

QUANTUM AUDIO LABS
MODEL QM-8A
AUDIO CONTROL CONSOLE

INSTRUCTION MANUAL



QUANTUM
AUDIO LABS, INC.

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INTRODUCTION

The QM-8A is a professional mixing console designed for use as a recording/mixdown board or as a sound-reinforcement console on the road or in a night club. Its exceptional performance and reliability are the result of Quantum's careful attention to mechanical as well as electronic design. Its adaptability is a result of well-planned, value-engineered features.

Inputs

There are eight input channels which can be switched to accept either balanced, low impedance microphones, or line-level sources. Each input channel has a low-noise, conductive-plastic fader, a 15 dB switchable microphone input attenuator, two echo send busses, four-band EQ (two controls, switchable frequencies), four program output busses and panning.

Adding accessories or additional input channels is easy. There are three Molex™ connectors on the rear panel; one is for adding extra inputs, and the other two are for use with accessories, including an optional QM-171 patch bay.

Outputs

The output section can be used for live stereo or 4-channel work, and with overdubbing, for larger multi-track recording formats. Each of the four program outputs has its own SUB MASTER control, and a VU Meter. A BOARD MASTER simultaneously controls all four outputs. Two echo returns, with individual level controls, can be switch-assigned into any of the four program outputs. A built-in TALKBACK MIC (with a level control and push-to-talk switch) feeds the headphone mix and the four program outputs. Activating the talkback mic automatically mutes the monitor outputs, thereby avoiding feedback.

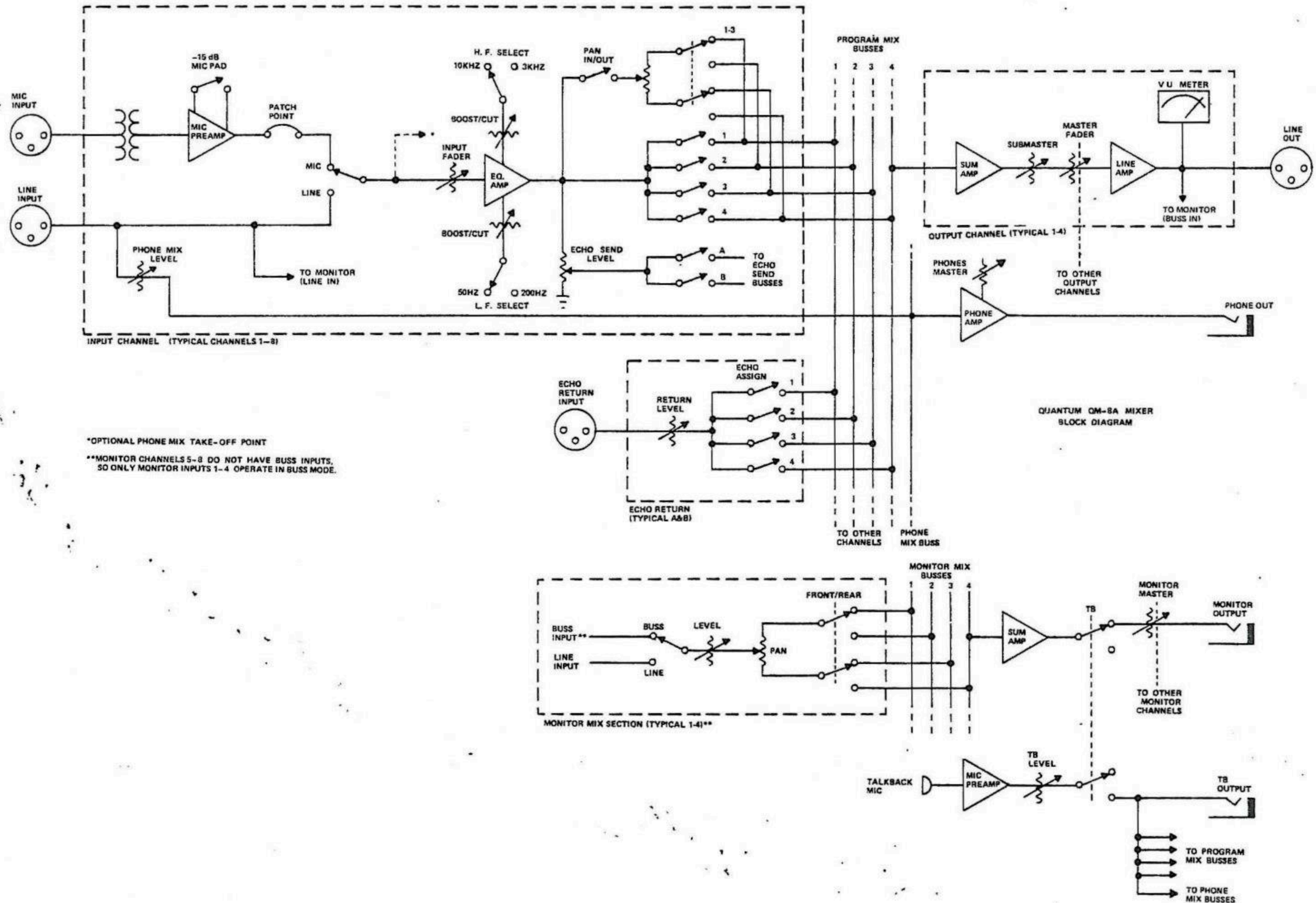
Monitors

The QM-8A's Monitoring system is like a separate mixing console. There are 8 separate MONITOR LEVEL controls, one for each line input. Four of the MONITOR LEVEL controls can be switched to derive signal from the program outputs. Whether signal is taken from the line input or the program output, each monitor signal can be panned left-to-right, and this panning is switch-assignable to the front or rear monitor outputs. A MONITOR MASTER control simultaneously

adjusts all four monitor outputs. This kind of monitoring is just right for preparing a stereo or 4-channel monitor mix from an 8-track tape machine. An independent headphone cue system, with 8 separate level controls (one for each line Input), further enhances the monitoring flexibility.

Value Engineering

The QM-8A is the product of more than five years of field experience and evaluation, coupled to Quantum's know-how in the design and manufacturing of professional audio systems. The QM-8A represents Quantum's successful execution of an idea: to develop a professional mixer with the performance and features of a larger, sophisticated studio console but at a substantially lower cost. The QM-8A is four mixers in one: a recording mixer, a mixdown board, or a reinforcement mixer that is right for the road or in the club.



QM-8A Block Diagram (Single-Line diagram)

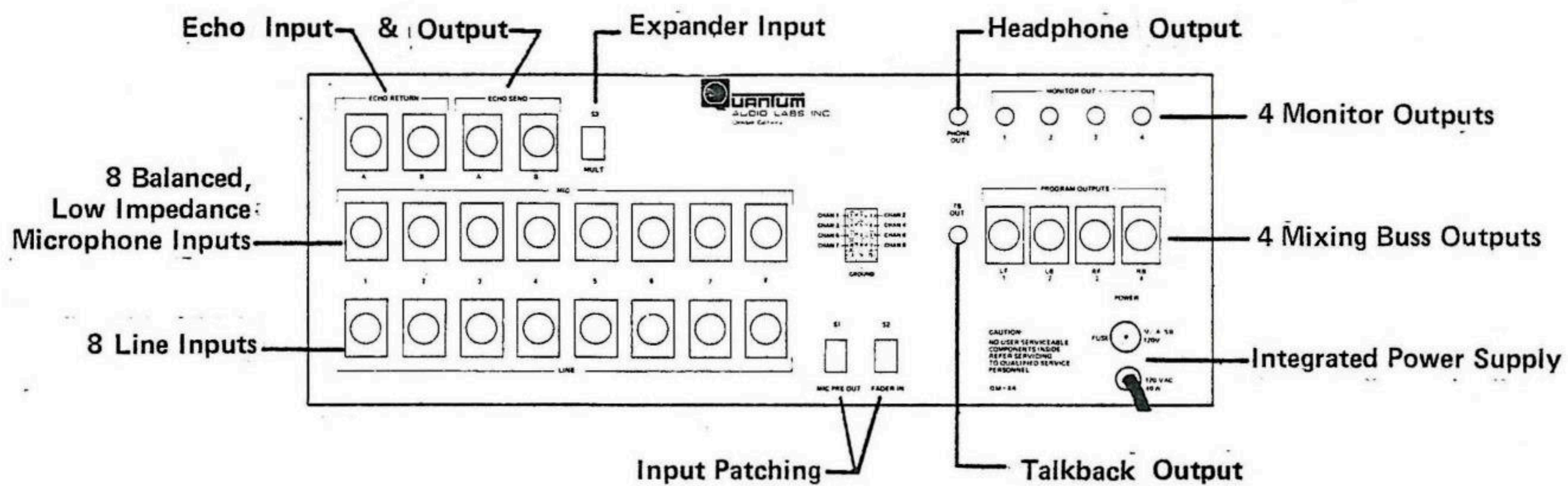
SPECIFICATIONS

MICROPHONE INPUT	Balanced, low-impedance input. Actual impedance is 1200 ohms; -50 dB (2.5 mV) nominal input level.*
MIC PAD	15 dB switchable gain-reduction provides adequate headroom for any type mic and program, while maintaining low noise and distortion.
LINE INPUT	Unbalanced, for low or medium impedance sources. Actual impedance is 2.5K ohms; +4 dB (1.23V) nominal input level, +30 dB (25V) maximum input level.
ECHO RETURN INPUT	Unbalanced, for low or medium-impedance sources. Actual input impedance is greater than 2000 ohms; +4 dB (1.23V) nominal level.
PROGRAM OUTPUT ECHO SEND OUTPUT TALKBACK OUTPUT	Unbalanced, for 600-ohm or higher-Z lines. Actual output impedance is less than 100 ohms; +4 dBm nominal output level, +18 dBm maximum (600-ohm termination).
MONITOR OUTPUT	Unbalanced, for high impedance lines. Actual impedance is 2.5K ohms; +21 dB (9V) maximum level.
HEADPHONE OUTPUT	Unbalanced, for high impedance (2000 ohms or greater) headphones; +4 dB (1.23V) nominal level; will drive 600-ohm headphones at reduced level.
PATCH POINT	Multi-pin Molex™ connectors between mic preamp outputs and fader inputs (jumper cable supplied) The MIC PRE OUTPUT is unbalanced, for high impedance lines (2000 ohms or greater); -5 dB (420 mV) nominal output level. The FADER INPUT is unbalanced, for low or high impedance sources. Actual impedance is approximately 10K ohms; +4 dB (1.23V) nominal input level. (See pin assignment diagram on back panel.)

SPECIFICATIONS (Continued)

MULT INPUT	Expander input for optional 8-bus Quantum Satellite Expander.
OVERALL GAIN	67 dB maximum, mic input to program output.
FREQUENCY RESPONSE	20 Hz to 20 kHz, <u>+1</u> dB (ref. to 1 kHz).
DISTORTION	Less than 0.25% THD at +18 dBm output from 20 Hz to 20 kHz (600-ohm load).
NOISE	-127 dBm equivalent input noise; -70 dB (0.24 mV) output noise; 88 dB signal-to-noise ratio.
EQUALIZATION (Shelving Type)	Low Frequency: +12 dB (max) at 50 Hz or 200 Hz (switchable). High Frequency: +12 dB (max) at 3 kHz or 10 kHz (switchable).
VU METERS	"0 VU" corresponds with +4 dB (1.23V) program output(+4 dBm @ 600 ohms); meters are illuminated.
POWER REQUIREMENTS	120V AC (convertable for 240V AC operation), 50 or 60 Hz, 40 Watts.
DIMENSIONS	20" wide x 20" deep x 8.5" high; (51 cm x 51 cm x 22 cm).
NET WEIGHT	38 pounds (17 kg).
SHIPPING WEIGHT	40 pounds (18 kg).
WARRANTY	1 (one) year parts/90 days labor.

* 0 dB is referenced to 0.775V. We use the term "dB" rather than "dBm" unless the actual impedance is 600 ohms. This is because, since "dBm" is a power expression, referenced to 1 milliwatt (0.775V across 600 ohms), the "dBm" value will change as the impedance changes. However, it is really the voltage drive value that is of significance, and the term "dB", where the 0 dB value is 0.775 volts, does not change with circuit impedance. This should avoid the misleading aspect of the widely misused "dBm" without creating a new reference.



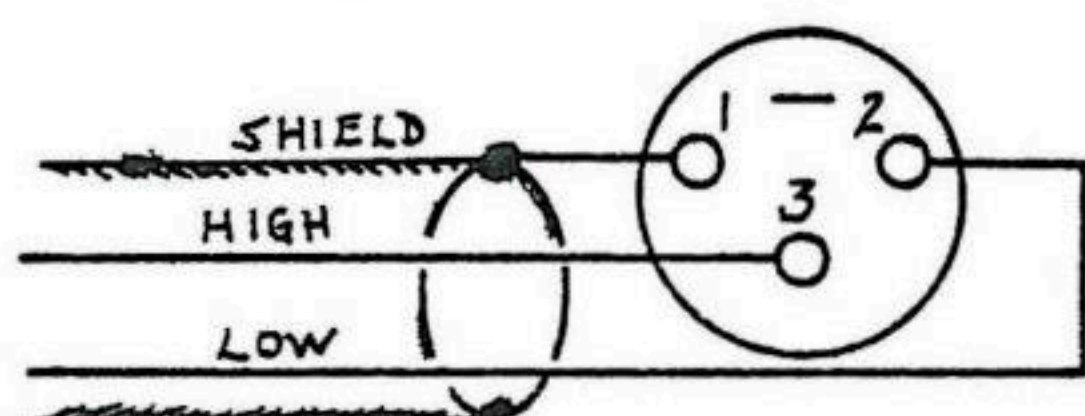
CAPTION: FIGURE 3. QM-8A REAR PANEL FEATURES.

OPERATION

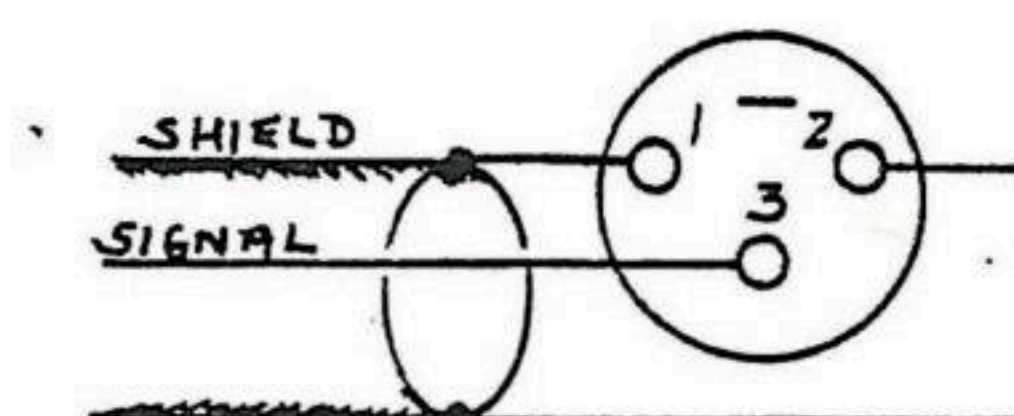
NOTE: All connectors are on the rear panel; all controls, and meters, and the talkback mic are on the front panel. Refer to the block diagram (Figure 1) and photos (Figures 2 and 3) while you are reading the following paragraphs.

MICROPHONE INPUTS

Eight female, XL-type connectors accept balanced, low impedance, professional microphones, such as the Sennheiser MD-451, Electro-Voice RE-20, Neumann U-87, Shure SM-58, etc. To connect a balanced, low impedance microphone, use twisted-pair, shielded cable. Wire both the source and the XL connector to the QM-8A as a floating (or balanced) circuit. For all unbalanced sources, use single-conductor, shielded cable, or use twisted-pair, shielded cable (connect one wire of the pair to the shield). See figure 4.



FOR BALANCED (FLOATING) SOURCES



FOR UNBALANCED SOURCES

FIGURE 4. XL WIRING FOR FLOATING (BALANCED) OR UNBALANCED MICROPHONE OR LINE INPUTS.

LINE INPUTS

Eight female, XL-type connectors (unbalanced) accept high-level instrument inputs, multi-track tape machine playback, or any other line-level, high or medium impedance sources. Use cables similar to those for unbalanced microphones. See figure 4.

MIC/LINE SWITCH

This switch feeds the input channel from either the MIC or LINE connectors on the rear panel; Pushbutton unlatched (up)= MIC input, latched (down)= LINE input.

MICROPHONE INPUT PAD (ATTENUATOR)

A switchable 15 dB pad affects only the MIC input (not LINE). Normally, the pad is not used, so the pushbutton is unlatched (up). Use the -15 dB position (pushbutton latched) whenever microphone levels are high enough that the VU meter reads "0" with the input fader less than 1/2 way up (BOARD MASTER and Buss SUB-MASTERS at full clockwise rotation.) The pad is most often used with condenser mics or even with dynamic mics in the presence of loud music.

FADER

Low noise, conductive plastic, linear-travel attenuators control the mix level of each input channel (MIC or LINE input). A Cue option is available for broadcast or disco use; the option includes a special fader that assigns the incoming signal to a preview buss (not the program mix) when the fader is pulled all the way down, below "infinite" attenuation.

ECHO SEND

Each input channel can be assigned to either of the two echo send busses using two switches labeled "A," and "B." Pushbuttons latched (down)=echo assigned (IN); pushbuttons unlatched (up)=echo not assigned (OUT). The rotary ECHO SEND control adjusts the level of the post-fader, post-EQ signal that feeds the two echo busses, provided the corresponding pushbutton(s) is latched. ECHO SEND A & B output connectors (male XL's) are on the rear panel.

OUTPUT (MIX BUSS) ASSIGNMENT

There are four program mixing busses. Four corresponding BUSS switches ("1," "2," "3" and "4,") assign each input channel to any combination of program mixing busses. Pushbuttons unlatched (up)=channel not assigned, pushbuttons latched (down)=channel assigned to the correspondingly-numbered buss.

PANNING

Panning assigns the input signal to the mixing busses, as do the BUSS switches. PAN assignment is better than BUSS switch assignment for stereo balance or placement. To activate PAN, latch the PAN pushbutton (with the button unlatched (up), the PAN control does not feed a signal to any buss).

To pan the input channel between the "front" program busses (1 and 3), the "1/3 - 2/4" pushbutton must be unlatched (up), and the BUSS #1 and #3 buttons also must be unlatched. The #2 and/or #4 button can be either latched or unlatched, depending on whether you want to feed one or both of these busses with the same signal being panned between busses #1 and #3. Remember that panning changes the level in one buss relative to the other, but switch-assignment feeds the corresponding buss at full post-fader, level, independent of the PAN control.

To pan the input channel between the "rear" program busses (2 and 4), the "1/3-2/4" pushbutton must be latched (down), the BUSS #2 and #4 buttons must be unlatched, and the BUSS #1 or #3 buttons can either be latched or unlatched, as desired.

EQUALIZATION

The HF EQ control can alter the frequency response at high frequencies by as much as +12 dB, and the LF EQ control does the same for low frequencies. Either of two shelving characteristics may be selected for each of these controls. See figure 5.

Unlatching the "10K/3K" pushbutton provides a mild, high frequency equalization because the effect begins at higher frequencies (reaching a maximum of +12 dB boost or cut at 10 kHz). Latching the "10K/3K" pushbutton yields a more pronounced equalization (reaching a maximum of +12 dB boost or cut at 3 kHz). Similarly, unlatching the "50/200" pushbutton yields a milder low frequency equalization (+12 dB maximum at 50 Hz) than latching the "50/200" pushbutton (+12 dB maximum at 200 Hz).

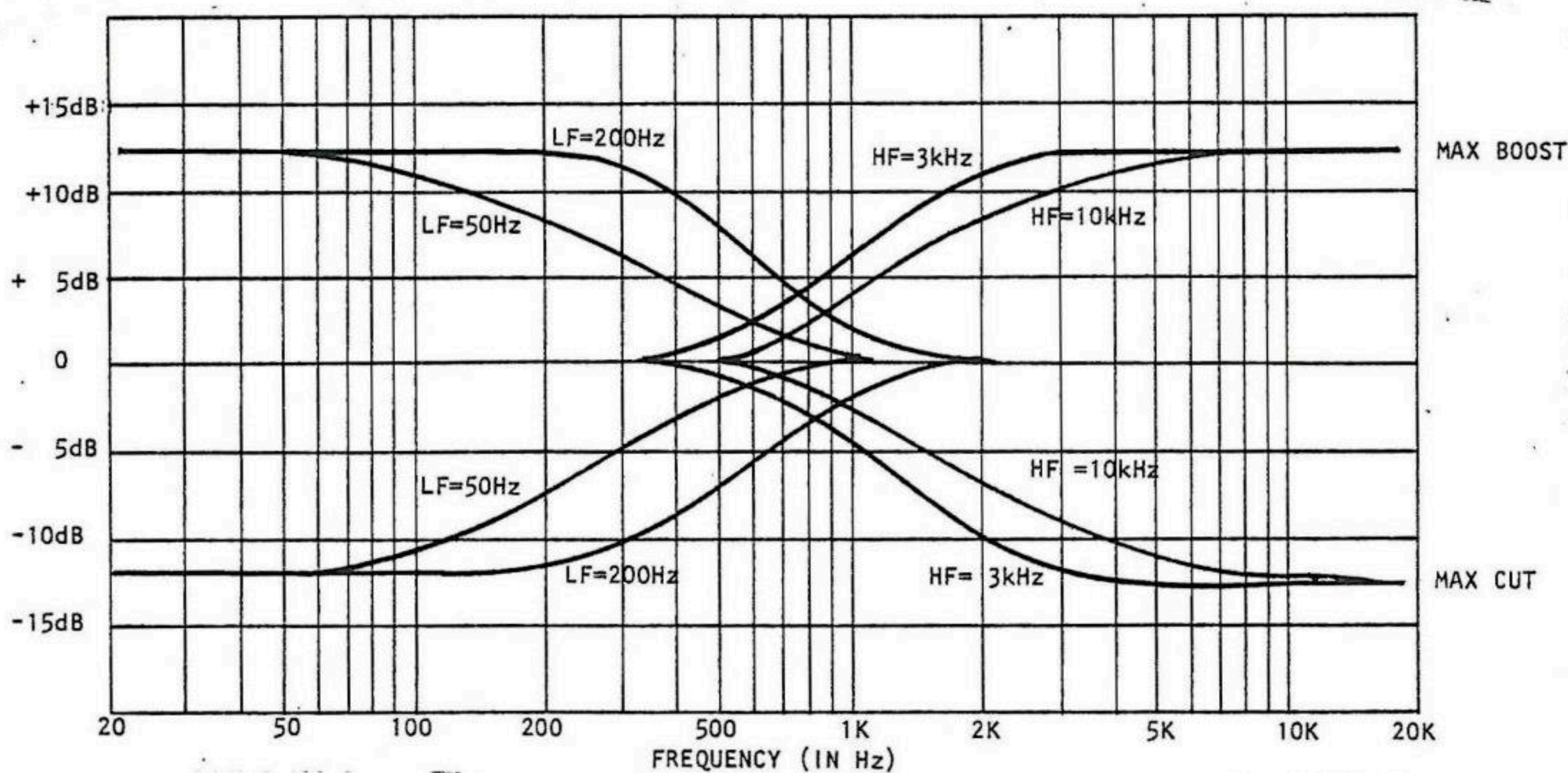


FIGURE 5. QM-8A CHANNEL EQUALIZATION

PROGRAM OUTPUTS

Each of the four program mix busses has its own SUB-MASTER control and VU Meter. The BOARD MASTER attenuator simultaneously adjusts the level of all four busses. The SUB-MASTERS and the BOARD MASTERS are normally set at full clockwise rotation, and the input faders (and mic pads) are adjusted for approximately "0" VU nominal meter indications. The SUB-MASTERS may be turned down (counterclockwise) somewhat for overall balance or minor level adjustments, and the BOARD MASTER is turned down primarily for program fades.

VU METERS

Illuminated meters with true VU ballistics indicate Program Output levels. "0" VU = +4 dB (1.23V), which is +4 dBm with a 600-ohm termination.

EXPANDER INPUT

To add 8 additional input channels, a female Molex™ connector on the rear panel facilitates interface with an optional Quantum Audio Satellite Expander.

INPUT PATCHING JACKS

Two Molex connectors on the rear panel (MIC PRE OUT and FADER IN), allow easy, channel by channel insertion of auxiliary signal processing equipment such as compressors, graphic equalizers, and noise gates. To add flexibility, you can use these connectors for Quantum's optional QM-171 patch bay, or for your own patch panel. Either the jumper cable (supplied) or some external device must be run between the Molex connectors in order to complete the signal flow through the input channels.

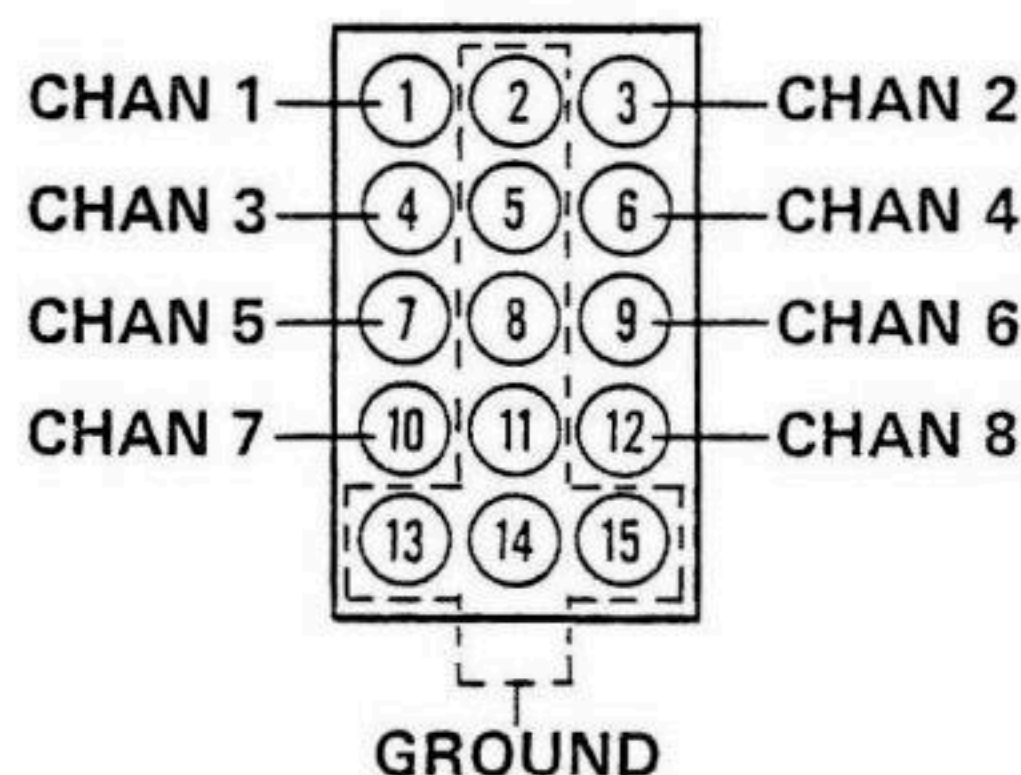


FIGURE 6. MIC PRE OUT/FADER IN CONNECTORS--
PIN ASSIGNMENT

ECHO RETURN

Two unbalanced, female XL connectors, ECHO RETURN A, and ECHO RETURN B, accept low to medium impedance sources. Each connector feeds an ECHO RETURN level control, and each control feeds four ECHO RETURN switches (#1, #2, #3 and #4). The switches assign the Echo signals to the four program mix busses. The echo return connectors may be used as auxiliary line inputs.

MONITOR MIX

When the Monitor LINE switch is latched (down), the eight MONITOR LEVEL controls derive their signals from the eight input channel's LINE inputs. This monitor mode is useful for playback of tape recordings (up to 8 tracks). When the MONITOR BUSS switch is latched (down), MONITOR LEVEL controls #1 through #4 derive their signals from the program outputs, and MONITOR LEVEL controls #5 through #8 are deactivated. This monitor mode is useful for control room monitoring during live recording or overdubbing, or for sound reinforcement stage monitoring.

There is one FRONT-REAR switch and one PAN control adjacent to each MONITOR LEVEL control. To assign the corresponding monitor input to the front MONITOR OUT jacks (#1 and #3), the FRONT-REAR switch should be unlatched (up). The corresponding PAN control then changes the proportion of that monitor signal applied to outputs #1 and #3.

Similarly, to assign a monitor input to the rear MONITOR OUT jacks (#2 and #4), the FRONT-REAR switch should be latched (down). The adjacent PAN control then changes the proportion of that monitor signal applied to outputs #2 (left rear) and #4 (right rear). The MONITOR MASTER control simultaneously adjusts the level of all four MONITOR OUT jacks.

HEADPHONE CUE SYSTEM

The PHONE OUT jack derives a signal from a mix of all eight LINE inputs, but this mix is independent of the monitor mix. Instead, the PHONE OUT mix is established by eight PHONES MIX controls and a PHONES MIX MASTER. For 3 or more sets of phones, we recommend using an external power amplifier. If an auxiliary amplifier is not used, use high-impedance (2000-ohm or greater) headphones. This headphone cue system is ideal for use by performers doing vocal or instrumental overdubs, or, when wired in the optional configuration (see block diagram) for use as a stage monitor feed.

TALKBACK SYSTEM

A talkback mic (in the upper left corner of the mixer) is preamplified and controlled by TALKBACK LEVEL. Pressing the TALKBACK switch then feeds this signal to all four program output busses, the phones mix buss and to a TB OUT jack. Pressing TALKBACK simultaneously mutes all four MONITOR OUT jacks as it activates the mic, thereby avoiding feedback. Talkback is handy for making announcements, for identifying (slating) tapes, and, using the TB OUT jack and an auxiliary power amplifier and speaker, for speaking to performers in the studio.

POWER

The AC POWER switch is on the rear panel. Connect the AC cable to a 120 V AC, 50 or 60 Hz, grounded (3-wire) outlet. Always replace the FUSE with another of the same size and type (1/2-amp, 3AG Slo-Blo).

Qualified service personnel can easily convert the QM-8A for 240V AC operation. All that is necessary is to open the rear panel, reconnect the power transformer primary leads as shown in figure 6, and change the fuse size from 1/2-amp to 1/4 amp.

Cut jumpers as they exist (left drawing), and install new jumper (right drawing) to convert to 240 V AC operation.

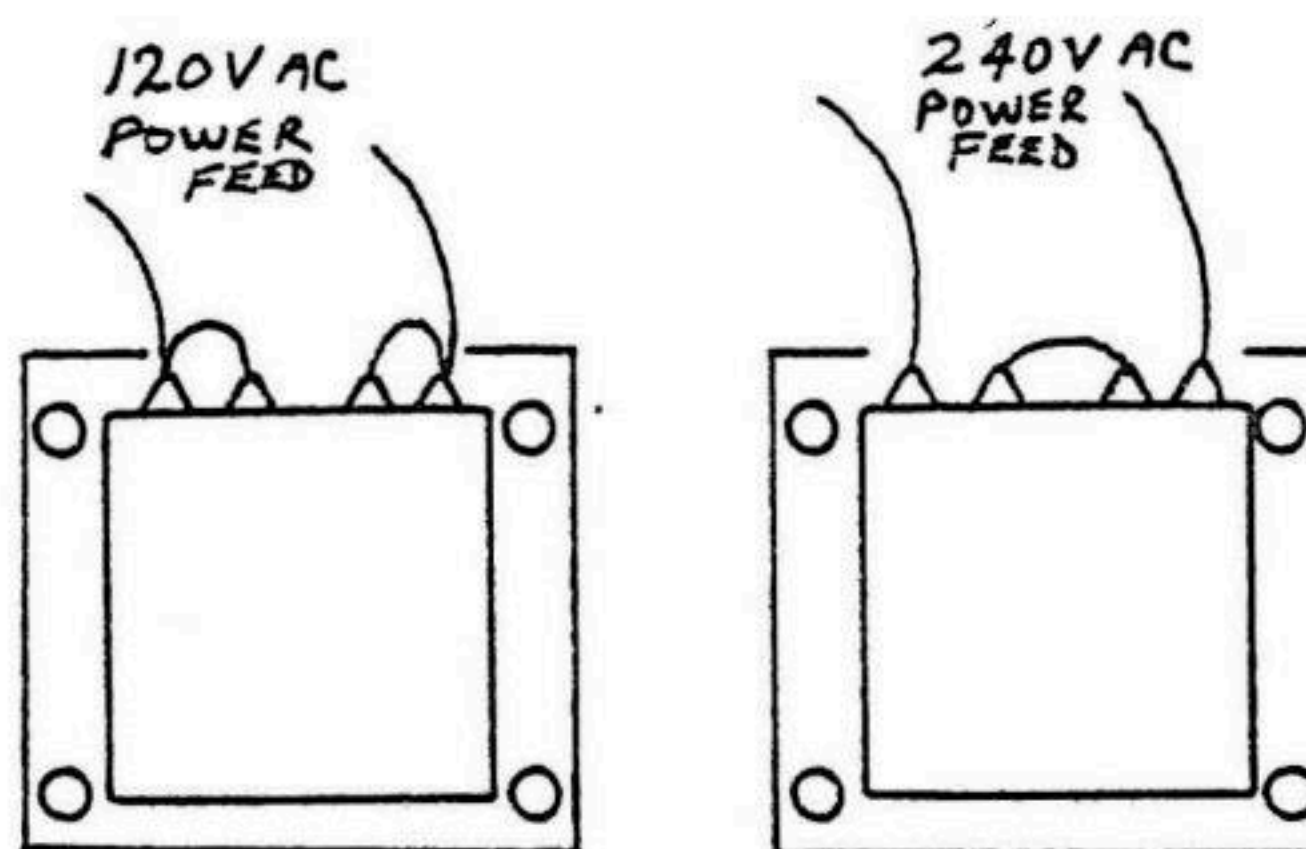


FIGURE 6. RE-WIRING THE POWER TRANSFORMER FOR 240V AC OPERATION

APPLICATIONS

As in any engineering design, a recording console is a series of compromises. Some of these compromises are economic, and some are scientific. At Quantum, we have tried to overcome these compromises as much as possible, by using careful engineering design to produce the best possible piece of equipment for the least amount of money.

The object in recording, overdubbing and mixdown is to get the best possible signal onto the recording tape. The QM-8A recording console is designed to complement most tape machines. The nominal input level of most quality tape machines is +4 dB (1.23 volts), thus the QM-8A console reads "0 VU" when it is delivering the required +4 dB (1.23 volts). There is at least 14 dB of headroom (and typically 17 dB headroom) before clipping. In addition, the output signal level is 70 dB above the noise level of the console itself.

When recording, overdubbing or mixing down, we recommend that you keep the meter pointers below the red area. A skilled operator will keep the meters moving up to "0 VU" with very little overshoot into the red area.

Recording

To lay down original tracks, set the MIC/LINE switches to MIC and the BUSS/LINE switch to BUSS. Initially, set the BOARD MASTER and SUB MASTER controls to the maximum clockwise position. Then, use the SUBMASTER controls to trim the four buss levels for optimum recording level on each track. The BOARD MASTER control may be used for overall fades. You can mix the desired microphones onto as many as four separate tracks at a time. Equalization and echo may be added as you are recording.

The MONITOR LEVEL 1-4 controls adjust the level of the four busses in the MONITOR outputs. Along with their PAN pots, the MONITOR LEVEL 1-4 controls can be used to generate a monitor mix which is independent of what is being fed to the tape machine. The TALK BACK MIC feeds the program and phone mix busses, and may therefore be used to talk with the musicians or to identify "takes".

Overdubbing

After recording the original tracks, you can add vocals, rhythm, percussion or any other instruments to previously unused tracks (or unwanted recorded tracks) before starting mixdown. This requires a headphone for each musician, and a headphone amplifier. Set the tape machine to the "sync" mode (where sync allows you to use the record

heads to listen to the already recorded tracks), and set the appropriate track (or tracks) to record.

For 8-track recording, the console outputs are split to drive all 8 tape inputs as shown in Figure 7 (page 16). You may use any input channel for your microphones even though it may have been used to record an original track. Just switch the OUTPUT ASSIGN to the proper output buss for the blank track.

The TALK BACK MIC may be used to talk to the musicians or to identify takes on the tape. Adjust the HEADPHONE MIX so that each musician can hear both the previously recorded tracks and his live microphone(s).

Place the BUSS/LINE switch in the LINE position. The monitor section now is used to simulate the final product. The 8 monitor level pots correspond to the 8 tracks (including the new ones being recorded). They may be panned left and right, in either the front or the back sets of speakers. The MONITOR control sets the overall level in the control room.

Mixdown

Mixdown is similar to doing original recording except that the source is the tape machine, and the outputs usually feed a two-track machine instead of a 4 or 8-track machine. Use BUSS 1 and BUSS 3 outputs for Left and Right (respectively). Pan BUSS 1 in the MONITOR section to the LEFT monitor (1) and BUSS 3 to the RIGHT monitor (3). Place all MIC/LINE switches to LINE and start the tape machine. Leave the BUSS ASSIGN switches unlatched (out) and press in the PAN IN/OUT switch. Leave the PAN ASSIGNMENT switch unlatched (out) for panning to BUSES 1 and 3. The PAN IN/OUT switch now acts as a mute switch.

Any channel may be soloed by using BUSS 2 or BUSS 4 as a solo buss and by depressing the corresponding CHANNEL ASSIGN button. Bring up MONITOR LEVEL 2 or 4 to hear the soloed signal.

Equalization may be added during recording or during mixdown, although it is usually better to equalize during the mixdown. (It is difficult to remove equalization that has already been applied to a tape). The 10 kHz and 50 Hz positions give you a gentle bass and treble control. The 3 kHz position lets you boost or cut in the sibilance range (and all frequencies above) and the 200 Hz position gives a low frequency boost or cut that is more dramatic than the 50 Hz position.

Echo may also be added either during recording or mixdown. You can use any standard echo chamber which takes

a +4 dB (1.23 volt) nominal input signal and delivers back to the console the same nominal output level. Avoid over-driving spring reverb chambers. It's better to drive the spring more gently and increase the return level.

Sound Reinforcement

When using the QM-8A for sound reinforcement it should be set up similar to the diagram in Figure 8 (page 17). Use BUSSES 1 and 3 for stereo audience feeds. BUSSES 2 and 4 may then be used for stage foldback, or to feed a stereo tape recorder (or broadcast feed).

A factory or dealer modification allows the headphone mix to be taken from the arm of the MIC/LINE switches instead of the line input only. This allows the headphone mix to be used to drive stage monitors, or as a pre-fader headphone mix.

In sound reinforcement, just as in recording, the SUBMASTER and BOARD MASTER attenuators should be left at or near their maximum level. This optimizes the signal-to-noise ratio throughout the console.

SERVICE

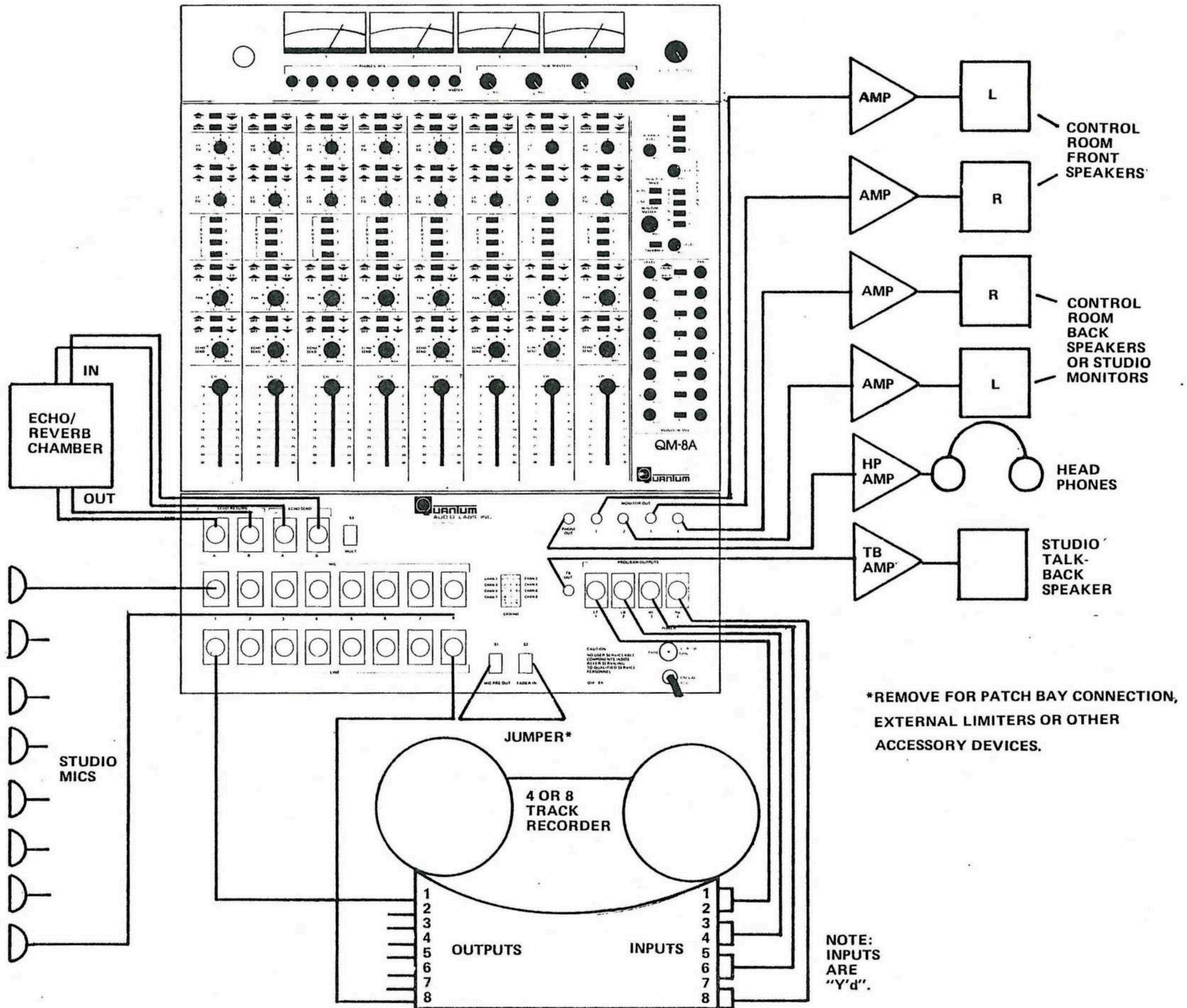
The QM-8A is covered by a limited warranty, one year for parts and 90 days for labor. The console is sturdily constructed, but abuse or normal wear may ultimately create a need for repairs.

Should your QM-8A require service, first consult your nearest Quantum Audio Labs dealer. He carries spare parts, is familiar with the circuitry, and will endeavour to give you the fastest possible service. You may call the factory during normal business hours (213-841-0970) for the name of the nearest dealer, or for any information. Do not return your console to the factory unless you have first received permission from the factory to do so.

CAUTION:

As with any sophisticated audio equipment, improper repairs can create more problems than they solve. Also, lethal AC voltages are present inside the console. For these reasons, the QM-8A should only be repaired by a qualified service technician. The following pages contain schematic diagrams that may be helpful for troubleshooting purposes.

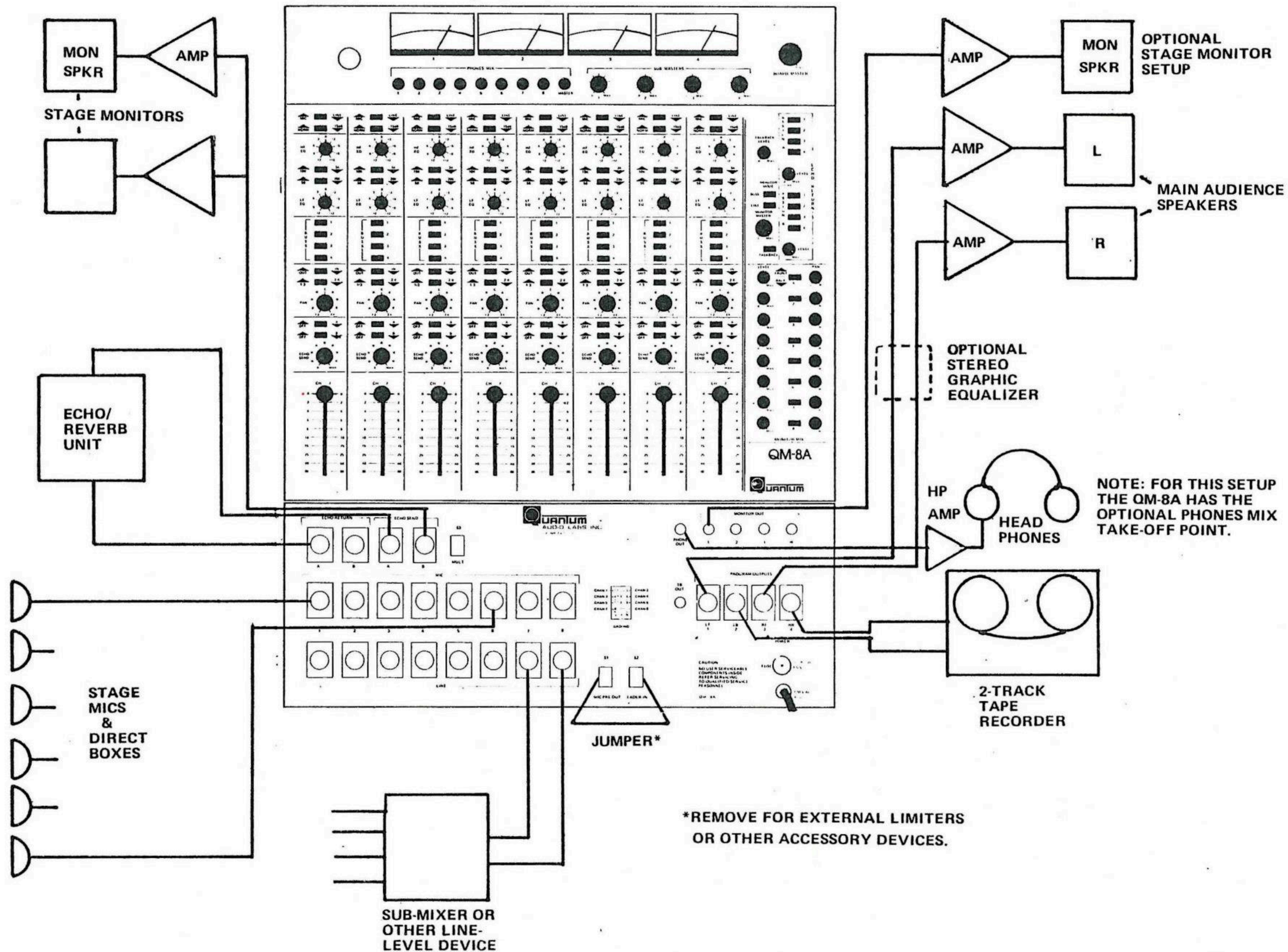
FIGURE 7. TYPICAL RECORDING SETUP

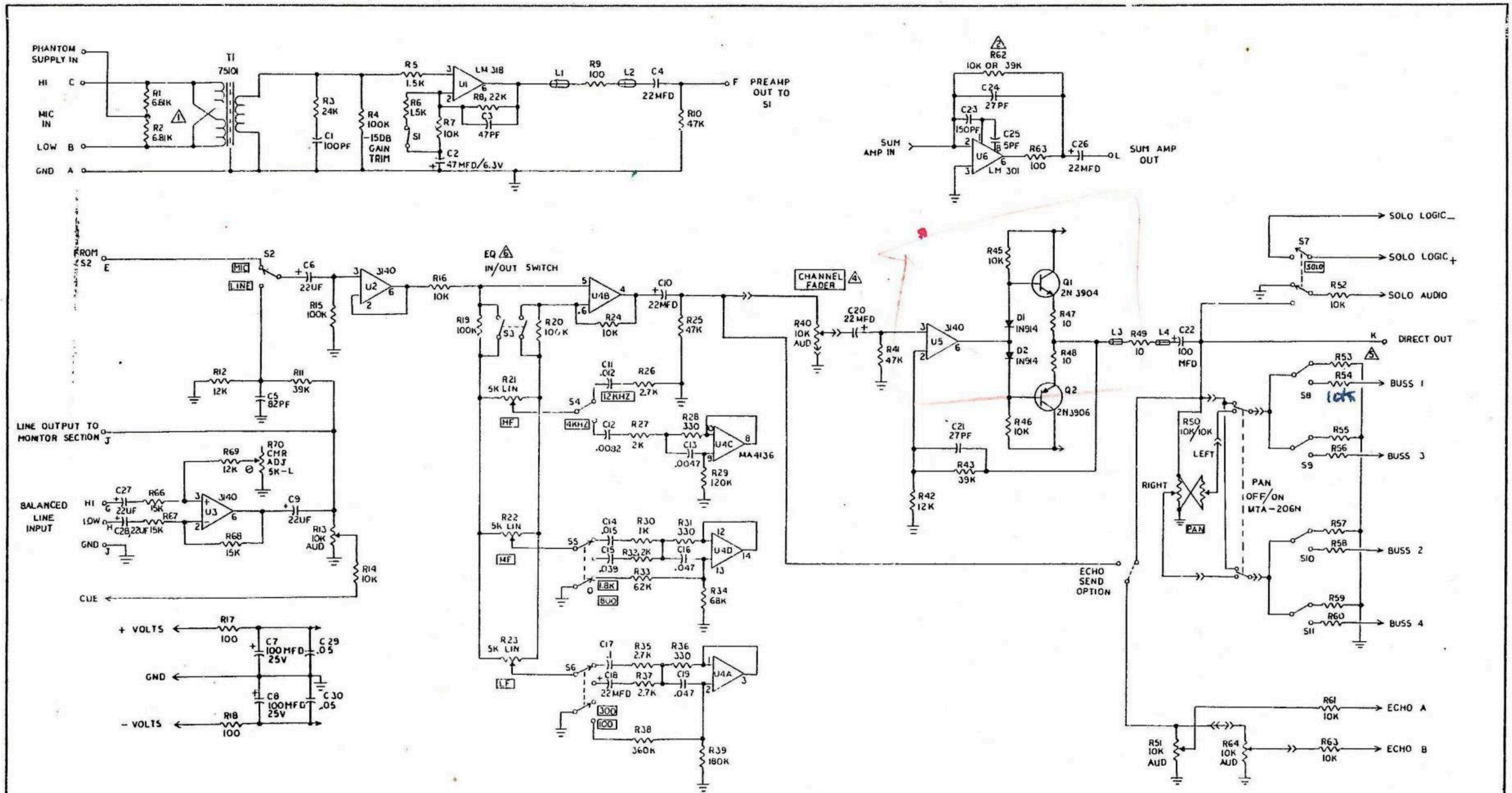


*REMOVE FOR PATCH BAY CONNECTION, EXTERNAL LIMITERS OR OTHER ACCESSORY DEVICES.

NOTE: INPUTS ARE "Y'd".

FIGURE 8. TYPICAL SOUND REINFORCEMENT SETUP

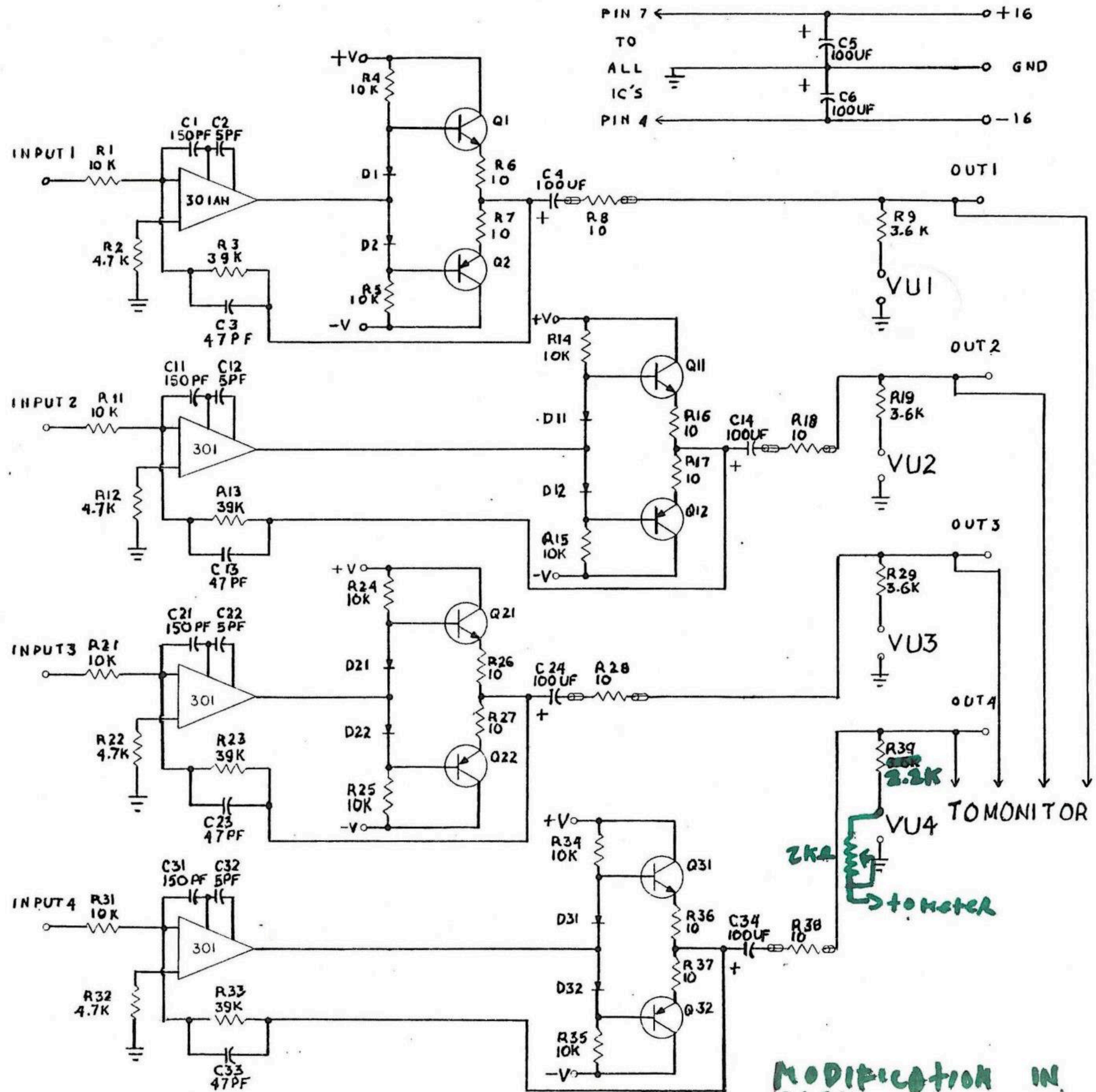




△ EQ SHOWN IN OUT POSITION
 △ R53-R60-10K
 △ CHANNEL FADER NOT MOUNTED ON PCB'S
 J ALL RESISTORS 1/4 WATT CARBON FILM 5% CAPACITORS IN MFD
 △ R62, 39K IN ECHO SUM POSITION ONLY, 10K ELSEWHERE
 △ R1 AND R2 OPTIONAL PHANTOM SUPPLY RESISTORS
 NOTES UNLESS OTHERWISE SPECIFIED

QUANTUM AUDIO LABS, INC. GLENDALE, CALIF.		
DATE: 1-2-78	APPROVED BY: C.L.	DRAWN BY: R. OGAN
SCHEMATIC, QM-8B INPUT MODULE		
1768		

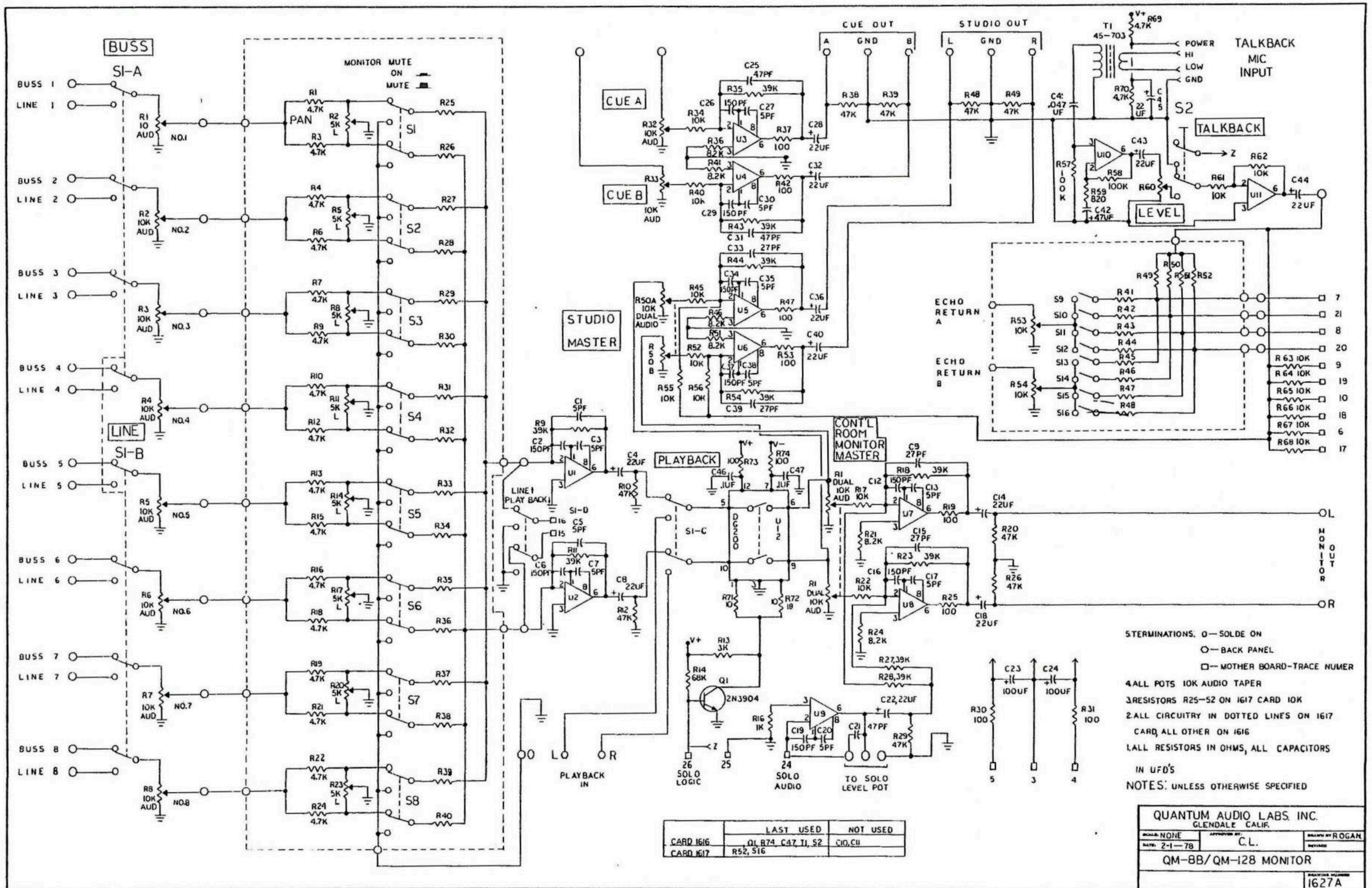
FIGURE 10. 1010 CIRCUIT CARD SCHEMATIC
-19-



NOTES:

5. FERRITE BEADS
4. Q1,11,21,31 2N3904
Q2,12,22,32 2N3906
3. All DIODES 1N914
2. All RESISTORS IN OHMS
1/4 WATT 5%
1. All CAPACITORS ARE 25
VOLTS OR BETTER

MODIFICATION IN



STERMINATIONS: ○— SOLDE ON
 ○— BACK PANEL
 □— MOTHER BOARD—TRACE NUMBER

4 ALL POTS 10K AUDIO TAPER
 3 RESISTORS R25-52 ON 1617 CARD 10K
 2 ALL CIRCUITRY IN DOTTED LINES ON 1617
 CARD ALL OTHER ON 1616
 1 ALL RESISTORS IN OHMS, ALL CAPACITORS
 IN UFD'S

NOTES: UNLESS OTHERWISE SPECIFIED

	LAST USED	NOT USED
CARD 1616	Q1, R74, C47, U1, S2	C10, C11
CARD 1617	R52, S16	

QUANTUM AUDIO LABS, INC. GLENDALE CALIF.		
DESIGNED BY: NONE	APPROVED BY: C.L.	DESIGNED BY: ROGAN
DATE: 2-1-78		REVISED:
QM-BB/QM-128 MONITOR		
SERIAL NUMBER: 1627A		

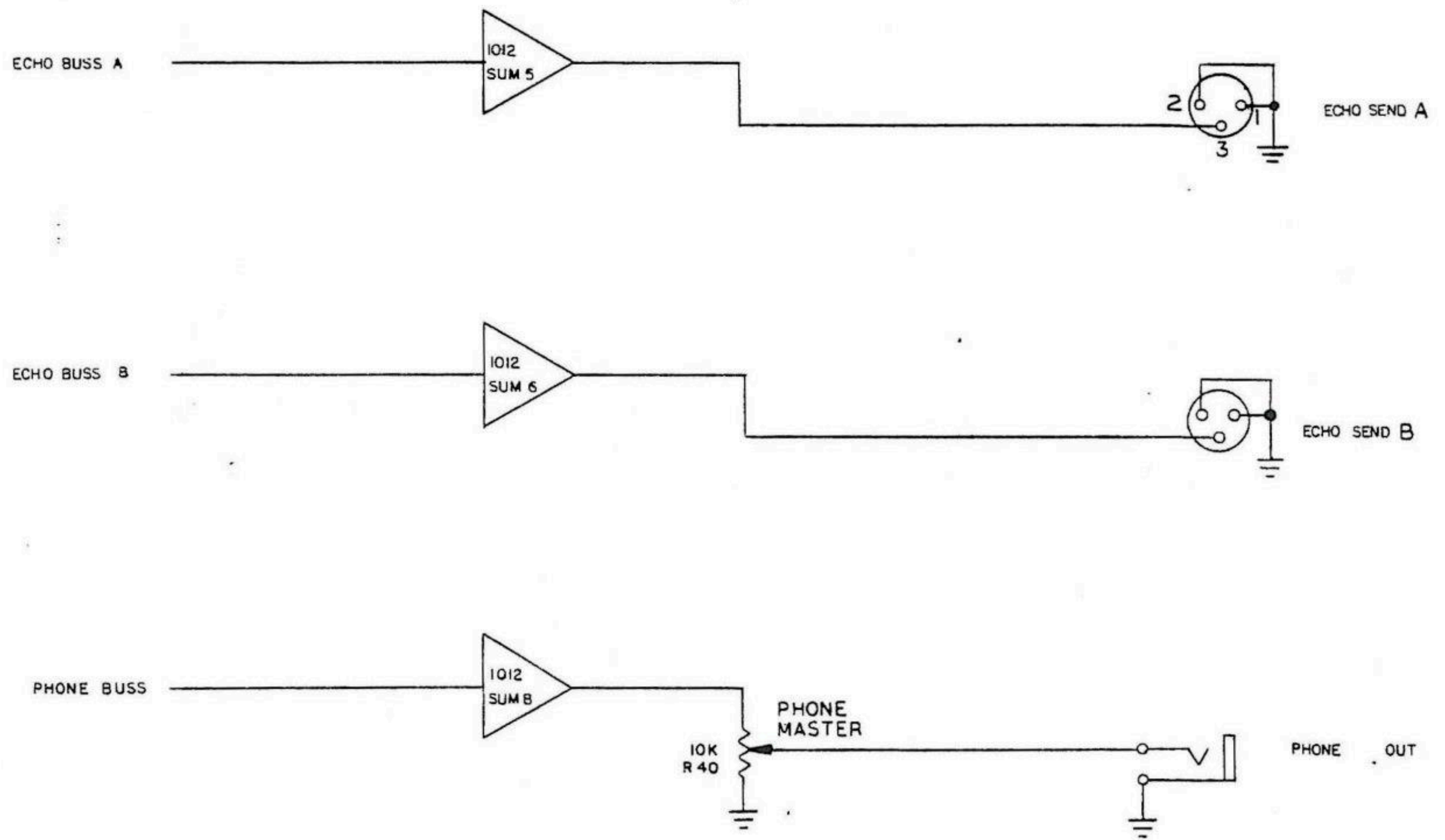
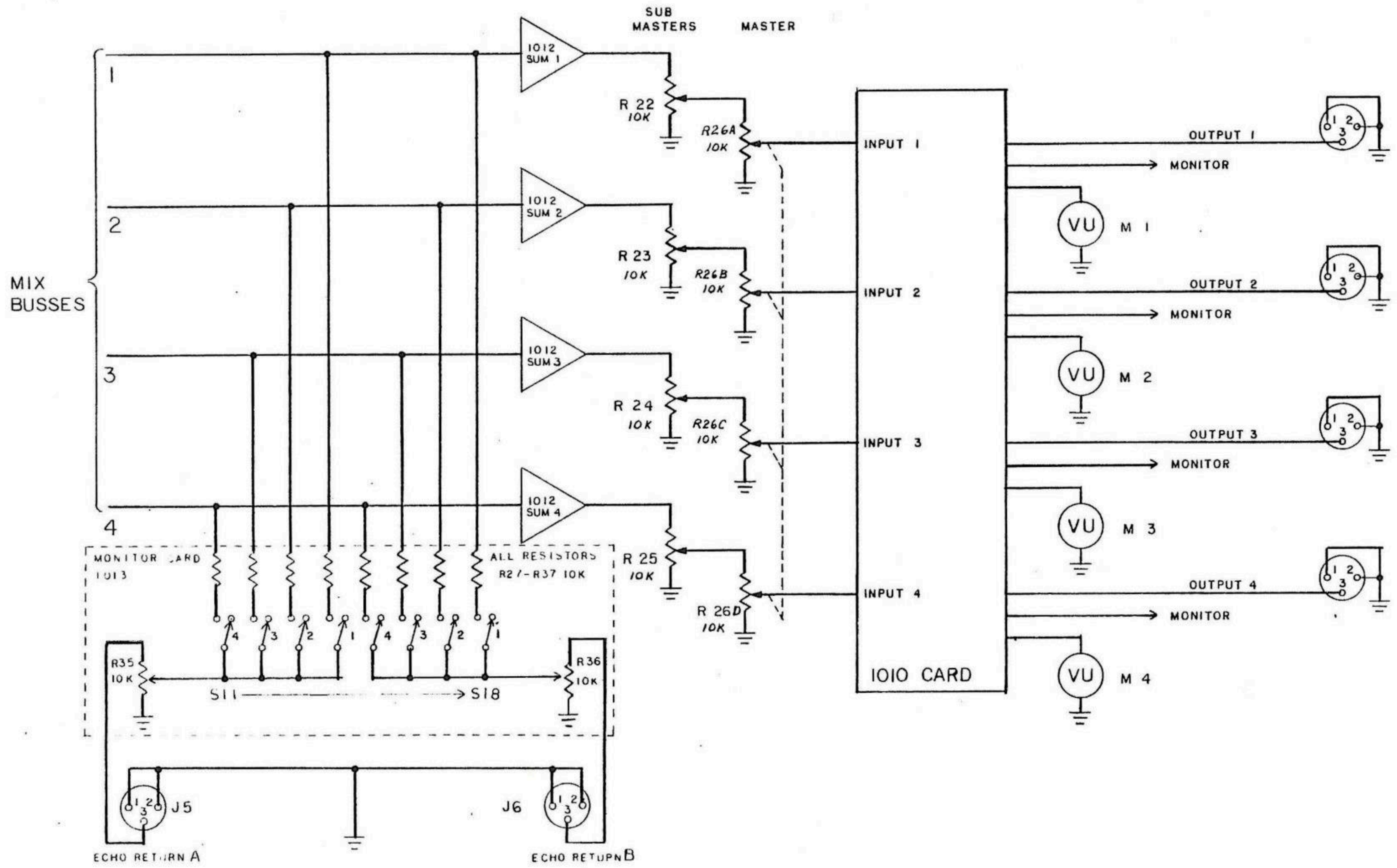


FIGURE 12. ECHO AND PHONE BUSSES SCHEMATIC
-21-

FIGURE 13. BUSS OUTPUTS SCHEMATIC
-22-



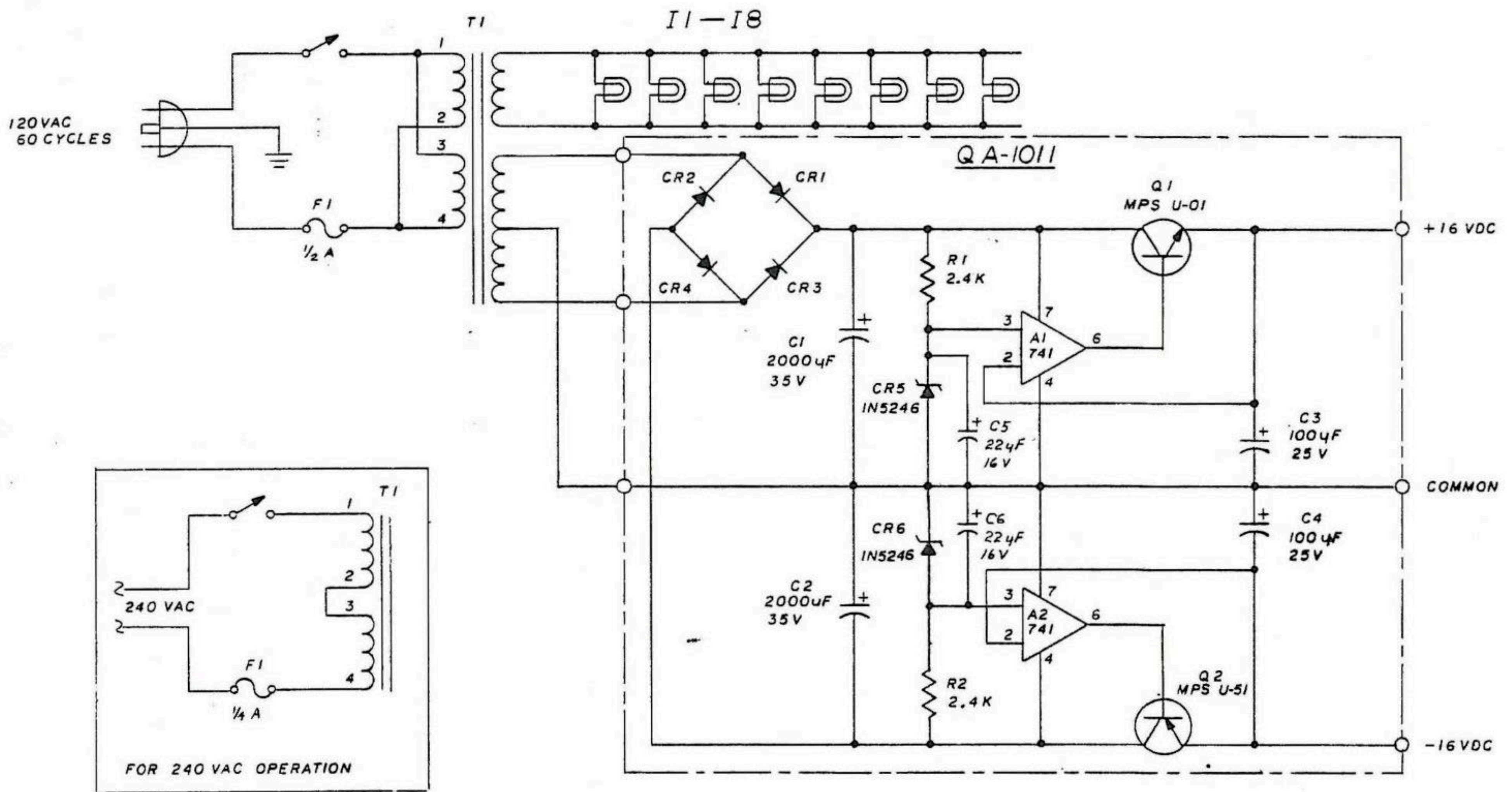


FIGURE 14. POWER SUPPLY SCHEMATIC
-23-