

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

PRODUCT BRIEF

MC206

SIX CHANNEL POWER AMPLIFIER

Project 1160

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PROMOTIONAL HIGHLIGHTS

- Six Powerful Channels For Home Theater Audio Systems, Dolby Digital, THX or DTS 6.1
- Illuminated Output Wattmeters
- 6 Channel DB-25 Input Connector
- High Output Current Capability
- 215 Joules of Energy Storage
- Gold Plated Output Terminals
- Toroid Power Transformer
- Ultra Low Distortion
- Wide Power Bandwidth
- Power Guard
- Thermal Protection
- DC Output Protection
- Turn On Delay
- Remote Turn "ON"

- System Calibrate Monitor
- Modular Construction

FEATURES AND BENEFITS

ILLUMINATED OUTPUT WATTMETERS

Three illuminated output wattmeters are provided on the glass front panel. A four position meter switch selects the channels being monitored.

6 CHANNEL DB-25 INPUT CONNECTOR

A 25 pin "D" connector is provided for a single cable interconnect to Dolby Digital, THX and DTS 6.1 processors. All six inputs and power control connections are made at once.

HIGH OUTPUT CURRENT

Greater than 25 amperes peak output current to drive uneven speaker loads. Some poor speaker designs have input impedance's that dip to 2 or 3 ohms at various frequencies. The MC206 has the output current reserve to drive them.

215 JOULES OF ENERGY STORAGE

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

GOLD PLATED OUTPUT TERMINALS

McIntosh gold plated output terminals are corrosion resistant and will deliver full output power to all speakers.

ULTRA LOW DISTORTION

The distortion is so low that it defies measurement, even with the finest distortion analyzers. At mid-frequencies, the distortion meter reads the residual distortion of the test oscillator, with or without the MC206 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 designed to prevent harsh sounding clipping and protect your speakers from damage.

THERMAL PROTECTION

The amplifier contains thermal sensors that turn off the speakers if improper loading or ventilation causes the amplifier to over heat.

DC OUTPUT PROTECTION

A circuit designed to turn off the speakers if, for any reason, a DC voltage appears at the speaker terminals. This prevents speaker damage.

TURN ON DELAY

The MC206 has a circuit that delays amplifier operation for about 2 seconds after turn ON. This prevents pops or thumps generated in other equipment from causing annoying noises or damaging your speakers

REMOTE TURN ON

In the REMOTE position the amplifier can be turned "ON" by a 5V logic level signal to the THX connector or POWER CONTROL INPUT jack.

SYSTEM CALIBRATE MONITOR

When the MC206 is connected to the MX132 or MX134 via the 25pin connector the amplifier will monitor each channel independently regardless of the meter switch position when the MX132 or MX134 is set into its System Calibrate Mode. The channel that is being monitored is clearly indicated with its associated light above each meter.

MODULAR CONSTRUCTION

If service should be required, modular construction makes repairs easier.

TOROID POWER TRANSFORMER

The toroid permits a design with low noise and cool operation.

PERFORMANCE SPECIFICATIONS

POWER OUTPUT PER CHANNEL

200 watts into 4 ohm loads or 120 watts into 8 ohm loads minimum sine wave continuous average power output per channel. The output RMS voltage is:

- 31.0 across 8 ohms
- 28.3 across 4 ohms

OUTPUT LOAD IMPEDANCE

NORMAL
8 or 4 ohms

RATED POWER BAND

20Hz to 20kHz

TOTAL HARMONIC DISTORTION

0.005% maximum harmonic distortion at any power level from 250 milliwatts to rated power per channel from 20Hz to 20,000Hz, all channels operating.

DYNAMIC HEADROOM

1.6dB

FREQUENCY RESPONSE

+0, -0.25dB from 20Hz to 20kHz
+0, -3.0dB from 10Hz to 100kHz

INPUT SENSITIVITY

1 volt (2.0V at gain control center detent)

INPUT IMPEDANCE

10,000 ohms

A WEIGHTED SIGNAL TO NOISE RATIO

113dB below rated output

INTERMODULATION DISTORTION

0.005% maximum if instantaneous peak per output does not exceed twice the output rating per channel, with all channels operating, for any combination of frequencies from 20Hz to 20,000Hz.

WIDE BAND DAMPING FACTOR

8 ohm, 200
4 ohm, 100

POWER REQUIREMENTS

120 volts 50/60Hz, 11 amps

FRONT PANEL INFORMATION

ILLUMINATED OUTPUT WATTMETERS

Three illuminated output wattmeters are provided on the glass front panel. A meter switch with four positions selects the channels being monitored.

The switch positions are:

1. Meter lights OFF with each meter displaying the summed output of two channels, Left Front plus Left Surround, Center plus Back Surround and Right Front plus Right Surround.
2. Meter lights ON with each meter displaying the output

of one channel, Left Front, Center and Right Front.

3. Meter lights ON with each meter displaying the output of one channel, Left Surround, Back Surround and Right Surround.
4. Meter lights ON with each meter displaying the summed output of two channels, Left Front plus Left Surround, Center plus Back Surround and Right Front plus Right Surround.

AC POWER SWITCH

The POWER switch has three positions OFF, ON and REMOTE. The REMOTE position provides a circuit that operates the power relay from a logic "1" (5V) signal. This signal can be applied between pin 13 (input) and pin 25 (control ground) of the DB-25 connector or to the POWER CONTROL IN jack (tip-input, sleeve-control ground). The POWER CONTROL OUT jack provides a power ON signal for the NEXT power amplifier. This signal is delayed approximately 2 seconds, thereby sequencing inrush current peaks.

REAR PANEL INFORMATION

GAIN CONTROLS

The input sensitivity of the MC206 is 1V with the gain controls full CW, and 2.0V in the detent position on the control. The controls should be full CW for THX operation.

INPUTS

Six pair of RCA jacks are provided for amplifier inputs. The DB-25 input connector is used when the MC206 is connected to a Dolby Digital THX or DTS Surround Decoder. It contains all six channel inputs and AC power control.

OUTPUTS

For normal operation, output connections for impedance's of 4 to 8 ohms are provided on gold plated five way binding posts.

AC POWER

The MC206 is rated for 120 volts, 50/60 hertz. It uses .8 amperes when there is no signal output and up to 15 amperes with all channels delivering rated power. A 15 ampere fuse protects the MC206 electrically.

TECHNICAL DESCRIPTION

The MC206 is a six channel power amplifier designed to operate with loudspeakers having a nominal impedance of 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 MC206 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 crossover distortion. The distortion graphs show clearly that distortion does not increase at low power output levels.

215 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.

PROTECTION CIRCUITS

Some manufacturers of power amplifiers advertised that their products do not require or use protection circuits and that such circuits compromise performance. MC206 incorporates six 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 each channel of the MC206 will deliver full power free of clipping distortion. Clipping is caused when an amplifier is asked to produce more power output than its design is capable of delivering with low distortion. Amplifiers that are overdriven may deliver

The Power Guard circuit consists of a waveform comparator which compares the wave shape of the amplifier input and output signals. Normally there is no difference between these signals and the comparator produces no output. When the amplifier is driven beyond its maximum power capacity a difference will develop. If this 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 to reduce 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 MC206 output transistors and power supply has 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 MC206, destructive current levels could be reached if not controlled by the Sentry Monitor circuit. This circuit senses the dynamic operating time, voltage, and current of the amplifier output stage and controls the current flow confining it to nondestructive limits. 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 MC206 uses a highly efficient amplifying circuit that produces relatively little heat for the output power produced. The amplifier has oversized heatsinks to dissipate heat generated by the transistors. Natural convection airflow is sufficient for cool operation. Should the cooling air be blocked or should the amplifier operating temperature become too high, thermal cutouts within the amplifier will turn off the speakers. POWER GUARD indicators will light

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.

continuously to show thermal protection is operating. When the amplifier has cooled, it will automatically turn on again.

TURN-ON DELAY

The MC206 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

A circuit is provided that disconnects the speakers if for any reason a DC voltage appears at the speaker terminals. This prevents speaker damage.

POWER LINE INRUSH PROTECTION

Turn on inrush current is cushioned by a thermistor in the power transformer primary circuit. A soft start is achieved that eliminates component stress during turn-on.

CIRCUIT OPERATION

The audio input passes through the preamplifier then to the gain control and on to the power guard attenuator.

The power output amplifier uses two 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 one input of the balanced differential stage. Feedback from the amplifier output is applied to the other input. The differential amplifiers drive

a balanced cascode connected voltage amplifier stage.

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The voltage amplifier output feeds complementary Darlington connected driver transistors. These supply the signal to 6 complementary connected output transistors per channel. Ancillary components for Power Guard, Sentry Monitor and other protection circuits interconnect with the amplifier circuits. The power supply uses a massive power transformer, full wave bridge rectifiers and large filter capacitors having 215 joules of energy storage. Large heatsinks provide cooling for the 36 output power transistors.

The mechanical and electrical design of the MC206 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 MC206 one of the finest amplifiers ever produced by McIntosh Laboratory.

From the McIntosh Design Engineering Dept.
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