

Omnia.9

ALL YOU CAN IMAGINE.
AND MORE.



There's no compromise when it comes to flexibility and features either. Omnia.9 can be configured to process audio for FM or AM, multiple HD channels, and even has separate processing and encoding for streaming audio, freeing up rack space otherwise used by external processors and encoders.

Advantages



Standard configuration offers processing for FM or AM, with optionalv separate and simultaneous processing for HD-1, HD-2, and HD-3. Each HD source can also be independently processed and encoded for streaming.



Dual Path configuration offers processing for two independent radio stations, FM+FM or AM+FM. In an AM simulcast situation, Dual Path can be FM+FM+AM simulcast, operating on three transmitters. Each path also receives separate and simultaneous processing for HD-1, plus independent processing and encoding for streaming audio.



Dedicated low-latency studio processing with independent input for talent monitoring.



“Undo” removes distortion and restores dynamics to poorly mastered source material Streaming encoding built in for Primary Digital (HD) and (Optional) Secondary (HD2) and Tertiary (HD3).

Advantages (Cont.)



Psychoacoustic distortion-masking clipper for unprecedented clarity and intelligibility on FM



Allows 140% L/R audio levels within 100% total modulation.



7-inch touch panel touch screen



Optional RDS encoder, dynamically updateable



Dayparting (scheduled preset selection)



Dual independent power supplies

Advantages (Cont.)



Audio pass-through (relay bypass) automatically places backup processor on-air for mission-critical applications

- AM Separate Day/Night settings with GPI and schedule control
- Line-up tones, Tilt and EQ for Analog AM transmitter calibration
- Separate and independent processing for all processing cores, including FM, HD, streaming, and studio.
- Up to three stages of wideband AGC with adjustable sidechain equalization.
- As few as two or as many as seven bands of multiband compression and look-ahead peak limiting.
- Multiband downward expansion (source noise reduction).
- User-selectable Auto Pilot automatically turns off 19kHz pilot on mono material for dramatically reduced multipath and noise, and increased coverage.
- Dry voice detector ensures distortion-free voice even with heavy processing.

Omnia.9 FM Screen

EXCLUSIVE "UNDO" TECHNOLOGY

1/6TH OCTAVE RTA

VERSATILE DYNAMICS PROCESSING

I/O LOUDNESS AND MPX POWER GRAPHS WITH 24-HR HISTORY

PSYCHOACOUSTIC DISTORTION MASKING CLIPPER

MULTIBAND STEREO ENHANCER

ON BOARD DIAGNOSTIC AND ANALYSIS TOOLS

The screenshot shows the Omnia.9 interface with the following elements:

- Top Bar:** Omnia.9 BY LEIF CLAESSON, FM Location: TX Site Rack, CPU Load: 21%, Menu 1-6.
- Left Column:** Undo - Input 1 - Aggressive Unprocessing (Multiband Exp, Input, Deed, Output); MPX Output - Multiplex.
- Middle Column:** FM - Main Digital - RustonLUT; Multiband Stereo Enhancer (Input, AG, Multiband, WZ, Out, M); MPX Output - Left De-emph.
- Right Column:** Loudness and MPX Power Graphs (6 LKFS to 30 LKFS); ST Graph - Program Input; MPX Out - MPX.
- Bottom Bar:** Home, Input 1-3, FM, AM, Studio Processing, HD1, HD2, HD3, Streaming 1-3, Monitor Outputs, System, Client Audio.

BUILT-IN ENCODING FOR STREAMING AUDIO

SELECTABLE PATCH POINTS AND SPEAKER CALIBRATION

OPTIONAL RDS ENCODING

AVAILABLE PROCESSING FOR FM, HD, AND STREAMING AUDIO

SEPARATE LOW-LATENCY STUDIO PROCESSING CORE

Omnia.9 AM Screen

The screenshot displays the Omnia.9 AM software interface. At the top, it shows 'Omnia.9 BY LEIF CLAESSON', 'AM Location: TX Site Rack', and 'CPU Load: 20%'. A menu bar contains buttons 1 through 6. The main workspace is divided into several sections: 'Undo - Input 1 - Aggressive Unprocessing' with a 'Multiband Exp' graph; 'AM - Main Digital - Flamerthrower' with 'Input', 'AGC', and 'Multiband' meters; 'ST Graph - Program Input' showing a waveform; 'Output - Pre-Emph' with a waveform; 'Output - De-emph' with a spectrum analyzer; and 'Output - PE' with a spectrum analyzer. A 'Home' section at the bottom contains buttons for 'Input 1-3', 'FM', 'AM', 'Studio Processing', 'HD1-3', 'Streaming 1-3', 'Monitor Outputs', 'System', and 'Client Audio'. Callout boxes point to various features: 'EXCLUSIVE "UNDO" TECHNOLOGY' points to the Undo button; '1/6TH OCTAVE RTA' points to the RTA graphs; 'ASYMMETRICAL CLIPPING' points to the clipping meters; 'I/O LOUDNESS AND MPX POWER GRAPHS WITH 24-HR HISTORY' points to the ST Graph; 'PSYCHOACOUSTIC DISTORTION MASKING CLIPPER' points to the 'Aggressive Unprocessing' section; 'VERSATILE DYNAMICS PROCESSING' points to the AGC and Multiband meters; 'ON BOARD DIAGNOSTIC AND ANALYSIS TOOLS' points to the various graphs; 'BUILT-IN ENCODING FOR STREAMING AUDIO' points to the Streaming buttons; 'SELECTABLE PATCH POINTS AND SPEAKER CALIBRATION' points to the Monitor Outputs button; 'AVAILABLE PROCESSING FOR FM, HD, AND STREAMING AUDIO' points to the Input and FM/AM buttons; and 'SEPARATE LOW-LATENCY STUDIO PROCESSING CORE' points to the Studio Processing button.

EXCLUSIVE "UNDO" TECHNOLOGY

1/6TH OCTAVE RTA

ASYMMETRICAL CLIPPING

I/O LOUDNESS AND MPX POWER GRAPHS WITH 24-HR HISTORY

PSYCHOACOUSTIC DISTORTION MASKING CLIPPER

VERSATILE DYNAMICS PROCESSING

ON BOARD DIAGNOSTIC AND ANALYSIS TOOLS

Home

Input 1 Input 2 Input 3 FM AM Studio Processing HD1

HD2 HD3 Streaming 1 Streaming 2 Streaming 3 Monitor Outputs System Client Audio

BUILT-IN ENCODING FOR STREAMING AUDIO

SELECTABLE PATCH POINTS AND SPEAKER CALIBRATION

AVAILABLE PROCESSING FOR FM, HD, AND STREAMING AUDIO

SEPARATE LOW-LATENCY STUDIO PROCESSING CORE

Omnia.9 Physical Specifications

Dimensions:

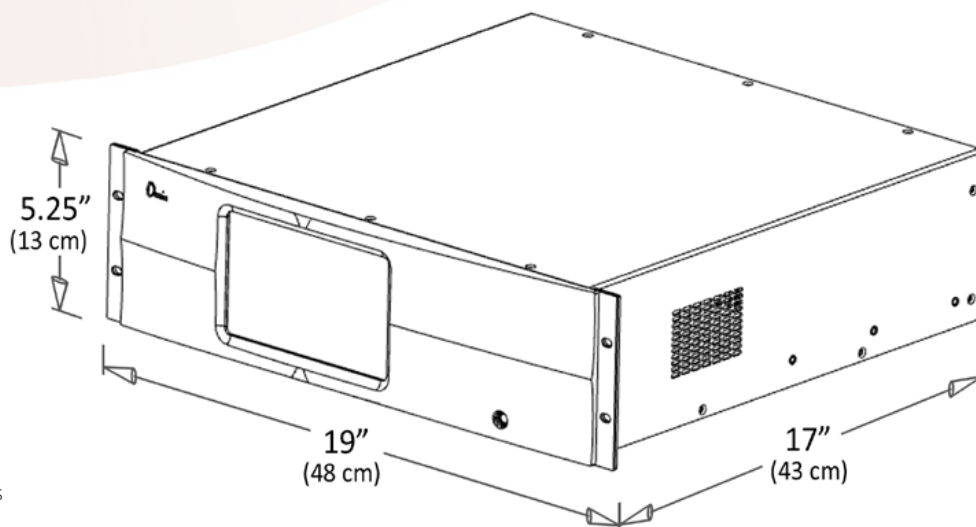
- 19" wide x 5.25" high x 17" deep (48 cm wide x 18 cm high x 51 cm deep). Unit requires three EIA rack spaces for mounting.
- Allow up to 4" in rear for connector and cable clearance.
- 18 lbs. unit weight

Shipping Weight:

- 28 lbs.

Accessories:

- Omnia.9 Manual
- Omnia.9 Quick Start Guide
- Warranty Registraton
- 120V AC power cord
- 2x 120V AC power cords
- 2x 240V AC Euro power cords
- Rack screws (bag of five)



Omnia.9 Back Panel



Omnia.9 Performance Specifications

Frequency Response:

- +/-0.5dB 20Hz to 15kHz, 17.5kHz in extended mode

Signal-Noise Ratio:

- Greater than -80dBu de-emphasized, 20Hz to 15kHz

System Distortion:

- Less than 0.01% THD below pre-emphasis, inaudible above

Stereo Separation:

- 65dB minimum, 20Hz to 15kHz, 70dB typical

Digital Output Level

- Adjustable from -24.0dBFS to 0.0dBFS in 0.1dB increments

Stereo Baseband Output

- Adjustable from -2dBu to +22dBu (0.1dB increments) into 600-Ohms, 20-Ohm output impedance

A/D Conversion:

- Crystal Semiconductor CS5361, 24 bit 128x over-sampled
- Delta sigma converter with linear-phase anti-aliasing filter.
- Pre-ADC anti-alias filter, with high-pass filter at <10 Hz

D/A Conversion:

- Crystal Semiconductor CS4391, 24-bit, 128x oversampled
- External Sync Input
- Per AES11 Digital Audio Reference Signal (DARS), reference for digital output sample rate.

External Sync Range

- 44.1 or 48kHz (Main and Aux Digital inputs accept 32 - 192kHz)

Analog I/O

- Two balanced, EMI filtered XLR connectors

Stereo Generator Connections

- Four 75-Ohm BNC female, two inputs, two outputs
- (FM style only) AES/EBU In & External Sync
- XLR-female
- AES/EBU Out
- Four XLR connectors for Main and Aux Digital programs (two stereo in, two stereo out)
- Ethernet
- Shared RJ45 supporting 100 BASE-T Ethernet connections

AM Bandwidth

- High-pass: 40 – 300 Hz. Low-pass 3.0 – 10.0 kHz.
Stop-band rejection: <100dB

AM Pre-emphasis:

- None, 50us, 75us or NRSC

Power Requirements

- 100-264 VAC, 47-63Hz autosensing

Power Connector

- IEC male, detachable 3-wire power cords supplied

Power Supply

- Dual redundant, hot-swappable

Environmental

- **Operating:** 0 to 50 degrees C
- **Non-operating:** -20 to 70 degrees C.
- **North America:** Designed to comply with the limits for a class A digital device pursuant to Part 15 of the FCC rules (CFR). Designed for U.S. and Canadian listing with UL.
- **Europe:** Designed to comply with the requirements of Low Voltage Directive 73/23/EEC and EMC Directive 89/336/EEC. Designed for RoHS and WEEE compliance.

A Few Words About Omnia.9 from developer Leif Claesson:

- Full remote control with return audio and speaker calibration.
- Digital oscilloscope, FFT, RTA, modulation monitor, and ITU-R BS.1770 loudness meters for signal analysis and monitoring.

The Omnia.9 is quite a unit. What was the thought process behind creating such a full-featured box?

I think it's a combination of things. I'm a stubborn, extremely driven, easily annoyed perfectionist -- but I'm not a complainer, so when something is not as good as it can be, I actually take the time and make the effort to improve it. I also always strive to improve efficiency in everything I do -- I can't stand wasting time, I'm always optimizing the process.

I LOVE music -- always have, always will, and I'm listening to something nearly all the time. I listen to so many different genres -- from pop, rock, electronic music (house and trance in particular), some jazz, some classical, some rap, country, and right this second Dutch 70s schlager pop. You get the idea.

However, the more I listen, and improve my listening environment, the more critical my ears have become, and I get better and better at picking up artifacts, whether I like it or not. It's truly an occupational hazard. To be able to get to the bottom of any issue I hear, I've had to develop my own tools in software so that they're always handy. RTAs, spectrum analyzers, oscilloscopes -- I really need all of them, to properly be able to make decisions on how to adjust any kind of processing. There's that efficiency / time-wasting thing again -- hooking up hardware takes a lot of time that could be better spent listening, experimenting and adjusting. For that reason, even if it means laying all the cards on the table, I feel they have to be included in the product -- if I myself need them (and I wrote the algorithms myself so I know exactly how they work!), how could I possibly expect a customer to be able to use and adjust it without having these instruments available? Working blind just won't do it -- listening alone is not enough when there are this many things going on. Once we use our eyes as well as our ears, it becomes much easier to figure out what's really going on. This is why Omnia.9 has a nice set of measurement tools with a huge amount of patch points, built right into the product. It's not a complete set yet, but it will improve - spectrogram (voiceprint) is coming, and so is an X-Y oscilloscope.

A shorter but equally accurate answer to the above question might have been: "Because I could!"

Tell me about the encoding capabilities.

You mean this unit will also encode my internet streams?

Omnia.9 can indeed encode your internet streams! It has completely separate processing cores for analog and digital, and all popular codecs are built in. Setting up internet streams is usually a royal pain in the neck -- audio interface issues, driver issues, buggy software. I thought, why not put good, stable encoders right in the audio processor? It makes sense -- the audio is there already, it's on the network already, and we have plenty of CPU left over to do it. Let's face it -- many stations have awful sounding internet streams, and this way, not only does it make setup a breeze, it also ensures the absolute highest audio quality, because there is no chance of glitches or audio degradation beyond what the chosen codec itself does.

Omnia.9 also has digital outputs to feed your existing HD encoders, however it does itself do the HD encoding, because even if it did, there would be no way to get the signal through to the transmitter, as IBOC is not a subcarrier but rather separate carriers, and must be inserted into the RF, not the MPX.

What if I don't have an HD-2 or HD-3 service? Can I purchase an Omnia.9 without the extra HD processing and encoding capabilities?

The base model is FM only. You can add separate processing for HD and streaming at any time, or processing for two analog FM signals plus HD-1.

RDS, too? Tell me about this.

Omnia.9 has an optional full dynamic RDS encoder, and with the Psychoacoustic Composite Embedder also having access to the RDS signal, we can take it into account, and actually insert the RDS without losing loudness. Adding the RDS to the composite signal adds overshoots which must then be compensated for by turning down the average modulation, and this means a 0.7dB loudness loss for 8% RDS injection. In today's competitive radio environment, every little bit counts, so being able to turn up the

A Few Words About Omnia.9 from developer Leif Claesson: (Cont.)

RDS (for increased coverage) while still maintaining loudness and signal-to-noise ratio (again for increased coverage) is a win-win.

The RDS encoder can be controlled from the front panel or remote application, as well as from the built-in HTTP server, for example for displaying the currently playing song, important messages, or advertisements.

The Omnia.9 does so much. What do you say to people who are nervous about having all of their eggs in one basket, so to speak, in terms of reliability?

Omnia.9 was built for years of trouble-free operation, both the software and hardware. It has dual independent hot-swappable power supplies (and can run on just one), software and hardware watchdogs, and MPX relay bypass for your backup chain. We have years of experience in building reliable systems for broadcast, both TV and radio, so we have learned how to build reliable systems. Computers are more reliable than ever before. We're confident in the Omnia.9.

Is the Omnia.9 difficult to set up and manage?

Not at all! The user interface is clean and organized, and you get the exact same user interface in the remote control as on the front panel, including all the instrumentation, as well as dedicated audio streaming for the remote, where you can listen to the audio from any patch point in the chain. No processor has ever been so cooperative in helping you get everything set up just the way you like it.

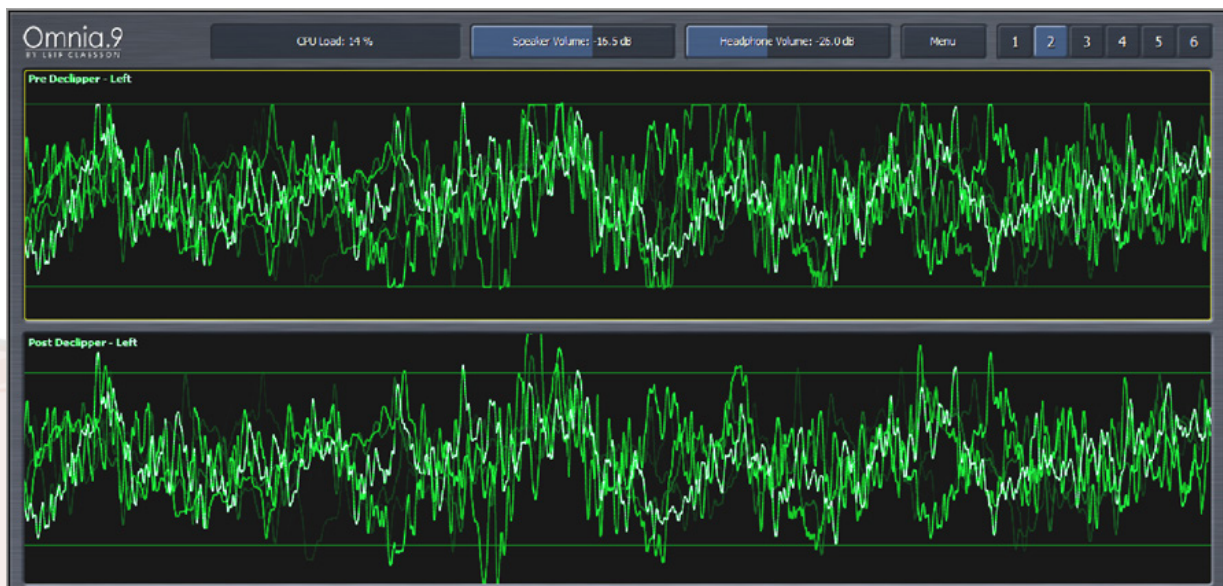
What Exactly *Is* Undo?

In order to understand how to best use Undo, it is helpful to understand exactly what it is and how it works. Undo is actually two separate processes - a de-clipper and a multiband expander - which work together to "undo" the poorly mastered, hyper-compressed and clipped audio found on so many modern CD's.

Take a look at the two waveforms below, captured using Omnia.9's built-in oscilloscope. The top window shows the unprocessed source audio. The bottom window shows the same audio after it has passed through the de-clipper. Notice how the peaks that were clipped during mastering have been restored by the de-clipper.

Note:

The oscilloscope gain was kept at the same level for comparison purposes, but Omnia.9 has sufficient internal headroom, and this illustrations that follow do not suggest that the audio is being clipped again by any portion of "Undo".



What Exactly Is Undo (Cont.)

The second stage of Undo is a multi-band expander that is designed to restore dynamic range to audio that has been excessively compressed. Each of the five bands of the expander has a corresponding psychoacoustic dynamics detector and a peak detector that examine the peak levels of the incoming audio, and based upon that information plus the settings of the various controls, tells the expander how much dynamic range to restore to the audio.

In the image below, the top window shows the unprocessed audio before de-clipping or expansion. The bottom window shows the same audio after it has been de-clipped and expanded.

