



AirPlay

Product Definition Specification

-Audio Streaming Devices

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Apple



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Introduction

AirPlay enables iTunes users to play their music library, hosted on a Mac, PC, iPhone, iPod touch, or iPad on any AirPlay-enabled device connected to the network.

With an AirPlay-enabled accessory users can:

- stream audio from their iTunes music library to any room in the house
- choose which AirPlay accessories they want to play music on
- stream audio to a variety of AirPlay accessories

AirPlay includes a number of proprietary Apple technologies to allow for a complete music streaming experience for the user.

Requirements

User requirements

Hardware

AirPlay requires a Mac or PC running a compatible version of iTunes (version 10.0 or greater) that acts as a host for the user's music library.

OR

AirPlay requires an iPhone, iPod touch, or iPad (running iOS version 4.2 or greater) that acts as a host for the user's music library.

AND

An AirPlay accessory with built-in or external speakers.

Network

AirPlay requires a wired or wireless TCP/IP network connection. The AirPlay-enabled device must reside on the same local network and subnet as the Mac, PC, iPhone, iPod touch, or iPad.

Wired networks require:

- a minimum of 100BaseT connection

Wireless networks require:

- 802.11b/g or 802.11n
- a password if you have wireless security enabled

AirPlay accessory requirements

All AirPlay accessories must incorporate the following features and requirements.

Product features

AirPlay accessories must include the following features:

- a network connection
- a built-in speaker or audio output capability
- a product status indicator
- a network status indicator
- the ability for the user to perform a firmware update
- **not** repeat or rebroadcast the AirPlay audio stream
- **not** background or render the audio in an inaudible way while the device is in an alternate mode

Network requirements

All AirPlay accessories must support a wired or wireless network connection, and Bonjour, Apple's service discovery protocol. Devices must also support changing the Bonjour name. The default name of all devices must be unique out of the box.

AirPlay accessories that support wireless networks must also:

- support 802.11b/g or 802.11n
- complete Wi-Fi certification (see Certification requirements)
- **not** use proprietary wireless technologies

Implementation requirements

All AirPlay accessories must meet the following implementation requirements:

- incorporate the iPod Authentication Coprocessor 2.0B
- **not** be based on an OS that is GPL controlled or otherwise incompatibly licensed, such as Linux
- meet all applicable requirements documented in the Made for iPod specification

Bonjour

The AirPlay accessory must only advertise its Bonjour service when that service is actively available. This means that a device which is in a mode where it cannot accept an AirPlay stream it must not advertise its service. Additionally, when a device is powered down it must deregister its Bonjour service on the network. By broadcasting its Bonjour service, the AirPlay accessory is indicating it is actively prepared and capable of accepting an AirPlay stream at that time.

Certification requirements

AirPlay accessories must complete the following certification requirements:

- Wi-Fi Alliance "Wi-Fi certified" program
- MFi program certification

NOTE: Pre-existing MFi program certification on an accessory is not in itself sufficient for AirPlay accessory certification.

AirPlay Setup Experience

Getting started

- 1) Install the latest version of iTunes on a Mac or PC.
- 2) Connect all necessary cables to the AirPlay accessory.
- 3) Connect the AirPlay accessory to power.
- 4) Connect the AirPlay accessory to the network (see Network configuration).

Network configuration

Network configuration for wireless networks

If the AirPlay accessory and user's Wi-Fi router both support WPS

- 1) Press the WPS button, or equivalent, on the router.
- 2) Press the WPS button, or equivalent, on the AirPlay accessory.
 - The AirPlay accessory joins the wireless network and is ready to be seen from the iTunes user interface.

If the AirPlay accessory or the user's Wi-Fi router do not support WPS, and the AirPlay accessory has no built-in display.

- 1) Turn on or reset the AirPlay accessory.
 - The AirPlay accessory creates a default network with a unique network name such as "PRODUCT_1234".
- 2) Join the AirPlay accessory's network from a Mac, PC or iPhone OS device.
- 3) Launch a web browser and enter the AirPlay accessory's IP address (user is required to consult the user manual for the IP address).
 - The AirPlay accessory includes an HTTP server to provide configuration web pages.
 - The configuration web pages must support common web browsers, including Safari on iPhone OS devices.
- 4) Enter the local Wi-Fi network name and password.
- 5) Enter a meaningful name for the AirPlay accessory.
 - The AirPlay accessory restarts and joins user's local Wi-Fi network. It is now ready to be seen from the iTunes user interface and appears on the network as its meaningful name.

If the AirPlay accessory or the user's Wi-Fi router do not support WPS, and the device has a built-in display.

- 1) Turn on the AirPlay accessory and select its “settings” screen.
- 2) The AirPlay accessory provides a user interface to enter the local Wi-Fi network name and password.
- 3) The AirPlay accessory provides a user interface to name the AirPlay accessory something meaningful.
 - The AirPlay accessory restarts and joins user's local Wi-Fi network. It is now ready to be seen from the iTunes user interface and appears on the network as it's meaningful name.

Network configuration for wired networks

- 1) Connect the AirPlay accessory to the local network router using an Ethernet cable.
- 2) The AirPlay accessory joins the network, obtains an IP address using DHCP, and is ready to be seen from the iTunes user interface.

User Interface Guidance

iTunes user interface

iTunes provides the following controls for AirPlay accessories:

- “on” selection for an AirPlay accessory
- “off” selection for an AirPlay accessory
- volume slider (requires optional setting in iTunes preferences)

Apple Remote app user interface

The Apple Remote app controls iTunes playback. AirPlay accessories are enabled as output speakers through the AirPlay UI element of the Remote app.

iOS device user interface

The iPhone, iPod touch, or iPad can playback from any audio application supporting the standard iOS volume controls. AirPlay accessories are enabled as output speakers through the AirPlay UI element.

AirPlay accessory user interface

AirPlay accessories must implement the following required product behaviors and required user interface. AirPlay accessories may also choose to implement control commands and display information about the currently-playing song.

Required product behaviors

The following behavior is suggested for all AirPlay accessories:

- if the AirPlay accessory receives an audio stream and the device is not actively engaged in playback on another source, it must automatically switch its audio input source to the audio stream

Note: If this suggestion cannot be supported, the AirPlay accessory is required to always be available to accept an AirPlay stream as long as it is in the power mode to do so. This means that an explicit user action selecting the speaker as an output must always interrupt the current activity and start the AirPlay activity.

The following behaviors are required of all AirPlay accessories that support “sleep” mode or low-power states:

- when the AirPlay accessory is in a low-power state, it must continue to maintain its Bonjour advertisements, respond to Bonjour queries, and accept TCP connection requests to start an audio stream session
- while the audio stream session is active, the AirPlay accessory must remain in a power state that allows it to play audio and receive TCP data and UDP packets

Required product user interface

Product GUI

Products which use a GUI are highly recommended to include the AirPlay logo as defined in the document: AirPlay Logo Guidelines for Made for iPod Licensees. Products may not use any imagery other than the AirPlay logo to represent the AirPlay feature.

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
	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
Optional	Source input label	Message on display	N/A
	AirPlay stream in progress	Logo or type on display	LED 2 illuminates SOLID, COLOR A
			LED 3 illuminates SOLID, COLOR A

Text indicators

Condition	Message
Network connection	“Successfully connected to [NETWORK NAME].”
Network problem	“Cannot connect to [NETWORK NAME]. Please try again.”
Critical firmware problem	“Please reset device by [RESET METHOD].”
Source input label	“AirPlay”

Controls

Transport Controls

Transport controls are optional for AirPlay accessories. AirPlay accessories choosing to implement transport controls MUST minimally implement Play, Pause, Next track, and Previous track.

Play

Starts playback of the currently selected track in iTunes. The AirPlay accessory that initiated the play event must be enabled as a playback endpoint (if not previously enabled in iTunes the command will have no effect). Other endpoints in the network will retain their ON/OFF settings as previously set.

Pause

Pauses the playback of the currently playing track in iTunes. Other endpoints in the network will retain their ON/OFF settings and audio stream state as previously set.

Stop

Stops the playback of the currently playing track in iTunes. If you are in the middle of playback, the song time will reset to the start of the track. Other endpoints in the network will retain their ON/OFF settings and audio stream state as previously set.

Next track/previous track

Skips to the next/previous track in the current playlist of iTunes. Has no effect if there is not a currently selected “now playing” track in iTunes. Previous track command automatically skips to the start of the song if more than 3 seconds of the currently playing track has passed.

Shuffle and Repeat State Controls

Shuffle and repeat controls are optional for AirPlay accessories. AirPlay accessories choosing to implement either shuffle or repeat MUST additionally implement the other command.

Shuffle toggle

Advances the iTunes shuffle setting from it's current state to the next in the progression (... shuffle all songs, shuffle off ...)

Repeat toggle

Advances the iTunes repeat setting from it's current state to the next in the progression (... repeat all songs, repeat single song, repeat off ...)

Volume Controls

Volume controls are optional for AirPlay accessories. AirPlay accessories choosing to implement volume controls MUST implement both local and remote volume controls and volume state must be communicated both directions. The device must respect the volume setting as commanded by the AirPlay stream and any local volume control should be applied immediately upon the AirPlay accessory and the new volume level reported back to the AirPlay source.

Volume is communicated as a floating-point dB attenuation value where 0.0 is full volume and -144.0 is completely muted. The practical volume range utilized for the AirPlay stream has a basis of -30dB to 0dB with a special cased mute level of -144dB (linear volume of 0) in order to avoid infinities. The following equations can be used to convert between a dB value and a linear volume:

$$\begin{aligned}\text{linear volume} &= \text{pow}(10, \text{dB} / 20) \\ \text{dB value} &= 20 * \log_{10}(\text{linear volume})\end{aligned}$$

The AirPlay accessory must map the communicated volume range to its own full scale range. Additionally, the AirPlay accessory must implement volume control at the final gain stage available to it in order to minimize audio quality loss through the system.

Local volume control

Controls the output volume of the local AirPlay accessory immediately upon action. The AirPlay accessory's new volume level **MUST** be reported back to the AirPlay server immediately upon setting the system volume.

Remote volume control

Controls the output volume of the local AirPlay accessory from a remote location. Upon receiving a remote volume setting the AirPlay accessory should send the actual volume set to the server.

Mute volume control

All accessories are required to support a true, no volume Mute audio level communicated by the AirPlay streaming protocol by a value of -144dB.

Accessory manufacturers can optionally decide to implement a Mute function within their Accessory. The operation of the mute function should bring the volume level down to -144dB when engaged and back to the pre-mute level when disengaged. It is the responsibility of the Accessory to remember the pre-mute level when entering the mute function and to ensure both that it returns to this level and that it reports the proper level to the AirPlay server when disengaging.

Further, any volume up or down commands that the Accessory receives from the user should disengage the mute function and then act upon the pre-mute level. The exception to this rule is when a volume level is commanded by the AirPlay stream itself. In this case the Accessory should cancel the mute function but set the return volume to that which has been dictated by the AirPlay stream.

Local Input Controls

AirPlay accessories are not required to have multiple modes or inputs other than AirPlay. AirPlay accessories choosing to implement multiple inputs or modes **MUST** automatically switch its audio input source to the AirPlay stream if the device receives an audio stream. If an audio stream session is active and the audio input source is changed to an alternate source, the AirPlay accessory **MUST** send a deselection of the AirPlay accessory output path to

iTunes. Similarly, if an audio stream session is inactive and the audio input source is changed to the AirPlay source, the AirPlay accessory MUST send a selection of the AirPlay accessory output path to iTunes.

Metadata Display

AirPlay accessories with display capability may choose to display the following information about the currently-playing song. When choosing to support metadata, the device must minimally support the Song title. It is highly recommended that the accessory support both the Song title and Artist name as a minimum display set on all visible user interfaces. The AirPlay accessory is required to display any metadata they choose to implement faithfully. All devices with limited display capabilities must scroll a piece of metadata that is too long for its display, ensuring the user can see the entirety of that piece of metadata.

Artist name

Song title

Album name

Album artwork

Permitted only on full color displays. JPEG rendering is a required minimum but JPEG, PNG, GIF, BMP, JPEG2000, TIFF, and PICT files should be accommodated when possible.

NOTE: An AirPlay accessory that is not capable of rendering file types besides JPEG must render a placeholder image in place of the missing album artwork.

Elapsed time

Total time

Firmware Update

All devices are required to be firmware updatable in the field. In the case where a AirPlay accessory's firmware update is not successful, the device must not advertise a Bonjour service unless it is in a state where that service can be fully supported.

AirPlay devices which choose to use an application to update their firmware must minimally include support for the OSX operating system.