BRIC-Link II

BRIC-Link II Point-to-Point
IP Audio Conversion

COMREX

USA DESIGNED + BUILT

The Comrex BRIC-Link II, like the Comrex BRIC-Link, is a low-cost, high-performance solution for audio-to-IP conversion. Leveraging many of the core technical aspects of Comrex's successful remote broadcast ACCESS product line, BRIC-Link II provides for an elegant way of moving linear or compressed audio with very low delay.

BRIC-Link II is very simple to use, and can be deployed over a wide range of IP links. While it carries an entry-level cost, BRIC-Link II maintains superb audio specifications and hardware reliability, making the system suitable for STLs and other mission-critical functions without the expense required of more full-featured codecs. BRIC-Link II is contained in a small desktop package. Two BRIC-Link IIs may be installed to occupy 1U of rack space.

Applications

Like its predecessor, BRIC-Link II is uniquely suited to point-to-point "nailed up" high-quality audio links over a variety of data networks, like ISM band IP radios, T1/E1s, satellite channels, WANs, and LANs. The robustness of the BRIC technology (Broadcast Reliable Internet Codec) used in the box allows the system to perform well on the public Internet as well (using AAC compression modes).

BRIC-Link II is capable of "multi-streaming" – BRIC-Link II has the ability to run one encoder per box, but this single encoder stream may be sent to up to three destinations simultaneously. Additionally, BRIC-Link II can act as a streaming server, delivering AAC and HE-AAC to compatible PC-based media players.

Audio Coding

For users concerned about delay and coding artifacts, BRIC-Link II offers a robust stereo or mono linear mode that does not compress audio. In addition, BRIC-Link II is the only real-time audio codec to offer FLAC lossless compression, which reduces network throughput by 30–40% with absolutely transparent coding and no tandem coding concerns.

For situations where more reduced bandwidth is desired, BRIC-Link II offers AAC/HE-AAC modes as standard, allowing superb audio quality at dramatically reduced data rates.

For compatibility with mobile phone and web apps, BRIC-Link II also implements Opus audio compression, along with VoIP standards G.722 and G.711.

Connections and Indicators

BRIC-Link II offers balanced, professional level analog I/O on standard XLR connectors. Alternately, the Left I/O connectors may be switched to AES3 digital audio format.

BRIC-Link II can be connected to an IP network through a Gigabit Ethernet jack. Contact Closure and Ancillary data are delivered on Mini-DIN style jacks.

Audio level is displayed on the front panel via L & R tri-color LEDs. These LEDs may be configured to display send or receive level. A status LED on the front panel displays connection status as well as Ethernet status.

BRIC-Link II is also equipped with a card slot and a USB port for future use.

Additionally, the front panel of the BRIC-Link II features a headphone jack for monitoring purposes.

User Interface

BRIC-Link II acts as a web server, allowing the user to access all controls through an intuitive web interface. The page displays connection status, extensive network diagnostics, and audio level meters for remote monitoring. From any location, users are able to configure profiles for various connections with point-and-click connection commands.

Initial IP configuration is easily managed by the user with a Windows-based setup utility to be run on a computer located on the same local area network for low-fuss installation. The setup utility also functions as an upgrade utility, allowing flash upgrades from the Comrex website to be applied to the hardware in minutes.

Transmission Modes and Delay

BRIC-Link II is a true codec, offering a full-duplex stereo encoder and decoder in each box. Where two-way transmission is not required, the reverse channel may be disabled. The BRIC technology incorporated includes a jitter buffer manager that automatically balances delay and stability, dynamically increasing and decreasing delay based on network performance. For networks where the QoS is known, these parameters may be set so that a consistent level of jitter buffer is maintained.

End-to-end coding delay in linear modes is less than 25mS and FLAC modes are less than 30mS. AAC modes incorporate around 100mS total end-to-end delay and HE-AAC modes deliver around 220mS.

In addition to coding delay, network propagation and jitter buffers will add delay to any IP link and are network dependent.

Additional Features

BRIC-Link II provides for four end-to-end contact closures to be delivered along with the audio stream in each direction. Alternately, the contact closure inputs may be configured to initiate connections. An ancillary data stream is available via RS232 along with the audio stream. In AAC modes, the system is capable of sending up to 3 one-way encode streams to separate decoders (requiring additional bandwidth).

In addition, BRIC-Link II supports IP Multicast on capable networks.

About the BRIC-Link II Coding Algorithms:

Linear - BRIC-Link II's linear mode digitizes audio to 16 bit samples. It does not compress the audio further, but packetizes a frame of audio samples and transfers them across the network uncorrupted. Analog audio is sampled at 48 kHz, proving 22 kHz frequency response. If AES3 Input/Output is used, BRIC-Link II can utilize 44.1 kHz and 32 kHz sampled audio.

As shown in the table below, this can conserve network bandwidth (and reduce frequency response slightly).

FLAC - BRIC-Link II offers the FLAC (Free Lossless Audio Compression) algorithm for those who wish to conserve bandwidth without sacrificing audio quality. Since FLAC is lossless, there are no concerns about artifacts or immunity to further coding in the link.

On average audio, FLAC will typically remove 30-35% of the network data when compared to linear. FLAC encodes analog audio at 48 kHz with 16-bit resolution. If AES3 In/Out is used, FLAC can utilize 44.1 kHz or 32 kHz sampled audio, further conserving bandwidth.

Frequency response and all other specifications are identical to linear, with a slightly longer (5ms) delay.

AAC - For applications that require reduced bandwidth but excellent audio quality, BRIC-Link II can utilize the highly regarded AAC coding algorithm (licensed by Fraunhofer IIS) to provide near transparent stereo audio at a data rate of 128 kb/s or lower. Several AAC modes are available that reduce bandwidth and offer a choice of stereo or mono operation.

HE-AAC - To further reduce network bandwidth requirements (for example, for operation on the public Internet) BRIC-Link II includes HE-AAC, which combines the coding power of AAC with Spectral Band Replication to reduce the data requirements for high frequencies. HE-AAC is typically deemed to sound nearly as good as AAC at lower network bandwidth. HE-AAC is the standardized version of the algorithm known as AAC-Plus. Several HE-AAC modes are available that reduce bandwidth and offer a choice of stereo or mono operation. HE-AACv2 is also included, which utilizes parametric stereo encoding resulting in extremely low data rates.

Opus - Opus is a newer offering that combines low delay and low network utilization. Opus is included primarily for compatibility with softphone apps and Internet connections using WebRTC (see Technotes about WebRTC on the Comrex website).

ALGORITHM	ENCODE RATE	NETWORK RATE	BANDWIDTH	DELAY
Linear 48 kHz Mono	768Kb/s	818Kb/s	22 kHz	25mS
Linear 48 kHz Stereo	1.536Mb/s	1.586Mb/s	22 kHz	25mS
Linear 44.1 kHz Mono*	705.6Kb/s	751.6Kb/s	20 kHz	27mS
Linear 44.1 kHz Stereo*	1.4112Mb/s	1.4572MB/s	20 kHz	27mS
Linear 32 kHz Mono*	512Kb/s	546Kb/s	15 kHz	31mS
Linear 32 kHz Stereo*	1.024Mb/s	1.058Mb/s	15 kHz	31mS
FLAC 48 kHz Mono	~540Kb/s	~572Kb/s	22 kHz	30mS
FLAC 48 kHz Stereo	~1.08Mb/s	~1.112Mb/s	22 kHz	30mS
FLAC 44.1 kHz Mono*	~500Kb/s	~530Kb/s	20 kHz	32mS
FLAC 44.1 kHz Stereo*	~1Mb/s	~1.03Mb/s	20 kHz	32mS
FLAC 32 kHz Mono*	~360Kb/s	~382Kb/s	15 kHz	36mS
FLAC 32 kHz Stereo*	~720Kb/s	~752Kb/s	15 kHz	36mS
AAC Mono	56-64Kb/s	72-80Kb/s	20 kHz	100mS
AAC Stereo	96-256Kb/s	112-272Kb/s	20 kHz	100mS
HE-AAC Mono	18-48Kb/s	26-56Kb/s	15-20 kHz	210mS
HE-AAC Stereo	64-96Kb/s	72-104Kb/s	20 kHz	210mS
HE-AAC Stereo v2	24-48Kb/s	32-56Kb/s	15 kHz	250mS
OPUS Mono 48kbps	48Kb/s	64Kb/s	20 kHz	46ms
OPUS Mono 56kbps	56Kb/s	72Kb/s	20 kHz	46ms
OPUS Mono 64kbps	64Kb/s	80Kb/s	20 kHz	46ms
OPUS Stereo 64kbps	64Kb/s	80Kb/s	20 kHz	46ms
OPUS Stereo 96kbps	96Kb/s	112Kb/s	20 kHz	46ms
OPUS Stereo 128kbps	128Kb/s	144Kb/s	20 kHz	46ms

- *44.1 kHz and 32 kHz modes are only supported via AES3 digital audio I/O on both ends of link
- FLAC bandwidth is variable and based on audio input