DX-100 Audio Codec
Product Manual

COMREX

DX-100
Digital Audio Codec

Section

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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. The toll free number from the United Kingdom is 0-800-96-2093. Product information along with Engineering Notes and User Reports are available through our Fax-on-Demand system. Simply dial 978-264-9973 from any TouchTone phone and follow the instructions.

This information can also be found on the World Wide Web at http://www.comrex.com. Our internet E-Mail address is info@comrex.com.

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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.

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SECTION 1: ABOUT THE DX-100 DIGITAL AUDIO CODEC

The DX100 is a digital audio codec designed for broadcasters. The codec is capable of encoding and decoding high quality audio at a number of different data rates. The codec is also capable of encoding and decoding in mono or stereo. The codec also has the ability to sum two, independent high speed data channels (inverse multiplex them) and create one, high quality, mono audio path.

The DX100 uses the apt-x algorithm for encoding and decoding. This algorithm is a proprietary form of sub-band ADPCM. G.722 is another popular SB-ADPCM algorithm, however apt-x is NOT compatible with G.722.

The apt-x algorithm has several advantages:

1) The apt-x algorithm will work with any data rate from 56 kb/s to 384 kb/s (the DX100 is capable of up to 256 kb/s). The sampling rate, and therefore the audio bandwidth, is a direct function of the data rate.

2) The algorithm has very low delay. Since apt-x works in real time on the audio waveform rather than buffering a "frame" of audio and processing it, the processing delay is far less than with perceptual based coders. Real time "mix minus" is often possible on the reverse channel of the same circuit.

3) The algorithm has a low susceptibility to transcoding problems. Since the apt-x algorithm relies very little on perceptual masking data, it may be recorded or processed after coding with fewer artifacts appearing in your audio.

The algorithm requires at least 112 kb/s for wideband audio transfer. This may be in the form of two, independent 56 or 64 kb/s data channels. The DX100 will align them. Without the use of the inverse mux, the codec may be configured for mono or stereo at any data rate from 56 to 256 kb/s.

As mentioned above, audio bandwidth of the DX100 is a function of the data rate available. The following chart shows the approximate relationship:

Data Rate	Mono Bandwidth	Stereo Bandwidth
56 kb/s	7 kHz	3.5 kHz
64 kb/s	7.5 kHz	4 kHz
112 kb/s	13.5 kHz	7 kHz
128 kb/s	15 kHz	7.5 kHz
224 kb/s	na	13.5 kHz
256 kb/s	na	15 kHz

na = not applicable

SECTION 2: SETUP

The DX100 modes are set via three rear panel dip switches.

SWITCH 1 - LOOPBACK

UP Position = Loopback Out
DOWN Position = Loopback In

Loopback

When the DX100 first arrives, it is advisable to run a loopback test before putting it into service. To do this, attach an audio source to the left/mono input connector on the rear panel and a monitor on the output labelled left/mono. The audio level should be adjusted so that the "peak" light on the front panel lights occasionally.

Set Switch 1 to the DOWNor "loopback" position. Set Switch 2 to the UP position and Switch 3 to the DOWN position. The "ready" light on the front panel should come on at this point and you should be able to hear your audio.
A loopback test may be run at any time by setting Switch 1to the DOWN position. Switch 2 should always be UP when running loopback tests. The internal clock which runs the loopback test is factory set to 112 KB/s. This may be changed via the procedures outlined below.

IMUX

SWITCH 2 - IMUX

UP Position = IMUX Out
DOWN Position = IMUX In

This switch determines whether the internal inverse multiplexer to the DX100 is engaged. When this switch is in the DOWN position, the inverse multiplexer is active and a data connection must be made to both data ports for the codec to operate. If using an external inverse mux, such as those built into some ISDN terminal adapters, or when runing on single, high speed data circuits, this switch should be in the UP position to disconnect the inverse multiplexer, and the data channel should be connected to Port 1 only. This switch should always be UP (IMUX out) when running loopback tests.

Mono / Stereo

SWITCH 3 - MONO/STEREO

UP Position = Stereo
DOWN Position = Mono

This switch determines whether the DX100 processes one audio channel or two. When the internal IMUX is in, this switch should always be set for "mono." When running in stereo mode, the audio bandwidth available will be approximately 1/2 that for mono.

Remote Connections

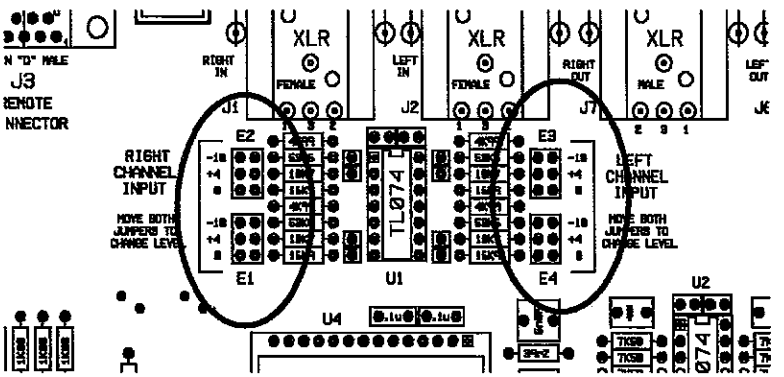
The 9-pin "D" connector on the rear panel labeled "remote" allows you to remote control the mode switches. To use this, all switches must be set to the DOWN positions. Connecting pin 3 to pin 2 on the remote connector is then equivalent to placing switch 1 UP. Likewise, connecting pin 4 to pin 2 puts switch 2 UP, and connecting pin 5 to pin 2 puts switch 3 UP. Connecting pin 6 to pin 2 momentarily provides a reset to all the internal processors in the codec, useful in case of hang-up due to a network or power glitch. Another way to reset the processors is to turn the power to the DX100 off for a few seconds.

Internal Jumpers

Several options are available to the user by opening the chassis of the DX100 and moving internal jumpers. *To change the setting, remove the hood that fits over the pins on the jumper block, then slide it over the new pin settings.*

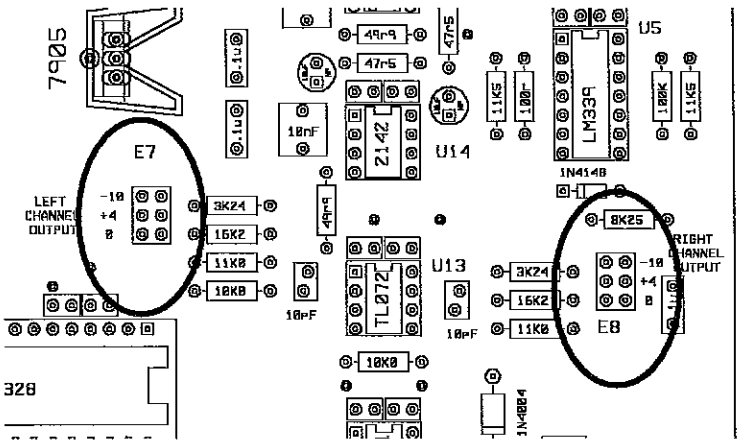
Input Levels (E1-E4)

A nominal input level of -10, 0, or +4 dBu may be selected for each channel by moving jumpers on connectors E1-E4. Note that both E1 and E2 must be moved to change right channel input level. Likewise for E3 and 4 for left channel.



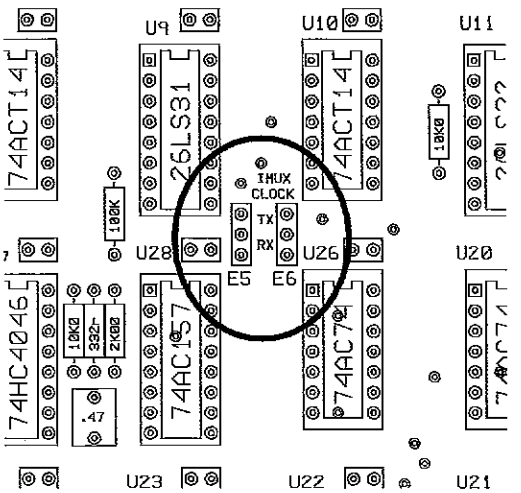
Output Levels (E7, E8)

Output level may be set to the same selections using E7 and E8 for left and right respectively.



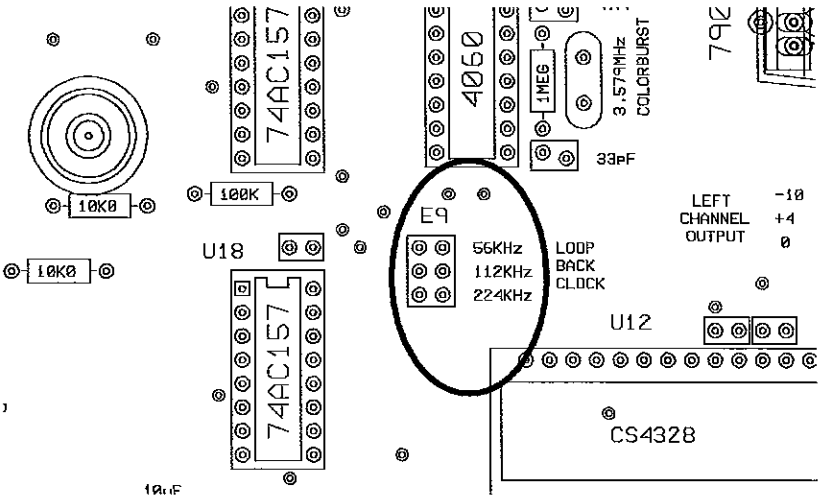
IMUX Clock (E5, E6)

E5 and E6 select which incoming clock line is sampled by the IMUX- normally you will not change these.



Loopback Clock (E9)

Finally, E9 selects which clock speed is enabled when running a loopback test. The options are 56, 112 and 224 KB/s.



Data Connections

The two 25 pin male connectors on the rear panel are connected to your data network. These connectors are configured per EIA-530. If your terminal adapter or CSU/DSU uses this protocol, a 25 pin straight through cable should do the job (Comrex has provided this cable with your unit).

If you have a V.35 or X.21 type connection, Comrex can provide (or has provided) an adapter cable. The pinnings of the 25 pin "D" connectors are specified below.

Pin #	Function
1	shield
7	gnd
17	RX Clk A
9	RX Clk B
15	TX Clk A
12	TX Clk B
3	RX Data A
16	RX Data B
2	TX Data A
14	TX Data B

Pins 24 and 11 are reserved for V.35 interface.
No connections should be made to these pins.

The data cables should be connected to the DX100 before power is applied to the codec. The codec "wakes up" best when clock signals from the network are available via the cables.

SECTION 3: OPERATION

The DX100 codec should remain idle, with audio muted, until it is connected to another codec or is put into loopback mode. The ready light should then turn on and audio should be available. The codec may occasionally require a hardware reset (power down briefly or momentary reset via the remote connector) when changing modes or IMUX status.

About the IMUX

The inverse multiplexer built into the DX100 will compensate for up to 1/2 second delay differential between the data channels. This is accomplished during a "training sequence" which takes place on the completion of two valid data calls. No status information is sent down either channel during program transmission - all data is dedicated to audio. A "bit slip" or burst error may cause the IMUX to malfunction- The apt-x processor will usually detect this and reset the IMUX. The effect of this will be a short interruption of audio.

On rare occasion, the apt-x processor may not correctly detect a problem with the IMUX or a drop of one data call- distorted audio may result. The DX100 will require a hardware reset if this happens, or the data channels will both need to be reestablished. This should happen rarely enough to be of little consequence (never), but if your application demands absolute insurance, we recommend use of an external IMUX with in-band monitoring. Contact Comrex for more details.