

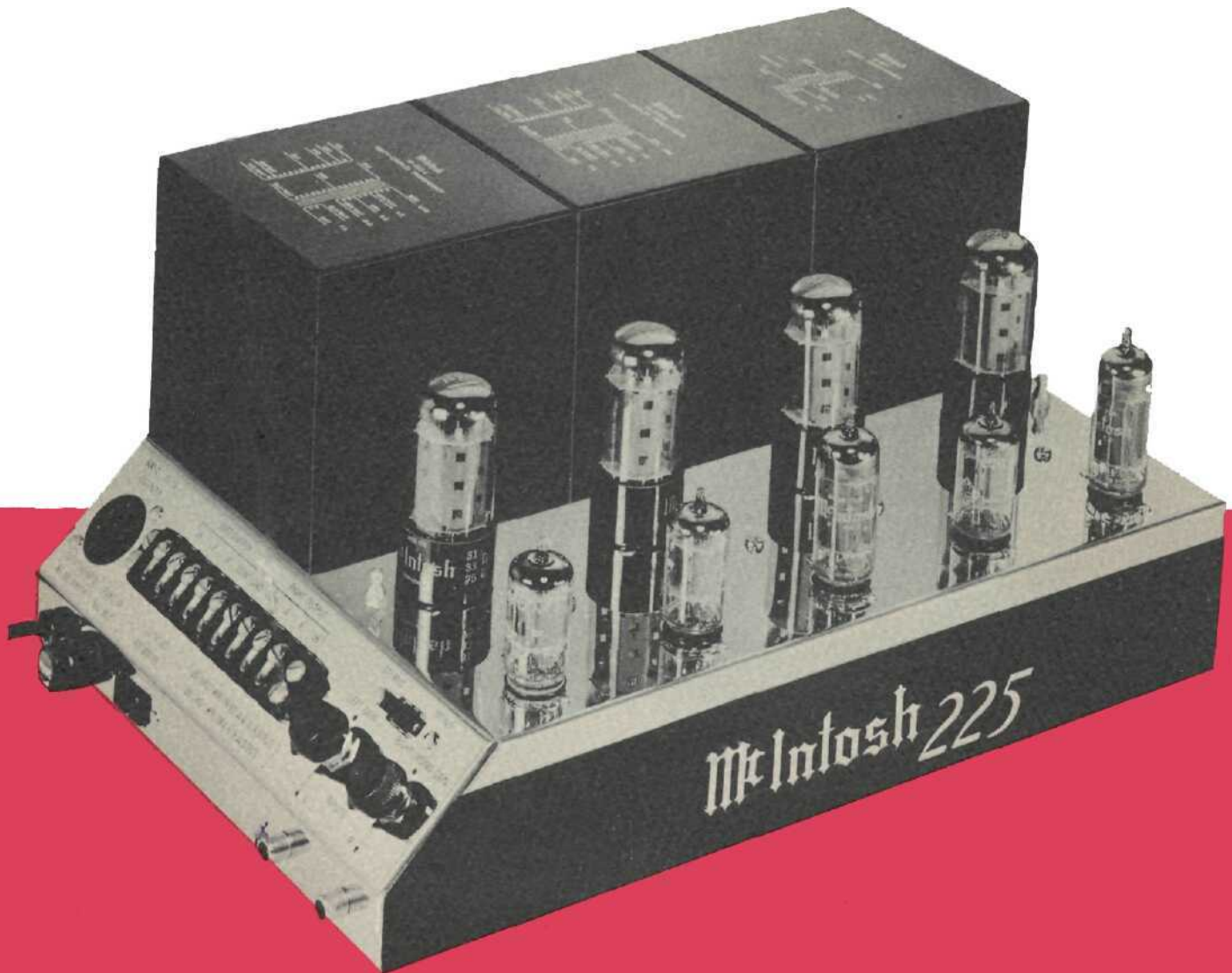
# McIntosh

## STEREO POWER AMPLIFIER

# MC225

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# OWNER'S MANUAL

Reading Time 20 Minutes

Price \$1.25

MC225  
ISSUE NO. 1



# MC225 POWER AMPLIFIER

## GENERAL DESCRIPTION

Over one million watts of amplifier output power capacity have been manufactured by McIntosh since 1947. In this 1,000,000 watts of audio power there are less than 10 watts of distortion capacity and less than 1/100 watt of noise capacity!

The dramatic difference in the quality of music reproduction when you listen through McIntosh instruments is directly due to low distortion performance. Careful, devoted research is a way of life at McIntosh. The world's finest amplifier is the creation of persevering, resourceful McIntosh engineers. McIntosh Laboratory is the only manufacturer in the entire industry to guarantee the lowest distortion at all audio frequencies, at full power. The U.S. Patent Office has recognized the advanced technology of the McIntosh circuit by granting 6 patents.<sup>1</sup>

Long life, flexibility, highest quality construction are characteristic designs in every McIntosh instrument. Wide electrical and thermal margins of safety for all components and tubes, advanced engineering, and cool operating design add to the long life built into every McIntosh product. Reliability prolongs your investment without expensive maintenance costs.

The MC225 has on one chassis two 25 watt power amplifiers. In addition to use as a stereo amplifier, the flexibility of the MC225 permits it to be used as a monophonic amplifier that delivers 50 watts, or as two separate 25 watt amplifiers with each channel amplifying completely separate programs, or as two amplifiers for use with an electronic crossover network. Such flexibility permits maximum use for greatest return from your investment.

## TECHNICAL DESCRIPTION

The patented McIntosh Unity Coupled circuit and output transformer have established McIntosh amplifiers as the unchallenged leaders in the audio field.

Before 1947, low distortion at high power and high efficiency was impossible. A completely new engineering approach resulted in an amplifier that for the first time permitted high power with distortion below 1%. That new engineering produced the McIntosh Unity coupled circuit and the McIntosh bifilar wound output transformer. With the introduction of the McIntosh amplifier new standards for distortion-free performance were established.

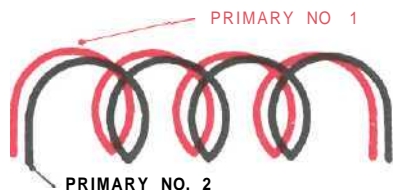


Fig. 1—Representation of bifilar winding.

The McIntosh output transformer is unique. It has two primary windings which are wound bifilarly. In the bifilar technique both primary wires are wound side by side. Each

turn of primary number one is next to the same turn of primary number two. There is almost complete magnetic coupling between the two wires. The magnetic coupling is reinforced by the capacitance between the two wires.

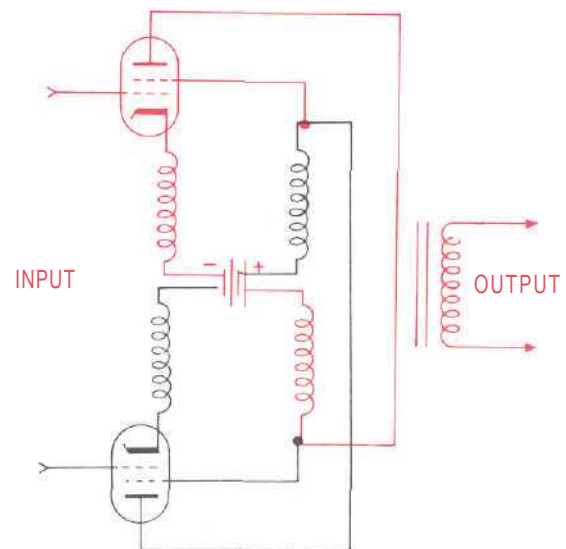


Fig. 2—Representation of McIntosh output circuit.

<sup>1</sup>U.S. Patent No's: 2,477,074; 2,545,788; 2,646,467; 2,654,058; 2,860,192; 2,929,028.

In the McIntosh Unity Coupled circuit one of the bifilar primary windings is connected through the power supply to the plate and cathode of one of the output tubes. The other bifilar primary winding is similarly connected to the other tube.

All low distortion high power amplifiers use push-pull output circuits known as Class AB<sub>1</sub>, AB<sub>2</sub> or B. Two tubes are arranged in a balanced circuit. This permits each tube to operate alternately somewhat over half the time. Compared to full time operation of the tubes, the push-pull method reduces heating and permits more power from a given type of tube. Despite this advantage of the conventional push-pull circuit one problem in particular remained to be solved. When current in each tube is cut off to begin the idle period distortion is produced at the instant of cut off and again at the instant when current flows. This form of distortion is known as Notch Distortion and was well illustrated by Mr. Pen Tung Sah in the "Proceedings of the I.R.E." Volume 24, pp 1522-1541 in 1936.

Imperfect coupling between the primary windings found in all conventional output transformers produces the notch distortion. Trying to improve coupling in a conventional transformer decreases the power response at both low and high frequencies, heating the output tubes and lowering the available power output.

The McIntosh Unity Coupled output circuit and bifilar transformer is the first commercial breakthrough that eliminates notch distortion by coupling both output tubes almost to perfection. In the McIntosh trans-

former the extremely close coupling of the bifilar windings removes the condition which permits notch distortion. Furthermore the two output tubes are arranged as partial cathode followers. Half of the output circuit is in the cathode and half in the plate of each tube. The output tubes now are operating in a local feedback loop which, reduces their distortion, reduces their internal generator resistance, and reduces their balance requirements. The McIntosh circuit in reality perfects push-pull high efficiency output circuits.

Good voltage regulation in the power supply permits overloads without overshoot or blocking, provides good transient response, and complete stability. To improve regulation a silicon rectifier power supply is used in the MC225. In addition to better voltage regulation, the silicon rectifier allows even higher operating efficiency, cooler operation, and longer amplifier life.

To greatly extend tube and component life a thermistor in the MC225 limits current surges produced when the equipment is turned on. The thermistor is a special type of resistor. Its resistance depends on its temperature. When the amplifier is off the thermistor has a high resistance value (about 79 ohms). Just after the amplifier is turned on the current which flows through the thermistor heats it and causes its resistance to decrease to a low value (less than .7 ohms). Current is thus limited when the MC225 is first turned on but is not limited as the unit warms.

## ELECTRICAL SPECIFICATIONS

### **Power Output:**

Stereo or twin amplifier: 25 watts continuous per channel

Monophonic: 50 watts continuous

### **Harmonic Distortion:**

Less than 0.5% at rated output or less,

20 cycles through 20,000 cycles. Typical performance is 0.3% or less at 20 cycles and 20,000 cycles at full power. Typical performance in the mid frequencies is 0.1% or less at full power.

**Intermodulation Distortion:**

Less than 0.5% for any combination of frequencies from 20 cycles through 20,000 cycles if instantaneous peak power is below twice the rated power.

**Phase Shift:**

Less than  $\pm 15^\circ$  20 cycles through 20,000 cycles

**Frequency Range:**

At rated output:

+0, -0.1 db 18 cycles through 30,000 cycles

+0, -0.5 db 18 cycles through 60,000 cycles

At one-half rated output:

+0, -1 db 14 cycles through 100,000 cycles

**Noise and Hum:**

90 db or more below rated output

**Output Impedance:****Stereo or Twin Amp:**

(Center tap internally grounded) 600 ohms  
(One side internally grounded) 4 ohms, 8 ohms, 16 ohms, 150 ohms, 200 ohms

**Mono:**

(Center tap internally grounded) 300 ohms

(One side internally grounded) 75 ohms, 100 ohms

**Output Voltages:** One side grounded**Stereo (or twin amplifier):**

25 and 70.7 volts

**Mono (single channel):**

25 and 70.7 volts

**Internal Impedance:**

Less than 10% of rated load impedance

**Input:**

Input impedance: 250,000 ohms

Input sensitivity: 0.5 volts to 30 volts through gain control. 2.0 volts with gain control turned to dot indicator.

**Power Requirements:**

117 volts AC, 50/60 cps

Uses 200 watts at rated output; 85 watts at zero signal output.

**Fuse**

2.0 Amp Slo Bio

**Tube Complement:**

Voltage Amplifier—1 ea. 12AX7

Phase Inverter—2 ea. 12AU7

Drive Amplifier—2 ea. 12BH7

Output—4 ea. 7591

## MECHANICAL SPECIFICATIONS

**Dimensions:**

Chassis dimensions: 14½" long x 9<sup>1</sup>/<sub>8</sub>" wide x 7" high. (See INSTALLATION on Page 5 for minimum mounting space.)

**Weight:**

Chassis only—34 pounds. In shipping carton—39 pounds.

**Finish:**

Chrome and Black

**Accessories Supplied:**

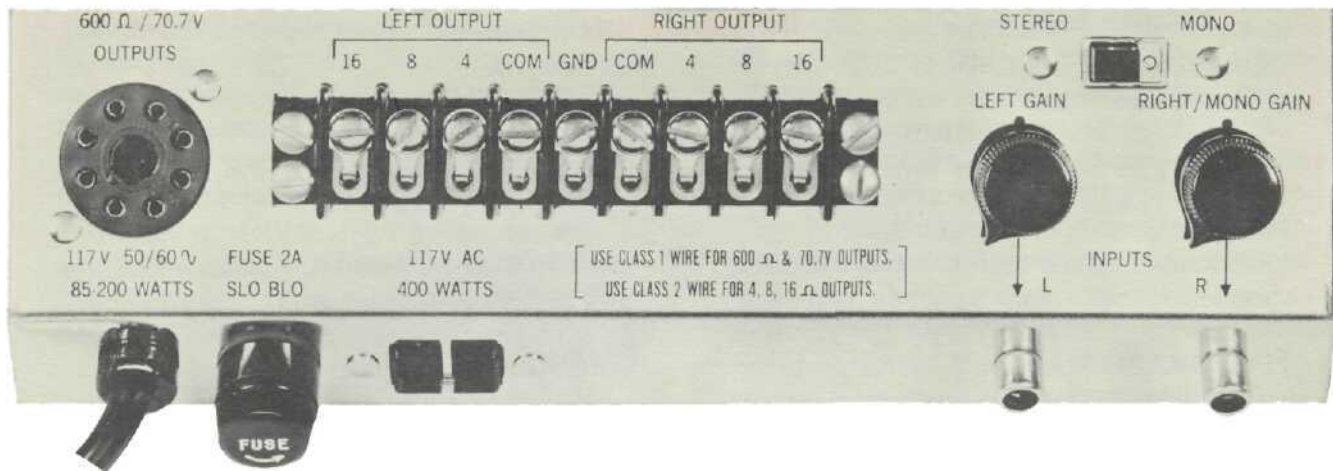
Instruction Manual

Mounting Template

Mounting Flanges

Octal output plug with cap





## PANEL FACILITIES

Fig. 3—End panel showing all input and output facilities.

### INPUT

The input of the MC225 has a two position lever switch to permit the amplifier to be used in one of two ways:

- (1) As a monophonic 50 watt amplifier
- (2) As twin 25 watt amplifiers used with an electronic crossover network, or two completely separate amplifiers, or in stereo applications.

With the input switch in the "Stereo" position the input marked "L" and the input marked "R" both have sensitivities of 0.5 volts when their gain controls are set fully clockwise. The input impedance of each is 250,000 ohms. Each gain control allows signal sources with output from 0.5 volts to 30 volts to be connected without overloading the input to the amplifier. The controls are set for 2.0 volts sensitivity by turning them to the dot indicator.

With the input switch in the "Mono" position the control marked "Right Mono Gain" sets the input sensitivity at the input marked "R."

The MONO position of the input switch parallels the inputs to both amplifiers. When the outputs are properly connected the MC225 becomes a 50 watt monophonic amplifier. The MONO input GAIN control permits connecting signal sources up to 30 volts without overloading the amplifier's input: The input impedance is 250,000 ohms.

### OUTPUT

The two barrier terminal strips marked OUTPUT provide stereo connections for the normal speaker impedances of 4 ohms, 8 ohms, and 16 ohms. For monophonic operation connections for 2 ohms, 4 ohms, 8 ohms,

and 16 ohms are provided. The terminal strips may also be connected for a constant voltage output of 25 volts in either stereo or mono.

As supplied, the secondary of the MC225 is grounded.

The barrier strip output connections are fed from the secondary of the output transformer.

### LINE OUTPUT (See also pages 5, 6, and 7)

The octal socket marked LINE OUTPUT has connections for 25 volts, 70.7 volts, and 600 ohms for stereo operation and 300 ohms for monophonic operation.

The 600 ohm winding and the 300 ohm winding are balanced to ground. Pin 1 of the octal socket is the center tap for these windings and is grounded.

The connections at the octal socket are fed from taps on the cathode winding in the primary of the output transformer.

### FUSE

The MC225 uses a 2.0 ampere slo-blo type fuse. The auxiliary AC socket is not fused.

### AC OUTLET

The auxiliary AC outlet can be used to supply power to other equipment in the system. The outlet will provide a maximum of 400 watts of power. The AC outlet is not fused.

### LINE VOLTAGE

The MC225 operates on line voltages between 105 volts to 130 volts, 50 cycles to 60 cycles.

## INSTALLATION

Adequate ventilation should always be provided in the installation of electronic instruments. The trouble free life of these instruments can be extended by adequate ventilation. It is generally found that each 10° centigrade (18°F) rise in temperature reduces the life of electrical insulation by one half. Adequate ventilation is an inexpensive and effective means of preventing insulation breakdown because of unnecessarily high operating temperatures. The direct benefit of adequate ventilation is longer, trouble free life.

The suggested minimum space for mounting the MC225 is 16" long x 10" wide x 10" high. Always supply ventilation holes in the bottom of the amplifier mounting space and a means for the warm air to escape at the top.

The MC225 can be mounted in any position except upside down. If the amplifier is to be installed on a vertical surface it is recommended that the transformers be on the down side. The advantage of this position is that the flow of heat from the tubes rises vertically and does not tend to heat the transformers.

if the MC225 is to be permanently mounted use the two mounting flanges supplied with the amplifier. The flanges are shipped separately and must be attached to the amplifier bottom at each end.

Turn the MC225 over with the transformers down and place it on a piece of cloth or cardboard to prevent scratches. The amplifier is shipped with 4 plastic feet on the bottom cover. Remove the 4 plastic feet. Remove the three self tapping screws at one end of the amplifier that hold the bottom cover to the chrome chassis. Place the

square edge of the mounting flange with the three round holes positioned over the three holes in the bottom cover. The three holes in the mounting flange will line up over the three holes in the chassis. Replace the three self tapping screws through the mounting flange and bottom cover. The mounting flange is now firmly attached to the amplifier. Repeat the same procedure to install the mounting flange on the other end of the amplifier.

Place the MC225 mounting template on the area where the amplifier is to be mounted. Center punch the 4 slotted holes in the mounting flanges shown on the template. Remove the template and install four #10 round head screws in the center punch marks. Do not tighten these screws. Place the amplifier over the screw heads and slide the amplifier to either side in the slotted holes in the mounting flanges. The #10 wood screws can then be tightened securely.

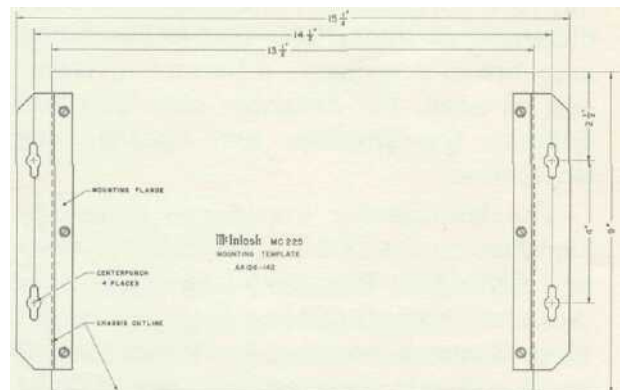


Fig. 4 Bottom of MC225 with mounting flanges attached.

## CONNECTING THE MC225

### INPUT-STEREO OR TWIN AMPLIFIER

The shielded cable from the left output of the McIntosh preamplifier is plugged into the jack marked INPUT-L. The shielded cable

from the right output of the McIntosh preamplifier is plugged into the jack marked STEREO INPUT-R. The input switch is moved to "Stereo."

## INPUT-MONO

The shielded cable from the program source is plugged into the jack marked INPUT-R and the input switch moved to "Mono."

## OUTPUT-STEREO OR TWIN AMPLIFIERS

For stereo or twin channel operation it is not necessary to use the same value of load impedance on each output. Simply connect each output for the impedance desired.

Warning: Do not parallel the amplifier outputs when using the amplifier as a stereo amplifier or twin channel amplifier. Damage to the output tubes may result if parallel operation is attempted when the output voltages are not the same phase and amplitude.

Speakers are connected at the barrier strips marked OUTPUT on the left end of the panel.

In compliance with the National Electrical Code, Class II wiring can be used between the speaker and the amplifier at the 4 ohm, 8 ohm, or 16 ohm connection. Class II wiring is lamp cord, bell wire, or other wire with this type of insulation. For the normally short distances of under 100 feet between the amplifier and speaker, #18 wire or larger can be used. For distances over 100 feet between the amplifier and speaker use larger wire.

The loudspeaker impedance is usually identified on the loudspeaker itself. Connect one of the leads from the left loudspeaker to the screw marked COM on the LEFT barrier strip. Connect the other lead from the left loudspeaker to the screw marked with the number corresponding to the speaker impedance on the LEFT barrier strip.

If the speaker impedance is:	Connect one left speaker lead to the screw marked LEFT-COM and the other to:	Connect one right speaker lead to the screw marked RIGHT-COM and the other to:
4 ohms	LEFT-4	RIGHT-4
8 ohms	LEFT-8	RIGHT-8
16 ohms	LEFT-16	RIGHT-16

The only adverse effect on the operation of a McIntosh amplifier when it is improperly matched is a reduction in the amount of distortion-free power available to the loudspeaker. Close impedance matching is de-

sirable for maximum distortion-free power.

Use this table to determine proper speaker connections:

If the speaker impedance is between:	Connect the speaker leads between COM and:
3.2 to 6.5 ohms	4 ohms
6.5 to 13 ohms	8 ohms
13 to 26 ohms	16 ohms

## OUTPUT-MONOPHONIC

When the MC225 is to operate as a 50 watt monophonic amplifier, the outputs of the two channels combine to produce a single 50 watt output. This chart lists the proper connections and interconnections for monophonic operation.

If the speaker impedance is:	Connect one speaker lead to the screw marked LEFT-COM and the other to:	Connect a wire between:	Connect another wire between:
2 ohms	LEFT-4	LEFT-COM and RIGHT-COM	LEFT-4 and RIGHT-4
4 ohms	LEFT-8	LEFT-COM and RIGHT-COM	LEFT-8 and RIGHT-8
8 ohms	LEFT-16	LEFT-COM and RIGHT-COM	LEFT-16 and RIGHT-16

When connected as outlined the MC225 operates as a 50 watt monophonic amplifier.

## LINE OUTPUT-STEREO or TWIN AMPLIFIERS

The octal socket marked LINE OUTPUT has connections for 70.7 volts, 200 ohms and 600 ohms. The 25 volt line is fed from the barrier strips.

For 25 volt line operation connect one of the left leads to the screw marked COM on the LEFT barrier strip. The other left lead is connected to the screw marked 16 on the LEFT barrier strip. Connect the right leads in the same manner on the RIGHT barrier strip.

The 200 ohm and 70.7 volt connections are the same. To connect for 200 ohm or 70.7 volt operation the octal plug supplied in the hardware bag is used. Solder one of the left leads to pin #7 and the other to pin #1. Solder one of the right leads to pin #8 and the other to pin #1. Pin #1 is the ground side.

The 600 ohm connections for the left side are made between pin #2 and pin #3. The 600 ohm connections for the right side are made between pin #4 and pin #5. The 600 ohm winding is balanced to ground. Pin #1 on the octal socket is the center tap of the 600 winding. Pin # 1 is grounded.



For all applications using 600 ohms use Class I wiring if the installation must meet the requirements of the National Electrical Code.

### **LINE OUTPUT-MONOPHONIC**

The octal socket marked LINE OUTPUT has connections for operating the MC225 monophonically at 70.7 volts, 100 ohms or 300 ohms. For operating at 25 volts connections are made at the barrier strips.

To feed a 25 volt line, connect one side to the screw marked COM on the LEFT barrier strip. Connect the other side to the screw marked 16 on the LEFT barrier strip. Then connect with a wire the screw marked COM on the LEFT barrier strip to the screw marked COM on the RIGHT barrier strip. Connect, with another wire, the screw marked 16 on the LEFT barrier strip to the screw marked 16 on the RIGHT barrier strip.

The 100 ohm and the 70.7 volt connections are the same. To connect for 100 ohms or 70.7 volts solder one of the leads to pin #1 in the octal socket. The other lead is soldered to pin #7. A wire is connected between pin #7 and pin #8.

To connect for 300 ohms one lead is soldered to pin #2. The other lead is soldered to pin #3. Connect pin #2 to pin #4 with a wire. With another wire connect pin #3 to pin #5. Pin #1 is the center tap of the 300 ohm winding. The 300 ohm winding is balanced to ground.

### **AC POWER**

The MC225 operates on 105 volt to 130 volt, 50 to 60 cycles power. The amplifier will be turned on and off if its power cord is plugged in one of the auxiliary AC outlets on the program source.

## **OPERATING THE MC225**

Before turning the MC225 on check all connections and plugs to see that they are firmly and correctly connected. Check to make sure that the tubes are firmly seated

in the proper sockets. After the following adjustments have been completed the MC225 will operate without any further attention.

## **ADJUSTMENTS**

### **INPUT SWITCH-STEREO**

With the input switch in the left position marked STEREO the input of the MC225 is connected to the two jacks marked "L" and "R" INPUT located below the GAIN controls. The amplifier has an input sensitivity in this position of 0.5 to 30 volts.

The two center control knobs marked GAIN should be adjusted to match the input sensitivity of the MC225 to the output voltage of the program source equipment.

To balance a stereo system using the STEREO input position use a monophonic signal from the program source. A monophonic signal supplies the same voltage to both channels. Turn the volume control on the source equipment to the 12 o'clock position (half rotation). Turn up the GAIN control on the LEFT input until the loudness in the room is not quite as loud as you like to

listen. Then turn the GAIN control on the RIGHT input until it is equally as loud as the left channel. The system is now balanced for loudness and provides the most convenient amount of loudness change when using the volume control on the source equipment.

### **INPUT SWITCH-MONO**

With the switch in the right position marked MONO the inputs of the MC225 are internally connected in parallel and to the jack marked "R" INPUT. This jack is located below the right control knob marked "RIGHT MONO GAIN." The input sensitivity in this position is 0.5 volt. The GAIN control should be adjusted to match the input voltage sensitivity of the MC225 to the output voltage of the program source.

For maximum flexibility set the GAIN control as follows: Turn the volume control

on the program source equipment (i.e. tape recorder, tuner, preamplifier, etc.) to the 12 o'clock (half rotation) position. Turn the "RIGHT MONO GAIN" control on the MC225 until the loudness of the sound from the

speaker is just a little louder than you normally like to listen. The volume control on the program source equipment now has the most convenient amount of loudness change in either direction from the 12 o'clock position.

#### **IMPORTANT**

The excellent performance that is inherent in all McIntosh amplifiers does not depend on the critical adjustment of bias or balance controls in the output circuit. The patented McIntosh circuit delivers its advertised specifications without any need for these controls and is not dependent on carefully balanced tubes for its performance. With McIntosh you can install the amplifier and forget it.

The MC225 you have purchased will give you years of pleasant and satisfactory performance. If you have any questions concerning the operation or maintenance of this amplifier please contact:

Customer Service  
McIntosh Laboratory, Inc.  
2 Chambers Street  
Binghamton, New York

Our telephone number is 723-5491.

The direct dial area code is 607.

#### **GUARANTEE**

McIntosh Laboratory Incorporated guarantees this equipment to perform as advertised. We also guarantee the mechanical and electrical workmanship and components of this equipment to be free of defects for a

period of 90 days from date of purchase. This guarantee does not extend to components damaged by improper use nor does it extend to transportation to and from the factory.

#### **3-YEAR FACTORY SERVICE CONTRACT**

An application for a FREE 3-YEAR FACTORY SERVICE CONTRACT is included in the pocket in the back cover of this manual. The FREE 3-YEAR FACTORY SERVICE CONTRACT will be issued by McIntosh Laboratory upon receipt of the completely filled out application form. The term of this contract is defined

in the 3-year factory service contract. If the application is not mailed to McIntosh Laboratory only the services offered under the standard 90-day guarantee will apply on this equipment. TAKE ADVANTAGE OF 3 YEARS OF FREE FACTORY SERVICE BY FILLING IN THE APPLICATION NOW.

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22 Front Street West  
Toronto, Canada

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