

OPTIMOD-FM 2300



**Advanced Processing
for FM Stations with
High Aspirations &
Modest Budgets**

orban





The new **OPTIMOD-FM 2300** builds on the 2200's sound, adding stereo enhancement, more powerful equalization, anti-aliased clipping, composite limiting, and full remote control facilities. AES/EBU digital input and output is now standard, as is clock-based automation. Switching between "Two-Band Normal" and "Two-Band Purist" processing is now gap-free.

With the 2300, 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. This versatility makes the 2300 work well with any format.

The 2300's optimized technology ensures unusually high average modulation and coverage for a given level of subjective quality. The compact 1u form factor makes the 2300 at home in any rack, and its solid, competitive sound makes it an ideal choice for medium and small market stations, non-commercial and educational stations, and any other broadcasters whose aspirations exceed their budgets.

The 2300 is also the ideal choice for network broadcasters who process with Orban's flagship Optimod-FM 8400 at the network origination point and who need a processor at every transmitter to eliminate STL overshoots or to process local insertions. The 2300's superb stereo encoder and composite limiter help deliver a transmitted signal that is always immaculately clean and perfectly peak limited, with full protection of subcarriers and RDS/RBDS regardless of the amount of composite limiting.

The built-in ITU 412 multiplex power controller means that the 2300's output meets even the most stringent European government regulations. In addition, strict 16 kHz band limiting ensures that the peak-limited left and right outputs can pass through 32 kHz uncompressed digital STLs without added overshoot—there is no need to use STLs having 44.1 or 48 kHz sample rates.

Like its predecessor, the 2300 is remote controllable via eight programmable GPI ports. However, unlike its processor, the 2300 is equipped for remote control via RS232 serial or Ethernet ports, and comes with a full-featured remote control application that runs on Windows 2000 or XP. If you're concerned about latency because you need to feed live talent headphones off air, you'll be pleased to know that the 2300's processing has only about 5 ms delay, which will keep talent happy.

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.

Absolute Control of Peak Modulation

- The 2300 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 2300 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 2300 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 2300 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 2300 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 2300's audio outputs and stereo encoder.

Flexible Configuration

- The 2300 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 kHz, 44.1 kHz, 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 2300 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. This 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 (with 50Ω impedance) to ensure highest transparency and accurate pulse response.
- The 2300 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 2300 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 2300 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 2300 has a defeatable, patented 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 2300-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 2300 is designed and certified to meet all applicable international safety and emissions standards.
- The 2300 features a versatile Two-Band processing structure that can be set for loudness processing or for "purist" processing, depending on the user-configurable crossover type (either allpass or phase-linear).
- The 2300 can increase the density and loudness of the program material by two-band compression, limiting, and clipping. This improves the consistency of the station's sound and increasing loudness and definition without producing unpleasant side effects.
- The 2300 rides gain over an adjustable range of up to 25 dB, compressing dynamic range and compensating for both operator gain-riding errors and gain inconsistencies in automated systems.

Controllable

- The 2300 can be remote-controlled by 5-12V pulses applied to eight programmable, optically isolated "general-purpose interface" (GPI) ports.
- 2300 PC Remote software is a highly graphical application that runs under Windows 2000 and XP. It communicates with a given 2300 via TCP/IP over modem, direct serial, and Ethernet connections. You can configure PC Remote to switch between many 2300s via a convenient organizer that supports giving any 2300 an alias and grouping multiple 2300s into folders. Clicking a 2300's icon causes PC Remote to connect to that 2300 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 2300 features (including advanced controls not available from the 2300's front panel), 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.).
- OPTIMOD-FM contains a versatile real-time clock, which allows automation of various events (including recalling presets) at pre-programmed times.
- A Bypass Test Mode can be invoked locally, by remote control (from either the 2300's GPI port or the 2300 PC Remote application), or by automation to permit broadcast system test and alignment or "proof of performance" tests.
- 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 by running Orban-supplied downloadable upgrade software on a PC. The upgrade can occur remotely through the 2300's Ethernet port or serial port (connected to an external modem), or locally (by connecting a Windows® computer to the 2300's serial port through the supplied null modem cable).

OPTIMOD-FM 2300

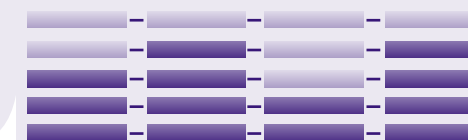
STEREO ENHANCEMENT

POWERFUL EQUALIZATION

ANTI-ALIASED CLIPPING

COMPOSITE LIMITING

FULL REMOTE CONTROL



Specifications

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 50µs or 75µs pre-emphasis curve ±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–15kHz; 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 2300 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 (and are anti-aliased), while the composite limiter operates at 512 kHz.

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

INSTALLATION

Analog Audio Input

Configuration: Stereo.

Impedance: >10kΩ+ 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 2300 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 50µs or 75µs), software-selectable.

Source Impedance: 50Ω, electronically balanced and floating.

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

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

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

L / R Crosstalk: <= –70 dB, 20 Hz–15 kHz.

Distortion: <= 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.

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, 88.2, or 96 kHz, automatically selected.

Connector: XLR-type, female, EMI-suppressed. Pin 1 chassis ground, pins 2 and 3 transformer balanced and floating, 110Ω 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 (50µs or 75µs), 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, 48, 88.1 or 96 kHz, as configured in software.

Word Length: Software selected for 24, 20, 18, 16 or 14-bit resolution. First-order highpass noise-shaped 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, 110Ω 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: 0Ω voltage source or 75Ω, jumper-selectable. Single-ended, floating over chassis ground.

Load Impedance: 37Ω 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, ±0.5 Hz (10 degrees to 40 degrees C).

D/A Conversion: 24-bit

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

Distortion: <= 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, > 60dB, 30 Hz–15 kHz. At 100% modulation = 1.0 - 8.0 Vp-p, > 55 dB, 30 Hz–15 kHz.

Crosstalk-Linear: <= –80 dB, main channel to sub-channel or sub-channel to main channel (referenced to 100% modulation).

Crosstalk-Non-Linear: <= –80 dB, main channel to sub-channel or sub-channel to main channel (referenced to 100% modulation).

38 kHz Suppression: >= 70 dB (referenced to 100% modulation).

76 kHz & Sideband Suppression: >= 80 dB (referenced to 100% modulation).

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

Subcarrier Protection (60–100 kHz): >= 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, ±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 (0Ω source impedance). Maximum cable length of 100 feet / 30 meters RG–58A / U.

Filtering: RFI filtered.

Subcarrier (SCA) Inputs

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

Impedance: >600Ω

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 pot.

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 re-jumpered to provide a 19 kHz pilot reference output.

Remote Computer Interface

Configuration: TCP/IP protocol via direct cable connect, modem, or Ethernet interface.

Serial Port: 115 kbps RS–232 port dB–9 male, EMI-suppressed.

Ethernet Port: 10 or 100 M bit / 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: DB–25 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.

Environmental

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

Humidity: 0–95% RH, non-condensing.

Dimensions (W x H x D): 19” x 1.875” x 14.25” / 48.3 cm x 4.8 cm x 36.2 cm. One rack unit high.

Humidity: 0–95% RH, non-condensing.

RFI / EMI: Tested according to Cenelec procedures. FCC Part 15 Class A device.

Shipping Weight: 19 lbs / 8.7 kg

Warranty

Two Years, Parts and Service: Subject to the limitations set forth in Orban’s Standard Warranty Agreement.

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

Orban

1525 Alvarado St. | San Leandro CA 94577
+1 510.351.3500 | +1 510.351.0500 fax | www.orban.com

CRL Systems, Inc.

1302 W. Drivers Way | Tempe AZ 85284
+1 480.403.8300 | +1 480.403.8301 fax | www.crlsystems.com

