

McIntosh Laboratory, Inc., Binghamton, NY 13903
Design Engineering Department

PRODUCT BRIEF

MC1201

POWER AMPLIFIER

Project 1146

- Thermal Protection
- DC Output Protection
- Regulated Illumination
- Turn On Delay
- ½ Inch Thick Glass Front Panel
- Modular Construction with Gold Plated Connectors
- Silent Convection Cooling

Features and Benefits

DOUBLE BALANCED PUSH PULL DESIGN

The MC1201 amplifier is fully balanced from input to speaker output. Two matched amplifiers operate in PUSH-PULL with their outputs combined in the "Output Autoformer". Each half of the amplifier contains complimentary balanced circuitry. The resulting double balanced configuration cancels virtually all distortion. This circuit is possible ONLY with the exclusive "McINTOSH OUTPUT AUTOFORMER".

REMOTE POWER CONTROL

High power amplifiers draw high current from the AC power line. Therefore, it is important that they plug directly into the wall outlet. Also, most owners desire that there be one power switch for the whole audio system. The M1201 is equipped with a circuit that provides remote POWER CONTROL from your McIntosh preamp or control center. A patch cord between 1/8" headphone jacks on the preamp and the MC1201 is all that's required. When you turn on your preamp a digital "1" (+5V) signal operates the power relay in the MC1201.

The MC1201 also has a remote POWER CONTROL OUT jack. The POWER CONTROL signal from this jack is delayed by a fraction of a second so that the turn on power surge of the next power amplifier occurs at a later time. This helps prevent power circuit overload that could pop circuit breakers or blow fuses, a very important feature in a high power Home System employing two MC1201s.

HIGH OUTPUT CURRENT

The MC1201 can provide greater than 200 amperes peak output current to drive uneven speaker loads. Some poor speaker designs have input impedance that dip to 1 or 2 ohms at various frequencies. The MC1201 has the output current reserve to drive them. It can deliver over 5KW output on tone bursts.

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Promotional Highlights

- Double Balanced Push Pull Design
- Remote Power Control
- Greater than 200 amps Output Current Capability
- Over 600 Joules of Energy Storage
- Huge Gold Plated Five Way Binding Post
- Huge Illuminated Peak Responding Output Wattmeter
- Watts Hold
- Ultra Low Distortion
- Wide Power Bandwidth
- Power Guard
- Output Autoformer

OVER 600 JOULES OF ENERGY STORAGE

The MC1201 has huge main filter capacitors that guarantee an excellent signal to noise ratio and the energy storage necessary for wide dynamic range.

GOLD PLATED FIVE WAY BINDING POST

McIntosh gold output terminals deliver full power output. You can connect large diameter wire directly to the post, use single "BANANA" plugs or large spade lugs.

ILLUMINATED OUTPUT WATTMETER

The McIntosh MC1201 has a huge hand built Output Watt meter that responds 95% full scale to a single cycle tone burst at 2kHz. Voltage and current output are electronically measured, multiplied and fed to a special circuit that accelerates the pointer movement in the upward direction. When the pointer reaches its peak it pauses only long enough for the human eye to perceive its position, then drops. It is almost 10 times faster than a professional VU meter.

WATTS HOLD

The "Watts Hold" mode for the output meter, records and maintains the highest power output peak of the source material being amplified.

ULTRA LOW DISTORTION

Output distortion is so low that it defies measurement, even with the finest distortion analyzers. At mid-frequencies, 8 ohm load, the distortion meter reads the residual distortion of the test oscillator (.0002%) with or without the MC1201 in the circuit. This means the amplifier distortion is lower than the analyzer is capable of measuring.

WIDE POWER BANDWIDTH

Full power output capability well above and below the frequencies that can be heard by humans.

POWER GUARD

The exclusive McIntosh circuit that prevents harsh sounding clipping and helps protect your speakers from damage.

THERMAL PROTECTION

Thermal sensors are provided that mute the input if improper loading or poor ventilation causes the amplifier to over heat.

TURN ON DELAY

The MC1201 has a circuit that delays amplifier operation for about two seconds. This prevents pops or thumps generated in other equipment from causing annoying noises or damaging your speakers.

OUTPUT AUTOFORMERS

The unequalled expertise of McIntosh in the design and manufacture of output transformers is legendary in the Hi Fi industry. In the MC1201 an autoformer provides proper matching for 2, 4 and 8 ohm loads. It protects your speakers from damage in the event of an output transistor failure, provides low distortion power transfer at frequencies well beyond human hearing and delivers peak output current in excess of 200 amperes.

REGULATED ILLUMINATION

The tremendous peak output power capability of the MC1201 has made the addition of a circuit that regulates the brilliance of the panel and meter illumination necessary. When there are high power output demands the line voltage may sag however this new circuit prevents the lights from dimming.

MODULAR CONSTRUCTION

If service should be required, modular construction makes repairs easier. Gold plated connectors are used to assure long life and distortion free connections even in hostile environments.

SILENT CONVECTION COOLING

New "High Efficiency Circuits", superior components and large area heatsinks, over 2,800 square inches, contribute to cool operation. No fans are required.

Performance Specifications

POWER OUTPUT STEREO

1200 watts into an 8, 4 or 2 ohm load is the minimum sine wave continuous average power output. The output RMS voltage is:

98 across 8 ohms

69.3 across 4 ohms

49 across 2 ohms

OUTPUT LOAD IMPEDANCE

Terminals for 8, 4 and 2 ohms

RATED POWER BAND

20Hz to 20kHz

TOTAL HARMONIC DISTORTION

0.005% maximum harmonic distortion at any level from 250 milliwatts to rated power output.

DYNAMIC HEADROOM

2.1dB

FREQUENCY RESPONSE

+0, -0.25dB from 20Hz to 20kHz

+0, -3.0dB from 10Hz to 100kHz

INPUT SENSITIVITY

2.45 volts unbalanced

4.9 volts balanced

A-WEIGHTED SIGNAL TO NOISE RATIO

93dB (120 below rated output) unbalanced

97dB(124dB below rated output) balanced

INTERMODULATION DISTORTION

SMPTE 0.005% maximum if instantaneous peak power output does not exceed twice the output power rating.

WIDE BAND DAMPING FACTOR

8 ohm output 100

INPUT IMPEDANCE

10,000 ohms

POWER GUARD

Less than 2% THD with 14dB overdrive

POWER REQUIREMENTS

120 volts, 50/60Hz, 15 amps UL/CSA.

Front Panel Information

ILLUMINATED OUTPUT WATTMETER

The McIntosh MC1201 is a high power amplifier that has an Output Wattmeter that respond 95% full scale to a single cycle tone burst at 2kHz. Voltage and current output are electronically measured, multiplied and fed to a special circuit that accelerates the pointer movement in the upward direction. When the pointer reaches its peak it pauses only long enough for the human eye to perceive its position, then drops. It is almost 10 times faster than a professional VU meter.

METER MODE SWITCH

The METER MODE switch has three positions: WATTS, HOLD, and LIGHTS OFF.

WATTS

In the WATTS position, the meter needle indicates the variations in program loudness. Although the primary output calibration of the meter is from 12 milliwatts up to 1200 watts, the rated power output of the MC1201, the additional indications to the right of the 1200 watts mark, are 2400W & 4800W. The MC1201 cannot reach this power level continuously; however, it is possible for short interval peaks to considerably exceed the 1200 watts continuous rating.

HOLD

In the HOLD position, the meter needle locks to the highest power peak in a sequence of peaks. The meter is driven to maximum power, electronically held there until a higher peak passes through the amplifier. If no further peaks are reached the meter needle will very slowly return to its rest position (decay rate: 6dB per minute).

LIGHTS OFF

In the LIGHTS OFF position, the meter functions as it does in the WATTS, the back lighting is turned OFF.

POWER SWITCH

The Power switch has three positions OFF, REMOTE and ON. The OFF position disconnects the main AC line. The REMOTE position is used when the amplifier is to be turned on via remote control. To accomplish this, a patch cord is connected between the Preamp POWER CONTROL OUT and POWER CONTROL IN on the rear of the MC1201. The ON position bypasses remote control and turns the amplifier "ON"

Power Guard Operation

Improved recordings and recording techniques have imposed higher power demands on today's amplifiers. Poorly designed amplifiers can present music listeners with a form of harsh unpleasant distortion due to amplifier overload (hard clipping). Clipping, which looks and acts like non musical square waves, is caused when the amplifier is asked to produce more power output than it is designed to deliver. Amplifiers, when driven to clipping, can deliver up to 40% harmonic and intermodulation distortion that decreases the pleasure and enjoyment you get from listening. This form of distortion (clipping signal) also produces extra heat energy which will damage most speakers. McIntosh has developed the Power Guard circuit which - (1) dynamically prevents power amplifiers from being over driven into hard clipping - (2) assures that the amplifier will produce its maximum output without increased distortion - (3) protects your speaker from excessive heating. Power Guard is a patented McIntosh design (U.S. patent #4048573).

The MC1201 has a circuit that compares the wave shape of the output signal to the input signal. If the disparity between the two signals, due to overdrive, exceeds an average of 0.3% (equivalent to 0.3% total harmonic distortion) an amber POWER GUARD indicator illuminates. With any further increase in distortion the POWER GUARD circuit operates to limit the amplifier input dynamically so that the amplifier cannot be over driven. POWER GUARD eliminates amplifier output

clipping. POWER GUARD only operates when the amplifier is asked to deliver more power than it was designed to produce.

Rear Panel Information

OUTPUT

Output connections for impedance's of 2, 4 and 8 ohms are provided on huge, gold plated five way binding posts allowing great flexibility in the type of wire connections that are available in the field.

INPUT

An XLR connector is provided for BALANCED input and an RCA connector is provided for UNBALANCED input. An INPUT MODE switch is provided to select either balanced or unbalanced.

POWER CONTROL

1/8" headphone jacks are provided for both POWER CONTROL IN and POWER CONTROL OUT.

OUTPUT MODE

The output mode is fully balanced stereo providing both + and - speaker connections for all taps.

AC POWER

The MC1201 is rated for 120 volts, 50/60 hertz.

Technical Description

The MC1201 is a power amplifier designed to operate with loudspeakers having a nominal impedance of 2, 4 or 8 ohms.

It features a new circuit design that holds harmonic distortion far below the amplifiers remarkably low noise floor. Only by using special spectrum analysis measuring techniques is the distortion measurable at all.

DESIGN PHILOSOPHY

The secret to this performance will sound very simple, but it is more difficult to carry out than it may seem. The principle used in the design of the MC1201 was to arrange every stage of voltage or current amplification to be as linear as possible.

This linear operation is accomplished by using several different techniques.

1. Each transistor is selected to have nearly constant current gain (Beta) over the entire range of currents at which the transistor must operate.
2. The load impedance presented to each amplification stage is made to be as uniform as possible for all

signal levels.

3. The input impedance of stages is increased and linearized where possible by using emitter degeneration.
4. Resistors and capacitors in the signal path are carefully selected to have exceedingly low voltage coefficients (low change of resistance or reactance with applied voltage). Precision metal film resistors and low dielectric absorption film capacitors are used in all critical circuit locations.
5. Output transistors have matched uniform current gain, high current gain-bandwidth product, low output capacitance, and large active-region safe operating area. These characteristics and the automatic tracking bias system eliminate cross-over distortion. The distortion graphs show clearly that distortion does not increase at low power output levels.

OVER 600 JOULES OF ENERGY STORAGE

Huge main filter capacitors are used to guarantee an excellent signal to noise ratio and the energy storage necessary for the wide dynamic range that "Digital Audio" demands.

ILLUMINATED, PEAK RESPONDING OUTPUT WATTMETER

The MC1201 is a high power amplifier with a REAL OUTPUT WATTMETER. The power output in WATTS of any amplifier is determined by multiplying the output voltage (E) by the output current (I), $EI=W$. Output meters on other amplifiers are only voltmeters. Output current is not considered. Calibration is in watts and is based on the false premise that all speakers have a fixed impedance regardless of frequency. In fact, the impedance of many poor speaker designs varies by as much as 4 to 1. For a specific output voltage the current varies inversely to the speaker impedance. So if the speaker impedance is lower, the output current and power are higher. Since McIntosh can not control other manufacturers speakers, we decided to provide extra output current to drive these mismatched low impedance's and to indicate the REAL output power required to drive them. Therefore the meter circuit in the MC1201 electronically measures both voltage and current, multiplies them and displays the REAL OUTPUT POWER IN WATTS.

Another important feature of this output watt meter is its ability to respond 95% full scale to a single cycle tone burst at 2kHz. After voltage and current are measured and multiplied, the product is fed to a special circuit that accelerates the meter pointer in the upward direction. When it reaches its peak, it pauses only long enough for

the human eye to perceive its position, then returns to 0. Response is almost 10 times faster than a professional VU meter.

A front panel switch is provided to change the meter to the WATTS HOLD mode of operation. This allows fast upward movement of the pointer but greatly increases HOLD time at the peak of its travel. The highest power output of the source material is thus recorded.

OUTPUT AUTOFORMER

The unequalled expertise of McIntosh in the design and manufacture of output transformers is legendary in the Hi Fi industry. In the MC1201 it provides proper matching for 2, 4 and 8 ohm loads. It protects your speaker from damage in the event of an output transistor failure, provides low distortion power transfer at frequencies well beyond human hearing and delivers peak output currents in excess of 200 amperes.

PROTECTION CIRCUITS

Some manufacturers of power amplifiers advertise that their products do not require or use protection circuits and that such circuits compromise performance. McIntosh Laboratory agrees that diligent measures are required to allow unrestricted performance, but we also insist that protection circuits are desirable and necessary to prevent amplifier or loudspeaker damage due to abnormal circumstances and that they actually enhance performance. The MC1201 incorporates seven protection circuits to enhance its performance, assure its reliability and to protect loudspeakers.

POWER GUARD

Power Guard, a unique feature of McIntosh amplifiers, assures that the MC1201 will deliver full power free of clipping distortion. Clipping is caused when an amplifier is asked to produce more power output than it was designed for. Amplifiers that are overdriven may deliver large quantities of power when they are clipping but they have more than 40% harmonic distortion. In this mode, the sound is grossly distorted and the extra energy content of the clipped signal will damage most loudspeakers. The McIntosh Power Guard circuit protects your ears and your speakers from this kind of damage.

The Power Guard circuit consists of a waveform comparator which monitors the wave shape of the amplifier input and output signals. Normally there is no disparity between these signals and the comparator produces no output. When the amplifier is overdriven a difference will develop. If the difference exceeds 0.3% (equivalent to 0.3% total harmonic distortion) the comparator output causes the amber power guard indicator to light. If there is a further increase in the disparity the

comparator output controls an electronic attenuator at the amplifier input. It reduces the amplifier gain, thus holding the amplifier output to a low distortion value. Overdrive by 14dB is possible before the output distortion exceeds 2%.

SENTRY MONITOR

All power transistors have limits for the maximum amount of power they can handle. The MC1201 output transistors and power supply have been designed to allow very high current flow into properly matched load impedances. If, however, a short circuit or very low value of load impedance is applied to the output of the MC1201, destructive current levels could be reached. The Sentry Monitor circuit prevents this. The circuit senses the dynamic operating time, voltage, and current of the amplifier output stage and confines it to nondestructive levels. Sentry Monitor does not limit the power output available from the amplifier.

THERMAL CONTROL

All power transistors have limits for the maximum amount of heat they can tolerate. The MC1201 uses a highly efficient amplifying circuit that produces relatively little heat for the output power produced. The amplifier has 4 oversized heatsinks to dissipate transistor generated heat. Natural convection air flow is sufficient for cool operation. Should the cooling air be blocked or should the amplifier operating temperature become too high, thermal cutouts will turn off the input signal to the amplifier. When the amplifier has cooled, it will automatically turn on again.

TURN-ON DELAY

The MC1201 has a turn-on delay circuit that delays amplifier operation for about 2 seconds after power turn on. This prevents pops or thumps generated in other equipment from causing annoying noises or damaging your loudspeakers.

DIRECT CURRENT FAILURE PROTECTION

The autoformer protects speakers from damage in the event of amplifier failure. Should a direct current component appear in the output circuit it is shunted by the autoformer and cannot damage the speaker.

POWER LINE INRUSH PROTECTION

Turn on inrush current is cushioned by thermistors in the power transformer primary circuit. This soft start eliminates component stress during turn-on.

CIRCUIT OPERATION

The power output amplifier uses two balanced stages of voltage amplification followed by three stages of current amplification. All stages are complimentary balanced. Even number harmonics are canceled by the balanced circuits. This means that the amplifying stages

have less total harmonic distortion and less negative feedback is required to achieve ultra low distortion.

The signal is fed to the +inputs of the balanced differential stages. Feedback from the amplifier output is applied to the -inputs. The differential amplifiers drive a balanced Darlington connected voltage amplifier stage.

The voltage amplifier's output feeds complementary Darlington connected driver transistors. These supply the signal to 24 complementary connected transistors per side for a total of 48 output transistors. Ancillary components for Power Guard, Sentry Monitor, Power Output Meter and other protection circuits interconnect with the amplifier circuits. The power supply uses a massive toroid power transformer, full wave bridge rectifiers and large filter capacitors, having 600 joules of energy storage. Four large heatsinks provide cooling for the 48 output power transistors.

The mechanical and electrical design of the MC1201 is the result of the many years of engineering and manufacturing experience held by the staff at McIntosh. This "know how", the meticulous attention to design and production details, makes the MC1201 one of the finest amplifiers ever produced by McIntosh Laboratory.

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