GREENLEE®

COMMUNICATIONS

A Textron Company

AirScout™

Instruction Manual

Contents

DESCRIPTION

The Greenlee Communications AirScout™ Automated Wi-Fi® Readiness Solution is intended to help identify the optimum location and settings for the access point of a broadband service within a home or small business.

AirScout consists of the following test devices:

• AirScout Master Controller 300 (ASM300), referred to in this manual as "master".

• AirScout Client 300 (ASC300), referred to in this manual as "client".

SAFETY

Safety is essential in the use and maintenance of Greenlee tools and equipment. This instruction manual and any markings on the tool provide information for avoiding hazards and unsafe practices related to the use of this tool. Observe all of the safety information provided.

Do not discard this product or throw away!
For recycling information, go to www.greenlee.com.

IMPORTANT SAFETY INFORMATION

⚠ WARNING

Read carefully all the safety information below before using AirScout.

Failure to follow these safety instructions could result in fire, electric shock, injury, or damage to the AirScout equipment or other property.

Operation

1. Charge all units for at least two hours before using.

2. Use the enclosed power supply adapter and connect it to the carry case.

3. The LED on the side of the carry case will turn on red while at least one unit is charging. The LED will turn green when charging is complete.

Specifications

Power input:

    Carry case: 11 to 15 VDC, 2.5 A maximum.

    AirScout Master Controller 300 (ASM300): 11 to 15 VDC, 1 A.

    AirScout Client 300 (ASC300): 5.00 ±0.5 V, 1 A.

Operating temperature: 0 to +60 °C (+32 to +140 °F).

Charging temperature: −10 to +55 °C (+14 to +131 °F).

Operating humidity: 90% max, non-condensing.

Storage temperature: −20 to +70 °C (−4 to +158 °F).

All parts are intended for indoor use only in dry conditions.

If soiled, clean the case only with a damp cloth and soap or mild detergent; ensure the product is fully dry before use.

Power Adapters

AirScout devices will operate from the internal battery or an external power supply. The master will accept the 12 VDC external power adapter supplied with the product.

AirScout 306 External Power Supply

12 VDC output, universal input (90~240 VAC) with interchangeable blades.

CAUTION: Use only Greenlee power adapters supplied with the kit. The use of any unauthorized power supplies is not recommended. As such, Greenlee is not responsible for any malfunction.

Automobile 12 V Power Adapter

12 VDC input, 5 A maximum.

CAUTION: Use only the power adapters supplied with the kit. The use of any unauthorized power supplies is not recommended. As such, Greenlee is not responsible for any malfunction.

Battery

AirScout master and client devices contain a lithium polymer cell that is permanently installed. **CAUTION:** Risk of explosion if battery is replaced by an incorrect type. Dispose of used batteries according to the instructions. This battery is not serviceable by the customer. The lithium polymer cell was tested in accordance with UL2054 and IEC 62133, and it has a capacity below 15.7 Wh. If service is required, contact Greenlee for your nearest authorized repair center.

• The battery must be recycled or disposed of separately from household waste.

• For more information go to www.greenlee.com.

Charging

AirScout batteries should be charged after each day of use. The AirScout 306 product includes a carry case with charge capability. When master and client devices are in the carry case and the carry case is connected to the external power supply or the automotive 12 VDC adapter, the devices will charge. The carry case LED will indicate charge status.

• Off indicates power is not present.

• Solid red indicates that one or more devices are charging.

• Solid green indicates that all devices are charged.

Compliance

This equipment complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines in Supplement C to OET65 and RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment should be installed and operated keeping the radiator at least 20 cm (8 in) or more away from person's body (excluding extremities: hands, wrists, feet and ankles).

Canadian Department of Communications Industry Canada Notice (Canada only)

This Class B digital apparatus complies with Canadian ICES-003.

FCC Rules, Part 15

This device complies with Part 15 of FCC Rules and Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

• This device may not cause harmful interference, and

• This device must accept any interference, including interference that may cause undesired operation.

EU Compliance

Greenlee Textron Inc. hereby declares that the AirScout kit is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC and the R&TTE Directive. A copy of the full Declaration of Conformity may be downloaded from www.greenleecommunications.com/support/compliance.

Limited Warranty Summary

Greenlee Textron Inc. warrants the included product and accessories against defects in materials and workmanship for one year from the date of original purchase. Greenlee does not warrant against normal wear and tear, nor damage caused by accident or abuse. All items are produced in accordance with Greenlee's production instructions and tested to perform as specified. Greenlee Textron Inc. is an ISO 9001 approved company. Full warranty text and details can be viewed at www.greenleecommunications.com.

INTRODUCTION

Wi-Fi around the home is increasingly important to consumers. Rapidly increasing numbers of portable terminal devices, such as Smartphones, tablets, laptops or "Internet of Things" gadgets, rely on wireless connections. Add gaming consoles, set-top-boxes and even desktop PCs that are increasingly using wireless rather than cables for Internet connectivity, and reliable Wi-Fi is now essential to reduce end user frustration.

AirScout provides a rapid and largely automated means of surveying an entire home or small business for effective Wi-Fi service. By surveying Wi-Fi coverage where it is wanted, AirScout allows users to optimize the settings and placement of the access point to maximize effectiveness in just a few minutes.

By using AirScout you can be assured that Wi-Fi service is reaching all the corners of the premises when you leave the site. A test report can be produced recording the conditions during the test and the performance of each location. Opportunities may additionally be presented for the installer to offer solutions to correct "dead-spots" in the building, such as repeaters, power-line extenders or wired access points.

AirScout works in parallel with your existing workflow as much as possible. Once the test has been set up and started, you can continue with other preparatory tasks while AirScout surveys the property automatically. You can then choose to check implementation of channel and location choices for the access point before completing the installation. Optionally, you may also repeat the test with the leave-behind access point hardware, ensuring that its performance meets the needs of the customer as well.

AirScout not only presents its results in easy-to-interpret "heat-map" form but also allows further exploration of the recorded results when needed to check for specific questions such as "will 4k video streaming work in this room?"

Please read this manual and, if in doubt, also check www.greenleecommunications.com for additional training material including links to videos showing setup and typical testing scenarios.

AIRSCOUT COMPONENTS

ASM300 AirScout Master Controller 300 (master)

The master is a compact, battery-powered 802.11 Wi-Fi access point (AP) test device providing a premises-wide solution for optimizing Wi-Fi installations and diagnosing Wi-Fi problems. The master, coupled with client devices, provides a client-side view of the Wi-Fi network, simultaneously measuring signal quality, congestion, interference and application level performance throughout the entire premises to determine the customer's quality of experience (QoE) for delivered services such as streaming video, streaming audio, gaming and web browsing.

Master Front View

1 Device Status LED
2 Power Status LED
3 Identification Button
4 Power Button
5 Pairing Button
6 10/100/1000 Ethernet
7 12 VDC Power Input

Master Rear View
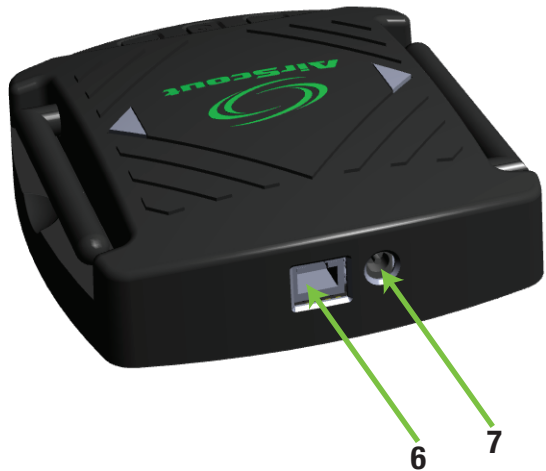
ASC300 AirScout Client 300 (client)

The client is a compact, battery-powered 802.11 Wi-Fi client test device that communicates with the master. AirScout can simultaneously test a premises using one to 30 client devices, providing needed coverage throughout the premises.

Client Front View

1 Device Status LED

2 Power Status LED

3 Identification Button

4 Power Button

5 Pairing Button

6 Micro USB Power Input

Client Rear View

OPERATION

Turning Power On

Press the center power button on either the master or client. The right side power status LED turns green, and the left side device status LED turns solid white, indicating the device is powering up. The master and client are ready for testing after approximately 50 seconds.

Turning Power Off

Press and hold the center power button on either the master or client for approximately two seconds to power off.

Power Status LED

The power status LED is located on the right side of both master and client devices:

1. Green (solid) – indicates the device is operating and the battery voltage is satisfactory.

2. Orange (solid) – indicates the device is operating and the battery voltage is low.

3. Blue (solid) – indicates the device is charging. Charging can occur while the unit is on or off.

Device Status LED

The device status LED is located on the left side of both master and client devices:

1. White (solid) – indicates the device is powering up.

2. Off – indicates the client and master are not connected.

    • client is not paired to a master

    • client is out of radio range from the paired master

    • master is not connected to any client devices

3. Green (solid) – indicates the client and master are connected and the devices are idle.

4. Green (blinking) – indicates that a test is in progress or the devices are in pairing mode.

5. Green/White (blinking) – indicates the master is attempting to send results to the tablet but the tablet is not currently connected. If the tablet is in the proximity of the master and this state persists, the tablet may have associated with a different access point. Refer to "Connecting a Tablet to the AirScout" to restore the connection.

6. Purple (blinking) – indicates location mode is active.

Connecting a Tablet or PC to the AirScout

Prior to testing, the tablet or PC must be connected to a master device. Refer to the rear label of the master to identify the SSID and Password necessary to connect your tablet or PC to AirScout.

1. On the tablet or PC, navigate to the Wi-Fi settings menu.

2. Ensure Wi-Fi is enabled.

3. From the available networks select the SSID of the master.
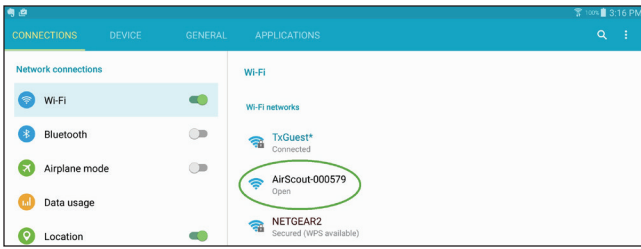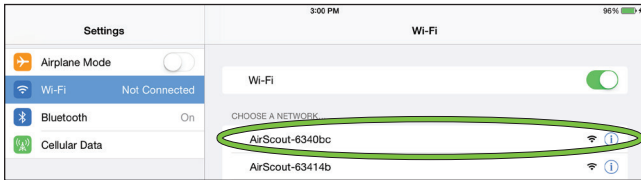
4. Once the tablet or PC is connected, the AirScout SSID appears in the connected list.
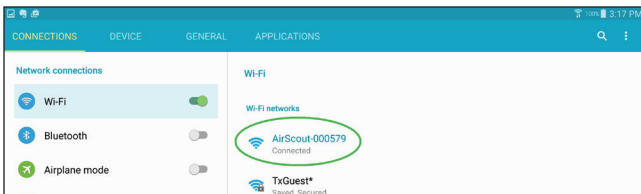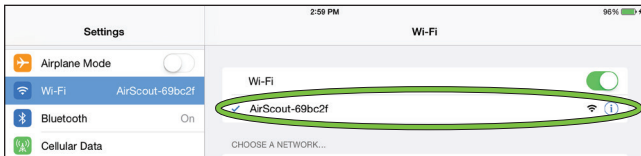
Note: During testing the AirScout master will temporarily disable its Wi-Fi connection to the tablet. If the tablet is in the presence of an alternate known Wi-Fi network or a carrier Wi-Fi hot spot, the tablet may switch connections without your knowledge, preventing the AirScout from re-establishing a connection. When this happens, the AirScout master will indicate it is trying to re-establish a connection and the application will inform the user that the connection has been lost. To avoid this situation, navigate to the Wi-Fi settings menu, "forget" known networks, and disable auto connections to carrier Wi-Fi hot spots.

## Pairing Clients to a Master

A master device can manage up to 30 connected clients. When pairing the AirScout solution, all client devices may be paired to a master simultaneously. To ensure client devices pair to the correct master, only pair one AirScout solution at a time if AirScout kits are within radio range of each other. The client cannot discriminate between two masters that are both in pairing mode. Prior to pairing, ensure that the client and master devices are in close proximity and the battery is not low.

1. Ensure all devices are powered on and the right side power status LED is green.

2. To start the pairing process, press the pairing button on the master device; the left side device status LED begins blinking green to indicate pairing mode is active.

3. While the master is in pairing mode, press the pairing button on one or more client devices; their device status LEDs begin blinking green to indicate pairing mode is active.

4. Once pairing is complete, each client device status LED turns solid green, indicating that pairing was successful.

5. The master remains in pairing mode for two minutes.
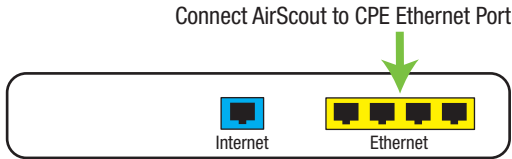
Un-pairing Clients from a Master

Client devices may be un-paired from a master using the AirScout application.

1. Using the AirScout application, press the selected client, which displays the client device status.

2. From the client device menu, press **Forget ASC300** and follow the instructions.
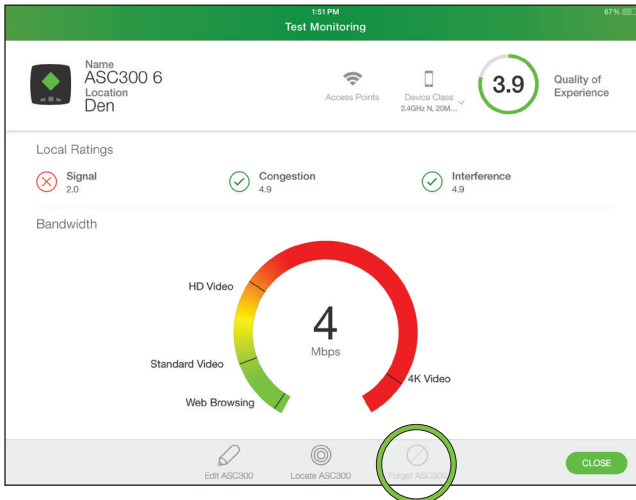
Connecting AirScout to a Customer's Premises Equipment (CPE)

AirScout can connect to and test using the customer's premises equipment (CPE) such as a Wi-Fi enabled gateway or access point. Testing using the CPE adds an additional level of confidence to results. It is recommended to test using either AirScout only or using AirScout and the CPE. CPEs typically have four Ethernet ports highlighted with a yellow background and one Internet port highlighted with a blue background although at least one manufacturer reverses the yellow and blue colors. Using a Category 5E or better twisted pair patch cord, connect the AirScout master Ethernet port to one of the CPE Ethernet ports.

Connect AirScout to CPE Ethernet Port

Internet   Ethernet

Note: If a connection is made to a different CPE port, AirScout will not be able to test using the CPE.

Locating a Client Device

Client devices that are connected to a master may be located using the AirScout application.
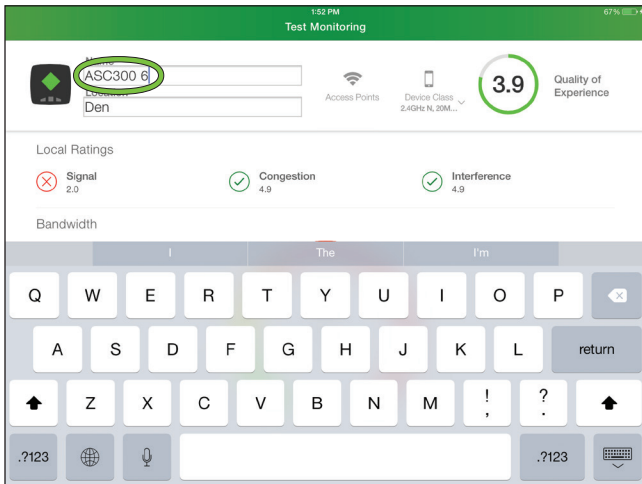
1. Using the AirScout application, press the selected virtual client, which displays the client device status.

2. From the client device menu, press **Locate ASC300**.

3. The selected client blinks its status LED.

Naming Client Devices

AirScout automatically assigns a unique name to each client during pairing. The user is encouraged to place a label with a unique name on each client, allowing a specific client to be quickly identified. Quick identification of a client lowers the time required to deploy AirScout in the premises.

1. Using the AirScout application, press the selected virtual client while in the Parking Lot or while on the floor plan to display the client device status.

2. From the client device menu, press **Edit ASC300**.

3. Press the name field to bring up a keyboard and type in the desired name.

4. The new client name will be retained by the master.

Naming a Master Device

AirScout assigns the master with a factory default name, which may be changed by the user.

1. Using the AirScout application, press the virtual master to display the master device status.

2. From the master device, press **Edit ASM300**.

3. Press the name field to bring up a keyboard and type in the desired name.

4. The master name will be retained.
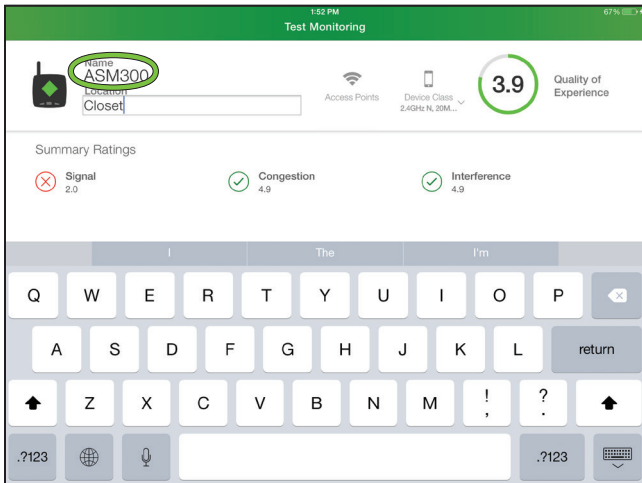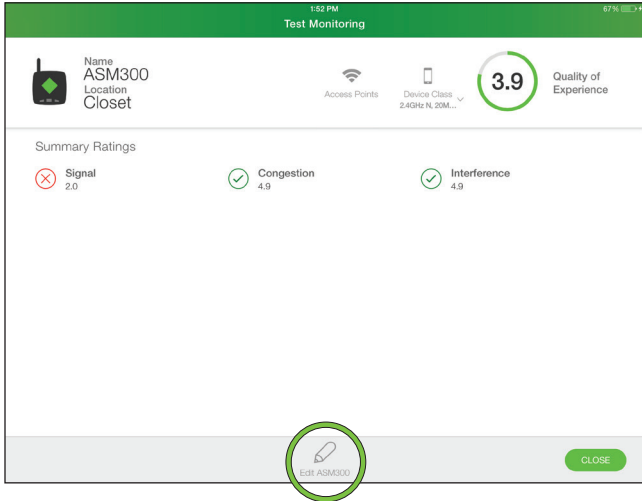
Device Location Name

Each AirScout device measures and records the Wi-Fi characteristics at the location it is placed. Naming the location where devices are placed provides a fast and simple way to associate results with locations in the premises. The location names are stored with the results allowing a customer, technician, or service representative to refer to named locations within the premises. The best practice is to assign precise location names in order to eliminate confusion when discussing results at a later time.
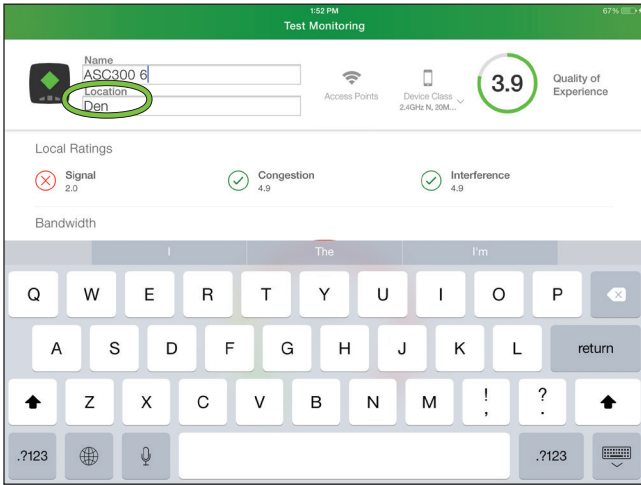
When Deploying Devices

Using the AirScout application, drag the master or client onto a floor plan. If the device location is not set, the user will be prompted to enter a location. Client location names are retained by the AirScout application while master location names are not retained and must be entered each time a device is deployed.

Prior to Deploying Devices

1. Using the AirScout application, press the selected virtual client or master to display device status.

2. From the device menu, press **Edit ASC300** or **Edit ASM300**.

3. Press the location field to bring up a keyboard and type in the desired location.

4. Client location names will be retained.

5. Master location names will not be retained and must be entered each time a device is deployed.

AIRSCOUT APPLICATION MANAGEMENT

The AirScout application running on an Android or Apple device may be updated using either the Google's Play Store or Apple's App Store. Updates provide the user with new features and improvements. Refer to Apple and Google for installing and updating applications.

AIRSCOUT CLOUD SERVICE MANAGEMENT

The AirScout solution works with Greenlee's Cloud Service, providing an automated, secure environment that links all of your AirScout test equipment results together, centralizing captured data across your organization. AirScout results are automatically sent to Greenlee's Cloud Service or a coordinated independent cloud service when a Wi-Fi or Cellular connection from the device to the Internet is available.

Prior to testing, contact Greenlee Communications at 800-642-2155 for technical assistance establishing cloud services for your AirScout.

TESTING

AirScout provides a rapid and largely automated means of surveying an entire home or small business for effective Wi-Fi service. AirScout works in parallel with your existing workflow as much as possible. Once the test has been set up and started, you can continue with other preparatory tasks while AirScout surveys the premises automatically. During the testing phase AirScout optimizes settings and location of the customer's premises equipment, identifies and helps resolve issues affecting network performance (such as signal quality, congestion and interference) and validates services (such as streaming video, streaming audio, gaming and more).

Testing Step 1 – Entering Order Details and Customer Information

Prior to testing it is important to accurately enter the work order details and customer information in order to associate results with the correct job order and customer for later recall.

1. Enter the work order number, which is used by AirScout to recall results at a later time.

2. Enter the service level agreement (SLA) downstream, which is used by AirScout to validate that Wi-Fi consumed bandwidth will not exceed the incoming bandwidth.

3. Enter the service level agreement (SLA) upstream, which can be used to validate that Wi-Fi upstream bandwidth will not exceed the outgoing bandwidth.

4. Enter the access point type.

5. Enter the customer's information, which is used by AirScout to associate the address with the work order and may be used to recall results at a later time.

6. Press **CONTINUE**.

Testing with Customer Premises Equipment (CPE)

AirScout is capable of connecting to and testing using the customer's premises equipment (CPE) such as a Wi-Fi enabled gateway or access point. Testing using the CPE adds an additional level of confidence to results. It is recommended to test using AirScout only or using AirScout and the customer's equipment.

1. Under **Test Data**, select the scan type: AirScout, Customer Gateway, or Both.
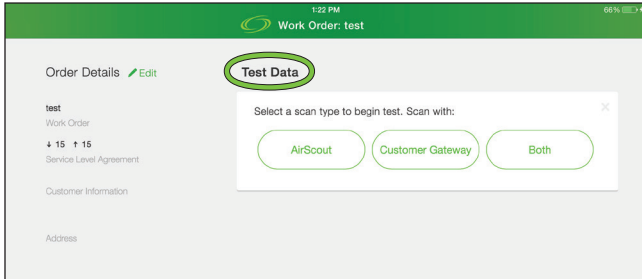

2. If either "Customer Gateway" or "Both" is selected, it is necessary to connect the AirScout master to the CPE and provide the SSID and Password for the CPE. For security reasons, AirScout will not record or save entered SSID or Passwords.

    Note: Refer to section "Connecting AirScout to a Customer's Premises Equipment (CPE)" for directions.

3. After providing the SSID and Password, press **CONTINUE**.
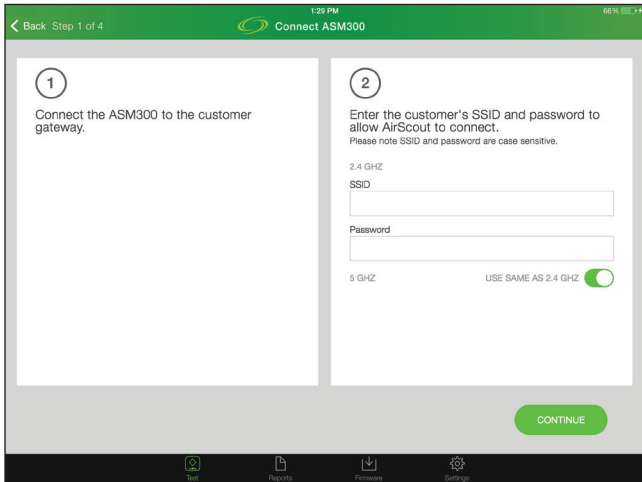
4. If desired, press **Edit** to go back to the order details screen to edit the information for the order.
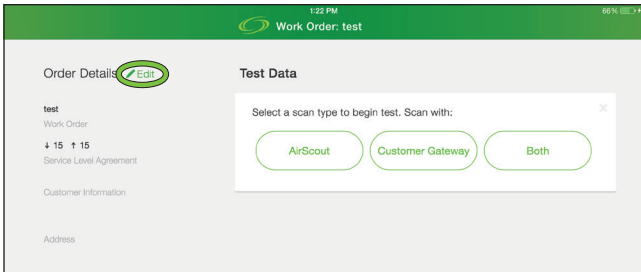

Testing Step 2 – Floor Plans

AirScout provides the user a selection of simple floor plans for deploying devices in the premises.

1. Select a floor type by pressing one of the floor types on the left side.

2. Press **Rotate 90°** to orient the floor as desired.

3. Press **USE FLOOR PLAN** to select.
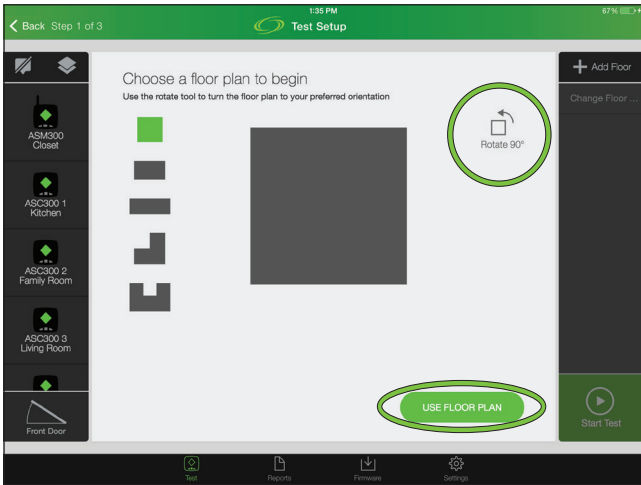
4. Each time a floor is added, a default name is provided; if desired, the floor can be renamed.
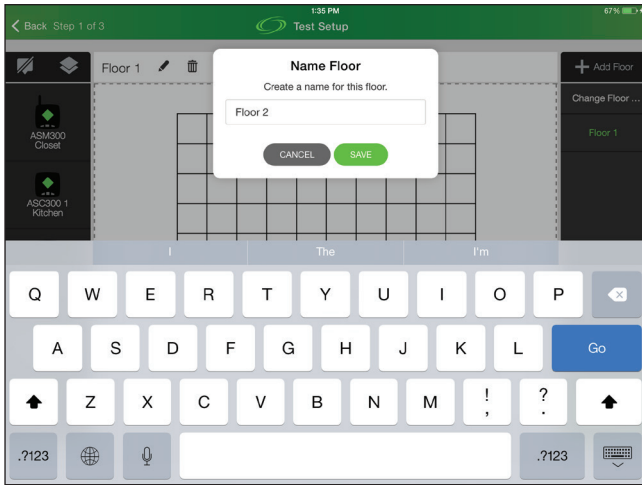
5. If multiple floors are required, press **Add Floor** to add an additional floor.
6. Floors may be deleted prior to testing by pressing the trash can icon.
7. A floor name may be changed by pressing the pen icon.
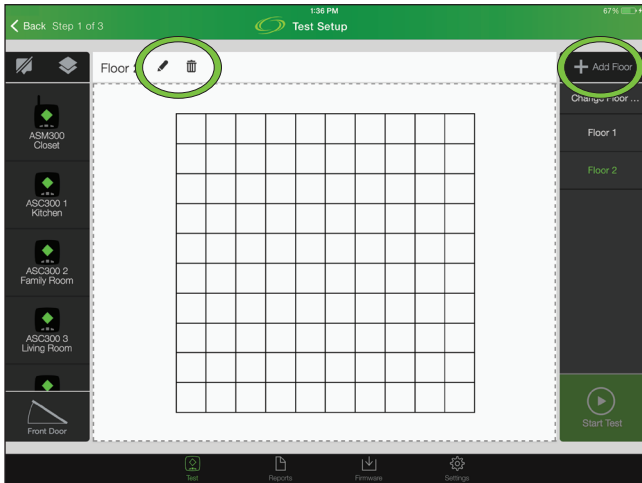
8. Press the stacked floor icon to toggle between single floor and isometric floor view.
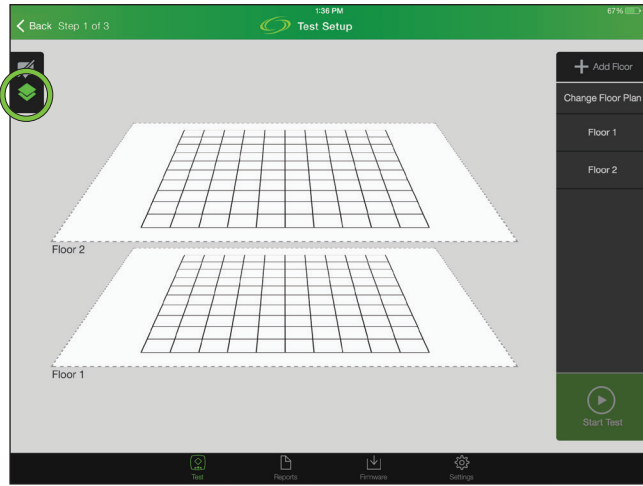

9. If desired, a front door may be placed on the floor plan to help orient the view of the heat map and the placement of ASC300s in the building.

10. If the floor plan needs to be updated, press **Change Floor Plan** to bring up a view that allows the floor plan to be changed. Select the new shape for the floor plan, and press **USE FLOOR PLAN** to return to the view with the updated shape.

Placing a Master

After a floor plan is created, the master and client devices need to be placed in the premises. All available devices appear in the Parking Lot and display their status. Once the master and one or more client devices are placed, testing can begin.
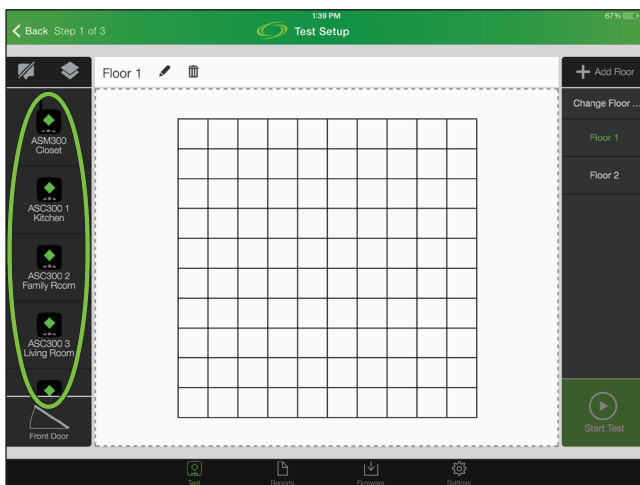
1. Identify the best location within the premises to place the customer's premises equipment, allowing access to power and the incoming wiring.

   Note: Placing the customer's premises equipment in the middle of the area to be serviced by Wi-Fi is typically best. Keep the equipment and its antennas a short distance away from walls and items that are largely metallic, e.g., televisions, water-tanks or appliances; consider what may be on the other side of a wall. **Beware:** *Foil-backed wall boards inhibit wireless propagation, largely reflecting the signal, while some solid wall materials absorb wireless signals very effectively. This is why AirScout can be very effective at finding the optimum access point location.*

2. Place the ASM300 in the identified location.

3. Using the AirScout application, drag the virtual master out of the Parking Lot and place it on the floor plan in the same relative location.

4. The AirScout application requires a location name when placing the virtual master.
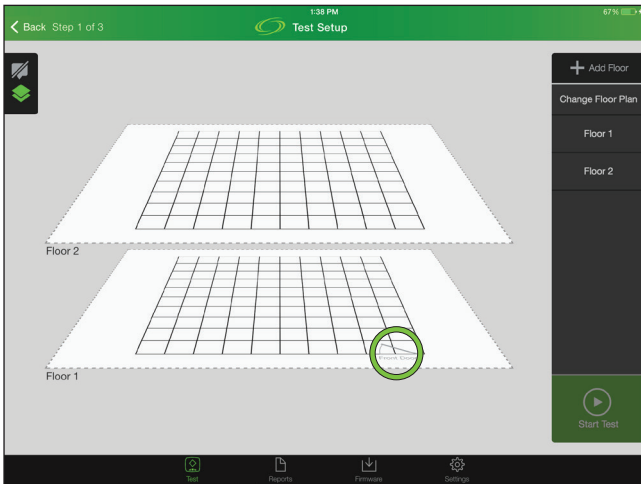
Placing Clients

1. Identify the rooms or locations outside the premises, such as a patio, where the customer desires Wi-Fi services.

   Note: This version of AirScout is not weatherproof so do not place outdoors during inclement weather.

2. Place the ASC300 devices in these rooms or locations.

   Note: When placing an ASC300, it is possible to lose radio contact as indicated by the device status LED turning off. This is a normal occurrence, indicating that the location is a radio dead zone and no Wi-Fi services can be obtained. The ASC300 can be left in this location to record the dead zone in the results and help educate the customer. If the ASC300 loses radio contact prior to moving the virtual client onto a floor, it will be necessary to re-establish radio contact prior to moving the virtual client onto the floor (only "connected" clients may be dragged onto the floor plan).

3. Using the AirScout application, drag the virtual clients out of the Parking Lot and place them on the floor plan, matching their same relative location in the rooms.

4. Ensure the client location name matches the room where it is placed.

5. When placing the client devices, the AirScout application uses the existing location name if present or requires a new location name.

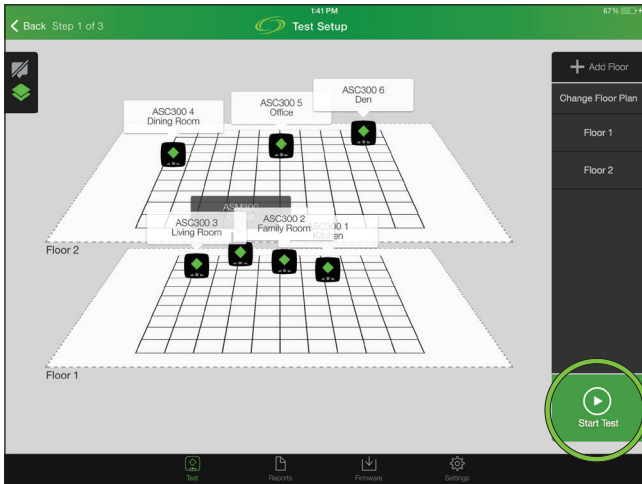6. Location names may be edited at any time prior to starting a test.
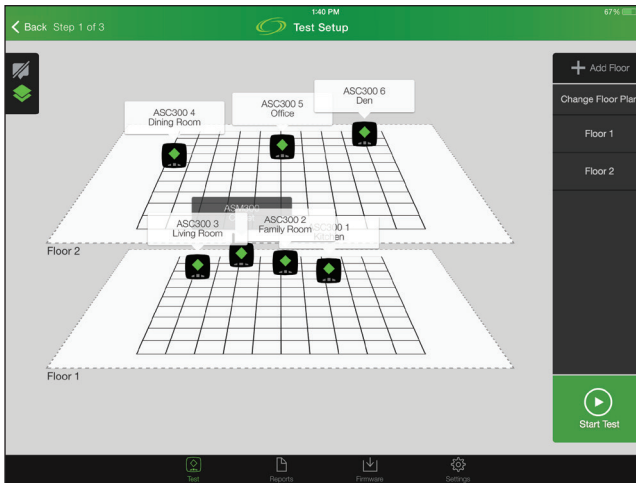
Testing Step 3 – Optimization

Testing can begin after placing the ASM300 and one or more ASC300 devices in the premises and deploying all virtual devices onto the floor plan in the AirScout application.

1. Press **Start Test** to begin the optimization test phase.

2. The optimization phase concludes with recommendations for the optimal 2.4 GHz and 5 GHz channels and AP location. Optimizing the channel and location of the customer's premises equipment can result in significant performance improvements.

3. If within the timeout period a selection is not made, AirScout continues on to the next phase of testing.
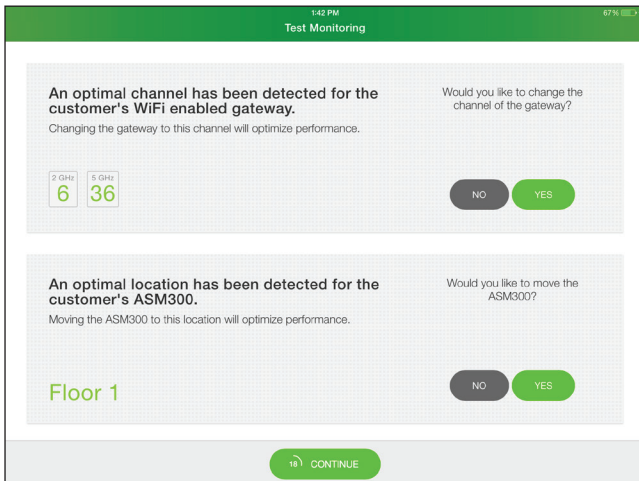
4. Changing the customer's premises equipment to the optimal network channel can minimize network congestion from nearby networks and improve performance.

5. Select **YES** to pause the AirScout application and allow the user time to change the CPE channels.

   Note: Refer to the customer's premises equipment instructions for changing the channel.

6. Moving the customer's premises equipment to the optimal location and floor can significantly improve network performance.

7. Select **YES** to pause the AirScout application and display the optimal location and floor, allowing the user to determine if the CPE can be moved to the optimal location.

8. If the customer's premises equipment can be moved to or near the optimal location, relocate the ASM300 and the customer's premises equipment to the new location on the designated floor.

9. Move the virtual master to the new position on the designated floor and follow the instructions for retesting.

Testing Step 4 – Multi-Dimensional Validation

After accepting or disregarding the optimizations, AirScout performs radio and Wi-Fi application validation. AirScout validation results are displayed using multi-dimensional heat maps, providing an intuitive, easy-to-understand method for visualizing results.

1. At test completion AirScout displays the signal strength in either isometric or single floor plan view.

2. Pressing the multi-dimensional mode control allows the user to choose other result dimensions.
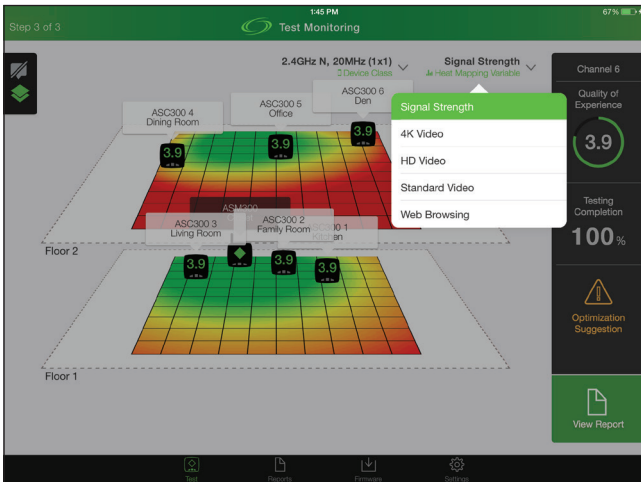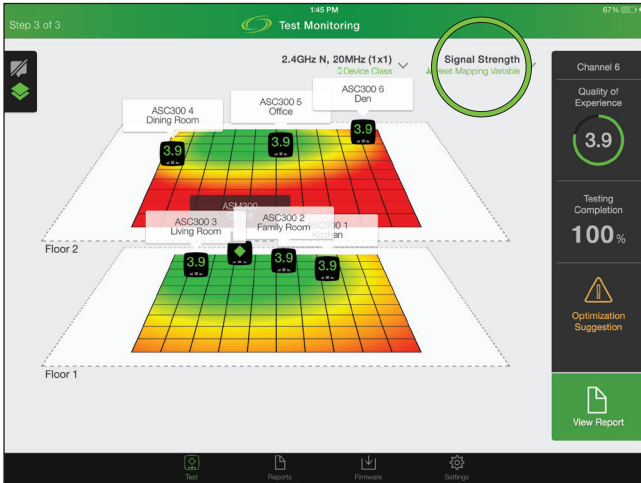
3. Tap the **Device Class** drop down menu to select which 802.11 standard should be visualized; 2.4 GHz (802.11n) or 5 GHz (802.11n/ac) options and multiple permutations are available.
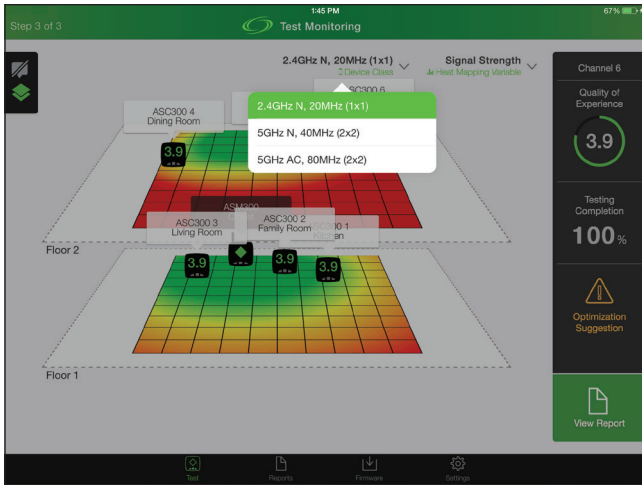
4. Press a client on the multi-dimensional heat map to display room performance metrics.

Correcting Performance Issues

AirScout identifies multiple performance limitations related to signal quality, congestion and interference, providing an opportunity to correct these issues.

Signal Quality

Radio dead zones and weak zones are displayed on the signal strength heat map. Dead zones occur when a Wi-Fi enabled device is outside the radio range of the master or CPE. Weak zones occur when signal strength is low or the signal-to-noise ratio is low.

1. Optimizing the CPE location can, under the right conditions, minimize dead and weak zones.

2. Adding a second access point near the dead or weak zone is often an effective method for eliminating dead or weak zones.

3. Adding a repeater between the working zone and the dead or weak zone is often an effective method for eliminating dead or weak zones, but a repeater operating on the same channel increases congestion, reducing maximum throughput.

Congestion

Congestion, defined by 802.11 as visible network traffic, is displayed on the client room performance metrics menu. AirScout measures congestion due to other networks operating on the same channel competing for radio resources.

1. Selecting the correct 2.4 GHz and 5 GHz CPE channel is the most effective solution for minimizing congestion.

2. Select a 2.4 GHz and 5 GHz CPE channel that is not in use by any other network. It is necessary to have complete AP visibility at every location within the premises where network resources are used.

3. If all channels are in use, select the channel with the minimal number of clients or lowest bandwidth utilization.

4. If all channels are heavily loaded, there may be no channel choice that can satisfy the customer's quality of experience expectations.

Interference

Interference is caused by devices emitting in the 2.4 GHz and 5 GHz 802.11 radio spectrum and is a common problem. This includes 802.11 compliant devices on adjacent channels, 802.11 compliant devices that are not cooperative, microwave ovens, cordless phones, Bluetooth devices, wireless video cameras, wireless game controllers, Zigbee devices, WiMAX, fluorescent lights, and more. Identifying possible common sources of interference and eliminating them from the premises if possible is the best method of minimizing interference.

1. Selecting the correct 2.4 GHz and 5 GHz CPE channel is an effective solution for minimizing interference from other 802.11 compliant devices.

2. Select a 2.4 GHz and 5 GHz CPE channel with the minimal number of adjacent channels.

Congestion and Interference from Other Networks

Congestion and interference are caused by other Wi-Fi networks operating on the same or adjacent channels. Viewing the AP information that AirScout uses to assist in selecting the optimal channel can be informative.

1. Using the AirScout application, press the selected virtual client or master to display device status.

2. To visualize AP information, press **Access Points**.

The selected client or master will display all detected Access Points in its location. AP results can be displayed in graphic or detail formats.
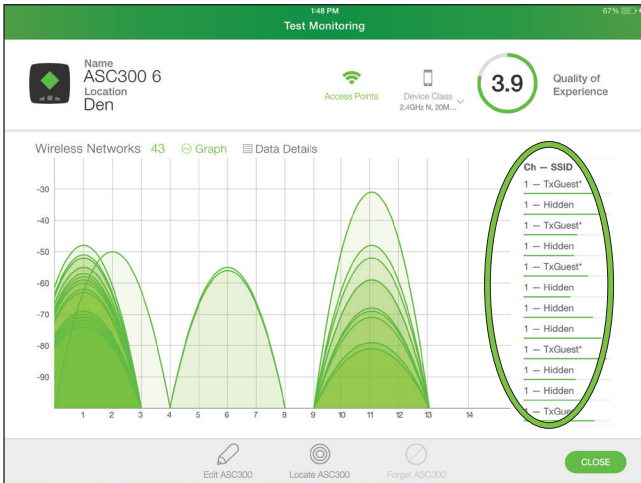
3. Tap the **Device Class** drop down menu to select which type of access point to display (2.4 GHz or 5 GHz). The subclasses (1x1, 2x2, and channel size) are irrelevant for this view.

4. While in graph mode, press any one of the APs listed on the right to highlight the AP signal strength signature.

5. Press **Graph** or **Data Details** to switch the data display type.
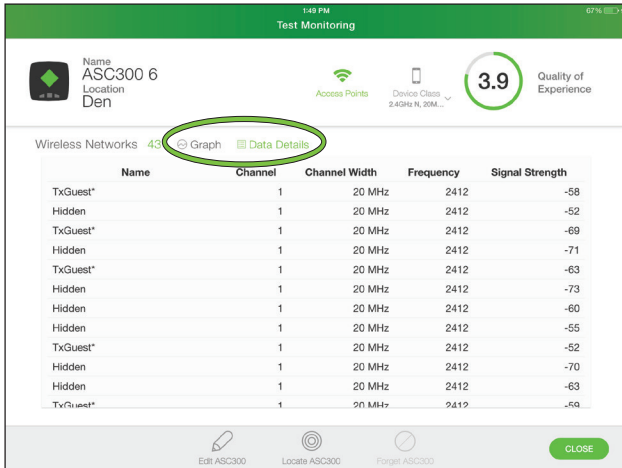
Testing Step 5 – Test Results

After testing is complete, press **View Report** to display all results. The user may navigate the test report to view the multi-dimensional heat maps, optimizations and client room performance metrics. The user may add comments if desired.
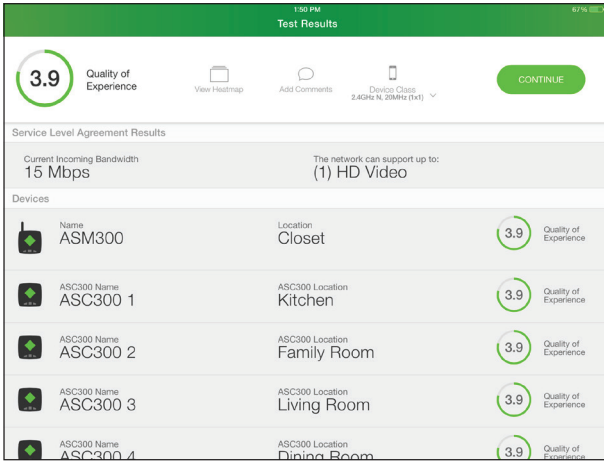
Saving Results

Press **CONTINUE** to move to the results summary screen. At this point, if the job is complete, press **SAVE AND CLOSE JOB**; otherwise, to run a new test, press **ADD NEW TEST**.
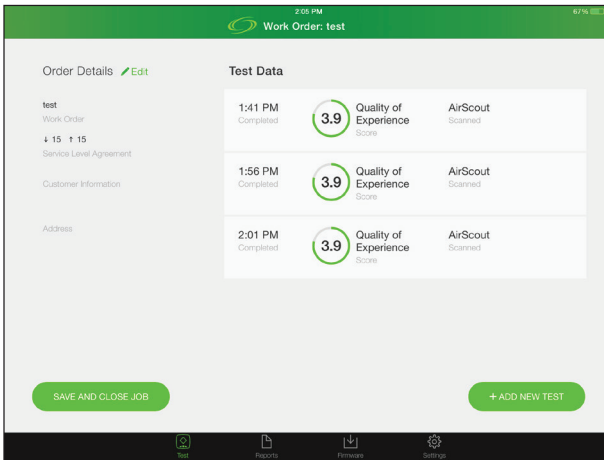
Note: AirScout requires a connection to Greenlee's Cloud Service or the creation of an independent cloud service in order to obtain device firmware updates, store results and retrieve results on the tablet. Please refer to the section "AirScout Cloud Service Management".

QOE – QUALITY OF EXPERIENCE

The AirScout quality of experience (QoE) score is a measure of the customer's experiences with services such as video streaming, audio streaming, gaming, web browsing, etc., delivered over their Wi-Fi network. To determine QoE, AirScout analyzes multiple environmental parameters related to signal quality, congestion, interference and bandwidth. The QoE score provides a quick and intuitive assessment of customer expectations for delivered services with respect to signal quality, congestion, and interference conditions.

ASC – Quality of Experience Score

A QoE score is calculated at each ASC location due to differences in signal quality, congestion and interference, which affect bandwidth and ultimately the customer's experiences in Wi-Fi delivered services. The ASC QoE score provides an assessment of customer expectations for delivered services in each location within the premises, providing quick identification of QoE degradation in one or more locations. Once QoE degradation is identified, the customer can be notified and preventative action can be determined.

QoE Score = Excellent (5)

A QoE Score of 5 is obtained when:

- Signal quality degradation is zero, permitting operation at maximum 802.11 Modulation and Coding Scheme (MCS) Index

- Congestion – None

- Interference – None

- Supported Simultaneous Services (minimum):
    - Two Ultra High Definition (UHD) streaming video sessions
    - Two High Definition (HD) video calling sessions
    - Two Email or Browsing sessions

Note: A QoE score of 5 is not obtainable by IEEE 802.11 a/b/g APs due to bandwidth limitations. IEEE 802.11n and 802.11ac devices require either MIMO or channel bonding capability to obtain a QoE score of 5 due to bandwidth limitations.

QoE Score = Good (4.9 – 4)

A QoE Score of 4.9 – 4.0 is obtained when:

• Signal quality degradation is minor to none, permitting operation at a high 802.11 MCS Index

• Congestion – Minor to None

• Interference – Minor to None

• Supported Simultaneous Services (minimum):

  - One Ultra High Definition (UHD) streaming video session

  - One High Definition (HD) video calling session

  - Two Email or Browsing sessions

Note: A QoE score of 4 is not obtainable by IEEE 802.11 b APs due to bandwidth limitations. A QoE score of 4 may not be obtainable by IEEE 802.11 a/g APs in compromised environments.

QoE Score = Fair (3.9 – 3.0)

A QoE Score of 3.9 – 3.0 is obtained when:

• Signal quality degradation is medium to minor, permitting operation at a mid 802.11 MCS Index

• Congestion – Medium to Minor

• Interference – Medium to Minor

• Supported Simultaneous Services (minimum):

  - One High Definition (HD) streaming video session

  - One High Definition (HD) video calling session

  - Two Email or Browsing sessions

Note: A QoE score of 3 is obtainable by all IEEE 802.11 protocols.

QoE Score = Poor (2.9 – 2.0)

A QoE Score of 2.9 – 2.0 is obtained when:

• Signal quality degradation is strong to medium, permitting operation at a low 802.11 MCS Index

• Congestion – Strong to Medium

• Interference – Strong to Medium

• Supported Simultaneous Services (minimum):

  - One standard definition (SD) streaming video session

  - One standard definition (SD) video calling session

  - Two Email or Browsing sessions

QoE Score = Bad (1.9 – 1.0)

A QoE Score of 1.9 – 1.0 is obtained when:

- Signal quality degradation is severe to strong, permitting operation at only a low 802.11 MCS Index

- Congestion – Severe to Strong

- Interference – Severe to Strong

- Supported Simultaneous Services (minimum):
    - One standard definition (SD) streaming video session
    - Two Email or Browsing sessions

QoE Score = Worst (0.9 – 0)

A QoE Score of 0.9 – 0 is obtained when:

- Signal quality degradation is extreme to severe, preventing operation or permitting operation at only the lowest 802.11 MCS Index

- Congestion – Extreme

- Interference – Extreme

- Supported Services (minimum):
    - QoE = 0 (None)
   - QoE > 0 Customer experience will be awful for all but the lowest bandwidth services

SERVICE LEVEL AGREEMENT ANALYSIS

AirScout can evaluate the bandwidth coming into the premises, defined by the service level agreement (SLA) and the customer's Wi-Fi bandwidth utilization. If AirScout determines the SLA cannot support the customer's bandwidth requirements, AirScout notifies that a bandwidth limitation exists. The customer can be informed of the bandwidth limitation and provided with an option to increase the SLA bandwidth.

RESULTS

The AirScout application allows the user to display recent results and also download results from the Greenlee Cloud Service.

1. Press **Reports**, located in the lower function bar.
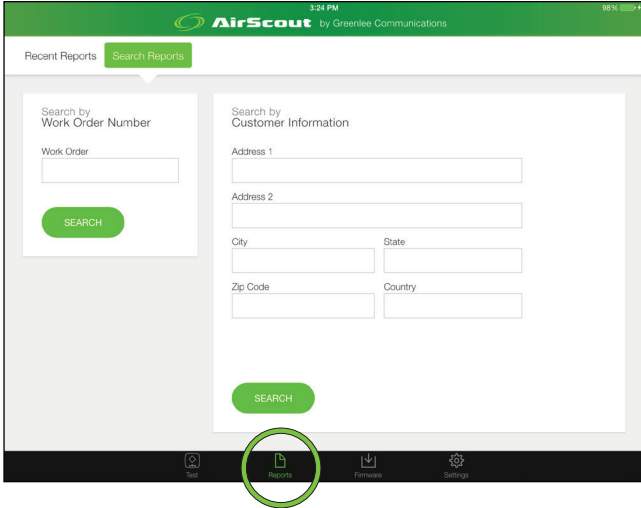
2. Press **Recent Reports** to display recently saved reports.
3. Press **Search Reports** to search the Greenlee Cloud Service for saved reports by work order number or by customer information.

Note: AirScout requires a connection to Greenlee's Cloud Service or the creation of an independent cloud service in order to obtain device firmware updates, store results and retrieve results on the tablet. Please refer to the section "AirScout Cloud Service Management".

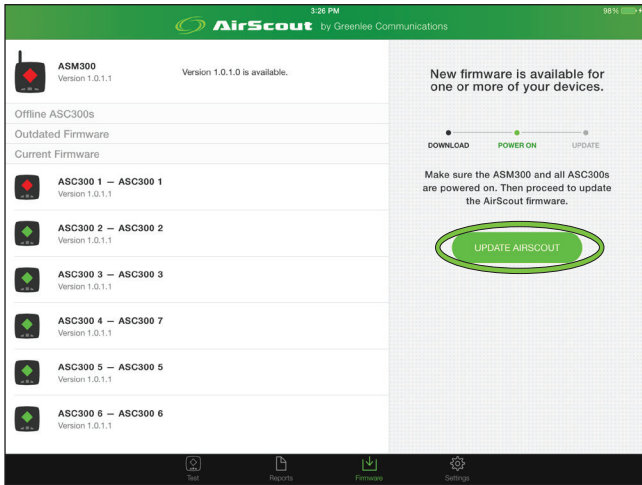# FIRMWARE – UPDATING AIRSCOUT DEVICES

The AirScout application alerts the user when new device firmware is available. Prior to updating the AirScout ASM300 and ASC300 firmware, ensure the tablet is connected to the master device and all client devices are connected to the master. ASC300 and ASM300 devices with the latest firmware will display a green diamond, devices with out-of-date firmware will display a red diamond, and devices that are not connected will display a gray diamond.

1. Press **Firmware**, located in the lower function bar.
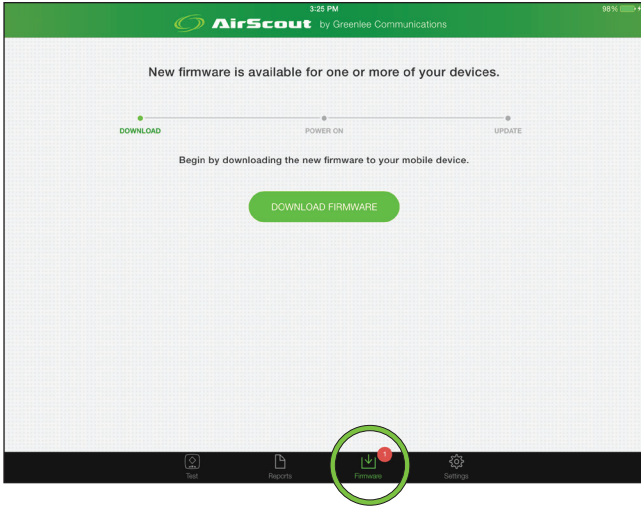
2. Press **DOWNLOAD FIRMWARE** to obtain the latest firmware from the Greenlee Cloud Service.

3. After downloading is complete, AirScout displays client device and firmware status.

4. Press **UPDATE AIRSCOUT** to begin the firmware update process. During the firmware update process AirScout will indicate ASC300 progress followed by ASM300 progress.


5. AirScout will notify the user when the firmware update is complete.

6. All ASC300 devices need to be at the same firmware version. Use the firmware update process to bring all ASC300 devices to the same firmware version.

Note: AirScout requires a connection to Greenlee's Cloud Service or the creation of an independent cloud service in order to obtain device firmware updates, store results and retrieve results on the tablet. Please refer to the section "AirScout Cloud Service Management".

SETTINGS

The AirScout application allows the user to change settings related to the Greenlee Cloud Server and Configurations.

1. Press **Settings**, located in the lower function bar.
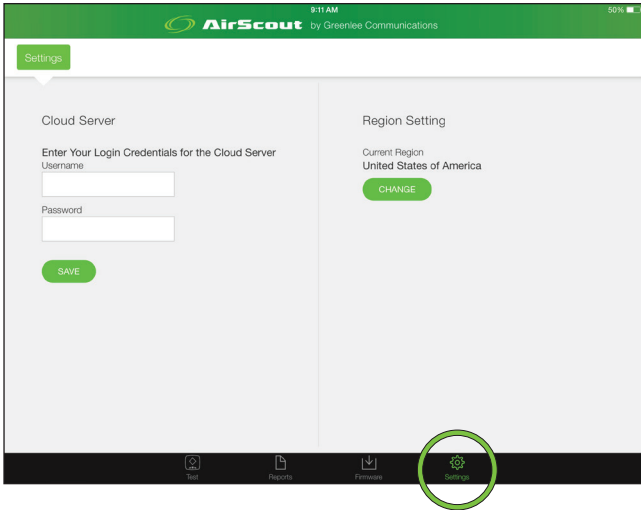
2. Enter the username and password, and then press **SAVE** to access the cloud server.