

# OPTIMOD-FM 8300



**Advanced FM**

**Processing**

**Made Affordable**

**orban**





**Ever since Orban introduced OPTIMOD-FM 8400**, stations that could not afford its admittedly premium price have coveted the loudness, cleanliness, competitiveness, and consistency that only an 8400 could provide. But good things come to those who wait. OPTIMOD-FM 8300 is a mid-priced processor with many of the sound processing features that were previously available only to 8400 owners.

The 8400 has developed a reputation as the FM processor that provides the best consistency and cleanest speech, and the 8300 reflects this sonic legacy. Quality sound is what 8300 is all about—sound that attracts audiences by providing a polished, outstandingly professional presentation regardless of format and source material. Exceptional versatility allows you to adjust the processor's audio texture to brand your sound, knowing that the resulting signature sound will remain consistent, cut to cut and source to source. Branding builds businesses, and no other processors have the consistency to brand your sound like OPTIMODs.

With the 8300, your signature sound is just a preset away. An easy, one-knob Less/More adjustment allows you to customize any factory preset, trading cleanliness against processing artifacts according to the requirements of your market and competitive environment. Full Control gives you the versatility to customize your audio further. And, if you are a hard-core processing expert, you can explore Advanced Control to tweak presets at the same level as Orban's factory programmers.

This versatility makes the 8300 a superb choice for any format. Its five-band processing is ideal for any pop music format (even the most competitive and aggressive CHR), while phase-linear two-band processing yields ultra-transparent sound for classical, classic jazz, and fine arts broadcasters. Regardless of your choice, 8300's optimized technology ensures unusually high average modulation and coverage for a given level of subjective quality.

Versatility does not stop with sound. The 8300's built-in stereo encoder, AES/EBU digital inputs and outputs, and analog I/O permit hassle-free interfacing to any broadcast plant, whether the 8300 is located at the studio or the transmitter. Tight band limiting to 15 kHz means you can use any uncompressed digital STL to pass 8300-processed audio from studio to transmitter without compromising on-air loudness—there is no need to use STLs having 44.1 or 48 kHz sample rates.

If you want to locate the 8300 away from the studio, you will be pleased by its three separate remote control ports—GPI contact closures, RS232 serial, and built-in Ethernet for TCP/IP networks. The serial and Ethernet ports are supported by the supplied 8300 PC Remote Control application. This highly graphic Windows® application allows you to do even more with the 8300 than you can do through its front panel, making remote control a pleasure.

Built-in clock-based automation lets you automatically daypart the processing. You can control many other 8300 operating parameters too; the 8300's feature set fully exploits the processor's DSP and computer-based control architecture.

If you are concerned about latency because you need to feed live talent headphones off air, be assured that the 8300's low-latency (5 ms delay) processing will keep the most finicky talent happy. Or use optimum latency (15 ms delay) processing for the most competitive sound with delay that is still low enough to satisfy most any talent.

## Features

### User-Friendly Interface

- An LCD and full-time LED meters make setup, adjustment and programming of OPTIMOD-FM easy—you can always see the metering while you are adjusting the processor. Navigation is by dedicated buttons, soft buttons (whose function is context-sensitive), and a large rotary knob. The LEDs show all metering functions of the processing structure (Two-Band or Five-Band) in use.

### Absolute Control of Peak Modulation

- The 8300 provides universal transmitter protection and audio processing for FM broadcast. It can be configured to interface ideally with any commonly found transmission system in the world.
- The 8300 provides pre-emphasis limiting for the two standard pre-emphasis curves of 50µs and 75µs. Its pre-emphasis control is seldom audibly apparent, producing a clean, open sound with subjective brightness matching the original program.
- The 8300 achieves extremely tight peak control at all its outputs— analog left/right, AES/EBU left/right, and composite baseband.
- By integrating the stereo encoder with the audio processing, the 8300 eliminates the overshoot problems that waste valuable modulation in traditional external encoders. The stereo encoder has two outputs with independent level controls, each capable of driving 75Ω in parallel with 47,000pF, (100ft/30m of coaxial cable).

- The 8300 prevents aliasing distortion in subsequent stereo encoders or transmission links by providing bandwidth-limiting and overshoot-compensated 15 kHz low-pass filters ahead of the 8300's audio outputs and stereo encoder.
- Anti-aliased clippers running at 256 kHz sample rate prevent any trace of "digital clipper" sound.

### Flexible Configuration

- The 8300 includes analog and AES/EBU digital inputs and outputs. Both digital input and digital output are equipped with sample-rate converters and can operate at 32, 44.1, 48, 88.2, and 96 kHz sample rates. The pre-emphasis status and output levels are separately adjustable for the analog and digital outputs.
- The 8300 has an internal, DSP-based stereo encoder (with a patented "half-cosine interpolation" composite limiter operating at 512 kHz sample rate) to generate the pilot tone stereo baseband signal and control its peak level. The composite limiter is a unique, "you can only do this in DSP" process that beats composite clippers by preserving stereo imaging while fully protecting the stereo pilot tone, RDS/RBDS, and subcarriers.
- The analog inputs are transformerless, balanced 10kΩ instrumentation-amplifier circuits, and the analog outputs are transformerless balanced, and floating to ensure highest transparency and accurate pulse response.

- The 8300 has two independent composite baseband outputs with digitally programmable output levels. Robust line drivers enable them to drive 100 feet of RG-59 coaxial cable without audible performance degradation.
- The 8300 has two subcarrier inputs that are mixed with the output of OPTIMOD-FM's stereo encoder before application to the composite output connectors. One input can be re-jumpered to provide a 19 kHz pilot reference output. The other input has an internal level trim to accommodate subcarrier generators with output levels as low as 220 mV.
- The 8300 precisely controls the audio bandwidth to 15 kHz. This prevents overshoots in uncompressed digital links operating at a 32 kHz sample rate and prevents interference to the pilot tone and RDS (or RBDS) subcarrier.
- The 8300 has a defeatable multiplex power limiter that controls the multiplex power to ITU-R BS412 standards. An adjustable threshold allows a station to achieve maximum legal multiplex power even if the downstream transmission system introduces peak overshoots into the 8300-processed signal. Because this limiter closes a feedback loop around the audio processing, it allows the user to adjust the processor's subjective setup controls freely without violating BS412 limits, regardless of program material. The multiplex power limiter acts on all outputs (not just the composite output) and works by adjusting the thresholds in the multiband compressor instead of adding another wideband gain control stage. The limiter is thus entirely multiband, which minimizes spectral gain intermodulation. It reduces clipper drive when it reduces power, simultaneously reducing clipping distortion.
- All input, output, and power connections are rigorously RFI-suppressed to Orban's traditional exacting standards, ensuring trouble-free installation.
- The 8300 is designed and certified to meet all applicable international safety and emissions standards.
- The 8300 is HD-ready. A future software upgrade will allow you to route HD-specific processing to the AES/EBU output, while the analog and composite outputs continue to supply processing optimized for the FM analog channel [HDFM™ is a trademark of iBiquity Corp.]

#### Adaptability through Multiple Audio Processing Structures

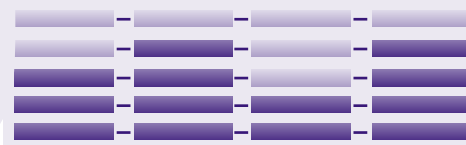
- A processing structure is a program that operates as a complete audio processing system. Only one processing structure can be on-air at a time. OPTIMOD-FM realizes its processing structures as a series of high-speed mathematical computations made by Digital Signal Processing (DSP) chips.
- The 8300 features three processing structures: Optimum Five-Band (or "Multiband"; 15 ms delay) for a consistent, "processed" sound, free from undesirable side effects, Low-Latency Five-Band (5 ms delay) for environments where talent monitors live off-air and they object to the delay of Optimum Five-Band, and Two-Band for a transparent sound that preserves the frequency balance of the original program material. A special Two-Band preset creates a no-compromise "Protect" function that is functionally similar to the "Protect" structures in earlier Orban digital processors. The Optimum Five-Band and the Two-Band structures can be switched via a mute-free crossfade; the Low Latency Five-Band structure causes a very brief audio mute when activated.

- The 8300 can increase the density and loudness of the program material by multiband compression, limiting, and clipping. This improves the consistency of the station's sound and increases loudness and definition remarkably, without producing unpleasant side effects.
- The 8300 rides gain over an adjustable range of up to 25dB, compressing dynamic range and compensating for both operator gain-riding errors and gain inconsistencies in automated systems.
- The 8300's Two-Band processing structure is phase-linear to maximize audible transparency.
- The 8300 can import and run any 8400 "LL" (Low-Latency) preset via the 8300 PC remote application. This means that you can use an 8400 to develop presets for 8300, provided you do not use 8400 features not supported by the 8300. (If you try to import an 8400 preset that uses features unsupported by 8300, the 8300 will interpret that preset as best it can by using the available 8300 features—see the 8300 Operating Manual for details.)

#### Controllable

- The 8300 can be remote-controlled by 5–12V pulses applied to eight programmable, optically isolated "general-purpose interface" (GPI) ports.
- 8300 PC Remote software is a highly graphical application that runs under Windows 2000 and XP. It communicates with a given 8300 via TCP/IP over modem, direct serial, and Ethernet connections. You can configure PC Remote to switch between many 8300s via a convenient organizer that supports giving any 8300 an alias and grouping multiple 8300s into folders. Clicking an 8300's icon causes PC Remote to connect to that 8300 through an Ethernet network, or initiates a Windows Dial-Up or Direct Cable Connection if appropriate. The PC Remote software allows the user to access all 8300 features and allows the user to archive and restore presets, automation lists, and system setups (containing I/O levels, digital word lengths, GPI functional assignments, etc.).
- A Bypass Test Mode can be invoked locally or by remote control to permit broadcast system test and alignment or "proof of performance" tests.
- OPTIMOD-FM contains a versatile real-time clock, which allows automation of various events (including recalling presets) at pre-programmed times.
- OPTIMOD-FM contains a built-in line-up tone generator, facilitating quick and accurate level setting in any system.
- OPTIMOD-FM's software can be upgraded remotely through its serial port (connected to an external modem), or Ethernet port, or locally (by connecting a Windows® computer to its serial port through the supplied null modem cable) and running Orban-supplied downloadable upgrade software.

OPTIMOD-FM  
8300



## 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 make certain comparisons with other processing equipment.

### PERFORMANCE

Specifications apply for measurements from analog left/right input to stereo composite output and to FM analog left/right output.

**Frequency Response (Bypass Mode):** Follows standard 50 $\mu$ s or 75 $\mu$ s pre-emphasis curve  $\pm$ 0.10 dB, 2.0 Hz–15 kHz. Analog left/right output and digital output can be user-configured for flat or pre-emphasized output.

**Noise:** Output noise floor will depend upon how much gain the processor is set for (Limit Drive, AGC Drive, Two-Band Drive, and/or Multi-Band Drive), gating level, equalization, noise reduction, etc. The dynamic range of the A/D Converter, which has a specified overload-to-noise ratio of 110 dB, primarily governs it. The dynamic range of the digital signal processing is 144 dB.

**Total System Distortion (de-emphasized, 100% modulation):** <0.01% THD, 20 Hz–1 kHz, rising to <0.05% at 15 kHz. <0.02% SMPTE IM Distortion.

**Total System L/R Channel Separation:** >50 dB, 20Hz–15 kHz; 60 dB typical.

**Polarity (Two-Band and Bypass Modes):** Absolute polarity maintained. Positive-going signal on input will result in positive-going signal on output.

**Processing Sample Rate:** The 8300 is a "multirate" system, using internal rates from 32 kHz to 512 kHz as appropriate for the processing being performed. Audio clippers operate at 256 kHz.

**Processing Resolution:** Internal processing has 24-bit (fixed point) or higher resolution; uses Motorola DSP56362 DSP chips.

### ANALOG AUDIO INPUT

**Configuration:** Stereo.

**Impedance:** >10 $\Omega$  load impedance, electronically balanced.

**Nominal Input Level:** Software adjustable from –4.0 to +13.0 dBu (VU).

**Maximum Input Level:** +27 dBu.

**Connectors:** Two XLR-type, female, EMI-suppressed. Pin 1 chassis ground, Pins 2 (+) and 3 electronically balanced, floating and symmetrical.

**A/D Conversion:** 24 bit 128x oversampled delta sigma converter with linear-phase anti-aliasing filter. Converter outputs 64 kHz sample rate, which the 8300 then decimates to 32 kHz in DSP using an ultra-high-quality image-free synchronous sample rate converter.

**Filtering:** RFI filtered, with high-pass filter at 0.15 Hz (–3 dB).

### ANALOG AUDIO OUTPUT

**Configuration:** Stereo. Flat or pre-emphasized (at 50 $\mu$ s or 75 $\mu$ s), software-selectable.

**Source Impedance:** 50 $\Omega$ , electronically balanced and floating.

**Load Impedance:** 600 $\Omega$  or greater, balanced or unbalanced. Termination not required or recommended.

**Output Level (100% peak modulation):** Adjustable from –6 dBu to +24 dBu peak, into 600 $\Omega$  or greater load, software-adjustable.

**Signal-to-Noise:**  $\geq$  90 dB unweighted (Bypass mode, de-emphasized, 20 Hz–15 kHz bandwidth, referenced to 100% modulation).

**L/R Crosstalk:**  $\leq$  –70 dB, 20 Hz–15 kHz.

**Distortion:**  $\leq$  0.01% THD (Bypass mode, de-emphasized) 20 Hz–15 kHz bandwidth.

**Connectors:** Two XLR-type, male, EMI-suppressed. Pin 1 chassis ground, Pins 2 (+) and 3 electronically balanced, floating and symmetrical.

**D/A Conversion:** 24 bit 128x oversampled, with 64 kHz output sampling rate.

**Filtering:** RFI filtered.

### DIGITAL AUDIO INPUT

**Configuration:** Stereo per AES/EBU standard, 24 bit resolution, software selection of stereo, mono from left, mono from right or mono from sum.

**Sampling Rate:** 32, 44.1, 48, 88.1, or 96 kHz, automatically selected.

**Connector:** XLR-type, female, EMI-suppressed. Pin 1 chassis ground, pins 2 and 3 transformer balanced and floating, 110 $\Omega$  impedance.

**Input Reference Level:** Variable within the range of –30 dBFS to –10 dBFS.

**J.17 De-emphasis:** Software-selectable.

**Filtering:** RFI filtered.

### DIGITAL AUDIO OUTPUT

**Configuration:** Stereo per AES/EBU standard. Output configured in software as flat or pre-emphasized to the chosen processing pre-emphasis (50 $\mu$ s or 75 $\mu$ s), with or without J.17 pre-emphasis.

**Sample Rate:** Internal free running at 32, 44.1, 48, 88.1 or 96 kHz, selected in software. Can also be synced to the AES/EBU digital input at 32, 44.1, or 48 kHz, as configured in software.

**Word Length:** Software selected for 24, 20, 18, 16 or 14-bit resolution. First-order highpass noiseshaped dither can be optionally added, dither level automatically adjusted appropriately for the word length.

**Connector:** XLR-type, male, EMI-suppressed. Pin 1 chassis ground, pins 2 and 3 transformer balanced and floating, 110 $\Omega$  impedance.

**Output Level (100% peak modulation):** –20.0 to 0.0 dBFS software controlled.

**Filtering:** RFI filtered.

### COMPOSITE BASEBAND OUTPUT

**Configuration:** Two outputs, each with an independent software-controlled output level control, output amplifier and connector.

**Source Impedance:** 0 $\Omega$  voltage source or 75 $\Omega$ , jumper-selectable. Single-ended, floating over chassis ground.

**Load Impedance:** 37 $\Omega$  or greater. Termination not required or recommended.

**Maximum Output Level:** +12.0 dBu (8.72 Vp-p).

**Minimum Output Level:** –12 dBu (0.55 Vp-p) for 0.5 dB adjustment resolution.

**Pilot Level:** Adjustable from 6.0% to 12.0%, software controlled.

**Pilot Stability:** 19 kHz,  $\pm$ 0.5 Hz (10 degrees to 40 degrees C).

**D/A Conversion:** 24-bit

**Signal-to-Noise Ratio:**  $\leq$  –85 dB (Bypass mode, de-emphasized, 20 Hz–15 kHz bandwidth, referenced to 100% modulation, unweighted).

**Distortion:**  $\leq$  0.02% THD (Bypass mode, de-emphasized, 20 Hz–15 kHz bandwidth, referenced to 100% modulation, unweighted).

**Stereo Separation:** At 100% modulation = 3.5Vp-p, > 60 dB, 30 Hz–15 kHz. At 100% modulation = 1.0 – 8.0 Vp-p, > 50 dB, 30 Hz–15 kHz.

**Crosstalk-Linear:**  $\leq$  –80 dB, main channel to sub-channel or sub-channel to main channel (referenced to 100% modulation).

**Crosstalk-Non-Linear:**  $\leq$  –80 dB, main channel to sub-channel or sub-channel to main channel (referenced to 100% modulation).

**38 kHz Suppression:**  $\geq$  70 dB (referenced to 100% modulation).

**76 kHz & Sideband Suppression:**  $\geq$  80 dB (referenced to 100% modulation).

**Pilot Protection:** –60 dB relative to 9% pilot injection,  $\pm$ 250 Hz (up to 2 dB composite processing drive).

**Subcarrier Protection (60–100 kHz):**  $\geq$  70 dB (referenced to 100% modulation; with up to 2 dB composite limiting drive; measured with 800 line FFT analyzer using "maximum peak hold" display).

**57 kHz (RDS/RBDS) Protection:** –50 dB relative to 4% subcarrier injection,  $\pm$ 2.0 kHz (up to 2 dB composite processing drive).

**Connectors:** Two BNC, floating over chassis ground, EMI suppressed.

**Maximum Load Capacitance:** 0.047 microfarad (0 $\Omega$  source impedance). Maximum cable length of 100 feet/30 meters RG-59A/U.

**Filtering:** RFI filtered.

### SUBCARRIER (SCA) INPUTS

**Configuration:** Subcarrier inputs sum into composite baseband outputs before digitally controlled composite attenuator.

**Impedance:** >600 $\Omega$

**SCA1 Sensitivity:** Variable from 220 mV p-p to >10 V p-p to produce 10% injection. Sensitivity is adjustable by an internal PC-board-mounted trim control.

**SCA2 Sensitivity:** Fixed at 772 mV p-p to produce 10% injection.

**Connectors:** Two BNC, unbalanced and floating over chassis ground, EMI suppressed.

**19 kHz Pilot Reference:** SCA2 input can be rejumped to provide a 19 kHz pilot reference output.

### REMOTE COMPUTER INTERFACE

**Configuration:** TCP/IP protocol via direct cable connect, modem, or Ethernet interface. Suitable null modem cable for direct connect is supplied. Modem is not supplied.

**Serial Port:** 115 kbps RS-232 port DB9 male, EMI-suppressed.

**Ethernet Port:** 10 Mbit/sec on RJ45 female connector.

### REMOTE CONTROL (GPI) INTERFACE

**Configuration:** Eight (8) inputs, opto-isolated and floating.

**Voltage:** 6–15V AC or DC, momentary or continuous. 9VDC provided to facilitate use with contact closure.

**Connector:** DB25 male, EMI-suppressed.

**Control:** User-programmable for any eight of user presets, factory presets, bypass, test tone, stereo or mono modes, analog input, digital input.

**Filtering:** RFI filtered.

### POWER

**Voltage:** 100–132 VAC or 200–264 VAC, switch-selected on the rear panel, 50–60 Hz, 40 VA.

**Connector:** IEC, EMI-suppressed. Detachable 3-wire power cord supplied.

**Grounding:** Circuit ground is independent of chassis ground, and can be isolated or connected with a rear panel switch.

**Safety Standards:** ETL listed to UL standards, CE marked.

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

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