

PRODUCT PREVIEW

MCC404M

Four Channel Automotive Power Amplifier

Project 1017

Promotional Highlights

- Conservative Power Rating
- High Output Current
- Ultra Low Distortion
- Ultra Low Noise
- Fully Discrete Design
- Balanced Noise Canceling Inputs
- Channel Source Selection (input steering)
- Bridgeable
- One Band Equalizer
- Variable Hi Pass Crossover Filter
- Variable Low Pass Crossover Filter
- Remote Subwoofer Control
- In/out pass through
- Subwoofer Line Output
- Individual Input Level Controls for Each Channel
- Gold Plated Inputs and Outputs
- Power Guard
- Speaker Protection
- Turn ON/OFF Transient Protection
- Forced Air Cooling
- Temperature Controlled Multi Level Power Supply
- High Efficiency MOSFET PWM Regulated Power

Supply

- DC Input Over and Under Voltage Protection
- Illuminated Watt Meters

Features and Benefits

CONSERVATIVE POWER RATING

McIntosh Power Output Specifications are the guaranteed minimum power output over the specified frequency range with less than 0.005% distortion.

Many manufacture's list a specification based on the best units off the production line. All McIntosh amplifiers meet the published specifications.

HIGH OUTPUT CURRENT

Greater than 20 amperes peak output current to drive uneven speaker loads. Some poor speaker designs have input impedance that dips to 1 or 2 ohms at various frequencies. McIntosh amplifiers have the current reserve to drive them.

ULTRA LOW DISTORTION

Distortion so low, that it defies measurement, even with the finest distortion analyzers. At mid-frequencies, 4 ohm load, the distortion meter reads less than .0009%.

ULTRA LOW NOISE

Noise is below audible levels even with high efficiency speakers.

FULLY DISCRETE DESIGN

A fully complimentary double balanced amplifier design has been incorporated, identical to that found in McIntosh's leading home amplifiers.

BALANCED NOISE CANCELING INPUTS

Interference noise that is produced by other sources in the vehicle are not amplified by the MCC404M. The inputs can be directly connected to the bridged speaker output of any head unit.

CHANNEL SOURCE SELECTION (input steering)

Allows easy configuration of the entire system depending if the system is to be a 4 channel system, a two channel bi-amped system or a 2 channel system with subwoofer.

BRIDGEABLE CHANNELS

The MCC404M can be configured for four 100 watt or two 200 watt channels.

ONE BAND EQUALIZER

The built in one band equalizer has variable frequency from 40 Hz to 1 kHz and variable level from +10 dB to -10 dB. The Q is fixed at 2.

VARIABLE HI PASS CROSSOVER FILTERS

The built in hi pass crossover filter with 12dB per octave slope is variable from 5 Hz to 500 Hz. The frequency can be individually set for channels 1-2 and 3-4. The low frequency characteristics of this filter allow it to be used as a subsonic filter.

VARIABLE LOW PASS CROSSOVER FILTERS

The built in low pass crossover filter with 12dB per octave slope is variable from 50 Hz to 500 Hz. The frequency can be individually set for channels 1-2 and 3-4. When the amplifier is configured for bridged operation the low pass filter is 24dB per octave.

When using the hi pass filter with the low pass filter the amplifier is configurable for a band pass application.

REMOTE SUBWOOFER CONTROL

The subwoofer level can be controlled via an external rotary control, that can be remotely mounted in the vehicle.

IN/OUT PASS THROUGH

There is an extra RCA output for each input channel which is provided to feed another amplifier for convenience of configuring multi amplifier systems.

SUBWOOFER LINE OUTPUT

A line level summed output is provided to drive an external subwoofer power amplifier. The inputs to both channels are summed for this output. This output level is adjusted by the remote subwoofer control.

INDIVIDUAL INPUT LEVEL CONTROLS

Input level controls provide an input sensitivity range of 500mV to 8VRMS for full power output, sufficient for use with any control center. Each channel can be individually set, for flexibility in custom configurations such as use with electronic crossovers.

GOLD PLATED INPUT AND OUTPUT TERMINALS

McIntosh provides gold plated input and output terminals on the amplifiers for superior corrosion resistance. A very important feature in the automotive environment. Speaker wires to 10 AWG and DC input wires to 4 AWG can be accommodated.

POWER GUARD

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

SPEAKER PROTECTION

A circuit that turns off the power supply if for any reason a DC voltage appears at the speaker terminals. This prevents speaker damage. If the fault is temporary, the circuit may be reset to normal operation by an OFF/ON cycle of the power switch.

TURN ON/OFF TRANSIENT PROTECTION

McIntosh amplifiers contain a circuit that provides a

turn ON delay and an instant OFF function. This prevents pops clicks and thumps generated in other equipment from causing annoying noises or damaging your speakers.

PORTED TUNNEL FORCED AIR COOLING

McIntosh amplifiers are constructed in an extruded aluminum tunnel that has exhaust ports along its length. These exhaust ports are tuned to provide even air flow, over the surface of the tunnel cooling fins. The cooling fans are controlled by temperature sensors, attached to the interior of the tunnel. The fans are normally off. If the program material contains sustained loud passages demanding high power, the fans will turn on to increase cooling.

TEMPERATURE CONTROLLED MULTI LEVEL POWER SUPPLY

Accidental blockage of the cooling intake port or some other fault condition could cause the amplifier temperature to continue to rise, even with the fan at full speed. A temperature sensing circuit in the power supply will reduce heat dissipation by lowering the voltage to the amplifier. If cooling is still not sufficient, additional heating will shut down the power supply completely. The fans will continue to run and once normal temperatures are restored, operation will resume.

HIGH EFFICIENCY MOSFET PWM REGULATED POWER SUPPLY

The supply operates with 85% efficiency. Regulation is maintained from 12 to 18 volts at the battery input.

DC INPUT OVER AND UNDER VOLTAGE PROTECTION

The power supply is turned OFF if the voltage exceeds safe limits.

ILLUMINATED WATT METERS

There are two illuminated watt meters on the glass panel one meter that reads the combined output power of channels 1 and 2, and the other channels 3 and 4.

Performance Specifications

POWER OUTPUT

Minimum sine wave continuous average power output per channel, all channels operating, into 4 ohm 100 watts/channel, into 2 ohm loads, 200 watts/channel.

RATED POWER BAND

20Hz to 20kHz

TOTAL HARMONIC DISTORTION

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

DYNAMIC HEADROOM

1dB

FREQUENCY RESPONSE

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

+0, -3.0dB from 10Hz to 50kHz

INPUT SENSITIVITY

0.5 to 8V

A-WEIGHTED SIGNAL-TO-NOISE RATIO

110dB (3V)

DC INPUT VOLTAGE

12.0V

CURRENT CONSUMPTION

Idle 2.5 amps

Rated Power 70 amps, with 4 ohm load

DIMENSIONS

Width (mm) 12.3" (311)

Height (mm) 3.0" (76)

Depth (mm) 18.4" (467)

Technical Description

The MCC404M is a 4 channel power amplifier designed to operate with loudspeakers having a nominal impedance of 4 or 2 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.

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 MCC404M 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, eliminates cross-over distortion.

This is the same DESIGN PHILOSOPHY that has made McIntosh the leader in home audio and commercial power amplifier design for over 40 years.

PROTECTION CIRCUITS

Some manufacturers of power amplifiers advertised 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 circumstance and that they actually enhance performance. The MCC404M incorporates several 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 MCC404M 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 over-driven 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 driven beyond its maximum power capacity a difference will develop. If the disparity 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 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 MCC404M 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 MCC404M, destructive current levels could be reached, if it was 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 MCC404M uses a highly efficient amplifying circuit, which produces relatively little heat, for the output power produced. The amplifier has oversized heat sinks and a fan to dissipate transistor generated heat. Should the cooling air be blocked or should the amplifier operating temperature become too high, thermal sensors within the amplifier will activate the fan. Next, it will lower the power supply voltage to reduce heating. If the temperature continues to rise, the power supply will shut down completely.

TURN-ON/OFF TRANSIENT PROTECTION

The MCC404M has turn-on delay and instant off circuitry. 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 turns off the power supply if for any reason a DC voltage appears at the speaker terminals. This prevents speaker damage. If the fault is only temporary the circuit can be reset, by cycling the power OFF/ON.

POWER LINE INRUSH PROTECTION

The turn-on inrush current is cushioned, by a soft start circuit in the power supply. This eliminates component stress during turn-on.

CIRCUIT OPERATION

Audio from the control center is fed to balanced noise canceling inputs and the POWER GUARD attenuator. Next, is a variable gain pre-amp, followed by the variable one band equalizer. Then through the variable hi pass/low pass crossover. The inputs of the two channels are summed and sent to the summed output.

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 into one input of the complimentary balanced differential stage. Feedback from the amplifier

output is applied to the other input. The differential amplifiers drive a balanced voltage amplifier stage. An inverted Darlington connection is used to improve bandwidth and linearity.

The voltage amplifier output feeds complementary Darlington connected driver transistors. These supply the signal to complementary connected output transistors. Ancillary components for Power Guard, Sentry Monitor and other protection circuits interconnect with the amplifier circuits.

The POWER Supply is a PWM, pulse width modulated, regulated switching supply. It features MOSFET power transistors switching at 40KHz.

The mechanical and electrical design of the MCC404M 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 MCC404M one of the finest automotive power amplifier ever produced.

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