FM & DAB+/HD Radio Audio Processor

OPTIMOD
8700i

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TECHNICAL DETAILS (continued from page 3)

Stereo Separation	At 100% modulation = 3.5 Vp-p, > 64 dB, 20 Hz - 15 kHz. 68 dB typical at 400 Hz
Baseband Spectral Protection	Pilot Protection, 19 kHz ±200 Hz, no composite limiting: >99 dB, 2 dB composite limiting: >79 dB with reference to 9% pilot injection
	RDS Protection, 57 kHz ±2 kHz, no composite limiting: >67 dB, 2 dB composite limiting: >63 dB with reference to 6% RDS injection
Digitized SCA Inputs	2 x digitized analog; summed into the digital composite but do not appear on the analog composite outputs
Non-Digitized SCA Inputs	2 x non-digitized analog on BNC connectors; summed into the analog composite outputs but do not appear at the digital composite outputs
	SCA1 input can be configured to accept the composite output of a backup audio processor or stereo encoder with hardwire bypass to analog comp output #1. SCA2 input can be configured to supply a 19 kHz pilot reference
Audio-Over-IP I/O	Dante™/AES67, supporting two stereo inputs pairs and two stereo output pairs @ 44.1, 48, 88.2 or 96 kHz; two Ethernet connectors are dedicated to audio-over-IP, supporting main and backup networks
Windows PC Software	Included in delivery; requires Microsoft Windows® 7 OS or higher; PC connection via TCP/IP protocol via direct cable connect, modem or Ethernet interface (RJ45) or serial RS232 interface
GPI Interface	8 x user-programmable inputs, floating on DB-25 male connector
Tally Outputs	2 x NPN open-collector
Voltage	90–240 VAC, auto-selected, 50–60 Hz, 50 VA, dual-redundant
Dimensions (W x H x D)	19" x 5.25" (3U) x 15.5" / 48.3 cm x 8.9 cm (3U) x 39.4 cm

OPTIMOD 8700i is Orban's flagship processor. Featuring versatile five-band and two-band processing for both analog FM transmission and digital media including DAB+, HD Radio and Streaming, the 8700i provides the industry's most consistent sound - track-to-track and source-to-source. This consistency allows you to create a sonic signature for your station with the assurance that your signature will stay locked in, uniquely branding your sound.

Key Features

Quick Setup provides a guided, systematic procedure for setting up the 8700i which should be adequate for most users.

Easy **LESS-MORE** adjustment of the dynamics processing lets anyone get excellent results, while processing experts can fine-tune to their exact preferences with Intermediate or Advanced Control.

Six Processing Structures: You can select between six processing structures that are Five-Band (or "Multiband") for a consistent, "processed" sound with 17 ms delay (typical), free from undesirable side effects, Low-Latency Five-Band (12 ms delay), Ultra-Low-Latency Five-Band (3.7 ms delay), and Two-Band (17 or 22 ms delay) for a transparent sound that preserves the frequency balance of the original program material. Additionally, the 8700i has two "MX" processing structures - one Five-Band and one Two-Band - which include the exclusive, advanced MX peak limiting technology to decrease distortion while achieving substantial improvements in transient punch and high frequency clarity.

Xponential Loudness™ Algorithm: The Xponential Loudness™ algorithm reduces listening fatigue and actually improves listeners' hearing using adaptive psychoacoustics. It's like an audio magnifying glass that brings out hidden details, clarifying audio and inspiring audiences to listen longer.

Subharmonic Synthesizer: The Subharmonic Synthesizer creates energy one octave below program energy in the range of 50-90 or 60-120 Hz when such energy is not present at the input and when music is detected. It adds punch and slam to older material while retaining musicality and prevents introducing unnatural coloration in male speech.

Multipath Mitigator: Applied to both the analog and digital radio processing chains, the phase skew corrector minimizes L–R energy that can cause multipath distortion while preventing comb filtering in mono receivers and stereo receivers when they blend.

The **Sophisticated Bass Pre-Limiter** has a new algorithm that generates carefully time-aligned, bandwidth-controlled harmonics that minimize the peak level of the bass so that very low frequencies can actually exceed 100% modulation. The main benefit is the ability to use more bass clipping without generating objectionable distortion in the upper mid-bass frequency range.

Speech and Music Detection: The OPTIMOD automatically detects if voice or music is being processed and allows you to set up the processing individually for both.

"True Peak" Control for the digital radio processing with an accuracy of better than 0.5 dB. For typical program material, accuracy is 0.2 dB.

ITU BS-412 Multiplex Power Control: An improved BS-412 Multiplex Power Controller provides a new user-adjustable, program-adaptive algorithm to make operation smoother and more subtle.

ITU-R BS.1770-4 Loudness Control for both analog and digital radio processing chains facilitates compliance with modern target loudness recommendations like EBU R128 and allows users to obey any associated government regulations.

Composite Limiter/Clipper: A two-stage "Half-Cosine Interpolation" composite limiter provides excellent spectral protection of the pilot tone and SCAs (including RDS). For

those preferring the sound of conventional composite clipping, the first stage can be run as a conventional composite clipper while the second-stage Half-Cosine Interpolation Limiter provides overshoot compensation, with full spectral protection.

SSB Stereo Encoder Operation: Allows its stereo encoder's stereo subchannel modulator to operate in an experimental compatible single sideband/vestigial sideband mode. In SSB mode, the subchannel modulator acts as a pure SSB generator for L–R material in the frequency range of 150 Hz to 17 kHz and as a vestigial sideband generator below 150 Hz.

Low-Delay DJ Monitor Output: A new, dedicated headphone monitor chain provides a full five-band FM processor that lets you dial in your preferred amount of "FM clipper sound".

Streaming Monitor Output: Used with the 8700i's remote control application, the streaming monitor facilitates checking or improving your station's signature sound when you are unable to receive the 8700i processed FM signal off-air. The streaming feature allows you to monitor several points within 8700i. The MP3 and OPUS codecs and the Icecast2 and SHOUTcast2 streaming protocols are supported, allowing streaming directly to the client PC via your LAN or the Internet.

Dante™ Audio-Over-IP Connectivity: The Dante™ interface provides a dual-redundant Ethernet connection for two stereo audio inputs and two stereo outputs, each with a dedicated level control. Sample rate conversion is provided for both the inputs and the outputs. Full AES67 support.

Digital MPX: A 384/192 kHz AES3 digital composite output is available that is compatible with the 192 kHz standard being implemented by several transmitter manufacturers.

10 MHz/Wordclock Reference Input: A reference input allows the internal DSP clock, the stereo pilot tone frequency and digital composite output sample rate to be locked to a 10 MHz or 1 x wordclock reference signal, facilitating single-frequency-network (SFN) and near-single-frequency-network (N-SFN) operation.

RDS: Built-in fully-featured RDS/RBDS generator that supports static and dynamic RDS values.

Ratings Encoder Loop-Through: You can place a ratings encoder between the AGC and the FM/digital radio split (allowing one ratings encoder to be used

for both FM and digital radio), or between the FM analog limiter output and the stereo encoder (to maximize the drive level to the ratings encoder and to avoid passing the watermark through FM peak limiting).

Bypass Test Mode and Tone Generator: A Bypass Test Mode can be invoked locally, by remote control or by automation to perform a broadcast system test or to compare easily original and processed sound. A built-in line-up tone generator facilitates quick and accurate level setting.
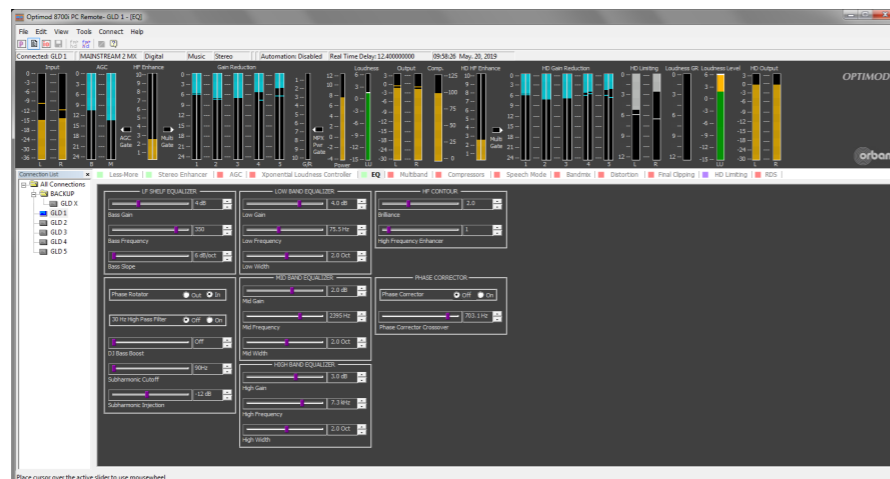
Defeatable Analog FM and HD/DAB+ Processing Delay: Important for radios with automatic crossfades between analog and digital, a configurable delay can be added to either the FM chain or the digital and FM chains to ensure time-synchronized reception of the FM and the HD radio/DAB+ signals.

Safety Bypass Relays: Analog, AES3 digital and analog MPX inputs and outputs have hard-wire safety bypass relays in case of hardware or power failures.

Dual Power Supplies: The 8700i's dual power supplies with independent AC line inputs provide redundant operation to ensuring maximum uptime.

SNMP Support: The SNMP (Simple Network Management Protocol) feature allows you to monitor your OPTIMOD's status and to send alarm notifications via your OPTIMOD's Ethernet connection to your network.

Remote Control or front panel operation: You can operate and configure the 8700i comfortably via the supplied Windows PC Software using your local network or the Internet. Alternatively all functionalities are also available via the front panel with its color display.

TECHNICAL DETAILS

Total System Distortion (de-emphasized, 100% modulation)	<0.01% THD, 20 Hz - 1 kHz, rising to <0.05% at 15 kHz. <0.005% SMPTE IM Distortion
Frequency Response	Follows standard 50µs or 75µs preemphasis 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
Sample Rate	64 kHz to 512 kHz, depending on processing being performed
Total System Separation	> 55 dB, 20 Hz - 15 kHz. 68 dB typical
Peak Overshoot at HD Output	0.5 dB True Peak maximum; 0.2 dBTP typical
Defeatable Analog FM Processing Delay	0.27 to 12.0 seconds
DAB+ /HD Mode Delay	0.365015625 to 8.0 seconds (FM path); 0 to 6.0 seconds (HD path)
Minimum Processing Delay	3.7 ms to 270 ms, processing structure dependent Multipath Mitigator delay = 146 ms Subharmonic Synthesizer delay = 67.5 ms
Low-Latency Monitor Output Delay	6 ms
Analog Audio Inputs/Outputs	Stereo on XLR connectors, with relay bypass Nominal Input level: –4.0 to +13.0 dBu (VU) or -2 dBu to +20 dBu (PPM) Output level: –6 dBu to +24 dBu peak
Digital AES Audio Inputs/Outputs	1 x Stereo input on XLR, 24 bit resolution, with relay bypass 1 x Stereo input or SYNC input on XLR, 24 bit resolution, with relay bypass Input Reference Level: Variable within the range of –30 dBFS to –7 dBFS (VU) or -23 dBFS to 0dBFS (PPM) 2 x Stereo outputs on XLR, can be individually set to emit the analog FM processed signal, the digital radio processed signal, or the monitor signal Output Level (100% peak modulation): –20.0 to 0.0 dBFS software controlled
Sampling Rate	32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, and 96 kHz
Wordclock Sync Input on BNC Connector	1x word clock or 10 MHz clock, automatically selected DSP master clock can be phase-locked to these signals, which phase-locks the 19 kHz pilot tone frequency, facilitating SFN operation. Digital output sample frequency can also be locked to these signals.
Composite Baseband Outputs	1 x 192 kHz AES3; 2 x analog providing –12 dBu (0.55 Vp-p) to +12.0 dBu (8.72 Vp-p) levels for 0.1 dB adjustment resolution