



MobileConnect

User documentation



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Product overview

MobileConnect - Sennheiser's WiFi based system for your venue that enables low-latency transmission of audio content to mobile devices such as smartphones and tablets. With our real time audio streaming server and the MobileConnect App, you can easily provide assistive listening for hearing impaired, audio description for blind people, interpretation channels or audio for silent screens to your venue as well as movie subtitles.

Sennheiser's MobileConnect system embraces the bring-your-own-device (BYOD) principle enabling users to use their own mobile devices on the MobileConnect WiFi network. The system consists of a ConnectStation, a central unit for integrating different audio streams and transmitting them via WiFi access points to the personal mobile devices.

Typical applications

Assistive listening

Audio description

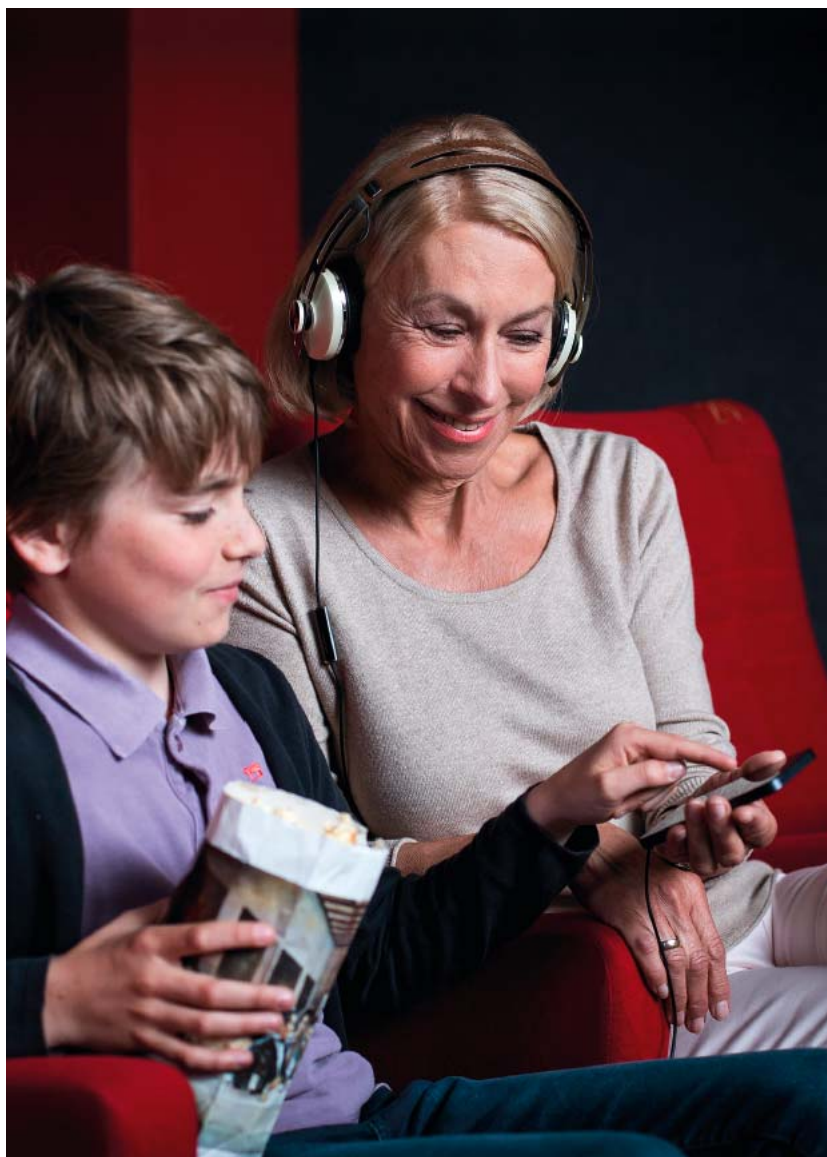
Interpretation / Multi-language audio

Digital signage / Silent screens



Features

Bring your own device



The streaming system adheres to the “bring your own device” (BYOD) philosophy. That means that all the people in the audience can use their own smartphones as receivers with their own headphones, and do not need any additional hardware. This way, they don’t have to rent expensive equipment and can use devices they are already familiar with. Of course, the venue can also offer iPods or other rental devices.

Personal Hearing Assistant

Developed with **Fraunhofer-Institut für Digitale Medientechnologie ID-MT**, the **Personal Hearing Assistant** allows for a truly intuitive sound adjustment. The audio signal can be adjusted easily according to individual hearing needs – not only the volume of the audio signal, but also more sophisticated sound parameters that affect speech intelligibility.



Components

The MobileConnect system consists of these components.

ConnectStation

The ConnectStation is the central unit for integrating different audio streams and transmitting them via WiFi access points to any personal mobile device.





MobileConnect App



Available for iOS / Android – and for free. The MobileConnect App is easy to use and convenient for everyone. It is fully compatible with iOS and Android accessibility modes where visual impairment support is required. Its advanced Personal Hearing Assistant is based on technologies by Fraunhofer Institute IDMT and allows for individual audio adjustments via a simple and intuitive touchscreen user interface.





Access Point (optional)



The Ruckus WiFi Access Point is used for wireless transmission of the audio signals to the users' personal devices. It is only necessary if the system is used in Standalone Mode.

The access point is only delivered with the **+WiFi** country variants (see "Country variants").



System planning

The following sections can help you with your system planning. You will find Information on the following topics.

A list of **country variants** of the MobileConnect and CinemaConnect systems including the delivery contents of the different variants.

See "Country variants"

Information on **network integration** of the MobileConnect and CinemaConnect systems for both **Standalone Mode** and **Integrated Mode**.

See:

- "Network integration"
 - "Standalone Mode"
 - "Integrated Mode"
-

Information on the **audio level** and **latency** in the **device chain**.

See "Planning audio level and latency"

Special information for installations in the **USA** concerning the **Americans with Disabilities Act (ADA)**.

See "Americans with Disabilities Act (ADA)"



Country variants

Before purchasing you can refer to the list of country variants to find the system suitable for you.

Country variants for Standalone Mode

▷ Select your **country variant**:

MobileConnect +WiFi EU	Article no. 506733
MobileConnect +WiFi UK	Article no. 506734
MobileConnect +WiFi US	Article no. 506735
CinemaConnect +WiFi EU	Article no. 506736
CinemaConnect +WiFi UK	Article no. 506731
CinemaConnect +WiFi US	Article no. 506732

▷ Scope of supply

1x ConnectStation CS1-M or CS1-C
1x power supply cable, 1.8 m
1x 15-pin D-sub to 4x RCA analog, 2x MIDI, 1x phones
1x 9-pin D-sub to 2x RCA digital (SPDIF)
1x Toslink cable 2 mm, 2 m
3x Ethernet cable Cat5e, 1 m
1x WiFi access point
1x PoE power over Ethernet injector EU/US/UK/AU for access point
1x Quick Guide
2x Safety Guide

i The following Access Points can be delivered: Ruckus ZoneFlex 7372 or R500 or R510.



Country variants for Integrated Mode

▷ Select your **country variant**:

MobileConnect EU	Article no. 506888
MobileConnect UK	Article no. 506889
MobileConnect US	Article no. 506890
CinemaConnect EU	Article no. 506885
CinemaConnect UK	Article no. 506886
CinemaConnect US	Article no. 506887

▷ Scope of supply

1x ConnectStation CS1-M or CS1-C
1x power supply cable, 1.8 m
1x 15-pin D-sub to 4x RCA analog, 2x MIDI, 1x phones
1x 9-pin D-sub to 2x RCA digital (SPDIF)
1x Toslink cable 2 mm, 2 m
3x Ethernet cable Cat5e, 1 m
1x Quick Guide
1x Safety Guide

Note: no access point included.



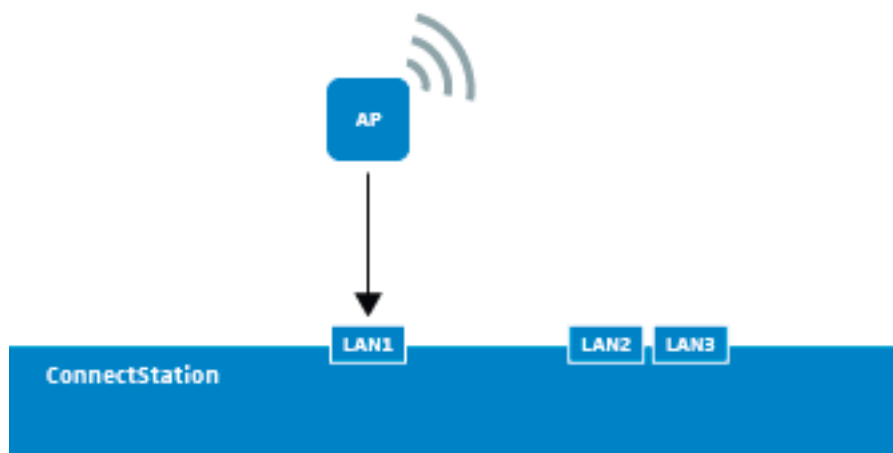
Network integration

The MobileConnect&CinemaConnect product can be used as a standalone system or can be integrated in your existing network infrastructure. To choose the most suitable configuration please read this section carefully.

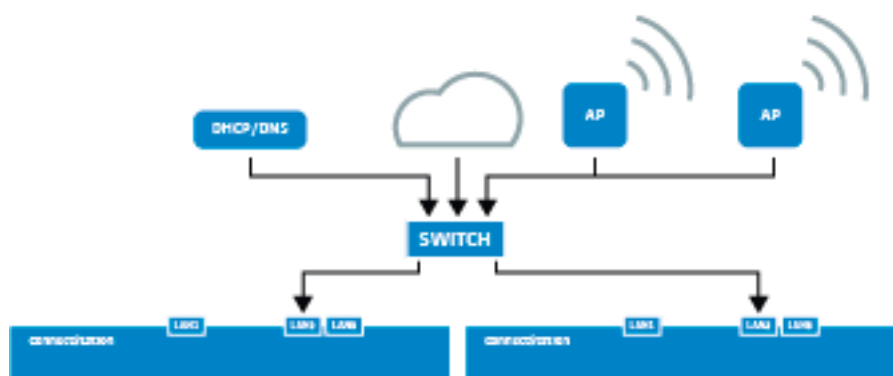
Selecting the network mode

The ConnectStation allows for two different network modes. The mode is selected during initial setup of the ConnectStation in the Admin Interface.

- ▷ **Standalone Mode** for using the ConnectStation with the supplied access point in a separate network. See "Standalone Mode".



- ▷ **Integrated Mode** for using one or multiple ConnectStations in an existing network infrastructure. See "Integrated Mode".



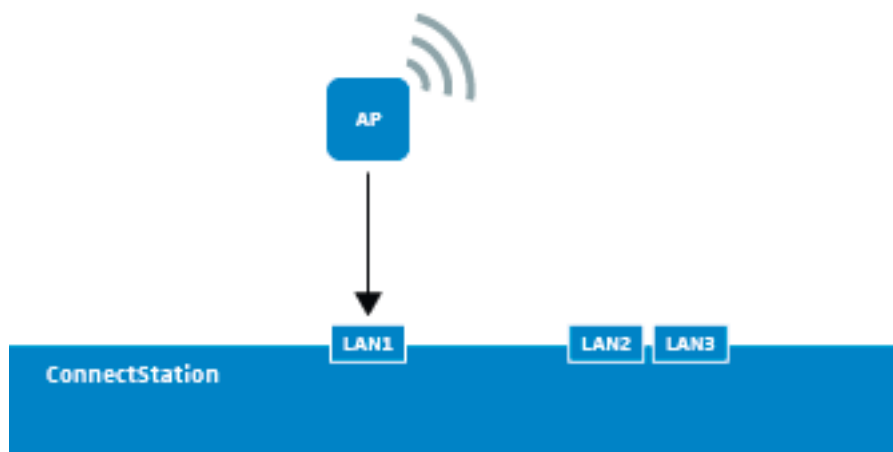


Standalone Mode

Standalone Mode is the easiest to configure if you do not need the ConnectStation to integrate into an existing WiFi infrastructure. Any Ruckus Access Point connected to LAN1 is considered to be the “delivery subnet”, and is assumed to be there for the sole purpose of delivering the streams of a single ConnectStation.

Note: The ConnectStation provides DHCP and DNS on LAN1. Make sure there is no other DHCP server in the network connected to LAN1!

Using a single Access Point



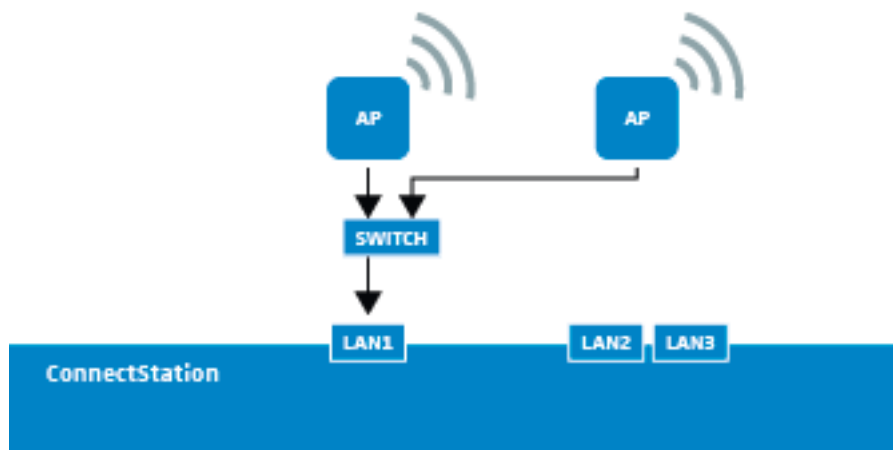
- ▷ Connect the 10/100/1000 port of the supplied AP directly to **LAN1**.
- ▷ Make sure the AP is associated via the administration interface of the ConnectStation.



For setting up the WiFi please consider the following information: "WiFi planning"



Using multiple Access Points



- ▷ Instead of a single AP, you can add up to 8 APs via an external network switch to extend the range of the delivery WiFi.
- ▷ The APs can be associated and configured via the administration interface of the ConnectStation.
- ▷ The client limit of the ConnectStation will not be changed.
- ▷ Observe common WiFi deployment guidelines about channel assignment etc.
- ▷ Instead of associating the APs with the ConnectStation, you can manage them yourself, or add a WiFi controller.



For setting up the WiFi please consider the following information: "WiFi planning"



Increasing the number of clients per ConnectStation (Standalone Mode)

In order to increase the number of clients per ConnectStation:

- ▷ Add two or more Access Points via LAN1 (see "Using multiple Access Points"). This is necessary in order to ensure the quality of the audio. A single AP cannot provide low latency unicast audio stream to 100 listeners.
- ▷ Open the Admin Interface of the ConnectStation. Navigate to the Overview page and enable 100 clients. A client limit of 25 clients per frequency band and 50 clients per Access Point will be set on all Access Points. This limit is for both streaming and non-streaming clients.

This setup is not suitable for large venues with unencrypted WiFi as a lot of mobile devices will attempt to use the WiFi for Internet. This may prevent the audio listeners from connecting, in case the AP client limit is reached. In such a case, you could add password protection to the WiFi, add additional Access Points, or reduce the client limit of the ConnectStation (which will automatically remove all limits for the Access Points).

When choosing the number of Access Points and the client limit, also consider that there are Android devices that do not support 5 GHz and can only connect to a 2.4 GHz WiFi.

For optimal audio quality, consider the WiFi deployment recommendations provided under "WiFi planning".

The client limit of the Access Point is necessary in order to ensure that an Access Point is not overloaded and can serve all streaming listeners. A single WiFi channel can support around 50 listeners. Having more listeners on the same band is not advisable. Even for Access Points with a higher throughput, the data rate is limited by the rate of the slower communication endpoints, which are the listeners.

Client limits on the ConnectStations and Access Points

Client limit per ConnectStation	Access point, radios enabled	Client limit per AP per radio	Client limit per AP	Number of AP in Standalone Mode
50	Both 2.4 GHz and 5 GHz radios enabled	512 (Ruckus default)	512 + 512 (Ruckus default)	>1+
100	Both 2.4 GHz and 5 GHz radios enabled	25	25 + 25 = 50	>2+
100	Only 2.4 GHz radio enabled	50	50	>2+
100	Only 5 GHz radio enabled	50	50	>2+

- ▷ Please consider that the introduced Access Point client limit is for both streaming and non-streaming clients.

In case of an unencrypted WiFi, where a lot of non-streaming clients may connect, the Access Point client limit can be reached and new clients may not be able to connect to the WiFi. In such a case, you could add password protection to the WiFi, add additional Access Points, or reduce the client limit of the ConnectStation (which will automatically remove all limits for the Access Points).

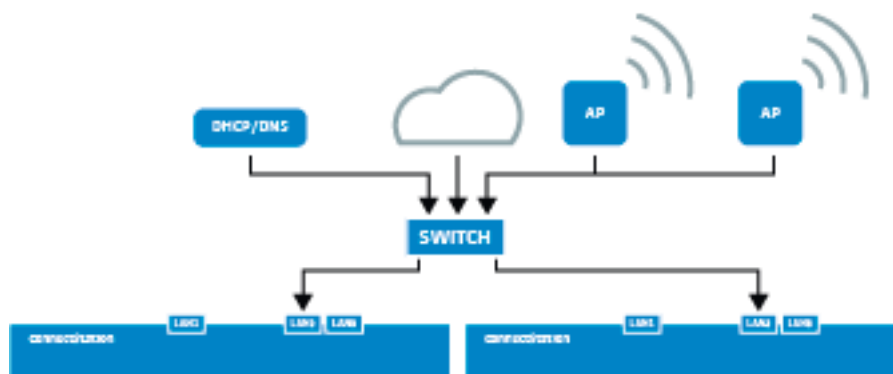
- ▷ When choosing the number of Access Points and the client limit, also consider that there are Android devices that do not support 5 GHz and can only connect to a 2.4 GHz WiFi.
- ▷ For optimal audio quality, please consider the WiFi deployment recommendations provided under "WiFi planning".



Integrated Mode

In Integrated Mode you can connect multiple ConnectStations to your existing network infrastructure. Please read the following sections carefully to give your users the best possible audio experience.

Network connection



- ▷ Connect **LAN 2** to your network.
- ▷ ConnectStations will acquire IPs via DHCP (or static configuration).
- ▷ Up to 10 ConnectStations will connect together to form a cluster (see "Cluster discovery (Integrated Mode)").
- ▷ Smartphone clients with the MobileConnect/CinemaConnect App connect via your APs and need to find a ConnectStation within the cluster (see "Service discovery (Integrated Mode)").
- ▷ The default client limit is 50 clients per ConnectStation.

You can increase the client limit to 100 for each ConnectStation in the cluster via the Admin Interface of the ConnectStation.

Before doing that, carefully consider the following sections and make sure your WiFi infrastructure can handle the increased number of clients. For more information see "Increasing the number of clients per ConnectStation (Standalone Mode)" and "Important recommendations towards WiFi".

Note: Observe the discovery options and other requirements described in the following sections.

i Sennheiser does not implement or provide the Network structure and components for this implementation mode (network integration). MobileConnect will be included into an existing network structure. To ensure network functionality, please keep your responsible IT department, consultant, supplier or administrator involved in all steps of the process.



Increasing the number of clients per ConnectStation (Integrated Mode)

In order to increase the number of clients per ConnectStation in Integrated Mode:

- Make sure that your network and WiFi infrastructure can handle the increased number of clients. Otherwise enabling more clients may lead to audio and connectivity problems for all listeners.

For more information see "Increasing the number of clients per ConnectStation (Standalone Mode)" and "Important recommendations towards WiFi".




Requirements/Recommendations towards your network (Integrated Mode)

While MobileConnect/CinemaConnect might function also in networks with cheap and / or misconfigured infrastructure, users might well experience increased audio latency, audio dropouts or even failure of the streams especially when more than a handful of clients try to connect.

To optimize your network for perfect MobileConnect/CinemaConnect reception, please observe the recommendations made by this document closely and keep monitoring the system during use.

Yet, detailing strategies for deployment of a workable WiFi network would exceed the scope of this document. If you want to provide excellent streaming service to a maximum number of users, you'll have to be careful in designing your infrastructure to high standards.

 Please keep in mind that MobileConnect needs to be implemented in a professional IT infrastructure which is not comparable with a common home network. Always keep your responsible IT department, consultant, supplier or administrator involved in all steps of the process to ensure network functionality.

The following application note on the Sennheiser website gives a short and comprehensive overview of the network requirements:

[Application Note Network Requirements in Integrated Mode \(PDF\)](#)

For detailed information continue reading the following paragraphs.



Traffic Structure to expect with a MobileConnect/CinemaConnect installation

To estimate the impact on your WiFi network to expect from a MobileConnect/CinemaConnect installation, we give some insight into what traffic to expect:

1. Multicast Announcement Packets

When using multicast discovery, the server ConnectStation will send out small announcement packets on the port specified, to the multicast group address specified, twice per second.

2. Inter-Cluster communication

ConnectStations that form a cluster will communicate with each other on ports in the 8000-9000 range, both via TCP and UDP. The traffic involved should stay minimal and not pose a problem to any cabled infrastructure.

3. Service Discovery, Registration and Control Connection

WiFi Clients with the MobileConnect/CinemaConnect App will use a discovery method as described above, and cause some registration traffic via http on port 8000, and keep a TCP control connection open in the 8000-9000 range. Whenever a change in configuration is detected, clients are triggered to re-request the channel configuration via http. If many clients are connected, this will cause http transfers which vary in size depending on the amount of ConnectStations and Channels configured in the cluster.

4. Audio streaming data

The most serious amount of traffic though will obviously be the audio streaming data which is sent via UDP on ports 3200-3400. Audio data is sent via UDP unicasting to each client registered for a stream. Every client receives around 100 packets per second, each 96 bytes plus UDP/IP/WiFi overhead. That is with our current recommended settings. In some circumstances, the system might increase the packet count up to 400 packets/s, and while the payload size per packet will go down accordingly, obviously header overhead stays the same, resulting in a higher overall data rate.

Note: It's important that these packets are delivered by your infrastructure in a timely fashion, ideally without any frame aggregation taking place, to keep audio latency down.

To allow prioritization of the streaming data on both your cabled infrastructure and - more importantly - with your WiFi equipment, we are tagging the traffic with DSCP 0x2E (EF). Please ensure that this traffic is handled accordingly, for example, it should usually end up in the WiFi Access Point's VO queue.



Important recommendations towards WiFi

With the Access Points delivered with the MobileConnect/CinemaConnect System (Ruckus ZF7372), we've seen the best results with 40MHz channel width in the 5GHz bands, but 20MHz on 2.4GHz.

In order to ensure best possible streaming quality, we recommend to have maximum of 50 clients per Ruckus 7372 access point due to the following reasons:

- A single WiFi channel can support around 50 listeners. Having more clients on the same band is not advisable. Even for Access Points with a higher throughput, the data rate is limited by the rate of the slower communication endpoints, which are the clients.
- The Ruckus 7273 Access Point can support around 60 to 70 streaming clients. Having more clients can cause high CPU for the Access Point.

When using more than one ConnectStation or increasing the number of clients per ConnectStation with your own WiFi infrastructure, especially if clients also use the WiFi for other purposes, you will have to take measures to ensure that enough bandwidth is available for streaming.

We recommend:

- keeping a strict client limit per access point, active load balancing, or similar
- providing active load balancing, or similar
- usage example: a cluster with 3 ConnectStations with a limit of 100 clients per ConnectStation should have at least 6 Access Points to support the number of streaming clients.

For more information see "WiFi planning".

General network requirements

1. Short path

Smartphone clients need to be able to connect to the ConnectStations as directly as possible. They need to get IPs assigned from your DHCP that are in the same broadcast domain as those assigned to the ConnectStations.

As far as possible, avoid too many switches and routing on Layer 2 between smartphone clients and ConnectStations. Any switch can introduce jitter and congestion, which will increase audio latency experienced by MobileConnect/CinemaConnect users or even cause the streams to stop working altogether.

2. Discovery

You'll need to support one of the **service discovery** option for the clients, as described in "Service discovery (Integrated Mode)".

If you want to integrate more than one ConnectStation into your network, you'll also need to support a **cluster discovery** option as described in "Cluster discovery (Integrated Mode)".

3. Connectivity

Modern mobile devices require an internet connection at all times. When connecting to a WiFi the devices may reject the network if there is no internet access. The MobileConnect/CinemaConnect system provides additional features to allow mobile devices to seamlessly connect to the MobileConnect/CinemaConnect WiFi. However, we cannot guarantee that all mobile devices on the market will be covered. We recommend providing internet access in the network for better client connectivity.



Switches, Access Points and QoS

1. Use Quality Equipment

We strongly recommend to use enterprise-grade switches and WiFi equipment and keep a close eye on the delivery of our data especially when the installation needs to support a large amount of simultaneous listeners.

2. “Just like VoIP”

Our audio streaming traffic is similar in structure to VoIP traffic, so lots of lessons learned there will apply here, too. The main difference is that our traffic is mostly unidirectional, i.e., there is not much data traffic originating from the client devices. Keep this in mind when configuring WMM and QoS settings in your network and WiFi controllers.

3. Requirements for Switches

Any cabled infrastructure should be Gigabit Ethernet or better.

All involved switches should:

- support QoS with strict priorities,
- not queue up any of our traffic (especially the audio payload on ports 32xx) and
- have energy saving functionality disabled.

Network bandwidth

The bandwidth usage is similar as for Voice over IP.

The system creates a bandwidth of **90 - 200 kbit/s** per client. Please be aware that in WiFi, the actual throughput can diverge significantly from the basic rate.



Cluster discovery (Integrated Mode)

When integrating multiple ConnectStations into a network, they need a way to find each other to set up the cluster. There are two options:

1. Explicit server selection via DNS SRV records
2. Automatic discovery by multicast announcements (with the option to override the default multicast address and port)

Order of methods for Cluster Discovery

The discovery process follows a strict order:

1. Explicit SRV

- ▷ When starting up, a ConnectStation will first query your DNS for **_cnct._tcp** SRV records. If it finds entries, it will try to connect to the specified server(s).

2. Multicast announcement on overridden address

- ▷ If no DNS SRV records are found, it will query your DNS for a **_cnct._udp** SRV record that can specify the multicast group and port for discovery. If found, it will use these values for the discovery process as described below.

3. Multicast announcement on default address

- ▷ If not specified in your DNS, it will use the default multicast group address **224.2.2.2** and port **32001** for the discovery process as described below.



Explicit server selection

You can explicitly set any of **1, 3 or 5** ConnectStation(s) as a server for your cluster. For that purpose, create a SRV record for **_cnct._tcp** pointing to the IP (or, if set in your DNS, hostname) for each of the ConnectStations you want to select as a server.

- ▷ It is advisable to select the stations with the least expected load (in terms of connected listeners and number of streams) to be servers.
- ▷ Note that the ConnectStations will observe DNS search domains as set by your DHCP server, and you will usually want to create the SRV entries under one of those search domains.
- ▷ If any of the explicitly selected servers are not reachable, the result is undefined and the whole cluster of ConnectStations might stop functioning.
- ▷ If you configure an illegal number of servers (any number other than 1, 3 or 5), the result again is undefined.

Example:

1. Assume you have a network setup with three ConnectStations, and you want to make one of those to be the server for your cluster explicitly.
2. Your DHCP hands out **IP addresses** to the ConnectStations connected via their LAN2 port- we'll assume for this example that they are: 192.168.0.101, 192.168.0.102 and 192.168.0.103.
3. Your DHCP sets the **domain** field (DHCP Option 15) to an arbitrary domain name, let's assume it is "your-domain.com".
4. Create SRV entries for the ConnectStation you want to be the server. The **priority** and **weight** field are currently irrelevant. Set the TTL to a sane value according to your network requirements. Set the **port** to 8000:

Service name	TTL	Class	Type	Priority	Weight	Port	Target
_cnct._tcp.your-domain.com	3600	IN	SRV	0	0	8000	192.168.0.101

5. When started up, the selected ConnectStation will discover it is set to be the single server and start listening for other ConnectStations to form a cluster.
6. The other ConnectStations will discover the selected server and connect to it to form a cluster.
7. You can configure the cluster via any connected station. If you are connected to the same network, you can browse to <http://192.168.0.101/> to open the administration interface.

Automatic cluster setup via multicast announcement

- ▷ When no **_cnct._tcp** SRV records are found, the ConnectStations will fall back to automatic discovery via a simple multicast announcement protocol.
- ▷ On startup, a ConnectStation will listen for announcements on multicast address 224.2.2.2 and port 32001. The multicast group address and port can be overridden by **_cnct._udp** SRV entries in your DNS.
- ▷ If it detects announcements, it will connect to the ConnectStation sending them. If no announcements are detected, it will assume the server role and start sending announcements itself.
- ▷ If the Server ConnectStation disappears from the cluster, another station will take over the server role automatically.



Overriding the default multicast group address and port for multicast announcements

You can override the default multicast group address and port for announcements by adding a `_cnct._udp` SRV entry into your DNS. ConnectStations will then use the specified address/port for cluster discovery via multicast announcement (as well as for Client's Discovery). As with explicit server selection, the entries need to correspond to the DNS search domain set by your DHCP server.

Example:

1. Assume you want to override the default multicast group address and port to be 224.1.2.3:1234.
2. Your DHCP sets the domain field (DHCP Option 15) to an arbitrary domain name, let's assume it is "your-domain.com".
3. Create a single SRV entry as follows. The priority and weight fields are currently irrelevant. Set the TTL to a sane value according to your network requirements.

Service name	TTL	Class	Type	Priority	Weight	Port	Target
<code>_cnct._udp.your-domain.com</code>	3600	IN	SRV	0	0	1234	224.1.2.3

4. When reconnected to your network, or restarted, all announcement and discovery between ConnectStations will now work on the group address and port specified.



Service discovery (Integrated Mode)

Similar to the discovery process between the ConnectStations, the smartphone clients running our MobileConnect/CinemaConnect App (“the App”) need a way to find at least one ConnectStation in your network. The process is roughly similar to the cluster discovery described above, except the DNS SRV records are accompanied with a single PTR record to adhere to the DNS-SD specification more closely. Finally, the App can discover the ConnectStation cluster via DNS A records (i.e., “hostnames”).

Order of methods for Service Discovery

The discovery process again follows a strict order:

1. Explicit DNS-SD (PTR/SRV)

- ▷ When starting up, the App will query your DNS for **_cnct._tcp PTR** records. If it finds entries, it will resolve the corresponding **SRV** records and try to connect to any of the specified server(s).

2. Multicast announcement on overridden address

- ▷ If no DNS PTR records are found, or none of the specified servers are reachable, it will query your DNS for a **_cnct._udp SRV** record that can specify the multicast group and port for discovery. If found, it will use these values for the discovery process as described below.

3. Multicast announcement on default address

- ▷ If not specified in your DNS, it will use the default multicast group address **224.2.2.2** and port **32001** for the discovery process as described below.

4. Simple hostname “sennheiser-connect”

- ▷ If none of the methods above yield a valid result, the App will try to resolve the hostname “**sennheiser-connect**” (searching within any search domains given via DHCP). If it can be resolved, it will connect to this station.

5. hostname/TLD “local.connect”

- ▷ As a last resort, the App will try to resolve the hostname “local.connect”.

6. Pause, repeat

- ▷ Finally, if all of the method fails, the App will pause and restart the discovery from step 1.

Explicit service registration via DNS-SD (PTR/SRV)

Explicit Service Registration is the preferred discovery method because it is standardized, explicit and usually well understood. It closely follows the DNS-SD specification (RFC6763 - see:

<https://tools.ietf.org/html/rfc6763>)

At the moment, only a single service name should be registered with a PTR record; multiple SRV records can be set to provide redundancy. The service name for MobileConnect/CinemaConnect discovery by Apps is **_cnct._tcp**. Contrary to Cluster Discovery (see “Cluster discovery (Integrated Mode)”), Apps will not directly look up a SRV record for **_cnct._tcp**, but instead take the indirection via a PTR record. Also, the ConnectStations registered via this method do not assume the “server” role for clustering; instead, any ConnectStation in a cluster can serve as the entry point for service discovery. If multiple SRV records are found, the App will probe them until it finds a station that is available. Apps will honor any search domains set via DHCP.

**Example:**

1. Let's assume that you want to register a cluster of three ConnectStations in your DNS. They discover each other with any of the Cluster Discovery methods described above.
2. Your DHCP hands out **IP addresses** to the ConnectStations connected via their LAN2 port- we'll assume they are: 192.168.0.101, 192.168.0.102 and 192.168.0.103.
3. Your DHCP sets the **domain** field (DHCP Option 15) to an arbitrary domain name, let's assume it is "your-domain.com".
4. The ConnectStations form a valid cluster via a Cluster Discovery method described above.
5. Create a PTR entry with an arbitrary **name for a service instance** that adheres to the DNS-SD specification; here, we use the name "XConnect". Set the **TTL** to a sane value according to your network requirements.

Service name	TTL	Class	Type	Target (service instance)
_cnct._tcp.your-domain.com	3600	IN	PTR	XConnect._cnct._tcp.your-domain.com

6. Create SRV entries for some or all of the ConnectStation in your cluster. The **priority** and **weight** field are currently irrelevant. Set the **TTL** to a sane value according to your network requirements. Set the port to 8000:

Service instance	TTL	Class	Type	Priority	Weight	Port	Target
XConnect._cnct._tcp.your-domain.com	3600	IN	SRV	0	0	8000	192.168.0.101
XConnect._cnct._tcp.your-domain.com	3600	IN	SRV	0	0	8000	192.168.0.102
XConnect._cnct._tcp.your-domain.com	3600	IN	SRV	0	0	8000	192.168.0.103

7. When started up, the App will discover all registered ConnectStations via these entries and try each of them in turn until at least one responds. It will serve as the entry point for all streaming channels on the cluster.

Automatic discovery via multicast announcement

When no DNS PTR records for _cnct._tcp are found, the App will resort to listening for multicast announcement packets on the same multicast address and port as used for Cluster Discovery. See above for details and information about overriding the default group address and port. The ConnectStation that is sending the multicast announcements (the cluster server) will be used as the entry point for all streaming channels on the cluster.

Note: ConnectStations only send the multicast announcements when they aren't clustered with each other via a DNS method, so **Service Discovery via multicast announcement works only if multicast announcements are also used for Cluster Discovery!**



Discovery via hostname “sennheiser-connect”

As a third option, you can register a single ConnectStation to be the entry point for Apps by registering its IP as a DNS A record (or indirectly via a CNAME record):

Example:

1. Your DHCP hands out **IP addresses** to the ConnectStations connected via their LAN2 port- we'll assume they are: 192.168.0.101, 192.168.0.102 and 192.168.0.103.
2. Your DHCP sets the **domain** field (DHCP Option 15) to an arbitrary domain name, let's assume it is “your-domain.com”.
3. The ConnectStations form a valid cluster via a Cluster Discovery method described above.
4. To select a ConnectStation as entry point for the App, register an A record to its IP address under one of your search domains:

Host name	TTL	Class	Type	Target
sennheiser-connect.your-domain.com	3600	IN	A	192.168.0.102

5. **Alternatively**, register a CNAME and an arbitrary host name for the ConnectStation:

Host name	TTL	Class	Type	Target
sennheiser-connect.your-domain.com	3600	IN	CNAME	Station1.your-domain.com

Host name	TTL	Class	Type	Target
Station1.your-domain.com	3600	IN	A	192.168.0.102

Discovery via hostname “local.connect”

The final service discovery was used by ConnectStation releases prior to 3.0.0 supported mainly for legacy installations. Similar to the “sennheiser-connect” hostname, a single ConnectStation serves as the entry point for Apps. It has to be registered with hostname “**local**” under the top-level domain “**.connect**”.

Host name	TTL	Class	Type	Target
local.connect	3600	IN	A	192.168.0.102

Note: Registering “.connect” as a subdomain of an existing domain, i.e. registering the host “local.connect.your-domain.com” will not work with iOS clients.

DHCP and DNS Search Domains

If you opt for a Cluster and/or Service Discovery method that uses DNS-SD or SRV records, please make sure you correctly set the **search domains** via DHCP for the Clients. If you use static IP configuration on the ConnectStation, make sure you set the “Search Domains” field correctly.



Setting a single Search Domain with DHCP Option 15

If you only need a single DNS search domain, simply set it via DHCP Option 15. This is standardized and well supported across all operating systems. Again, if you use static IP Configuration for LAN2 on a ConnectStation, make sure you manually set the “Search Domains” field there.

Setting multiple Search Domains

Most Operating Systems allow multiple search domains for their DNS lookups which will be used one by one for DNS lookups. By standardization, the DHCP Option 15 allows setting only a single domain, and there is a further DHCP Option (119) to set multiple additional search domains.

Note: We found that **Option 119** is not supported widely enough to be functional for the purposes described here. Most notably, Android smartphones ignore the option completely in all versions we tested (4.1 to 6.0.1).

If you do need to set multiple search domains, we can suggest to add **multiple search domains separated by space characters into DHCP Option 15**. From our tests, this correctly works across iOS versions, it works for the ConnectStation, and it “mostly works” for Android clients. Although our tests have not been exhaustive, Windows-based clients seem to ignore any domain after the first entry in this list.

On Android, our Apps (MobileConnect and CinemaConnect) correctly use the full list of search domains passed via Option 15 to look up PTR and SRV records. Discovery via hostname “sennheiser-connect” works only if the hostname is configured with the first domain in the list.

Beware though that this use of Option 15 is outside the standard use of DHCP, yet seems a common practical solution to setting multiple search domains. If you have services in your network that depend on the primary domain setting from DHCP, make sure to test these after setting multiple domains.



WiFi planning

Please observe the following information when planning the WiFi setup of the ConnectStation for Standalone Mode. The same recommendations can also be taken into consideration for WiFi planning with different Access Points or in Integrated Mode.

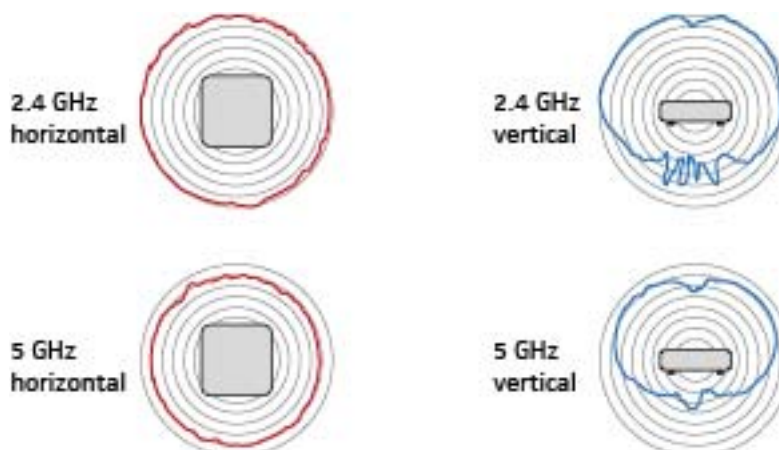
WiFi coverage

The system's WiFi coverage is determined by the access point, the reception quality of the connected devices and the environmental conditions. We recommend performing a site survey to understand interference, bandwidth usage and reception strength within the facility before and after the installation. The table and graphs below roughly estimates general coverage distance and pattern for Ruckus Zoneflex 7273. Please note that each facility may greatly vary based upon network and environmental conditions.

Frequency	Line-of-sight		With physical obstacles	
	Radius	Area	Radius	Area
2.4 GHz min. RSSI* -74 dBm	65 m (213 ft)	13,270 m ² (142,500 ft ²)	35 m (115 ft)	3,840 m ² (41,500 ft ²)
5 GHz min. RSSI* -74 dBm	40 m (131 ft)	5,020 m ² (53,900 ft ²)	20 m (65 ft)	1,250 m ² (13,200 ft ²)

*RSSI = Received Signal Strength Indicator

Antenna pattern Ruckus Zoneflex 7273



As visible from the coverage patterns, the location and orientation of the AP plays a critical role in performance. Ensure that the top of the AP points in the general direction of wireless clients, as the signal strength is stronger in the front.

Recommended types of mounting the access point

- ▷ wall
- ▷ ceiling

Note: Make sure to have a direct line of sight between the mobile devices and the access point. The number of clients per access point impacts the reception quality. In order to ensure the best possible streaming quality, we recommend to have a maximum of 50 clients per Ruckus 7372 access point. For other access points, the number of clients may vary.



WiFi Design

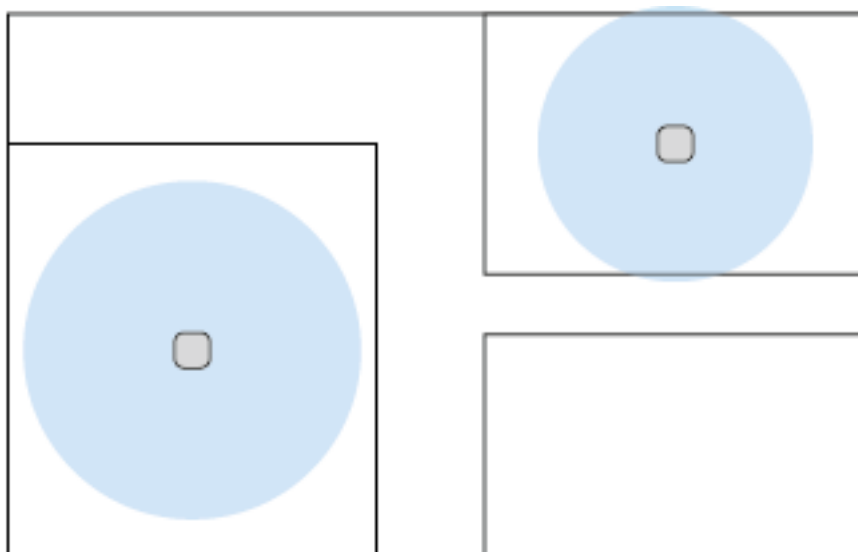
For designing the WiFi system, please observe the following steps:

- ▷ Define the number of access points (max. 50 clients per each Ruckus ZoneFlex 7372 AP recommended).
- ▷ Determine the room size, shape and RF conditions of the facility.

The best performance is achieved:

- ▷ When the WiFi channel used is free and not occupied by multiple networks.
- ▷ When the AP is installed in line of sight to every mobile device.
- ▷ When the AP is installed away from other electrical equipment.

Example:



We recommend a thorough WiFi analysis. There are several tools available on the market, like for example:

- [inSSIDer](#)
- [TamoGraph](#)
- [HeatMapper](#)

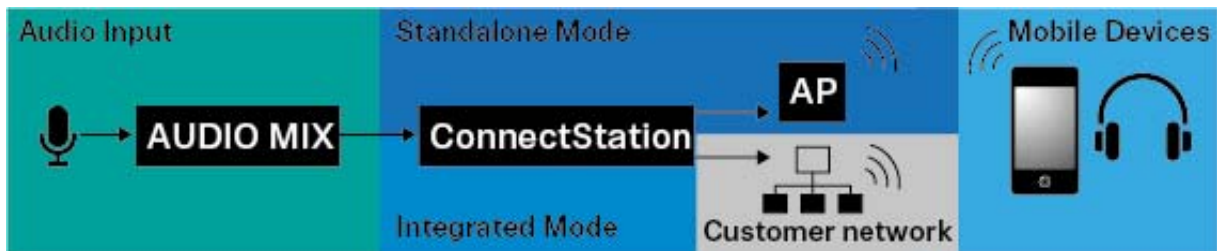
You can also refer to the technical documentation of the Ruckus access point at www.ruckus.com.



Planning audio level and latency

The latency and audio quality of the entire system depend on the audio signal coming from the audio source and the mobile device used. For the lowest possible latency and the best possible audio quality please consider the following information.

Overview audio chain



Latency notes:

- ▷ Make sure the audio source is not delayed. Please note that every additional audio device (mixing console, amplifier, etc.) may increase the latency.
- ▷ Mobile devices, especially Android phones, can add a higher latency (also see the "List of tested mobile devices").
- ▷ Wireless headphones may have a higher latency than wired headphones, which do not add any latency.

Audio quality notes:

- ▷ Make sure the audio source is not distorted or noisy.
- ▷ Make sure the input sensitivity and gain settings of the audio source as well as the gain settings of the ConnectStation are adjusted correctly.



List of tested mobile devices

To provide a quantitative and qualitative scale on the performance of the system, we measured the performance of our system in combination with various smartphones. Latencies may vary in reality depending on installed software of the respective device and reception strength within the facility. We have tested the following devices in a defined test environment.

Latency < 80 ms:

- iPod (iOS 8.3-10.0.0)
- iPhone (iOS 8.3-10.1.1)
- Pixel (Android 8.1)
- Samsung S8 (Android 8.0)
- Samsung S7 Edge (Android 7.0)
- Samsung S6 (Android 6.0.1)
- LG G4S H735 (Android 5.1.1)
- Asus Zenfone2 Laser Z00ED (Android 5.0.2)
- Phicomm Energy L (Android 5.0.2)
- Moto G3 (Android 6.0)
- Moto E2 (Android 5.0.2)
- Sony Experia (Android 5.1.1)

Latency 80-100 ms:

- Nexus 5 (Android 6.0.0)
- Nexus 5X (Android 6.0.0-7.1.1)
- Samsung Galaxy J5 (Android 5.1.1)
- Asus Nexus 7 Tab (Android 5.1)



Americans with Disabilities Act (ADA)

For US installations/usage, please refer to the ADA information provided below.

The Americans with Disabilities Act (ADA) was signed into law on July 26, 1990. The ADA prohibits discrimination and includes provisions to accommodate hard of hearing people. Please see below for informational resources regarding ADA compliance.

- ▷ U.S. Department of Justice ADA
- ▷ 2010 Standards for Accessible Design

California Building Standards

While they've adopted the format of the ADA, the State of California relies on the California Building Code to outline their compliance laws. This means that the requirements for assistive listening systems in California are a little different. You can find the requirements listen under sections 11B-219 and 11B-706 in the CBC, which gets updated every three years.

- ▷ California Building Standards Commission

ADA Standards for Accessible Design

Receivers for Assistive Listening Systems

Seating capacity of assembly arena	Minimum number of required receivers	Minimum number of receivers required to be hearing-aid compatible
50 or less	2	2
51 to 200	2, plus 1 per 25 seats over 50 seats*	2
201 to 500	2, plus 1 per 25 seats over 50 seats*	1 per 4 receivers*
501 to 1000	20, plus 1 per 33 seats over 500 seats*	1 per 4 receivers*
1001 to 2000	35, plus 1 per 50 seats over 1000 seats*	1 per 4 receivers*
2001 and over	55, plus 1 per 100 seats over 2000 seats*	1 per 4 receivers*

*or fraction thereof.

EXCEPTIONS

- Where a building contains more than one assembly area and the assembly areas required to provide assistive listening systems are under one management, the total number of required receivers shall be permitted to be calculated according to the total number of seats in the assembly areas in the building provided that all receivers are usable with all systems.
- Where all seats in an assembly area are served by an induction loop assistive listening system, the minimum number of receivers required by 2010 ADA Standards for Accessible Design Table 219.3 to be hearing-aid compatible shall not be required to be provided.



Installation and configuration

The following sections will give you an overview on how to install and configure the MobileConnect or CinemaConnect system. You will find Information on the following topics.

A **hardware overview** of the **ConnectStation** including all sockets and connectors and how to use them.

See "ConnectStation hardware overview"

Information on installing the system including **cabling** for **power supply**, **audio signals** and **network connectivity**.

See "Installation"

Information on **access** to the **Admin Interface** for the **initial configuration** of the system.

See "Access and initial configuration"

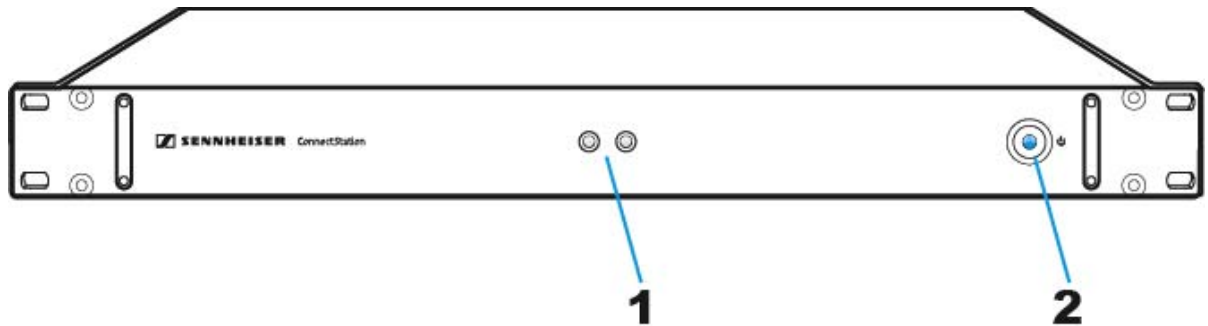
A detailed **Configuration Guide** with **step by step** information on configuring the system after the installation.

See "Configuration guide"








ConnectStation hardware overview

Product overview - front



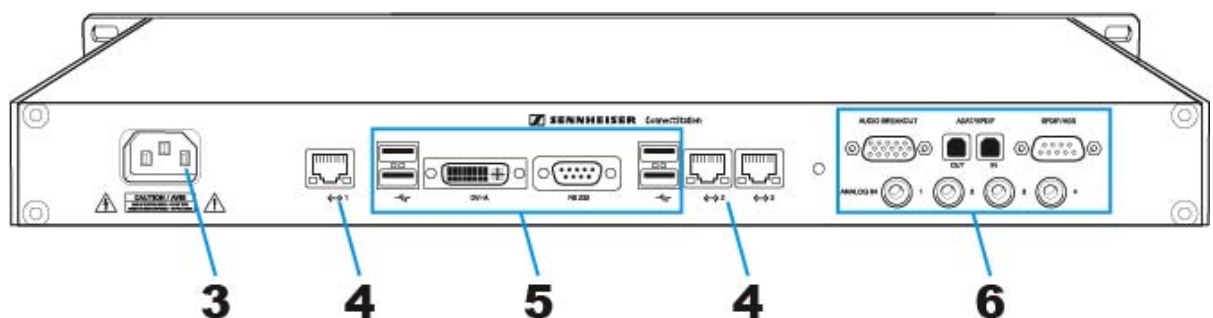
1 Status LEDs

-  System is booting up or shutting down
-  System is running
-  System is switched off
-  There is a warning
-  Alert: there is a fatal error

2 Mains power switch

- ▷ Press briefly to switch the ConnectStation on or off.
The LED lights up blue when the ConnectStation is switched on.

Product overview - back



3 Mains socket for mains cable

4 LAN 1, LAN 2, LAN 3 Ethernet ports (see "Network cabling")

5 Service ports

6 Audio inputs (see "Power and audio cabling").



Installation

For connecting the ConnectStation to the mains power supply and for connecting audio signals, see "Power and audio cabling".

For establishing the network connection of the ConnectStation see "Network cabling".



Power and audio cabling

i For the product overview of the ConnectStation also see "ConnectStation hardware overview".

Connecting/Disconnecting the ConnectStation to/from the mains power supply

To connect the ConnectStation to the mains power supply:

- ▷ Connect the IEC connector of the supplied mains cable to the mains socket.
- ▷ Connect the mains plug of the mains cable to a suitable electrical socket.

To disconnect the ConnectStation from the mains power supply:

- ▷ Switch the ConnectStation off.
- ▷ Pull the mains plug of the mains cable out of the electrical socket.

Switching the ConnectStation on/off

To switch the ConnectStation on:

- ▷ Briefly press the mains power switch on the front panel of the ConnectStation.



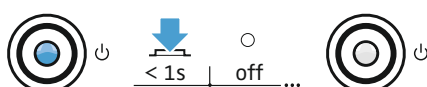
Status LEDs:



The ConnectStation boots up. The mains power switch lights up blue and the status LEDs indicate when the system is running.

To switch the Connectstation off:

- ▷ Briefly press the mains power switch on the front panel of the ConnectStation.



Status LEDs:



The ConnectStation shuts down. The blue light of the mains power switch goes off and the status LEDs indicate when the system is switched off.

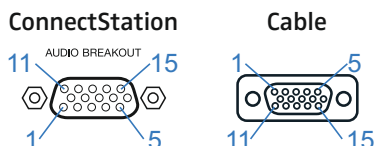


Connecting audio signals

The ConnectStation offers various possibilities to connect audio signals.

AUDIO BREAKOUT:

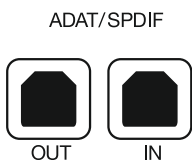
For connecting audio signals to the 15-pin Sub-D socket please observe the following pin allocation:



- | | | |
|---------------------|---------------------|---------------------|
| 1 Line In Left - | 6 Line In Left + | 11 Line In Right - |
| 2 Line In Right + | 7 Line Out Left -* | 12 Line Out Left +* |
| 3 Line Out Right +* | 8 Line Out Right -* | 13 Phones Left* |
| 4 MIDI Out (5)* | 9 GND/Shell | 14 Phones Right* |
| 5 MIDI In (4)* | 10 MIDI In (5)* | 15 MIDI Out (4)* |
- *not in use, do not connect

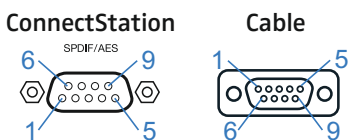
ADAT/SPDIF:

Connect ADAT or SPDIF audio signals with a Toslink cable to the ADAT/SPDIF IN socket.



SPDIF/AES:

For connecting audio signals to the 9-pin Sub-D socket please observe the pin allocation.



- | | | |
|----------------|----------------|--------------|
| 1 GND | 4 AES Out +* | 7 SPDIF In - |
| 2 SPDIF Out +* | 5 AES In + | 8 AES Out -* |
| 3 SPDIF In + | 6 SPDIF Out -* | 9 AES In - |
- *not in use, do not connect



ANALOG IN:

Four analog jack inputs are available.



Stereo audio

Note: Stereo audio is disabled by default.

- ▷ To enable and configure stereo streaming please go to the [Audio Inputs](#) section of the admin interface (see "Access and initial configuration").
- ▷ For stereo audio you have to combine two mono audio inputs. More details regarding cabling see above.

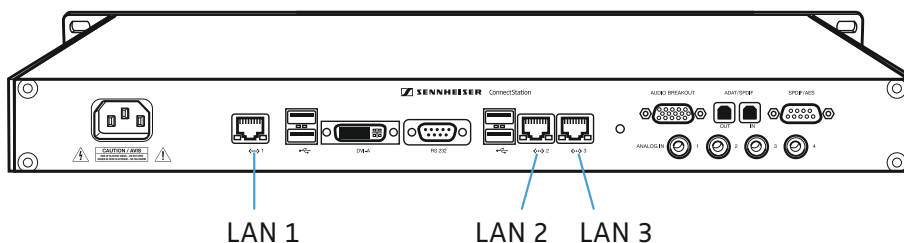
Network cabling



For further information also refer to "Selecting the network mode".

Placement of Ethernet ports on the back panel of the ConnectStation

The ConnectStation provides three Gigabit Ethernet ports that are allocated to different functionalities:



Standalone Mode:

- ▷ **LAN1** is used to connect a **delivery** subnet in Standalone Mode.
- ▷ **LAN2** is used to integrate into an existing network as a client. In Standalone mode, this network is only used to connect to the Internet for service and support.

Integrated Mode:

- ▷ **LAN1** is disabled when the ConnectStation is set to Integrated Mode.
- ▷ **LAN2** is used to integrate into an existing network as a client. In Integrated mode, all stream delivery to clients will be via LAN2, and it is used to connect multiple ConnectStations into a cluster.

Both modes:

- ▷ **LAN3** is used to connect a laptop for administrative access. It can only be configured to have a static IP address and netmask (no DHCP), and not gateway or DNS server.

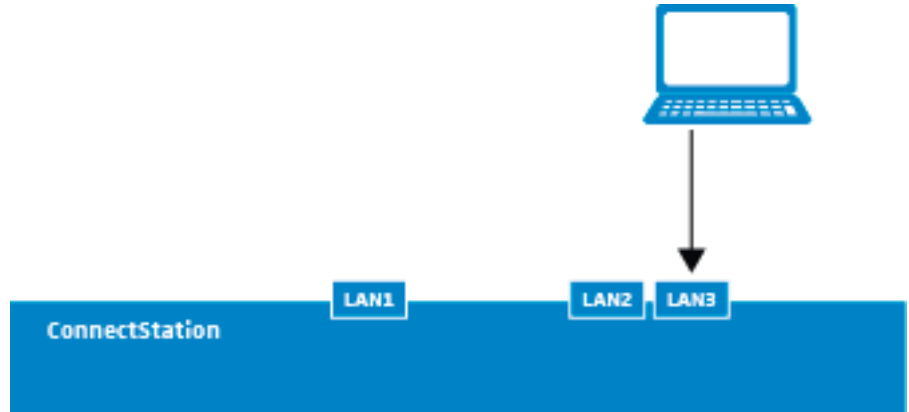
Note: There is **no routing** between any of these networks, i.e. clients accessing the WiFi connected to LAN1 cannot access any network resources connected via LAN2.



Access and initial configuration

i During the initial setup you have to choose a network mode. Before choosing the network mode please read "Selecting the network mode".

To access the Admin Interface for initial configuration:



- ▷ Connect your laptop to the **LAN3** port of the ConnectStation using a standard CAT5 Ethernet cable.
- ▷ Configure the laptop with the **static IP** address **192.168.0.2**, subnet **255.255.255.0**.
- ▷ Open a web browser on the laptop and navigate to **192.168.0.10**.
- ▷ Enter the user name and password to login.
 - Default user name: **admin**
 - Default password: **sennheiser**
- ▷ Follow the instructions in the Admin Interface to perform the initial setup of the ConnectStation.

i For detailed information on configuring the system refer to the "Configuration guide".



Configuration guide

This configuration guide will give you details on how to configure the entire system using the Admin Interface.

i For information on how to access the Admin Interface see "Access and initial configuration".

Getting started

To start configuring the system:

- ▷ Open the Admin Interface in a web browser.
- ▷ Enter the default user name and password to login:

- ▷ Select a network mode:

i For more information also see "Selecting the network mode".

- ▷ For **Standalone Mode** continue to: "Standalone Mode"
- ▷ For **Integrated Mode** continue to: "Integrated Mode"



Standalone Mode

This section provides a detailed configuration guide for the MobileConnect and CinemaConnect system in Standalone Mode.

Setup

To configure the system in Standalone Mode:

The screenshot shows the Sennheiser Setup interface. At the top, there is a blue header with the Sennheiser logo and the word "Setup". Below the header, the main content area is titled "Choose a networking mode". There are two options: "Standalone" and "Integrated".

Standalone	Integrated
Clients connect via dedicated Access Points on Network Interface 1.	Clients connect via existing infrastructure on Network Interface 2.
<input checked="" type="radio"/> Set Standalone	<input checked="" type="radio"/> Set Integrated

At the bottom of the page, there is a copyright notice: "Copyright © 2014-2017 Sennheiser Streaming Technologies GmbH | Licenses".

▷ Select **Set Standalone** and proceed with the initial system setup.

▷ First, change the password:

The screenshot shows the Sennheiser Setup Standalone Mode interface. At the top, there is a blue header with the Sennheiser logo and the text "Setup Standalone Mode". Below the header, the main content area is titled "Networking mode".

Under "Networking mode", there is a confirmation message: "✓ Networking mode has been set to 'standalone'".

Below this, there is a section titled "Administration Login". It contains the following fields:

- Username: admin
- New Password:
- Confirm Password:

At the bottom of the "Administration Login" section, there is a button: Change Password.

At the bottom of the page, there is a copyright notice: "Copyright © 2014-2017 Sennheiser Streaming Technologies GmbH | Licenses".



This setting can be modified later or recovered with a factory reset (see "Factory reset").



- ▷ Select your country from the dropdown menu and click **Set country** (this will affect the Access Point configuration).

SENNHEISER

Setup Standalone Mode

Networking mode

✔ Networking mode has been set to 'standalone'.

Administration Login

✔ Administrator password has been set.

Configure Regulatory Domain

To associate Access Points, you need to define in which country you are operating.

Country

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i This setting can be modified only with a factory reset (see "Factory reset").

- ▷ You can scan for an Access Point connected to the ConnectStation (see "Standalone Mode" in section "Network integration"), add a known Access Point manually, or finish the configuration and add an Access Point later on.



SENNHEISER

Setup Standalone Mode

Networking mode

✔ Networking mode has been set to 'standalone'.

Administration Login

✔ Administrator password has been set.

Configure Regulatory Domain

✔ Country has been set to 'Germany' (code: DE)

Add Access Point

Scan for new Access Points

or [Manually add an Access Point](#)

Finish Initial Setup

Initial setup can be completed. Click "Finish" to proceed to the Administration interface.

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- ▷ Click **Start Scan**, wait until an Access Point is found and select **Add**. You can add up to 8 Access Points (see "Using multiple Access Points" in section "Standalone Mode").

Add Access Point

Scanning for Access Points...

	<table style="margin: auto;"> <tr> <td style="font-size: x-small;">Discovered</td> <td style="font-size: x-small;">Ruckus Device</td> </tr> <tr> <td style="font-size: x-small;">MAC Address</td> <td style="font-size: x-small;">e0:10:7f:06:92:60</td> </tr> <tr> <td style="font-size: x-small;">IP Address</td> <td style="font-size: x-small;">10.11.0.36</td> </tr> </table>	Discovered	Ruckus Device	MAC Address	e0:10:7f:06:92:60	IP Address	10.11.0.36	<input type="button" value="Add"/>
Discovered	Ruckus Device							
MAC Address	e0:10:7f:06:92:60							
IP Address	10.11.0.36							

- i** Make sure the Access Point is connected to the LAN1 socket of the ConnectStation (see "Standalone Mode" in section "Network integration").



- ▷ Once the Access Point is added successfully it is shown as **Associated**:

Add Access Point

Scan for new Access Points

	Discovered MAC Address e0:10:7f:06:92:60 IP Address 10.11.0.36	<i>Associated</i>
--	---	-------------------

- ▷ To manually add a known Access Point please provide the IP address of the Access Point:

Add Access Point

Scan for new Access Points

Manually add an Access Point by it's IP

IP

- ▷ Click **Finish** to finalize the Standalone Mode setup.

Finish Initial Setup

Initial setup can be completed. Click "Finish" to proceed to the Administration interface.



In order to change the network mode a factory reset is required (see "Factory reset").



System Overview

The **System Overview** page gives the user basic information about the system such as the following.

- ▷ Resetting the password.

Administration Login

Username	admin
Existing Password	<input type="password"/>
New Password	<input type="password"/>
Confirm Password	<input type="password"/>
<input type="button" value="Change Password"/>	

- ▷ Finding the model, serial number, software system release and current status of the system.
- ▷ Checking the self-status notification to find errors in the system configuration.
- ▷ **Time Set-Up:** Here you can change the time and timezone for your Connect Station which is necessary to generate the client statistics (see "Client Monitoring").

Note: A change will delete the existing monitoring/client statistics data.

Date and Time

Date and Time	Please set the date and time for your ConnectStation(s) to ensure that the Client-Monitoring-Data is collected correctly. Changing the time should not be performed while listeners are connected.
Status	OK
Time	<input type="text" value="11"/> : <input type="text" value="00"/>
Date	<input type="text" value="03/13/2018"/>
<input type="button" value="Set Date/Time"/>	

- ▷ Changing the name of the ConnectStation.
 - The default name is the serial number of the ConnectStation. To change it enter a new name and click Apply.

System Info


Model	CS1-M (EU)
Serial Number	0384300012
System Release	4.1.0 (release-23)
Self-Check Status	
	OK
Name	
	<input type="text" value="#0384300012"/>
<input type="button" value="Apply"/>	

- ▷ Updating the firmware using a USB drive.
 - For the latest firmware see here:
 - [Firmware Download](#)




- ▷ Performing a factory reset.
 - This will reset the system to factory defaults. Your configuration will be lost.

Update & Reset



System Update
To perform a system update, insert a USB drive with the new release into this ConnectStation.



Factory Reset
Reset this ConnectStation to factory default configuration.

- ▷ Increasing the number of clients.
 - The default number of clients per ConnectStation is 50, while a maximum of 100 is supported. A minimum of two Access Points is required to support 100 clients.
 - Before increasing the number of clients, read the information provided under "Increasing the number of clients per ConnectStation (Standalone Mode)".

Client limit

Client limit A single ConnectStation can serve up to 100 clients.
In order to increase the client limit, connect at least 2 Access Points.
 Refer to the ConnectStation user documentation for more on WIFI planning.

50 100



- ▷ Connect 2 or more Access Points via the **Wifi** page. See "WiFi" in the "Standalone Mode" section of the "Configuration guide".

Client limit

Client limit A single ConnectStation can serve up to 100 clients. In order to maintain high audio quality, upon setting the ConnectStation client limit to 100, the number of users that can connect to a single Access Point will be limited. Refer to the ConnectStation user documentation for more on WiFi planning.

50
 100

When the number of clients per ConnectStation is increased to 100, a client limit is set on the Access Point:

RuckusAP 10.11.0.36

Model	Ruckus 7372
Firmware	9.7.1.0.32
Client Limit	25 (2.4 GHz) / 25 (5 GHz)

	2.4 GHz	5 GHz
State	<input checked="" type="checkbox"/> up	<input checked="" type="checkbox"/> up
SSID	<input type="text" value="CinemaConnect"/>	<input type="text" value="CinemaConnect"/>
Encryption	<input type="text" value="disabled"/>	<input type="text" value="disabled"/>
Channel	<input type="text" value="auto"/> (selected: 11)	<input type="text" value="auto"/> (selected: 124)
Transmit Power	<input type="text" value="max"/>	<input type="text" value="max"/>
Channel Width	<input type="text" value="20 MHz"/>	<input type="text" value="40 MHz"/>
	<input type="button" value="Apply Configuration"/>	<input type="button" value="Reset to Defaults"/>



Network

The **Network** page allows the user to modify the network configuration.

#0275600023: Network Configuration

Network Interface 1

Network Type	Distribution Subnet serving APs and Clients APs should be connected to this port, this ConnectStation provides DHCP and DNS. Do not connect this port to an existing network that includes a DHCP server (most do), it will result in a DHCP conflict!
MAC Address	00:03:1d:0e:a8:bd
Status	link (1000 Mbit/s), up

Network Interface 2

Network Type	Service Connectivity The service uplink needs ports 1194 and 1195 (both UDP) open to the outside.
MAC Address	00:d0:93:34:cc:c0
Status	no link, down
Configuration	Automatic (DHCP) <input type="button" value="Apply"/>

Network Interface 3

Network Type	Administration Access Connect to this network for administrative access. You are using the administration interface via this network port.
MAC Address	00:13:95:14:7e:14
Status	link (1000 Mbit/s), up
IP Address	<input type="text" value="192.168.0.10"/>
Netmask	<input type="text" value="255.255.255.0"/>
	<input type="button" value="Apply"/>

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- ▷ In Standalone Mode the **Network Interface 1** (LAN1 socket of the ConnectStation) cannot be modified.
- ▷ Connect your Ruckus Access Point to this socket.

- ▷ In Standalone Mode the **Network Interface 2** (LAN2 socket of the ConnectStation) is not used except for service and support are required.
- ▷ You can also use this interface for administration access if you connect it to a network with a DHCP server.

- ▷ You can change the static **Network Interface 3** (LAN3 socket of the ConnectStation) for administration access.



WiFi

In the **WiFi** page of the Admin Interface you can add, remove or configure your Ruckus Access Points. Up to 8 Access Points can be added for a single ConnectStation (see "Standalone Mode" in section "Network integration").

The screenshot shows the WiFi configuration page for a Ruckus Access Point. The page is titled "#0275600023: WiFi Access Points" and includes a sidebar with navigation options: Overview, App Interface, Channel Groups, Monitor, Audio Inputs, Network, WiFi (selected), Captions, and Log.

Regulatory Domain

Country:

RuckusAP 10.11.0.36

Model: Ruckus 7372
Firmware: 9.7.1.0.32

	2.4 GHz	5 GHz
State	<input checked="" type="checkbox"/> up	<input checked="" type="checkbox"/> up
SSID	<input type="text" value="CinemaConnect"/>	<input type="text" value="CinemaConnect"/>
Encryption	<input type="text" value="disabled"/>	<input type="text" value="disabled"/>
Channel	<input type="text" value="auto"/> (selected: 7)	<input type="text" value="auto"/> (selected: 100)
Transmit Power	<input type="text" value="max"/>	<input type="text" value="max"/>
Channel Width	<input type="text" value="20 MHz"/>	<input type="text" value="40 MHz"/>

Add Access Point

Scan for new Access Points

Discovered	Ruckus Device	Associated
MAC Address	e0:10:7f06:92:60	
IP Address	10.11.0.36	

or [Manually add an Access Point](#)

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The Access Point is pre-configured to the SSID **MobileConnect** or **CinemaConnect**, depending on your hardware variant. You can modify these settings here.

**WiFi recommendations:**

If more than one Access Point is used, make sure that they use channels which do not overlap.

At 2.4 GHz, you can use channels 1, 5, 9, and 13 with a bandwidth of 20 MHz (13 is not available in some countries).

If you use more than 4 Access Points in that band, try applying the same frequencies for Access Points which are further apart.

If all Access Points are in close proximity, it might be better to turn off the 2.4 GHz band in some Access Points in order to avoid overlapping.

You can check if your Access Points use overlapping frequencies by means of a WiFi analyzer app in an Android phone. At 5 GHz, also avoid using channels that overlap, and prefer channels with indexes lower than 50, which do not have to do DFS.

[Click here](#) for a list of channels.

If you use the default setting for channel selection, set to “auto”, make sure you give enough time for the Access Point to find the optimal channel.

The Ruckus Access Point may switch frequently for 1 to 2 hours after booting up, until the optimal channel is found. If the Access Point is in use during that time, the clients may experience the connection breaking up from time to time.



Integrated Mode

This section provides a detailed configuration guide for the MobileConnect and CinemaConnect system in Integrated Mode.

Setup

When you are adding ConnectStations to an existing cluster you will be asked for the cluster password. Once it is entered, the initial setup will be skipped (as it was already performed for the cluster).

The Admin Interface will be redirected to "System Overview" in "Integrated Mode".

Otherwise the Admin Interface will be redirected to a setup page, as described below:

- ▷ Select **Set Integrated** and proceed with the initial system setup.



- ▷ First, change the password:

SENNHEISER

Setup Integrated Mode

Networking mode

✓ Networking mode has been set to 'integrated'.

Administration Login

Username admin

New Password

Confirm Password

Cluster Status


This station tries to connect to a ConnectStation cluster in your network on Network Interface 2.

Cluster discovered via SRV records in DNS.

This station is a designated server.

- 192.168.5.178 (this station)

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-  This setting can be modified later or recovered with a factory reset (see "Factory reset").

Under **Cluster Status** you will find information about the ConnectStation cluster. In Integrated Mode, you can connect one or more ConnectStations in one cluster.

- ▷ Make sure to connect all ConnectStations via the LAN2 socket (Network Interface 2) and provide the necessary configuration.
- For more information on network configuration in Integrated Mode, see "Integrated Mode" in section "Network integration".

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Setup Integrated Mode

Networking mode

✓ Networking mode has been set to 'integrated'.

Cluster Status

This station tries to connect to a ConnectStation cluster in your network on Network Interface 2.

Cluster discovered via SRV records in DNS.

This station is a designated server.


- 192.168.5.178 (this station)

Finish Initial Setup

Initial setup can be completed. Click "Finish" to proceed to the Administration interface.

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- ▷ Click **Finish** to finalize the Integrated Mode setup.

-  In order to change the network mode a factory reset is required (see "Factory reset").



System Overview

Click on **Overview** to access the **Cluster Overview** page.

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System Overview

Overview

App Interface

Channel Groups

Monitor

#0125300033 !

Audio Inputs

Network

Log

#0384300012

Audio Inputs

Network

Log

Administration Login

Username

Existing Password

New Password

Confirm Password

Cluster Status

Connection Mode Discovery You are accessing station #0384300012 (#0384300012)
Server
by SRV records in DNS

Cluster Peers

Name	IP Address	Status	Type	Version	Product	Serial Number
#0125300033	192.168.5.155	alive	Client	4.0.0 release-18	CS1-M	0125300033
#0384300012	192.168.5.178	alive	Server	4.0.0 release-18	CS1-M	0384300012

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You can perform the following actions here:

- ▷ Resetting the password (applies to all ConnectStations in the cluster).

- ▷ Finding the cluster status, mode and a list of all ConnectStations which are connected in the cluster.



- Click on the name of a ConnectStation to open a specific overview for that ConnectStation:

SENNHEISER #0384300012: System Overview

System Info

Model	C51-M (EU)
Serial Number	0384300012
System Release	4.1.0 (release-23)

Self-Check Status: **OK**

Name:

Client limit

Client limit: A single ConnectStation can serve up to 100 clients. We recommend to limit the number of clients per band (frequency) to 50 and provide a load balancing functionality between the Access Points. Refer to the ConnectStation user documentation for more on WiFi planning.

50 100

Update & Reset

System Update
To perform a system update, insert a USB drive with the new release into this ConnectStation.

Factory Reset
Reset this ConnectStation to factory default configuration.

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You can perform the following actions here:

- Finding the model, serial number, software system release and current status of the system.
- Checking the self-status notification to find errors in the system configuration.
- Changing the name of the ConnectStation.
 - The default name is the serial number of the ConnectStation. To change it enter a new name and click Apply.
- **Time Set-Up:** Here you can change the time and timezone for your Connect Station which is necessary to generate the client statistics (see "Client Monitoring").
Note: A change will delete the existing monitoring/client statistics data.

Date and Time

Date and Time: Please set the date and time for your ConnectStation(s) to ensure that the Client-Monitoring-Data is collected correctly. Changing the time should not be performed while listeners are connected.

Status: **OK**

Time: :

Date:



- ▷ Increasing the number of clients
 - The default number of clients per ConnectStation is 50, while a maximum of 100 is supported. A minimum of two Access Points is required to support 100 clients.
 - Before increasing the number of clients, read the information provided under "Increasing the number of clients per ConnectStation (Standalone Mode)".

- ▷ Updating the firmware using an USB drive.
 - For the latest firmware see here:
 - Firmware Download

- ▷ Performing a factory reset.
 - This will reset the system to factory defaults. Your configuration will be lost.

Client Balancing

Use Cases:

- Increasing the number (up to 1000) of simultaneously connected clients to one channel.
- Optimizing the client distribution over the different Connect Stations in a cluster.
- Simplify the audio-source set-up (Audio-Source needs to be connected and distributed only once).

The screenshot shows the Sennheiser System Overview web interface. The left sidebar contains navigation links: Overview, App Interface, Channel Groups, Client Monitoring, #0125300033, Audio Inputs, Network, Captions, Log, #0384300012, Audio Inputs, Network, Captions, and Log. The main content area is titled 'System Overview' and contains several configuration sections:

- Administration Login:** Username: admin, New Password and Confirm Password fields, and a 'Change Password' button.
- Date and Time:** Date and Time fields, Status: OK, Time: 11:00, Date: 03/13/2018, and a 'Set Date/Time' button.
- Client Balancing:** Client Balancing now ensures the optimal distribution of the clients across all individual ConnectStations in the cluster. This allows the maximum number of simultaneous clients to be up to 1000 (with 10 ConnectStations in a Cluster). Status: Enabled (radio button selected), Disabled (radio button unselected), and an 'Apply' button.
- Cluster Status:** Connection Mode: Server, Discovery: by SRV records in DNS. You are accessing station #0384300012 (#0384300012).
- Cluster Peers:** A table listing cluster members:

Name	IP Address	Status	Type	Version	Product	Serial Number
#0125300033	192.168.5.155	alive	Client	5.0.0 release-28	CS1-M	0125300033
#0384300012	192.168.5.178	alive	Server	5.0.0 release-28	CS1-M	0384300012

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Network

The **Network** page allows the user to modify the network configuration.

SENNHEISER

#0384300012: Network Configuration

Overview

App Interface

Channel Groups

Monitor

#0125300033

Audio Inputs

Network

Log

#0384300012

Audio Inputs

Network

Log

Network Interface 1

Network Type	Disabled This ConnectStation is set to integrated networking mode, and this interface is only available in standalone mode.
MAC Address	00:03:1d:0e:a8:8d
Status	no link, down

Network Interface 2

Network Type	Cluster and/or Service Connectivity The service uplink needs ports 1194 and 1195 (both UDP) open to the outside. This interface is used to connect to a potential cluster of ConnectStations.
MAC Address	00:d0:93:33:ce:73
Status	link (1000 Mbit/s), up
Configuration	Automatic (DHCP) ▾ <input checked="" type="radio"/> Apply
IP Address	192.168.5.178
Netmask	255.255.255.0

Network Interface 3

Network Type	Administration Access Connect to this network for administrative access. You are using the administration interface via this network port.
MAC Address	00:13:95:14:7e:21
Status	link (1000 Mbit/s), up
IP Address	<input type="text" value="10.149.1.222"/>
Netmask	<input type="text" value="255.255.255.0"/>
	<input checked="" type="radio"/> Apply

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- ▷ In Integrated Mode the **Network Interface 1** (LAN1 socket of the ConnectStation) is disabled.
- ▷ In Integrated Mode the **Network Interface 2** (LAN2 socket of the ConnectStation) is used for cluster connectivity and for distribution of the audio streams.

Note: Make sure this interface and the network are configured correctly. Otherwise the ConnectStation(s) might not function. For more information see "Integrated Mode" in section "Network integration".
- ▷ You can change the static **Network Interface 3** (LAN3 socket of the ConnectStation) for administration access.



General configuration

The following configuration section applies to both Standalone and Integrated Mode.

App Interface

You can configure the text that is shown in the MobileConnect and CinemaConnect Apps when the users connect to the network.

The screenshot shows the Sennheiser configuration interface for the App Interface. The page title is "#0275600023: App Interface". A sidebar on the left contains navigation links: Overview, App Interface (selected), Channel Groups, Monitor, Audio Inputs, Network, WiFi, Captions, and Log. The main content area is divided into sections for different languages: German, English, Spanish, and French. Each section contains fields for Title and Text, and buttons for Apply and Remove. At the bottom, there is an "Add Language" section with a dropdown menu and an "Add" button. The footer contains the copyright information: "Copyright © 2014-2017 Sennheiser Streaming Technologies GmbH | Licenses".

Language	Title	Text	Buttons
German	CinemaConnect Netzwerk	Sie sind mit dem CinemaConnect-Netzwerk verbunden. Bitte wählen Sie einen Kanal.	Apply German, Remove German
English	CinemaConnect Network	You are connected to the CinemaConnect network. Please choose a channel.	Apply English
Spanish	Red CinemaConnect	Se ha conectado a la red CinemaConnect. Por favor seleccione un canal.	Apply Spanish, Remove Spanish
French	Réseau CinemaConnect	Vous êtes connecté au réseau CinemaConnect. Choisissez un canal.	Apply French, Remove French

Add Language

Language:

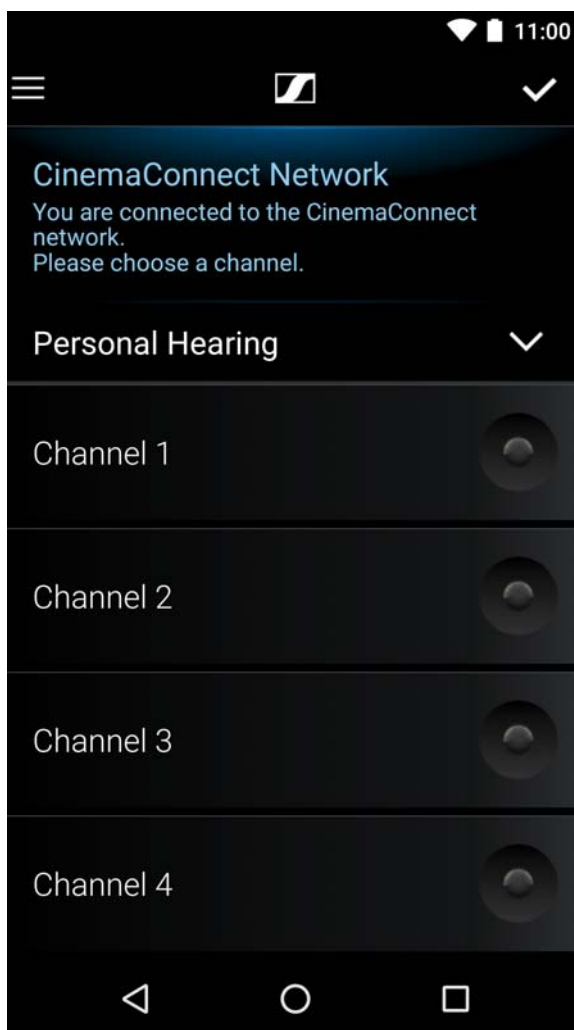
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German, English, Spanish and French are the four default languages of the ConnectStation.

When you add new languages, please provide the text accordingly (English will be displayed by default for any new language).



The text and title configured here will then appear in the MobileConnect and CinemaConnect Apps connected to the WiFi.



▷ For the channel list configuration see next section [Channel Groups](#).



Channel Groups

You can configure how the channels are displayed in the MobileConnect and CinemaConnect Apps.

i In Standalone Mode the maximum number of channels is 4. In Integrated Mode it depends on the number of ConnectStations in the cluster.

For each channel you can provide your own title, view the audio input and the status:

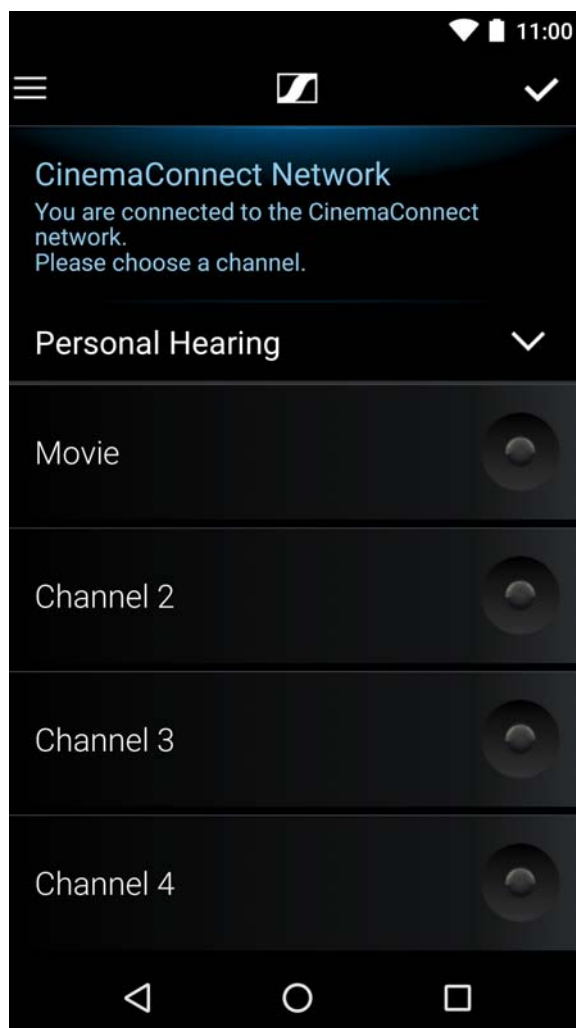
▷ Click on the **Station** link to see the audio input configuration.



You can **rename** the channel titles:

The screenshot shows the Sennheiser web interface for configuring channel groups. The page title is "#0275600023: Channel Groups". The left sidebar contains navigation options: Overview, App Interface, Channel Groups (selected), Monitor, Audio Inputs, Network, WIFI, Captions, and Log. The main content area is titled "Configure Channel Groups" and shows a list of "Active Channels" with "Movie" selected. Below the list is an "Apply" button. To the right, there are input fields for "German Title" (Film), "English Title" (Movie), "Spanish Title" (Película), and "French Title" (Film). Below these fields, the "Station Channel" is set to 1 and the "Input Source" is set to 13. At the bottom right, there are buttons for "Create new Group" and "Create new Headline". The footer contains the copyright notice: "Copyright © 2014-2017 Sennheiser Streaming Technologies GmbH | Licenses".

This is how the renamed channel is displayed in the App:





Channels can be organized in **groups**:

- you can add a group
- you can modify the group title
- you can add channels to the groups by dragging them into the group container

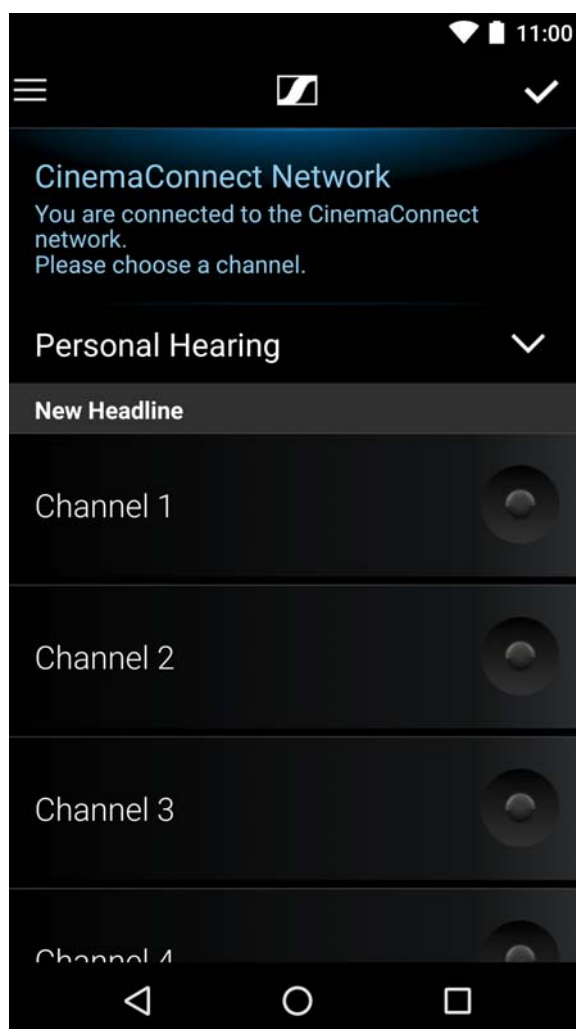


For more information on how to drag and drop click the **?** button in the Admin Interface.



You can use **headlines** to add additional text above the channels:

This is how the headline is displayed in the App:





You can **remove** a **channel** from the active list by selecting the channel and clicking on the - icon.

- ▶ Click **Apply** to save the changes.
Channels greyed out in the active list are not enabled in the audio inputs (see "Audio Inputs" below).

Removed channels will be moved to the **unassigned** list and the channel titles will be changed to the default ConnectStation name:

- ▶ To re-assign the unassigned channel, simply drag and drop it into the active list and click **Apply**.



For more information on how to drag and drop click the ? button in the Admin Interface.



Protected Channels

To set a password for a channel or channel-group click on the Channel Groups section in the admin interface. With a click on the channel or channel-group you can set a password in the password field. Don't forget to click on the Apply-Button on the left side to activate the password. Once activated a Lock-Icon will appear in the app on every password protected channel or group.

The screenshot shows the Sennheiser admin interface for configuring channel groups. The main content area is titled 'Configure Channel Groups' and features a list of 'Active Channels' on the left and configuration fields on the right. The 'Active Channels' list includes Channel 1 (selected), Channel 2, Channel 3, Channel 4, and a caption entry. The configuration fields include German Title (Lecture room 1), English Title (Channel 1), Spanish Title (Canal 1), and French Title (Canal 1). A Password field is set to 'test-password' and the Show Password checkbox is checked. An 'Apply' button is located below the channel list. At the bottom, there are buttons for 'Create new Group' and 'Create new Headline'. The footer contains copyright information: 'Copyright © 2014-2018 Sennheiser Streaming Technologies GmbH | Licenses'.

Use-Cases:

- Limit the access to a channel for a defined number of users who know the password
- Make it impossible to access a channel from a different location
- Hide channels in a password protected channel-group



Client Monitoring

With Client Monitoring it is possible to analyze the number of connected clients over the last 12 months and the current number of users listening to each channel in realtime. This enables you to monitor the workload of your ConnectStation's and even to measure the marketing efforts for Mobile-Connect.

- The statistics include the total number of connected clients per day and the maximum number of simultaneously connected clients per day.
- The statistics will be stored for the last 12 months (rolling).
- Select the Month and the ConnectStation serial number to get the statistics for the selected month.

Note: The client statistics data will be stored only on the ConnectStation. To use the monitoring feature the system time has to be set-up once in the Overview section or in the initial set-up process.

SENNHEISER

Monitor

- Overview
- App Interface
- Channel Groups
- Client Monitoring
- Audio Inputs
- Network
- WiFi
- Captions
- Log

Real-time Monitor

Channel	Users
0477700276:1	0
0477700276:2	0
0477700276:3	0
0477700276:4	0

Client history statistics

Connect station
Log date

0477700276 ▾

November 2017 ▾

Date	Total active users	Max. simultaneous users
Wed Nov 15 2017	36	34 at 17:10:23
Thu Nov 16 2017	112	87 at 21:51:00
Fri Nov 17 2017	234	56 at 13:58:00
Sat Nov 18 2017	321	89 at 14:58:00
Sun Nov 19 2017	1245	35 at 15:58:00
Mon Nov 20 2017	1256	74 at 16:58:00
Tue Nov 21 2017	12345	876 at 17:58:00



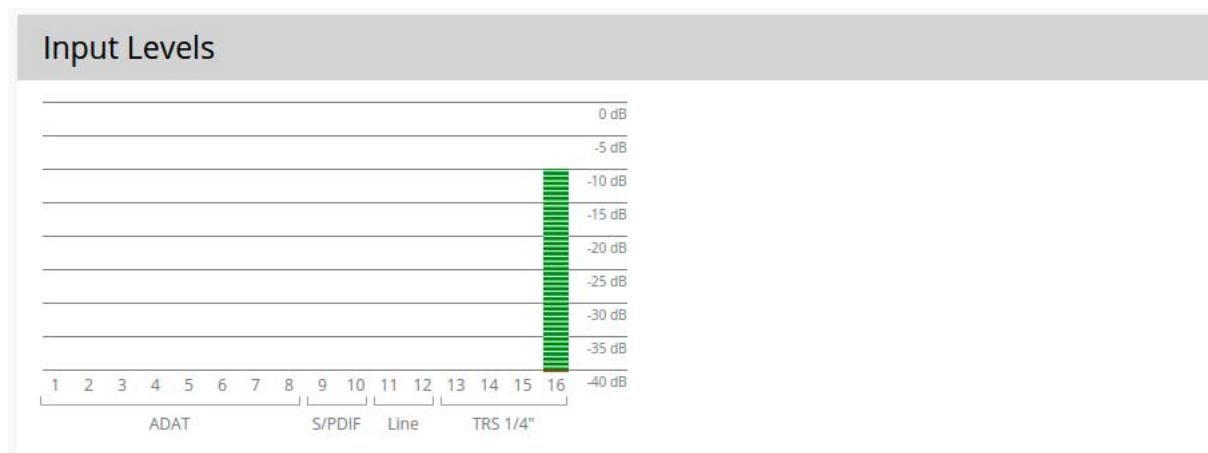
Audio Inputs

In the Audio Inputs section you can configure the audio inputs.

Make sure that all audio cables are connected before proceeding with the configuration.

- ▷ You can increase the input sensitivity (for analog inputs only).
- ▷ You can select the input connector (SPDIF or AES).

- ▷ You can see the input levels which can be useful for troubleshooting.



If there are no green bars, try increasing the volume of the audio input. Also see "Planning audio level and latency". For analog inputs you can also increase the input sensitivity.



- ▷ You can configure the streaming channels.

Streaming Channels

Channel	Active	AGC	Stereo	Input(s)
1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	TRS Analog In 1 (13) ▾
2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	TRS Analog In 2 (14) ▾
3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	TRS Analog In 3 (15) ▾
4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	TRS Analog In 4 (16) ▾

Apply

By default, 4 mono channels are configured with the 4 TRS analog inputs. You can activate/deactivate channels and change the input source.

Stereo and Automatic Gain Control:

- ▷ You can enable stereo for individual channels by selecting the stereo box.

For stereo you have to combine two mono audio inputs.

Streaming Channels

Channel	Active	AGC	Stereo	Input(s)
1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	L TRS Analog In 1 (13) ▾ R TRS Analog In 2 (14) ▾
2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	TRS Analog In 2 (14) ▾
3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	TRS Analog In 3 (15) ▾
4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	TRS Analog In 4 (16) ▾

Apply

- ▷ You can enable Automatic Gain Control (AGC) for individual channels by selecting the AGC box.
- ▷ In the AGC tab you can adjust the AGC parameters.



AGC (Automatic Gain Control) Parameters ▼

Channel	AGC Active	Threshold	Ratio	Attack	Decay	Noise Floor	Noise Gain
1	<input checked="" type="checkbox"/>	<input type="text" value="-40"/> dB	<input type="text" value="2"/> :1	<input type="text" value="50"/> ms	<input type="text" value="2000"/> ms	<input type="text" value="-80"/> dB	<input type="text" value="-10"/> dB
2	<input type="checkbox"/>	<input type="text" value="-40"/> dB	<input type="text" value="2"/> :1	<input type="text" value="50"/> ms	<input type="text" value="2000"/> ms	<input type="text" value="-80"/> dB	<input type="text" value="-10"/> dB
3	<input type="checkbox"/>	<input type="text" value="-40"/> dB	<input type="text" value="2"/> :1	<input type="text" value="50"/> ms	<input type="text" value="2000"/> ms	<input type="text" value="-80"/> dB	<input type="text" value="-10"/> dB
4	<input type="checkbox"/>	<input type="text" value="-40"/> dB	<input type="text" value="2"/> :1	<input type="text" value="50"/> ms	<input type="text" value="2000"/> ms	<input type="text" value="-80"/> dB	<input type="text" value="-10"/> dB

Automatic Gain Control can be very useful when the output level has large variations or is usually too small. It increases the volume of low-volume sections without affecting much the high-volume portions.

It hence reduces the dynamics of audio, which is not always desirable for music, but is well accepted for speech.

Therefore, it is generally not advisable to use very high compression ratios when streaming music.

The AGC may also increase noise level, as the AGC feature includes a noise gate parameter for reducing unwanted noise, such as microphone background noise, where the threshold can be fine-tuned for your setup.

- Use AGC in case your audio source has large variations in signal levels (e.g. when using a microphone).



Captions

This feature is available for both the CinemaConnect and the Mobile-Connect systems with firmware versions 5.0.0 and higher. You may use LAN2 or LAN3 for providing the captions content. Make sure the network is correctly configured (Gateway address) in case of static configuration.

#0275600023: Subtitle/Closed Caption Configuration

Overview
App Interface
Channel Groups
Monitor
Audio Inputs
Network
WiFi
Captions
Log

DCS Connection

Configure Subtitle/Caption Access to your DCS (Cinema Server) via SMPTE 430-10.

Server IP or hostname

HTTP Port for RPL Resources

Status

Connection not connected

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To enable caption/subtitle channels:

- ▷ Provide a server address and port and click **Apply**.

#0384600004: Subtitle/Closed Caption Configuration

Overview
App Interface
Channel Groups
Monitor
Audio Inputs
Network
WiFi
Captions
Log

DCS Connection

Configure Subtitle/Caption Access to your DCS (Cinema Server) via SMPTE 430-10.

Server IP or hostname

HTTP Port for RPL Resources

Status

Connection	connected
DCS Device Identifier	Demo-DCS
Output	enabled
Resources	Suspicion - Four o'Clock - Subtitles (fr)
	Suspicion - Four o'Clock - Subtitles (es)
	Suspicion - Four o'Clock - Subtitles (cz)

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- ▷ Check the status and verify it is correct.

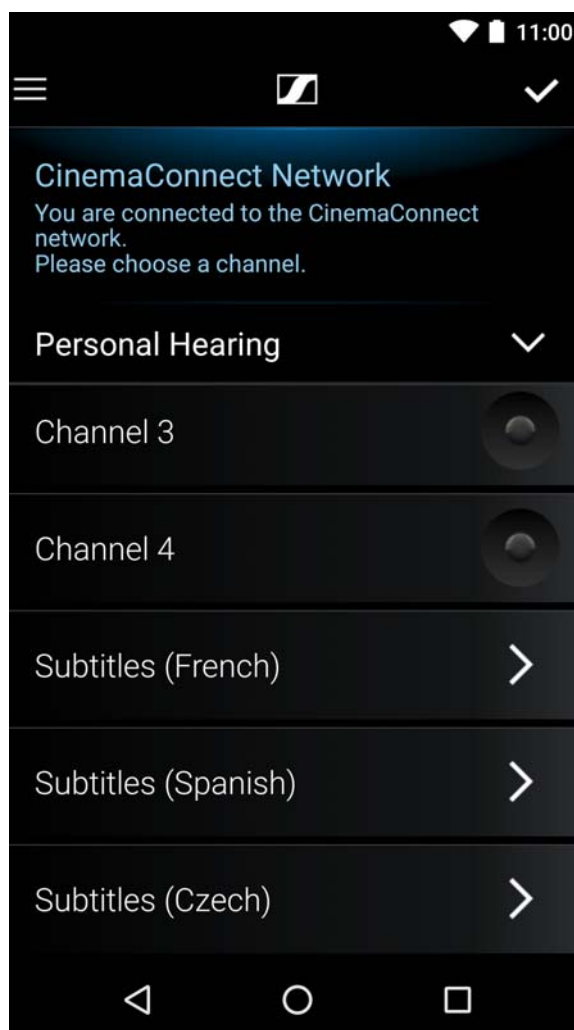


The caption channel will be added to the active channel list.

The screenshot shows the Sennheiser web interface for configuring channel groups. The page title is "#0384600004: Channel Groups". On the left, there is a navigation menu with options: Overview, App Interface, Channel Groups (highlighted), Monitor, Audio Inputs, Network, WiFi, Captions, and Log. The main content area is titled "Configure Channel Groups" and contains a list of "Active Channels": Channel 1, Channel 2, Channel 3, and Channel 4. Below this list, a blue button labeled "<Captions on #0384600004>" is visible. To the right of the channel list, there is a placeholder text: "This is a placeholder for Caption/Subtitle feeds on #0384600004 (#0384600004)." Below the placeholder, there are two buttons: "Create new Group" and "Create new Headline". At the bottom of the main content area, there is an "Apply" button. The footer of the page reads: "Copyright © 2014-2017 Sennheiser Streaming Technologies GmbH | Licenses".

For information on how to modify the order or titles of the channels refer to "Channel Groups" above.

The captions will be displayed in the channel list in the App:





Log

You can view and download the system log.

SENNHEISER

#0384600004: Log Messages

- Overview
- App Interface
- Channel Groups
- Monitor
- Audio Inputs
- Network
- WiFi
- Captions
- Log

Log Messages
Download

Feb 27, 16:43:28	[ccaster] Start completed
Feb 27, 16:43:28	[director] Start relay 0384600004:2 224.1.1.104:3234
Feb 27, 16:43:28	[ccaster] Start caster ip 224.1.1.104 : 3234
Feb 27, 16:43:28	[ccaster] Start completed
Feb 27, 16:43:28	[director] Start relay 0384600004:3 224.1.1.182:3248
Feb 27, 16:43:28	[ccaster] Start caster ip 224.1.1.182 : 3248
Feb 27, 16:43:28	[ccaster] Start completed
Feb 27, 16:43:28	[director] Start relay 0384600004:4 224.1.1.86:3243
Feb 27, 16:43:28	[ccaster] Start caster ip 224.1.1.86 : 3243
Feb 27, 16:43:28	[ccaster] Start completed
Feb 27, 16:43:28	[director] Running http(s) server on port 8000
Feb 27, 16:43:28	[director] Control connection server is listening on port 8005
Feb 27, 16:43:29	[config-backup] Saved configuration cluster to local backup
Feb 27, 16:43:29	[config-backup] Saved configuration stations/0384600004 to local backup
Feb 28, 09:16:11	[admin] SET stations/0384600004/st430 {"dcs_host":"athome.sst.sennheiser.com","dcs_port":"9099"}
Feb 28, 09:16:12	[config-backup] Configuration for stations/0384600004 changed. Backup!
Feb 28, 09:16:12	[subtitle-engine] HTTP interface on port 3200
Feb 28, 09:16:12	[subtitle-engine] Connected to: Demo-DCS
Feb 28, 09:16:12	[subtitle-engine] Trying to load resources from http://athome.sst.sennheiser.com:9099/data/suspicion/rpl.xml
Feb 28, 09:16:12	[subtitle-engine] Output enabled
Feb 28, 09:16:13	[RplResourceLoader] Trying to load resources from http://athome.sst.sennheiser.com:9099/data/suspicion/suspicion-fourclock_fr.xml
Feb 28, 09:16:13	[RplResourceLoader] Trying to load resources from http://athome.sst.sennheiser.com:9099/data/suspicion/suspicion-fourclock_es.xml

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Maintenance and troubleshooting

The following sections will give you an overview on how to perform updates and resets and deal with troubleshooting. You will find information on the following topics.

Information on powering off the ConnectStation.

See "Usage Recommendations"

Information on performing a software update of the system.

See "System update"

Information on resetting the components to their factory settings.

See "Factory reset"

Information on how to reset the password in case you have forgotten it.

See "Forgotten password"

Information on how to grant the Sennheiser service access to your system for servicing.

See "Service access"

A troubleshooting guide with information on various topics and how to handle them.

See "Troubleshooting"



Usage Recommendations

Powering off the ConnectStation

We recommend that the ConnectStations are powered off using the button.

Frequency of powering on and off the ConnectStation in Integrated Mode

- We recommend that you power on the Connect Stations in a cluster one by one, especially in case of cluster discovery by multicast announcements.
- In case of cluster discovery by DNS-SD, make sure that the configure cluster server(s) are powered on first.
- For larger clusters (3 and more ConnectStations) preferably do not frequently power on and off the ConnectStations, as the cluster takes time to form.



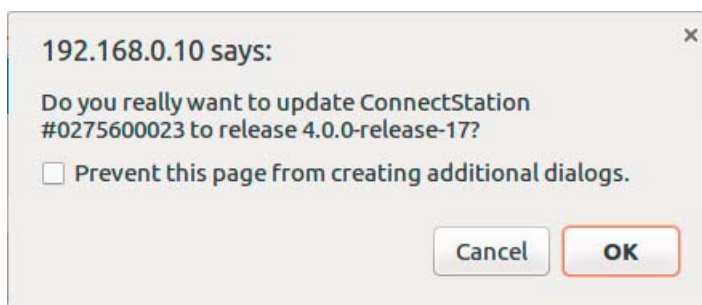
System update

Follow these steps for updating the system image of the ConnectStation to 3.0.0 and higher.

Please note: if you want to update multiple ConnectStations, always update them one at a time, not at the same time.

- ▷ Download the image here:
www.sennheiser.com/download
- ▷ Store it to a FAT/FAT32 formatted USB device.
- ▷ Do not change the name of the update file.
- ▷ Insert the USB device into one of the USB ports of the ConnectStation.
- ▷ The system image is displayed under **Update & Reset** in the **System** tab of the Admin Interface.

- ▷ Click on **Install**.



Click **OK** to confirm the update.



After the update has been installed, the following message is displayed:

The screenshot shows the Sennheiser web interface. On the left is a navigation menu with items: Overview, App Interface, Channel Groups, Monitor, #0275600023, and Audio Inputs. The main content area has a header 'Performing System Update' and a message: 'Station #0275600023 is performing a system update. Please stand by.' Below this is a progress bar with the label 'Progress' and the text 'Extracting update package...'. At the bottom, there is a copyright notice: 'Copyright © 2014-2016 Sennheiser Streaming Technologies GmbH | Licenses'.

▷ When the update is completed, remove the USB device.

The screenshot shows the Sennheiser web interface. On the left is a navigation menu with items: Overview, App Interface, Channel Groups, Monitor, #0275600023, and Audio Inputs. The main content area has a header 'System Update installed' and a message: 'Please remove the USB stick.' At the bottom, there is a copyright notice: 'Copyright © 2014-2016 Sennheiser Streaming Technologies GmbH | Licenses'.

▷ Click on **Restart Now** to restart the ConnectStation.

The screenshot shows the Sennheiser web interface. On the left is a navigation menu with items: Overview, App Interface, Channel Groups, Monitor, #0275600023, and Audio Inputs. The main content area has a header 'System Update installed' and a message: 'Station #0275600023 has installed a system update (to 4.0.0-release-17), and needs to be restarted.' Below this message is a button labeled 'Restart now'. At the bottom, there is a copyright notice: 'Copyright © 2014-2016 Sennheiser Streaming Technologies GmbH | Licenses'.

When the update is finished the system will redirect you to the Admin Interface.

▷ Perform an extra reload/refresh of the web page.

Update from 3.0.x: After the update, the ConnectStation will automatically select the previously used network mode. For changing the network mode see "Selecting the network mode".

Update from 2.0.3: After the update, perform a factory reset of the ConnectStation and select the desired network mode. See "Factory reset" and "Selecting the network mode".



Factory reset

Resetting the ConnectStation via Admin Interface

To reset the ConnectStation to factory settings:

- ▷ Connect your computer to LAN3 of the ConnectStation.
- ▷ Open a browser and navigate to **192.168.0.10**.
- ▷ Login with your user credentials.
- ▷ In the **Update & Reset** tab click on **Perform reset now**.
The ConnectStation will be reset to factory settings.

Resetting the ConnectStation via USB keyboard

To reset the ConnectStation via USB keyboard:

- ▷ Connect the access point to the ConnectStation.
- ▷ Power up both the ConnectStation and the access point.
- ▷ Wait until the system is ready (2-3 min).
- ▷ Connect a USB keyboard to one of the USB sockets of the ConnectStation.
- ▷ Type **reset** and press **Enter**.
- ▷ The ConnectStation and the access point will be reset to factory settings.
- ▷ Log into the admin interface with the default login details:
 - Username: [admin](#)
 - Password: [sennheiser](#)
- ▷ If the admin interface shows that the access point is not getting connected, a hard reset of the access point has to be performed. See below: "Resetting the access point").

Resetting the access point

To reset the access point Ruckus ZoneFlex 7372 to factory settings:

- ▷ Disconnect the access point from its power supply.
- ▷ Press and hold the RST (reset) button of the access point.
- ▷ Insert the power supply into the access point while holding the RST button.
- ▷ Hold the RST button for approximately 15 seconds.
The access point will be reset to factory settings.



Forgotten password

If you have forgotten your password for the Admin Interface of the ConnectStation, you need to reset the ConnectStation to the factory settings. This will reset all settings of the ConnectStation and the access point.

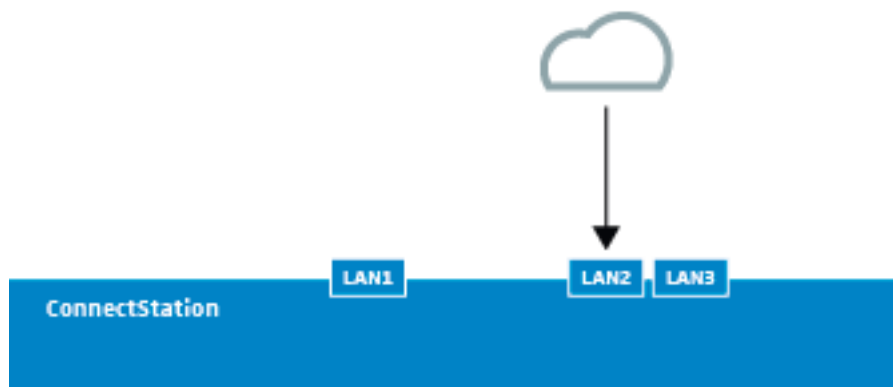
See "Resetting the ConnectStation via USB keyboard".



Service access

Connecting to the Internet for service and support access

i This is an optional feature, which is only used for service and support. The access to the ConnectStation is only possible when granted by the user. If the user does not grant access, the Sennheiser service team will not have access.



- ▷ Connect **LAN2** to your network, providing DHCP. Alternatively, configure **LAN2** to a static IP including Gateway and DNS settings. The ConnectStation will try to reach our support VPN via ports 1194 and 1195, TCP and UDP. These ports need to be open to the Internet (or at least to sprinkler.sst.sennheiser.com).



Troubleshooting

Apps

Mobile device does not see the MobileConnect/CinemaConnect WiFi (Standalone Mode)

- ▷ Make sure that the AP is connected to the LAN1 port of the ConnectStation.
- ▷ Make sure that the ConnectStation is powered on by checking that the two status LEDs on the front light up green.
- ▷ Make sure that the AP is powered on by checking if the PWR light is green.
- ▷ Make sure that the AP 2.4G and 5G lights are either amber or green.
- ▷ Make sure you are looking for the correct SSID (default: MobileConnect or CinemaConnect).

MobileConnect/CinemaConnect WiFi is visible but mobile device does not connect

- ▷ Make sure that the AP is connected to the LAN1 port of the ConnectStation.
- ▷ Make sure that the ConnectStation is powered on by checking that the two status LEDs on the front light up green.
- ▷ Restart the whole system by switching off and on again.

Mobile device is frequently disconnecting from MobileConnect/CinemaConnectWiFi

- ▷ Make sure that the AP is using a fixed channel or you allowed enough time for the Ruckus AP to select a channel.
(**Note:** the Ruckus AP frequently changes the channel in order to select the optimal one. This can take up to 1-2 hours after boot.)
- ▷ Enable “Use network as it is” on the mobile device if the mobile device runs on Android 7 and your network does not provide internet access (Standalone Mode).
- ▷ Provide internet access for better connectivity if the system is running in Integrated Mode (see "General network requirements" in "Requirements/Recommendations towards your network (Integrated Mode)").

MobileConnect/CinemaConnect App shows no channels to select

- ▷ Make sure that the mobile device is still connected to the MobileConnect WiFi/CinemaConnect WiFi.
- ▷ Make sure that the channels are activated in the admin interface.

MobileConnect/CinemaConnect app shows “No connection”

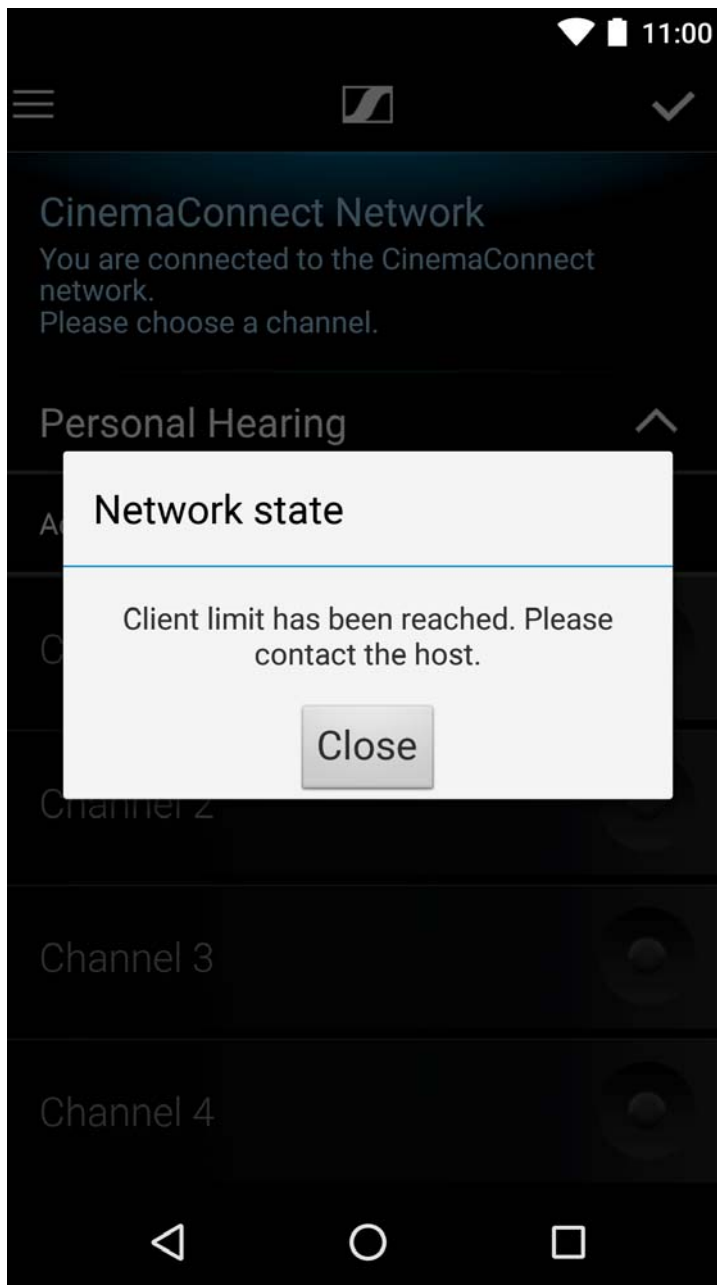
- ▷ Make sure that the mobile device is connected to the correct MobileConnect/CinemaConnect WiFi.
- ▷ In Integrated Mode, if your system is configured with multicast discovery, make sure that the whole network is configured for multicast.
- ▷ In Integrated Mode, if your system is configured with DNS-SD, make



sure that the DNS configuration is correct.

MobileConnect/CinemaConnect app shows “Client limit has been reached”

- The MobileConnect/CinemaConnect app channel list is greyed out and shows the following notification, when trying to select a channel.



- The Admin interface shows the following notification.



System Info

Model CS1-C (EU)
 Serial Number 0275600023
 System Release 4.1.2 (release-26)

Self-Check Status **Warning:** Client limit exhausted

Name

- ▷ Consider increasing the client limit and your WiFi infrastructure in order to support more clients.
- For Standalone Mode: "Increasing the number of clients per ConnectStation (Standalone Mode)"
- For Integrated Mode: "Increasing the number of clients per ConnectStation (Integrated Mode)"



Audio quality

MobileConnect/CinemaConnect App does show channels to select from but when selected there is no audio

- ▷ Make sure that the audio source is playing and has sufficient gain.
- ▷ Make sure you have activated a channel in the app (indicated by blue light).
- ▷ Make sure that the mobile device's volume is turned up.
- ▷ Make sure that the mobile device's headphones/loudspeakers are working properly.

MobileConnect/CinemaConnect App does provide audio but it is distorted or has drop outs

- ▷ Check the audio source for any interference.
- ▷ Make sure the input sensitivity and gain settings of the audio source as well as the gain settings of the ConnectStation are adjusted correctly.
- ▷ Make sure you have a direct line of sight to the WiFi AP.
- ▷ Disable location based service (Android devices).
- ▷ Try to disable Mobile data or enter Airplane mode with WiFi on the mobile device. In a WiFi without internet, the mobile device will try to stay connected using mobile data and can cause interference with the audio streaming.
- ▷ Use a WiFi analyser software to make sure to use a channel where no other WiFi or disturber is active as well as the gain settings of the ConnectStation are adjusted correctly.

Audio latency is higher than expected

- ▷ Make sure the audio source is not delayed. Please note that every additional audio device (mixing console, amplifier, etc.) between the source and the ConnectStation audio input may increase the latency.
- ▷ Make sure you have a direct line of sight to the WiFi AP.
- ▷ Mobile devices, especially Android phones, can add a higher latency (see "List of tested mobile devices").
- ▷ Wireless headphones may have a higher latency than wired headphones, which do not add any latency.

Audio is ahead of the video

- ▷ Check the audio source.



The audio level is low

- ▷ Check the amplitude of the audio signal in the Input Levels tab on the Audio Inputs page of the Admin Interface. See "Audio Inputs" in section "General configuration".
- ▷ Make sure the amplitude is high enough. If it is always lower than -20 dB, increase the sensitivity of the analog audio input from +4 dBu to -10 dBu.
- ▷ Enable the AGC. If the audio level remains low, increase the parameter ratio from 2:1 to 3:1 or higher. Alternatively, reduce the threshold from -40 dB to -60 dB or -80 dB to provide extra gain on the low-volume portions of the input.

There is a lot of noise

- ▷ In case you are streaming from a microphone or other noisy source: Adjust the noise threshold and noise gain in the AGC tab on the Audio Inputs page of the Admin Interface. See "Audio Inputs" in section "General configuration".
Increasing the noise threshold, e.g. from -80 dB to -60 dB, will cause the noise gate to trigger faster. This results in less noise streaming, however, risking to reduce the non-noise portions of the audio.
Decreasing the noise gain, e.g. from -10 dB to -20 dB, will increase the attenuation of the noise.

There is clipping noise

- ▷ Check the amplitude of the audio signal in the Input Levels tab on the Audio Inputs page of the Admin Interface. See "Audio Inputs" in section "General configuration". If the audio level is too high, reduce the analog input sensitivity to +4 dBu.



Integrated Mode

The admin interface cannot be accessed or shows “Configuration problem”

- ▷ Make sure you are accessing via the correct IP address.
- ▷ In case of the admin interface cannot be accessed via LAN2, check if the lights on the LAN2 port are blinking. If not, remove the network cable, wait 15 seconds and plug it in again. In case that does not help, plug in the cable and reboot the ConnectStation.
- ▷ In case of notification “Configuration problem” in a system in Integrated Mode, using DNS-SD, make sure the cluster server is accessible.
- ▷ In case of notification “Configuration problem” in a system in Integrated Mode, using multicast announcements, make sure that the whole network is configured for multicast. Restart the ConnectStation.

The user enters a wrong static IP for LAN2 in Integrated Mode

- ▷ When a wrong IP or IP address of different subnet is entered for LAN2 for a client ConnectStation in a cluster in Integrated Mode, it leaves the cluster to form a cluster of its own.
- ▷ In order to correct the IP address and the ConnectStation to rejoin cluster, first access the cluster Admin interface and click on the "Remove from this cluster" button. Try to change the IP address, in case it doesn't work perform a factory reset of the ConnectStation.

A ConnectStation cannot join or rejoin a cluster in Integrated Mode

- ▷ Make sure that the LAN2 cable is connected and the ConnectStation has a valid IP address in the same network as the cluster.
- ▷ In case the network cable is unplugged, wait for at least 20 seconds before reconnecting. In case the ConnectStation still doesn't join the cluster, restart it after plugging the LAN2 cable back.
- ▷ In case of a cluster using DNS-SD, make sure that configuration is correct, and the cluster server is reachable.
- ▷ In case of a cluster using multicast announcement, make sure that the whole network is configured for multicast. If the ConnectStations are frequently leaving a cluster, that is an indication for filtered multicast packets.

Client Balancing or Client Monitoring are not visible on the admin interface page

- ▷ Make sure that all your ConnectStations are updated to firmware version 5.0.0 or higher.