

RUSSCO



STUDIO/MASTER 505S

5 CHANNEL STEREO BROADCAST AUDIO MIXER



STUDIO/MASTER 505S

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Figure 1-1. Studio/Master 505S/505SR Audio Mixer Console

SECTION I

GENERAL INFORMATION

1-1. DESCRIPTION

- 1-2. The Russco Studio/Master 505S Audio/Mixer Console is a professional stereo audio mixer designed for broadcast studio applications where five mixing channels provides adequate flexibility. The 505 features built-in preamps on mixers 1 thru 4 and five balanced high level inputs on mixer 5. Also featured is cue on all channels, light emitting diode (LED) indicators, headphone amp, on-the-air warning light relay driver and field-effect transistor (FET) muting for the monitor output.
- 1-3. Cue and mute features can be deleted from any channel by removing jumpers on the mixer printed circuit board. The preamps can be modified for RIAA phono, microphone or hi level unbalanced input by moving jumpers on the pc board.
- 1-4. The 505S comes with a finished cover for desk top installation. The rack mount version (model 505SR) is supplied without the cover. It mounts in an EIA standard 19" rack taking 5 1/4" of vertical space.
- 1-5. The 505S uses integrated circuit amplifiers throughout, with power transistors to drive the cue and headphone outputs. The output line impedance is 600 ohms, balanced. The VU meter features true VU ballistics.
- 1-6. The monitor output is driven by a low impedance output line amplifier. The monitor amplifier may be located away from the console.
- 1-7. Audio switching on channels 1-4 is done with solid state field-effect transistors (FET). These switches can be remote controlled by DC switching.
- 1-8. Any monaural source may be split to feed both outputs by moving a jumper on the pot. P.C. board. This causes no additional loading on the source.

1-9. SPECIFICATIONS

1-10. Table 1-1 lists the specifications for the Studio/Master 505S. General information is listed in Table 1-2.

1-11. ACCESSORIES

1-12. Many accessories for the Studio/Master 505S are available from Russco Electronics. Included are monitor speakers and headphones, microphones and stands, remote start relays and headphone jack boxes.

1-13. Russco studio turntables are available finished to match the Studio/Master 505S.

Table 1-1. Specifications

Inputs: 9 Total Stereo

Channels 1-4 (Preamps, Unbalanced Stereo)

	Hi Level	Microphone**	Phono***
Sensitivity*	-10dBm	1.00mv	10mv
Max Input	+14dBm	13mv	100mv
Impedance	47K	47K	47K

Channel 5 (Balanced, 5 Stereo Inputs, Switched)

*Sensitivity: -10dBm
 Max Input: +18dBm
 Impedance: 600 ohms

Outputs:

Monitor: (External Package, Optional)

Power: 25 Watts Average per Channel (14.14 volts RMS across
 8 ohm load at 1KHz)

Impedance: 8 ohms

Total Harmonic Distortion: Less than 1% at full rated output

Program: (Stereo)

Level: +4 or +8dBm, for OVU, +17dBm maximum

Impedance: 600 ohms

Frequency Response: 20 to 15 KHz, +1dB

Total Harmonic Distortion: Less than 0.5% at 1KHz, +8dBm out.

Noise: Greater than 60db below +4dBm output referenced to
 -50dBm input.

Headphones: (Stereo)

Level: 0dBm

Impedance: Hi down to 8 ohms

Cue: (Mono, both channels mixed)

Power: 1 watt average

Speaker: 8 ohms, 3 inch

On-Air Light (Relay Driver)

Voltage: -24 VDC

Current: 40ma (600 ohm coil)

*Mixer Pot at 1:30 o'clock position, OVU out.

**Referenced to low impedance microphone source

***At 1KHz.

Table 1-2. General Information

Controls:

- *Input mixing - 5 each, Stereo Ganged, with Cue;
 - *Monitor level - 1 each, Stereo Ganged, with power switch, on front panel.
 - Master Level (2)
 - Cue level
 - Headphone level (2)
 - **On-Air key switches (Channel 1-4) -4 each, push-button, alternate latching, SPDT.
 - Input selector switches (Channel 5) - Push-button, interlocked, 5x 4PDT.
- } Trim pot on main P.C. Board

P.C. Boards: (Seven Total)

Main Board
 Four Preamp Boards (plug-in)
 Pot Board - Mixing busses and booster amp.
 Hi Level Board - Hi level input switch, Power indicator and VU meter leads.

P.C. Interconnections:

Flat Cable and Multi-pin plugs.

Audio Switching:

DC Controlled field-effect transistor switches on Channel 1-4.
 Push button switch on Channel 5.

Audio Mute:

DC controlled FET switch.

Size:

Rack Mount - 8" deep x 5 1/4" high x 19" wide, (20.32x13.34x48.26CM)
 Desk Mount - 8" x 5 1/2" x 20 1/4", (20.32x13.97x51.44CM)

Weight:

14 pounds (6.35 KG)

Power Requirements:

117 VAC, 60 Hz, 100 watts

*Allen-Bradley MOD POT, Hot-molded element, rated at 100,000 rotations.

**Grayhill series 46, rated at 250,000 operations.

SECTION II
INSTALLATION

2-1. UNPACKING

- 2-2. Remove packing material and lift the console out of the box.
- 2-3. Save all packing material should it be necessary to ship the console again.

2-4. MOUNTING

- 2-5. Rack mount model panel mounts to rack with four standard rack screws. Vertical space required is 5 1/4". Be sure the rear apron of the chassis is open for ventilation. The 505SR should not be mounted near any high temperature equipment. Ambient temperature should be no higher than 55°C (131°F).
- 2-6. Desk mount model can be set on any level surface. The friction of the rubber feet on the desk surface should prevent any movement of the unit.
- 2-7. To anchor the console to the surface, proceed as follows:
 - a. Drill holes (5/32") in the table top at the points where the rubber feet sit.
 - b. Remove the screws from the rubber feet and remove the feet.
 - c. Insert 6-32 screws up through the holes in the table top. (Screws should project 1/2" to 5/8" above the table).
 - d. Place the feet over the screws.
 - e. Run screws into the bottom of the chassis.

2-8. INPUT ASSIGNMENTS

- 2-9. Before connecting the input lines, the input configuration should be planned. The flexibility of the Studio/Master 505S allows a variety of configurations. The factory has pre-set the console for one configuration.
- 2-10. Figure 2-1 illustrates a typical input configuration, using the factory settings.
- 2-11. Table 2-1 lists the factory settings of the various jumpers options.
- 2-12. The input configuration can be changed by moving jumpers as described in 3-1.

2-12. INPUT CONNECTIONS

- 2-14. Phono. Phono lines connect to terminal barriers of Channels 1-4. Connect center conductor to +, Shield to -. Ground lead connects to the ground terminal (G) at the center of the barrier block. Phono jacks can be installed on short pigtail leads and left attached to barriers. (Supplied on Ch. 1 & 2)
- 2-15. Microphone. Mic lines connect to the terminal barriers of channels 1-4.
 - a. Connect 3 wire (low impedance) lines with white to +, black to -, and shield to G.
 - b. Connect 2 wire (high impedance) lines with center conductor to + and shield to - or G.
 - c. Be sure to defeat cue on mic channel.
- 2-16. High level (Unbalanced). Connect to barrier terminals of channel 1-4. Connect positive or center conductor to +, negative or shield to - or G.

NOTE: Balanced inputs can be connected to channel 1-4. One side of the line will be grounded. A resistor can be placed across the input terminals if termination is desired.

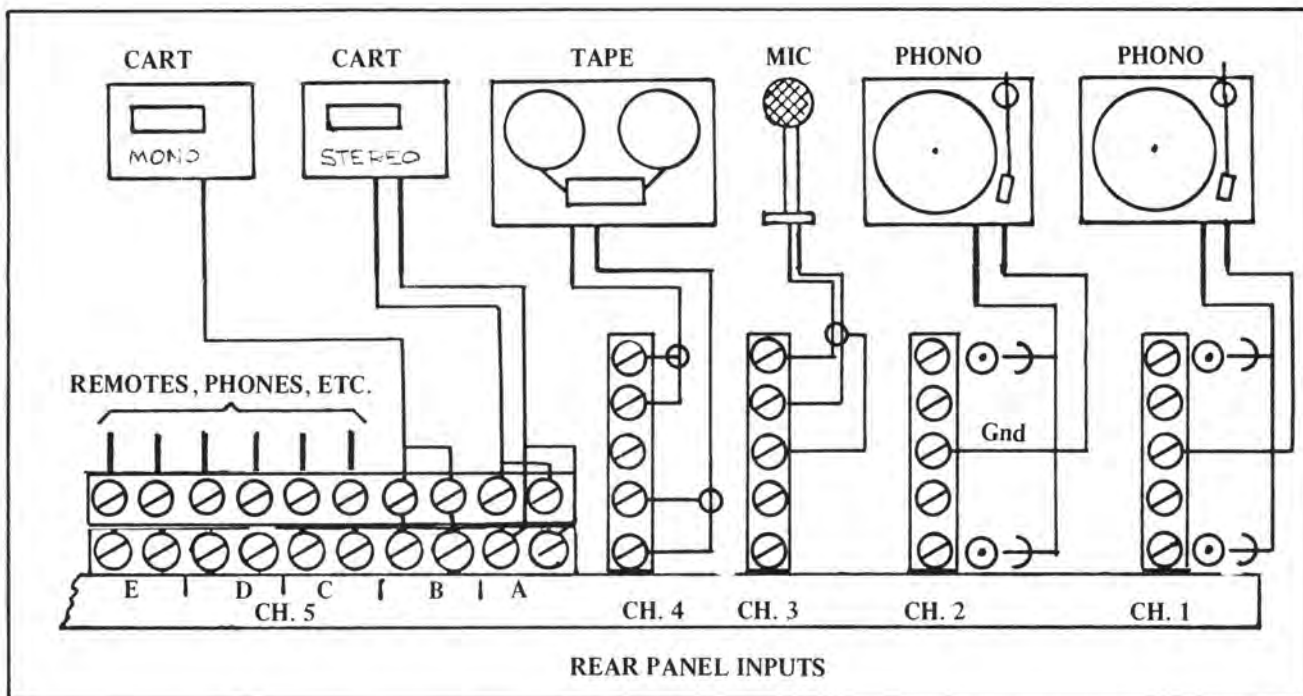


Figure 2-1. Typical Input Configuration, Using Factory Settings

Table 2-1. FACTORY SETTINGS OF JUMPER OPTIONS

CHANNEL	INPUT LEVEL	EQUILIZATION	CUE	MUTE	INTENDED FOR
1	Lo	RIAA	Yes	No	Phono
2	Lo	RIAA	Yes	No	Phono
*3	Lo	Flat	No	Yes	Mic
4	Hi	Flat	Yes	No	Hi level, Unbalanced
**5	Hi	Flat	Yes	No	Hi level, Balanced

*Channel 3 set for mono source. All others are Stereo.
**Channel 5 has no jumpers, settings are fixed.

2-17. Hi level (Balanced). Connect to inputs of channel 5. Ten pairs of terminal barriers are on the rear apron for channel 5 inputs A, B, C, D and E. The terminals are labeled + and - for phasing purposes. The upper terminals are for left channel, lower are for right.

NOTE: Unbalanced inputs may be connected to channel 5 inputs. The negative side of the line will have to be separately grounded by running a jumper from the (-) terminal to the chassis.

2-18. The channel 5 inputs do not provide a line termination load. Termination resistors can be installed as outlined in paragraph 4-1.

2-19. OUTPUT CONNECTIONS

2-20. Figure 2-2 illustrates typical output connections.

2-21. Program. Connect to output terminals marked "program, +, G, -." Polarity markings indicate phase, G is ground. Connect signal lines to + and -, shield to G. (Terminate shield at one end only).

2-22. Terminate program line in 600 ohms for proper VU meter calibration.

2-23. Monitor. Connect monitor amplifier to "Monitor, +,G" terminals. Shielded wire should be used. Amplifier may be located several hundred feet away.

- 2-24. Set input sensitivity of monitor amplifiers so they will not overdrive when monitor level is full on.
- 2-25. External muting relays are not needed as the muting is built into the console.
- 2-26. On-the-air light. Connect relay to operate warning light to terminals labeled "On-Air, G, +DC." The relay should draw no more than 40ma at 24 volts (600 ohms coil). Observe that the ground terminal is negative with respect to the DC terminal. Do not connect 115 VAC to the On-Air terminals.
- 2-27. A diode should be placed backwards across the relay coil to speed relay release. See Fig. 2-2.
- 2-28. Sometimes the use of a relay will cause a "pop" in the program when the microphone is keyed. When this occurs, use a lower current relay or a solid-state relay. (Hamlin 701-11-300 or equal recommended.)
- 2-29. Headphone. Plug monitor headphones into the phone jack on the rear panel. This is a stereo jack for a three section plug (body, ring, tip). If a monaural plug (body, tip) is used it should be inserted only part way. Full insertion will short out the signal.
- 2-30. Headphone impedance can be as low as 8 ohms. For optimum performance 600 ohms is recommended.
- 2-31. A headphone jack can be mounted in a utility box at the front of the desk and a line run from the box to the jack at the rear of the console to facilitate easier change of headsets. A pre-wired box is available from Russco Electronics.
- 2-32. POWER CONNECTION
- 2-33. Plug AC cord into any 115 VAC, 60 Hz outlet. Dress AC cord away from audio leads, especially microphone and phono leads.
- 2-34. GROUND CONNECTION
- 2-35. Connect ground lead under chassis screw located on chassis bottom, rear near the fuse holder. Use at least 18 gauge wire. Connect to station ground. See figure 2-2.

- 2-36. For additional ground termination points (for shields, etc.) a ground buss can be installed across the back of the console.
- Cut a piece of 18 gauge or larger buss wire, about 17 inches long.
 - Form it to fit across the back of the chassis, under the terminal barriers.
 - Anchor it under the screws that hold the two rear PC board supports on the bottom side of the chassis. (Spade lugs should be soldered to the buss for anchoring).
 - Solder shields and grounds to the buss bar.

NOTE: This is a static ground. Do not connect signal grounds to the buss.

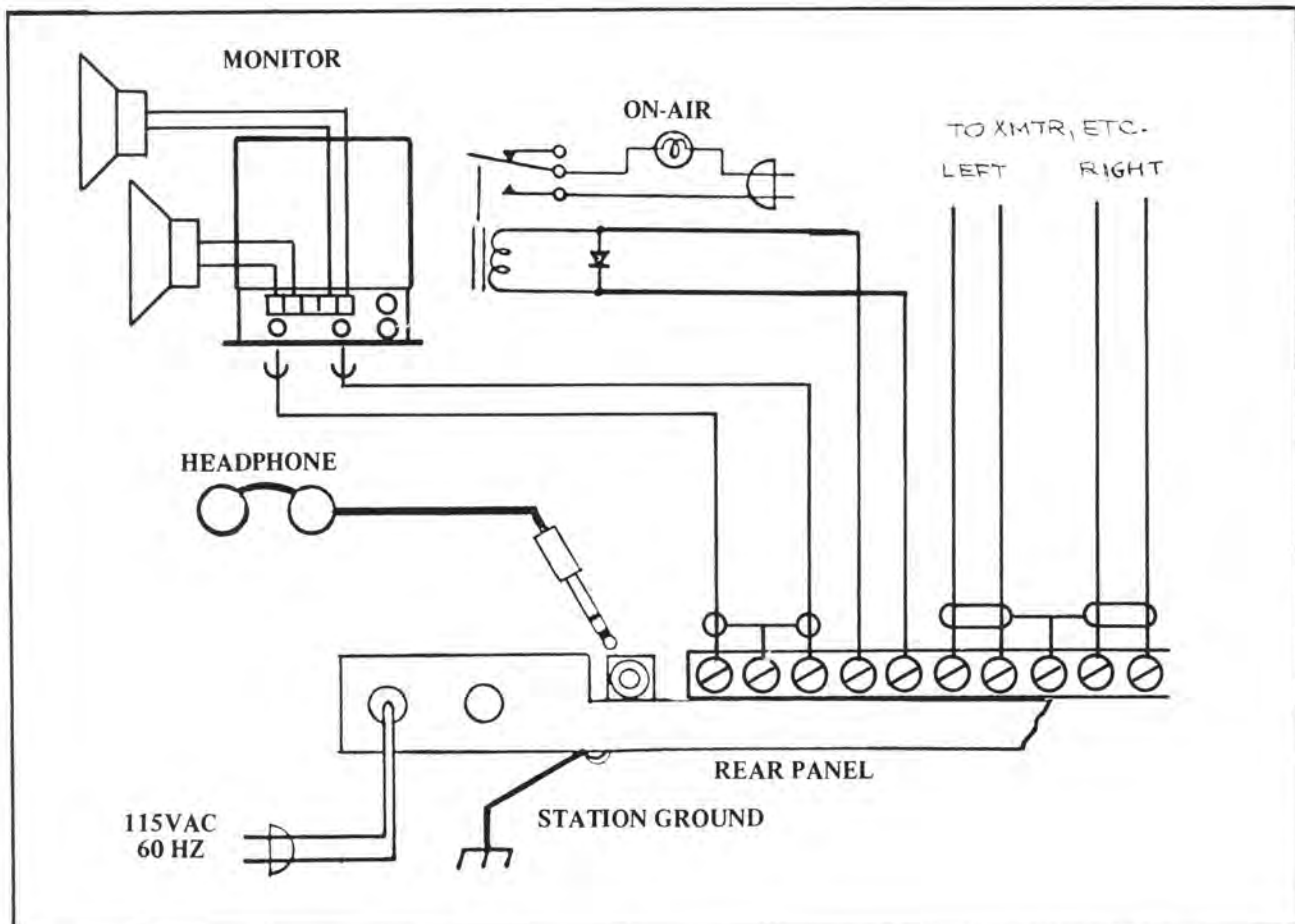


Figure 2-2 Typical Output Connections

SECTION III

CALIBRATION

3-1. JUMPER SETTINGS

- 3-2. Jumper locations are shown in figure 3-1 thru 3-4.
- 3-3. Table 3-1 lists identification and color coding of jumpers.
- 3-4. Input Attenuation (Fig. 3-4). Located on the preamp PC boards behind the input barrier terminals. Install jumper appropriate to the source level. Set right & left channels alike.
- 3-5. Equalization (Fig. 3-4). Located on the preamp PC Boards next to the preamp I.C.'s. Install the jumper for the desired equalization. Only one jumper should be installed on each channel. One of the jumpers must be installed for the preamps to operate. Set right & left channels alike.
- 3-6. Cue (Fig. 3-3). Located on top of each pot, connecting two terminals together. Remove the jumper to defeat the cue. To restore cue, solder a jumper between the terminals.
- 3-7. Mute (Fig. 3-3). Located on the mixer PC board to the left of their respective mixing pots. (Viewed from front). Remove the jumper to defeat the mute. To restore mute, solder a jumper between the terminal posts.
- 3-8. VU Meter (Fig. 3-2). VU meter sensitivity can be set for +4 or +8dBm output level. Install the appropriate jumper. The +4 jumper has been factory installed. Only one jumper should be installed.
- 3-9. Transformer Center-Taps (Fig. 3-2). Input and output transformer center-taps can be grounded if desired. Grounding center-taps may reduce noise. Jumper posts are adjacent to transformers. Install jumpers to ground the center-taps.
- 3-10. Mono Source. These terminals are located in a row to the left of each mixer pot. Lettering these A, B, C (left to right), Jumper A to B for mono, B to C for stereo.

3-11. LEVEL SETTINGS (Fig. 3-2)

- 3-12. Output. (Output must be loaded with 600 ohms for proper calibration).
- a. Use an appropriate level set source, such as the NAB standard reference level disc, a level set tape or a generator. Set generator at -10 or 0dBm (depending on the output level of the studio equipment) 1KHz and connect to hi level input, balanced or unbalanced, left channel.
 - b. Rotate mixer pot to the desired physical position for average level. (3:00 o'clock position is recommended).
 - c. Press on-the-air button.
 - d. Adjust left channel program level pot (on main PC board) for OVU indication.
 - e. Repeat for right channel, leaving mixer pot at same position.

3-13. Cue.

- a. Use appropriate cue material for source, such as the lead-in groove of a typical record or head of a typical tape.
- b. Rotate mixer pot to cue (full counter-clockwise position.)
- c. Play cue material.
- d. Adjust cue level pot for adequate volume.

3-14. Headphone.

- a. Average listening material such as a typical musical selection would be an appropriate source.
- b. Set mixer pot for normal VU deflection. (Between -10 and 0, into red only for peaks).
- c. Plug in headset and adjust level for comfortable listening. Monitor pot should be at minimum setting. Level may have to be set on the high side to satisfy some operators. Right and left channels are adjusted separately. Be sure to balance them. A mono record is helpful here.

Table 3-1. IDENTIFICATION AND COLOR CODING OF JUMPERS

<u>Function</u>	<u>Setting</u>	<u>Identification</u>	<u>Color</u>
Input Pad	Lo Level (Phono Mic)	J1	Brown
	Hi Level (-10dBm)	J2	Red
Equalization	Flat	J3	Orange
	RIAA	J4	Yellow
Cue		J5	Green
Mute		J6	Blue
VU	+4dBm	J7	Violet
	+8dBm	J8	Gray
Mono Source Splitter		J9	White
Xfmr. C. T. Ground		J10	Black

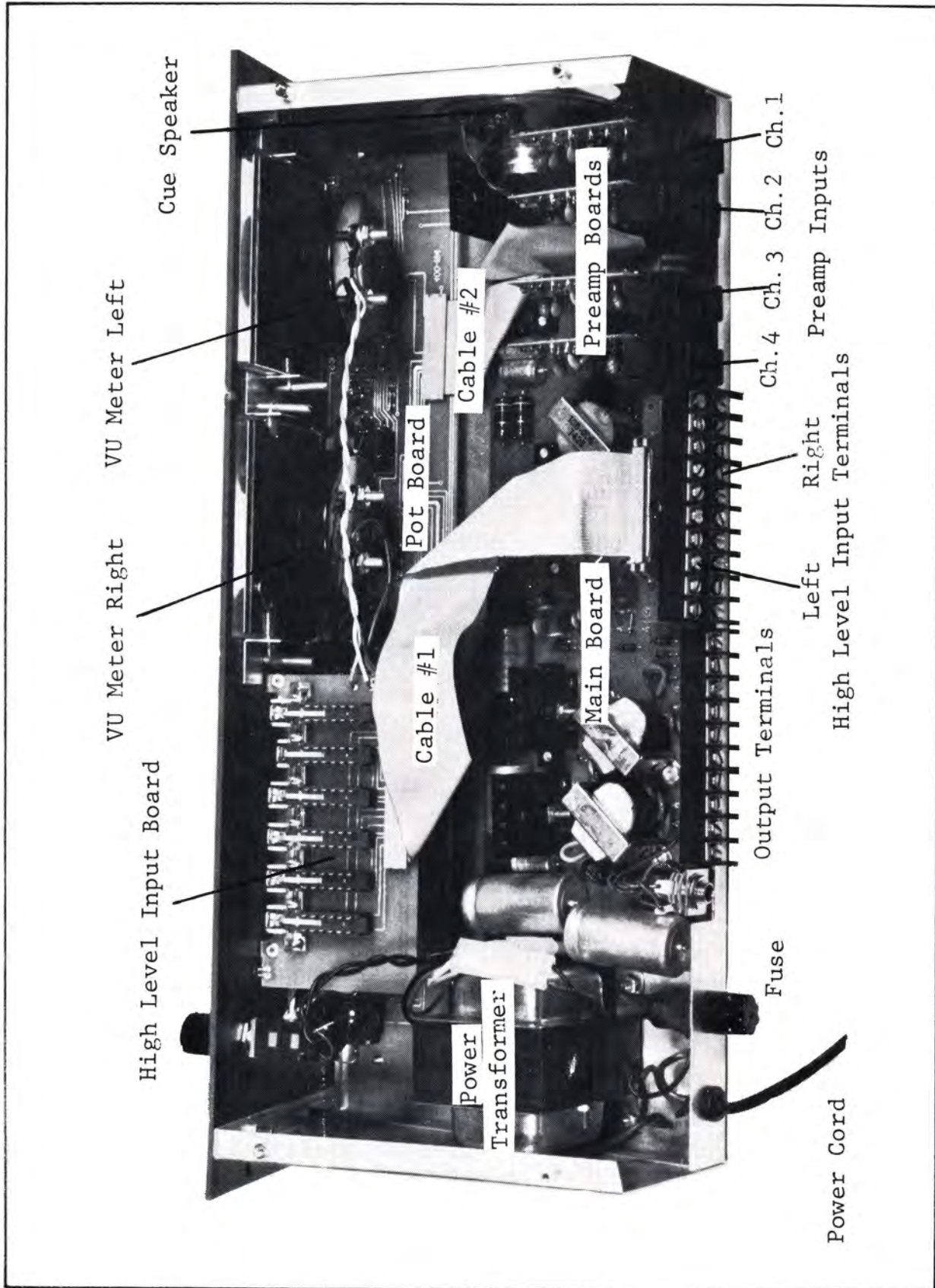


Figure 3-1 General Parts Locations

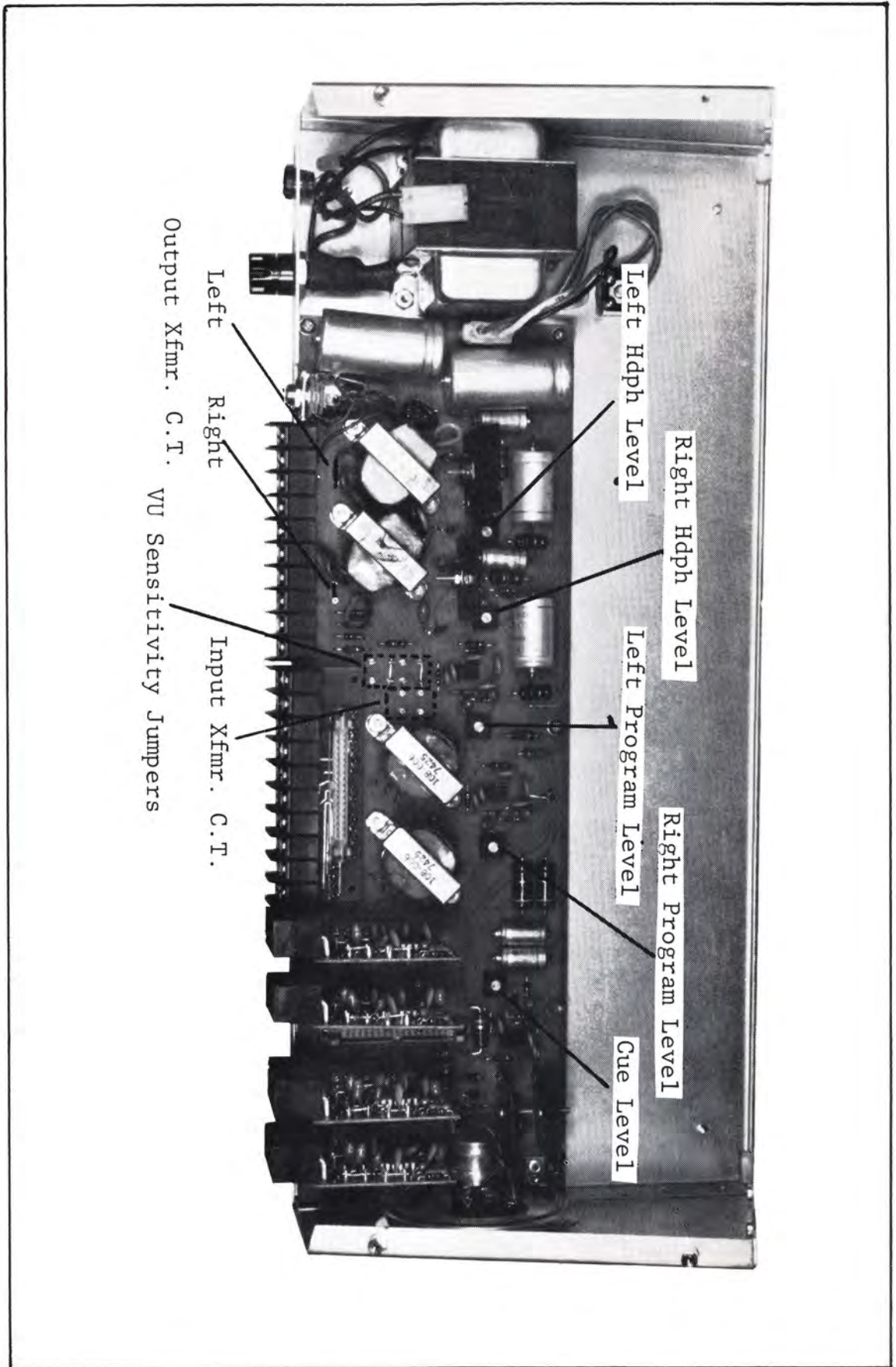


Figure 3-2 Main Board Pot and Jumper Locations

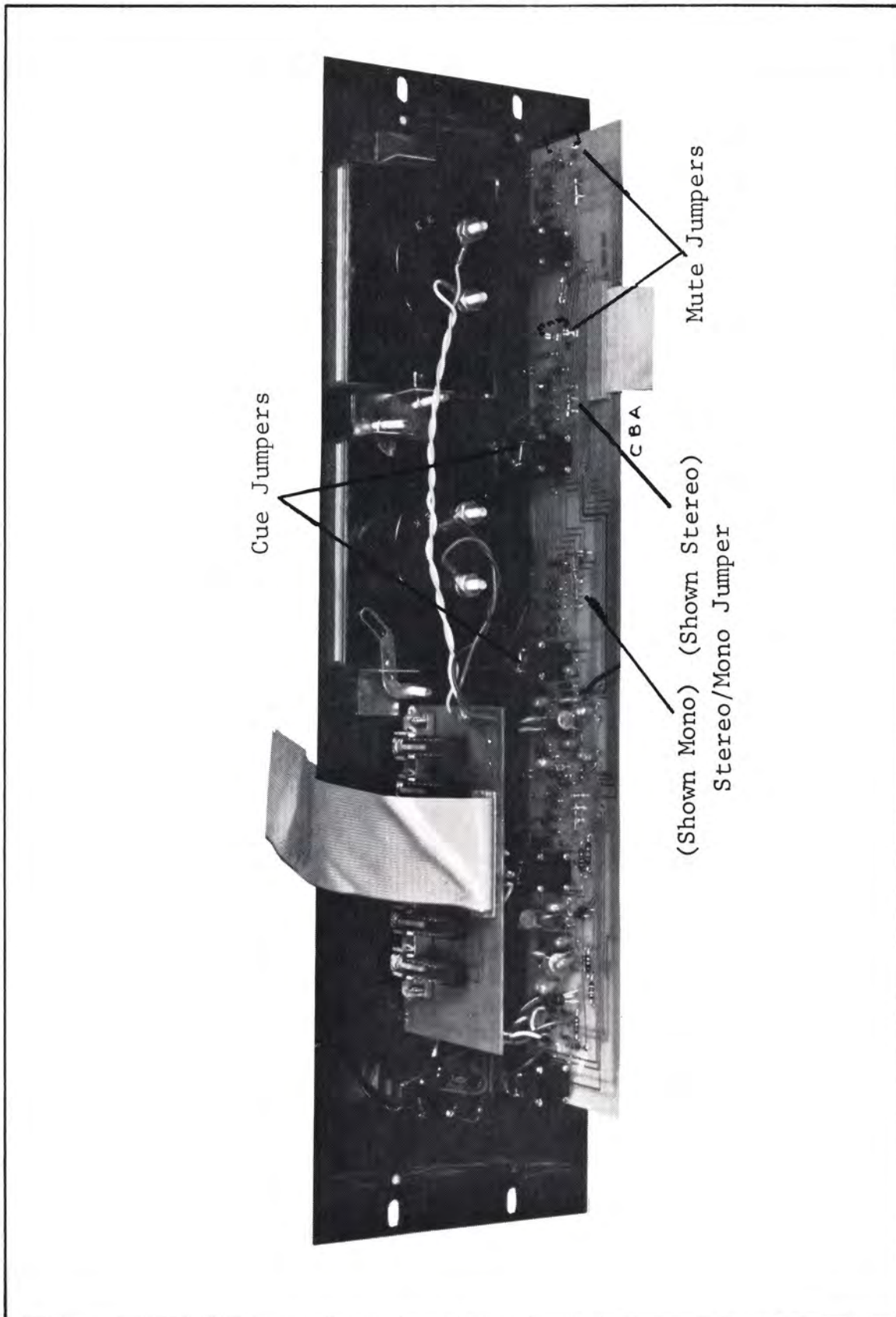


Figure 3-3 Cue, Mute & Stereo/Mono Jumper Locations

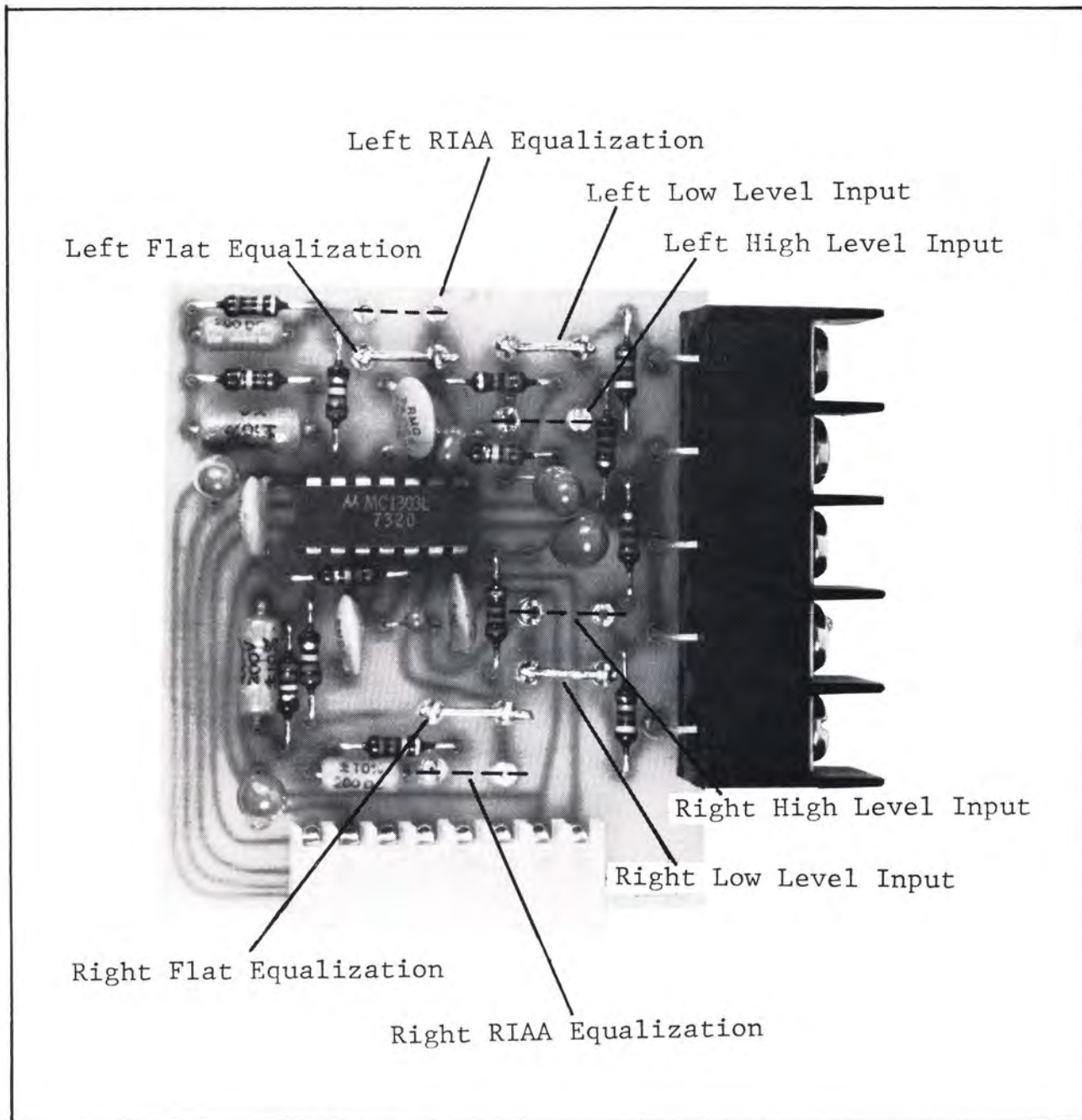


Figure 3-4 Preamp Board Jumpers

SECTION IV

SPECIAL MODIFICATIONS

4-1. HIGH LEVEL SWITCH TERMINATION

- 4-2. The input lines to channel 5 are not always connected to the transformer, so are not always terminated. The input transformer secondary terminates in 10K ohms so that is the load reflected to an input line.
- 4-3. Termination resistors can be installed if it is necessary for the sources feeding channel 5 to see a load. Three methods of termination are:
- a. To terminate only certain sources, install resistor across the input terminals. The source will always be terminated.
 - b. To terminate all sources the same, but only when selected, install the desired load across the secondary side of the input transformer.
 - c. To terminate all sources the same, whether selected or not, proceed as under a or perform b and install the same value resistors across the normally closed side of the selector switches. Install on the 5 selector switches, A thru E, but not on the "off" button. The normally closed terminals are closest to the front panel. Install on right and left channels.

4-4. REMOTE START OF EQUIPMENT

- 4-5. Channel 1 thru 4 push-button on-the-air switches may be wired to operate relays to remote start turntables or tape machines. The channel 5 switch cannot be wired for remote start.

WARNING: DO NOT RUN 115 VAC INTO THE CONSOLE
PUSH-BUTTON SWITCH

- 4-6. It is recommended that a solid-state AC relay be used to operate AC devices. A 24 volt unit such as the Hamlin 701-11-300 is recommended for turntables and other AC devices. (Available from Russco Electronics).

- 4-7. A 24 volt relay with a coil impedance of no less than 600 ohms can be used to operate DC controlled devices. The higher the coil impedance, the less chance there will be for a "pop" to get into the program.
- 4-8. Wire the "coil" side of the relay to the Studio/Master 505S as follows:
- a. Wire the negative side of the relay coil to the console chassis ground.
 - b. Connect the positive side of the relay coil to the mute jumper post nearest to the front panel for the respective control pot.
 - c. Place a diode backwards across the relay coil for fast relay release.
 - d. If the relay contacts carry 115 VAC, they should be protected with an arc suppression network. Connect a 0.1mFd capacitor in series with a 100 ohm resistor across the contacts.
- 4-9. Pressing the on-the-air switch will start the device. Releasing it will stop the device.
- 4-10. REMOTE CONTROL OF CHANNELS 1-4
- 4-11. The FET audio switches of channels 1-4 can be remotely controlled with any single-pole single-throw switch (normally open). Simply wire the switch in parallel with the push-button switch on the console. For access to these switches, remove the front panel as described in Section VII. Ordinary hook-up wire can be used. All normal functions (mute, on-air-light) will be operated by this switch. Level cannot be remotely controlled.

SECTION V

OPERATING INSTRUCTIONS

5-1. GENERAL

- 5-2. Input information is selected by pressing the appropriate push-button key switch. The information is mixed and controlled with the five large mixer control knobs.
- 5-3. Signal level is monitored visually with the VU meter and aurally with a monitor speaker or headset.
- 5-4. Cueing or material preview is accomplished by rotating the appropriate mixer control knob fully counter-clockwise. The cue signal is heard over a built-in loudspeaker.

5-5. CONTROLS AND INDICATORS

- 5-6. Figure 5-1 illustrates front panel controls.
- 5-7. Power. Turn on by rotating the monitor level control knob clockwise. The LED indicator to the left of the knob lights when power is on.
- 5-8. Inputs. Select by pressing the appropriate push-button switch.
- 5-9. Channel 1-4 switches. To operate, press button down and release. It will latch in the down position. To turn off, press button down and release. It will return to the up position.
- 5-10. LED indicators above the push-button switches for channels 1-4 light when a channel has been selected for mixing.
- 5-11. Channel 5 switches. Push-buttons are interlocked so that only one button can be engaged at a time. Pushing a button releases any other button previously engaged. Pressing the "off" button releases all buttons. Off does not have to be pressed when going from one input (A) to another (B).
- 5-12. Color panels in channel 5 input selector switch buttons show when one of the channel 5 inputs has been selected for mixing.

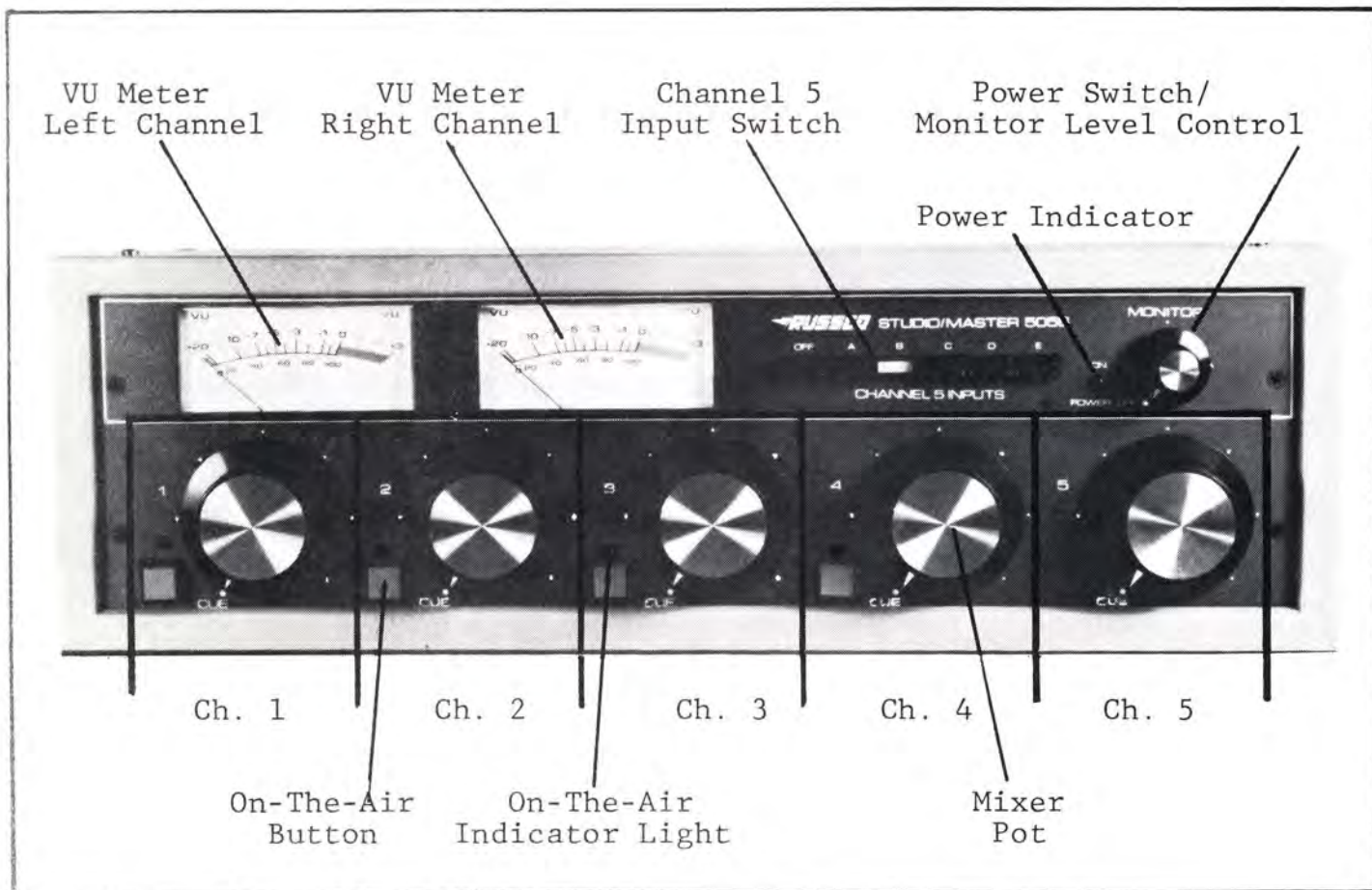


Figure 5-1. Front Panel Controls

- 5-13. Mixer pots. The level of information fed to the output (mixed) is controlled with the appropriate mixer pot control knob. Clockwise rotation increases the level.
- 5-14. VU meters. Indicate output level with reference to a predetermined standard. Adjust levels for meter deflection between -10 and 0VU points. Red area should be indicated only on peaks. Material that has been recorded with a great deal of compression should indicate between -3 and +1. Left meter is left channel, right meter is right channel.
- 5-15. Monitor speaker. Level is controlled with the monitor level control knob. Rotate clockwise to increase level. The monitor speaker will be muted when the studio microphone is turned on to prevent feed-back. (Ref. paragraph 3-7).

- 5-16. Headset. Level is preset with a control inside the console. Headset monitors the output line and does not mute.
- 5-17. Cue (Channel 1 thru 4). Rotate mixer knob fully counter-clockwise until the knob passes a soft detent and the pointer is next to the "Cue" marking on the panel. It is not necessary to press the on-the-air switch for cue on channels 1 thru 4.
- 5-18. Cue (Channel 5). Rotate mixer knob to cue as in 5-17. Select the desired input by pressing one of the 5 input selector buttons.

NOTE: Channel 5 cueing cannot be done while another channel 5 input is on the air.

5-19. OPERATION METHODS

- 5-20. Keying operation. Pots are turned up first, then on-the-air button is pressed and source material is started. This method is used when the switches have been wired to start turntables and tape decks. Button is released at the end of the material.
- 5-21. Potting-up operation. Pots are down, on-the-air button is pressed, then pot is turned up and material is started. This method is used to "fade in" source material. Pots are faded down at the end of the material.
- 5-22. Open-pot Operation. Pots are turned up and on-the-air switch is pressed before material is started. Material is then on the air as soon as it is started.

SECTION VI

THEORY OF OPERATION

6-1. GENERAL

6-2. The Studio/Master 505S is a 5 channel Stereo audio mixer that uses integrated circuit operational amplifiers and passive mixer controls and switching to combine a number of input signals at various levels into a single output. Peripheral features are headphone monitoring amplifiers, monitor speaker muting circuitry, monitor line driving amplifier, and external warning light driver. A cue buss and cue amplifier/speaker are included.

6-3. BLOCK DIAGRAM

6-4. The Studio/Master 505S block diagram is illustrated in figure 6-1.

6-5. Channel 1 thru 4 inputs are amplified and equalized before being fed through the on-the-air FET switches to the mixer pots. Input pads may be strapped in for 50dB of padding to accommodate hi levels.

6-6. Channel 5 inputs are fed through the push-button selector switch to a transformer then to the mixer pot.

6-7. Booster amplifier performs impedance buffering and provides 20dB of gain. It drives the output amp through the master control pot and the monitor buffer through the muting FET and level control.

6-8. Output amplifier provides 20dB of gain and drives the output transformer and the headphone amplifier.

6-9. Cue switches connect signal from the high side of the on-the-air switches to a buss which drives the cue amp and speaker through the cue level control. (Channel 5 cue switch is connected to the high side of the pot).

6-10. The mute FET and on-the-air light driver are operated by connection of a mute buss to -DC through the on-the-air switch.

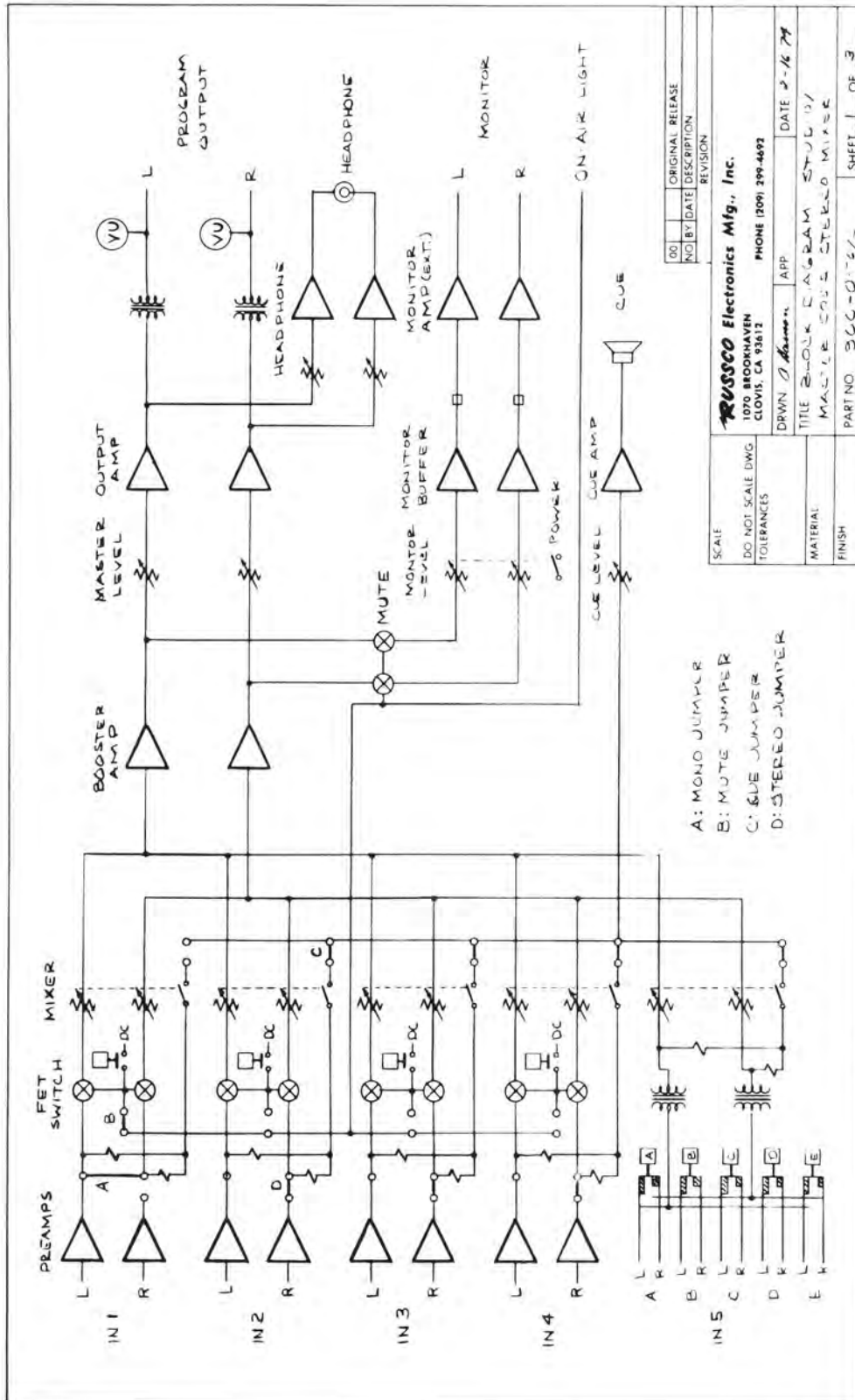


Figure 6-1. Studio/Master 505S/505SR Block Diagram

6-11. INPUT PADS

6-12. Preamp input level sensitivity is -60DB with flat equalization. To accommodate input levels of a nominal -10dBm, a 50dB pad is put in at the input by changing a jumper. The pad consists of a 47K resistor in series with the input terminated in 150 ohms.

6-13. INTEGRATED CIRCUITS

6-14. The basic amplifier used in the 505S is the integrated circuit operational amplifier. This amplifier features high gain and a differential input. Negative feedback is used to reduce distortion, flatten frequency response, perform equalization and set gain.

6-15. A type LM1303 I.C. is used for the preamplifiers. It contains two preamps in one case. Type LM301 is used for the cue and output amps. It is a single amplifier in a "mini-DIP" (8 pin) package. It features a high slew-rate output. The booster and monitor buffer amps use an RC4739 dual I.C., similar to the 1303. Both types of I.C. operate from a plus-and-minus power supply.

6-16. The output impedance of the I.C. operational amplifier is very low and the DC potential at the output is zero volts (ground potential). These two factors make possible the use of non-loaded switching and potentiometer type level controls.

6-17. EQUALIZATION

6-18. Preamplifier equalization is changed by moving a jumper to select a different set of feed-back components. The flat setting uses a purely resistive feed-back loop. The RIAA setting uses an RC circuit to provide non-linear response.

6-19. BOOSTER AMPLIFIER

6-20. The booster amplifier is placed near the pots, and the mixer buss feeding it is as short as possible to minimize crosstalk. The low output impedance of the booster amp allows output lines to be run to various parts of the console with a minimum of crosstalk and noise pickup.

6-21. CUE AMPLIFIER

6-22. Cue. Uses an LM301 I.C. coupled to two complementary current-gain transistors to drive the speaker. The transistors are inside the feedback loop. The output is at zero or ground potential, therefore, no output coupling capacitor is used.

6-23. HEADPHONE AMPLIFIER

6-24. The headphone amp is a single-stage class A amplifier operating on one-half the power supply voltage. It is biased with sufficient current to drive an 8 ohm load. It is driven from the primary side of the output transformer.

6-25. POWER SUPPLY

6-26. An unregulated, positive-negative power supply provides the console power.

6-27. DC lines to the I.C.'s are decoupled and regulated with resistors and zener diodes. The resistances are calculated for enough current to put the zeners into full conduction. This keeps their dynamic impedance low for excellent filtering. The zeners also maintain the voltage below the maximum rating for the I.C.'s. Ceramic capacitors are in parallel with the zeners for high-frequency decoupling.

6-28. MONITOR BUFFER

6-29. Uses an RC4739 dual I.C. operating as a flat, non-inverting amplifier with 20dB of gain. The low output impedance of this buffer amp allows a monitor amp of just about any input impedance to be used. It can even drive a 600 ohm line in a distribution system.

6-30. FET SWITCHES

6-31. Audio switching on channels 1 thru 4 and monitor mute uses a field effect transistor for a switch. By biasing the gate negative, the FET becomes a several megohm resistor in the line. Biasing the gate positive changes this resistance to a few hundred ohms, thus "turning on" the signal.

SECTION VII

MAINTENANCE

7-1. GENERAL

7-2. The only regular maintenance needed is general cleaning. Dust should be removed from components as it hampers the dissipation of heat, shortening component life.

7-3. DISMANTLING FOR SERVICE ACCESS

7-4. Cover.

- a. Remove four screws in the top.
- b. Slide the cover forward so bottom bar clears knob.
- c. Lift cover off.

7-5. Main PC board underside. Remove six screws from bottom cover plate on chassis bottom and remove plate.

7-6. Preamps.

- a. Remove clamp holding down preamps.
- b. Unplug preamp with a rocking motion.
- c. Watch pin location with plugging in preamp.

7-7. Front Panel.

- a. Unplug AC cord.
- b. Unplug two 34 conductor cables and Molex connectors at rear of monitor pot and under the mixer P.C. board.
- c. Remove ground lead from under main board mounting screw.
- d. Remove four front panel screws and remove panel. (see figure 5-1).

7-8. Main PC board removal.

- a. Unplug AC cord.
- b. Unplug two 34 conductor cables and Molex connectors next to the power transformer and under the mixer P.C. board.

7-8. Main PC board removal (continued)

- c. Remove five mounting screws.
- d. Lift board from chassis.

7-9. Mixing pot PC board removal.

- a. Remove front panel as described in paragraph 7-6.
- b. Remove five large mixer knobs (two hex-heads Allen screws on each).
- c. Remove shaft nut from each pot.
- d. Remove board by working board and pots back out of panel.

NOTE: The switches are wired to the board preventing the board from being completely removed from the panel. Switches will have to be unsoldered to completely free the board from the panel. This is not necessary in most cases.

7-10. CHANGING POTS

7-11. To change a worn-out mixer pot, proceed as follows:

- a. Remove mixing pot PC board as described in paragraph 7-8.
- b. Remove old pot from board and clean solder from PC holes.
- c. Insert new pot in the board - do not solder.
- d. Reinstall board in the panel and align new pot for proper fit.
- e. Solder new pot to the board.

7-12. GENERAL REPAIR

7-13. A trouble chart is listed in table 7-1. It lists preliminary steps to be taken before actually trouble shooting and repairing the console.

7-14. Trouble shooting and repair should be performed only by a qualified technical person.

NOTE: Use only high impedance AC and DC meters for testing the circuitry of the mixer.

- 7-15. The first test performed on a non-operational unit should be for proper DC voltages. Note that both positive and negative DC voltages are used. Meter polarity will have to be carefully observed. All measurements are made with respect to ground.
- 7-16. If DC voltages are normal, signal tracing should be used to determine the point of signal loss. Use either the normal source material (record, etc.) or a signal generator for a source. Inject the signal at the input of the section of the console in question. Signal tracing set-up is shown in figure 7-1.

7-17. CHANGING INTEGRATED CIRCUITS

- 7-18. If a defective integrated circuit is suspected, remember that these are highly reliable devices with a failure rate equal to many other components. Be sure that thorough investigation of external components is made before deciding to change an I.C. If the I.C. proves to be the cause of the trouble, proceed as follows:
- a. Remove the solder from all pins of the I.C. (Use a solder removal tool such as Edsyn "Soldavac.") Make sure that each pin is free from the PC board.
 - b. Lift the I.C. from the board, being careful not to bend leads or damage the body. (It may still be good).
 - c. Insert the new I.C. and solder it to the board. Make sure that each pin is soldered well and that there are no bridges between pads. Do not over-heat the I.C. during soldering.
 - d. If your console is equipped with I.C. sockets, simply unplug old I.C. and install the new one. (Watch pin alignment carefully).

7-19. RETURNING FOR SERVICE

- 7-20. Items returned for service should be packed well (preferably in the original carton) and shipped prepaid to the factory. Please do not fail to include or mail under separate cover, a description of the defect. Include serial number. Return charges will be prepaid if the item is under warranty. Out of warranty items will be shipped freight collect or billed.

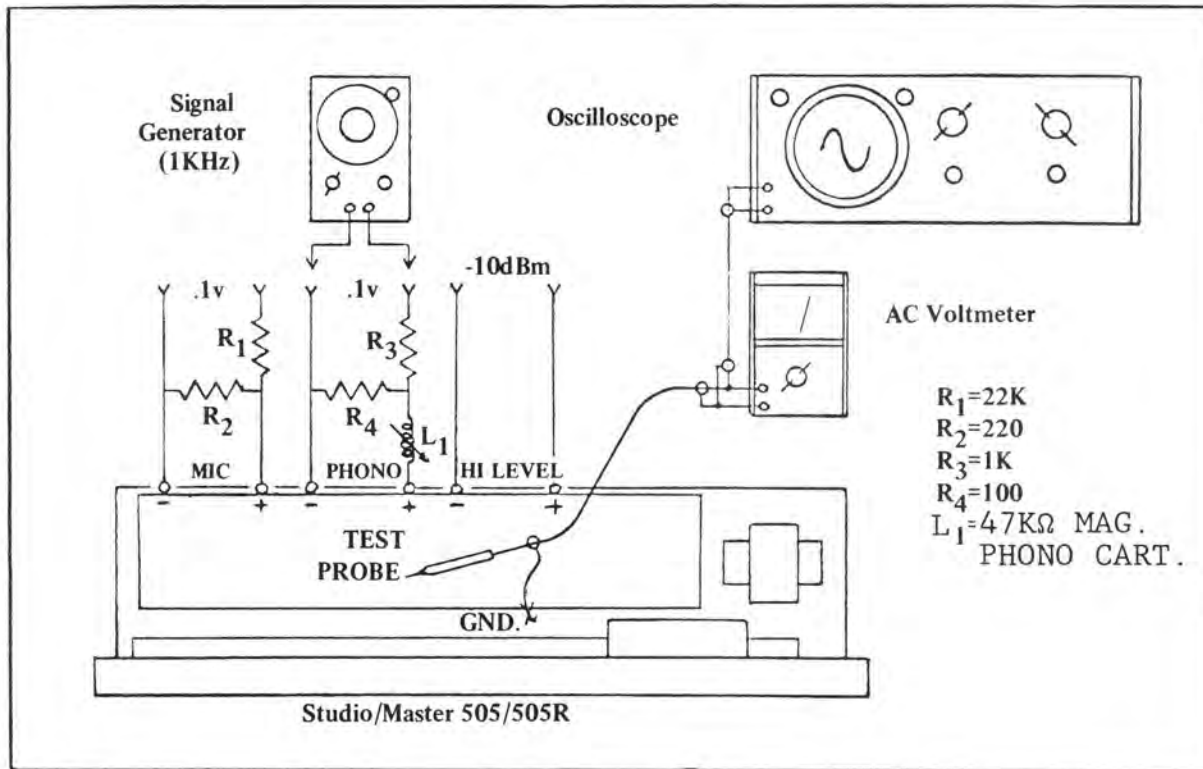


Figure 7-1. Signal Tracing Setup

7-21 SERIAL NUMBER

- 7-22. When corresponding with the factory regarding service, please give the serial number of the console.
- 7-23. The serial number is located on a label on the inside of the rear of the chassis next to the power transformer.

Table 7-1. TROUBLE CHART

SYMPTOM	PROCEDURE
A. No Power (Power Indicator does not light)	<ol style="list-style-type: none"> 1. Check AC Power Connection. 2. Check external connections for shorts. 3. Check Multi-conductor cable for proper insertion in connectors. 4. Check fuse & replace if blown. 5. If fuse continues to blow, repairs may have to be made by a technician or the factory.
B. No Signal Output (Power Indicator does light)	<ol style="list-style-type: none"> 1. Be sure that controls have been properly set to obtain an output signal. 2. Check all input and output connections. Is the output shorted? 3. Is there a signal at the input? 4. Check Multi-conductor cables for proper insertion in the sockets. 5. Check for signal at the monitor output. If OK, trouble in output stage. If no, trouble is at the booster amp or preamps. 6. Interchange preamp boards.
C. Hum	<ol style="list-style-type: none"> 1. Make sure ground connections are tight. 2. Make sure input lines are not near any field producing objects such as motors, AC lines or transformers. 3. Turn over the AC plug. 4. Try various methods of grounding turntables, tape decks and other source machines to the console. 5. Move the mixer away from any hum field producing objects.
D. Distortion (Program output)	<ol style="list-style-type: none"> 1. Check for partial shorts on the output line. 2. Make sure that the load on the output is no less than 600 ohms. Series isolation resistors should be used if the load is less than 600 ohms.
E. Distortion (Monitor output)	<ol style="list-style-type: none"> 1. Check output line for partial shorts. 2. Is speaker load less than 8 ohms? (8 ohms recommended).
F. Low Output (Program)	<ol style="list-style-type: none"> 1. Check for partial shorts on the output. 2. Is the input properly connected and is the level sufficient? 3. Are the front panel controls set properly? 4. Has the master level control been properly set?

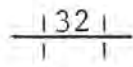





SECTION VIII

SCHEMATICS

8-1. INTRODUCTION

8-2. This section contains the parts location drawings and schematic for the Studio/Master 505S and 505SR audio mixer consoles. Figure 3-1 shows the location of major parts in the console. Figure 8-1, 8-2, and 8-3 illustrate parts location of the PC boards. Figure 8-4 is the schematic of the 505S/505SR.

SCHEMATIC NOTES

1. Cable Connections:..... 
2. Molex Connectors:.....  (P3, P4, P5)
3. Pot Board Ground:..... 
4. Main Board Ground:..... 
5. Chassis Ground:..... 
6. Jumpers:..... JX
7. Preset Controls:..... 
8. All switches shown in the "OFF" (open) position.
9. Capacitor values in microfarads (mF), unless specified.
P = pF, (mmF).
10. Resistor values in ohms (Ω), 1/4 watt unless specified.
K = 1000.
11. For resistor power and capacitor voltage ratings, see parts list.
12. Preamp parts reference numbers for channels 2 through 4 same as for channel 1.

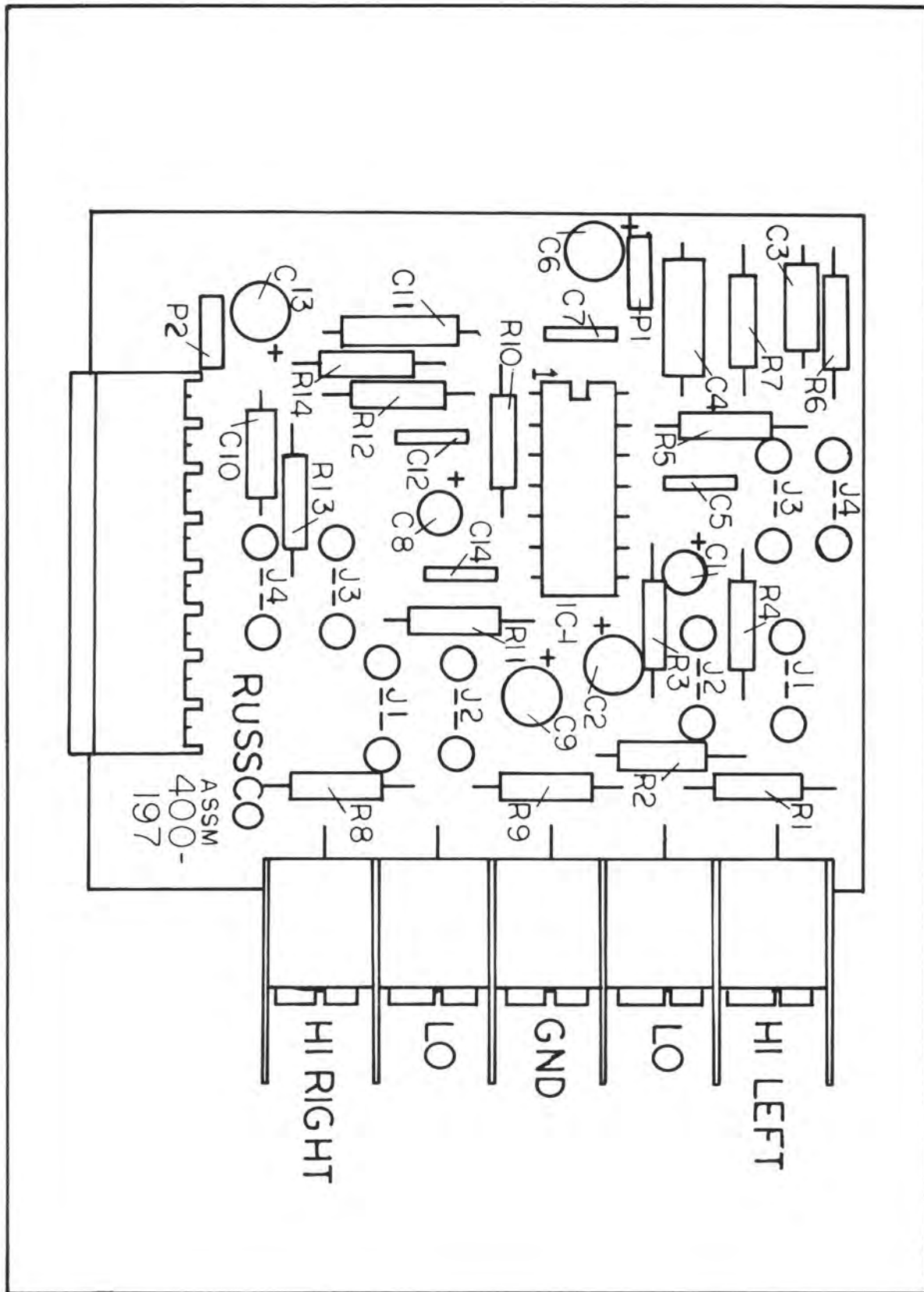


Figure 8-1

Preamp P.C. Board

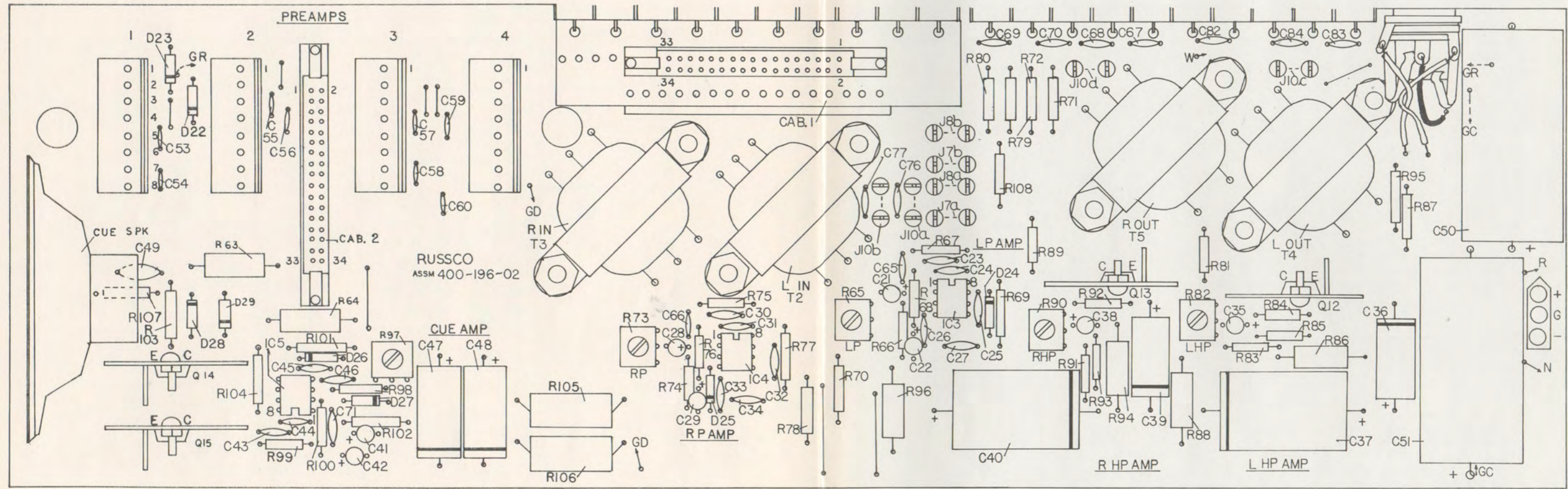


FIGURE 8-2 MAIN PC BOARD

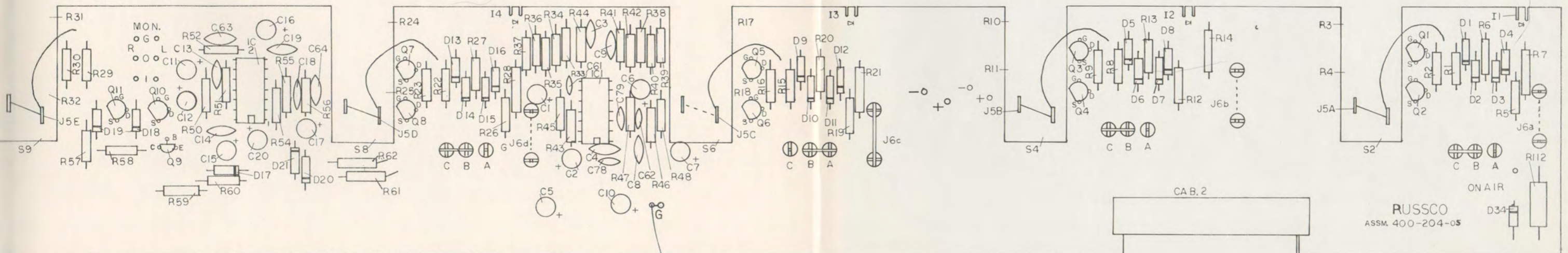
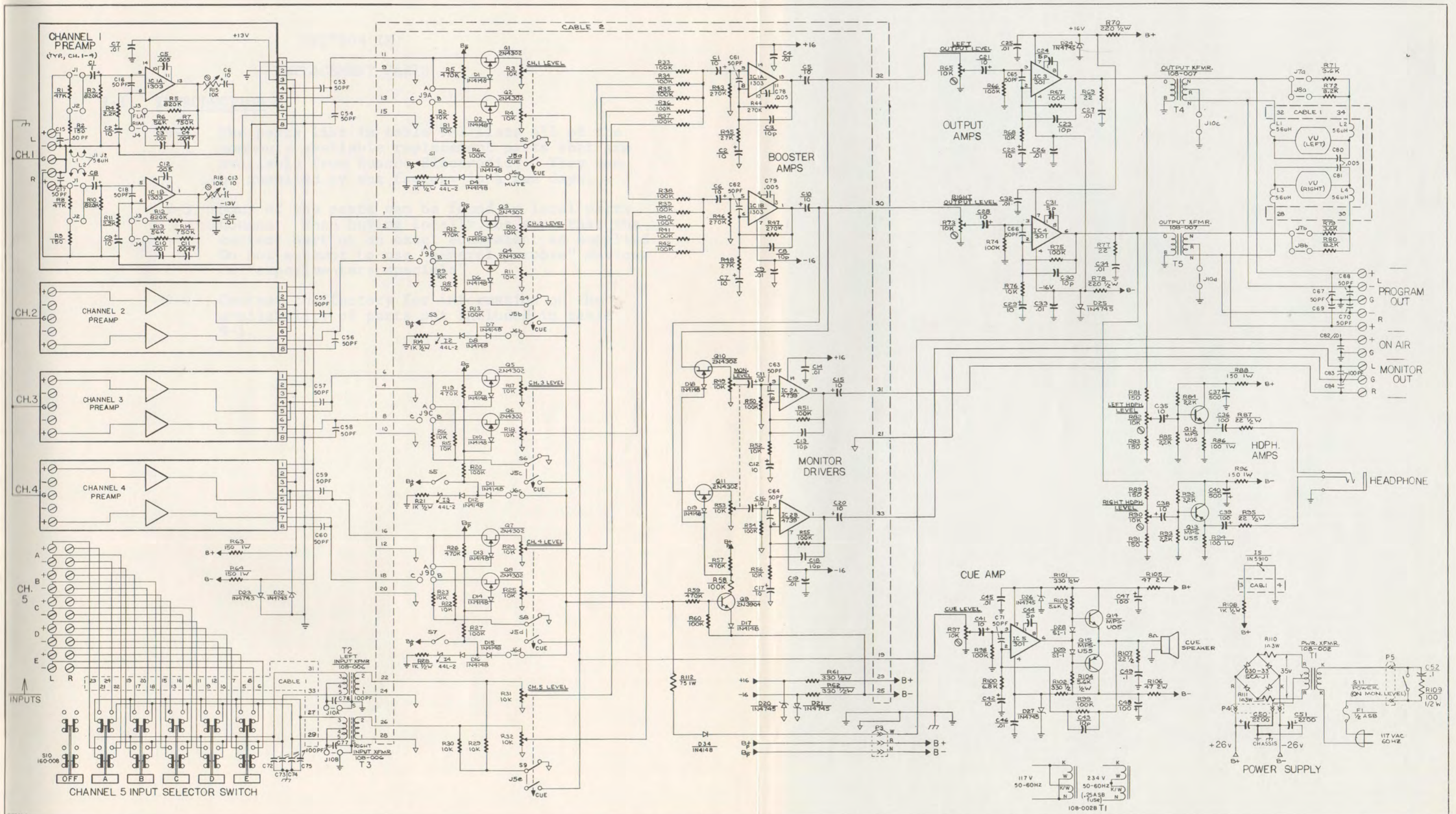


FIGURE 8-3 POT PC BOARD

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SECTION IX

REPLACEMENT PARTS

9-1. INTRODUCTION

- 9-2. The parts list in table 9-1 lists all of the commonly available replacement parts that are available from Russco Electronics. They can be supplied by the factory in a few days.
- 9-3. Many of the parts can be found in local parts houses. When buying locally, be sure that the correct part or an exact equivalent is supplied. Do not attempt to use "general purpose" devices or "experimenters specials".
- 9-4. Contact the factory for information on the availability of parts not included in table 9-1.

Table 9-1. REPLACEMENT PARTS

REFERENCE	A. PREAMP	RUSSCO P/N
C1, 8	Capacitor, DT, 1mF/35V	110-019
C2, 6, 9, 13	Capacitor, DT, 10mF/35V	110-017
C3, 10	Capacitor, AM, 0.001mF/200V 10%	110-020
C4, 11	Capacitor, AM, 0.0047mF/200V 10%	110-021
C5, 12	Capacitor, CD, 0.005mF/100V	110-025
C7, 14	Capacitor, CD, 0.01mF/100V	110-026
C15 - 18	Capacitor, CD, 50pF	110-034
IC1	Stereo Preamp, LM1303N	140-002
L1, L2	Choke, 56uH	100-002
R1, 8	Resistor, DC, 47K Ω , 1/4W	150-032
R2, 9	Resistor, DC, 150 Ω , 1/4W	150-044
R3, 5, 10, 12	Resistor, DC, 820K Ω , 1/4W	150-035
R4, 11	Resistor, DC, 2.2K Ω , 1/4W	150-040
R6, 13	Resistor, DC, 56K Ω , 1/4W	150-042
R7, 14	Resistor, DC, 750K Ω , 1/4W	150-034
R6, 16 (P1,2)	Trimmer, 2.5K Ω	150-136
	Complete Preamp Assembly	400-197
<u>B. SWITCH FILTER</u>		
C52	Capacitor, PA, 0.1mF/400V	110-031
R109	Resistor, DC, 100 Ω , 1/2W	150-003

Table 9-1. REPLACEMENT PARTS

REFERENCE	C. CONSOLE	RUSSCO P/N
C1, 2	Capacitor, DT, 10mF/35V	110-017
C3	Capacitor, CD, 10pF/1Kv	110-024
C4	Capacitor, CD, .01mF/100V	110-026
C5 - 7	Reference C1	
C8	Reference C3	
C9	Reference C4	
C10 - 12	Reference C1	
C13	Reference C3	
C14	Reference C4	
C15 - 17	Reference C1	
C18	Reference C3	
C19	Reference C4	
C20 - 22	Reference C1	
C23	Reference C3	
C24	Capacitor, CD, 5pF/1Kv	110-023
C25 - 27	Reference C4	
C28, 29	Reference C1	
C30	Reference C3	
C31	Reference C24	
C32 - 34	Reference C4	
C35	Reference C1	
C36	Capacitor, AE, 100mF/35V	110-009
C37	Capacitor, AE, 500mF/50V	110-016
C38	Reference C1	
C39	Reference C36	

Table 9-1. (Continued)

C40	Reference C37	
C41, 42	Reference C1	
C43	Reference C3	
C44	Reference C24	
C45, 46	Reference C4	
C82	Reference C4	
C47, 48	Reference C36	
C78 - 79	Capacitor, CD, .005mF	110-025
C49	Capacitor, CD, .1mF/100V	110-033
C72 - 77, 83, 84	Capacitor, CD, 100pF	110-005
C50- 51	Capacitor, AE, 2500mF/35V	110-010
C53 - 71	Capacitor, CD, 50pF	110-034
D1 - 19	Diode, 1N4148	130-005
D20, 21	Diode, Zener, 16V, 1N4745A	130-012
D22, 23	Diode, Zener, 13V, 1N4743A	130-010
D24 - 27	Reference D20	
D28, 29	Diode, 100V, 1A, SI-1	130-007
D30 - 33	Bridge Rectifier, 100V, 5A, SCAJ-1	130-001
I1 - 5	Indicator, LED, HP5082-4440, 1N5910	130-011
IC1, 2	Stereo Amplifier, RC4739	140-003
IC3 - 5	Op. Amp., LM 301 AN	140-001
L1 - 4	Choke, 56uH	100-002
Q1 8	Transistor, FET, 2N4302	180-007
Q9	Transistor, NPN, 2N3904	180-001
Q10, 11	Reference Q1	
Q12	Transistor, NPN, Motorola MPS-U05	180-016
Q13	Transistor, PNP, Motorola MPS-U55	180-017
Q14	Reference Q12	

Table 9-1. (Continued)

Q15	Reference Q13	
R1, 2	Resistor, DC, 10K Ω , 1/4W	150-031
R3, 4	Potentiometer, Dual, 10K Ω w/switch	150-056
R5	Resistor, DC, 470K Ω , 1/4W	150-059
R6	Resistor, DC, 100K Ω , 1/4W	150-033
R7	Resistor, DC, 1K Ω , 1/2W	150-010
R8, 9	Reference R1	
R10, 11	Reference R3, 4	
R12	Reference R5	
R13	Reference R6	
R14	Reference R7	
R15, 16	Reference R1	
R17, 18	Reference R3, 4	
R19	Reference R5	
R20	Reference R6	
R21	Reference R7	
R22, 23	Reference R1	
R24, 25	Reference R3, 4	
R26	Reference R5	
R27	Reference R6	
R28	Reference R7	
R29, 30	Reference R1	
R31, 32	Reference R3, 4	
R33 - 44	Reference R6	
R45	Reference R1	
R46, 47	Reference R6	
R48	Reference R1	
R49, 53	Reference R3, 4	

Table 9-1. (Continued)

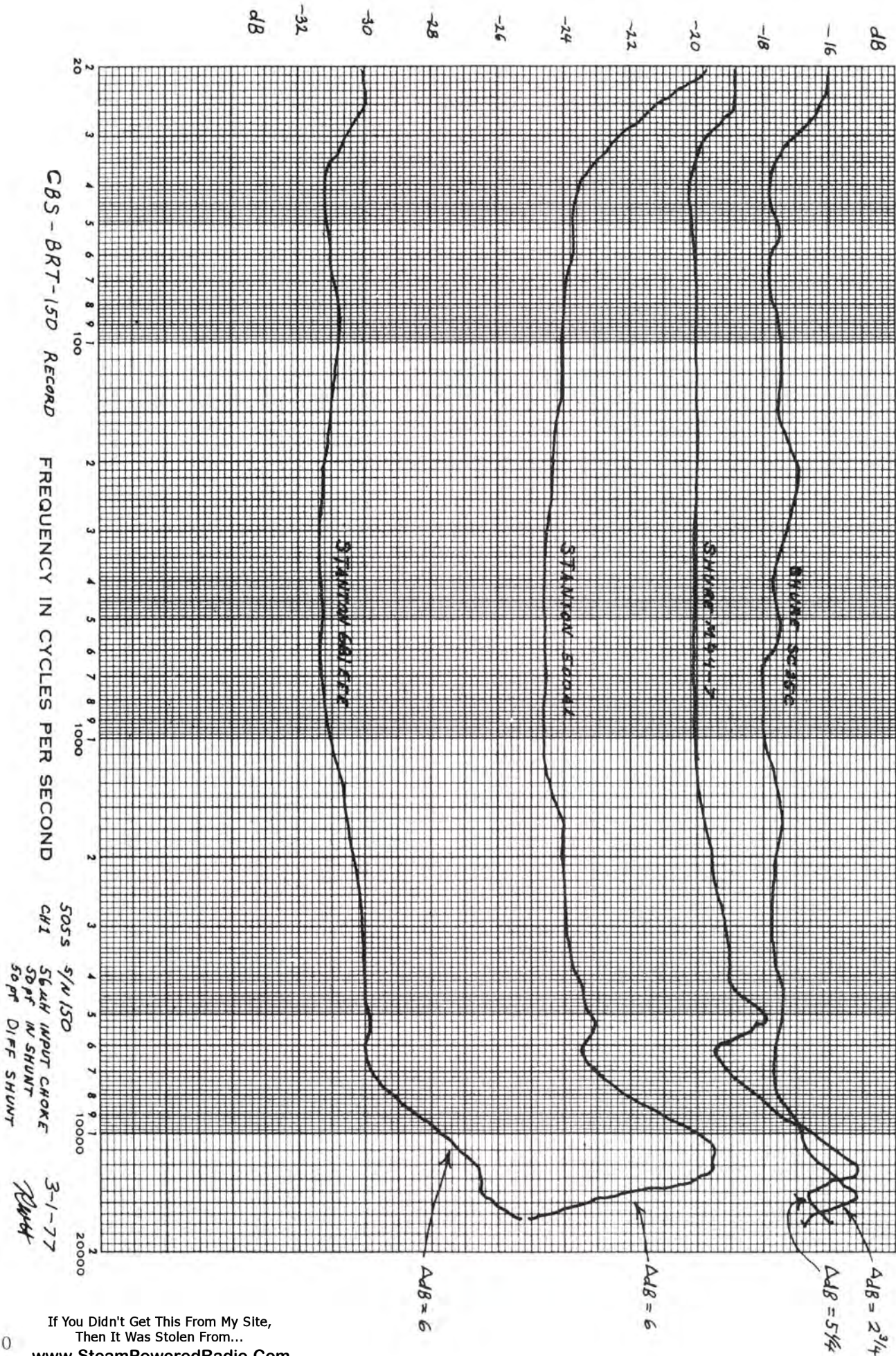
R50, 51	Reference R6	
R52	Reference R1	
R54, 55	Reference R6	
R56	Reference R1	
R57	Reference R5	
R58	Reference R6	
R59	Reference R5	
R60	Reference R6	
R61, 62	Resistor, DC, 330 Ω , 1/2W	150-008
R63, 64	Resistor, DC, 150 Ω , 1W	150-058
R65	Potentiometer, Trimmer, 10K Ω Linear	150-043
R66, 67	Reference R6	
R68	Reference R1	
R69	Resistor, DC, 22 Ω , 1/2W	150-002
R70	Resistor, DC 220 Ω , 1/2W	150-006
R71	Resistor, DC, 3.6K Ω , 1/2W	150-020
R72	Resistor, DC, 8.2K Ω , 1/2W	150-052
R73	Reference R65	
R74, 75	Reference R6	
R76	Reference R1	
R77	Reference R69	
R78	Reference R70	
R79	Refernece R71	
R80	Reference R72	
R81	Resistor, DC, 150 Ω , 1/4W	150-044
R82	Reference R65	
R83	Reference R81	
R84, 85	Resistor, DC, 2.2K Ω , 1/4W	150-040

Table 9-1. (Continued)

R86	Resistor, DC, 100 Ω , 1W	150-054
R87	Reference R69	
R88	Resistor, DC, 75 Ω , 1W	150-053
R89	Reference R81	
R90	Reference R65	
R91	Reference R81	
R92, 93	Reference R84	
R94	Reference R86	
R95	Reference R69	
R96	Reference R88	
R97	Reference R65	
R98, 99	Reference R6	
R100	Resistor, DC, 6.8K Ω , 1/4W	150-041
R101, 102	Reference R61	
R103, 104	Resistor, DC, 5.6K Ω , 1/2W	150-013
R105, 106	Resistor, DC, 47 Ω , 2W	150-038
R107	Reference R69	
R108	Reference R7	
R110, 111	Resistor, 1 Ω , 3W	150-069
Transformer, Input, 600 ohm		108-006
Transformer, Output, 600 ohm		108-007
Transformer, Power, 35 VCT @ 2½ A		108-002B
Switch, Push-Button, 6 Station (Ch. 5) (S1,3,5,7)		160-008
Switch, Push-Button, SPDT (Ch. 1-4)		160-009
VU Meter, Modutec 3LW3-AVU-000- AW-Z		104-001B
Cue-Speaker, 3", 2W, 8 ohm		107-001
Fuse, 1/2A Slow Blow, 3AG ½		101-010

ABBREVIATIONS

DT	-	Dipped Tantalum
CD	-	Ceramic Disc
AE	-	Axial Electrolytic
AM	-	Axial Mylar
LED	-	Light Emitting Diode
FET	-	Field Effect Transistor
DC	-	Deposited Carbon
PA	-	Paper or equivalent



ADDENDUM

Studio-Master 505-S ----- 109-011
Hi-Gain Modification ----- Phono Preamp

It has come to our attention here at Russco that some of our customers desire more phono preamp gain than was originally designed into the 505-S Console. These preamps were originally designed to be used with the Shure M-44-7 cartridges which have a medium level output. It is noted that some of the new cartridges on the market today do not have such a high output level. One of the popular cartridges today is the Stanton series which has a lower output level than that of the Shure. To make our preamps compatible with these cartridges, the gain of the preamp itself must be increased. This can be accomplished easily with the addition of just a few components to the back of the circuit board. The modification is as follows:

Parts Required:	Russco P/N
2 ----- 2.2K 1/4 watt resistors	150-040
2 ----- 10mfd 35 volt tantalum cap.	110-017

Procedure:

Locate and unplug the phono preamps (P/N 400-197) from the main PC Board. Looking at the preamp module and referring to page 8-2 of the instruction manual, locate R4 and R11 (2.2K). Now solder a new 2.2K resistor in parallel to each of these existing resistors on the board. Note: Do this on the back of the PC Board making the leads as short as possible.

Now locate C2 and C9 (10mfd) on the board and note the polarity. Solder a new 10mfd capacitor in parallel with each of these on the board making sure to match the polarity. Do this on the back side of the PC Board and again, make the leads as short as possible.

Now check for any solder bridges and push the capacitors down against the board. Reinstall the preamp modules on the plugs of the main board making sure to watch the pin alignment with the holes of the plug.

Results:

This modification should effectively increase the gain of the phono preamps by about 6dB across the full audio range.

NOTE: If the resistors are only installed and not the capacitors, you will have a slight bass rolloff as noted on the response graph. This may be desirable if turntable rumble is a problem. The parts for this modification should be available at most electronic outlets, and are available on request from RUSSCO.

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