

INSTRUCTION MANUAL

4R50 AUDIO CONSOLE

January, 1987

IM No. 597-0453

BROADCAST ELECTRONICS, INC.



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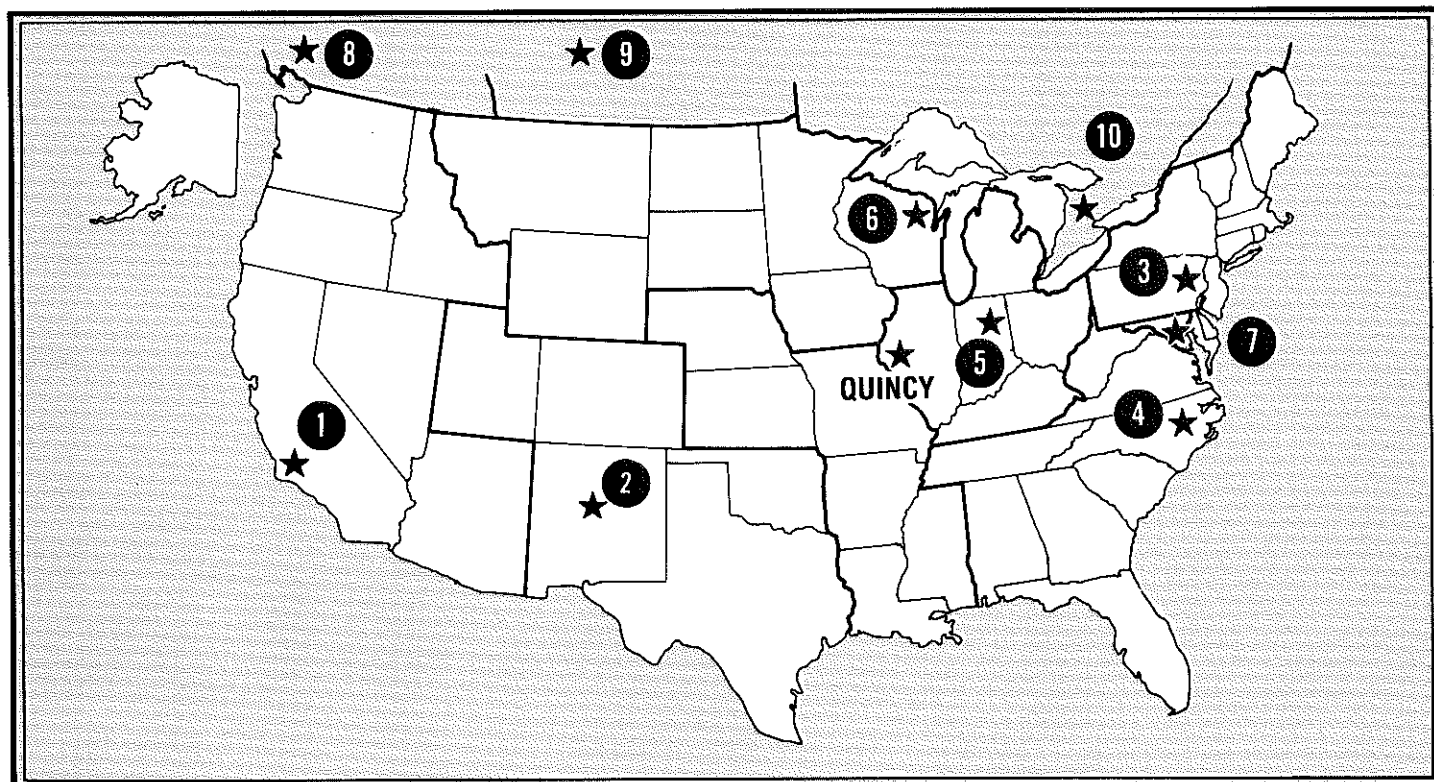
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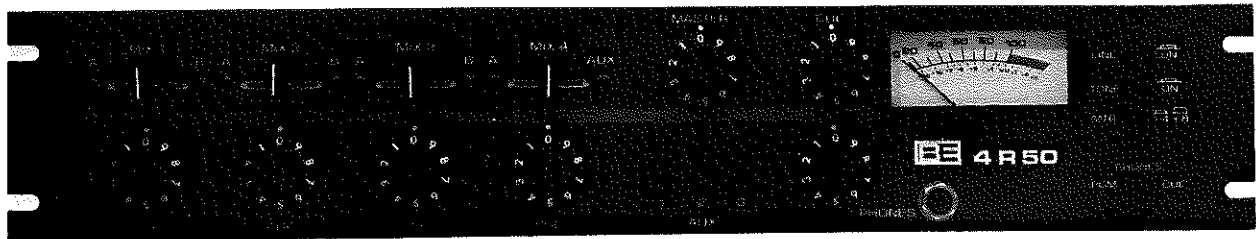
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TECHNICAL MANUAL
 597-0453
 BROADCAST ELECTRONICS
 MODEL 4R50
 AUDIO CONSOLE



597-0453-1

<u>MODEL</u>	<u>STOCK NO.</u>
4R50 - FOUR MIXER MONOPHONIC RACK MOUNT AUDIO CONSOLE, 117 VAC/60 Hz	901-2000
4R50 - FOUR MIXER MONOPHONIC RACK MOUNT AUDIO CONSOLE, 220 VAC/50 Hz	901-2000-300

TABLE OF CONTENTS

<u>PARAGRAPH</u>		<u>PAGE NO.</u>
SECTION I	GENERAL INFORMATION	
1-1	Scope of Manual	1-1
1-3	Description and Features	1-1
1-9	Specifications	1-1
SECTION II	INSTALLATION	
2-1	Introduction	2-1
2-5	Installation	2-1
2-6	Mounting	2-1
2-9	Assignment of Input Sources	2-1
2-12	Wiring	2-3
2-13	General	2-3
2-15	Grounding	2-3
2-18	Terminations	2-4
2-19	Input Source Level Sensitivity	2-4
2-20	Input Source Wiring	2-4
2-23	Program Output	2-4
2-25	Cue	2-4
2-26	Monitor Outputs	2-4
2-27	PA Output	2-4
2-28	Remote Muting	2-5
2-29	AC Power	2-5
2-32	Input Source Level Adjustment	2-5
SECTION III	OPERATION	
3-1	Introduction	3-1
3-3	Operation	3-1
3-6	Input Selection	3-1
3-8	Level Control	3-1
3-9	Program Output Level	3-1
3-10	Mixer Controls	3-2
3-11	VU Meter	3-2
3-12	Monitoring	3-2
3-14	Headphones	3-2
3-16	Cue System	3-2
3-17	Monitor	3-3
3-18	Additional Controls	3-3
3-19	Tone Switch	3-3
3-20	PA Volume	3-3

<u>PARAGRAPH</u>		<u>PAGE NO.</u>
SECTION IV	THEORY OF OPERATION	
4-1	Introduction	4-1
4-3	Functional Description	4-1
4-5	Power Supply	4-1
4-9	Audio Circuit Program Bus	4-1
4-15	Audio Circuit Cue Bus	4-2
4-17	Muting	4-3
4-19	Tone Generator	4-3
SECTION V	MAINTENANCE	
5-1	Introduction	5-1
5-3	Safety Considerations	5-1
5-5	First Level Maintenance	5-1
5-7	Cleaning	5-1
5-9	Visual Inspection	5-1
5-11	Specification Measurements	5-2
5-14	Second Level Maintenance	5-2
5-16	Troubleshooting	5-2
5-18	Adjustments	5-4
5-19	VU Meter Calibration	5-4
5-20	Component Replacement	5-4
5-28	Integrated Circuits	5-5
SECTION VI	PARTS LISTS	
6-1	Introduction	6-1
SECTION VII	DRAWINGS	
7-1	Introduction	7-1

LIST OF ILLUSTRATIONS

<u>FIGURE</u>	<u>TITLE</u>	<u>PAGE NO.</u>
2-1	Representative Studio Block Diagram	2-2
2-2	Amplifier Jumper Arrangement	2-6

LIST OF TABLES

<u>TABLE</u>	<u>TITLE</u>	<u>PAGE NO.</u>
1-1	Electrical and Physical Specifications	1-2
5-1	4R50 Series Audio Console Troubleshooting	5-3
6-1	Final Assembly 4R50 Console	6-1
6-2	4R50 Circuit Board Assembly	6-2

SECTION I

GENERAL INFORMATION

1-1. SCOPE OF MANUAL.

1-2. This manual provides installation, operation, and maintenance procedures for the Broadcast Electronics 4R50 Audio Console.

1-3. DESCRIPTION AND FEATURES.

1-4. The 4R50 audio console is a dual-input, four mixer monophonic device designed for use in CATV, CCTV, film studios, commercial sound installations, or dubbing facilities, etc.

1-5. The 4R50 audio console is designed to accept up to ten inputs. Mixers 1, 2, and 3 will accept two inputs each. All six inputs are level-switchable with a rear panel switch for either high (line) or low (microphone) level inputs. Mixer 4 has four inputs with one level-switchable input (either microphone or line level) and three auxiliary inputs for high-level signals only.

1-6. The 4R50 console features a headphone system which monitors either the program or cue channel. Cue channels are provided on all four mixers for auditioning inputs. An internal speaker is provided for cue audio. The speaker is FET muted for use next to a live microphone.

1-7. A VU meter is provided as an aid in determining proper output levels. The VU meter will indicate 0 VU when the program output is +8 dBm or +4 dBm. An internal 1kHz generator is designed into the 4R50 circuitry for VU meter calibration and troubleshooting.

1-8. For simplified installation, all input connections are made at the rear-panel terminal strips. Other rear-panel connections and controls include level switches, output posts, PA output jack, and PA level control.

1-9. SPECIFICATIONS.

1-10. Electrical and physical specifications for the 4R50 audio console are presented in Table 1-1.

TABLE 1-1. ELECTRICAL AND PHYSICAL SPECIFICATIONS
(Sheet 1 of 2)

PARAMETER	SPECIFICATIONS
<u>INPUT LEVELS</u>	
Low Level (MIC)	-50 dBm nominal, -38 dBm Maximum, 150 Ohms input impedance, balanced transformer input.
High Level (LINE)	-10 dBm nominal, +10 dBm Maximum, 20 k Ohm balanced bridging input impedance.
<u>OUTPUTS</u>	
Program	600 Ohms balanced line. +18 dBm maximum.
Cue	1.0 Watt maximum into 8 Ohms, FET muted by Channel 1. Internal and/or external speaker.
Headphone	1.0 Watt maximum into 8 Ohms.
PA (Monitor)	10 k Ohms unbalanced @ 0.45V, +8 dBm program output level.
<u>FREQUENCY RESPONSE</u>	+0 -2 dB, 30 Hz - 20 kHz at +8 dBm output. 1kHz reference.
<u>DISTORTION</u>	
Harmonic	Less than 0.3% from 30 Hz to 20 kHz at +8 dBm output.
Intermodulation	Less than 0.05% up to +18 dBm output (4:1, 60 Hz/7 kHz).
<u>SIGNAL-TO-NOISE RATIO</u>	70 dB or better below +18 dBm output with a +0 dBm level signal applied to any high-level input (75 dB A-weighted). 65 dB or better below +18 dBm output with a -50 dBm level signal applied to any low-level input (68 dB A-weighted).

TABLE 1-1. ELECTRICAL AND PHYSICAL SPECIFICATIONS
(Sheet 2 of 2)

PARAMETER	SPECIFICATIONS
<u>POWER REQUIREMENTS</u>	115/230V ac, 50/60 Hz, 11 Watts Maximum.
<u>DIMENSIONS</u>	19 inches Wide, 10 inches Deep, 3.5 inches High (48.3 X 25.4 X 8.9 cm) EIA Standard 19 inch rack mounting.
<u>WEIGHT</u> Unpacked	10.4 Pounds (4.7 kg).

SECTION II INSTALLATION

2-1. INTRODUCTION.

2-2. This section contains information required for installation of the 4R50 console.

2-3. The equipment becomes the property of the customer when the equipment is delivered to the carrier. Carefully unpack all equipment and perform a visual inspection to determine that no apparent damage has been incurred during shipment. All shipping materials should be retained until it is determined that the unit has not been damaged. Claims for damaged equipment must be promptly filed with the carrier or the carrier may not accept the claim.

2-4. The contents of the shipment should include a warranty card, a test certification card, and an instruction manual in addition to the console. If the contents are incomplete, or if the unit is damaged electrically or mechanically, notify both the carrier and Broadcast Electronics, Inc.

2-5. INSTALLATION.

2-6. MOUNTING.

2-7. Place the console within convenient access of the operator and within easy access of power and audio cabling. The 4R50 console is intended for rack mounting in a standard EIA 19 inch (48.26 cm) rack with 3 1/2 inches (8.9 cm) of vertical space.

2-8. Select a height for rack mounting that allows easy operator access. Ventilation must be provided as required to prevent the ambient temperature from exceeding 120°F (48.5°C) for best operation. To minimize noise, equipment having 50 or 60 Hz radiation should not be mounted directly above or below the unit.

2-9. ASSIGNMENT OF INPUT SOURCES.

2-10. Electrical installation is primarily controlled by the level and type of input sources, the need for microphone muting, and the separation of various signals. It is recommended that both inputs to a mixer have the same level (either microphone or line level).

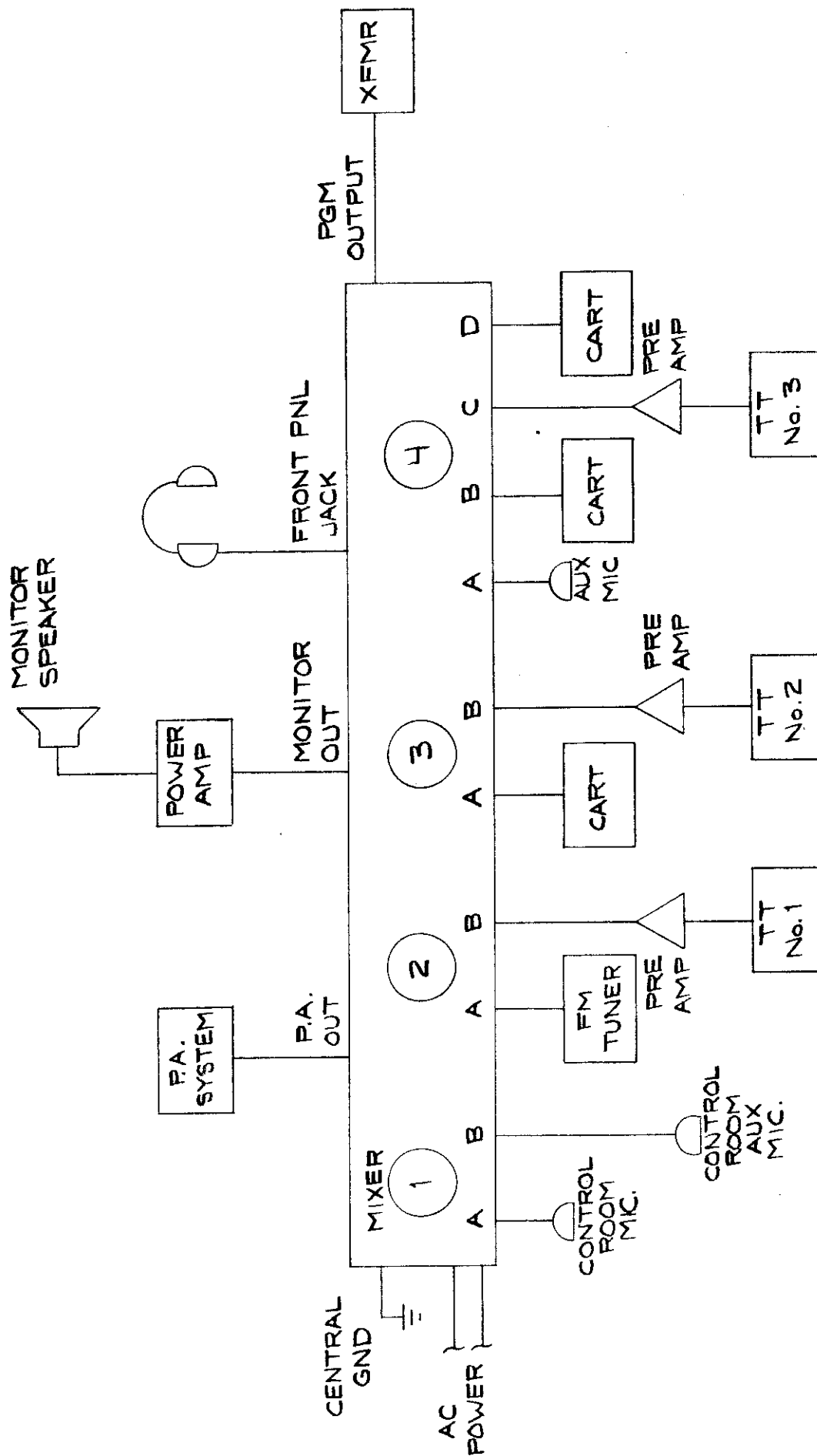


FIGURE 2-1. REPRESENTATIVE STUDIO BLOCK DIAGRAM

2-11. Operationally, input sources used simultaneously (mixed), cross faded, or used in rapid sequence should be on separate mixers. Conversely, two inputs rarely or never used in conjunction with each other may be assigned to the same mixer. Examples are provided in Figure 2-1. Each turntable is assigned to a separate mixer so that records may be sequenced or mixed easily. The control room microphone is connected to mixer 1 so that the built-in FET muting circuitry may be utilized.

2-12. WIRING.

WARNING

DO NOT CONNECT AC POWER UNTIL INSTALLATION IS COMPLETE.

2-13. GENERAL. Audio connections to the console should be made with a 2-conductor shielded cable such as Belden 8441, Alpha 2400, etc. Separate the cables carrying different signal levels (i.e. microphone from high-level and source inputs from speaker wiring) and route the cables to the console keeping as much distance between the cables as possible.

2-14. Similarly, route audio and power cables to the console keeping as much distance between the cables as possible. If practical, wire the power connections with shielded cables to prevent ac coupling to the audio cables.

2-15. GROUNDING. The most important consideration in ensuring low noise performance from the unit is the grounding and shielding of the various interconnections.

2-16. First, it is necessary to achieve a good ground for the console itself. This should be a central earth ground. If possible, connect the console to the transmitter RF ground. Alternately, connect it to a power line earth ground. The console ground post is located on the rear panel and should be connected to ground with a braided strap (such as Alpha 1235 or Belden 8657) or a solid copper strap.

2-17. Secondly, the grounding of the signal shields is recommended to avoid ground loops. To prevent ground loops, shields should be grounded at only one end of the cable. Generally this is done at the console. However, it may be best to ground the shield at the source equipment or even at a point between the source and the console. Particular care must be exercised to avoid unintended grounds at patch panels, at external switching arrangements, through uninsulated (case grounded) jacks on associated equipment, or from grounded racks or cabinets.

2-18. TERMINATIONS. Proper load or termination of transformer-coupled equipment is essential to ensure specified frequency response. The program outputs of the console require 600 Ohm terminations. This termination may be installed at the console. Proper terminations should be provided for other transformer-coupled equipment connected to the console.

2-19. INPUT SOURCE LEVEL SENSITIVITY. Both channels on mixers 1 through 3 will accept low-level (microphone) or high-level (line) inputs. Mixer 4 channel A will also accept low or high level inputs, but auxiliary inputs 1, 2, and 3 accept high level inputs only. The level sensitivity is determined by the position of the switches located on the rear-panel of the console. Operate the level switches to LO for microphone levels or to HI for line levels.

2-20. INPUT SOURCE WIRING. Input connections are made to the marked terminal strips located on the rear panel of the console.

2-21. Balanced Inputs. Connect the high input to the + terminal and the low input to the - terminal. Connect the shields to the GND terminal common to the A and B inputs for a given mixer.

2-22. Unbalanced Inputs. Connect the high input to the + terminal and the low input to the - terminal. Connect the shield to the GND terminal and then connect a wire from the - terminal to the GND terminal.

2-23. PROGRAM OUTPUT. The program output is located on the rear panel. Connections may be made to either the color-coded binding posts or to the screw terminals.

2-24. Connect the high input to the + terminal or the green binding post, the low input to the - terminal or the red binding post, and the shield to ground. For proper level and frequency response, if the output is not connected to an external 600 Ohm load, a 620 Ohm, half-watt resistor should be connected at the console.

2-25. CUE. An internal cue speaker is provided for monitoring purposes. If an external speaker is to be used, disconnect the internal speaker by unsoldering the lead from the speakers voice coil terminal and insulating the exposed end. An unbalanced external cue speaker connection (CUE) is provided on the rear-panel to drive an 8 Ohm high efficiency device.

2-26. MONITOR OUTPUTS. Three external monitoring output terminals (EXT OUT, MON, MONITOR) are provided on the rear-panel. Both the EXT OUT and the MON terminals provide unbalanced outputs. These two monitor outputs are wired in parallel to the MONITOR output phone jack.

2-27. PA OUTPUT. A PA OUTPUT connection is provided on the rear-panel as an auxiliary program output for use as an input to a public address system. The level is controlled by the PA VOLUME control which is located on the rear-panel.

2-28. REMOTE MUTING. A remote muting connection (MUTE) is provided on the rear-panel. To mute the cue speaker from a remote location, connect a normally open SPST switch between the GND and the + MUTE terminals.

2-29. AC POWER.

2-30. The 4R50 console operates at 117V ac, 50/60 Hz. The transformer may be rewired for 220V 50/60 Hz service if required (refer to schematic DS911-0004). The console power switch and fuse are located on the rear panel.

2-31. Ensure the power switch is in the OFF position and connect the console to the proper ac input source.

2-32. INPUT SOURCE LEVEL ADJUSTMENT.

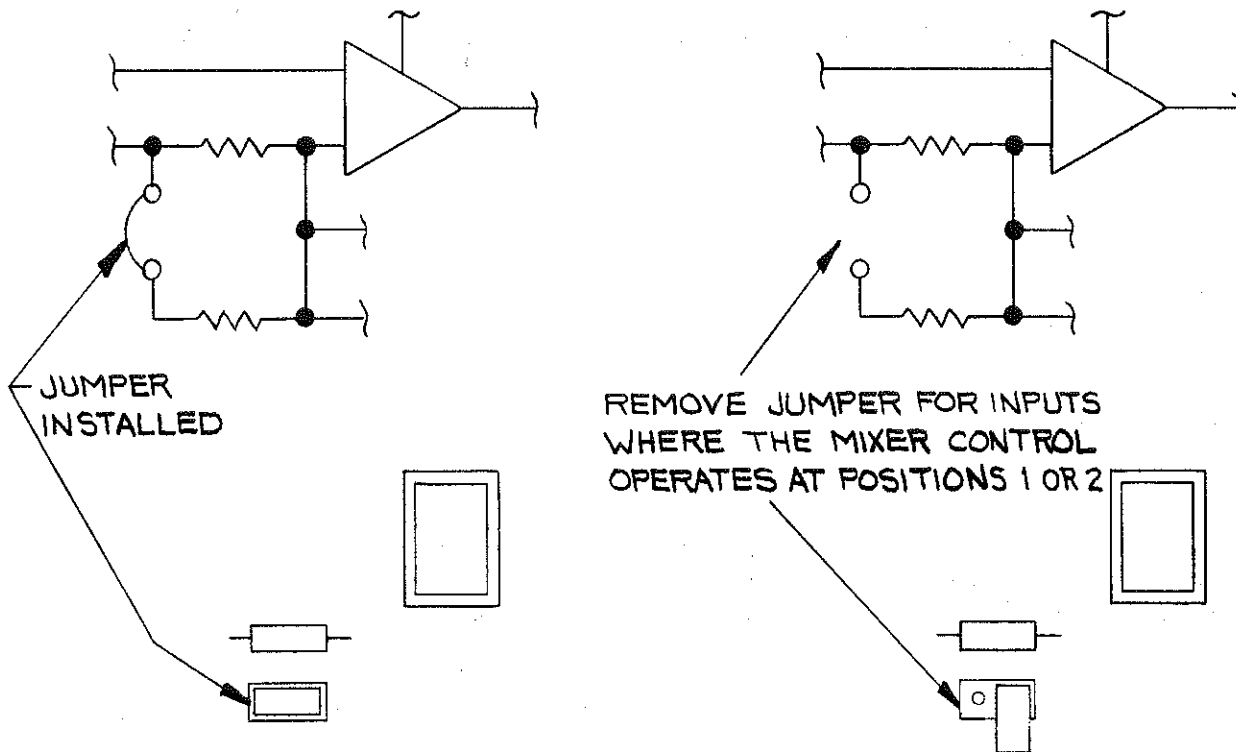
2-33. For maximum console performance the input source level should be adjusted so the mixer controls operate between positions 3 and 7. To adjust each input source level, refer to the following procedure:

- A. Operate the rear-panel power switch to on and adjust the MASTER gain control to position 5 (maximum performance is between positions 3 and 7).
- B. Start the source that is connected to channel 1A and operate the MIX 1 selector switch to the A position.
- C. Slowly adjust mixer control MIX 1 until the VU meter indicates 0 VU (+8 dBm or +4 dBm depending upon the MTR switch).

WARNING

DISCONNECT POWER PRIOR TO THE REMOVAL OF A JUMPER OR THE INSTALLATION OF A RESISTANCE PAD.

- D. If the mixer control is at positions 1 or 2, disconnect power and remove the jumper for Mixer 1 (refer to Figure 2-2).
- E. Reapply power to the console and check the VU meter for a 0 VU indication while operating the mixer control between positions 3 and 7.
- F. If the mixer control is still not at a position between 3 and 7 with the meter indicating 0 VU, disconnect power and install a resistance pad external to the console for channel 1A. The resistance pad will lower the level so the mixer control can operate between positions 3 and 7 with the console meter at 0 VU.
- G. Repeat the procedure for each input source.



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FIGURE 2-2. AMPLIFIER JUMPER ARRANGEMENT

SECTION III

OPERATION

3-1. INTRODUCTION.

3-2. This section provides operating procedures for the 4R50 audio consoles.

3-3. OPERATION.

3-4. Operate the power switch located on the rear-panel to on.

3-5. Operate the LINE switch located to the right of the VU meter to ON for program output. In the OFF position, the program output will be disconnected, but the MON and EXT OUT, and PA OUT terminals will be on.

3-6. INPUT SELECTION.

3-7. Two inputs may be connected to mixers 1, 2, and 3. Operate the mixer selector switch (MIX 1, MIX 2, MIX 3) to either the A or B position to feed the desired input to the mixer. Four inputs may be connected to mixer 4. Operate the MIX 4 selector switch to the A position for a high-level or low-level input or to the AUX position for three high-level inputs. If AUX is selected, depress one of the three input switches (AUX 1, 2, 3) to feed the desired input to the mixer.

3-8. LEVEL CONTROL.

NOTE

DO NOT ADJUST THE MASTER CONTROL DURING NORMAL OPERATION.

3-9. PROGRAM OUTPUT LEVEL. The program output level is controlled by the front-panel MASTER control. Operate the MASTER control to a position between 3 and 7 for maximum performance. Once the MASTER control is operated to a position, the control must not be adjusted during normal operation.

NOTE

MAXIMUM PERFORMANCE CAN BE OBTAINED WHEN THE MIXER CONTROLS ARE OPERATED TO A POSITION BETWEEN 3 AND 7.

NOTE

3-10. MIXER CONTROLS. The mixers can be used to control level in two ways:

1. To keep each input at approximately the same volume.
2. To combine signals from two or more inputs in a desired relationship.

3-11. VU METER. The VU meter is an aid in determining the proper levels or volumes. The VU meter is controlled by the front-panel MTR switch. The VU meter will indicate 0 VU at a +4 dBm or +8 dBm output with the MTR switch in the appropriate position. Adjust the mixer(s) of active sources for a peak level indication of 0 VU (100%). When mixing two or more inputs, adjust the mixers to yield the desired sound while maintaining a peak level indication of 0 VU.

3-12. MONITORING.

3-13. The console monitoring system consists of the following:
1) headphones, 2) cue system, and 3) monitor output.

CAUTION

HEADPHONE AMPLIFIER LOAD IMPEDANCE SHOULD NOT BE LESS THAN 8 OHMS.

3-14. HEADPHONES. The headphone jack on the front-panel will accept a wide variety of head sets, including low impedance stereo headphones. When using stereo headphones with the 4R50 console, only one channel of the headphones will be active.

NOTE

THE HEADPHONE OUTPUT JACK IS NOT MUTED BY THE ACTIVATION OF MIXER 1.

3-15. The headphones may be used to monitor either program or cue output. Operate the PHONES switch to PGM for program monitoring or to the CUE position for cue monitoring. The level is controlled by the PHONES level control.

3-16. CUE SYSTEM. An input is connected to the CUE system by placing the mixer selector switch in the appropriate position (A or B) and rotating the mixer control to the 0 position (extreme counterclockwise stop). An internal cue speaker is provided for monitoring the cue system. The level of the cue speaker is determined by the front-panel CUE level control. The cue speaker is muted by operating the MIX 1 selector switch to the A or B position.

3-17. MONITOR. Three monitor outputs are provided on the rear-panel (EXT OUT, MON, MONITOR) for use with an external amplifier and speaker.

3-18. ADDITIONAL CONTROLS.

3-19. TONE SWITCH. When the TONE switch (located on the front-panel) is operated to ON, a 1kHz signal is applied to the program bus which can be used for VU meter calibration and troubleshooting procedures.

3-20. PA VOLUME. The PA VOLUME control (located on the rear-panel) provides level control of the PA OUTPUT which is an auxiliary output for use with a public address system.

SECTION IV

THEORY OF OPERATION

4-1. INTRODUCTION.

4-2. This section provides theory of operation for the Broadcast Electronics Model 4R50 Audio Console. Refer to schematic D911-0004 for the following discussion.

4-3. FUNCTIONAL DESCRIPTION.

4-4. Each channel/mixer circuit operates in an identical manner, therefore only channel/mixer circuit MIX 2 will be described in detail.

4-5. POWER SUPPLY.

4-6. The console operates from a primary input potential of 117V or 220V ac. Primary ac is applied to power transformer T6 through fuse F1 which provides overload protection and power switch S21 which allows on/off control.

4-7. The secondary voltage of power transformer T6 is full-wave rectified and filtered and applied: 1) as an unregulated +15V supply to integrated circuits U6 and U7, 2) to voltage regulator U9 which provides a stable +30V dc supply. The +30V supply is then re-regulated into a +15V source by U10A.

4-8. Regulator U9 is a three-terminal adjustable voltage regulator containing internal thermal overload protection and short-circuit current limiting features. Further protection for U9 is provided by diode D5 which protects the regulator from a reverse polarity potential applied to the output and diode D14 which protects the regulator from a short circuit on the regulator input.

4-9. AUDIO CIRCUIT PROGRAM BUS.

4-10. Audio for channel/mixer circuit MIX 2 is applied to level switch S5 for channel 2A and S4 for channel 2B (all inputs are applied to level switches except for high-level inputs from MIX 4 AUX which are applied to ON/OFF switches). Audio will be applied through a resistor for high-level inputs or directly through the switch for low-level inputs. Audio from switches S4 and S5 will then be applied to the MIX 2 selector switch S13. Selection of the input source is accomplished by a three-position wafer switch. Depending upon the position of the switch, audio from input A or B will be applied to transformer T2 which provides input balancing and impedance matching.

4-11. The balanced audio from transformer T2 is ac-coupled to pre-amplifier U2A. When installed, jumper J6 provides an additional 7 dB of gain from preamplifier U2A if required. The output of U2A is then ac-coupled to potentiometer R33 (MIX 2) which adjusts the level of channel 2.

4-12. Audio from R33 is ac-coupled to amplifier U2B. The output of amplifier U2B is routed through the program bus and applied to mixing amplifier U5A. The output from U5A is then ac-coupled to potentiometer R87 (MASTER) which adjusts level of program output.

4-13. Audio from R87 is ac-coupled to line amplifier U5B. The output of U5B drives a power amplifier which is comprised of transistors Q1 and Q2. The output of the power amplifier is then ac-coupled to program output switch S8 (LINE).

4-14. Audio from switch S8 is routed to four different circuits:

- A. Audio from switch S8 is transformer-coupled through T5 to the output terminals.
- B. Audio from switch S8 is applied to VU meter amplifier U10B. Potentiometer R102 adjusts the gain of U10B which allows calibration of the VU meter. The output of U10B is full-wave rectified and routed through switch S10 to the console VU meter. The VU meter will indicate 0 VU when switch S10 is in the +4 dBm or +8 dBm position.
- C. Audio from switch S8 is applied to the MONITOR jack, EXT OUT and MON terminals, and through the PA VOLUME control to the PA output jack.
- D. Audio from switch S8 is routed through switch S11 (PHONE select) when S11 is in the PGM position to potentiometer R74 (PHONES level) which adjusts the headphone level. Audio from R74 is then ac-coupled to headphone amplifier U7 with the output of U7 ac-coupled to the HEADPHONE jack.

4-15. AUDIO CIRCUIT CUE BUS.

4-16. When mixer control MIX 2 is operated to the cue position, audio from preamplifier U2A is ac-coupled to the internal cue switch (S18) on the mixer control. The cue audio from the internal cue switch is routed through the cue bus and applied to two different circuits:

- A. Audio from the cue bus is applied through switch S11 (PHONES select) when S11 is in the CUE position to potentiometer R74 (PHONES level) which adjusts the headphone level. Audio from R74 is then ac-coupled to headphone amplifier U7 with the output of U7 ac-coupled to the HEADPHONE jack.

- B. Audio from the cue bus is applied to potentiometer R75 (CUE level) which adjusts the level of cue audio. Audio from R75 is amplified by transistor Q4 and ac-coupled to cue amplifier U6. The output of U6 is then ac-coupled to the internal cue speaker and external cue speaker (CUE) terminals.

4-17. MUTING.

4-18. Muting is accomplished when the MIX 1 selector switch is the A or B position. A ground is applied from selector switch S12 through the muting bus to transistor Q3. The ground biases transistors Q3 and Q4 off which mutes the internal and/or external cue speaker.

4-19. TONE GENERATOR.

4-20. When switch S9 (TONE) is operated to ON, a ground is applied to D13 which allows oscillating amplifier U8A to output a 1kHz tone to potentiometer R82. Potentiometer R82 allows adjustment of the 1kHz tone level and applies the signal to buffer U8B. The output of U8B is then routed to the program bus where the 1kHz tone can be used for VU meter calibration and troubleshooting.

SECTION V MAINTENANCE

5-1. INTRODUCTION.

5-2. This section provides general maintenance information, electrical adjustment procedures and component replacement procedures for the Broadcast Electronics 4R50 Audio Console.

5-3. SAFETY CONSIDERATIONS.

5-4. Low voltage is used throughout the 4R50 circuitry, however maintenance with power energized is always considered hazardous and caution should be observed. Good judgement, care, and common sense are the best accident preventives. The procedures contained in this section should be performed only by trained and experienced maintenance personnel.

5-5. FIRST LEVEL MAINTENANCE.

5-6. First level maintenance of the 4R50 audio console falls into the category of good housekeeping, which consists of procedures performed on a regular basis to maintain the correct operational environment for the console.

WARNING

ENSURE ALL POWER IS DISCONNECTED FROM THE UNIT
BEFORE ATTEMPTING PREVENTIVE MAINTENANCE.

5-7. CLEANING.

5-8. Use a soft cloth moistened with a mild household cleaner to remove fingerprints and other marks from the machine chassis and other surfaces. Remove dust from the interior with a soft-bristled brush. The mixer controls are sealed units and do not require cleaning. Lever switches may be cleaned, if required, with an aerosol spray contact cleaner.

5-9. VISUAL INSPECTION.

5-10. Regularly inspect the console for loose connections and hardware, damaged or improperly seated semi-conductors, components damaged by overheating, and mechanical surfaces requiring lubrication.

5-11. SPECIFICATION MEASUREMENTS.

5-12. A specification test performed periodically is a good way to check for the proper operation of the console. A copy of the original factory specifications test results can be obtained from Broadcast Electronics by returning the test certification card which is supplied with each unit.

5-13. These specification tests are performed at the factory with a 0 dBm signal supplied to a high-level input. The gain controls are adjusted to yield a +18 dBm output. Active inputs and outputs are terminated with the proper load. When measuring the signal-to-noise ratio, the input signal should be disconnected.

5-14. SECOND LEVEL MAINTENANCE.

5-15. Second level maintenance consists of procedures required to restore the unit to proper operation after a fault has occurred.

5-16. TROUBLESHOOTING.

5-17. The troubleshooting philosophy for the 4R50 audio console consists of isolating a problem to a specific component. If desired, an entire defective assembly may be returned to the factory for repair or exchange. Refer to the following information and Table 5-1 for the 4R50 audio console troubleshooting.

WARNING

REMOVE ALL JEWELRY BEFORE PROCEEDING.

WARNING

DO NOT TOUCH ANY COMPONENTS WITHIN THE EQUIPMENT WITH THE POWER ENERGIZED THAT MAY CAUSE AN ELECTRICAL SHOCK. GOOD JUDGEMENT, CARE, AND COMMON SENSE MUST BE PRACTICED TO PREVENT ACCIDENTS.

WARNING

WARNING

CAUTION

DO NOT TOUCH ANY CONNECTIONS OR INTEGRATED CIRCUIT PINS THAT MAY CAUSE AN ACCIDENTAL SHORT AND DAMAGE THE COMPONENT OR CIRCUIT BOARD.

CAUTION

CAUTION

TO AVOID DAMAGE TO THE INTEGRATED CIRCUITS, USE A METER WITH A SENSITIVITY OF 20,000 OHMS/VOLT OR GREATER FOR TROUBLESHOOTING THE 4R50 CONSOLE.

CAUTION

TABLE 5-1. 4R50 SERIES AUDIO CONSOLE TROUBLESHOOTING

PROBLEM	ITEMS TO CHECK
Complete failure in console operation.	Line fuse, power supply circuitry.
Missing program and monitor output.	Power supply to U5A and U5B, mixing amplifier U5A, line amplifier U5B, transistors Q1 and Q2, master level control R87, capacitors C26, C40, or C24, transformer T5, and switch S8.
Missing headphone output.	Power supply to U7, headphone amplifier U7, headphone level control R74, capacitors C35 or C32, and switch S11.
Missing cue audio.	Power supply to U6, cue amplifier U6, transistors Q3 and Q4, cue level control R75, and capacitors C31 and C30.
Missing audio from any one mixer control.	Audio source, power supply to the pre-amplifier (i.e. U2A) or amplifier (i.e. U2B), preamplifier or amplifier, mixer control, coupling capacitors, input transformer, A-B switch, and level switches.
No muting.	Wire from S12 to terminal E38, transistor Q3, switch S12.

5-18. ADJUSTMENTS.

5-19. VU METER CALIBRATION. The console VU meter is calibrated at the factory to indicate 0 VU when the output level is +8 dBm or +4 dBm with the front-panel MTR switch set accordingly. To calibrate the VU meter, refer to the following procedure:

WARNING

DISCONNECT POWER AND REMOVE ALL JEWELRY
BEFORE PROCEEDING.

- A. Disconnect power and connect an external VU meter to the rear-panel program output.
- B. Provide a 600 Ohm termination for the output.
- C. Apply power and adjust the MASTER control to position 5.
- D. Operate the front-panel MTR switch to the +8 dBm position.
- E. Operate the front-panel TONE switch to ON, which activates the internal 1kHz tone generator.
- F. Remove the top cover and adjust tone generator potentiometer R82 for a +8 dBm indication on the external VU meter.
- G. Adjust VU meter potentiometer R102 for a +8 dBm indication on the console VU meter.

5-20. COMPONENT REPLACEMENT.

WARNING

DISCONNECT AC POWER WHEN REMOVING OR REPLACING
CIRCUIT BOARDS OR COMPONENTS.

5-21. The circuit board used in the 4R50 is double-sided with plated through-holes. Because of the plated through-holes, solder fills the holes by capillary action. These conditions require that defective components be removed carefully to avoid damage to the board.

5-22. On all circuit boards, the adhesion of the copper trace to the board fails at almost the same temperature as solder melts. A circuit board trace can be destroyed by excessive heat or lateral movement during soldering. Use of a small iron with steady pressure is required for circuit board repairs.

5-23. To remove a component from a board such as the type used in the 4R50, cut the leads from the body of the defective component while the device is still soldered to the board.

5-24. Grip each component lead, one at a time, with long nose pliers. Turn the board over and touch the soldering iron to the lead at the solder connection. When the solder begins to melt, push the lead through the back side of the board and cut off the clinched end of the lead. Each lead may now be heated independently and pulled out of each hole. The holes may be cleared of solder by carefully re-heating with a low wattage iron and removing the residual solder with a soldering vacuum tool.

5-25. Install the new component and apply solder from the bottom side of the board. If no damage has been done to the plated through-holes, soldering of the top side is not required.

WARNING

MOST SOLVENTS WHICH WILL REMOVE ROSIN FLUX ARE VOLATILE AND TOXIC BY THEIR NATURE AND SHOULD BE USED ONLY IN SMALL AMOUNTS IN A WELL VENTILATED AREA, AWAY FROM FLAME, CIGARETTES, OR HOT SOLDERING IRONS.

WARNING

WARNING

WARNING

OBSERVE THE MANUFACTURER'S CAUTIONARY INSTRUCTIONS.

5-26. After soldering, remove residual flux with a cotton swab moistened with a suitable solvent. Rubbing alcohol is highly diluted and is not effective. Solvents are available from electronic supply houses which are useful.

5-27. The board should be checked to ensure the flux has been removed and not just smeared about. Rosin flux is not normally corrosive, but it will absorb enough moisture in time to become conductive and cause problems.

5-28. INTEGRATED CIRCUITS. Extra care should be exercised with integrated circuits. All integrated circuits must be oriented so that its notch matches the notch on the socket for replacement. Do not attempt to remove an integrated circuit with your fingers. Use a circuit puller to lightly pry the integrated circuit from its socket.

SECTION VI

PARTS LISTS

6-1. INTRODUCTION.

6-2. This section provides descriptions and part numbers of parts and assemblies required for maintenance of the 4R50 Audio Console.

TABLE 6-1. FINAL ASSEMBLY 4R50 CONSOLE - 901-2000-XXX
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
F1	Fuse, 1/4 Ampere, Slow-Blow, AGC	330-0250	1
J1,J2	Phone Jack, 2-Conductor (MONITOR, PHONES)	417-0111	2
J3	Phone Jack, (PA OUT)	417-0135	1
M1	Meter, VU, 2.5 inch (6.35 cm) dc Microammeter Type, 1900 Ohms internal resistance	319-1002	1
P1	Potentiometer, 10 k Ohm (PA VOLUME)	191-1053C	1
P2	Potentiometer, 100 k Ohm with switch (MASTER)	190-1063	1
P3,P4	Potentiometer, 10 k Ohm (CUE, PHONES)	191-1053C	2
P5 THRU P8	Potentiometer, 10 k Ohm with switch (MIXER Controls)	193-1053B	4
R1 THRU R14, R19, R29, R39, R49	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	18
R56	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R69	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R71	Resistor, 5.11 k Ohm $\pm 1\%$, 1/4W	103-5141	1
R84,R85	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	2
R98	Resistor, 620 Ohm $\pm 5\%$, 1/4W	100-6233	1
S1 THRU S7	Switch, Slide, DPDT, 125V ac @ 1 Ampere (HI/LO LEVEL)	345-0126	7
S8 THRU S11	Switch, 5 Position, 4 Station (LINE, TONE, MTR, PHONES)	340-0058	4
S12 THRU S15	Switch, Lever, 3 Pole, 3 Position (MIX 1 A/B, MIX 2 A/B, MIX 3 A/B, and MIX 4 A/AUX)	343-3001	4
S16	Switch, DPDT, 3 Station, Interlocked, Push, 25W Maximum, 0.125 Ampere @ 110/120V ac, Resistive Load (AUX 1, 2, 3)	343-1202	1
S21	Switch, Toggle (POWER Switch)	348-7101	1
T6	Transformer, Power Primary: 115/230V ac, 50/60 Hz Secondary: +34V dc +17V dc	370-0090	1

TABLE 6-1. FINAL ASSEMBLY 4R50 CONSOLE - 901-2000-XXX
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
TS1,TS2	Barrier Strip, 20 Position	412-0020	2
XF1	Fuse Holder, AGC	415-2012	1
----	Barrier Strip, Insulated, 5 Terminal (AC Input)	411-0000	1
----	Knob, (MIXER Controls, MASTER, CUE, PHONES)	481-0015	7
----	Knob, Lever Switch	481-0017	4
----	Speaker Cue, 3 inch, 8 Ohm voice coil	414-0001	1
----	4V50 Circuit Board Assembly	911-0004	1

TABLE 6-2. 4R50 CIRCUIT BOARD ASSEMBLY - 911-0004
(Sheet 1 of 4)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1,C2	Capacitor, Electrolytic, 4700 uF, 50V	014-4793	2
C3	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C4	Capacitor, Ceramic, 5 pF, 500V	001-5004	1
C5	Capacitor, Electrolytic, 470 uF, 35V	024-4773	1
C6	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C7	Capacitor, Ceramic, 5 pF, 500V	001-5004	1
C8 THRU C14	Capacitor, Electrolytic, 10 uF, 35V	023-1076	7
C15	Capacitor, Ceramic, 5 pF, 500V	001-5004	1
C16 THRU C25	Capacitor, Electrolytic, 10 uF, 35V	023-1076	10
C26	Capacitor, Electrolytic, 470 uF, 35V	024-4773	1
C27	Capacitor, Ceramic, 5 pF, 500V	001-5004	1
C28	Capacitor, Electrolytic, 22 uF, 25V	013-2574	1
C29,C30	Capacitor, Mylar, 0.1 uF, 100V	030-1053	2
C31	Capacitor, Electrolytic, 100 uF, 25V	023-1084	1
C32	Capacitor, Mylar, 0.1 uF, 100V	030-1053	1
C33	Capacitor, Electrolytic, 22 uF, 25V	013-2574	1
C34	Capacitor, Mylar, 0.1 uF, 100V	030-1053	1
C35	Capacitor, Electrolytic, 1000 uF, 25V	023-1094	1
C36 THRU C38	Capacitor, Mylar, 0.047 uF, 100V	030-4743	3
C39	Capacitor, Electrolytic, 100 uF, 25V	023-1084	1
C40	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C41 THRU C44	Capacitor, Ceramic, 5 pF, 500V	001-5004	4
C45,C46	Capacitor, Electrolytic, 10 uF, 35V	023-1076	2
C47	Capacitor, Ceramic, 10 pF $\pm 10\%$, 1 kV	001-1014	1
C48	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C49	Capacitor, Mylar, 0.022 uF, 200V	031-2243	1
C50,C51	Capacitor, Mylar, 0.01 uF, 100V	030-1043	2
C52	Capacitor, Mica, 100 pF $\pm 5\%$, 500V	040-1022	1

TABLE 6-2. 4R50 CIRCUIT BOARD ASSEMBLY - 911-0004
(Sheet 2 of 4)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C53	Capacitor, Ceramic, 10 pF $\pm 10\%$, 1 kV	001-1014	1
C54	Capacitor, Electrolytic, 10 μ F, 35V	023-1076	1
C55	Capacitor, Electrolytic, 100 μ F, 50V	020-1083	1
C56,C57	Capacitor, Electrolytic, 10 μ F, 35V	023-1076	2
C58	Capacitor, Mylar, 0.1 μ F, 100V	030-1053	1
D1 THRU D5	Diode, 1N4005, Rectifier, Silicon, 600V @ 1 Ampere	203-4005	5
D6 THRU D8	Diode, 1N4148, Silicon, 75V @ 0.3 Ampere	203-4148	3
D9 THRU D12	Diode, 1N60, Germanium, 25V @ 50 mA	202-0060	4
D13	Diode, 1N4148, Silicon, 75V @ 0.3 Ampere	203-4148	1
D14	Diode, 1N4005, Rectifier, Silicon, 600V @ 1 Ampere	203-4005	1
J5 THRU J8	Connector, Header, 2-Pin	417-4004	4
P5 THRU P8	Jumper, Programmable (Secondary Gain Control)	340-0004	4
Q1	Transistor, MPSU55, Silicon, PNP	210-0155	1
Q2	Transistor, MPSUC5, Silicon, NPN	211-0005	1
Q3	Transistor, 2N3904, Silicon, NPN, TO-92 Case	211-3904	1
Q4	Transistor, J271, Silicon, N-Channel, FET	210-0271	1
R14	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R15	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R16	Resistor, 6.8 k Ohm $\pm 5\%$, 1/4W	100-6843	1
R17	Resistor, 121 Ohm $\pm 1\%$, 1/4W	100-1231	1
R18	Resistor, 24 k Ohm $\pm 5\%$, 1/4W	100-2453	1
R20	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R21	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R22	Resistor, 121 k Ohm $\pm 1\%$, 1/4W	103-1261	1
R24	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R25	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R26	Resistor, 6.8 k Ohm $\pm 5\%$, 1/4W	100-6843	1
R27	Resistor, 2.8 k Ohm $\pm 1\%$, 1/4W	103-2804	1
R28	Resistor, 24 k Ohm $\pm 5\%$, 1/4W	100-2453	1
R30	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R31	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R32	Resistor, 121 k Ohm $\pm 1\%$, 1/4W	103-1261	1
R34	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R35	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R36	Resistor, 6.8 k Ohm $\pm 5\%$, 1/4W	100-6843	1
R37	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R38	Resistor, 24 k Ohm $\pm 5\%$, 1/4W	100-2453	1
R40	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R41	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R42	Resistor, 121 k Ohm $\pm 1\%$, 1/4W	103-1261	1
R45	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R46	Resistor, 6.8 k Ohm $\pm 5\%$, 1/4W	100-6843	1
R47	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R48	Resistor, 24 k Ohm $\pm 5\%$, 1/4W	100-2453	1

TABLE 6-2. 4R50 CIRCUIT BOARD ASSEMBLY - 911-0004
(Sheet 3 of 4)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R50	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	2
R51	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R52	Resistor, 121 k Ohm $\pm 1\%$, 1/4W	103-1261	1
R54	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R55	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R57	Resistor, 6.8 k Ohm $\pm 5\%$, 1/4W	100-6843	1
R58	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-3953	1
R59,R60	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1023	2
R61	Resistor, 3.6 k Ohm $\pm 5\%$, 1/4W	100-3643	1
R63	Resistor, 5.1 k Ohm $\pm 5\%$, 1/4W	100-5143	1
R64	Resistor, 220 Ohm $\pm 5\%$, 1/4W	100-2233	1
R65,R66	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	2
R67	Resistor, 2 Meg Ohm $\pm 5\%$, 1/4W	100-2073	1
R68	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R70	Resistor, 2.7 Ohm $\pm 5\%$, 1/4W	100-2713	1
R72	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R73	Resistor, 2.7 Ohm $\pm 5\%$, 1/4W	100-2713	1
R76	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R77	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R78,R79	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	2
R80	Resistor, 820 k Ohm $\pm 5\%$, 1/4W	100-8263	1
R81	Resistor, 330 Ohm $\pm 5\%$, 1/4W	100-3323	1
R82	Potentiometer, 10 k Ohm $\pm 10\%$, 1/2W	177-1054	1
R86	Resistor, 2.7 Ohm $\pm 5\%$, 1/4W	100-2713	1
R87	Resistor, 5.1 k Ohm $\pm 5\%$, 1/4W	100-5143	1
R89	Resistor, 27 k Ohm $\pm 5\%$, 1/4W	100-2753	1
R90	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R91	Resistor, 2.7 k Ohm $\pm 5\%$, 1/4W	100-2743	1
R92,R93	Resistor, 5.6 k Ohm $\pm 5\%$, 1/4W	100-5643	2
R94	Resistor, 2.7 Ohm $\pm 5\%$, 1/4W	100-2713	1
R95,R96	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1023	2
R97	Resistor, 5.1 k Ohm $\pm 5\%$, 1/4W	100-5143	1
R99,R100	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	2
R101	Resistor, 13 k Ohm $\pm 5\%$, 1/4W	100-1353	1
R102	Potentiometer, 10 k Ohm $\pm 10\%$, 1/2W	177-1054	1
R103	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R104 THRU R107	Resistor, 5.6 k Ohm $\pm 1\%$, 1/4W	100-5643	4
T1 THRU T4	Transformer, Audio Input Frequency Response: ± 0.5 dB @ 30 Hz to 20 kHz Primary: 150 Ohm Secondary: 100 k Ohm	376-0521	4
T5	Transformer, Audio Output, 30 Hz to 20 kHz Primary: 150 Ohm/600 Ohm Secondary: 600 Ohm	370-1217	1

TABLE 6-2. 4R50 CIRCUIT BOARD ASSEMBLY - 911-0004
(Sheet 4 of 4)

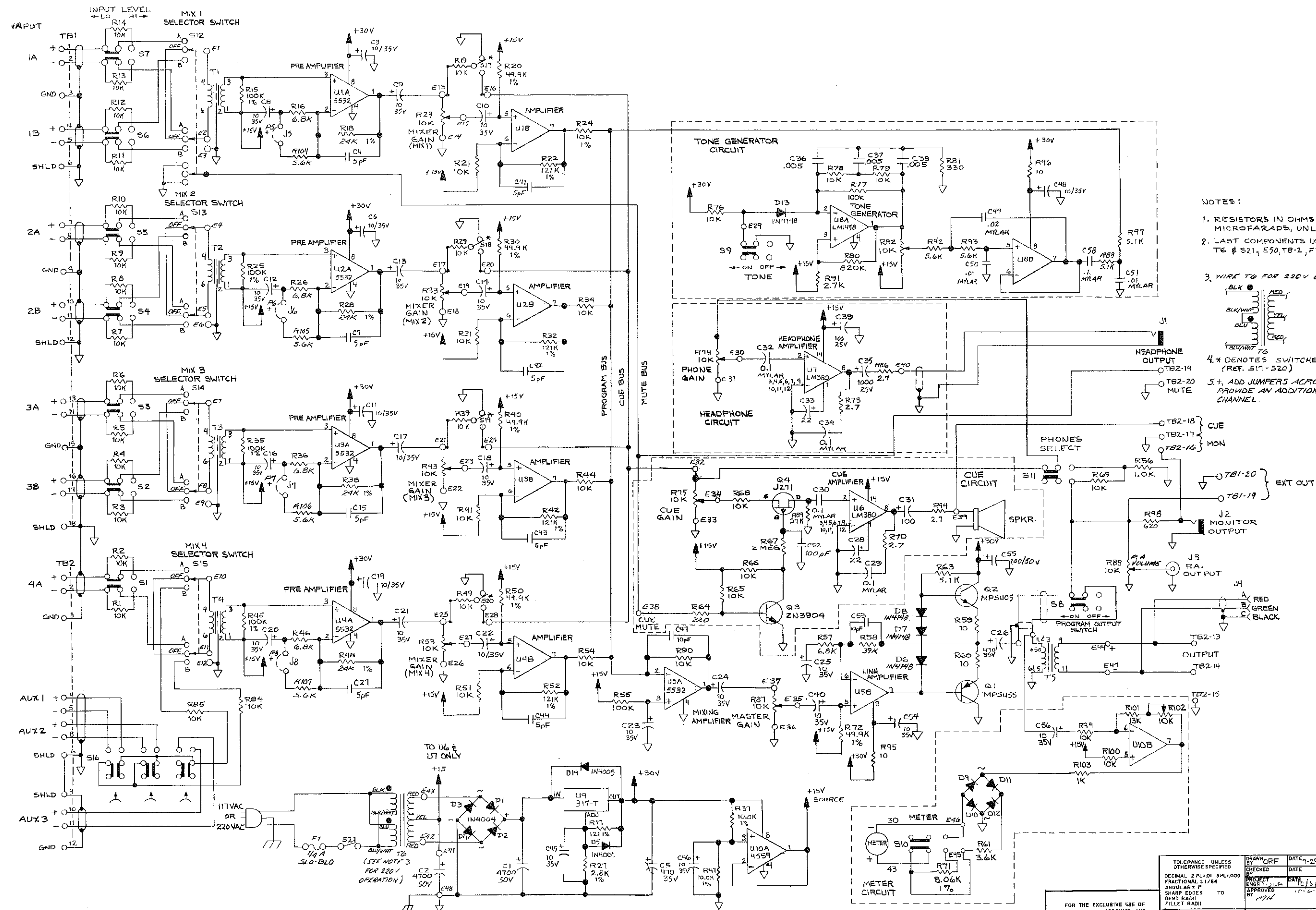
REF. DES.	DESCRIPTION	PART NO.	QTY.
U1 THRU U5	Integrated Circuit, NE5532, Dual Low Noise Operational Amplifier, 8-Pin DIP	221-5532	5
U6,U7	Integrated Circuit, LM380, Power Amplifier, 14-Pin DIP	222-3800	2
U8	Integrated Circuit, RC4559, Operational Amplifier, 8-Pin DIP	221-4559	1
U9	Integrated Circuit, LM317T, Adjustable Positive Voltage Regulator, 1.2V to 37V, TO-220 Case	227-0317	1
U10	Integrated Circuit, RC4559, Operational Amplifier, 8-Pin DIP	221-4559	1
XU1 THRU XU5, XU8, XU10	Socket, 8-Pin DIP	417-0804	7
----	Insulator Pad, TO-220 Package (U9)	455-7805	1
----	Blank Circuit Board	511-0004	1

SECTION VII
DRAWINGS

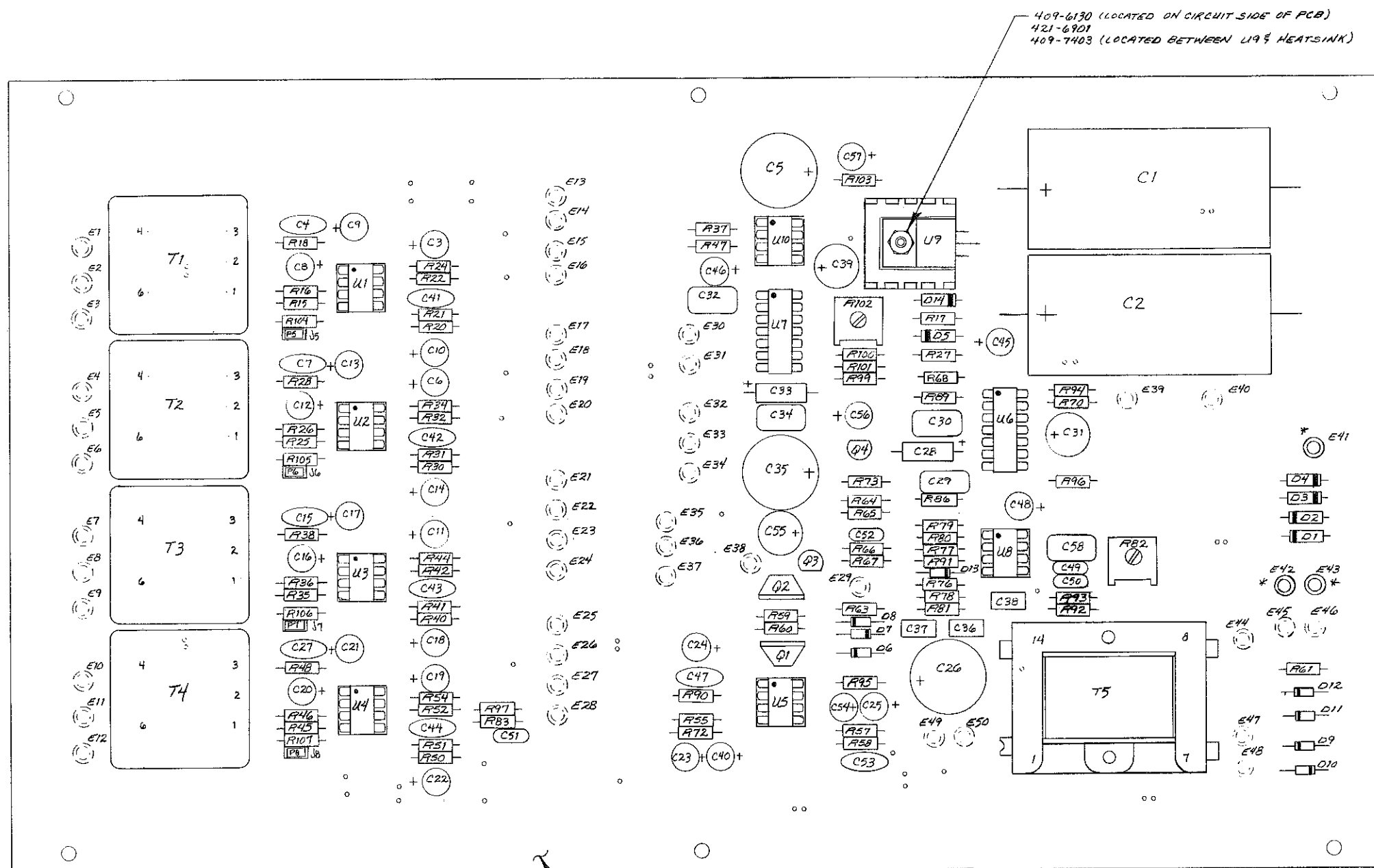
7-1. INTRODUCTION.

7-2. This section provides assembly drawings and schematic diagrams as indexed below.

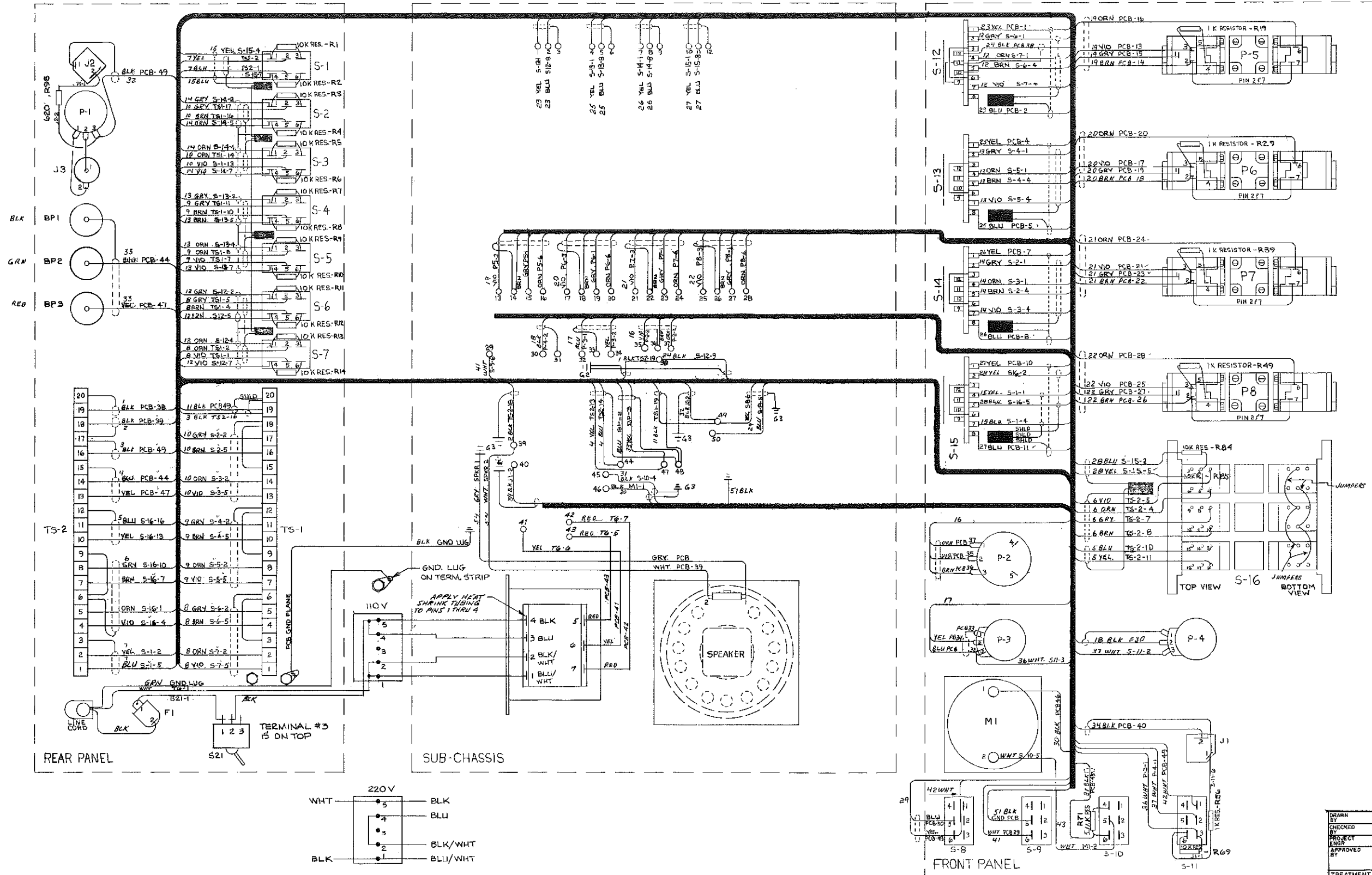
<u>FIGURE</u>	<u>TITLE</u>	<u>NUMBER</u>
7-1	WIRING DIAGRAM	D901-2000
7-2	OVERALL SCHEMATIC DIAGRAM	D911-0004
7-3	4R50 CONSOLE CIRCUIT BOARD ASSEMBLY	D911-0004



FOR THE EXCLUSIVE USE OF BROADCAST ELECTRONICS, INC. PERSONNEL AND CUSTOMERS ALL RIGHTS RESERVED	TOLERANCE UNLESS OTHERWISE SPECIFIED		DRAWN BY ORF	DATE 1-29-82	BROADCAST ELECTRONICS INC.	
	DECIMAL 2 PL. 01 3PL. 000	FRACTIONAL 1/164	CHECKED BY	DATE		
	ANGULAR 2°	TO	PROJECT ENG 3-16-82	DATE 1-16-82	TITLE SCHEMATIC	
	SHARP EDGES		APPROVED BY	DATE 1-16-82	4N50/4R50 CONSOLE PCB	
	BEND RADI				D	
	MATERIAL	TREATMENT OR FINISH	DWG NO. 911-0004		REV G	
			4N50/4R50		SCALE	SHEET 1 OF 1



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TOLERANCE (DECIMAL) U.S.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°		CHKD VPH 10-6-83	FINISH 	
ME 		PROJ. ENGR. 	NEXT ASSY. 	TITLE PCB ASSEMBLY 4V50/4R50 CONSOLE PCB TYPE A SIZE D DWG. NO. 911-0004 REV E MODEL 4V50/4R50 SCALE 2/1 SHEET 1 OF 1



DRAWN BY	DATE	BROADCAST ELECTRONICS INC.
CHECKED BY	DATE	- A FILMWAYS COMPANY -
PROJECT	DATE	TITLE
APPROVED BY		WIRING DIAGRAM
TREATMENT OR FINISH		DWG NO. 901-2000
		4V50/4R50
		SCALE SHEET 1 OF 1

PRODUCT WARRANTY

LIMITED ONE YEAR

While this warranty gives you specific legal rights, which terminate one (1) year (6 months on turntable motors) from the date of shipment, you may also have other rights which vary from state to state.

Broadcast Electronics, Inc. ("BE"), 4100 North 24th Street, P. O. Box 3606, Quincy, Illinois 62305, hereby warrants cartridge machines, consoles, transmitters and other new Equipment manufactured by BE against any defects in material or workmanship at the time of delivery thereof, that develop under normal use within a period of one (1) year (6 months for turntable motors) from the date of shipment. Other manufacturers' Equipment, if any, shall carry only such manufacturers' standard warranty. This warranty extends to the original user and any subsequent purchaser during the warranty period. BE's sole responsibility with respect to any Equipment or parts not conforming to this warranty is to replace such equipment or parts upon the return thereof F.O.B. BE's factory or authorized repair depot within the period aforesaid.

In the event of replacement pursuant to the foregoing warranty, only the unexpired portion of the warranty from the time of the original purchase will remain in effect for any such replacement. However, the warranty period will be extended for the length of time that the original user is without the services of the Equipment due to its being serviced pursuant to this warranty. The terms of the foregoing warranty shall be null and void if the Equipment has been altered or repaired without specific written authorization of BE, or if Equipment is operated under environmental conditions or circumstances other than those specifically described in BE's product literature or instruction manual which accompany the Equipment purchased. BE shall not be liable for any expense of any nature whatsoever incurred by the original user without prior written consent of BE.

BE shall not be liable to the original user for any and all incidental or consequential damages for breach of either expressed or implied warranties. However, some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. All express and implied warranties shall terminate at the conclusion of the period set forth herein.

Except as set forth herein, and except as to title, there are no warranties, or any affirmations of fact or promises by BE, with reference to the Equipment, or to merchantability, fitness for a particular application, signal coverage, infringement, or otherwise, which extend beyond the description of the Equipment in BE's product literature or instruction manual which accompany the Equipment. Any card which is enclosed with the Equipment will be used by BE for survey purposes only.

BROADCAST ELECTRONICS, INC.

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