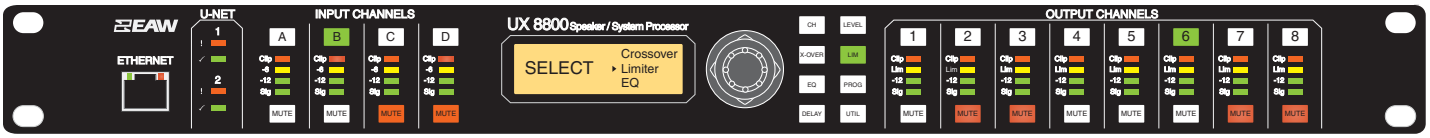


Features and Benefits

- Two operational modes.

  System Processor - All signal processing is user-adjustable.

  Loudspeaker Processor - Preset signal processing for EAW loudspeakers with Gunness Focusing™ to optimize performance.
- Comprehensive, intuitive front panel control makes computer control unnecessary for most adjustments.
- U-Net – EAW-designed signal and control networking between UX8800s and other U-Net enabled products.
- Digital inputs to reduce A/D & D/A stages.
- EAWPilot software for comprehensive computer control.
- Filter parameters are compatible with EAW's modeling and alignment software for optimized performance.

Description

The UX8800 provides a complete suite of state-of-the art, digital signal processing tools. Additional capabilities and features set the UX8800 apart as the head end processor for large systems with a variety of output channels and for processing specific, EAW loudspeakers.

In System Processor mode, user-adjustable functions include the expected range of processing tools, such as EQ filters, delay, gain, crossovers, and polarity. However, these functions are implemented using custom-designed algorithms to optimize their usefulness when applied to loudspeakers. For example, unlike many bell filter designs, the UX8800's produce a flat frequency response when reciprocal cut and boost filters are overlaid. Also, to more accurately calculate signal delay distances, a temperature setting compensates for sound speed differences.

In Loudspeaker Processor mode, preset processing is available for specific EAW loudspeakers and loudspeaker arrays. The UX8800 hardware is designed to implement EAW's innovative Gunness Focusing™ as part of the preset processing to correct loudspeaker anomalies that cannot be corrected with conventional digital processing. Advanced limiting is designed to maintain sound quality while achieving maximum output levels based on amplifier outputs and. An ambient humidity setting provides appropriate air loss equalization based on listening distances. While the output settings are locked to prevent inadvertent or purposeful modification, the user retains control of input gain, EQ, signal delay, and polarity for the entire loudspeaker. This mode's simplicity makes the UX8800 practical for entry level users and fast to operate for experienced users, providing a high degree of system consistency while retaining all necessary, user adjustable, alignment controls.

The UX8800 uses standard Ethernet protocol and CAT-5 cabling for computer control using the custom EAWPilot software. A unique design that permits plug-and-play Ethernet communication without having to deal with problematic IP addresses. In addition, both audio and control signals can be transmitted between additional processors and other EAW products using the built-in, 32-channel, U-Net network and standard CAT-5 cabling. Up to 254 devices can be linked using U-Net, all controlled by EAWPilot.

Two year warranty.

DIGITAL SIGNAL PROCESSOR, 4-Input x 8-Output

*See **NOTES TABULAR DATA** for details*

PERFORMANCE

Operating Range	15 Hz to 22 kHz, +/-0.25 dB
THD + Noise	<0.005%, 20 Hz to 20 kHz, +10 dBu output
Channel Separation	80 dB, 20 Hz to 20 kHz
Dynamic Range	>114 dB, A-weighted, analog/digital in to analog out

INPUTS *(4x)*

Analog Mode	Type	Electronically balanced
	Connector	4x XLR female
	Impedance	20k ohm(balanced), 10k ohm (unbalanced)
	CMR	80 dB, 1 kHz >50 dB, 30 Hz to 20 kHz
	Crosstalk	-110 dB, 1 kHz
	Maximum Level	18 dBu, 6.2 V
Analog to Digital Converters (4x)		
Resolution/Sampling		24 bit, 48 kHz
Digital Mode	Type	*AES/EBU* Transformer and DC isolated
	Connector	2x XLR female
	Impedance	110 ohm
	Nominal Level	2 V to 7 V peak-to-peak
	Sampling Rates	44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz [1]
U-Net Digital	Type	Proprietary 32 channel
	Connector	2x RJ-45
	Sampling Rates	44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz [1]

OUTPUTS *(8x)*

Analog	Type	Electronically balanced
	Connector	8x XLR male
	Impedance	<50 ohm
	Crosstalk	-115 dB, 1 kHz
	Max Level	18 dBu, 6.2 V @ >600 ohm load
	Absolute Min load	>50 Ohm / 20 nf)
Digital to Analog Converters (8x)		
Resolution/Sampling		24 bit, 48 kHz
U-Net Digital	Type	Proprietary 32 channel
	Connector	2x RJ-45
	Sampling Rate	48 kHz

DIGITAL PROCESSING

Processor	50 Mflop, 32 bit, 48 kHz Sharc
Latency	3.13 ms

NETWORKING *(Communication / Control)*

	Type	Ethernet (10/100 Mbps) 1x RJ-45 front panel
	U-Net	U-net 2x RJ-45 rear panel
	Network Protocols	TCP/IP static / dynamic
	Control Software	EAWPilot

AC MAINS *(Nominal)*

	Connector	IEC C14 with integral fuse drawer
Maximum Input Range		100 V to 240 V 50 Hz to 60 Hz
	Load	<75 VA
	Fuse	Slow-blow 4 A, 250 V, 5 mm x 20 mm, IEC
	Temperature Range	32° F to 104° F / 0 °C to 40 °C

ORDERING DATA

Description	***Part Number***
UX8800 Digital Processor	0018650
Supplied Accessories	
ac mains cables	120 V 6 ft and 220 V 1 m
Ethernet crossover cable	7 ft / 2.1 m
Spare fuse (in rear panel fuse drawer)	Slow-blow 4 A, 250 V
CD-ROM with EAWPilot control software and trial version of Smaart	
Optional Accessories	
None	

1 All incoming sample rates converted to 48 kHz for internal processing

COMPLIANCES

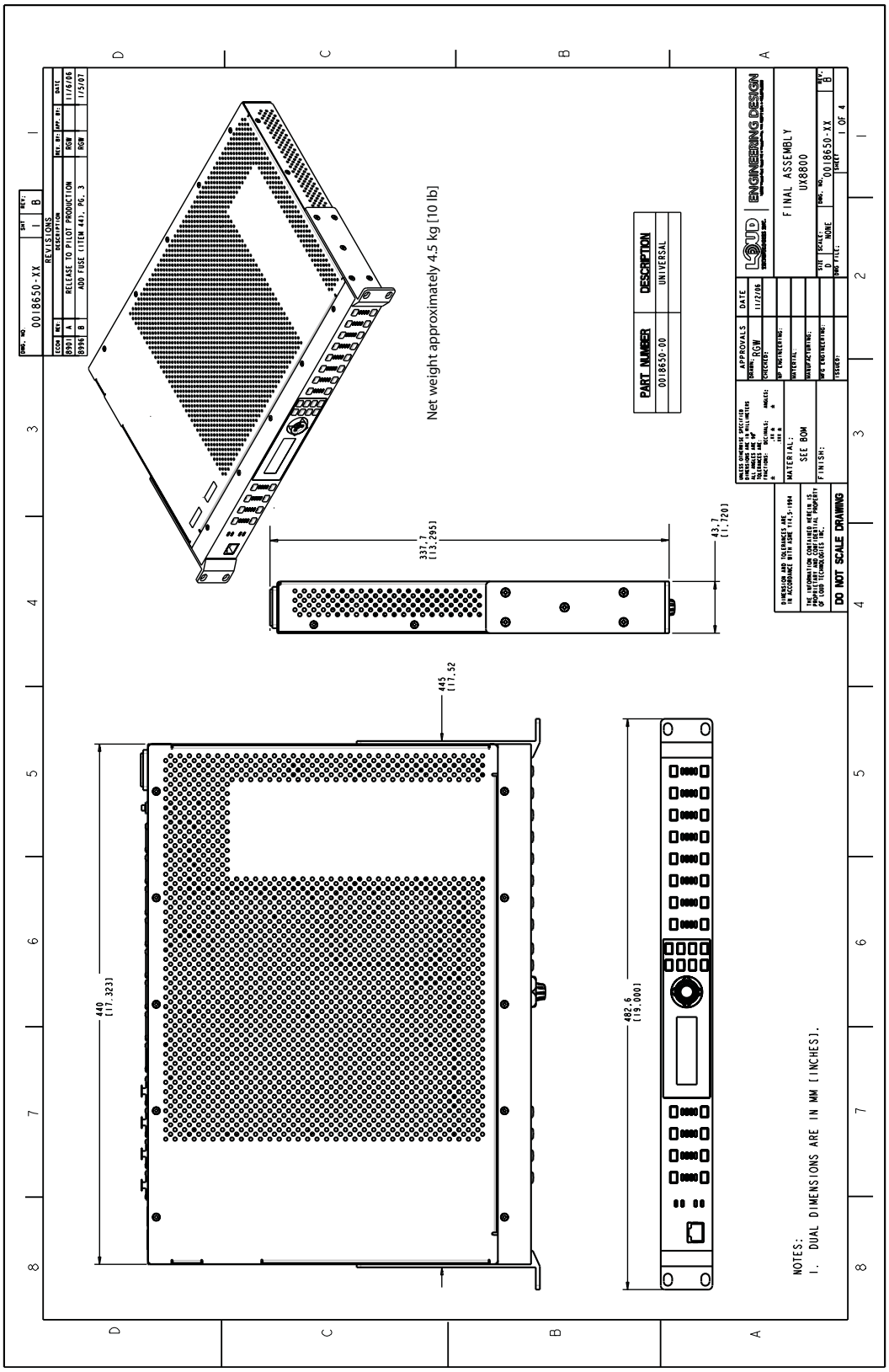
Part 15 EN 60065:2002, EN 55103-1:1997, EN 55103-2:1997, EN55103-1, EN55103-2, EN60065

SYSTEM SPECIFICATION STANDARD

Eastern Acoustic Works One Main Street Whitinsville, MA 01588 tel 800 992 5013 / 508 234 6158 fax 508 234 8251 www.eaw.com

ENCLOSURE

Material	18 gauge electro-galvanized steel
Finish	Textured black paint



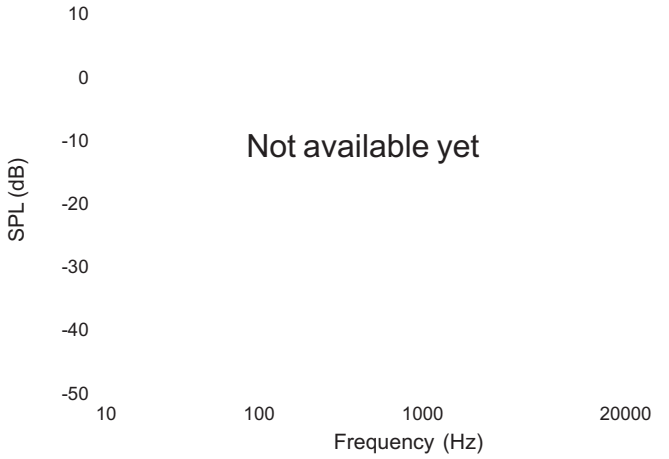
NOTE: This drawing has been reduced. Do not scale.

PERFORMANCE DATA

*See **NOTES GRAPHIC DATA** for details*

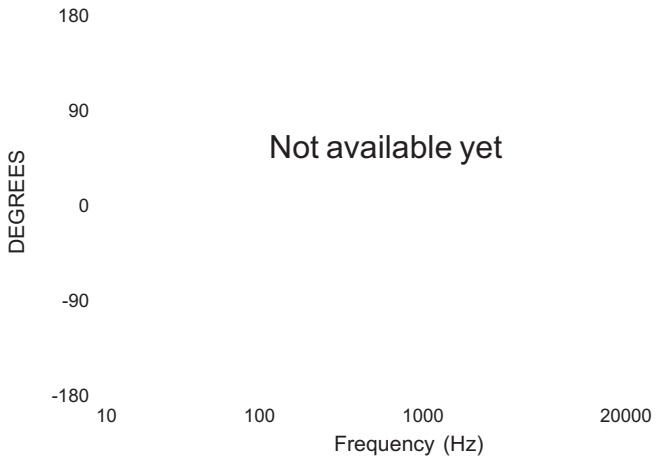
Frequency Responses:

Default Settings = blue



Frequency Responses:

Default Settigs = blue



CHANNEL FUNCTIONS *(Ch A to Ch D and Ch 1 to Ch 8)*

*See **NOTES TABULAR DATA** for details*

EQ Filters (10 filters for each input and output channel)

Parametric

Type	Symmetrical boost / cut
Frequency	20 Hz to 20 kHz, 1/24 octave steps
Gain	+/-15 dB, 0.1 dB steps
Bandwidth	0.2 to 2 octave, 0.1 octave steps
Q	0.25 to 64, 0.1 octave steps

Low / High Shelf

Slope	6 dB / 12 dB
Frequency	20 Hz to 20 kHz, 1/24 octave steps

Low / High Pass

Slope	6 dB / 12 dB per octave

Bypass

Bypass Filter	For each individual filter
Bypass EQ	For all EQ filters

Crossover *(each output channel)*

Low Pass / High Pass

Slopes	Butterworth, Bessel: 6 dB to 48 dB per octave, 6 dB steps
Slopes	Linkwitz-Reily: 12 dB to 48 dB per octave, 12 dB steps
Frequency	20 Hz to 20 kHz, 1/24 octave steps
Bypass	For each individual low and high pass filter

Other Channel Functions

Input Delay	0.00 To 1200 ms, 20.83 us steps
Output Delay	0.00 ms to 1200 ms, 20.83 us steps
Gain	+/-15 dB
Polarity	Normal / Inverted
Mute	Muted / Unmuted

Source Select

In A to In D	2x Analog, digital, or U-Net (two signals are summed)
Out 1 to Out 8	In A to In D

U-Net Out Assign

In A to In D	U-Net 1 to 32/64 (no processing)
Out 1 to Out 8	U-Net 1 to 32/64 (all processing)

Limiter (Out 1 to Out 8)

Threshold	-10 dBu to 20 dBu in 0.1 dB steps
Ratio	1:1 to 20:1 and Inf:1, integer steps
Attack	40 us to 1 ms, 10 us steps / 1 ms to 40 ms, 1 ms steps
Release	10 ms to 2 s, 10 ms steps
Knee	Hard / Soft
Bypass	Each output limiter

CONTROLS AND INDICATORS

FRONT PANEL

Meters

Input *(4x)*	4 segment LED, Clip= 0 dBFS = full scale on ADC
Output *(8x)*	2 segment LED, Clip = 0 dBFS = full scale on DAC 2 segment LED, LIM = 0 dB = Limiter threshold

Buttons

Inputs A to D	Selects input channel for editing
Output 1 to 8	Selects output channel for editing
Input Mutes *(4x)*	Mutes the output of the input channel
Output Mutes *(8x)*	Mutes the output of the output channel
CH	Channel Setup
X-OVER	Crossover
EQ	Equalization
DELAY	Signal Delay
LEVEL	Level and Polarity
LIM	Limiter
PROG	User programs
UTIL	Global functions

Other

Data Entry Encoder	8-way joystick v-pot navigates the menu system
Display	Backlit LCD 122 pixel x 32 pixel graphic
Ethernet port	RJ45, red and green LED status indicators
U-Net	Red and green LED status indicators

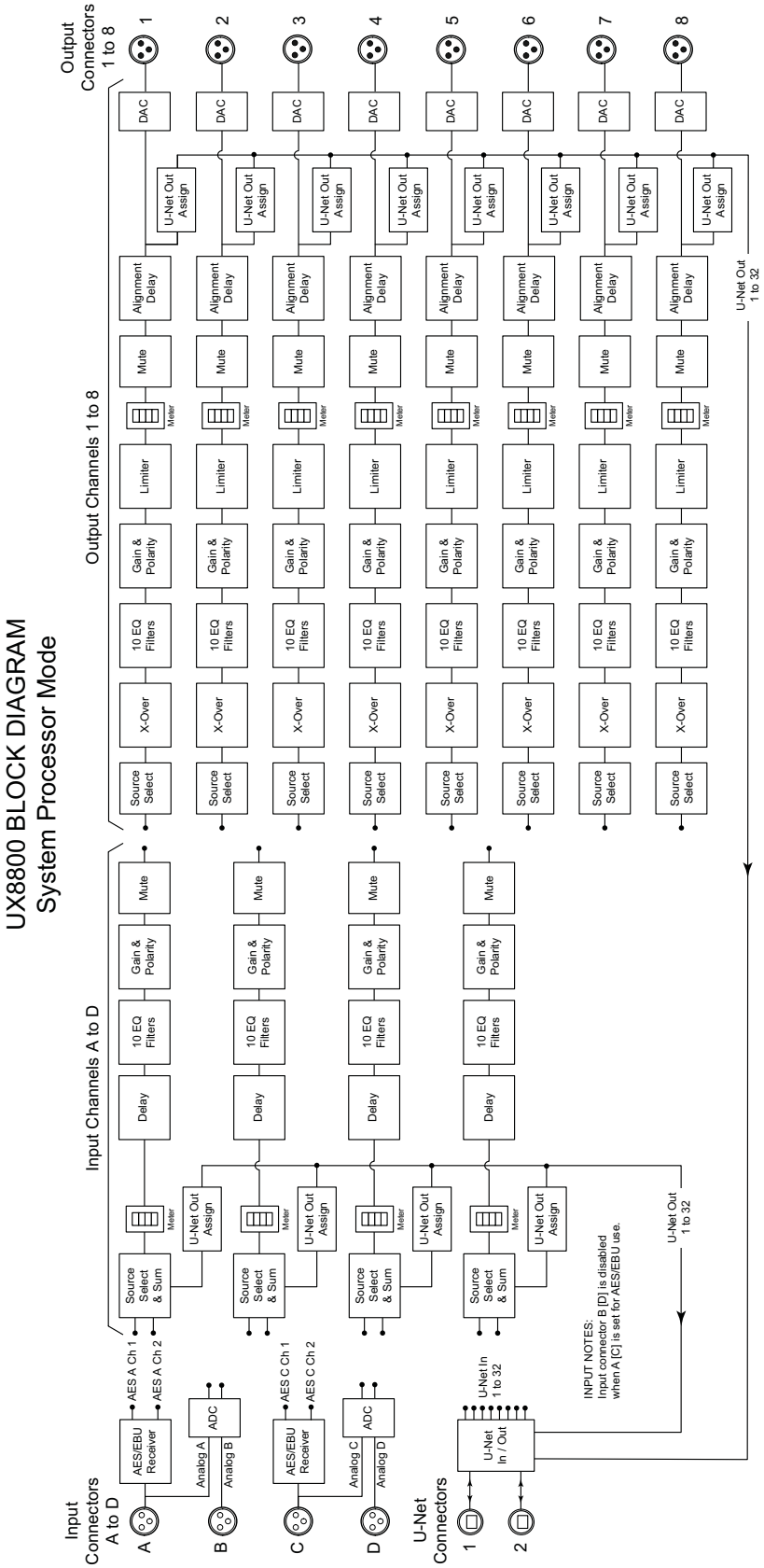
REAR PANEL

Power Switch	Turns ac mains on and off
U-Net Ports *(2x)*	Red and green LED status indicators

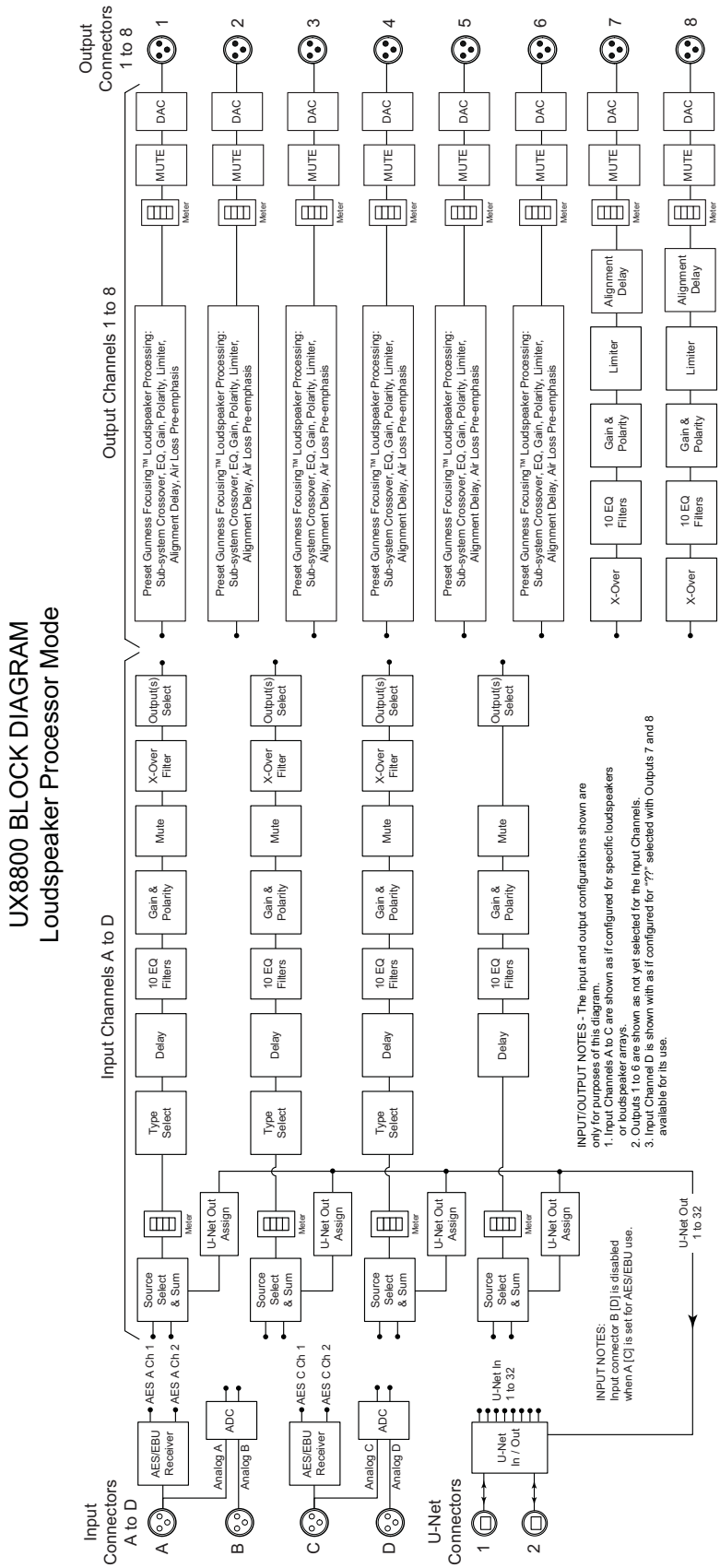
GLOBAL FUNCTIONS

Modes	System Processor / Loudspeaker Processor
Units	Imperial / Metric
Temperature	32 F to 114 F / 0 C to 40 C degrees, 1 F degree steps (used to convert delay time to distance)
Humidity	10% to 100% relative, 1% steps (functions only in Loudspeaker Processor mode for the air loss pre-emphasis filter)
LCD Contrast	0 to 10 (relative scale)
Front Panel Lock	Password protects all functions except mute buttons
Input Configuration	Analog or AES/EBU
Programs	50 memories for user configuration
Memory Recall	<1 s, all parameters

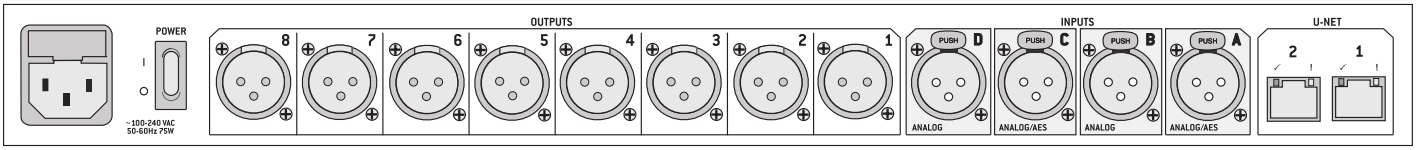
SIGNAL DIAGRAM (System Processor Mode)



SIGNAL DIAGRAM (Loudspeaker Processor Mode)



REAR PANEL - INPUTS / OUTPUTS



UX8800 TECHNOLOGY

UX8800 Design Challenges: The goal for UX8800 digital signal processor was to provide the standard set of digital processing tools in a 4 input by 8 output processor. In addition, the processor's hardware had to be able to implement Gunness Focusing™ in order to provide preset, factory-optimized processing for specific EAW loudspeakers. This would include those intended for standalone use and those normally used in arrays. The preset processing allows unused input and output channels to have standard processing for other uses.

In addition to its functions as a digital processor, the UX8800 needed to be network capable using standard Ethernet protocol and hardware. However, using the EAWPilot software, Ethernet communication would need to be plug-and play to avoid troublesome IP addressing issues. In order to facilitate control of and connect audio to multiple additional products, EAW designed a new networking topology called U-Net. U-Net's 32 channels allow a combination of control signals and audio signals to be networked between products over standard CAT-5 cabling. Designed as a mesh network, no specific wiring configuration is required as is for Ethernet, CobraNet, and other popular network topologies used for audio signals and equipment control.

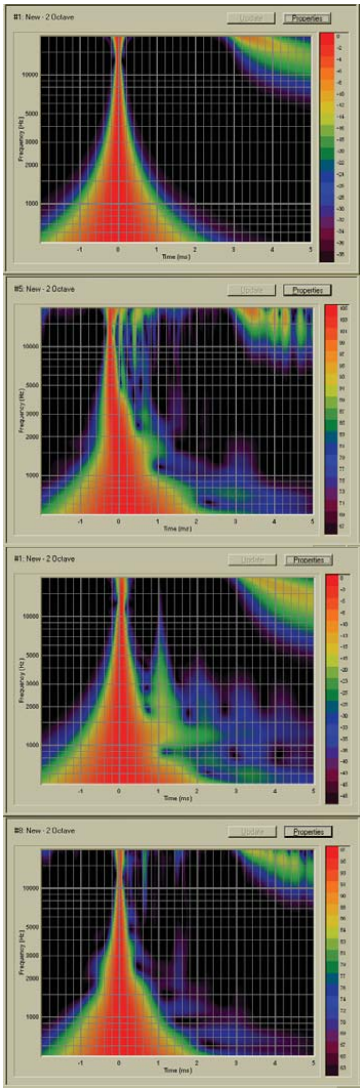
Gunness Focusing™ : Using innovative analysis tools and methods developed by EAW, specific, long-standing, loudspeaker problems were isolated and analyzed as to their solutions using DSP. However, the desired complex filter responses required accuracies grossly lacking in conventional DSP filters based on the Bilinear Z Transform (BZT). These filters sacrifice response accuracies in the upper audible octaves to avoid mathematical difficulties involving the Nyquist frequency. Using standard algorithms can result in filter response magnitude errors of over 15 dB, with equally flawed phase performance. Using FIR (Finite Impulse Response) filters would have resulted in latencies in excess of acceptability for real time use. Gunness Focusing uses EAW-developed filter algorithms that avoid these issues while providing the exact, complex, filter responses required to correct the loudspeaker problems.

Gunness Focusing is implemented in the UX8800 for many EAW loudspeaker models. Of particular note are EAW array loudspeakers. Gunness Focusing not only optimizes the performance of the individual loudspeakers, but it also optimizes the integration of adjacent loudspeaker outputs and the off-axis performance of entire arrays.

Gunness Focusing Example: Figure 1 shows the spectrogram of an ideal, point-source loudspeaker. Figures 2 and 3 show two different spectrograms of a 2-way loudspeaker optimized with conventional digital signal processing (DSP) and conventional measurements. In Figure 2 the time domain performance is emphasized. In Figure 3 the frequency domain performance is emphasized. In both cases there is significant energy to the right of the main energy spectrum compared to the ideal loudspeaker shown in Figure 1. These are all caused by inherent, mechanical properties of both the cone LF driver, the HF compression driver, and the HF horn itself. Although the frequency response (not shown) is nearly an ideal, flat line, these anomalies obviously exist in spite of the conventional processing. Because the usual measurements and corrective filtering lumped the undistorted signal and the anomalies together, the flat response is actually a combination of the energies from both. Anomalies like these are generally described as coloration and are responsible for why two, similar, flat-response loudspeakers can sound quite different.

In contrast, the result of applying Gunness Focusing to this same loudspeaker is shown in Figure 4. The anomalies in both time and frequency are largely gone, making the spectrogram in Figure 4 look quite similar to that of the ideal loudspeaker in Figure 1. While the frequency response is also nearly an ideal, flat line, it is almost entirely a result of reproducing the energy from flat input signal.

Summary: EAW's engineering efforts resulted in the UX8800 digital signal processor which provides complete user control as well as factory-optimized, Gunness Focusing settings for EAW standalone and arrayed loudspeakers. User-friendly, advanced, processing functions and plug-and-play audio/control networking facilitate its use for first-time DSP users, seasoned professional operators, system designers, and audio aficionados all over everywhere. In keeping with the performance of EAW loudspeakers, the UX8800's sonic performance is superb.



Figures 1 to 4 (top to bottom)

SPECTROGRAMS: EAW's proprietary spectrograms show the spectrum or frequency content of sound (vertical axis) and its variation in time (horizontal axis), the colors representing intensity. The width of the data reflects the size of the sliding time window applied to the data, which increases in size with lower frequency. The "data" in the upper right is simply a limitation of the spectrograph's mathematics and has no relevance.

NOTES

TABULAR DATA

1. Measurement/Data Processing Systems: Primary - FChart: proprietary EAW software; Audio Precision. ??
2. Measurements: Dual channel FFT; length: 32 768 samples; sample rate: 48 kHz; logarithmic sine wave sweep. ??
3. Measurement System Qualification (includes all uncertainties): Level: accuracy +/-0.05 dB 20 Hz to 20 kHz, precision +/-0.1 dB 20 Hz to 20 kHz, resolution 0.01 dB; Frequency: accuracy +/-1 %, precision +/-0.1 Hz, resolution the larger of 1.5 Hz or 1/48 octave; Time: accuracy +/-10.4 µs, precision +/-0.5 µs, resolution 10.4 µs. ??
4. Volts/Amperes: Measured rms value of the signal or as noted.
5. Performance: Input, DSP (Digital Signal Processing), outputs, and ac mains characteristics.
6. Functions: Operating controls, function parameters, and indicators.

GRAPHIC DATA

1. Graphs are plotted using raw data.
2. Frequency Response: Variation in output level with frequency for a constant input signal.
3. Phase Linearity: The difference in phase between the input signal and output, with signal processing latency removed.