McIntosh®

OWNER'S MANUAL

MC7100
POWER
AMPLIFIER

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POWER
AMPLIFIER

IMPORTANT SAFETY INSTRUCTIONS

THESE INSTRUCTIONS ARE TO PROTECT YOU AND THE McINTOSH INSTRUMENT. BE SURE TO FAMILIARIZE YOURSELF WITH THEM

1. Read all instructions - Read the safety and operating instructions before operating the instrument.
2. Retain Instructions - Retain the safety and operating instructions for future reference.
3. Heed warnings - Adhere to warnings and operating instructions.
4. Follow Instructions - Follow all operating and use instructions.

   W A R N I N G : TO REDUCE RISK OF FIRE OR ELECTRICAL SHOCK, DO NOT EXPOSE THIS INSTRUMENT TO RAIN OR MOISTURE.
5. Power Sources - Connect the power supply only to the type described in the operating instructions or as marked on the unit.
6. Power-Cord Protection - Route power-supply cords so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the instrument.
7. Ventilation - Locate the instrument for proper ventilation. For example, the instrument should not be placed on a bed, sofa, rug, or similar surface that may block ventilation openings; or, placed in a built-in installation, such as a bookcase or cabinet, that may impede the flow of air through the ventilation openings.
8. Heat - Locate the instrument away from heat sources such as radiators, heat registers, stoves, or other appliance (including amplifiers) that produce heat.
9. Wall or Cabinet Mounting - Mount the instrument in a wall or cabinet only as described in the owner's manual.
10. Water and Moisture - Do not use the instrument near water - for example, near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, etc.
11. Cleaning-Clean the instrument by dusting with a dry cloth. Clean the panel with a cloth moistened with a window cleaner.
12. Object and Liquid Entry - Do not permit objects to fall and liquids to spill into the instrument through enclosure openings.
13. Nonuse Periods - Unplug the power cord from the AC power outlet when left unused for a long period of time.
14. Damage Requiring Service - **Service must be performed by qualified service personnel when:**
    A. The power supply cord or the plug has been damaged: or
    B. Objects have fallen, or liquid has been spilled into the instrument; or
    C. The instrument has been exposed to rain; or
    D. The instrument does not appear to operate normally or exhibits a marked change in performance; or
    E. The instrument has *been* dropped, or the enclosure damaged.
15. Servicing - Do not attempt to service beyond that described in the operating instructions. All other service should be referred to qualified service personnel.
16. Grounding or Polarization - Do not defeat the inherent design features of the polarized plug. Non-polarized line cord adaptors will defeat the safety provided by the polarized AC plug.
17. CAUTION: TO PREVENT ELECTRICAL SHOCK DO NOT USE THIS (POLARIZED) PLUG **WITH AN EXTENSION CORD, RECEPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.**

    ATTENTION: POUR PREVENIR LES CHOCS ELECTRIQUES PAS UTILISER CETTE **FICHE POLARISEE AVEC UN PROLONGATEUR, UNE PRISE DE COURANT OU UNE AUTRE SORTIE DE COURANT, SAUF SI LES LAMES PEUVENT ETRE INSEREES A FOND SANS EN LAISSER AUCUNE PARTIE A DECOUVERT.**

The lightning flash with arrowhead, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

CAUTION: TO PREVENT THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED PERSONNEL.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

WARNING: THIS UNIT IS CAPABLE OF PRODUCING HIGH SOUND PRESSURE LEVELS. CONTINUED EXPOSURE TO HIGH SOUND PRESSURE LEVELS CAN CAUSE PERMANENT HEARING IMPAIRMENT OR LOSS. USER CAUTION IS ADVISED AND EAR PROTECTION IS RECOMMENDED WHEN PLAYING AT HIGH VOLUMES.

The serial number, purchase date, and McIntosh Laboratory Service Contract number are important to you for possible insurance claim or future service. Record this information here.

Serial Number

Purchase Date

Service Contract Number

Upon application, McIntosh Laboratory provides a Service Contract to the original purchaser. Your McIntosh Authorized Service Agency can expedite repairs when you provide the Service Contract with the instrument for repair.

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TAKE ADVANTAGE OF 3 YEARS OF CONTRACT SERVICE. . . FILL IN THE APPLICATION NOW.

Your MC7100 Power Amplifier will give you many years of satisfactory performance. If you have any questions, please contact,

McIntosh Laboratory Inc.
2 Chambers Street
Binghamton, New York 13903-2699
Phone: 607-723-3512

McINTOSH THREE YEAR SERVICE CONTRACT

An application for A THREE YEAR SERVICE CONTRACT is included with this manual. The terms of the contract are:

1. If the instrument covered by this contract becomes defective, McIntosh will provide all parts, materials, and labor needed to return the measured performance of the instrument to the original performance limits free of any charge. The service contract does not cover any shipping costs to and from the authorized service agency or the factory.
2. Any McIntosh authorized service agency will repair all McIntosh instruments at normal service rates. To receive the free service under the terms of the service contract, the service contract certificate must accompany the instrument when taken to the service agency.
3. Always have service done by a McIntosh authorized service agency. If the instrument is modified or damaged as a result of unauthorized repair the service contract will be cancelled. Damage by improper use or mishandling is not covered by the service contract.
4. The service contract is issued to you as the original purchaser. To protect you from misrepresentation this contract cannot be transferred to a second owner.
5. Units in operation outside the United States and Canada are not covered by the McIntosh Factory Service Contract, irrespective of the place of purchase. Nor are units acquired outside the USA and Canada, the purchasers of which should consult with their dealer to ascertain what, if any, service contract or warranty may be available locally.

INTRODUCTION

The electrical and mechanical design of the MC7100 Power Amplifier is the result of the many years of engineering and manufacturing experience of the design staff at McIntosh. This "Know How", along with the meticulous attention to design and production details, makes the MC7100 one of the finest amplifiers ever produced by McIntosh Laboratory.

The use of 4 complimentary connected output transistors per channel, allows not only full power output into normal loads, but extra high current output to drive uneven speaker loads. Some speakers have design characteristics that cause them to dip below their rated impedances at certain frequencies. It is possible for the MC7100 to deliver as much as 18 amperes peak current into these lower impedance loads.

The MC7100 provides this extra current output with complete reliability due to the use of McIntosh Sentry Monitor protection circuits. Some power amplifier manufacturers have claimed that their products do not use protection circuits since they compromise performance. The real genius of McIntosh engineering design has recognized these potential problems and completely eliminated them. Properly designed protection circuits assure you an amplifier that will operate under all types of user conditions with maximum reliability and freedom from possible speaker or amplifier damage. The benefits of these designs mean you own an amplifier that will continue to operate safely for many years.

The MC7100 output is so distortion free, it is difficult to measure with conventional instruments. The performance limit is 0.005% maximum distortion, yet it is typical for an amplifier to measure as low as 0.002% at mid frequencies into 8 ohms.

As in all McIntosh power amplifiers, the famous patented McIntosh POWER GUARD circuit is included. You never have to be concerned with possible amplifier overdrive. You will not experience amplifier clipping with its harsh speaker damaging distortion when playing wide dynamic range program sources such as compact discs.

Many other desirable features are included such as gold plated output terminals, DC output protection, thermal protection and a turn on delay circuit. A Toroidal wound power transformer permits a low profile design with quiet cool operation.

Refer to the section in this manual titled TECHNICAL DESCRIPTION for detailed information on all the outstanding circuit and performance features of the MC7100.

INSTALLATION

LOCATION

The MC7100 may be installed on a shelf or table, in a McIntosh cabinet, or custom installed in furniture of your choice. Always provide adequate ventilation for the amplifier. The trouble free life of any electronic instrument is greatly extended by providing sufficient ventilation. This prevents build-up of internal temperatures that can cause deterioration of circuit components. The McIntosh cabinet design allows for proper ventilation.

Allow enough clearance so cool air can enter at the bottom of the cabinet and be vented from the top. Provide at least 1 1/2 inches (3.8cm) above the amplifier heat sink area so airflow is not obstructed. The recommended minimum space for installation is 18 1/2 inches (47cm) wide, 14 1/2 inches (36.8cm) deep, (including connectors) and 4 1/2 inches (11.5cm) high. Allow 1 inch (2.54cm) in front of the mounting surface for panel clearance.

McINTOSH PANLOC MOUNTING SYSTEM

The PANLOC system of installing equipment is a product of McIntosh research. Two steel PANLOC mounting shelves are attached to the front panel at each side of the panel cutout, using the screws and brackets provided. The amplifier has runners on the bottom of its chassis,

INSTALLATION

allowing it to slide into the shelves. When the unit has been positioned completely into the cabinet and its front panel is against the cabinet panel, it can be locked into position. Turn each PANLOC button approximately one-quarter turn clockwise to lock. Turn the PANLOC button one-quarter turn counterclockwise to unlock the unit so it can be removed from the cabinet.

UNPACKING

Open the carton and remove the PANLOC shelves, the hardware package and the mounting template. Lift the amplifier up off the shipping pallet and remove the plastic bag. The amplifier is now ready for shelf or table top installation.

If the amplifier is to be installed in a McIntosh cabinet or custom installation, place it carefully upside-down on a flat surface and unscrew the four plastic feet from the bottom of the amplifier chassis.

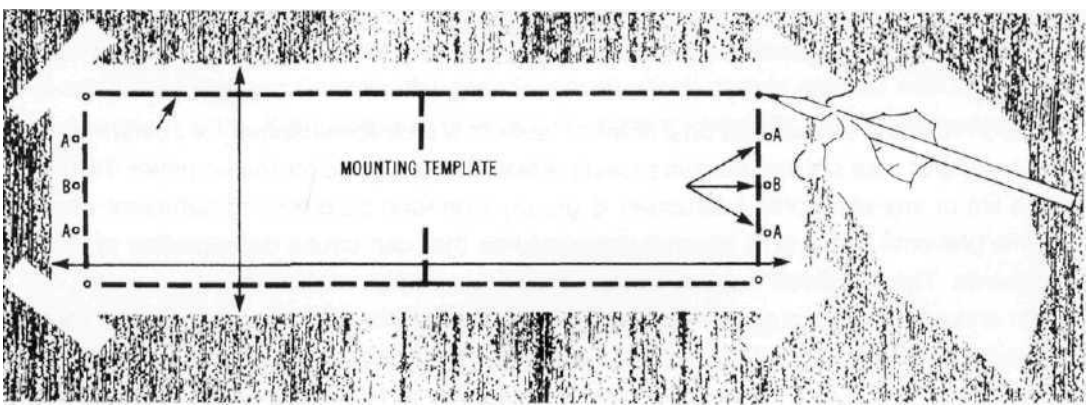
INSTALLING IN A McINTOSH CABINET

Guide the amplifier AC power cord through the front panel opening to the back of the cabinet. Slide the amplifier into the opening, making sure the rails on the bottom of each side of the amplifier chassis engage the tracks on the PANLOC shelves. Slide the amplifier completely into the cabinet until the back side of its front panel is pressing gently against the front of the cabinet panel. Turn the PANLOC buttons approximately one-quarter turn clockwise to lock the amplifier into the cabinet. Turn the buttons one-quarter turn counterclockwise to unlock and remove the amplifier.

CUSTOM INSTALLATION

1. MARK THE CABINET FRONT PANEL

Tape the plastic mounting template to the cabinet panel in the position where the amplifier is to be mounted. The broken lines that represent the outline of the rectangular cutout also represent the outside dimensions of the amplifier chassis. Make sure these lines clear any shelves, partitions or any other equipment mounted in the same cabinet. With the template in place, first mark the six A and B holes, and the four small holes that locate the corners of the cutout. Then join the four corner markings with a ruler or straightedge.



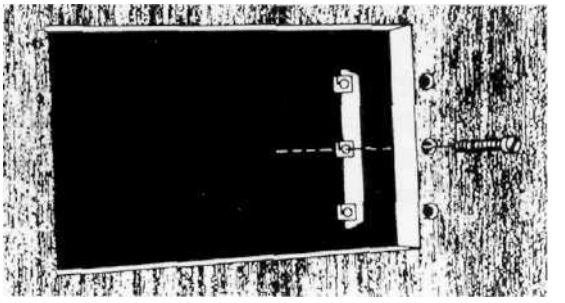
2. DRILL THE HOLES

Use a drill with a 3/16 inch (5mm) bit. Drill perpendicular to the front panel the six A and B holes. Then, using a drill bit slightly larger than the tip of your saw blade, drill one hole at each of two diagonally opposite corners. The holes should barely touch the inside edge of the penciled outline. Before taking the next step, be sure the six A and B holes have been drilled.

3. SAW THE PANEL CUTOUT

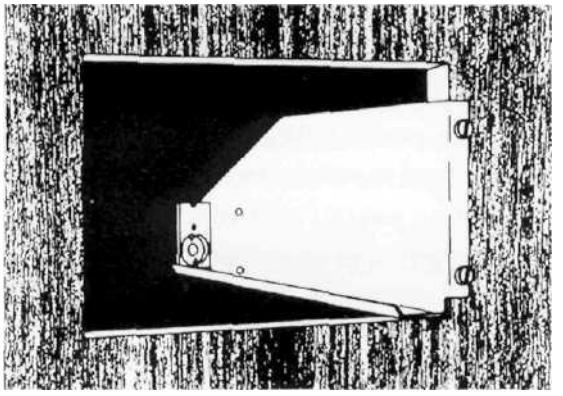
First make the two long horizontal cuts. Then make the two short vertical cuts. After the cutout is finished, use a file to square the corners and smooth any rough edges.

4. INSTALL THE PANLOC MOUNTING STRIPS



The hardware package includes two mounting strips and two black flat head 6/32 x 1 1/4 inch (31.8mm) screws and two 6/32 x 1 1/4 inch (31.8mm) fillister head screws. Place a mounting strip behind each edge of the cutout and secure it to the back side of the panel inserting a black flat head 6/32 screw through the center holes marked B on the template. Make sure the screws are drawn flush or slightly into the wood before attaching the PANLOC shelves.

5. ATTACH THE PANLOC SHELVES



Position the PANLOC shelves inside the cutout with the short flange against the front face of the cabinet panel. Fasten the shelves by inserting two fillister head 6/32 screws through the holes in each of the PANLOC shelf flanges, through the front panel and into the threaded receptacle on the mounting strips.

6. INSTALL THE AMPLIFIER

Guide the amplifier AC power cord through the panel opening to the back of the cabinet. Slide the amplifier into the opening, making sure the rails on the bottom of each side of the amplifier chassis engage the tracks on the PANLOC shelves. Slide the amplifier completely into the cabinet until the back side of its front panel is pressing gently against the front of the cabinet panel. Turn the PANLOC buttons approximately one-quarter turn clockwise to lock the amplifier in the cabinet. Turn the PANLOC buttons one-quarter turn counterclockwise to unlock and remove the amplifier.

HOW TO CONNECT INPUTS

INPUT CABLES

Use shielded cables to connect the signals from the preamplifier or other signal source to the power amplifier. To minimize the possibility of hum pickup or interference, locate the cables away from AC power cords or loudspeaker cables.

Use good quality cables. Your McIntosh dealer can advise you on the types and lengths of cables that will work best in your installation.

STEREO OPERATION

Use shielded single conductor cable with RCA type connectors. Connect a cable from the LEFT channel of a preamplifier output to the L (left) INPUT jack on the MC7100. Connect the RIGHT channel preamplifier output to the R (right) INPUT jack on the MC7100.

MONOPHONIC (BRIDGED) OPERATION

A rear panel MODE switch allows the MC7100 to be used as a normal stereo amplifier, or as a bridged mono amplifier.

Connect a shielded cable from a mono signal source to the R (right) /MONO input jack on the MC7100. Set the mode switch to MONO. Only the right channel LEVEL control functions in MONO operation. The outputs must be connected as indicated in HOW TO CONNECT OUTPUTS for proper mono operation.

INPUT LEVEL CONTROLS

These controls adjust the input volume levels of each channel. When the LEVEL controls are in the 12 o'clock or DETENT position, the amplifier input sensitivity for the rated 100 watts output is 2.5 volts.

THE 2.5 VOLT SENSITIVITY SETTING IS RECOMMENDED FOR BEST OPERATION WITH A McINTOSH PREAMPLIFIER.

Turning the LEVEL controls fully on, (clockwise), will give a higher amplifier sensitivity of 1.4 volts which may be required for other applications.

HOW TO CONNECT OUTPUTS

SPEAKER CABLES

Use high quality speaker cables since this is an important link in your stereo system. Selection of the proper size and type of speaker cable is necessary for you to receive the best possible performance from your amplifier and speaker combination. Consult your McIntosh dealer for recommendations on the cables that will best fit the needs of your stereo installation.

STEREO OPERATION

(SET THE MODE SWITCH SET TO STEREO POSITION)

The outputs of the MC7100 are direct coupled, and match speaker loads from four to eight ohms and higher.

Connect a cable from the LEFT speaker COMMON terminal to the amplifier L (Left) - (minus) OUTPUT terminal. Connect a cable from the LEFT speaker HOT terminal to the amplifier L (Left) + (Plus) OUTPUT terminal. Connect the right speaker to the right channel output terminals in a similar manner.

The COMMON and HOT terminals, (- and +), of both speakers must be connected in an identical manner to the proper amplifier output terminals so they will operate IN PHASE. This means that the speaker driver surfaces move back and forth the same in each speaker

HOW TO CONNECT OUTPUTS

system. Almost all loudspeaker systems have their hot and common terminals color coded, with red usually as hot or plus. The output signals of all McIntosh power amplifiers are always IN PHASE with the input signals.

The crosstalk between channels on the MC7100 is almost none existent, so each channel can be used as a separate monophonic amplifier. An example would be one channel feeding background music to a given area, and the other channel feeding a different program signal to another area.

MONOPHONIC (BRIDGED) OPERATION

(SET THE MODE SWITCH TO MONO POSITION)

Connect a cable from the monophonic speaker COMMON terminal to the MONO - (Minus) amplifier output terminal. Connect a cable from the speaker HOT terminal to the amplifier MONO + (Plus) terminal.

The MC7100 amplifier monophonic output signal will be in phase with the input signal when the speaker is connected as indicated.

It is recommended that speaker loads no lower than 8 ohms be used with the amplifier in the bridged Monophonic configuration.

HOW TO CONNECT AC POWER

The MC7100 is designed to operate on 120 volts 50/60Hz current. Plug the power cord into a switched AC receptacle on the back of a preamplifier or other accessory component. The plug blades are polarized; so be certain the plug is fully inserted in the outlet to prevent blade exposure. (The MC7100 has no AC power switch, so it must be switched on and off by a preamplifier or other accessory component.) Make certain that the AC outlet used can supply at least 6 amperes of current. The amplifier can draw up to 5 amperes from the AC power line when both channels are producing rated power output.

The auxiliary AC outlet on the amplifier rear panel will provide up to 600 watts (5 amperes) current, and is not fused or switched.

CAUTION: TO PREVENT ELECTRIC SHOCK, DO NOT CONNECT THE POLARIZED AC PLUG ON THIS UNIT TO AN EXTENSION CORD OR OTHER AC OUTLET THAT IS NOT DESIGNED TO ACCEPT POLARIZED PLUGS. THE PLUG MUST BE FULL Y INSERTED TO PREVENT BLADE EXPOSURE AND MAINTAIN LINE POLARITY.

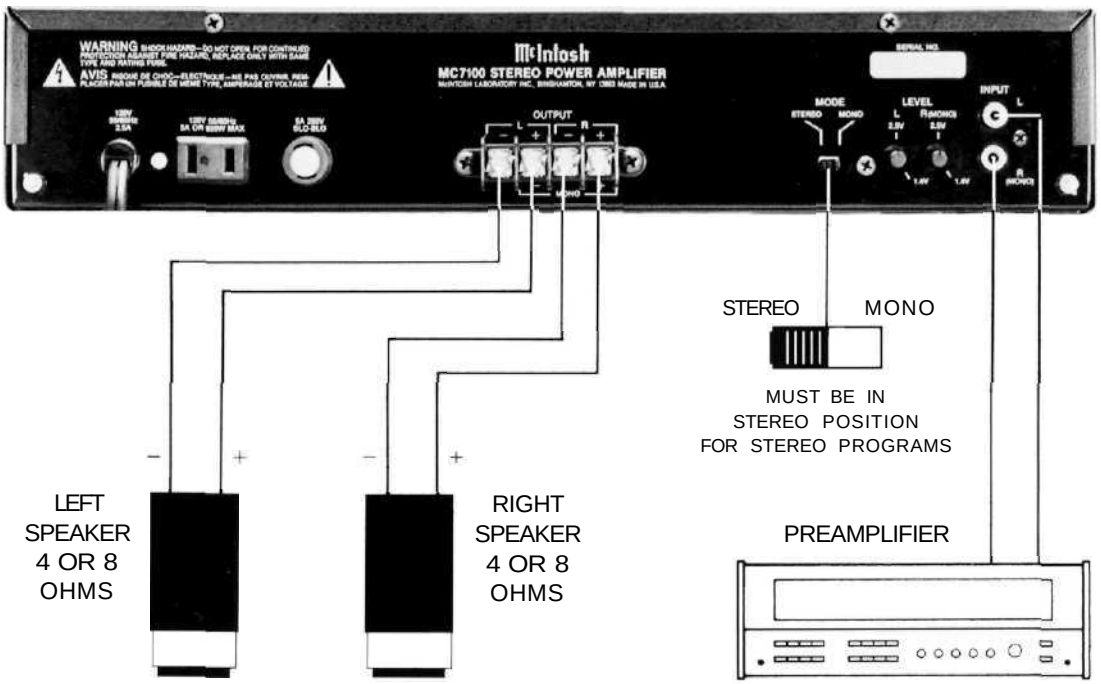
FUSE

A 5 ampere fuse protects the MC7100 circuits. This fuse does not protect the auxiliary AC outlet.

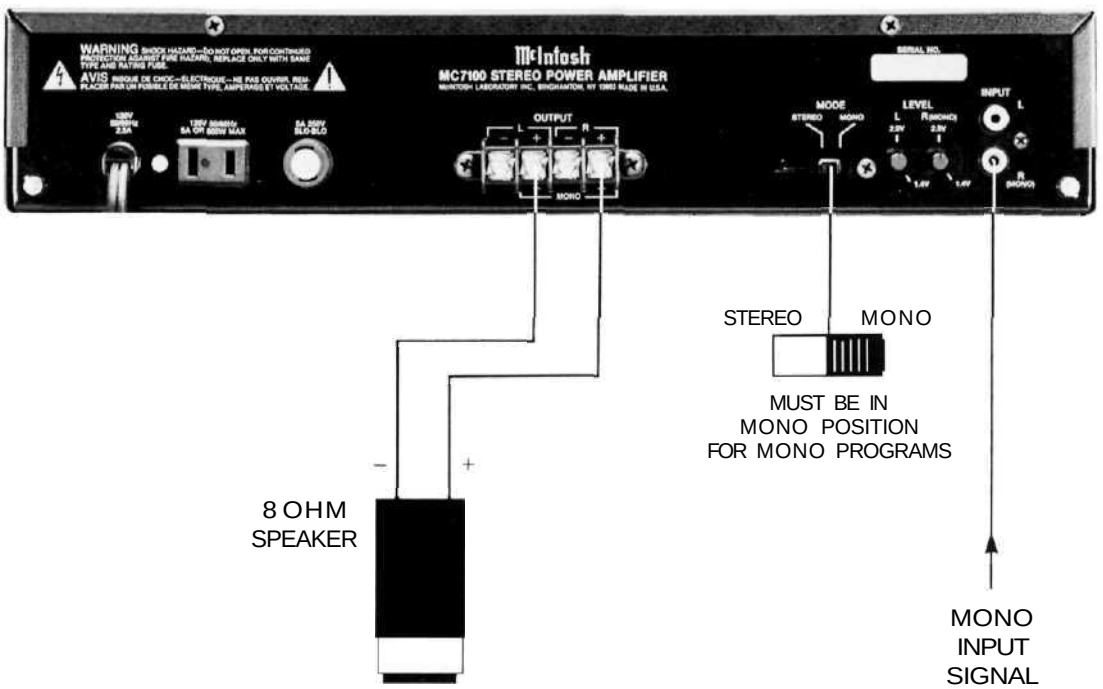
FRONT PANEL

The front panel is the "Classic McIntosh" black glass with back lighted nomenclature. The RED AC power indicator as well as the teal colored panel nomenclature will illuminate when AC power is on. The amber POWER GUARD indicators will flash whenever the POWER GUARD circuit is activated.

STEREO CONNECTION



BRIDGED MONOPHONIC CONNECTION



SPECIFICATIONS

PERFORMANCE LIMITS

Performance limits are the maximum deviation from perfection permitted for a McIntosh instrument. We promise you that when you purchase a new MC7100 from a McIntosh Franchised Dealer, it will be capable of performance at or better than these limits.

STEREO POWER OUTPUT

150 watts into 4 ohm loads or 100 watts into 8 ohm loads minimum sine wave continuous average power output per channel, both channels operating.

The output RMS voltage is:

28.3V across 8 ohms

24.5V across 4 ohms

MONOPHONIC (BRIDGED)

300 watts into an 8 ohm load minimum sine wave continuous average power output. The output RMS voltage is: 49 volts across 8 ohms.

OUTPUT LOAD IMPEDANCE

STEREO

8 or 4 ohms

MONOPHONIC

8 ohms

RATED POWER BAND

20Hz to 20,000Hz

TOTAL HARMONIC DISTORTION

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

IHF DYNAMIC HEADROOM

8 ohms, 1.7dB

4 ohms, 2.1dB

FREQUENCY RESPONSE

+0, -0.25dB from 20Hz to 20.000Hz

+0, -3.0dB from 10Hz to 100,000Hz

INPUT SENSITIVITY

1.4 volts (2.5 volts at gain control center detent)

A-WEIGHTED SIGNAL-TO-NOISE RATIO

95dB (115dB below rated output)

INTERMODULATION DISTORTION. SMPTE

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

RATINGS

WIDE BAND DAMPING FACTOR

8 ohms, 200

4 ohms, 100

INPUT IMPEDANCE

20,000 ohms

POWER GUARD

Clipping is prevented and THD does not exceed 2% with up to 14dB overdrive at 1000Hz.

POWER REQUIREMENTS

120 volts, 50/60HZ, 3.0 amps UL/CSA

MECHANICAL

SIZE

Front panel: 17 1/2 inches (44.5cm) wide, by 3 5/8 inches (9.2cm) high.

Chassis: 14 3/4 inches (37.5cm) wide, by 2 3/8 inches (6cm) high, by 14 1/2 inches (36.9cm) deep, (from back of front panel), including connectors. Panel clearance required in front of the mounting surface is 1 inch (2.54cm).

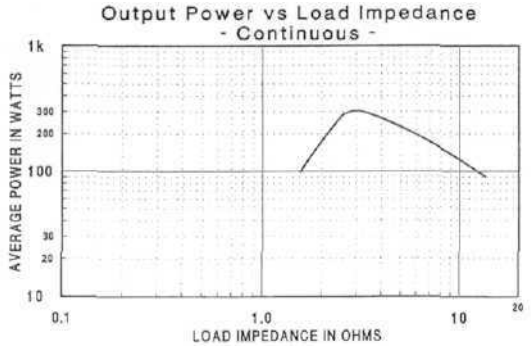
FINISH

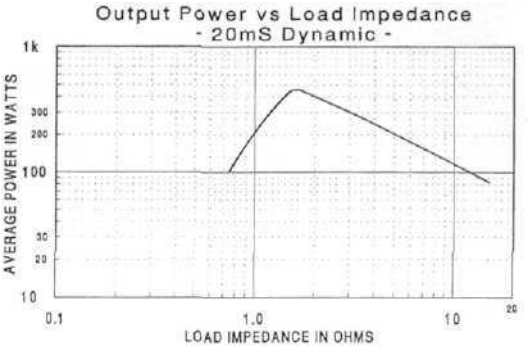
Glass with special gold/teal nomenclature illumination. Chassis and chassis cover are black.

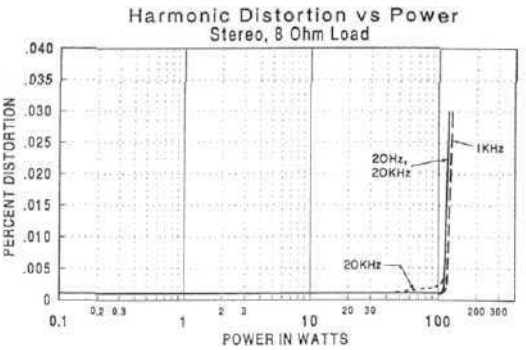
WEIGHT

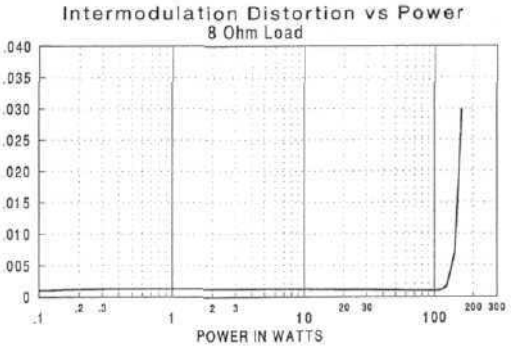
24 pounds (11 Kg) net; 35 pounds (15.9Kg) in shipping carton.

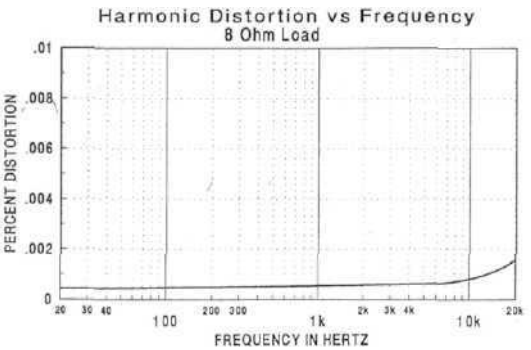
PERFORMANCE CHARTS

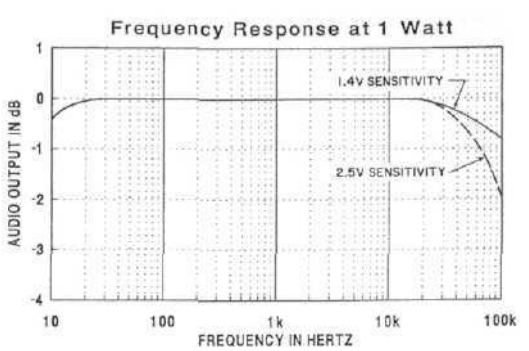












TECHNICAL DESCRIPTION

DESIGN PHILOSOPHY

The MC7100 stereo power amplifier is designed to operate loudspeakers with a nominal impedance of 4 to 8 ohms. It features a new circuit design that keeps distortion levels so low it takes special test gear for accurate measurements.

The design philosophy that resulted in the outstanding performance of this amplifier involved several different techniques. Every stage of voltage or current amplification was designed to be as linear as possible prior to the use of negative feedback,

1. Each transistor is selected to have nearly constant current gain (Beta) over its entire operating range.

2. The load impedance presented to each amplification stage is made as uniform as possible for all signal levels.

3. The input impedance of each amplifier stage is increased and made more linear by using emitter degeneration whenever possible.

4. Resistors and capacitors in the signal path are carefully selected to have exceedingly low voltage coefficients (change of resistance or reaction 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 together with the automatic tracking bias system eliminate crossover distortion.

PROTECTION CIRCUITS

Some manufacturers of power amplifiers claim that their products do not need or use protection circuits and that such circuits compromise performance. McIntosh feels that protection circuits are desirable and necessary to prevent amplifier or loudspeaker damage due to abnormal circumstances. The genius of McIntosh engineering has resulted in protection circuits which have no effect or compromise on the normal performance of a power amplifier. The SENTRY MONITOR circuit is a good example. The MC7100 incorporates seven specific protection circuits to enhance its performance, increase its reliability and protect loudspeakers.

SENTRY MONITOR CIRCUIT

All power transistors have limits for the maximum amount of power they can handle. The MC7100 output transistors and power supply have been designed to allow very high current flow into properly matched load impedances. However, if a short circuit or very low load impedance is connected to the MC7100 outputs, 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 output stage, and controls it to safe operating limits. The SENTRY MONITOR circuit does not limit the power output available from the amplifier.

THERMAL CONTROL

All power transistors have limits to the maximum amount of heat they can safely tolerate. The MC7100 uses a highly efficient amplifying circuit which produces relatively little heat for the output power produced. The amplifier uses large area heat sinks to efficiently dissipate what heat it does generate. Natural convection air flow is sufficient for safe cool operation.

If the cooling air is blocked, or the amplifier operating temperature is forced too high, thermal cutout switches will turn off the speakers. Both POWER GUARD indicators will light continuously to show that thermal protection is operating. When the problem is corrected and

the amplifier cools down to its normal operating temperature, the speakers will be turned back on.

DIRECT CURRENT FAILURE PROTECTION

A protection circuit is provided that turns off the speakers if for any reason a DC voltage should appear at the output terminals. This prevents possible speaker damage.

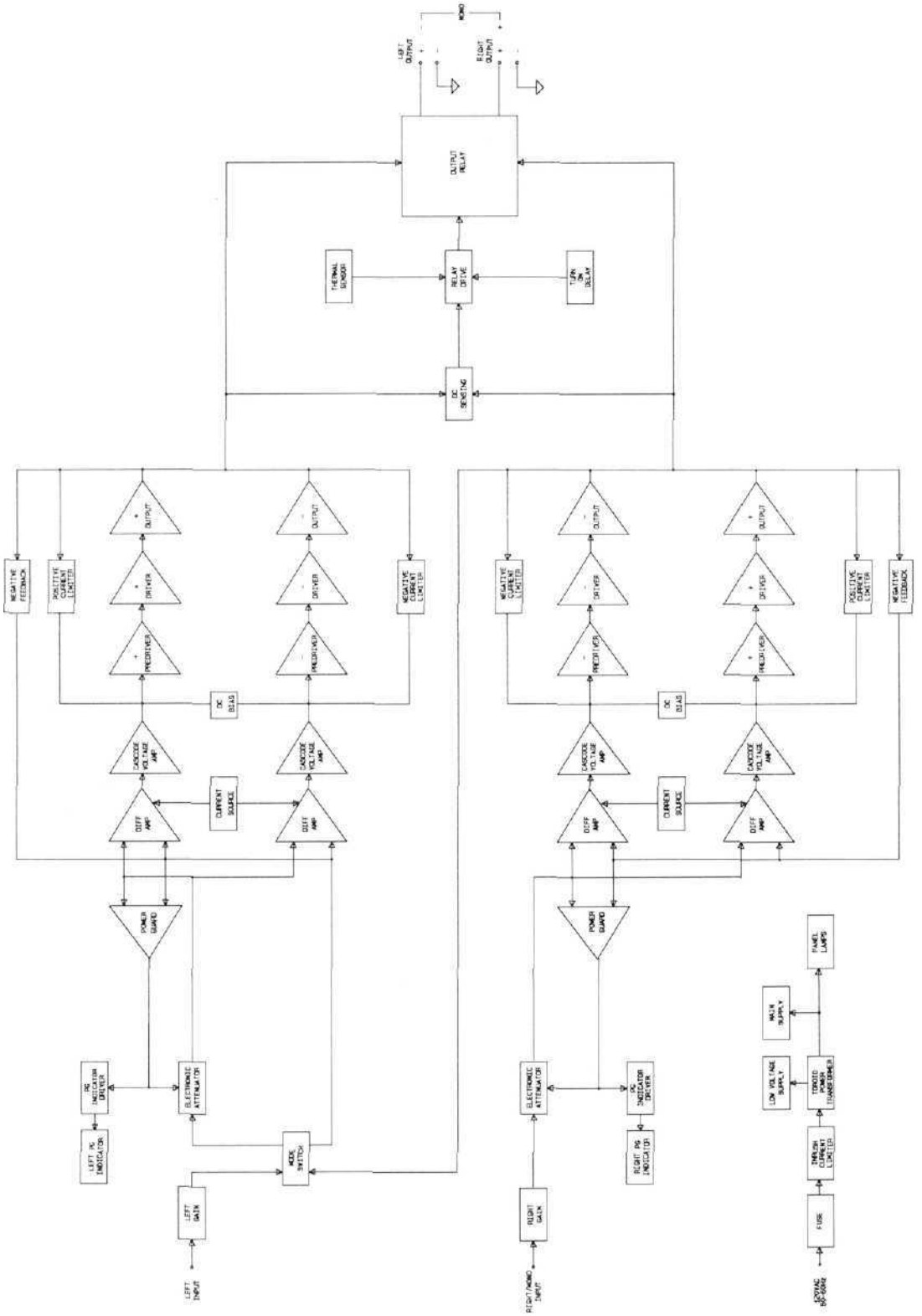
POWER GUARD

A unique and patented feature of McIntosh power amplifiers insures that each channel of the MC7100 will deliver full power, free of clipping distortion. Clipping occurs when an amplifier is overdriven past its output design capabilities. An overdriven amplifier can produce both audible and ultrasonic distortion levels approaching 40%. The audible distortion is certainly unpleasant, but the ultrasonic distortion is also undesirable, since it can damage tweeter loudspeakers.

The POWER GUARD circuit acts as a waveform comparator, monitoring both the input and output waveforms. Under normal operating conditions there are no differences between these waveforms. When an amplifier is overdriven beyond its maximum distortion free output, then there will be a difference between the two waveforms. If the difference exceeds 0.3% (equivalent to 0.3% harmonic distortion), the amber POWER GUARD indicator will light. If the difference continues to increase, the POWER GUARD circuit controls an electronic attenuator at the input to reduce the gain of the amplifier just enough to prevent any further increase in distortion. Distortion will not exceed 2% with as much as 14dB overdrive.

A McIntosh power amplifier with POWER GUARD will always deliver its maximum distortion free output. This power is always well above the rated power due to the McIntosh philosophy of conservative design. You will never experience the harsh and damaging distortion due to clipping when using a McIntosh POWER GUARD amplifier.

BLOCK DIAGRAM



McINTOSH LABORATORY INC.
2 CHAMBERS STREET, BINGHAMTON, NEW YORK 13903-2699