






You'll be seeing me from time to time throughout this manual to point out ACCESS advanced topics. Feel free to ignore these sections as the default settings provide good performance for most users.

Warning: Advanced Topic

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### ***About Comrex***

Comrex has been building reliable, high quality broadcast equipment since 1961. Our products are used daily in every part of the world by networks, stations and program producers.

Every product we manufacture has been carefully designed to function flawlessly, under the harshest conditions, over many years of use. Each unit we ship has been individually and thoroughly tested. Most items are available off the shelf, either directly from Comrex or from our stocking dealers.

Comrex stands behind its products. We promise that if you call us for technical assistance, you will talk directly with someone who knows about the equipment and will do everything possible to help you.

Our toll free number in North America is 800-237-1776. Product information along with engineering notes and user reports are available on our website at [www.comrex.com](http://www.comrex.com). Our email address is [info@comrex.com](mailto:info@comrex.com).

### ***Warranty and Disclaimer***

All equipment manufactured by Comrex Corporation is warranted by Comrex against defects in material and workmanship for one year from the date of original purchase, as verified by the return of the Warranty Registration Card. During the warranty period, we will repair or, at our option, replace at no charge a product that proves to be defective, provided you obtain return authorization from Comrex and return the product, shipping prepaid, to Comrex Corporation, 19 Pine Road, Devens, MA 01434 USA. For return authorization, contact Comrex at 978-784-1776 or fax 978-784-1717.

This Warranty does not apply if the product has been damaged by accident or misuse or as the result of service or modification performed by anyone other than Comrex Corporation.

With the exception of the warranties set forth above, Comrex Corporation makes no other warranties, expressed or implied or statutory, including but not limited to warranties of merchantability and fitness for a particular purpose, which are hereby expressly disclaimed. In no event shall Comrex Corporation have any liability for indirect, consequential or punitive damages resulting from the use of this product.

## SECTION 1

## INTRODUCTION

Congratulations on purchasing the Comrex ACCESS codec. This product is the next step in the evolution of audio transportation over networks. For Comrex, this began in 1976 with the introduction of the Frequency Extender, followed by ISDN codecs in the early 1990s and POTS codecs in 1996. So we've been doing this for a long time.

The ACCESS product is the result of years of our research into the state of IP networks and audio coding algorithms. This has all been in the quest to do what we do best, which is to leverage existing, available services to the benefit of our core customers - radio remote broadcasters.

The heart of this product is called BRIC (Broadcast Reliable Internet Codec). While others have introduced hardware coined "IP Codecs," this is the first product we're aware of that dares to use the word Internet "with a capital I." Given the challenges the public Internet presents, it's no small boast to say that this product will perform over the majority of available connections.

BRIC represents a change that is both desirable and inevitable for remotes. It's inevitable because, as available connections move from old fashioned "circuit switched" style to newer "packet switched" style, technology like ISDN and POTS codecs will begin to work less and less often. The desirability stems from the new wireless networks that will make remote broadcasting more mobile, simpler and less expensive. BRIC technology has been engineered not only to be robust enough for the Internet, but usable in really challenging Internet environments like 802.11x Wi-Fi, Wi-Max, 3G cellular and satellite based Internet connections.

Those of us here who have been remote broadcasters have been wishing for a system like this for a long time. As former broadcasters turned designers, it's our hope that this kind of enabling technology will tickle the imagination of the user, enabling more creative and entertaining programming to be broadcast from more diverse and interesting locations. Please let us know about your unique ideas and adventures by dropping us a note at [techies@comrex.com](mailto:techies@comrex.com).

## ABOUT BRIC

BRIC (Broadcast Reliable Internet Codec) is a breakthrough technology with hardware that will deliver audio over the public Internet in much the same way that ISDN and POTS codecs have performed in the past. BRIC consists of three pieces:

- Rackmount ACCESS codec (which you are using)
- Portable ACCESS codec
- BRIC Traversal Server

We will describe each piece independently:

1) Rackmount ACCESS codec — This product is designed for installation in a radio station's "remote rack" and is designed for "always on" operation. Hence the lack of a power switch. Also, it is envisioned that this product will be controlled entirely from a computer connected to the local LAN. There are no user controls on the ACCESS Rack (other than a recessed reset button) and the only indications are audio meters and a **Ready** light to indicate an incoming data stream. After initial configuration, all connection, status and diagnostics are available via the internal web server and Console Connection Interface.

2) Portable ACCESS codec — This product is engineered to provide the most convenience for the remote broadcaster on the road. It combines small size, battery power, clip-on mixer and headphone drivers with an audio codec capable of remarkable quality on the public Internet.

3) BRIC Traversal Server — This server exists on the public Internet at a fixed address and performs several functions. Its use is optional but makes connections between ACCESS codecs much simpler and removes worries about dynamic IP's, NATs, and other concerns that can make peer-to-peer connection over the Internet difficult (especially over tightly controlled networks like 3G or Wi-Fi). The BRIC TS provides the following functions:

- a) Communicates with all ACCESS codecs that are provisioned to work with it. It keeps a log of the IP address of every codec that wishes to be subscribed.
- b) Maintains a "keep alive" channel to each codec subscribed, allowing Traversal of firewall and Network Address Translators when receiving an incoming call.
- c) Provides each subscribed ACCESS codec with a "Buddy List" of other users, their current status, and will facilitate connection to them if desired.

*MORE ABOUT ACCESS  
RACK*

ACCESS Rack incorporates all the features, algorithms and services of BRIC as defined in the previous sections. Its main function is to provide a robust, high quality, low-delay audio link in full-duplex over challenging IP networks like the public Internet. To this end, it provides an intuitive and attractive *Web-based Interface* via web-browser and a direct connect *Console Connection Interface*. Using these interfaces, you can select operating modes, check audio levels, make and end connections, and check network statistics of any connections you make. While ACCESS is designed to handle most network challenges in its default configuration, advanced options are available to allow customization of parameters that have effect on link stability and delay.

But wait! There's more! ACCESS is also a POTS codec. It has a built-in modem which can be set to make calls over analog phone lines directly to other units. In this mode, ACCESS can communicate with other ACCESS devices, or with a range of previous generation POTS codec devices made by Comrex.

*WHAT COMES WITH  
ACCESS RACK*

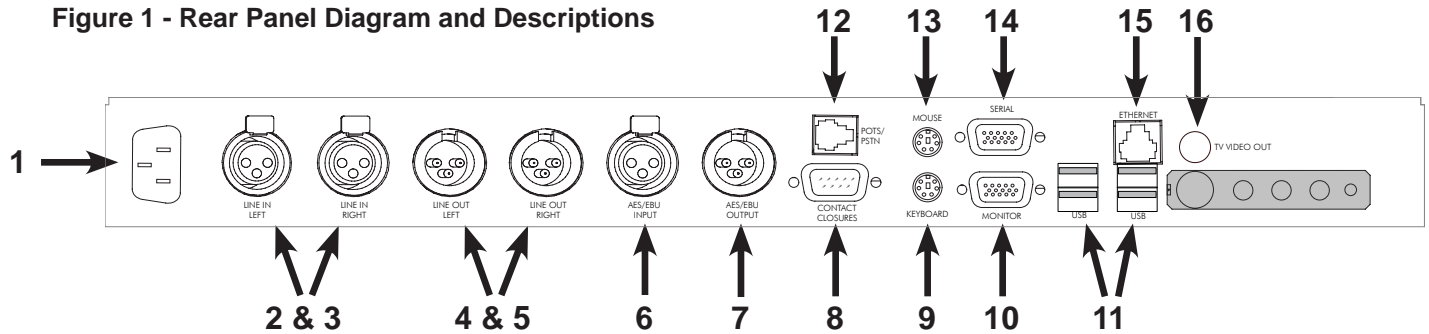
The following items are shipped with a new ACCESS Rack:

- (1) ACCESS Stereo BRIC IP Codec (Rackmount)
- (1) 6' Ethernet cable
- (1) 6' Telephone cable
- (1) AC Power cord
- (1) Operating manual
- (1) Warranty card (Please fill out and return)

## SECTION 2

## RACK DIAGRAMS AND INSTALLATION

Figure 1 - Rear Panel Diagram and Descriptions

**1) AC INPUT**

This is an IEC connector for the main power. ACCESS works on worldwide AC power at 110-240VAC 50-60Hz, auto detecting.

**2) AND 3) ANALOG AUDIO INPUT**

Apply balanced analog audio to be sent over the network here. Left channel is used for mono encoding modes. Level is set to 0dBu (0.775VRMS) nominal. Full scale input is +20dBu.

**4) AND 5) ANALOG AUDIO OUTPUT**

Balanced analog audio is available at these ports. Level is set to 0dBu (0.775VRMS). Full scale output is +20dBu.

**6) AES3 DIGITAL AUDIO INPUT**

Apply a stereo AES3 signal here. The AES3 input supports all standard sampling rates. When an AES3 signal is present on this connector, the analog input connectors are disabled.

**7) AES3 DIGITAL AUDIO OUTPUT**

A 48KHz AES3 stereo signal is available here. AES3 output is available simultaneously with analog. When the AES3 Input is active, the AES3 Output will lock to the sampling rate and clock signal of the Input.

**8) CONTACT CLOSURES**

Four sets of contact closure inputs and outputs are available on this port. These can be used to send signals to the far end of the link or to trigger remote control gear like automation equipment.

**9) KEYBOARD PORT**

Attach a PS/2 style keyboard here for accessing the *Console Connection Interface*.

**10) MONITOR OUTPUT**

Attach a VGA or better monitor here for obtaining IP addresses and accessing the *Console Connection Interface*.

**11) USB PORTS**

Available for use with an USB style keyboard and mouse. May also be used with some 3G USB wireless modems.

**12) POTS/PSTN**

Attach an analog telephone line here for POTS codec compatibility.

**13) MOUSE PORT**

Attach a PS/2 compatible mouse here, if required.

**14) SERIAL PORT**

Asynchronous ancillary data is available here.

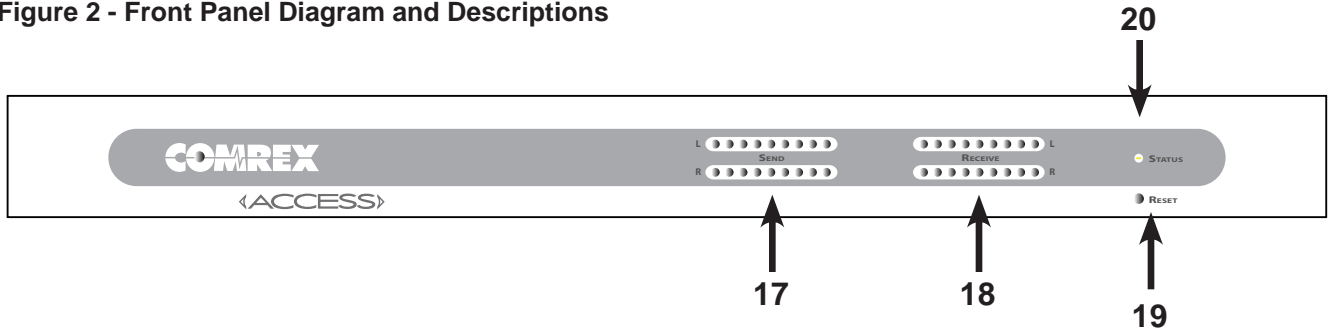
**15) ETHERNET PORT**

10/100BaseT Ethernet port for connection to your network.

**16) TV VIDEO OUT**

For future use.

**Figure 2 - Front Panel Diagram and Descriptions**



- 17) *SEND* Peak meter that displays the level of audio being sent locally into the ACCESS, regardless of whether or not a connection is active. Proper level is indicated by peaks driving the **Yellow LEDs**, while avoiding lighting the **Red LEDs** (which indicates clipping).
- 18) *RECEIVE* Peak meter that displays the level of audio being sent remotely when a connection is active. Proper level is indicated by peaks driving the **Yellow LEDs**, while avoiding lighting the **Red LEDs** (which indicates clipping). Adjustments to this level must be made on the far end of the link.
- 19) *RESET* Recessed button to send ACCESS into hardware reset mode. Approximately 30 seconds are required to reboot when this is pressed.
- 20) *STATUS* Indicates several states of **Ready**:  
 Off = Network ready, not connected to remote  
 Red = Network unavailable  
 Green = Connected to remote  
 Yellow = Connected to remote but no network (i.e. network connectivity lost during connection)  
 Slow Red Blink = Software update in progress  
 Fast Red Blink = Displaying unit IP address
- MONO VS. STEREO* ACCESS uses its left channel input only for *Mono Modes*. Right channel is ignored. Output audio is available at both the left and right outputs in *Mono Mode*.
- PINOUTS - AUDIO* ACCESS audio connections are balanced professional level inputs and outputs.

**Table 1 - XLR Pinout**

Pin 1	Ground
Pin 2	Audio +
Pin 3	Audio -

**Table 2 - AES3 Pinout**

Pin 1	Ground
Pin 2	Data +
Pin 3	Data -

*PINOUTS - CONTACT CLOSURE* Contact closures are available via the male 9-pin D connector on the back of the ACCESS Rack. Inputs are triggered by shorting the respective input to **Pin 5**. Outputs consist of an *open collector* circuit which, when inactive, will offer a high-impedance path to **Pin 5** and, when active, will offer a low impedance path to **Pin 5**. These outputs are capable of sinking up to 200mA at a voltage up to 12V. Do not switch AC mains power using these contacts.

**Table 3 - Contact Closure Pinouts**

Pin 1	Input #1
Pin 2	Input #2
Pin 3	Input #3
Pin 4	Input #4
Pin 5	Ground
Pin 6	Output #1
Pin 7	Output #2
Pin 8	Output #3
Pin 9	Output #4

*PINOUTS - SERIAL PORT*

The **Serial Port** is capable of transferring ancillary data to the far end of the connection. By default, the communication parameters are set for 9600bps, no handshaking, no parity, 8 data bits, one stop bit (9600,n,8,1). It is pinned on a 9-pin D female in DCE-style pinning. The port is designed to connect to a 9-pin PC serial port with a straight-through M-F cable. RS-232 levels are used.

**Table 4 - Serial Port Pinouts**

Pin #	Function	Direction
1	CD	Unused
2	RX Data	From ACCESS
3	TX Data	To ACCESS
4	DTR	To ACCESS
5	Ground	
6	DSR	From ACCESS
7	RTS	To ACCESS
8	CTS	From ACCESS
9	RI	Unused

## SECTION 3

## SETTING UP ACCESS

### *HOOKING UP*

At a minimum, ACCESS will need an audio connection and a network connection. Levels of all analog audio I/O is 0dBu (0.775V) nominal. This level will provide 20dB headroom before the clipping point. Input audio is reflected on the front panel LED based peak meters. Clipping is indicated by the **Red LED** on these meters.

### *ABOUT NETWORK CONNECTIONS*

ACCESS needs a network connection to be useful. On ACCESS Rack, the network connection is made via a standard 10/100baseT Ethernet connection on an RJ-45 connector.

In most ways, ACCESS will look like an ordinary computer to this network. In fact, ACCESS contains an embedded computer with a Linux-based operating system and a full network protocol stack.

ACCESS is perfectly capable of working over most LANs, but there may be situations where a LAN is heavily firewalled, subject to overloaded traffic conditions, or have security concerns. Better performance is possible if ACCESS has its own Internet connection. Often, it's worth the trouble to install a DSL line especially for ACCESS, especially if the cost is reasonable.

Since there may be bandwidth, firewall, and security concerns with installing ACCESS on a managed LAN, it is recommended that your IT manager be consulted in these environments. The details that follow assume a working knowledge of IT topics and network configuration.

### *SETTING UP ACCESS NETWORK CONNECTIONS*

We recommend putting ACCESS on a LAN and scoping out its functions before use. To do this, ACCESS must be given an IP address. This is the Internet location where you can connect to ACCESS through a web browser. It will also be the address used when another ACCESS is connecting to it.

Every device on an IP network must have a unique IP address. This is a number between 0 and 4,294,967,295, which is the range of values that can be represented by 32 binary bits. For simplicity, we break this 32-bit value into four eight-bit values and represent each as a decimal number (between 0-255) separated by dots. For example, the Comrex test IP number is 70.22.155.131.

A device with a public Internet connection can either have a public IP address (which is directly accessible by the Internet) or a private IP address, which is directly accessible only by the LAN on which it is connected.

Figure 3 shows connection of an ACCESS directly to the Internet using a public IP address. Figure 4 shows connection to a subnet (or LAN) using a private IP address, with a gateway router separating the LAN from the public Internet.

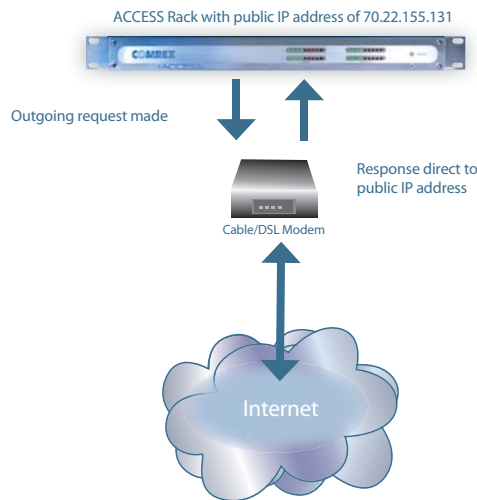


Figure 3 - Direct connection to Internet

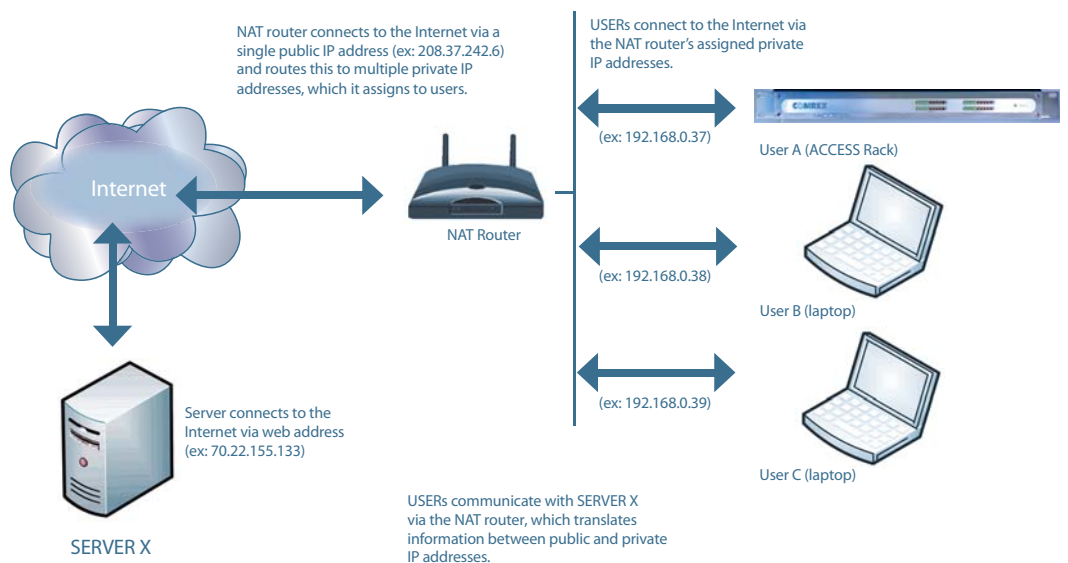


Figure 4 - Connection to Internet via subnet (or LAN)

To have the ability to make connections universally, in advance of the delivery of BRIC Traversal Server (BRIC-TS), one of the ACCESS in the link should be connected to a public IP address. This can be achieved several ways:

- 1) ACCESS can be the only device connected directly to its Internet link or it can share an Internet link that provides more than one IP address.
- 2) ACCESS can be connected behind a NAT router, which can be programmed to provide public Internet access to it through port forwarding.

But for now we'll assume you have a way to set up at least one end of your ACCESS link with a public IP. In a radio remote environment, this should probably be the studio end, since you will often have much less control on the remote side.

#### *DYNAMIC VS. STATIC ADDRESSING*

ACCESS can be set to its own, fixed IP address (referred to as *Static* in Internet-speak) or can obtain its address from the network (known as *Dynamic* or DHCP). This concept is entirely independent from the *Public vs. Private* concept. Public and private addresses can each be dynamic or static.

**Dynamic (DHCP)** — ACCESS is set by default to DHCP addressing, meaning that it looks to your network for assignment of an IP address. If your network has a DHCP server and this is the way you intend to use it, you don't need to alter any settings in the config program. You will, however, need to know what address is being assigned to ACCESS by the network. This is easily done by attaching a computer monitor to the VGA port on ACCESS before applying power. After ACCESS boots, it will display the current IP address on the monitor. Note: DHCP addresses can change over time, so you may need to recheck the address if you are having trouble connecting.

Finally, there's one other way to determine the IP address of ACCESS. If you're unable to put a computer monitor on the system, you can infer the IP address by what's displayed on the front panel LEDs for a few seconds during the boot process.

DHCP servers typically assign IP address in a standard format. This is because they must choose addresses that are not in use by the Internet at large. They will likely choose an address at one of 3 distinct ranges:

192.168.x.x                      172.16.x.x                      10.x.x.x

Also, on 192.168 style and 172.16 style subnets, the third entry will typically be a single digit (often 0 or 1). You can usually find out the DHCP assignment style by querying a Windows computer on the same LAN using Run->Cmd->ipconfig. If you know your DHCP server assigns addresses using one of the first two formats (or you know the DHCP assignment range on a 10.x.x.x network) you can usually derive the true IP address by the front panel LEDs. They will display a “coded” version of the IP address assigned for a few seconds during boot just before the ACCESS enters operational mode. During this time, the **Ready** light on the front panel flashes quickly, and the **Level** LEDs display the last 4 digits of the IP address. This is best shown by example:

Assume you are using a Linksys router on your network that has a built-in DHCP server. You may be aware that by default this router assigns IP addresses using the range 192.168.1.2-255. Let’s assume that when connected, the ACCESS is assigned an IP address of 192.168.1.7. The **LEDs** will display the last four decimals of this address (including zeros) so during boot you will see the following code:

L Send will display 1 LED  
R Send will display 0 LEDs  
L Receive will display 0 LEDs  
R Receive will display 7 LEDs

You can now assume that your ACCESS has the address of 192.168.1.007

**Static IP** — Setting a Static IP requires that you enter some details into the ACCESS. You will need to enter the following information via the *Console Connection Interface*:

- **IP address of the ACCESS** – make sure this has been provided by your ISP or that nobody else on your LAN is using this address.
- **Subnet Mask** – A series of numbers that indicate the range of your LAN addresses. If in doubt, try 255.255.255.0.
- **Gateway Address** – The address of the Internet gateway on your account. If in doubt, try the first three number of your IP address with the last digit of 1 (e.g. xxx.xxx.xxx.1).

More details on how to input this information are contained in the next section.

## SECTION 4

## GAINING ACCESS TO ACCESS VIA THE CONSOLE CONNECTION INTERFACE

The use of the *Console Connection Interface* is required when configuring the IP parameters. It also provides access to many of the features found in the *Web-based Interface*. We'll cover the *Console Connection Interface* here, and the *Web-based Interface* in later sections.

Using the *Console Connection Interface* requires that you attach a PS/2 or USB style keyboard and video monitor to the appropriate jacks on the rear panel of ACCESS Rack. You may also attach an USB or PS/2 style mouse to make navigation easier. When using the PS/2 style keyboard or mouse remove and re-apply power after connection.

*TOP AND BOTTOM  
NAVIGATION BARS*

As shown in Figure 5, all menus on the *Console Connection Interface* contain the top and bottom navigation bars, which contain shortcuts to various setup and status displays. The top bar contains four tabs:

- **Network** – Enable and disable the Ethernet Port or POTS Modem. Configure IP parameters.
- **Remotes** – Create and configure the addresses and profiles of the various outgoing connections. Essentially, this creates an editable “phone book” of places you connect to.
- **Stats** – View network performance data of active connections
- **Configure** – Create profiles for outgoing connections, manage how incoming connections are treated, and change configurations of additional features like audio switching, contact closures and incoming password security.

The bottom bar contains the following shortcuts:

- **Pickboard** – Allows use of the pop-up keyboard for text entry and eliminates the use of a PS/2 or USB style keyboard.
- **Chat** – Jumps immediately to the chat screen/pickboard, allowing text messaging to other ACCESS users.
- **F1/Arrow/Enter** – As shown in the legend on the bottom of the page, the **F1** key on the keyboard provides access to the pull-down menus and the **Arrow** and **Enter** keys are used to navigate.

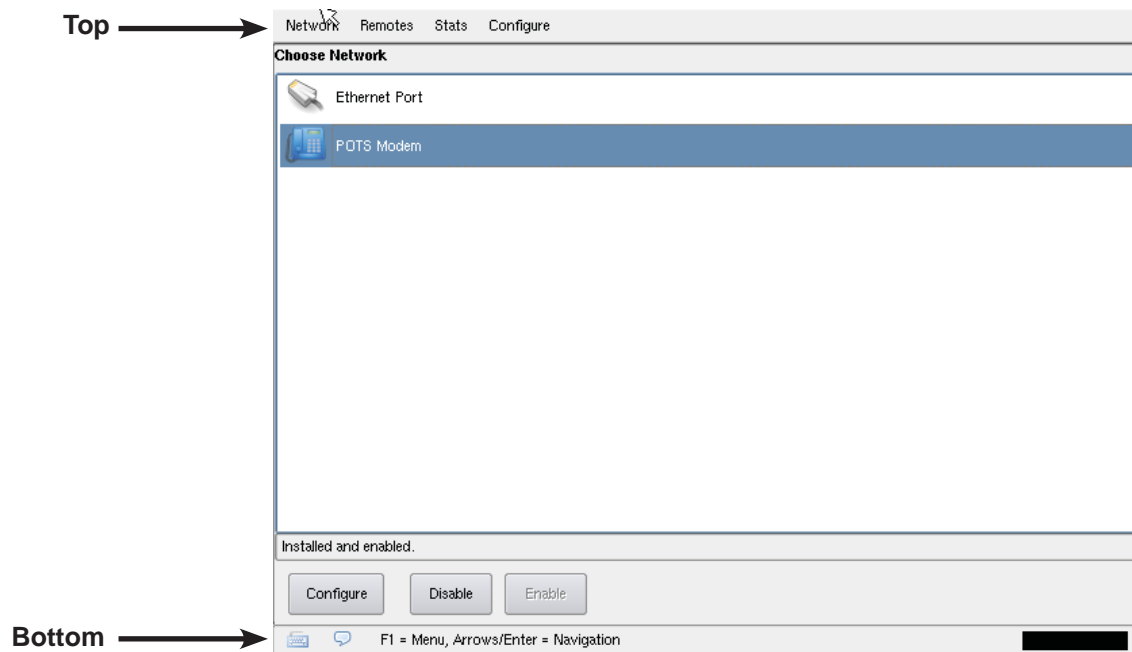


Figure 5 - Top and Bottom Navigation Bars

*NETWORK TAB*

The **Network Tab** is shown in Figure 5. The Ethernet port and POTS modem may be individually enabled and configured via this interface.

*NETWORK TAB - ETHERNET PORT SET-UP*

The main tab of interest in configuring the Ethernet port is shown in Figure 6, the **TCP/IP Tab**. Use the drop down menu to select one of the four configuration options for Ethernet - **Static**, **DHCP**, **PPPoE**, **Gateway**.

For DHCP (Dynamic) connections, simply select **DHCP** and the unit will automatically obtain the network settings.

If your connection requires a static, or fixed IP address, you can enter that along with your subnet mask and gateway information in the appropriate fields. DNS server is not required at this time, but may be used in the future so there's no harm in entering it if you know it.

The **Gateway** option is an advanced topic and is described in the *GATEWAY OPERATION* section. It should not be enabled for most applications.

After the Ethernet parameters are set, you may enable the Ethernet port. For DHCP connections, this will prompt ACCESS to acquire an IP address from the DHCP server. Enabling and disabling the Ethernet port is equivalent to "releasing" and "renewing" IP addresses. The acquired IP address will appear on the bottom bar of this display.

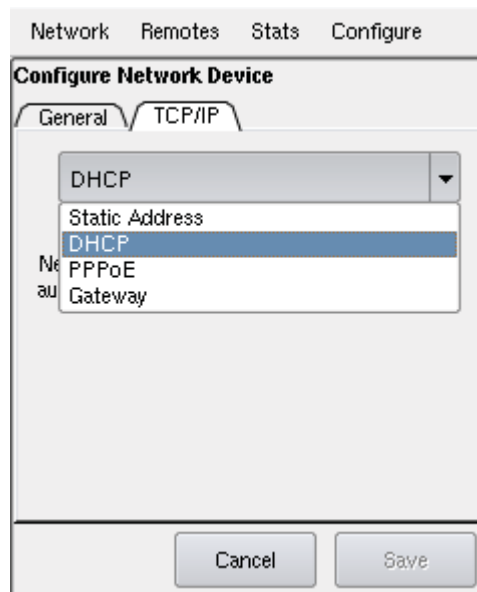


Figure 6 - TCP/IP Tab for Ethernet Port Configuration

*NETWORK TAB - POTS  
MODEM SET-UP*

The modem in the ACCESS can be configured for either *Non-PPP Mode* or *PPP Mode*, as shown in Figure 7. Most users may leave the default settings.

The screenshot shows a window titled 'Configure Network Device' with a menu bar containing 'Network', 'Remotes', 'Stats', and 'Configure'. Below the title bar are two tabs: 'General' and 'Modem'. The 'Modem' tab is active and contains the following fields and controls:

- 'Phone Number' text input field
- 'User Name' text input field
- 'Password' text input field
- 'Modem Init String' text input field
- A checkbox labeled 'PPP enabled' with the text '\*Leave disabled for Matrix/Vector compatibility' below it.
- 'Cancel' and 'Save' buttons at the bottom.

**Figure 7 - POTS Modem Configuration Tabs**

*Non-PPP (POTS Codec) Mode* is the default setting. This is used to place a call to another codec directly over the telephone line with no Internet Service Provider involved. This is the only mode available to connect to other Comrex POTS codecs. Because of the narrow bandwidth of dial-up Internet connections, use of *POTS Codec Mode* is strongly preferred over modem *PPP Mode*. No options are available for *Non-PPP Mode*. The extra modem init string for this mode is done in the **System Settings Tab** (the **Advanced** box must be selected in order for this option to appear).

*PPP Mode* allows the use of a dial-up Internet Service Provider. Configure your ACCESS with your ISP information. The ACCESS will function like an IP codec over the link, connecting to other ACCESS IP addresses.

*PPP Mode* should only be used when connecting to an Internet Service Provider via the modem. In this mode, you will need to enter the phone number, user name and password settings provided by your ISP.

Once your ISP parameters are configured, you may enable the modem and the call to your ISP will be dialed automatically. This call will be maintained until the modem is disabled in the **Network Tab**.

Connections in this mode are placed in the same way that normal IP connections are placed. A remote connection must be built using one of the non-POTS based profiles and the address must be an IP address.

*PPP Mode* depends on the modem connect rate and many codec profiles will not fit within the PPP channel. We recommend use of the *ULB Mode* for most reliable connections over modem PPP.

### REMOTES TAB

The **Remotes Tab** (shown in Figure 8) is the first screen to appear when the system is turned on. It allows you to define and edit your outgoing connections, as well as indicate the presence of incoming connections.

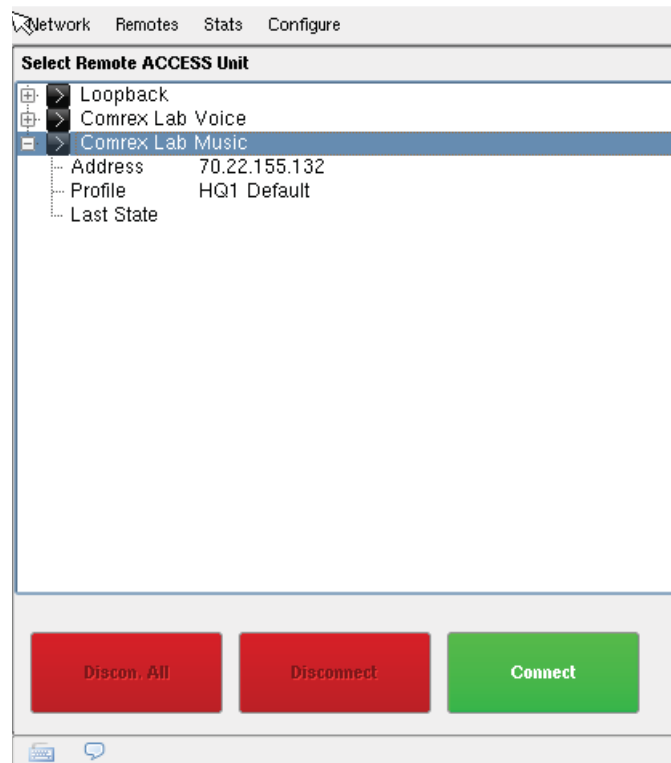


Figure 8 - Console Connection Interface Remotes Tab

By default, three remotes are already present on the **Remotes Tab**, and can be used immediately for testing. You may add to this list by pulling down the **Remotes** menu and selecting **Add New Remote**. This display is shown in Figure 9. You will need to input a name for this remote (which can be anything), as well as the destination IP address (or phone number for a POTS call). Finally, you must choose one of the pre-defined profiles to dictate how each direction of the connection behaves. Several factory defined profiles exist for commonly used configurations, and you can create your own (described in the *Console Connection Interface CONFIGURE TAB* section).

Optionally, you may add a password to this outgoing remote for connection authentication. In this case, the incoming ACCESS must also be programmed with the matching incoming password.

Network Remotes Stats Configure

**Add New Remote**

General

Name Studio

IP/Phone #

Password

Settings Profile

Profile HQ2 Default

Backup Behavior

Backup Remote (No backup)

Automatically fall forward

Cancel OK

Figure 9 - Add New Remote Screen

Finally, you may specify how the unit is to behave when connection is lost to this remote (see *BACKING UP A CONNECTION* in the *Web-based Interface* section).

Once a connection is added, it will appear in the main remotes list. Return to the list by selecting **Remotes** and then **Manage Connections**. If you expand your chosen remote with the + option, the system will display the destination IP address and the profile for that remote. Remotes will remain in this list until they are deleted or the configuration of the entire system is reset.

Existing remotes may be edited by highlighting one and selecting **Remotes** and then **Change Remote Settings**.

Incoming connections are displayed by their IP address, or, if also configured as outgoing connections, by their names. Incoming POTS connections are displayed as “incoming”.

To make a connection, be sure your network is configured and enabled in the **Network Tab**. Then, from the **Remotes Tab**, simply select an outgoing connection and choose **Connect**. Choose **Disconnect** to end a connection. If more than one connection is active, select **Disconnect All** to end all connections (see *SECTION 10 MULTI-STREAMING*).

## STATS TAB

ACCESS provides lots of information on the **Stats Tab** about network performance. This information is divided into **Channel Stats**, which provides information about all incoming and outgoing data, and **Peer Stats**, which gives detailed information regarding the decoder buffer manager's functions. Both sets of information are available on a text-tree basis, as well as graphical real time charts showing historical performance.

As shown in Figure 10A, the **Channel Stats** provide real-time graphs of outgoing and incoming packets. Each column represents one second of outgoing data, segmented into audio coding data (blue) and overhead like IP/UDP headers, RTP headers etc (light blue).

The *Numeric Channel Stats* tab (Figure 10B) gives an indication of the same values instantaneously, as well as the total amounts of incoming and outgoing data in bytes for the current connection. This information can be helpful when operating on data networks with per-megabyte transfer charges. If you do not have an unlimited data plan you may want to keep track of overall data usage and optimize your connection profile for the most efficient transfer settings. For additional information on choosing encoding algorithms and other ACCESS settings see *SECTION 14 ADVANCED TOPICS*. These totals reset once the connection is closed.

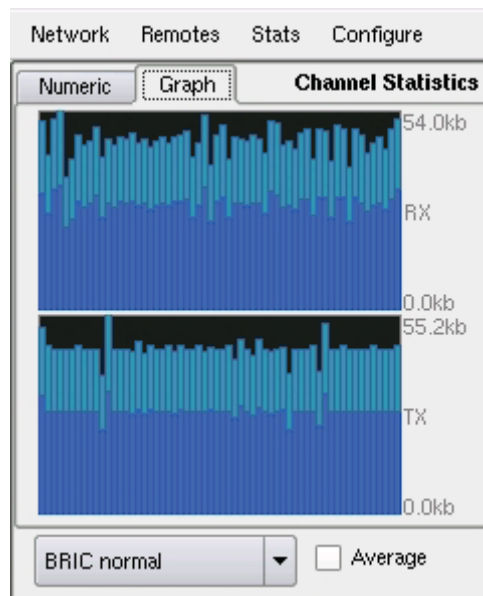


Figure 10A - Channel Stats in Graph Format

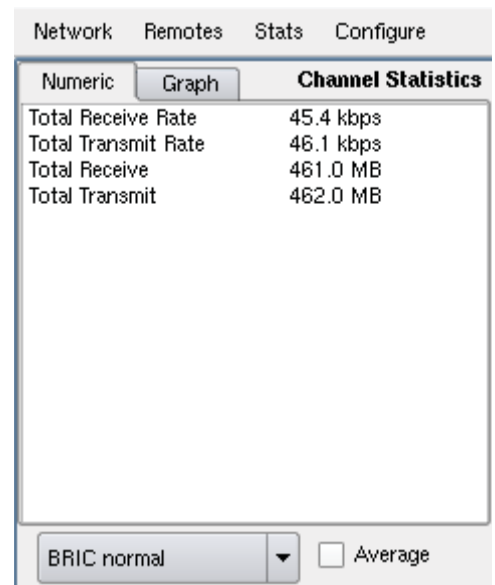


Figure 10B - Channel Stats in Numeric Format

The **Peer Stats** display is shown in Figure 11A. The top graph represents the work of the **Jitter Buffer Manager**. The area of most interest is the light blue area as shown in the diagram, which illustrates a spread of jitter values (referenced to the current playout pointer) over the last second. If this area covers a large span, the relative jitter is high. If the light blue section of the graph is small or invisible over a time period, there has been very little jitter present.

Based on the historical value of this jitter figure, the buffer manager will expand or contract the receive buffer (lengthening and shortening overall delay). The time interval over which this measurement is assessed is called the “jitter window” and is adjustable in the **Advanced Profile** editor.

The work of the **Jitter Buffer Manager** is shown by the green line, which is the target buffer delay that the system is trying to achieve, based on measurements done over the jitter window.

The lower half of the **Peer Stats** display shows a real time and historical representation of frame loss. If the decoder does not receive packets in time, the chart will show a red line indicating percentage of lost packets over the one second interval.

The **Numeric Peer Tab** (Figure 11B) gives an indication of the same values instantaneously, as well as call duration and other parameters.

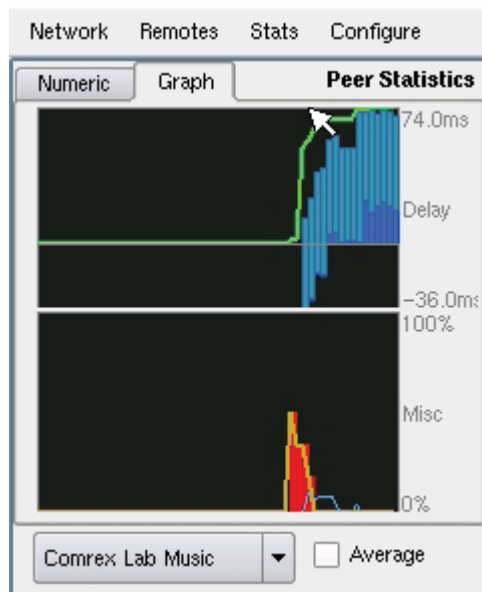


Figure 11A - Peer Stats in Graph Format

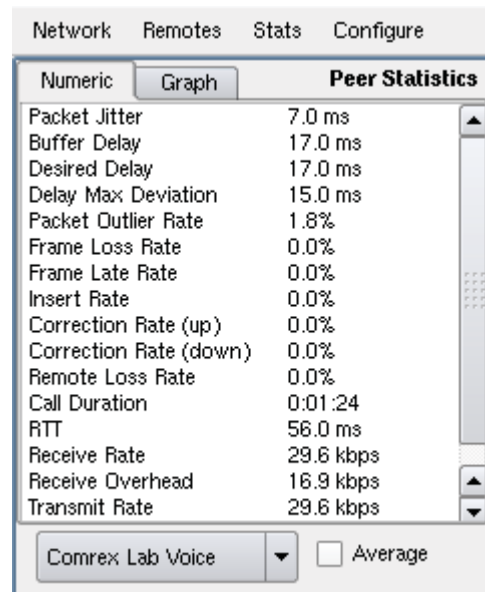


Figure 11B - Peer Stats in Numeric Format

*AUDIO LEVEL TAB*

The **Audio Level Tab** displays current input and output audio levels in a digital format. The scale may be set for either dBu or dbFS, as shown in Figure 12.

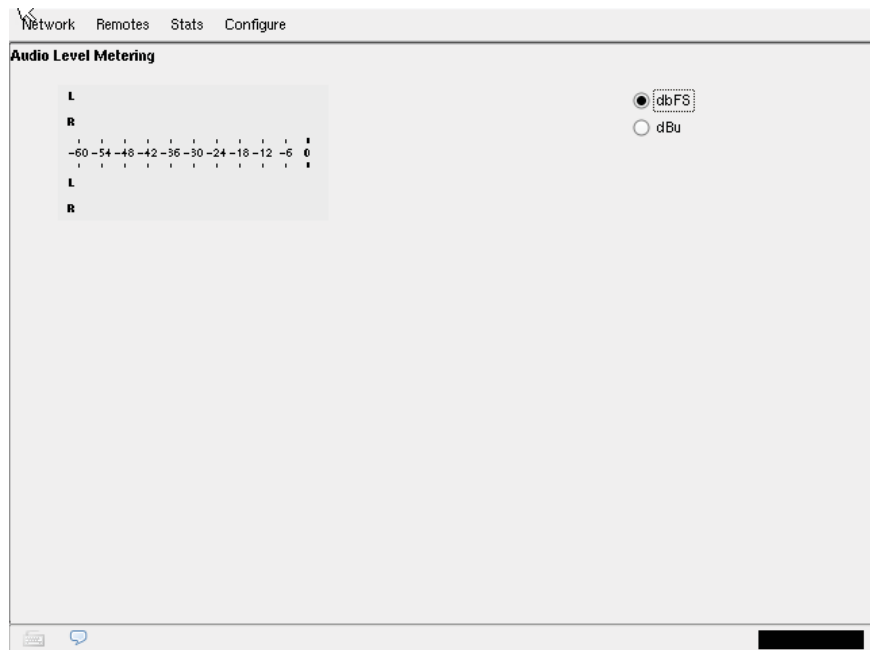


Figure 12 - Audio Metering

*CONFIGURE TAB*

The **Configure Tab** allows you to set up any global options on ACCESS, as well as create custom profiles to determine the performance of outgoing connections. Since these options are many, they are treated individually in the next section.

## SECTION 5

## CONFIGURING ACCESS VIA THE CONSOLE CONNECTION INTERFACE

The **Configure Tab** offers choices on two layers as shown in Figure 13; The first two commonly used functions, followed by additional, less often used functions.

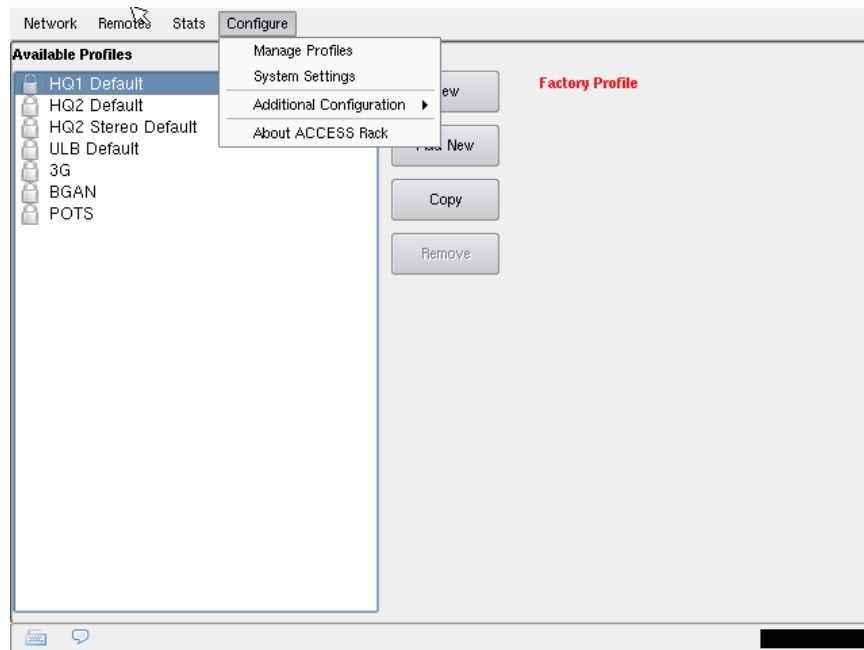


Figure 13 - Configure Tab Pull Down Menu

### MANAGE PROFILES

Because ACCESS has many options to optimize individual connections, it includes the concept of **Profiles**, which allow you to define the behavior of a connection in both directions. **Profiles** are separate from the concept of **Remotes**, which define the address to which to connect. A pre-defined **Profile** can be assigned to multiple **Remotes** (and multiple remotes may be defined to the same address which can have different profiles).

ACCESS comes with a series of profiles that are optimized for the majority of IP and POTS connections. Many users may never have the need to define their own profiles. But many advanced options are available to help with troublesome remotes, or remotes with special requirements. In this way, you can build a profile having these advanced options and assign them to one or all remotes you've defined. When using ACCESS, the point where the connection originates controls all available connection parameters in both directions. Keep in mind that these profiles are useful only for connections initiated from the local ACCESS. Incoming connections are defined by the ACCESS at the other end.

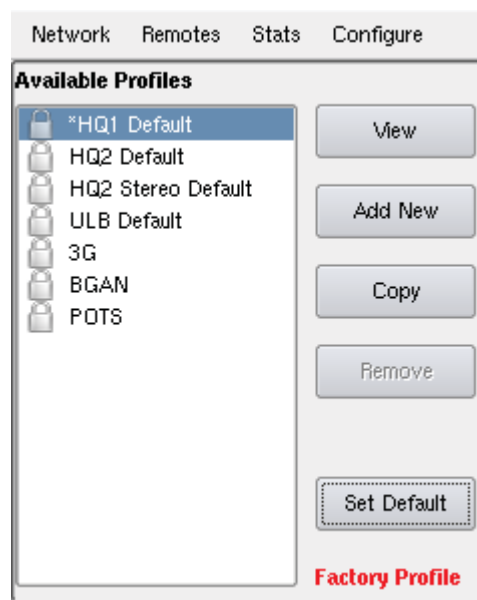


Figure 14 - Available Factory Profiles

Several factory profiles are available (as shown in Figure 14), and these may not be edited by the user. Here's a short description of each:

**POTS** – Profile used for connections over the modem directly to other ACCESS or other Comrex POTS codecs (not through the internet).

**BGAN** – Profile optimized for use over INMARSAT BGAN terminals. This profile keeps the entire data stream beneath the limit for 32K streaming service, which is the most economical mode for use on BGAN. This mode provides a robust, medium delay mono stream in the forward direction, and a low delay mono stream in the reverse direction.

**3G** – This mode is optimized for use over 3G wireless networks like UMTS, EVDO, and HSDPA. Because 3G networks are usually asymmetrical (they have higher download speeds), this profile delivers a robust, medium delay mono stream in the upload direction, and two, independent low delay mono streams in the reverse direction. These two streams can be useful as separate program and cueing channels, as an example.

**ULB Default** – This profile is best for challenging IP connections. It uses a very small bandwidth stream (14 kb/s) and delivers two-way 7KHz mono voice audio. Not useful for music. For more details, see the algorithms section.

**HQ1 Default** – This is the default choice of profiles for new remotes. It provides a low delay, full duplex, 15KHz mono audio channel over a small (28kb/s) data stream.

**HQ2 Default** – Although this profile adds substantial additional delay (350mS each way), it is extremely robust and performs well over connections that are prone to packet loss. It provides 15KHz two-way mono audio over small (24kb/s) data streams.

**HQ2 Stereo Default** – This profile offers a stereo stream using only around 30kb/s. It has the same delay and robustness aspects as HQ2 default above. The stereo stream created needs to have correlation between left and right channels (i.e. you can not send independent programming down each channel).

**BUILDING PROFILES**

Custom profiles are easy to create on ACCESS. You may create one from scratch by selecting **Add New** on the profile display, or copy an existing profile using the **Copy** button.

Profile creation is segmented into commonly used and advanced options. In order to simplify the interface, **Advanced Options** are normally hidden from the user. Please refer to the *Web-based Interface ADVANCED PROFILE OPTIONS* section for complete details.

Remember, building a profile doesn't change how any remotes are connected until that profile is assigned to a remote on the **Remotes Tab**. Once a profile is defined, it will be available on the **Remotes Tab** to be assigned to any defined connection.

You may also select a profile to be the **Default Profile** when creating new remotes. Simply highlight the desired profile and press **Set Default**. This profile will be used on all new remotes unless a different one is selected from the Profile drop-down menu in the **Add New Remote** screen.

To build a new profile, select **Add New** (#1 in Figure 15) and a new profile appears on the list labeled **New Profile**. Select it and press **Edit**, and you'll see a list of options segmented into three categories - **Global Settings**, **Local Settings** and **Remote Settings**. To edit an option, choose it and select **Edit**.

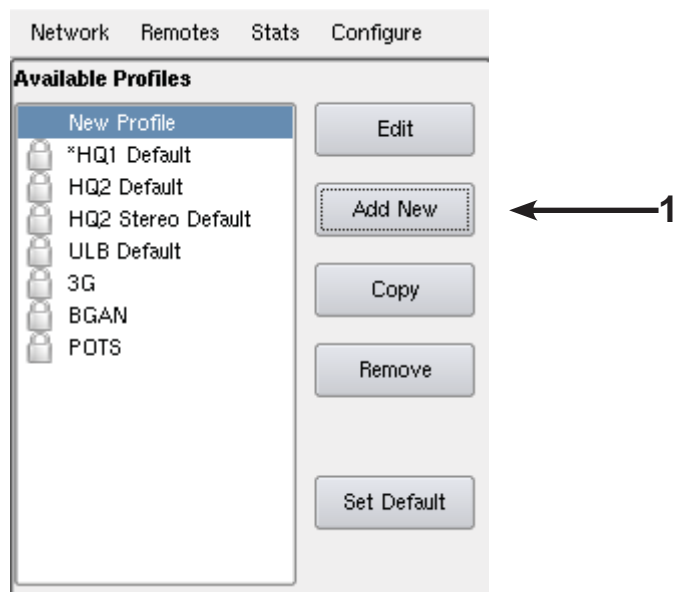


Figure 15 - Building a New Profile

## PROFILE SETTINGS

**Profile Name** – Here you can rename the profile to something that will help you remember it.

**Channel** – Here you can select whether this is an IP connection (BRIC normal) or a modem based connection (which uses the telephone line rather than an IP network). The three other available options – Multicast, Standard RTP and TCP, are discussed in later sections. *Note: It's important to define the channel of a profile before moving on to other options, since the choices in the subsequent sections will vary, depending on this selection.* Make sure to press **Save** in order to confirm your selection.

**Visible** – Here you can select whether this profile will be available as an option when setting up or editing **Remote Settings**. If you select **No**, the profile will not be visible in the **Profile** select pull-down in **Remote Settings**. This feature is useful to remove factory and user profiles that will not ever be used. *Note: You will notice that there is no Edit button when a factory profile is selected in Manage Profiles. To change the Visible option for these profiles, select the desired factory profile and press View. You can then highlight the Visible option and then press Edit. Visible is the only setting you can change for factory profiles.*

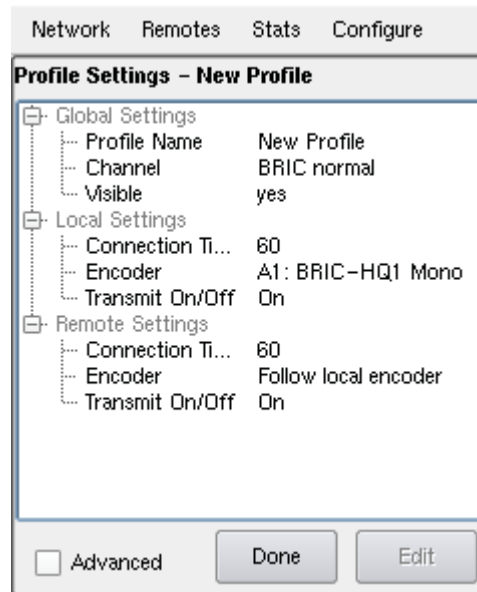


Figure 16 - Profile Settings for a New Profile

The **Local, Remote and Advanced Options** on the *Console Connection Interface* are similar to using the *Web-based Interface*. Please refer to *BUILDING A PROFILE* and *ADVANCED PROFILE OPTIONS* in the web-based sections for complete details.

## SYSTEM SETTINGS

The **System Settings Tab** defines parameters that are not specific to a particular remote connection. Examples are how incoming (POTS and IP) calls are handled, global modem settings, and how the contact closures are assigned. The **System Settings Tab** is shown in Figure 17.

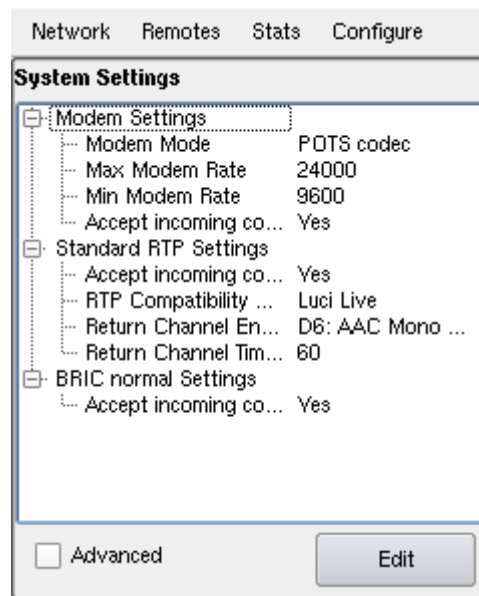


Figure 17 - System Settings Tab

The **Systems Settings** screen has three categories: **Modem Settings**, **Standard RTP Settings** and **BRIC Normal Settings**. As with the **Profile Manager**, basic options are shown by default. Less used options are hidden until the **Advanced** box is clicked. These advanced options are similar in the *Web-based Interface*, please refer to the *ADVANCED SYSTEM SETTINGS* section on pages 55-56.

- **Modem Settings** – #1 in Figure 18 determines which of the two POTS modes is to be used for incoming calls. One limitation of ACCESS' *POTS Codec Modes* is that both ends must be set correctly for POTS codec calls to work. The default setting is **POTS codec**, which causes ACCESS to answer incoming POTS calls that are compatible with ACCESS, Matrix, BlueBox and Vector codecs (but not Hotline). The other option is **Stereo POTS**. *Stereo POTS Mode* provides a stereo audio signal over a single dial-up phone connection. It utilizes a POTS-optimized version of the *HQ2* algorithm. This mode utilizes intensity stereo coding, so channels may not be used to send uncorrelated audio material i.e they must be left and right channels of a stereo feed. See *SECTION 8 POTS CODEC CONNECTIONS* for more information.

Again, ACCESS does not have the ability to adapt between the two types of POTS calls it supports. The proper mode must be selected before an incoming call of that type is received.

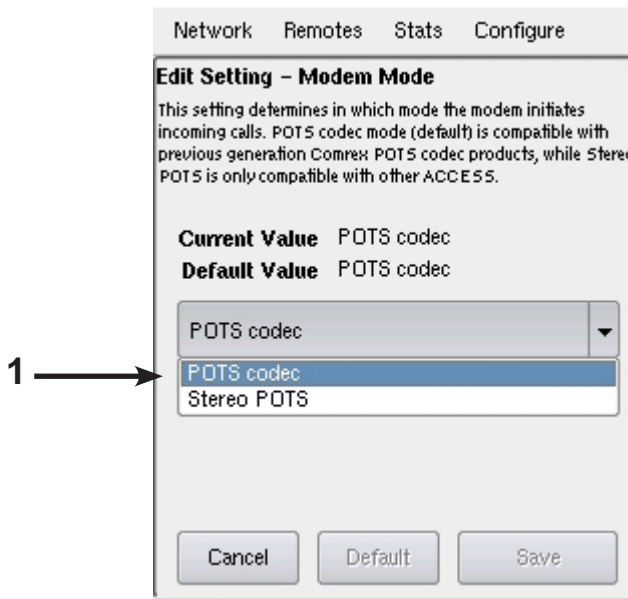


Figure 18 - Modem Mode Options

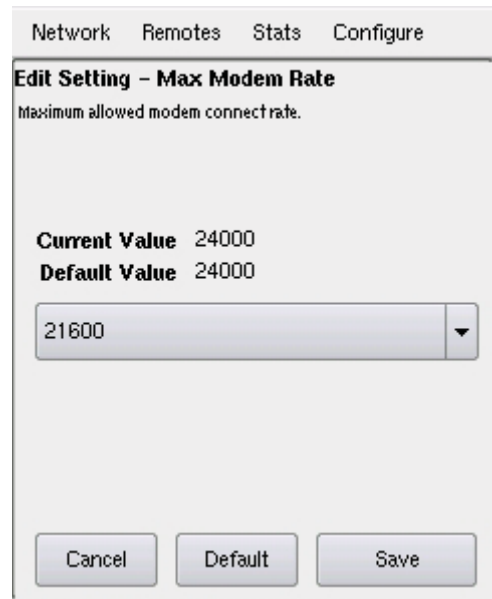


Figure 19 - Modem Connect Rates

Figure 19 shows options for setting the minimum and maximum connect rate for the modem. The setting will affect the connect rate on both ends of the call e.g if unit A has a max rate of 28800 and unit B has a max rate of 24000, the rate will be constrained by the lowest setting of 24000 on both ends.

The last **Modem Settings** option determines whether incoming calls are accepted. If this is not selected, ACCESS can not receive incoming POTS calls.

- **Standard RTP Settings** – This setting offers several modes that allow compatibility with other IP coding devices. For complete details please review the *IP COMPATIBILITY* appendix of this manual.
- **BRIC Normal Settings** – #1 in Figure 20 determines if this ACCESS is to be used for incoming normal IP connections. If this function is not enabled ACCESS will only support outgoing calls using *BRIC Normal Mode*.

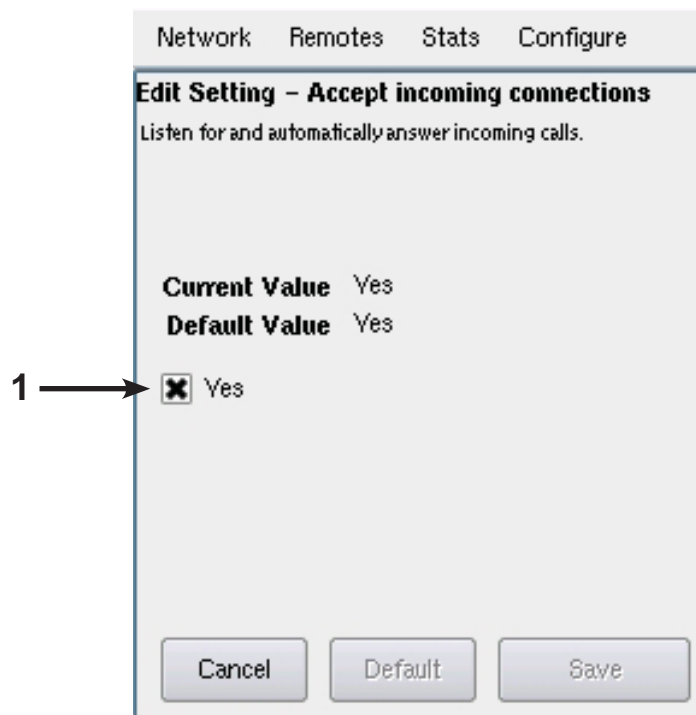


Figure 20 - Incoming Connection Option

*ADDITIONAL CONFIGURATION* Several less used options are available under **Additional Configuration**. These options define things like remote access and passwords.

*SECURITY - PASSWORD TAB* The **Security Settings** option is divided into three tabs - **Passwords**, **Ports** and **Options**. The first section in the **Passwords Tab** (#1 in Figure 21A) allows you to define a password that must be attached to all incoming connections before they are accepted. Units placing outgoing connections to you must know this password and apply it to their outgoing stream. Leaving the field blank will disable this function.

The second section in the **Passwords Tab** (#2 in Figure 21A) allows you to define a password for the web page login screen and firmware updater. The default password is comrex (lower case).



Figure 21A - Security Settings - Passwords Tab

*SECURITY - PORTS*

The second tab under **Security Settings** defines which ports are used for remote control and upgrading firmware on the ACCESS.

**Web Server Port** - In order to deliver the remote control web page, ACCESS must “listen” on a certain Internet port number for a request from a web browser. By default, web page servers listen on port 80 for incoming requests. In some environments, you may wish to remote control the ACCESS through your router, and port 80 may already be utilized by another device. This tab gives you the ability to change the port where the system listens for and delivers web pages from.

As shown in Fig 21B, change the value of the **Web Server Port** field to alter this setting. Note that you will now need to enter this new port number into your browser in order to see the unit. As an example, if the **Web Server Port** is changed from 80 to 8000, the address of the unit must be entered in a browser in the following manner: `http://192.168.1.142:8000`

The screenshot shows a web interface with a navigation bar at the top containing 'Network', 'Remotes', 'Stats', and 'Configure'. Below this is the 'Security Settings' section, which has three sub-tabs: 'Passwords', 'Ports', and 'Options'. The 'Ports' tab is selected. Under the 'Ports' tab, there are two sections: 'GUI' and 'Web Server'. Each section has a 'Port' label and a text input field with up and down arrow buttons. The 'GUI' port is set to 8080, and the 'Web Server' port is set to 80. At the bottom right of the form is a 'Save' button.

Figure 21B - Security Settings - Ports Tab

The second tab under **Security Settings** defines which ports are used for remote control and upgrading firmware on the ACCESS.

**Web Server Port** - In order to deliver the remote control web page, ACCESS must “listen” on a certain Internet port number for a request from a web browser. By default, web page servers listen on port 80 for incoming requests. In some environments, you may wish to remote control the ACCESS through your router, and port 80 may already be utilized by another device. This tab gives you the ability to change the port where the system listens for and delivers web pages from.

As shown in Fig 24B, change the value of the **Web Server Port** field to alter this setting. Note that you will now need to enter this new port number into your browser in order to see the unit. As an example, if the **Web Server Port** is changed from 80 to 8000, the address of the unit must be entered in a browser in the following manner: `http://192.168.1.142:8000`

#### SECURITY - OPTIONS

In the **Options Tab** (Figure 21C) you have to ability to determine whether the Ethernet **Remote Control** option is enabled. If this function is disabled, the unit will not serve any web page from its IP address, and the firmware updater will not function. If this option is enabled, you should define a password that will be used to enable both functions.



Figure 21C - Security Settings - Options Tab

**Enable Diagnostic Remote Access (SSH)** provides the ability for Comrex support to connect to this unit using the SSH protocol in order to troubleshoot. We recommend leaving this option enabled, since SSH access requires a key value that is not disclosed by Comrex, generic SSH requests are rejected.

The last selection in the **Options Tab** allows you to disable the *Safe Shutdown* feature. The ACCESS will spend approximately five seconds in powering down its systems safely. We recommend allowing this process to complete before disconnecting all power sources.

#### CONTACT CLOSURE

Figure 22 shows the system **Contact Closure/Auto-connect** options. All of these features are explained in detail under the *Web-based Interface SYSTEM SETTINGS TAB* section of the manual.

The screenshot displays the 'Contact Closure Settings' configuration page. At the top, there are navigation tabs: 'Network', 'Remotes', 'Stats', and 'Configure'. The main content area is titled 'Contact Closure Settings' and is divided into three sections:

- Always Connect To:** A dropdown menu currently set to '(no auto-connect)'. A mouse cursor is visible over the 'Stats' tab above this section.
- Connect on Contact Closure:** Four numbered dropdown menus (#1, #2, #3, #4), each currently set to '(no auto-connect)'. A mouse cursor is visible over the first dropdown menu.
- Contact Closure Output:** A checkbox labeled 'Activate CC4 out when connected', which is currently unchecked.

A 'Save' button is located at the bottom right of the settings area. At the very bottom of the page, there is a footer with a keyboard icon and the text 'F1 = Menu, Arrows/Enter = Navigation'.

Figure 22 - Contact Closure/Auto-connect Settings

*AUXILIARY SERIAL PORT*

This display, shown in Figure 23, allows you to set the parameters of the auxiliary serial data port provided on the ACCESS. This port is always active during an IP connection and allows serial data transfer along the same path used for the audio data. It does not remove any audio data; the serial data is added to the packets and bandwidth is increased to support the additional data. For this reason heavy use of serial data can affect overall codec performance. Settings are available for baud rate, parity, data bits, stop bits, and flow control. Most users will leave the defaults of 9600,n,8,1 with no flow control.

**Figure 23 - Auxiliary Serial Port Settings**

*RESET CONFIGURATION*

This option will restore your ACCESS software to factory default settings. **WARNING:** All settings, profiles, remotes and other changes will be lost in this procedure. This function is not reversible and should be used only as a last resort to restore factory settings.

*RESTRICTED USER MODE*

ACCESS has many administrative features that are often unnecessary for the casual user. *Restricted User Mode* allows you to “hide” options that would confuse non-technical users, allowing them only to connect and disconnect calls, enable and disable available networks, and change the audio settings.

*Restricted User Mode* is enabled and disabled using the **Additional Configuration** pull-down menu. It is not password protected, and can easily be disabled by any user.

## SECTION 6

## GAINING ACCESS TO ACCESS VIA THE WEB-BASED INTERFACE

*ACCESS WEB-BASED  
INTERFACE*

Once your IP settings are configured and ACCESS has cleanly booted on your LAN, it's time to take a look at the *ACCESS Web-based Interface*. This is done by pointing a web browser on your LAN to the ACCESS IP address. To do this, simply type the address into the URL bar of your browser. You will need Internet Explorer 6 or higher or Mozilla Firefox 1.0 or higher with Macromedia Flash plug-in 7 or higher. Opera 8.5 works well also. If you experience trouble connecting to ACCESS, be sure you have the latest Flash Plug-in installed by right-clicking your mouse in the main browser window and selecting "about Macromedia Flash." This will take you to the Macromedia website where you can download the latest free plug-in.

Once you are connected to ACCESS, a login screen will appear (see Figure 24). Key in any user name along with the default password (comrex, case sensitive) to get to the *Main User Interface* display. This display is optimized for full-screen mode (F11 on most browsers) on a 1024x768 display.

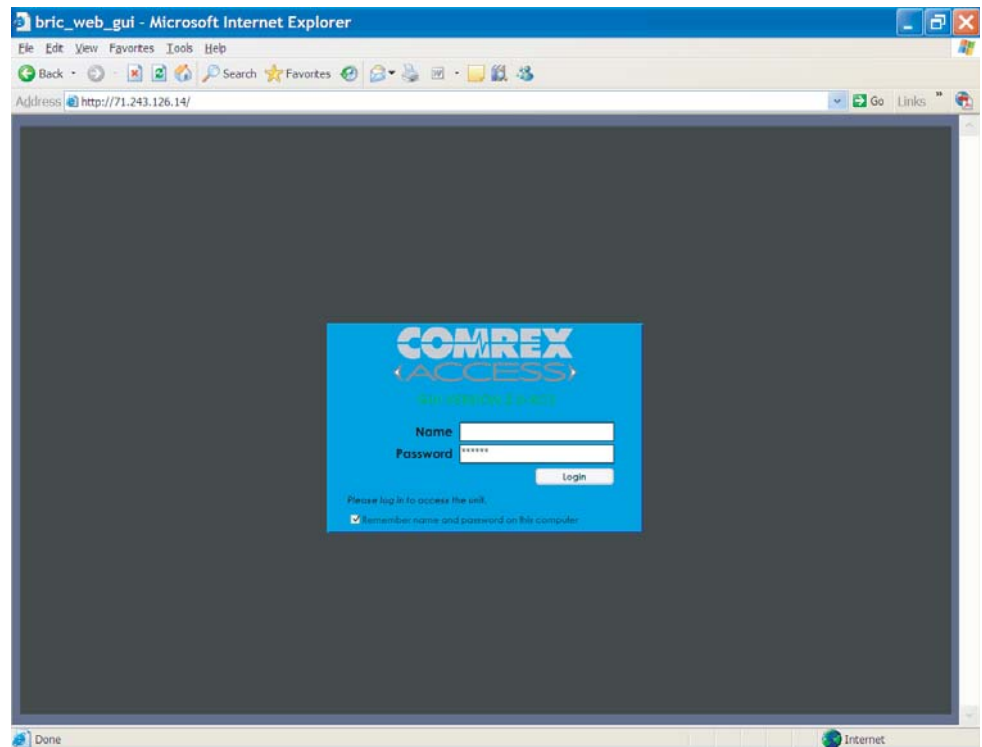


Figure 24 - Web-based Interface Login Screen

There are three main parts to the *ACCESS Web-based Interface* screen:

- 1) **Main Audio Meter** — The level meters are defaulted to off to conserve bandwidth and client CPU, but when these are enabled this top bar emulates the front panel of ACCESS.
- 2) **Tabs** — Use these tabs to control and obtain status of ACCESS. They are described in detail in the next four sections.
- 3) **Chat Window** — Allows for a chat utility between any users that are logged into that particular ACCESS web interface. In addition, when ACCESS is connected to a remote user, chat text will appear from any users logged into the remote web interface.

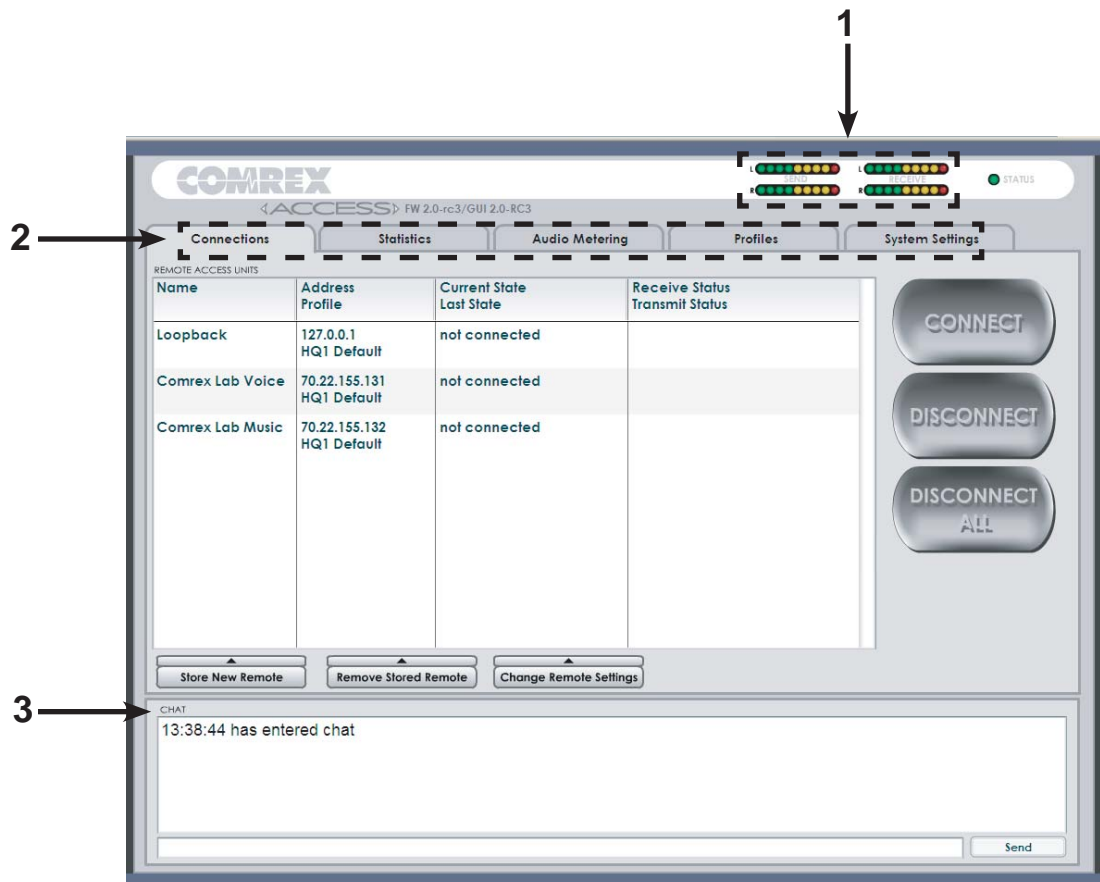


Figure 25 - Web-based Interface Screen

*CONNECTIONS TAB*

The **Connections Tab** is the default setting for the *Web-based Interface* (as shown in Figure 25). In this tab you can program and save the names and addresses of any remote units you connect to. This allows custom programming of policy parameters for each remote and allows point-and-click connect and disconnect. To add a remote ACCESS to the list, simply click **Store New Remote** in the lower section. An input box will appear allowing you to enter a user name (which can be anything) and the IP address of the unit. You will also need to choose a profile to use when connections to that remote are initiated. To get started, simply choose one of the default profiles provided (we'll show you how to build your own later). You may remove any stored value simply by highlighting and clicking **Remove Stored Remote**. Stored remote addresses are saved to system memory, where they will remain through power cycles.

The **Connection Tab** will also display **IP** and **Status** information of a remote ACCESS when it has initiated a connection to you. Their information will only appear while the connection is active.

By default, three users appear on the list. You may use any of these to test different encoder modes.

- 1) **Loopback** — Allows for connection between encoder and decoder in the same system.
- 2) **Comrex Lab Voice** — Allows testing back to the Comrex headquarters in Massachusetts, USA.
- 3) **Comrex Lab Music** — This additional user provides a music feed from the Comrex lab.

## STATISTICS TAB

The information in the **Statistics Tab** either can be updated instantly or the system can provide a moving average of information over an interval of one second. The **Statistics Tab** defaults to **Moving Average** but can be changed to **Instantaneous** using the radio button in the upper right corner, shown as #1 in Figure 26.

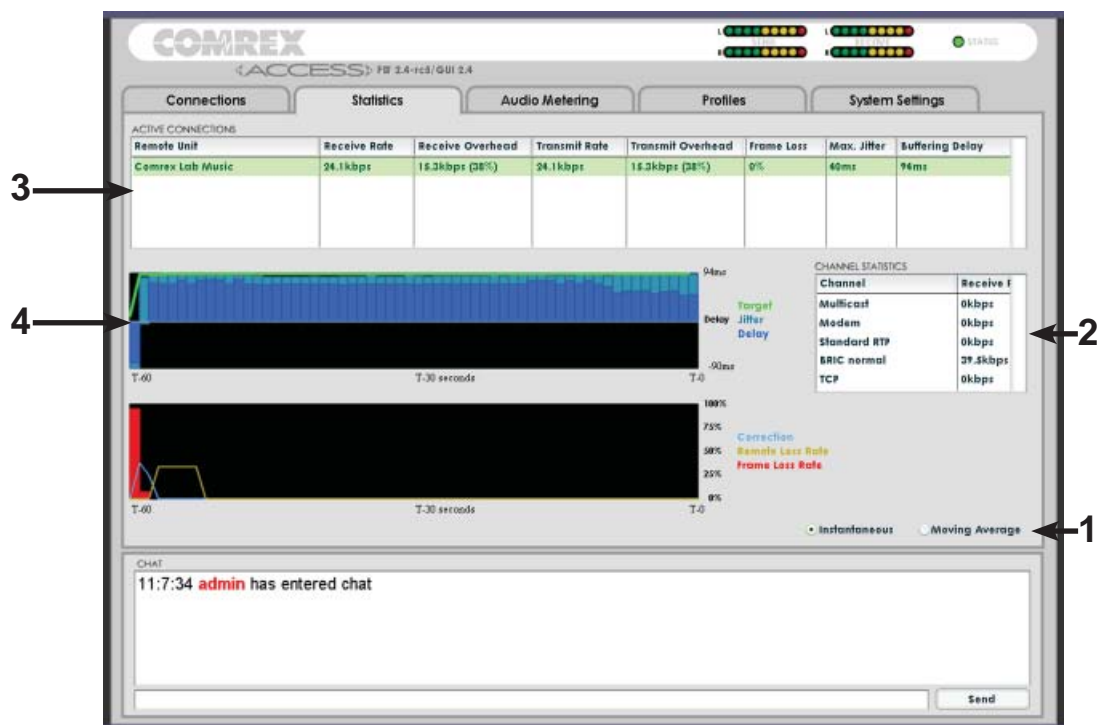


Figure 26 - Statistics Tab

The **Channel Statistics** field (#2 in Figure 26) delivers information on the total number of bits entering or leaving the ACCESS (including multiple connections if applicable), IP, UDP and RTP packet headers and coded audio.

The **Active Connections** box (#3 in Figure 26) breaks this information down further. Because ACCESS is capable of more than one simultaneous connection (in some modes), each connection is listed independently. The raw **Receive Rate** and **Transmit Rate** are listed, along with an indication of how much overhead is required for the various IP headers on each packet. **Frame Loss** is also listed as an individual figure for lost and late packets.

Finally, a **Max Jitter** figure is calculated to give an indication of the time difference between earliest and latest received packets, followed by an indication of how much delay is being added to the decoder to compensate for jitter.

Graphical representations of **Jitter Buffer Manager** activity and **Frame Loss** are also displayed (#4 in Figure 43). The light blue area in the upper graph represents the jitter values over time. The work of the **Buffer Manager** is shown by the green line, which is the target buffer delay that the system is trying to achieve, based on measurements done over the jitter window.

The lower graph displays a real time and historical representation of frame loss. If the decoder does not receive packets in time, the chart will show a red line indicating percentage of lost packets over the one second interval.

AUDIO METERING TAB

The **Audio Metering Tab**, as shown in Figure 28, provides a representation of **Input** and **Output** audio levels in several formats. Each of these meters (including the top section meters, which are always visible) may be turned **On** and **Off** individually. All audio meters are defaulted to **Off** when ACCESS is first enabled. This is because transfer of audio level information consumes bandwidth on the local network, as well as CPU cycles on the client computer. Whenever ACCESS is connected to a data constrained network (e.g. wireless), it is strongly recommended that these meters be **Off**, especially if the **Web-based Interface** on the constrained network will also be accessed via the wireless network (e.g. from the studio end). The bandwidth requirements to drive the meters may affect performance of the audio codec.

The **Metering Quality** option (which is defaulted to low) adjusts how often the meters are updated—better networks can support higher quality settings. Refer to #1 in Figure 27.

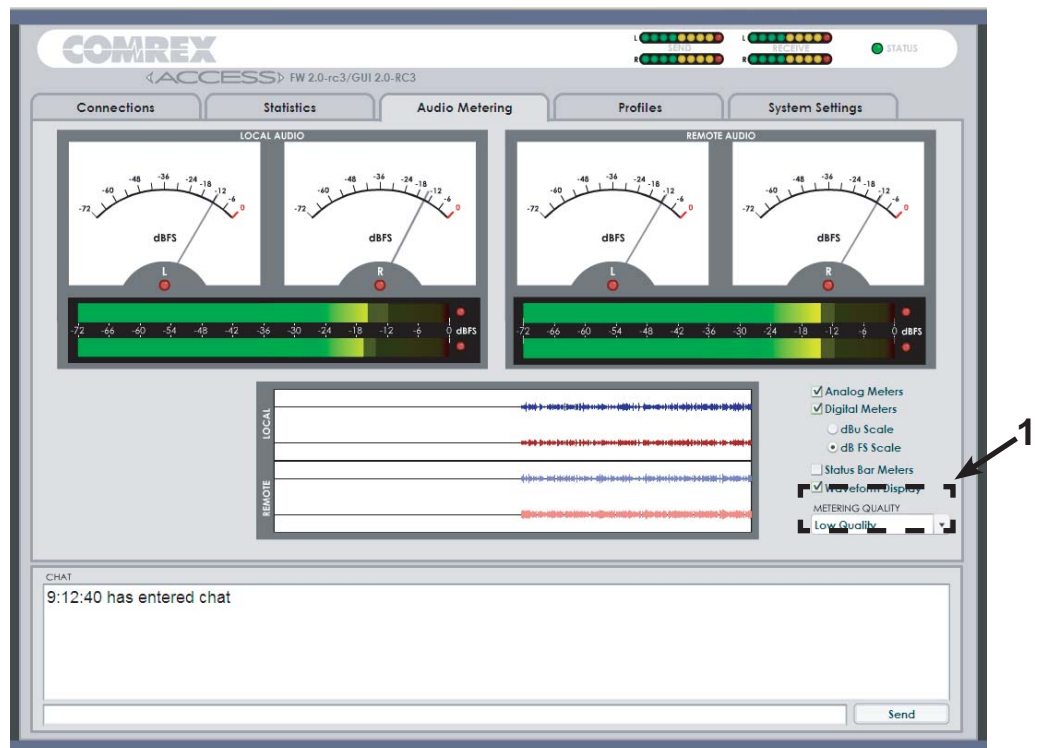


Figure 27 - Audio Metering Tab

*PROFILES TAB*

ACCESS provides a powerful set of controls to determine how it connects. The **Profiles Tab** allows you to define one or more profiles to assign to outgoing remote connections. It's often not necessary to define any profiles, since ACCESS ships with a set of default profiles that cover most users. But this tab allows you to build custom profiles to allow for different encoders in each direction, special POTS coding modes, and special options for jitter buffer management. Keep in mind that these profiles are useful only for connections initiated from the local ACCESS. Incoming connections are defined by the ACCESS at the other end.

Profile creation is segmented into commonly used and advanced options. In order to simplify the interface, **Advanced Options** are normally hidden from the user.

Remember, building a profile doesn't change how any remotes are connected until that profile is assigned to a remote on the **Connections Tab**. Once a profile is defined, it will be available on the **Connections Tab** to be assigned to any defined connection.

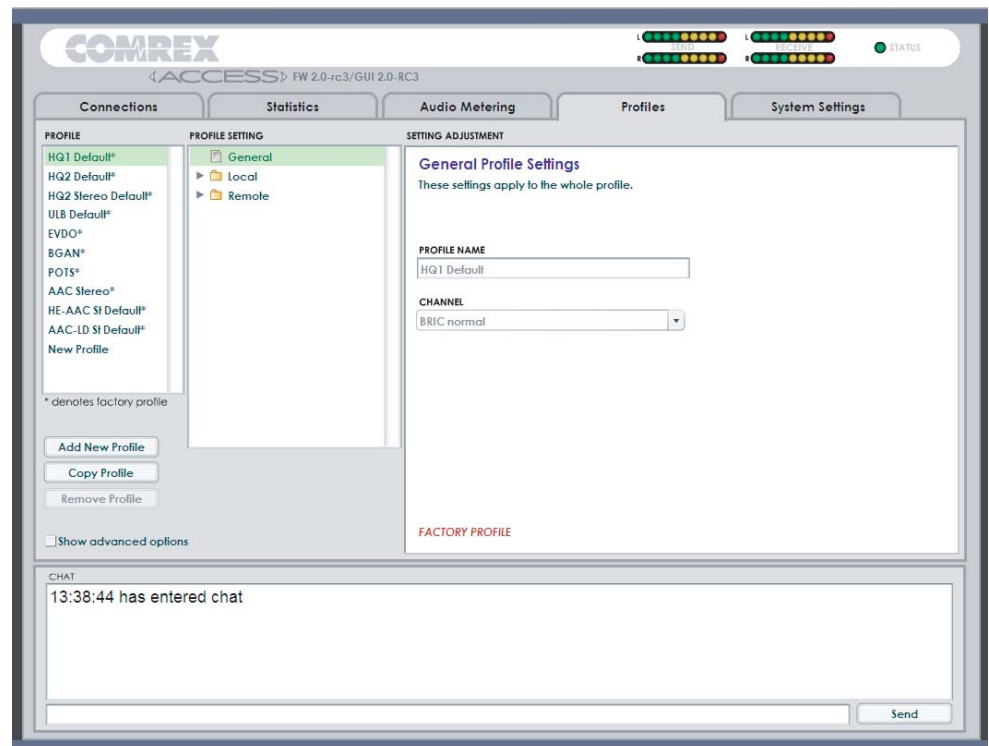


Figure 28 - Profiles Tab

## BUILDING A PROFILE

We'll discuss the various profile options without the **Advanced Options** first, and move on to the advanced selections in the next section.

To build a new profile, select **Add New Profile** (#1 in Figure 29) and a new profile appears on the list labeled **New Profile**. Select it and you'll see the first set of options available in the **General Profile Settings** category (#2 in Figure 29). Here you can rename the profile to something that will help you remember it. Under the **Channel** category (#3 in Figure 29), you can select whether this is an IP connection (BRIC normal), a modem based connection (which uses the telephone line rather than the Ethernet jack) or IP Multicast (a method to deliver audio to multiple locations). *Note: It's important to define the channel of a profile before moving on to other options, since the choices in the subsequent sections will vary in this choice.* Make sure to press **Apply** in order to confirm your selection.

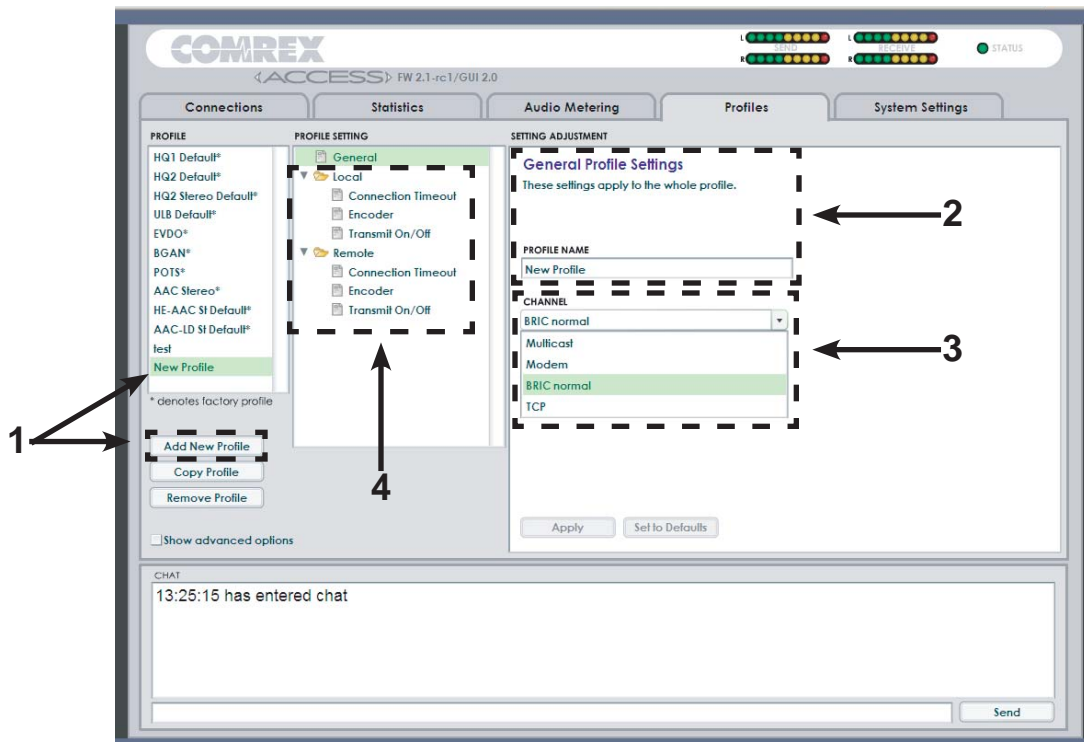


Figure 29 - Creating a New Profile

If you've chosen an IP-based channel (like normal BRIC) then you'll be presented with two categories of options: **Local** and **Remote** (#4 in Figure 29). You'll use the **Local** section to determine how your ACCESS behaves, and the **Remote** section will determine how the ACCESS on the far end behaves. Each category lists identical options, so we'll cover only the **Local** options:

**1) Connection Timeout** – Under normal circumstances, a connection will be terminated on one end and the other end will drop the connection in turn. But if a network failure occurs or a connection is ended abruptly (e.g. killing power to an ACCESS), the system will drop the connection after a pre-determined time. The default is 60 seconds, but this can be shortened or lengthened here. If an indefinite connection is required, see page 43 for additional information on operating ACCESS in a 24/7 environment.

**2) Encoder** – It's not necessary to define any decoder types when using ACCESS because they automatically adapt to the incoming stream. Using this menu, you can select the encoder used to send audio from this ACCESS (local) as well as the encoder used to send audio to this ACCESS (remote). The default value of the remote encoder is to follow the local encoder i.e. it will send exactly the same codec mode it receives. This is defined as **Follow Mode** in the remote encoder selection table. See the algorithm section for more info on selecting encoders.

**3) Transmit On/Off** – This option determines whether the selected encoder (local or remote) is actually sending any data. By default, all encoders are turned on, but there may be circumstances where one-way operation is desired (e.g. multi-streaming, as described in section 8). Turning off the local encoder disables outgoing audio streaming, and disabling the remote encoder disables incoming audio streaming.

For POTS connections, the choices are fewer. POTS users simply choose between one of the two available POTS modes:

**1) POTS Codec** – This is the default setting and emulates the coding channel of previous Comrex POTS codecs like the Matrix, Vector and BlueBox products. ACCESS does not support compatibility with Hotline codecs.

**2) Stereo POTS** – Allows connection between ACCESS users providing stereo audio over a dial-up connection.

IP Multicast is designed to deliver digital audio streams over an IP Multicast-capable network. Please see *SECTION 11 IP MULTICAST* for complete details and setup instructions.



Warning: Advanced Topic

### ADVANCED PROFILE OPTIONS

The options available in the default mode should provide good performance for most users, but in some circumstances it may become important to fine tune some of the more obscure parameters that make ACCESS work. By clicking the **Advanced Options** box in the lower left of the **Profile Tab** (#1 in Figure 30), the following **Advanced Options** will be available:

#### ADVANCED CHANNEL

One additional channel is available to each profile when **Advanced Options** are enabled (besides normal BRIC and POTS codec). This is the ability to initiate a TCP channel rather than the normal UDP/RTP channel created in the normal BRIC mode. Some explanation:

Internet IP packets come in two flavors: TCP and UDP. Most web browsing, email and other computer-based functions travel over the TCP protocol, which inherently assures retransmission if a packet is lost, and is therefore reliable. UDP is optimized for real-time applications, and does not offer any guarantee of packet delivery. Retransmission typically causes extra delay in an IP network, and ACCESS is optimized to conceal an occasional lost packet, so it makes more sense for ACCESS to use UDP for transmission under most circumstances. But there are occasions where a network will treat UDP packets poorly. Some examples are:

- Networks with high packet loss (rather than jitter)
- Networks with very high security firewalls
- Networks trying to discourage the use of VOIP functions

In these circumstances it makes more sense to enable a TCP channel. The result will usually be a more robust audio channel with a delay several magnitudes higher than an equivalent UDP channel. Channel overhead is also raised so you will utilize a higher network bandwidth.

#### ADVANCED LOCAL AND REMOTE OPTIONS

When designating local and remote options for a normal BRIC or TCP channel, several new categories will appear. Some of them address the encoder and some address the decoder.

Most of the **Advanced Encoder** options alter the relationship between frames and packets. In this context, a frame is the smallest chunk of encoded audio that can be extracted from the encoder. For the lowest possible delay, this frame is wrapped into its own packet and sent into the network.

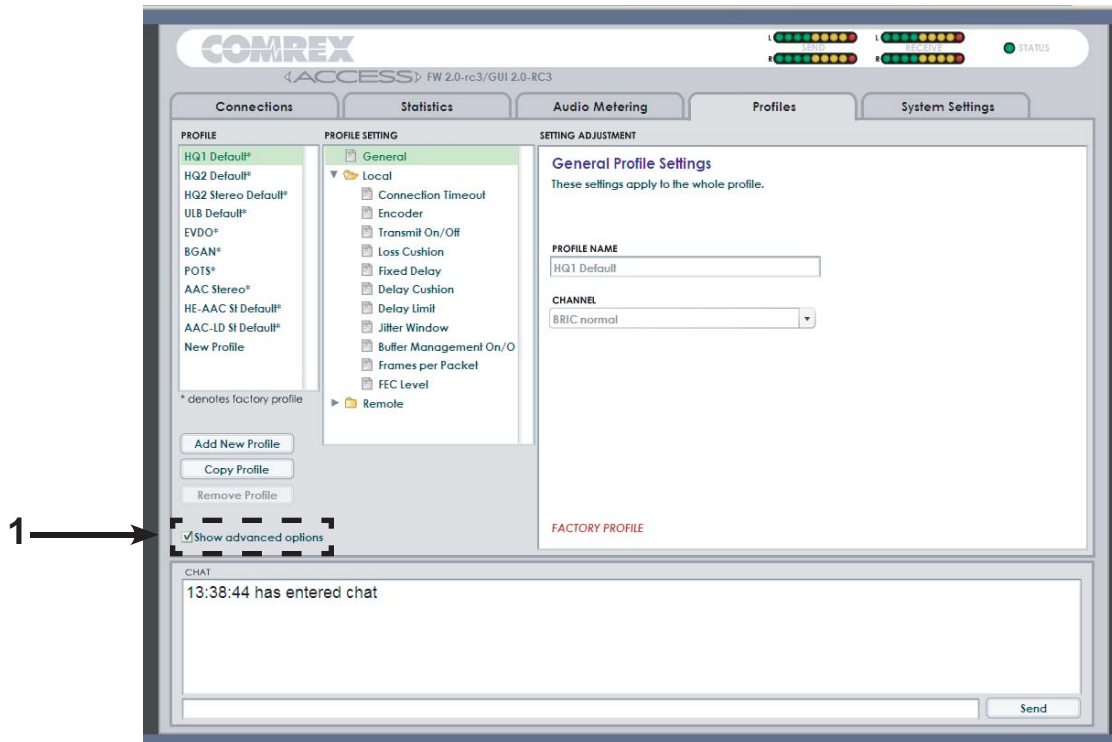


Figure 30 - Advanced Options in the Profiles Tab

#### ADVANCED ENCODER OPTIONS

The following advanced options affect the Encoder:

- **Frames per Packet** – Allows the encoder to wait for X number of frames to exist before sending a packet. This option differs from FEC because each frame is only sent once. Setting this value to a number higher than one can reduce network usage, at the expense of delay. This is because packet overhead bits like IP and UDP headers are sent less often.

**ADVANCED DECODER  
OPTIONS**

**Advanced Decoder** options have to do with how the jitter buffer manager performs. This is the algorithm that determines, based on network performance, how much delay to install in front of the decoder to achieve uninterrupted audio. It does this by creating a statistical analysis of the amount of jitter experienced over a fixed interval of time (the window) and making a judgment based on other parameters like the decoder's resiliency to errors. This is actually a very complex decision-making process involving many variables, and most of the time the default parameters should work well. The **Advanced Decoder** options are a means to override these defaults, and changing them should be done with care.

The following advanced options affect the Decoder:

- **Jitter Window** – This parameter defines the amount of time (in minutes) that historical network performance is analyzed in order to make the rest of the calculations. As an example, if the **Jitter Window** is set to the default of five minutes, and if a dramatic network event happens and the buffer manager reacts (perhaps by increasing the buffer), the event will be included in the manager's calculations for the next five minutes. If the network experiences improved performance over this period, the manager may choose to wind the buffer back down after the five minutes has passed.
- **Loss Cushion** – Packets may arrive at the decoder displaying a range of statistical properties. They may arrive in reasonably good timing and in order, or half may arrive quickly with the other half delayed significantly. In some cases, most of the packets arrive in a timely manner, but a small percentage of them may be extremely late. In this case, it's usually preferable to allow these late packets to be left out, and keep the delay lower. The decoder error concealment does a very good job of hiding these losses. The **Loss Cushion** parameter instructs the buffer manager to ignore a certain percentage of late packets in its calculation. The default value is 5%. Applications that are not at all delay sensitive may wish to reduce this value to zero, while extremely delay sensitive applications may prefer to have this closer to 25%.
- **Delay Cushion** – The jitter buffer manager usually works very hard to keep absolute delay to a minimum. Some applications are not delay sensitive and would rather not have the manager working that hard. The **Delay Cushion** setting is a way to instruct the manager not to attempt to drive the delay below a certain value. E.g. if the delay cushion is set to 500mS, this amount of fixed delay will be added to the buffer. If the jitter manager needs to increase the buffer it will do so, but will not fall below the ½ second level.

- **Delay Limit** – The inverse of the **Delay Cushion**, this parameter instructs the manager not to wind the buffer out beyond a certain delay value, regardless of how many packets are lost. Use of the delay limit can result in very poor performance if the network jitter exceeds the limit.
- **Fixed Delay** – This option simply sets the **Delay Cushion** and **Delay Limit** at a similar value, so that the delay buffer is defined to the chosen value and will not increase or decrease significantly.
- **Buffer Management On/Off** – This option is available only as a troubleshooting tool. Turning the manager off will result in eventual failure, since the manager is required to compensate for clock skew between the encoder and decoder.

## SYSTEM SETTINGS TAB

The **System Settings Tab** defines parameters that are not specific to a particular remote connection. Examples are how incoming (POTS and IP) calls are handled, global modem settings, and how the contact closures are assigned. The **System Settings Tab** is shown in Figure 31.

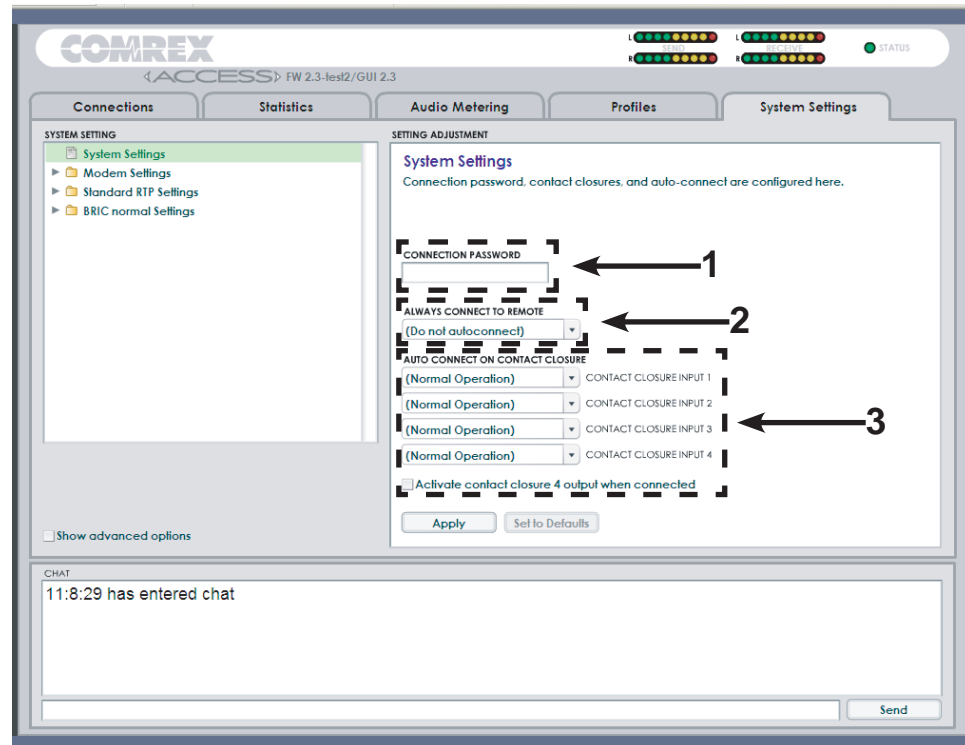


Figure 31 - System Settings Tab

The **Systems Settings Tab** has four categories: **System Settings**, **Modem Settings**, **Standard RTP Settings** and **BRIC Normal Settings**. As with the **Profile Tab**, basic options are shown by default. Less used options are hidden until the **Show Advanced Options** box is clicked.

- **System Settings** – As shown in #1 in Figure 31, the first **System Setting** determines the incoming password for IP connections. If this field is populated, all incoming IP calls must have the correct password assigned to them. This optional feature allows for the screening of connection requests, and prevents connections (and bandwidth utilization) by those who do not know the password. A global password is defined for all incoming calls to the local ACCESS, but passwords for outgoing calls can be assigned to individual remote entries (See SECTION 7 MAKING CONNECTIONS USING THE WEB-BASED INTERFACE). *Note: Password functionality is not available for POTS connections.*

#2 in Figure 31 shows the system **Auto Connect** options. Remote connections must be created in the **Connections Tab** before they can be assigned to any of these functions. One field is available to designate a remote for always on operation. This is useful in “nailed up” environments, where a signal is required across the link 24 hours a day. To assign an always on remote, simply pull down the menu and select which remote to designate as **Always On**. A connection will be made and sustained to the chosen remote.

The next four fields (#3 in Figure 31) define auto connect rules for remotes to be triggered by the four external triggers available on the rear panel of the ACCESS. *Note: These inputs are shared with the end-to-end contact closure signals, so if a remote is designated as **Auto Connect** on a closure, that closure signal is sacrificed in the direction from this ACCESS.*

To assign a remote connection to a contact closure, simply pull down the menu box next to the desired closure and select the proper remote. A connection attempt will be made whenever the contact is triggered, and will disconnect whenever the contact is released.

The last **System Setting** alters the performance of output contact closure #4. Under normal circumstances the signal indicates a trigger of the corresponding contact closure input on the far end of the connection. If this box is selected, that function is no longer available, and the signal follows the ACCESS front panel **Ready** light. This signal will be valid (closed) when a valid connection is present, and invalid (open) when no connection is present.

- **Modem Settings** – Figure 32 shows the options that define *POTS Codec Modes*. #1 determines whether incoming calls are accepted. If this is not selected, ACCESS can not receive incoming POTS calls.

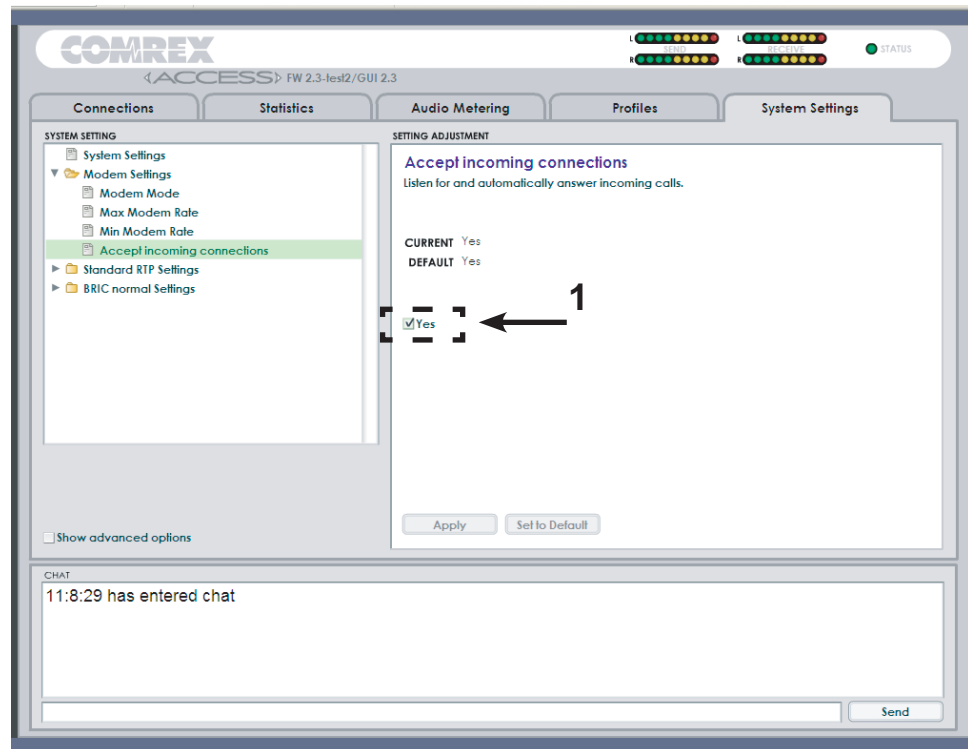


Figure 32 - Modem Settings in the System Settings Tab

#1 in Figure 33 determines which of the two POTS modes is to be used for incoming calls. One limitation of ACCESS' *POTS Codec Modes* is that both ends must be set correctly for POTS codec calls to work. The default setting is **POTS codec**, which causes ACCESS to answer incoming POTS calls that are compatible with ACCESS, Matrix, BlueBox and Vector codecs (but not Hotline). The other option is **Stereo POTS**.

*Stereo POTS Mode* provides a stereo audio signal over a single dial-up phone connection. It utilizes a POTS-optimized version of the HQ2 algorithm. This mode utilizes intensity stereo coding, so channels may not be used to send uncorrelated audio material i.e. they must be Left and Right channels of a stereo feed. See *SECTION 8 POTS CODEC CONNECTIONS* for more information.

Again, ACCESS does not have the ability to adapt between the two types of POTS calls it supports. The proper mode must be selected before an incoming call of that type is received.

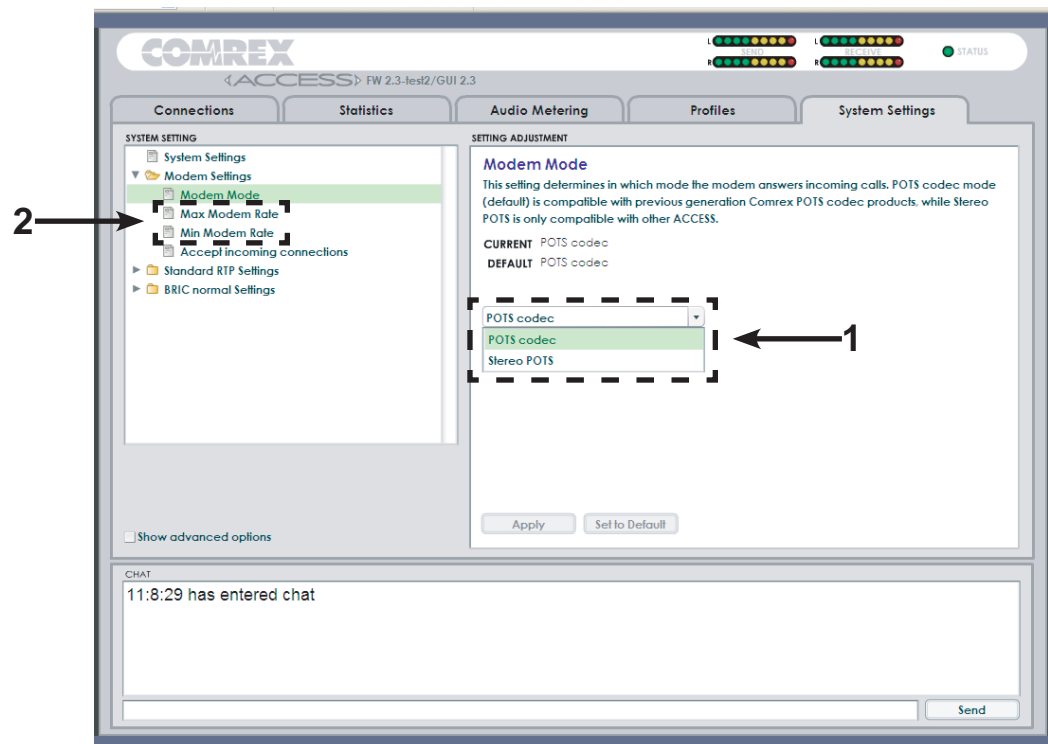


Figure 33 - Modem Modes and Connect Rates in the System Settings Tab

#2 in Figure 33 shows options for setting the minimum and maximum connect rate for the modem. The setting will affect the connect rate on both ends of the call e.g. if unit A has a max rate of 28800 and unit B has a max rate of 24000, the rate will be constrained by the lowest setting of 24000 on both ends.

- **Standard RTP Settings** – This setting offers several modes that allow compatibility with other IP coding devices. For complete details please review the *IP COMPATIBILITY* appendix of this manual.
- **BRIC Normal Settings** – #1 in Figure 34 determines if this ACCESS is to be used for incoming normal IP connections. If this function is not enabled ACCESS will only support outgoing calls using *BRIC Normal Mode*.

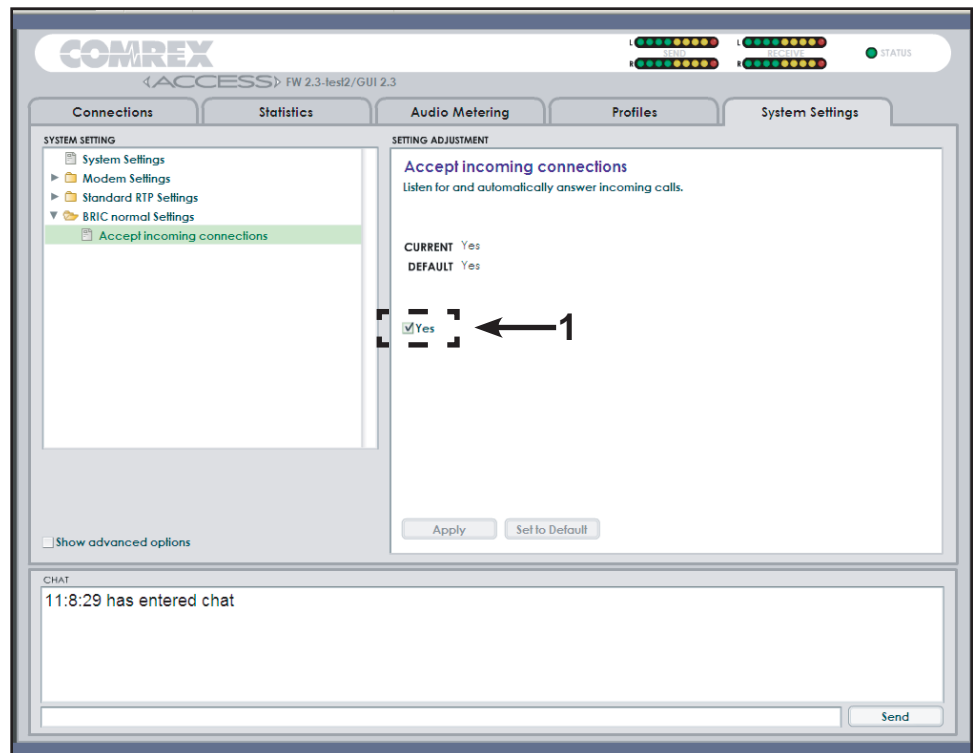


Figure 34 - BRIC Normal Settings in the System Settings Tab



Warning: Advanced Topic

### ADVANCED SYSTEM SETTINGS

When the **Advanced System Settings** box is checked, a few additional options are enabled (as shown in Figure 35).

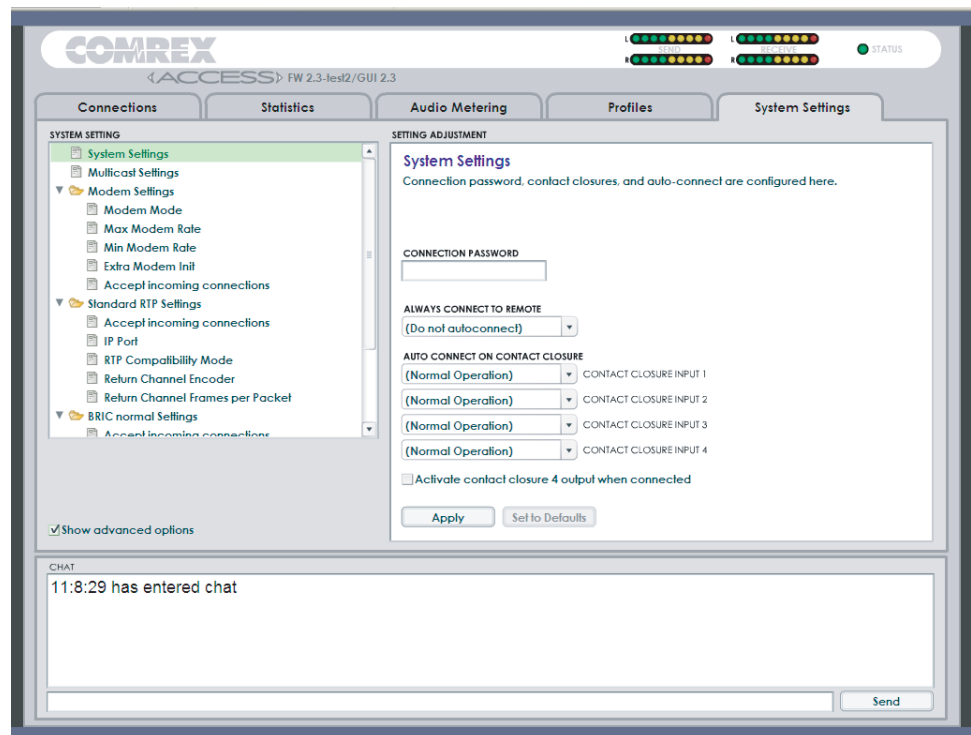


Figure 35 - Advanced System Settings

Under **Modem Settings**, an option appears labeled **Extra Modem Init**. This is a field that will allow the entry of special initialization strings to be sent to the internal modem before a call is placed. These strings can change things like country of operation, dial tone and ring cadence frequencies, and other phone-line based parameters. If special modem configuration is necessary, please contact Comrex for information on how to set this up.

Under **BRIC Normal Settings**, an option appears to define the incoming UDP port number. This is the number to be used for incoming IP connections. The default is 9000. Note that since most ACCESS codecs attempt a connection on this port number, changing it can mean ACCESS in the field must dial specifically to your new port number in order to connect. As shown in *SECTION 7 MAKING CONNECTIONS USING THE WEB-BASED INTERFACE*, an outgoing call must be made to a specific port number in the form of IP\_ADDRESS:PORT e.g. dialing port 5004 on the Comrex test line is formatted 70.22.155.131:5004

A new section is shown under **Advanced Options**, labeled **TCP Settings**. As described earlier, ACCESS performs best when using UDP for connections but there are some rare circumstances when the system may need to be switched over to TCP operation. This advanced option defines how incoming TCP calls are handled.

Outgoing calls are defined as TCP when their profile is configured. ACCESS normally listens for incoming calls on both TCP and UDP ports, and chooses the first to arrive. If a TCP call is detected, ACCESS will attempt to use the same TCP link to transmit in the reverse direction.

**TCP Advanced Settings** allow you to turn *TCP Auto Answer* on and off (using the **Accept Incoming Connections** option). Disabling this function means only outgoing TCP calls can be established.

You also have the option of setting the incoming TCP port number, which can be different than the UDP port number. Note warnings given above about changing port numbers — calls with mismatched port numbers will fail.

## SECTION 7

## MAKING CONNECTIONS USING THE WEB-BASED INTERFACE

*CREATING A REMOTE CONNECTION*

So now it's time to make a connection on ACCESS. We will assume that the proper network and audio connections have been made. Before you can establish an outgoing connection on ACCESS, you must enter the info about remote connection into the **Connections Tab**. This acts like a phone book, saving the names and numbers of everyone to whom you connect.

As shown in Figure 36A, ACCESS comes pre-programmed with three connections. Loopback is chosen when you wish to test ACCESS by connecting the local encoder and decoder together. The other two entries are connections to Comrex in Massachusetts, and these may be used for your testing (when they're not busy with other users). We maintain two CD players on these ACCESS, feeding voice and music audio respectively.

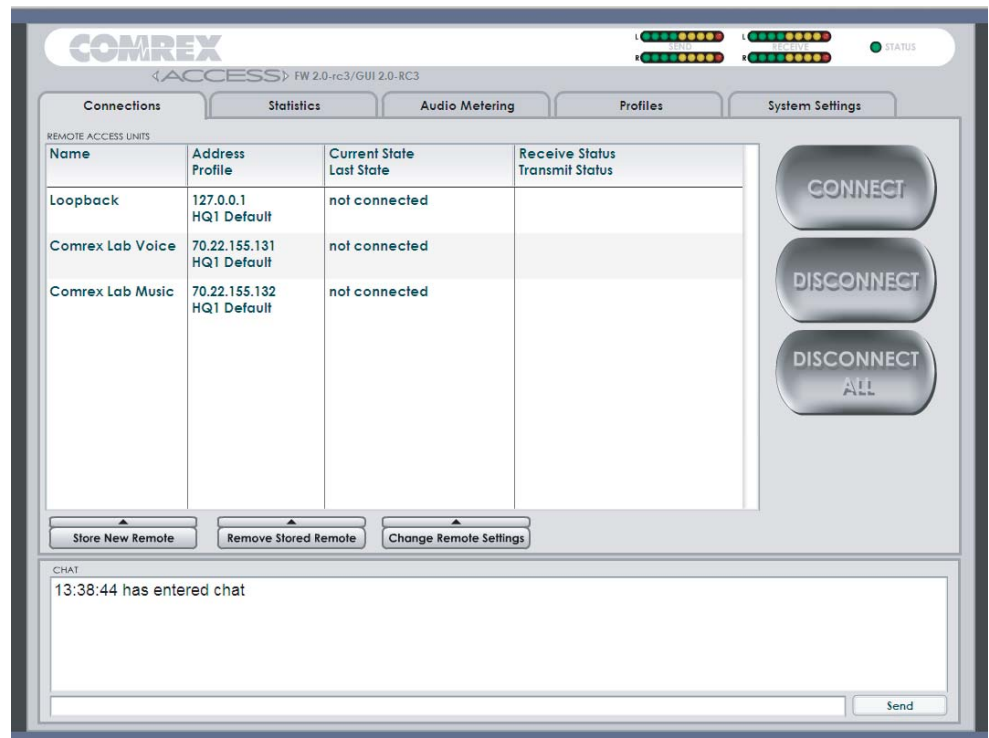


Figure 36A - Connections Tab

To create your own outgoing connection, click **Store New Remote** (#1 in Figure 36B) to get the entry pop-up. Choose a name for the remote (e.g. WXYZ) followed by the IP address or phone number of the remote. The next field is optional. If the remote has password filtering enabled for incoming calls, you will need to enter that password into the next field (case sensitive) in order to make a connection to it (see *PASSWORD FILTERING* in the next section for further information). If no password is required, leave this blank

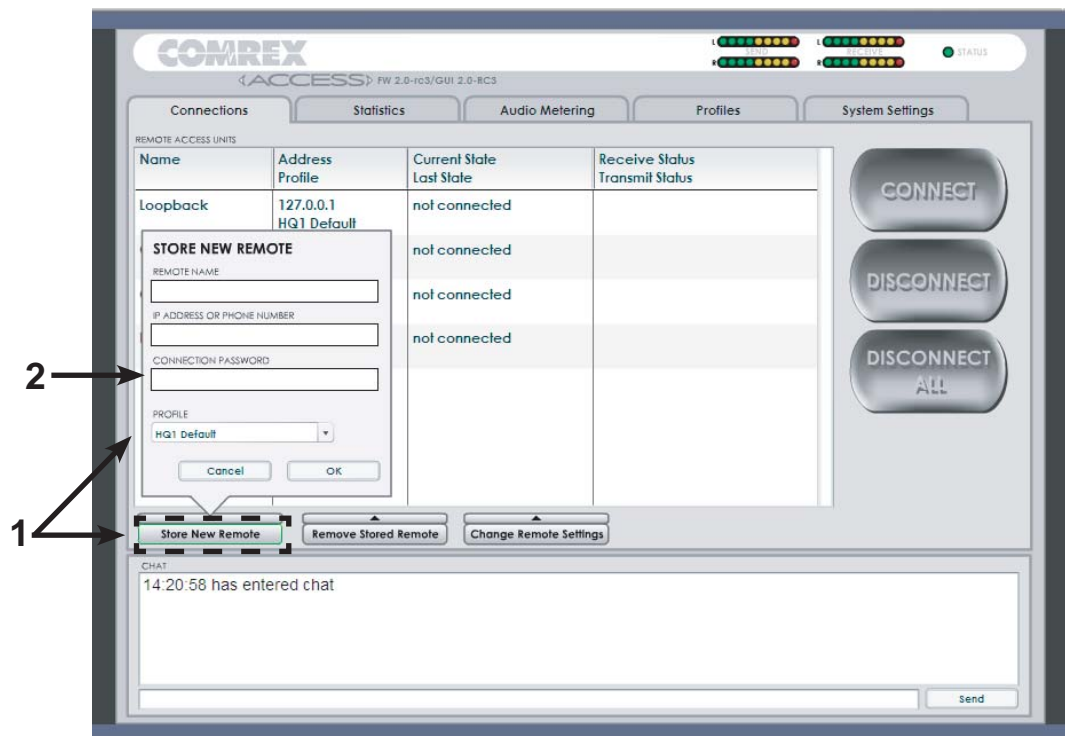


Figure 36B - Store New Remote in the Connections Tab

Finally, you will need to choose a profile to use when making these connections. ACCESS includes several common default profiles to choose from, each of which enable a simple full-duplex link using one of the available algorithms. If you wish for a more complex feature set when making this connection, you will need to click over to the **Profile Tab** and set up a specific profile using your custom parameters. Custom options can include one-way transmission, different encoders in each direction, specialized packet arrangement, etc. Once defined on the **Profile Tab**, the new profiles will be available in the **Profile** select window and they can be assigned to a remote connection.

Once your remote connection entry is correct, it's simply a matter of pointing and clicking to connect and disconnect a remote. When a connection is attempted, the **Current State** value in the connection table will change to reflect the progress of the connection. If the connection fails, the reason for failure will be shown in the **Last State** category. If it succeeds, the encoder and decoder mode will be reflected in the **Transmit** and **Receive Status** columns.

#### *DISCONNECTING*

Disconnecting is just as simple — Highlight the desired connection and click **Disconnect** to end the connection. If more than one connection is active (see *SECTION 10 MULTI-STREAMING*), clicking the **Disconnect All** button will end all connections.



Warning: Advanced Topic

#### *ADVANCED CONNECTION OPTIONS*

#### *PASSWORD FILTERING*

The **Connection Password** function can be used to filter incoming BRIC IP connections (but not POTS calls). Using this function, attempted incoming connections will be rejected if they do not know the proper case-sensitive password. For outgoing connections, the password is entered when the remote connection is created on the **Store New Remote** menu (#2 in Figure 36B). For incoming connections, the password is set on the **System Settings Tab**. (#1 in Figure 37). There isn't any way to retrieve a forgotten password; it must simply be changed in each ACCESS.

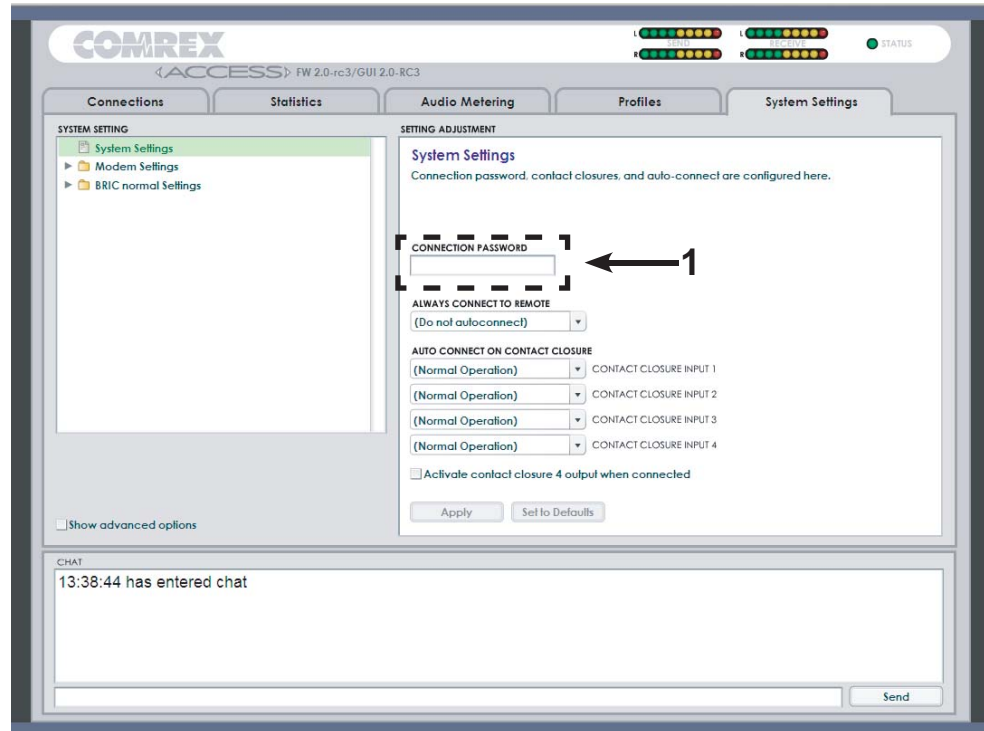


Figure 37 - Connections Password in the Settings Tab

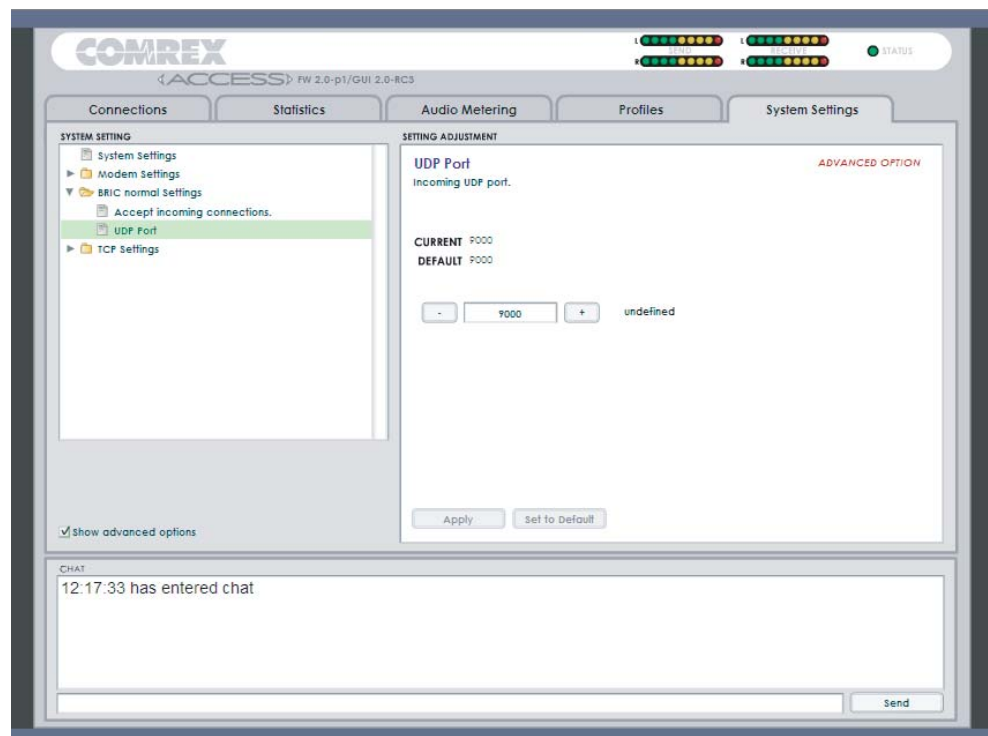
### CONNECTING TO A SPECIFIC PORT

BRIC IP connections (and all IP traffic) use a concept known as ports to differentiate between different applications on the same computer. A port is simply a number contained in the IP header, but it can be treated as a physical opening in and out of your computer. Most firewalls function by opening the network to traffic with only specific port numbers.

Each IP connection has a source and destination port. Under most circumstances, the source port is unimportant, but the destination port can be key. Certain incoming ports can be firewalled to outside traffic, and in the case of several ACCESS behind a router (sharing a single public IP address), the only way for them all to take incoming calls is to assign different incoming ports to each device.

To transfer audio, ACCESS uses a default source and destination port of 9000. If this is changed, both the outgoing and incoming ACCESS must be made aware of the change.

Changing the port for incoming connections is done on the **System Settings Tab**. Because this can really mess things up if not done properly, the function is hidden in the **Advanced Options** of this tab (as shown in Figure 38). Access the **Advanced Options** by clicking the **Show Advanced Options** box in the lower left corner of the **System Settings Tab**.



**Figure 38 - Changing the UDP Port for Incoming Connections**

To change the destination port of an outgoing call, you must add the port number to the IP address in the following format:

IP\_address:port\_num

For example, to initiate a connection to the Comrex test line at port number 5004, enter the following into the IP address field:

70.22.155.131:5004

*Note: The call will fail unless the ACCESS on the far end is set to receive data on that port.*

*BACKING UP A CONNECTION*

ACCESS features an ability to have an automatic backup to IP remote connections. The backup may be either another IP connection, or a POTS phone number. Automatic backup works as follows:

If an IP connection fails, ACCESS will sense this and wait the amount of time designated in the **Local Timeout** parameter in the profile assigned to the primary connection. If the connection is restored in that amount of time, no backup will occur.

If the timeout period passes without restoration of the primary connection, ACCESS will automatically establish a connection (POTS or IP) to the designated backup connection. It will maintain that connection until manually disconnected.

Backup connections are enabled and selected on the **Change Remote Settings** option on the **Connection Tab** (shown as #1 Figure 39).

To enable an automatic backup, both the primary and secondary remote connections must first be defined and assigned profiles. Next, select the primary remote and click **Change Remote Settings**. On this pop-up, choose the pull-down menu labeled **Backup Remote** (#2 in Figure 39) and select the backup for this primary connection.

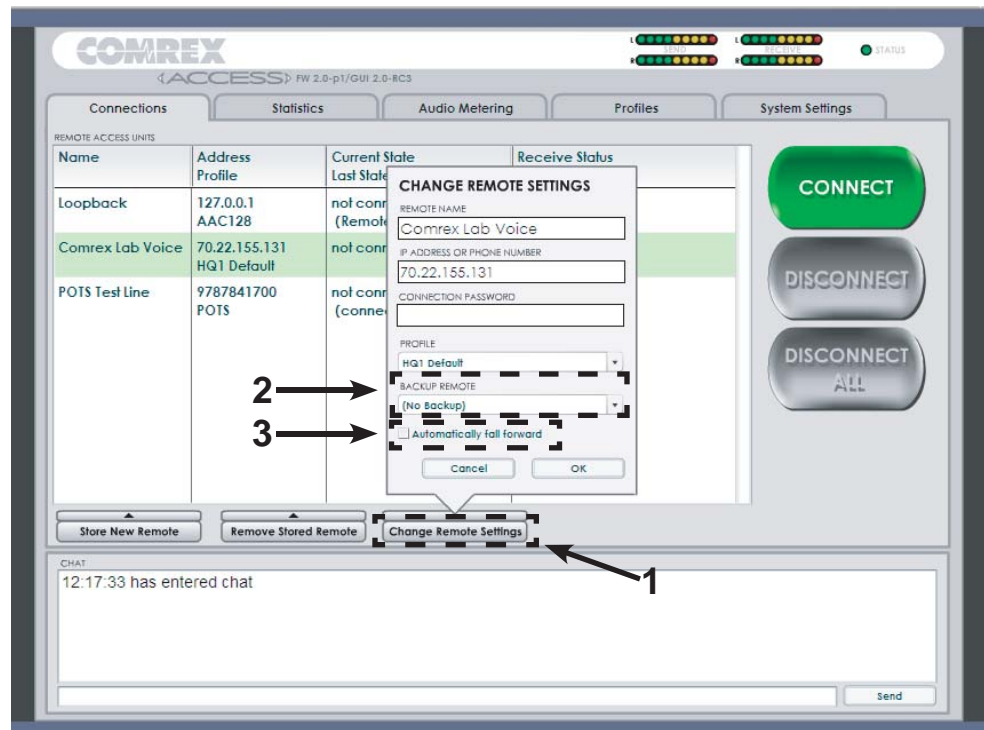


Figure 39 - Backup/Fall Forward Functions in the Connections Tab

*FALL FORWARD FUNCTION*

By selecting the **Automatically Fall Forward** function in this pop-up (#3 Figure 39), you will enable ACCESS to monitor the primary IP connection while the backup is active. If the primary is restored and is detected to be valid for the timeout period, the backup will be disconnected and operation will revert to the primary.

*BACKUP/FALL FORWARD LIMITATIONS*

The **Backup/Fall Forward** functions have the following limitations:

- 1) Only IP connections can be designated as primary — IP or POTS connections can be backups.
- 2) **Fall Forward** does not work when the POTS backup is the same physical ACCESS as the primary IP. This is because ACCESS receiving incoming POTS calls cannot restore IP connections.

*OPERATING ACCESS IN A 24/7 ENVIRONMENT*

Many ACCESS users simply require the system to connect between the same IP addresses full-time. ACCESS can accomplish this, but the topic can be a bit confusing, so we'll attempt to explain it in a bit more detail.

First, let's handle the topic of the **Connection Timeout** parameter. This parameter, which is set in your profile, determines how long ACCESS stays connected with the remote end after loss of signal. Once this time period has passed, ACCESS will abandon the connection and be ready for the next one. It follows that on a connection you don't ever want to lose that you don't really want *any* **Connection Timeout**—What you want is for the ACCESS encoder to continue to dump data into the network regardless of the state of the network. This way when the network is restored your audio will be restored.

The easiest way to make sure that ACCESS does not drop a connection is to enable the **Retry** mode on the **Connections Tab**. To do this, select the connection of interest, and click **Change Remote Settings**. Under **Backup Remote** choose the option labeled **Keep Trying This Remote** and click **OK**.

This selection will make several changes in the way ACCESS behaves. First of all, the **Connection Timeout** variable will be ignored. For **BRIC Normal** style connections, this is all that is necessary, since this mode uses an IP protocol called UDP, which can indeed continue to send data regardless of connection state.

TCP and POTS protocols are connection oriented, so simply always sending data isn't an option. In these environments (with the **Retry** function enabled) ACCESS will actually continually try to re-establish the connection until it is restored, then restore the encoder stream.

Regardless of the setting of the **Retry** function, ACCESS will not attempt to re-establish a connection if it is manually disconnected. Also, ACCESS will not re-establish a manually placed connection in the event of a system power failure.

In order to automatically restore a connection after a power failure, the remote connection should be made using the **Always Connect to Remote** function in the **System Settings Tab**. Once that selection is complete, a connection will be established and maintained (and re-established on a subsequent reboot).

## SECTION 8

## POTS (PLAIN OLD TELEPHONE SERVICE) CODEC CONNECTIONS

ACCESS is capable of connections over modem links. This mode emulates the function of Comrex POTS codecs, which have been used for years to deliver high quality audio over normal, dial-up telephone lines. This mode provides for a point-to-point connection between the codecs i.e. no internet access is used, and the call is placed directly from one ACCESS (or legacy codec) to the other.

In the current firmware, ACCESS is capable of connecting over dial-up phone lines to:

- ACCESS Codecs
- Comrex Matrix Codecs
- Comrex BlueBox Codecs
- Comrex Vector Codecs

Note: Backward compatibility to Hotline codecs is not supported.

*POTS CODEC SET-UP FOR  
ACCESS COMPATIBILITY*

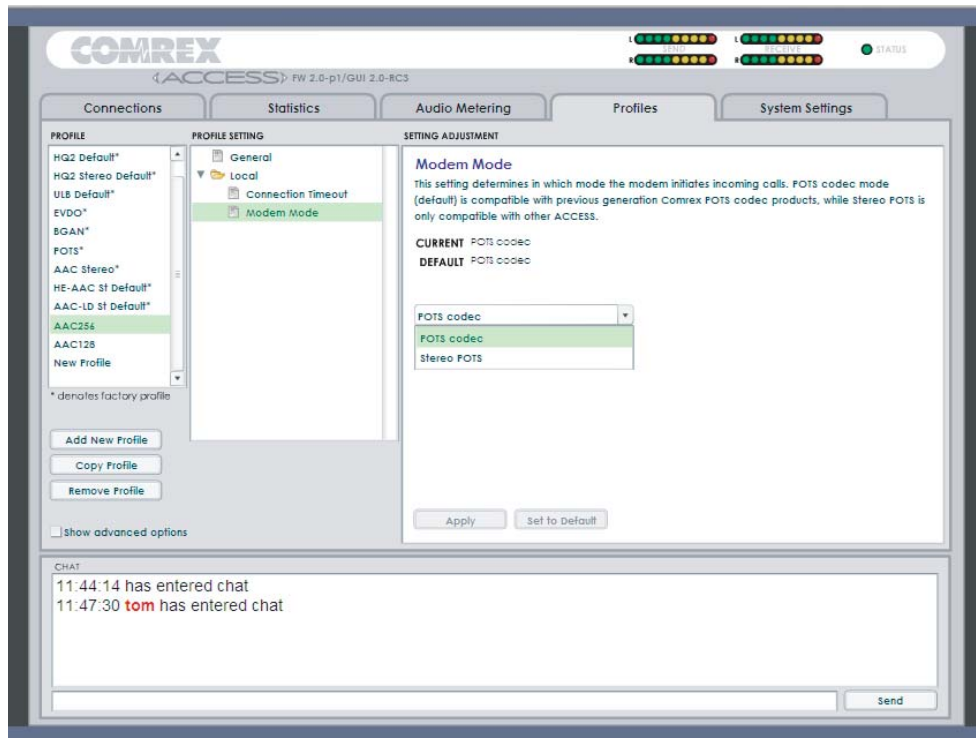
The legacy codecs (Matrix, Vector or BlueBox) must be configured for operation in *Music Mode*, which will allow full-fidelity (up to 15 KHz) connections. *Voice Mode* is not supported by ACCESS. Contact closures and ancillary data supported by legacy codecs are not supported by ACCESS.

ACCESS requires that outgoing POTS connections be defined on the **Connections Tab**. When defining any outgoing connection, a profile must be assigned to it. For POTS Codec compatible connections, the factory default **POTS Profile** should work best. *Note: When creating a profile, you must designate the modem mode as **POTS Codec** rather than **POTS Stereo** in order to be compatible with legacy devices. This is shown in Figure 40.*

*USING ACCESS WITH  
POTS*

To use ACCESS on POTS, a normal, analog telephone line must be connected to the rear panel telephone line RJ-11 connector. If possible, try to obtain a true telephone company grade line, rather than an extension from your digital phone system. Under no circumstances should the raw extension from a digital phone system be attached to this port—you will likely damage ACCESS, your phone system, or both.

To initiate calls from ACCESS, simply create a remote connection with a telephone number as an address, rather than an IP address, in the **Connections Tab**. You must designate a POTS-based profile for this remote.



**Figure 40 - POTS Codec vs. POTS Stereo Mode in the Profiles Tab**

*SETTING UP ACCESS FOR  
USE ON POTS STEREO*

In order to use *POTS Stereo Mode*, special configuration must be done on each end of the link. Once an ACCESS is set for incoming POTS stereo connections, normal mono POTS codec compatible calls can not be received until the settings are changed back.

**Outgoing unit settings (usually the field unit) –** The outgoing ACCESS will dial the phone call but a profile for the outgoing call that specifically uses *POTS Stereo Mode* must be built. This is done by creating a new profile in the **Profile Manager**. Select **Channel** under **Global Settings** and then **Modem** for the outgoing channel. Under **Local Settings** choose a **Modem Mode** of **Stereo POTS**.

Once the profile with these parameters is built, it can be named and assigned to any outgoing remote that uses a phone number (rather than an IP address) as its destination.

Additional profiles may be built utilizing the normal POTS codec modem mode, if desired. You can then build two remotes to the same phone number — one using your stereo profile and one using your legacy compatible POTS codec profile.

**Incoming unit settings (usually the studio unit)** – The incoming unit will receive the call from the field. In this case, the ACCESS must be configured to treat all incoming calls as *POTS Stereo Mode*. This is done in the **System Settings** section by selecting **Mode Modem** under **Modem Settings**. To receive stereo calls, this setting must read “Stereo POTS”. To receive calls from older Comrex POTS codecs (or ACCESS configured to emulate them) the setting must be “POTS Codec”.

#### RATE DROP VS. RETRAIN

When incoming or outgoing POTS calls are active, the **Connections Tab** changes slightly. You will see two additional buttons appear on the tab, labeled **Retrain** and **Rate Drop**. These are special functions applicable only to POTS calls, so they are not visible during IP connections.

The **Connection Tab** display contains two user controls, **Rate Drop** and **Retrain** (#1 in Figure 41). These controls are similar in function to those provided on POTS codecs. ACCESS will initially connect at the best data rate supported by the telephone line, and will display that connect rate on the **Connections Tab** page.

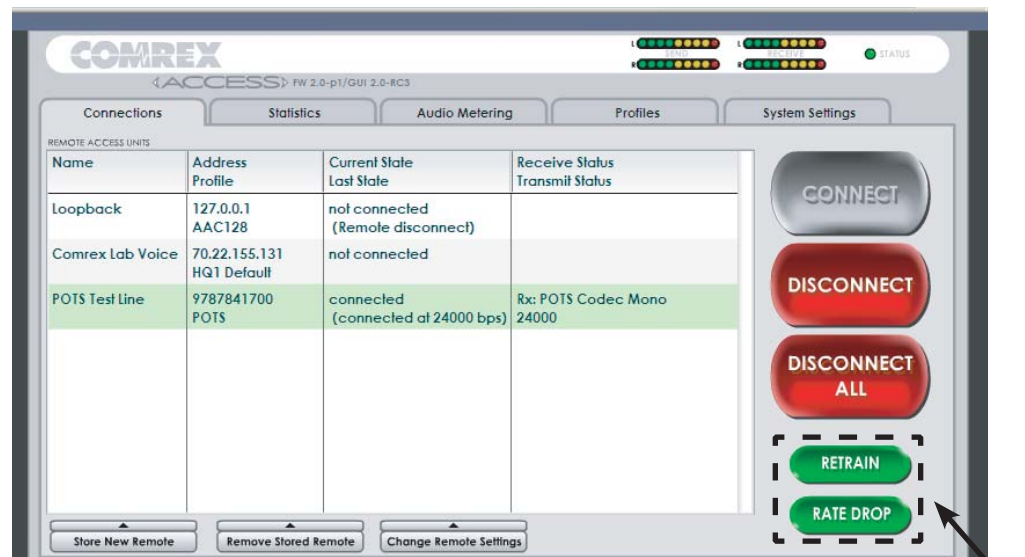


Figure 41 - Connections Tab During an Active POTS Call

You can force the system to drop to the next lowest connect rate at any time by clicking the **Rate Drop** button at any time. Audio transfer will be interrupted momentarily while the units negotiate the new connect rate. Alternately, you can force the system to initiate the entire training sequence

again (the “chat” sounds heard at the beginning of a call) by clicking the **Retrain** button. You will lose audio for a longer time (approx. 7 seconds) but the modems will completely re-equalize the connection and return audio when finished.

Once ACCESS has dropped to a lower rate, either by rate drop or retrain from either end, there is no way to force it to connect at a higher rate. If you want ACCESS to try again for a higher connect rate, you will need to disconnect the call and dial again.

*TROUBLESHOOTING POTS  
CONNECTION*

There are dozens of factors that can affect the success or failure of a POTS codec call, some within the user’s control and some not. Here’s a short list of rules to follow for POTS codec connections:

1. Use the POTS codec on a direct telephone company line and avoid in-house phone systems. A line used by a fax machine usually provides this direct access. (Be sure to disconnect the fax machine before connecting the codec!)
2. Check to see that there are no extensions or modems on the line you are using — or at least arrange that no one uses these during your broadcast.
4. If there is call-waiting on your line, disable it by entering “\*70” in front of the number you are dialing.
5. If possible, try the POTS codec out at the remote site before your actual broadcast at about the same time of day that you plan to use it. This will give you a good idea of expected connect rates and possible line problems.
6. At minimum, connect a few minutes before airtime to assess the connection quality. Setting a MaxRate on the POTS codec, based on your findings, is highly recommended. MaxRate usually should be set at a level or two below the maximum unrestricted rate. This will provide a “guard band” of sorts against noise and corruption which may cause errors on the line.
7. If operation starts to degrade after a long period of connection, it may be that the phone line parameters have changed. These parameters are affected by factors such as time of day, weather and geographic location. The modems should be given the opportunity to renegotiate for these new parameters.
8. If you experience low connection rates or errors, try redialing. If that does not help, dial from the other end. If the call is long distance, try forcing the call to another carrier. If a good connection is found, keep that line up.

## SECTION 9

## ABOUT THE ALGORITHMS

ACCESS contains eight different types of encoders and decoders for use on networks.

*BRIC-HQ1*  
(HIGH QUALITY 1)

This encoder/decoder provides 15 kHz voice/music transmission with extremely low delay and low network utilization. It supports mono, stereo, and dual-mono. Here are some details of *BRIC-HQ1*:

- **Low Delay** — *BRIC-HQ1* uses a 20mS audio frame, with an overall encode/decode time of around 80mS. This makes *BRIC-HQ1* a good choice for real-time, interactive applications.
- **Low Digital Bandwidth** — *BRIC-HQ1* has a data rate of around 24 or 28 kbps for mono, and 56 kbps for dual mono allowing it to travel over medium-to-low speed networks.
- **Voice/Music Capable** — *BRIC-HQ1* is designed as a voice codec, but does a respectable job at encoding music.
- **Dual Mono Mode** — Supports the encoding of two independent audio channels, such as a dual-language broadcast. These two channels will be multiplexed into a single outgoing stream.
- **Stereo Mode** — This mode uses matrixing to deliver stereo audio at less than double the bandwidth.

*BRIC-HQ2*  
(HIGH QUALITY 2)

This encoder/decoder provides high fidelity (12 or 15 kHz) mono or stereo transmission at low data rates and reasonable delay. Here are some details of *BRIC-HQ2*:

- **Medium Delay** — *BRIC-HQ2* uses a 64 or 80mS audio frame, with an overall encode/decode time around 360 mS. Interactive applications are possible using *BRIC-HQ2* in the forward direction and *BRIC-ULB* or *BRIC-HQ1* in the reverse.
- **Low Digital Bandwidth** — *BRIC-HQ2* encodes at 24 kbps for a full bandwidth mono signal. Stereo signals occupy 30 kbps. Dual mono is not supported in *BRIC-HQ2*.
- **Voice/Music Agnostic** — *BRIC-HQ2* utilizes a blend of different audio coding techniques, so it does a good job of encoding non-voice audio.
- **Mono/Stereo** — *BRIC-HQ2* has stereo modes which utilize a parametric stereo effect; so it is not possible to send independent audio over the L&R channels. The channels must be a related stereo image. Use *BRIC-HQ1* or *AAC-LD* when *Dual Mono* is required.
- **Audio Bandwidth** — *BRIC-HQ2* default modes utilize a 32 kHz sampling rate to deliver 15 kHz audio fidelity. *BRIC-HQ2 12K* modes utilize a 26 kHz sampling rate to achieve a 12 kHz audio fidelity. Because the data rate is the same between the two modes, *BRIC-HQ2 12K* can be considered to sacrifice some slight high end fidelity in exchange for overall lower audio coding artifacts.

**BRIC-ULB**  
(ULTRA LOW BITRATE)

This encoder/decoder provides 7 kHz voice audio transmission with extremely low delay and extremely low network utilization. Due to its low digital bandwidth, it is considered to be the most robust mode for use on constrained networks. Here are some of the details of *BRIC-ULB*:

- **Low Delay** — *BRIC-ULB* uses a 20mS audio frame, with an overall encode/decode time of around 80mS. This makes *BRIC-ULB* a good choice for real-time, interactive applications.
- **Low Digital Bandwidth** — *BRIC-ULB* has a data rate of around 12 kbps, allowing it to travel over very low speed networks. Also, since *BRIC-ULB* is so efficient, error correction may be added in many situations without congesting the network.
- **Vocoder** — *BRIC-ULB* relies on an voice based vocoder, which is the same principal utilized in many digital mobile phones. The difference is that while mobile phone vocoders typically provide about 3 kHz audio bandwidth, *BRIC-ULB* delivers more than twice that fidelity, providing a much more listenable and less fatiguing sound. *BRIC-ULB* is optimized for human voices. It does a respectable job of encoding background noise and crowds, but music tends to suffer rather dramatically on *BRIC-ULB*.
- **Mono** — Only a single audio channel is supported on *BRIC-ULB*.
- **Dynamic Data Rate** — The *BRIC-ULB* encoder adapts its outgoing audio frame size based on the complexity of the incoming audio.

**LINEAR PCM**

This encoder does not compress audio at all. It uses a 48 kHz sampling rate and simply applies small frames of linear audio to IP packets. This mode is only useful on high bandwidth LAN or managed WAN environments. *Mono Mode* requires a network capacity of 768 kbps while *Stereo Mode* requires a network bandwidth over 1.5 Mb/s.

**Note: The remaining encoders discussed are optional ACCESS upgrades. All ACCESS codecs with 2.0 firmware are capable of decoding these signals, but an upgrade must be purchased to enable these encoders. A single upgrade enables all four encode modes.**

**AAC (OPTIONAL UPGRADE)**

This algorithm is a highly regarded standard for compressing audio to critical listening standards. It has been judged to produce “near transparent” audio at a coding rate of 128 kbps stereo. The standard is a collaborative of several audio companies best efforts, and has become popular as the default audio codec of the Apple<sup>™</sup> iTunes<sup>™</sup> program.

*HE-AAC*  
(*OPTIONAL UPGRADE*)

This is a newer version of AAC defined for increased efficiency. The goal of the algorithm is to produce AAC comparable quality at a lower bit rate. It does this by encoding lower frequencies to AAC, and higher frequencies using Spectral Band Replication (SBR), a technique that partially synthesizes these high frequencies. HE-AAC is trademarked by other companies as AACPlus.<sup>™</sup> HE-AAC (and close derivatives) are often used as the main audio codec for digital radio and satellite networks.

*HE-AACv2*  
(*OPTIONAL UPGRADE*)

This algorithm further increases the efficiency of HE-AAC by adding intensity stereo coding. This results in a lower bit rate for stereo signals. We also cluster a very reduced rate HE-AAC mono into this category, although technically it does not contain v2 coding.

*AAC-LD*  
(*OPTIONAL UPGRADE*)

This algorithm is an extension of AAC developed by the FhG IIS, who are the contributors to AAC and primary inventors of the MP3 algorithm. It's quality is superior to MP3 at similar bitrates (64-128 kbps) but it exhibits very low delay (100mS). This choice is best when reasonable network throughput is assured, near-transparent audio is required and interactivity is needed.

SECTION 10

MULTI-STREAMING



Warning: Advanced Topic

ACCESS supports the ability to run one encoder per box. But this single encoder stream may be sent to up to nine destinations simultaneously. We call this capability multi-streaming, since the encoder creates a separate but identical outgoing stream to each decoder. *Note: Your Internet connection must be able to support these streams. For example, if your encoder runs at 35 kbps network utilization, sending to two locations will require 70 kbps upload speed from your network.*

Multi-streaming should not be confused with IP Multicast, which is described in the next section.

Each ACCESS can also run only one decoder. So it's important that in a multi-stream environment, a maximum of one stream is sent in the reverse direction. This means that users interested in hearing a multi-stream must turn off their encoders.

This can be a bit confusing because multi-streams can be initiated from either end of the link.

Figure 42 shows an ACCESS multi-stream arrangement. ACCESS A is the multi-streamer, with ACCESS B, C and D listening to the same audio. In order to set up a multi-stream scenario, you will need to know how to turn ACCESS encoders **Off**. This must be done by building a profile with either the **Local** or **Return Transmitter** mode set to **Off**, as shown in Figure 43.

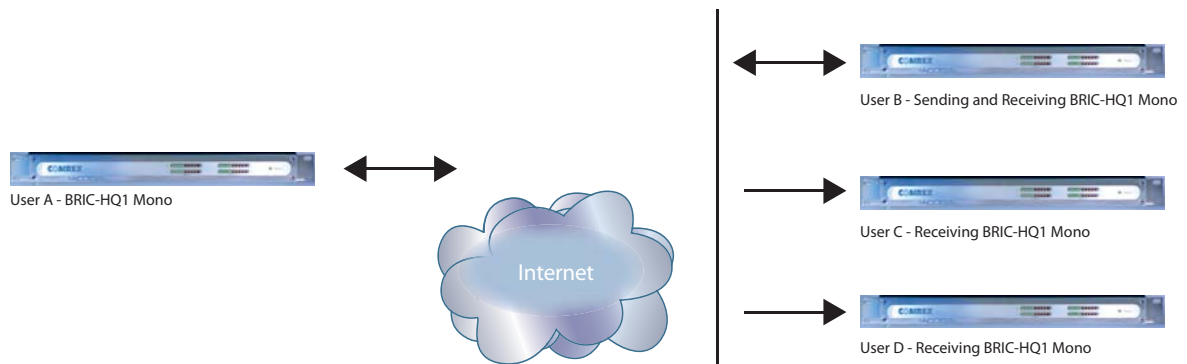


Figure 42 - Multi-Streaming Arrangement

We'll give two examples of multi-streaming scenarios. The first is an environment where the ACCESS that is serving the multi-stream initiates the calls, and in the second the serving ACCESS accepts all its incoming connections.

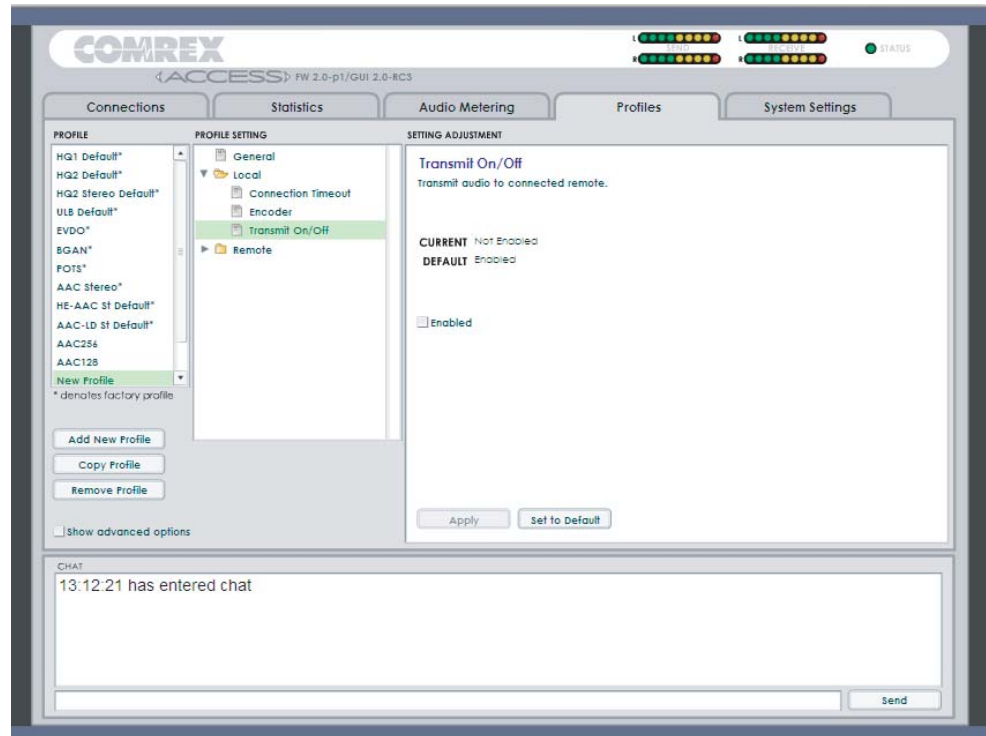


Figure 43 - Transmit On/Off in the Profiles Tab

In the “multi-streamer as caller” model, two different profiles will be built on ACCESS A. The first profile, labeled “Multi-Duplex,” will be defined as a normal, full-duplex ACCESS 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 ACCESS B, C, and D. He will assign the “Multi-Duplex” profile to ACCESS B, and “Multi-Simplex” profile to the others. He will then establish a connection with ACCESS B first, followed by C and D.

In model number 2 where the serving ACCESS accepts all incoming connections, all the profiles are built on the **Remote Receivers**. ACCESS B will use a simple profile by defining the encoders in each direction, and assign it to ACCESS A. ACCESS C and D will each define a profile with their **Local Encoders** turned **Off**, and assign them to A. ACCESS 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 multi-streaming 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.

## SECTION 11

## IP MULTICAST



**Warning: Advanced Topic**

IP Multicast is an efficient way of delivering ACCESS 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.

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 supports only a single direction stream. An IP Multicast encoder can not receive input streams.

In this manual, we assume that IP Multicast users will be familiar with the basic concepts of setup and operation of the network, so we will focus on how to configure ACCESS for Multicast mode.

### MULTICAST PROFILES

To set any remotes to Multicast, you must first create a profile for either a Multicast Sender or a Multicast Receiver on the **Profiles Tab**.

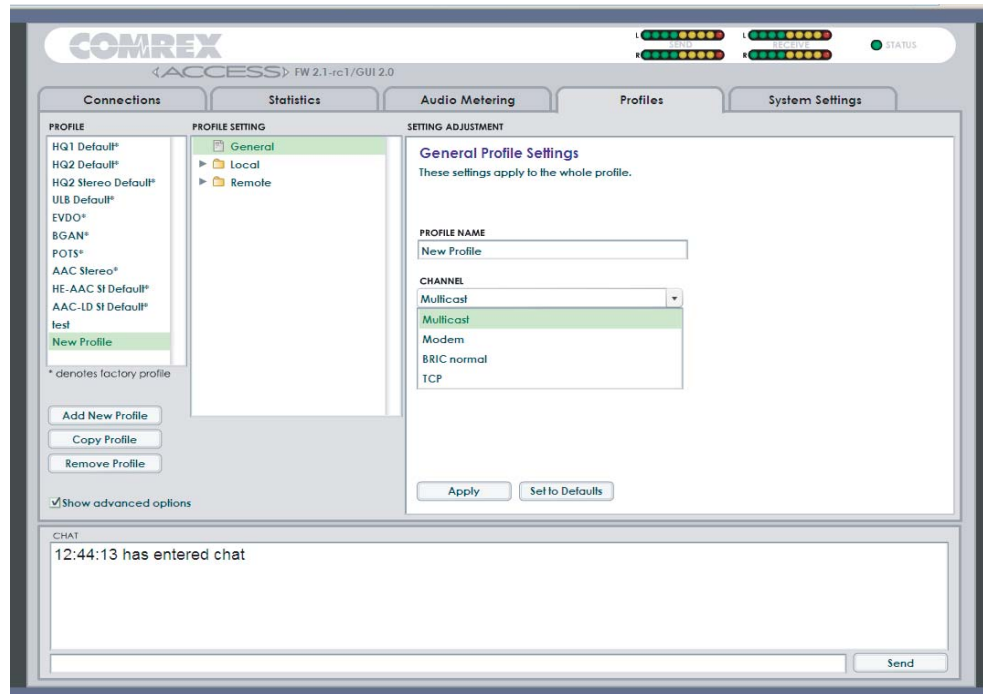


Figure 44 - Multicast selection in the Profiles Tab

As shown in Figure 44, when you define a new profile, you have the option to choose **Multicast** as the profile type. Multicast profiles have fewer options than other profile types, and some of the available options will have no effect (e.g. setting an encoder type on a Multicast receiver has no effect). The important settings for Multicast are:

- **Sender/Receiver** – Determines whether this particular ACCESS is designed to generate the IP Multicast stream (send) or decode one (receive).
- **Encoder Type** – Determines the type 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. See the *Profiles Tab* section for more information.

#### 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 ACCESS 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 usual way, 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

## SECTION 12

## GATEWAY OPERATION



Warning: Advanced Topic

*ABOUT GATEWAY OPERATION*

ACCESS includes a special operational mode that allows it to share a network connection with other devices. ACCESS will create and maintain the main network channel, then act as router over a second network port to deliver data to an external device.

ACCESS codec packets contain real-time headers, and the ACCESS will deliver these to the network ahead of other user information. In this way, ACCESS will assure that outgoing user data will not affect outgoing codec packets.

On the return channel, priority of audio codec packets vs. user packets are determined by the Internet Service provider, so if there is contention heavy user data may have an affect on decoder performance.

*CONNECTING AS A GATEWAY*

Under most circumstances, ACCESS will be sharing a network with an USB-based network based attached to its **USB** port, and distributing data to other users via Ethernet. In this configuration, you will need an Ethernet switch between ACCESS and the computers getting the data. Alternately, if only one computer will be connected, an Ethernet crossover cable may be used between ACCESS and the computer.

This type of connection is shown in Figure 45. ACCESS is using an USB-based device to connect to the Internet and using its Ethernet port to share the IP connection with a laptop computer via a crossover cable.

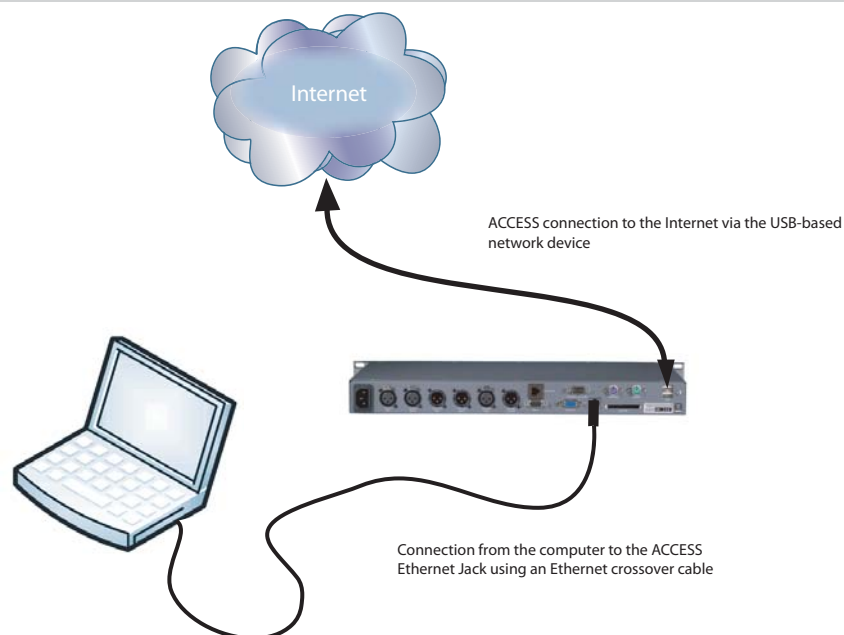


Figure 45 - Gateway Connection

**GATEWAY MODE**

*Gateway Mode* involves having two networks active and enabled on ACCESS; The Internet side (usually an USB-based network device) which is used to connect to the world at large, and the shared side (usually Ethernet), which is used to connect with other computers.

Configuring for *Gateway* operation may only be done through the *Console Connection Interface*. The only step to *Gateway Mode* is setting up your shared network side with the factory default static IP address, network mask and DHCP pool information. Since this is usually Ethernet, this is done in the normal Ethernet **TCP/IP Tab**. Simply select **Gateway** in the pull-down menu (as shown in Figure 46).

In *Gateway Mode*, ACCESS is acting as a DHCP server and router to the other devices. It will assign a dynamic address to all devices connected to it on the LAN. The static address assigned to the ACCESS Ethernet port is 192.168.42.1. The pool of addresses assigned by the DHCP server is 192.168.42.128 - 192.168.42.192.

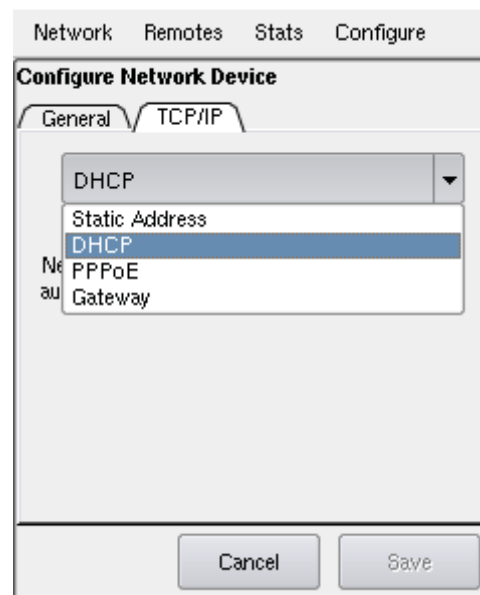


Figure 46 - TCP/IP Tab for Gateway Setup

## SECTION 13

## ADVANCED TOPICS

This section discusses some frequently asked questions (and possible solutions) encountered when setting up, configuring, troubleshooting and achieving optimum ACCESS performance.

**Q: How do I choose which encoding algorithm to use?**

A: ACCESS offers a very wide range of encoding algorithms. To some this may seem daunting. Here's a short guide and comparison chart on how to choose what's best for your application:

- 1) *Do I have lots and lots of bandwidth?* If you're running on an entirely unconstrained network like a campus LAN or local Wi-Fi, *Mono* or *Stereo Linear Mode* will offer the highest audio quality with lowest delay. If you're hitting the public Internet at any point in the link, however, avoid *Linear Mode*.
- 2) *Do I require interactivity?* If you need to chat back and forth across the link, choose one of our low delay algorithms like *BRIC-ULB*, *BRIC-HQ1* or *AAC-LD*. The deciding factor between these algorithms is digital bandwidth — *BRIC-ULB* uses very little, *BRIC-HQ1* uses more, and *AAC-LD* (optional upgrade) requires a relatively fat pipe.
- 3) *Is audio quality the paramount concern?* *AAC* or *HE-AAC* (optional upgrades) is the best choice for applications that need excellent audio quality. If delay is also a concern, consider *AAC-LD* (optional upgrade). If your running on an unconstrained network and without the optional algorithms, *Linear PCM* would be a good choice.
- 4) *Am I running on a constrained network?* If your Internet pipe is subject to being throttled, use *BRIC-ULB* for mono voice audio and *BRIC-HQ2* for stereo voice or music. These algorithms offer the absolute highest quality in exchange for extremely low network bandwidth. If you have the optional AAC upgrade, *HE-AACv2* can also be a very effective, low network utilization option.
- 5) *Do I need to deliver two unrelated audio signals to the same location?* *BRIC-HQ1*, *AAC*, *HE-AAC* and *AAC-LD* (optional upgrade) offer *Dual Mono* options that allow uncorrelated signals (such as dual language broadcasts) to be combined to a single outgoing stream. Note: It isn't possible to send one stream to location A and one to location B. However, it is possible to send the combined stream to locations A and B and have them tap only their respective channels (although this can be a confusing solution subject to operator error).

## Comparison Chart for ACCESS Settings

Required Bitrate	Coding Delay	Audio Bandwidth	
<b>BRIC HQ1:</b> Sends good quality audio over narrow digital channels with low delay.			
28 kb/s	80 ms	15 kHz	<b>A1 Mono</b>
42 kb/s	80 ms	15 kHz	<b>A2 Stereo</b>
56 kb/s	80 ms	15 kHz	<b>A3 Dual Mono</b> allows independent programming to be sent on both L&R channels
24 kb/s	80 ms	15 kHz	<b>A4 Mono 24Kb</b> restricted to 24 kbps coding rate
<b>BRIC HQ2:</b> Sends excellent quality audio over narrow digital channels with moderate delay.			
24 kb/s	360 ms	15 kHz	<b>B1 Mono</b>
24 kb/s	380 ms	12 kHz	<b>B2 Mono 12K</b> reduced bandwidth with fewer coding artifacts
30 kb/s	360 ms	15 kHz	<b>B3 Stereo</b>
30 kb/s	380 ms	12 kHz	<b>B4 Stereo 12K</b> reduced bandwidth with fewer coding artifacts
24 kb/s	360 ms	15 kHz	<b>B5 Stereo 24Kb</b>
<b>BRIC ULB:</b> For "worst case" networks — delivers 7 kHz voice at ultra low bitrates with low delay (not recommended for music).			
14 kb/s	80 ms	7 kHz	<b>C1 Mono (Default)</b> lowest bitrate of any BRIC algorithm
<b>Linear PCM:</b> Delivers transparent audio with no compression and very low delay - for use on high throughput networks.			
768 kb/s	40 ms	20 kHz	<b>F1 Mono</b>
1536 kb/s	40 ms	20 kHz	<b>F2 Stereo</b>
<b>AAC:</b> Provides near transparent audio at relatively high data rates. Best used on non-constrained data networks - for situations where latency is not important.			
<b>Optional AAC Encoders</b>			
64 kb/s	300 ms	20 kHz	<b>D1 Mono</b>
96 kb/s	300 ms	20 kHz	<b>D2 Stereo</b>
128 kb/s	300 ms	20 kHz	<b>D3 Dual Mono</b> allows independent programming to be sent on both L&R channels
128 kb/s	300 ms	20 kHz	<b>D4 Stereo 128Kb</b>
256 kb/s	300 ms	20 kHz	<b>D5 Dual Mono 256Kb</b> allows independent programming to be sent on both L&R channels
<b>HE-AAC:</b> Provides near transparent audio at low data rates - for situations where latency is not important.			
48 kb/s	300 ms	20 kHz	<b>E1 Mono</b>
64 kb/s	300 ms	20 kHz	<b>E2 Stereo</b>
96 kb/s	300 ms	20 kHz	<b>E3 Dual Mono</b> allows independent programming to be sent on both L&R channels
<b>HE-AAC V2:</b> Provides medium quality HE-AAC implementation using Spectral Band Replication.			
18 kb/s	300 ms	12 kHz	<b>G1 Mono 18Kb/s</b>
24 kb/s	300 ms	12 kHz	<b>G2 Stereo 24Kb/s</b> adds Parametric Stereo to SBR for higher quality audio at low data rate
48 kb/s	300 ms	20 kHz	<b>G3 Stereo 48Kb/s</b> adds Parametric Stereo to SBR for higher quality audio at low data rate
<b>AAC-LD:</b> Requires higher data rates but provides near transparent voice or music with low delay.			
96 kb/s	85 ms	20 kHz	<b>H1 Mono</b>
128 kb/s	85 ms	20 kHz	<b>H2 Stereo</b>
192 kb/s	85 ms	20 kHz	<b>H3 Dual Mono</b> allows independent programming to be sent on both L&R channels

**How do I choose?**

ACCESS offers a wide array of encoder modes, and the choice can be daunting. In general:

**BRIC-HQ1** is the most popular for wired IP networks, combining good quality and low delay.

**BRIC-HQ2** is often better for wireless networks, as it has superior error concealment and high quality.

**BRIC-ULB** is the best choice for the worst networks, providing "G.722-grade" (7kHz) transmission of voice audio.

For AAC-based encoders (optional):

**HE-AAC** is a good choice for delivering near-AAC quality while conserving network bandwidth.

**HE-AACv2** is the best choice for constrained networks.

**AAC-LD** provides the highest quality audio with low-delay.

**Q: Can I make ACCESS maintain an IP connection regardless of network status?**

A: Yes. First define your remote setting and apply a profile to it. Next go to the **System Settings Tab**, and pull down the menu labeled **Always Connect to Remote**. Once you select your remote here, a connection to the remote will be established and remain indefinitely.

**Q: Can I get a remote indication that ACCESS is connected to someone?**

A: Yes. Using the **System Settings Tab**, you can re-assign **Contact Closure Output #4** to trigger whenever the ACCESS front panel **Ready** light is lit, indicating a valid incoming connection. The function of **Contact Closure #4** will be changed in the following ways:

- a) **Contact Closure #4** will no longer be available as an end-to-end signal.
- b) Whenever ACCESS detects a valid incoming stream, it will trigger **CC #4** and maintain it until all valid connections stop.

**Q: What steps should I take when I'm having connection problems with ACCESS?**

A: There are several steps you can take to determine that cause of poor IP connection using ACCESS. The first step is to determine whether the problem is occurring in one direction or both. If in only one direction, take a look at network usage patterns on the local end of each ACCESS. If someone else on your LAN is downloading large files on the decoder side (or uploading large files on the encoder side) this may cause some performance issues. You may need to ask them to temporarily cease activity, or investigate a network router solution that will offer ACCESS priority over other traffic. Next, take a look at the **Status Tab** on the ACCESS that is decoding the faulty audio. Take a look at the jitter figure for your incoming connection. If this number is varying dramatically (good networks keep this figure below 50mS) then you may need to increase the **Local Delay Cushion** setting within the profile used to connect to that remote. Although it will increase your audio time delay, you may find increasing the cushion by 100-300mS or more will result in more stable connections, since the jitter buffer manager will no longer attempt to reduce delay by making the buffer smaller than the cushion.

**Q: How can I optimize settings for EVDO, UMTS, or other wireless access?**

A: Since there is typically already a substantial delay in these networks, it's often not a priority to keep ACCESS delay to the absolute minimum. Using the profile that you set up for the EVDO connection, enter the **Advanced Options**. Raise the **Frames/Packet** setting to 4 in both **Local** and **Remote Encoders**. This will reduce overall bandwidth and enhance reliability on many networks. You may also need to increase **Delay Cushion** on the non-wireless decode side as described in the previous answer.

**Q: I'm paying for my network bandwidth by the megabyte. How can I conserve?**

A: Set both **Local** and **Remote** encoders (in the profile) to *BRIC-ULB*, which uses by far the lowest amount of data. While setting the profile, click the **Advanced Options** and set both **Local** and **Return Frames per Packet** setting to 4. This will decrease overhead and preserve bandwidth. Finally, if you don't require audio in both directions, disable the return channel by turning off the **Remote Transmitter** in the profile. As a guide, an ACCESS set this way will average about 8 minutes of talk time per megabyte in each direction.

**Q: My IT guy wants to know what protocols and ports are being used. Can you enlighten him?**

A: Sure. The **Web-Based Remote Control** ports are set by default to 80 and 8080, although they can be changed in the **Ports Tab** of **Security Settings**.

The audio streaming port (9000) can be changed for send and receive. See *SECTION 7 MAKING CONNECTIONS USING THE WEB-BASED INTERFACE* for info on how to change ports on outgoing calls, and *SYSTEM SETTINGS TAB (Web-based or Console Connection Interfaces)* for information on changing the incoming port.

**Q: My IT guy is concerned about security and wants to know what services are open on this box.**

A: As mentioned, we're serving an HTML/XML page on the well known server ports, 80 and 8080. Our streaming application is UDP/RTP on port 9000. SSH is enabled by default but requires a passkey. You can disable it completely in the *Console Connection Interface* by selecting **Configure, Additional Configuration** and then **Security**. Click off the box labeled **Enable Diagnostic Remote Access (SSH)**. Leaving SSH enabled will help if Comrex support needs to interface with your ACCESS.

**Q: How can I change modem parameters like dial-tone-detect and ring cadence detection?**

A: Contact Comrex for more info on this.

**Q: I notice in the Advanced Options that I can change my streaming from UDP to TCP. Should I?**

A: Not if you want the best overall performance. ACCESS is optimized in terms of data rate, stability and delay to use UDP. TCP mode increases overhead and delay, and is included only for environments where UDP is hopelessly blocked by a firewall. ACCESS decoders do listen to both TCP and UDP ports and choose whichever arrives first. If an ACCESS gets an incoming TCP connection, it will establish TCP in the other direction automatically. One other note for use with TCP — most of the information presented on the **Statistics Tab** is generated by the UDP functionality, so you won't see much here using TCP.

**Q: My IT guy has apparently had way too much coffee because his face is all red and he's running around yelling something about Sarbanes/Oxley and crashing the corporate network. Is there something I can give him to make him feel better about the security of the network and his life in general?**

A: Why, yes! We've created a special document called "Information for IT Managers regarding the Comrex ACCESS IP Codec" which was written specifically to help keep the blood pressure and stress levels of IT managers within normal tolerance. It can be found in the *APPENDIX B* of this manual or in the Support section of our website at [www.comrex.com](http://www.comrex.com)

## SECTION 14

## LICENSE AND WARRANTY DISCLOSURES FOR COMREX ACCESS

*LICENSE***MPEG-4 audio coding technology licensed by Fraunhofer IIS**

<http://www.iis.fraunhofer.de/amm/>



ACCESS uses proprietary and open-source software programs. Some of the open-source programs are licensed under the Gnu Public License (GPL). For more information on GPL see <http://www.gnu.org>.

As per the GPL, source code for this software is available on request from Comrex on CD-ROM or other electronic format. To obtain this software please contact our support department at +1 978 784 1776. We retain the right to charge a small handling fee for distribution of this software.

ACCESS makes use of open-source and/or free software with the following copyright restrictions:

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See further Copyright notice below

**dropbear**

Copyright (c) 2002-2004 Matt Johnston  
Portions copyright (c) 2004 Mihnea Stoenescu  
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**libxml2**

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

PuTTY is copyright 1997-2003 Simon Tatham

Portions copyright Robert de Bath, Joris van Rantwijk, Delian Delchev, Andreas Schultz, Jeroen Massar, Wez Furlong, Nicolas Barry, Justin Bradford, and CORE SDI S.A.

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**Libpcap  
tcpdump**

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**WARRANTY**

All Equipment manufactured by Comrex Corporation is warranted by Comrex against defects in material and workmanship for one year from the date of original purchase, as verified by the return of the warranty registration card. During the warranty period, we will repair or, at our option, replace at no charge a product that proves to be defective, provided you obtain a return authorization from Comrex and return the product, shipping prepaid to Comrex Corporation, 19 Pine Rd, Devens MA 01434 USA. For return authorization, contact Comrex at 800-237-1776 or 978-784-1776 or email [repair@comrex.com](mailto:repair@comrex.com).

This warranty does not apply if the product has been damaged by accident or misuse or as a result of service or modification performed by anyone other than Comrex Corporation.

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## SECTION 15

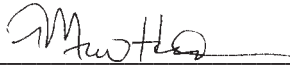
## CONFORMITY AND REGULATORY INFORMATION

*SUPPLIERS' DECLARATION OF  
CONFORMITY*

Place of Issue: Devens, Massachusetts

Date of Issue: January 23, 2006

Comrex Corporation, located at 19 Pine Road, Devens, MA in the United States of America hereby certifies that the Comrex ACCESS 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 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 (72/23/EEC)

EN 60950-1: 2001

Information regarding configuration of this equipment for operation on the telephone networks of the EC countries may be found in the Comrex ACCESS Rack product manual.

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

Signed:  \_\_\_\_\_

Date: 23 January 2006

*U.S. AND CANADIAN  
REGULATORY INFORMATION  
FOR THE ACCESS 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 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 Rack is 0.1, and is shown as the digits represented by ## in the product identifier US: DXDMD##ACCRK.

If the Comrex ACCESS 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 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 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

## IP COMPATIBILITY

IP compatibility using ACCESS firmware 2.3 and later offers several modes that allow compatibility with other IP coding devices. These compatible modes rely on the AAC family of algorithms. All ACCESS with firmware 2.3 are capable of *decoding* streams sent to them using these devices. In order to *encode* streams that are compatible with these devices, the optional AAC upgrade must be installed on the ACCESS. Contact Comrex for more details.

The ACCESS is capable of encoding and decoding a choice of three different types of non-ACCESS streams: Standard RTP, Luci Live and Zephyr Xstream. The choice is exclusive i.e. you must set the ACCESS specifically for the type of stream you wish to be compatible with, and you will remain incompatible with the other two types until you change it. This setting has no effect on normal ACCESS BRIC/POTS/AAC functions, which continue to operate as before.

**1) Luci Live** — This PDA/PC-based software allows real-time streaming over IP links. As of version 1.2, Luci Live includes AAC and HE-AAC in addition to the default MP2 algorithm. ACCESS can communicate with Luci Live only in Luci's AAC modes. Note: The free demo available from Luci does not incorporate the AAC functions; you must have a licensed and registered copy to use AAC.

To communicate with a Luci Live device:

a) Initial Setup — This will define all Standard RTP connections to be Luci Compatible

i) ACCESS Rack — On the **System Settings Tab**, open the **Standard RTP Settings** option and choose **RTP Compatibility Mode**. On the pull-down box, choose **Luci Live**.

ii) ACCESS Portable — Choose **Configure** then **System Settings** on the display. Under **Standard RTP Settings** select **RTP Compatibility Mode** and choose **Luci Live**.

b) Incoming Connections — Luci Live sends either an AAC or HE-AAC stream to the ACCESS on UDP port 5004. These streams will be automatically decoded. By default, a return channel of AAC 56kb/s mono is returned to the Luci Live product. The return channel may be altered to any Luci-compatible mode in the **Systems Setting** section. ACCESS that do not have the AAC upgrade applied will not create a return channel.

c) Outgoing Connections (ACCESS AAC Option required) — Build a profile using the **Profile Manager** on either the ACCESS Rack or Portable and select a *Channel Mode* of **Standard RTP**. Then choose a Luci-compatible encoder for the outgoing call. The Luci software will control what type of stream, if any, is returned to the ACCESS.

**2) Zephyr Xstream** — Xstream Firmware version 3.2.0 and higher support an “RTP Push” function that is compatible with ACCESS in some modes. ACCESS is not currently compatible with the Xstream’s HTTP and SIP streaming functions. There are several limitations imposed by the Xstream when using the RTP Push function:

- On the Xstream, only AAC and MP3 coding are available in this mode, and ACCESS is only compatible with the AAC mode
- The Xstream uses downsampling in modes below 96Kb/s, which is not supported by ACCESS.
- In order for an Xstream to decode an ACCESS stream, the default decoder setting must be changed from <Auto> to <AAC> in the codec menu of the Xstream.

To communicate with a Zephyr Xstream:

a) Initial Setup — This will define all Standard RTP connections to be Xstream Compatible.

i) ACCESS Rack — On the **System Settings Tab**, open the **Standard RTP Settings** option and choose **RTP Compatibility Mode**. On the pull-down box, select **Zephyr Xstream**.

ii) ACCESS Portable — Choose **Configure** then **System Settings** on the display. Under **Standard RTP Settings** select **RTP Compatibility Mode** and choose **Zephyr Xstream**.

b) Incoming Connections— Zephyr Xstream sends an AAC stream to the ACCESS on UDP port 9150. These streams will be automatically decoded. By default, a return channel of AAC 96kb/s mono is returned to the Xstream. The return channel may be altered to any Xstream-compatible mode in the **Systems Setting** section. ACCESS that do not have the AAC upgrade applied will not create a return channel.

c) Outgoing Connections (ACCESS AAC Option required) — Build a profile using the **Profile Manager** on either the ACCESS Rack or Portable and select a *Channel Mode* of **Standard RTP**. Then choose an Xstream-compatible encoder for the outgoing call. The Xstream will control what type of stream, if any, is returned to the ACCESS.

**3) Standard RTP** — This mode is set to receive a basic, unformatted AAC stream within a standard RTP/UDP structure. At present, this mode does not offer compatibility with other industry devices.

**APPENDIX B****INFORMATION FOR IT MANAGERS**

The purpose of this appendix is to describe all open ports and services available on the Comrex ACCESS. If a service is not mentioned here, it is disabled by default.

The Comrex ACCESS is a device designed to move real-time, wideband audio over IP networks. The main network interface is 10/100 10baseT Ethernet.

The device contains an optimized version of the 2.6 Linux kernel. The IP parameters are set using a GUI that requires attachment of a keyboard and VGA monitor to the device.

Alternately, during the first five minutes of power up, the IP parameters may be set by a PC on the local LAN using a proprietary broadcast UDP protocol. Comrex provides a Java-based application to perform this function on the local PC. After five minutes of operation, this function is disabled.

Updates to the system are provided by a custom on-line updater utility. This update process is password protected and done via XML over TCP port 8080. In addition to the password protection, the update data itself must have a valid cryptographic signature from Comrex, or else it is rejected. In order for the unit to be factory updated, TCP port 8080 must be forwarded to the device. Alternately, updates can be initiated from any local PC using the Comrex supplied java based update utility.

The ACCESS codec delivers an RTP/UDP stream from source port 9000 to destination port 9000 by default. By default it listens for incoming RTP/UDP streams on port 9000. To use the default mode, only UDP 9000 needs to be forwarded to the device.

Alternately, the device can be configured to deliver a similar TCP-based stream on TCP port 9000. By default, the device listens for incoming TCP streams on TCP 9000. This function may be disabled. The source port of TCP streams is ephemeral, and, if an incoming stream is detected, one will be returned to the ephemeral port.

The device also supports transmitting and receiving UDP multicast streams, using UDP port 9002 unless another port is specified by the user. This is not enabled by default, and a configuration must be explicitly created and connected on both ends for this function. Multicast streams are inherently unidirectional, and the configured port must be forwarded to the device on the receiving end. The multicast TTL value defaults to 1 (for in-network multicasting), but may be changed to any valid TTL by the user.

Outgoing ports and incoming ports may be altered via the user interface.

For compatibility with other industry devices, the ACCESS also listens for incoming streams (and can place outgoing streams) on UDP 5004 and 9150. These ports may be changed via the user interface, and this function may be disabled.

By default, the device serves as an SSH host on TCP port 22. Only SSH clients with an authorized DSA key can access SSH services on the device. Other forms of authentication are disabled. This key is kept confidentially by Comrex for factory diagnostics only. SSH services may be disabled completely via the user interface.

Under normal operation, the device is controlled by a networked computer via a web page served from the device on the standard HTTP port 80 (TCP). This page requires Adobe Flash player on the browser; and the flash plugin establishes a TCP connection back to the device on the XML port 8080. Both of these ports are required for the remote UI to function, and the port assignments are not configurable. These services may be disabled by the user interface, but this will disable both the remote GUI and the on-line updater.

The device will respond to standard ICMP requests.

