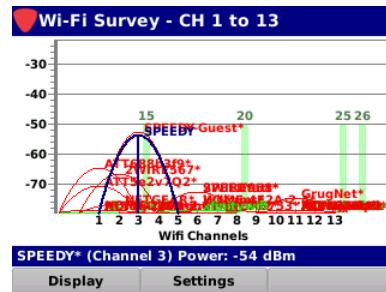
Wi-Fi Survey

dBm	SSID	SEC	802.11	CH
-36	SPEEDY-Guest	🔒	b g n	3
-49	SPEEDY-5GHz	🔓	a n a	153
-51	SPEEDY-5GHz-Guest	🔓	a n a	153
-67	SPEEDYatt	🔒	b g n	6
-69	MG Network WAP	🔓	b g n	11
-71	ATT5e2v7Q2	🔒	b g n	1
-71	(Hidden)	🔓	b g n	36
-71	MG 2.4 Guest	🔓	b g n	11

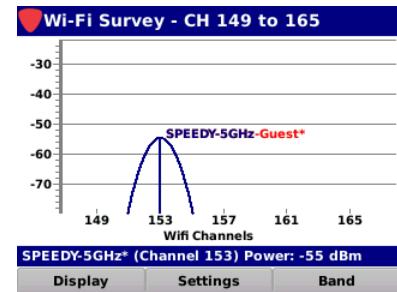
SPEEDY-5GHz* (Channel 153) Power: -49 dBm

Display Find Sort

List View



2.4 GHz Graph



5 GHz Graph

List Display Mode

This display mode shows all access points within range of the 802 AWE in the form of a tabular list with rows and columns:

- Use the up/down arrow buttons on the keypad to scroll through the wireless access points. The currently selected access point is highlighted in blue.
- The **Message Bar** at the bottom of the screen will display the SSID, channel number, and power of the currently selected access point.
- Columns within the table display the following information as outlined in the following sections.
 - **dBm** – Signal Level
 - **SSID** – Access Point Name
 - **SEC** – Security Status
 - **802.11** – Wireless Frequencies
 - **CH** – Wireless Channel

Wi-Fi Survey					
dBm	SSID	SEC	802.11	CH	
-36	SPEEDY-Guest	🔓	b g n	3	
-49	SPEEDY-5GHz	🔓	a n a c	153	
-51	SPEEDY-5GHz-Guest	🔓	a n a c	153	
-67	SPEEDYatt	🔒	b g n	6	
-69	MG Network WAP	🔒	b g n	11	
-71	ATT5e2v7Q2	🔒	b g n	1	
-71	(Hidden)	🔒		36	
-71	MG 2.4 Guest	🔒	b a n	11	
SPEEDY-5GHz* (Channel 153) Power: -49 dBm					
Display		Find		Sort	

Sorting List Data

Perform the following steps to sort the tabular list of access points:

1. Select the **Sort** softkey.
2. From the **Sort** pop-up menu, select the desired method for sorting the tabular list. The tabular list can be sorted by **Level**, **Security**, **Frequency**, **Channel**, or **SSID**.

Wi-Fi Survey					
dBm	SSID	SEC	802.11	CH	
-75	Gruginet	🔒	b g n	11	
-79	MG Network WAP	🔓	b g n	11	
-79	MG 2.4 Guest	🔒	b g n	11	
-67	ATTI3jjMkl	🔒	b g n	11	
-73	(Hidden)	🔒			
-79	MotoVAP_M91311SA...	🔒			
-57	SPEEDY-5GHz	🔓			
-57	SPEEDY-5GHz-Guest	🔓			
(Channel 36) Power: -73 dBm					
Sort Level Sort Security Sort Frequency Sort Channel Sort SSID					
Display		Find		Sort	

Access Point Properties

Signal Level

The column labeled **dBm** within the table displays the signal level measurement in dB from a minimum of -100 dBm to a maximum of 0 dBm.

Access Point Name

The column labeled **SSID** within the table displays the name of the access point.

Security Status

The column labeled **SEC** within the table displays the security status of the access point as follows:

-  When this icon is displayed, it indicates that the access point is using either WEP, WPA, or WPA2 security.
-  When this icon is displayed, it indicates that the access point is not using either WEP, WPA, or WPA2 security.

Wireless Frequencies

The column labeled **802.11** within the table displays the wireless frequencies of the access point as follows:

-  When this icon is displayed, it indicates that the access point is using 802.11a wireless within the 5 GHz frequency spectrum.
-  When this icon is displayed, it indicates that the access point is using 802.11b wireless within the 2.4 GHz frequency spectrum.
-  When this icon is displayed, it indicates that the access point is using 802.11g wireless within the 2.4 GHz frequency spectrum.
-  When this icon is displayed, it indicates that the access point is using 802.11n wireless within the 2.4 GHz & 5 GHz frequency spectrums.
-  When this icon is displayed, it indicates that the access point is using 802.11ac wireless within the 5 GHz frequency spectrum.

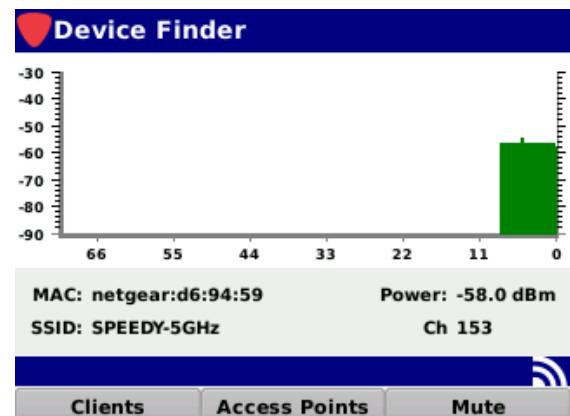
Wireless Channel

The column labeled **CH** within the table displays the wireless channel of the access point.

Finding Devices

Perform the following steps to find the selected device:

1. Use the up/down arrow buttons on the keypad to scroll through the wireless access points. The currently selected access point is highlighted in blue as shown in the image to the right.
2. Select the **Find** softkey.
3. The **Device Finder** screen will be displayed as shown in the image to the right.
 - This screen displays the following information about the selected device:
 - **MAC** – Device MAC Address
 - **SSID** – Access Point Name
 - **Power** – Signal Power Level
 - **CH** – Wireless Channel
 - The internal speaker of the 802 AWE will emit an audible beeping sound when trying to locate devices.
 - As the user moves closer to the device they are trying to find, the beeping becomes more frequent and increases in tone.
 - When the user moves away from the device, the beeping becomes less frequent and decreases in tone.
 - Select the **Mute** softkey to disable the beeping sound or select the **Unmute** softkey to enable the beeping sound.
 - The vertical axis (up/down) of the graph represents the signal level of the selected device. The graph displays a maximum level of -30 dBm (top of graph) and minimum level of -90 dBm (bottom of graph).



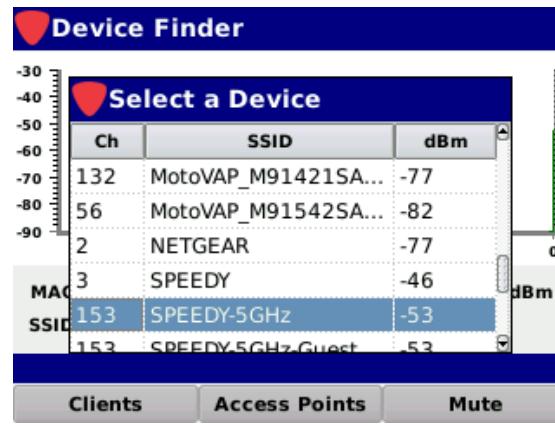
- The horizontal axis (left/right) of the graph represents the number of measurement samples taken from when you first entered the **Device Finder** screen.
 - The measurement samples continuously move from the right hand side of the graph toward the left hand side of the graph.
 - The newest measurement sample is displayed at the far right hand side of the screen.
 - The oldest measurement sample is displayed at the far left hand side of the screen.
 - The graph can display 70 measurement samples over a time period of approximately 45 seconds as shown in the image above.

4. Select the **Clients** or **Access Points** softkeys to open the **Select a Device** screen as shown in the following images.

- Use the up/down arrow buttons on the keypad to navigate through the list of wireless clients or access points. The currently selected access point is highlighted in blue.
- Press the **Enter** key on the keypad to select the highlighted client or access point and return to the **Device Finder** screen.



Clients List

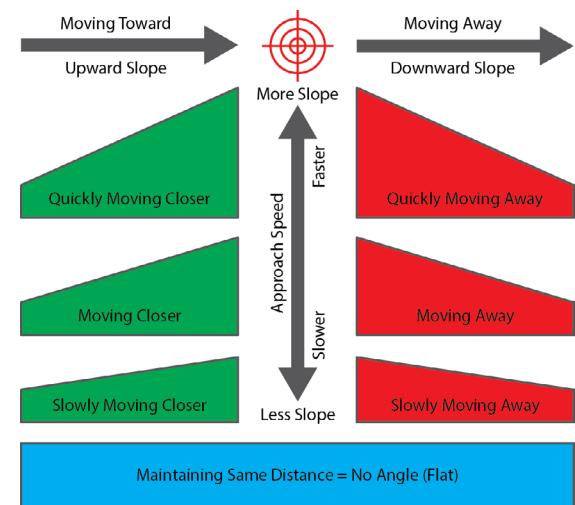


Access Points List

Rules to Follow when Finding Wireless Devices

The illustration shown to the right provides helpful hints on how to properly read the Device Finder graph.

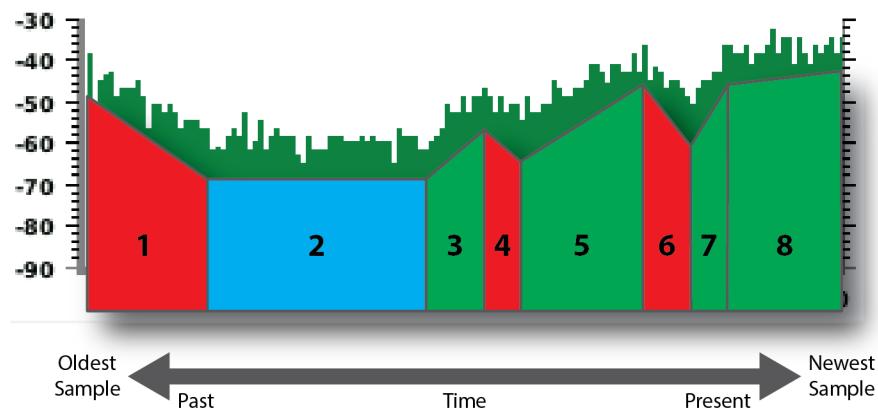
- The graph will display an upward slope when the 802 AWE is moving toward the device you are trying to find.
- The graph will display a downward slope when the 802 AWE is moving away from the device you are trying to find.
- The graph will not display any slope or will appear flat when the 802 AWE is maintaining the same distance from the device you are trying to find.
- The upward or downward slope of the device will have more or less slope based on how quickly you are moving towards or away from the device you are trying to find.



Real World Example of Finding Wireless Devices

The illustration shown below provides a real world example of how to properly read the Device Finder graph.

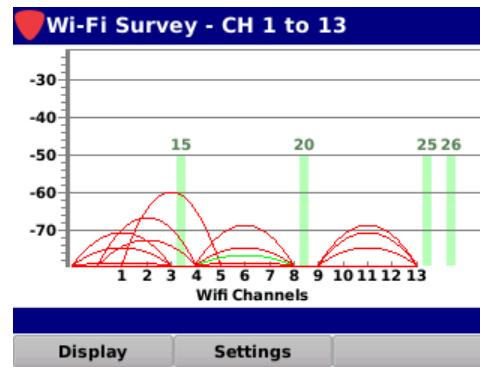
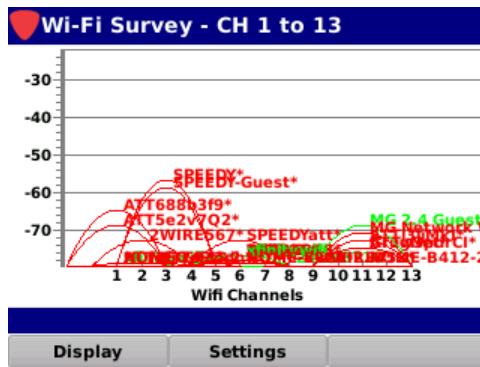
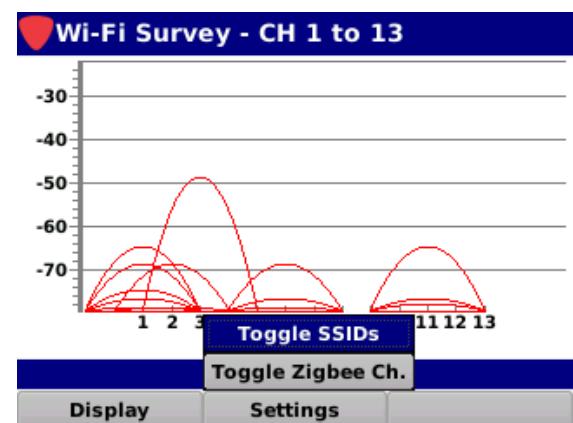
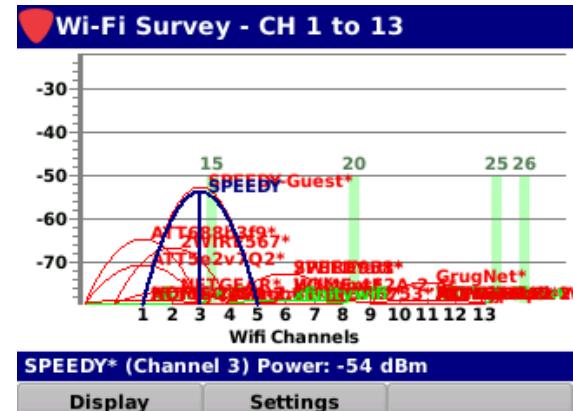
- During this measurement period, we can identify eight segments of time where the user was getting closer to, farther away, or staying the same distance from the device they were trying to find.
- In segments 1, 4, and 6 the user was in closer proximity to the device they were trying to find at the beginning of the segment than they were at the end of the segment. This is indicated by the downward slope of these segments.
- In segment 2, the user stayed in constant proximity of the device and was neither moving toward or away from the device they were trying to find.
- In segments 3, 5, 7, and 8, the user was in closer proximity to the device that they were trying to find at the end of the segment than they were at the beginning of the segment. This is indicated by the upward slope of these segments.
- In segments 7 and 8, the user was always moving toward the device they were trying to find. However, during segment 7, the user was moving toward the device at a faster rate than they were moving during segment 8. This is indicated by the greater slope of the measurement samples within segment 7, versus those of segment 8, which can be seen to be relatively flat by comparison.



2.4 GHz Graph Display Mode

This display mode shows all access points using the 2.4 GHz frequency band within range of the 802 AWE in the form of a wireless channel level graph.

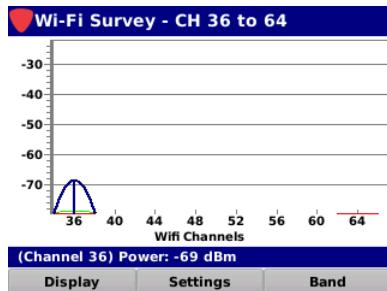
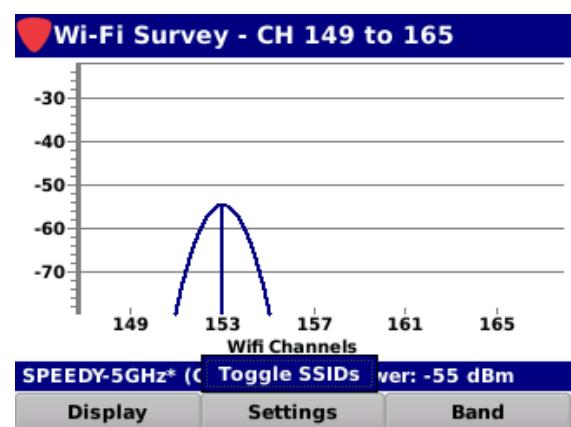
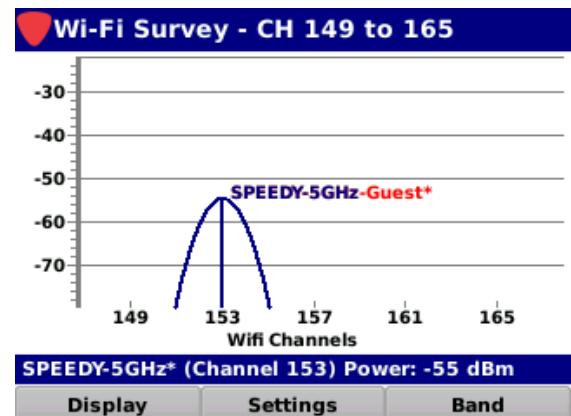
- Use the up/down arrow buttons on the keypad to scroll through the wireless access points.
- The vertical axis (up/down) of the graph represents the signal level of the access points within the 2.4 GHz frequency band. The graph displays a maximum level of -20 dBm (top of graph) and minimum level of -80 dBm (bottom of graph).
- The horizontal axis (left/right) of the graph represents the individual channels within the 2.4 GHz frequency band.
- Select the **Settings** softkey to toggle the SSID and Zigbee channel labels as described below:
 - In the above-right image, all labels are turned on.
 - In the image to the right, all labels are turned off.
 - In the below-left image, the SSID labels have been turned on.
 - In the below-right image, the ZigBee Channel labels have been turned on.



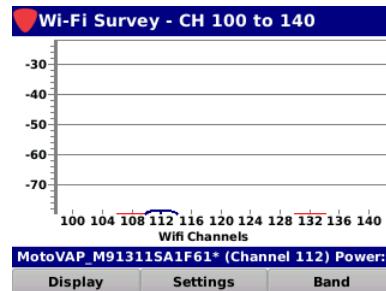
5 GHz Graph Display Mode

This display mode shows all access points using the 5 GHz frequency band within range of the 802 AWE in the form of a wireless channel level graph.

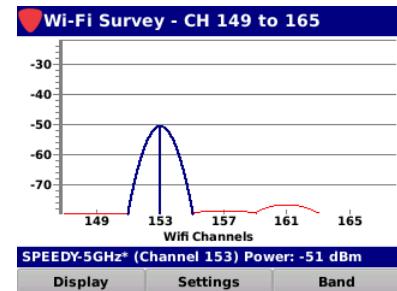
- Use the up/down arrow buttons on the keypad to scroll through the wireless access points.
- The vertical axis (up/down) of the graph represents the signal level of the access points within the 5 GHz frequency band. The graph displays a maximum level of -20 dBm (top of graph) and minimum level of -80 dBm (bottom of graph).
- The horizontal axis (left/right) of the graph represents the individual channels within the 5 GHz frequency band.
- Select the **Settings** softkey to toggle the SSID labels on and off as shown as described below:
 - In the above-right image, all labels are turned on.
 - In the image to the right, all labels are turned off.
- Select the **Band** softkey to toggle between the three different wireless channel frequency bands shown below.



Channels 36 to 64



Channels 100 to 144



Channels 149 to 165

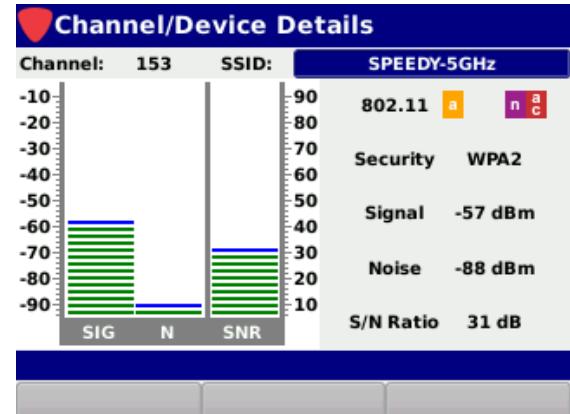
Viewing Channel/Device Details

From within any of the display modes of the **Wi-Fi Survey** screen, press the **Enter** key on the keypad to display the **Channel/Device Details** screen.

Use the up/down arrow buttons on the keypad to navigate through the list of wireless access points.

The channel number, 802.11 wireless frequencies, security type, and the selected channel are displayed for the currently selected wireless access point.

Additionally, the signal level, noise level, and signal-to-noise ratio will be displayed both numerically and as a bar graph, as shown in the image to the right.



- The vertical axis (up/down) of the signal and noise bar graphs represents the signal level of the selected access point. The graph displays a maximum level of 0 dBm (top of graph) and minimum level of -100 dBm (bottom of graph).
- The vertical axis (up/down) of the signal-to-noise bar graph represents the ratio between the signal level of the access point and that of interfering non Wi-Fi noise. The graph displays a maximum level of 100 dB (top of graph) and minimum level of 0 dBm (bottom of graph).

S/N Ratio (dB)	Connectivity	Speed	Overall Quality
> 40	★★★★	★★★★	★★★★
25 to 40	★★★★	★★★	★★★
15 to 25	★★★★	★★	★★
10 to 15	★★★	★	★
5 to 10			

To return to the **Wi-Fi Survey** screen, select the **Back** button on the keypad.

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Advanced Wireless Test Set

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Wi-Fi Client Device Survey

Overview

Select the **Wi-Fi Clients** icon as shown in the image to the right to perform a survey of all Wi-Fi clients broadcasting within range of the 802 AWE.



The **Wi-Fi Clients** screen will be displayed as shown in the image to the right. This display mode shows all Wi-Fi clients broadcasting within range of the 802 AWE in the form of a tabular list with rows and columns.

- Use the up/down arrow buttons on the keypad to navigate through the list of Wi-Fi clients. The currently selected Wi-Fi client is highlighted in blue.
- Columns within the table display the following information:
 - dBm** – Signal Level
 - Mac** – Client MAC Address
 - SSID** – Access Point Name
 - CH** – Wireless Channel
- Select the **Clear** softkey to refresh the list of client devices and remove the Wi-Fi clients that are no longer broadcasting.
- Press the **Enter** key on the keypad to display the client details for the highlighted Wi-Fi client as shown in the image to the right. Press the **Enter** key again to return to the **Wi-Fi Clients** screen.

All			
dBm	Mac	SSID	CH
-83	murata_m:dc:a2:45	2WIRE958	6
-91	apple:7c:a4:18	ATT395	6
-73	intel_co:45:fc:8e	ATT688b3f9	1
-82	samsung:17:c8:4b	ATTi3jjMkl	1
-73	private:e7:14:09	ATTqfjQeul	1
-81	hon_hai:31:bb:ce	ATTqfjQeul	1
-79	barnesno:5b:45:be	ATTqfjQeul	1

Select an SSID Clear Find



Filtering Client Devices by SSID

Use the left/right arrow buttons on the keypad to move between the **SSID** field and the body of the table. When the **SSID** field is selected, the field is highlighted in blue as shown in the images below.

Use the up/down arrow buttons on the keypad to select the wireless access point(s) used to filter the list of Wi-Fi clients that are displayed.

- Selecting **All** within this field will display the client devices for all access points.
- Selecting **None** within this field will display the client devices for all access points without an SSID.
- Selecting **(Hidden)** within this field will display the client devices for all access points with a hidden SSID.
- Selecting the name of a specific network SSID within this field will display the client devices for only that specific access point.

Wi-Fi Clients			
SSID		All	
dBm	Mac	SSID	CH
-45	apple:54:7e:38	SPEEDY-5GHz	153
-60	wistron:a6:11:ec	SPEEDY-5GHz	153
-73	apple_in:4e:50:24	SPEEDY-5GHz	153
-65	f8:32:e4:0f:61:43	SPEEDYatt	6
-41	hon_hai:8a:b6:a4	SPEEDYatt	6
-51	82:db:d3:cd:79:c7		-
-79	vivotek:29:2f:f2		-

All Access Points

Wi-Fi Clients			
SSID		None	
dBm	Mac	SSID	CH
-51	82:db:d3:cd:79:c7		-
-79	vivotek:29:2f:f2		-
-75	hon_hai:03:5d:29		-
-75	private:e7:14:09		-
-82	ec:9b:f3:6a:27:fd		-
-51	a6:c5:f0:5d:b2:44		-
-79	amazon t:f7:05:8a		-

Access Points without SSID

Wi-Fi Clients			
SSID		(Hidden)	
dBm	Mac	SSID	CH
-73	7e:ed:8c:93:8d:0c	(Hidden)	48

Access Points with Hidden SSID

Wi-Fi Clients			
SSID		SPEEDY-5GHz	
dBm	Mac	SSID	CH
-79	microsof:9f:d0:b5	SPEEDY-5GHz	153
-71	samsung:f1:69:b0	SPEEDY-5GHz	153
-53	apple:54:7e:38	SPEEDY-5GHz	153
-53	wistron:a6:11:ec	SPEEDY-5GHz	153
-73	apple_in:4e:50:24	SPEEDY-5GHz	153

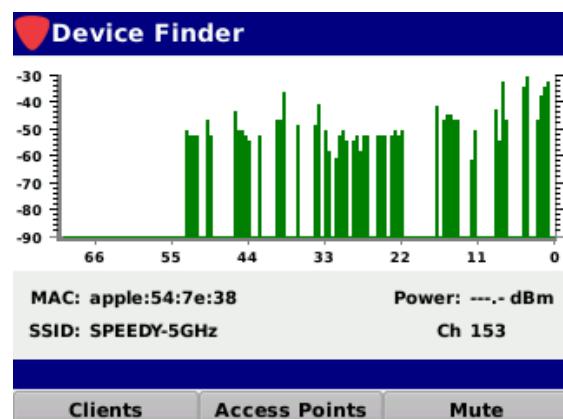
Specific SSID

Finding Devices

Perform the following steps to find the selected device:

1. Use the up/down arrow buttons on the keypad to scroll through the Wi-Fi Clients. The currently selected Wi-Fi client is highlighted in blue as shown in the image to the right.
2. Select the **Find** softkey.
3. The **Device Finder** screen will be displayed as shown in the image to the right.
 - This screen displays the following information about the selected device:
 - **MAC** – Device MAC Address
 - **SSID** – Access Point Name
 - **Power** – Signal Power Level
 - **CH** – Wireless Channel
 - The internal speaker of the 802 AWE will emit an audible beeping sound when trying to locate devices.
 - As the user moves closer to the device they are trying to find, the beeping becomes more frequent and increases in tone.
 - When the user moves away from the device, the beeping becomes less frequent and decreases in tone.
 - Select the **Mute** softkey to disable the beeping sound or select the **Unmute** softkey to enable the beeping sound.
 - The vertical axis (up/down) of the graph represents the signal level of the selected device. The graph displays a maximum level of -30 dBm (top of graph) and minimum level of -90 dBm (bottom of graph).
 - The horizontal axis (left/right) of the graph represents the number of measurement samples taken from when you first entered the **Device Finder** screen.

Wi-Fi Clients			
SSID		SPEEDY-5GHz	
dBm	Mac	SSID	CH
-71	microsof:9f:d0:b5	SPEEDY-5GHz	153
-47	apple:54:7e:38	SPEEDY-5GHz	153
-65	wistron:a6:11:ec	SPEEDY-5GHz	153
-75	apple_in:4e:50:24	SPEEDY-5GHz	153



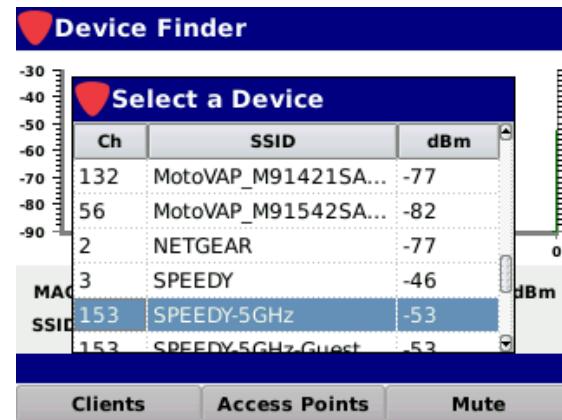
- The measurement samples continuously move from the right side of the graph toward the left hand side of the graph.
- The newest measurement sample is displayed at the far right side of the screen.
- The oldest measurement sample is displayed at the far left side of the screen.
- The graph can display 70 measurement samples over a time period of approximately 45 seconds as shown in the image above.

4. Select the **Clients** or **Access Points** softkeys to open the **Select a Device** screen as shown in the following images.

- Use the up/down arrow buttons on the keypad to navigate through the list of wireless clients or access points. The currently selected access point is highlighted in blue.
- Press the **Enter** key on the keypad to select the highlighted client or access point and return to the **Device Finder** screen.



Clients List

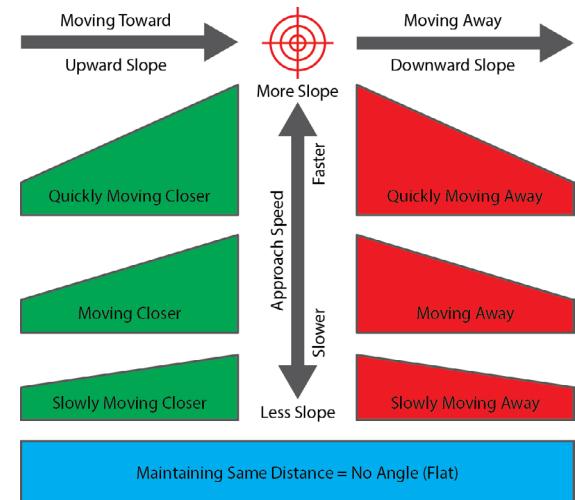


Access Points List

Rules to Follow when Finding Wireless Devices

The illustration shown to the right provides helpful hints on how to properly read the Device Finder graph.

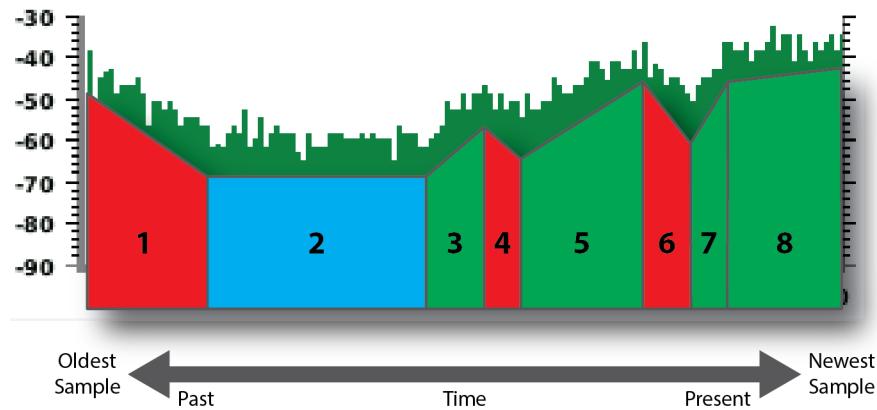
- The graph will display an upward slope when the 802 AWE is moving toward the device you are trying to find.
- The graph will display a downward slope when the 802 AWE is moving away from the device you are trying to find.
- The graph will not display any slope or will appear flat when the 802 AWE is maintaining the same distance from the device you are trying to find.
- The upward or downward slope of the device will have more or less slope based on how quickly you are moving towards or away from the device you are trying to find.



Real World Example of Finding Wireless Devices

The illustration shown below provides a real world example of how to properly read the Device Finder graph.

- During this measurement period, we can identify eight segments of time where the user was getting closer to, farther away, or staying the same distance from the device they were trying to find.
- In segments 1, 4, and 6 the user was in closer proximity to the device they were trying to find at the beginning of the segment than they were at the end of the segment. This is indicated by the downward slope of these segments.
- In segment 2, the user stayed in constant proximity of the device and was neither moving toward or away from the device they were trying to find.
- In segments 3, 5, 7, and 8, the user was in closer proximity to the device that they were trying to find at the end of the segment than they were at the beginning of the segment. This is indicated by the upward slope of these segments.
- In segments 7 and 8, the user was always moving toward the device they were trying to find. However, during segment 7, the user was moving toward the device at a faster rate than they were moving during segment 8. This is indicated by the greater slope of the measurement samples within segment 7, versus those of segment 8, which can be seen to be relatively flat by comparison.



Coming Soon

This feature is still in development and will be arriving soon.

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Bluetooth Device Survey

Coming Soon

This feature is still in development and will be arriving soon.

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802 AWE

Advanced Wireless Expert

Section IV: Troubleshoot Menu



802AWE

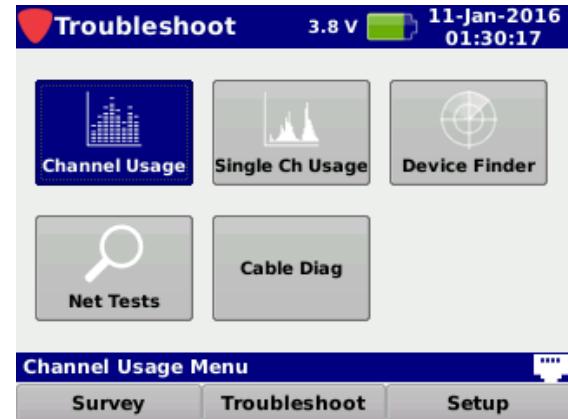
Advanced Wireless Test Set

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Introduction

Select the **Troubleshoot** softkey to display the **Troubleshoot** menu as shown in the image to the right. This section will provide you with instructions on how to utilize the functions available in the **Troubleshoot** menu of the instrument including:

- **Channel Usage** – This function is used to view the percentage of utilization for both 802.11 and non-802.11 (interference) signals on all channels within the 2.4 GHz and 5 GHz frequency bands.
- **Single Ch Usage** – This function is used to view the percentage of utilization for both 802.11 and non-802.11 (interference) signals on a single channel within the 2.4 GHz and 5 GHz frequency bands.
- **Device Finder** – This function is used to target and find any 2.4 & 5 GHz 802.11 (a/b/g/n/ac) access points or client devices within range of the 802 AWE.
- **Net Tests** – This function is used to perform ping, throughput, and traceroute tests over networks that are connected to the 802 AWE using either the Ethernet or Wi-Fi network connections.
- **Cable Diag** – This function is used to perform diagnostics on cables that are connected to the Ethernet port of the 802 AWE.



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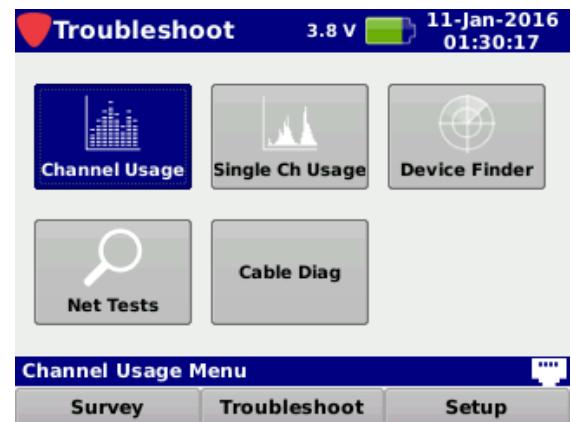
Advanced Wireless Test Set

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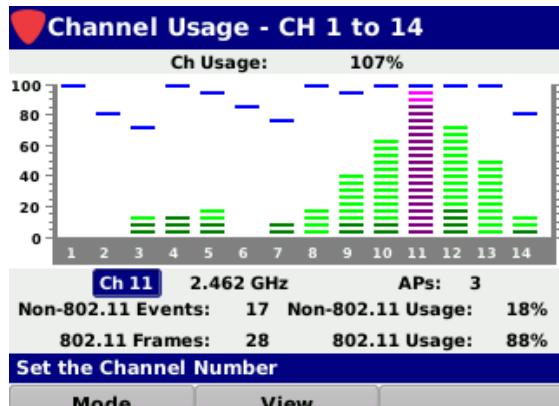
Frequency Band Channel Usage

Overview

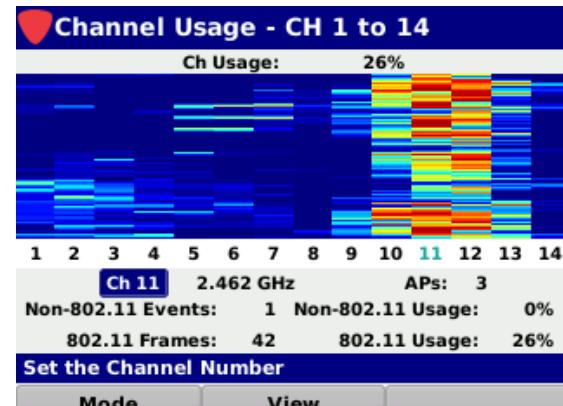
Select the **Channel Usage** icon as shown in the image to the right to view the percentage of utilization for both 802.11 and non-802.11 (interference) signals on all channels within the 2.4 GHz and 5 GHz frequency bands.



The **Wi-Fi Survey** screen will be displayed as shown in one of the following images based on the settings selected by the user the last time the application was used. Each of these screens allow you to select either the 2.4 GHz or 5 GHz display mode and either the bar or waterfall graph view.



2.4 or 5 GHz Bar Graph



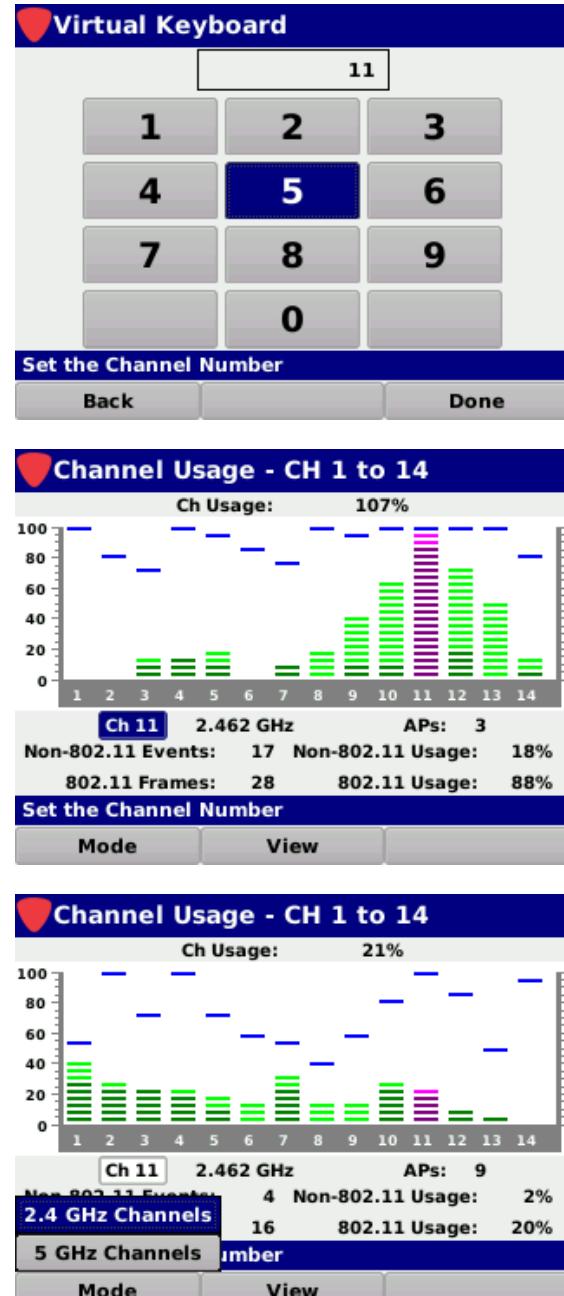
2.4 or 5 GHz Waterfall Graph

802AWE

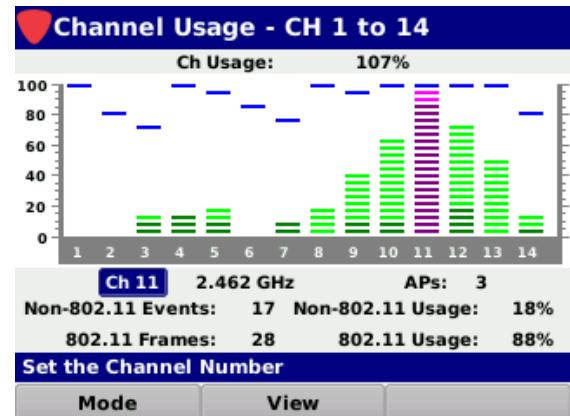
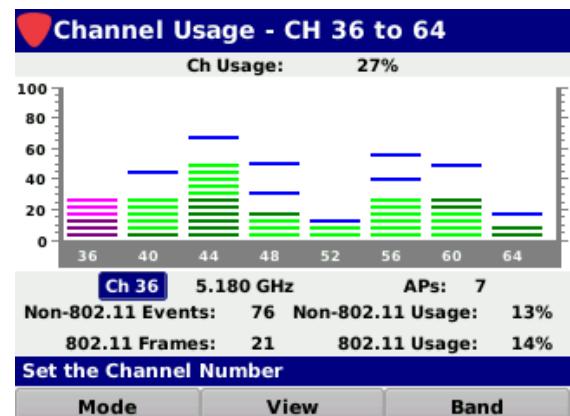
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From within any of the display modes or graph views of the **Channel Usage** screen;

- The currently selected channel is highlighted in magenta and can be adjusted by:
 - Using the up/down arrow buttons on the keypad
 - Pressing the **Enter** key on the keypad and entering the channel number using the **Virtual Keyboard** as shown in the image to the right.
- The center frequency of the selected channel and number of access points currently using that channel are displayed to the right of the channel number as shown in the image to the right.
- The following usage measurements for the selected channel are displayed within the main display area:
 - Ch Usage** – This displays the real-time total percentage of utilization from both 802.11 and non-802.11 sources.
 - Non-802.11 Events** – This displays the real-time number of events for non-802.11 sources only.
 - Non-802.11 Usage** – This displays the real-time percentage of utilization for non-802.11 sources only.
 - 802.11 Events** – This displays the real-time number of events for 802.11 sources only.
 - 802.11 Usage** – This displays the real-time percentage of utilization for 802.11 sources only.
- Select the **Mode** softkey to toggle the display mode between 2.4 GHz and 5 GHz channels.



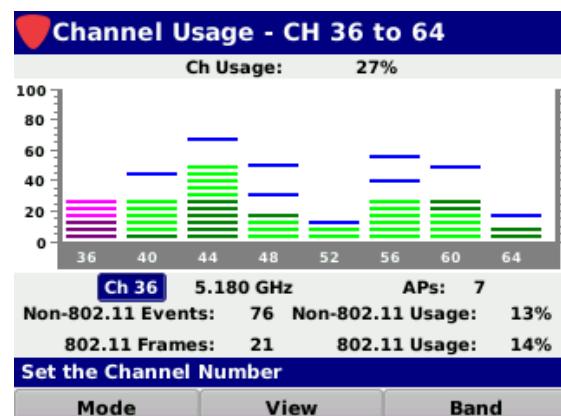
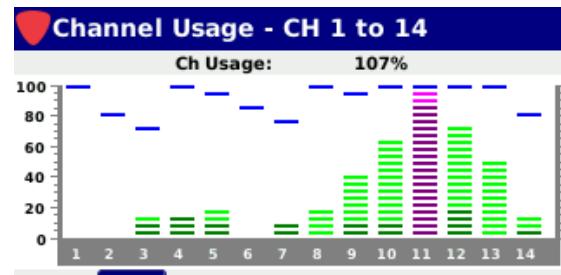
- At any given time, the total percentage utilization for the selected channel is the sum of the individual percentage of utilization components (802.11 and non-802.11).
 - For example, in the image to the right the 802.11 percentage of utilization is 14% and the non-802.11 percentage of utilization is 13%. So, the total percentage of utilization for the selected channel is 27%.
- In the case where a channel exceeds 100% total utilization, the graph will display the full measurement value of the non-802.11 percentage of utilization as the noise floor, while the remaining space on the graph will be occupied by part of the 802.11 percentage of utilization. In this case, the non-802.11 percentage of utilization acts as a noise floor that squeezes out the desired 802.11 percentage of utilization.
 - For example, in the image to the right the 802.11 percentage of utilization is 18% and the non-802.11 percentage of utilization is 88%. So, the total percentage of utilization is actually 106%, which exceeds the maximum percentage of utilization (100%).
 - The remaining 802.11 percentage of utilization (6%) is squeezed out of the graph by the non-802.11 percentage of utilization and will not be displayed.



Bar Graph Display Mode

This display mode shows the percentage of utilization for all channels within a selected frequency band in the form of a bar graph.

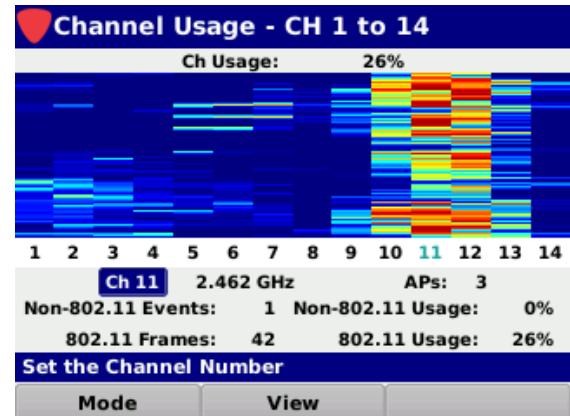
- The horizontal axis (left/right) of the graph represents the individual channels within the selected frequency band.
- The bar graph of the currently selected channel will be displayed in shades of purple, while all other channels will appear in shades of green.
- The vertical axis (up/down) of the graph represents the total percentage of utilization for the channel within the 2.4 GHz frequency band.
 - The graph displays a maximum level of 100% (top of graph) and minimum level of 0% (bottom of graph).
 - Each column within the graph will appear in shades of either green or purple.
- Each horizontal bar within a column of the graph represents approximately 5% utilization and is color coded as follows:
 - █ █ Horizontal bars of these darker colors correspond to the measurement value displayed by the **802.11 Usage** field. When present, these darker bars will always appear at the bottom of the column.
 - █ █ Horizontal bars of these lighter colors correspond to the measurement value displayed by the **non-802.11 Usage** field. When darker bars are present, the lighter bars will be placed at the top of the column.
 - █ Horizontal bars in blue always appear at the top of the column and represent the maximum total percentage of utilization that was recorded during the sampling period.
- When the display mode is set to **5 GHz Channels**, use the **Band** softkey to toggle between the three different 5 GHz wireless frequency bands.



Waterfall Graph Display Mode

This display mode shows the percentage of utilization over time for all channels within a selected frequency band in the form of a waterfall graph.

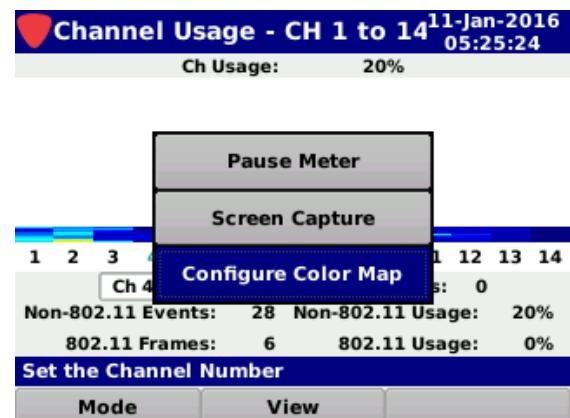
- The horizontal axis (left/right) of the graph represents the individual channels within the selected frequency band.
- Below the graph, the channel number that is currently selected will be highlighted in light blue while all other channels numbers will appear black.
- The vertical axis (up/down) of the graph represents the number of measurement samples taken from when you first entered the **Channel Usage** screen. The graph displays the oldest samples at the top of the graph and the newest samples at the bottom of the graph.
- When the display mode is set to **5 GHz Channels**, use the **Band** softkey to toggle between the three different 5 GHz wireless frequency bands.



Color Settings

The color coding for the horizontal bars within the columns of the graph is user configurable.

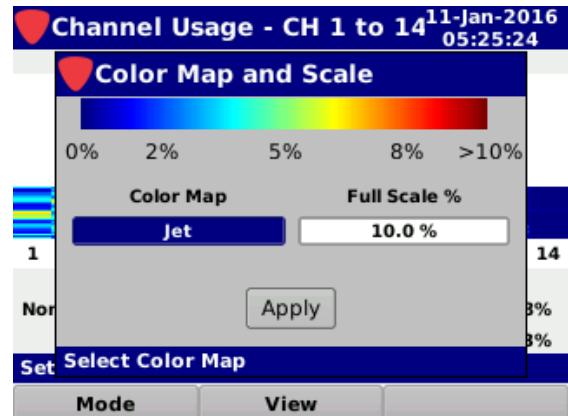
- To modify the color coding, press the **Function** button and select **Configure Color Map** from the **Function** menu as shown in the image to the right.



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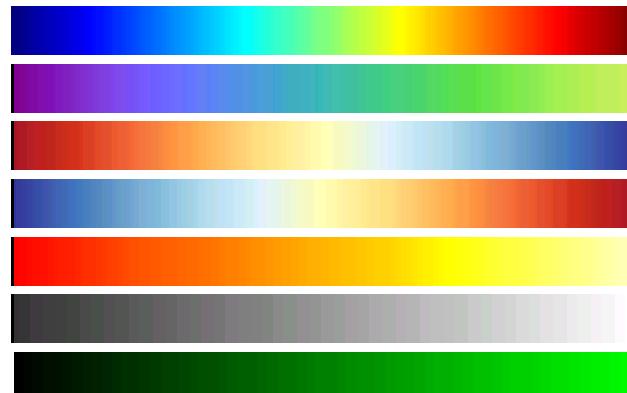
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- The **Color Map and Scale** window will be displayed as shown in the image to the right.

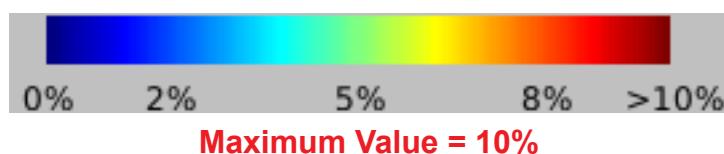
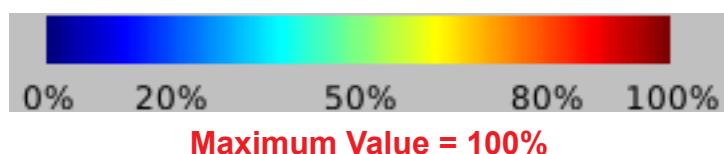


- To adjust the color scheme, use the left/right arrow buttons on the keypad to highlight the **Color Map** field. Then, use the up/down arrow buttons on the keypad to select from the following color schemes:

- Jet
- Rainbow
- Red Yellow Blue
- Blue Yellow Red
- Heat
- Black to White
- Black to Green



- To adjust the maximum percentage of utilization that is displayed within the graph, use the left/right arrow buttons on the keypad to highlight the **Full Scale %** field. Then, use the up/down arrow buttons on the keypad to adjust the maximum value.

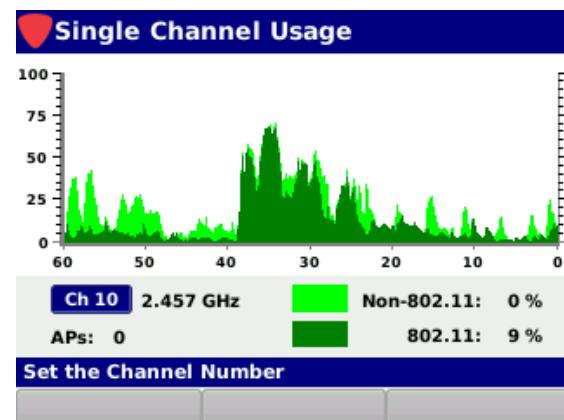


Overview

Select the **Single Ch Usage** icon as shown in the image to the right to view the percentage of utilization for both 802.11 and non-802.11 (interference) signals on a single channel within the 2.4 GHz and 5 GHz frequency bands.

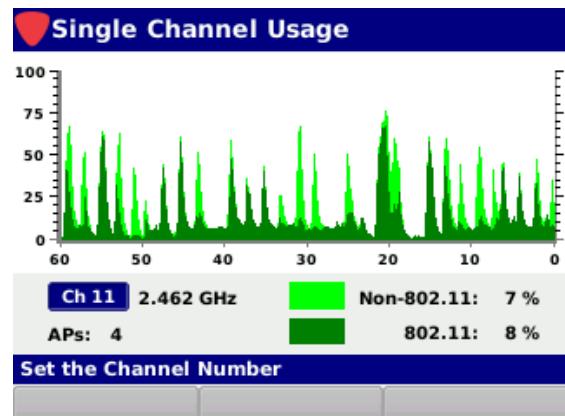


The **Single Channel Usage** screen will be displayed as shown in the image to the right. Each of these screens allows you to select a single 2.4 GHz or 5 GHz wireless channel.



The **Single Channel Usage** screen shows the percentage of utilization over time for a single channel in the form of an area graph.

- The horizontal axis (left/right) of the graph represents the last sixty seconds of measurements. The graph displays the oldest samples at the left of the graph (60 seconds) and the newest samples at the right of the graph (0 seconds or current time).
- The vertical axis (up/down) of the graph represents the total percentage of utilization for the selected channel.
 - The graph displays a maximum level of 100% (top of graph) and minimum level of 0% (bottom of graph).
 - The percentage of utilization within the graph will appear in shades of green as follows:
 - █ This darker color corresponds to the measurement value displayed by the **802.11** field. When present, this darker 802.11 percentage of utilization will always appear at the bottom of the graph.
 - █ This lighter color corresponds to the measurement value displayed by the **non-802.11** field. When the darker non-802.11 percentage of utilization is present, the lighter 802.11 percentage of utilization will be placed at the top of the graph.
- Below the graph, the channel number that is currently selected will be highlighted in blue and the number of access points using this channel will also be displayed.



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- At any given time, the total percentage utilization for the selected channel is the sum of the individual percentage of utilization components (802.11 and non-802.11). However, the total percentage of utilization cannot exceed 100%
 - For example, in the image to the right the 802.11 percentage of utilization is 8% and the non-802.11 percentage of utilization is 7%. So, the total percentage of utilization for the selected channel is 15%.
 - In the case where a channel exceeds 100% total utilization, the graph will display the full measurement value of the non-802.11 percentage of utilization as the noise floor, while the remaining space on the graph will be occupied by part of the 802.11 percentage of utilization. In this case, the non-802.11 percentage of utilization acts as a noise floor that squeezes out the desired 802.11 percentage of utilization.
 - For example, the 802.11 percentage of utilization is 74% and the non-802.11 percentage of utilization is 48%. So, the total percentage of utilization is actually 122%, which exceeds the maximum percentage of utilization (100%).
 - In this example, the full percentage of utilization for non-802.11 signals (48%) is displayed at the bottom of the graph and the remaining space on the graph will be filled with the 802.11 percentage of utilization (52%).
 - The remaining 802.11 percentage of utilization (22%) is squeezed out of the graph by the non-802.11 percentage of utilization and will not be displayed.

