



**M O O N**

TECHNICAL WHITE PAPER

## MOON W-5 Dual-Mono Power Amplifier

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## Company Philosophy

Keeping an open mind and producing the best products at every price point is Simaudio's basic design philosophy. We strongly believe in the long term use of products and are against forced or premature obsolescence. Consequently, we will never manufacture a product under a certain level of performance, where the lower limit is determined by 1) the costs associated with high quality electronic components and 2) the R&D investment to achieve a long lasting durable design. As well, our manufacturing facility addresses numerous environmental concerns that include Recyclability, careful attention to packaging and the ROC cleaning process for aluminum and steel.

**Purchasing a component represents the beginning of what we see as a long term relationship between Simaudio and the customer.**

## Design Philosophy

Over two years of extensive research and development into amplification design produced "**Renaissance**" technology; Essentially a no overall feedback design which uses a very precise differential circuit that employs only 1 step of local feedback (found in the output stage to maintain low THD). The result is **virtually non-existent intermodulation distortion** (which is more damaging than harmonic distortion) and **an extremely fast amplifier with no phase errors resulting from feedback**. More importantly, with this circuit topology, the speaker cannot send back its counter-reaction after a musical impulsion which normally leads to a reduction in clarity of the music, a lack of tonal accuracy and the feeling of the live performance being lost.

"**Renaissance**" technology reached the consumer market in 1993 through Simaudio's Celeste product line. In 1996 we introduced "**Advanced Renaissance**" technology which resolved, what we felt was, a minor flaw in the original design; The end result of this advancement being more extension, articulation and dynamics in the lower frequency octaves. "**Advanced Renaissance**" technology is employed in the MOON W-5 Power Amplifier.

**"Advanced Renaissance" technology is why Simaudio MOON W-5 amplifiers sounds uncoloured, natural and so true-to-life.**

## Significant Power Amplifier Characteristics

- Larger than average power supplies.
- Stable to any known speaker impedance.
- Class AB output, Class A to 5 watts for greater efficiency.
- No overall feedback resulting in:
  - a) Real-time amplification
  - b) More accurate music with respect to tonality
  - c) Greater musical fidelity
- A high damping factor to achieve:
  - a) Superior musical dynamics
  - b) Improved signal speed
  - c) Refined timbre accuracy
- Low power consumption; The Simaudio Moon W-5 dual-mono amplifier is designed to be powered up at all times for optimal performance.

## General Description and Specifications

Type.....	Solid State
Configuration.....	Dual Mono
Transformers .....	2 x 1kVA
Power Supply Capacitance .....	216,000 $\mu$ F
Class of operation.....	A/AB
Single-Ended Input .....	RCA - 2 pairs (normal & phase inverted)
Balanced Input .....	XLR - 1 pair
Input Device Types .....	J-FETs
Input Impedance.....	47,500 ohms
Input Sensitivity.....	1050mV
Output Device Types.....	Bipolars - 10 per channel
Output Binding Posts.....	WBT
Output Power @ 8 ohms.....	190 watts
Output Power @ 4 ohms .....	380 watts @ 4 ohms
Output Power @ 2 ohms .....	750 watts @ 2 ohms
Output Power – Bridged Mono .....	750 watts
Frequency Response.....	10Hz – 200kHz (+0/-3dB)
Output Impedance.....	0.01 ohms
Damping Factor (static).....	800
Gain.....	33 dB
Signal-to-Noise Ratio .....	100dB @ full power
Max. output Volts.....	40 Volts
Slew Rate.....	40V/ $\mu$ s
Maximum current - Peak .....	55 amperes
Maximum current - Continuous .....	20 amperes
Crosstalk @ 1kHz .....	-100 dB
IMD.....	Unmeasurable
THD (20Hz – 20kHz @ 1 watt).....	< 0.02 %
THD (20Hz – 20kHz @ 190 watts).....	< 0.05 %
Power consumption @ idle.....	48 watts
Shipping Weight.....	71 lbs. / 32 kgs.
Dimensions (w x h x d) .....	19" x 7.5" x 19 inches / 49 x 19 x 49 cm.

## Technical Design Features

Simaudio has developed a **custom proprietary toroidal transformer** design used in most of our Moon components. Sonic improvements are obtained as follows: This design has a lower magnetic, electrical and thermal loss, resulting in an improved power transfer. Consequently, **a lower regulation factor is achieved resulting in increased current speed and better dynamics.**

Chronologically, here are some of the significant highlights of the transformer manufacturing process which we call the *VPI (Vacuum Pressure Impregnation) Process*:

- The core is made from a very accurately processed steel imported from Japan.
- These cores are first placed into a vacuum chamber where -28 PSI is applied for 15 minutes, removing any air pockets trapped inside the core structure.
- Epoxy resin is then released from a holding tank into the vacuum chamber, filling any microscopic gaps that may exist in the cores.
- Pressure is then applied at +30 PSI for 15 minutes, causing the resin to return to its holding tank. Chamber pressure is then stabilized to a normal level.
- These treated cores are then baked at 300 degrees Fahrenheit for 8 hours.
- Core insulation is then applied for mechanical, temperature and electrical protection.
- All transformer wire is Class H type for the longest possible lifespan.

**These custom toroidal transformers function at a very low temperature (the same as their operating environment) due to their stress-free performance characteristics. The result is an electronic component with a much longer life expectancy.**

**Input stage devices are Siliconix J-FETs.** They are employed in the circuit based on their sonic merit. As well, they produce only second order harmonic distortion which the human ear interprets as a more natural occurrence, therefore eliminating what we call a 'hard' sound. These devices also produce a very natural harmonic structure for signal amplification.

**Output stage devices are Motorola Bipolars.** We prefer them over MOSFETs since they show a little more linearity through the audio spectrum. These devices are matched on the basis of their HFE characteristics to tolerances of 0.5% or better.

The W-5 power amplifier has three circuit boards; one for each channel and one for the power supply protection circuit. These **circuit boards are made of FR4 material** and have a thickness of 0.062 inches. The base has 2 ounces of pure copper. The plating on top of the base is 1.5 ounce pure copper. This affects the sound by yielding better timbre and rhythm of music.

**Extremely rigid chassis construction minimizes the effects that outside vibrations have on the amplifier's performance, thus reducing mechanical colorations to the music.** Ergonomics are taken into consideration via the 'bar handles' running the length of both sides of the amplifier. As well, mechanical grounding is addressed through the use of four height adjustable cylindrical cones which screw onto the amplifier's base. Not only do all the physical aspects of the chassis serve a purpose, they all come together to form an extremely attractive audio component.

Since the MOON W-5 Amplifier is a fully balanced design, XLR connectors are found on the rear panel. These are the highest quality available from Neutrik. As well, the option of single-ended connectivity is furnished through two pairs of gold-plated RCA connectors with teflon dielectric insulation. The reason for two RCA inputs per channel is the result of the balanced circuit topology - 1 set of left/right RCA's is phase correct and the other pair is reversed phase; When using a phase-inverted preamp this can make life a whole lot simpler. Speaker outputs are the heavy gold-plated WBT binding posts chosen for both their sonic merits and build quality.

#### **The highest quality electronic components are used throughout the W-5:**

- Vishay Dale metal film resistors with tolerances of 1% or better.
- Film Capacitors from Phillips, Ero, Wima and Thompson.
- Electrolytic Capacitors from Nichicon, United Chemi-con and Cornell Dubillier.
- Output section wiring is custom proprietary using silver plated OFC copper with teflon insulation.
- All other signal path wiring uses silver plated copper with teflon insulation.

#### **Other significant design factors include:**

- The use of 2% silver alloy multicore solder throughout the circuit for better accuracy and precision of the audio signal
- Short signal paths for better dielectric coloration factor
- Tight component match in all critical positions for better transparency
- Symmetrical circuit design for better focus and soundstage
- Low impedance capacitor networks for better transient response
- Teflon dielectric on specific wires for better dielectric coloration factor

## **Quality Control**

By this point, it must be quite obvious that Simaudio pays careful attention to quality control throughout the each stage of the entire manufacturing process; From the selection and inspection of individual electronic components through to final testing and packaging.

Once assembled, each MOON W-5 amplifier undergoes a rigorous test procedure. Some of the more significant aspects include:

- Protection circuit functionality
- Voltage level measurements
- Distortion, Bandwidth & Crosstalk testing
- Bias calibration
- Minimum 24 hour burn-in
- Precision tuning calibration including fine bias adjustments
- Listening tests

**Our commitment to the reliability and quality control invested into each and every MOON W-5 power amplifier is backed up by a ten year factory warranty.**

The Simaudio MOON W-5 is our 'statement' 2 channel amplifier. It's a zero overall feedback, balanced circuit using in-house designed proprietary transformers and some of the finest electronic components available. The result is an exceptional sounding amplifier capable of handling any speaker load. This is a product that is built to last while providing musical nirvana for many years, and furnished at an extremely competitive price .