



AirMedia[®] Presentation Gateway

Deployment Guide

Crestron Electronics, Inc.

Crestron product development software is licensed to Crestron dealers and Crestron Service Providers (CSPs) under a limited non-exclusive, non-transferable Software Development Tools License Agreement. Crestron product operating system software is licensed to Crestron dealers, CSPs, and end-users under a separate End-User License Agreement. Both of these Agreements can be found on the Crestron website at www.crestron.com/legal/software_license_agreement.

The product warranty can be found at www.crestron.com/legal/sales-terms-conditions-warranties.

The specific patents that cover Crestron products are listed at www.crestron.com/legal/patents.

Certain Crestron products contain open source software. For specific information, visit www.crestron.com/legal/open-source-software.

Crestron, the Crestron logo, AirMedia, Crestron Connected, Crestron Fusion, Crestron Mercury, and PinPoint are either trademarks or registered trademarks of Crestron Electronics, Inc. in the United States and/or other countries. AirPlay, App Store, Bonjour, iPad, iPhone, iTunes store, Mac, macOS, and OS X are either trademarks or registered trademarks of Apple, Inc. in the U.S. and/or other countries. IOS is either a trademark or registered trademark of Cisco Systems, Inc. in the United States and/or other countries. Android and Google Play are either trademarks or registered trademarks of Google, Inc. in the United States and/or other countries. HDMI is either a trademark or registered trademark of HDMI Licensing, LLC in the United States and/or other countries. Excel, Microsoft, PowerPoint, and Windows are either trademarks or registered trademarks of Microsoft Corporation in the United States and/or other countries. Wi-Fi is either a trademark or registered trademark of Wi-Fi Alliance in the United States and/or other countries. Other trademarks, registered trademarks, and trade names may be used in this document to refer to either the entities claiming the marks and names or their products. Crestron disclaims any proprietary interest in the marks and names of others. Crestron is not responsible for errors in typography or photography.

This document was written by the Technical Publications department at Crestron.
©2018 Crestron Electronics, Inc.

Contents

Introduction	1
Crestron AirMedia Apps	2
Crestron AirMedia App for iOS Devices	2
Crestron AirMedia App for Android Devices	2
Accessing AirMedia	3
User Experience with Windows.....	4
On-Screen Display	4
Login Code	4
AirMedia Guest Application	4
Deployable (Installed) Application	6
Connecting to AirMedia.....	8
User Experience with a Mac	9
On-Screen Display	9
Passcode	9
AirMedia Guest Application	9
Deployable (Installed) Application	11
Connecting to AirMedia.....	12
Configuration File (config.ini)	13
Room List (XML File) for Windows and Mac	14
File Association for Windows	15
File Association for Mac	15
Discovery.....	15
Manual Entry	16
Device Considerations	17
Device Naming	17
Device Administration	17
Connecting to Mobile Applications	21
AirMedia Installation Applications	22
AirMedia Installable Application for Windows	22
AirMedia Installable Application for Mac.....	23
AirMedia Network Infrastructure and Security	24

Network Infrastructure and Design Considerations	24
Deployment Options for Guest Network Access	27
VLAN	27
Physical Air Gap	28
Data Transport	28
Device Upgrades	29
Single Device (Web Interface)	29
Multiple Devices.....	29
Control	29
Crestron Connected	29
Control System.....	30

AirMedia Presentation Gateway

Introduction

The AirMedia family of products [AM-100](#), [AM-101](#), [AM-200](#), [AM-300](#), [DMPS3-4K-250-C](#), [DMPS3-4K-350-C](#), [DMPS3-4K-250-C-AIRMEDIA](#), [DMPS3-4K-350-C-AIRMEDIA](#), and [Crestron Mercury™](#) (CCS-UC-1) devices allow users to present content via projectors and displays wirelessly with the existing IT infrastructure using a single 10/100 Mbit/s Ethernet port. AirMedia is designed with the IT professional in mind and includes many features to ease deployment.

When connecting to AirMedia, there are no wires to hook up or settings to configure, and no AV or control system is required. Simply connect via the local Wi-Fi® network and start sharing content from the device.

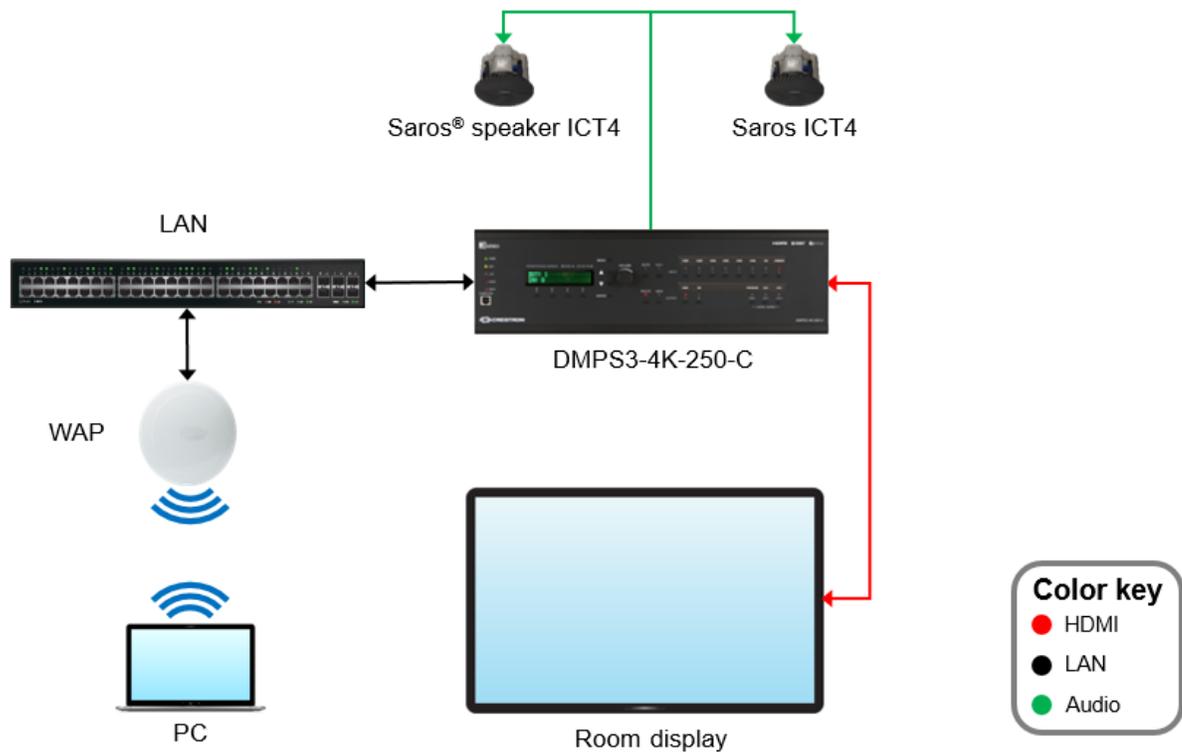
AirMedia supports computers running Windows® or macOS® operating systems, as well as mobile devices running Apple® iOS® and Android™ operating systems. Presenters using a Mac® computer or a Windows-based computer can connect to AirMedia without any special software.

Apple iOS and Android mobile devices can share Excel® spreadsheets, Word documents, PowerPoint® presentations, PDF files, on-device videos, photos, and other content by using the free application available from the App Store® online store and in the Google Play™ retail stores. Android users can share their screen from the PinPoint™ App.

The documents referenced below are all available at www.crestron.com/manuals

- Crestron AM-100 Operations Guide (Doc 7463).
- AM-101 Supplemental Guide (Doc 7918).
- AM-200/AM-300 Product Manual (Doc. 8254).
- Crestron® PinPoint App Deployment Guide (Doc 7976).
- CCS-UC-1 Supplemental Guide (Doc 7844).
- DMPS3-4K-250-C, DMPS3-4K-350-C, DMPS3-4K-250-C-AIRMEDIA, or DMPS3-4K-350-C-AIRMEDIA, refer to the DMPS3-4K-200-C/DMPS3-4K-300-C Series Supplemental Guide (Doc 7849C).

DMPS3-4K-250-C Deployment Application



Crestron AirMedia Apps

There are two Crestron AirMedia apps: one for iOS devices and one for Android devices.

Crestron AirMedia App for iOS Devices

This app is designed for iPhone® and iPad® devices. For information on the Crestron AirMedia app for iOS devices, refer to <https://itunes.apple.com/us/app/crestron-airmeia/id685412055?mt=8>.

This app is only available to download from the App Store for iOS devices.

Crestron AirMedia App for Android Devices

This app is designed for Android devices. To install the Crestron AirMedia app for Android devices and for information on the Crestron AirMedia app for Android devices, refer to <https://play.google.com/store/apps/details?id=com.crestron.airmedia>.

Accessing AirMedia

There are two ways to access an AirMedia device using a Windows or a macOS computer:

- **Guest Application:** Download the guest application using the Windows guest application or the macOS guest application from the AirMedia webpage at present.crestron.com, the built-in AirMedia web page, or from the corresponding product page.
- **Deployable Application:** Download the deployable application using either the Windows deployable application or the macOS deployable application from the AirMedia webpage at present.crestron.com or from the corresponding product page.

NOTE: For more information on connecting to AirMedia with a Windows or macOS PC, refer to the “User Experience with Windows” section on page 4 or the “User Experience with a Mac” section on page 9.

AirMedia Presentation Gateway Using an AM-101 Device



The guest and deployable applications are compatible with the operating systems shown in the table below.

Operating System Compatibility Chart

OPERATING SYSTEM	VERSIONS SUPPORTED
Windows	Windows 7, Windows 8, Windows 8.1, and Windows 10
macOS	macOS version 10.10 or later

User Experience with Windows

This section provides information on the AirMedia user experience when using a PC running Windows.

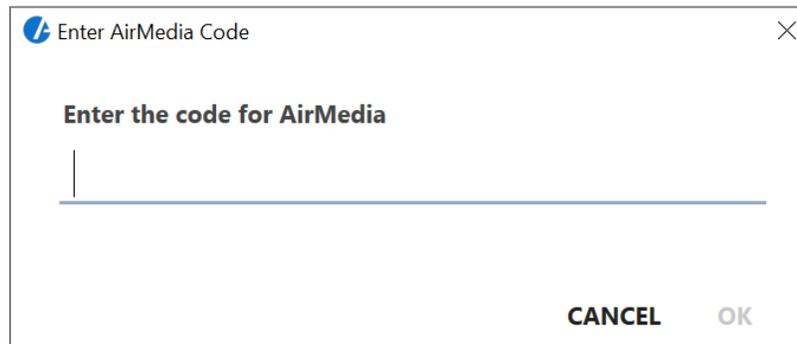
On-Screen Display

AirMedia uses an on-screen display to convey the connection instructions for guest access. The display can be configured to allow custom login instructions and branding. It provides the hostname, IP address (optional), and login code for the specific AirMedia device.

Login Code

A login code is provided to help prevent users from accidentally connecting to an unintended device. When connecting to AirMedia, the user is prompted to enter a code in the **Login** window. The code is only four digits, so it is easy for the user to remember while still preventing unwanted presentations.

Login Code Screen



There are three modes of operation:

- **Disabled:** A login code is not required.
- **Random:** A login code is generated after the last user disconnects.
- **Fixed:** A login code can be set in the web administration pages (static). It can also be programmed using a control system.

AirMedia Guest Application

The guest application is a small downloadable that runs with standard user permissions. The IP address of the AirMedia device is encoded in the filename of the application. The user may save the application locally, which allows for direct connection to the device the next time the user accesses the application. Download the guest application for Windows at present.crestron.com.

For custom deployments, download and save the guest application to websites or other media. The connection parameters for the guest application are embedded in the file name.

The supported formats are:

<any_text>_<ip_address>.exe

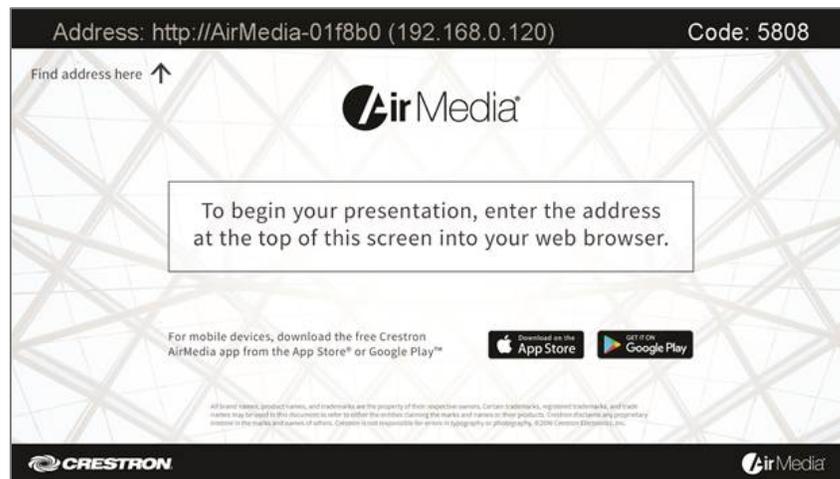
<any_text>.<ip_address>.exe

The underscore and dot must precede the IP address, for example:
executive_conference_room_.10.1.1.13.exe.

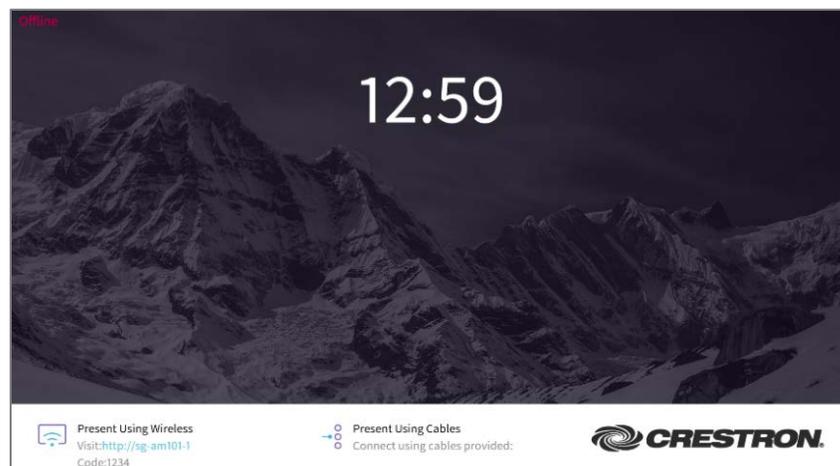
To access the guest application from the **AirMedia Welcome** window, complete the steps below:

1. Open a web browser and enter the user's IP address or hostname into the browser.

AirMedia Welcome Screen for AM-100 and AM-101

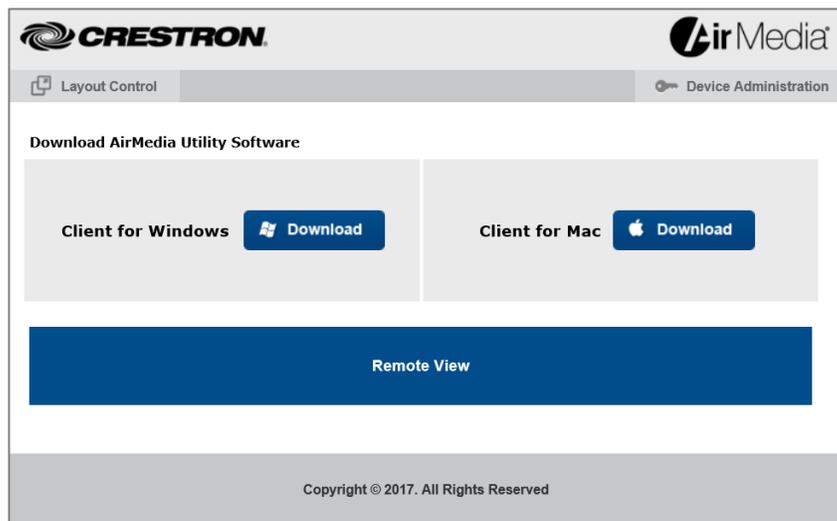


AirMedia Welcome Screen for AM-200, AM-300, DMPS3, and Crestron Mercury

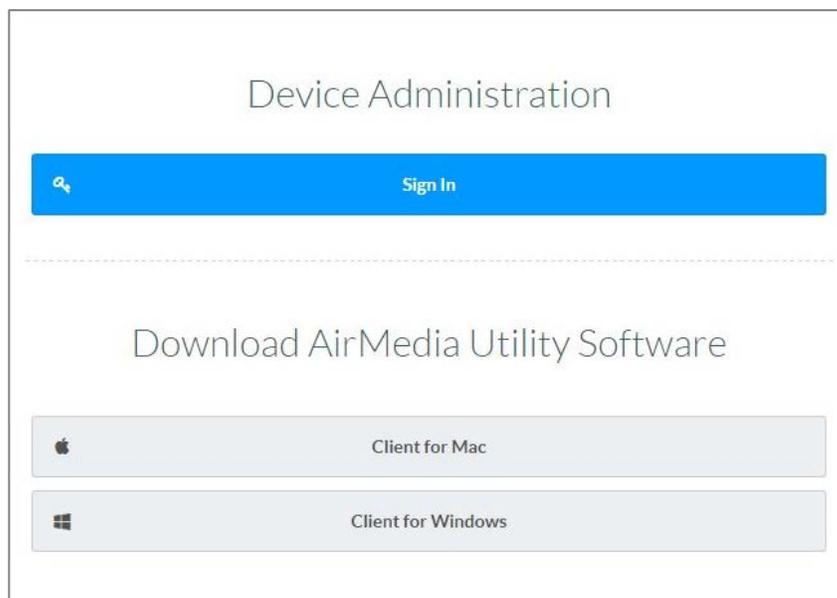


The **AirMedia Download** screen opens.

AirMedia Download Screen for AM-100 and AM-101



AirMedia Download Screen for AM-200, AM-300, DMPS3, and Crestron Mercury



2. Download the **Client for Windows** AirMedia software.
3. Run the application. If prompted, enter the login code.

The session begins. The user's desktop is shown on the AirMedia on-screen display.

Deployable (Installed) Application

A deployable stand-alone application available for users' computers across the enterprise. The application connects to all AirMedia devices and can be silently deployed using MSI.

The deployable application for Windows is available at present.crestron.com.

Managing the rooms in which AirMedia is installed can be a significant task. There may be multiple campuses or rooms that only certain employees can access. To address the various deployment scenarios, AirMedia provides the following methods to access the connection parameters of a room:

- **Room Lists:** The AirMedia client application reads the XML file containing a list of rooms and presents them in the **Connect** screen that contains a list of all remote AirMedia devices.

NOTE: Two files need to be created: a config.ini file and an XML file. For information on the config.ini file, refer to the “Configuration File (config.ini)” section on page 13. For information on the XML file, refer to the “Room List (XML File) for Windows and Mac” section on page 14.

- **File Association:** The AirMedia client application is associated with .present files and room list files. Embed the .present files in meeting invitations or host them on a corporate website.
- **Discovery:** If the AirMedia devices and the user’s computer are on the same subnet, the AirMedia client application locates these devices and presents them to the user. Crestron recommends this method if a room list or .present file is not used.
- **Manual Entry:** AirMedia allows the user to enter the hostname or IP address of the device.

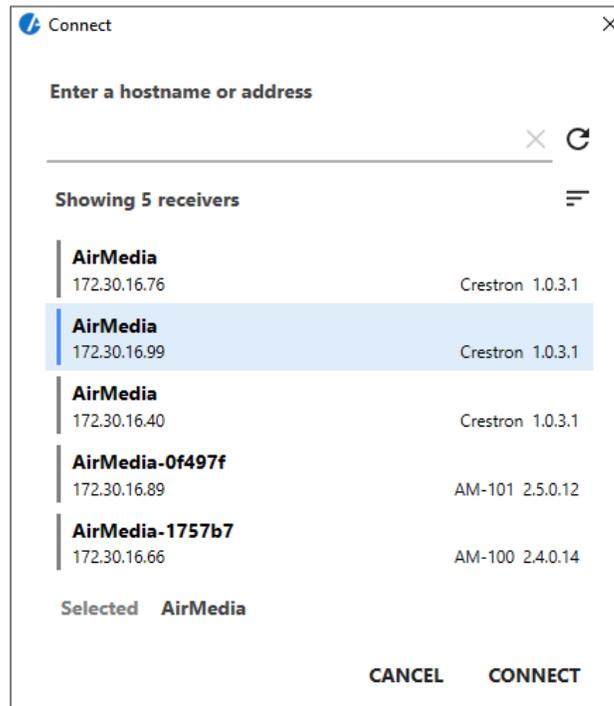
Connecting to AirMedia

The application reads a list of devices and populates the **Connect** screen. A search box helps the user locate devices in long room lists.

To connect using a room list, complete the steps below:

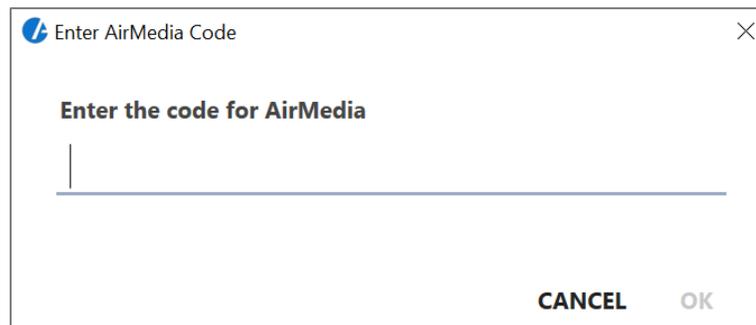
1. Launch AirMedia.
2. From the **Connect** screen, select the desired gateway from the list.

Connect Screen



3. Click **Connect**. If prompted, enter the login code.

Login Code Screen



The application can be launched and connect automatically using the following command in a Windows command prompt:

```
start present:<IP_ADDRESS>?code=<CODE>
```

where <IP_ADDRESS> is the IPv4 address of the AirMedia Presentation Gateway and <CODE> is the passcode for the AirMedia Presentation Gateway.

If a Crestron Connected® display is used, the display turns on automatically. The session begins.

User Experience with macOS

This section provides information on the AirMedia user experience when using macOS.

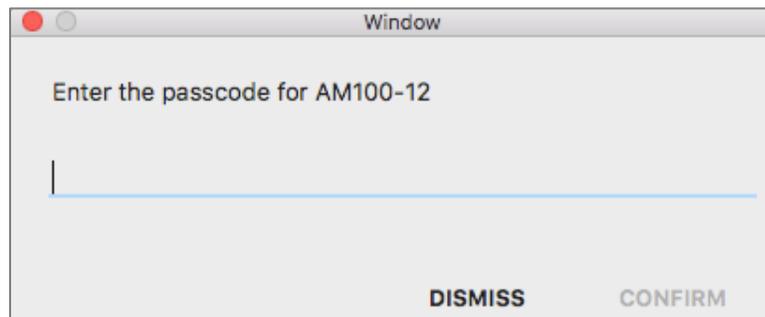
On-Screen Display

AirMedia uses an on-screen display to convey the connection instructions for guest access. The display can be configured to allow custom login instructions and branding. It provides the hostname, IP address (optional), and login code for the specific AirMedia device.

Passcode

A passcode is provided to help prevent users from accidentally connecting to an unintended device. When connecting to AirMedia, the user is prompted to enter a passcode in the **Passcode** screen. The passcode is only four digits, so it is easy for the user to remember while still preventing unwanted presentations.

Passcode Screen



There are three modes of operation:

- **Disabled:** A login code is not required.
- **Random:** A login code is generated after the last user disconnects.
- **Fixed:** A login code can be set in the web administration pages (static). It can also be programmed using a control system.

AirMedia Guest Application

The guest application is a small downloadable that runs with standard user permissions. The user needs to open the .zip package and then run the guest application within the package.

The user can save the .zip package locally, which allows for direct connection to the device the next time the user accesses the application. The IP address of the AirMedia device is encoded in the filename of the application. Download the guest application executable for macOS at present.crestron.com.

For custom deployments, download and save the guest application to websites or other media. The connection parameters for the guest application are embedded in the file name. The supported formats are:

<any_text>_<ip_address>.dmg

<any_text>_<ip_address>.dmg

The underscore and dot must precede the IP address, for example:
executive_conference_room_.10.1.1.13.dmg.

To access the guest application from the **AirMedia Welcome** screen, complete the steps below:

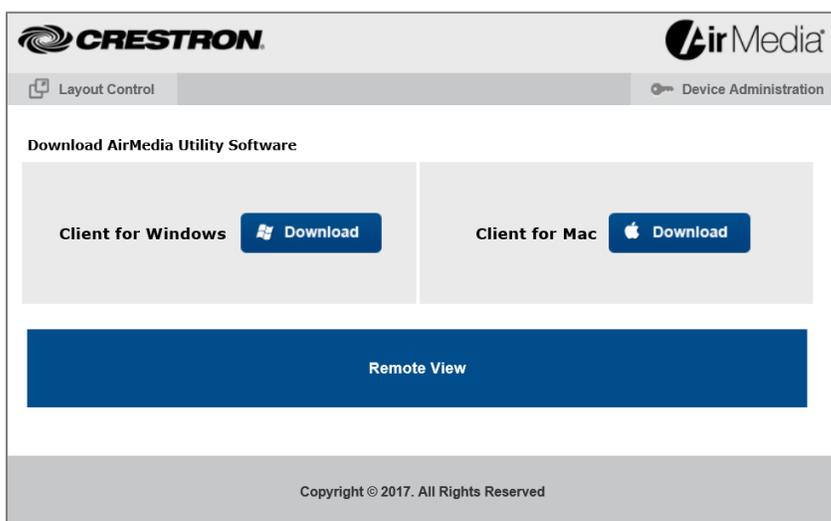
1. Open a web browser and enter the user's **IP address** or **hostname** into the browser.

Connected Device Displaying AirMedia Screen

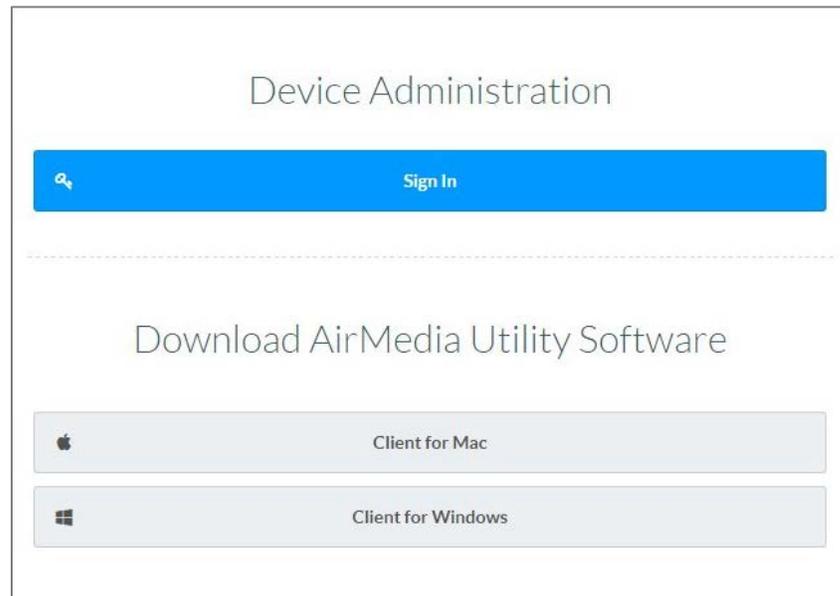


The **AirMedia Download** screen opens.

AirMedia Download Screen for AM-100 and AM-101



AirMedia Download Screen for Crestron Mercury and DMPS3



2. Download the **Client for Mac** AirMedia software
3. Run the application. If prompted, enter the passcode.

Deployable (Installed) Application

A deployable stand-alone application is available for users' computers across the enterprise. This application allows other types of connections to the AirMedia device and has no registry requirements. The application is silently deployed as a group of files to a folder on the users' computers.

The deployable application for macOS is available at present.crestron.com.

Managing the rooms in which AirMedia is installed can be a significant task. There may be multiple campuses or rooms that only certain employees can access. To address the various deployment scenarios, AirMedia provides the following methods to access the connection parameters of a room:

- **Room Lists:** The AirMedia client application reads the XML file containing a list of rooms and presents them in a searchable list in the **Available Remote Box List**.

NOTE: Two files need to be created: a config.ini file and an XML file. For information on the config.ini file, refer to the "Configuration File (config.ini)" section on page 13. For information on the XML file, refer to the "Room List (XML File) for Windows and Mac" section on page 14.

- **File Association:** The AirMedia client application is associated with .present files. Embed the .present files in meeting invitations or host on a corporate website.
- **Discovery:** If the AirMedia devices and the user's computer are on the same subnet, the AirMedia client application locates these devices and presents them to the user. This method is recommended if a room list or .present file is not used.

NOTE: Device connection will not be possible on macOS or iOS devices if the network blocks Bonjour® networking technology, multicast DNS devices are not discovered, or outgoing Bonjour or multicast DNS is blocked at the sender device.

- **Manual Entry:** AirMedia allows the user to enter the hostname or IP address of the device.

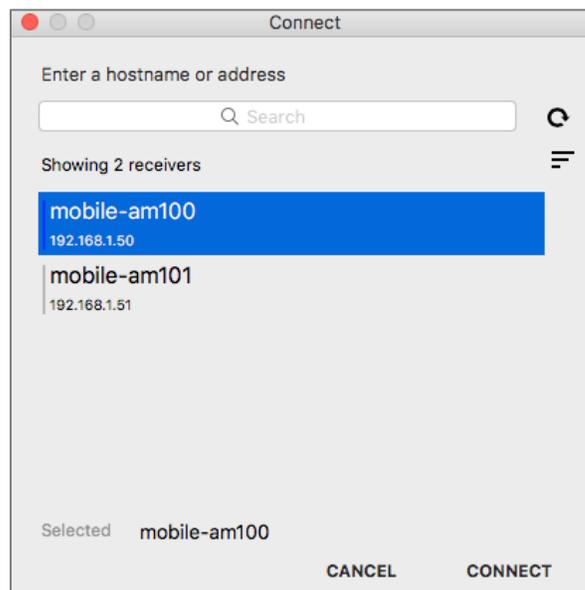
Connecting to AirMedia

The application reads a list of devices and populates the connection dialog. A search box helps the user locate devices in long room lists.

To connect using a room list, complete the steps below:

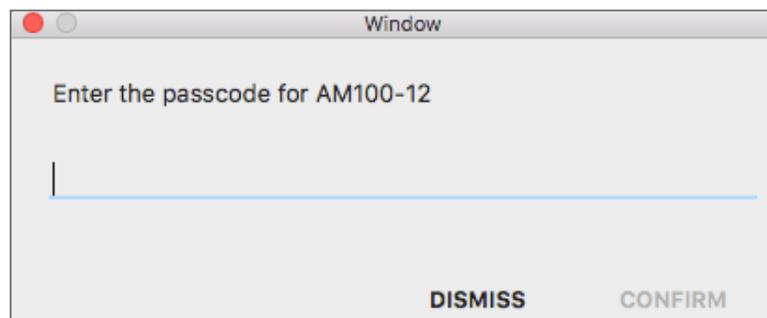
1. Launch AirMedia.
2. From the **Connect** screen, select a gateway from the list.

Connect Screen



3. Click **Connect**. If prompted, enter the passcode.

Passcode Screen



If a Crestron Connected display is used, the display turns on automatically. The session begins.

Configuration File (config.ini)

Crestron software uses a common repository for user-specific data on Windows and macOS to store its config.ini file. Windows refers to this as the application data folder, and it can be accessed by the environmental variable %APPDATA%. For macOS, the files are stored in the user's home directory under Application Support, inside the Library Folder. For both operating systems, the configuration file must be located within Crestron\AirMedia in the common repository. Examples of user directory locations for Windows 8 and macOS are shown below (for the user name TestUser):

Windows: C:\Users\TestUser\AppData\Roaming\Crestron\AirMedia

macOS: /Users/TestUser/Library/Application Support/Crestron/AirMedia/Configure

After the folder is created, the configuration file must be created. The config.ini file contains the location of the room list file. The file contains two items: the section Crestron and the key XMLPath. An example of a config.ini file is shown below.

```
[Crestron]
XMLPath=M:\config\airmedia\room_list.xml
```

When the AirMedia application starts, it attempts to read the file at the location specified by the XMLPath. Local and network paths are allowed. Do not enclose the path in quotes. Note that environmental variables are not supported.

Room List (XML File) for Windows and macOS

The room list file is an XML file that defines the devices and their connection parameters. The specifics of the file are defined in the table below.

Room List File Details

TAG	DESCRIPTION	EXAMPLE FOR WINDOWS AND macOS
devices	This is the main container for the room list file. Each file must contain only one set of tags.	<pre><?xml version="1.0"?> <devices> <device> <name>Room 239</name> <address>192.168.0.184</address> <code>5885</code> </device> <device> <name>Room 240</name> <address>192.168.0.186</address> </device> <device> <name>Room 241</name> <address>192.168.0.186</address> </device> </devices></pre>
device	This is the container for each device to be displayed. The file may contain one more set of tags.	
name	This is the display name for the AirMedia device that is shown in the Device Name column of the application.	
address	This is the IP address of the AirMedia device. This field is currently limited to IPv4 addresses only.	
code	This tag is used to limit access to AirMedia. The tag can be disabled, randomly generated, or fixed to a specific value. In fixed mode, the code tag may be used to specify the access code.	

File Association for Windows

The .present files contain the connection parameters and are used to start a connection. A web server can host these files or the files can be deployed to folders within the user's computer. The installer makes the association.

The .present file uses the same format as the device section of the room list file. An example of the .present file is shown below.

```
<?xml version="1.0"?>
<device>
  <name>Room 239</name>
  <address>192.168.0.184</address>
  <code>5885</code>
</device>
```

To connect using file association, double-click a .present file to launch the application. If prompted, enter the login code in the **Login** screen and click **OK**.

NOTE: If a Crestron Connected display is used, the display turns on automatically.

File Association for macOS

The .present files contain the connection parameters and are used to start a connection. A web server can host these files or the files can be deployed to folders within the user's computer. The installer makes the association.

The .present file uses the same format as the device section of the room list file. An example of the .present file is shown below.

```
<?xml version="1.0"?>
<device>\
  <name>Room 239</name>
  <address>192.168.0.184</address>
  <code>5885</code>
</device>
```

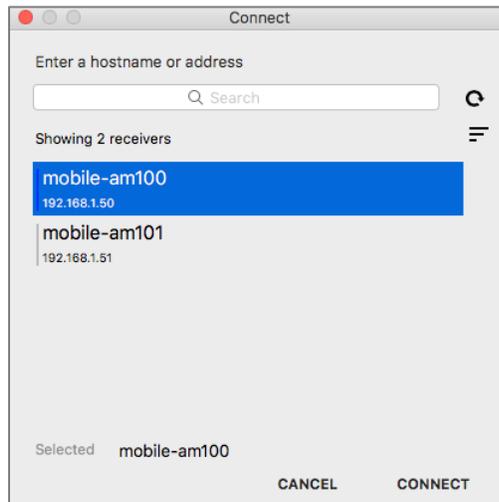
To connect using file association, double-click a .present file to launch the application. If prompted, enter the passcode in the **Login** screen and click **Confirm**. The session starts.

NOTE: If a Crestron Connected display is used, the display turns on automatically.

Discovery

If a room list file is not located when AirMedia opens, the application scans the local subnet for connection devices. If only one device is located, the application tries to connect to that device. If multiple devices are located, the application displays a list of connection devices. Select a gateway from the list and click **Connect**.

Connect Screen



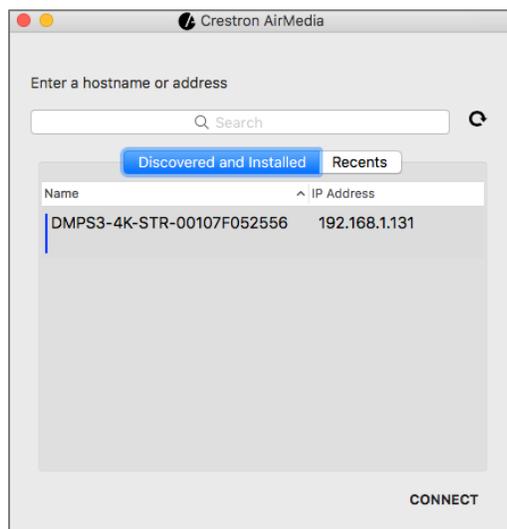
NOTE: If mDNS or Bonjour services are not blocked on the network, the DMPS3 and Crestron Mercury devices will display in the AirPlay® software list rather than the **Connect** screen. The AM-101 will display in both lists.

Manual Entry

If the application is unable to find any devices from the **Login** screen, the user can manually enter the information.

From the **Connect** screen, enter the **hostname** or **IP address** of the device, and then click **Connect**. If a passcode is required on the target device, the **Passcode** screen displays.

Manually Entering Device Information



NOTE: After connecting to an AM-100 device, the user name is set in the **Preferences** menu. The default username is the username for whoever is currently logged into macOS.

Device Considerations

Device Naming

The use of IP addresses can cause confusion. Therefore, Crestron recommends each AirMedia device be given a hostname that is easy for the user to remember. The IP address can be hidden from the on-screen display, which limits the amount of information presented to the user. Crestron has implemented the following automated ways of resolving the device by hostname:

- NetBIOS resolution
- DHCP options 12 and 81
- NSUPDATE for dynamic DNS servers
- Bonjour and Multicast DNS

Crestron recommends configuring either a static IP or a DHCP reservation for the IP address, as well as a DNS entry for the AirMedia device. Once the hostname is configured, the IP address display can be turned off in the **Device Setup** section of the AirMedia web pages.

NetBIOS is used only if the hostname is 15 characters or less. NetBIOS is disabled if the hostname is longer than 15 characters.

NSUPDATE is sent under the following conditions:

- If the device is using a static address and the DNS field is populated
- If the device is using DHCP to obtain an IP address, and the **Domain Name** field in the **Network Setup** screen is not blank

NOTE: If the domain name field is blank, NSUPDATE is not sent.

Device Administration

AirMedia is configured through the built-in web pages of the device. Parameters such as the device IP address, remote view settings, connections to control systems, and Crestron Connected devices are set in the **Device Administration** screen. The default password is “admin” however, the user can change the password.

Device Administration Screen for AM-100 and AM-101

Device Administration		Network Setup		Logout		
<ul style="list-style-type: none"> System Status Device Setup Network Setup OSD Setup Change Password Firmware Upgrade Remote View Setup Reset to Default Reboot System 	Host Name and Domain Name	Host Name	<input type="text" value="My-AirMedia"/>			
		Domain Name	<input type="text"/>			
	<p>Note: For maximum compatibility, host names less than 15 characters are recommended allow char: [0-9], [A-Z], [a-z], [-].</p>					
	IP Setup	<input checked="" type="radio"/> Obtain an IP address automatically <input type="radio"/> Use the following IP address				
		IP Address	<input type="text" value="192"/>	<input type="text" value="168"/>	<input type="text" value="100"/>	<input type="text" value="10"/>
		Subnet Mask	<input type="text" value="255"/>	<input type="text" value="255"/>	<input type="text" value="255"/>	<input type="text" value="0"/>
		Default Gateway	<input type="text" value="192"/>	<input type="text" value="168"/>	<input type="text" value="100"/>	<input type="text" value="10"/>
	Crestron Control System	IP Address or Hostname	<input type="text"/>			
IPID		05 <input type="button" value="v"/>				
Crestron Connected™ Device	Communication Status	Offline				
	IP Address or Hostname	<input type="text"/>				
	Communication Status	Offline				
	CurrentSource	None				
	Source	None <input type="button" value="v"/> <input type="button" value="Set"/>				
	Automatic Power On	<input checked="" type="radio"/> Immediately <input type="radio"/> After Code Entry				
	Power Off Time Out	0 <input type="text" value=""/> minutes <input type="button" value="Set"/>				
	Power Control	<input type="button" value="Power On"/> <input type="button" value="Power Off"/>				
Power Status	Unknown					
Lamp Hours	0 hours					
Device Status	No Error					
				<input type="button" value="Apply"/> <input type="button" value="Cancel"/>		

Device Administration Screen for AM-200, AM-300, DMPS3, and Crestron Mercury

Airmedia

Code

Login Code Mode:
 Disabled
 Random
 Use the following code

Login Code:

Ethernet Adapter

Assigned Ethernet Port:
 Adapter 1
 Adapter 2

Display Options

Display IP Address: Enabled

Display HostName: Disabled

Display DomainName: Disabled The Domain Name option is unavailable if Host Name is not displayed.

Display CustomString: Disabled

Custom String: The Custom option is unavailable if IP Address and/or Host Name are displayed.

The AirMedia application requires firewall rules to allow it to communicate with AM-100 and AM-101 devices. Crestron recommends creating a rule for the application that allows all traffic to pass to the device. If the rule does not exist, the operating system prompts the user to add a rule. This may require administrator privileges.

For the set of ports that allow the client to communicate with the device, refer to the table below.

Port Map 1: Ports Used by the Client

PORT	TYPE	DIRECTION	FUNCTION	OPEN	NOTES
80	TCP	Both	Projector Control	Optional	This port is used to turn on a Crestron Connected projector. If this port is blocked, the device functions normally, but the automatic projector power on feature does not work.
389 443 445	TCP	Both	Control Channel	Required	For best performance, Crestron recommends that ports 389, 443, and 445 be open. At a minimum, one port needs to be open for the device to function properly. If only one port is open and that port is used by another application, AirMedia will not function properly.
515	TCP	Both	Video	Required	This port is for the video data channel.
1041	TCP	Outbound	Control Channel	Required	If this port is not open, AirMedia does not function properly.
1047 1048 1049	UDP	Inbound	Discovery	Optional	These ports are used for device discovery. If the port is closed, AirMedia may not be able to find devices automatically.
1688	TCP	Both	Audio	Recommended	This port is for the audio data channel.
3268	TCP	Both	Control Channel	Required	This port is used as part of the screen sharing process.
8080	TCP	Both	Video	Required	This port is for the video data channel. If the port is not open, AirMedia does not function properly.
19996	TCP	Both	Future	Optional	This port is reserved for future use.
31865	TCP	Both	Discovery	Optional	This port is used for device discovery. If this port is closed, AirMedia may not be able to find devices automatically.

For the ports that AM-100 and AM-101 devices use only for management functions, refer to the table below.

Port Map 2: Ports Used by the Device (AM-100 and AM-101)

PORT	TYPE	DIRECTION	FUNCTION	OPEN	NOTES
21	TCP	Both	Update Utility	Optional	This port is used only to transfer the firmware to the device with the batch update application. This port is not used when updating with the web interface.
80	TCP	Both	Web Services	Required	This port is used to access the AirMedia device configuration website.
137	TCP	Both	NetBIOS Discovery	Optional	This port allows the device to be resolved without a DNS server present. This port is enabled if the hostname is fewer than 15 characters.
138	UDP	Both	NetBIOS Discovery	Optional	This port allows the device to be resolved without a DNS server present. This port is enabled if the hostname is fewer than 15 characters.
41794	TCP	Both	Control System	Required	This port is used to control Crestron Connected devices.
42891 42892	TCP	Both	Update Utility	Required	These ports are used to control firmware updates and are used only with the batch update application. These ports are not used when updating the device with the web interface.

For the ports used by DMPS3, Crestron Mercury, and AM-101 devices using full-screen mirroring on mobile devices and macOS, refer to the table below.

Port Map 3: Ports Used by the Device (AM-200, AM-300, DMPS3, Crestron Mercury, and AM-101)

PORT	TYPE	DIRECTION	FUNCTION	OPEN	NOTES
4100-4101	UDP	Both	Control Channel	Required	This port carries control channel information. If this port is blocked, AirMedia will not function.
5353	UDP	Both	Discovery	Optional	This port is for AirMedia Presentation Gateway discovery. If this port is blocked, automatic network discovery will not function correctly.
6000-7000	TCP, UDP	Both	Audio, Video	Required	These ports carry audio and video streams. If these ports are blocked, AirMedia will not function.
7011	UDP	Both	Control Channel	Required	This port carries control channel information. If this port is blocked, AirMedia will not function.
7200	TCP	Both	Control Channel	Required	This port carries control channel information. If this port is blocked, AirMedia will not function.
47010	TCP	Both	Audio, Video	Required	This port carries audio and video. If this port is blocked, AirMedia will not function.

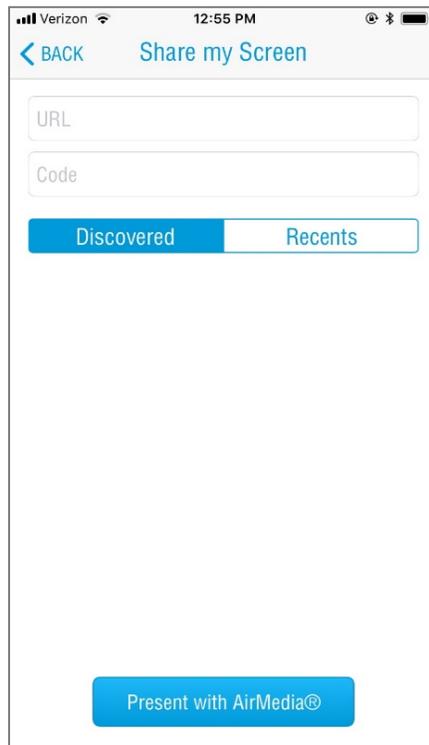
Connecting to Mobile Applications

Crestron offers applications for both iOS and Android to allow users to give presentations using their mobile devices. Applications for iOS are available at no cost from the iTunes store® online store and for Android on Google Play (search for AirMedia). The applications connect to AirMedia devices by discovering them or when the IP address or hostname of the device is entered.

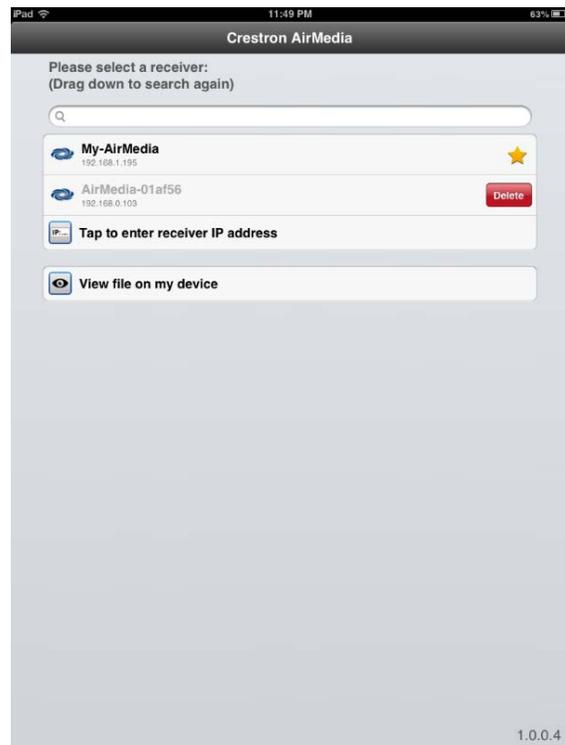
Connected devices are saved to allow for easier future connection. A search function provides quick navigation of long lists. AirMedia devices can be marked as favorites for quick connections to frequently used rooms.

The Crestron AirMedia app screens are shown below.

AirMedia for iOS and Android



AirMedia for AM-10 on iOS and Android



AirMedia Installation Applications

This section includes instructions on how to install AirMedia applications on a Windows PC and macOS.

AirMedia Installable Application for Windows

The AirMedia Windows sender application is available at present.crestron.com or from the corresponding AirMedia product page.

NOTE: Login is required to access the installer from the product page.

The Windows installer is a Microsoft® Software Installer (.msi) file. An account with administrative privileges must be used in order to execute this file or correct installation will not occur.

The Windows installer can be run in the following ways:

- Through Microsoft Group Policy for mass deployment
- Through the Windows command line.

Administrators can set up a Group Policy Object (GPO) to script the installation to use the next time the user logs into their Windows system. The default behavior of executing the .msi without any command line options is to do the following:

- Install the application in its default location (C:\Program Files (x86)\Crestron\AirMediaV2)
- Install desktop and Start menu shortcut icons
- Start automatically

End users installing the application for the first time without any options will have a fast connection experience during installation with easy access to the sender application.

To use the installer with command line options, the “msiexec” function must be used in conjunction with the .msi file as specified below.

The general format for running the installer is as follows:

```
msiexec /I AirMedia_Windows_<VERSION>_deployable.msi /qn <OPTIONS>
```

- /I is the command line switch that tells msiexec to install the msi (required)
- <VERSION> is the version number of the deployable .msi file
- /qn is the command line switch that suppresses .msi dialogs
- <OPTIONS> is one or more of the following options, separated by spaces:
 - INSTALLATIONMODE=--silent – suppresses the launching of the AirMedia application after installation is complete (the default behavior is to launch the AirMedia application)

When the option is silent and /qn is used, the installer will suppress any installer dialogs and the application will not be launched

- INSTALLPATH=<PATH> - installs the application in the specified path on the device rather than the default location
- SHORTCUTOPTION=<OPTION> - installs shortcuts according to one of four specified options:

- --none – installs no shortcuts
- --desktop – installs application shortcut only to the desktop
- --menu – installs application shortcut only to the Start menu
- --all – installs application shortcut to both the desktop and the Start menu

Examples of .msi installation are as follows:

- `msiexec /I AirMedia_Windows_3.0.1.254_deployable.msi/qn
INSTALLATIONMODE=--silent SHORTCUTOPTION=--menu`

This command will install the AirMedia sender application silently, without any dialogs or notifications, with only the **Start** menu shortcut installed, and without the application starting.

- `msiexec /I AirMedia_Windows_3.0.1.254_deployable.msi/qn
INSTALLATIONMODE=--silent INSTALLPATH=D:\AirMedia`

This command will install the AirMedia application with desktop and **Start** menu shortcuts, and in a path not on the main Windows partition of the machine.

- `msiexec /I AirMedia_Windows_3.0.1.254_deployable.msi`

This command may be used to observe the behavior of the installer as it installs the AirMedia sender application on a machine to validate its operation visually.

AirMedia Installable Application for macOS

The AirMedia macOS sender application installer is available at present.crestron.com or from the corresponding AirMedia product page.

NOTE: Login is required to access the installer from the product page.

The macOS installer is a .zip archive file containing the AirMedia application as an executable. An account with administrative privileges must be used in order to install the application or correct installation will not occur. For users of the AM-100, the installer must be used in order to send audio to the AM-100, as a user-mode driver is installed alongside the application and that driver is not available with the guest application version. This user-mode audio driver may require a reboot in order to function consistently.

The macOS installer can be run in the following ways.

- Open the .zip archive file, and run the installer file inside.

After installation, the sender app appears in the macOS dock and in the /Applications/Crestron folder, and the sender app is launched. End users installing the application for the first time will have a fast connection experience upon installation with easy access to the sender application.
- Use the .pkg file within the installer for administrators to silently install the application on users' machines. Inside the .zip archive file is the InstallAirMedia.app bundle. Within this app bundle in the Content/Resources folder is the required `airmedia_osx_installer.pkg` package file. On a terminal, issue the following command to run the installer:
`sudo installer -pkg airmedia_osx_installer.pkg -target /`

The behavior is the same as the deployable installer, except the sender app does not run after installation completes, and the UI is not displayed.

Administrators can silently install the AirMedia sender application on a macOS (without user knowledge) using Apple policies, MDM, or other similar management tools. Additional options for installation of desktop icons and specifying installation location are not available due to the conventions of the macOS platform.

AirMedia Network Infrastructure and Security

AirMedia leverages existing IT network infrastructure and policies. It contains a single-wired network interface with no wireless interfaces or bridges in the device. It becomes a wireless solution by utilizing the existing wireless network in the deployed network infrastructure.

All policies, encryption, and other security measures implemented carry over to AirMedia because it creates standard Ethernet traffic. Once AirMedia is on the corporate network, the traffic generated by AirMedia is treated like any other streaming network traffic. All existing policies that apply to physical network devices (switches, routers, etc.) also apply to AirMedia. AirMedia is a standard network appliance (like a printer) and is as secure as the supporting network.

AirMedia employs a proprietary protocol to transport the screen data to the device. Average bandwidth requirements are typically low, down to 1.4 Mbit/s on AirMedia 2.0 devices such as AM-200, AM-300, DMPS3-4K-250-C, DMPS3-4K-350-C, and Crestron Mercury. Bandwidth will vary depending on content, but will not go below 0.25 Mbit/s or exceed 8.5 Mbit/s. In Windows only, the quality slider in the settings limits the peak bandwidth only, not average or minimum bandwidth, and behaves logarithmically rather than linearly.

When using native mirroring in macOS and iOS with AM-101 and later devices, the OS negotiates and controls the bandwidth to the AirMedia Presentation Gateway due to the way the native mirroring protocol is defined. Official numbers are not published for minimum and maximum required bandwidth, but observed minimum and maximum numbers are similar to the AirMedia proprietary protocol. Typical average bandwidth has been measured at approximately 5Mbit/s; however, these numbers will again depend largely on the type and complexity of content displayed.

In contrast, AM-100 and AM-101 devices with the latest firmware have average bandwidth usage of 1.5Mbit/s or greater, and AM-100 devices with older firmware may have much higher bandwidth requirements on the order of over 32Mbit/s average and 46Mbit/s peak when displaying full-motion video. For this reason, it is highly recommended to upgrade all AirMedia devices to the latest firmware to ensure the most optimal network performance.

The following table summarizes the bandwidth requirements for AirMedia devices.

AirMedia Bandwidth Requirements

	MINIMUM	TYPICAL	MAXIMUM
AirMedia 2.0	0.25 Mbit/s	1.4 Mbit/s	8.5 Mbit/s
macOS/iOS native sending to AirMedia 2.0 and AM-101	N/A	5 Mbit/s	N/A
AM-100 & AM-101	0.5 Mbit/s	1.5 Mbit/s	10 Mbit/s
AM-100 (Old Firmware)	<0.1 Mbit/s	32 Mbit/s	46 Mbit/s

Network Infrastructure and Design Considerations

Prior to deploying AirMedia products, it is important to assess the network infrastructure and design.

As the table in the previous section shows, AirMedia connection average bandwidth varies from the 46Mbit/s peak of the older AM-100 firmware, to 5Mbit/s average when sending with native macOS and iOS mirroring, and down to 1.4Mbit/s typical for the latest generation of AirMedia 2.0 technology found in the AM-200, AM-300, DMPS3, and Crestron Mercury. AirMedia 2.0 is substantially better in average and peak bandwidth, and has better quality at any given bandwidth than AM-100 and AM-101 devices.

The default peak bitrate in the Windows sender is 5 Mbit/s to ensure a high-quality experience for all types of content and a high frame rate at any resolution up to 1080p with 30 frames per second.

The peak bitrate target can be lowered to 1 Mbit/s on Windows senders, which is adequate for most static content types. Video at 1080p with high motion and levels of detail, or complex motion with high foreground-background contrast such as smoke and flames may not be high quality at the lowest bitrates. This is due to the limitations of live video encoding and decoding on current devices. If this type of video content is played consistently, a higher bandwidth quality setting is recommended.

AirMedia 2.0 is also tuned for lower latency than the older AM-101, and has been observed down to 80ms in a well-designed and properly provisioned network with ideal WiFi network conditions versus more than double that in the AM-101. Despite this, it is difficult to specify actual latency due to the enormous variability of network environments that may be encountered. It is important that end users also understand that high CPU load applications running in the background may occasionally affect the wireless presentation experience.

To ensure proper bandwidth provisioning, low latency and consistent performance, the following considerations should be taken into account:

- Manage wireless network infrastructure correctly.
- Architect the network between the AirMedia sender and presentation gateway correctly.
- Minimize non-AirMedia device network traffic impact on the network.

Proper wireless access point design is a critical component of successful wireless presentation that is often overlooked and can cause problems. While most access point vendors offer specific guidance on this subject, the following checklist may help prevent issues at scale:

- Understand the bandwidth requirements per access point for all use types, including AirMedia, versus the available bandwidth the access point and non-overlapping WiFi channels provide.
- Understand placement of wireless access points both on and between floors of a building so that co-channel interference is minimized; the use of different antenna types and mounting locations can assist in minimizing interference by design.
- Understand what the capabilities of the radios that the most commonly-used connecting devices will have, and take advantage of both 2.4 GHz and 5 GHz bands as well as newer technologies such as 802.11ac whenever possible; in particular, 5 GHz bands have far more channels and capacity than 2.4 GHz, though not all devices support both bands and 5 GHz can have more limited range through walls and objects than 2.4 GHz.
- Minimize the use of unmanaged and unwanted wireless devices via corporate policies and control of WiFi network device access.
- Conduct a wireless survey with calibrated equipment to understand coverage overlaps and holes, appropriate access point power levels and channel bandwidths, and the like.

Most wireless equipment vendors have authorized providers of design and survey services, and should be used whenever possible.

Beyond wireless considerations, proper network architecture between sender and receiver is important. Some considerations :

- Minimize the number of network hops from the wireless access point to the AirMedia presentation gateway.
- Ensure high-quality non-blocking switches and routers with sufficient capability to move unicast streaming traffic from senders to presentation gateways.
- Recommend that end users do not use highly processor intensive or network-intensive applications in the background at the same time as the AirMedia sender will be active.

Minimizing traffic from non-AirMedia devices can be challenging given end user expectations on wireless networks; there are, however, several techniques to help ensure AirMedia traffic comes first:

- Keep AirMedia devices and traffic on their own VLANs and subnet, but routable from outside.
- Use quality-of-service features on switches and routers to prioritize AirMedia traffic as per the audio/video ports listed elsewhere in this document.
- Conduct network traffic flow analysis to identify network hot spots around the presentation gateway

If Bonjour or multicast DNS services are to be blocked, such blocking needs to occur at the switch level; if blocking occurs on a macOS or iOS sending device due to administrative policy regarding firewall settings, the native mirroring connection to AirMedia presentation gateways will not be possible without the AirMedia app. Some organizations manage mDNS/Bonjour on their network using specialized management tools for these protocols that minimize broadcast chatter while still providing services. These tools can occasionally interfere with device discovery and so should not be relied upon.

The techniques above are not intended to be a complete list of possible issues, but are intended to give guidance to minimize disruption of the AirMedia experience to end users and administrators alike.

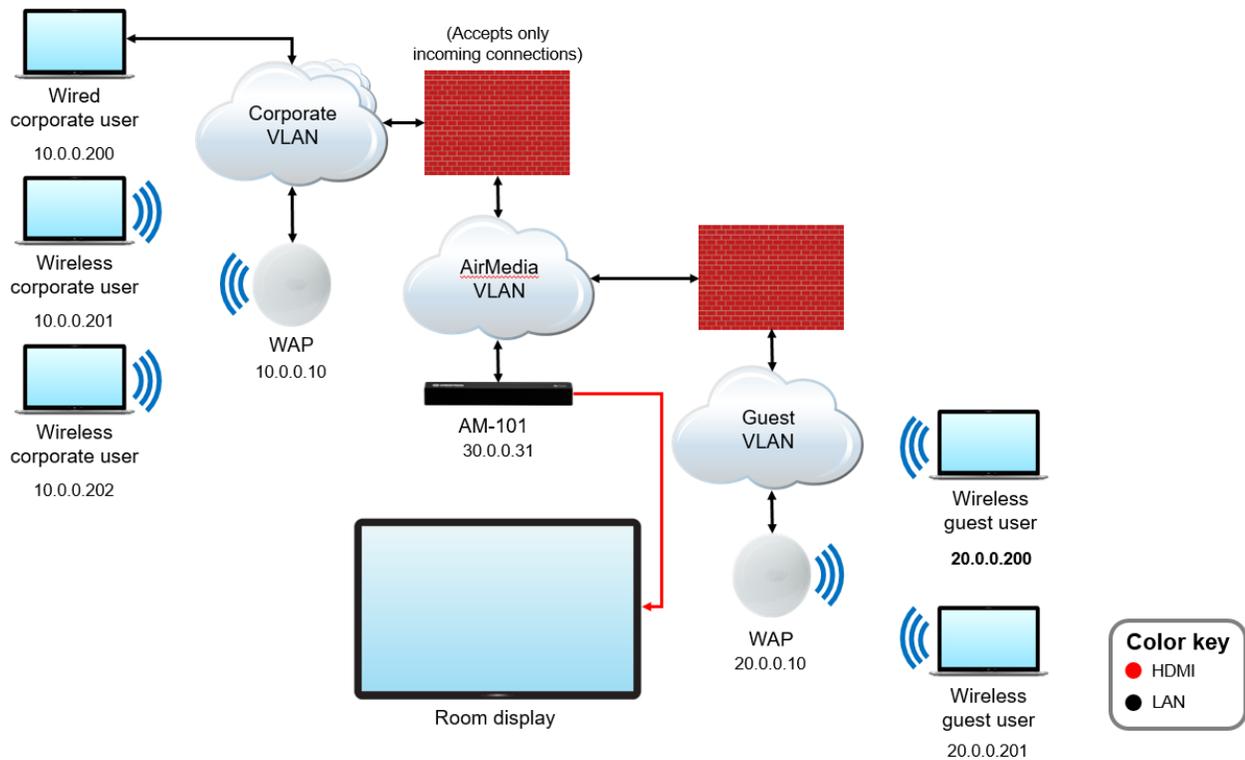
Deployment Options for Guest Network Access

In meeting rooms, guests may want to present to corporate users. Keeping the guest networks and corporate networks separate while allowing the users to share a display is challenging. As a standard network device, AirMedia solves this problem by using standard networking practices. There are two suggested methods: VLAN-based method and physical air gap method.

VLAN

AirMedia devices are placed in their own VLAN. This VLAN is configured to allow only incoming connections. Outbound traffic is not allowed. The guest and corporate networks exist in separate VLANs. Since outbound connections are not allowed, the guest VLAN cannot access the corporate VLAN through the AirMedia VLAN.

AirMedia VLAN-Based Method Example

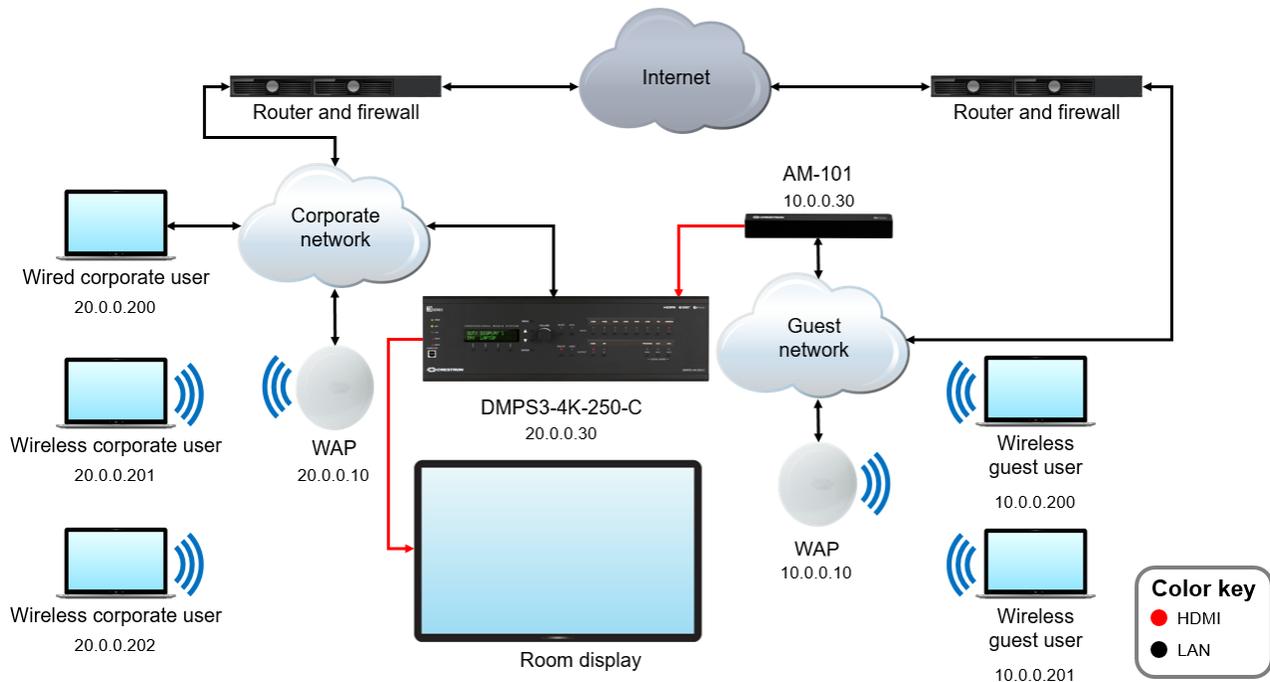


Physical Air Gap

If networks (for security reasons) require some type of physical separation, there are two approaches when using current AirMedia devices:

- Devices such as the AM-101 with a single network interface, two AirMedia devices can be used, one for corporate users and one for guest users.
- To switch presentations in the HDMI® interface domain, use an HDMI switch such as the DMPS3-4K-250-C. While extremely secure, this approach requires more hardware.

AirMedia Physical Air Gap Method Example



Data Transport

Media employs a proprietary protocol with 128-bit security to transport screen data to the AirMedia Presentation Gateway. The data connection from the sender is encrypted and can only be decrypted by an authorized AirMedia Presentation Gateway. In combination with wireless access point security, AirMedia content cannot be secretly eavesdropped by non-authorized parties. Correct operation of the security protocols is contingent on leaving the correct ports open for the receiver at the network switch as shown in a previous section.

Device Upgrades

Single Device (Web Interface)

All AirMedia devices support firmware upgrades via the web interface. Upgrades are deployed as a single file, which is uploaded and programmed by the device. Upgrades take from 15 to 30 minutes to load if using the AM-100 and AM-101 devices. Upgrades may take longer if using an AM-200, AM-300, DMPS3, or Crestron Mercury device.

Multiple Devices

Crestron provides an application to upgrade multiple AirMedia devices (AM-100 and AM-101). The application reads room list files to simplify management. Devices can be upgraded one at a time or in a batch operation.

To upgrade the AirMedia devices, the user needs to connect to an FTP server. The application provides an FTP server or AirMedia can be configured to use an external FTP server. The application is available at present.crestron.com.

AirMedia 2.0 products such as AM-200, AM-300, DMPS3 and Crestron Mercury are also capable of upgrading the firmware of multiple devices through Crestron XIO Cloud. Consult the corresponding product documentation for specific procedures on firmware upgrades.

Control

Crestron Connected

AirMedia devices can control any Crestron Connected display. When launching the application a “power on” command is sent to the display. This means no more searching for remote control devices or pressing the power button.

The user provides the AirMedia device with the display's IP address, and AirMedia begins controlling the display. During connection to AirMedia, a command is issued to turn on the display. After the last user disconnects, AirMedia automatically turns off the display.

For more information on Crestron Connected devices, refer to <https://www.crestron.com/en-US/Products/Crestron-Connected-Devices>

Control System

Some AirMedia devices, such as the AM-100, AM-101, and DMPS3 can integrate with Crestron control systems for complete room control. When a control system is used, lights, display, HVAC, shading, and anything else in the room can be controlled.

In addition, the control system can implement Simple Network Management Protocol (SNMP) to integrate with existing IT management tools. The device parameters can be set and monitored using a Crestron control system, as shown in the Device Parameters table below.

Device Parameters

NAME	ACCESS	TYPE	FUNCTION
Status	Read	Analog	Reports the status of the device
Number of Users Connected	Read	Analog	Indicates the number of users currently connected
Device Access Code	Read	Analog	Sets the device access code NOTE: The input sets the current code and is only valid when the device code is in Fixed mode (configured through the device's web pages).
Projector Connected	Read/Write	Analog	Reports the status of a connected projector Valid Values: 0 = Not connected 1 = Connected
Status Text	Read	Serial	Returns the status of the device as a string for display

Device Parameters Table (Type Column) Key

CRESTRON TYPE	STANDARD TYPE
Digital	Boolean
Analog	16-bit integer
Serial	String (maximum length 255 bytes)

For AirMedia devices, Crestron Fusion® software can also provide an alternative monitoring mechanism to SNMP. For more information on Crestron Fusion, refer to <https://www.crestron.com/en-US/Products/Featured-Solutions/Crestron-Fusion>

AirMedia 2.0 devices such as AM-200, AM-300, DMPS3 and Crestron Mercury also have the capability to be controlled via .AV Framework, providing an easy to deploy web configuration with simple rules for programming behavior. These devices are also equipped for mass deployment and management of configuration via XIO Cloud. For more information on device configuration with .AV Framework and XIO Cloud, consult the corresponding product documentation.

This page is intentionally left blank.

Crestron Electronics, Inc.
15 Volvo Drive, Rockleigh, NJ 07647
Tel: 888.CRESTRON
Fax: 201.767.7576
www.crestron.com



Deployment Guide – DOC. 7693J
(2041620)
04.18
Specifications subject to
change without notice.