



OPTIMOD DIGITAL
6300

OPTIMOD 6300 – THE multipurpose Stereo Digital Audio Processor for Digital Media

The Orban 6300 is a high quality, multipurpose stereo audio processor for digital radio, digital television, netcasts, STL protection, satellite uplink protection, and digital mastering. Thanks to versatile signal routing, the 6300 can also serve as a studio AGC with an all-digital signal path, and simultaneously as a talent headphone processor.

Because all processing is performed by high-speed mathematical calculations within digital signal processing (DSP) chips, the processing has cleanliness, quality, and stability over time and temperature that is unmatched by analog processors.

The 6300 is Dialnorm-aware. Loudness control is excellent when measured by the ITU BS.1770-2 standard (as specified in ATSC A/85:2011) or by the 6300's built-in CBS Loudness Meters. When properly installed and set up, the 6300 will automatically make a station compliant with the CALM Act.

OPTIMOD 6300 is descended from the industry-standard OPTIMOD audio processors for radio and television. Thousands of these broadcast-specific processors are attracting and holding audiences all over the world. They have proven that the "OPTIMOD sound" can attract and keep an audience even in the most competitive commercial environment.



A talent headphone processor

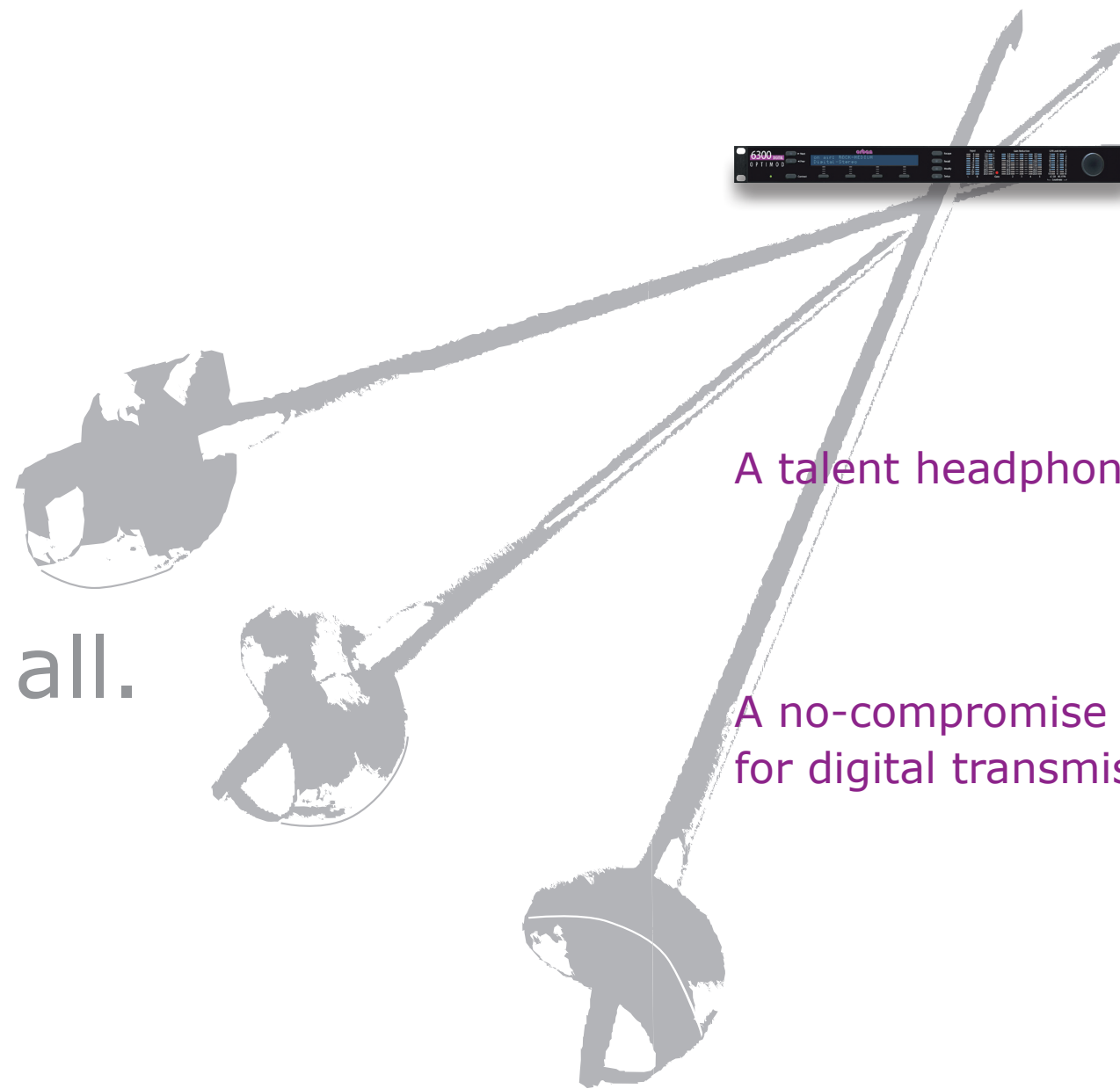
Use the stereo enhancement, equalization, and multiband processing without peak limiting to drive talent headphones. Delay is less than 5 milliseconds from input to output. This is particularly useful in HD Radio™ facilities, where off-air headphone monitoring is impossible due to delay.

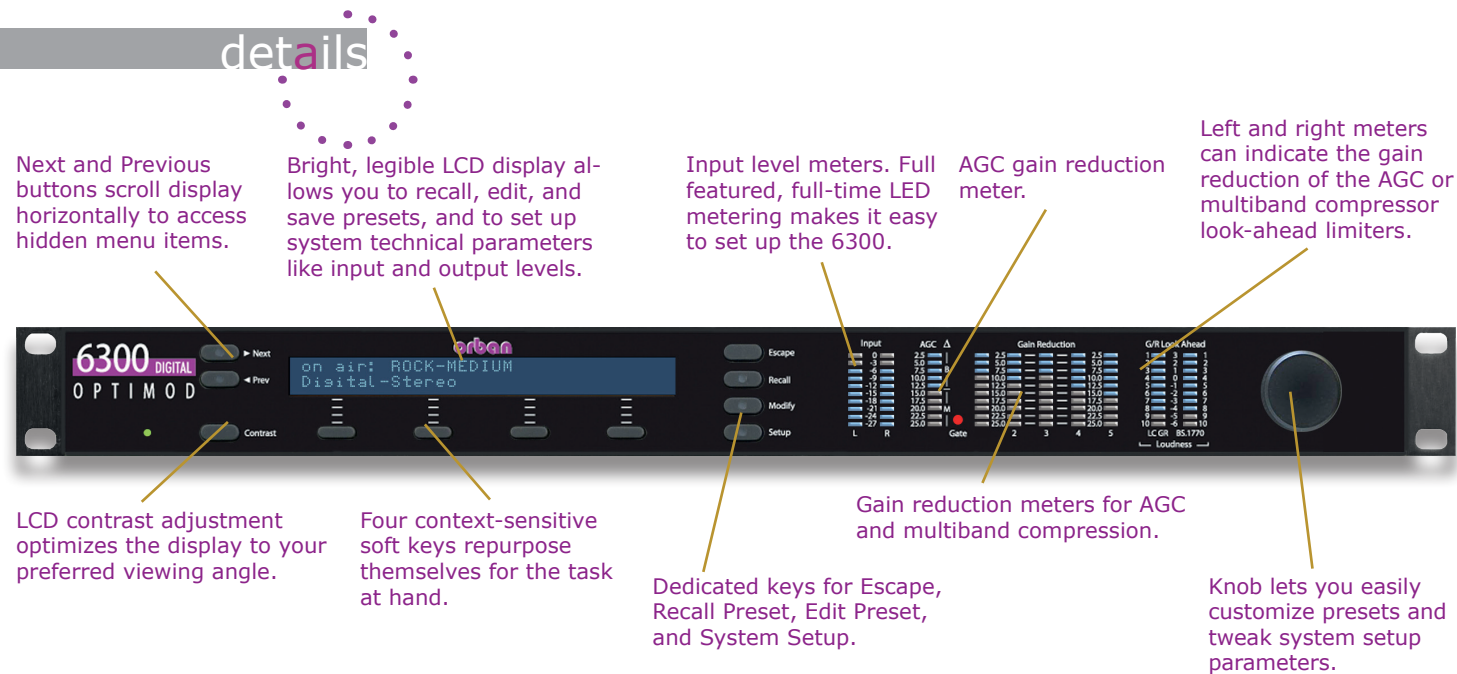
A no-compromise processing chain for digital transmission and media

Use the stereo enhancement, equalization, multiband processing, and peak limiting chain for any digital transmission channel, like HD Radio™, DAB, DAB+, DRM, digital television, and netcasts. Compression ratio and knee controls make the 6300 perfect for subtle compression in mastering and production. Mastering-quality look-ahead limiters and a pristine signal path provide superb audio quality.

Need to slash processing cost,
complexity,
and clutter?
Here's the perfect weapon —

one for three
and three for all.





Absolute Peak Control

The 6300 implements “true peak” control by oversampling the peak limiter’s sidechain at 192 kHz. This allows the 6300 to prevent clipping in a playback device’s analog signal path by predicting and controlling the analog peak level following the playback device’s reconstruction filter to an accuracy of better than 0.5 dB. For typical program material, accuracy is 0.2 dB! Without true peak control, analog clipping can occur even if all peak values of the digital samples are below 0 dBFS. This phenomenon has also been termed “0 dBFS+,” and is explained in the BS.1770 standard (“Considerations for accurate peak metering of digital audio signals”).

Thanks to true peak control, sample rate conversion, unless it removes high frequency program energy or introduces group delay distortion, cannot cause sample peaks to increase more than 0.5 dB. For example, sample rate conversion from 48 kHz to 44.1 kHz is highly unlikely to cause sample peak clipping in the 44.1 kHz audio data

A studio AGC (with peak limiting for STL protection)

Use the 6300’s AGC with peak limiting to substitute for the AGC in an OPTIMOD at the transmitter and to provide protection limiting for the STL. The AGC is turned off in the transmitter-side OPTIMOD. The 6300’s two independent stereo look-ahead limiters can be switched to operate either “flat” or on a 50 μ s or 75 μ s pre-emphasis curve to protect a pre-emphasized path like a typical analog microwave STL.

The 6300’s AGC uses the same dual-band, window-gated, matrix technology as the AGCs in all Orban OPTIMODs. It can accurately substitute for the AGCs in these devices and can help maintain an all-digital signal path throughout the facility. Moreover, because the 6300 supports presets that can be recalled by remote control, it can be automatically synchronized to the presets on-air at a transmitter-side OPTIMOD when presets are dayparted.

The 6300’s multiband processing is the same as that used in OPTIMOD-Surround 8685’s and 6585’s 2.0 processing path and sounds identical.

advanced
2-band AGC
perfectly complements
any OPTIMOD installed

at the
transmitter

Automatic Loudness Control for Digital Television and Netcasts

The 6300 offers two-band and five-band presets carefully tuned to the demands of sound-for-picture applications. These ride gain subtly and unobtrusively so that the sound is always comfortably listenable.

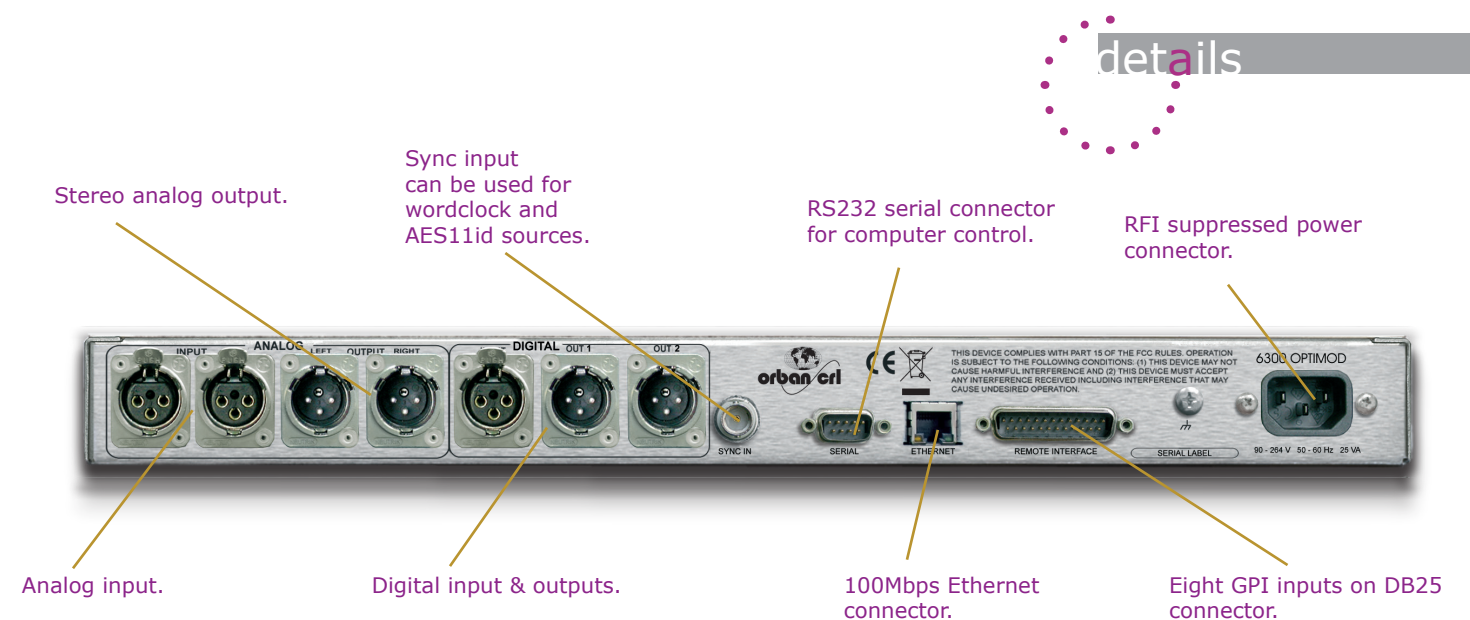
The 6300 includes third-generation CBS Loudness Controllers™ for DTV applications that work with the both Two-Band and Five-Band structures. Material processed by the CBS Loudness Controller has been shown to be well controlled when measured with a long-term loudness meter using the ITU-R BS.1770-3 standard. The 6300 also includes a “BS.1770 Safety Limiter” that follows the CBS Loudness Controller; use the BS.1770 limiter if the BS.1770 meter reading must be constrained to a preset value.

The 6300 works very easily with Dolby Digital® transmission systems. Tell the 6300 what value of Dolby Digital Dialnorm metadata you are transmitting to your audience, and the 6300 will prevent your transmission from being too loud or quiet compared to other correctly set up Dolby Digital transmissions.

PreCode™ Conditions Audio for Low Bitrate Codecs

Orban’s PreCode™ technology manipulates several aspects of the audio to minimize artifacts caused by low bitrate codecs. 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 or mastered by other processing than Optimod. There are several factory presets tuned specifically for low bitrate codecs. These presets have “LBR” in their names. PreCode offers an optimum balance between liveliness and artifact reduction, minimizing “phasey” and “underwater” artifacts without sucking the life out of the audio.

minimizes codec artifacts
without killing the music



features & benefits

| USER-FRIENDLY INTERFACE | |
|--|--|
| LCD and full-time LED meters | An LCD and full-time LED meters make setup, adjustment and programming of OPTIMOD 6300 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 (2-band or 5-band) in use. |
| Dedicated Keys | Push one of the dedicated buttons to “Recall” a preset, to “Modify” processing, or to access the system’s Setup controls. |
| ABSOLUTE CONTROL OF LOUDNESS AND PEAK MODULATION | |
| CBS Loudness Controllers | <p>The 6300 includes third-generation CBS Loudness Controllers™ for DTV applications. Loudness controllers work with the both Two-Band and Five-Band structures. Material processed by the CBS Loudness Controller has been shown to be well controlled when measured with a long-term loudness meter using the ITU-R BS.1770-3 standard.</p> <p>The CBS algorithm has proven its effectiveness by processing millions of hours of on-air programming since the early 1980s. It smoothly limits subjectively perceived loudness to a broadcaster-set threshold, preventing audience irritation. The controller measures subjective loudness (as perceived by an average listener) and then closes a feedback loop to limit loudness to a preset level. It effectively controls loud commercials, which are the primary irritant in sound-for-picture applications. Third generation improvements reduce annoyance more than simple loudness control alone, doing so without audible gain pumping. Attack time is adjustable to trade off short-term loudness control against transient punch and is fast enough to prevent audible loudness overshoots, so the control is smooth and unobtrusive.</p> |
| BS.1770 Safety Limiter | <p>The 6300 also includes a “BS.1770 Safety Limiter” that follows the CBS Loudness Controller; use the BS.1770 if the BS.1770 meter reading must be constrained to a preset value.</p> <p>The 6300 implements BS.1770-compliant “true peak” control by oversampling the peak limiter’s sidechain at 192 kHz. This allows the 6300 to prevent clipping in a playback device’s analog signal path by predicting and controlling the analog peak level following the playback device’s reconstruction filter to an accuracy of better than 0.5 dB.</p> |
| Pre-emphasis limiting for the two standard pre-emphasis curves of 50µs and 75µs | While primarily oriented toward “flat” media, the 6300 can also provide preemphasis limiting for the two standard preemphasis curves of 50µs and 75µs. This allows it to protect pre-emphasized microwave links, satellite uplinks and similar channels where protection limiting or light processing is required. It can also be used to process analog television FM aural carriers in television applications because these are usually processed lightly compared to FM radio. |
| FLEXIBLE CONFIGURATION | |
| Analog & AES3 digital inputs & outputs | The 6300 includes analog and dual AES3 digital inputs and outputs. The digital input and digital outputs have sample-rate converters and can operate at 32 kHz, 44.1 kHz, 48, 88.2, and 96 kHz sample rates. The preemphasis status and output levels are separately adjustable for the analog and digital outputs. |

features & benefits

| Independently configured outputs | OPTIMOD 6300’s outputs can be independently configured to emit the output of the AGC or the output of the multiband compressor/limiter , all configurable to use or bypass look-ahead limiting. So a 6300 can be configured to drive an STL with a peak-limited output from the AGC while also providing a fully processed digital radio/netcast feed and a low delay, multiband compressed talent headphone feed . |
|--|---|
| Dual-mono mode | The 6300’s dual-mono mode allows entirely separate mono programs to be processed, facilitating dual-language operation. |
| Versatile lowpass filtering | OPTIMOD 6300 controls the audio bandwidth as necessary to accommodate the transmitted sample frequency. OPTIMOD 6300’s high frequency bandwidth can be switched instantly (typically in 1 kHz increments) between 10 kHz and 20 kHz. 20 kHz is used for highest-quality systems. 15 kHz meets the requirements of any system that uses 32 kHz sample frequency, while 10 kHz is appropriate for 24 kHz sample frequency. |
| Dolby Digital® Dialnorm metadata | OPTIMOD 6300 supports Dolby Digital® Dialnorm metadata , which simplifies setting up the 6300 to drive Dolby Digital channels. |
| Transformerless, balanced amplifier circuits | 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. |
| International safetyand emissions standards | All input, output, and power connections are rigorously RFI-suppressed to Orban’s traditional exacting standards, ensuring trouble-free installation. The 6300 is designed and certified to meet all applicable international safety and emissions standards . |
| ADAPTABILITY THROUGH MULTIPLE AUDIO PROCESSING STRUCTURES | |
| DSP processing allows the 6300 to be reconfigured instantly | A processing structure is a program that operates as a complete audio processing system. Only one processing structure can be active at a time. OPTIMOD 6300 realizes its processing structures as a series of high-speed mathematical computations made by Digital Signal Processing (DSP) chips. |
| Two processing structures | The 6300 features two processing structures: 5-band for a spectrally consistent sound with good loudness control, and 2-band for a transparent sound that preserves the frequency balance of the original program material while also effectively controlling subjective loudness. |
| PreCode™ technology | Orban’s PreCode™ technology manipulates several aspects of the audio to minimize artifacts caused by low bitrate codecs, minimizing “underwater” and “phasey” artifacts. |
| No-compromise “Protect” function | A special 2-band preset creates a no-compromise “Protect” function that is functionally similar to the “Protect” structures in earlier Orban digital processors. The 5-band and the 2-band structures can be switched via a mute-free crossfade. |
| Dual-bank AGC smoothly rides gain | The 6300’s AGC 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 AGC output is available to drive STLs, so the 6300 can be used as a studio AGC. |
| Phase-linear processing structures | The 6300’s processing structures are all phase-linear to maximize audible transparency. |
| Mastering- quality noise and distortion performance | The 6300’s equalizers and crossovers use 48-bit arithmetic to ensure mastering- quality noise and distortion performance . |

features & benefits

CONTROLLABLE

Remote control

The 6300 **can be remote-controlled** by 5-12V pulses applied to eight programmable, optically isolated "general-purpose interface" (GPI) ports. **6300 PC Remote software** is a graphical application that runs under Windows 2000, XP, Vista, 7, 8 and 8.1. It communicates with a given 6300 **via TCP/IP** over **modem, direct serial, and Ethernet** connections. You can configure PC Remote to switch between many 6300s via a convenient organizer that supports giving any 6300 an alias and supports grouping multiple 6300s into folders. Clicking a 6300's icon causes PC Remote to connect to that 6300 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 6300 features (including advanced controls not available from the 6300'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.).

Versatile real-time clock

The 6300 contains a versatile **real-time clock**, which allows automation of various events (including recalling presets) at pre-programmed times. To ensure accuracy, the clock can be synchronized to an **Internet timeserver**.

Silence alarm

Silence alarm and digital audio fault tally outputs are available.

Bypass Test Mode

A **Bypass Test Mode** can be invoked locally, by remote control (from either the 6300's GPI port or the 6300 PC Remote application), or by automation to permit broadcast system **test and alignment** or "proof of performance" tests.

Built-in line-up tone generator

The 6300 contains a built-in **line-up tone generator**, facilitating quick and accurate level setting in any system.

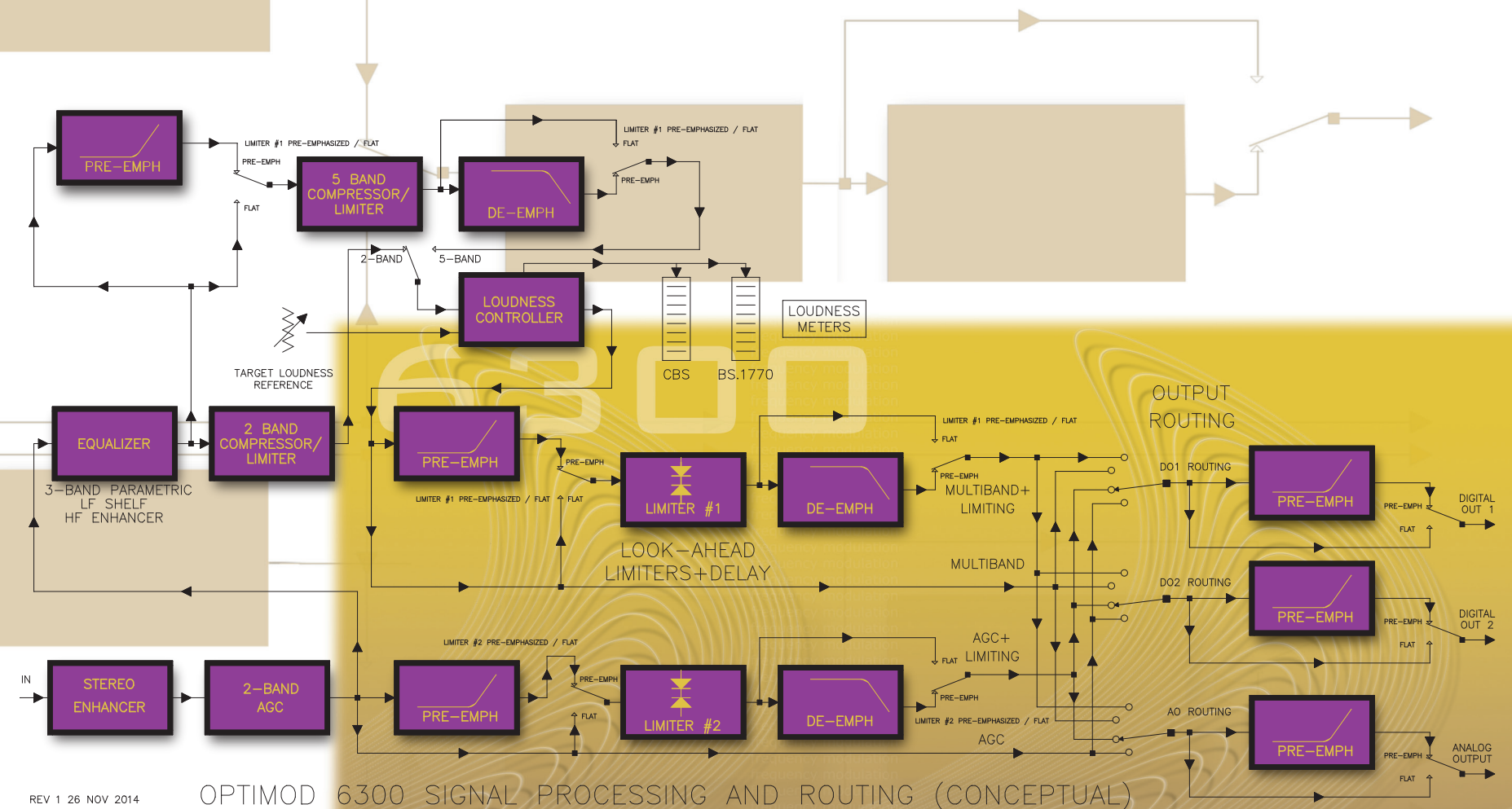
SNMP

The **SNMP** (Simple Network Management Protocol) features allow you to monitor the 6300's status and to send Alarm notifications via the 6300's Ethernet connection to your network.

Updating 6300's software

The 6300's **software can be upgraded** by running Orban-supplied download-able upgrade software on a PC. The upgrade can occur remotely through the 6300's Ethernet port or serial port (connected to an external modem), or locally (by connecting a Windows® computer to the 6300's serial port through the supplied null modem cable).

about the 6300's audio processing



OPTIMOD 6300
Signal Processing and Routing

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 analog left/right output.

| | |
|--|--|
| Frequency Response (Bypass Mode) | Depending on settings, is flat or follows standard 50µs or 75µs preemphasis curve ±0.10 dB, 20 Hz–20 kHz. (At 32 kHz input sample rate, the passband is reduced to approximately 14.7 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, 2-band Drive, and/or Multiband 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 L/R Channel Separation | >70 dB, 20 Hz – 20 kHz; 90 dB typical (analog I/O). Digital I/O separation is infinite. |
| Polarity | Bypass Mode; Operate Mode when processing chain is configured for linear phase): Absolute polarity maintained. Positive-going signal on input will result in positive- going signal on output. |
| Internal Processing Sample rate | 48 kHz. We believe this provides maximum audible transparency by minimizing numerical “noise” in the equalizers and filters while still pre- serving a pure, transparent sound. The double-precision equalizers and crossover filters used throughout the 6300 produce at least 6 dB lower noise and nonlinear distortion than they would at 96 kHz. |
| Processing Resolution | Internal processing has 24 bit (fixed point) or higher resolution; uses Freescale (formerly Motorola) DSP56367 DSP chips. |
| Delay | The minimum available input/output delay is approximately 20 ms with look-ahead limiting active and 6 ms with look-ahead limiting bypassed. This can be padded to exactly one frame of 24, 25, 29.97, or 30 frames / second video up to a maximum delay of 50 ms. |
| Operating Mode | Stereo or dual-mono. In dual-mono mode, both processing channels have the same subjective adjustments (as determined by the active preset) but are otherwise independent, making this mode appropriate for dual-language transmissions. Operating mode can be set via GPI, Ethernet and serial connections, internal clock-based automation, and AES3 Status Bits. |
| Loudness Level Meter (x2): | One meter for stereo-mode processing or two meters for dual-mono mode processing channels, all meters realized in software. For a given processing chain, two meters operate simultaneously: a long-term loudness meter displays loudness over an ungated 3-second integration time or 10-second integration time using the ITU-R BS.1770-3 algorithm (per ATSC A/85 and EBU R 128) and a short-term loudness meter uses the Jones & Torick algorithm developed at CBS Technology Center in 1981. The Jones & Torick meter’s display time constants are matched to the psychoacoustic loudness integration time of the human ear, reaching steady-state level in approximately 200 ms and having a decay time constant of approximately 300 ms. Hence, this meter can indicate the momentary loudness of transient events like pistol shots, which may be annoying to viewers but which the BS.1770 meter ignores because of its longer integration time. (B. L. Jones & E. L. Torick: “A New Loudness Indicator for Use in Broadcasting,” J. SMPTE, September 1981, pp 772-777.) One ITU BS.1770-2 meter is always displayed on the 6300’s front panel; it indicates the stereo loudness when the 6300 is in Stereo mode and it indicates the loudness of one of the two mono processing channels (user selected) when the 6300 is in Dual-Mono Mode. In 6300 PC Remote software, all loudness meters are displayed simultaneously. |
| Peak Control: | As recommended in ITU-R BS.1770, the peak limiter is oversampled at 192 kHz, yielding a worst-case overshoot of 0.5 dB at the analog output and for all output sample rates. (To achieve this performance at 32 kHz output sample rate, it is necessary to set the 6300’s lowpass filter cutoff frequency to 15 kHz.) |

Analog Audio Input

| | |
|----------------------------|---|
| Configuration | Stereo / Dual-Mono. |
| 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. |
| 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 | ≥ 100 dB unweighted (Bypass mode, 20 Hz–20 kHz bandwidth, referenced to 100% modulation). |
| Distortion | ≤ 0.01% THD (Bypass mode, de-emphasized) 20 Hz–20 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. |

INSTALLATION

INSTALLATION

Digital Audio Input

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|----------------------|--|
| Configuration | Stereo or two-channel (dual-mono) per AES3 standard, 24 bit resolution, software selection of stereo or dual-mono. Unit can detect Stereo or Two-Channel status bits and switch modes appropriately. |
| User Bits | Unit can pass AES3 User Bits from its AES input to AES Output #1. |
| Sample 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 trans- former balanced and floating, 110Ω impedance. |

Digital Audio Inputs

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|------------------------------|--|
| Input Reference Level | Variable within the range of –30 dBFS to –10 dBFS. |
| J.17 De-emphasis | Software-selectable. |
| Filtering | RFI filtered. |

Digital Audio Outputs

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| Configuration | Stereo or two-channel per AES3 standard. Output configured in software as flat or pre-emphasized to the chosen processing preemphasis (50µs or 75µs), with or without J.17 preemphasis. |
| Samplerate | Internal free running at 32, 44.1, 48, 88.1 or 96 kHz, selected in software. Can also be synced to the AES3 digital, AES11id, or Wordclock input at 32, 44.1, 48, 88.1 or 96 kHz, as configured in software. (Passband is limited to approximately 14.7 kHz when using 32 kHz output sample rate.) |
| 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 trans- former balanced and floating, 110Ω impedance. |
| Output Level (100% peak modulation) | –20.0 to 0.0 dBFS software controlled. |
| Filtering | RFI filtered. |

Sync Input

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|----------------------|--|
| Configuration | Can accept wordclock or AES11id (75Ω) sync, selectable in software. |
| Connector | Female BNC. |
| Termination | Unterminated. For wordclock, use an external 75Ω terminator if the 6300 is the last item in the chain. For AES11id, always use a 75Ω terminator. |

Remote Computer Interface

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|----------------------|--|
| Configuration | TCP/IP protocol via direct cable connect, modem, or Ethernet interface. Modem is not supplied. |
| Serial Port | 115 kbps RS–232 port DB–9 male, EMI-suppressed. |
| Ethernet Port | 100 Mbit / sec on RJ45 female connector. |

Remote Control (GPI) Interface

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| Configuration | Eight (8) inputs, opto-isolated and floating. |
| Voltage | 6–15V AC or DC, momentary or continuous. 12 VDC 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. |

Tally Outputs

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|------------------------------|--|
| Circuit Configuration | Two NPN open-collector outputs. |
| Voltage | +15 volts maximum. Do not apply negative voltage. When driving a relay or other inductive load, connect a diode in reverse polarity across the relay coil to protect the driver transistors from reverse voltage caused by inductive kickback. |
| Current | 30 mA maximum. |
| Indications | Tally outputs can be programmed to indicate a number of different operational and fault conditions, including Input: Analog, Input: Digital, Analog Input Silent, AES Input Silent, and AES Input Error. |

Power

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|-------------------------|---|
| Voltage | 85–264 VAC, 50–60 Hz, 30 VA. |
| Connector | IEC, EMI-suppressed. Detachable 3-wire power cord supplied. |
| Fuse | 2.5A 20mm Quick Acting HBC, mounted on the power supply circuit board. |
| 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

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| 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 1.75” x 14.25” / 48.3 cm x 4.5 cm x 36.2 cm. One rack unit high. |
| RFI / EMI | Tested according to Cenelec procedures. FCC Part 15 Class A device. |
| Shipping Weight | 10 lbs / 4.6 kg . |

Warranty

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| Five Years, Parts and Service | Subject to the limitations set forth in Orban’s Standard Warranty Agreement. |
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INSTALLATION

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



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