ROGER MAYER

OPERATING MANUAL

456 Microphone Pre-Amplifier



Features:

- Golden Era Analogue Microphone Pre-Amplifier Design
- 456HD® Analogue Tape Simulation
- Discrete Ultra Low Noise Class A Design
- Ultra Wide Bandwidth
- Transformer Fully Balanced Inputs and Outputs
- 22 way stepped Microphone Gain Control
- 22 way stepped Output Gain Control
- Line Input Switch with Output Gain Adjust
- 180º Phase Reversal Switch
- Accurate Wide Band VU with Calibration Adjustment
- 456HD® Output Level Adjustment
- Gold Plated XLR Connectors
- Triple Shielded 6 layer PC Card construction
- Ultra low noise 48V Phantom Supply
- 2-Channel version available upgradable to 4-Channel

Introduction:

Roger Mayer is proud to announce the latest evolution from a long series of award winning pre-amplifier designs. It began its development history in 1968 whilst I was working in Olympic Studios, London. The development continued with my move to New York and the formation of Roger Mayer Electronics Inc with designs of Recording Studio Desks, RM58 Limiters, RM 68 Noise Gates, Mastering Equalisers and Location Recorders all using evolutions of our design. These products were supplied to many top Studios in the USA and Europe. The transparency and detail from our wideband design configuration is considered by many to be the ultimate 3D sounding pre-amplifier and can be heard on many landmark recordings of all kinds of musical genres. The phase accuracy and lack of time smearing artefacts is unbeatable and we welcome audio comparison to other products. The innovative addition of being able to add the acclaimed 456HD® Analogue Tape Simulation provides a full analogue signal path from Microphone straight into the DAW. The result is a Golden Era Signal path for the digital world.



History:

The development of Microphone Pre-Amplifiers that were used in recording consoles before 1970 all used discrete configurations that in many ways were derived from the tube circuits previously used. In fact the introduction of silicon low noise transistors did not begin until around 1968. The germanium transistors previously used were not that quiet and had to be carefully selected to obtain good performance.

The semiconductor industry was changing very quickly back then and had been driven forwards to a large extent by the USA and the demands of the NASA Space Programs and the Apollo Program to “Land a Man on the Moon”. Integrated circuits had not yet been commercially released and any previous operational amplifiers relied on discrete and hybrid construction. The manufacture of ICs requires a very pure silicon wafer which as a secondary spin off made low noise discrete devices with both PNP and NPN types available for the first time. Footprint and line width reduced dramatically to enable all the circuit components to be shrunk and fitted on the ever decreasing die size used in making ICs. It soon became apparent that this small die size came with several important performance limitations with regards to stability, power dissipation and high frequency phase performance. Also the need for dual complimentary tracking power supply rails. The almost universal adoption of long tailed pair input stages in the IC also became popular with this new manufacturing technology and is very beneficial if you are using the ICs for instrumentation and scientific applications. This input stage configuration however does not produce the optimum audio performance for ultimate audio quality. ICs were much cheaper than the discrete equivalent circuit and were used in commercial consumer products with the marketing people using their skill to manipulate public perception of this new technology much in the same way as the word Digital is nowadays used to imply quality when in actual fact the resulting audio quality produced is inferior to the Analogue information it is derived from.

The top recording studios however in the early 1970’s mostly built their own custom recording consoles using discrete methods and can be thought of in the same way as F1 Racing Car Manufacturers who are interested in obtaining a technological advantage by developing and setting new performance standards. The recordings produced by those top world studios featured on so many famous legendary artist’s albums are considered today the Benchmark and Holy Grail of Recordings eg: Jimi Hendrix - Axis Bold as Love (Olympic Studios - London), Stevie Wonder: Innervisions, Music of My Mind (Electric Lady Studio, Record Plant - New York), Rolling Stones, Jumpin Jack Flash etc. (Olympic Studios - London).

The concept of the most accurate and direct possible path from microphone to the recorder was always followed in the quest for ultimate quality.

Using up to a 17 ICs in a chain found in some of today’s recording signal paths of course degrades the signal as all op-amps will never perform up to their theoretical performance and their errors all add up. This becomes ever apparent when making a comparison to a direct path approach design

Most modern designed products are marketed on price then features with performance reduced to what can be acceptable to the public. This is not the State of the Art and should never be considered as such. After all a mass produced car is never considered to be racing car.

The 456 Microphone Pre-Amplifier uses the expensive discrete approach to audio performance without any ICs in the Audio Path and sets the current State of the Art performance using today's highest quality parts and techniques all evolved from the ground breaking and pioneering techniques we developed back then.
The detail, phase and frequency response from our direct approach has to be heard and compared to other pre-amplifiers.

CHANNEL TECHNICAL INFORMATION:

The following details apply for every channel of the 456 and the 2 Channel model can easily be upgraded to the 4 Channel model. Each channel has its own multistage onboard power supply circuits providing the required voltages and also providing signal isolation from the other channels to minimise crosstalk. A single 48V World Power Supply Desktop Adaptor is supplied and is conforms to the latest ECO and Safety Regulations.

TRANSFORMER BALANCED INPUTS AND OUTPUTS

We manufacture in house our own custom transformers using Ferrite Cores with wide bandwidth material specification to ensure ultimate high frequency, phase response and hum rejection. There is no better way to connect a microphone into an amplifier than by using a high bandwidth quality transformer. Perfect isolation and safety can be obtained in the most demanding situations with no chance of destroying your microphone pre-amp by plugging a microphone in. Phantom Powering can be left on as traditionally always was done without damage to the microphones whether they are Ribbon, Dynamic or Condenser. Just make sure your microphone cables are correctly wired and of the highest quality. The modern myths about turning the phantom on and off have been discussed and dismissed and began with the introduction of electronically balanced input circuits with phantom power issues.
Electronically balancing an input with a multiple IC configuration is cheaper for sure but then you have introduced a convoluted signal path right before you start to amplify it. Also be aware that audio signals are not symmetrical about the zero axis and also differ with every 180° so electronic balancing will always introduce input errors.
So it makes sense to have a direct balanced transformer path to the pre-amplifier.

MICROPHONE INPUT TRANSFORMER: This has been especially designed to interface and accommodate high output condenser capsules as well as low output ribbon types. SPL levels of 150dB from an AKG 414 will not overload it.

PHANTOM POWERING: is from carefully matched pairs of 6K8 resistors with a tolerance typically. 0.02%. Each channel provides a 4-stage filter network producing 175dB of noise reduction. Virtual DC operation to the microphone is thus ensured.

LINE INPUT TRANSFORMER: The transformer is capable of accepting high levels in excess of +35dBu.

OUTPUT TRANSFORMER: This has an electronic specification that is perfectly matched to DAW input specifications. The headroom provided is at least 24dB above nominal operating conditions.

MICROPHONE PRE-AMP

This is a 2 stage design using both PNP and NPN low noise transistors in our proprietary configuration. The GAIN is controlled by a 22way stepped conductive plastic potentiometer so as not to cause any clicks or drop outs but also have recall ability.
The GAIN CONTROL is used in conjunction with OUTPUT CONTROL to quickly and easily set the required level. The total range of GAIN CONTROL with the 2 CONTROLS is 65dB.
180° Phase Reversal Switch: This is provided to flip the phase of the microphone when needed.

OUTPUT AMPLIFIER

This is also a 2 stage design as above. The LINE INPUT can be directly routed to this stage by activating the line select switch and is by default connected to the pre-amp stage.

OUTPUT CONTROL is also a 22way stepped conductive plastic potentiometer and has a range of about 14dB to offer fine gain adjustment to both operational modes of line or pre-amp with 10dB of overall gain available for the LINE INPUT.

VU METER: This is illuminated and driven from a high input impedance custom designed meter driver circuit. The meter gives very good ballistic response with all types of program material and is easy to use when recording.
High Accuracy of +/- 0.2dB 20Hz to 80Khz.

VU METER CALIBRATION: This can be adjusted with a screwdriver through a small hole in the front panel to activate a 22 Turn Preset Potentiometer. The sensitivity can then be set to your preferred operational set up standards. Factory default setting is 0VU = +4dBu

DUAL VU METER MODES: They can be accessed on the PC Card and set by moving a Jumper.
Mode 1: This is the factory default setting with the VU Meter monitoring the Pre-Amplifier Output before the 456HD® Tape Simulation so you can judge with the VU Meter how hard you are pushing the 456HD®.
Mode 2: This is the optional setting to monitor the output after the 456HD® Tape Simulation and will follow any output offset you set for the 456HD® when it is active.

456HD® TAPE SIMULATION ANALOGUE DYNAMICS PROCESS:

This can activated with the switch and LED Status provided.
Output Level Calibration: The maximum level of simulated tape saturation or dynamic analogue effect can easily be adjusted so that the peak level reached does not ever exceed 0dBFS and thus enter digital distortion. Front panel screwdriver access enables setting this 22 turn control for the various operating standards occurring with DAW software or outboard converters. The factory default setting is set at +6dB above 0 VU so that the peak levels reach about -3dBFS with the current Avid Pro-Tools default setting for 0VU. Please check your supplier's manuals for calibration info regarding your equipment.
Please read the page on the 456HD® process for more detailed information.

MICROPHONE RECORDING OPERATION:

So once the 456® Level has been adjusted for your system and you are monitoring in VU Mode 1 (Default), simply plug in your choice of Microphone set the OUTPUT CONTROL to 12 o'clock and adjust the GAIN control so that a reading around 0 VU is obtained. Further fine adjustments can be made with the OUTPUT CONTROL. You can then activate the 456HD® Process to hear the difference and then hear the changes as you increase the VU READING just like when recording with tape as the record level progressively saturates the tape.

LINE INPUT RECORDING OPERATION:

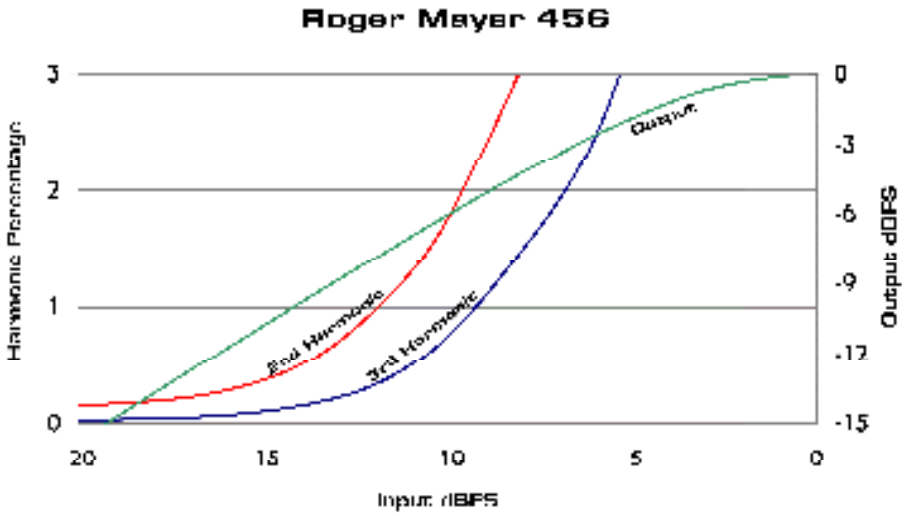
The Line Input function uses a separate transformer and XLR Connector and when the Line Switch is pressed in this input is selected and the OUTPUT control sets the level required. Up to 10dB of Gain is available and about 3dB of loss to enable ease of use. Direct access to the 456HD® can then be made for use in other recording or mixing scenarios.



456HD® ANALOGUE DYNAMICS PROCESS:

The 456HD® Analogue Dynamics Process is an innovative new way to experience modern dynamic and harmonic control in real time with zero latency. It was inspired by the desirable qualities of tape recording and can reproduce their dynamics and harmonic properties accurately plus improves the overall dynamic performance of Digital Recording. After 1 year of testing and development with some top producers from the UK and being featured on many records it has been recognised that this process is a game changer and not to be thought of as just another tape emulator. It brings a far more sophisticated approach to dynamic control and its performance exceeds that of any tape recorder previously produced now setting a new benchmark.

The ultra high speed analogue processing will effectively improve the dynamics both when using it as a pre-recording analogue processor before a conventional DAW and also in post playback from the DAW. Live recording or tracking using multiple instances of the 456HD® are very beneficial for Drum, Vocal and Instruments and in many instances obviate the need for further limiting to control input levels. What the 456HD® Process brings to the table cannot be duplicated by any digital plug-in because all of the difficult ultra high speed control of the source signal has been taken care of by using the 456HD® so the Digital Recording simply put sounds much better. So as they say give it a listen.



The 456 circuit used in the 456 Microphone pre-amplifier is exactly the same as in our other models but does not have the equaliser section so it is perfect for recording with the minimum of fuss during setup. The BYPASS function being very useful.

For full information please see our website and download the manual.
http:www.roger-mayer.co.uk/456manual.pdf

TECHNICAL SPECIFICATION

The audio signal path is completely Class A with a very high bandwidth. The -3dB point has been set to above 100Khz. The low end extends to below 10Hz.
Peaks are accurately high speed manipulated with ease and maintain the original phase position in the waveform. This fact can be observed using the latest high speed storage oscilloscope technology.

This is a completely discrete analogue design hand built using only selected low noise transistors, low noise metal film 1% resistors, plastic film capacitors from the World's top manufacturers all combined in a design to provide ultimate studio quality audio. Gold Plated Neutrik XLR connectors are used, LED Status Indication and Custom Conductive Plastic 22 way Stepped Potentiometers manufactured for best tracking accuracy.

A 6 layer multi layer PC Card provides full shielding for all circuit traces with the Ground and Power Planes all contributing to outstanding high frequency phase performance and stability. The enclosure manufactured from stainless steel completes the 3 faraday cage triple shielding design necessary in today's RF congested environment.

The 48V DC input power is further regulated and filtered onboard to provide *virtual battery* performance and the lowest possible noise under all conditions.

Microphone Input Sensitivity: -75dBV to -10dBV

Line Input Level: Nominal +4dBu Balanced

Line Input Impedance: 10K

Operating Output Level: Nominal +4dBu Balanced

Output Level Noise (LINE): -118dBu

Output Impedance: 100ohms Balanced

Output Load Impedance: 10K or greater

456HD® Dynamic Range: 96dB

Headroom: Maximum Line Input level +35dBm – Internal Headroom 25dB

Size: Standard 2U Rack Size – 483 x 90 x 250mm (19 x 3.5. x 10in).

Weight: 4.0Kg

Power Requirements: +48V DC regulated
Universal World AC / DC Switching Adaptor Supplied

www.roger-mayer.co.uk