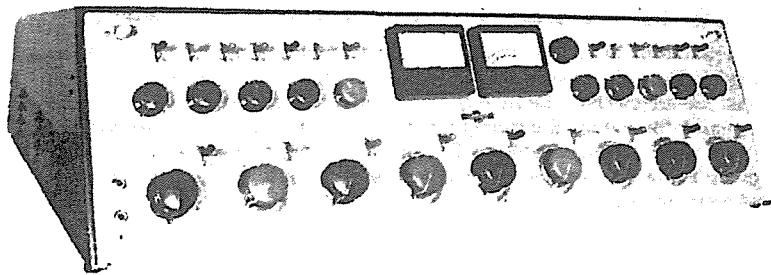


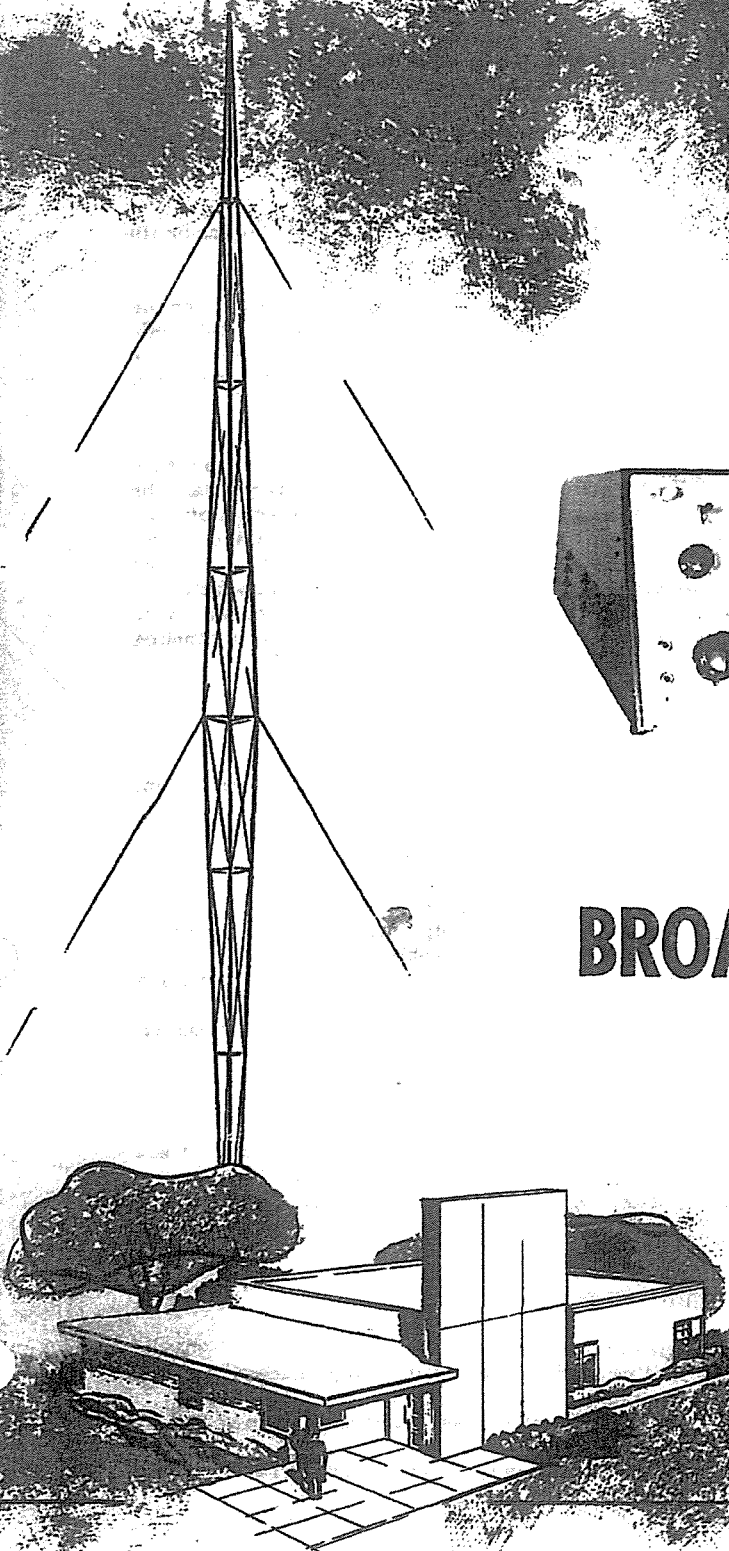
# Collins

## INSTRUCTION BOOK



### BROADCAST CONSOLE

### 212E-1



COLLINS RADIO COMPANY

## GUARANTEE

The equipment described herein is sold under the following guarantee:

Collins agrees to repair or replace, without charge, any equipment, parts, or accessories which are defective as to design, workmanship or material, and which are returned to Collins at its factory, transportation prepaid, provided

- (a) Notice of the claimed defect is given Collins within one (1) year from date of delivery and goods are returned in accordance with Collins' instructions.
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Sales Service Department  
Cedar Rapids, Iowa

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- (A) Type number, name, and serial number of equipment
- (B) Date of delivery of equipment
- (C) Date placed in service
- (D) Number of hours of service
- (E) Nature of trouble
- (F) Cause of trouble if known
- (G) Part number (9 or 10 digit number) and name of part thought to be causing trouble
- (H) Item or symbol number of same obtained from parts list or schematic
- (I) Collins' number (and name) of unit sub-assemblies involved in trouble
- (J) Remarks

**HOW TO ORDER REPLACEMENT PARTS.**

When ordering replacement parts, you should direct your order as indicated below and furnish the following information insofar as applicable. To enable us to give you better replacement service, please be sure to give us complete information.

**ADDRESS:**

Collins Radio Company  
Sales Service Department  
Cedar Rapids, Iowa

**INFORMATION NEEDED:**

- (A) Quantity required
- (B) Collins' part number (9 or 10 digit number) and description
- (C) Item or symbol number obtained from parts list or schematic
- (D) Collins' type number, name, and serial number of principal equipment
- (E) Unit sub-assembly number (where applicable)

# **Instruction Book**

## **BROADCAST CONSOLE**

### **212E-1**

#### NOTE

Instructional material for units used with the Broadcast Console 212E-1 are included in this publication in the following order:

- 356A-1 Preamplifier
- 356B-1 Program/Monitor Amplifier
- 356E-1 Limiter Amplifier
- 274K-1 Relay Unit
- 409X-2 Power Supply
- 409Y-1 Power Supply



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1957, 1959, 1961

**Cedar Rapids, Iowa, U.S.A.**

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SECTION I  
General Description

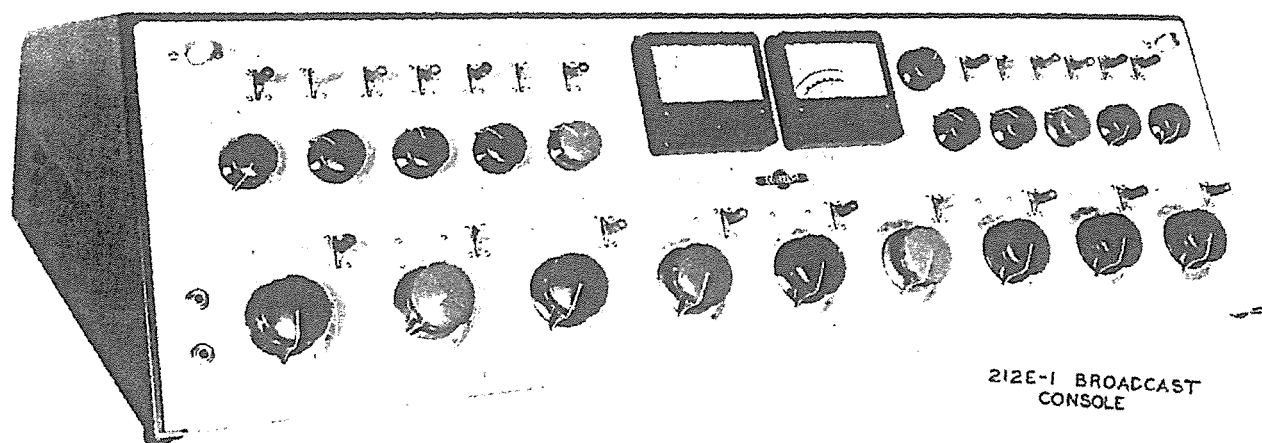


Figure 1-1. 212E-1 Broadcast Console

## SECTION I GENERAL DESCRIPTION

### 1.1 PURPOSE OF INSTRUCTION BOOK.

This instruction book is intended to serve as a guide in the installation, adjustment, operation, and maintenance of the Collins 212E-1 Broadcast Console.

remote line inputs are provided. Ease of operation is assured by clearly identified and color coded control knobs. The number of functions available and performance are determined by the selection of pre-amplifiers and program/monitor amplifiers to be installed in the console.

### 1.2 PURPOSE OF EQUIPMENT.

The 212E-1 Broadcast Console is designed especially for use in high-fidelity AM., FM, or TV broadcast installations. The number and arrangement of amplifiers may be selected to fit individual requirements. Simultaneous mixing facilities for auditioning or broadcasting of up to seven of 13 low-level inputs and two of eight

### 1.3 BASIC EQUIPMENT.

The 212E-1 Broadcast Console is illustrated in figure 1-1. The equipment available is listed in table 1-1. The type and quantity of subassemblies supplied will depend on individual station requirements.

TABLE 1-1. 212E-1 BROADCAST CONSOLE, EQUIPMENT AVAILABLE

ITEM	WEIGHT (lb)	OVER-ALL DIMENSIONS (inches)			COLLINS PART NUMBER
		H	W	D	
212E-1 Broadcast Console	82	11 max	41-1/8	22-1/2	522-0773-006
356A-1 Preamplifier	7-1/2	4-5/8	2-1/8	9-1/2	522-0389-005
356B-1 Program/Monitor Amplifier	9	5-3/4	2-7/8	9-1/2	522-0390-005
409X-2 Power Supply	20	6	8	9-1/2	522-0392-006
409Y-1 Power Supply	10-3/4	5-9/16	5-1/2	9-1/2	522-0961-005
274K-1 Relay Unit	2-1/2	5-1/2	2-1/2	9-1/2	522-0391-005
499G-1 Rack Mounting Shelf*	11	8-23/32	19	14	522-0774-00
One Jumper Plug*	1/2				541-6459-002
Unit Connector, 12 Pin					542-3038-002
Unit Connector, 15 Pin					542-3039-002
Repeat Coil Assembly*	2-3/4	4	5-1/2	9-1/2	542-3071-00

\*Supplied as part of 212E-1 Broadcast Console.



SECTION I  
General Description

1.4 APPLICABLE SUBASSEMBLY INSTRUCTION BOOKS.

Applicable subassembly instruction books are listed in table 1-2 and supplied following section VII of this instruction book.

TABLE 1-2  
SUBASSEMBLY INSTRUCTION BOOKS

Publication	Collins Part Number
356A-1 Preamplifier	520-5446-00
356B-1 Program/Monitor Amplifier	520-5447-00
356E-1 Limiter Amplifier	520-5448-00
274K-1 Relay Unit	520-5449-00
409X-2 Power Supply	522-1691-00
409Y-1 Power Supply	520-5753-00

1.5 DESCRIPTION OF MAJOR COMPONENTS.

1.5.1 212E-1 BROADCAST CONSOLE.

The 212E-1 Broadcast Console utilizes modular type construction to provide a choice of plug-in amplifier units which will meet individual installation requirements. The front panel is hinged at the bottom and slopes backward 30 degrees from vertical. The unit may be serviced from the front allowing the cabinet to be flush against a wall or window. Slots in top, back, and sides provide cooling by convection. Space provided for up to 11 type 356A-1 Preamplifiers and three type 356B-1 Program/Monitor Amplifiers or two type 356E-1 Limiter Amplifiers and one type 356B-1 Program/Monitor Amplifiers.

1.5.2 356A-1 PREAMPLIFIER.

The necessary circuitry for two stages of amplification makes up this plug-in module. It provides 40 db of gain from low-level microphone or transcription lines to feed program, audition, or cue lines. Refer to paragraph 1.4.

1.5.3 356B-1 PROGRAM/MONITOR AMPLIFIER.

The 356B-1 Program/Monitor Amplifier has an over-all gain of 56 or 68 db for use on program lines or

speaker operation. The desired level is selected by means of a toggle switch located on the amplifier chassis. The output impedance is factory wired for 600 ohms. It may be changed easily for 150-ohm output impedance. Refer to paragraph 1.4.

1.5.4 356E-1 LIMITER AMPLIFIER.

The 356E-1 Limiter Amplifier contains two stages of amplification and a bias rectifier. It has an over-all gain of 54 db. The compression ratio is adjustable from a ratio of 1.6:1 to a ratio of 5:1. A choice of either 11 milliseconds attack time and 0.9 second release time or 62 milliseconds attack time and 5.2 seconds release time for 63% recovery is provided. Refer to paragraph 1.4.

1.5.5 274K-1 RELAY UNIT.

The 274K-1 Relay Unit controls application of audio power to monitor speakers and a-c power to studio warning lights. The four 12-volt d-c relays are mounted on vibration dampeners to minimize mechanical noise. Transient suppressing networks across the relay coils minimize radio interference and contact wear. Refer to paragraph 1.4.

1.5.6 409X-2 POWER SUPPLY.

The 409X-2 Power Supply furnishes power for filaments, plate circuits, and relays in the 212E-1 Broadcast Console. Its output is as follows: 250 to 300 volts d-c (adjustable) at 250 ma, 6.3 volts a-c at 6 amperes, and 12 volts d-c at 1.0 ampere. Refer to paragraph 1.4.

1.5.7 409Y-1 POWER SUPPLY.

The 409Y-1 Power Supply may be used as a second power supply in installations requiring less power than the 409X-2 Power Supply. Its output is 300 volts d-c at 100 ma and 6.3 volts at 3.0 amperes. Refer to paragraph 1.4.

1.5.8 499G-1 RACK MOUNTING SHELF.

The 499G-1 Rack Mounting Shelf consists of a panel and chassis assembly for use in an RMA standard relay rack. The panel is a hinged door that opens downward. The base perforations provide mounting holes to accommodate any arrangement of small modules without drilling. A variety of associated connectors, mounting brackets, and cables can be supplied.

1.6 ELECTRICAL CHARACTERISTICS.

Electrical characteristics of the 212E-1 Broadcast Console are listed in table 1-3. These characteristics are measured with d-c voltage adjusted to 300 volts.

TABLE 1-3. 212E-1 BROADCAST CONSOLE ELECTRICAL CHARACTERISTICS

CHARACTERISTICS	DESCRIPTION
Maximum Number of Channels	<p>7 low-level inputs, 2 remote inputs, 2 program outputs, one monitor channel, and one cue channel when provided with:</p> <ul style="list-style-type: none"> <li>Ten - 356A-1 Preamplifiers</li> <li>Two - 356B-1 or 356E-1 Amplifiers</li> <li>One - 356B-1 Program/Monitor Amplifier</li> <li>One - 274K-1 Relay Unit</li> <li>Two - 409X-2 Power Supplies</li> <li>Two - 499G-1 Rack Mounting Shelves</li> </ul>
Input Impedance	Low Level: 30/150/250/600* ohms balanced or un-balanced). Remote lines 150/600* ohms
Output Impedance	Line 150/600* ohms. Monitor 600 ohms
Input Level	Low Level: -50 dbm nominal (100-db gain). Remote 0 dbm (58-db gain)
Gain	<p>Low level to program lines at least 100 db</p> <p>Remote line to program lines 58 db</p>
Output Level	<p>Program +18 dbm (50 mw)</p> <p>Monitor 8 watts. Four speaker circuits</p>
Response	Within 3 db 50 - 15,000 cps at program lines
Distortion	Less than 1% at +18 dbm at program lines - less than 3% at 8 watts at monitor amplifier output
Noise	At least 68 db below +18 dbm output with -50 dbm input. (Equivalent input noise level -118 dbm or less.)
Audible Noise	None
Ambient Temperature Range	+15°C to +45°C
Ambient Humidity Range	Up to 95%
Power Source	115* or 230 volts a-c ±10%, 50/60 cps
<p>*Shipped wired for 600 ohms output and remote line impedance, 150 ohms low-level input impedance, and 115-volt power source.</p>	

## SECTION II INSTALLATION AND ADJUSTMENT

### 2.1 UNPACKING AND INSPECTING THE EQUIPMENT.

Remove all packing material, and carefully lift the units from their crates. Check the equipment against the packing slips. Visually inspect the units for any apparent damage and for missing components. Check for proper operation of controls. Any claims for damage should be filed promptly with the transportation agency. If such claims are to be filed, all packing material must be retained.

### 2.2 INSTALLATION PROCEDURE.

#### 2.2.1 GENERAL.

The location in an individual station will be determined by the arrangement of studio and control room facilities. The placement of equipment and wiring should be planned carefully before any installation work is started. Low-level microphone input leads must be separated from high-level audio leads. All audio leads should be separated from the power and control wiring.

#### 2.2.2 EQUIPMENT LOCATION.

The 212E-1 Broadcast Console may be placed against a window, wall, or other vertical surface without sacrificing maintenance accessibility. Outline and mounting dimensions of the console are shown in figure 7-2. The 499G-1 rack shelf mounts in an RMA standard 19-inch rack and requires 8-23/32 inches of panel space. It extends 14 inches behind the front panel.

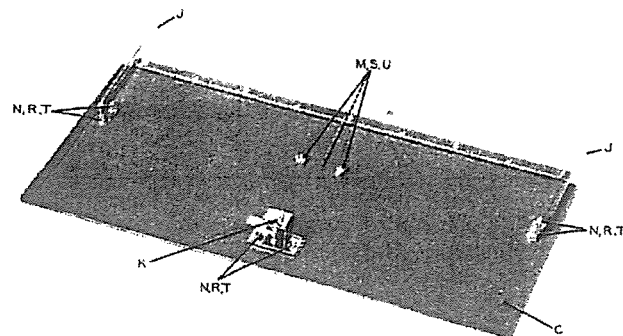


Figure 2-1. 499G-1 Rack Mounting Shelf, Front Panel Assembly

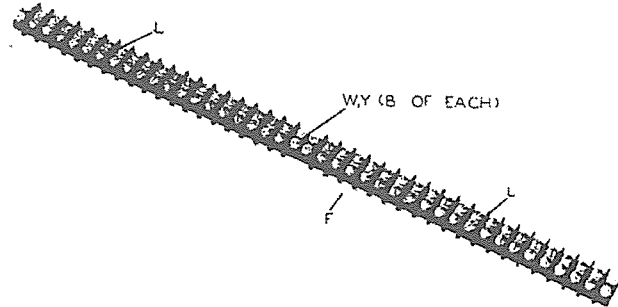


Figure 2-2. 499G-1 Rack Mounting Shelf, Terminal Strip

#### 2.2.3 499G-1 RACK SHELF ASSEMBLY.

**2.2.3.1 GENERAL.** Work on a bench that is clean and free from grit, metal chips, or any other scratchy substances. If a sponge rubber kneeling pad or any other soft material is available, place it beneath the kit during assembly. There are certain subassemblies which must be put together before final assembly of the unit: front door subassembly and terminal strip subassembly.

##### 2.2.3.2 FRONT DOOR ASSEMBLY. (See figure 2-1.)

a. Enter the knob of the latch assembly, item K, from the rear of the door.

b. Bolt to the door with two each of the following: items N, R, and T. (See the parts list.)

c. See figure 2-1. Attach the two lid supports, item J, to the rear of the door with the slotted arm adjacent to the edge of the door. Use two each of items N, R, and T on each support.

**2.2.3.3 TERMINAL STRIP ASSEMBLY.** (See figure 2-2.) The terminal strips, item L, must be mounted on metal strip, item F, before they are ready for final assembly onto the shelf.

a. The terminal strips are symmetrical and interchangeable.

b. Mount the terminal strips to the metal strip, item F, with eight each of items W and Y.

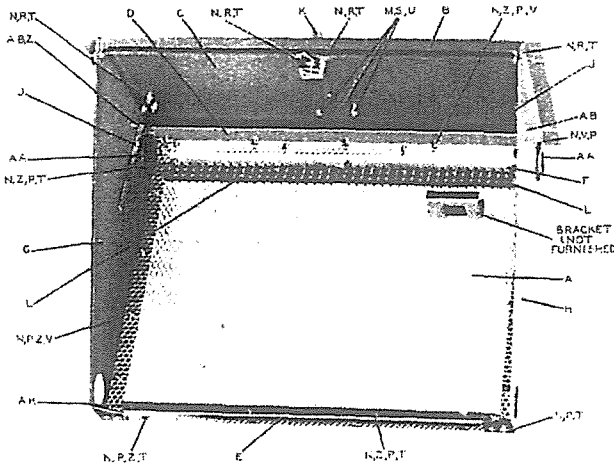


Figure 2-3. 499G-1 Rack Mounting Shelf, Shelf Assembly

2.2.3.4 FINAL ASSEMBLY. (See figure 2-3.) In the final assembly procedure, all bolts will be allowed to remain in a loose condition until the unit is completely assembled; then the parts will be brought into alignment, and the bolts tightened.

a. Set the rear support, item E, over the upturned rear lip of the shelf, item A, with the longer side of the support toward the front of the shelf. Bolt the rear support to the rear lip of the shelf with four each of items N, P, Z, and T.

b. Bolt the front angle support, item D, to the front of the shelf with four each of items N, P, Z, and V. Bolt to the first row of holes in the shelf.

c. Side brackets, items G and H, may be assembled next. Select one, and set it upright in position. The lower lip of the bracket should go under the shelf. Bolt the side bracket to the front support angle, item D, through the small hole near the front grommet hole with one each of items N, P, and V. Bolt the rear of the side bracket to the rear support strip with two each of items N, P, and T. Bolt the side bracket to the bottom plate with four each of items N, P, Z, and V. Use the second row of holes in the shelf. Repeat this procedure with the other side bracket.

d. Top brace, item B, now can be installed. The top brace is symmetrical but must be installed so that the open side of the channel faces to the rear. Bolt in place with four each of items N, R, and T.

e. The front door assembly now can be bolted in place using five of item N with the bolt head next to the hinge and items Z, P, and V on the inside. With the panel still lying flat in front of the unit, raise up the slotted arms of the panel supports, and place them

over the studs that protrude from the inside of the side brackets. Place flat washers, item Z, on the studs and follow with retaining rings, item AB.

f. Using a machinist's square and a steel tape measure, square up the unit; then tighten all bolts.

g. Mount the terminal strip assembly. This may be mounted anywhere, but for most purposes, it is best to mount it just inside the front door or just inside the rear lip. See figure 2-4. Bolt in place with three each of items N, Z, P, and T. Insert the bolts through the plate from the top and through the fifth line of holes from the front or back of the shelf bottom.

h. Choose the cable holes to be used, and insert the rubber grommets, item AA.

i. The stop strip, item AK, can be attached to the shelf after the modules which are to be mounted on the 499G-1 Rack Mounting Shelf have been added. This strip presses against the rear of the modules after they are plugged in to prevent them from working out. See figure 2-4. Bolt in place with four each of items N, Z, P, and T.

#### 2.2.4 EQUIPMENT MOUNTING PROCEDURE.

2.2.4.1 212E-1 BROADCAST CONSOLE. Refer to figures 2-5 and 7-2. Five 1-1/2-inch-diameter holes are provided in the console base plate for the entry of external wiring. The holes are equally spaced and located directly in front of the terminal strip. Two 1/4-inch diameter holes and hole mounting center rubber foot, located on front of the wiring entry

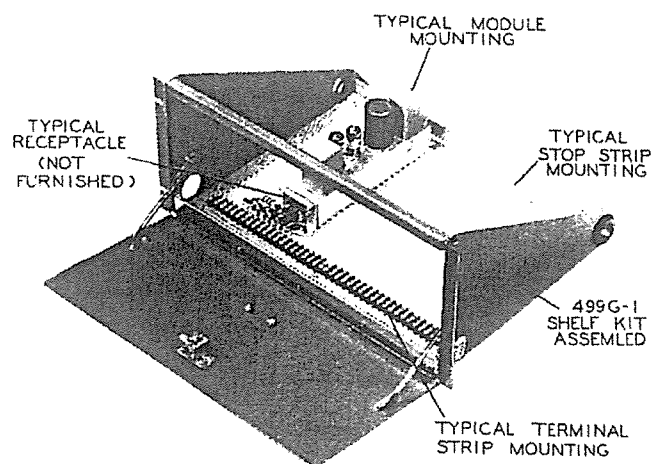


Figure 2-4. 499G-1 Rack Mounting Shelf, Complete Assembly

**SECTION II**  
**Installation and Adjustment**

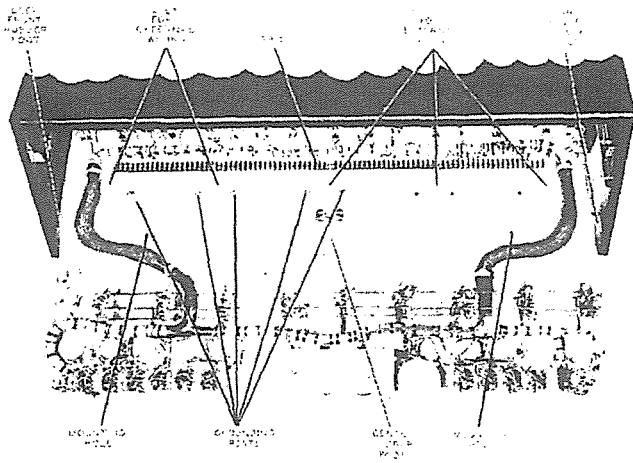


Figure 2-5. 212E-1 Broadcast Console, Mounting and Wiring Detail

openings (refer to figure 2-5), may be used when the console is bolted to the desk or table top. Three spacers are supplied for bolting down the console.

- a. Drill holes for bolting down the console if desired.
- b. Complete wiring between connectors and terminal strip, as necessary.
- c. Rewire the 356A-1 Preamplifiers to be used as booster amplifiers for 250 ohms input impedance as shown in figure 2-6.

**NOTE**

Resistors for balancing are not required. These networks are unbalanced.

d. After the 212E-1 Broadcast Console is mounted, the modules may be plugged into their receptacles according to steps e. through k. Refer to figure 2-8 for layout of unit connectors.

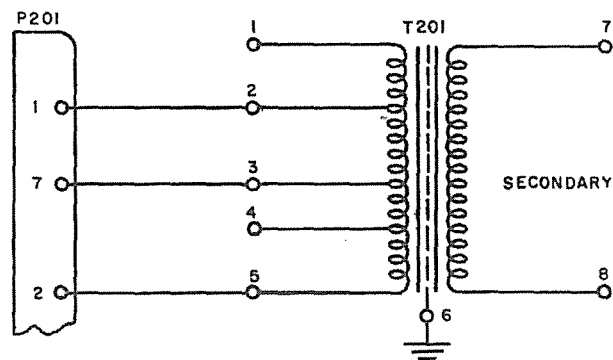


Figure 2-6. 356A-1 Preamplifier, Connections for 250-Ohm Input

- e. Plug type 356A-1 Preamplifier into J101 through J107 as determined by the number of input lines used.

**NOTE**

If a mixer is used with a source which does not require a preamplifier (tape recorder-turntable with external preamplifier), a jumper plug may be used in lieu of a preamplifier. The input impedance should be 600 ohms (unbalanced). A pad may be used to match the 600-ohm mixer input impedance. Refer to figure 2-16.

- f. Plug booster amplifier into a J108 and J110.
- g. If cue amplifier is used, rewire a 356A-1 Preamplifier for 600-ohm input as shown in figure 2-13. Plug it into J113.
- h. Plug type 356B-1 Program/Monitor Amplifiers into J109 and J111. Set S301 at LOW position.
- i. Plug a type 356B-1 Program/Monitor Amplifier into J114. Set S301 at HIGH position.

**NOTE**

When a plug-in unit is to be removed, the rear edge must be lifted clear of the retaining rail before the unit is pushed to the rear to disengage the plug from its jack.

- j. Plug repeat coil assembly into connectors J115 and J116.

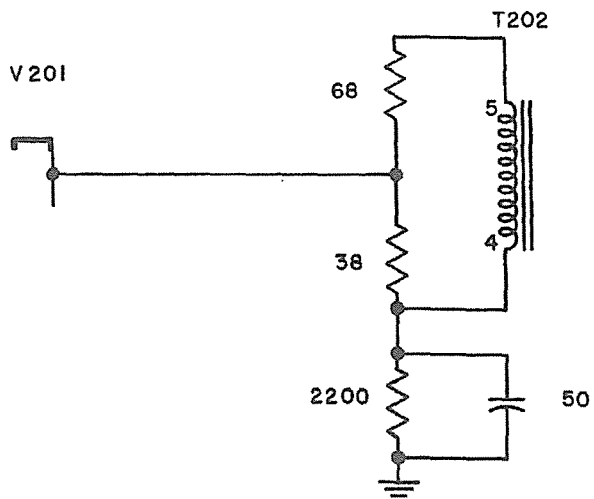


Figure 2-7. 356A-1 Preamplifier, Cue Amplifier Gain Adjustment

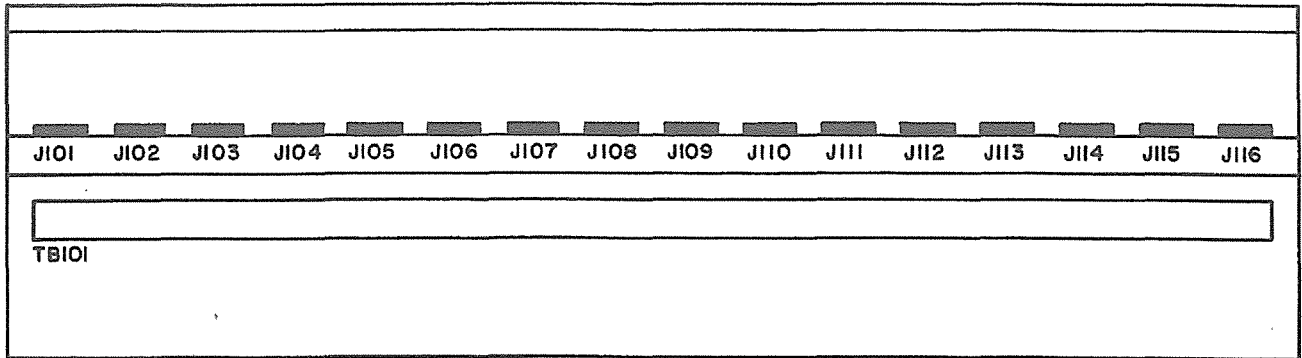


Figure 2-8. 212E-1 Broadcast Console, Amplifier Connector Locations

**NOTE**

Care must be exercised to insure correct pin alignment as these connectors have a flexible mounting.

k. Close the front panel, and tighten the knurled knobs at the upper corners.

**2.2.4.2 499G-1 RACK MOUNTING SHELF.**

**NOTE**

Twelve-pin bracket assemblies (Collins part number 542-3038-002) and a fifteen-pin bracket

assembly (Collins part number 542-3039-002) are available to satisfy individual requirements. The twelve-pin bracket assembly may be used with the following units: 356A-1 Pre-amplifier, 356B-1 Program/Monitor Amplifier, 356E-1 Limiter Amplifier, 274K-1 Relay Unit, and 409Y-1 Power Supply. The fifteen-pin bracket assembly is used with the 274K-1 Relay Unit. Refer to figures 2-10 and 2-11.

- a. Mount the 499G-1 Rack Mounting Shelf in the equipment rack.
- b. The modules may be plugged into their receptacles according to steps c. through d.
- c. Place the 409X-2 Power Supply units in the 499G-1 Rack Mounting Shelf. Typical arrangements are shown in figures 2-9A and 2-9B. Power circuit wiring to the

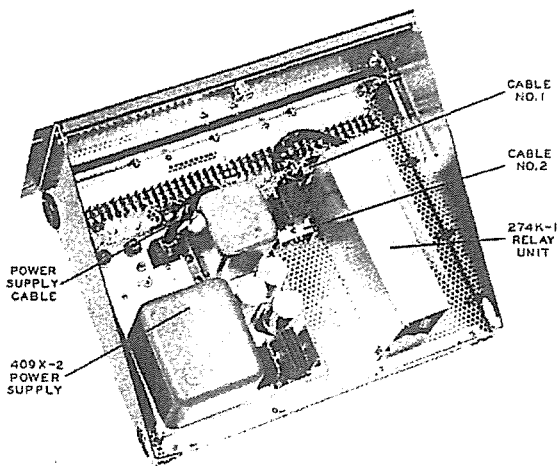


Figure 2-9A. 499G-1 Rack Mounting Shelf, Typical Equipment Arrangements

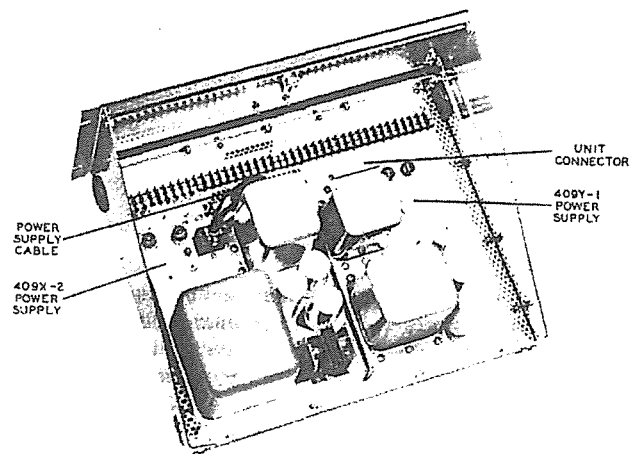


Figure 2-9B. 499G-1 Rack Mounting Shelf, Typical Equipment Arrangements

## SECTION II Installation and Adjustment

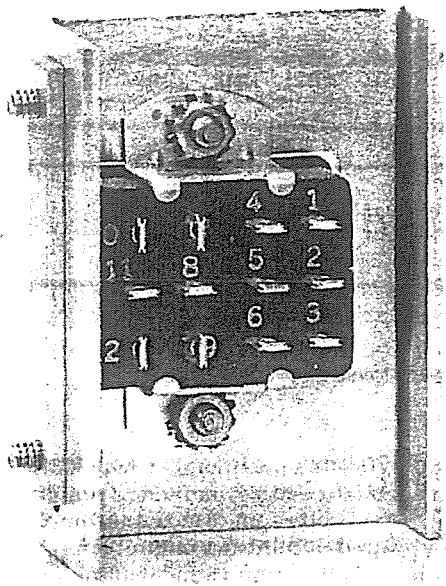


Figure 2-10. Twelve-Pin Bracket Assembly

subassembly connectors in the 212E-1 Broadcast Console is divided to permit the use of an additional power supply if a full complement of amplifiers is utilized. Refer to figure 2-20. Power requirements for the two circuits fully loaded, together with individual unit requirements, are shown in table 2-1. Either a second type 409X-2 or a 409Y-1 Power Supply may be used depending upon total power necessary. If connection to 230 volts a-c is desired, see figure 2-12.

d. Place the 274K-1 Relay Unit beside the power supplies, and move it forward to engage connectors.

### 2.2.5 INSTALLATION WIRING.

2.2.5.1 212E-1 BROADCAST CONSOLE. All connections to the 212E-1 Broadcast Console are made with screw type terminals.

#### NOTE

All low-level audio input lines should be kept separate from the power and control wires. All wiring should be made with twisted shielded pairs preferably insulated and grounded at one end only. Audio lines should be a no. 20 or 22 AWG twisted shielded pair. Studio circuit connections for signal lights should be made with a no. 16 AWG twisted shielded pair. Filament leads should be a no. 12 AWG twisted pair. The following connections should be made to the numbered terminal strip, TB101, located

on the base plate of the console. The shields of the input lines should be grounded at the five 1/4-inch ground studs and lugs provided adjacent to the terminal strip. Refer to figure 7-1. Table 2-2 lists line connections and their respective terminal numbers.

#### NOTE

If both line 1 and line 2 outputs are not used, terminate unused line in a 600-ohm resistor.

2.2.5.2 499G-1 RACK MOUNTING SHELF. All connections between the 212E-1 Broadcast Console, studio warning lights, monitor speakers, and power source are made at the connector strip with screw type terminals. Refer to instruction books for individual units used for terminal information.

a. With subassemblies placed in rack shelf as in paragraph 2.2.4.2, steps c. and d., connect the wiring cables shown in figure 2-14. Color code and terminal information may be found in figure 2-15.

b. Connect studio warning lights and speaker leads.

#### NOTE

If no speaker is to be connected to a pair of speaker terminals, a 600-ohm 10-watt resistor should be connected in its place. Mount the resistor on the 499G-1 Rack Mounting Shelf terminal strip.

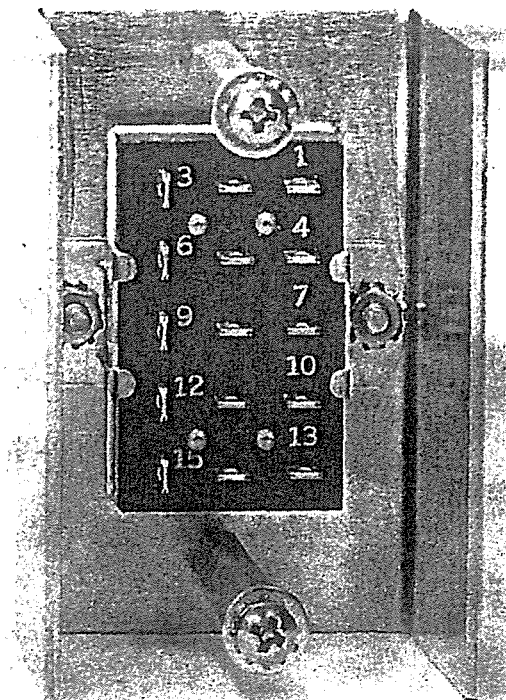


Figure 2-11. Fifteen-Pin Bracket Assembly

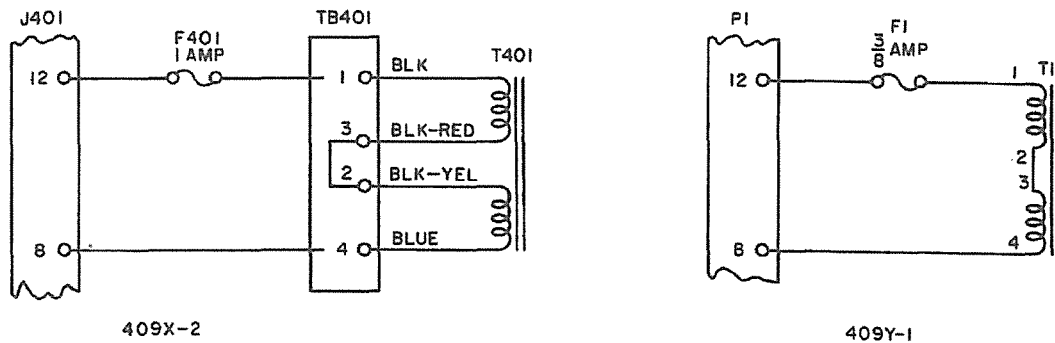


Figure 2-12. 409X-2 and 409Y-1 Power Supplies, Connections for 230-Volt A-C Input

TABLE 2-1. POWER REQUIREMENTS

NO. 1 CIRCUIT				NO. 2 CIRCUIT			
UNIT	QTY	PLATE CURRENT (ma)	FIL CURRENT (amp)	UNIT	QTY	PLATE CURRENT (ma)	FIL CURRENT (amp)
356A-1	4	30	1.2	356A-1	6**	45	1.8
356B-1	1	77*	1.2	356B-1	1***	77	1.2
356B-1	1	88	1.2	VU METERS	2	--	0.6
TOTAL		195	3.6	TOTAL		122	3.6
Individual Unit Power Requirements							
356A-1		7.5 ma (300 v d-c)		0.3 amp (6.3 v a-c)			
356B-1		77 ma (+30 dbm) 88 ma (+39 dbm)		1.2 amp (6.3 v a-c)			
356E-1		72 ma		1.55 amp (6.3 v a-c)			
VU meter				0.3 amp (6.3 v a-c)			
274K-1				0.55 amp (12 v d-c)			
Individual Power Supply Rating							
409X-2		250 ma 6.0 amp 1.0 amp		300 v d-c 6.3 v a-c 12 v d-c			
409Y-1		100 ma 3.0 amp		300 v d-c 6.3 v a-c			
*If 356E-1 is used for channel one program amplifier, the total no. 1 circuit requirement is 190 ma plate and 3.95 amp filament.							
**Six 356A-1 Preamplifiers are the maximum number of preamplifiers used in the complete circuit at one time. When a 356A-1 Preamplifier is used as a booster in the channel 2 program circuit, the 356A-1 Preamplifier is omitted from the monitor circuit.							
***If a 356E-1 is used for channel two program amplifier, the total power requirement is 117 ma plate and 3.95 amp filament.							



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TABLE 2-2. CONNECTIONS TO TERMINAL STRIP TB101

LINE	TERMINAL NUMBER	LINE	TERMINAL NUMBER
Low-Level Input Line 1	1 and 2	Monitor	49 and 50
Low-Level Input Line 2	3 and 4	Cue	51 and 52
Low-Level Input Line 3	5 and 6	Ext Input	53 and 54
Low-Level Input Line 4	7 and 8	VU	55 and 56
Low-Level Input Line 5	9 and 10	Output Line 2	57 and 58
Low-Level Input Line 6	11 and 12	Output Line 1	59 and 60
Low-Level Input Line 7	13 and 14	-12 Volts	61
Low-Level Input Line 8	15 and 16	+12 Volts	62
Low-Level Input Line 9	17 and 18	Ground	63
Low-Level Input Line 10	19 and 20	Mute	64
Low-Level Input Line 11	21 and 22	B+ (No. 2 Circuit)	65
Low-Level Input Line 12	23 and 24	B+ (No. 1 Circuit)	66
Low-Level Input Line 13	25 and 26	B-	67 and 68
Ground	27	Mixer 1 Warning Light Control	69
Remote Line 1 (A)	28 and 29	Mixer 2 Warning Light Control	70
Remote Line 2 (A)	30 and 31	Mixer 3 Warning Light Control	71
Remote Line 3 (B)	32 and 33	Mixer 4 Warning Light Control	72
Remote Line 4 (B)	34 and 35	Mixer 5 Warning Light Control	73
Remote Line 5 (C)	36 and 37	Mixer 6 Warning Light Control	74
Remote Line 6 (C)	38 and 39	Mixer 7 Warning Light Control	75
Not Used	40	Not Used	76
Remote Line 7 (D)	41 and 42	6.3 Volts A-C (No. 2 Circuit)	77
Remote Line 8 (D)	43 and 44	6.3 Volts A-C (No. 1 Circuit)	78
Not Used	45 and 46	6.3 Volts A-C (No. 2 Circuit)	79
Not Used	47 and 48	6.3 Volts A-C (No. 1 Circuit)	80

## 2.3 MODIFICATION AND INITIAL ADJUSTMENTS.

### 2.3.1 GENERAL.

Initial adjustments of the 212E-1 Broadcast Console consist of input and output impedance selection, gain level selection of the 356B-1 Program/Monitor Amplifiers, and d-c voltage adjustment of the 409X-2 Power Supply.

### 2.3.2 SELECTION OF IMPEDANCES.

The 356A-1 Preamplifiers are factory wired for input impedance of 150 ohms and output of 600 ohms. When the 356A-1 Preamplifier is used as a booster or cuing amplifier, its input must be rewired for 250 or 600 ohms impedance, respectively, as shown in figure 2-6 or 2-13. For other input or output impedances, refer to terminal connections indicated in the 356A-1 Preamplifier Instruction Book.

The 356B-1 Program/Monitor Amplifier is factory wired for 600-ohm input and output impedances. For other desired input or output impedances, refer to the 356B-1 Program/Monitor Amplifier Instruction Book.

### 2.3.3 GAIN ADJUSTMENTS.

#### 2.3.3.1 356B-1 PROGRAM/MONITOR AMPLIFIER.

If the 356B-1 Program/Monitor Amplifier is to be used as a program amplifier, 56 db gain is required, and the gain selection switch (S301) on the right front cover of the chassis (near P301) should be operated to the LOW position. If the 356B-1 is to be used as a monitor amplifier, the switch should be operated to the HIGH position to provide 68 db gain.

**2.3.3.2 356A-1 PREAMPLIFIER.** The gain of the 356A-1 Preamplifier may be increased by reducing the amount of feedback in the amplifier circuit. As supplied, the 356A-1 has an over-all gain of 40 db and approximately 28 db of feedback. With no feedback, it would have 68 db gain. The feedback may be reduced when used as a cuing amplifier by using a resistance divider connected across the output transformer feedback winding. A typical example is shown in figure 2-7. The gain of the amplifier with this modification is 50.5 db, with distortion of less than 1%. The 356A-1 is rated at +18 dbm output; however, the level may be raised to approximately +23 dbm (200 mw) before clipping occurs.

#### 2.3.4 ADJUSTMENT OF 300 VOLTS D-C OUTPUT FROM 409X-2 POWER SUPPLY.

A screw driver adjustment, R401, on top of the 409X-2 Power Supply chassis varies the d-c output voltage. Adjust R401 until the output voltage is 300 volts d-c.

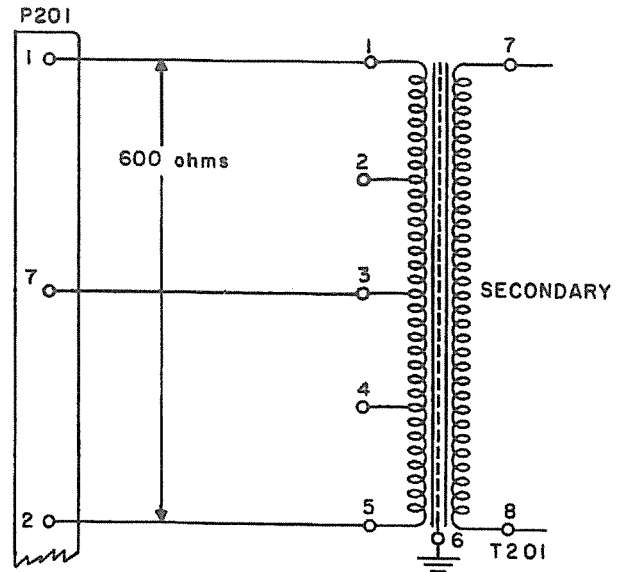


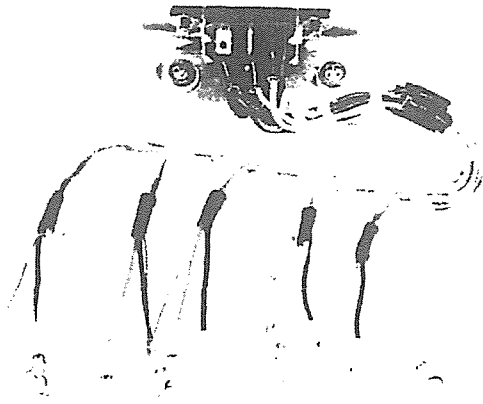
Figure 2-13. 356A-1 Preamplifier, Connections for 600-Ohm Input

### 2.3.5 INITIAL ADJUSTMENTS FOR USE OF 356E-1 LIMITER AMPLIFIER.

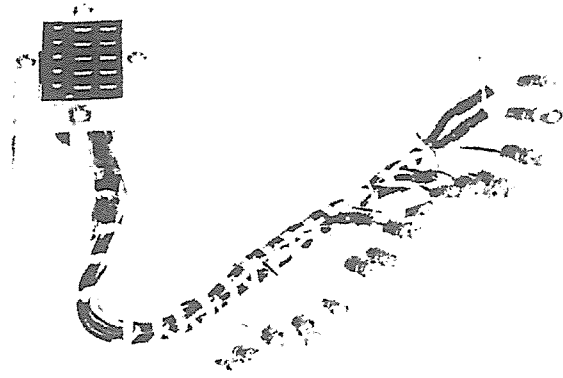
The following steps outline initial adjustments of the 356E-1 Limiter Amplifier for a 3-to-1 compression ratio:

- Plug the 356E-1 Limiter Amplifier into J109 or J111.
- Adjust the 409X-2 Power Supply output for 300 volts d-c.
- With no input to the amplifier, make the adjustments of steps d. through f.
- Set the VU METER INPUT switch to GR1, channel 1 position, and adjust the zeroing potentiometer, R192, for a 0 reading on the GR meter. If a 356E-1 Limiter Amplifier is used in channel 2, adjust R19J with VU METER INPUT switch in GR2 position.
- Adjust R162 for 23.5 volts at the test jacks located on the 356E-1 Limiter Amplifier.
- Repeat step e. after 30 minutes warmup.
- Set S601 at average.
- The GR meter and amplifiers now are ready to use. The GR meter will read the level of the input signal above the threshold in the GR positions. With the equipment adjusted as in step g., the 356E-1 Limiter Amplifier will operate according to steps i. through k.

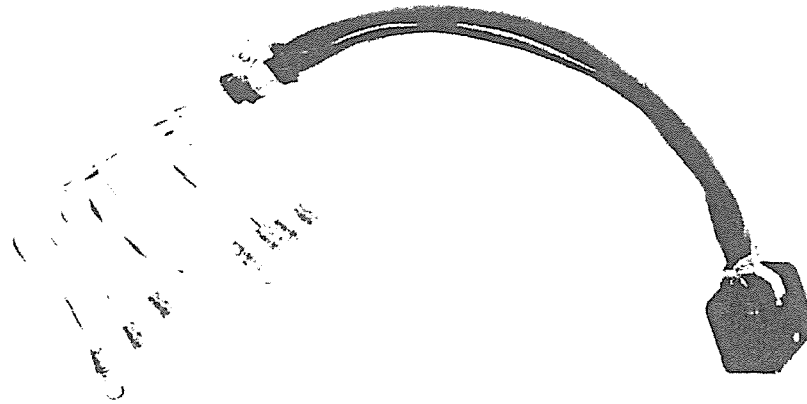
SECTION II  
Installation and Adjustment



RELAY UNIT CABLE NO.1



RELAY UNIT CABLE NO.2



POWER SUPPLY CABLE

Figure 2-14. Power Supply and Relay Unit Cables

i. All signals below threshold (-44 VU) applied to the input of the 356E-1 Limiter Amplifier will be amplified uniformly.

j. All signals above threshold will be limited at a 3-to-1 compression ratio. For every 3 VU rise in input above the threshold level, the output level will increase 1 VU.

**NOTE**

Levels are specified in VU, implying a complex wave, such as a program waveform with high peaks. The peaks usually are assumed to be about 10 db above the sine wave peak. When testing with a sine wave input, it is normal to test at a level 10 db higher than normal VU level.

With a signal level 10 db higher than normal level, the CHANNEL 1 VU meter in the 212E-1 will be pinned. When testing at higher levels, disable the CHANNEL 1 VU meter by disconnecting one side to M101 or R210. Zero dbm is a power level of 1 milliwatt in 600 ohms.

k. The desired amount of system limiting may be obtained by adjustment of the 356E-1 Limiter Amplifier. The average signal level may be maintained at threshold or above threshold according to the operator's preference. Table 2-3 gives typical values of the input, output, and program line levels based on a 3-to-1 compression ratio, a 6-db line pad, and a 356E-1 Limiter Amplifier with 54 db gain.

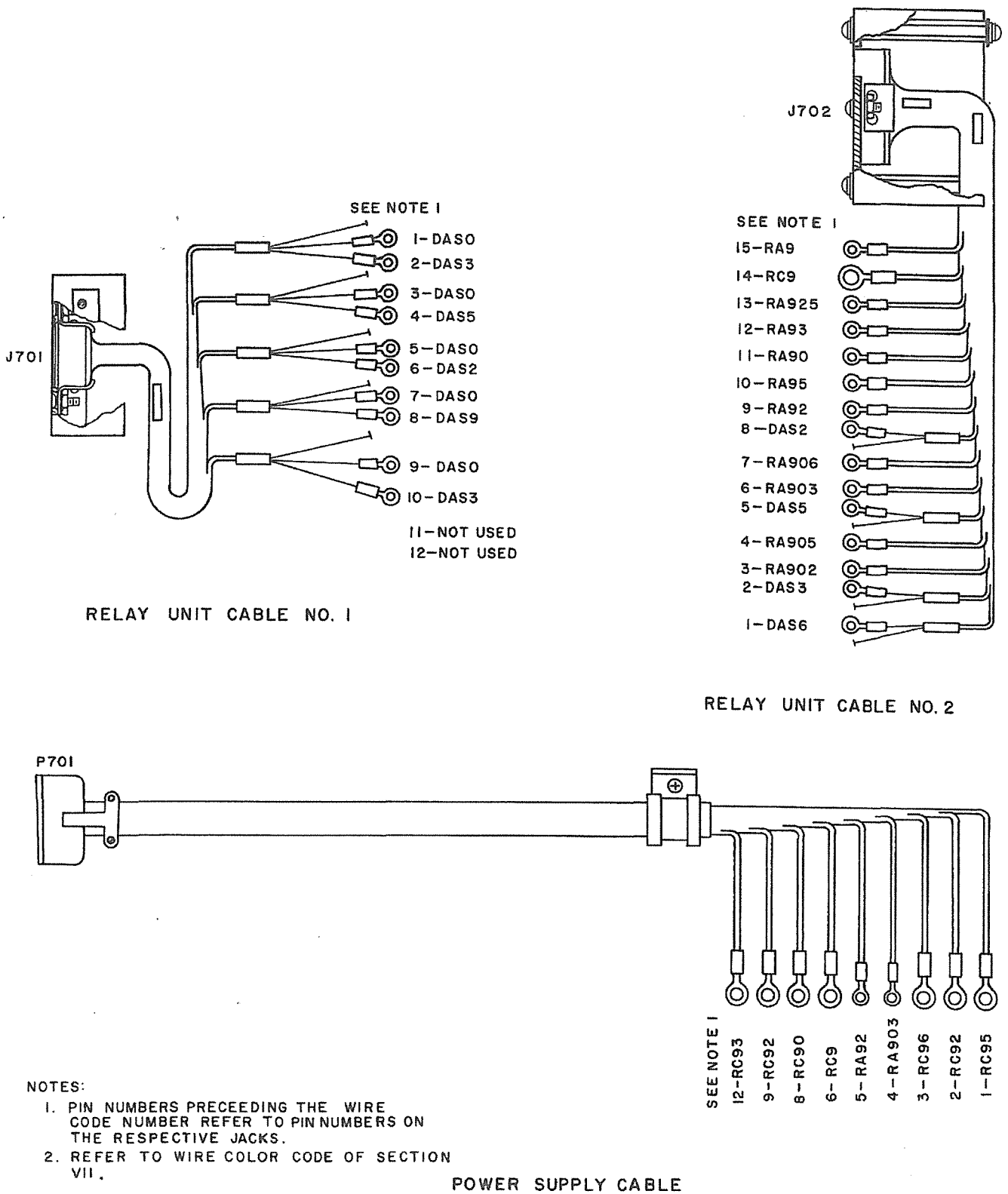


Figure 2-15. No. 1 and No. 2 Relay Unit Cables and Power Supply Cable

SECTION II  
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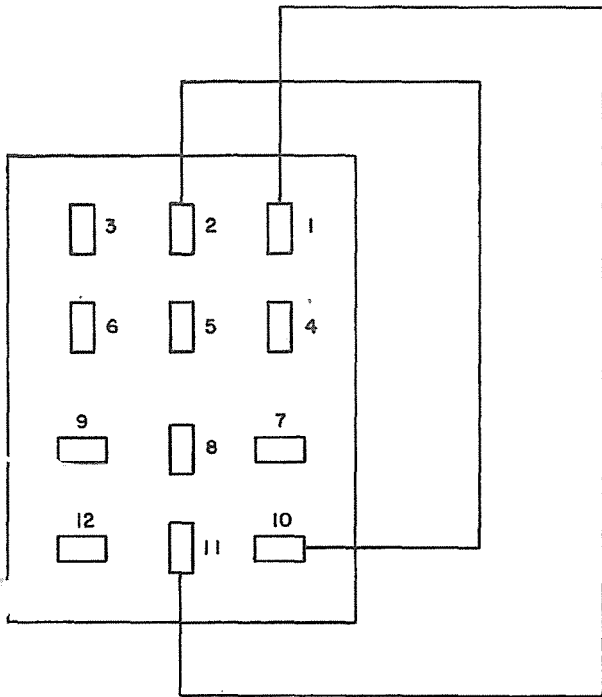


Figure 2-16. Jumper Plug Wiring Schematic

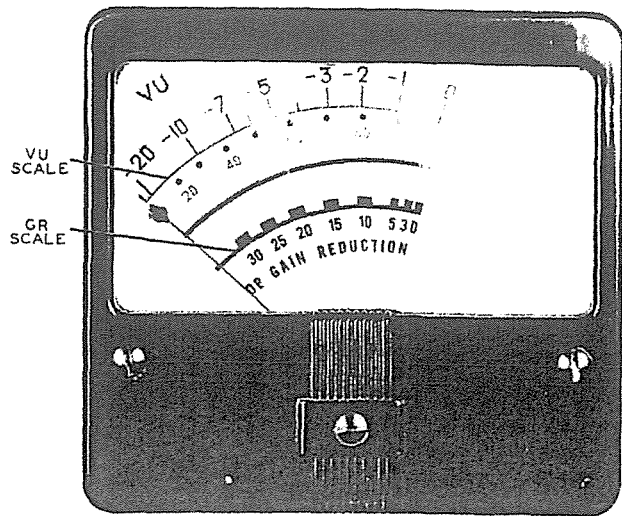


Figure 2-17. VU - GR Meter

NOTE

The GR scale on M102 (refer to figure 2-17) is calibrated for a 3-to-1 compression ratio. Correction should be made for other ratios.

TABLE 2-3. LINE LEVELS

INPUT TO 356E-1 (VU)	OUTPUT LEVEL 356E-1 (VU)	LINE LEVEL (VU)
-44*	+10	+4
-39	+11.5	+5.5
-34	+13	+7
-30-2/3	+14	+8
-29	+14.5	+8.5
-24	+16	+10

\*Threshold Conditions: 3-to-1 ratio, 6-db line pad, and 54-db gain.

NOTE

The VU meter in channel 1 as shipped will indicate 0 VU at +14 VU channel 1 program amplifier output. If it is desired to change the operating level of the 356E-1, the VU meter pad must be modified.

2.3.6 MONITORING EXTERNAL CIRCUIT LEVELS WITH CHANNEL 2 VU METER.

External signal levels may be monitored by connecting the circuit to be metered at terminals 55 and 56 of TB101.

2.3.7 RESISTOR VALUES FOR FIXED PADS.

The VU meter, M101, and its pad are connected to the program line between the program amplifier and LINE switch S126. A 6-db pad in each line provides isolation between the program amplifier and the output lines. The line 1 pad consists of resistors R196, R197, R198, R199, and R200. The line 2 pad is made up of resistors R201, R202, R203, R204, and R205. A 7500/3900-ohm pad made up of resistors R209, R210, and R211 serves as a meter multiplier. As shipped, VU meter M101 will indicate 0 VU at a program level of +8 VU, which normally is a standard level for program lines. With a +8 VU level at the program line, the program amplifier output level is +14 VU. The meter pad consisting of R209, R210, and R211 has a 10-db loss which provides +4 VU at the meter terminals. A level of +4 VU will indicate 0 VU on the meter (minimum value). The pad resistors are located on TB102 which is mounted on the rear of the front panel above meters M101 and M102.

If a program line level other than +8 VU is used, the pads must be modified. Table 2-4 gives selected resistor values for VU meter pads. Only calculated values of resistance are shown, but the nearest standard value of resistance may be substituted without seriously affecting the attenuation through the pad. The level given is the level at the output of the program amplifier and is higher than the program line level by the decibel attenuation in the line pad. A typical example would be a desired program line level of +4 VU and a line pad of 6 db. The level at the output of the program amplifier will be +10 VU and resistor values for the meter pad will be R209, 4896 ohms; R210, 1296 ohms; and R211, 5221 ohms. Other typical resistor values for pads are shown in figure 2-18.

NOTE

Above levels are specified in VU, implying a complex wave, such as a program waveform with high peaks. It usually is assumed that the peaks are 10 db above the sine wave peak. When testing with a sine wave input, it is normal to test at a level 10 db higher than normal level. At this 10-db higher level, the 212E-1 CHANNEL 1 VU meter, M101, will be pinned if it is left in the circuit. When testing at higher levels, disable VU meter M101 by disconnecting it or one end of R210. The VU ATTENUATOR should be set 10 db higher than normal for metering of channel 2.

A resistor kit is included in the cloth bag tied to the front of the console. This kit can be used to make pads to change the channel 1 level to plus 6 VU or plus 10 VU. The following resistors are included in the kit:

Collins Part No.	Value (ohms)
745-1361-00	1000
745-1364-00	2000
745-1368-00	2400
745-1375-00	3600
745-1382-00	5100
745-1385-00	6200

TABLE 2-4  
METER PAD RESISTOR VALUES

VU Level for 0 VU on Meter	R209	R210	R211
18	6203	2603	1620
16	5934	2334	2091
14	5926	2026	2741
12	5279	1679	3690
10	4896	1296	5221
8	4482	882	8177
6	4047	447	16788
4	3600	0	Open

2.3.8 SUGGESTED FUNCTION FOR S125 SPARE SWITCH.

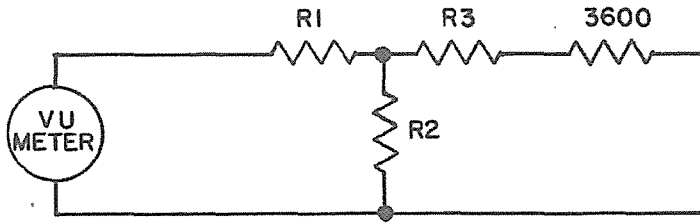
Unused contacts on the SPARE switch, S125, may be wired for switching the following functions:

- a. Override.
- b. Tape recorder.
- c. Headphones.
- d. VU meter.
- e. Auxiliary input or output circuits.

2.3.9 SUGGESTED SPEAKER AND WARNING LIGHT CONTROL CIRCUIT MODIFICATIONS.

A simplified schematic of the speaker and warning light control circuits is shown in figure 4-7. Mixer

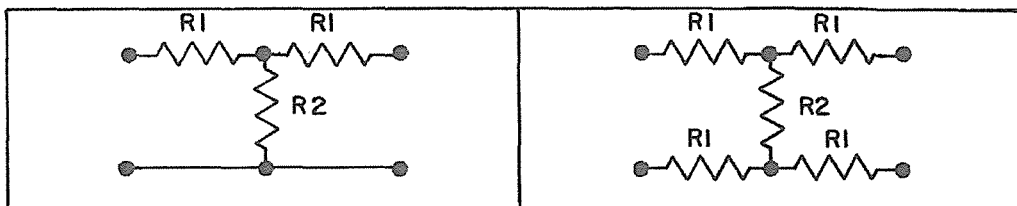
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RESISTANCE VALUES IN OHMS				
LEVEL TO BE METERED	PAD LOSS FOR 0 VU READING	R 1	R 2	R 3
+ 4 DBM	0	0	OPEN	0
+10DBM	6DB	1296	5221	1296
+32DBM	28DB	3601	311	3601
+39DBM	35DB	3764	139	3764

A. RESISTANCE VALUES FOR VU METER PADS

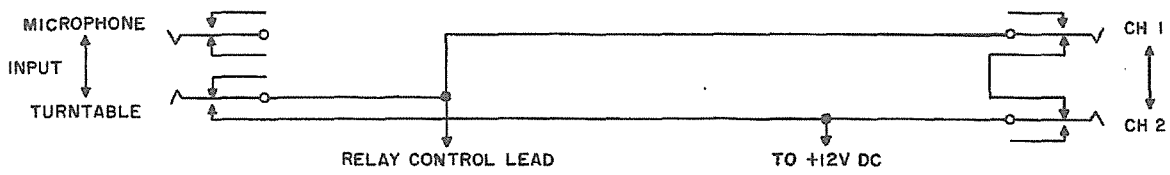
600 OHM PADS



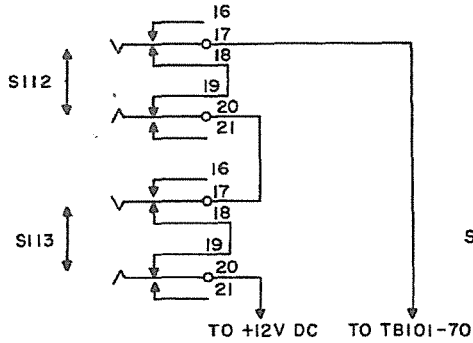
LOSS IN DB	R1 IN OHMS	R2 IN OHMS	R1 IN OHMS	R2 IN OHMS
0	0	OPEN	0	OPEN
3	103	1703	51.3	1703
6	199	803	98	803
10	312	422	156	422
15	419	220	209	220
20	490	121	245	121

B. RESISTOR VALUES FOR 600 OHM PADS

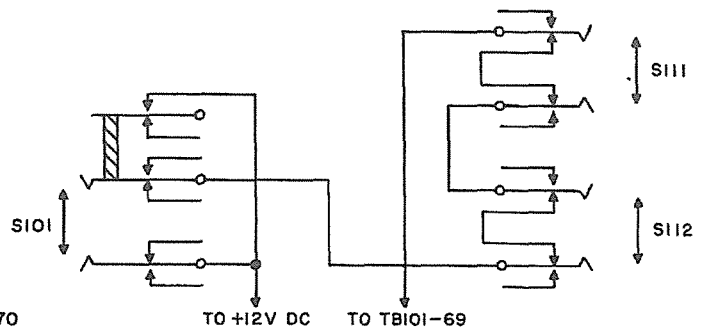
Figure 2-18. Resistor Values for Fixed Pads



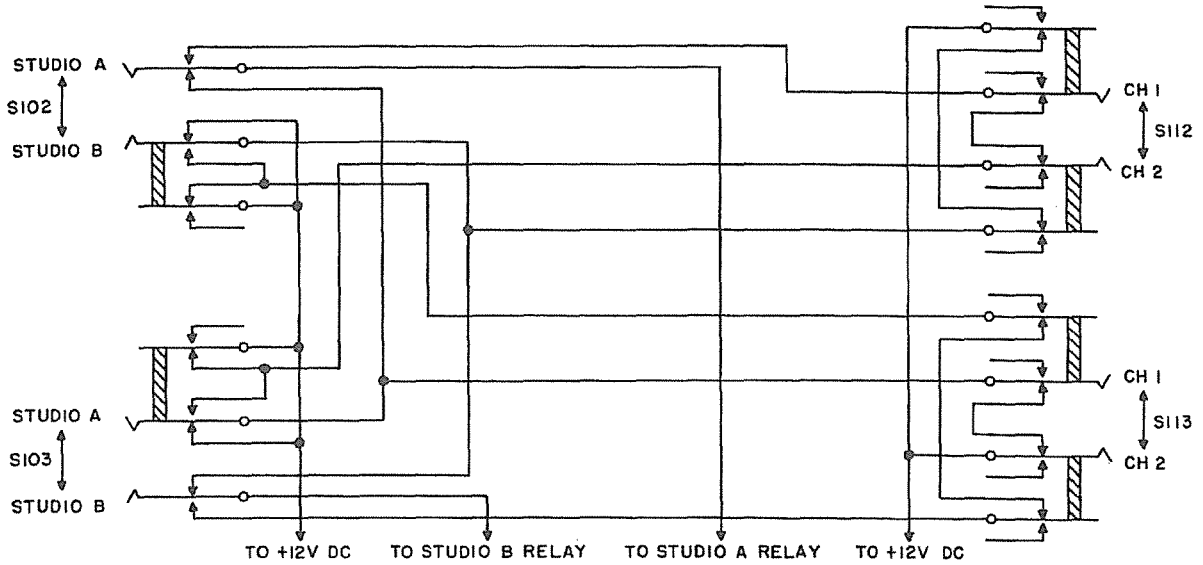
(A). MIXER WIRED FOR MICROPHONE AND TURNTABLE INPUTS.



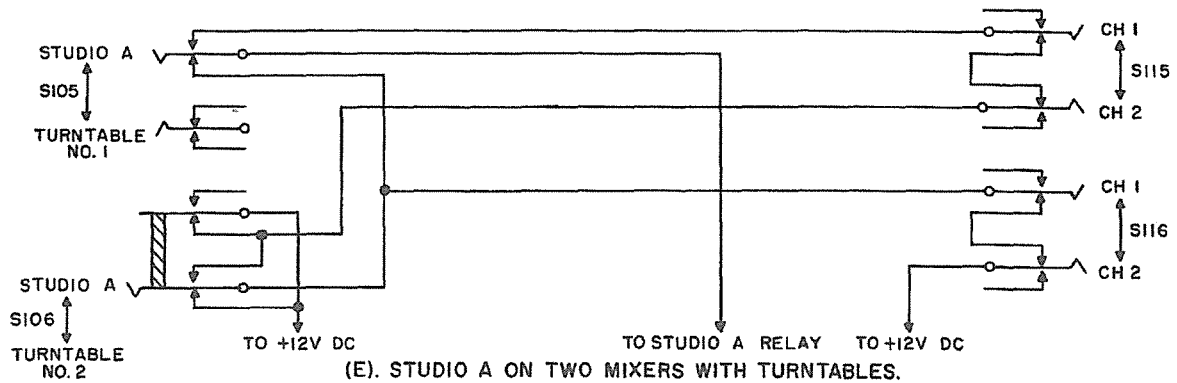
(B). MIXER NO.2 AND NO.3 WIRED TO OPERATE THE SAME SPEAKER-LIGHT RELAY.



(C). MIXER NO.2 WIRED FOR A SECOND CONTROL ROOM MICROPHONE FOR PROGRAM OR AUDITION.



(D). TWO STUDIOS ON TWO MIXERS.



(E). STUDIO A ON TWO MIXERS WITH TURNTABLES.

Figure 2-19. Suggested Speaker and Warning - Light Control Circuit Modifications



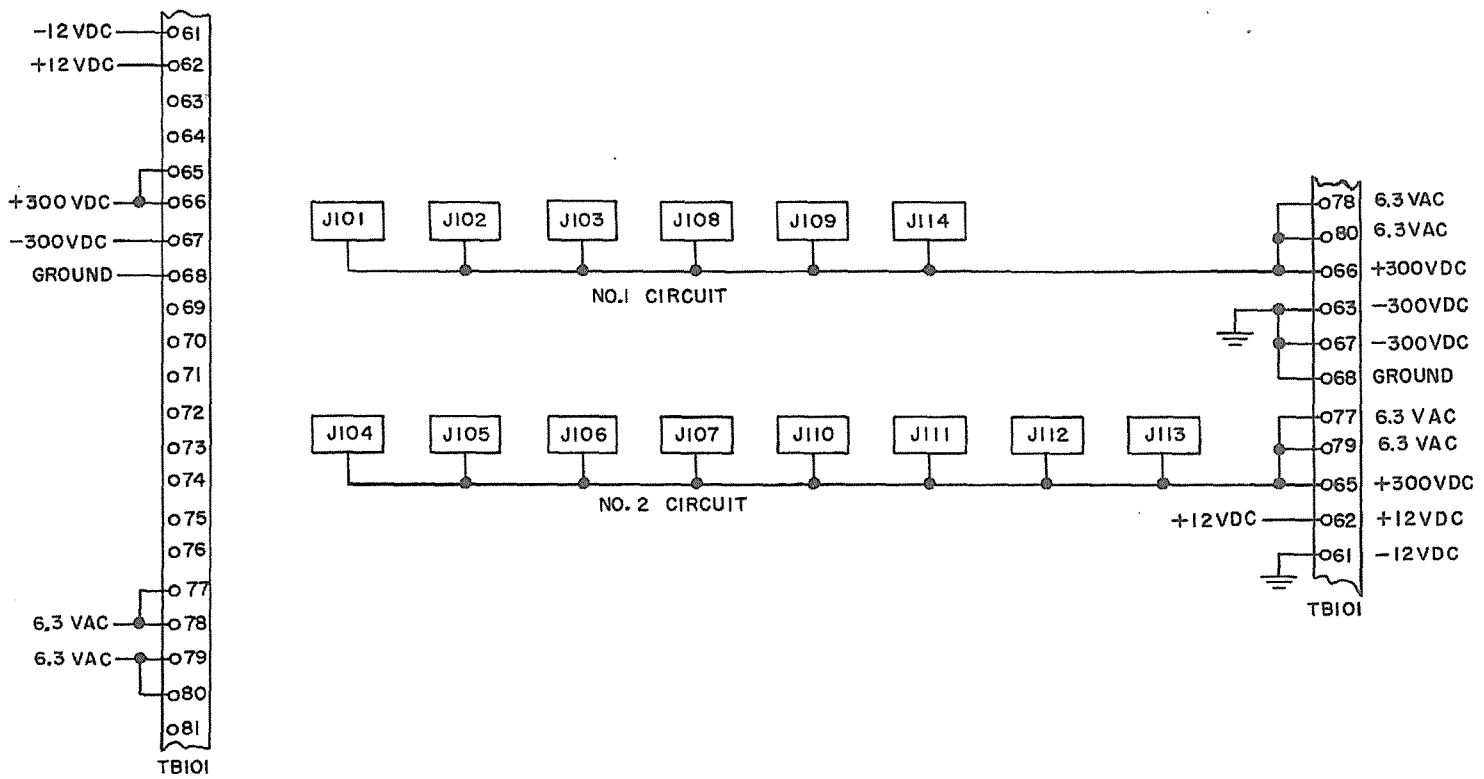


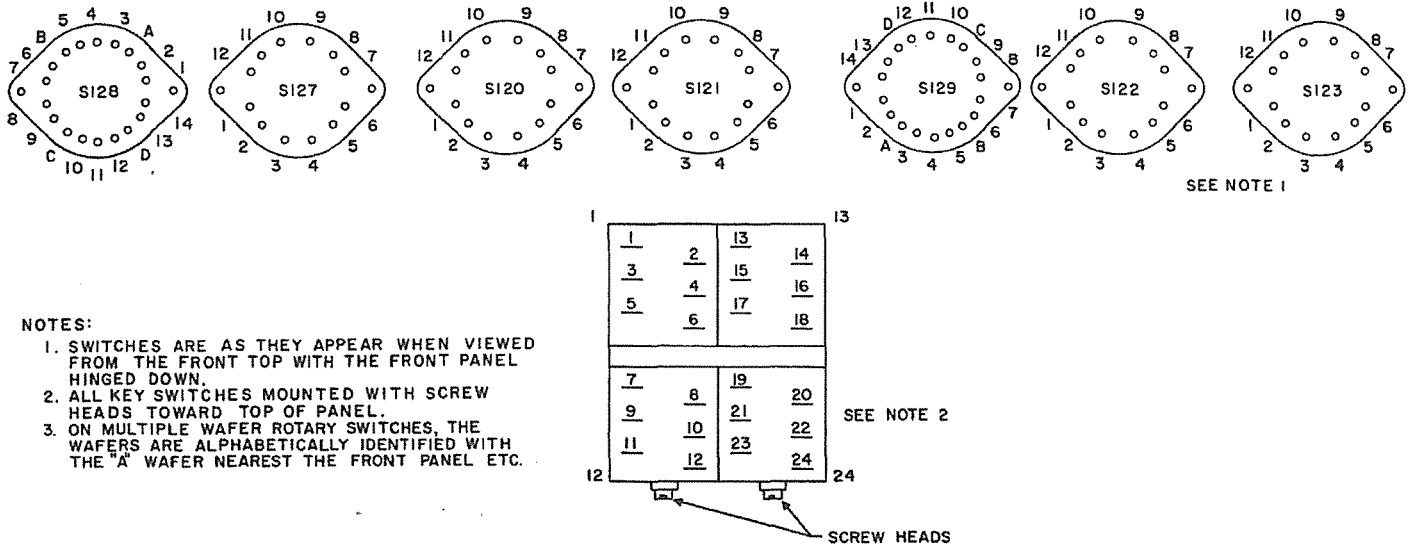
Figure 2-20. 212E-1 Broadcast Console, Power Distribution

key switch S101 and channel key switches S111 through S117 control application of 12 volts d-c to relays located in the 274K-1 Relay Unit. Mixer circuit wiring may be modified easily for specific station applications. Refer to figure 2-19 for suggested circuit modifications. Circuit (a) shows a mixer wired for microphone and turntable inputs. Circuit (b) shows a mixer no. 2 and no. 3 rewired to operate one speaker-light relay. Circuit (c) shows mixer (a) modified for a second control room microphone to be used for program or audition. Circuit (d) shows two studios wired on two mixers. Circuit (e) shows warning light relay wiring for studio A on two mixers with turntables. Individual volume level controls should be connected at each speaker.

2.3.10 MONITOR INPUT SWITCH (S128).

The MONITOR INPUT switch can be used to mute studio speakers in CUE or TB REMOTE positions. When the

switch is set at CUE or TB REMOTE, 12 volts d-c is provided at TB101 terminal 64. This voltage can be used to operate relays which will mute (silence) the studio speakers without operating the studio warning lights. The relays should be wired to disconnect the speakers and load the line when operated. If you want to mute the studio speakers on CUE or TB REMOTE and will disregard studio light operation, remove the jumper connections indicated in figure 4-4. With these jumpers removed, the studio speaker will be muted and ON AIR lights turned on when the switch is set at CUE or TB REMOTE. The monitor amplifier may be connected to an external circuit by placing the MONITOR INPUT switch in the EXT position. The line to be monitored should be connected at terminals 53 and 54 of TB101. Terminals 53 and 54 should be terminated with a 600-ohm resistor when not used. If an unbalanced input is used, connect the ground lead to terminal 54.



NOTES:

1. SWITCHES ARE AS THEY APPEAR WHEN VIEWED FROM THE FRONT TOP WITH THE FRONT PANEL HINGED DOWN.
2. ALL KEY SWITCHES MOUNTED WITH SCREW HEADS TOWARD TOP OF PANEL.
3. ON MULTIPLE WAFER ROTARY SWITCHES, THE WAFERS ARE ALPHABETICALLY IDENTIFIED WITH THE "A" WAFER NEAREST THE FRONT PANEL ETC.

Figure 2-21. 212E-1 Broadcast Console; Switch Pin Orientation

## SECTION III OPERATION

### 3.1 CONTROL FUNCTIONS.

#### 3.1.1 MIXER.

The nine mixer controls are located near the lower edge of the front panel of the 212E-1 Broadcast Console. The attenuators are identified as MIXER 1 through MIXER 7, REMOTE 1, and REMOTE 2. To the right of each mixer control knob is located a channel 1 or channel 2 selector switch. Each switch is color coded to identify it with an associated mixer control knob. The designation of these mixers are silk screened on the front panel and covered by Plexiglas. The Plexiglas can be removed and other designations inserted on paper strips. These controls adjust the signal levels fed to the program lines. MIXERS 5 through 7 and REMOTE 1 and 2 are provided with cue positions.

#### NOTE

Mixers should not be set in cue position (extreme counterclockwise) except when this function is in use.

#### 3.1.2 MIXER SELECTOR SWITCHES.

The switches are identified as MIXER 2 through MIXER 7 and REMOTE A through REMOTE D. The key switches are arranged across the top of the panel

and are color coded to match their companion mixer controls. A spare key switch is provided on the right side of the panel to be used as desired in any custom wiring addition. MIXER 2 through MIXER 7 switches select one of two low-level input lines to be fed to the preamplifiers. REMOTE A, B, C, or D line switches select one of two remote lines to be fed to REMOTE A, B, C, or D function switches for program, audition, or monitoring. The panel designations for these switches are on paper strips covered by Plexiglas. These strips may be removed and desired designations inserted.

#### 3.1.3 GAIN CONTROLS.

The MONITOR gain control is located at the center of the left end of the panel directly above MIXER 1 control. The MASTER 1 and MASTER 2 gain controls are located at the center of the right end of the panel directly above the remote mixer controls. The MONITOR gain control adjusts the input level to the monitor amplifier, and the MASTER 1 and MASTER 2 gain controls adjust the input level to the program amplifiers.

#### 3.1.4 REMOTE FUNCTION SELECTOR SWITCHES.

The remote function selector switches are identified as REMOTE A, REMOTE B, REMOTE C, and REMOTE D. REMOTE switches A and B are located above MIXER 3 and REMOTE switches C and D above MIXER 7. Each has OFF, MONITOR, CUE, and MIX positions.

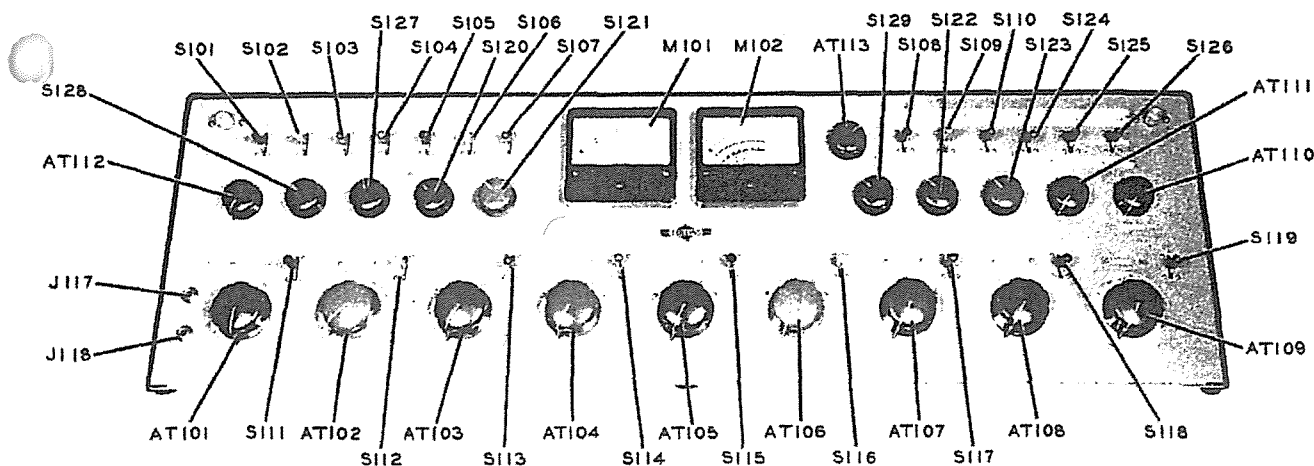


Figure 3-1. 212E-1 Broadcast Console, Control Locations

When both of the function switches associated with a particular mixer are set at OFF, the mixer is out of the circuit. When any switch is in the MONITOR position, its remote line may be monitored by phones connected at the MONITOR jack. When one of the switches is in CUE position, the cuing signal from monitor amplifier may be fed back into the remote line. When any switch is in the MIX position, the signal from an associated remote line may be mixed into either of the program channels.

#### NOTE

Remote mixers should not be set in the CUE position except when this function is in use.

#### 3.1.5 MONITOR INPUT SWITCH.

The MONITOR INPUT switch is located above the MIXER 1 attenuator. It has seven positions (EXT, CH 1, CH 2, CUE, TB REMOTE, TB STUDIO, and AUD). When the MONITOR INPUT switch is in the off position, no signal is connected to the monitor amplifier input. In the EXT position, a signal connected at terminals 53 and 54 of TB101 may be monitored. When the switch is in CH 1 or CH 2 position, the indicated program line is connected through a bridging pad to the MONITOR level control and monitor amplifier input. Placing the switch in the CUE position and setting MIXER 5, MIXER 6, MIXER 7, REMOTE 1, or REMOTE 2 at cue (extreme counter-clockwise position) will remove the input signal from the mixer and connect it to the MONITOR level control and monitor amplifier input. The TB REMOTE and TB STUDIO positions allow talk-back with the control room microphone. The AUD position permits the MONITOR level control and monitor amplifier to be connected to the monitor booster amplifier and CHANNEL 2 bus.

#### 3.1.6 VU METER INPUT SWITCH.

The VU METER INPUT switch is located to the right of the CHANNEL 2 VU meter. It has seven positions (MON, CH 2, REMOTE 1, REMOTE 2, EXT, GR CH 1, and GR CH 2). In the MON, CH 2, REMOTE 1, REMOTE 2, and EXT positions, the VU METER INPUT switch connects the CHANNEL 2 VU meter, M102, and the VU ATTENUATOR to that particular circuit. If type 356E-1 Limiter Amplifiers are used, operation of the switch to GR CH 1 and GR CH 2 positions provides indication of the gain reduction in decibels above threshold.

#### 3.1.7 VU ATTENUATOR.

The VU ATTENUATOR is used to adjust the CHANNEL 2 VU meter, M102, to peak at zero for various indicated and desired levels. Always set the VU ATTENUATOR to OFF when not in use, and start at OFF when measuring unknown signal levels.

#### 3.1.8 MONITOR PHONE INPUT.

The MONITOR PHONE INPUT switch allows the MONITOR phone jack to be connected to either channel 2 output or remote phone circuits.

#### 3.1.9 LINE SWITCH.

The LINE switch, S126, permits switching LINE 1 to either CH 1 or CH 2 position. LINE 2 is switched to the other program channel at the same time. In the middle position, both channels are terminated in a resistive load. Figure 3-1 shows a simplified diagram of the switch and associated circuitry.

### 3.2 OPERATING PROCEDURES.

#### 3.2.1 ROUTINE OPERATION.

3.2.1.1 LOCAL PROGRAM ON THE AIR. To put local program on the air, channel 1, the following is a procedure for local studio operation:

- a. Choose the input lines desired with the mixer selector switches.
- b. Move mixer key switches as required to channel 1 position.
- c. Rotate MONITOR INPUT switch to CH 1 position.
- d. Set MASTER 1 to 24.
- e. Turn up MIXER 1, MIXER 2, or MIXER 3 as required, and adjust for desired microphone output balance.
- f. Adjust MASTER 1 gain control to desired level as indicated on CHANNEL 1 VU meter.
- g. Adjust the level of monitor speakers as desired by use of the MONITOR gain control.

3.2.1.2 AUDITION PROGRAM. To audition program, channel 2 may be used for audition when not being employed as a program channel.

- a. Select desired microphone inputs with the mixer selector switches.
- b. Move mixer key switches to channel 2 position.
- c. Turn up the corresponding mixer controls.
- d. Set the MONITOR INPUT to AUD.
- e. The audition may be heard over the monitor speakers. The level may be adjusted by means of the MONITOR gain control.

#### 3.2.2 REMOTE LINE OPERATION.

3.2.2.1 REMOTE PROGRAM ON THE AIR. To put remote program on the air, the following detailed

## SECTION IV Principles of Operation

operating procedures are necessary to put a remote line on the air:

- a. Set remote line switch to proper line.
- b. Set associated REMOTE (A, B, C, or D) function switch to MIX.
- c. Set remote mixer switch to desired program channel.
- d. Adjust remote mixer for proper level.

**3.2.2.2 FEED CUE SIGNAL AND SWITCH REMOTE LINE TO ON THE AIR.** To feed cue signal and switch remote line to on the air, set up as previously set for putting remote line on air except set remote function switch to CUE. The cue signal is then fed from the monitor amplifier through the function switch to the remote line. When the cue is sent, the control room

operator switches the remote function switch from CUE to MIX, and the remote line is on the air.

**3.2.2.3 TALK BETWEEN CONTROL ROOM OPERATOR AND REMOTE OPERATOR.** To talk between control room operator and remote operator, set controls as follows:

- a. Set remote line switch to proper line.
- b. Set REMOTE (A, B, C, or D) function switch to MONITOR.
- c. Set MONITOR INPUT switch to TB REMOTE.
- d. Set VU METER INPUT switch to REMOTE (1 or 2). To talk, control room operator sets the CR MIC switch to TB REMOTE and adjusts MONITOR attenuator for desired remote line level. To listen to the remote operator, the control room operator sets the CR MIC switch to MIX and adjusts MONITOR attenuator for speaker level.

## SECTION IV PRINCIPLES OF OPERATION

### 4.1 GENERAL.

A functional block diagram of a typical 212E-1 Broadcast Console is shown in figure 4-1. Amplifiers of the plug-in module type may be added, as necessary, to handle up to 9 of 21 possible inputs simultaneously and serve two output lines. Lever switches permit the selection of two possible sources for each of six of the low-level input attenuators. Each remote input attenuator may be switched to four possible sources. The output of each step type attenuator is connected to a key switch which can feed either of the two program lines when the console is used for dual operation. During normal single line program operation, the second channel can be used for audition purposes. Output from the two-stage 356A-1 Preamplifiers is passed through constant impedance attenuators before being switched to the program lines. Connections for control room speaker and warning lights must be interlocked with the first mixer key switch (MXER 1) and remote and cue functions to prevent program interruptions. Studio speakers can be interlocked with other mixer keys. The channel 1 line is monitored continually by VU meter M101. External circuit levels may be monitored on the CHANNEL 2 VU meter, M102. Cuing signals from cue positions on MIXERS 5, 6, 7, and REMOTE mixers 1 and 2 are available for headphone operation from TB101, terminals 51 and 52, when a jumper plug is used in J113. If a 356A-1 Preamplifier (wired for 600 ohms) is plugged into J113, the power level is sufficient for cue speaker operation. If a cue speaker is

used, a speaker level control should be provided. If desired, the cue signal may be amplified by the monitor amplifier by placing the MONITOR INPUT switch at CUE. The MONITOR level control will control speaker level when using the monitor amplifier for cuing. Program cuing signals may be taken from the audition circuits and amplified by the monitor amplifier. Studio speakers normally will be metered by operation of the MONITOR INPUT switch in cue or talk-back remote position. However, studio speakers may be wired to use external position. Typical signal levels are shown in figure 4-2.

### 4.2 MIXER CIRCUITS.

Refer to figures 4-1 and 7-1. Nine independent input circuits are provided. Seven are low-level microphone or transcription inputs each having an individual two-stage preamplifier. Two remote inputs may be selected from eight remote lines. The mixing circuits maintain the correct impedance relationship at all times, and the volume level in any specific circuit is independent of mixing and switching operations in other circuits. Attenuators AT101 through AT109 control the input levels to the mixing circuits. Each is a constant-impedance attenuator with 600:1200 impedance ratio. Resistors R125 through R160 compensate changes of impedance at the mixer bus when one or more of the mixers is out of the circuit. Mixer controls and terminating resistors introduce approximately 15 db minimum loss. Contacts on the mixer and channel key switches complete 12-volt d-c circuits

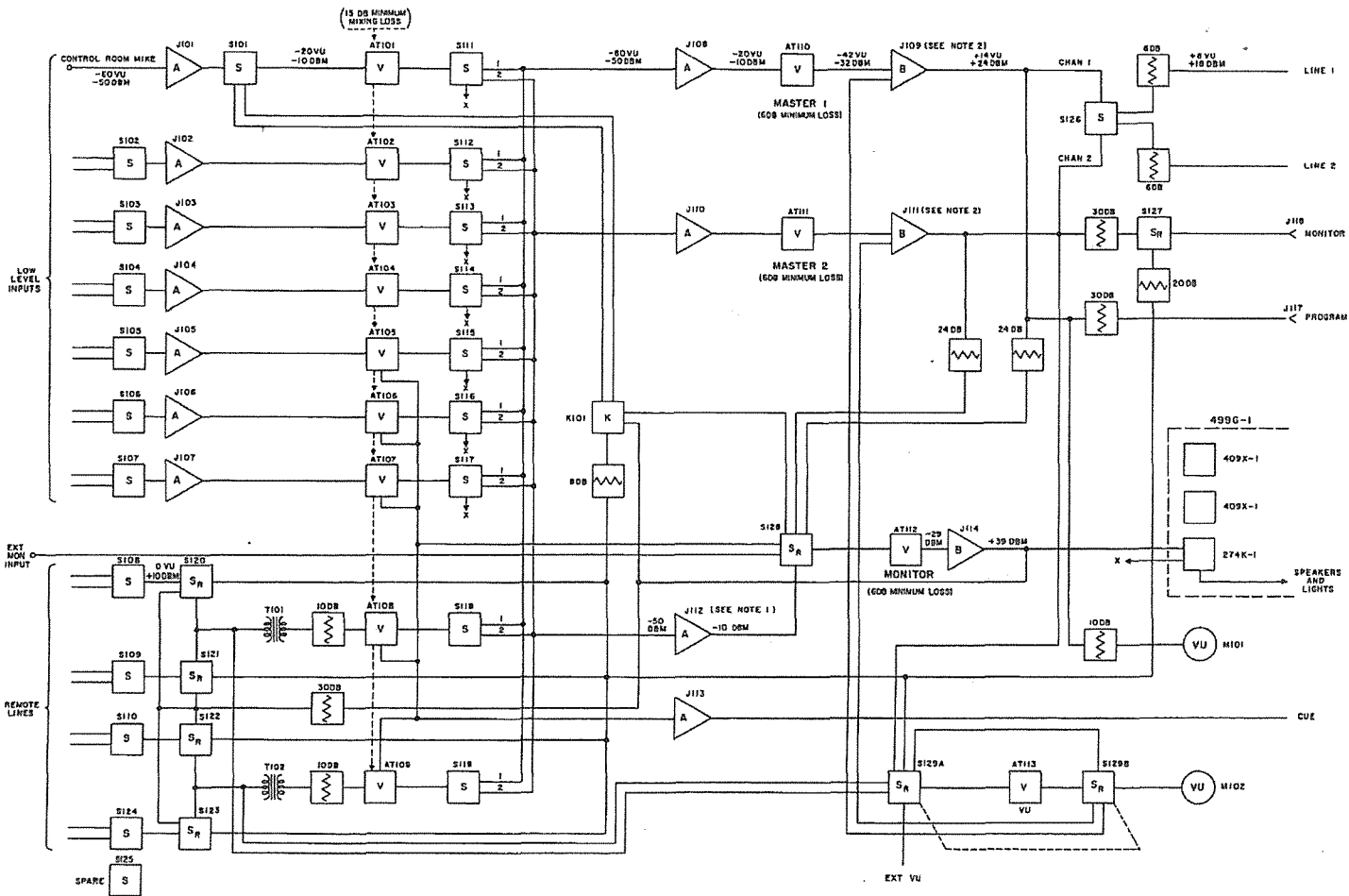


Figure 4-1. 212E-1 Broadcast Console, Functional Block Diagram

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Principles of Operation

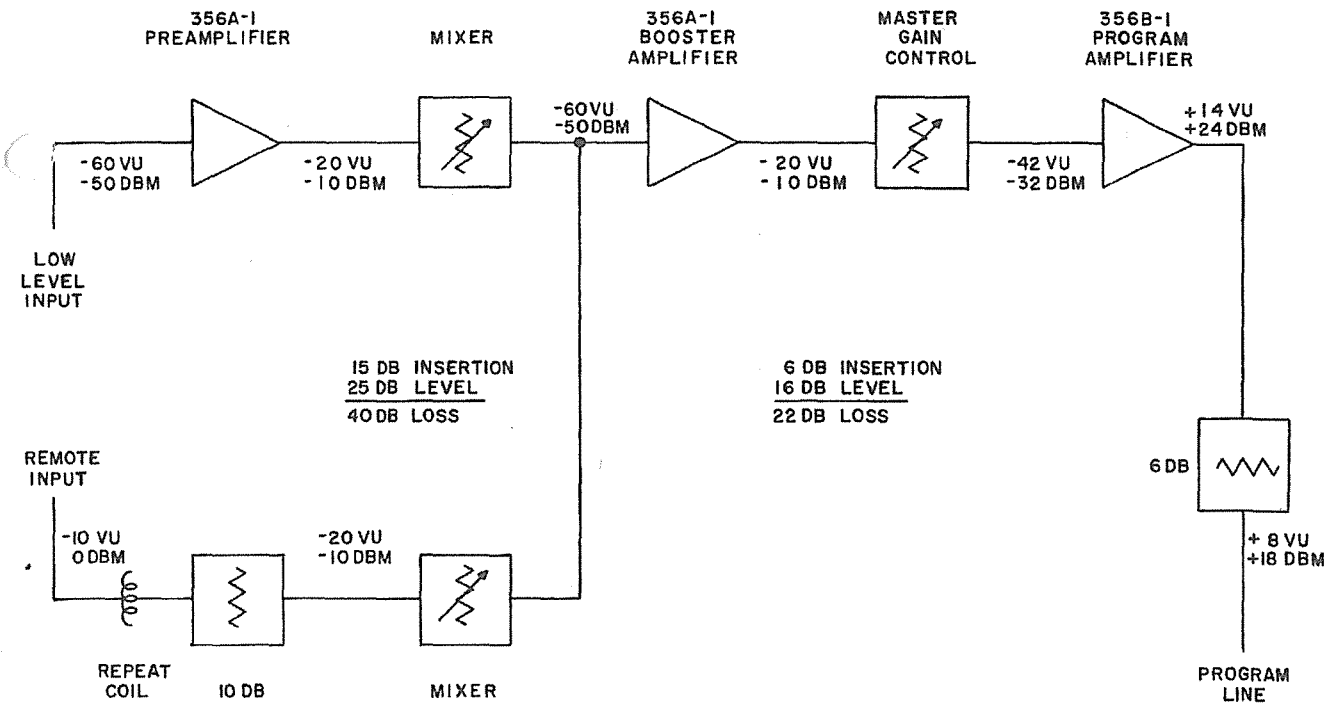


Figure 4-2. Typical Power Levels

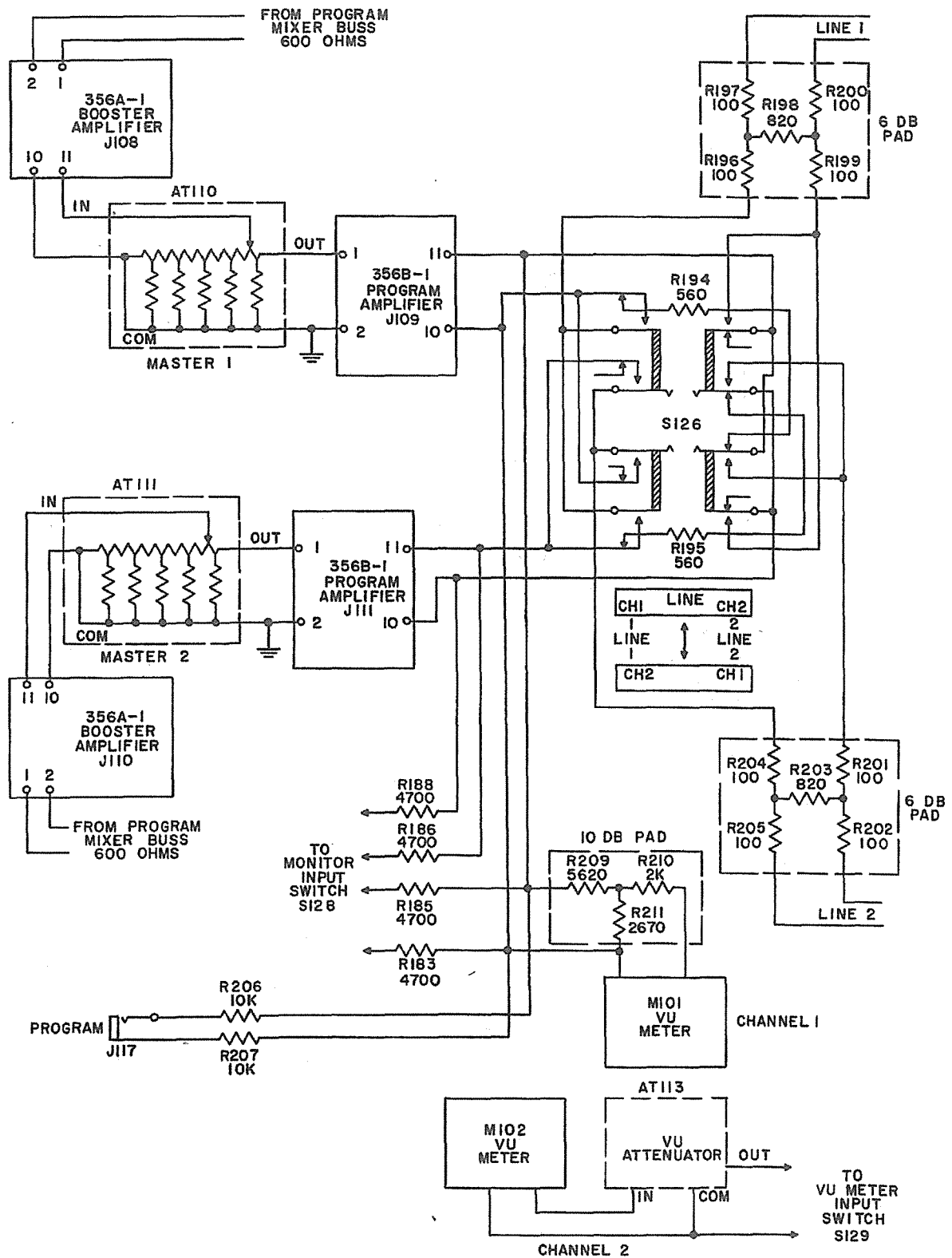


Figure 4-3. Program Circuits, Simplified Schematic Diagram



SECTION IV  
Principles of Operation

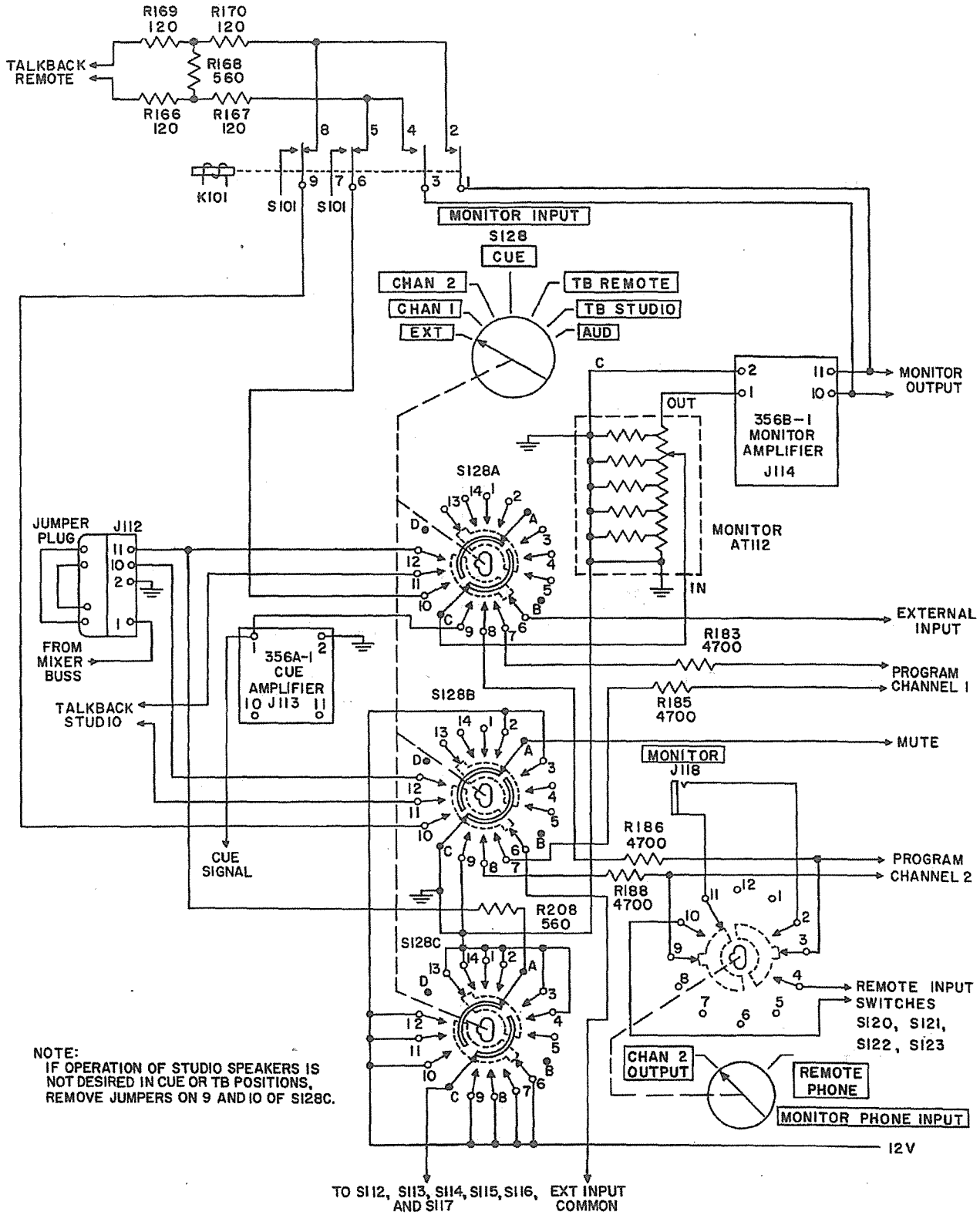


Figure 4-4. Monitor Circuits, Simplified Schematic Diagram

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to operate the speaker and warning light control relays K501, K502, K503, and K504. These circuits should be interlocked to prevent program interruption. Talk-back from the control room into any one of the studios or into the remote lines not in use is possible by key switch control.

4.3 PROGRAM CIRCUITS.

Refer to figures 3-1 and 4-3. Input signals connected into a particular program line by the channel key switches are applied to the input of the associated booster amplifier. The booster amplifier is a type 356A-1 with input terminals connected for 250 ohms impedance, as shown in figure 2-6. Channel 1 booster plugs into J108, and channel 2 booster amplifier plugs into J110. Output from the booster amplifiers is attenuated by MASTER 1 and MASTER 2 gain controls AT110 and AT111. Output from the program amplifier is isolated from the program lines by 6-db pads. The line 1 pad consists of resistors R196, R197, R198, R199, and R200. Resistors R201, R202, R203, R204, and R205 make up the 6-db pad for line 2. Nominal signal levels are -50 dbm at the input of the booster amplifier, -10 dbm at the output of the booster amplifier, -32 dbm at the input of the program amplifier, +24 dbm at program amplifier output, and +18 dbm at

program line. The signal from the output of the program amplifiers (+24 dbm) is connected through a LINE switch, S126, and a 6-db pad to the output line connections of the console. The program amplifier output also is applied through pads, to the MONITOR INPUT switch, S128, and the CH 1 PROGRAM phone jack, J117. The output of channel 1 program amplifier connects through a 10-db pad to VU meter (M101). The VU METER INPUT switch, S129, connects the CHANNEL 2 VU meter, M102, to monitor the output of the channel 2 program amplifier.

4.4 MONITOR CIRCUITS.

Refer to figure 4-4. The MONITOR INPUT selector (S128) has seven positions: EXT, CH 1, CH 2, CUE, TB REMOTE, TB STUDIO, and AUD. When the switch is in EXT position, a signal connected at terminals 53 and 54 of TB101 may be monitored. With the switch in CH 1 or CH 2 position, the respective program line may be monitored. In the cue position, cue signals from MIXER 5, MIXER 6, MIXER 7, REMOTE 1, or REMOTE 2 attenuators may be applied to the input of the monitor amplifier. The control room microphone may be used for remote line talk-back functions by placing the switch in TB REMOTE position. Typical circuit levels are shown

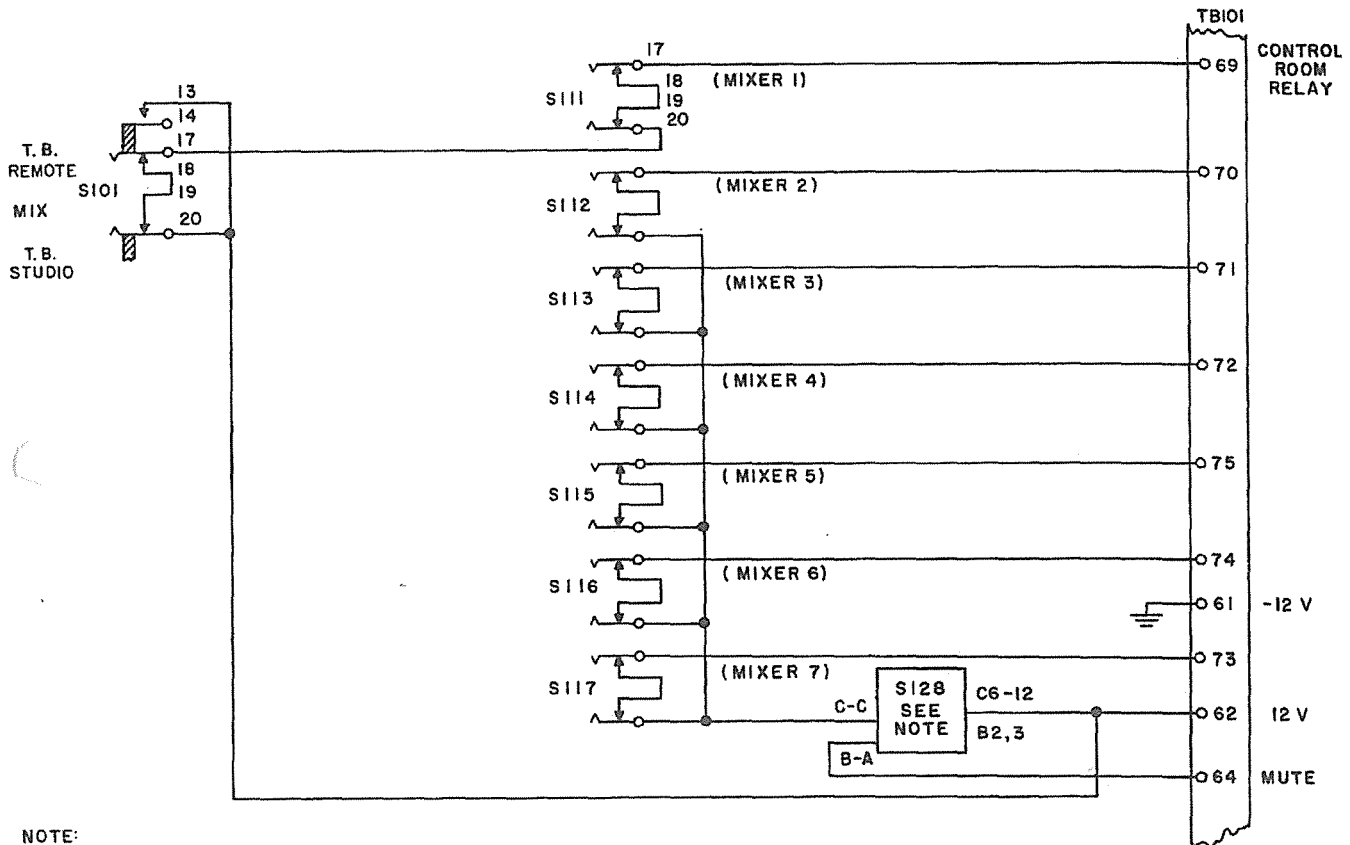


Figure 4-6. Mixer Switching Circuits, Simplified Schematic Diagram

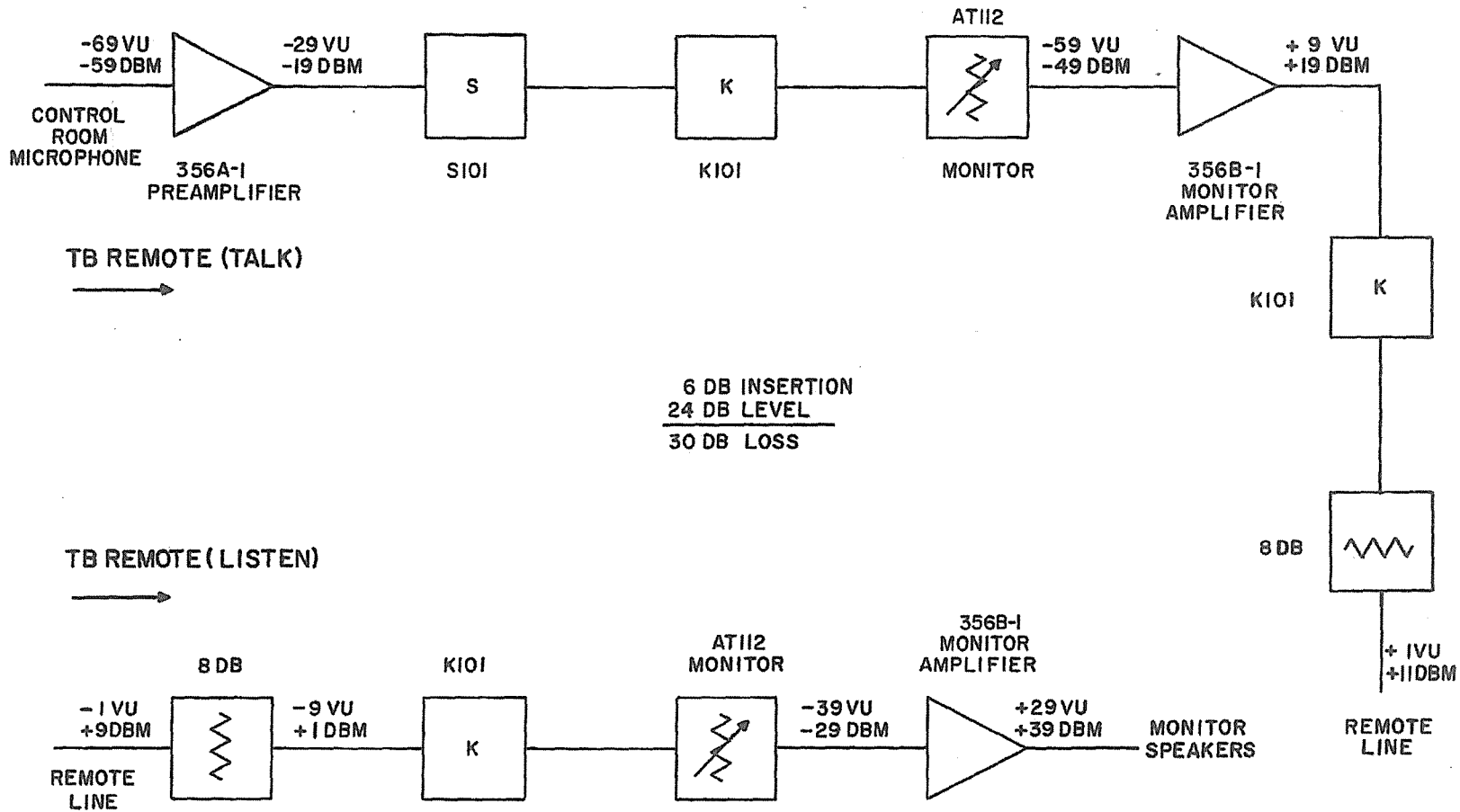


Figure 4-5. Typical Remote Talk-Back Circuit Levels

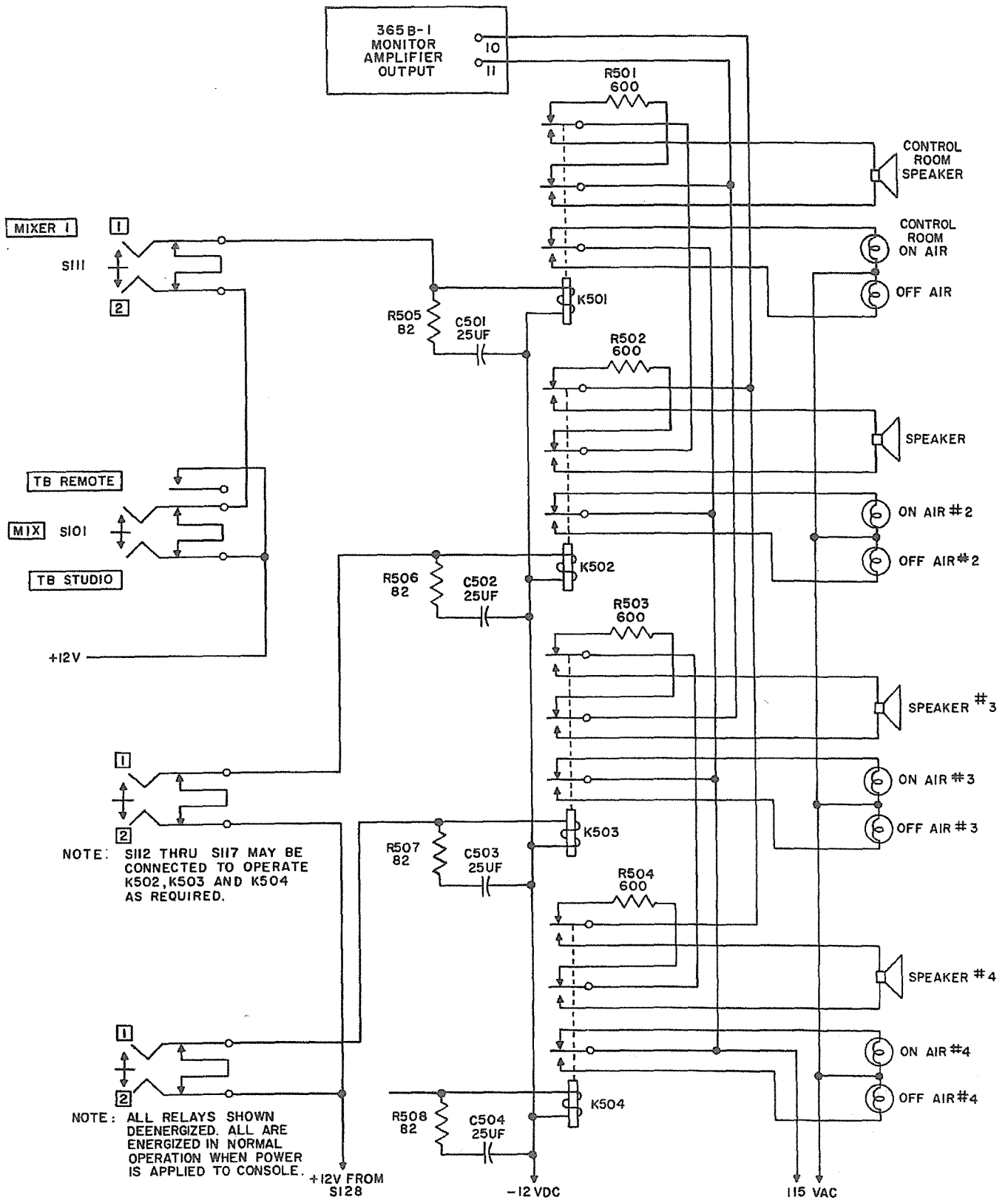


Figure 4-7. Speaker and Warning Light Control Circuits

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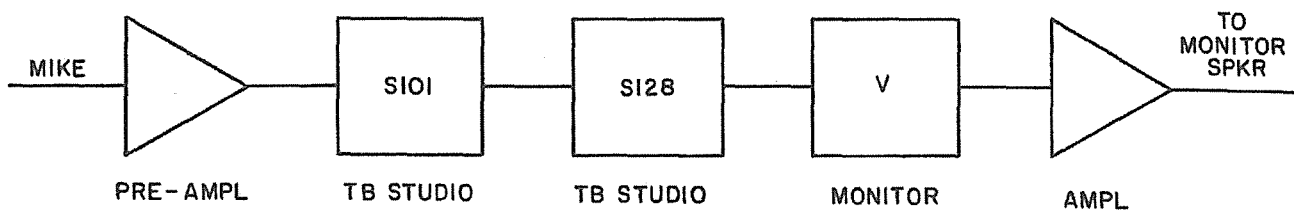
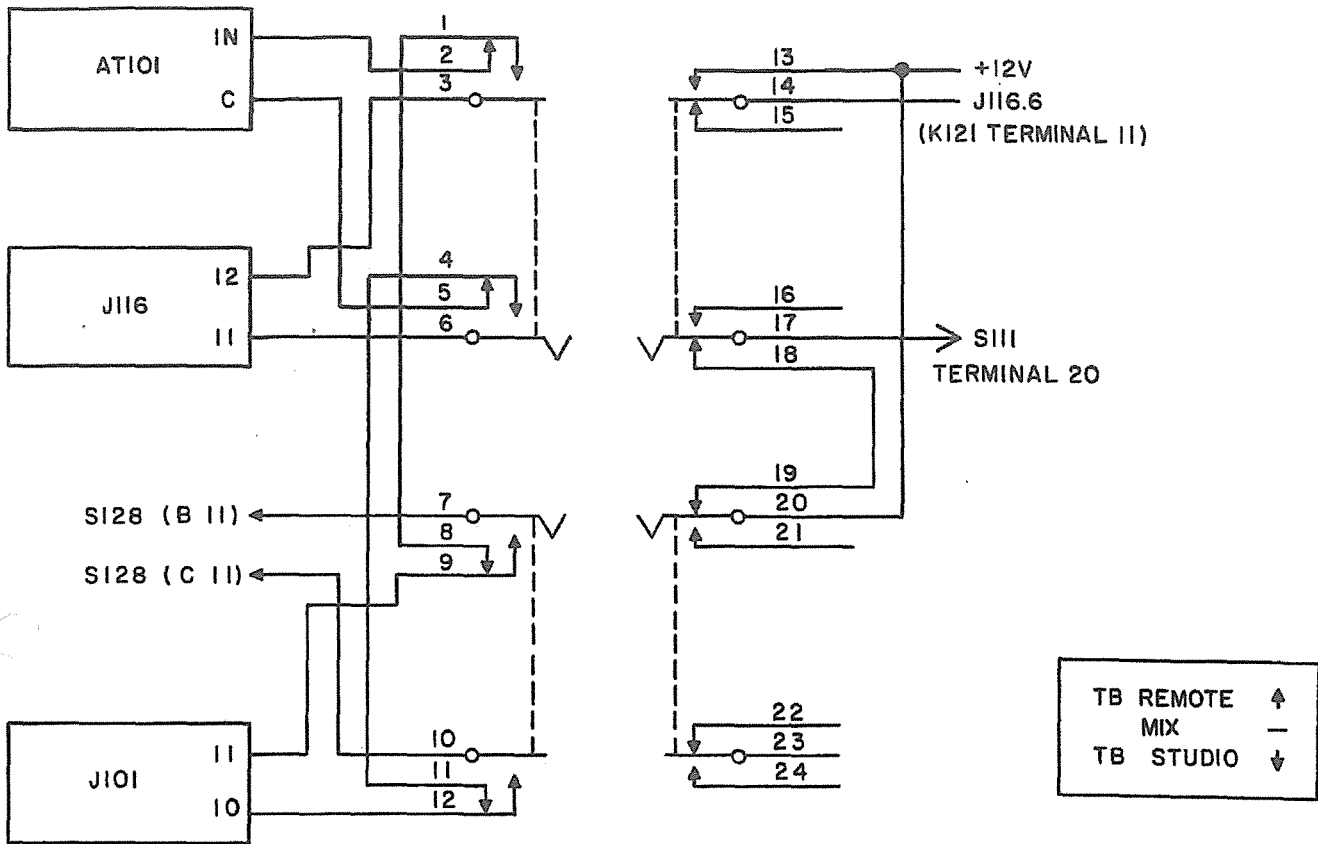


Figure 4-8. Studio Talk-Back Circuit, Simplified Schematic Diagram

in figure 4-5. Placing the switch in the TB STUDIO position allows talk-back functions with studio microphones where a program is not in progress. Switch S128 can be wired to provide muting of studio speakers in cue and talk-back positions. The MONITOR phone jack may be used to monitor either the incoming remote lines or channel 2 output by means of the MONITOR PHONE INPUT switch, S127. If desired, channel 2 may be used for audition. It will be necessary to plug a 356A-1 booster amplifier in J112. With the MONITOR INPUT switch in AUD and mixer key in CH 2 position, the program will be connected to the monitor circuit.

4.5 STUDIO SPEAKER AND WARNING LIGHT CONTROL CIRCUITS.

Refer to figure 4-6. Mixer circuit key switch S101 and channel selector switches S111 through S117 control application of 12 volts d-c to relays K501, K502, K503, and K504.

The switches are interlocked electrically to prevent program interruption. Speakers are operated from the 600-ohm output of the 356B-1 Program/Monitor Amplifier. Resistors R501, R502, R503, and R504 are connected as terminating resistors when speakers

are removed from the circuit. Contacts on relays K501, K502, K503, and K504 control the application of 115 volts a-c to the ON AIR and OFF AIR warning lights. Wiring modifications may be necessary to meet individual station requirements. A few typical modifications are shown in figure 2-19.

#### 4.6 STUDIO TALK-BACK CIRCUITS.

Refer to figure 4-8. The MONITOR INPUT switch should be in TB STUDIO position. Switch S101 will connect the control room microphone to the monitor amplifier input circuit. The level is adjusted by use of MIXER 1. The EXT meter position must be used for level indicating circuits.

## SECTION V MAINTENANCE

### 5.1 PERIODIC INSPECTIONS AND PREVENTIVE MAINTENANCE.

#### 5.1.1 ATTENUATORS.

Clean all attenuators occasionally to avoid noisy operation. To clean attenuators, proceed as follows:

- a. Remove the dust cover.
- b. Saturate a piece of lint-free cloth with carbon tetrachloride, and wipe each contact and contact arm.
- c. Apply a thin film of contact lubricant such as Daven oil or equivalent.
- d. Replace and secure dust cover.

#### 5.1.2 KEY SWITCHES.

The contacts of the key switches should be cleaned occasionally with a burnishing tool. Be careful not to bend any of the leaf springs.

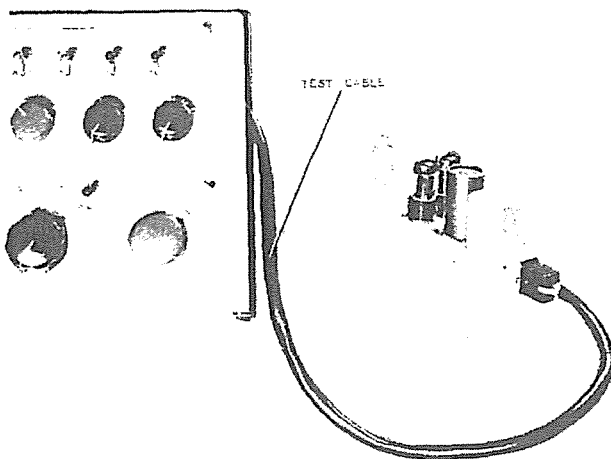


Figure 5-1. 212E-1 Broadcast Console, 356A-1 Preamp Connected to Test Cable

#### 5.1.3 WIRING.

Check all wiring for loose connections and frayed insulation. Make certain that all terminal strip screws are tight.

### 5.2 TROUBLE SHOOTING.

#### 5.2.1 GENERAL.

When one of the amplifiers is plugged into the test cable connector and the cable is plugged into the console, the amplifier may be turned upside down for testing and maintenance. See figure 5-1.

#### NOTE

When an amplifier module is to be removed from the cabinet, lift the rear edge of the module clear of the retaining rail, and push toward the rear to unplug.

#### 5.2.2 REPLACEMENT OF METER LAMPS.

The two lamps in each VU meter (M101 or M102) are accessible from the front. Both are mounted on a bracket at the front of the meter case. Remove the screws at the edge of the meter face, remove front of meter case, replace the lamps, and replace the front of meter case.

#### 5.2.3 EXCESSIVE DISTORTION.

If excessive distortion is noted, it may be due to an unbalanced condition in the push-pull output stage of the 356B-1 Program/Monitor Amplifier. Replace tubes V303 and V304.

SECTION VI  
PARTS LIST

212E-1 Broadcast Console

ITEM	DESCRIPTION	COLLINS PART NUMBER	ITEM	DESCRIPTION	COLLINS PART NUMBER
AT101	ATTENUATOR, VARIABLE: 600/1200 ohms impedance; 20 steps; 2 db each, except last step, last step infinity	378-0368-00	M102	METER, AUDIO LEVEL: same as M101 plus GR scale	456-0042-00
AT102	ATTENUATOR, VARIABLE: same as AT101	378-0368-00	P115	CONNECTOR, PLUG, ELECTRICAL: 12 prong chassis mtg plug w/ angle brackets; special wax impregnated contact retainer plate	365-2120-00
AT103	ATTENUATOR, VARIABLE: same as AT101	378-0368-00	P116	CONNECTOR, PLUG, ELECTRICAL: same as P115	365-2120-00
AT104	ATTENUATOR, VARIABLE: same as AT101	378-0368-00	R101	RESISTOR, FIXED, COMPOSITION: 0.22 megohm $\pm 10\%$ , 1/2 w	745-1450-00
AT105	ATTENUATOR, VARIABLE: 600/1200 ohms impedance; 20 steps; 2 db each; except last step, last step infinity, with cuing position	378-0367-00	R102	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
AT106	ATTENUATOR, VARIABLE: same as AT105	378-0367-00	R103	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
AT107	ATTENUATOR, VARIABLE: same as AT105	378-0367-00	R104	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
AT108	ATTENUATOR, VARIABLE: same as AT105	378-0367-00	R105	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
AT109	ATTENUATOR, VARIABLE: same as AT105	378-0367-00	R106	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
AT110	ATTENUATOR, VARIABLE: 600/600 ohms impedance; 20 steps; 2 db each step; except last step; last step infinity	378-0369-00	R107	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
AT111	ATTENUATOR, VARIABLE: same as AT110	378-0369-00	R108	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
AT112	ATTENUATOR, VARIABLE: same as AT110	378-0369-00	R109	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
AT113	ATTENUATOR, VARIABLE: T type multiplier; 7500/3900 ohms; 20 steps, 2 db per step; 15 degree contact spacing; cw shaft rotation; 1st step 1 MW, 2nd step 4 VU, 3rd step 6 VU, last step OFF	378-0011-00	R110	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
CR101	SEMICONDUCTOR DEVICE, DIODE: germanium; type 1N48; peak inv. volts, 85 v; peak rect current 150 ma; 0.225 in. dia by 2-3/4 in. lg approx overall	353-0027-00	R111	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
J101	CONNECTOR, RECEPTACLE, ELECTRICAL: 12 flat polarized female contacts, 10 amp, 730 v; straight shape	366-2120-00	R112	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
J102	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J101	366-2120-00	R113	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
J103	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J101	366-2120-00	R114	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
J104	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J101	366-2120-00	R115	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
J105	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J101	366-2120-00	R116	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
J106	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J101	366-2120-00	R117	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
J107	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J101	366-2120-00	R118	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
J108	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J101	366-2120-00	R119	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
J109	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J101	366-2120-00	R120	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
J110	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J101	366-2120-00	R121	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
J111	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J101	366-2120-00	R122	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
J112	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J101	366-2120-00	R123	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
J113	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J101	366-2120-00	R124	RESISTOR, FIXED, COMPOSITION: same as R101	745-1450-00
J114	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J101	366-2120-00	R125	RESISTOR, FIXED, COMPOSITION: 150 ohms $\pm 10\%$ 1/2 w	745-1317-00
J115	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J101	366-2120-00	R126	RESISTOR, FIXED, COMPOSITION: same as R125	745-1317-00
J116	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J101	366-2120-00	R127	RESISTOR, FIXED, COMPOSITION: same as R125	745-1317-00
J117	JACK TELEPHONE: midget, for a two conductor plug	358-1080-00	R128	RESISTOR, FIXED, COMPOSITION: same as R125	745-1317-00
J118	JACK TELEPHONE: same as J117	358-1080-00	R129	RESISTOR, FIXED, COMPOSITION: same as R125	745-1317-00
K101	RELAY, ARMATURE: contact arrangement, rt 1C, 1A; left 1C, 1A; 12 v; 87 coil resistance $\pm 10\%$ ; palladium contacts 1/16 in. dia, 3 amp, 150 w, cone shape	970-1156-00	R130	RESISTOR, FIXED, COMPOSITION: same as R125	745-1317-00
M101	METER, AUDIO LEVEL: volume level indicator in a 4 in. by 4-1/4 in. case w/ internal illumination of two 6.3 v 0.15 amp lamps in parallel; plain buff scale, type A, shall show levels from -20 to 0 thru plus 3 above the arc, and per cent v from 0 thru 100 below the arc; the figures -20 thru 0 and 0 thru 100 are black, plus 1 thru plus 3 are red	456-0042-00	R131	RESISTOR, FIXED, COMPOSITION: 1000 ohms $\pm 10\%$ 1/2 w	745-1352-00
			R132	RESISTOR, FIXED, COMPOSITION: same as R131	745-1352-00
			R133	RESISTOR, FIXED, COMPOSITION: same as R131	745-1352-00
			R134	RESISTOR, FIXED, COMPOSITION: same as R131	745-1352-00

SECTION VI  
Parts List

212E-1 Broadcast Console

ITEM	DESCRIPTION	COLLINS PART NUMBER
R135	RESISTOR, FIXED, COMPOSITION: same as R131	745-1352-00
R136	RESISTOR, FIXED, COMPOSITION: same as R131	745-1352-00
R137	RESISTOR, FIXED, COMPOSITION: same as R131	745-1352-00
R138	RESISTOR, FIXED, COMPOSITION: same as R131	745-1352-00
R139	RESISTOR, FIXED, COMPOSITION: same as R131	745-1352-00
R140	RESISTOR, FIXED, COMPOSITION: 2200 ohms $\pm 10\%$ 1/2 w	745-1366-00
R141	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R142	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R143	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R144	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R145	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R146	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R147	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R148	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R149	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R150	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R151	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R152	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R153	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R154	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R155	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R156	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R157	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R158	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R159	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R160	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
R161	RESISTOR, FIXED, COMPOSITION: 160 ohms $\pm 5\%$ 1/2 w	745-1319-00
R162	RESISTOR, FIXED, COMPOSITION: same as R161	745-1319-00
R163	RESISTOR, FIXED, COMPOSITION: 430 ohms $\pm 5\%$ 1/2 w	745-1336-00
R164	RESISTOR, FIXED, COMPOSITION: same as R161	745-1319-00
R165	RESISTOR, FIXED, COMPOSITION: same as R161	745-1319-00
66	RESISTOR, FIXED, COMPOSITION: 120 ohms $\pm 5\%$ 1/2 w	745-1313-00
R167	RESISTOR, FIXED, COMPOSITION: same as R166	745-1313-00
R168	RESISTOR, FIXED, COMPOSITION: 560 ohms $\pm 5\%$ 1/2 w	745-1341-00
R169	RESISTOR, FIXED, COMPOSITION: same as R166	745-1313-00
R170	RESISTOR, FIXED, COMPOSITION: same as R166	745-1313-00
R171	RESISTOR, FIXED, COMPOSITION: 1500 ohms $\pm 5\%$ 1/2 w	745-1358-00
R172	RESISTOR, FIXED, COMPOSITION: same as R171	745-1358-00
R173	RESISTOR, FIXED, COMPOSITION: same as R161	745-1319-00
R174	RESISTOR, FIXED, COMPOSITION: same as R161	745-1319-00
R175	RESISTOR, FIXED, COMPOSITION: same as R163	745-1336-00
R176	RESISTOR, FIXED, COMPOSITION: same as R161	745-1319-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
R177	RESISTOR, FIXED, COMPOSITION: same as R161	745-1319-00
R178	NOT USED	
R179	RESISTOR, FIXED, COMPOSITION: 620 ohms $\pm 5\%$ 1/2 watt	745-1343-00
R180	RESISTOR, FIXED, COMPOSITION: same as R179	745-1343-00
R181	RESISTOR, FIXED, COMPOSITION: same as R179	745-1343-00
R182	NOT USED	
R183	RESISTOR, FIXED, COMPOSITION: 4700 ohms $\pm 10\%$ 1/2 w	745-1380-00
R184	NOT USED	
R185	RESISTOR, FIXED, COMPOSITION: same as R183	745-1380-00
R186	RESISTOR, FIXED, COMPOSITION: same as R183	745-1380-00
R187	NOT USED	
R188	RESISTOR, FIXED, COMPOSITION: same as R183	745-1380-00
R189	RESISTOR, FIXED, COMPOSITION: 3900 ohms $\pm 5\%$ 1/2 w	745-1376-00
R190	RESISTOR, FIXED, COMPOSITION: same as R168	745-1341-00
R191	RESISTOR, FIXED, COMPOSITION: same as R189	745-1376-00
R192	RESISTOR, VARIABLE, COMPOSITION: 1000 ohms $\pm 20\%$ 1 w	380-5263-00
R193	RESISTOR, VARIABLE, COMPOSITION: same as R192	380-5263-00
R194	RESISTOR, FIXED, COMPOSITION: 560 ohms $\pm 10\%$ 1 w	745-3342-00
R195	RESISTOR, FIXED, COMPOSITION: same as R194	745-3342-00
R196	RESISTOR, FIXED, COMPOSITION: 100 ohms $\pm 5\%$ 1 w	745-3309-00
R197	RESISTOR, FIXED, COMPOSITION: same as R196	745-3309-00
R198	RESISTOR, FIXED, COMPOSITION: 820 ohms $\pm 5\%$ 2 w	745-5648-00
R199	RESISTOR, FIXED, COMPOSITION: same as R196	745-3309-00
R200	RESISTOR, FIXED, COMPOSITION: same as R196	745-3309-00
R201	RESISTOR, FIXED, COMPOSITION: same as R196	745-3309-00
R202	RESISTOR, FIXED, COMPOSITION: same as R196	745-3309-00
R203	RESISTOR, FIXED, COMPOSITION: same as R198	745-5648-00
R204	RESISTOR, FIXED, COMPOSITION: same as R196	745-3309-00
R205	RESISTOR, FIXED, COMPOSITION: same as R196	745-3309-00
R206	RESISTOR, FIXED, COMPOSITION: 10,000 ohms $\pm 10\%$ 1/2 w	745-1394-00
R207	RESISTOR, FIXED, COMPOSITION: same as R206	745-1394-00
R208	RESISTOR, FIXED, COMPOSITION: 560 ohms $\pm 10\%$ 2 w	745-5642-00
R209	RESISTOR, FIXED, FILM: 5620 ohms $\pm 1\%$ 1/2 w	705-2149-00
R210	RESISTOR, FIXED, FILM: 2000 ohms $\pm 1\%$ 1/2 w	705-2138-00
R211	RESISTOR, FIXED, FILM: 2670 ohms $\pm 1\%$ 1/2 w	705-2141-00
R212	RESISTOR, FIXED, COMPOSITION: same as R206	745-1394-00
R213	RESISTOR, FIXED, COMPOSITION: same as R206	745-1394-00
R214	RESISTOR, FIXED, COMPOSITION: same as R140	745-1366-00
	RESISTOR, FIXED, COMPOSITION: 1000 ohms $\pm 5\%$ 1/2 w	745-1361-00
	RESISTOR, FIXED, COMPOSITION: 2000 ohms $\pm 5\%$ 1/2 w	745-1364-00
	RESISTOR, FIXED, COMPOSITION: 2400 ohms $\pm 5\%$ 1/2 w	745-1368-00
	RESISTOR, FIXED, COMPOSITION: 3600 ohms $\pm 5\%$ 1/2 w	745-1375-00
	RESISTOR, FIXED, COMPOSITION: 5100 ohms $\pm 5\%$ 1/2 w	745-1382-00
	RESISTOR, FIXED, COMPOSITION: 6200 ohms $\pm 5\%$ 1/2 w	745-1385-00



212E-1 Broadcast Console

ITEM	DESCRIPTION	COLLINS PART NUMBER
S101	SWITCH, LEVER: 2 lever positions, locking in both positions; palladium contacts; 110 v 60 cycles a-c, 3 amp, 150 watts	375-0017-00
S102	SWITCH, LEVER: same as S101	375-0017-00
S103	SWITCH, LEVER: same as S101	375-0017-00
S104	SWITCH, LEVER: same as S101	375-0017-00
S105	SWITCH, LEVER: same as S101	375-0017-00
S106	SWITCH, LEVER: same as S101	375-0017-00
S107	SWITCH, LEVER: same as S101	375-0017-00
S108	SWITCH, LEVER: same as S101	375-0017-00
S109	SWITCH, LEVER: same as S101	375-0017-00
S110	SWITCH, LEVER: same as S101	375-0017-00
S111	SWITCH, LEVER: same as S101	375-0017-00
S112	SWITCH, LEVER: same as S101	375-0017-00
S113	SWITCH, LEVER: same as S101	375-0017-00
S114	SWITCH, LEVER: same as S101	375-0017-00
S115	SWITCH, LEVER: same as S101	375-0017-00
S116	SWITCH, LEVER: same as S101	375-0017-00
S117	SWITCH, LEVER: same as S101	375-0017-00
S118	SWITCH, LEVER: same as S101	375-0017-00
S119	SWITCH, LEVER: same as S101	375-0017-00
S120	SWITCH, ROTARY: 2 pole, 4 positions	259-0759-00
S121	SWITCH, ROTARY: same as S120	259-0759-00
S122	SWITCH, ROTARY: same as S120	259-0759-00
S123	SWITCH, ROTARY: same as S120	259-0759-00
S124	SWITCH, LEVER: same as S101	375-0017-00
S125	SWITCH, LEVER: same as S101	375-0017-00
S126	SWITCH, LEVER: same as S101	375-0017-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
S127	SWITCH, ROTARY: 1 section, 2 position, 30° positioning detent, 2 pole, 6 fixed contacts, 2 moving contacts	259-0844-00
S128	SWITCH, ROTARY: 3 section, 7 position, 30° positioning detent, 6 pole, 16 fixed contacts, 2 moving contacts each section	259-0842-00
S129	SWITCH, ROTARY: 2 section, 7 position, 25.7° positioning detent, 4 pole, 16 fixed contacts, 2 moving contacts each section	259-0843-00
T101	TRANSFORMER, AUDIO: high-fidelity isolation; primary 150-600 ohm ct; secondary 600 ohm ct	677-0108-00
T102	TRANSFORMER, AUDIO: same as T101	677-0108-00
TB101	TERMINAL STRIP: molded bakelite barrier strip, 20 terminals, 7-7/8 in. lg, 7/8 in. w 0.656 in. thk	367-0131-00
TB102	TERMINAL BOARD: XXXX natural phenolic material 3/32 in. thk; 9-3/8 in. lg by 3 in. w; incl 31 terminals, silver pl brass 5/32 in. dia by 13/32 in. lg	542-3767-003
TB103	TERMINAL BOARD: XXXX natural phenolic material 3/32 in. thk, 4-1/8 in. lg, 3-3/8 in. w; incl 28 terminals silver pl brass 5/32 in. dia by 13/32 in. lg	542-3768-003
TB104	TERMINAL BOARD: XXXX natural phenolic material 3/32 in. thk; 7-1/2 in. lg by 1-7/8 in. w; incl 30 terminals, silver pl brass 5/32 in. dia by 13/32 in. lg and resistors	542-3067-003

499G-1 Rack Mounting Shelf

ITEM	QTY	DESCRIPTION	COLLINS PART NUMBER
A	1	Perforated steel plate, rear edge bent upward, 13-5/8 d x 16-25/32 w	542-3144-004
B	1	Steel channel 16.975 lg x 3/4 h x 1/2 d	542-3138-003
C	1	Welded door assembly, includes hinge	542-3140-00
D	1	Steel angle, 16.975 lg x 1-1/4 h x 11/16 d	542-3148-004
E	1	Folded steel strip 16-3/4 lg x 1 h x 0.166 d	542-3141-003
F	1	Steel strip 15-7/8 lg x 1-11/32 w x 0.59 thk	542-3143-003
G	1	Fabricated side assembly complete with door support stud	542-3136-002
H	1	Fabricated side assembly complete with door support stud	542-3137-002
J	2	Sliding lid support for front door	015-0613-00
K	1	Rotary door latch	015-0547-00

ITEM	QTY	DESCRIPTION	COLLINS PART NUMBER
L	2	Barrier, 19 double terminals	367-3190-00
N	44	6-32 x 5/16 Phillips head	343-0168-00
P	34	Split lock no. 6	310-0071-00
R	10	External no. 6	373-8020-00
S*	2	Split lock no. 8	310-0072-00
T	25	Hex no. 6-32	313-0002-00
U*	2	Hex no. 8-32	313-0017-00
V	19	Cap no. 6-32	334-0044-00
W	8	Machine 4-40 x 7/16 flathead	342-0047-00
Y	8	Hex 4-40	313-0043-00
Z	30	Flat washer, no. 6	310-6360-00
AA	2	Rubber, for 1-3/8 in. hole	201-0012-00
AB	2	For 0.140 dia shaft 0.025 thk x 0.270 OD	340-0255-00
AK	1	Steel strip 15-7/8 lg x 19/32 w x 0.074 thk	542-3142-003

\*Part of Item C.

SECTION VI  
Parts List

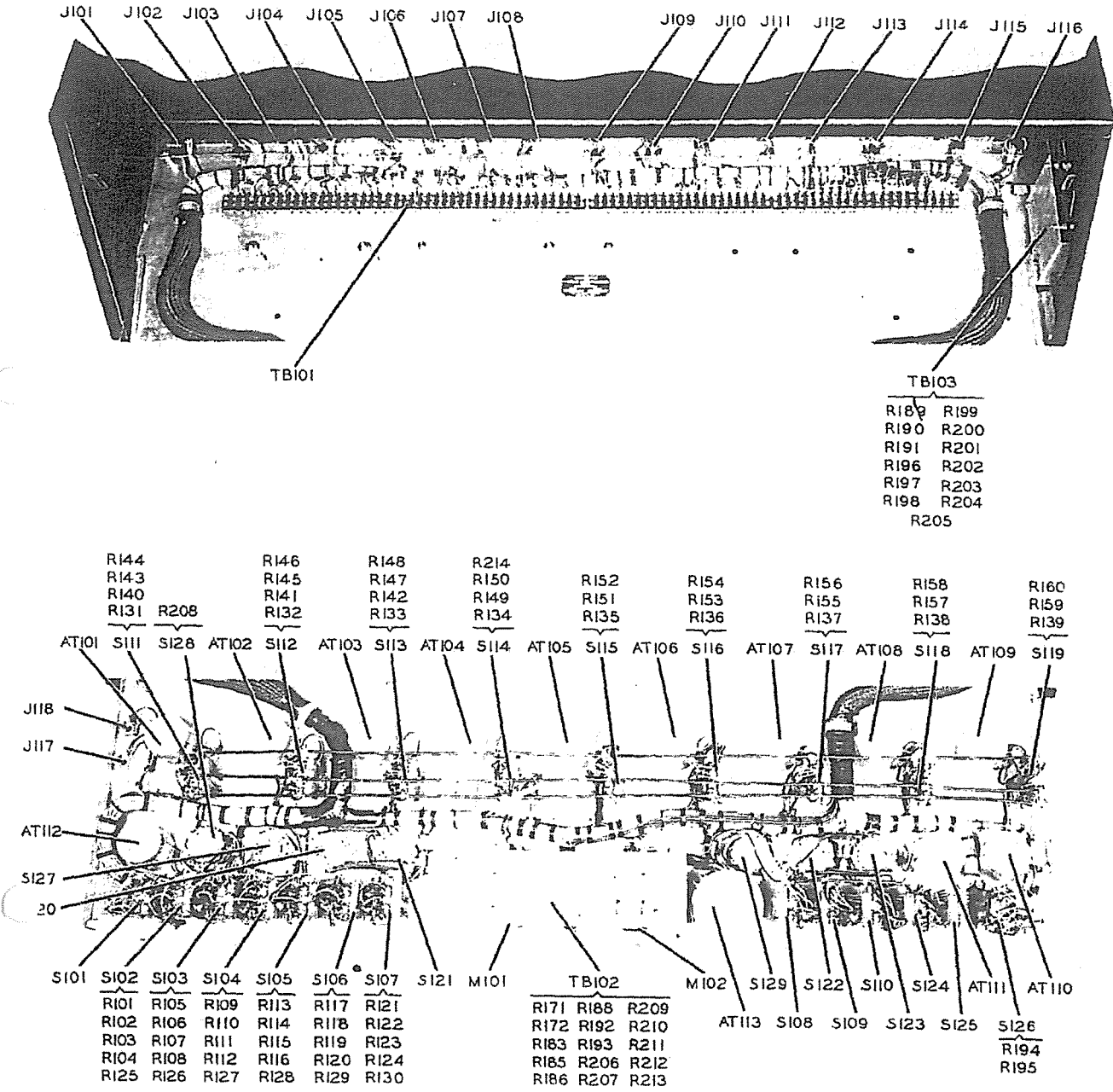


Figure 6-1. 212E-1 Broadcast Console, Parts Location

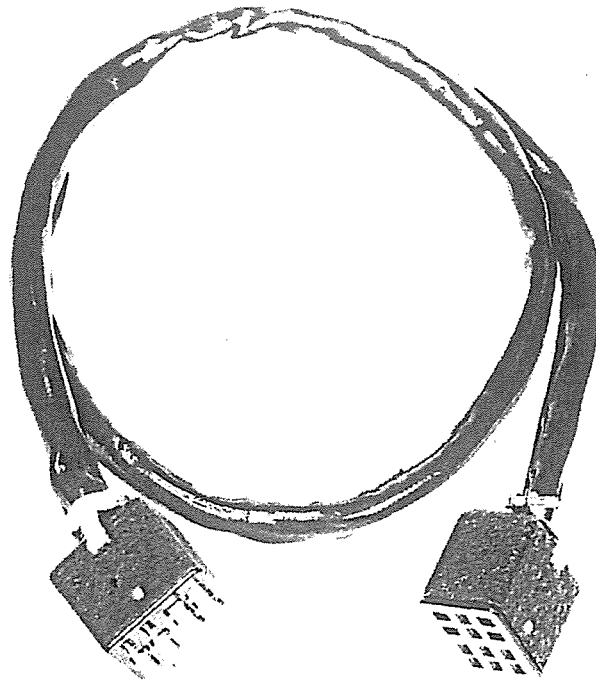


Figure 6-2. Test Cable (Not Supplied)

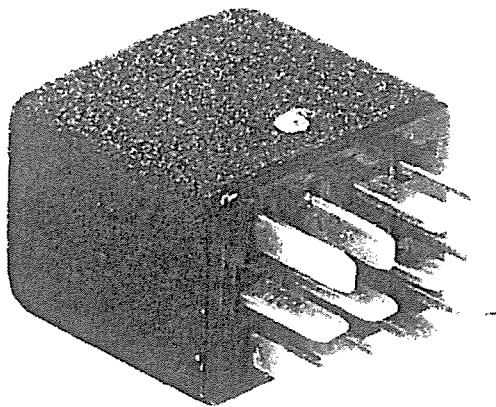


Figure 6-3. Jumper Plug

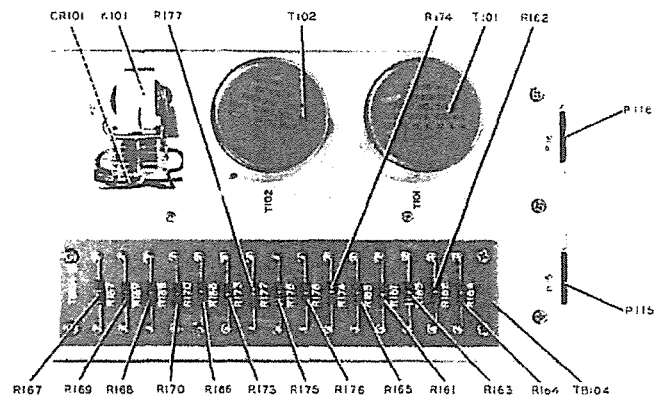
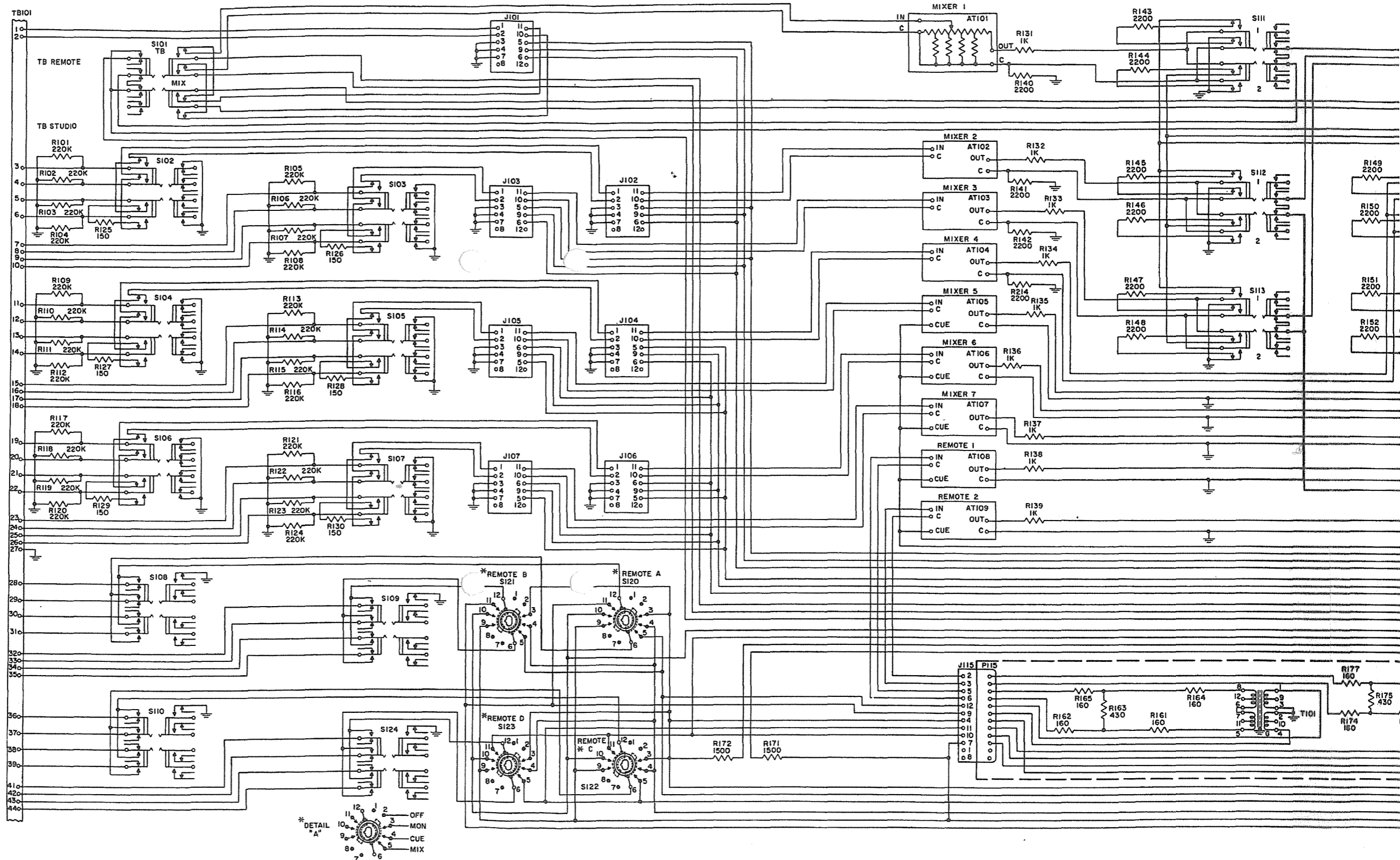


Figure 6-4. Repeat Coil Assembly, Top View



# SECTION VII ILLUSTRATIONS

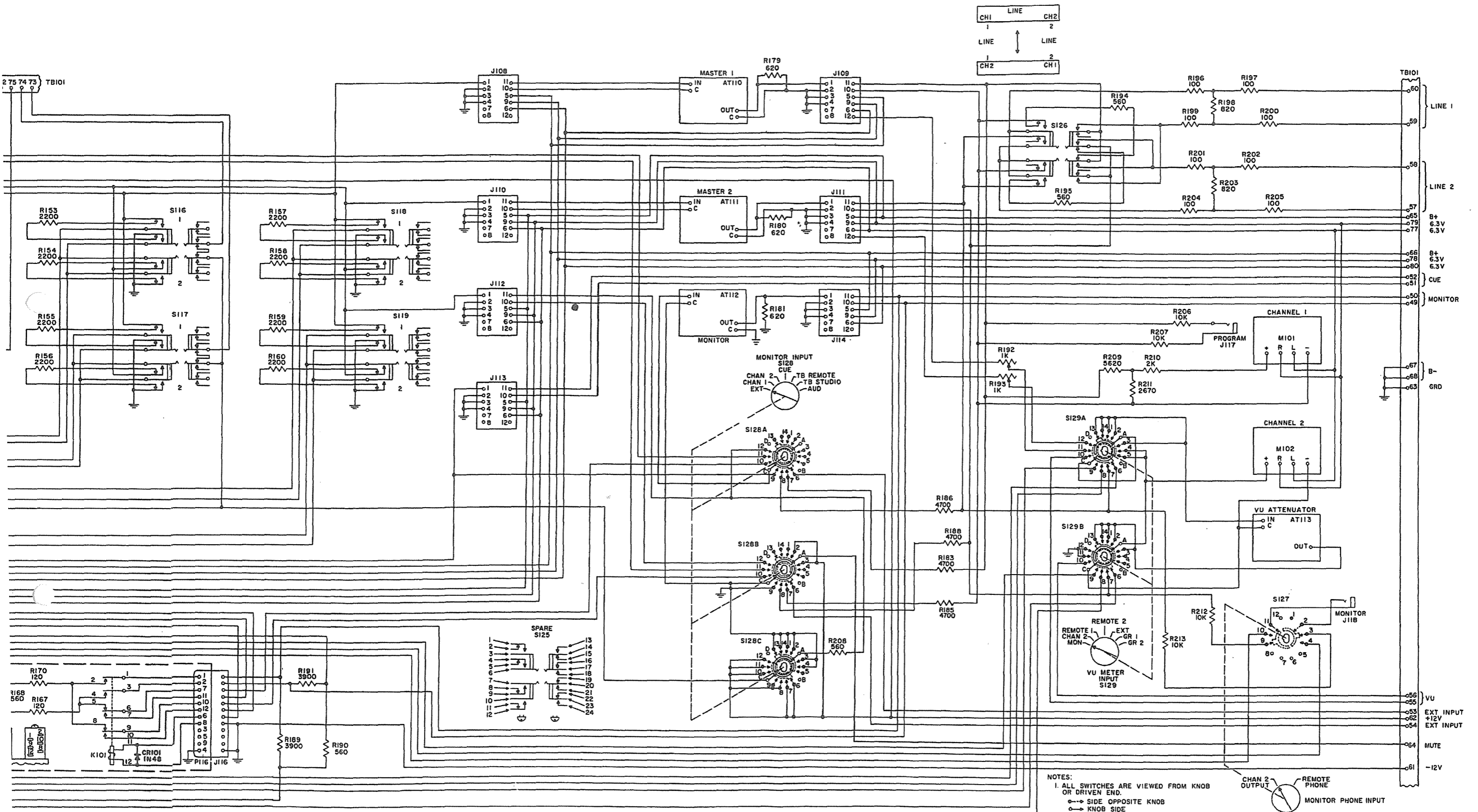


Figure 7-1. 212E-1 Broadcast Console, Schematic Diagram

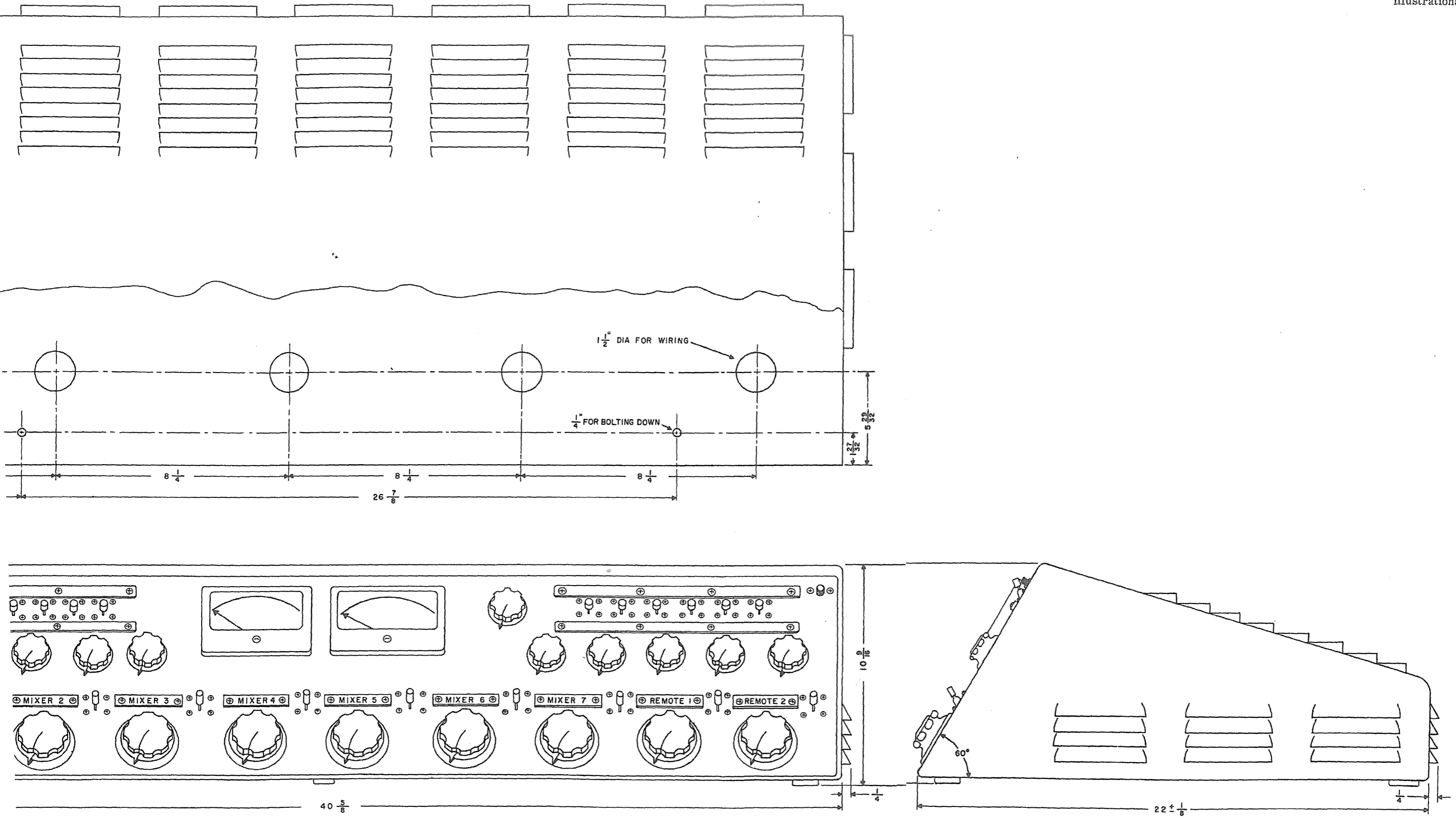
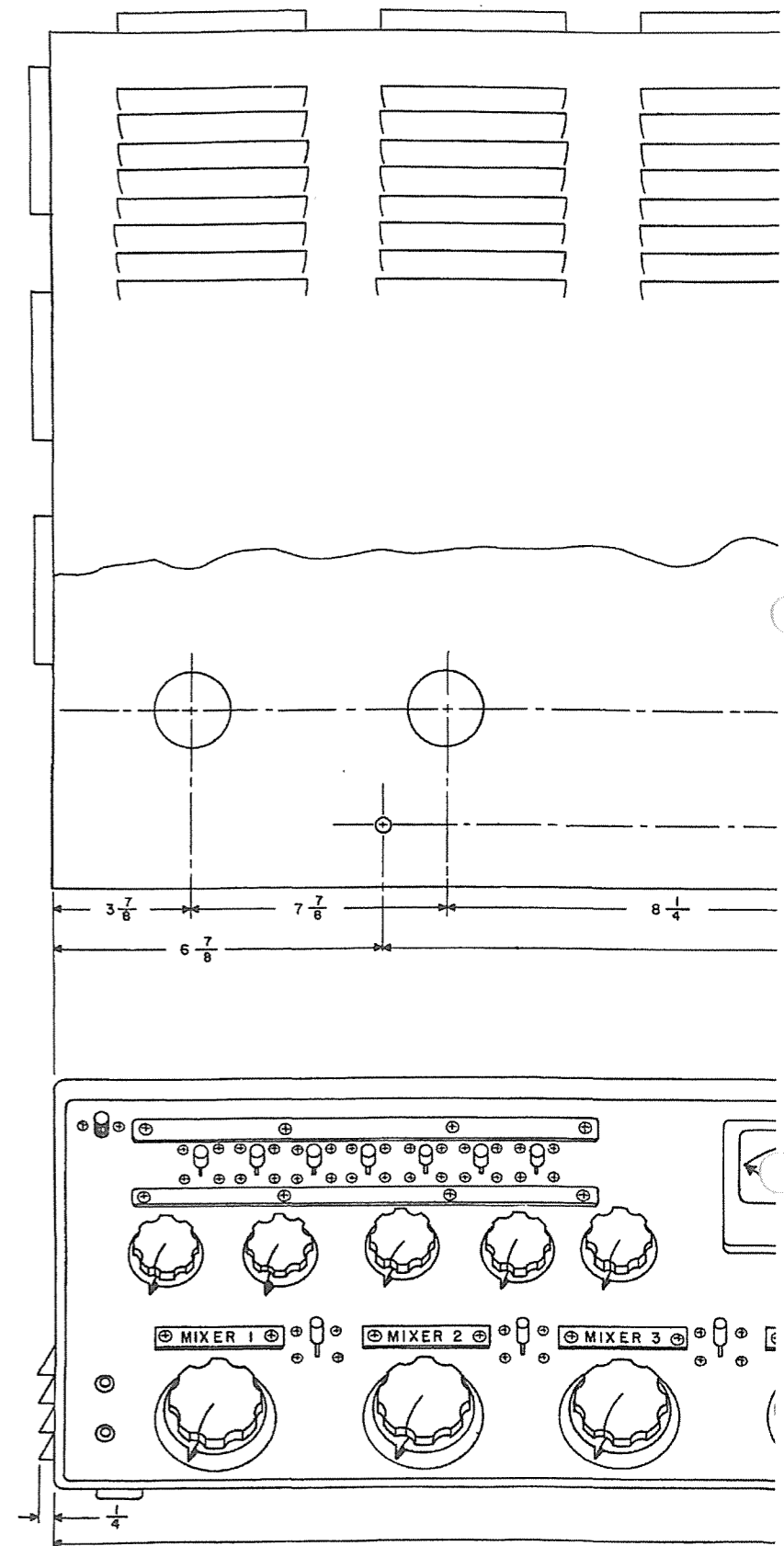


Figure 7-2. 212E-1 Broadcast Console, Outline and Mounting Dimensions

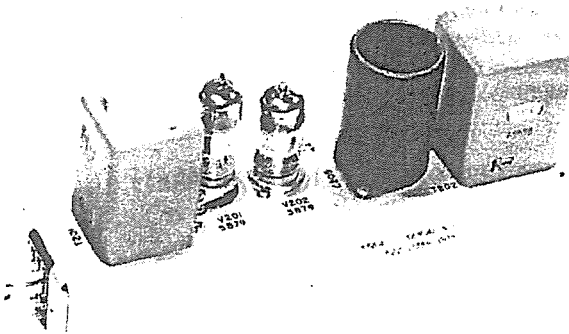


## PREAMPLIFIER 356A-1

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1956, 1960

CEDAR RAPIDS, IOWA, U.S.A.

PRINTED IN THE UNITED STATES OF AMERICA



C99-40-P.

Figure 1. Preamplifier, 356A-1 Equipment Supplied

### 1.1 PURPOSE OF EQUIPMENT.

Preamplifier 356A-1 is intended for use as a preamplifier or booster with broadcast studio equipment such as Broadcast Console 212F-1 or 212G-1. It may be used in high-fidelity AM, FM, and TV broadcast service or program control in audio systems.

### 1.2 PHYSICAL DESCRIPTION.

Preamplifier 356A-1 (figure 1) is a plug-in module containing the necessary circuitry for two stages of amplification. The 356A-1 is 4-5/8 inches high,

2-1/8 inches wide, and 9-1/2 inches long and weighs approximately 2.5 pounds.

### 1.3 TUBE COMPLEMENT.

Function	Symbol	Tube Type
Input amplifier	V201	5879
Output amplifier	V202	5879

### 1.4 ELECTRICAL CHARACTERISTICS.

1.4.1 CONNECTORS. One 12-pin connector, P201, is located at the front end of the chassis. All connections to the 356A-1 are made at this connector.

1.4.2 POWER REQUIREMENTS. Power requirements for the 356A-1 are as follows: 250 - 300 volts d-c filtered at 6.5 - 7.5 ma and 6.3 volts a-c or d-c at 0.3 amperes.

1.4.3 FREQUENCY RANGE. The frequency range of the 356A-1 is 50 to 15,000 cycles per second.

1.4.4 INPUT IMPEDANCE. The 356A-1 is factory wired for 150 ohms unloaded transformer input impedance. Choice of 30, 150, 250, or 600 ohm impedance connections is available at the input transformer. See figure 4.



NOTE

If 250-ohm balanced input to the 356A-1 is desired, connect a 2700-ohm resistor from transformer T201 terminal 2 to ground and a 2700-ohm resistor from terminal 5 to ground. Disconnect the wire from terminal 4 and connect it to terminal 5. Disconnect terminal 3. If 30-ohm balanced input is desired, connect a 270-ohm resistor from terminal 4 to ground and connect a 270-ohm resistor from terminal 5 to ground. Disconnect the wire from terminal 2 and connect it to terminal 5. Disconnect terminal 3.

1.4.5 GAIN. When the 356A-1 is used in preamplifier service, a -60 dbm (nominal) input from a commercial microphone produces a -20 dbm output. When used as a booster with input connected for 600 ohms impedance, a -22 dbm input signal produces an output of +18 dbm which is maximum rated output power. Gain through the preamplifier is 40 db.

1.4.6 OUTPUT IMPEDANCE. The output of the 356A-1 may be connected for either 150 or 600 ohms output impedance (balanced or unbalanced). It is factory connected for 600 ohms output impedance. For information on terminal connection for 150 ohms output impedance, see figure 4, note 2.

1.4.7 FREQUENCY RESPONSE. The frequency response of the 356A-1 is  $\pm 1$  db from 50 to 15,000 cps at  $\pm 0.5\%$  maximum distortion.

1.4.8 NOISE LEVEL. The equivalent input noise level of the preamplifier is -118 dbm. When the 356A-1 is used with Power Supply 409X-1 or 409X-2, the filaments are maintained at approximately +30 volts d-c above ground. This positive bias minimizes a-c noise in the preamplifier.

2.1 CIRCUIT DESCRIPTION.

Figure 4 is a schematic diagram of Preamplifier 356A-1. Input to the preamplifier is coupled by transformer T201 to the grid of V201. The input amplifier (V201) is a pentode-connected type 5879. Its output is resistance-capacitance coupled to the grid of a triode-connected type 5879 (V202). Output from V202 is taken from the secondary winding of transformer T202. A third winding of T202 supplies inverse feed-back voltage to the cathode of the input amplifier. All connections to the amplifier are made at P201.

3.1 MAINTENANCE.

Normal maintenance will consist of tube replacement. Table 1 gives voltage and resistance measurements for Preamplifier 356A-1.

4.1 TABLE OF REPLACEABLE PARTS.

Table 2 gives the description, circuit function, and Collins part number for all replaceable parts in the 356A-1. When replacement of parts is necessary, only parts identical or equivalent to those listed should be used. All parts above the chassis are identified in figure 2. All parts under the chassis are identified in figure 3.

TABLE 1. VOLTAGE AND RESISTANCE MEASUREMENTS FOR PREAMPLIFIER 356A-1

Conditions of Measurement:

- a. Voltage readings are taken with power applied as in normal operation.
- b. Line voltage 115 volts a-c. Plate supply voltage adjusted to +300 volts.
- c. Resistance readings are taken with no power applied.
- d. All measurements from terminal to ground.
- e. Voltage measurements made with a 20,000 ohms-per-volt meter.

TUBE		PIN NUMBER								
		1	2	3	4	5	6	7	8	9
V201 (5879)	V DC	0	0	1.9	20-50	20-50	0	46	82	1.9
	V AC	0	0	0	3.0	3.0	0	0	0	0
	Ohms	6K	0	2300	2800	2800	0	37K	200K	2300
V202 (5879)	V DC	0	0	5.7	40	40	0	210	210	210
	V AC	0	0	0	3.0	3.0	0	0	0	0
	Ohms	2.2 meg	0	900	2800	2800	0	40K	40K	40K

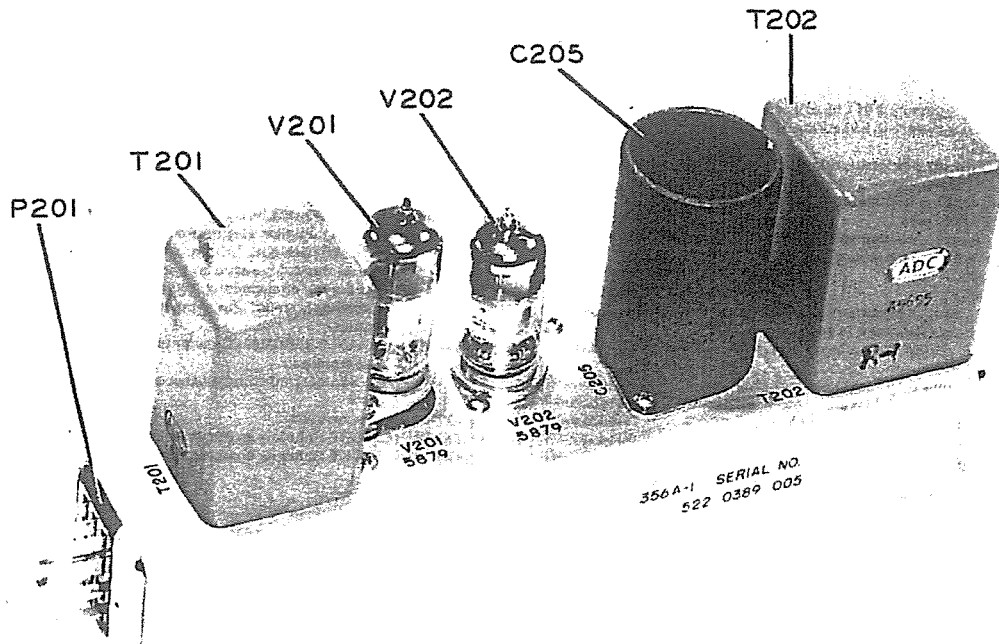


Figure 2. Preamplifier, 356A-1 Top View

C99-30-P.

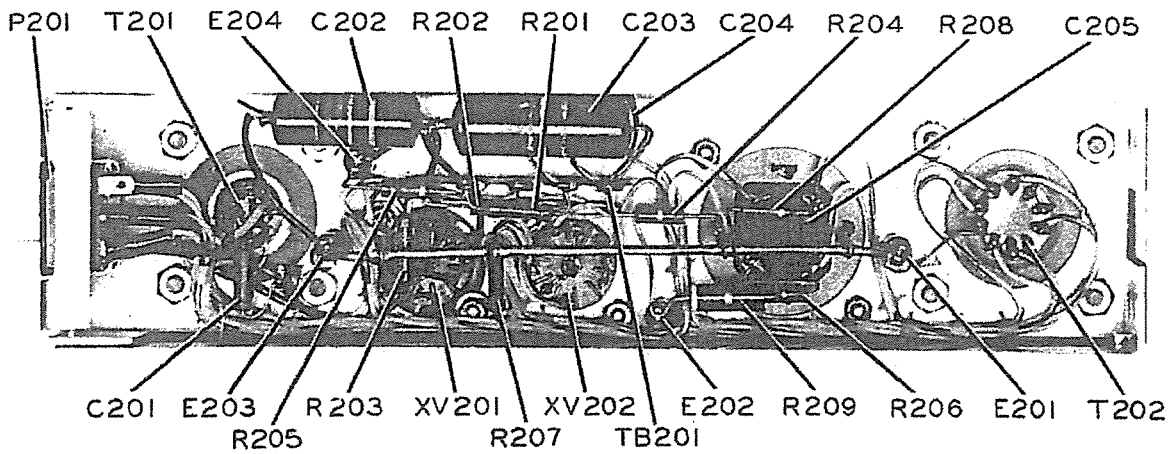


Figure 3. Preamplifier, 356A-1 Bottom View

C99-31-P.

PARTS LIST

ITEM	DESCRIPTION	COLLINS PART NUMBER
C201	NOT USED	
C202	CAPACITOR: paper, 0.047 uf ±10%, 400 vdcw	931-0295-00
C203	CAPACITOR: paper, 0.1 uf ±10%, 400 vdcw	931-0299-00
C204	Same as C203	931-0299-00
C205	CAPACITOR: dry electrolytic, quadruple section; sections 1 and 2, 20 uf, 450 vdcw +250% -10% tolerance; section 3 and 4, 50 uf, 50 vdcw +250% -10% tolerance	183-1260-00
E201	TERMINAL, stud: melamine body, brass terminal, brass base, cadmium plated; hex	306-0233-00
E202	Same as E201	306-0233-00
E203	Same as E201	306-0233-00
E204	TERMINAL, stud: melamine body, terminal brass hot tin dipped, base brass cadmium plated	306-0234-00
P201	CONNECTOR, plug: 12 rectangular male contacts	365-2120-00
R201	RESISTOR: comp, 0.16 megohms ±5%, 1/2 w	745-1445-00
R202	RESISTOR: comp, 0.10 megohms ±10%, 1/2 w	745-1436-00
R203	RESISTOR: comp, 51,000 ohms ±5%, 1/2 w	745-1424-00
R204	RESISTOR: comp, 2.2 megohm ±10%, 1/2 w	745-1492-00
R205	RESISTOR: comp, 5.6 megohm ±10%, 1/2 w	745-1510-00
R206	RESISTOR: comp, 30,000 ohms ±5%, 1/2 w	745-1413-00
R207	RESISTOR: comp, 910 ohms ±5%, 1/2 w	745-1350-00
R208	RESISTOR: comp, 2,200 ohms ±10%, 1/2 w	745-1366-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
R209	RESISTOR: comp, 9100 ohms ±5%, 1 w	745-3392-00
R210	RESISTOR: comp, 270 ohms ±10%, 1/2 w (separate) in cloth bag	745-1328-00
R211	Same as R210	745-1328-00
R212	RESISTOR: comp, 2700 ohms ±10%, 1/2 w (separate) in cloth bag	745-1370-00
R213	Same as R212	745-1370-00
T201	TRANSFORMER, AF: input type; 600 ohms; primary impedance; secondary 50,000 ohms	667-0435-00
T202	TRANSFORMER, AF: output type; primary 16,600 ohms, 6 ma dc; secondary impedance 800 ohms when series connected; 150 ohms when parallel connected; transformer contains a feedback winding	667-0436-00
TB201	BOARD, TERMINAL: phenolic PCB; 5 solder lug terminals	306-0550-00
V201	TUBE, electron: miscellaneous type, pentode 5879	257-0104-00
V202	Same as V201	257-0104-00
XV201	SOCKET, tube: 9 contact miniature	220-1274-00
XV202	SOCKET, tube: 9 contact miniature	220-1274-00

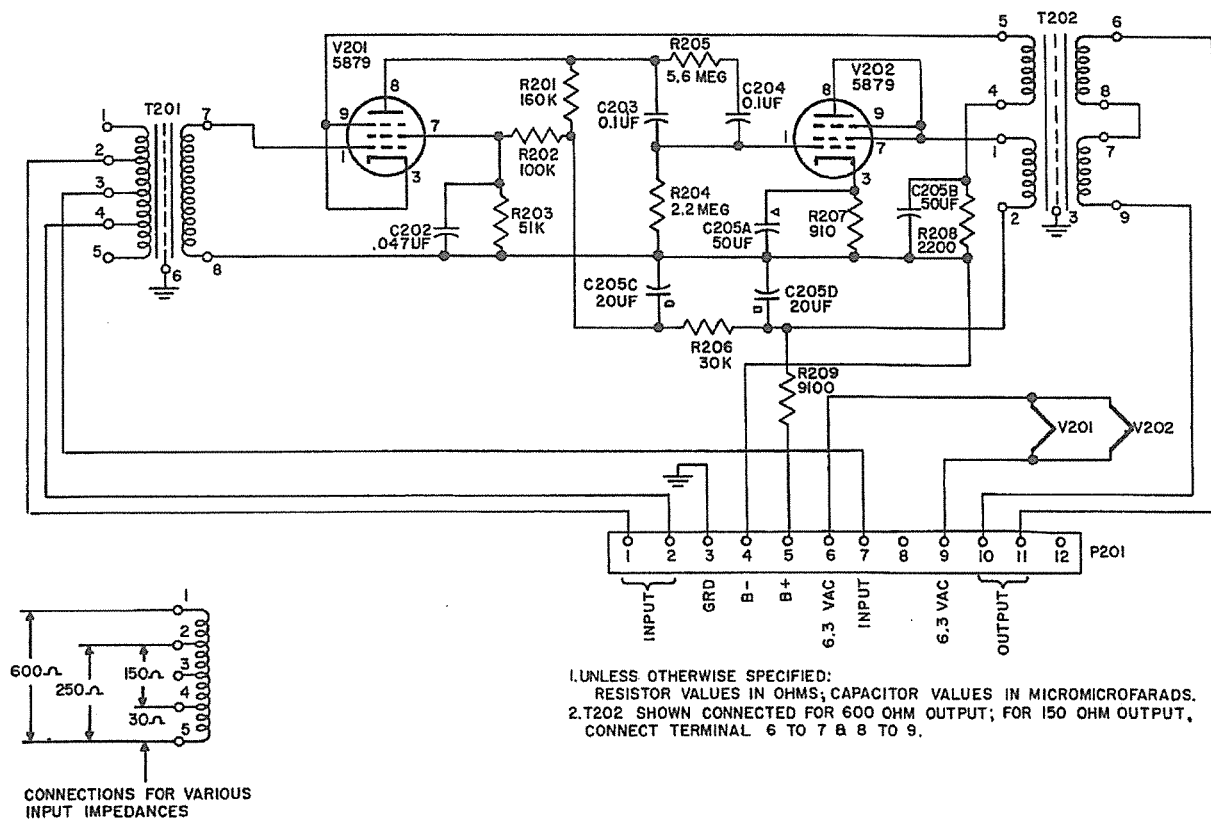


Figure 4. Preamplifier 356A-1, Schematic Diagram

C99-05-3

# UNIT INSTRUCTIONS

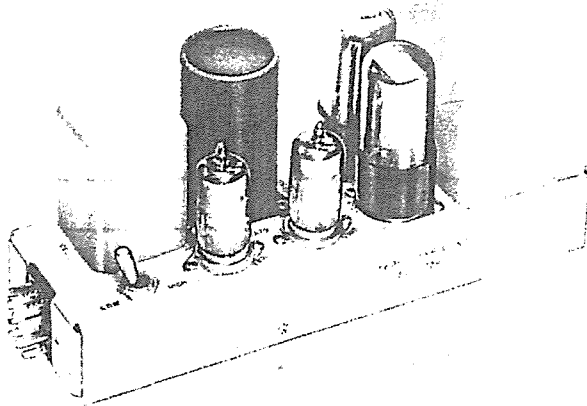
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## PROGRAM/MONITOR AMPLIFIER 356B-1

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1956, 1960, 1961

**CEDAR RAPIDS, IOWA, U.S.A.**

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5342301

Figure 1. Program/Monitor Amplifier 356B-1,  
Equipment Supplied

### 1.1 PURPOSE OF EQUIPMENT.

Program/Monitor Amplifier 356B-1 is intended for use as a program or monitor amplifier with broadcast studio equipment such as Broadcast Console 212F-1, 212F-2, or 212G-1. It may be used in high-fidelity

AM, FM, and TV broadcast service or program control in audio systems.

### 1.2 PHYSICAL DESCRIPTION.

Program/Monitor Amplifier 356B-1 (figure 1) is a plug-in module containing necessary circuitry for three stages of amplification. The 356B-1 is 5-3/4 inches high, 2-3/4 inches wide, and 9-1/2 inches long and weighs approximately 4-3/4 pounds.

### 1.3 TUBE COMPLEMENT.

Function	Symbol	Tube Type
Input amplifier	V301	5879
Phase inverter	V302	5879
Output amplifier	V303	6V6
Output amplifier	V304	6V6

### 1.4 ELECTRICAL CHARACTERISTICS.

1.4.1 CONNECTORS. One 12-pin connector, P301, is located at the front end of the chassis. All connections to the 356B-1 are made at this connector.

1.4.2 POWER REQUIREMENTS. Power requirements for the 356B-1 are as follows: 250 - 300 volts

d-c at 63 - 88 ma and 6.3 volts a-c or d-c at 1.2 amperes.

1.4.3 FREQUENCY RANGE. The frequency range of the 356B-1 is 50 to 15,000 cycles per second.

1.4.4 INPUT IMPEDANCE. The 356B-1 is factory wired for 600 ohms unloaded transformer input impedance. It may be rewired for 150 ohms input impedance if desired. See figure 4.

1.4.5 GAIN. When the HI-LOW gain switch on the top of the amplifier chassis is in the HI position the amplifier has 68-db gain. When the gain switch is in the LOW position, the gain is 56 db.

1.4.6 OUTPUT IMPEDANCE. The 356B-1 is factory wired for 600 ohms output impedance. It may be rewired for 150 ohms output impedance. See figure 4.

1.4.7 FREQUENCY RESPONSE. The frequency response of the 356B-1 is  $\pm 1$  db from 50 to 15,000 cps.

1.4.8 DISTORTION. The distortion in the output of the 356B-1 is 0.5% maximum at +30 dbm (one watt) output and 3% maximum at +39 dbm (8 watts) output.

1.4.9 NOISE LEVEL. The equivalent input noise level of the amplifier is -116 dbm.

## 2.1 CIRCUIT DESCRIPTION.

Figure 4 is a schematic diagram of Program/Monitor Amplifier 356B-1. Input signal is coupled by transformer T301 to the grid of the input amplifier V301. The input amplifier is a pentode-connected type 5879. Its output is resistance-capacitance coupled to the phase inverter V302. The phase inverter is a triode-connected type 5879. Output from the phase inverter is RC coupled to the grids of two type 6V6 tubes (V303 and V304) in push-pull. Output from the amplifier is coupled to the load by transformer T302. Inverse feedback is taken from a third winding of T302 and applied to the cathode of V301.

## 3.1 MAINTENANCE.

Normal maintenance will consist of tube replacement. Table 1 gives voltage and resistance measurements for Program/Monitor Amplifier 356B-1. If excessive distortion occurs, replace V303 and V304.

## 4.1 TABLE OF REPLACEABLE PARTS.

Table 2 gives the description, circuit function, and Collins part number for all replaceable parts in Program/Monitor Amplifier 356B-1. When replacement of parts is necessary, only parts identical or equivalent to those listed should be used. All parts on top of the chassis are identified in figure 2. All parts mounted beneath the chassis are identified in figure 3.

TABLE 1. VOLTAGE AND RESISTANCE MEASUREMENTS FOR THE 356B-1 PROGRAM/MONITOR AMPLIFIER

Conditions of measurement:

- Voltage readings are taken with a 20,000 ohms-per-volt meter.
- Line voltage 115 v a-c. Plate voltage adjusted to +300 volts.
- Resistance readings taken with no power applied.
- All measurements from terminal to ground.

TUBE		PIN NUMBER								
		1	2	3	4	5	6	7	8	9
V301 (5879)	V DC	0	0	1.4	20-50	20-50	0	54	141	1.4
	V AC	0	0	0	3.0	3.0	0	0	0	0
	Ohms	6K	0	1400	2800	2800	0	27K	120K	1400
V302 (5879)	V DC	24	0	50	20-50	20-50	0	170	170	170
	V AC	0	0	0	3.0	3.0	0	0	0	0
	Ohms	1 meg	0	23K	2800	2800	0	55K	55K	55K
V303 (6V6)	V DC	0	20-50	290	300	0	0	20-50	18	
	V AC	0	3.0	0	0	0	0	3.0	0	
	Ohms	0	2800	24K	23K	560K	Inf	2800	470	
V304 (6V6)	V DC	0	20-50	290	300	0	0	20-50	18	
	V AC	0	3.0	0	0	0	0	3.0	0	
	Ohms	0	2800	24K	23K	560K	Inf	2800	470	

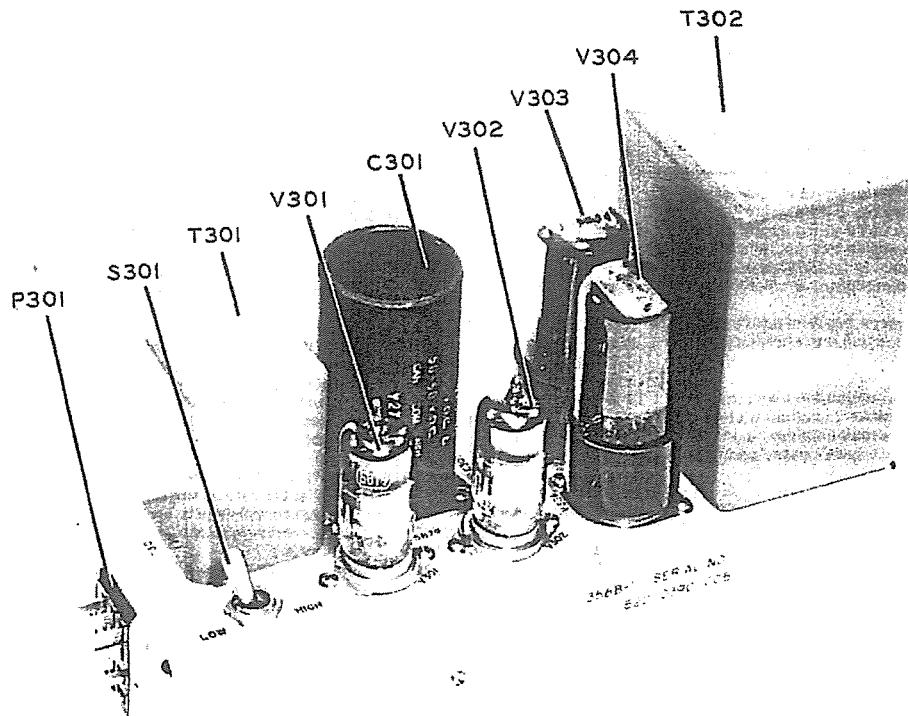


Figure 2. Program/Monitor, Amplifier, 356B-1, Top View

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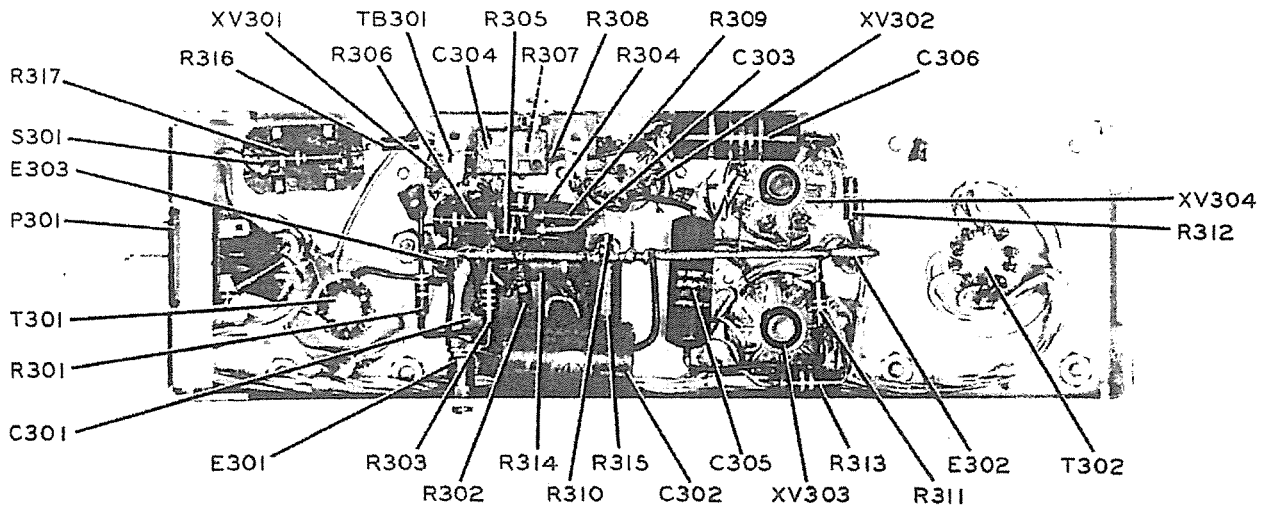


Figure 3. Program/Monitor Amplifier, 356B-1, Bottom View

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## PARTS LIST

ITEM	DESCRIPTION	COLLINS PART NUMBER
C301, C301A, C301B, C301C, C301D, C302	CAPACITOR: dry electrolytic, quadruple sections, section No. 1, 40 uf, 450 V dc, section No. 2, 50 uf 50 V dc, section No. 3, 50 uf, 50 V dc, section No. 4, 50 uf V dc capacity tolerance -10%+250% each section CAPACITOR: electrolytic, 4 uf -15% +100%, 250 vdcw	183-1261-00      183-1209-00
C303	CAPACITOR: paper, 0.047 uf ±10%, 400 vdcw	931-0295-00
C304	CAPACITOR: mica, 82 uuf ±10%, 500 vdcw	935-0170-00
C305	SAME as C303	931-0295-00
C306	SAME as C303	931-0295-00
E301	TERMINAL: stud, melamine body, brass term tinned, brass base, cadmium plated, hex	306-0233-00
E302	TERMINAL: stud, melamine body, terminal, brass hot tin dipped, base brass, cadmium plated, hex	306-0234-00
E303	SAME as E302	306-0234-00
P301	CONNECTOR: plug, 12 rectangular male contacts	365-2120-00
R301	RESISTOR: comp, 330 ohms ±10%, 1/2 w	745-1331-00
R302	RESISTOR: comp, 1100 ohms ±5%, 1/2 w	745-1354-00
R303	RESISTOR: comp, 33,000 ohms ±10%, 1/2 w	745-1415-00
R304	RESISTOR: comp, 0.10 megohm ±10%, 1/2 w	745-1436-00
R305	RESISTOR: comp, 0.10 megohm ±10%, 1 w	745-3436-00
R306	RESISTOR: comp, 0.20 megohm ±5%, 1/2 w	745-1448-00
R307	RESISTOR: comp, 1.0 megohm ±10%, 1/2 w	745-1478-00
R308	RESISTOR: comp, 2000 ohms ±5%, 1/2 w	745-1364-00
R309	RESISTOR: comp, 22,000 ohms ±5%, 1/2 w	745-1407-00
R310	RESISTOR: comp, 24,000 ohms ±5%, 1/2 w	745-1410-00
R311	RESISTOR: comp, 0.56 megohm ±10%, 1/2 w	745-1468-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
R312	SAME as R311	745-1468-00
R313	RESISTOR: comp, 15,000 ohms ±10%, 1 w	745-3401-00
R314	RESISTOR: comp, 510 ohms ±5%, 2 w	745-5640-00
R315	SAME as R314	745-5640-00
R316	RESISTOR: comp, 9,100 ohms ±5%, 1/2 w	745-1392-00
R317	RESISTOR: comp, 91,000 ohms ±5%, 1/2 w	745-1434-00
S301	SWITCH: toggle, spst, 30 V dc 20 amps in locking position	266-3072-00
T301	TRANSFORMER AF: input type, 600 ohms primary impedance; secondary 50,000 ohms	667-0435-00
T302	TRANSFORMER, AF: output type; primary 9,000 ohms, secondary impedance 600 ohms when series connected; 150 ohms when parallel connected; transformer contains a feedback winding	667-0437-00
TB301	BOARD, TERMINAL: component mtg; four solder lug terminals; terminals 3/8 in. between centers; brown bakelite board	306-2230-00
V301	TUBE: electron, pentode, 5879	257-0104-00
V302	SAME as V301	257-0104-00
V303	TUBE: electron, tetrode amplifier, 6Y8GT	255-0021-00
V304	SAME as V303	255-0021-00
XV301	SOCKET: tube, 9 miniature contacts	220-1274-00
XV302	SAME as XV301	220-1274-00
XV303	SOCKET: tube, 8 prong octal	220-1005-00
XV304	SAME as XV303	220-1005-00



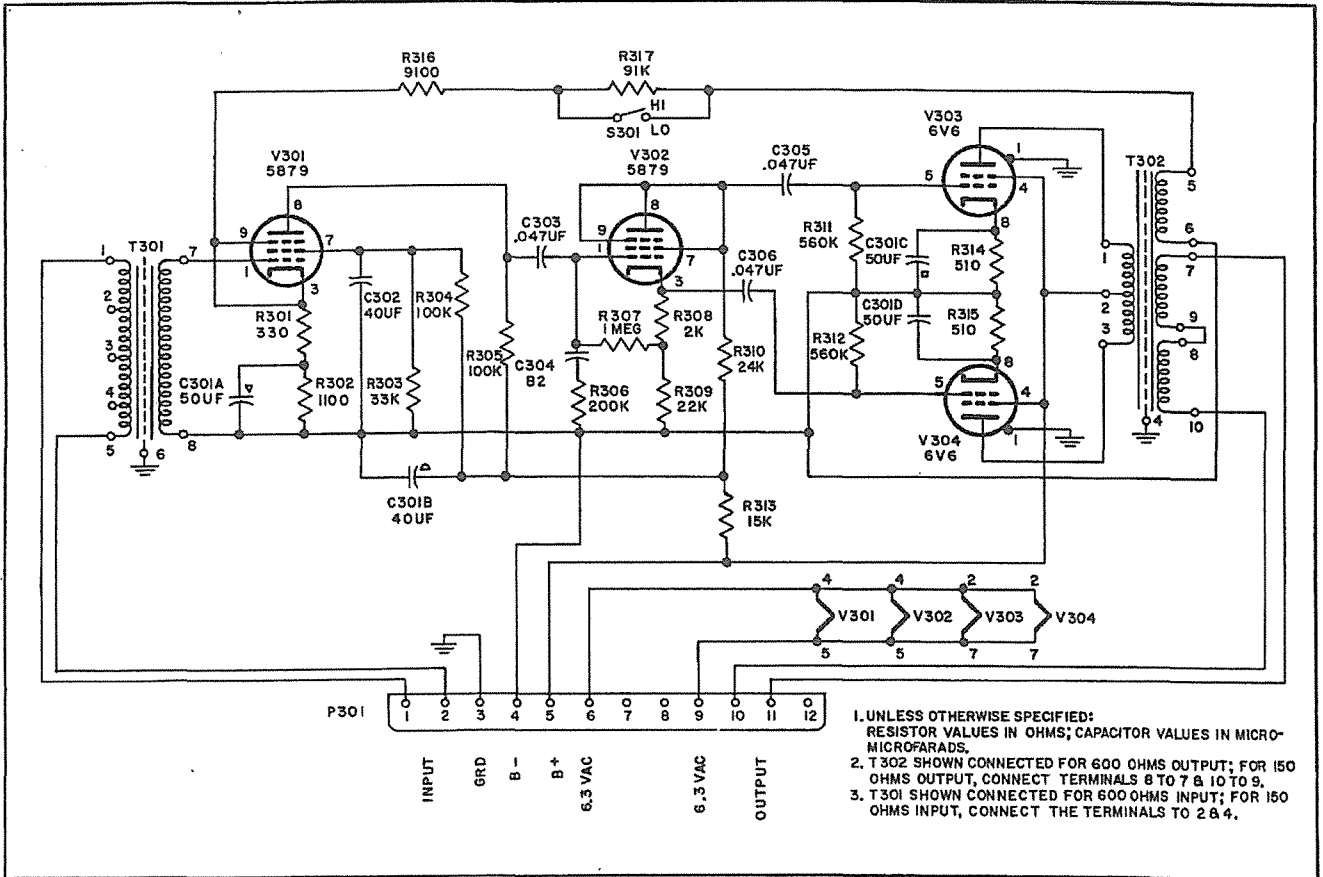


Figure 4. Program/Monitor Amplifier, 356B-1, Schematic Diagram

C99-09-3

## LIMITER AMPLIFIER 356E-1

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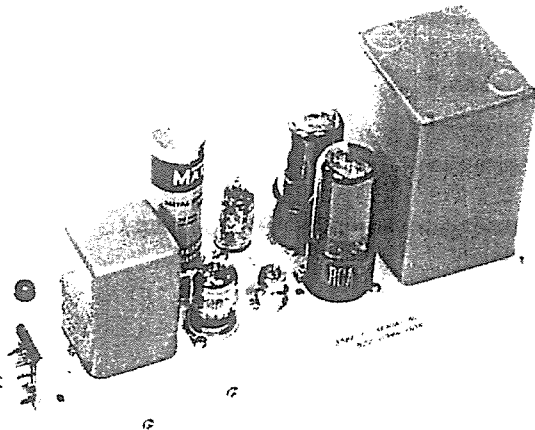


Figure 1. Limiter Amplifier, 356E-1,  
Equipment Supplied

### 1.1 PURPOSE OF EQUIPMENT.

Limiter Amplifier 356E-1 is an automatic average level or peak-limiting amplifier for broadcast, TV, and microwave audio systems.

### 1.2 PHYSICAL DESCRIPTION.

Limiter Amplifier 356A-1 (figure 1) is a plug-in module containing two stages of amplification with a

bias rectifier. It is 5-5/16 inches high, 3 inches wide, and 9-1/2 inches long and weighs 4.75 pounds.

### 1.3 TUBE COMPLEMENT.

Function	Symbol	Tube Type
Input amplifier	V601	GL6386
Output amplifier	V602	6V6
Output amplifier	V603	6V6
Bias rectifier	V604	6AL5

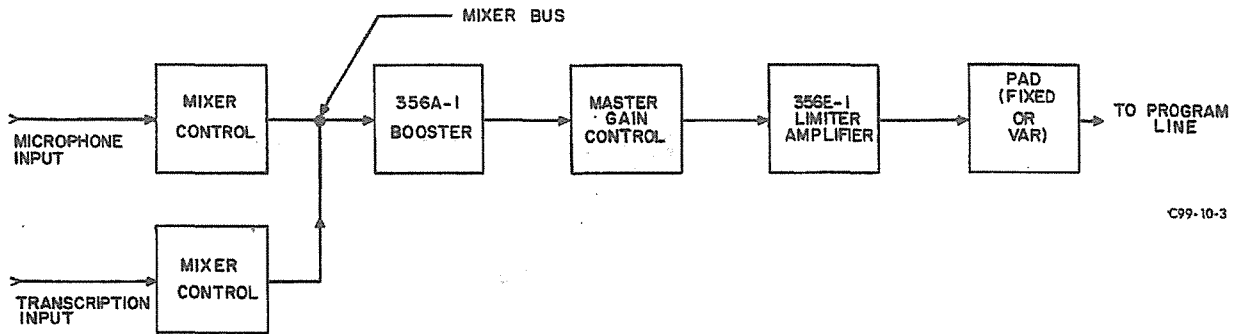
### 1.4 ELECTRICAL CHARACTERISTICS.

1.4.1 CONNECTORS. One 12-pin connector, P601, is located at the front end of the chassis. All connections for input, output, and power are made at this connector. Two jacks, J601 and J602, are provided at the front corners of the chassis top for measurement of threshold voltage.

1.4.2 POWER REQUIREMENTS. Power requirements for the 356E-1 are as follows: 300 volts d-c at 77 milliamperes and 6.3 volts a-c at 1.55 amperes.

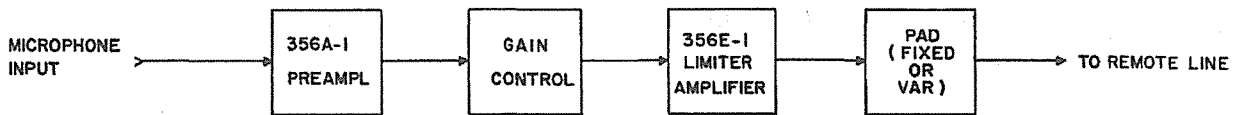
1.4.3 FREQUENCY RANGE. The frequency range of the 356E-1 is 50 to 15,000 cycles per second.

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Figure 2. Collins Type 356E-1 Limiter Amplifier as Automatic Fader Control, Suggested Arrangement



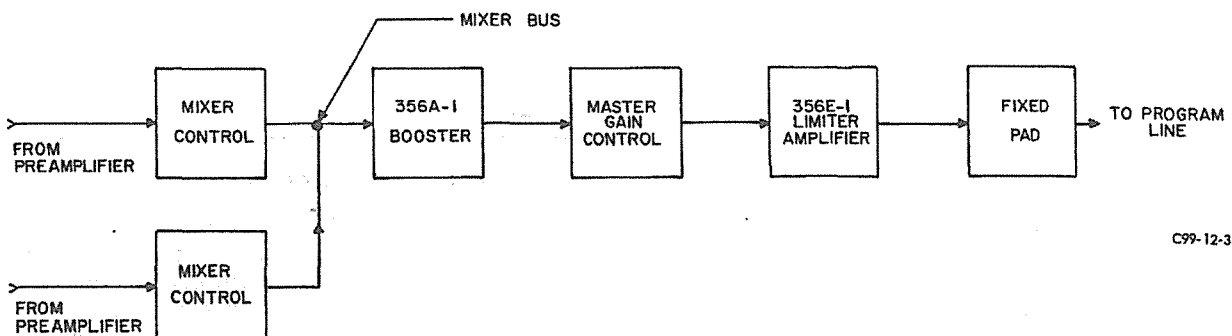
A. 356E-1 LIMITER AMPLIFIER LOCATED REMOTELY



B. 356E-1 LIMITER AMPLIFIER FED FROM REMOTE LINE

C99-13-3

Figure 3. Collins Type 356E-1 Limiter Amplifier as Automatic Level Control, Suggested Arrangement



C99-12-3

Figure 4. Collins Type 356E-1 Limiter Amplifier as Automatic Mixer, Suggested Arrangement

1.4.4 INPUT IMPEDANCE. Limiter Amplifier 356E-1 is factory wired for 600 ohms unloaded transformer input impedance. It may be rewired for 150 ohms input impedance if desired. See figure 11.

1.4.5 GAIN. The gain of the 356E-1 is 54 db.

1.4.6 OUTPUT IMPEDANCE. The 356E-1 is factory wired for 600 ohms output impedance. It may be rewired for 150 ohms output impedance if desired. See figure 11.

1.4.7 FREQUENCY RESPONSE. The frequency response of the 356E-1 is  $\pm 1$  db from 50 to 15,000 cps.

1.4.8 DISTORTION. The distortion of the 356E-1 is as follows: 1.5% maximum distortion from 50 to 15,000 cps with no compression and 2% maximum distortion from 50 to 15,000 cps at any level up to 30 db gain reduction (with threshold set at +20 dbm output).

1.4.9 NOISE LEVEL. The noise level in the output of the 356E-1 is -50 dbm with threshold control set for +20 dbm output.

1.4.10 COMPRESSION RATIO. The compression ratio of the 356E-1 is adjustable from a ratio of 1.6/1 to a ratio of 5/1. A ratio of 3/1 is optimum over a 30-db range of input levels.

1.4.11 ATTACK TIME. The attack time of the 356E-1 is 11 milliseconds with the switch set in DUAL position or 62 milliseconds with the switch set in AVERAGE position.

1.4.12 RELEASE TIME. The release time of Limiter Amplifier 356E-1 is 0.9 seconds for 63% recovery with the switch set in the DUAL position, or 5.2 seconds for 63% recovery with the switch set in the AVERAGE position.

## 2.1 CIRCUIT DESCRIPTION.

Figure 11 is a schematic diagram of Limiter Amplifier 356E-1. Transformer T601 couples input signal to the grids of the push-pull input stage V601. Output from V601 is coupled to the grids of the push-pull output stage by C602 and C603. The output stage is transformer coupled to the load by T602. The threshold voltage control (R612) adjusts the positive bias applied to the cathodes of the bias rectifier V604. A sample of the output signal from the plates of V602 and V603 is coupled to the bias rectifier cathodes by C605 and C606. When the audio voltage at the plates of the output stage is high enough to overcome the threshold voltage, the bias rectifier V604 conducts. Plate current for V604 develops a negative voltage across R616. This negative voltage is the control voltage for the automatic gain circuit. It is applied to the grid return of the input amplifier V601. An increase in level of the input signal does not produce any limiting action until the threshold voltage is exceeded. When this happens, the gain of the input stage is reduced and the output level remains comparatively constant. When

the signal level at the input is again reduced below the threshold voltage, the bias rectifier V604 stops conducting and the bias of the input stage falls back to normal. Attack and release times of the amplifier are determined by the RC time constants in the plate circuit of V604. When S601 is in DUAL position, C607 is charged by the voltage across R616 and the attack time of the amplifier is determined by the time constant of R615 and C607. When the switch, S601, is in the same position and V604 stops conducting, the release time of the circuit is the time necessary for C607 to discharge through R616. When S601 is in AVERAGE position, R617 is shorted out. This connects C608 in parallel with C607 and the attack time is determined by the RC time constant of R615 and the sum of the capacities of C607 and C608. When V604 stops conducting, the release time of the circuit is the time necessary for C607 and C608 to discharge through R616.

## 2.2 APPLICATION.

2.2.1 GENERAL. The 356E-1 may be used as an automatic fader control, as an automatic level control in unattended remote operation, as an automatic mixer, or as a level control in microwave relay systems. Arrangements and adjustments for these uses are described in the following paragraphs.

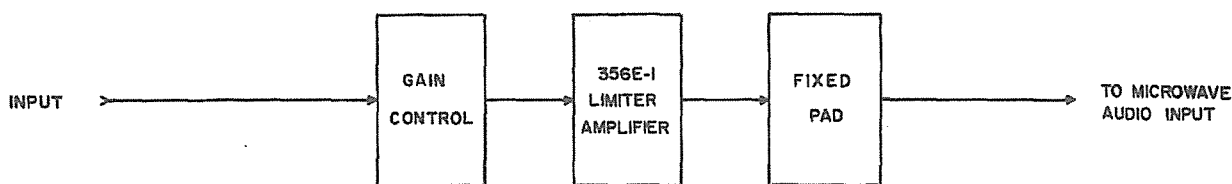
2.2.2 THE 356E-1 USED AS AUTOMATIC FADER CONTROL. Refer to figure 2. The 356E-1 is plugged into J108 of the 212F-1 Broadcast Console. Operate the switch on the 356E-1 to DUAL position. Adjust the mixer in the transcription channel until the GR meter indicates a 2 to 5 db gain reduction. Adjust the mixer in the microphone channel until the microphone signal at the mixer bus is 20 db higher than the transcription signal at the same point. The use of the microphone channel automatically causes the transcription signal to drop 20 db below the microphone signal with an overall output increase of less than 7 db. This 7-db increase may be handled by the peak-limiting amplifier usually employed at the transmitter.

With this type of operation, announcements may be made over the transcription signal without adjustment of the mixers in the microphone or transcription channels. When an announcement is over, the transcription signal automatically returns to its original level.

2.2.3 THE 356E-1 USED AS AUTOMATIC LEVEL CONTROL IN UNATTENDED REMOTE OPERATION. Figure 3A shows a suggested arrangement for using Limiter Amplifier 356E-1 at a remote location. Figure 3B shows a suggested arrangement for using the 356E-1 at a studio with input from a remote line.

With an average input signal, adjust the input to the 356E-1 to produce approximately 15-db gain reduction.

2.2.4 THE 356E-1 USED AS AUTOMATIC MIXER. Figure 4 shows a suggested arrangement for using the 356E-1 as an automatic mixer. When two signals are present at the mixer bus, the amplifier acts as a master gain control, expander-compressor, or as a straight program amplifier.



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Figure 5. Collins Type 356E-1 Limiter Amplifier as Automatic Level Control in Microwave Relay Systems, Suggested Arrangement

2.2.5 THE 356E-1 USED IN MICROWAVE RELAY SYSTEM. Figure 5 shows a suggested arrangement for using the 356E-1 to minimize audio level variations in a microwave relay system.

2.3 ADJUSTMENTS OR MODIFICATIONS.

2.3.1 GENERAL. The following paragraphs describe adjustments of threshold voltage for various input and output levels, modification of resistor values for various release times, and modification of meter and switching circuits to provide for monitoring the amount of gain reduction.

2.3.2 THRESHOLD VOLTAGE SETTINGS. Table 1 gives threshold voltage settings for various input and output levels. Optimum operation results when the threshold voltage is set at 23.5 volts for an output level of +20 dbm. If this level is too high, a fixed pad may be inserted in the output line. For selection of resistor values for selected values of attenuation, refer to figure 6.

TABLE 1. THRESHOLD VOLTAGE SETTINGS

Input DBM	Output DBM	Threshold Voltage
-44	+10	7.5
-40	+14	12.0
-36	+18	19.5
*-34	*+20	*23.5
-32	+22	29.0
-28	+26	45.0
-24	+30	69.0
*Optimum		

2.3.3 RELEASE TIME. The release time of the 356E-1 is satisfactory for most applications. If some other

LOSS IN DB	R1 IN OHMS	R2 IN OHMS	R1 IN OHMS	R2 IN OHMS
0	0	OPEN	0	OPEN
3	103	1703	51.3	1703
6	199	803	98	803
10	312	422	156	422
15	419	220	209	220
20	490	121	245	121

C99-18-3

Figure 6. Resistor Values for 600-Ohm Fixed Pads

value of release time is desired, change the values of R616 and R617. Table 2 gives other values of resistance for R616 and R617 with corresponding release times.

TABLE 2. VALUES OF R616 AND R617 AND CORRESPONDING RELEASE TIMES

Megohms		DUAL Position Seconds		AVERAGE Position Seconds
R616	R617	FAST	SLOW	
2.2	10	0.48	12.2	2.7
3.3	3.3	0.73	6.6	4.0
3.3	10	0.73	13.3	4.0
4.3	4.3	0.95	8.6	5.3
4.3	10	0.95	14.3	5.3
5.1	10	1.1	15.1	6.2
6.2	10	1.4	18.2	7.6

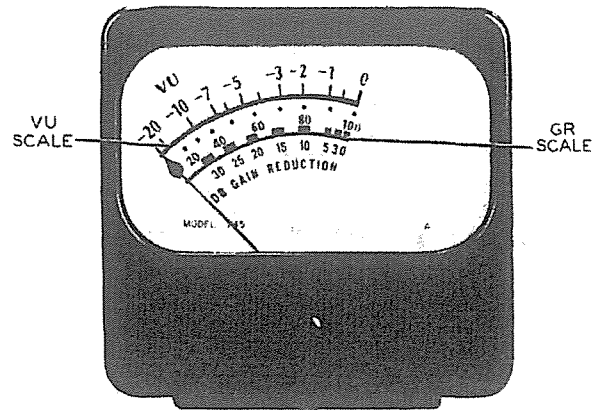


Figure 7. Vu Meter With GR Scale Decal Applied C99-26-P.

Procedures for application of the GR-scale decal (supplied with the 356E-1) and for modification of switching circuits are outlined in the following steps:

2.3.4 MODIFICATION OF VU METER AND SWITCHING CIRCUITS TO READ GAIN REDUCTION.

- a. Remove the front of the vu meter.
- b. Prepare the decal for application according to printed instructions on the decal.

TABLE 3. VOLTAGE AND RESISTANCE MEASUREMENTS FOR THE 356E-1 LIMITER AMPLIFIER

Conditions of measurements:

- a. Voltage readings are taken with a 20,000 ohms-per-volt meter.
- b. Line voltage 115 v a-c. Plate voltage adjusted to +300 volts d-c.
- c. Resistance readings taken with no power applied and amplifier disconnected from power supply.
- d. All measurements from terminal to B-.

Tube		Pin Number								
		1	2	3	4	5	6	7	8	9
V601 (6386)	V DC	20-50	1.2	-0.2	67	0	67	-0.2	1.2	20-50
	V AC	3.0	0	0	0	0	0	0	0	3.0
	Ohms	Inf	200	3.8 meg	300K	Inf	55K	3.8 meg	200	Inf
V602 (6V6)	V DC	0	20-50	290	300	0	0	20-50	18	
	V AC	0	3.0	0	0	0	0	3.0	0	
	Ohms	Inf	Inf	300K	300K	510K	Inf	Inf	230	
V603 (6V6)	V DC	0	20-50	290	300	0	0	20-50	18	
	V AC	0	3.0	0	0	0	0	3.0	0	
	Ohms	Inf	Inf	300K	300K	510K	Inf	Inf	230	
V604 (6AL5)	V DC	0	0	20-50	20-50	0	0	0		
	V AC	0	0	3.0	3.0	0	0	0		
	Ohms	510K	3.8 meg	Inf	Inf	510K	Inf	3.8 meg		

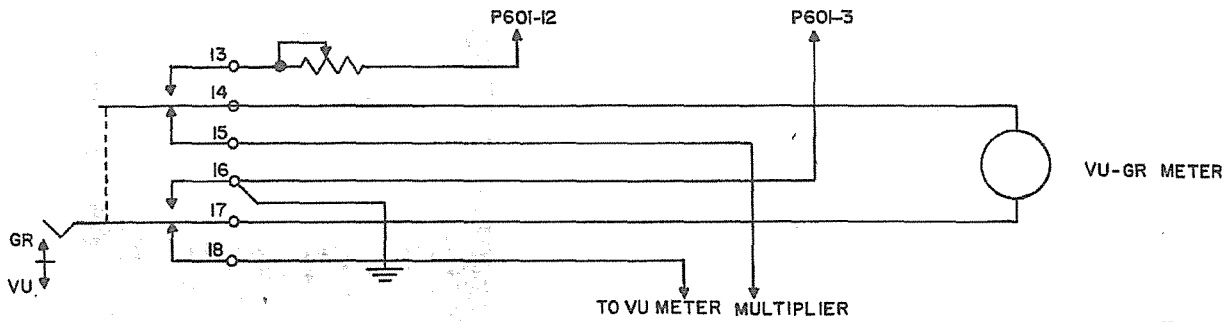


Figure 8. Vu Meter and GR Switch Connections, Schematic Diagram

c. Apply the decal to the VU meter scale with the plain black line of the decal directly over the black line on the meter scale and with the zero of the decal aligned with the zero of the meter scale. See figure 7.

d. Replace the front of the VU meter.

e. If VU-GR switching is desired, refer to figure 8 for wiring connections.

### 3.1 MAINTENANCE.

Normal maintenance will consist of tube replacement. When replacing V602 and V603, adjust R618 for minimum distortion at 50 cps. As these tubes age, this adjustment may again be made. If excessive distortion

occurs, replace V602 and V603. Table 3 gives voltage and resistance measurements for Limiter Amplifier 356E-1.

### 4.1 TABLE OF REPLACEABLE PARTS.

Table 4 gives the description, circuit function, and Collins part number for all replaceable parts in Limiter Amplifier 356E-1. When replacement of parts is necessary, only parts identical or equivalent to those listed should be used. All parts on top of the chassis are identified in figure 9. All parts mounted beneath the chassis are identified in figure 10.

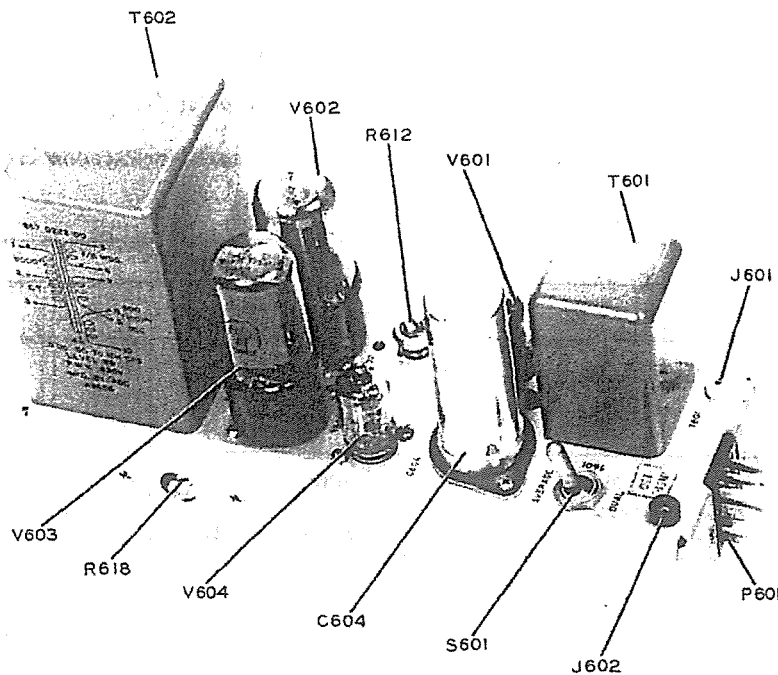


Figure 9. Limiter Amplifier, 356E-1 Top View

C99-42-P.

TABLE 4. TABLE OF REPLACEABLE PARTS FOR LIMITER AMPLIFIER 356E-1

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C601	Frequency compensation	CAPACITOR: paper, 0.001 uf $\pm 10\%$ , 400 vdcw	931 0277 00
C602	Coupling	CAPACITOR: paper, 0.1 uf $\pm 10\%$ , 400 vdcw	931 0299 00
C603	Coupling	SAME as C-602	931 0299 00
C604	Decoupling	CAPACITOR: electrolytic; dual section; 20 uf -10% +50%, 450 vdcw each section	183 1262 00
C605	Coupling	SAME as C602	931 0299 00
C606	Coupling	SAME as C602	931 0299 00
C607	Part of attack-and-release time circuit	CAPACITOR: paper, 0.22 uf $\pm 10\%$ , 400 vdcw	931 0303 00
C608	Part of attack-and-release time circuit	CAPACITOR: paper, 1.00 uf $\pm 20\%$ , 200 vdcw	931 0908 00
E601	Tie point	TERMINAL, stud: melamine body, terminal, brass hot tin tipped, base brass, cadmium plated; hex	306 0234 00
E602	Tie point	SAME as E601	306 0234 00
J601	Pin jack	JACK, TIP: small phone tip, insulated w/ yellow low-loss nylon; nonprecious contact w/ precious metal finish; solder wire attachment	360 0066 00
J602	Pin jack	CONNECTOR, receptacle: 1 round female contact; straight type	360 0063 00
P601	Connector	CONNECTOR, plug: 12 rectangular male contacts	365 2120 00
R601	Frequency compensation	RESISTOR: comp, 0.33 megohm $\pm 5\%$ , 1/2 w	745 1456 00
R602	Cathode bias for V601A	RESISTOR: comp, 130 ohms $\pm 5\%$ , 1/2 w	745 1315 00
R603	Cathode bias for V601B	SAME as R602	745 1315 00
R604	Cathode bias for V601	RESISTOR: comp, 68 ohm $\pm 5\%$ , 1/2 w	745 1302 00
R605	Plate load for V601A	RESISTOR: comp, 10,000 ohms $\pm 5\%$ , 1/2 w	745 1393 00
R606	Plate load for V601B	SAME as R605	745 1393 00
R607	Decoupling	RESISTOR: wire wound, 20,000 ohms $\pm 5\%$ , 5 w	747 9796 00
R608	Grid load for V602	RESISTOR: comp, 0.51 megohm $\pm 5\%$ , 1/2 w	745 1466 00
R609	Cathode bias	RESISTOR: comp, 180 ohm $\pm 10\%$ , 2 w	745 5621 00
R610	Grid load for V603	SAME as R608	745 1466 00
R611	Voltage-dropping	RESISTOR: comp, 0.20 megohm $\pm 5\%$ , 1/2 w	745 1448 00
R612	Threshold voltage adjust	RESISTOR: variable; comp, 100,000 ohms $\pm 20\%$ , 2 w at 70°C	380 5766 00
R613	Diode bias	SAME as R608	745 1466 00



TABLE 4. TABLE OF REPLACEABLE PARTS FOR LIMITER AMPLIFIER 356E-1 (Cont)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R614	Diode bias	SAME as R608	745 1466 00
R615	Part of attack-and-release time circuit	RESISTOR: comp, 51,000 ohms $\pm 5\%$ , 1/2 w	745 1424 00
R616	Part of attack-and-release time circuit	RESISTOR: comp, 4.3 megohm $\pm 5\%$ , 1/2 w	745 1504 00
R617	Part of attack-and-release time circuit	RESISTOR: 10 megohm $\pm 5\%$ , 1/2 w	745 1519 00
R618	V602, V603 cathode balance	RESISTOR: variable; 100 ohms $\pm 10\%$ WW A linear; 2 watts	750 0516 00
S601	Selects Dual or AVERAGE limiting	SWITCH, toggle: spst, 30 V dc, 20 amps in locking position, phenolic body	266 3072 00
T601	Input transformer	TRANSFORMER, AF: input type; 1000 cps, 1 milliwatt; primary 600 ohm, tap No. 1, 150 ohms, connected CT, tap No. 2, 150 ohms, 500 rms; secondary 60,000 ohms connected CT, 500 rms	667 0211 00
T602	Output transformer	TRANSFORMER, AF: output type; primary 9000 ohms, secondary impedance 600 ohms when series connected; 150 ohm when parallel connected; transformer contains a feedback winding shielded between primary and secondary grounded	667 0222 00
TB601		BOARD, TERMINAL: phenolic, 3 solid lug terminals, brass terminals	306 9033 00
TB602		SAME as TB601	306 9033 00
TB603		SAME as TB601	306 9033 00
TE604		SAME as TB601	306 9033 00
V601	Input amplifier	TUBE, electron: vacuum tube, 6386	253 0015 00
V602	Output amplifier	TUBE, electron: receiving tube beam, 6V6 GT	255 0021 00
V603	Output amplifier	SAME as V602	255 0021 00
V604	Diode limiter	TUBE, electron: twin diode rectifier 6AL5	257 0018 00
XV601		SOCKET, tube: 9 contact miniature	220 1262 00
XV602		SOCKET, tube: 8 prong octal	220 1005 00
XV603		SAME as XV602	220 1005 00
XV604		SOCKET TUBE: 7 contact miniature	220 1235 00

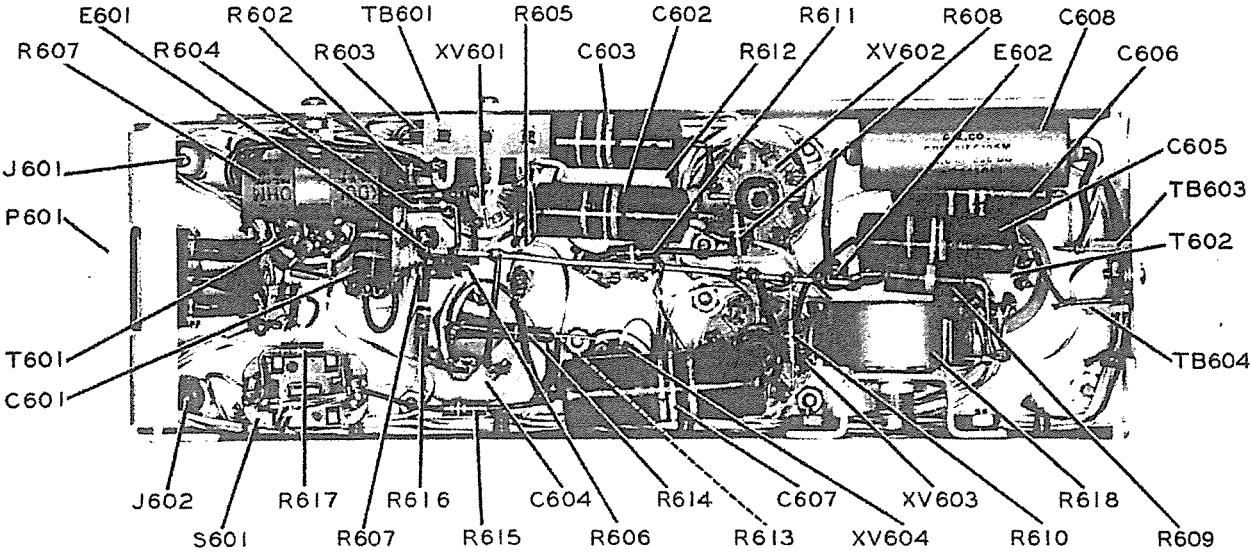
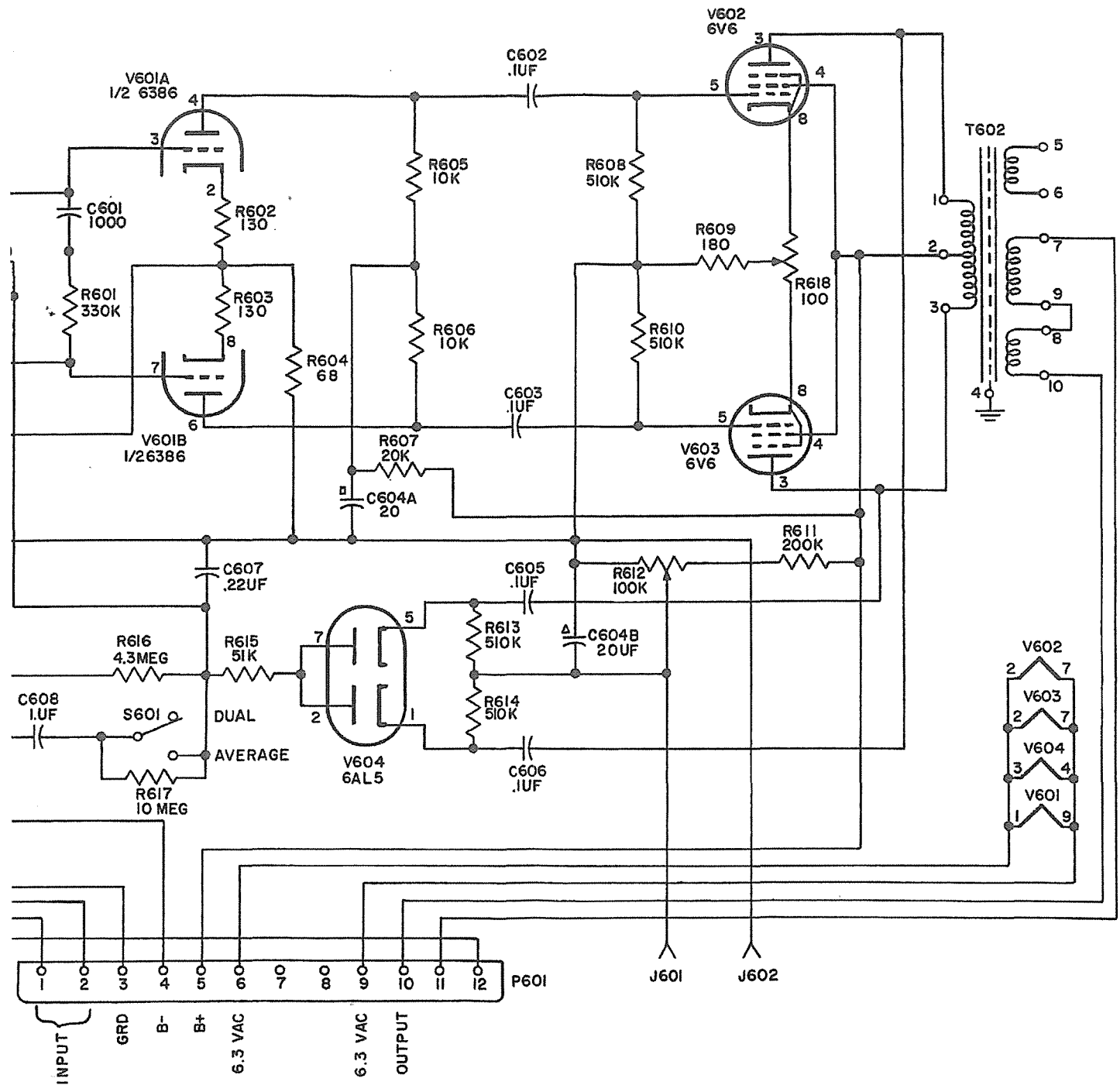


Figure 10. Limiter Amplifier, 356E-1 Bottom View

CP-43-P.

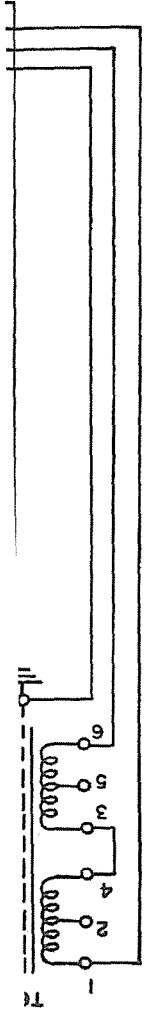


UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE IN OHMS,  
 CAPACITOR VALUES ARE IN MICROMICROFARADS.  
 V601 IN DUAL POSITION.

Figure 11. Limiter Amplifier 356E-1,  
 Schematic Diagram

C99-07-3

NOTES  
1. UNLESS  
CAPACIT  
2. 5601 5



**Instruction Book  
for**

**274K-1 RELAY UNIT**

**COLLINS RADIO COMPANY  
Cedar Rapids, Iowa**

**520 5449 00  
15 MAY 1956**

# GUARANTEE

The equipment described herein is sold under the following guarantee:

Collins agrees to repair or replace, without charge, any equipment, parts, or accessories which are defective as to design, workmanship or material, and which are returned to Collins at its factory, transportation prepaid, provided

- (a) Notice of the claimed defect is given Collins within one (1) year from date of delivery and goods are returned in accordance with Collins' instructions.
- (b) Equipment, accessories, tubes, and batteries not manufactured by Collins or from Collins' designs are subject to only such adjustments as Collins may obtain from the supplier thereof.
- (c) No equipment or accessory shall be deemed to be defective if, due to exposure or excessive moisture in the atmosphere or otherwise after delivery, it shall fail to operate in a normal or proper manner.

Collins further guarantees that any radio transmitter described herein will deliver full radio frequency power output at the antenna lead when connected to a suitable load, but such guarantee shall not be construed as a guarantee of any definite coverage or range of said apparatus.

The guarantee of these paragraphs is void if equipment is altered or repaired by others than Collins or its authorized service center.

No other warranties, expressed or implied, shall be applicable to any equipment sold hereunder, and the foregoing shall constitute the Buyer's sole right and remedy under the agreements in this paragraph contained. In no event shall Collins have any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with other equipment or materials, or from any other cause.

**HOW TO RETURN MATERIAL OR EQUIPMENT.** If, for any reason, you should wish to return material or equipment, whether under the guarantee or otherwise, you should notify us, giving full particulars including the details listed below, insofar as applicable. If the item is thought to be defective, such notice must give full information as to nature of defect and identification (including part number if possible) of part considered defective. (With respect to tubes we suggest that your adjustments can be speeded up if you give notice of defect directly to the tube manufacturer.) Upon receipt of such notice, Collins will promptly advise you respecting the return. Failure to secure our advice prior to the forwarding of the goods or failure to provide full particulars may cause unnecessary delay in handling of your returned merchandise.

**ADDRESS:**

Collins Radio Company  
Sales Service Department  
Cedar Rapids, Iowa

**INFORMATION NEEDED:**

- (A) Type number, name, and serial number of equipment
- (B) Date of delivery of equipment
- (C) Date placed in service
- (D) Number of hours of service
- (E) Nature of trouble
- (F) Cause of trouble if known
- (G) Part number (9 or 10 digit number) and name of part thought to be causing trouble
- (H) Item or symbol number of same obtained from parts list or schematic
- (I) Collins' number (and name) of unit sub-assemblies involved in trouble
- (J) Remarks

**HOW TO ORDER REPLACEMENT PARTS.** When ordering replacement parts, you should direct your order as indicated below and furnish the following information insofar as applicable. To enable us to give you better replacement service, please be sure to give us complete information.

**ADDRESS:**

Collins Radio Company  
Sales Service Department  
Cedar Rapids, Iowa

**INFORMATION NEEDED:**

- (A) Quantity required
- (B) Collins' part number (9 or 10 digit number) and description
- (C) Item or symbol number obtained from parts list or schematic
- (D) Collins' type number, name, and serial number of principal equipment
- (E) Unit sub-assembly number (where applicable)

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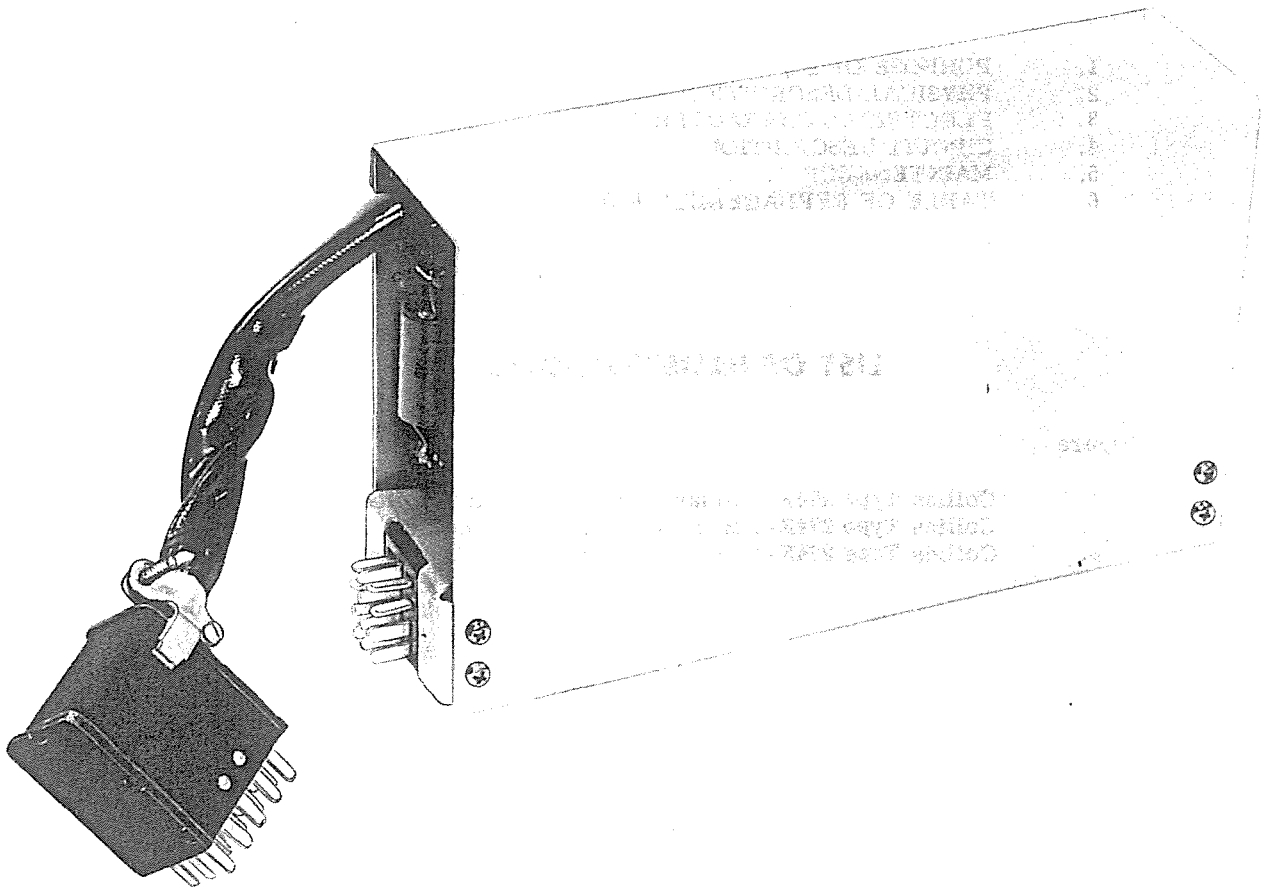


Figure 1. Collins Type 274K-1 Relay Unit, Equipment Supplied

534 2303



# TYPE 274K-1 RELAY UNIT

## 1. PURPOSE OF EQUIPMENT.

The 274K-1 Relay Unit controls application of audio power to station speakers and a-c power to studio warning lights when used with broadcast studio equipment such as the Collins Type 212F-1 Broadcast Console. It may be used in AM, FM, and TV broadcast service or program control in audio systems.

## 2. PHYSICAL DESCRIPTION.

The 274K-1 Relay Unit (figure 1) is a plug-in module containing four 12-volt d-c relays and their associated circuitry. The 274K-1 Relay Unit is 5-1/2 inches high, 2-1/2 inches wide, and 9 inches long and weighs approximately 2.5 pounds.

## 3. ELECTRICAL CHARACTERISTICS.

a. CONNECTORS. - One 12-pin connector, P502, is located at the front end of the chassis. One 15-pin connector, P501, is connected to the 274K-1 Relay Unit by a cable.

b. POWER REQUIREMENTS. - Power requirements for the 274K-1 Relay Unit are 12 volts d-c at 0.56 amperes.

c. NOISE. - The four relays of the 274K-1 Relay Unit are mounted on rubber to minimize noise.

## 4. CIRCUIT DESCRIPTION.

Figure 3 is a schematic diagram of the 274K-1 Relay Unit. The relays are shown de-energized. When 12 volts d-c is applied to the unit all relays are normally energized. All connections to the relay coils and contacts are made at P501 and P502. Resistors R505 through R508 and capacitors C501 through C504 are connected as transient suppressing networks across the relay coils to minimize radio interference and contact wear. Power necessary for operation of the relays must be supplied from an external source such as the Collins Type 409X-1 Power Supply.

## 5. MAINTENANCE.

The 274K-1 Relay Unit will require very little maintenance other than periodic inspections. Keep the relay contacts clean and bright.

## 6. TABLE OF REPLACEABLE PARTS.

Table 1 gives the description, circuit function, and Collins part number for all replaceable parts in the 274K-1 Relay Unit. When replacement of parts is necessary, only parts identical or equivalent to those listed should be used. All parts are identified in figure 2.

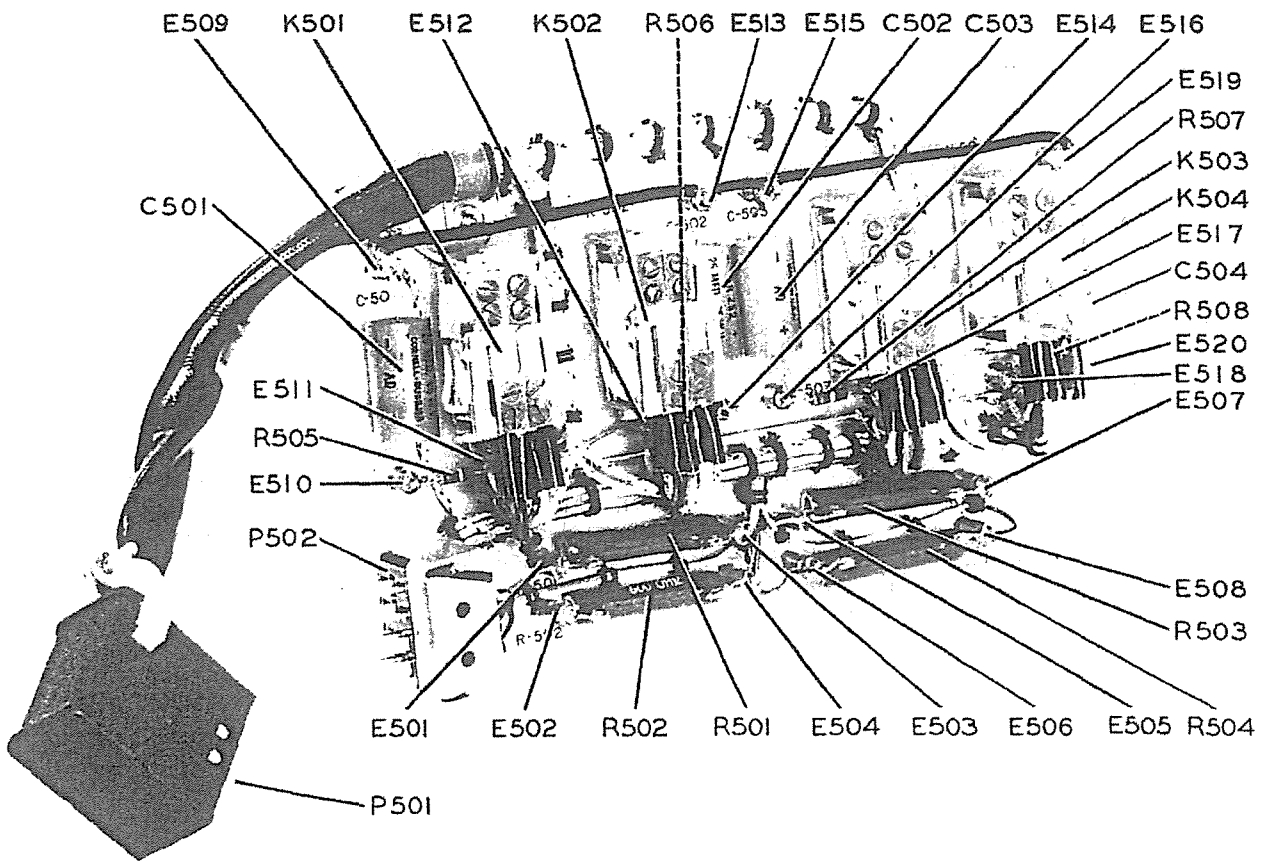


Figure 2. Collins Type 274K-1 Relay Unit, Cover Removed

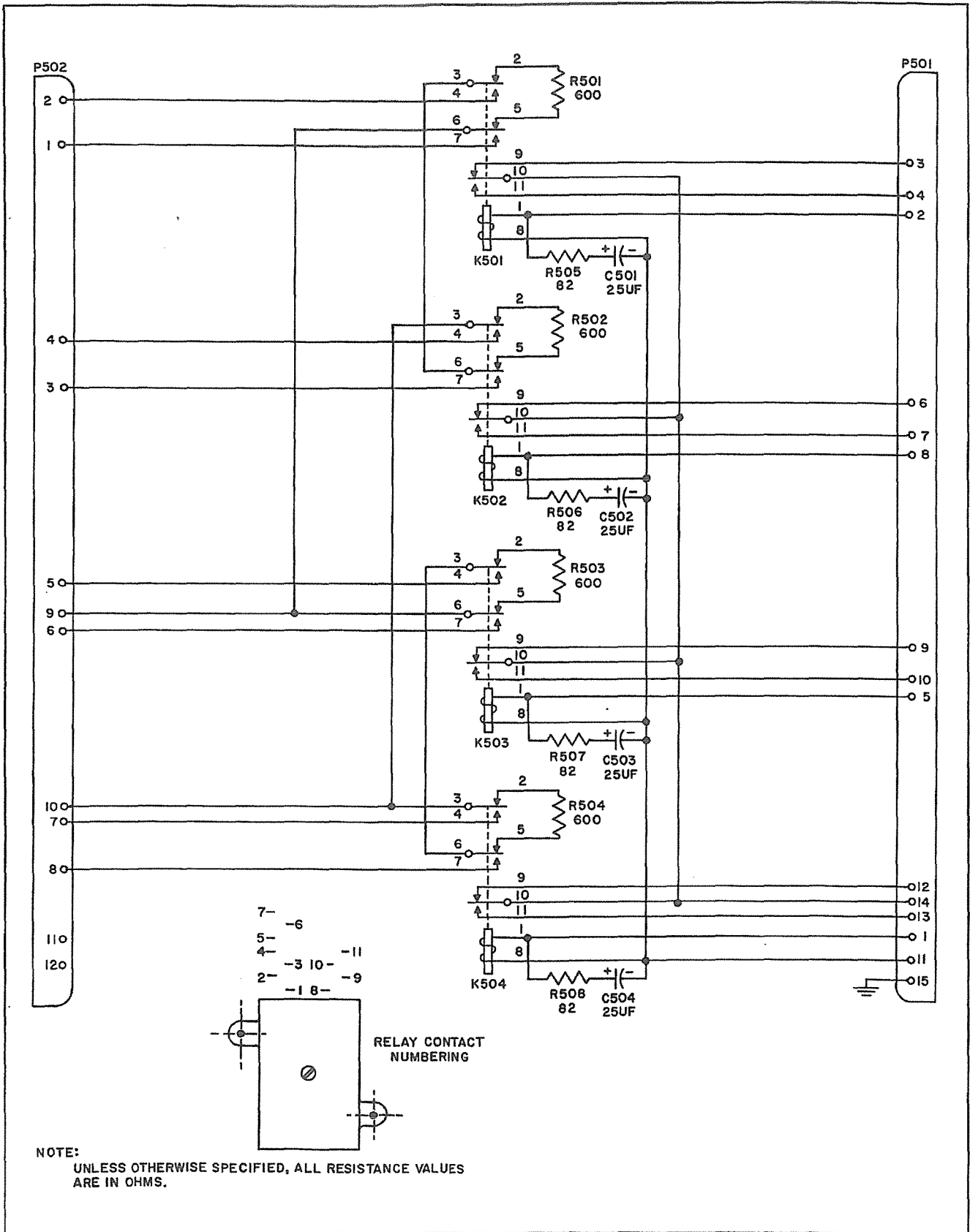
534 2308

TABLE 1. TABLE OF REPLACEABLE PARTS FOR THE 274K-1 RELAY UNIT

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C501	P/o transient sup- pressing network	CAPACITOR: electrolytic 25 uf -10% +100%; 25 vdcw	183 1034 00
C502	P/o transient sup- pressing network	SAME as C501	183 1034 00
C503	P/o transient sup- pressing network	SAME as C501	183 1034 00
C504	P/o transient sup- pressing network	SAME as C501	183 1034 00
E501		TERMINAL, stud: melamine body, brass term tinned brass base cadmium plated; hex	306 0233 00
E502		SAME as E501	306 0233 00
E503		SAME as E501	306 0233 00
E504		SAME as E501	306 0233 00
E505		SAME as E501	306 0233 00
E506		SAME as E501	306 0233 00
E507		SAME as E501	306 0233 00
E508		SAME as E501	306 0233 00
E509		TERMINAL, stud: melamine body, brass term tinned brass base cadmium plated; hex	306 0234 00
E510		SAME as E509	306 0234 00
E511		SAME as E509	306 0234 00
E512		SAME as E509	306 0234 00
E513		SAME as E509	306 0234 00
E514		SAME as E509	306 0234 00
E515		SAME as E509	306 0234 00
E516		SAME as E509	306 0234 00
E517		SAME as E509	306 0234 00
E518		SAME as E509	306 0234 00
E519		SAME as E509	306 0234 00
E520		SAME as E509	306 0234 00
K501	Speaker control relay	RELAY, telephone: contact arrangement right 1 c, left 2 c contact capacity 3 amps; 150 w coil voltage 12 V	970 1139 00
K502	Speaker control relay	SAME as K501	970 1139 00
K503	Speaker control relay	SAME as K501	970 1139 00

TABLE 1. TABLE OF REPLACEABLE PARTS FOR THE 274K-1 RELAY UNIT (Cont)

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
K504	Speaker control relay	SAME as K501	970 1139 00
P501	Connector	CONNECTOR, plug: 15 prong contacts	365 9150 00
P502	Connector	CONNECTOR, plug: 12 prong contacts	365 2120 00
R501	Line terminating resistor	RESISTOR: ww, 129 ma max current $\pm 10\%$ , 10 w	710 1600 20
R502	Line terminating resistor	SAME as R501	710 1600 20
R503	Line terminating resistor	SAME as R501	710 1600 20
R504	Line terminating resistor	SAME as R501	710 1600 20
R505	P/o transient suppressing network	RESISTOR: comp, 82 ohms $\pm 10\%$ , 1/2 w	745 1307 00
R506	P/o transient suppressing network	SAME as R505	745 1307 00
R507	P/o transient suppressing network	SAME as R505	745 1307 00
R508	P/o transient suppressing network	SAME as R505	745 1307 00



C99-04-3

Figure 3. Collins Type 274K-1 Relay Unit, Schematic Diagram

# UNIT INSTRUCTIONS

TD-328  
15 JANUARY 1960  
523 0035 00

## POWER SUPPLY 409X-2

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1960

CEDAR RAPIDS, IOWA, U.S.A.

PRINTED IN THE UNITED STATES OF AMERICA

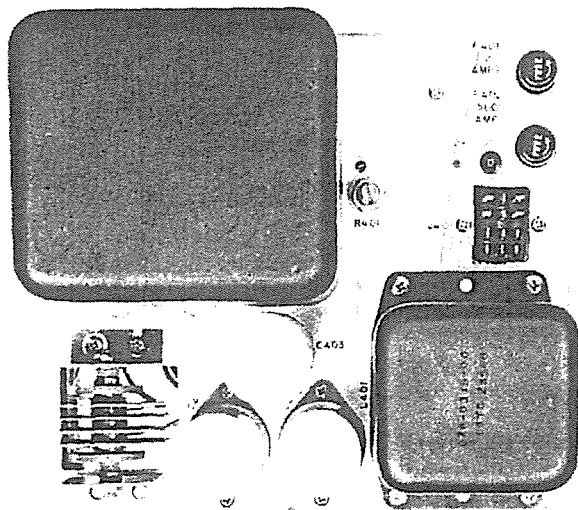


Figure 1. Power Supply 409X-2

C583-17-P

### 1.1 PURPOSE OF EQUIPMENT.

Power Supply 409X-2 furnishes power for filaments, plate circuits, and relays in Collins Broadcast Consoles 212E-1, 212F-1, and 212G-1.

### 1.2 PHYSICAL DESCRIPTION.

Power Supply 409X-2 (figure 1) is a plug-in power supply. It is 9 inches long, 8 inches wide, and 6 inches high and weighs 25 pounds.

### 1.3 ELECTRICAL CHARACTERISTICS.

a. CONNECTORS. One 12-pin connector, J401, is located on top of the chassis. All connections to Power Supply 409X-2 are made at this connector.

b. POWER SOURCE. The 409X-2 requires a 115- or 230-volt a-c  $\pm 10\%$ , 50/60-cps, single-phase power source capable of supplying 225 watts maximum power.

c. OUTPUT VOLTAGES. The output of the 409X-2 is as follows: 250 to 300 volts d-c (adjustable) at 250 ma maximum, 6.3 volts a-c at 6.0 amperes, biased at approximately +30 volts d-c, 12 volts d-c at 1 ampere.

### 2.1 CIRCUIT DESCRIPTION.

Figure 3 is a schematic diagram of Power Supply 409X-2. The 409X-2 is factory wired for a 115-volt a-c operation, but may be connected to a 230-volt source if transformer T401 primary terminals are connected as follows: disconnect the wires from terminal 1 to terminal 2 and from terminal 3 to terminal 4 on TB401. Connect terminal 2 to terminal 3. Replace F401 with a 1.0-amp fuse. The power supply is protected by fuse F401 in the transformer primary circuit and by fuse F402 in the B- output lead. The 409X-2 has an unregulated output.

Four type 1N1492 silicon rectifiers, CR401 through CR404, are utilized to provide the high-voltage output. This output is filtered by C401, C402, and L401. The high-voltage output may be adjusted from 250 to 300 volts d-c by R401. A selenium rectifier, CR405, provides 12 volts d-c for operation of relays. The 12-volt supply is filtered by C403. The a-c power is supplied to the rectifying circuits from windings on T401. The winding associated with the 12-volt supply has a high-voltage tap to be used when necessary to compensate for aging of CR405. Another winding on T401 provides the 6.3-volt a-c for the filament string. This winding is biased with approximately +30 volts d-c to minimize a-c noise in the preamplifiers.

### 3.1 MAINTENANCE.

Normal maintenance consists of fuse replacement. Refer to figure 4, if necessary, to perform continuity or voltage checks. Test points J1- and J2+ are located on top of the chassis for ease of B+ adjustment.

### 4.1 REPLACEMENT PARTS.

The parts list gives the description and Collins part number for all replaceable parts in Power Supply 409X-2. When replacement of parts is necessary, only parts identical or equivalent to those listed should be used. All parts are identified in figure 2.

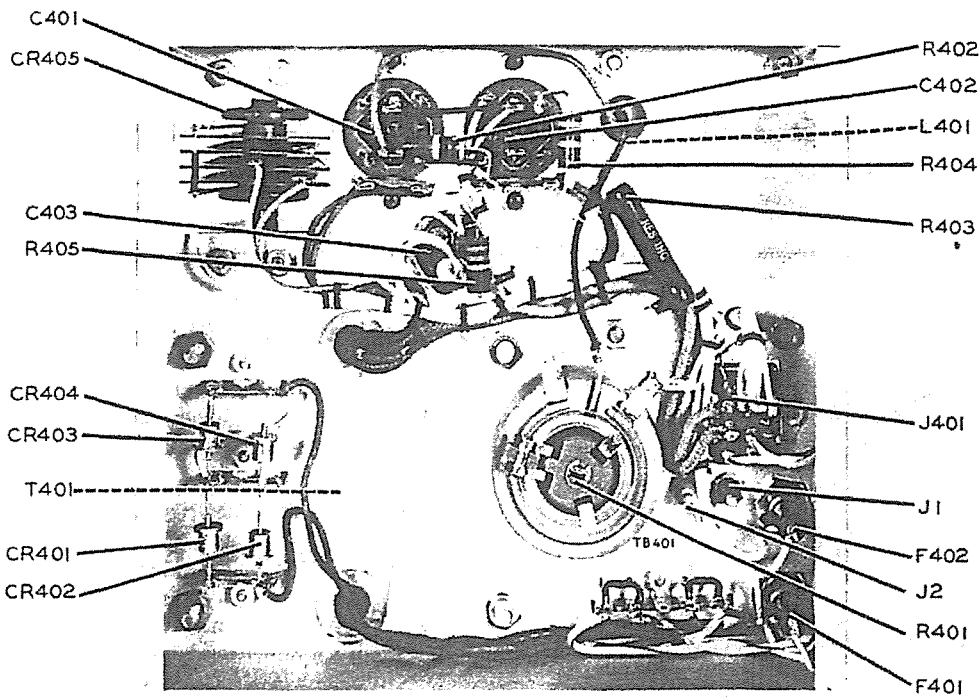


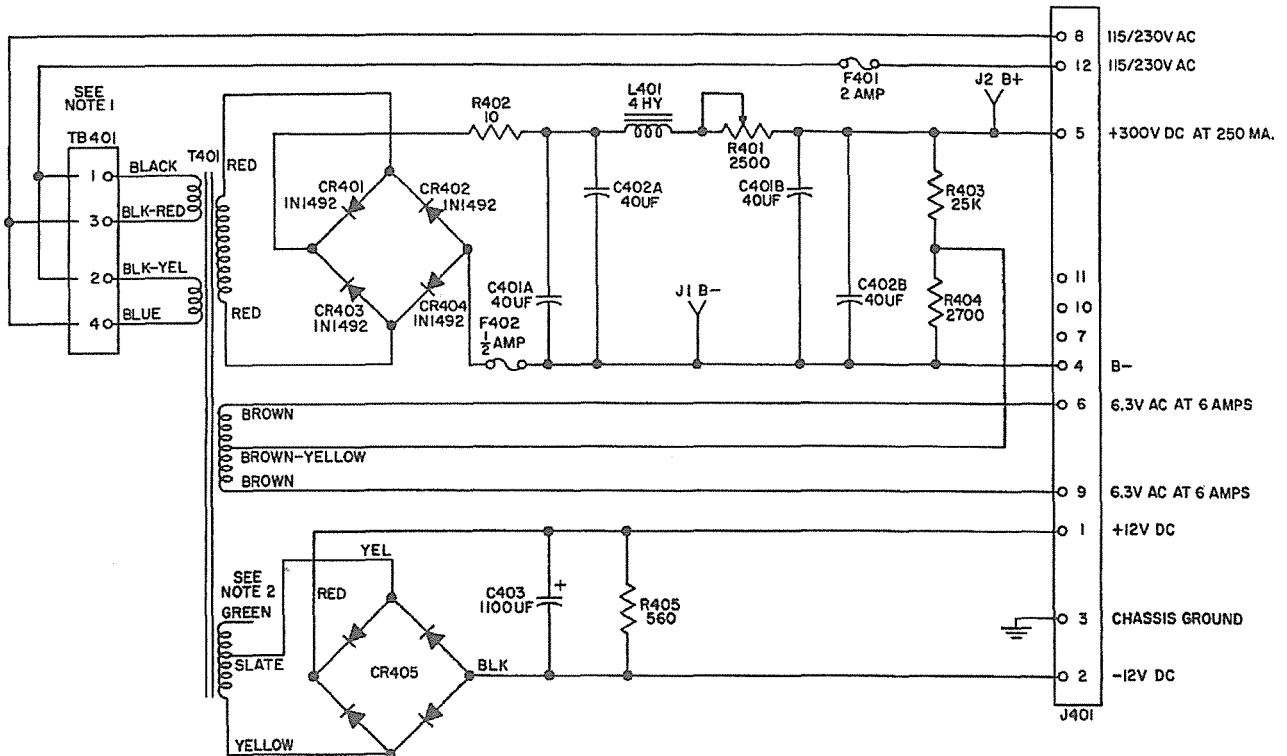
Figure 2. Power Supply 409X-2, Bottom View

C583-19-P

PARTS LIST

ITEM	DESCRIPTION	COLLINS PART NUMBER
POWER SUPPLY 409X-2		522 1691 000
C401	CAPACITOR, FIXED, ELECTROLYTIC: dual section, 40 uf ea, +5% -10%, 450 v dc	183 1259 00
C402	CAPACITOR, FIXED, ELECTROLYTIC: same as C401	183 1259 00
C403	CAPACITOR, FIXED, ELECTROLYTIC: 1100 uf, 25 v dc	184 2000 00
CR401	RECTIFIER: silicon, General Electric IN1492	353 1661 00
CR402	RECTIFIER: same as CR401	353 1661 00
CR404	RECTIFIER, METALLIC: selenium; Sarkes-Tarzian type 5N26-1B-1BBS	353 0254 00
CR405		353 0254 00
F401	FUSE, CARTRIDGE: 2 amp, 125 v dc; time delay, ferrule type terminal	264 0008 00
F402	FUSE, CARTRIDGE: 1/2 amp, 250 v; time delay, ferrule terminals; 1/4 in. dia. by 1-1/4 in. lg o/a	264 0293 00
J401	CONNECTOR, RECEPTACLE, ELECTRICAL: 12 male contacts, 10 amps, 730 v ac; straight shape	356 2120 00
J1	JACK, TIP: accommodates standard phone tip, black plastic insulation, precious metal plated contact, terminal lug for wire accommodation	360 0063 00
J2	JACK, TIP: accommodates std phone tip, red plastic insulation, precious metal plated contact, terminal lug for wire accommodation	360 0062 00

ITEM	DESCRIPTION	COLLINS PART NUMBER
L401	REACTOR: 4.0 hy inductance 275 ma dc, 100 ohms dc resistance, metal encased, 3-1/4 in. by 4-1/32 in. by 3-7/8 in. h	668 0446 00
R401	RESISTOR, VARIABLE, WIRE WOUND: 2500.0 ohms, ±10%, 50 w	736 0231 00
R402	RESISTOR, FIXED, COMPOSITION: 10 ohms, ±10%, 2 w	745 5568 00
R403	RESISTOR, FIXED, WIRE WOUND: 25,000 ohms, ±10%, 10 w	710 8068 00
R404	RESISTOR, FIXED, COMPOSITION: 2700 ohms, ±10%, 2 w	745 5670 00
R405	RESISTOR, FIXED, COMPOSITION: 560 ohms, ±10%, 2 w	745 5642 00
T401	TRANSFORMER POWER STEP-UP, STEP-DOWN: encased, metal case, primary winding no. 1 and no. 2, 115 v each 230 connected, 50/60 cps secondary windings 265 v, 12.0 v, 13.5 v, 6.3 v ct	862 0445 00
TB401	TERMINAL BOARD: phenolic; incl 5 solder lug terminals; 1/16 in. by 3/8 in. by approx 1-15/16 in.	306 0550 00
XF401	FUSEHOLDER: extractor post type; 250 v, 15 amp	265 1003 00
XF402	FUSEHOLDER: same as XF401	265 1003 00



NOTES:  
1. T401 WIRED FOR 115V OPERATION. FOR 230V OPERATION MAKE FOLLOWING CHANGES ON TB401:  
REMOVE JUMPERS 1 TO 2 AND 3 TO 4, ADD JUMPER 2 TO 3. REPLACE F401 WITH 1 AMP FUSE.  
2. GREEN LEAD OF T401 IS AN AGING TAP.

Figure 3. Power Supply 409X-2, Schematic Diagram



# POWER SUPPLY 409Y-1

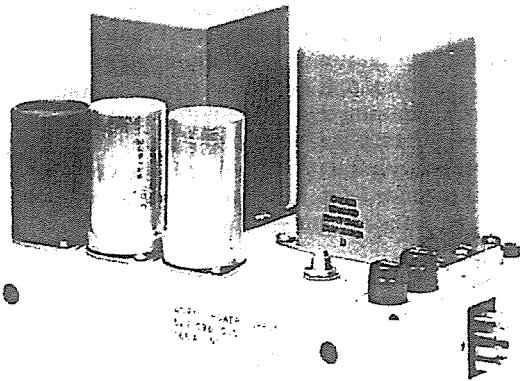


Figure 1. Power Supply 409Y-1

C277-02-P

## 1.1 DESCRIPTION OF EQUIPMENT.

Power Supply 409Y-1 (see figure 1) is a plug-in, unregulated power supply designed for use with Collins speech equipment such as Preamplifier 356A-1, the Program/Monitor Amplifier 356B-1, and Limiter Amplifier 356E-1.

The 409Y-1 may be mounted in any axis in speech consoles, relay racks, or rack shelves. All external connections terminate at the front in a 12-contact Howard Jones plug so that the unit can be removed from its place of mounting with minimum of effort and time. The overall dimensions of the unit are 9-1/2 in. lg by 5-1/2 in. w by 5-9/16 in. h. It is finished in natural aluminum, and it weighs 10-3/4 pounds.

## 1.2 EQUIPMENT SUPPLIED.

The equipment supplied under part number 522 0961 005 consists of Power Supply 409Y-1 complete with one set of fuses and rectifiers.

## 1.3 SPECIFICATIONS.

Power source	115 or 230 volts a-c $\pm 10\%$ , 50/60 cps, single phase.
Type of service	Continuous.

Ambient temperature range	+15°C to +45°C.
Ambient humidity range	Up to 95%.
Altitude	Up to 10,000 feet.
Power input	85 watts max.
Output voltage	Up to 100 ma at 300 volts d-c, adjustable; 3.0 amperes at 6.3 volts a-c.
Ripple	25 millivolts max.
Rectifiers	Two commercial-type IN1084 silicon rectifiers.

## 1.4 LIST OF FUSES.

One 3/4-amp, 250-volt MDL 3/4 fuse in the primary of the power transformer; one 1/8-amp, 250-volt MDL 1/8 fuse in the B-minus lead. Change the primary fuse to 3/8 ampere when using 230 volts input.

## 2.1 INSTALLATION.

The 409Y-1 can be mounted in a console, relay rack, or rack shelf (see figure 2). Collins Rack Shelf 499G-1 is especially adapted to mounting the 409Y-1. The mating connector used is a Howard Jones type S-312-AB, Collins part number 366 2120 00, for bracket mounting; or a Howard Jones type S-312-CCT, Collins part number 366 8120 00, for cable mounting. Refer to figure 5, the main schematic diagram of the 409Y-1. The B- is terminated at pin 4 of P1 and floats

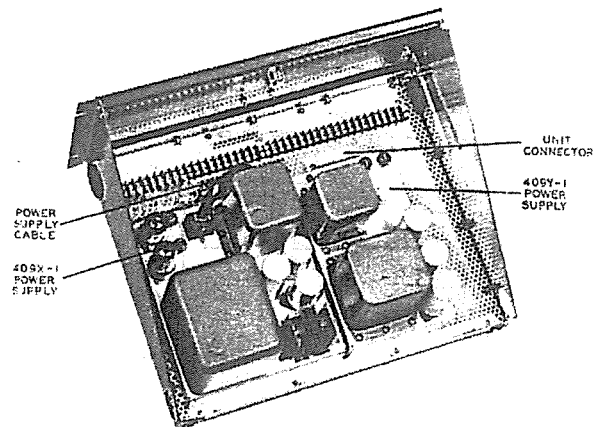
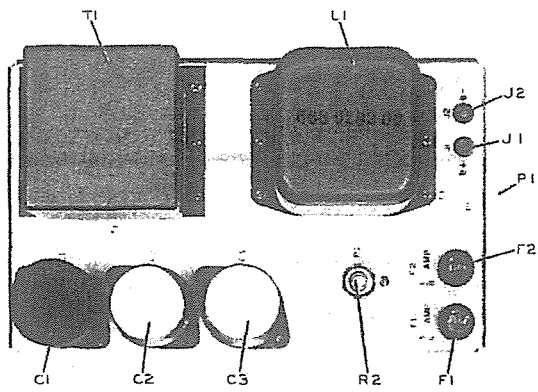


Figure 2. Rack Shelf 499G-1 Typical Arrangement

C187-19-P





C277-03-P

Figure 3. Power Supply 409Y-1, Top View

above chassis ground. If chassis grounding of the B- is desired, jumper pins 3 and 4 of the mating connector. The filament winding of the power transformer is biased with a positive potential, so the filaments of the tubes to be excited must not be grounded in the unit being served by the power supply.

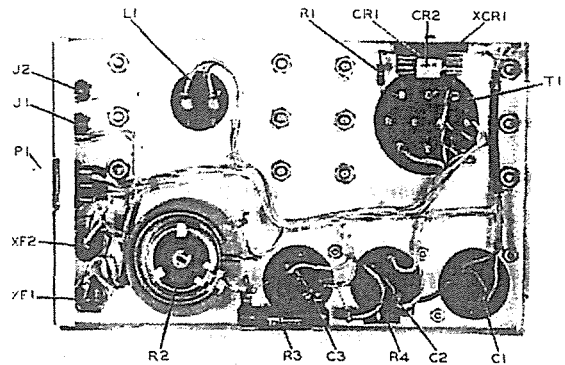
If 230 volts a-c source is to be used, reconnect the primary of the power transformer to place the windings in series, i.e., connect terminals 2 and 3 together and excite the primary at terminals 1 and 4. Change the primary fuse F1 to 3/8 ampere.

Connect the load to Power Supply 409Y-1, and allow the load to stabilize. Then connect a d-c voltmeter to test jacks J1 (positive) and J2 (negative), and adjust resistor R2 for desired voltage.

If the line voltage at the installation is low, the wire at terminal 6 of T1 can be moved to terminal 7 to increase the output as much as 35 volts.

### 3.1 PRINCIPLES OF OPERATION.

Refer to figure 5. Power Supply 409Y-1 uses a full-wave voltage doubler circuit. The combination plate and filament transformer, T1, drives the half-wave silicon rectifiers, CR1 and CR2. Capacitors C1 and C2 are part of the voltage doubling circuit, and capacitor C3 along with inductor L1 filters the hum from the direct current. Resistors R3 and R4 perform the function of bleeder for the power supply and voltage divider for obtaining positive bias for application to the filament winding. Resistor R1 is a 10-ohm resistor used as a surge limiter. Variable resistor R2 is used to reduce the output voltage to the desired value (within limits, depending upon the current used). Test jacks are provided for checking the value of plate supply voltage.



C277-04-P

Figure 4. Power Supply 409Y-1, Bottom View

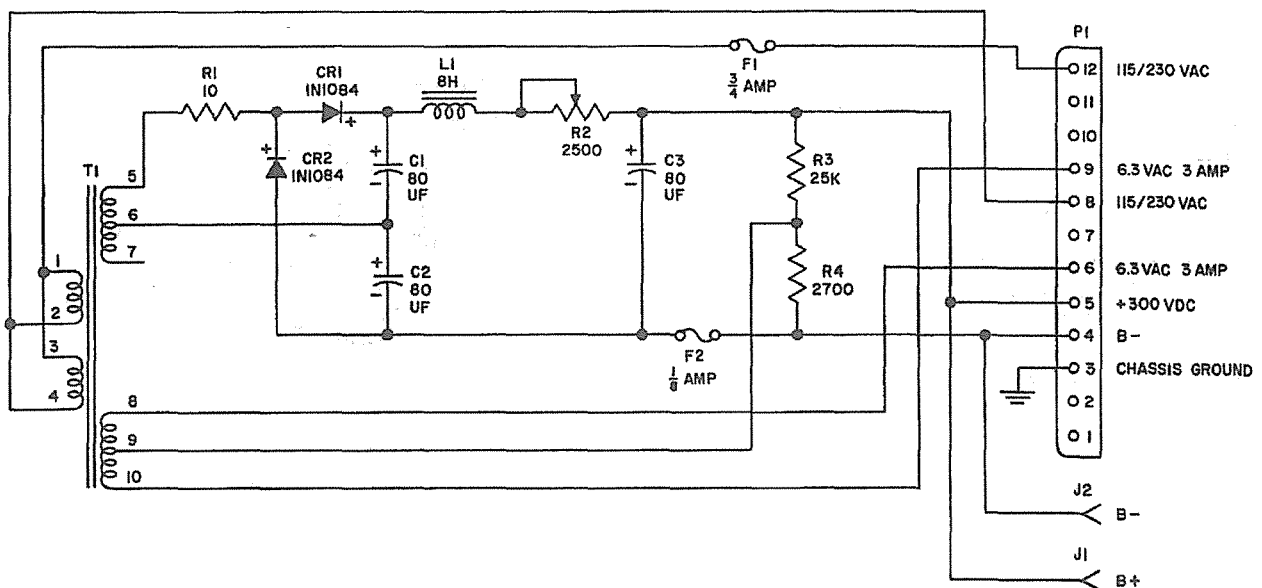


Figure 5. Power Supply 409Y-1, Schematic Diagram

C277-01-3

# PARTS LIST

Power Supply 409Y-1

ITEM	DESCRIPTION	COLLINS PART NUMBER
C1	CAPACITOR, FIXED, DRY ELECTROLYTIC: dual section, 40 uf ea, plus 100% minus 10%, 450 vdcw; Sprague Electric	183 1263 00
C2	CAPACITOR, FIXED, DRY ELECTROLYTIC: dual section, 40 uf ea, plus 5% minus 10%, 450 vdcw; Sprague Electric	183 1259 00
C3	CAPACITOR, FIXED, DRY ELECTROLYTIC: same as C2	183 1259 00
CR1	SEMICONDUCTOR DEVICE, DIODE: type 1N1084; Sarkes-Tarzian 40M(M500)	353 1567 00
CR2	SEMICONDUCTOR DEVICE, DIODE: same as CR1	353 1567 00
E1	TERMINAL, LUG: bronze, rd tongue end, for u/w #6 size screw; shakeproof Inc.	304 0318 00
E2	TERMINAL, STUD: brass, 1/4 in. hex by 0.632 in. lg overall; Whitso Inc.	306 0234 00
F1	FUSE, CARTRIDGE: cylindrical, 0.750 amp, 250 v max, glass body, ferrule term; Buss Mfg. MDL3/4	264 4270 00
F2	FUSE, CARTRIDGE: cylindrical, 0.125 amp, 250 v max, time lag, glass body, ferrule term; Buss Mfg. MDL 1/8	264 4230 00
J1	CONNECTOR, RECEPTACLE, ELECTRICAL: single rd female contact, straight shape; E. F. Johnson type #105	360 0062 00

ITEM	DESCRIPTION	COLLINS PART NUMBER
J2	JACK, TIP: accommodates standard phone tip; E. F. Johnson type #105	360 0063 00
L1	REACTOR: 8 by inductance, 105 ma d-c, 100 ohms d-c resistance; Chicago Std. Trans.	668 0282 00
P1	CONNECTOR, RECEPTACLE, ELECTRICAL: 12 male contacts, 10 amps, 730 v a-c; H. H. Jones, Div. Cinch Mfg. no. P-312-A-B-W. I.	365 2120 00
R1	RESISTOR, FIXED, COMPOSITION: 10 ohms 10%, 1/2 w; MIL RC20GF100K	745 1268 00
R2	RESISTOR, RHEOSTAT, WIRE WOUND: 2500.0 ohms $\pm 10\%$ , 50 w; Clarostat	736 0231 00
R3	RESISTOR, FIXED, WIRE WOUND: 25,000 ohms $\pm 10\%$ , 10 w; Ohmite type Brown Devil	710 1254 20
R4	RESISTOR, FIXED, COMPOSITION: 2700 ohms $\pm 10\%$ , 2 w; MIL RC42GF272K	745 5870 00
T1	TRANSFORMER POWER, STEP-DOWN AND STEP-UP: pri 115 v, 115 v; sec 150 v tapped at 135 v, 6.3 v ct; Chicago Std. Trans.	662 0277 00
XCR1	MOUNTING BLOCK: polarized, 2 rectifiers per block; Bussman 3795 (mod.)	265 1058 00
XF1	FUSEHOLDER: extractor post type, 250 v, 15 amp; Bussman no. HKP-JR	265 1003 00
XF2	FUSEHOLDER: same as XF1	265 1003 00

## GUARANTEE

The equipment described herein is sold under the following guarantee:

Collins agrees to repair or replace, without charge, any equipment, parts, or accessories which are defective as to design, workmanship or material, and which are returned to Collins at its factory, transportation prepaid, provided

- (a) Notice of the claimed defect is given Collins within one (1) year from date of delivery and goods are returned in accordance with Collins' instructions.
- (b) Equipment, accessories, tubes, and batteries not manufactured by Collins or from Collins' designs are subject to only such adjustments as Collins may obtain from the supplier thereof.
- (c) No equipment or accessory shall be deemed to be defective if, due to exposure or excessive moisture in the atmosphere or otherwise after delivery, it shall fail to operate in a normal or proper manner.

Collins further guarantees that any radio transmitter described herein will deliver full radiofrequency power output at the antenna lead when connected to a suitable load, but such guarantee shall not be construed as a guarantee of any definite coverage or range of said apparatus.

The guarantee of these paragraphs is void if equipment is altered or repaired by others than Collins or its authorized service center.

No other warranties, expressed or implied, shall be applicable to any equipment sold hereunder, and the foregoing shall constitute the Buyer's sole right and remedy under the agreements in this paragraph contained. In no event shall Collins have any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with other equipment or materials, or from any other cause.

**HOW TO RETURN MATERIAL OR EQUIPMENT.** If, for any reason, you should wish to return material or equipment, whether under the guarantee or otherwise, you should notify us, giving full particulars including the details listed below, insofar as applicable. If the item is thought to be defective, such notice must give full information as to nature of defect and identification (including part number if possible) of part considered defective. (With respect to tubes we suggest that your adjustments can be speeded up if you give notice of defect directly to the tube manufacturer.) Upon receipt of such notice, Collins will promptly advise you respecting the return. Failure to secure our advice prior to the forwarding of the goods or failure to provide full particulars may cause unnecessary delay in handling of your returned merchandise.

**ADDRESS:**

Collins Radio Company  
Sales Service Department  
Cedar Rapids, Iowa

**INFORMATION NEEDED:**

- (A) Type number, name, and serial number of equipment
- (B) Date of delivery of equipment
- (C) Date placed in service
- (D) Number of hours of service
- (E) Nature of trouble
- (F) Cause of trouble if known
- (G) Part number (9 or 10 digit number) and name of part thought to be causing trouble
- (H) Item or symbol number of same obtained from parts list or schematic
- (I) Collins' number (and name) of unit sub-assemblies involved in trouble
- (J) Remarks

**HOW TO ORDER REPLACEMENT PARTS.** When ordering replacement parts, you should direct your order as indicated below and furnish the following information insofar as applicable. To enable us to give you better replacement service, please be sure to give us complete information.

**ADDRESS:**

Collins Radio Company  
Sales Service Department  
Cedar Rapids, Iowa

**INFORMATION NEEDED:**

- (A) Quantity required
- (B) Collins' part number (9 or 10 digit number) and description
- (C) Item or symbol number obtained from parts list or schematic
- (D) Collins' type number, name, and serial number of principal equipment
- (E) Unit sub-assembly number (where applicable)



# 212E-1 Broadcast Console Stereo Modification

instruction sheet

Cedar Rapids Division | Collins Radio Company, Cedar Rapids, Iowa

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523-0724000-002411  
2nd Edition, 15 March 1964

## 1. Purpose of Instruction Sheet.

This instruction sheet describes the modifications made in a type 212E-1 Broadcast Console to adapt it for stereocasting. It also contains instructions for connecting and operating the modified console.

This instruction sheet is intended to be an addendum to the 212E-1 Broadcast Console Instruction book, Collins part number 520-5601-00.

## 2. Description of Modifications.

The 212E-1 Broadcast Console, before modification for stereo use, was a dual-channel console with two separate program-line outputs. The two console channels were used independently, and the channel outputs could be switched to either program line.

After the stereo modification, the two console channels and program lines are used simultaneously during stereocasting. Dual mixers are used in five of the seven possible stereo inputs to simultaneously control both stereo channels. Switching is provided so that the stereo channel inputs may be combined for monophonic operation, and both program lines can be fed by either console channel for FM/AM simulcasting.

Figure 1 is a block diagram of the modified console. Figure 4 is a schematic diagram of the console.

The modified stereo console can simultaneously mix the following inputs:

- a. One control-room microphone (feeds both stereo channels equally).
- b. Two of four possible studio microphone inputs (1 of 2 stereo inputs).
- c. Two stereo turntable inputs.
- d. Two stereo tape inputs.
- e. Two of eight possible remote-line inputs (1 of 4 stereo inputs).

The control-room microphone, turntable, and tape inputs are controlled by dual mixers (Collins part number 378-0607-00); the control-room microphone input is split and feeds both channels equally during stereocasting.

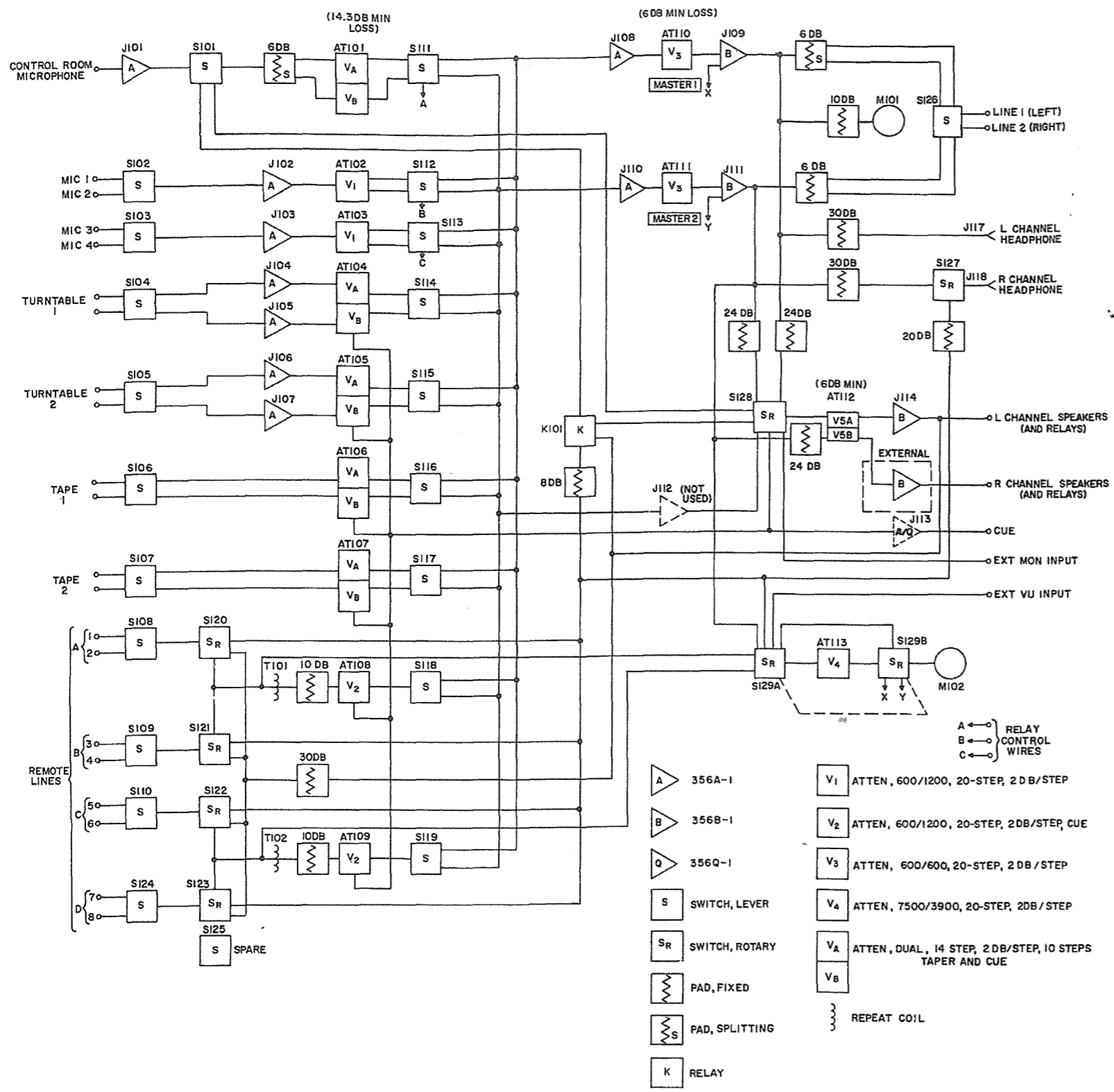
The studio microphone and remote inputs may be used for stereocasting by switching the outputs of single mixers to separate console channels.

Refer to figure 2(A). This figure is a block diagram of one of the four stereo channels. The operation of such a channel is as follows:

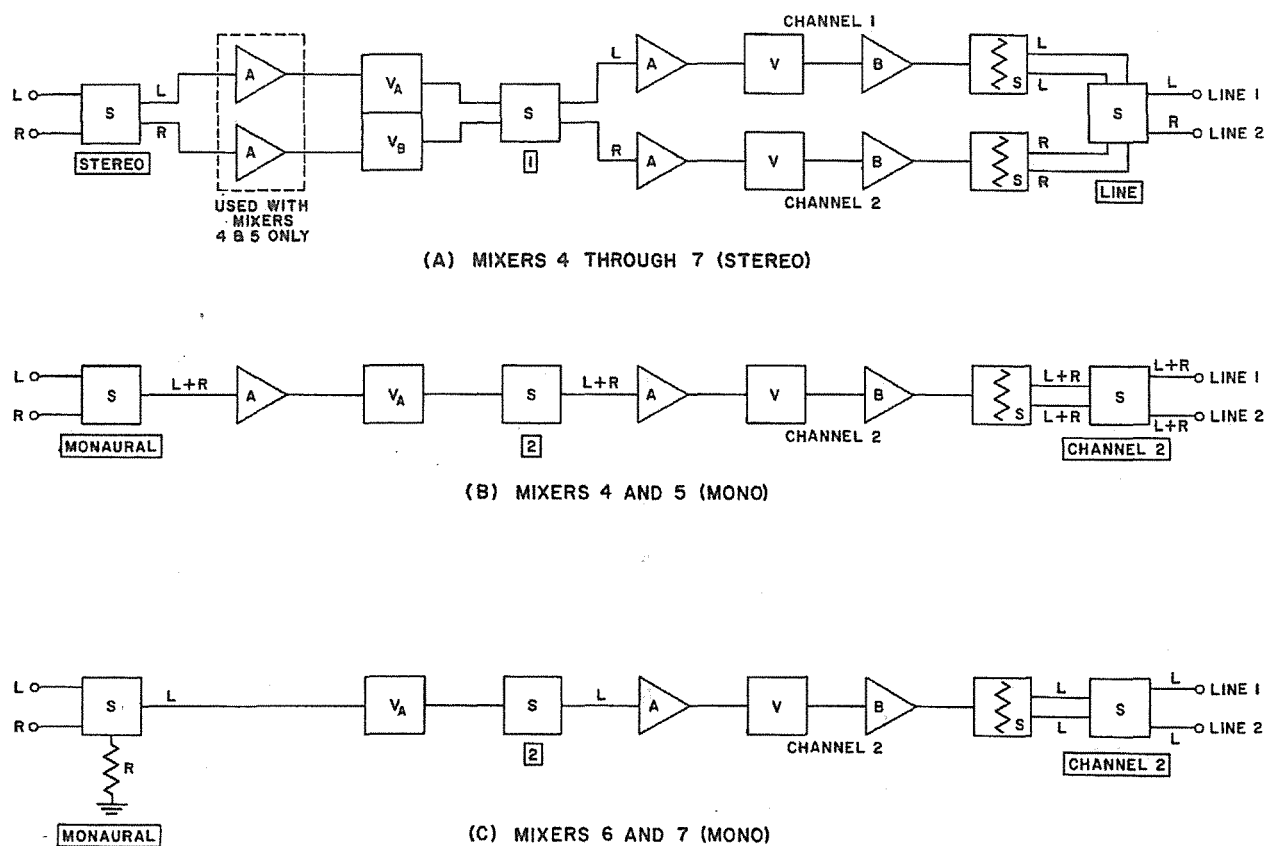
The left- and right-channel stereo inputs are connected to a mixer selector switch. In the STEREO position, this switch feeds the stereo turntable inputs to separate preamplifiers and then to dual mixers. In the case of the tape inputs, the internal preamplifiers are not used, and the inputs go directly to the mixers. The mixer outputs go to a channel selector switch. In the 1 (up) position, this switch connects the left- and right-channel signals to channel 1 and channel 2 in the console, respectively. Both console channels have separate booster amplifiers, attenuators, and output amplifiers. The channel outputs are split by a splitting pad and fed to the line selector switch. In the LINE position, this switch connects the outputs of channel 1 and channel 2 to program lines 1 and 2, respectively.

The operation of the turntable and tape stereo channels is slightly different during monophonic operation. Figure 2(B) shows the turntable channel, and figure 2(C) the tape channel.

In the turntable channels, the mixer selector switches, in the MONAURAL position, combine the left- and right-channel inputs and feed the combined inputs to a single preamplifier. In the tape channels, the left channel only is used, and the right channel is terminated with a resistance.



c187-39-5 Figure 1. 212E-1 Broadcast Console, Stereo Modification, Block Diagram



C187-38-4

Figure 2. Stereo Channel, Block Diagram

The studio microphone and remote-line inputs function in exactly the same manner during stereo or monophonic operation. During stereo operation, the left- and right-channel signals are fed to separate console channels.

### 3. Console Connections.

All connections to the stereo console are made at TB101, the long terminal strip on the inside bottom of the console. Table 1 lists the connections to be made of each of the terminals of TB101.

When connecting the stereo inputs, keep proper phase relationships between the stereo channels by connecting the signal line to the lower numbered terminal on TB101 and the common line to the higher numbered terminal.

In order to correct for recordings with improper phase relationships between channels, a phase-reversing switch may be inserted in one of the program lines. The SPARE switch on the front panel, S125, may be rewired for this purpose.

Since the output of the control-room microphone pre-amplifier is split to feed both channels, this 356A-1

pre-amplifier (J101) may be modified to increase its gain. Refer to the 212E-1 instruction book, figure 2-7 and paragraph 2.3.3.2, for the modification instructions.

If external preamplifiers are used for the turntable inputs, replace the 356A-1 preamplifiers in J104 through J107 with jumper plugs.

In order to monitor the right stereo channel on an external speaker, an external monitor amplifier must be connected to the right-channel monitor output at terminals 47 and 48 on TB101.

The operation of the external studio speaker muting and warning-light control relay has been changed after the stereo modification. Refer to figure 3. Before the modification, the relay control terminals on TB101 were open circuited to mute. These terminals were connected to a type 274K-1 relay unit to control studio speakers and warning lights. After the modification, the relay control terminals on TB101 receive +12 volts d-c to mute. This requires a type 274K-2 external relay unit.

S111, S112, and S113, associated with mixers 1, 2, and 3, provide muting when in either channel position.

TABLE 1. CONNECTIONS TO TERMINAL STRIP TB101

LINE	TERMINAL NUMBER	LINE	TERMINAL NUMBER
Control-room microphone	1 and 2	Tape 1 (right)	21 and 22
Studio microphone 1	3 and 4	Tape 2 (left)	23 and 24
Studio microphone 2		left	Tape 2 (right)
Studio microphone 3	7 and 8	Ground	27
Studio microphone 4		right	Remote line 1 (A)
Turntable 1 (left)	9 and 10	Remote line 2 (A)	left
Turntable 1 (right)	11 and 12	Remote line 3 (B)	
Turntable 2 (left)	13 and 14	Remote line 4 (B)	
Turntable 2 (right)	15 and 16	Remote line 5 (C)	right
Tape 1 (left)	17 and 18	Remote line 6 (C)	
Not used	19 and 20	B+ (no. 2 circuit)	65
Remote line 7 (D)	40	B+ (no. 1 circuit)	66
Remote line 8 (D)		right	B-
Not used	41 and 42	Mixer 1 relay control wire	69
Monitor, channel 2 (right)	43 and 44	Mixer 2 relay control wire	70
Monitor, channel 1 (left)	45 and 46	Mixer 3 relay control wire	71
Cue output	47 and 48	Not used	72
External monitor output	49 and 50	Not used	73
External vu meter input	51 and 52	Not used	74
Program line 2 (right)	53 and 54	Not used	75
Program line 1 (left)	55 and 56	Not used	76
-12 volts d-c	57 and 58	6.3 volts a-c (no. 2 circuit)	77
+12 volts d-c	59 and 60	6.3 volts a-c (no. 1 circuit)	78
Ground	61	6.3 volts a-c (no. 2 circuit)	79
Mute	62	6.3 volts a-c (no. 1 circuit)	80
	63		
	64		



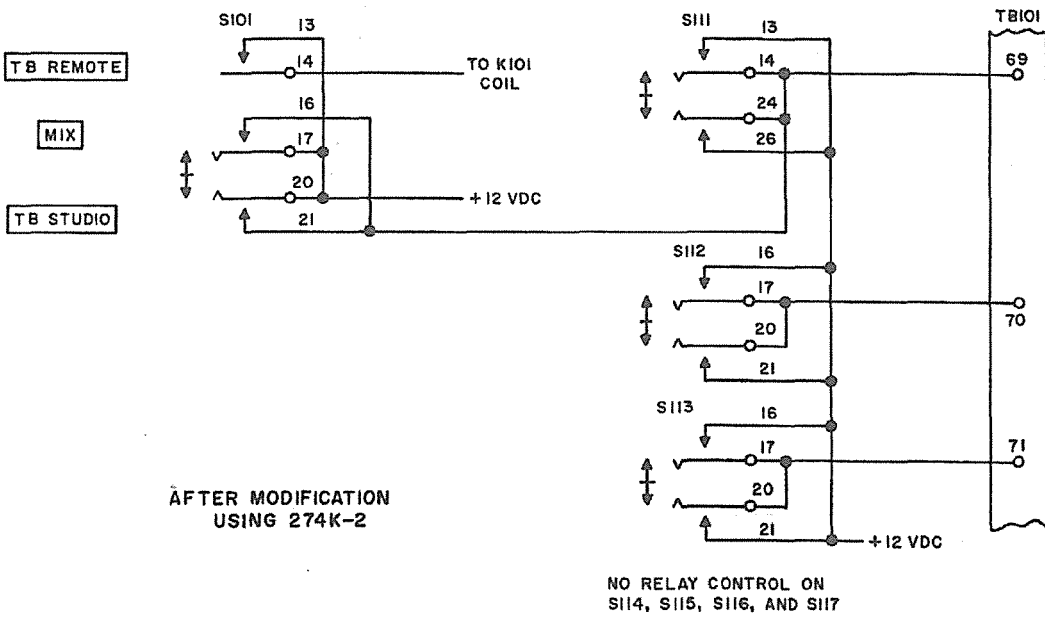
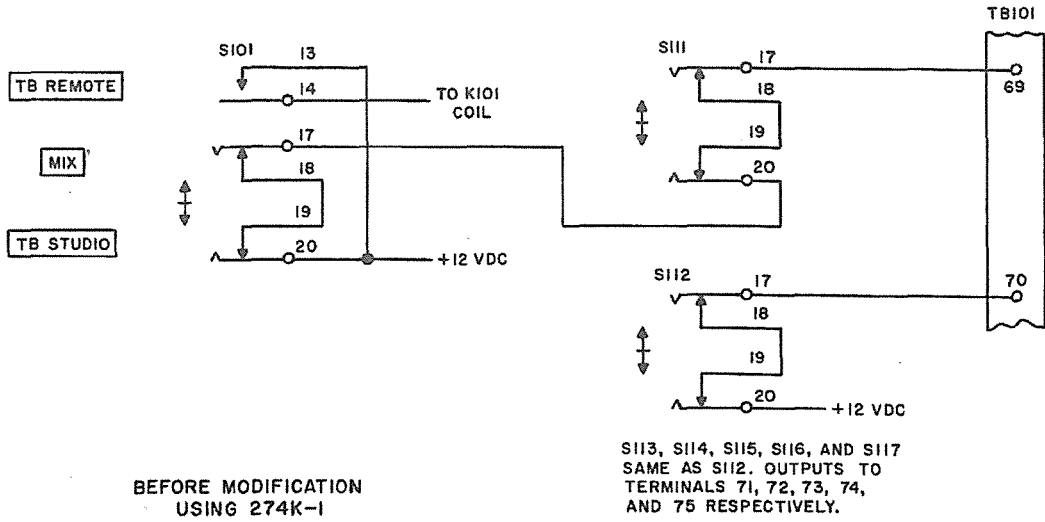


Figure 3. Relay Control Circuits, Simplified Schematic Diagram

Since S114 through S117 are for only recorded inputs on the modified console, these switches do not have relay control outputs.

In order to mute both stereo monitors, two 274K-2 relay units must be used with the relay control inputs paralleled. As an alternative, separate dpdt relays can be used to control muting, for only one warning light relay is needed for each stereo channel.

Refer to the 274K-2 schematic diagram in the unit instructions for the 274K-2, TD-327, Collins part number 523-0036-00, for assistance in connecting the relay unit.

#### 4. Console Operation.

Refer to figure 3-1 in the 212E-1 instruction book for the locations of the operating controls referred to in the following paragraphs.

##### 4.1 STEREO OPERATION.

###### 4.1.1 GENERAL.

When the console is to be used for stereocasting, perform the following steps:

- a. Set both the MASTER 1 and MASTER 2 attenuators, AT111 and AT112, to 24.
- b. Set S126 line selector switch to LINE, its middle position.
- c. Set S129 VU METER INPUT switch to CH2.
- d. Set VU ATTENUATOR AT113 to the setting that makes the CHANNEL 1 and CHANNEL 2 vu meters, M101 and M102, give the same indications for the same inputs. This setting can be checked by noting that the two meters give the same indications when the control-room microphone is used since this microphone feeds both channels equally.

###### 4.1.2 STEREO CUING.

When dual mixers 4 through 7 are turned fully counterclockwise, a combined output of both stereo channels is connected to a cue amplifier and then to a cue speaker for cuing stereo recordings or tapes.

###### 3 STEREO MONITORING.

To monitor the stereo program-line outputs on the monitor speakers, set MONITOR INPUT switch S128 to CH 1. Adjust the monitor level with MONITOR attenuator AT112.

To monitor the stereo output on headphones, set MONITOR PHONE INPUT switch S127 to CH 2 OUTPUT. Connect the left-channel headphone to CH 1 PROGRAM jack J117 and the right-channel headphone to MONITOR jack J118.

###### 4.1.4 RECORDED STEREO.

To broadcast recorded stereo material, perform the following steps:

- a. Set the MIXER 4 through MIXER 7 mixer selector switches, S104 through S107, to STEREO.
- b. Set the MIXER 4 through MIXER 7 channel selector switches, S114 through S117, to position 1 (up).
- c. Adjust the appropriate MIXER 4 through MIXER 7 mixer controls, AT104 through AT107, for proper indications on the vu meters.

###### 4.1.5 STUDIO OR REMOTE STEREO.

To use the control-room microphone during stereocasting, set microphone function selector switch S101 to MIX (middle position). The microphone input will then be fed to both channels equally. Adjust MIXER 1, AT101, for proper indications on the vu meters.

The studio microphone and remote-line console inputs may be used for stereocasting by using separate mixers to control the two channel inputs, as in normal monophonic operation, then switching each mixer output to separate console channels. When the studio or remote inputs are used, talk back from the control room and remote cuing are possible just as in monophonic operation.

To use studio microphones for stereocasting, connect the left-channel microphone input to MIXER 2, AT102, and the right-channel microphone input to MIXER 3, AT103, using mixer selector switches S102 and S103. Then connect MIXER 2 to channel 1 and MIXER 3 to channel 2 using channel selector switches S112 and S113. Adjust MIXER 2 and MIXER 3 for proper indications on the vu meters.

To use the remote lines for stereocasting, connect the left-channel line to the REMOTE 1 mixer, AT108, and the right-channel line to the REMOTE 2 mixer, AT109, using remote function selector switches S120 through S123. Then connect REMOTE 1 mixer to channel 1 and REMOTE 2 mixer to channel 2 using channel selector switches S118 and S119. Adjust the REMOTE 1 and REMOTE 2 mixers for proper indications on the vu meters.

##### 4.2 MONOPHONIC OPERATION.

When the modified 212E-1 console is used for monophonic programming, its operation is nearly the same as before modification. The only differences are (1) channel selector switches S114 through S117 should be set to position 2 (down), and (2) the S126 line selector switch should be in the CHANNEL 2 (up) position during monophonic operation.

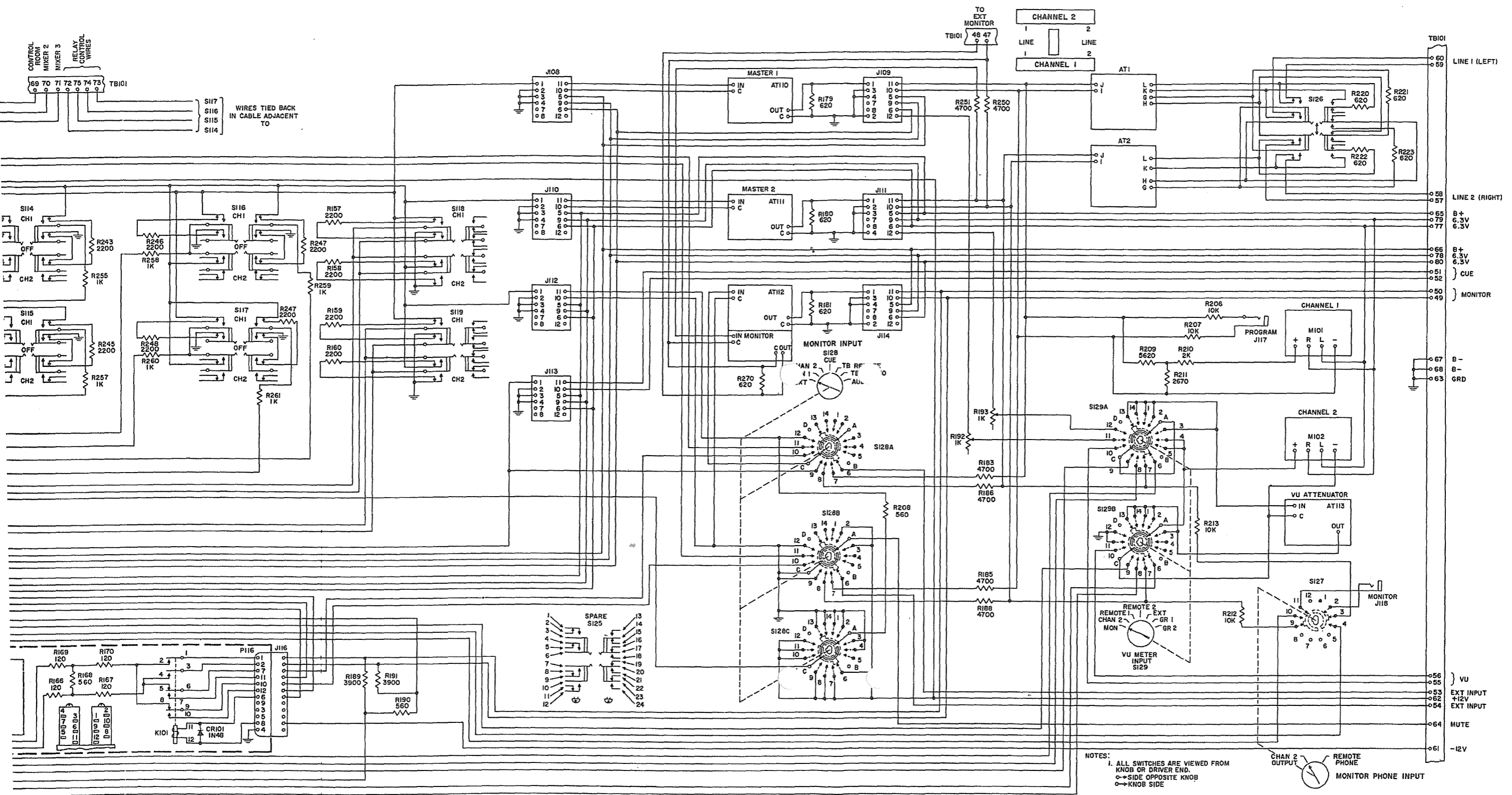
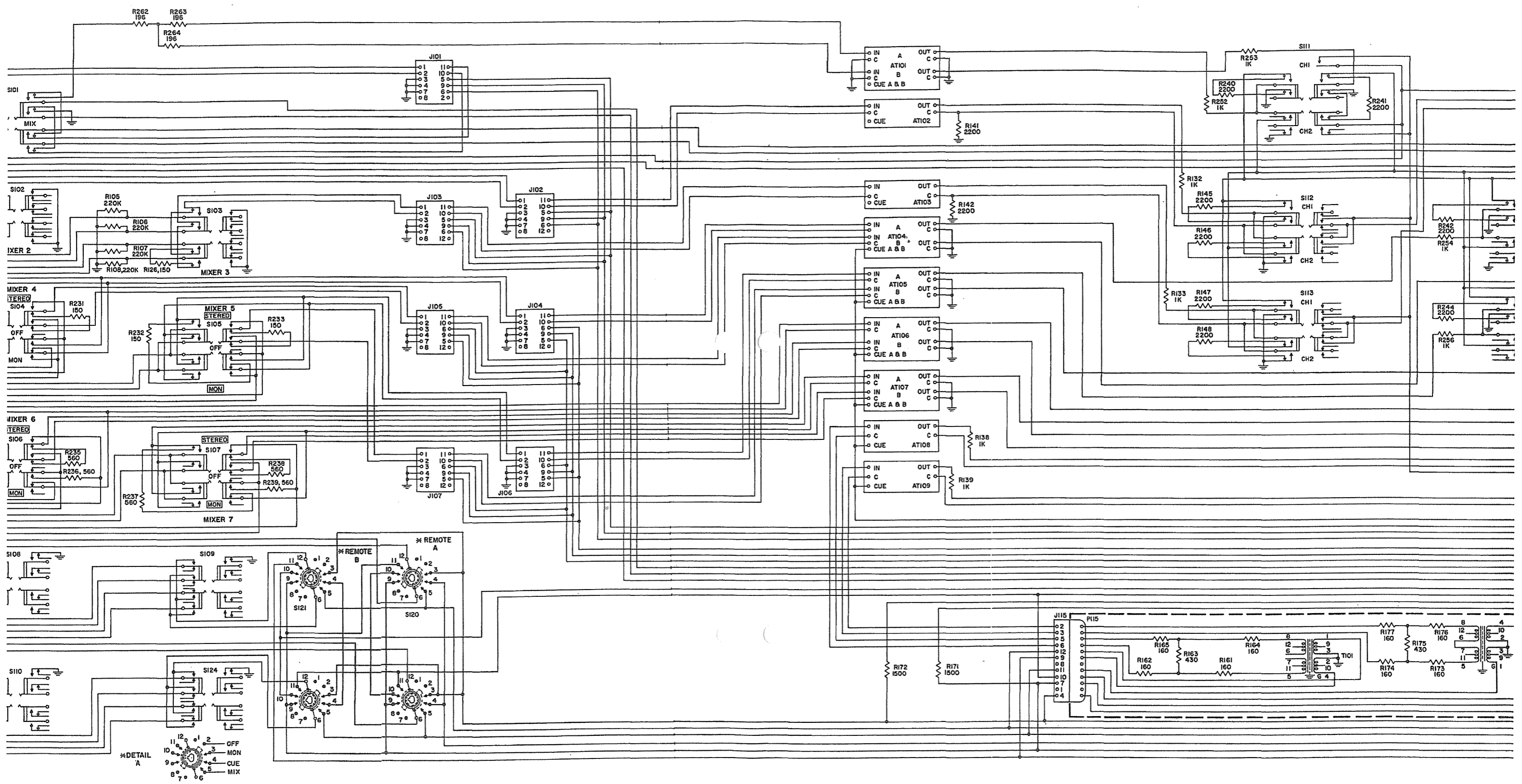
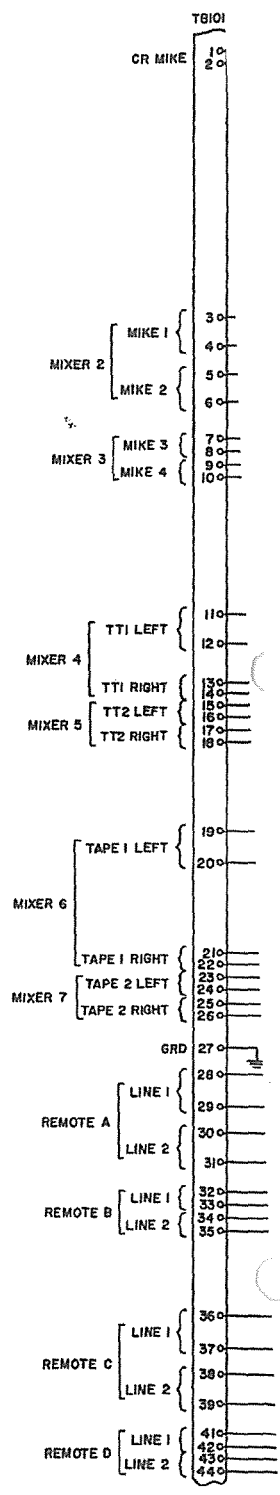


Figure 4. 212E-1 Broadcast Console, Stereo Modification, Schematic Diagram

C187-37-6





# ELECTRICAL WIRE CODE

## EXAMPLES

UNSHIELDED WIRE, MIL TYPE B #22 AWG, WHITE WITH RED AND GREEN TRACERS:

  D    
Type of Wire
  A    
Size of Wire
  9    
Color of Body
  25    
Color of Tracers
  4-1/4    
Length of Wire in Inches  
(Includes Stripping & Tinning)

SHIELDED WIRE (SINGLE), MIL TYPE C, #15 AWG, WHITE WITH RED AND GREEN TRACERS:

  R    
Type of Wire
  D    
Size of Wire
  S    
Shielded
  9    
Color of Body
  25    
Color of Tracers
  4-1/4    
Length of Wire in Inches  
(Includes Stripping & Tinning)

SHIELDED WIRE (MULTIPLE), MIL TYPE B, #22 AWG, WHITE, AND WHITE WITH RED TRACER:

  D    
Type of Wire
  A    
Size of Wire
  S    
Shielded
  (9)    
First Conductor
  (92)    
Second Conductor
  4-1/4    
Length of Wire in Inches  
(Includes Stripping & Tinning)

TYPE OF WIRE CODE			SIZE OF WIRE CODE		COLOR CODE	
LETTER	TYPE OF WIRE	FAMILY USUALLY FOUND IN	LETTER	SIZE	NUMBER OR LETTER	COLOR
A	Cotton Braid Over Plastic (Formerly AN-J-C-48)	440 Plain 443 Shielded	A	#22 AWG	0	Black
B	Busbar, Round Tinned	421	B	#20	1	Brown
C	MIL-W-16878 Type B (#20 and Larger) (600 Volts)	439	C	#18	2	Red
D	Miniature Wire, MIL-W-16878 Type B (#22 & Smaller)	439-7000 Series	D	#16	3	Orange
E			E	#14	4	Yellow
F	Extra Flexible Varnished Cambric	423	F	#12	5	Green
G			G	#10	6	Blue
H	Kel-F (Monochlorotrifluoroethylene)	422	H	#8	7	Violet
J			J	#6	8	Gray (Slate)
K	Neon Sign Cable (15,000 Volts)	423 0004 00	K	#4	9	White
L	Silicone	425 0942 00	L	#2	a	Clear
M			M	#1	b	Tan
N	Single Conductor Stranded (Not Rubber Covered)	422	N	#0	c	Pink
P	Single Conductor Stranded (Rubber Covered)	423	P	#00	d	Maroon
Q			Q	#000	e	Light Green
R	MIL-W-16878 Type C (1000 Volts)	439 1000 Series	R	#0000	f	Light Blue
T	Teflon, MIL-W-16878 Type E (600 Volts)	439 4000 Series	T	#28		
V	MIL-W-16878 Type D (3000 Volts)	439 3000 Series	V	#26		
W	Teflon, MIL-W-16878 Type EE (1000 Volts)	439 0000 Series	W	#24		
X			X	#19		
Y			Y	#30		
Z	Acetate Yarn Telephone Type	428	Z			

TYPE OF COLOR

TYPE OF COLOR (continued)

TYPE OF COLOR (continued)

TYPE OF COLOR (continued)

TYPE OF COLOR (continued)

TYPE OF COLOR (continued)



TYPE OF COLOR	LETTER
Black	A
Dark Blue	B
Blue	C
Green	D
Yellow	E
Red	F
White	G
Light Green	H
Light Blue	I
Light Yellow	J
Light Red	K
Light Grey	L
Light Brown	M
Light Purple	N
Light Orange	O
Light Pink	P
Light Grey	Q
Light Brown	R
Light Purple	S
Light Orange	T
Light Pink	U
Light Grey	V
Light Brown	W
Light Purple	X
Light Orange	Y
Light Pink	Z