streaming

orban crl

audio processing

Optimod-PC 1101

From Orban, the most experienced provider

of broadcast audio processing for

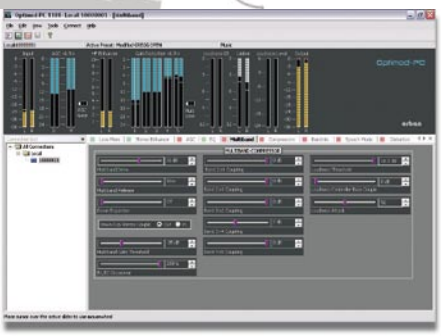
AM, FM and television stations worldwide —

fully professional processing
on a PCI or PCIe sound card
for Windows computers

From the ground up, OPTIMOD-PC 1101 was designed for professionals. It has broadcast-quality digital signal processing on-board that's suitable for both live streaming and on-demand programming. OPTIMOD-PC's three on-board Freescale DSP56367 DSP chips provide a loud, consistent sound to the consumer by performing stereo enhancement, automatic gain control (AGC), equalization, multiband gain control, peak-level control and subjective loudness control. Moreover, OPTIMOD-PC supports AES3 digital connections and is equipped with balanced analog inputs and outputs that can operate at professional +4 dBu reference levels while resisting pickup of hum and noise.

OPTIMOD-PC is available in two versions — the 1101 is for PCI bus systems and the 1101e is for PCI Express. OPTIMOD-PC's audio driver allows it to appear as two standard sound devices to the computer's operating system. This allows netcasters who need to replace selected content (such as commercials in a program originally created for radio broadcast) to do so with only one sound card.

"Major-Market" processing for digital media and channels



OPTIMOD-PC audio processing is appropriate for all digital transmission media and channels. It tailors your audio signal to help you compete in audio netcasting, HD Radio® (both primary and multicast digital channels), DAB, DRM and other dedicated digital radio services, FMExtra™ and other digital subcarriers, mastering, audio production and many others. Additionally, video-oriented presets use OPTIMOD-PC's built-in CBS Loudness Controller™ to make OPTIMOD-PC an unsurpassed choice for mono or stereo sound-for-picture applications, including HDTV, DVB-x digital television and audio/video netcasting.

While primarily oriented toward "flat" media, OPTIMOD-PC can also provide pre-emphasis limiting for the two standard pre-emphasis curves of 50 µs and 75 µs. This allows it to protect pre-emphasized analog satellite uplinks and similar channels where protection limiting or light processing is required and makes it ideal for use as a studio AGC driving transmitter-located OPTIMODs.

Without OPTIMOD-PC processing, audio can sound dull, boring, 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. It also helps overcome background noise in mobile listening environments and helps you stand out from poorly processed streams.

details

Broadcasters have known for decades that this polished, produced sound attracts and holds listeners. Orban has long been the number one vendor of stand-alone transmission processing to professional broadcasters worldwide. Commercial broadcasters think nothing of spending upwards of $10,000 to sculpt their audio with an OPTIMOD! Audio processing can help create an audio environment or mood. A broadcaster's revenue depends on audience share and broadcasters know that compromising their processing is false economy.

Professional radio broadcasters would never consider going on the air without audio signal processing. They consider it a vital aspect of their program content. This carefully crafted content is what holds listeners and keeps them coming back. Since 1975, OPTIMOD algorithms have dominated the world market for professional radio and television audio processing and have been improved continuously since then. OPTIMOD-PC puts this technology inside your computer.

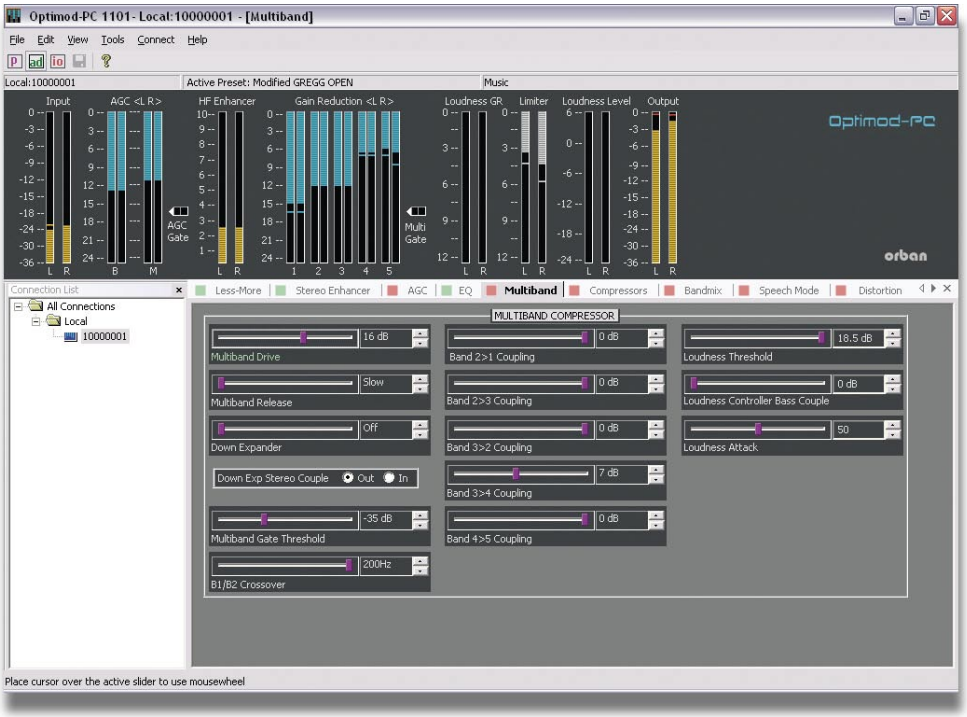
There are many gain/peak control devices and software available to perform dynamics processing. Many of these tools are designed for recording studio applications as effects compressors/limiters for individual microphone or instrument tracks. These devices' controls need to be tuned carefully for the specific material being processed — they are not "set and forget" processors. Moreover, most do not process mixed program material without introducing objectionable audible artifacts, particularly when called upon to gain-ride input material having widely varying levels.

sculpt or tailor audio with

A broadcast audio processor should ideally be "seen, but not heard." OPTIMOD processing algorithms simultaneously control audio gain and peaks, artistically, musically and naturally, to give the illusion that processing is not taking place. Moreover, OPTIMOD algorithms intelligently adapt themselves to the input program material. Once OPTIMOD-PC is tuned for the sound texture required for the broadcast or netcast format (which is made easy by OPTIMOD-PC's many format-specific presets), it will provide excellent consistency regardless of the level or texture of the original program material. OPTIMOD-PC's automatic gain control and equalization achieve a consistent sound, while accurate peak control maximizes loudness. Booming bass is tightened; weak, thin bass is brought up; highs are always present and consistent in level.

full broadcast quality
maximizes audience share

Thanks to OPTIMOD-PC, a netcaster who wants to maximize audience share no longer has to make do with toy processing, ineffective CPU-hungry plug-ins and inappropriate recording studio plug-ins. OPTIMOD-PC offers full broadcast-quality OPTIMOD processing on a card — an economical, space-saving alternative to conventional stand-alone boxes. But thanks to its tight integration into the PC, OPTIMOD-PC offers more features than any stand-alone processor. Among others, these include two digital inputs with mixing of asynchronous sources, two digital outputs, and sound card emulation that allows OPTIMOD-PC to talk through the operating system to applications running on the host.



To bring out the best in the low bit-rate codecs used in netcasting, you should preprocess an Internet audio signal to condition it prior to encoding. The appropriate preprocessing has much in common with the preprocessing required for DAB, HD Radio™, CD mastering or digital satellite. OPTICODEC-PC can provide this processing.

Conventional AM, FM or TV audio processors that employ pre-emphasis/de-emphasis and/or clipping peak limiters do not work well with perceptual audio coders such as Orban OPTICODEC-PC® MPEG-4 AAC/HE-AACv2 streaming encoder. The pre-emphasis/de-emphasis limiting in these processors unnecessarily limits high frequency headroom. Further, their clipping limiters create high frequency energy — distortion — that the perceptual audio coders have to encode, wasting bits. None of these devices has the full set of audio and control features found in OPTIMOD-PC.

Peak clipping sounds bad even in uncompressed digital channels because these channels do not rely on pre-emphasis/de-emphasis to reduce audible distortion. Instead of peak clipping, OPTIMOD-PC uses look-ahead limiting to protect the following channel from peak overload.

OPTIMOD-PC's PreCode™ technology manipulates several aspects of the audio to minimize artifacts caused by low bitrate codecs, ensuring consistent loudness and texture from one source to the next. PreCode includes special audio band detection algorithms that are energy and spectrum aware. This can improve codec performance on some codecs by reducing audio processing induced codec artifacts, even with program material that has been preprocessed by other processing than OPTIMOD. There are several factory presets tuned specifically for low performance, low bitrate codecs.

Unlike some other codec preprocessors, PreCode™ does not suck the punch and life out of music. Instead, PreCode™ strikes an artistic balance between liveliness and artifact reduction, ensuring that the cure is never worse than the disease.

PreCode™ brings out the best in low-bitrate codecs

OPTIMOD-PC is also an excellent mastering processor, offering soft knee multiband compression with knee and ratio controls available separately for

each band. OPTIMOD-PC's low-IM look-ahead limiter can typically achieve 12 dB of gain reduction before it produces objectionable artifacts — this limiter is exceptionally loud and clean.

dual soundcard functionality makes commercial insertion easy

Digital mixing is crucially important to a netcaster who needs to control commercial content and insertion. Unlike most sound cards, OPTIMOD-PC allows you to mix an analog source, two digital sources and two Wave sources. For example, you could run a playout system on your computer while using the three hardware inputs for a live microphone feed, commercial insert, and network insert. Or you could run the commercial insert playout software on the same computer as the main playout system, using OPTIMOD-PC's second Wave input to separately route the outputs of the two playout systems to the card. In most cases, an external mixer isn't needed, making OPTIMOD-PC a more economical system solution than a low-priced sound card combined with external hardware. OPTIMOD-PC is also perfect for podcast production.

For applications like commercial insertion, an API provides complete remote administration over TCP/IP and/or Serial. The OPTIMOD-PC Service application hosts a TCP/IP terminal server and a serial interface to allow external control of the OPTIMOD-PC cards from either a software Telnet/SSH terminal client, a custom third party application, or a hardware device such as a Broadcast Tools SRC-16. All OPTIMOD-PC Mixer and System Controls are accessible and all commands are simple text strings. You can adjust and monitor levels, tweak the processor's sound, save and recall presets, and more. Password security is provided.

OPTIMOD-PC comes with over 20 great-sounding presets that make it easy to create a sonic texture that's just right for your target audience. If you want to customize a preset, you can start with an easy LESS-MORE control. If that's not enough, tweak over 50 parameters to hone your sound to perfection. OPTIMOD-PC's deep interface will never hold you back as your processing expertise increases, yet its carefully crafted design insulates you from the details if you need great sound right now.

You can expect a considerable increase in loudness from OPTIMOD-PC processing by comparison to unprocessed audio (except for audio from recently mastered

CDs, which are often overprocessed in mastering). Broadcasters generally believe that loudness relative to other stations attracts an audience that perceives the station as being more powerful than its competition. We believe that the same subliminal psychology holds in netcasting.

Figure 1-1 shows a 15-minute snapshot of program audio as it emerged from the on-air mixer of a major Los Angeles radio station. Source material included music, speech, and commercials. Notice the large inconsistency in peak and average level between one program source and the next. Figure 1-2 shows the same material after being processed through OPTIMOD-PC, using the Gregg preset. Notice that program levels are now consistent from source to source.

Figure 1-1: Unprocessed Audio

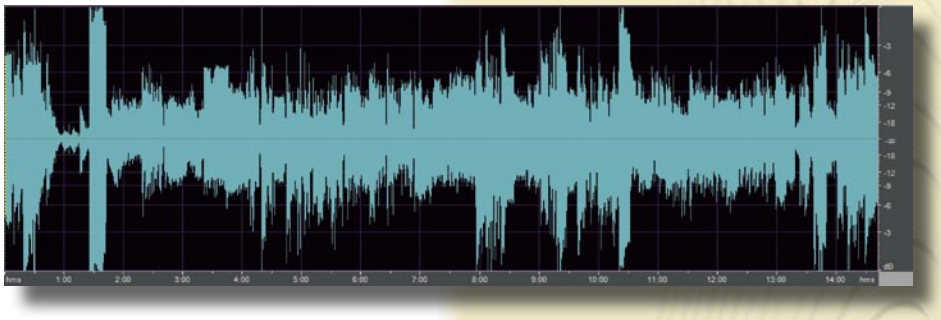
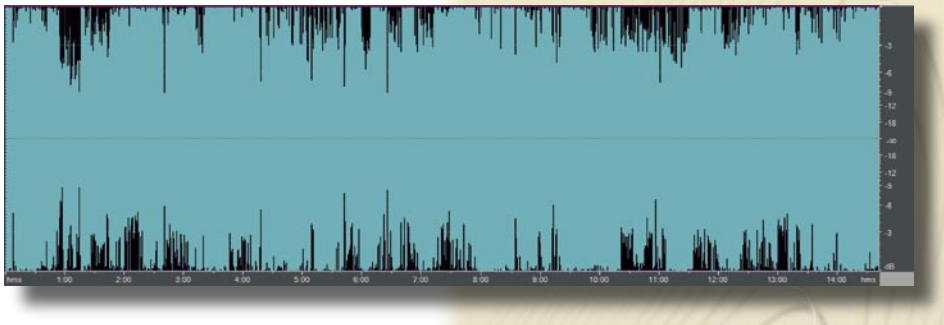


Figure 1-2: Same Audio Processed Through OPTIMOD-PC



It is important to understand that peak or average file normalization does not accomplish what OPTIMOD-PC processing can. Normalization applies a fixed loudness adjustment to the entire file — it's like setting a volume control once and only once. On the other hand, OPTIMOD-PC processing constantly adjusts spectral balance and loudness to achieve a consistency that brands your sound. This particularly important during transitions from one program element to the next and is one of the key techniques that major-market radio stations use to achieve their polished, "produced" audio texture.

Make your audio all it can be and get this turbo-powered, economical processing solution today.

features & benefits

GENERAL FEATURES	
OPTIMOD-quality digital audio processing	On a PCI sound card that pre-processes audio for consistency and loudness before it is transmitted or recorded.
Available in two versions	**1101** for **PCI** sockets and **1101e** for **PCIe** (PCI Express) sockets.
Applications	include netcasting, HD Radio® (both primary and secondary digital channels), DAB and other dedicated digital radio services, FMExtra™ and other digital subcarriers, mastering, audio production and many others.
Supplied WAVE drivers	Allow OPTIMOD-PC's processed output to pass through the PCI bus to the CPU, driving standard PC applications like Orban's OPTIMOD-PC MPEG-4 HE-AAC, as well as well as Microsoft or Real streaming encoders. OPTIMOD-PC's audio driver allows it to appear as **two sound devices** to the computer's operating system. The driver (with the aid of concurrently running third-party software) also allows OPTIMOD-PC to receive **audio over IP** from the host computer's network connection. Drivers are available for **32 and 64-bit Windows XP, 32 and 64-bit Windows Vista, and 32 and 64-bit Windows 7**.
Orban PreCode™ technology	Manipulates several aspects of the audio to minimize artifacts caused by low bitrate codecs, ensuring consistent loudness and texture from one source to the next. PreCode includes special audio band detection algorithms that are energy and spectrum aware. This can improve codec performance on some codecs by reducing audio processing induced codec artifacts, even with program material that has been preprocessed by other processing than OPTIMOD.
Two-Band automatic gain control	With window gating and selectable L/R or sum/difference processing; compensates for widely varying input levels.
Bass equalizer and parametric equalizer	Shelving **bass equalizer** and three-band **parametric equalizer** let you color the audio to your exact requirements.
Low-IM look-ahead limiter	Effectively limits peaks while ensuring that low-bit-rate codecs operate optimally without overload.
Precisely controls peak levels	To prevent overmodulation or codec overload. The peak limiter can be set up to control "flat" transmission channels or channels pre-emphasized at 50 µs or 75 µs.
Pre-emphasis limiting	While **primarily oriented toward "flat" media**, OPTIMOD-PC can also provide **pre-emphasis limiting** for the two standard pre-emphasis curves of 50 µs and 75 µs. This allows it to protect pre-emphasized **satellite uplinks and similar channels** where protection limiting or light processing is required. Because analog television FM aural carriers are lightly processed, OPTIMOD-PC can also be used to process these. *Because its processing topology is most effective with "flat media", OPTIMOD-PC cannot provide extreme loudness for pre-emphasized radio channels. Use one of Orban's OPTIMOD-FM processors for this application.*
Dual-mono architecture	OPTIMOD-PC's **dual-mono architecture** allows entirely separate mono programs to be processed in 5-band mode, facilitating dual-language operation. In mono mode, each channel has its own CBS Loudness Controller and Loudness Meter. *In this mode, both processing channels operate using the same processing parameters (like release time); you cannot adjust the two channels to provide different processing textures.*
Balanced analog input	With 24-bit A/D converter is always active, mixing with the two digital inputs.
Balanced analog monitor output	With 24-bit D/A converter.
Two AES3 or S/PDIF digital inputs	With high-quality sample rate conversion to allow two asynchronous digital sources to be mixed: Ideal for network operations using local commercial/announcement insertion.
The **second digital input**	also accepts AES3 house sync, synchronizing the AES3 output sample rate to the sample rate of the sync input.
Accepts sample rate from 32 to 96 kHz	Digital inputs **accept any sample rate** from 32 to 96 kHz without manual configuration.

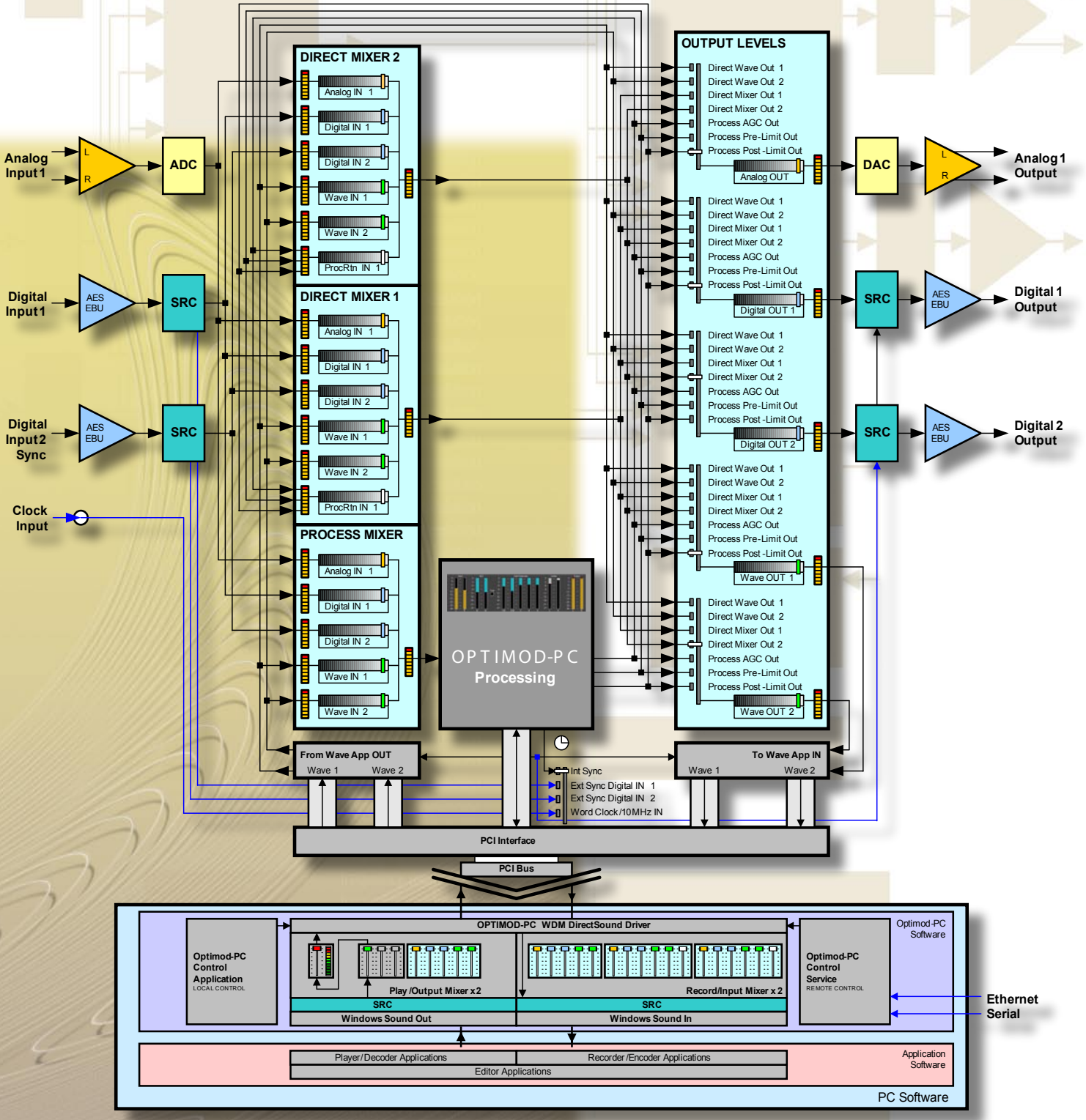
features & benefits

GENERAL FEATURES *(continued)*	
Two AES3 digital outputs	At 32, 44.1, 48, 88.2 or 96 kHz sample rate.
Two Wave inputs	from any PC audio application (like a playout system) that can emit standard Wave audio. Audio from the Wave inputs can be mixed and switched with OPTIMOD-PC's hardware inputs. Because there are two inputs, you can operate two PC applications simultaneously and mix and/or switch their Wave outputs inside OPTIMOD-PC, such as content/commercial insertion systems.
Internal processing	Occurs at **48 kHz** sample rate and **20 kHz** audio bandwidth.
Full PCI bus-mastering	Minimizes load on the host computer's memory and CPU.
I/O Mixer application	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 WAVE audio.
Terminal Control API	For network or localhost control and automation of all I/O Mixer functions and Preset switching. Status is broadcast to all active clients.
Serial Control API	Allows OPTIMOD-PC to be controlled either by ASCII serial commands or by a serial-to–contact-closure device such as a Broadcast Tools SRC-16.
MS Windows Mixer API	Support in parallel to the existing Orban Mixer allows standard Microsoft Windows audio applications to control OPTIMOD PC's inputs and outputs.
MS Windows Metering API	Windows applications using this API will display audio levels. (Many broadcast playout systems use this.)
Freescale DSPs	DSP chips do all the audio processing — there is no extra DSP load on your computer's CPU, freeing more CPU cycles for encoding bit-reduced audio.
Full coprocessing	Coprocessing independent of the host computer's CPU means that audio will ordinarily continue to pass through the card from its hardware inputs to its hardware outputs during a host computer soft reboot or crash. (Of course, Wave inputs and outputs will stop working because these are dependent on operating system services.)
Twenty standard presets	OPTIMOD-PC ships with over **twenty 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. There are also special-purpose presets for mastering, studio AGC, pure peak limiting and low bitrate encoding applications.
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. The Orban software offers a server function, allowing other computers on your network to address cards located in your PC. (This server software is installed automatically as part of the OPTIMOD-PC installation process and runs as a Windows Service.)
Custom presets	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.
Orban ClockLock™ technology	ClockLock™ locks the 1101's output sample rate to an external 10 MHz, word clock, or AES3/AES11 reference. Both AES3 outputs and WAV output can be locked, which prevents buffer underflows and overflows in downstream software and hardware. ClockLock uses a phase-locked loop with crystal VFO to ensure low jitter and will lock to 32, 44.1, 48, 88.2 and 96 kHz samplerates.
ADAPTABILITY THROUGH MULTIPLE AUDIO PROCESSING STRUCTURES	
Multiple processing structures	A processing structure ss 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 several 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.
Five-Band and **Two-Band** processing structures	OPTIMOD-PC features two processing structures: **Five-Band** (or Multiband) 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.

features & benefits

ADAPTABILITY THROUGH MULTIPLE AUDIO PROCESSING STRUCTURES *(continued)*	
Protection Limiter	The Two-Band structure can also be tuned to operate as a **Protection Limiter**, providing up to 25 dB of safety limiting with minimal side effects.
Increased **density** and **loudness**	OPTIMOD-PC **can increase the density and loudness** of the program material by multiband compression and look-ahead limiting, remarcably improving sonic consistency while increasing loudness and definition, all without producing unpleasant side effects.
Smooth automatic **gain riding**	OPTIMOD-PC **rides gain** over an adjustable range of up to 25 dB, compressing dynamic range and compensating for operator gain-riding errors and for gain inconsistencies in automated systems.
Phase-linear processing structures	OPTIMOD-PC's processing structures are all **phase-linear** to maximize audible transparency.
Change by **smooth cross-fade**	OPTIMOD-PC can be changed from one processing structure to another with a **smooth cross-fade**.
Two styles of **stereo enhancement algorithms**	The 1101 provides two different **stereo enhancement algorithms**. The first is based on Orban's patented analog 222 Stereo Enhancer, which increases the energy in the stereo difference signal (L–R) whenever a transient is detected in the stereo sum signal (L+R). The second stereo enhancement algorithm passes the L–R signal through a delay line and adds this decorrelated signal to the unenhanced L–R signal. Gating circuitry prevents over-enhancement and undesired enhancement on slightly unbalanced mono material.
Two-Band **automatic gain control**	Two-Band **automatic gain control** with window gating and selectable L/R or sum/difference processing compensates for widely varying input levels.
Two-band and **five-band compressors**	With **parametric soft-knee compression curves** allow you to **fine-tune the audio to your exact requirements** and make OPTIMOD-PC an excellent **mastering processor**.
Low-delay monitoring path for talent headphones	The output of the two-band or five-band compressor can be routed directly to the card's outputs, bypassing the delay in the look-ahead limiter and facilitating creation of a **low-delay monitoring path for talent headphones**.
Low-IM look-ahead limiter	Effectively limits peaks while ensuring that low-bit-rate codecs operate optimally without overload.
CBS Loudness Controller™	**Limits subjective loudness to a preset threshold**, making the 1101 an **ideal processor in sound-for-picture applications** by **taming loud commercials** before they annoy and alienate the audience. The Loudness Controller uses the 1981 Jones & Torick algorithm developed at CBS Technology Center and further refined by Orban.
Two independent loudness controllers and **two loudness meters**	**CBS Loudness Meter™ measures the subjective loudness of the 1101's output** and is displayed in the 1101's control application meter window. In dual-mono mode, there are **two independent loudness controllers** and **two loudness meters** available.
Transparently supports Dolby Digital® dialnorm metadata	If you tell the 1101 the **dialnorm value** you are sending to Dolby Digital receivers and use a "TV" processing preset, your transmission will **automatically have the same loudness** as other properly aligned Dolby Digital sources. This makes the 1101 an excellent choice to process ATSC subchannels.
Very high quality peak limiting	A pure peak limiting preset is available. It allows the 1101 to perform **very high quality peak limiting in mastering applications**.
AGC functionality	OPTIMOD-PC can be used as for automatic gain control, **AGC** (including peak limiting) to protect a studio-to-transmitter link (STL), optimally using the STL's native dynamic range.

Operational Block Diagram



specifications

It is impossible to characterize the listening quality of even the simplest limiter or compressor based on specifications because such specifications cannot adequately describe the crucial dynamic processes that occur under program conditions. Therefore, the only way to evaluate the sound of an audio processor meaningfully is by subjective listening tests.

Certain specifications are presented here to assure the engineer that they are reasonable, to help plan the installation, and to facilitate making certain comparisons with other processing equipment.

SPECIFICATIONS SPECIFICATIONS SPECIFICATIONS SPECIFICATIONS

System	
Number of Audio Processors	One stereo or two independent mono audio processors, each consisting of the following cascaded processing elements: Internal Processing: Input ➛ Stereo Enhancer ➛ Two-Band defeatable AGC with window gating ➛ Five-Band Equalizer/HF Enhancer ➛ Multiband Compressor ➛ Look-ahead Limiter ➛ Automatic Loudness Controller ➛ Output.
Number of Channels	The 1101 audio driver allows it to appear as two standard sound devices to the computer operating system. Each of the two sound devices can handle one stereo channel or two mono channels. The channels can be mixed and routed via a three-bus mixer ("Processed", "Direct 1" and "Direct 2"); however the 1101 can only apply stereo or dual-mono audio processing to the output of the "Processed" bus. The remaining two "Direct" busses are applied to the Output Routing Switcher but cannot be further processed. See block diagram.
Frequency Response (Bypass software running)	±0.1 dB, 2 – 20,000 Hz.
Input/Output Delay	Adjustable from 25 ms to 62 ms in 1 ms steps. Presets available for one frame of: 30 fps (33.33 ms), 29.97 fps (NTSC color video; 33.37 ms), 25 fps (most PAL video; 40 ms) and 24 fps (film; 41.67 ms). "Minimum" delay is also available; this delay will vary according to the processing structure in use and crossover mode settings.
Internal Filters	10, 11, 12, 13, 14, 15 and 20 kHz can be used to provide additional anti-aliasing for low sample rate services, such as Internet Streaming Encoders, Eureka-147 (24 kHz mode), iBiquity® HD AM™ (IBOC) (32 kHz) and Digital Radio Mondiale.
Internal Sample Rate	48 kHz.
Wave Sample Rate	8 – 96 kHz.
Internal Resolution	24-bit fixed point (3 x 150 MHz Freescale DSP56367).
Input/Output Resolution	24-bit.
Peak Control Accuracy	If output samples are synchronous with internal samples, maximum overshoot of any output sample is 0.1 dB. 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 (0.3 dB typical).
Phase Response	All dynamics processing is linear-phase (constant group delay). Equalizers are minimum-phase.
AGC (Automatic Gain Control)	±12 dB / 24 dB gain range, Two-Band, Gate and Window enabled.
Stereo Enhancer	Two styles available: (1) Orban-patented L–R dynamic expansion triggered by L+R transients; (2) L–R delay.
Multiband Compressors	-24 dB gain range, Five-Band and Two-Band, selectable by mute-free crossfade.
Equalizers	Shelving Low Bass EQ, selectable 6 dB, 12 dB or 18 dB/octave. Three-band Parametric EQ with analog-style bell-shaped curves. Program Adaptive HF Enhancer.
Limiter	-12 dB gain reduction range; Look-ahead; IM distortion reduced; competitive with the best dedicated mastering limiters; achieves high loudness with a remarkable lack of side-effects
Loudness Controller	Constrains subjective loudness to a user-adjustable threshold via the 1981 Jones & Torick CBS Technology Center algorithm as further refined and developed by Orban. The algorithm also drives a subjective loudness meter, which is displayed on the 1101's GUI. In dual-mono mode, there are two independent loudness controllers and meters.
Number of Factory Presets	More than 20, each with 19-step LESS-MORE control. Presets are fully customizable with FULL CONTROL. In addition to presets for full processing, there are also "AGC", "Look-ahead Limiter" and "mastering" presets. There are also presets for analog television that uses an FM aural carrier.
Number of User Presets	Essentially unlimited. User presets can be saved on the host hard drive or on other storage devices.
Wave Audio Input	
Number of Inputs	Two.
Configuration	Stereo.
Sound Devices	Two.
Driver	Multi-client Driver allows 1101 to appear as two standard sound devices to the computer operating system. The input can therefore be received from multiple software applications running on the host computer system by use of standard operating system sound device driver calls. For example, this could include single or multiple player applications, such as an audio playout system with multiple players, content insertion system, or audio over IP routed into the host computer through an Ethernet port, and/or multiple streaming audio encoders. Because the driver is multi-client, it allows it to source multiple applications simultaneously. A versatile mixer and router application allows you to mix digital, analog, and wave inputs to three busses (one with OPTIMOD-PC processing and two without) and to route the outputs of the "Processed" and "Direct" busses to the Analog, Digital, and Wave Outputs in any configuration or combination, such that any output can receive any bus or the unprocessed Wave Input. Content insertion systems that would normally require two sound devices can be configured to work with one 1101 OPTIMOD-PC, requiring only one PCI or PCIe slot per program source.
Sample Rate	8 – 96 kHz. Asynchronously Sample Rate Converted by Driver.
Sync	Internal free running or External. Either AES/EBU, Word Clock, or 10 MHz input can be used as source for external sync. Wave data will be clocked to software-configurable Internal or External sources.
Input Level	Variable within the range of -20 to 0 dBFS (Peak) in 0.5 dB steps. Software-adjustable via OPTIMOD-PC Mixer Application and Windows Mixer API.

specifications

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Wave Audio Output	
Number of Outputs	Two.
Configuration	Stereo.
Sound Devices	Two.
Driver	Multi-client Driver allows 1101 to appear as two standard sound devices to the computer operating system. The output can therefore be routed to multiple software applications simultaneously, such as audio encoders, recorders, and content insertion systems running on the host system, and/or the card physical outputs via the Mixer Application. Software applications running on the host system do not require the use of physical cables to connect Wave Inputs and Outputs to applications, eliminating any unnecessary digital sample rate conversion. Content insertion systems that would normally require two sound devices can be configured to work with one 1101 OPTIMOD-PC, requiring only one PCI or PCIe slot per program source.
Sample Rate	Internal free running at 32 kHz, 44.1 kHz, 48 kHz, selected in software. External Sync to either AES/EBU or Word Clock Input at 32 kHz, 44.1 kHz, 48 kHz, 88.1 kHz, 96 kHz or 10 MHz, all ±0.05%.
Sync	Internal free running or external. Either AES/EBU, Word Clock or 10 MHz input can be used as source for external sync. AES/EBU and Word Clock input must be 32, 44.1, 48, 88.1 or 96 kHz, ±0.05%. Wave data will be clocked to software-configurable Internal or External sources.
Jitter	Less than 10 ns rms.
Output Level Control	Peak level is adjustable from -20 to 0 dBFS in 0.1 dB steps. Software-adjustable via OPTIMOD-PC Mixer Application and Windows Mixer API.
Analog Audio Input	
Number of Inputs	One pair.
Configuration	Stereo.
Impedance	>10 kΩ impedance, electronically balanced, floating and symmetrical.
Nominal Input Level	-10 dBu / +4 dBu VU, -2 dBu / +21 dBu PPM. Software-adjustable via OPTIMOD-PC Mixer Application and Windows Mixer API.
Maximum Input Level	+20 dBu, peak.
Reference Level	-20 dBFS. -10 dBu / +4 dBu VU Input Level produces -20 dBFS when Input Level fader is 0 dB.
A/D Conversion	24-bit 128X oversampled delta sigma A/D converter with linear phase anti-aliasing filter.
Audio Connector	DB-25, EMI suppressed.
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 facility. Peak control will not be as good as at the digital output because transmitted samples will be asynchronous with peak-controlled internal samples. Like the other OPTIMOD-PC outputs, the source of this output can be switched between the computer's WAVE output, the output of OPTIMOD-PC's Direct Mixer, OPTIMOD-PC's peak limiter output and OPTIMOD-PC's multiband compressor output. Because most of the delay occurs in the peak limiter, using the multiband compressor output can make headphone monitoring much more comfortable for live talent when live microphone inputs are used.	
Number of Outputs	One pair.
Configuration	Stereo.
Source Impedance	50 Ω, electronically balanced and floating.
Load Impedance	600 Ω or greater, balanced or unbalanced. Termination not required or recommended.
Output Level	+4 dBu nominal; Clip level +18 dBu unbalanced, +24 dBu balanced. Software-adjustable via OPTIMOD-PC Mixer Application and Windows Mixer API.
Signal-to-Noise	96 dB unweighted signal-to-noise re +24 dBu, 20 Hz – 20 kHz (bypass mode).
Distortion	<0.01% THD (bypass mode), 20 Hz – 20 kHz. (Note: To prevent out-of-band noise caused by noise shaping from causing falsely high noise readings, noise and distortion specifications must be verified by a bandpass filter having a very sharp cutoff at 20 kHz.)
D/A Conversion	24-bit 128X oversampled D/A with linear phase anti-imaging filter.
DC Offset	Less than 10 mV differential offset.
Highpass Filter	-3 dB 2.0 Hz.
Audio Connector	DB-25, EMI suppressed.
Digital Audio Input	
Number of Inputs	Two, each with Sample-Rate Converter. The two inputs can accept asynchronous inputs and these can be mixed. 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 AES/EBU (AES3-1992/AES18) 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).
User Bits	AES18 compliant. Incoming User Bits will pass through to Digital Output. User Bits can also be inserted or extracted via Serial or Ethernet using OPTIMOD-PC Control Application.
Impedance	Transformer balanced and floating, 110 Ω impedance, AES/EBU.
Sample Rate	20 – 96 kHz.
Input Level	Variable within the range of -20 to 0 dBFS (Peak) in 0.5 dB steps. Software-adjustable via OPTIMOD-PC Mixer Application and Windows Mixer API.
Internal Input	See 'Wave Audio Input' above.
Audio Connector	DB-25, EMI suppressed.
Word Clock	DB-25, EMI Suppressed and/or BNC; input accepts 1x word clock at 32, 44.1, 48, 88.2 and 96 kHz or 10 MHz sine or squarewave.
Digital Audio Output	
Number of Outputs	Two.
Configuration	Two-channel per AES/EBU-standard (AES3-1992) or S/PDIF (consumer) standard, software selectable.
Output Level Control	Peak level is adjustable from -20 to 0 dBFS in 0.1 dB steps. Software-adjustable via OPTIMOD-PC Mixer Application and Windows Mixer API.

***Digital Audio Output** (continued)*	
Sample Rate	Internal free running at 32, 44.1, 48, 88.1 or 96 kHz, selected in software. Can also be synced to either AES/EBU input at 32, 44.1, 48, 88.1 or 96 kHz, all ±0.05%.
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 6 dB/octave.) It sounds substantially quieter than white triangular PDF dither but, in contrast to more extreme noise-shaped dither, it adds only 3 dB unweighted noise by comparison to white PDF dither.
Sync	Internal free running or external. Either AES/EBU, Word Clock or 10 MHz input can be used as source for external sync. AES/EBU and Word Clock input must be 32, 44.1, 48, 88.1 or 96 kHz, ±0.05%
Frequency Response	DC - 20,000 Hz ± 0.1 dB (Digital I/O).
Signal-to-Noise	100 dB (referenced to -20 dBFS Lineup Level) (Digital I/O).
Dynamic Range	120 dB (bypass mode) (Digital I/O).
THD+N	0.0006 %, 1 kHz, -1 dBFS (bypass mode) (Digital I/O).
Crosstalk	Infinite (Digital I/O).
Internal Output	See 'Wave Audio Output'.
Audio Connector	DB-25, EMI suppressed.
Audio Cable Assembly	
Optional	DB-25 plug-in 6' / 1.8 m I/O cable assembly, terminated in XLR connectors.
	Audio Inputs are XLR Female, Audio Outputs are XLR Male, Clock Input is BNC Female.
	Some applications will not require the use of external audio I/O, and therefore do not require a cable.
	Cable wiring is Tascam compatible.
Power	
PCI Connector	+3.3 V at 1.1 A, +12 V at 260 mA maximum.
PCIe Connector	+3.3 V at 1.3 A, +12 V at 260 mA maximum.
Computer	
Minimum System Requirements	Minimum System Requirements: Recommend Intel CPU and Chipsets. Microsoft Windows 2000 - Intel Pentium IV 800 MHz RAM 64 MB, 128 MB recommended. Microsoft Windows XP - Intel Pentium IV 1.0 GHz, RAM 128 MB, 256 MB recommended. Microsoft Windows Vista - Intel Pentium IV 1.0. GHz, RAM 512 MB, 1024 MB recommended. This provides the minimum recommended CPU power to control an arbitrary number of OPTIMOD-PC cards with external audio sources. Audio player and/or encoding software will require additional CPU power.
Bus	PCI Version 2.2 compliant; 32-bit; 33 MHz; transfer rate up to 132 MB/s. Will operate in 3.3 V or 5 V PCI slot and bus extenders. PCI-X 2.0 compliant. Plug and Play supported. PCIe: PCIe 1x Version 1.1 compliant. 250/500 MB/s. Plug and Play supported.
Audio Drivers	Microsoft Windows 2000/XP: WDM Audio DirectSound; multi-client; bus-mastering. 32/64-bit. Microsoft Windows Vista: WDM Audio; DirectSound; multi-client; bus-mastering 32/64-bit. Microsoft Windows 7: WDM Audio; DirectSound; multi-client; bus-mastering 32/64-bit.
Software	Mixer application provides complete control of digital mixer and all hardware settings. The control application provides subjective adjustment controls of the audio processing and remote administration. It also allows factory and user presets to be recalled from and save to a host storage device such as a hard disk drive or removable drive. The control application client addresses multiple OPTIMOD-PC cards, either housed in the local host or anywhere on a TCP/IP network or by local serial communication. The control application also functions as a server, interfacing cards installed in a given host computer with the network for control and monitoring.
API	Microsoft Windows Mixer Control API is supported for Input and Output switching and levels. This provides compatibility with Windows applications that use standard Microsoft Windows Mixer calls and enumeration. The IP API provides complete remote administration over TCP/IP. The OPTIMOD-PC Service application hosts a TCP/IP Terminal Server to allow external control of the OPTIMOD-PC cards from either a Telnet/SSH client or a custom third party application. All OPTIMOD-PC Presets and Mixer Controls are accessible and all commands are simple text strings. Telnet/SSH: RFC 318 compliant basic subset. Compatible with Windows Telnet and PuTTY Telnet clients. TCP/IP Port user assignable. The Serial API provides complete remote administration over serial port communication. The OPTIMOD-PC Service application hosts a serial terminal server to allow external control of OPTIMOD-PC cards from either a terminal client or a custom third party application. All OPTIMOD-PC Presets and Mixer Controls are accessible and all commands are simple text strings. Compatible with terminal programs such as Windows HyperTerminal and PuTTY VT-100 clients. COM Port user assignable from COM1 to COM100.
Status Monitoring	SNMP RFC 1157 compliant. Monitors all Audio Input and Output presence, Mixer Control status, Active Preset, Control Application Connections and Control Client Connections.
Regulatory	
Certifications	CE and FCC Class B, RoHS compliant.
Environmental	
Operating Temperature	32 to 122 °F / 0 to 50 °C for all operating voltage ranges.
Humidity	0 – 95% RH, non-condensing.
Size	PCI Standard Full Hight / Short Length (L x H x W): 6.6" x 4.2" x 0.75" – 168 mm x 107 mm x 19 mm.
Shipping Weight	4 lbs. / 1.8 kg with cable assembly.
	2.0 lbs. / 1.0 kg 1101 OPTIMOD-PC Card.
	2.0 lbs. / 1.0 kg 1101 Cable Assembly.

Because engineering improvements are ongoing, specifications are subject to change without notice.

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