

ScreenBeam[™]

Deployment Guide

**Wireless Display
over LAN**

Version 1.0

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Part I Introduction

Actiontec's ScreenBeam 960 receiver brings wireless display capability to a variety of devices and operating systems, both with native screen mirroring capability and those that do not. ScreenBeam 960 allows for an optimal experience in installation, deployment, management and end-user satisfaction. Native P2P screen mirroring with direct connection via Miracast is built into ScreenBeam 960 for Windows 10/8.1 and Android 4.2 and later Miracast devices. The information contained in this document outlines the general features, requirements and recommendations for all other presentation scenarios for ScreenBeam 960, including streaming over LAN using apps and native macOS/iOS screen mirroring. For instructions on connection via native mirroring for Windows 10/8.1 and Android, please visit <https://www.screenbeam.com/setup>.

1.1 Key Features

Key features of ScreenBeam 960 include:

- Native wireless display support without apps for modern operating systems
- Wireless display on legacy devices and operating systems over LAN
- Fast, responsive and stable wireless display connection
- Secured user connection with PIN to limit access to authorized display sources
- Video and audio streaming support for responsive screen mirroring
- USB HID support for front-of-room touch screen collaboration
- Analog line audio out for external audio amplification or capture
- VGA pass-through input for wired connection to sources for display
- VGA video out for projectors and legacy display devices
- HDMI video out with HDCP for modern display devices

1.2 System Requirements for Display Devices

The minimum system requirements of devices used to connect to ScreenBeam 960 with [firmware 9.15.39.0 \(or later\)](#) are:

- OS: MS Windows 7 with SP2 or later, macOS 10.10 or later, and Android 4.2 or later with Miracast
- CPU: 4th Gen Intel Core i3 or AMD equivalent
- Wi-Fi: 802.11n or 802.11ac Dual-Band 2x2
- RAM: 4GB
- HDD free space: 50GB

The recommended system requirements of devices used to connect to ScreenBeam 960 with firmware 9.15.39.0 (or later) are:

- OS: MS Windows 8.1 or later, or 2012 and later Macs running macOS 10.10 or later
- CPU: 5th Gen Intel Core i5 or AMD equivalent, or later
- Wi-Fi: Intel Dual-Band Wireless AC 726x (or later)
- RAM: 8GB
- HDD free space: 50GB (or more)

1.3 ScreenBeam Network Requirements

The minimum network requirements for ScreenBeam 960 Ethernet connection for Wireless Display over LAN are:

- IEEE 802.3u / 100BASE-TX compliant 100Mbps Ethernet connection for ScreenBeam receiver connection
Note: IEEE 802.3ab / 1000BASE-T 1Gbps Ethernet connection is recommended
- RJ-45-terminated shielded Cat 5e or better Ethernet cable from switch to ScreenBeam receiver
- 802.11n/ac Wi-Fi connectivity for client devices (5GHz strongly recommended)
- Network ports:
 - macOS: 8554 (TCP), 24030 (UDP), 35507 (TCP)
 - macOS native mirroring: 5353 (UDP), 7000 (UDP), 7100 (TCP), 47000 (TCP), 32768 to 60000 (UDP)
 - Win 7: 7236 (TCP), 24030 (UDP), 35507 (TCP)

Note: VLAN routing may be required if ScreenBeam and Client devices are connected to different VLAN networks.

1.4 ScreenBeam Display Requirements

ScreenBeam 960 requires a display with available HDMI or VGA port supporting 720p/WXGA resolution or higher. 1080p or higher is recommended.

1.5 Related Documents

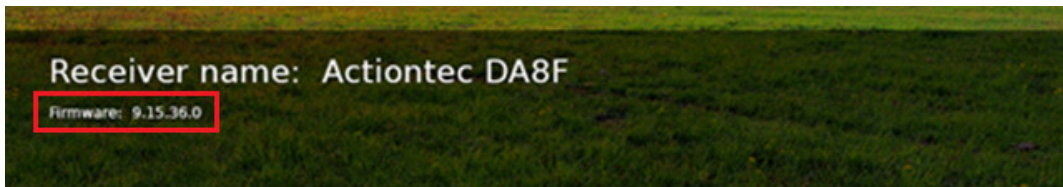
To better understand the deployment of ScreenBeam Wireless Display, and its display capabilities over LAN, the following documents are recommended for review prior to ScreenBeam deployment:

- ScreenBeam Receiver (ScreenBeam 960) user guide
- ScreenBeam Central Management System user guide

Note: ScreenBeam Central Management System (CMS) is not required for ScreenBeam Wireless Display over LAN, but it is highly recommended for managing ScreenBeam receivers. See <https://www.screenbeam.com/products/screenbeam-cms/> for details.

Part II Setting up ScreenBeam

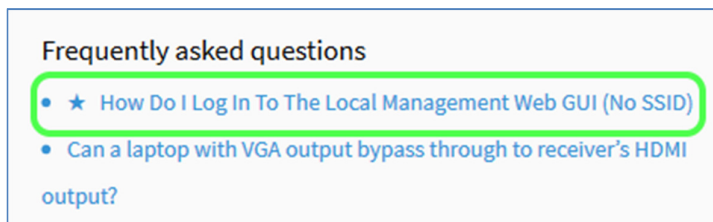
Ensure the ScreenBeam 960 receiver is updated to the latest firmware version. The firmware version is indicated on the Ready to Connect screen at the bottom left corner. In the example below, the receiver has outdated firmware that will need to be updated to the latest firmware prior to proceeding.



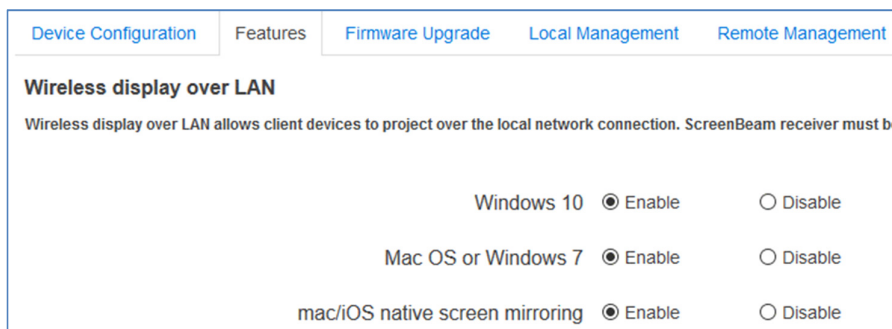
The latest firmware and update instructions may be obtained from the [ScreenBeam support webpage](#) in the ScreenBeam 960 section.

Confirm that the support for Wireless display over LAN is enabled on your receiver. Follow the procedures below to enable the support for Wireless display over LAN:

1. Go to the [ScreenBeam support webpage](#) and click on the ScreenBeam 960, scroll down to the Frequently asked questions category, and click on the link for 'How Do I Log In To The Local Management Web GUI (No SSID)'



2. Follow the steps to connect to the local management page for the ScreenBeam 960.
3. In the Features Tab, check that 'Wireless display over LAN' is enabled for the desired scenarios. To save any changes scroll to the bottom of the page and press 'Apply' then press 'Ok' in the pop-up message.



Note: The “Wireless display over LAN” feature is required to support Windows 7 and pre-2012 macOS 10.10 and later devices, as well as iOS 11 and later devices with the optional ScreenBeam app. This does not affect iOS 9 and later or macOS 10.10 and later native screen mirroring devices. Refer to the receiver’s user manual or Quick Start Guide for details on how to access the receiver’s Local Management Interface.

Note: Actiontec recommends reboot of the receiver after settings changes whenever possible.

Part III Configuring the

Infrastructure Network

Wireless display over LAN can allow ScreenBeam to stream video over both wireless and Ethernet networks. While all devices are normally connected wirelessly, those connecting over LAN rather than P2P directly to the ScreenBeam receiver rely upon properly-configured wireless access points and a wired Ethernet connection for enhanced stability and throughput. Since the stream quality and user experience heavily relies on the network's performance, consider adjusting your network and Wireless APs for optimal performance as recommended below.

3.1 Wired Network

A ScreenBeam connection to a wired 1Gbps Ethernet complying with IEEE 802.3ab / 1000BASE-T using shielded Cat5e or better cable is strongly preferred. A 100Mbps IEEE 802.3u / 100BASE-TX compliant connection is the minimum requirement.

Whenever possible, use the following guidelines to assist in successful ScreenBeam receiver deployment:

- Use non-blocking switches/routers to avoid intermittent connection issues over infrastructure.
- Use Quality-of-Service features on switches and routers to prioritize ScreenBeam port traffic.
- Employ policies for managed devices to prevent CPU-intensive or high-bandwidth tasks such as online backups during times when wireless presentations may occur.
- Use virtual LANs (VLANs) with routing to sequester traffic on subnets wherever possible.

For iOS/macOS native screen mirroring and wireless mirroring over LAN, the multicast DNS (mDNS) protocol is required on port 5353 UDP. Since this protocol broadcasts the ScreenBeam receiver's presence to all IP addresses on a subnet, some network switches may be configured to block traffic on this port to prevent excessive use of network bandwidth by such traffic. It is important to configure switches to pass mDNS traffic to all stations on a network so they become visible to user devices. If this cannot be done, solutions exist that can cache mDNS broadcast requests and send them out of band to all WAPs in a network without the corresponding bandwidth burden. Consult the documentation from the WAP manufacturer or network vendor on how to deploy such solutions.

3.2 Wireless Network

802.11ac wireless access points (WAPs) networking is strongly recommended. 802.11n WAPs are the minimum required for ScreenBeam to work correctly. Dual-band 2.4GHz/5GHz support for WAPs is strongly recommended.

ScreenBeam 960 does not support Dynamic Frequency Selection (DFS) channel for wireless connectivity. Dynamic Frequency Selection is required in the 5GHz band so that wireless connection on DFS channels automatically switches when in use by other applications such as radar. Ensure wireless APs are configured to support non-DFS 5GHz (recommended) and/or 2.4GHz band as follows:

- 2.4GHz – Channels 1, 6, 11 only
- 5GHz (non-DFS, 20MHz wide channels) – Channels 36, 40, 44, 48, 149, 153, 157, 161 only
- 5GHz (non-DFS, 40MHz wide channels) – Channels 36, 44, 149, 157 only

To avoid connectivity issues, the following practices are strongly recommended:

- Do not use overlapping channels for WAPs in adjacent rooms, including between floors. Alternating channels used helps ensure reliable connectivity.
- Use 5GHz whenever possible versus 2.4GHz, as 5GHz signals cannot penetrate through walls to adjacent rooms as well as 2.4GHz signals can, 5GHz channels have better separation, and 2.4GHz is used by more devices.
- Minimize use of unauthorized or unmanaged wireless devices by policy (e.g. Bluetooth, wireless game controllers, wireless video cameras), especially those using the 2.4GHz band.
- Avoid use of 802.11n for clients and WAPs whenever possible, as 802.11ac is more spectrum efficient than 802.11n and will give a better presentation experience.

If connectivity issues persist, contact a qualified IT professional to conduct a wireless survey for recommendations on improving Wi-Fi connectivity.

As discussed above, network switches may not pass mDNS traffic across the network and block that traffic at switches and routers. If unblocking the port is infeasible, solutions exist that can cache mDNS broadcast requests and send them out of band to all WAPs in a network without the corresponding bandwidth burden. Consult the documentation from the WAP manufacturer or network vendor on how to deploy such solutions.

3.3 Connecting Receiver to Infrastructure Network

ScreenBeam receivers can be connected to the network over wireless or Ethernet. Ethernet is strongly recommended for stability and optimal experience. ScreenBeam receivers can also be deployed on separate VLANs from clients provided the 2 VLANs are configured for the client device to communicate with the receiver.

Note: Receivers behind a Network Address Translated (NATed) router will not work. Traffic must be explicitly routed between networks.

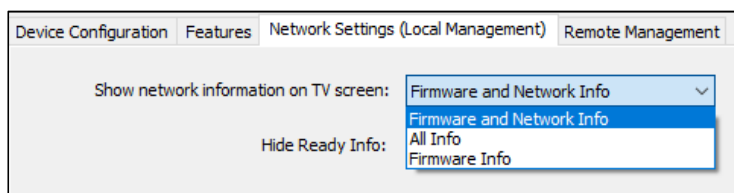
If total isolation from a wired network is required, such as a guest network / room in a business, ScreenBeam with Miracast is the ideal solution for most modern Windows and Android devices and requires no Ethernet or WAP connection. If iOS/macOS native screen mirroring or legacy device support (e.g. Windows 7) is required with isolation, a sequestered WAP and router will be required on the Ethernet connection, and those users will need to connect to the WAP prior to presenting to the ScreenBeam.

3.4 Connecting Client Device to Infrastructure Network

Connect the client device to the same network where the receiver is connected. This means the WAP, LAN/VLAN and ScreenBeam must be able to see each other. Ensure the source device gets a good connection to the AP. The recommended connection signal strength should be good to excellent, i.e. beyond -50dBm (RSSI level).

Ensure the client device and receiver have a low latency by pinging the ScreenBeam from a device in the desired connection scenario. A network ping response time under 20ms is desirable to ensure excellent end-user wireless presentation experiences.

The IP address of ScreenBeam 960 receiver is displayed by default on the Ready to Connect screen on the attached display. For older firmware revisions, or when this has been switched off previously in the management console or through CMS, the IP address can be displayed by going to the receiver's management console and setting the "Show network information on the TV screen" option to "Firmware and Network Info" or "All Info".



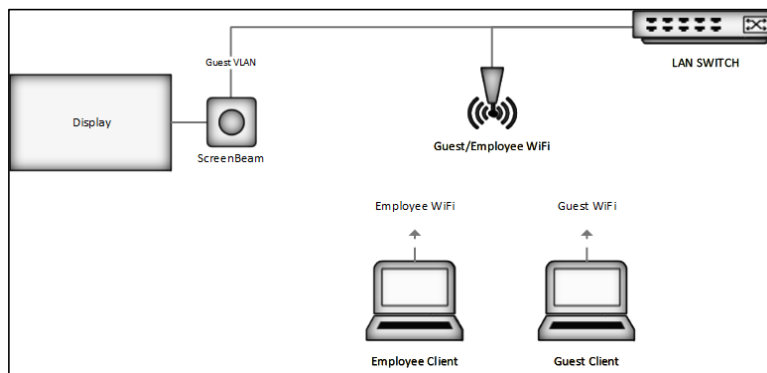
Part IV Setup Topology

4.1 Introduction

ScreenBeam 960 can be set up in different room types. This section outlines the most common setup topologies for ScreenBeam deployments.

4.2 Meeting Room

The recommended setup for an office/meeting room is placing ScreenBeam 960 receiver on the guest network/VLAN. This solution allows both the employee and guest to present.



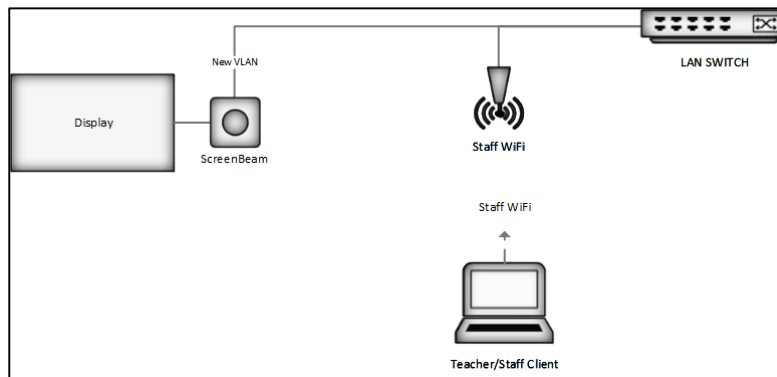
Additional considerations include the following:

- If the client system is connected to the Guest's Wi-Fi, the assumption is both are on the same VLAN and no additional configuration required.
- If the client system is connected to the Employee/Internal Wi-Fi, then it's likely both devices are on different VLANs. The network may need to be configured to allow traffic on the required ports for the Employee client system to communicate and stream to ScreenBeam receiver.
- If sequestration of guest access to the network in the room is required, and Windows 10/8.1 or Android Miracast for guest presentation is desired, ScreenBeam connections via P2P Miracast are ideal. For guest presentation by Windows 7, macOS or iOS devices, the ScreenBeam and its network will need to be run with Ethernet connected to its own router/switch and WAP.

4.3 Classroom

The recommended setup for a classroom environment is to place the ScreenBeam 960 receiver on a LAN/VLAN dedicated to the ScreenBeam. This will allow the teacher/staff member to present directly.

In this scenario, the network administrator must configure the required ports for the staff client system to communicate and stream to ScreenBeam receiver.



Part V iOS/macOS Native Screen

Mirroring

5.1 Introduction

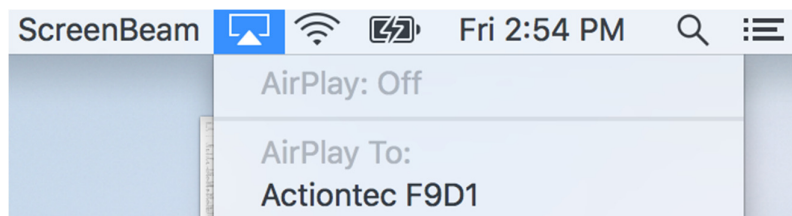
ScreenBeam 960 now offers iOS/macOS native screen mirroring. This feature allows iOS 9 and later devices, and macOS 10.10 and later devices produced from 2012 onward, to have wireless screen display. Unlike Windows 10/8.1 native screen mirroring using Miracast P2P mode direct connections, iOS/macOS native screen mirroring requires the use of existing WAPs and other network infrastructure to mirror the user device on the front-of-room display.

Please note the requirements for mDNS broadcast as outlined in section on Infrastructure Network Configuration above, as well as the need for the iOS or macOS device to be on the same network as the ScreenBeam device. If mDNS broadcast traffic is blocked on a network, or if the ScreenBeam device is inaccessible from the network that the iOS or macOS device is on, iOS/macOS native screen mirroring will not work.

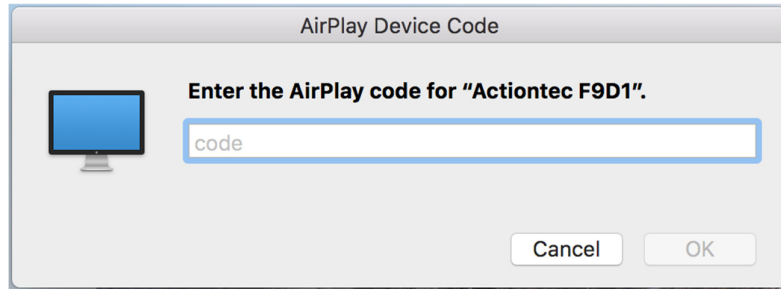
5.2 macOS Native Screen Mirroring

To initiate macOS native screen mirroring:

1. On the Menu bar, click on the screen mirroring icon, which is a small square with a triangle at the bottom. A menu will pop up with a list of available receivers.

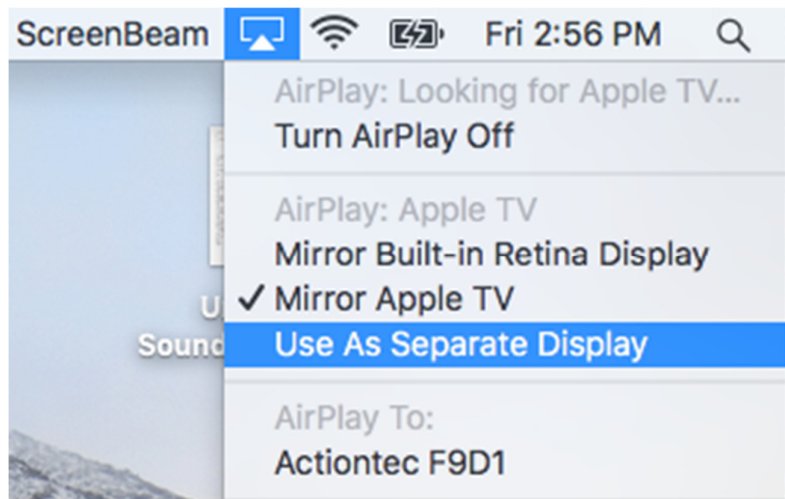


2. Click on the name of the ScreenBeam receiver at the front of the room from the list of receivers to connect to the receiver.
3. If the PIN option is enabled on the ScreenBeam, another dialog box will appear asking for the PIN as follows:



Enter the corresponding PIN and click Ok.

4. The macOS device should now be mirroring to the front-of-room display.
5. The default option is to mirror the screen directly, but extended desktop can be chosen by clicking the "Use as Separate Display" option:



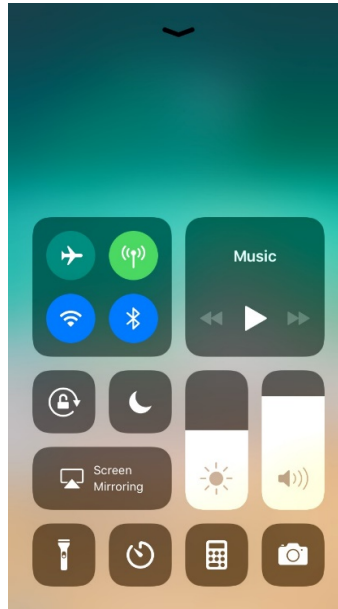
6. To disconnect from the ScreenBeam, click on the screen mirroring icon again and click on Off to turn native screen mirroring off. The macOS device will stop mirroring to the front-of-room display.

Note: DRM-protected content from apps or browsers cannot be displayed from a macOS device to the ScreenBeam front-of-room display.

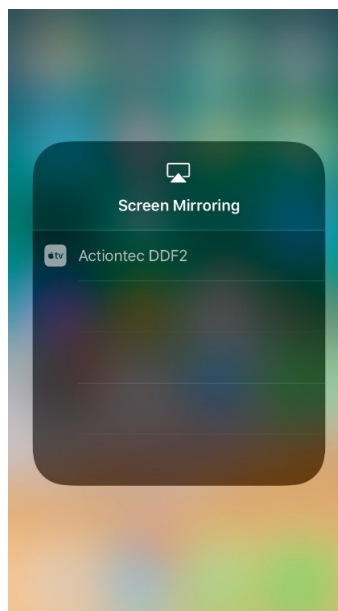
5.3 iOS Native Screen Mirroring

To initiate iOS native screen mirroring:

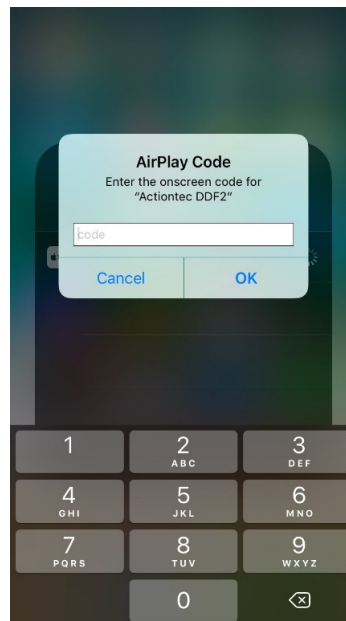
1. Swipe upward from the bottom of the iOS device screen to bring up the Control Center, or inward from the top-right corner on newer versions of iOS, then tap on the Screen Mirroring button:



2. A list of receivers will pop up on the screen. Select the ScreenBeam receiver to present to by tapping on the receiver name:

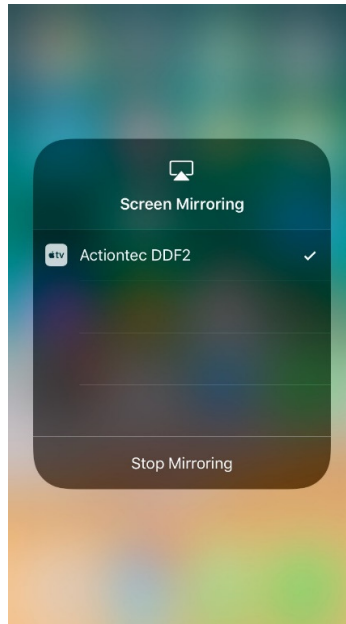


3. If the PIN option is enabled on the ScreenBeam, another dialog box will appear asking for the PIN as follows:



Enter the corresponding PIN and tap Ok.

4. The iOS device should now be mirroring to the front-of-room display.
5. To disconnect the iOS device from the front-of-room display, swipe upward from the bottom of the iOS device screen, or inward from the top-right corner on newer versions of iOS, to bring up the Control Center. Tap on Screen Mirroring, then tap on Stop Mirroring.



The iOS device will stop mirroring to the front-of-room display.

Note: When playing videos from YouTube or similar apps, the receiver may enter a mode that plays the video directly on the receiver rather than mirror the screen. In such cases, only the video controls may be present on the screen.

Note: Occasionally, during updates of video streaming apps, this mode may work erratically. In such cases, the app itself will need to be updated.

Note: DRM-protected content from apps or browsers cannot be displayed from an iOS device to the ScreenBeam front-of-room display.

Part VI Miracast Over Infrastructure

6.1 Introduction

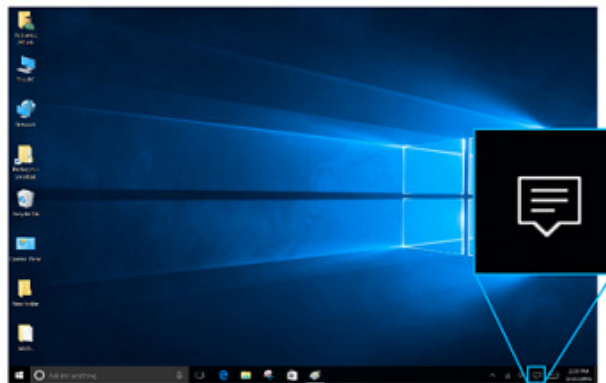
The ScreenBeam 960 supports native Miracast using peer-to-peer (P2P) connection. In some circumstances, it may be desirable to carry Miracast traffic over the existing network infrastructure into the ScreenBeam's Ethernet port. Cases requiring this type of connection include having limited available wireless spectrum due to the number of devices on the same wireless band, and policies requiring exclusive use of managed WAPs for wireless network traffic. This section describes the requirements for Miracast over Infrastructure. The connection procedure is identical to the procedure for P2P connection.

Miracast over infrastructure must be enabled in the Wireless Display over LAN section of the device configuration or CMS, and both the ScreenBeam and the Windows device must be on the same network. Only Windows 10 devices with build 1703 or later can display to a ScreenBeam via Miracast over infrastructure. Although the display connection uses network infrastructure to transmit to the display, the Windows 10 device must have Wi-Fi enabled to detect the presence of the receiver.

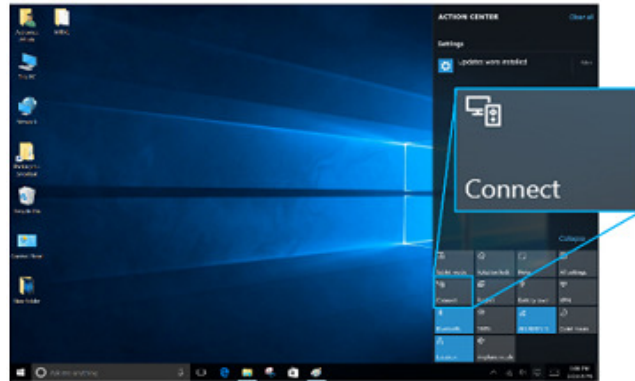
6.2 Windows 10 Miracast Over Infrastructure

To initiate Windows 10 Miracast over infrastructure screen mirroring:

1. Click on the Action Center icon in the notification area of the taskbar.



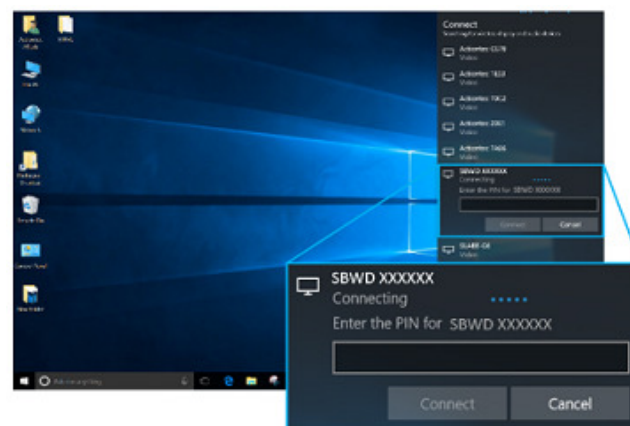
2. Click on the Connect button:



- Find the name of the ScreenBeam receiver on the “Ready to Connect” screen on the front-of-room display, and click to connect:

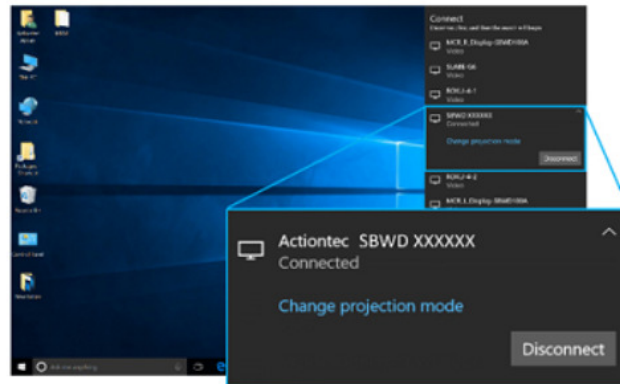


- If a PIN is requested, enter the number displayed on the front-of-room display:



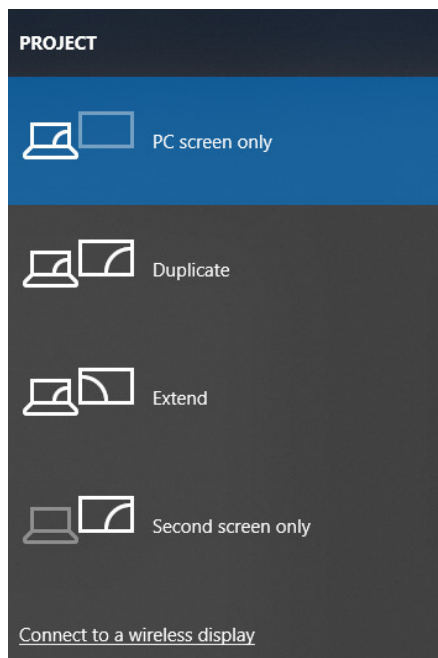
Note: If no PIN number is displayed on the front-of-room screen, use the PIN provided by the device administrator or, if none, use 12345670.

5. The Windows device will begin mirroring to the front-of-room screen, and will display the following confirmation window:



Note: Steps 1 and 2 above may be substituted by using the Windows key + K key combination instead.

Note: For additional display options such as extended desktop, use the Windows key + P key combination to bring up the screen as shown below while connected to the ScreenBeam. The option you choose will be remembered for future wireless display connections.



Part VII Installing Wireless Display over LAN Software

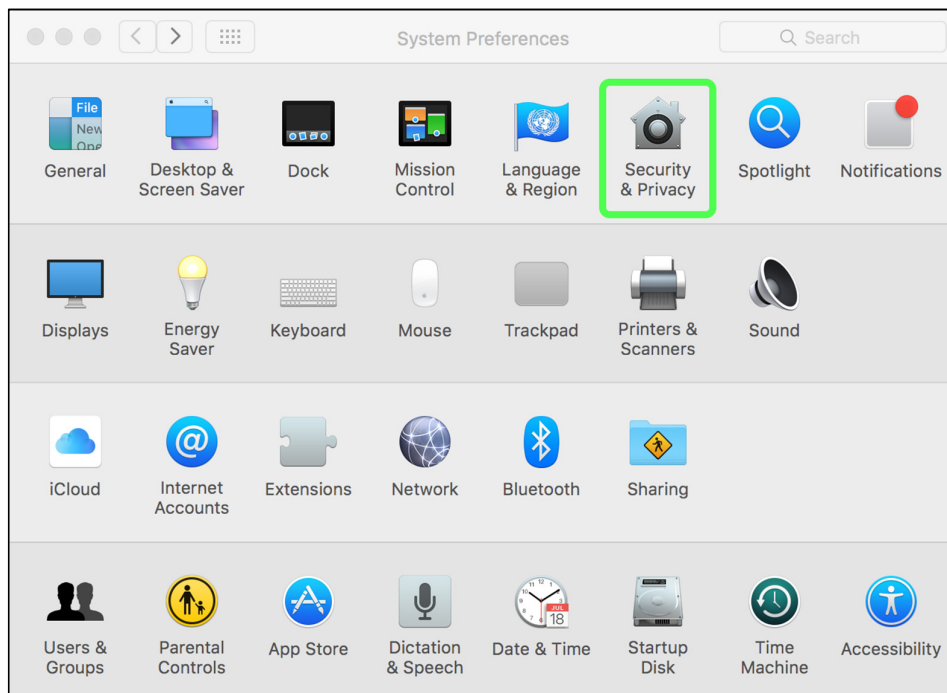
7.1 Introduction

ScreenBeam 960 allows for a no-app wireless presentation experience on Windows 10/8.1 devices, 2012 and later Macs running macOS 10.10 and later, and iOS 9 and later devices. Users of Windows 7 devices, pre-2012 Macs with macOS 10.10 or later, as well as certain iOS 11 and later users desiring an alternative wireless presentation solution will require additional software installation as outlined below.

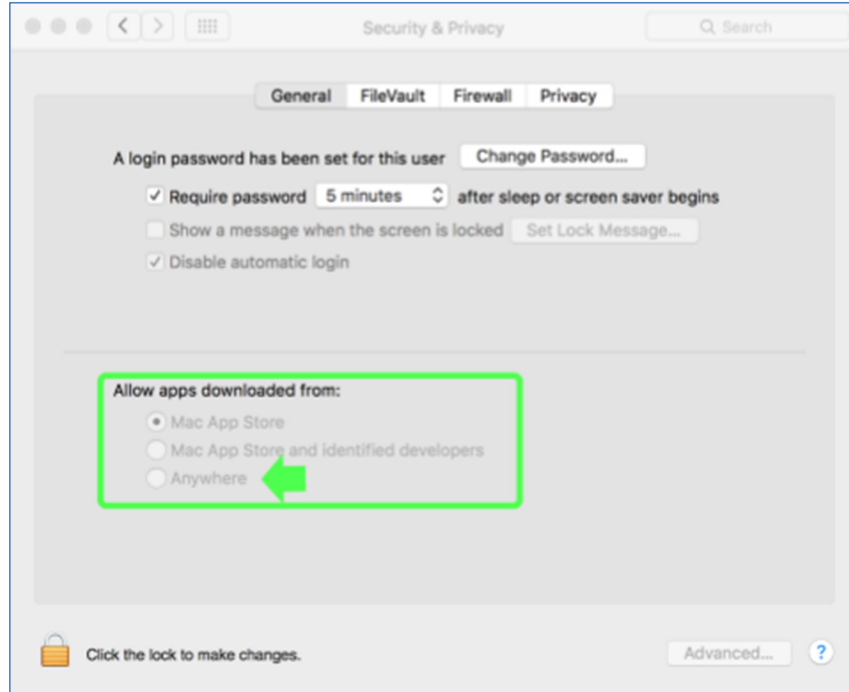
7.2 macOS Installation

7.2.1 Configure macOS for ScreenBeam application

- 1) Log in with administrative privileges, open the *System Preferences* and click on *Security & Privacy*



- 2) The Mac must be set to *Allow apps downloaded from Anywhere* to be installed.



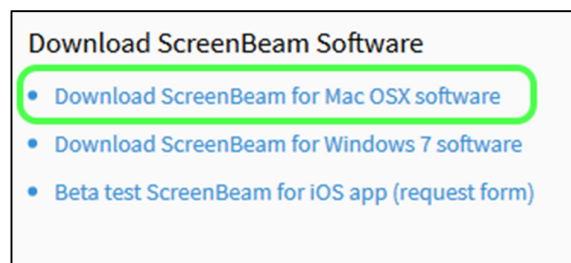
Note: If Allow apps to be downloaded from *Mac App Store* or *Mac App Store and identified developers* is selected, close *System Preferences* and enter the following command from terminal shell with Administrator privileges:

```
sudo spctl --master-disable
```

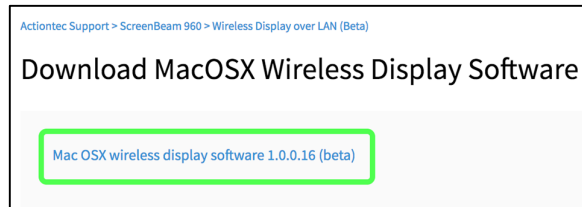
7.2.2 Install macOS application

To install the macOS application for pre-2012 macOS devices:

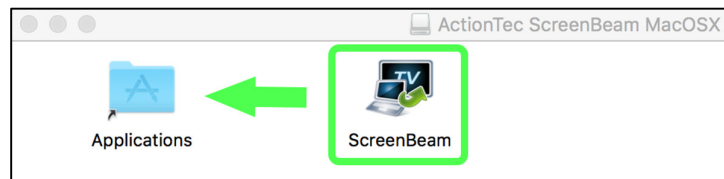
1. Go to <https://support.screenbeam.com> and click on the ScreenBeam 960 product page. On the ScreenBeam 960 page, scroll down to the *Download ScreenBeam Software* section and open the link to *Download Mac OSX wireless display software*.



2. Click on the link to download the *MacOSX wireless display software 1.0.0.16 (beta)*. The version number and beta status may differ from this document.

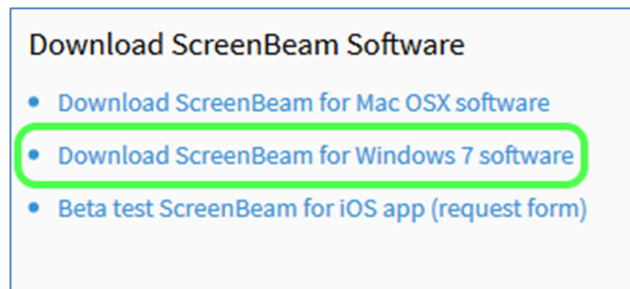


3. Open the downloaded file and click and hold on the *ScreenBeam* application and drag it to the *Applications* folder.



7.3 Windows 7 Installation

For Windows 7 wireless display over LAN, installation of the ScreenBeam Wireless Display app requires Administrator access. Go to <https://support.screenbeam.com> and click on the ScreenBeam 960 product page, then download the ScreenBeam Wireless Display app for Windows. To install, double click on the file to start the installation.



Part VIII Setting up Firewall

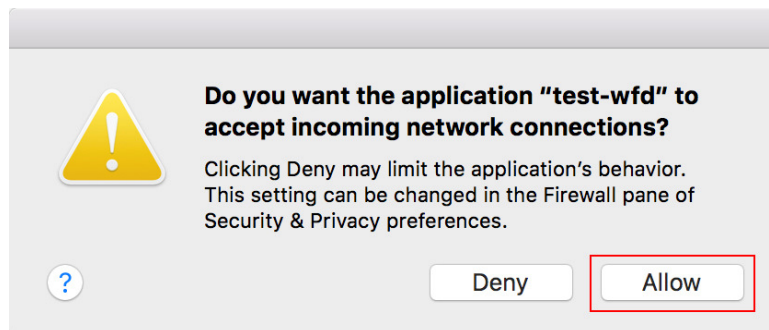
The system firewall in the operating system and any additional firewalls or port-filtering devices must be properly configured to use Wireless display over LAN. This section details the requirements for setting up such firewalls.

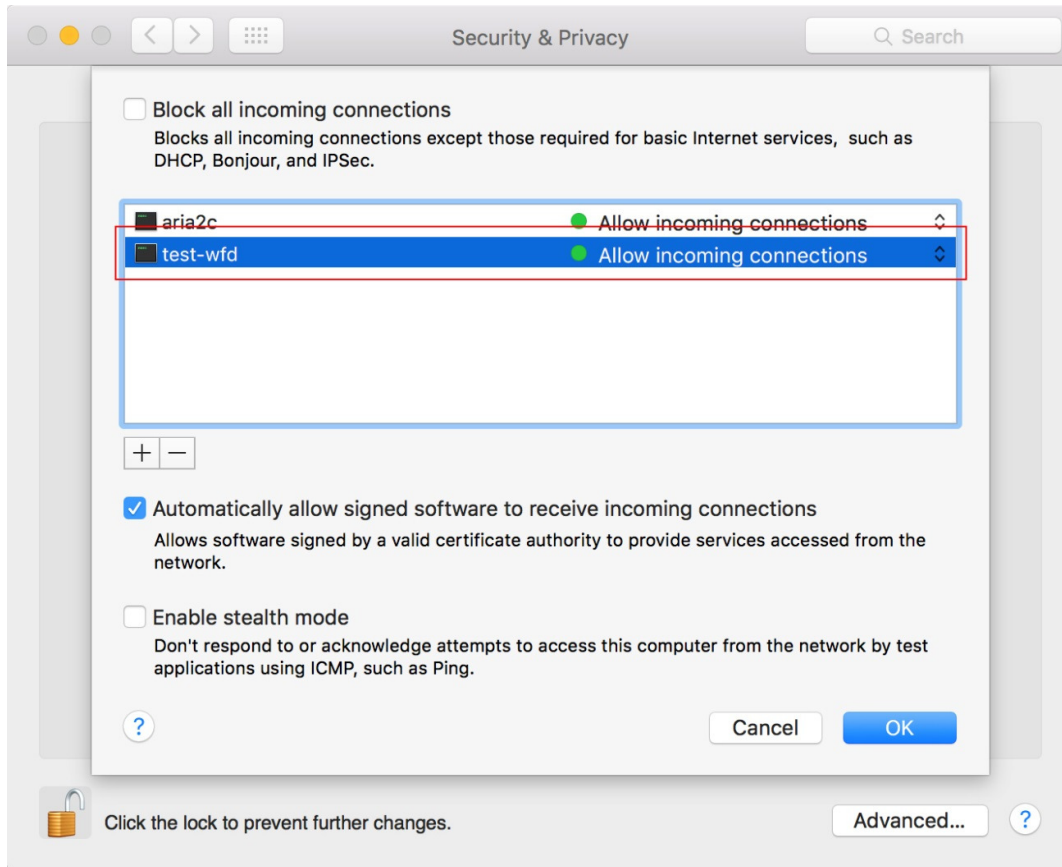
8.1 macOS

If macOS is being used, it is recommended to disable firewall on the system or allow all ports. If a limited number of open ports is required for network policy reasons, open the following ports for Wireless display over LAN:

- 35507 (TCP)
- 8554 (TCP)
- 24030 (UDP)

The firewall must allow incoming connections for the app “test-wfd” if enabled, as follows:



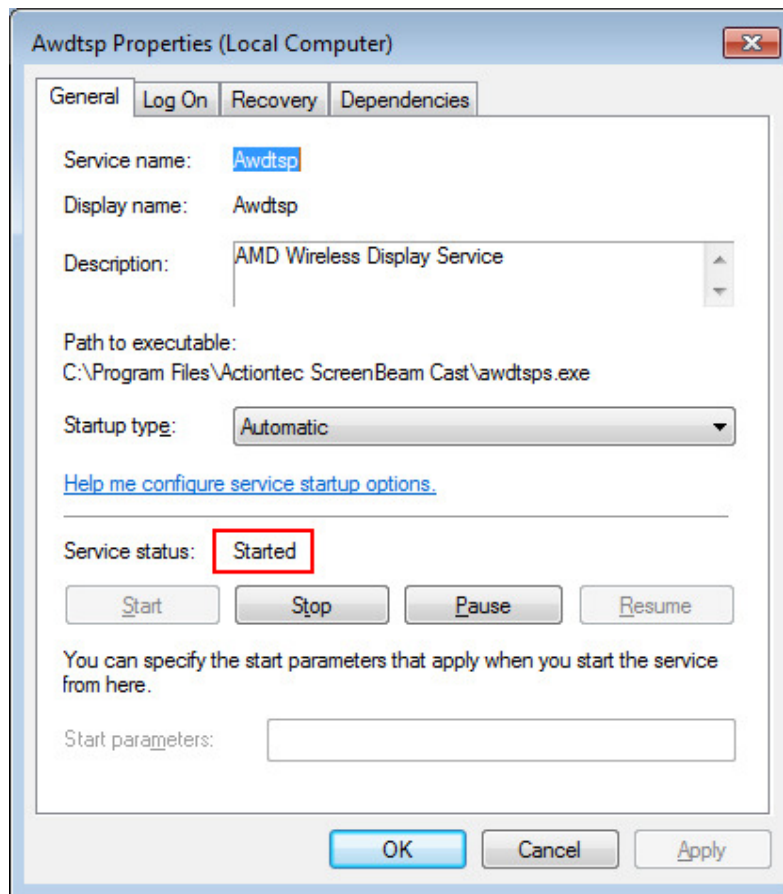


8.2 Windows 7

To enable Wireless Display over LAN, open the following ports in the Windows network and firewall settings:

- 35507 (TCP)
- 7326 (TCP)
- 24030 (UDP)

Ensure the “awdtsp” service is also started.



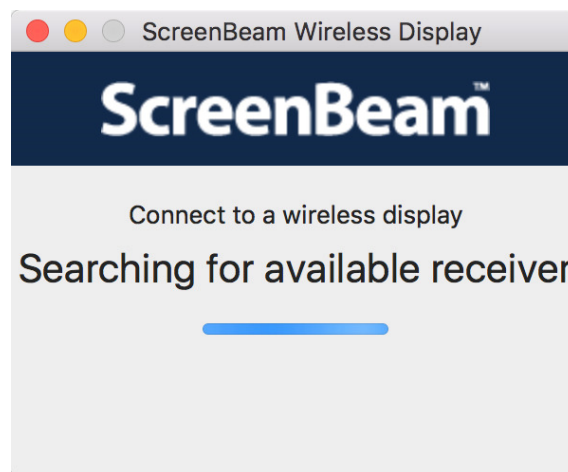
Part IX Connecting to Receiver

The following outlines procedures for connecting devices wirelessly to the display over LAN using the ScreenBeam receiver.

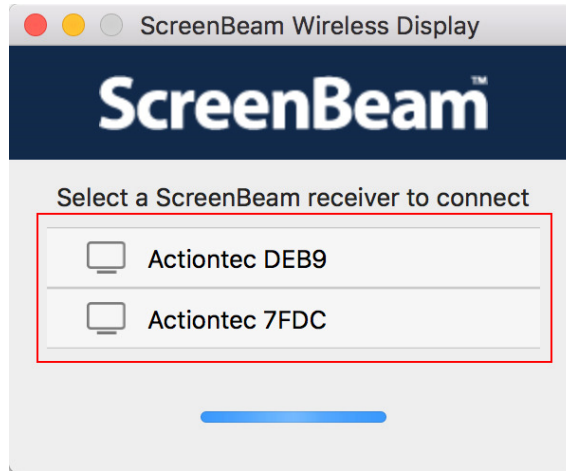
9.1 macOS

For macOS devices, follow the connection procedure below:

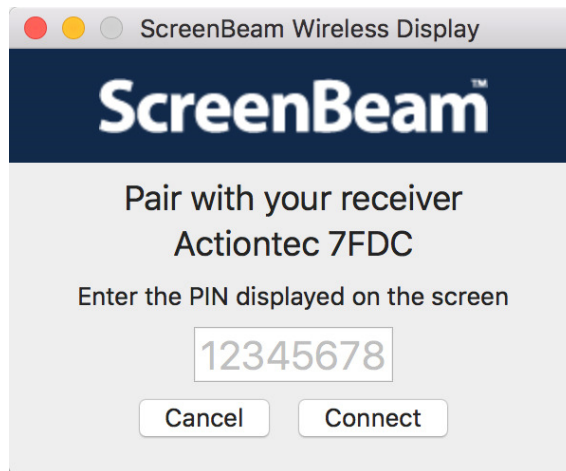
1. Ensure that Wi-Fi on the source device is turned on.
2. Confirm that the source device and the ScreenBeam receiver are connected to the same LAN.
3. Start the ScreenBeam Wireless Display application. The application starts and scans for ScreenBeam receivers:



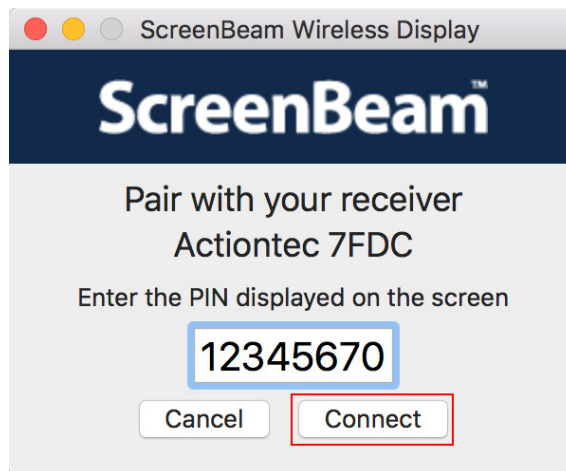
4. The application then discovers ScreenBeam receivers on the same LAN and displays them in the list:



5. Double click a receiver in the list to connect to the receiver. A PIN entry box appears:



6. Enter the PIN and click "Connect" to connect to the receiver:



Note: Refer to the receiver's User Manual for details about the PIN. If the PIN is not displayed on the connected screen, the network setup and ports will need to be checked.

7. The application will connect to the receiver after a brief delay:

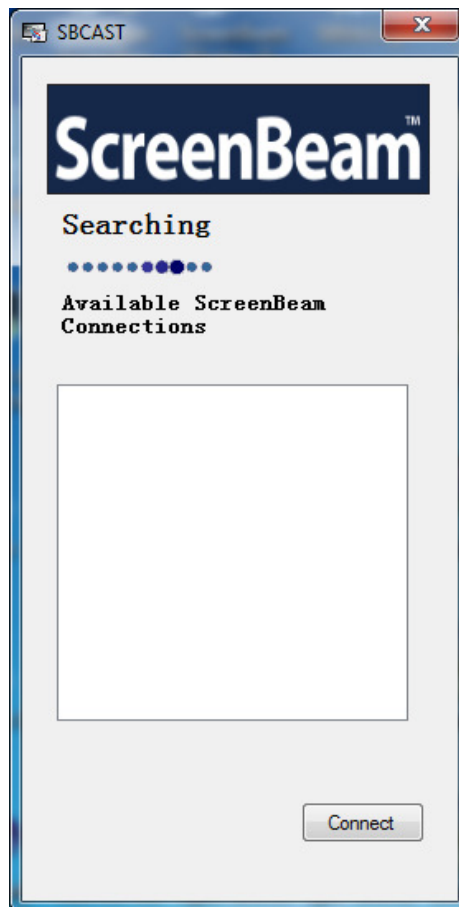


8. The device screen should now be mirrored on the front-of-room display.

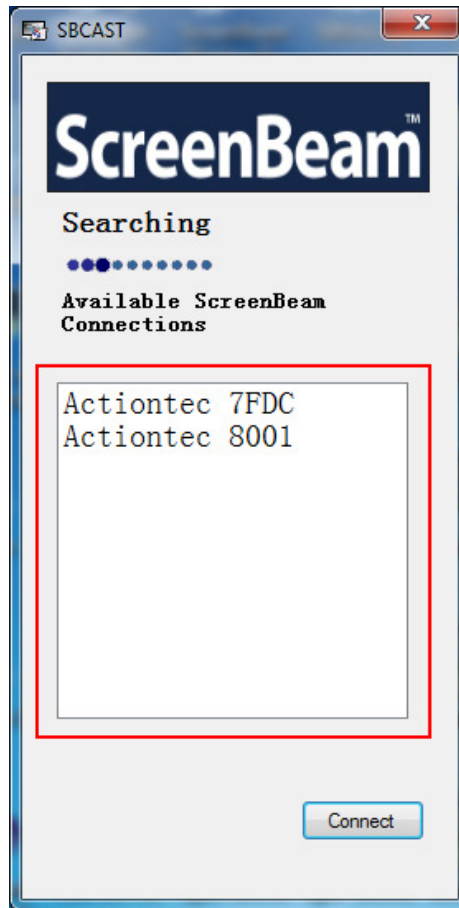
9.2 Windows 7

For Windows 7 devices, follow the connection procedure below:

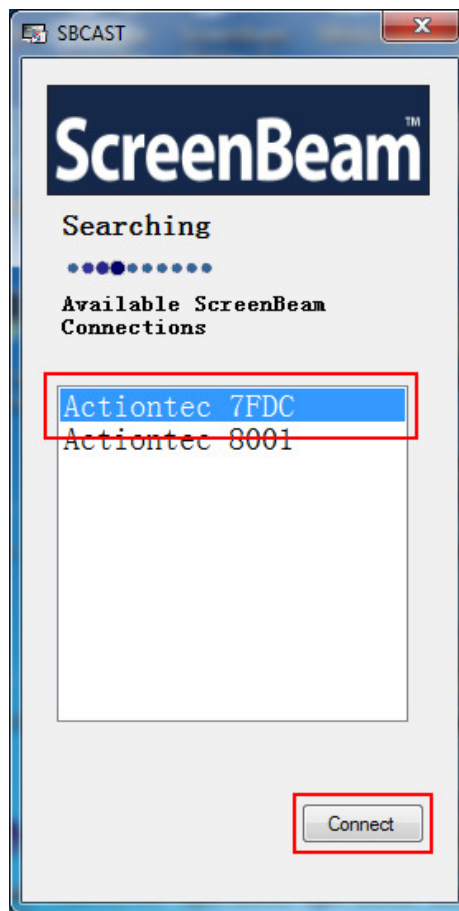
1. Make sure that Wi-Fi on the source device is turned on.
2. Confirm that the source device and the ScreenBeam receiver are connected to the same LAN.
3. Start the Actiontec ScreenBeam Cast application. The application starts and scans for ScreenBeam receivers.



4. The application discovers ScreenBeam receivers in the network and displays them in the list:

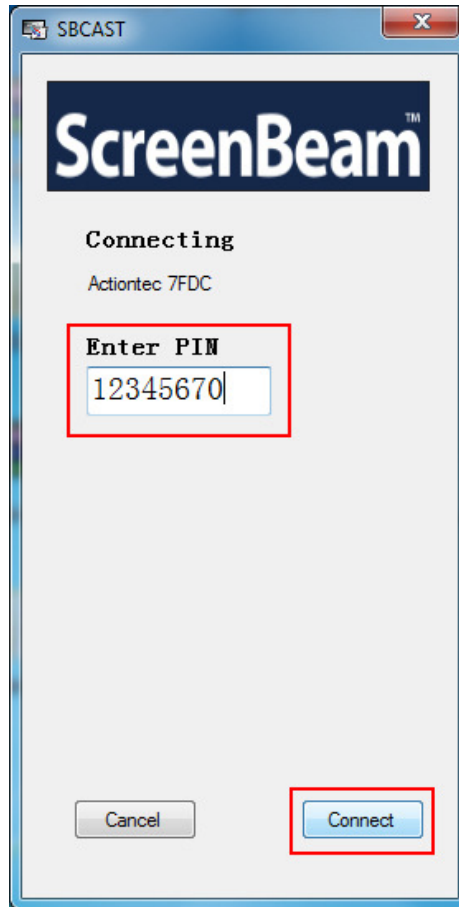


5. Select a receiver in the list and click “Connect” to connect to the receiver.



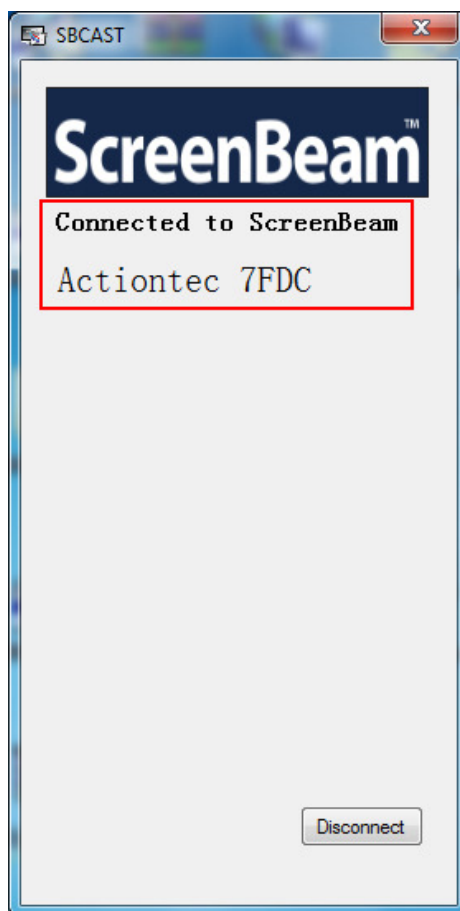
Note: Only receivers connected on the same LAN as the device can be used when using this application.

6. A PIN entry box appears. Enter the PIN and click “Connect” to connect to the receiver:



Note: Refer to the receiver’s User Manual for details about the PIN. If the PIN is not displayed on the connected screen, the network setup and ports will need to be checked.

7. The application will connect to the receiver after a brief delay:



8. The device's screen should now be mirrored on the room display.