



M O O N

TECHNICAL WHITE PAPER

MOON P-5 Dual-Mono Preamplifier

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November 2002
Revision: 6

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

The main goal of the P-5 engineering development team was to design a preamplifier that allowed the listener to feel the emotion of the music as was intended by the composer and the performing musicians. To achieve this, **Simaudio's design strategy concentrated on four critical areas of preamplifier design.**

First, we sought out a **lean design** by eliminating all potential sources of signal interference. The shortest possible signal path is the end result of this approach. Sonically, a faster transient response is achieved, thus bringing the listener that much closer to the music. **The P-5's signal path measures a total of 9 inches**, roughly half the length commonly found in many other quality preamplifiers.

Second, and directly related to the lean design, we wanted to **minimize signal path obstacles**. To accomplish this, we chose an open loop design with zero feedback. We found that virtually all carbon-based parts (resistors, pots, etc) adversely affect the signal, therefore we eliminated them. As well, we decided on a 'no capacitor' design since all caps that we encountered during product development, even the most expensive ones, had various negative effects on the audio signal such as the introduction of some colorations and a degree of inaccuracy. The one disadvantage to a capacitorless signal path is a very small audible pop when the unit is powered on or off. However, the advantages of this design overwhelm this minor inconvenience, especially since the P-5 is intended to be powered on at all times.

Third, was the **gain stage**. It had to meet the following three conditions: a) Produce no colorations b) Be more reliable than motorized potentiometers which are commonly found in many remote controlled high end preamplifiers and c) Operate in a 4 channel configuration for fully balanced differential operation. The end result was RBG, named after Richard Benoit, the engineer who developed this technology.

This gain circuit treats the input signal like a pipe from which a T connection controls the flow. Moving the signal to the right or the left will decrease or increase the volume by simply applying more or less impedance, in a shunt mode to ground, against the input signal via high quality resistors. These resistors are selected by a network of relays controlled by a micro-controller.

The RBG gain control used in the MOON P-5 preamplifier is based on second generation technology. Originally, RBG technology used variable impedance opto devices which were also controlled digitally by a micro-controller. The switch from opto devices to a relay network resulted from the difficulty encountered in precisely matching four channels in balanced operation. As well, this newer technology provides the accuracy associated with a stepping attenuator and allows for the gain stage to be placed anywhere in the signal path; We've located it at a point where no colorations are introduced to the signal, therefore the P-5 gain stage is completely neutral. Regardless of the chosen volume setting, the audio signal will pass through only one selected metal film resistor, not a series of them. Consequently, **absolutely no gain setting will, in any way, degrade the audio signal** - unlike most other preamplifier gain circuits.

Finally, we felt the need for an **outstanding power supply** was mandatory. Simaudio believes that small preamplifier signals require a better power supply than do amplifiers. Therefore, we selected very high quality components with low resonance characteristics to provide as much current stability as possible. The power supply is housed in its own chassis which was designed to quickly drain micro vibrations to the supporting surface. Also found in the P-5's power supply is our proprietary toroidal transformer design (see technical design features) which improves the precision and control of the musical signal.

All these technologies explain why the Simaudio MOON P-5 preamplifier sounds uncoloured, natural and so true-to-life.

By meeting these four aforementioned criteria the MOON P-5 preamplifier brings the listener that much closer to the music. Of course, there are other significant factors at work here which we will now discuss.

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, as opposed to third order, therefore eliminating what we call a 'hard' sound. These devices also produce a very natural harmonic structure for signal amplification.

Output stage devices are MOSFETs manufactured by International Rectifier. Preserving the same harmonic structure as the input J-FETs, the overall result is a very natural sound which can be described as non-aggressive due to the presence of even-ordered harmonics.

The P-5 preamplifier has three circuit boards; one for the power supply in the second chassis, one for all digital controls and one for the audio circuitry. 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 very low impedance tracing affects the sound by yielding better timbre and rhythm of music.

Extremely rigid chassis construction minimizes the effects that outside vibrations have on the preamplifier's performance, thus reducing mechanical colorations to the music. As well, mechanical grounding is addressed through the use of four height adjustable cylindrical cones which screw onto the preamplifier'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 P-5 Preamplifier is a **fully balanced design** with a capacity of six line-level inputs; 1 balanced input is provided for via a pair of XLR AES-EBU connectors. These are the highest quality available from Neutrik. As well, there are 5 single-ended inputs via pairs of gold-plated RCA connectors with teflon dielectric insulation. The A-4 single-ended input completely bypasses the gain stage, therefore allowing the input source component to be controlled by it's own volume setting, a home theatre processor for instance.

The highest quality electronic components are used throughout the P-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 matching in all critical positions for better transparency.
- Symmetrical circuit design for better focus and soundstage.
- Low impedance capacitor networks in the power supply section for better transient response.
- Teflon dielectric on specific wires for better dielectric coloration factor.

General Description and Specifications

Type.....	Solid State
Configuration	Dual Mono
Transformer	0.5kVA
Power Supply Capacitance.....	70,000 μ F
Working Class.....	Single-ended class A
Design	Open Loop / Fully Balanced Differential
Remote Control.....	Full function
Single-ended inputs (RCA)	5 pairs (1 bypasses gain stage)
Balanced Inputs (XLR).....	1 pair
Input Device Type.....	J-FETs
Input Impedance.....	47,500 ohms
Input Sensitivity.....	200mV – 4.0V RMS
Tape Output	1
Tape Monitor Loop.....	none
Output Device Types	MOSFETs
Balanced Outputs (XLR)	1 pair
Single-ended Output (RCA)	1 pair
Output Impedance - XLR	110 ohms
Output Impedance - RCA.....	220 ohms
Gain control.....	RBG ry (fully discrete)
Gain - XLR.....	12 dB
Gain - RCA.....	9 dB
Maximum output voltage - XLR	10 Volts
Maximum output voltage - RCA	5 Volts
Signal-to-noise Ratio.....	98 dB @ full output
Frequency Response	20Hz - 20kHz (+0/-1 dB)
Crosstalk @ 1kHz	- 65 dB
IMD	unmeasurable
THD (20Hz – 20kHz).....	0.05 %
Number of chassis	2 (matching)
Shipping Weight	40 lbs. / 18 kgs.
Dimensions (w x h x d)	17 x 4 x 15 in. / 43 x 10 x 38 cm. (each chassis)
Phono Section.....	Optional Moon PSP (3 rd chassis) which uses PS-5.

Remote Control

Full function includes increase and decrease in the gain, left/right channel balance, input selection, mute and power on/off. Only the ability to turn the front-panel digital display on and off isn't available on the remote control. As well, this remote control is compatible with other Simaudio products such as the Moon Eclipse CD player.

Quality Control

By this point, it must be quite obvious that Simaudio pays careful attention to quality control throughout 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 P-5 preamplifier undergoes a rigorous test procedure. Some of the more significant aspects include:

- Protection circuit functionality
- Voltage level measurements
- Distortion testing
- Bandwidth testing
- Crosstalk testing
- Noise testing
- Tracking testing
- Balanced symmetrical test
- Functionality test
- Bias calibration
- Minimum 24 hour burn-in
- Precision tuning calibration.
- Listening tests

Our commitment to the reliability and quality control invested into each and every MOON P-5 preamplifier is backed up by a transferable 10 year factory warranty.

Conclusion

The Simaudio MOON P-5 is our 'statement' preamplifier. It operates in an open-loop pure class A mode, using a fully balanced differential circuit with proprietary technologies for both the power supply and the gain stage, as well as some of the finest electronic components available. The result is an exceptional sounding preamplifier that is built to last while providing musical nirvana for many years, and furnished at an extremely competitive price.