

McIntosh

STEREO POWER AMPLIFIER

MC240

TABLE OF CONTENTS

GENERAL DESCRIPTION	1	CONNECTIONS	5
TECHNICAL DESCRIPTION	1	Input—Stereo.....	5
Electrical Specifications.....	2	Input—Twin Amp.....	5
Mechanical Specifications.....	3	Input—Mono.....	6
PANEL FACILITIES	4	Output—Stereo or Twin Amp.....	6
Input.....	4	Output—Mono.....	6
Stereo Preamp Power.....	4	Line Output—Stereo or Twin Amp.....	6
Output.....	4	Line Output—Mono.....	7
Line Output.....	4	AC Power.....	7
Fuse.....	5	OPERATION	7
AC Outlet.....	5	ADJUSTMENTS	7
Line Voltage.....	5	Line Voltage.....	7
INSTALLATION	5	Input Switch.....	7
		GUARANTEE	8



OWNER'S MANUAL

ISSUE NO. 1 READING TIME 20 MINUTES

MC240 STEREO 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.¹

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 MC240 has on one chassis two 40 watt power amplifiers. In addition to use as a stereo amplifier, the flexibility of the MC240 permits it to be used as a monophonic amplifier that delivers 80 watts, or as two separate 40 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.

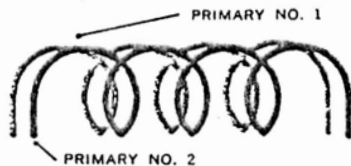


Fig. 1—Representation of bifilar winding.

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.

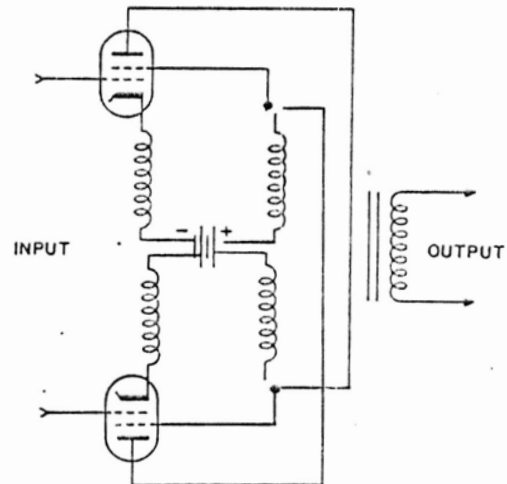


Fig. 2—Representation of McIntosh output circuit.

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

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 $\pm 6^\circ$ 20 cycles through 20,000 cycles

Frequency Range:

At rated output:

+0, -0.1 db 16 cycles through 40,000 cycles

+0, -0.5 db 16 cycles through 60,000 cycles

At one-half rated output:

+0, -1 db 10 cycles through 100,000 cycles

Noise and Hum:

90 db or more below rated output

Output Impedance:

Stereo or Twin Amp:

(Isolated from ground) 4 ohms, 8 ohms, 16 ohms

(Center tap internally grounded) 600 ohms

(One side internally grounded) 125 ohms

Mono:

(Isolated from ground) 2 ohms, 4 ohms, 8 ohms, 16 ohms, 32 ohms

(Center tap internally grounded) 300 ohms

(One side internally grounded) 62 ohms

Output Voltage:

Stereo or Twin Amp:

(Isolated from ground) 25 volts

(Center tap internally grounded) 140 volts

(One side internally grounded) 70.7 volts

Mono:

(Isolated from ground) 25 volts

(Center tap internally grounded) 140 volts

(One side internally grounded) 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 with input switch in MONO or TWIN AMP position. With the switch in the STEREO position, sensitivity is 2.0 volts through a balance control.

Power Requirements:

105 volts to 130 volts at 50/60 cycles:

145 watts at zero signal output: 270 watts at rated output. The power transformer is tapped for 117 volts and 125 volts.

Tube Complement:

Voltage Amplifier—One 12AX7 (drives both amps)

Phase Inverter—Two 12AU7

Drive Amplifier—Two 12BH7

Cathode Follower Drive—Two 12AX7

Output—Four 6L6GC or 7027A

MECHANICAL SPECIFICATIONS

Dimensions:

Chassis dimensions: 17 $\frac{1}{4}$ " long x 10 $\frac{3}{4}$ " wide x 8" high. (See INSTALLATION on Page 5 for minimum mounting space.)

Weight:

Chassis only—56 pounds. In shipping carton—65 pounds.

Finish:

Chromium and Black

Accessories Supplied:

Owners Manual

Mounting Template

Mounting Flanges

Octal output plug with cap

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 AB₁, AB₂ 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 condition which permits 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 transformer 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.

Leakage inductance (lack of coupling) between the primary and secondary windings of the output transformer limits the high frequency response of an amplifier. The primary and secondary windings of the McIntosh output transformer are interleaved five times to improve coupling. The interleaving is accomplished by winding groups of primary layers, then secondary layers alternately until the total transformer is wound. Interleaving helps to extend the McIntosh power band width to over 100,000 cycles. Since 1947 this new technology has been built into every McIntosh power amplifier.

Good voltage regulation in the power supply permits overloads without overshoot or blocking, good transient response, and complete stability. To improve regulation a silicon rectifier power supply is used in the MC240. 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 MC240 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 MC240 is first turned on but is not limited as the unit warms.

ELECTRICAL SPECIFICATIONS

Power Output:

Stereo or twin amplifier—40 watts continuous per channel

Monophonic—80 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.

PANEL FACILITIES

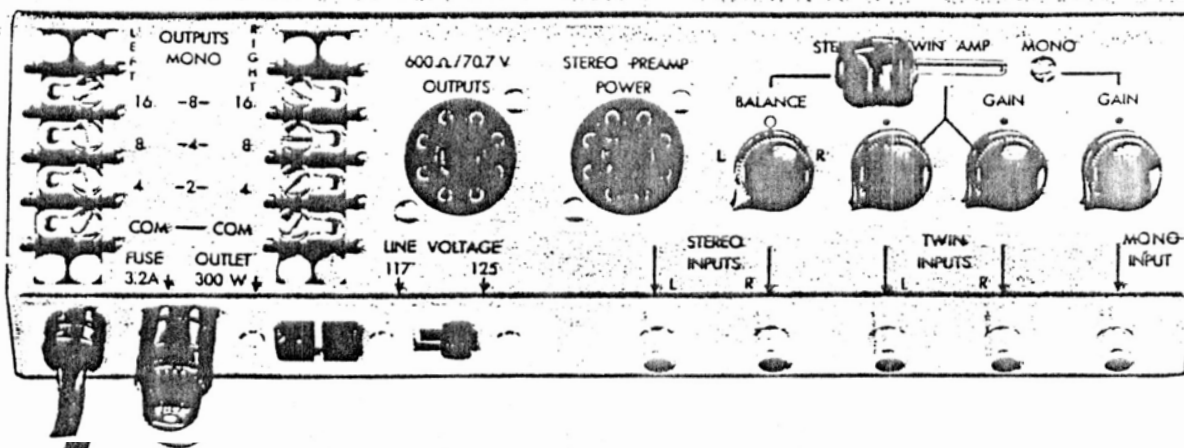


Fig. 3—The end panel of the MC240 showing all input and output facilities.

INPUT

The input of the MC240 has a three position lever switch to permit the amplifier to be used in any one of three ways:

- (1) As a monophonic 80 watt amplifier
- (2) As twin 40 watt amplifiers used with an electronic crossover network, or two completely separate amplifiers, or in stereo applications requiring 0.5 volt sensitivity in the power amplifiers
- (3) As a stereo amplifier used with a McIntosh preamplifier or other high output stereo program sources.

The input marked STEREO has a sensitivity of 2.0 volts controlled by a BALANCE control. The input impedance is 250,000 ohms.

The input marked TWIN AMP has a sensitivity of 0.5 volt. Each TWIN AMP input is controlled by a GAIN control. The GAIN control allows signal sources with output from 0.5 volt up to 30 volts to be connected without overloading the input to the amplifier. The input impedance is 250,000 ohms.

The input marked MONO has a sensitivity of 0.5 volt. The MONO position of the input switch parallels the inputs to both amplifiers. When the outputs are properly connected the MC240 becomes an 80 watt monophonic amplifier. The MONO input has a GAIN control that permits connecting signal sources up to 30 volts without overloading the amplifier's input. The input impedance is 250,000 ohms.

STEREO PREAMP POWER

The octal socket marked STEREO PREAMP POWER supplies B+ and filament voltages for preamplifiers that are not self powered. This socket supplies 375 volts at

15 milliamperes and 25.2 volts center-tapped at 1.2 amperes.

This socket is not wired to supply the power to McIntosh monophonic preamplifiers Model C8 and C4.

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, 16 ohms, and 32 ohms are provided. The terminal strips may also be connected for a constant voltage output of 25 volts in either stereo or mono.

The secondary of the McIntosh output transformer may be operated either grounded or not grounded. As supplied, the secondary of the MC240 is not grounded. If grounding is desirable a wire may be connected between chassis and common of either or both output terminal strips.

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

LINE OUTPUT (See also pages 6 and 7)

The octal socket marked LINE OUTPUT has connections for 70.7 volts, 125 ohms, 140 volts, or 600 ohms for stereo operation. For monophonic operation the octal socket provides connections for 70.7 volts, 62 ohms, 140 volts, or 300 ohms.

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 MC240 uses a 3.2 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 300 watts of power. The AC outlet is not fused.

LINE VOLTAGE

The MC240 operates on any line voltages between 105 volts and 130 volts, 50 cycles to 60 cycles. The switch marked LINE VOLTAGE changes the tap on the primary of the power transformer. The switch can be adjusted at any time.

INSTALLATION

Adequate ventilation extends the trouble-free life of electronic instruments. 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 that results from unnecessarily high operating temperatures. The direct benefit of adequate ventilation is longer, trouble-free life.

The suggested minimum space for mounting the MC240 is 20" long x 14" wide x 10" high. Always allow for air flow either by ventilation holes or space next to the bottom of the amplifier and a means for the warm air to escape at the top.

The MC240 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 MC240 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 MC240 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 chromium 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. The mounting flange on the other end of the amplifier is installed in the same way.

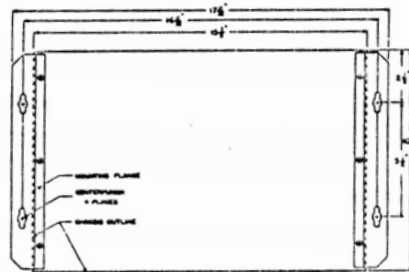


Fig. 4—Bottom of MC240 with mounting flanges attached.

Place the MC240 mounting template on the area where the amplifier is to be mounted. Center punch the mounting shelf through 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 of the mounting flanges. The #10 wood screws can then be tightened securely.

CONNECTING THE MC240

INPUT-STEREO

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

INPUT-TWIN AMP

The shielded cable from the left program source is plugged into the jack marked TWIN INPUT-L. The shielded cable from the right program source is plugged into the jack marked TWIN INPUT-R.

INPUT-MONO

The shielded cable from the program source is plugged into the jack marked MONO INPUT.

OUTPUT-STEREO OR TWIN AMPLIFIERS

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

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 screw 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 desirable 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 MC240 is to operate as an 80 watt monophonic amplifier, the outputs of the two channels combine to produce a single 80 watt output. This chart lists the proper connections and interconnections for monophonic operation.

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.

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
16 ohms	RIGHT-8	RIGHT-COM and LEFT-8	—
32 ohms	RIGHT-16	RIGHT-COM and LEFT-16	—

When connected as outlined the MC240 operates as an 80 watt monophonic amplifier.

LINE OUTPUT-STEREO or TWIN AMPLIFIERS

The octal socket marked LINE OUTPUT has connections for 70.7 volts, 125 ohms and 140 volts or 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 125 ohm and 70.7 volt connections are the same. To connect for 125 ohm or 70.7 volt operation the octal plug supplied in the hardware bag is used. Solder one of the left leads to pin #2 and the other to pin #1. Solder one of the right leads to pin #4 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 MC240 monophonically at 70.7 volts, 62 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 62 ohm and the 70.7 volt connections are the same. To connect for 62 ohms or 70.7 volts solder one of the leads to pin #1 in the octal socket. The other lead is soldered to pin #2. A wire is connected between pin #2 and pin #4.

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 MC240 operates on 105 volt to 130 volt, 50 to 60 cycle 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 MC240

Before turning the MC240 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 MC240 will operate without any further attention.

ADJUSTMENTS

LINE VOLTAGE

The LINE VOLTAGE switch should be set to the position that more closely matches the average line voltage in your area. The local electric power company can usually tell you the average line voltage in your area. If the line voltage is between 105 volts and 120 volts put the LINE VOLTAGE switch in the 117 volt position. If the line voltage is between 120 volts and 130 volts put the switch in the 125 volt position. If the line voltage is unknown, it is safer to operate with the switch in the 125 volt position.

INPUT SWITCH

STEREO

With the input switch in the left position marked STEREO the input of the MC240 is connected to the two jacks marked STEREO INPUT located below the BALANCE control. The amplifier has an input sensitivity in this position of 2.0 volts. This position has been provided to be used with McIntosh preamplifiers or any other high output preamplifiers.

The BALANCE control assists in balancing the overall stereo system for equal loudness. Equal loudness is affected by room acoustics, furniture placement, speakers and many other things. With a monophonic signal adjust this control until both loudspeakers are equal in sound output.

TWIN AMP

With the input switch in the center position marked TWIN AMP, the input of the MC240 is connected to the two jacks marked TWIN INPUT located below the two center control knobs marked GAIN. The input sensitivity in this position is 0.5 volt. This position has been provided for use with a low output stereo preamplifier, an electronic crossover network, or as two completely separated monophonic 40 watt amplifiers.

The two center control knobs marked GAIN should be adjusted to match the input sensitivity of the MC240 to the output voltage of the program source equipment.

To balance a stereo system using the TWIN AMP 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.

MONO

With the switch in the right position marked MONO the inputs of the MC240 are internally connected in parallel to the jack

marked MONO INPUT. This jack is located below the right control knob marked 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 MC240 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 GAIN control on the MC240 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.

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