

INSTRUCTION MANUAL

100A & 200A
Series Audio Consoles

1 October 1980

⁵⁹⁷
IM No. 839-1021



BROADCAST ELECTRONICS INC. *Spotmaster*® TAPE CARTRIDGE SYSTEMS

a FILMWAY company

IMPORTANT INFORMATION

EQUIPMENT LOST OR DAMAGED IN TRANSIT

When delivering the equipment to you, the truck driver or carrier's agent will present a receipt for your signature. Do not sign it until you have (a) inspected the containers for visible signs of damage and (b) counted the containers and compared with the amount shown on the shipping papers. If a shortage or if evidence of damage is noted, insist that notation to that effect be made on the shipping papers before you sign them.

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Technical assistance is available by letter or prepaid telephone or telegram from Broadcast Electronics or the franchised parts and repair Service Centers shown on the outside back cover of this manual. Equipment requiring repair or overhaul should be sent by common carrier, prepaid, insured and well protected. Do not mail equipment. We can assume no liability for inbound damage, and necessary repairs become the obligation of the shipper. Prior arrangement is necessary. Contact Customer Service Department or the nearest repair depot for a Return Authorization.

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RETURN, REPAIR AND EXCHANGES

Do not return any merchandise without our written approval and Return Authorization. We will provide special shipping instructions and a code number that will assure proper handling and prompt issuance of credit. Please furnish complete details as to circumstances and reasons when requesting return of merchandise. All returned merchandise must be sent freight prepaid and properly insured by the customer.

REPLACEMENT PARTS

Replacement and Warranty Parts may be ordered from the address below. Be sure to include equipment model and serial number and part description and part number.

Broadcast Electronics, Inc.
4100 N. 24th St., P. O. Box 3606
Quincy, Illinois 62301
Tel: (217) 224-9600
Telex: 25-0142 CABLE: "SPOTMASTER"

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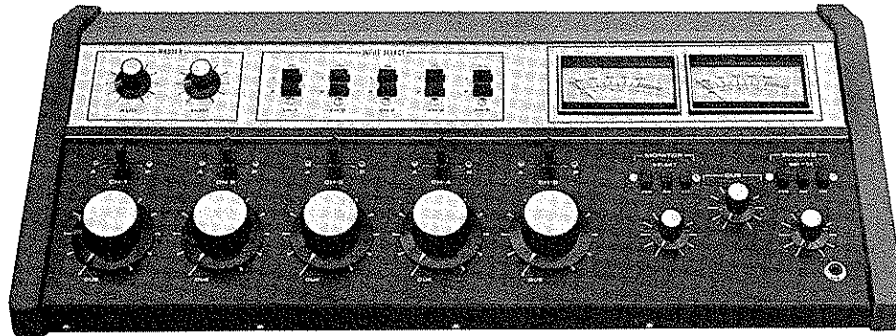
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MODIFICATIONS

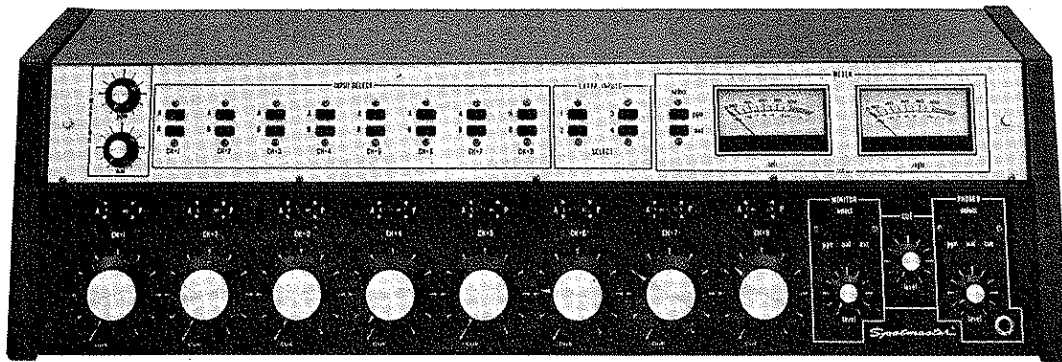
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Instruction Manual

100A & 200A
Series Audio Consoles



5M100A



8S200A

IM No. 839-1020

Price \$ _____

Product Serial Number _____

Purchase Date _____



a FILMWAY company

BROADCAST ELECTRONICS INC. *Spotmaster*[®] TAPE CARTRIDGE SYSTEMS

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SECTION I INTRODUCTION

1.1 MANUAL

This manual provides operation, installation and maintenance information for the SPOTMASTER 100A and 200A series audio consoles. There are eight models:

5M100A.....	5 mixer dual monophonic
5S100A.....	5 mixer dual stereophonic (2 Aud. Channel Line Drivers optional)
5M200A.....	5 mixer dual monophonic
5S200A.....	5 mixer dual stereophonic
8M100A.....	8 mixer dual monophonic
8S100A.....	8 mixer dual stereophonic (2 Aud. Channel Line Drivers optional)
8M200A.....	8 mixer dual monophonic
8S200A.....	8 mixer dual stereophonic

Specifications and comparative information on these models are in Table 1.

1.2 FEATURES AND DESCRIPTION

The SPOTMASTER audio console line provides a complete range of 5 and 8 mixer devices in monophonic and stereophonic configurations. Each console represents an economical yet superior performing console designed to switch and mix multiple audio sources in AM, FM, and TV broadcast installations, CATV systems, recording studios, and other facilities. All of the consoles are designed with features that are most needed to provide operating flexibility, installation simplicity, and service convenience. Components and circuit designs were chosen for performance and reliability.

All amplifiers are mounted on plug-in circuit board modules. Integrated circuits are used extensively. The power supply is mounted in the console cabinet.

All preamplifiers are equipped for operation with microphone or line level input signals as selected on the preamplifier card. A cue detent position is installed on all mixers, so that input assignments can be made as desired. In stereophonic consoles both the left and right channels are fed to the cue system. The stereophonic consoles are also equipped to accept monophonic or stereophonic inputs to all preamplifiers. This selectable capability can be used to feed a mono signal to both the left and right channels.

All consoles are designed for dual channel operation with the audition and program channels identical in operating specifications. (In certain models the audition output amplifier is optional. All wiring is in place, so this capability may be added at a later date). A third output is available as an option in the stereo models; a monophonic signal derived from the stereophonic program channel.

The switching of signals to the audition or program channel is accomplished electronically with Field Effect Transistors. The FET's provide excellent isolation when off and are protected from RF pick-up.

Built-in amplifier(s) are provided for monitor speakers. Separate outputs are provided for several studios. These outputs are connected through relays which can be activated to mute the speaker when used next to a live microphone. Separate contacts are provided on the relay for controlling a studio "on-the-air" light.

Separate amplifiers are provided to drive a cue speaker and headphones. An internal cue speaker and connections for an external speaker are provided. Both a front panel headphone jack and parallel external connections are incorporated.

For ease in installation and interconnection, most connections are made to screw terminals. All terminals are labeled for quick identification. Since all connections are made inside the cabinet, wiring is protected from dirt, tampering, or accidental damage.

There are eight models of audio consoles in the SPOTMASTER 100A and 200A Series. Their specifications and comparative features are shown in Table 1.

1.3 WARRANTY

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Broadcast Electronics, Inc. ("BEI"), 4100 North 24th Street, P. O. Box 3606, Quincy, Illinois 62301, hereby warrants cartridge machines, consoles, and other new equipment manufactured by Broadcast Electronics, Inc., against any defects in material or workmanship at the time of delivery thereof, that develop under normal use within a period of one (1) year from the date of shipment. Other manufacturers' equipment, if any, shall carry only such manufacturers' standard warranty. This warranty extends to the original user and any subsequent purchaser during the warranty period. BEI's sole responsibility with respect to any equipment or parts not conforming to this warranty is to replace such equipment or parts upon the return thereof F.O.B. BEI's factory or authorized repair depot within the period aforesaid.

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

BEI shall not be liable to the original user for any and all incidental or consequential damages for either express or implied warranties. However, some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. All express and implied warranties shall terminate at the conclusion of the period set forth herein. The card which is enclosed with the product will be used by BEI for survey purposes only.

1.4

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1.6

SERVICE

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Technical assistance is available by letter or prepaid telephone or telegram from Broadcast Electronics or the franchised parts and repair depots shown on the outside back cover of this manual. Equipment requiring repair or overhaul should be sent by common carrier, prepaid, insured and well protected. Do not mail equipment. We can assume no liability for inbound damage, and necessary repairs become the obligation of the shipper. Prior arrangement is necessary. Contact Customer Service Department or the nearest repair depot for a Return Authorization.

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1.8

MODIFICATIONS

Broadcast Electronics, Inc. reserves the right to modify the design and specifications of the equipment in this manual without notice. Any modifications shall not adversely affect performance of the equipment so modified.

TABLE 1. SPECIFICATIONS AND COMPARATIVE FEATURES

MODEL	5M150	5S150	5M250	5S250	8M150	8S150	8M250	8S250
MONO/STEREO	MONO	STEREO	MONO	STEREO	MONO	STEREO	MONO	STEREO
NUMBER OF MIXERS	5 MIXERS				8 MIXERS			
MIXER TYPE	SEALED POTENTIOMETER	SEALED POTENTIOMETER	STEP ATTENUATOR	STEP ATTENUATOR	SEALED POTENTIOMETER	SEALED POTENTIOMETER	STEP ATTENUATOR	STEP ATTENUATOR
NUMBER OF INPUTS	10 INPUTS				16 INPUTS			
LINE INPUTS	54 k Ohms, BALANCED BRIDGING, -20 dBm NOMINAL, +20 dBm MAXIMUM							
MICROPHONE INPUTS	150 Ohms, BALANCED, -65 dBm NOMINAL, -38 dBm MAXIMUM							
OUTPUT LEVEL	PGM-AUD	PGM-AUD* MONO*	PGM-AUD	PGM-AUD MONO*	PGM-AUD	PGM-AUD* MONO*	PGM-AUD	PGM-AUD MONO*
FREQUENCY RESPONSE	600 Ohm BALANCED +8 dBm FOR OVU, +18 dBm MAXIMUM							
DISTORTION	30 Hz to 20 kHz ± 0.5 dB							
NOISE	0.05% THD and IM, 30 Hz to 20 kHz at +18 dBm OUTPUT							
MONITOR RESPONSE	8W	1.5 W PER CHANNEL	8 W	8 W PER CHANNEL	8 W	1.5 W PER CHANNEL	8 W	8 W PER CHANNEL
DISTORTION	70 dB BELOW +18 dBm OUTPUT WITH -50 dBm INPUT, 20 kHz BANDWIDTH							
CUE	50 Hz to 20 kHz ± 0.75 dB, 1 kHz REFERENCE							
HEADPHONES	0.75% OR LESS, 30 Hz to 20 kHz, AT RATED OUTPUT AND LOAD							
MUTING RELAYS	1.0 W TO INTERNAL SPEAKER							
VU METERS	1.0 W PER CHANNEL, HIGH OR LOW IMPEDANCE							
DIMENSIONS ENGLISH (in)	1 (NO. 2)*	1 (NO. 2)*	3	3	1 (NO. 2)*	1 (NO. 2)*	3	3
METRIC (cm)	PGM AUD	L PGM R PGM	PGM AUD	L PGM/AUD R PGM/AUD	PGM AUD	L PGM/AUD R PGM/AUD	PGM AUD	L PGM/AUD R PGM/AUD
WEIGHT POUNDS	2.9 W x 15.75 D x 8.25 H				33 W x 15.75 D x 8.25 H			
KILOGRAMS	73.66 W x 40.0 D x 20.96H				83.82 W x 40.0 D x 20.96 H			
POWER REQUIREMENTS	49	54	55	55	55	55	60	60
	22.23	24.49	24.95	24.95	24.95	24.95	27.22	27.22
	105 - 125 V ac, 60 Hz or 210 - 230 V ac, 50/60 Hz (OPTIONAL)							
	*PLUG IN OPTION							

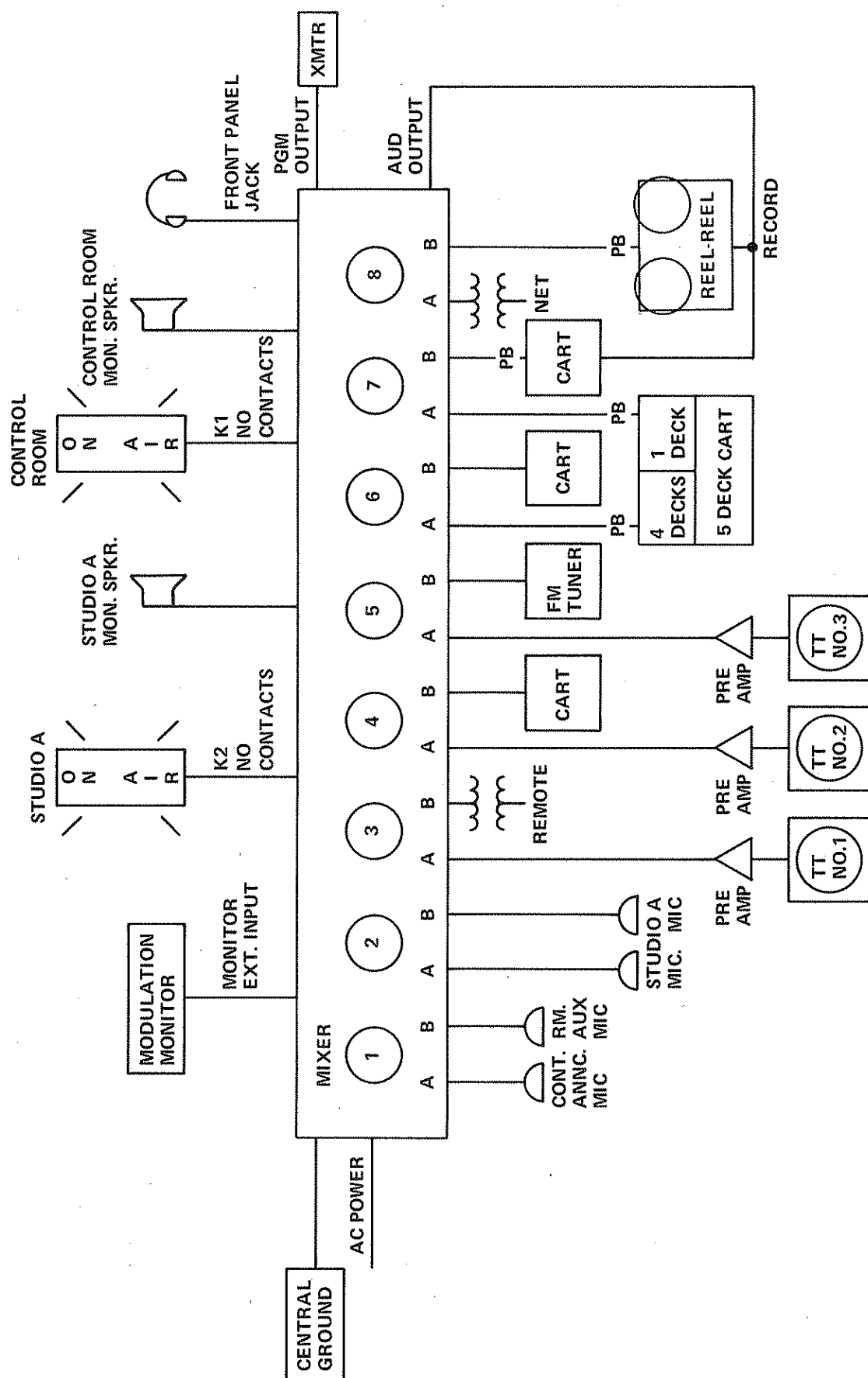


Figure 1A. Representative Studio Employing Monophonic SPOTMASTER® Audio Console

SECTION II INSTALLATION

2.1 SCOPE

This section of the manual details the various procedures entailed in preparing the console for operation. The installation procedures are presented in chronological order to minimize the time between incoming inspection and operation.

2.2 UNPACKING

The console is shipped in one container. Carefully unpack and inspect the console to make certain that no damage has occurred during shipment. Any damage should be immediately reported to Broadcast Electronics, Inc. and to the transportation company. Check before throwing away the packing material to determine if all invoiced items are present. Besides the console, the shipment should include a Warranty Registration Card and the Instruction Manual.

2.3 INSTALLATION PROCEDURES

The installation of a SPOTMASTER audio console requires four steps:

1. Determine the physical location of the console in relation to other associated equipment. Specifically, requirements for operator convenience, cable access and proper electrical interconnection must be considered. General information on planning the console installation is contained in paragraph 2.4 below. Representative studios are shown in the block diagrams in Figures 1A and 1B.
2. SPOTMASTER audio consoles are intended for desk top mounting. All connections are made inside the cabinet. Cable access is provided through cut-outs located in the bottom of the cabinet. If mounted flush on a table top, matching openings are required in the table top beneath the console.
3. Make the electrical interconnections as described individually for the different types of connections in paragraphs 2.5 through 2.9. The internal arrangements of the consoles are shown in Figures 4 through 11.
4. Finally, perform the following adjustments and checks: check the input level settings on each mixer preamplifier for proper sensitivity as explained in 2.5.1 for input level switches or 4.16 for jumper selection. These jumper selections have been used in consoles of recent production.

In stereo consoles, check mono/stereo presets on each preamplifier for proper setting as explained in 2.5.2. Check all input wiring for proper connection of balanced or unbalanced inputs as explained in 2.5.3. Check the muting relays for proper operation as required in 2.8.5. In 200A series consoles, be sure that jumpers required for other than standard muting relay control are installed, if desired. If an external cue speaker is installed, be certain the precautions described

in 3.7 are observed. Perform the level setting procedure outlined in 2.10.1. If required in stereo consoles, perform the monophonic balance adjustment and level balances procedures set forth in 2.10.2 and 2.10.3. If the console is NOT operated at a +8dBm output level, calibrate the VU meter(s) as explained in 2.10.4. If desired, a specifications test may be performed as confirmation of proper console installation and operation. The results can be compared to the original factory results shown on the test sheet supplied with each unit. Proper conditions for these tests are indicated in 5.2.

2.4 INSTALLATION, PLANNING AND TECHNIQUES

2.4.1 Assignment of Inputs and Outputs

Refer to the representative studio installation shown in block diagram form in Figures 1A and 1B.

Electrically, the most important consideration in assigning the mixer inputs is the level of the source signal. Both inputs to a mixer must be the same level class (microphone or line level). Since the two muting relays in 100A series consoles are activated by mixers 1 and 2, microphones operated in a studio with a monitor speaker must be connected to these mixers. In 200A series consoles, the three muting relays may be controlled by any mixer. (See paragraph 2.8.5).

Additionally, in stereo consoles, the inputs may be monophonic or stereophonic. But both inputs to a mixer must be either mono or stereo; one cannot be mono with the other stereo. See mixer 7 in Figure 1B.

Operationally input sources used simultaneously (mixed), cross faded, or used in a rapid sequence should all be on separate mixers. Conversely, two inputs rarely used in conjunction with each other may be assigned to the same mixer.

The output lines are identical in performance so that these may be used as required. However, in the 5S100A and 8S100A models, the optional audition channel is not provided with a VU meter. It is best used as a recording output or with external metering provided.

2.4.2 Wiring

Audio connections to the console should be made with shielded cable such as Belden 8441, Belden 8451, Alpha 2400, etc. Separate as much as possible, cables carrying different signal levels. Separate microphone cables from high level cabling and all inputs from speaker connections.

Similarly, run audio and power cables as far apart as is possible. Use the appropriate type wiring for power cables ("zip cord", twisted pair, etc.). If practical, wire power connections with a shielded cable to prevent coupling to audio cables.

2.4.3 Grounding

The most important consideration in ensuring good noise performance of the installation is the grounding and shielding of the various interconnections.

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

Secondly, the grounding of the signal shields must be executed so as to avoid ground loops (unintended signal paths through shields and grounds). To prevent ground loops, shields are grounded at only one end of the cable. Generally, this is done at the console. However, it may be best to ground the shield at the source equipment or in between the console and the source.

Particular care must be exercised to avoid unintended grounds at patch panels, through external switching arrangements, through uninsulated (case grounded) jacks on associated equipment or from grounded racks and cabinets.

2.4.4 Terminations

Proper load or termination for transformer coupled equipment is necessary for proper frequency response and level. The program outputs of SPOTMASTER consoles must have a 600 ohm termination. This may be installed at the console or externally. Proper termination should be provided for transformer coupled equipment connected to the console. For example, sources requiring 600 ohm termination should have a 620 ohm resistor installed at the console.

2.5 MIXER INPUTS

2.5.1 Input Level Sensitivity

Any mixer will accept either low level (microphone) or high level (line) inputs. This is determined by the setting of the HI/LO switch(es) or jumper selection on the preamplifier cards located in the console cabinet. One preamplifier is included for each mixer beginning with mixer 1 to the left as viewed from the front of the console. In new consoles, the first two preamplifiers (mixer 1 and 2) have been preset for low level and the remainder for high level use.

NOTE

While a mixer may be set for either high or low level inputs, both inputs (A or B; 1 or 2) to that mixer must be either high or low level.

2.5.2 Monophonic and Stereophonic Inputs

Any mixer in stereo consoles will accept either monophonic or stereophonic inputs as determined by the setting of the MONO-STEREO switch on each preamplifier card. When set to MONO, a signal connected to the LEFT input will also be fed to the right channel. In the MONO position, the RIGHT input is not connected.

NOTE

When a mixer is set for monophonic input, both inputs (A and B; 1 and 2) must be mono sources.

2.5.3 Input Wiring

BALANCED INPUTS

Connect the high side to the + terminal and the low side to the COM terminal. Connect the shield to the GND terminal.

UNBALANCED INPUT

Connect the high side to the + terminal. Connect the low side (shield) to the GND terminal. Connect the COM and GND terminals.

NOTE

Place a 600 ohm resistor across high level inputs requiring termination.

2.6 CONSOLE PROGRAM OUTPUTS

Identical program and audition channel outputs are provided in the 5M100A, 8M100A, 5M200A, 8M200A, 5S200A, and 8S200A consoles. The audition output is optional in the 5S100A and 8S100A.

Additionally, a mono sum output derived from the left and right program signals is optional in all stereo consoles.

These outputs are transformer coupled, balanced with an impedance of 600 ohms. Connect the high side to the + terminal, the low side to the COM terminal, and the shield to the GND terminal. A 600 ohm termination should be provided for proper level and frequency response.

2.7 EXTERNAL MONITOR INPUT

This input to the monitor amplifier is intended to accept the output from a modulation monitor or other auxiliary audio monitor source. It is unbalanced with an impedance of approximately 10,000 ohms. The input level should be adjusted with an external pad so that the monitor level remains constant when switching from audition or program monitor feed to the external input.

2.8 SPEAKER, HEADPHONE, AND MUTING RELAY CONNECTIONS

2.8.1 Speaker Connections

Outputs for monitor speakers are provided for the control room (console location) and various studios. These speaker outputs are connected through the muting relays for operation with live microphones. The control room speaker is controlled by relay K1, studio A by K2, etc.

The monitor circuitry is designed to drive 8 ohm speakers. For multiple speaker installations, use 16 ohm speakers or matching transformers to maintain an overall impedance above 4 ohms. Refer to specifications (Table 1) for power available in the various model consoles.

NOTE

To avoid damage to the monitor amplifier,
DO NOT EXCEED the power capabilities of
the amplifier. DO NOT operate the amplifier
into speaker loads below 4 ohms.

2.8.2 External Cue Speaker

An internal cue speaker is provided; however, an external cue speaker may be connected if desired. This should be a high efficiency device of 8 or 16 ohms impedance. When an external cue speaker is connected, disconnect the internal one.

The external cue speaker will be muted by relay K1.

2.8.3 Muting Relay Contacts

The solder terminals on the power supply board give access to the normally open contacts of the muting relays to control studio "on-the-air" lights. These contacts are rated at 1 amp resistive at 125 VAC. These contacts can be used to activate an external relay to actually switch the lamps.

2.8.4 External Headphones Connection and Front Panel Head Phone Jacks

Terminals are provided to connect an external headphone jack should this be more convenient than the front panel jack.

NOTE

Refer to Section 3.7 for use of low impedance headphones or use of both the front panel jack and the external connection.

2.8.5 Muting Relay Control

100A SERIES CONSOLES

The 100A series consoles have provisions for two muting relays: one is standard and the second is a plug-in option.

All 100A series consoles come wired for activation of relay K1 (control room), when the mixer 1, audition/program switch is in either the audition or program position. The studio A relay (K2) is similarly controlled by mixer 2. Each relay can be controlled by only one mixer (the relay is activated by breaking a connection to ground). If it is necessary to change the muting as wired at the factory, see the "100A Series Console Muting" diagram (Figure 12).

200A SERIES CONSOLES

All 200A series consoles are equipped with 3 muting relays. As wired at the factory, the control room relay (K1) is activated when the mixer 1 audition/program switch is in the program position. The studio A (K2) and studio B (K3) relays are similarly controlled by mixers 2 and 3 respectively.

This control designation may be changed. Refer to the console schematic diagram (Figures 15 and 16). Wiring is provided so that the muting may be controlled by any of the mixers.

2.9 AC POWER

All SPOTMASTER audio consoles are equipped with three-wire grounded AC line cords. This should be connected to a single phase 117 VAC, 50/60Hz power source. (Models for operation from 220 VAC, 50/60 Hz, are optionally available).

The console AC power switch and fuse are located inside the cabinet on the right hand side.

2.10 ELECTRONIC ADJUSTMENTS

2.10.1 Level Setting

Refer to the chassis layout diagrams in Figures 4 through 11.

All SPOTMASTER consoles are designed to operate at an output level of +8 dBm. The VU meter(s) are calibrated to read 0 VU (100) with an output of +8 dBm. The level adjustments described here may be performed using the console VU meter as reference. Use 1 kHz sine wave signal or any program signal with a consistent level as a test signal.

Set the front panel master gain control to the 12 o'clock position.

Switch each input source to the program or audition channel in turn. Adjust the front panel mixer for +8 dBm output. If the mixer is only set at 9 o'clock or 8 o'clock, install a pad on the input. Ideally, the mixer should be operated in the 10 o'clock to 2 o'clock range for best performance.

The front panel master control may be adjusted slightly, if required.

2.10.2 Level Balance

The level balance trimmers on the 918-3604 Mixer Line Driver Amplifiers are not used to set the output level but to balance the left to right output levels in stereophonic consoles or to match the audition to program outputs in monophonic consoles.

NOTE

These controls need not be adjusted in monophonic consoles unless the audition and program outputs are used to feed the same line. For this reason, the procedure for stereo consoles is described below.

The level balance adjustment must be performed with an external VU meter connected to the output and proper 600 ohm termination provided to the output. The level adjustments described in 1.10.1 above should first be performed.

Feed a sine wave signal to any mixer's right input. Observe the output level. Feed the same signal to the same mixer's left input. Adjust the left or right balance trimmer to match the two output levels.

2.10.3 Balance Adjustment of Monophonic Output

NOTE

This adjustment is required only in stereophonic consoles equipped with the 918-3602 mono matrix amplifier.

The trimmers on the 918-3602 amplifier are used to adjust the input signals so that the left and right channel signal are mixed 50%/50% in the monophonic output. This adjustment is performed after the leveled adjustments described in 1.10.1 and 1.10.2 above.

This adjustment requires an external VU meter connected to the mono output. This output must be terminated with 600 ohms.

Feed a sine wave signal to the right input of any mixer. Place that mixer in the program channel and adjust the mixer for 0 VU (+8 dBm output) on the console VU meter. Adjust the right trimmer on the 918-3602 for a mono output on the external meter of +5 dBm. Connect the same signal to the left input of the same mixer and perform the adjustment with the left trimmer on the 918-3602.

NOTE

When inputs are present from both the left and right channels, the mono output will be +8 dBm.

2.10.4 VU Meter Calibration

The console VU meters are calibrated at the factory to indicate 0 VU (100) when the output is +8 dBm. If the console is operated at a different output level, the VU meter(s) may be re-calibrated if the meter rectifier circuit is equipped with calibration trimmers.

Refer to Figure 19. Meters so equipped can be adjusted to zero with output levels between +3 dBm and +11 dBm.

Connect an external meter to the output and provide 600 ohm termination to the output. Adjust the output to the desired level as indicated on the external meter. Adjust the calibration trimmer on the VU-1 Meter Rectifier circuit so that the console VU meter reads 0 VU (100).

SECTION III OPERATION

3.1 GENERAL OPERATION

The SPOTMASTER audio consoles combine several audio sources at various levels into a single source. For convenience of operation, several subsidiary systems are included.

A cue circuit allows preview of a source before mixing. The two separate channels, audition and program, make the console two units in one. Each mixer may control more than one input, although not simultaneously. Built-in amplifiers allow speaker or headphone monitoring of the two mixing circuits and the cue systems. The controls are explained below.

3.2 INPUT SELECTION

Two separate input sources may be connected to each mixer. Two pushbutton switches labeled A and B (1 and 2) are provided for each mixer. The desired input is fed to the mixer by depressing the A or B (1 or 2) switch for that mixer.

3.3 CHANNEL SELECTION

Any mixer may be operated into either of the two console outputs: program or audition. This is determined by the setting of the three position switch immediately above the mixer. In the audition (A) position, the signal from either the A or B (1 or 2) input is fed through the mixer to the audition output only. In the program (P) position, the input selected is fed through the mixer to the program output only. In the center position, the input signal is off and is fed to neither the audition nor program position.

3.4 LEVEL CONTROL

The mixers are used in two ways to control level: to keep each input approximately the same volume or to combine the signal from two (or more) inputs in a desired relationship. The VU meter(s) and the monitor circuits are provided as an aid in determining the proper levels or volumes. The mixer or mixers for active sources are adjusted so that the VU meter reads 100 (0 VU) on peaks. When mixing two or more inputs, the mixers are adjusted to yield the desired sound while maintaining a VU meter reading which peaks to 100 (0 VU). The level is increased by rotating the mixer clockwise and decreased by rotating the mixer counter-clockwise.

NOTE

The master level controls provided for the audition and program outputs SHOULD NOT BE USED in normal operation.

3.5 VU METERS

In the 5M100A, 8M100A, 5M200A, and 8M200A consoles, separate VU meters are provided for the audition and program channels. In the 5S200A and 8S200A consoles, separate VU meters are provided for the left and right channels. These two meters may monitor either the program or audition channel as determined by the setting of the VU meter switch.

In the 5S100A and 8S100A VU meters are provided for the left program and right program channels only.

3.6 CUE SYSTEM

The cue system is provided for previewing or monitoring sources prior to mixing. An input is connected to the cue system by depressing its input selector switch (A or B; 1 or 2) and rotating its mixer into the cue detent (click stop) at the extreme counter clockwise position of the mixer.

An internal amplifier and speaker are provided for monitoring the cue system. The volume of the cue speaker is determined by the setting of the CUE LEVEL control. The cue speaker is muted by the control room muting relay.

The cue system may also be monitored by headphones plugged into the front panel jack by depressing the CUE switch above the headphones level control.

3.7 HEADPHONES

The front panel headphone jack is designed to accept a wide variety of headsets including low impedance stereo headphones. In monophonic consoles, only one channel of the stereo headphones will be active.

Low impedance stereo headphones can be modified for use with mono consoles in several ways. The headphone plug can be rewired so that the left and right channels are in series (isolate wire/s originally connected to the sleeve of the plug, and move ring connection to the sleeve). If the channels are paralleled (tip and ring shorted), a 4 ohm resistor (2W) must be added in series with the headphones. The series resistance method must be used if the front panel headphone jack and internal barrier-strip headphone outputs are used simultaneously. AT NO TIME SHOULD A LOAD OF LOWER RESISTANCE THAN 8 OHMS BE USED WITH THE HEADPHONE AMPLIFIER.

The headphones may be connected to either program, audition or cue outputs by depressing the appropriate switch above the headphones level control. The headset volume is determined by the setting of this level control.

The headphone jack is never muted.

3.8 MONITOR SPEAKERS

An internal amplifier is provided to drive a control room speaker as well as separate speakers in several studios. These speakers may be muted for use with live microphones.

The speakers may monitor either the program output, audition output or an external signal by depressing the appropriate switch located above the front panel monitor level control.

The volume of all speakers connected to the various monitor outputs is determined by the setting of the monitor level control.

SECTION IV ELECTRONIC THEORY OF OPERATION

4.1 GENERAL SYSTEM DESCRIPTION

Refer to the block diagrams in Figures 2 (monophonic) and 3 (stereophonic). Separate in-depth circuit descriptions for the monophonic and stereophonic consoles are included in paragraphs 4.2 and 4.3 below.

In all consoles, two inputs may be connected to operate through each mixer. One of these is selected by the input switches. This signal is fed through the input level select to a preamplifier stage. The level select properly sets the preamplifier input pad for microphone or other input.

The output of the preamplifier is connected to an adjustable level control or mixer. In stereophonic models, the signal is connected through a mono/stereo select which allows a monophonic input source to be fed to both the left and right mixing busses.

The output of the mixer is connected through the FET switch to either the audition or program bus. The signals from all the mixers are combined on the bus and fed to a line amplifier. The output of this final amplifier stage is coupled to an output transformer. A VU meter is connected after the final amplifier to measure the signal level on the output.

In stereophonic consoles, a third output is available. This mono matrix signal consists of the combined left and right channels of the (stereophonic) program output. These two signals are taken from the output of the two program channel line amplifiers. They are combined, amplified, and coupled to an output transformer.

A preview (cue) circuit is built into each console. Signals are taken from each mixer to feed the cue bus. In stereophonic models, both left and right channel signals are combined into a monophonic composite signal so that the entire stereo signal is previewed. When a mixer is connected to the cue bus, its signal is disconnected from the normal mixing circuitry.

The cue bus feeds the headphone selector switch and the cue amplifier. The amplifier is connected through a muting relay to an internal speaker and terminals for an external speaker.

Signal from the output of the audition and program line amplifiers is connected to the headphone and monitor selector switches. A third position accepts the external input to the monitor. The third position of the headphone switch is connected to the cue bus.

The outputs of the selector switches are fed to separate power amplifiers. The monitor circuit provides sufficient power to drive several speakers. The outputs to these speakers are connected through the muting relays so that the speakers can be shut off by energizing a particular relay. Several relays are provided so that speakers can be muted in one studio without muting all other speakers. Each relay is also equipped with contacts to turn on an "on-the-air" light. The headphone circuit provides power to drive a headset. This amplifier is connected to the front panel jack and parallel terminals for external connection.

Low voltage DC (V+) is provided to all the printed circuit modules by the power supply.

Refer to the schematic diagrams in Figures 13 and 15. These drawings function as combined schematic, wiring and block diagrams. The physical arrangement of the electronic modules is shown in Figures 4, 6, 8, and 10. Operation of the circuits on individual printed circuit modules is described in detail in the following sections.

4.2.1 Audition and Program Channels.

Terminals are provided to connect two input sources to each mixer. Signal passes from the input terminals on the sub-chassis inside the cabinet to the front panel selector switches. Here, either the A or B (1 or 2) source is connected to the preamplifier. The signal enters the 918-3600 preamplifier, passes through the level sensitivity pad, and enters the preamplifier.

Following amplification, the signal is taken from the 918-3600 to the front panel mixer. In 100A series consoles, this is a sealed composition potentiometer designed for several million operations. In 200A series consoles, a ladder attenuator (Daven or equivalent) with 20 steps of 2 dB attenuation per step is used. These may be opened and cleaned. In both 100A and 200A series consoles, a cue switch is installed on all mixers to route the signal to the cue system instead of the attenuator.

From the mixer, the signal is returned to the 918-3600 preamplifier to the FET switch, which is controlled by the front panel audition/program switch. Following the FET's, separate outputs are taken from the 918-3600 to the audition and program busses.

The program outputs of all the 918-3600 preamplifiers are bussed together and presented to the input of a 918-3604 Mixer Line Driver Amplifier module. The mixed signal is amplified, passed to the front panel program master gain control, and returned to the 918-3604. The signal enters the final amplification stage through a level trim potentiometer. This amplifier is directly coupled to the 600 ohm/600 ohm output transformer. A feed to the monitor selector switch is bridged off from the amplifier output.

After the output transformer, the line level signal leaves the 918-3604 module and is connected to the program output terminal strips. At the output of the 918-3604, a sample for the program VU meter is bridged from the line signal and connected to the VU-1 rectifier module mounted on the rear of the VU meter.

The audition channel is identical in operation to the program channel. The audition outputs of all the 918-3600 preamplifiers are bussed together and presented to a separate 918-3604 driver amplifier. The amplified signal passes through the audition master gain control and is returned to the 918-3604 for final amplification. Following this, the audition monitor feed is bridged off from the output. The line signal is passed through the output transformer to the audition output terminals. The audition channel VU meter is bridged from the line signal utilizing the VU-1 rectifier mounted on the audition VU meter.

4.2.2 Cue Circuitry

The outputs of all cue switches (on the front panel mixers) are bussed together to feed the headphone selector switch and the cue speaker amplifier.

Signal from the cue bus is taken to the front panel cue level control. From there, the signal enters the cue speaker amplifier on the 918-3605 module. Following amplification, the cue signal leaves this module for the power supply board (918-3507 or 918-4001) where the control room muting relay is mounted.

The cue output is routed through a set of normally closed contacts on K1. After the relay, the signal is split. A connection is made directly to the external cue speaker screw terminals on the sub-chassis. A separate connection is made through an exposed jumper on the power supply board to the internal cue speaker. If an external cue speaker is connected, this jumper should be moved to disconnect the built-in speaker.

4.2.3 Monitor Circuitry

The monitor outputs of the audition and program channel 918-3604 Mixer Line Amplifier modules are connected to separate sections of the monitor selector switch on the front panel. A third position is provided on this switch for connection of an "off-the-air" indicator or other external load which is connected directly from its input terminals on the sub-chassis to the selector switch.

The output of the selector switch is taken through the front panel monitor level control to the 918-3609 monitor amplifier module. Following amplification, the signal is routed to the muting relays on the power supply board. There the signal is split and fed through normally closed contacts. The monitor output from each relay is taken to separate terminals on the sub-chassis barrier strips.

The monitor busses from the audition and program Mixer Line Amplifiers are also connected to separate sections of the front panel headphone selector switch. A third position on this switch is connected to the cue bus. From the selector switch, the signal passes through the front panel headphone level control to the headphone amplifier. This amplifier is mounted on the same module as the cue amplifier: the 918-3605 Cue/Headphone Amplifier. Following amplification, the signal leaves the printed circuit module. The signal is connected to the front panel headphone jack and to terminals on the sub-chassis. An external headphone jack may be connected to these terminals.

4.2.4 Muting Relays and Control

The muting relays are provided to shut off any speakers and to turn on a warning ("on-the-air") light in a studio with a live microphone. Speaker connections are made through normally closed contacts which open when the relay is energized. The warning light (external and not supplied with the console) is connected through the normally open contacts which close when the relay is energized.

The relays and the relay driver circuits are located on the power supply board (918-3507 or 918-4001). The relays are controlled by the front panel audition/program switches. In the 100A series consoles, the relay is energized by removing the ground from the mute control bus (Figure 12). In the 200A series consoles, the relay is energized by supplying a ground to the mute control bus. (The schematic diagram shows the standard relay control designation. These may be changed, however, as explained in the paragraph 2.8.5 above).

4.2.5 Power Supply

All consoles are equipped with a three conductor, NEMA standard, grounded line cord. The high side of the AC line is connected through the fuse to the primary at the power transformer. The low side of the AC line is connected through the switch to the transformer primary. The ground line is connected to the transformer frame and chassis at the point where the station ground terminal is located.

The secondary of the power transformer is connected to the full wave bridge rectifier located on the chassis. The 100A series consoles are equipped with the 918-3507 board. The 200A series consoles are equipped with the 918-4001 board. The power supply furnishes rectified and filtered DC only.

4.3 STEREOPHONIC SYSTEM DESCRIPTION

Refer to the schematic diagrams in Figures 14 and 16. These drawings function as combined schematic, wiring, and block diagrams. The physical arrangement of the electronic modules is shown in Figures 5, 7, 9, and 11. The operation of the modules is described in detail in the following sections.

4.3.1 Audition and Program Channels

Terminals are provided to connect two stereo input sources to each mixer. Signal passes from the input terminals on the sub-chassis inside the cabinet to the front panel selector switches. Here either the A or B (1 or 2) source is connected to the preamplifier. The left and right channel signals enter the 918-3601, pass through the separate level sensitivity pads, and enter separate preamplifiers.

The output of the right channel preamplifier is connected to the stereo/mono switch on the 918-3601 module. When the switch is in the mono position, the output of the right channel preamplifier is disconnected; the left channel preamplifier output is connected to both the left and right channels. In the stereo position, the two channels remain separate.

Following amplification, the two stereophonic signals are taken from the 918-3601 module to the front panel mixer. In 100A series consoles, this is a dual, concentric, sealed composition potentiometer designed for several million operations. In 200A series models, a dual, concentric, ladder attenuator (Daven or equivalent) with 20 steps of 2 dB attenuation per step is used. These may be opened and cleaned. In both 100A and 200A series consoles, cue switches are installed on both the left and right channel stages of the mixer to route both these signals to the (mono) cue system instead of the mixer. This unique cue feature is installed on all mixers.

From the mixer, the stereo signal is returned to the 918-3601 pre-amplifier to the FET switch which is controlled by the front panel audition/program switch. Following the FET's, separate outputs are taken from the 918-3601 to left and right audition and program busses.

The left program outputs of the 918-3601 preamplifiers are bussed together and presented to the input of a 918-3604 mixer Line Driver Amplifier Module. The right program outputs are similarly bussed to a second 918-3604 module. In the 918-3604, the signal is amplified, passes to the front panel program master gain control, and returns to the 918-3604. For convenience, the left and right channel master level controls are mounted on a single control shaft.

The signal enters the final amplification stage on the 918-3604 amp through a level trimming potentiometer. This amplifier is directly coupled to the 600 ohm/600 ohm output transformers. A feed to the monitor selector switch is bridged off of the amplifier output.

After the output transformer, the line level signal leaves the 918-3604 module and is connected to the left or right program output terminal strip. At the output of the 918-3604 signal for the program VU meter and mono matrix output are bridged from the line signal.

In the 100A series consoles, the program VU meter signals are connected directly to separate VU-1 rectifier circuits mounted on the rear of the left and right VU meters. In 200A series consoles, the VU meter signals are connected to the meter rectifier circuits through a front panel selector switch so that either the audition or program output channel may be metered.

The left and right program outputs for the mono matrix are connected directly to separate inputs on the 918-3602 mono matrix amplifier. The signals enter through separate level balancing potentiometers, are combined, and amplified. The amplified monophonic signal is coupled through a 600 ohm/600 ohm output transformer and taken from the 918-3602 to the mono program output terminals. No metering is provided for this derived monophonic output, since it is taken from the primaries of the left and right line output transformers. The level into the 918-3602 is controlled by the program master level control. The program VU meters give a true indication of the input level to the 918-3602.

The audition channel is nearly identical in operation to the program channel. The left and right audition outputs of all the 918-3601 preamplifiers are presented to separate 918-3604 driver amplifiers. The amplified signals pass through the dual audition master gain control and are returned to the 918-3604 modules for final amplification. Following this, the audition monitor feeds (left and right) are bridged from the output. The line signal is passed through the output transformers to the audition left and right output terminals. No provision is made for a monophonic signal derived from the audition channel. In 100A series consoles, no metering is provided for the audition channel. In 200A series models, a meter connection is bridged from the line signal and delivered to the VU meter selector switch.

4.3.2 Cue Circuitry

The outputs from the left and right cue switches (on the front panel mixers) are combined into a single cue bus to feed the headphone selector switch and the cue speaker amplifier.

Signal from the cue bus is taken to the front panel cue level control. From there, the signal enters the cue speaker amplifier on the 918-3606 module. Following amplification, the cue signal leaves this module for the power supply board (918-3507 or 918-4001) where the control room muting relay is mounted.

A cue output is routed through a set of normally closed contacts on K1. After the relay, the signal is split. A connection is made directly to the external cue speaker screw terminals on the sub-chassis. A separate connection is made through an exposed jumper on the power supply board to the internal cue speaker. When an external speaker is connected, this jumper should be removed to disconnect the built-in speaker.

4.3.3 Monitor Circuitry

The monitor outputs from the left and right audition and program channel 918-3604 Mixer Line Amplifier modules are connected to separate sections of the monitor selector switch on the front panel. A third position is provided for connection of a stereo "off-the-air" or other external feed; this is connected directly from its input terminals on the sub-chassis to the selector switch.

The left and right outputs of this switch are taken through the dual front panel monitor level control to the monitor amplifiers. In 100A series models, a single dual amplifier module 918-3603 is used. In 200A series consoles, two single channel amplifiers, two 918-3609 modules, are used. Following amplification, the signals are routed to the muting relays on the power supply board. There the signals are split and fed through normally closed contacts. The left and right monitor outputs from each relay are taken to separate terminals on the sub-chassis barrier strips.

The left and right audition and program monitor busses from the Mixer Line Amplifiers are also connected to separate sections of the front panel headphone selector switch. A third position is connected to the monophonic cue bus. From the selector switch, the signals pass through the dual front panel headphone level control to the headphone amplifier. This dual channel amplifier is mounted on the same module as the cue amplifier: the 918-3606 Cue/Headphone Amplifier. Following amplification, the stereo signal leaves the printed circuit module. The signal is connected to both the front panel stereo headphone jack and to terminals on the sub-chassis. An external jack may be connected to these terminals.

4.3.4 Muting Relays and Control

The muting relay system in the 100A and 200A series stereophonic consoles is identical to the monophonic system described for monophonic consoles in section 4.2.4 above.

4.3.5 Power Supply

The power supply in stereophonic consoles is identical to that described for the monophonic consoles in section 4.2.5.

4.4 918-3507 POWER SUPPLY

Refer to Figure 17

The 918-3507 printed circuit board mounts the low voltage power supply and muting relays and their control circuits. The power transformer is mounted in the cabinet adjacent to the 918-3507. Low voltage AC from the power transformer is rectified by the full wave bridge rectifier mounted on the chassis. C1, C2 and R1 provide filtration. Additional filtration and regulation is provided by circuitry on the individual amplifier modules.

Control circuits for two muting relays are built on the 918-3507. The relays are controlled by the audition/program switches: K1 by mixer 1 and K2 by mixer 2. In the center (OFF) position a ground is supplied to the base of Q1 (Q2 so it is non-conducting). When the switch is placed in either the program or audition position the ground is removed. The relay driver Q1 (Q2) is forward biased and conducts. Voltage is supplied to the coil of K1 (K2) to activate the relay. The normally closed contacts open to shut off the speaker outputs. The normally open contacts close to activate any "on-air" lights connected.

4.5 918-4001 POWER SUPPLY

Refer to Figure 18

The 918-4001 contains the low voltage power supply, three muting relays, and the muting relay control circuits.

Low voltage AC is supplied to the full wave bridge rectifier from the secondary of the power transformer mounted on the sub-chassis adjacent to the 918-4001. Filtration is provided by R1, C1, And C2. Additional filtration and regulation is provided as required on the amplifiers.

The three separate muting relay circuits are identical in operation. Control is exercised by the audition/program switches above the mixers. As shipped from the factory, mixer 1 controls relay K1, mixer 2 - K2, and Mixer 3 - K3. However, circuitry is provided on all mixers so that any of the relays may be controlled by any mixer audition/program key by installation of the proper connections. Activating the relay disconnects the speaker lines connected through the normally closed contacts. The normally open contacts close.

The relay is energized by supplying a ground to shut-off the sub-driver (Q1, Q3 or Q5) to allow the driver transistor (Q2, Q4, or Q6) to conduct. When the ground is removed, the sub-driver conducts to shut off the driver transistor. As long as the sub-driver is in conduction, the driver transistor and the relay are held off.

Refer to Figure 19

The VU-1 contains the rectifier circuit for the VU meter. The T pad (R1, R2, R3) provides calibration so that the meter reads 0 VU (100) when the output is +8 dBm.

4.7 918-3600 MONOPHONIC PREAMPLIFIER

Refer to Figures 20 & 21

The following section under 4.8 also applies to the 918-3601 stereophonic preamplifier unless otherwise stated.

The input level selection can be preset via jumper selection to accept low level (mic) or high level (line) signals. See notes 3 and 4 on Figure 8. Proper jumper selection must be made prior to operation.

In new consoles, the first two preamps (mixer 1 and 2) have been preset for low level (mic). The remainder are preset for high level (line). To change factory level preset selection, simply change jumpers as noted above.

The PC board accepts the left input signal on pins 16 and 17 and the corresponding pins for the right input (This applies to the monophonic preamp only).

After the input attenuators consisting of resistors R1, 2 and 3, several components will reject possible RF pick-up. These being ferrite bead Lk and disc capacitors C1 and C4. Then the signal is applied to the base transistor pair Q1 and Q2. The purpose of which is to raise the level of the signal sufficiently above the noise floor of the following IC1, which is a 748 operational amplifier. The base of Q1 and Q2 is maintained at approximately +14V which is one half the supply voltage. This voltage is derived through transistor Q15 and the circuit was chosen to avoid long charge up times for capacitor C23.

The signal after amplification from the collector of Q1 and Q2 is applied to IC 1 and then amplified and the output of IC 1, pin 6, which is at approximately +14V will drive a complementary pair of transistors Q3 and Q5. These in turn provide the output signal from this stage. The overall gain is determined by the feedback resistor R12 in conjunction with R7, R5, and R6, R4 respectively. The purpose of transistor Q4 is to avoid damage to transistor Q3 in case an excessively low load is applied to the output of the complementary pair. The right channel amplifier employs exactly the same circuitry as the left channel amplifier. The output from both preamplifiers then leaves the boards, goes to the mixer potentiometer and returns to the board's pins 12 and 7 and will then see the FET switches Q6, Q7, Q13 and Q14. These FET switches are off in the OFF position when the gate is at approximately +24V and are on when the gate is at approximately ground level. These voltages are controlled by switches placing pins 10 or 9 to ground.

4.8 918-3601 STEREOGRAPHIC PREAMPLIFIER

Refer to Figures 20 and 21

For input level selection, refer to the 918-3600, section 4.7 as procedure is the same for both preamplifiers.

The 918-3601 stereo preamplifier can be preset for mono or stereo operation via jumper selection. See notes 5, 6, and 7 on Figure 21. Jumper orientation can be located on Figure 20.

All 918-3601 stereo preamplifiers shipped from the factory, either in new consoles or for replacement, are preset for stereo operation.

4.9 918-3602 MONO MATRIX AMPLIFIER

Refer to Figures 22 and 23.

Signal enters through R1 and R2 which are level balancing controls. L1 and C1 form an RF filter. IC-1 performs the active mixing function, while Q3, Q4 and their associated components provide a low impedance output. T1 provides a balanced output. Q2 supplies a decoupled bias source to IC-1.

4.10 918-3603 STEREO MONITOR (POWER) AMPLIFIER

Refer to Figures 24 and 25.

This card contains two identical amplifiers of which one will be explained.

IC-2 is a self-contained 18V regulator providing power to IC-1, a dual power amplifier. Signal is coupled through L1, R1 and C4 to pin 6 (input) of IC-1. L1, R1 and C3 form a low pass filter to keep RF from the amplifiers input. Pin 1 of IC-1 provides bias current through R3 to pin 6. Negative feedback components R4, R5 and C5 determine amplifier gain. The output signal is coupled through DC blocking capacitor C6.

4.11 918-3604 MIXER LINE DRIVER AMPLIFIER

Refer to Figures 27 and 28.

The 918-3604 contains two multiple stage amplifiers and the isolation transformer to supply the console output. In monophonic consoles, two 918-3604 amplifiers are used to provide MIX 1 and MIX 2 (Program and Audition) outputs. In stereophonic consoles, four are required to provide the MIX 1 and MIX 2 (Program and Audition) outputs.

Signal from MIX 1 or MIX 2 (Program or Audition) bus enters on pin 1 and is coupled through C2 to the input of the mixer amplifier composed of IC-1 and Q1-Q2. Choke L1 and capacitor C1 act as a low-pass filter to prevent the appearance of RF in the amplifier's input. Operational amplifier IC-1 supplies 12 dB of gain as determined by R3 and the mix sum resistors in the mixing modules. Output drive is supplied by the complementary pair Q1 and Q2 which is driven directly by IC-1. Capacitor C6 provides boot-strapping for the output stage. Transistor Q3 provides protection in case of a short circuit on the output.

The output of the mixer amplifier is coupled through C7 to pin 3. Following the master level control, the signal is returned to pin 5 for final amplification in the line driver. This three-step amplifier consists of a differential input stage (Q4-Q5), an operational amplifier (IC-2), and a complementary-symmetry output pair (Q6-Q7). Transistor Q8 provides short circuit protection. This stage can provide up to 40 dB of gain as determined by R16, R18, and variable resistor R17. In conjunction with the master level control, R17 permits matching the gain of two 918-3604 amplifiers. A signal for use in the monitor circuit is bridged from the primary of T1.

4.12 918-3605 MONOPHONIC CUE/HEADPHONE AMPLIFIER

Refer to Figures 25 and 26.

Due to similarity between the Stereo Monitor Amplifier 918-3603, they are built on the same blank printed circuit board; refer to Section 4.10. Jumper location for input/output terminals is the only difference.

4.13 918-3606 STEREOPHONIC CUE/HEADPHONE AMPLIFIER

Refer to Figures 29 and 30.

There are three identical sections to this amplifier, therefore, only one will be explained.

Input signal is coupled through L2, R2, C4 and R3, an attenuator and RF filter to the input of IC-2. Gain is set by R11, R12 and C9. Output signal is coupled through C7. Pin 1 of IC-2 provides bias for all amplifiers via R8, R9, and R10. VR-1 supplies 18V DC to IC-1 and IC-2. One-half of IC-1 is not used.

4.14 918-3609 MONITOR (POWER) AMPLIFIER

Refer to Figures 31 and 32.

This amplifier uses a hybrid audio power amplifier module whose gain is fixed at 30 dB. The input signal is coupled to the module via L1, R2 and C6, which form an RF filter. The output is coupled through C1 whose purpose is DC blocking. Capacitor C5 performs bootstrapping for the output stage.

Fuse F1 prevents IC-1 destruction if the amplifier should see a shorted load.

SECTION V MAINTENANCE

5.1 CLEANING

A. Pushbutton Switches

These switches are self-wiping and should not require cleaning.

B. Lever Switches

These may be cleaned, if required, with either a burnishing tool or an aerosol spray contact cleaner.

C. Step Attenuators

The mixers in the 200A series consoles can be opened and the steps cleaned with isopropyl alcohol or an aerosol spray contact cleaner.

NOTE

Do not use an abrasive cleaner or burnishing tool on the step attenuators.

D. Printed Circuit Boards and Card Edge Connectors

The card edge connectors do not require cleaning. Should intermittent contact between the connector and the printed circuit board occur, polish the fingers on the board with a soft pencil eraser. The life of the card edge connectors can be prolonged by minimizing the removal and re-insertion of printed circuit modules.

5.2 CONSOLE SPECIFICATION MEASUREMENTS

As a check on continued proper operation of the console, the user may wish to periodically perform a specifications test. The results can be compared to the original factory results shown on the test sheet supplied with each unit.

These specification tests are performed at the factory with a -50dBm signal supplied to a low level input. The gain controls are adjusted to yield a +8dBm output. Active inputs and outputs are terminated with the proper load. When measuring the noise figure, the input signal should be disconnected and replaced by a 150 ohm resistor.

5.3 TROUBLE SHOOTING

NOTE

AC power must be turned off when printed circuit boards are removed or replaced.

In determining the cause of a fault in the console it is necessary to isolate it to a particular section or electronic module. Begin by determining that the main power supply is functioning (VU meter lamps burning, muting relays operational, or by actual voltage check). Second check signal presence in the

audition, program, and cue channels. Thirdly, interchange printed circuit modules to determine if the fault is caused by a particular module.

NOTE

The 918-3600 monophonic preamplifier may be installed in stereophonic consoles without harm. It will provide a left channel signal only. Similarly the 918-3601 stereophonic preamplifier may be installed in monophonic consoles without damage. The left channel only is used.

Fourth, if the fault occurs with more than one module check wiring continuity within the console.

The major faults which occur on the printed circuit modules are failure of the integrated circuits or shorting of capacitors. Test the IC by measuring the DC voltage present on the IC input and output pins (with a 20,000 ohms/volt VOM). This should be one half the DC voltage present at the IC's DC supply voltage input pin (V+). With the power off, test all capacitors for shorting or reversed polarity.

NOTE

The optional 277-3000 extender card is helpful in raising a module above the level of other modules when performing these measurements.

5.4 COMPONENT REPLACEMENT ON PRINTED CIRCUIT BOARDS

Great care should be exercised when working on printed circuit boards, since excessive heat may cause the foil to peel off. The Broadcast Electronics warranty on printed circuit boards is void if boards are damaged by improper handling.

Broadcast Electronics maintains a complete inventory of parts (e.g., resistors, transistors, etc.) as well as complete board assemblies. Order by Broadcast Electronics part number.

When replacing components on a printed circuit board use a small soldering iron (60 watts maximum) with a small tip. Use a de-soldering aid to remove excess solder. Protect the board contacts with masking tape and mount gently in a small vise.

Touch the iron to the connection to be unsoldered. When heated, quickly remove the iron and remove the excess solder. Be careful that no solder splatters onto the board. Unbend the leads with a small pair of needle nose pliers and remove the component.

NOTE

When replacing multi-pin components (integrated circuitry, connectors, etc.) de-solder all of the pins before attempting to remove the component. It is virtually impossible to heat all the pins simultaneously.

Check the mounting holes in the board to be sure they are clear of solder and open before mounting the replacement. Put the leads through the holes and trim the leads to about 1/8 inch. Bend the leads over so they touch only the foil strips the leads are to be soldered to.

Touch the iron to the leads and let the solder flow onto the foil. Always use a fine rosin core solder such as No. 20 gauge. Check for "bridges" of solder between adjacent foil strips.

Clean the flux off the connection with alcohol. Solder flux left on the printed circuit board may cause noise in the circuit. If the contacts were covered with masking tape, clean them also with alcohol.

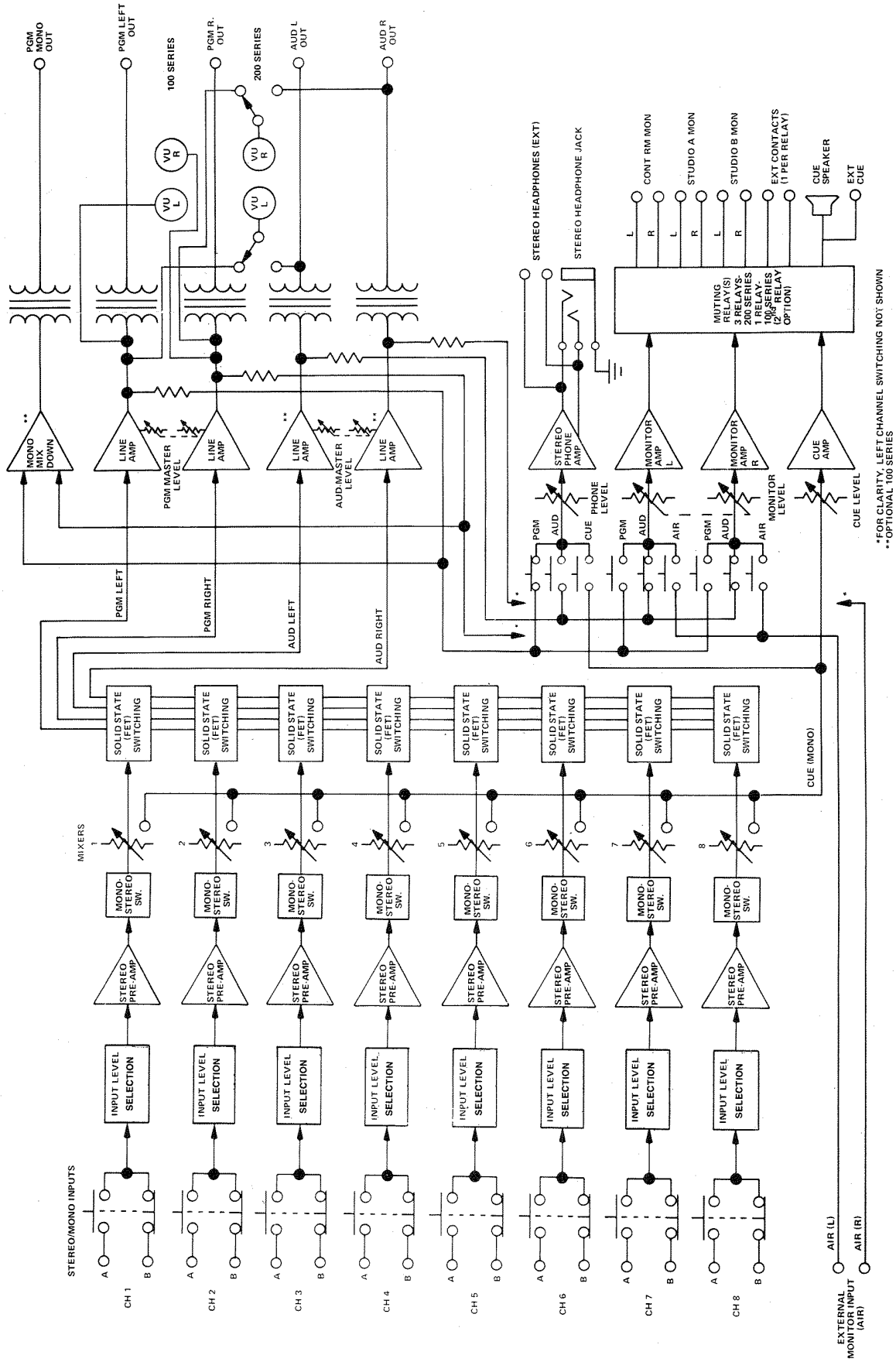
GENERAL REPLACEABLE PARTS TABLE 2

Part Number	Description	5M100A	5M200A	5S100A	5S200A	8M100A	8M200A	8S100A	8S200A
100-1043	Resistor, 1K, 1/4 Watt	X		X		X		X	
190-1054A	Potentiometer, Audio, 10K, Single	X		X		X		X	
190-1054B	Potentiometer, Audio, 10K, Dual			X				X	
192-1053A	Potentiometer, Audio, 10K, Master Level Control				X				X
192-1053B	Potentiometer, Audio, 10K, Dual, Master Level C.		X		X		X		X
193-1053A	Potentiometer, Audio, 10K, w/switch Dual Mixer			X				X	
193-1053B	Potentiometer, Audio, 10K, w/switch Single Mixer	X				X			
194-6032A	Step Attenuator, Stereo Mixer				X				X
194-6032B	Step Attenuator, Mono Mixer		X				X		
203-4004	Diode, 1N4004		X		X		X		X
239-0004	Rectifier Assembly	X	X	X	X	X	X	X	X
270-0007	Muting Relay	X	X	X	X	X	X	X	X
319-1003	Meter, VU, with/Bezel	X	X	X	X	X	X	X	X
321-1828	Meter Lamp, 28V	X	X	X	X	X	X	X	X
334-0200	Fuse, 2A, 3AG, Slo-Blo	X	X	X	X	X	X	X	X
343-1003	Black Cap for 343-1201, 343-1202, 343-1401, Blk.	X	X	X	X	X	X	X	X
343-1201	Switch, PB, DPDT, 2 Station Interlocking	X	X			X	X		
343-1202	Switch, PB, DPDT, 3 Station Interlocking	X	X	X	X	X	X	X	X
343-1401	Switch, PB, DPDT, 2 Station Interlocking			X	X			X	X
343-3003	Switch, Lever, 2P, 3 Position Telephone Type		X		X		X		X
343-3004	Switch, Lever, 2P, 3 Position Telephone Type	X		X		X		X	
348-0110	Switch, Toggle, SPST; Power	X	X	X	X	X	X	X	X
376-0007	Transformer, Power 60Hz, 117 VAC.	X	X	X	X	X	X	X	X
414-0001	Speaker, Cue	X	X	X	X	X	X	X	X
417-0111	Connector, Phone Jack	X	X			X	X		
417-0311	Connector, Phone Jack			X	X			X	X
417-1801	Connector, 18 Pin, PC Mount, w/Guides	X	X	X	X	X	X	X	X
482-0001	Knob, Round; Large Mixer		X		X		X		X
482-0002	Knob, Round; Small	X	X	X	X	X	X	X	X
482-0003	Knob for Lever Switches 343-3003/3004	X		X		X		X	
A-482-0011	Knob, Modified, Round, Large Mixer	X		X		X		X	

TABLE 3. PRINTED CIRCUIT BOARD COMPLEMENT

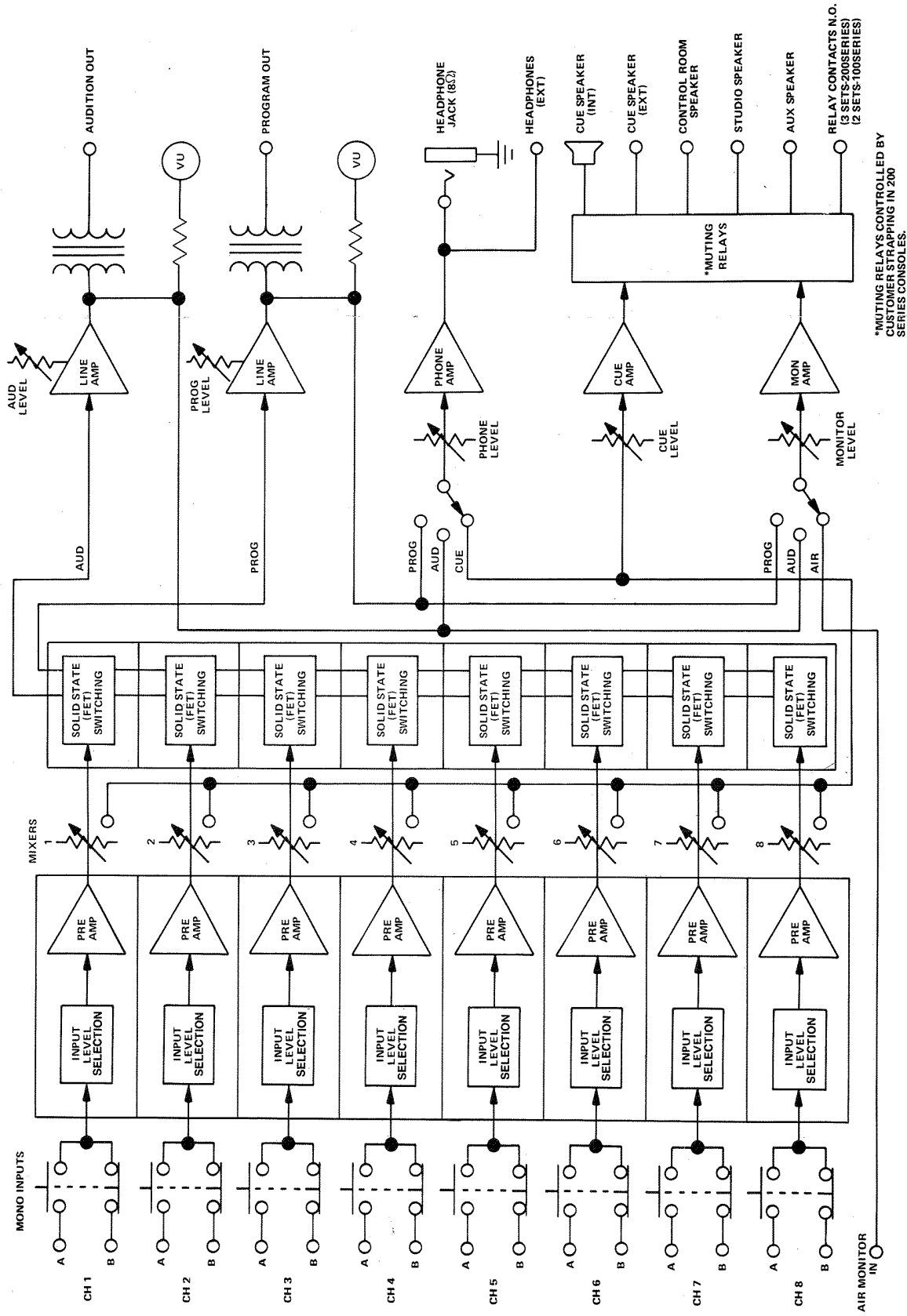
BOARD/MODEL	5M100A	5S100A	5M200A	5S200A	8M100A	8S100A	8M200A	8S200A
The following modules were installed in consoles manufactured after Jan. 1978								
918-3600 Mono Preamp	5	-	5	-	8	-	8	-
918-3601 Stereo Preamp	-	5	-	5	-	8	-	8
918-3602 Mono Mix	-	1-Opt.	-	1-Opt.	-	1-Opt.	-	1-Opt.
918-3603 Stereo Amp	-	1	-	-	-	1	-	-
918-3604 Line Drive								
Amp: PGM Channel	1	2-Std.	1	2	1	2 Std.	1	2
AUD Channel	1	2-Opt.	1	2	1	2-Opt.	1	2
918-3605 Mono Cue & Headphone Amp	1	-	1	-	1	-	1	-
918-3606 Stereo Cue & Headphone Amp	-	1	-	1	-	1	-	1
918-3507 Power Supply	1	1	-	-	1	1	-	-
918-3609 Monitor Amp	1	-	1	2	1	-	1	2
918-4001 Power Supply	-	-	1	1	-	-	1	1
The following modules were installed in consoles prior to Jan. 1978								
918-3500 Mono Preamp	5	-	5	-	8	-	8	-
918-3501 Stereo Preamp	-	5	-	5	-	8	-	8
918-3502 Mono Mix	-	1-Opt.	-	1-Opt.	-	1-Opt.	-	1-Opt.
918-3503 Stereo Amp	-	1	-	-	-	1	-	-
918-3504 Line Driver								
Amp: PGM Channel	1	2-Std.	1	2	1	2-Std.	1	2
AUD Channel	1	2-Opt.	1	2	1	2-Opt.	1	2
918-3505 Mono Cue & Headphone Amp	1	-	1	-	1	-	1	-
918-3506 Stereo Cue & Headphone Amp	-	1	-	1	-	1	-	1
918-3509 Monitor Amp	1	-	1	2	1	-	1	2

REV A 9-6-78



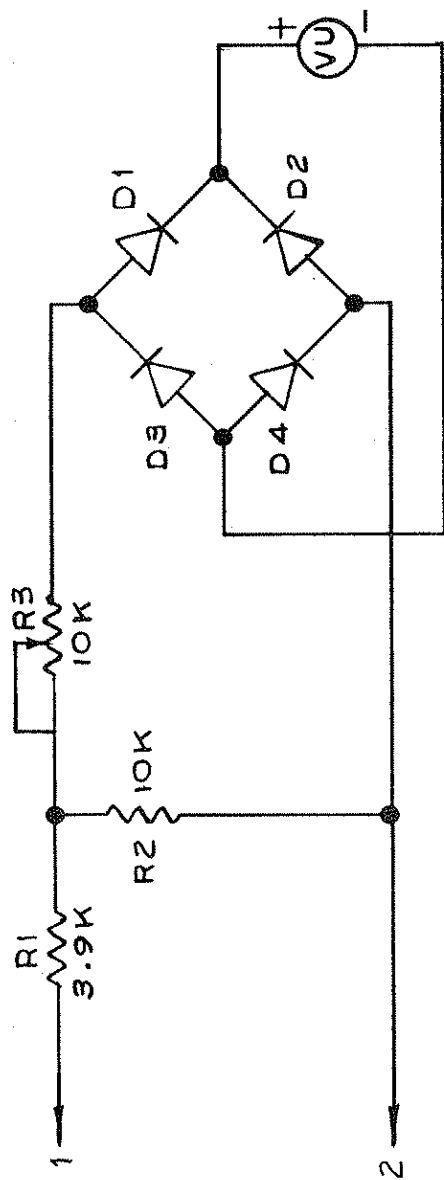
*FOR CLARITY, LEFT CHANNEL SWITCHING NOT SHOWN
 **OPTIONAL 100 SERIES

Figure 3. Stereophonic Consoles Block Diagram

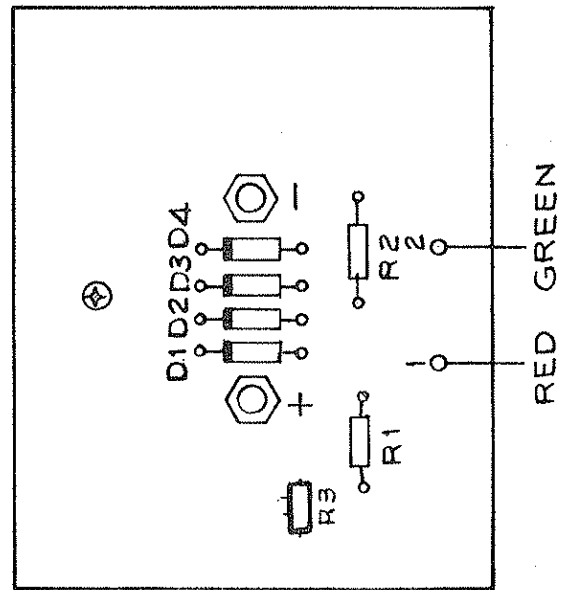


*MUTING RELAYS CONTROLLED BY CUSTOMER STRAPPING IN 200 SERIES CONSOLES.

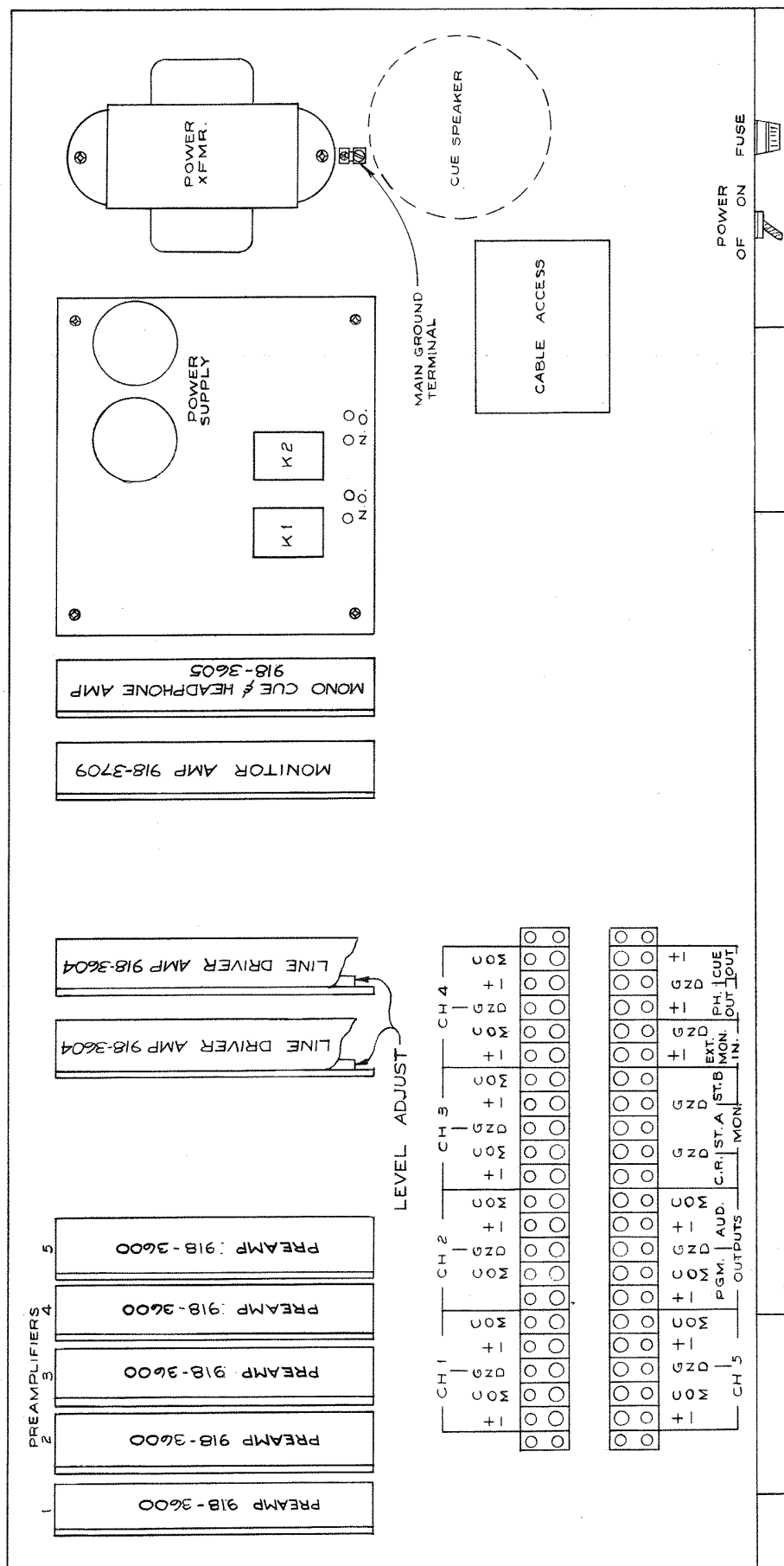
Figure 2. Monophonic Consoles Block Diagram



NOTE:
1. ALL DIODES IN98 OR EQUIVALENT



BROADCAST ELECTRONICS, INC. A FILMWAYS COMPANY
METER RECTIFIER CARD VU-1
A DWG.NO.: A-918-0001



NOTES

1-PRINTED CIRCUIT MODULES INSERT WITH COMPONENTS TO THE RIGHT AS CONSOLE IS VIEWED FROM THE FRONT.

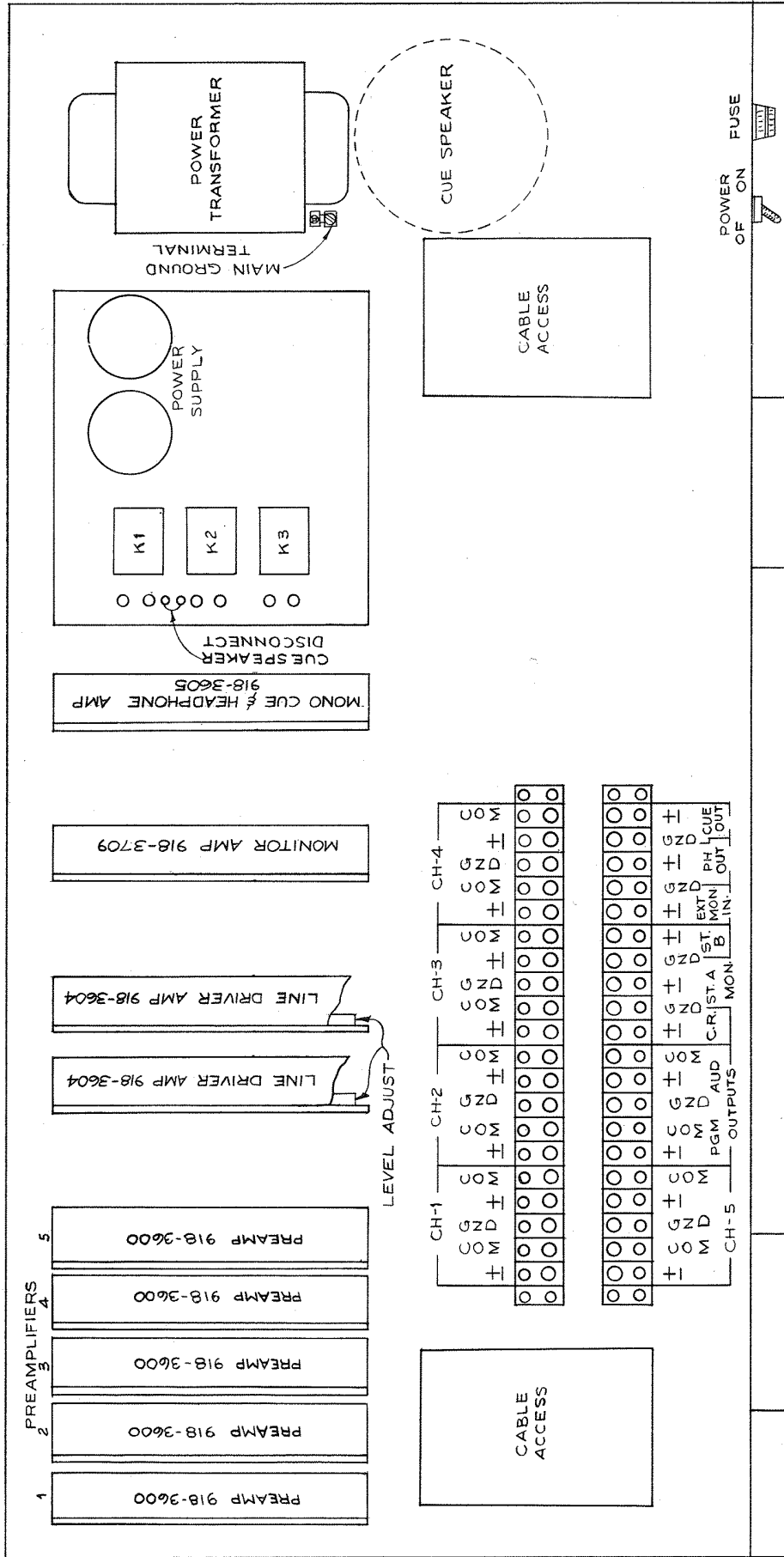
BROADCAST ELECTRONICS, INC.
A FILMWAYS COMPANY

5M 100A/5M 150 CONSOLE CHASSIS

B-838-0510

DRAWN 7-10-74 M.A.M.

REV A 9-6-78
B 1-30-80
MH
JH

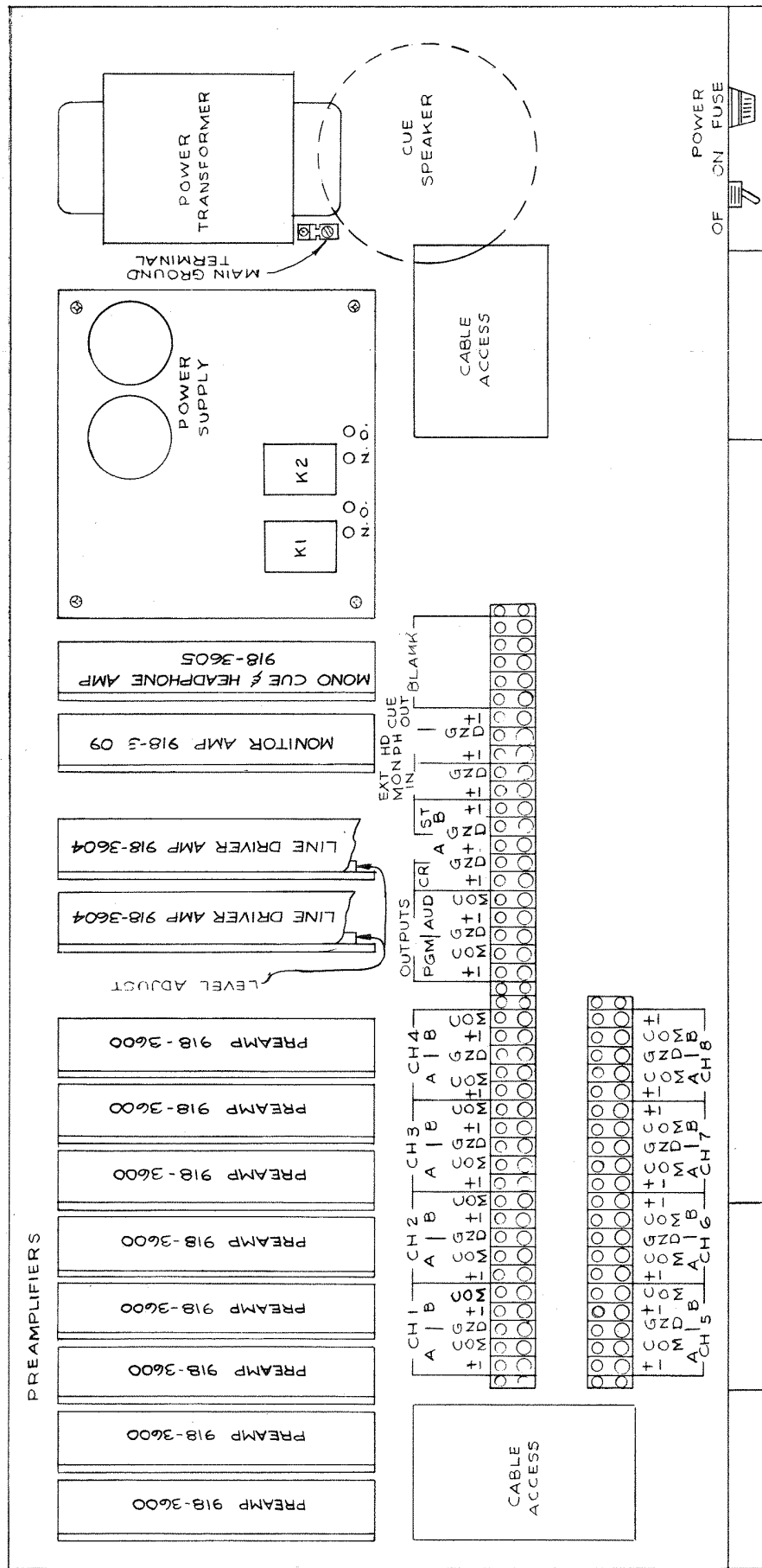


NOTE:
1. PRINTED CIRCUIT MODULES INSERT WITH COMPONENTS TO THE RIGHT AS CONSOLES IS VIEWED FROM THE FRONT.

BROADCAST ELECTRONICS, INC.
A FILMWAYS COMPANY
5M 200A/5M 250 CONSOLE CHASSIS

B 838-0511

MM-8-8-74
REV A 9-7-78
8 1-30-80



TOP VIEW

NOTE:

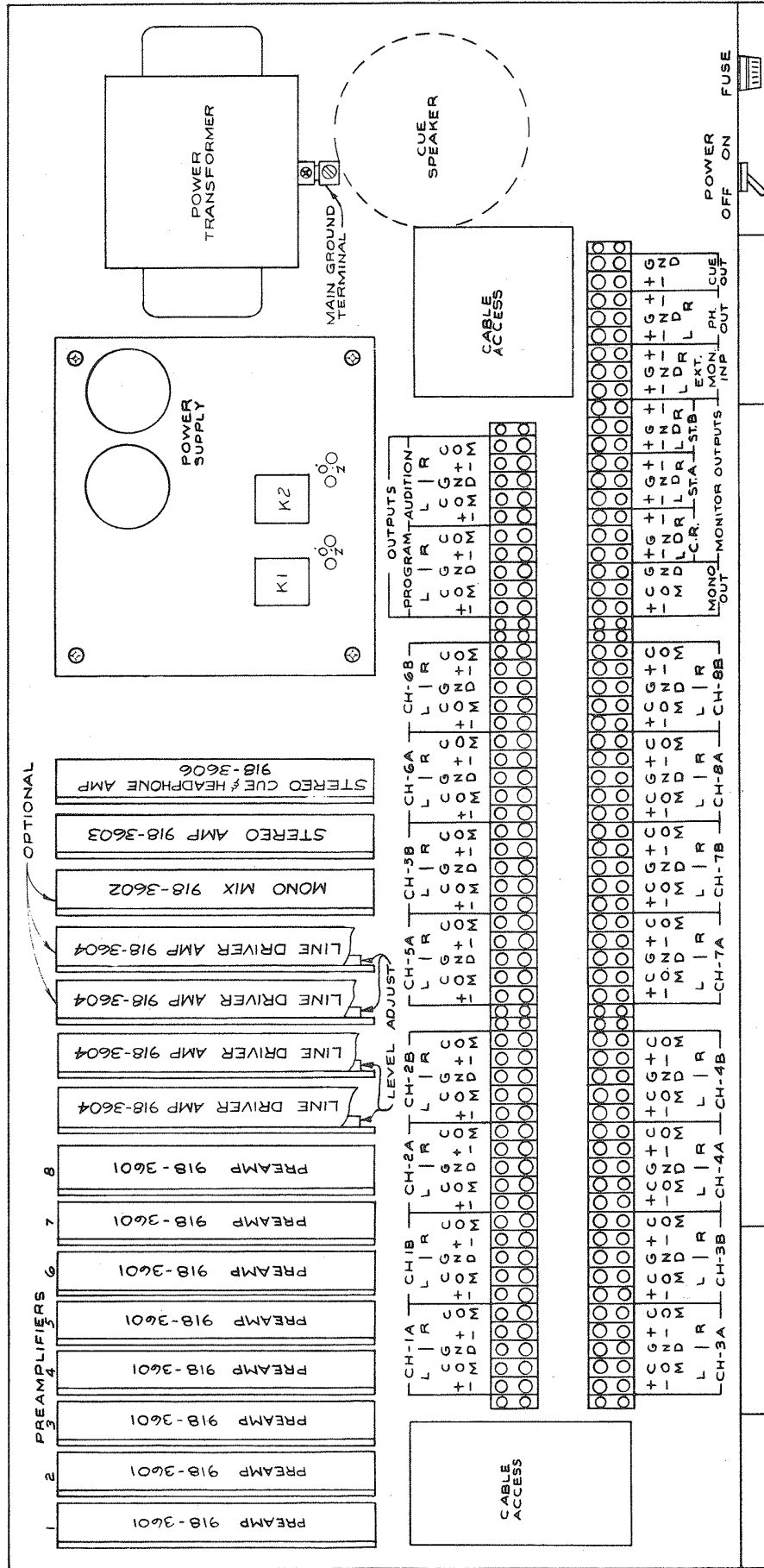
1. PRINTED CIRCUIT MODULES INSERT WITH COMPONENTS TO THE RIGHT AS CONSOLE IS VIEWED FROM THE FRONT.

BROADCAST ELECTRONICS, INC.
A FILMWAYS COMPANY

BM/00A/BM/50 CONSOLE CHASSIS

B 838-0810

DRAWN 7-26-74 MM
REV A 9-7-78 JH
B 1-30-80

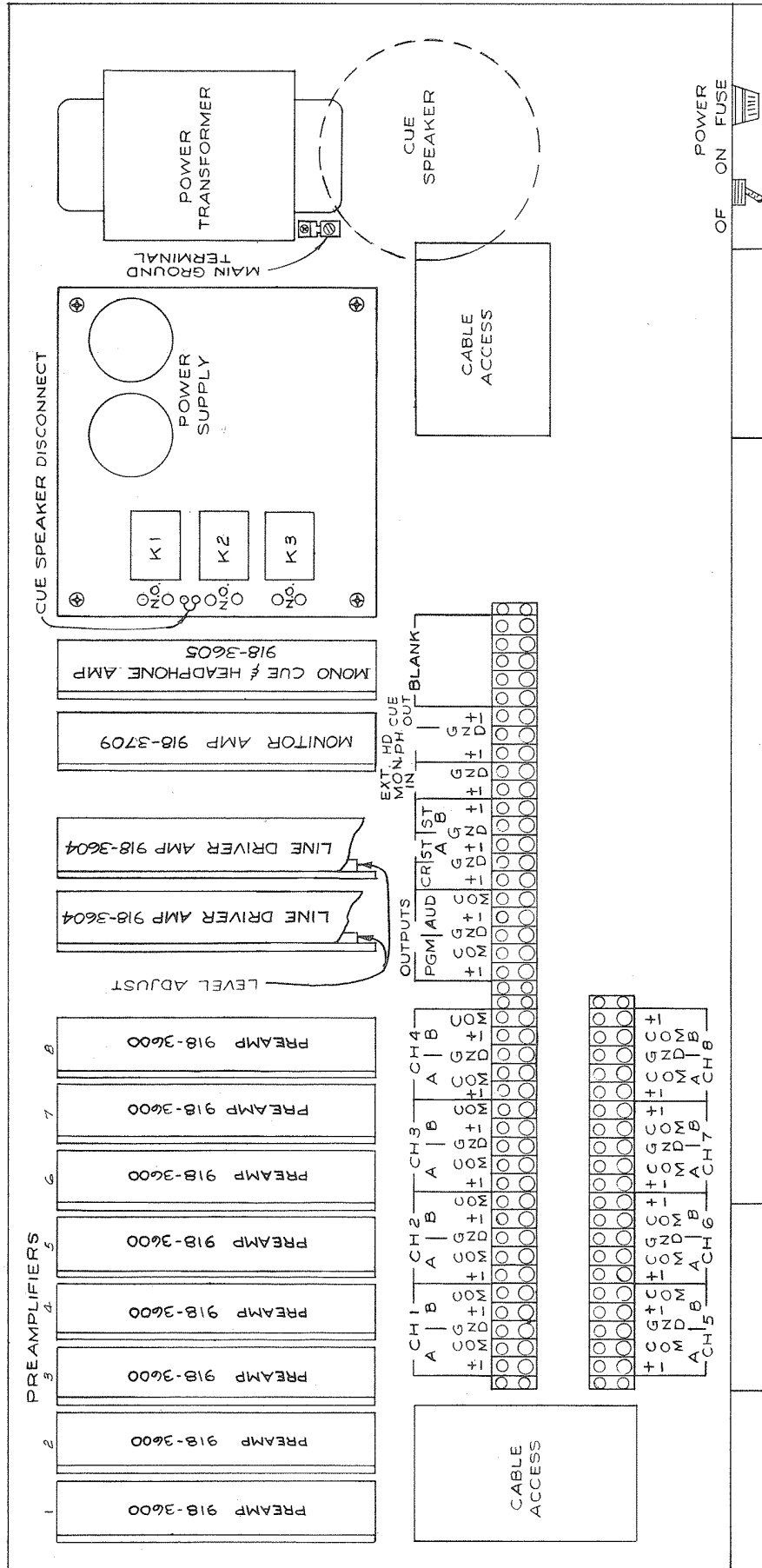


TOP VIEW

NOTE:
1. PRINTED CIRCUIT MODULES INSERT WITH COMPONENTS TO THE RIGHT AS CONSOLE IS VIEWED FROM THE FRONT.

BROADCAST ELECTRONICS, INC
AFILWAYS COMPANY
85100A/BS 150 CONSOLE CHASSIS
B838-0820

7-10-74 M.M.
REV A 9-7-78 MM
B 1-30-80. JH



TOP VIEW

NOTE:

1. PRINTED CIRCUIT MODULES INSERT WITH COMPONENTS TO THE RIGHT AS CONSOLE IS VIEWED FROM THE FRONT.

BROADCAST ELECTRONICS, INC. A FILMWAYS COMPANY	
8M200A/8M250 CONSOLE CHASSIS	
B 838-0811	
DRAWN 7-9-74 MM	
REV A 9-7-78 MH	
B 1-30-80 JH	

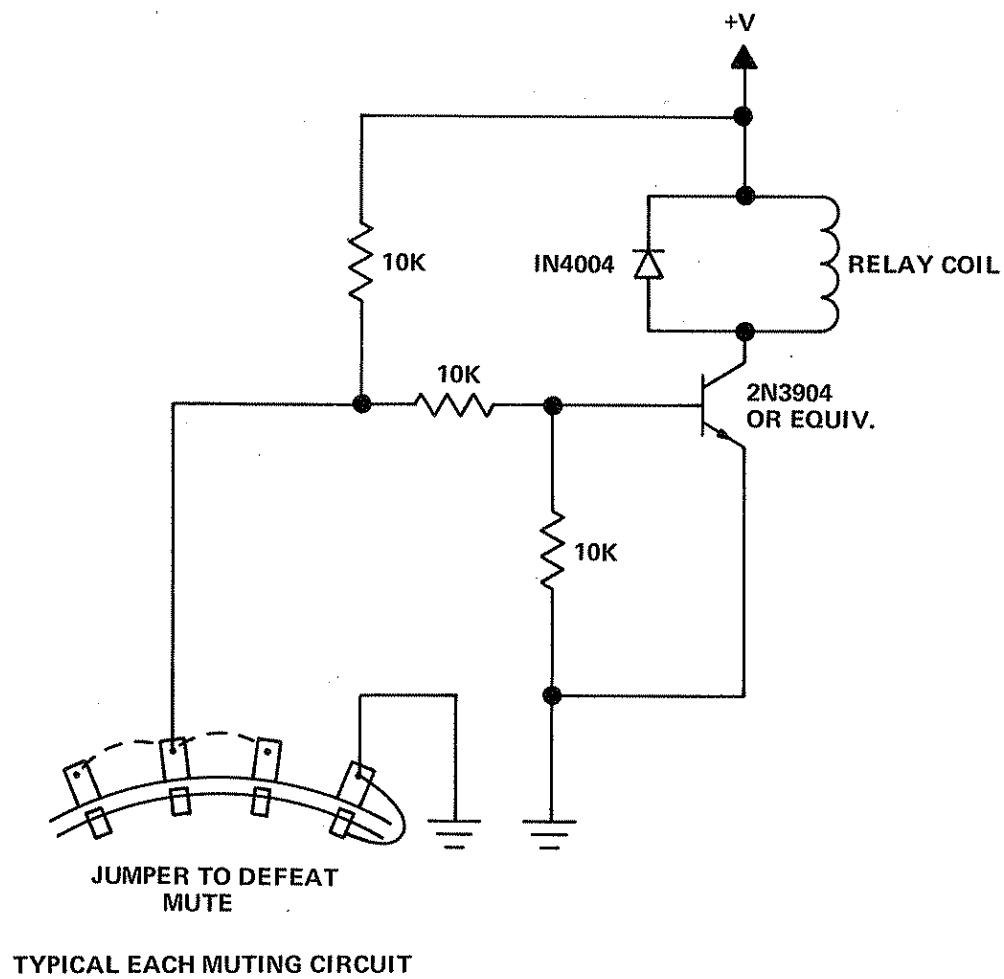
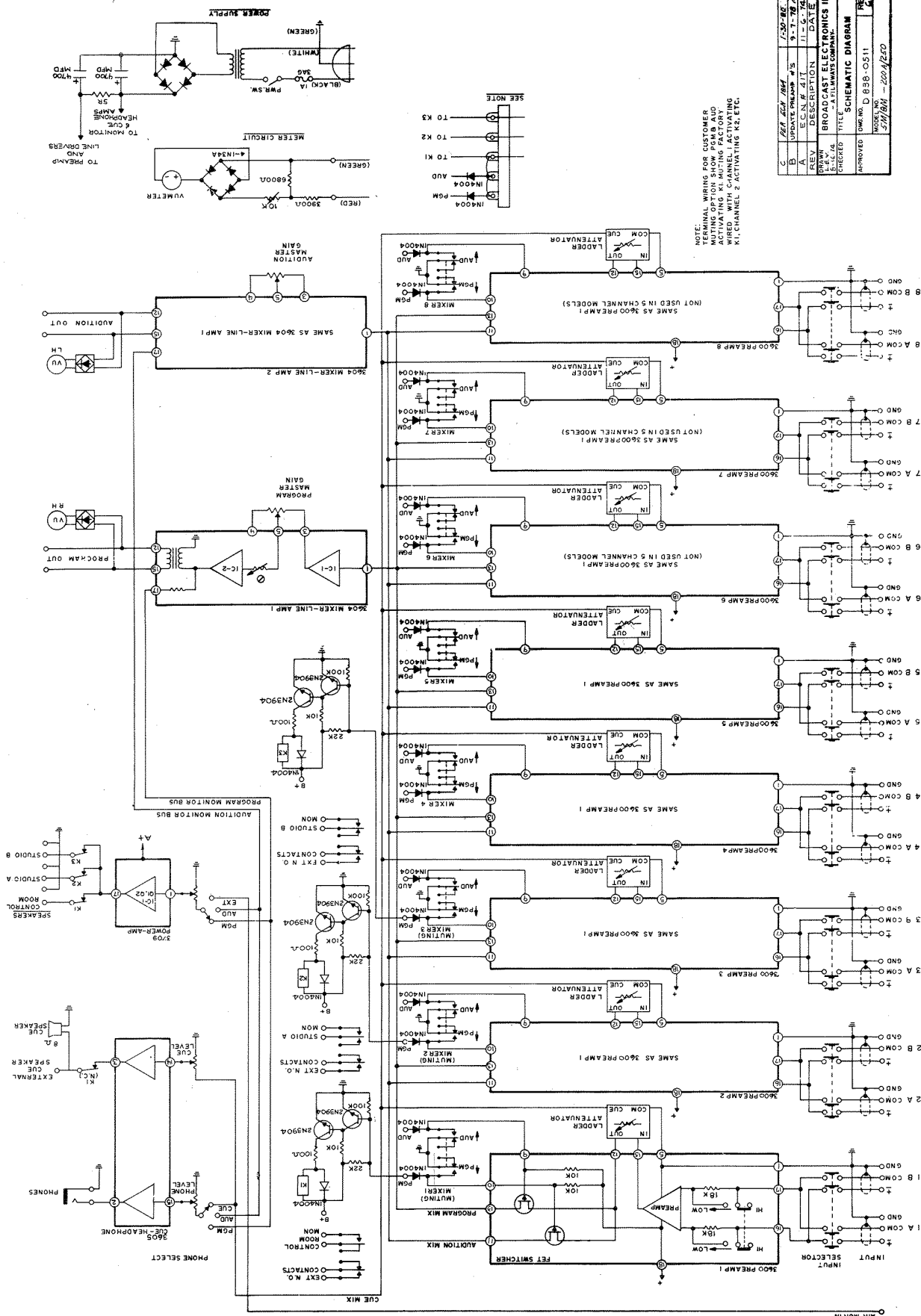
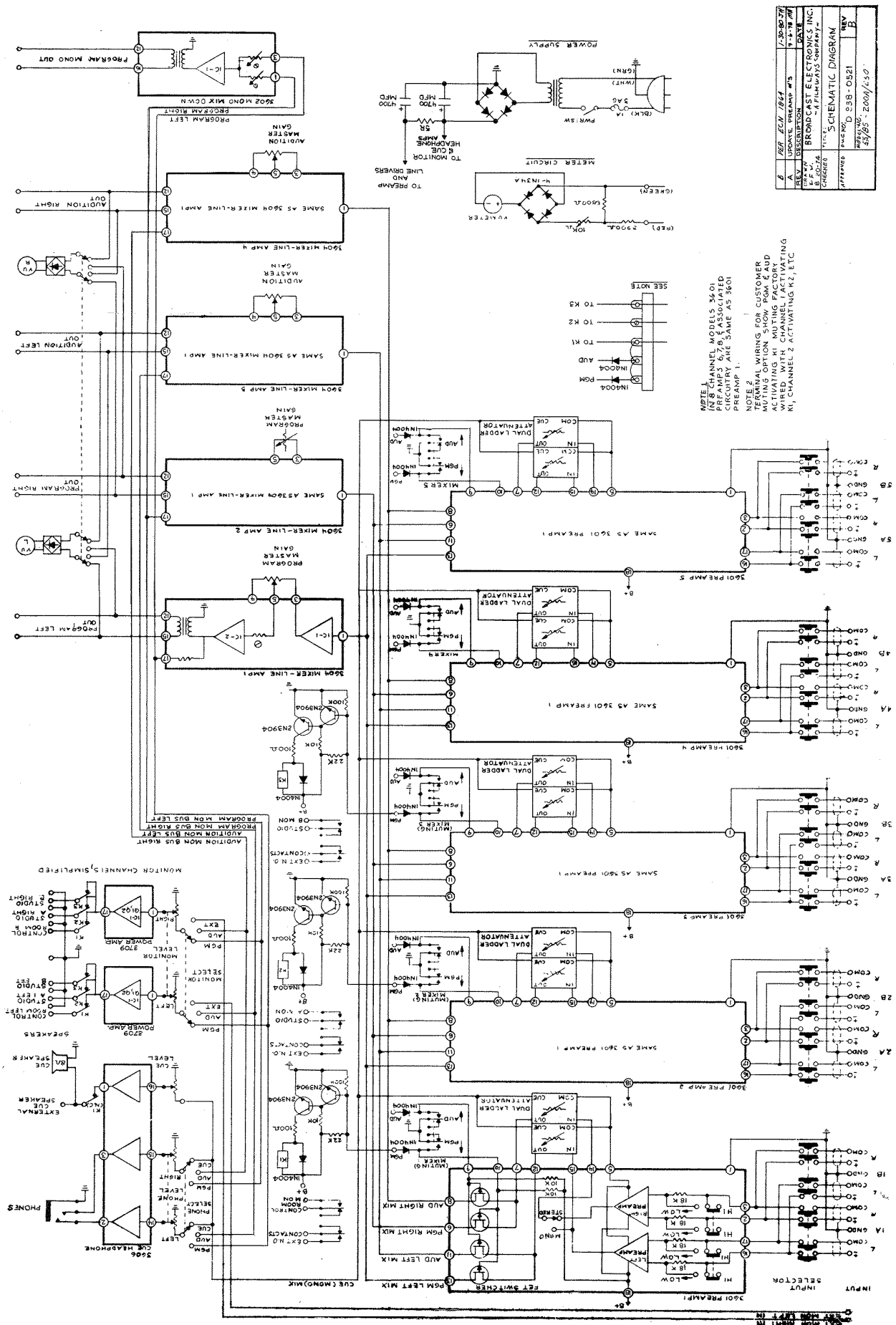


Figure 12. 100 Series Console Muting Diagram



C	PER ECH 184	1-30-68 3P
B	UPDATE PRELIMS #5	9-7-78 MP
A	ECN # 417	11-6-74
REV	DESCRIPTION	DATE
DRAWN BY: 11-16-74		
CHECKED:		
BROADCAST ELECTRONICS INC. - A FILMWAYS COMPANY -		
TITLE: SCHEMATIC DIAGRAM		
APPROVED	DMC NO. D 838-0511	REV 5
MODEL NO. 100-1000		USE 100-1000

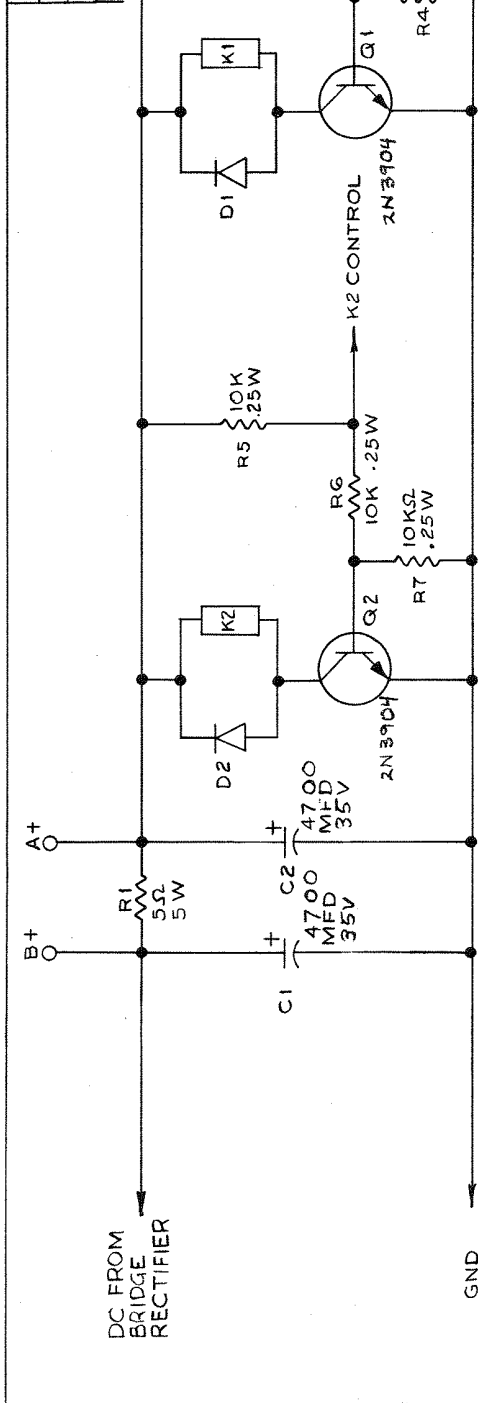


NOTE 1
IN 8 CHANNEL MODELS 3601
PREAMP AND 3602 MONO MIX
DOWN CIRCUITRY ARE SAME AS 3604
PREAMP 1.

NOTE 2
TERMINAL WIRING FOR CUSTOMER
FACTORY WIRING FOR FACTORY
ACTIVATING K1 MUTE FACTORY
WIRING WITH CHANNEL FACTORY
K1 CHANNEL 2 ACTIVATING K2, ETC

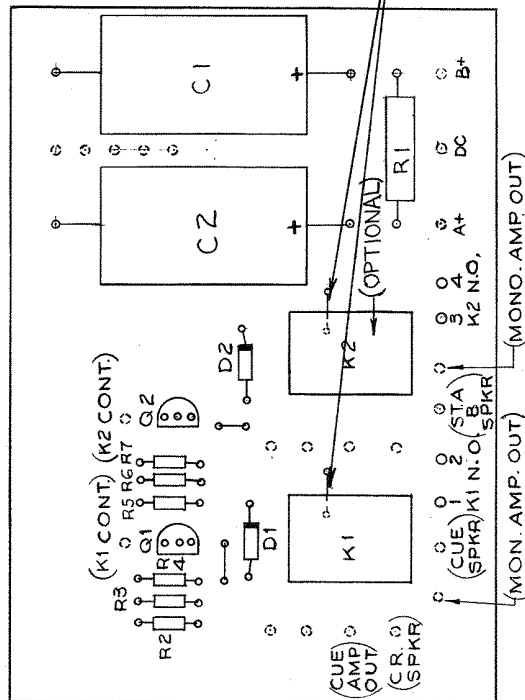
REV	DATE	BY	CHKD	APP'D	REV	DATE	BY	CHKD	APP'D
1	12-18-64	J. J. BROADCAST			1	12-18-64	J. J. BROADCAST		
2	12-18-64	J. J. BROADCAST			2	12-18-64	J. J. BROADCAST		
3	12-18-64	J. J. BROADCAST			3	12-18-64	J. J. BROADCAST		
4	12-18-64	J. J. BROADCAST			4	12-18-64	J. J. BROADCAST		
5	12-18-64	J. J. BROADCAST			5	12-18-64	J. J. BROADCAST		
6	12-18-64	J. J. BROADCAST			6	12-18-64	J. J. BROADCAST		
7	12-18-64	J. J. BROADCAST			7	12-18-64	J. J. BROADCAST		
8	12-18-64	J. J. BROADCAST			8	12-18-64	J. J. BROADCAST		
9	12-18-64	J. J. BROADCAST			9	12-18-64	J. J. BROADCAST		
10	12-18-64	J. J. BROADCAST			10	12-18-64	J. J. BROADCAST		
11	12-18-64	J. J. BROADCAST			11	12-18-64	J. J. BROADCAST		
12	12-18-64	J. J. BROADCAST			12	12-18-64	J. J. BROADCAST		
13	12-18-64	J. J. BROADCAST			13	12-18-64	J. J. BROADCAST		
14	12-18-64	J. J. BROADCAST			14	12-18-64	J. J. BROADCAST		
15	12-18-64	J. J. BROADCAST			15	12-18-64	J. J. BROADCAST		
16	12-18-64	J. J. BROADCAST			16	12-18-64	J. J. BROADCAST		
17	12-18-64	J. J. BROADCAST			17	12-18-64	J. J. BROADCAST		
18	12-18-64	J. J. BROADCAST			18	12-18-64	J. J. BROADCAST		
19	12-18-64	J. J. BROADCAST			19	12-18-64	J. J. BROADCAST		
20	12-18-64	J. J. BROADCAST			20	12-18-64	J. J. BROADCAST		

REV	DESCRIPTION	DATE
A	ECN#412	11-6-74
B	ECN#1235	6-9-78 MH
C	CHANGE C1, C2 VALUE	1-31-80 DK

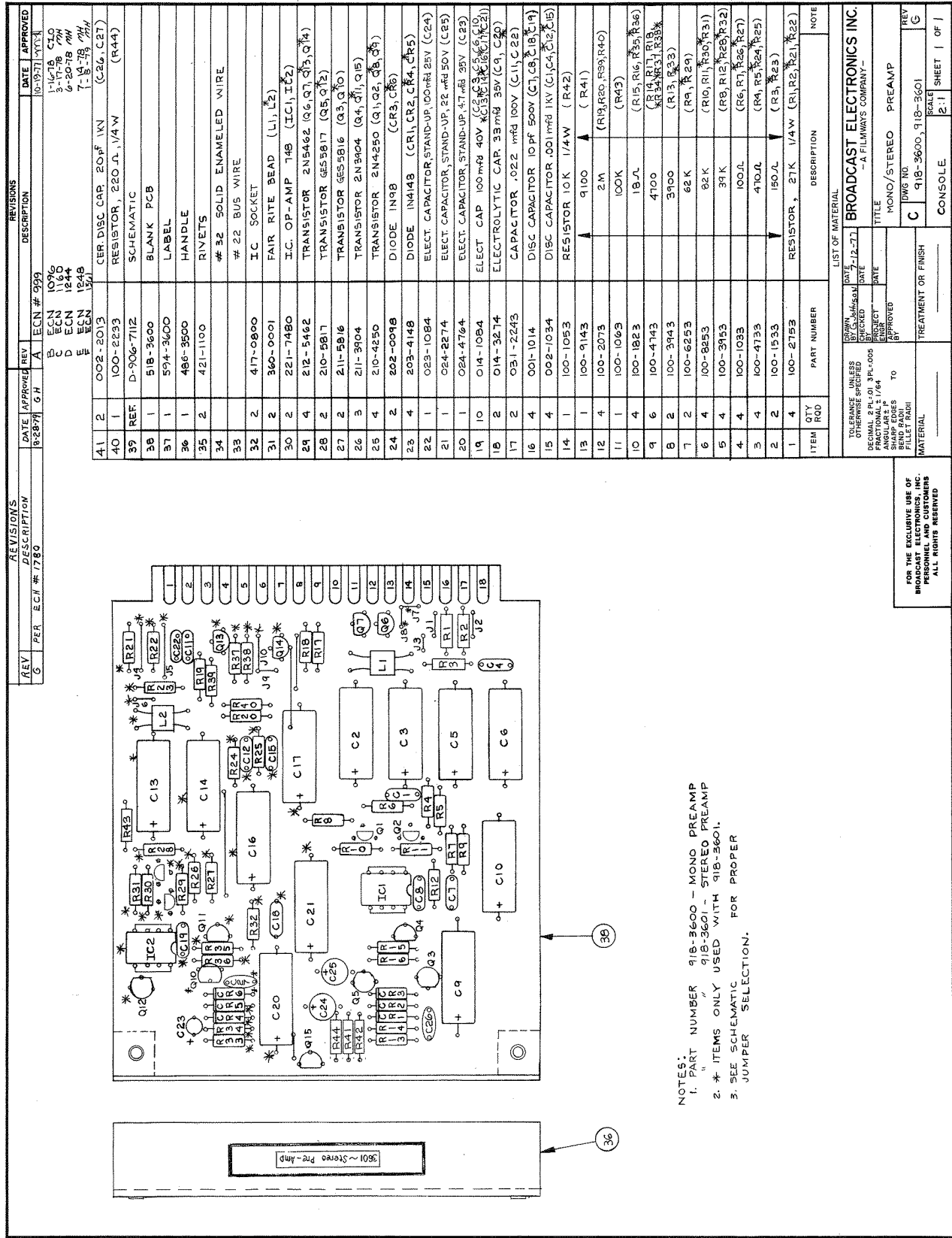


NOTE:

1. ALL DIODES = IN4004
2. B+ TO ALL POWER AMPLIFIERS AND LAMPS
3. A+ TO ALL PREAMPS AND DRIVER AMPS



BROADCAST ELECTRONICS, INC. A FILMWAYS COMPANY	
POWER SUPPLY/RELAY BOARD 100 SERIES CONSOLES	
B	DWG. NO.: B-918-3507
C	REV.
PART NO.: 918-3507	
SCALE: 1:1	



NOTES:
 1. PART NUMBER 918-3600 - MONO PREAMP
 2. * ITEMS ONLY USED WITH 918-3601.
 3. SEE SCHEMATIC JUMPER SELECTION.

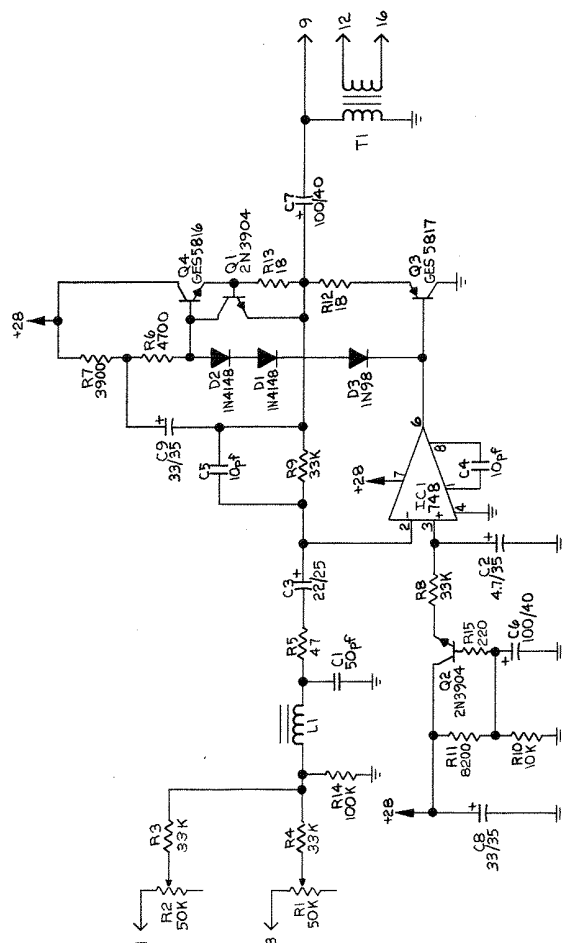
REVISIONS			REVISIONS		
REV	PER	ECN #	DATE	APPROVED	DESCRIPTION
G		1780			
A		1096	10-19-71		
B		1160	3-17-78		
C		1244	6-20-78		
D		1244	7-19-78		
E		1244	7-19-78		
F		1244	7-19-78		
G		1244	7-19-78		
H		1244	7-19-78		
I		1244	7-19-78		
J		1244	7-19-78		
K		1244	7-19-78		
L		1244	7-19-78		
M		1244	7-19-78		
N		1244	7-19-78		
O		1244	7-19-78		
P		1244	7-19-78		
Q		1244	7-19-78		
R		1244	7-19-78		
S		1244	7-19-78		
T		1244	7-19-78		
U		1244	7-19-78		
V		1244	7-19-78		
W		1244	7-19-78		
X		1244	7-19-78		
Y		1244	7-19-78		
Z		1244	7-19-78		

LIST OF MATERIAL		
ITEM	QTY	DESCRIPTION
41	2	002-2013
40	1	100-2293
39	REF	D-906-7112
38	1	518-3600
37	1	594-3600
36	1	486-3600
35	2	421-1100
34		# 32 SOLID ENAMELED WIRE
33		# 22 BUS WIRE
32	2	417-0800
31	2	360-0001
30	2	221-7480
29	4	212-5462
28	2	210-5817
27	2	211-5916
26	3	211-3904
25	4	210-4250
24	2	202-0098
23	4	203-4148
22	1	029-1084
21	1	024-2274
20	1	024-4764
19	10	014-1084
18	2	031-2243
17	2	031-2243
16	4	001-1014
15	4	002-1034
14	1	100-1053
13	1	100-9143
12	4	100-2073
11	1	100-1063
10	4	100-1823
9	6	100-4743
8	2	100-3443
7	2	100-6253
6	4	100-8253
5	4	100-3953
4	4	100-1033
3	4	100-4733
2	2	100-1533
1	4	100-2753

BROADCAST ELECTRONICS INC.		
-A FILMWAYS COMPANY-		
TITLE	DATE	REV
MONO/STEREO PREAMP	7-12-71	1
918-3600, 918-3601		2
918-3602, 918-3603		3
918-3604, 918-3605		4
918-3606, 918-3607		5
918-3608, 918-3609		6
918-3610, 918-3611		7
918-3612, 918-3613		8
918-3614, 918-3615		9
918-3616, 918-3617		10
918-3618, 918-3619		11
918-3620, 918-3621		12
918-3622, 918-3623		13
918-3624, 918-3625		14
918-3626, 918-3627		15
918-3628, 918-3629		16
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918-3632, 918-3633		18
918-3634, 918-3635		19
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918-3638, 918-3639		21
918-3640, 918-3641		22
918-3642, 918-3643		23
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918-3646, 918-3647		25
918-3648, 918-3649		26
918-3650, 918-3651		27
918-3652, 918-3653		28
918-3654, 918-3655		29
918-3656, 918-3657		30
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918-3708, 918-3709		56
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918-3712, 918-3713		58
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918-3786, 918-3787		95
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918-3790, 918-3791		97
918-3792, 918-3793		98
918-3794, 918-3795		99
918-3796, 918-3797		100

FOR THE EXCLUSIVE USE OF
 BROADCAST ELECTRONICS INC.
 PERSONNEL AND CUSTOMERS
 ALL RIGHTS RESERVED

REVISIONS		
REV	DESCRIPTION	DATE
A	PER ECN #1248	7/4/78
B	PER ECN #692	4-18-78
C	PER ECN #1716	5-17-79

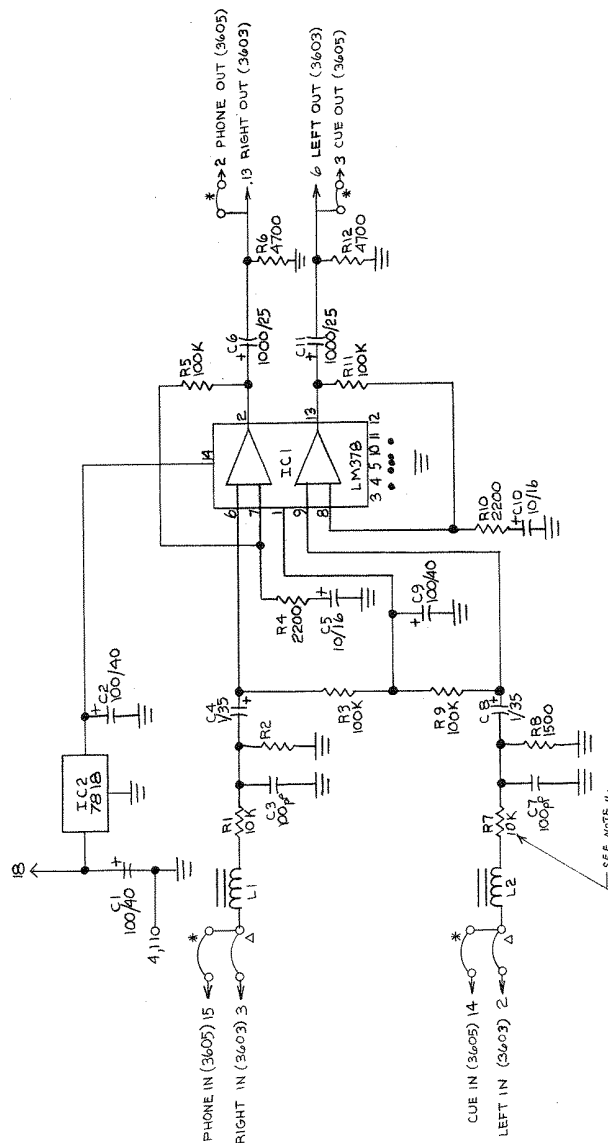


NOTES:
 1. RESISTORS IN OHMS, 1/4 W; CAPACITORS IN MICROFARADS, UNLESS OTHERWISE NOTED.
 2. LAST COMPONENTS USED: R15, C9, D3, Q4, L1, T1, IC1.
 3. SEE PC BOARD ASSEMBLY NO. 918-3602.

ITEM	QTY	ROD	PART NUMBER	DESCRIPTION	NOTE
LIST OF MATERIAL					
BROADCAST ELECTRONICS INC.					
-A FILMWAYS COMPANY-					
TITLE: SCHEMATIC					
MONO MATRIX PCB					
C 906-3602					
CONSOLES					
SHEET 1 OF 1					

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 ALL RIGHTS RESERVED

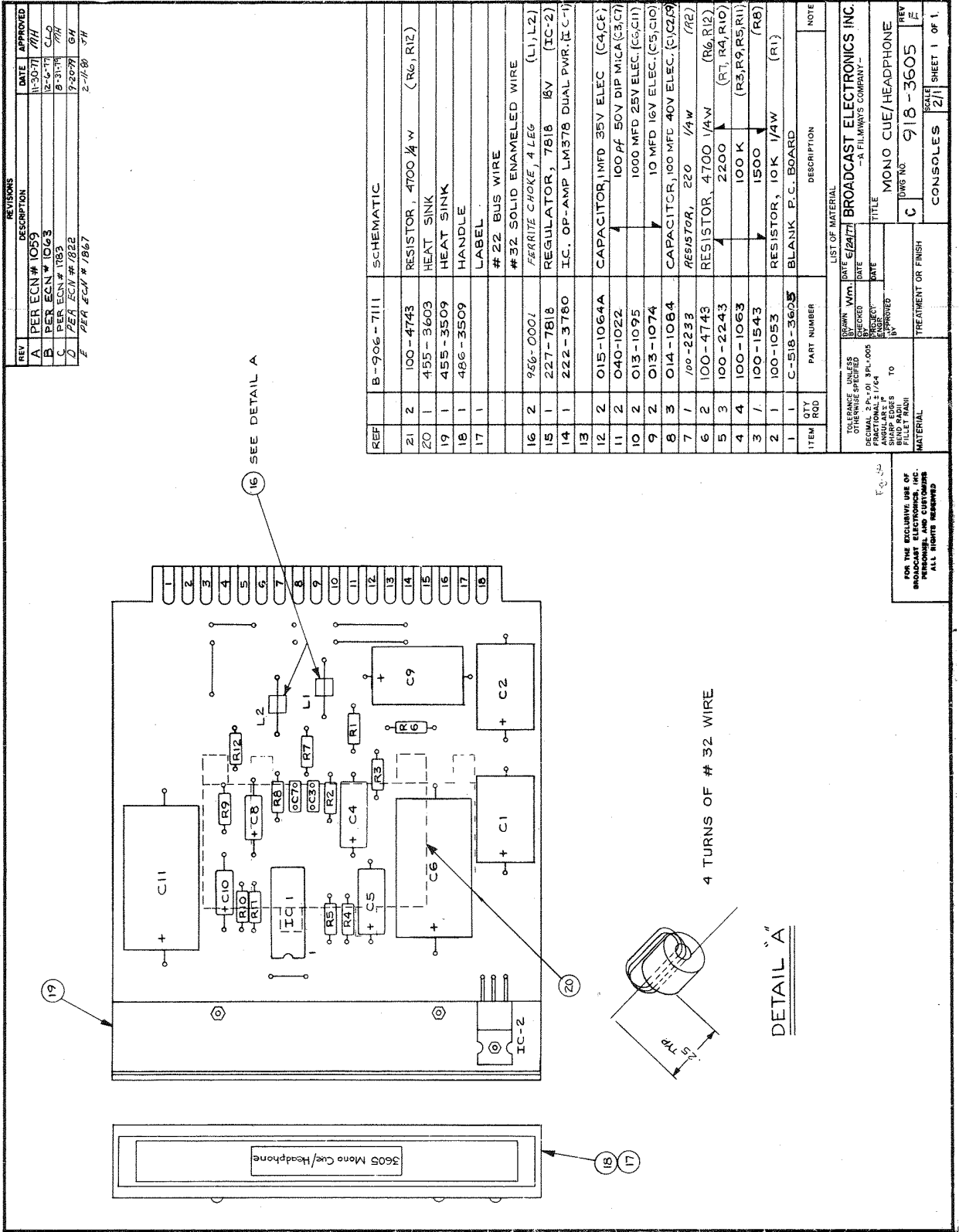
REV		REVISIONS		DATE		APPROVED	
REV	PER-ECN 1723	DESCRIPTION					
B	PER-ECN 1822			5-27-74	GH		
				9-20-74	GH		



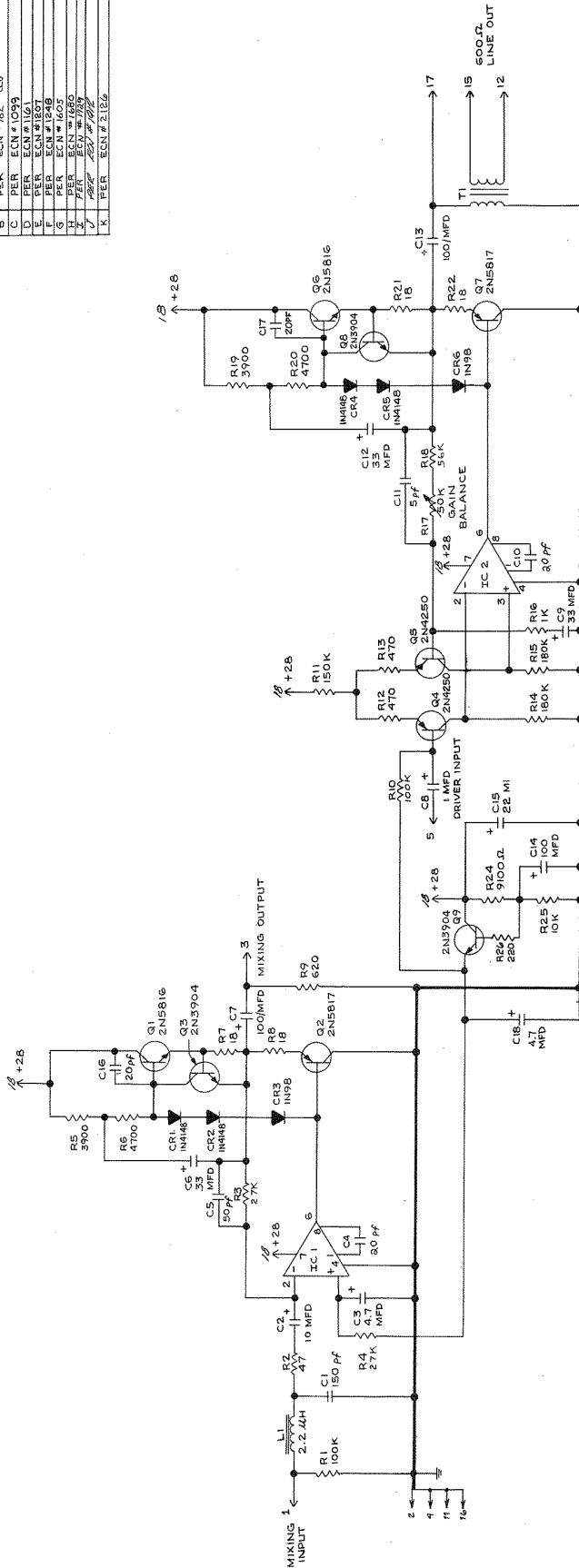
- NOTES:
1. RESISTORS IN OHMS, 1/4 W; CAPACITORS IN MICROFARADS, UNLESS OTHERWISE NOTED.
 2. LAST COMPONENTS USED: IC1, IC2, L2, R12.
 3. SEE P.C. BOARD ASSEMBLY NO. 918-3603 AND 918-3605.
 - * JUMPER FOR 918-3605.
 - Δ JUMPER FOR 918-3603.
 4. R7 IS 2.2K OHMS ONLY FOR 3605.
 5. R2 IS 220 OHMS ONLY FOR 3605 CARD.
 6. R2 IS 1500 OHMS ONLY FOR 3603 CARD.

ITEM	QTY	QTD	PART NUMBER	DESCRIPTION	NOTE
LIST OF MATERIAL					
DRAWN BY: J. HENDERSON					
CHECKED BY: J. HENDERSON					
DATE: 2-3-78					
TITLE: SCHEMATIC - STEREO MONITOR					
SUBTITLE: MONITOR CUE HEADPHONE					
DWG NO. 906-7111					
REV B					
TREATMENT OR FINISH					
MATERIAL					
CONSULE					
SHEET 1 OF 1					

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BROADCAST ELECTRONICS, INC.
PERSONNEL AND CUSTOMERS
ALL RIGHTS RESERVED



REV	DESCRIPTION	DATE	APPROVED
A	INCORP. ECN # 962	9-5-77	
B	PER ECN # 982	1-18-78	AM
C	PER ECN # 1099	3-17-78	AM
D	PER ECN # 1161	5-10-78	AM
E	PER ECN # 1807	5-10-78	AM
F	PER ECN # 1808	5-10-78	AM
G	PER ECN # 1605	2-4-79	BE
H	PER ECN # 1680	2-27-79	BE
I	PER ECN # 1739	2-27-79	BE
J	PER ECN # 1739	2-27-79	BE
K	PER ECN # 2126	2-23-80	AM

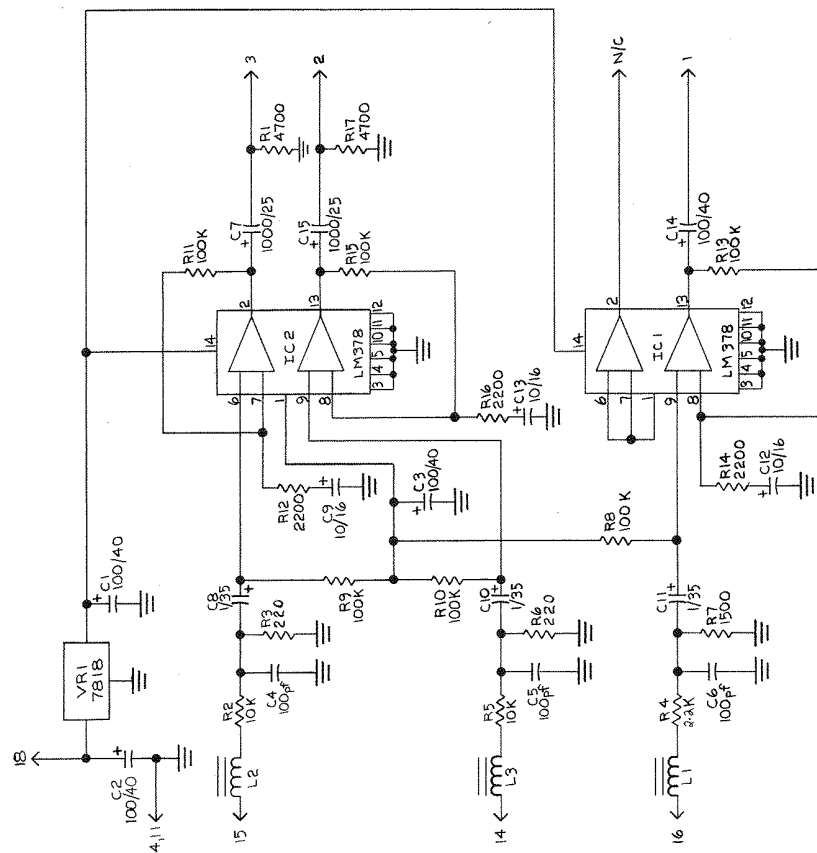


- NOTE :
1. LAST COMPONENTS USED,
C18, R26, CR6, Q9, IC-2, T1, L1
 2. IC-1, IC-2 ARE 5534 .
 3. COMPONENT NOT USED R23.

ASSY. NO. 918-3604

ITEM	QTY	QTY	PART	DESCRIPTION	NO.
LIST OF MATERIAL					
BROADCAST ELECTRONICS INC.					
5/9/77					
MIXER-LINE DRIVER AMB					
D					
906-7100					
SHEET 1 OF 1					

REVISIONS		
REV	DESCRIPTION	DATE
1	PER-ECM 1743	8/27/71
2	PER-ECM 1743	8/27/71

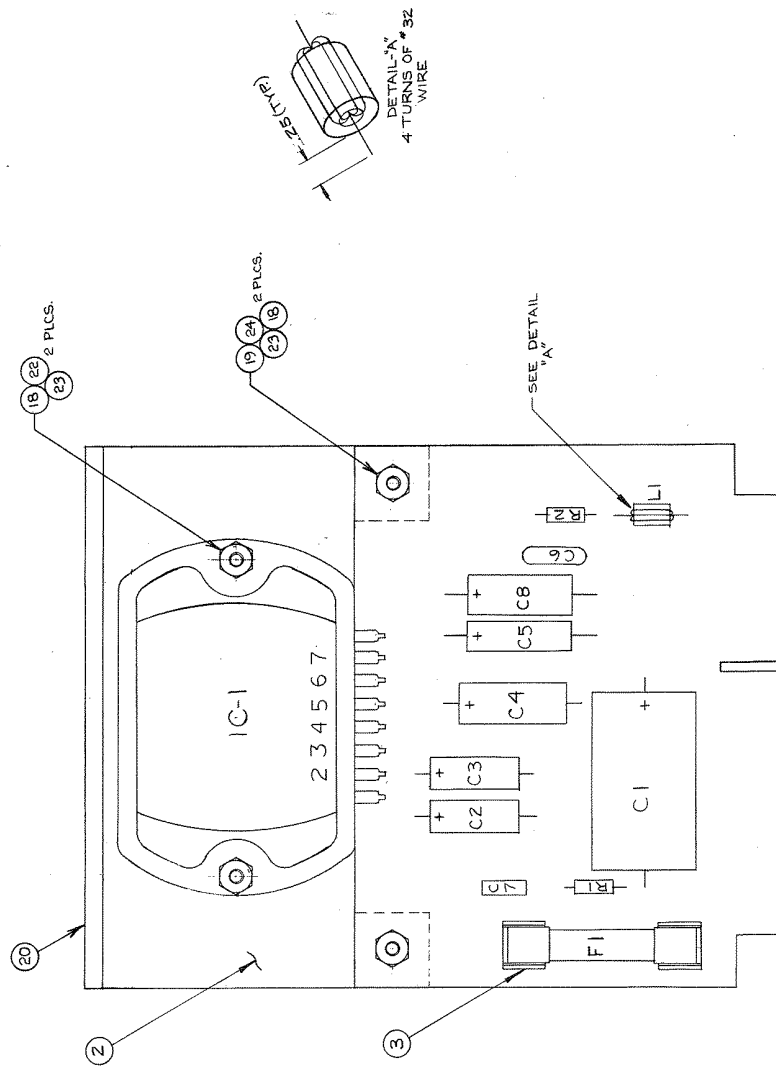


NOTES:
 1. RESISTORS IN OHMS 1/4 W. CAPACITORS IN MICROFARADS, UNLESS OTHERWISE NOTED.
 2. LAST COMPONENTS USED: R17,C15,IC2,VRI,L3.
 3. SEE PC BOARD ASSEMBLY NO. 918-3606.

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
LIST OF MATERIAL				
TOLERANCE UNLESS OTHERWISE SPECIFIED				
DECIMAL 2 PL 01 3 PL 1000				
ANGULAR 1 PL 1/4				
SHARP EDGES TO				
FILLET RADI				
MATERIAL				
DRAWN BY: DATE: CHECKED BY: DATE: PROJECT: APPROVED BY: TREATMENT OR FINISH: SCALE: SHEET 1 OF 1				
BROADCAST ELECTRONICS INC. - A FILMWAYS COMPANY -				
TITLE: SCHEMATIC STEREOPHONIC CUE/HEADPHONE AMPLIFIER				
DWG NO. 906-3606				
REV B				

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 ALL RIGHTS RESERVED

REVISIONS		
REV	DESCRIPTION	DATE APPROVED
A	ECN 1196	3/3/78 CLO
B	ECN 1237	6-9-78 PMH



SEE B/M NO. 918-3609

ITEM	QTY	ROD	PART NUMBER	DESCRIPTION	NOTE
LIST OF MATERIAL					
DRAWN BY C. ORR DATE 1-16-77					
CHECKED BY C. ORR DATE 1-16-77					
APPROVED BY C. ORR DATE 1-16-77					
TREATMENT OR FINISH					
MATERIAL					
FOR THE EXCLUSIVE USE OF BROADCAST ELECTRONICS, INC. PERSONNEL AND CUSTOMERS ALL RIGHTS RESERVED					
BROADCAST ELECTRONICS, INC. - A FILMWAYS COMPANY -					
TITLE ASSY-MONITOR/AMP PCB					
DWG NO. 918-3609					
REV B					
CONSLES					
SCALE 2/1					
SHEET 1 OF 1					

PRODUCT WARRANTY

LIMITED ONE YEAR

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Broadcast Electronics, Inc. ("BEI"), 4100 North 24th Street, P.O. Box 3606, Quincy, Illinois 62301, hereby warrants cartridge machines, consoles, and other new equipment manufactured by Broadcast Electronics, Inc., against any defects in material or workmanship at the time of delivery thereof, that develop under normal use within a period of one (1) year from the date of shipment. Other manufacturers' equipment, if any, shall carry only such manufacturers' standard warranty. This warranty extends to the original user and any subsequent purchaser during the warranty period. BEI's sole responsibility with respect to any equipment or parts not conforming to this warranty is to replace such equipment or parts upon the return thereof F.O.B. BEI's factory or authorized repair depot within the period aforesaid.

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

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

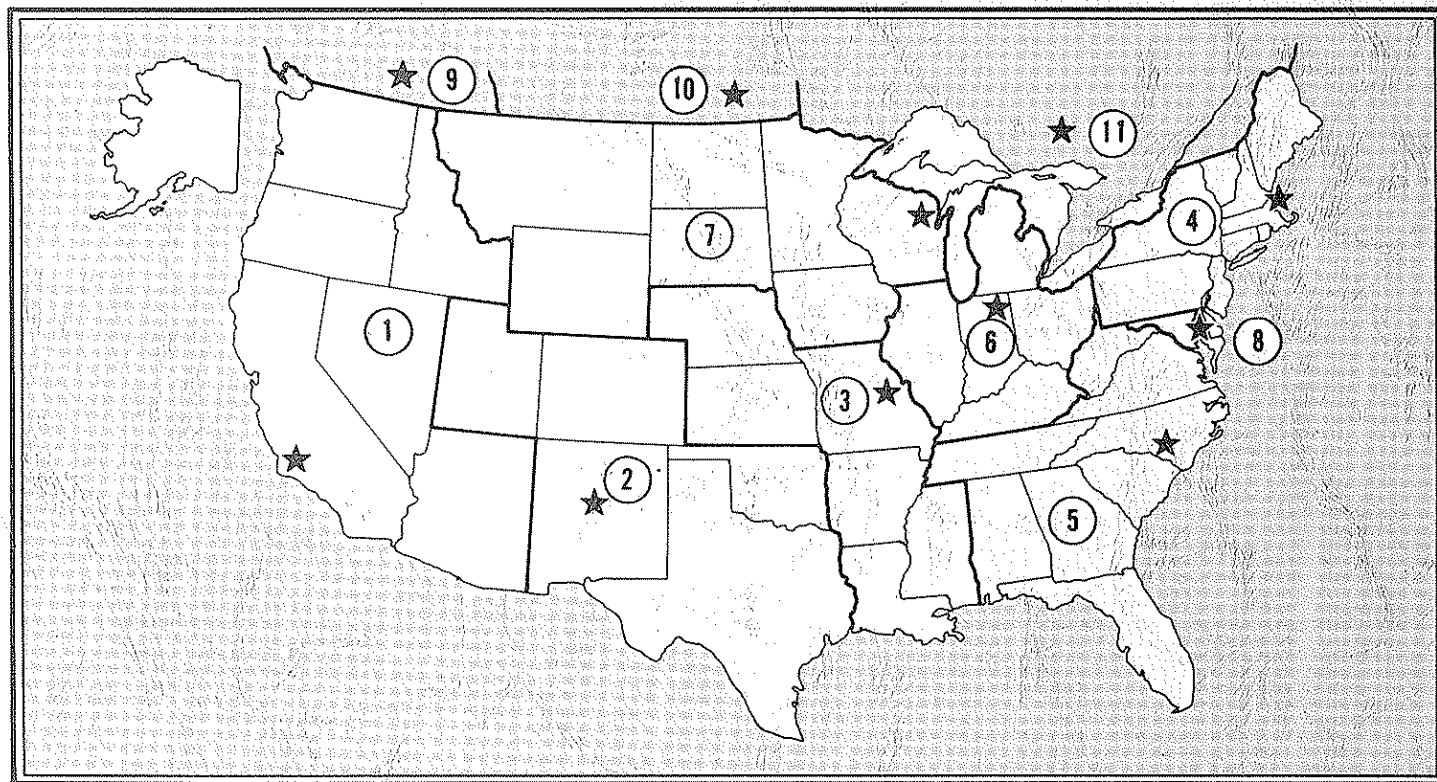
BROADCAST ELECTRONICS, INC.

4100 North 24th Street, Quincy, Illinois 62301

AUTHORIZED SERVICE CENTERS

● Equipped to serve you with *Spotmaster*® parts and repairs — both in and out of warranty

● Regional depots reduce parts delivery time and repair turn-around time



UNITED STATES

1. **Riggins Electronics**
3272 E. Willow St.
Long Beach, CA 90815
Ph: (213) 598-7007

States Covered:
Alaska
Arizona
California
Hawaii
Nevada
Oregon
Washington

2. **Dyma Engineering**
Route 1, Box 51
Taos, NM 87571
Ph: (505) 758-2686

States Covered:
Colorado
New Mexico
Oklahoma
Texas
Utah

3. **TV Engineering Corporation**
519 Rudder Road,
Fenton, MO 63026
Ph: (314) 343-5605

States Covered:
Arkansas Missouri
Kansas Mississippi
Louisiana Nebraska

4. **Broadcast Services, Inc.**
Micro Road
Micro, NC 27555
Ph: (919) 284-2102

States Covered:
Connecticut
Maine
Massachusetts
New Hampshire
New Jersey
New York
Pennsylvania
Rhode Island
Vermont

5. **Broadcast Services, Inc.**
Micro Road
Micro, NC 27555
Ph: (919) 284-2102

States Covered:
Alabama
Florida
Georgia
North Carolina
South Carolina
Tennessee
Virginia
West Virginia

6. **Allied Broadcasting Equipment**
635 South E. St.
Richmond, IN 47374
Ph: (317) 962-8596

States Covered:
Illinois
Indiana
Kentucky
Michigan
Ohio

7. **Electronic Industries**
19 East Irving St.
Oshkosh, WI 54901
Ph: (414) 235-8930

States Covered:
Iowa
Minnesota
Montana
North Dakota
South Dakota
Wisconsin
Wyoming

8. **Midwest Telecommunications**
4700 G. Boston Way
Lanham (Wash. D.C.) MD 20801
Ph: (301) 577-4903

States Covered:
District of Columbia
Delaware
Maryland

CANADA

9. **Nortec West, Ltd.**
325 West Fifth Avenue
Vancouver 10, B.C., Canada
Ph: (604) 872-8525

Provinces Covered:
British Columbia
Yukon Territory

10. **Nortec West, Ltd.**
7056B Farrell Road
Calgary, Alta., Canada
Ph: (403) 252-8141

Provinces Covered:
Alberta
Manitoba
NW Territory
Saskatchewan

11. **J-Mar Electronics, Ltd.**
6 Banigan Drive
Toronto 17, Ontario, Canada
Ph: (416) 421-9080

Provinces Covered:
New Brunswick
Nova Scotia
Ontario
Quebec



BROADCAST ELECTRONICS INC. *Spotmaster*® TAPE CARTRIDGE SYSTEMS

4100 NORTH 24TH STREET • P. O. BOX 3606 • QUINCY, ILLINOIS 62301 • TELEX 250142 • CABLE "SPOTMASTER" • PHONE 217/224-9600