XV. MULTISTREAMING

NX Rack supports the ability to run one encoder per connection, but this single encoder stream may be sent to up to three destinations simultaneously. This capability is referred to as a **Multistream**, as the encoder creates a separate but identical outgoing stream to each decoder. (Note: A User's Internet connection must be able to support these streams. For example, if an encoder runs at 35 kb/s network utilization, sending to two locations will require 70 kb/s upload speed from the network.)

Multistreaming should not be confused with IP Multicast, which is described in the next section. Each NX Rack can only run one decoder, so it's important that in a **Multistream** environment, a maximum of one stream is sent in the reverse direction. This means that users interested in hearing a Multistream must turn off their encoders. This can be a bit confusing because **Multistream** can be initiated from either end of the link.

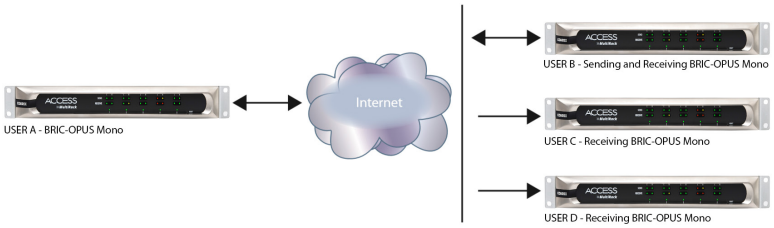

FIGURE 67 **MULTISTREAMING ARRANGEMENT**

Figure 67 shows a NX Rack **Multistream** arrangement. NX Rack A is the Multistreamer, with NX Rack B, C and D listening to the same audio. In order to set up a Multistreaming scenario, the NX Rack encoders must be turned **Off**. This is done by building a profile with either the **Local** or **Return Transmitter** mode set to **Off**, as shown in **Figure 68**.

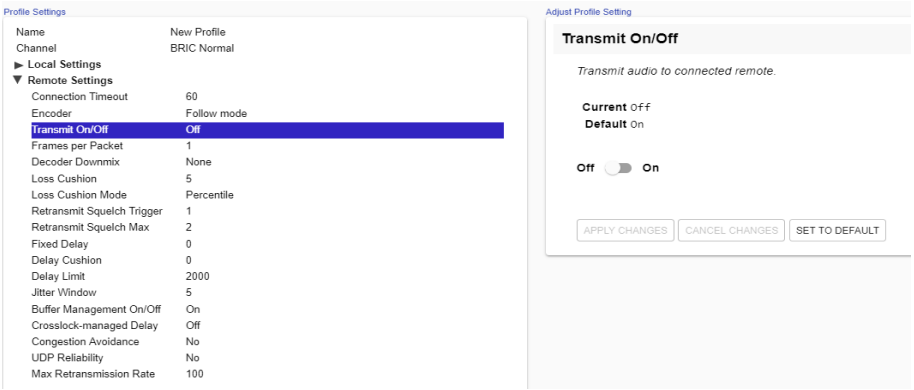

FIGURE 68 **TRANSMIT ON/OFF**

MULTISTREAMING ARRANGEMENTS

The following includes two examples of **Multistream** arrangements involving the NX Rack. In the first environment, the NX Rack that is serving the Multistream initiates calls, and in the second, the serving NX Rack accepts all of the incoming connections.

NX RACK INITIATES THE CALL

In the “Multistreamer as caller” model, two different profiles will be built on NX Rack A. The first profile, labelled “Multi-Duplex”, will be defined as a standard, duplex NX Rack connection. The encoder to be used will be selected in the **Local Encoder** section, and the stream desired in return will be defined in the **Remote Encoder** section.

The second profile is called “Multi-Simplex” and in this profile the **Remote Transmitter** is turned **Off**. Most other selections in this profile are irrelevant. User A will define remote connections for NX Rack B, C, and D. They will assign the “Multi-Duplex” profile to NX Rack B, and “Multi-Simplex” profile to the others. They will then establish a connection with NX Rack B first, followed by C and D.

NX RACK RECEIVES THE CALL

In model number 2 where the serving NX Rack accepts all incoming connections, all the profiles are built on the **Remote Receivers**. NX Rack B will use a simple profile by defining the encoders in each direction, and assign it to NX Rack A. NX Rack C and D will each define a profile with their **Local Encoders** turned **Off**, and assign them to A. NX Rack B should connect first. When C and D connect, they will hear the same stream as B, regardless of how their **Remote Encoders** are set in their profiles.

In a **Multistream** environment, the first man wins. For example, the first connection made between units will determine the encoders used for all others. After the first full-duplex connection is made, all other attempts at full-duplex connections to either end will be rejected.

USING CROSSLOCK WITH MULTISTREAM CONNECTIONS

CrossLock functionality in Multistreaming has been introduced with NX Rack. Previous Comrex Access Racks did not support CrossLock VPN when performing a **Multistream**. With the introduction of NX Rack, the added broadcast reliability of CrossLock brings increased connection stability in Multistreaming environments.

XVI. IP MULTICAST

IP Multicast is an efficient way of delivering NX Rack digital audio streams to multiple locations. This involves relying on the network to distribute the stream to the locations that require it, rather than creating an independent stream for each user.

Performing an IP Multicast requires the use of an IP Multicast-capable network. The commercial Internet, with few exceptions, is *not* capable of supporting IP Multicast. Some private LANs and WANs *are* IP Multicast-capable.

IP Multicast does not support duplex connections, and only supports a single direction stream. An encoder can not receive input streams when multicasting. CrossLock is not supported and should be turned off for all IP Multicast connections.

The following section presupposes that IP Multicast users will be familiar with the basic concepts of setup and operation of the network, and will thus focus on how to configure NX Rack for Multicast mode.

MULTICAST PROFILES

To configure remotes for Multicast, first create a profile for either a Multicast Sender or a Multicast Receiver on the **Profile Manager** tab.

As shown in **Figure 69**, when defining a new profile there is the option to choose **Multicast** as the profile type. Multicast profiles have fewer options than other profile types, however, and some of the available options will have no effect (e.g. setting an encoder type on a Multicast receiver has no effect).

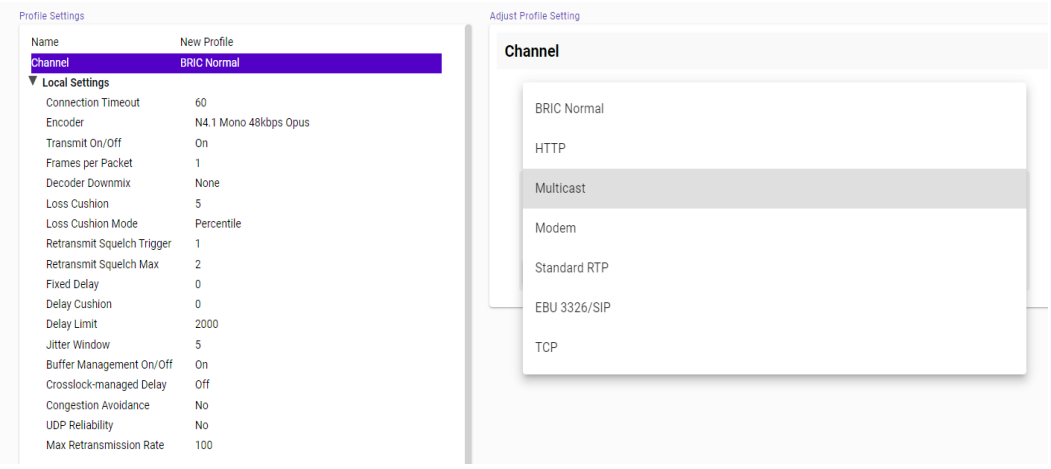

FIGURE 69 **MULTICAST SETTINGS**

The important settings for Multicast are:

- **Sender/Receiver** - Determines whether this particular NX Rack is designed to generate and encode the IP Multicast stream (send) or decode one (receive).
- **Encoder Type** - Determines the algorithm format of stream to be used by the Multicast encoder—not relevant for decoders.

In addition to the basic options for IP Multicast profiles, clicking the **Advanced** box will allow setting of the same **Advanced Options** available for Normal BRIC (Unicast) profiles.

SETTING UP A MULTICAST REMOTE

All **Multicast** connections are outgoing connections. A Multicast Sender must initiate an outgoing stream, and a Multicast Receiver must initiate an incoming one. These remotes are configured within a special address range known as a Multicast Block, typically **224.0.0.0** to **239.255.255.255**. To establish a Multicast connection, simply define a remote as having an address within the IP Multicast Block, use an IP Multicast profile, and press **Connect**.

TIME-TO-LIVE

Time-to-Live (TTL) is a variable set by Multicast encoders to determine how long a packet is processed before it is dropped by the network. The default value of TTL in NX Rack is 0, which limits its use to within a LAN environment. TTL may be manually changed on a **Multicast Sender** remote by configuring the IP address followed by a "/", followed by the TTL value. An example remote Multicast encoder could be set for the address 224.0.2.4/255, which would signify an address with the Multicast Block with a TTL of 255 (which is the max value available).

CHANGING PORT NUMBERS FOR MULTICAST

The default port of UDP 9000 may also be changed on Multicast remotes. The port number is assigned in the standard socket format, directly after the IP address, preceded by ":", followed by the TTL. As an example, the IP address of a Multicast Sender on port 443 with a TTL of 100 would read: **224.0.2.4:443/100**.

XVII. STREAMING SERVER FUNCTION

NX Rack has the ability to act as a streaming server, delivering AAC and HE-AAC to compatible PC-based media players. Currently tested media players include **WinAmp, VLC,** and **Windows Media Player 12** and up.

By default, streaming server functionality is turned off. To enable it, go to the **System Settings** tab of the User Interface and choose **HTTP Settings** option. Under the first option, set **Accept Incoming Connections** to **Enabled** (**Figure 70**). This allows outside users to initiate a "pull" connection to the codec.

FIGURE 70 **ACCEPT INCOMING HTTP CONNECTIONS**

The default port for serving streams is TCP 8000. Creating a custom port can be done in the HTTP settings under **IP Port**. Note that this port will need to be referenced in the URL provided to listeners.

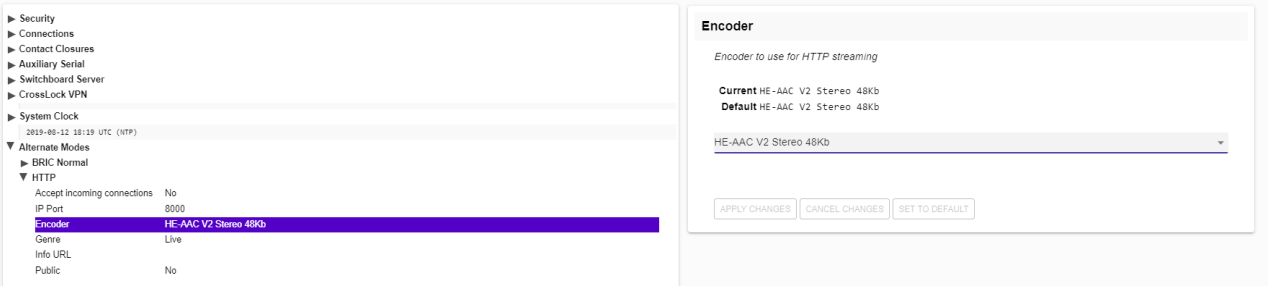

FIGURE 71 **HTTP STREAMING ENCODER**

Next, select an encoder for use by the streaming server (**Figure 71**). Only the encoder choices that are compatible with the players listed are shown in this menu. Choices span from a mono audio feed at 18 kb/s up to a stereo feed at 128 kb/s. Keep in mind, multiple streams will require this bandwidth along with around 25% overhead for each stream.

The **Genre, Info URL,** and **Public** options may be set for anything, or left alone. These options, if applied, will be embedded into the stream.

DECODING A STREAM

To decode a stream, open one of the supported players and select the option to open a URL-based stream.

In **Winamp** and **VLC**, input the address of the NX Rack in the following format:

http://192.168.0.75:8000
(using the actual IP address, and the actual port—if it has not been changed from default, it is **8000**)

In **Windows Media Player**, input the address like this:

http://192.168.1.75:8000/stream.asx
(using the actual IP address, of course)

SIMULTANEOUSLY CONNECTING NX RACKS AND STREAMING

NX Rack can stream while connected to another Comrex codec in BRIC Normal mode. If the BRIC connection is using an AAC algorithm supported by players, then when a stream is requested it will be delivered using the same encoder as the BRIC connection, regardless of the HTTP settings. If the NX Rack encoder is Linear or FLAC, the stream request will be rejected.

XVIII. MAKING EBU3326/SIP-COMPATIBLE CONNECTIONS

Comrex codecs (and many other brands) have a set of protocols that allow easy IP connections between units. In general, when connecting between Comrex hardware, it's best to use these proprietary modes to take the most advantage of the features of the product.

However, many users are concerned about getting "locked in" to a certain codec brand. Because of this, an international committee was formed by the European Broadcast Union called N/ACIP to hammer out a common protocol to interconnect codec brands. This committee resulted in the establishment of **EBU3326**, a technical document describing how best to achieve this goal.

EBU3326 by and large establishes a set of features each codec should support, then leaves most of the heavy lifting to other, previously established standards like SIP (IETF RFC 3261). Topics not covered (yet) by EBU3326 include things like carrying ancillary data, contact closures from end-to-end, codec remote control, monitoring, and complex NAT traversal—which at this point are still left to the individual manufacturer's discretion. If these topics are important to a user's application, it's best to stick to a single codec vendor and their proprietary protocols.

MORE ABOUT EBU3326

The Tech 3326 document defines several mandatory encoding algorithms, and the transport layer that could be used on them for compatibility. But the most complex part of the standard was the decision on how to arrange Session Initialization, which is the handshake that takes place at the start of an IP codec call. The most commonly used protocol is called **SIP**, which is used extensively by VoIP phones and therefore was a logical choice. SIP carries the advantage of making NX Rack compatible with a range of other non-broadcast products, like VoIP hardware, software, and even mobile phone apps.

EBU3326 IN NX RACK

NX Rack does not fully comply with EBU3326, as it does not feature the mandatory MPEG Layer II codec. Aside from this, NX Rack has been tested to be compatible with several other manufacturers' devices using encoders supported by both products. When using **EBU3326/SIP Compatible** mode (how the user interface describes EBU3326), ancillary data, contact closures, Switchboard TS, Multistreaming and Multicasting are not supported. Outgoing call profiles built with the EBU3326/SIP channel may lack some advanced options, and cannot be set for different encoders in each direction (i.e., EBU3326/SIP calls are always symmetrical).

EBU3326/SIP MODES

A function of placing a SIP-style call is the ability to register with a SIP server. This is a server that exists somewhere on the network, usually maintained by a service provider. Several free servers exist that can offer registration, like **Onsip.com**.

The NX Rack allows EBU3326/SIP calls to be placed or received with or without registration on a SIP server. If registration is not enabled, connections are made directly to the compatible device by dialing its IP address, just like in **BRIC Normal** mode.

UNREGISTERED MODE

Placing a call in **Unregistered EBU3326/SIP** mode is simple—just build a profile, but instead of choosing **BRIC Normal** channel, choose **EBU3326/SIP**. This will make sure the call is initiated on the proper ports and with the proper signaling. The majority of system settings relating to EBU3326/SIP relate to **Registered** mode.

REGISTERED MODE

Registering with a SIP server in **EBU3326/SIP** mode can have some advantages. When using a SIP server:

- The server can be used to help make connections between codecs through routers.
- The remote codec can be dialed by its SIP URI instead of IP address.
- The SIP server can be used to find codecs on dynamic IP addresses.

SIP SERVERS

A SIP server exists in a domain. This domain is represented by a web-style URL like **sipphone.com** or **iptel.org**. A SIP server or proxy generally handles IP connections within its domain.

SIP URIS

The SIP server assigns a fixed alphanumeric name to each subscribed account. For example, an Iptel user may be assigned the user name comrex_user. URIs consist of a SIP user name, followed by a domain, delineated with the @ symbol, like an email address. Comrex's Iptel user URI would be comrex_user@iptel.org. Comrex devices do not use the designation "sip:" before a SIP address.

If a connection is made exclusively within a domain, the domain name can be left off. As an example, to make a call to this codec from another Iptel-registered codec, the dialing string can simply be comrex_user (with the domain being assumed).

REGISTERING WITH A SERVER

At a minimum, you will need the following information when registering NX Rack with a SIP server:

- The Internet address of your SIP proxy/server (e.g. **proxy01.sipphone.com**);
- The username on the SIP account (this is usually the dialing address);

- The password on the SIP account.

Figure 72 shows how this information can be applied: by enabling the **Use SIP Proxy** option under **EBU 3326/SIP** on the **Systems Settings** tab.

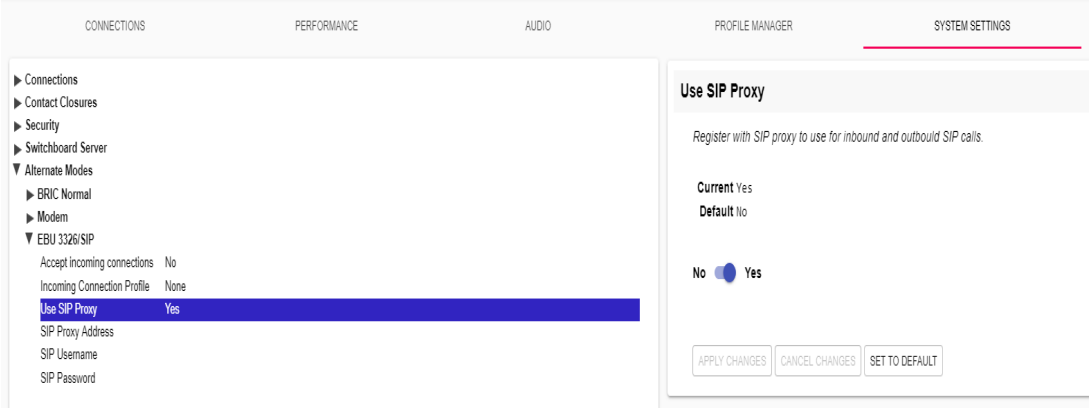

FIGURE 72 **EBU3326/SIP SETTINGS**

Once this information is correctly entered, a new field appears in the “Registration Status” box located on the **Connections** tab (**Figure 73**).

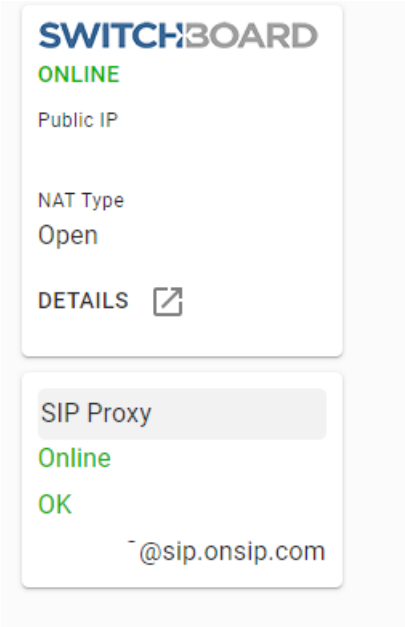

FIGURE 73 **SIP STATUS**

The status will reflect the progress of the registration process. When complete, this will display **Online**. If the box does not display **Online** after a short time, it means that registration likely failed. It’s best to go back and carefully check the registration info. It might also be useful to ensure the registration information is valid by configuring a VoIP phone or softphone with it and attempting registration.

SIP registration can be very simple with some servers, and others can require more advanced settings, which are described in the **Advanced Topics** section on the following page.

MAKING REGISTERED SIP CALLS

When registered, calls made using an EBU3326/SIP profile behave differently than normal. The address field, regardless of whether it is a SIP URI or an IP address, is forwarded to the server. No connection attempt is made until the server responds.

If the server accepts the address, the call will be attempted. If not, an error message will appear in the status line. Reasons for call rejection by a server are numerous. Some examples are:

- The server does not support direct connection to IP addresses (if the address is in this format).
- The server does not recognize the address.
- The server does not forward calls beyond its own domain.
- The server does not support the chosen codec.
- The called device does not support the chosen codec.
- The address is a POTS telephone number, and POTS interworking is not supported.
- The address is a POTS telephone number, and no credit is available (most services charge for this).

ADVANCED EBU3326/SIP TOPICS

The basic entries provided will allow support for the vast majority of EBU3326/SIP-based applications. There are inevitably situations where the defaults won't work, however. Comrex has provided some advanced options that can help. These options are located in the Systems Settings and can be made visible by selecting the **Advanced** box:

- **IP Port** - Universally, SIP connections are supposed to use UDP port **5060** to negotiate calls between devices (and between servers and devices). Note that this is only the negotiation channel; actual audio data is passed on the RTP ports. Changing this port number will change which incoming ports are used to initiate connections and to which ports connection requests are sent. Obviously, the change must be made on both devices, and this change will essentially make your codec incompatible with industry-standard VoIP devices.
- **RTP Port** - This is one of two port numbers used for audio data transfer (the port number directly above this is used as well). Because this port number is negotiated at the beginning of a call (over the IP port), this port may be changed without breaking compatibility. Note that many SIP standard devices use port **5004** for this function. Due to the negotiation, it is not important that these numbers match on each end. Changing this port to **5004** can actually have an adverse effect, as **5004** is the default port for other services on Comrex codecs.
- **Public IP Override** - See the **SIP Troubleshooting** section for more information on this option.
- **Use STUN Server** - See the **SIP Troubleshooting** section for more information on this option.
- **SIP Proxy Keepalive** - Only applies to **Registered** mode. This variable determines how often the codec "phones home" if registered with a SIP server. It's important that the codec periodically "ping" the server, so the server can find the codec for incoming calls. It can be adjusted primarily to compensate for firewall

routers that have shorter or longer binding timings, i.e., the router may have a tendency to “forget” that the codec is ready to accept incoming calls and block them.

- **SIP Domain** - This only applies to **Registered** mode. It’s the name of the network controlled by the SIP server. This parameter must be passed by the codec to the server. Under most circumstances, this is the same as the server/proxy address, and if this field is not populated, that is the default. If, for some reason, the domain is different than the server/proxy address, then this field is used.

SIP TROUBLESHOOTING

In a nutshell, SIP establishes a communication channel from the calling device to the called device (or server) on port 5060. All handshaking takes place over this channel, and a separate pair of channels is opened between the devices: one to handle the audio, and the other to handle call control. The original communication channel is terminated once the handshaking is complete. Note that firewalls must have all three ports open for calls to be established correctly.

The primary area where SIP complicates matters is how an audio channel is established once the handshake channel is defined. In the common-sense world, the call would be initiated to the destination IP address, and then the called codec would extract the source IP address from the incoming data and return a channel to that address. This is the default method Comrex devices use to create and maintain a connection.

But SIP includes a separate “forward address” or “return address” field, and requires that a codec negotiating a call send to that address only. This is important in the case of having an intermediate server, and works fine as long as each codec knows its public IP address.

OUTGOING CALL ISSUES

A unit making an outgoing call must populate the “return address” field. But any codec sitting behind a router has a private IP address, and does not know its public address. A codec will populate its private IP address (e.g. **192.168.x.x** style) into that “return address” field. The called codec will attempt to connect to that address and fail, because its private IP Address can’t be reached from the public Internet.

INCOMING CALL ISSUES

Incoming calls to codecs behind routers are complicated by the need to forward ports on the router to the codec. In the case of SIP, this must be three discrete ports (for Comrex codecs these are UDP 5060, 5014 and 5015) <6014 and 6015 with 3.0 firmware>. As the “forward address” is negotiated in SIP, the incoming unit is likely to populate the “forward address” field with its private address as well.

SOLUTIONS

Many times the “return address” field issue is fixed by the SIP server (in **Registered** mode) and no compensation measures are necessary. Often, the server insists on acting as a “proxy” and handles all the traffic itself. Outgoing and incoming streams are relayed directly by the server, solving any router issues.

In point-to-point connections this isn't possible, and some hacks are required to make this work. The first place to look is the router, as many modern routers are aware of this issue and may be configured to ease connectivity. If a router supports the **SIP Application Layer Gateway (ALG)**, enabling this option can fix the issue. The router will read the SIP handshake, find the outgoing address field, and replace it with the public IP. This is a valuable solution in environments where the router supports ALG. In environments where ALG is not available, **STUN** is a valuable alternative.

STUNNING SUCCESS

Another technique for working around the SIP-Router issue uses a protocol called **STUN**. This can be enabled in Comrex codecs in the **Advanced EBU3326/SIP** options, and allows for the codec to learn its public IP address. It does this by contacting a STUN server on the Internet (the default one is maintained by Comrex) and requesting its Public IP. If this option is enabled, the codec itself will handle the address switching.

Be aware of the "battling workarounds" issue, as ports are being translated by the router as well as IP addresses. If the ALG-enabled router receives an unexpected result in the SIP address field (as it might if using STUN), it may not translate ports as expected, and it's likely that the call will fail. When in doubt, the best technique is to try a SIP call with STUN turned off, and if the return channel fails, try enabling STUN.

FIX OF LAST RESORT

Finally, there's a brute-force option available on Comrex Codecs when STUN ports are blocked by a firewall, or when STUN is unusable for some reason. Under **Advanced System Settings**, a field is available called **Public IP Override**. Any address put into that field will be pasted into the address SIP field. A user can thus place their Public IP address (obtainable from many websites via a browser) in this location. Keep in mind, the Public IP Address is often subject to change over time, so it's important to remember that this change has been made on a codec.

XIX. LICENSE & WARRANTY DISCLOSURES FOR ACCESS NX RACK

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Import code in keyimport.c is modified from PuTTY's import.c, licensed as follows:

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xx. SWITCHBOARD TRAVERSAL SERVER USE DISCLAIMER

TRAVERSAL SERVER DISCLAIMER

You have purchased a product from Comrex that uses the Switchboard TS (Traversal Server) to provide the ability to locate Comrex hardware via the Internet and to aid in the making of connections when certain types of NAT routers are involved in the link. Switchboard TS consists of two distinct elements: the firmware that functions within the codec hardware to enable use of the function; and a server deployed on the Internet which provides the services to the codec hardware.

The purchase you have made entitles you only to the firmware elements within your codec that utilize these functions. The functions of Switchboard TS, as implemented in your codec, are warranted to work as described (according to standard Comrex warranty terms found in your User Manual) when used with a properly functioning Traversal Server deployed on the Internet.

Comrex has deployed and provided you account details for a Switchboard TS account on our server, located at **http://switchboard.comrex.com**.

Comrex provides this service, free of charge and at will. As such, Comrex offers no warranty as to availability of this server or of its function. Comrex reserves the right to discontinue availability of this service at any time. Comrex also reserves the right to remove any account from the server at **http://switchboard.comrex.com** at any time for any reason. In no way shall Comrex be liable for this server's malfunction, lack of availability or any resultant loss therein.

The software that runs the Comrex Traversal Server on the Internet is available from Comrex in an executable format, free of charge, with basic instructions on how to set it up. The address of the server used for these functions is configurable in the codec firmware. If you wish to deploy your own Traversal Server, contact Comrex for details on obtaining this software.

Comrex is not liable for training or support in setting up a TS server, and the software is available without warrantee or guarantee of suitability of any kind.

XXI. CONFORMITY AND REGULATORY INFORMATION

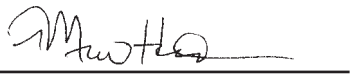
SUPPLIERS' DECLARATION OF CONFORMITY

Place of Issue: Devens, Massachusetts

Date of Issue: **January 23, 2006**

Equipment: Comrex ACCESS NX Rack

Comrex Corporation, located at 19 Pine Road, Devens, MA in the United States of America hereby certifies that the Comrex ACCESS NX Rack bearing identification number **US:DXDMD01BACCRK** complies with the Federal Communications Commission's ("FCC") Rules and Regulations 47 CFR Part 68, and the Administrative Council on Terminal Attachments ("ACTA")-adopted technical criteria TIA/EIA/IS-968, Telecommunications – Telephone Terminal Equipment – Technical Requirements for Connection of Terminal Equipment To the Telephone Network, July 2001.



Thomas O. Hartnett, Vice President, Comrex Corporation

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

EC DECLARATION OF CONFORMITY FOR R&TTE DIRECTIVE

We:

Manufacturer's Name: Comrex Corporation

Manufacturer's Address: 19 Pine Road
Devens, MA 01434

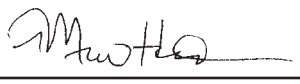
hereby declare on our sole responsibility that the product:

Comrex ACCESS NX Rack
Digital Audio Codec

to which this declaration relates is in conformity with the essential requirements and other relevant requirements of the R&TTE Directive (1999/5/EC). This product is compliant with the following standards and other normative documents:

European EMC Directive (89/336/EEC)
EN 55022:1998/A1:2000, Class A Conducted and Radiated Emissions
EN55024: 1998/A1:2001/A2:2003 (Immunity, ITE Equipment)
Low Voltage Directive (2006/95/EEC)
EN 60950-1: 2001

Contact person: Thomas O. Hartnett, V.P., Engineering

Signed: 

Date: **23 January 2006**

U.S. AND CANADIAN REGULATORY INFORMATION FOR THE ACCESS NX RACK

This equipment complies with Part 68 of the FCC rules and the requirements adopted by the ACTA, as well as the applicable Industry Canada technical specifications. On the bottom of this equipment is a label that contains, among other information, a product identifier in the format **US:DXDMD01BACCRK**. If requested, this number must be provided to a U.S. telephone company.

Telephone line connections to the Comrex ACCESS NX Rack are made via an RJ11C jack. A plug and jack used to connect this equipment to the premises wiring and telephone network must comply with the applicable FCC Part 68 rules and requirements adopted by the ACTA. **A compliant telephone cord and modular plug is provided with this product. It is designed to be connected to a compatible modular jack that is also compliant.** See installation instructions for details.

The REN is used to determine the number of devices that may be connected to a telephone line. Excessive RENs on a telephone line may result in the devices not ringing in response to an incoming call. The sum of RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to a line, as determined by the total RENs, contact the local telephone company. The REN for the Comrex ACCESS NX Rack is **0.1**, and is shown as the digits represented by ## in the product identifier **US:DXDMD###ACCRK**.

If the Comrex ACCESS NX Rack causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of this equipment. If this happens the telephone company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

If trouble is experienced with the Comrex ACCESS NX Rack, please contact Comrex Corporation at 978-784-1776 for repair or warranty information. If the equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is solved.

No user serviceable parts are contained in this product. If damage or malfunction occurs, contact Comrex Corporation for instructions on its repair or return.

Connection to party line service is subject to state tariffs. Contact the state public utility commission, public service commission or corporation commission for information. This equipment cannot be used on telephone company provided coin service.

If you have specially wired alarm equipment connected to the telephone line, ensure the installation of the Comrex NX Rack ACCESS Rack does not disable your alarm equipment. If you have questions about what will disable alarm equipment, consult your telephone company or a qualified installer.

APPENDIX A - HOTSWAP

NX Rack connections are able to utilize **Hotswap**, allowing users running **CrossLock** in “Dual Network” mode to designate a primary and secondary network. This secondary network (e.g. wireless 4G) serves as a backup to the primary in case of network failure. Hotswap is a System Setting in NX Rack.

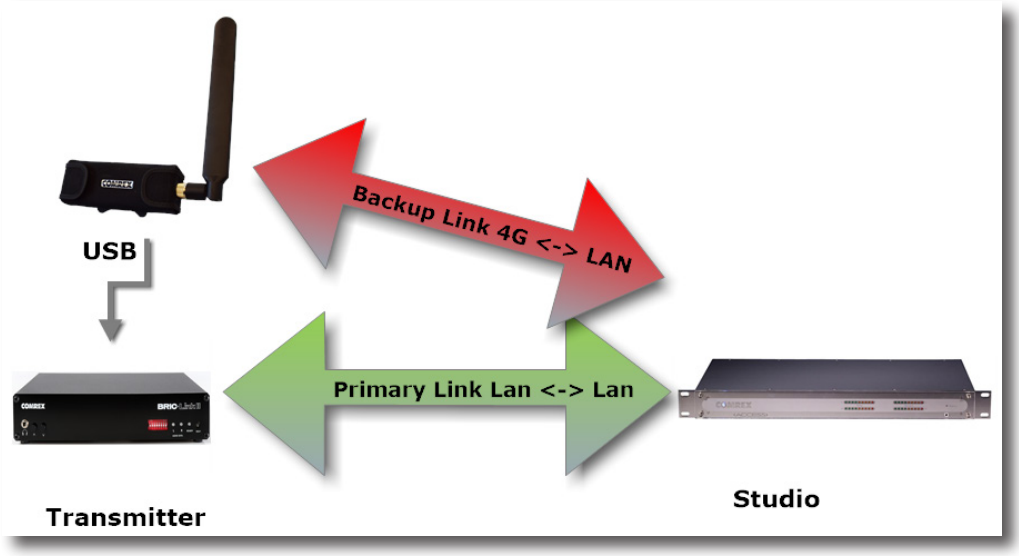


FIGURE 74 **HOTSWAP**

A typical usage scenario would be a codec that is active 24/7 providing a STL connection as shown in **Figure 74**. As it is often impractical (and expensive) to run audio over a 4G cellular network 24/7, **Hotswap** ensures that the **CrossLock** connection prioritizes a different network (e.g. an Ethernet connection). In this example, in the event of a network failure, **Hotswap** would divert from the primary connection to the secondary 4G cellular network as a backup. When the primary network is restored, **Hotswap** will switch back to it and continue to hold the secondary network in a backup state. Any supported network type (e.g. Ethernet, Wi-Fi, 4G cellular) can be designated as the primary or secondary backup network.

Since **Hotswap** is an alternate mode of the Comrex **CrossLock** reliability layer, connections between codecs must be established via CrossLock in order to use it.

Please note: Codecs on **both ends of the link** must be running at least 4.3-level firmware in order to operate **HotSwap**.

DATA USAGE

It is imperative to note that even a network in a backup state still utilizes a small amount of data. This is important when considering using cellular networks. For 24/7 operation, this data will total less than 0.5 GB for a typical month of usage, assuming no **Hotswap** activity occurs. If the **Hotswap** function engages to a cellular network, much more data will be used while the primary network is down. Regardless of how **Hotswap** is used or set up, Comrex assumes no liability for data overage charges, even in the event of software bugs or any other failure of hardware or software. It is entirely the responsibility of the user to monitor any metered data usage.

SETUP

Setup for **HotSwap** is done entirely on the end of the link that has dual networks connected. On the NX Rack, the best way to set up **HotSwap** is via the **Network Manager** page, accessible via the web-based interface. Navigate to the three-line Main Menu icon in the upper left hand corner of the screen and select Network Manager.

Before entering the Network Manager, the secondary network should be attached to the NX Rack via USB or Ethernet. NX Rack Ethernet ports designate a primary and secondary port for this very purpose. The default behavior for CrossLock is to use all networks available to aggregate and apportion data based on capacity and delay calculations. To configure primary and secondary networks, this behavior will require changes in the Network Manager.

In Network Manager, a list of all networks attached to the codec and their status will populate under “Select Network Device”, as shown in **Figure 75**.

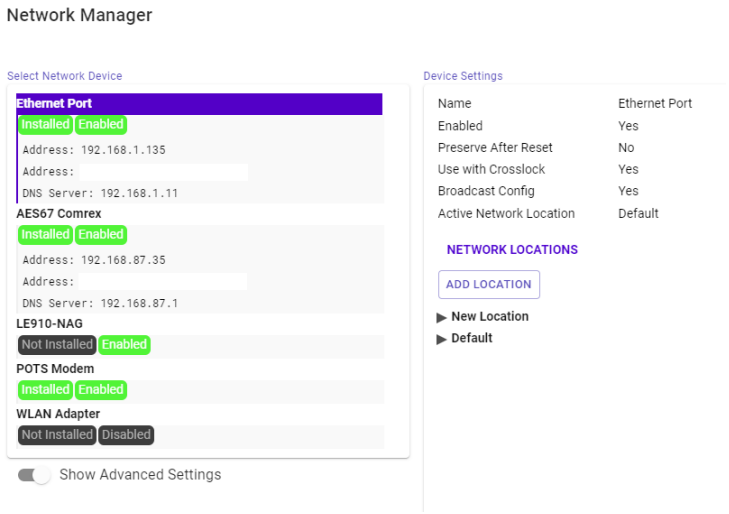


FIGURE 75 **NETWORK SETUP**

Here the backup network can be selected. This network’s options can be expanded using the “**Show Advanced**” button, which will reveal additional configuration options. Find the option labelled “Use with CrossLock” and change the default from “yes” to “backup” (**Figure 76**).

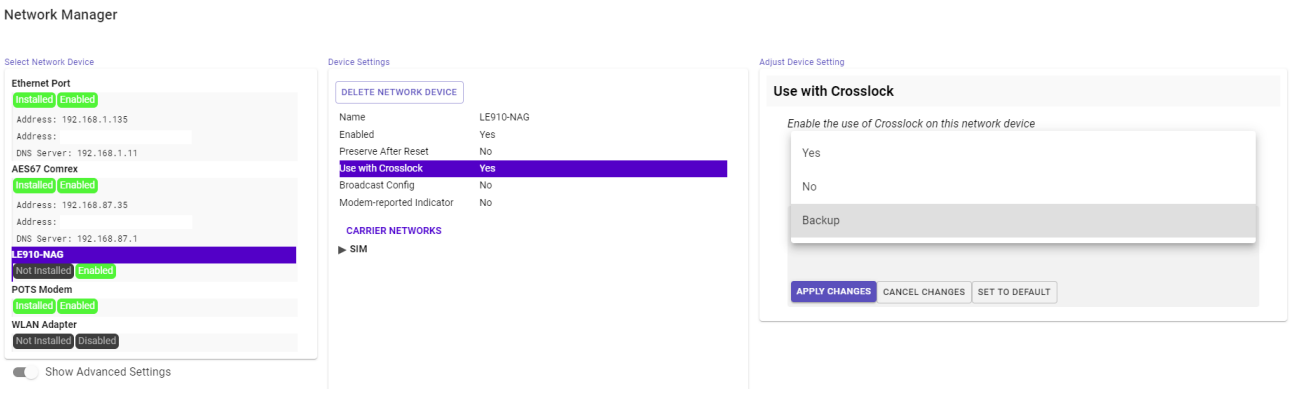


FIGURE 76 **HOTSWAP NETWORK DEVICE SETUP**

Select “Save Settings”, then click “Close” or press ESC to exit Network Manager.

Exit the Main Menu and navigate to the System Settings page. Under CrossLock VPN, locate the entry labeled “Redundant Transmission” (**Figure 77**). Change this from the default “Off” to “On”, and then click “Apply Changes”.

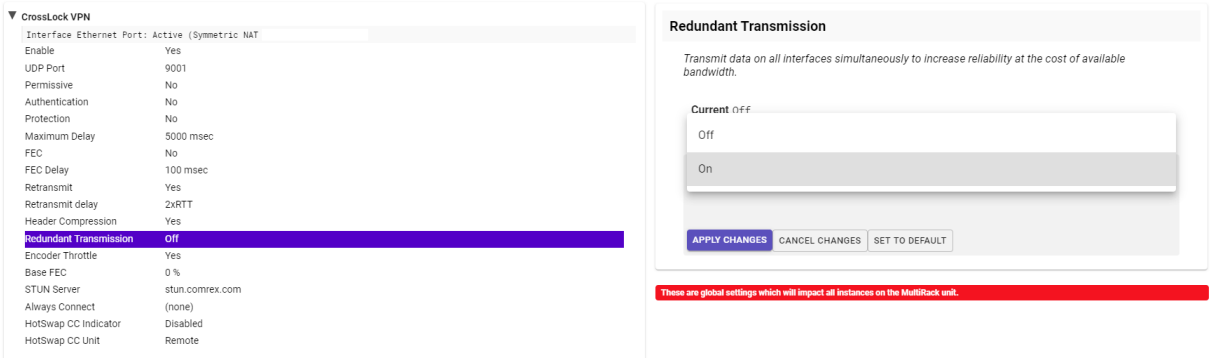


FIGURE 77 **CROSSLOCK REDUNDANT TRANSMISSION**

Finally, set one of the contact closures to sound an alert when the HotSwap function is engaged. Still in the CrossLock VPN settings, select “HotSwap CC unit”. Choose whether the contact closure output triggers on the local, remote, or both codecs (**Figure 78**). Select “Apply Changes” to save your new settings.

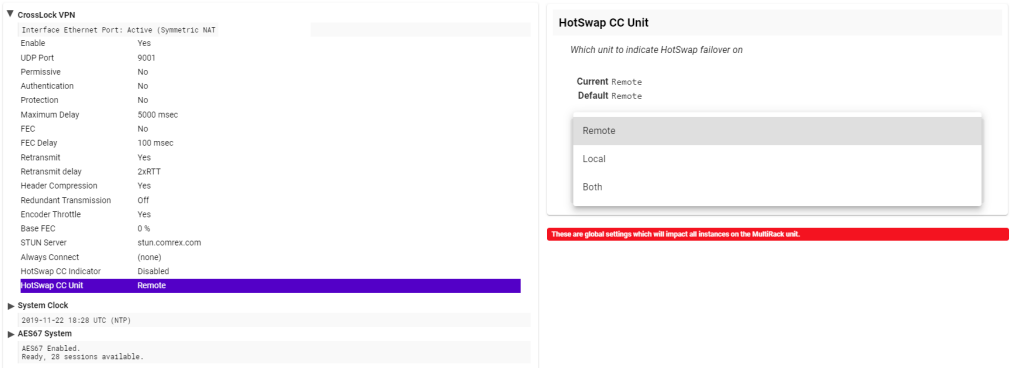


FIGURE 78 **HOTSWAP CC UNIT**

Next choose “HotSwap CC Indicator” and select which contact closure to trigger (**Figure 79**). This will override any previous setting changes made in the main configuration web page regarding contact closures.

Choose “Apply Changes” to save changes.

MAKING CONNECTIONS WITH SWITCHBOARD

In order to use Switchboard, users must first have an account with the server. This account can be obtained by contacting Comrex at 978-784-1776 / 800-237-1776, or by emailing techies@comrex.com / info@comrex.com. Only one account is required for each group of codecs. Once a username and password are provided, navigate to **switchboard.comrex.com** in a web browser. When first accessing Switchboard, there will be a notice stating that no units have been added to the account. Clicking on **Add New Unit** will open a dialogue box that asks for the Ethernet MAC address of the MultiRack.

When adding MultiRack to your Switchboard Account, each instance must be added individually as a separate device. The primary Ethernet MAC address is used here only for MultiRack instance #1. Each instance must be added to Switchboard individually. Instances 2-5 use the same MAC address with a suffix (e.g. -2, -3, -4, and -5) added to designate the instance.

As an example, if the primary Ethernet MAC address is 00:01:40:c0:0d:15, that's the Switchboard ID input for MultiRack instance #1. Instance #2 is added as 00:01:40:c0:0d:15-2, instance #3 uses -3, etc.

FIGURE 80 **MULTIRACK INSTANCE ENTRIES IN SWITCHBOARD**