

APPLICATION NOTE

Connection and remote control of AEQ Phoenix ALIO audiocodecs from the studio and simultaneous usage as a phone set.



AEQ PHOENIX AUDIOCODECS. APPLICATION NOTE 6

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1. INTRODUCTION

Nowadays, the ISDN lines are being left behind, IP audiocodecs are proving to be the most suitable method for outdoors broadcasting.

But in order to establish communications using these IP audiocodecs, some facts about this technology must be had in mind, and their features must be used properly.

This Application Note details how to configure a Phoenix ALIO audiocodec to establish connections to a fixed studio and explains how to connect it to a IP phone that will provide communication with smartphones and PSTN terminals.

The details about the configuration of this device is a general interest task, as they can be extrapolated to other audiocodec models and brands, provided that they include the proper features.

This Application Note also explains how to configure the devices so they can be controlled from the fixed studio, what allows a minimal intervention by the staff in the event, who will be freed from most of the configuration and technical operation hassles.

2. FEATURES INCLUDED IN THE REFERENCE EQUIPMENT

Phoenix ALIO is the ideal portable audiocodec for reporting sports or any other events. The "Full Channel" version includes two bidirectional audiocodecs. These channels are indicated as Program (PROG) and Coordination (COORD) in the unit. It features a five-input mixer, 4 inputs for microphones and also a stereo line input. Besides, it includes two stereo headphones and a stereo line output to provide signal to an external headphone distributor, P.A. system, etc.



The unit also includes three internal audio buses that allow sending any kind of input signal to the program, coordination or CUE channel. The signal from these buses can be obtained by any output, as well as the return of each codec. This option makes the Phoenix ALIO a very versatile device, as it is able to transmit two different audio signals to two destinations or, just use one of the codecs as an internal 4-wire coordination channel while the other is used to send the program. This application note will also explain how we can use the coordination channel in order to make and receive phone calls, and not only to the studio, but to any other location.

Phoenix ALIO is connected to an IP network using an Ethernet port, making easier linking it to any IP data interface (routers, 3G/4G modems, satellite data, etc). The Phoenix ALIO is not just a very easy to use device, but it also has been provided with full remote control capability, no matter where it is located, so the user only needs to worry about connecting the supply, audio and data wiring.

Once it is connected and visible through Internet, Phoenix ALIO offers its exclusive "HELP" button, which may be used to ask for assistance from the studio or simply become an internal warning system.

In order to obtain more information about Phoenix ALIO, please read:

http://www.aeq.eu/sites/4f0b6c69570d992512000fe/contents/content_instance/55506be91ed92f11ab00016e/files/Catalogo_Phoenix_Alio_eng_web_2016.pdf

The corresponding user's manual can be found at:

http://www.aeq.eu/sites/4f0b6c69570d992512000fe/contents/content_instance/55506be91ed92f11ab00016e/files/AEQ_Phoenix_ALIO_Users_Manual.pdf

3. COMMONLY FOUND ISSUES WHILE WORKING WITH PORTABLE IP AUDIOCODECS

A typical usage of Phoenix ALIO is the generation of audio contributions from a changing location to a fixed production studio. An example may be the reporting of a sports event by a journalist from a stadium.

In order to operate in these scenarios, there are two main issues to solve:

- a) First, a bidirectional audio link from that stadium or remote location to the broadcaster facilities must be established. This is the most basic function of any audiocodec. If we talk about IP audiocodecs, connectivity will be achieved through a digital link based on that protocol, using either fixed (ADSL type) networks or even a 3G/4G mobile access through AEQ certified router (see AN-5B). Once connectivity is achieved, there are several ways to establish the audio connection. In the present Application Note you will find several alternatives, depending on the situation.
- b) Phoenix ALIO audiocodec is designed to be pre-configured at the base facilities and readily establish the audio connection towards them as soon as it is connected and powered up in an easy way, requiring little user intervention. However, if you want to go further and achieve full device control from the studio, it is necessary to perform some configuration that it is also detailed in this Application Note. This remote control is very useful as it allows the studio technicians to make the necessary adjustments in the remote venue audiocodec, as the person operating it will not always be qualified to change configurations or solve the issues that could arise in-field. This control connection can be established no matter if the audio call is connected or not. In fact, the technician at the studio can even make and hang up calls from the ALIO without intervention by the journalist.

4. ESTABLISHING THE AUDIO CONNECTION

The next paragraphs show how to configure a Phoenix ALIO audiocodec in order to establish an audio connection from a remote location to a fixed studio.

Usually, the Internet access at the mobile side (the ALIO, in this case), is obtained in any of these ways:

- Using a fixed ADSL access or similar, provided by the event organizer, by simply connecting an Ethernet cable to the audiocodec (or to a switch, if we want to simultaneously connect a laptop for local control). The ALIO should be configured in DHCP mode in order to obtain its IP parameters automatically from the network.
- WiFi based Internet access, using an external adapter (see AN-5B application note appendix) or by setting up a bridge using a laptop (see AN-1). In any case, a connection to the ALIO Ethernet codec will be required. It should be configured in DHCP mode in order to obtain its IP parameters automatically from the WiFi adapter or laptop.

- 3G/4G mobile connection by means of modem-router with SIM and data plan (see AN-5B). The ALIO will also be operated in DHCP mode in order to obtain its IP parameters automatically from the modem-router.

In any of these cases, once Internet access is available, we still have two alternatives to set up the connection:

a) RTP connection

The studio's public IP address is known, and it is fixed (the mobile end IP address will rarely be, and it may be even unknown to the user), the RTP connection mode with Smart RTP protocol can be used.

This is the process to be followed in order to make a call in RTP mode with ALIO:

Make sure that the audiocodec is set up in RTP mode by pressing the "IP" key, and double check that SmartRTP is active by pressing the "AUTO" key and activating the so-named option.



Press on the CALL (green) key, and the call menu will appear. The ALIO end should dial the <IP:port> corresponding to the channel that will listen to it in the Phoenix audiocodec located in the studio.

Edit this IP to fill-in the studio's public IP and adequate port (read the user's manual to obtain more details) and press on the call key again. The status will change to CONNECTING and then to CONNECTED if everything went ok:



Enter IP and port



Press CALL key



Call established

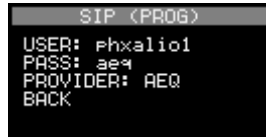
If both ALIO channels are used simultaneously, make sure that each one calls to a unique <IP:port> pair.

The only required configuration at the router of the studio-side consist on making a port-forward rule in the UDP audio ports (and the three following ones) towards the local IP address of the codec receiving the call. For example, if we decide to make a call using channel 1 to port 5004, UDP ports 5004-5007 must be open. If both channels are required, the second one could use the 5008 port, so, additionally, UDP ports 5008-5011 should be open.

b) SIP Connection

The IP address of the studio is either variable or unknown, SIP protocol is required, taking advantage of an external Proxy (Proxy SIP mode). Depending on the nature of the NAT (Network Address Translation) mechanisms at each end, **sip.aeq.es** SIP server can be used, which is provided by AEQ free of charge to all its customers, by previously registering both audiocodecs in it.

In order to do this, ALIO must be set up in PROXY SIP mode (press the "SIP" key once or twice as required) and correctly configure both the server and the credentials, as well as the Internet access. Use "AEQ ControlPHOENIX" software or, on the device itself, by means of **MENU→COMMUNICATIONS→SIP**:



Once both ends are registered (the "SIP" key will stop blinking and become steadily illuminated) press the green CALL key to dial and enter the destination name in the URI field. Press the CALL key again and the call should be established.



If this method doesn't provide the expected results (for example, calls are not established or they are, but audio is not coming through any or both ends), using the alternative Asterisk server is recommended. It is also provided by AEQ (see AN-01 for more details). This server operates in a different way than the one provided for free bay AEQ (sip.aeq.es), as with Asterisk, the audio stream travels through the server, what, in many cases where connectivity problems arise with sip.aeq.es, makes the call establish successfully (these issues are associated to SIP limitations with certain kinds of routers/networks and sometimes caused by service providers when using that protocol).

In a nutshell, if, after testing with sip.aeq.es you experience connection issues, contact AEQ Technical Service and, if a solution can't be provided by us, we will help you configure the Asterisk accounts you need at a low cost.

5. PLACE AND RECEIVE PHONE CALLS

A very interesting tool of IP audiocodescs is the possibility to make and receive phone calls using an Internet SIP server. This is specially useful if you are working with the ALIO, as these calls can be made simultaneously with the program + return channel, thanks to the (optional) second channel.

These servers allow us to register using the codec in just the same way we would when using, for example, sip.aeq.es, but they offer a virtual phone number which is public and unique, that can be called from any fixed or mobile phone terminal, SIP phone or audiocodec all over the world.

This way, the user can make the program contribution towards the studio using the PROG channel, in the desired quality and, independently, set up communications on the second channel, as it was a phone terminal. But also taking advantage of the mixing features of the device, the microphone inputs and headphone outputs, etc., and the phone conversation audio could even be eventually incorporated to the program.

The first step is the registration in any of these servers, that usually have a reduced cost, such as **netelip**, **ecofon**, **ovh**, **at&t** etc, that will assign us a virtual phone number.

These servers will also provide a username and password required to register the codec in the corresponding SIP server (i.e.: sip.netelip.com). In the same way it was explained before in this chapter.

Once the coordination channel is configured in Proxy SIP mode and the registration data is entered, if the audiocodec is connected to Internet and the "SIP" key stops blinking, calls can be received (by dialing the virtual phone number from any terminal) and sent (by typing the destination number in the URI field under the CALL menu).

NOTE: Calls will usually be connected in G.722 mode, although if the remote peer is a conventional phone terminal, the quality will be equivalent to G.711 (4 kHz bandwidth), but simply transcoded. In order to obtain true G.722 quality (what it is usually called "HD-Voice" nowadays, offering 7 kHz audio bandwidth), the remote peer must be a compatible SIP-Phone or audiocodec.

6. CONTROLLING PHOENIX ALIO FROM THE STUDIOS

6.1. Controlling one or more remote codecs from a single PC in the studio

This section explains how to remotely control Phoenix ALIO from the studio.

If the audiocodecs are circumscribed into a local area network, "AEQ ControlPHOENIX" software automatically discovers the Phoenix devices reachable from all the network range/s configured in the PC where it is running. After they are found, a control connection is established. If any audiocodec is in a different network, or even in the Internet, we can manually add it, provided that its IP is known. But, in cases where its IP is unknown or it varies depending on its location -and this may happen when the audiocodec is connected to Internet through an ADSL that we don't manage, a WiFi access point or through a 3G/4G access- we won't be able to gain control of it in this way.

Fortunately, AEQ provides an alternative control method. ALIO can be pre-configured so it sends a connection to a PC where "AEQ ControlPHOENIX" is running. Obviously, the IP address of that PC must be specified. This way, when everything is properly configured and the control software is running in the studio, as soon as the journalist arrives to the stadium and turns the ALIO on, once it has Internet access it will readily appear on our screen.

In order to configure the audiocodec this way, please proceed as follows:

- a) Open "AEQ ControlPHOENIX" and locally connect to the Phoenix ALIO (let it be in the studio, before sending it outside, or by means of a laptop and an Ethernet cable right in the event venue).
- b) Open **CONFIG → Network** menu and select the **Remote control** tab.
- c) Select the option *Automatic for Outgoing connection mode*.
- d) Specify the (public) IP address of the PC where "AEQ ControlPHOENIX" will be running in the **Server host** field (Warning! This IP may or not match the IP of the remote codec we are going to call to in order to establish an audio connection). Keep port **4422**.

- e) Make sure that the **Accept incoming connections on** combo box doesn't have the value *None*, in order to still being able to connect to the ALIO in the usual way, if required.
- f) When the audiocodec is an ALIO, the only possible selection for the **Send outgoing connections on** combo box is ETH1, as it has a single Ethernet port.



- g) Save the changes with the **Apply** button and restart the audiocodec, either manually or using the option **CONFIG → Miscellaneous → Reboot equipment**.

Audiocodecs that are always going to contribute to this studio can be permanently left configured this way, so the above described task will only need to be performed once.

NOTE: This functionality is included in all Phoenix audiocodecs except for Mobile, but it is not internally enabled in CPU versions between v5.60 and v5.90, both included.

On the other hand, control packets sent by the audiocodec must reach the specific PC within the studio local network where "AEQ ControlPHOENIX" is running. In order to achieve this, you must ask your IT manager to configure a port-forwarding in the company's router so TCP port 4422 is redirected from the router's public IP to that PC's private IP, without changing the port number.

For instance, let's assume that we want to control an ALIO audiocodec from a PC which local IP is 192.168.0.101. We will show how to configure a TP-LINK TL-R470T+ router. Under the **Advanced → Virtual server** tab, just add a rule just like the example one named "**control alio**" in this screen capture:

NAT Setup | **Virtual Server** | Port Triggering | ALG

Operation succeeded.

Virtual Server

Name:

Interface:

External Port: -







Internal Port: -

Protocol:

Internal Server IP:

Status: Activate Inactivate

List of Rules

No.	Name	Interface	Protocol	External Port	Internal Port	Internal Server IP	Status	Action
1	control alio	WAN1	TCP/UDP	4422	4422	192.168.0.101	Active	  
2	vumetros phoenix	WAN1	UDP	50000-60000	50000-60000	192.168.0.101	Active	  

Note:
"Internal Server IP" must be within the LAN IP address range and the IP pool range of the PPPoE Server.

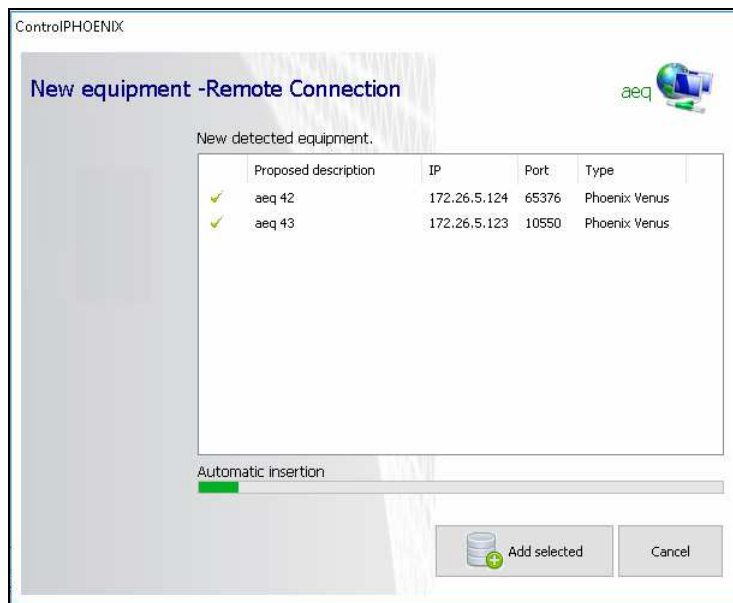
As you can observe, we have created a second rule ("vumetros phoenix"), required whenever we also want to have access to the virtual vu-meters remotely: this rule redirects port range 50000 to 60000 towards the same private IP in UDP protocol.

This configuration needs to be performed only once.

IMPORTANT NOTE: Due to a change in how equipment is controlled from firmware version v8.00 or later (associated to ControlPhoenix v.2.3.0.2 or later), the port to specify is no longer TCP 4422 but 2022 UDP, both in the configuration of the unit and in the port-forward to establish in the router.

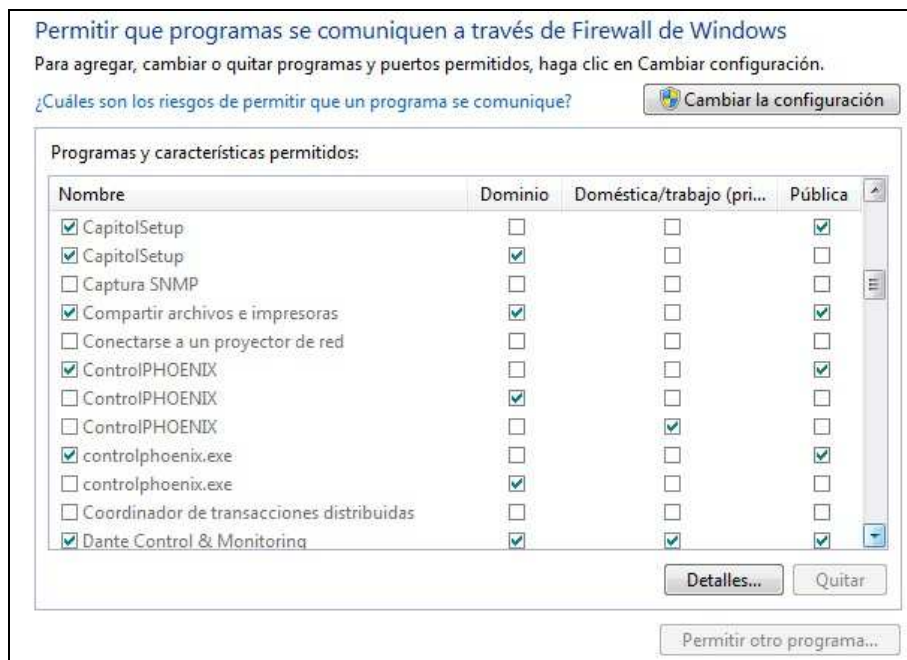
Note that you can have several ALIO audiocoders distributed around with the same configuration and we will still be able to control all of them simultaneously from a single "AEQ ControlPHOENIX" instance (having in mind only the maximum number of allowed devices depending on the software license).

Once the configuration is complete, if "AEQ ControlPHOENIX" application is launched in the adequate PC, a pop-up window should appear inviting us to add the configured ALIO device/s:

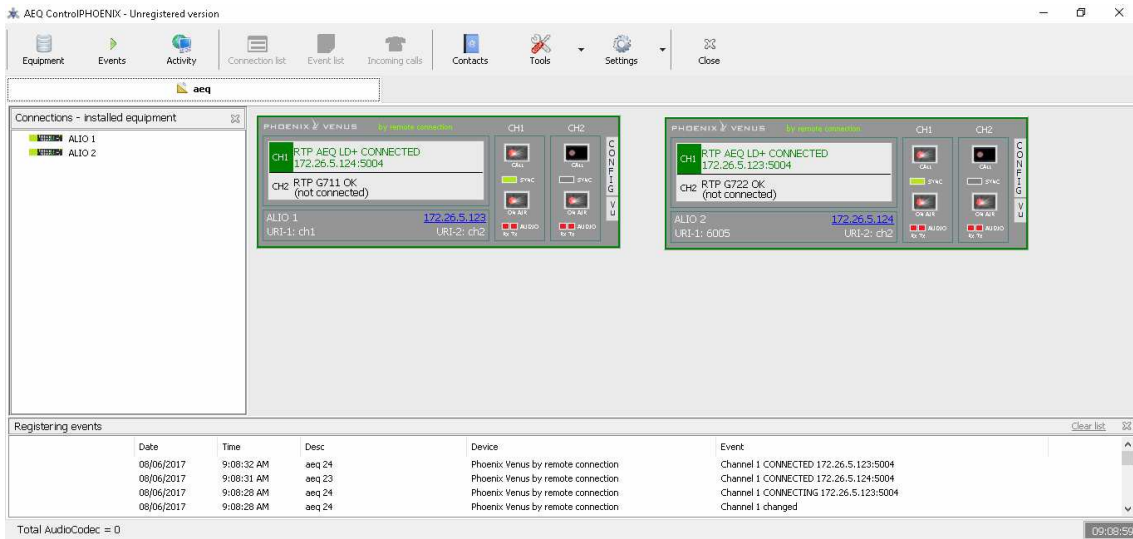


If the notification is received successfully, just select the devices that you want to control and click on the **Add selected** key. Then, assign each one a friendly name and you will have full control over them.

If, on the other hand, this notification is not received, there is still something we should check: have a look at Windows Firewall options and make sure that it is allowing "AEQ ControlPHOENIX" to communicate with the public network (see example in next image):

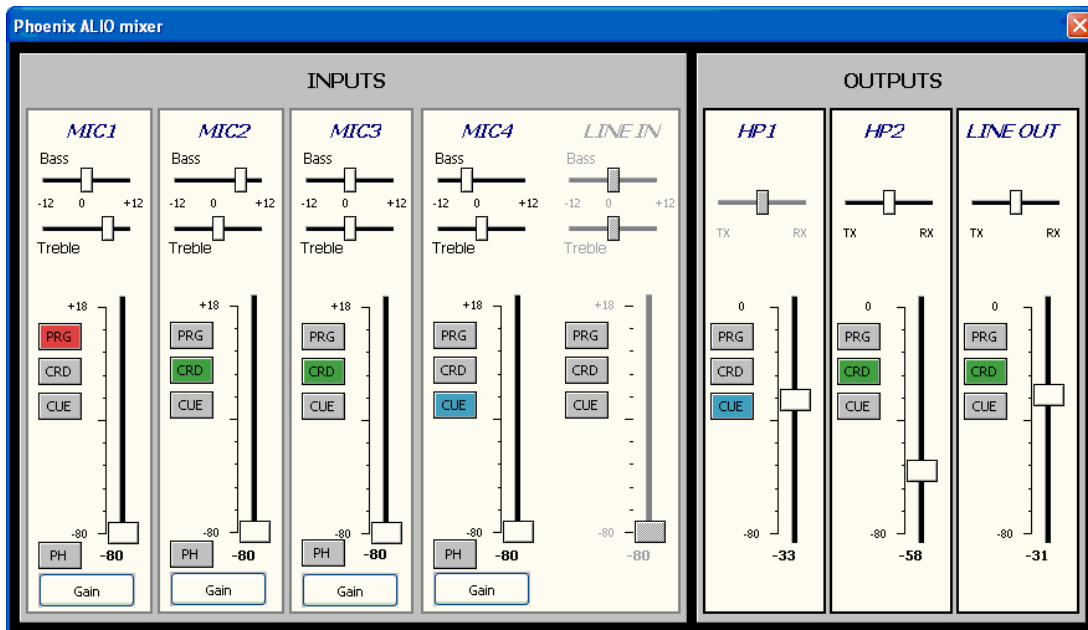


NOTE: Firewall configuration may vary depending on the Windows version installed



Warning: If more than one device is added at the same time, their corresponding control windows may appear overlapped, leading us to think that only one was added. If this happens, you can drag and move them manually or automatically arrange them using the **Settings** → **Organize** function.

The full audiocodec configuration can be accessed by clicking on the "CONFIG" button. ALIO audio mixer can also be controlled by means of the "MIX" button:



Finally, it is also important to note that the journalist can also simultaneously control the audiocodec by a local "AEQ ControlPHOENIX" instance installed on his local laptop, using a switch for the Ethernet connections. The control from both locations will be coherent, also with the ALIO's front panel controls.

In order to obtain more information about Phoenix ALIO remote control possibilities, reading Chapter 4 of its user's manual is strongly recommended:

http://www.aeq.eu/sites/4f0b6c69570d992512000fe/contents/content_instance/55506be91ed92f11ab00016e/files/AEQ_Phoenix_ALIO_Users_Manual.pdf

6.2. Controlling several remote audiocodexs from different PCs within the same building

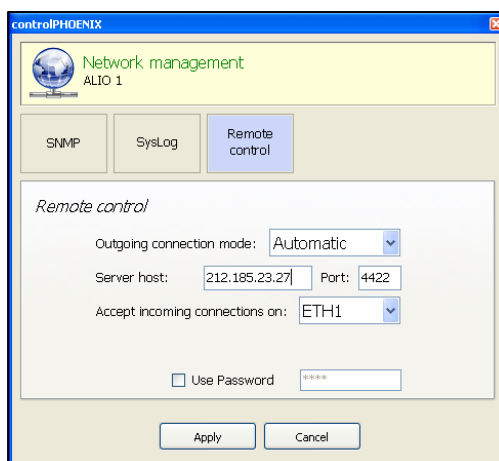
In this scenario we have several remotely located Phoenix devices and they need to be controlled by different people at separate locations within the same building (with common public IP), we will use different control ports in order to distinguish between PCs, so the association between each ALIO codec and the assigned operator's PC must be previously defined. Next, a different outgoing control port must be configured for each codec (for example, 4422, 4423, 4424...) in the *Port* field within the *Network* → *Remote control* tab explained before.

However, it is important to know that "AEQ ControlPHOENIX" only admits connections sent to TCP port 4422. This makes necessary to establish a *port-forwarding* rule for each ALIO-PC pair in the router that provides Internet access to the building, so each unique control port is redirected to a different PC IP address, but always to the destination TCP port number 4422.

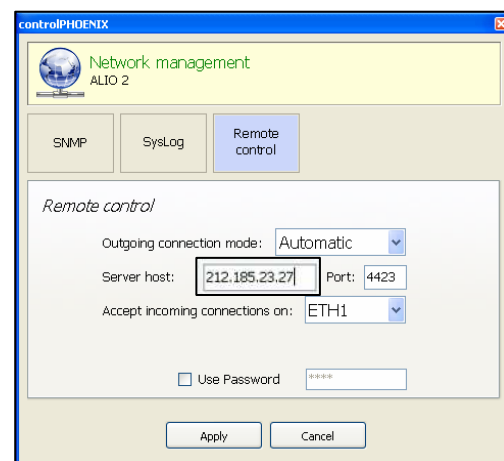
Example (version Fw >=7.70, Sw >=2.3.0.0):

Let's imagine that we have 2 codecs, named **ALIO1** and **ALIO2**. The building's public IP address is 212.185.23.27. We have 2 control PCs within the local area network, **PC1** (192.168.0.101) and **PC2** (192.168.0.102). We want to use "AEQ ControlPHOENIX" application installed on PC1 to control ALIO1, and PC2 to control ALIO2.

- a) First of all, let's configure the automatic connection mode for both ALIOs, towards the same building's public IP (212.185.23.27), through 4422 port in ALIO1 but using port 4423 in ALIO2. This configuration is performed under the **CONFIG** → **Network** → **Remote control** tab in "AEQ ControlPHOENIX":



ALIO 1 configuration



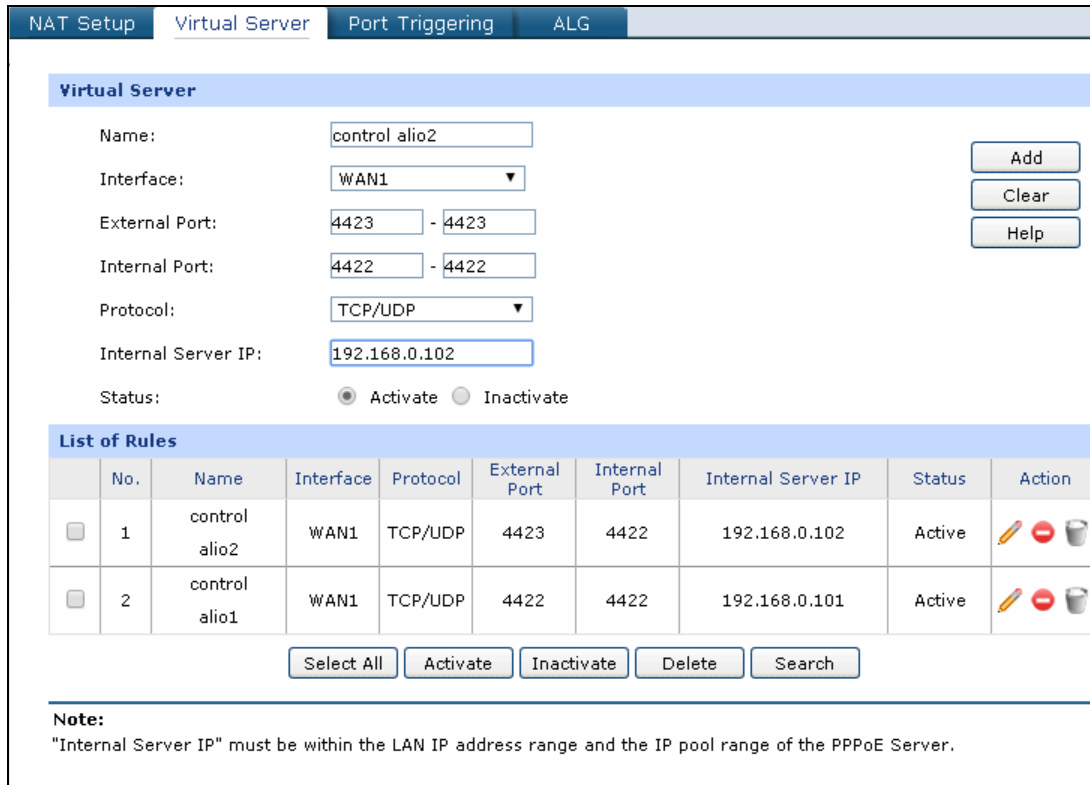
ALIO 2 configuration

- b) We now have to create two rules in our router:
- 1) Every TCP+UDP packet coming through origin TCP port 4422 will be redirected to IP address 192.168.0.101 with destination port 4422.
 - 2) Every TCP+UDP packet coming through origin TCP port 4423 will be redirected to IP address 192.168.0.102 with destination port 4422.







Note that these are advanced *port-forwarding* rules. It is important to remark that NOT ALL ROUTERS allow us to specify different origin and destination port numbers, so they are not suitable for this configuration. In this example, we will show how to configure an inexpensive TP-LINK TL-R470T+ router, that does allow for this.

We need to create two rules, one for each PC-ALIO pair. The *External port* is the one where the ALIO sends the control packets to, and being only one port number, the start and end ports will be the same (i.e.: External Port: 4423-4423). The *Internal port* will always be 4422 (just in the same way, remember that we should fill in Internal Port: 4422-4422). The control PC IP address must be specified in the *Internal Server IP* field.

This should be done for TCP ports:



The screenshot shows the 'Virtual Server' configuration page. The 'Name' field is 'control alio2', 'Interface' is 'WAN1', 'External Port' is '4423 - 4423', 'Internal Port' is '4422 - 4422', 'Protocol' is 'TCP/UDP', and 'Internal Server IP' is '192.168.0.102'. The status is 'Activate'. Below the form is a 'List of Rules' table with two entries:

No.	Name	Interface	Protocol	External Port	Internal Port	Internal Server IP	Status	Action
1	control alio2	WAN1	TCP/UDP	4423	4422	192.168.0.102	Active	  
2	control alio1	WAN1	TCP/UDP	4422	4422	192.168.0.101	Active	  

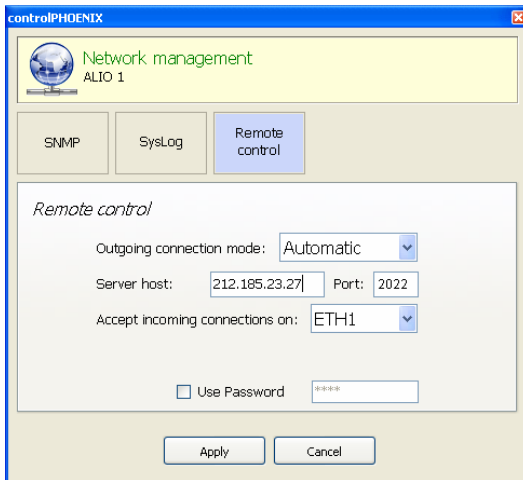
Buttons at the bottom include 'Select All', 'Activate', 'Inactivate', 'Delete', and 'Search'. A note at the bottom states: "Internal Server IP" must be within the LAN IP address range and the IP pool range of the PPPoE Server.

IMPORTANT NOTE: Due to a change in the way the equipment is controlled from firmware version v8.00 or later (associated to ControlPhoenix software version v2.3.0.2 or later) **the port to specify is no longer TCP 4422 but 2022 in UDP**, both in the codec configuration and in the port-forward to configure in the router. **The software admits connections on port 2022 UDP only**, but different ports can be defined in the codec, exactly as explained in section 6.2. So the previous example would remain this way:

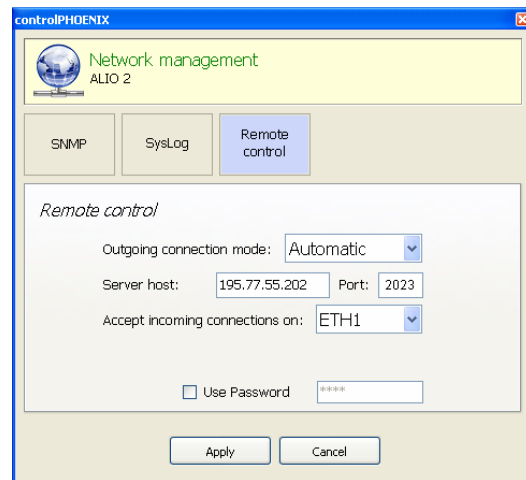
Example (version Fw >=8.00, Sw >=2.3.0.2):

Let's imagine that we have 2 codecs, named **ALIO1** and **ALIO2**. The building's public IP address is 212.185.23.27. We have 2 control PCs within the local area network, **PC1** (192.168.0.101) and **PC2** (192.168.0.102). We want to use "AEQ ControlPHOENIX" application installed on PC1 to control ALIO1, and PC2 to control ALIO2.

- c) First of all, let's configure the automatic connection mode for both ALIOs, towards the same building's public IP (212.185.23.27), through UDP port 2022 in ALIO1 but using UDP port 2023 for ALIO2. This configuration is performed under the **CONFIG → Network → Remote control** tab in "AEQ ControlPHOENIX":



ALIO 1 configuration



ALIO 2 configuration

d) We now have to create two rules in our router:

- 1) Every TCP+UDP packet coming through origin port UDP 2022 will be redirected to IP address 192.168.0.101 with destination port 2022.
- 2) Every TCP+UDP packet coming through origin port UDP 2023 will be redirected to IP address 192.168.0.102 with destination port 2022.

Note that these are advanced *port-forwarding* rules. It is important to remark that NOT ALL ROUTERS allow us to specify different origin and destination port numbers, so they are not suitable for this configuration. In this example, we will show how to configure an inexpensive TP-LINK TL-R470T+ router, that does allow for this.

We need to create two rules, one for each PC-ALIO pair. The *External port* is the one where the ALIO sends the control packets to, and being only one port number, the start and end ports will be the same (i.e.: External Port: 2023-2023). The *Internal port* will always be 2022 (just in the same way, remember that we should fill in Internal Port: 2022-2022). The control PC IP address must be specified in the *Internal Server IP* field.

Make all this in UDP protocol:

NAT Setup Virtual Server Port Triggering ALG

Virtual Server

Name:

Interface:

External Port: -







Internal Port: -

Protocol:

Internal Server IP:

Status: Activate Inactivate

List of Rules

	No.	Name	Interface	Protocol	External Port	Internal Port	Internal Server IP	Status	Action
<input type="checkbox"/>	1	control alio2	WAN1	TCP/UDP	2023	2022	192.168.0.102	Active	  
<input type="checkbox"/>	2	control alio1	WAN1	TCP/UDP	2022	2022	192.168.0.101	Active	  

Note:
 "Internal Server IP" must be within the LAN IP address range and the IP pool range of the PPPoE Server.

Whatever the versions are, once the specified rules are active, if both "AEQ ControlPHOENIX" applications are open, a pop-up window should appear on each one inviting us to add the incoming connection of the respective codecs. After adding them, each operator will be able to completely control his assigned codec, in just the same way that was explained in section 6.1

NOTE: This method has a limitation: the assigned codec's remote vu-meters will only be visible in one of the control PCs, provided that the corresponding rule involving ports 50000-60000 has been added to the router, as explained in section 6.1.

7. CONCLUSIONS

Using ALIO as an example, several important features included in last-generation portable IP audiocodecs have been proved. ALIO is a powerful audio mixer that is, at the same time, flexible and easy to use, powerful connecting possibilities -not only with a fixed studio but also to other correspondents using IP telephone networks-, and centralized control & supervision. In order to take full advantage of these features, some pre-configuration is required. In some cases, beyond the previous experience of most broadcast engineers. But who can receive help from their IT engineers, from these Application Notes or from the technical supports of their suppliers.



**APPLICATION NOTE:
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