Inter-M DSP MultiMode Equalizer

An alliance that produces sound results

By Christoph M. Musialik, PhD

This Factory Direct was submitted by Inter-M. Live Sound *makes every effort to eliminate any use of marketing inspired hyperbole.*

It's normal for synergy to produce a positive outcome. Unfortunately, in the world of high-end digital signal processing (DSP), a positive outcome alone isn't insufficient because technology is advancing at such a rapid pace.

We have met this challenge with the alliance of Algorithmix (of Germany) and Inter-M Ltd. (of Korea), which has produced an East-West synergy that has fostered several new DSP products and technologies, including the development of the Inter-M MEQ-2000 24/96 MultiMode Equalizer.

The primary focus of Algorithmix is the development and licensing of high-end, artifact-free, real-time DSP algorithms for custom digital audio processing systems such as digital audio workstations, mixing consoles, 19-inch audio processing and effects devices, acceleration boards and native software audio plug-ins for PCs, broadcast systems, audio for film and video, networked sound reinforcement systems, digital musical instruments and historic audio digitalization, restoration and archiving.

The alliance with Inter-M dates back to 1997, and at that time, the company was already one of Asia's major manufacturers of analog audio gear, looking to add digital technology to its roster. Shortly after the agreement was reached, cooperative efforts commenced on development of the MEQ-2000. The design goal was to maintain "warm" analog sound, with the high precision and versatility of digital audio processing. Of course, our list also included an affordable and easy to use product.

The original MEQ-2000 concept was part of a system-oriented line of 19-inch rack-mount devices covering recording, mixing, mastering and sound reinforcement. We envisioned (and have subsequently delivered) a complete system of tools, each offering multifunctionality and flexibility.

The digital audio interconnection between chained devices permits the units to stay within their 24/96 digital domain (24-bit audio interface resolution, 96 kHz sample rate) to avoid unnecessary signal quality degradation. Built-in digital outputs and inputs on AES/EBU or S/PDIF provide comprehensive sample rate conversion (with input sample rates of 20 kHz to 100 kHz) and 40-bit internal signal paths with 80-bit processing.

Onboard the MEQ-2000, a 31-band graphic equalizer and eight-band parametric equalizer are supported by six-band notch, low-cut and high-cut filters. For sound finishing in mastering mode, a combined limiter/compressor is provided; for loudspeaker protection in reinforcement mode, a reliable peak limiter is available.

In sound reinforcement mode, typical applications include sound field control; balancing of

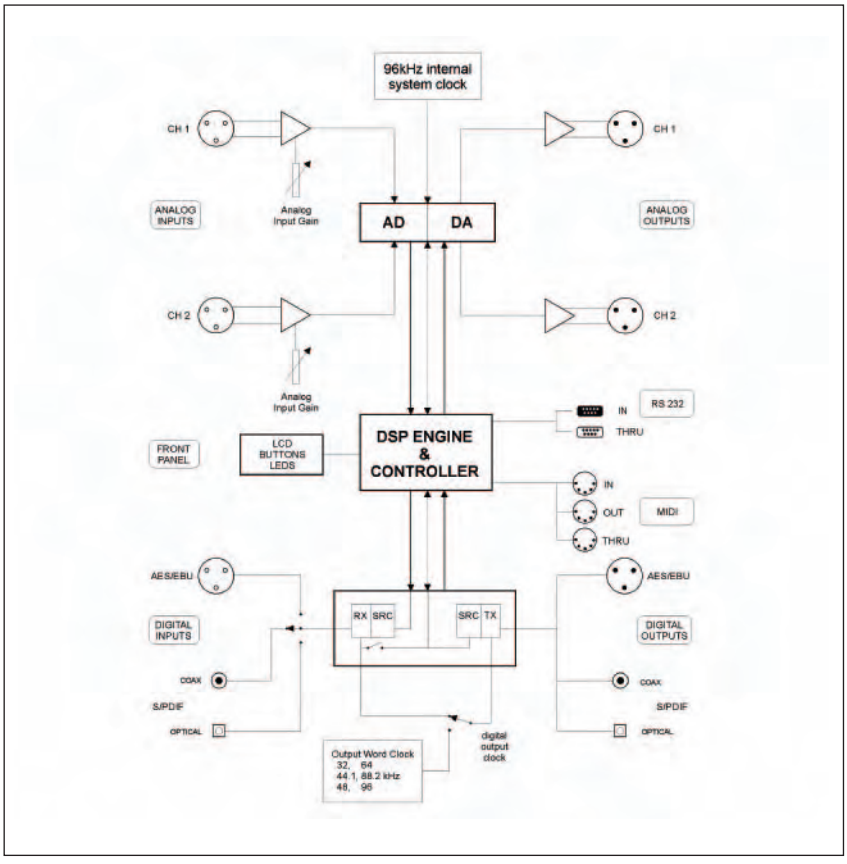
The MEQ-2000, clean and simple.

the room characteristics; microphone alignment; loudspeaker compensation and protection; and manual feedback detection and reduction.

A long separate delay in every channel allows adjusting the sound for different loudspeaker or spot microphone positions. The processor offers two fully independent channels that can be coupled for stereo use.

The MEQ-2000 consistently remains in the 24-bit/96-kHz digital domain through the whole audio processing path, thus maintaining the highest signal fidelity. The dithering and noise shaping options at the output of the processing chain take care of the audio quality when tailored down to 16-bit compact discs.

The device's remote control capability via MIDI or RS-232 permits cascading the unit with third party equipment and allows convenient control of the parameters using a PC-compatible computer with proprietary software.



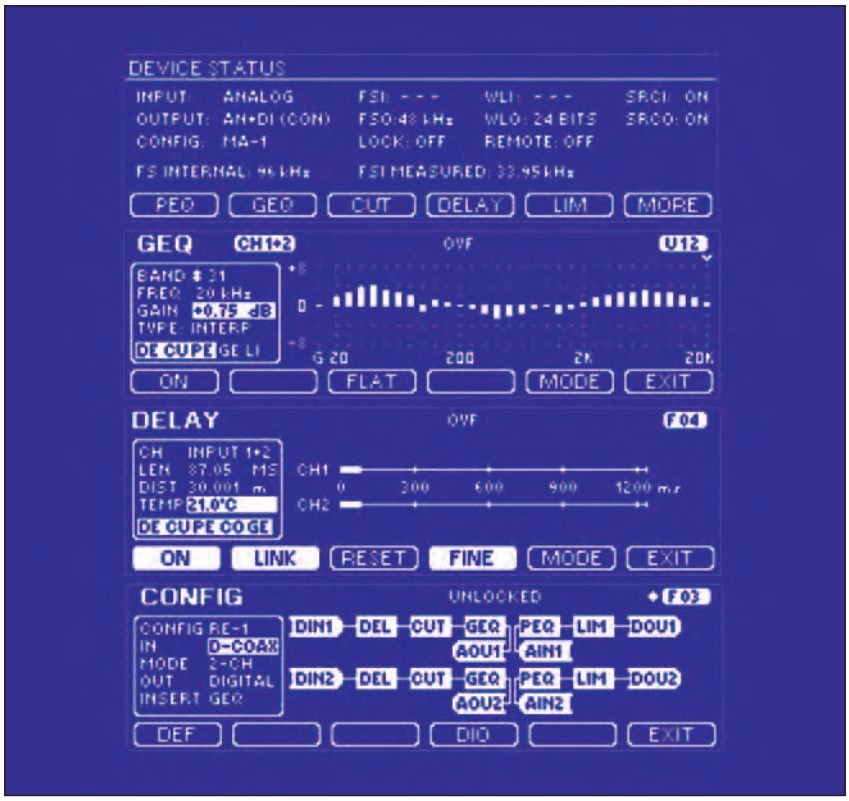
A flow chart showing the unit's inner workings.

TWO DIFFERENT MODES

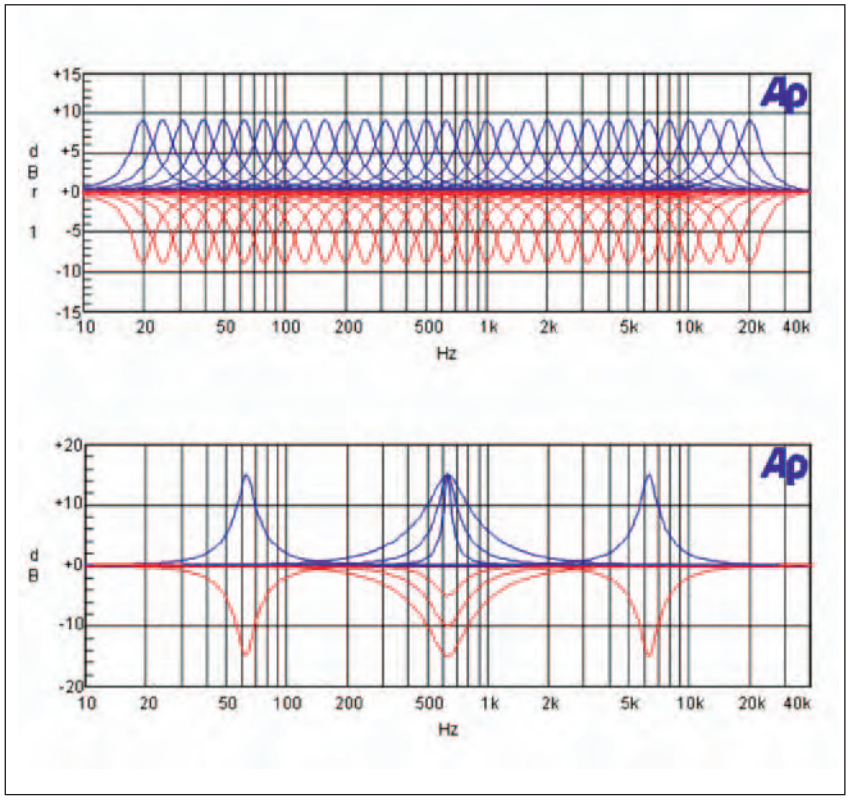
The MEQ-2000's graphic equalizer incorporates 31 constant-Q filters on a 1/3-octave ISO or musically divided center frequencies, a frequency range of 20 Hz to 20 kHz, bandwidth of 1/3, 2/3, 1 or 1/6 octaves, a boost/cut range of +/-16 dB or +/-8 dB, and filter curves that are visually displayed.

The 31-band filter bank can be set to two different modes: parallel and interpolating. The former simulates the typical sound of a quality analog graphic EQ, while the latter uses a unique proprietary compensation technique to avoid level overshoots arising in traditional analog equalizers when sliders are drawn up.

Another property of the MEQ-2000's GEQ section allows it to accept reference curves taken from "normalized" spectrums of RTA or other graphic EQ setups. This is useful for maintaining basic room equalization, and adding individual corrections relating to music character.



The front screen provides access to a wide range of modes and settings.



Above, in GEQ mode, performance of all bands – separately – at + 9 dB and -9 dB. Below, different adjustments in PEQ mode.

Also incorporating full parametric equalization, the unit offers eight high-precision, low-noise filters with low shelving, 6x constant-Q bell, and high shelving, with shelving characteristics of either Baxandall or 6 dB-per-octave slopes. Its extended frequency range is 20 Hz to 25 kHz, bandwidth is 1/12 to 2 octaves, and its boost cut range, like that of the graphic equalizer mode, is +/-16 dB or +/-8 dB. Filter curves are visually displayed.

In sound reinforcement mode configuration, a peak limiter provides "brick-wall" function, an adaptive soft knee, a threshold of 0 to –50 dBF, auto-attack for reliable peak-stop function, a hold time of 0.1 milliseconds (ms) to 500 ms, a release time of 20 ms to 5000 ms, look-ahead delay of 0.1, 2, 5, 10, and 25 ms, a program-dependant auto-release function, make-up gain, true stereo coupling and sophisticated metering encompassing input, output and gain reduction. Its "musicality" allows for gain reduction of up to 12 dB without any annoying artifacts.

The MEQ-2000 also functions as a real-time 31-band, 1/3-octave audio analyzer with filtering technology focusing on better resolution in the low-frequency range. Its key features include a selectable range and offset for the display, variable decay time and RMS integration time, peak-hold function with reset possibility and comprehensive post processing functions for curve inverting, normalizing, and room equalization.

The measurement functions of the MEQ-2000 are supported by a signal generator, including an ultra-precise reference sine and sine sweep capable of producing signal purity of -144 dB THD+N in the extended frequency range of 10 Hz (subsonic) to 43.5 kHz (ultrasonic).

Of a variety normally only found with dedicated measurement equipment, the generator additionally provides white noise and pink noise for acoustic measurements, plus special digital signals for troubleshooting DSP systems. ■

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