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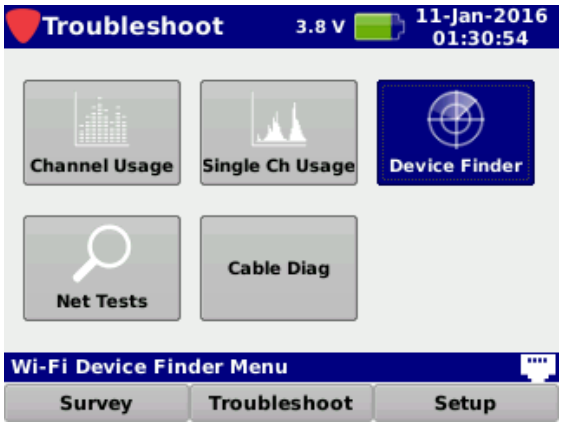
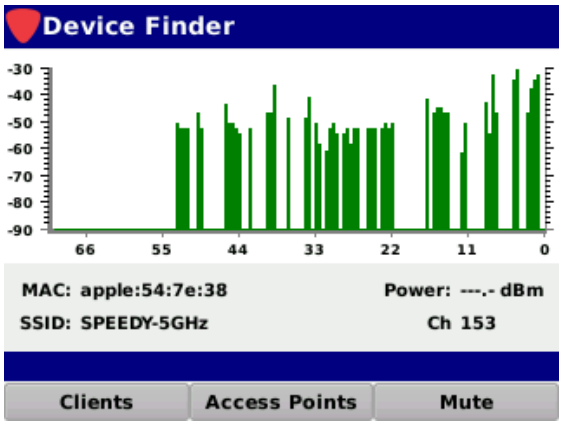
Overview

Select the **Device Finder** icon as shown in the image to the right to find access points and client devices that are currently broadcasting within the 2.4 GHz and 5 GHz frequency bands.

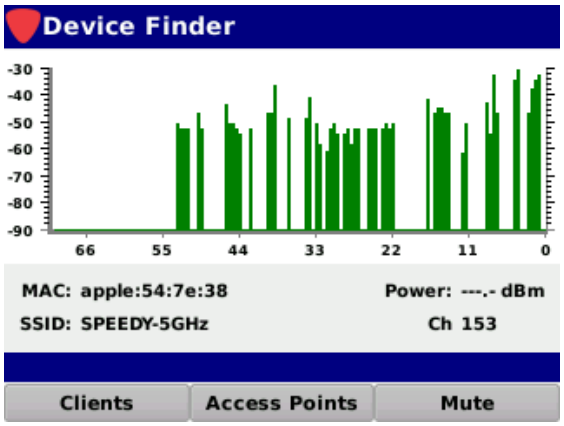


The **Device Finder** screen will be displayed as shown in the image to the right.



Finding Devices

The **Device Finder** screen shows the signal level over time for a single device in the form of a bar graph.



- 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 or selected a new device.

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.

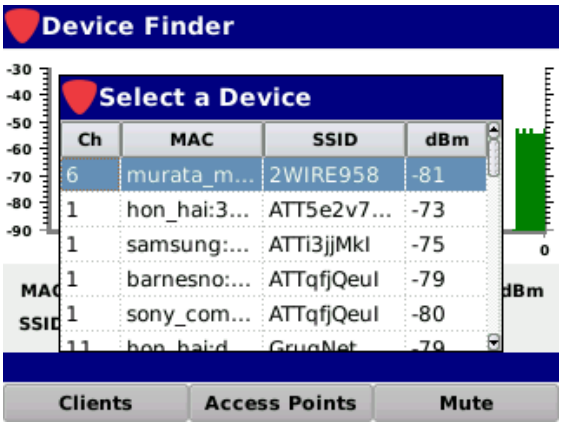
- As the user moves closer to the device they are trying to find, the beeping becomes more frequent and increases in tone.
- When the user moves away from the device, the beeping becomes less frequent and decreases in tone.
- Select the **Mute** softkey to disable the beeping sound or select the **Unmute** softkey to enable the beeping sound.

The measurement samples continuously move from the right side of the graph toward the left side of the graph.

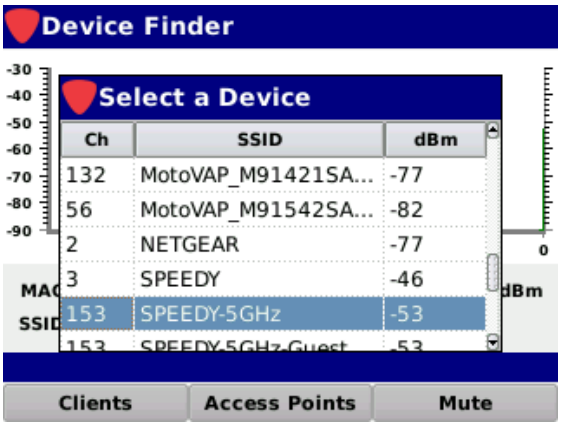
- The newest measurement sample is displayed at the far right side of the screen.
- The oldest measurement sample is displayed at the far left side of the screen.
- The graph can display 70 measurement samples over a time period of approximately 45 seconds, as shown in the image above.

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

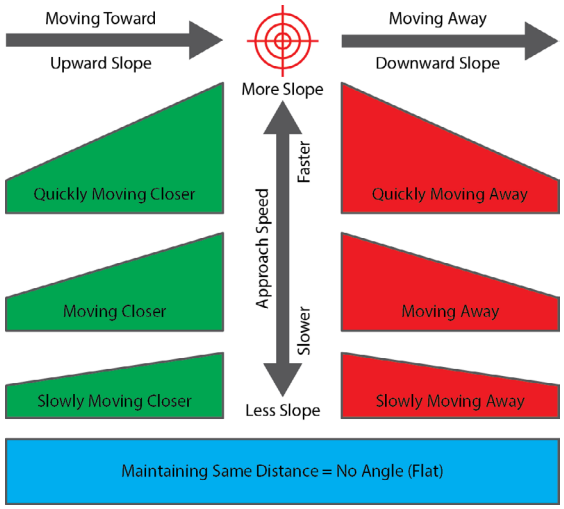


Access Points List

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.

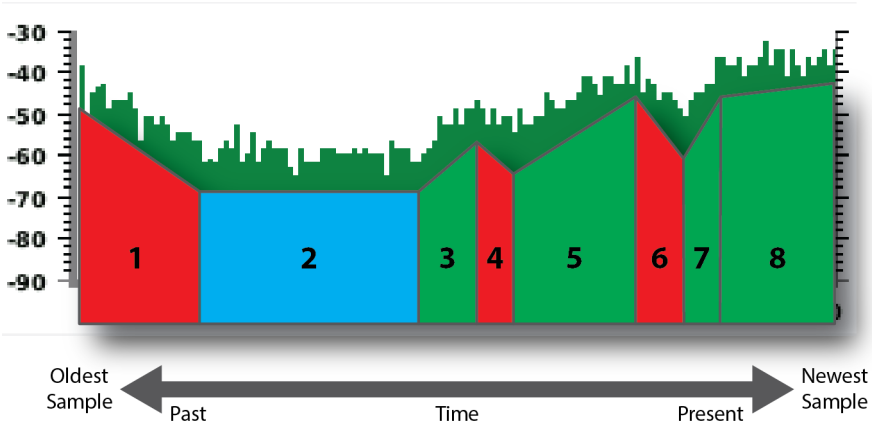
- The graph will display an upward slope when the 802 AWE is moving toward the device you are trying to find.
- The graph will display a downward slope when the 802 AWE is moving away from the device you are trying to find.
- The graph will not display any slope or will appear flat when the 802 AWE is 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.



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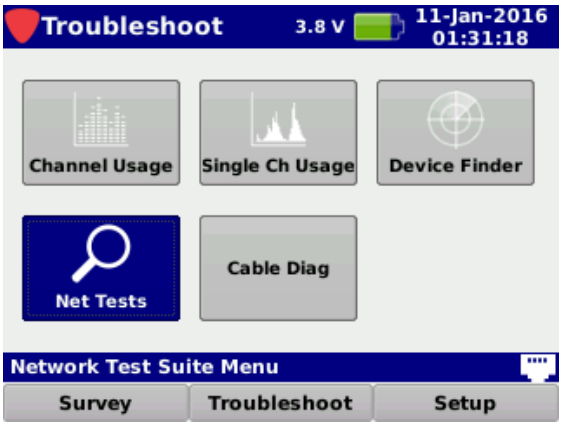
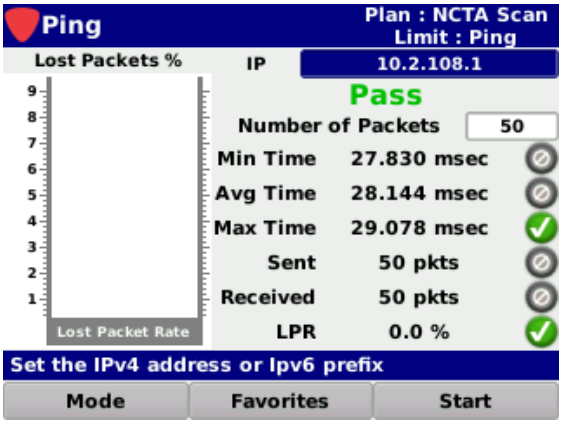
Overview

The Network Test Suite is used to perform network tests that include Ping, Trouceroute, and Throughput tests. Select the **Net Tests** icon as shown in the image to the right to perform network tests using either the Ethernet or Wi-Fi network connections of the 802 AWE.



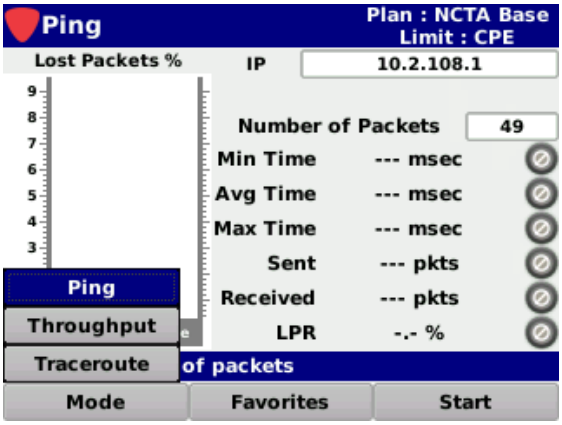
The **Network Tests** screen will be displayed as shown in the image to the right. This screen displays a measurement bar graph specific to the type of measurement, along with relevant measurement values.

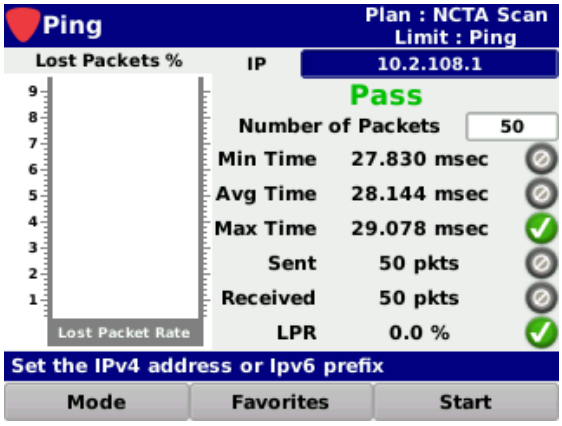


Selecting the Test Mode

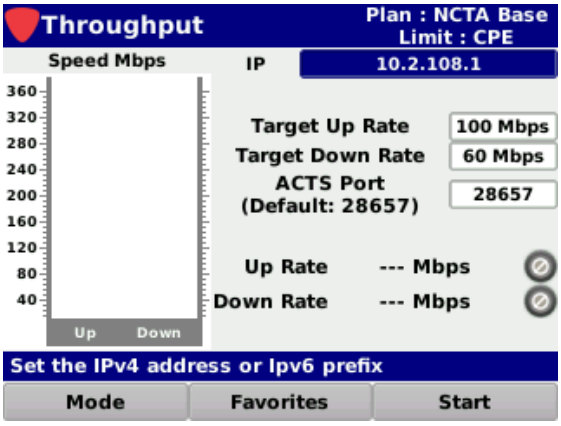
Select the **Mode** softkey to choose from the following network tests:

- Ping
- Throughput
- Traceroute

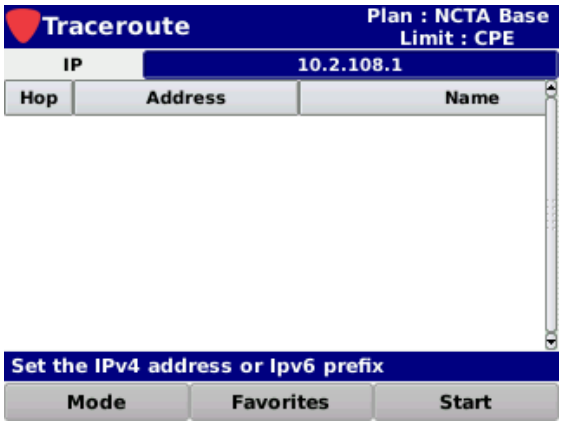




Ping



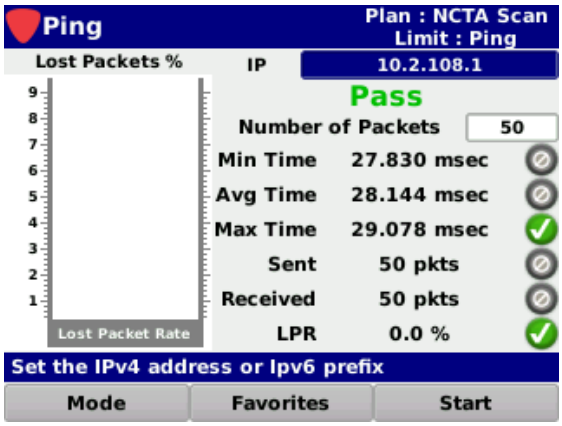
Throughput



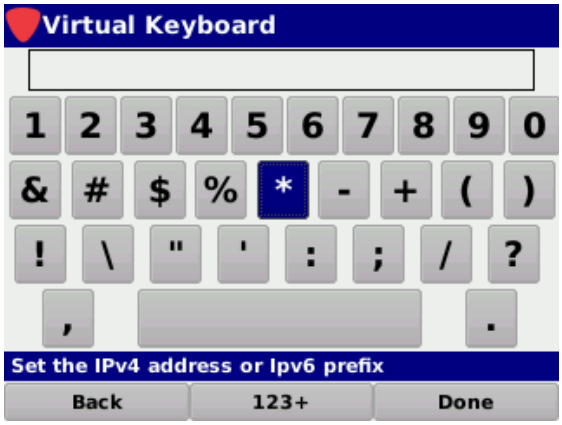
Traceroute

Setting the Destination IP Address

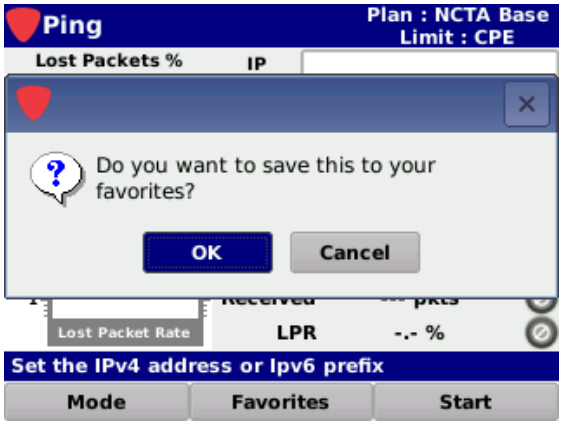
To manually enter the destination IP address for the network testing, highlight the **IP** field as shown in the image to the right.



Then, press the **Enter** button and use the **Virtual Keyboard** to directly enter the IP address as shown in the image to the right.



After selecting the **Done** softkey, a confirmation window will be displayed as shown in the image to the right. Select the **OK** button to save the location to your favorites or select the **Cancel** button to accept the changes without saving to your favorites.

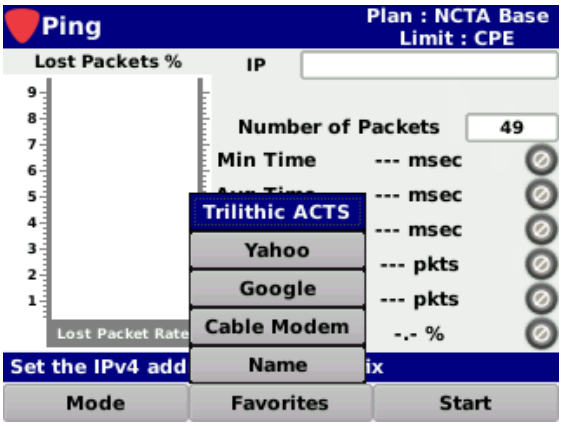


Selecting a Favorite

After entering a destination IP address as shown in the previous section, the 802 AWE allows you to save the entered IP address as a favorite location for quick and easy access.

Select the **Favorites** softkey to view a list of up to six (6) favorite destination IP addresses.

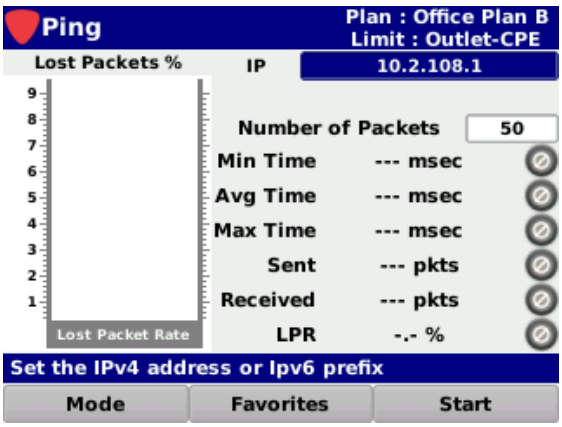
From the **Favorites** pop-up menu, select the name of the favorite to use for testing. The IP address or URL of the selected location will be entered automatically in the **IP** field.

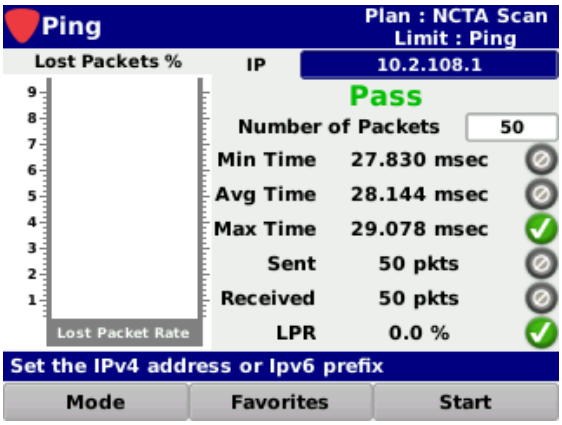


Executing Network Tests

After entering a destination IP address or selecting a favorite, select the **Start** softkey to execute the selected test.

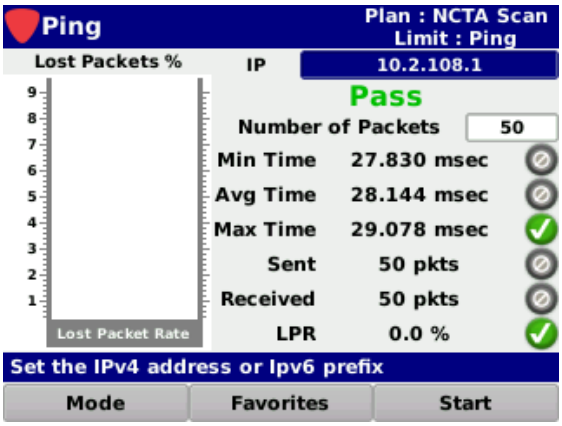
The 802 AWE will display the measurement results for each test mode as shown in the following sections.





Ping Mode

When the **Ping** mode is selected, the following measurement results are displayed as shown in the image to the right:

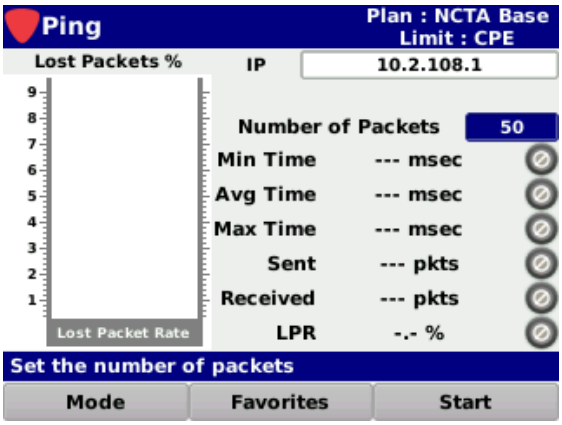


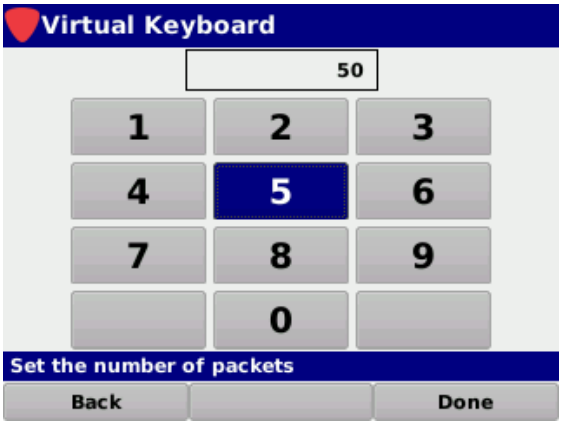
- **Minimum Time** – This is the minimum time required to send/receive a single test packet.
- **Average Time** – This is the average time required to send/receive all test packets.
- **Maximum Time** – This is the maximum time required to send/receive a single test packet.
- **Sent** – This is the number of packets sent by the 802 AWE to the destination IP address.
- **Received** – This is the number of packets received by the 802 AWE from the destination IP address.
- **LPR** – This is the lost packet ratio. This measurement is displayed in the bar graph and as a numeric value. The LPR is calculated as the percentage of packets received to those which were sent (LPR = {Received Packets / Sent Packets} * 100%), for example:
    - 50 sent packets
    - 25 received packets
    - LPR = {25 / 50} * 100%
      {0.50} * 100%
      50%

Setting the Number of Packets

To manually enter the number of packets for the ping test, highlight the **Number of Packets** field as shown in the image to the right and then use either of the following methods to change the packet number:

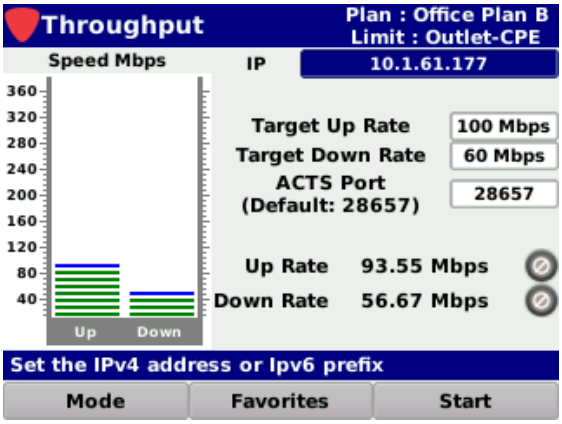
- Use the up/down arrow buttons to adjust the number in 1 packet increments.
- Press the **Enter** button and use the **Virtual Keyboard** to directly enter the number of packets as shown in the image to the right.





Throughput Mode

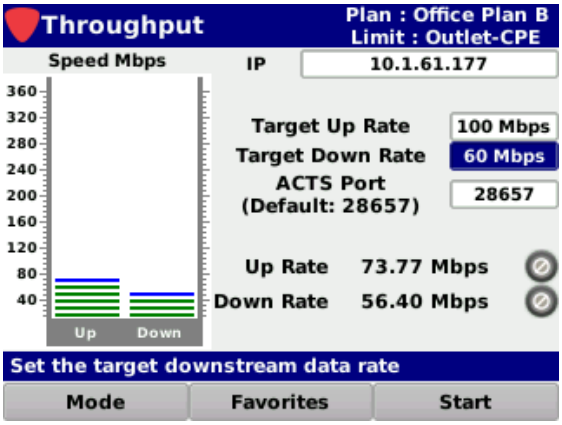
When the **Throughput** mode is selected, the following measurement results are displayed as shown in the image to the right:



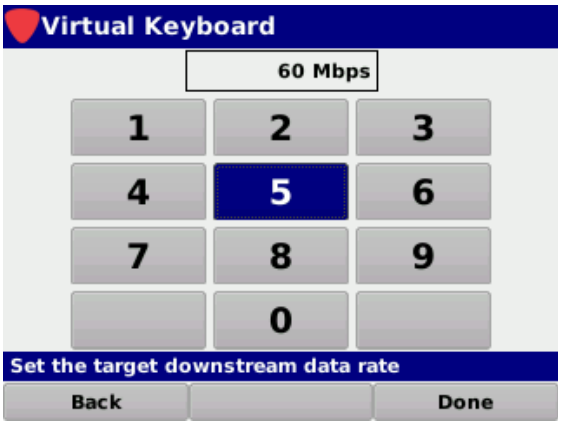
- **Target Up Rate** – This is the up stream data rate. This measurement is displayed in the bar graph and as a numeric value. This value is fixed.
- **Target Down Rate** – This is the down stream data rate. This measurement is displayed in the bar graph and as a numeric value.

Setting the Target Downstream Rate

To manually enter the target downstream rate for the throughput test, highlight the **Target Down Rate** field as shown in the image to the right and then use either of the following methods to change the target downstream rate:



- Use the up/down arrow buttons to adjust the rate in 1 Mbps increments.
- Press the **Enter** button and use the **Virtual Keyboard** to directly enter the target downstream rate as shown in the image to the right.

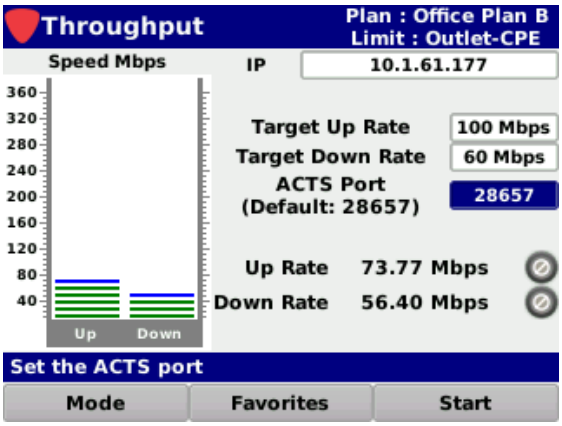


Setting the ACTS Port

To manually enter the ACTS server port for the throughput test, highlight the **ACTS Port** field as shown in the image to the right and then use either of the following methods to change the port:

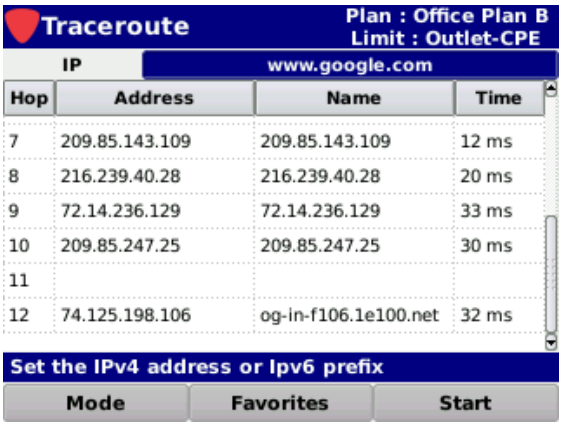
- Use the up/down arrow buttons to adjust the port number.
- Press the **Enter** button and use the **Virtual Keyboard** to directly enter the ACTS port as shown in the image to the right.

The default ACTS port is set to **28657**.



Traceroute

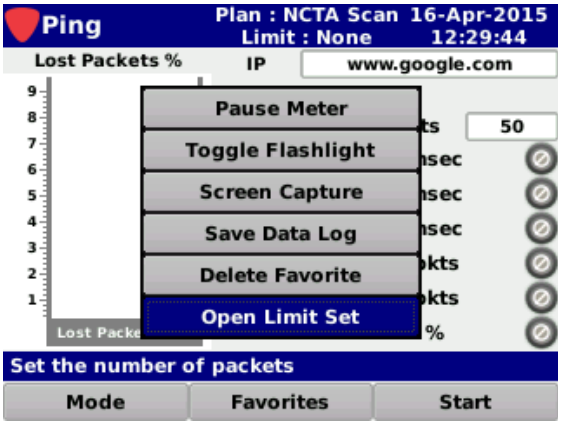
When the **Traceroute** mode is selected, the following measurement results are displayed as shown in the image to the right:



- **Hop** – This is the number of the intermediary point (hop) in the route between the meter and the destination address.
- **Address** – This is the IP address of the corresponding intermediary point (hop).
- **Name** – This is the name of the corresponding intermediary point (hop).
- **Time** – This is the time to each intermediary point (hop).

Opening a Limit Set

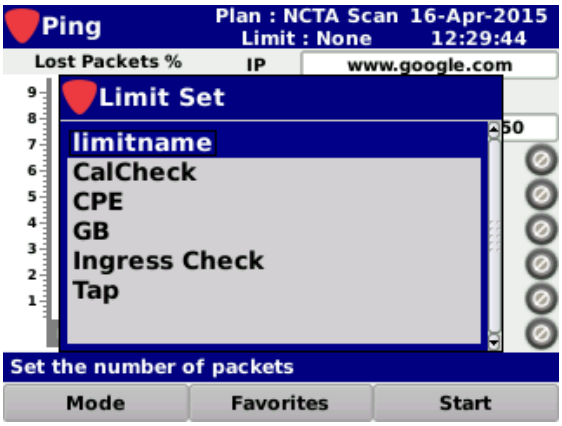
Select the **Open Limit Set** button in the **Function** menu as shown in the image to the right to select the limit set to use for the network testing.



The **Limit Set** window will be displayed as shown in the image to the right.

From the **Limit Set** window, select the name of the limit set to use for the network testing.

After selecting the limit set, the **Network Tests** screen will be displayed again.

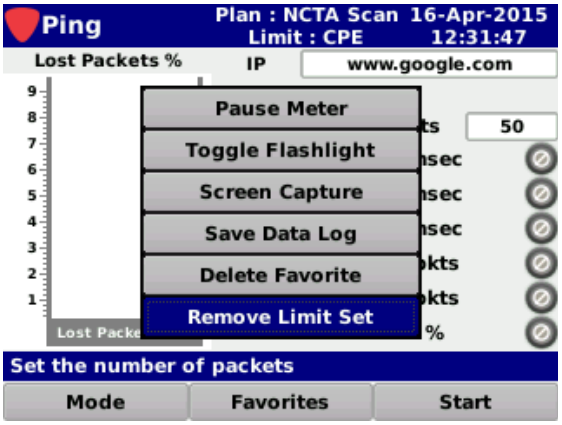


NOTE

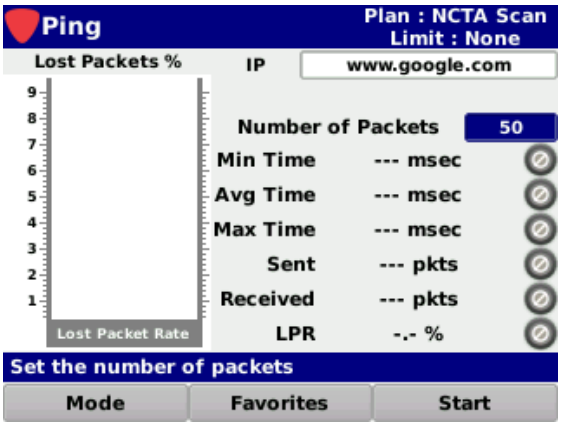
The Limit Set window will be bypassed if there is only one limit set to choose from.

Removing a Limit Set

Select the **Remove Limit Set** button in the **Function** menu as shown in the image to the right to remove the limit set for the network testing.



The pass/fail results will no longer be displayed as shown in the image to the right.



Pass/Fail Measurement Indicators

When a limit set has been opened, the network tests will be tested against the current limit set. When any of the individual measurement parameters of a network tests fail, the network tests as a whole will indicate a Fail status.

A Pass/Fail status will be displayed next to each measurement parameter. The pass/fail status of the network tests will be indicated using the following icons:

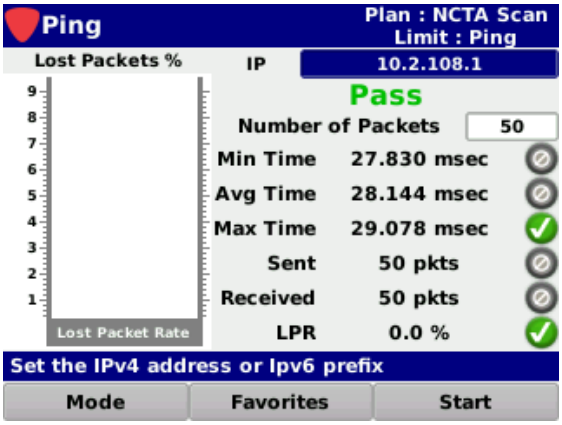
This icon indicates that this measurement was skipped. This only applies to measurements that have been removed from the currently selected limit set.

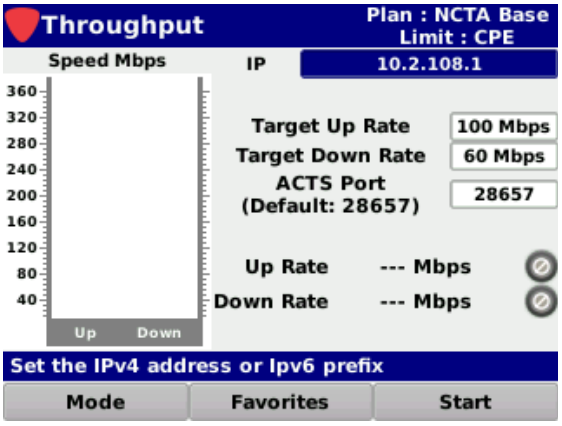
This icon indicates that this measurement is within the measurement thresholds of the currently selected limit set.

This icon indicates that the measurement limit set has failed.

This icon indicates that the measurement has failed the high limit measurement threshold.

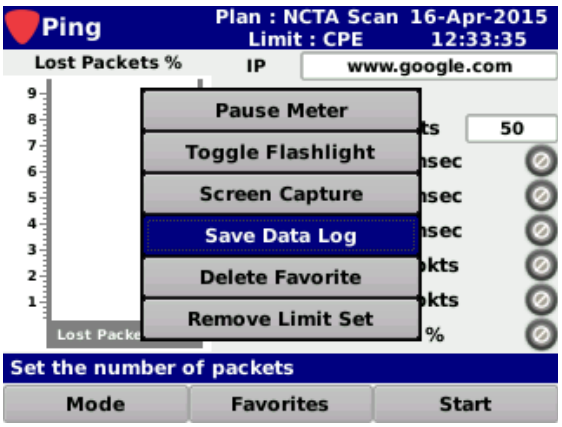
This icon indicates that the measurement has failed the low limit measurement threshold.





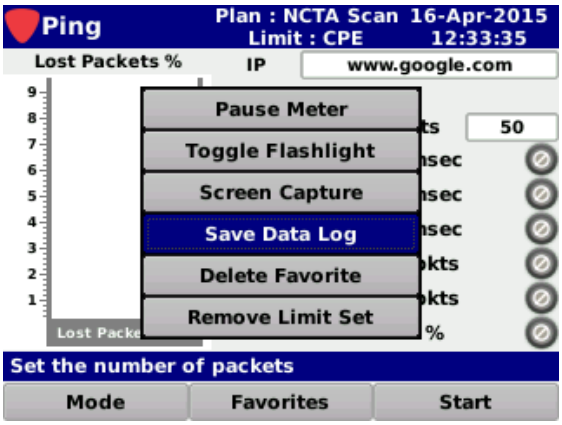
Function Menu Options

Additional functions can be accessed from within the **Network Tests** screen by pressing the **Function** button. The **Function** menu will be displayed as shown in the image to the right and includes the following functions specifically for the **Network Tests** screen.

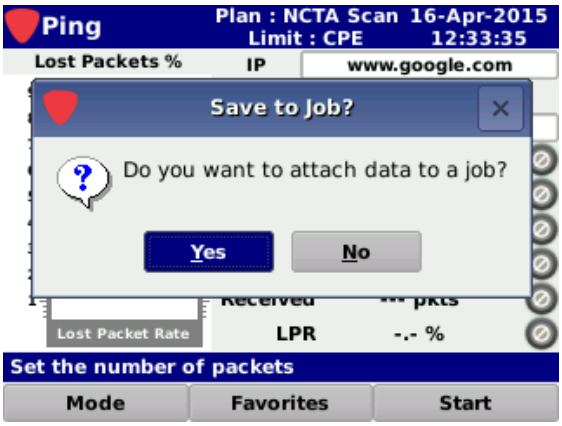


Save Data Log

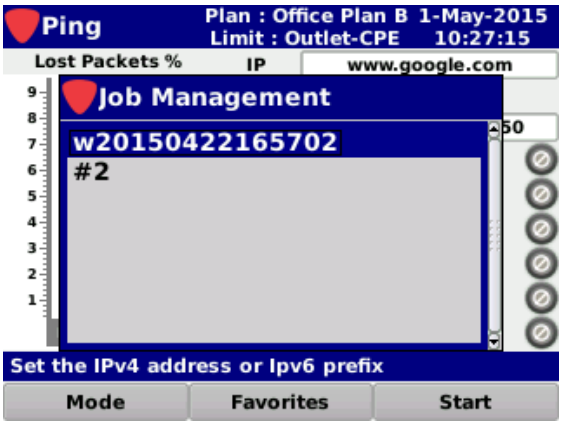
Select the **Save Data Log** button from the **Function** menu to save a copy of the measurement result data log.



If you have an open job, you can also save the test to the job by selecting **Yes**.



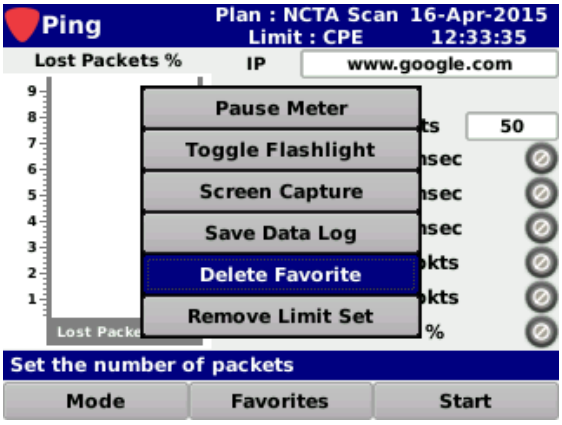
If you have multiple open jobs, the **Job Management** window will be displayed. Choose the job you would like to save the log to.



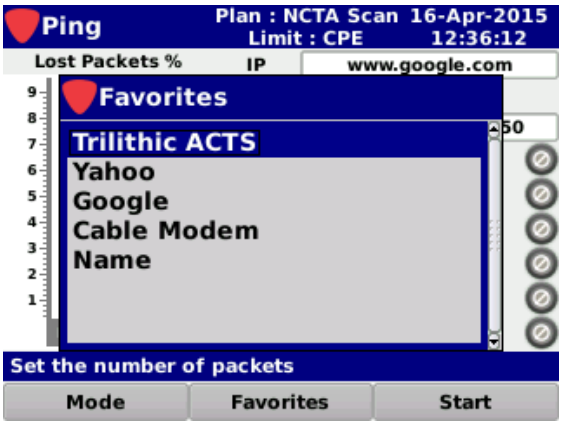
If you don't want to save the test to the open job, select **No** and you will be prompted to enter a file name using the **Virtual Keyboard**. It will then be saved to the internal memory of the 802 AWE.

Delete Favorites

Select the **Delete Favorite** button from the **Function** menu to delete any one of the six available favorites.



The **Favorites** window will be displayed as shown in the image to the right. Select the name of the favorite you want to delete.



NOTE

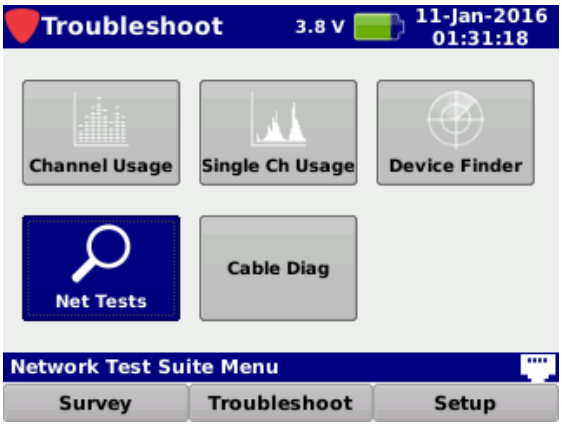
The Open Limit Set and Remove Limit Set buttons in the Function menu were covered previously. For more information, see these sections earlier in this chapter.

Chapter 6

Cable Diagnostics

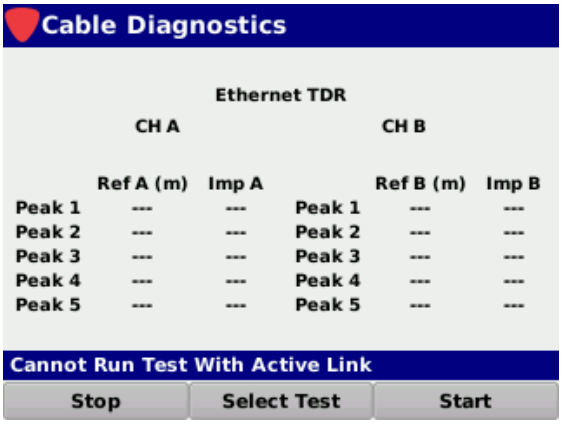
Overview

The Cable Dignostics Test Suite of the 802 AWE is used to perform cable diagnostics tests on Ethernet cables connected to the 802 AWE. Select the **Cable Diag** icon as shown in the image to the right to perform cable diagnostics testing.



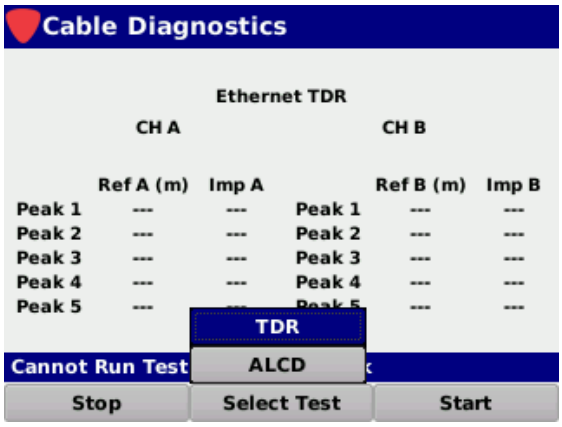
The **Cable Diagnostics** screen will be displayed as shown in the image to the right. The following measurements can be performed from this screen:

- Time Domain Reflectometry (TDR)
- Active Link Cable Diagnostic (ALCD)

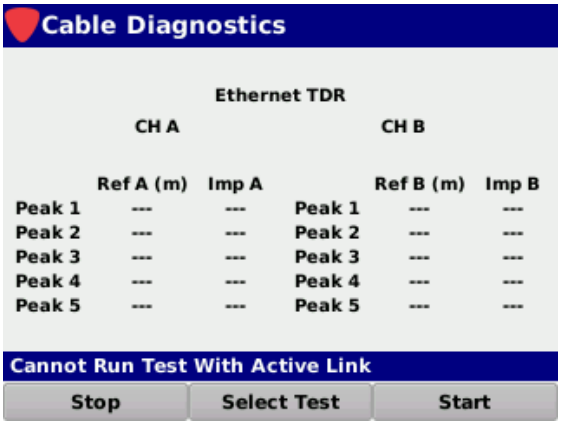


Selecting the Test Type

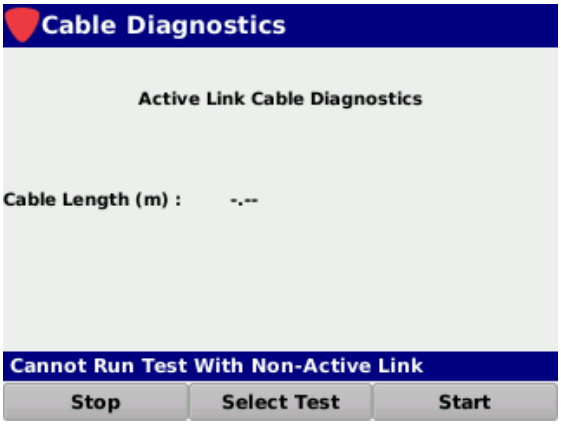
Select the **Select Test** softkey to choose between the following types of cable diagnostic tests:



- **TDR** – This test is performed over an inactive cable and uses Time Domain Reflectometry (TDR) to determine the quality of the cables, connectors, and terminations in addition to estimation of the cable length. Some of the possible problems that can be diagnosed include opens, shorts, cable impedance mismatch, bad connectors, termination mismatches, and any other discontinuities on the cable.
- **ALCD** – This test is performed over an active cable that uses a passive measurement method to estimate the cable length present during an active link.



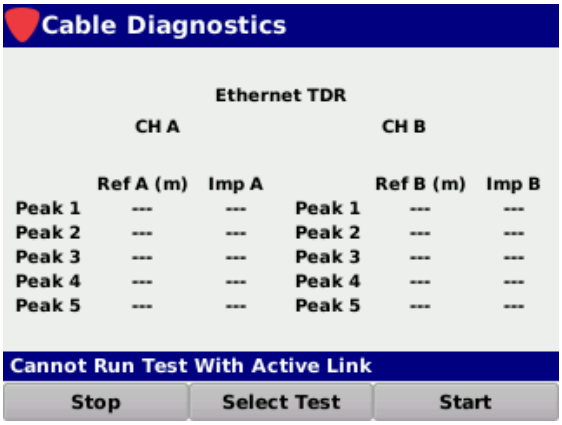
TDR



ALCD

Ethernet TDR

The Ethernet TDR function of the 802 AWE device transmits a test pulse of known amplitude (1V) down both Channel A and Channel B (twisted pairs 1,2 & 3,6) of an attached cable. The transmitted signal travels down each pair of cables and reflects from each cable imperfection, fault, bad connector and the end of the cable itself.



After the pulse transmission, the 802 AWE measures the return time and amplitude of all these reflected pulses and displays the following measurement values:

- **Ref** – This is the distance to a fault measured in meters with an accuracy of ±1m.
- **Imp** – This is the impedance type of the detected fault. The values that can be displayed within this field are as follows:
  - **Open** – This is a non-terminated twisted-pair whose ends are not in contact with each other.
  - **Short** – This is a non-terminated twisted-pair whose ends are not in contact with each other.
  - **Terminated** – This is a properly terminated twisted-pair.
  - **No Info** – This is some other type of impedance mismatch.

The 802 AWE is capable of recording up to five reflections within each tested pair. In a situation where more than 5 reflections are recorded, the 802 AWE will only display the last 5 recorded reflections.

Fault Detection

When using a terminated cable:

- Open peaks are cable faults (open / short to shield / strong impedance match)
- All other peaks are impedance mismatches (according to their values)

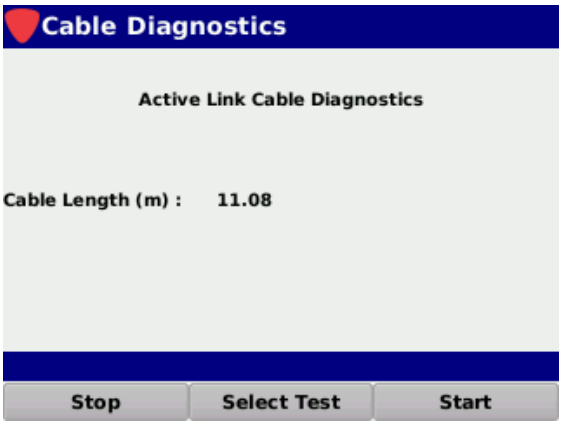
When having open peak followed by additional peaks:

- The open peak is a cable fault (open / short to shield / strong impedance match)
- The additional peaks are either end of cable or impedance mismatches (according to their values)

Active Link Cable Diagnostics (ACLD)

The Active Link Cable Diagnostic (ALCD) feature of the 802 AWE offers a passive method of measuring in the Rx path to estimate the cable length during active link. It uses passive digital signal processing based on adapted data, thus enabling measurement of cable length with an active link partner. The ALCD Cable length measurement accuracy is ±5 m.

Select the **Start** softkey to start the test and select the **Stop** softkey to stop the test. The length of the cable will be displayed in meters as shown in the image to the right.



802 AWE
Advanced Wireless Expert

Section V: Appendix

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Wi-Fi Specifications

Supported Protocols	IEEE 802.11a, 802.11b, 802.11g, 802.11n and 802.11ac* *limited to 802.11n speeds)
WI-FI Modes	Embedded Wi-Fi Client
802.11ac Features	Detection/Location of Access Points, Network Connectivity & Performance Validation, Connects to 802.11ac Access Points at 802.11n data rates
Device Analysis	Access Point and Client Detection/Properties/Login Smart Device Classification Rogue Access Point and Client Detection/Location
Channel & Noise Analysis	Wi-Fi Signal Strength, Noise, SNR, Channel Utilization & Availability
Network Protocols	DHCP or Static IP
Performance Analysis	Ping & Trace Route
Receive Channels/ Frequencies	**2.4 GHz Band** 2402 to 2494 MHz (Channels 1 to 14) **5 GHz Band** 5170 to 5330 MHz (Channels 34, 36, 38, 40, 42, 44, 46, 48, 52, 56, 60 & 64) 5490 to 5710 MHz (Channels 100, 104, 108, 112, 116, 120, 124, 128, 132, 136 & 140) 5735 to 5835 MHz (Channels 149, 153, 157, 161 & 165)
Transmit Channels/ Frequencies	**2.4 GHz Band** 802.11b, 22 MHz BW 2401 to 2483 MHz (Channels 1 to 14) 802.11g/n, 20 MHz BW (HT20) 2402 to 2482 MHz (All combinations of legally available bonded channel pairs) 802.11n, 40 MHz BW (HT40) 2402 to 2482 MHz (All combinations of legally available bonded channel pairs) **5 GHz Band** *802.11a/n, 20 MHz BW (HT20)* 5170 to 5250 MHz (All combinations of legally available bonded channel pairs) 5735 to 5835 MHz (All combinations of legally available bonded channel pairs) *802.11n, 40 MHz BW (HT40)* 5170 to 5330 MHz (All combinations of legally available bonded channel pairs) 5735 to 5815 MHz (All combinations of legally available bonded channel pairs)
Modulation	OFDM with BPSK, QPSK, 16-QAM and 64-QAM 802.11b with CCK and DSSS
Data Rates	802.11b: from 1 Mbps to 11 Mbps 802.11a/g: from 6 Mbps to 54 Mbps 802.11n/ac: from 6.5 Mbps to 150 Mbps (MCS 0-7)

*802.11ac connection and testing limited to 802.11n speeds

Bluetooth Specifications

Supported Protocols	Bluetooth v2.1 + EDR, v3.0 + HS, v4.0
Bluetooth Modes	Master, Slave
Modulation	GFSK, DQPSK and 8DPSK
Data Rates	1, 2 or 3 Mbps

Zigbee Specifications

Supported Protocols	802.15.4-2009 (2.4 GHz)
ZigBee Modes	End Device
ZigBee Advanced Features	CCM Security, Orphan Scanning, Coordinator Realignment and Mesh Routing
Modulation	DSSS
Data Rates	250 Kbps
Typical Transmit Power	19 dBm, ±2 dBm
Receiver Sensitivity	250 Kbps: -101 dBm (< 8& PER)

Physical & Environmental Specifications

Physical Specifications

Construction	Rugged plastic housing
Control	Water resistant front panel solid membrane keypad
Display	Color LCD screen 320 x 240 pixels (approx 3.5" x 2.67")
Annunciators	Audible annunciator for key strokes
Dimensions w/o Case (H x W x D)	7.00 x 4.50 x 1.75 in (20.32 x 13.97 x 5.08 cm)
Dimensions w/ Case (H x W x D)	8.00 x 5.50 x 2.75 in (22.86 x 16.51 x 7.62 cm)
Weight w/o Case	1.00 lbs (0.45 Kg)
Weight w/ Case	1.50 lbs (1.09 Kg)

Available Interface Types

USB	Mini-USB 2.0 Type B female receptacle
Ethernet (Optional)	RJ45 Ethernet Port (10/100 Mbps)

Battery & Power Specifications

Operating Time	10 hours, dependent on use
Charge Time	12 hours
Battery	Two 2600 mAh @ 3.6V Li-Ion internal battery, factory replaceable
Power Adapter Input	**Type:** 2-prong un-grounded male plug (NEMA 1-15p) **Voltage:** 100 to 240 VAC ~ 50 to 60 Hz **Current:** 0.3 A Max
International Power Adapters (Optional)	**Type:** Interchangeable clip-on, US adapter (included) **Euro:** CEE 7/16 Europlug, Type C **UK:** BS 546, Type D **AUS:** AS/NZS 3112
Power Adapter Output	**Type:** USB Type A female receptacle **Voltage:** 5 VDC **Current:** 1.0A
Data & Charge Cable	USB Type A male plug to Mini-USB Type B male plug

Environmental Specifications

Storage & Operating Temperature	-18˚ to +50˚ C (0˚ to 122˚ F)

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802.11 Standards & Channels

Wireless Standard	Frequency Band (GHz)	Channel Width (MHz)	Channels
802.11a	5	20	36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 144, 149, 153, 157, 161, 165
802.11b	2.4	22	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
802.11g	2.4	20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
802.11n	2.4	20	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
		40	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
	5	20	36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 144, 149, 153, 157, 161, 165
		40	38, 46, 54, 62, 102, 110, 118, 126, 134, 142, 151, 159
802.11ac	5	20	36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 144, 149, 153, 157, 161, 165
		40	38, 46, 54, 62, 102, 110, 118, 126, 134, 142, 151, 159
		80	42, 58, 106, 122, 138, 155
		160	50, 114

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Warranty Information

Trilithic Broadband Instruments 2-Year Limited Warranty

Trilithic, Inc. (“Trilithic”) warrants to the buyer that the product will be free from defects in materials and workmanship, under normal use, operating conditions and service for a period of two (2) years from date of delivery. Trilithic reserves the right, before having any obligation under this limited warranty, to inspect the damaged product, and all costs of shipping the product to Trilithic for inspection shall be borne solely by the buyer. Trilithic’s obligation under this limited warranty shall be limited, at Trilithic’s sole option, to replacing or repairing the product, or to replacing or repairing any defective part, F.O.B. Indianapolis, Indiana. If neither of the two options is reasonably available, then Trilithic, in its sole discretion, may provide a prorated refund to the buyer of the purchase price of the product, as evidenced by the proof of purchase, less any applicable service fees in accordance with the following schedule: months 0-3 = 100%; months 4-12 = 50%; and months 13–24 = 25%. Batteries and fans are not included or covered by this limited warranty. Any product or part that is repaired or replaced under this limited warranty shall be covered only for the remainder of the original warranty period which applied to the original product or part, or for ninety (90) days, whichever is longer. All products or parts that are exchanged for replacement shall become the property of Trilithic.

In order to recover under this limited warranty, buyer must make a written claim to Trilithic within sixty (60) days of the occurrence and must present acceptable proof of original ownership of the product (such as an original receipt, purchase order or similar documentation). In order for this limited warranty to be effective, the product must have been handled and used as set forth in the documentation accompanying the product and/or its packaging. This limited warranty shall not apply to any damage due to accident, misuse, abuse, neglect, fire or other casualty. Further, this limited warranty shall not apply to any product which has been altered or where the damage was caused by a part not supplied by Trilithic. Trilithic retains the final decision whether a product is within warranty conditions.

THE REMEDY SET FORTH HEREIN SHALL BE THE ONLY REMEDY AVAILABLE TO THE BUYER AND TO THE FULLEST EXTENT PERMITTED BY LAW, IN NO EVENT SHALL TRILITHIC BE LIABLE FOR ANY SPECIAL, INCIDENTAL, PUNITIVE OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO, LOST REVENUES, LOST PROFITS, LOSS OF USE OF SOFTWARE, LOSS OR RECOVERY OF DATA, DOWNTIME, REPLACEMENT EQUIPMENT AND ANY THIRD PARTY CLAIMS ARISING OUT OF ANY THEORY OF RECOVERY INCLUDING WARRANTY, CONTRACT, STATUTORY OR TORT IN CONNECTION WITH THE PRODUCT, EVEN IF TRILITHIC HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. NOTWITHSTANDING THE FOREGOING, IN THE EVENT THAT THIS LIMITED WARRANTY FAILS OF ITS ESSENTIAL PURPOSE, IN NO EVENT SHALL TRILITHIC’S ENTIRE LIABILITY TO BUYER EXCEED THE PURCHASE PRICE OF THE DEFECTIVE PRODUCT.

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