



AirPlay

Product Compliance Test Plan

-Audio Streaming Devices

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Authors:

Apple



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1 Overview

1.1 Introduction and Scope

The purpose of this test plan is to specify the testing that vendors **MUST** perform to verify that their products conform to the AirPlay specification provided by Apple Inc. Section 3.1 describes tests that **MUST** be run and successfully completed for all AirPlay products. In addition, Section 3.1 also contains test that are optional but are required to be tested if implemented.

1.2 Terms and Definitions

Term	Definition
IE	Information Element
AP	Access Point
AU	AirPort Utility
STA	Non-AP 802.11 station
BSSID	Basic Service Set Identifier
SSID	Service Set Identifier
MAC	Media Access Control
BSS	Basic Service Set
ESS	Extended Service Set
DS	Distribution System
DUT	Device Under Test
URL	Uniform Resource Locator
PHY	Physical Layer (802.11a, b, g, n, ac)
OOB	Out of the Box

1.3 Applicability of Tests

AirPlay is an evolution of Apple's AirTunes technology, allowing for music to be played seamlessly over any IP connected device. As such, all network interfaces are acceptable to run AirPlay, however it is understood that all AirPlay DUTs will not implement all of the possible network interfaces and thus only the network interface that are implemented will need to be tested.

1.4 Minimum Requirements

While not necessarily required to run AirPlay as a feature, the following are minimum requirements to complete the test suites that are included in this test plan.

- MacBook or MacBook Pro running OS X 10.8.2 or greater
- iTunes 10.7 or greater
- Apple AirPort Extreme 802.11n (5th Generation) Base Station running 7.6.4 or greater
- Apple AirPort Express 802.11n (2nd Generation) running 7.6.4 or greater

- Apple AirPort Utility 6.3.1 or greater
- Apple iPad/iPhone/iPod Touch running iOS 6.0.1 or greater (iPad is recommended)

2 Test Tools and Methodology

2.1 Safari

Some tests will require the use of Safari. These tests should use the latest version of Safari available for the test platform.

Before performing these tests, ensure that the “Include Bonjour in the Bookmarks menu” option is enabled in the Safari Preferences pane, under the “Advanced” tab.

When a test refers to accessing the Bonjour list, you may find this in the Bookmarks menu bar, under the “Bonjour” menu bar item.

2.2 dns-sd

Some tests require the ability to query specific Bonjour records. In order to get the Bonjour information, some tests will require the use of dns-sd, a standard tool provided in OS X. Please refer to the Unix man page provided with dns-sd for usage details not provided in this document.

2.3 iperf

iPerf is a network bandwidth performance tool used for testing both TCP and UDP performance with various options to test network quality metrics. All necessary options for operation for this test plan will be provided for each test case that iPerf is necessary.

2.4 Test Environment

The following test beds are designed and specified for each test case in this test plan. While not all DUTs will need to use every test bed, the minimum requirement for every test bed is a wired OS X computer running the latest version of iTunes and a simultaneous dual band Apple Base Station, running the latest firmware.

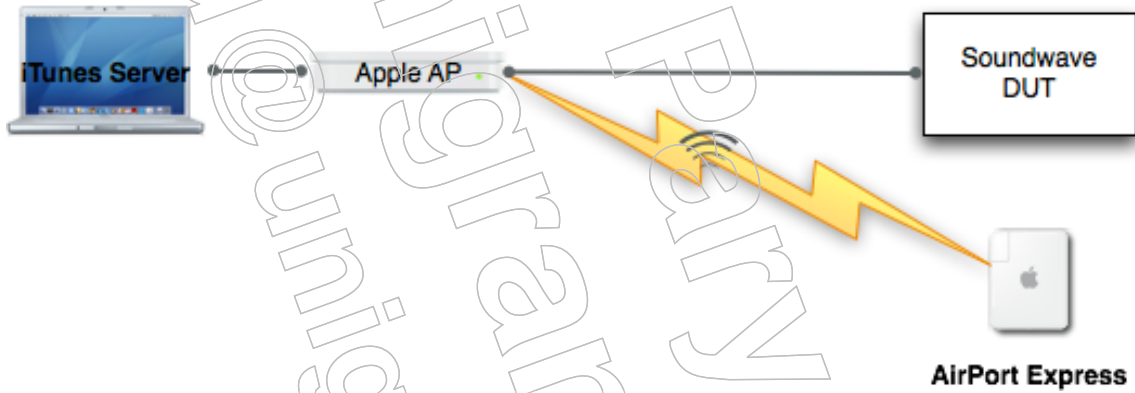
2.4.1 Test bed 1 [1]



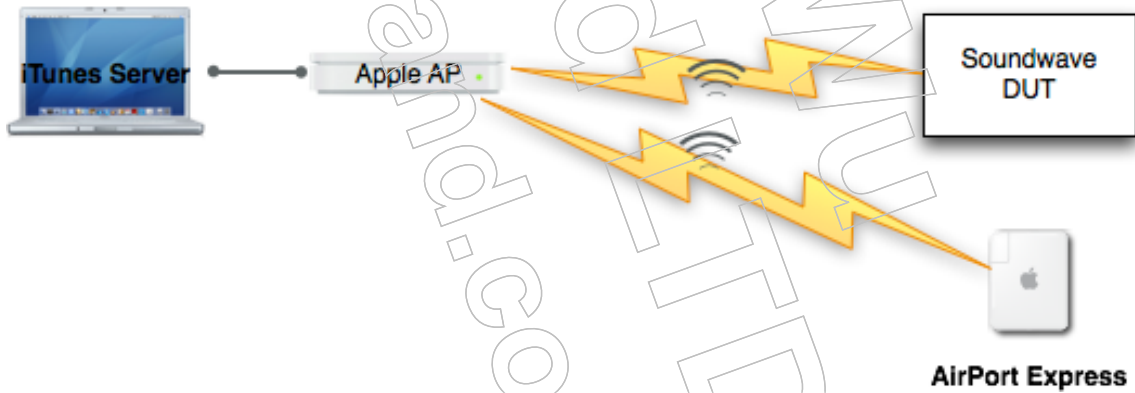
2.4.2 Test bed 2 [2]



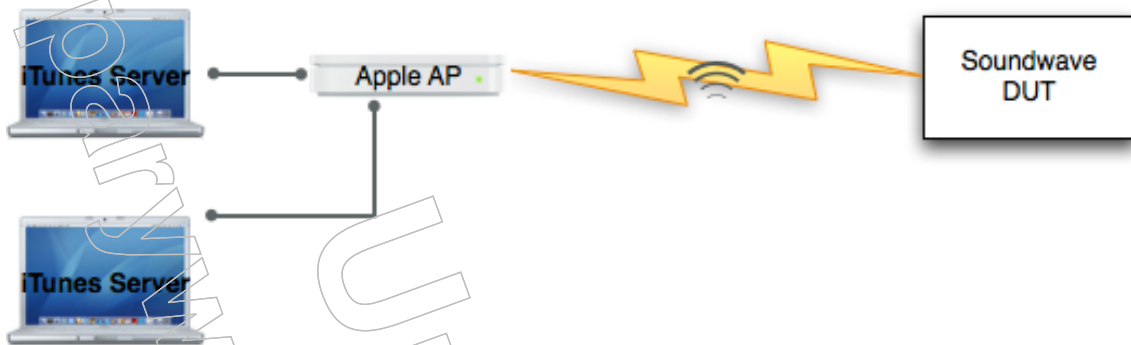
2.4.3 Test Bed 3 [3]



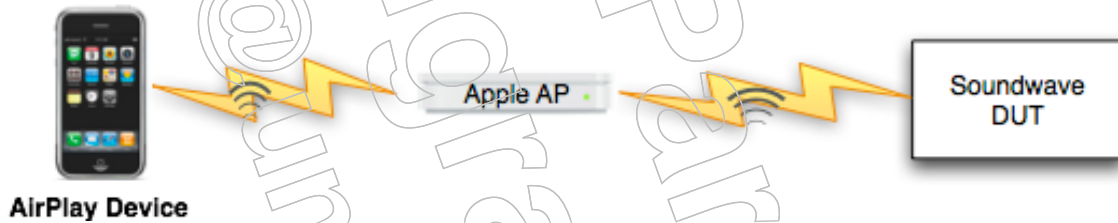
2.4.4 Test Bed 4 [4]



2.4.5 Test Bed 5 [5]



2.4.6 Test Bed 6 [6]



3 AirPlay Testing

The following test cases must be completed successfully to ensure compliance with the AirPlay specification and interoperability with Apple Base Station product lines. While it is possible to implement AirPlay without an Apple Base Station, all tests will be done with an Apple Base Station (AirPort Extreme or Time Capsule) product because certain features of the Base Station are required to complete all of the testing.

3.1 Firmware Upgrade

Customer accessible product firmware upgrade is a required feature of AirPlay Audio devices. All supported firmware upgrade methodologies must be tested and verified as a part of AirPlay product compliance testing.

3.1.1.1 Web Based Firmware Upgrade Test

Test Environment		[1] and/or [2]	
Step	DUT	Web Browser	Expected Behavior
1	Power on the DUT.		
2	Conduct applicable tests from section 3.2.1 – 3.2.4		
3	Connect the DUT to the network. There are two options here, either		Verify the device that has just been added to the network appears as a speaker in iTunes within 30 seconds, or else FAIL.

	Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		
4		From Safari, select the DUT from the Bonjour list	The speaker should be able to be selected without and error, or else FAIL.
5		Follow the onscreen instructions to conduct a firmware update to the _telnet image provided.	The unit should firmware update and rejoin the network, or else FAIL.
6	Conduct tests from section 3.2.5		
7		From Safari, select the DUT from the Bonjour list	The speaker should be able to be selected without and error, or else FAIL.
8		Follow the onscreen instructions to conduct a firmware update to the _production image provided.	The unit should firmware update and rejoin the network, or else FAIL.
9	Conduct remainder of test plan.		

3.1.1.2 Generic Firmware Upgrade Test

Note: This test shall be repeated for all available upgrade methodologies available to the end user.

Test Procedure	
Step	DUT
1	Power on the DUT.

2	Conduct applicable tests from sections 3.2.1 – 3.2.4
2	Use the web interface to upgrade firmware to debug image provided.
3	Conduct tests from section 3.2.5
4	Use the web interface to upgrade firmware to production image provided.
5	Conduct remainder of test plan.

3.2 Networking Test Cases

Network connectivity is a requirement for AirPlay and may be implemented either via Ethernet (802.3) or Wireless (802.11). Only the implemented features are required to be tested; however if a DUT contains both interfaces, both must be tested.

3.2.1 Wired

If the DUT contains an Ethernet Port, the following test must be completed successfully.

3.2.1.1 Link Layer Connection Auto Negotiation

Test Environment		[1]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2		In the AirPort Utility go to Internet-> Internet connection and make sure the Connection Sharing is set to “Share a public IP address”. Then set the Ethernet WAN Port to Automatic and click update.	
3	Using an Ethernet wire, connect the DUT to the WAN port on the Base Station.		The green light on the port that the DUT is connected to should illuminate to indicate link and some indication on the DUT should also indicate a link. (This can be a light on the DUT’s Ethernet port, like the Base Station or some other form).

3.2.2 Wireless

If the DUT contains a Wireless (802.11) interface, the following tests must be completed successfully. Each DUT that supports Wireless must, at minimum, support 802.11g. All support PHYs must be tested.

3.2.2.1 Association Verification

AirPlay DUTs have two options of how to be configured based on whether there is an interface that allows for the SSID and security modes to be configured. Only run the test that applies to your DUT.

3.2.2.1.1 Out of the Box Association Verification

The following tests assume the device has had no configuration done to the DUT and is still in its factory default state.

3.2.2.1.1.1 Web Interface

Test Environment		[2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Wait for DUT to complete booting.		The DUT should begin beaconing 802.11 beacons and advertising as an 802.11 network with a SSID that is descriptive of the DUT. At minimum the indication of the manufacturer should be present, with no security enabled.
3		Using the iTunes server, associate wirelessly to the DUT.	The iTunes server should be able to associate on the 2.4GHz band using 802.11b/g with no security and receive a network that is on the same IPv4 network as the DUT. If the DUT does not have a DHCP server and instead would like to use the IPv4 link local IP space, this must be specified in manufacturer's documentation.
4		Using Safari on the iTunes server connect to the IP address that is provided by the manufacturer for the DUT.	The webpage should appear without problems and if a password is required, this also should be provided in the manufacturer's documentation.
5	Configure the DUT to connect		The DUT MUST have a way to manually enter the SSID for the wireless network and

	to the wireless network on the Apple Base Station. Minimally their needs to be away to manually specify the SSID and security, however there can also be a way to select from a list obtained via scanning.		select a security mode. Optionally it can create a list (scan list) for the user pick their network from, if desired. Once the device is connected to the Base Station, there MUST be some indication on the DUT that device is connected.
6		Open the AU and verify the settings are correct.	In the Apple AU, go to Advanced->Logs and Statistics->Wireless Clients. In list box look for the MAC address that was collected from the Step 1. Verify that Type that is listed is one of the following options: 802.11b/g, 802.11g, 802.11a, 802.11a/n, 802.11b/g/n, or 802.11g/n. If any other Type is present, FAIL. Next go to Advanced->Logs and Statistics->DHCP clients, and In list box look for the MAC address that was collected from the Step 1. If the MAC address is not present, FAIL.
7		Open Safari on the iTunes Server and attempt to connect to the web server on the DUT with the address it just received.	Safari should be able to navigate to the web server, or else FAIL. All of the settings that were entered in previous steps should be reflected in the user interface.

3.2.2.1.1.2 User Configurable Interface

Test Environment		[2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT. Note the MAC address of		

	the DUT.		
2		Configure the Base Station to its OOB configuration and note the SSID that is present. It should be something in the form of Apple Network XXXXXX.	
3	Use the user interface on the DUT to connect to the Base Station Network with no security. There should be, at a minimum, some way to enter the SSID manually and the security mode. Optionally there can also be a way to select the SSID from a collected list.		The DUT MUST have a way to manually enter the SSID for the wireless network and select a security mode. Optionally it can create a list (scan list) for the user pick their network from, if desired. Once the device is connected to the Base Station, there MUST be some indication on the DUT that device is connected.
4		Open the AU and verify the settings are correct.	In the Apple AU, go to Advanced->Logs and Statistics->Wireless Clients. In list box look for the MAC address that was collected from the Step 1. Verify that Type that is listed is one of the following options: 802.11b/g, 802.11g, 802.11a, 802.11a/n, 802.11b/g/n, or 802.11g/n. If any other Type is present, FAIL. Next go to Advanced->Logs and Statistics->DHCP clients, and In list box look for the MAC address that was collected from the Step 1. If the MAC address is not present, FAIL.

3.2.2.1.2 Previously Configured Association Verification

The following tests assume that the DUT has already been configured and can be accessed via a user configurable interface.

3.2.2.1.2.1 802.11b/g Association Verification

If the DUT supports 802.11b/g the following test must be run.

Test Environment		[2]	
Step	DUT	Base Station	Expected Behavior
1		Power on the Base Station and connect to it via the Apple AirPort Utility. In the AirPort Utility select "Manual Setup".	
2		On the bar across the top of the AirPort Utility, select "Wireless"	
3		Under the Section that says "Wireless Network Name:" change it to Soundwave24. Then under the "Radio Mode:" pull down menu select, 802.11a – 802.11b/g.	
4		Click "Wireless Network Options". Check the box that says "5GHz Network Name" and the box should be come editable. Change the name to Soundwave5 and click Done. Then click update on the AirPort Utility.	

		The AirPort Utility may prompt for various errors and all of them can be ignored.	
5	Power on the DUT. Note the MAC address of the DUT.		
6	Use the user interface on the DUT to connect to the Base Station Network with no security and Network Name of Soundwave24. There should be, at a minimum, someway to enter the SSID manually and the security mode. Optionally there can also be a way to select the SSID from a collected list.		
7		Open the AU and verify the settings are correct.	In the Apple AU, go to Advanced->Logs and Statistics->Wireless Clients. In list box look for the MAC address that was collected from the Step 1. Verify that Type that is listed is one of the following options: 802.11b/g or 802.11g. If any other Type is present or if the MAC address is not present, FAIL. Next go to Advanced->Logs and Statistics->DHCP clients, and In list box look for the MAC address that was collected from the Step 1. If the MAC address is not present, FAIL.

3.2.2.1.2.2 802.11a Association Verification

If the DUT supports 802.11a the following test must be run.

Test Environment		[2]	
Step	DUT	Base Station	Expected Behavior
1		Power on the Base Station and connect to it via the Apple AirPort Utility. In the AirPort Utility select "Manual Setup".	
2		On the bar across the top of the AirPort Utility, select "Wireless"	
3		Under the Section that says "Wireless Network Name:" change it to Soundwave24. Then under the "Radio Mode:" pull down menu select, 802.11 a – 802.11b/g.	
4		Click "Wireless Network Options". Check the box that says "5GHz Network Name" and the box should be come editable. Change the name to Soundwave5 and click Done. Then click update on the AirPort Utility. The AirPort Utility may prompt for various errors and all of them	

		can be ignored.	
5	Power on the DUT. Note the MAC address of the DUT.		
6	Use the user interface on the DUT to connect to the Base Station Network with no security and Network Name of Soundwave5. There should be, at a minimum, some way to enter the SSID manually and the security mode. Optionally there can also be a way to select the SSID from a collected list.		
7		Open the AU and verify the settings are correct.	In the Apple AU, go to Advanced->Logs and Statistics->Wireless Clients. In list box look for the MAC address that was collected from the Step 1. Verify that Type that is listed is one of the following options: 802.11a. If any other Type is present or if the MAC address is not present, FAIL. Next go to Advanced->Logs and Statistics->DHCP clients, and In list box look for the MAC address that was collected from the Step 1. If the MAC address is not present, FAIL.

3.2.2.1.2.3 802.11n (5GHz) Association Verification

If the DUT supports 802.11n (5GHz) the following test must be run.

Test Environment		[2]	
Step	DUT	Base Station	Expected Behavior
1		Power on the	

		Base Station and connect to it via the Apple AirPort Utility. In the AirPort Utility select “Manual Setup”.	
2		On the bar across the top of the AirPort Utility, select “Wireless”	
3		Under the Section that says “Wireless Network Name:” change it to Soundwave24. Then under the “Radio Mode:” pull down menu select, 802.11a/n – 802.11b/g/n.	
4		Click “Wireless Network Options”. Check the box that says “5GHz Network Name” and the box should be come editable. Change the name to Soundwave5 and click Done. Then click update on the AirPort Utility. The AirPort Utility may prompt for various errors and all of them can be ignored.	
5	Power on the DUT. Note the MAC address of		

	the DUT.		
6	Use the user interface on the DUT to connect to the Base Station Network with no security and Network Name of Soundwave5. There should be, at a minimum, some way to enter the SSID manually and the security mode. Optionally there can also be a way to select the SSID from a collected list.		
7		Open the AU and verify the settings are correct.	In the Apple AU, go to Advanced->Logs and Statistics->Wireless Clients. In list box look for the MAC address that was collected from the Step 1. Verify that Type that is listed is: 802.11a/n. If any other Type is present or if the MAC address is not present, FAIL. Next go to Advanced->Logs and Statistics->DHCP clients, and In list box look for the MAC address that was collected from the Step 1. If the MAC address is not present, FAIL.

3.2.2.1.2.4 802.11n (2.4GHz) Association Verification

If the DUT supports 802.11 (2.4GHz) the following test must be run.

Test Environment		[2]	
Step	DUT	Base Station	Expected Behavior
1		Power on the Base Station and connect to it via the Apple AirPort Utility. In the AirPort	

		Utility select “Manual Setup”.	
2		On the bar across the top of the AirPort Utility, select “Wireless”	
3		Under the Section that says “Wireless Network Name:” change it to Soundwave24. Then under the “Radio Mode:” pull down menu select, 802.11a/n – 802.11b/g/n.	
4		Click “Wireless Network Options”. Check the box that says “5GHz Network Name” and the box should be come editable. Change the name to Soundwave5 and click Done. Then click update on the AirPort Utility. The AirPort Utility may prompt for various errors and all of them can be ignored.	
5	Power on the DUT. Note the MAC address of the DUT.		
6	Use the user interface on the DUT to connect to the Base		

	<p>Station Network with no security and Network Name of Soundwave24. There should be, at a minimum, some way to enter the SSID manually and the security mode. Optionally there can also be a way to select the SSID from a collected list.</p>		
7		<p>Open the AU and verify the settings are correct.</p>	<p>In the Apple AU, go to Advanced->Logs and Statistics->Wireless Clients. In list box look for the MAC address that was collected from the Step 1. Verify that Type that is listed is: 802.11b/g/n. If any other Type is present or if the MAC address is not present, FAIL.</p> <p>Next go to Advanced->Logs and Statistics->DHCP clients, and In list box look for the MAC address that was collected from the Step 1. If the MAC address is not present, FAIL.</p>

3.2.2.2 Security Mode Verification

All AirPlay DUTs must support no security (None) and WPA2-PSK (AES) at minimum. Other security modes are supported by the Apple Base Station and other 3rd party AP products however only those two will be tested.

3.2.2.2.1 WPA2-PSK

Test Environment		[2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT. Note the MAC address of the DUT.		
2		Configure the Base Station to	

		<p>its OOB configuration and note the SSID that is present. It should be something in the form of Apple Network XXXXXX. Configure the Base Station with WPA2-PSK Security with a Pass phrase of 12345678.</p>	
3	<p>Use the user interface on the DUT to connect to the Base Station Network with WPA2-PSK with a Pass Phrase of 12345678. There should be, at a minimum, some way to enter the SSID manually and the security mode. Optionally there can also be a way to select the SSID from a collected list.</p>		<p>The DUT MUST have a way to manually enter the SSID for the wireless network and select a security mode. Optionally it can create a list (scan list) for the user pick their network from, if desired. Once the device is connected to the Base Station, the DUT MUST indicate it is connected based on [Table 1].</p>
4		<p>Open the AU and verify the settings are correct.</p>	<p>In the Apple AU, go to Advanced->Logs and Statistics->Wireless Clients. In list box look for the MAC address that was collected from the Step 1. Verify that Type that is listed is one of the following options: 802.11b/g, 802.11g, 802.11a, 802.11a/n, 802.11b/g/n, or 802.11g/n. If any other Type is present, FAIL. Next go to Advanced->Logs and Statistics-</p>

		>DHCP clients, and in list box look for the MAC address that was collected from the Step 1. If the MAC address is not present, FAIL.
--	--	--

3.2.2.2.2 WPA/WPA2-PSK (TKIP Group Key Verification)

Test Environment		[2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT. Note the MAC address of the DUT.		
2		Configure the Base Station to its OOB configuration and note the SSID that is present. It should be something in the form of Apple Network XXXXXX. Configure the Base Station with WPA/WPA2-PSK Security with a Pass phrase of 12345678.	
3	Use the user interface on the DUT to connect to the Base Station Network with WPA2-PSK with a Pass Phrase of 12345678. There should be, at a minimum, someway to		The DUT MUST have a way to manually enter the SSID for the wireless network and select a security mode. Optionally it can create a list (scan list) for the user pick their network from, if desired. Once the device is connected to the Base Station, the DUT MUST indicate it is connected based on Table 1 .

	enter the SSID manually and the security mode. Optionally there can also be a way to select the SSID from a collected list.		
4		Open the AU and verify the settings are correct.	In the Apple AU, go to Advanced->Logs and Statistics->Wireless Clients. In list box look for the MAC address that was collected from the Step 1. Verify that Type that is listed is one of the following options: 802.11b/g, 802.11g, 802.11a, 802.11a/n, 802.11b/g/n, or 802.11g/n. If any other Type is present, FAIL. Next go to Advanced->Logs and Statistics->DHCP clients, and in list box look for the MAC address that was collected from the Step 1. If the MAC address is not present, FAIL.

3.2.2.2.3 WPA/WPA2-PSK (WPA-PSK (TKIP) Verification)

This needs to be tested if the DUT can select WPA-Personal as a possible security mode.

Test Environment		[2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT. Note the MAC address of the DUT.		
2		Configure the Base Station to its OOB configuration and note the SSID that is present. It should be something in the form of Apple Network XXXXXX. Configure the Base Station	

		with WPA/WPA2-PSK Security with a Pass phrase of 12345678.	
3	Use the user interface on the DUT to connect to the Base Station Network with WPA-PSK with TKIP encryption with a Pass Phrase of 12345678. There should be, at a minimum, someway to enter the SSID manually and the security mode. Optionally there can also be a way to select the SSID from a collected list.		The DUT MUST have a way to manually enter the SSID for the wireless network and select a security mode. Optionally it can create a list (scan list) for the user pick their network from, if desired. Once the device is connected to the Base Station, the DUT MUST indicate it is connected based on Table 1 .
4		Open the AU and verify the settings are correct.	In the Apple AU, go to Advanced->Logs and Statistics->Wireless Clients. In list box look for the MAC address that was collected from the Step 1. Verify that Type that is listed is one of the following options: 802.11b/g, 802.11g, 802.11a, 802.11a/n, 802.11b/g/n, or 802.11g/n. If any other Type is present, FAIL. Next go to Advanced->Logs and Statistics->DHCP clients, and in list box look for the MAC address that was collected from the Step 1. If the MAC address is not present, FAIL.

3.2.3 IP Connectivity

IP connectivity is required for all AirPlay devices, with a minimum of IPv4 with a DHCP client to be implemented. It is preferred that an IPv6 stack is also implemented; however this is not required, but highly recommended. If a dual stack (IPv4 and IPv6) is

implemented, both will need to be verified. (These tests must be repeated for all interfaces, Ethernet and/or Wireless, if both are present.)

3.2.3.1 IPv4 DHCP

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT. Note the MAC address of the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. Additionally, if Wireless is supported this test must be repeated for both No Security and WPA2-PSK.		Once connected to the network, open the Apple AU and go to Advanced->Logs and Statistics->DHCP clients, and in list box look for the MAC address that was collected from the Step 1. If the MAC Address is not present, FAIL. If the MAC address is present, note the IP Address next to the MAC Address and note the "Lease Time".
3		On the iTunes server connected to the Base Station ping the IP address that was collected from Step 2.	If all the pings are successful, then PASS, else FAIL.
4	Reboot the DUT and wait for it to come back up.		Once connected to the network, open the Apple AU and go to Advanced->Logs and Statistics->DHCP clients, and in list box look for the MAC address that was collected from the Step 1. If the MAC Address is not present, FAIL. If the MAC address is present, note the "Lease Time" and make sure it has been updated than what was in Step 2.

3.2.4 IPv6 Connectivity

It is highly recommended that IPv6 is also implemented on all AirPlay DUTs and these tests must be run if IPv6 is implemented. (These tests must be repeated for all interfaces, Ethernet and/or Wireless, if both are present.)

3.2.4.1 IPv6 Link Local

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT. Note the MAC address of the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. Additionally, if Wireless is supported this test must be repeated for both No Security and WPA2-PSK.		For IPv6 there may be no indication that the DUT has an IPv6 address if it is just using a link local address. If this is the case, the manufacturer must either provide the IPv6 address in the user interface or some documentation on how to obtain this IP address.
3		On the iTunes server connected to the Base Station ping, using the ping6 command, the IP address that was collected from Step 2.	If all the pings are successful, then PASS, else FAIL.

3.2.5 PHY Performance

All wired tests must be conducted from host machine to base station, to DUT.

All wireless tests must be conducted on an Apple approved rate vs. range test bed. The test bed may be line of sight or non-line of sight but must be conducted in a clean RF environment as confirmed by a spectrum analyzer. At Apple, these tests are conducted in an office environment with walls and hallways interfering with direct line of sight between the units. The DUT and AP are positioned on the same vertical plane, approximately 1m off the ground. The DUT is rotated about its vertical axis at a rate of 1 RPM during iPerf testing. Tests are required on channels 1 and 11 in the 2.4Ghz band and channels 36 and 161 if the 5Ghz band is supported.

3.2.5.1 Wired Performance

Test Environment		[1]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the Base Station via a wired connection. The DUT should be set to its out of the box configuration.		
3	On the DUT start iperf with the following command. iperf -s -u -i 1 -w 128k		
4		On the iTunes server connected to the Base Station start iperf with the following command. iperf -c IP_of_DUT -u -b 10M -t 120 -i 1 -w 128k	The bandwidth output at the end of the test must be greater than 5Mb/s.

3.2.5.2 Wireless Performance (100 ft)

Test Environment		[2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the Base Station and make sure the DUT is within 100ft of the base station and is associated at the DUT's highest PHY rate.		Verify in the Apple Airport Utility the DUT connected as an RSSI of > -75dB.
3	On the DUT start iperf with the following command. iperf -s -u -i 1 -w 128k		
4		On the iTunes server connected to the Base Station start iperf with the following command. iperf -c IP_of_DUT -u -b 5M -t 120 -i 1 -w 128k	The bandwidth output at the end of the test must be greater than 4.9Mb/s with a packet loss < 0.1% on both channels 1 and 11

3.3 AirPlay Test Cases

3.3.1 Bonjour TXT Records

3.3.1.1 Bonjour ADD and RMV via browsing

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the		

	<p>DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.</p>		
3		<p>On the iTunes server connected to the Base Station, issue the following command in a Terminal and leave it running. dns-sd -B _raop</p>	<p>A Bonjour record should appear with the following format: Timestamp A/R Flags if Domain Service Type Instance Name</p> <p>The A/R should have “Add” below it, if this is true, PASS. The Service Type should have “_raop._tcp.” below it, if this is true, PASS. The Instance have “MACADDRESS@DeviceName” below it, if this is true, PASS. (Example: 78CA3901C341@AirTunes)</p>
4	<p>Power off or shut down the DUT in a controlled manner. (Pulling the power out is NOT a controlled manner.)</p>		<p>In the same terminal as in step 2, a Bonjour record should appear with the following format: Timestamp A/R Flags if Domain Service Type Instance Name</p> <p>The A/R should have “Rmv” below it, if this is true, PASS. The Service Type should have “_raop._tcp.” below it, if this is true, PASS. The Instance have “MACADDRESS@DeviceName” below it, if this is true, PASS. (Example:</p>

		78CA3901C341@AirTunes)
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3.3.1.2 Bonjour TXT Record Lookup

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		
3		<p>On the iTunes server connected to the Base Station, issue the following command in a Terminal.</p> <pre>dns-sd -B _raop</pre> <p>Use Control-C to stop dns-sd at the end of this step.</p>	<p>A Bonjour record should appear with the following format:</p> <pre>Timestamp A/R Flags if Domain Service Type Instance Name</pre> <p>The A/R should have "Add" below it, if this is true, PASS. The Service Type should have "_raop._tcp." below it, if this is true, PASS. The Instance have "MACADDRESS@DeviceName" below it, if this is true, PASS. (Example: 78CA3901C341@AirTunes)</p> <p>Note the Instance Name, Domain, and Service Type.</p>

4		<p>On the iTunes server connected to the Base Station, issue the following command in a Terminal.</p> <pre>dns-sd -L Instance Name _raop local.</pre> <p>(Example: dns-sd -L 78CA3901C341@AirTunes _raop local.)</p>	<p>The Bonjour record needs to contain a minimum of the following TXT records (a value is specified that is the requirement for field):</p> <pre>am=<vendor model name> cn=0,1 da=true et=0,4 fv= <AirPlay firmware version>.<MCU firmware version>.<vendor custom> (unused fields should contain a 0 and the AirPlay firmware version field should start with a "p" or "s" only, followed by a number) md=(This may only be present if the device displays the meta data options selected) pw=(required only if a password is required) tp=UDP vn=65537 vs=190.9.p6 (Populated by AirPlay source code)</pre> <p>(No field should be left empty, any field that contains no data should not be present.)</p> <p>If all of the fields are present then PASS, else FAIL.</p>
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3.3.1.3 Bonjour IP Lookup

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or		

	Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		
3		<p>On the iTunes server connected to the Base Station, issue the following command in a Terminal.</p> <pre>dns-sd -B _raop</pre> <p>Use Control-C to stop dns-sd at the end of this step.</p>	<p>A Bonjour record should appear with the following format:</p> <pre>Timestamp A/R Flags if Domain Service Type Instance Name</pre> <p>The A/R should have “Add” below it, if this is true, PASS. The Service Type should have “_raop._tcp.” below it, if this is true, PASS. The Instance have “MACADDRESS@DeviceName” below it, if this is true, PASS. (Example: 78CA3901C341@AirTunes)</p> <p>Note the Instance Name.</p>
4		<p>Obtain the IP address that is listed in the Apple AU under the DHCP clients for this MAC address.</p> <p>On the iTunes server connected to the Base Station, issue the following command in a Terminal.</p> <pre>ping IP address</pre> <p>Use Control-C to stop dns-sd at the end of this step.</p>	<p>If ping is unsuccessful, FAIL.</p>
5		<p>If the DUT also supports</p>	<p>If ping is unsuccessful, FAIL.</p>

		<p>IPv6, on the iTunes server connected to the Base Station, issue the following command in a Terminal.</p> <p>ping6 IP address</p> <p>Use Control-C to stop dns-sd at the end of this step.</p>	
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3.3.1.4 Bonjour TXT Record Change based on Speaker Name Change

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		
3		<p>On the iTunes server connected to the Base Station, issue the following command in a Terminal and leave it running.</p> <p>dns-sd -B _raop</p>	<p>A Bonjour record should appear with the following format:</p> <p>Timestamp A/R Flags if Domain Service Type Instance Name</p> <p>The A/R should have “Add” below it, if this is true, PASS.</p> <p>The Service Type should have “_raop._tcp.” below it, if this is true, PASS.</p> <p>The Instance have</p>

			“MACADDRESS@DeviceName” below it, if this is true, PASS. (Example: 78CA3901C341@AirTunes)
4	Use the user interface to rename the speaker to “DUTSpeaker” and apply the settings. This may require a soft restart of the DUT.		<p>In the same terminal as in step 2, a Bonjour record should appear with the following format:</p> <p>Timestamp A/R Flags if Domain Service Type Instance Name</p> <p>The A/R should have “Rmv” below it, if this is true, PASS. The Service Type should have “_raop._tcp.” below it, if this is true, PASS. The Instance have “MACADDRESS@DeviceName” below it, if this is true, PASS. (Example: 78CA3901C341@AirTunes)</p>
5			<p>In the same terminal as in step 2, a Bonjour record should appear with the following format:</p> <p>Timestamp A/R Flags if Domain Service Type Instance Name</p> <p>The A/R should have “Add” below it, if this is true, PASS. The Service Type should have “_raop._tcp.” below it, if this is true, PASS. The Instance have “MACADDRESS@DUTSpeaker” below it, if this is true, PASS. (Example: 78CA3901C341@AirTunes)</p> <p>If DUTSpeaker is not the name of the speaker, then FAIL.</p>

3.3.1.5 Bonjour TXT Record Change based on change Password Protection

Test Environment	[1] and/or [2]		
Step	DUT	Base Station	Expected Behavior
1	Power on the		

	DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		
3		<p>On the iTunes server connected to the Base Station, issue the following command in a Terminal.</p> <pre>dns-sd -B _raop</pre> <p>Use Control-C to stop dns-sd at the end of this step.</p>	<p>A Bonjour record should appear with the following format:</p> <pre>Timestamp A/R Flags if Domain Service Type Instance Name</pre> <p>The A/R should have “Add” below it, if this is true, PASS. The Service Type should have “_raop._tcp.” below it, if this is true, PASS. The Instance have “MACADDRESS@DeviceName” below it, if this is true, PASS. (Example: 78CA3901C341@AirTunes)</p> <p>Note the Instance Name, Domain, and Service Type.</p>
4		<p>On the iTunes server connected to the Base Station, issue the following command in a Terminal.</p> <pre>dns-sd -L Instance Name _raop local.</pre> <p>(Example: dns-sd -L</p>	<p>The Bonjour record needs to contain a minimum of the following TXT records (a value is specified that is the requirement for field):</p> <pre>am=<vendor model name> cn=0,1 da=true</pre>

		78CA3901C341@AirTunes_raop local.)	<p>et=0,4 fv=<AirPlay firmware version>.<MCU firmware version>.<vendor custom> (unused fields should contain a 0 and the AirPlay firmware version field should start with a “p” or “s” only, followed by a number) md=(This may only be present if the device displays the meta data options selected) pw=(required only if a password is required) tp=UDP vn=65537 vs=190.9.p6 (Populated by AirPlay source code)</p> <p>(No field should be left empty, any field that contains no data should not be present.)</p> <p>The pw TXT record should not be present as the out of box behavior.</p>
5	Use the user interface to set a password for the speaker and apply the settings. This may require a soft restart.		<p>The Bonjour record needs to contain a minimum of the following TXT records (a value is specified that is the requirement for field):</p> <p>am=<vendor model name> cn=0,1 da=true et=0,4 fv= <AirPlay firmware version>.<MCU firmware version>.<vendor custom> (unused fields should contain a 0 and the AirPlay firmware version field should start with a “p” or “s” only, followed by a number) md=(This may only be present if the device displays the meta data options selected) pw=(required only if a password is required)</p>

			<p>tp=UDP vn=65537 vs=190.9.p6 (Populated by AirPlay source code)</p> <p>(No field should be left empty, any field that contains no data should not be present.)</p> <p>Verify the pw TXT record is now set to true and in iTunes the speaker has a lock next the name of the speaker and when the user attempts to connect, iTunes ask for the password that was entered in the user interface. If all of this is true, PASS.</p>
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3.3.2 Single Audio Stream (iTunes)

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		Verify the device that has just been added to the network appears as a speaker in iTunes within 30 seconds, or else FAIL.
3		On the iTunes server that is connected to the Apple Base	The speaker should be able to be selected without and error, or else FAIL.

		Station, select the newly added speaker.	
4		Once the speaker is selected, set the volume in iTunes to 50% and click play. (The 50% does not need to be exact.)	The audio should begin playing within 15 seconds, or else FAIL.
5		Click the stop button within iTunes.	The audio should stop playing within 15 seconds, or else FAIL.

3.3.3 Single Audio Stream (iOS)

Test Environment		[6]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		Verify the device that has just been added to the network appears as a speaker in iOS within 30 seconds, or else FAIL.
3		On the iOS device that is connected to the Apple Base Station, select the newly added speaker.	The speaker should be able to be selected without and error, or else FAIL.

4		Once the speaker is selected, set the volume on the iOS device to 50% and click play. (The 50% does not need to be exact.)	The audio should begin playing within 15 seconds, or else FAIL.
5		Click the stop button on the iOS device.	The audio should stop playing within 15 seconds, or else FAIL.

3.3.4 Single Audio Stream to Multiple Devices (iTunes)

Test Environment		[3] and/or [4]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		Verify the device that has just been added to the network appears as a speaker in iTunes within 30 seconds, or else FAIL.
3		On the iTunes server that is connected to the Apple Base Station, confirm the DUT is selectable.	The speaker should be able to be selected without an error, or else FAIL.
4		Connect the AirPort Express	The AirPort Express will show up in iTunes as a speaker.

		wirelessly to the Apple Base Station and insure the AirTunes option is selected in the Apple AU.	
5		In iTunes select “Multiple Speakers” and check both of the boxes for the DUT and the AirPort Express. Then click Play in iTunes.	The audio should begin playing within 15 seconds on both devices and should be in sync, or else FAIL.
6		Click the stop button within iTunes.	The audio should stop playing within 15 seconds on both devices, or else FAIL.

~~3.3.5 Two iTunes Server with a Single AirPlay Device (iTunes)~~

Test has been deprecated for release R5 of the AirPlay Product Definition Specification onward.

~~3.3.6 Two iTunes Server with a Single AirPlay Device (iOS)~~

Test has been deprecated for release R5 of the AirPlay Product Definition Specification onward.

3.3.7 Devices with Multiple Inputs

~~3.3.7.1 Switching to Other Input where the Other Input is active (Activity Checking Supported)~~

Test has been deprecated for release R5 of the AirPlay Product Definition Specification onward.

~~3.3.7.2 Switching to Other Input where the Other Input is inactive (Activity Checking Supported)~~

Test has been deprecated for release R5 of the AirPlay Product Definition Specification onward.

3.3.7.3 Switching to Other Input where the Other Input is active (Manual Switch Available)

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		
2	On the DUT set the device to AirPlay input selection.		
3		On the iTunes server that is connected to the Apple Base Station select the DUT and click on a song in your iTunes library and then click Play in iTunes.	The audio should begin playing within 15 seconds, or else FAIL.
4	On a different input on the DUT begin some activity. (Example: For a receiver, attach a CD player and		The audio from the iTunes server should keep playing on the speakers.

	click play so music will be going into the DUT. This will be different based on the type of device.)		
5	On the DUT switch the input from the AirPlay input to the input from step 4.		<p>The active input should be acting correctly and actively using the DUT.</p> <p>Using the sniffer on the iTunes server, verify three HTTP Get Requests are sent from the DUT IP to the iTunes server's IP. The payload of one should contain an AirPlay device-Prevent-playback=1 (Prevent) command. Another request's payload should contain an AirPlay device-busy=1 (Busy) command. Another request's payload should contain an AirPlay device-Prevent-playback=0 (Allow) command. These commands must come immediately after each other, or FAIL. The order for of the Device-Prevent-playback=1 (Prevent) and Device-busy=1 (Busy) commands does not matter but the Device-Prevent-playback=0 (Allow) must come after the Device-Prevent-playback=1 (Prevent) command, or FAIL.</p>
6		Continue the activity on the other input for 60 seconds while taking a sniffer trace on the iTunes server.	<p>There are two options:</p> <ol style="list-style-type: none"> 1. No HTTP Get Requests are sent from the DUT to the iTunes. 2. The device-busy=1 (Busy) and device-Prevent-playback=0 (Allow) HTTP Get commands could be sent at regular intervals, which are manufacturer dependent. <p>If a HTTP Get Request with either the Device- Prevent-playback =1 (Prevent) or Device-busy=0 (Available) command is sent, FAIL.</p>
7	Stop the activity		There are two options:

	on the DUT but leave it on the input other than AirPlay.		<ol style="list-style-type: none"> 1. No HTTP Get Requests are sent from the DUT to the iTunes. 2. The device-busy=1 (Busy) and device-Prevent-playback=0 (Allow) HTTP Get commands could be sent at regular intervals, which are manufacturer dependent. <p>If a HTTP Get Request with either the Device- Prevent-playback =1 (Prevent) or Device-busy=0 (Available) command is sent, FAIL.</p>
8	Change the input to the AirPlay input.		<p>Using the sniffer on the iTunes server, verify a HTTP Get Request is sent from the DUT IP to the iTunes server's IP. The payload of one should contain an AirPlay Device-busy=0 (Available) command.</p> <p>Another HTTP Get Request with a payload of the Device-Prevent-playback=0 (Allow) command could also be sent in addition to the Device-busy=0 (Available) command but if a HTTP Get Request with a payload of either Device-Prevent-playback=1 (Prevent) or Device-busy=1 (Busy) is sent, FAIL.</p>
9		On the iTunes server that is connected to the Apple Base Station select the DUT and click on a song in your iTunes library and then click Play in iTunes.	The audio should begin playing within 15 seconds, or else FAIL.
10	On a different input on the DUT begin some activity. (Example: For a receiver, attach a CD player and click play so		The audio from the iTunes server should keep playing on the speakers.

	music will be going into the DUT. This will be different based on the type of device.)		
11	On the DUT switch the input from the AirPlay input to the input from the step above.		<p>The active input should be acting correctly and actively using the DUT.</p> <p>Using the sniffer on the iTunes server, verify three HTTP Get Requests are sent from the DUT IP to the iTunes server's IP. The payload of one should contain an AirPlay device-Prevent-playback=1 (Prevent) command. Another request's payload should contain an AirPlay device-busy=1 (Busy) command. Another request's payload should contain an AirPlay device-Prevent-playback=0 (Allow) command. These commands must come immediately after each other, or FAIL. The order for of the Device-Prevent-playback=1 (Prevent) and Device-busy=1 (Busy) commands does not matter but the Device-Prevent-playback=0 (Allow) must come after the Device-Prevent-playback=1 (Prevent) command, or FAIL.</p>
12		Continue the activity on the other input for 60 seconds while taking a sniffer trace on the iTunes server.	<p>There are two options:</p> <ol style="list-style-type: none"> 1. No HTTP Get Requests are sent from the DUT to the iTunes. 2. The device-busy=1 (Busy) and device-Prevent-playback=0 (Allow) HTTP Get commands could be sent at regular intervals, which are manufacturer dependent. <p>If a HTTP Get Request with either the Device- Prevent-playback =1 (Prevent) or Device-busy=0 (Available) command is sent, FAIL.</p>
13		On the iTunes server that is	The audio should begin playing within 15 seconds, or else FAIL.

		<p>connected to the Apple Base Station select the DUT and click on a song in your iTunes library and then click Play in iTunes.</p>	<p>Using the sniffer on the iTunes server, verify a HTTP Get Request is sent from the DUT IP to the iTunes server's IP. The payload of one should contain an AirPlay Device-busy=0 (Available) command.</p> <p>Another HTTP Get Request with a payload of the Device-Prevent-playback=0 (Allow) command could also be sent in addition to the Device-busy=0 (Available) command but if a HTTP Get Request with a payload of either Device-Prevent-playback=1 (Prevent) or Device-busy=1 (Busy) is sent, FAIL.</p>
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3.3.7.4 Switching to Other Input where the Other Input is inactive (Manual Switch Available)

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		
3	On the DUT set the device to AirPlay input selection.		

4		On the iTunes server that is connected to the Apple Base Station select the DUT and click on a song in your iTunes library and then click Play in iTunes.	The audio should begin playing within 15 seconds, or else FAIL.
5	On the DUT switch the input from the AirPlay input to an idle input.		<p>The idle input should be selected correctly.</p> <p>Using the sniffer on the iTunes server, verify three HTTP Get Requests are sent from the DUT IP to the iTunes server's IP. The payload of one should contain an AirPlay device-Prevent-playback=1 (Prevent) command. Another request's payload should contain an AirPlay device-busy=1 (Busy) command. Another request's payload should contain an AirPlay device-Prevent-playback=0 (Allow) command. These commands must come immediately after each other, or FAIL. The order for of the Device-Prevent-playback=1 (Prevent) and Device-busy=1 (Busy) commands does not matter but the Device-Prevent-playback=0 (Allow) must come after the Device-Prevent-playback=1 (Prevent) command, or FAIL.</p>
6		Stay on the idle input for 60 seconds while taking a sniffer trace on the iTunes server.	<p>There are two options:</p> <ol style="list-style-type: none"> 1. No HTTP Get Requests are sent from the DUT to the iTunes. 2. The device-busy=1 (Busy) and device-Prevent-playback=0 (Allow) HTTP Get commands could be sent at regular intervals, which are manufacturer dependent. <p>If a HTTP Get Request with either the Device- Prevent-playback =1 (Prevent) or Device-busy=0 (Available) command is sent, FAIL.</p>
7	Change the input		Using the sniffer on the iTunes server,

	to the AirPlay input.		<p>verifies a HTTP Get Request is sent from the DUT IP to the iTunes server's IP. The payload of one should contain an AirPlay device-busy=0 (Available) command.</p> <p>Another HTTP Get Request with a payload of the Device-Prevent-playback=0 (Allow) command could also be sent in addition to the Device-busy=0 (Available) command but if a HTTP Get Request with a payload of either Device-Prevent-playback=1 (Prevent) or Device-busy=1 (Busy) is sent, FAIL.</p>
8		On the iTunes server that is connected to the Apple Base Station select the DUT and click on a song in your iTunes library and then click Play in iTunes.	The audio should begin playing within 15 seconds, or else FAIL.
9	On the DUT switch the input from the AirPlay input to an idle input.		<p>The idle input should be selected correctly.</p> <p>Using the sniffer on the iTunes server, verify three HTTP Get Requests are sent from the DUT IP to the iTunes server's IP. The payload of one should contain an AirPlay device-Prevent-playback=1 (Prevent) command. Another request's payload should contain an AirPlay device-busy=1 (Busy) command. Another request's payload should contain an AirPlay device-Prevent-playback=0 (Allow) command. These commands must come immediately after each other, or FAIL. The order for of the Device-Prevent-playback=1 (Prevent) and Device-busy=1 (Busy) commands does not matter but the Device-Prevent-playback=0 (Allow) must come after the Device-Prevent-playback=1 (Prevent) command, or FAIL.</p>
10		Stay on the idle	There are two options:

		input for 60 seconds while taking a sniffer trace on the iTunes server.	<ol style="list-style-type: none"> 1. No HTTP Get Requests are sent from the DUT to the iTunes. 2. The device-busy=1 (Busy) and device-Prevent-playback=0 (Allow) HTTP Get commands could be sent at regular intervals, which are manufacturer dependent. <p>If a HTTP Get Request with either the Device- Prevent-playback =1 (Prevent) or Device-busy=0 (Available) command is sent, FAIL.</p>
11		On the iTunes server that is connected to the Apple Base Station select the DUT and click on a song in your iTunes library and then click Play in iTunes.	<p>The audio should begin playing within 15 seconds, or else FAIL.</p> <p>Using the sniffer on the iTunes server, verify a HTTP Get Request is sent from the DUT IP to the iTunes server's IP. The payload of one should contain an AirPlay Device-busy=0 (Available) command.</p> <p>Another HTTP Get Request with a payload of the Device-Prevent-playback=0 (Allow) command could also be sent in addition to the Device-busy=0 (Available) command but if a HTTP Get Request with a payload of either Device-Prevent-playback=1 (Prevent) or Device-busy=1 (Busy) is sent, FAIL.</p>

3.3.7.5 Switching to Other Input where the Other Input is active (No Manual Switch Available)

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
	Connect the DUT to the network. There are two options here, either		

	<p>Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.</p>		
2	<p>On the DUT set the device to AirPlay input selection.</p>		
3		<p>On the iTunes server that is connected to the Apple Base Station select the DUT and click on a song in your iTunes library and then click Play in iTunes.</p>	<p>The audio should begin playing within 15 seconds, or else FAIL.</p>
4	<p>On a different input on the DUT begin some activity. (Example: For a receiver, attach a CD player and click play so music will be going into the DUT. This will be different based on the type of device.)</p>		<p>The DUT should automatically switch to the input selected.</p> <p>Using the sniffer on the iTunes server, verify three HTTP Get Requests are sent from the DUT IP to the iTunes server's IP. The payload of one should contain an AirPlay device-Prevent-playback=1 (Prevent) command. Another request's payload should contain an AirPlay device-busy=1 (Busy) command. Another request's payload should contain an AirPlay device-Prevent-playback=0 (Allow) command. These commands must come immediately after each other, or FAIL. The order for of the Device-Prevent-playback=1 (Prevent) and Device-busy=1 (Busy) commands does not matter but the Device-Prevent-playback=0 (Allow) must</p>

			come after the Device-Prevent-playback=1 (Prevent) command, or FAIL.
5		Continue the activity on the other input for 60 seconds while taking a sniffer trace on the iTunes server.	<p>There are two options:</p> <ol style="list-style-type: none"> 1. No HTTP Get Requests are sent from the DUT to the iTunes. 2. The device-busy=1 (Busy) and device-Prevent-playback=0 (Allow) HTTP Get commands could be sent at regular intervals, which are manufacturer dependent. <p>If a HTTP Get Request with either the Device- Prevent-playback =1 (Prevent) or Device-busy=0 (Available) command is sent, FAIL.</p>
6	Stop the activity on the DUT.		<p>There are two options:</p> <ol style="list-style-type: none"> 1. No HTTP Get Requests are sent from the DUT to the iTunes. 2. The device-busy=1 (Busy) and device-Prevent-playback=0 (Allow) HTTP Get commands could be sent at regular intervals, which are manufacturer dependent. <p>If a HTTP Get Request with either the Device- Prevent-playback =1 (Prevent) or Device-busy=0 (Available) command is sent, FAIL.</p>
7		On the iTunes server that is connected to the Apple Base Station select the DUT and click on a song in your iTunes library and then click Play in iTunes.	<p>The input should switch to AirPlay and audio should begin playing within 15 seconds, or else FAIL.</p> <p>Using the sniffer on the iTunes server, verify a HTTP Get Request is sent from the DUT IP to the iTunes server's IP. The payload of one should contain an AirPlay Device-busy=0 (Available) command.</p> <p>Another HTTP Get Request with a payload of the Device-Prevent-playback=0 (Allow) command could also be sent in addition to the Device-busy=0 (Available) command</p>

			but if a HTTP Get Request with a payload of either Device-Prevent-playback=1 (Prevent) or Device-busy=1 (Busy) is sent, FAIL.
8	On a different input on the DUT begin some activity. (Example: For a receiver, attach a CD player and click play so music will be going into the DUT. This will be different based on the type of device.)		<p>The DUT should automatically switch to the input selected.</p> <p>Using the sniffer on the iTunes server, verify three HTTP Get Requests are sent from the DUT IP to the iTunes server's IP. The payload of one should contain an AirPlay device-Prevent-playback=1 (Prevent) command. Another request's payload should contain an AirPlay device-busy=1 (Busy) command. Another request's payload should contain an AirPlay device-Prevent-playback=0 (Allow) command. These commands must come immediately after each other, or FAIL. The order for of the Device-Prevent-playback=1 (Prevent) and Device-busy=1 (Busy) commands does not matter but the Device-Prevent-playback=0 (Allow) must come after the Device-Prevent-playback=1 (Prevent) command, or FAIL.</p>
9		Continue the activity on the other input for 60 seconds while taking a sniffer trace on the iTunes server.	<p>There are two options:</p> <ol style="list-style-type: none"> 1. No HTTP Get Requests are sent from the DUT to the iTunes. 2. The device-busy=1 (Busy) and device-Prevent-playback=0 (Allow) HTTP Get commands could be sent at regular intervals, which are manufacturer dependent. <p>If a HTTP Get Request with either the Device- Prevent-playback =1 (Prevent) or Device-busy=0 (Available) command is sent, FAIL.</p>
10		On the iTunes server that is connected to the Apple Base	<p>The audio should begin playing within 15 seconds, or else FAIL.</p> <p>Using the sniffer on the iTunes server,</p>

		<p>Station select the DUT and click on a song in your iTunes library and then click Play in iTunes.</p>	<p>verify a HTTP Get Request is sent from the DUT IP to the iTunes server's IP. The payload of one should contain an AirPlay Device-busy=0 (Available) command.</p> <p>Another HTTP Get Request with a payload of the Device-Prevent-playback=0 (Allow) command could also be sent in addition to the Device-busy=0 (Available) command but if a HTTP Get Request with a payload of either Device-Prevent-playback=1 (Prevent) or Device-busy=1 (Busy) is sent, FAIL.</p>
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3.3.7.6 Switching to Other Input where the Other Input is inactive (No Manual Switch Available)

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		
3	On the DUT set the device to AirPlay input selection.		
4		On the iTunes	The audio should begin playing within 15

		server that is connected to the Apple Base Station select the DUT and click on a song in your iTunes library and then click Play in iTunes.	seconds, or else FAIL.
5	On the DUT verify there is no way to switch the input from the AirPlay input to an idle input.		If there is no manual way to switch away from the AirPlay input test is PASS.

3.3.8 Metadata publishing

3.3.8.1 Metadata TXT Record Verification

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		
3		On the iTunes server connected to the Base Station, issue the following command in a	A Bonjour record should appear with the following format: Timestamp A/R Flags if Domain Service Type

		<p>Terminal. dns-sd -B _raop</p> <p>Use Control-C to stop dns-sd at the end of this step.</p>	<p>Instance Name</p> <p>The A/R should have “Add” below it, if this is true, PASS. The Service Type should have “_raop._tcp.” below it, if this is true, PASS. The Instance have “MACADDRESS@DeviceName” below it, if this is true, PASS. (Example: 78CA3901C341@AirTunes)</p> <p>Note the Instance Name, Domain, and Service Type.</p>
4		<p>On the iTunes server connected to the Base Station, issue the following command in a Terminal. dns-sd -L Instance Name _raop local. (Example: dns-sd -L 78CA3901C341@AirTunes _raop local.)</p>	<p>The Bonjour record needs to contain the following field in the TXT record. md= (This should only be present if the devices supports one of the meta data options)</p> <p>This field can be populated with any combination of the following fields and the field can contain more than one.</p> <p>0 = Text is supported 1 = Artwork is supported 2 = Progress is supported</p> <p>In order for a metadata option to be considered supported the device must contain the appropriate mechanism to display the metadata that is supported. (i.e. if there is no display the device can not support metadata)</p> <p>If the metadata field shows all of the supported options that the device does support then PASS, else FAIL.</p>

3.3.8.2 Song Text Verification (Locally Stored)

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		Verify the device that has just been added to the network appears as a speaker in iTunes within 30 seconds, or else FAIL.
3		On the iTunes server that is connected to the Apple Base Station, select the newly added speaker.	The speaker should be able to be selected without and error, or else FAIL.
4		Once the speaker is selected, select a song that does not have the Artist section in the song info set, set the volume in iTunes to 50% and click play. (The 50% does not need to be exact.)	The audio should begin playing within 15 seconds, or else FAIL.
5	Look at the display on the DUT.		The Song title should be the same as what is displayed in iTunes, and the Artist should not be displayed.
6		Select a song that does have	The audio should begin playing within 15 seconds, or else FAIL.

		the Artist section in the song info set, set the volume in iTunes to 50% and click play. (The 50% does not need to be exact.)	
7	Look at the display on the DUT.		The Artist and Song title should be the same as what is displayed in iTunes.
8		Select a song that does not have the Artist section in the song info set, set the volume in iTunes to 50% and click play. (The 50% does not need to be exact.)	The audio should begin playing within 15 seconds, or else FAIL.
9	Look at the display on the DUT.		The Song title should be the same as what is displayed in iTunes, and the Artist should not be displayed.
10		Click the stop button within iTunes.	The audio should stop playing within 15 seconds, or else FAIL.

3.3.8.3 Artwork Verification (Locally Stored)

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports		Verify the device that has just been added to the network appears as a speaker in iTunes within 30 seconds, or else FAIL.

	both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		
3		On the iTunes server that is connected to the Apple Base Station, select the newly added speaker.	The speaker should be able to be selected without and error, or else FAIL.
4		Once the speaker is selected, select a song that does not have any album artwork, set the volume in iTunes to 50% and click play. (The 50% does not need to be exact.)	The audio should begin playing within 15 seconds, or else FAIL.
5	Look at the display on the DUT.		No artwork should be displayed.
6		Select a song that does have any album artwork, set the volume in iTunes to 50% and click play. (The 50% does not need to be exact.)	The artwork should be the same that is displayed in iTunes.
7	Look at the display on the DUT.		The artwork should be the same that is displayed in iTunes.
8		Select a song that does not	The audio should begin playing within 15 seconds, or else FAIL.

		have any album artwork, set the volume in iTunes to 50% and click play. (The 50% does not need to be exact.)	
9	Look at the display on the DUT.		No artwork should be displayed.
10		Click the stop button within iTunes.	The audio should stop playing within 15 seconds, or else FAIL.

3.3.8.4 Progress Bar Verification (Locally Stored)

Test Environment		{1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		Verify the device that has just been added to the network appears as a speaker in iTunes within 30 seconds, or else FAIL.
3		On the iTunes server that is connected to the Apple Base Station, select the newly added speaker.	The speaker should be able to be selected without and error, or else FAIL.

4		Once the speaker is selected, select a song that does not have any album artwork, set the volume in iTunes to 50% and click play. (The 50% does not need to be exact.)	The audio should begin playing within 15 seconds, or else FAIL.
5	Look at the display on the DUT.		The Progress bar and time should be the same as what is displayed on the iTunes. Observe Progress bar and displayed time for minimum 60 sec. If all of this is true, PASS.
6	Using either the buttons on the device or on a remote click the "Previous Track" release the button.		The audio should begin playing within 15 seconds, or else FAIL.
7	Look at the display on the DUT.		The current song should move back to the beginning of the song and restart playing and the slider bar in iTunes should have moved to the far left, indicating time 0. The Progress bar and time should move back and start from 0 in DUT. If all of this is true, PASS.
8		Click the stop button within iTunes.	The audio should stop playing within 15 seconds, or else FAIL.

3.3.8.5 Song Text Verification (iOS)

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either		Verify the device that has just been added to the network appears as a speaker in iTunes within 30 seconds, or else FAIL.

	Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		
3		In the music section of the iOS device that is connected to the Apple Base Station, select the newly added speaker.	The speaker should be able to be selected without and error, or else FAIL.
4		Once the speaker is selected, select a song that does not have the Artist section in the song info set, set the volume on the iOS device to 50% and click play. (The 50% does not need to be exact.)	The audio should begin playing within 15 seconds, or else FAIL.
5	Look at the display on the DUT.		The Song title should be the same as what is displayed on the iOS device, and the Artist should not be displayed.
6		Select a song that does have the Artist section in the song info set, set the volume on the iOS device to 50% and click play. (The 50%	The audio should begin playing within 15 seconds, or else FAIL.

		does not need to be exact.)	
7	Look at the display on the DUT.		The Artist and Song title should be the same as what is displayed on the iOS device.
8		Select a song that does not have the Artist section in the song info set, set the volume on the iOS device to 50% and click play. (The 50% does not need to be exact.)	The audio should begin playing within 15 seconds, or else FAIL.
9	Look at the display on the DUT.		The Song title should be the same as what is displayed on the iOS device, and the Artist should not be displayed.
10		Click the stop button within iTunes.	The audio should stop playing within 15 seconds, or else FAIL.

3.3.8.6 Artwork Verification (iOS)

Test Environment		[6]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of		Verify the device that has just been added to the network appears as a speaker in iOS within 30 seconds, or else FAIL.

	12345678.		
3		In the music section of the iOS device that is connected to the Apple Base Station, select the newly added speaker.	The speaker should be able to be selected without and error, or else FAIL.
4		Once the speaker is selected, select a song that does not have any album artwork, set the volume in iTunes to 50% and click play. (The 50% does not need to be exact.)	The audio should begin playing within 15 seconds, or else FAIL.
5	Look at the display on the DUT.		No artwork should be displayed.
6		Select a song that does have album artwork, set the volume in iTunes to 50% and click play. (The 50% does not need to be exact.)	The audio should begin playing within 15 seconds, or else FAIL.
7	Look at the display on the DUT.		The artwork should be the same that is displayed in iOS device.
8		Select a song that does not have any album artwork, set the volume in iTunes to 50% and click play. (The 50% does not need to be exact.)	The audio should begin playing within 15 seconds, or else FAIL.

9	Look at the display on the DUT.		No artwork should be displayed.
10		Click the stop button on the iOS device.	The audio should stop playing within 15 seconds, or else FAIL.

3.3.8.7 Progress Bar Verification (IOS)

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		Verify the device that has just been added to the network appears as a speaker in iTunes within 30 seconds, or else FAIL.
3		In the music section of the iOS device that is connected to the Apple Base Station, select the newly added speaker.	The speaker should be able to be selected without and error, or else FAIL.
4		Once the speaker is selected, select a song that does not have the Artist section in the song info set,	The audio should begin playing within 15 seconds, or else FAIL.

		set the volume on the iOS device to 50% and click play. (The 50% does not need to be exact.)	
5	Look at the display on the DUT.		The Progress bar and time should be the same as what is displayed on the iOS device. Observe Progress bar and displayed time for minimum 60 sec. If all of this is true, PASS.
6	Using either the buttons on the device or on a remote click the "Previous Track" release the button.		The audio should begin playing within 15 seconds, or else FAIL.
7	Look at the display on the DUT.		The current song should move back to the beginning of the song and restart playing and the slider bar in iOS device should have moved to the far left, indicating time 0. The Progress bar and time should move back and start from 0 in DUT. If all of this is true, PASS.
8		Click the stop button within iTunes.	The audio should stop playing within 15 seconds, or else FAIL.

3.3.9 AirPlay Password

3.3.9.1 iTunes streaming after setting/changing/clearing AirPlay password via DUT UI

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or		Verify the accessory that has just been added to the network appears as a speaker in iTunes within 30 seconds, or else FAIL.

	<p>Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678</p>		
3		<p>On the iTunes server connected to the Base Station, issue the following command in a Terminal.</p> <pre>dns-sd -B _raop</pre> <p>Use Control-C to stop dns-sd at the end of this step.</p>	<p>A Bonjour record should appear with the following format: Timestamp A/R Flags if Domain Instance Name Service Type</p> <p>The A/R should have “Add” below it, if this is true, PASS. The Service Type should have “_raop._tcp.” below it, if this is true, PASS.</p> <p>The Instance have “MACADDRESS@DeviceName” below it, if this is true, PASS. (Example: 78CA3901C341@AirTunes)</p> <p>Note the Instance Name.</p>
4		<p>On the iTunes server connected to the Base Station, issue the following command in a Terminal.</p> <pre>dns-sd -L Instance Name _raop local.</pre> <p>(Example: dns-sd -L 78CA3901C341@AirTunes _raop local.)</p>	<p>Verify that the Bonjour record does not contain “pw=” field, or else FAIL.</p>

5		On the iTunes server that is connected to the Apple Base Station, select the newly added speaker and then click play.	The speaker should be able to be selected without an error, user should not be asked for a password and the audio should begin playing within 15 seconds, or else FAIL.
6		Click the stop button in iTunes.	The audio should stop playing within 15 seconds, or else FAIL.
7		Deselect the speaker from iTunes accessory list.	
8	Use the DUT user interface to set a password for the speaker and apply the settings. This may require a soft restart.		
9		On the iTunes server that is connected to the Apple Base Station, select the speaker again and then click play.	The speaker should be able to be selected without an error, user should be asked for the password. Once the user provides the previously set password, the audio should begin playing within 15 seconds, or else FAIL.
10		Click the stop button in iTunes.	The audio should stop playing within 15 seconds, or else FAIL.
11		Deselect the speaker from iTunes accessory list.	
12	Use the DUT user interface to set a different password for the speaker and apply the settings. This may require a soft restart.		

13		On the iTunes server that is connected to the Apple Base Station, select the speaker again and then click play.	The speaker should be able to be selected without an error, user should be asked for the password. Once the user provides the newly set password, the audio should begin playing within 15 seconds, or else FAIL.
14		Click the stop button in iTunes.	The audio should stop playing within 15 seconds, or else FAIL.
15		Deselect the speaker from iTunes accessory list.	
16	Use the DUT user interface to clear the password for the speaker and apply the settings. This may require a soft restart.		
17		On the iTunes server that is connected to the Apple Base Station, select the speaker again and then click play.	The speaker should be able to be selected without an error, user should not be asked for a password and the audio should begin playing within 15 seconds, or else FAIL.

3.3.9.2 iOS streaming after setting/changing/clearing AirPlay password via DUT UI

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or		Verify the accessory that has just been added to the network appears as a speaker in the iOS device within 30 seconds, or else FAIL.

	<p>Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678</p>		
3		<p>On the iTunes server connected to the Base Station, issue the following command in a Terminal.</p> <pre>dns-sd -B _raop</pre> <p>Use Control-C to stop dns-sd at the end of this step.</p>	<p>A Bonjour record should appear with the following format:</p> <p>Timestamp A/R Flags if Domain Instance Name Service Type</p> <p>The A/R should have “Add” below it, if this is true, PASS. The Service Type should have “_raop._tcp.” below it, if this is true, PASS.</p> <p>The Instance have “MACADDRESS@DeviceName” below it, if this is true, PASS. (Example: 78CA3901C341@AirTunes)</p> <p>Note the Instance Name.</p>
4		<p>On the iTunes server connected to the Base Station, issue the following command in a Terminal.</p> <pre>dns-sd -L Instance Name _raop local.</pre> <p>(Example: dns-sd -L 78CA3901C341@AirTunes _raop local.)</p>	<p>Verify that the Bonjour record does not contain “pw=” field, or else FAIL.</p>

5		On the iOS device that is connected to the Apple Base Station, select the newly added speaker and then click play.	The speaker should be able to be selected without an error, user should not be asked for a password and the audio should begin playing within 15 seconds, or else FAIL.
6		Click the stop button on the iOS device.	The audio should stop playing within 15 seconds, or else FAIL.
7		Deselect the speaker from the iOS device accessory list.	
8	Use the DUT user interface to set a password for the speaker and apply the settings. This may require a soft restart.		
9		On the iOS device that is connected to the Apple Base Station, select the speaker again and then click play.	The speaker should be able to be selected without an error, user should be asked for the password. Once the user provides the previously set password, the audio should begin playing within 15 seconds, or else FAIL.
10		Click the stop button on the iOS device.	The audio should stop playing within 15 seconds, or else FAIL.
11		Deselect the speaker from the iOS device accessory list.	
12	Use the DUT user interface to set a different password for the speaker and apply the settings. This may require a		

	soft restart.		
13		On the iOS device that is connected to the Apple Base Station, select the speaker again and then click play.	The speaker should be able to be selected without an error, user should be asked for the password. Once the user provides the newly set password, the audio should begin playing within 15 seconds, or else FAIL.
14		Click the stop button on the iOS device.	The audio should stop playing within 15 seconds, or else FAIL.
15		Deselect the speaker from the iOS device accessory list.	
16	Use the DUT user interface to clear the password for the speaker and apply the settings. This may require a soft restart.		
17		On the iOS device that is connected to the Apple Base Station, select the speaker again and then click play.	The speaker should be able to be selected without an error, user should not be asked for a password and the audio should begin playing within 15 seconds, or else FAIL.

3.3.9.3 iTunes streaming after setting AirPlay password via WAC

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network using Wireless Accessory		Verify the accessory that has just been added to the network appears as a speaker in iTunes within 60 seconds, or else FAIL.

	<p>Configuration (WAC). Ensure that the AirPlay Password has been entered during the WAC setup process. (Refer to WAC Compliance Test documentation for more details)</p>		
3		<p>On the iTunes server connected to the Base Station, issue the following command in a Terminal.</p> <pre>dns-sd -B _raop</pre> <p>Use Control-C to stop dns-sd at the end of this step.</p>	<p>A Bonjour record should appear with the following format:</p> <p>Timestamp A/R Flags if Domain Instance Name Service Type</p> <p>The A/R should have “Add” below it, if this is true, PASS. The Service Type should have “_raop._tcp.” below it, if this is true, PASS.</p> <p>The Instance have “MACADDRESS@DeviceName” below it, if this is true, PASS. (Example: 78CA3901C341@AirTunes)</p> <p>Note the Instance Name.</p>
4		<p>On the iTunes server connected to the Base Station, issue the following command in a Terminal.</p> <pre>dns-sd -L Instance Name _raop local.</pre> <p>(Example: dns-sd -L 78CA3901C341@AirTunes _raop local.)</p>	<p>Verify that the Bonjour record contains “pw=true” field, or else FAIL.</p>

5		On the iTunes server that is connected to the Apple Base Station, select the newly added speaker and then click play.	The speaker should be able to be selected without an error, user should be asked for the password. Once the user provides the previously set password, the audio should begin playing within 15 seconds, or else FAIL.
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3.3.9.4 iOS streaming after setting AirPlay password via WAC

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network using Wireless Accessory Configuration (WAC). Ensure that the AirPlay Password has been entered during the WAC setup process. (Refer to WAC Compliance Test documentation for more details)		Verify the accessory that has just been added to the network appears as a speaker on the iOS device within 60 seconds, or else FAIL.
3		On the iTunes server connected to the Base Station, issue the following command in a Terminal. dns-sd -B _raop Use Control-C to stop dns-sd at the end of this step.	A Bonjour record should appear with the following format: Timestamp A/R Flags if Domain Instance Name Service Type The A/R should have "Add" below it, if this is true, PASS. The Service Type should have "_raop._tcp." below it, if this is true, PASS.

			The Instance have “MACADDRESS@DeviceName” below it, if this is true, PASS. (Example: 78CA3901C341@AirTunes) Note the Instance Name.
4		On the iTunes server connected to the Base Station, issue the following command in a Terminal. dns-sd -L Instance Name _raop local. (Example: dns-sd -L 78CA3901C341@AirTun es _raop local.)	Verify that the Bonjour record contains “pw=true” field, or else FAIL.
5		On the iOS device that is connected to the Apple Base Station, select the newly added speaker and then click play.	The speaker should be able to be selected without an error, user should be asked for the password. Once the user provides the previously set password, the audio should begin playing within 15 seconds, or else FAIL.

3.4 DACP Test Cases

3.4.1 Device Commands (DACP) (iTunes)

3.4.1.1 Play/Pause/Stop

Note: Steps 7-10 should only be run if the device has a “Stop” button on the DUT or its remote.

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options		

	here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		
3		On the iTunes server select DUT as the speaker and select a song in the main music library and click Play.	
4	Using either the buttons on the device or on a remote click the "Pause" button.		The music should pause immediately on the DUT and the pause button in iTunes should have changed to the play symbol and progress should stop moving. If all of this is true, PASS.
5		Wait 60 seconds.	The speaker should not disconnect.
6	Using either the buttons on the device or on a remote click the "Play" button.		The music should start playing immediately on the DUT and the play button in iTunes should have changed to the pause symbol and progress should be moving. The metadata information (Artwork, Artist and Song title) should be the same as what is displayed in iTunes. If all of this is true, PASS.
7	Using either the buttons on the device or on a remote click the "Stop" button.		The music should stop immediately on the DUT and the pause button in iTunes should have changed to the play symbol and progress should stop moving and the progress indicator should have moved back to 0:00. If all of this is true, PASS.
8		Wait 60 seconds.	The speaker should not disconnect.
9	Using either the buttons on the device or on a		The music should start playing immediately on the DUT and the play button in iTunes should have changed to

	remote click the “Play” button.		the pause symbol and progress should be moving. The metadata information (Artwork, Artist and Song title) should be the same as what is displayed in iTunes. If all of this is true, PASS.
10	Using either the buttons on the device or on a remote click the “Stop” button.		The music should stop immediately on the DUT and the pause button in iTunes should have changed to the play symbol and progress should stop moving and the progress indicator should have moved back to 0:00. If all of this is true, PASS.

3.4.1.2 Next Item/Previous Item

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		
3		On the iTunes server select DUT as the speaker and select a song in the main music library and click play.	
4	Using either the buttons on the		The current song should have moved to the next song in the playlist and should have

	device or on a remote click the “Next Track” button and release the button immediately.		started playing. The metadata information (Artwork, Artist and Song title) should be the same as what is displayed in iTunes. If all of this is true, PASS.
5	Using either the buttons on the device or on a remote click the “Previous Track” release the button immediately. The button must be pressed within 2 secs of the song starting.		The current song should have moved to the previous song in the playlist and should have started playing. The metadata information (Artwork, Artist and Song title) should be the same as what is displayed in iTunes. If all of this is true, PASS.

3.4.1.3 Volume Up/Volume Down/Mute

Note: Steps 6-13 should only be run if the DUT supports the Mute functionality.

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		
3		On the iTunes	

		server load Wireshark and start sniffing all of the traffic on the wired interface.	
4		On the iTunes server select DUT as the speaker and select a song in the main music library and click play. Move the Volume indicator bar to approximately 50%. This does not need to be exact.	The music should start playing immediately on the DUT and the play button in iTunes should have changed to the pause symbol and progress should be moving. If all of this is true, PASS.
5	Using either the buttons on the device or on a remote click the "Volume Up" button and release the button immediately.		<p>The volume coming out of the speaker should increase and the slider bar in iTunes indicating the volume should also increase. If true, PASS.</p> <p>The music should never stop playing.</p> <p>On the sniffer verify an HTTP Get Request is sent from the DUT IP to the iTunes server's IP with a payload that indicates a value between -30 and 0. This value must be in a floating-point format and be close to the middle of the scale, i.e. plus or minus 5 db from -15.</p>
6	Using either the buttons on the device or on a remote click the "Volume Down" button and release the button immediately.		<p>The volume coming out of the speaker should decrease and the slider bar in iTunes indicating the volume should also decrease. If true, PASS.</p> <p>The music should never stop playing.</p> <p>On the sniffer verify an HTTP Get Request is sent from the DUT IP to the iTunes server's IP with a payload that indicates a value between -30 and 0. This value must</p>

			be in a floating-point format and be close to the middle of the scale, i.e. plus or minus 5 db from -15. This value should be less than the volume from the previous step.
7	Using either the buttons on the device or on a remote click the “Mute” button and release the button immediately.		<p>No volume should be heard coming from the speaker and the slider bar in iTunes should have moved to the far left, indicating 0 volume. However the progress bar for the song should still be moving forward. If true, PASS.</p> <p>On the sniffer verify an HTTP Get Request is sent from the DUT IP to the iTunes server’s IP with a payload that indicates a value of -144. This value must be in a floating-point format.</p>
8	Using either the buttons on the device or on a remote click the “Mute” button and release the button immediately.		<p>The volume coming out of the speaker should go back to the volume that was being used in step 5.</p> <p>On the sniffer verify that a HTTP Get Request is sent from the DUT IP to the iTunes server’s IP with a payload that indicates a value that is the same as what was sent in step 5.</p>
9	Using either the buttons on the device or on a remote click the “Mute” button and release the button immediately.		<p>No volume should be heard coming from the speaker and the slider bar in iTunes should have moved to the far left, indicating 0 volume. However the progress bar for the song should still be moving forward. If true, PASS.</p> <p>On the sniffer verify an HTTP Get Request is sent from the DUT IP to the iTunes server’s IP with a payload that indicates a value of -144. This value must be in a floating-point format.</p>
10	Using either the buttons on the device or on a remote click the “Volume Down” button and release the button		<p>The volume should go to slightly a lower volume than what was being used in step 5.</p> <p>On the sniffer verify an HTTP Get Request is sent from the DUT IP to the iTunes server’s IP with a payload that indicates a value slightly lower than what was present in step 5. This value must be in a floating-</p>

	immediately.		point format. If the value is not lower than what was sent in step 5 or if it is more than 5 db less than what is in step 5, FAIL.
11	Using either the buttons on the device or on a remote click the “Mute” button and release the button immediately.		<p>No volume should be heard coming from the speaker and the slider bar in iTunes should have moved to the far left, indicating 0 volume. However the progress bar for the song should still be moving forward. If true, PASS.</p> <p>On the sniffer verify an HTTP Get Request is sent from the DUT IP to the iTunes server’s IP with a payload that indicates a value of -144. This value must be in a floating-point format.</p>
12	Using either the buttons on the device or on a remote click the “Volume Up” button and release the button immediately.		<p>The volume coming out of the speaker should go back to the volume that was being used in step 5.</p> <p>On the sniffer verify that a HTTP Get Request is sent from the DUT IP to the iTunes server’s IP with a payload that indicates a value that is the same as what was sent in step 5.</p>
13	Using either the buttons on the device or on a remote click the “Mute” button and release the button immediately.		<p>The volume coming out of the speaker should go back to the volume that was being used in step 5.</p> <p>On the sniffer verify that a HTTP Get Request is sent from the DUT IP to the iTunes server’s IP with a payload that indicates a value that is the same as what was sent in step 5.</p>
14		On the iTunes server, adjust the volume to about 50%; this does not need to be exact.	The DUT should come out of the mute state and play the music with approximately 50% volume.

3.4.1.4 Repeat/Shuffle

Note: Only run these tests if the DUT supports Repeat/Shuffle functionality.

Test Environment	[1] and/or [2]		
Step	DUT	Base Station	Expected Behavior

1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		
3		On the iTunes server select DUT as the speaker and select a song in the main music library and click play.	
4	Using either the buttons on the device or on a remote click the "Repeat" button and release the button immediately.		Verify in iTunes the Repeat icon changes from grey to blue and appears highlighted. If true, PASS. The music should never stop playing.
5	Using either the buttons on the device or on a remote click the "Repeat" button and release the button immediately.		Verify in iTunes the Repeat icon changes from blue to blue with a little "1" on the icon and appears highlighted. If true, PASS. The music should never stop playing.
6	Using either the buttons on the		Verify in iTunes the Repeat icon changes from blue with a little "1" on the icon to

	device or on a remote click the “Repeat” button and release the button immediately.		grey. If true, PASS. The music should never stop playing.
7	Using either the buttons on the device or on a remote click the “Shuffle” button and release the button immediately.		Verify in iTunes the Shuffle icon changes from grey to blue and appears highlighted. If true, PASS. The music should never stop playing.
8	Using either the buttons on the device or on a remote click the “Shuffle” button and release the button immediately.		Verify in iTunes the Shuffle icon changes from blue to grey. If true, PASS. The music should never stop playing.

3.4.2 Device Commands (DACP) (iOS)

3.4.2.1 Play/Pause/Stop

Test Environment		[6]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK		

	with a Pass phrase of 12345678.		
3		On the iOS device select the DUT as the speaker and select a song in the main music library and click play.	
4	Using either the buttons on the device or on a remote click the "Pause" button.		The music should pause immediately on the DUT and the pause button in iOS should have changed to the play symbol and progress should stop moving. If all of this is true, PASS.
5	Wait 10 seconds. Using either the buttons on the device or on a remote click the "Play" button.		The music should start playing immediately on the DUT and the play button in iTunes should have changed to the pause symbol and progress should be moving. The metadata information (Artwork, Artist and Song title) should be the same as what is displayed in iOS. If all of this is true, PASS.
6	Using either the buttons on the device or on a remote click the "Stop" button.		The music should stop immediately on the DUT and the pause button in iTunes should have changed to the play symbol and progress should stop moving and the progress indicator should have moved back to 0:00. The metadata information (Artwork, Artist and Song title) should be the same as what is displayed in iOS. If all of this is true, PASS.

3.4.2.2 Next Item/Previous Item

Test Environment		[1] and/or [2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either		

	Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		
3		On the iOS device select the DUT as the speaker and select a song in the main music library and click play.	
4	Using either the buttons on the device or on a remote click the “Next Track” button and release the button immediately.		The current song should have moved to the next song in the playlist and should have started playing. The metadata information (Artwork, Artist and Song title) should be the same as what is displayed in iOS. If all of this is true, PASS.
5	Using either the buttons on the device or on a remote click the “Previous Track” release the button immediately. The button must be pressed within 2 secs of the song starting.		The current song should have moved to the previous song in the playlist and should have started playing. The metadata information (Artwork, Artist and Song title) should be the same as what is displayed in iOS. If all of this is true, PASS.
6	Using either the buttons on the device or on a remote click the		The current song should move back to the beginning of the song and restart playing. If all of this is true, PASS.

	<p>“Rewind” button and release the button immediately. Wait until the song has been playing before pressing rewind.</p>		
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3.4.2.3 Volume Up/Volume Down/Mute

Note: Steps 6-13 should only be run if the DUT supports the Mute functionality.

Test Environment	[1] and/or [2]		
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		
3		On the iOS device select DUT as the speaker and select a song in the main music library and click play. Move the Volume indicator bar to approximately	The music should start playing immediately on the DUT and the play button in iOS should have changed to the pause symbol and progress should be moving. If all of this is true, PASS.

		50%. This does not need to be exact.	
4	Using either the buttons on the device or on a remote click the “Volume Up” button and release the button immediately.		<p>The volume coming out of the speaker should increase and the slider bar in iTunes indicating the volume should also increase. If true, PASS.</p> <p>The music should never stop playing.</p>
5	Using either the buttons on the device or on a remote click the “Volume Down” button and release the button immediately.		<p>The volume coming out of the speaker should decrease and the slider bar in iTunes indicating the volume should also decrease. If true, PASS.</p> <p>The music should never stop playing.</p>
6	Using either the buttons on the device or on a remote click the “Mute” button and release the button immediately.		<p>No volume should be heard coming from the speaker and the slider bar in iTunes should have moved to the far left, indicating 0 volume. However the progress bar for the song should still be moving forward. If true, PASS.</p>
7	Using either the buttons on the device or on a remote click the “Mute” button and release the button immediately.		<p>The volume coming out of the speaker should go back to the volume that was being used in step 5.</p>
8	Using either the buttons on the device or on a remote click the “Mute” button and release the button immediately.		<p>No volume should be heard coming from the speaker and the slider bar in iTunes should have moved to the far left, indicating 0 volume. However the progress bar for the song should still be moving forward. If true, PASS.</p>

9	Using either the buttons on the device or on a remote click the “Volume Down” button and release the button immediately.		The volume should go to slightly a lower volume than what was being used in step 5.
10	Using either the buttons on the device or on a remote click the “Mute” button and release the button immediately.		No volume should be heard coming from the speaker and the slider bar in iTunes should have moved to the far left, indicating 0 volume. However the progress bar for the song should still be moving forward. If true, PASS.
11	Using either the buttons on the device or on a remote click the “Volume Up” button and release the button immediately.		The volume coming out of the speaker should go back to the volume that was being used in step 5.
12	Using either the buttons on the device or on a remote click the “Mute” button and release the button immediately.		No volume should be heard coming from the speaker and the slider bar in iTunes should have moved to the far left, indicating 0 volume. However the progress bar for the song should still be moving forward. If true, PASS.
13		On the iTunes server, adjust the volume to about 50%; this does not need to be exact.	The DUT should come out of the mute state and play the music with approximately 50% volume.

3.4.2.4 Repeat/Shuffle

Test Environment	[1] and/or [2]		
Step	DUT	Base Station	Expected Behavior

1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		
3		On the iOS device select the DUT as the speaker and select a song in the main music library and click play.	
4	Using either the buttons on the device or on a remote click the "Repeat" button and release the button immediately.		Verify in iOS the Repeat icon changes from grey to blue and appears highlighted. If true, PASS. The music should never stop playing.
5	Using either the buttons on the device or on a remote click the "Repeat" button and release the button immediately.		Verify in iTunes the Repeat icon changes from blue to blue with a little "1" on the icon and appears highlighted. If true, PASS. The music should never stop playing.
6	Using either the buttons on the		Verify in iTunes the Repeat icon changes from blue with a little "1" on the icon to

	device or on a remote click the “Repeat” button and release the button immediately.		grey. If true, PASS. The music should never stop playing.
7	Using either the buttons on the device or on a remote click the “Shuffle” button and release the button immediately.		Verify in iTunes the Shuffle icon changes from grey to blue and appears highlighted. If true, PASS. The music should never stop playing.
8	Using either the buttons on the device or on a remote click the “Shuffle” button and release the button immediately.		Verify in iTunes the Shuffle icon changes from blue to grey. If true, PASS. The music should never stop playing.

3.5 Standby/Sleep Test Cases

This section is only required if the DUT has a way to put itself into a low power standby state or sleep state. If the device always stays in an active state, then this section does not need to be tested.

3.5.1 Standby State

These tests only needs to run if DUT can be put into a standby state, however only choose the applicable test if the DUT supports a full network while in standby state or not. These tests need to be rerun for both wired and wireless if the device contains both interfaces.

3.5.1.1 Full Network Standby State

Test Environment		[1]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options		Once connected to the network, open the Apple AU and go to Advanced->Logs and Statistics->DHCP clients, and in list box look for the MAC address that was

	here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		collected from the Step 1. If the MAC Address is not present, FAIL. If the MAC address is present, note the IP Address next to the MAC Address.
3	Put the DUT into its standby state. (This maybe done by pushing the power button.		The speaker should remain as a selectable speaker option.
4		On the iTunes server connected to the Base Station ping the IP address that was collected from Step 2.	If all the pings are successful, then PASS, else FAIL.
5		On the iTunes server connected to the Base Station, issue the following command in a Terminal and leave it running. dns-sd -B _raop	A Bonjour record should appear with the following format: Timestamp A/R Flags if Domain Service Type Instance Name The A/R should have "Add" below it, if this is true, PASS. The Service Type should have "_raop._tcp." below it, if this is true, PASS. The Instance have "MACADDRESS@DeviceName" below it, if this is true, PASS. (Example: 78CA3901C341@AirTunes)

3.5.1.2 Full Network Standby State Not Supported (Wired)

Test Environment	[1]
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Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network.		<p>Once connected to the network, open the Apple AU and go to Advanced->Logs and Statistics->DHCP clients, and in list box look for the MAC address that was collected from the Step 1. If the MAC Address is not present, FAIL. If the MAC address is present, note the IP Address next to the MAC Address.</p> <p>Verify the green link light is lit on the Ethernet port that the DUT is plugged into, if not, FAIL.</p>
3		On the iTunes server connected to the Base Station ping the IP address that was collected from Step 2.	If all the pings are successful, then PASS, else FAIL.
4	Put the DUT into its standby state. (This maybe done by pushing the power button.	On the iTunes server connected to the Base Station, issue the following command in a Terminal and leave it running. dns-sd -B _raop	<p>The speaker should be removed as a selectable speaker option.</p> <p>A Bonjour record should appear with the following format: Timestamp A/R Flags if Domain Service Type Instance Name</p> <p>The A/R should have "Rmv" below it, if this is true, PASS.</p> <p>The Service Type should have "_raop._tcp." below it, if this is true, PASS.</p> <p>The Instance have "MACADDRESS@DeviceName" below it, if this is true, PASS. (Example: 78CA3901C341@AirTunes)</p>
5		On the iTunes server connected to the Base Station ping the IP address that	<p>If all the pings are unsuccessful, then PASS, else FAIL.</p> <p>Verify the green link light is off on the Ethernet port that the DUT is plugged into,</p>

	was collected from Step 2.	if not, FAIL.
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3.5.1.3 Full Network Standby State Not Supported (Wireless)

Test Environment		[2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		<p>Once connected to the network, open the Apple AU and go to Advanced->Logs and Statistics->DHCP clients, and in list box look for the MAC address that was collected from the Step 1. If the MAC Address is not present, FAIL. If the MAC address is present, note the IP Address next to the MAC Address.</p> <p>In the Apple AU, go to Advanced->Logs and Statistics->Wireless Clients. In list box look for the MAC address that was collected from the DHCP table. Verify that Type that is listed is one of the following options: 802.11b/g, 802.11g, 802.11a, 802.11a/n, 802.11b/g/n, or 802.11g/n. If any other Type is present, FAIL.</p>
3		On the iTunes server connected to the Base Station ping the IP address that was collected from Step 2.	If all the pings are successful, then PASS, else FAIL.
4	Put the DUT into its standby state. (This maybe done by pushing the power button.)		<p>The speaker should be removed as a selectable speaker option.</p> <p>A Bonjour record should appear with the following format: Timestamp A/R Flags if Domain Service Type Instance Name</p> <p>The A/R should have "Rmv" below it, if this is true, PASS. The Service Type should have</p>

			<p>“_raop._tcp.” below it, if this is true, PASS.</p> <p>The Instance have “MACADDRESS@DeviceName” below it, if this is true, PASS. (Example: 78CA3901C341@AirTunes)</p>
5		<p>On the iTunes server connected to the Base Station ping the IP address that was collected from Step 2.</p>	<p>If all the pings are unsuccessful, then PASS, else FAIL.</p> <p>In the Apple AU, go to Advanced->Logs and Statistics->Wireless Clients. In list box look for the MAC address that was collected from Step 2. The MAC address should not be present, if it is, FAIL.</p>

3.5.2 Wake on LAN

Test Environment		[1]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Using an Ethernet wire, connect the DUT to one of the LAN ports on the Base Station.		
3		<p>On the iTunes server connected to the Base Station, use iTunes and select the DUT as a Speaker that was just added to the network. Once the speaker is selected attempt to start the stream.</p>	<p>Music should start playing within 15 seconds of clicking play.</p>
4		<p>Stop the audio stream and select the Computer as</p>	<p>Music should stop playing within 15 seconds of clicking stop.</p>

		the speaker.	
5	Put the DUT into its low power or sleep state.		The speaker should remain as a selectable speaker option.
6		On the iTunes server connected to the Base Station, use iTunes and select the DUT as a Speaker that was just added to the network. Once the speaker is selected attempt to start the stream.	Music should start playing within 15 seconds of clicking play.

3.5.3 Wake on WLAN

Test Environment		[2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the Wireless network using WPA2-PSK with a Pass Phrase of 12345678.		
3		On the iTunes server connected to the Base Station, use iTunes and select the DUT as a Speaker that was just added to the network. Once the speaker is selected attempt to start the stream.	Music should start playing within 15 seconds of clicking play.
4		Stop the audio	Music should stop playing within 15

		stream and select the Computer as the speaker.	seconds of clicking stop.
5	Put the DUT into its low power or sleep state.		The speaker should remain as a selectable speaker option.
6		On the iTunes server connected to the Base Station, use iTunes and select the DUT as a Speaker that was just added to the network. Once the speaker is selected attempt to start the stream.	Music should start playing within 15 seconds of clicking play.

3.6 Web Configuration Interface

AirPlay products must support the use of a Bonjour HTTP record and a web based configuration page that is compatible with the Safari browser on Mac, PC, and iPhone, and iPad. The accessory will be tested and verified with the latest version of Safari on all three operating systems.

The web configuration interface must provide access to the following accessory settings: All settings must be modifiable from the web interface.

3.6.1 Friendly Product Name

Test Environment		[1] and/or [2]	
Step	DUT	Web Browser	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		Verify the device that has just been added to the network appears as a speaker in iTunes within 30 seconds, or else FAIL.
3		From Safari, select the DUT from the Bonjour list	The speaker should be able to be selected without and error, or else FAIL.
4		Follow the onscreen instructions to rename the DUT.	The unit should update its name and rejoin the network, or else FAIL.
5		From Safari, go to the Bonjour list	The unit should be present in the list with its updated name, or else FAIL.
6		From iTunes, verify that the proper name is indicated in the AirPlay list.	The unit should indicate its new name, or else FAIL.
7		From Safari, select the DUT from the Bonjour list	The speaker should be able to be selected without and error, or else FAIL.
8		From Safari, verify that the proper name is indicated in the Web interface	The unit should indicate its new name, or else FAIL.

3.6.2 Wi-Fi Network Selection of available networks

Test Environment		[2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Wait for DUT to complete booting.		The DUT should begin beaconing 802.11 beacons and advertising as an 802.11b/g network with a SSID that is descriptive of the DUT. At minimum the indication of the manufacturer should be present, with no security enabled.
3		Using the iTunes server, associate wirelessly to the DUT.	The iTunes server should be able to associate on the 2.4GHz band using 802.11b/g with no security and receive a network that is on the same IPv4 network as the DUT. If the DUT does not have a DHCP server and instead would like to use the IPv4 link local IP space, this must be specified in manufacturer's documentation.
4		From Safari, select the DUT from the Bonjour list	The speaker should be able to be selected without and error, or else FAIL.
5		From Safari, configure the DUT to connect to the wireless network on the Apple Base Station. Minimally their needs to be a way to manually specify the SSID and security passphrase, however there can also be a way to select from a list obtained via scanning.	The DUT MUST have a way to manually enter the SSID for the wireless network and select a security mode. Optionally it can create a list (scan list) for the user pick their network from, if desired. Once the device is connected to the Base Station, there MUST be some indication on the DUT that device is connected.
6		Open the AU and verify the	In the Apple AU, go to Advanced->Logs and Statistics->Wireless Clients. In list

		settings are correct.	box look for the MAC address that was collected from the Step 1. Verify that Type that is listed is one of the following options: 802.11b/g, 802.11g, 802.11a, 802.11a/n, 802.11b/g/n, or 802.11g/n. If any other Type is present, FAIL. Next go to Advanced->Logs and Statistics->DHCP clients, and In list box look for the MAC address that was collected from the Step 1. If the MAC address is not present, FAIL.
7		Open Safari on the iTunes Server and attempt to connect to the web server on the DUT with the address it just received.	Safari should be able to navigate to the web server, or else FAIL. All of the settings that were entered in previous steps should be reflected in the user interface.

3.6.3 DHCP Setting / Manual IP Settings

Test Environment		[2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		Verify the device that has just been added to the network appears as a speaker in iTunes within 30 seconds, or else FAIL.
3		Using the iTunes	The iTunes server should be able to

		server, associate wirelessly to the DUT.	associate on the 2.4GHz band using 802.11b/g with no security and receive a network that is on the same IPv4 network as the DUT. If the DUT does not have a DHCP server and instead would like to use the IPv4 link local IP space, this must be specified in manufacturer's documentation.
4		From Safari, select the DUT from the Bonjour list	The speaker should be able to be selected without an error, or else FAIL.
5		From Safari, configure the DUT to connect to the wireless network on the Apple Base Station. Minimally there needs to be a way to manually specify the SSID and security passphrase, however there can also be a way to select from a list obtained via scanning.	The DUT MUST have a way to manually enter the SSID for the wireless network and select a security mode. Optionally it can create a list (scan list) for the user pick their network from, if desired. Once the device is connected to the Base Station, there MUST be some indication on the DUT that device is connected.
6		Open the AU and verify the settings are correct.	In the Apple AU, go to Advanced->Logs and Statistics->Wireless Clients. In list box look for the MAC address that was collected from the Step 1. Verify that Type that is listed is one of the following options: 802.11b/g, 802.11g, 802.11a, 802.11a/n, 802.11b/g/n, or 802.11g/n. If any other Type is present, FAIL. Next go to Advanced->Logs and Statistics->DHCP clients, and In list box look for the MAC address that was collected from the Step 1. If the MAC address is not present, FAIL.
7		Open Safari on the iTunes	Safari should be able to navigate to the web server, or else FAIL. All of the settings

		Server and attempt to connect to the web server on the DUT with the address it just received.	that were entered in previous steps should be reflected in the user interface.
8		From Safari, select the DUT from the Bonjour list	The speaker should be able to be selected without an error, or else FAIL.
9		From Safari, turn off DHCP on the DUT. Manually configure the DUT to connect to the AP with a known good IP address.	
10		Open Safari on the iTunes Server and attempt to connect to the web server on the DUT with the address it just received.	Safari should be able to navigate to the web server, or else FAIL. All of the settings that were entered in previous steps should be reflected in the user interface.

3.7 Audio Delay

AirPlay audio modules are tightly controlled for audio-delay characteristics. The software on AirPlay audio modules can be adjusted to compensate for inherent system audio delays such as DSP processing. Please see vendor specific AirPlay module documentation on how to achieve this.

All DUTs must be tested to ensure additional delay has not been introduced into the system. DUTs will be tested by taking an oscilloscope trace with one channel connected to the line out audio jack of an AirPort Express 802.11n (2nd Generation) and a second channel connected to a microphone input axially aligned with the DUT's right speaker driver. Both the AirPort Express and the DUT shall be connected via Wi-Fi if available, otherwise both shall be connected via ethernet directly to an AirPort Extreme Base Station.

A Mac will be used as an iTunes server with both the AirPort Express and DUT selected as speaker outputs. The signal delay between the oscilloscope channels must measure no more than 5ms between the DUT and the AirPort Express.

3.7.1 DUT Audio Delay Measurement

Test Environment		[2]	
Step	DUT	Base Station	Expected Behavior
1	Power on the DUT.		
2	Connect the DUT to the network. There are two options here, either Ethernet or Wireless. If the device supports both interfaces then the test must be done for both. For Wireless only use WPA2-PSK with a Pass phrase of 12345678.		Verify the device that has just been added to the network appears as a speaker in iTunes within 30 seconds, or else FAIL.
3		Using the iTunes server, associate wirelessly to the DUT.	The iTunes server should be able to associate on the 2.4GHz band using 802.11b/g with no security and receive a network that is on the same IPv4 network as the DUT. If the DUT does not have a DHCP server and instead would like to use the IPv4 link local IP space, this must be specified in manufacturer's documentation.
4		On the iTunes server that is connected to the Apple Base Station, select multiple speaker output: AirPort Express & the newly added DUT.	The speaker should be able to be selected without and error, or else FAIL.
5		Once the	

		speakers are selected, set the volume in iTunes to 50% and click play. (The 50% does not need to be exact.)	
6		Start playing a click track from the iTunes server.	The audio should begin playing within 15 seconds, or else FAIL.
7		Measure the time delay from the rising edge of the signal from the AirPort Express and the DUT.	The time delay must be less than 5ms, or else FAIL.
8		Click the stop button within iTunes.	The audio should stop playing within 15 seconds, or else FAIL.

4 Certification Procedure

4.1.1 Production Certification Event:

- Product submission must be accompanied by proof of Wi-Fi Certification for the product
- 2ea Production samples are required
- Two firmware versions are required for certification. The firmware shipped on both units should be the production candidate firmware as would ship to the end customer. The submission should additionally include a copy of the production firmware for reflashing the units (use name convention <filename>_production) and a copy of firmware that is identical to the production firmware but enables a telnet debug console and is enabled to run the iPerf tests required in section 3.2.5 of this document (use name convention <filename>_telnet). The firmware update test of section 3.1 requires that the product firmware be updated to the debug version and then back.
- Full product documentation must be provided in both printed and soft copy form (all customer facing documents such as user manuals and quick start guides)

· The submission must be accompanied by a completed “AirPlay Product Compliance Questionnaire R6”

5 References

5.1 Tables

5.1.1 Table 1

Status indicators

Action		Implementation	
		Accessory with Display	Accessory without Display
Required	Network connection	Message on display	LED 1 illuminates SOLID, COLOR A
	Network problem	Message on display	LED 1 illuminates BLINKING, COLOR B
Optional	Critical firmware problem	Message on display	LED 1 illuminates BLINKING, COLOR C
			LED 1 illuminates BLINKING faster, COLOR B
			LED 2 illuminates BLINKING, COLOR B
	Source input label	Message on display	N/A
	AirTunes stream in progress	Logo or type on display	LED 2 illuminates SOLID, COLOR A
		LED 3 illuminates SOLID, COLOR A	