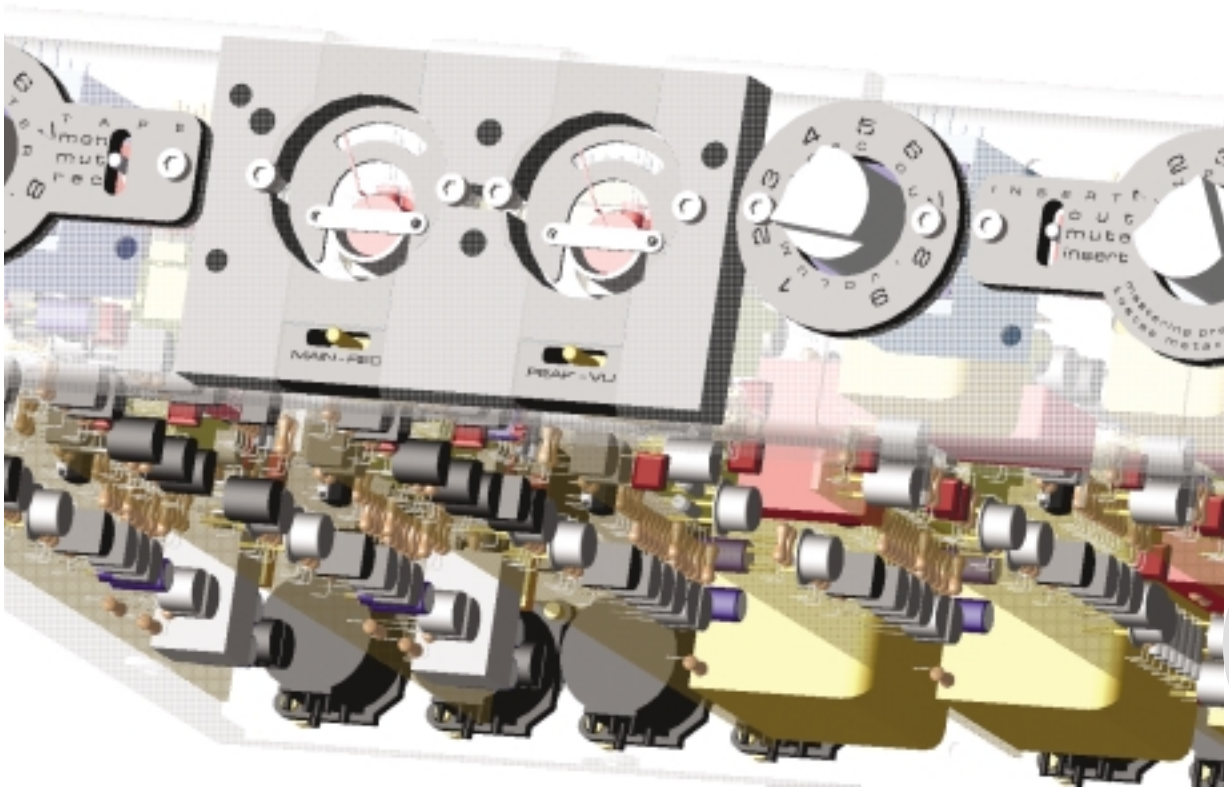
Opus 1



KOSTAS METAXAS DESIGN

Contents

Awards & Innovations

You are about to listen to an amplifier which has evolved from over 20 years of dedicated listening and the application of the state-of-the-art in every process of design and manufacture. I'm sure you'll enjoy listening to it as much as I do.

-Kostas Metaxas DESIGNER

2 X AUSTRALIAN EXPORT AWARD, BHP STEEL DESIGN AWARD,

runner up in AUSTRALIAN SMALL BUSINESS AWARDS

First - Amplifiers- No wire construction with

shortest possible signal path

First - 'Capacitorless' circuits in Audio design

First power amplifier can put full power into

8 ohm load at 1.0MegaHertz!

(refer to article in USA "AUDIO").

First - High Speed diodes in power supply

First - DAC to use lowest jitter 'APOGEE CLOCK'

First - FULL range and high efficiency electrostatic

First - Audio Manufacturer to use BMW-Porsche CAD-PCB

software design systems

01

3 Decades of Hi-End : 1980's

Opulence Preamplifier

Assembly

Engraving

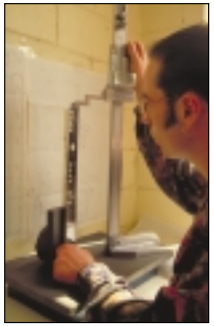
Ecstatic & Revelation Electrostatics

Kostas Metaxas circa 1985

Soliloquy Monoblocks

3 Decades of Hi-End : 1990's

Apollo Speaker



Stainless Steel Turret Punching

Empress Full-range electrostatics using plastic-composite moulded frame

Iraklis "on-test"

PCB design

EMPEROR Assembly

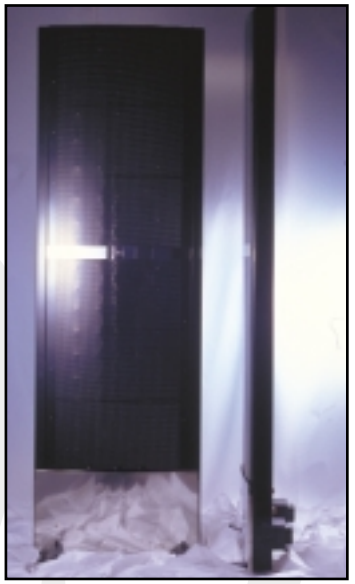
Reference System circa 1992

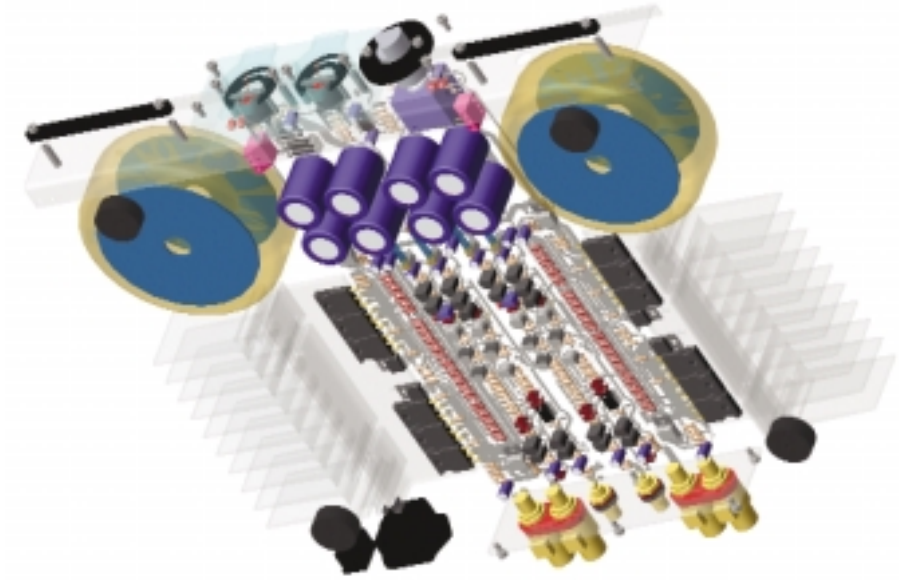
Assembly

Assembly

Opulence, Marquis & Charisma Preamplifiers

CZAR 2-way full range electrostatic

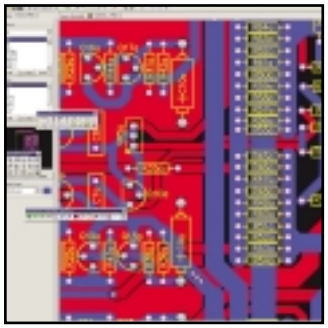




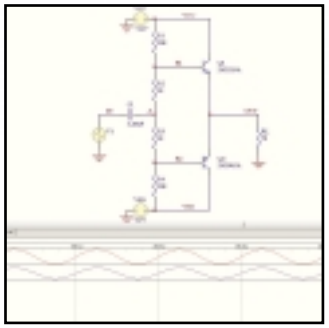
Using technology borrowed from Aerospace and Formula 1, the new Kostas Metaxas *Audio designs reflect the extraordinary advances that have been made recently in modelling and simulation software.*

For the first time, a High End Audio manufacturer offers audiophiles a rare glimpse into the conception, design and execution of a complete product on a component by component basis in 3D.

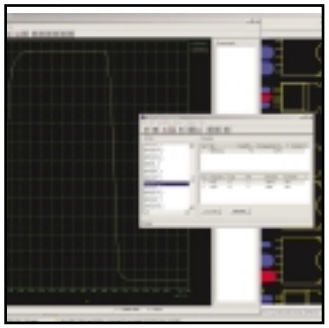
The Protel PCB software [www.protel.com] extends the quite normal listening tests on a component by component level to the PCB level. Schematic Based simulations can test [or verify] the PCB's signal integrity by running the "Signal Integrity Simulator" which displays a Reflection and Crosstalk Analysis. And the 3D visualization allows one to include the PCB as part of the overall wholistic design.



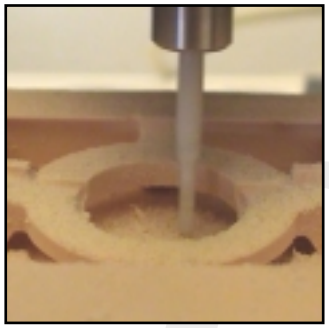
Schematic Capture & PCB design



Schematic "Spice" Circuit Simulation



PCB Track Risetime & Slew rate signal integrity testing.



In-house RAPID PROTOTYPING

Laser Engraving

Listening Philosophy

REFERENCE

The only way to design state-of-the-art audio equipment is to have first-hand experience with the finest available recording equipment AND playback equipment.

This is important for two reasons; it ensures that our designs work and 'mate-well' with other products and that their resolution is not limited by the weakest link in the playback 'chain'.

Kostas Metaxas *products have been conceived using extensive listening tests with a variety of state-of-the-art ancillary equipment for more than 25 years.*

Our amplifiers have been designed using a variety of state-of-the-art phono playback equipment and our ABSOLUTE REFERENCE - a custom-made battery-powered Stellavox SM-8 Tape Recorder using 1/4" tape at 30 ips and a Stellavox TD-9 using 1/2" tape at 30 ips specially calibrated for the Bruel & Kjaer 4003 1/4" omnidirectional electrostatic instrumentation microphones.

Design Philosophy

ULTRA-SHORT SIGNAL PATH : NO-WIRE DESIGN

A prominent audio designer once described an amplifier as "A straight piece of wire with gain". We take this further by featuring the ***shortest*** *possible signal path in a commercial amplifier.*

We do not use wire in any of our signal paths and every component is directly soldered to one large printed circuit board.

From input to output, the signal passes through no more than 150mm of P.C. track. The transformer is connected with only 40mm of wiring to the PC board. This is only possible with our unique construction which features the complete amplifier (including filtering capacitors) is assembled onto one single rectangular Printed Circuit Board where the four sides connect directly to the inputs and outputs, power transistors on their heat sinks and power transformer.

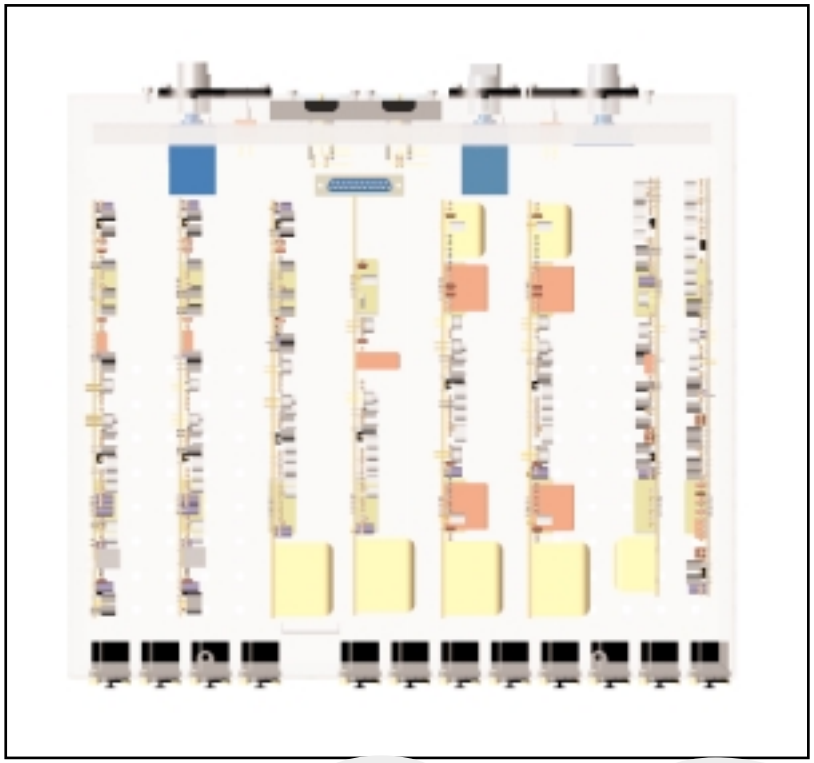
The audio signal passes through ONLY ONE TYPE OF WIRE which is the high speed, wave controlled oxygen free copper of our PC board.

HIGH SPEED POWER SUPPLIES

Every amplifier uses a large, high-current power transformer which feeds a 'high-current' bridge rectifier to convert the AC from the transformer into DC voltages which are then mains ripple filtered using massive, computer grade capacitors.

The rectifier bridge that is normally used is relatively large, handles high current and low voltage which slow switching speed because of its inherent high internal capacitance.

It has a response time measured in milliseconds which if converted to frequency would mean that it would have a frequency response from DC to around 100Hz .



Frequencies above 1 kHz would be unable to draw current from the power transformer directly and would need to rely on the charge stored in the power supply filtering capacitors.

We replace this slow DC rectifier with ultra high speed diodes wired in parallel with switching times in 'nanoseconds' which when converted to audio frequencies have a frequency response from DC-10 MegaHertz.

High and low frequency currents can be drawn from the power supply more effortlessly .

Design Philosophy

LOW NOISE, HIGH SPEED VOLTAGE REGULATOR DESIGN.

The most significant difference between VALVE and TRANSISTOR circuits is the amplifier/power supply interaction.

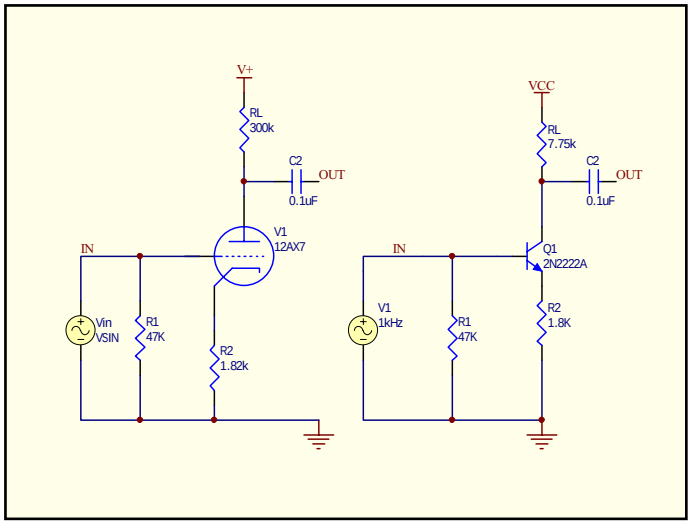
In VALVE amplifier, the high voltages (from 200-400 Volts DC) result in a 50,000 to 100,000 Ohms value for resistor R. The equivalent transistor amplifier using much lower voltages (from 12-30 Volts) would have a substantially lower value of R between 200 Ohms-100 Ohms. Therefore a normal power supply in a transistor amplifier is more likely to affect the transistor amplifier circuit compared to a Valve amplifier circuit.

If we assume that the regulator impedance at V+ is around 2 Ohms just for the purpose of this illustration, then let us study the amplitude of the 10 VOLT sine wave as it goes through R and returns back to the OUTPUT of the TRANSISTOR circuit and VALVE circuit.

In the VALVE circuit, when 10 VOLTS travels across the 50,000 Ohms R towards the power supply impedance of 2 Ohms , the 10V signal is attenuated 50,000/2 = 25,000 times. Therefore 10V/25,000 = 0.0004 Volts of 1,0kHz sine wave.

On its way back to the OUTPUT of the circuit it is attenuated by the impedance of the amplifier (say 100 Ohms): 0.0004 Volts/50,000/1,000 = 0.000008 Volts. Therefore, 0.000008 VOLTS of out of phase sine wave accompanies the 10 Volts sine wave as out-of-phase distortion in the VALVE CIRCUIT.

In a normal TRANSISTOR circuit, the 10 VOLTS going across the 200 Ohms resistor R would be attenuated only 10/200/2 = 0.1 VOLTS. On the way back to the output, the voltage is attenuated by: 0.1V/200/1000 = 0.05 VOLTS of out-of-phase sine wave added to the 10 VOLT output sine wave.



07

Design Philosophy

In a normal Transistor circuit, the 'phase distortion' is 0.5% as compared to 0.000008% for a normal VALVE circuit .

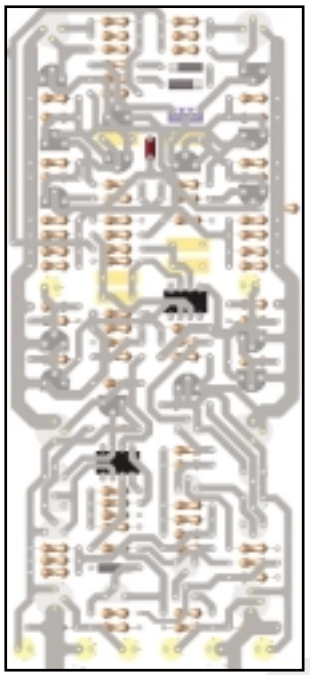
If we monitor the V+ point of the transistor circuit using an oscilloscope, we would notice this 0.1 Volts, 1.0 kHz signal. If we were to increase the frequency to 10,000 Hz and up to 1.0 MegaHertz the speed of dynamic behaviour of the power supply becomes critical. Using a normal I.C. regulator would result in the signal at V+ actually increasing in amplitude as the frequency increases to that at 1.0 MegaHertz the 1.0 Volt sine wave is now over 1.0 Volt!

To fully understand this interaction between the amplifier an power supply, it is necessary to understand how a voltage regulated power supply works.

A voltage regulated power supply is essentially a D.C. amplifier (not unlike a normal power amplifier) which instead of having an audio signal at the input which is then amplified to become a larger audio signal at the output, has a fixed D.C. voltage reference at the input which is then amplified and becomes a larger DC voltage of at the output. The output impedance of the regulator, not unlike the output impedance (or "Damping Factor') of a power amplifier is less than one ohm at D.C.

If we use a 2.0 Volt zener diode as our fixed DC voltage reference at the input of the D.C. amplifier which has a gain of 10, the resulting output voltage is 20 Volts D.C.

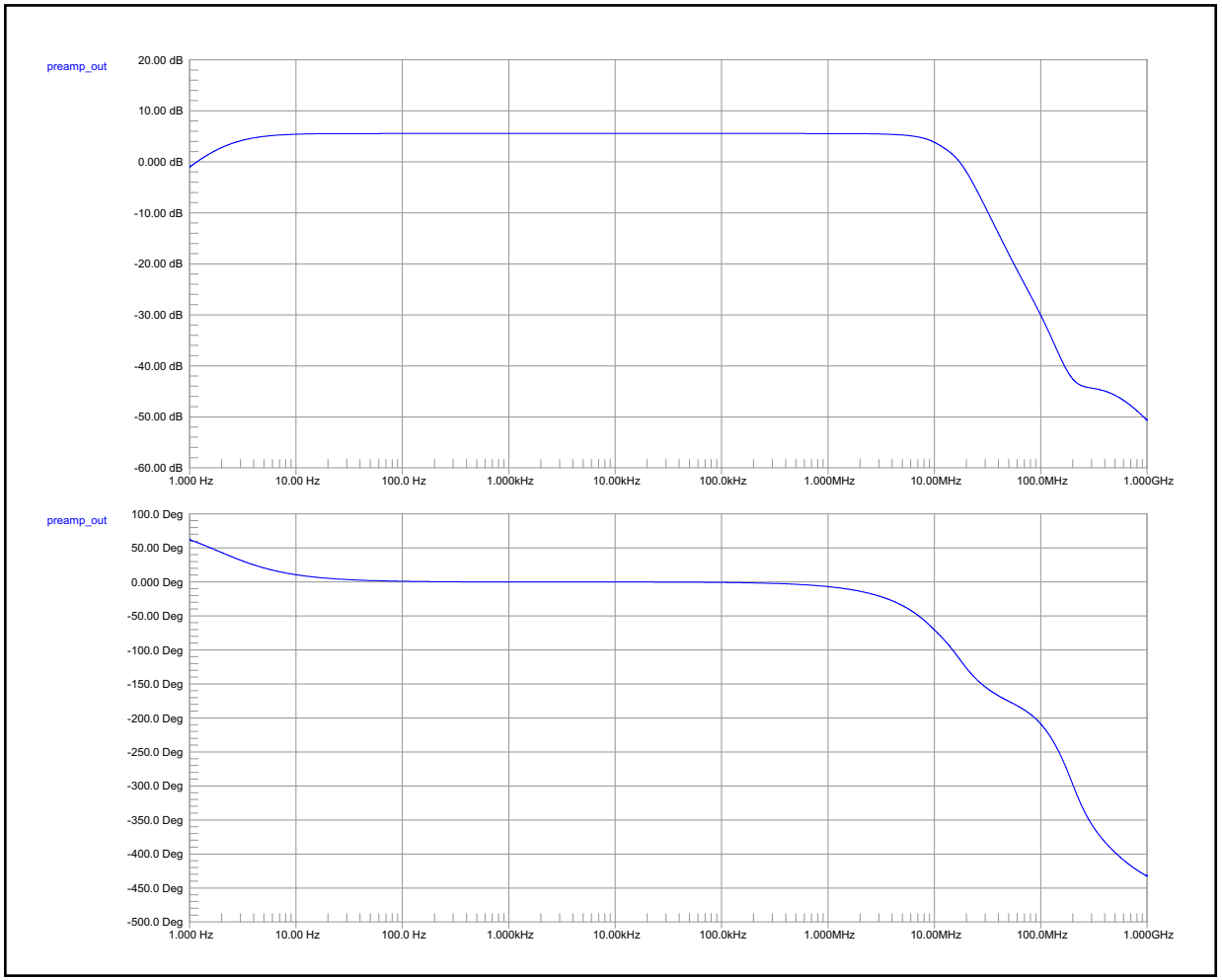
The negative feedback loop of the amplifier which fixes the gain of 10 times the 2.0 Volt zener reference is very important because it maintains the output voltage irrespective; of an increase or decrease in the power supply voltage to the amplifier as long as there is a minimum voltage for the regulator circuit to operate (for a 12 Volt regulator, the minimum voltage is 15 Volts).



Our "wholistic" approach to Line Stage/Regulator design

Design Philosophy

Frequency and Phase response to 1.0 GIGAHetrz



This is the STATIC performance of a voltage regulator which although important, does not affect the overall sound of the amplifier as much as the regulator's DYNAMIC performance which is influenced by the speed and 'open loop gain' of the regulator.

To understand why the Dynamic performance of a voltage regulator is so important, we need to go back to our basic amplifier circuit and investigate what happens to the 1.0 Hz, 10 Volt output signal as it goes across resistor R and encounters our voltage regulator.

To ensure an absolutely stable D.C. at V+ the residual of the 10 Volt sine wave at the OUTPUT is fed through the negative feedback loop of the regulator to force the amplifier to correct this error by applying an inverted signal identical to the residual sine wave to totally eliminate the residual sine wave at V+. A high speed regulator would therefore treat a signal 1.0 Mega Hertz in the same manner as a signal at 1.0kHz. The ultimate voltage regulator would effectively have a theoretical output impedance (or 'Damping Factor') at V+ of zero ohms at all frequencies as a result of its wide bandwidth before the addition of negative feedback.

In this way, the attenuation of the 10 Volts across the resistor R residual would be complete, and no attenuated component of the 10 VOLT sine wave could be deflected and return to the OUTPUT of the circuit and cause severe phase anomalies by adding to the new signal p;resented at the output - remember that it would take a few nanoseconds for the signal to go through the resistor and come back.

This extraneous out-of-phase information if allowed to adds to the new OUTPUT signal, would then destroys TIME/PHASE characteristics of the amplifier circuit.

In real world power supply circuits, the impedance of the power supply actually increases with frequency because the open loop gain rolls off at high frequencies .

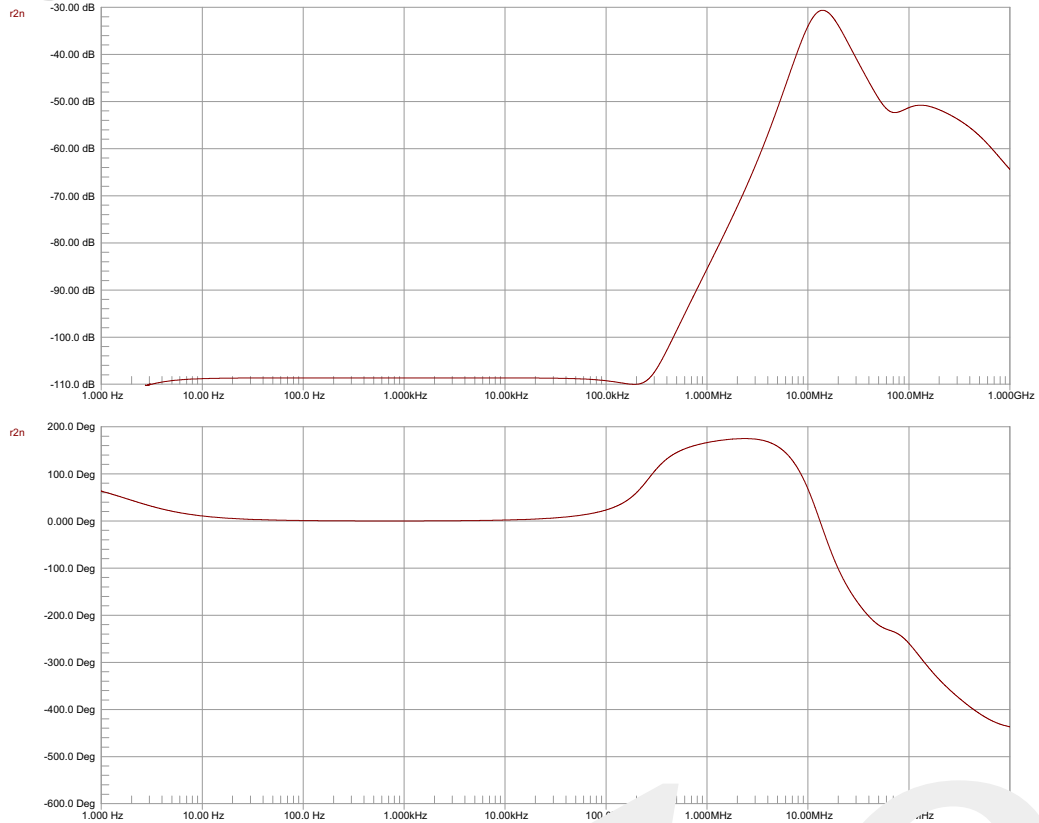
Design Philosophy

If we go back to our basic circuit and analysed the performance of an I.C. positive voltage regulator (say a LM78LXX from NATIONAL SEMICONDUCTORS) it would have an output impedance at the pin of its output lead of around 0.2 Ohms from DC to 10kHz, and then an increase to 0.4 Ohms at 20kHz, then 4.0 Ohms at 1 MEGAHERTZ which clearly illustrates the open loop frequency response has a turnover point around 10 kHz. When you add the normal distance between the regulator output and amplifier circuits which may be as little as 60mm to as much as 200mm in many circuits, the overall impedance in creases 5 to 10 times. Also, to stabilise the operation of this I.C. regulator, it is essential to use an output capacitor for stability.

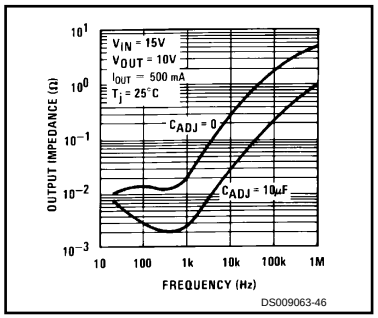
Clearly, this is not good enough for high performance, high speed transistor circuits. For this reason, we have approached the design of our regulators as PART of our amplifier circuits, rather than make the fastest amplifier circuit and add a slow I.C. voltage regulator with an output capacitor and call it a finished design. Our discrete voltage regulators are designed to have the absolute lowest noise, reject mains ripple, but more importantly to have a speed (1000 V/microsecond) which is a result of their wide bandwidth design (an open loop frequency response greater than 500kHz) and output impedance which is an order of magnitude better than any I.C. The regulator stability is achieved without ANY capacitors by varying the ratio between the local and overall feedback of each device.

We position the regulators within inches of the active circuits (in the case of the OPULENCE, the regulator is 3mm! from the active circuits) and the regulator impedance is flat from DC to beyond 5 MegaHertz at less than 0.05 Ohms.

Beyond this electrical design aspect, we listen to the sound of our regulators whilst developing each amplifier circuit to ensure that every component change or substitution produces an audible improvement from the selection of transistors to best biasing currents , choice of voltage references zeners and degree of local feedback.



Compare our discrete "capacitorless" regulator design [above] to the IC Regulator used in many designs today [below]



Steps for Connection

1. Ensure that the mainframe and power supply are connected before connecting the amplifier into your system and powering it up.

Note: For the best results, it is recommended that the unit is powered on for at least 15 minutes before critical listening is attempted.

DC Protection Circuits [except for Balanced Out Version]

The output stage of the preamplifier is connected to a DC protection circuit which activates a relay if it senses any DC.

Mains Fuse

A 2AMP SLOW BLOW DA205 Type fuse is located on the AC MAINS SOCKET. If this blows, simply replace with the same rating fuse. If the fuse continues to blow,

Serviceability

The complete active circuitry of the amplifier including primary filtering capacitors are all mounted to the large single ground P.C.B. Easy access to the board is maintained by simply removing the base to gain access to the 'component side' for servicing.

What the critics say...

"The METAXAS OPULENCE stretches our acoustic expectations.
At present, it defines the standard as to how far we can travel into the music ...
and it does so with style ..."

Martin de Wulf, BOUND FOR SOUND, USA

" So neutral though, is the Metaxas Opulence/Soliloquy set up that I could have used just about any sources I liked once the interconnecting cables were sorted. All I'd be hearing were the individual characteristics of the source components. However neutral or 'naked' the sound, the MAS doesn't come off as 'transistory' or clinical ... it had a feather-light touch and a way with tiny details that suggest either a pedigreed 60W or 70W per channel tube amp of recent vintage ..."

Ken Kessler, HI FI NEWS& RECORD REVIEW, England.

What the critics say...

" It would make a perfect tool to assess equipment by. If any component is not in the top league, the amps will betray the culprit with surprising honesty. Its other great strength is the speed of delivery. It can keep up with the fastes of guitar runs and tambla rolls with a speed normally associated with single-ended valve amplifiers".

Alan Sircom, HI FI CHOICE, England.

"From this moment on, "the miracle" from Metaxas brought out high frequency information with such clarity which was never before heard".

Rating: Absolute Spitzenclasse, REFERENCE.

STEREOPLAY MAGAZINE, Germany.

Specifications

The OPUS 1 is the result of an intense 25 years research to perfect the most transparent, reference calibre "mastering" preamplifier to complement the finest audio & professional mastering systems in the world.

Being involved in the creation of audio purist recordings, audio production for Broadcast Television and domestic "Hi-End" audio, designer Kostas Metaxas has produced a future-proof preamplifier which offers the simplest, purest signal path and can be "customised" to suit the most demanding applications.

All switches, attenuators and sockets/plugs are of the highest quality possible, and the "plug-in modules' allow almost infinite possibilities for the serious broadcast audio engineer, mastering engineer, studio recording engineer or serious audiophile.

Construction is reminiscent of purist designs conceived in the 60's with emphasis on hand-construction using the finest materials.

F U T U R E - P R O O F F O R M A T

The Opulence Mastering Preamplifier is the world's first hi-end audio AND mastering preamplifier which can be "customised" to suit exactly the requirements of his/her owner.
In its basic format it comes with the "Mainframe" & "Power Supply" which can be mechanically connected by a pair of Black Methacrylate side panels.
The "Mainframe" features all the switching and attenuator pots with internal sockets to accept the following modules:

1. Master Out Line Stage Module Plug-ins
Gain 20-40db internal microswitch switchable in 1db increments, Balanced or Single-ended output.

2. Record Out Line Stage Module Plug-ins
Gain 20-40db internal microswitch switchable in 1db increments, Balanced or Single-ended output.

3. Phono RIAA Stage Module Plug-ins
Balanced or Single-Ended input with Gain 50-80db internally microswitch switchable, input capacitance/resistance microswitch switchable.

4. Microphone Preamplifier Module Plug-ins
Balanced or Single-Ended input with Gain 40-70db internally microswitch switchable.

5. Professional VU meter drive circuits Plug-in
Circuit with Average or Peak reading VU referenced to "your" specification - dBm or dBV.

I N P U T S / O U T P U T S

5 X RCA LINE LEVEL INPUTS - 1 with active plug in [PHONO MODULE, MICROPHONE PREAMP MODULE]
2 X XLR INPUTS [in parallel with 2 X RCA inputs - 1 with ACTIVE MODULE in signal path - as above]
1 X XLR "INSERT" - allows the insertion of a professional EQ, Compressor/Limiter or insertion of our external INSERT BOX which allows up to 6 units to be inserted into the signal path.
2 X RECORD OUT - 1 with attenuator control and plug-in module in signal path [XLR output], and the other a bufferred single-ended RCA output for back-up DAT or tape machine.
1 X RECORD MONITOR INPUT
1 X MASTER OUTPUT - 1 with attenuator control and plug-in module in signal path [XLR output], and the other a single-ended RCA output [can be used for "active" speaker systems or subwoofers].

Specifications

FREQUENCY RESPONSE : DC - 10MHz (-3dB)

VOLTAGE OUTPUT : 15VRMS per channel into 50 Ohms with no more than 0.05% T.H.D.

SLEW RATE : Greater than 1000V/us small and large signal

T.H.D. : Less than 0.005% 20Hz-20KHz

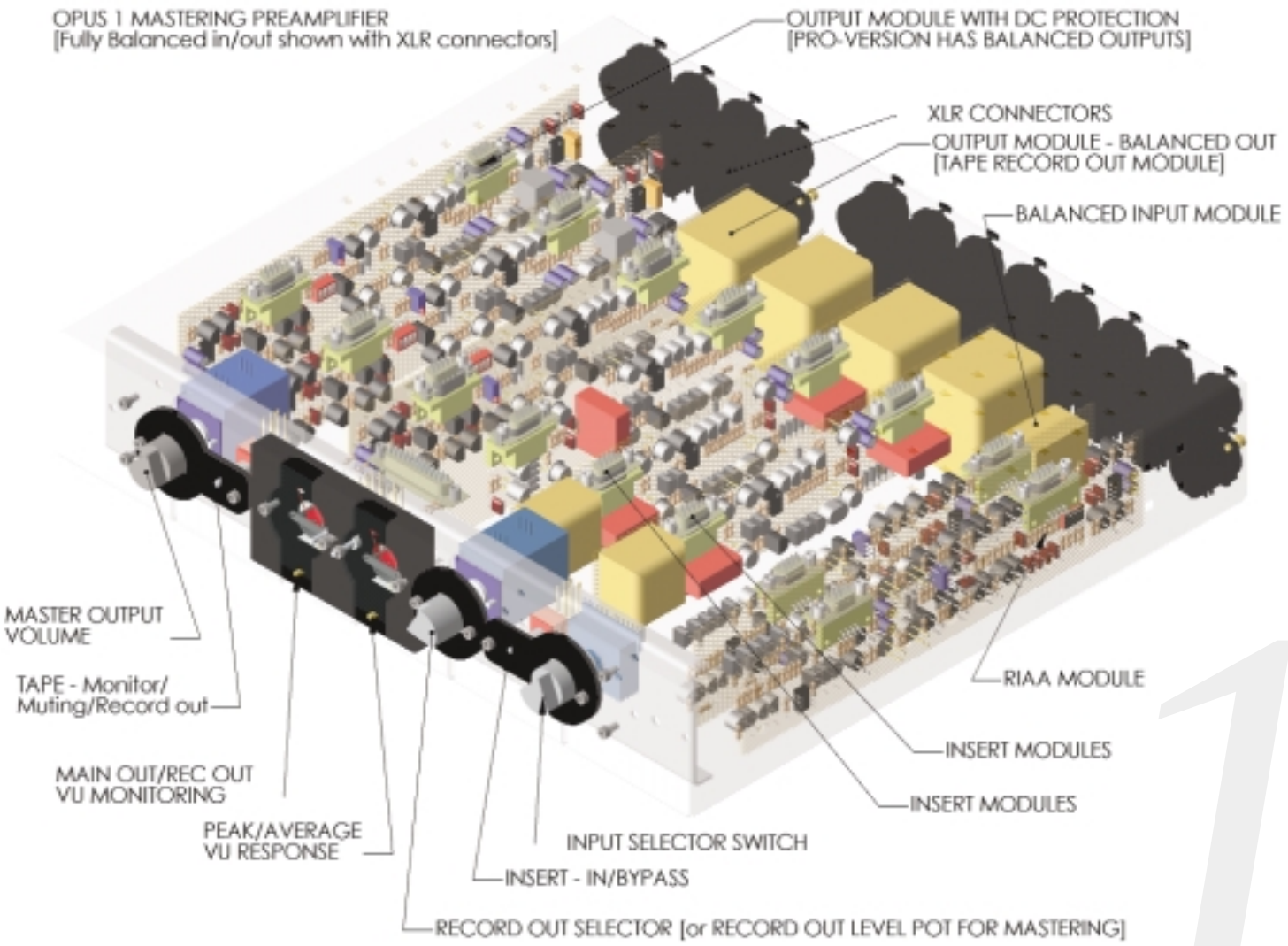
I.M.D.(S.M.P.T.E.) : Less than 0.005%

SIGNAL/NOISE : -117DBV unweighed input shorted

SENSITIVITY : 26dB

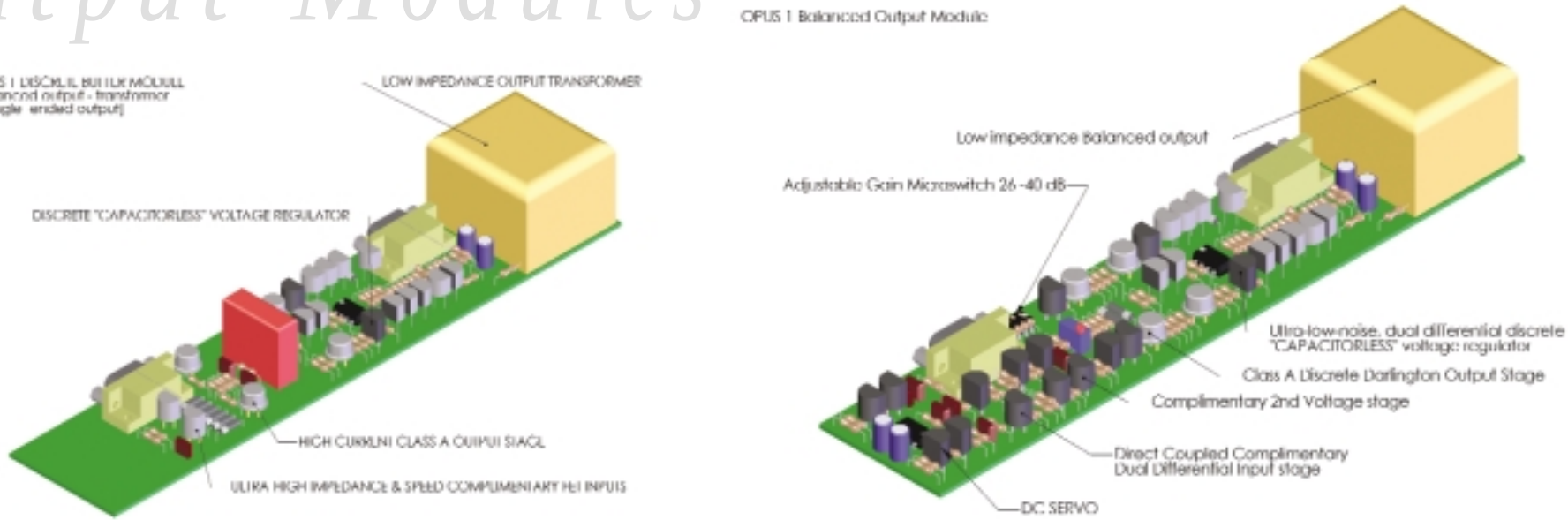
INPUT IMPEDANCE : 100kOhms in parallel with 11pF

Controls & Features

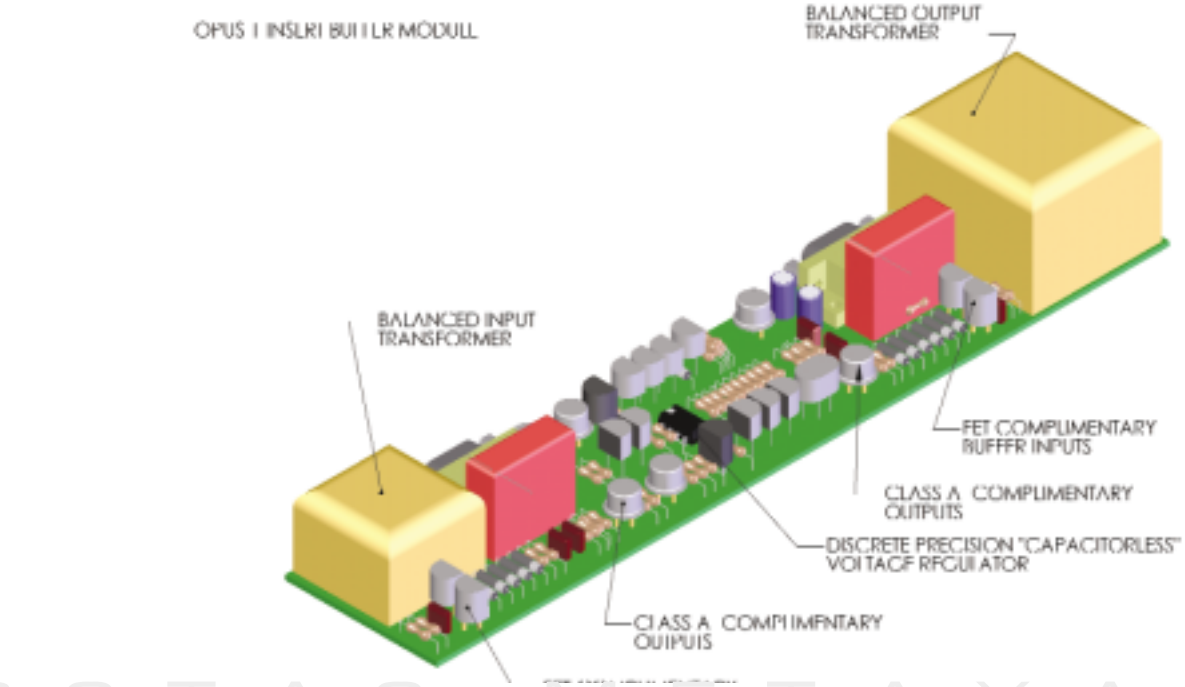


Output Modules

OPUS 1 Balanced Output Module

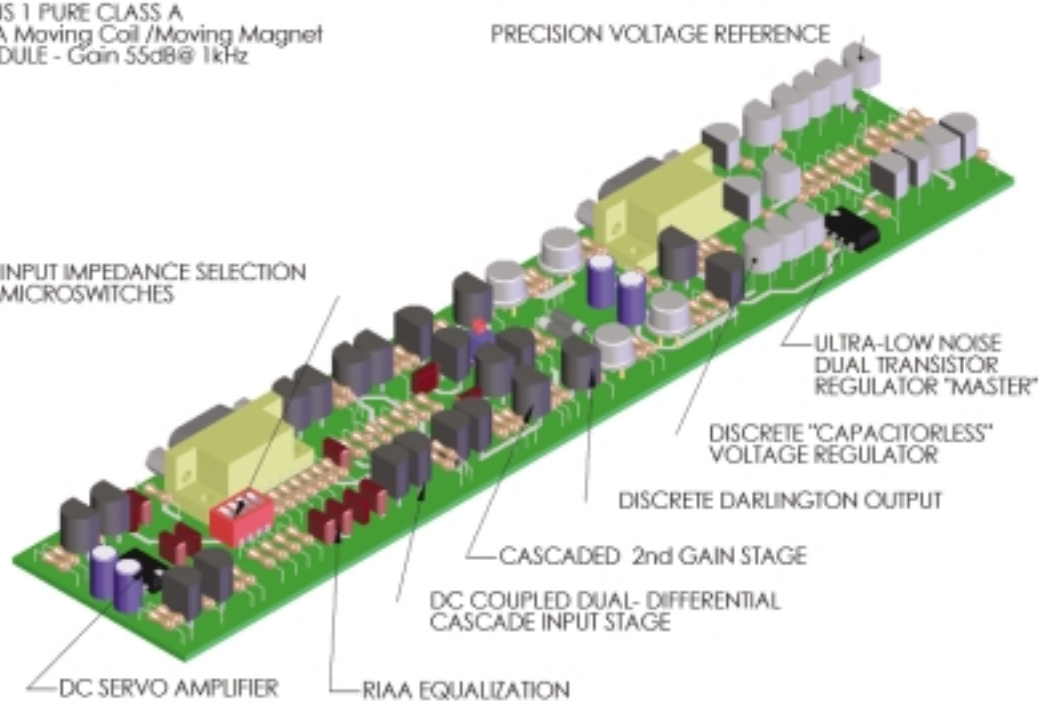


OPUS 1 INSERT BUFFER MODULE

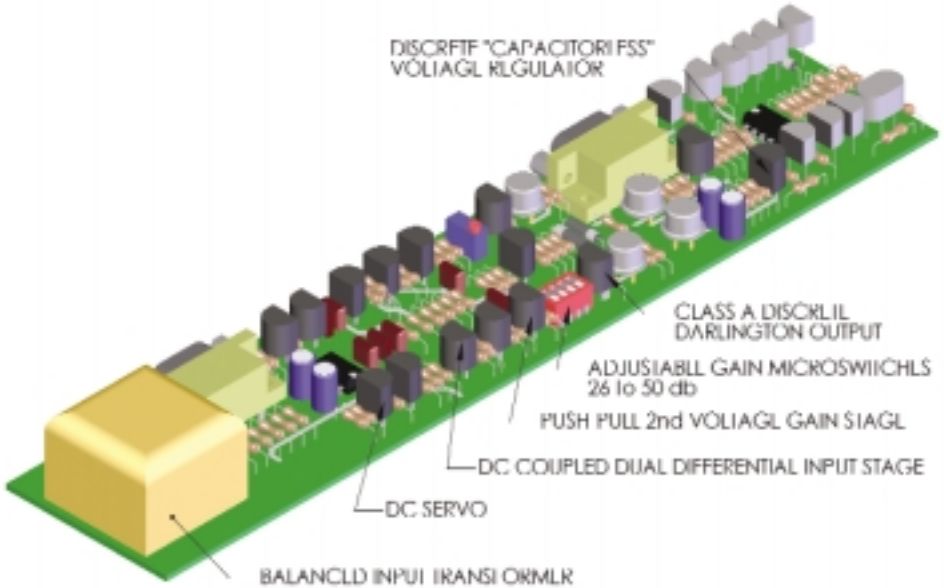


Input Modules

OPUS 1 PURE CLASS A
RIAA Moving Coil /Moving Magnet
MODULE - Gain 55dB@ 1kHz



OPUS 1 MICROPHONE PREAMPLIFIER MODULE
GAIN adjustable 26dB 50 dB



Schematic

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KOSTAS METAXAS DESIGN

EC Declaration of Conformity to Appropriate Standards

Safety

HD 195-S6

EN 60 065

EMC

Emissions Tested to EN 55013

Sound and television broadcast

receivers and associated equiment

Immunity Tested to EN55020

Electromagnetic immunity of

broadcast receivers and associated equipment

In accordance with

CISPR 16-1

Radio disturbance and immunity measuring apparatus

CISPR 16-2

Methods of measurement of

disturbances and immunity

IEC 801-2)

IEC 801-3 3V/m 20dB

IEC 801-4 1KV (AC lines)

Manufacturer

Metaxas Audio Systems
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Romsey 3434
Victoria AUSTRALIA
www.metaxas.com
metaxas@netspace.net.au
FAX:+613992 36481

Product

Kostas Metaxas Opus 1 Preamplifier

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