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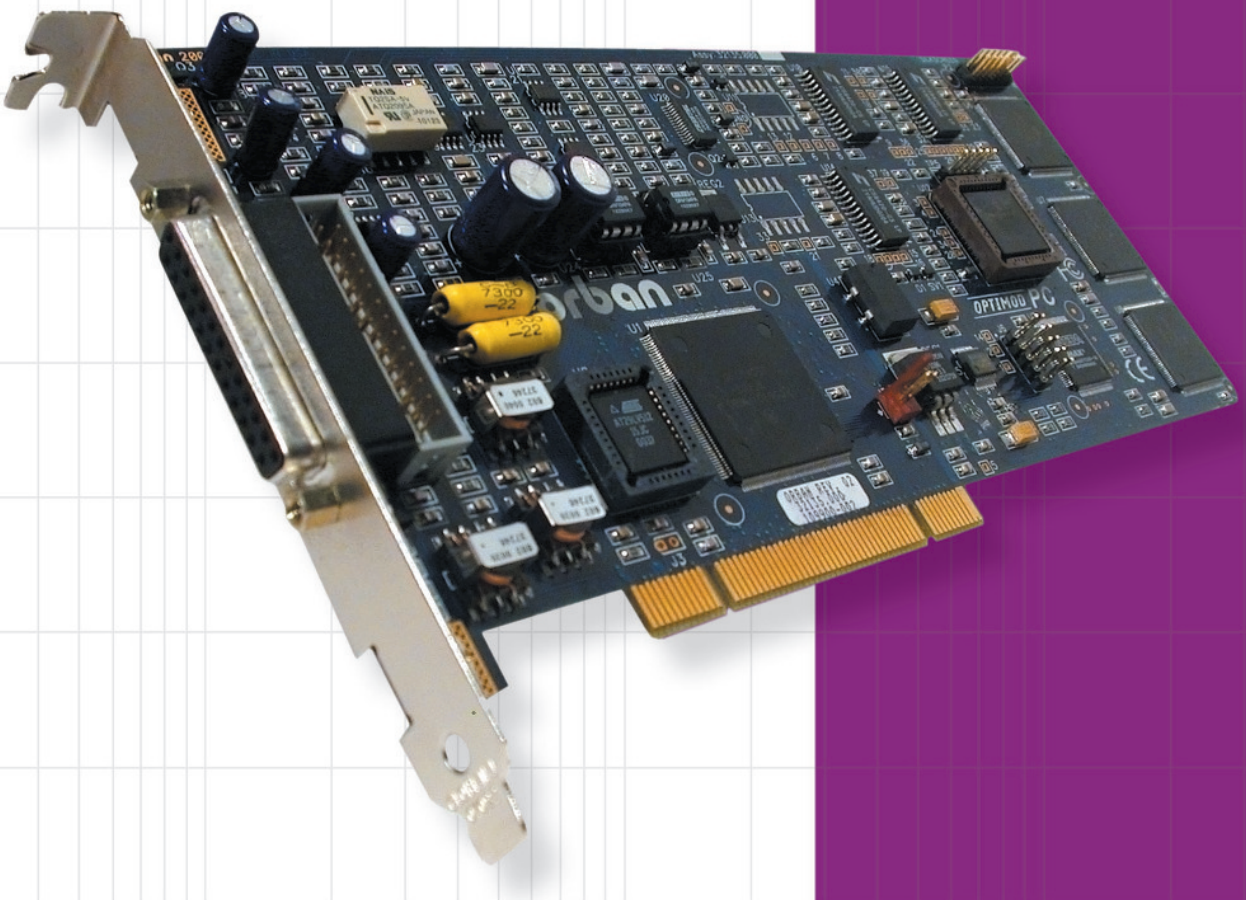
OPTIMOD-PC 1100

Broadcast-Quality Audio Processing on a PCI Sound Card



OPTIMOD-PC 1100

Overview

Since 1975, competitive radio stations have used Orban Optimod® audio processing before their transmitters to create a cleaner, brighter, louder, and more consistent sound on-air. Now netcasters and digital radio broadcasters get this competitive edge from an affordable PCI card-an edge that gets your broadcast noticed and keeps listeners coming back.

OPTIMOD-PC fits in an IBM-compatible PC and processes one stereo audio stream. With its supplied Microsoft Windows WAV drivers, it looks like a standard sound card to your native applications, like the Real® or Microsoft® streaming encoders. But unlike a sound card, Optimod-PC packs hundreds of MIPS of built-in DSP processing power, allowing it to apply broadcast-quality audio processing to your netcast or digital broadcast without loading down your computer's CPU with DSP tasks.

Optimod-PC tailors your audio signal to help you compete in digital audio broadcasting (DAB), Internet web/netcasting, and recording applications. Optimod-PC's on-board digital signal processing is suitable for both live streaming and on-demand programming. The DSP provides a loud, consistent sound to the listener by performing automatic gain control, equalization, multiband gain control, and peak-level control. Without Optimod-PC processing, audio can sound dull, thin, or inconsistent in any combination. Optimod-PC's multiband processing automatically levels and re-equalizes its input to the "major-market" standards expected by the mass audience. Broadcasters have known for decades that this polished, produced sound attracts and holds listeners, and Orban has long been the number one vendor of stand-alone transmission processing to professional broadcasters worldwide. In fact, more hit music, news, and information has been broadcast to the world through Optimod than any other processor.

Make no mistake-unlike the "toy" audio processors often sold by video-oriented manufacturers as part of their integrated netcasting solutions, Optimod-PC is the real deal: professional, industrial-strength. multiband radio-style audio processing from the company that's led this field with improvement after improvement for almost three decades. We understand what it takes to create the slick, "produced" sound that listeners associate with contemporary, "big-time" radio, and we've packed it all into one little card.

Optimod-PC uses advanced "look-ahead" limiting with very low overshoot, effectively preventing clipping in the sound card or encoder overload. "Look-ahead" limiting technology automatically produces maximum loudness with minimum side effects. Unlike clipper-based peak limiting, look-ahead limiting doesn't generate extra spectral "junk" that wastes precious encoder bits in the lossy codecs universally used in digital transmission. It's the ideal way to perfect your sound for any digital audio, streaming audio, or audio-over-IP application.

Optimod-PC ships with over 20 factory presets (each adjustable with easy LESS/MORE control), allowing immediate, effortless setup for any programming format. It includes an application for complete remote administration over TCP/IP. You can adjust and monitor levels, tweak the processor's sound through a versatile user interface, and save and recall presets.

On-board DSP minimizes CPU load. By comparison to processing running on the computer's CPU, Optimod-PC's built-in DSP allows several streams from a single computer, and minimizes signal delay to help preserve lip sync in video streams.

Multiple cards can be used in a given computer or placed in a PCI expansion chassis, which is useful in multi-program environments like a Eureka-147 multiplex or large encoder farms. Optimod-PC is compatible with industry standard encoders such as Microsoft Windows Media Encoder, RealNetworks Real/Helix Producer, Apple QuickTime, MP2/MP3, AAC, and OEM applications, and ships with WDM drivers for Microsoft Windows 2000 and XP.

OPTIMOD-PC is useful for users with multiple streams because you can load up one computer with as many Optimod-PC cards as you have free PCI slots, each card handling one stereo program. Each card has two AES/EBU or SPDIF digital inputs and one high-quality analog input, all of which can be mixed-built-in sample rate converters allow sources to be asynchronous. The card also offers an AES/EBU output and an analog monitor output. Therefore, you can route audio through the computer's PCI bus or entirely independently of the computer-the choice is yours, and will depend on your application. For example, Eureka-147 multiplexes could use multiple OPTIMOD-PC cards to save cost and space by comparison to stand-alone processors. (The multiplexes would use OPTIMOD-PC's AES/EBU inputs and outputs, and could exploit OPTIMOD-PC's ability to genlock its output sample rate to the sample rate applied to either AES/EBU input.) Multiple program inputs allow you to locally insert program material (like spots) specific to your netcast, which is convenient when your over-the-air spots are not licensed for webcasting.

In digital radio applications, if you wish to place level protection prior to your studio/transmitter link (STL), use the Orban 8200ST OPTIMOD-Studio Compressor/Limiter/HF Limiter/Clipper. The 8200ST can be adjusted so that it substitutes for the broadband AGC circuitry in OPTIMOD-PC, which is then defeated.

General Features

- Multiple cards can be installed in one computer, limited only by the computer's power supply capacity and number of available PCI slots. PCI extender chassis are also supported. A unique serial number burned into each card allows an Orban Control application to identify it anywhere on a network, and each card can also be given a descriptive alias (like "KABC").
- Two-layer password protection (Administrator and User) plus other security features allow cards to be safely exposed to the public Internet-one Control Application can control unlimited numbers of OPTIMOD-PC cards in computers nationwide or worldwide with excellent security. This feature is particularly valuable to large group or network operators.
- Orban Optimod® 6200-class digital audio processing on a PCI card-pre-processes audio for consistency and loudness before it is transmitted via netcast or digital radio.
- Two-Band automatic gain control compensates for widely varying input levels.
- Shelving bass equalizer and two-band parametric equalizer let you color the audio to your exact requirements.
- Five-band compressor creates source-to-source consistency and high average loudness.
- Look-ahead limiter effectively limits peaks while ensuring that low-bit-rate codecs operate optimally.
- Two AES/EBU or SPDIF digital inputs with high-quality sample rate conversion allow two sources to be mixed: Ideal for network operations using local spot insertion.
- Digital inputs accept any sample rate from 30 to 96 kHz.
- Backup function allows automatic reversion to analog input if digital input lock is lost.
- Balanced analog input with 24-bit A/D converter is always active, mixing with the two digital inputs.
- AES/EBU output at 32, 44.1, 48, 88.2, or 96 kHz sample rate.
- Supplied .WAV drivers allow Optimod-PC's processed output to pass through the PCI bus to the CPU, driving standard PC applications, like Microsoft or Real Helix streaming encoders. The driver (with the aid of concurrently running software) also allows Optimod-PC to receive audio over IP from the host computer's network connection, or from any other WAV source (like a digital playout system).
- IO Mixer permits versatile routing and switching of processed and unprocessed audio from and to OPTIMOD-PC's inputs and outputs, and to and from the host computer's WAV audio.
- Balanced analog monitor output with 24-bit D/A converter.
- Precisely controls peak levels to prevent overmodulation. The maximum level of the digital samples is controlled to better than 1%.
- The second digital input can also be used to accept AES/EBU house sync, synchronizing the AES/EBU output sample rate to the sample rate of the sync input.
- Internal processing occurs at 48 kHz sample rate and 20 kHz audio bandwidth.
- OPTIMOD-PC controls the audio bandwidth as necessary to accommodate the transmitted sample frequency, obviating the need for extra, overshooting anti-aliasing filters in downstream equipment. OPTIMOD-PC's high frequency

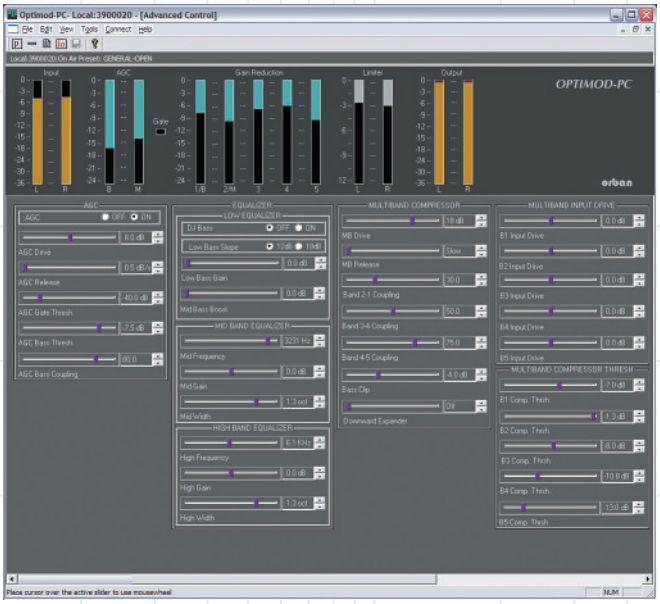
Broadcast-Quality Audio Processing on a PCI sound Card

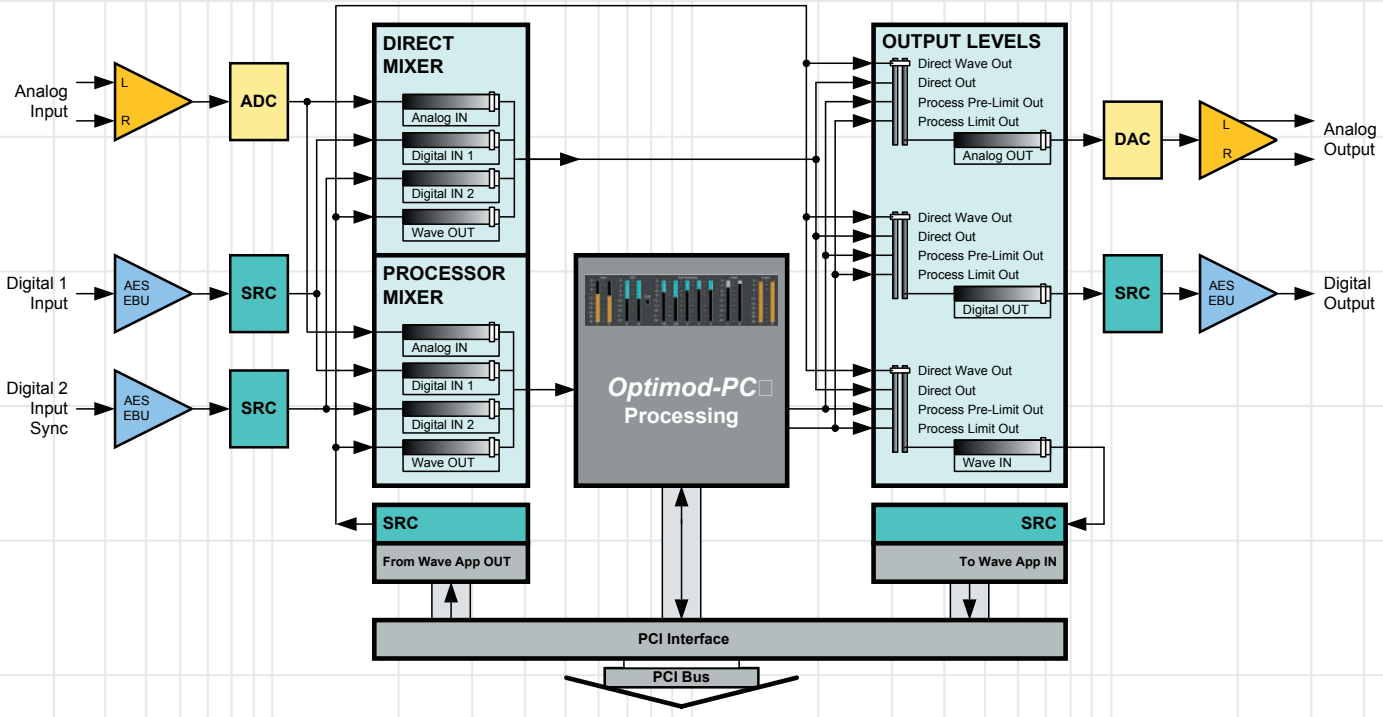
bandwidth can be switched instantly (typically in 500Hz increments) between 4.0 kHz and 20 kHz. 20 kHz is used for highest-quality systems. 15 kHz meets the requirements of the proposed AM IBOC systems that use 32 kHz sample frequency. 10 kHz bandwidth meets the requirements of auxiliary Eureka-147 transmissions using a 24 kHz sample frequency. Lower audio bandwidths meet the requirements of auxiliary speech grade services and the proposed digital shortwave systems.

- Three Motorola DSPs do all the audio processing-there's no extra DSP load on your computer's CPU.
- Full coprocessing (independent of the CPU) means that audio will ordinarily continue to pass through the card from its AES/EBU or analog inputs to its outputs even if the host computer crashes. (Of course, WAV inputs and outputs will stop working because these are dependent on operating system services.)
- Optimod-PC is supplied with over 20 standard presets, which correspond to different programming formats. These presets have already been tested and field-proven in major-market radio netcasting, digital radio, and direct satellite broadcasting applications (both radio and television) worldwide.
- An easy-to-use graphic control application runs on your PC, and can act as a client to control any number of Optimod-PC cards, either locally or in other PCs on your network, via TCP/IP addressing. Other Orban software offers a server function, allowing other computers on your network to address cards located in your PC. (This server software is automatically installed as part of the OPTIMOD-PC installation process and runs as a Windows service.)
- The Control application allows you complete flexibility to create your own custom presets, to save as many as you want to your local hard drive, and to recall them at will.

Adaptability through Multiple Audio Processing Structures

- A processing structure is a program that operates as a complete audio processing system. Only one processing structure can be active at a time. Just as there are many possible ways of configuring a processing system using analog components (such as equalizers, compressors, limiters, and clippers), there are many possible processing structures achievable by OPTIMOD-PC. OPTIMOD-PC realizes its processing structures as a series of high-speed mathematical computations made by Digital Signal Processing (DSP) chips.
- OPTIMOD-PC features two processing structures: Five-Band (or Multi-Band) for a consistent, "processed" sound, free from undesirable side effects and Two-Band for a tastefully controlled sound that preserves the frequency balance of the original program material. Two-Band can also be tuned to operate as a Protection Limiter, providing up to 25dB of safety limiting with minimal side effects.
- OPTIMOD-PC can increase the density and loudness of the program material by multi-band compression and look-ahead limiting, improving the consistency of the station's sound and increasing loudness and definition remarkably, without producing unpleasant side effects.
- OPTIMOD-PC rides gain over an adjustable range of up to 25dB, compressing dynamic range and compensating for operator gain-riding errors and for gain inconsistencies in automated systems.
- To maximize audible transparency, OPTIMOD-PC's processing structures are all phase-linear with any amount of gain reduction.
- OPTIMOD-PC can be changed from one processing structure to another with a smooth cross-fade.





OPTIMOD-PC 1100

Specifications

SYSTEM

Frequency Response: ±0.1 dB, 2-20,000Hz (Bypass software running).

Input/Output Delay: Approximately 25 milliseconds. Can be padded to full frame of: 30 fps (33.33ms), 29.97 fps (NTSC color video; 33.37ms), 25 fps (most PAL video; 40ms), 24 fps (film; 41.67ms), and 96 milliseconds.

Low-Delay Monitor Output: A low-delay (pre-lookahead limiter; 6 ms latency) monitor output is available for foldback into live talent headphones and can be routed to any output.

Internal Filters: 4.0...11.5 kHz (in 500Hz steps), 12, 13, 14, 15, 20 kHz provide anti-aliasing for low sample rate services, such as Eureka-147 (24 kHz mode), iBiquity® HD AM™ (IBOC) Radio (32 kHz) and Digital Radio Mondiale systems.

Internal Sample Rate: 48 kHz.

Internal Resolution: 24-bit fixed point (Motorola DSP56362).

Input/Output Resolution: 24-bit.

Peak Control Accuracy: If output samples are synchronous with internal samples, maximum overshoot of any output sample is 0.1dB. This is true at 48 kHz output sample rate. If sample rate conversion after internal processing makes output samples asynchronous with internal samples, output samples can overshoot as much as 1dB (0.3dB typical).

Phase Response: All processing is linear-phase (constant group delay), even when the multiband compressors have unequal amounts of gain reduction.

Internal Processing Chain: Input>Low-Pass Filter>Two-Band defeatable AGC>Four-Band Equalizer>Multiband Compressor>Look-ahead Limiter>Output.

Multiband Compressors: Three available: Five-Band, Two-Band, and Protect, selectable by mute-free crossfade.

Equalizers: Shelving Low Bass Eq, selectable 12dB or 18dB/octave Shelving Mid Bass Eq. Parametric Midrange Eq with analog-style bell-shaped curves. Parametric High Frequency Eq with analog-style bell-shaped curves.

Number of Factory Presets: greater than 20, each with 19-step LESS-MORE control. Presets are fully customizable with FULL CONTROL.

Number of User Presets: Essentially unlimited. User presets can be saved on the host hard drive or on other storage devices.

ANALOG AUDIO INPUT

Configuration: Stereo.

Impedance: >10kΩ impedance, electronically balanced, floating, and symmetrical.

Reference Level: +4 dBu/–10 dBu= –18 dBfs When mixer level set to 0 with 0 dB gain

Maximum Input Level: +20 dBu, peak.

Connector: DB-25, EMI suppressed. Mates with optional 1100/CBLXLR or 1100/CBL cable harnesses.

A-D Conversion: 24-bit 128X oversampled delta sigma A/D converter with linear phase anti-aliasing filter.

ANALOG AUDIO OUTPUT

Note that this output is primarily for monitoring. Nevertheless, it has been designed for low noise, distortion, and overshoot and can drive an STL or transmitter in an analog plant. Peak control will not be as good as at the digital output because transmitted samples will be asynchronous with peak-controlled internal samples.

Configuration: Stereo.

Source Impedance: 50Ω, electronically balanced and floating.

Load Impedance: 600Ω or greater, balanced or unbalanced. Termination not required or recommended.

Output Level: +4 dBu nominal; adjustable in software. Clip level is +18 dBu into an unbalanced load and +24 dBu into a balanced load.

Reference Level: –18 dBfs = +4 dBu When mixer level set to 0

Signal-to-Noise: 90 dB unweighted signal-to-noise, 20Hz-20 kHz (bypass mode).

Distortion: <0.01% THD (bypass mode), 20Hz-20 kHz.

Connector: DB-25, EMI suppressed. Mates with optional 1100/CBLXLR or 1100/CBL cable harnesses.

DA Conversion: 24-bit 128X oversampled D/A with linear phase anti-aliasing filter.

DC Offset: Less than 10mV differential offset.

Highpass Filter: –3 dB at 0.15 Hz.

DIGITAL AUDIO INPUTS

Number of Inputs: Two, each with sample rate converter. The two inputs can accept asynchronous inputs, which can be mixed glitch-free within OPTIMOD-PC. One of the inputs can also be configured as sync reference to lock output sample rate to the sample rate at this input.

Configuration: Stereo per AES/EBU-standard (AES3-1992) or S/PDIF, 24-bits resolution, software selection of stereo, mono from left, mono from right, or mono from sum (as source to use as a mono processor).

Impedance: Transformer balanced and floating, 110W impedance. AES/EBU or S/PDIF protocols, software selectable.

Sampling Rate: accepts any rate between 30 and 96 kHz.

Connector: DB-25, EMI suppressed. Mates with optional 1100/CBLXLR or 1100/CBL cable harnesses.

Input Reference Level: Variable within the range of –30 to –10 dBFS (VU metering assumed) or –23 to –3 dBFS (PPM metering assumed) in 0.5dB steps.

Internal WAV Input: The card is equipped with a driver that allows it to look like a standard sound card to Windows. The input can therefore be received from multiple software applications running on the host system by use of the standard operating system hooks. For example, this could include audio over IP routed into the host computer through an Ethernet port.

DIGITAL AUDIO OUTPUT

Configuration: Two-channel per AES/EBU-standard (AES3-1992) or S/PDIF (consumer) standard, selectable in software.

Output Level Control: Peak level is adjustable from –20dBFS to 0 in 0.1dB steps. Controlled by software.

Sampling Rate: Internal free running at 32 kHz, 44.1 kHz, 48 kHz, 88.1 kHz, or 96 kHz, selected in software. Can also be synced to either AES/EBU input at 32 kHz, 44.1 kHz, 48 kHz, 88.1 kHz, or 96 kHz, all ±4%.

Word Length: Selectable 24, 20, 18, or 16-bit. Optional dither can be added, with level adjusted appropriate to word length. This is first-order noise-shaped dither. (i.e., white TPDF dither of peak amplitude equal to the quantizer step size with noise shaping spectral density of 6dB/octave.) It sounds substantially quieter than white triangular PDF dither but, in contrast to more extreme noise-shaped dither, it adds only 3dB unweighted noise by comparison to white PDF dither.

Sync: Internal free running or external. Either AES/EBU input can be used as source for external sync.

Connector: DB-25, EMI suppressed. Mates with optional 1100/CBLXLR or 1100/CBL cable harnesses.

Jitter: Less than 10ns rms.

Internal WAV Output: The card is equipped with a driver that allows it to look like a standard sound card to Windows. The output can therefore be routed to software running on the host system by use of the standard operating system hooks.

I/O MIXER AND ROUTING SWITCHER

Number of Mixers: Two: Processed and Unprocessed. The Processed Mixer feeds OPTIMOD-PC's audio processing. The Unprocessed Mixer feeds the Routing Switcher directly. Each mixer has an output level meter that allows the operator to detect and correct internal clipping in the mix bus.

Inputs per Mixer: Four faders (with maximum gain switchable to 0 or +12 dB) receive:

- analog input
- AES/EBU input #1
- AES/EBU input #2
- WAV stream generated by computer

Routing Switcher:

The three-switch output routing switcher determines the signal applied to:

- OPTIMOD-PC card stereo analog output
- OPTIMOD-PC card AES/EBU digital output
- WAV stream feeding computer

Each switch accepts four sources:

- WAV stream received from computer
- Output of OPTIMOD-PC Unprocessed Mixer
- Output of OPTIMOD-PC audio processing that follows all processing except final peak limiting
- Output of OPTIMOD-PC audio processing that follows all processing, including peak limiting

POWER

PCI Connector: +5V at 800mA, +12V at 200mA maximum, –12V at 100mA maximum, 7.5 watts total maximum.

COMPUTER

Bus: Plug & Play PCI Version 2.2 compliant, 32-bit, 33 MHz, transfer rate up to 132 MBytes/sec. Will operate in 3.3V or 5V PCI slot, and bus extenders.

Drivers: Microsoft Windows 2000 and XP, WDM, DirectSound, bus mastering. (Note: No other Windows versions are supported. Macintosh and UNIX variants are not currently supported.)

Software: Control Application provides subjective adjustment controls of the audio processing and remote administration. It also allows factory and user presets to be recalled, and stored on host storage device (such as the local hard drive). The control application includes the Mixer Window that provides complete control of the audio mixer and all hardware settings. Windows Service running on a PC housing a given OPTIMOD-PC card allows the Control Application to address that card from anywhere on a TCP/IP network.

REGULATORY

Certifications: CE and FCC Class B

ENVIRONMENTAL

Operating Temperature: 32° to 122° F / 0° to 50° C for all operating voltage ranges.

Humidity: 0-95% RH, non-condensing.

Size: (L x H x W): 9"/22.9cm x 5"/12.7cm PCI Standard Height x 0.75"/1.9cm PCI Standard Width

OPTIONAL ACCESSORIES

1100/CBLXLR: Pre-wired cable option for 1100 I/O Interface, terminated in XLR connectors. Pin 1 chassis ground, Pins 2 (+) and 3 (–) electronically balanced, floating and symmetrical.

1100/CBL: Pre-wired cable option for 1100 I/O Interface, unterminated.

These specifications are subject to design improvements and changes without notice.

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