

**MIX-TRAK 90 SERIES
MODULAR AUDIO
CONSOLES MANUAL**

**VOLUME II
MAINTENANCE**

**597-9018-001
OCTOBER, 1992**

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INSTRUCTION MANUAL CONTENTS

This manual presents technical information for the Broadcast Electronics Mix-Trak 90 Series Audio Consoles. The manual is divided into two volumes as described below.

VOLUME I – Contains detailed information relative to the installation and operation of the console.

VOLUME II – Contains detailed theory of operation, maintenance, parts lists, and drawings for the console mainframe and each individual console module.

THEORY OF OPERATION

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SECTION I

THEORY OF OPERATION

1-1. INTRODUCTION.

1-2. This section presents the overall theory of operation for the Broadcast Electronics Mix-Trak 90 series audio consoles.

1-3. The Mix-Trak 90 series audio console overall theory of operation is presented by modular assemblies. Figure 1-1 presents a block diagram of the Mix-Trak 90 audio console system. Refer to Figure 1-1 as required for a general description of audio console operation. The console audio, control, power supply, and talkback circuitry are discussed in further detail at the end of this section. Each Mix-Trak 90 modular component is discussed in detail by the modular sections in Part II of this manual.

1-4. GENERAL DESCRIPTION.

1-5. LINE INPUT MODULE.

1-6. Mix-Trak 90 line input modules select and process line level audio for application to the console output and mixing bus network. Input selection is accomplished by an interlocked two-position select switch/indicator. Audio amplification is performed by a programmable differential input amplifier. The amplifier is designed to provide the appropriate gain for a wide range of input audio levels.

1-7. Precision control of the audio source level is provided by a voltage-controlled-amplifier (VCA) network. The network consists of a slide-action attenuator assembly which controls a precision VCA stage. Balanced stereophonic patch point transmitting and receiving stages allow the connection of external audio processing equipment to the module. Output signal routing is accomplished by a two-position select switch/indicator.

1-8. Remote and local control of module operations is accomplished by a CMOS logic circuit. A cue circuit is provided to allow the auditioning of audio source material. DC operating potentials for the module circuitry are generated by a built-in regulator network.

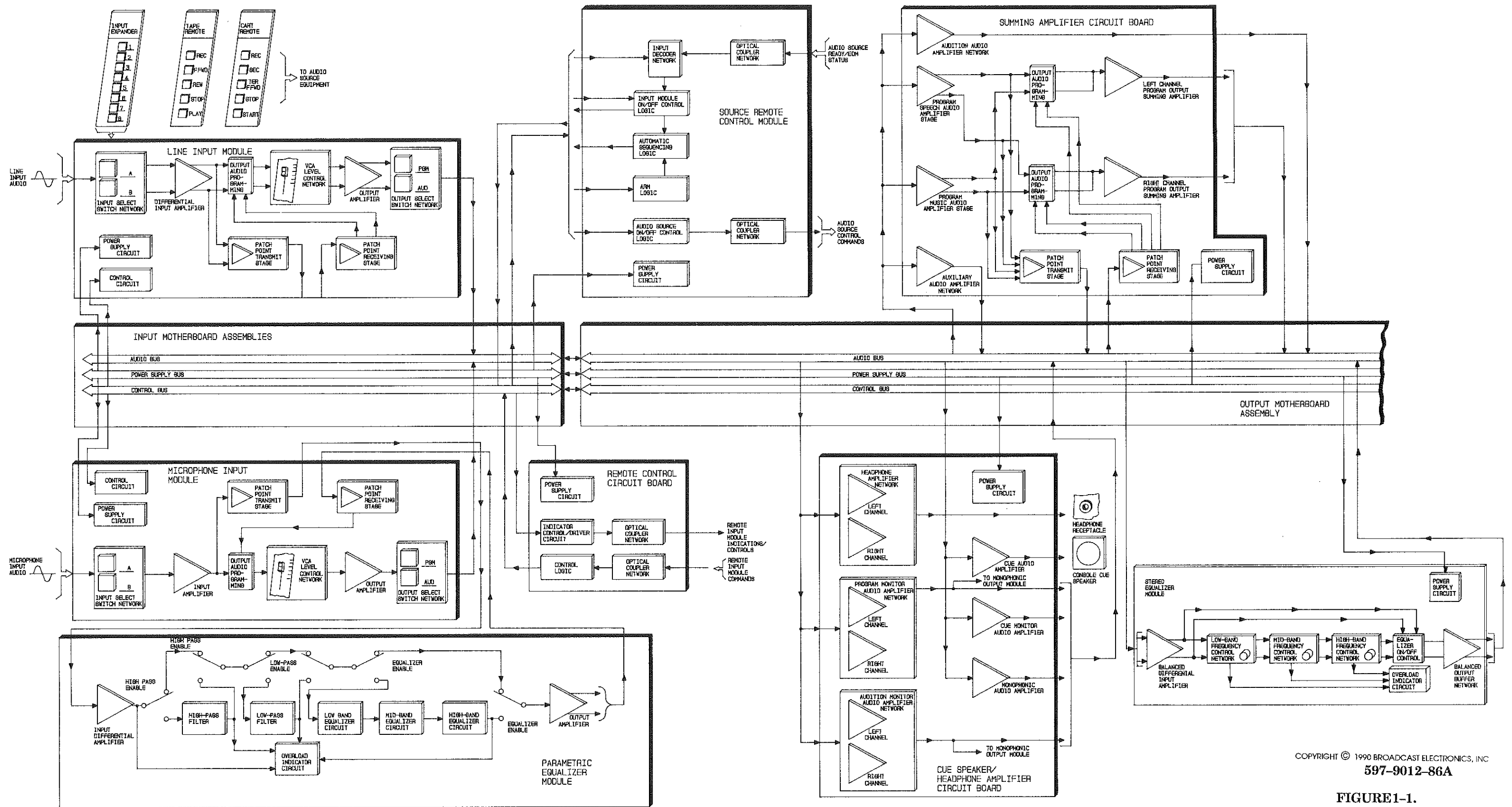
1-9. MICROPHONE INPUT MODULE.

1-10. Microphone input modules select and process microphone level audio for application to the console output and mixing bus network. Input selection is accomplished by an interlocked two-position select switch/indicator. The module is equipped with an ultra low-noise differential input amplifier stage. The amplifier is designed to provide the appropriate gain for a wide range of input audio levels.

1-11. Precision control of the microphone audio source level is provided by a voltage-controlled-amplifier (VCA) network. The network consists of a slide-action attenuator assembly which controls a precision VCA stage. Balanced patch point transmitting and receiving stages allow the connection of external audio processing equipment to the module. Output signal routing is accomplished by a two-position select switch/indicator.

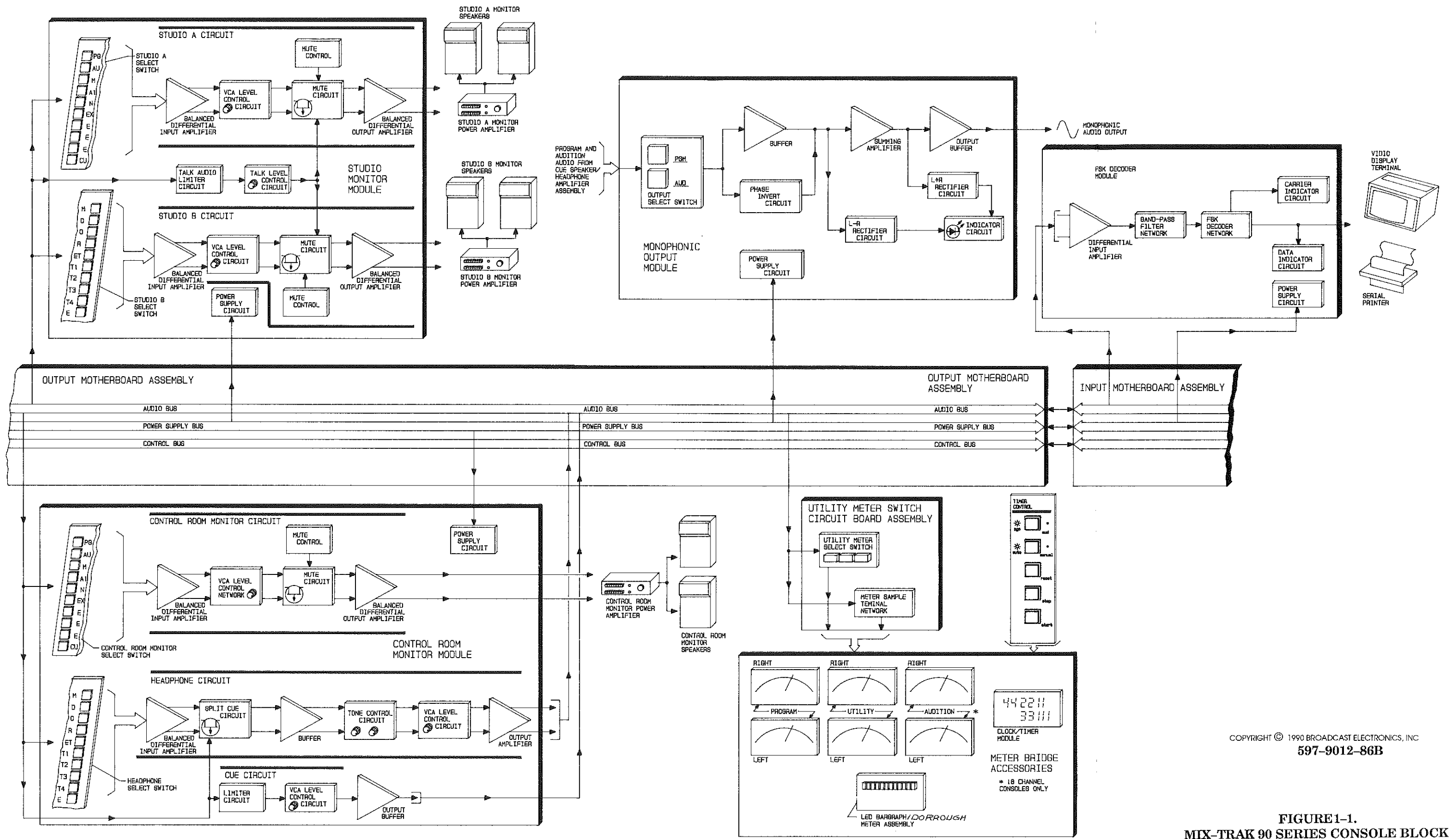
1-12. The microphone input module is equipped with a cue circuit. The cue circuit is designed for intercom operation. Remote and local control of module operations is accomplished by a CMOS logic circuit. The logic circuit consists of on/off control, cue control, and indicator driver networks. A built-in regulator network generates dc operating potentials for module circuitry.

- 1-13. **INPUT EXPANDER MODULE.**
- 1-14. Any microphone or line input module source selection capabilities may be increased by the installation of an input expander module. The module consists of a switch/indicator network which controls up to eight additional input sources. Individual muting of the input expander sources is not supported.
- 1-15. **TAPE REMOTE SWITCH MODULE.**
- 1-16. Remote control of tape audio source functions such as record, rewind, stop, play, and fast forward may be executed by the tape remote switch module. The module consists of five switch/indicators which illuminate to indicate the selected function.
- 1-17. **CART REMOTE SWITCH MODULE.**
- 1-18. Cart source remote functions such as record, secondary, tertiary/fast forward, stop, and start may be initiated by the cart source remote switch module. The module consists of five switch/indicators which illuminate to indicate the selected function.
- 1-19. **INPUT/OUTPUT MOTHERBOARD ASSEMBLIES.**
- 1-20. Console input, output, and internal circuit communication is provided by input and output motherboard assemblies. The input/output motherboards route information to and from the console modular assemblies through audio, power supply, and control bus networks. The audio bus is current-operated to provide maximum noise performance.
- 1-21. **REMOTE CONTROL MODULE.**
- 1-22. The remote control module allows control of a line or microphone input module from a remote location. The module is designed for maximum interfacing flexibility by allowing the connection of either positive or negative logic control circuitry. All remote control inputs and indications are processed through optical coupler networks to provide interfacing flexibility and a high degree of isolation. A CMOS logic circuit encodes remote on/off/cue control commands for application to the module and decodes module indications for application to remote indicators.
- 1-23. **SOURCE REMOTE CONTROL MODULE.**
- 1-24. The source remote control module is designed for the control of line input module audio source equipment. The source remote control module consists of line input module on/off control logic, audio source control logic, arm control logic, and automatic sequencing logic. All audio source remote inputs and control commands are processed through optical coupler networks to provide interfacing flexibility and a high degree of isolation. The source remote control module circuitry is designed to generate remote module and audio source on/off control commands for automatic audio source sequencing.
- 1-25. **SUMMING AMPLIFIER CIRCUIT BOARD.**
- 1-26. Console audio output summing operations are performed by the summing amplifier circuit board assembly. Console program music and program speech busses are routed to the module for mixing and amplification to produce program output audio. Separate amplifier stages are provided for the audition, auxiliary 1, auxiliary 2, and auxiliary 3 output audio busses. Balanced stereophonic patch point transmitting and receiving stages provide interfacing for the connection of external audio processing equipment to the program music and program speech busses. A built-in regulator network generates dc operating potentials for circuit components.



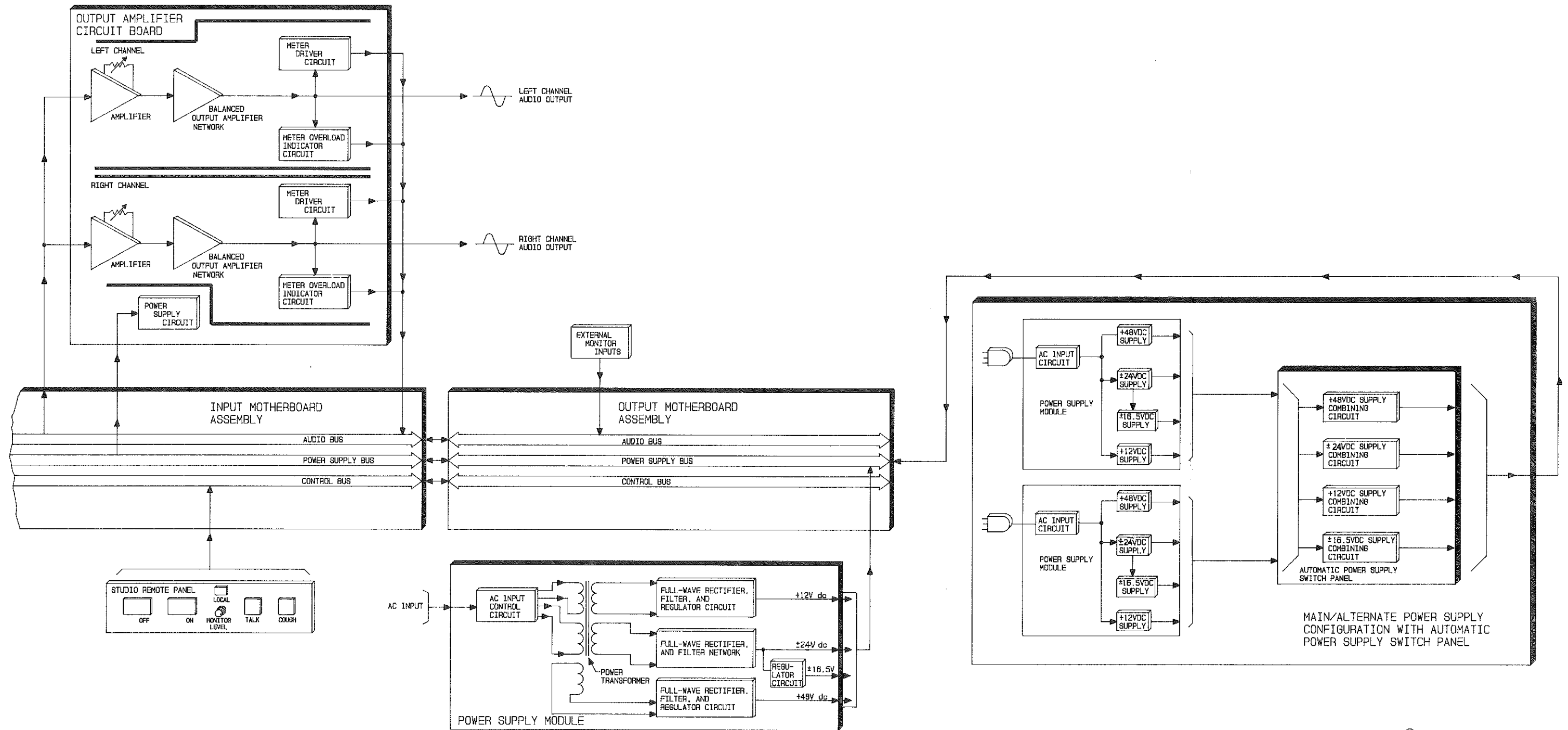
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FIGURE 1-1.
MIX-TRAK 90 SERIES CONSOLE BLOCK
DIAGRAM (Sheet 1 of 3)



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FIGURE 1-1.
 MIX-TRAK 90 SERIES CONSOLE BLOCK
 DIAGRAM (Sheet 2 of 3)



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FIGURE 1-1.
MIX-TRAK 90 SERIES CONSOLE BLOCK
DIAGRAM (Sheet 3 of 3)

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1-27. CUE SPEAKER/HEADPHONE AMPLIFIER CIRCUIT BOARD.

1-28. Program, audition, and cue audio for application to the cue speaker, headphone, or monitor circuitry is amplified at the cue speaker/headphone amplifier circuit board assembly. The assembly contains individual amplifier stages for: 1) headphone audio, 2) cue audio, 3) program audio, 4) audition audio, and 5) monophonic audio. The program, audition, and monophonic audio is routed for application to the monitor circuitry.

1-29. STEREO EQUALIZER MODULE.

1-30. Console audio processing operations may be performed by the stereo equalizer module. The module is designed to provide audio processing for microphone input, line input, or program buss audio. The module consists of three individual tone control networks. A low-band frequency circuit boosts/cuts frequencies from 20 Hz to 250 Hz. A mid-band frequency circuit boosts/cuts frequencies from 250 Hz to 2.5 kHz. A high-band frequency circuit boosts/cuts frequencies from 2.5 kHz to 20 kHz. Operating potentials for the module are generated by a built-in regulator circuit.

1-31. PARAMETRIC EQUALIZER MODULE.

1-32. Console audio processing operations may be performed by the parametric equalizer module. The parametric equalizer is a monophonic module designed to provide audio processing for microphone input audio. The module contains a high-pass network, low-pass network, and a tone control network. The tone control network consists of low-band, mid-band, and high-band circuits. The low-band circuit boosts/cuts frequencies from 27 Hz to 600 Hz. The mid-band circuit boosts/cuts frequencies from 320 Hz to 5.5 kHz. The high-band circuit boosts/cuts frequencies from 1.8 kHz to 19.5 kHz. Each tone network will boost/cut frequencies ± 15 dB and is designed with a Q (bandwidth) from .3 (wide) to 3 (narrow). Operating potentials for the module are generated by a built-in regulator circuit.

1-33. CONTROL ROOM MONITOR MODULE.

1-34. All control room monitoring operations are performed by the control room monitor module. The module consists of three individual circuits which process audio for application to the control room monitor speakers, the headphone receptacle, and the console cue speaker.

1-35. **CONTROL ROOM MONITOR CIRCUIT.** A ten-position switch/indicator assembly selects either program, audition, monophonic, air, network, external 1, external 2, external 3, external 4, or cue audio for control room monitoring operations. The selected audio is amplified by a balanced differential input amplifier network. Precision control of the monitor audio level is provided by a voltage-controlled-amplifier (VCA) network. The network consists of a front panel mounted potentiometer assembly which controls a precision VCA stage. Control room monitor speaker muting operations are performed by a series-shunt field-effect-transistor (FET) muting circuit. The control room monitor circuit output stage consists of a second balanced differential amplifier which processes the monitor audio for application to an external control room monitor power amplifier.

1-36. **HEADPHONE CIRCUIT.** A second ten-position switch/indicator assembly selects either program, audition, monophonic, air, network, external 1, external 2, external 3, external 4, or cue audio for headphone monitoring operations. The headphone circuit input amplifier stage consists of a balanced differential amplifier circuit. Simultaneous monitoring of cue and headphone information is provided by a split cue circuit. The split cue circuit is designed to route headphone audio to the headphone left channel and cue audio to the headphone right channel for simultaneous cue/headphone monitoring operations.

- 1-37. Audio from the split cue circuit is routed through a buffer to the headphone tone control circuit. The tone control circuit consists of a bass and treble control network which allows the operator to adjust the headphone audio for the desired characteristics. Precision control of the headphone audio level is provided by a voltage-controlled-amplifier (VCA) network. The network consists of a potentiometer assembly which controls a precision VCA stage. Audio from the VCA network is applied to a balanced output driver circuit for application to the console headphone receptacle.
- 1-38. **CUE CIRCUIT.** The control room monitor cue circuit is designed to process audio for application to the console cue speaker. Cue audio from the console cue bus is applied to a limiter circuit. The limiter is design to provide protection from over-voltage input conditions. Precision control of the cue audio level is provided by a voltage-controlled-amplifier (VCA) network. The network consists of a potentiometer assembly which controls a precision VCA stage. Audio from the VCA circuit is applied through a buffer for application to the console cue speaker.
- 1-39. **STUDIO MONITOR MODULE.**
- 1-40. The studio monitor module consists of two identical audio circuits which control studio A and studio B monitor audio. The module circuitry also processes and routes intercom audio for application to the studio facilities.
- 1-41. A ten-position switch/indicator assembly selects either program, audition, monophonic, air, network, external 1, external 2, external 3, external 4, or cue audio for studio A monitoring operations. The selected monitor audio is applied to a balanced differential input amplifier stage. Precision control of the studio A audio level is provided by a voltage-controlled-amplifier (VCA) network. The network consists of a front-panel mounted potentiometer assembly which controls a precision VCA stage. Studio A monitor speaker muting operations are performed by a series-shunt field-effect-transistor (FET) muting circuit. The studio A monitor circuit output stage consists of a second balanced differential driver network which processes the monitor audio for application to an external studio A monitor power amplifier. The operation of the studio B circuitry is identical.
- 1-42. Intercom audio for application to the studio facilities is controlled by the operation of the studio monitor module talk audio circuit. Intercom audio from the control room microphone module is applied to a limiter circuit which provides protection from over-voltage input conditions. Control of the intercom audio level is provided by a talk level control circuit. Audio from the level control circuit is routed for application to the studio A and B monitor muting and output driver networks.
- 1-43. **MONOPHONIC OUTPUT MODULE.**
- 1-44. Monophonic program or audition output information is generated by the circuitry on the monophonic output module. A two-position switch/indicator selects either stereophonic program or audition audio for conversion to a monophonic format. The input signal phase is monitored by L-R and L+R rectifier circuits. The rectifier circuits process samples for application to a normal/inverted phase indicator circuit. A phase invert circuit consisting of a phase select switch and a operational amplifier allows the operator to conveniently reverse stereo phase relationships as required. Additional circuitry includes a conventional inverting summing amplifier stage and an output buffer stage.
- 1-45. **METER BRIDGE ASSEMBLY.**
- 1-46. **UTILITY METER SWITCH CIRCUIT BOARD.** The utility meter switch circuit board assembly consists of a three-position utility meter select switch and a meter sample terminal network. The meter switch/indicator selects the following audio signals for application to the utility meter assemblies.

12 CHANNEL CONSOLES

1. Audition/Auxiliary 1 and 2
2. Air
3. Headphone

18 CHANNEL CONSOLES

1. Auxiliary 1 and 2
2. Air
3. Headphone

21 CHANNEL CONSOLES

1. Auxiliary 1 and 2
2. Monophonic 1 and 2
3. Headphone

- 1-47. Meter sample distribution is accomplished by the meter sample terminal network. Samples of program output, audition output, auxiliary outputs, monophonic output, and clock/timer module information are routed to the terminal network for convenient application to the Mix-Trak 90 meter assemblies.
- 1-48. **METER ASSEMBLIES.** The Mix-Trak 90 series audio consoles are equipped with analog VU meter assemblies for the monitoring of program, utility, and audition (18 channel consoles only) audio output level parameters. The 21 channel consoles are also equipped with LED bargraph off-air meters. Each VU meter assembly is configured with an overload indicator which illuminates to indicate excessive audio output conditions. Monitoring of audio output level parameters may also be performed by LED bargraph meter or Dorrrough loudness meter assemblies.
- 1-49. **CLOCK/TIMER MODULE.** Console clock and timer functions are performed by the circuitry on the clock/timer module. The clock/timer module contains a crystal controlled Motorola 68701 microprocessor. The microprocessor is programmed to operate as: 1) a precision clock and 2) an elapsed timer.
- 1-50. The clock section of the clock/timer module contains a six-digit LED display. Clock information may be displayed in a 12 or 24 time format. A battery back-up circuit is provided to maintain clock operation during power failures. The clock is also equipped with an interfacing circuit and control programming for automatic synchronization. When the clock is connected to network audio, the clock will be automatically synchronized to network time to eliminate drift.
- 1-51. The timer section of the clock/timer module is equipped with a five-digit LED display. The control programming establishes two independent timers: 1) an automatic timer and 2) a manual timer. The automatic timer is controlled by the operation of the console program and audition busses. The manual timer is controlled by the timer control module.
- 1-52. **TIMER CONTROL MODULE.**
- 1-53. The timer control module is designed to provide automatic timer and manual timer control operations. The module consists of five switch/indicators which output logic commands to the clock/timer module. Automatic timer control operations include program/audition assignment. Manual timer controls include reset, stop, and start. An AUTO/MAN control selects between automatic and manual operation.
- 1-54. **FSK DECODER MODULE.**
- 1-55. All audio source FSK information is decoded by the FSK decoder module. The module consists of an input amplifier, a band-pass filter, and an FSK decoder network. Operating status information is provided by carrier and data indicators. The output of the module is routed for application to a video display terminal or a serial printer.
- 1-56. **OUTPUT AMPLIFIER CIRCUIT BOARD.**
- 1-57. The output amplifier circuit board consists of identical left and right channel amplifier networks which increase the internal buss signal to an output level from 0 dBu to +8 dBu. The networks consist of audio amplifier stages and meter driver circuitry.

1-58. Audio from the internal signal bus is applied to an adjustable inverting amplifier stage. The stage is designed to provide an adjustable output level from 0 dBu to +8 dBu. Audio from the amplifier network is applied to a balanced short-circuit protected output driver network. The network is designed to output a normal signal level into a balanced or unbalanced load. Samples from the output driver network are processed by meter driver and meter overload indicator circuits for application to the meter assemblies.

1-59. **STUDIO REMOTE PANEL.**

1-60. The studio remote panel consists of four control switch/indicators and a potentiometer for the remote control of studio functions. On/Off switch/indicators provide logic commands for the remote control of the studio microphone input module. A talk switch/indicator is designed for control of studio-to-control room intercom operation. A monitor level control outputs a varying dc voltage for local control of the studio monitor level. A cough switch outputs a logic command to attenuate the studio signal approximately 60 dB for special operating conditions.

1-61. **POWER SUPPLY MODULE.**

1-62. The Mix-Trak 90 console power supply module is a self contained unit designed to generate dc operating potentials for application to the console mainframe. The ac input control circuit consists of a modular ac input receptacle, fuse holder, and ac power switch. AC power transformation is provided by a power transformer assembly. DC power transformation is provided by three full-wave rectifier and filter networks. One network generates a regulated +48 volt dc phantom microphone operating supply. A second network generates unregulated ± 24 volt dc audio supplies and regulated ± 16.5 volt dc supplies. The ± 24 volt dc supplies provide operating potentials for the console audio circuitry. The ± 16.5 volt dc supplies provide operating potentials for the cue speaker/headphone amplifier circuit board. A third network generates a regulated +12 volt dc supply for application to the console logic circuitry.

1-63. **AUTOMATIC POWER SUPPLY SWITCH/COMBINER PANEL.**

1-64. The Mix-Trak 90 12 and 18 channel consoles may be equipped with a main/alternate power supply configuration which consists of two power supply modules and an automatic power supply switch/combiner panel. The 21 channel console is standard equipped with two power supply modules and an automatic power supply switch/combiner panel. The automatic power supply switch/combiner panel contains six individual diode combining circuits and eight front-panel indicators. In the event of a power supply module failure, the combining circuits will automatically transfer dc potentials from the remaining operational power supply to the console without interruption.

1-65. **FUNCTIONAL DESCRIPTION.**

1-66. **OVERALL CONSOLE AUDIO SYSTEM.**

1-67. The Mix-Trak 90 series consoles internally process and route audio signals through numerous modules and assemblies. Figure 1-2 presents Mix-Trak 90 series console overall audio information. Refer to Figure 1-2 as required for overall console audio routing and processing information.

1-68. **OVERALL CONSOLE CONTROL SYSTEM.**

1-69. The Mix-Trak 90 series console control system is designed for high-reliability and flexible control circuit interfacing. The console modules utilize CMOS logic integrated circuits for control operations. Remote control modules are equipped with optical coupler networks to allow the use of either positive or negative logic for maximum control circuit interfacing flexibility. Figure 1-3 presents the Mix-Trak 90 series console overall control information. Refer to Figure 1-3 as required for overall console control routing and processing information.

1-70. OVERALL CONSOLE POWER SUPPLY SYSTEM.

1-71. DC operating potentials for the Mix-Trak 90 console are generated by the power supply circuit. The power supply circuit may consist of a single power supply module or a main/alternate power supply configuration which includes two power supply modules and the automatic power supply switch panel. DC potentials from the power supply module or main/alternate system are applied to the motherboard assemblies for distribution to built-in regulator networks on each console modular assembly. Figure 1-4 presents information on the Mix-Trak 90 series console overall power supply system. Refer to Figure 1-4 as required for overall console power supply system information.

1-72. TALKBACK SYSTEM.

1-73. The Mix-Trak 90 talkback system provides intercom communication between the control room and associated studio facilities. Control room-to-studio communication is performed by the control room microphone, the control room microphone input module, the control room monitor module, and the studio monitor speakers. Studio-to-control room communication is performed by the studio microphone, the studio microphone input module, the studio remote panel, the control room monitor module, and the console cue speaker. Figure 1-5 presents the talkback system circuitry. Refer to Figure 1-5 as required for talkback system information.

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NOTES:
 1. ONLY 1 MICROPHONE INPUT MODULE AND 1 LINE INPUT MODULE SHOWN. AUDIO INPUT CONNECTOR REFERENCE DESIGNATORS WILL VARY DEPENDING ON MODULE LOCATION.

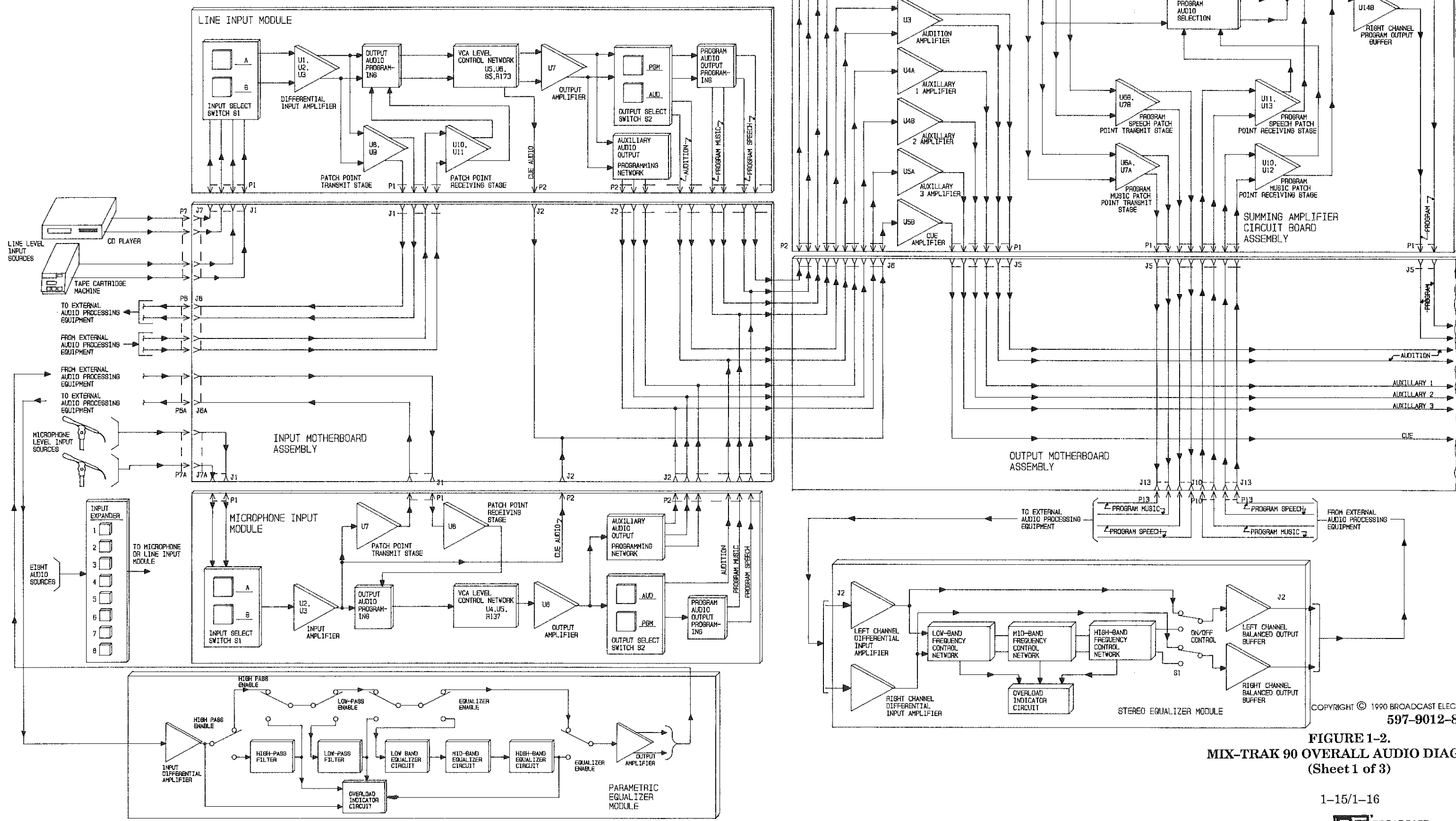


FIGURE 1-2.
 MIX-TRAK 90 OVERALL AUDIO DIAGRAM
 (Sheet 1 of 3)

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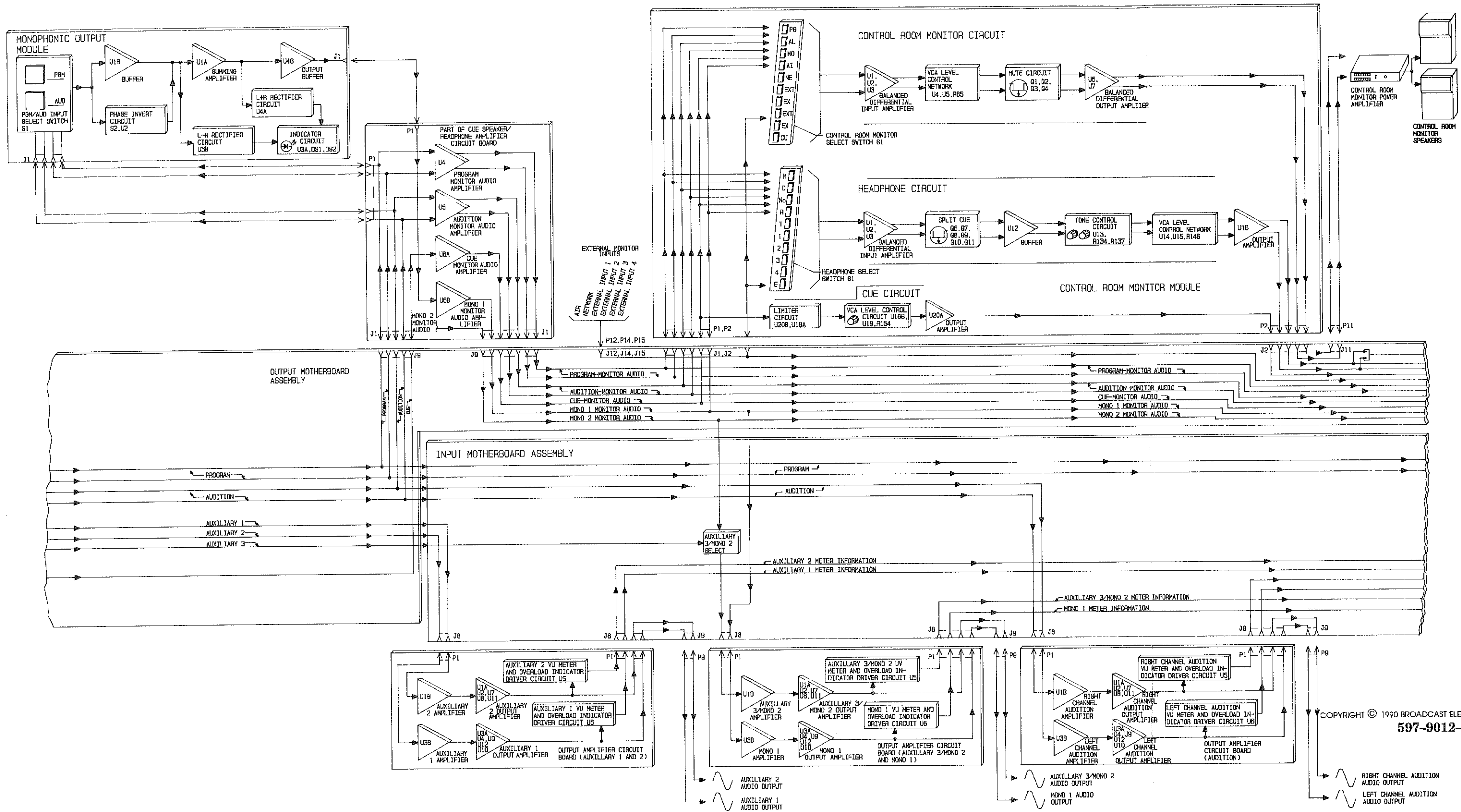
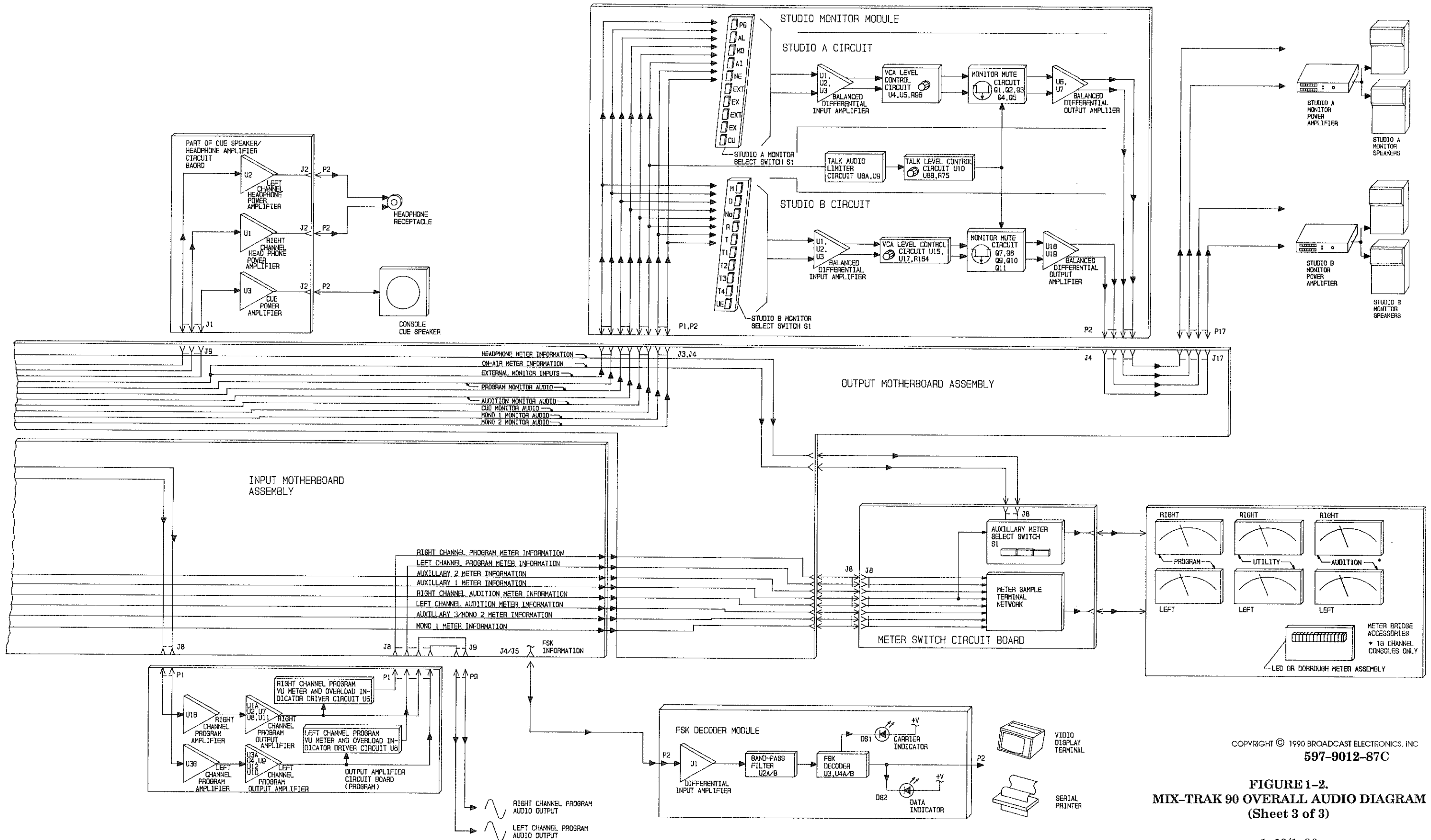


FIGURE 1-2.
MIX-TRAK 90 OVERALL AUDIO DIAGRAM
(Sheet 2 of 3)

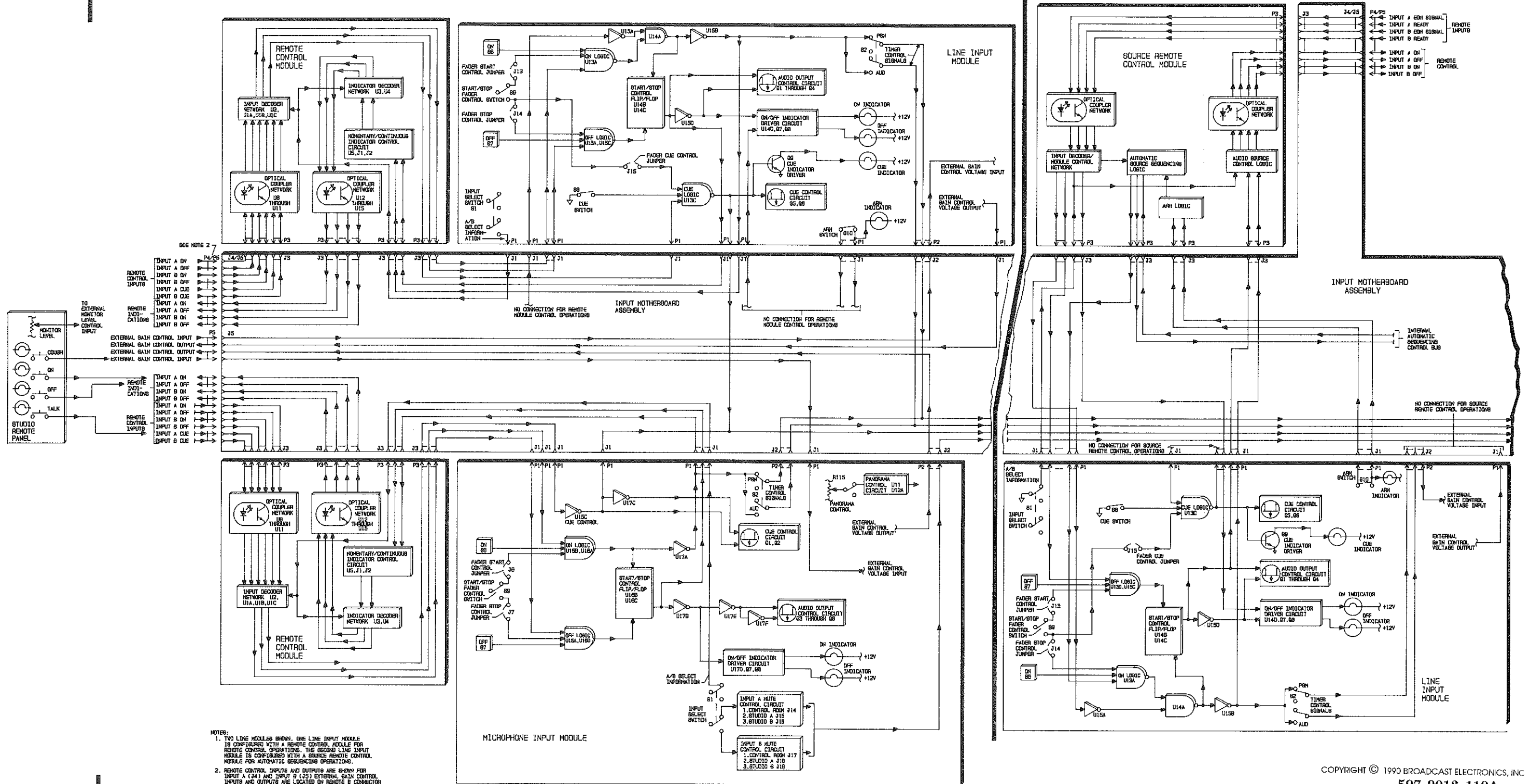
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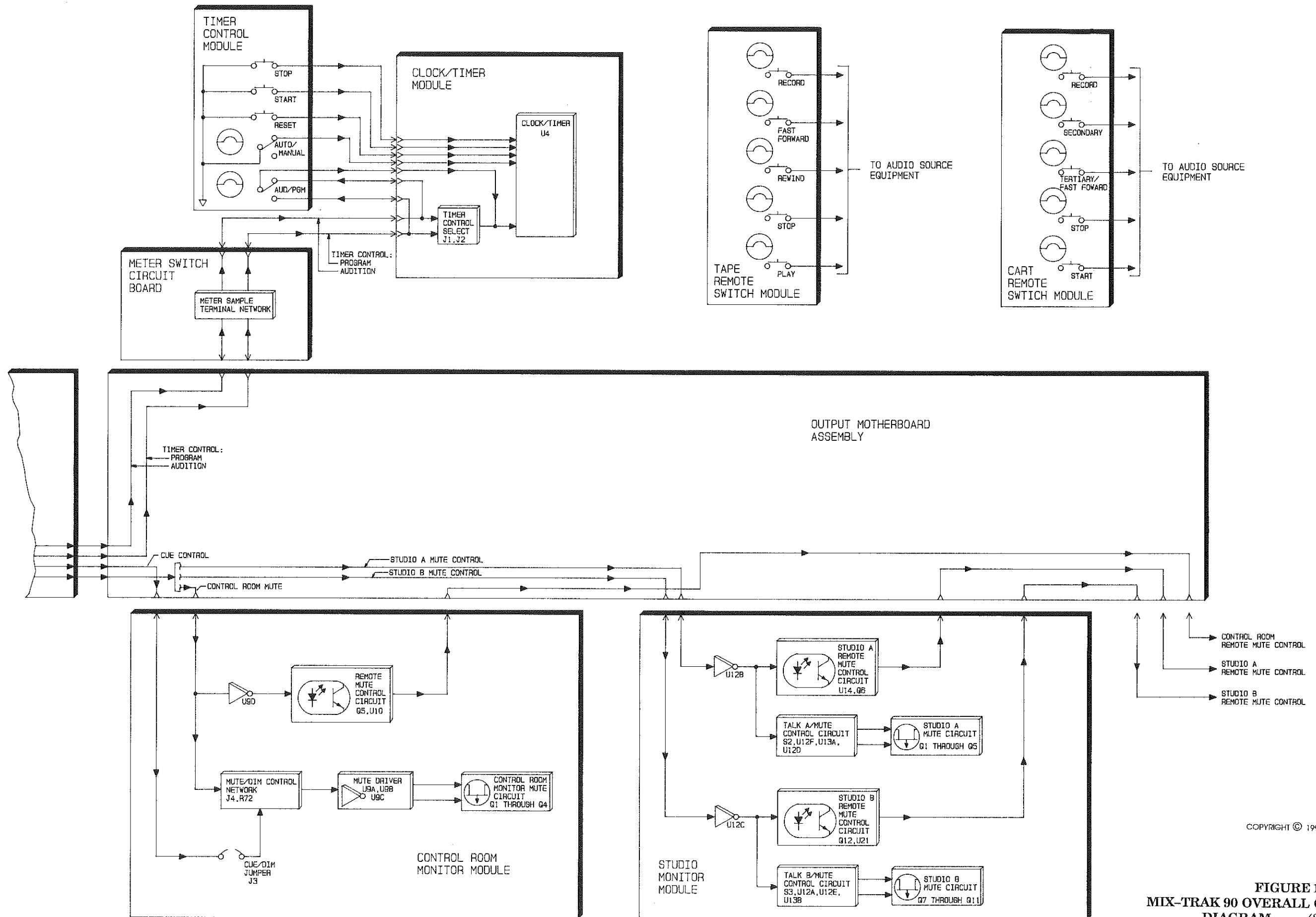
FIGURE 1-2.
MIX-TRAK 90 OVERALL AUDIO DIAGRAM
(Sheet 3 of 3)

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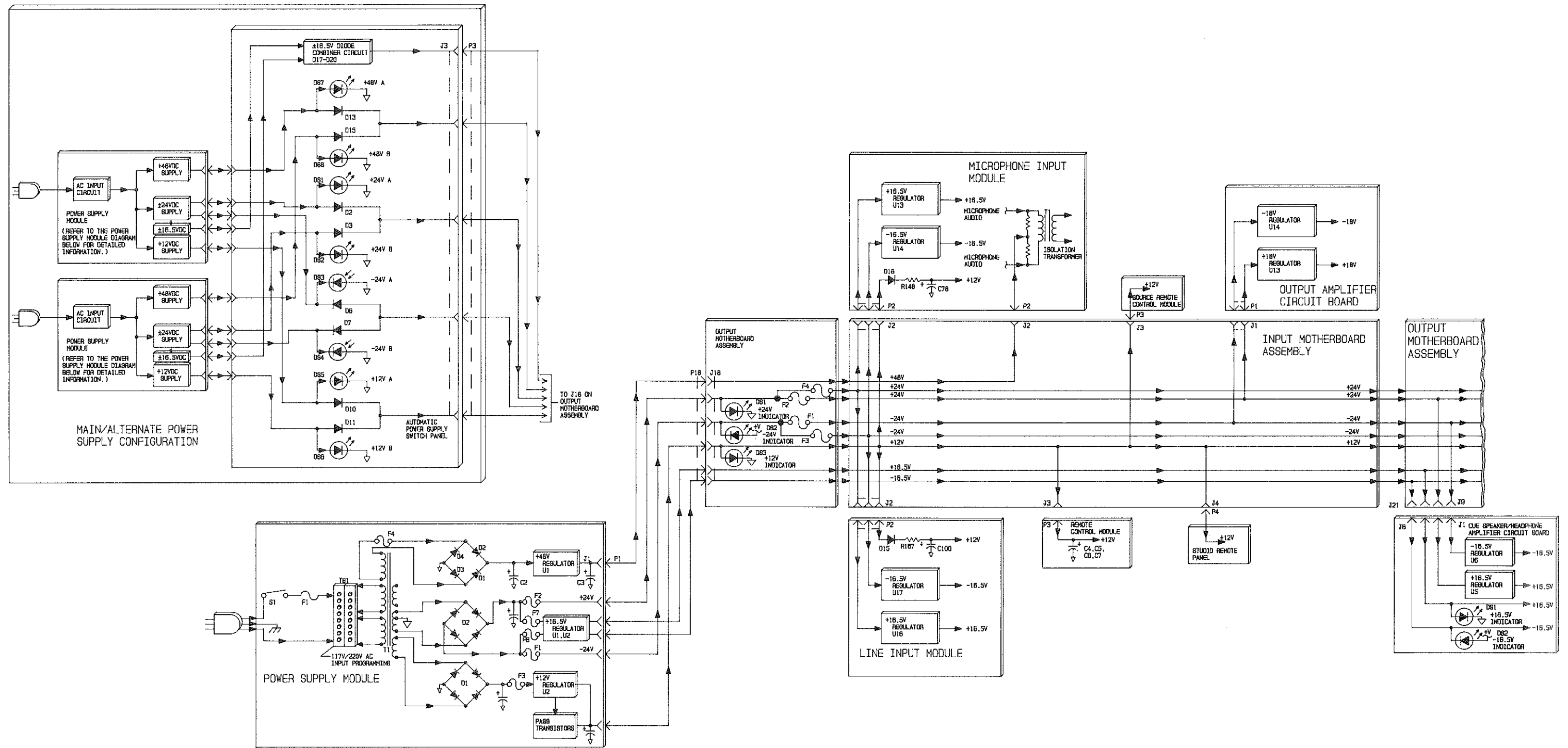
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FIGURE 1-3.
MIX-TRAK 90 OVERALL CONTROL SYSTEM
DIAGRAM (Sheet 1 of 2)



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FIGURE 1-3.
MIX-TRAK 90 OVERALL CONTROL SYSTEM
DIAGRAM (Sheet 2 of 2)

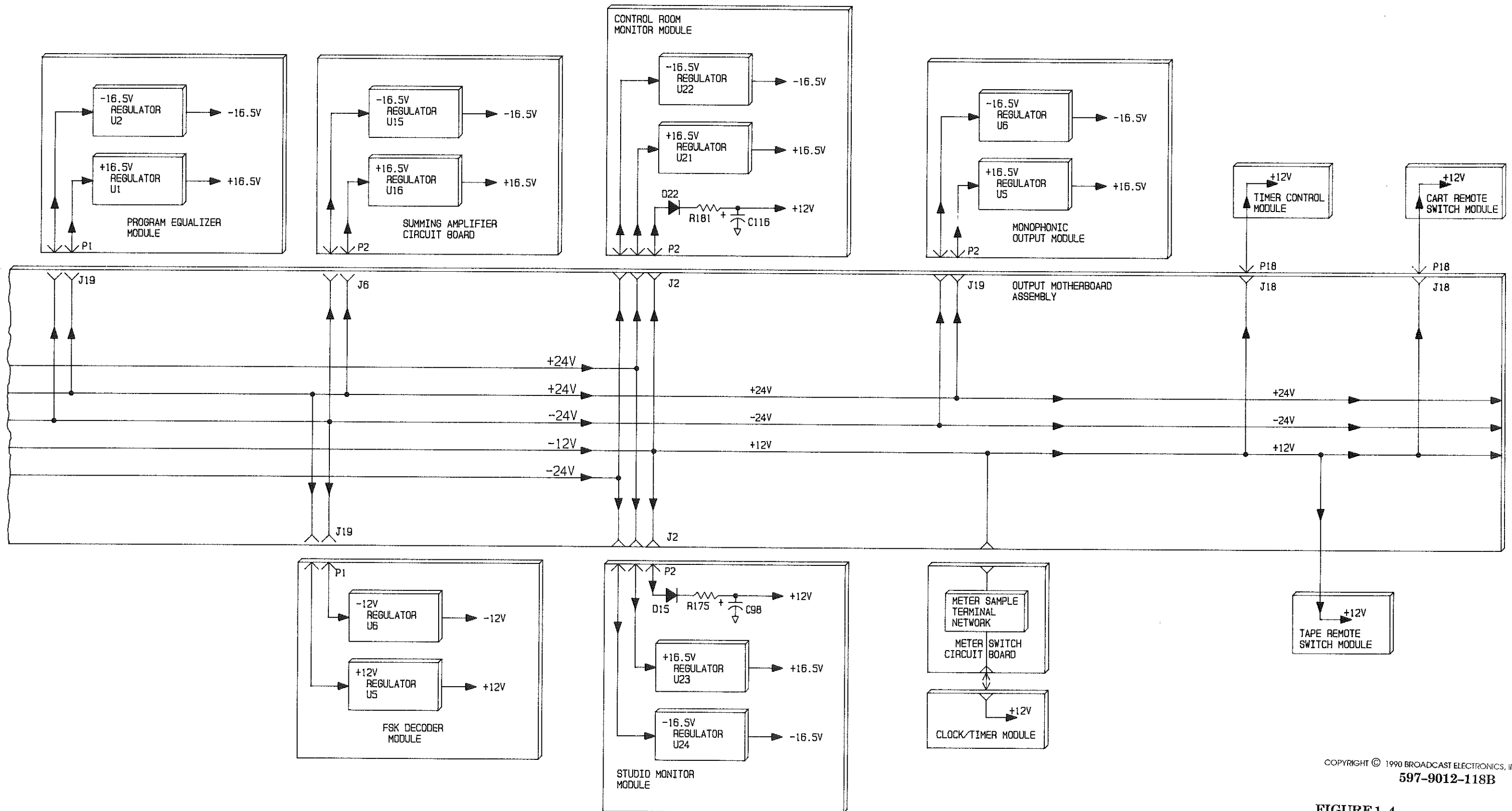


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FIGURE 1-4.
MIX-TRAK 90 OVERALL POWER SUPPLY SYSTEM
DIAGRAM (Sheet 1 of 2)

1-25/1-26

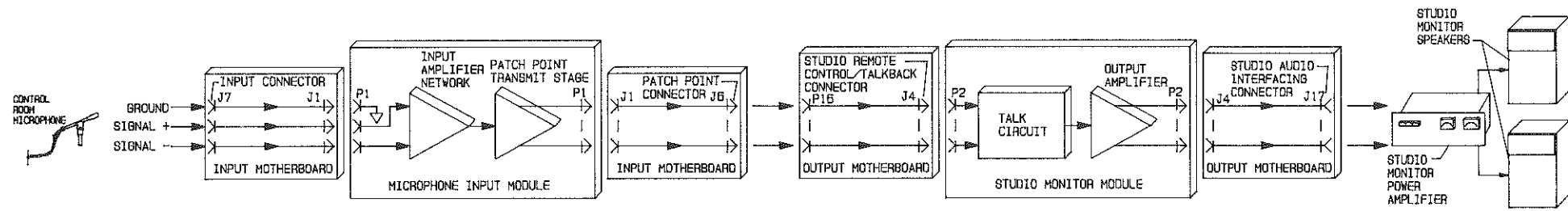




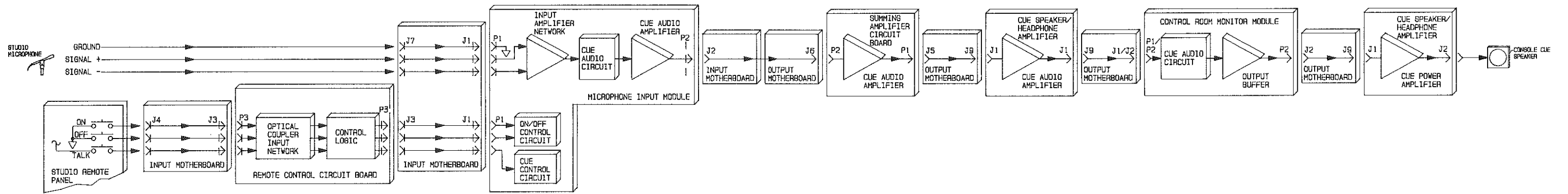
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FIGURE 1-4.
MIX-TRAK 90 OVERALL POWER SUPPLY SYSTEM
DIAGRAM (Sheet 2 of 2)

1-27/1-28



CONTROL ROOM-TO-STUDIO TALKBACK OPERATIONS



STUDIO-TO-CONTROL ROOM TALKBACK OPERATIONS

FIGURE 1-5. TALKBACK SYSTEM DIAGRAM

MAINTENANCE

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SECTION II MAINTENANCE

2-1. INTRODUCTION.

2-2. This section provides general maintenance information and overall console system troubleshooting information for the Mix-Trak 90 series modular audio consoles.

2-3. SAFETY CONSIDERATIONS.

2-4. Low voltages are used throughout the Mix-Trak 90 console mainframe assembly, the accessory modules, and the power supply module. All high voltages and large current sources used within the power supply module have been shielded; however, do not touch any components within the console mainframe or power supply module with power energized. Good judgment, care, and common sense must be practiced to prevent accidents. The procedures contained in this section should be performed only by experienced and trained maintenance personnel.

2-5. FIRST LEVEL MAINTENANCE.

2-6. First level maintenance consists of precautionary procedures applied to the equipment to prevent future failures. The procedures are performed on a regular basis and the results recorded in a performance log.



WARNING ***DISCONNECT ALL CONSOLE PRIMARY POWER BEFORE ATTEMPTING ANY EQUIPMENT MAINTENANCE.***

2-7. OVERALL CONSOLE SYSTEM.

2-8. Clean the console mainframe assembly, all accessory modules, and the power supply module of accumulated dust as required using a nylon-bristle brush and vacuum cleaner. Remove accumulated dirt from the console overlays using a cloth and any mild household cleaner. Inspect the console mainframe circuit boards and each accessory module for improperly seated semiconductors and components damaged by overheating. Also, periodically inspect the circuit boards, the accessory modules, and the chassis for loose hardware.

2-9. SECOND LEVEL MAINTENANCE.

2-10. Second level maintenance consists of procedures required to restore the Mix-Trak 90 console to operation after a fault has occurred. The maintenance philosophy of the console consists of isolating a problem to a specific assembly with subsequent troubleshooting to isolate the defective components. The defective components may be repaired locally or the entire device may be returned to Broadcast Electronics, Inc. for repair or replacement.

2-11. MODULE REMOVAL AND EXTENDER ASSEMBLY OPERATIONS.

2-12. **MODULE REMOVAL.** Many Mix-Trak 90 modular assemblies may be removed from the console mainframe for maintenance procedures. Any Mix-Trak 90 input module, audio source switch module, or meter bridge accessory may be removed with power energized for troubleshooting or maintenance procedures. When removing microphone or line input modules with power energized, ensure the PGM/AUD switch/indicators are operated to off to prevent the generation of inadvertent audio noise.

- 2-13. All the MT-90 modules may be removed from the mainframe at the same time for maintenance if required. If all the modules are removed, replace the modules by installing the modules located in the center of the mainframe first. This will ensure proper alignment of the console bulkhead and each module.
- 2-14. **EXTENDER ASSEMBLY.** Two 40-pin and one 50-pin extender ribbon cable assemblies are provided to interface plug-in modular assemblies to the chassis mounted motherboards for maintenance procedures. When required, remove the desired plug-in module and connect the extender ribbon cable assemblies to the module. On microphone and line input modules, connect the 50-pin connector to the module before the 40-pin connector to prevent the generation of inadvertent audio noise.
- 2-15. **TROUBLESHOOTING.**
- 2-16. **SAFETY CONSIDERATIONS.** Low voltages are used throughout the Mix-Trak 90 console mainframe and all modular assemblies. The power supply module contains primary ac line voltage and high current capacitors. All power supply module high voltage and current components contain shields; however, do not perform any maintenance or troubleshooting procedures within the power supply module with power energized. Troubleshooting with power energized is always considered hazardous and caution should be observed. Good judgment, care, and common sense must be practiced to prevent accidents.



WARNING ***TO PREVENT POTENTIAL DAMAGE TO THE HEADPHONE CIRCUIT AND TO THE HEARING OF THE OPERATOR, ENSURE THE PROPER SIZE FUSES ARE INSTALLED IN THE HEADPHONE SYSTEM.***

WARNING

- 2-17. **HEADPHONE SYSTEM FUSE.** The headphone system is equipped with fuses to prevent potential damage to the headphone system and to the hearing of the operator. The fuses are located on the left and right side-panels of the console (refer to Figure 2-2) and are programmed for operation with a specific set of headphones. If a headphone system fuse failure is encountered, install replacement fuses with the same current rating as recorded in the HEADPHONE FUSE PROGRAMMING procedure presented in VOLUME I, SECTION II, INSTALLATION. If a different set of headphones is used with the console, refer to VOLUME I, SECTION II, INSTALLATION and perform the HEADPHONE FUSE PROGRAMMING procedure.
- 2-18. **MODULE TROUBLESHOOTING.** The Mix-Trak 90 series troubleshooting philosophy consists of isolating a problem to a specific module or assembly. The following text provides module troubleshooting information applicable to the overall console system.
- 2-19. **Module Substitution.** The modular design of the console allows modules and circuit boards to be substituted for isolating problems to a specific assembly. Perform circuit board substitution as required to isolate a console symptom to a specific assembly.
- 2-20. **Power Supply Protection.** Each console module with the exception of the output amplifier, cue/headphone amplifier, and the clock/timer module contain 10 Ohm series power supply protection resistors. In the event of a short-circuit potential on an individual module, the resistor will open to prevent the loss of power supply potentials to the entire console.

- 2-21. **Main/Alternate Power Supply Configuration.** If the console is configured with a main/alternate power supply system, the automatic power supply switch panel will control the application of power to the console mainframe. In the event of a power supply failure, the automatic power supply switch panel will route power from the operating supply module to the console. The appropriate power supply module A or B status indicator(s) on the automatic switch panel will extinguish to indicate a failed power supply circuit. Troubleshoot the defective power supply module by disconnecting the unit from primary ac power and the automatic power supply switch panel and isolate the circuit failure to specific components.



WARNING

DISCONNECT ALL PRIMARY POWER BEFORE REPLACING CIRCUIT BOARD COMPONENTS.

WARNING



CAUTION

INADVERTENT CONTACT BETWEEN ADJACENT COMPONENTS OR MODULES WITH TEST EQUIPMENT MAY CAUSE SERIOUS DAMAGE TO THE CONSOLE CIRCUITRY. EXERCISE CARE WHEN TROUBLESHOOTING WITHIN AN ASSEMBLY WITH TEST EQUIPMENT AND POWER ENERGIZED.

CAUTION

- 2-22. **CONSOLE SYSTEM TROUBLESHOOTING.** Figure 2-1 presents the Mix-Trak 90 series console troubleshooting. The troubleshooting information utilizes modular troubleshooting techniques to isolate problems. Refer to Figure 2-1 and isolate the console malfunction to a specific module or assembly.
- 2-23. Once the problem is isolated to a specific assembly and power is totally deenergized, refer to the modular assembly schematic diagrams and the detailed theory of operation to assist in problem resolution. The defective assembly may be repaired locally or the entire device may be returned to Broadcast Electronics Inc. for repair or replacement.



WARNING

DISCONNECT ALL PRIMARY POWER BEFORE REPLACING CIRCUIT BOARD COMPONENTS.

WARNING



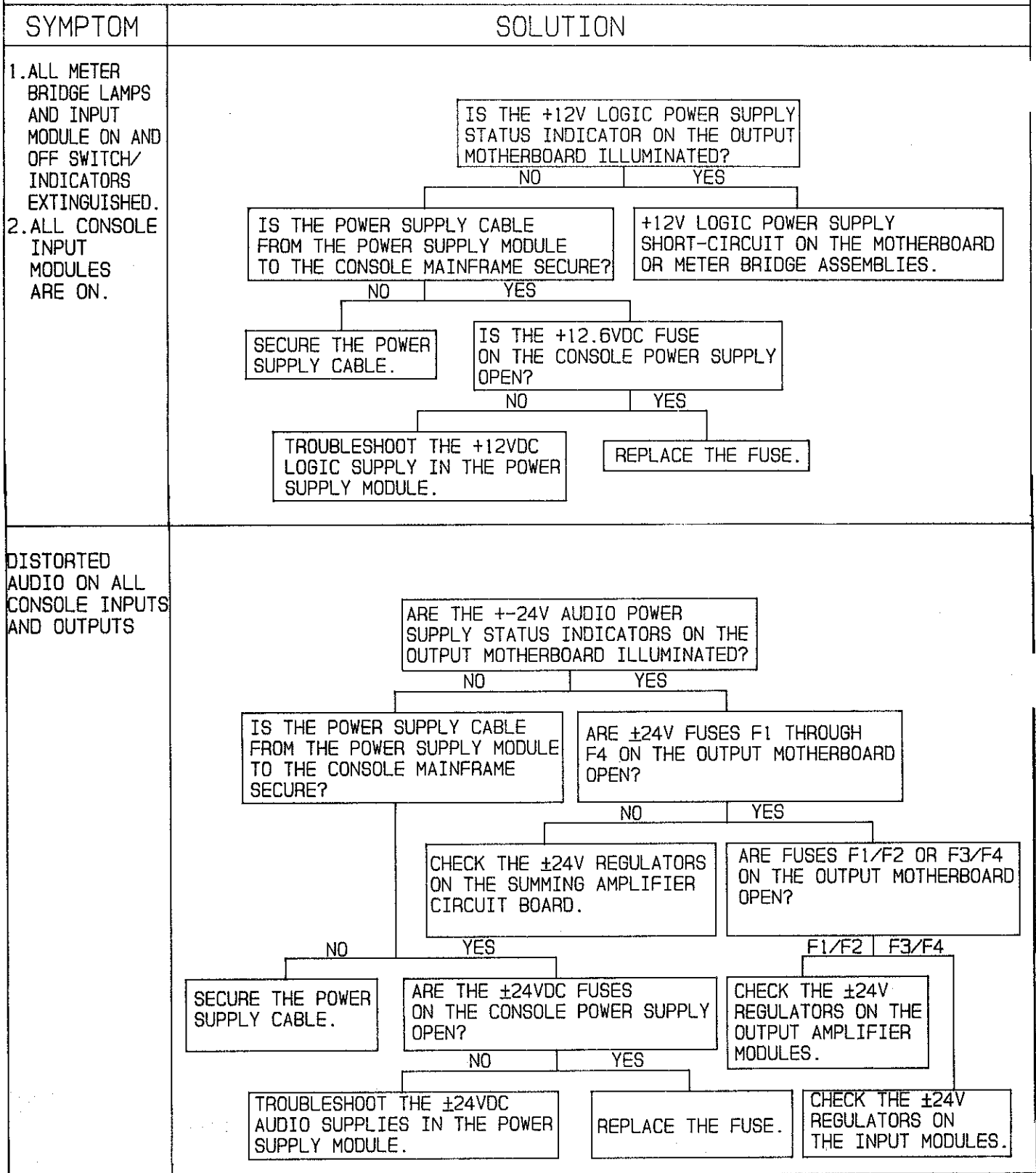
CAUTION

WHEN REPLACING A COMPONENT MOUNTED ON A HEAT-SINK, ENSURE A THIN FILM OF HEAT-SINK COMPOUND IS USED TO ASSURE GOOD HEAT DISSIPATION.

CAUTION

- 2-24. **COMPONENT REPLACEMENT.** The circuit boards used in the Mix-Trak 90 series consoles are double-sided with plated-through holes. Due to the plated-through hole design, solder fills the holes by capillary action. This condition requires that defective components be removed carefully to avoid damage to the circuit board.
- 2-25. On all circuit boards, the adhesion between the copper trace and the circuit 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. The use of a small soldering iron with steady pressure is required for circuit board repairs.

MIXTRAK 90 SYSTEM TROUBLESHOOTING



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597-9012-121A

FIGURE 2-1. MIX-TRAK 90 SYSTEM TROUBLESHOOTING
(Sheet 1 of 3)

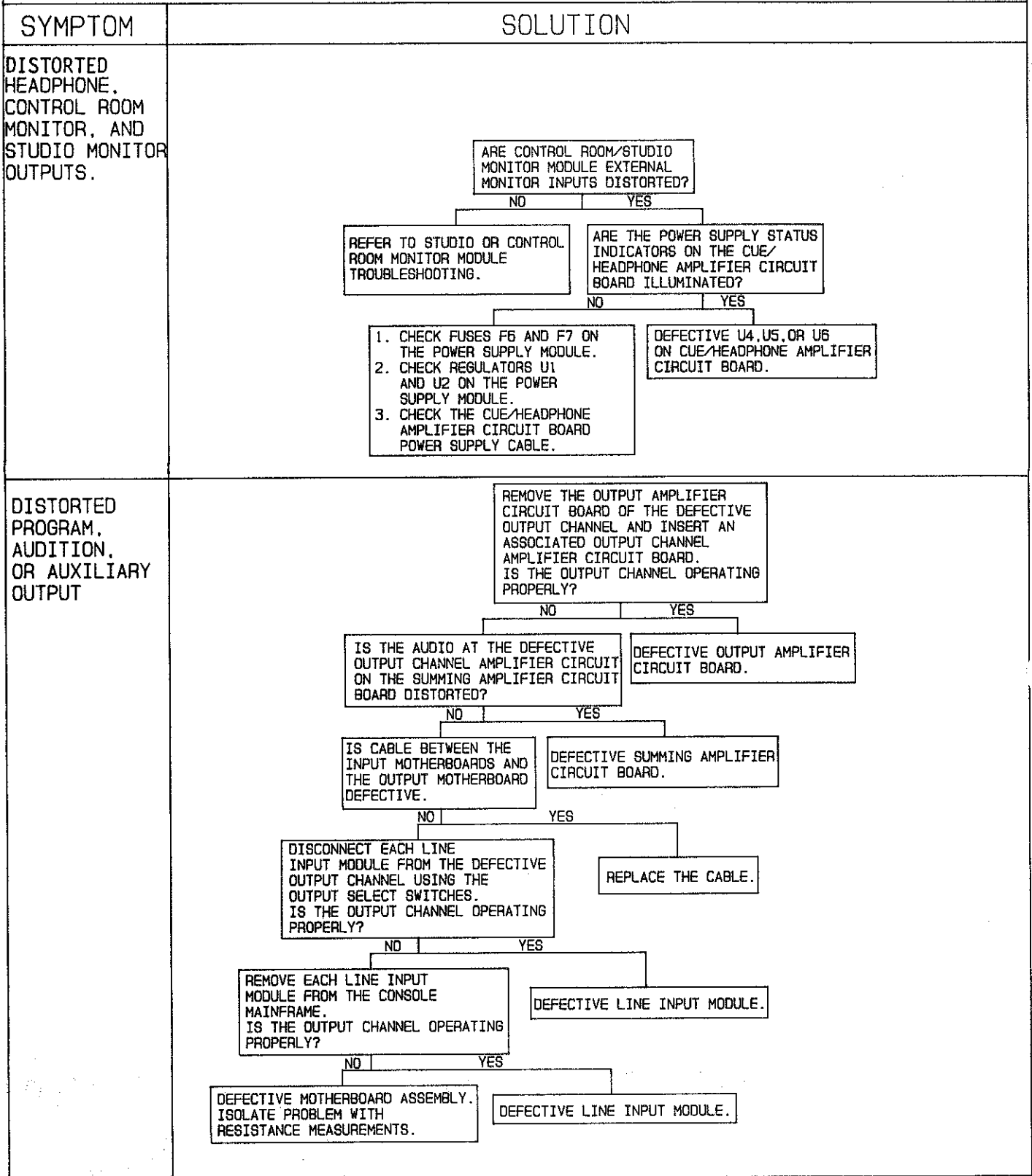
MIX TRAK 90 SYSTEM TROUBLESHOOTING

SYMPTOM	SOLUTION
<p>NO PROGRAM, AUDITION, OR AUXILIARY VU METER INDICATION</p>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> IS AUDIO PRESENT AT THE DEFECTIVE OUTPUT CHANNEL VU METER TERMINALS? </div> <div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> YES NO </div> <div style="display: flex; justify-content: space-around;"> <div style="width: 45%; border: 1px solid black; padding: 5px; margin-bottom: 5px;"> DEFECTIVE VU METER </div> <div style="width: 50%; border: 1px solid black; padding: 5px; margin-bottom: 5px;"> IS AUDIO PRESENT AT U6 PIN 7 AND U5 PIN 7 ON THE DEFECTIVE OUTPUT CHANNEL OUTPUT AMPLIFIER CIRCUIT BOARD? </div> </div> <div style="display: flex; justify-content: space-around;"> YES NO </div> <div style="display: flex; justify-content: space-around;"> <div style="width: 55%; border: 1px solid black; padding: 5px; margin-bottom: 5px;"> 1. CHECK THE WIRING FROM THE OUTPUT MOTHERBOARD TO THE METER SWITCH CIRCUIT BOARD. 2. CHECK THE WIRING FROM THE METER SWITCH CIRCUIT BOARD TO THE VU METER. </div> <div style="width: 40%; border: 1px solid black; padding: 5px; margin-bottom: 5px;"> DEFECTIVE U5 AND U6 ON THE OUTPUT AMPLIFIER CIRCUIT BOARD. </div> </div>
<p>ALL CONSOLE LAMPS ILLUMINATE BRIGHTLY.</p>	<ol style="list-style-type: none"> 1. CHECK PASS TRANSISTORS Q1 AND Q2 ON THE POWER SUPPLY MODULE. 2. CHECK INTEGRATED CIRCUIT U2 ON THE POWER SUPPLY CIRCUIT BOARD ASSEMBLY.
<p>ALL MICROPHONE AND LINE INPUT MODULE OVERLOAD INDICATORS ILLUMINATED.</p>	<ol style="list-style-type: none"> 1. TROUBLESHOOT THE -24V POWER SUPPLY CIRCUIT.
<p>DISTORTED PROGRAM, AUDITION, AND AUXILIARY OUTPUTS.</p>	<ol style="list-style-type: none"> 1. TROUBLESHOOT THE SUMMING AMPLIFIER CIRCUIT BOARD ASSEMBLY.

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FIGURE 2-1. MIX-TRAK 90 SYSTEM TROUBLESHOOTING
(Sheet 2 of 3)

MIX TRAK 90 SYSTEM TROUBLESHOOTING



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597-9012-121C

FIGURE 2-1. MIX-TRAK 90 SYSTEM TROUBLESHOOTING
(Sheet 3 of 3)

- 2-26. To remove a soldered component from a circuit board, cut the leads from the body of the defective component while the device is still soldered to the board. Grip a component lead with needle-nose pliers. Touch the soldering iron to the lead at the solder connection on the circuit side of the board. 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 by careful re-heating with a low wattage iron and removal the residual solder with a soldering vacuum tool.
- 2-27. Install the new component and apply solder from the circuit side of the board. If no damage has been incurred to the plated-through holes, soldering of the component side of the board will not be required.



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

WARNING



WARNING *OBSERVE THE MANUFACTURERS CAUTIONARY INSTRUCTIONS.*

WARNING

- 2-28. After soldering, remove residual flux with a suitable solvent. Rubbing alcohol is highly diluted and is not effective.
- 2-29. Inspect the circuit board to ensure the flux has been completely removed. Rosin flux is not normally corrosive, however in time, the flux will absorb enough moisture to become conductive and create problems.
- 2-30. **INTEGRATED CIRCUITS.** Special care should be exercised with integrated circuits. Each integrated circuit must be installed by matching the integrated circuit notch with the notch on the socket. Do not attempt to remove an integrated circuit from a socket with your fingers. Use an integrated circuit puller to lightly pry the component from the socket.

PARTS LIST

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Replaceable Parts Lists

PAGE NO.

3-1

SECTION VI PARTS LIST

3-1. INTRODUCTION.

- 3-2. This section provides descriptions and part numbers of electrical components, assemblies, and selected mechanical parts required for maintenance of the Broadcast Electronics Mix-Trak 90 series modular audio consoles. Each table entry in the section is indexed by reference designators appearing on the applicable schematic diagram.
- 3-3. The section presents parts lists information for the overall console, the overall console sub-assemblies, and the console meter bridge. Parts list information for each modular assembly such as the microphone input module and summing amplifier assembly are listed in the modular publications of this manual.

TABLE 6-1. REPLACEABLE PARTS LISTS

TABLE	DESCRIPTION	PART NO.	PAGE
3-2	12 CHANNEL MAINFRAME ASSEMBLY	901-9012-001	2
3-3	18 CHANNEL MAINFRAME ASSEMBLY	901-9018-001	2
3-4	21 CHANNEL MAINFRAME ASSEMBLY	901-9021-001	3
3-5	12,18, AND 21 CHANNEL MAINFRAME CABLE ASSEMBLIES	941-0038, 941-0039, 941-0037	4
3-6	12 CHANNEL INSTALLATION KIT	971-0023-001	4
3-7	18 CHANNEL INSTALLATION KIT	971-0026-001	4
3-8	21 CHANNEL INSTALLATION KIT	971-0031	5
3-9	40-PIN EXTENDER CABLE ASSEMBLY	941-0016	5
3-10	50-PIN EXTENDER CABLE ASSEMBLY	941-0017	5
3-11	SPARE PARTS KIT	971-0024	5
3-12	OUTPUT MOTHERBOARD ASSEMBLY	911-0069	6
3-13	INPUT MOTHERBOARD ASSEMBLY	911-0068	6
3-14	METER SWITCHBOARD ASSEMBLY	911-0031-002	7
3-15	MICROPHONE INPUT TRANSFORMER OPTION	951-0016	7
3-16	UTILITY RELAY	951-0036	7
3-17	VU METER ASSEMBLY	951-0044	8

TABLE 3-2. 12 CHANNEL MAINFRAME ASSEMBLY - 901-9012-001/-301

REF. DES.	DESCRIPTION	PART NO.	QTY.
H1,H2	Jack, Switchcraft #N-112B, 3-Conductor	417-0311	2
SPKR 1	Speaker, 4 Inch (10.16 cm), JFX124, 4 Ohm, 30 Watts Continuous, Frequency Response: 75 Hz to 20 kHz	414-0010	1
—	Fuse, AGC, 1A, 250V, Slow-Blow (Cue Speaker)	334-0100	1
—	Fuse, MDL, 0.1A, Slow-Blow (Headphone Jack)	334-0202	4
—	Overlay, Meter Bridge, Blue Trim	595-0086	1
—	Card Guide, Modular Console	407-0146	40
—	Label, Legend Strip, 12 and 18 Channel	594-3616	1
—	12 Channel Mainframe Cable Assembly	941-0038	1
—	Installation Kit	971-0023-001	1
—	Spare Parts Kit	971-0024	1
—	Line Output Module Assembly	911-0016	2
—	Headphone and Cue Speaker Power Amplifier Assembly	911-0065-002	1
—	Power Supply Assembly	951-0006	1
—	Control Room Monitor Module Assembly	951-0046	1
—	Summing Amplifier Circuit Board Assembly	911-0062	1
—	Output Motherboard Assembly	911-0069	1
—	Input Motherboard Assembly	911-0068	4
—	Meter Switchboard Assembly	911-0031-002	1
—	VU Meter Assembly (UTILITY and PROGRAM Meters)	951-0044	4
—	Clock/Timer Module	951-0037	1
—	Timer Control Module	951-0035	1
—	Card Guide, Vertical, VG2-5	407-0075	4

ADDITIONAL PARTS FOR 220V MODEL - 901-9012-301

F5, Spare	Fuse, 3AG, 2 Ampere, Slow-Blow	334-0200	2
—	AC Line Cord, CEE 7/7 3-Wire European Plug	682-0003	1

TABLE 3-3. 18 CHANNEL MAINFRAME ASSEMBLY - 901-9018-001
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
H1,H2	Jack, Switchcraft #N-112B, 3-Conductor	417-0311	2
SPKR 1	Speaker, 4 Inch (10.16 cm), JFX124, 4 Ohm, 30 Watts Continuous, Frequency Response: 75 Hz to 20 kHz	414-0010	1
—	Fuse, AGC, 1A, 250V, Slow-Blow (Cue Speaker)	334-0100	1
—	Fuse, MDL, 0.1A, Slow-Blow (Headphone Jack)	334-0202	4
—	Overlay, Meter Bridge, Blue Trim	595-0086	1
—	Card Guide, Modular Console	407-0146	58
—	Label, Legend Strip, 12 and 18 Channel	594-3616	1
—	18 Channel Mainframe Cable Assembly	941-0039	1
—	Installation Kit	971-0026-001	1
—	Spare Parts Kit	971-0024	1
—	Line Output Module Assembly	911-0016	2
—	Headphone and Cue Speaker Power Amplifier Assembly	911-0065-002	1
—	Power Supply Assembly	951-0006	1
—	Control Room Monitor Module Assembly	951-0046	1
—	Summing Amplifier Circuit Board Assembly	911-0062	1
—	Output Motherboard Assembly	911-0069	1
—	Input Motherboard Assembly	911-0068	6
—	Meter Switchboard Assembly	911-0031-002	1

TABLE 3-3. 18 CHANNEL MAINFRAME ASSEMBLY - 901-9018-001
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	VU Meter Assembly (UTILITY, PROGRAM, and AUDITION Meters)	951-0044	6
—	Clock/Timer Module	951-0037	1
—	Timer Control Module	951-0035	1
—	Card Guide, Vertical, VG2-5	407-0075	4
————— ADDITIONAL PARTS FOR 220V MODEL - 901-9018-301 —————			
F5, Spare	Fuse, 3AG, 2 Ampere, Slow-Blow	334-0200	2
—	AC Line Cord, CEE 7/7 3-Wire European Plug	682-0003	1

TABLE 3-4. 21 CHANNEL MAINFRAME ASSEMBLY - 901-9021-001

REF. DES.	DESCRIPTION	PART NO.	QTY.
H1,H2	Jack, Switchcraft #N-112B, 3-Conductor	417-0311	2
SPKR 1	Speaker, 4 Inch (10.16 cm), JFX124, 4 Ohm, 30 Watts Continuous, Frequency Response: 75 Hz to 20 kHz	414-0010	1
—	Fuse, AGC, 1A, 250V, Slow-Blow (Cue Speaker)	334-0100	1
—	Fuse, MDL, 0.1A, Slow-Blow (Headphone Jack)	334-0202	4
—	Overlay, Meter Bridge, Blue Trim	595-0093	1
—	Card Guide, Modular Console	407-0146	67
—	Label, Legend Strip, 21 Channel	594-3617	1
—	21 Channel Mainframe Cable Assembly	941-0037	1
—	Installation Kit	971-0031	1
—	Spare Parts Kit	971-0024	1
—	Line Output Module Assembly	911-0016	2
—	Headphone and Cue Speaker Power Amplifier Assembly	911-0065-002	1
—	Power Supply Assembly	951-0006	1
—	Control Room Monitor Module Assembly	951-0046	1
—	Summing Amplifier Circuit Board Assembly	911-0062	1
—	Output Motherboard Assembly	911-0069	1
—	Input Motherboard Assembly	911-0068	7
—	Meter Switchboard Assembly	911-0031-002	1
—	VU Meter Assembly (UTILITY, PROGRAM, and AUDITION Meters)	951-0044	6
—	LED Bargraph Meter Assembly (AIR Meters)	951-0029	2
—	Clock/Timer Module	951-0037	1
—	Timer Control Module	951-0035	1
—	Card Guide, Vertical, VG2-5	407-0075	4
————— ADDITIONAL PARTS FOR 220V MODEL - 901-9021-301 —————			
F5, Spare	Fuse 3AG, 2 Ampere, Slow-Blow	334-0200	2
—	AC Line Cord, CEE 7/7 3-Wire European Plug	682-0003	1

**TABLE 3-5. 12, 18, AND 21 CHANNEL MAINFRAME CABLE ASSEMBLIES
941-0037, 941-0038, AND 941-0039**

REF. DES.	DESCRIPTION	PART NO.	QTY.
P2	Connector, Housing, 6-Pin	418-0670	1
P21	Plug, Housing, 4-Pin	418-0240	1
—	Plug, 40-Pin Dual In-line	418-4001	5
—	Socket, Connector, 10-Pin	417-1003	4
—	Pins, Connector (for P2 and P21)	417-0053	9
—	Housing, 9-Pin In-line	417-0161	1
<hr/>			
ADDITIONAL PARTS FOR 12 CHANNEL CONSOLE ASSEMBLY - 941-0038			
—	Plug, Housing, 8-Pin	417-0046	6
—	Pins, Crimp Type (for Connector 417-0046)	417-8766	7
—	Pins, Crimp Type (for Connector 417-0046)	417-8728	35
<hr/>			
ADDITIONAL PARTS FOR 18 CHANNEL CONSOLE ASSEMBLY - 941-0039			
—	Plug, Housing, 8-Pin	417-0046	8
—	Pins, Crimp Type (for Connector 417-0046)	417-8766	14
—	Pins, Crimp Type (for Connector 417-0046)	417-8728	49
<hr/>			
ADDITIONAL PARTS FOR 21 CHANNEL CONSOLE ASSEMBLY - 941-0037			
—	Plug, Housing, 8-Pin	417-0046	9
—	Pins, Crimp Type (for Connector 417-0046)	417-8766	14
—	Pins, Crimp Type (for Connector 417-0046)	417-8728	56

TABLE 3-6. 12 CHANNEL INSTALLATION KIT - 971-0023-001

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	Connector, Housing, 12-Pin	418-1271	60
—	Pins, Connector	417-0053	800
—	Tool, Adjustment, 8 T000/5 Spectrol	407-0186	1
—	Driver, 3/32" Hex Ball	300-0007	1
—	Crimping Tool, Paladin PA-1645	300-0010	1
—	Tool, Contact Removal	710-0002	1
—	MT-90 Binder and Manual Assembly	971-9021-001	1
—	40-Pin Extender Cable Assembly	941-0016	2
—	50-Pin Extender Cable Assembly	941-0017	1

TABLE 3-7. 18 CHANNEL INSTALLATION Kit - 971-0026-001

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	Connector, Housing, 12-Pin	418-1271	86
—	Pins, Connector	417-0053	1100
—	Tool, Adjustment, 8 T000/5 Spectrol	407-0186	1
—	Driver, 3/32" Hex Ball	300-0007	1
—	Crimping Tool, Paladin PA-1645	300-0010	1
—	Tool, Contact Removal	710-0002	1
—	MT-90 Binder and Manual Assembly	971-9021-001	1
—	40-Pin Extender Cable Assembly	941-0016	2
—	50-Pin Extender Cable Assembly	941-0017	1

TABLE 3-8. 21 CHANNEL INSTALLATION Kit - 971-0031

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	Connector, Housing, 12-Pin	418-1271	104
—	Pins, Connector	417-0053	1248
—	Tool, Adjustment, 8 T000/5 Spectrol	407-0186	1
—	Driver, 3/32" Hex Ball	300-0007	1
—	Crimping Tool, Paladin PA-1645	300-0010	1
—	Tool, Contact Removal	710-0002	1
—	MT-90 Binder and Manual Assembly	971-9021-001	1
—	40-Pin Extender Cable Assembly	941-0016	2
—	50-Pin Extender Cable Assembly	941-0017	1

TABLE 3-9. 40-PIN EXTENDER CABLE ASSEMBLY - 941-0016

REF. DES.	DESCRIPTION	PART NO.	QTY.
P1	Connector, Header, 40-Pin Dual In-line	417-0134	1
P2,P3	Receptacle, 40-Pin	418-0028	2
P4	Receptacle, 40-Pin Dual In-line	417-4041	1
—	Blank, Male, 40-Pin Extender Circuit Board	511-0041	1
—	Blank, Female, 40-Pin Extender Circuit Board	511-0042	1

TABLE 3-10. 50-PIN EXTENDER CABLE ASSEMBLY - 941-0017

REF. DES.	DESCRIPTION	PART NO.	QTY.
P1	Connector, Header, 50-Pin Dual In-line	417-0146	1
P2,P3	Receptacle, 50-Pin	417-0171	2
P4	Receptacle, 50-Pin Dual In-line	417-0147	1
—	Blank, Male, 50-Pin Extender Circuit Board	511-0066	1
—	Blank, Female, 50-Pin Extender Circuit Board	511-0067	1

TABLE 3-11. SPARE PARTS KIT - 971-0024
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	Fuse, 3AG, 1/8 Ampere, 250V, Slow-Blow	334-0051	1
—	Fuse, AGC, 1 Ampere, 250V, Slow-Blow	334-0100	1
—	Integrated Circuit, TL783C, Adjustable Three-Terminal Positive Voltage Regulator, 1.25V to 125V at 700 mA, TO-220 Case	227-0783	1
—	Integrated Circuit, MC1723CL, Adjustable Positive Voltage Regulator, 37V to 2V at 150 mA, 14-Pin DIP	227-0723	1
—	Integrated Circuit, NE5532AP, Dual Low-Noise Operational Amplifier, 8-Pin DIP	221-5532-001	4
—	Integrated Circuit, LF353N, Dual JFET-Input Operational Amplifier, 8-Pin DIP	221-0353	2
—	Integrated Circuit, LT1010CT, Power Buffer Amplifier, Continuous Output Current ± 150 mA, Continuous Power 4W, TO-220 Case	220-1010	4
—	Integrated Circuit, NE5534AN, Low-Noise Operational Amplifier, 8-Pin DIP	221-5534	2
—	Integrated Circuit, LM317T, Adjustable Positive Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0317	1
—	Integrated Circuit, LM337T, Adjustable Negative Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0337	1

TABLE 3-11. SPARE PARTS KIT -971-0024
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	Integrated Circuit, LM833N, Dual Audio Operational Amplifier, 8-Pin DIP	220-0833	2
—	Integrated Circuit, TLO72CP, Dual JFET-Input Operational Amplifier, 8-Pin DIP	221-0072	1
—	Integrated Circuit, MC14584, Hex Schmitt Trigger, CMOS, 14-Pin DIP	228-4584	1
—	Integrated Circuit, TDA1074A, DC Controlled Dual Potentiometer, 18-Lead DIL	220-1074	1
—	Transistor, 2N3906, PNP, Silicon, TO-92 Case	210-3906	1
—	Lamp, No. 73, 14V, 0.08A, T-1 3/4 Bulb, Wedge Base	320-0007	1

TABLE 3-12. OUTPUT MOTHERBOARD ASSEMBLY - 911-0069

REF. DES.	DESCRIPTION	PART NO.	QTY.
DS1,DS2,DS3	Indicator, LED, Red, 521-9212, 1.7V @ 50 mA Maximum	323-9217	3
F1 THRU F4	Fuse, 3AG, 2 Amperes	330-0200	4
J1 THRU J6	Connector Header, 40-Pin Dual In-line	417-0134	6
J7,J8,J9	Connector Header, 40-Pi	417-0173	3
J10 THRU J19	Receptacle, 12-Pin	417-1276	10
J20	Connector Header, 3-Pin	417-0003	1
J21	Connector, Male, 4-Pin	418-0255	1
P20	Jumper, Programmable, 2-Pin	340-0004	1
R1,R2	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	2
R3	Resistor, 510 Ohm $\pm 5\%$, 1/4W	100-5133	1
W1	Connector Header, Male, 50-Pin Dual In-line Printed Circuit Board Mount	417-0227	1
XF1 THRU XF4	Fuse Clips, AGC	415-2068	8
—	Receptacle, Flexstrip (for use w/417-4086)	417-0186	7
—	Blank Output Motherboard Assembly	511-0069	1

TABLE 3-13. INPUT MOTHERBOARD ASSEMBLY - 911-0068
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1 THRU C9	Capacitor, Mica, 330 pF $\pm 5\%$, 500V	042-3322	9
J1,J1A,J1B	Connector Header, 40-Pin Dual In-line	417-0134	3
J2,J2A,J2B	Connector Header, 50-Pin Dual In-line	417-0146	3
J3,J3A,J3B	Connector Header, 40-Pin Dual In-line	417-0134	3
J4,J4A,J4B, J5,J5A,J5B, J6,J6A,J6B, J7,J7A,J7B	Receptacle, 12-Pin	417-1276	12
J8	Connector Header, 40-Pin Dual In-line	417-0134	1
J9	Receptacle, 12-Pin	417-1276	1
J10	Connector, 10-Pin	418-1003	1
R1,R2,R3	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	3
W1	Connector Header, Male, 50-Pin Dual In-line, Printed Circuit Board Mount	417-0227	1

TABLE 3-13. INPUT MOTHERBOARD ASSEMBLY - 911-0068
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
W1	Connector Header, 50-Pin, Printed Circuit Board Mount	417-0171	1
—	Receptacle, Flexstrip (for use w/417-4086)	417-0186	14
—	Blank Input Motherboard Assembly	511-0068	1

TABLE 3-14. METER SWITCHBOARD ASSEMBLY - 911-0031-002

REF. DES.	DESCRIPTION	PART NO.	QTY.
E1,E3 THRU E12,E14 THRU E21,E23,E24, E27 THRU E32, E34,E35,E41 THRU E55	Terminal, Barrel, 4 Amperes	417-0133	44
J1 THRU J7	Connector Header, 3-Pin	417-0003	7
J8	Connector, 40-Pin	417-0173	1
J9,J10	Connector Header, 3-Pin	417-0003	2
P1 THRU P7, P9,P10	Jumper, Programmable, 2-Pin	340-0004	9
R1,R2	Resistor, 3.65 k Ohm 1%, 1/4W	103-3641	2
S1	Switch, 3 Section, Blue Indications Contacts: Section 1: 4PDT Sections 2 & 3: 6 PDT (Utility Meter Select Switch)	340-0123	1
—	Cap, Barrel Terminal	417-0133-001	44
—	Blank Meter Switchboard Circuit Board	511-0031-002	1

TABLE 3-15. MICROPHONE INPUT TRANSFORMER OPTION - 951-0016

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	Transformer, Microphone Bridge, Ratio: 1:1 turns Primary: 150 Ohms Secondary: 1000 Ohms	370-0032	1

TABLE 3-16. UTILITY RELAY - 951-0036

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	Relay, General Purpose Coil: 12V dc, 160 Ohms Contacts: DPDT, 0.9W @ 10 Amperes	270-0060	1
—	Socket, Surface Mount	417-0183	1

TABLE 3-17. VU METER ASSEMBLY - 951-0044

REF. DES.	DESCRIPTION	PART NO.	QTY.
D1,D2	Diode, Zener, 1N4735, 6.2V \pm 10%, 1 Watt	200-4735	2
DS1,DS2	Lamp, FK6332430, Incandescent, 24V, 3 Watts	321-0692	2
DS3	LED, 534141, Red, Peak Flasher, Printed Circuit Board Mount	320-0029	1
J1	Header, 8-Pin, Right Angle	417-0080-001	1
M1	Meter, 3.5 Inch (8.89 cm), Model 3LW Window Mount w/Peak Flasher, Taut Band Type, 3900 Ohm Resistance	319-0004	1
XDS1,XDS2	Fuseclip, Printed Circuit Board Mount	415-2068	4
—	Blank VU Meter Circuit Board	511-0044	1

DRAWINGS
TABLE OF CONTENTS

PARAGRAPH
4-1

Introduction

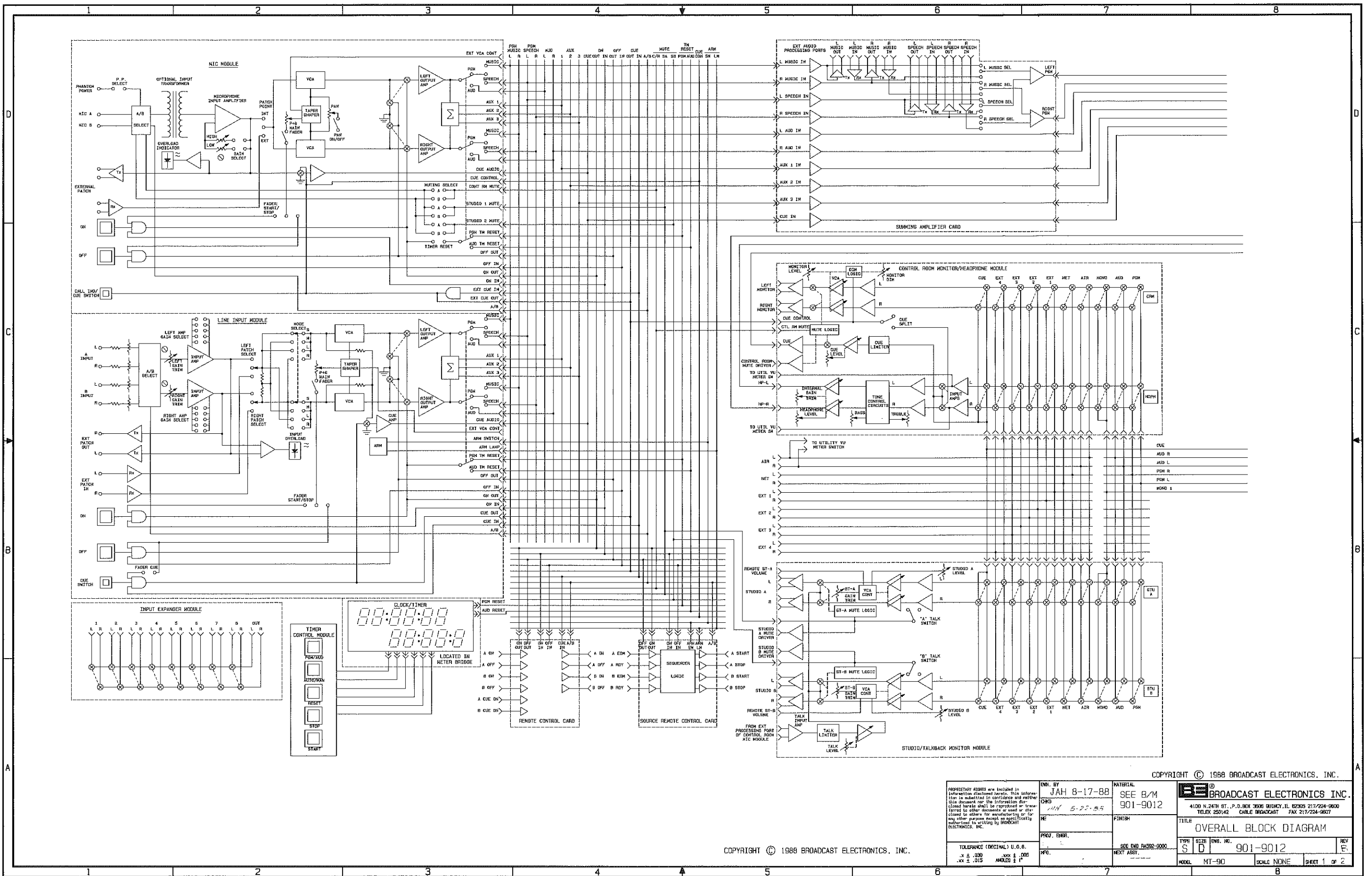
PAGE NO.
4-1

SECTION IV DRAWINGS

4-1. INTRODUCTION.

- 4-2. This section provides assembly drawings, wiring diagrams, and schematic diagrams as listed below for the Broadcast Electronics Mix-Trak 90 series audio consoles. The section presents drawings for the overall console, the overall console sub-assemblies, and the meterbridge assembly. Drawings for each modular assembly such as the microphone input module and summing amplifier assembly are listed in the modular publications of this manual.

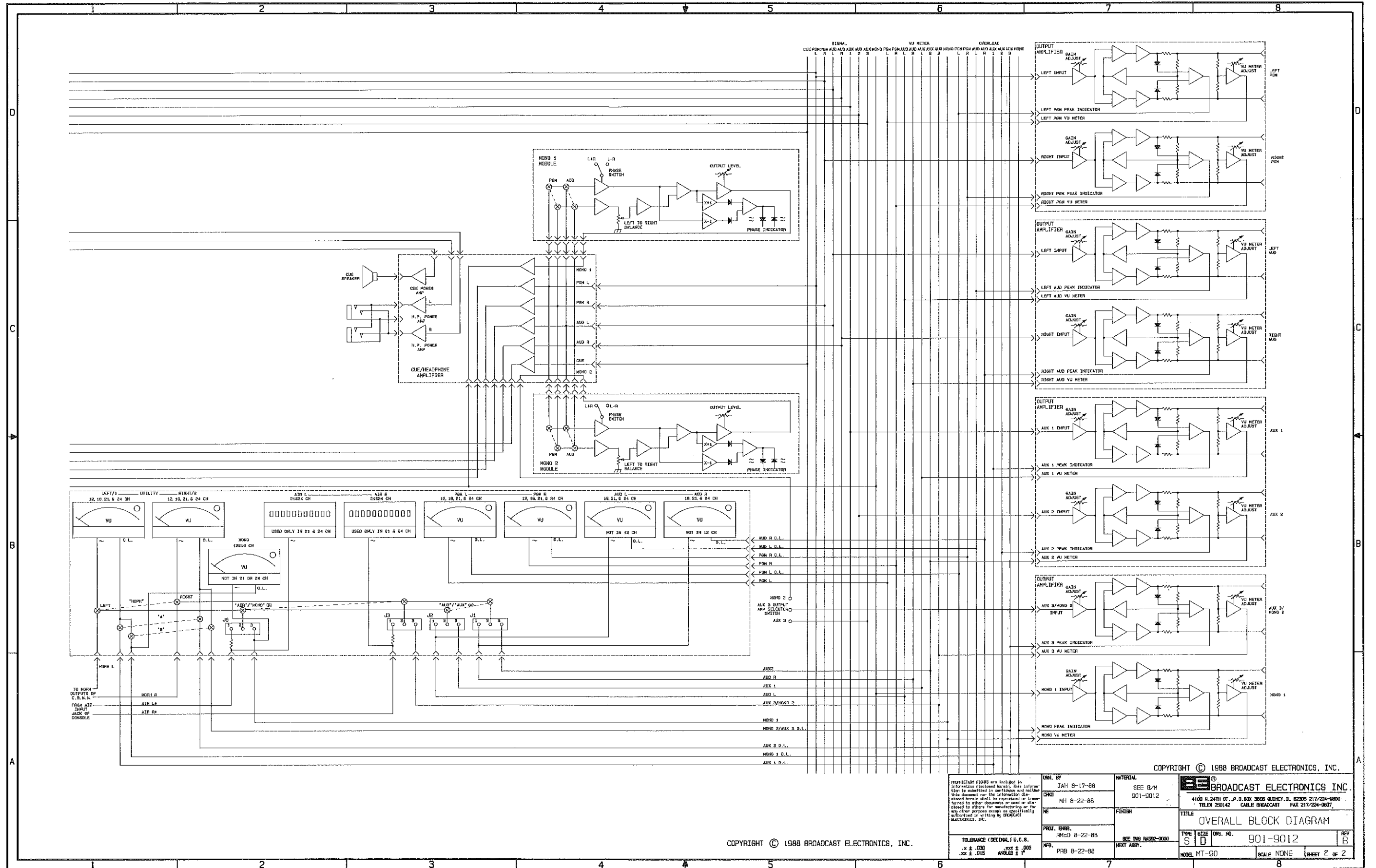
FIGURE	TITLE	NUMBER
4-1	SCHEMATIC DIAGRAM, MT-90 OVERALL	SD901-9012
4-2	SCHEMATIC DIAGRAM, UTILITY METER SWITCH CIRCUIT BOARD	SC911-0031-002
4-3	ASSEMBLY DIAGRAM, UTILITY METER SWITCH CIRCUIT BOARD	AB911-0031-002
4-4	SCHEMATIC DIAGRAM, OUTPUT MOTHERBOARD	SD911-0069
4-5	ASSEMBLY DIAGRAM, OUTPUT MOTHERBOARD	AC911-0069
4-6	SCHEMATIC DIAGRAM, INPUT MOTHERBOARD	SD911-0068
4-7	ASSEMBLY DIAGRAM, INPUT MOTHERBOARD	AD911-0068
4-8	SCHEMATIC DIAGRAM, VU METER ASSEMBLY CIRCUIT BOARD	SB951-0044
4-9	ASSEMBLY DIAGRAM, VU METER ASSEMBLY CIRCUIT BOARD	AB951-0044



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TOLERANCE (DECIMAL) U.S.S. .005 ± .003 .010 ± .005 ANGLES 1/2	PROJ. ENGR. HFR.	FINISH SEE END PAGES 0000	TITLE OVERALL BLOCK DIAGRAM	TYPE SIZE DWG. NO. S D 901-9012
NEXT ASSY.		MODEL NT-90 SCALE NONE SHEET 1 OF 2		REV E

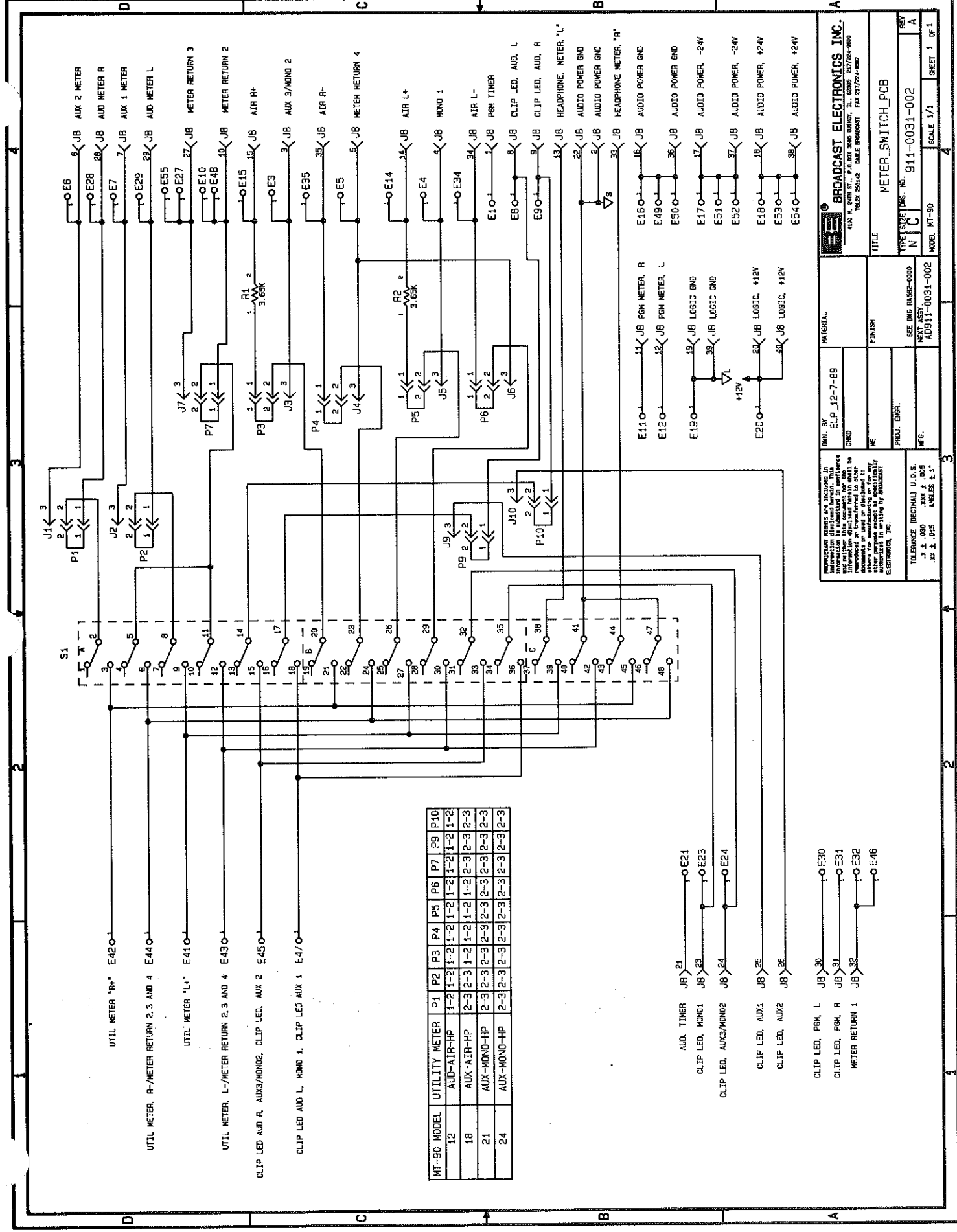
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CHG. NH 8-22-88	DATE 8-22-88	FINISH SEE DWG RA382-0000 NEXT ASSY.	TITLE OVERALL BLOCK DIAGRAM	
PROJ. ENGR. RMD 8-22-88	DATE 8-22-88	SCALE NONE	REV. B	MODEL MT-90
TLRANCE (DECIMAL) D.G.B. .x ± .030 ANGLE 1° .x ± .015 ANGLE 1°	TYPE S D	SIZE 	OW. NO. 901-9012	SHEET 2 OF 2



MT-90 MODEL	UTILITY METER	P1	P2	P3	P4	P5	P6	P7	P9	P10
12	AUD-AIR-HP	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2
18	AUX-AIR-HP	2-3	2-3	1-2	1-2	1-2	1-2	1-2	2-3	2-3
21	AUX-MONO-HP	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3
24	AUX-MONO-HP	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3

BROADCAST ELECTRONICS, INC.
 4500 N. 30TH ST., PALM BEACH GARDENS, FL. 33408 217/764-0000
 TELETYPE: 217/764-0007

MT-90

MODEL: MT-90

SCALE: 1/1

SHEET: 1 OF 1

TITLE: METER_SWITCH_PCB

DESIGNER: N C

DATE: 9/11-0031-002

REV: A

DATE: 9/11-0031-002

SCALE: 1/1

SHEET: 1 OF 1

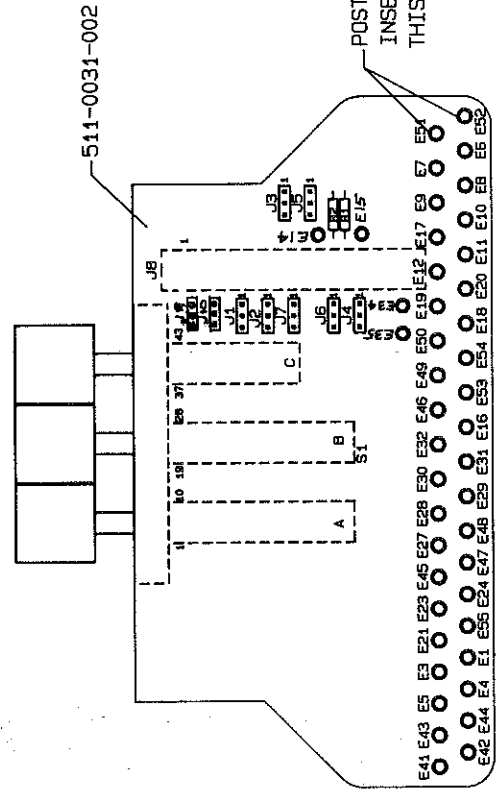
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DATE: 9/11-0031-002

SCALE: 1/1

SHEET: 1 OF 1

REVISIONS			
REV	DATE	DESCRIPTION	DFTSMN ENGR
A	12-7-89	ADDED E14, E15, E34, E35, J7, J10	ELP



POSITION BARREL TERMINALS SO WIRE
INSERTION WILL BE MADE FROM
THIS DIRECTION.

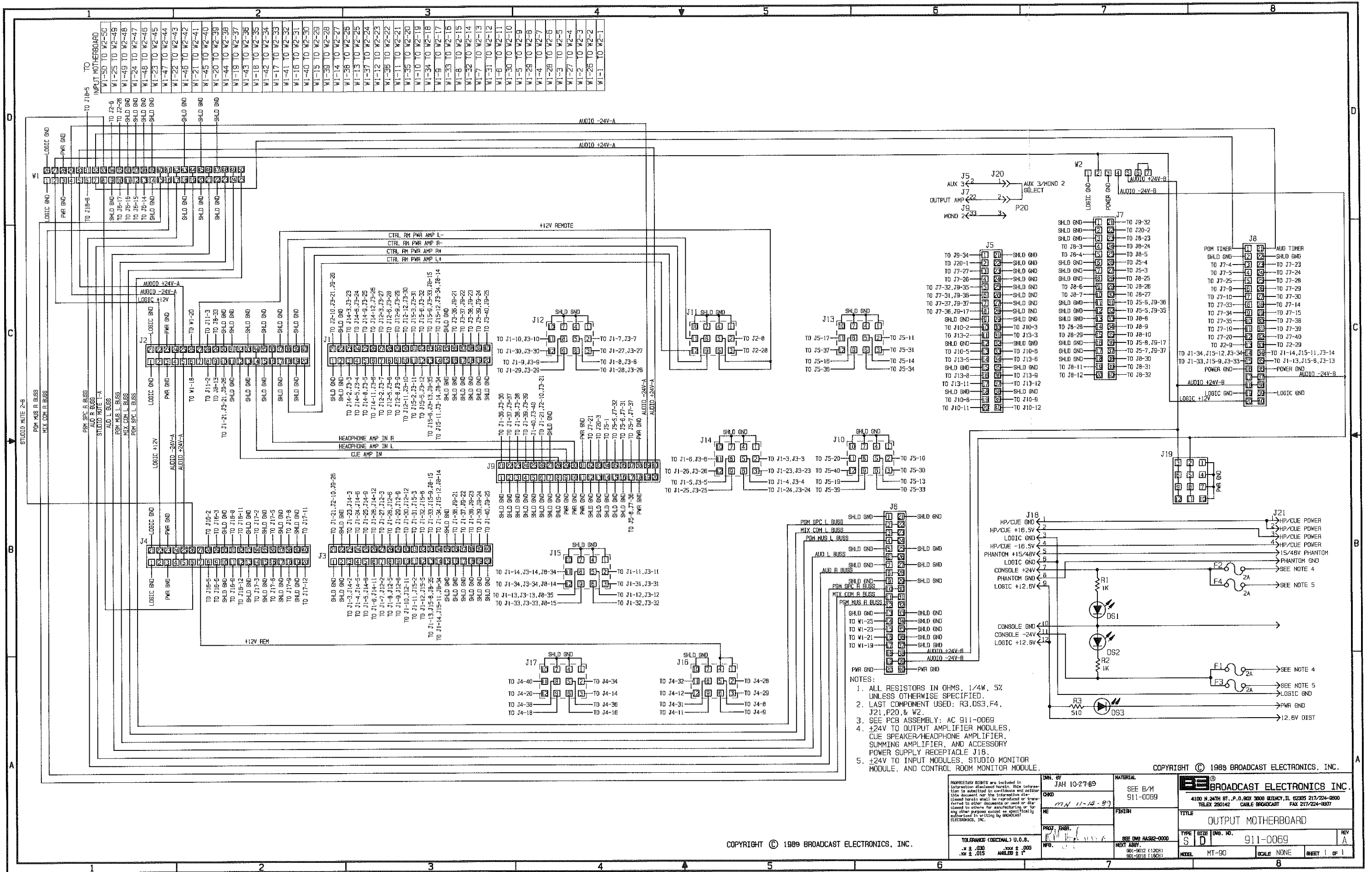
NOTE:
1. SEE SCHEMATIC SB9111-0031-002.

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BROADCAST ELECTRONICS INC. 4100 N. 24TH ST., P.O. BOX 3606 GAITHERSBURG, MD 20878 TELEX 230142 CABLE BROADCAST FAX 217/284-9607		MATERIAL SEE B/M 911-0031-002	
TITLE PCB ASSEMBLY - METER SWITCH BO.		FINISH	
TYPE A B		NEXT ASSY 901-0012 "13CH" 901-9018 "15CH"	
DWG. NO. 911-0031-002		SCALE 1/1	
MODEL MT90		SHEET 1 OF 1	

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TOLERANCE DECIMAL U.O.S.
 .X ± .030 .XXX ± .005
 .XX ± .015 ANGLES ± °

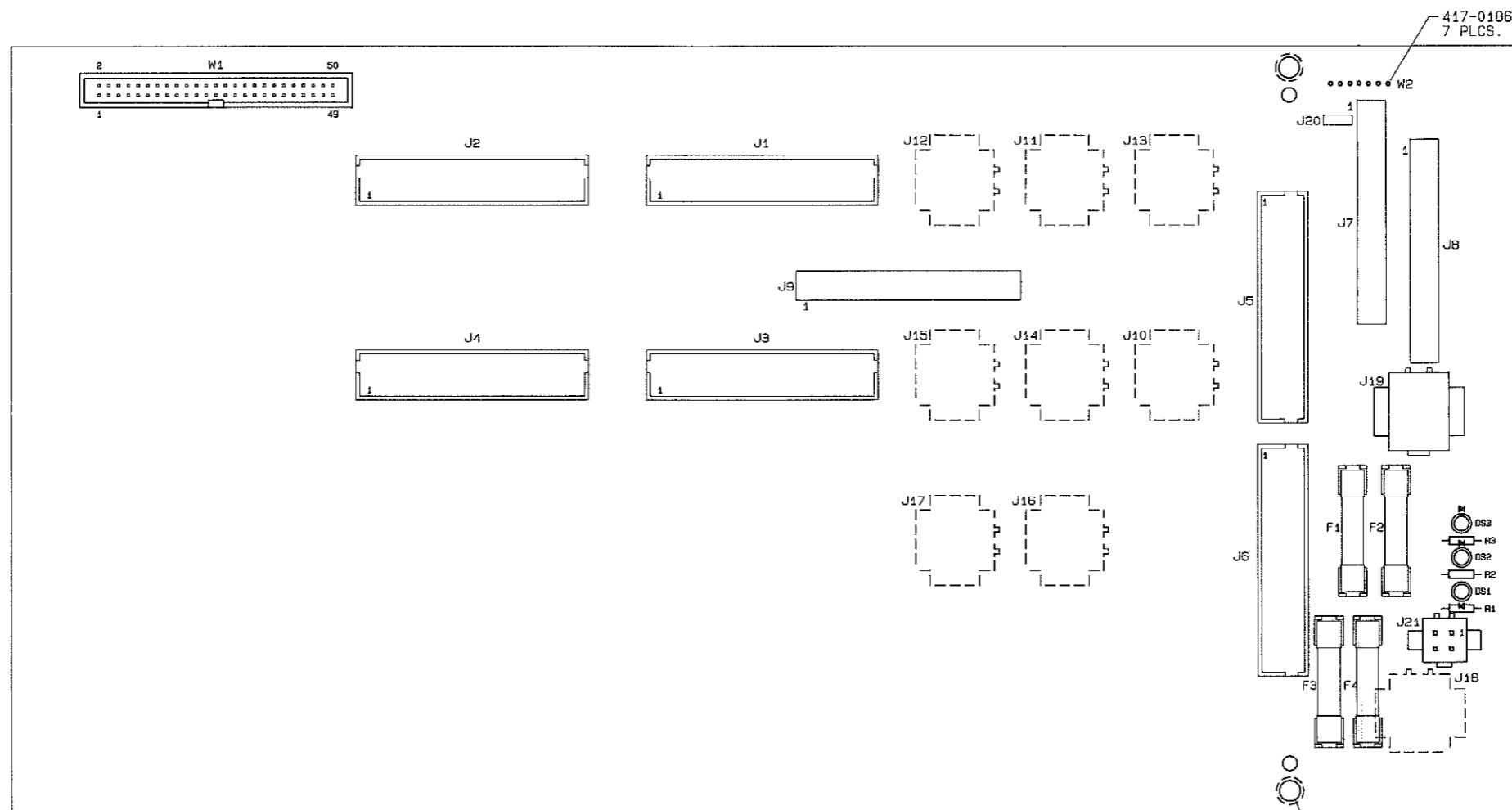


- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5% UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENT USED: R3,DS3,F4, J21,P20, & W2.
 3. SEE PCB ASSEMBLY: AC 911-0069
 4. +24V TO OUTPUT AMPLIFIER MODULES, CUE SPEAKER/HEADPHONE AMPLIFIER, SUMMING AMPLIFIER, AND ACCESSORY POWER SUPPLY RECEPTACLE J18.
 5. +24V TO INPUT MODULES, STUDIO MONITOR MODULE, AND CONTROL ROOM MONITOR MODULE.

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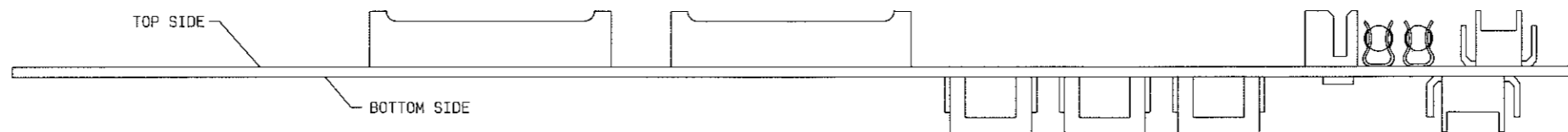
DESIGNED BY JAH 10-27-89	MATERIAL SEE B/M 911-0069	 BROADCAST ELECTRONICS INC. 4100 N. 24TH ST., P.O. BOX 3900 BIRMGHAM, AL 35205 217/224-9900 TELE 250142 CABLE BROADCAST FAX 217/224-9977
DATE 11-14-89	FINISH	
PROJ. ENGR.	SEE ENG DRAWING-0000	TITLE OUTPUT MOTHERBOARD
TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLE ± 1°	NEXT ASST. 90-9012 (12CH) 901-9018 (18CH)	TYPE SIZE (ENS. NO.) S D 911-0069
		MODEL MT-90 SCALE NONE SHEET 1 OF 1

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VIEW IS FROM
TOP SIDE OF PCB

P/N 426-6000 TO BE INSTALLED TO
BOTTOM SIDE OF PCB TYP. 2 PLCS.

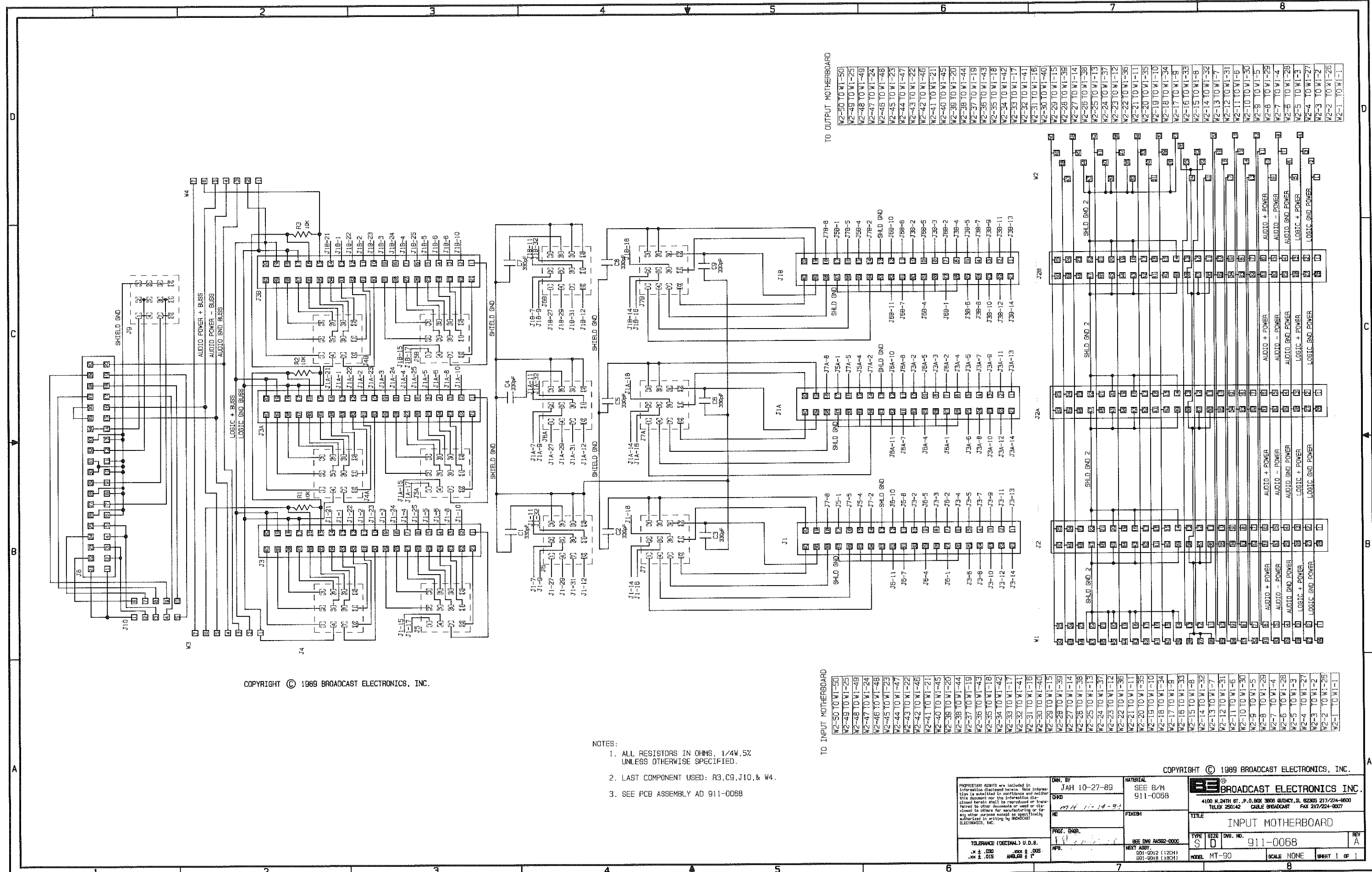


NOTES:

1. LAST COMPONENT USED: R3, J21, W2, F4, DS3.
2. CARD GUIDES P/N 407-0075 "QTY. 2", AND MOUNTING HARDWARE 420-6108 AND 423-6002 "QTY. 2 EACH". TO BE BAGGED SEPARATELY AND SENT TO STOCK WITH BOARD ASSEMBLY.

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	CHKD M.H. 11-28-89	FINISH	
	ME 11/28/89	NEXT ASSY 901-9012 "12CH" 901-9018 "18CH"	
	PROJ. ENGR. M.F. 11-28-89	MODEL MT90 SCALE 1/1 SHEET 1 of 1	
TITLE PCB ASSEMBLY OUTPUT MOTHERBOARD		TYPE A SIZE C DWG. NO. 911-0069 REV A	MODEL MT90 SCALE 1/1 SHEET 1 of 1



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- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5% UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENT USED: R3, C9, J10, & W4.
 3. SEE PCB ASSEMBLY AD 911-0068

TO INPUT MOTHERBOARD

W2-50 TO W1-50
W2-49 TO W1-25
W2-48 TO W1-49
W2-47 TO W1-24
W2-46 TO W1-48
W2-45 TO W1-23
W2-44 TO W1-47
W2-43 TO W1-22
W2-42 TO W1-46
W2-41 TO W1-21
W2-40 TO W1-45
W2-39 TO W1-20
W2-38 TO W1-44
W2-37 TO W1-19
W2-36 TO W1-43
W2-35 TO W1-18
W2-34 TO W1-42
W2-33 TO W1-17
W2-32 TO W1-41
W2-31 TO W1-16
W2-30 TO W1-40
W2-29 TO W1-15
W2-28 TO W1-39
W2-27 TO W1-14
W2-26 TO W1-38
W2-25 TO W1-13
W2-24 TO W1-37
W2-23 TO W1-12
W2-22 TO W1-36
W2-21 TO W1-11
W2-20 TO W1-35
W2-19 TO W1-10
W2-18 TO W1-34
W2-17 TO W1-9
W2-16 TO W1-33
W2-15 TO W1-8
W2-14 TO W1-32
W2-13 TO W1-7
W2-12 TO W1-31
W2-11 TO W1-6
W2-10 TO W1-30
W2-9 TO W1-5
W2-8 TO W1-29
W2-7 TO W1-4
W2-6 TO W1-28
W2-5 TO W1-3
W2-4 TO W1-27
W2-3 TO W1-2
W2-2 TO W1-26
W2-1 TO W1-1

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TOLERANCE (DECIMAL) U.O.B. .x ± .030 .xxx ± .005 .x ± .015 ANGLES ± 1°		DATE 10-14-89	FINISH SEE DWG RA302-0000	
NEXT ASSY: 901-9012 (12CH) 901-9018 (18CH)		PROJ. ENGR. W. J. ...	TYPE S D	DWS. NO. 911-0068
MODEL MT-90		SCALE NONE	SHEET 1 OF 1	REV A

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TO OUTPUT MOTHERBOARD

W2-50 TO W1-50
W2-49 TO W1-25
W2-48 TO W1-49
W2-47 TO W1-24
W2-46 TO W1-48
W2-45 TO W1-23
W2-44 TO W1-47
W2-43 TO W1-22
W2-42 TO W1-46
W2-41 TO W1-21
W2-40 TO W1-45
W2-39 TO W1-20
W2-38 TO W1-44
W2-37 TO W1-19
W2-36 TO W1-43
W2-35 TO W1-18
W2-34 TO W1-42
W2-33 TO W1-17
W2-32 TO W1-41
W2-31 TO W1-16
W2-30 TO W1-40
W2-29 TO W1-15
W2-28 TO W1-39
W2-27 TO W1-14
W2-26 TO W1-38
W2-25 TO W1-13
W2-24 TO W1-37
W2-23 TO W1-12
W2-22 TO W1-36
W2-21 TO W1-11
W2-20 TO W1-35
W2-19 TO W1-10
W2-18 TO W1-34
W2-17 TO W1-9
W2-16 TO W1-33
W2-15 TO W1-8
W2-14 TO W1-32
W2-13 TO W1-7
W2-12 TO W1-31
W2-11 TO W1-6
W2-10 TO W1-30
W2-9 TO W1-5
W2-8 TO W1-29
W2-7 TO W1-4
W2-6 TO W1-28
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W2-3 TO W1-2
W2-2 TO W1-26
W2-1 TO W1-1

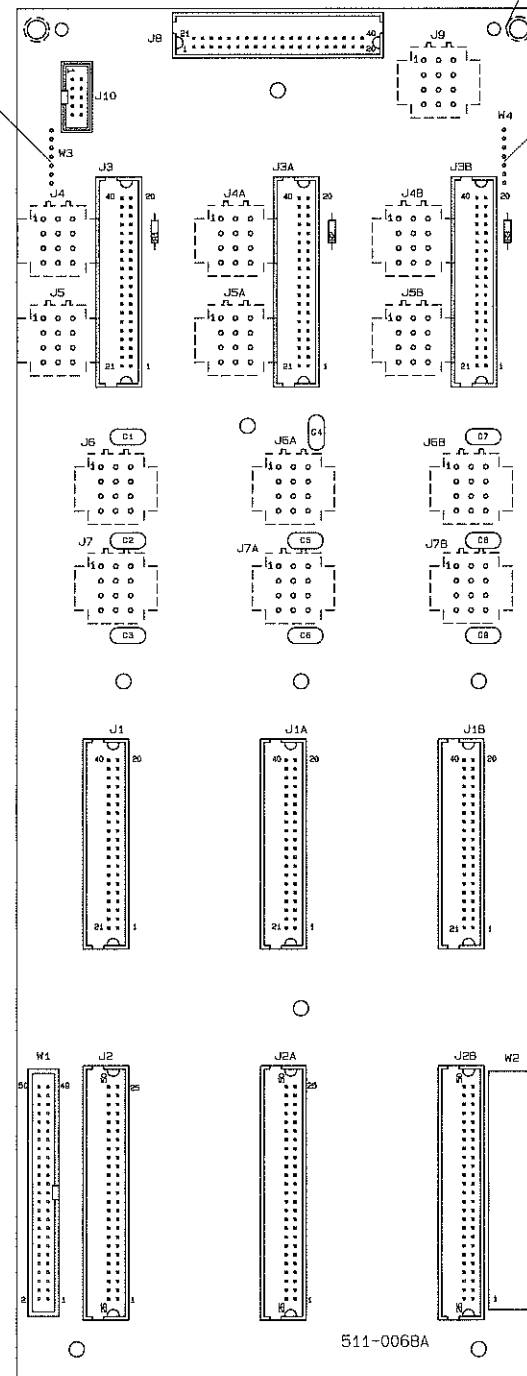
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417-0186 TO BE INSTALLED TO TOP SIDE OF PCB. TYP. 7 PLCS.

SEE NOTE 1

P/N 426-6000 TO BE INSTALLED TO BOTTOM SIDE OF PCB. TYP. 2 PLCS.

417-0186 TO BE INSTALLED TO TOP SIDE OF PCB. TYP. 7 PLCS.



VIEW IS FROM TOP SIDE OF PCB

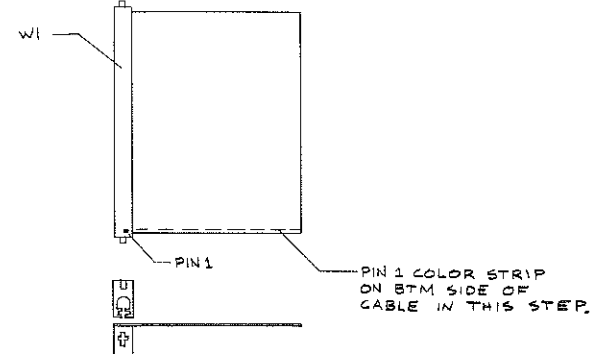
TOP SIDE

BOTTOM SIDE

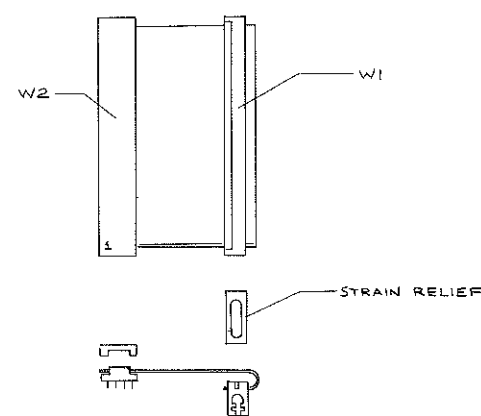
600-0050

SEE DETAIL "A"

DETAIL "A"
STEP 1



STEP 2

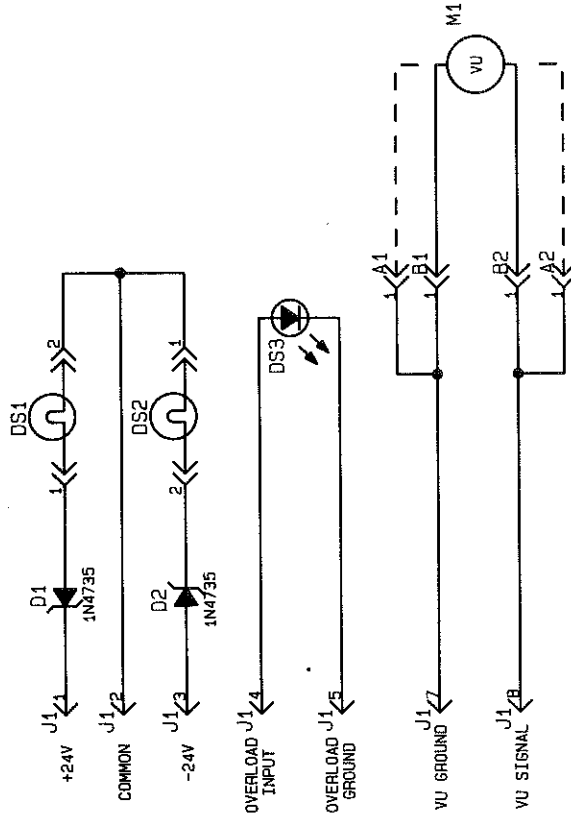


NOTE:

- CARD GUIDES P/N 407-0075 "QTY. 2", AND MOUNTING HARDWARE 420-6108 AND 423-6002 "QTY. 2 EACH", TO BE BAGGED SEPARATELY AND SENT TO STOCK WITH BOARD ASSEMBLY.

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	CHKD HE PROJ. ENGR.	FINISH	
TOLERANCE DECIMAL U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°	NEXT ASSY 901-9012 *12CH* 901-9018 *18CH*	TYPE A D SIZE DWS. NO. 911-0068	REV A
MODEL MT90		SCALE 1/1	SHEET 1 OF 1



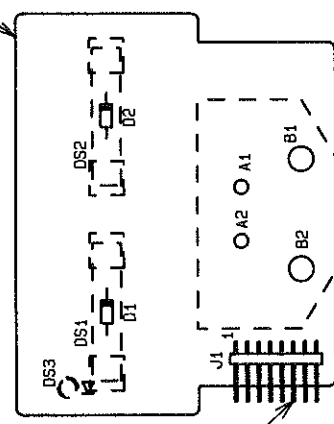
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BROADCAST ELECTRONICS, INC. 4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL 62305 217/224-9600 TELEX 250142 CABLE BROADCAST FAX 217/224-9607		TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°					

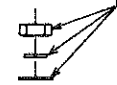
511-0044

511-0044 (REF)

319-0004



PIN 6 TO BE CUT FOR KEYING



FLAT WASHER
SPLIT WASHER
NUT TYP. 2 PLCS.
SUPPLIED WITH METER

NOTES:

1. DASHED COMPONENTS MOUNTED ON OPPOSITE SIDE SHOWN.
2. SEE SCHEMATIC SB 951-0044.

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PROPRIETARY RIGHTS are included in information disclosed herein. This information is confidential and its disclosure near the information disclosed herein shall be to other persons, or used or disclosed to others for manufacturing or for any other purpose except as specifically authorized by BROADCAST ELECTRONICS, INC.		DWN. BY JAH 11-13-89	MATERIAL SEE B/M 951-0044	TITLE VU METER PCB	TYPE A	SIZE B	DNG. NO. 951-0044	REV A
TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°		CHKD 11/14/89	FINISH SEE DNG BMS92-0000 NEXT ASSY.	ME 11/14/89	MODEL MT-90	SCALE 1=1	SHEET 1 OF 1	REV A
BROADCAST ELECTRONICS, INC. 4100 N. 24TH ST., P.O. BOX 3606 GAITHERSBURG, MD. 20878 TELEPHONE 301-224-9607 TELETYPE 301-224-9607		PROJ. ENGR. 11/14/89	SEE DNG BMS92-0000	VU METER PCB	MODEL MT-90	SCALE 1=1	SHEET 1 OF 1	REV A

APPENDIX

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Introduction

PAGE NO.

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SECTION V APPENDIX

5-1. INTRODUCTION.

5-2. This appendix provides technical data associated with the maintenance of the Broadcast Electronics Mix-Trak 90 audio consoles. The information contained in this appendix is presented in the following order.

- A. Technical Information, Signetics Dual DC Controlled Potentiometers, TDA1074A.
- B. Technical Information, SGS HI-FI Audio Power Amplifier, TDA2030.
- C. Technical Information, dbx 2150 Series Voltage-Controlled Amplifiers.
- D. Technical Information, VCA Associates Quad Transistor Array, MTA-401.
- E. Technical Information, Signetics Programmable Analog Compandor, NE572.

GENERAL DESCRIPTION

The TDA1074A is a monolithic integrated circuit designed for use as volume and tone control circuit in stereo amplifiers. This dual tandem potentiometer IC consists of two ganged pairs of electronic potentiometers with the eight inputs connected via impedance converters, and the four outputs driving individual operational amplifiers. The setting of each electronic potentiometer pair is controlled by an individual d.c. control voltage. The potentiometers operate by current division between the arms of cross-coupled long-tailed pairs. The current division factor is determined by the level and polarity of the d.c. control voltage with respect to an externally available reference level of half the supply voltage. Since the electronic potentiometers are adjusted by a d.c. control voltage, each pair can be controlled by single linear potentiometers which can be located in any position dictated by the equipment styling. Since the input and feedback impedances around the operational amplifier gain blocks are external, the TDA1074A can perform bass/treble and volume/loudness control. It also can be used as a low-level fader to control the sound distribution between the front and rear loudspeakers in car radio installations.

Features

- High impedance inputs to both 'ends' of each electronic potentiometer
- Ganged potentiometers track within 0.5 dB
- Electronic rejection of supply ripple
- Internally generated reference level available externally so that the control voltage can be made to swing positively and negatively around a well-defined 0 V level
- The operational amplifiers have push-pull outputs for wide voltage swing and low current consumption
- The operational amplifier outputs are current limited to provide output short-circuit protection
- Although designed to operate from a 20 V supply (giving a maximum input and output signal level of 6 V), the TDA1074A can work from a supply as low as 7.5 V with reduced input and output signal levels

QUICK REFERENCE DATA

Supply voltage (pin 11)	V_p	typ.	20 V
Supply current (pin 11)	I_p	typ.	22 mA
Input signal voltage (r.m.s. value)	$V_{i(rms)}$	max.	6 V
Output signal voltage (r.m.s. value)	$V_{o(rms)}$	max.	6 V
Total harmonic distortion	THD	typ.	0.05 %
Output noise voltage (r.m.s. value)	$V_{no(rms)}$	typ.	50 μ V
Control range	$\Delta\alpha$	typ.	110 dB
Cross-talk attenuation (L/R)	α_{ct}	typ.	80 dB
Ripple rejection (100 Hz)	α_{100}	typ.	46 dB
Tracking of ganged potentiometers	ΔG_v	typ.	0.5 dB

Supply voltage range	V_p		7.5 to 23 V
Operating ambient temperature range	T_{amb}		-30 to +80 °C

PACKAGE OUTLINE

18-lead DIL; plastic (SOT-102CS).

DC CONTROLLED DUAL POTENTIOMETERS

TDA1074A

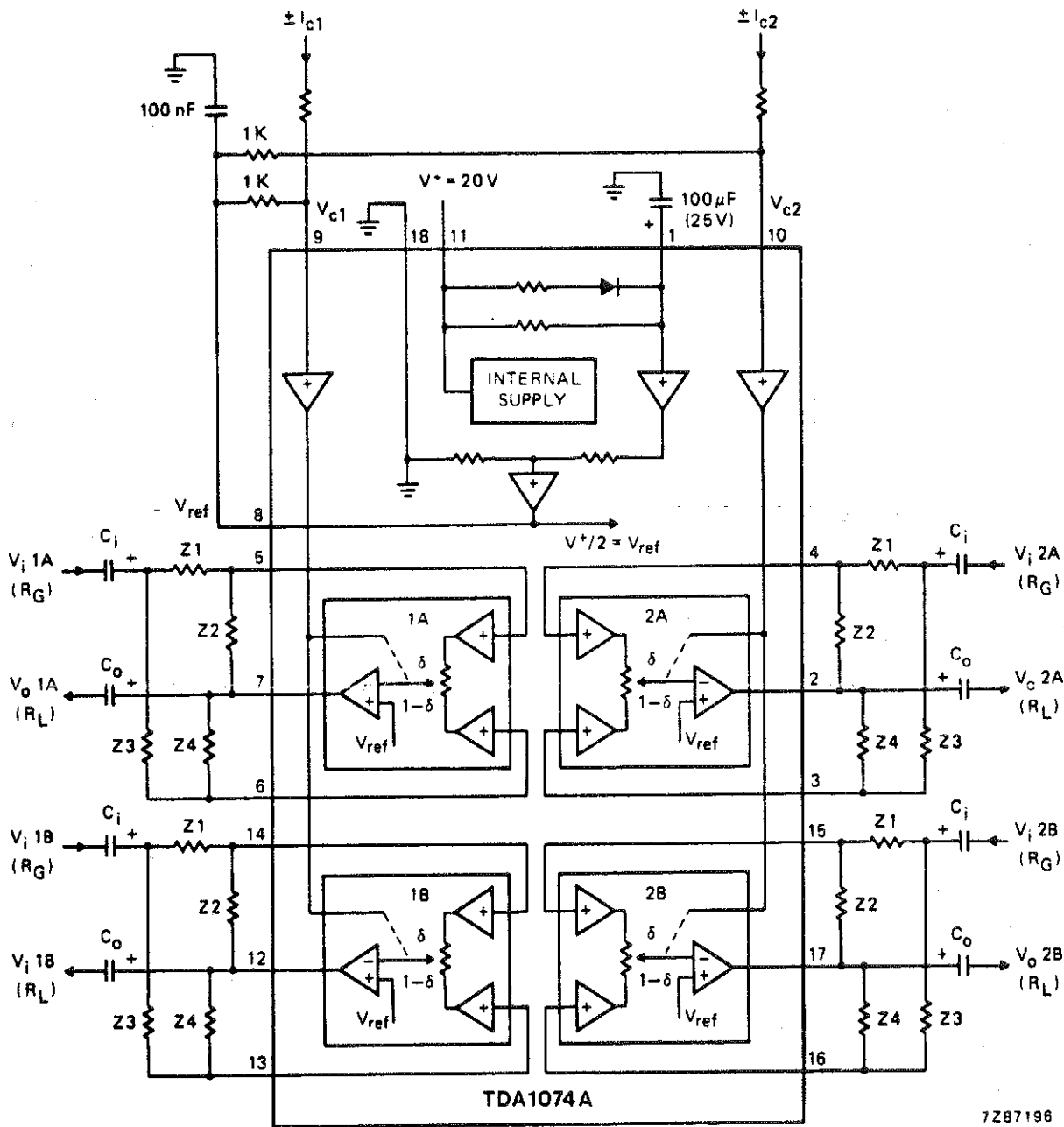


Fig. 1 Block diagram and basic external components; I_{c1} (at pin 9) and I_{c2} (at pin 10) are control input currents; V_{c1} (at pin 9) and V_{c2} (at pin 10) are control input voltages with respect to $V_{ref} = V_p/2$ at pin 8; $Z1 = Z2 = Z3 = Z4 = 22 \text{ k}\Omega$; the input generator resistance $R_G = 60 \Omega$; the output load resistance $R_L = 4.7 \text{ k}\Omega$; the coupling capacitors at the inputs and outputs are $C_i = 2,2 \mu\text{F}$ and $C_o = 10 \mu\text{F}$ respectively.



LINEAR INTEGRATED CIRCUITS

14W Hi-Fi AUDIO AMPLIFIER

The TDA 2030 is a monolithic integrated circuit in Pentawatt[®] package, intended for use as a low frequency class AB amplifier. Typically it provides 14W output power ($d = 0.5\%$) at $\pm 14V/4\Omega$; at $\pm 14V$ the guaranteed output power is 12W on a 4Ω load and 8W on a 8Ω (DIN 45500). The TDA 2030 provides high output current and has very low harmonic and cross-over distortion. Further the device incorporates an original (and patented) short circuit protection system comprising an arrangement for automatically limiting the dissipated power so as to keep the working point of the output transistors within their safe operating area. A conventional thermal shut-down system is also included.

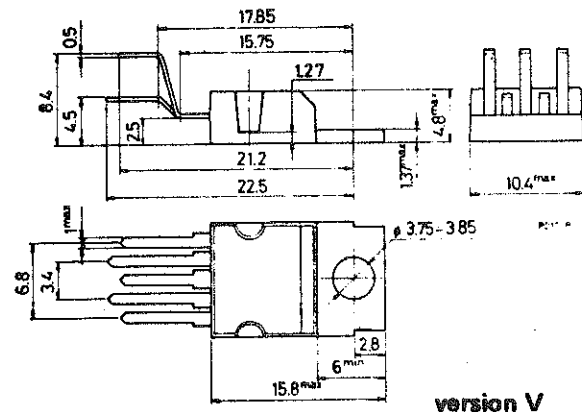
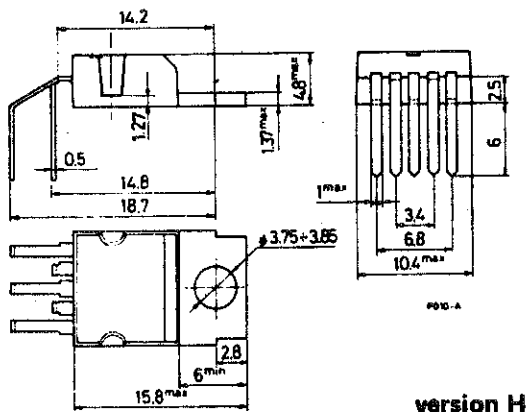
ABSOLUTE MAXIMUM RATINGS

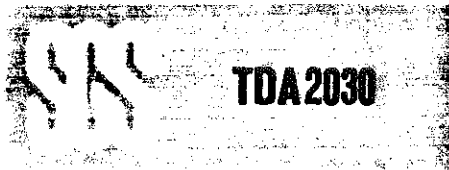
V_s	Supply voltage	± 18	V
V_i	Input voltage	V_s	
V_{i1}	Differential input voltage	± 15	V
I_o	Output peak current (internally limited)	3.5	A
P_{tot}	Power dissipation at $T_{case} = 90^\circ C$	20	W
T_{stg}, T_j	Storage and junction temperature	-40 to 150	$^\circ C$

ORDERING NUMBERS: TDA 2030 H; TDA 2030 V

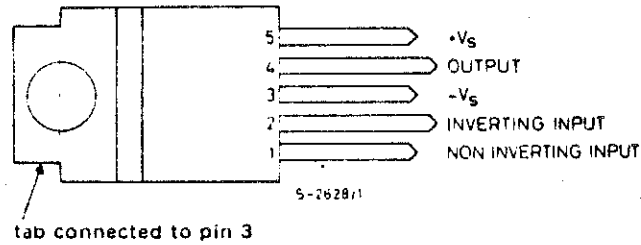
MECHANICAL DATA

Dimensions in mm

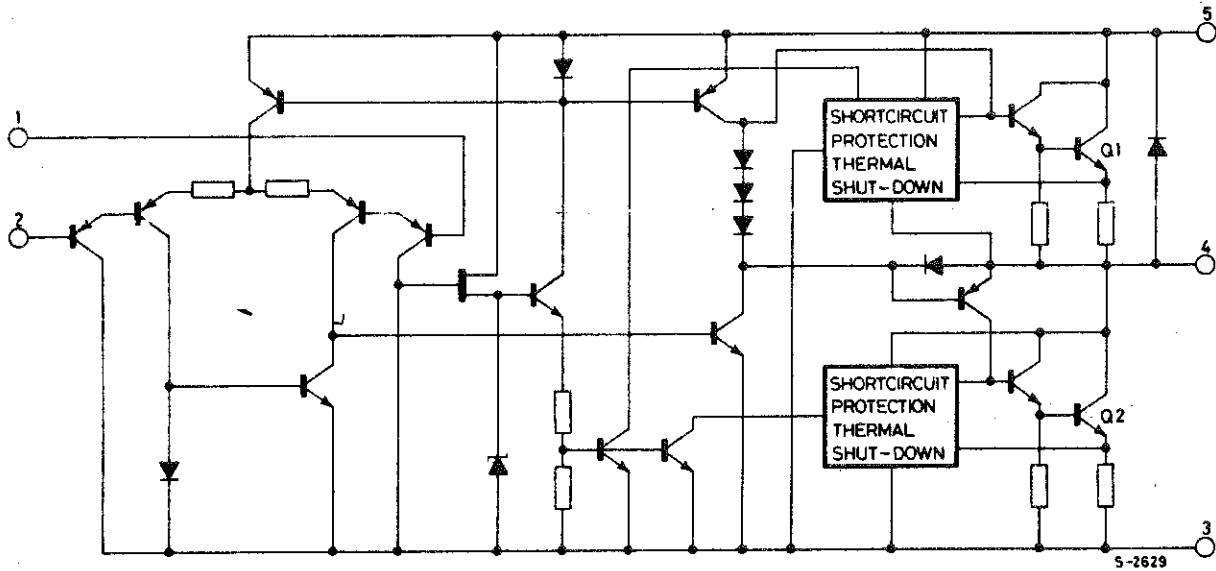




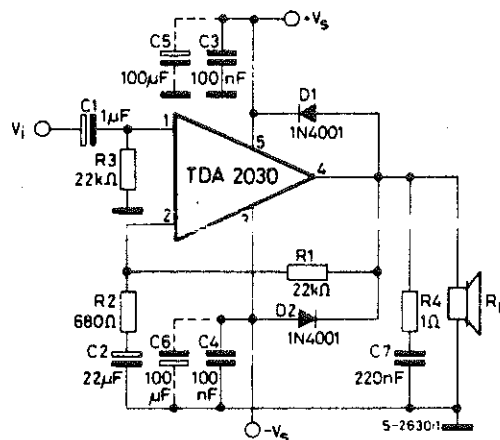
CONNECTION DIAGRAM
(top view)



SCHEMATIC DIAGRAM



TEST CIRCUIT



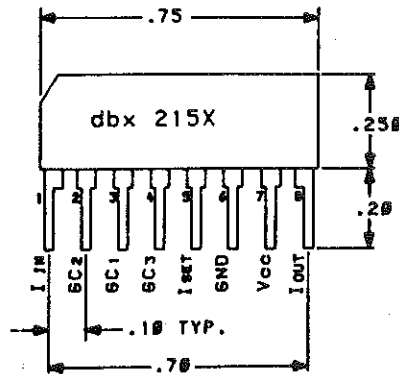
dbx 2150 SERIES VOLTAGE-CONTROLLED AMPLIFIERS

GENERAL DESCRIPTION

The dbx 2150 Series integrated-circuit, voltage-controlled amplifiers (VCAs) are high-performance, current-in/current-out devices with dual-polarity, voltage-sensitive control ports. They require little external support circuitry and are housed in a plastic 8-pin single-in-line (SIP) package, thereby affording unusually high PCB packing densities. Combining a high-gain-bandwidth product with low noise, low distortion, and low input-bias current, these devices offer performance similar to discrete or modular VCAs with the economy of ICs.

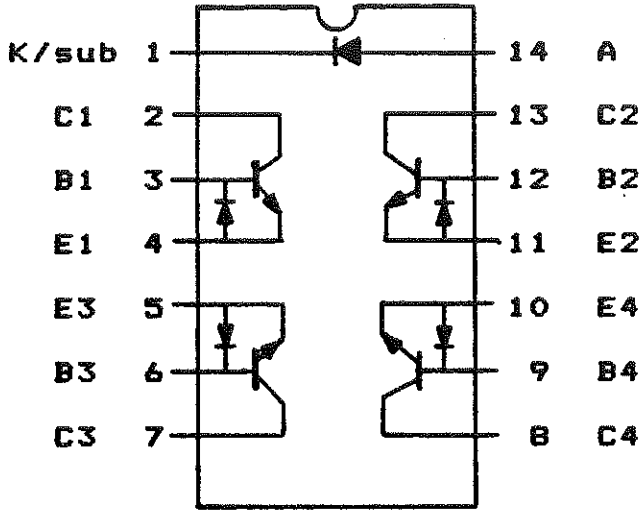
These VCAs may be used in VCF and VCO designs as well as in audio mixing console applications including voltage-controlled faders, voltage-controlled panners, voltage-controlled equalizers, and console automation systems.

PIN CONFIGURATION



VCA ASSOCIATES

7131 Owensmouth St. B-87
 Canoga Park, CA 91303
 Phone: (818) 704-9202
 TWX: 5106015809 VCA ASSOC



TOP VIEW

The MTA 401 SUPERMATCHED QUAD NPN array is a junction isolated, diode-protected, monolithic transistor array featuring extremely low noise, tight Hfe and Vbe matching and excellent log conformity over a very wide current range. A thermally tracking diode is also on the die.

PARAMETER	MIN	TYP	MAX	UNITS
Hfe	100	150	200	
VCBO	36			Volts
VCEO	50			Volts
Vsat		30		mV
Ft		210		MHz
En (Ic=1.5mA)				
at 1 kHz		0.65		nV/rt Hz
at 10 Hz		1.00		nV/rt Hz
HFE MATCH		<1		percent
VBE MATCH		<1		percent
Ft MATCH		<1		percent
Vsat MATCH		<1		percent
Log conformity		<1		percent

PROGRAMMABLE ANALOG COMPANDOR

NE572

DESCRIPTION

The NE572 is a dual channel, high performance gain control circuit in which either channel may be used for dynamic range compression or expansion. Each channel has a full wave rectifier to detect the average value of input signal; a linearized, temperature compensated variable gain cell (ΔG) and a dynamic time constant buffer. The buffer permits independent control of dynamic attack and recovery time with minimum external components and improved low frequency gain control ripple distortion over previous compandors.

The NE572 is intended for noise reduction in high performance audio systems. It can also be used in a wide range of communication systems and video recording applications.

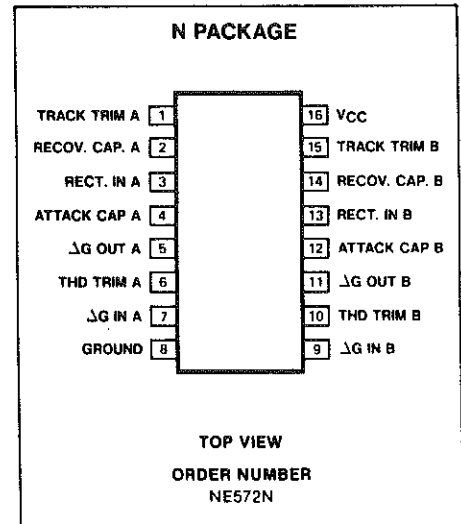
FEATURES

- Independent control of attack and recovery time.
- Improved low frequency gain control ripple
- Complementary gain compression and expansion with external Op Amp
- Wide dynamic range—greater than 110dB
- Temperature compensated gain control
- Low distortion gain cell
- Low noise— $6\mu V$ typical
- Wide supply voltage range—6V–22V
- System level adjustable with external components.

APPLICATIONS

- Dynamic noise reduction system
- Voltage control amplifier
- Stereo expander
- Automatic level control
- High level limiter
- Low level noise gate
- State variable filter

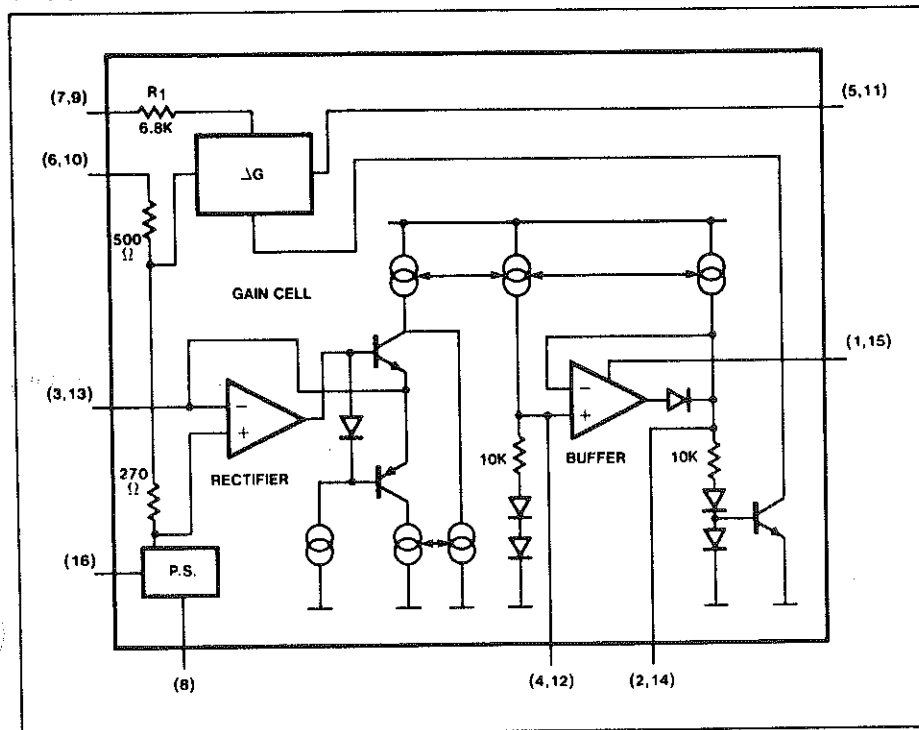
PIN CONFIGURATION



ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNIT
V _{CC} Supply voltage	22	VDC
T _A Operating temperature range	0 to 70	°C
P _D Power dissipation	500	mW

BLOCK DIAGRAM



LINE INPUT MODULE

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SECTION I

LINE INPUT MODULE THEORY OF OPERATION

1-1. INTRODUCTION.

1-2. The following text provides detailed theory of operation for the Mix-Trak 90 series audio console line input module. A detailed block diagram of the line input module circuitry is presented in Figure 1-1. Refer to Figure 1-1 as required for the following circuit discussion.

1-3. When applicable, the text describes the operation of module audio circuitry. The audio circuit left and right channels are identical, therefore only the left channel will be discussed.

1-4. FUNCTIONAL DESCRIPTION.

1-5. INPUT CIRCUIT.

1-6. The Mix-Trak 90 console line input modules are designed to process audio from two balanced stereophonic or monophonic line level audio sources. Audio is applied to the module circuitry through programmable attenuator networks. The networks accept resistors for the attenuation of audio source input levels. The attenuator networks are provided to equalize the input level when two sources at different levels are applied to the module. Audio from the attenuator networks is routed to an input selection and audio amplifier circuit.

1-7. **INPUT SELECTION.** Audio source input selection is accomplished by interlocked two-position switch/indicator S1A/B. The switch selects and routes audio for application to the module audio circuitry. Switch S1A/B also contains A/B input select status contacts. The contacts output A/B select status information for application to remote control assemblies. Audio from input select switch network S1 is applied through left channel gain control potentiometer R21 to a left channel input amplifier network. R21 provides approximately 10 dB of gain control adjustment to align the audio input levels.

1-8. **INPUT AMPLIFIER.** Left channel input amplification is provided by a programmable instrumentation amplifier. The instrumentation amplifier consists of integrated circuits U1A/B and U3A. The amplifier stage is designed to accept input levels ranging from +8 dBu to -10 dBu and will generate a nominal audio output level of approximately -5 dBu. The gain of the amplifier stage is established by jumper network J4. The network consists of five jumper programmable positions which establish the amplifier stage gain for the following audio input levels: 1) +8 dBu, 2) +4 dBu, 3) 0 dBu, 4) -5 dBu, and 5) -10 dBu. The output of the amplifier stage is routed for application to overload indicator and patch point circuitry.

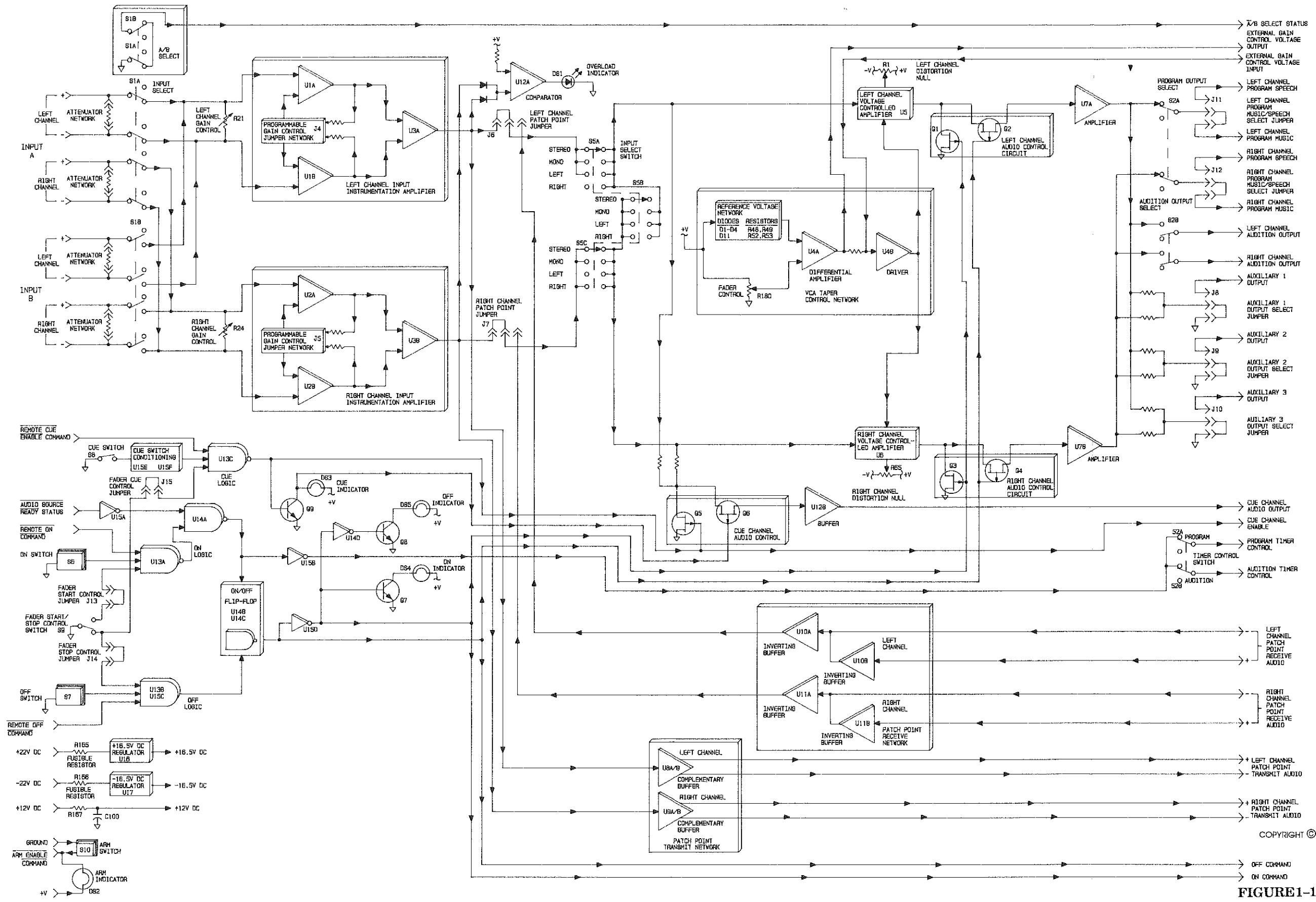
1-9. OVERLOAD INDICATOR CIRCUIT.

1-10. Samples from the left and right channel input instrumentation amplifiers are applied to overload indicator comparator U12A. When either the left or right channel level increases above approximately +20 dBu, the output of comparator U12A will go HIGH. Overload indicator DS1 will illuminate to indicate an excessive audio input level conditions.

1-11. PATCH POINT NETWORKS.

1-12. The line input module patch point networks consists of a transmitting stage, a receiving stage, and a jumper network. The patch point networks are incorporated into the module design to provide interfacing for the connection of external audio processing equipment.

- 1-13. Audio from the input instrumentation amplifier is applied to a patch point transmitting stage consisting of complementary buffers U8A/B and U9A/B. U8A/B and U9A/B produce balanced stereophonic audio at approximately -5 dBu for application to external audio processing equipment. The stage is configured for continuous operation to provide access to module audio without circuit board programming.
- 1-14. Audio from external audio processing equipment is applied to the patch point receiving stage. The receiving stage consists of a balanced two-stage inverting buffer network. Balanced left channel audio is applied to inverting buffers U10A/B. Positive audio is inverted at U10B and summed at the input of U10A to provide balanced-to-unbalanced audio conversion. The output of the stage is routed to left channel patch point jumper J6. J6 routes audio from either the input amplifier or the patch point receiving network to the audio level control circuit.
- 1-15. **AUDIO LEVEL CONTROL CIRCUIT.**
- 1-16. Audio from the input amplifier or the patch point receiving network is routed to the audio level control circuit. The audio level control circuit consists of: 1) a mono/stereo select switch, 2) a VCA taper control network, and 3) a VCA level control circuit. The entire control circuit functions to select and provide precision low-noise control of the module audio level.
- 1-17. **MONO/STEREO SELECT.** Mono/stereo select switch S5 is a rotary four-position switch designed to direct audio in a variable manner to a VCA level control circuit. The stereo position routes left channel audio to the VCA left channel circuit and right channel audio to the VCA right channel circuit. The mono position sums the left and right channel audio input information for application to both the VCA left and right channel circuitry. The left position routes left channel audio source information to the VCA left and right channel circuits. The right position routes right channel audio input information to the left and right channel VCA circuits.
- 1-18. **VCA TAPER CONTROL CIRCUIT.** Module audio level control operations are performed by two 2150A series VCA modules. The VCA modules are directed by a taper control circuit which establishes the module operating parameters. The VCA taper control network consists of: 1) slide-action fader control R180, 2) a reference voltage network consisting of diodes D1 through D4, diode D11 and resistors R48, R49, R52, and R53, 3) differential amplifier U4A, and 4) driver U4B.
- 1-19. The taper control circuit is designed to operate in response to changes in the output voltage from fader control R180. R180 is designed with a dc control range from 0 to 5 volts. A non-linear taper control circuit gain response is established by the reference voltage network. When the voltage from R180 is from 0 volts (+10 dB fader position) to approximately 0.40 volts (-5 dB fader position), the taper control circuit gain will be unity. A 0.40 volt (-5 dB fader position) to 2 volt (-30 dB fader position) output from R180 will result in a circuit gain of approximately 2. A 2 volt (-30 dB fader position) to 5 volt (-55 dB fader position) output from R180 will generate a taper control circuit gain of approximately 4. As a result of gain design, a -55 dB to +10 dB non-linear operating response is established for the VCA level control network.
- 1-20. The dc control voltage from the VCA taper control circuit is applied to the VCA modules for precision control of the module audio level. When fader control R180 is operated to the +10 dB position, a 0 volt dc reference is applied to differential amplifier U4A. U4A will output approximately 0 volts dc through driver U4B to the VCA modules to establish maximum audio level gain. When fader R180 is operated to the -55 dB position, a +5 volt dc reference is applied to amplifier U4A. U4A will output approximately 12 volts dc through U4B to establish minimum audio level gain.



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FIGURE 1-1.
LINE INPUT MODULE DETAILED BLOCK DIAGRAM

- 1-21. **External Gain Control.** An external gain control feature is incorporated into the taper driver circuit design for control of the module audio level by external equipment or additional input modules. DC control voltage from U4A is routed to control master/slave input module configurations or to control external audio equipment. An external gain control input routes control voltage to the taper control circuit for application to the VCA circuit.
- 1-22. **VCA CIRCUIT.** Audio from the input select switch network is applied to left channel voltage-controlled-amplifier (VCA) module U5. U5 is a 2150A series precision low-noise voltage-controlled-amplifier. The VCA is a current-input/current output device with a voltage sensitive control port. VCA U5 actively controls the left channel audio level as directed by the VCA taper control circuit. Potentiometer R1 is provided to null distortion at the VCA stage. Audio from VCA module U5 is routed through a series-shunt audio control circuit consisting of field-effect-transistors (FET) Q1 and Q2. The output of the control circuit is applied to amplifier U7A. U7A operates in association with VCA U5 to convert the current output of the VCA to a voltage. The output of U7A is routed for application to the output circuit.
- 1-23. **OUTPUT CIRCUIT.**
- 1-24. Audio from amplifier U7A is applied to an output circuit for distribution to the console output bus network. The console output bus network consists of three stereophonic and three monophonic output busses. Stereophonic busses include: 1) program speech, 2) program music, and 3) audition. Monophonic busses include: 1) auxiliary 1, 2) auxiliary 2, and 3) auxiliary 3. Each output bus is current-operated to provide maximum noise performance.
- 1-25. Output selection is accomplished by program/audition select switch S2A/B. Switch S2A is designed to route audio to left channel program music/speech select jumper J11. J11 assigns the audio to either the program speech bus or to the program music bus.
- 1-26. Audio from U7A is also applied to auxiliary 1 jumper J8, auxiliary 2 jumper J9, and auxiliary 3 jumper J10. The jumpers allow output audio to be assigned to the auxiliary 1, auxiliary 2, or auxiliary 3 output busses.
- 1-27. **CONTROL CIRCUIT.**
- 1-28. The line input module control circuit consists of individual CMOS logic gates. The gates are organized into functional circuits to provide module on/off control, cue circuit control, muting control, and status indicator control.
- 1-29. **ON/OFF CIRCUIT.** Line input module on/off control functions are accomplished by on switch/indicator S6 and off switch/indicator S7. S6 and S7 are hall-effect switches which exhibit reliable low-noise operation. Module on/off control functions may also be initiated by the operation of the fader control. Detent switch S9 is incorporated into the fader to provide on/off control commands. A LOW module on command is generated when the fader is operated from the off position. A LOW module off command is generated when the fader is operated to the off position. Fader start control jumper J13 and stop control jumper J14 enable or disable the control functions as required.
- 1-30. A module on sequence is initiated when a LOW control command is generated by: 1) on switch/indicator S6, 2) the remote on switch/indicator, or 3) fader switch S9. The LOW is applied to NAND gate U13A which outputs a HIGH to NAND gate U14A. U14A NANDs a HIGH from U13A and a HIGH from inverter U15A to produce a LOW for application to the on/off flip-flop and a timer control circuit.

- 1-31. The control circuit on/off flip-flop is constructed from NAND gates U14B and U14C. With a LOW command from U14A, the output of the on/off flip-flop will go LOW. The LOW is routed through inverter U15D to produce complementary HIGH/LOW commands for application to left and right channel audio control networks. The commands configure the networks for audio output routing operations. A HIGH command from inverter U15D is also applied to an indicator circuit consisting of inverter U14D, driver transistors Q7 and Q8, on indicator DS4, and off indicator DS5. The HIGH: 1) biases driver transistor Q7 on to illuminate module on indicator DS4 and 2) biases driver transistor Q8 off to extinguish off indicator DS5.
- 1-32. A module off sequence is initiated when a LOW control command is generated by: 1) off switch/indicator S7, 2) the remote off switch/indicator, or 3) fader switch S9. The LOW is applied to off logic U13B and U15C. The output of U13B/U15C will go LOW and reset on/off flip-flop U14B/C. The output of on/off flip-flop U14B/C will go HIGH. The HIGH is routed through inverter U15D to generate complementary HIGH/LOW commands to configure the audio control circuitry to mute the output audio. A LOW command from inverter U15D is also applied to: 1) bias transistor Q7 off to extinguish on indicator DS4 and 2) bias transistor Q8 on to illuminate off indicator DS5.
- 1-33. **CUE CIRCUIT.**
- 1-34. The line input module cue circuit consists of an on/off logic circuit and an audio control network. Audio for application to the console cue channel is routed from input select switch S5 to a cue channel control circuit consisting of field-effect-transistors (FET) Q5 and Q6. The audio control circuit is directed by a logic network consisting of cue switch S8, a switch conditioning circuit, and cue on/off gate U13C.
- 1-35. Audio is applied to the console cue channel when a LOW control command is generated by cue switch S8 or the remote cue switch. When a cue on command is generated by S8, the command is applied through a contact conditioning circuit consisting of inverters U15E/F. A console cue command may also be initiated by fader control switch S9. Jumper J15 allows the fader cue feature to be disabled.
- 1-36. With a cue switch activated, a LOW cue control command is applied to NAND gate U13C. The output U13C will go HIGH. The HIGH will bias driver transistor Q9 on to generate a LOW control command and to illuminate cue indicator DS3. The LOW from Q9 and the HIGH from U13C provide complementary control signals for application to a series-shunt audio control circuit consisting transistors Q5 and Q6. The HIGH biases Q5 off and the LOW biases Q6 on to enable cue audio. The audio is routed through buffer U12B for application to the console cue speaker.
- 1-37. **OUTPUT AUDIO CONTROL CIRCUIT.**
- 1-38. Control of the line input module output audio is provided by left and right channel series-shunt field-effect-transistor (FET) control circuits. The left channel circuit consists of transistors Q1 and Q2. The transistors are controlled by complementary commands from on/off flip-flop U14B/C. When the module is operated to on, complementary HIGH/LOW control commands are applied to transistors Q1 and Q2. A HIGH biases Q1 off and a LOW biases Q2 on to enable the left channel program audio.
- 1-39. **ARM CIRCUIT.**
- 1-40. Audio source sequencing operations are initiated by the arm circuit. The arm circuit consists of switch S10 and indicator DS2. When audio source sequencing is required, a LOW arm enable command is routed from switch S10 for application to control circuitry on a source remote control module and to illuminate indicator DS2.

1-41. **TIMER CONTROL CIRCUIT.**

1-42. Control commands for application to the console clock/timer module are generated by the contacts of switch S2. A HIGH on command from inverter U15B is applied to program/audition output select switch S2. S2 will route a HIGH control command to the clock/timer module program or audition control line as required for the selected output buss.

1-43. **POWER SUPPLY CIRCUIT.**

1-44. DC operating potentials for application to the line input module components are produced by a regulator network. Unregulated ± 24 volt supplies from the console power supply module are applied through fusible resistors R165 and R166 to a regulator network consisting of U16 and U17. R165/R166 are carbon-composition resistors which function as fusible links in the event of a short-circuit potential on the module. The fusible resistors limit a power supply failure to the module and prevent a failure in the entire console system.

1-45. ± 24 V dc supplies from the console power supply module are applied to +16.5 volt dc regulator U16 and -16.5 volt dc regulator U17. U16/U17 are three terminal adjustable regulators containing internal thermal and short-circuit current limiting features. The regulated ± 16.5 volt outputs from U16 and U17 are routed for application to the module audio components.

1-46. A regulated +12 volt supply is applied through an RC filter network consisting of resistor R167 and capacitor C100. The output of the filter network is routed for application to the module control logic components.

SECTION II

LINE INPUT MODULE MAINTENANCE

2-1. INTRODUCTION.

2-2. This section provides general maintenance information, electrical adjustment procedures, and troubleshooting information for the line input module.

2-3. FIRST LEVEL MAINTENANCE.

2-4. First level maintenance consists of precautionary procedures applied to the equipment to prevent future failures. The procedures are performed on a regular basis and the results recorded in a performance log.

2-5. GENERAL.

2-6. The line input module circuitry should be periodically cleaned of accumulated dust using a nylon-bristle brush and vacuum cleaner. Inspect the module for improperly seated semi-conductors and components damaged by overheating.

2-7. AUDIO SWITCHES.

2-8. Each line input module is equipped with ITT Shadow audio switches. The switches are sealed for low-noise long-life operation and do not permit cleaning. If a switch becomes noisy or defective, the switch will require replacement.

2-9. FADER CONTROL.

2-10. Each line input module is equipped with a Penny and Giles slide-action fader control. If a fader control becomes defective, the control may require: 1) cleaning or 2) replacement of the control shaft bushings.

2-11. To clean the slide-action fader, remove the fader from the line input module assembly. Remove the fader end-caps and slide the fader assembly out of the aluminum housing. Using distilled water and a cotton swab, remove all dust and dirt from the fader circuit board area. Re-assemble the fader control and replace the fader assembly in the module.

2-12. To replace the fader shaft bushings, replacement parts and a recommended procedure must be obtained from Penny and Giles Inc. Contact Penny and Giles at the address shown below for the replacement bushings and the installation instructions.

Penny and Giles
2716 Ocean Park Blvd.
Suite 1005
Santa Monica, California 90405

2-13. SECOND LEVEL MAINTENANCE.

2-14. Second level maintenance consists of procedures required to restore a line input module to operation after a fault has occurred. The procedures are divided into electrical adjustments, troubleshooting, and component replacement procedures.

2-15. ELECTRICAL ADJUSTMENTS.

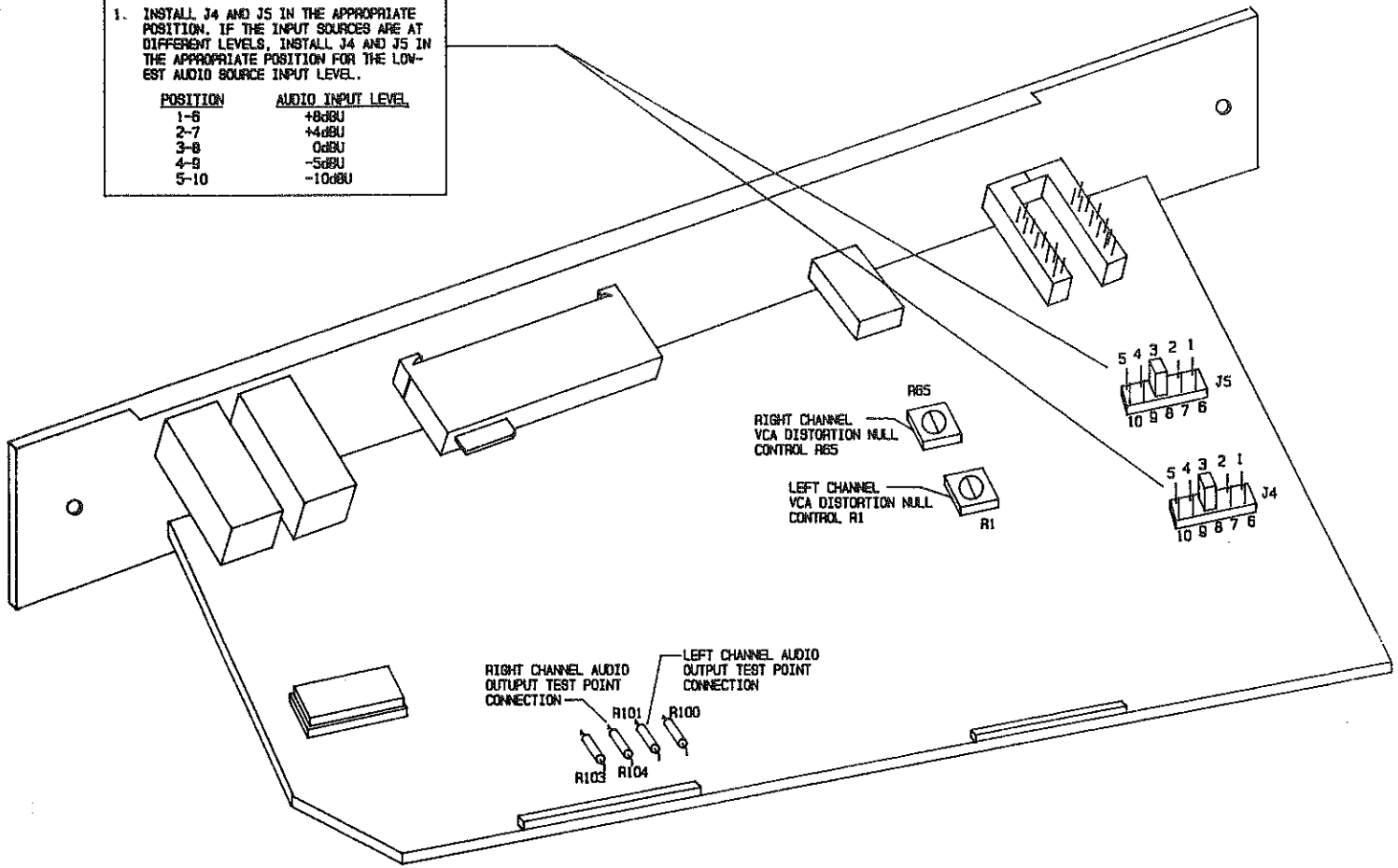
2-16. **VCA DISTORTION ADJUSTMENT.** Left channel VCA distortion control R1 and right channel VCA distortion control R65 null distortion at the VCA modules. Distortion adjustment is not required unless VCA modules U5 or U6 are replaced. The VCA distortion is nulled as follows.

- 2-17. **Required Equipment.** The following test equipment is required to null the VCA distortion.
- A. Allen Wrench (supplied with the console).
 - B. Non-Metallic Adjustment Tool.
 - C. Extender Ribbon Cable Assemblies:
 - 40-Pin Assembly
 - 50-Pin Assembly
 - D. Audio Signal Generator (Potomac AG-51 or equivalent).
 - E. Audio Analyzer – Capable of indicating distortion levels from 0.05% to 0.1% (Sound Technology 1710A Distortion Analyzer or equivalent).
- 2-18. **Procedure.** To null the VCA distortion, proceed as follows:
- 2-19. Remove the line input module from the mainframe and connect the extender cable assemblies between the line input module and the receptacles on the mainframe input motherboard assemblies.
- 2-20. Connect the audio signal generator to the A or B left channel input on the line input module associated input/remote connector.
- 2-21. Refer to Figure 2-1 and connect the audio analyzer between chassis ground and resistor R101 as shown.
- 2-22. Refer to Figure 2-1 and install jumpers J4 and J5 in the 0 dBu position.
- 2-23. Adjust the audio generator for a 1 kHz output at 0 dBu.
- 2-24. Operate the line input module at a normal level and route the test audio to the audition output bus.
- 2-25. Refer to Figure 2-1 and adjust left channel VCA distortion null control R1 for a minimum audio analyzer indication.
- 2-26. Repeat the procedure for the right channel. Connect the audio analyzer to resistor R104 and adjust the right channel distortion with right channel VCA distortion null control R65.
- 2-27. Disconnect all test equipment, reprogram jumpers J4 and J5 if required, and replace the line input module.
- 2-28. **TROUBLESHOOTING.**
- 2-29. The troubleshooting philosophy for the line input module consists of isolating a problem to a specific circuit or group of components. Two 40-pin and one 50-pin extender ribbon cable assemblies are provided to interface plug-in modular assemblies to the chassis mounted motherboards for troubleshooting procedures. To prevent the application of inadvertent audio noise to the console audio system, attach the 50-pin extender assembly to the module before the 40-pin assembly.
- 2-30. Figures 2-2 through 2-4 present the line input module troubleshooting. Refer to Figures 2-2 through 2-4 to isolate a failure to a specific group of components.
- 2-31. Once trouble is isolated and power is totally deenergized, refer to the schematic diagrams and the theory of operation to assist in problem resolution. The defective component may be repaired locally or the entire module may be returned to Broadcast Electronics for repair or replacement.
- 2-32. **COMPONENT REPLACEMENT.**
- 2-33. Component replacement procedures for the console modular assemblies are presented in SECTION II MAINTENANCE. Refer to SECTION II as required for the replacement procedures.

LEFT CHANNEL INPUT AMPLIFIER GAIN JUMPER J4 AND RIGHT CHANNEL INPUT AMPLIFIER GAIN JUMPER J5:

1. INSTALL J4 AND J5 IN THE APPROPRIATE POSITION. IF THE INPUT SOURCES ARE AT DIFFERENT LEVELS, INSTALL J4 AND J5 IN THE APPROPRIATE POSITION FOR THE LOWEST AUDIO SOURCE INPUT LEVEL.

POSITION	AUDIO INPUT LEVEL
1-6	+8dBu
2-7	+4dBu
3-8	0dBu
4-9	-5dBu
5-10	-10dBu



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FIGURE 2-1. LINE INPUT MODULE ADJUSTMENT CONTROLS

LINE INPUT MODULE GENERAL TROUBLESHOOTING.	
NUMBER	PROCEDURES
1	MEASURE THE VOLTAGE AT U16 PIN 2. THE VOLTAGE MUST BE +16.5VDC.
2	MEASURE THE VOLTAGE AT U17 PIN 3. THE VOLTAGE MUST BE -16.5VDC.
3	MEASURE THE VOLTAGE ACROSS R165. THE VOLTAGE MUST BE LESS THAN 1 VOLT DC.
4	MEASURE THE VOLTAGE ACROSS R166. THE VOLTAGE MUST BE LESS THAN 1 VOLT DC.
5	MEASURE THE VOLTAGE AT U14 PIN. THE VOLTAGE MUST BE GREATER THAN 10 VOLTS DC.
6	MEASURE THE VOLTAGE ACROSS R167. THE VOLTAGE MUST BE GREATER THAN 1 VOLT DC.
7	CHECK U13,U14,AND U15 FOR OVER-TEMPERATURE CONDITIONS.

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FIGURE 2-2. LINE INPUT MODULE GENERAL TROUBLESHOOTING

LINE INPUT MODULE CONTROL LOGIC TROUBLESHOOTING	
SYMPTOM	SOLUTION
NO LOCAL MODULE ON/OFF CONTROL	1. DEFECTIVE S6 OR S7
NO REMOTE MODULE ON/OFF CONTROL	1. REFER TO SIMPLE REMOTE CONTROL MODULE TROUBLESHOOTING.
NO MODULE ON/OFF CONTROL WITH FADER	1. DEFECTIVE FADER SWITCH S9.
NO LOCAL AND NO REMOTE ON/OFF CONTROL	1. DEFECTIVE U13,U14,OR U15.
NO CUE OPERATION	1. CHECK CUE SWITCH S8. 2. CHECK FADER SWITCH S9. 3. DEFECTIVE U13 OR U15.

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FIGURE 2-3. LINE INPUT MODULE CONTROL LOGIC TROUBLESHOOTING

LINE INPUT MODULE AUDIO TROUBLESHOOTING	
SYMPTOM	SOLUTION
MISSING OR DISTORTED AUDIO OUTPUT	<p>ACTIVATE THE B AUDIO SOURCE AND OPERATE THE MODULE. IS NORMAL OUTPUT AUDIO PRESENT?</p> <p>NO YES</p> <p>IS AUDIO PRESENT AT U8 PINS 1 AND 7 AND U9 PINS 1 AND 7? 1. DEFECTIVE S1. 2. DEFECTIVE AUDIO SOURCE.</p> <p>NO YES</p> <p>1. NO LEFT CHANNEL AUDIO: DEFECTIVE U1,U3,OR U8. 2. NO RIGHT CHANNEL AUDIO: DEFECTIVE U2,U3,OR U9. 3. NO LEFT CHANNEL AND NO RIGHT CHANNEL AUDIO: DEFECTIVE U1,U2,U3,U8,OR U9. IS AUDIO PRESENT AT CAPACITOR C81 AND C93?</p> <p>NO YES</p> <p>DEFECTIVE S5 OPERATE THE FADER TO THE 0dB POSITION. IS 0.00VDC PRESENT AT U5 AND U6 PIN 3?</p> <p>NO YES</p> <p>1. DEFECTIVE U4. 2. DEFECTIVE FADER R180. OPERATE THE FADER TO THE +12dB POSITION. IS -0.072VDC PRESENT AT U5 AND U6 PIN 3?</p> <p>NO YES</p> <p>1. DEFECTIVE U4 OR D11. 2. DEFECTIVE FADER R180. OPERATE FADER TO THE OFF POSITION. IS +0.4VDC PRESENT AT U5 AND U6 PIN 3?</p> <p>NO YES</p> <p>1. DEFECTIVE U4 OR D11. 2. DEFECTIVE FADER R180. DEFECTIVE U5,U6,Q1,Q2,Q3,Q4,OR U7.</p>
FADER NOT CONTROLLING CHANNEL LEVEL	<p>OPERATE THE FADER TO THE +12dB POSITION. IS 0.00VDC PRESENT AT U4 PIN 3? OPERATE THE FADER TO THE OFF POSITION. IS +5.1VDC PRESENT AT U4 PIN 3?</p> <p>NO YES</p> <p>1. CHECK E11,E12,AND E13 2. DEFECTIVE FADER CONTROL R180. 1. DEFECTIVE U4,D11,OR D1 THROUGH D4. 2. CHECK EXTERNAL GAIN CONTROL INPUT AT P1 PIN 15 FOR 0.0VDC.</p>
NO CUE AUDIO OUTPUT	<p>1. CHECK CUE SWITCH S8. 2. CHECK Q5,Q6,AND U12. 3. CHECK U13 AND U15.</p>
NO PATCH POINT OPERATION	<p>1. DEFECTIVE U10 AND U11.</p>

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FIGURE 2-4. LINE INPUT MODULE AUDIO TROUBLESHOOTING

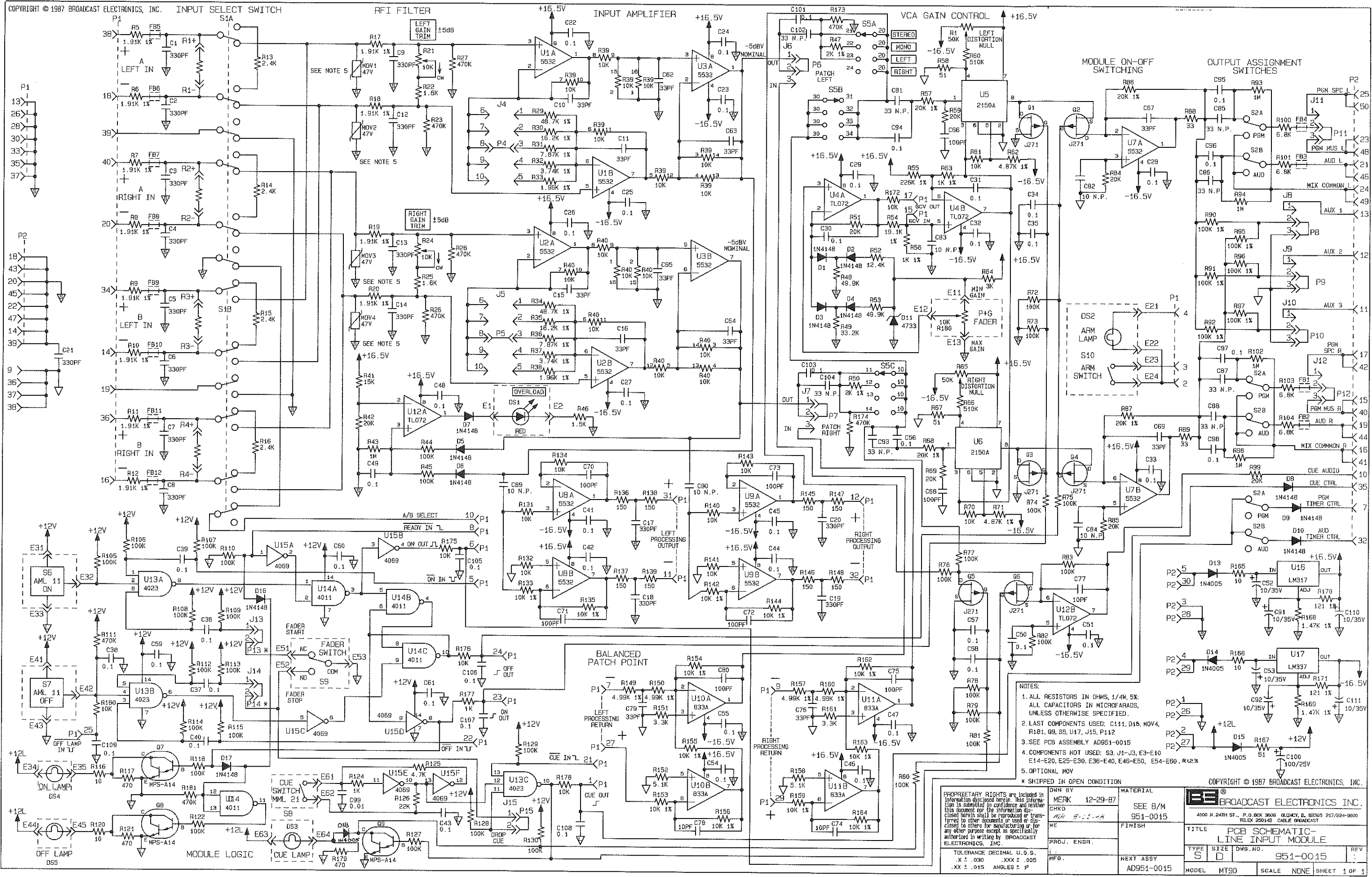
SECTION III

LINE INPUT MODULE DRAWINGS

3-1. INTRODUCTION.

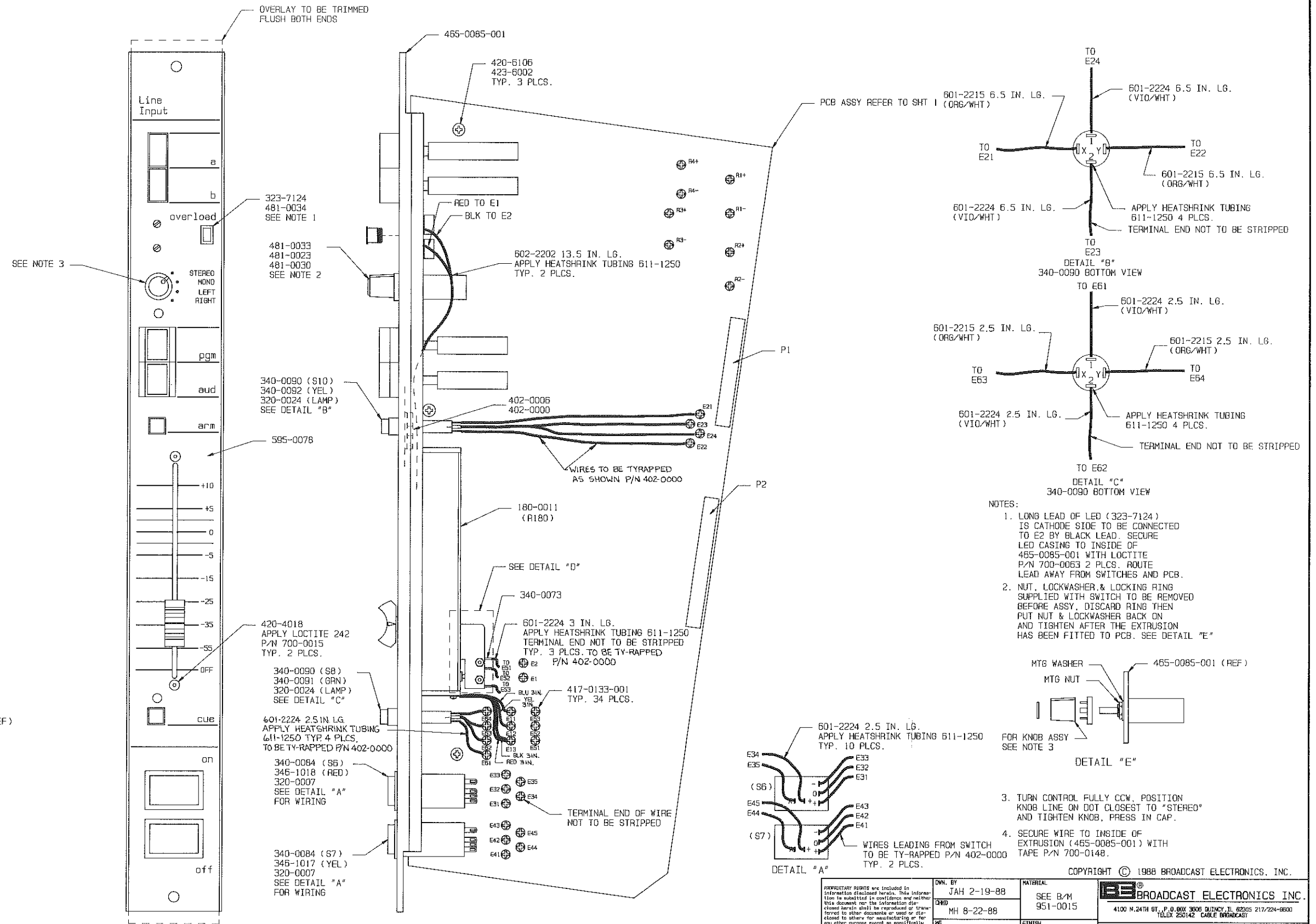
3-2. This section provides assembly drawings and schematic diagrams as listed below for the line input module.

FIGURE	TITLE	NUMBER
3-1	SCHEMATIC DIAGRAM, LINE INPUT MODULE	SD951-0015
3-2	ASSEMBLY DIAGRAM, LINE INPUT MODULE	AD951-0015



- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5%; ALL CAPACITORS IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENTS USED: C111, D18, MOV4, R101, 09, S5, U17, J15, P112
 3. SEE PCB ASSEMBLY AD951-0015
 4. COMPONENTS NOT USED: S3, U1-J3, E3-E10, E14-E20, E25-E30, E36-E40, E46-E50, E54-E60, R123
 5. OPTIONAL MOV
- * SHIPPED IN OPEN CONDITION

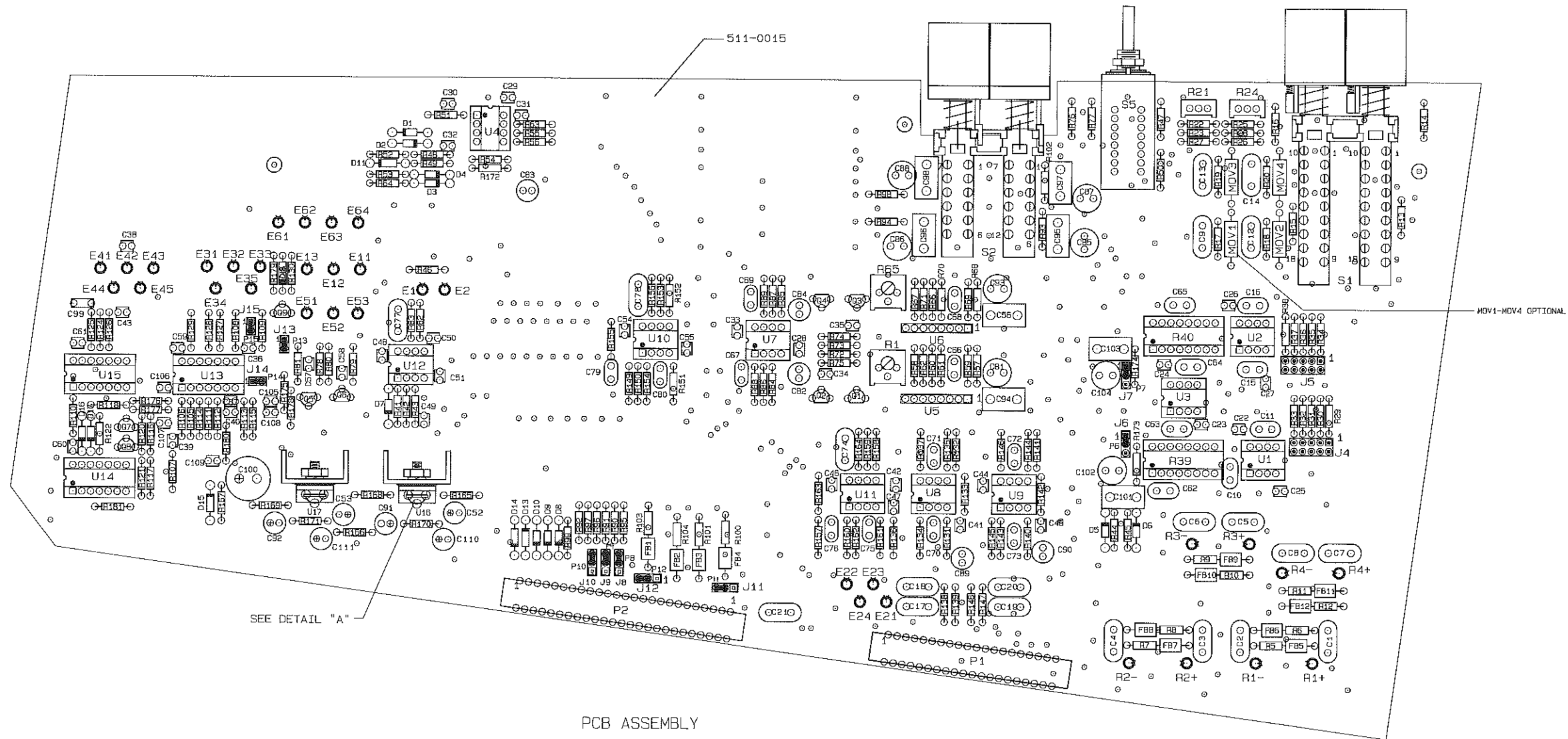
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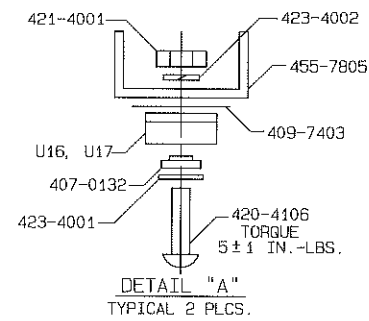
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	CHKD MH 8-22-88	FINISH SEE DWG BROADCAST-0000	
	DESIGNED BY JHS 8-22-88	NEXT ASSY. 301-5012 (12CH) 801-8018 (18CH)	
	PRST. ENGR. RMD 8-22-88	DATE PRB 8-22-88	
TOLERANCE (DECIMAL) U.O.B. .x ± .030 .xx ± .015	ANGLES ± 1°	TYPE A D	DWG. NO. 951-0015
MODEL MIX TRAK 90			SCALE 1/1
SHEET 2 OF 2			REV



PCB ASSEMBLY



- NOTE:
- SEE SCHEMATIC SD951-0015
 - REFER TO PAGE 2 FOR MODULE ASSEMBLY
 - INDICATES SLOT IN BARREL TERMINAL.

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	CHKD ME 8-22-88	FINISH	
	ME 9-1-88	TITLE LINE INPUT MODULE	
	PAQUJ. ENGR. MFG.	TYPE A D	
TOLERANCE DECIMAL U.S.S. .X ± .030 .XX ± .005 .XX ± .015 ANGLES ± P	NEXT ASSY 901-9012 *12CH* 901-9018 *18CH*	DWG. NO. 951-0015	R/FV ©
MODEL MT90		SCALE 1.5/1	SHEET 1 OF 2

SECTION IV

LINE INPUT MODULE PARTS LIST

4-1. INTRODUCTION.

4-2. This section provides descriptions and part numbers of electrical components and assemblies required for maintenance of the line input module. Each table entry in this section is indexed by reference designators appearing on the applicable schematic diagram.

TABLE 4-1. LINE INPUT MODULE PARTS LIST INDEX

TABLE	TITLE	PART NO.	PAGE
4-2	LINE INPUT MODULE CIRCUIT BOARD ASSEMBLY	951-0015	4-1

TABLE 4-2. LINE INPUT MODULE CIRCUIT BOARD ASSEMBLY - 951-0015
(Sheet 1 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1 THRU C9	Capacitor, Mica, 330 pF $\pm 5\%$, 500V	042-3322	9
C10,C11	Capacitor, Mica, 33 pF $\pm 5\%$, 500V	042-3312	2
C12,C13,C14	Capacitor, Mica, 330 pF $\pm 5\%$, 500V	042-3322	3
C15,C16	Capacitor, Mica, 33 pF $\pm 5\%$, 500V	042-3312	2
C17 THRU C21	Capacitor, Mica, 330 pF $\pm 5\%$, 500V	042-3322	3
C22 THRU C51	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	30
C52,C53	Capacitor, Electrolytic, 10 uF, 35V	023-1076	2
C54,C55	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	2
C56	Capacitor, Mylar Film, 0.1 uF $\pm 10\%$, 100V	030-1053	1
C57 THRU C61	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	5
C62 THRU C65	Capacitor, Mica, 33 pF $\pm 5\%$, 500V	042-3312	4
C66	Capacitor, Silvered Mica, 100 pF $\pm 5\%$, 500V	040-1022	1
C67	Capacitor, Mica, 33 pF $\pm 5\%$, 500V	042-3312	1
C68	Capacitor, Silvered Mica, 100 pF $\pm 5\%$, 500V	040-1022	1
C69	Capacitor, Mica, 33 pF $\pm 5\%$, 500V	042-3312	1
C70 THRU C73	Capacitor, Silvered Mica, 100 pF $\pm 5\%$, 500V	040-1022	4
C74	Capacitor, Mica, 10 pF $\pm 5\%$, 500V	042-1012	1

TABLE 4-2. LINE INPUT MODULE CIRCUIT BOARD ASSEMBLY - 951-0015
(Sheet 2 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C75	Capacitor, Silvered Mica, 100 pF \pm 5%, 500V	040-1022	1
C76	Capacitor, Mica, 33 pF \pm 5%, 500V	042-3312	1
C77,C78	Capacitor, Mica, 10 pF \pm 5%, 500V	042-1012	2
C79	Capacitor, Mica, 33 pF \pm 5%, 500V	042-3312	1
C80	Capacitor, Silvered Mica, 100 pF \pm 5%, 500V	040-1022	1
C81	Capacitor, Electrolytic, 33 uF, 25V	020-3374	1
C82,C83,C84	Capacitor, Electrolytic, 10 uF, 35V	023-1075	3
C85 THRU C88	Capacitor, Electrolytic, 33 uF, 25V	020-3374	4
C89,C90	Capacitor, Electrolytic, 10 uF, 35V	023-1075	2
C91,C92	Capacitor, Electrolytic, 10 uF, 35V	023-1076	2
C93	Capacitor, Electrolytic, 33 uF, 25V	020-3374	1
C94 THRU C98	Capacitor, Mylar Film, 0.1 uF \pm 10%, 100V	030-1053	5
C99	Capacitor, Mylar Film, 0.01 uF \pm 10%, 100V	031-1043	1
C100	Capacitor, Electrolytic, 100 uF, 35V	023-1084	1
C101	Capacitor, Mylar Film, 0.1 uF \pm 10%, 100V	030-1053	1
C102	Capacitor, Electrolytic, 33 uF, 25V	020-3374	1
C103	Capacitor, Mylar Film, 0.1 uF \pm 10%, 100V	030-1053	1
C104	Capacitor, Electrolytic, 33 uF, 25V	020-3374	1
C105 THRU C109	Capacitor, Monolythic Ceramic, 0.1 uF \pm 20%, 50V	003-1054	5
C110,C111	Capacitor, Electrolytic, 10 uF, 35V	023-1076	2
D1 THRU D10	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	10
D11	Diode, Zener, 1N4733A, 5.1V \pm 5%, 1W	200-4733	1
D13,D14,D15,	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	4
D16,D17	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	2
D18	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	1
DS1	LED, Red, MV57124, 3V @ 20 mA Maximum	323-7124	1
DS2,DS3	Lamp, 11-903-1, 12V, 0.7W, T-1 Bi-Pin	320-0024	2
DS4,DS5	Lamp, No. 73, 14V, 0.08A, T-1 3/4 Bulb, Wedge Base	320-0007	2
E1,E2,E11, E12,E13,E21 THRU E24,E31 THRU E35,E41 THRU E45,E51, E52,E53,E61 THRU E64	Terminal, Barrel, 4 Amperes	417-0133	26
FB1 THRU FB12	Ferrite Beads	360-0001	12
J4,J5	Receptacle, Male, 13-Pin Dual In-line	417-2600	2
J6 THRU J12	Receptacle, Male, 3-Pin In-line	417-0003	7
J13,J14,J15	Receptacle, Male, 2-Pin In-line	417-4004	3
MOV1 THRU MOV4	Metal Oxide Varistor, V47MA2A, 27V ac RMS, 0.19 Joules	140-0017	4
P1	Receptacle, 40-Pin Dual In-line	417-4041	1
P2	Receptacle, 50-Pin Dual In-line	417-0147	1
P4 THRU P15	Jumper, Programmable, 2-Pin	340-0004	12
Q1 THRU Q6	Field Effect Transistor, J271, P-Channel JFET, TO-92 Case	210-0271	6
Q7,Q8,Q9	Transistor, MPS-A14, Silicon, NPN, Darlington, TO-92 Case	211-0014	3
R1	Potentiometer, 50 k Ohm \pm 10%, 1/2W	177-5054	1
R5 THRU R12	Resistor, 1.91 k Ohm \pm 1%, 1/4W	103-1914	8
R13 THRU R16	Resistor, 2.4 k Ohm \pm 5%, 1/4W	100-2443	4

TABLE 4-2. LINE INPUT MODULE CIRCUIT BOARD ASSEMBLY - 951-0015
(Sheet 3 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R17 THRU R20	Resistor, 1.91 k Ohm $\pm 1\%$, 1/4W	103-1914	4
R21	Potentiometer, 10 k Ohm $\pm 10\%$, 1/2W	178-1054	1
R22	Resistor, 1.6 k Ohm $\pm 5\%$, 1/4W	100-1643	1
R23	Resistor, 470 k Ohm $\pm 5\%$, 1/4W	100-4763	1
R24	Potentiometer, 10 k Ohm $\pm 10\%$, 1/2W	178-1054	1
R25	Resistor, 1.6 k Ohm $\pm 5\%$, 1/4W	100-1643	1
R26,R27,R28	Resistor, 470 k Ohm $\pm 5\%$, 1/4W	100-4763	3
R29	Resistor, 48.7 k Ohm $\pm 1\%$, 1/4W	103-4875	1
R30	Resistor, 16.2 k Ohm $\pm 1\%$, 1/4W	103-1625	1
R31	Resistor, 7.87 k Ohm $\pm 1\%$, 1/4W	103-7874	1
R32	Resistor, 3.74 k Ohm $\pm 1\%$, 1/4W	103-3744	1
R33	Resistor, 1.96 k Ohm $\pm 1\%$, 1/4W	103-1964	1
R34	Resistor, 48.7 k Ohm $\pm 1\%$, 1/4W	103-4875	1
R35	Resistor, 16.2 k Ohm $\pm 1\%$, 1/4W	103-1625	1
R36	Resistor, 7.87 k Ohm $\pm 1\%$, 1/4W	103-7874	1
R37	Resistor, 3.74 k Ohm $\pm 1\%$, 1/4W	103-3744	1
R38	Resistor, 1.96 k Ohm $\pm 1\%$, 1/4W	103-1964	1
R39,R40	Resistor Network, 10-10 k Ohm 0.5% Resistors, 0.7W Total Dissipation, 16-Pin DIP	226-0392	2
R41	Resistor, 15 k Ohm $\pm 5\%$, 1/4W	100-1553	1
R42	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R43	Resistor, 1 Meg Ohm $\pm 5\%$, 1/4W	100-1073	1
R44,R45	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	2
R46	Resistor, 1.5 k Ohm $\pm 5\%$, 1/4W	100-1543	1
R47	Resistor, 2 k Ohm $\pm 1\%$, 1/4W	100-2041	1
R48	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R49	Resistor, 33.2 k Ohm $\pm 1\%$, 1/4W	103-3325	1
R50	Resistor, 2 k Ohm $\pm 1\%$, 1/4W	100-2041	1
R51	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R52	Resistor, 12.4 k Ohm $\pm 1\%$, 1/4W	103-1245	1
R53	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R54	Resistor, 19.1 k Ohm $\pm 1\%$, 1/4W	103-1915	1
R55	Resistor, 226 k Ohm $\pm 1\%$, 1/4W	103-2276	1
R56	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	1
R57	Resistor, 20 k Ohm $\pm 1\%$, 1/4W	103-2051	1
R58	Resistor, 51 Ohm $\pm 5\%$, 1/4W	100-5123	1
R59	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R60	Resistor, 510 k Ohm $\pm 5\%$, 1/4	100-5163	1
R61	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R62	Resistor, 4.87 k Ohm $\pm 1\%$, 1/4W	103-4874	1
R63	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	1
R64	Resistor, 3 k Ohm $\pm 5\%$, 1/4W	100-3043	1
R65	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W	177-5054	1
R66	Resistor, 510 k Ohm $\pm 5\%$, 1/4W	100-5163	1
R67	Resistor, 51 Ohm $\pm 5\%$, 1/4W	100-5123	1
R68	Resistor, 20 k Ohm $\pm 1\%$, 1/4W	103-2051	1

TABLE 4-2. LINE INPUT MODULE CIRCUIT BOARD ASSEMBLY - 951-0015
(Sheet 4 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R69	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R70	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R71	Resistor, 4.87 k Ohm $\pm 1\%$, 1/4W	103-4874	1
R72 THRU R83	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	12
R84,R85	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	2
R86,R87	Resistor, 20 k Ohm $\pm 1\%$, 1/4W	103-2051	2
R88,R89	Resistor, 33 Ohm $\pm 5\%$, 1/4W	100-3323	2
R90,R91,R92	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	3
R93,R94	Resistor, 1 Meg Ohm $\pm 5\%$, 1/4W	100-1073	2
R95,R96,R97	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	3
R98	Resistor, 1 Meg Ohm $\pm 5\%$, 1/4W	100-1073	1
R99	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R100,R101	Resistor, 6.8 k Ohm $\pm 5\%$, 1/4W	100-6843	2
R102	Resistor, 1 Meg Ohm $\pm 5\%$, 1/4W	100-1073	1
R103,R104	Resistor, 6.8 k Ohm $\pm 5\%$, 1/4W	100-6843	2
R105 THRU R110	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	6
R111	Resistor, 470 k Ohm $\pm 5\%$, 1/4W	100-4763	1
R112 THRU R115	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	4
R116	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1023	1
R117	Resistor, 470 Ohm $\pm 5\%$, 1/4W	100-4733	1
R118	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R120	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1023	1
R121	Resistor, 470 Ohm $\pm 5\%$, 1/4W	100-4733	1
R122	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R124	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R125	Resistor, 4.7 k Ohm $\pm 5\%$, 1/4	100-4743	1
R126	Resistor, 22 k Ohm $\pm 5\%$, 1/4	100-2253	1
R127 THRU R130	Resistor, 100 k Ohm $\pm 5\%$, 1/4	100-1063	4
R131,R132	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	2
R133	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R134	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R135	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R136 THRU R139	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	4
R140,R141	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	2
R142	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R143	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R144	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R145 THRU R148	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	4
R149,R150	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	2
R151	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R152	Resistor, 5.1 k Ohm $\pm 5\%$, 1/4W	100-5143	1

TABLE 4-2. LINE INPUT MODULE CIRCUIT BOARD ASSEMBLY - 951-0015
(Sheet 5 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R153 THRU R156	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	4
R157	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	1
R158	Resistor, 5.1 k Ohm $\pm 5\%$, 1/4W	100-5143	1
R159	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R160	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	1
R161	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R162 THRU R164	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	3
R165,R166	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1024	2
R167	Resistor, 51 Ohm $\pm 5\%$, 1/4W	100-5123	1
R168,R169	Resistor, 1.47 k Ohm $\pm 1\%$, 1/4W	103-1474	2
R170,R171	Resistor, 121 Ohm $\pm 1\%$, 1/4W	100-1231	2
R172	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R173,R174	Resistor, 470 k Ohm $\pm 5\%$, 1/4W	100-4763	2
R175,R176	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	3
R177	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R178	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R179	Resistor, 470 Ohm $\pm 5\%$, 1/4W	100-4733	1
R180	Potentiometer, 10 k Ohm $\pm 2\%$, Slide-attenuator	180-0011	1
R181	Resistor, 470 k Ohm $\pm 5\%$, 1/4W	100-4763	1
R182	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R1+,R1-,R2+, R2-,R3+,R3-, R4+,R4-	Terminal Barrel, 4 Amperes	417-0133	8
S1	Switch, 2 Section, 6PDT Pushbutton, White/Blue Indications, (A/B Select)	340-0082	1
S2	Switch, 2 Section, 4PDT Pushbutton, White/Blue Indications, (AUD/PGM Select)	340-0086	1
S5	Switch, 3P4T, Right Angle, Modified (STEREO/MONO/LEFT/RIGHT Switch)	340-0083-001	1
S6,S7	Switch, Hall-Effect, Pushbutton, Rectangular, Momentary Action (ON/OFF Switches)	340-0084	2
S8	Switch, Miniature, Square Pushbutton, Momentary Action (CUE Switch)	340-0090	1
S9	Switch, Micro, Detent, 125V ac @ 100 mA	340-0073	1
S10	Switch, Miniature, Square Pushbutton, Momentary Action (ARM Switch)	340-0090	1
U1,U2,U3	Integrated Circuit, NE5532AP, Dual Low-Noise Operational Amplifier, 8-Pin DIP	221-5532-001	3
U4	Integrated Circuit, TLO72CP, Dual JFET-Input Operational Amplifier, 8-Pin DIP	221-0072	1
U5,U6	Integrated Circuit, 2150A, Voltage Controlled Amplifier, 8-Pin DIP	220-2150	2
U7,U8,U9	Integrated Circuit, NE5532AP, Dual Low-Noise Operational Amplifier, 8-Pin DIP	221-5532-001	3
U10,U11	Integrated Circuit, LM833N, Dual Audio Operational Amplifier, 8-Pin DIP	220-0833	2
U12	Integrated Circuit, TLO72CP, Dual JFET-Input Operational Amplifier, 8-Pin DIP	221-0072	1
U13	Integrated Circuit, MC14023B, CMOS, Triple 3-Input NAND Gate	228-4023	1
U14	Integrated Circuit, MC14011BCP, Quad 2-Input NAND Gate, CMOS, 14-Pin DIP	228-4011	1
U15	Integrated Circuit, MC14069UBCP, Hex Inverter, CMOS, C-Channel and N-Channel Modes, 14-Pin DIP	228-4070	1

TABLE 4-2. LINE INPUT MODULE CIRCUIT BOARD ASSEMBLY - 951-0015
(Sheet 6 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
U16	Integrated Circuit, LM317T, Adjustable Positive Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0317	1
U17	Integrated Circuit, LM337T, Adjustable Negative Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0337	1
XR39, XR40	Socket, 16-Pin DIP	417-1604	2
XU1 THRU XU4, XU7 THRU XU12	Socket, 8-Pin DIP	417-0804	10
XU13, XU14, XU15	Socket, 14-Pin DIP	417-1404	3
—	Lens, Red (for ON Switch)	346-1018	1
—	Lens, Amber (for OFF Switch)	346-1017	1
—	Lens, Switch, Square, Green (for CUE Switch)	340-0091	1
—	Lens, Switch, Square, Yellow (for ARM Switch)	340-0092	1
—	Panel Mounting Grommet, MP65, for Rectangular Lamps (for OVERLOAD Indicator)	481-0034	1
—	Knob Cap, 11mm Gray w/Spot, C112 (for STEREO/MONO/LEFT/RIGHT Switch)	481-0023	1
—	Cap, Barrel Terminal	417-0133-001	34
—	Blank Stereo Line Input Module Circuit Board	511-0015	1

MICROPHONE INPUT MODULE

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SECTION I

MICROPHONE INPUT MODULE THEORY OF OPERATION

1-1. INTRODUCTION.

1-2. The following text provides detailed theory of operation for the Mix-Trak 90 series audio console microphone input module. A detailed block diagram of the microphone input module circuitry is presented in Figure 1-1. Refer to Figure 1-1 as required for the following circuit discussion.

1-3. When applicable, the text describes the operation of module audio circuitry. The audio circuit left and right channels are identical, therefore only the left channel will be discussed.

1-4. FUNCTIONAL DESCRIPTION.

1-5. INPUT CIRCUIT.

1-6. **INPUT SELECTION.** The Mix-Trak 90 audio console microphone input modules are designed to accept audio from two balanced microphone level audio sources. Audio source input selection is accomplished by interlocked two-position switch/indicator S1A/B. The switch selects and routes audio for application to the module audio input amplifier. Switch S1A/B also contains A/B select status contacts. The contacts output A/B select status information for application to remote control assemblies. Microphone audio from input select switch network S1 is routed for application to the optional microphone transformer and to the module input amplifier stage.

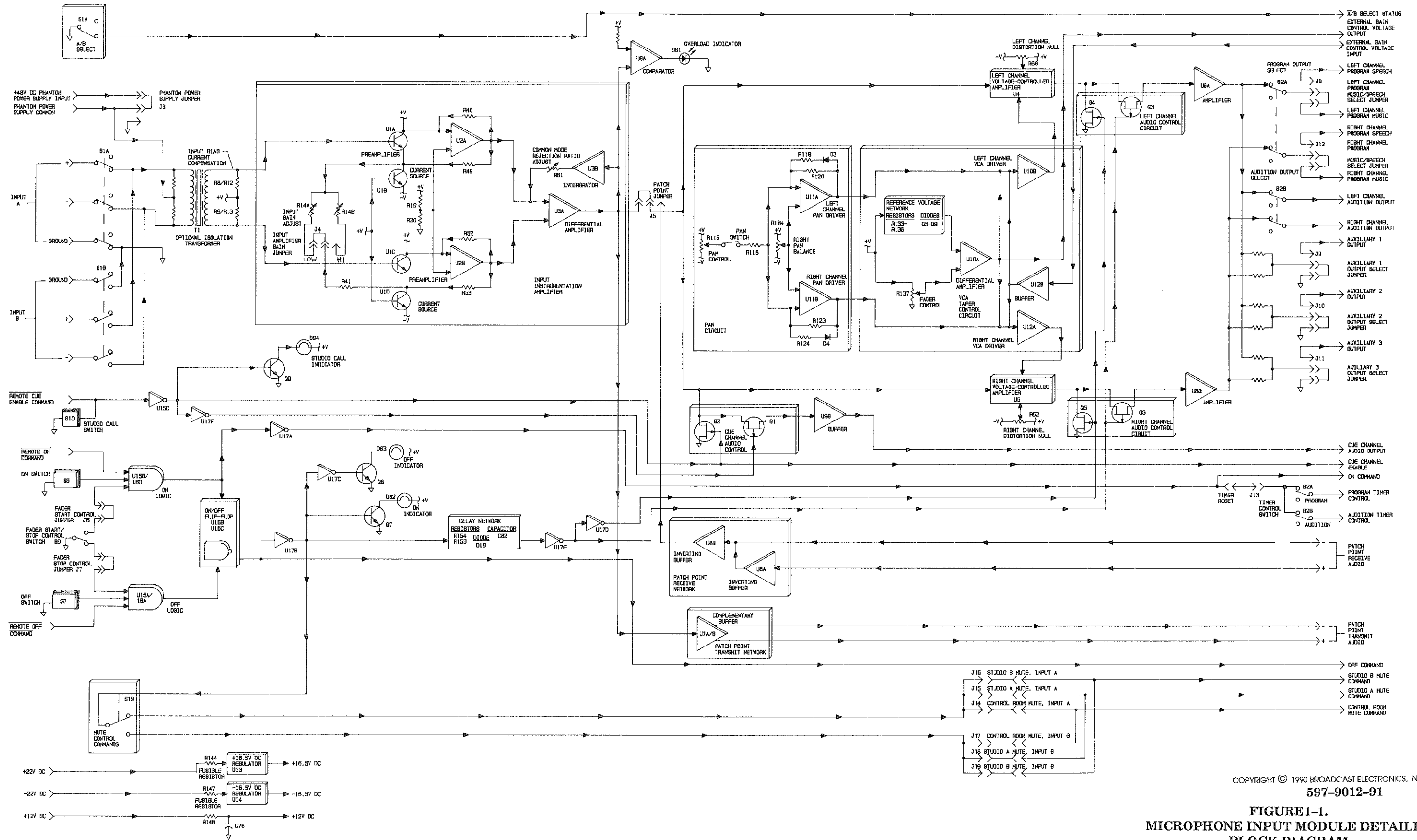
1-7. **OPTIONAL PHANTOM SUPPLY TRANSFORMER.** The microphone input module may be configured for operation with a condenser type microphone with the installation of optional isolation transformer assembly T1. T1 is a 600 Ohm primary/600 Ohm secondary isolation transformer designed for operation with a microphone phantom power supply potential. The Mix-Trak 90 phantom power supply is a regulated adjustable +15 to +48 volt dc operating potential provided for the phantom powering of a condenser type microphone. The supply is enabled/disabled by jumper J3. A potentiometer in the power supply module is provided to adjust the operating level of the supply.

1-8. **INPUT AMPLIFIER.** Microphone audio is amplified to a -5 dBu nominal level by a programmable high-gain low-noise instrumentation amplifier. The instrumentation amplifier consists of precision matched transistor array U1, operational amplifiers U2 and U3, input gain adjust control R14, and input amplifier gain jumper J4.

1-9. Positive-going audio waveforms from the select switch network are applied to matched transistor pair U1A/B and operational amplifier U2A. Transistor U1A functions as a precision low-noise preamplifier stage which operates from a constant current source established by transistor U1B. Integrated circuit U2A is configured as an inverting second stage amplifier which is biased to approximately 7 volts by R19 and R20. Together, amplifiers U1A and U2A provide precision low-noise amplification of the microphone audio. Feedback for the amplifier network is provided by resistors R48 and R49. Negative-going audio waveforms are applied to an identical amplifier circuit consisting of transistors U1C/D and operational amplifier U2B.

1-10. The outputs of U2A/B are applied to operational amplifier U3A. U3A differentially amplifies the applied audio for application to an overload circuit, a level control circuit, and a patch point transmit stage. Samples from U3A are also applied to integrator U3B. U3B operates in a feedback loop to invert any dc potential present at the output of U3A and apply the voltage to the input to cancel any dc potentials. Potentiometer R61 is provided for common mode rejection ratio adjustment.

- 1-11. The overall gain of the instrumentation amplifier is controlled by input gain adjust control R14 and input amplifier gain jumper J4. Potentiometer R14 is a dual reverse logarithmic taper control designed to provide approximately 20 dB of gain control adjustment. R14A operates in association with the LOW gain position of J4 to establish the appropriate gain for microphone inputs from -35 dBu to -15 dBu. R14B operates in association with the HIGH position of J4 to establish the appropriate gain for microphone inputs from -55 dBu to -35 dBu.
- 1-12. **OVERLOAD INDICATOR CIRCUIT.**
- 1-13. Samples from the instrumentation amplifier are applied to overload indicator comparator U9A. When the output level of the instrumentation amplifier increases above approximately +18 dBu, the output of comparator U9A will go HIGH. Overload indicator DS1 will illuminate to indicate an excessive audio input level condition.
- 1-14. **PATCH POINT NETWORKS.**
- 1-15. The microphone input module patch point networks consists of a transmitting stage, a receiving stage, and a control jumper. The patch point networks are incorporated into the module design to provide interfacing for the connection of external audio processing equipment.
- 1-16. Audio from the input instrumentation amplifier is applied to a patch point transmitting stage consisting of complementary buffers U7A/B. U7A/B produce balanced monophonic audio at approximately -5 dBu for application to external audio processing equipment. The stage is configured for continuous operation to provide access to module audio without circuit board programming.
- 1-17. Audio from external audio processing equipment is applied to the patch point receiving stage. The receiving stage consists of a balanced two-stage inverting buffer network. Balanced audio is applied to inverting buffers U8A/B. Positive-going audio is inverted at U8A and summed at the input of U8B to provide balanced-to-unbalanced audio conversion. The output of the stage is routed to patch point jumper J5. J5 routes audio from either the input amplifier or the patch point receiving network for application to the audio level control circuit.
- 1-18. **AUDIO LEVEL CONTROL CIRCUIT.**
- 1-19. Audio from the input amplifier or the patch point receiving network is routed to the audio level control circuit. The audio level control circuit consists of: 1) a VCA taper control circuit, 2) a pan control circuit, and 3) a voltage-controlled-amplifier (VCA) circuit. The entire control circuit functions to provide precision low-noise control of the module audio level.
- 1-20. **VCA TAPER CONTROL CIRCUIT.** Module audio level control operations are performed by two 2150A series VCA modules. The modules are directed by a taper circuit which establishes the module operating parameters. The VCA taper control network consists of: 1) slide-action fader control R137, 2) a reference voltage network consisting of diodes D5 through D9 and resistors R133 through R136, and 3) differential amplifier U10A, and 4) drivers U10B and U12A.



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FIGURE 1-1.
MICROPHONE INPUT MODULE DETAILED
BLOCK DIAGRAM

- 1-21. The taper control circuit operates in response to changes in the output voltage from fader control R137. R137 is designed with a dc control range from 0 to 5 volts. A non-linear taper circuit gain response is established by the reference voltage network. When the voltage from R137 is from 0 volts (+10 dB fader position) to approximately 0.40 volts (-5 dB fader position), the taper control circuit gain will be unity. A 0.40 volt (-5 dB fader position) to 2 volt (-30 dB fader position) output from R137 will result in a circuit gain of approximately 2. A 2 volt (-30 dB fader position) to 5 volt (-55 dB fader position) output from R137 will generate a taper control circuit gain of approximately 4. As a result of the gain design, a -55 dB to +10 dB non-linear operating response is established for the VCA level control network.
- 1-22. The dc control voltage from the VCA taper control circuit output is applied to the VCA modules for precision control of the module audio level. When fader control R137 is operated to the +10 dB position, a 0 volt dc reference is applied to differential amplifier U10A. U10A will output approximately 0 volts dc through left channel driver U10B and right channel driver U12A to the VCA modules to establish maximum audio level gain. When fader R137 is operated to the -55 dB position, a +5 volt dc reference is applied to amplifier U10A. U10A will output approximately 12 volts dc through drivers U10B/U12A to establish minimum audio level gain.
- 1-23. **External Gain Control.** An external gain control feature is incorporated into the taper driver circuit design for the control of the module by external equipment or additional input modules. DC control voltage from U10A is routed to control master/slave input module configurations or to control external audio equipment. An external gain control input routes control voltage through buffer U12B for application to the VCA circuit.
- 1-24. **VCA CIRCUIT.** Audio from patch point jumper J5 is applied to left channel voltage-controlled-amplifier (VCA) module U4. U4 is a 2150A series precision low-noise voltage-controlled-amplifier. The VCA is a current-input/current-output device with a voltage sensitive control port. VCA U4 actively controls the left channel audio level as directed by the VCA taper control circuit. Potentiometer R68 is provided to null distortion at the VCA stage. Audio from VCA module U4 is routed through a series-shunt audio control network consisting of field-effect-transistors Q3 and Q4. The output of the control circuit is applied to amplifier U6A. U6A operates in association with VCA U4 to convert the current output of the VCA to a voltage. The output of U6A is routed for application to the output circuit.
- 1-25. **PAN CIRCUIT.** Microphone audio is amplified in the VCA circuit left or right channel in a continuously variable format by the operation of the pan circuit. The circuit consists of pan control R115, left channel driver stage U11A, and right channel driver stage U11B.
- 1-26. The pan circuit operates in response to changes in control voltage from pan control R115. Pan control R115 is a dual function control switch/potentiometer assembly designed to route a control voltage to driver stages U11A/B. U11A and U11B are inverting driver stages with a polarized dual gain design.
- 1-27. When the pan control is operated to the right channel position, a positive voltage is applied to drivers U11A/B. U11A responds by generating a negative voltage. The negative voltage biases diode D3 off to establish a gain of about 25 for the stage. As a result, a negative voltage is applied to left channel VCA driver U10B. U10B inverts the applied negative voltage to output a positive voltage to decrease the left channel level. U11B also responds to the positive voltage from R115 by generating a negative voltage. The negative voltage biases diode D4 on to establish a gain of approximately one for the stage. As a result, a small negative voltage is applied through right channel VCA driver U12A to increase the right channel level.

- 1-28. When the pan control is operated to the left channel position, the pan circuit operates in an inverted manner. A negative voltage is applied to drivers U11A/B. The left channel circuit will generate a negative voltage to increase the left channel level. The right channel circuit will generate a positive voltage to decrease the right channel level.
- 1-29. **OUTPUT CIRCUIT.**
- 1-30. Audio from left channel amplifier U6A is applied to an output circuit for distribution to the console output bus network. The console output bus network consists of three stereophonic and three monophonic output busses. Stereophonic busses include: 1) program speech, 2) program music, and 3) audition. Monophonic busses include: 1) auxiliary 1, 2) auxiliary 2, and 3) auxiliary 3. Each output bus is current-operated to provide maximum noise performance.
- 1-31. Output selection is accomplished by program/audition select switch S2A/B. Switch S2A routes audio to left channel program music/speech select jumper J8. J8 assigns the audio to either the program speech bus or to the program music bus.
- 1-32. Audio from U6A is also applied to auxiliary 1 jumper J9, auxiliary 2 jumper J10, and auxiliary 3 jumper J11. The jumpers allow output audio to be assigned to the auxiliary 1, auxiliary 2, or auxiliary 3 output busses.
- 1-33. **CONTROL CIRCUIT.**
- 1-34. The microphone input module control circuit consists of individual CMOS logic gates. The gates are organized into functional circuits to provide module on/off control, cue circuit control, muting control, and status indicator control.
- 1-35. **ON/OFF CIRCUIT.** Line input module on/off control functions are accomplished by on switch/indicator S6 and off switch/indicator S7. S6 and S7 are hall-effect switches which exhibit reliable low-noise operation. Module on/off control functions may also be initiated by the operation of the fader control. Detent switch S9 is incorporated into the fader to provide on/off control commands. A LOW module on command is generated when the fader is operated from the off position. A LOW module off command is generated when the fader is operated to the off position. Fader start control jumper J6 and stop control jumper J7 enable or disable the control functions as required.
- 1-36. A module on sequence is initiated when a LOW control command is generated by: 1) on switch/indicator S6, 2) the remote on switch/indicator, or 3) fader switch S9. The LOW is applied to on logic consisting of NAND gates U15B and U16D. The logic outputs a LOW to the on/off flip-flop and a timer control circuit.
- 1-37. The on/off flip-flop is constructed from NAND gates U16B and U16C. With a LOW command from U15B/U16D, the output of the on/off flip-flop will go LOW. The LOW is routed through inverter U17B to inverters U17D/E. U17D/E produce complementary HIGH/LOW commands for application to left and right channel audio control networks. The commands configure the networks for audio output routing operations. A HIGH command from inverter U17B is also applied to: 1) a mute control circuit and 2) an indicator circuit consisting of inverter U17C, driver transistors Q7 and Q8, on indicator DS2, and off indicator DS3. The HIGH: 1) biases driver transistor Q7 on to illuminate module on indicator DS2 and 2) biases driver transistor Q8 off to extinguish off indicator DS3.
- 1-38. A module off sequence is initiated when a LOW control command is generated by: 1) off switch/indicator S7, 2) the remote off switch/indicator, or 3) fader switch S9. The LOW is applied to off logic consisting of NAND gates U15A and U16A. The output of the off logic will go LOW and reset on/off flip-flop U16B/C. The output of on/off flip-flop U16B/C will go HIGH. The HIGH is routed through inverter U17B to generate complementary HIGH/LOW commands to configure the audio control networks to mute the output audio. A LOW command from inverter U17B is also applied to: 1) bias transistor Q7 off to extinguish on indicator DS2 and 2) bias transistor Q8 on to illuminate off indicator DS3.

1-39. **CUE CIRCUIT.**

1-40. The microphone input module cue circuit is enabled when a studio talk command is applied through the remote cue line or when the studio call switch is operated. Audio for application to the cue channel is routed from patch point jumper J5 to a cue channel control circuit consisting of field-effect-transistors Q1 and Q2. The audio control circuit is directed by inverters U15C and U17F.

1-41. Audio is applied to the cue channel when studio call switch S10 is depressed or when a studio talk switch routes a talk command to the remote cue enable line. A LOW control command is applied to inverters U15C and U17F. U15C/U17F generate complementary control signals for application to a series-shunt audio control circuit consisting of transistors Q1 and Q2. The HIGH biases Q2 off and the LOW biases Q1 on to enable cue audio. A HIGH from inverter U15C is also applied to transistor Q9. The HIGH will bias driver transistor Q9 on to illuminate studio call indicator DS4.

1-42. **OUTPUT AUDIO CONTROL CIRCUIT.**

1-43. Control of the microphone input module output audio is provided by series-shunt field-effect-transistor control circuits. The left channel circuit consists of transistors Q3 and Q4. The transistors are controlled by complementary commands from inverters U17D/E. When the module is operated to on, complementary HIGH/LOW control commands are applied to transistors Q3 and Q4. A HIGH biases Q4 off and a LOW biases Q3 on to enable the left channel program audio.

1-44. **MUTE CONTROL CIRCUIT.**

1-45. A module on command from the control circuit is applied to contacts of switch S1B to provide mute control. When input A is selected, a HIGH command from inverter U17B is applied to a jumper network consisting of studio B mute jumper J16, studio A mute jumper J15, and control room mute jumper J14. The jumpers route the mute command to the studio A, studio B, or the control room mute lines to mute the selected audio facility. When input B is selected, a HIGH command is applied to control room mute jumper J17, studio A mute jumper J18, and studio B mute jumper J19 to mute the selected facility.

1-46. **TIMER CONTROL CIRCUIT.**

1-47. Control commands for application to the console clock/timer module are generated by the contacts of switch S2A/B. A HIGH control command from inverter U17A is applied to timer reset jumper J13. J13 disables the timer control command for microphone input modules if desired. The control command from J13 is applied to program/audition output select switch S2. S2 will route a HIGH control command to the clock/timer module program or audition control line as required for the selected output buss.

1-48. **POWER SUPPLY CIRCUIT.**

1-49. DC operating potentials for application to the line input module components are produced by a regulator network. Unregulated ± 24 volt supplies from the console power supply module are applied through fusible resistors R144 and R147 to a regulator network consisting of U13 and U14. R144/R147 are carbon-composition resistors which function as fusible links in the event of a short-circuit potential on the module. The fusible resistors limit a power supply failure to the module and prevent a failure in the entire console system.

1-50. ± 24 V dc supplies from the console power supply module are applied to +16.5 volt dc regulator U13 and -16.5 volt dc regulator U14. U13/U14 are three terminal adjustable regulators containing internal thermal and short-circuit current limiting features. The regulated ± 16.5 volt outputs from U13 and U14 are routed for application to the module audio components.

- 1-51. A regulated +12 volt supply is applied through an RC filter network consisting of resistor R148 and capacitor C78. The output of the filter network is routed for application to the module control logic components.

SECTION II

MICROPHONE INPUT MODULE MAINTENANCE

2-1. INTRODUCTION.

2-2. This section provides general maintenance information, electrical adjustment procedures, and troubleshooting information for the microphone input module.

2-3. FIRST LEVEL MAINTENANCE.

2-4. First level maintenance consists of precautionary procedures applied to the equipment to prevent future failures. The procedures are performed on a regular basis and the results recorded in a performance log.

2-5. GENERAL.

2-6. The microphone input module circuitry should be periodically cleaned of accumulated dust using a nylon-bristle brush and vacuum cleaner. Inspect the module for improperly seated semiconductors and components damaged by overheating.

2-7. AUDIO SWITCHES.

2-8. The microphone input module is equipped with ITT Shadow audio switches. The switches are sealed for low-noise long-life operation and do not permit cleaning. If a switch becomes noisy or defective, the switch will require replacement.

2-9. FADER CONTROL.

2-10. Each microphone input module is equipped with a Penny and Giles slide-action fader control. If a fader control becomes defective, the control may require: 1) cleaning or 2) replacement of the control shaft bushings.

2-11. To clean the slide-action fader, remove the fader from the microphone input module assembly. Remove the fader end-caps and slide the fader assembly out of the aluminum housing. Using distilled water and a cotton swab, remove all dust and dirt from the fader circuit board area. Re-assemble the fader control and replace the fader assembly in the module.

2-12. To replace the fader shaft bushings, replacement parts and a recommended procedure must be obtained from Penny and Giles Inc. Contact Penny and Giles at the address shown below for the replacement bushings and the installation instructions.

Penny and Giles
2716 Ocean Park Blvd.
Suite 1005
Santa Monica, California 90405

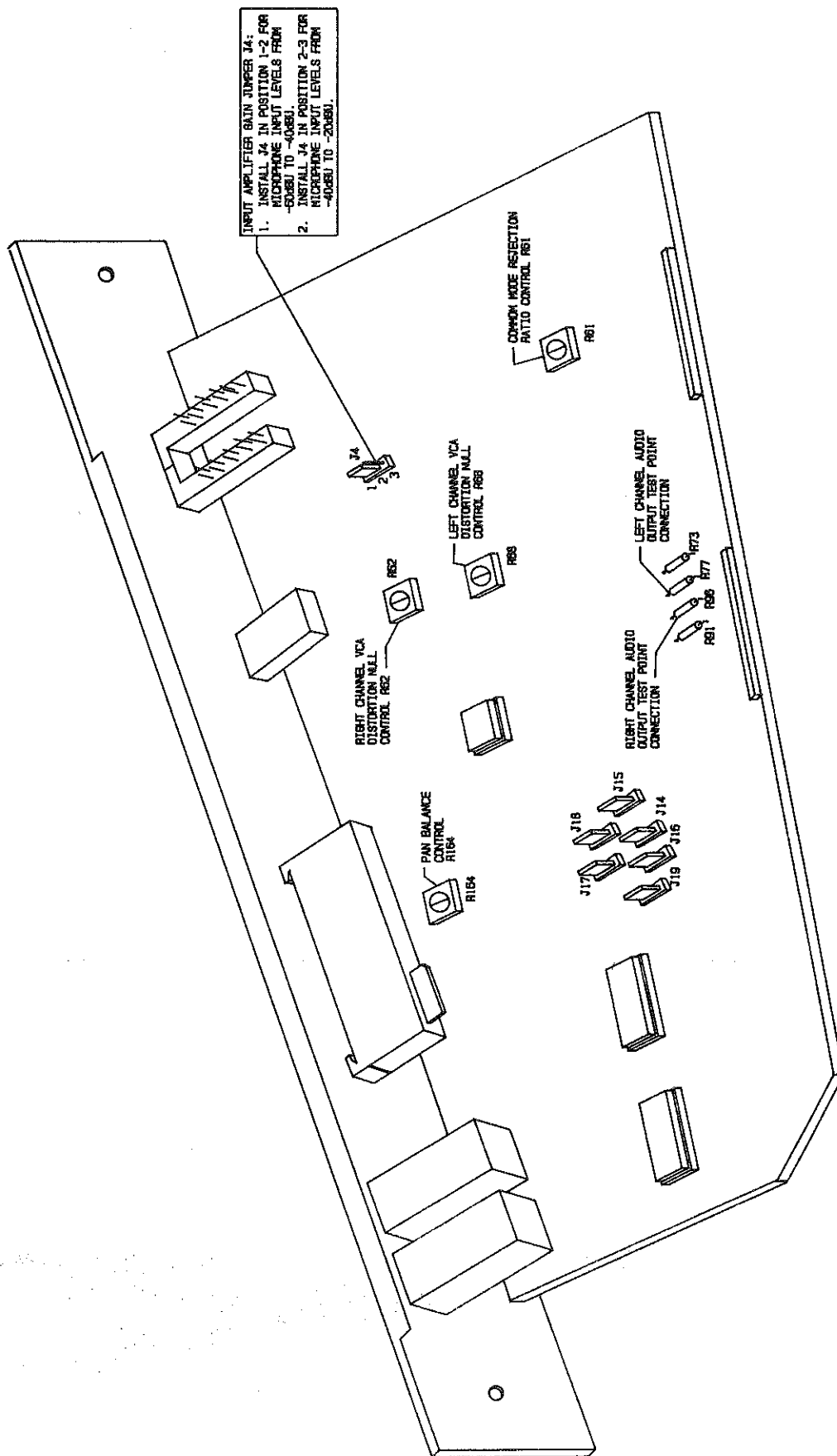
2-13. SECOND LEVEL MAINTENANCE.

2-14. Second level maintenance consists of procedures required to restore a microphone input module to operation after a fault has occurred. The procedures are divided into electrical adjustments, troubleshooting, and component replacement procedures.

2-15. ELECTRICAL ADJUSTMENTS.

2-16. **VCA DISTORTION ADJUSTMENT.** Left channel VCA distortion control R68 and right channel VCA distortion control R62 null distortion at the VCA modules. Distortion adjustment is not required unless VCA modules U4 or U5 are replaced. The VCA distortion is nulled as follows.

- 2-17. **Required Equipment.** The following test equipment is required to null the VCA distortion.
- A. Allen Wrench (supplied with the console).
 - B. Non-Metallic Adjustment Tool.
 - C. Extender Ribbon Cable Assemblies:
 - 40-Pin Assembly
 - 50-Pin Assembly
 - D. Audio Signal Generator (Potomac AG-51 or equivalent).
 - E. Audio Analyzer – Capable of Indicating Distortion Levels of 0.05% to 0.1% (Sound Technology 1710A or equivalent).
- 2-18. **Procedure.** To null the VCA distortion, proceed as follows:
- 2-19. Remove the microphone input module from the mainframe and connect the extender cable assemblies between the microphone input module and the receptacles on the mainframe input motherboard assemblies.
- 2-20. Refer to Figure 2-1 and install jumper J4 in position 1-2.
- 2-21. Connect the audio signal generator to the A or B left channel input on the microphone input module associated input/remote connector.
- 2-22. Refer to Figure 2-1 and connect the audio analyzer between chassis ground and resistor R77 as shown.
- 2-23. Adjust the audio generator for a 1 kHz output at -50 dBu.
- 2-24. Operate the microphone input module at a normal level and route the test audio to the audition output bus.
- 2-25. Refer to Figure 2-1 and adjust left channel VCA distortion null control R68 for a minimum audio analyzer indication.
- 2-26. Repeat the procedure for the right channel. Connect the audio analyzer to resistor R96 and adjust the right channel distortion with right channel VCA distortion null control R62.
- 2-27. Disconnect all test equipment, reprogram jumper J4 if required, and replace the microphone input module.
- 2-28. **PAN BALANCE CALIBRATION.** Potentiometer R164 calibrates the pan circuit left and right channel balance. Pan balance calibration is not required unless replacement components are installed in the circuit or the complete microphone input module is replaced. The pan balance is calibrated as follows.
- 2-29. **Required Equipment.** The following test equipment is required to calibrate the pan circuit balance.
- A. Allen Wrench (supplied with the console).
 - B. Non-Metallic Adjustment Tool.
 - C. Extender Ribbon Cable Assemblies:
 - 40-Pin Assembly
 - 50-Pin Assembly
 - D. Audio Signal Generator (Potomac AG-51 or equivalent).
 - E. VU Meter



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 597-9012-106

FIGURE 2-1. MICROPHONE INPUT MODULE ADJUSTMENT CONTROLS

- 2-30. **Procedure.** To calibrate the pan circuit balance, proceed as follows:
- 2-31. Remove the microphone input module from the mainframe and connect the extender cable assemblies between the microphone input module and the receptacles on the mainframe input motherboard assemblies.
- 2-32. Refer to Figure 2-1 and install jumper J4 in position 1-2.
- 2-33. Connect the audio signal generator to the A or B left channel input on the microphone input module associated input/remote connector.
- 2-34. Refer to Figure 2-1 and connect the VU meter between chassis ground and resistor R77 as shown.
- 2-35. Adjust the audio generator for a 1 kHz output at -50 dBu.
- 2-36. Enable the microphone input module. Operate the fader to the 0 position and route the test audio to the audition output bus.
- 2-37. Refer to Figure 2-1 and adjust pan balance control R164 until the VU meter indicates approximately -5 dBu.
- 2-38. Refer to Figure 2-1 and connect the VU meter to resistor R96 as shown.
- 2-39. Refer to Figure 2-1 and adjust pan balance control R164 until the VU meter indicates approximately -5 dBu.
- 2-40. Repeat the procedure to obtain equal VU meter indications from the both the left and right channels.
- 2-41. Disconnect all test equipment, reprogram jumper J4 if required, and replace the microphone input module.
- 2-42. **COMMON MODE REJECTION RATIO ADJUSTMENT.** Potentiometer R61 adjusts the microphone input module common mode rejection ratio. Due to the extremely low common mode rejection level, the adjustment cannot be performed without a special audio analyzer. If components are replaced in the circuit or potentiometer R61 is replaced, excellent performance may be obtained by adjusting R61 to approximately mid-range. If further adjustment is required, contact the Broadcast Electronics Customer Service Department for a recommended test procedure and list of test equipment.
- 2-43. **TROUBLESHOOTING.**
- 2-44. The troubleshooting philosophy for the microphone input module consists of isolating a problem to a specific circuit or group of components. Two 40-pin and one 50-pin extender ribbon cable assemblies are provided to interface plug-in modular assemblies to the chassis mounted motherboards for troubleshooting procedures. To prevent the application of inadvertent audio noise to the console audio system, attach the 50-pin extender assembly to the module before the 40-pin assembly.
- 2-45. Figures 2-2 through 2-4 present the microphone input module troubleshooting. Refer to Figures 2-2 through 2-4 to isolate a failure to a specific group of components.
- 2-46. Once trouble is isolated and power is totally deenergized, refer to the schematic diagrams and the theory of operation to assist in problem resolution. The defective component may be repaired locally or the entire module may be returned to Broadcast Electronics for repair or replacement.
- 2-47. **COMPONENT REPLACEMENT.**
- 2-48. Component replacement procedures for the console modular assemblies are presented in SECTION II, MAINTENANCE. Refer to SECTION II as required for the replacement procedures.

MICROPHONE INPUT MODULE GENERAL TROUBLESHOOTING PROCEDURES	
NUMBER	PROCEDURE
1	MEASURE THE VOLTAGE AT U13 PIN 2. THE VOLTAGE MUST BE +16.VDC.
2	MEASURE THE VOLTAGE AT U14 PIN 3. THE VOLTAGE MUST BE -16.5VDC.
3	MEASURE THE VOLTAGE ACROSS R144 THE VOLTAGE MUST BE LESS THAN 1VDC.
4	MEASURE THE VOLTAGE ACROSS R147. THE VOLTAGE MUST BE LESS THAN 1VDC.
5	MEASURE THE VOLTAGE AT U16 PIN 14. THE VOLTAGE MUST BE GREATER THAN 10VDC.
6	MEASURE THE VOLTAGE ACROSS R148. THE VOLTAGE MUST BE GREATER THAN 1VDC.
7	CHECK U15,U16,AND U17 FOR OVER-TEMPERATURE CONDITIONS.

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FIGURE 2-2. MICROPHONE INPUT MODULE GENERAL TROUBLESHOOTING

MICROPHONE INPUT MODULE CONTROL LOGIC TROUBLESHOOTING	
SYMPTOM	SOLUTION
NO LOCAL MODULE ON/OFF CONTROL	1. DEFECTIVE S6 OR S7.
NO REMOTE MODULE ON/OFF CONTROL	1. REFER TO SIMPLE REMOTE CONTROL MODULE TROUBLESHOOTING.
NO MODULE ON/OFF CONTROL WITH FADER	1. DEFECTIVE FADER SWITCH.
NO LOCAL AND NO REMOTE ON/OFF CONTROL	1. DEFECTIVE U15,U16,OR U17.

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FIGURE 2-3. MICROPHONE INPUT MODULE CONTROL LOGIC TROUBLESHOOTING

MICROPHONE INPUT MODULE AUDIO TROUBLESHOOTING

SYMPTOM	SOLUTION
MISSING OR DISTORTED AUDIO OUTPUT	<p style="text-align: center;">ACTIVATE THE B AUDIO SOURCE AND OPERATE THE MODULE. IS NORMAL OUTPUT AUDIO PRESENT?</p> <p style="text-align: center;">NO YES</p> <p style="text-align: center;">IS AUDIO PRESENT AT U7 PINS 1 AND 7?</p> <p style="text-align: center;">NO YES</p> <p style="text-align: center;">DEFECTIVE U1, U2, OR U3.</p> <p style="text-align: center;">OPERATE THE FADER TO THE 0dB POSITION IS 0.00VDC PRESENT AT U4 AND U5 PIN 3? OPERATE THE FADER TO THE OFF POSITION IS +0.4VDC PRESENT AT U4 AND U5 PIN 3?</p> <p style="text-align: center;">NO YES</p> <p style="text-align: center;">DEFECTIVE U10, U11, OR U12.</p> <p style="text-align: center;">DEFECTIVE U4, U5, U6, Q3, Q4, Q5, OR Q6.</p>
FADER NOT CONTROLLING CHANNEL LEVEL	<p style="text-align: center;">OPERATE THE FADER TO THE +10dB POSITION. IS 0.00VDC PRESENT AT U10 PIN 3? OPERATE THE FADER TO THE OFF POSITION. IS +5.1VDC PRESENT AT U10 PIN 3?</p> <p style="text-align: center;">NO YES</p> <p style="text-align: center;">1. CHECK P33, P34, AND P35 2. DEFECTIVE FADER CONTROL R137.</p> <p style="text-align: center;">1. DEFECTIVE U10, U11, OR U12. 2. CHECK EXTERNAL GAIN CONTROL INPUT AT U12 PIN 5 FOR 0.00VDC.</p>
NO LEFT CHANNEL OR RIGHT CHANNEL OUTPUT	<p style="text-align: center;">IS THE PAN CONTROL OPERATED TO OFF?</p> <p style="text-align: center;">NO YES</p> <p style="text-align: center;">OPERATE THE PAN SWITCH TO OFF.</p> <p style="text-align: center;">OPERATE THE FADER TO THE 0dB POSITION. IS 0.00VDC AT U14 AND U15 PIN 3?</p> <p style="text-align: center;">NO YES</p> <p style="text-align: center;">DEFECTIVE U10, U11 OR U12.</p> <p style="text-align: center;">DEFECTIVE U6, Q3, Q4, Q5, OR Q6.</p>
NO PATCH POINT OPERATION	1. DEFECTIVE U7 OR U8.

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FIGURE 2-4. MICROPHONE INPUT MODULE AUDIO TROUBLESHOOTING

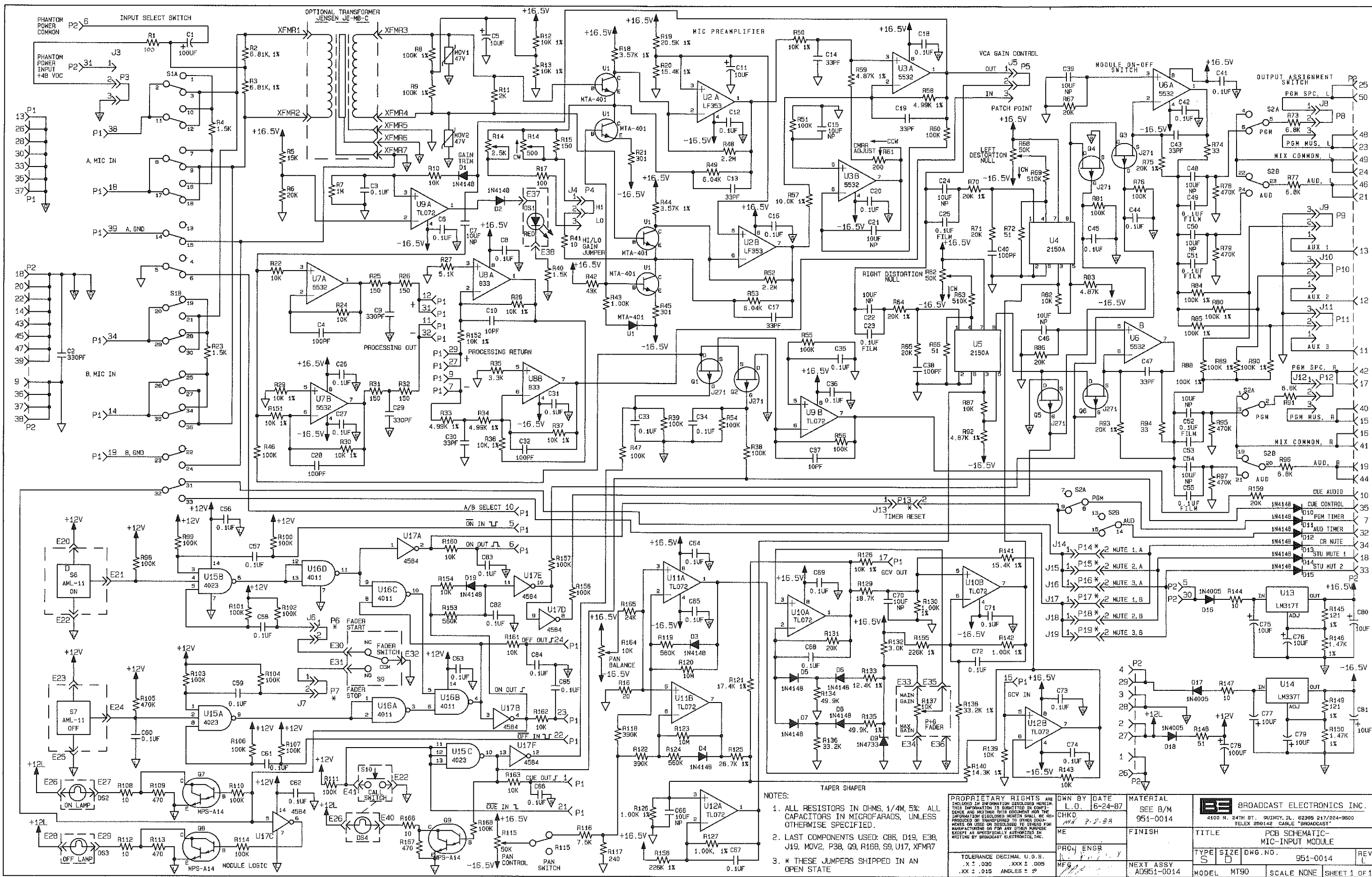
SECTION III

MICROPHONE INPUT MODULE DRAWINGS

3-1. **INTRODUCTION.**

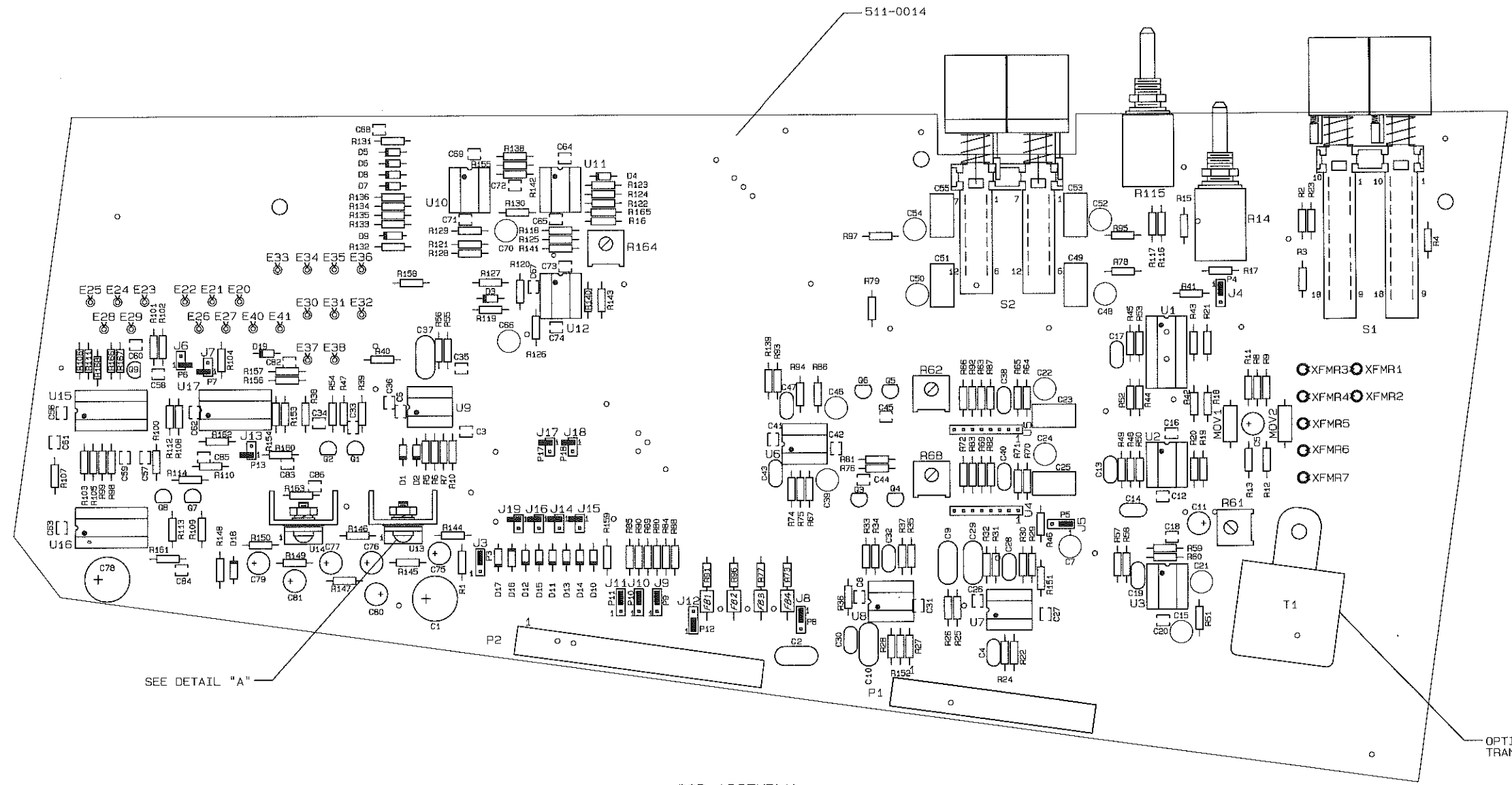
3-2. This section provides assembly drawings and schematic diagrams as listed below for the microphone input module.

FIGURE	TITLE	NUMBER
3-1	SCHEMATIC DIAGRAM, MICROPHONE INPUT MODULE	SD951-0014
3-2	ASSEMBLY DIAGRAM, MICROPHONE INPUT MODULE	AD951-0014

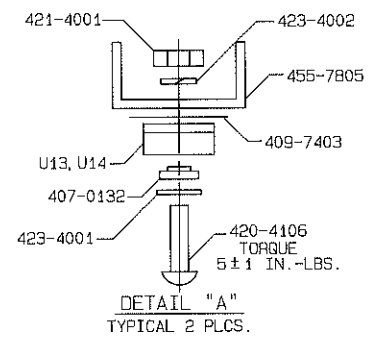


- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5%. ALL CAPACITORS IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENTS USED: C85, D19, E38, J19, MOV2, P38, Q9, R168, S9, U17, XFMR7
 3. * THESE JUMPERS SHIPPED IN AN OPEN STATE.

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DOWN BY DATE L.O. 6-24-87	MATERIAL SEE B/M 951-0014	BROADCAST ELECTRONICS INC. 4100 N. 24TH ST., QUINCY, ILL. 62305 217/224-9600 TELEX 280142 CABLE "BROADCAST"
CHKD ME PROJ ENGR MFG	FINISH 951-0014	TITLE PCB SCHEMATIC- MIC-INPUT MODULE
NEXT ASSY A0951-0014	TYPE SIZE DWG. NO. S D 951-0014	MODEL MT90 SCALE NONE SHEET 1 OF 1

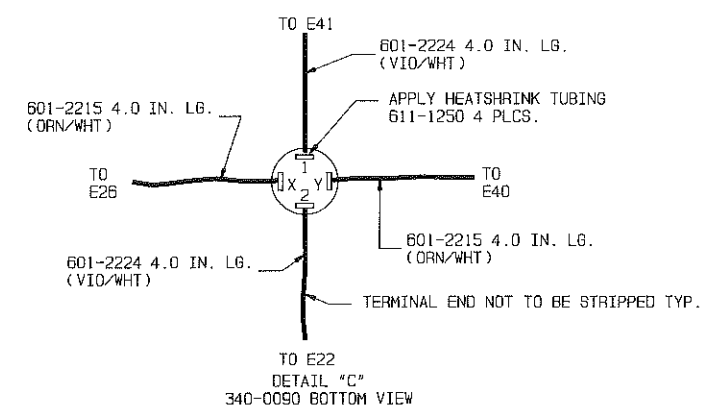
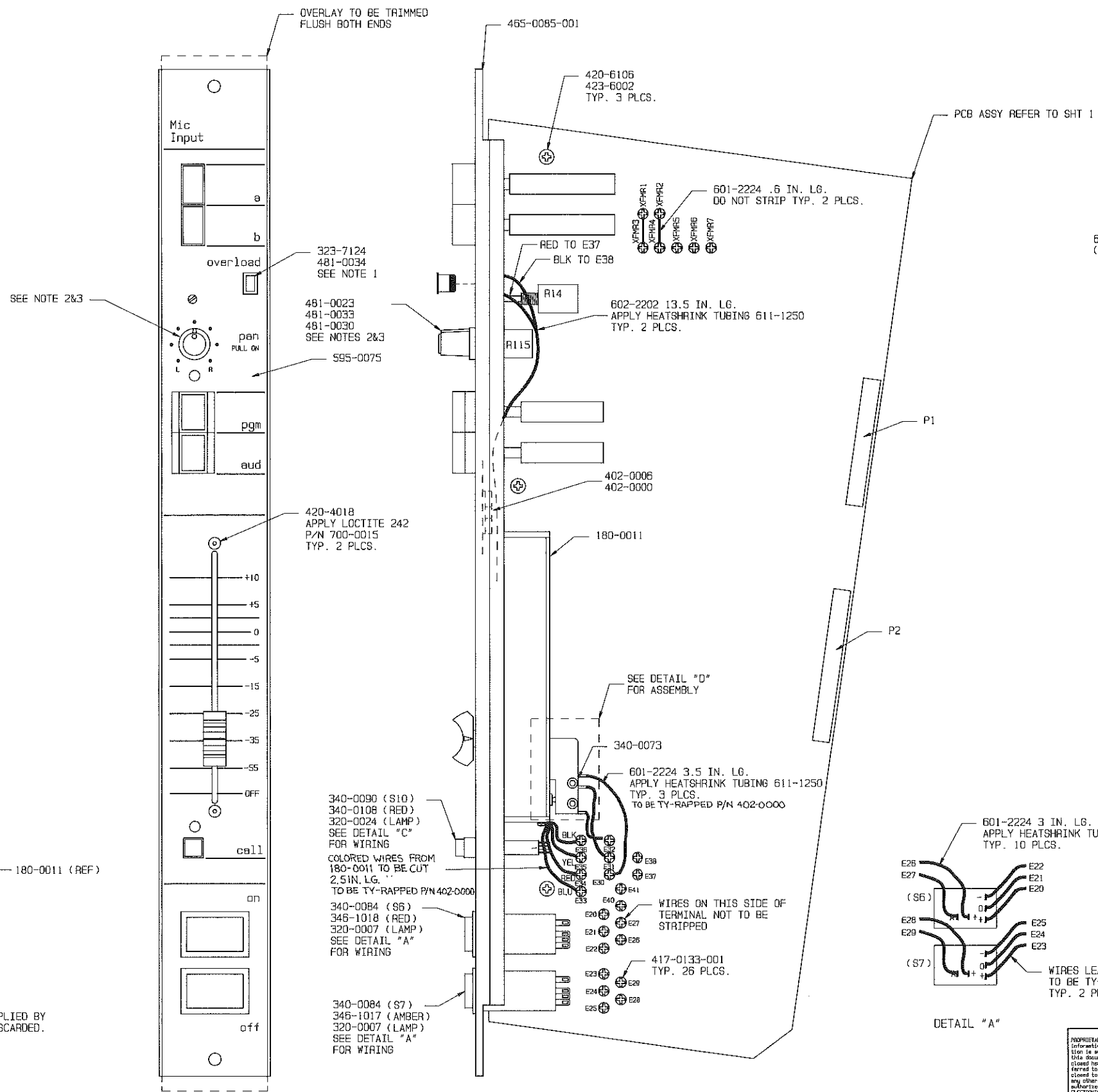


PCB ASSEMBLY

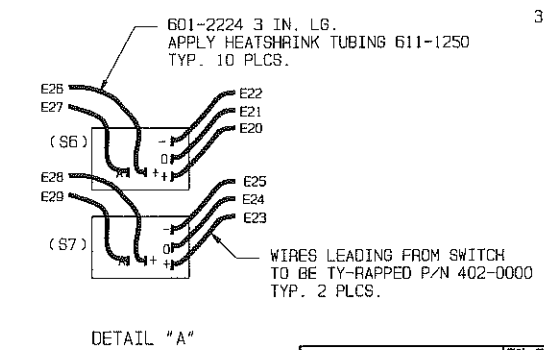
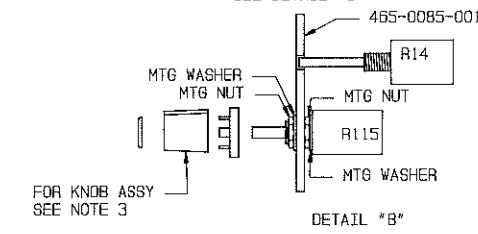


- NOTE:
1. REFER TO SHEET 2 FOR MODULE ASSEMBLY.
 2. SEE SCHEMATIC SD951-0014
 3. ⊗ INDICATES SLOT IN BARREL TERMINAL.

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TOLERANCE DECIMAL U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± °		TITLE MIC INPUT MODULE	TYPE A	SCALE 1.5/1
NEXT ASSY 901-9012 *12CH* 901-9018 *18CH*		MODEL MT90	SHEET 1 OF 2	REV H



- NOTES:
1. LONG LEAD OF LED (323-7124) IS CATHODE SIDE TO BE CONNECTED TO E38 BY BLACK LEAD. SECURE LED CASING TO INSIDE OF 465-0085-001 P/N 700-0063. ROUTE LEAD AWAY FROM SWITCHES AND PCB.
 2. REMOVE HARDWARE FROM R14 AND TIGHTEN DOWN ON R115 AFTER MODULE AND PCB ARE ASSEMBLED SEE DETAIL "B"
 3. TURN CONTROL FULLY CCW. PLACE KNOB LINE ON DOT ABOVE "L" TIGHTEN KNOB.



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TOLERANCE (DECIMAL) U.O.B. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°	CHG MH 8-22-88	FINISH JHS 8-22-88	TITLE MIC INPUT MODULE	
	PRD. ENGR. RMD 8-22-88	SEE ENG RAS22-0000	TYPE SIZE DWG. NO. A D 951-0014	REV H
	WFB PRB 8-22-88	NEXT ASSY 901-9012 (12CH) 901-9018 (18CH)	MODEL MIX TRAK 90	SCALE 1/1 SHEET 2 OF 2

SECTION IV

MICROPHONE INPUT MODULE PARTS LIST

4-1. INTRODUCTION.

4-2. This section provides descriptions and part numbers of electrical components and assemblies required for maintenance of the microphone input module. Each table entry in this section is indexed by reference designators appearing on the applicable schematic diagram.

TABLE 4-1. MICROPHONE INPUT MODULE PARTS LIST INDEX

TABLE	TITLE	PART NO.	PAGE
4-2	MICROPHONE INPUT MODULE ASSEMBLY	951-0014	4-1

**TABLE 4-2. MICROPHONE INPUT MODULE ASSEMBLY -951-0014
(Sheet 1 of 6)**

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1	Capacitor, Electrolytic, 100 uF, 50V	020-1083	1
C2	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C3	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C4	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C5	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C6	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C7	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C8	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C9	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C10	Capacitor, Mica, 10 pF ±5%, 500V	042-1012	1
C11	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C12	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C13,C14	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	2
C15	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C16	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C17	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C18	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C19	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C20	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C21,C22	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	2
C23	Capacitor, Mylar, 0.1 uF ±10%, 100V	030-1053	1
C24	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C25	Capacitor, Mylar, 0.1 uF ±10%, 100V	030-1053	1
C26,C27	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	2

TABLE 4-2. MICROPHONE INPUT MODULE ASSEMBLY -951-0014
(Sheet 2 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C28	Capacitor, Silvered Mica, 100 pF $\pm 5\%$, 500V	040-1022	1
C29	Capacitor, Mica, 330 pF $\pm 5\%$, 500V	042-3322	1
C30	Capacitor, Mica, 33 pF $\pm 5\%$, 500V	042-3312	1
C31	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C32	Capacitor, Silvered Mica, 100 pF $\pm 5\%$, 500V	040-1022	1
C33 THRU C36	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	4
C37	Capacitor, Mica, 10 pF $\pm 5\%$, 500V	042-1012	1
C38	Capacitor, Silvered Mica, 100 pF $\pm 5\%$, 500V	040-1022	1
C39	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C40	Capacitor, Silvered Mica, 100 pF $\pm 5\%$, 500V	040-1022	1
C41,C42	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	2
C43	Capacitor, Mica, 33 pF $\pm 5\%$, 500V	042-3312	1
C44,C45	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	2
C46	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C47	Capacitor, Mica, 33 pF $\pm 5\%$, 500V	042-3312	1
C48	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C49	Capacitor, Mylar, 0.1 uF $\pm 10\%$, 100V	030-1053	1
C50	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C51	Capacitor, Mylar, 0.1 uF $\pm 10\%$, 100V	030-1053	1
C52	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C53	Capacitor, Mylar, 0.1 uF $\pm 10\%$, 100V	030-1053	1
C54	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C55	Capacitor, Mylar, 0.1 uF $\pm 10\%$, 100V	030-1053	1
C56 THRU C65	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	10
C66	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C67,C68,C69	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	3
C70	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C71 THRU C74	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	4
C75,C76,C77	Capacitor, Electrolytic, 10 uF, 35V	023-1076	3
C78	Capacitor, Electrolytic, 100 uF, 25V	023-1084	1
C79,C80,C81	Capacitor, Electrolytic, 10 uF, 35V	023-1076	3
C82 THRU C86	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	5
D1 THRU D8	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	8
D9	Diode, Zener, 1N4733A, 5.1V $\pm 5\%$, 1W	200-4733	1
D10 THRU D15	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	6
D16,D17,D18	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	3
D19	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	1
DS1	LED, Red, MV57124, 3V @ 20 mA Maximum	323-7124	1
DS2,DS3	Lamp, No. 73, 14V, 0.08A, T-1 3/4 Bulb, Wedge Base	320-0007	2
DS4	Lamp, 11-903-1, 12V, 0.7W, T-1 Bi-Pin	320-0024	1
E20 THRU E38,E40,E41	Terminal, Barrel, 4 Amperes	417-0133	21
J3,J4,J5	Receptacle, Male, 3-Pin In-line	417-0003	3
J6,J7	Receptacle, Male, 2-Pin In-line	417-4004	2
J8 THRU J12	Receptacle, Male, 3-Pin In-line	417-0003	5

TABLE 4-2. MICROPHONE INPUT MODULE ASSEMBLY -951-0014
(Sheet 3 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
J13 THRU J19	Receptacle, Male, 2-Pin In-line	417-4004	7
MOV1,MOV2	Metal Oxide Varistor, V47MA2A, 27V ac RMS, 0.19 Joules	140-0017	2
P1	Receptacle, 40-Pin Dual In-line	417-4041	1
P2	Receptacle, 50-Pin Dual In-line	417-0147	1
P3 THRU P19	Jumper, Programmable, 2-Pin	340-0004	17
Q1 THRU Q6	Field Effect Transistor, J271, P-Channel JFET, TO-92 Case	210-0271	6
Q7,Q8,Q9	Transistor, MPS-A14, Silicon, NPN, Darlington, TO-92 Case	211-0014	3
R1	Resistor, 100 Ohms $\pm 5\%$, 1/4W	100-1033	1
R2,R3	Resistor, 6.81 k Ohm $\pm 1\%$, 1/4W	103-6814	2
R4	Resistor, 1.5 k Ohm $\pm 5\%$, 1/4W	100-1543	1
R5	Resistor, 15 k Ohm $\pm 5\%$, 1/4W	100-1553	1
R6	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R7	Resistor, 1 Meg Ohm $\pm 5\%$, 1/4W	100-1073	1
R8,R9	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	2
R10	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R11	Resistor, 2 k Ohm $\pm 5\%$, 1/4W	100-2043	1
R12,R13	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	2
R14	Potentiometer, 500 Ohm & 2.5 k Ohm $\pm 10\%$, 1/2W	190-5031	1
R15	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	1
R16	Resistor, 20 Ohm $\pm 5\%$, 1/4W	100-2023	1
R17	Resistor, 100 Ohm $\pm 5\%$, 1/4W	100-1033	1
R18	Resistor, 3.57 k Ohm $\pm 1\%$, 1/4W	103-3574	1
R19	Resistor, 20.5 k Ohm $\pm 1\%$, 1/4W	103-2055	1
R20	Resistor, 15.4 k Ohm $\pm 1\%$, 1/4W	103-1551	1
R21	Resistor, 301 Ohm $\pm 1\%$, 1/4W	100-3031	1
R22	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R23	Resistor, 1.5 k Ohm $\pm 5\%$, 1/4W	100-1543	1
R24	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R25,R26	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R27	Resistor, 5.1 k Ohm $\pm 5\%$, 1/4W	100-5143	1
R28,R29,R30	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	3
R31,R32	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R33,R34	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	2
R35	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R36,R37	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	2
R38,R39	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	2
R40	Resistor, 1.5 k Ohm $\pm 5\%$, 1/4W	100-1543	1
R41	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1023	1
R42	Resistor, 43 k Ohm $\pm 5\%$, 1/4W	100-4353	1
R43	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	1
R44	Resistor, 3.57 k Ohm $\pm 1\%$, 1/4W	103-3574	1
R45	Resistor, 301 Ohm $\pm 1\%$, 1/4W	100-3031	1
R46,R47	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	2
R48	Resistor, 2.2 Meg Ohm $\pm 5\%$, 1/4W	100-2273	1
R49	Resistor, 6.04 k Ohm $\pm 1\%$, 1/4W	103-6044	1
R50	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1

TABLE 4-2. MICROPHONE INPUT MODULE ASSEMBLY -951-0014
(Sheet 4 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R51	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R52	Resistor, 2.2 Meg Ohm $\pm 5\%$, 1/4W	100-2273	1
R53	Resistor, 6.04 k Ohm $\pm 1\%$, 1/4W	103-6044	1
R54,R55,R56	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	3
R57	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R58	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	1
R59	Resistor, 4.87 k Ohm $\pm 1\%$, 1/4W	103-4874	1
R60	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R61	Potentiometer, 200 Ohm $\pm 10\%$, 1/2W	177-2034	1
R62	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W	177-5054	1
R63	Resistor, 510 k Ohm $\pm 5\%$, 1/4W	100-5163	1
R64	Resistor, 20.0 k Ohm $\pm 1\%$, 1/4W	103-2051	1
R65	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R66	Resistor, 51 Ohm $\pm 5\%$, 1/4W	100-5123	1
R67	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R68	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W	177-5054	1
R69	Resistor, 510 k Ohm $\pm 5\%$, 1/4W	100-5163	1
R70	Resistor, 20.0 k Ohm $\pm 1\%$, 1/4W	103-2051	1
R71	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R72	Resistor, 51 Ohm $\pm 5\%$, 1/4W	100-5123	1
R73	Resistor, 6.8 k Ohm $\pm 5\%$, 1/4W	100-6843	1
R74	Resistor, 33 Ohm $\pm 5\%$, 1/4W	100-3323	1
R75	Resistor, 20.0 k Ohm $\pm 1\%$, 1/4W	103-2051	1
R76	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R77	Resistor, 6.8 k Ohm $\pm 5\%$, 1/4W	100-6843	1
R78,R79	Resistor, 470 k Ohm $\pm 5\%$, 1/4W	100-4763	2
R80	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R81	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R82	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R83	Resistor, 4.87 k Ohm $\pm 1\%$, 1/4W	103-4874	1
R84,R85	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	2
R86	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R87	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R88,R89,R90	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	3
R91	Resistor, 6.8 k Ohm $\pm 5\%$, 1/4W	100-6843	1
R92	Resistor, 4.87 k Ohm $\pm 1\%$, 1/4W	103-4874	1
R93	Resistor, 20.0 k Ohm $\pm 1\%$, 1/4W	103-2051	1
R94	Resistor, 33 Ohm $\pm 5\%$, 1/4W	100-3323	1
R95	Resistor, 470 k Ohm $\pm 5\%$, 1/4W	100-4763	1
R96	Resistor, 6.8 k Ohm $\pm 5\%$, 1/4W	100-6843	1
R97	Resistor, 470 k Ohm $\pm 5\%$, 1/4W	100-4763	1
R98 THRU R104	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	7
R105	Resistor, 470 k Ohm $\pm 5\%$, 1/4W	100-4763	1
R106,R107	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	2

TABLE 4-2. MICROPHONE INPUT MODULE ASSEMBLY -951-0014
(Sheet 5 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R108	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1023	1
R109	Resistor, 470 Ohm $\pm 5\%$, 1/4W	100-4733	1
R110,R111	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	2
R112	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1023	1
R113	Resistor, 470 Ohm $\pm 5\%$, 1/4W	100-4733	1
R114	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R115	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W, SPDT BJ	190-5051	1
R116	Resistor, 7500 Ohm $\pm 5\%$, 1/4W	100-7543	1
R117	Resistor, 240 Ohm $\pm 5\%$, 1/4W	100-2433	1
R118	Resistor, 390 k Ohm $\pm 5\%$, 1/4W	100-3963	1
R119	Resistor, 560 k Ohm $\pm 5\%$, 1/4W	100-5663	1
R120	Resistor, 10 Meg Ohm $\pm 5\%$, 1/4W	100-1083	1
R121	Resistor, 17.4 k Ohm $\pm 1\%$, 1/4W	103-1745	1
R122	Resistor, 390 k Ohm $\pm 5\%$, 1/4W	100-3963	1
R123	Resistor, 10 Meg Ohm $\pm 5\%$, 1/4W	100-1083	1
R124	Resistor, 560 k Ohm $\pm 5\%$, 1/4W	100-5663	1
R125	Resistor, 28.7 k Ohm $\pm 1\%$, 1/4W	103-2851	1
R126,R127	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	2
R128	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R129	Resistor, 18.7 k Ohm $\pm 1\%$, 1/4W	103-1875	1
R130	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	1
R131	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R132	Resistor, 3 k Ohm $\pm 5\%$, 1/4W	100-3043	1
R133	Resistor, 12.4 k Ohm $\pm 1\%$, 1/4W	103-1245	1
R134,R135	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	2
R136	Resistor, 33.2 k Ohm $\pm 1\%$, 1/4W	103-3325	1
R137	Potentiometer, 10 k Ohm $\pm 2\%$, slide-attenuator	180-0011	1
R138	Resistor, 33.2 k Ohm $\pm 1\%$, 1/4W	103-3325	1
R139	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R140	Resistor, 14.3 k Ohm $\pm 1\%$, 1/4W	103-1435	1
R141	Resistor, 15.4 k Ohm $\pm 1\%$, 1/4W	103-1551	1
R142	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	1
R143	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R144	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1024	1
R145	Resistor, 121 Ohm $\pm 5\%$, 1/4W	100-1231	1
R146	Resistor, 1.47 k Ohm $\pm 1\%$, 1/4W	103-1474	1
R147	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1024	1
R148	Resistor, 51 Ohm $\pm 5\%$, 1/4W	100-5123	1
R149	Resistor, 121 Ohm $\pm 5\%$, 1/4W	100-1231	1
R150	Resistor, 1.47 k Ohm $\pm 1\%$, 1/4W	103-1474	1
R151,R152	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	2
R153	Resistor, 560 k Ohm $\pm 5\%$, 1/4W	100-5663	1
R154	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R155	Resistor, 226 k Ohm $\pm 1\%$, 1/4W	103-2276	1
R156,R157	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	2
R158	Resistor, 226 k Ohm $\pm 1\%$, 1/4W	103-2276	1
R159	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1

TABLE 4-2. MICROPHONE INPUT MODULE ASSEMBLY -951-0014
(Sheet 6 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R160 THRU R163	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	4
R164	Potentiometer, 10 k Ohm $\pm 10\%$, 1/2W (PAN Control)	177-1054	1
R165	Resistor, 24 k Ohm $\pm 5\%$, 1/4W	100-2453	1
R166	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1023	1
R167	Resistor, 470 Ohm $\pm 5\%$, 1/4W	100-4733	1
R168	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
S1	Switch, 2 Section, 6PDT Pushbutton, White/Blue Indications (A/B SELECT Switch)	340-0082	1
S2	Switch, 2 Section, 4PDT Pushbutton, White/Blue Indications (AUD/PGM SELECT Switch)	340-0086	1
S6,S7	Switch, Hall-Effect, Pushbutton, Rectangular, Momentary Action (ON/OFF Switches)	340-0084	2
S9	Switch, Micro, Detent, 125V ac @ 100 mA	340-0073	1
S10	Switch, Miniature Square Pushbutton, Momentary Action (CALL Switch)	340-0090	1
U1	Integrated Circuit, MTA-401, Quad Monolithic Transistor Array, NPN, 14-Pin DIP	220-0401	1
U2	Integrated Circuit, LF353N, Dual JFET-Input Operational Amplifier, 8-Pin DIP	221-0353	1
U3	Integrated Circuit, NE5532AP, Dual Low Noise Operational Amplifier, 8-Pin DIP	221-5532-001	1
U4,U5	Integrated Circuit, 2150A, Voltage Controlled Amplifier, 8-Pin DIP	220-2150	2
U6,U7	Integrated Circuit, NE5532AP, Dual Low Noise Operational Amplifier, 8-Pin DIP	221-5532-001	2
U8	Integrated Circuit, LM833N, Dual Audio Operational Amplifier, 8-Pin DIP	220-0833	1
U9 THRU U12	Integrated Circuit, TL072CP, Dual JFET-Input Operational Amplifier, 8-Pin DIP	221-0072	4
U13	Integrated Circuit, LM317T, Adjustable Positive Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0317	1
U14	Integrated Circuit, LM337T, Adjustable Negative Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0337	1
U15	Integrated Circuit, MC14023B, CMOS, Triple 3-Input NAND Gate	228-4023	1
U16	Integrated Circuit, MC14011BCP, Quad 2-Input NAND Gate, CMOS, 14-Pin DIP	228-4011	1
U17	Integrated Circuit, MC14584, Hex Schmitt Trigger, CMOS, 14-Pin DIP	228-4584	1
XMFR1 THRU XMFR7	Terminal, Barrel, 4 Amperes	417-0133	7
XU1	Socket, 14-Pin DIP	417-1404	1
XU2,XU3, XU6 THRU XU12	Socket, 8-Pin DIP	417-0804	9
XU15 THRU XU17	Socket, 14-Pin DIP	417-1404	3
—	Panel Mounting Grommet, MP65, for Rectangular Lamps (for OVERLOAD Indicator)	481-0034	1
—	Knob Cap, 11mm Gray W/Spot, C112 (PAN Switch)	481-0023	1
—	Lens, Switch, Square, Red (CALL Switch)	340-0108	1
—	Lens, Red (for ON Switch)	346-1018	1
—	Lens, Amber (for OFF Switch)	346-1017	1
—	Cap, Barrel Terminal	417-0133-001	1
—	Blank Microphone Input Module Circuit Board	511-0014	1

CONTROL ROOM MONITOR MODULE

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SECTION I

CONTROL ROOM MONITOR MODULE

THEORY OF OPERATION

1-1. INTRODUCTION.

1-2. The following text provides detailed theory of operation for the Mix-Trak 90 series audio console control room monitor module. A detailed block diagram of the control room monitor module circuitry is presented in Figure 1-1. Refer to Figure 1-1 as required for the following circuit discussion.

1-3. When applicable, the text describes the operation of module audio circuitry. The audio circuit left and right channels are identical, therefore only the left channel will be discussed.

1-4. FUNCTIONAL DESCRIPTION.

1-5. CONTROL ROOM MONITOR CIRCUIT.

1-6. **INPUT NETWORK.** The control room monitor circuit is designed to accept ten console audio sources for control room monitoring operations. The following text provides a list of the control room monitor circuit audio sources.

INTERNAL AUDIO SOURCES

1. Program output audio.
2. Audition output audio.
3. Monophonic output audio.
4. Cue channel audio.

EXTERNAL INPUTS

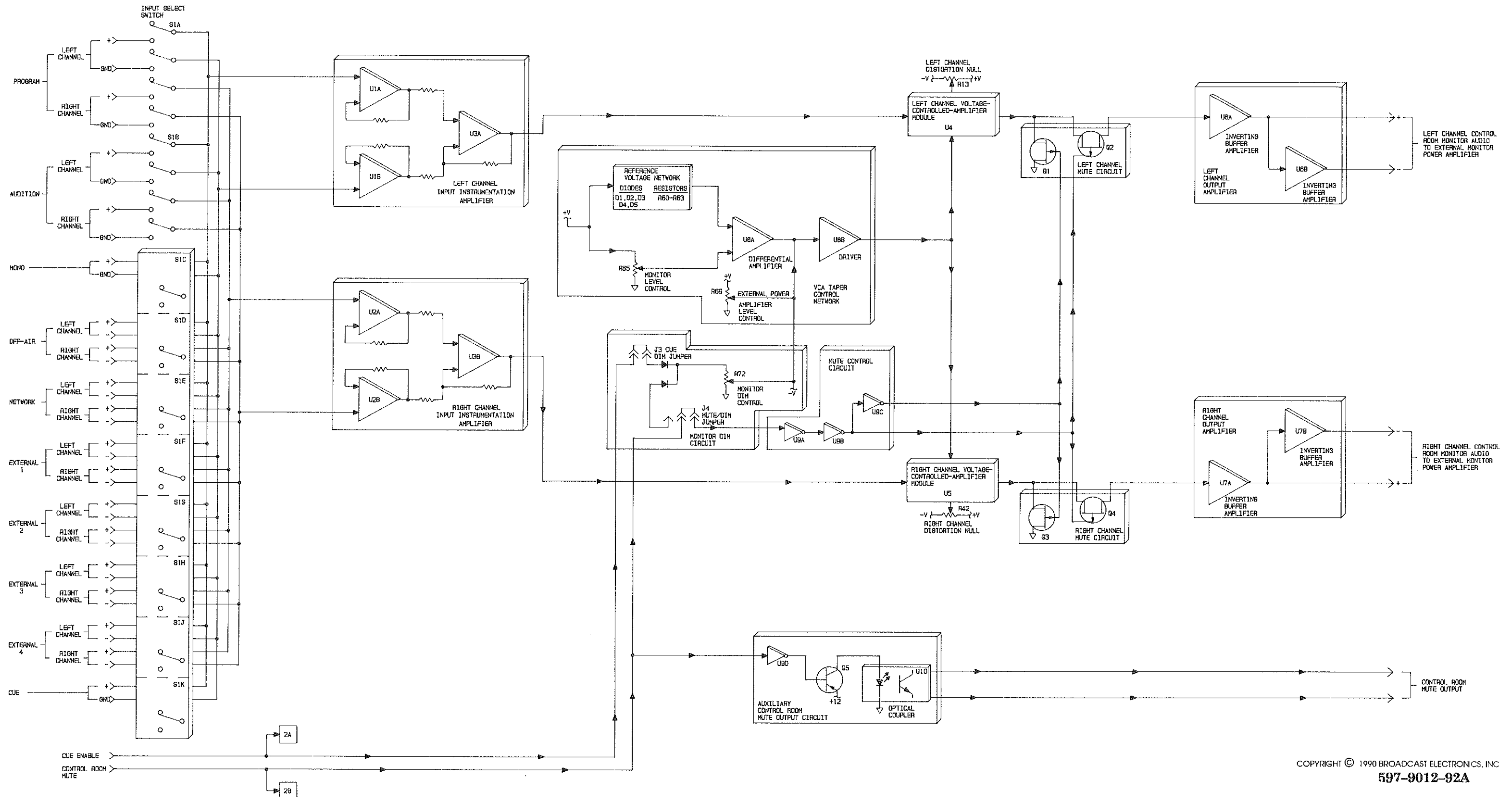
1. Off-Air audio.
2. Network audio.
3. External 1 audio.
4. External 2 audio.
5. External 3 audio.
6. External 4 audio.

1-7. Audio source selection is accomplished by input select switch S1. S1 is a yellow-coded ten-position switch/indicator designed to select audio for application to the module left and right channel input amplifier stages. The left channel input amplifier consists of integrated circuits U1A/B and U3A. U1A/B and U3A are configured as a precision instrumentation amplifier with a gain of approximately -6 dB. The output of the amplifier stage is routed for application to the level control circuit.

1-8. **VCA LEVEL CONTROL CIRCUIT.** Audio from the input amplifier network is applied to left channel voltage-controlled-amplifier (VCA) module U4. U4 is a 2150A series precision low-noise voltage-controlled-amplifier. The VCA is a current-input/current-output device with a voltage sensitive control port. VCA U4 actively controls the left channel audio level as directed by a VCA taper control circuit. Potentiometer R13 is provided to null distortion generated at the VCA stage. Audio from VCA module U4 is routed through a series-shunt mute circuit consisting of field-effect-transistors Q1 and Q2 for application to the output amplifier network.

1-9. **VCA TAPER CONTROL CIRCUIT.** Control room monitor audio level control operations are performed by two 2150A series VCA modules. The modules are directed by a taper circuit which establishes the module operating parameters. The VCA taper control network consists of: 1) rotary monitor level control R65, 2) a reference voltage network consisting of diodes D1 through D5, resistors R60 through R65, 3) differential amplifier U8A, and 4) driver U8B.

- 1-10. The taper control circuit operates in response to changes in the output voltage from monitor level control R65. R65 is designed with a dc control range from 0 to 5 volts. A non-linear taper circuit gain response is established by the reference voltage network. When the voltage from R65 is from 0 volts to approximately 0.40 volts, the taper control circuit gain will be unity. A 0.40 volt to 2 volt output from R65 will result in a circuit gain of approximately 2. A 2 volt to 5 volt output from R65 will generate a taper control circuit gain of approximately 4. As a result of the gain design, a non-linear operating response is established for the monitor audio level.
- 1-11. The dc control voltage from the VCA taper circuit output is applied to the VCA modules for precision control of the monitor audio level. When monitor level control R65 is operated fully counterclockwise, a 0 volt dc reference is applied to differential amplifier U8A. U8A will output approximately 0 volts dc through driver U8B to the VCA modules to establish minimum audio level gain. When monitor control R65 is operated fully clockwise, a +5 volt dc reference is applied to differential amplifier U8A. U8A will output approximately 12 volts dc through driver U8B to establish a maximum control room monitor speaker audio level.
- 1-12. The control room monitor speaker level is also controlled by external power amplifier level control R69. R69 is provided to limit the maximum level of the control room monitor speakers.
- 1-13. **MONITOR DIM CIRCUIT.** The monitor dim circuit is designed to lower the control room monitor speaker level during cue channel monitoring operations. When an input module is configured for cue channel operation, a HIGH is applied through the cue enable control line and cue dim jumper J3 to monitor dim control R72. R72 will output a voltage to control the monitor speaker level during cue channel monitoring operations. Jumper J3 is provided to disable monitor dim operation.
- 1-14. The monitor dim circuit may also be configured for operation during control room mute conditions. When a control room muting sequence is initiated, a HIGH is applied through the control room mute line and mute/dim jumper J4 to monitor dim control R72.
- 1-15. **OUTPUT CIRCUIT.** Audio from the muting circuitry is applied to an output amplifier network. The left channel output amplifier network consists of integrated circuits U6A/B. U6A/B are configured as inverting amplifier stages to provide unbalanced-to-balanced audio signal conversion at a nominal level of 0 dBu. The output of the amplifier network is routed for application to an external monitor power amplifier.
- 1-16. **MUTE CIRCUIT.** The control room monitor mute circuit consists of an inverter control network and series-shunt field-effect-transistor (FET) circuits. When a microphone input module initiates a control room mute sequence, a HIGH is routed through the control room mute command line to the mute control circuit. The HIGH is inverted at U9A which outputs a LOW to inverters U9B/C. U9B/C generates complementary control signals for application to left channel mute circuit transistors Q1 and Q2. A HIGH from inverter U9B will bias Q2 off and a LOW from U9C will bias Q1 on to mute the left channel monitor audio.
- 1-17. A HIGH from the control room mute line is also applied to the auxiliary control room mute output circuit. The HIGH is inverted LOW at U9D which biases transistor Q5 on. Q5 will route a control voltage to energize optical coupler U10 and provide an auxiliary control room mute output command for application to external circuitry.

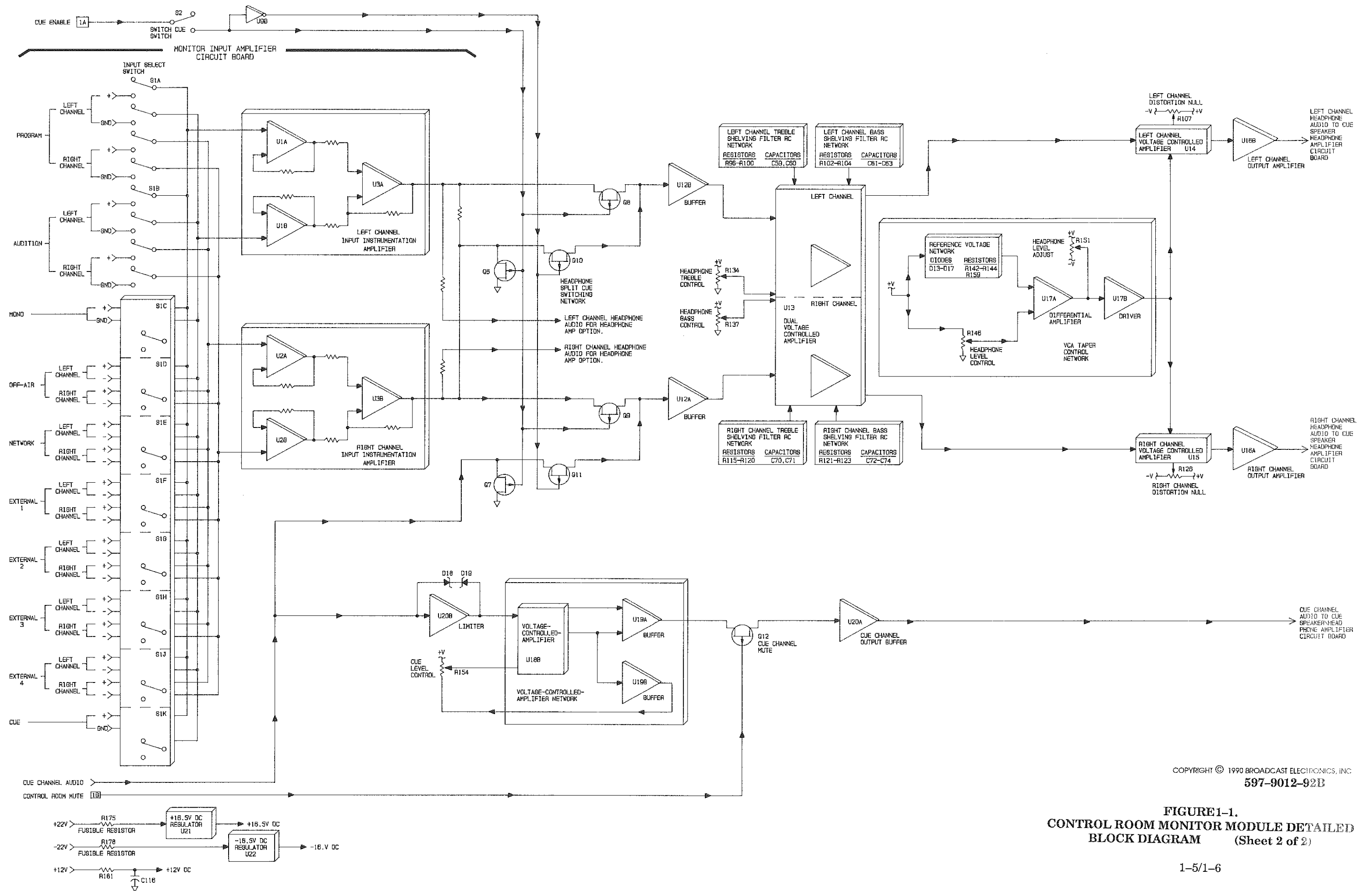


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FIGURE 1-1.
CONTROL ROOM MONITOR MODULE DETAILED
BLOCK DIAGRAM (Sheet 1 of 2)

1-3/1-4





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FIGURE 1-1.
CONTROL ROOM MONITOR MODULE DETAILED
BLOCK DIAGRAM (Sheet 2 of 2)

1-18. **HEADPHONE CIRCUIT.**

1-19. **INPUT NETWORK.** The control room monitor module headphone circuit input network consists of an input select switch and an input amplifier stage. The input network is housed on a separate piggy-back mounted monitor input amplifier circuit board assembly. The input network is equipped for the monitoring of ten balanced console audio sources. The following text provides a list of the headphone circuit audio sources.

INTERNAL AUDIO SOURCES

1. Program output audio.
2. Audition output audio.
3. Monophonic output audio.
4. Cue channel audio.

EXTERNAL INPUTS

1. Off-Air audio.
2. Network audio.
3. External 1 audio.
4. External 2 audio.
5. External 3 audio.
6. External 4 audio.

1-20. Headphone audio source selection is accomplished by input select switch S1. S1 is an orange-coded ten-position switch/indicator designed to select audio for application to the left and right channel input amplifier stages. The left channel input amplifier consists of integrated circuits U1A/B and U3A. U1A/B and U3A are configured as a precision instrumentation amplifier with a gain of approximately -6 dB. The output of the amplifier stage is routed for application to: 1) the headphone split cue circuit and 2) a connector which provides audio for a headphone amplifier option.

1-21. **SPLIT CUE CIRCUIT.** Simultaneous headphone/cue monitoring operation is performed by the split cue circuit. The circuit consists of a front-panel control switch and field-effect-transistor switching network. The split cue circuit is designed to route left and right channel headphone information to the headphone left channel circuit and cue channel information to the headphone right channel circuit for simultaneous headphone/cue monitoring operations.

1-22. A split cue operating sequence is initiated when a line input module is configured to cue and when split cue switch S2 is depressed. A HIGH from the cue enable line will be routed through S2 to inverter U9B. Signals from S2 and U9B produce complementary control commands for application to the FET switching network consisting of transistors Q6 through Q11. A HIGH from switch S2 will bias transistors Q6, Q7, Q8, and Q9 off. A LOW from U9B will bias transistors Q10 and Q11 on. The resultant transistor configuration routes left and right channel headphone information to the headphone left channel and cue channel information to the headphone right channel. The output of the switching network is applied through buffers U12A/B to the headphone tone control network.

1-23. **TONE CONTROL CIRCUIT.** The headphone circuit is equipped with a tone control network to allow the operator to adjust the headphone audio for specific characteristics. Audio from buffers U12A/B is applied to integrated circuit U13. U13 is a dual voltage-controlled-amplifier stage which operates in association with individual RC networks to produce left and right channel treble and bass shelving filters. The left channel treble shelving filter RC network consists of resistors R96 through R100 and capacitors C59 and C60. The left channel bass shelving filter RC network consists of resistors R102 through R104 and capacitors C61 through C63. The treble and bass networks respond to control voltages from headphone treble control R134 and bass control R137. The controls continuously adjust the treble and bass filter gain networks for specific headphone audio characteristics.

- 1-24. **VCA LEVEL CONTROL CIRCUIT.** Audio from the tone control circuit is applied to left and right channel level control components. The left channel level control component consists of voltage-controlled-amplifier (VCA) U4. U4 is a 2150A series precision low-noise voltage-controlled-amplifier module. The VCA is a current-input/current-output device with a voltage sensitive control port. VCA U4 actively controls the left channel audio level as directed by the voltage from a VCA taper control circuit. Potentiometer R107 nulls the distortion generated at the VCA stage. Audio from VCA module U4 is routed for application to the output buffer network.
- 1-25. **VCA TAPER CONTROL CIRCUIT.** Headphone audio level control operations are performed by two 2150A series VCA modules. The modules are directed by a taper circuit which establishes the module operating parameters. The VCA taper control network consists of: 1) rotary headphone level control R146, 2) a reference voltage network consisting of diodes D13 through D17, resistors R142 through R144, and R159, 3) differential amplifier U17A, and 4) driver U17B.
- 1-26. The taper control circuit operates in response to changes in the output voltage from headphone level control R146. R146 is designed with a dc control range from 0 to 5 volts. A non-linear taper circuit gain response is established by the reference voltage network. When the voltage from R146 is from 0 volts to approximately 0.40 volts, the driver circuit gain will be unity. A 0.40 volt to 2 volt output from R146 will result in a circuit gain of approximately 2. A 2 volt to 5 volt output from R146 will result in a driver circuit gain of approximately 4.
- 1-27. The dc control voltage from the VCA driver circuit output is applied to the VCA modules for precision control of the module audio level. When headphone level control R146 is operated fully counterclockwise, a 0 volt dc reference is applied to differential amplifier U17A. U17A will output approximately 0 volts dc through driver U17B to the VCA modules to establish minimum audio level gain. When headphone control R146 is operated fully clockwise, a +5 volt dc reference is applied to differential amplifier U17A. U17A will output approximately 12 volts dc through driver U17B to establish a maximum headphone audio level.
- 1-28. The headphone level is also controlled by headphone level adjust control R151. R151 is provided to limit the maximum headphone level.
- 1-29. **OUTPUT CIRCUIT.** Audio from the VCA circuit is applied to an output amplifier network. The left channel output amplifier consists of integrated circuit U16B. U16B outputs headphone audio for application to the cue speaker/headphone amplifier circuit board assembly.
- 1-30. **CUE CIRCUIT.**
- 1-31. The control room monitor module cue circuit processes input module cue audio for application to the cue speaker/headphone amplifier circuit board. Cue channel audio is applied to a limiter circuit consisting of operational amplifier U20B and zener diodes D18 and D19. The limiter is configured to clip audio signal levels above +20 dBu. Audio from the limiter is applied to a voltage-controlled-amplifier network consisting of integrated circuit U18B and operational amplifier U19A/B.
- 1-32. Integrated circuit U18B functions as the voltage-controlled-amplifier stage. The VCA is controlled by cue level potentiometer R154. The output of VCA U18B is applied to U19A which is configured as a buffer stage. A voltage reference from U18B is also buffered by U19B and routed as a bias voltage to cue level control R154. This allows level control R154 to operate at the appropriate control range for VCA U18B.

- 1-33. The VCA network output from U19A is applied to cue channel mute transistor Q12. During cue channel monitoring conditions, a LOW is applied through the control room mute line to Q12. The LOW biases Q2 on to enable cue audio. The cue audio is routed through buffer U20A for application to the cue speaker/headphone amplifier circuit board. During a control room mute condition, a HIGH is applied to bias Q12 off and mute the cue speaker.
- 1-34. **POWER SUPPLY CIRCUIT.**
- 1-35. DC operating potentials for application to the control room monitor module components are produced by a regulator network. Unregulated ± 24 volt supplies from the console power supply module are applied through fusible resistors R175 and R178 to a regulator network consisting of U21 and U22. R175/R178 are carbon-composition resistors which function as fusible links in the event of a short-circuit potential on the module. The fusible resistors limit a power supply failure to the module and prevent a failure in the entire console system.
- 1-36. ± 24 V dc supplies from the console power supply module are applied to +16.5 volt dc regulator U21 and -16.5 volt dc regulator U22. U21/U22 are three terminal adjustable regulators containing internal thermal and short-circuit current limiting features. The regulated ± 16.5 volt outputs from U21 and U22 are routed for application to the module audio components.
- 1-37. A regulated +12 volt supply is applied through an RC filter network consisting of resistor R181 and capacitor C116. The output of the filter network is routed for application to the module control logic components.

SECTION II

CONTROL ROOM MONITOR MODULE MAINTENANCE

2-1. INTRODUCTION.

2-2. This section provides general maintenance information, electrical adjustment procedures, and troubleshooting information for the control room monitor module.

2-3. FIRST LEVEL MAINTENANCE.

2-4. First level maintenance consists of precautionary procedures applied to the equipment to prevent future failures. The procedures are performed on a regular basis and the results recorded in a performance log.

2-5. GENERAL.

2-6. The control room monitor module circuitry should be periodically cleaned of accumulated dust using a nylon-bristle brush and vacuum cleaner. Inspect the module for improperly seated semiconductors and components damaged by overheating.

2-7. AUDIO SWITCHES.

2-8. The control room monitor module is equipped with ITT Shadow audio switches. The switches are sealed for low-noise long-life operation and do not permit cleaning. If a switch becomes noisy or defective, the switch will require replacement.

2-9. SECOND LEVEL MAINTENANCE.

2-10. Second level maintenance consists of procedures required to restore a control room monitor module to operation after a fault has occurred. The procedures are divided into electrical adjustments, troubleshooting, and component replacement procedures.

2-11. ELECTRICAL ADJUSTMENTS.

2-12. **CONTROL ROOM MONITOR CIRCUIT VCA DISTORTION ADJUSTMENT.** Left channel VCA distortion control R13 and right channel VCA distortion control R42 null distortion at the VCA modules. Distortion adjustment is not required unless VCA modules U4 or U5 are replaced. The VCA distortion is nulled as follows.

2-13. **Required Equipment.** The following test equipment is required to null the VCA distortion.

A. Allen Wrench (supplied with the console).

B. Non-Metallic Adjustment Tool.

C. Extender Ribbon Cable Assemblies:

40-Pin Assembly

50-Pin Assembly

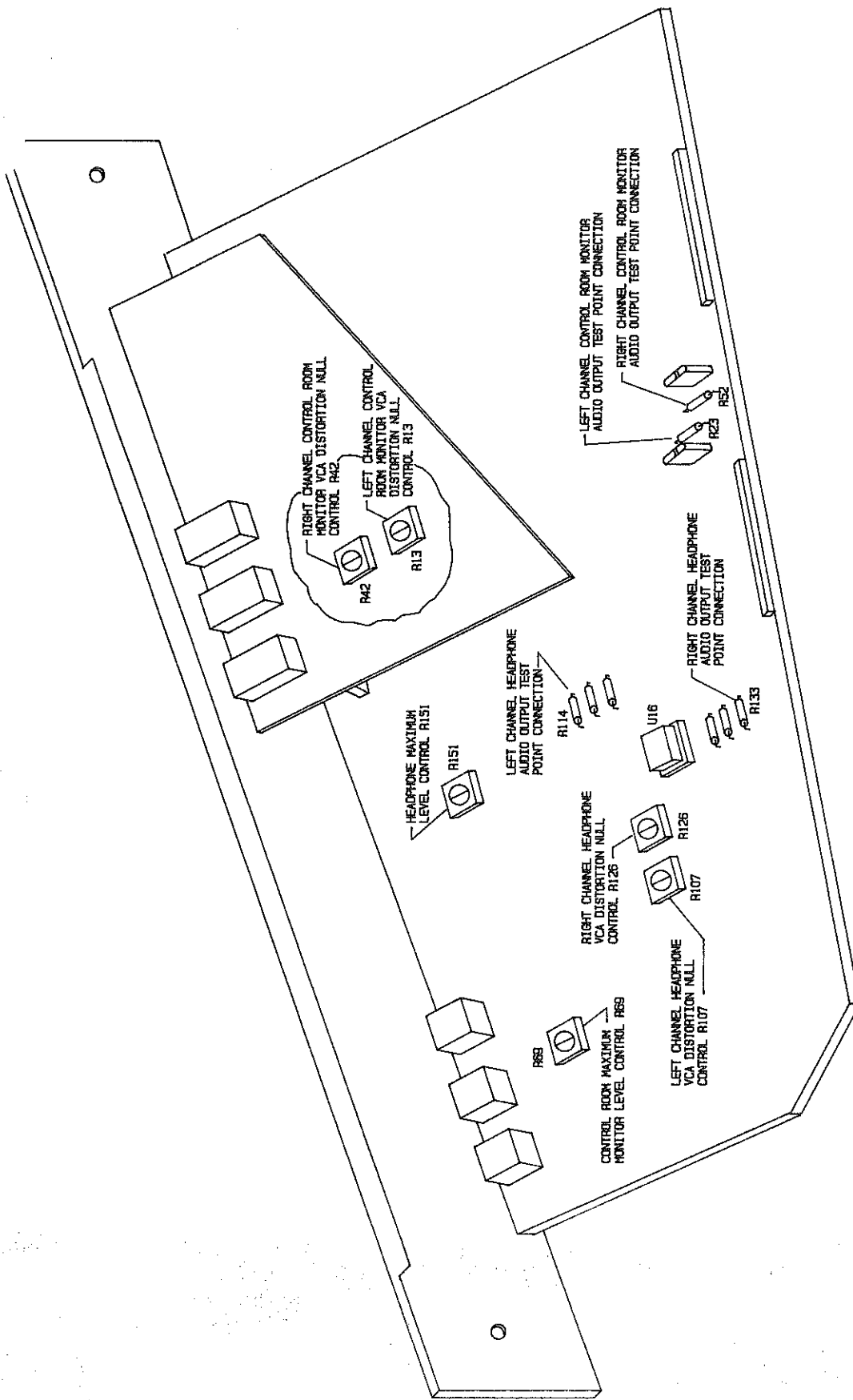
D. Audio Signal Generator (Potomac AG-51 or equivalent).

E. Audio Analyzer - Capable of indicating distortion levels from 0.05% to 0.1% (Sound Technology 1710A Distortion Analyzer or equivalent).

2-14. **Procedure.** To null the VCA distortion, proceed as follows:

2-15. Remove the control room monitor module from the mainframe and connect the extender cable assemblies between the control room monitor module and the receptacles on the mainframe.

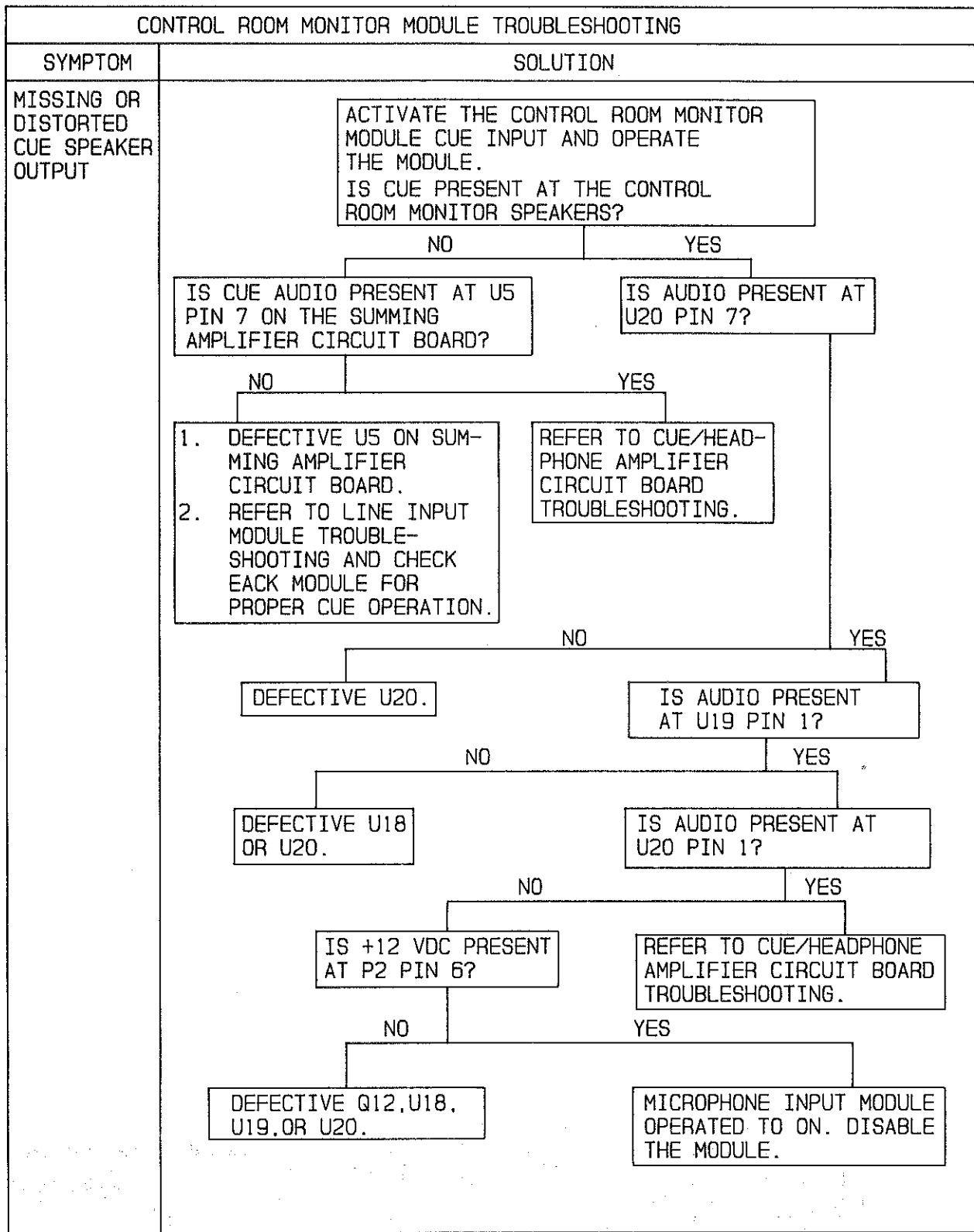
- 2-16. Connect the audio signal generator to a control room monitor module left channel external input on the control room/studio external input connector.
- 2-17. Refer to Figure 2-1 and connect the audio analyzer between chassis ground and resistor R23 as shown.
- 2-18. Adjust the audio generator for a 1 kHz output at 0 dBu.
- 2-19. Operate the control room monitor module to select the test audio for control room monitoring operations.
- 2-20. Refer to Figure 2-1 and adjust left channel control room monitor VCA distortion null control R13 for a minimum audio analyzer indication.
- 2-21. Repeat the procedure for the right channel. Connect the audio analyzer to resistor R52 and adjust the right channel distortion with right channel control room monitor VCA distortion null control R42.
- 2-22. Disconnect all test equipment and replace the control room monitor module.
- 2-23. **HEADPHONE CIRCUIT VCA DISTORTION ADJUSTMENT.** Left channel VCA distortion control R107 and right channel VCA distortion control R126 null distortion at the VCA modules. Distortion adjustment is not required unless VCA modules U14 or U15 are replaced. The VCA distortion is nulled as follows.
- 2-24. **Required Equipment.** The following test equipment is required to null the VCA distortion.
- A. Allen Wrench (supplied with the console).
 - B. Non-Metallic Adjustment Tool.
 - C. Extender Ribbon Cable Assemblies:
 - 40-Pin Assembly
 - 50-Pin Assembly
 - D. Audio Signal Generator (Potomac AG-51 or equivalent).
 - E. Audio Analyzer - Capable of indicating distortion levels from 0.05% to 0.1% (Sound Technology 1710A Distortion Analyzer or equivalent).
- 2-25. **Procedure.** To null the VCA distortion, proceed as follows:
- 2-26. Remove the control room monitor module from the mainframe and connect the extender cable assemblies between the control room monitor module and the receptacles on the mainframe.
- 2-27. Connect the audio signal generator to a control room monitor module left channel external input on the control room/studio external input connector.
- 2-28. Refer to Figure 2-1 and connect the audio analyzer between chassis ground and resistor R114 as shown.
- 2-29. Adjust the audio generator for a 1 kHz output at 0 dBu.
- 2-30. Operate the control room monitor module to select the test audio for headphone monitoring operations.
- 2-31. Refer to Figure 2-1 and adjust left channel headphone VCA distortion null control R107 for a minimum audio analyzer indication.
- 2-32. Repeat the procedure for the right channel. Connect the audio analyzer to resistor R133 and adjust the right channel distortion with right channel headphone VCA distortion null control R126.



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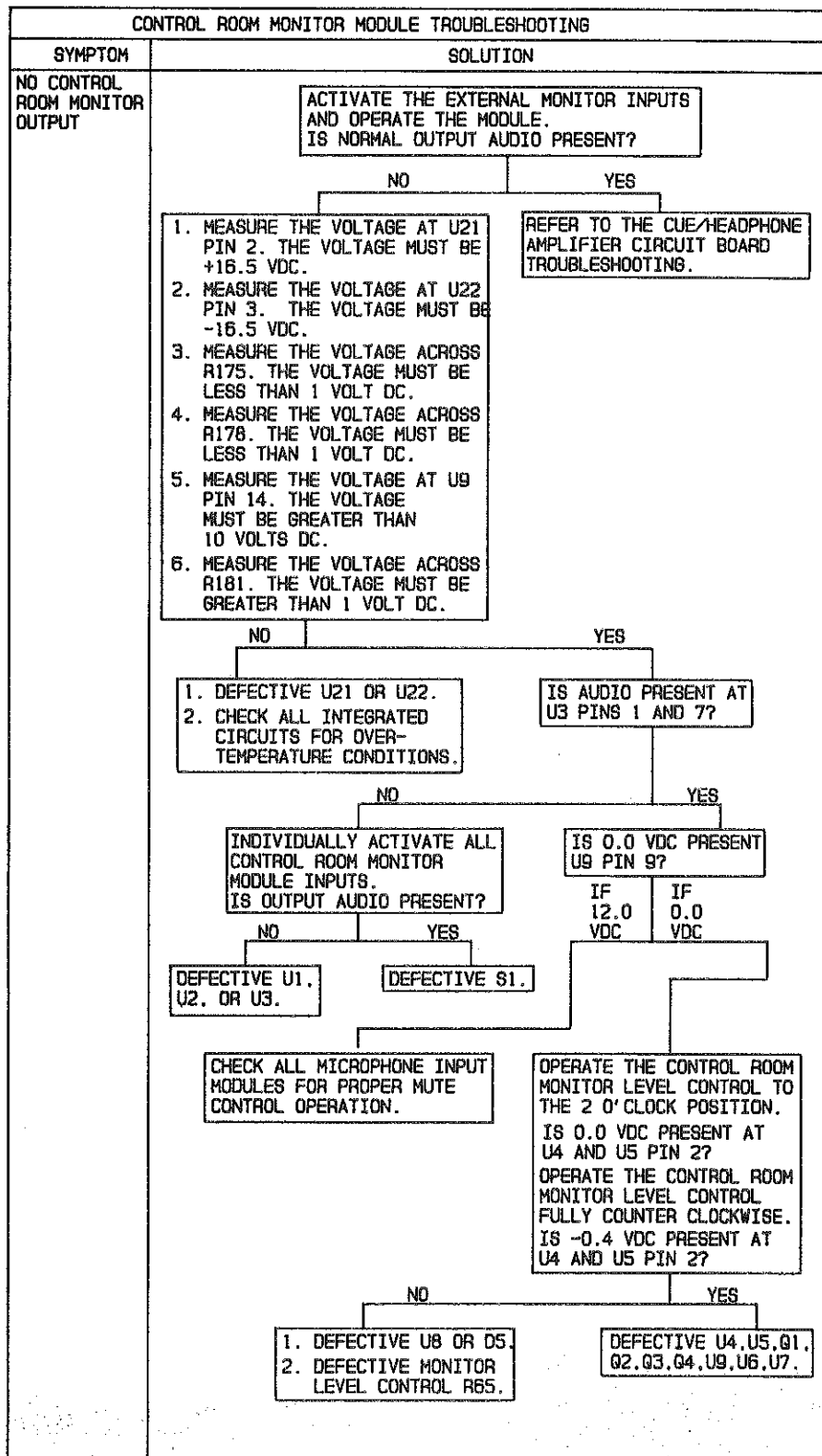
FIGURE 2-1. CONTROL ROOM MONITOR MODULE ADJUSTMENT CONTROLS

- 2-33. Disconnect all test equipment and replace the control room monitor module.
- 2-34. **CONTROL ROOM MAXIMUM MONITOR LEVEL CONTROL.** Potentiometer R69 adjusts the control room monitor maximum level. The adjustment procedure for the control is presented in the installation section of this manual. Refer to VOLUME I SECTION II, INSTALLATION for the adjustment procedure.
- 2-35. **HEADPHONE MAXIMUM LEVEL CONTROL.** Potentiometer R151 adjusts the headphone maximum level. The adjustment procedure for the control is presented in the installation section of this manual. Refer to VOLUME I SECTION II, INSTALLATION for the adjustment procedure.
- 2-36. **TROUBLESHOOTING.**
- 2-37. The troubleshooting philosophy for the control room monitor module consists of isolating a problem to a specific circuit or group of components. Two 40-pin and one 50-pin extender ribbon cable assemblies are provided to interface plug-in modular assemblies to the chassis mounted motherboards for troubleshooting procedures. To prevent the application of inadvertent audio noise to the console audio system, attach the 50-pin extender assembly to the module before the 40-pin assembly.
- 2-38. Figures 2-2 and 2-3 present the control room monitor module and the monitor input amplifier circuit board troubleshooting. Refer to Figures 2-2 and 2-3 to isolate a failure to a specific group of components.
- 2-39. Once trouble is isolated and power is totally deenergized, refer to the schematic diagrams and the theory of operation to assist in problem resolution. The defective component may be repaired locally or the entire module may be returned to Broadcast Electronics for repair or replacement.
- 2-40. **COMPONENT REPLACEMENT.**
- 2-41. Component replacement procedures for the console modular assemblies are presented in SECTION II, MAINTENANCE. Refer to SECTION II as required for the replacement procedures.



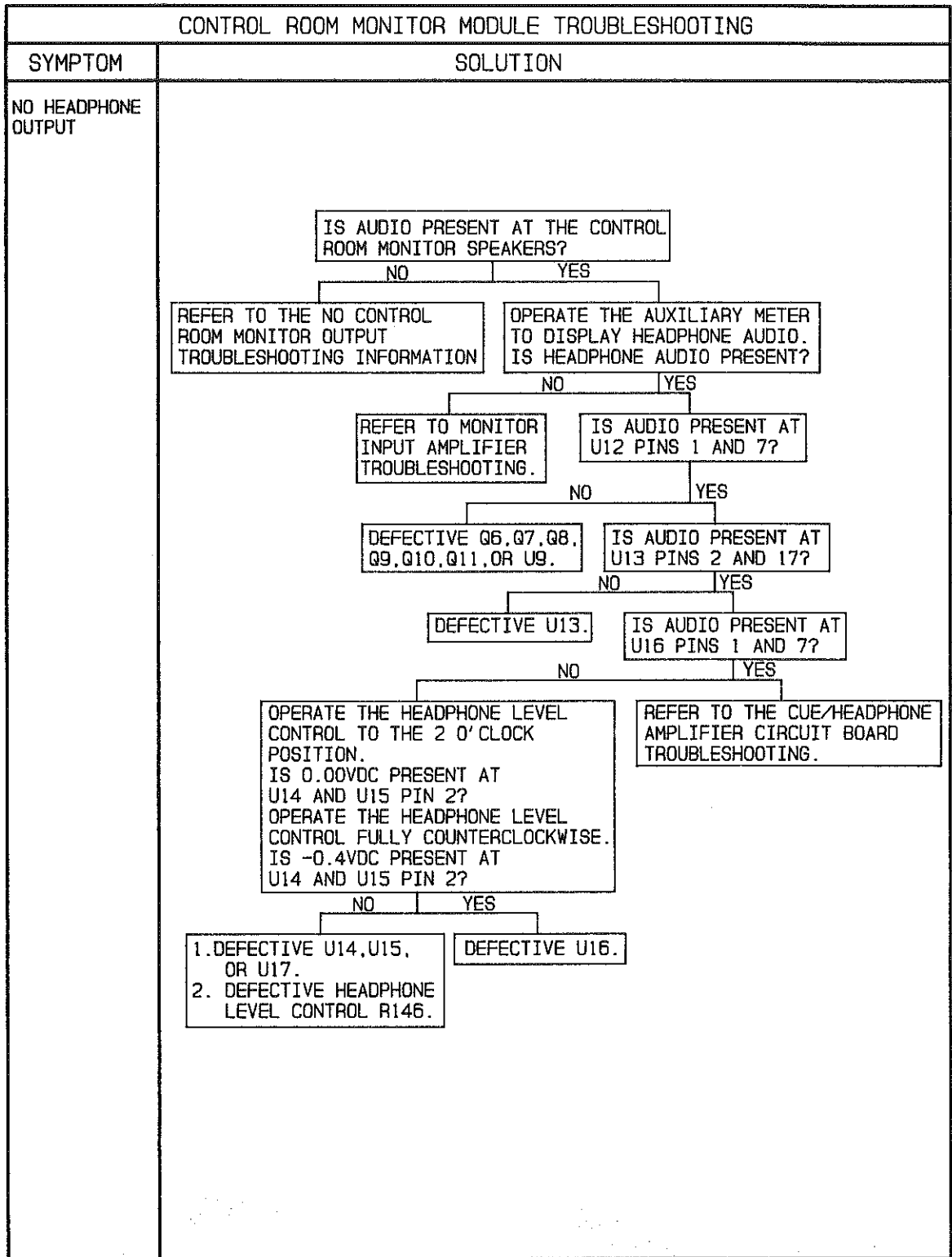
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597-9012-135A

FIGURE 2-2. CONTROL ROOM MONITOR MODULE TROUBLESHOOTING
(Sheet 1 of 3)



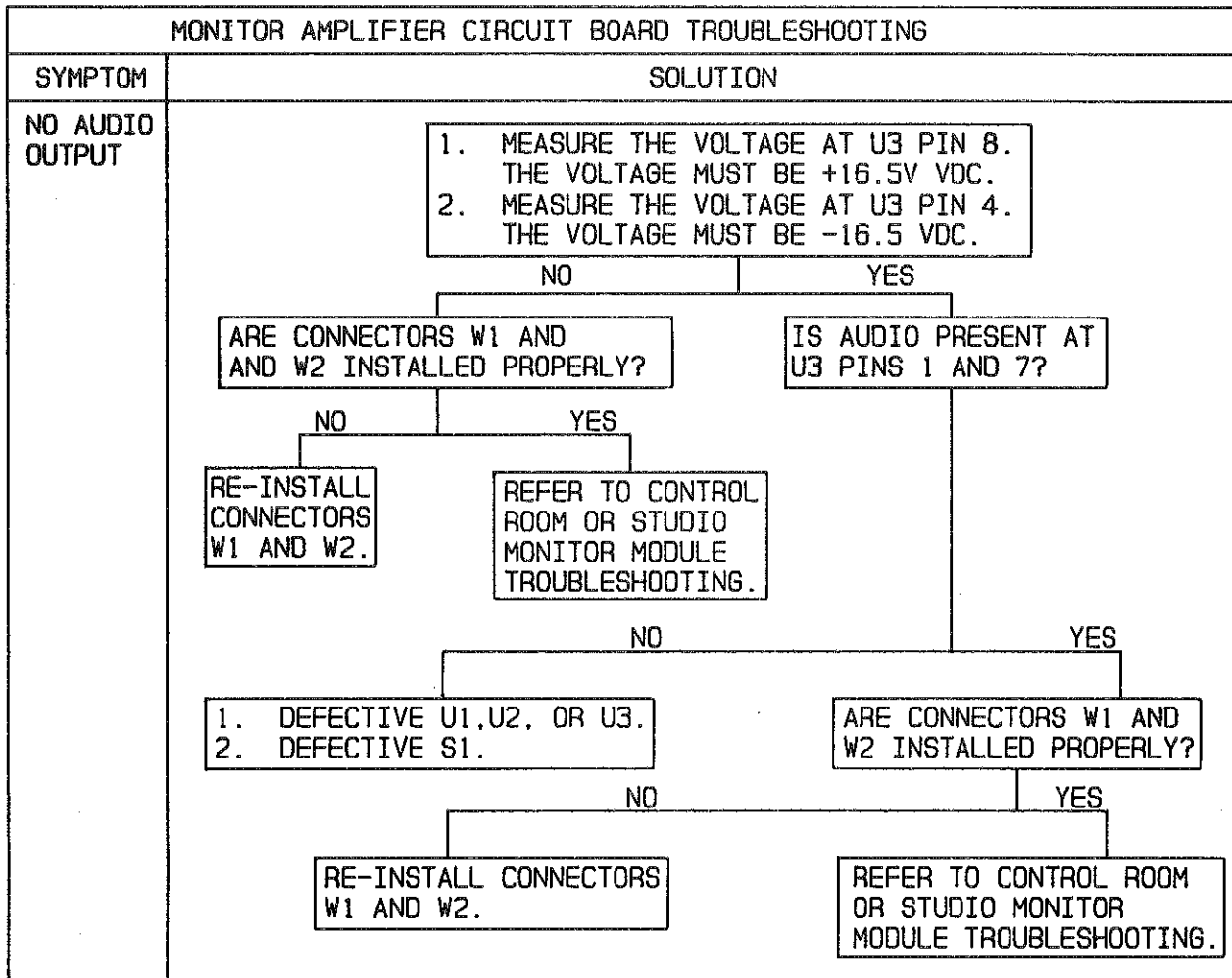
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FIGURE 2-2. CONTROL ROOM MONITOR MODULE TROUBLESHOOTING
(Sheet 2 of 3)



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FIGURE 2-2. CONTROL ROOM MONITOR MODULE TROUBLESHOOTING
(Sheet 3 of 3)



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FIGURE 2-3. MONITOR INPUT AMPLIFIER CIRCUIT BOARD TROUBLESHOOTING

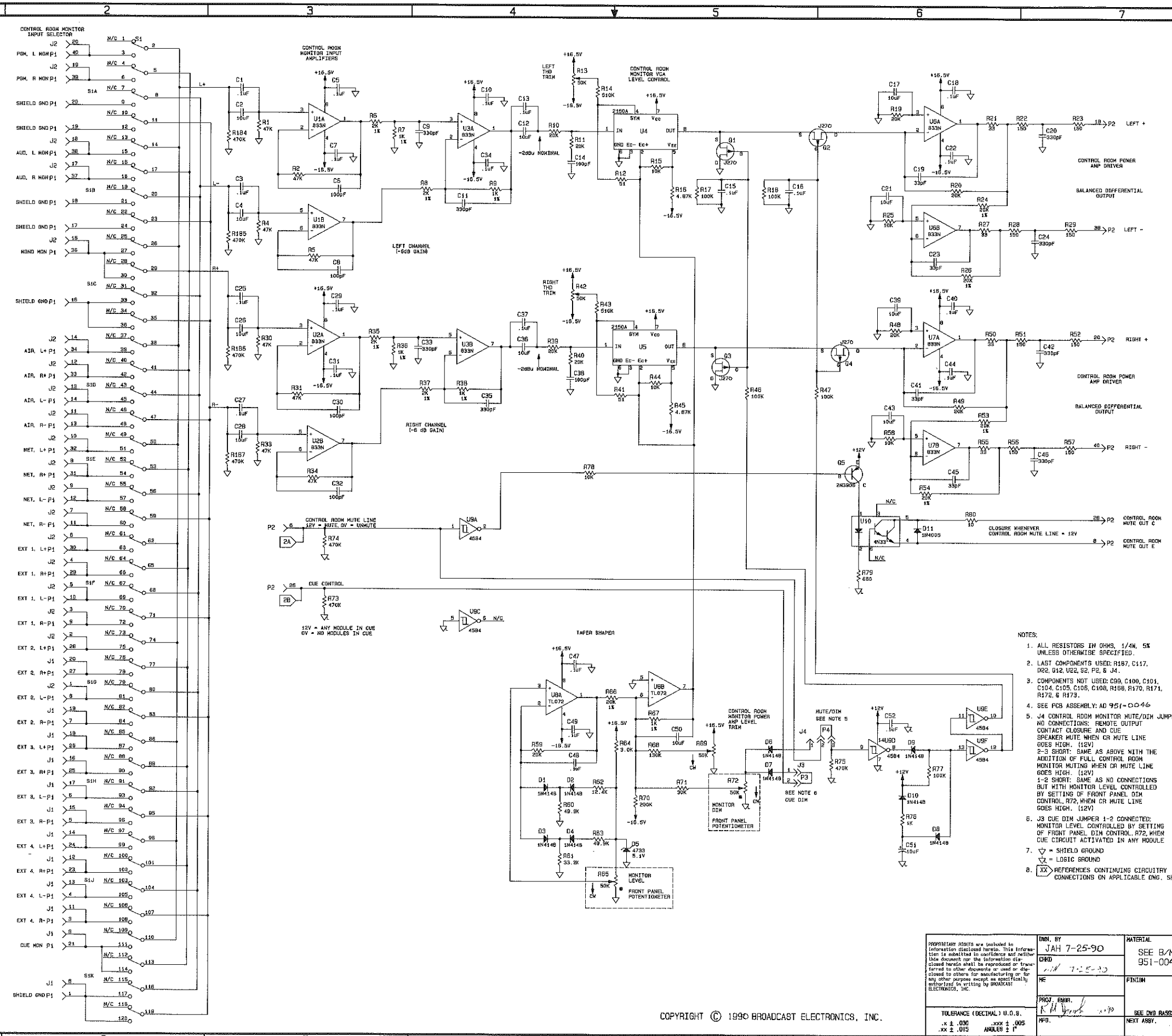
SECTION III

CONTROL ROOM MONITOR MODULE DRAWINGS

3-1. INTRODUCTION.

3-2. This section provides assembly drawings and schematic diagrams as listed below for the control room monitor module.

FIGURE	TITLE	NUMBER
3-1	SCHEMATIC DIAGRAM, CONTROL ROOM MONITOR MODULE	SD951-0046
3-2	ASSEMBLY DIAGRAM, CONTROL ROOM MONITOR MODULE	AD951-0046
3-3	SCHEMATIC DIAGRAM, MONITOR INPUT AMPLIFIER CIRCUIT BOARD	SD911-0101-001
3-4	ASSEMBLY DIAGRAM, MONITOR INPUT AMPLIFIER CIRCUIT BOARD	AC911-0101-001

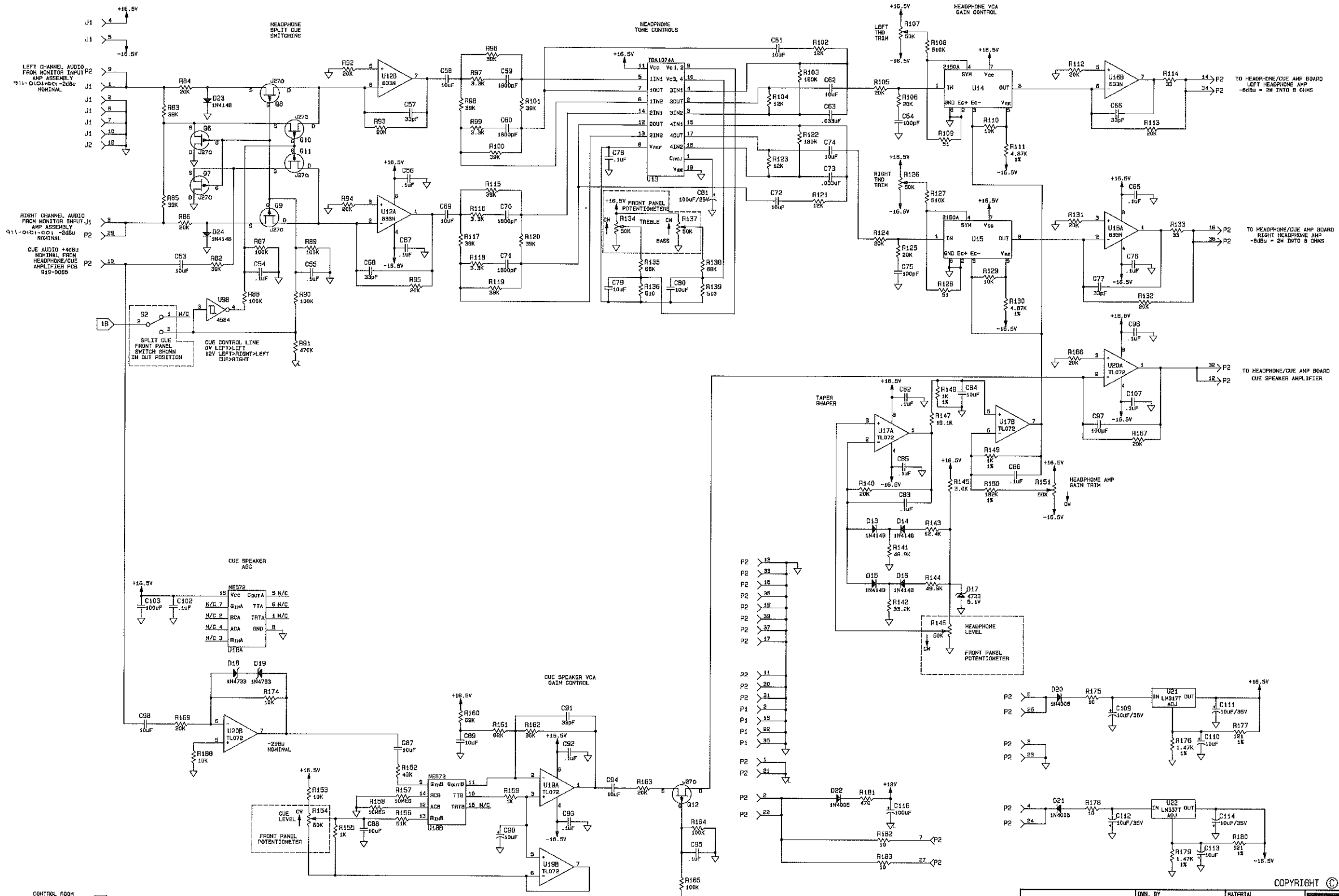


- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5% UNLESS OTHERWISE SPECIFIED.
 2. LARGEST COMPONENTS USED: R187, C117, D02, D12, U02, S2, P2, & J4.
 3. COMPONENTS NOT USED: C09, C100, C101, C104, C105, C106, C108, R156, R170, R171, R172, & R173.
 4. SEE PCB ASSEMBLY: AD 951-0046
 5. J4 CONTROL ROOM MONITOR MUTE/DIM JUMPER NO CONNECTIONS: REMOTE OUTPUT CONTACT CLOSURE AND CUE SPEAKER MUTE WHEN CR MUTE LINE GOES HIGH. (12V) 1-2 SHORT: SAME AS ABOVE WITH THE ADDITION OF FULL CONTROL ROOM MONITOR MUTING WHEN CR MUTE LINE GOES HIGH. (12V) 1-2 SHORT: SAME AS NO CONNECTIONS BUT WITH MONITOR LEVEL CONTROLLED BY SETTINGS OF FRONT PANEL DIM CONTROL. R72, WHEN CR MUTE LINE GOES HIGH. (12V)
 6. J3 CUE DIM JUMPER 1-2 CONNECTED: MONITOR LEVEL CONTROLLED BY SETTINGS OF FRONT PANEL DIM CONTROL. R72, WHEN CUE CIRCUIT ACTIVATED IN ANY MODULE
 7. ∇ = SHIELD GROUND
 ∇ = LOGIC GROUND
 8. \square REFERENCE CONTINUING CIRCUITRY CONNECTIONS ON APPLICABLE DNG. SHTS.

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	DATE 7-25-90	FINISH SEE DNG 951-0000	
TOLERANCE (DECIMAL) U. O. S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± °	PROJ. ENGR. <i>[Signature]</i>	NEXT ASSY.	TYPE S D
MODE MT-90		SCALE NONE	SHEET 1 of 2

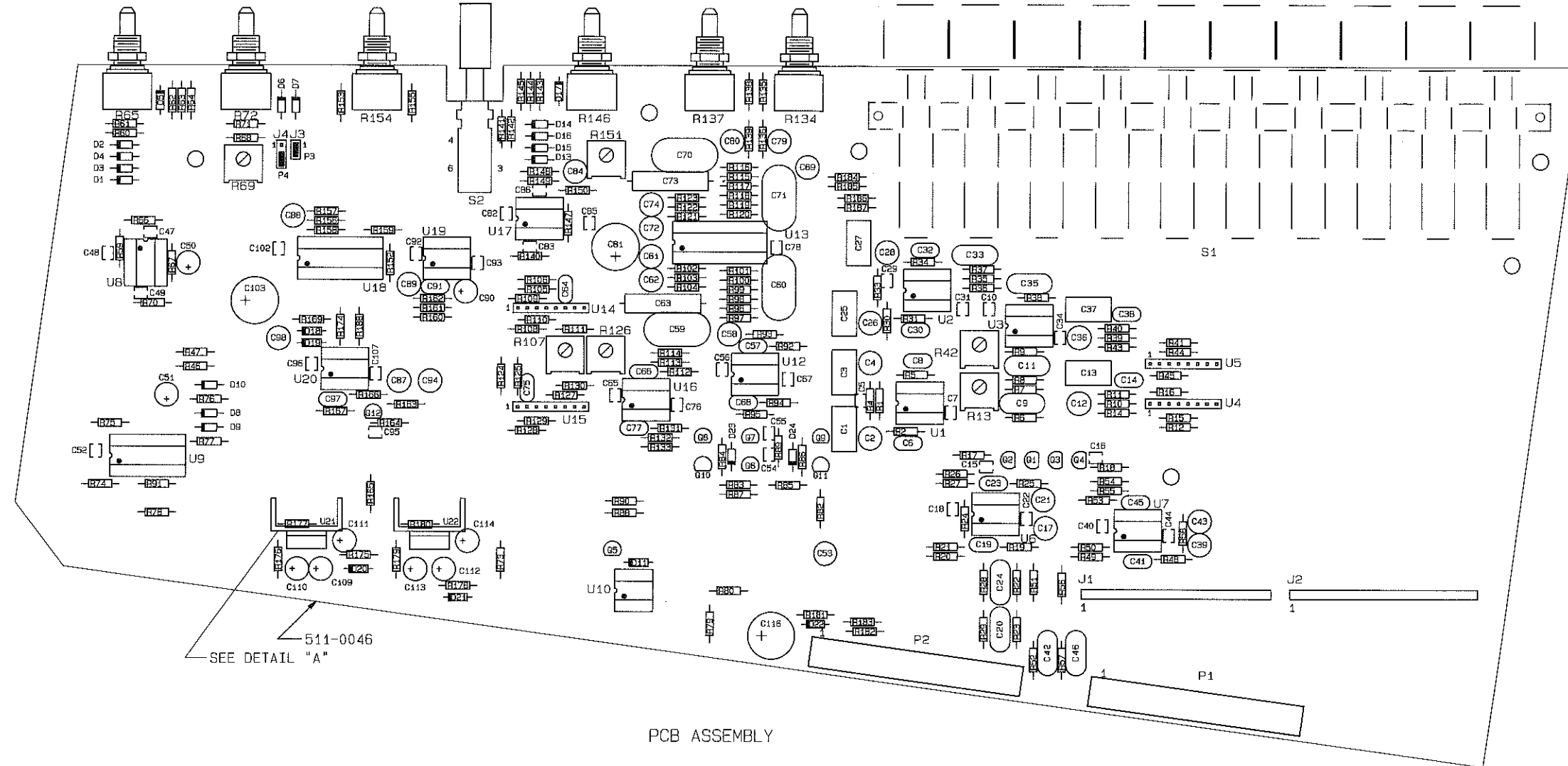


CONTROL ROOM
MUTE LINE
12V-CUE SPKR MUTED

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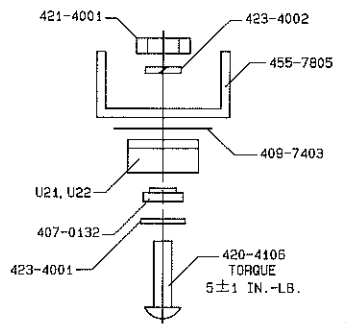
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	DATE 7-25-90	FINISH SEE DWG. RAS2-0000 NEXT ASSY.	
TOLERANCE (DECIMAL) U.O.B. .x ± .030 .xx ± .005 .xx ± .015 ANGLES ± 1°	DRAWN BY JAH	FINISH SEE DWG. RAS2-0000 NEXT ASSY.	TYPE S D
	PART NO. 951-0046	MODEL MT-90	SCALE NONE SHEET 2 OF 2



SEE DETAIL "A"

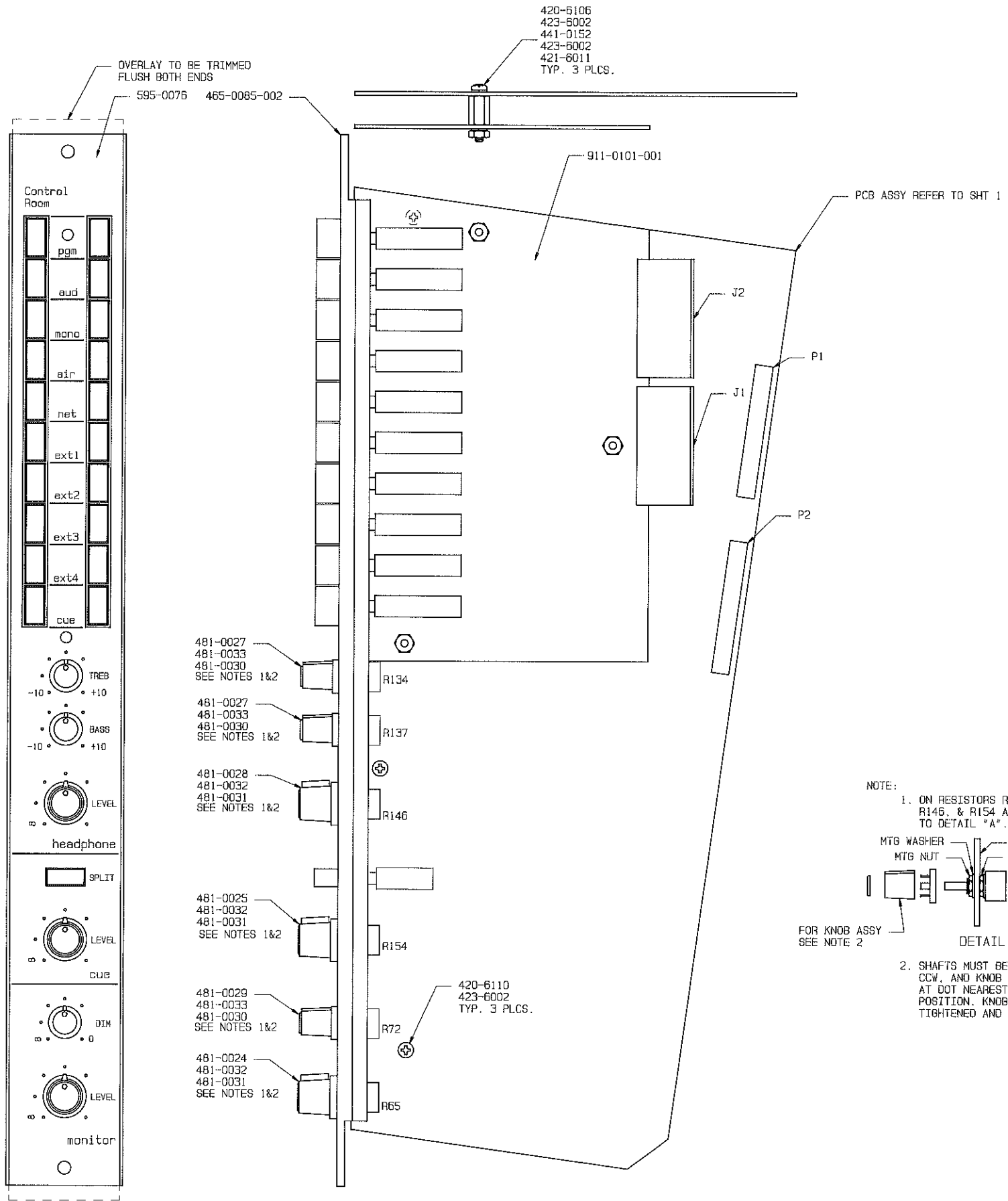
PCB ASSEMBLY



DETAIL "A"
TYPICAL 2 PLCS.

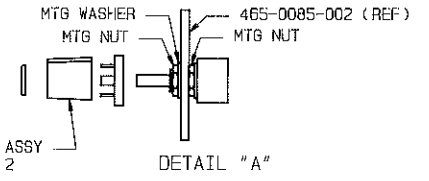
- NOTES:
1. REFER TO SHEET 2 FOR MODULE ASSEMBLY.
 2. SEE PCB SCHEMATIC SD951-0046

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TOLERANCE DECIMAL U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± °	PRD. ENGR. MFG.	FINISH	TITLE CONTROL ROOM MONITOR / HEADPHONE MODULE	
		NEXT ASSY	TYPE SIZE A D	DWS. NO. 951-0046
				REV B
				MODEL MT90 SCALE 1.5/1 SHEET 1 OF 2



NOTE:

- ON RESISTORS R65, R72, R134, R137, R146, & R154 ASSEMBLE ACCORDING TO DETAIL "A".
- SHAFTS MUST BE TURNED FULLY CCW, AND KNOB POINTERS POSITIONED AT DOT NEAREST TO THE FULLY CCW POSITION. KNOB CAN THEN BE TIGHTENED AND CAP PRESSED INTO PLACE.

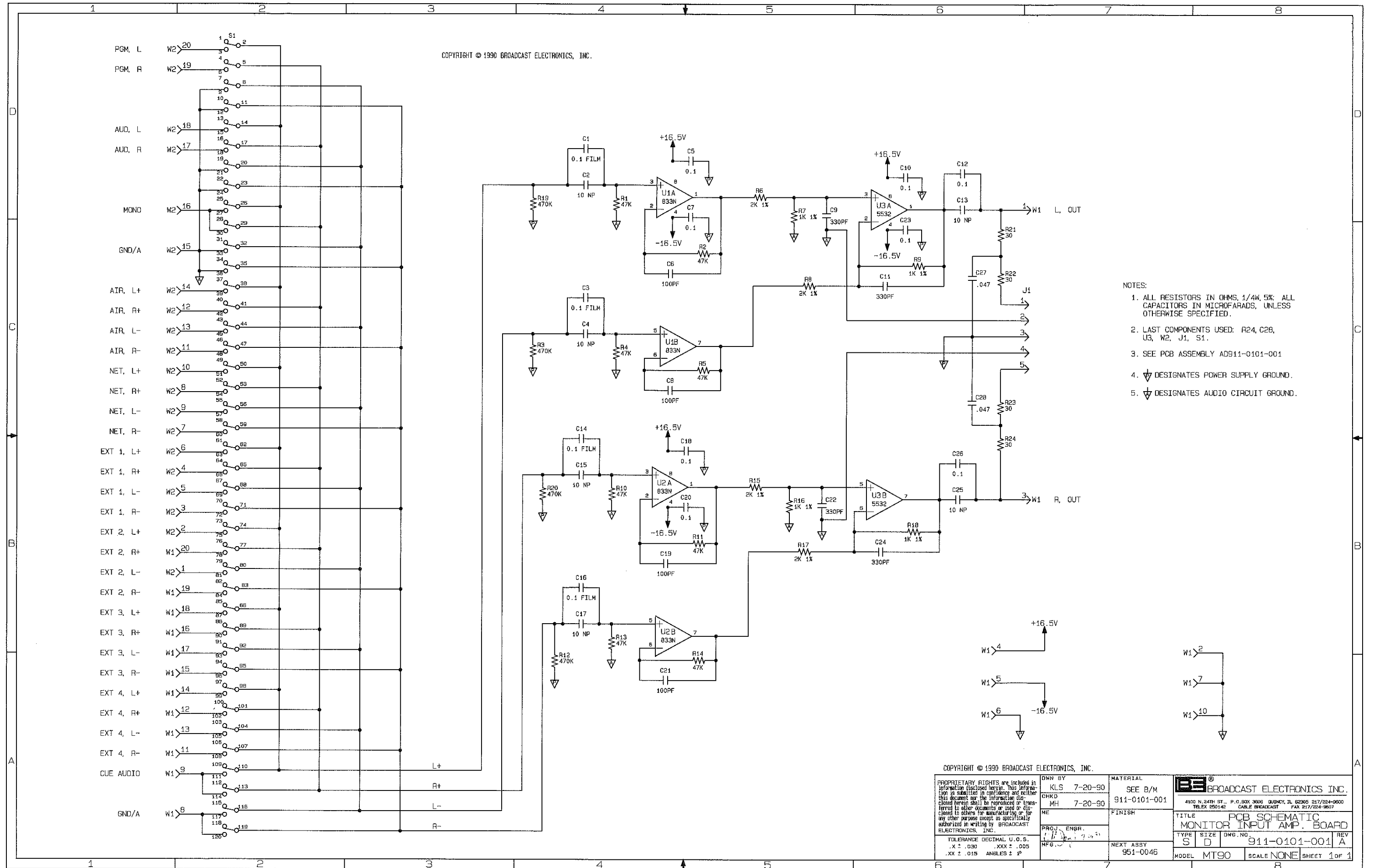


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	DATE 7/25/90	FINISH SEE THE DRAWING	
TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XES ± .025 .X ± .015 ANGLES ± 1°	PROJ. ENGR. MFB	SEE THE DRAWING	TYPE A D
		NEXT ASSY.	DWG. NO. 951-0046
			MODEL MT-90
			SCALE 1/1
			SHEET 2 OF 2

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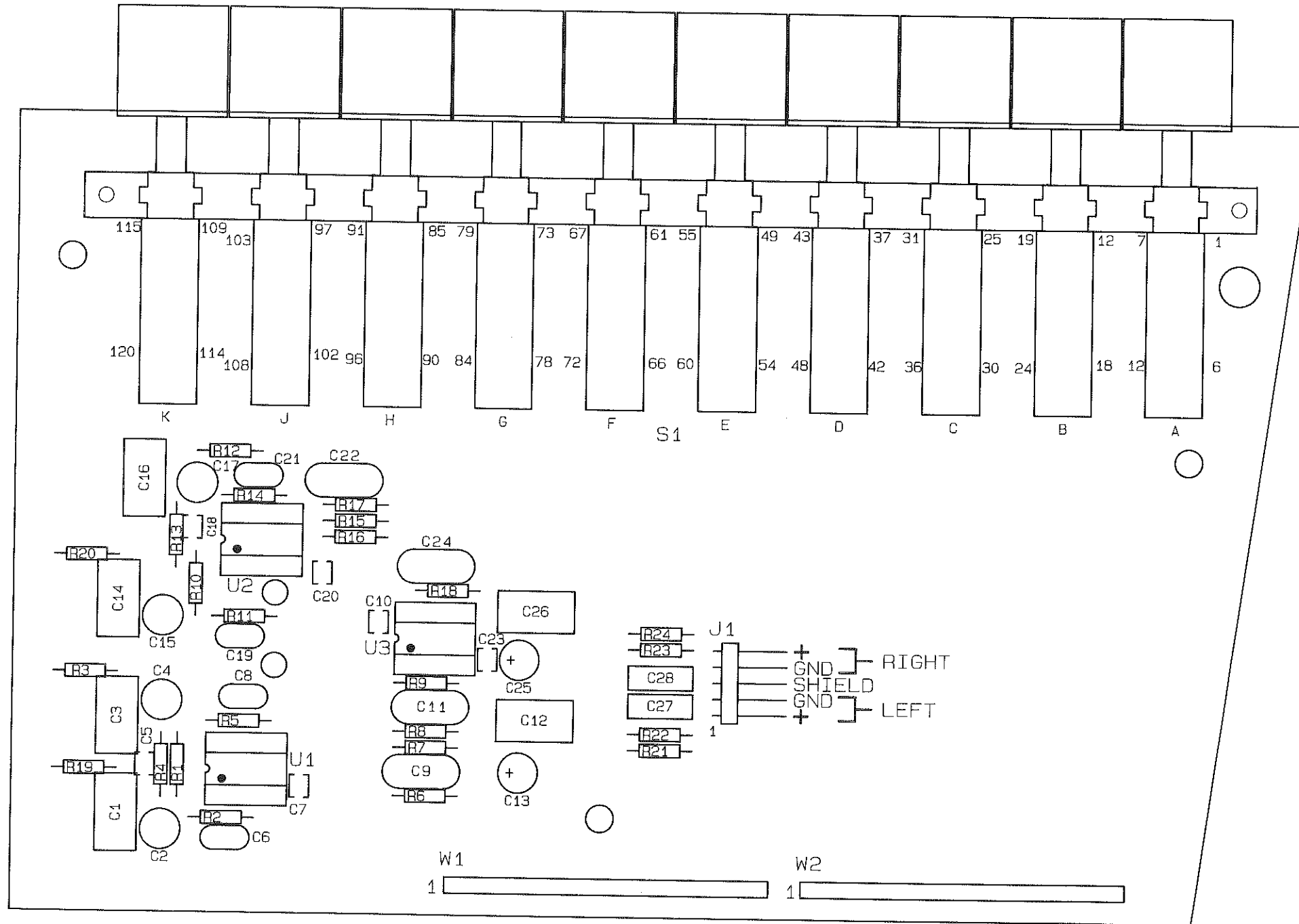


- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5%; ALL CAPACITORS IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENTS USED: R24, C28, U3, W2, J1, S1.
 3. SEE PCB ASSEMBLY AD911-0101-001
 4. ⏏ DESIGNATES POWER SUPPLY GROUND.
 5. ⏏ DESIGNATES AUDIO CIRCUIT GROUND.

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TOLERANCE DECIMAL U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°		CHKD MH 7-20-90	FINISH NEXT ASSY 951-0046	
PROJ. ENGR. 			TYPE S D	DWG. NO. 911-0101-001
MFG.			MODEL MT90	SCALE NONE
			SHEET 1 OF 1	REV A

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511-0101-001

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	CHKD	MH 7-20-90	FINISH	911-0101-001	
	ME	PROJ. ENGR.	NEXT ASSY	951-0046	TITLE PCB ASSEMBLY MONITOR INPUT AMP. BOARD TYPE A SIZE C DWG. NO. 911-0101-001 REV A
	MFG.		SCALE	-/1	SHEET 1 OF 1

SECTION IV

CONTROL ROOM MONITOR MODULE PARTS LIST

4-1. INTRODUCTION.

4-2. This section provides descriptions and part numbers of electrical components and assemblies required for maintenance of the control room monitor module. Each table entry in this section is indexed by reference designators appearing on the applicable schematic diagram.

TABLE 4-1. CONTROL ROOM MONITOR MODULE PARTS LIST INDEX

TABLE	TITLE	PART NO.	PAGE
4-2	CONTROL ROOM MONITOR MODULE ASSEMBLY	951-0046	4-1
4-3	MONITOR INPUT AMPLIFIER CIRCUIT BOARD	911-0101-001	4-6

**TABLE 4-2. CONTROL ROOM MONITOR MODULE ASSEMBLY -951-0046
(Sheet 1 of 7)**

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C2	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C3	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C4	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C5	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C6	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C7	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C8	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C9	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C10	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C11	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C12	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C13	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C14	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C15,C16	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	2
C17	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C18	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C19	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C20	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C21	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C22	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C23	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C24	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1

TABLE 4-2. CONTROL ROOM MONITOR MODULE ASSEMBLY - 951-0046
(Sheet 2 of 7)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C25	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C26	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C27	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C28	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C29	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C30	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C31	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C32	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C33	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C34	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C35	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C36	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C37	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C38	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C39	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C40	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C41	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C42	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C43	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C44	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C45	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C46	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C47,C48,C49	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	3
C50	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C51	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C52	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C53	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C54,C55,C56	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	3
C57	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C58	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C59,C60	Capacitor, Mica, 1800 pF ±5%, 500V	040-1833	2
C61,C62	Capacitor, Electrolytic, 10 uF, 35V	023-1075	2
C63	Capacitor, Mylar, 0.33 uF, 50V	038-1049	1
C64	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C65	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C66	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C67	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C68	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C69	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C70,C71	Capacitor, Mica, 1800 pF ±5%, 500V	040-1833	2
C72	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C73	Capacitor, Mylar, 0.33 uF, 50V	038-1049	1
C74	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C75	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C76	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C77	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C78	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C79,C80	Capacitor, Electrolytic, 10 uF, 35V	023-1075	2
C81	Capacitor, Electrolytic, 100 uF, 35V	023-1084	1

TABLE 4-2. CONTROL ROOM MONITOR MODULE ASSEMBLY - 951-0046
(Sheet 3 of 7)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C82,C83	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	2
C84	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C85,C86	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	2
C87,C88,C89	Capacitor, Electrolytic, 10 uF, 35V	023-1075	3
C90	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C91	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C92,C93	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	2
C94	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C95,C96	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	2
C97	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C98	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C102	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C103	Capacitor, Electrolytic, 100 uF, 35V	023-1084	1
C107	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C109 THRU C114	Capacitor, Electrolytic, 10 uF, 35V	023-1076	6
C116	Capacitor, Electrolytic, 100 uF, 35V	023-1084	1
D1 THRU D4	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	4
D5	Diode, Zener, 1N4733A, 5.1V ±5%, 1W	200-4733	1
D6 THRU D10	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	5
D11	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	1
D13 THRU D16	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	4
D17,D18,D19	Diode, Zener, 1N4733A, 5.1V ±5%, 1W	200-4733	3
D20,D21,D22	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	3
D23,D24	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	2
J1,J2	Socket, Flexstrip, 20-Pin	417-0168	2
J3	Connector, Header, 2-Pin	417-4004	1
J4	Connector, Header, 3-Pin	417-0003	1
P1,P2	Receptacle, 40-Pin Dual In-line	417-4041	2
P3,P4	Jumper, Programmable, 2-Pin	340-0004	2
Q1 THRU Q4	Field Effect Transistor, J270, P-Channel JFET, TO-92 Case	210-0270	4
Q5	Transistor, 2N3906, PNP, Silicon, TO-92 Case	210-3906	1
Q6 THRU Q12	Field Effect Transistor, J270, P-Channel JFET, TO-92 Case	210-0270	7
R1,R2,R4,R5	Resistor, 47 k Ohm ±5%, 1/4W	100-4753	4
R6	Resistor, 2 k Ohm ±1%, 1/4W	100-2041	1
R7	Resistor, 1 k Ohm ±1%, 1/4W	103-1041	1
R8	Resistor, 2 k Ohm ±1%, 1/4W	100-2041	1
R9	Resistor, 1 k Ohm ±1%, 1/4W	103-1041	1
R10,R11	Resistor, 20 k Ohm ±5%, 1/4W	100-2053	2
R12	Resistor, 51 Ohm ±5%, 1/4W	100-5123	1
R13	Potentiometer, 50 k Ohm ±10%, 1/2W	177-5054	1
R14	Resistor, 510 k Ohm ±5%, 1/4W	100-5163	1
R15	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	1
R16	Resistor, 4.87 k Ohm ±1%, 1/4W	103-4874	1
R17,R18	Resistor, 100 k Ohm ±5%, 1/4W	100-1063	2
R19,R20	Resistor, 20 k Ohm ±5%, 1/4W	100-2053	2
R21	Resistor, 33 Ohm ±5%, 1/4W	100-3323	1
R22,R23	Resistor, 150 Ohm ±5%, 1/4W	100-1533	2

TABLE 4-2. CONTROL ROOM MONITOR MODULE ASSEMBLY - 951-0046
(Sheet 4 of 7)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R24	Resistor, 20 k Ohm $\pm 1\%$, 1/4W	103-2051	1
R25	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R26	Resistor, 20 k Ohm $\pm 1\%$, 1/4W	103-2051	1
R27	Resistor, 33 Ohm $\pm 5\%$, 1/4W	100-3323	1
R28,R29	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R30,R31, R33,R34	Resistor, 47 k Ohm $\pm 5\%$, 1/4W	100-4753	4
R35	Resistor, 2 k Ohm $\pm 1\%$, 1/4W	100-2041	1
R36	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	1
R37	Resistor, 2 k Ohm $\pm 1\%$, 1/4W	100-2041	1
R38	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	1
R39,R40	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	2
R41	Resistor, 51 Ohm $\pm 5\%$, 1/4W	100-5123	1
R42	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W	177-5054	1
R43	Resistor, 510 k Ohm $\pm 5\%$, 1/4W	100-5163	1
R44	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R45	Resistor, 4.87 k Ohm $\pm 1\%$, 1/4W	103-4874	1
R46,R47	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	2
R48	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R49	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R50	Resistor, 33 Ohm $\pm 5\%$, 1/4W	100-3323	1
R51,R52	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R53,R54	Resistor, 20 k Ohm $\pm 1\%$, 1/4W	103-2051	2
R55	Resistor, 33 Ohm $\pm 5\%$, 1/4W	100-3323	1
R56,R57	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R58	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R59	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R60	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R61	Resistor, 33.2 k Ohm $\pm 1\%$, 1/4W	103-3325	1
R62	Resistor, 12.4 k Ohm $\pm 1\%$, 1/4W	103-1245	1
R63	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R64	Resistor, 3 k Ohm $\pm 5\%$, 1/4W	100-3043	1
R65	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W (Monitor Level)	178-5056	1
R66	Resistor, 20 k Ohm $\pm 1\%$, 1/4W	103-2051	1
R67	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	1
R68	Resistor, 130 k Ohm $\pm 5\%$, 1/4W	100-1363	1
R69	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W	177-5054	1
R70	Resistor, 200 k Ohm $\pm 5\%$, 1/4W	100-2063	1
R71	Resistor, 30 k Ohm $\pm 5\%$, 1/4W	100-3053	1
R72	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W (Monitor Dim)	178-5056	1
R73,R74,R75	Resistor, 470 k Ohm $\pm 5\%$, 1/4W	100-4763	3
R76	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R77	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R78	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R79	Resistor, 680 Ohm $\pm 5\%$, 1/4W	100-6833	1
R80	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1024	1
R82,R83	Resistor, 39 k Ohm $\pm 5\%$, 1/4W	100-3953	2

TABLE 4-2. CONTROL ROOM MONITOR MODULE ASSEMBLY - 951-0046
(Sheet 5 of 7)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R84	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R85	Resistor, 39 k Ohm $\pm 5\%$, 1/4W	100-3953	1
R86	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R87 THRU R90	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	4
R91	Resistor, 470 k Ohm $\pm 5\%$, 1/4W	100-4763	1
R92 THRU R95	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	4
R96	Resistor, 39 k Ohm $\pm 5\%$, 1/4W	100-3953	1
R97	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R98	Resistor, 39 k Ohm $\pm 5\%$, 1/4W	100-3953	1
R99	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R100,R101	Resistor, 39 k Ohm $\pm 5\%$, 1/4W	100-3953	2
R102	Resistor, 12 k Ohm $\pm 5\%$, 1/4W	100-1253	1
R103	Resistor, 180 K Ohm $\pm 5\%$, 1/4W	100-1863	1
R104	Resistor, 12 k Ohm $\pm 5\%$, 1/4W	100-1253	1
R105,R106	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R107	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W	177-5054	1
R108	Resistor, 510 k Ohm $\pm 5\%$, 1/4W	100-5163	1
R109	Resistor, 51 Ohm $\pm 5\%$, 1/4W	100-5123	1
R110	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R111	Resistor, 4.87 k Ohm $\pm 1\%$, 1/4W	103-4874	1
R112,R113	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	2
R114	Resistor, 33 Ohm $\pm 5\%$, 1/4W	100-3323	1
R115	Resistor, 39 k Ohm $\pm 5\%$, 1/4W	100-3953	1
R116	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R117	Resistor, 39 k Ohm $\pm 5\%$, 1/4W	100-3953	1
R118	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R119,R120	Resistor, 39 k Ohm $\pm 5\%$, 1/4W	100-3953	2
R121	Resistor, 12 k Ohm $\pm 5\%$, 1/4W	100-1253	1
R122	Resistor, 180 k Ohm $\pm 5\%$, 1/4W	100-1863	1
R123	Resistor, 12 k Ohm $\pm 5\%$, 1/4W	100-1253	1
R124,R125	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	2
R126	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W	177-5054	1
R127	Resistor, 510 k Ohm $\pm 5\%$, 1/4W	100-5163	1
R128	Resistor, 51 Ohm $\pm 5\%$, 1/4W	100-5123	1
R129	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R130	Resistor, 4.87 k Ohm $\pm 1\%$, 1/4W	103-4874	1
R131,R132	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	2
R133	Resistor, 33 Ohm $\pm 5\%$, 1/4	100-3323	1
R134	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W (Treble Control)	178-5056	1
R135	Resistor, 68 k Ohm $\pm 5\%$, 1/4W	100-6853	1
R136	Resistor, 510 Ohm $\pm 5\%$, 1/4W	100-5133	1
R137	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W (Bass Control)	178-5056	1
R138	Resistor, 68 k Ohm $\pm 5\%$, 1/4W	100-6853	1
R139	Resistor, 510 Ohm $\pm 5\%$, 1/4W	100-5133	1
R140	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1

TABLE 4-2. CONTROL ROOM MONITOR MODULE ASSEMBLY - 951-0046
(Sheet 6 of 7)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R141	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R142	Resistor, 33.2 k Ohm $\pm 1\%$, 1/4W	103-3325	1
R143	Resistor, 12.4 k Ohm $\pm 1\%$, 1/4W	103-1245	1
R144	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R145	Resistor, 3 k Ohm $\pm 5\%$, 1/4W	100-3043	1
R146	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W (Headphone Level Control)	178-5056	1
R147	Resistor, 19.1 k Ohm $\pm 1\%$, 1/4W	103-1915	1
R148,R149	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	2
R150	Resistor, 182 k Ohm $\pm 1\%$, 1/4W	103-1826	1
R151	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W	177-5054	1
R152	Resistor, 43 k Ohm $\pm 5\%$, 1/4W	100-4353	1
R153	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R154	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W (Cue Level Control)	178-5056	1
R155	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R156	Resistor, 51 k Ohm $\pm 5\%$, 1/4W	100-5153	1
R157,R158	Resistor, 10 Meg Ohm $\pm 5\%$, 1/4W	100-1083	2
R159	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R160,R161	Resistor, 62 k Ohm $\pm 5\%$, 1/4W	100-6253	2
R162	Resistor, 36 k Ohm $\pm 5\%$, 1/4W	100-3653	1
R163	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R164,R165	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	2
R166,R167, R169	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	3
R174	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R175	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1024	1
R176	Resistor, 1.47 k Ohm $\pm 1\%$, 1/4W	103-1474	1
R177	Resistor, 121 Ohm $\pm 1\%$, 1/4W	100-1231	1
R178	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1024	1
R179	Resistor, 1.47 k Ohm $\pm 1\%$, 1/4W	103-1474	1
R180	Resistor, 121 Ohm $\pm 1\%$, 1/4W	100-1231	1
R181	Resistor, 470 Ohm $\pm 5\%$, 1/4W	100-4733	1
R182,R183	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1024	2
R184 THRU R187	Resistor, 470 k Ohm $\pm 5\%$, 1/4W	100-4763	4
R188	Resistor, 10 k Ohm 5%, 1/4W	100-1053	1
S1	Switch, 10 Section 4PDT Pushbutton, Black/Yellow Indications (CONTROL ROOM MONITOR SELECT Switch)	340-0098	1
S2	Switch, 1 Section DPDT Pushbutton, White/Green Indications (HEADPHONE SPLIT CUE Switch)	340-0102	1
U1,U2,U3	Integrated Circuit, LM833N, Dual Audio Operational Amplifier, 8-Pin DIP	220-0833	3
U4,U5	Integrated Circuit, 2150A, Voltage Controlled Amplifier, 8-Pin DIP	220-2150	2
U6,U7	Integrated Circuit, LM833N, Dual Audio Operational Amplifier, 8-Pin DIP	220-0833	2
U8	Integrated Circuit, TLO072CP, Dual JFET-Input Operational Amplifier, 8-Pin DIP	221-0072	1
U9	Integrated Circuit, MC14584, Hex Schmitt Trigger, CMOS, 14-Pin DIP	228-4584	1

TABLE 4-2. CONTROL ROOM MONITOR MODULE ASSEMBLY - 951-0046
(Sheet 7 of 7)

REF. DES.	DESCRIPTION	PART NO.	QTY.
U10	Integrated Circuit, 4N33, Optical Isolator, NPN Photo Transistor/Infared Emitting Diode Type, 1500V Isolation, Response: 30 kHz Maximum, Current: 50 mA Maximum, 6-Pin DIP	229-0033	1
U12	Integrated Circuit, LM833N, Dual Audio Operational Amplifier, 8-Pin DIP	220-0833	1
U13	Integrated Circuit, TDA1074A, DC Controlled Dual Potentiometer, 18-Pin DIP	220-1074	1
U14,U15	Integrated Circuit, 2150A, Voltage Controlled Amplifier, 8-Pin DIP	220-2150	2
U16	Integrated Circuit, LM833N, Dual Audio Operational Amplifier, 8-Pin DIP	220-0833	1
U17	Integrated Circuit, TLO072CP, Dual JFET-Input Operational Amplifier, 8-Pin DIP	221-0072	1
U18	Integrated Circuit, NE572N, Programmable Analog Combandor, 16-Pin DIP	220-0572	1
U19,U20	Integrated Circuit, TLO072CP, Dual JFET-Input Operational Amplifier, 8-Pin DIP	221-0072	2
U21	Integrated Circuit, LM317T, Adjustable Positive Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0317	1
U22	Integrated Circuit, LM337T, Adjustable Negative Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0337	1
XU1,XU2,XU3, XU6,XU7,XU8	Socket, 8-Pin DIP	417-0804	6
XU9	Socket, 16-Pin DIP	417-1604	1
XU10	Socket, 6-Pin DIP	417-0600	1
XU12	Socket, 8-Pin DIP	417-0804	1
XU13	Socket, 18-Pin DIP	417-1804	1
XU16,XU17	Socket, 8-Pin DIP	417-0804	2
XU18	Socket, 14-Pin DIP	417-1404	1
XU19,XU20	Socket, 8-Pin DIP	417-0804	2
—	Cap, Knob, Yellow, 11mm w/Spot C112 (for Monitor DIM Control)	481-0029	1
—	Cap, Knob, Orange, 11mm w/Spot C112 (for Headphone BASS/TREBLE Controls)	481-0027	2
—	Cap, Knob, Yellow, 15mm w/Spot C152 (for Monitor LEVEL Control)	481-0024	1
—	Cap, Knob, Orange, 15mm w/Spot C152 (for Headphone LEVEL Control)	481-0028	1
—	Cap, Knob, Green, 15mm w/Spot C152 (for Cue LEVEL Control)	481-0025	1
—	Monitor Input Amplifier Board Assembly	911-0101-001	1
—	Blank Control Room Monitor Module Circuit Board	511-0046	1

TABLE 4-3. MONITOR INPUT AMPLIFIER CIRCUIT BOARD ASSEMBLY - 911-0101-001
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C2	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C3	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C4	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C5	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C6	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C7	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C8	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C9	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1

TABLE 4-3. MONITOR INPUT AMPLIFIER CIRCUIT BOARD ASSEMBLY - 911-0101-001
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C10	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C11	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C12	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C13	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C14	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C15	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C16	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C17	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C18	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C19	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C20	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C21	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C22	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C23	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C24	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C25	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C26	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C27,C28	Capacitor, Mylar Film, .047 uF, 100V	030-4743	2
J1	Connector, Header, 5-Pin	417-4000-002	1
R1,R2	Resistor, 47 k Ohm ±5%, 1/4W	100-4753	2
R3	Resistor, 470 k Ohm 15%, 1/4W	100-4763	1
R4,R5	Resistor, 47 k Ohm ±5%, 1/4W	100-4753	2
R6	Resistor, 2 k Ohm ±1%, 1/4W	100-2041	1
R7	Resistor, 1 k Ohm ±1%, 1/4W	103-1041	1
R8	Resistor, 2 k Ohm ±1%, 1/4W	100-2041	1
R9	Resistor, 1 k Ohm ±1%, 1/4W	103-1041	1
R10,R11	Resistor, 47 k Ohm ±5%, 1/4W	100-4753	2
R12	Resistor, 470 k Ohm 15%, 1/4W	100-4763	1
R13,R14	Resistor, 47 k Ohm ±5%, 1/4W	100-4753	2
R15	Resistor, 2 k Ohm ±1%, 1/4W	100-2041	1
R16	Resistor, 1 k Ohm ±1%, 1/4W	103-1041	1
R17	Resistor, 2 k Ohm ±1%, 1/4W	100-2041	1
R18	Resistor, 1 k Ohm ±1%, 1/4W	103-1041	1
R19,R20	Resistor, 470 k Ohm 15%, 1/4W	100-4763	2
R21 THRU R24	Resistor, 30 Ohm ±5%, 1/4W	100-3023	4
S1	Switch, 10 Position 4PDT Pushbutton, Black/Orange Indications (HEADPHONE SELECT Switch)	340-0101	1
U1,U2	Integrated Circuit, LM833N, Dual Audio Operational Amplifier, 8-Pin DIP	220-0833	2
U3	Integrated Circuit, NE5532AP, Dual Low-Noise Amplifier, 8-Pin DIP	221-5532-001	1
XU1,XU2,XU3	Socket, 8-Pin DIP	417-0804	3
W1,W2	Flexstrip Jumpers, 20-Conductor, Straight Pins	600-0012	2
—	Blank Circuit Board, Monitor Input Amplifier	511-0101-001	1

STUDIO MONITOR MODULE

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SECTION I

STUDIO MONITOR MODULE

THEORY OF OPERATION

1-1. INTRODUCTION.

1-2. The following text provides detailed theory of operation for the Mix-Trak 90 series audio console studio monitor module. A detailed block diagram of the studio monitor module circuitry is presented in Figure 1-1. Refer to Figure 1-1 as required for the following circuit discussion.

1-3. The studio monitor module contains monitoring circuitry for the studio A and B audio facilities. The studio A and B circuitry and the associated audio circuit left and right channels are identical, therefore only the studio A left channel circuit will be discussed.

1-4. FUNCTIONAL DESCRIPTION.

1-5. STUDIO A MONITOR CIRCUIT.

1-6. **INPUT NETWORK.** The studio A monitor circuit is designed to accept ten console audio sources for studio A monitoring operations. The following text provides a list of the studio A monitor circuit audio sources.

INTERNAL AUDIO SOURCES

1. Program output audio.
2. Audition output audio.
3. Monophonic output audio.
4. Cue channel audio.

EXTERNAL INPUTS

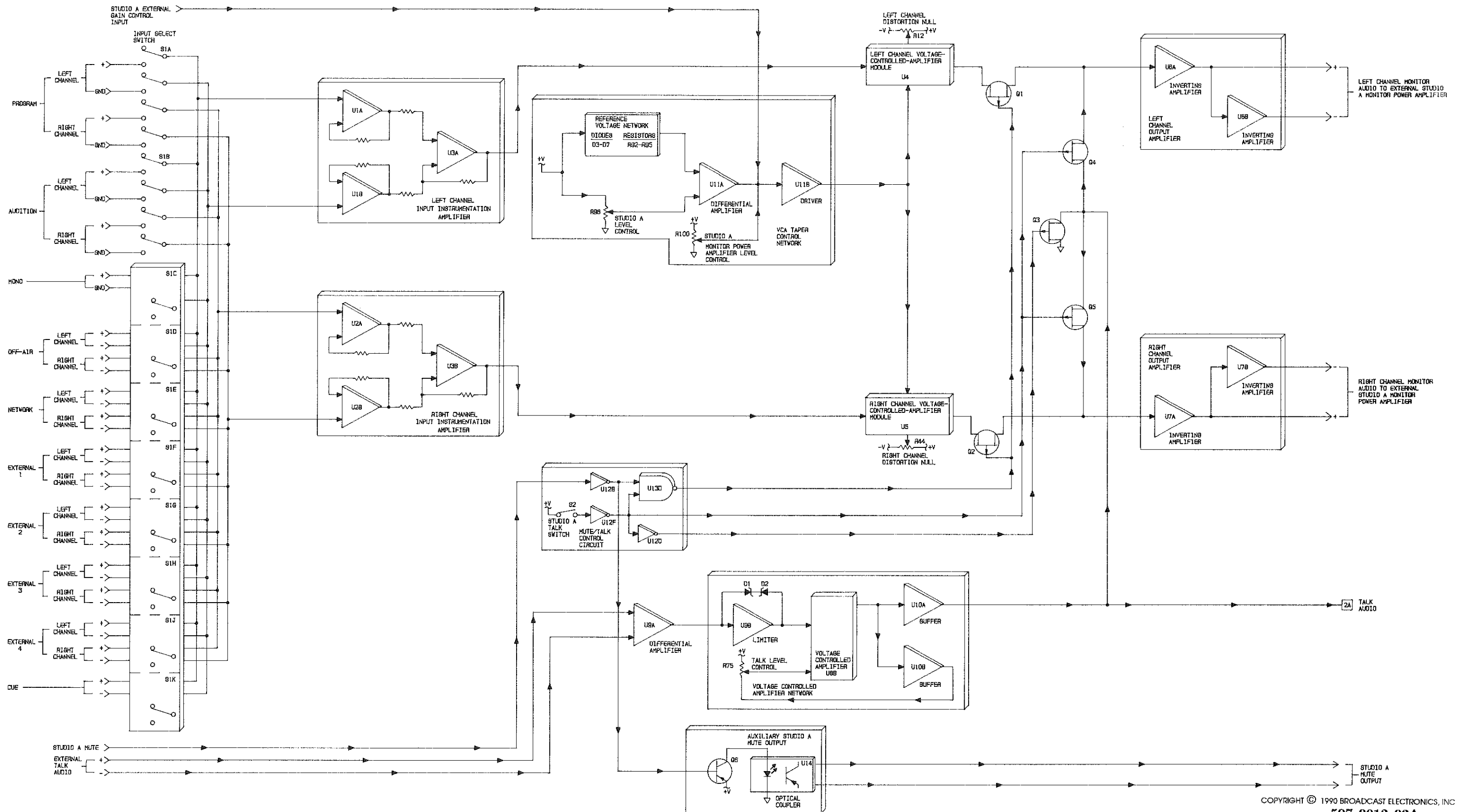
1. Off-Air audio.
2. Network audio.
3. External 1 audio.
4. External 2 audio.
5. External 3 audio.
6. External 4 audio.

1-7. Audio source selection is accomplished by input select switch S1. S1 is a yellow-coded ten-position switch/indicator designed to select audio for application to the module left and right channel input amplifier stages. The left channel input amplifier consists of integrated circuits U1A/B and U3A. U1A/B and U3A are configured as a precision instrumentation amplifier with a gain of approximately -6 dB. The output of the amplifier stage is routed for application to the level control circuit.

1-8. **VCA LEVEL CONTROL CIRCUIT.** Audio from the input amplifier network is applied to left channel voltage-controlled-amplifier (VCA) module U4. U4 is a 2150A series precision low-noise voltage-controlled-amplifier. The VCA is a current-input/current-output device with a voltage sensitive control port. VCA U4 actively controls the left channel audio level as directed by a VCA taper control circuit. Potentiometer R12 is provided to null distortion generated at the VCA stage. Audio from VCA module U4 is routed through a field-effect-transistor talk/mute switching circuit for application to the output amplifier network.

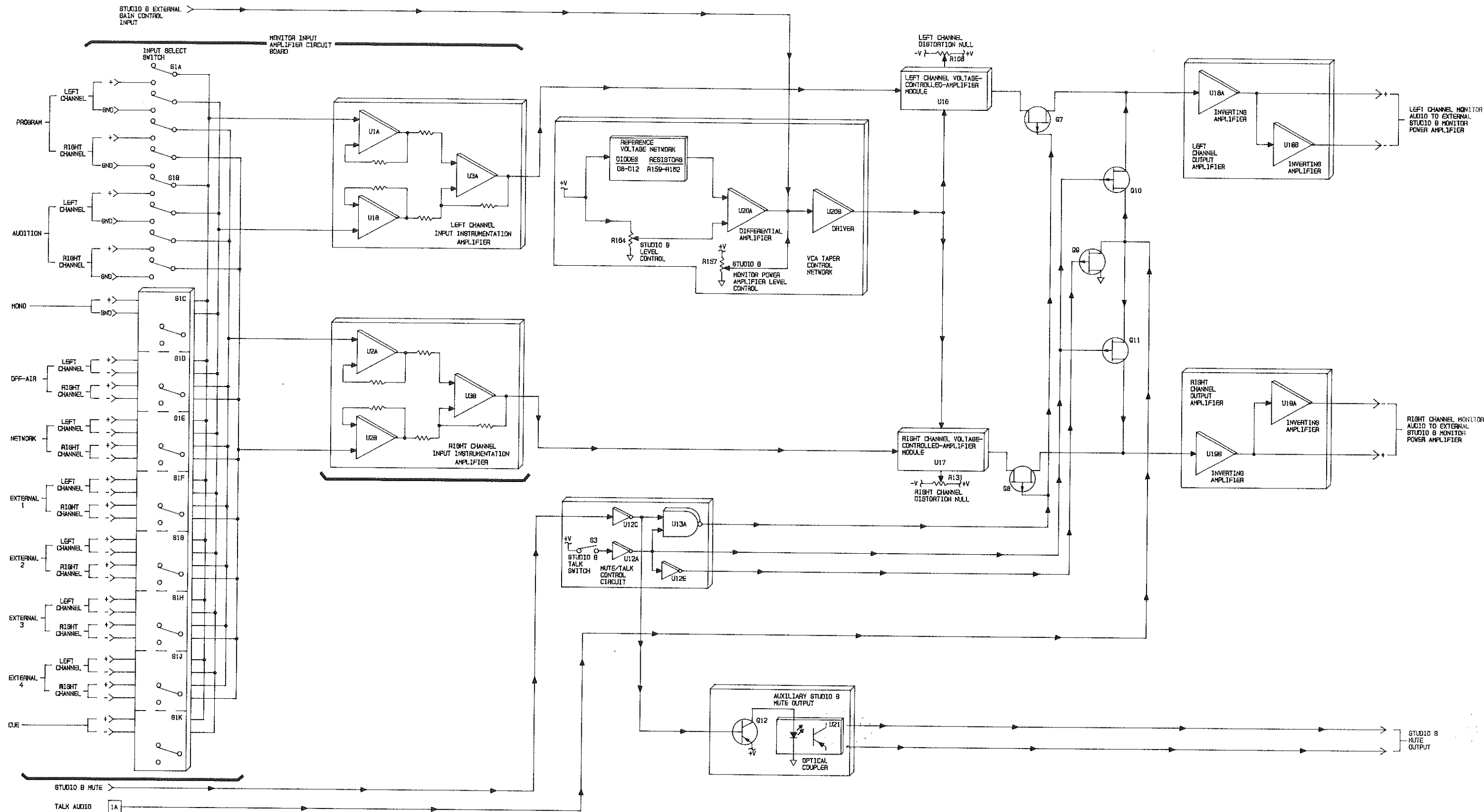
1-9. **VCA TAPER CONTROL CIRCUIT.** Studio monitor audio level control operations are performed by two 2150A series VCA modules. The modules are directed by a taper circuit which establishes the module operating parameters. The VCA taper control network consists of: 1) rotary studio A monitor level control R96, 2) a reference voltage network consisting of diodes D3 through D7, resistors R92 through R95, 3) differential amplifier U11A, and 4) driver U11B.

- 1-10. The taper control circuit operates in response to changes in the output voltage from monitor level control R96. R96 is designed with a dc control range from 0 to 5 volts. A non-linear taper circuit gain response is established by the reference voltage network. When the voltage from R96 is from 0 volts to approximately 0.40 volts, the control circuit gain will be unity. A 0.40 volt to 2 volt output from R65 will result in a circuit gain of approximately 2. A 2 volt to 5 volt output from R65 will generate a control circuit gain of approximately 4. As a result of the gain design, a non-linear operating response is established for monitor level control.
- 1-11. The dc control voltage from the VCA taper control circuit is applied to the VCA modules for precision control of the monitor audio level. When studio A monitor level control R96 is operated fully counterclockwise, a 0 volt dc reference is applied to differential amplifier U11A. U11A will output approximately 0 volts dc through driver U11B to the VCA modules to establish minimum audio level gain. When monitor control R96 is operated fully clockwise, a +5 volt dc reference is applied to differential amplifier U11A. U11A will output approximately 12 volts dc through driver U11B to establish a maximum studio A monitor speaker audio level.
- 1-12. The studio A monitor speaker level is also controlled by external monitor power amplifier level control R100. R100 is provided to limit the maximum level of the studio A monitor speakers.
- 1-13. **External Gain Control.** The studio A monitor speaker level may be controlled externally by the studio A external gain control input. The input routes a dc control voltage from an external potentiometer to the VCA taper control circuit to adjust the studio A monitor level.
- 1-14. **MUTE/TALK CIRCUIT.** The studio A mute/talk circuit controls the muting of the studio A monitor speakers and the application of intercom audio. The mute/talk circuit consists of an inverter control network and a series-shunt field-effect-transistor switching network.
- 1-15. A studio monitor mute operating sequence is initiated when a HIGH is applied through the studio A mute line to inverter U12B. U12B outputs a LOW which is applied to NAND gate U13D. With talk switch S2 open, a HIGH from inverter U12F is applied to NAND gate U13D and inverter U12D. U13D, U12F, and U12D produce complementary control commands for application to a FET switching network consisting of transistors Q1 through Q5. A HIGH from U13D will bias transistors Q1 and Q2 off. A HIGH from U12F will bias transistors Q4 and Q5 off and a LOW from U12D will bias transistor Q3 on. The resultant transistor configuration will mute the studio A monitor speakers.
- 1-16. A studio talk operating sequence is initiated when studio talk switch S2 is closed. A HIGH is inverted LOW by U12F and applied to NAND gate U13D and inverter U12D. A LOW from the studio A mute line will be inverted HIGH at U12B and applied to U13D. U13D NANDs the LOW from U12F and a HIGH from U12B to output a HIGH to bias transistors Q1 and Q2 off. The HIGH from U12D will bias Q3 off and the LOW from U12F will bias Q4 and Q5 on. The resultant configuration will route talk audio to the external studio A monitor power amplifier.
- 1-17. **Auxiliary Studio A Mute Output.** A control command from the mute/talk control circuit is also applied to the auxiliary studio A mute output circuit. During studio A mute conditions, a HIGH is inverted LOW by U12B and applied to transistor Q6. The HIGH biases Q6 on to energize optical coupler U14 and provide an auxiliary studio A mute output command for application to external circuitry.
- 1-18. **OUTPUT CIRCUIT.** Audio from the mute/talk circuit is applied to an output amplifier network. The left channel output amplifier network consists of integrated circuits U6A/B. U6A/B are configured as an inverting amplifier stage to provide unbalanced-to-balanced audio signal conversion at a nominal level of 0 dBu. The output of the amplifier network is routed for application to an external monitor power amplifier.



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FIGURE 1-1.
STUDIO MONITOR MODULE DETAILED
BLOCK DIAGRAM (Sheet 1 of 2)



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FIGURE 1-1.
STUDIO MONITOR MODULE DETAILED
BLOCK DIAGRAM (Sheet 2 of 2)

1-5/1-6



1-19. TALK CIRCUIT.

1-20. The studio monitor module talk circuit processes talk audio from the control room for application to the studio A and B monitor speakers. Talk audio from the control room microphone input module is applied to differential amplifier U9A. U9A is configured to provide balanced-to-unbalanced signal conversion. The output of U9A is applied to a limiter circuit consisting of operational amplifier U9B and zener diodes D1 and D2. The limiter is configured to clip audio signal levels above +20 dBu. Audio from the limiter is applied to a voltage-controlled-amplifier network consisting of integrated circuit U8B and operational amplifier U10A/B.

1-21. Integrated circuit U8B functions as the voltage-controlled-amplifier stage. The VCA is controlled by talk level potentiometer R75. The output of U8B is applied to U10A which is configured as a buffer stage. A voltage reference from U8B is also buffered by U10B and routed as a bias voltage to talk level control R75. This allows R75 to operate at the appropriate control range for VCA U8B.

1-22. POWER SUPPLY CIRCUIT.

1-23. DC operating potentials for application to the studio monitor module components are produced by a regulator network. Unregulated ± 24 volt supplies from the console power supply module are applied through fusible resistors R169 and R172 to regulator network consisting of U23 and U24. R169/R172 are carbon-composition resistors which function as fusible links in the event of a short-circuit potential on the module. The fusible resistors limit a power supply failure to the module and prevent a failure in the entire console system.

1-24. ± 24 V dc supplies from the console power supply module are applied to +16.5 volt dc regulator U23 and -16.5 volt dc regulator U24. U23/U24 are three terminal adjustable regulators containing internal thermal and short-circuit current limiting features. The regulated ± 16.5 volt outputs from U23 and U24 are routed for application to the module audio components.

1-25. A regulated +12 volt supply is applied through an RC filter network consisting of resistor R175 and capacitor C98. The output of the filter network is routed for application to the module control logic components.

SECTION II

STUDIO MONITOR MODULE MAINTENANCE

2-1. INTRODUCTION.

2-2. This section provides general maintenance information, electrical adjustment procedures, and troubleshooting information for the studio monitor module.

2-3. FIRST LEVEL MAINTENANCE.

2-4. First level maintenance consists of precautionary procedures applied to the equipment to prevent future failures. The procedures are performed on a regular basis and the results recorded in a performance log.

2-5. GENERAL.

2-6. The studio monitor module circuitry should be periodically cleaned of accumulated dust using a nylon-bristle brush and vacuum cleaner. Inspect the module for improperly seated semiconductors and components damaged by overheating.

2-7. AUDIO SWITCHES.

2-8. The studio monitor module is equipped with ITT Shadow audio switches. The switches are sealed for low-noise long-life operation and do not permit cleaning. If a switch becomes noisy or defective, the switch will require replacement.

2-9. SECOND LEVEL MAINTENANCE.

2-10. Second level maintenance consists of procedures required to restore a studio monitor module to operation after a fault has occurred. The procedures are divided into electrical adjustments, troubleshooting, and component replacement procedures.

2-11. ELECTRICAL ADJUSTMENTS.

2-12. **STUDIO A CIRCUIT VCA DISTORTION ADJUSTMENT.** Left channel VCA distortion control R12 and right channel VCA distortion control R44 null VCA distortion products in the studio A level control circuit. Distortion adjustment is not required unless VCA modules U4 or U5 are replaced. The VCA distortion is nulled as follows.

2-13. **Required Equipment.** The following test equipment is required to null the VCA distortion.

A. Allen Wrench (supplied with the console).

B. Non-Metallic Adjustment Tool.

C. Extender Ribbon Cable Assemblies:

40-Pin Assembly

50-Pin Assembly

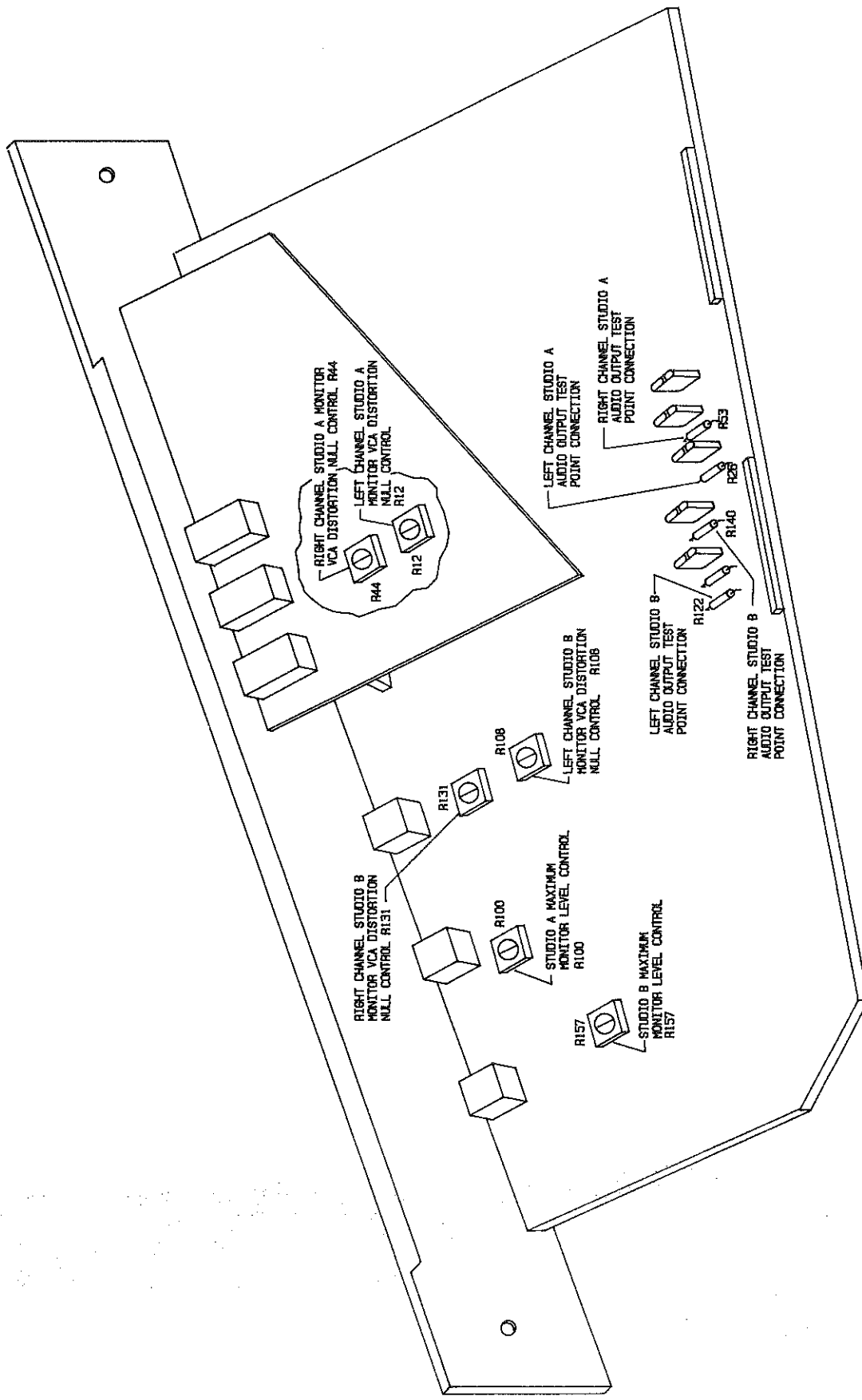
D. Audio Signal Generator (Potomac AG-51 or equivalent).

E. Audio Analyzer – Capable of indicating distortion levels from 0.05% to 0.1% (Sound Technology 1710A Distortion Analyzer or equivalent).

2-14. **Procedure.** To null the VCA distortion, proceed as follows:

2-15. Remove the studio monitor module from the mainframe and connect the extender cable assemblies between the studio monitor module and the receptacles on the mainframe.

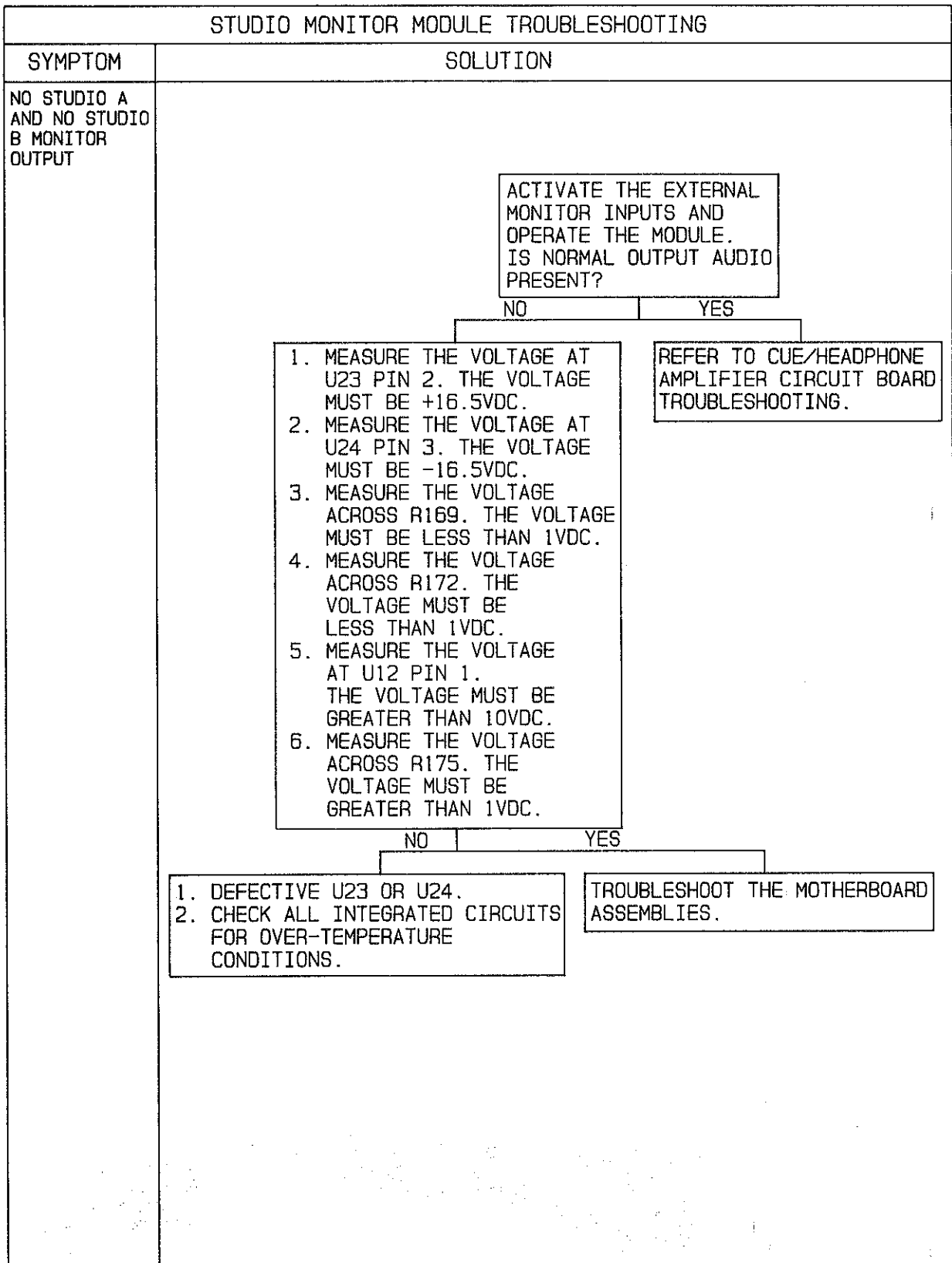
- 2-16. Connect the audio signal generator to a studio monitor module left channel external input on a control room/studio external input connector.
- 2-17. Refer to Figure 2-1 and connect the audio analyzer between chassis ground and resistor R26 as shown.
- 2-18. Adjust the audio generator for a 1 kHz output at 0 dBu.
- 2-19. Operate the studio monitor module to select the test audio for studio A monitoring operations.
- 2-20. Refer to Figure 2-1 and adjust left channel studio A monitor VCA distortion null control R12 for a minimum audio analyzer indication.
- 2-21. Repeat the procedure for the right channel. Connect the audio analyzer to resistor R53 and adjust the right channel distortion with right channel studio A monitor VCA distortion null control R44.
- 2-22. Disconnect all test equipment and replace the studio monitor module.
- 2-23. **STUDIO B CIRCUIT VCA DISTORTION ADJUSTMENT.** Left channel VCA distortion control R108 and right channel VCA distortion control R131 null VCA distortion products in the studio B level control circuit. Distortion adjustment is not required unless VCA modules U16 or U17 are replaced. The VCA distortion is nulled as follows.
- 2-24. **Required Equipment.** The following test equipment is required to null the VCA distortion.
- A. Allen Wrench (supplied with the console).
 - B. Non-Metallic Adjustment Tool.
 - C. Extender Ribbon Cable Assemblies:
 - 40-Pin Assembly
 - 50-Pin Assembly
 - D. Audio Signal Generator (Potomac AG-51 or equivalent).
 - E. Audio Analyzer – Capable of indicating distortion levels from 0.05% to 0.1% (Sound Technology 1710A Distortion Analyzer or equivalent).
- 2-25. **Procedure.** To null the VCA distortion, proceed as follows:
- 2-26. Remove the studio monitor module from the mainframe and connect the extender cable assemblies between the studio monitor module and the receptacles on the mainframe.
- 2-27. Connect the audio signal generator to a studio monitor module left channel external input on a control room/studio external input connector.
- 2-28. Refer to Figure 2-1 and connect the audio analyzer between chassis ground and resistor R122 as shown.
- 2-29. Adjust the audio generator for a 1 kHz output at 0 dBu.
- 2-30. Operate the studio monitor module to select the test audio for studio B monitoring operations.
- 2-31. Refer to Figure 2-1 and adjust left channel studio B monitor VCA null control R108 for a minimum audio analyzer indication.
- 2-32. Repeat the procedure for the right channel. Connect the audio analyzer to resistor R140 and adjust the right channel distortion with right channel studio B monitor VCA distortion null control R131.



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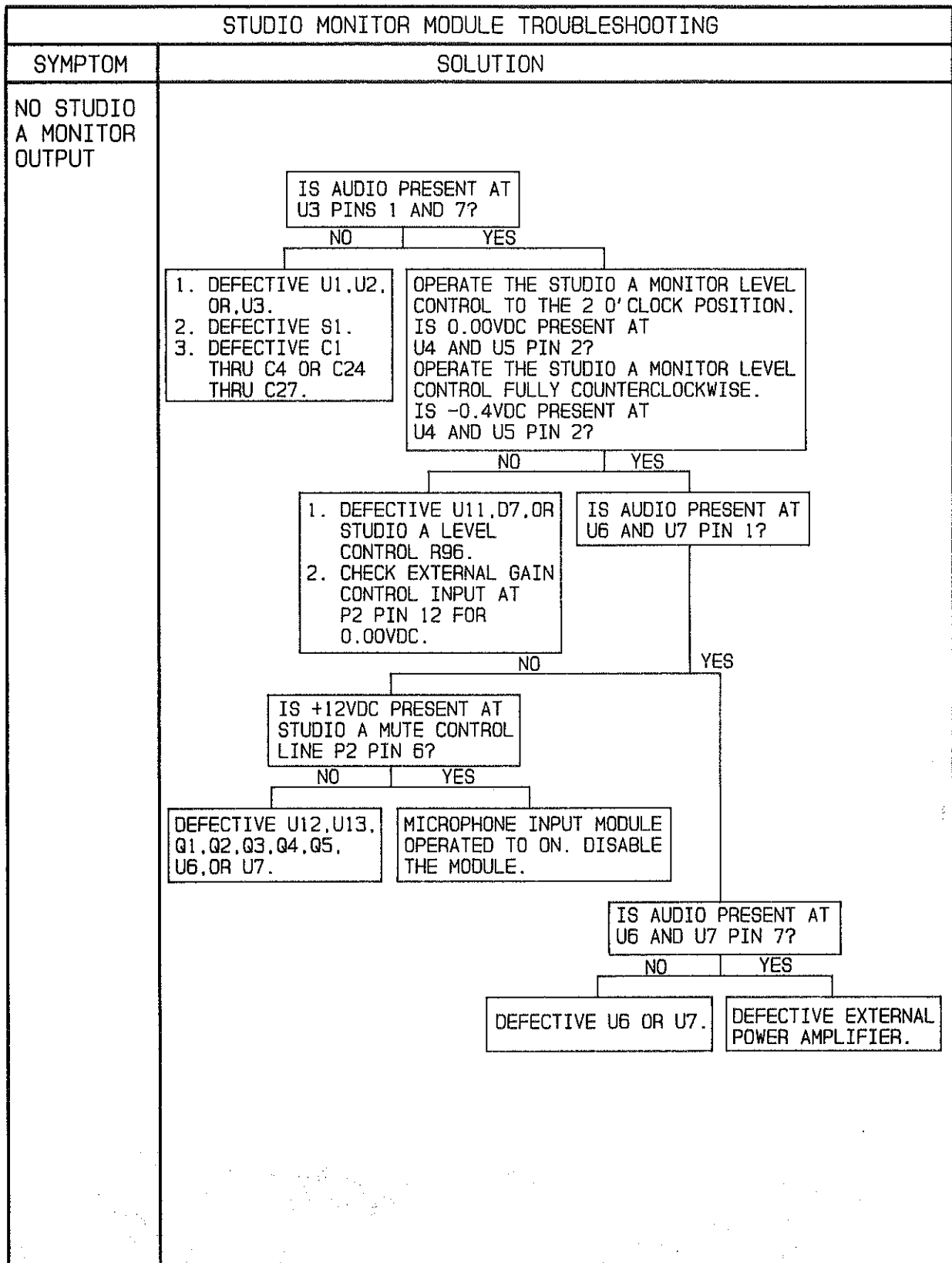
FIGURE 2-1. STUDIO MONITOR MODULE ADJUSTMENT CONTROLS

- 2-33. Disconnect all test equipment and replace the studio monitor module.
- 2-34. **STUDIO A AND B MAXIMUM MONITOR LEVEL CONTROL.** Studio A potentiometer R100 and studio B potentiometer R157 adjust the studio A and B maximum monitor level. The adjustment procedure for the controls is presented in the installation section of this manual. Refer to VOLUME I SECTION II, INSTALLATION for the adjustment procedure.
- 2-35. **TROUBLESHOOTING.**
- 2-36. The troubleshooting philosophy for the studio monitor module consists of isolating a problem to a specific circuit or group of components. Two 40-pin and one 50-pin extender ribbon cable assemblies are provided to interface plug-in modular assemblies to the chassis mounted motherboards for troubleshooting procedures. To prevent the application of inadvertent audio noise to the console audio system, attach the 50-pin extender assembly to the module before the 40-pin assembly.
- 2-37. Figure 2-2 presents the studio monitor module troubleshooting. Monitor input amplifier circuit board troubleshooting is presented in the CONTROL ROOM MONITOR MODULE section of this manual. Refer to Figure 2-2 and the CONTROL ROOM MONITOR MODULE section as required to isolate a failure to a specific group of components.
- 2-38. Once trouble is isolated and power is totally deenergized, refer to the schematic diagrams and the theory of operation to assist in problem resolution. The defective component may be repaired locally or the entire module may be returned to Broadcast Electronics for repair or replacement.
- 2-39. **COMPONENT REPLACEMENT.**
- 2-40. Component replacement procedures for the console modular assemblies are presented in SECTION II, MAINTENANCE. Refer to SECTION II as required for the replacement procedures.



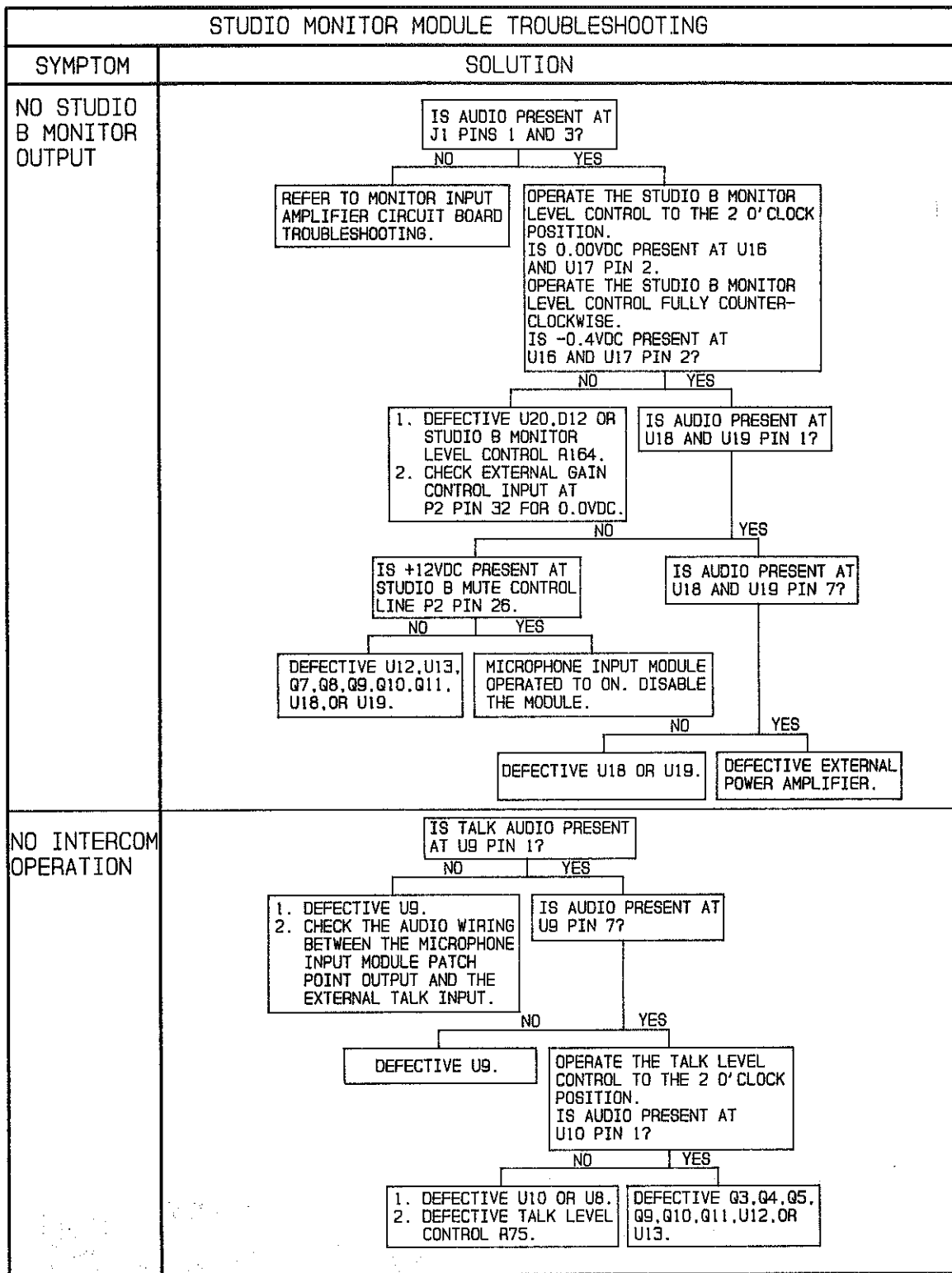
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FIGURE 2-2. STUDIO MONITOR MODULE TROUBLESHOOTING
 (Sheet 1 of 3)



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FIGURE 2-2. STUDIO MONITOR MODULE TROUBLESHOOTING
(Sheet 2 of 3)



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FIGURE 2-2. STUDIO MONITOR MODULE TROUBLESHOOTING
(Sheet 3 of 3)

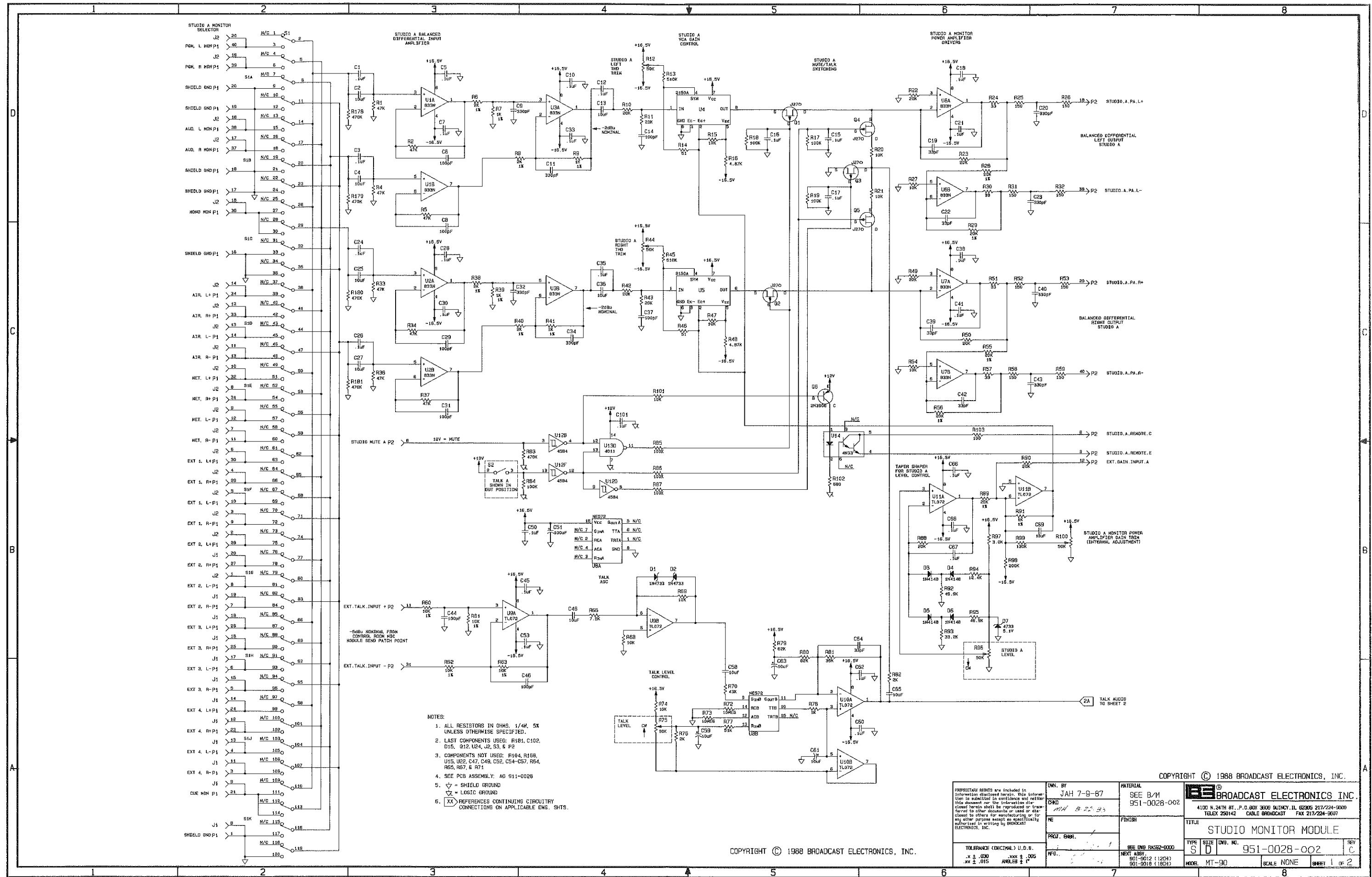
SECTION III

STUDIO MONITOR MODULE DRAWINGS

3-1. INTRODUCTION.

3-2. This section provides assembly drawings and schematic diagrams as listed below for the studio monitor module.

FIGURE	TITLE	NUMBER
3-1	SCHEMATIC DIAGRAM, STUDIO MONITOR MODULE	SD951-0028-002
3-2	ASSEMBLY DIAGRAM, STUDIO MONITOR MODULE	AD951-0028-002
3-3	SCHEMATIC DIAGRAM, MONITOR INPUT AMPLIFIER CIRCUIT BOARD	SD911-0101
3-4	ASSEMBLY DIAGRAM, MONITOR INPUT AMPLIFIER CIRCUIT BOARD	AC911-0101

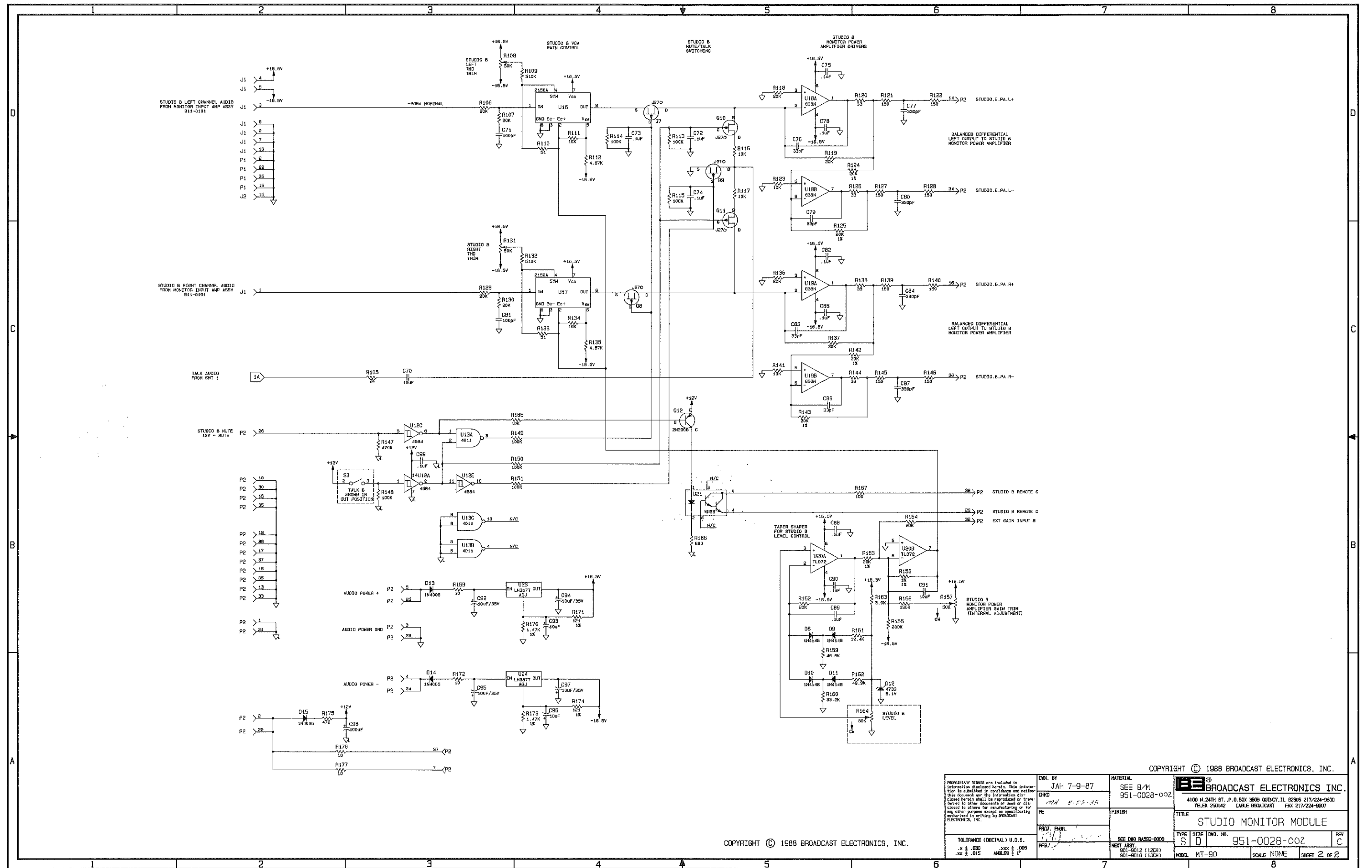


- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5% UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENTS USED: R101, C102, D15, Q12, U24, J2, S3, S P2
 3. COMPONENTS NOT USED: R104, R166, U15, U22, C47, C49, C52, C54-C57, R54, R55, R57, & R71
 4. SEE PCB ASSEMBLY: AD 911-0028
 5. ∇ = SHIELD GROUND
 6. ∇ = LOGIC GROUND
 7. $\times\times$ REFERENCES CONTAINING CIRCUITRY CONNECTIONS ON APPLICABLE DWS. SHTS.

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	PROJ. ENGR. SEE DWS RAS52-0000	FINISH SEE DWS RAS52-0000	
TOLERANCE (DECIMAL) U.D.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°	PROJ. ENGR. WFB	TYPE S D	DWS. NO. 951-0028-002
		SCALE NONE	SHEET 1 OF 2

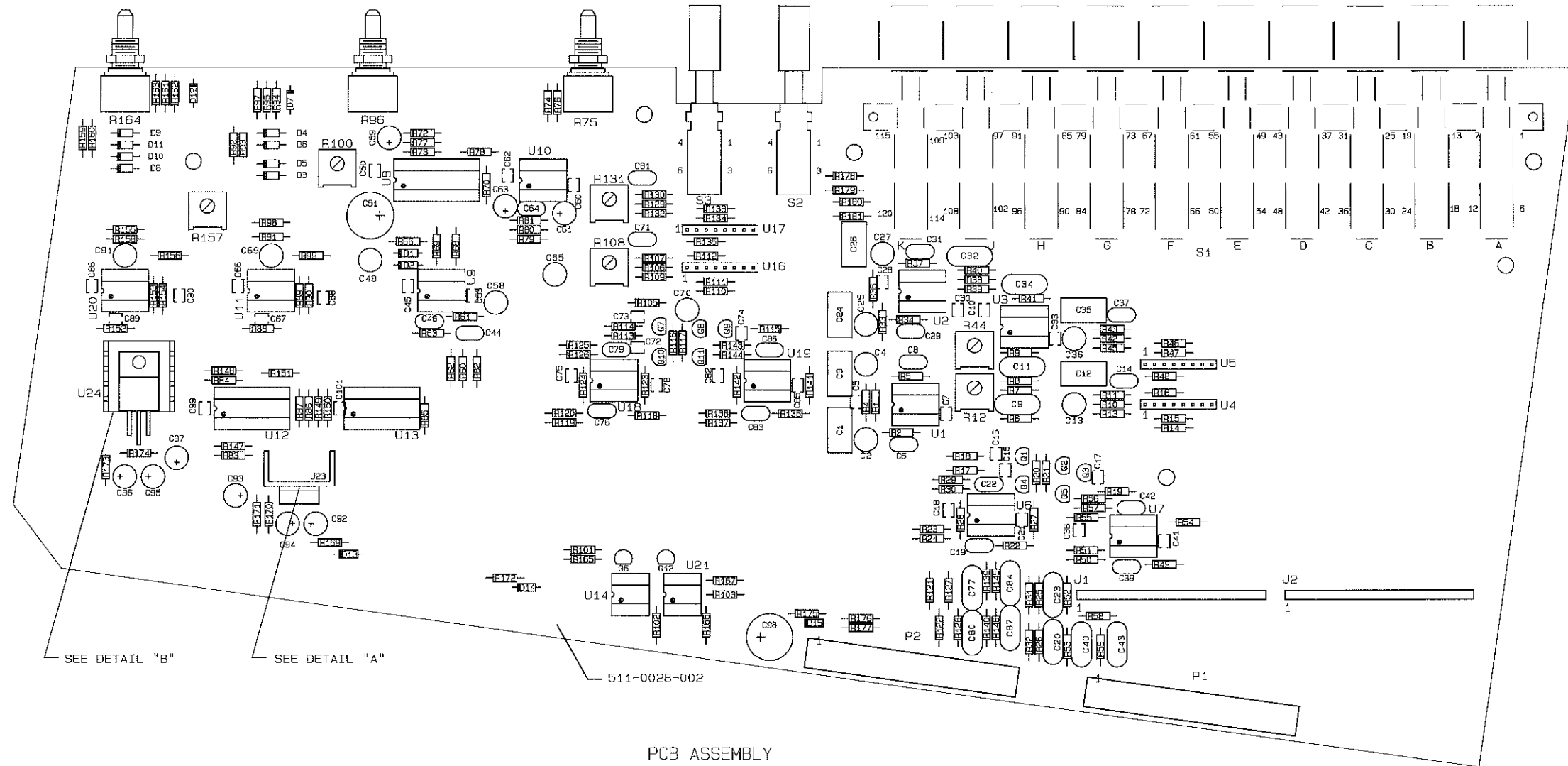


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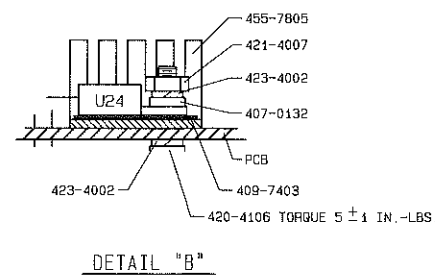
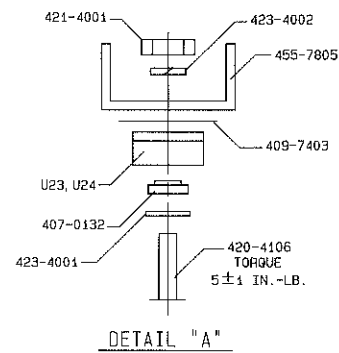
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QND MA 8-22-85	FINISH	TITLE STUDIO MONITOR MODULE	TYPE SIZE DWG. NO. S D 951-0028-002	
TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLE ± P	REF. DWG. PARTS-0000 NEXT ASSY 901-9012 (12CH) 901-9016 (18CH)	MODEL MT-90	SCALE NONE SHEET 2 OF 2	

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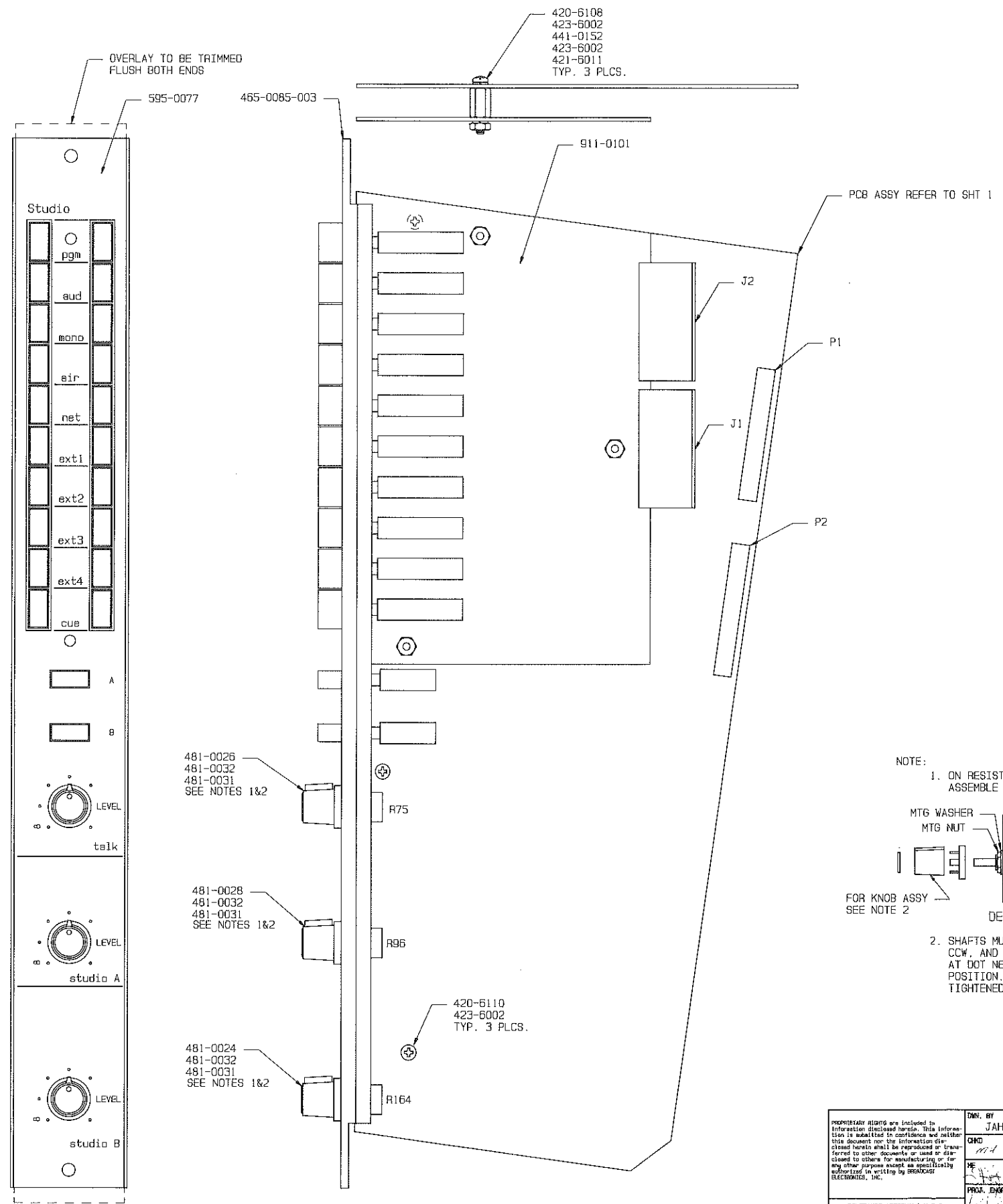
PCB ASSEMBLY

- NOTE:
1. REFER TO SHEET 2 FOR MODULE ASSEMBLY.
 2. SEE SCHEMATIC SD951-002B-002.



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OVERLAY TO BE TRIMMED
FLUSH BOTH ENDS

420-6108
423-6002
441-0152
423-6002
421-6011
TYP. 3 PLCS.

481-0026
481-0032
481-0031
SEE NOTES 1&2

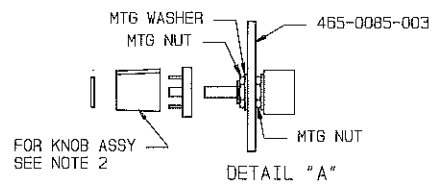
481-0028
481-0032
481-0031
SEE NOTES 1&2

481-0024
481-0032
481-0031
SEE NOTES 1&2

420-6110
423-6002
TYP. 3 PLCS.

PCB ASSY REFER TO SHT 1

NOTE:
1. ON RESISTORS R75, R96, & R164
ASSEMBLE ACCORDING TO DETAIL "A".

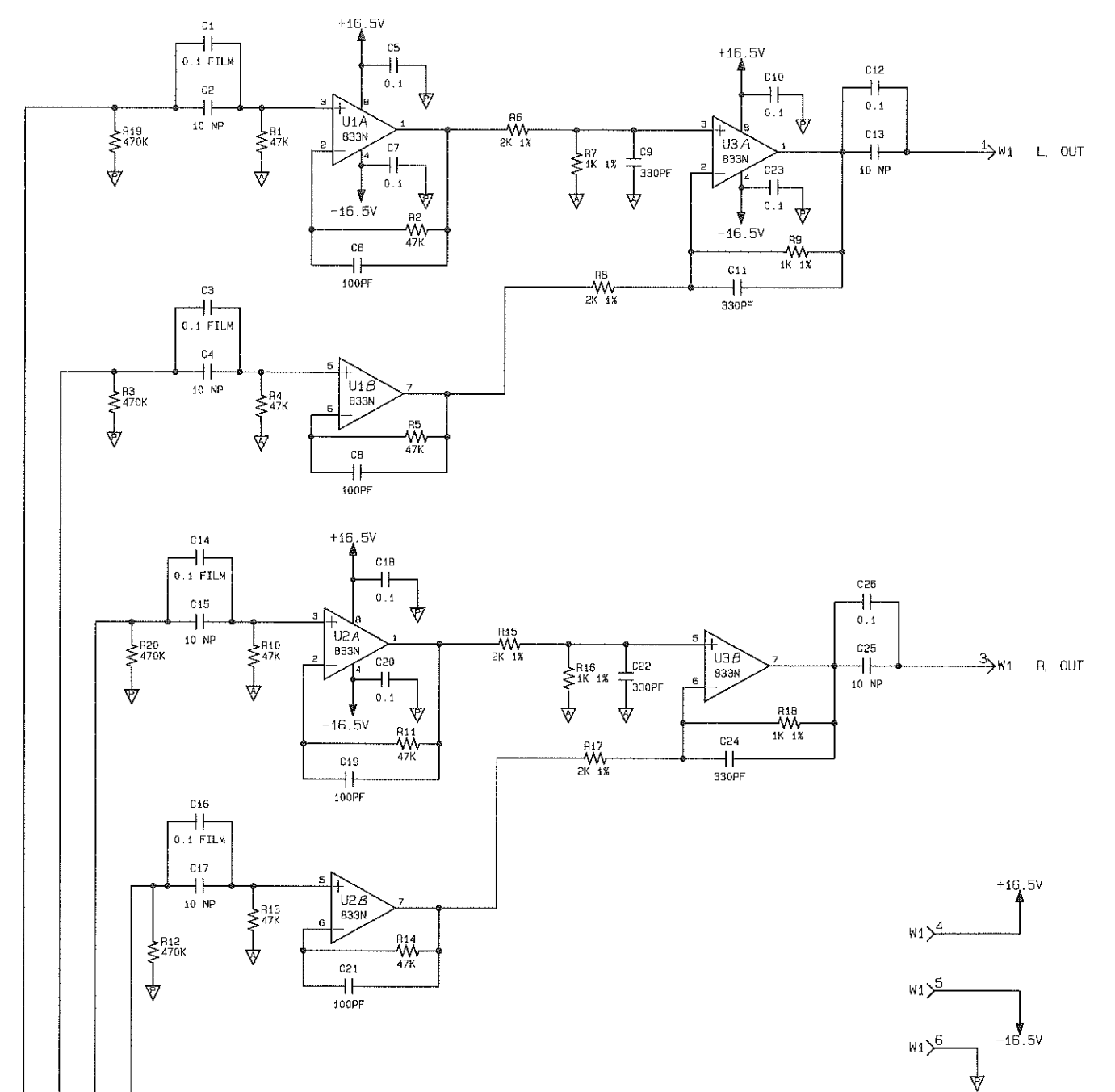
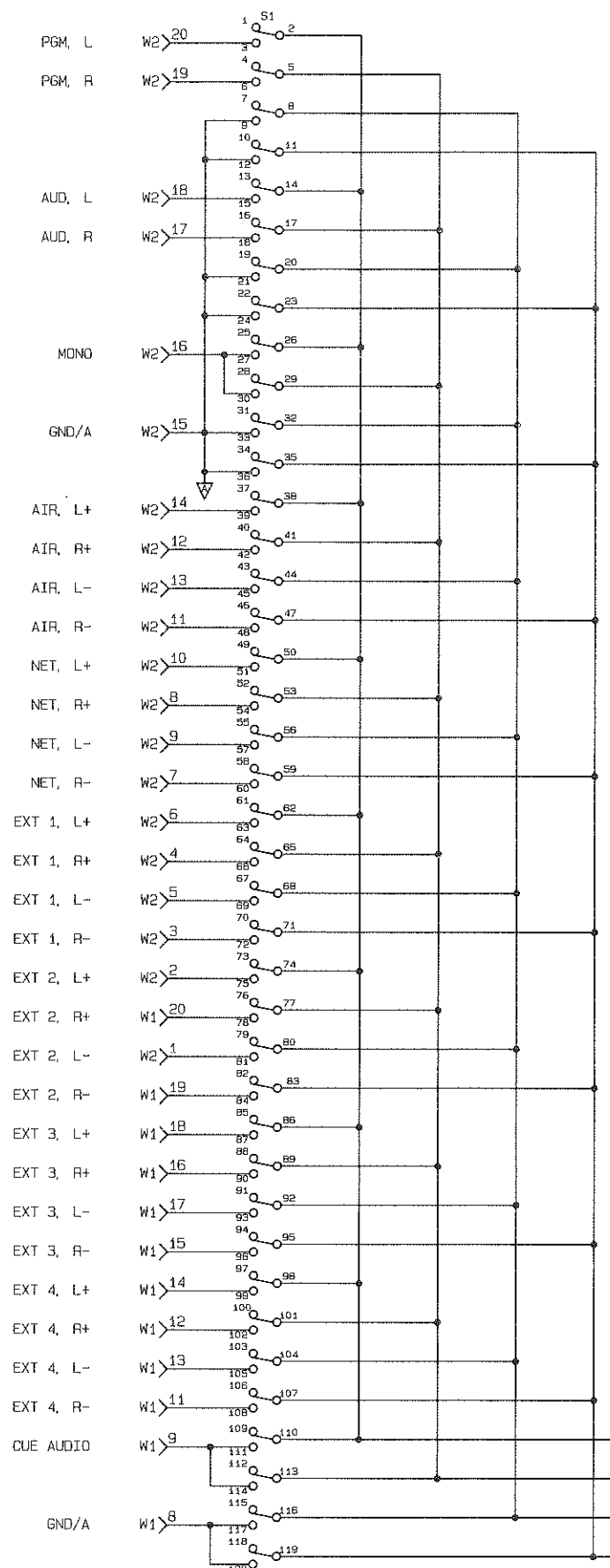


2. SHAFTS MUST BE TURNED FULLY
CCW, AND KNOB POINTERS POSITIONED
AT DOT NEAREST TO THE FULLY CCW
POSITION. KNOB CAN THEN BE
TIGHTENED AND CAP PRESSED INTO PLACE.

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	CHG MD 3-22-88	FINISH 3/21/88	
TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°	PROJ. ENGR. MFB	SEE DWG B4502-0000 NEXT ASSY. 901-9012 (12CH) 901-9018 (18CH)	TYPE SIZE A D DWS. NO. 951-0028-002 MODEL MIX TRAK 90 SCALE 1/1 SHEET 2 OF 2

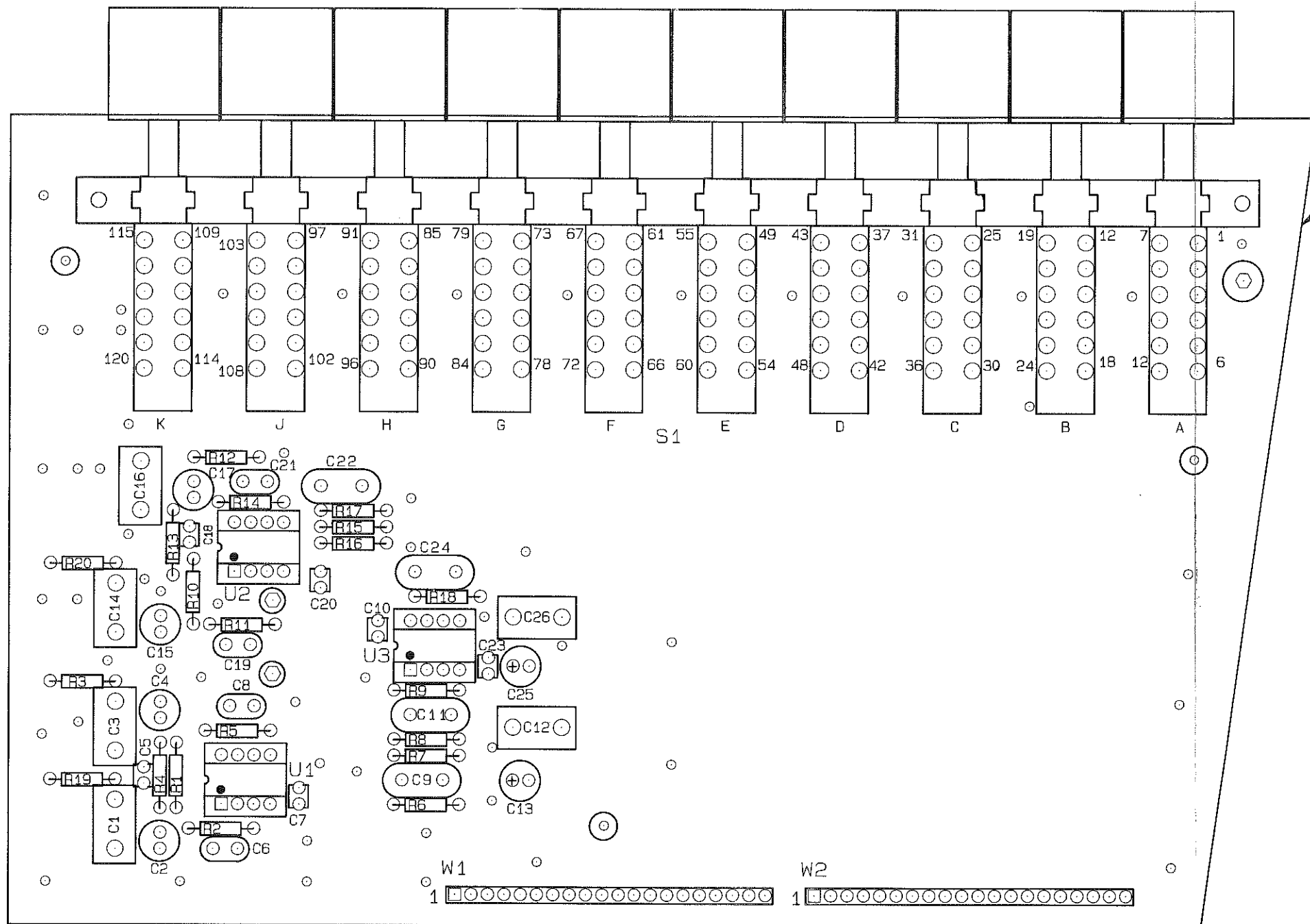


- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5%; ALL CAPACITORS IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENTS USED: R20, C26, U3, W2, S1.
 3. SEE PCB ASSEMBLY A0911-0101
 4. ▽ DESIGNATES POWER SUPPLY GROUND.
 5. ▽ DESIGNATES AUDIO CIRCUIT GROUND...

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	CHKD ME 5-22-87	FINISH	
TOLERANCE DECIMAL U.S.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°	PROJ. ENGR. 11-11-87	NEXT ASSY	TYPE SIZE DWG. NO. REV S D 911-0101 4
	MFG:	MODEL MT90	SCALE NONE SHEET 1 OF 1

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	CHKD 8-22-88	FINISH		TITLE PCB ASSEMBLY MONITOR INPUT AMP. BOARD
	ME 8/22/88	PROJ. ENGR.	NEXT ASSY 901-9012 (12CH) 901-1015 (18CH)	TYPE SIZE DWG. NO. REV A C 911-0101 C
	MFG.	MODEL MT90	SCALE 2/1	SHEET 1 OF 1

SECTION IV

STUDIO MONITOR MODULE PARTS LIST

4-1. INTRODUCTION.

4-2. This section provides descriptions and part numbers of electrical components and assemblies required for maintenance of the studio monitor module. Each table entry in this section is indexed by reference designators appearing on the applicable schematic diagram.

TABLE 4-1. STUDIO MONITOR MODULE PARTS LIST INDEX

TABLE	TITLE	PART NO.	PAGE
4-2	STUDIO MONITOR MODULE ASSEMBLY	951-0028-002	4-1
4-3	MONITOR INPUT AMPLIFIER BOARD ASSEMBLY	911-0101	4-7

TABLE 4-2. STUDIO MONITOR MODULE ASSEMBLY - 951-0028-002
(Sheet 1 of 7)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1	Capacitor, Mylar, 0.1 uF ±10%, 100V	030-1053	1
C2	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C3	Capacitor, Mylar, 0.1 uF ±10%, 100V	030-1053	1
C4	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C5	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C6	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C7	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C8	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C9	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C10	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C11	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C12	Capacitor, Mylar, 0.1 uF ±10%, 100V	030-1053	1
C13	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C14	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C15 THRU C18	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	4
C19	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C20	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C21	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C22	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C23	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C24	Capacitor, Mylar, 0.1 uF ±10%, 100V	030-1053	1

TABLE 4-2. STUDIO MONITOR MODULE ASSEMBLY - 951-0028-002
(Sheet 2 of 7)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C25	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C26	Capacitor, Mylar, 0.1 uF ±10%, 100V	030-1053	1
C27	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C28	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C29	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C30	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C31	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C32	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C33	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C34	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C35	Capacitor, Mylar, 0.1 uF ±10%, 100V	030-1053	1
C36	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C37	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C38	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C39	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C40	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C41	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C42	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C43	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C44	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C45	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C46	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C48	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C50	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C51	Capacitor, Electrolytic, 100 uF, 25V	023-1084	1
C53	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C58	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C59	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C60	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C61	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C62	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C63	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C64	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C65	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C66,C67,C68	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	3
C69,C70	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	2
C71	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C72 THRU C75	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	4
C76	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C77	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C78	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C79	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C80	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C81	Capacitor, Mica, 100 pF, 500V	040-1022	1
C82	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C83	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C84	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C85	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1

TABLE 4-2. STUDIO MONITOR MODULE ASSEMBLY - 951-0028-002
(Sheet 3 of 7)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C86	Capacitor, Mica, 33 pF $\pm 5\%$, 500V	042-3312	1
C87	Capacitor, Mica, 330 pF $\pm 5\%$, 500V	042-3322	1
C88,C89,C90	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	3
C91	Capacitor, Electrolytic, 10 uF, 25V, Non-Polarized	023-1075	1
C92 THRU C97	Capacitor, Electrolytic, 10 uF, 35V	023-1076	6
C98	Capacitor, Electrolytic, 100 uF, 25V	023-1084	1
C99,C101	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	2
D1	Diode, Zener, 1N4733A, 5.1V $\pm 5\%$, 1W	200-4733	1
D2	Diode, Zener, 1N4733A, 5.1V $\pm 5\%$, 1W	200-4733	1
D3 THRU D6	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	4
D7	Diode, Zener, 1N4733A, 5.1V $\pm 5\%$, 1W	200-4733	1
D8 THRU D11	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	4
D12	Diode, Zener, 1N4733A, 5.1V $\pm 5\%$, 1W	200-4733	1
D13,D14,D15	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	3
J1,J2	Socket, Flexstrip, 20-Pin	417-0168	2
P1,P2	Receptacle, 40-Pin Dual In-line	417-4041	2
Q1 THRU Q5	Field Effect Transistor, J270, P-Channel JFET, TO-92 Case	210-0270	5
Q6	Transistor, 2N3906, PNP, Silicon, TO-92 Case	210-3906	1
Q7 THRU Q11	Field Effect Transistor, J270, P-Channel JFET, TO-92 Case	210-0270	5
Q12	Transistor, 2N3906, PNP, Silicon, TO-92 Case	210-3906	1
R1,R2,R4,R5	Resistor, 47 k Ohm $\pm 5\%$, 1/4W	100-4753	4
R6	Resistor, 2 k Ohm $\pm 1\%$, 1/4W	100-2041	1
R7	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	1
R8	Resistor, 2 k Ohm $\pm 1\%$, 1/4W	100-2041	1
R9	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	1
R10,R11	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	2
R12	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W	177-5054	1
R13	Resistor, 510 k Ohm $\pm 5\%$, 1/4W	100-5163	1
R14	Resistor, 51 Ohm $\pm 5\%$, 1/4W	100-5123	1
R15	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R16	Resistor, 4.87 k Ohm $\pm 1\%$, 1/4W	103-4874	1
R17,R18,R19	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1062	3
R20,R21	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	2
R22,R23	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	2
R24	Resistor, 33 Ohm $\pm 5\%$, 1/4W	100-3323	1
R25,R26	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R27	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R28,R29	Resistor, 20.0 k Ohm $\pm 1\%$, 1/4W	103-2051	2
R30	Resistor, 33 Ohm $\pm 5\%$, 1/4W	100-3323	1
R31,R32	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R33,R34,R36,R37	Resistor, 47 k Ohm $\pm 5\%$, 1/4W	100-4753	4
R38	Resistor, 2 k Ohm $\pm 1\%$, 1/4W	100-2041	1
R39	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	1
R40	Resistor, 2 k Ohm $\pm 1\%$, 1/4W	100-2041	1
R41	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	1

TABLE 4-2. STUDIO MONITOR MODULE ASSEMBLY - 951-0028-002
(Sheet 4 of 7)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R42,R43	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	2
R44	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W	177-5054	1
R45	Resistor, 510 k Ohm $\pm 5\%$, 1/4W	100-5163	1
R46	Resistor, 51 Ohm $\pm 5\%$, 1/4W	100-5123	1
R47	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R48	Resistor, 4.87 k Ohm $\pm 1\%$, 1/4W	103-4874	1
R49,R50	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	2
R51	Resistor, 33 Ohm $\pm 5\%$, 1/4W	100-3323	1
R52,R53	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R54	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R55,R56	Resistor, 20.0 k Ohm $\pm 1\%$, 1/4W	103-2051	2
R57	Resistor, 33 Ohm $\pm 5\%$, 1/4W	100-3323	1
R58,R59	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R60 THRU R63	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	4
R66	Resistor, 7500 Ohm $\pm 5\%$, 1/4W	100-7543	1
R68,R69	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	2
R70	Resistor, 43 k Ohm $\pm 5\%$, 1/4W	100-4353	1
R72,R73	Resistor, 10 Meg Ohm $\pm 5\%$, 1/4W	100-1083	2
R74	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R75	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W (TALK Level Control)	178-5056	1
R76	Resistor, 2 k Ohm $\pm 5\%$, 1/4W	100-2043	1
R77	Resistor, 51.1 k Ohm $\pm 5\%$, 1/4W	100-5153	1
R78	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R79,R80	Resistor, 62 k Ohm $\pm 5\%$, 1/4W	100-6253	2
R81	Resistor, 36 k Ohm $\pm 5\%$, 1/4W	100-3653	1
R82	Resistor, 2 k Ohm $\pm 5\%$, 1/4W	100-2043	1
R83	Resistor, 470 k Ohm $\pm 5\%$, 1/4W	100-4763	1
R84 THRU R87	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1062	4
R88	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R89	Resistor, 20.0 k Ohm $\pm 1\%$, 1/4W	103-2051	1
R90	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R91	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	1
R92	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R93	Resistor, 33.2 k Ohm $\pm 1\%$, 1/4W	103-3325	1
R94	Resistor, 12.4 k Ohm $\pm 1\%$, 1/4W	103-1245	1
R95	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R96	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W (STUDIO A LEVEL Control)	178-5056	1
R97	Resistor, 3 k Ohm $\pm 5\%$, 1/4W	100-3043	1
R98	Resistor, 200 k Ohm $\pm 5\%$, 1/4W	100-2063	1
R99	Resistor, 130 k Ohm $\pm 5\%$, 1/4W	100-1363	1
R100	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W	177-5054	1
R101	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R102	Resistor, 680 Ohm $\pm 5\%$, 1/4W	100-6833	1
R103	Resistor, 100 Ohm $\pm 5\%$, 1/4W	100-1033	1
R105	Resistor, 2 k Ohm $\pm 5\%$, 1/4W	100-2043	1

TABLE 4-2. STUDIO MONITOR MODULE ASSEMBLY - 951-0028-002
(Sheet 5 of 7)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R106,R107	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	2
R108	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W	177-5054	1
R109	Resistor, 510 k Ohm $\pm 5\%$, 1/4W	100-5163	1
R110	Resistor, 51 Ohm $\pm 5\%$, 1/4W	100-5123	1
R111	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R112	Resistor, 4.87 k Ohm $\pm 1\%$, 1/4W	103-4874	1
R113 THRU R115	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1062	3
R116,R117	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	2
R118,R119	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	2
R120	Resistor, 33 Ohm $\pm 5\%$, 1/4W	100-3323	1
R121,R122	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R123	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R124,R125	Resistor, 20.0 k Ohm $\pm 1\%$, 1/4W	103-2051	2
R126	Resistor, 33 Ohm $\pm 5\%$, 1/4W	100-3323	1
R127,R128	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R129,R130	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	2
R131	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W	177-5054	1
R132	Resistor, 510 k Ohm $\pm 5\%$, 1/4W	100-5163	1
R133	Resistor, 51 Ohm $\pm 5\%$, 1/4W	100-5123	1
R134	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R135	Resistor, 4.87 k Ohm $\pm 1\%$, 1/4W	103-4874	1
R136,R137	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	2
R138	Resistor, 33 Ohm $\pm 5\%$, 1/4W	100-3323	1
R139,R140	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R141	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R142,R143	Resistor, 20.0 k Ohm $\pm 1\%$, 1/4W	103-2051	2
R144	Resistor, 33 Ohm $\pm 5\%$, 1/4W	100-3323	1
R145,R146	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R147	Resistor, 470 k Ohm $\pm 5\%$, 1/4W	100-4763	1
R148 THRU R151	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1062	4
R152	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R153	Resistor, 20.0 k Ohm, $\pm 1\%$, 1/4W	103-2051	1
R154	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R155	Resistor, 200 k Ohm $\pm 5\%$, 1/4W	100-2063	1
R156	Resistor, 130 k Ohm $\pm 5\%$, 1/4W	100-1363	1
R157	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W	177-5054	1
R158	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	1
R159	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R160	Resistor, 33.2 k Ohm $\pm 1\%$, 1/4W	103-3325	1
R161	Resistor, 12.4 k Ohm $\pm 1\%$, 1/4W	103-1245	1
R162	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R163	Resistor, 3 k Ohm $\pm 5\%$, 1/4W	100-3043	1
R164	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W (STUDIO B LEVEL Control)	178-5056	1
R165	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R166	Resistor, 680 Ohm $\pm 5\%$, 1/4W	100-6833	1

TABLE 4-2. STUDIO MONITOR MODULE ASSEMBLY - 951-0028-002
(Sheet 6 of 7)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R167	Resistor, 100 Ohm $\pm 5\%$, 1/4W	100-1033	1
R169	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1024	1
R170	Resistor, 1.47 k Ohm $\pm 1\%$, 1/4W	103-1474	1
R171	Resistor, 121 Ohm $\pm 5\%$, 1/4W	100-1231	1
R172	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1024	1
R173	Resistor, 1.47 k Ohm $\pm 1\%$, 1/4W	103-1474	1
R174	Resistor, 121 Ohm $\pm 5\%$, 1/4W	100-1231	1
R175	Resistor, 470 Ohm $\pm 5\%$, 1/4W	100-4733	1
R176,R177	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1024	2
R178 THRU R181	Resistor, 470 k Ohm $\pm 5\%$, 1/4W	100-4763	4
S1	Switch, 10 Section, 4PDT Pushbutton, Black/Yellow Indications (STUDIO A MONITOR SELECT Switch)	340-0098	1
S2	Switch, 1 Section Pushbutton, 2PDT, Momentary, Yellow/Black Indications (TALK A Switch)	340-0099	1
S3	Switch, 1 Section Pushbutton, 2PDT, Momentary, Orange/Black Indications (TALK B Switch)	340-0100	1
U1,U2,U3	Integrated Circuit, LM833N, Dual Audio Operational Amplifier, 8-Pin DIP	220-0833	3
U4,U5	Integrated Circuit, 2150A, Voltage Controlled Amplifier, 8-Pin DIP	220-2150	2
U6,U7	Integrated Circuit, LM833N, Dual Audio Operational Amplifier, 8-Pin DIP	220-0833	2
U8	Integrated Circuit, NE572N, Programmable Analog Compandor, 16-Pin DIP	220-0572	1
U9,U10,U11	Integrated Circuit, TL072CP, Dual JFET-Input Operational Amplifier, 8-Pin DIP	221-0072	3
U12	Integrated Circuit, MC14584, Hex Schmitt Trigger, CMOS, 14-Pin DIP	228-4584	1
U13	Integrated Circuit, MC14011BCP, Quad 2-Input NAND Gate, CMOS, 14-Pin DIP	228-4011	1
U14	Integrated Circuit, 4N33, Optical Isolator, NPN Photo Transistor/Infared Emitting Diode Type, 1500V Isolation, Response: 30 kHz Maximum, Current: 50 mA Maximum, 6-Pin DIP	229-0033	1
U16,U17	Integrated Circuit, 2150A, Voltage Controlled Amplifier, 8-Pin DIP	220-2150	2
U18,U19	Integrated Circuit, LM833N, Dual Audio Operational Amplifier, 8-Pin DIP	220-0833	2
U20	Integrated Circuit, TL072CP, Dual JFET-Input Operational Amplifier, 8-Pin DIP	221-0072	1
U21	Integrated Circuit, 4N33, Optical Isolator, NPN Photo Transistor/Infared Emitting Diode Type, 1500V Isolation, Response: 30 kHz Maximum, Current: 50 mA Maximum, 6-Pin DIP	229-0033	1
U23	Integrated Circuit, LM317T, Adjustable Positive Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0317	1
U24	Integrated Circuit, LM337T, Adjustable Negative Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0337	1
XU1 THRU XU7	Socket, 8-Pin DIP	417-0804	5
XU8	Socket, 16-Pin DIP	417-1604	1
XU9 THRU XU11	Socket, 8-Pin DIP	417-0804	3
XU12,XU13	Socket, 14-Pin DIP	417-1404	2
XU14	Socket, 6-Pin DIP	417-0600	1
XU18 THRU XU20	Socket, 8-Pin DIP	417-0804	3
XU21	Socket, 6-Pin DIP	417-0600	1
—	Knob Cap, 15mm Orange W/Spot, C152 (for STUDIO B MONITOR LEVEL Control)	481-0028	1

TABLE 4-2. STUDIO MONITOR MODULE ASSEMBLY - 951-0028-002
(Sheet 7 of 7)

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	Knob Cap, 15mm Gray W/Spot, C152 (for TALK LEVEL Control)	481-0026	1
—	Knob Cap, 15mm Yellow W/Spot, C152 (for STUDIO A MONITOR LEVEL Control)	481-0024	1
—	Monitor Input Amplifier Board Assembly	911-0101	1
—	Blank Studio Monitor Module Circuit Board	511-0028-002	1

TABLE 4-3. MONITOR INPUT AMPLIFIER CIRCUIT BOARD ASSEMBLY - 911-0101
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C2	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C3	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C4	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C5	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C6	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C7	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C8	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C9	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C10	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C11	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C12	Capacitor, Mylar Film 0.1 uF ±10%, 100V	030-1053	1
C13	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C14	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C15	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C16	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C17	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C18	Capacitor, Monolythic Ceramic 0.1 uF ±20%, 50V	003-1054	1
C19	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C20	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C21	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C22	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C23	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C24	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C25	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C26	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
R1,R2	Resistor, 47 k Ohm ±5%, 1/4W	100-4753	2
R3	Resistor, 470 k Ohm 15%, 1/4W	100-4763	1
R4,R5	Resistor, 47 k Ohm ±5%, 1/4W	100-4753	2
R6	Resistor, 2 k Ohm ±1%, 1/4W	100-2041	1
R7	Resistor, 1 k Ohm ±1%, 1/4W	103-1041	1
R8	Resistor, 2 k Ohm ±1%, 1/4W	100-2041	1
R9	Resistor, 1 k Ohm ±1%, 1/4W	103-1041	1
R10,R11	Resistor, 47 k Ohm ±5%, 1/4W	100-4753	2
R12	Resistor, 470 k Ohm 15%, 1/4W	100-4763	1
R13,R14	Resistor, 47 k Ohm ±5%, 1/4W	100-4753	2

TABLE 4-3. MONITOR INPUT AMPLIFIER CIRCUIT BOARD ASSEMBLY - 911-0101
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R15	Resistor, 2 k Ohm $\pm 1\%$, 1/4W	100-2041	1
R16	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	1
R17	Resistor, 2 k Ohm $\pm 1\%$, 1/4W	100-2041	1
R18	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	1
R19,R20	Resistor, 470 k Ohm 15%, 1/4W	100-4763	2
S1	Switch, 10 Position 4PDT Pushbutton, Black/Orange Indications (HEADPHONE SELECT Switch)	340-0101	1
U1,U2,U3	Integrated Circuit, LM833N, Dual Audio Operational Amplifier, 8-Pin DIP	220-0833	3
XU1,XU2,XU3	Socket, 8-Pin DIP	417-0804	3
W1,W2	Flexstrip Jumpers, 20-Conductor, Straight Pins	600-0012	2

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SECTION I

REMOTE CONTROL MODULE

SOURCE REMOTE CONTROL MODULE

THEORY OF OPERATION

1-1. INTRODUCTION.

1-2. The following text provides detailed theory of operation for the Mix-Trak 90 series audio console remote control and source remote control modules.

1-3. REMOTE CONTROL MODULE FUNCTIONAL DESCRIPTION.

1-4. The following text provides a functional description of the remote control module. Figure 1-1 presents a detailed block diagram of the remote control module circuitry. Refer to Figure 1-1 as required for the following circuit description. To simplify and clarify the discussion, the text will describe the operation of the remote control module circuitry for a remote input A on command.

1-5. GENERAL.

1-6. Remote control operations such as input A/B on/off control, input A/B on/off indications, and cue control for a line input or microphone input module are performed by the remote control module. The module is equipped with optical coupler input/output networks and CMOS control logic. The module utilizes the input optical coupler network in a manner to allow the initiation of a remote control function from either a positive or negative logic control circuit. The output optical coupler network is utilized in a similar manner to allow the connection of either a positive or negative logic indicator circuit.

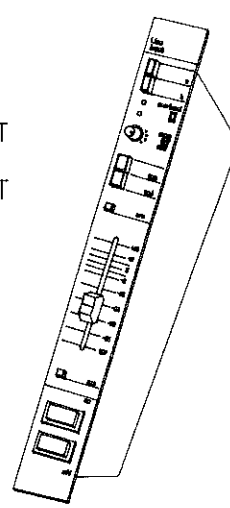
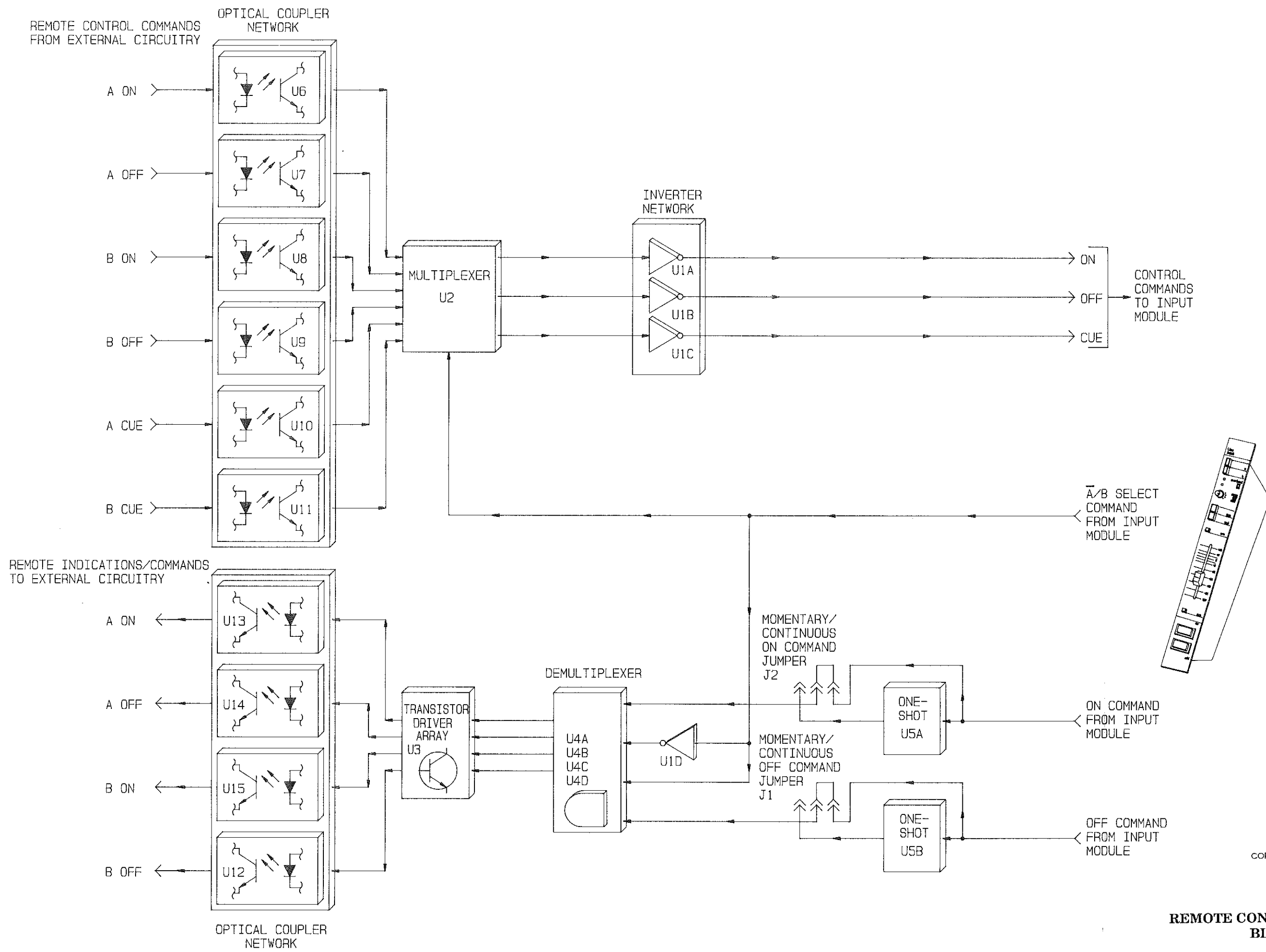
1-7. REMOTE COMMAND CIRCUIT.

1-8. The remote control module input network consists of optical couplers U6 through U11. When a remote function is initiated such as an input A on command, the remote control circuit will energize optical coupler U6. U6 will output a HIGH control command to multiplexer U2. U2 controlled by A/B select information from the input module. When audio source A is selected on the input module, a LOW will be routed to U2. The LOW instructs the multiplexer to select source A remote control information. The remote control information from U2 is applied to an inverter network consisting of U1A/B/C. With the application of an input A on command, the HIGH from U2 will be inverted LOW by U1A and routed to the associated input module.

1-9. REMOTE INDICATION CIRCUIT.

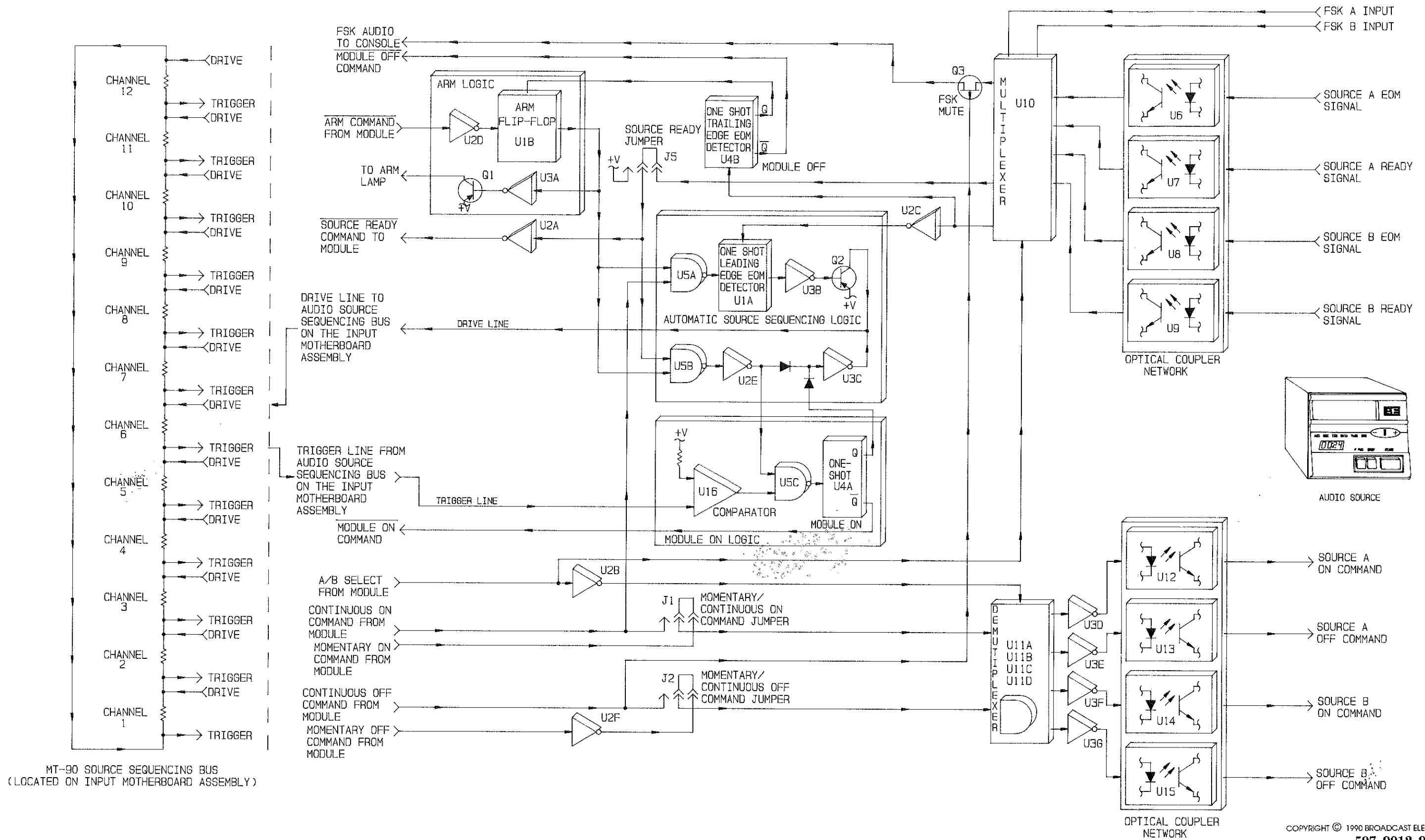
1-10. The input module will respond to the input A on command by enabling the audio circuitry and processing the source A audio. The input module will also generate a continuous on command which is applied to one-shot U5A and jumper J2. U5A and jumper J2 allow the selection of either a momentary or continuous remote on command. The command from J2 is applied to an AND gate demultiplexer consisting of U4A/B/C/D. The demultiplexer is provided to decode the source on/off and A/B select information. With the application of an input A on command, the demultiplexer will output a HIGH through a control line to transistor driver array U3. U3 inverts the command and outputs a LOW to energize optical coupler U13 and generate a source A on indicator command for application to external circuitry.

- 1-11. **SOURCE REMOTE CONTROL MODULE FUNCTIONAL DESCRIPTION.**
- 1-12. The following text presents a functional description of the source remote control module. Figure 1-2 presents a detailed block diagram of the source remote control module circuitry. Refer to Figure 1-2 as required for the following circuit description. To simplify and clarify the discussion, the text will describe the operation of the source remote control module circuitry for the sequencing of the A audio sources on console channels 1 and 2.
- 1-13. **GENERAL.**
- 1-14. Control of line input module audio sources is performed by source remote control modules. The source remote control modules operate in association with the line input modules and a bus on the input motherboard assemblies to provide an automatic source sequencing feature. Sequencing operations are directed by the source remote control module which processes ready and end-of-message (EOM) status information from the audio sources and operating information from the line input module. The module evaluates the information and generates the appropriate audio source and line input module commands.
- 1-15. **ARM CIRCUIT.**
- 1-16. A line input module is configured for automatic source sequencing operations when the module arm switch/indicator is depressed. A LOW from the switch/indicator is applied to the associated source remote control module and is inverted HIGH by U2D. The HIGH is applied to arm flip-flop U1B. The Q output of U1B will go HIGH. The HIGH is inverted LOW by U3A and biases driver transistor Q1 on to illuminate the arm lamp on the line input module. The HIGH is also applied to an automatic source sequencing circuit.
- 1-17. **INPUT CIRCUIT.**
- 1-18. Audio source EOM and ready status information are applied to the module through an coupler network consisting of integrated circuits U6 through U9. The optical coupler network is utilized in a manner which allows audio source indications from either a positive or negative logic control circuit.
- 1-19. Audio source control and sequencing operations are controlled by the source ready status. When audio source A is ready, the source will output a ready command. The command will energize optical coupler U7. U7 will output a HIGH to multiplexer U10. U10 is controlled by A/B select information from the input module. With audio source A selected, a LOW will be routed to U10. The LOW instructs the multiplexer to select source A status information. As a result, the HIGH source A ready command from U10 will be applied through source ready jumper J5 to inverter U2A and to the automatic source sequencing logic. U2A inverts the command and outputs a LOW source ready command to the input module. Jumper J5 provides a ready status command for an audio source not equipped with a ready status output. J5 may also be programmed to configure the source remote control module as a remote control module.
- 1-20. **AUTOMATIC SOURCE SEQUENCING LOGIC.**
- 1-21. The automatic source sequencing logic consists of AND gates U5A/B, one-shot U1A, inverters U2E and U3B/C, and transistor Q2. With the channel 1 and 2 line input modules armed and the associated audio sources ready, an audio source sequencing operation is initiated when the channel 1 module on switch/indicator is depressed. The channel 1 source will begin operation and play the selected source. HIGH commands from the input module continuous on control line and from arm flip-flop U1B will be applied to NAND gate U5A. U5A will output a LOW to one-shot U1A.



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FIGURE 1-1.
REMOTE CONTROL MODULE DETAILED
BLOCK DIAGRAM



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FIGURE 1-2.
SOURCE REMOTE MODULE DETAILED
BLOCK DIAGRAM

1-5/1-6

- 1-22. The channel 1 audio source will play until the source outputs an end-of-message (EOM) command. The EOM command will energize optical coupler U6. U6 will output an EOM pulse to multiplexer U10. With the A input selected, U10 will output the pulse to inverter U2C and module off command one-shot U4B. The leading edge of the EOM pulse will trigger U1A which outputs a pulse to inverter U3B. U3B inverts the pulse to bias transistor Q2 on. Q2 will output a square-wave trigger pulse for application to the module drive line.
- 1-23. The drive line is controlled by NAND gate U5B and inverters U2E and U3C. When channel 1 is armed, ready, and not in operation, HIGH commands from the source ready jumper and from arm flip-flop U1B will be applied to NAND gate U5B. The output of U5B will go LOW. The LOW is inverted at U2E and U3C to clamp the drive line LOW. When the source is started, the LOW will be removed and the drive line will float to allow the application of the trigger pulse.
- 1-24. The source remote control module drive line is connected to a source sequencing bus on the input motherboard assemblies. The sequencing bus consists of a drive control line and a trigger control line for each channel in the console. The drive line is designed to route a control signal for application to the trigger lines of associated audio channels. The trigger line routes the pulse to a circuit which enables the line input module and the associated audio source.
- 1-24. With the channel 1 drive line floating, transistor Q2 will output a square-wave trigger pulse to the drive line. The pulse will be routed through the sequencing bus to the channel 2 trigger line. The trigger pulse is applied to comparator U16. When the pulse level increases above the comparator reference voltage, the output of U16 will go HIGH. The HIGH is applied to NAND gate U5C. U5C NANDs the HIGH from U16 and a HIGH from U2E to generate a LOW control pulse to trigger module on one-shot U4A. The Q output of U4A will route a LOW input module on command to channel 2. The Q output of U4A will route a HIGH to U3C. U3C inverts the signal and outputs a LOW to the drive line. This LOW clamps the drive line at ground potential for approximately one second to prevent the trigger pulse from enabling two armed input modules simultaneously.
- 1-25. With the application of an on command from one-shot U4A, the channel 2 input module will be enabled. Continuous and momentary on commands from the input module will be routed through jumper J1 to a demultiplexer consisting of AND gates U11A/B/C/D. J1 allows the selection of a continuous or momentary on command for application to the audio source. AND gate demultiplexer U11 is controlled by A/B select information from the input module. With source A selected, a LOW will be routed to the demultiplexer. The LOW instructs the demultiplexer to output a HIGH source A on command to inverter U3D. U3D outputs a LOW which energizes optical coupler U12 to generate a source A on command.
- 1-26. With the channel 2 audio source enabled, the trailing edge of the EOM signal from multiplexer U10 will trigger one-shot U4B. The Q output of U4B will go high to reset arm flip-flop U1B. The Q output will go LOW to generate a module off command and terminate channel 1 module operation.
- 1-27. **FSK INFORMATION PROCESSING.**
- 1-28. FSK information from audio sources A/B is processed by the source remote control module input circuit for application to the FSK decoder module. The FSK information is applied to multiplexer U10. U10 selects either audio source A or B FSK information as directed by the A/B select line and routes the information to the console for application to the FSK decoder module. Refer to the FSK DECODER module section of this manual for detailed information.

SECTION II

REMOTE CONTROL MODULE

SOURCE REMOTE CONTROL MODULE

MAINTENANCE

2-1. INTRODUCTION.

2-2. This section provides general maintenance information and troubleshooting information for the remote control module and the source remote control module.

2-3. FIRST LEVEL MAINTENANCE.

2-4. First level maintenance consists of precautionary procedures applied to the equipment to prevent future failures. The procedures are performed on a regular basis and the results recorded in a performance log.

2-5. The remote control module and the source remote control module should be periodically cleaned of accumulated dust using a nylon-bristle brush and vacuum cleaner. Inspect the module for improperly seated semiconductors and components damaged by overheating.

2-6. SECOND LEVEL MAINTENANCE.

2-7. Second level maintenance consists of procedures required to restore a remote control module or a source remote control module to operation after a fault has occurred. The procedures are divided into troubleshooting information and component replacement procedures.

2-8. TROUBLESHOOTING.

2-9. The troubleshooting philosophy for the remote control and source remote control modules consists of isolating a problem to a specific circuit or group of components. Two 40-pin and one 50-pin extender ribbon cable assemblies are provided to interface plug-in modular assemblies to the chassis mounted motherboards for troubleshooting procedures.

2-10. Figure 2-1 presents the remote control module troubleshooting information. Figure 2-2 presents the source remote control module troubleshooting information. Refer to Figures 2-1 and 2-2 to isolate a failure to a specific group of components.

2-11. Once trouble is isolated and power is totally deenergized, refer to the schematic diagrams and the theory of operation to assist in problem resolution. The defective component may be repaired locally or the entire module may be returned to Broadcast Electronics for repair or replacement.

2-12. COMPONENT REPLACEMENT.

2-13. Component replacement procedures for the console modular assemblies are presented in SECTION II, MAINTENANCE. Refer to SECTION II as required for the replacement procedures.

REMOTE CONTROL MODULE TROUBLESHOOTING	
SYMPTOM	SOLUTION
NO INDIVIDUAL REMOTE COMMAND (INPUT A ON, INPUT A OFF ETC.)	<ol style="list-style-type: none"> 1. CHECK THE REMOTE CONTROL INTERFACING CIRCUIT. 2. CHECK THE REMOTE COMMAND ASSOCIATED OPTICAL COUPLER (U6 THROUGH U11). 3. CHECK INTEGRATED CIRCUITS U1 AND U2.
NO INDIVIDUAL REMOTE INDICATIONS (INPUT A ON, INPUT A OFF ETC.)	<ol style="list-style-type: none"> 1. CHECK THE REMOTE INDICATION INTERFACING CIRCUIT. 2. ENSURE JUMPERS J1 AND J2 ARE INSTALLED. 3. CHECK THE REMOTE INDICATION ASSOCIATED OPTICAL COUPLER (U12 THROUGH U15). 4. CHECK INTEGRATED CIRCUITS U3, U4, AND U5.

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FIGURE 2-1. REMOTE CONTROL MODULE TROUBLESHOOTING

SOURCE REMOTE CONTROL MODULE TROUBLESHOOTING	
SYMPTOM	SOLUTION
NO SOURCE READY INDICATIONS	<ol style="list-style-type: none"> 1. CHECK AUDIO SOURCE FOR PROPER READY STATUS INDICATIONS 2. ENSURE JUMPER J5 IS INSTALLED. 3. CHECK OPTICAL COUPLERS U7 AND U9. 4. CHECK INTEGRATED CIRCUITS U10 AND U2.
INPUT MODULE WILL NOT OPERATE TO THE ARM MODE	<ol style="list-style-type: none"> 1. CHECK ARM SWITCH S10 ON THE INPUT MODULE. 2. CHECK TRANSISTOR Q1. 3. CHECK INTEGRATED CIRCUITS U1,U2,AND U3.
NO SOURCE SEQUENCING	<ol style="list-style-type: none"> 1. CHECK AUDIO SOURCE TO BE STARTED FOR PROPER READY STATUS INDICATIONS. 2. CHECK ENABLED AUDIO SOURCE FOR PROPER EOM STATUS INDICATIONS. 3. CHECK OPTICAL COUPLERS U6 AND U8. 4. CHECK INTEGRATED CIRCUITS U1,U2,U3, U5,AND TRANSISTOR Q2. 5. CHECK INTEGRATED CIRCUITS U16,U5,AND U4. 6. ENSURE JUMPER J1 IS INSTALLED. 7. CHECK INTEGRATED CIRCUITS U3,AND U11 AND OPTICAL COUPLERS U12 AND U14.
SIMULTANEOUS ENABLING OF TWO CONSOLE CHANNELS	<ol style="list-style-type: none"> 1. CHECK INTEGRATED CIRCUITS U3 AND U4.
NO MODULE TERMINATION	<ol style="list-style-type: none"> 1. CHECK INTEGRATED CIRCUIT U4.
NO SOURCE TERMINATION	<ol style="list-style-type: none"> 1. ENSURE JUMPER J2 IS INSTALLED. 2. CHECK INTEGRATED CIRCUITS U3 AND U11 AND OPTICAL COUPLERS U13 AND U15.

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FIGURE 2-2. SOURCE REMOTE CONTROL MODULE TROUBLESHOOTING

SECTION III

REMOTE CONTROL MODULE

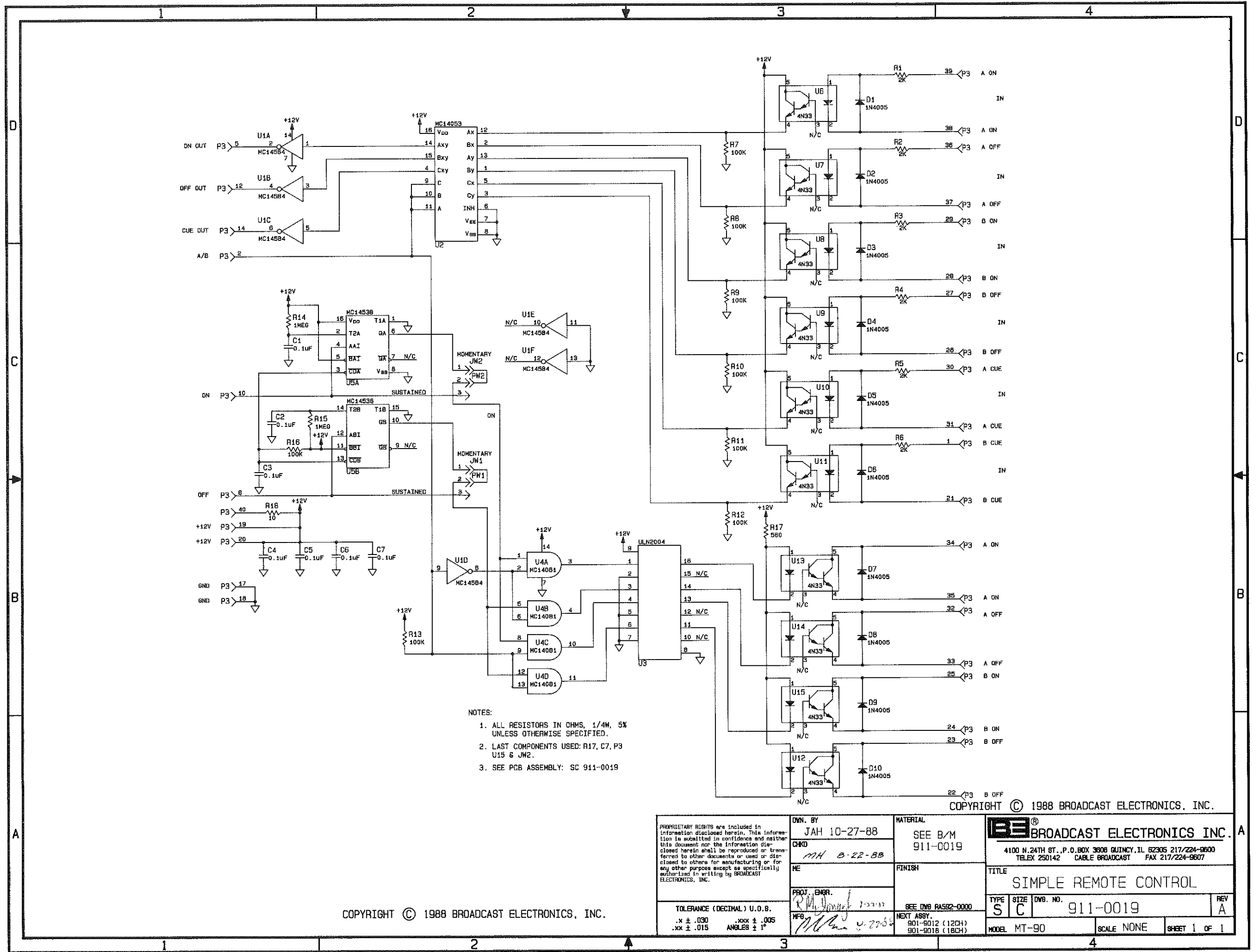
SOURCE REMOTE CONTROL MODULE

DRAWINGS

3-1. INTRODUCTION.

3-2. This section provides assembly drawings and schematic diagrams as listed below for the remote control module and the source remote control module.

FIGURE	TITLE	NUMBER
3-1	SCHEMATIC DIAGRAM, REMOTE CONTROL MODULE	SC911-0019
3-2	ASSEMBLY DIAGRAM, REMOTE CONTROL MODULE	AC911-0019
3-3	SCHEMATIC DIAGRAM, SOURCE REMOTE CONTROL MODULE	SC911-0035
3-4	ASSEMBLY DIAGRAM, SOURCE REMOTE CONTROL MODULE	AC911-0035



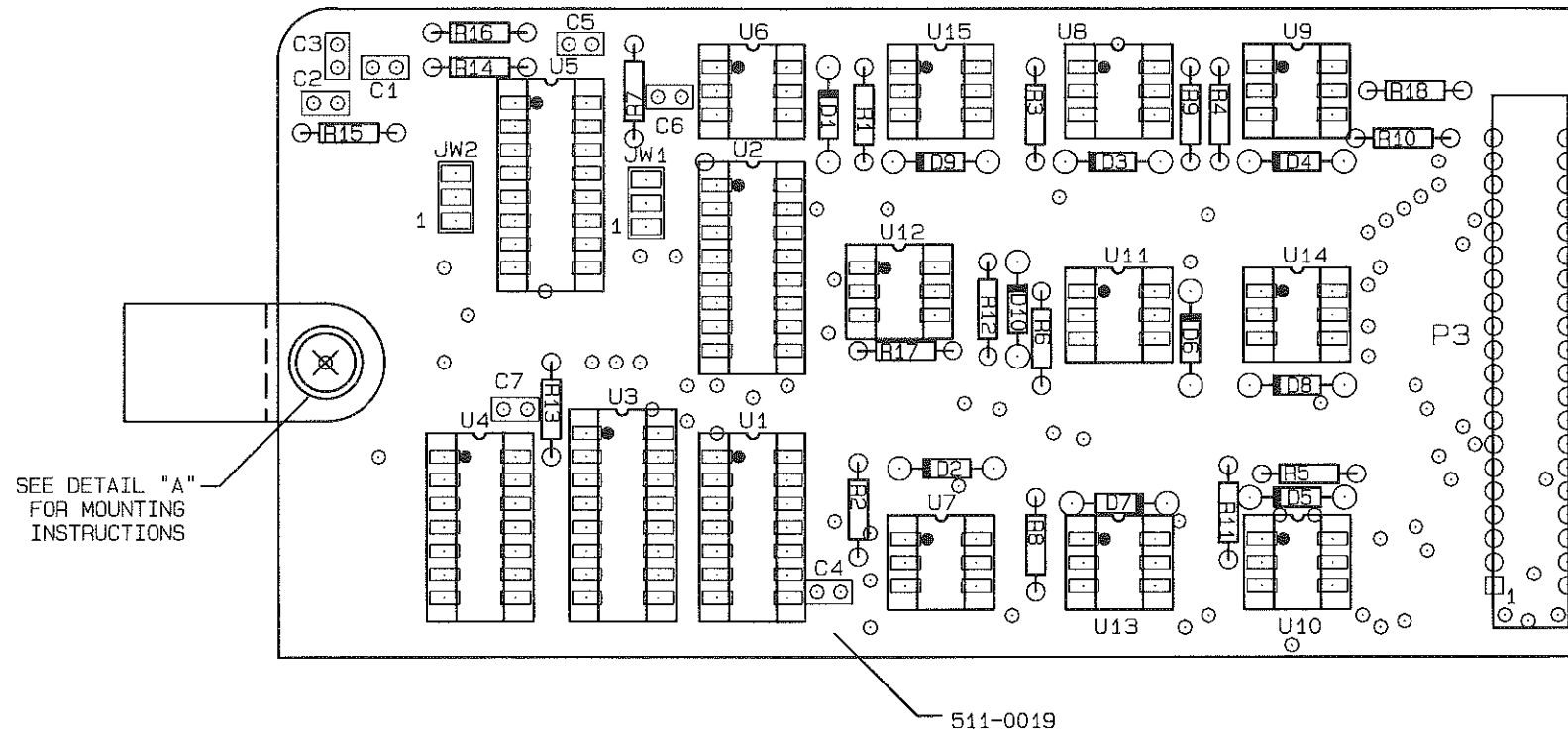
- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5% UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENTS USED: R17, C7, P3 U15 & JW2.
 3. SEE PCB ASSEMBLY: SC 911-0019

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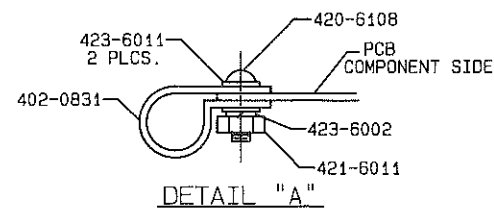
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	CHKD <i>MH B-22-88</i>	FINISH	
TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°	PROJ. ENGR. <i>R.M. [Signature]</i>	SEE DWG RA592-0000	TITLE SIMPLE REMOTE CONTROL
NEXT ASSY. 901-9012 (12CH) 901-9018 (18CH)	HFB <i>M.A. [Signature]</i>	TYPE S	SIZE C
		DWG. NO. 911-0019	REV A
		MODEL MT-90	SCALE NONE
		SHEET 1	OF 1

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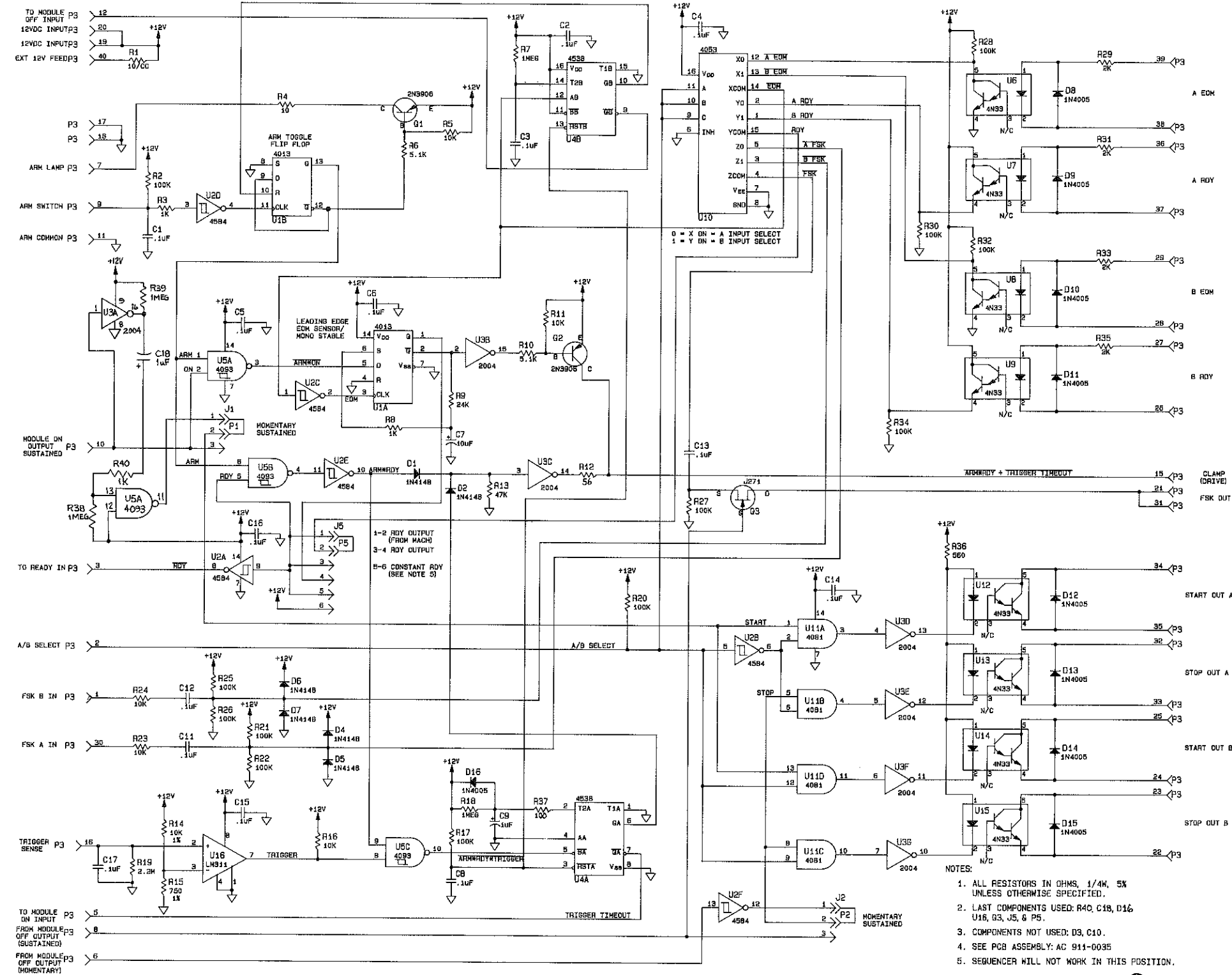


NOTE:
1. SEE SCHEMATIC SC911-0019



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	CHKD MH 8-22-88	FINISH		TITLE PCB ASSEMBLY- SIMPLE REMOTE CONTROL BOARD
	ME JHR 8/22/88	PROJ ENGR K.M. Dwyer	NEXT ASSY 901-9012 "12CH" 901-9018 "18CH"	TYPE SIZE DWG. NO. REV A C 911-0019 A
	TOLERANCE DECIMAL U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°	MFG Mfg 8-22-88	MODEL MT90 SCALE 2:1 SHEET 1 OF 1	



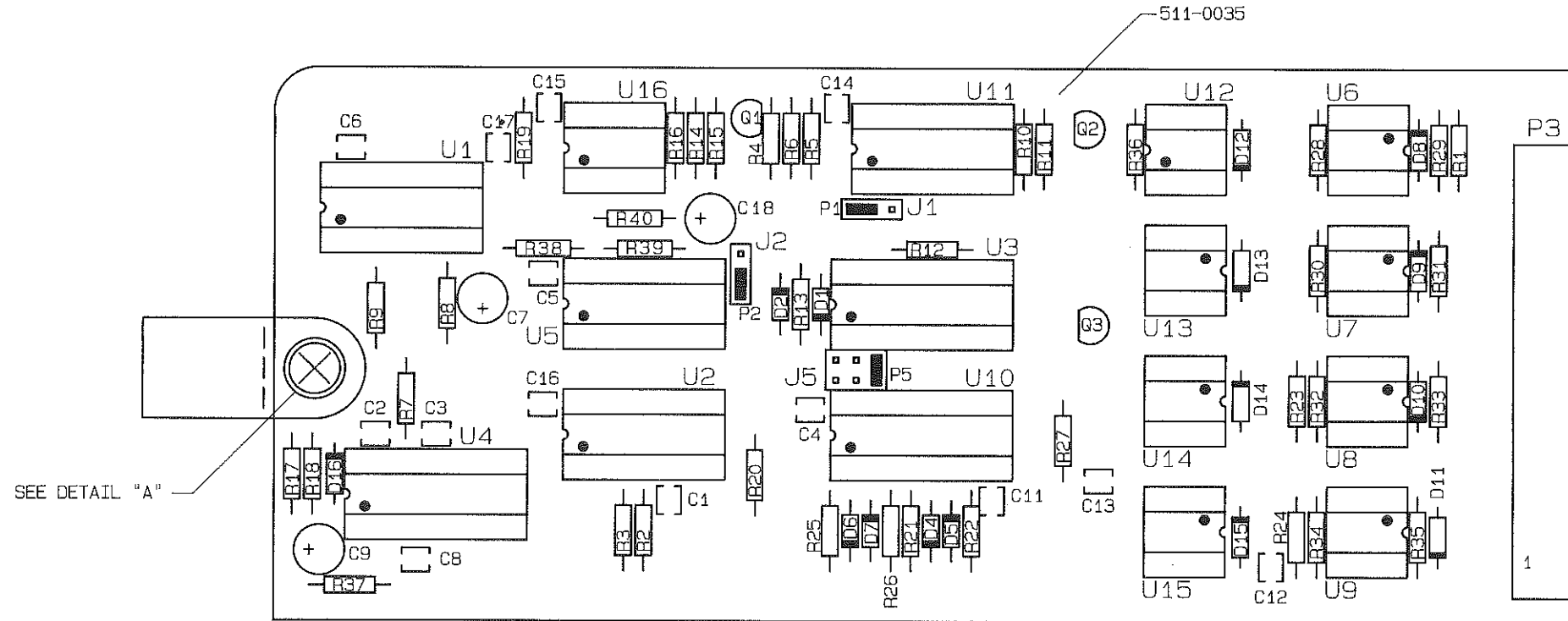
- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5% UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENTS USED: R40, C18, D16, U16, Q3, J5, & P5.
 3. COMPONENTS NOT USED: D3, C10.
 4. SEE PCB ASSEMBLY: AC 911-0035
 5. SEQUENCER WILL NOT WORK IN THIS POSITION.

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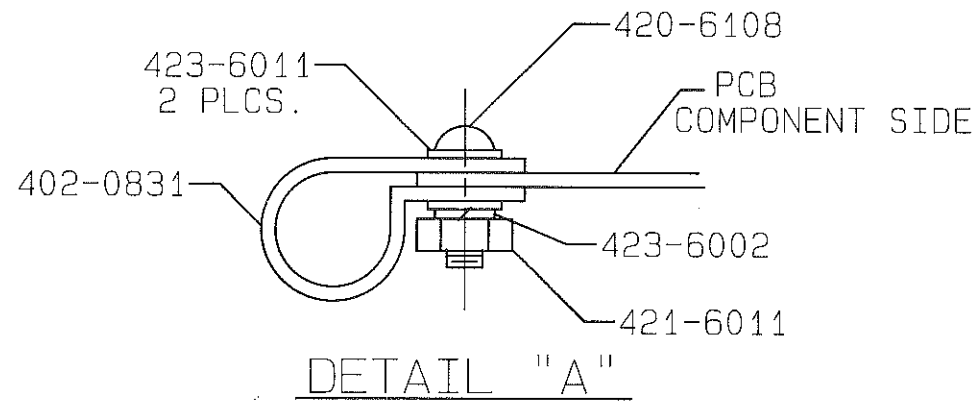
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	CHKD <i>MJA 12-13-89</i>	FINISH	
TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°	PROJ. ENGR. <i>MJA 12-13-89</i>	SEE DWG RA582-0000 NEXT ASSY. 901-9012 (12 CH) 901-9018 (18 CH)	TITLE SOURCE REMOTE CONTROL
			TYPE SIZE DWS. NO. REV S C 911-0035 B
			MODEL MT-90 SCALE NONE SHEET 1 OF 1

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NOTES:

1. LAST COMPONENT USED: R40, C18, D16, G3, U16, J4, P5.
2. SEE PCB SCHEMATIC: SD911-0035



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	CHKD MH 12-13-90	ME JHS 12-13-90	
TOLERANCE DECIMAL U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°	PROJ. ENGR. RM 12-13-90	NEXT ASSY 901-9012 "12CH" 901-9018 "18CH"	TITLE PCB ASSEMBLY- SOURCE REMOTE CONTROL BD.
MFG. JRB 12-14-90	TYPE A	SIZE C	DWG. NO. 911-0035
	MODEL MT90	SCALE 2/1	REV B
		SHEET 1 OF 1	

SECTION IV

REMOTE CONTROL MODULE

SOURCE REMOTE CONTROL MODULE

PARTS LIST

4-1. INTRODUCTION.

4-2. This section provides descriptions and part numbers of electrical components and assemblies required for maintenance of the remote control and source remote control modules. Each table entry in this section is indexed by reference designators appearing on the applicable schematic diagram.

**TABLE 4-1. REMOTE CONTROL MODULE/SOURCE REMOTE CONTROL MODULE
PARTS LIST INDEX**

TABLE	TITLE	PART NO.	PAGE
4-2	REMOTE CONTROL CIRCUIT BOARD ASSEMBLY	911-0019	4-1
4-3	SOURCE REMOTE CONTROL ASSEMBLY	911-0035	4-2

**TABLE 4-2. REMOTE CONTROL CIRCUIT BOARD ASSEMBLY - 911-0019
(Sheet 1 of 2)**

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1 THRU C7	Capacitor, Monolithic Ceramic, 0.1 uF \pm 20%, 50V	003-1054	7
D1 THRU D10	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	10
JP1,JP2	Programmable Jumper	340-0004	2
JW1,JW2	Connector Header, 3-Pin	417-0003	2
P1	Receptacle, 40-Pin Dual In-line	417-4041	1
R1 THRU R6	Resistor, 2 k Ohm \pm 5%, 1/4W	100-2043	6
R7 THRU R13	Resistor, 100 k Ohm \pm 5%, 1/4W	100-1063	7
R14,R15	Resistor, 1 Meg Ohm \pm 5%, 1/4W	100-1073	2
R16	Resistor, 100 k Ohm \pm 5%, 1/4W	100-1063	1
R17	Resistor, 560 Ohm \pm 5%, 1/4W	100-5633	1
R18	Resistor, 10 Ohm \pm 5%, 1/4W	100-1024	1
U1	Integrated Circuit, MC14584, Hex Schmitt Trigger, CMOS, 14-Pin DIP	228-4584	1
U2	Integrated Circuit, MC14053B, Analog Multiplexers/Demulti- plexers, CMOS MSI, 16-Pin DIP	220-4053	1
U3	Integrated Circuit, ULN2004, 7 NPN Darlington Driver Pack, 16-Pin DIP	226-2004	1
U4	Integrated Circuit, CD4081BE, Quad 2-Input AND Gate, CMOS, 14-Pin DIP	225-0008	1
U5	Integrated Circuit, MC14538B, Dual Retriggerable, Resettable Monostable Multivibrator, CMOS, 16-Pin DIP	228-4538	1
U6 THRU U15	Integrated Circuit, 4N33, Optical Isolator, NPN Photo Transistor/Infared Emitting Diode Type, 1500V Isolation, Response: 30 kHz Maximum, Current: 50 mA Maximum, 6-Pin DIP	229-0033	10

TABLE 4-2. REMOTE CONTROL CIRCUIT BOARD ASSEMBLY - 911-0019
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
XU1	Socket, 14-Pin DIP	417-1404	1
XU2,XU3	Socket, 16-Pin DIP	417-1604	2
XU4	Socket, 14-Pin DIP	417-1404	1
XU5	Socket, 16-Pin DIP	417-1604	1
XU6 THRU XU15	Socket, 6-Pin DIP	417-0600	10
—	Blank Simple Remote Control Circuit Board	511-0019	1

TABLE 4-3. SOURCE REMOTE CONTROL ASSEMBLY - 911-0035
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1 Thru C6	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	6
C7	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C8	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C9	Capacitor, Electrolytic, 1 uF, 50V	024-1064	1
C11 THRU C17	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	7
C18	Capacitor, Electrolytic, 1 uF, 50V	024-1064	1
D1,D2,D4 THRU D7	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	6
D8 THRU D16	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	9
J1,J2	Connector Header, 3-Pin	417-0003	2
J5	Connector Header, 13-Pin Dual In-line	417-2600	1
P1,P2	Programmable Jumper	340-0004	2
P3	Receptacle, 40-Pin Dual In-line	417-4041	1
P5	Programmable Jumper	340-0004	1
Q1,Q2	Transistor, 2N3906, PNP, Silicon, TO-92 Case	210-3906	2
Q3	Field Effect Transistor, J271, P-Channel JFET, TO-92 Case	210-0271	1
R1	Resistor, 10 Ohm ±5%, 1/4W	100-1024	1
R2	Resistor, 100 k Ohm ±5%, 1/4W	100-1063	1
R3	Resistor, 1 k Ohm ±5%, 1/4W	100-1043	1
R4	Resistor, 10 Ohm ±5%, 1/4W	100-1023	1
R5	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	1
R6	Resistor, 5.1 k Ohm ±5%, 1/4W	100-5143	1
R7	Resistor, 1 Meg Ohm ±5%, 1/4W	100-1073	1
R8	Resistor, 1 k Ohm ±5%, 1/4W	100-1043	1
R9	Resistor, 24 k Ohm ±5%, 1/4W	100-2453	1
R10	Resistor, 5.1 k Ohm ±5%, 1/4W	100-5143	1
R11	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	1
R12	Resistor, 56 Ohm ±5%, 1/4W	100-5623	1
R13	Resistor, 47 k Ohm ±5%, 1/4W	100-4753	1
R14	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	1
R15	Resistor, 750 Ohm ±1%, 1/4W	103-7503	1
R16	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	1
R17	Resistor, 100 k Ohm ±5%, 1/4W	100-1063	1
R18	Resistor, 1 Meg Ohm ±5%, 1/4W	100-1073	1

TABLE 4-3. SOURCE REMOTE CONTROL ASSEMBLY - 911-0035
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R19	Resistor, 2.2 Meg Ohm $\pm 5\%$, 1/4W	100-2273	1
R20,R21,R22	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	3
R23,R24	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	2
R25 THRU R28	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	4
R29	Resistor, 2 k Ohm $\pm 5\%$, 1/4W	100-2043	1
R30	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R31	Resistor, 2 k Ohm $\pm 5\%$, 1/4W	100-2043	1
R32	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R33	Resistor, 2 k Ohm $\pm 5\%$, 1/4W	100-2043	1
R34	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R35	Resistor, 2 k Ohm $\pm 5\%$, 1/4W	100-2043	1
R36	Resistor, 560 Ohm $\pm 5\%$, 1/4W	100-5633	1
R37	Resistor, 100 Ohm $\pm 5\%$, 1/4W	100-1033	1
R38,R39	Resistor, 1 Meg Ohm $\pm 5\%$, 1/4W	100-1073	2
R40	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
U1	Integrated Circuit, MC14013BCP, Dual D-Type Flip-Flop, CMOS, 14-Pin DIP	228-4013	1
U2	Integrated Circuit, MC14584, Hex Schmitt Trigger, CMOS, 14-Pin DIP	228-4584	1
U3	Integrated Circuit, ULN2004, 7 NPN Darlington Driver Pack, 16-Pin DIP	226-2004	1
U4	Integrated Circuit, MC14538B, Dual Retriggerable, Resettable Monostable Multivibrator, CMOS, 16-Pin DIP	228-4538	1
U5	Integrated Circuit, MC14093B, Quad 2-Input NAND Schmitt Trigger, CMOS, 14-Pin DIP	220-4093	1
U6 THRU U9	Integrated Circuit, 4N33, Optical Isolator, NPN Photo Transistor/Infared Emitting Diode Type, 1500V Isolation, Response: 30 kHz Maximum, Current: 50 mA Maximum, 6-Pin DIP	229-0033	4
U10	Integrated Circuit, MC14053B, Analog Multiplexers/Demulti- plexers, CMOS MSI, 16-Pin DIP	220-4053	1
U11	Integrated Circuit, CD4081BE, Quad 2-Input AND Gate, CMOS, 14-Pin DIP	225-0008	1
U12 THRU U15	Integrated Circuit, 4N33, Optical Isolator, NPN Photo Transistor/Infared Emitting Diode Type, 1500V Isolation, Response: 30 kHz Maximum, Current: 50 mA Maximum, 6-Pin DIP	229-0033	4
U16	Integrated Circuit, LT311, JFET-Input Differential Comparator, 8-Pin DIP	220-0311	1
XU1,XU2	Socket, 14-Pin DIP	417-1404	2
XU3,XU4	Socket, 16-Pin DIP	417-1604	2
XU5	Socket, 14-Pin DIP	417-1404	1
XU6 THRU XU9	Socket, 6-Pin DIP	417-0600	4
XU10	Socket, 16-Pin DIP	417-1604	1
XU11	Socket, 14-Pin DIP	417-1404	1
XU12 THRU XU15	Socket, 6-Pin DIP	417-0600	4
XU16	Socket, 8-Pin DIP	417-0804	1
—	Blank Source Remote Control Circuit Board	511-0020	1

MONOPHONIC OUTPUT MODULE

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2-1	Monophonic Output Module Adjustment Controls	2-2
2-2	Monophonic Output Module Troubleshooting	2-4

SECTION I

MONOPHONIC OUTPUT MODULE

THEORY OF OPERATION

1-1. INTRODUCTION.

- 1-2. The following text provides detailed theory of operation for the Mix-Trak 90 series audio console monophonic output module. A detailed block diagram of the monophonic output module is presented in Figure 1-1. Refer to Figure 1-1 as required for the following circuit discussion.

1-3. FUNCTIONAL DESCRIPTION.

1-4. INPUT CIRCUIT.

- 1-5. Unbalanced stereophonic program and audition audio from the cue speaker/headphone amplifier circuit board is applied to the monophonic output module for conversion to a monophonic format. Input selection is accomplished by interlocked two-position switch/indicator S1. The switch selects and routes either program or audition audio for application to a summing amplifier circuit and a phase inverting circuit. Right channel audio is routed to the summing amplifier circuitry. Left channel audio is routed to the phase inverting circuitry.

1-6. PHASE INVERTING CIRCUIT.

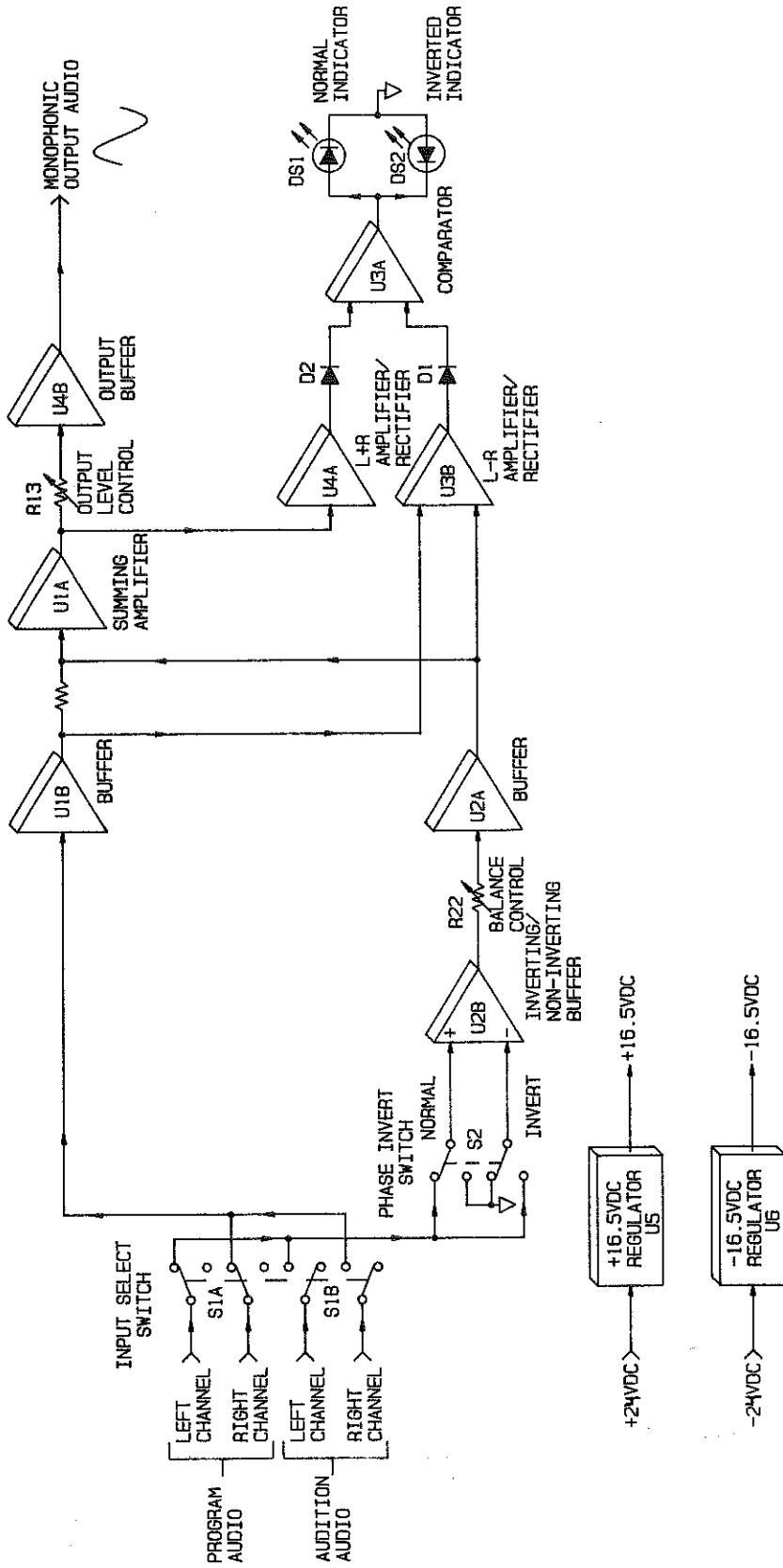
- 1-7. Audio from input select switch S1 is applied to phase inverting switch S2. S2 operates in association with integrated circuit U2B to function as an inverting/non-inverting amplifier stage. When switch S2 is operated to the normal position, left channel audio will be routed to the non-inverting input of U2B and the inverting input will be grounded. As a result, U2B will operate as a non-inverting buffer stage. When the switch is operated to the invert position, left channel audio will be routed to the inverting input of U2B and the non-inverting input will be grounded. As a result, U2B will operate as an inverting buffer stage. The output of U2B is routed through potentiometer R22 to buffer U2A. Potentiometer R22 is configured to provide left/right balance control. The output of buffer U2A is applied to a summing amplifier circuit and an indicator circuit.

1-8. SUMMING AMPLIFIER CIRCUIT.

- 1-9. Right channel audio from buffer U1B and left channel audio from U2A of the phase inverting circuit is summed at amplifier U1A. U1A is configured for a gain of approximately one. The output of U1A is applied through potentiometer R13 to output buffer U4B. The monophonic output of U4B is routed for application to a console monophonic output bus.

1-10. INDICATOR CIRCUIT.

- 1-11. The indicator circuit consists of: 1) L+R amplifier/rectifier network U4A, 2) L-R amplifier/rectifier network U3B, 3) comparator U3A, and 4) indicators DS1 and DS2. L+R audio from summing amplifier U1A is applied to an amplifier/rectifier network consisting of integrated circuit U4A and diode D2. The network is configured for a gain of approximately 19 dB. Left channel audio from buffer U2A and right channel audio from buffer U1B is applied to an L-R amplifier/rectifier network consisting of integrated circuit U3B and diode D1. The network is configured for a gain of approximately 15 dB.



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FIGURE 1-1. MONOPHONIC OUTPUT MODULE DETAILED BLOCK DIAGRAM

- 1-12. The outputs from the L+R and L-R amplifier/rectifier networks are applied to comparator U3A and indicators DS1 and DS2. During in-phase audio conditions, the L-R audio will be a minimum of 6 dB below the L+R audio. The output of comparator U3A will be HIGH to illuminate normal indicator DS1. During out-of-phase audio conditions, the L-R audio will be greater than 6 dB below the L+R audio. The output of comparator U3A will go LOW to illuminate inverted indicator DS2.
- 1-13. **POWER SUPPLY CIRCUIT.**
- 1-14. DC operating potentials for application to the monophonic output module components are generated by a regulator network. Unregulated $\pm 24V$ dc supplies from the console power supply module are applied to +16.5 volt dc regulator U5 and -16.5 volt dc regulator U6. U5/U6 are three terminal adjustable regulators containing internal thermal and short-circuit current limiting features. The regulated ± 16.5 volt outputs from U5 and U6 are routed for application to the circuit board audio components.

SECTION II

MONOPHONIC OUTPUT MODULE MAINTENANCE

2-1. INTRODUCTION.

2-2. This section provides general maintenance information, electrical adjustment procedures, and troubleshooting information for the monophonic output module.

2-3. FIRST LEVEL MAINTENANCE.

2-4. First level maintenance consists of precautionary procedures applied to the equipment to prevent future failures. The procedures are performed on a regular basis and the results recorded in a performance log.

2-5. The monophonic output module should be periodically cleaned of accumulated dust using a nylon-bristle brush and vacuum cleaner. Inspect the module for improperly seated semi-conductors and components damaged by overheating.

2-6. SECOND LEVEL MAINTENANCE.

2-7. Second level maintenance consists of procedures required to restore a monophonic output module to operation after a fault has occurred. The procedures are divided into electrical adjustments, troubleshooting, and component replacement procedures.

2-8. ELECTRICAL ADJUSTMENTS.

2-9. **OUTPUT LEVEL ADJUSTMENT.** Potentiometer R13 adjusts the monophonic output module output level. The output level control is adjusted as follows.

2-10. **Required Equipment.** The following test equipment is required to adjust the monophonic module output level.

- A. Allen Wrench (supplied with the console).
- B. Non-Metallic Adjustment Tool.
- C. Audio Signal Generator (Potomac AG-51 or equivalent).
- D. VU Meter.

2-11. **Procedure.** To adjust the monophonic output module output level, proceed as follows:

2-12. Ensure the output amplifier module and meter assembly assigned to the monophonic output is calibrated for the desired output level. If output amplifier module calibration is required, refer to the OUTPUT AMPLIFIER MODULE section in this manual.

2-13. Remove the monophonic output module and a line input module from the console main-frame.

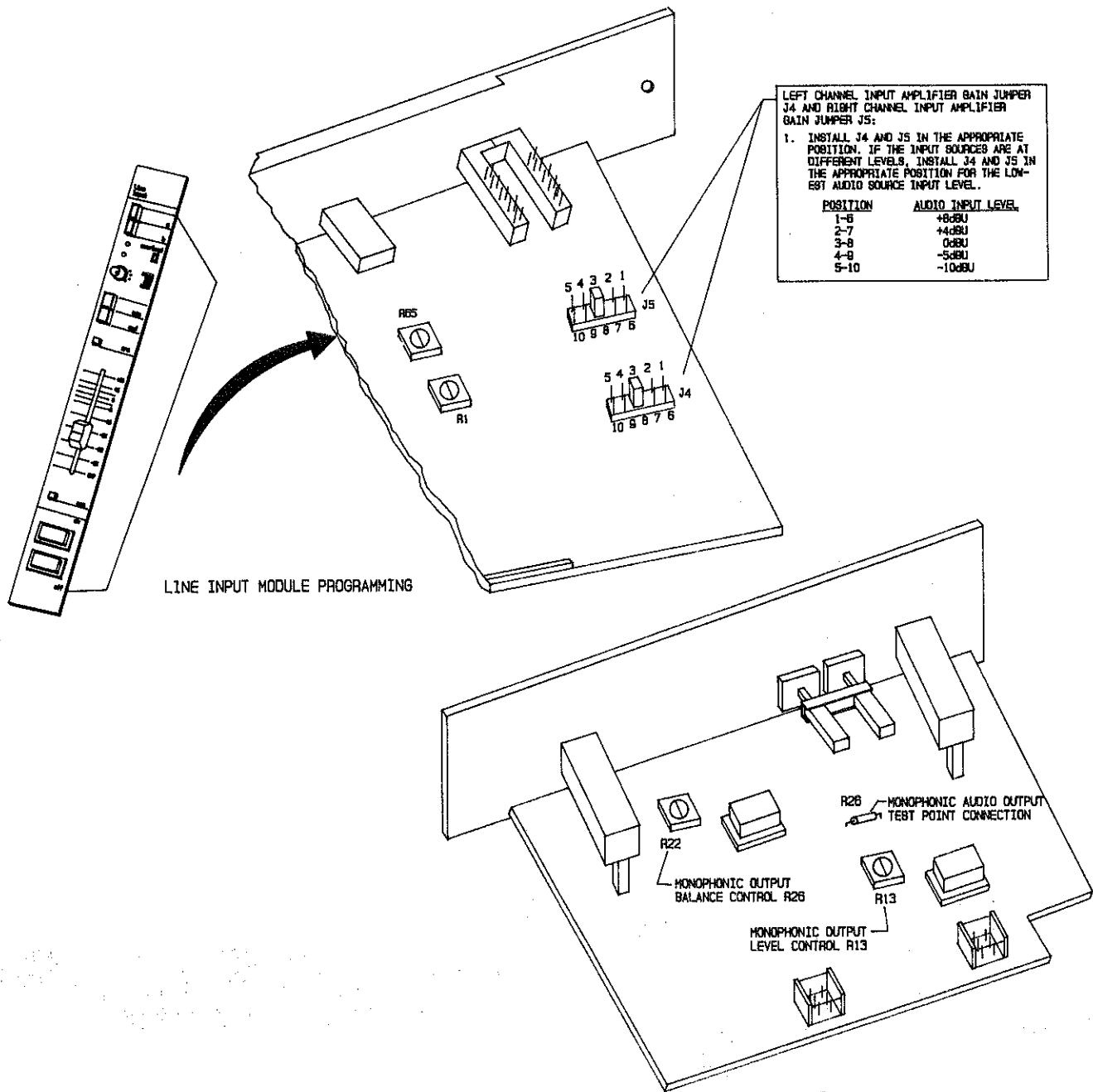
2-14. Connect the audio signal generator to the A or B left and right channel inputs on a line input module input/remote connector.

2-15. Refer to Figure 2-1 and install line input module jumpers J4 and J5 in the 0 dBu position. Replace the line input module.

2-16. Adjust the audio generator for a 1 kHz output at 0 dBu.

2-17. Operate the line input module fader to the 0 position and route the test audio to the audition output bus.

- 2-18. Depress the monophonic output module **AUD** switch/indicator to illuminate the switch/indicator.
- 2-19. Refer to Figure 2-1 and adjust monophonic output level control R13 until the monophonic output meter indicates 0 VU.



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FIGURE 2-1. MONOPHONIC OUTPUT MODULE ADJUSTMENT CONTROLS

- 2-20. Disconnect all test equipment, reprogram jumpers J4 and J5 on the line input module if required, and replace the line input module and the monophonic output module.
- 2-21. **BALANCE ADJUSTMENT.** Potentiometer R22 adjusts the balance of the monophonic signal left and right channels. Adjustment of the control is not required unless replacement components are installed in the circuit. The monophonic module balance is adjusted as follows.
- 2-22. **Required Equipment.** The following test equipment is required to adjust the monophonic module balance.
- A. Allen Wrench (supplied with the console).
 - B. Non-Metallic Adjustment Tool.
 - C. Audio Signal Generator (Potomac AG-51 or equivalent).
 - D. Calibrated Oscilloscope.
- 2-23. **Procedure.** To adjust the monophonic output module balance, proceed as follows:
- 2-24. Remove the monophonic output module and a line input module from the console main-frame.
- 2-25. Connect the audio signal generator to the A or B left and right channel inputs on a line input module input/remote connector.
- 2-26. Refer to Figure 2-1 and install line input module jumpers J4 and J5 in the 0 dBu position. Replace the line input module.
- 2-27. Refer to Figure 2-1 and connect the oscilloscope to resistor R26 as shown.
- 2-28. Adjust the audio generator for a 1 kHz output at 0 dBu.
- 2-29. Operate the line input module and route the test audio to the audition output bus.
- 2-30. Depress the monophonic output module **AUD** switch/indicator to illuminate the switch/indicator and depress the **PHASE INVERT** switch to illuminate the switch/indicator.
- 2-31. Refer to Figure 2-1 and adjust monophonic output balance control R22 to null the audio signal presentation on the oscilloscope.
- 2-32. Disconnect all test equipment, reprogram jumpers J4 and J5 on the line input module if required, and replace the line input module and the monophonic output module.
- 2-33. **TROUBLESHOOTING.**
- 2-34. The troubleshooting philosophy for the monophonic output module consists of isolating a problem to a specific circuit or group of components. Figure 2-2 presents the monophonic output module troubleshooting information. Refer to Figure 2-2 to isolate a failure to a specific group of components.
- 2-35. Once trouble is isolated and power is totally deenergized, refer to the schematic diagrams and the theory of operation to assist in problem resolution. The defective component may be repaired locally or the entire module may be returned to Broadcast Electronics for repair or replacement.
- 2-36. **COMPONENT REPLACEMENT.**
- 2-37. Component replacement procedures for the console modular assemblies are presented in SECTION II, MAINTENANCE. Refer to SECTION II as required for the replacement procedures.

MONOPHONIC OUTPUT MODULE TROUBLESHOOTING

SYMPTOM	SOLUTION
NO AUDIO OUTPUT	<ol style="list-style-type: none"> 1. CHECK REGULATORS U5 AND U6. 2. CHECK INTEGRATED CIRCUITS U1 AND U4. 3. CHECK SWITCH S1.
NO PHASE INVERT OPERATION	<ol style="list-style-type: none"> 1. CHECK SWITCH S2 AND INTEGRATED CIRCUIT U2.
NO PHASE INDICATIONS	<ol style="list-style-type: none"> 1. CHECK INTEGRATED CIRCUITS U3 AND U4. 2. CHECK INDICATORS DS1 AND DS2.

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FIGURE 2-2. MONOPHONIC OUTPUT MODULE TROUBLESHOOTING

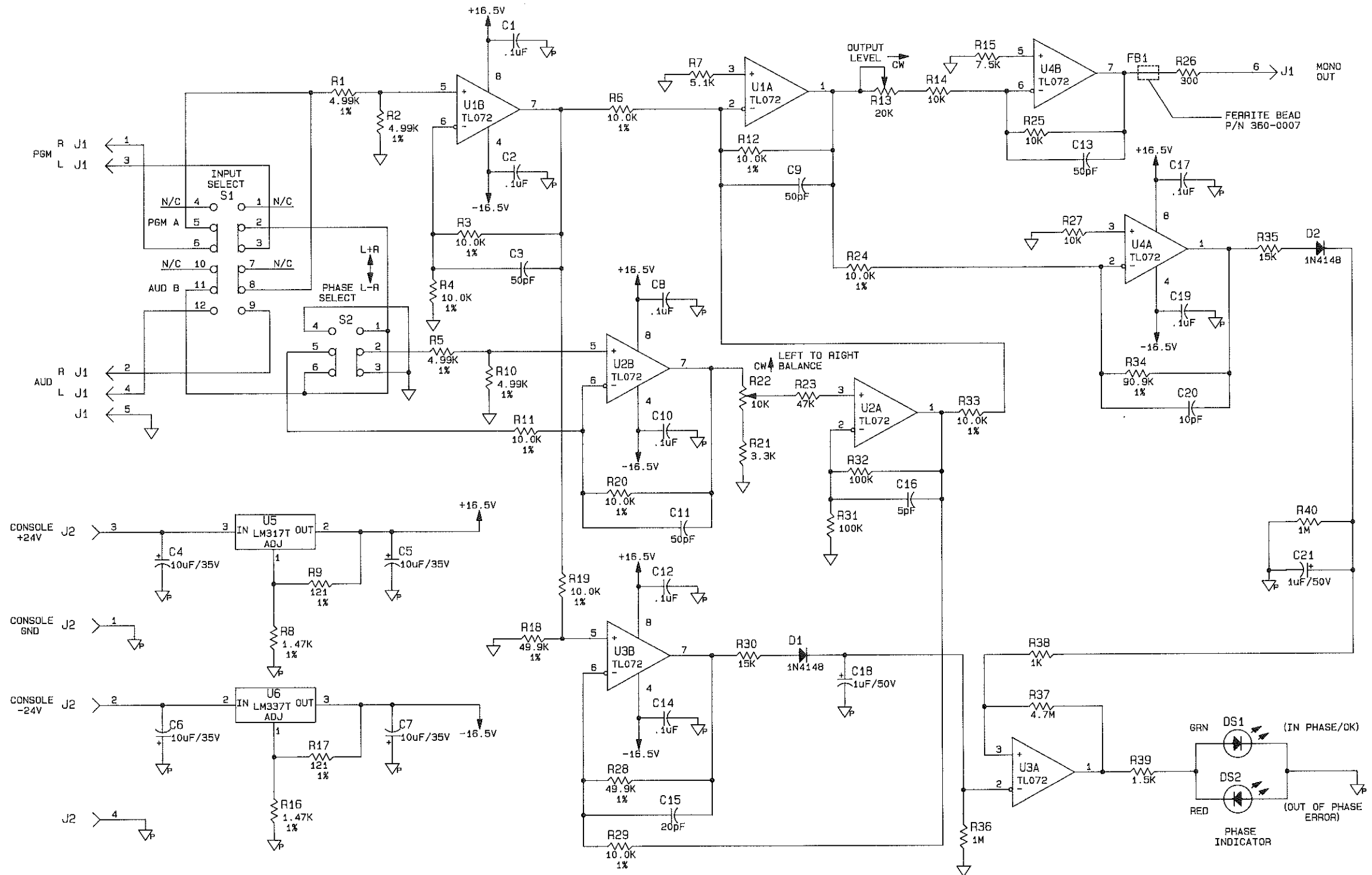
SECTION III

MONOPHONIC OUTPUT MODULE DRAWINGS

3-1. INTRODUCTION.

3-2. This section provides assembly drawings and schematic diagrams as listed below for the monophonic output module.

FIGURE	TITLE	NUMBER
3-1	SCHEMATIC DIAGRAM, MONOPHONIC OUTPUT MODULE	SC951-0024
3-2	ASSEMBLY DIAGRAM, MONOPHONIC OUTPUT MODULE	AC951-0024



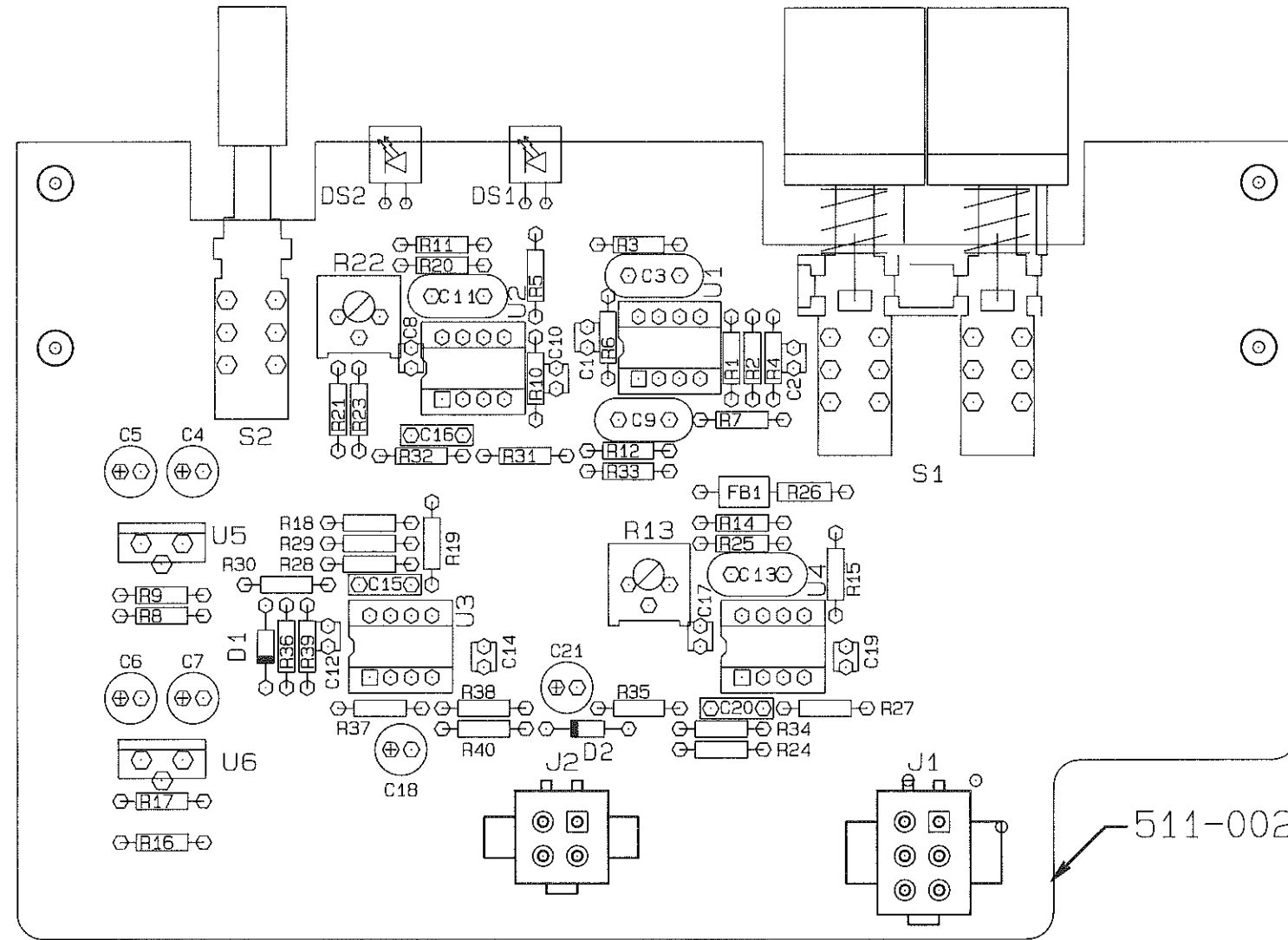
- NOTES:
1. RESISTORS ARE IN OHMS, 1/4W, UNLESS OTHERWISE SPECIFIED.
 2. COMPONENTS LAST USED: U6, R40, C21, D2, S2, J2, P5, & DS2.
 3. ∇_P = POWER SUPPLY GND
 ∇_A = AUDIO GND

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	CHK MA 8-22-88	FINISH		TITLE MONO OUTPUT SWITCHER
	PROJ. ENGR.	SEE DWG RAS92-0000	TYPE S	SIZE C
	DATE 11/12/88	NEXT ASSY. 901-5012 (12CH) 901-5018 (18CH)	DWG. NO. 951-0024	REV A
TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°	MODEL MT-90	SCALE NONE	SHEET 1 OF 1	

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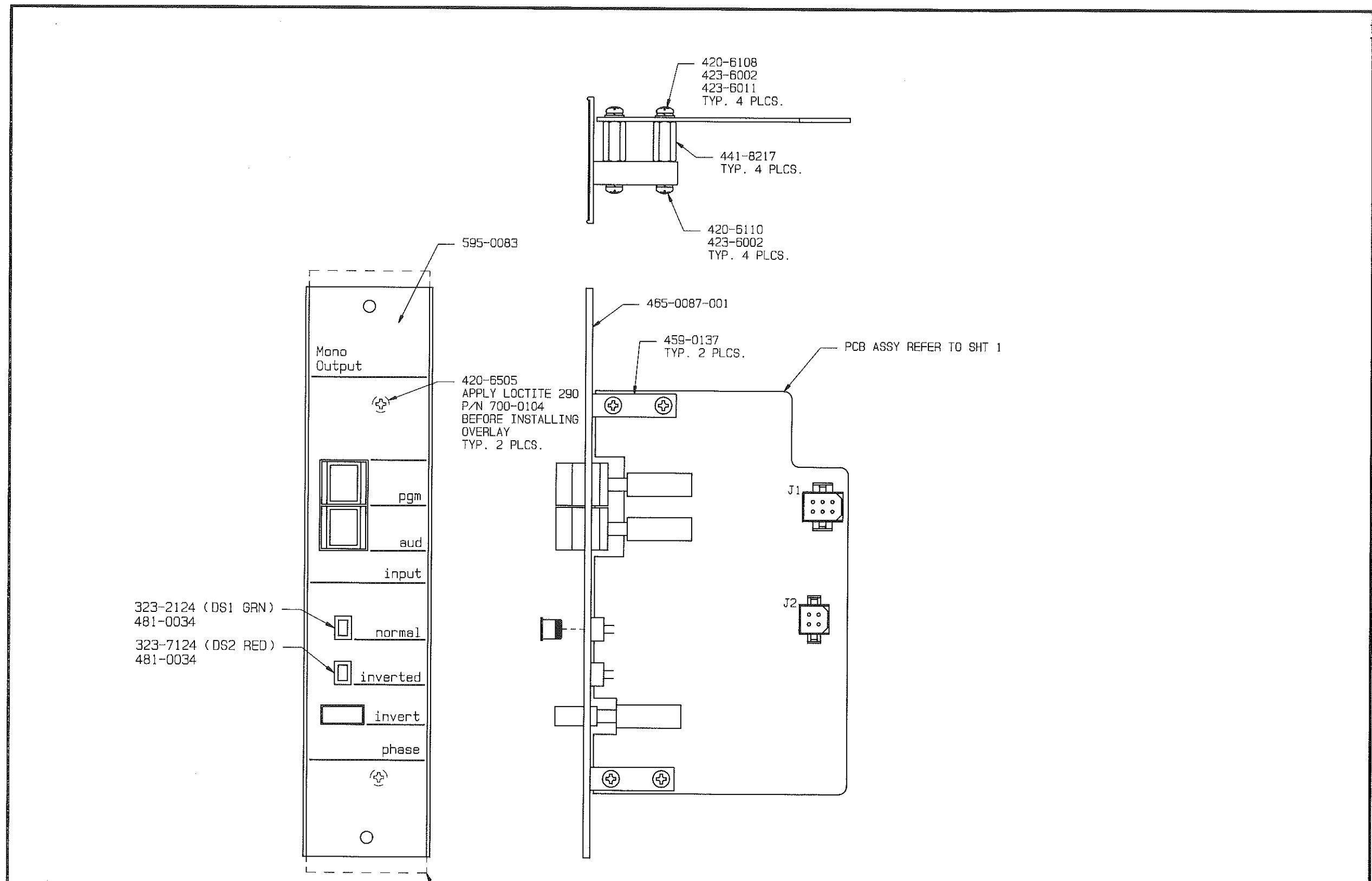
PCB ASSEMBLY

NOTE:

1. REFER TO SHEET 2 FOR MODULE ASSEMBLY.
2. SEE SCHEMATIC SC951-0024

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	CHKD MA 8-22-88	951-0024			
	ME DHW 8/22/88	FINISH	TITLE MONO OUTPUT MODULE		
	PROJ. ENGR.		TYPE A	SIZE C	DWG. NO. 951-0024
TOLERANCE DECIMAL U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°	MFG.	NEXT ASSY 901-9012 "12CH" 901-9018 "18CH"	MODEL MT90	SCALE 2/1	SHEET 1 OF 2



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	<small>CHKD</small>	<small>FINISH</small>			
	<small>ME</small> SJA 8/22/88	<small>PROT. ENGR.</small> MAG	<small>SEE DWG PAS52-0000</small>	<small>TITLE</small> MONO OUTPUT MODULE	
	<small>HEB</small> MAG 9-22-88	<small>NEXT ASSY.</small> 901-9012 (12CH) 901-9018 (18CH)	<small>TYPE</small> A	<small>SIZE</small> C	<small>DWG. NO.</small> 951-0024
<small>TOLERANCE (DECIMAL) U.O.S.</small> .x ± .030 .xx ± .015	<small>.xxx ± .005</small> <small>ANGLES ± 1°</small>	<small>MODEL</small> MIX TRAK 90	<small>SCALE</small> 1/1	<small>SHEET</small> 2 OF 2	

SECTION IV

MONOPHONIC OUTPUT MODULE PARTS LIST

4-1. INTRODUCTION.

4-2. This section provides descriptions and part numbers of electrical components and assemblies required for maintenance of the monophonic output module. Each table entry in this section is indexed by the reference designators appearing on the applicable schematic diagram.

TABLE 4-1. MONOPHONIC OUTPUT MODULE PARTS LIST INDEX

TABLE	TITLE	PART NO.	PAGE
4-2	MONOPHONIC OUTPUT MODULE ASSEMBLY	951-0024	4-1
4-3	MONOPHONIC OUTPUT MODULE CABLE ASSEMBLY	941-0043/ -0044/ -0045	4-2

**TABLE 4-2. MONOPHONIC OUTPUT MODULE ASSEMBLY - 951-0024
(Sheet 1 of 2)**

REF. DES.	DESCRIPTION	PART NO.	QTY.
C3	Capacitor, Mica, 50 pF $\pm 5\%$, 500V	040-5013	1
C4 THRU C7	Capacitor, Electrolytic, 10 uF, 35V	023-1076	4
C8	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C9	Capacitor, Mica, 50 pF $\pm 5\%$, 500V	040-5013	1
C10	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C11	Capacitor, Mica, 50 pF $\pm 5\%$, 500V	040-5013	1
C12	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C13	Capacitor, Mica, 50 pF $\pm 5\%$, 500V	040-5013	1
C14	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C15	Capacitor, Ceramic Disc, 20 pF $\pm 10\%$, 1kV	002-2013	1
C16	Capacitor, Ceramic Disc, 5 pF $\pm 5\%$, 500V, Non-Polarized	001-5004	1
C17	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C18	Capacitor, Electrolytic, 1 uF, 50V	024-1064	1
C19	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C20	Capacitor, Ceramic Disc, 10 pF $\pm 10\%$, 1 kV, Non-Polarized	001-1014	1
C21	Capacitor, Electrolytic, 1 uF, 50V	024-1064	1
D1,D2	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	2
DS1	Indicator, LED, Green, CMD54124A, 3V @ 20 mA Maximum (NORMAL Indicator)	323-2124	1
DS2	Indicator, LED, Red, CMD57124A, 3V @ 20 mA Maximum (INVERTED Indicator)	323-7124	1
FB1	Ferrite Bead	360-0007	1
J1	Receptacle, 6-Pin	417-0677	1
J2	Socket, 4-Pin	418-0255	1
R1,R2	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	2

TABLE 4-2. MONOPHONIC OUTPUT MODULE ASSEMBLY - 951-0024
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R3,R4	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	2
R5	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	1
R6	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R7	Resistor, 5.1 k Ohm $\pm 5\%$, 1/4W	100-5143	1
R8	Resistor, 1.47 k Ohm $\pm 1\%$, 1/4W	103-1474	1
R9	Resistor, 121 Ohm $\pm 1\%$, 1/4W	100-1231	1
R10	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	1
R11,R12	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	2
R13	Potentiometer, 20 k Ohm $\pm 10\%$, 1/2W	177-2054	1
R14	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R15	Resistor, 7.5 k Ohm $\pm 5\%$, 1/4W	100-7543	1
R16	Resistor, 1.47 k Ohm $\pm 1\%$, 1/4W	103-1474	1
R17	Resistor, 121 Ohm $\pm 1\%$, 1/4W	100-1231	1
R18	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R19,R20	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	2
R21	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R22	Potentiometer, 10 k Ohm $\pm 10\%$, 1/2W	177-1054	1
R23	Resistor, 47 k Ohm $\pm 5\%$, 1/4W	100-4753	1
R24	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R25	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R26	Resistor, 300 Ohm $\pm 5\%$, 1/4W	100-3033	1
R27	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R28	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R29	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R30	Resistor, 15 k Ohm $\pm 5\%$, 1/4W	100-1553	1
R31,R32	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	2
R33	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R34	Resistor, 90.9 k Ohm $\pm 1\%$, 1/4W	103-9095	1
R35	Resistor, 15 k Ohm $\pm 5\%$, 1/4W	100-1553	1
R36	Resistor, 1 Meg Ohm $\pm 5\%$, 1/4W	100-1073	1
R37	Resistor, 4.7 Meg Ohm $\pm 5\%$, 1/4W	100-4773	1
R38	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R39	Resistor, 1.5 k Ohm $\pm 5\%$, 1/4W	100-1543	1
R40	Resistor, 1 Meg Ohm $\pm 5\%$, 1/4W	100-1073	1
S1	Switch, 2 Sections, DPDT, Pushbutton, White/Blue Indications (AUD/PRO SELECT Switch)	340-0109	1
S2	Switch, 1 Section, DPDT, Pushbutton, White/Green Indications (PHASE INVERT Switch)	340-0102	1
U1 THRU U4	Integrated Circuit, TLO72CP, Dual JFET-Input Operational Amplifier, 8-Pin DIP	221-0072	4
U5	Integrated Circuit, LM317T, Adjustable Positive Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0317	1
U6	Integrated Circuit, LM337T, Adjustable Negative Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0337	1
XU1 THRU XU4	Socket, 8-Pin DIP	417-0804	4
—	Grommet, MP65, Rectangular (for DS1, DS2)	481-0034	2
—	Blank Mono Output Module Circuit Board	511-0024	1

TABLE 4-3. MONOPHONIC OUTPUT MODULE CABLE ASSEMBLY - 941-0043/-0044/-0045

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	Pins, Connector	417-0053	19
—	Plug, Housing, 4-Pin	418-0240	1
—	Connector Housing, 6-Pin	418-0670	2
—	Plug, Connector Housing, 12-Pin	418-1271	1

**CLOCK/TIMER MODULE
TIMER CONTROL MODULE
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SECTION I

CLOCK/TIMER MODULE

TIMER CONTROL MODULE

THEORY OF OPERATION

1-1. INTRODUCTION.

1-2. The following text provides detailed theory of operation for the Mix-Trak 90 series audio console clock/timer and timer control modules. A detailed block diagram of the clock/timer module and the timer control module is presented in Figure 1-1. Refer to Figure 1-1 as required for the following circuit discussion.

1-3. CLOCK/TIMER MODULE FUNCTIONAL DESCRIPTION.

1-4. GENERAL.

1-5. Console clock and timer information is presented to the console operator by the clock/timer module. The module consists of an Intel 80C31 microprocessor, a precision clock circuit, and an LED display circuit. The circuitry is designed to function as a precision clock and as an elapsed timer. Clock information is presented on a 6-digit LED display. Timer information is presented on a 5-digit LED display. The clock section of the module is equipped with an interface circuit which allows the clock to be synchronized to network audio or a logic signal to eliminate drift. The timer section of the module can be configured for automatic or manual operation.

1-6. CLOCK/TIMER FUNCTION CIRCUIT.

1-7. The module clock and timer functions are created by a circuit consisting of microprocessor U1, EPROM U4, address latch U3, and clock integrated circuit U5. The circuit is designed to generate and display clock and timer information.

1-8. U1 is an Intel 80C31 microprocessor containing built-in random-access-memory (RAM) and a universal-asynchronous-receiver-transmitter (UART). U1 is responsible for all data processing operations. A clock reference for U1 is provided by oscillator Y1. U4 is an erasable-programmable-read-only-memory (EPROM) integrated circuit. The EPROM provides a permanent location for the clock/timer module program code. The code directs the operation of all microprocessor functions. Integrated circuit U3 is a latch for the addressing of EPROM U4. U5 is a clock integrated circuit. The clock circuit will output hour/minute/second information for application to microprocessor U1. A clock reference for U5 is provided by oscillator Y2. The oscillator circuit is equipped with frequency calibration capacitor C9.

1-9. **READ OPERATION.** When microprocessor U1 is required to read information, the microprocessor will select a memory location or peripheral integrated circuit by presenting the appropriate address on the data bus. If U1 is addressing EPROM U4, the address will be output using: 1) address bus A8-A12 and 2) address latch U3. The device containing the address location is selected by control lines. A microprocessor PSEN control line will go LOW to select U4. A microprocessor RD line will go LOW to select clock integrated circuit U5 or peripheral interface U9. The device will respond by presenting the requested information on the data bus.

1-10. **WRITE OPERATION.** When microprocessor U1 is required to write information, U1 will select clock integrated circuit U5 or peripheral interface U9 by presenting the appropriate address on the data bus. The microprocessor WR control line will go LOW to select the device. The device will respond by accessing the information from the data bus.

1-11. **CLOCK OPERATION.**

1-12.. The clock/timer module clock is generated by microprocessor U1 and the clock/timer module program code. Clock integrated circuit U5 and three clock control circuits provide programming data for clock operation. During initial power-on or a reset operation, U1 will read data from clock circuit U5. The information from U5 programs the microprocessor clock for the correct hour/minute/second. The microprocessor clock is synchronized to clock integrated circuit U5 by one second interrupt pulse INT0. Once the clock information is determined, U1 will write the information to the data display circuit. Information from the clock control circuitry is processed in an identical manner.

1-13. **CLOCK CONTROL.** Clock operation is directed by a 12/24 hour format circuit, a synchronization circuit, and a clock set circuit. 12/24 hour format and clock set information is interfaced to microprocessor U1 via peripheral interface integrated circuit U9. Synchronization circuit information is routed to the INT1 port of U1. The following text presents information on the clock control circuitry.

1-14. **12/24 Hour Format.** Jumper P7 programs the clock to display information in a 12 or 24 hour time format. A LOW configures the clock for a 24 hour time format. A HIGH configures the clock for a 12 hour format. The information is routed to port C of peripheral interface U9. Microprocessor U1 will read the information from U9 to establish the clock format.

1-15. **Synchronization Circuit.** The clock synchronization circuit consists of a differential amplifier/rectifier stage and a comparator network. The circuit allows the clock to be synchronized to network audio or a logic signal to eliminate drift. Clock synchronization is initiated when audio at a level of -30 dBm or a logic signal is applied to a differential amplifier/rectifier stage consisting of integrated circuit U6A and diode D2. The synchronization signal must be present within ± 2 seconds from the beginning of the hour to initiate circuit operation. Jumper P11 configures the circuit for an audio or logic synchronization signal.

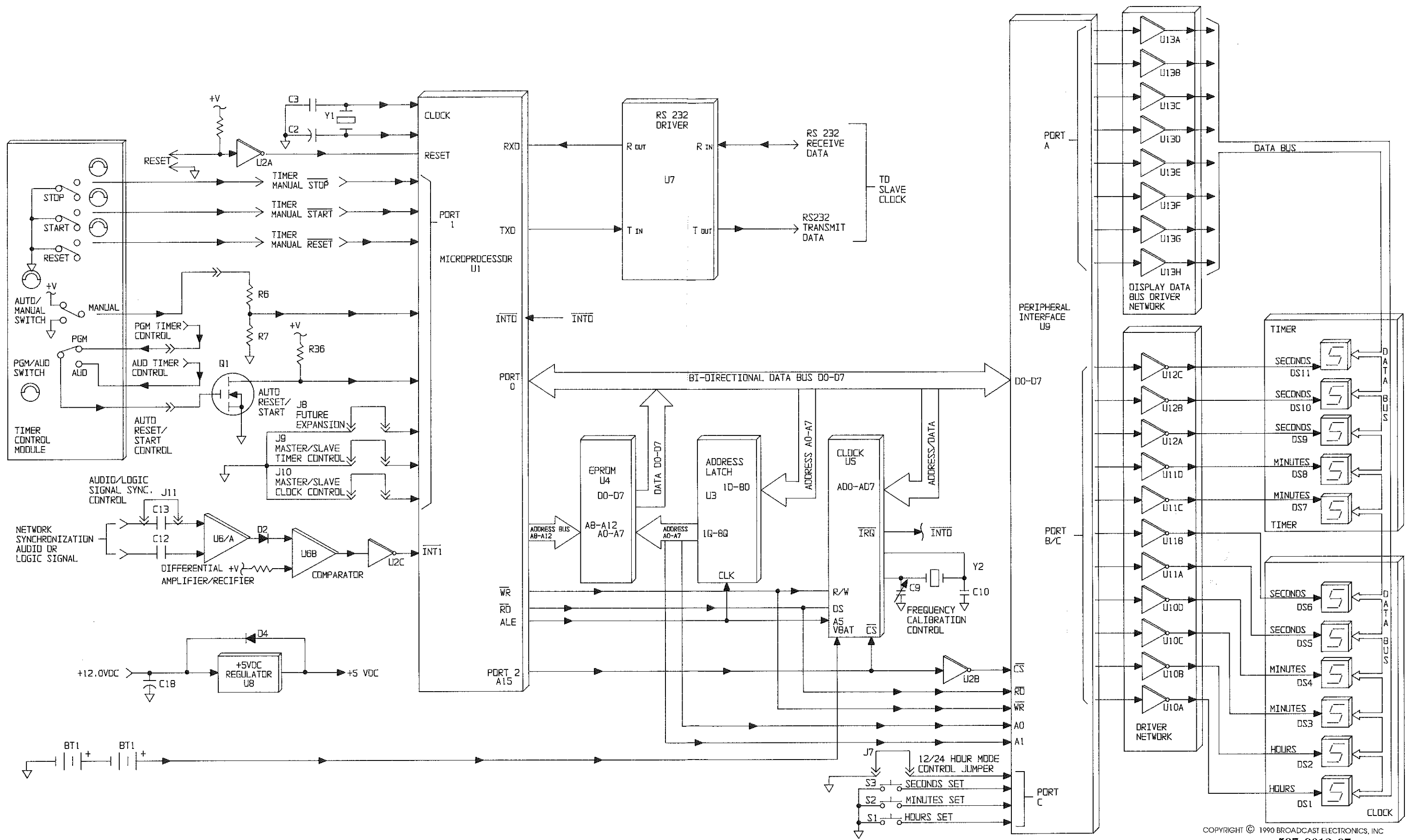
1-16. When a synchronization signal is applied, amplifier/rectifier stage U6A/D2 will output a dc level to comparator U6B. As the audio or logic signal increases above the comparator reference voltage, the output of U6B will go HIGH. The HIGH is inverted by U2C and applied to U1 at interrupt INT1. U1 responds by: 1) incrementing the clock 0.1 seconds if the synchronization signal is received before the hour or 2) decrementing the clock 0.1 seconds if the synchronization signal is received after the hour.

1-17. **Clock Set Circuit.** The clock set circuit consists of hour set switch S1, minutes set switch S2, and seconds set switch S3. The clock hour is set when switch S1 is depressed. A LOW is routed to port C of peripheral interface U9. Microprocessor U1 will read the information from U9 to set the clock. Minutes set switch S2 and seconds set switch S3 operate in an identical manner.

1-18. **TIMER CIRCUIT.**

1-19. The timer section consists of two individual timers: 1) an automatic timer and 2) a manual timer. The timer is created by microprocessor U1 and the clock/timer module program code. Five control lines direct the operation of the timer. The control lines are interfaced to microprocessor U1 at port 1.

1-20.. Automatic or manual timer operation is selected by the auto/manual switch on the timer control module. A HIGH command configures the timer for manual operation. A LOW command configures the timer for automatic operation. When the automatic timer is selected, the timer is controlled by the timer control module audition/program switch. When an input module is operated to on, a program or audition timer reset/start signal is routed to the AUD/PGM switch. The switch selects and routes the signal to the timer for reset/start operations.



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FIGURE 1-1,
CLOCK/TIMER MODULE AND TIMER CONTROL
MODULE DETAILED BLOCK DIAGRAM

- 1-21. When the manual timer is selected, LOW commands from the timer reset circuit board stop, start, and reset switches are routed to U1 to control the manual timer as desired. The timer may be configured to display time information generated by the automatic timer or manual timer. When timer information is to be displayed, the information will be routed to the data display circuit.
- 1-22. **DATA DISPLAY CIRCUIT.**
- 1-23. Clock and timer information from microprocessor U1 is displayed on seven-segment LED digits. Clock information is presented on a six-digit red display consisting of digits DS1 through DS6. Timer information is presented on a five-digit green display consisting of digits DS7 through DS11.
- 1-24. The data from microprocessor U1 is interfaced to the LED digits by: 1) peripheral interface integrated circuit U9, 2) display data bus driver network U13, and digit driver network U10/U11/U12. When microprocessor U1 is required to display information on the clock seconds display, the microprocessor will address peripheral interface circuit U9. U1 will output an eight-bit code to disable all display digit segments. Next, U1 will output an eight-bit digit code through U9 and digit driver network U10/U11/U12 to enable DS6. Next, U1 will output an eight-bit code through U9 and display data driver network U13 to enable the required segments of DS6. The remaining clock display digits and the timer display digits operate in an identical manner.
- 1-25. **MASTER/SLAVE CLOCK OPERATION.**
- 1-26. The clock/timer module can be connected to additional clock/timer modules for master/slave operation. Jumpers P9 and P10 configure the module for master/slave operation. On master clocks, jumpers P9 and P10 must be removed. On slave clocks: 1) jumper P10 is installed when only clock operation is desired or 2) jumpers P9 and P10 are installed when clock and timer operation is desired.
- 1-27. Master/slave clock interfacing is performed by an RS232 network. RS232 driver U7 provides the data transfer interfacing required for master/slave operation. Master/slave operation is accomplished: 1) by connecting the master clock module transmit control line to the slave clock/timer module receive control line and 2) programming jumpers P9 and P10 for the desired operation.
- 1-28. **RESET CIRCUIT.**
- 1-29. The clock/timer module is equipped with a reset circuit. The reset circuit consists of two reset terminals and inverter U2A. When the microprocessor module is to be reset, the reset terminals are momentarily shorted to apply a LOW to inverter U2A. The output of U2A will go HIGH to reset microprocessor U1.
- 1-30. **POWER SUPPLY.**
- 1-31. DC operating potentials for application to clock/timer module components are produced by a regulator network. An unregulated +12V supply is applied to +5V dc regulator U8. U8 is a three terminal adjustable regulator containing internal thermal and short-circuit current limiting features. Diode D4 protects the regulator from a short circuit potential applied to the input. The regulated output from U8 is applied to the circuit board components.
- 1-32. The power supply circuit also contains a battery back-up system. Battery BT1 will output a +3V supply to maintain clock integrated circuit U5 during a power failure. The battery system will maintain clock operation for several months.

1-33. **TIMER CONTROL MODULE FUNCTIONAL DESCRIPTION.**

1-34. **GENERAL.**

1-35. The timer section of the clock/timer module can be controlled by the timer control module. The module consists of five switch/indicators which control timer functions such as: 1) automatic timer and manual timer selection, 2) automatic timer program/audition control, and 3) manual timer start, stop, and reset control.

1-36. **TIMER CONTROL CIRCUITRY.**

1-37. The timer control module configures the timer section of the clock/timer module for either automatic timer or manual timer display via the manual/auto switch. The auto/manual switch routes control signals through the auto/manual control line for application to micro-processor U1. A HIGH is routed to U1 to configure the timer for manual timer displays. A LOW is routed to U1 to configure the timer for automatic timer displays.

1-38. When the timer is configured for automatic timer displays, timer reset operations will be controlled by the program/audition switch/indicator. The timer is reset by pulses from the program and audition timer control busses. The pulses are routed to the program/audition switch. The switch selects either the program or audition signals and routes the signal through the auto reset/start control line to U1 to reset the timer.

1-39. When the timer is configured for manual timer displays, three switch/indicators provide stop, start, and reset control functions. A manual timer stop command is generated when the stop switch/indicator is depressed. A LOW is routed through the manual stop control line to U1 to stop the manual timer. The manual timer start and reset switch/indicators operate in an identical manner.

SECTION II

CLOCK/TIMER MODULE

TIMER CONTROL MODULE MAINTENANCE

2-1. INTRODUCTION.

2-2. This section provides general maintenance information, electrical adjustment procedures, and troubleshooting information for the clock/timer module and the timer control module.

2-3. FIRST LEVEL MAINTENANCE.

2-4. First level maintenance consists of precautionary procedures applied to the equipment to prevent future failures. The procedures are performed on a regular basis and the results recorded in a performance log.

2-5. The clock/timer and timer control modules should be periodically cleaned of accumulated dust using a nylon-bristle brush and vacuum cleaner. Inspect the module for improperly seated semiconductors and components damaged by overheating.

2-6. SECOND LEVEL MAINTENANCE.

2-7. Second level maintenance consists of procedures required to restore a clock/timer module or a timer control module to operation after a fault has occurred. The procedures are divided into troubleshooting and component replacement procedures.

2-8. The troubleshooting philosophy for the clock/timer and timer control modules consists of isolating a problem to a specific circuit or group of components. Figure 2-1 presents the clock/timer troubleshooting information. Refer to Figure 2-1 to isolate a failure to a specific group of components.

2-9. Once trouble is isolated and power is totally deenergized, refer to the schematic diagrams and the theory of operation to assist in problem resolution. The defective component may be repaired locally or the entire module may be returned to Broadcast Electronics for repair or replacement.

2-10. COMPONENT REPLACEMENT.

2-11. Component replacement procedures for the console modular assemblies are presented in SECTION II, MAINTENANCE. Refer to SECTION II as required for the replacement procedures.

CLOCK/TIMER MODULE TROUBLESHOOTING	
SYMPTOM	SOLUTION
NO CLOCK/ TIMER OPERATIONS	<ol style="list-style-type: none"> 1. CHECK REGULATOR U8. 2. CHECK INTEGRATED CIRCUITS U1 AND U4.
MISSING CLOCK DIGIT	<ol style="list-style-type: none"> 1. CHECK INTEGRATED CIRCUITS U10 THROUGH U12. 2. CHECK SEVEN-SEGMENT LEDS DS1 THROUGH DS6.
MISSING TIMER DIGIT	<ol style="list-style-type: none"> 1. CHECK INTEGRATED CIRCUIT U13. 2. CHECK SEVEN-SEGMENT LEDS DS7 THROUGH DS11.
NO CLOCK SYNCHRONIZATION	<ol style="list-style-type: none"> 1. CHECK INTEGRATED CIRCUITS U6 AND U2. 2. CHECK THE SYNCHRONIZATION AUDIO TO THE CLOCK/TIMER MODULE.
NO MANUAL TIMER CONTROL OPERATIONS	<ol style="list-style-type: none"> 1. CHECK THE TIMER CONTROL MODULE. 2. CHECK THE CABLE BETWEEN THE TIMER CONTROL MODULE AND THE CLOCK/TIMER MODULE.

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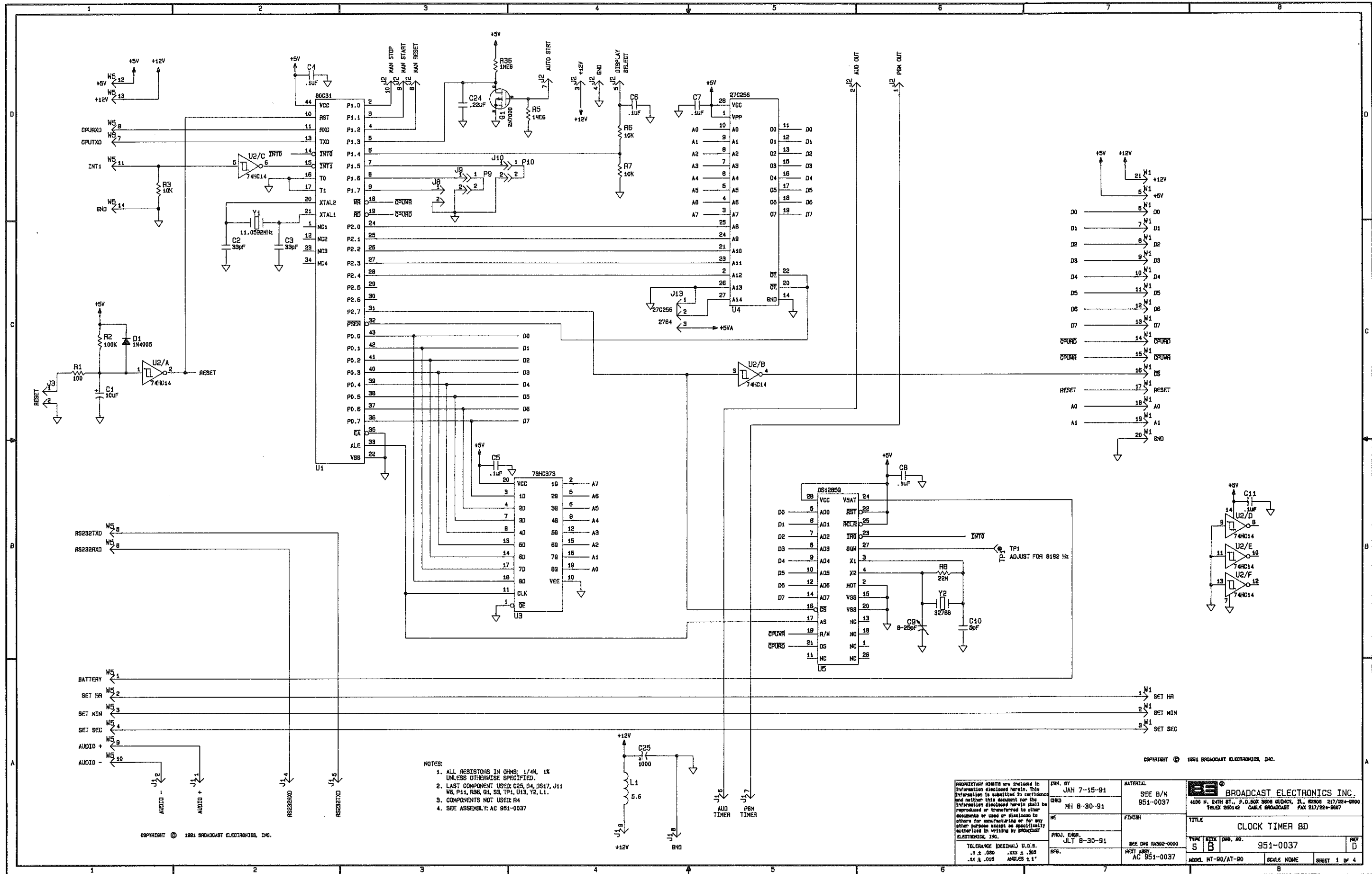
FIGURE 2-1. CLOCK/TIMER MODULE TROUBLESHOOTING

SECTION III CLOCK/TIMER MODULE TIMER CONTROL MODULE DRAWINGS

3-1. INTRODUCTION.

3-2. This section provides assembly drawings and schematic diagrams as listed below for the clock/timer module and the timer control module.

FIGURE	TITLE	NUMBER
3-1	SCHEMATIC DIAGRAM, CLOCK/TIMER MODULE	SD951-0037
3-2	ASSEMBLY DIAGRAM, CLOCK/TIMER MODULE	AC951-0037
3-3	ASSEMBLY DIAGRAM, TIMER CONTROL MODULE	AC951-0035

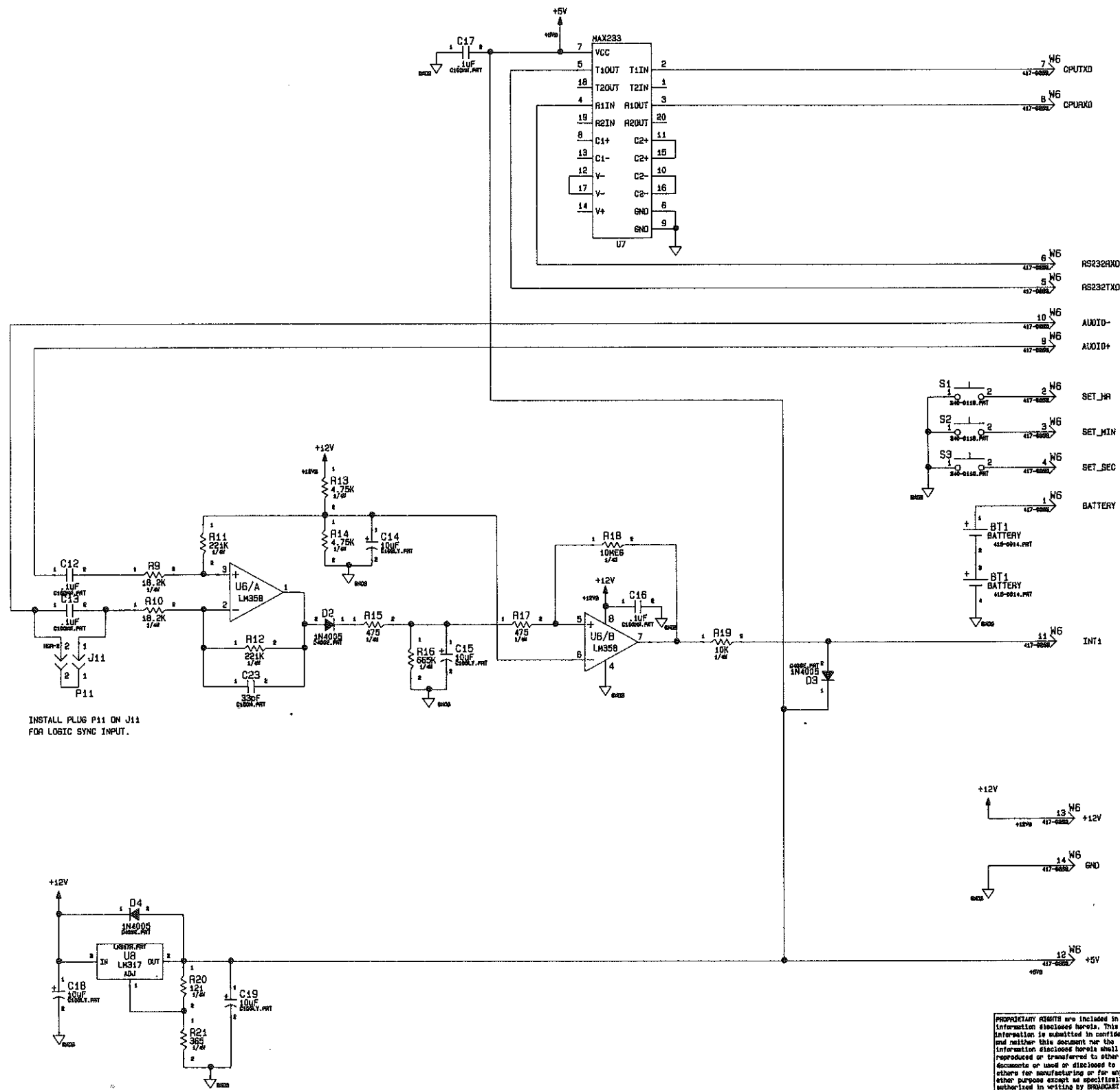


- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 1% UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENT USED: C25, D4, DS17, J11, W6, P14, R36, G1, S3, TP1, U13, Y2, L1.
 3. COMPONENTS NOT USED: R4
 4. SEE ASSEMBLY: AC 951-0037

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TOLERANCE (DECIMAL) U.S.S. .X ± .030 .XXX ± .003 .XX ± .010 ANGLES ± 1°		FINISH SEE DAG RAS02-0000	TITLE CLOCK TIMER BD	
TYPE SIZE DWG. NO. S B 951-0037		PROJ. ENGR. JLT B-30-91	REV D	MODEL: HT-90/AT-90 SCALE: NONE SHEET 1 OF 4

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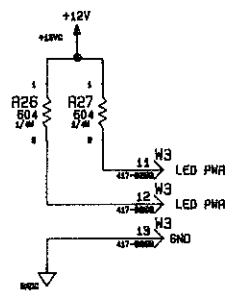
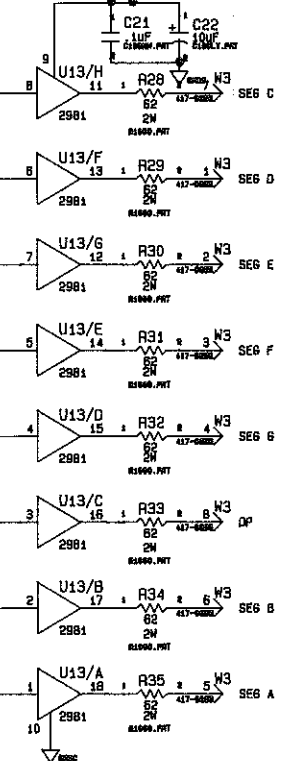
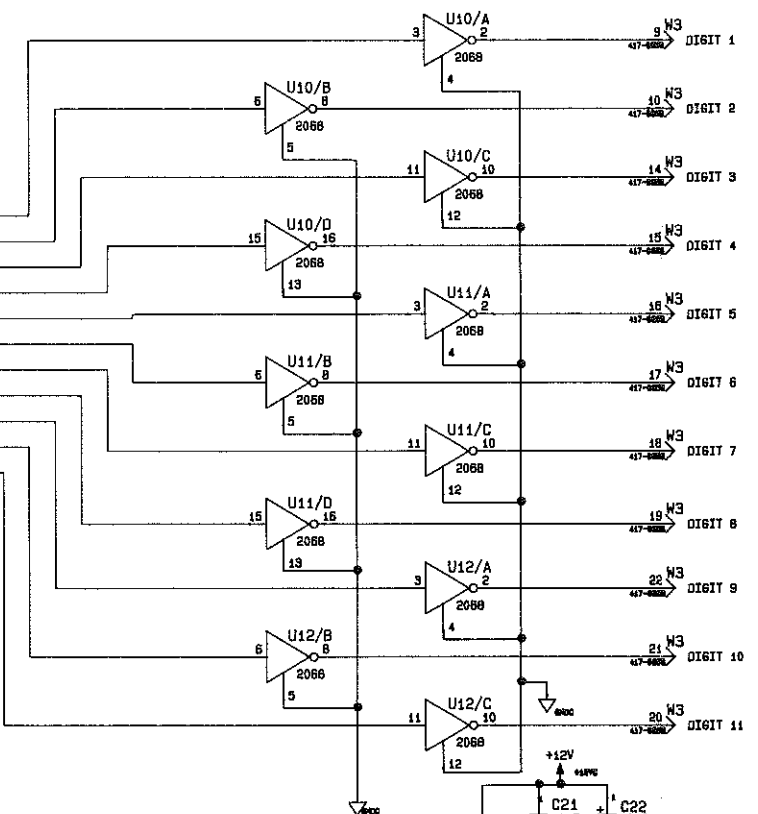
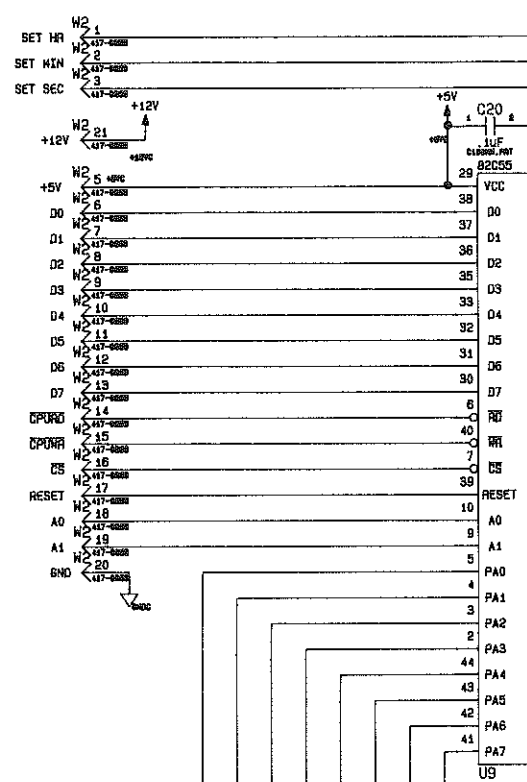
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TOLERANCE DECIMAL U.S.S. .2 ± .030 .125 ± .005 .12 ± .015 ANGLES ± .1°	PROJ. ENGR. JLT B-30-91	FINISH SEE DRG BMS20-0000	TITLE CLOCK TIMER BD	TYPE SIZE DRG. NO. S D 951-0037
	MFG. NEXT ASSY AC 951-0037	MODEL MT90/AT90	SCALE NONE	SHEET 2 OF 4

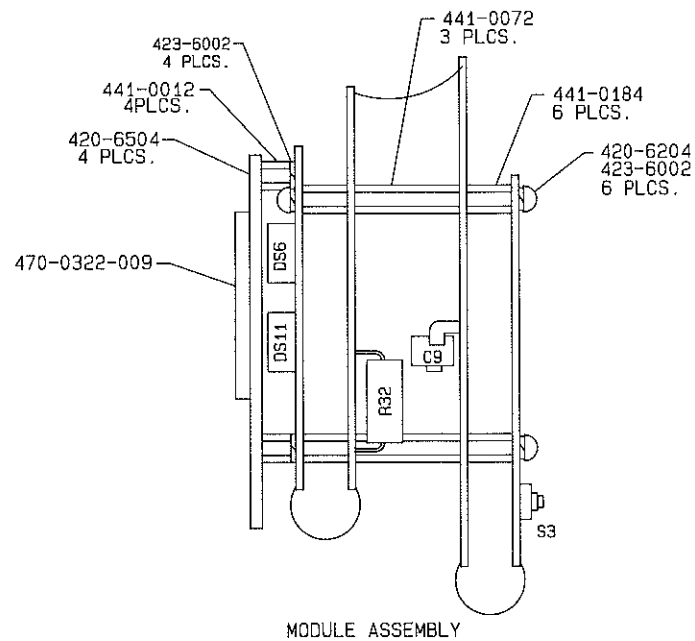


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03

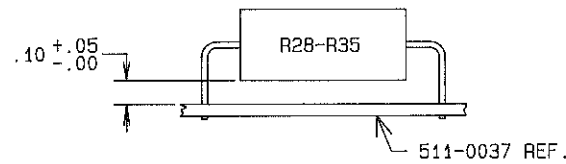
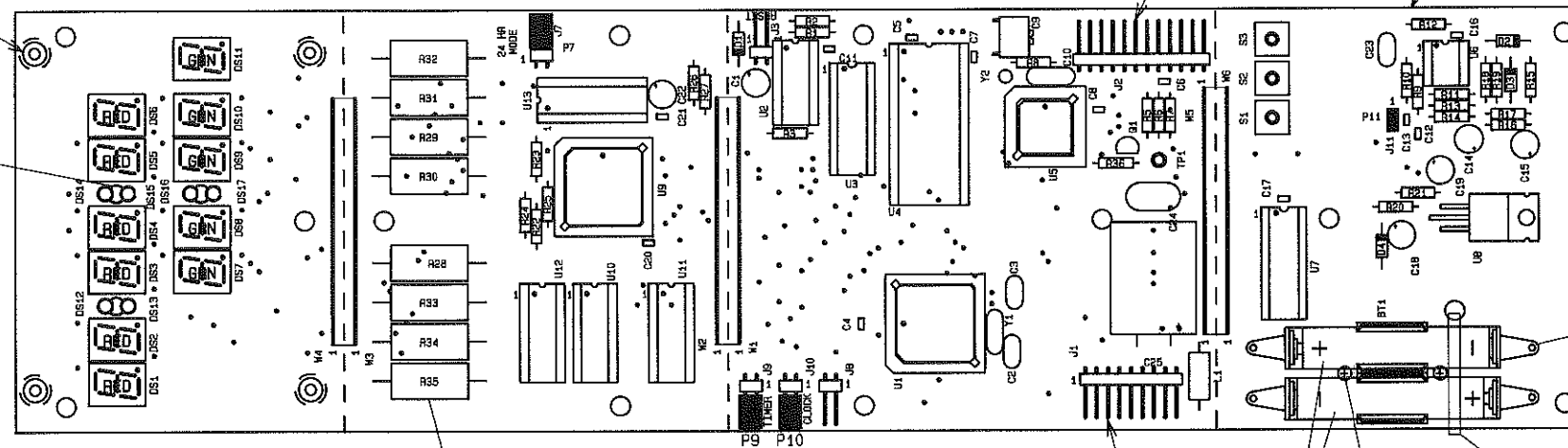
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	CHWG HH 8-30-91	FINISH SEE (RHS) RA582-0000	
PROJ. ENGR. JLT 8-30-91	NEXT ASSY. AC 951-0037	TYPE SIZE DWG. NO. S D 951-0037	REV C
MODEL MT90/AT90		SCALE NONE	SHEET 3 of 4



MODULE ASSEMBLY

426-6000 TO BE MOUNTED ON SOLDER SIDE 4 PLCS.

SPACER 441-0185 TO BE INSTALLED UNDER 1 LEG OF EACH LED AS SHOWN TYP. 3 PLCS.



DETAIL 'A' SCALE 2=1

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DWN. BY
JAH 8-30-91

CHKD
MH 8-30-91

ME

PROJ. ENGR.
JLT 8-30-91

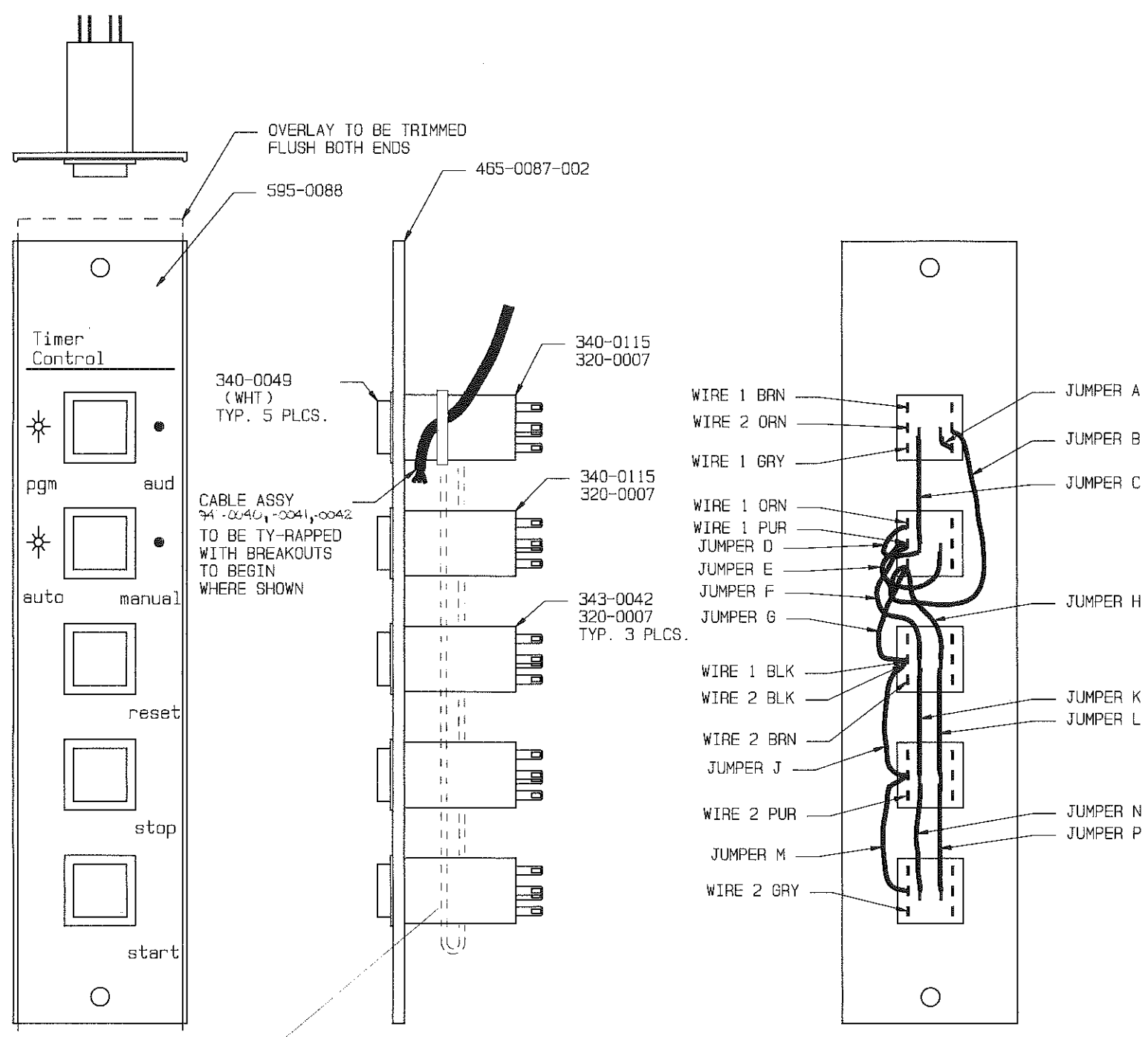
MFG.

MATERIAL
SEE B/M
951-0037

FINISH
SEE DWG RA592-0000

NEXT ASSY.

		BROADCAST ELECTRONICS INC. 4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL 62305 PH. 217/224-9600 TELEX 250142 CABLE BROADCAST FAX 217/224-9607	
TITLE PCB ASSEMBLY CLOCK TIMER			
TYPE A	SIZE C	DWG No. 951-0037	REV D
MODEL MT90/AT90		SCALE 1=1	SHEET 1 OF 1



← WHEN THE TIMER CONTROL IS USED ON RIGHT SIDE OF CONSOLE, WRAP EXTRA LENGTH OF HARNESS AROUND SWITCHES.

JUMPER TABLE P/N 601-2200	
SYM	LENGTH
A	.45 IN.
B	5.5 IN.
C	3 IN.
D	3 IN.
E	3 IN.
F	3 IN.
G	3 IN.
H	3 IN.
J	3 IN.
K	3 IN.
L	3 IN.
M	3 IN.
N	3 IN.
P	3 IN.

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	CHKD <i>W 8-11-88</i>	FINISH SEE DWG RA582-0000	
TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°	ME <i>JAH</i>	NEXT ASSY 901-9312 (12CH) 901-9318 (18CH)	TYPE SIZE DWG. NO. REV A C 951-0035 D
PROT. ENGR.		MODEL MT-90	SCALE 1=1 SHEET 1 OF 1

SECTION IV

CLOCK/TIMER MODULE

TIMER CONTROL MODULE

PARTS LIST

4-1. INTRODUCTION.

4-2. This section provides descriptions and part numbers of electrical components and assemblies required for maintenance of the clock/timer module and the timer control module. Each table entry in this section is indexed by the reference designators appearing on the applicable schematic diagram.

**TABLE 4-1. CLOCK/TIMER MODULE AND TIMER CONTROL MODULE
PARTS LIST INDEX**

TABLE	TITLE	PART NO.	PAGE
4-2	CLOCK/TIMER MODULE CIRCUIT BOARD ASSEMBLY	951-0037	4-1
4-3	CLOCK/TIMER MODULE CABLE ASSEMBLY	941-0030	4-3
4-4	TIMER CONTROL MODULE	951-0035	4-3
4-5	TIMER CONTROL MODULE CABLE ASSEMBLY	941-0040/ -0041/ -0042	4-3

**TABLE 4-2. CLOCK/TIMER MODULE CIRCUIT BOARD ASSEMBLY - 951-0037
(Sheet 1 of 3)**

REF. DES.	DESCRIPTION	PART NO.	QTY.
C2, C3	Capacitor, Mica, 33 pF $\pm 5\%$, 500V	042-3312	2
C4 THRU	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	5
C8, C9	Capacitor, Ceramic, 8-25PF N470 250V	090-0825	1
C10	Capacitor, Mica 5PF $\pm 5\%$ 500V	040-5003	1
C11 THRU C13	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	3
C14, C15	Capacitor, Electrolytic, 10 uF, 35V	023-1076	2
C16, C17	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	2
C18, C19	Capacitor, Electrolytic, 10 uF, 35V	023-1076	2
C20, C21	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	2
C22	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C23	Capacitor, Mica, 33 pF $\pm 5\%$, 500V	042-3312	1
C24	Capacitor, Mylar, 0.22 uF $\pm 10\%$, 100V	030-2253	1
D1 THRU D4	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	4

TABLE 4-2. CLOCK/TIMER MODULE CIRCUIT BOARD ASSEMBLY - 951-0037
(Sheet 2 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
DS1 THRU DS6	LED, HD11070, Red, 7-Segment High Efficiency Common Cathode	320-0023	6
DS7 THRU DS11	LED, HD1107G, Green, 7-Segment High Efficiency Common	320-0022	5
DS12 THRU DS15	LED, 1321DR, Red, 2.0v @ 20mA maximum	320-0032	4
DS16	Light-Emitting Diode, Green, Miniature, L321DC, 2.5V @ 20 mA Maximum	320-0009	1
DS17	Light-Emitting Diode, Green, Miniature, L321DC, 2.5V @ 20 mA Maximum	320-0009	1
J1	Receptacle Header, 12-Pin In-Line	417-1203	1
J2	Receptacle Header, 12-Pin In-Line	417-1203	1
J3	Receptacle, 2-Pin	417-0075	1
J7	Receptacle, 2-Pin	417-0075	1
J8	Receptacle, 2-Pin	417-0075	1
J9	Receptacle, 2-Pin	417-0075	1
J10	Receptacle, 2-Pin	417-0075	1
J11	Receptacle, Male, 2-Pin In-line	417-4004	1
P7	Jumper, Programmable, 2-Pin	340-0004	1
P9	Jumper, Programmable, 2-Pin	340-0004	1
P10	Jumper, Programmable, 2-Pin	340-0004	1
Q1	Transistor, 2N7000, N-Channel MOSFET 60V @ 75 mA, TO-92 Case	210-7000	1
R1	Resistor, 100 Ohm $\pm 1\%$, 1/4W	100-1031	1
R2	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R3	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R5	Resistor, 1 Meg Ohm $\pm 1\%$, 1/4W	103-1007	1
R6, R7	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	2
R8	Resistor, 22 Meg Ohm, $\pm 5\%$, 1/4W	100-2283	1
R9, R10	Resistor, 18.2 k Ohm $\pm 1\%$, 1/4W	103-1825	2
R11, R12	Resistor, 221 k Ohm $\pm 1\%$, 1/4W	103-2216	2
R13, R14	Resistor, 4.75 k Ohm $\pm 1\%$, 1/4W	103-4741	2
R15	Resistor, 475 Ohm $\pm 1\%$, 1/4W	103-4753	1
R16	Resistor, 665K Ohm, $\pm 1\%$ 1/4W	103-6654	1
R17	Resistor, 475 Ohm $\pm 1\%$, 1/4W	103-4753	1
R18	Resistor, 10 Meg Ohm $\pm 5\%$, 1/4	100-1083	1
R19	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R20	Resistor, 121 Ohm $\pm 5\%$, 1/4W	100-1231	1
R21	Resistor, 365 Ohm $\pm 1\%$, 1/4W	103-3631	1
R22 THRU R25	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	4
R26, R27	Resistor, 604 Ohm $\pm 1\%$, 1/4W	100-6031	2
R28 THRU R35	Resistor 62 Ohm, $\pm 5\%$, 2W	130-6223	8
R36	Resistor, 1 Meg Ohm $\pm 1\%$, 1/4W	103-1007	1
S1 THRU S3	Switch, Pushbutton, Momentary, Circuit Board Mount	340-0116	3
TP1	Terminal, Turret, Double Shoulder	413-1597	1
U1	Integrated Circuit, 80C31BH, Microcontroller, 3.5 to 12 MHz, 44-Pin PLCC	229-8031-001	1
U2	Integrated Circuit, MC74HC14 Hex Schmitt Trigger,	220-4106	1

TABLE 4-2. CLOCK/TIMER MODULE CIRCUIT BOARD ASSEMBLY - 951-0037
(Sheet 3 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
U3	CMOS, 14-Pin DIP Integrated Circuit, 74HC373, 8-Bit Latch, Tri-State Output,	220-7473	1
U4	CMOS, 20-Pin DIP Kit, Software, Clock/Timer Module	971-0037	1
U5	Integrated Circuit, DS1285Q, Real Time Clock, 28-Pin PLCC	229-1285	1
U6	Integrated Circuit, LM358N, Dual Operational Amplifier, 8-Pin DIP	221-0358	1
U7	Integrated Circuit, MAX233, Dual RS232 Driver/Receiver 20-Pin DIP	229-0233	1
U8	Integrated Circuit, LM317T, Adjustable Positive Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0317	1
U9	Integrated Circuit, 82C55A, Peripheral Interface, 44-Pin PLCC	229-8255-001	1
U10 THRU U12	Integrated Circuit, ULN2068B, 35V, 1.5A Darlington Quad Driver 16-Pin DIP	220-2068	3
U13	Integrated Circuit, UDN2981A, CMOS, HIGH-Voltage/High-Current Source Drivers, 50V @ 350mA, 18-Pin DIP	220-2981	1
W1 THRU W6	Flexstrip Jumper 22-Pin	417-0253	6
XU1	Socket, 44Pin PLCC	417-4401	1
XU2	Socket, 14-Pin DIP	417-1404	1
XU3	Socket, 20-Pin DIP	417-2004	1
XU4	Socket, 28-Pin DIP	417-2804	1
XU5	Socket, 28-Pin PLCC	417-2801	1
XU6	Socket, 8-Pin DIP	417-0804	1
XU7	Socket, 20-Pin DIP	417-2004	1
XU9	Socket, 44Pin PLCC	417-4401	1
XU10, THRU XU13	Socket, 16-Pin DIP	417-1604	4
Y1	Crystal, 11.0592 MHZ NE-18 Case	390-0033	1
Y2	Oscillator, Crystal, NTF3238C, 10.5 pF, 32.768 kHz	390-0011	1
—	Blank Clock/Timer Module Circuit Board	511-0037	1

TABLE 4-3. CLOCK/TIMER MODULE CABLE ASSEMBLY - 941-0030

REF. DES.	DESCRIPTION	PART NO.	QTY.
P1	Connector Housing, 9-Pin In-line	417-0161	1
—	Pins, Crimp Type	417-8766	8

TABLE 4-4. TIMER CONTROL MODULE - 951-0035

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	Switch, Pushbutton, Square, 2PDT, Illuminated, 3A @ 125V ac	340-0115	2
—	Switch, Push, Illuminated, 2PDT, Square, Momentary Contact, 3A @ 125V ac	343-0042	3
—	Lamp, No. 73, Wedge Base, 14V, 0.08A, T-1 3/4 Bulb	320-0007	5
—	Switch Cap, White, Square	340-0049	5

TABLE 4-5. TIMER CONTROL MODULE CABLE ASSEMBLY - 941-0040/-0041/-0042

REF. DES.	DESCRIPTION	PART NO.	QTY.
---	Plug, Key	417-0090	1
---	Pins, Crimp Type	417-8766	9
---	Plug, Housing, 12-Pin	417-1202	1

TAPE SOURCE REMOTE SWITCH MODULE CART SOURCE REMOTE SWITCH MODULE

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FIGURE NO.	DESCRIPTION	PAGE NO.
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SECTION I

TAPE SOURCE REMOTE SWITCH MODULE CART SOURCE REMOTE SWITCH MODULE THEORY OF OPERATION

1-1. **INTRODUCTION.**

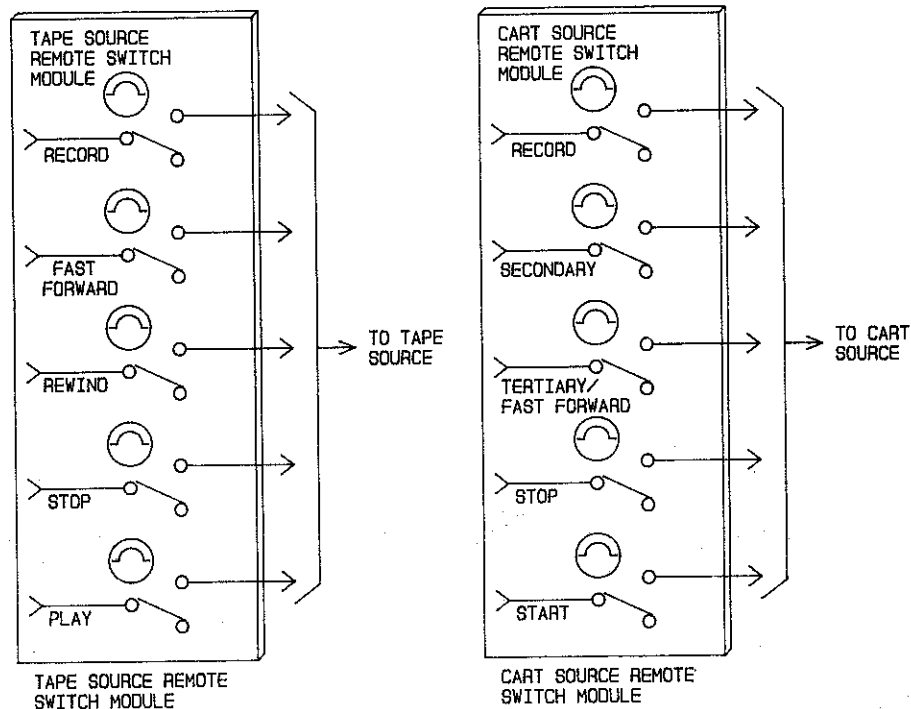
1-2. The following text provides detailed theory of operation for the Mix-Trak 90 series audio console tape and cart source remote switch modules. A diagram of the tape and cart remote switch modules is presented in Figure 1-1. Refer to Figure 1-1 as required for the following circuit discussion.

1-3. **TAPE SOURCE REMOTE SWITCH MODULE FUNCTIONAL DESCRIPTION.**

1-4. The tape source remote switch module consists of five color-coded momentary contact switch/indicators for the remote control of a tape source such as a reel-to-reel machine. The switches will provide control signals for basic operating functions such as record, fast forward, rewind, stop, and stop.

1-5. **CART SOURCE REMOTE SWITCH MODULE FUNCTIONAL DESCRIPTION.**

1-6. The cart source remote switch module consists of five color-coded momentary contact switch/indicators for the remote control of a cartridge machine source. The switches will provide control signals for basic operating functions such as record, secondary cue tone record, tertiary cue tone record/fast forward, stop, and stop.



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597-9012-103

**FIGURE 1-1. TAPE AND CART SOURCE REMOTE SWITCH MODULE
DETAILED BLOCK DIAGRAM**

SECTION II

TAPE SOURCE REMOTE SWITCH MODULE

CART SOURCE REMOTE SWITCH MODULE

MAINTENANCE

2-1. INTRODUCTION.

2-2. This section provides general maintenance information for the tape and cart source remote switch modules.

2-3. MAINTENANCE.

2-5. The tape and cart source remote switch modules should be periodically cleaned of accumulated dust using a nylon-bristle brush and vacuum cleaner. The modules should also be periodically inspected for loose wiring, otherwise no special maintenance procedures need be performed.

SECTION III

TAPE SOURCE REMOTE SWITCH MODULE

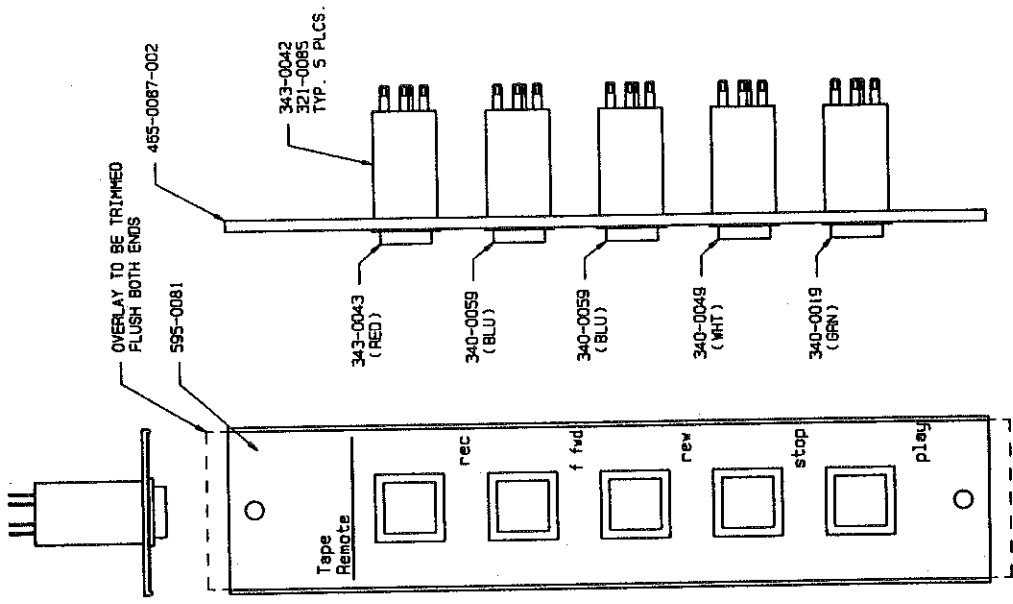
CART SOURCE REMOTE SWITCH MODULE

DRAWINGS

3-1. INTRODUCTION.

3-2. This section provides assembly drawings and schematic diagrams as listed below for the tape and cart source remote switch modules.

FIGURE	TITLE	NUMBER
3-1	ASSEMBLY DIAGRAM, TAPE SOURCE REMOTE SWITCH MODULE	AC951-0017
3-2	ASSEMBLY DIAGRAM, CART SOURCE REMOTE SWITCH MODULE	AC951-0019



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BROADCAST ELECTRONICS INC.
 4108 N. W. 11th St., Ft. Lauderdale, FL 33309-4000
 TEL: 305-457-1200 FAX: 305-457-1207

TITLE: TAPE SOURCE REMOTE SWITCH MODULE

REV: A C
 DATE: 01-90
 MODEL: RT-80

SCALE: 1:1 SHEET 1 OF 1

DATE: JAN 6-20-88
 DRAWN BY: JAH
 CHECKED BY: JAH
 DATE: 8-22-88

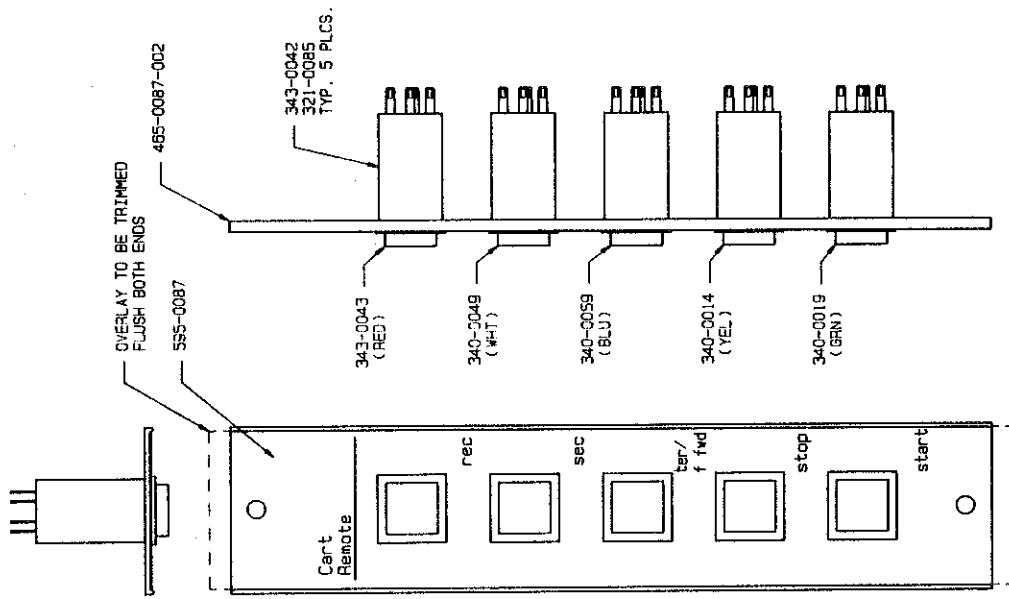
SEE BOM INSTRUCTIONS
 951-0017

SEE BOM INSTRUCTIONS
 951-0017 (1/23/91)
 951-0018 (1/23/91)

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DIMENSIONS (DECIMAL) IN O.S. DIMENSIONS (FRACTIONS) IN O.S. DIMENSIONS (MILLIMETERS) IN O.S.		SEE DIM 0082-0000 DIM 0012 (12X) DIM 0013 (12X)	FINISH: 91-1-W	TYPE: A C	MODEL: MT-90	SCALE: 1:1
BROADCAST ELECTRONICS, INC. 4100 N. JAYH ST., P.O. BOX 2000, BOSTON, MA 02208-2000 TEL: 617/294-8000 CABLE: BROADCAST FAX: 617/294-8007		BROADCAST ELECTRONICS, INC.				SHEET 1 OF 1

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SECTION IV

TAPE SOURCE REMOTE SWITCH MODULE

CART SOURCE REMOTE SWITCH MODULE

PARTS LIST

4-1. INTRODUCTION.

4-2. This section provides descriptions and part numbers of electrical components and assemblies required for maintenance of the tape and cart source remote switch modules.

**TABLE 4-1. TAPE AND CART SOURCE REMOTE SWITCH MODULE
PARTS LIST INDEX**

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4-3	CART SOURCE REMOTE SWITCH MODULE	951-0019	4-1

TABLE 4-2. TAPE SOURCE REMOTE SWITCH MODULE -951-0017

REF. DES.	DESCRIPTION	PART NO.	QTY.
S1 THRU S5	Switch, Push, Illuminated, 2PDT, Square, Momentary Contact, 3A @ 125V ac	343-0042	5
—	Lamp, No. 85, Wedge Base, 28V @ 0.04 Amperes	321-0085	5
—	Switch Cap, Blue, Square (for FAST FORWARD and REWIND Switches)	340-0059	2
—	Switch Cap, Red, Square (for RECORD Switch)	343-0043	1
—	Switch Cap, White, Square (for STOP Switch)	340-0049	1
—	Switch Cap, Green, Square (for PLAY Switch)	340-0019	1

TABLE 4-3. CART SOURCE REMOTE SWITCH MODULE - 951-0019

REF. DES.	DESCRIPTION	PART NO.	QTY.
S1 THRU S5	Switch, Push, Illuminated, 2PDT, Square, Momentary Contact, 3A @ 125V ac	343-0042	5
—	Lamp, No. 85, Wedge Base, 28V @ 0.04 Amperes	321-0085	5
—	Switch Cap, Blue, Square (for TERTIARY/FAST FORWARD Switch)	340-0059	1
—	Switch Cap, Red, Square (for RECORD Switch)	343-0043	1
—	Switch Cap, White, Square (for SECONDARY Switch)	340-0049	1
—	Switch Cap, Yellow (for STOP Switch)	340-0014	1
—	Switch Cap, Green, Square (for START Switch)	340-0019	1

STUDIO REMOTE PANEL

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SECTION I

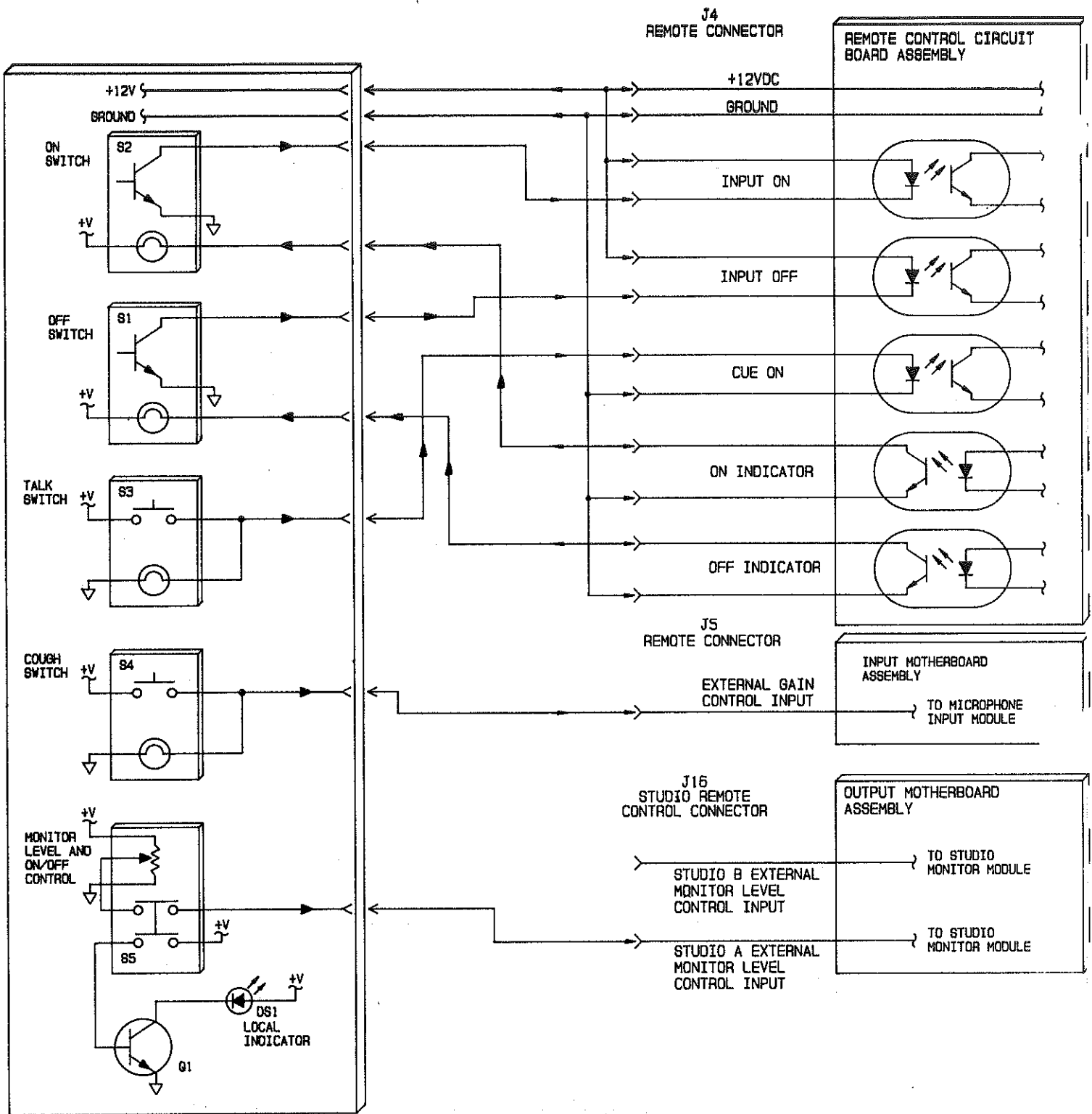
STUDIO REMOTE PANEL THEORY OF OPERATION

1-1. INTRODUCTION.

- 1-2. The following text provides detailed theory of operation for the Mix-Trak 90 series audio console studio remote panel. A detailed block diagram of the studio remote panel is presented in Figure 1-1. Refer to Figure 1-1 as required for the following circuit discussion.

1-3. FUNCTIONAL DESCRIPTION.

- 1-4. Local control of a studio facility microphone level, monitor level, and intercom operation is performed by the studio remote panel. The panel consists of four switch/indicators and a potentiometer assembly. Two hall-effect switch/indicators provide on/off control of the studio facility microphone input module. Studio-to-control room intercom operation is controlled by a talk switch/indicator. A cough switch/indicator is provided to conveniently lower the microphone level for special operating conditions. Local control of the studio monitor level is provided by a monitor level control and indicator.
- 1-5. Hall-effect switch/indicators S1 and S2 output LOW on/off commands to the remote control circuit board assembly to enable/disable the studio facility microphone input module. On/off pulses from the input module are routed to the remote control circuit board assembly which outputs low control commands to the S1 and S2 indicators for on/off status indications. Studio-to-control room intercom operations are directed by talk switch/indicator S3. When S3 is depressed, a HIGH will be routed to the remote control circuit board assembly cue input. The HIGH configures the microphone input module to cue mode for studio-to-control room intercom communication.
- 1-6. Cough switch/indicator S4 is designed to generate a HIGH control command for application to the microphone input module external gain control input. The command lowers the microphone input level approximately 60 dB for special operating conditions.
- 1-7. Local control of the studio monitor level is provided by monitor on/off level control S5. When switch S5 is operated to the on position, a dc control voltage will be routed to the studio monitor module external gain control input for control of the studio facility monitor level. An indication of local monitor level control is provided by transistor Q1 and local indicator DS1. A positive dc voltage from the contacts of switch S5 is applied to transistor Q1. The voltage biases Q1 on and illuminates local indicator DS1.



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FIGURE 1-1. STUDIO REMOTE PANEL DETAILED BLOCK DIAGRAM

SECTION II

STUDIO REMOTE PANEL MAINTENANCE

2-1. INTRODUCTION.

2-2. This section provides general maintenance information for the studio remote panel.

2-3. MAINTENANCE.

2-4. GENERAL.

2-5. The studio remote panel circuitry should be periodically cleaned of accumulated dust using a nylon-bristle brush and vacuum cleaner. The panel should also be periodically inspected for loose wiring and components, otherwise no special maintenance procedures need be performed.

2-6. COMPONENT REPLACEMENT.

2-7. Component replacement procedures for the console modular assemblies are presented in SECTION II, MAINTENANCE. Refer to SECTION II as required for the replacement procedures.

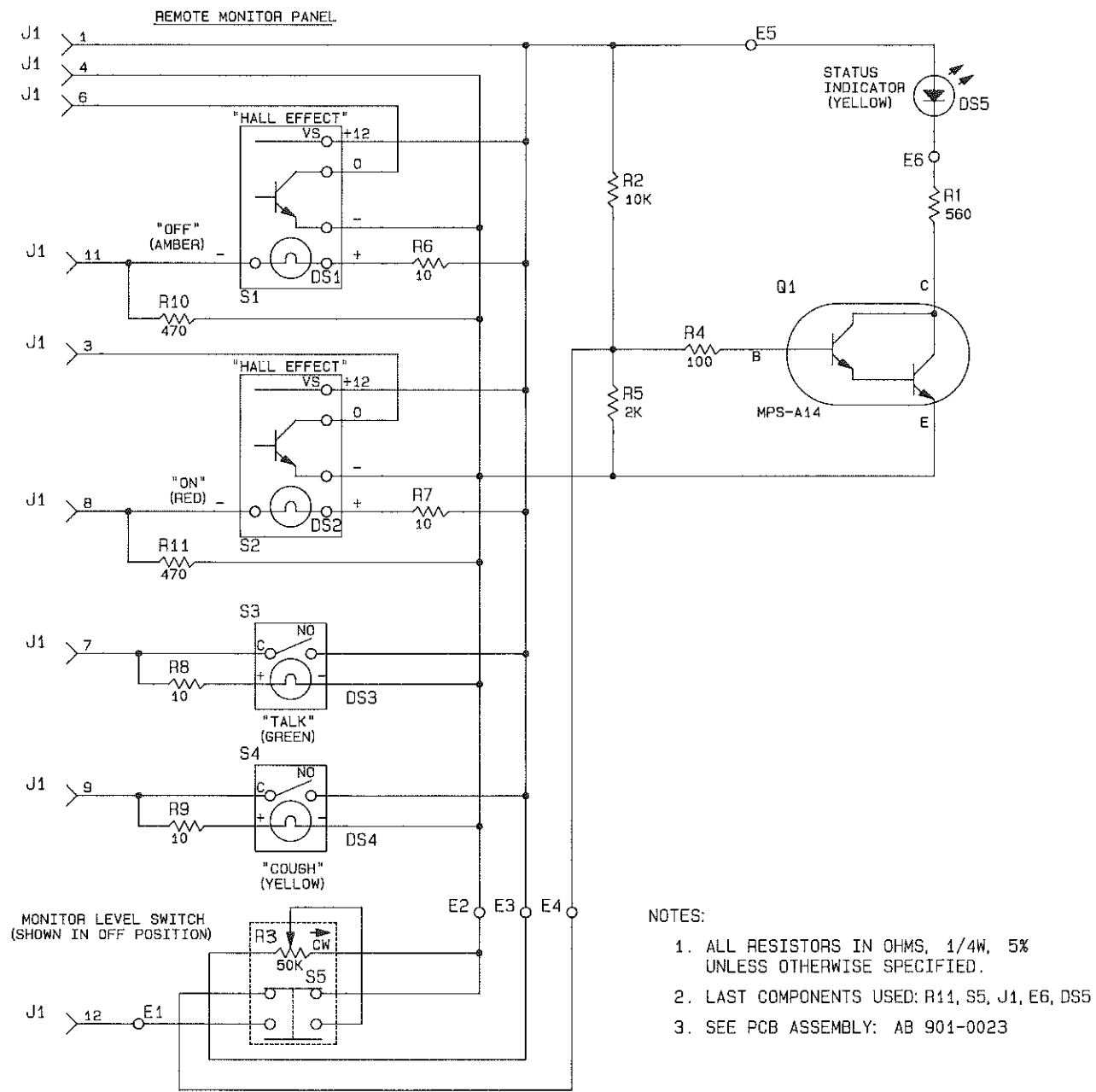
SECTION III

STUDIO REMOTE PANEL DRAWINGS

3-1. **INTRODUCTION.**

3-2. This section provides assembly drawings and schematic diagrams as listed below for the studio remote panel.

FIGURE	TITLE	NUMBER
3-1	SCHEMATIC DIAGRAM, STUDIO REMOTE PANEL	SC901-0023
3-2	ASSEMBLY DIAGRAM, STUDIO REMOTE PANEL	AC901-0023



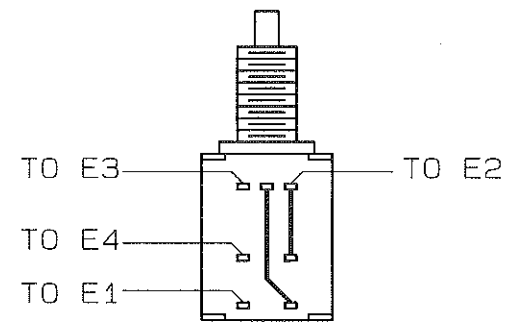
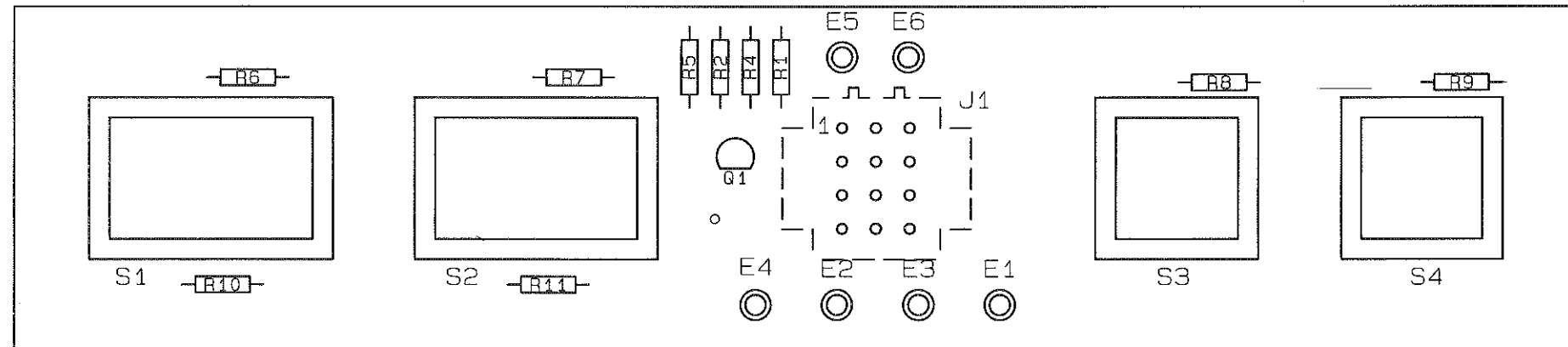
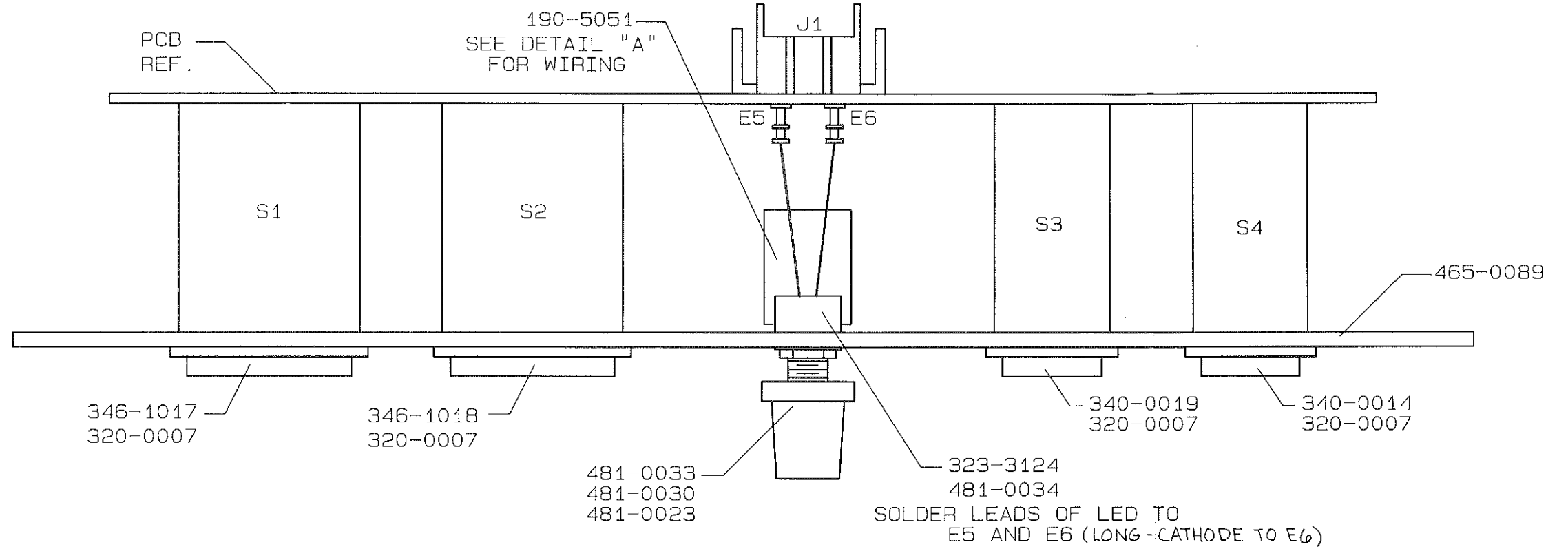
- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5% UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENTS USED: R11, S5, J1, E6, DS5
 3. SEE PCB ASSEMBLY: AB 901-0023

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	CHND <i>7/11 9-2-88</i>	FINISH SEE DWS RA592-0000	
TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°	PROJ. ENGR. <i>[Signature]</i>	NEXT ASSY. 901-9012 (12CH) 901-9018 (18CH)	TYPE SIZE DWG. NO. REV S C 901-0023 A
	MFG <i>[Signature]</i>		MODEL MT-90 SCALE NONE SHEET 1 OF 1

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DETAIL "A"

USE WIRE 601-2209

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	CHKD MH 7-2-88	FINISH		
	ME	PRD. ENGR. R.M. [Signature] 9/2/88	NEXT ASSY	TITLE ASSEMBLY STUDIO REMOTE MODULE
	TOLERANCE DECIMAL U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°	MFG MS 9-7-88	TYPE A C	DWG. NO. 901-0023
		MODEL MT90	SCALE 2/1	SHEET 1 OF 1

SECTION IV

STUDIO REMOTE PANEL PARTS LIST

4-1. INTRODUCTION.

4-2. This section provides descriptions and part numbers of electrical components and assemblies required for maintenance of the studio remote panel. Each table entry in this section is indexed by the reference designators appearing on the applicable schematic diagram.

TABLE 4-1. STUDIO REMOTE PANEL PARTS LIST INDEX

TABLE	TITLE	PART NO.	PAGE
4-2	STUDIO REMOTE PANEL ASSEMBLY	901-0023	4-1

TABLE 4-2. STUDIO REMOTE PANEL CIRCUIT BOARD ASSEMBLY - 901-0023

REF. DES.	DESCRIPTION	PART NO.	QTY.
DS1 THRU DS4	Lamp, No. 73, 14V, 0.08A, T-1 3/4 Bulb, Wedge Base	320-0007	4
DS5	LED, Yellow, MV53124, 3V @ 20 mA Maximum	323-3124	1
E1 THRU E6	Terminal Turret, Double Shoulder	413-1597	6
J1	Receptacle, 12-Pin	417-1276	1
Q1	Transistor, MPS-A14, Silicon, NPN, Darlington, TO-92 Case	211-0014	1
R1	Resistor, 560 Ohm $\pm 5\%$, 1/4W	100-5633	1
R2	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R3/S5	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W, SPDT BJ	190-5051	1
R4	Resistor, 100 Ohm $\pm 5\%$, 1/4W	100-1033	1
R5	Resistor, 2 k Ohm $\pm 5\%$, 1/4W	100-2043	1
R6 THRU R9	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1023	4
R10,R11	Resistor, 470 Ohm $\pm 5\%$, 1/4W	100-4733	2
S1,S2	Switch, Pushbutton, Rectangular, Momentary Contact, Illuminated (ON/OFF Switches)	340-0103	2
S3,S4	Switch, Pushbutton, Momentary Contact, Illuminated, SPDT, 3A @ 125V (TALK and COUGH Switches)	340-0015	2
—	Lens, Red (for ON Switch)	346-1018	1
—	Lens, Amber (for OFF Switch)	346-1017	1
—	Switch Cap, Yellow, Square (for COUGH Switch)	340-0014	1
—	Switch Cap, Green, Square (for TALK Switch)	340-0019	1
—	Knob Cap, 11mm Gray W/Spot, C112 (for MONITOR LEVEL Control)	481-0023	1
—	Panel Mounting Grommet, MP65, for Rectangular Lamps	481-0034	1
—	Blank Studio Remote Panel Circuit Board	511-0023	1

SUMMING AMPLIFIER CIRCUIT BOARD CUE SPEAKER/HEADPHONE AMPLIFIER CIRCUIT BOARD

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SECTION I

SUMMING AMPLIFIER CIRCUIT BOARD

CUE SPEAKER/HEADPHONE AMPLIFIER CIRCUIT BOARD

THEORY OF OPERATION

1-1. INTRODUCTION.

1-2. The following text provides detailed theory of operation for the Mix-Trak 90 series audio console summing amplifier and cue speaker/headphone amplifier circuit boards.

1-3. SUMMING AMPLIFIER CIRCUIT BOARD FUNCTIONAL DESCRIPTION.

1-4. The following text provides a functional description of the summing amplifier circuit board. Figure 1-1 presents a detailed block diagram of the summing amplifier circuitry. Refer to Figure 1-1 as required for the following circuit description. The summing amplifier audio circuit left and right channels are identical, therefore only the left channel will be discussed.

1-5. GENERAL.

1-6. The console summing amplifier circuit board provides audio amplification for the console output bus system. Program music, program speech, audition audio, auxiliary 1 audio, auxiliary 2 audio, auxiliary 3 audio, and cue audio are applied to individual amplifier networks. Patch point transmitting and receiving networks are also incorporated into the circuit board design. The networks provide the interfacing required for the connection of external audio processing equipment to the program music and program speech audio networks.

1-7. PROGRAM AUDIO.

1-8. Left channel program music audio from the console bus system is applied to an inverting amplifier stage consisting of integrated circuit U1A. U1A is configured for a gain of approximately 1. The gain of U1A is established by resistive components on the circuit board and the output amplifier network resistance on an associated input module. The output of U1A is applied to a patch point transmit network and left channel program music jumper J1. J1 selects either non-processed audio from U1A or processed audio from the patch point receiving stage for application to the summing amplifier stage.

1-9. Left channel program speech audio from the console bus system is also applied to an inverting amplifier stage consisting of integrated circuit U1B. U1B is configured for a gain of approximately 1. The gain of U1B is established by resistive components on the circuit board and the output amplifier network resistance on an associated input module. The output of U1B is applied to a patch point transmit network and left channel program speech jumper J2. J2 selects either non-processed audio from U1B or processed audio from the patch point receiving stage for application to the summing amplifier stage.

1-10. AUDITION AUDIO.

1-11. Left channel audition audio from the console bus system is applied to inverting amplifier stage U3B. U3B is configured for a gain of approximately 1. The gain of U3B is established by resistive components on the circuit board and the output amplifier network resistance on an associated input module. The output of U3B is routed for application to the console output amplifier module assigned to the audition bus.

1-12. AUXILIARY AUDIO.

1-13. Auxiliary 1 audio from the console bus system is applied to inverting amplifier stage U4A. U4A is configured for a gain of approximately 1. The gain of U4A is established by resistive components on the circuit board and the output amplifier network resistance on an associated input module. The output of U4A is routed for application to the console output amplifier module assigned to the auxiliary 1 bus. The auxiliary 2 and auxiliary 3 amplifier circuitry is identical.

1-14. CUE AUDIO.

1-15. Cue audio from the console cue system is applied to the summing amplifier circuit board and amplified at U5B. U5B is an inverting amplifier configured for a gain of approximately 1. The gain of U5B is established by resistive components on the circuit board and the output amplifier network resistance on an associated input module. The output of U5B is routed for application to the cue speaker/headphone amplifier circuit board.

1-16. OUTPUT SUMMING AMPLIFIER NETWORK.

1-17. Left channel program music and program speech audio from jumpers J1 and J2 are applied to summing amplifier U14B. U14B is configured for a gain of one. The output of U14B is routed for application to the console output amplifier module assigned to the program bus.

1-18. PATCH POINT NETWORKS.

1-19. The summing amplifier patch point networks consist of a transmitting stage and a receiving stage. The patch point networks are incorporated into the design to provide interfacing for the connection of external audio processing equipment to the program music and program speech audio busses.

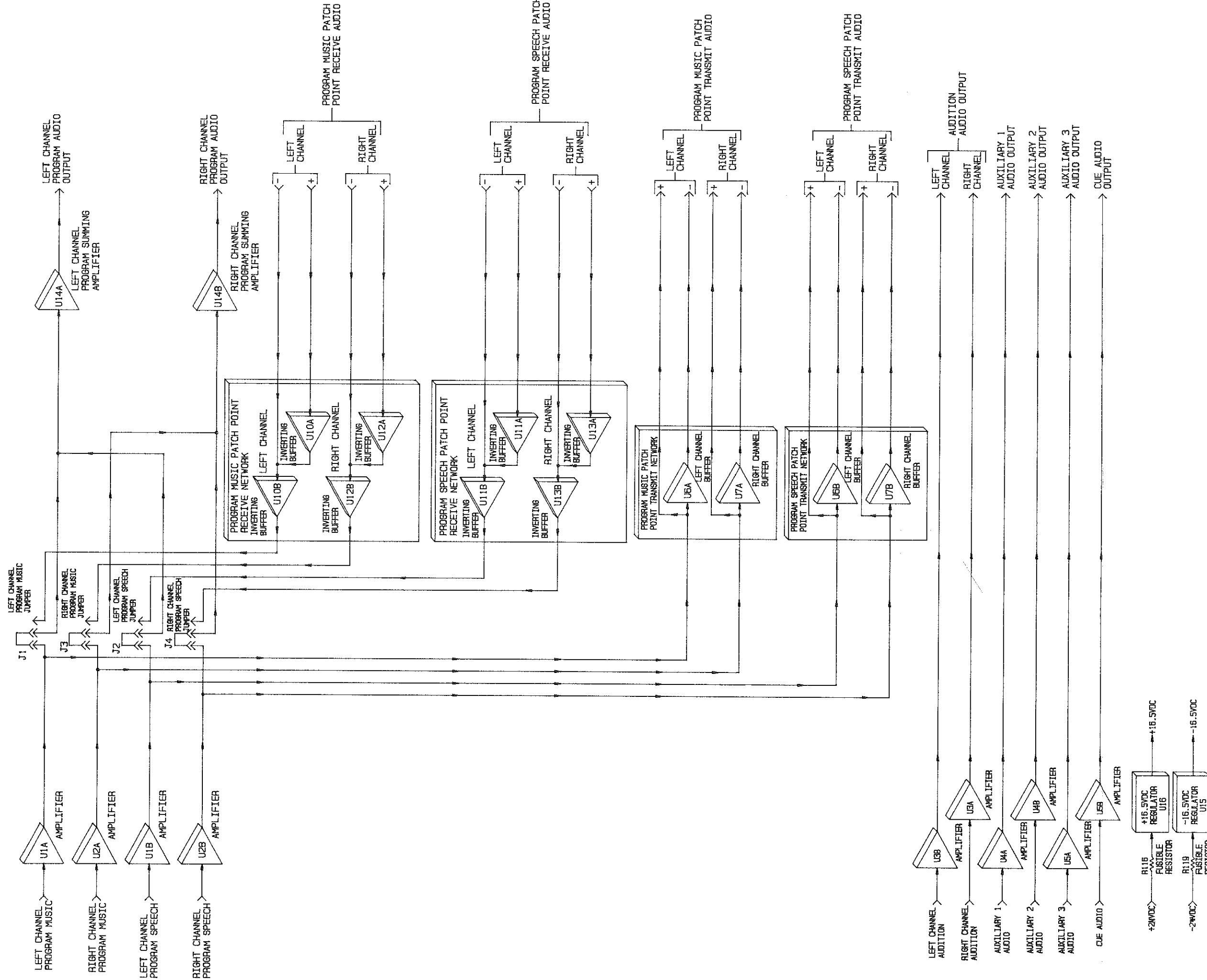
1-20. Left channel program music audio from U1A is applied to a patch point transmitting stage consisting of buffer U6A. U6A inverts the signal to produce balanced audio for application to external audio processing equipment. The stage is configured for continuous operation to provide access to the audio without circuit board programming.

1-21. Audio from external audio processing equipment is applied to the patch point receiving stage. The receiving stage consists of a two-stage inverting buffer network. Balanced left channel program music audio is applied to inverting buffers U10A/B. Positive-going audio is inverted at U10A and summed at the input of U10B to provide balanced-to-unbalanced audio conversion. The output of the stage is routed for application to left channel program music select jumper J1.

1-22. POWER SUPPLY CIRCUIT.

1-23. DC operating potentials for application to the summing amplifier circuit board components are produced by a regulator network. Unregulated ± 24 volt supplies from the console power supply module are applied through fusible resistors R116 and R119 to a regulator network consisting of U15 and U16. R116/R119 are carbon-composition resistors which function as fusible links in the event of a short-circuit potential on the circuit board. The fusible resistors limit a power supply failure to the circuit board and prevent a failure in the entire console system.

1-24. ± 24 V dc supplies from the console power supply module are applied to +16.5 volt dc regulator U16 and -16.5 volt dc regulator U15. U15/U16 are three terminal adjustable regulators containing internal thermal and short-circuit current limiting features. The regulated ± 16.5 volt outputs from U15 and U16 are routed for application to the circuit board audio components.



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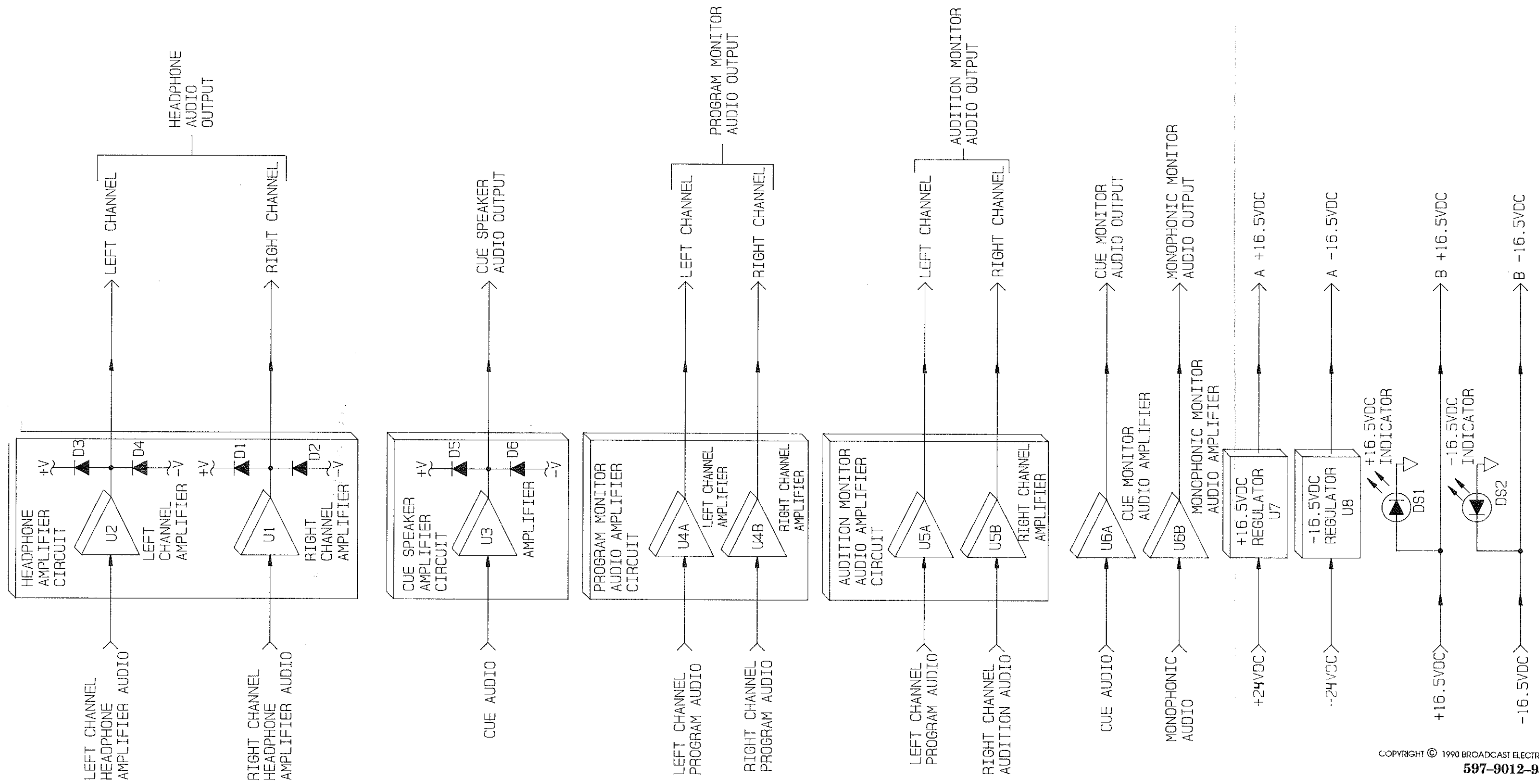
FIGURE 1-1.
SUMMING AMPLIFIER
CIRCUIT BOARD DETAILED
BLOCK DIAGRAM



- 1-25. **CUE SPEAKER/HEADPHONE AMPLIFIER FUNCTIONAL DESCRIPTION.**
- 1-26. The following text provides a functional description of the cue speaker/headphone amplifier circuit board. Figure 1-2 presents a detailed block diagram of the cue speaker/headphone amplifier circuitry. Refer to Figure 1-2 as required for the following circuit description. The cue speaker/headphone amplifier audio circuit left and right channels are identical, therefore only the left channel will be discussed.
- 1-27. **GENERAL.**
- 1-28. The cue speaker/headphone amplifier circuit board contains six individual amplifier networks. The networks amplify audio for application to the console headphone system, cue speaker, and monitor system.
- 1-29. **HEADPHONE AMPLIFIER CIRCUIT.**
- 1-30. Left channel headphone audio from the control room monitor module headphone circuit is applied to amplifier U2. U2 is a power amplifier stage designed to output approximately 2 watts into an 8 Ohm load. Output limiting is provided by diodes D3 and D4. D3 and D4 limit positive and negative output peaks above ± 16 volts. The output of power amplifier U2 is routed for application to the console headphone receptacles.
- 1-31. **CUE SPEAKER AMPLIFIER CIRCUIT.**
- 1-32. Cue audio from the cue circuit on the control room monitor module is applied to amplifier U3. U3 is a power amplifier stage designed for a nominal output of 5 watts. Output limiting is provided by diodes D5 and D6. D5 and D6 limit positive and negative output peaks above ± 16 volts. The output of power amplifier U2 is routed for application to the cue speaker.
- 1-33. **PROGRAM MONITOR AUDIO AMPLIFIER CIRCUIT.**
- 1-34. Left channel program audio from the summing amplifier circuit board is applied to operational amplifier U4A. U4A is an inverting amplifier stage configured for a gain of approximately 6 dB. The output U4A is routed for application to the monitor circuitry on the control room and studio monitor modules.
- 1-35. **AUDITION MONITOR AUDIO AMPLIFIER CIRCUIT.**
- 1-36. Left channel audition audio from the summing amplifier circuit board is applied to operational amplifier U5A. U5A is an inverting amplifier stage configured for a gain of approximately 6 dB. The output U5A is routed for application to the monitor circuitry on the control room and studio monitor modules.
- 1-37. **CUE MONITOR AUDIO AMPLIFIER CIRCUIT.**
- 1-38. Cue audio from the summing amplifier circuit board is applied to operational amplifier U6A. U6A is an inverting amplifier stage configured for a gain of approximately 6 dB. The output U6A is routed for application to the monitor circuitry on the control room and studio monitor modules.
- 1-39. **MONOPHONIC MONITOR AUDIO AMPLIFIER CIRCUIT.**
- 1-40. Monophonic audio from the monophonic output module is applied to operational amplifier U6B. U6B is an inverting amplifier stage configured for a gain of approximately 6 dB. The output U6B is routed for application to the monitor circuitry on the control room and studio monitor modules.

1-41. POWER SUPPLY CIRCUIT.

- 1-42. DC operating potentials for application to the cue speaker/headphone amplifier circuit board components are produced by a regulator network. $\pm 24V$ dc supplies from the console power supply module are applied to +16.5 volt dc regulator U7 and -16.5 volt dc regulator U8. U7/U8 are three terminal adjustable regulators containing internal thermal and short-circuit current limiting features. The regulated ± 16.5 volt outputs from U15 and U16 are routed for application to the program monitor, audition monitor, cue monitor, and monophonic monitor amplifier circuitry.
- 1-43. Regulated +16.5v and -16.5v dc supplies from the console power supply module are also routed to the cue speaker/headphone amplifier circuit board. The regulated supplies are applied to the headphone and cue speaker amplifier circuits. LEDs DS1 and DS2 provide operational status indications of the ± 16.5 supplies.



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FIGURE 1-2.
CUE SPEAKER/HEADPHONE AMPLIFIER
CIRCUIT BOARD DETAILED BLOCK DIAGRAM

1-7/1-8

SECTION II

SUMMING AMPLIFIER CIRCUIT BOARD CUE SPEAKER/HEADPHONE AMPLIFIER CIRCUIT BOARD MAINTENANCE

2-1. INTRODUCTION.

2-2. This section provides general maintenance information and troubleshooting information for the summing amplifier and cue speaker/headphone amplifier circuit boards.

2-3. FIRST LEVEL MAINTENANCE.

2-4. First level maintenance consists of precautionary procedures applied to the equipment to prevent future failures. The procedures are performed on a regular basis and the results recorded in a performance log.

2-5. The summing amplifier and cue speaker/headphone amplifier circuit boards should be periodically cleaned of accumulated dust using a nylon-bristle brush and vacuum cleaner. Inspect the circuit boards for improperly seated semiconductors and components damaged by overheating.

2-6. SECOND LEVEL MAINTENANCE.

2-7. Second level maintenance consists of procedures required to restore a summing amplifier or cue speaker/headphone amplifier circuit board to operation after a fault has occurred. The procedures are divided into troubleshooting information and component replacement procedures.

2-8. TROUBLESHOOTING.

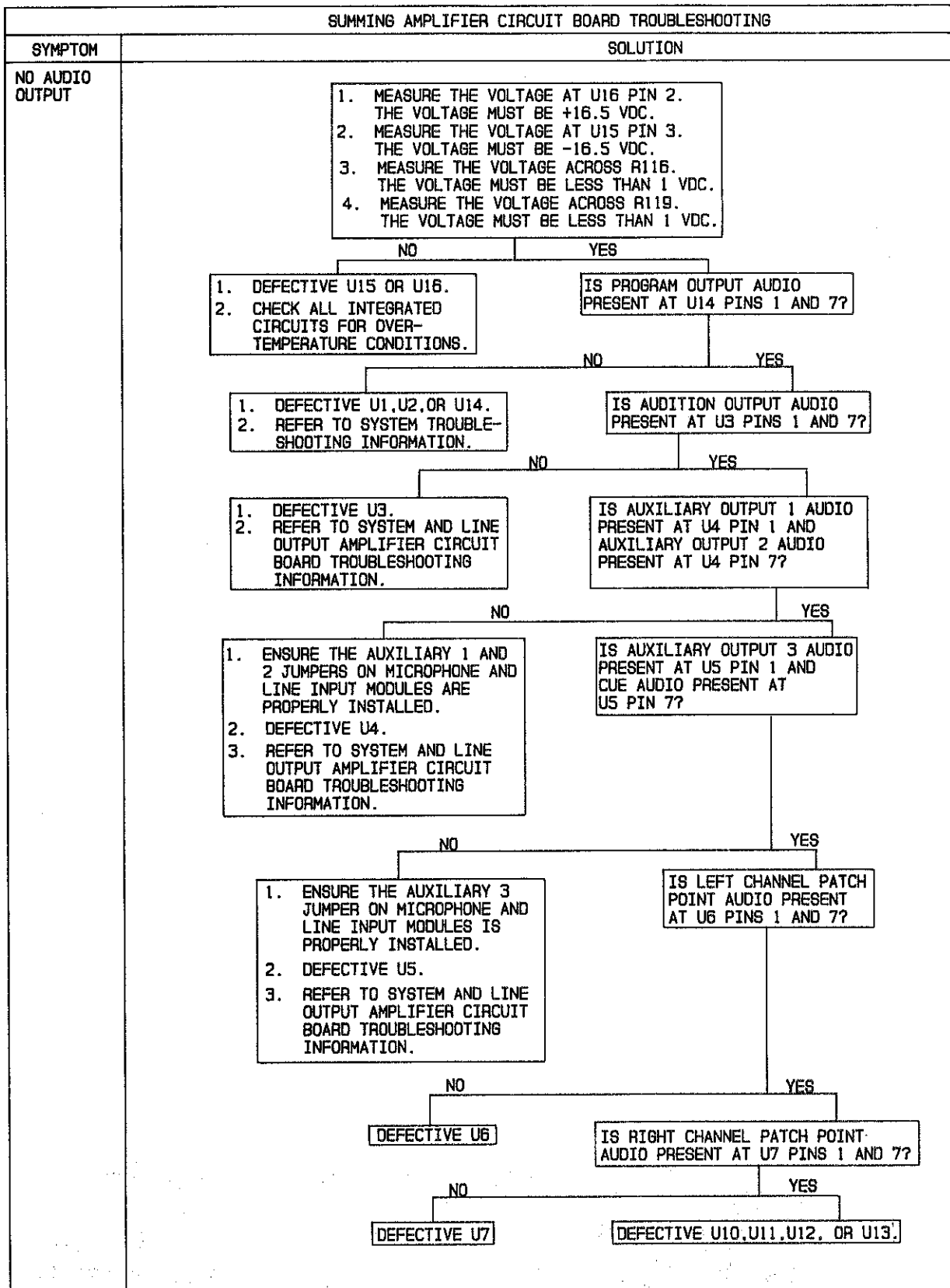
2-9. The troubleshooting philosophy for the summing amplifier and cue speaker/headphone amplifier circuit board assemblies consists of isolating a problem to a specific circuit or group of components. Two 40-pin and one 50-pin extender ribbon cable assemblies are provided to interface plug-in modular assemblies to the chassis mounted motherboards for troubleshooting procedures.

2-10. Figure 2-1 presents the summing amplifier circuit board troubleshooting information. Figure 2-2 presents the cue speaker/headphone amplifier circuit board troubleshooting information. Refer to Figures 2-1 and 2-2 to isolate a failure to a specific group of components.

2-11. Once trouble is isolated and power is totally deenergized, refer to the schematic diagrams and the theory of operation to assist in problem resolution. The defective component may be repaired locally or the entire module may be returned to Broadcast Electronics for repair or replacement.

2-12. COMPONENT REPLACEMENT.

2-13. Component replacement procedures for the console modular assemblies are presented in SECTION II, MAINTENANCE. Refer to SECTION II as required for the replacement procedures.



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FIGURE 2-1. SUMMING AMPLIFIER CIRCUIT BOARD TROUBLESHOOTING

CUE SPEAKER/HEADPHONE AMPLIFIER CIRCUIT BOARD TROUBLESHOOTING	
SYMPTOM	SOLUTION
NO HEADPHONE OUTPUT	<ol style="list-style-type: none"> 1. CHECK ± 16.5 VOLT INDICATORS DS1 AND DS2. IF EXTINGUISHED, CHECK FUSES F6 AND F7 ON THE POWER SUPPLY MODULE . IF DIMLY ILLUMINATED, CHECK REGULATORS U1 AND U2 ON THE POWER SUPPLY. 2. CHECK POWER AMPLIFIERS U1 AND U2.
NO CUE AUDIO OUTPUT	<ol style="list-style-type: none"> 1. CHECK ± 16.5 VOLT INDICATORS DS1 AND DS2. IF EXTINGUISHED, CHECK FUSES F6 AND F7 ON THE POWER SUPPLY MODULE . IF DIMLY ILLUMINATED, CHECK REGULATORS U1 AND U2 ON THE POWER SUPPLY. 2. CHECK INTEGRATED CIRCUIT U3.
NO PROGRAM MONITOR AUDIO OUTPUT	<ol style="list-style-type: none"> 1. CHECK ± 16.5 VOLT REGULATORS U7 AND U8. 2. CHECK INTEGRATED CIRCUIT U4.
NO AUDITION MONITOR AUDIO OUTPUT	<ol style="list-style-type: none"> 1. CHECK ± 16.5 VOLT REGULATORS U7 AND U8. 2. CHECK INTEGRATED CIRCUIT U5.
NO CUE MONITOR AUDIO OUTPUT	<ol style="list-style-type: none"> 1. CHECK ± 16.5 VOLT REGULATORS U7 AND U8. 2. CHECK INTEGRATED CIRCUIT U6.
NO MONOPHONIC MONITOR AUDIO OUTPUT	<ol style="list-style-type: none"> 1. CHECK ± 16.5 VOLT REGULATORS U7 AND U8. 2. CHECK INTEGRATED CIRCUIT U6.

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FIGURE 2-2. CUE SPEAKER/HEADPHONE AMPLIFIER CIRCUIT BOARD TROUBLESHOOTING

SECTION III

SUMMING AMPLIFIER CIRCUIT BOARD

CUE SPEAKER/HEADPHONE AMPLIFIER CIRCUIT BOARD

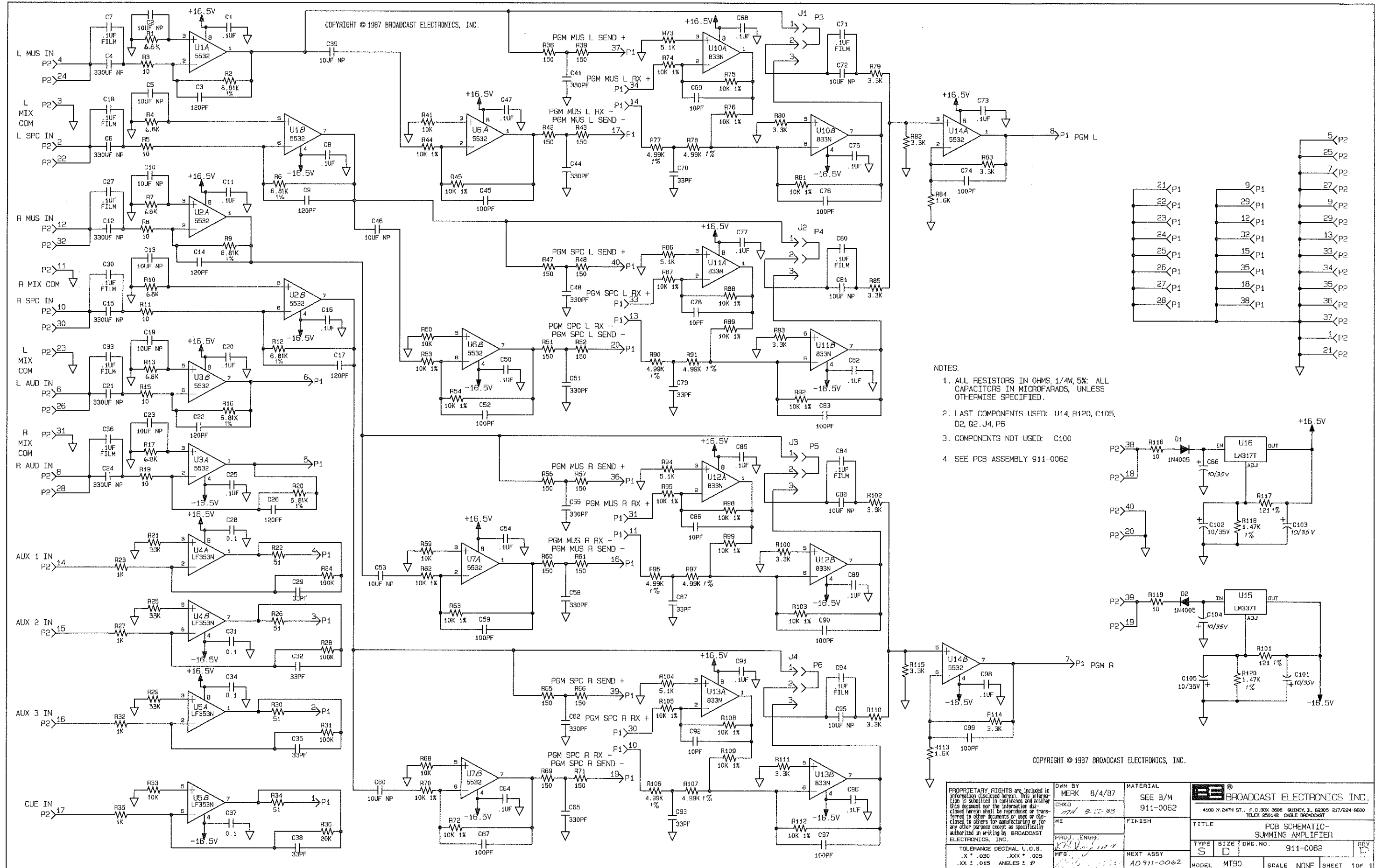
DRAWINGS

3-1. INTRODUCTION.

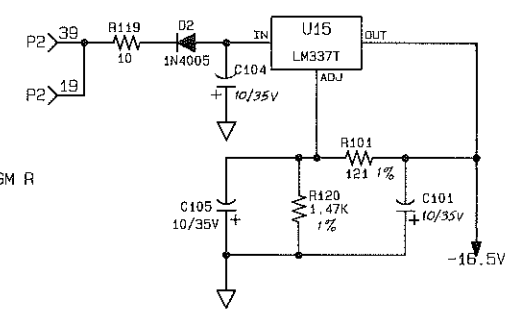
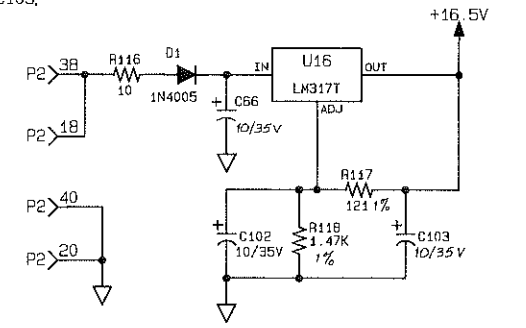
3-2. This section provides assembly drawings and schematic diagrams as listed below for the summing amplifier and cue speaker/headphone amplifier circuit board assemblies.

FIGURE	TITLE	NUMBER
3-1	SCHEMATIC DIAGRAM, SUMMING AMPLIFIER CIRCUIT BOARD	SD911-0062
3-2	ASSEMBLY DIAGRAM, SUMMING AMPLIFIER CIRCUIT BOARD	AD911-0062
3-3	SCHEMATIC DIAGRAM, CUE SPEAKER/HEADPHONE AMPLIFIER CIRCUIT BOARD	SC911-0065-002
3-4	ASSEMBLY DIAGRAM, CUE SPEAKER/HEADPHONE AMPLIFIER CIRCUIT BOARD	AB911-0065-002

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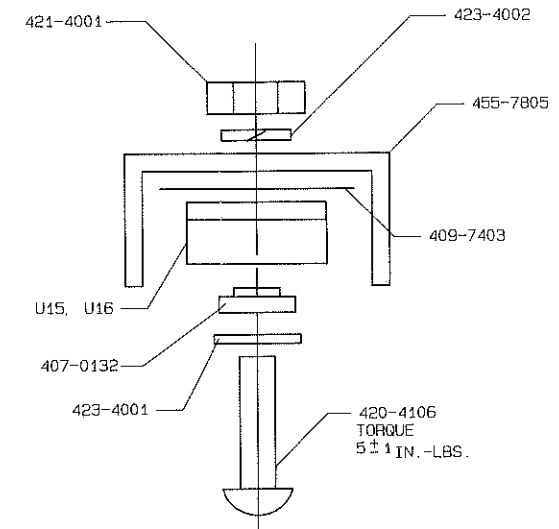
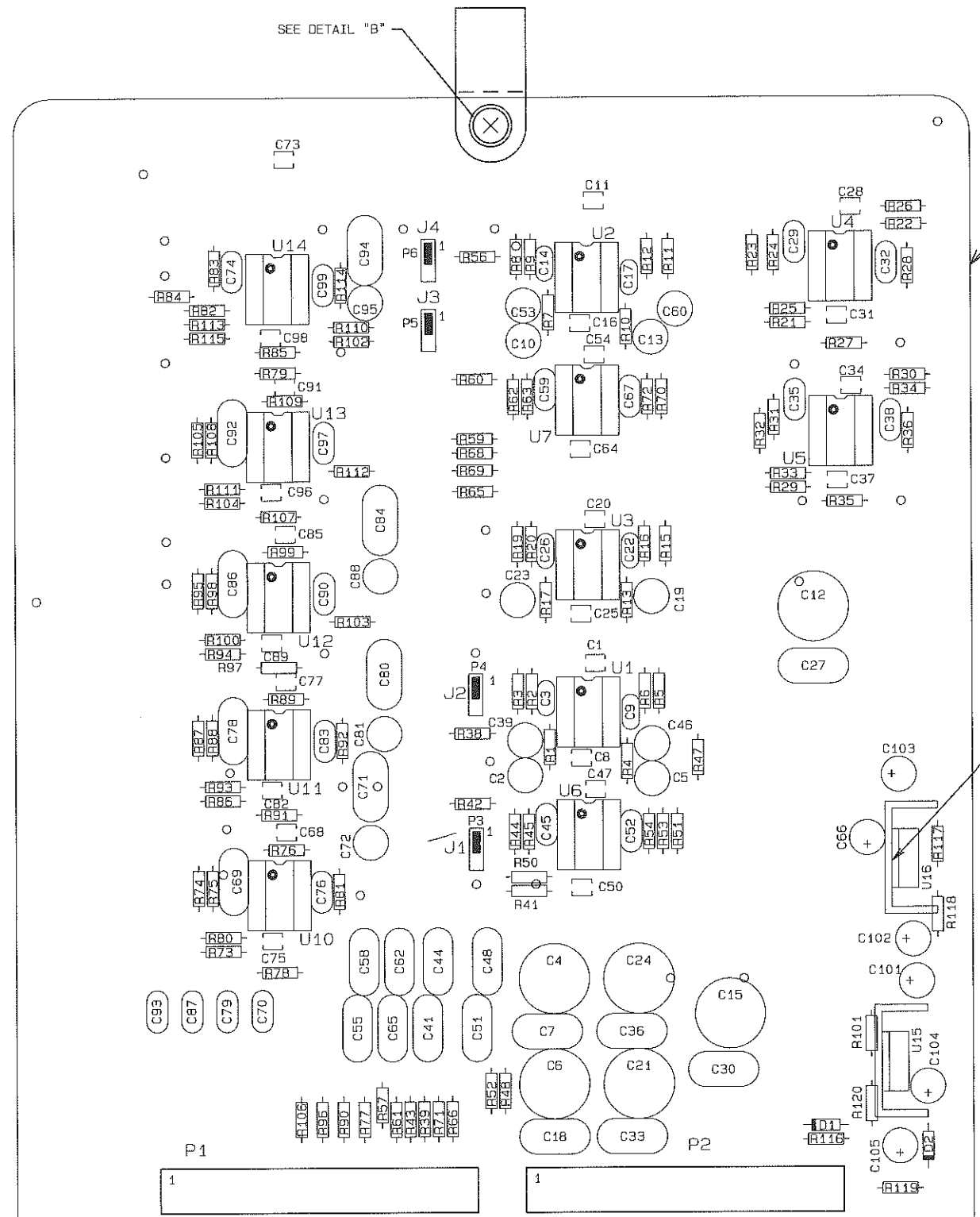


- NOTES:
1. ALL RESISTORS IN OHMS 1/4W 5%; ALL CAPACITORS IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENTS USED: U14, R120, C105, D2, Q2, J4, P6
 3. COMPONENTS NOT USED: C100
 4. SEE PCB ASSEMBLY 911-0062

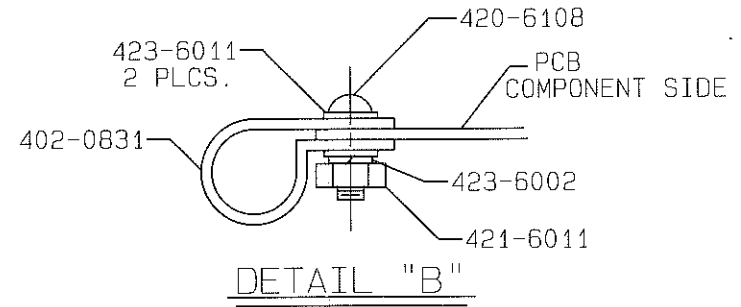


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TOLERANCE DECIMAL U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°	TITLE: PCB SCHEMATIC-SUMMING AMPLIFIER TYPE: S SIZE: D DWG. NO.: 911-0062 MODEL: MT90 SCALE: NONE SHEET: 1 OF 1	REV: [Blank]	[Blank]	[Blank]

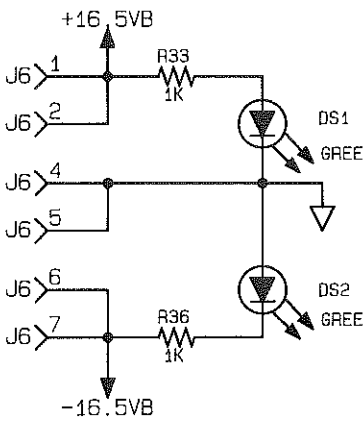
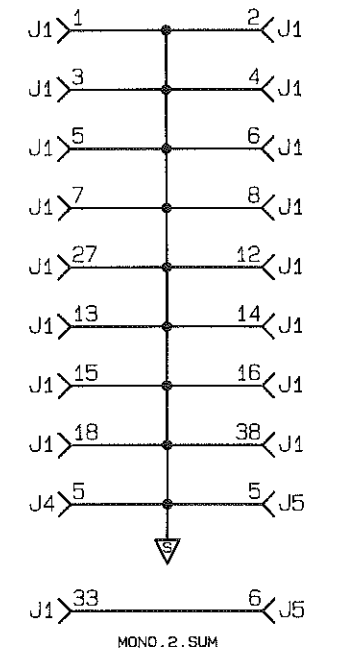
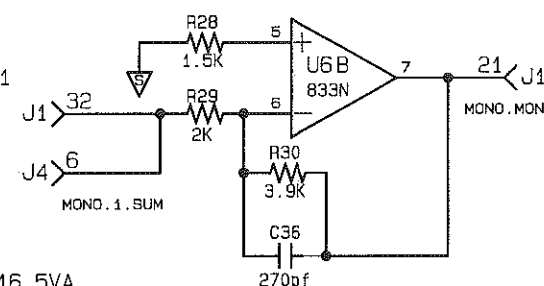
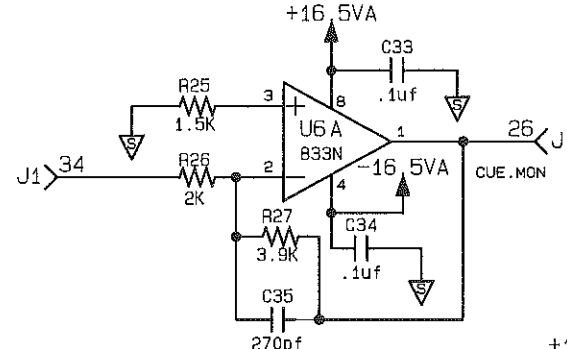
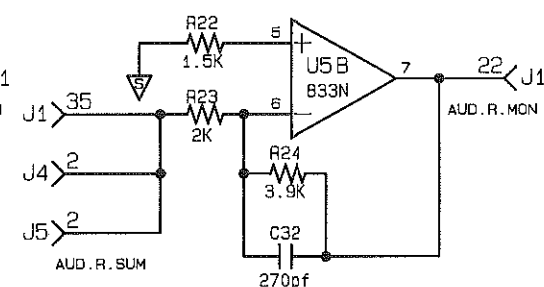
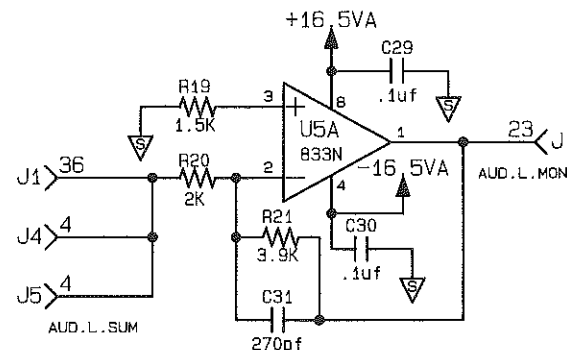
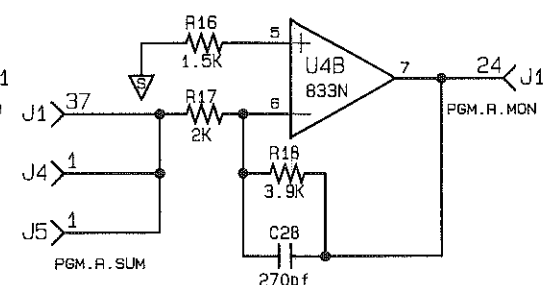
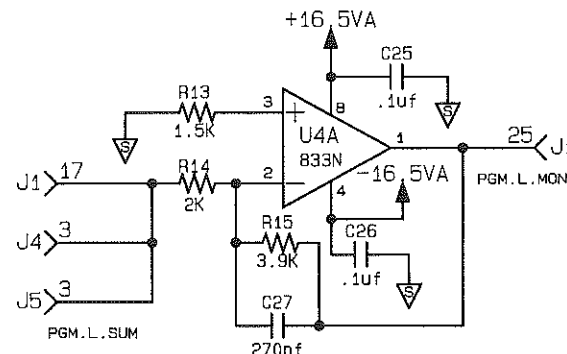
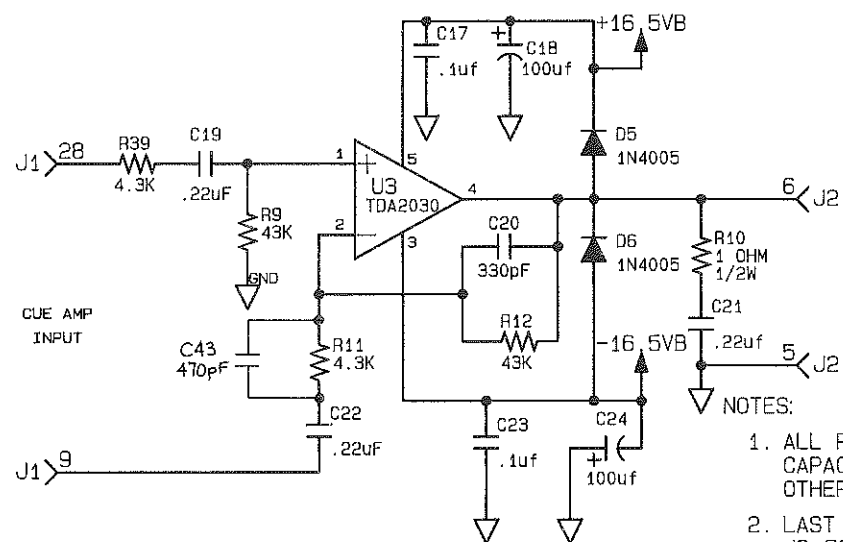
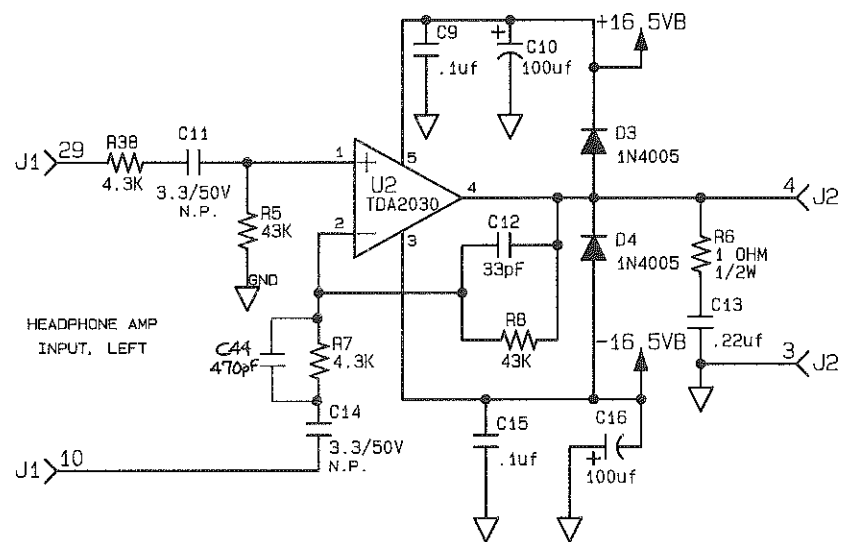
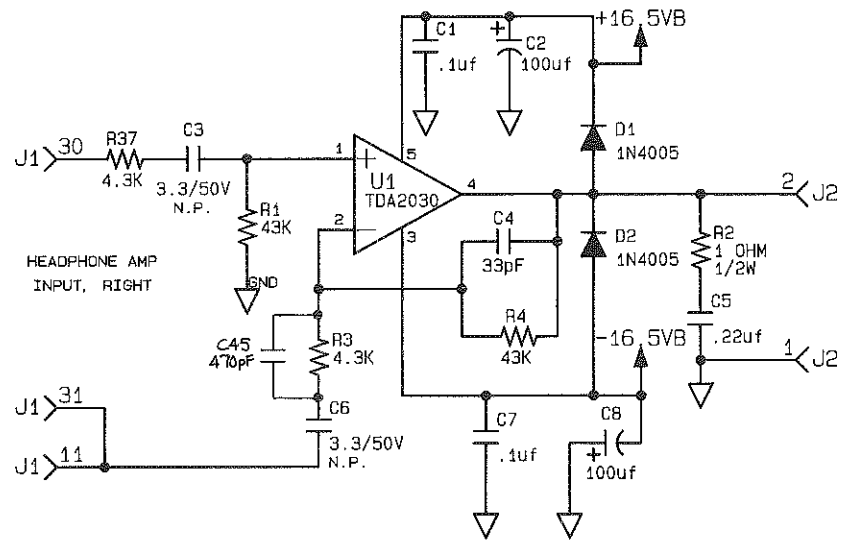


DETAIL "A"
TYP. 2 PLCS. SCL. 1.5



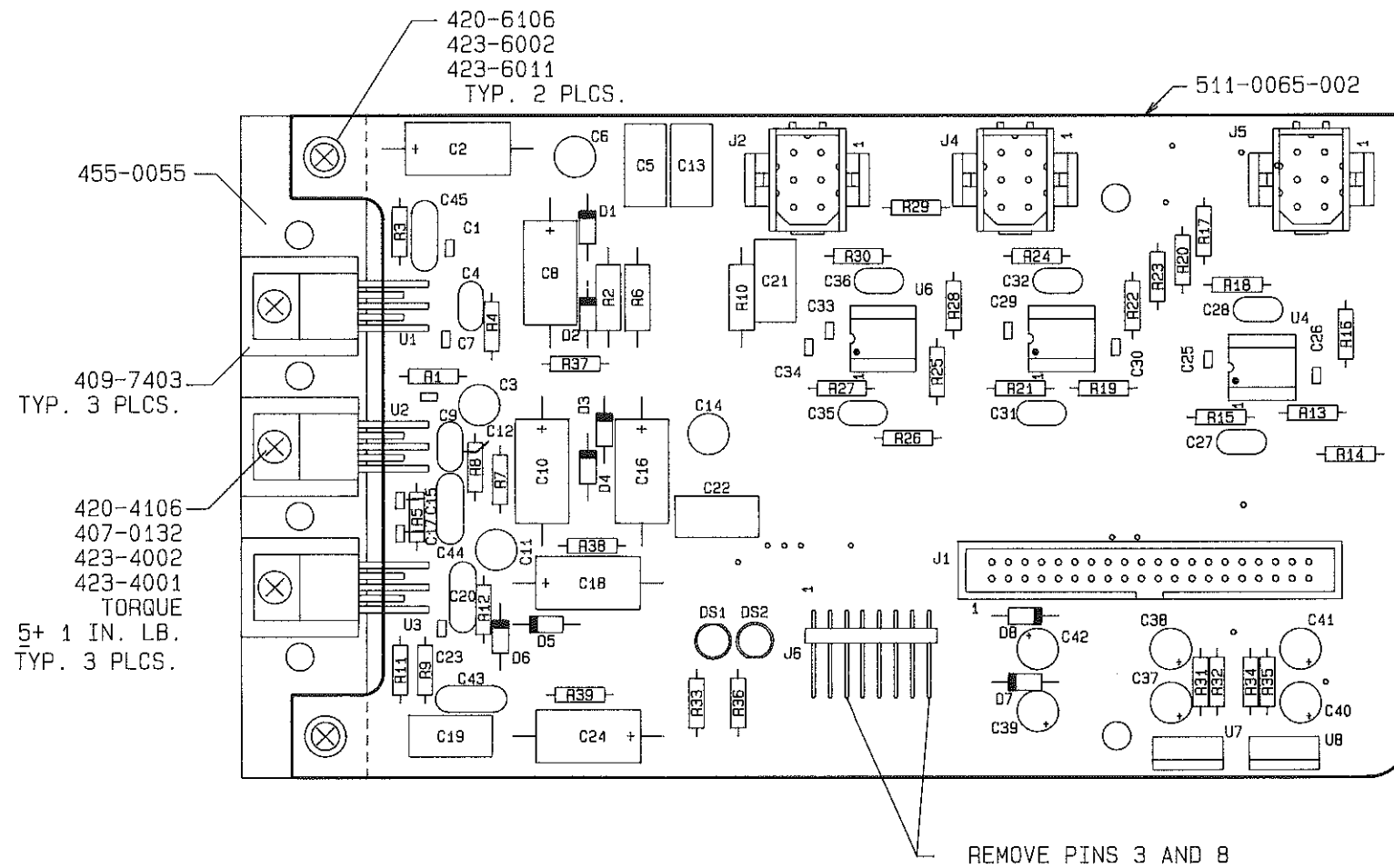
DETAIL "B"

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	CHKD MH 8-22-88	FINISH	
TOLERANCE DECIMAL U.S.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°	PROJ. ENGR. MFG.	TITLE PCB ASSEMBLY - SUMMING AMPLIFIER	TYPE SIZE DWG NO. REV A D 911-0062 E
		NEXT ASSY 901-9012 "12CH" 901-9018 "18CH"	MODEL MT90 SCALE 2/1 SHEET 1 OF 1



- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5%; ALL CAPACITORS IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENTS USED: C45, D8, DS2, J6, R39, U8.
 3. COMPONENTS NOT USED: J3
 4. SEE PCB ASSEMBLY AC911-0065-002

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TOLERANCE DECIMAL U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°		CHKD M 7-17-89	911-0065-002	
ME		FINISH	TITLE SCHEMATIC-CUE SPEAKER / HEADPHONE AMPLIFIER	TYPE SIZE DWG. NO. REV S C 911-0065-002 C
PROJ ENGR M 7-12-89		NEXT ASSY AC911-0065-002	MODEL MT90 SCALE NONE SHEET 1 OF 1	



NOTE:
1. SEE SCHEMATIC SC 911-0065-002

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TOLERANCE (DECIMAL) U.O.S.
.X ± .030 .XXX ± .005
.XX ± .015 ANGLES + 1°

DWN. BY	JAH 9-5-91
CHKD	MH 7-17-89
ME	JHS 7-25-89
PROJ. ENGR.	RMCD 7-25-89
MFG.	PRB 7-25-89

MATERIAL	SEE B/M 911-0065-002
FINISH	SEE DWG RA592-0000
NEXT ASSY.	901-9012 (12 CH) 901-9018 (18 CH)

BE BROADCAST ELECTRONICS INC.			
4100 N. 24TH ST. P.O. BOX 3606 QUINCY, IL. 62305 PH. 217/224-9600 TELEX 250142 CABLE BROADCAST FAX 217/224-9607			
TITLE PCB ASSEMBLY HEADPHONE AND CUE SPEAKER POWER AMP BD			
TYPE	SIZE	DWG No.	REV
A	B	911-0065-002	C
MODEL	MT90	SCALE	1=1
		SHEET	1 OF 1

SECTION IV

SUMMING AMPLIFIER CIRCUIT BOARD

CUE SPEAKER/HEADPHONE AMPLIFIER CIRCUIT BOARD

PARTS LIST

4-1. INTRODUCTION.

4-2. This section provides descriptions and part numbers of electrical components and assemblies required for maintenance of the summing amplifier and cue speaker/headphone amplifier circuit boards. Each table entry in this section is indexed by the reference designators appearing on the applicable schematic diagram.

**TABLE 4-1. SUMMING AMPLIFIER AND CUE SPEAKER AMPLIFIER CIRCUIT BOARDS
PARTS LIST INDEX**

TABLE	TITLE	PART NO.	PAGE
4-2	SUMMING AMPLIFIER CIRCUIT BOARD ASSEMBLY	911-0062	4-1
4-3	CUE SPEAKER/HEADPHONE AMPLIFIER CIRCUIT BOARD ASSEMBLY	911-0065-002	4-5

**TABLE 4-2. SUMMING AMPLIFIER CIRCUIT BOARD ASSEMBLY - 911-0062
(Sheet 1 of 5)**

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C2	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C3	Capacitor, Mica, 120 pF ±5%, 500V	042-1222	1
C4	Capacitor, Electrolytic, 330 uF, 25V Non-Polarized	020-3385	1
C5	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C6	Capacitor, Electrolytic, 330 uF, 25V Non-Polarized	020-3385	1
C7	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C8	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C9	Capacitor, Mica, 120 pF ±5%, 500V	042-1222	1
C10	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C11	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C12	Capacitor, Electrolytic, 330 uF, 25V Non-Polarized	020-3385	1
C13	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C14	Capacitor, Mica, 120 pF ±5%, 500V	042-1222	1
C15	Capacitor, Electrolytic, 330 uF, 25V Non-Polarized	020-3385	1
C16	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C17	Capacitor, Mica, 120 pF ±5%, 500V	042-1222	1
C18	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C19	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1

TABLE 4-2. SUMMING AMPLIFIER CIRCUIT BOARD ASSEMBLY - 911-0062
(Sheet 2 of 5)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C20	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C21	Capacitor, Electrolytic, 330 uF, 25V Non-Polarized	020-3385	1
C22	Capacitor, Mica, 120 pF ±5%, 500V	042-1222	1
C23	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C24	Capacitor, Electrolytic, 330 uF, 25V Non-Polarized	020-3385	1
C25	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C26	Capacitor, Mica, 120 pF ±5%, 500V	042-1222	1
C27	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C28	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C29	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C30	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C31	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C32	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C33	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C34	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C35	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C36	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C37	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C38	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C39	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C41,C44	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	2
C45	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C46	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C47	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C48	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C50	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C51	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C52	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C53	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C54	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C55,C58	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	2
C59	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C60	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C62	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C64	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C65	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C66	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C67	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C68	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C69	Capacitor, Mica 10 pF ±5%, 500V	042-1012	1
C70	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C71	Capacitor, Mylar Film, 0.1 uF ±10%, 100V	030-1053	1
C72	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C73	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C74	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C75	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C76	Capacitor, Silvered Mica, 100 pF ±5%, 500V	040-1022	1
C77	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1

TABLE 4-2. SUMMING AMPLIFIER CIRCUIT BOARD ASSEMBLY - 911-0062
(Sheet 3 of 5)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C78	Capacitor, Mica 10 pF $\pm 5\%$, 500V	042-1012	1
C79	Capacitor, Mica, 33 pF $\pm 5\%$, 500V	042-3312	1
C80	Capacitor, Mylar Film, 0.1 uF $\pm 10\%$, 100V	030-1053	1
C81	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C82	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C83	Capacitor, Silvered Mica, 100 pF $\pm 5\%$, 500V	040-1022	1
C84	Capacitor, Mylar Film, 0.1 uF $\pm 10\%$, 100V	030-1053	1
C85	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C86	Capacitor, Mica 10 pF $\pm 5\%$, 500V	042-1012	1
C87	Capacitor, Mica, 33 pF $\pm 5\%$, 500V	042-3312	1
C88	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C89	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C90	Capacitor, Silvered Mica, 100 pF $\pm 5\%$, 500V	040-1022	1
C91	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C92	Capacitor, Mica 10 pF $\pm 5\%$, 500V	042-1012	1
C93	Capacitor, Mica, 33 pF $\pm 5\%$, 500V	042-3312	1
C94	Capacitor, Mylar Film, 0.1 uF $\pm 10\%$, 100V	030-1053	1
C95	Capacitor, Electrolytic, 10 uF, 35V	023-1075	1
C96	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C97	Capacitor, Silvered Mica, 100 pF $\pm 5\%$, 500V	040-1022	1
C98	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C99	Capacitor, Silvered Mica, 100 pF $\pm 5\%$, 500V	040-1022	1
C101 THRU C105	Capacitor, Electrolytic, 10 uF, 35V	023-1076	5
D1,D2	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	2
J1 THRU J4	Connector, Header, 3-Pin	417-0003	4
P1,P2	Receptacle, 40-Pin Dual In-line	417-4041	2
P3 THRU P6	Jumper, Programmable, 2-Pin	340-0004	4
R1	Resistor, 6.8 k Ohm $\pm 5\%$, 1/4W	100-6843	1
R2	Resistor, 6.81 k Ohm $\pm 1\%$, 1/4W	103-6814	1
R3	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1023	1
R4	Resistor, 6.8 k Ohm $\pm 5\%$, 1/4W	100-6843	1
R5	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1023	1
R6	Resistor, 6.81 k Ohm $\pm 1\%$, 1/4W	103-6814	1
R7	Resistor, 6.8 k Ohm $\pm 5\%$, 1/4W	100-6843	1
R8	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1023	1
R9	Resistor, 6.81 k Ohm $\pm 1\%$, 1/4W	103-6814	1
R10	Resistor, 6.8 k Ohm $\pm 5\%$, 1/4W	100-6843	1
R11	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1023	1
R12	Resistor, 6.81 k Ohm $\pm 1\%$, 1/4W	103-6814	1
R13	Resistor, 6.8 k Ohm $\pm 5\%$, 1/4W	100-6843	1
R15	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1023	1
R16	Resistor, 6.81 k Ohm $\pm 1\%$, 1/4W	103-6814	1
R17	Resistor, 6.8 k Ohm $\pm 5\%$, 1/4W	100-6843	1
R19	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1023	1
R20	Resistor, 6.81 k Ohm $\pm 1\%$, 1/4W	103-6814	1
R21	Resistor, 33 k Ohm $\pm 5\%$, 1/4W	100-3353	1
R22	Resistor, 51 Ohm $\pm 5\%$, 1/4W	100-5123	1

TABLE 4-2. SUMMING AMPLIFIER CIRCUIT BOARD ASSEMBLY - 911-0062
(Sheet 4 of 5)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R23	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R24	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R25	Resistor, 33 k Ohm $\pm 5\%$, 1/4W	100-3353	1
R26	Resistor, 51 Ohm $\pm 5\%$, 1/4W	100-5123	1
R27	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R28	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R29	Resistor, 33 k Ohm $\pm 5\%$, 1/4W	100-3353	1
R30	Resistor, 51 Ohm $\pm 5\%$, 1/4W	100-5123	1
R31	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R32	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R33	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R34	Resistor, 51 Ohm $\pm 5\%$, 1/4W	100-5123	1
R35	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R36	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R38,R39	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R41	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R42,R43	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R44,R45	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	2
R47,R48	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R50	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R51,R52	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R53,R54	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	2
R56,R57	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R59	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R60,R61	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R62,R63	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	2
R65,R66	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R68	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R69	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	1
R70	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R71	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	1
R72	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R73	Resistor, 5.1 k Ohm $\pm 5\%$, 1/4W	100-5143	1
R74,R75,R76	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	3
R77,R78	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	2
R79,R80	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	2
R81	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R82,R83	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	2
R84	Resistor, 1.6 k Ohm $\pm 5\%$, 1/4W	100-1643	1
R85	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R86	Resistor, 5.1 k Ohm $\pm 5\%$, 1/4W	100-5143	1
R87,R88,R89	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	3
R90,R91	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	2
R92	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R93	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R94	Resistor, 5.1 k Ohm $\pm 5\%$, 1/4W	100-5143	1

TABLE 4-2. SUMMING AMPLIFIER CIRCUIT BOARD ASSEMBLY - 911-0062
(Sheet 5 of 5)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R95	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R96,R97	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	2
R98,R99	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	2
R100	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R101	Resistor, 121 Ohm $\pm 1\%$, 1/4W	100-1231	1
R102	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R103	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R104	Resistor, 5.1 k Ohm $\pm 5\%$, 1/4W	100-5143	1
R105	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R106,R107	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	2
R108,R109	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	2
R110,R111	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	2
R112	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R113	Resistor, 1.6 k Ohm $\pm 5\%$, 1/4W	100-1643	1
R114,R115	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	2
R116	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1024	1
R117	Resistor, 121 Ohm $\pm 1\%$, 1/4W	100-1231	1
R118	Resistor, 1.47 k Ohm $\pm 1\%$, 1/4W	103-1474	1
R119	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1024	1
R120	Resistor, 1.47 k Ohm $\pm 1\%$, 1/4W	103-1474	1
U1,U2,U3	Integrated Circuit, NE5532AP, Dual Low-Noise Operational Amplifier, 8-Pin DIP	221-5532-001	3
U4,U5	Integrated Circuit, LF353N, Dual JFET-Input Operational Amplifier, 8-Pin DIP	221-0353	2
U6,U7	Integrated Circuit, NE5532AP, Dual Low-Noise Operational Amplifier, 8-Pin DIP	221-5532-001	2
U10 THRU U13	Integrated Circuit, LM833N, Dual Audio Operational Amplifier,	220-0833	4
U14	Integrated Circuit, NE5532AP, Dual Low-Noise Operational Amplifier, 8-Pin DIP	221-5532-001	1
U15	Integrated Circuit, LM337T, Adjustable Negative Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0337	1
U16	Integrated Circuit, LM317T, Adjustable Positive Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0317	1
XU1 THRU XU7, XU10 THRU XU14	Socket, 8-Pin DIP	417-0804	12
—	Blank Summing Amplifier Circuit Board	511-0062	1

TABLE 4-3. CUE SPEAKER/HEADPHONE AMPLIFIER CIRCUIT BOARD ASSEMBLY - 911-0065-002
(Sheet 1 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1	Capacitor, Monolithic Ceramic, 0.1 uf $\pm 20\%$, 50V	003-1054	1
C2	Capacitor, Electrolytic, 100 uF, 25V	013-1084	1
C3	Capacitor, Electrolytic, 3.3 uF, 50V	024-3364	1
C4	Capacitor, Mica, 33 pF $\pm 5\%$, 500V	042-3312	1
C5	Capacitor, Mylar Film, 0.22 uF $\pm 10\%$, 100V	030-2253	1

TABLE 4-3. CUE SPEAKER/HEADPHONE AMPLIFIER CIRCUIT BOARD ASSEMBLY -
911-0065-002 (Sheet 2 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C6	Capacitor, Electrolytic, 3.3 uF, 50V	024-3364	1
C7	Capacitor, Monolythic Ceramic. 0.1 uF ±20%, 50V	003-1054	1
C8	Capacitor, Electrolytic, 100 uF, 25V	013-1084	1
C9	Capacitor, Monolythic Ceramic. 0.1 uF ±20%, 50V	003-1054	1
C10	Capacitor, Electrolytic, 100 uF, 25V	013-1084	1
C11	Capacitor, Electrolytic, 3.3 uF, 50V	024-3364	1
C12	Capacitor, Mica, 33 pF ±5%, 500V	042-3312	1
C13	Capacitor, Mylar Film, 0.22 uF ±10%, 100V	030-2253	1
C14	Capacitor, Electrolytic, 3.3 uF, 50V	024-3364	1
C15	Capacitor, Monolythic Ceramic. 0.1 uF ±20%, 50V	003-1054	1
C16	Capacitor, Electrolytic, 100 uF, 25V	013-1084	1
C17	Capacitor, Monolythic Ceramic. 0.1 uF ±20%, 50V	003-1054	1
C18	Capacitor, Electrolytic, 100 uF, 25V	013-1084	1
C19	Capacitor, Mylar Film, 0.22 uF ±10%, 100V	030-2253	1
C20	Capacitor, Mica, 330 pF ±5%, 500V	042-3322	1
C21,C22	Capacitor, Mylar Film, 0.22 uF ±10%, 100V	030-2253	2
C23	Capacitor, Monolythic Ceramic. 0.1 uF ±20%, 50V	003-1054	1
C24	Capacitor, Electrolytic, 100 uF, 25V	013-1084	1
C25,C26	Capacitor, Monolythic Ceramic. 0.1 uF ±20%, 50V	003-1054	2
C27,C28	Capacitor, Mica, 270 pF ±5%, 300V	041-2722	2
C29,C30	Capacitor, Monolythic Ceramic. 0.1 uF ±20%, 50V	003-1054	2
C31,C32	Capacitor, Mica, 270 pF ±5%, 300V	041-2722	2
C33,C34	Capacitor, Monolythic Ceramic. 0.1 uF ±20%, 50V	003-1054	2
C35,C36	Capacitor, Mica, 270 pF ±5%, 300V	041-2722	2
C37 THRU C42	Capacitor, Electrolytic, 10 uF, 50V	023-1076	6
C43 THRU C45	Capacitor, Mica, 470 pF +1%, 500V	040-4721	3
D1 THRU D8	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	8
DS1,DS2	Indicator, LED, Green, 521-9175, 3V @ 40 mA Maximum	323-9224	2
J1	Connector, Header, 40-Pin	417-0173	1
J2,J4,J5	Receptacle, 6-Pin	417-0677	3
J6	Receptacle, Male, 8-Pin In-line, Right Angle	417-0080-001	1
R1	Resistor, 43 k Ohm ±5%, 1/4W	100-4353	1
R2	Resistor, 1 Ohm ±5%, 1/2W	110-1013	1
R3	Resistor, 4.3 k Ohm ±5%, 1/4W	100-4343	1
R4,R5	Resistor, 43 k Ohm ±5%, 1/4W	100-4353	2
R6	Resistor, 1 Ohm ±5%, 1/2W	110-1013	1
R7	Resistor, 4.3 k Ohm ±5%, 1/4W	100-4343	1
R8,R9	Resistor, 43 k Ohm ±5%, 1/4W	100-4353	2
R10	Resistor, 1 Ohm ±5%, 1/2W	110-1013	1
R11	Resistor, 4.3 k Ohm ±5%, 1/4W	100-4343	1
R12	Resistor, 43 k Ohm ±5%, 1/4W	100-4353	1
R13	Resistor, 1.5 k Ohm ±5%, 1/4W	100-1543	1
R14	Resistor, 2 k Ohm ±5%, 1/4W	100-2043	1
R15	Resistor, 3.9 k Ohm ±5%, 1/4W	100-3943	1
R16	Resistor, 1.5 k Ohm ±5%, 1/4W	100-1543	1
R17	Resistor, 2 k Ohm ±5%, 1/4W	100-2043	1
R18	Resistor, 3.9 k Ohm ±5%, 1/4W	100-3943	1

TABLE 4-3. CUE SPEAKER/HEADPHONE AMPLIFIER CIRCUIT BOARD ASSEMBLY -
911-0065-002 (Sheet 3 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R19	Resistor, 1.5 k Ohm $\pm 5\%$, 1/4W	100-1543	1
R20	Resistor, 2 k Ohm $\pm 5\%$, 1/4W	100-2043	1
R21	Resistor, 3.9 k Ohm $\pm 5\%$, 1/4W	100-3943	1
R22	Resistor, 1.5 k Ohm $\pm 5\%$, 1/4W	100-1543	1
R23	Resistor, 2 k Ohm $\pm 5\%$, 1/4W	100-2043	1
R24	Resistor, 3.9 k Ohm $\pm 5\%$, 1/4W	100-3943	1
R25	Resistor, 1.5 k Ohm $\pm 5\%$, 1/4W	100-1543	1
R26	Resistor, 2 k Ohm $\pm 5\%$, 1/4W	100-2043	1
R27	Resistor, 3.9 k Ohm $\pm 5\%$, 1/4W	100-3943	1
R28	Resistor, 1.5 k Ohm $\pm 5\%$, 1/4W	100-1543	1
R29	Resistor, 2 k Ohm $\pm 5\%$, 1/4W	100-2043	1
R30	Resistor, 3.9 k Ohm $\pm 5\%$, 1/4W	100-3943	1
R31	Resistor, 121 Ohm $\pm 1\%$, 1/4W	100-1231	1
R32	Resistor, 1.47 k Ohm $\pm 1\%$, 1/4W	103-1474	1
R33	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R34	Resistor, 121 Ohm $\pm 1\%$, 1/4W	100-1231	1
R35	Resistor, 1.47 k Ohm $\pm 1\%$, 1/4W	103-1474	1
R36	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R37,R38,R39	Resistor, 4.8 k Ohm $\pm 5\%$, 1/4W	100-4343	3
U1,U2,U3	Integrated Circuit, TDA2030V, Audio Power Amplifier, 14W Output, Pentawatt Package	220-2030	3
U4,U5,U6	Integrated Circuit, LM833N, Dual Audio Operational Amplifier, 8-Pin DIP	220-0833	3
U7	Integrated Circuit, LM317T, Adjustable Positive Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0317	1
U8	Integrated Circuit, LM337T, Adjustable Negative Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0337	1
XU4,XU5,XU6	Socket, 8-Pin DIP	417-0804	3
—	Blank Cue Speaker/Headphone Amplifier Circuit Board	511-0065	1

OUTPUT AMPLIFIER CIRCUIT BOARD

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SECTION I

OUTPUT AMPLIFIER CIRCUIT BOARD

THEORY OF OPERATION

1-1. INTRODUCTION.

1-2. The following text provides detailed theory of operation for the Mix-Trak 90 series audio console output amplifier circuit board. A detailed block diagram of the output amplifier circuitry is presented in Figure 1-1. Refer to Figure 1-1 as required for the following circuit discussion.

1-3. The text describes the output amplifier audio circuitry. The audio circuit left and right channels are identical, therefore only the left channel will be discussed.

1-4. FUNCTIONAL DESCRIPTION.

1-5. OUTPUT AMPLIFIER CIRCUIT.

1-6. Left channel audio is applied to a preamplifier stage consisting of operational amplifier U3B and left channel output level control R69. The stage is configured with a gain range of ± 6 dB. The output from preamplifier U3B is applied to an output amplifier network consisting of integrated circuits U4A/B, U9, U10, and U12.

1-7. Audio from U3B is applied to the output amplifier network in an inverted and non-inverted format. Inverted audio from U3A is applied to an amplifier stage consisting of U4A and U9. Non-inverted audio from U3B is applied to a second amplifier stage consisting of U4B and U10. Together, U4A/U9 and U4B/U10 operate as a balanced output amplifier stage with a gain of one.

1-8. Amplifier U12 is designed as a monitoring stage. U12 monitors the output load for unbalanced audio output conditions. When the audio output load is balanced, the input of U12 is at virtual ground which isolates the stage from the circuit. When either the positive or negative output terminals are grounded, an audio signal will be applied to U12. U12 will output a signal to increase the gain of the remaining amplifier network. As a result, the network will output a normal signal into a balanced or unbalanced output condition.

1-9. METER OVERLOAD INDICATOR CIRCUIT.

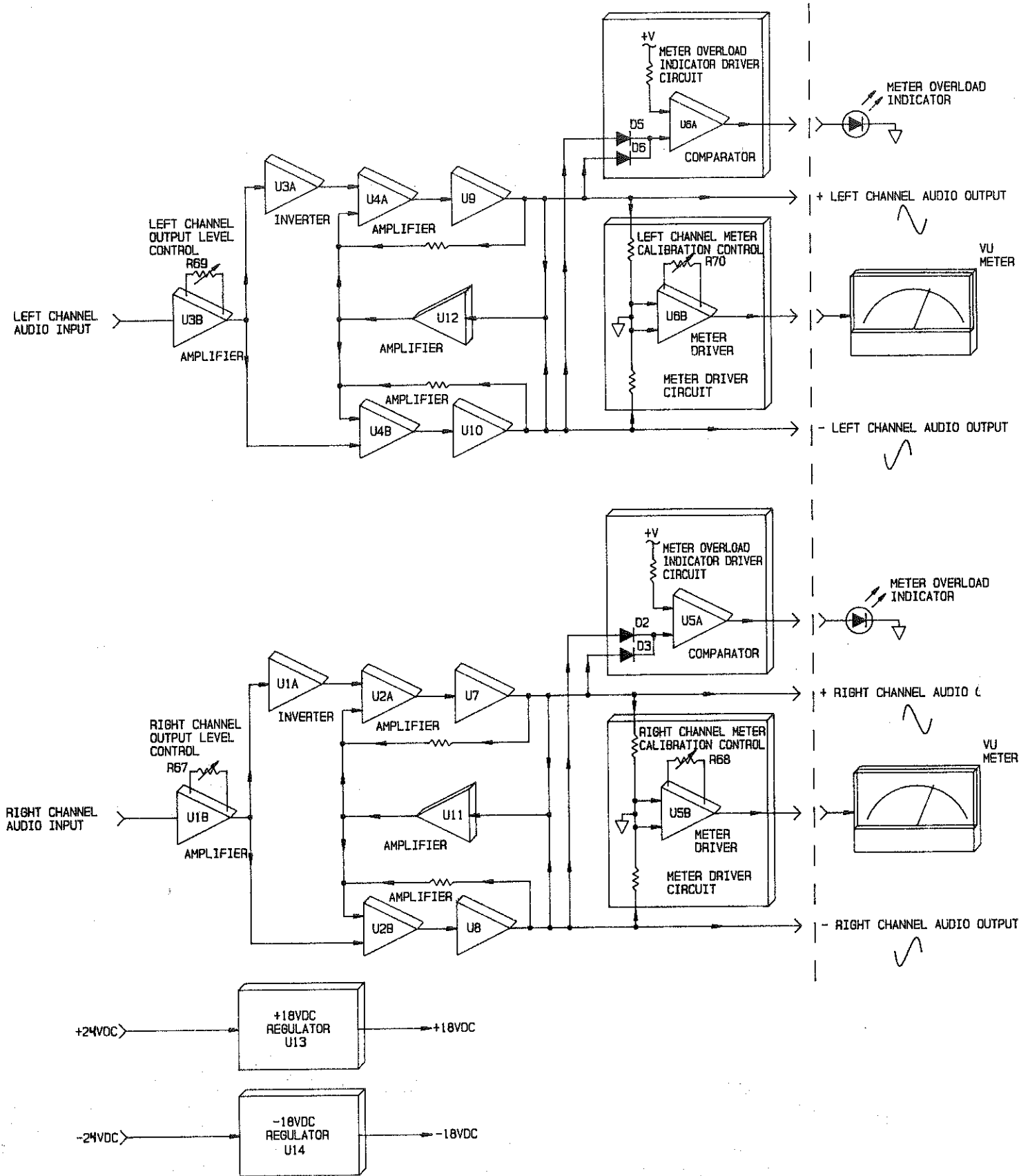
1-10. Samples from the output amplifier network are applied to a meter indicator driver circuit consisting of comparator U6A. The samples are summed at diodes D5 and D6 and applied to the input of comparator U6A. When the sample level increases above approximately +28 dB, the output of comparator U6A will go HIGH. The HIGH is routed to the meter to illuminate the overload indicator.

1-11. METER DRIVER CIRCUIT.

1-12. Samples from the output amplifier network are also applied to a meter driver circuit. The samples are differentially amplified at U6B. The output of U6B is routed to drive a console VU meter. Potentiometer R70 provides left channel meter calibration control.

1-13. POWER SUPPLY CIRCUIT.

1-14. DC operating potentials for application to the output amplifier circuit board components are produced by a regulator network. Unregulated ± 24 V dc supplies from the console power supply module are applied to +18 volt dc regulator U13 and -18 volt dc regulator U14. U13/U14 are three terminal adjustable regulators containing internal thermal and short-circuit current limiting features. The regulated ± 18 volt outputs from U13 and U14 are routed for application to the circuit board audio components.



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FIGURE 1-1. OUTPUT AMPLIFIER CIRCUIT BOARD DETAILED BLOCK DIAGRAM

SECTION II

OUTPUT AMPLIFIER CIRCUIT BOARD MAINTENANCE

2-1. INTRODUCTION.

2-2. This section provides general maintenance information, electrical adjustment procedures, and troubleshooting information for the output amplifier circuit board.

2-3. FIRST LEVEL MAINTENANCE.

2-4. First level maintenance consists of precautionary procedures applied to the equipment to prevent future failures. The procedures are performed on a regular basis and the results recorded in a performance log.

2-5. The output amplifier circuit board should be periodically cleaned of accumulated dust using a nylon-bristle brush and vacuum cleaner. Inspect the module for improperly seated semiconductors and components damaged by overheating.

2-6. SECOND LEVEL MAINTENANCE.

2-7. Second level maintenance consists of procedures required to restore an output amplifier module to operation after a fault has occurred. The procedures are divided into electrical adjustments, troubleshooting information, and component replacement procedures.

2-8. ELECTRICAL ADJUSTMENTS.

2-9. **OUTPUT LEVEL/VU METER CALIBRATION.** Left channel output level control R69 and left channel VU meter control R70 calibrate the left channel output level and VU meter parameters. Right channel output level control R67 and right channel VU meter control R68 calibrate the right channel output level and VU meter parameters. The output level and VU meters are calibrated as follows.

2-10. **Required Equipment.** The following test equipment is required to calibrate the output level and VU meter.

- A. Allen Wrench (supplied with the console).
- B. Non-Metallic Adjustment Tool.
- C. Audio Signal Generator (Potomac AG-51 or equivalent).
- D. Audio Analyzer (Potomac AA-51 or equivalent).

2-11. **Procedure.** To calibrate the output level and VU meter, proceed as follows:

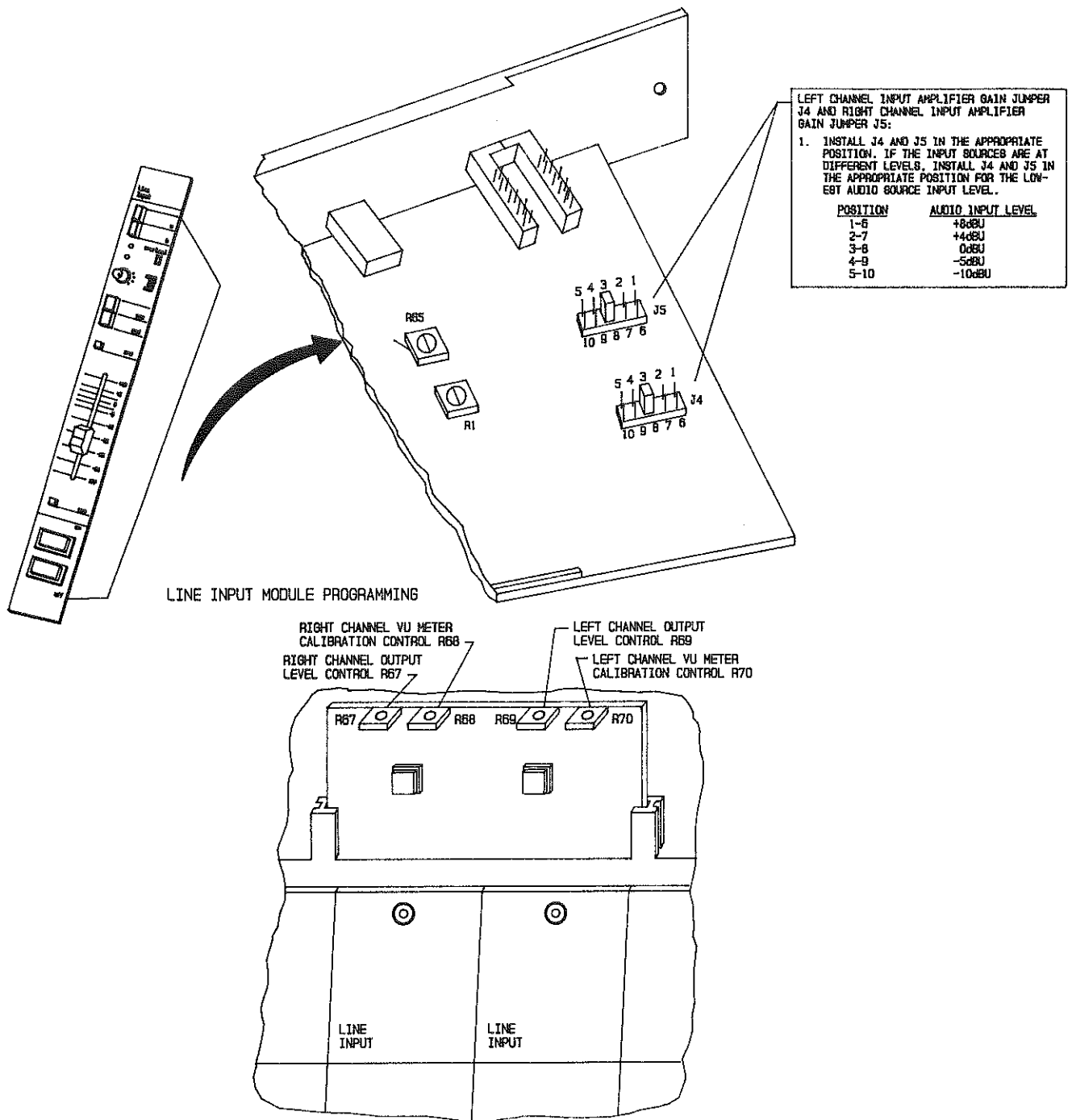
2-12. Remove a line input module from the console mainframe.

2-13. Connect the audio signal generator to the A or B left channel input on a line input module input/remote connector.

2-14. Refer to Figure 2-1 and install line input module jumpers J4 and J5 in the 0 dBu position. Replace the line input module.

2-15. Connect the audio analyzer between chassis ground and the left channel output pin on the connector for the output bus selected for calibration. Operate the analyzer for audio level indications.

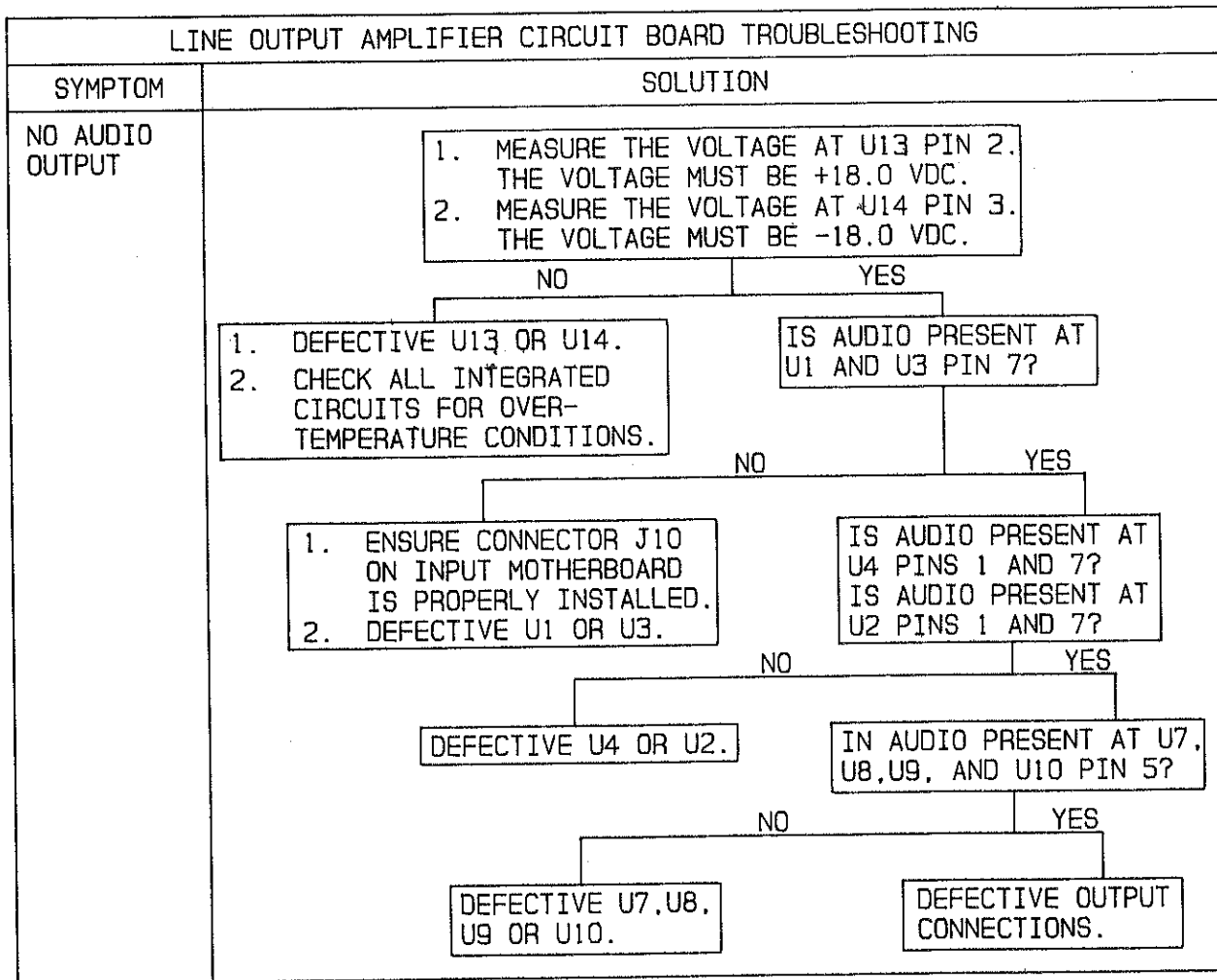
- 2-16. Adjust the audio generator for a 1 kHz output at 0 dBu.
- 2-17. Operate the line input module fader to the 0 position and route the test audio to the output bus selected for calibration.
- 2-18. Refer to Figure 2-1 and adjust left channel output level control R69 until the analyzer indicates the desired output level.
- 2-19. Refer to Figure 2-1 and adjust left channel VU meter calibration control R70 until the selected output bus VU meter indicates 0 VU.
- 2-20. Repeat the procedure for the right channel. Connect the analyzer to the right channel output and calibrate the output level with right channel output level control R67. Calibrate the VU meter with right channel VU meter calibration control R68.
- 2-21. Disconnect all test equipment, reprogram jumpers J4 and J5 on the line input module if required, and replace the line input module.
- 2-22. **TROUBLESHOOTING.**
- 2-23. The troubleshooting philosophy for the output amplifier circuit board assembly consists of isolating a problem to a specific circuit or group of components. Two 40-pin and one 50-pin extender ribbon cable assemblies are provided to interface plug-in modular assemblies to the chassis mounted motherboards for troubleshooting procedures.
- 2-24. Figure 2-2 presents the output amplifier circuit board troubleshooting information. Refer to Figure 2-2 to isolate a failure to a specific group of components.
- 2-25. Once trouble is isolated and power is totally deenergized, refer to the schematic diagrams and the theory of operation to assist in problem resolution. The defective component may be repaired locally or the entire module may be returned to Broadcast Electronics for repair or replacement.
- 2-26. **COMPONENT REPLACEMENT.**
- 2-27. Component replacement procedures for the console modular assemblies are presented in SECTION II, MAINTENANCE. Refer to SECTION II as required for the replacement procedures.



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FIGURE 2-1. LINE OUTPUT AMPLIFIER CONTROLS AND INDICATORS

WARNING: DISCONNECT PRIMARY POWER PRIOR TO SERVICING



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FIGURE 2-2. LINE OUTPUT AMPLIFIER CIRCUIT BOARD TROUBLESHOOTING

SECTION III

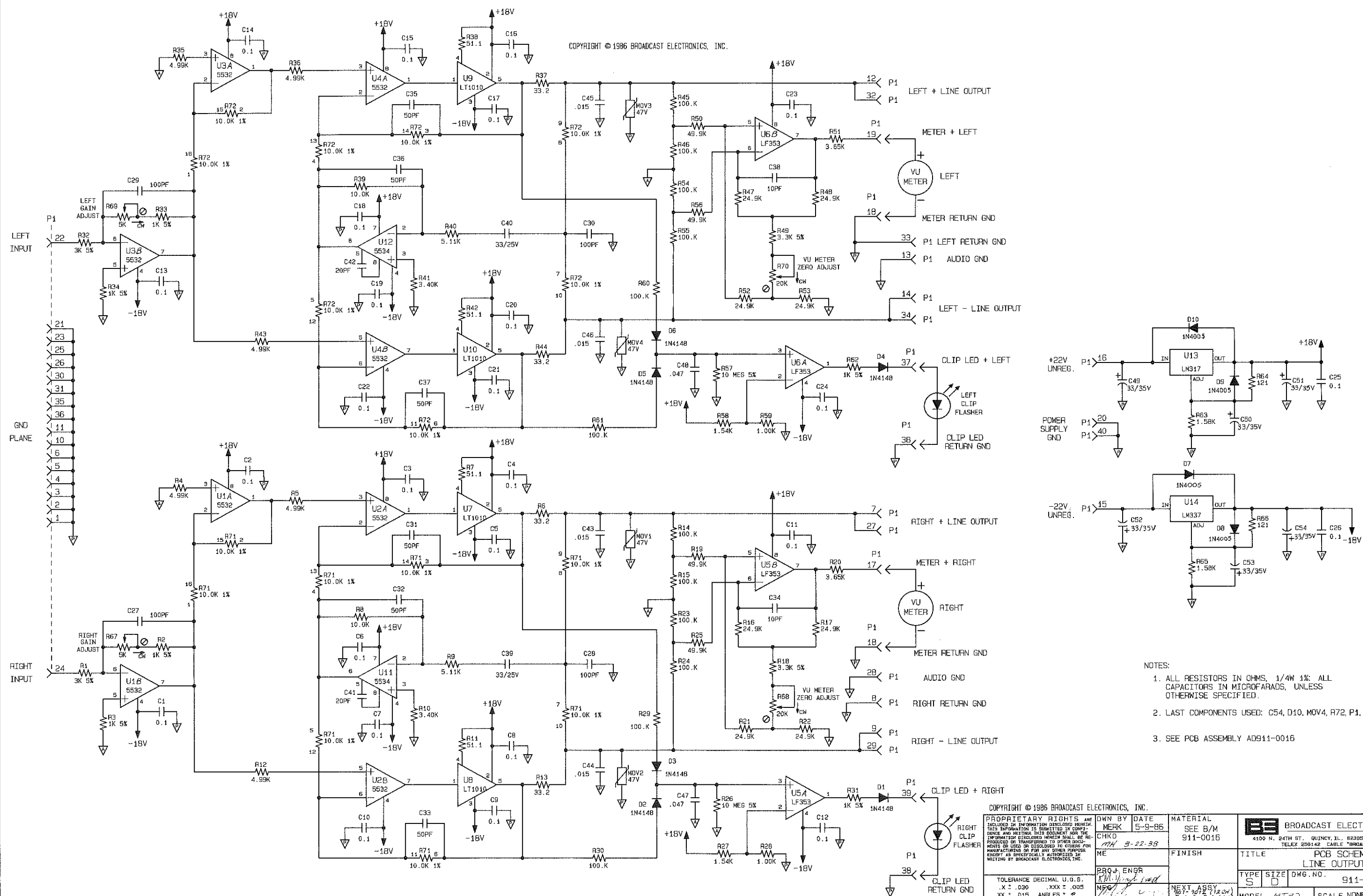
OUTPUT AMPLIFIER CIRCUIT BOARD DRAWINGS

3-1. INTRODUCTION.

3-2. This section provides assembly drawings and schematic diagrams as listed below for the output amplifier circuit board.

FIGURE	TITLE	NUMBER
3-1	SCHEMATIC DIAGRAM, OUTPUT AMPLIFIER CIRCUIT BOARD	SD911-0016
3-2	ASSEMBLY DIAGRAM, OUTPUT AMPLIFIER CIRCUIT BOARD	AC911-0016

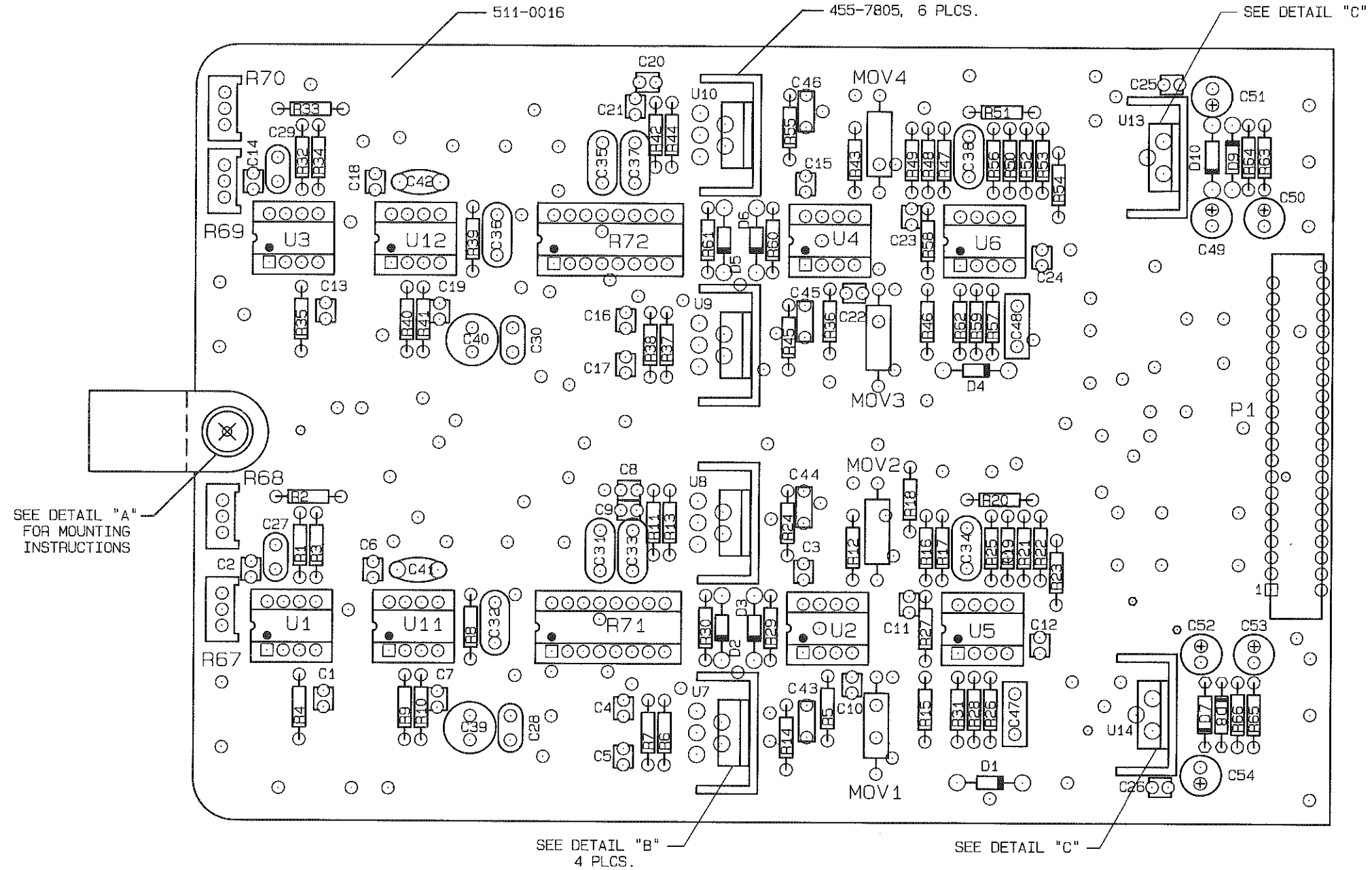
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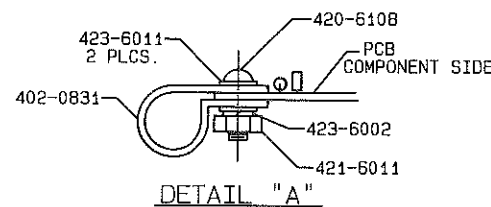
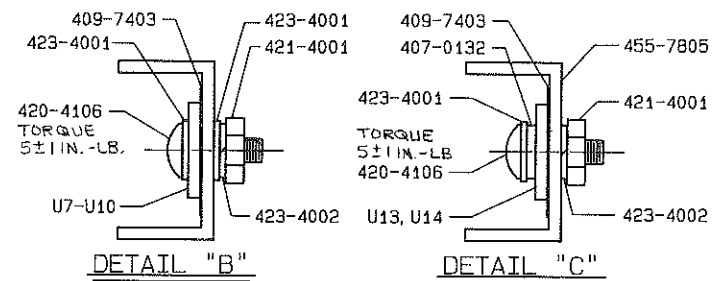
- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W 1%; ALL CAPACITORS IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENTS USED: C54, D10, MOV4, R72, P1, U14.
 3. SEE PCB ASSEMBLY AD911-0016

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<small>TOLERANCE DECIMAL U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± °</small>		NEXT ASSY 901-2012 (120V) 901-2012 (100V)	MODEL MT-D	SCALE NONE	SHEET 1 OF 1					



NOTE:
1. SEE SCHEMATIC SD911-0016.



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	CHKD MH 8-24-88	FINISH		
	ME 9/25/88	PROJ. ENGR [Signature]	NEXT ASSY 901-9012 (12 CH) 901-9018 (18 CH)	TITLE PCB ASSEMBLY- LINE OUTPUT MODULE
	MFG [Signature]	MODEL MT90	SCALE 2/1	SHEET 1 OF 1

TYPE	SIZE	DWG. NO.	REV
A	C	911-0016	B

SECTION IV

OUTPUT AMPLIFIER CIRCUIT BOARD PARTS LIST

4-1. INTRODUCTION.

4-2. This section provides descriptions and part numbers of electrical components and assemblies required for maintenance of the output amplifier circuit board. Each table entry in this section is indexed by the reference designators appearing on the applicable schematic diagram.

TABLE 4-1. OUTPUT AMPLIFIER CIRCUIT BOARD PARTS LIST INDEX

TABLE	TITLE	PART NO.	PAGE
4-2	LINE OUTPUT MODULE CIRCUIT BOARD ASSEMBLY	911-0016	4-1

TABLE 4-2. LINE OUTPUT MODULE ASSEMBLY - 911-0016
(Sheet 1 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1 THRU C26	Capacitor, Monolithic Ceramic, 0.1 uF \pm 20%, 50V	003-1054	26
C27 THRU C30	Capacitor, Silvered Mica, 100 pF \pm 5%, 500V	040-1022	4
C31, C32, C33	Capacitor, Mica, 50 pF \pm 5%, 500V	040-5013	3
C34	Capacitor, Ceramic Disc, 10 pF \pm 10%, 1kV, Non-Polarized	001-1014	1
C35, C36, C37	Capacitor, Mica, 50 pF \pm 5%, 500V	040-5013	3
C38	Capacitor, Ceramic Disc, 10 pF \pm 10%, 1kV, Non-Polarized	001-1014	1
C39, C40	Capacitor, Monolithic Ceramic, 33 uF \pm 20%, 25V, Non-Polarized	020-3374	2
C41, C42	Capacitor, Ceramic Disc, 20 pF \pm 10%, 1 kV	002-2013	2
C43 THRU C46	Capacitor, Polycarbonate, 0.015 uF \pm 10%, 100V	030-1532	4
C47, C48	Capacitor, Mylar Film, 0.047 uF \pm 10%, 100V	030-4743	2
C49 THRU C54	Capacitor, Electrolytic, 33 uF, 35V	024-3335	6
D1 THRU D6	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	6
D7 THRU D10	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	4
MOV1 THRU MOV4	Metal Oxide Varistor, V47MA2A, 27V ac RMS, 0.19 Joules	140-0017	4
P1	Receptacle, 40-Pin Dual In-line	417-4041	1
R1	Resistor, 3 k Ohm \pm 5%, 1/4W	100-3043	1
R2, R3	Resistor, 1 k Ohm \pm 5%, 1/4W	100-1043	2
R4, R5	Resistor, 4.99 k Ohm \pm 1%, 1/4W	100-5041	2
R6	Resistor, 33.2 Ohm \pm 1%, 1/4W	103-3322	1
R7	Resistor, 51.1 Ohm \pm 1%, 1/4W	103-5112	1
R8	Resistor, 10 k Ohm \pm 1%, 1/4W	100-1051	1
R9	Resistor, 5.11 k Ohm \pm 1%, 1/4W	103-5141	1
R10	Resistor, 3.40 k Ohm \pm 1%, 1/4W	103-3404	1

TABLE 4-2. LINE OUTPUT MODULE ASSEMBLY - 911-0016
(Sheet 2 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R11	Resistor, 51.1 Ohm $\pm 1\%$, 1/4W	103-5112	1
R12	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	1
R13	Resistor, 33.2 Ohm $\pm 1\%$, 1/4W	103-3322	1
R14,R15	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	2
R16,R17	Resistor, 24.9 k Ohm $\pm 1\%$, 1/4W	103-2495	2
R18	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R19	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R20	Resistor, 3.65 k Ohm $\pm 1\%$, 1/4W	103-3641	1
R21,R22	Resistor, 24.9 k Ohm $\pm 1\%$, 1/4W	103-2495	2
R23,R24	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	2
R25	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R26	Resistor, 10 Meg Ohm $\pm 5\%$, 1/4W	100-1083	1
R27	Resistor, 1.54 k Ohm $\pm 1\%$, 1/4W	103-1544	1
R28	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	1
R29,R30	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	2
R31	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R32	Resistor, 3 k Ohm $\pm 5\%$, 1/4W	100-3043	1
R33,R34	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	2
R35,R36	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	2
R37	Resistor, 33.2 Ohm $\pm 1\%$, 1/4W	103-3322	1
R38	Resistor, 51.1 Ohm $\pm 1\%$, 1/4	103-5112	1
R39	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R40	Resistor, 5.11 k Ohm $\pm 1\%$, 1/4W	103-5141	1
R41	Resistor, 3.40 k Ohm $\pm 1\%$, 1/4W	103-3404	1
R42	Resistor, 51.1 Ohm $\pm 1\%$, 1/4W	103-5112	1
R43	Resistor, 4.99 k Ohm $\pm 1\%$, 1/4W	100-5041	1
R44	Resistor, 33.2 Ohm $\pm 1\%$, 1/4W	103-3322	1
R45,R46	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	2
R47,R48	Resistor, 24.9 k Ohm $\pm 1\%$, 1/4W	103-2495	2
R49	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R50	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R51	Resistor, 3.65 k Ohm $\pm 1\%$, 1/4W	103-3641	1
R52,R53	Resistor, 24.9 k Ohm $\pm 1\%$, 1/4W	103-2495	2
R54,R55	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	2
R56	Resistor, 49.9 k Ohm $\pm 1\%$, 1/4W	103-4951	1
R57	Resistor, 10 Meg Ohm $\pm 5\%$, 1/4W	100-1083	1
R58	Resistor, 1.54 k Ohm $\pm 1\%$, 1/4W	103-1544	1
R59	Resistor, 1 k Ohm $\pm 1\%$, 1/4W	103-1041	1
R60,R61	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	2
R62	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R63	Resistor, 1.58 k Ohm $\pm 1\%$, 1/4W	103-1584	1
R64	Resistor, 121 Ohm $\pm 1\%$, 1/4W	100-1231	1
R65	Resistor, 1.58 k Ohm $\pm 1\%$, 1/4W	103-1584	1
R66	Resistor, 121 Ohm $\pm 1\%$, 1/4W	100-1231	1
R67	Potentiometer, 5 k Ohm $\pm 10\%$, 1/2W	178-5044	1
R68	Potentiometer, 20 k Ohm $\pm 10\%$, 1/2W	178-2054	1

TABLE 4-2. LINE OUTPUT MODULE ASSEMBLY-911-0016
(Sheet 3 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R69	Potentiometer, 5 k Ohm $\pm 10\%$, 1/2W	178-5044	1
R70	Potentiometer, 20 k Ohm $\pm 10\%$, 1/2W	178-2054	1
R71,R72	Resistor Network, 10-10 k Ohm 0.5% Resistor, 0.7W Total Dissipation, 16-Pin DIP	226-0392	2
U1 THRU U4	Integrated Circuit, NE5532AP, Dual Low-Noise Operational Amplifier, 8-Pin DIP	221-5532-001	4
U5,U6	Integrated Circuit, LF353N, Dual JFET-Input Operational Amplifier, 8-Pin DIP	221-0353	2
U7 THRU U10	Integrated Circuit, LT1010CT, Power Buffer Amplifier, Continuous Output Current ± 150 mA, Continuous Power 4W, TO-220 Case	220-1010	4
U11,U12	Integrated Circuit, NE5534AN, Low-Noise Operational Amplifier, 8-Pin DIP	221-5534	2
U13	Integrated Circuit, LM317KC, Adjustable Positive Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0317	1
U14	Integrated Circuit, LM337T, Adjustable Negative Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0337	1
XR71,XR72	Socket, 16-Pin DIP	417-1604	2
XU1 THRU XU6, XU11, XU12	Socket, 8-Pin DIP	417-0804	8
—	Blank Line Output Module Circuit Board	511-0016	1

POWER SUPPLY MODULE AUTOMATIC POWER SUPPLY SWITCH PANEL

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SECTION I

POWER SUPPLY MODULE

AUTOMATIC POWER SUPPLY SWITCH PANEL

THEORY OF OPERATION

1-1. INTRODUCTION.

1-2. The following text provides detailed theory of operation for the Mix-Trak 90 series audio console power supply module and automatic power supply switch panel.

1-3. POWER SUPPLY MODULE FUNCTIONAL DESCRIPTION.

1-4. The following text provides a functional description of the power supply module. Figure 1-1 presents a detailed block diagram of the power supply module circuitry. Refer to Figure 1-1 as required for the following circuit description.

1-5. GENERAL.

1-6. The console power supply consists of a self-contained modular assembly external to the console mainframe. The module contains ac power transformation and dc rectification circuitry for the generation of all console operating potentials. The potentials are routed through a power supply cable to the console mainframe for distribution to the individual mainframe modules by the motherboard network.

1-7. AC INPUT CIRCUIT.

1-8. Primary ac power is applied to the module through the ac input receptacle. The ac input receptacle is equipped with built-in overload component fuse F5 and ac control component switch S1. Power from the receptacle is routed to terminal strip TB1. TB1 consists of a programming network for the configuration of the module for 117 volt or 234 volt ac input operation. AC power transformation is provided by transformer T1. T1 is equipped with three primary windings and two secondary windings. One primary winding and the two secondary windings produce low-voltage ac potentials for application to the rectifier and regulator networks.

1-9. RECTIFIER NETWORKS.

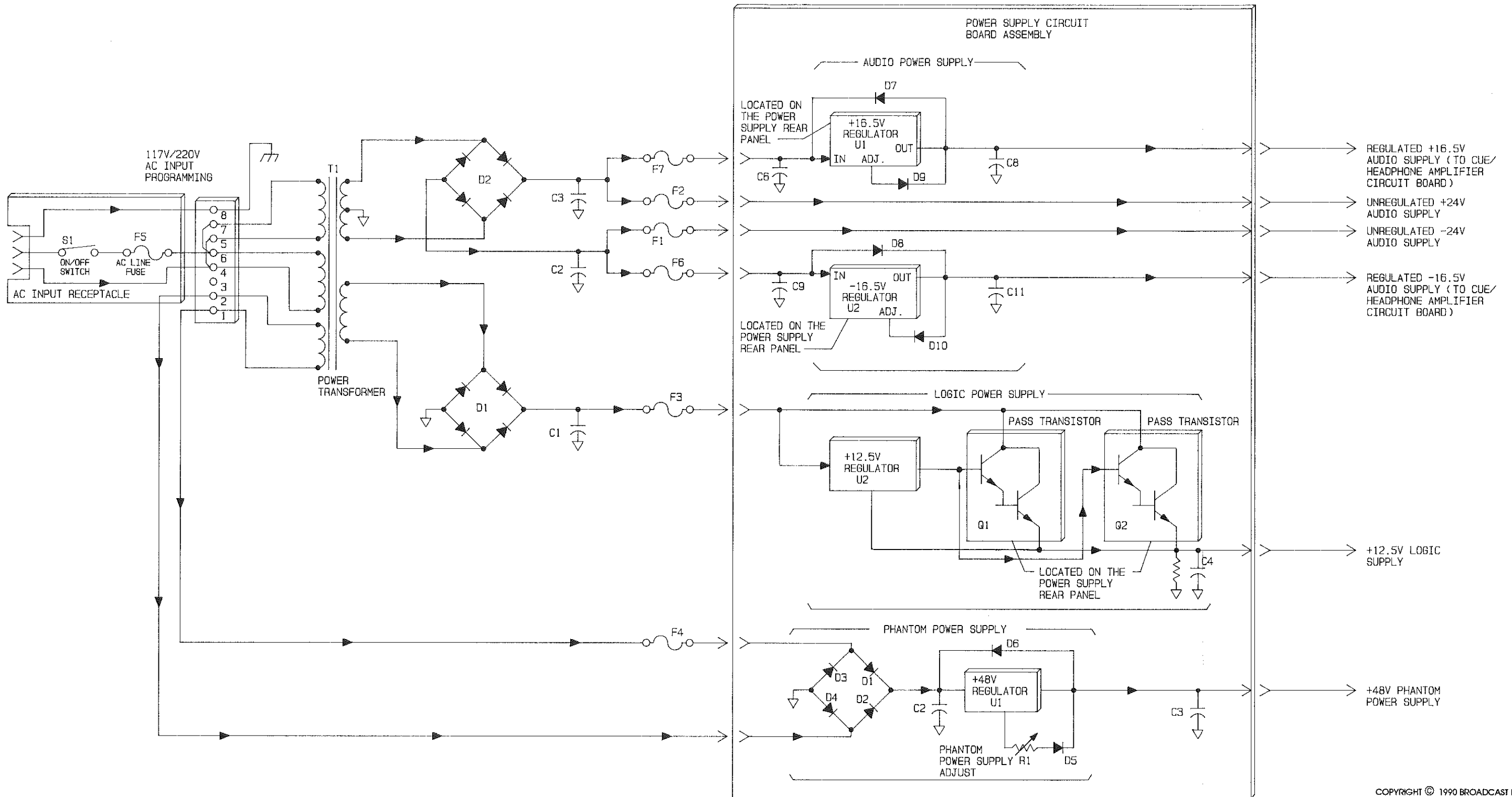
1-10. The ac potential from secondary 1 of power transformer T1 is full-wave rectified by bridge rectifier D2 and filtered by capacitors C2 and C3 into two ± 24 volt dc supplies. The +24 volt potentials are protected from overload conditions by fuses F7 and F2. The -24 volt potentials are protected from overload conditions by fuses F1 and F6. The ± 24 volt supplies are routed from the rectifier network to a power supply circuit board for regulation and distribution.

1-11. The ac potential from secondary 2 of power transformer T1 is full-wave rectified by bridge rectifier D1 and filtered by capacitor C1 into a +21 volt dc supply. The supply is protected from overload conditions by fuse F3 and routed to a power supply circuit board for regulation.

1-12. POWER SUPPLY CIRCUIT BOARD.

1-13. The power supply circuit board contains support circuitry for: 1) an audio regulator network and 2) a logic regulator network. The circuit board also contains components for a phantom power supply rectifier and regulator network.

- 1-14. **AUDIO REGULATOR CIRCUIT.** ± 24 volt supplies from the rectifier circuit are applied to a regulator circuit which produces operating potentials for the console audio circuitry. The +24 volt supply from fuse F7 is applied to +16.5 volt regulator U1. Capacitors C6 and C8 provide filtering for the supply. The output of U1 is routed for application to the cue/headphone amplifier circuit board. The second +24 volt supply from fuse F2 is routed through the power supply circuit board to provide an unregulated dc potential for application to the audio circuitry on the console modular assemblies.
- 1-15. The -24 volt supply from fuse F6 is applied to -16.5 volt regulator U2. Capacitors C9 and C11 provide filtering for the supply. The output of U2 is routed for application to the cue headphone amplifier circuit board. The second -24 supply from F1 is routed through the power supply circuit board to provide an unregulated dc potential for application to the audio circuitry on the console modular assemblies.
- 1-16. Regulators U1 and U2 are three-terminal adjustable devices containing internal thermal-overload and short-circuit current limiting features. Additional protection for the regulators is provided by diodes D7 through D10. Diodes D9 and D10 provide protection from reverse polarity potentials applied to the outputs. Diodes D7 and D8 provide protection from a short circuit applied to the input.
- 1-17. **LOGIC REGULATOR CIRCUIT.** The +21 volt potential from fuse F3 is applied to +12.5 volt regulator U2. The output of U2 is applied to a pass transistor network consisting Q1 and Q2. Capacitor C4 provides filtering for the supply. The +12 volt output of the pass transistor network is routed for application to the logic circuitry on the console modular assemblies.
- 1-18. **PHANTOM CIRCUIT.** An ac potential from the primary of power transformer T1 is applied to a phantom power supply rectifier and regulator network. The supply is protected from overload conditions by fuse F4.
- 1-19. The ac potential is full-wave rectified by diodes D1 through D4 and filtered by capacitor C2 into a +59 volt dc supply. The +59 volt supply is applied to +48 volt regulator U1. Capacitor C3 provides filtering for the supply. The +48 volt output is routed to the console mainframe for phantom powering of condenser type microphones. Potentiometer R1 provides adjustment of the phantom power supply level from +15V to +48V dc.
- 1-20. Regulator U1 is a three-terminal adjustable device containing internal thermal-overload and short-circuit current limiting features. Additional protection for the regulator is provided by diodes D5 and D6. Diode D5 provides protection from reverse polarity potentials applied to the output. Diode D6 provides protection from a short circuit applied to the input.
- 1-21. **AUTOMATIC POWER SUPPLY SWITCH PANEL FUNCTIONAL DESCRIPTION.**
- 1-22. The following text provides a functional description of the automatic power supply switch panel. Figure 1-2 presents a detailed block diagram of the automatic power supply switch panel circuitry. Refer to Figure 1-2 as required for the following circuit description.
- 1-23. **GENERAL.**
- 1-24. The automatic power supply switch panel controls the application of dc operating potentials to the console in a main/alternate power supply configuration. The switch panel consists of individual diode combining networks for the: 1) ± 24 volt supplies, 2) +48 volt supply, 3) +12 volt supply, and 4) ± 16.5 volt supplies. In the event of a power supply failure, the switch panel will automatically transfer dc potentials from the remaining operational power supply to the console without console interruption.



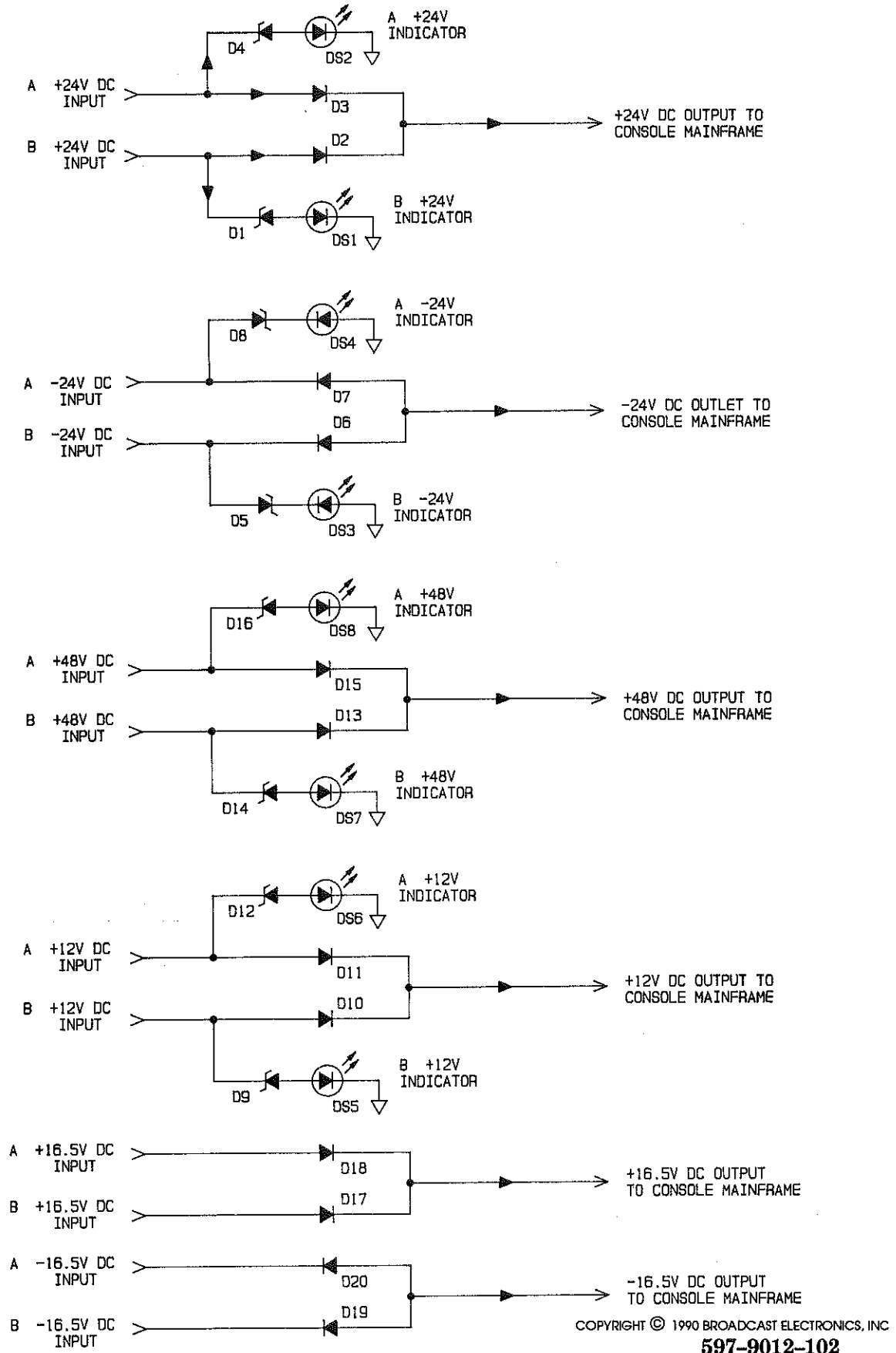
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FIGURE 1-1.
POWER SUPPLY MODULE DETAILED
BLOCK DIAGRAM

1-3/1-4

1-25. **SWITCHING NETWORKS.**

- 1-26. +24 volt supplies from power supply module A and power supply module B are applied to the +24 volt diode combining circuit. The combining circuit consists of diodes D2 and D3. In the event of a failure in a +24 volt supply circuit, the combining circuit will automatically route the remaining operational +24 volt supply to the console without interruption. Power supply A +24 volt indicator DS2 and power supply B +24 volt indicator DS1 provide status indications. The indicators illuminate when the supplies are operational. The -24 volt, +48 volt, +12 volt and the ± 16.5 volt supply combining circuits operate in an identical manner.



**FIGURE 1-2. AUTOMATIC POWER SUPPLY SWITCH PANEL
DETAILED BLOCK DIAGRAM**

SECTION II

POWER SUPPLY MODULE

AUTOMATIC POWER SUPPLY SWITCH PANEL

MAINTENANCE

2-1. INTRODUCTION.

- 2-2. This section provides general maintenance information and troubleshooting information for the power supply module and automatic power supply switch panel.



WARNING **DISCONNECT ALL PRIMARY POWER BEFORE ATTEMPTING ANY POWER SUPPLY MAINTENANCE.**

WARNING

2-3. FIRST LEVEL MAINTENANCE.

- 2-4. First level maintenance consists of precautionary procedures applied to the equipment to prevent future failures. The procedures are performed on a regular basis and the results recorded in a performance log.

- 2-5. The power supply module and automatic power supply switch panel should be periodically cleaned of accumulated dust using a nylon-bristle brush and vacuum cleaner. Inspect the module for improperly seated semiconductors and components damaged by overheating.

2-6. SECOND LEVEL MAINTENANCE.

- 2-7. Second level maintenance consists of procedures required to restore a power supply module or an automatic power supply switch panel to operation after a fault has occurred. The procedures are divided into electrical adjustment procedures, troubleshooting, and component replacement procedures.

2-8. ELECTRICAL ADJUSTMENTS.

- 2-9. **+48 VOLT PHANTOM POWER SUPPLY ADJUST.** Potentiometer R1 on the power supply module power supply circuit board adjusts the phantom power supply level from +15V to +48V dc. The phantom power supply is adjusted as follows.

- 2-10. **Required Equipment.** The following test equipment is required to adjust the phantom power supply level.

- A. Non-Metallic Adjustment Tool.
- B. Multipurpose voltmeter.

- 2-11. **Procedure.** To adjust the phantom power supply level, proceed as follows:



WARNING **DISCONNECT ALL CONSOLE PRIMARY POWER BEFORE PROCEEDING.**

WARNING

- 2-12. Disconnect all console primary power and remove the power supply module top-panel.

- 2-13. Refer to Figure 2-1 and connect the voltmeter to the mounting base of regulator U1.
- 2-14. Apply power to the module.



WARNING **MAINTENANCE WITH POWER ENERGIZED IS ALWAYS CONSIDERED HAZARDOUS AND CAUTION SHOULD BE OBSERVED. DO NOT TOUCH ANY COMPONENTS WITHIN THE POWER SUPPLY MODULE WHEN POWER IS ENERGIZED.**

WARNING

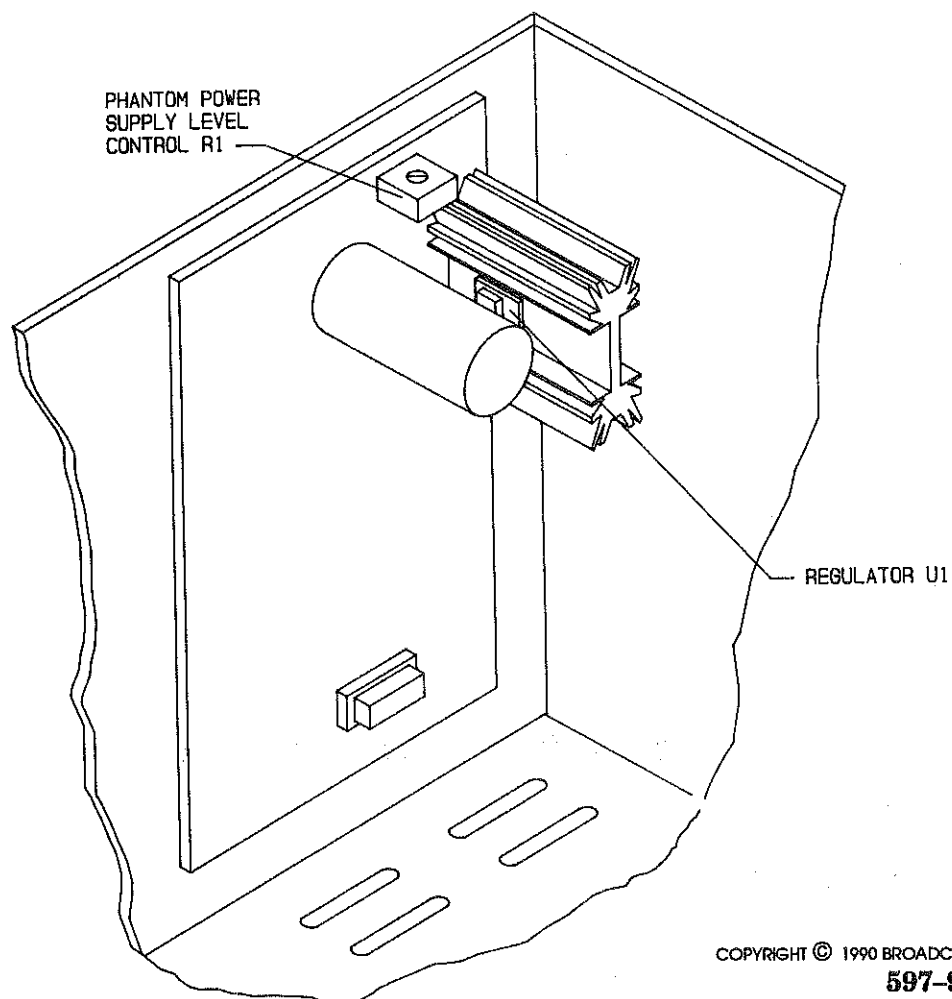
- 2-15. Refer to Figure 2-1 and adjust phantom power supply level control R1 until the voltmeter indicates the desired operating level.



WARNING **DISCONNECT ALL CONSOLE PRIMARY POWER BEFORE PROCEEDING.**

WARNING

- 2-16. Disconnect the console primary power supply.



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FIGURE 2-1. POWER SUPPLY CIRCUIT BOARD ADJUSTMENT CONTROLS

- 2-17. Remove the test equipment and replace the power supply module top-panel.
- 2-18. **TROUBLESHOOTING.**
- 2-19. The troubleshooting philosophy for the power supply module and automatic power supply switch panel consists of isolating a problem to a specific circuit or group of components. Figure 2-2 presents the power supply module troubleshooting information. Refer to Figure 2-2 to isolate a failure to a specific group of components.
- 2-20. Once trouble is isolated and power is totally deenergized, refer to the schematic diagrams and the theory of operation to assist in problem resolution. The defective component may be repaired locally or the entire module may be returned to Broadcast Electronics for repair or replacement.
- 2-21. **COMPONENT REPLACEMENT.**
- 2-22. Component replacement procedures for the console modular assemblies are presented in SECTION II, MAINTENANCE. Refer to SECTION II as required for the replacement procedures.
- 2-23. If the capacitors in the power supply module are replaced in the field, the capacitors must be correctly re-assembled to meet operating specifications. Refer to the power supply module assembly diagram in SECTION III for assembly information.

POWER SUPPLY MODULE TROUBLESHOOTING	
SYMPTOM	SOLUTION
NO +16.5 VOLT SUPPLY	1. CHECK FUSE F7. 2. CHECK REGULATOR U1.
NO +24 VOLT SUPPLY	1. CHECK FUSE F2.
NO -16.5 VOLT SUPPLY	1. CHECK FUSE F6. 2. CHECK REGULATOR U2.
NO -24 VOLT SUPPLY	1. CHECK FUSE F1.
NO ±24 VOLT SUPPLIES AND ±16.5 VOLT SUPPLIES	1. CHECK BRIDGE RECTIFIER D2. 2. CHECK FUSE F5.
NO +12 VOLT SUPPLIES	1. CHECK FUSE F3. 2. CHECK REGULATOR U2. 3. CHECK TRANSISTORS Q1 AND Q2. 4. CHECK BRIDGE RECTIFIER D1.
NO PHANTOM POWER SUPPLY	1. CHECK FUSE F4. 2. CHECK REGULATOR U1. 3. CHECK DIODES D1 THROUGH D4.

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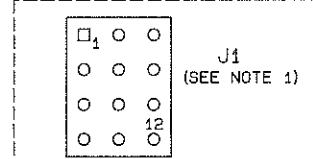
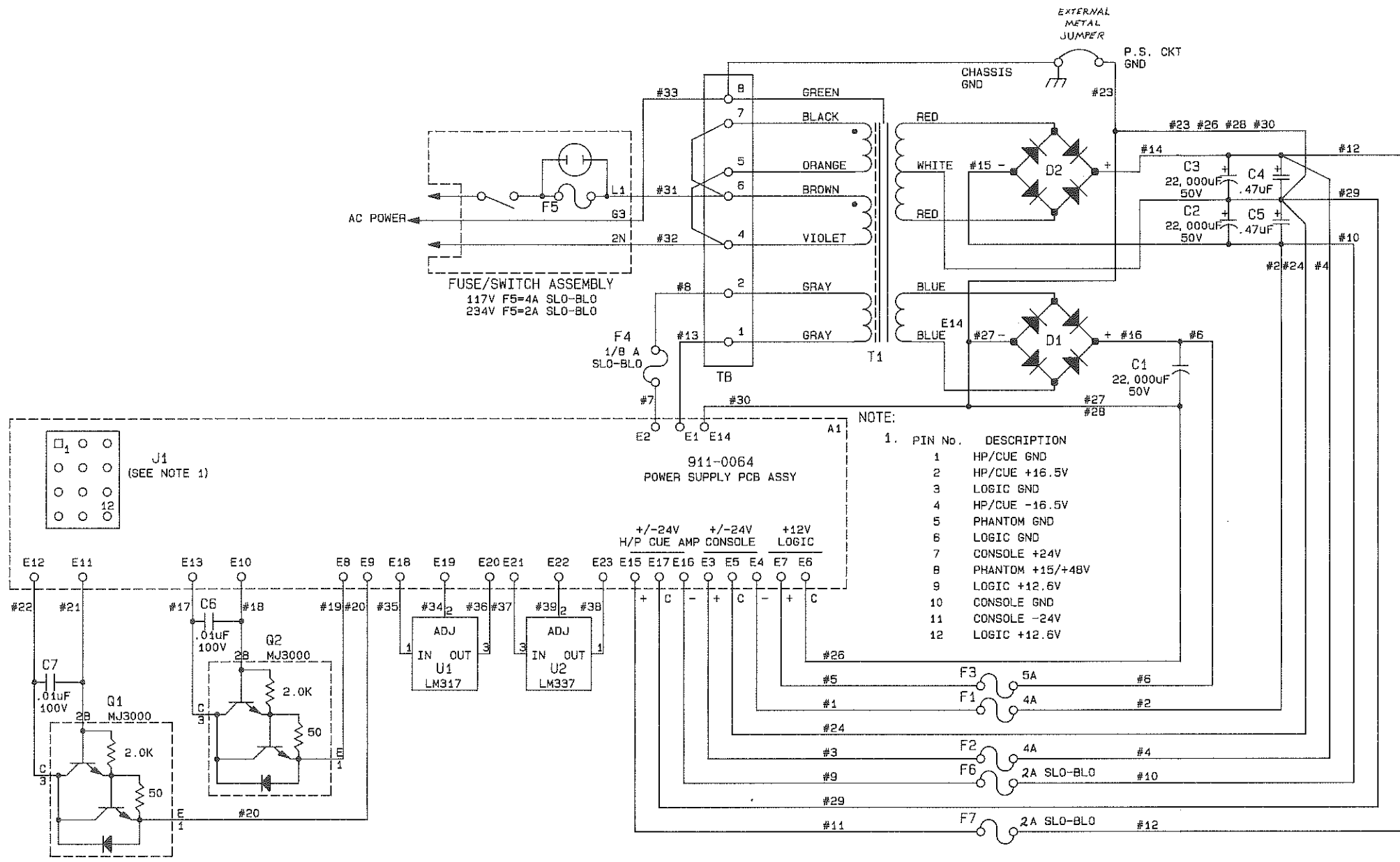
FIGURE 2-2. POWER SUPPLY MODULE TROUBLESHOOTING

SECTION III POWER SUPPLY MODULE AUTOMATIC POWER SUPPLY SWITCH PANEL DRAWINGS

3-1. INTRODUCTION.

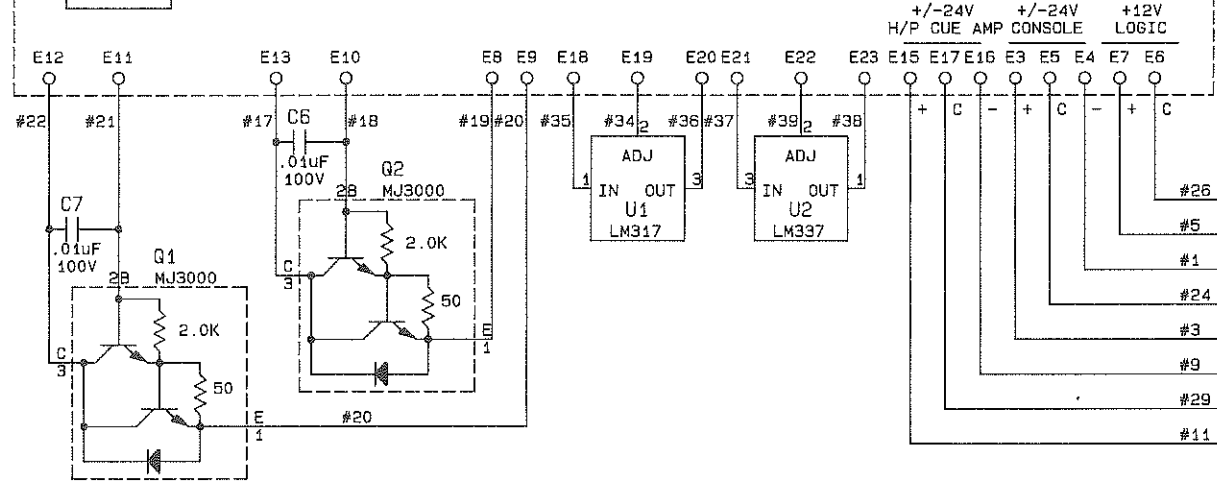
3-2. This section provides assembly drawings and schematic diagrams as listed below for the power supply module and automatic power supply switch panel.

FIGURE	TITLE	NUMBER
3-1	SCHEMATIC DIAGRAM, POWER SUPPLY MODULE	SC951-0006
3-2	ASSEMBLY DIAGRAM, POWER SUPPLY MODULE	AD951-0006
3-3	SCHEMATIC DIAGRAM, POWER SUPPLY CIRCUIT BOARD	SC911-0064
3-4	ASSEMBLY DIAGRAM, POWER SUPPLY CIRCUIT BOARD	AC911-0064
3-5	SCHEMATIC DIAGRAM, AUTOMATIC POWER SUPPLY SWITCH PANEL	SC951-0032
3-6	ASSEMBLY DIAGRAM, AUTOMATIC POWER SUPPLY SWITCH PANEL	AC951-0032



NOTE:

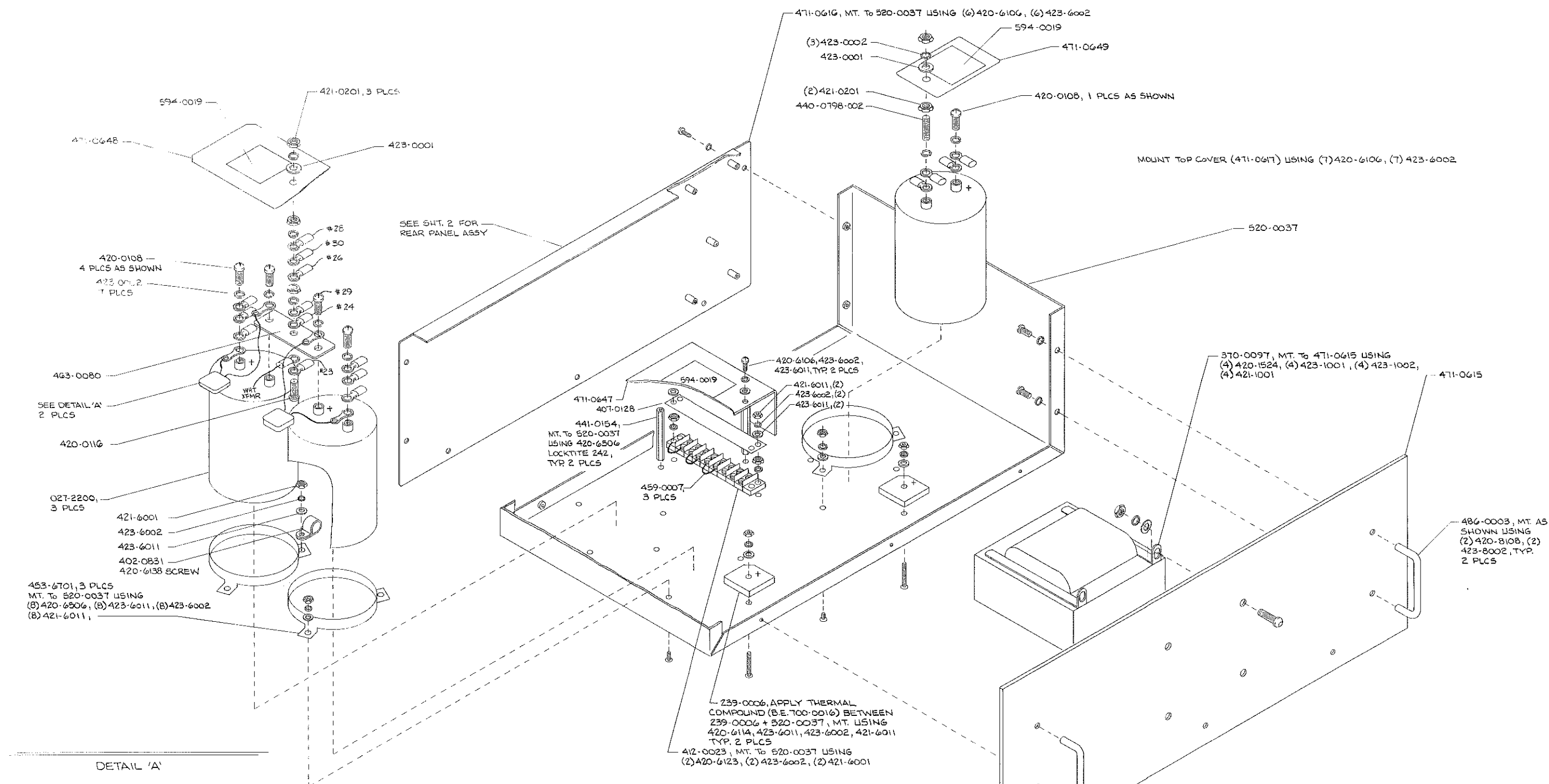
PIN No.	DESCRIPTION
1	HP/CUE GND
2	HP/CUE +16.5V
3	LOGIC GND
4	HP/CUE -16.5V
5	PHANTOM GND
6	LOGIC GND
7	CONSOLE +24V
8	PHANTOM +15/+48V
9	LOGIC +12.6V
10	CONSOLE GND
11	CONSOLE -24V
12	LOGIC +12.6V



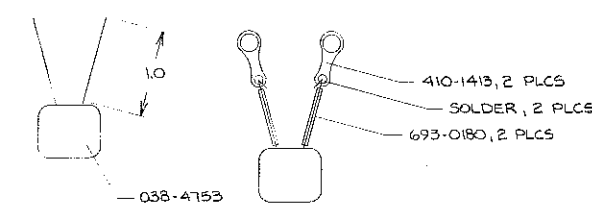
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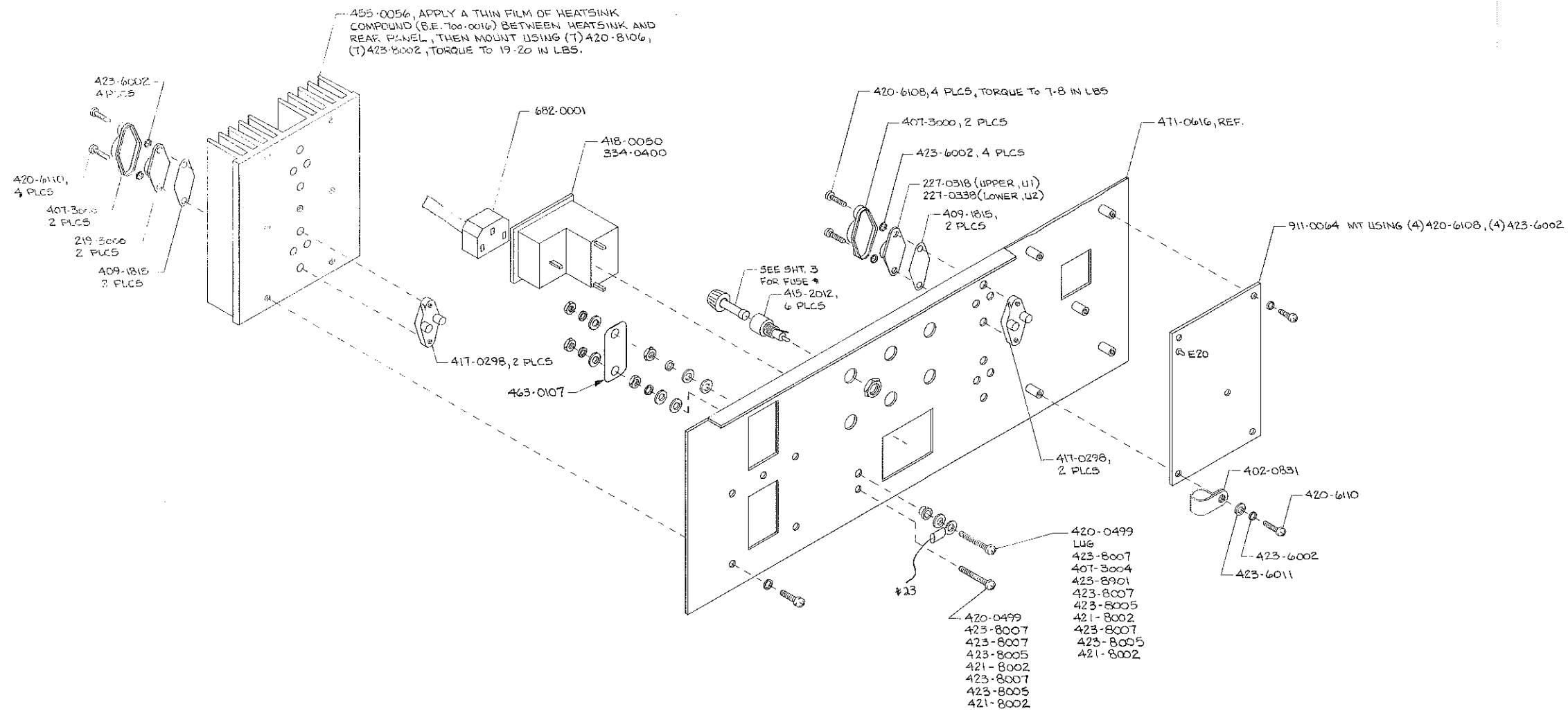
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	CHKD <i>MMH 3-22-88</i>	FINISH	
TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°	PROJ. ENGR. <i>[Signature]</i>	SEE DWG RA582-0000 NEXT ASSY. 901-9012 (12CH) 901-9018 (18CH)	TYPE SIZE DWG. NO. REV S C 951-0006 C
MODEL MT-90 SCALE NONE SHEET 1 OF 1			



DETAIL 'A'

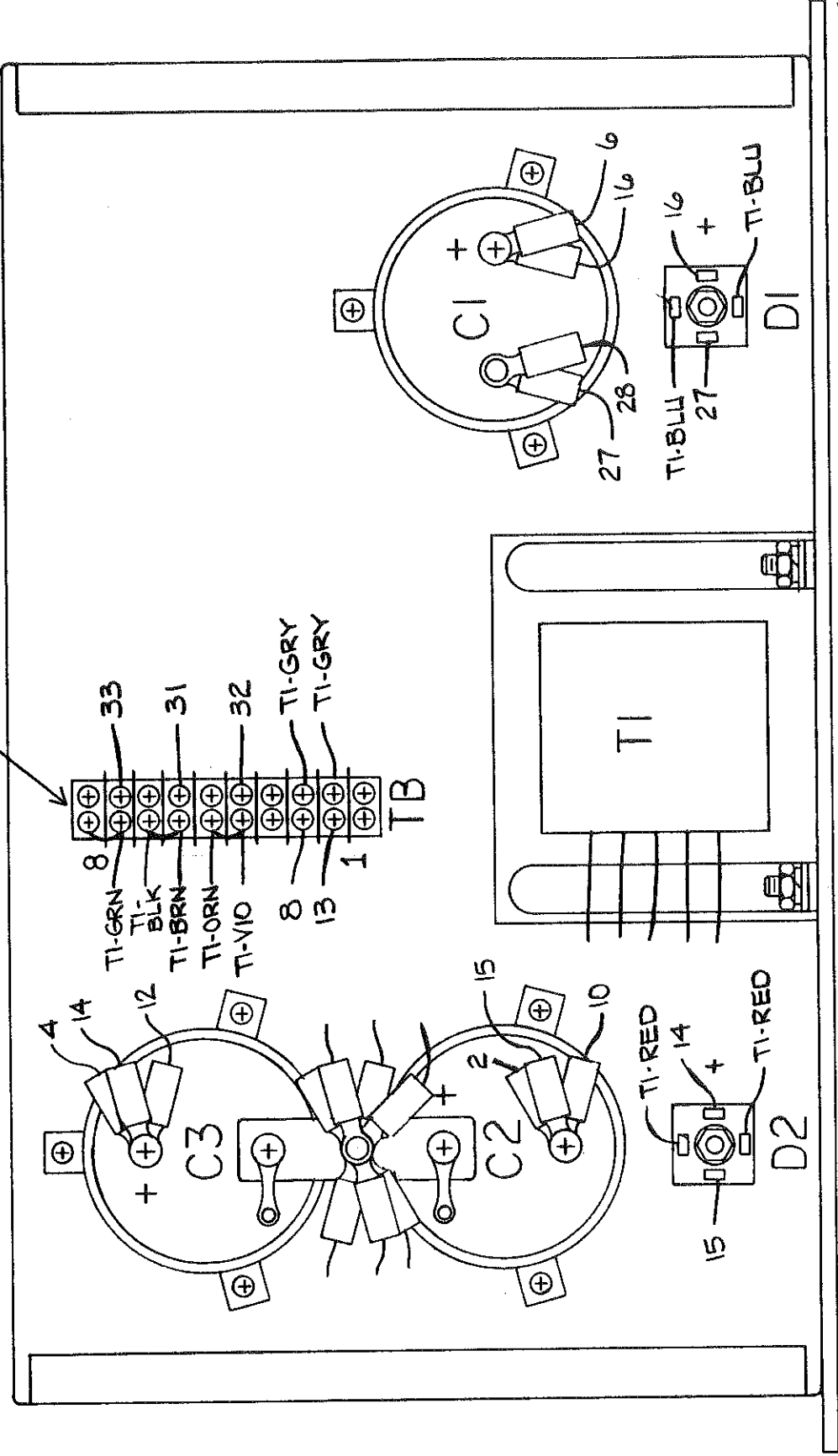


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	CHKD	FINISH		
	ME	PROJ. ENGR.	SEE DWG BASS2-0006	TITLE -ASSY- CONSOLE POWER SUPPLY
	MFG	NEXT ASSY.	TYPE SIZE DWG. NO. A D 951-0006	REV 1
TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°		MODEL M79D	SCALE 1/2	SHEET 1 OF 4



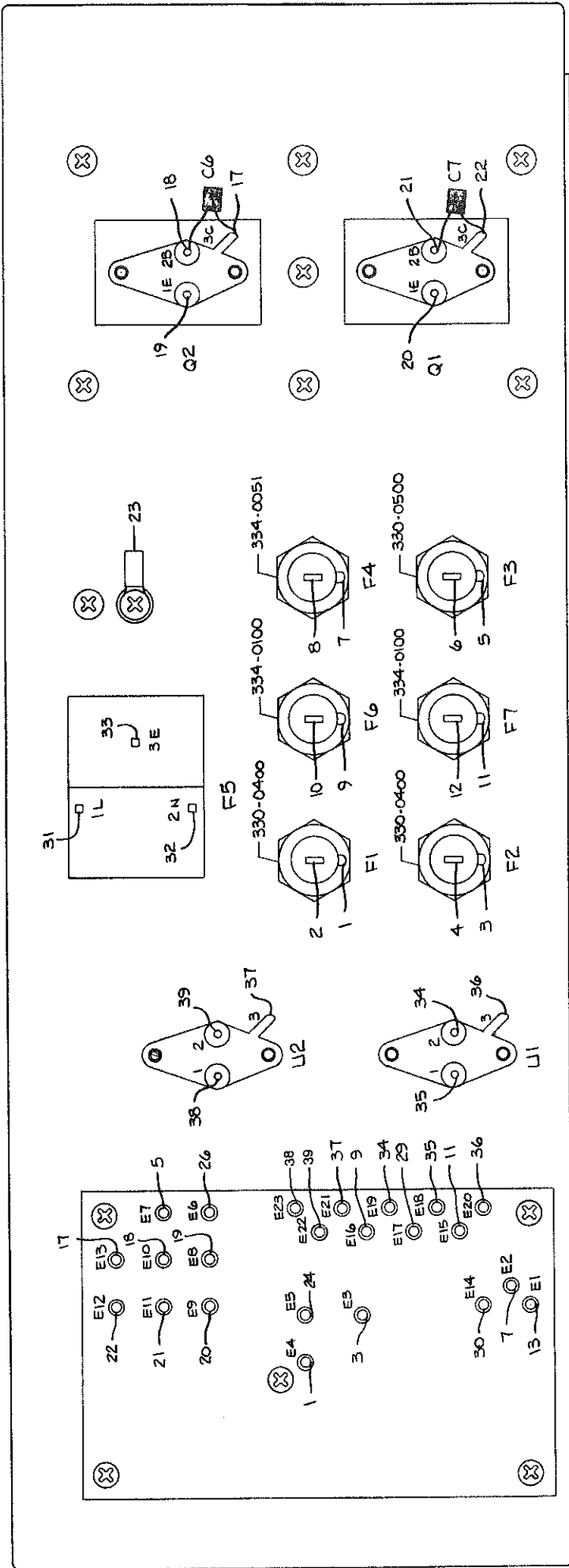
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	CHKD	FINISH		TITLE — ASSY — CONSOLE POWER SUPPLY
	ME	PROJ. ENGR. <i>[Signature]</i>	SEE DWG R4592-0000	TYPE SIZE DWG. NO. REV A D 951-0006 H
	MFG.	NEXT ASSY.	MODEL MT 90	SCALE V2 SHEET 2 OF 4
TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°				

FOR 220V OPERATION, MOVE WIRE #31 TO TERMINAL 7 AND JUMPER ACROSS TERMINALS 5-6. ALL OTHER WIRING TO REMAIN THE SAME.



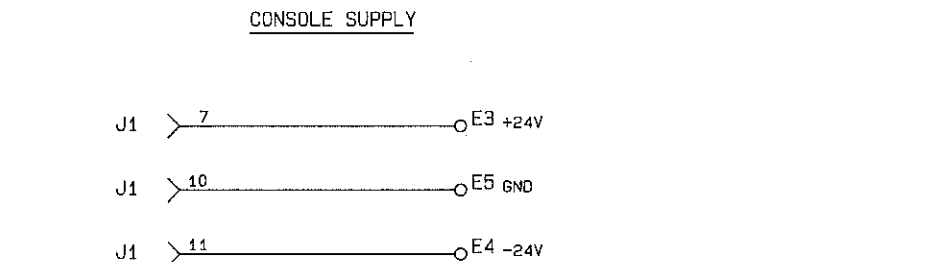
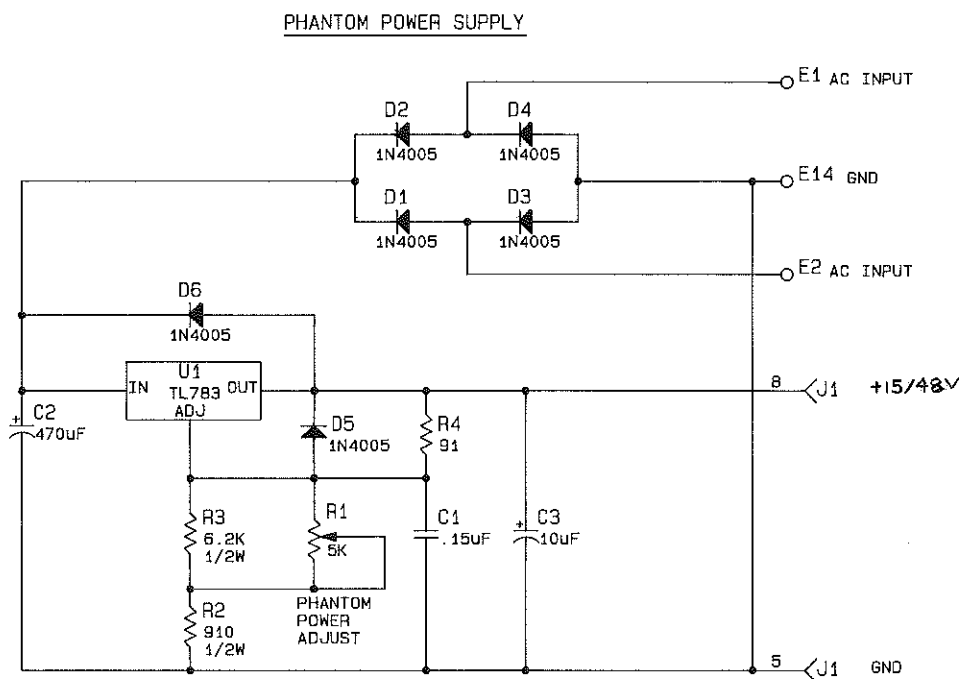
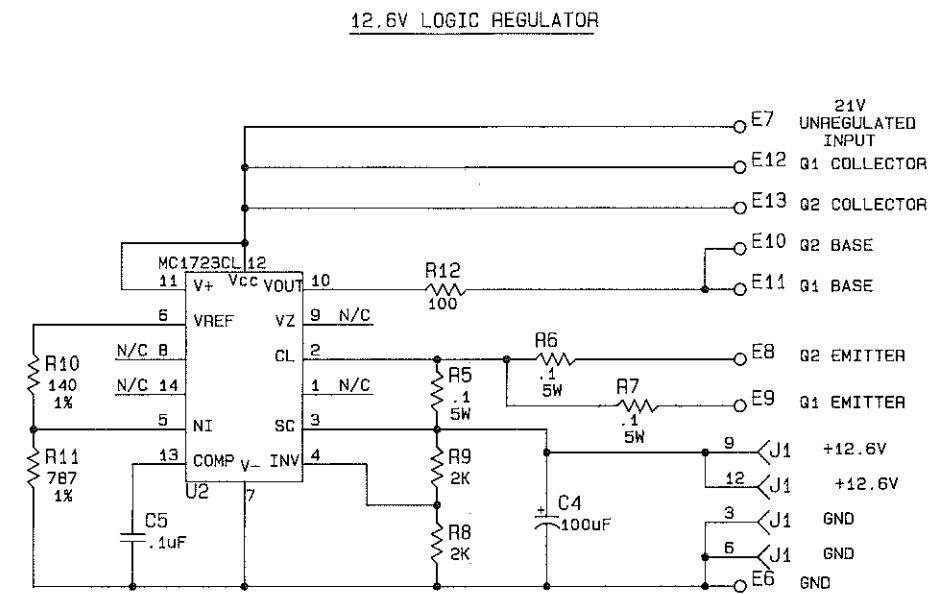
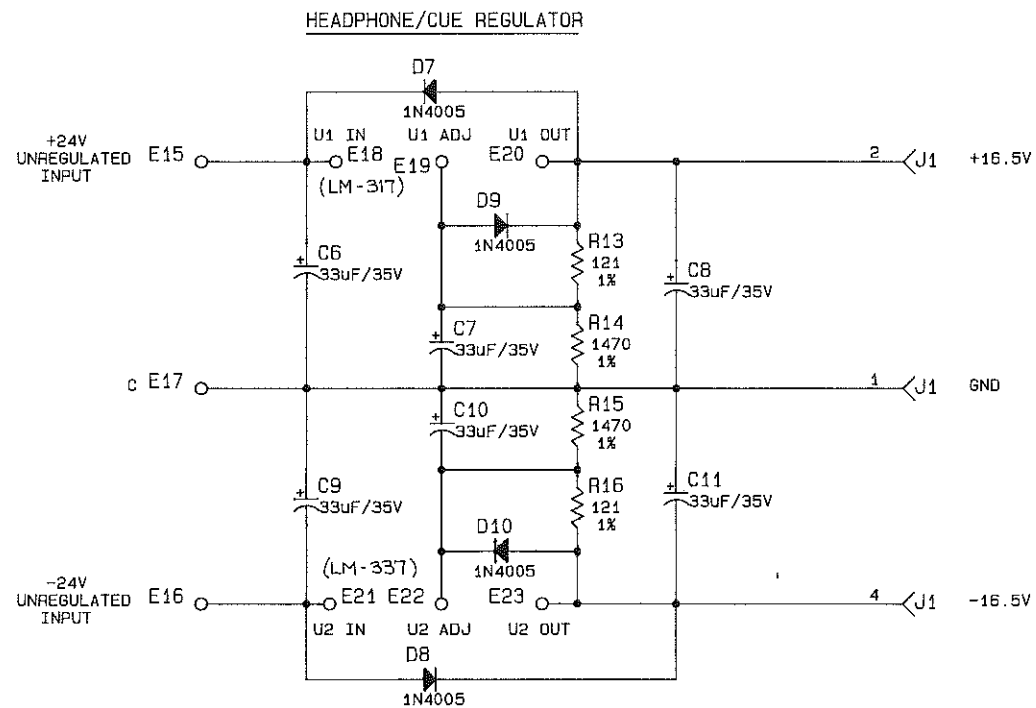
VIEW TOP W/COVER REMOVED

FIGURE 3-2. POWER SUPPLY MODULE ASSEMBLY DIAGRAM (Sheet 3 of 4)



TOP OF REAR PANEL

FIGURE 3-2. POWER SUPPLY MODULE ASSEMBLY DIAGRAM
(Sheet 4 of 4)



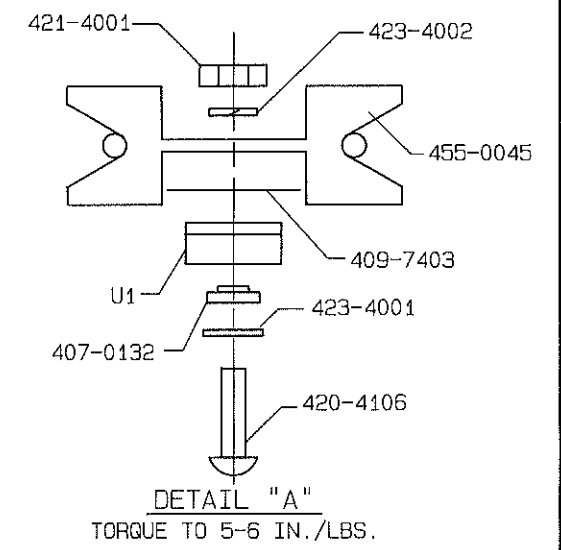
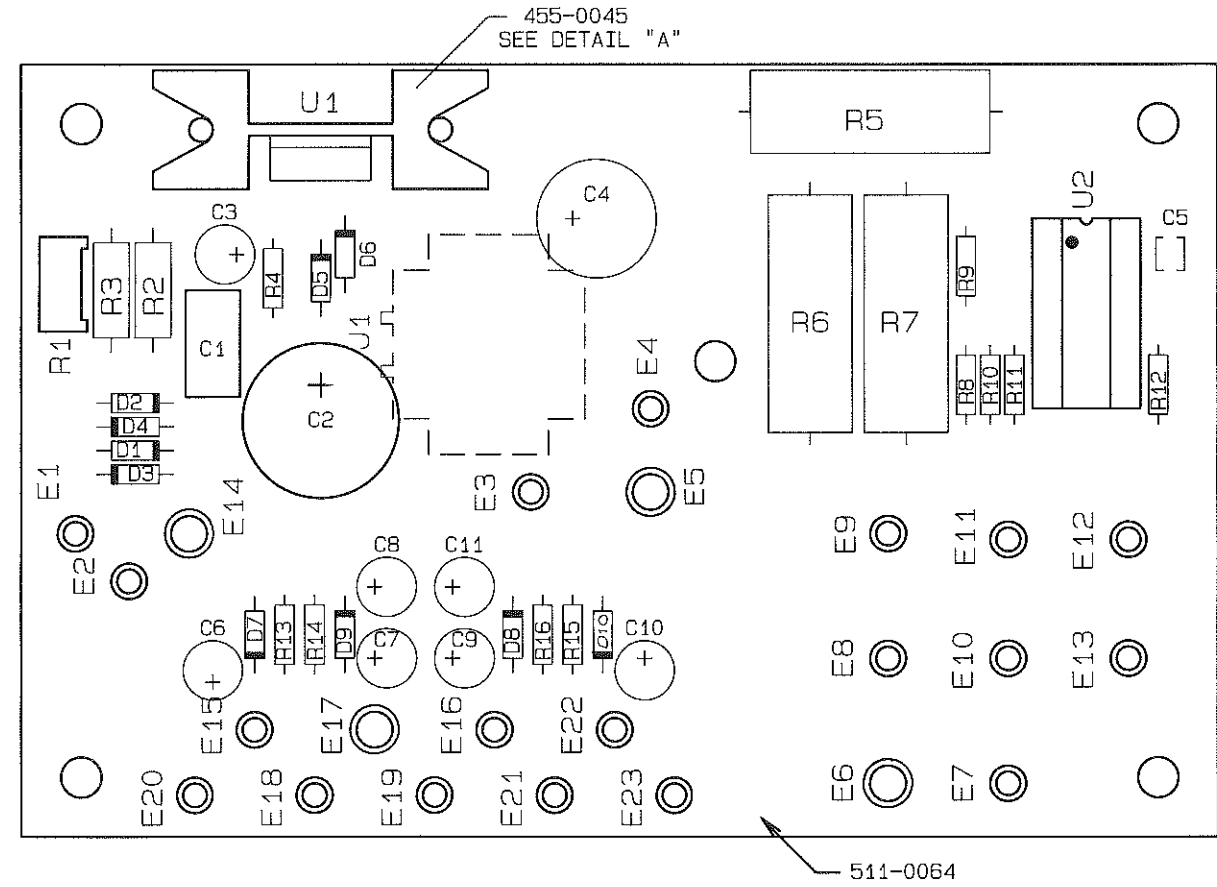
- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5% UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENTS USED: R16, C11, U2, D10, J1, & E23.
 3. SEE PCB ASSEMBLY: AC 911-0064

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	CHKD <i>MH 8-22-88</i>	FINISH SEE DWG RA582-0000	
TOLERANCE (DECIMAL) U.D.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°	PRY. ENGR. <i>[Signature]</i>	NEXT ASSY. 901-9012 (12CH) 901-9018 (18CH)	TYPE SIZE DWG. NO. REV S C 911-0064 A
MODEL MT-90		SCALE NONE	SHEET 1 OF 1

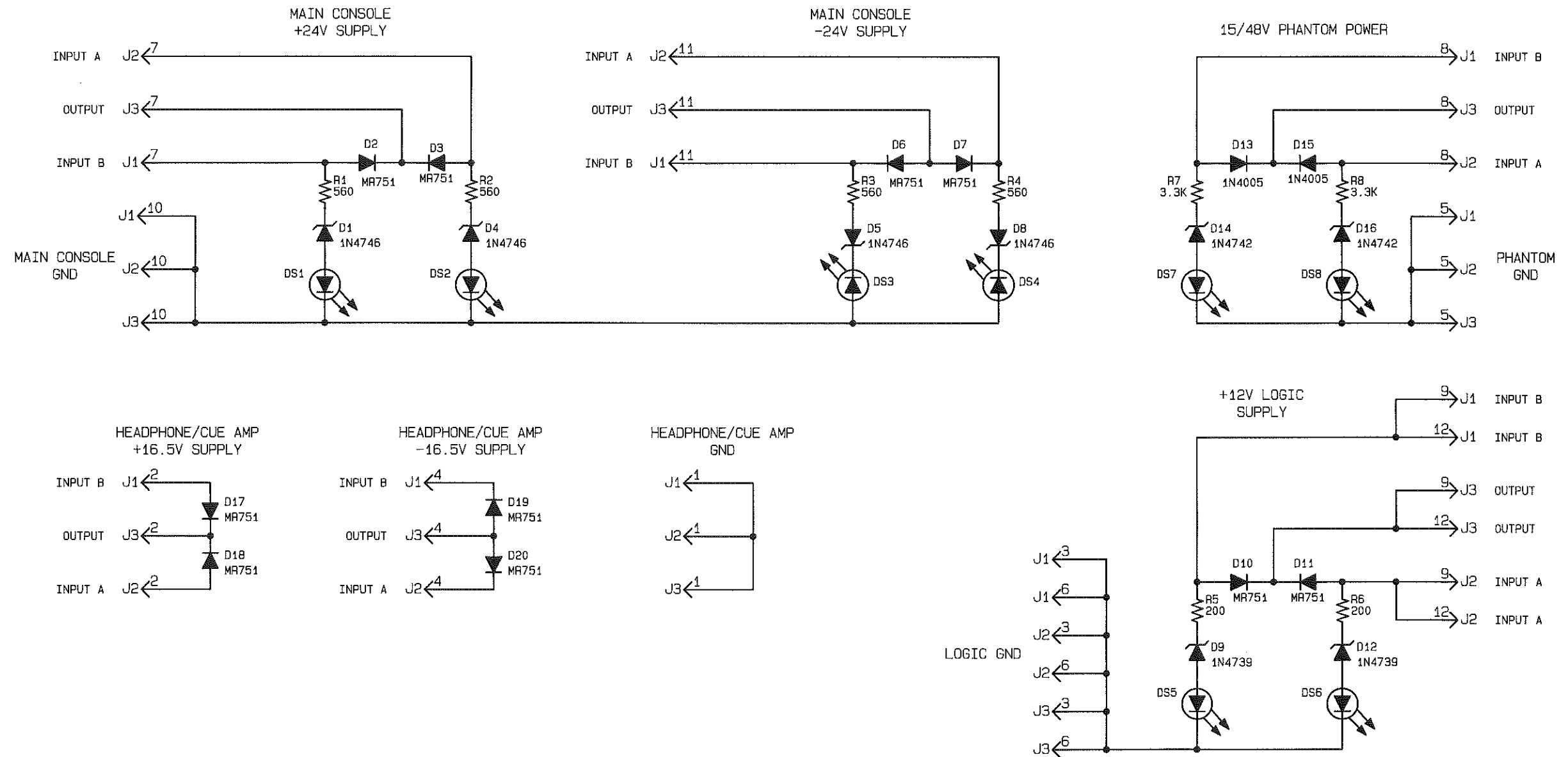
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NOTE:
1. SEE SCHEMATIC SC911-0064

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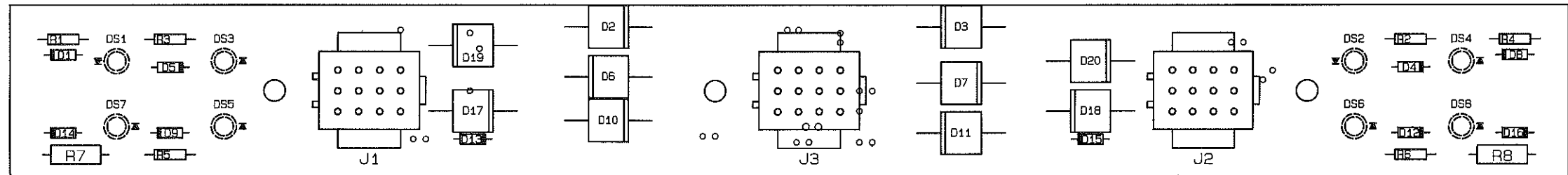
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	CHKD MH 8-22-88	FINISH		TITLE PCB ASSEMBLY POWER SUPPLY BOARD
	ME JLH 8/22/88	PROJ. ENGR.	TYPE SIZE DWG. NO. REV A C 911-0064 D	MODEL MT90 SCALE 2/1 SHEET 1 OF 1
	TOLERANCE DECIMAL U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°	MFG 	NEXT ASSY 901-9012 "12CH" 901-9018 "18CH"	



- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5%, UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENT USED: R8, D20, DS8, J3.
 3. SEE PCB ASSEMBLY AC951-0032

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	CHKD MH 9.2.88	FINISH	
ME	PROD. ENGR J.M. 9-2-88	NEXT ASSY AC951-0032	TYPE S
MFG 1/15 9-2-88	SCALE NTS	DWG. NO. 951-0032	REV C
MODEL MT90	SHEET 1 OF 1	SCALE NTS	SHEET 1 OF 1

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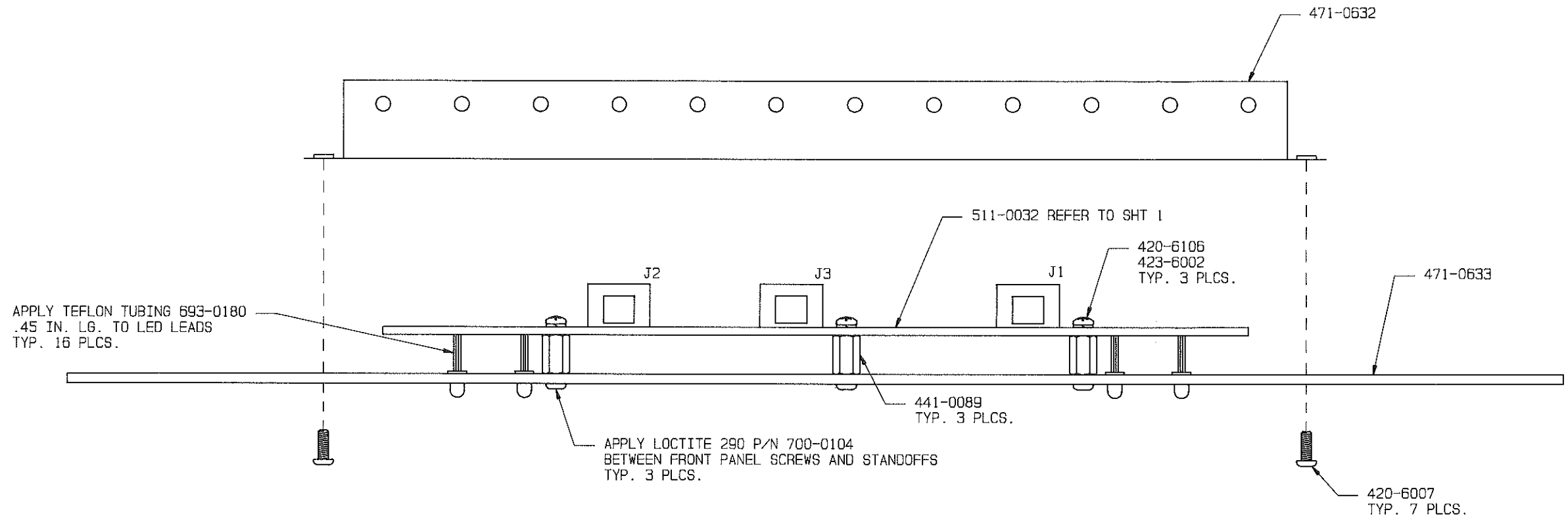
PCB ASSEMBLY

NOTE:

1. REFER TO SHEET 2 FOR PANEL ASSEMBLY
2. SEE SCHEMATIC SC951-0032

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	CHKD	MH 9-2-88	FINISH		
	ME		PROJ. ENGR		TITLE
	MFG		MFG		POWER SUPPLY AUTOMATIC SWITCHER PANEL
TOLERANCE DECIMAL U.O.S.			NEXT ASSY	901-9012 "12CH"	TYPE
.X ± .030 .XXX ± .005			901-901B "18CH"		SIZE
.XX ± .015 ANGLES ± 1°					DWG. NO.
					951-0032
					REV
					B
					MODEL
					MT90
					SCALE
					1.5/1
					SHEET
					1 OF 2



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	CHKD MH 9-7-88	FINISH SEE DWG RA592-0000	
TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°	NE 9/9/83 PRD (ENR) 9-12-88 MFB 9-7-88	NEXT ASSY. 901-9012 (12CH) 901-9018 (18CH)	TYPE SIZE DWS. NO. REV A C 951-0032 B
		MODEL MIX TRAK 90 SCALE 1/1 SHEET 2 OF 2	

SECTION IV POWER SUPPLY MODULE AUTOMATIC POWER SUPPLY SWITCH PANEL PARTS LIST

4-1. INTRODUCTION.

4-2. This section provides descriptions and part numbers of electrical components and assemblies required for maintenance of the power supply module and automatic power supply switch panel. Each table entry in this section is indexed by the reference designators appearing on the applicable schematic diagram.

TABLE 4-1. POWER SUPPLY MODULE AND AUTOMATIC POWER SUPPLY SWITCH PANEL PARTS LIST INDEX

TABLE	TITLE	PART NO.	PAGE
4-2	POWER SUPPLY MODULE ASSEMBLY	951-0006	4-1
4-3	POWER SUPPLY CIRCUIT BOARD ASSEMBLY	911-0064	4-2
4-4	POWER SUPPLY CABLE ASSEMBLY	941-0036	4-3
4-5	AUTOMATIC POWER SUPPLY SWITCH PANEL ASSEMBLY	951-0032	4-3
4-6	AUTOMATIC POWER SUPPLY SWITCH PANEL CABLE ASSEMBLY	941-0032	4-3

**TABLE 4-2. POWER SUPPLY MODULE ASSEMBLY - 951-0006
(Sheet 1 of 2)**

REF DES.	DESCRIPTION	PART NO.	QTY.
A1	Power Supply Circuit Board Assembly	911-0064	1
C1,C2,C3	Capacitor, Electrolytic, 22,000 uF, 50V	027-2200	3
C4,C5	Capacitor, Polyester, 0.47 uF ±10%, 100V	038-4753	2
C6,C7	Capacitor, Mylar Film, 0.01 uF, 100V	031-1043	2
D1,D2	Full-Wave Bridge Rectifier, MDA2502, Silicon, 200 PIV, 25 Amperes	239-0006	2
F1,F2	Fuse, 3AG, 32V, 4 Amperes	330-0400	2
F3	Fuse, 3AG, 250V, 5 Amperes	330-0500	1
F4	Fuse, MDL, 1/8 Ampere, 250V, Slow-Blow (for 120V Operation)	334-0051	1
F5	Fuse, 4AG, 125V, Slow-Blow	334-0400	1
F6,F7	Fuse, AGC, 2A, 250V, Slow-Blow (for 115V Operation)	334-0200	2
Q1,Q2	Transistor, MJ3000, Silicon, NPN Darlington, TO-3 Case	219-3000	2
T1	Transformer, Power Primary: 117/234V ±10%, 50/60 Hz, Single Phase Secondary: 1: 22V @ 4 Amperes Continuous 2: 22V @ 4 Amperes Continuous 3: 18V @ 5 Amperes Continuous 4: 59V @ 1 Ampere Continuous	370-0097	1

TABLE 4-2. POWER SUPPLY MODULE ASSEMBLY - 951-0006
(Sheet 2 of 2)

REF DES.	DESCRIPTION	PART NO.	QTY.
TB	Barrier Strip, 8 Terminals	412-0023	1
U1	Integrated Circuit, LM317K, Three-Terminal Adjustable Positive Voltage Regulator, 1.2 to 37V, 1.5 Ampere Maximum, TO-3 Case	227-0318	1
U2	Integrated Circuit, LM337K, Adjustable Negative Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-3 Case	227-0338	1
XC1,XC2,XC3	Capacitor Mounting Bracket	453-6701	3
XF1 THRU XF4,XF6,XF7	Fuse Holder, AGC	415-2012	6
XF/S ASSY	Connector, Power, Snap-in, Black (Combination fuse holder, switch, and IEC Connector)	418-0050	1
XQ1,XQ2, XU1,XU2	Socket, Transistor, TO-3	417-0298	4
—	AC Line Cord, N.E.M.A.3-Wire North American Plug	682-0001	1
—	Insulator, Barrier Strip	407-0128	1
—	Shield, Capacitor (for C1)	471-0649	1
—	Shield, Capacitor (for C2 & C3)	471-0648	1
—	Power Supply Wire Harness Assembly	949-0154	1
—	Power Supply Cable Assembly	941-0036	1

TABLE 4-3. POWER SUPPLY CIRCUIT BOARD ASSEMBLY - 911-0064

REF DES.	DESCRIPTION	PART NO.	QTY.
C1	Capacitor, Mylar Film, 0.15 uF, 100V	030-1553	1
C2	Capacitor, Electrolytic, 470 uF ±20%, 100V	020-4785	1
C3	Capacitor, Electrolytic, 10 uF ±20%, 63V	020-1075	1
C4	Capacitor, Electrolytic, 100 uF, 50V	020-1083	1
C5	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C6 THRU C11	Capacitor, Electrolytic, 33 uF, 35V	024-3335	6
D1 THRU D10	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	10
E1 THRU E23	Terminal, Turret, Double Shoulder	413-1597	23
J1	Receptacle, 12-Pin	417-1276	1
R1	Potentiometer, 5 k Ohm ±10%, 1/2W	178-5044	1
R2	Resistor, 910 Ohm ±5%, 1/2W	110-9133	1
R3	Resistor, 6.2 k Ohm, 1/2W	110-6243	1
R4	Resistor, 91 Ohm ±5%, 1/4W	100-9123	1
R5,R6,R7	Resistor, 0.1 Ohm ±5%, 5W, W/W	130-1003	3
R8,R9	Resistor, 2 k Ohm ±5%, 1/4W	100-2043	2
R10	Resistor, 140 Ohm ±1%, 1/4W	103-1403	1
R11	Resistor, 787 Ohm ±1%, 1/4W	103-7873	1
R12	Resistor, 100 Ohm ±5%, 1/4W	100-1033	1
R13	Resistor, 121 Ohm ±1%, 1/4W	100-1231	1
R14,R15	Resistor, 1.47 k Ohm ±1%, 1/4W	103-1474	2
R16	Resistor, 121 Ohm ±1%, 1/4W	100-1231	1
U1	Integrated Circuit, TL783C, Adjustable Three-Terminal Positive Voltage Regulator, 1.25V to 125V at 700 mA, TO-220 Case	227-0783	1
U2	Integrated Circuit, UA723, Voltage Regulator, 14-Pin DIP	227-0723	1
XU2	Socket, 14-Pin DIP	417-1404	1
—	Blank Power Supply Circuit Board	511-0064	1

TABLE 4-4. POWER SUPPLY CABLE ASSEMBLY - 941-0036

REF DES.	DESCRIPTION	PART NO.	QTY.
—	Connector, Housing, 12-Pin	418-1271	2
—	Pins, Connector	417-0053	24

TABLE 4-5. AUTOMATIC POWER SUPPLY SWITCH PANEL ASSEMBLY - 951-0032

REF DES.	DESCRIPTION	PART NO.	QTY.
D1	Diode, Zener, 1N4746, 18V ±10%, 1W	200-4746	1
D2,D3	Diode, MR751, Silicon, 100V @ 6 Amperes	202-0751	2
D4,D5	Diode, Zener, 1N4746, 18V ±10%, 1W	200-4746	2
D6,D7	Diode, MR751, Silicon, 100V @ 6 Amperes	202-0751	2
D8	Diode, Zener, 1N4746, 18V ±10%, 1W	200-4746	1
D9	Diode, Zener, 1N4739A, 9.1V ±5%, 1W	200-0009	1
D10,D11	Diode, MR751, Silicon, 100V @ 6 Amperes	202-0751	2
D12	Diode, Zener, 1N4739A, 9.1V ±5%, 1W	200-0009	1
D13	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	1
D14	Diode, Zener, 1N4742A, 12V ±5%, 1W	200-4742	1
D15	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	1
D16	Diode, Zener, 1N4742A, 12V ±5%, 1W	200-4742	1
D17 THRU D20	Diode, MR751, Silicon, 100V @ 6 Amperes	202-0751	4
DS1 THRU DS8	Indicator, LED, Green, 521-9175, 3V @ 40 mA Maximum	323-9224	8
J1,J2,J3	Receptacle, 12-Pin	417-1276	3
R1 THRU R4	Resistor, 560 Ohm ±5%, 1/4W	100-5633	4
R5,R6	Resistor, 200 Ohm ±5%, 1/4W	100-2033	2
R7,R8	Resistor, 3.3 k Ohm ±5%, 1/2W	110-3343	2
—	Automatic Power Supply Switcher Cable Assembly	941-0032	2
—	Blank Automatic Power Supply Switch Panel Circuit Board	511-0032	1

TABLE 4-6. AUTOMATIC POWER SUPPLY SWITCH PANEL CABLE ASSEMBLY - 941-0032

REF DES.	DESCRIPTION	PART NO.	QTY.
—	Connector Housing, 12-Pin	418-1271	4
—	Pins, Connector	417-0053	48

INPUT EXPANDER MODULE

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1-3	Functional Description	1-1
1-4	Input Expander Module	1-1
SECTION II	MAINTENANCE	
2-1	Introduction	2-1
2-3	Maintenance	2-1
2-4	General	2-1
2-6	Audio Switches	2-1
2-8	Component Replacement	2-1
SECTION III	DRAWINGS	
3-1	Introduction	3-1
SECTION IV	PARTS LIST	
4-1	Introduction	4-1

LIST OF TABLES

TABLE NO.	DESCRIPTION	PAGE NO.
4-1	Input Expander Module Parts List Index	4-1

LIST OF ILLUSTRATIONS

FIGURE NO.	DESCRIPTION	PAGE NO.
1-1	Input Expander Module Detailed Block Diagram	1-2

SECTION I

INPUT EXPANDER MODULE THEORY OF OPERATION

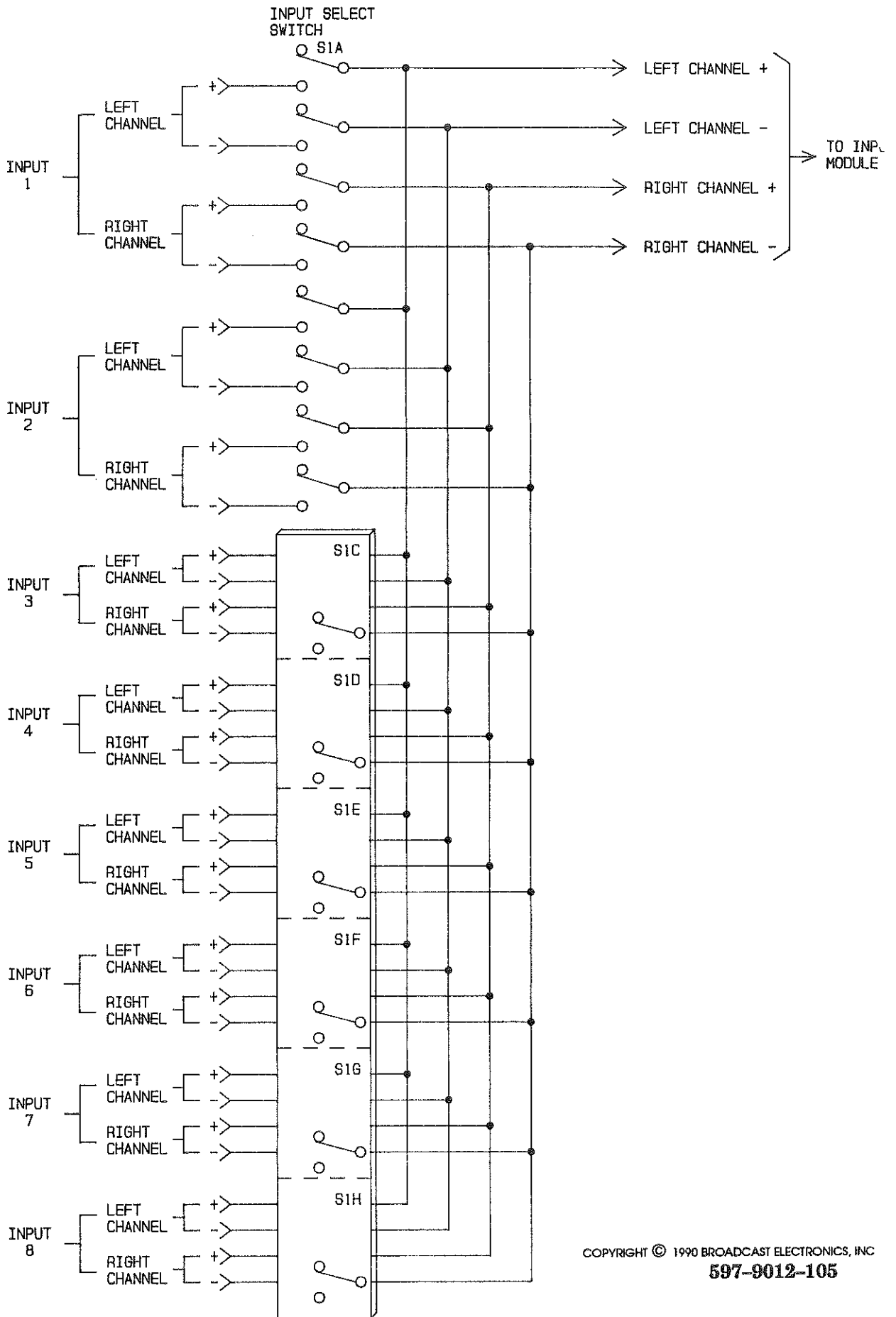
1-1. INTRODUCTION.

1-2. The following text provides detailed theory of operation for the Mix-Trak 90 series audio console input expander module. A detailed block diagram of the input expander module is presented in Figure 1-1. Refer to Figure 1-1 as required for the following circuit discussion.

1-3. FUNCTIONAL DESCRIPTION.

1-4. INPUT EXPANDER MODULE.

1-5. Additional input source selection and control capabilities for Mix-Trak 90 input modules is provided by the input expander module. The input expander module consists of eight color-coded switch/indicators designed to accept and control eight balanced stereophonic audio sources. The switch/indicators select an input source and route the audio for application to the associated line or microphone input module.



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597-9012-105

FIGURE 1-1. INPUT EXPANDER MODULE DETAILED BLOCK DIAGRAM

SECTION II INPUT EXPANDER MODULE MAINTENANCE

2-1. INTRODUCTION.

2-2. This section provides general maintenance information for the input expander module.

2-3. MAINTENANCE.

2-4. GENERAL.

2-5. The input expander module should be periodically cleaned of accumulated dust using a nylon-bristle brush and vacuum cleaner. The module should also be periodically inspected for loose wiring and components.

2-6. AUDIO SWITCHES.

2-7. The input expander module is equipped with ITT Shadow Inc. audio switches. The switches are sealed for low-noise long-life operation and do not permit cleaning. If a switch becomes noisy or defective, the switch will require replacement.

2-8. COMPONENT REPLACEMENT.

2-9. Component replacement procedures for the console modular assemblies are presented in SECTION II, MAINTENANCE. Refer to SECTION II as required for the replacement procedures.

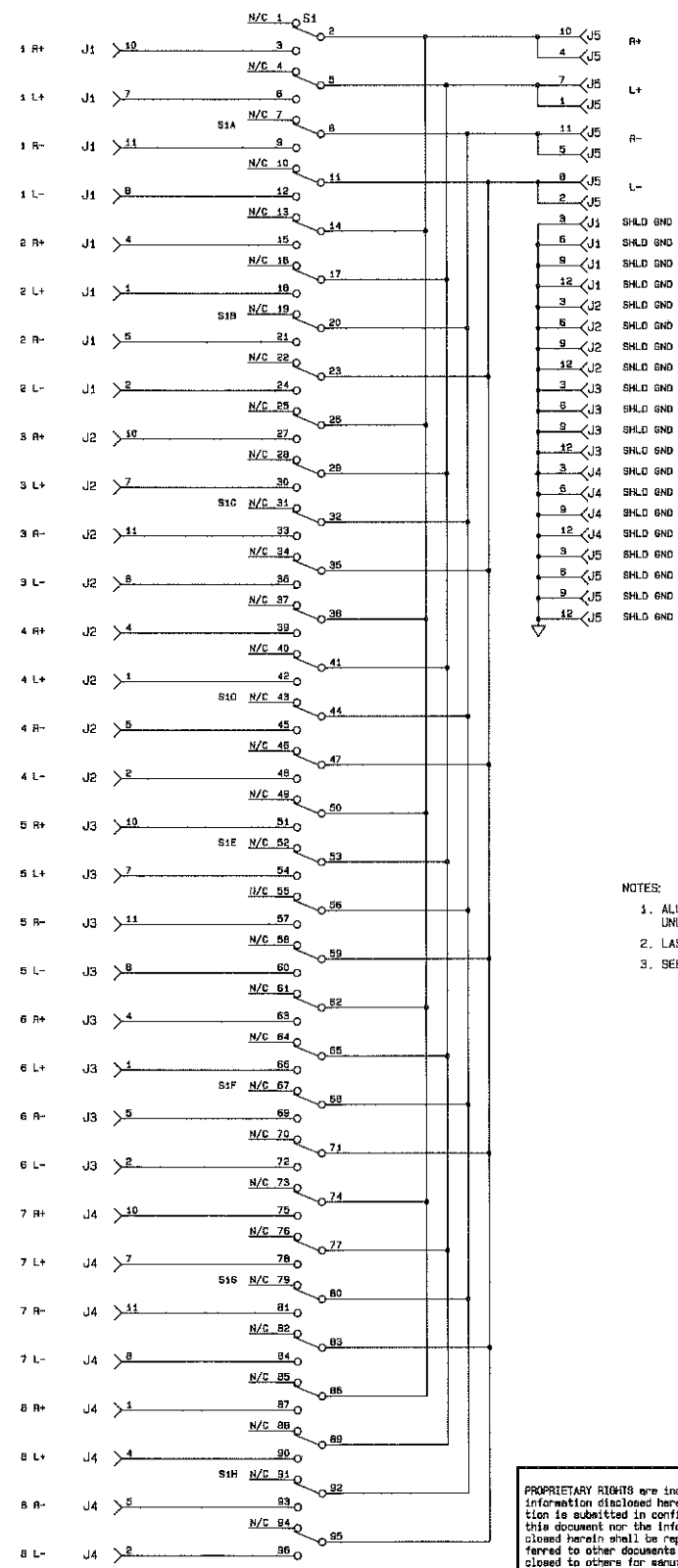
SECTION III

INPUT EXPANDER MODULE DRAWINGS

3-1. **INTRODUCTION.**

3-2. This section provides assembly drawings and schematic diagrams as listed below for the input expander module.

FIGURE	TITLE	NUMBER
3-1	SCHEMATIC DIAGRAM, INPUT EXPANDER MODULE	SC951-0018
3-2	ASSEMBLY DIAGRAM, INPUT EXPANDER MODULE	AC951-0018



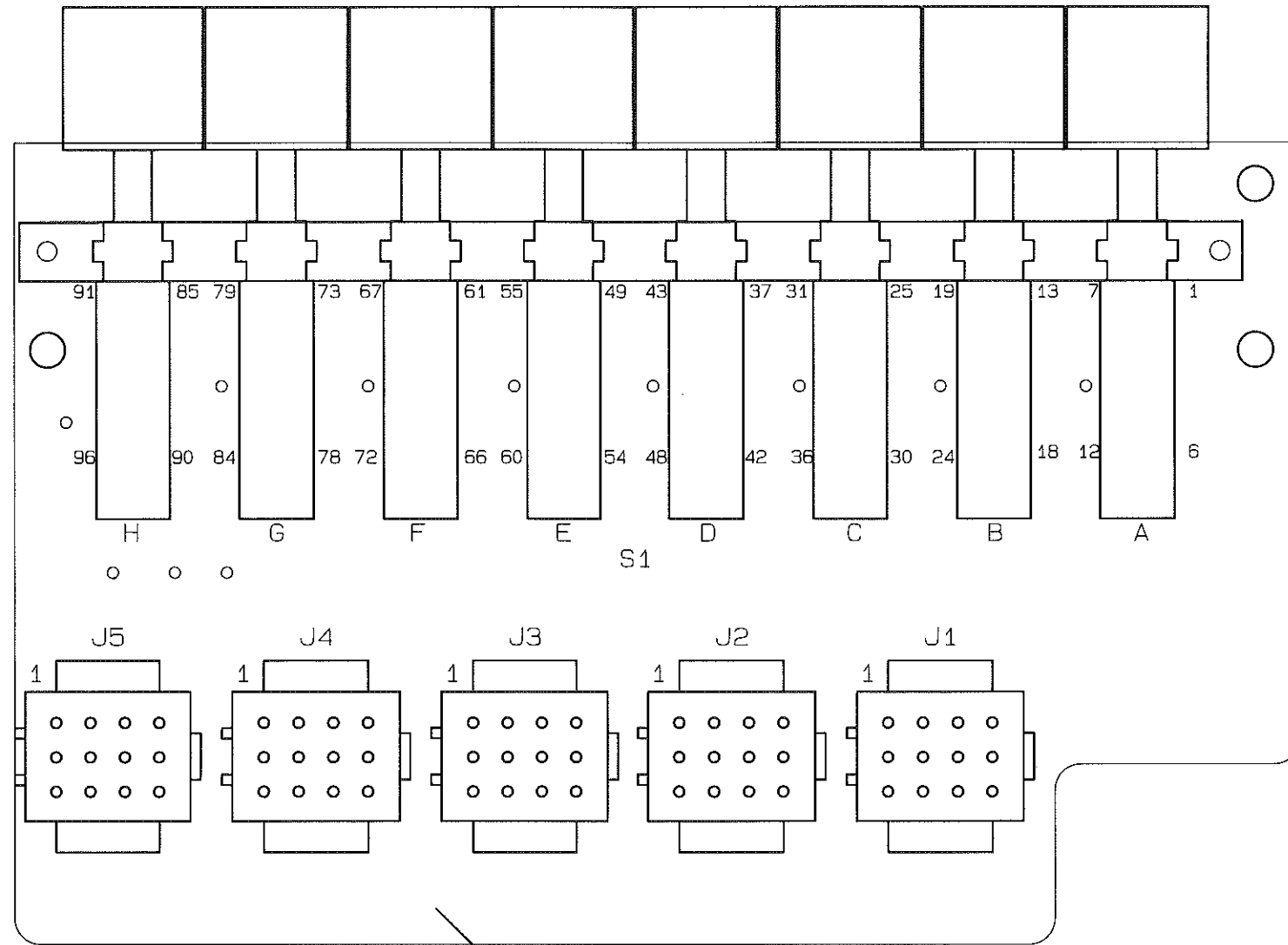
- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5% UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENTS USED: S1, & J5
 3. SEE PCB ASSEMBLY: AC 951-0018

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	CHKD <i>MH 8-22-88</i>	FINISH SEE DWG RA592-0000	
TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°	PROJ. ENGR. <i>[Signature]</i>	NEXT ASSY. 901-9012 (12CH) 901-9018 (16CH)	TYPE SIZE DWG. NO. REV S C 951-0018 A
	MFG. <i>[Signature]</i>	MODEL MT-90	SCALE NONE SHEET 1 OF 1

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511-0018

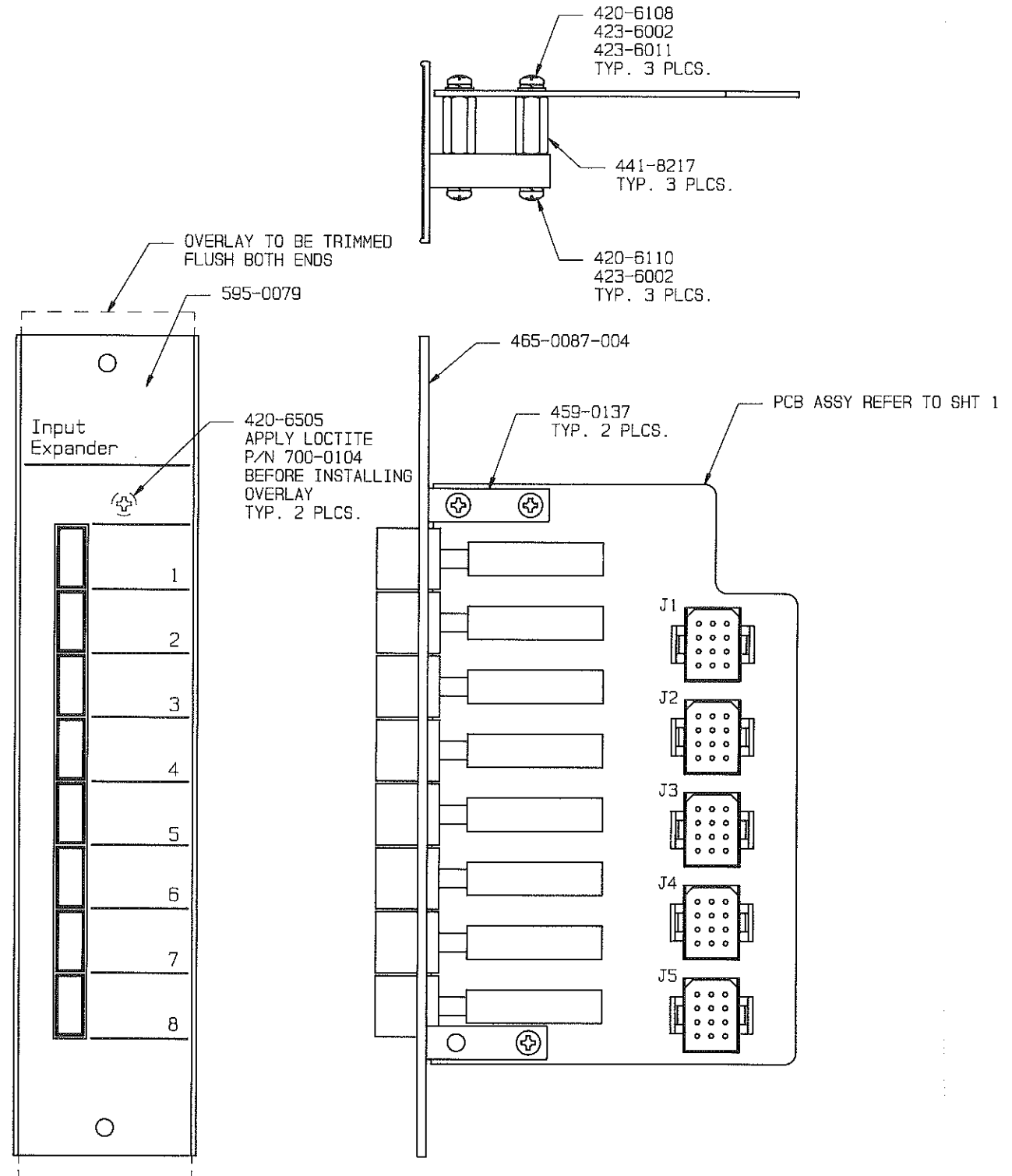
PCB ASSEMBLY

NOTE:

1. REFER TO SHEET 2 FOR MODULE ASSEMBLY
2. SEE SCHEMATIC SC951-0018

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	CHKD MH 8-22-88	951-0018	
	ME 8/22/88	FINISH	TITLE INPUT EXPANDER MODULE
	PRD ENGR MFG 8/22/88	NEXT ASSY 901-9012 "12CH" 901-9018 "18CH"	TYPE SIZE DWG. NO. REV A C 951-0018 A
TOLERANCE DECIMAL U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°	MODEL MT90	SCALE 2/1	SHEET 1 OF 2



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	<small>CHKD</small> MH 8-22-88	<small>DATE</small> 9/22/85	<small>4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL 62305 217/224-9600 TELEX 250142 CABLE BROADCAST</small>	
	<small>PROJ. ENGR.</small> 	<small>FINISH</small> SEE DWG RAS92-0000	<small>TITLE</small> INPUT EXPANDER MODULE	
	<small>TOLERANCE (DECIMAL) U.O.S.</small> .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°	<small>NEXT ASSY.</small> 901-9012 (12CH) 901-9018 (16CH)	<small>TYPE</small> A <small>SIZE</small> C <small>DWG. NO.</small> 951-0018	<small>REV</small> A
		<small>MODEL</small> MIX TRAK 90 <small>SCALE</small> 1/1	<small>SHEET 2 OF 2</small>	

SECTION IV

INPUT EXPANDER MODULE PARTS LIST

4-1. **INTRODUCTION.**

4-2. This section provides descriptions and part numbers of electrical components and assemblies required for maintenance of the input expander module. Each table entry in this section is indexed by the reference designators appearing on the applicable schematic diagram.

TABLE 4-1. INPUT EXPANDER MODULE PARTS LIST INDEX

TABLE	TITLE	PART NO.	PAGE
4-2	INPUT EXPANDER MODULE CIRCUIT BOARD ASSEMBLY	951-0018	4-1

TABLE 4-2. INPUT EXPANDER MODULE CIRCUIT BOARD ASSEMBLY - 951-0018

REF. DES.	DESCRIPTION	PART NO.	QTY.
J1 THRU J5	Receptacle, 12-Pin	417-1276	5
S1	Switch, 8 Section, 4PDT Pushbutton, Out Position White, In Position Blue	340-0114	1
—	Connector Housing, 12-Pin	418-1271	5
—	Pins, Connector	417-0053	65
—	Blank Input Expander Module Circuit Board	511-0018	1

FSK DECODER MODULE

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LIST OF TABLES

TABLE NO.	DESCRIPTION	PAGE NO.
4-1	FSK Decoder Module Parts List Index	4-1

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1-1	FSK Decoder Detailed Block Diagram	1-2
2-1	FSK Decoder Module Adjustment Controls	2-3
2-2	FSK Decoder Module Troubleshooting	2-3

SECTION I

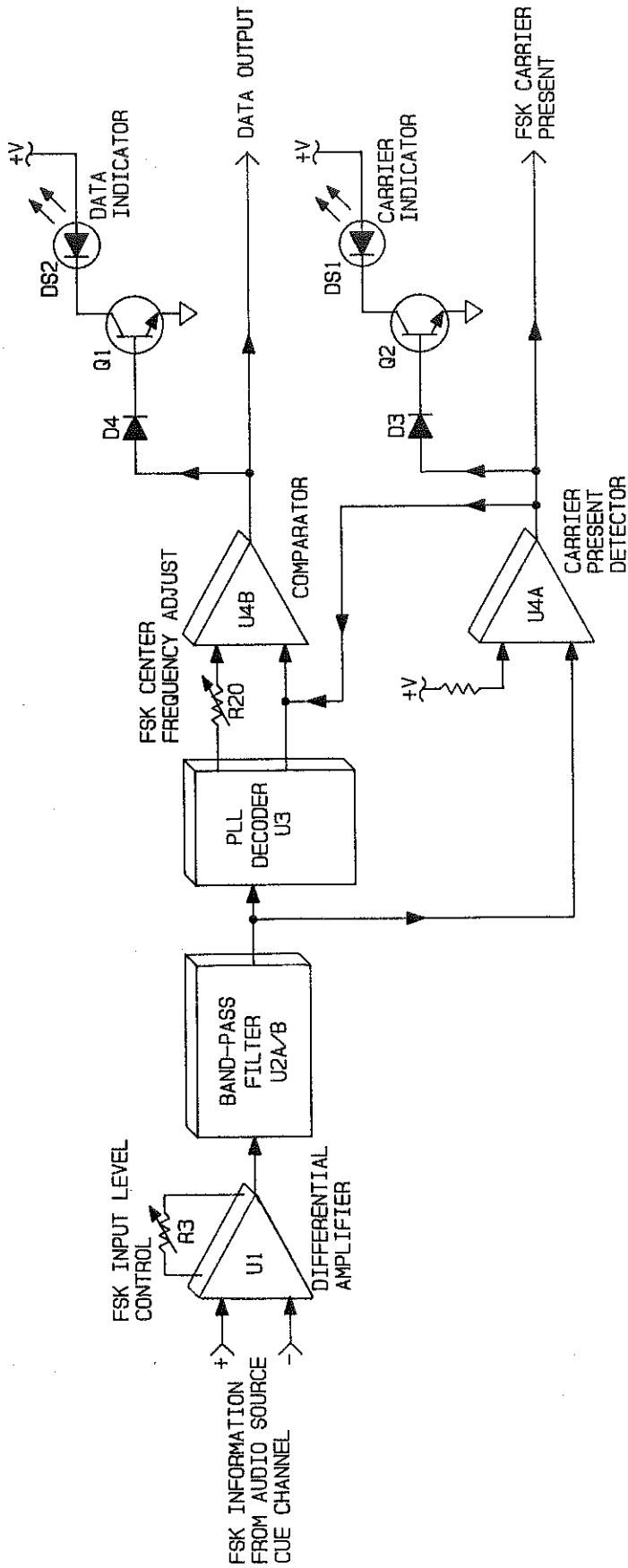
FSK DECODER MODULE THEORY OF OPERATION

1-1. INTRODUCTION.

- 1-2. The following text provides detailed theory of operation for the Mix-Trak 90 series audio console FSK decoder module. A detailed block diagram of the FSK decoder circuitry is presented in Figure 1-1. Refer to Figure 1-1 as required for the following circuit discussion.

1-3. FUNCTIONAL DESCRIPTION.

- 1-4. FSK information from the audio source cue channel is applied to an input network consisting of an amplifier stage and a band-pass filter. The FSK information is applied to differential amplifier U1. Potentiometer R3 is provided to adjust the FSK input level. The output of U1 is applied to a band-pass filter consisting of integrated circuits U2A/B. The filter is configured to pass the FSK data frequency band from 3350 Hz to 3650 Hz.
- 1-5. The output of the filter network is applied to PLL decoder U3 and a carrier detector network. Decoder U3 locks to the FSK carrier frequency and generates a corresponding dc output as the carrier shifts to the mark and space frequencies. Potentiometer R20 is provided to adjust the FSK center frequency. The output of decoder U3 is applied to comparator U4B. U4B is designed to convert the dc information into an RS-232 format. The output of U4B is routed for application to a serial printer or video display terminal. The output of comparator U4B is also applied to a data indicator circuit consisting of transistor Q1 and indicator DS2. The data is half-wave rectified by diode D4 and applied to transistor Q1. The dc potential will bias Q1 on and illuminate data indicator DS2.
- 1-6. The non-decoded FSK information from the band-pass filter is also applied to carrier present detector U4A. If FSK information is present, the output of U4A will go HIGH. The HIGH will bias transistor Q2 on to illuminate carrier indicator DS1.



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FIGURE 1-1. FSK DECODE TAILED BLOCK DIAGRAM

SECTION II

FSK DECODER MODULE MAINTENANCE

2-1. INTRODUCTION.

2-2. This section provides general maintenance information, electrical adjustment procedures, and troubleshooting information for the FSK decoder module.

2-3. FIRST LEVEL MAINTENANCE.

2-4. First level maintenance consists of precautionary procedures applied to the equipment to prevent future failures. The procedures are performed on a regular basis and the results recorded in a performance log.

2-5. The FSK decoder module should be periodically cleaned of accumulated dust using a nylon-bristle brush and vacuum cleaner. Inspect the module for improperly seated semiconductors and components damaged by overheating.

2-6. SECOND LEVEL MAINTENANCE.

2-7. Second level maintenance consists of procedures required to restore an FSK decoder module to operation after a fault has occurred. The procedures are divided into electrical adjustments, troubleshooting, and component replacement procedures.

2-8. ELECTRICAL ADJUSTMENTS.

2-9. **FSK INPUT LEVEL.** Potentiometer R3 adjusts the FSK decoder input level. The FSK decoder input level is adjusted as follows.

2-10. **Required Equipment.** The following test equipment is required to adjust the FSK input level.

- A. Allen Wrench (supplied with the console).
- B. Non-Metallic Adjustment Tool.
- C. Bulk Erased Tape Cartridge.
- D. Voltmeter.

2-11. **Procedure.** To adjust the FSK decoder input level, proceed as follows:

2-12. Remove the FSK decoder module from the console mainframe.

2-13. Create an FSK carrier test tape for input level alignment by recording FSK carrier information on the bulk erased tape cartridge.

2-14. Refer to Figure 2-1 and connect the voltmeter to U1 pin 6.

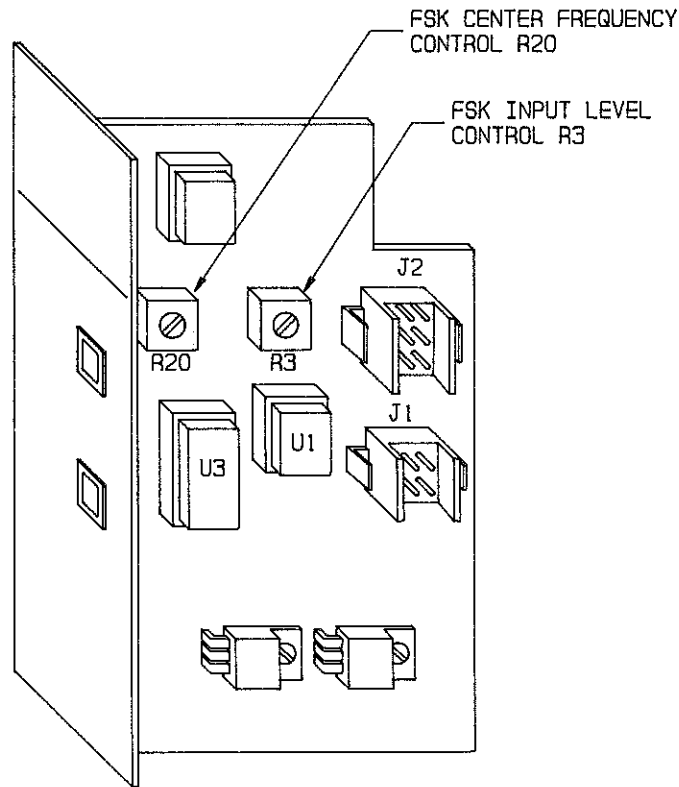
2-15. Insert the FSK carrier test tape into an appropriate audio source and reproduce the FSK carrier information.

2-16. Refer to Figure 2-1 and adjust FSK input level control R3 until the voltmeter indicates 1.0 volts. The DATA indicator will illuminate.

2-17. Terminate the FSK test audio and replace the FSK decoder module.

2-18. **FSK CENTER FREQUENCY ADJUSTMENT.** FSK center frequency control R20 adjusts the operating frequency of the FSK decoder. Adjustment of the control is not required unless replacement components are installed in the circuit. The FSK decoder center frequency is adjusted as follows.

- 2-19. **Required Equipment.** The following test equipment is required to adjust the FSK center frequency.
- A. Allen Wrench (supplied with the console).
 - B. Non-Metallic Adjustment Tool.
 - C. General Purpose Oscilloscope.
 - D. Frequency Counter.
 - E. Function Generator or Bulk Erased Tape Cartridge.
- 2-20. **Procedure.** To adjust the FSK center frequency control, proceed as follows:
- 2-21. Remove the FSK decoder module from the console mainframe.
- 2-22. Refer to Figure 2-1 and connect the oscilloscope and frequency counter to J2 pin 1.
- 2-23. Provide a signal source for FSK center frequency alignment by performing one of the following:
- A. Refer to Figure 2-1 and connect a function generator to J2 pin 5 (FSK input +) and J2 pin 6 (FSK input -). Operate the generator to modulate a 3500 Hz tone ± 200 Hz at a 50% duty cycle.
- OR
- B. Generate an FSK test tape for center frequency alignment by recording the letter U continuously on a bulk erased tape cartridge for approximately 1.5 minutes. Insert the test tape into an appropriate audio source.
- 2-24. Enable the FSK test signal source.
- 2-25. Refer to Figure 2-1 and adjust FSK center frequency control R20 for a symmetrical 150 Hz square-wave presentation on the oscilloscope. The **CARRIER** indicator will illuminate.
- 2-26. Remove all test equipment and replace the FSK decoder module.
- 2-27. **TROUBLESHOOTING.**
- 2-28. The troubleshooting philosophy for the FSK decoder module consists of isolating a problem to a specific circuit or group of components. Figure 2-2 presents the FSK module troubleshooting information. Refer to Figure 2-2 to isolate a failure to a specific group of components.
- 2-29. Once trouble is isolated and power is totally deenergized, refer to the schematic diagrams and the theory of operation to assist in problem resolution. The defective component may be repaired locally or the entire module may be returned to Broadcast Electronics for repair or replacement.
- 2-30. **COMPONENT REPLACEMENT.**
- 2-31. Component replacement procedures for the console modular assemblies are presented in **SECTION II, MAINTENANCE**. Refer to **SECTION II** as required for the replacement procedures.



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FIGURE 2-1. FSK DECODER MODULE ADJUSTMENT CONTROLS

FSK DECODER MODULE TROUBLESHOOTING	
SYMPTOM	SOLUTION
NO FSK OUTPUT	<ol style="list-style-type: none"> 1. ENSURE THE FSK CARRIER IS PRESENT. 2. CHECK INTEGRATED CIRCUITS U4 AND U3. 3. CHECK INTEGRATED CIRCUITS U2 AND U1.
NO DATA INDICATIONS	<ol style="list-style-type: none"> 1. CHECK TRANSISTOR Q1 AND LED DS2.
NO CARRIER INDICATIONS	<ol style="list-style-type: none"> 1. CHECK INTEGRATED CIRCUIT U4, TRANSISTOR Q2, AND LED DS1.

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FIGURE 2-2. FSK DECODER MODULE TROUBLESHOOTING

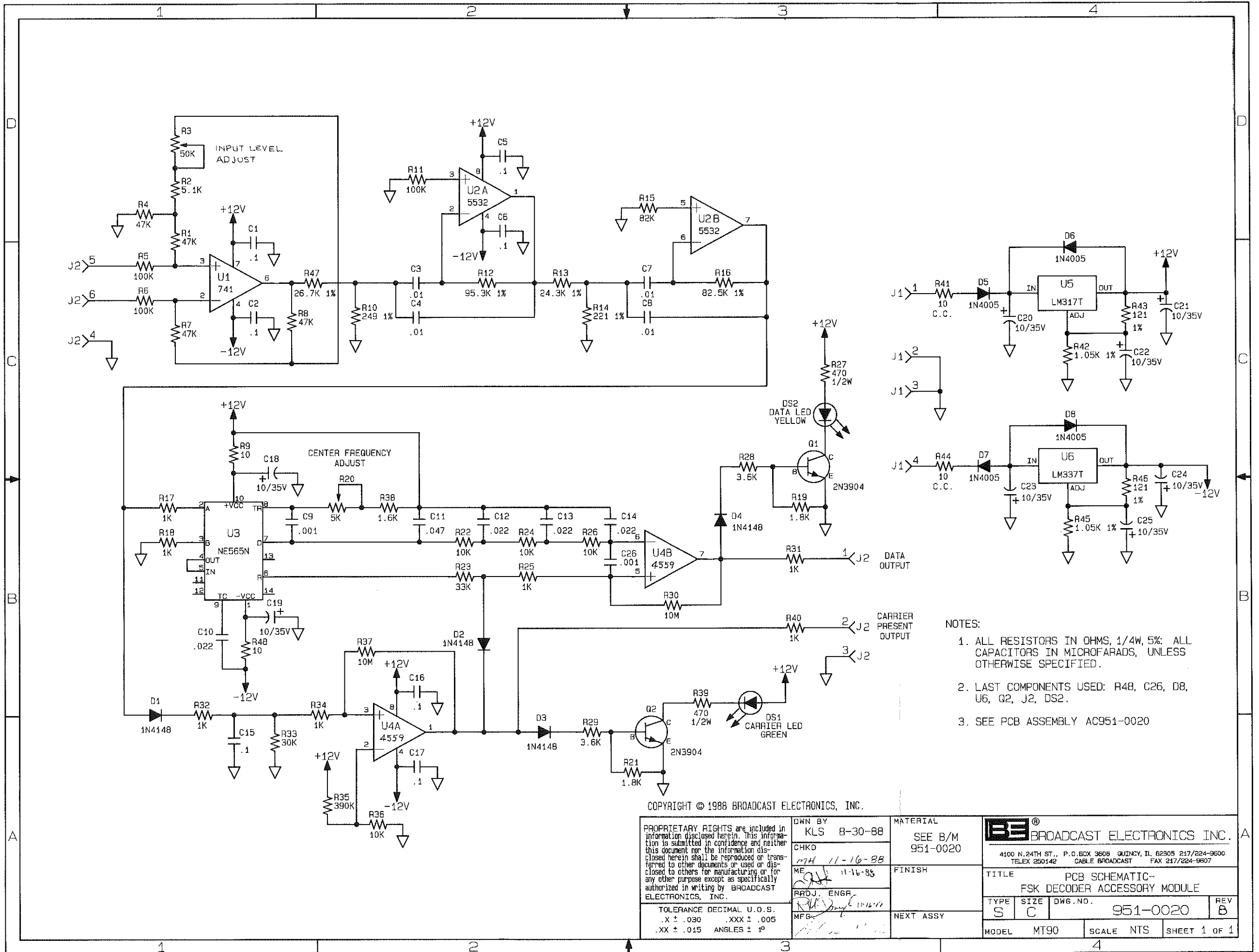
SECTION III

FSK DECODER MODULE DRAWINGS

3-1. **INTRODUCTION.**

3-2. This section provides assembly drawings and schematic diagrams as listed below for the FSK decoder module.

FIGURE	TITLE	NUMBER
3-1	SCHEMATIC DIAGRAM, FSK DECODER MODULE	SC951-0020
3-2	ASSEMBLY DIAGRAM, FSK DECODER MODULE	AC951-0020



- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5%; ALL CAPACITORS IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENTS USED: R48, C26, D8, U6, Q2, J2, DS2.
 3. SEE PCB ASSEMBLY AC951-0020

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	CHKD ME 11-16-88	FINISH		TITLE PCB SCHEMATIC- FSK DECODER ACCESSORY MODULE
	PROJ. ENGR MFG	NEXT ASSY	TYPE SIZE DWG. NO. S C 951-0020	REV B
	MODEL MT90	SCALE NTS	SHEET 1 OF 1	

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511-0120

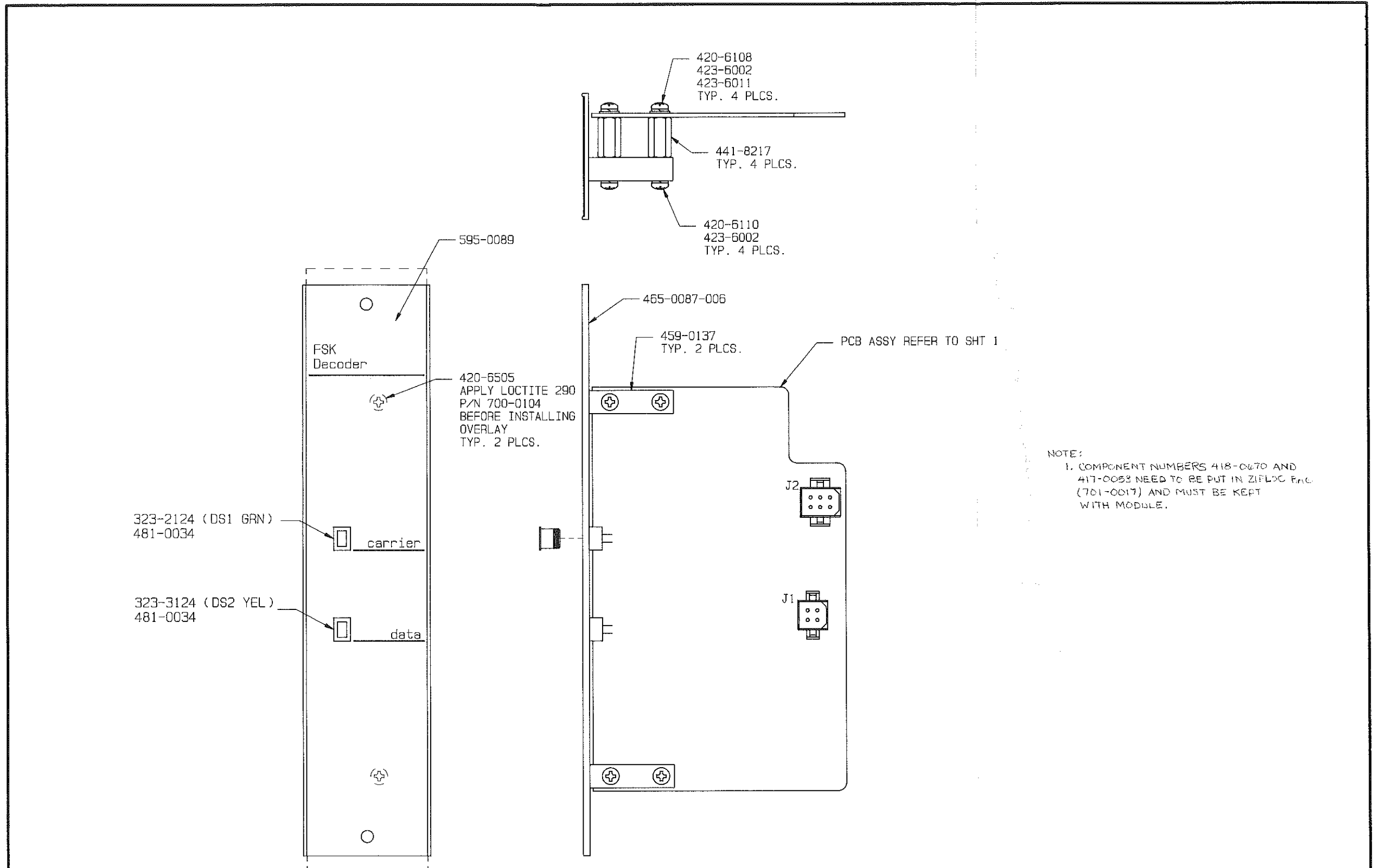
420-6130
421-6901

NOTES:

1. SEE SCHEMATIC SC951-0020
2. LAST COMPONENT USED: R48, C26, D8, U6, Q2, J2, DS2.

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	CHKD <i>ME 11-16-88</i> PROD. ENGR. <i>PHU and P. W. C.</i> MFG.	FINISH	
TOLERANCE DECIMAL U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°	NEXT ASSY	TYPE A SIZE C DWS. NO. 951-0020 REV B	MODEL MT90 SCALE 2/1 SHEET 1 of 2



NOTE:
1. COMPONENT NUMBERS 418-0670 AND
417-0053 NEED TO BE PUT IN ZIPLOC BAG
(701-0017) AND MUST BE KEPT
WITH MODULE.

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	CHD <i>MA 11-16-88</i>	FINISH SEE DWG RAS92-0000		TITLE FSK DECODER MODULE		
	ME <i>MA 11-16-88</i>	PROJ. ENGR. <i>[Signature]</i>	NEXT ASSY. 901-9012 (12CH) 901-9018 (18CH)	TYPE A C	DWG. NO. 951-0020	REV B
	TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°	MFG <i>[Signature]</i>	MODEL MIX TRAK 90	SCALE 1/1	SHEET 2 OF 2	

SECTION IV

FSK DECODER MODULE PARTS LIST

4-1. INTRODUCTION.

4-2. This section provides descriptions and part numbers of electrical components and assemblies required for maintenance of the FSK decoder module. Each table entry in this section is indexed by the reference designators appearing on the applicable schematic diagram.

TABLE 4-1. FSK DECODER MODULE PARTS LIST INDEX.

TABLE	TITLE	PART NO.	PAGE
4-2	FSK DECODER MODULE CIRCUIT BOARD ASSEMBLY	951-0020	4-1
4-3	FSK DECODER CABLE ASSEMBLY	941-0023	4-3

TABLE 4-2. FSK DECODER MODULE CIRCUIT BOARD ASSEMBLY - 951-0020
(Sheet 1 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1,C2	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	2
C3,C4	Capacitor, Polycarbonate, 0.01 uF ±2%, 100V	037-1043	2
C5,C6	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	2
C7,C8	Capacitor, Polycarbonate, 0.01 uF ±2%, 100V	037-1043	2
C9	Capacitor, Ceramic, 0.001 uF ±10%, 200V	030-1033	1
C10	Capacitor, Mylar Film, 0.022 uF ±10%, 200V	031-2243	1
C11	Capacitor, Mylar Film, 0.047 uF ±10%, 100V	030-4743	1
C12,C13,C14	Capacitor, Mylar Film, 0.022 uF ±10%, 200V	031-2243	3
C15,C16,C17	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	3
C18 THRU C25	Capacitor, Electrolytic, 10 uF, 50V	023-1076	8
C26	Capacitor, Ceramic, 0.001 uF ±10%, 200V	030-1033	1
D1 THRU D4	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	4
D5 THRU D8	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	4
DS1	LED, Green, CMD54124A, 3V @ 20 mA Maximum	323-2124	1
DS2	LED, Yellow, CMD53124A, 3V @ 20 mA Maximum	323-3124	1
J1	Connector, Male, 4-Pin	418-0255	1
J2	Receptacle, 6-Pin	417-0677	1
P2	Connector Housing, 6-Pin	418-0670	1
Q1,Q2	Transistor, 2N3904, NPN, Silicon, TO-92 Case	211-3904	2
R1	Resistor, 47 k Ohm ±5%, 1/4W	100-4753	1
R2	Resistor, 5.1 k Ohm ±5%, 1/4W	100-5143	1
R3	Potentiometer, 50 k Ohm ±10%, 1/2W	177-5054	1
R4	Resistor, 47 k Ohm ±5%, 1/4W	100-4753	1
R5,R6	Resistor, 100 k Ohm ±5%, 1/4W	100-1063	2

TABLE 4-2. FSK DECODER MODULE CIRCUIT BOARD ASSEMBLY - 951-0020
(Sheet 2 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R7,R8	Resistor, 47 k Ohm $\pm 5\%$, 1/4W	100-4753	2
R9	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1023	1
R10	Resistor, 249 Ohm $\pm 1\%$, 1/4W	103-2493	1
R11	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R12	Resistor, 95.3 k Ohm $\pm 1\%$, 1/4W	103-9535	1
R13	Resistor, 24.3 k Ohm $\pm 1\%$, 1/4W	103-2435	1
R14	Resistor, 221 Ohm $\pm 1\%$, 1/4W	103-2213	1
R15	Resistor, 82 k Ohm $\pm 5\%$, 1/4W	100-8253	1
R16	Resistor, 82.5 k Ohm $\pm 1\%$, 1/4W	103-8255	1
R17,R18	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	2
R19	Resistor, 1.8 k Ohm $\pm 5\%$, 1/4W	100-1843	1
R20	Potentiometer, 5 k Ohm $\pm 10\%$, 1/2W	177-5044	1
R21	Resistor, 1.8 k Ohm $\pm 5\%$, 1/4W	100-1843	1
R22	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R23	Resistor, 33 k Ohm $\pm 5\%$, 1/4W	100-3353	1
R24	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R25	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R26	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R27	Resistor, 470 Ohm $\pm 5\%$, 1/2W	110-4733	1
R28,R29	Resistor, 3.6 k Ohm $\pm 5\%$, 1/4W	100-3643	2
R30	Resistor, 10 Meg Ohm $\pm 5\%$, 1/4W	100-1083	1
R31,R32	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	2
R33	Resistor, 30 k Ohm $\pm 5\%$, 1/4W	100-3053	1
R34	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R35	Resistor, 390 k Ohm $\pm 5\%$, 1/4W	100-3963	1
R36	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R37	Resistor, 10 Meg Ohm $\pm 5\%$, 1/4W	100-1083	1
R38	Resistor, 1.6 k Ohm $\pm 5\%$, 1/4W	100-1643	1
R39	Resistor, 470 Ohm $\pm 5\%$, 1/2W	110-4733	1
R40	Resistor, 1 k Ohm $\pm 5\%$, 1/4W	100-1043	1
R41	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1024	1
R42	Resistor, 1.05 k Ohm $\pm 1\%$, 1/4W	103-1054	1
R43	Resistor, 121 Ohm $\pm 5\%$, 1/4W	100-1231	1
R44	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1024	1
R45	Resistor, 1.05 k Ohm $\pm 1\%$, 1/4W	103-1054	1
R46	Resistor, 121 Ohm $\pm 5\%$, 1/4W	100-1231	1
R47	Resistor, 26.7 k Ohm $\pm 1\%$, 1/4W	103-2675	1
R48	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1023	1
U1	Integrated Circuit, RC741DN, Operational Amplifier, 8-Pin DIP	221-7410	1
U2	Integrated Circuit, NE5532AP, Dual Low Noise Operational Amplifier, 8-Pin DIP	221-5532-001	1
U3	Integrated Circuit, NE565N, Phase-locked Loop Linear, 14-Pin DIP	229-0565	1
U4	Integrated Circuit, RC4559NB, Operational Amplifier, 8-Pin DIP	221-4559	1
U5	Integrated Circuit, LM317T, Adjustable Positive Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0317	1
U6	Integrated Circuit, LM337T, Adjustable Negative Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0337	1

TABLE 4-2. FSK DECODER MODULE CIRCUIT BOARD ASSEMBLY - 951-0020
 (Sheet 3 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
XU1,XU2	Socket, 8-Pin DIP	417-0804	2
XU3	Socket, 14-Pin DIP	417-1404	1
XU4	Socket, 8-Pin DIP	417-0804	1
—	Pins, Connector	417-0053	9
—	Overlay, FSK Decoder Module	595-0089	1
—	FSK Decoder Cable Assembly	941-0023	1
—	Blank FSK Decoder Module Circuit Board	511-0120	1

TABLE 4-3. FSK DECODER CABLE ASSEMBLY - 941-0023

REF. DES.	DESCRIPTION	PART NO.	QTY.
P1	Plug, Housing, 4-Pin	418-0240	1
—	Pins, Connector	417-0053	4

LED BARGRAPH METER DORROUGH LOUDNESS METER

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FIGURE NO.	DESCRIPTION	PAGE NO
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SECTION I

LED BARGRAPH METER

DORROUGH LOUDNESS METER

THEORY OF OPERATION

1-1. INTRODUCTION.

1-2. The following text provides detailed theory of operation for the Mix-Trak 90 series audio console LED bargraph meter and Dorrough loudness meter assemblies.

1-3. LED BARGRAPH METER FUNCTIONAL DESCRIPTION.

1-4. The following text provides detailed theory of operation for the Mix-Trak 90 series audio console LED bargraph meter assembly. A detailed block diagram of the LED bargraph meter is presented in Figure 1-1. Refer to Figure 1-1 as required for the following circuit discussion.

1-5. METER CIRCUIT.

1-6. Audio samples from the meter switch circuit board assembly are applied through ac coupling capacitors to differential input amplifier U3A. The differential amplifier is designed to provide balanced-to-unbalanced signal conversion. The output of U3A is applied to a full-wave rectifier and gain stage consisting of integrated circuits U3B and U4A. U3B operates in association with diodes D5 and D6 to full-wave rectify the audio samples. The rectified output of U3B is applied to amplifier U4A. U4A is configured for a gain of approximately 2.

1-7. The output of U4A is applied to a meter ballistics network consisting of resistors R22 through R25 and diode D7. The VU meter attack/recovery time is established by resistor R22 and capacitor C9. The peak-program-meter attack/recovery time is established by resistor R25 and capacitor C9. Resistors R23 and R24 function as a voltage divider to maintain the circuit calibration. D7 functions as a blocking diode during peak-program recovery operations. The output of the network is applied to jumper J2. J2 selects between VU and peak-program-meter operations.

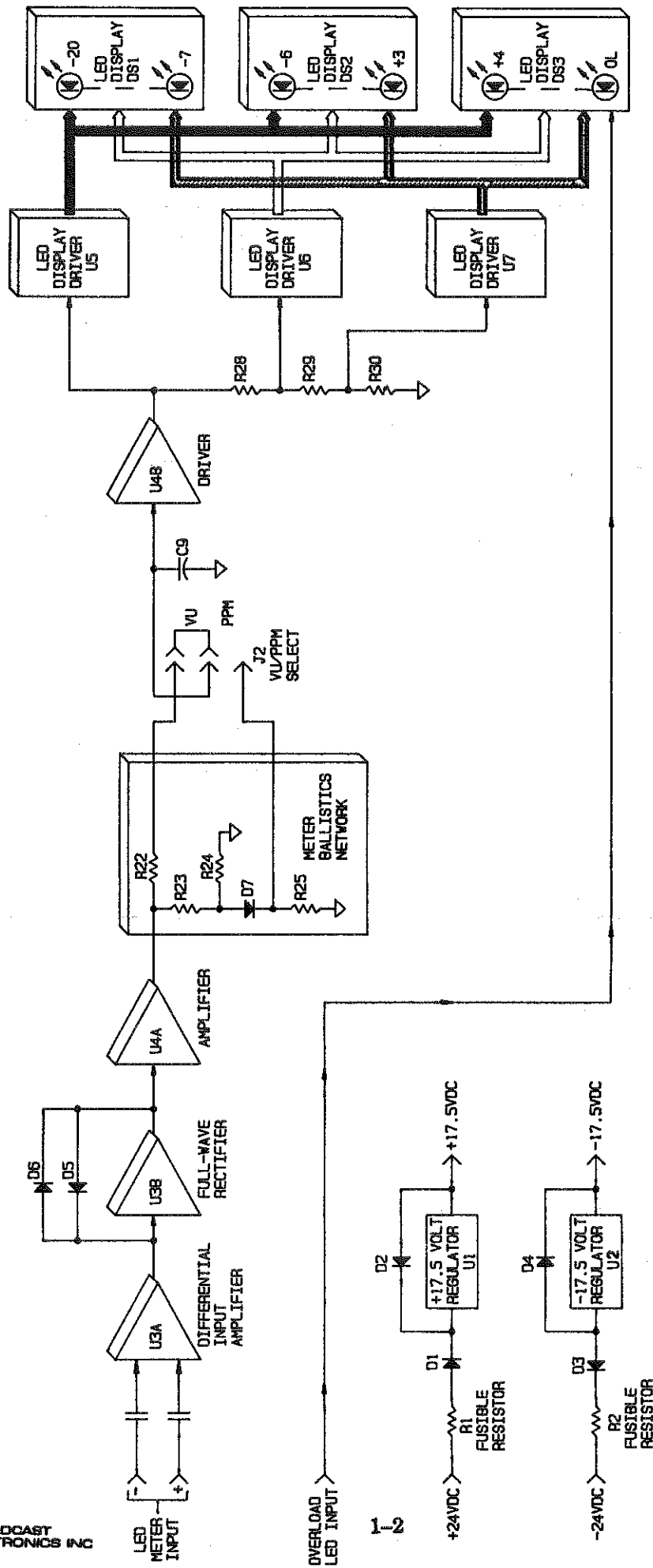
1-8. The full-wave rectified samples from J2 are applied to driver stage U4B. The output of U4B is applied to a meter display control circuit consisting of a voltage divider and a meter driver network. The voltage divider consists of resistors R28 through R30. The divider generates control voltages for application to integrated circuits U5, U6, and U7. U5, U6, and U7 are bar/dot display drivers which control the operation of a 30-segment multi-color LED meter display. The meter display consists of green 10-segment LED display DS1, multi-color 10-segment display DS2, and red 10-segment display DS3. Each display driver controls approximately nine LEDs in 3 dB increments. The following text presents LED display control information.

DISPLAY DRIVER

U5

LED

1. -20	6. -2
2. -14	7. +1
3. -11	8. +4
4. -8	9. +7
5. -5	



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FIGURE 1-1. LED BARGRAPH METER BLOCK DIAGRAM

U6	1. -16	6. +2
	2. -10	7. +5
	3. -7	8. +8
	4. -4	
	5. -1	
U7	1. -18	6. 0
	2. -12	7. +3
	3. -9	8. +6
	4. -6	9. +9
	5. -3	

1-9. The meter control circuit operates by evaluating the applied samples and illuminating the appropriate LEDs on the display. For example, when U4B routes a dc level representing a -20 dB signal to the meter control network, the voltage divider will generate three proportional control voltages for application to drivers U5, U6, and U7. Each display driver functions as a comparator and will be enabled only if the voltage is within the assigned reference voltage. With a -20 dB signal applied, the voltage will be within the threshold of driver U5. U5 will respond by illuminating the -20 indicator on the display. Drivers U6 and U7 will be disabled.

1-10. POWER SUPPLY CIRCUIT.

1-11. DC operating potentials for application to the LED bargraph meter assembly components are produced by a regulator network. Unregulated ± 24 volt supplies from the console power supply module are applied through fusible resistors R1 and R2 to a regulator network consisting of U1 and U2. R1/R2 are carbon-composition resistors which function as fusible links in the event of a short-circuit potential on the assembly. The fusible resistors limit a power supply failure to the assembly and prevent a failure in the entire console system.

1-12. ± 24 V dc supplies from the console power supply module are applied to +17.5V dc regulator U1 and -17.5V dc regulator U2. U1/U2 are three terminal adjustable regulators containing internal thermal and short-circuit current limiting features. Additional protection for the regulators is provided by diodes D1 through D4. Diodes D1 and D3 provide protection from a short-circuit applied to the input. Diodes D2 and D4 provide protection from reverse polarity potentials applied to the outputs. The regulated ± 17.5 volt outputs from U1 and U2 are routed for application to the circuit board components.

1-13. DORROUGH LOUDNESS METER FUNCTIONAL DESCRIPTION.

1-14. A description of the Dorrough loudness meter circuitry is presented in the Dorrough loudness meter information which is shipped with the meter assembly. Refer to the Dorrough information as required for a description of the meter assembly.

SECTION II

LED BARGRAPH METER DORROUGH LOUDNESS METER MAINTENANCE

2-1. INTRODUCTION.

2-2. This section provides general maintenance information for the LED bargraph meter and Dorrough loudness meter assemblies.

2-3. LED BARGRAPH METER MAINTENANCE.

2-4. GENERAL.

2-5. The LED bargraph meter assembly should be periodically cleaned of accumulated dust using a nylon-bristle brush and vacuum cleaner. The meter assembly should also be inspected for loose wiring and components.

2-6. TROUBLESHOOTING.

2-7. The troubleshooting philosophy for the LED bargraph meter assembly consists of isolating a problem to a specific circuit or group of components. Once the trouble is isolated and power is totally deenergized, refer to the schematic diagram and the theory of operation to assist in problem resolution. The defective component may be repaired locally or the entire assembly may be returned to Broadcast Electronics for repair or replacement.

2-8. COMPONENT REPLACEMENT.

2-9. Component replacement procedures for the console modular assemblies are presented in SECTION II, MAINTENANCE. Refer to SECTION II as required for the replacement procedures.

2-10. DORROUGH LOUDNESS METER MAINTENANCE.

2-11. Maintenance information for the Dorrough loudness meter is presented in the Dorrough loudness meter information which is shipped with the meter assembly. Refer to the Dorrough information as required for maintenance procedures.

SECTION III

LED BARGRAPH METER DORROUGH LOUDNESS METER DRAWINGS

3-1. INTRODUCTION.

3-2. This section provides assembly and schematic diagrams as listed below for the LED bargraph meter and Dorrough loudness meter assemblies.

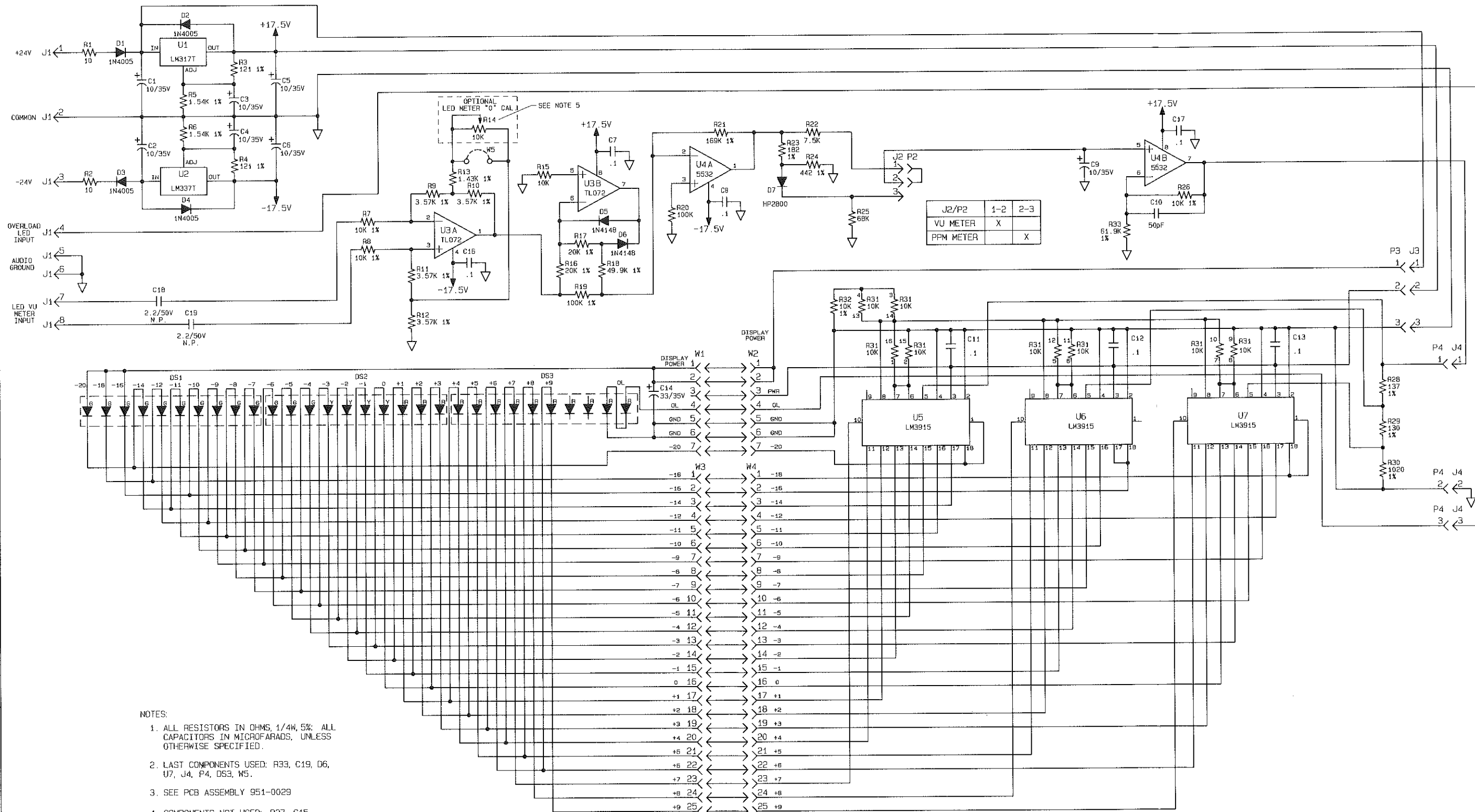
3-3. LED BARGRAPH METER ASSEMBLY.

FIGURE	TITLE	NUMBER
3-1	SCHEMATIC DIAGRAM, LED BARGRAPH METER	SD951-0029
3-2	ASSEMBLY DIAGRAM, LED BARGRAPH METER	AD951-0029

3-4. DORROUGH LOUDNESS METER.

3-5. Schematic diagrams and assembly drawings for the Dorrough loudness meter assembly are presented in the Dorrough loudness meter information which is shipped with the meter assembly. Refer to the Dorrough information as required for the schematic and assembly drawings. Schematic diagrams and assembly drawings for the Broadcast Electronics manufactured Dorrough loudness meter interface circuit board are presented in this section. The following text presents the Dorrough loudness meter interface circuit board drawings.

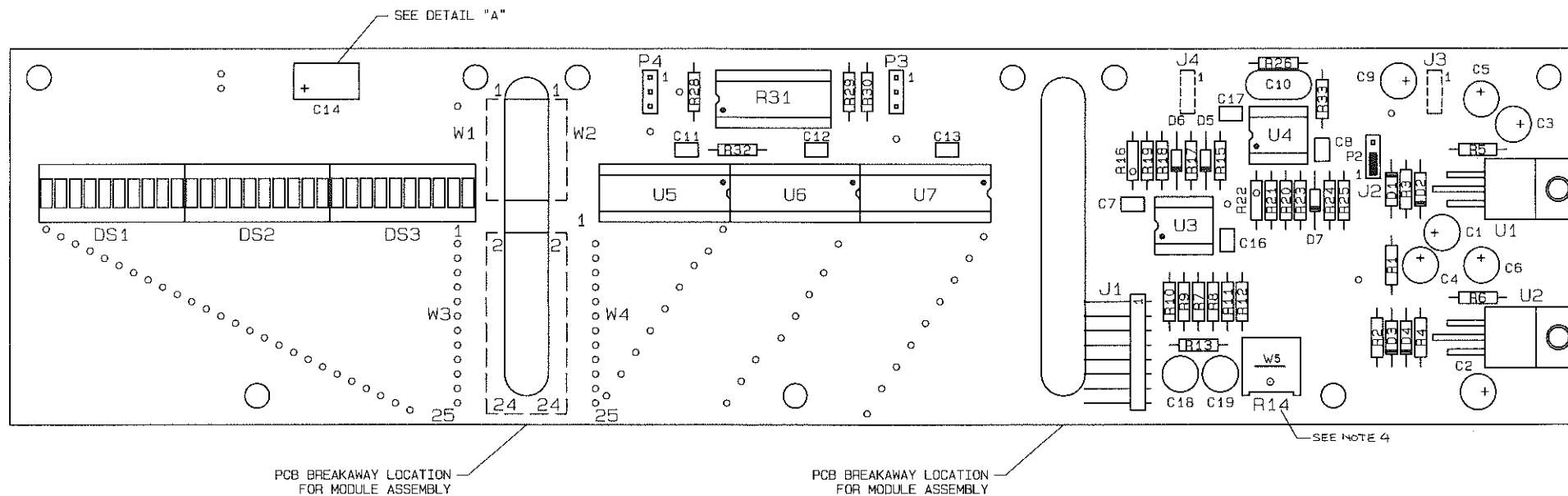
FIGURE	TITLE	NUMBER
3-3	ASSEMBLY DIAGRAM, DORROUGH LOUDNESS METER	597-9012-500
3-4	SCHEMATIC DIAGRAM, DORROUGH LOUDNESS METER INTERFACE CIRCUIT BOARD	SC951-0047-001
3-5	ASSEMBLY DIAGRAM, DORROUGH LOUDNESS METER INTERFACE CIRCUIT BOARD	AB951-0047-001



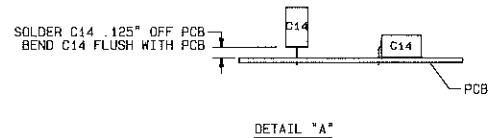
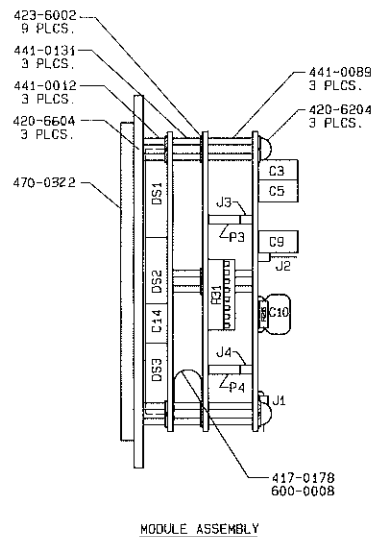
J2/P2	1-2	2-3
VU METER	X	
PPM METER		X

- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5%; ALL CAPACITORS IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENTS USED: R33, C19, D6, U7, J4, P4, DS3, W5.
 3. SEE PCB ASSEMBLY 951-0029
 4. COMPONENTS NOT USED: R27, C15.
 5. IF USING R14, REMOVE W5 AND CHANGE R13 TO 75 OHM.

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	CHKD RJA 4-13-89	FINISH	
	PROJ. ENGR MFG	NEXT ASSY	
	TITLE PCB SCHEMATIC- LED BARGRAPH METER 8D.	TYPE SIZE DWG. NO. REV S D 951-0029 C	
MODEL		SCALE	SHEET 1 OF 1



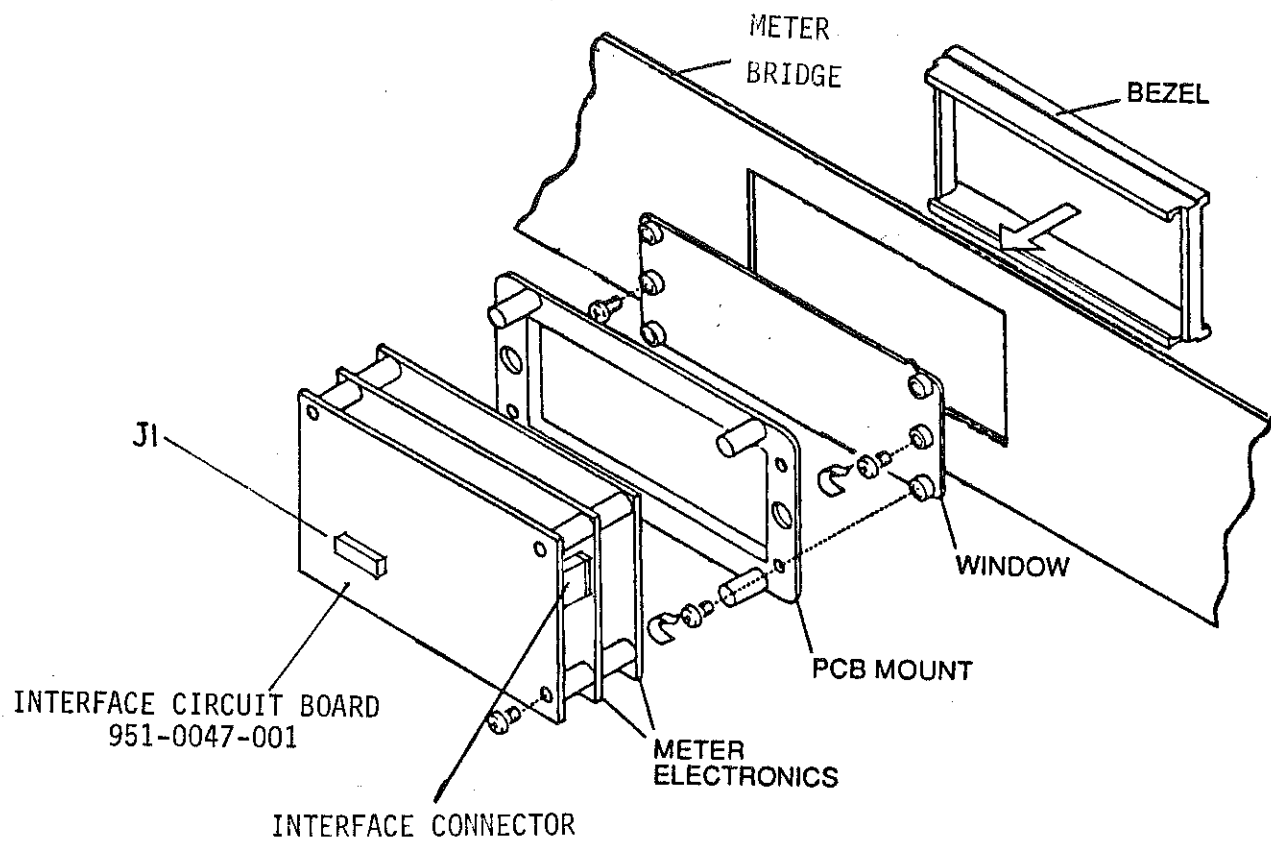
420-6106
423-6002
423-6011
421-6011
2 PLCS.



- NOTES:
1. LAST COMPONENT USED: R33, C19, D6, U7, J4, P4, DS3, W5.
 2. COMPONENTS NOT USED: R27, C15.
 3. SEE SCHEMATIC SD951-0029
 4. WHEN USING OPTIONAL R14, REMOVE W5 AND CHANGE R13 TO 75 OHM.

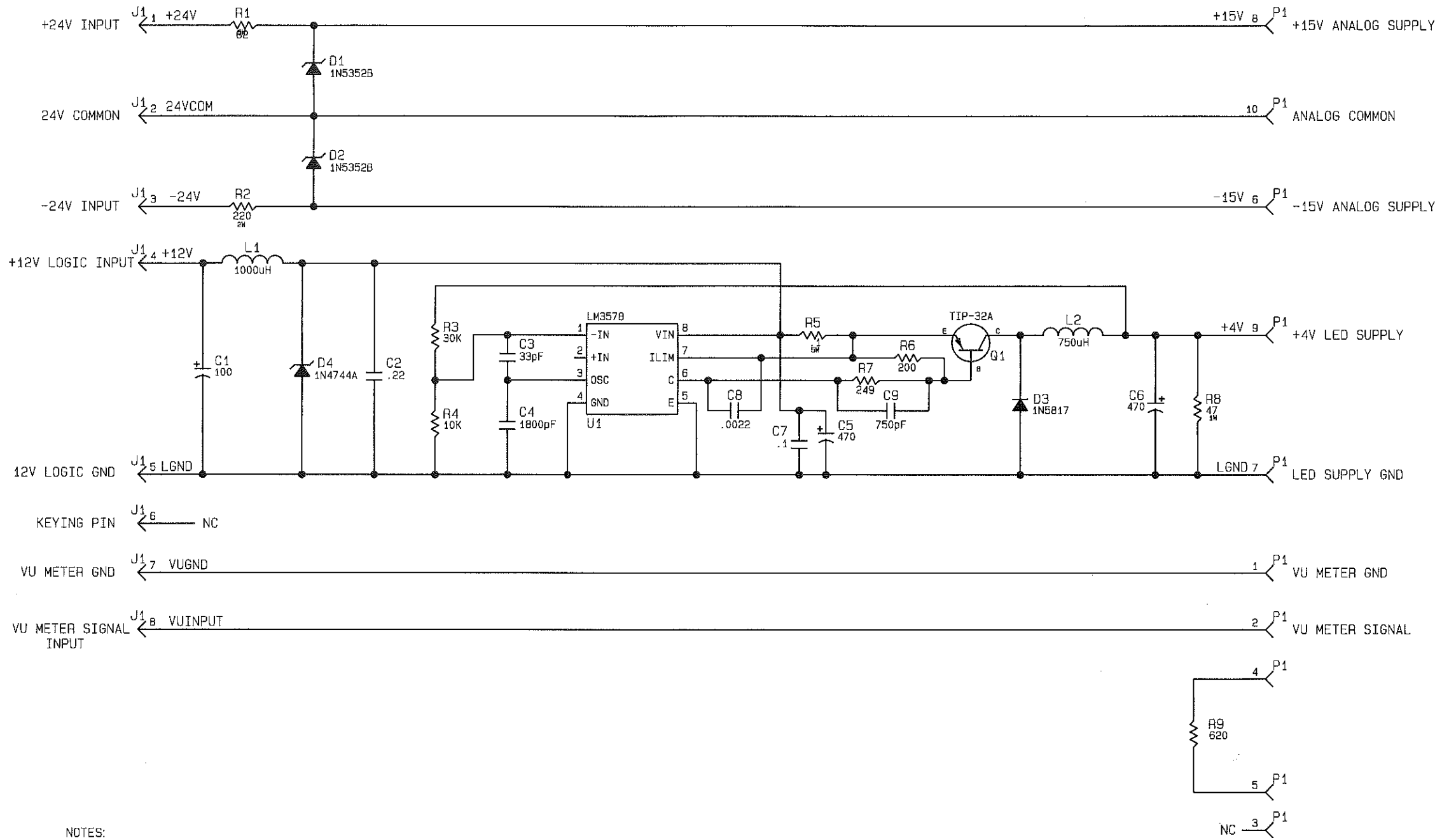
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	CHKD ME BRG. ENGR MFG	FINISH	
	DATE 11-18-88	NEXT ASSY	TYPE SIZE DWG. NO. REV A D 951-0029 C
			MODEL MT90 SCALE 2/1 SHEET 1 OF 1



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597-9012-500

FIGURE 3-3. ASSEMBLY DIAGRAM, DORROUGH LOUDNESS METER

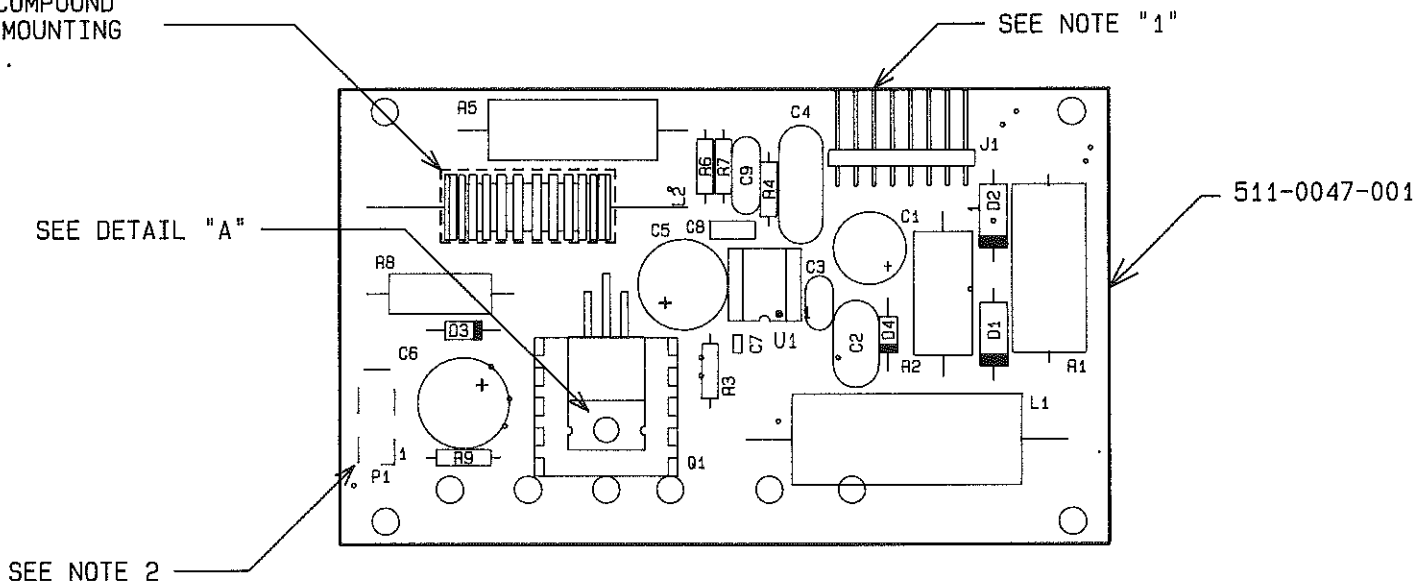


- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5%; ALL CAPACITORS IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENT USED: R9, C9, D4, J1, L2, P1, Q1 & U1.
 3. COMPONENTS NOT USED:
 4. SEE ASSEMBLY: AB951-0047-001.

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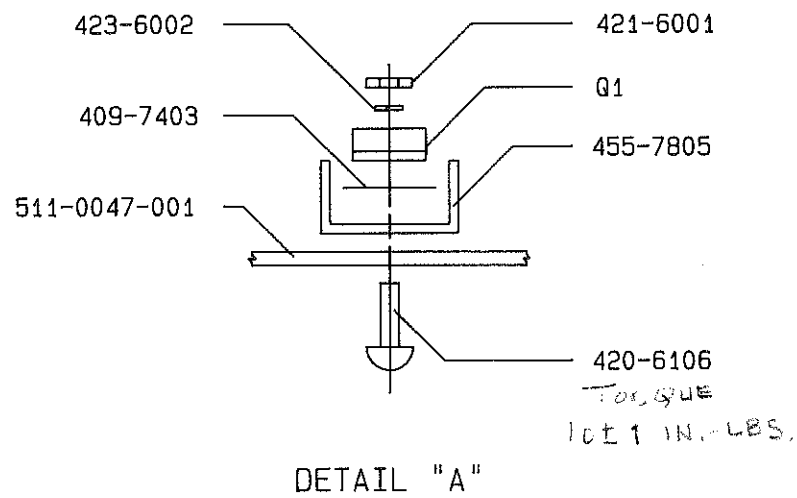
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	CHKD 4-24-91	FINISH	
	PROJ. ENGR.	SEE DWG RA592-0000	
	MFG.	NEXT ASSY.	
TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°	TITLE SCHEMATIC DORROUGH LOUDNESS METER INTERFACE		TYPE SIZE DWG. NO. REV S C 951-0047-001 C
MODEL MT-90		SCALE NONE	SHEET 1 OF 1

APPLY SILICONE RUBBER OR RTV COMPOUND TO PCB AREA OUTLINED PRIOR TO MOUNTING COMPONENT L2 (360-0092).



NOTES:

1. PIN 6 ON CONNECTOR J1 TO BE REMOVED FOR KEYING.
2. DASHED COMPONENT (P1) TO BE MOUNTED FROM OPPOSITE SIDE.
3. SEE SCHEMATIC SC951-0047-001



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	CHKD <i>M. H. [Signature]</i> 4-24-91	FINISH SEE DWG RA592-0000	TITLE PCB ASSEMBLY DORROUGH LOUDNESS METER INTERFACE BD.		
	ME <i>M. H. [Signature]</i> 4/24/91		TYPE A	SIZE B	DWG No. 951-0047-001
	TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES + 1°	PROJ/ ENGR. <i>M. H. [Signature]</i> 4-24-91	NEXT ASSY.	MODEL MT-90 SERIES	SCALE 1:1

SECTION IV

LED BARGRAPH METER DORROUGH LOUDNESS METER

PARTS LIST

4-1. INTRODUCTION.

4-2. This section provides descriptions and part numbers of electrical components and assemblies required for maintenance of the LED bargraph meter and Dorrough loudness meter assemblies. Each table entry in this section is indexed by the reference designators appearing on the applicable schematic diagram.

**TABLE 4-1. LED BARGRAPH AND DORROUGH LOUDNESS METER
ASSEMBLY PARTS LIST INDEX**

TABLE	TITLE	PART NO.	PAGE
4-2	LED BARGRAPH METER ASSEMBLY	951-0029	4-2
4-3	DORROUGH LOUDNESS METER ASSEMBLY	951-0047	4-2
4-4	DORROUGH LOUDNESS METER INTERFACE CIRCUIT BOARD	951-0047-001	4-3

**TABLE 4-2. LED BARGRAPH METER ASSEMBLY - 951-0029
(Sheet 1 of 2)**

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1 THRU C6	Capacitor, Electrolytic, 10 uF, 35V	023-1076	6
C7,C8	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	2
C9	Capacitor, Electrolytic, 10 uF, 35V	023-1076	1
C10	Capacitor, Mica, 50 pF ±5%, 500V	040-5013	1
C11 THRU C13	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	3
C14	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C16,C17	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	2
C18,C19	Capacitor, Electrolytic, 2.2 uF, 50V	020-2264	2
D1 THRU D4	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	4
D5,D6	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	2
D7	Diode, HP5082-2800, High Voltage, Schottky Barrier Type, 70V, 15 mA	201-2800	1
DS1	LED, Green, HDSP-4950, 10-Element Bar Graph Array	320-0028	1
DS2	LED, Multicolor, HDSP-4832, 10-Element Bar Graph Array	320-0025	1
DS3	LED, High-Efficiency Red, HDSP-4830, 10-Element Bar Graph Array	320-0026	1

TABLE 4-2. LED BARGRAPH METER ASSEMBLY - 951-0029
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
J1	Receptacle, Male, 8-Pin In-Line	417-0080-001	1
J2 THRU J4	Receptacle, Male, 3-Pin In-line	417-0003	3
P2	Jumper, Programmable, 2-Pin	340-0004	1
P3,P4	Socket, Connector, 3-Pin	417-0223	2
R1,R2	Resistor, 10 Ohm +5%, 1/4W	100-1024	2
R3,R4	Resistor, 121 Ohm +5%, 1/4W	100-1231	2
R5,R6	Resistor, 1.54 k Ohm ±1%, 1/4W	103-1544	2
R7,R8	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	2
R9 THRU R12	Resistor, 3.57 k Ohm ±1%, 1/4W	103-3574	4
R13	Resistor, 1.43 k Ohm ±1%, 1/4W	100-1431	1
R15	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	1
R16,R17	Resistor, 20.0 k Ohm ±1%, 1/4W	103-2051	2
R18	Resistor, 49.9 k Ohm ±1%, 1/4W	103-4951	1
R19	Resistor, 100 k Ohm ±1%, 1/4W	103-1062	1
R20	Resistor, 100 k Ohm ±5%, 1/4W	100-1063	1
R21	Resistor, 169 k Ohm ±1%, 1/4W	103-1696	1
R22	Resistor, 7500 Ohm ±5%, 1/4W	100-7543	1
R23	Resistor, 182 Ohm ±1%, 1/4W	103-1823	1
R24	Resistor, 442 Ohm ±1%, 1/4W	103-4423	1
R25	Resistor, 68 k Ohm ±5%, 1/4W	100-6853	1
R26	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	1
R28	Resistor, 137 Ohm ±1%, 1/4	103-1373	1
R29	Resistor, 130 Ohm ±1%, 1/4W	103-1333	1
R30	Resistor, 1.02 k Ohm ±1%, 1/4W	103-1024	1
R31	Resistor Network, 8-10 k Ohm ±1%, 1/4W, 16-Pin DIP	226-1055	1
R32	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	1
R33	Resistor, 61.9 k Ohm ±1%, 1/4W	103-6195	1
U1	Integrated Circuit, LM317T, Adjustable Positive Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0317	1
U2	Integrated Circuit, LM337T, Adjustable Negative Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0337	1
U3	Integrated Circuit, TL072CP, Dual JFET-Input Operational Amplifier, 8-Pin DIP	221-0072	1
U4	Integrated Circuit, NE5532A, Dual Low Noise Operational Amplifier, 8-Pin DIP	221-5532	1
U5 THRU U7	Integrated Circuit, LM3915, Dot/Bar Display Driver, 18-Pin DIP	220-3915	3
XU3,XU4	Socket, 8-Pin DIP	417-0804	2
XU5 THRU XU7	Socket, 18-Pin DIP	417-1804	3
—	Blank LED Bargraph Meter Circuit Board	511-0029	1

TABLE 4-3. DORROUGH LOUDNESS METER ASSEMBLY - 951-0047

REF. DES.	DESCRIPTION	PART NO.	QTY.
A1	Dorrough Loudness Meter Interface Circuit Board	951-0047-001	1
M1	Dorrough Loudness Meter, Model 12-A	310-0061	1

**TABLE 4-4. DORROUGH LOUDNESS METER INTERFACE CIRCUIT BOARD
ASSEMBLY -951-0047-001**

REF. DES.	DESCRIPTION	PART NO.	QTY.
A1	Blank Dorrough Loudness Meter Circuit Board	511-0047-001	1
C1	Capacitor, Electrolytic, 100 uF, 50V	020-1083	1
C2	Capacitor, Mylar Film, 0.22 uF $\pm 10\%$, 200V	030-2253	1
C3	Capacitor, Mica, 33 pF $\pm 5\%$, 500V	042-3312	1
C4	Capacitor, Mica, 1800 pF $+5\%$, 500V	040-1833	1
C5	Capacitor, Electrolytic, 470 uF $+20\%$, 25V	020-4784	1
C7	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C8	Capacitor, Polyester, 0.0022 uF $\pm 10\%$, 100V	031-2033	1
C9	Capacitor, Mica, 750 pF $\pm 5\%$, 300V	042-7522	1
D3	Diode, 1N5817, Schottky Barrier Type, 20V, 1 Ampere	200-0019	1
D4	Diode, Zener, 1N4744A, 15V, 1W	200-0015	1
J1	Receptacle, Male, 8-Pin In-Line, Right Angle	417-0080-001	1
L1	Inductor, 1000 uH $\pm 20\%$, .087 Ohms DC Resistance, 1 Ampere Maximum	360-0082	1
L2	RF Choke, Power Supply, MT-90	360-0092	1
P1	Receptacle, 10-Pin DIP	417-1006	1
Q1	Transistor, TIP32A, Silicon, NPN, TO-220 AB Case	218-0032	1
R1	Resistor, 62 Ohm $\pm 5\%$, 5W, W/W	130-6233	1
R2	Resistor, 220 Ohm $\pm 5\%$, 2W, W/W	132-2233	1
R3	Resistor, 30 k Ohm $\pm 5\%$, 1/4W	100-3053	1
R4	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R5	Resistor, 0.1 Ohm $\pm 1\%$, 5W, W/W	130-1000	1
R6	Resistor, 200 Ohm $\pm 1\%$, 1/4W	103-2003	1
R7	Resistor, 249 Ohm $\pm 1\%$, 1/4W	103-2493	1
R8	Resistor, 47 Ohm $\pm 5\%$, 1W	120-4723	1
R9	Resistor, 620 Ohm $\pm 5\%$, 1/4W	100-6233	1
U1	Integrated Circuit, LM3578N, Adjustable Switching Regulator, 40V to 0V at 750 mA, 8-Pin DIP	227-3578	1
XQ1	Heatsink, TO-220 Package	455-7805	1
XU1	Socket, 8-Pin DIP	417-0804	1

STEREO EQUALIZER MODULE PARAMETRIC EQUALIZER MODULE

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4-1	Stereo Equalizer Module Parts List Index	4-1

SECTION I

STEREO EQUALIZER MODULE

PARAMETRIC EQUALIZER MODULE

THEORY OF OPERATION

1-1. INTRODUCTION.

- 1-2. The following text provides detailed theory of operation for the Mix-Trak 90 series console stereo and parametric equalizer modules.
- 1-3. The following text provides detailed theory of operation for the Mix-Trak 90 series console stereo equalizer module. A detailed block diagram of the stereo equalizer module is presented in Figure 1-1. Refer to Figure 1-1 as required for the following circuit discussion. The stereo equalizer module left and right channel audio circuits are identical, therefore only the left channel will be discussed.

1-4. STEREO EQUALIZER MODULE FUNCTIONAL DESCRIPTION.

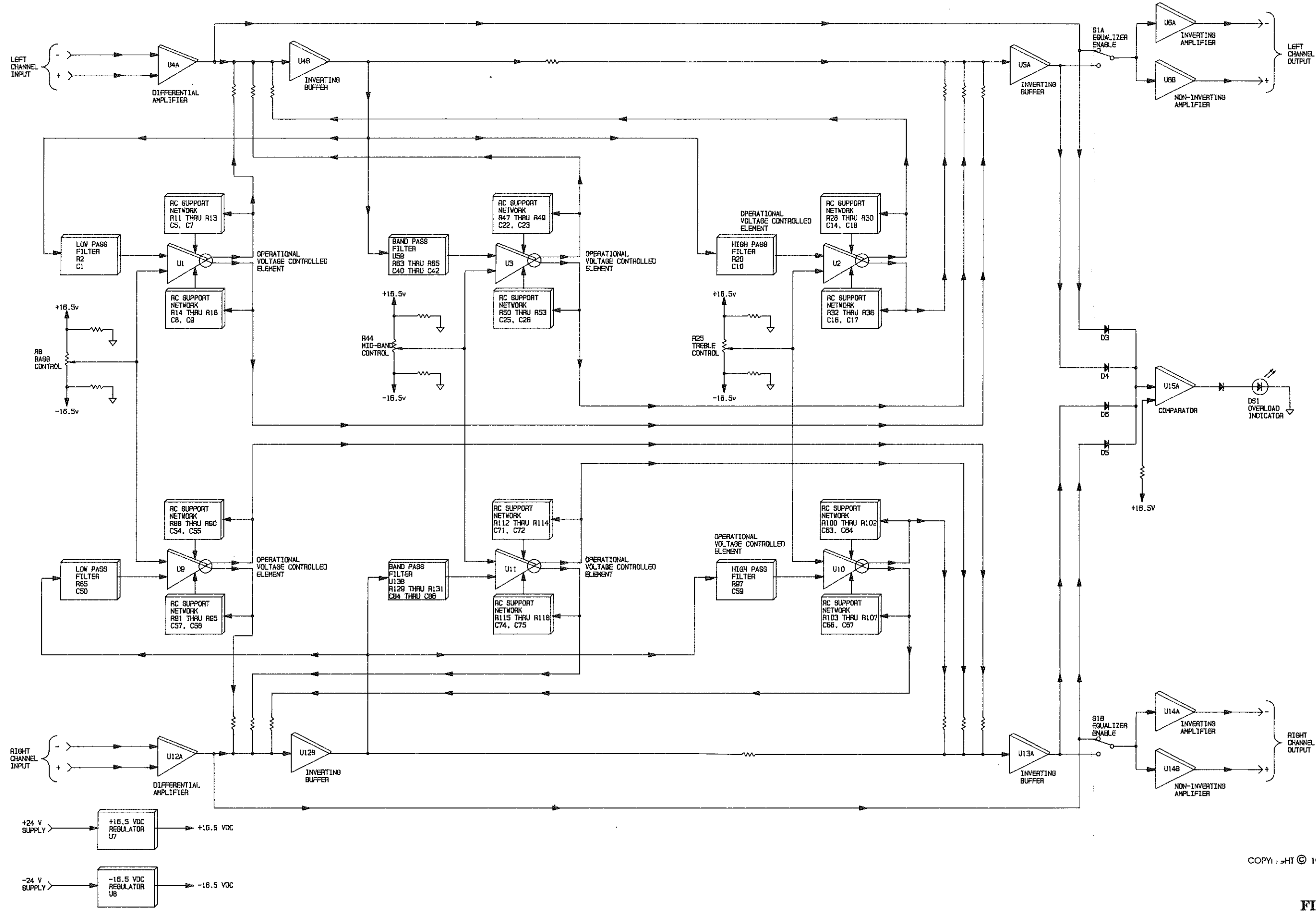
1-5. INPUT CIRCUIT.

- 1-6. Balanced left channel audio from a console patch point transmitting stage is applied to integrated circuit U4A. U4A is configured as a differential amplifier with a gain of approximately 8 dB and provides balanced-to-unbalanced signal conversion. The output of U4A is routed to integrated circuit U4B. U4B is configured as an audio inverting stage. The output of U4B is routed for application to the bass, mid-band, and treble equalization circuits.

1-7. BASS EQUALIZATION CIRCUIT.

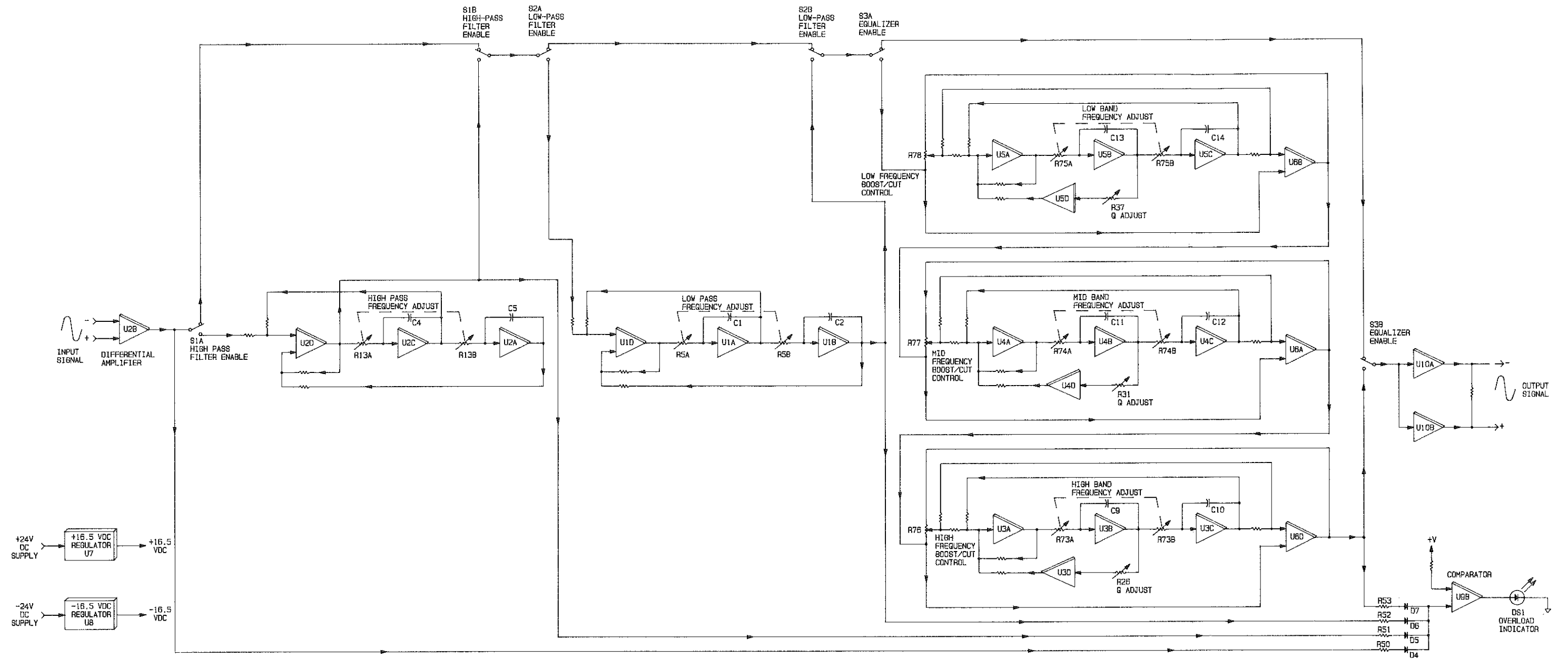
- 1-8. Left channel audio from U4B is applied to a passive single pole low-pass filter consisting of resistor R2 and capacitor C1. The low-pass filter is designed to attenuate frequencies above 250 Hz. The output of the low-pass filter is applied to operational voltage controlled element (OVCE) U1. U1 is a unique semiconductor device equipped with voltage-controlled-amplifier circuitry and a dual output network.
- 1-9. In the bass equalization circuit, OVCE U1 is configured as a voltage-controlled-amplifier. The operation of U1 is directed by front-panel bass control R8. R8 is designed with a dc control range from approximately -1 to +1 volts. This dc control range establishes a -15 to +15 dB operating response for OVCE U1. Additional operating characteristics of OVCE U1 such as stabilization, compensation, and gain are established by two RC support networks.
- 1-10. The dual outputs from OVCE U1 are routed to separate inverting buffer stages. One output is routed through a summing resistor to inverting buffer U4B. The second output is also routed through a summing resistor to inverting buffer stage U5A. Together, inverting buffer stages U4B and U5A function as a summing network to combine the output signals and establish closed-loop operation for the boost/cut of frequencies below 250 Hz.

- 1-11. **MID-BAND EQUALIZATION CIRCUIT.**
- 1-12. The mid-band equalization circuit operates in an identical manner as the bass equalization circuit with the exception of the filter. The mid-band equalization circuit is equipped with a single pole active band-pass filter circuit consisting of: 1) integrated circuit U5B, 2) resistors R63 thru R65, and 3) capacitors C40 thru C42. The filter is designed to pass frequencies from 250 Hz to 2.5 kHz. For a detailed explanation of the equalization circuit operation, refer to the BASS EQUALIZATION CIRCUIT description in the preceding text.
- 1-13. **TREBLE EQUALIZATION CIRCUIT.**
- 1-14. The treble equalization circuit operates in an identical manner as the bass equalization circuit with the exception of the filter. The treble equalization circuit is equipped with a single pole passive high-pass filter circuit consisting of resistor R20 and capacitor C10. The filter is designed to attenuate frequencies below 2.5 kHz. For a detailed explanation of the equalization circuit operation, refer to the BASS EQUALIZATION CIRCUIT description in the preceding text.
- 1-15. **OUTPUT CIRCUIT.**
- 1-16. The output circuit consists of an equalizer on/off control switch and an output amplifier network. Left channel equalized audio from inverting buffer U5A and left channel non-equalized audio from inverting buffer U4A are applied to equalizer enable switch S1. S1 enables/disables the circuitry by selecting either equalized or non-equalized audio for application to the output amplifier network.
- 1-17. The output amplifier network consists operational amplifiers U6A and U6B. U6A is configured as an inverting amplifier stage. U6B is configured as a non-inverting amplifier stage. U6A and U6B operate in association to function as a balanced output amplifier with a gain of -8 dB and a 600 Ohm output impedance. The output amplifier stage is designed with a -8 dB gain to compensate for an 8 dB increase in the operating level of the equalization circuit. The increased operating level allows the equalization circuit to obtain optimum signal-to-noise performance.
- 1-18. **OVERLOAD INDICATOR CIRCUIT.**
- 1-19. The left channel input audio and the audio from the equalization circuitry is monitored for overload conditions by the overload indicator circuit. The audio is half-wave rectified and summed by diodes D3 and D4. The half-wave rectified audio from D3/D4 is applied to overload comparator U15A. When either the input audio level or the audio level from the equalization circuitry increases above approximately 20 dBu, the output of comparator U15A will go HIGH. Overload indicator DS1 will illuminate to indicate an excessive input audio or audio equalization level conditions.
- 1-20. **POWER SUPPLY.**
- 1-21. DC operating potentials for application to the stereo equalizer module components are generated by a regulator network. Unregulated $\pm 24\text{V}$ dc supplies from the console power supply module are applied to +16.5 volt dc regulator U7 and -16.5 volt dc regulator U8. U7/U8 are three terminal adjustable regulators containing internal thermal and short-circuit current limiting features. The regulated ± 16.5 volt outputs from U7 and U8 are routed for application to the circuit board audio components.
- 1-22. **PARAMETRIC EQUALIZER MODULE FUNCTIONAL DESCRIPTION.**
- 1-23. The following text provides detailed theory of operation for the Mix-Trak 90 series console parametric equalizer module. A detailed block diagram of the parametric equalizer module is presented in Figure 1-2. Refer to Figure 1-2 as required for the following circuit discussion.



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FIGURE 1-1.
STEREO EQUALIZER MODULE
DETAILED BLOCK DIAGRAM



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FIGURE 1-2.
PARAMETRIC EQUALIZER MODULE
DETAILED BLOCK DIAGRAM

1-5/1-6

1-24. INPUT CIRCUIT.

1-25. Balanced audio from a console patch point transmitting stage is applied to integrated circuit U2B. U2B is configured as a differential amplifier with unity gain and provides balanced-to-unbalanced signal conversion. The output of U2B can be applied to any combination of high-pass, low-pass, and band-pass filter circuits, or directly applied to the output amplifier network depending on the position of front-panel switches S1, S2, and S3.

1-26. HIGH-PASS FILTER CIRCUIT

1-27. The high-pass filter circuit is designed to attenuate frequencies below 35 Hz to 350 Hz depending on frequency adjust control R13A/B. Integrated circuit U2D operates as a unity gain summing amplifier and high-pass filter section. Integrated circuit U2C, capacitor C4, and R13A operate as a band-pass filter section. Integrated circuit U2A, capacitor C5, and R13B operate as a low-pass filter section. Together, these sections operate as a state-variable 2 pole high-pass filter network.

1-28. Filter sections U2C and U2A are configured as unity gain inverting integrators which are connected in cascade. The output of each section is routed to the input of U2D through summing resistors. The value of the summing resistor at the output of U2C is selected to provide a constant Q (or damping) for the filter circuit. The value of R13A/B and capacitors C4 and C5 establish the frequency range of the circuit.

1-29. When high-pass filter switch S1A is operated to the enable position, audio from amplifier U2B is applied to U2D for processing through a summing resistor. The signal is further processed by U2C and U2A. U2D functions as a summing network to: 1) combine the input and output signals, 2) generate the required amount of damping, and 3) prevent sustained oscillations. The location of the output connection determines the type of filter circuit. For a high-pass filter, the connection is at the output of U2D.

1-30. LOW-PASS FILTER CIRCUIT.

1-31. The operation of the low-pass filter circuit is identical to the high-pass filter circuit with the following exceptions. The low-pass filter circuit is designed to attenuate frequencies above 4.7 kHz to 15 kHz depending on frequency adjust control R5A/B, and the output connection is at U1B. For a detailed explanation of the low-pass circuit operation, refer to the HIGH-PASS FILTER CIRCUIT description in the preceding text.

1-32. BAND-PASS FILTER CIRCUITS.

1-33. When equalizer switch S3 is operated to the enable position, the wide-band audio signal is applied to the low-band, mid-band, and high-band equalization circuits. The operation of the high-band, mid-band, and low-band equalizer circuits is identical. Therefore, only the operation of the low-band equalization circuit will be discussed.

1-34. **LOW-BAND EQUALIZATION CIRCUIT.** The low-band equalization circuit is a modified version of the state-variable 2 pole low-pass filter network. Therefore, the basic operation of integrated circuits U5A, U5B, and U5C in the low-band equalization circuit is identical to the low-pass filter circuit. For a detailed explanation of U5A, U5B, and U5C circuit operation, refer to the LOW-PASS FILTER CIRCUIT description in the preceding text.

1-35. In addition, the low-band equalization circuit is equipped with a: 1) variable Q circuit, 2) an output differential amplifier circuit, and 3) a boost/cut control circuit. The variable Q circuit consists of integrated circuit U5D and potentiometer R37 which is connected between the output of U5B and input of U5A. This circuit provides a variable bandwidth at a constant amplitude when front-panel Q control R37 is adjusted.

- 1-36. Boost/Cut control R78 is connected between the input and output of differential amplifier U6B. The wiper of R78 routes the wide-band signal to the input of the filter section and the non-inverting input of U6B through a bypass resistor. The full wide-band signal is applied to the inverting input of U6B. The output of filter section U5C is applied to the non-inverting input of U6B. U6B differentially combines the out-of-phase signal from the output of U5C and the in-phase signal from the bypass resistor at the non-inverting input with the full wide-band signal at the inverting input to establish the band-pass filter characteristics.
- 1-37. The low-band equalization circuit will pass a band of frequencies between 27 Hz and 600 Hz. Frequency adjust control R75 adjusts the center frequency within the pass-band and potentiometer R78 adjusts the amplitude of the pass-band frequencies. R75, R78, and Q control R37 will operate independently to provide unlimited band-pass filter variations.
- 1-38. **OUTPUT CIRCUIT.**
- 1-39. The output circuit consists of an equalizer on/off control switch and an output amplifier network. Equalized audio from inverting buffer U6C is applied to switch S1. S1 enables/disables the circuitry by selecting either equalized or non-equalized audio for application to the amplifier network.
- 1-40. The output amplifier consists of operational amplifiers U10A and U10B. U10A is configured as an inverting amplifier stage. U10B is configured as a non-inverting amplifier stage. U10A and U10B operate as a balanced output amplifier with a gain of 1 at 600 Ohm output impedance.
- 1-41. **OVERLOAD INDICATOR CIRCUIT.**
- 1-42. Audio from the input amplifier and audio from the output of the high-pass, low-pass, and band-pass filter circuits is monitored for excessive conditions by the overload indicator circuit. Half-wave rectified audio is applied to overload comparator U9B through summing resistors R50 through R53 and diodes D4 through D7. When the audio level exceeds approximately 20 dBu, the output of U9B will go HIGH. LED indicator DS1 will illuminate to indicate an overload condition.
- 1-43. **POWER SUPPLY.**
- 1-44. DC operating potentials for application to the parametric equalizer module components are generated by a regulator network. Unregulated $\pm 24V$ dc supplies from the console power supply module are applied to +16.5 volt dc regulator U7 and -16.5 volt dc regulator U8. U7 and U8 are three terminal adjustable regulators containing internal thermal and short-circuit current limiting features. The regulated ± 16.5 volt outputs from U7 and U8 are routed for application to the circuit board audio components.

SECTION II

STEREO EQUALIZER MODULE

PARAMETRIC EQUALIZER MODULE

MAINTENANCE

2-1. INTRODUCTION.

2-2. This section provides general maintenance information for the stereo and parametric equalizer modules.

2-3. MAINTENANCE.

2-4. GENERAL.

2-5. The stereo and parametric equalizer modules should be periodically cleaned of accumulated dust using a nylon-bristle brush and vacuum cleaner. The modules should also be inspected for loose connections and components.

2-6. TROUBLESHOOTING.

2-7. The troubleshooting philosophy for the stereo and parametric equalizer modules consists of isolating a problem to a specific circuit or group of components. Troubleshooting information for stereo equalizer modules is presented in Figure 2-1. Once trouble is isolated and power is totally deenergized, refer to the appropriate schematic diagram and the theory of operation to assist in problem resolution. The defective component may be repaired locally or the entire module may be returned to Broadcast Electronics for repair or replacement.

2-8. COMPONENT REPLACEMENT.

2-9. Component replacement procedures for the console modular assemblies are presented in SECTION II, MAINTENANCE. Refer to SECTION II as required for the replacement procedures.

STEREO EQUALIZER MODULE TROUBLESHOOTING	
SYMPTOM	SOLUTION
NO EQUALIZER MODULE OPERATION	<ol style="list-style-type: none"> 1. CHECK EQUALIZER ENABLE SWITCH S1. 2. CHECK CONNECTOR J1. 3. CHECK REGULATORS U7 AND U8.
NO LEFT CHANNEL OUTPUT	<ol style="list-style-type: none"> 1. CHECK INTEGRATED CIRCUITS U4 AND U5. 2. CHECK INTEGRATED CIRCUIT U6.
NO RIGHT CHANNEL OUTPUT	<ol style="list-style-type: none"> 1. CHECK INTEGRATED CIRCUITS U12 AND U13. 2. CHECK INTEGRATED CIRCUIT U14.
NO BASS EQUALIZATION	<ol style="list-style-type: none"> 1. CHECK POTENTIOMETER R8. 2. CHECK INTEGRATED CIRCUITS U1 AND U9.
NO MID-BAND EQUALIZATION	<ol style="list-style-type: none"> 1. CHECK POTENTIOMETER R44. 2. CHECK INTEGRATED CIRCUITS U3 AND U11.
NO TREBLE EQUALIZATION	<ol style="list-style-type: none"> 1. CHECK POTENTIOMETER R25. 2. CHECK INTEGRATED CIRCUITS U2 AND U10.
NO OVERLOAD INDICATIONS	<ol style="list-style-type: none"> 1. CHECK INDICATOR DS1. 2. CHECK INTEGRATED CIRCUIT U15.

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597-9012-206

FIGURE 2-1. STEREO EQUALIZER MODULE TROUBLESHOOTING

SECTION III

STEREO EQUALIZER MODULE

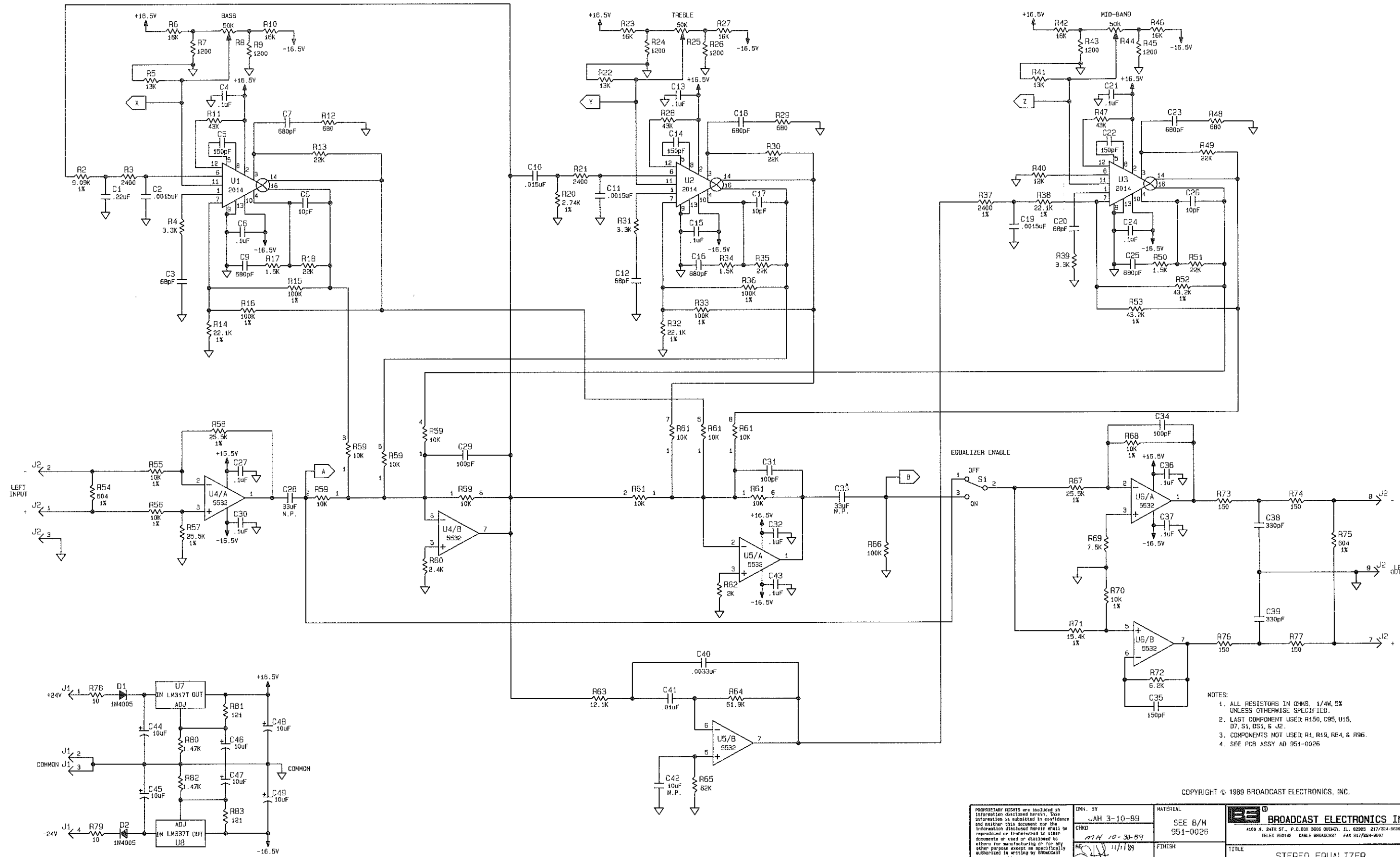
PARAMETRIC EQUALIZER MODULE

DRAWINGS

3-1. INTRODUCTION.

3-2. This section provides assembly drawings and schematic diagrams as listed below for the stereo and parametric equalizer modules.

FIGURE	TITLE	NUMBER
3-1	SCHEMATIC DIAGRAM, STEREO EQUALIZER MODULE	SD951-0026
3-2	ASSEMBLY DIAGRAM, STEREO EQUALIZER MODULE	AC951-0026
3-3	SCHEMATIC DIAGRAM, PARAMETRIC EQUALIZER MODULE	SD951-0033
3-4	ASSEMBLY DIAGRAM, PARAMETRIC EQUALIZER MODULE	AD951-0033

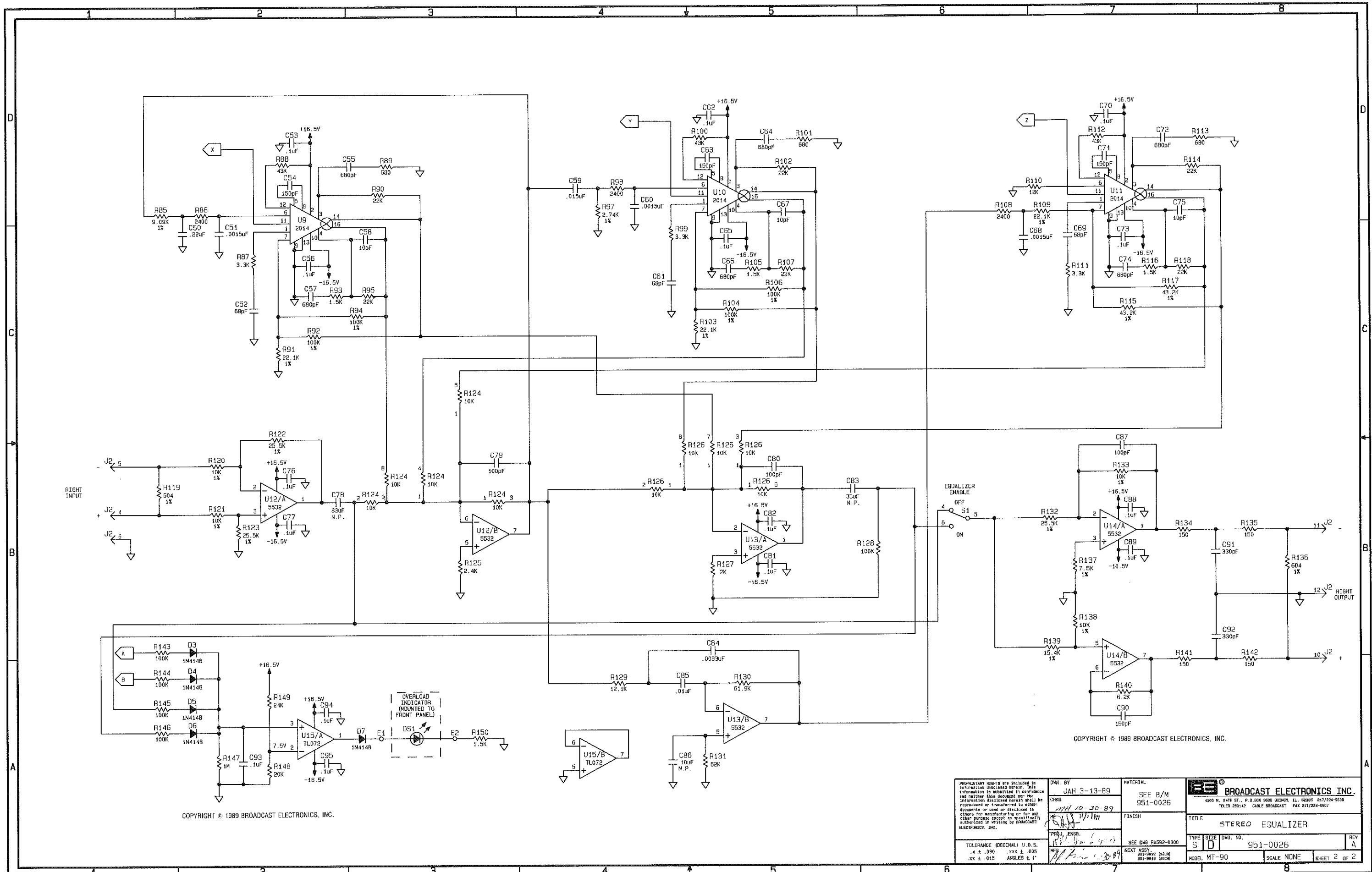


- NOTES:
1. ALL RESISTORS IN OHMS, 1/4W, 5% UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENT USED: R150, C95, U15, D7, S1, DS1, & J2.
 3. COMPONENTS NOT USED: R1, R19, R4, & R96.
 4. SEE PCB ASSY AD 951-0026

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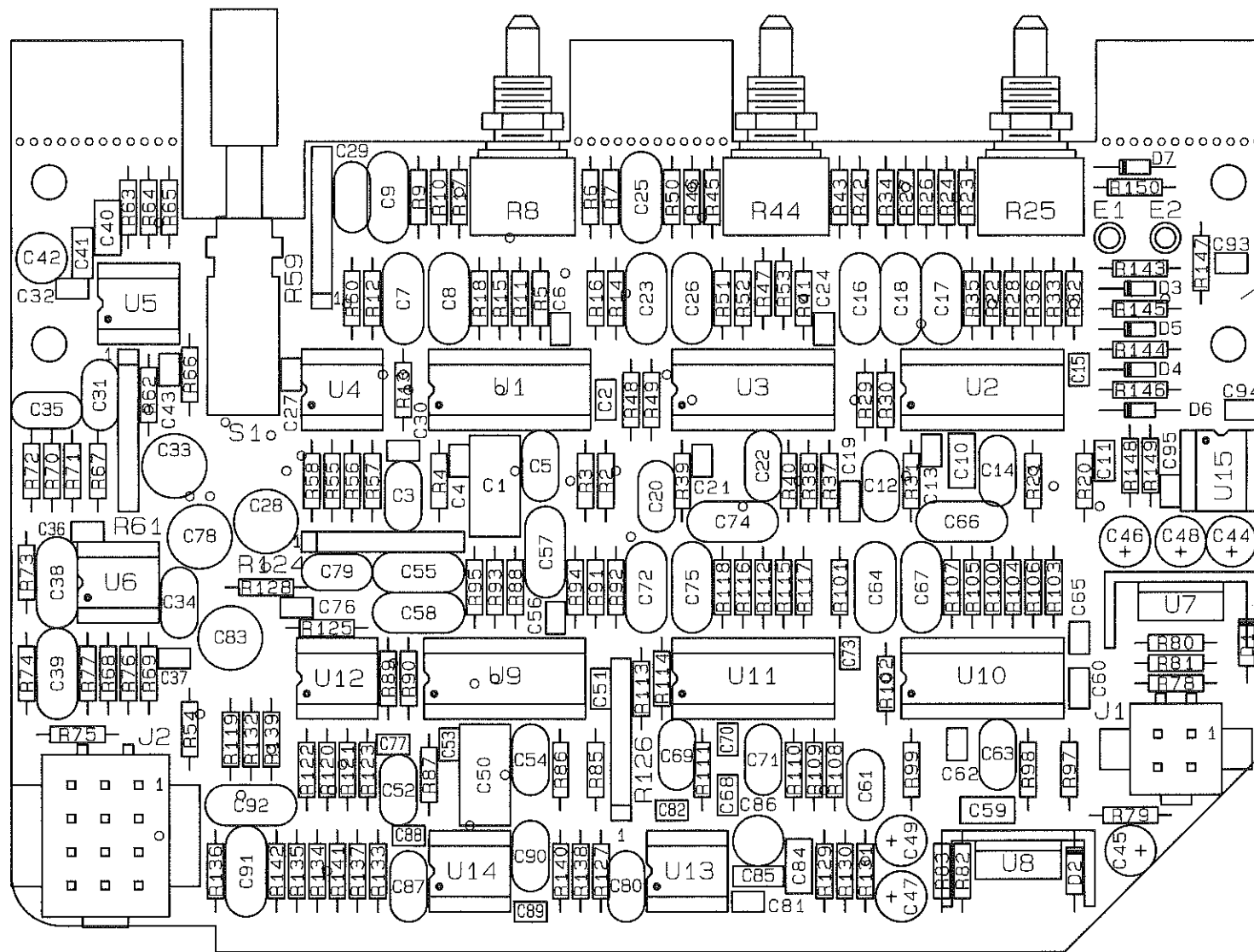
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CHKD MTH 10-30-89 11/1/89	FINISH SEE DWS RA582-0000	TITLE STEREO EQUALIZER	TYPE S D	
TOLERANCE (DECIMAL) U.S.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°	NEXT ASSY 901-9012 (12CH) 901-9018 (18CH)	MODEL MT-90	SCALE NONE SHEET 1 OF 2	REV A



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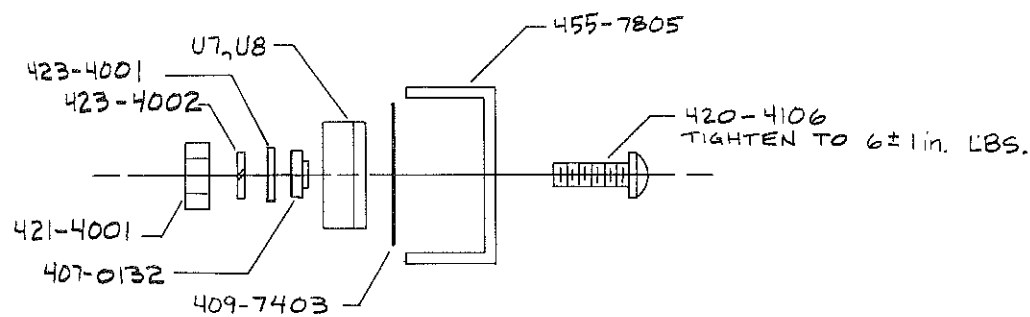
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DATE 10-30-89	FINISH 11/1/89	TITLE STEREO EQUALIZER	TYPE SIZE DWG. NO. S D 951-0026	
TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XX ± .005 .XX ± .015 ANGLES & 1°	SEE DWG RA592-0000 NEXT ASSY. 901-9012 (NORM) 901-9018 (CRCH)	MODEL MT-90	SCALE NONE	REV A
		SHEET 2 OF 2		



511-0026

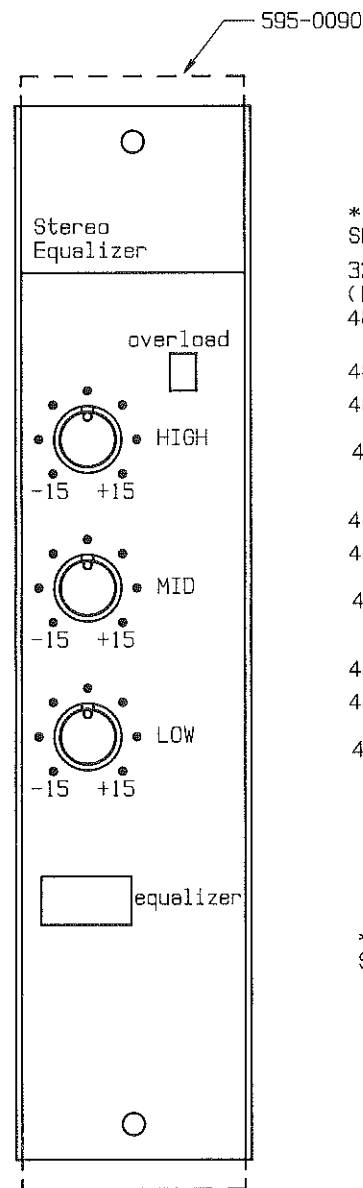
SEE DETAIL "A"

NOTE:
1. SEE SCHEMATIC SD951-0026



DETAIL "A"
TYP. 2 PLCS

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TOLERANCE DECIMAL U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°		FINISH	TITLE PCB ASSEMBLY- STEREO EQUALIZER	
TYPE A C			DWG. NO. 951-0026	REV B
MODEL MT90		SCALE 2/1	SHEET 1 OF 2	



595-0090

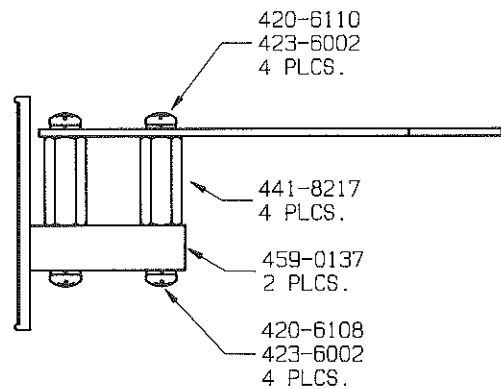
* 420-6505
SEE NOTE 3
323-7124
(DS1 RED)
481-0034

481-0030
481-0029
481-0033

481-0030
481-0027
481-0033

481-0030
481-0035
481-0033

* 420-6505
SEE NOTE 3

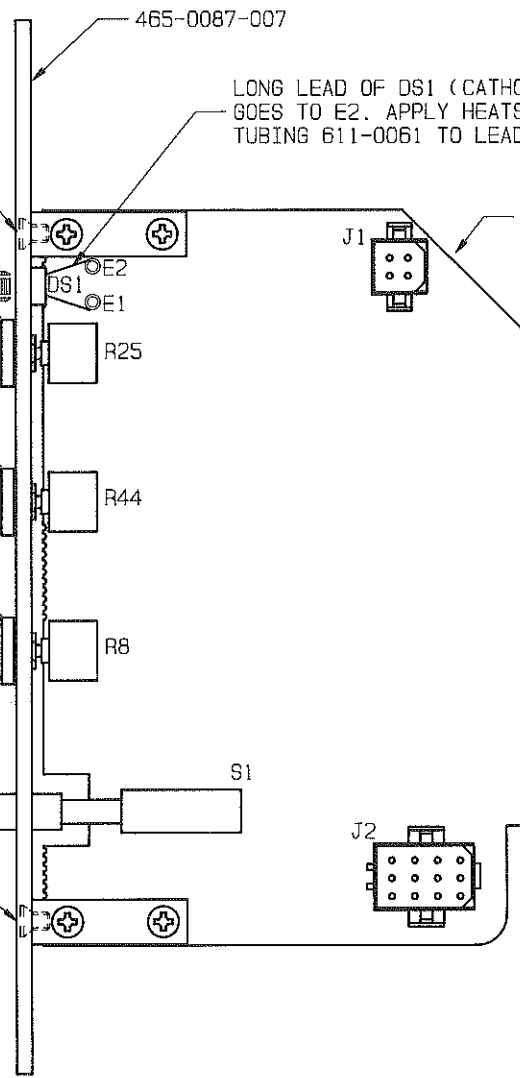


420-6110
423-6002
4 PLCS.

441-8217
4 PLCS.

459-0137
2 PLCS.

420-6108
423-6002
4 PLCS.

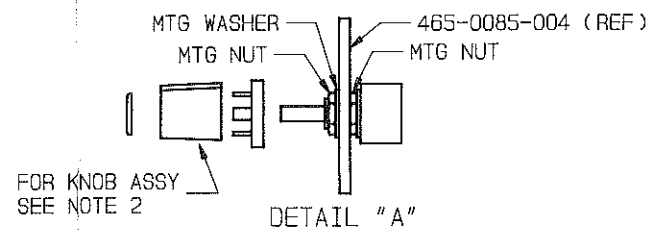


LONG LEAD OF DS1 (CATHODE LEAD)
GOES TO E2. APPLY HEATSHRINK
TUBING 611-0061 TO LEADS OF DS1.

FOR PCB ASSY REFER TO SHT. 1

NOTE:

- ON RESISTORS R8, R25, R44 ASSEMBLE ACCORDING TO DETAIL "A".



FOR KNOB ASSY
SEE NOTE 2

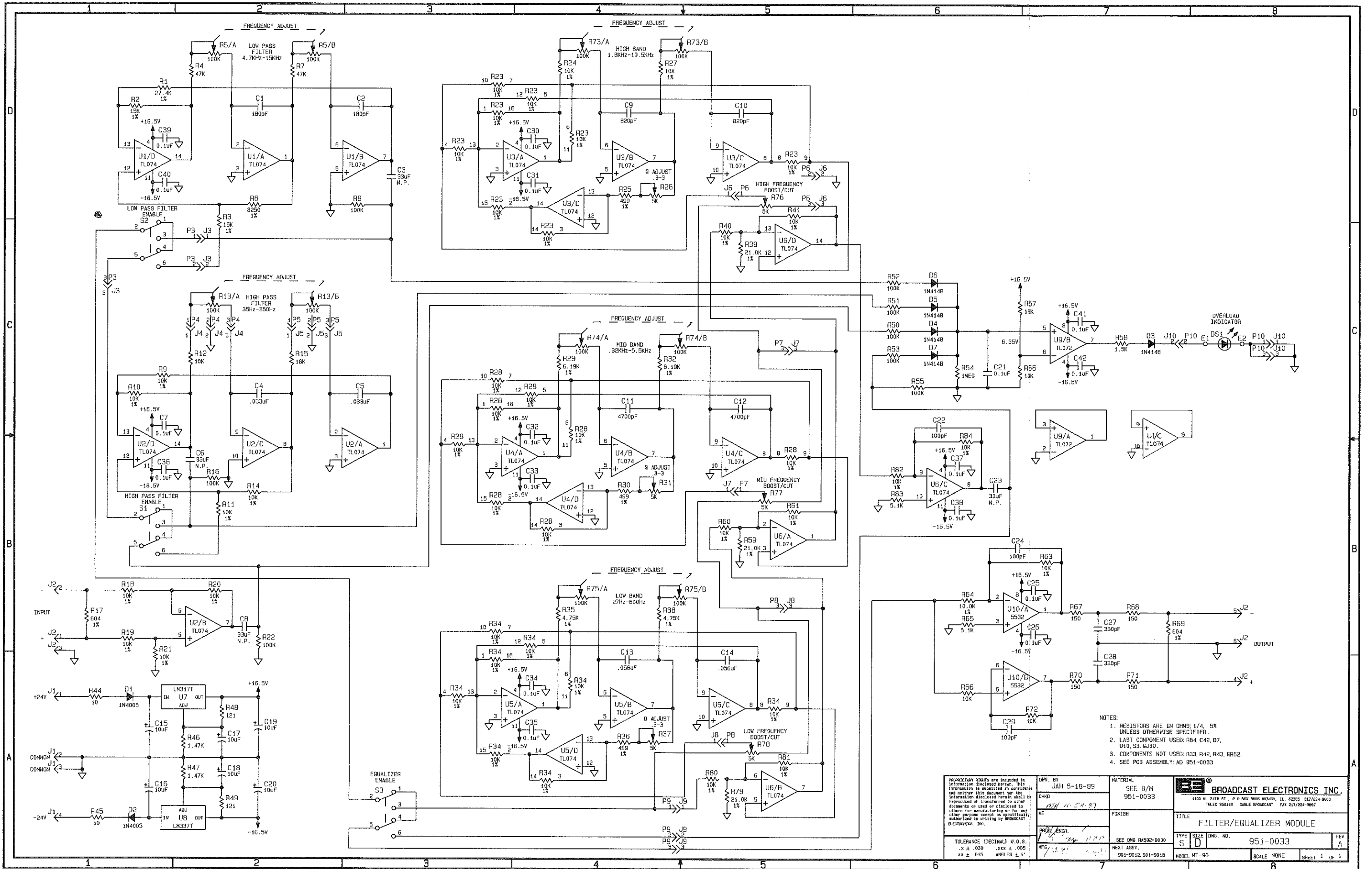
- SHAFTS MUST BE TURNED FULLY CCW, AND KNOB POINTERS POSITIONED AT DOT NEAREST TO THE FULLY CCW POSITION. KNOB CAN THEN BE TIGHTENED AND CAP PRESSED INTO PLACE.
- ASSY 459-0137 TO 465-0087-007 WITH 420-6505 BEFORE INSTALLING OVERLAY.

OVERLAY TO BE TRIMMED
FLUSH. BOTH ENDS

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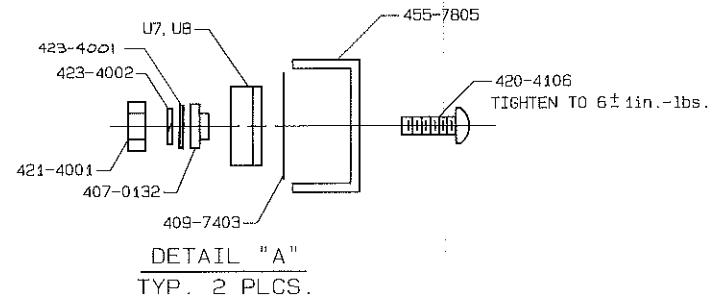
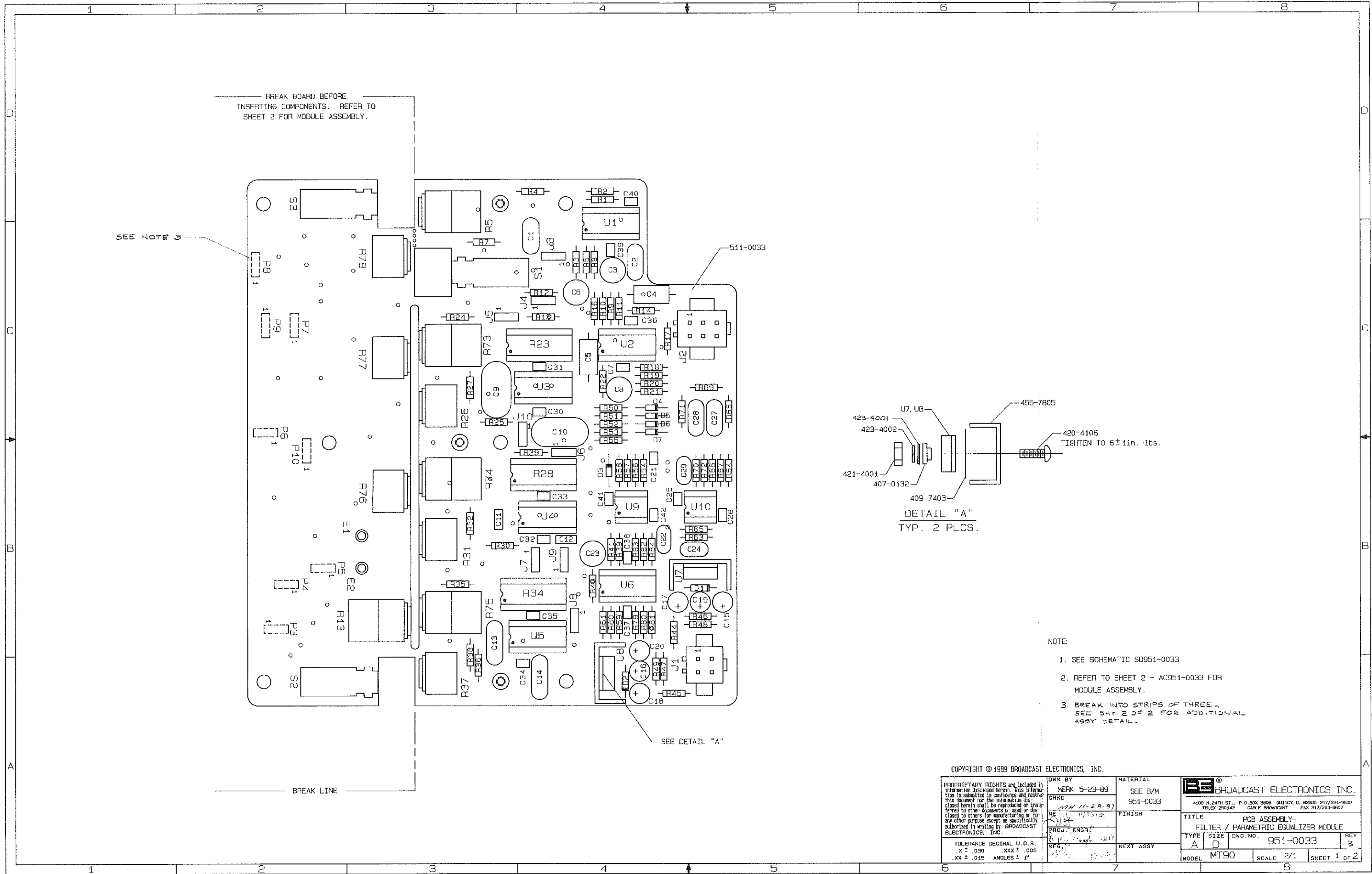
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	CRD M4 10-30-89	FINISH SEE DWG BASE2-0000	
TOLERANCE (DECIMAL) U.O.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°	NEXT ASSY. 901-9012 (12CH) 901-9016 (18CH)	TYPE SIZE DWG. NO. REV A C 951-0026 B	MODEL MIX TRAK 90 SCALE 1/1 SHEET 2 OF 2



- NOTES:
1. RESISTORS ARE IN OHMS; 1/4, 5% UNLESS OTHERWISE SPECIFIED.
 2. LAST COMPONENT USED: R84, C42, D7, U10, S3, J10.
 3. COMPONENTS NOT USED: R33, R42, R43, R62.
 4. SEE PCB ASSEMBLY: AD 951-0033

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TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .095 .xx ± .015 ANGLES ± 1°	CHKD MFG PROD. ENGR.	FINISH SEE DWG RA592-0000 NEXT ASSY. 901-9012, 901-9018	TITLE FILTER/EQUALIZER MODULE	
		TYPE SIZE DWG. NO. S D 951-0033		REV A
		MODEL MT-90 SCALE NONE SHEET 1 OF 1		

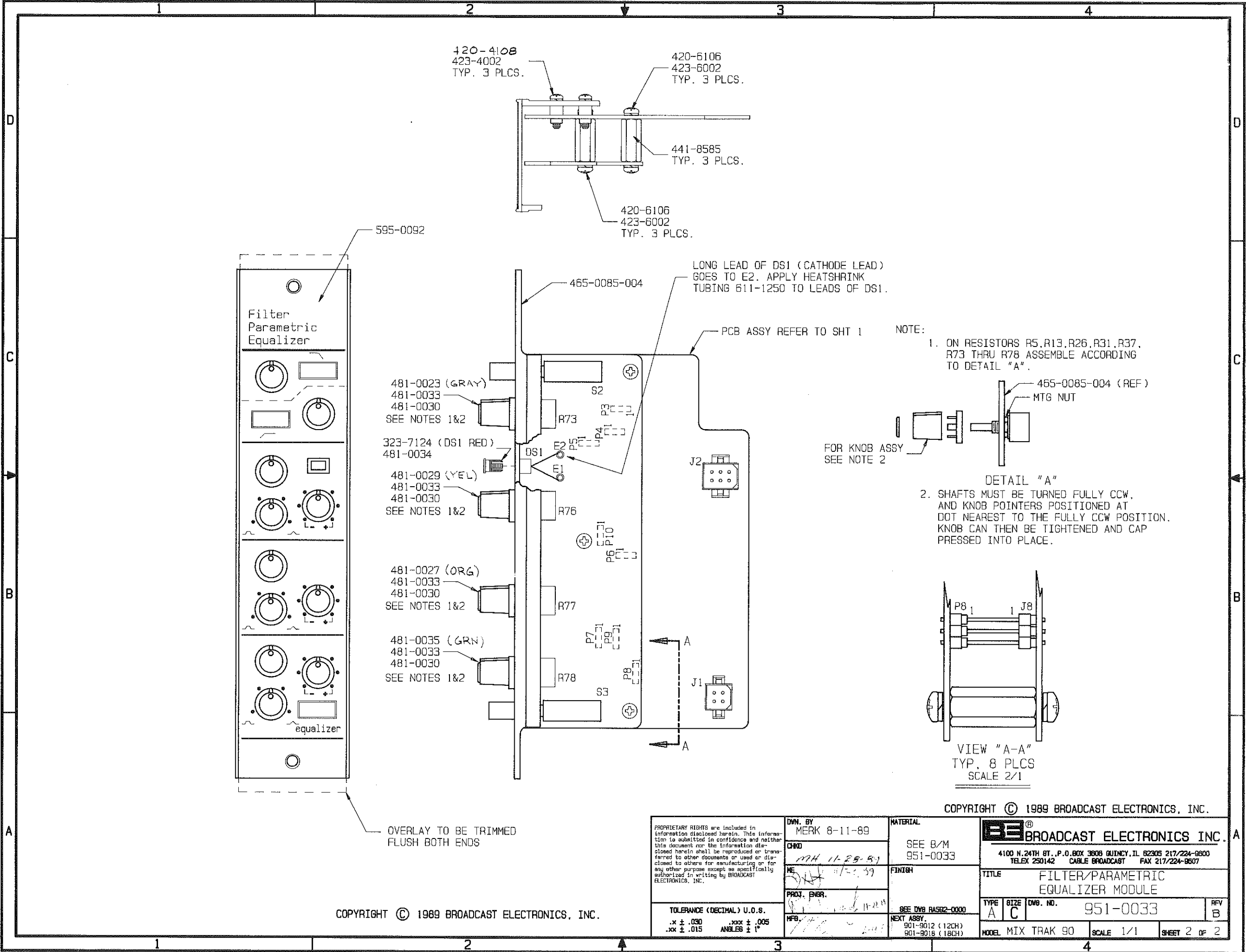


DETAIL "A"
TYP. 2 PLCS.

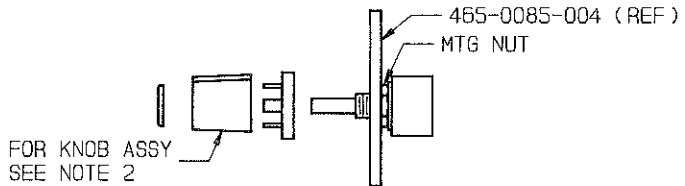
- NOTE:
1. SEE SCHEMATIC SD951-0033
 2. REFER TO SHEET 2 - AC951-0033 FOR MODULE ASSEMBLY.
 3. BREAK INTO STRIPS OF THREE, SEE SH 2 OF 2 FOR ADDITIONAL ASSY DETAIL.

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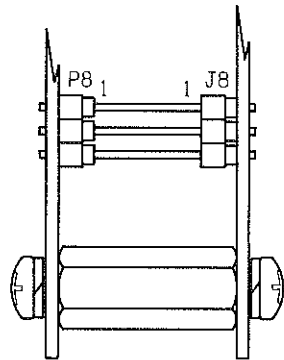
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	CHECKED <small>11-28-91</small>	FINISH	
<small>TOLERANCE DECIMAL U.S.S. .X ± .030 .XXX ± .005 .XX ± .015 ANGLES ± 1°</small>	WE PROJ. ENGR. MFB	NEXT ASSY	TITLE PCB ASSEMBLY- FILTER / PARAMETRIC EQUALIZER MODULE TYPE SIZE DWG. NO. REV A D 951-0033 3 MODEL MT90 SCALE 2/1 SHEET 1 OF 2



NOTE:
 1. ON RESISTORS R5, R13, R26, R31, R37, R73 THRU R78 ASSEMBLE ACCORDING TO DETAIL "A".



DETAIL "A"
 2. SHAFTS MUST BE TURNED FULLY CCW, AND KNOB POINTERS POSITIONED AT DOT NEAREST TO THE FULLY CCW POSITION. KNOB CAN THEN BE TIGHTENED AND CAP PRESSED INTO PLACE.



VIEW "A-A"
 TYP. 8 PLCS
 SCALE 2/1

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OVERLAY TO BE TRIMMED
 FLUSH BOTH ENDS

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DWN. BY MHA 11-28-89		FINISH SEE DWG PAS32-0000	TITLE FILTER/PARAMETRIC EQUALIZER MODULE	
TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLE ± 1°		PROJ. ENGR. MFB	NEXT ASSY. 901-9012 (12CH) 901-9018 (18CH)	TYPE A C
		DWG. NO. 951-0033		REV B
		MODEL MIX TRAK 90		SCALE 1/1 SHEET 2 OF 2

SECTION IV

STEREO EQUALIZER MODULE

PARAMETRIC EQUALIZER MODULE

PARTS LIST

4-1. INTRODUCTION.

4-2. This section provides descriptions and part numbers of electrical components and assemblies required for maintenance of the stereo and parametric equalizer modules. Each table entry in this section is indexed by the reference designators appearing on the applicable schematic diagram.

TABLE 4-1. STEREO AND PARAMETRIC EQUALIZER MODULE PARTS LIST INDEX

TABLE	TITLE	PART NO.	PAGE
4-2	STEREO EQUALIZER CIRCUIT BOARD	951-0026	4-1
4-3	STEREO EQUALIZER MODULE CABLE ASSEMBLY	941-0028	4-5
4-4	PARAMETRIC EQUALIZER CIRCUIT BOARD	951-0033	4-7
4-5	PARAMETRIC EQUALIZER CIRCUIT BOARD CABLE ASSEMBLY	941-0027	4-11

TABLE 4-2. STEREO EQUALIZER CIRCUIT BOARD ASSEMBLY - 951-0026
(Sheet 1 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1	Capacitor, Mylar, 0.22 uF ±10%, 100V	030-2253	1
C2	Capacitor, Monolythic Ceramic, 0.0015 uF ±5%, 100V	003-1523	1
C3	Capacitor, Mica, 68 pF ±5%, 500V	040-6813	1
C4	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C5	Capacitor, Mica, 150 pF ±5%, 500V	040-1522	1
C6	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C7	Capacitor, Mica, 680 pF ±5%, 300V	040-6824	1
C8	Capacitor, Mica, 10 pF ±5%, 500V	042-1012	1
C9	Capacitor, Mica, 680 pF ±5%, 300V	040-6824	1
C10	Capacitor, Polyester, 0.015 uF ±10%, 100V	030-1532	1
C11	Capacitor, Monolythic Ceramic, 0.0015 uF ±5%, 100V	003-1523	1
C12	Capacitor, Mica, 68 pF ±5%, 500V	040-6813	1
C13	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C14	Capacitor, Mica, 150 pF ±5%, 500V	040-1522	1
C15	Capacitor, Monolythic Ceramic, 0.1 uF ±20%, 50V	003-1054	1
C16	Capacitor, Mica, 680 pF ±5%, 300V	040-6824	1
C17	Capacitor, Mica, 10 pF ±5%, 500V	042-1012	1

TABLE 4-2. STEREO EQUALIZER CIRCUIT BOARD ASSEMBLY - 951-0026
(Sheet 2 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C18	Capacitor, Mica, 680 pF $\pm 5\%$, 300V	040-6824	1
C19	Capacitor, Monolythic Ceramic, 0.0015 uF $\pm 5\%$, 100V	003-1523	1
C20	Capacitor, Mica, 68 pF $\pm 5\%$, 500V	040-6813	1
C21	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C22	Capacitor, Mica, 150 pF $\pm 5\%$, 500V	040-1522	1
C23	Capacitor, Mica, 680 pF $\pm 5\%$, 300V	040-6824	1
C24	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C25	Capacitor, Mica, 680 pF $\pm 5\%$, 300V	040-6824	1
C26	Capacitor, Mica, 10 pF $\pm 5\%$, 500V	042-1012	1
C27	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C28	Capacitor, Electrolytic, 33 uF, 25V, Non-Polarized	020-3374	1
C29	Capacitor, Silvered Mica, 100 pF $\pm 5\%$, 500V	040-1022	1
C30	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C31	Capacitor, Silvered Mica, 100 pF $\pm 5\%$, 500V	040-1022	1
C32	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C33	Capacitor, Electrolytic, 33 uF, 25V, Non-Polarized	020-3374	1
C34	Capacitor, Silvered Mica, 100 pF $\pm 5\%$, 500V	040-1022	1
C35	Capacitor, Mica, 150 pF $\pm 5\%$, 500V	040-1522	1
C36,C37	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	2
C38,C39	Capacitor, Mica, 330 pF $\pm 5\%$, 500V	042-3322	2
C40	Capacitor, Mylar Film, 0.0033 uF $\pm 10\%$, 200V	030-3333	1
C41	Capacitor, Mylar, 0.01 uF $\pm 10\%$, 100V	031-1043	1
C42	Capacitor, Electrolytic, 10 uF, 35V, Non-Polarized	023-1075	1
C43	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C44 THRU C49	Capacitor, Electrolytic, 10 uF, 50V	023-1076	6
C50	Capacitor, Mylar, 0.22 uF $\pm 10\%$, 100V	030-2253	1
C51	Capacitor, Monolythic Ceramic, 0.0015 uF $\pm 5\%$, 100V	003-1523	1
C52	Capacitor, Mica, 68 pF $\pm 5\%$, 500V	040-6813	1
C53	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C54	Capacitor, Mica, 150 pF $\pm 5\%$, 500V	040-1522	1
C55	Capacitor, Mica, 680 pF $\pm 5\%$, 300V	040-6824	1
C56	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C57	Capacitor, Mica, 680 pF $\pm 5\%$, 300V	040-6824	1
C58	Capacitor, Mica, 10 pF $\pm 5\%$, 500V	042-1012	1
C59	Capacitor, Polyester, 0.015 uF $\pm 10\%$, 100V	030-1532	1
C60	Capacitor, Monolythic Ceramic, 0.0015 uF $\pm 5\%$, 100V	003-1523	1
C61	Capacitor, Mica, 68 pF $\pm 5\%$, 500V	040-6813	1
C62	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C63	Capacitor, Mica, 150 pF $\pm 5\%$, 500V	040-1522	1
C64	Capacitor, Mica, 680 pF $\pm 5\%$, 300V	040-6824	1
C65	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C66	Capacitor, Mica, 680 pF $\pm 5\%$, 300V	040-6824	1
C67	Capacitor, Mica, 10 pF $\pm 5\%$, 500V	042-1012	1
C68	Capacitor, Monolythic Ceramic, 0.0015 uF $\pm 5\%$, 100V	003-1523	1
C69	Capacitor, Mica, 68 pF $\pm 5\%$, 500V	040-6813	1
C70	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1

TABLE 4-2. STEREO EQUALIZER CIRCUIT BOARD ASSEMBLY - 951-0026
(Sheet 3 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C71	Capacitor, Mica, 150 pF $\pm 5\%$, 500V	040-1522	1
C72	Capacitor, Mica, 680 pF $\pm 5\%$, 300V	040-6824	1
C73	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C74	Capacitor, Mica, 680 pF $\pm 5\%$, 300V	040-6824	1
C75	Capacitor, Mica, 10 pF $\pm 5\%$, 500V	042-1012	1
C76,C77	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	2
C78	Capacitor, Electrolytic, 33 uF, 25V, Non-Polarized	020-3374	1
C79,C80	Capacitor, Silvered Mica, 100 pF $\pm 5\%$, 500V	040-1022	2
C81,C82	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	2
C83	Capacitor, Electrolytic, 33 uF, 25V, Non-Polarized	020-3374	1
C84	Capacitor, Mylar Film, 0.0033 uF $\pm 10\%$, 200V	030-3333	1
C85	Capacitor, Mylar, 0.01 uF $\pm 10\%$, 100V	031-1043	1
C86	Capacitor, Electrolytic, 10 uF, 35V, Non-Polarized	023-1075	1
C87	Capacitor, Silvered Mica, 100 pF $\pm 5\%$, 500V	040-1022	1
C88,C89	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	2
C90	Capacitor, Mica, 150 pF $\pm 5\%$, 500V	040-1522	1
C91,C92	Capacitor, Mica, 330 pF $\pm 5\%$, 500V	042-3322	2
C93 THRU C95	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	3
D1,D2	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	2
D3 THRU D7	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	5
DS1	LED, Red, MV57124, 3V @ 20 mA Maximum	323-7124	1
J1	Socket, 4-Pin	418-0255	1
J2	Receptacle, 12-Pin	417-1276	1
R2	Resistor, 9.09 k Ohm $\pm 1\%$, 1/4W	103-9041	1
R3	Resistor, 2.4 k Ohm $\pm 5\%$, 1/4W	100-2443	1
R4	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R5	Resistor, 13 k Ohm $\pm 5\%$, 1/4W	100-1353	1
R6	Resistor, 16 k Ohm $\pm 5\%$, 1/4W	100-1653	1
R7	Resistor, 1.2 k Ohm $\pm 5\%$, 1/4W	100-1243	1
R8	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W	178-5056	1
R9	Resistor, 1.2 k Ohm $\pm 5\%$, 1/4W	100-1243	1
R10	Resistor, 16 k Ohm $\pm 5\%$, 1/4W	100-1653	1
R11	Resistor, 43 k Ohm $\pm 5\%$, 1/4W	100-4353	1
R12	Resistor, 680 Ohm $\pm 5\%$, 1/4W	100-6833	1
R13	Resistor, 22 k Ohm $\pm 5\%$, 1/4W	100-2253	1
R14	Resistor, 22.1 k Ohm $\pm 1\%$, 1/4W	103-2211	1
R15,R16	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	2
R17	Resistor, 1.5 k Ohm $\pm 5\%$, 1/4W	100-1543	1
R18	Resistor, 22 k Ohm $\pm 5\%$, 1/4W	100-2253	1
R20	Resistor, 2.74 k Ohm $\pm 1\%$, 1/4W	103-2744	1
R21	Resistor, 2.4 k Ohm $\pm 5\%$, 1/4W	100-2443	1
R22	Resistor, 13 k Ohm $\pm 5\%$, 1/4W	100-1353	1
R23	Resistor, 16 k Ohm $\pm 5\%$, 1/4W	100-1653	1
R24	Resistor, 1.2 k Ohm $\pm 5\%$, 1/4W	100-1243	1
R25	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W	178-5056	1
R26	Resistor, 1.2 k Ohm $\pm 5\%$, 1/4W	100-1243	1
R27	Resistor, 16 k Ohm $\pm 5\%$, 1/4W	100-1653	1

TABLE 4-2. STEREO EQUALIZER CIRCUIT BOARD ASSEMBLY - 951-0026
(Sheet 4 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R28	Resistor, 43 k Ohm $\pm 5\%$, 1/4W	100-4353	1
R29	Resistor, 680 Ohm $\pm 5\%$, 1/4W	100-6833	1
R30	Resistor, 22 k Ohm $\pm 5\%$, 1/4W	100-2253	1
R31	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R32	Resistor, 22.1 k Ohm $\pm 1\%$, 1/4W	103-2211	1
R33	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R34	Resistor, 1.5 k Ohm $\pm 5\%$, 1/4W	100-1543	1
R35	Resistor, 22 k Ohm $\pm 5\%$, 1/4W	100-2253	1
R36	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R37	Resistor, 2.4 k Ohm $\pm 5\%$, 1/4W	100-2443	1
R38	Resistor, 22.1 k Ohm $\pm 1\%$, 1/4W	103-2211	1
R39	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R40	Resistor, 12 k Ohm $\pm 5\%$, 1/4W	100-1253	1
R41	Resistor, 13 k Ohm $\pm 5\%$, 1/4W	100-1353	1
R42	Resistor, 16 k Ohm $\pm 5\%$, 1/4W	100-1653	1
R43	Resistor, 1.2 k Ohm $\pm 5\%$, 1/4W	100-1243	1
R44	Potentiometer, 50 k Ohm $\pm 10\%$, 1/2W	178-5056	1
R45	Resistor, 1.2 k Ohm $\pm 5\%$, 1/4W	100-1243	1
R46	Resistor, 16 k Ohm $\pm 5\%$, 1/4W	100-1653	1
R47	Resistor, 43 k Ohm $\pm 5\%$, 1/4W	100-4353	1
R48	Resistor, 680 Ohm $\pm 5\%$, 1/4W	100-6833	1
R49	Resistor, 22 k Ohm $\pm 5\%$, 1/4W	100-2253	1
R50	Resistor, 1.5 k Ohm $\pm 5\%$, 1/4W	100-1543	1
R51	Resistor, 22 k Ohm $\pm 5\%$, 1/4W	100-2253	1
R52,R53	Resistor, 43.2 k Ohm $\pm 1\%$, 1/4W	103-4325	2
R54	Resistor, 604 Ohm $\pm 1\%$, 1/4W	100-6031	1
R55,R56	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	2
R57,R58	Resistor, 25.5 k Ohm $\pm 1\%$, 1/4W	103-2551	2
R59	Resistor Network, 10 k Ohm $\pm 2\%$, 1W Resistors, Single In-Line Package, 8-Pin	226-1051	1
R60	Resistor, 2.4 k Ohm $\pm 5\%$, 1/4W	100-2443	1
R61	Resistor Network, 10 k Ohm $\pm 2\%$, 1W Resistors, Single In-Line Package, 8-Pin	226-1051	1
R62	Resistor, 2 k Ohm $\pm 5\%$, 1/4W	100-2043	1
R63	Resistor, 12.1 k Ohm $\pm 1\%$, 1/4W	103-1215	1
R64	Resistor, 61.9 k Ohm $\pm 1\%$, 1/4W	103-6195	1
R65	Resistor, 62 k Ohm $\pm 5\%$, 1/4W	100-6253	1
R66	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R67	Resistor, 25.5 k Ohm $\pm 1\%$, 1/4W	103-2551	1
R68	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R69	Resistor, 7500 Ohm $\pm 5\%$, 1/4W	100-7543	1
R70	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R71	Resistor, 15.4 k Ohm $\pm 1\%$, 1/4W	103-1551	1
R72	Resistor, 6.2 k Ohm $\pm 5\%$, 1/4W	100-6243	1
R73,R74	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R75	Resistor, 604 Ohm $\pm 1\%$, 1/4W	100-6031	1
R76,R77	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2

TABLE 4-2. STEREO EQUALIZER CIRCUIT BOARD ASSEMBLY - 951-0026
(Sheet 5 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R78,R79	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1024	2
R80	Resistor, 1.47 k Ohm $\pm 1\%$, 1/4W	103-1474	1
R81	Resistor, 121 Ohm $\pm 1\%$, 1/4W	100-1231	1
R82	Resistor, 1.47 k Ohm $\pm 1\%$, 1/4W	103-1474	1
R83	Resistor, 121 Ohm $\pm 1\%$, 1/4W	100-1231	1
R85	Resistor, 9.09 k Ohm $\pm 1\%$, 1/4W	103-9041	1
R86	Resistor, 2.4 k Ohm $\pm 5\%$, 1/4W	100-2443	1
R87	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R88	Resistor, 43 k Ohm $\pm 5\%$, 1/4W	100-4353	1
R89	Resistor, 680 Ohm $\pm 5\%$, 1/4W	100-6833	1
R90	Resistor, 22 k Ohm $\pm 5\%$, 1/4W	100-2253	1
R91	Resistor, 22.1 k Ohm $\pm 1\%$, 1/4W	103-2211	1
R92	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R93	Resistor, 1.5 k Ohm $\pm 5\%$, 1/4W	100-1543	1
R94	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R95	Resistor, 22 k Ohm $\pm 5\%$, 1/4W	100-2253	1
R97	Resistor, 2.74 k Ohm $\pm 1\%$, 1/4W	103-2744	1
R98	Resistor, 2.4 k Ohm $\pm 5\%$, 1/4W	100-2443	1
R99	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R100	Resistor, 43 k Ohm $\pm 5\%$, 1/4W	100-4353	1
R101	Resistor, 680 Ohm $\pm 5\%$, 1/4W	100-6833	1
R102	Resistor, 22 k Ohm $\pm 5\%$, 1/4W	100-2253	1
R103	Resistor, 22.1 k Ohm $\pm 1\%$, 1/4W	103-2211	1
R104	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R105	Resistor, 1.5 k Ohm $\pm 5\%$, 1/4W	100-1543	1
R106	Resistor, 100 k Ohm $\pm 1\%$, 1/4W	103-1062	1
R107	Resistor, 22 k Ohm $\pm 5\%$, 1/4W	100-2253	1
R108	Resistor, 2.4 k Ohm $\pm 5\%$, 1/4W	100-2443	1
R109	Resistor, 22.1 k Ohm $\pm 1\%$, 1/4W	103-2211	1
R110	Resistor, 12 k Ohm $\pm 5\%$, 1/4W	100-1253	1
R111	Resistor, 3.3 k Ohm $\pm 5\%$, 1/4W	100-3343	1
R112	Resistor, 43 k Ohm $\pm 5\%$, 1/4W	100-4353	1
R113	Resistor, 680 Ohm $\pm 5\%$, 1/4W	100-6833	1
R114	Resistor, 22 k Ohm $\pm 5\%$, 1/4W	100-2253	1
R115	Resistor, 43.2 k Ohm $\pm 1\%$, 1/4W	103-4325	1
R116	Resistor, 1.5 k Ohm $\pm 5\%$, 1/4W	100-1543	1
R117	Resistor, 43.2 k Ohm $\pm 1\%$, 1/4W	103-4325	1
R118	Resistor, 22 k Ohm $\pm 5\%$, 1/4W	100-2253	1
R119	Resistor, 604 Ohm $\pm 1\%$, 1/4W	100-6031	1
R120,R121	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	2
R122,R123	Resistor, 25.5 k Ohm $\pm 1\%$, 1/4W	103-2551	2
R124	Resistor Network, 10 k Ohm $\pm 2\%$, 1W Resistors, Single In-Line Package, 8-Pin	226-1051	1
R125	Resistor, 2.4 k Ohm $\pm 5\%$, 1/4W	100-2443	1
R126	Resistor Network, 10 k Ohm $\pm 2\%$, 1W Resistors, Single In-Line Package, 8-Pin	226-1051	1

TABLE 4-2. STEREO EQUALIZER CIRCUIT BOARD ASSEMBLY - 951-0026
(Sheet 6 of 6)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R127	Resistor, 2 k Ohm $\pm 5\%$, 1/4W	100-2043	1
R128	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R129	Resistor, 12.1 k Ohm $\pm 1\%$, 1/4W	103-1215	1
R130	Resistor, 61.9 k Ohm $\pm 1\%$, 1/4W	103-6195	1
R131	Resistor, 62 k Ohm $\pm 5\%$, 1/4W	100-6253	1
R132	Resistor, 25.5 k Ohm $\pm 1\%$, 1/4W	103-2551	1
R133	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R134,R135	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R136	Resistor, 604 Ohm $\pm 1\%$, 1/4W	100-6031	1
R137	Resistor, 7500 Ohm $\pm 5\%$, 1/4W	100-7543	1
R138	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R139	Resistor, 15.4 k Ohm $\pm 1\%$, 1/4W	103-1551	1
R140	Resistor, 6.2 k Ohm $\pm 5\%$, 1/4W	100-6243	1
R141,R142	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R143 THRU R146	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	4
R147	Resistor, 1 Meg Ohm $\pm 5\%$, 1/4W	100-1073	1
R148	Resistor, 20 k Ohm $\pm 5\%$, 1/4W	100-2053	1
R149	Resistor, 24 k Ohm $\pm 5\%$, 1/4W	100-2453	1
R150	Resistor, 1.5 k Ohm $\pm 5\%$, 1/4W	100-1543	1
S1	Switch, 1 Section DPDT Pushbutton, White/Green Indications (EQUALIZER Switch)	340-0102	1
U1 THRU U3	Integrated Circuit, SSM-2014, Operational Voltage Controlled Element, 16-Pin DIP	221-2014	3
U4 THRU U6	Integrated Circuit, NE5532AP, Dual Low Noise Operational Amplifier, 8-Pin DIP	221-5532-001	3
U7	Integrated Circuit, LM317T, Adjustable Positive Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0317	1
U8	Integrated Circuit, LM337T, Adjustable Negative Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0337	1
U9 THRU U11	Integrated Circuit, SSM-2014, Operational Voltage Controlled Element, 16-Pin DIP	221-2014	3
U12 THRU U14	Integrated Circuit, NE5532AP, Dual Low Noise Operational Amplifier, 8-Pin DIP	221-5532-001	3
U15	Integrated Circuit, TL072CP, Dual JFET-Input Operational Amplifier, 8-Pin DIP	221-0072	1
XDS1	Panel Mounting Grommet, MP65, for Rectangular Lamps	481-0034	1
XU1 THRU XU3	Socket, 16-Pin DIP	417-1604	3
XU4 THRU XU6	Socket, 8-Pin DIP	417-0804	3
XU9 THRU XU11	Socket, 16-Pin DIP	417-1604	3
XU12 THRU XU15	Socket, 8-Pin DIP	417-0804	4
—	Cap, Knob, Yellow, 11mm W/Spot C112	481-0029	1
—	Cap, Knob, Green, 11mm W/Spot C112	481-0035	1
—	Cap, Knob, Orange, 11mm W/Spot C112	481-0027	1
—	Nut Cover, Black, 11mm W/Line N111	481-0030	3
—	Knob, Collect, Black, 11mm W/Line SP111-125	481-0033	3
—	Overlay, Stereo Equalizer	595-0090	1
—	Stereo Equalizer Cable Assembly	941-0028	1
—	Blank Stereo Equalizer Module Circuit Board	511-0026	1

TABLE 4-3. STEREO EQUALIZER CABLE ASSEMBLY - 941-0028

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	Connector, Housing, 12-Pin	418-1271	2
—	Pins, Connector	417-0053	31
—	Plug, Housing, 4-Pin	418-0240	1

TABLE 4-4. PARAMETRIC EQUALIZER CIRCUIT BOARD - 951-0033
(Sheet 1 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1,C2	Capacitor, Mica, 180 pF $\pm 5\%$, 500V	042-1822	2
C3	Cap, Electrolytic, 33 uF, 25V NP	020-3374	1
C4,C5	Capacitor, Mylar, 0.033 uF, 80V	038-1049	2
C6	Capacitor, Electrolytic, 33 uF, 25V NP,	020-3374	1
C7	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C8	Capacitor, Electrolytic, 33 uF, 25V NP	020-3374	1
C9,C10	Capacitor, Mica, 820 pF, $\pm 5\%$, 500V	042-2213	2
C11,C12	Capacitor, Polyester, .0047 uF $\pm 10\%$, 100V	030-4732	2
C13,C14	Capacitor, Polyester, .056 uF $\pm 10\%$, 100V	030-5643	2
C15 THRU C20	Capacitor, Electrolytic, 10 uF, 35V	023-1076	6
C21	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	1
C22	Capacitor, Silvered Mica, 100 pF $\pm 5\%$, 500V	040-1022	1
C23	Cap, Electrolytic, 33 uF, 25V NP	020-3374	1
C24	Capacitor, Silvered Mica, 100 pF $\pm 5\%$, 500V	040-1022	1
C25,C26	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	2
C27,C28	Capacitor, Mica, 330 pF $\pm 5\%$, 500V	042-3322	2
C29	Capacitor, Silvered Mica, 100 pF $\pm 5\%$, 500V	040-1022	1
C30 THRU C42	Capacitor, Monolythic Ceramic, 0.1 uF $\pm 20\%$, 50V	003-1054	13
D1,D2	Diode, 1N4005, Silicon, 600V @ 1 Ampere	203-4005	2
D3 THRU D7	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	5
DS1	LED, Red, MV57124, 3V @ 20 mA Maximum	323-7124	1
E1,E2	Terminal, Turret, Double Shoulder	413-1597	2
J1	Socket, 4-Pin	418-0255	1
J2	Receptacle, 6-Pin	417-0677	1
J3 THRU J10	Receptacle, 32-Pin In-Line	417-3200	8
P3 THRU P10	Interconnect Strip, 3-Pin In-Line	417-0500	8
R1	Resistor, 27.4 k Ohm 1%, 1/4W	103-2751	1
R2,R3	Resistor, 15 k Ohm 5%, 1/4W	100-1551	2
R4	Resistor, 47 k Ohm 5%, 1/4W	100-4753	1
R5	Potentiometer, 100 k Ohm, 10%, 1/2W	190-1065	1
R6	Resistor, 8.25 k Ohm 1%, 1/4W	103-8254	1
R7	Resistor, 47 k Ohm 5%, 1/4W	100-4753	1
R8	Resistor, 100 k Ohm 5%, 1/4W	100-1063	1
R9 THRU R11	Resistor, 10 k Ohm 1%, 1/4W	100-1051	3
R12	Resistor, 10 k Ohm 5%, 1/4W	100-1053	1
R13	Potentiometer, 100 k Ohm, 10%, 1/2W	190-1065	1
R14	Resistor, 10 k Ohm 1%, 1/4W	100-1051	1
R15	Resistor, 18 k Ohm 5%, 1/4W	100-1853	1
R16	Resistor, 100 k Ohm 5%, 1/4W	100-1063	1
R17	Resistor, 604 Ohm 1%, 1/4W	100-6031	1
R18 THRU R21	Resistor, 10 k Ohm 1%, 1/4W	100-1051	4

TABLE 4-4. PARAMETRIC EQUALIZER CIRCUIT BOARD - 951-0033
(Sheet 2 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R22	Resistor, 100 k Ohm 5%, 1/4W	100-1063	1
R23	Resistor Network, 10-10 k Ohm 0.5% Resistors, 0.7W Total Dissipation, 16-Pin DIP	226-0392	1
R24	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R25	Resistor, 499 Ohm $\pm 1\%$, 1/4W	103-4993	1
R26	Potentiometer, 5 k Ohm $\pm 10\%$, 1/2W	190-5046	1
R27	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1
R28	Resistor Network, 10-10 k Ohm 0.5% Resistors, 0.7W Total Dissipation, 16-Pin DIP	226-0392	1
R29	Resistor, 6.19 k Ohm $\pm 1\%$, 1/4W	103-6194	1
R30	Resistor, 499 Ohm $\pm 1\%$, 1/4W	103-4993	1
R31	Potentiometer, 5 k Ohm $\pm 10\%$, 1/2W	190-5046	1
R32	Resistor, 6.19 k Ohm $\pm 1\%$, 1/4W	103-6194	1
R34	Resistor Network, 10-10 k Ohm 0.5% Resistors, 0.7W Total Dissipation, 16-Pin DIP	226-0392	1
R35	Resistor, 4.75 k Ohm $\pm 1\%$, 1/4W	103-4741	1
R36	Resistor, 499 Ohm $\pm 1\%$, 1/4W	103-4993	1
R37	Potentiometer, 5 k Ohm $\pm 10\%$, 1/2W	190-5046	1
R38	Resistor, 4.75 k Ohm $\pm 1\%$, 1/4W	103-4741	1
R39	Resistor, 21 k Ohm $\pm 1\%$, 1/4W	103-2105	1
R40,R41	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	2
R44,R45	Resistor, 10 Ohm $\pm 5\%$, 1/4W	100-1024	2
R46,R47	Resistor, 1.47 k Ohm $\pm 1\%$, 1/4W	103-1474	2
R48,R49	Resistor, 121 Ohm $\pm 5\%$, 1/4W	100-1231	2
R50 THRU R53	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	4
R54	Resistor, 1 Meg Ohm $\pm 5\%$, 1/4W	100-1073	1
R55	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R56	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R57	Resistor, 16 k Ohm, 1/4W, 5%	100-1653	1
R58	Resistor, 1.5 k Ohm $\pm 5\%$, 1/4W	100-1543	1
R59	Resistor, 21 k Ohm $\pm 1\%$, 1/4W	103-2105	1
R60 THRU R64	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	5
R65	Resistor, 5.1 k Ohm $\pm 5\%$, 1/4W	100-5143	1
R66	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R67,R68	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R69	Resistor, 604 Ohm $\pm 1\%$, 1/4W	100-6031	1
R70,R71	Resistor, 150 Ohm $\pm 5\%$, 1/4W	100-1533	2
R72	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	1
R73 THRU R75	Potentiometer, 100 k Ohm $\pm 10\%$, 1/2W	190-1065	3
R76 THRU R78	Potentiometer, 5 k Ohm $\pm 10\%$, 1/2W	190-5046	3
R79	Resistor, 21 k Ohm $\pm 1\%$, 1/4W	103-2105	1
R80 THRU R82	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	3
R83	Resistor, 5.1 k Ohm $\pm 5\%$, 1/4W	100-5143	1
R84	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	1

TABLE 4-4. PARAMETRIC EQUALIZER CIRCUIT BOARD - 951-0033
(Sheet 3 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
S1,S2	Switch, 1 Section DPDT Pushbutton, White/Black Indications (LP and HP Switches)	340-0121	2
S3	Switch, 1 Section DPDT Pushbutton, White/Green Indications (Equalizer Switch)	340-0102	1
U1 THRU U6	Integrated Circuit, TLO74CN, Quad JFET-Input Operational Amplifier, 14-Pin DIP	221-0074	6
U7	Integrated Circuit, LM317T, Adjustable Positive Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0317	1
U8	Integrated Circuit, LM337T, Adjustable Negative Voltage Regulator, 1.2V to 37V, 1.5 Ampere, TO-220 Case	227-0337	1
U9	Integrated Circuit, TL072CP, Dual JFET-Input Operational Amplifier, 8-Pin DIP	221-0072	1
U10	Integrated Circuit, NE5532AP, Dual Low Noise Operational Amplifier, 8-Pin DIP	221-5532-001	1
XS1,XS2	Switch Button, White/Black Indications (LP and HP Switches)	340-0122	2
XU1 THRU XU6	Socket, 14-Pin DIP	417-1404	6
XU9,XU10	Socket, 8-Pin DIP	417-0804	2
XU10	Socket, 8-Pin DIP	417-0804	1
—	Cap, Knob, Orange, 11mm w/Spot C112	481-0027	1
—	Overlay, Filter/Parametric Equalizer	595-0092	1
—	Cap, Knob, Green, 11mm w/Spot C112	481-0035	1
—	Knob, Black, 11mm w/Line SP111-125	481-0033	1
—	Cap, Knob, Yellow, 11mm w/Spot C112	481-0029	1
—	Assembly Cable, Parametric Equalizer	941-0027	1
—	Cap, Knob, Gray, 11mm w/Spot, C112	481-0023	1
—	PCB, Blank, Parametric Equalizer	511-0033	1

TABLE 4-5. PARAMETRIC EQUALIZER CABLE ASSEMBLY - 941-0027

REF. DES.	DESCRIPTION	PART NO.	QTY.
—	Connector, Housing, 6-Pin	418-0670	2
—	Pins, Connector	417-0053	13
—	Plug, Housing, 4-Pin	418-0240	1

AUXILIARY BUS ADAPTOR

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TABLE NO.	DESCRIPTION	PAGE NO.
4-1	Auxiliary Bus Adaptor Parts List Index	4-1

SECTION I

THEORY OF OPERATION

1-1. INTRODUCTION.

1-2. The following text provides detailed theory of operation for the Mix-Trak 90 audio console auxiliary bus adaptor. Refer to the auxiliary bus adaptor schematic diagram in SECTION III as required for the following circuit discussion.

1-3. FUNCTIONAL DESCRIPTION.

1-4. AUXILIARY BUS ADAPTOR.

1-5. The auxiliary bus adaptor provides remote access to the MT-90 cue, auxiliary, studio mute, control room mute, cue control, and program timer busses. In addition, the adaptor provides access to the ± 24 volt and +12 volt dc supplies. Access to the MT-90 busses and power supplies allow the console to be configured for specialized talkback and audio distribution systems.

1-6. **INPUT AMPLIFIER NETWORKS.** The auxiliary bus adaptor contains an input amplifier network for the cue, auxiliary 1, auxiliary 2, and auxiliary 3 busses. The input amplifier networks are identical, therefore only the cue bus will be discussed.

1-7. Balanced cue input audio is applied to operational amplifier U1D. U1D is configured as a differential amplifier and provides balanced-to-unbalanced signal conversion. The gain of the amplifier network is controlled by potentiometer R6. Capacitors C5 and C6 prevent the coupling of dc potentials into the circuit.

1-8. **POWER SUPPLY.** The auxiliary bus adaptor provides access to the MT-90 ± 24 volt and +12 volt dc supplies. The supplies are protected from overload conditions by fuses F1, F2, and F3. Zener diodes D7 and D8 provide operating potentials for operational amplifier U1.

SECTION II AUXILIARY BUS ADAPTOR

2-1. INTRODUCTION.

2-2. This section provides general maintenance information for the auxiliary bus adaptor.

2-3. MAINTENANCE.

2-4. GENERAL.

2-5. The auxiliary bus adaptor should be periodically cleaned of accumulated dust using a nylon-bristle brush and vacuum cleaner. The adaptor should also be periodically inspected for loose wiring and components.

2-6. COMPONENT REPLACEMENT.

2-7. Component replacement procedures for the console modular assemblies are presented in SECTION II, MAINTENANCE. Refer to SECTION II as required for the replacement procedures.

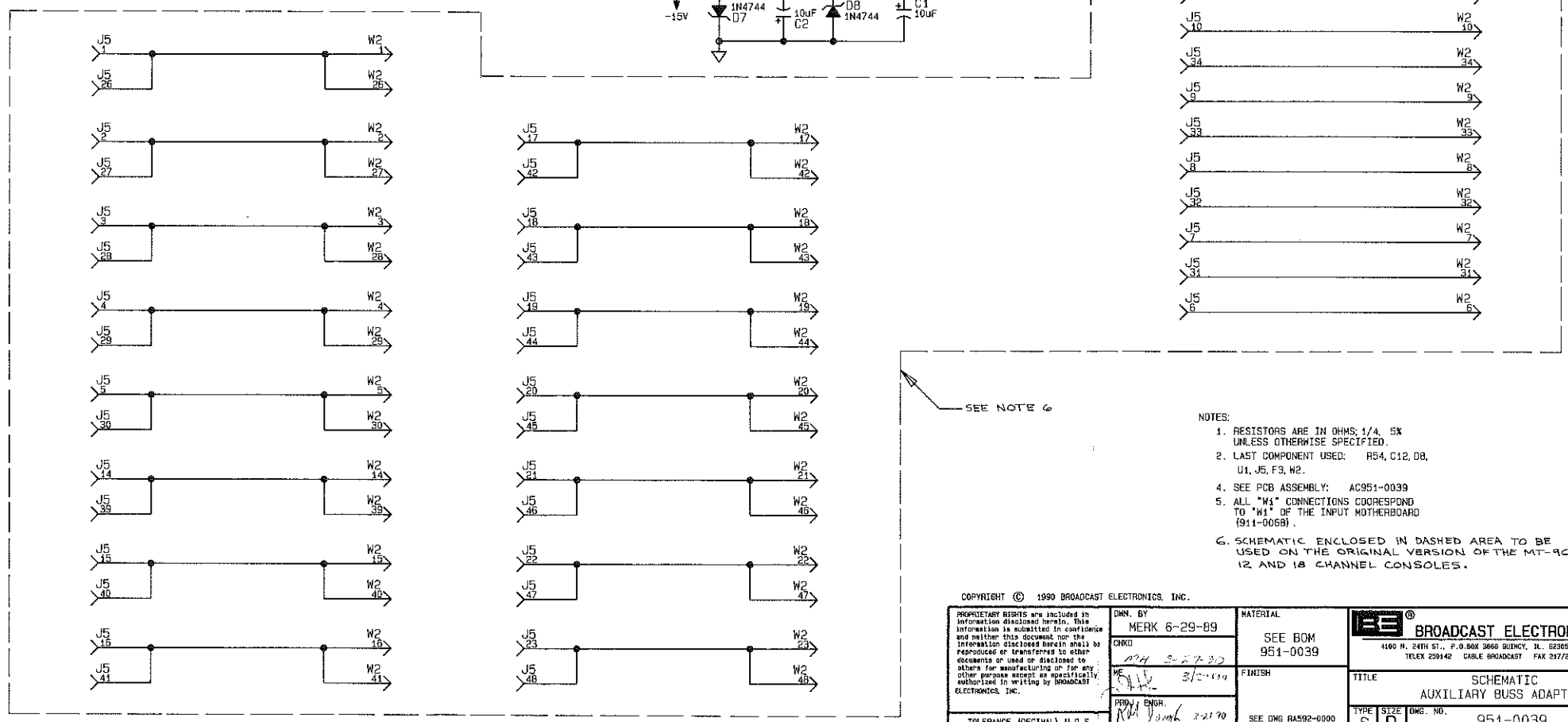
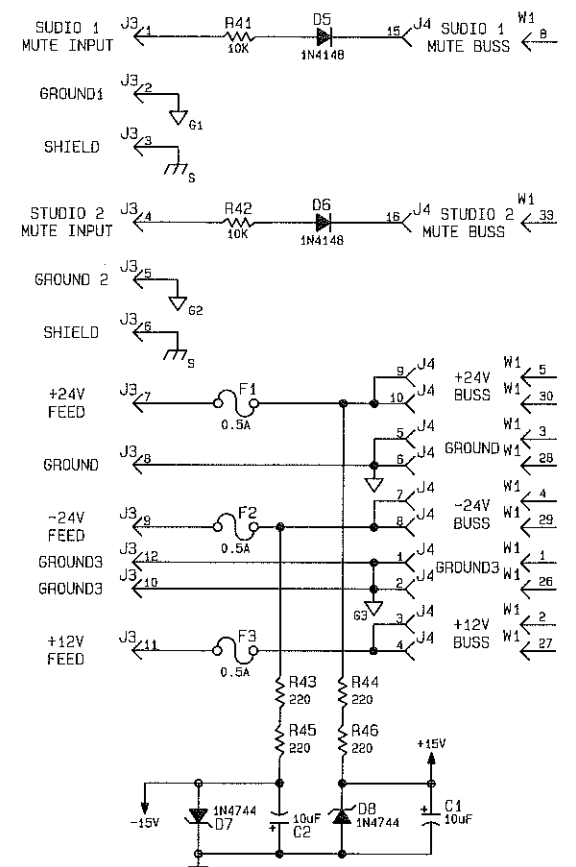
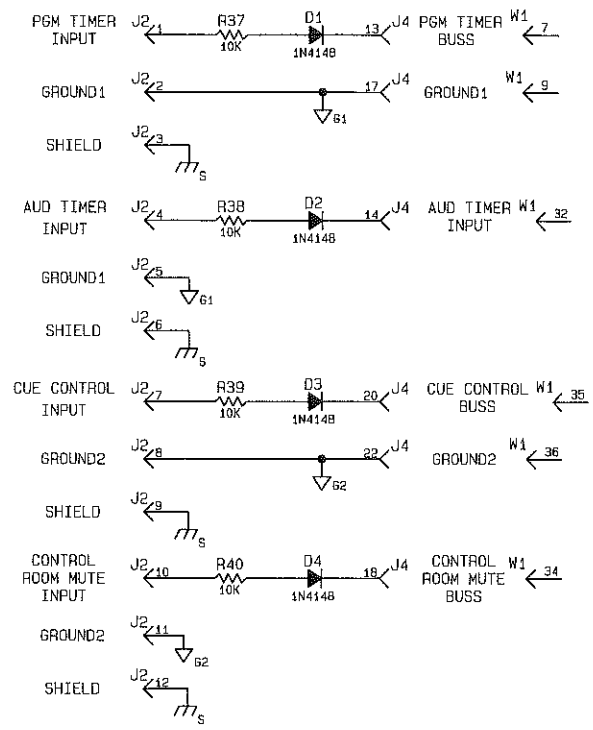
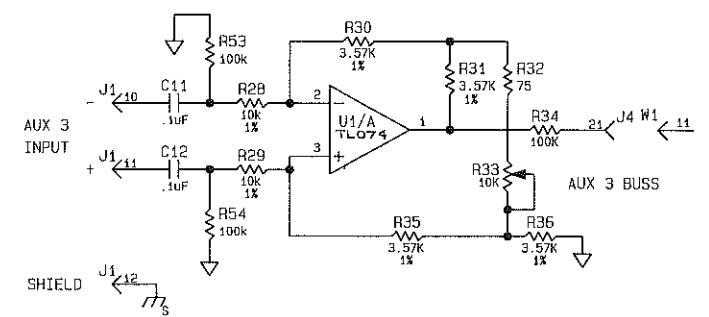
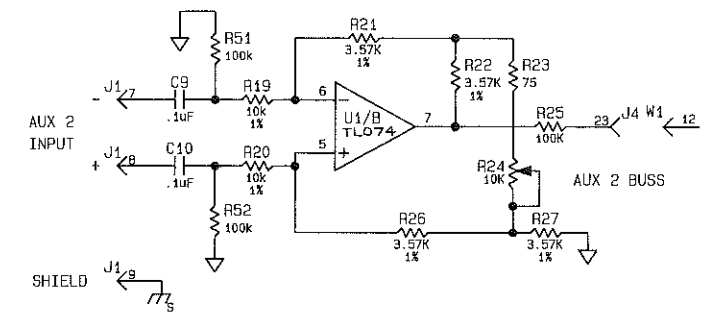
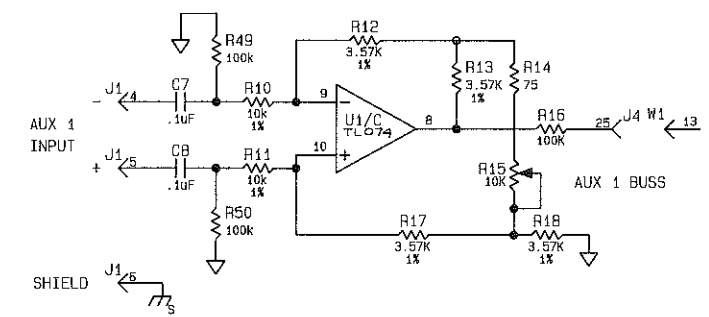
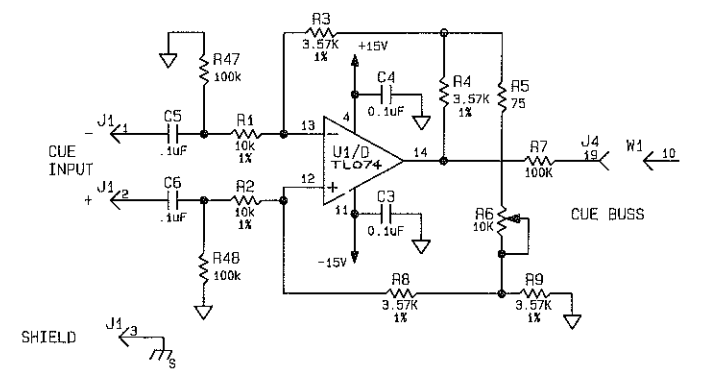
SECTION III

AUXILIARY BUS ADAPTOR DRAWINGS

4-1. **INTRODUCTION.**

4-2. This section provides assembly drawings and schematic diagrams as listed below for the auxiliary bus adaptor.

FIGURE	TITLE	NUMBER
3-1	SCHEMATIC DIAGRAM, AUXILIARY BUS ADAPTOR	SD951-0039
3-2	ASSEMBLY DIAGRAM, AUXILIARY BUS ADAPTOR	AC951-0039



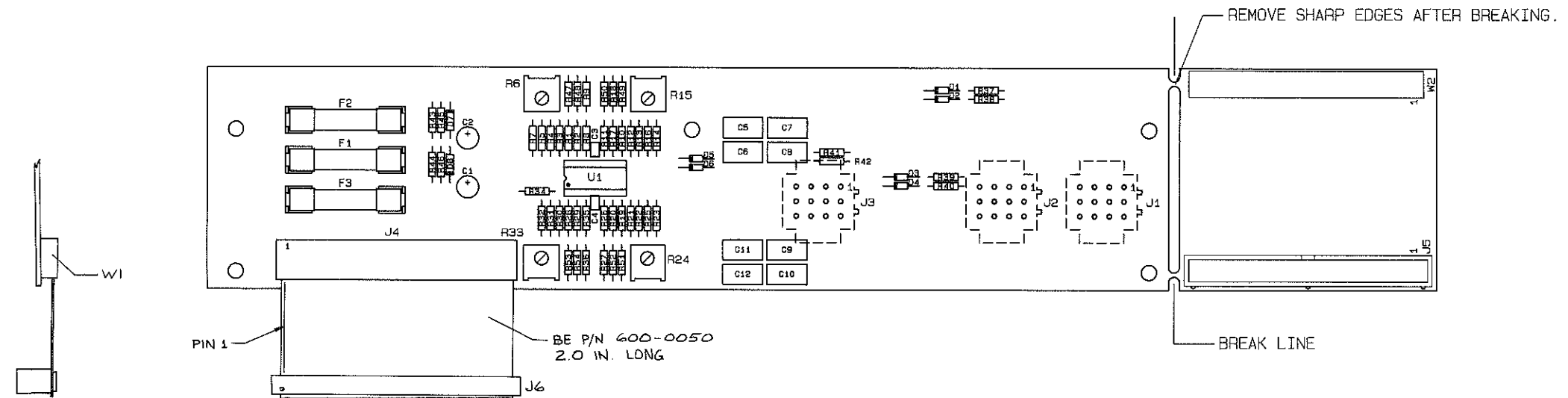
SEE NOTE 6

NOTES:

1. RESISTORS ARE IN OHMS; 1/4, 5% UNLESS OTHERWISE SPECIFIED.
2. LAST COMPONENT USED: R54, C12, D8, U1, J5, F3, W2.
3. SEE PCB ASSEMBLY: AC951-0039
4. ALL "W1" CONNECTIONS CORRESPOND TO "W1" OF THE INPUT MOTHERBOARD (911-0058).
5. SCHEMATIC ENCLOSED IN DASHED AREA TO BE USED ON THE ORIGINAL VERSION OF THE MT-90 12 AND 18 CHANNEL CONSOLES.

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TOLERANCE (DECIMAL) U.O.S. .X ± .050 .XXX ± .005 .XX ± .015 ANGLES ± 1°	DATE 3/2/89	FINISH	TITLE AUXILIARY BUSS ADAPTER	
TYPE S D	DWG. NO. 951-0039	SEE DWG. RA592-0000	REV B	MODEL MT-90
NEXT ASSY. AC951-0039	SCALE NONE	SHEET 1	OF 1	

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- NOTES:
1. LAST COMPONENT USED: R46, C12, D8, U1, J5, F3, W2.
 2. SEE SCHEMATIC SD951-0039

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	CHKD MH 3-27-90	FINISH		TITLE PCB ASSEMBLY- AUXILIARY BUSS ADAPTER
	ME 3/27/90	PROJ. ENGR. [Signature] 7-27-90	NEXT ASSY	TYPE A C
	MFG [Signature]	SCALE 1/1	SHEET 1 OF 1	REV B

SECTION IV

AUXILIARY BUS ADAPTOR PARTS LIST

4-1. INTRODUCTION.

4-2. This section provides descriptions and part numbers of electrical components and assemblies required for maintenance of the auxiliary bus adaptor. Each table entry in this section is indexed by the reference designators appearing on the applicable schematic diagram.

TABLE 4-1. AUXILIARY BUS ADAPTOR PARTS LIST INDEX

TABLE	TITLE	PART NO.	PAGE
4-2	AUXILIARY BUS ADAPTOR CIRCUIT BOARD ASSEMBLY	951-0039	4-1

TABLE 4-2. AUXILIARY BUS ADAPTOR CIRCUIT BOARD ASSEMBLY - 951-0039
(Sheet 1 of 2)

REF.DES.	DESCRIPTION	PART NO.	QTY.
C1,C2	Capacitor, Electrolytic, 10 uF, 50V	023-1076	2
C3,C4	Capacitor, Monolithic Ceramic, 0.1 uF ±20%, 50V	003-1054	2
C5 THRU C12	Capacitor, Mylar, 0.1 uF ±10%, 100V	030-1053	8
D1 THRU D6	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes	203-4148	6
D7,D8	Diode, Zener, 1N4744A, 15V, 1W	200-0015	2
F1 THRU F3	Fuse, 3AG, 250V, 1/2 Amperes	330-0050	3
J1 THRU J3	Connector, 12-Pin	417-1276	3
J6	Socket, Connector, 50-Pin	417-0228	1
R1,R2	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	2
R3,R4	Resistor, 3.57 k Ohm ±1%, 1/4W	103-3574	2
R5	Resistor, 75 Ohm ±5%, 1/4W	100-7523	1
R6	Potentiometer, 10 k Ohm ±10%, 1/2W	177-1054	1
R7	Resistor, 100 k Ohm ±5%, 1/4W	100-1063	1
R8,R9	Resistor, 3.57 k Ohm ±1%, 1/4W	103-3574	2
R10,R11	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	2
R12,R13	Resistor, 3.57 k Ohm ±1%, 1/4W	103-3574	2
R14	Resistor, 75 Ohm ±5%, 1/4W	100-7523	1
R15	Potentiometer, 10 k Ohm ±10%, 1/2W	177-1054	1
R16	Resistor, 100 k Ohm ±5%, 1/4W	100-1063	1
R17,R18	Resistor, 3.57 k Ohm ±1%, 1/4W	103-3574	2
R19,R20	Resistor, 10 k Ohm ±1%, 1/4W	100-1051	2
R21,R22	Resistor, 3.57 k Ohm ±1%, 1/4W	103-3574	2
R23	Resistor, 75 Ohm ±5%, 1/4W	100-7523	1
R24	Potentiometer, 10 k Ohm ±10%, 1/2W	177-1054	1
R25	Resistor, 100 k Ohm ±5%, 1/4W	100-1063	1

TABLE 4-2. AUXILIARY BUS ADAPTOR CIRCUIT BOARD ASSEMBLY - 951-0039
(Sheet 2 of 2)

REF.DES.	DESCRIPTION	PART NO.	QTY.
R26,R27	Resistor, 3.57 k Ohm $\pm 1\%$, 1/4W	103-3574	2
R28,R29	Resistor, 10 k Ohm $\pm 1\%$, 1/4W	100-1051	2
R30,R31	Resistor, 3.57 k Ohm $\pm 1\%$, 1/4W	103-3574	2
R32	Resistor, 75 Ohm $\pm 5\%$, 1/4W	100-7523	1
R33	Potentiometer, 10 k Ohm $\pm 10\%$, 1/2W	177-1054	1
R34	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	1
R35,R36	Resistor, 3.57 k Ohm $\pm 1\%$, 1/4W	103-3574	2
R37 THRU R42	Resistor, 10 k Ohm $\pm 5\%$, 1/4W	100-1053	6
R43 THRU R46	Resistor, 220 Ohm $\pm 5\%$, 1/4W	100-2233	4
R47 THRU R54	Resistor, 100 k Ohm $\pm 5\%$, 1/4W	100-1063	8
U1	Integrated Circuit, TL074CN, Quad JFET-Input Operational Amplifier, 14-Pin DIP	221-0074	1
W1	Connector, 50-Pin	417-0171	1
XF1 THRU XF3	Fuse Clips	415-2068	3
XU1	Socket, 14-Pin DIP	417-1404	1
—	Blank Auxiliary Bus Circuit Board	511-0039	1

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LIMITED TWO YEAR

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