

Omnia Audio

*Features of the Omnia-6EX
and
Omnia-6EXi Audio Processors*

Edited by
Kirk Harnack
Executive Director
International Business Development
Telos – Omnia – Axia

July, 2009

Audio Processing and the Competitive Landscape

Less than a dozen manufacturers around the world comprise the majority of all audio processor manufacturers for radio broadcasting service. Of these, only two companies, Omnia and Orban, enjoy worldwide acceptance and popularity of their offerings.

Both companies design, test, and manufacture high-quality audio processors for the broadcasting services of AM, FM, TV (digital and analog), Shortwave, DAB, HD Radio, DRM, and other variants. Orban enjoyed dominance in the marketplace until around 2001 when Omnia processors began outpacing others in terms of features, algorithm sophistication, and audio clarity in demanding situations. Within four years of introduction, the Omnia-6 series and the Omnia-3 series of audio processors had taken the lead in USA sales and popularity.

Omnia Audio Processor – Popularity Spreads

Many countries are now dominated by Omnia audio processors as word spreads among engineers, program directors, and station managers about the advantages of Omnia's unique approach to audio processing. For example, in France, after wildly successful trials at the Eiffel Tower and the signals of NRJ, Omnia's popularity spread quickly. Now there are over 800 Omnia audio processors in France, with another 1,200 Omnia ONE FM processors being installed during the Summer of 2009. As with many large deployments of equipment, Omnia audio processors were selected after extensive audio testing by the engineers at Radio France in Paris. By the end of 2009, there will be over 2,000 Omnia audio processors serving on-air duty throughout France.

Omnia audio processors are in use in virtually every major city in the world. In New York City (USA) the competition among radio stations is fierce. Engineers cannot allow their on-air sound to lag behind any other station. Of the top 15 Arbitron-rated radio stations in New York, all 15 of them are using Omnia audio processors as their main, on-air audio processing device. This includes both FM and AM stations.

Around the globe, Omnia processors are the choice of engineers and program directors at the top stations in such cities as these:

Paris, Berlin, London, Rome, Milan, Oslo, Johannesburg, Istanbul, Prague, Mumbai, Delhi, Singapore, Hong Kong, Beijing, Taipei, Sao Paulo, Bogota, Mexico City, Sydney, Auckland, Toronto, Los Angeles, and many, many more.

Born from Competitive Need

Omnia's chief designer is Frank Foti. As a broadcast engineer in the highly competitive New York radio market, Frank was dissatisfied with the on-air sound achievable with the (then) most popular audio processors from Orban. He knew that a brighter, more open sound should be attainable, but not with the internal processing architecture offered in Orban and competing products.

Frank set out to develop a new FM audio processor with a different approach to FM pre-emphasis and the multi-band audio processing concept. His research and design work resulted in audio processors from the Vigilante to the Unity 2000 and then to the original Omnia.fm. These processors became popular among the audio processing "underground" – engineers who were also seeking a better sound than that attainable from traditional processors such as Orban. Encouraged further by the popularity of his processors among some of the best engineers in the world, Frank expanded his team of designers and software and hardware engineers. The prime result of their cooperative work is the world's most popular high-end FM audio processors, the Omnia-6EX and Omnia-6EXi.

What's Different about Omnia?

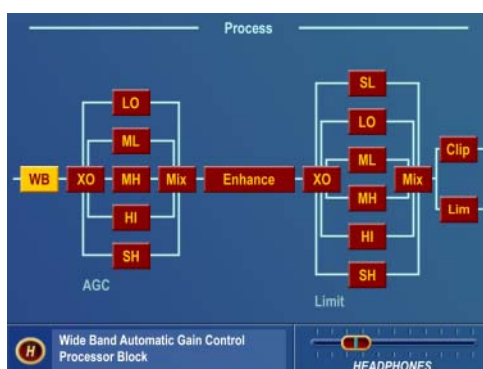
A comparison of the technical specifications between an Omnia-6 and a competing audio processor – for example, an Orban 8500 – will reveal many similarities along with some small differences. However, any competent broadcast audio processor – used in the role as intended by its designers – is going to sound just fine. The "state of the art" in audio processing has risen to quite a high level. Thus, similarly-priced and similarly-spec'd audio processors from Omnia, Orban, Voris, BW, and others will all be reasonably comparable and competent.

The differences among processors and between the top two processors become most apparent when they are competing in a given radio market against each other with similar music or voice formats. Any critical comparison must be set up such that all parameters other than the processors themselves are equal. Modulation metering must be "spot-on" in order to accurately weigh the merits of competing processors, for example. Other factors, such as source audio "cleanliness", avoidance of audio compression algorithms, and proper transmission bandwidth must also be similar if not identical during any comparison.

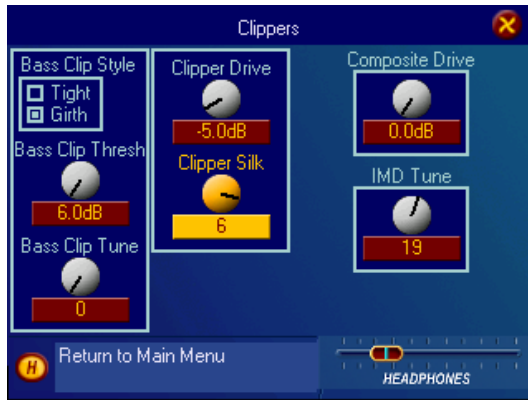
Given the information above, what, then, are the precise features and benefits of the Omnia-6 series of audio processors over others?

Following is a list of such features:

1. Time-alignment. Omnia audio processors are completely, 100% time-aligned. This means that all audio signals, no matter what frequency, have the exact same propagation time from Input to Output of the Omnia audio processor. This is a claim that other manufacturers cannot make, as they don't deem time-alignment to be important. Omnia processors sound more precise and less "smeary" due to this attention to time-alignment.
2. Pre-emphasis placement. All other FM audio processors employ FM pre-emphasis prior to their multi-band limiting. This placement of the pre-emphasis function results in a more convenient design for the manufacturer. However, it invariably results in the processor giving a "dense" and "packed-up" sound to the higher frequencies of the audio. Most engineers and listeners have come to accept this sound as the "FM" sound. However, this audio aberration is not a function of FM transmission, but a bad result of the design of traditional, multiband FM audio processors. Omnia takes a different approach. In all Omnia FM processors, the necessary FM pre-emphasis is engaged after the multi-band limiting. This technique requires difficult attention to both the limiting and clipping algorithms. However, the audible result is a cleaner, much more detailed high-end in the transmitted audio. This advantage of Omnia processing architecture is most easily noticed on musical instruments such as cymbals, castanets, trumpets, and other sounds with a lot of high-frequency energy. The careful listener will notice that these musical instruments sound "fake" through other audio processors, but they sound very real and natural through an Omnia audio processor.
3. Separate multiband AGC and multiband limiter stages. Most other audio processors take a shortcut in the execution of multiband AGC and limiting functions; they put both functions within the same audio processing "block". Omnia takes a more comprehensive approach. We designed the multiband AGC and multiband limiting blocks completely separate from each other. This allows us to give slightly different treatment as needed for the absolute cleanest and competitively loudest audio. For example, some bands of limiting are best served by feed-back servo control, while the higher bands are best served by feed-forward servo control. Our design, which breaks these multiband functions into individual processing blocks, allows for the absolute best treatment of each audio band.

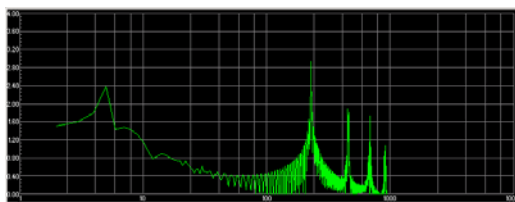


- Powerful and comprehensive FM clipper. In any FM audio processor the final audio clipper presents the largest hindrance or benefit to the loudness and clarity of the on-air sound for a given modulation level. The FM clipper section in the Omnia-6 series includes two distinct sections: a bass-management clipper and a main clipper. The bass clipper is quite sophisticated in its own right, but the main clipper offers two different clipping styles and the ability to “balance” between them, if desired. This flexibility gives the curious or competitive user the ability to finely tune this most important function.

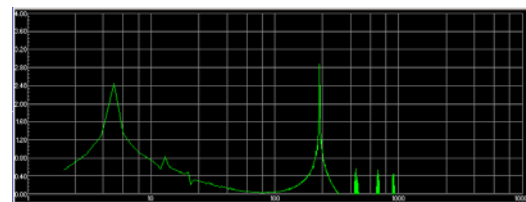


- LoIMD clipper. The Omnia-6EXi model includes a 10-second “diversity delay” function. This is used in iBiquity HD Radio installations to provide a more direct path to the analog FM transmitter and avoiding some complexity in the setup. A side benefit of having this adjustable (0 to 10 seconds) delay is an exclusive Omnia function, the “LoIMD” clipper. An introduction to this unique technology appears in a white paper on the Omnia Audio web site. Direct link is this...
http://www.telos-systems.com/techtalk/papers4_05/CompetProc.pdf

This white paper explains the benefits of Omnia’s LoIMD clipper in obtaining cleaner sound and increased loudness.



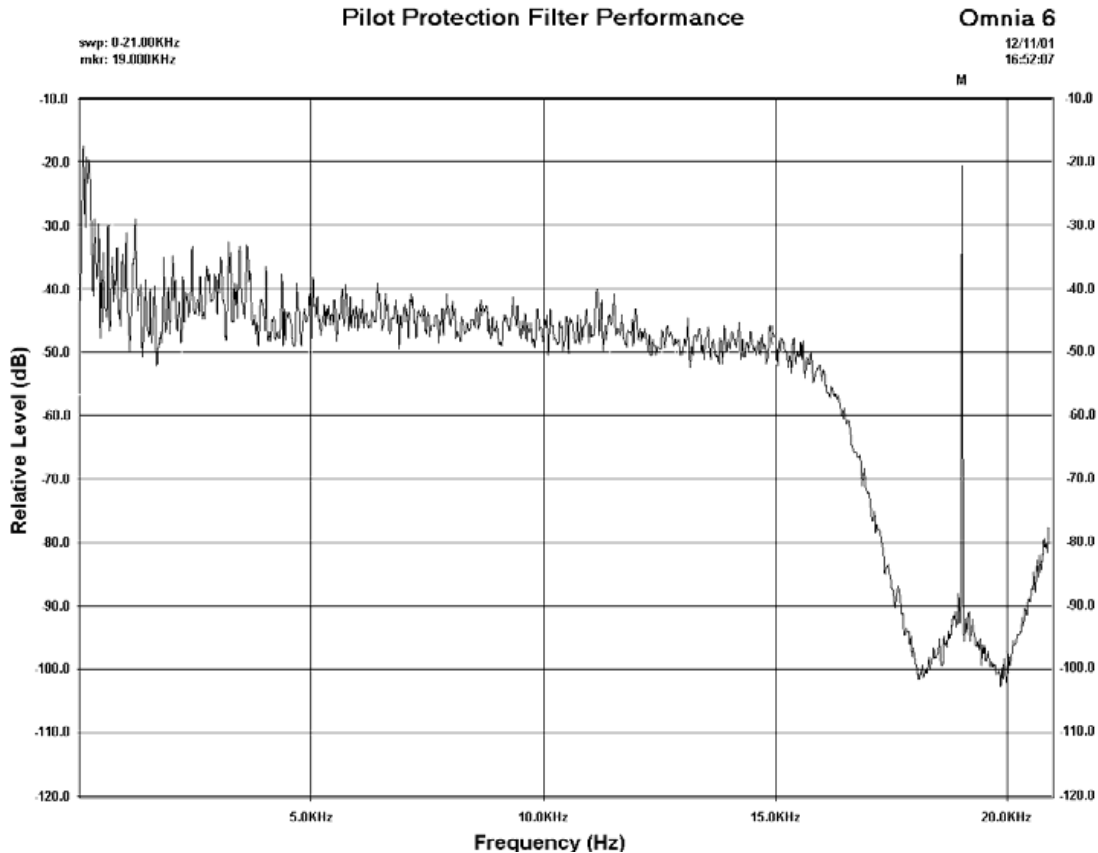
100Hz & 5kHz Fundamental: Elapsed Clipper Action



100Hz & 5kHz Fundamental: Reduced IMD Products

While using the diversity delay is not required to use the LoIMD clipper, this clipper is available only in the “i” version of the Omnia-6EX – the Omnia-6EXi.

6. FM Pilot protection performance. In the Omnia-6EX is a pilot notch filter to protect the pilot region from clipper artifacts. The wide, deep notch helps the stereo pilot region stay immaculately clean, reducing multipath, and keeping receiver's stereo decoders firmly locked to your signal. (Some radios "look" at the pilot region to determine when to activate their blend to mono and/or high frequency roll off functions.)



7. Comprehensive and sophisticated parallel processing for coded audio transmission, such as HD Radio, DAB, DRM and Internet streaming. Intelligent look-ahead limiting, bandwidth control, separate shelving and density adjustments afford perfect setup for coded audio applications. Omnia's unique processing architecture allowed the addition of this parallel processing with no extra cost to Omnia users.

There are many other features in the Omnia-6 series. Most are features that have been added in response to customer requests. A few of these are:

1. NTP time synchronization
2. Remote control, configuration, and administration via dial-up modem, serial connection, Ethernet/IP connection
3. Built-in scheduling of audio preset changes
4. BS-412 limiting function
5. Dynamic, intelligent stereo enhancement
6. Stereo width limiting for harsh multipath environments
7. External RDS injection
8. External triggers, programmable for almost any processor function
9. Dual color screens for instant visual feedback and confirmation of adjustments
10. Simply and intuitive jog wheel with click-select for fast adjustments
11. Wide variety of factory presets
12. Easily downloadable third-party presets
13. Three levels of password protection to allow certain functions available to select users
14. Comprehensive audio input conditioning including phase rotation, stereo channel selections and summing, and auto switching to alternate input (AES or Analog)
15. Intelligent wideband input AGC (can be bypassed) with exclusive "Makeup Gain" to gracefully handle large changes in program volume

The Omnia-6EX and Omnia-6EXi have been tested and selected by the world's top broadcasters. Many have offered testimonial statements, describing their experience with Omnia-6EX. Omnia has collected some of these testimonials and published them at <http://omniaaudio.com/news/testimonials.html>

On the following pages are the technical specifications and graphics concerning the Omnia-6EX series. Ultimately, the test of any audio processor is proper installation, careful adjustment, and a good listening test over several days. Broadcasters who take the time for such a test most often choose and trust Omnia audio processors to deliver the best sounding broadcast possible.

Omnia 6 Performance Specifications

As of June 2007 – Version 7.2.5 Software

Note: All measurements made with the supplied "FACT TEST2" preset, available in the Preset Menu.

System

Signal to Noise	The measured noise floor will depend upon the settings of the Input and Output Gain controls. The Omnia 6's noise floor is primarily governed by the dynamic range of the 24-bit Crystal Semiconductor CS5361 A/D Converter, which has a specified Dynamic Range of 110 dB. The dynamic range of the Omnia 6 digital signal processing chain is 144 dB. Typical SNR using the "FactTest2" preset is greater than -80dB referenced to 100% modulation.
Distortion	No greater than 0.01% THD 20 Hz -- 20 kHz bandwidth.

Conventional FM Specifications (FM Analog)

Frequency Response	Complies with the standard 50 or 75 microsecond pre-emphasis curve within ± 0.50 dB, 30 Hz to 15 kHz. The analog left/right outputs and AES/EBU Digital outputs can be configured for flat or pre-emphasized output.
Signal-to-Noise Ratio	> -80 dB de-emphasized, 20 Hz -- 15 kHz bandwidth, referenced to 100% modulation.
System Distortion	Less than 0.01% THD, 20 Hz – 7.5 kHz. Second harmonic distortion above 7.5 kHz is not audible in the FM system.
Stereo Separation	Greater than 65 dB, 20 Hz -- 15 kHz; 70 dB typical.
Crosstalk	> -70 dB, 20 Hz -- 15 kHz.

Composite Outputs

Configuration	Two electrically independent outputs. Software based level adjustment.
Source Impedance	10 ohms or 75 ohms, jumper-selectable. Single-ended and floating over chassis ground.
Load Impedance	50 ohms or greater load is suggested.

Output Level Ranges

Low Range	0.66 to 5.02 V P-P, High Range: 1.45 to 11.02 V P-P software selectable
Pilot Level	Adjustable from 6.0% to 12.0% in 0.1% steps
Pilot Stability	19 kHz, \pm 0.5 Hz
D/A Conversion	Burr Brown PCM1704, 24-bit sign-magnitude D/A converter
Signal-to-Noise Ratio	-85 dB typical, 75 μ S de-emphasized, 15 kHz bandwidth, referenced to 100% modulation)
Distortion	< 0.02% THD 20 Hz – 15 kHz bandwidth, 75 μ S de-emphasized, referenced to 100% modulation
Stereo Separation	> 65 dB, 30 Hz – 15 kHz
Linear Crosstalk	> -80 dB, main to sub or sub to main channel (referenced to 100% modulation)
Non-linear Crosstalk	> -80 dB, main to sub or sub to main channel(referenced to 100% modulation)
38 kHz Suppression	>70 dB (referenced to 100% modulation)
76 kHz Suppression	> 80 dB (referenced to 100% modulation)
Pilot Protection	> -65 dB relative to 9% pilot injection, \pm 1 kHz
57 kHz (RDS/RBDS) Protection	better than -50 dB
Connectors	Two EMI suppressed female BNC, floating over chassis ground
Maximum Load Capacitance	5nF (at 10 ohms source impedance). Maximum cable length: 100 feet/30 meters RG-58A/U

HD Radio Specifications (DAB)

Frequency Response	Within \pm 0.50 dB, 30 Hz to 20 kHz.
Distortion	Less than 0.01% THD 20 Hz – 20 kHz bandwidth
Signal-to-Noise Ratio	> -100 dB, 20 Hz -- 20 kHz bandwidth, referenced to 0dBfs
Stereo Separation	Greater than 95 dB, 20 Hz -- 20 kHz; 85 dB typical

Analog Audio Input

Configuration	Left / Right Discrete Stereo. Electronically balanced, floating and symmetrical.
Input impedance	10k ohms resistive, electronically balanced
Maximum Input Level	+24 dBu
12dBFS input meter	Nominal Input Level: A 13dBu input signal nets a – reading when the Input Gain Control is set to 0.0 dB. A 1dBu input signal nets a -12dBFS input meter reading when the Input Gain Control is set to +12 dB. (Note: When the Input Gain and Master Drive controls are set to 0.0 dB, a +13dBu input signal results in an input level of –12dBFS, and a Wideband AGC gain reduction of –15dB.
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.
Connectors	Two EMI-suppressed XLR female. Pin 1 chassis ground, and Pin 2 is “hot”

Analog Audio Output

Configuration	Left/Right Discrete Stereo. Electronically balanced.
Source Impedance	20 ohms, electronically balanced and floating.
Load Impedance	600 ohms or greater, balanced or unbalanced.
Output Level (100% peak modulation)	Adjustable from -6 dBu to +24 dBu peak, into 600 ohms or greater load, software-adjustable.
D/A Conversion	Crystal Semiconductor CS4391, 24 bit, 128x over-sampled.
Connectors	Two, EMI-suppressed XLR-male. Pin 1 chassis ground, Pin 2 “Hot”.
Digital Audio Input	Configuration: Stereo per AES/EBU standard, CS8420 Digital Audio Transceiver with 24 bit resolution, software selection of stereo, mono from left, mono from right or mono from sum. Automatically accepts and locks to input sample rates between 30 and 108 kHz.
Connector	XLR-female, EMI-suppressed. Pin 1 chassis ground, pins 2 and 3 transformer isolated, balanced, and floating – AES3 standard 110 ohm impedance.

Digital Audio Output

#1	Stereo per AES3 standard. Output can be configured in software for flat or pre-emphasized response at 50 or 75 microseconds.
Digital Sample Rates	Output sample rates software selectable for 32kHz, 44.1kHz, 48kHz, and 96 kHz.
Connector	XLR-male, EMI-suppressed. Pin 1 chassis ground, pins 2 and 3 transformer isolated, balanced, and floating. Standard AES3 specified 110 ohm source impedance.
Digital Output Level	-22.0 to 0.0 dBFS software adjustable.

Digital Audio Output

#2	Stereo per AES3 standard. Output can be configured in software for flat or pre-emphasized response at 50 or 75 microseconds.
Digital Sample Rates	Output sample rates hardware jumper selectable for 32kHz, 44.1kHz, 48kHz, or 96 kHz, or its rate slaved to AES #1.
Connector	XLR-male, EMI-suppressed. Pin 1 chassis ground, pins 2 and 3 transformer isolated, balanced, and floating. Standard AES3 specified 110 ohm source impedance.
Digital Output Level	-22.0 to 0.0 dBFS software adjustable.

Digital Sync Input

External Sync	Output sample rate can be synchronized to the signal present on the AES/EBU input, or to an AES3 signal applied to the Ext. Sync input connector. (does not accept Word Clock inputs)
External Sync Range	Accepts sample rates from 32kHz to 96 kHz. Used for synchronization of the Digital Output signal to an external reference. Automatically accepts sample rates between 32 and 96 kHz.
Connector	XLR-female, EMI-suppressed. Pin 1 chassis ground, Pin 2-3 transformer isolated, balanced, and floating. Standard AES3 specified balanced 110 ohm input impedance. Note: If AES Output #2 is slaved to AES Output #1 (hardware jumper) and External Sync is selected for AES #1, then AES Output #2 becomes slaved to the sample rate of the Sync input for AES Output #1.

Remote Control

Configuration	Modem, Direct Serial, or 10/100BaseTX Ethernet.
Modem	Optional PCMCIA modem with pop-out X-jack connector or any Hayes command set compatible external modem.
Direct Serial	Standard RS-232, no hardware handshaking employed. Baud rates of 9,600, 19,200, and 57,600 supported.
TCP/IP Ethernet	Emulates a Telnet session on Port 23.
Connectors	RS-232 port, EMI-suppressed DB-25 female connector. Industry standard EMI suppressed RJ-45 connector for Ethernet.

Remote Interface

Configuration	Eight (8) inputs, RS-232 level-compatible. Software sensing of both 'go-high' and 'go-low' transitions. Inputs are protected to +/- 15 VDC.
Connector	EMI suppressed DE-9 male.
Control	User-programmable using built-in Trigger Script feature in Omnia 6 Remote Control software. Virtually any parameter of the Omnia 6 may be programmed to change through this interface feature.

Power Requirements

Voltage	100-250 VAC, 50/60/440 Hz., < 75VA
Connector	EMI suppressed IEC male. Detachable 3-wire power cords supplied for US and European use.

Internal Power Supply	Overvoltage and short circuit protected. Meets EN55022, EN55011 Level B Conducted Emissions. EN61000-4-2, -3, -4, -5, -6 level 3 immunity compliant. Full international safety approval. CE marked.
------------------------------	---

Environmental

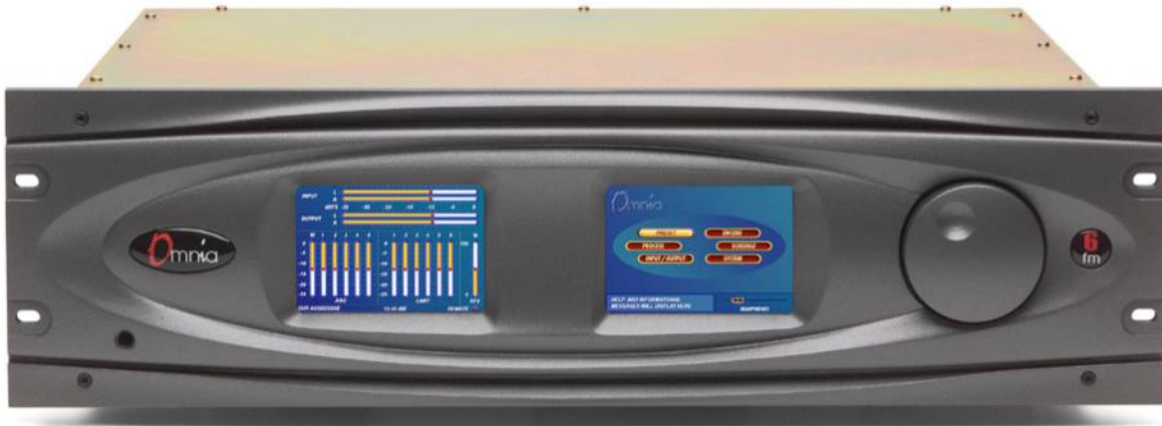
Operating Temperature 32 to 122 degrees F / 0 degrees to 50 degrees C for all operating voltage ranges.

Humidity 0-95% RH, non-condensing.

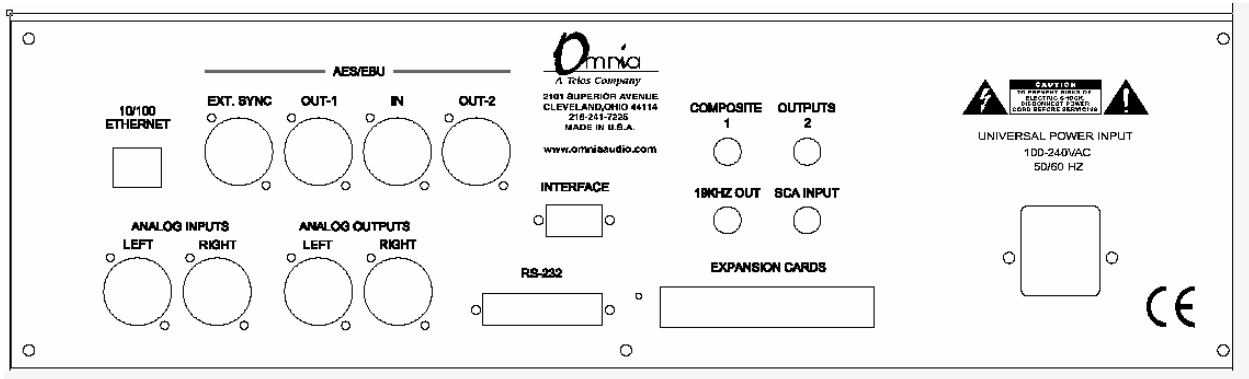
Dimensions 19" wide x 5.25" high x 16" deep (48.26cm wide x 13.335 cm high x 40.64 cm deep) including connectors. Unit requires three EIA rack spaces for proper mounting.

Shipping Weight 35 lbs. / 15.876 kg

Telos/Omnia Research and Development is constantly working to improve the quality of our products. Actual specifications are subject to change or improvement without notice.



Omnia-6EX series front panel



Omnia-6EX series rear panel