

STEREO PREAMPLIFIER

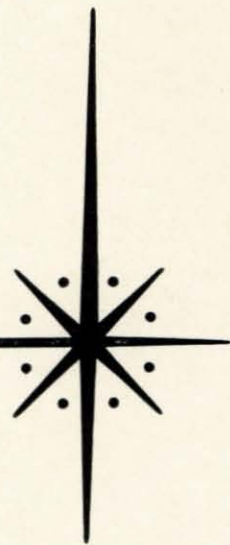
MODEL
ST84



EICO

INSTRUCTION

MANUAL



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EICO



Stereo Preamplifier

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SECTION I. GENERAL DESCRIPTION AND SPECIFICATIONS

1-1. GENERAL DESCRIPTION

The EICO Model ST84 is a complete high fidelity stereophonic control center. It offers practically every control and switching facility anyone could want in a physical design adaptable to any type of installation. With it you can select, preamplify and control accurately, any stereophonic source, whether it be from tape, discs or broadcasts. Facilities are comprehensive, including two mag phono inputs, a seven position mode selector, tape monitor, and high and low frequency filters. Every control facility is both useful and effective.

For all functions of the preamp, all types of distortion are down to 0.05% at all levels. Regardless of price, no preamp can offer audibly lower distortion. For all basic functions (mag phono, tuner, tape), hum and noise is down to 0.05% or better, of the average program level.

Present-day low level audio tubes employ coiled heater construction and are far less susceptible to hum than they were years ago, when a dc filament supply was the only answer for really low hum level. In the ST84, the total of hum and noise is .0005 of the average program level. If a dc filament supply were used, this figure might be reduced to .0003, hardly a significant improvement. Furthermore, there is an unfortunate aspect to a dc filament supply that is not generally realized. If a heater-cathode short should develop in one of the tubes, hum will immediately be evident with an a-c filament supply and the tube can easily be spotted and replaced. If the same thing happens with a d-c filament supply, no hum will be evident; however, the operating bias of the tube will be changed by the presence of the dc filament voltage at the cathode and distortion will result, which may not be immediately realized and will obviously be more difficult to track down. In the Model ST-84, an a-c filament supply is used, biased to a d-c potential to minimize susceptibility to a-c leakage.

The ST84 is self-powered, for better performance and convenience. It uses a full-wave rectifier tube power supply. It works in conjunction with any high quality basic stereo power amplifier, such as the EICO HF86, HF87 and HF89, or with any two high quality power amplifiers such as the EICO HF14, HF22, HF30, HF35, HF50 and HF60.

1-2. FEATURES

1. Provision for two stereo phono cartridges to

be connected. Permits the use of both a turntable and a record changer in the installation. One pair presents 47K ohm load and the other pair 100K ohm load, to cover most popular cartridges. RIAA equalization.

2. Provision for connecting stereo tape heads. NARTB equalization for 7-1/2 and 15, or 3-3/4 ips tape speeds.

3. Stereo microphone inputs.

4. High level input pairs for multiplex adaptor, preamplified and equalized tape, FM tuner, and AM tuner.

5. Versatile Mode Selector chooses stereo and stereo reverse functions. Positions for sum of channel 1 and channel 2 inputs to channel 1 output, and sum of channel 1 and channel 2 inputs to channel 2 output, used for stereo balancing. Positions for channel 1 input to channel 1 and channel 2 outputs, channel 2 input to channel 1 and channel 2 outputs, and for mono records, the sum of channel 1 and channel 2 to channel 1 and channel 2 outputs, all for versatile mono playing.

6. Separate level and balance controls.

7. Switched high and low frequency filter circuits permit elimination of rumble problem or scratch and distortion when need be.

8. Switched loudness compensation.

9. Tape monitor switch.

10. Feedback equalization, with feedback around both preamplifier stages. High overload point.

11. Three-stage independent bass and treble control circuits in each channel. They are of the variable inflection point, feedback type for exceptionally low distortion and the most desirable control characteristics. These controls do not affect the volume or interact with each other, and boost or cut at the extremes of the audio range do not affect the mid-range.

12. Separate filament windings and hum balance controls for each channel permit an optimum hum balance for each channel, rather than a compromise for both channels.

13. Unused inputs grounded by SELECTOR switch to eliminate cross-talk, except for TAPE inputs, since some tape machines are adversely affected if playback outputs are grounded during recording.

1-3. SPECIFICATIONS

Frequency Response: ± 0.3 db 5-25,000 cps at any level up to 3V RMS out. (Measured from high level inputs with level controls set at maximum and tone controls electrically flat.)

Hum & Noise:

Mag Phono and Tape Head: -65db at 10mv in.

Tuner, Tape, Aux.: -75db at 0.5V in.

Sensitivity (minimum 1kc input for 1V out.):

Mag Phonos: 1.6mv; Tape Head: 1mv

Microphone: 2.8mv

High Level Inputs (tuner, tape, aux.): 0.17V

IM Distortion (60 and 7000 cps at 4:1): 0.04% at 2V out.

Harmonic Distortion (20-20,000 cps): 0.05% at 2V out.

Tone Control Range: At 10kc: 15db boost, 15db cut;
At 50 cps: 15db boost, 15db cut

Equalization: Phono - RIAA; Tape Head - NARTB for 15 ips and 7-1/2 ips, 3-3/4 ips

Output to Tape Recorder Impedance: Same as source (tuner, etc.) feeding preamp

Output to Main Amplifier Impedance: 8,000 ohms

Tubes: 5-12AX7/ECC83; 1-6X4

Size: 5-1/2" high, 15-7/8" wide, 8-3/4" deep

Weight: 8-1/2 lbs.

SECTION II. MECHANICAL INSTALLATION

2-1. GENERAL

1. Mount horizontally on a well-braced shelf. The stock thickness of the wood panel may not exceed 3/4".

2. Do not remove feet for mounting. Air must be allowed to enter through the perforations in the bottom plate to avoid overheating.

3. Any shelf above the unit must be spaced away at least 2 inches. Allow at least a 1-inch space on each side of the unit.

4. Leave the back of the cabinet essentially open.

5. **EASY ACCESS TO CONTROLS:** Mount the preamplifier at a height which will permit easy manipulation of the controls.

6. **ACCESSIBILITY TO PARTS:** Tubes are the most frequently replaced items in electronic equipment. If the preamplifier is installed in a console, sufficient space should be allotted to reach and remove any tube in the unit. Furthermore, input and output terminals of the preamplifier should be accessible to permit

easy interchanging of system components for comparison. If antennas are strung around the back of the console in which the preamplifier is installed, arrange them so they will not interfere with access to the unit.

7. **ACOUSTICAL ISOLATION:** If preamplifier and speaker are installed in the same cabinet (not recommended), provide sufficient separation to minimize mechanical speaker vibration reaching the preamplifier which may result in microphonics and howling. The minimum separation is about one foot. A baffle, usually the preamplifier mounting shelf, should be present between preamplifier and speaker. In extreme cases, it may be necessary to mount the preamplifier on sponge rubber pads.

2-2. CONSOLE MOUNTING

2-2A. PREPARATION OF UNIT

1. Turn unit over and loosen the front and rear pairs of screws (4 in all) that fasten the bottom plate to the side pieces. Then turn the unit back right side up.

2. Remove the 4 screws, two on each side, that fasten the cover to the side pieces. Remove the cover and set aside.

3. On the top side of the chassis, loosen all 4 screws (2 on each side) that fasten the chassis to the side pieces.

4. Push both side pieces back as far as they will go. The screws that have been loosened will move from the front to the rear ends of the slots in the chassis and the bottom plate. Then re-tighten all the screws that have been loosened. Check to see that all the tubes are properly seated in their sockets and then replace and re-fasten the cover to the side extrusions.

5. Detach all the knobs from the control shafts and then remove the 4 screws, (2 previously concealed by knobs and 2 in the recessed area) that fasten the panel to the chassis. Lift the panel out over the control shafts and set it aside. The unit is now prepared for cabinet installation.

2-2B. PREPARATION OF THE CABINET

1. Two templates are provided, one for the cabinet shelf and the other for the cabinet panel. The shelf template is used to locate exactly two holes that are to be drilled in the shelf. The panel template is used to locate exactly the required rectangular cut-out. The two templates must be used together as indicated, as there is an exact relationship between the locations of the shelf holes and panel cut-out.

2. To use the shelf template, cut it or fold it back exactly along the dashed line that corresponds to the panel thickness. Remove the shelf from the cabinet and line up this dashed line on the template with the front edge of the shelf, positioning it also along the edge to leave at least 1-inch clearance on each side. Tape the template in position and use a center punch to mark the centers of the two holes to be drilled. If

the shelf can not be removed, place the template in a similar manner on the top side of the shelf if there is room to drill from the top side, or on the underside of shelf if there is only room to drill from the underside. If the template is used on the underside of the shelf, mark the rear edge of the shelf at the points where the extended heavy lines on the template hit the rear shelf edge. After the holes are center-punched, remove the template and drill carefully through the punched centers to a diameter of 1/4". If the shelf has been removed for the drilling operation, now re-mount it. Finally, replace the shelf-template in exactly its former position on the top-side of the shelf and tape it down. If the shelf template has been used on the underside of a stationary shelf, now place it on the top-side of the shelf using the marks on the rear edge of the shelf previously made. (In the latter case, accuracy may be improved by cutting the two holes out of the shelf-template with a razor blade and then lining up the holes in the shelf-template with the holes in the shelf).

3. To use the panel template, cut it or fold it back exactly along the dashed line. This dashed line corresponds to the junction of the top side of the cabinet shelf and the interior side of the wood panel. Position the panel template against the interior side of the wood panel so that the dashed line rests against the shelf and the two heavy vertical lines in the panel template meet with the two heavy horizontal lines in the shelf templates. Tape the panel template down and use a center-punch to make the centers of the four 3/8" holes in the four corners of the rectangular cut-out shown on the template. Now remove both templates and drill carefully through each of the four punched centers to a hole diameter of 3/8". On the front side of the wood panel scribe a rectangle externally tangential to the four drilled holes. Check the height and width of the rectangle against the panel template dimensions. These dimensions should not be exceeded. Now carefully cut out the rectangle with a sabre saw, using a small blade to start accurately in the 3/8" holes. After the cutting operation, any rough spots or excess material along the edges of the cut-out may be removed with a file. Finally, brush or blow out all chips and sawdust.

2-2C. MOUNTING THE UNIT

1. Insert the unit from the rear of the cabinet, carefully guiding the controls through the panel cut-out. Center the unit in the cut-out and re-mount the panel with the four screws previously removed.

2. From the rear of the cabinet, pull the amplifier toward you gently, until the front panel is flush against the wood panel.

3. Now place 5/8" flatwashers against the heads of the two No. 8 x 1-3/4" screws provided and insert them from the bottom side of the shelf into the two holes drilled previously. It may be necessary to shift the unit slightly to the left or right in order to afford clear access for the screws. When both screws have caught, tighten them to secure the unit to the shelf.

4. Replace the knobs previously removed on the control shafts.

SECTION III. ELECTRICAL INSTALLATION

3-1. INPUT CONNECTIONS

Channels 1 and 2 have 7 inputs each.

The channel 1 inputs are identified by the suffix "1" and are as follows:

CH.1 Low Level Inputs	CH.1 High Level Inputs
PHONO A 1	FM
PHONO B 1	AUX. 1
MIC 1	TAPE 1
TAPE HEAD 1	

The channel 2 inputs are identified by the suffix "2" and are as follows:

CH.2 Low Level Inputs	CH.2 High Level Inputs
PHONO A 2	AM
PHONO B 2	AUX. 2
MIC 2	TAPE 2
TAPE HEAD 2	

All high level inputs provide the same gain and flat frequency response. Low level inputs provide much higher gain and the prescribed gain-frequency characteristics of RIAA for phono and NARTB for tape head.

Monophonic sources, such as FM tuner, AM tuner, or monophonic phono cartridge, are plugged into Channel 1 inputs. Stereophonic sources, such as stereo phono cartridge, stereo tape heads, or FM, Multiplex (MX) adaptor, are plugged in as follows: left channel into channel 1 inputs; right channel into channel 2 inputs.

Setting the SELECTOR switch to FM-AM and the MODE switch to STEREO or REVERSE takes care of feeding two normally monophonic channel 1 inputs (FM tuner and AM tuner) one to Channel 1 and the other to channel 2 for FM-AM simulcast stereo.

1. PHONO: The PH. A input jacks 1 and 2 and the PH. B input jacks 1 and 2 permit the use of two magnetic cartridges in your system. One cartridge can be a stereo type and the other monophonic or both can be stereo. One cartridge can be in a turntable, and the other in a record changer or an inexpensive phono for children's use. A monophonic cartridge is plugged into the channel 1 input only.

When playing a monophonic record with a stereo cartridge, set the MODE switch to the MONO 1-2 position, specifically intended for this purpose. In the MONO 1-2 position, the channel 1 and 2 inputs are fully blended internally, and the blend is fed to both amplifiers. The purpose here is to cancel extraneous vertical noise components in the cartridge output.

When playing a monophonic record with a monophonic cartridge, set the MODE switch to MONO 1, the normal monophonic position at which the channel 1 input is fed to both amplifiers.

The load presented to the cartridge by the PHONO A inputs is 100Kohms. The load presented to the cartridge by the PHONO B inputs is 47Kohms. The choice of load impedance permits accomodation of most popular cartridges. Most popular cartridges, including all Shure and the Pickering 381A require 47K ohm load. The Pickering 380A, however, requires 100K ohm load.

If the Weathers C501-D cartridge is used, connect a 180K ohm resistor in series with it, followed by a 33K ohm resistor in shunt across the preamplifier input. Plug into PHONO A inputs. This network avoids overloading the preamplifier when this cartridge is used.

2. TAPE HEAD: The TAPE HEAD 1 & TAPE HEAD 2 input jacks permit the connection of a tape deck having no playback preamplifiers to the unit. The tape head should be of the conventional high impedance, high output type normally supplied in decks without playback electronics. If the head is of the stereo type, connect the upper track output to TAPE HEAD 1 and the lower track output to TAPE HEAD 2. If the head is of the monophonic type, connect the output to TAPE HEAD 1. The load presented to the tape head by each input is 1 megohm.

3. MIC: The MIC 1 & MIC 2 input jacks permit the connection of a single or stereo pair of dynamic, ceramic, or crystal microphones to your unit. If you have dynamic microphones that can be connected for either low or high output impedance, use the high output impedance connection. For a stereo pair of microphones, connect the left microphone to MIC 1 and the right microphone to MIC 2. If a single microphone is used, connect it to MIC 1 or MIC 2 and use MODE switch setting MONO 1 or MONO 2 accordingly. The load presented to the microphone by each mic input is 1 megohm.

4. TUNERS: For FM-AM simulcast tuners or separate FM & AM tuners, connect the regular FM audio output to the FM input jack and the AM output to the AM input jack. For FM Multiplex stereo tuners, including AM facilities or not, connect the left channel output to the FM input jack and the right channel output to the AM input jack. If you have a non-simulcast FM-AM tuner, such as the EICO HFT-92, connect the regular audio output to the FM input jack and use the MODE switch setting MONO 1 for mono tuner listening. If the AM input jack is used, then the MONO 2 setting is correct.

5. FM MULTIPLEX ADAPTOR: The AUX. 1 and AUX. 2 input jacks permit the connection of an FM

Multiplex adaptor. Any adaptor will provide a left channel output and a right channel output. The left channel output is connected to AUX. 1 and the right channel output to AUX. 2. The connections described in 3 above shall be made also.

6. TAPE: The TAPE 1 and TAPE 2 input jacks permits the connection of a tape machine complete with playback preamplifiers. If the machine provides stereo playback, connect the upper track output to TAPE 1, and the lower track output to TAPE 2. If the machine is of the monophonic type, connect the output to TAPE 1.

3-2. OUTPUT CONNECTIONS

1. OUTPUTS TO TAPE RECORDER: The TAPE OUT CH.1 and CH.2 jacks permit feeding the channel 1 and channel 2 signals to a stereo tape recorder. With monophonic source connected to a channel 1 input, the TAPE OUT CH.1 jack is used for feeding out to a monaural tape recorder. Low-capacity shielded audio cables with RCA-type phono connectors at the end may be used in lengths up to 20 ft. to connect each jack to the tape recorder inputs. The shortest possible lengths should always be used. Note that any inputs chosen by the SELECTOR switch feed out through these jacks. Outputs are not affected by balance, level, tone controls or filters.

2. SIGNAL CONNECTIONS TO MAIN POWER AMPLIFIERS: The PREAMPOUT CH.1 and CH.2 jacks are each connected to the input of a basic power amplifier. The two basic amplifiers may be separate or combined on one chassis. Low capacity shielded audio cables with RCA-type phono connectors at the ends should be used in lengths to 10 feet normally. If the cable capacity is as low as 25mmfd per foot, lengths up to 40 feet may be used if necessary. However, the shortest possible cable length should always be used.

3-3. POWER CONNECTIONS

The power cords of the basic power amplifiers, the turntable, and the tuner may be inserted in the convenience outlets provided on the rear chassis apron. The receptacle marked 117 VAC is intended for use primarily with a record changer or turntable and provides 117VAC regardless of whether the power switch of the preamplifier is turned on or off in order to protect the record changer or turntable mechanism. The receptacle marked 117VAC SWITCHED is "live" or "dead" depending on whether the preamplifier power switch is turned on or off and is intended primarily for use with the basic power amplifiers. The recommended method is to plug the line cord of one basic power amplifier

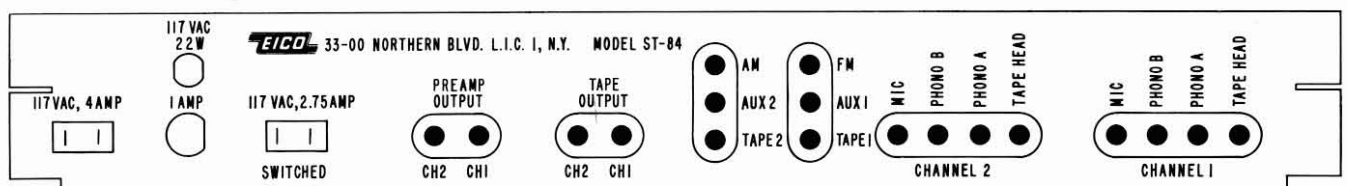


Figure 3-1. Rear Panel Connections

into the 117VAC SWITCHED receptacle of the ST84 and the line cord of the other basic power amplifier into either convenience receptacle on the first power amplifier. Tuners and other devices which may be turned on and off with the preamplifier power switch should be plugged into the remaining receptacles on the basic power amplifiers.

3-4. HUM ADJUSTMENT

1. **AC LINE CORD ORIENTATION:** After checking the preamplifier for proper operation make the following control settings which hold throughout the process of hum adjustment: **SELECTOR** switch at **PHONO B**, **MODE** switch at **STEREO**, the **BALANCE** control at 0, the **LEVEL** control at 0, all switches down (off), both **BASS** controls at 0, both **TREBLE** controls at -5. The preamplifier should be connected to the two basic power amplifiers which must in turn be connected to the two speaker systems. The two speaker system must be in phase and placed near one another for this adjustment. Connect the line cords of the two basic power amplifiers as recommended in **POWER CONNECTIONS** above. Plug the preamplifier line cord into a 117VAC wall outlet. Touch one end of a length of hook-up wire to the preamp chassis and check for a spark when the other end is touched to an unpainted chassis point on both power amplifiers. If a spark occurs in either case, reverse the prong position of the line cord plug for that power amplifier. Now place your ear close to both loudspeakers and listen to the hum level. Reverse the prong position of the preamplifier line cord plug in the wall outlet and listen again. Choose the prong position giving the least hum.

With the **SELECTOR** switch, select a particular piece of equipment, and determine the insertion position of its AC line cord plug that results in least hum.

Repeat this for every piece of equipment used with the preamplifier.

2. **HUM BALANCE:** Separate filament windings and hum-balance controls are provided for the two channels, so that an optimum hum balance setting can be found for each channel, rather than a compromise setting for both channels. Connect the phonograph and leave it shut-off with the tone arm at rest. Set the **SELECTOR** to the **PH. A** or **PH. B** position depending on which inputs are used. Set the **MODE** switch at **MONO 1**, **BALANCE** at 0, **LEVEL** at 10, **BASS 1 & 2** at 0, **TREBLE 1 & 2** at 0 (amplifier turned on). Set all slide switches at "off" (down). Adjust the channel 1 hum-balance control (R-57) with a screwdriver until the hum heard from the channel 1 speaker is at a minimum. Now set the **MODE** switch at **MONO 2** and adjust the channel 2 hum-balance control (R-58) until the hum heard from the channel 2 speaker is at a minimum. See figure 5-3 for the locations of R57 and R58.

3. **GROUNDING:** The cause of phonograph hum may be a metal pick-up arm not grounded to the cable

shield (try a good single ground connection to the cable shield from turntable frame, pick-up arm, and cartridge case), direct hum pick-up by the magnetic cartridge from the record player motor (try using a rubber mat on the turntable to increase the separation of the pick-up from the motor), or pick-up from a power transformer or other magnetic field in the vicinity (try moving phonograph away from suspected source). Check also that the phono input cable shielding is grounded to the amplifier chassis at one point only, through the skirt of the input connector where it plugs into the amplifier. Finally, try a good building ground, such as a connection from a cold water pipe terminated under any screwhead on the rear apron or bottom plate of the preamplifier. Do not connect such a ground wire to other components in the system. If possible, let each channel be connected to the amplifier using a separate shielded cable to the amplifier input. It is also desirable that the ground leads on both cables not be connected together at any point — not even at the cartridge. However, with some cartridges, it will not be possible to do this. In this case, just disregard this last instruction.

3-5. POWER AMP LEVEL ADJUSTMENT

To permit simultaneous accommodation of very low output pick-ups and comparatively low sensitivity power amplifiers, the ST84 is designed with high gain. As a consequence, it is required that shorted RCA-type phono plugs be inserted into all unused low input jacks.

Another consequence of the high gain, is that the input level controls of the associated power amplifiers must be adjusted correctly. Adjustment is made by just turning the input level controls on the power amplifiers to minimum. Using a stereo pick-up connected normally to your preamp, play a monophonic or orchestral recording. Turn the ST84 **BALANCE** control to 0 and the **LEVEL** control to maximum. Set the **MODE** switch to **STEREO** and turn up the input level controls of power amplifier until a volume as loud as you will ever require is reached. Now you can adjust the **LEVEL** controls of the preamp until the desired listening level is obtained.

All EICO single and dual power amplifiers are now provided with input level controls. Some power amplifiers of other manufacture do not have level controls. You may wish to provide level controls in the latter case if you are not using a low output pickup and low-efficiency loudspeakers. This may be done by mounting a pair of 500K ohm audio pots in a small metal utility cabinet 4" x 4" x 2" (Bud Model CU883) and connecting it between the ST84 preamp outputs and the power amplifier inputs. The length of lead from the pots to the power amplifiers should be as small as possible. A schematic diagram of the connections from one preamp output to one power amplifier input is shown below.

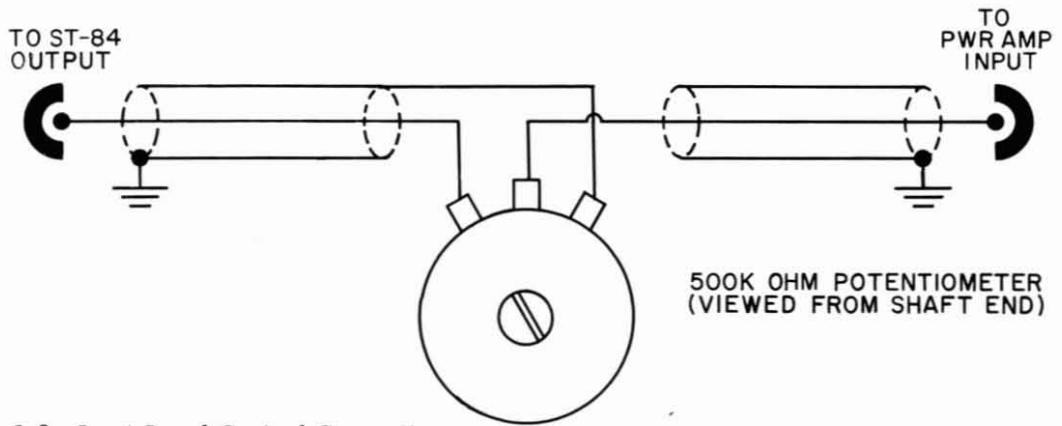


Figure 3-2. Input Level Control Connection

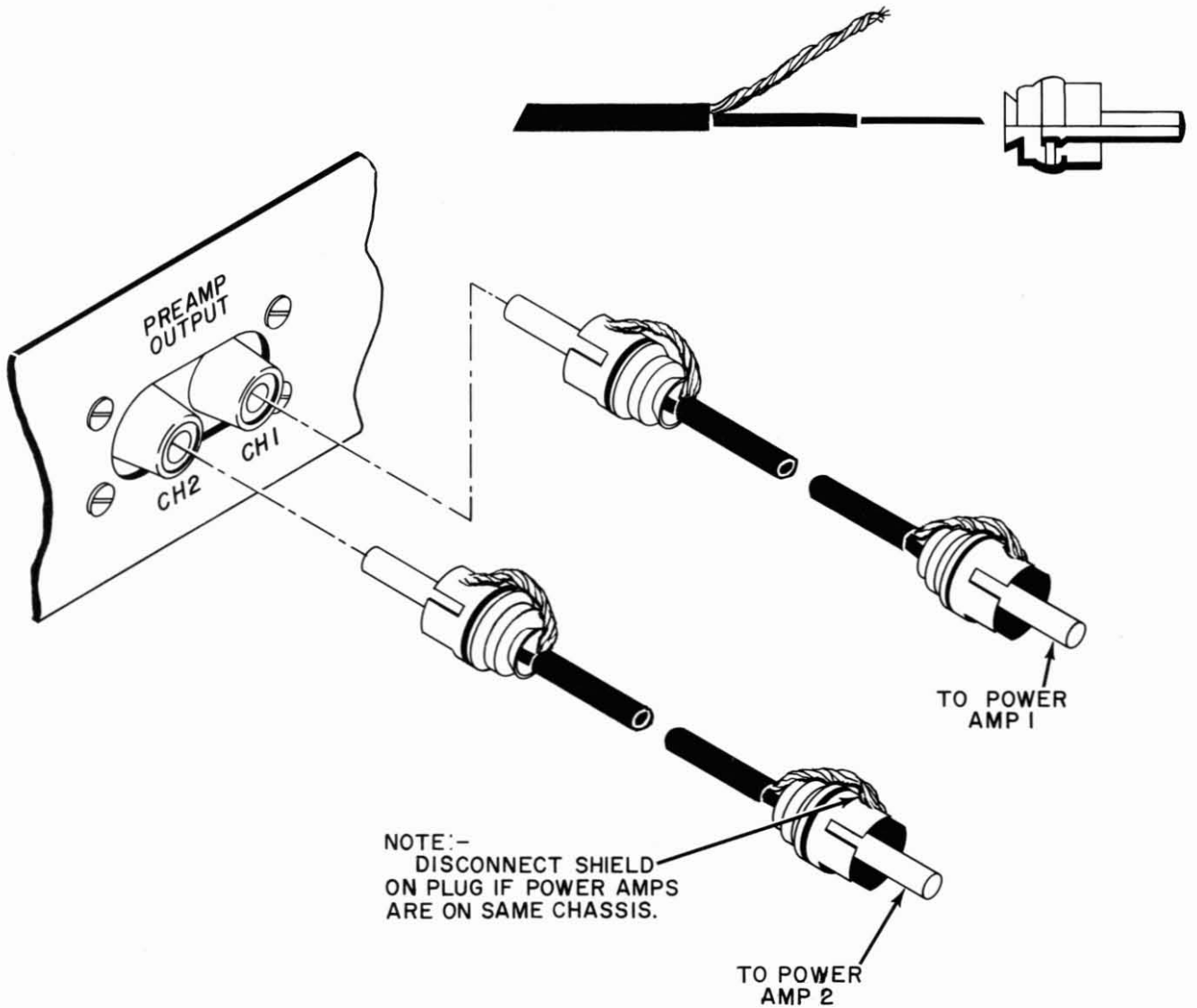


Figure 3-3. Power Amp Connection

SECTION IV. OPERATION

4-1. PRELIMINARY

Be sure all tubes are firmly seated in their sockets and that the tube shields are making good contact with their bases. As initial adjustments, set these controls

as follows: LEVEL controls 1 & 2 at 0, BASS controls 1 & 2 at 0, TREBLE controls 1 & 2 at 0, LOUDNESS compensation switch at OFF. Turn the system on by setting the POWER switch at ON. Please note that in the instructions that follow, it is assumed that a stereo pickup and/or a stereo tape head is being employed in the system.

4-2. SELECTOR Switch: Used to select any input or pair of inputs as follows:

POSITION	SOURCE	INPUTS	COMMENTS
TAPE/AUX.	Pre-amplified tape	TAPE 1 & TAPE 2	
MX/AUX.	FM Multiplex Stereo	MX 1 and MX 2	
FM-AM	FM tuner & AM tuner	FM & AM	FM only with MODE Sw. at MONO 1, AM only with MODE sw. at MONO 2.
TAPE HD.	Stereo tape head in deck without preamplifiers	TAPE HD. 1 & TAPE HD. 2	
PHONO A	Stereo mag. phono cartridge	PH. A 1 & PH. A 2	Set MODE Sw at MONO 1-2 to play mono record
PHONO B	Stereo mag. phono cartridge	PH. B 1 & PH. B 2	Set MODE Sw at MONO 1-2 to play mono record
MIC	Microphones	MIC 1 & MIC 2	

4-3. MODE Switch: Used to select mode of operation

POSITION	OPERATION	COMMENTS
BAL 1	CH.1 plus CH.2 inputs blended out CH.1 speaker	For checking left side of stereo reproduction
BAL 2	CH.1 plus CH.2 inputs blended out CH.2 speaker	For checking right side of stereo reproduction
STEREO	CH.1 input out CH. 1 speaker CH.2 input out CH. 2 speaker	Should normally give left side of program out of left speaker, and right side of program out of right speaker.
REVERSE	CH.1 input out CH.2 speaker CH.2 input out CH.1 speaker	Use if left side of program is coming out of right speaker when set at STEREO.
MONO 1	CH.1 input out CH.1 & 2 speakers	Use for mono listening when source is played into CH.1 inputs, except when playing mono records. With stereo cartridge.
MONO 2	CH.2 input out CH.1 & CH.2 speakers	Use for mono listening when source is played into CH.2 inputs, except when playing mono records. With stereo cartridge.
MONO 1-2	CH.1 plus CH.2 inputs blended out CH.1 & 2 speakers	Used only when playing mono record (with stereo cartridge).

4-4. LEVEL CONTROL

Used to adjust the listening level in both channels. (The BALANCE control is adjusted after setting the LEVEL control.) Substantial changes in LEVEL control setting may require re-setting the BALANCE control. Adjust the output level controls in stereo high level sources (where present) to match the sound level obtained on phono, if possible. If any of the high level sources cannot provide high enough output to match phono, simply set this source to maximum output.

4-5. BALANCE CONTROL

Used to achieve equal left and right side program levels in stereo. Effective in mono to center the apparent source between the speakers. Neither channel amplifier is favored (as to gain) at the zero setting (mid-rotation). As the control is turned clockwise from zero, the channel 2 (right) speaker is made louder and the channel 1 (left) speaker is made softer, while the overall level remains about the same. As the control is turned counter-clockwise from zero, the channel 1 (left) speaker is made louder and the channel 2 (right) speaker is made softer, while the overall level remains about the same.

If audible balance is not achieved at the 0 setting of the control,* the indication is that the sources feeding the amplifier are not equal. If the sources have their own level controls, such as FM or AM tuners or Multiplex adaptors, then these level controls should be set at equal output by successively setting the MODE switch at MONO 1 and MONO 2 while adjusting the source level controls for equal output in both positions. Once the source levels have been adjusted, balance can be achieved by switching the MODE selector from BAL 1 and BAL 2 while adjusting the BALANCE control for equal output from both channels at the desired level.

If one speaker is a little more efficient than the other, or one power amplifier is more sensitive than the other, cut down the gain at the more efficient system using the level control on that power amplifier.

*With the power amp level controls set as in 3-5 and the LEVEL control set for a normal listening level.

4-6. LOUDNESS SLIDE SWITCH

A characteristic of human hearing is that sensitivity to bass tones diminishes more rapidly, as the listening level is lowered, than sensitivity to middle and high frequency tones. Many people find the audible loss of bass at low listening levels unsatisfying. Setting the LOUDNESS slide switch to ON provides a compensating amount of bass boost at low listening levels. Do not leave the LOUDNESS switch at ON when listening at normal volume, since the amount of bass boost provided will usually be excessive and unmusical. Some people prefer not to use loudness compensation at all, because it does not correspond to any natural listening condition at a live performance.

4-7. BASS CONTROL CH. 1, BASS CONTROL CH. 2 (CONCENTRIC)

The plus sign on the right side of the dial indicates

that clockwise rotation from the mid-point (0) of either control increases (boosts) bass response; the minus sign on the left side indicates that counter-clockwise rotation from the mid-point decreases (cuts) bass response. There is no interaction with the TREBLE control. Start all adjustments with this control set at the mid-point (0), which is called the "flat" position since bass response is neither cut nor boosted at this position.

4-8. TREBLE CONTROL CH. 1, TREBLE CONTROL CH. 2 (CONCENTRIC)

The plus sign on the right side of the dial indicates that clockwise rotation from the mid-point (0) of either control increases (boosts) treble response; the minus sign indicates that counter-clockwise rotation from the mid-point decreases (cuts) treble response. There is no interaction with the BASS control. Start all adjustments with this control set at the mid-point (0), which is called the "flat" position since treble is neither cut nor boosted at this position.

The amplifier ON-OFF power switch is ganged with the CH.2 TREBLE control. Note the word "OFF" on the panel just beyond full-counter-clockwise rotation. The plain circle symbol preceding it indicates that the power switch is ganged with the CH.2 control. Turn the amplifier off by turning the CH.2 TREBLE control beyond full counter-clockwise rotation until the power switch clicks to OFF. Turn the amplifier on by turning the CH.2 TREBLE control clockwise from OFF and setting it at the mid-point (0) or some customary setting of the CH.2 TREBLE control you may use.

4-9. LO FILTER SLIDE SWITCH

Set to ON when it is desired to cut low frequency response below 100 cps because of rumble in a phonograph or even in broadcast program material. Phonograph rumble is usually at about 29 cps and may well not be directly audible. Sometimes it can be at a much lower frequency, which is definitely not directly audible. However, the effect of rumble can be heard even if the rumble itself is not. It manifests itself by using up amplifier power at low frequencies and can even overload the amplifier. If, at normal listening levels on phonograph, setting the LO FILTER to ON definitely results in "cleaner", less-distorted sound, the indication is that your phonograph suffers from excessive rumble. Whether it is worth doing anything about it, depends on the installation. If you have inexpensive speaker systems that do not produce substantial undistorted sound below 80 cycles, you may just as well live with the rumble and eliminate its bad effects by using the LOW filter. If you have made a considerable investment in speakers, partly in order to obtain full, undistorted response below 80 cycles, you may not want to forego full bass response. In the latter cases, have the phonograph examined by a qualified service man to see if the rumble is caused by a defect that can be remedied.

4-10. HI FILTER SLIDE SWITCH

Set to ON when it is desired to cut high frequency

response above 5000 cps. Useful for minimizing extraneous noise when listening to narrow range AM broadcasting, for listening to noisy or worn records, and for reducing the annoyance of excessive distortion from any source.

4-11. TAPE MONITOR SLIDE SWITCH

Useful with complete tape machines (including record and playback electronics) that provide off-the-tape monitoring facilities while recording. In this situation, setting the TAPE MONITOR slide switch to ON permits you to hear the program being recorded directly from the tape.

4-12. TAPE EQUALIZATION SLIDE SWITCH

Adjusts the equalization at the TAPE HD. position of the SELECTOR switch according to the NARTB standard for the 7-1/2 (and 15) ips tape speeds and 3-3/4 ips tape speeds.

4-13. LISTENING TO PHONOGRAPH

Set the SELECTOR switch to PHONO (A or B) if you have a magnetic cartridge, or a ceramic/crystal cartridge with adaptors interposed between the cartridge outputs and the MAG. PHONO 1 and 2 inputs. (The RIAA equalization provided at the PHONO position is now the international standard in the recording industry for both monophonic and stereophonic records and is also a very good compromise for the most important of the older monophonic recording characteristics.) Set the SELECTOR switch to the appropriate AUX if you are using a stereophonic ceramic/crystal cartridge connected to the AUX or TAPE pair of inputs. To play a stereophonic record, set the MODE switch to STEREO or REVERSE for stereo listening. To play a monophonic record, the procedure is exactly the same, only the MODE switch remains set at the MONO 1.2 position, providing the identical signal in both channels with mixing of the inputs for vertical rumble cancellation.

4-14. LISTENING TO TAPE DECK (direct connection to tape head)

Set the SELECTOR to TAPE. NARTB tape equalization is provided in both channels for the tape speed selected with the TAPE switch on the front panel. One position is for 7-1/2 ips tapes and the other for 3-3/4 ips tapes. These equalizations are the industry standard for pre-recorded stereophonic and monophonic tapes.

4-15. LISTENING TO A MONOPHONIC SOURCE CONNECTED TO TAPE 1, AUX 1, OR TO MONOPHONIC FM BROADCAST

Set the SELECTOR to TAPE, MX/AUX or FM-AM respectively and the MODE switch to MONO 1.

4-16. LISTENING TO A MONOPHONIC SOURCE CONNECTED TO TAPE 2, AUX 2, OR TO AM

Set the SELECTOR to TAPE, MX/AUX, or FM-AM respectively and the MODE switch to MONO 2.

4-17. LISTENING TO A STEREOPHONIC SOURCE CONNECTED TO TAPE 1 AND 2, AUX 1 AND 2, AM AND FM

Set the SELECTOR to TAPE, MX/AUX, or FM-AM respectively. Set the MODE switch at STEREO or REVERSE.

4-18. MAKING RECORDINGS

Tape recordings may be made by connecting the recorder to the TAPE OUTPUT jacks. Please note that recordings cannot be made on tape decks unless those decks are equipped with the electronics required for recording.

SECTION V. MAINTENANCE

5-1. GENERAL

Your preamplifier should require little service except for normal tube replacement. We recommend no substitutions for the tube types used in this amplifier except as stated. All the tube types used are distributed nationally, but replacements can be obtained directly from EICO if desired.

To facilitate servicing, remedial and trouble-shooting procedures have been provided in the TROUBLE SHOOTING CHART that follows. VOLTAGE and RESISTANCE CHARTS are also provided as an aid to locating defective components.

5-2. TROUBLE-SHOOTING PROCEDURES

Set the SELECTOR switch at PHONO A or B, whichever is appropriate, and the MODE switch at STEREO or REVERSE. Play a known high quality stereo recording on the phonograph. If there is no output to one or both speakers, or if the output is low or audibly distorted, proceed to the checks for those symptoms. If there is excessive hum in the output, disconnect the appropriate phono input cable from the preamplifier and short the phono input jack at the chassis. If the hum disappears, the trouble is not in the amplifier but in the phonograph or in the connection to the amplifier. In each case, check for the trouble in the preamplifier channel which seems defective. If both channels are defective, check the power supply.

The cause of phonograph hum may be a metal pick-up arm or motor not grounded to the preamplifier chassis (run these ground leads directly to the preamplifier chassis, not to the outer braid conductors of the phono input cables), direct hum pick-up by the magnetic cartridge from the record player motor (try using a rubber mat on the turntable to increase the separation of the pick-up from the motor), or pick-up from a power transformer or other magnetic field in the vicinity (try moving phonograph away from suspected source). Check also that the phono input cable shielding is grounded to the amplifier chassis at one point only, through the skirt of the input connector where it plugs into the amplifier. Finally, try a good building ground such as a connection from a cold water pipe terminated under speaker terminal "G" on the

amplifier. Do not connect such a ground wire to other components in the system. If possible, let each channel be connected to the amplifier using a separate shielded cable to the amplifier input. It is also desirable that the ground leads on both cables not be connected together at any point — not even at the cartridge. However, with some cartridges, it will not be possible to do this. In this case, just disregard this last instruction.

Excessive hum on other inputs may be checked in a similar manner. Disconnect the input cable in question and short the particular input jack to the chassis. If the hum disappears, the trouble is external to the preamplifier. Note that on all inputs, the braid of the input cable should connect to the preamplifier only through the skirt of the input connector. The cause and remedies for the following symptoms are then based on the assumption that checks made in the manner described above have eliminated the possibility of the trouble being external to the preamplifier.

If the trouble is no output or low output, check AC signal voltages and DC operating voltages starting at the input and work step-by-step toward the output in each amplifier. Set the LEVEL controls to maximum

(10), the BASS and TREBLE controls to their mid-points (0), the SELECTOR switch to PHONO and the MODE switch to STEREO or REVERSE. Use a 1000 cycle sine wave signal, such as supplied by the EICO 377 Sine & Square Wave Audio Generator. In addition, use a precision 100:1 attenuator to permit obtaining a level of 0.0032 volt fed into the appropriate PHONO A or B input from an audio generator output of 0.32 volts, which can easily be measured on the lowest AC volts range of your VTVM (also improves signal to hum from generator). Use a high input impedance VTVM for all AC signal voltage measurements; a VTVM or 20,000 ohm/V VOM for DC volts measurements.

If the trouble is an excessively distorted output, try tube replacement, signal tracing, or proceed directly to voltage and resistance measurements.

5-3. TRANSFORMER TEMPERATURE

The transformer used in this unit runs at a temperature less than 195°F despite the fact that the safety limit is at a much higher 221°F. Although 195° is cool for a transformer, it is very hot to the touch. Transformers which seem too hot when touched with the hand, are usually good and are actually not overheating.

Fig. 5-1. TROUBLE SHOOTING CHART

SYMPTOM	CAUSE	REMEDY
Preamplifier causes power line fuse to blow.	Line cord, J19, J20, primary or high voltage secondary windings of T1 incorrectly wired.	Repair
	Pri./h.v. sec. windings of T1 shorted.	Replace
V1, V3, V5, V6 and pilot tube filament not lit.	Open lead from 6V (green leads) winding of T1.	Repair
	6V winding (green leads) of T1 open.	Replace
V2, V4 tube filaments not lit.	Open lead from 6V (brown leads) winding of T1.	Repair
	6V winding (brown leads) of T1 open.	Replace
DC voltage at V6 cathode (pin 7) is incorrect as specified below.	Defective V6 C31A shorted internally or externally. Connection to center-tap of high voltage winding of T1 is open.	Replace
		Replace (or repair)
		Repair
b) Low voltage	C31A O.K. but C31B or C31C shorted. C31A open or no connection Excessive current drain in amplifier	Replace Replace (or repair) Repair
c) High voltage	Tubes V1-V5 defective or over-biased and not drawing normal current. Open R59, R60, R61 or R62	Repair (or replace)
		Replace
Filaments not at DC potential - hum	Shorted pot to chassis through mounting screws	Mount screw head for pot below chassis and not on top surface of chassis.

Fig. 5-2. VOLTAGE & RESISTANCE CHART

TUBE	PIN#	OPERATING VOLTS (DC UNLESS NOTED)	SIGNAL VOLTS (1kc) at 2V OUT	OHMS (UNIT DISCONNECTED FROM POWER)
V1 (ECC83/12AX7)	1	113	.38	51K
	2	0	.025	1.5M
	3	0.83	.014	1150
	4&5	fil. (12VDC; 6VAC to pin 9)		
	6	41	.025	341K
	7	0	.0032	113K
	8	0.5	.0038	2300
	9	fil.		
	V2 (ECC83/12AX7)	1	50	.082
2		0	.026	1.5M
3		1.83	0	1150
4&5		fil. (12VDC; 6VAC to pin 9)		
6		78	.026	355K
7		0	—	113K
8		0.45	0	2300
9		fil.		
V3,V4 (both ECC83/ 12AX7)		1	180	3.2
	2	0	0.47	470K
	3	1.5	0.32	2.2K
	4&5	fil. (12VDC; 6VAC to pin 9)		
	6	140	0.47	231K
	7	0	0.19	125K
	8	1.15	0.19	2.2K
	9	fil.		
	V5 (ECC83/12AX7)	1	140	2
2		0.4	0.13	260K
3		1.25	0.050	1K
4&5		fil. (12VDC; 6VAC to pin 9)		
6		140	2	44K
7		0.4	0.13	260K
8		1.25	0.050	1K
9		fil.		
V6 6X4		1	265 VAC*	
	2			—
	3&4	fil. (12VDC; 6VAC between pins 3 & 4)		—
	5			—
	6	265 VAC*		400-900
	7	345		over 30K

* = 60 cycles

All resistance measurements, except from pin 7 of V6 (6X4 rectifier) are made with pin 7 of V6 grounded. All voltage and resistance measurements are measured to chassis with controls set as follows: SELECTOR Switch to PHONO A, MODE switch to MONO 1, BALANCE control at 0, LEVEL control at 10, BASS 1 & 2 and TREBLE 1 & 2 controls all at 0, all slide switches down to off position. For voltage measurements as they appear in this chart, feed 0.0032 volts (3.2mv) 1kc signal into the PHONO A1 input only, shorting out the PHONO A2 input. Voltage measurements are made with a VTVM. Operating line voltage at which voltage measurements are made is 117VAC, 60 cps. NOTE: ALL VOLTAGE & RESISTANCE VALUES MAY NORMALLY BE $\pm 20\%$.

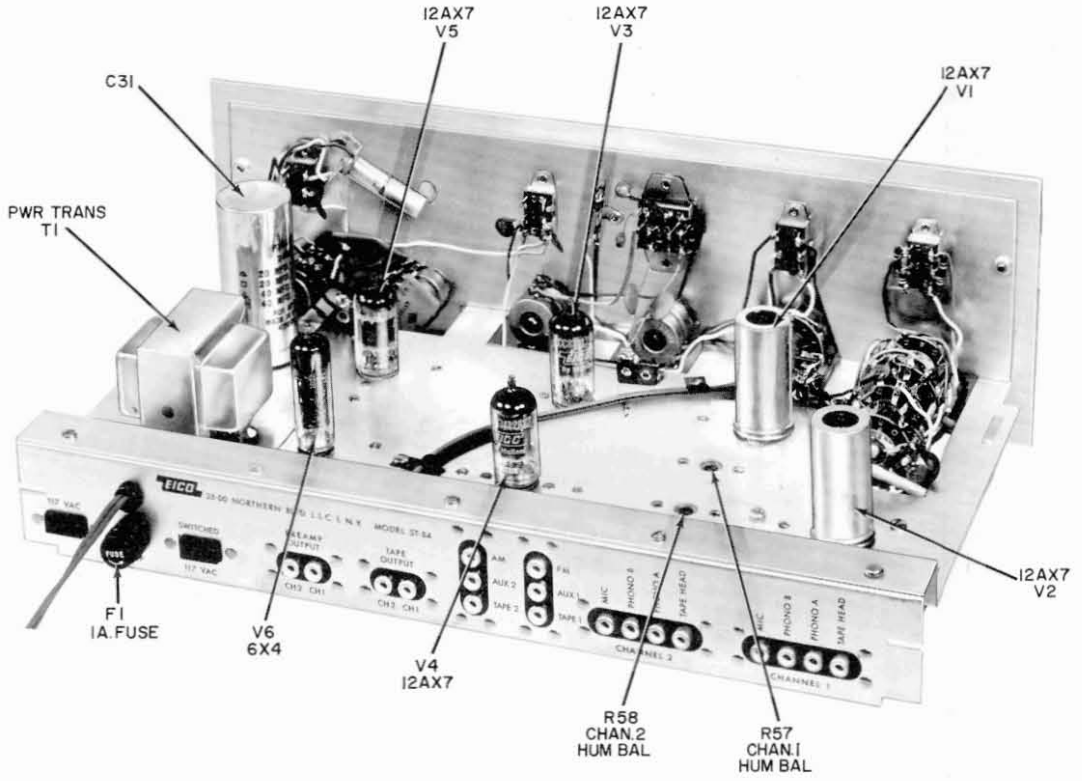


Figure 5-3. Tube Layout (Top Chassis View)

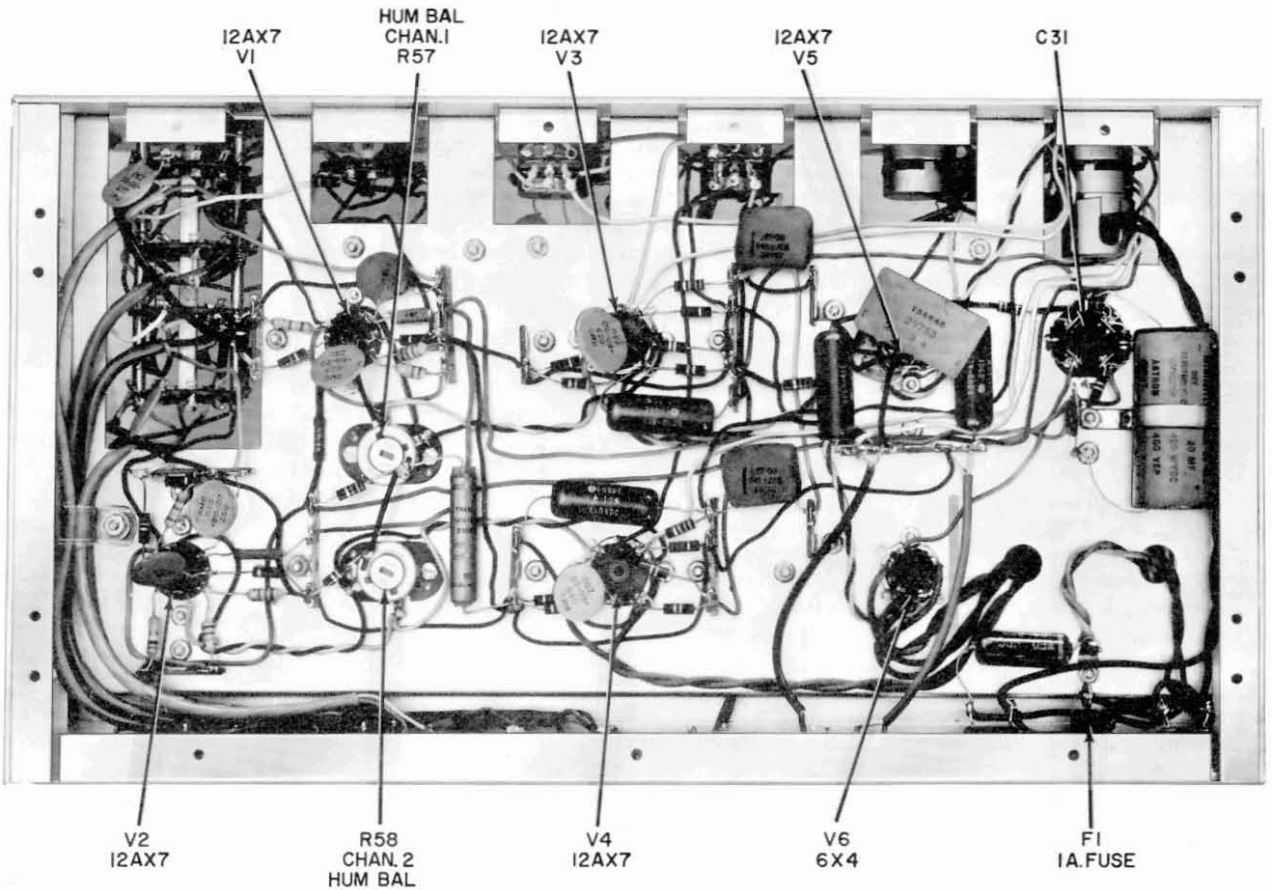


Figure 5-4. Bottom Chassis View

SECTION VI. EICO'S SERVICE POLICY

If you are experiencing trouble that you cannot diagnose yourself, you are invited to avail yourself of the EICO Service Consultation Department. The consultant handling your inquiry will make every effort to diagnose the cause of your particular difficulty based on the information that you provide. Please be as thorough as possible. Include the following information about your unit:

- a) Have you made a thorough check of the wiring, checking also for cold solder joints, or accidental shorting between parts, or to chassis? (Check to see whether a bare wire or lead extends far enough to be shorted when the bottom plate is put on).
- b) Have you checked that the proper tube or transistor is in each socket, and also making proper contact in the socket? Are all shields firmly in place?
- c) Does the trouble occur at one time or one operating situation, but not at another time or operating situation? Be as specific as possible in this respect.
- d) If the unit is of the type that involves alignment or calibration, be as specific as possible as to what you have done or not done with regard to these requirements. If the unit incorporates tuned circuits stated to be factory pre-aligned, did you change any settings? If so, what alignment procedure did you use?
- e) Have you observed any peculiarity about a part? If a part appears charred or otherwise damaged by excessive heat, please say so. If you think you have damaged a particular part in the assembly or wiring, please say so. In conjunction with the symptoms, the consultant may be able to determine whether such a part is likely to be defective.
- f) Have you gone through any trouble-shooting procedure that may be provided? If your manual includes a table of contacts made at each switch position, have you checked out the switches accordingly (if the trouble is such that doing this would be appropriate)? Have you been able to make checks of the operating voltages and/or resistances, if this is appropriate, and your manual provides a table of voltages and resistances? What are the results of these checks? Also, have you taken any other trouble-shooting approaches? What have been the results?
- g) If this is high fidelity equipment, please state the type (magnetic, ceramic, crystal) of phono cartridge you are using and/or the make and model number. State the make and model of your record changer, or turntable and tone arm. Are the speakers in the same cabinet with your electronic equipment? If so, describe the cabinet and the placement of the components. Please state the make and model of your speakers.

In addition, list any code numbers in red under the words INSTRUCTION MANUAL on the cover of the book provided with your unit. If there are no red code numbers, state this specifically. If the unit bears a serial number, it is essential that you include this also.

PARTS REPLACEMENT

If it appears that a component is defective, and you desire a replacement from EICO, address your correspondence to our Customer Service Department.

If you are claiming the right to a no-charge replacement under the terms and conditions of the warranty, it is required that you shall have sent in the registration card within 10 days of the date of purchase, and that you send back the defective part transportation prepaid. EICO will make the necessary replacement at no charge for parts eligible under the terms and conditions of the warranty. In returning tubes, pack them very carefully to avoid breakage in shipment. Broken tubes will not be replaced. Please read the warranty on the subject of parts eligible for replacement.

Further information required on a part returned to the factory for a no-charge replacement under the terms and conditions of the warranty is as follows:

- a) Model number and serial number, if any, of unit. Also any code numbers in red under the words INSTRUCTION MANUAL on the cover of the book supplied with the unit.
- b) Stock number and description of part as given on the parts list. If the part is not listed (of itself) in the parts list, it means that the part is integral with a sub-assembly. If the sub-assembly is not sealed, and the defective part is definitely identified and easily replaceable (not more than two connections), you may request replacement for the particular part. If the sub-assembly is sealed, or if the defective part is not definitely identified or is not easily replaceable (more than two connections), then remove the sub-assembly and return it to EICO (less any tubes) for repair or replacement, if your unit is in warranty. If your unit is out of warranty, you are generally advised to order a replacement sub-assembly.
- c) Describe as completely as possible the nature of the defect, or your reason for requiring replacement.

FACTORY REPAIR SERVICE

EICO maintains a Factory Repair Service Department for in-warranty or out-of-warranty repair of EICO equipment. It is intended to serve those customers who are not adequately familiar with electronics to make use of the EICO Service Consultation facilities, or whose difficulties cannot be solved by correspondence.

For all out-of-warranty units, there is a minimum labor and handling fee. For the Model ST-84, this fee is \$10.00. Charges for components replaced are additional to the minimum fee.

For in-warranty completed kit units, there is a minimum labor and handling fee. For the Model ST-84, this fee is \$10.00. There is no charge for a replaced defective part provided that the terms and conditions of the warranty for no charge replacement are not violated in the judgement of EICO.

For in-warranty factory-wired units, there is no labor and handling fee if the unit complies with the terms and conditions of the warranty in the judgement of EICO. However, if the terms and conditions of the warranty are violated, then there will be charged to customer a minimum labor and handling fee plus the cost of parts replaced.

In all cases, the unit must be sent to the factory transportation prepaid, and the unit will be returned to the customer transportation collect.

The services rendered for the minimum labor and handling fee are the correction of any minor wiring errors (not extensive corrections or re-wiring), the labor involved in replacing defective parts, and any adjustments, alignment, or calibration procedures that would normally be performed on a factory-wired unit. Units not wired according to instructions, or modified in any way, or showing evidence of the use of acid core solder, will not be serviced and will be returned to the customer forthwith.

Units requiring extensive corrections or re-wiring will incur an additional labor charge which will be set by EICO. The customer will be informed of this situation and written authorization from the customer will be required before the work is done.

Please note: minimum labor and handling fees are subject to revision at any time.

LOCAL REPAIR FACILITIES

Out-of-warranty repair work may also be performed by authorized service stations as well as the EICO factory. A list of authorized service stations is provided with this manual. The roster of stations may change from time to time, and if considerable time has elapsed since you purchased your unit, you are advised to contact the station you choose before sending the unit to them for repair. Use of a local service station will often result in faster service, and, usually, lower transportation costs.

It is necessary that you comply with the Shipping Instructions that follow when sending in a unit for service.

SHIPPING INSTRUCTIONS

You are strongly advised to retain the original shipping carton and inserts in the case that re-shipment

is required for service or any other purpose. The carton may be collapsed, for storage in as small a space as possible. In very many cases, the same carton is used for kit and factory-wired units so that the kit carton will serve for re-shipment of the completed kit.

To submit a unit for service, either to the factory or an authorized service station,* fill out completely the Service Work Order form provided with the manual. Pack the unit very carefully, preferably in the original shipping carton with the original inserts.

If this is not possible, use a strong oversize carton, preferably wood, allowing at least 3 inches of resilient packing material such as shredded paper or excelsior, to be inserted between all sides of the unit and the carton. Seal the carton with strong gummed paper tape or strong twine, or both. Include the Service Work Order in the carton and in addition, attach a tag to the instrument on which is printed your name and address and brief reference to the trouble experienced. Affix "FRAGILE" or "HANDLE WITH CARE" labels to at least four sides of the carton, or print these words large and clear with a bright color crayon. Ship by prepaid Railway Express or parcel post to:

Electronic Instrument Co., Inc.
33-00 Northern Blvd.
Long Island City 1, New York
Attention: Service Department

Include your name and address on the outside of the carton. Return shipment will be made transportation charges collect. Note that a carrier cannot be held liable for damages in transit, if packing, **IN HIS OPINION**, is insufficient.

*Authorized service stations are for out-of-warranty units only, unless the station is specifically noted on the List of Authorized Service Stations to be authorized for other work.



THE EICO WARRANTY



The Electronic Instrument Company, Inc., hereafter referred to as EICO, warrants that, for a period of 90 days from the date of purchase, any EICO kit will be free of defects in parts, and that any EICO factory-wired unit will be free of defects in parts and workmanship. For an EICO kit, EICO's obligation is limited to those parts which are returned transportation prepaid to the factory without further damage, and in the judgement of EICO are either originally defective or have become defective in normal use. For an EICO factory-wired unit, EICO's obligation is limited to those parts, sections, or the entire unit which is returned transportation prepaid to the factory without further damage, and in the judgement of EICO are either originally defective or have become defective in normal use.

The warranty does not apply to any parts damaged in the course of handling, assembling, or wiring by the customer, or damaged due to abnormal usage or in violation of instructions or reasonable practice, or further damaged to a consequential degree in return shipment. Furthermore, the foregoing warranty is made only to the original customer, and is and shall be in lieu of all other warranties, whether expressed or implied, and of all other obligations or liabilities on the part of EICO, and in no event shall EICO be liable for any anticipated profits, consequential damages, loss of time, or other losses incurred by the customer in connection with the purchase or operation of EICO products or components thereof.

The registration card, which accompanies each EICO kit or factory-wired unit, must be filled in and returned to the company within 10 days after the date of purchase. This warranty applies only to registered units.

SECTION VII. PARTS LIST

SYM.#	STOCK#	AM'T.	DESCRIPTION
C1,2,3,4,5,6	22517	6	capacitor, disc, .025mfd (25K or 25,000mmf) GMV
C7,8	22538	2	capacitor, disc, 400mmf, 10%
C9,10	22536	2	capacitor, disc, 25mmf, 10%
C11,12	22522	2	capacitor, disc, 330mmf, 10%
C13,14	22520	2	capacitor, disc, .0012mfd (1.2K or 1200mmf), 10%
C15,16	22580	2	capacitor, disc, .2mfd, 10V
C17,18	22534	2	capacitor, disc, 68mmf, 10%
C19,20	22517	2	capacitor, disc, .025mfd (25K or 25,000mmf) GMV
C21,22	20039	2	capacitor, molded, .1mfd, 400V, 10%
C23,24	22532	2	capacitor, disc, .0015mfd (1.5K or 1500mmf), 10%
C25,26	20057	2	capacitor, molded, .47mfd, 200V
C27,28	22563	2	capacitor, disc, .01mfd (10K or 10,000mmf) 25V, 10%
C29,30	20039	2	capacitor, molded, .1mfd, 400V, 10%
C31	24020	1	capacitor, elec., 2 x 20mfd, 400V + 2 x 40mfd, 350V
C32	23016	1	capacitor, elec., 30mfd, 400V
C33	23028	1	capacitor, elec., 10mfd, 150V
C34	20043	1	capacitor, molded, .03mfd, 600V
F1	91002	1	fuse, 1 Amp
I1	92000	1	pilot light bulb, #47
J1,2,3,4;	50020	2	jack, input, quadruple
J5,6,7,8			
J9,10,11;12,	50018	2	jack, input, triple
J13,14			
J15,16;17,18	50011	2	jack, input, dual
J19,20	50016	2	AC receptacle
PC1,2	29751	2	printed circuit, 7 leads
PC3	29753	1	printed circuit, 5 leads
R1,2	10428	2	resistor, 47K, 1/2W, 10% (yellow, violet, orange, silver)
R3,4	10410	2	resistor, 100K, 1/2W, 10% (brown, black, yellow, silver)
R5,6,7,8	11526	4	resistor, 200K, 1/2W, 5% (red, black, yellow, gold)
R9,10	10424	2	resistor, 22K, 1/2W, 10% (red, red, orange, silver)
R11,12	10407	2	resistor, 1M, 1/2W, 10% (brown, black, green, silver)
R13,14	10455	2	resistor, 1.5M, 1/2W, 10% (brown, green, green, silver)
R15,16	11512	2	resistor, 2400, 1/2W, 5% (red, yellow, red, gold)
R17,18	11533	2	resistor, 1200, 1/2W, 5% (brown, red, red, gold)
R19,20	11523	2	resistor, 68K, 1/2W, 5% (blue, gray, orange, gold)
R21,22	11520	2	resistor, 40K, 1/2W, 5% (yellow, black, orange, gold)
R23,24,25,26	10435	4	resistor, 150K, 1/2W, 10% (brown, green, yellow, silver)
R27,28	10408	2	resistor, 680K, 1/2W, 10% (blue, grey, yellow, silver)
R29,30	11532	2	resistor, 4M, 1/2W, 5% (yellow, black, green, gold)
R31,32	10421	2	resistor, 6800 ohm, 1/2W, 10% (blue, gray, red, silver)
R33-34	18068	1	potentiometer, 750K, dual
R35-36	18069	1	potentiometer, 250K, dual
R37,38	10413	2	resistor, 2.7K, 1/2W, 10% (red, violet, red, silver)
R39,40	10417	2	resistor, 220K, 1/2W, 10% (red, red, yellow, silver)
R41,42,43,44	10423	4	resistor, 2200 ohm, 1/2W, 10% (red, red, red, silver)
R45,46	10431	2	resistor, 470K, 1/2W, 10% (yellow, violet, yellow, silver)
R47,48	10426	2	resistor, 33K, 1/2W, 10% (orange, orange, orange, silver)
R49,50	10410	2	resistor, 100K, 1/2W, 10% (brown, black, yellow, silver)
R51-52	18071	1	potentiometer, 1M, concentric
R53-54-S8	18096	1	potentiometer, 500K, concentric, w/SPST switch and cover
R55,56	10426	2	resistor, 33K, 1/2W, 10% (orange, orange, orange, silver)
R57,58	19016	2	potentiometer, 100 ohm, WW
R59,60	10449	2	resistor, 5600 ohm, 1/2W, 10% (green, blue, red, silver)
R61	10400	1	resistor, 10K, 1/2W, 10% (brown, black, orange, silver)
R62	10444	1	resistor, 120K, 1/2W, 10% (brown, red, yellow, silver)
R63	10451	1	resistor, 27K, 1/2W, 10% (red, violet, orange, silver)
R64	10410	1	resistor, 100K, 1/2W, 10% (brown, black, yellow, silver)
S1	60100	1	switch, rotary, 4 section
S2	60101	1	switch, rotary, 1 section
S3,4	62012	2	switch, slide, DPDT
S5	62014	1	switch, slide, 4PDT
S6,7	62012	2	switch, slide, DPDT
S8		1	switch, SPST mounted on R53-54
T1	30034	1	transformer, power
TB1,2	54000	2	terminal strip, 1 post left
TB3,4,5	54001	3	terminal strip, 1 post right

SECTION VII. PARTS LIST (Cont'd.)

SYM.#	STOCK#	AM'T.	DESCRIPTION
TB6,7,8,9,10	54003	5	terminal strip, 2 post
TB11	54006	1	terminal strip, 3 post 2 right
TB12,13	54008	2	terminal strip, 4 post
TB14	54011	1	terminal strip, 1 post, dual upright
TB15,16	54014	2	terminal strip, 3 post 2 left
TB17	54015	1	terminal strip, 3 post 2 left, with ground
V1,2,3,4,5	90034	5	tube, 12AX7/ECC83/7025
V6	90036	1	tube, 6X4
XF1	97800	1	fuseholder
XI1	97712	1	pilot light assembly
XV1,2	97027	2	socket, 9 pin miniature with shield support
XV3,4,5	97025	3	socket, 9 pin miniature
XV6	97024	1	socket, 7 pin miniature
	40000	30	nut, hex, No. 6-32
	40001	6	nut, hex, 3/8"-32
	40007	52	nut, hex, No. 4-40
	40016	1	nut, hex, 1/2" for fuseholder
	41008	1	screw, No. 6-32 x 1/2, binding head
	41035	5	screw, No. 6, self tapping
	41047	7	screw, No. 8 x 5/16, self tapping
	41086	29	screw, No. 6-32 x 5/16, binding head
	41090	40	screw, No. 4-40 x 5/16, binding head
	41091	12	screw, No. 4-40 x 1/4, flat head
	41096	2	screw, No. 4-40 x 3/8, binding head, brass
	41097	2	screw, No. 6-32 x 5/16, binding head, brown oxide
	41099	12	screw, No. 8-32 x 3/8, self threading, brown oxide
	41100	2	screw, No. 8-32 x 1 3/4"
	42000	6	washer, lock, 3/8"
	42001	6	washer, flat, 3/8"
	42002	29	washer, lock, No. 6
	42005	1	washer, flat, No. 6
	42007	52	washer, lock, No. 4
	42029	1	washer, rubber, 1/2" for fuseholder
	42055	2	washer, 5/8" O.D.
	43000	1	lug, ground, No. 6
	46011	4	foot, plastic
	50012	2	insulator for 50011 (dual jack)
	50019	2	insulator for 50018 (triple jack)
	50021	2	insulator for 50020 (quadruple jack)
	53047	2	knob, concentric, inner
	53048	2	knob, concentric, outer
	53049	4	knob, dual
	57000	1	line cord
	58300	length	spaghetti, small
	58303	length	spaghetti, large
	58408	length	cable, 1 conductor, black
	58410	length	cable, 4 conductor
	58412	length	cable, 3 conductor
	58414	length	cable, 1 conductor, grey
	58501	length	wire
	80119	1	panel, front
	81920	2	cable clamp, metal
	81175	1	cable clamp, plastic
	81326	1	chassis
	81327	1	panel, rear
	81328	1	hood
	81329	1	bottom plate
	81935	2	bracket, side
	82101	1	strain relief
	89537	1	shield, pilot bulb
	89627	1	glue capsule
	97300	2	shield for 9 pin socket
	97717	1	jewel, pilot bulb
	66107	1	manual of instruction (wired)
	66360	1	manual of instruction (kit)



SERVICE WORK ORDER



Model No. _____ Serial No. _____ Date _____

Indicate red code numbers (if any) under words "INSTRUCTION MANUAL" on cover of manual _____

Check one: Purchased as kit Purchased factory-wired

Name _____

Address _____

Item (s) Returned: (specify any separately purchased accessories included in shipment, or any detachable parts normally supplied that are omitted)

Troubles and/or Repairs Required _____

Check one: Repair Unit & Bill Send Quote Before Service

Check one: Warranty Privileges Claimed Yes No

If Warranty Privileges Are Claimed, Please Supply Information Required Below

.....
WARRANTY REPAIR REQUIRED INFORMATION

Date of Purchase _____ Date Registration Card Mailed _____

Date Completed (if kit) _____

Sales Slip (or facsimile thereof) enclosed Yes No

Distributor _____

Address _____

TEAR ALONG PERFORATED LINE

	SECTION	TAPE/AUX	MX/AUX	FM-AM	TAPE HD.	PHONO A	PHONO B	MIC
INPUT SELECTOR SWITCH S1	A, G	4-5	N.C.	N.C.	2-5, 7-12	4-5, 8-12	4-5, 9-12	5-6, 10-12
	B, H	1-7-8-9- 10-12	1-7-8-9- 10-12	1-7-8-9- 10-12	1-8-9-10	1-7-9-10	1-7-8-10	1-7-8-9
	C, E	7-12	8-12	9-12	3-10-12	3-4-12	3-4-12	3-6-12
	D, F	2-3-8-9	2-3-8	2-8-9	2-8-9	2-8-9	2-8-9	2-8-9

	SECTION	BAL.1	BAL.2	STEREO	REVERSE	MONO 1	MONO 2	MONO 1-2
MODE SELECTOR SWITCH S2	A	2-6	N.C.	2-6	N.C.	N.C.	6-8	6-8
	B	6-8	2-3-8	3-8	2-3 6-8	2-3-6	3-6	2-3-6

- 1) Entries are numbers of those switch contacts which are connected together by the rotors at the particular position. NC means no connection.
- 2) On schematic diagram, all switch wafers in the maximum counter-clockwise position (TAPE/AUX and BAL. 1) as seen from the front or shaft end.

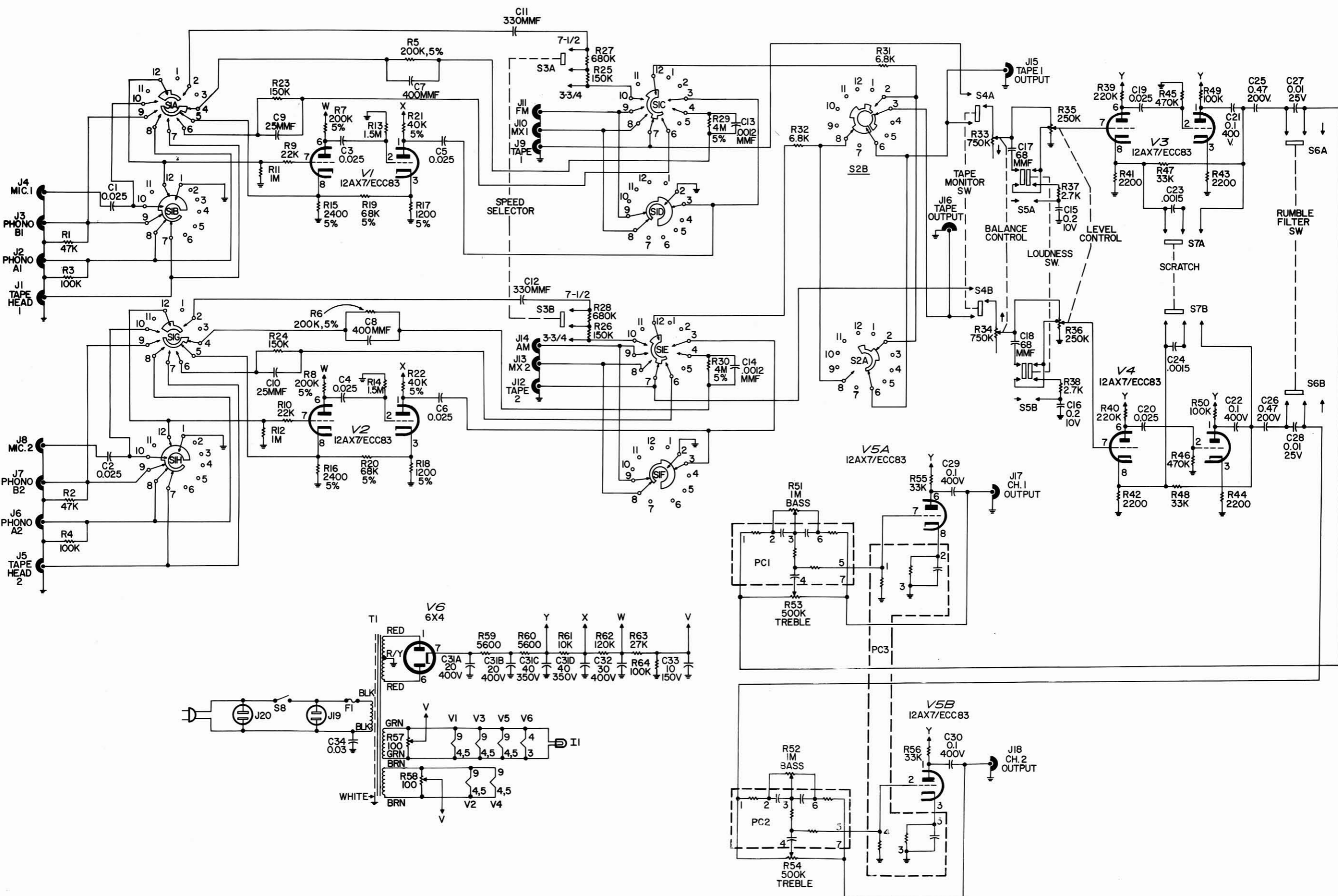


Figure 5-6. ST-84 Schematic Diagram



EICO

ANOTHER PERFORMANCE PROVEN PRODUCT