



**instruction book**

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

**212G-1**  
**Broadcast Console**



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- (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 subassemblies involved in trouble
- (J) Remarks

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**ADDRESS:**

Collins Radio Company  
Service Division  
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 subassembly number (where applicable)



## instruction book

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# 212G-1 Broadcast Console

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*This manual includes:*

*SP-144 Broadcast Console 212G-1 523-0755412*

*TD-323 Preamplifier 356A-1 520-5446000*

*TD-324 Program/Monitor Amplifier 356B-1 520-5447000*

*TD-325 Limiter Amplifier 356E-1 520-5448000*

*TD-326 Cue Amplifier 356Q-1 523-0034000*

*TD-327 Relay Unit 274K-2 523-0036000*

*TD-328 Power Supply 409X-2 523-0035000*

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# BROADCAST CONSOLE

## 212G-1

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1960, 1961

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

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## UNIT INSTRUCTIONS

TD No.	Title
323	Preamplifier 356A-1
324	Program/Monitor Amplifier 356B-1
325	Limiter Amplifier 356E-1
326	Cue Amplifier 356Q-1
327	Relay Unit 274K-2
328	Power Supply 409X-2

SP-144  
Broadcast Console 212G-1

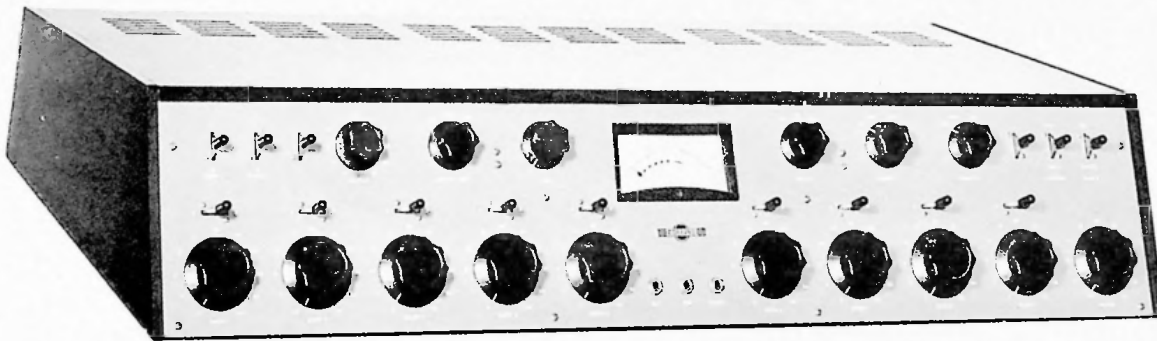


Figure 1-1. Broadcast Console 212G-1



## 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 Broadcast Console 212G-1.

### 1.2 PURPOSE OF EQUIPMENT.

Broadcast Console 212G-1 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 9 of 13 possible inputs are provided. Ease of operation is assured by clearly identified control knobs. The number of functions available and performance are determined by the selection of preamplifiers and program/monitor amplifiers to be installed in the console.

### 1.3 BASIC EQUIPMENT.

The 212G-1 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. BROADCAST CONSOLE 212G-1, EQUIPMENT AVAILABLE

ITEM	OVER-ALL DIMENSIONS (inches)			WEIGHT (lb)	COLLINS PART NUMBER
	H	W	D		
Broadcast Console 212G-1	8-3/16 max	41-1/16	21-1/8	75	522-1605-00
Preamplifier 356A-1	4-5/8	2-1/8	9-1/2	2-1/2	522-0389-005
Program/Monitor Amplifier 356B-1	5-3/4	2-3/4	9-1/2	4-3/4	522-0390-005
Limiter Amplifier 356E-1	5-5/16	3	9-1/2	4-3/4	522-0394-004
Cue Amplifier 356Q-1	4-5/8	2-1/8	9-1/2	2-1/4	522-1607-00
Relay Unit 274K-2	5-1/2	2-1/2	9	2-1/2	522-1606-00
Power Supply 409X-2	6	8	9	25	522-1691-00
Rack Mounting Shelf 499G-1	8-23/32	19	14	11	522-0774-00
*Jumper Plug				1/2	541-6459-002
Amplifier Test Cable	35 length			1	541-6473-003

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

#### 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
Preamplifier 356A-1	520-5446-00
Program/Monitor Amplifier 356B-1	520-5447-00
Limiter Amplifier 356E-1	520-5448-00
Cue Amplifier 356Q-1	523-0034-00
Relay Unit 274K-2	523-0036-00
Power Supply 409X-2	523-0035-00

#### 1.5 DESCRIPTION OF MAJOR COMPONENTS.

##### 1.5.1 BROADCAST CONSOLE 212G-1.

The 212G-1 utilizes modular type construction to provide a choice of plug-in amplifier units which will meet individual installation requirements. The front panel and top are hinged to allow easy access to all parts. The 212G-1 may be serviced from the front allowing the cabinet to be almost flush against a wall or window. There should be about 1/2-inch clearance behind the console to allow ventilation and to provide clearance for the top when open. Slots in the bottom, back, and top provide cooling by convection. Space is provided for up to eight Preamplifiers 356A-1, two Program/Monitor Amplifiers 356B-1, or one 356B-1 and one Limiter Amplifier 356E-1, one Cue Amplifier 356Q-1, one Relay Unit 274K-2, and one Power Supply 409X-2.

##### 1.5.2 PREAMPLIFIER 356A-1.

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 circuits. Refer to paragraph 1.4.

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

The 356B-1 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 easily be changed for 150-ohm output impedance. Refer to paragraph 1.4.

##### 1.5.4 LIMITER AMPLIFIER 356E-1.

The necessary circuitry for two stages of amplification and a bias rectifier makes up this plug-in module. 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 percent recovery is provided. Refer to paragraph 1.4.

##### 1.5.5 CUE AMPLIFIER 356Q-1.

The necessary circuitry for two stages of amplification makes up this plug-in module. It provides up to 55 db gain from the cue line. The 212G-1 console provides a gain control for the 356Q-1 and a speaker for the output. The output impedance is factory wired for four ohms. Refer to paragraph 1.4.

##### 1.5.6 RELAY UNIT 274K-2.

The 274K-2 is a plug-in module which controls application of audio power to studio speakers and a-c power to studio warning lights. The four 12-volt d-c relays are mounted on rubber to minimize noise. Transient suppressing networks across the relay coils minimize arcing and radio interference. Refer to paragraph 1.4.

##### 1.5.7 POWER SUPPLY 409X-2.

The 409X-2 furnishes power for filaments, plate circuits, and relays in the Broadcast Console 212G-1. Silicon rectifiers are used in the high voltage circuit to eliminate the heat associated with vacuum-tube rectifiers and to ensure long life. The output of the 409X-2 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 ampere. Refer to paragraph 1.4.

##### 1.5.8 RACK MOUNTING SHELF 499G-1.

The 499G-1 consists of a panel and chassis assembly for use in an RMA standard relay rack. The front panel is a hinged door that opens downward. 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.

##### 1.5.9 JUMPER PLUG.

When mixing facilities are desired for a program source that has a self-contained preamplifier, it is necessary to insert a jumper plug into the jack normally used for a Preamplifier 356A-1. The jumper plug wiring schematic diagram is shown in figure 2-3. One jumper plug is supplied with Broadcast Console 212G-1.

1.5.10 AMPLIFIER TEST CABLE.

An amplifier test cable is available for use with Broadcast Console 212G-1. This cable is 35 inches long and has a twelve-pin plug on one end and a twelve-pin jack on the other. The amplifier test cable permits operation of amplifier while it is out of the console.

1.6 ELECTRICAL CHARACTERISTICS.

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

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

CHARACTERISTICS	DESCRIPTION
Maximum Number of Channels	<p>6 low-level inputs, 2 medium level inputs, 1 remote or net input, 1 program channel, 1 monitor channel, and one cue channel when provided with:</p> <ul style="list-style-type: none"> <li>8 -- Preamplifiers 356A-1</li> <li>1 -- Amplifier 356B-1 or 356E-1</li> <li>1 -- Program/Monitor Amplifier 356B-1</li> <li>1 -- Relay Unit 274K-2</li> <li>1 -- Cue Amplifier 356Q-1</li> <li>1 -- Power Supply 409X-2</li> </ul>
Input Impedance	<p>Low Level: 20/150/250/600 ohms balanced or unbalanced*</p> <p>Net/Remote Lines: 50/150/250/600 ohms*</p> <p>Medium Level: 600 ohms (unbalanced)</p>
Output Impedance	<p>Line: 150/600 ohms*</p> <p>Monitor: 600 ohms</p>
Gain	<p>Low level to program line at least 100 db.</p> <p>Remote line to program line at least 53 db.</p> <p>Medium level to program line at least 62 db.</p>
Output Level	<p>Program Line: ±18 dbm (50 mw)</p>
Response	<p>±1.5 db, 50-15,000 cps at program line.</p>
Distortion	<p>Less than 1% at ±18 dbm at program line, less than 3% at +39 dbm at monitor amplifier output.</p>
Noise	<p>At least 68 db below +18 dbm program output with -50 dbm low level input. (Equivalent input noise level -118 dbm or less.)</p>
Power Source	<p>115 or 230 volts a-c ±10%, 50/60 cps, single phase.</p>
<p>*Shipped wired for 600 ohms output and net/remote line impedance, 150 ohms low-level impedance, and 115-volt power source.</p>	



### 1.7 PHYSICAL SPECIFICATIONS.

Physical specifications of Broadcast Console 212G-1 are listed in table 1-4.

TABLE 1-4. BROADCAST CONSOLE 212G-1 PHYSICAL SPECIFICATIONS

SPECIFICATION	DESCRIPTION
Size (inches)	20-7/32 deep at base, 40-5/16 wide, 7-7/8 high at front, 6-5/8 high at back
Weight	75 pounds (basic cabinet less modules)
Finish	Metalized blue-gray enamel front panel with white silk-screened letters. Cabinet black baked enamel.

## SECTION II INSTALLATION AND ADJUSTMENT

### 2.1 UNPACKING AND INSPECTING.

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 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.

Broadcast Console 212G-1 may be placed within 1/2-inch of a window, wall, or other vertical surface without sacrificing maintenance accessibility. Outline and mounting dimensions of the console are shown in figure 7-3.

#### 2.2.3 EQUIPMENT MOUNTING PROCEDURE.

Lift the top panel and swing the front panel forward. Remove the three wing nuts that secure the terminal strip cover and remove the cover. Refer to figures 2-1 and 7-3. Four 1-1/2-inch diameter holes are

provided in the console base plate for the entry of external wiring. These holes are located directly in front of the terminal strip, TB1.

a. Drill additional holes for bolting down the console if desired. If the console is bolted down, the rubber feet should be left in place for spacers.

b. Rewire Preamplifiers 356A-1 to be used as booster amplifiers (J7 and J10) as follows. Move the lead that is connected to terminal 4 of transformer T201 in the 356A-1 to terminal 5 of T201. This reconnection changes the input impedance of the pre-amplifier from 150 ohms to 250 ohms.

c. After Broadcast Console 212G-1 is mounted, the modules may be plugged into their receptacles according to the following steps. Refer to figure 2-2 for layout of unit connectors.

#### NOTE

To remove an amplifier module, lift its rear edge clear of the retaining rail, and push toward the rear to unplug.

d. Plug Preamplifiers 356A-1 or jumper plugs into J1 through J6 as determined by the number and types of inputs to be used. If a mixer is used with a source which does not require a preamplifier (tape recorder, turntable with external preamplifier) use a jumper plug in lieu of a 356A-1. Refer to figure 2-3 for the schematic diagram of a jumper plug. The input impedance should be 600 ohms (unbalanced). If an attenuation pad is needed, refer to figure 2-4 for correct values of resistance.

e. Plug booster amplifiers (356A-1 modules wired for 250-ohm input impedance) into J7 and J10.

f. Plug a Program/Monitor Amplifier 356B-1 into J8. Set S301 at LOW.

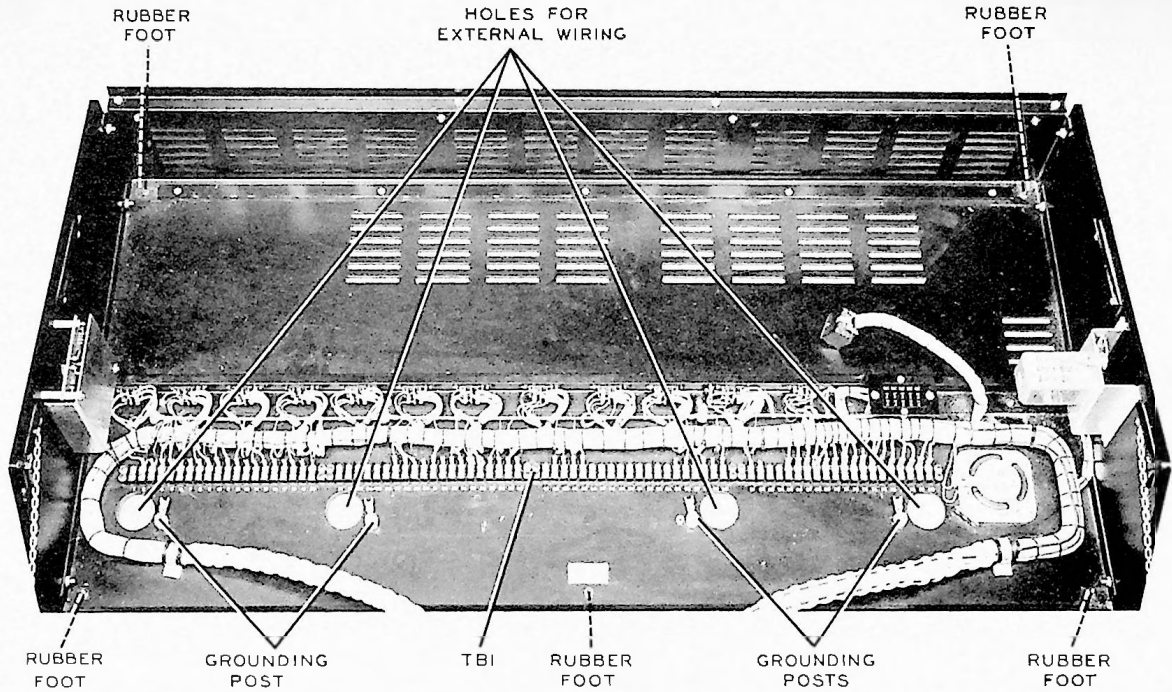


Figure 2-1. Broadcast Console 212G-1, Mounting and Wiring Detail

- g. Plug a Cue Amplifier 356Q-1 into J9, if cue speaker LS1 in the console is to be used. If a headset or an external cueing amplifier is to be used, insert a jumper plug into J9 and disconnect cue speaker LS1.
- h. Plug a Program/Monitor Amplifier 356B-1 into J11. Set S301 at HIGH.
- i. Plug Relay Unit 274K-2 into J12.
- j. Plug the connector on the pendant cable from Relay Unit 274K-2 into J13.

- k. Mount Power Supply 409X-2.
- l. Plug J14 into the plug on the 409X-2.
- m. Wire jumper connections on TB4 as desired for the specific installation. Use insulated wire for all jumpers. Jumper terminals CR and RELAY 1. Jumper other terminals as desired for control of studio lights and speakers. Refer to figure 4-5.
- n. A cue speaker is located in the 212G-1. If a different location is desired for the cue speaker, it

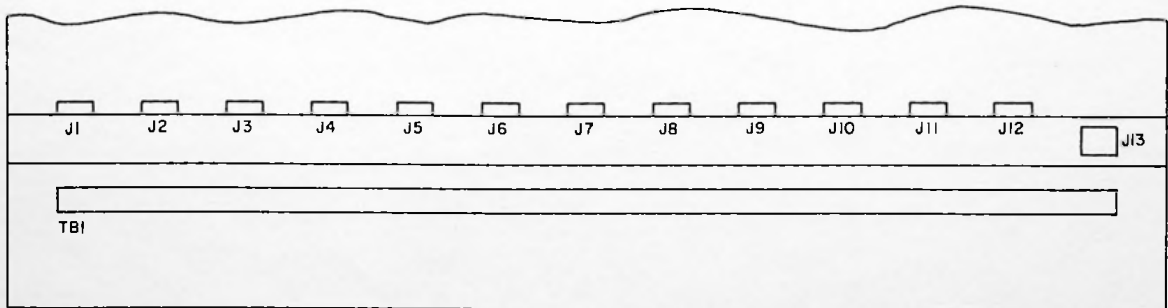


Figure 2-2. Broadcast Console 212G-1, Amplifier Connector Location

may be removed. A two-lug terminal strip is provided in the 212G-1 for making the necessary connections.

- o. Close the top and front panels.

#### 2.2.4 INSTALLATION WIRING.

All connections to the 212G-1 are made with screw type terminals. 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 no. 12 AWG twisted pair. All connections should be made to the numbered terminal strip, TB1, located on the base plate of the console. The shields of the input lines should be grounded at the four 1/4-inch ground studs and lugs provided adjacent to the terminal strip. Refer to figure 2-1. Table 2-1 lists the line connections and their respective terminal numbers. If line 1 or line 2 (TB1, terminals 42 and 43, and 44 and 45) is not used, terminate unused line in a 600-ohm resistor.

TABLE 2-1. CONNECTIONS TO TERMINAL STRIP TB1

LINE	TB1 TERMINAL NUMBERS	LINE	TB1 TERMINAL NUMBERS
Spare	1	Program line 1	42 and 43
Low-level input A	2 and 3	Program line 2	44 and 45
Low-level input B	4 and 5	Spares	46 through 54
Low-level input C	6 and 7	Speaker no. 1 (or 600-ohm 10-w resistor)	55 and 56
Low-level input D	8 and 9	Speaker no. 2 (or 600-ohm 10-w resistor)	57 and 58
Control room mike input	10 and 11	Speaker no. 3 (or 600-ohm 10-w resistor)	59 and 60
Auxiliary input	12 and 13	Speaker no. 4 (or 600-ohm 10-w resistor)	61 and 62
Turntable input 1	14 and 15	Spares	63 and 64
Turntable input 2	16 and 17	ON AIR no. 1	65 and 66
Tape input 1	18 and 19*	OFF AIR no. 1	65 and 67
Ground	20	ON AIR no. 2	68 and 69
Spares	21 through 26	OFF AIR no. 2	68 and 70
Tape input 2	27 and 28*	OFF AIR no. 3	71 and 72
Net	29 and 30	OFF AIR no. 3	71 and 73
Remote input 1	31 and 32	ON AIR no. 4	74 and 75
Remote input 2	33 and 34	OFF AIR no. 4	74 and 76
Record output	35 and 36	115/230 v a-c for 409X-2	77 and 78
External monitor input	37 and 38*	115 v a-c for studio lights	79 and 80
External VU meter input	39 and 40	ON AIR-OFF AIR	
Spare	41		

\*Unbalanced inputs, 19, 28, and 38 grounded.



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

A screwdriver adjustment, R401, on top of Power Supply 409X-2 chassis varies d-c output voltage. Adjust R402 until the output voltage is 300 volts d-c. Test points J1- and J2+ are provided on the top of the chassis to facilitate this adjustment. J1- is connected to B-, J2+ to the B+ output.

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

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

- a. Plug Limiter Amplifier 356E-1 into J8.
- b. Adjust Power Supply 409X-2 output for 300 volts d-c.
- c. With no input to the amplifier, make the adjustments of steps d through f.
- d. Set the METER switch to GR, and adjust the zeroing potentiometer, R47, for a 0 reading on the GR meter.
- e. Adjust R612 for 23.5 volts at the test jacks located on the 356E-1.
- f. Repeat step e after 30 minutes warmup.
- g. Set S601 at average.
- h. The GR meter and amplifiers now are ready to use. The GR meter will read the level of the input signal above the threshold when the METER switch is in the GR position. With the equipment adjusted as in step g, the 356E-1 will operate according to steps i through k.
- i. All signal below threshold (-44 vu) applied to the input of the 356E-1 will be amplified uniformly.
- j. All signals above threshold will be limited at a three-to-one 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 vu meter in the 212G-1 will be pinned. When testing at higher levels, disable the vu meter by setting the METER switch, S13, to EXT. 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 Limiter Amplifier 356E-1. The average signal level may be maintained at threshold or above threshold according to the operator's preference. Table 2-2 gives typical values of the

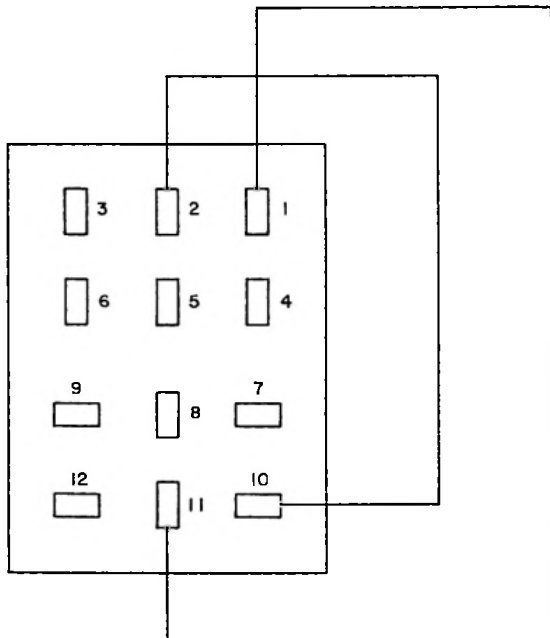


Figure 2-3. Jumper Plug Wiring Schematic Diagram

2.3 MODIFICATION AND INITIAL ADJUSTMENTS.

2.3.1 GENERAL.

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

2.3.2 SELECTION OF IMPEDANCES.

Preamplifiers 356A-1 are factory wired for input impedance of 150 ohms and output impedance of 600 ohms. When Preamplifier 356A-1 is used as a booster amplifier, its input must be rewired for 250 ohms impedance. Refer to Preamplifier 356A-1 Instruction Book for rewiring information.

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

2.3.3 GAIN ADJUSTMENT FOR PROGRAM/MONITOR AMPLIFIER 356B-1.

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

input, output, and program line levels based on a 3-to-1 compression ratio, a 6-db line pad, and a 356E-1 with 54 db gain.

TABLE 2-2  
LINE LEVELS

VU INPUT TO 356E-1	OUTPUT LEVEL 356E-1 (VU)	LINE LEVEL IN VU
-44*	+10	+4
-39	+11.5	+5.5
-34	+13	+7
-30.67	+14	+8
-29	+14.5	+8.5
-24	+16	+10
*Threshold		

NOTE

Assuming 3:1 ratio, 6 db line pad, 54 db gain in 356E-1.

NOTE

The vu meter will indicate 0 vu at +14 vu 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 MONITOR EXTERNAL CIRCUIT LEVEL WITH VU METER.

External levels may be monitored by connecting the circuit to be metered at terminals 39 and 40 of TB1.

NOTE

External circuit must include a fixed or variable meter pad. For fixed pad values see figure 2-4. Variable pads, Collins part number 378 0011 00 or Daven 7500/3900 ohm vu meter attenuator, may be used.

2.3.7 RESISTOR VALUES FOR FIXED PADS.

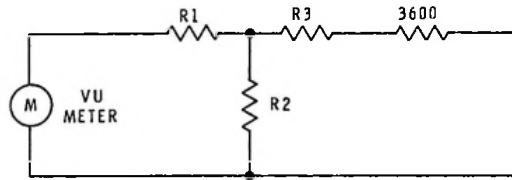
The vu meter, M1, and its pad are connected to the program line between the program amplifier and LINE switch S10. A 6-db pad in the line provides isolation between the program amplifier and the output line. The line pad consists of R42, R43, R44, R45, and R46. A 7500/3900-ohm pad made up of resistors R48, R49, and R50 serves as a meter multiplier. As shipped, vu meter M1 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 R48, R49, and R50 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 TB3 which is mounted on the left side of the console when viewed from front.

If a program line level other than +8 vu is used, the pads must be modified. Table 2-3 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.

TABLE 2-3  
LINE LEVELS

VU LEVEL FOR 0 VU ON METER	R48	R49	R50
18	6203	2603	1620
16	5934	2334	2091
14	5626	2026	2741
12	5279	1679	3690
10	4896	1296	5221
8	4482	882	8177
6	4047	447	16,788
4	3600	0	Open

The level given is the level at the output of the program amplifier and is higher than the program line 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 R48, 4896 ohms; R49, 1296 ohms; and R50, 5221 ohms.



RESISTANCE VALUES IN OHMS				
LEVEL TO BE METERED	PAD LOSS FOR 0 VU READING	R1	R2	R3
+ 4DBM	0	0	OPEN	0
+10DBM	6DB	1296	5221	1296
+32DBM	28DB	3601	311	3601
+39DBM	35DB	3764	139	3764

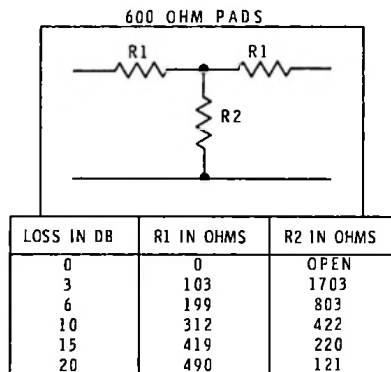


Figure 2-4. Resistor Values for Fixed Pads

**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 212G-1 vu meter, M1, will be pinned if it is left in the circuit. When testing at higher levels, disable vu meter by setting the METER switch S13 to EXT.

**2.3.8 SUGGESTED FUNCTION FOR SPARE SWITCHES.**

Spare switches may be wired for switching the following:

- a. Override.
- b. Tape recorder.
- c. Headphones.

- d. Vu meter.
- e. Auxiliary input or output circuits.

**2.3.9 SPEAKER AND WARNING LIGHT CONTROL CIRCUITS.**

A simplified schematic diagram of the speaker and warning light control circuits is shown in figure 4-5. Mixer key switches S11 and S12 and program/audition switches S1 through S6 control application of 12 volts d-c to relays located in Relay Unit 274K-2. Mixer circuit wiring may be modified easily for specific station applications. Cue speaker LS1 in the console is removed from the circuit by MIXER 3 A/P switch S3 whenever the control room microphone is in use.

**NOTE**

If this interlock feature is not desired, jumper contacts 14 and 20 on S3. A jack may be placed in the cue speaker line so that the speaker is muted when a headset is plugged into the jack.



## SECTION III OPERATION

### 3.1 CONTROL FUNCTIONS.

#### 3.1.1 MIXER.

Refer to figure 3-1. The nine mixer controls are located near the lower edge of the front panel of Broadcast Console 212G-1. They are identified by silk-screening as MIXER 1 through MIXER 9. Above each mixer control knob is located an audition/program (A/P) switch. The mixer controls adjust the signal levels fed to the program or audition circuits. MIXERS AT4 through AT9 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.

Two mixer selector switches, S11 and S12, are located on the left-hand side near the top of the panel; they are identified as MIXER 1 and MIXER 2. MIXER 1 and MIXER 2 switches each select one of two low-level input lines to be fed to the preamplifiers. The panel designations for these switches are silk-screened on the front panel.

#### 3.1.3 PROGRAM/AUDITION SELECTOR SWITCHES.

Above each mixer control is located a program/audition selector switch. They are identified on the

panel by a silk-screened "A" to the left of the switch and a "P" to the right. These silk-screened letters indicate whether the input is being switched to program (P) or audition (A). The center position is "off."

#### 3.1.4 GAIN CONTROLS.

The MONITOR gain control, AT11, is located near the top, in the center of the left-hand portion of the front panel. The MASTER gain control, AT10, is located in the lower right-hand corner of the front panel. MONITOR gain control AT11 adjusts the input level to the monitor amplifier and MASTER gain control AT10 adjusts the input level to the program amplifier. CUE gain control R58 is located to the left of the meter. This control adjusts the input level to Cue Amplifier 356Q-1. The panel designations for these controls are silk screened on the front panel.

#### 3.1.5 MIXER 9 NET/REMOTE SWITCH.

MIXER 9 NET/REMOTE switch S14 is located in the upper right corner of the front panel. In the NET position, the network line is tied into the mixer 9 input circuit where the network line may be switched to program or audition. In the REMOTE position, mixer 9 is connected to remote function selector switches REMOTE 1 and REMOTE 2, S15 and S16.

#### 3.1.6 REMOTE FUNCTION SELECTOR SWITCHES.

The remote function selector switches, S15 and S16, are identified as REMOTE 1 and REMOTE 2, and are

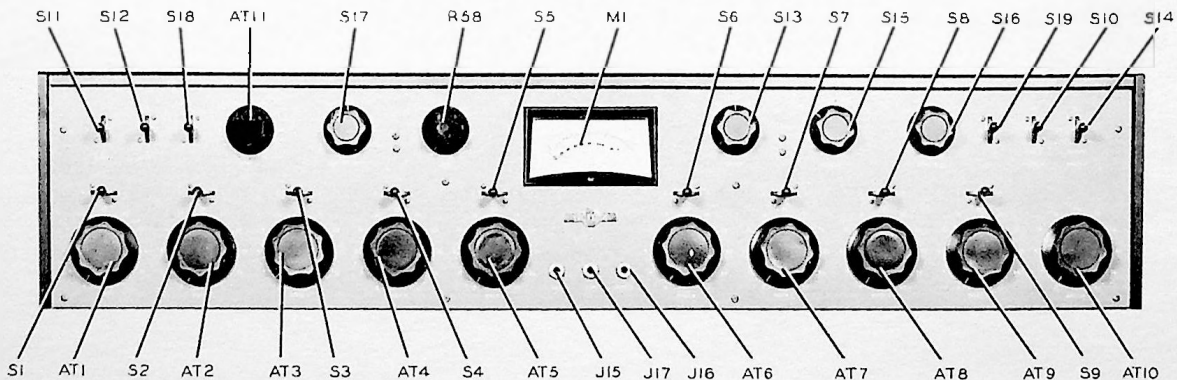


Figure 3-1. Broadcast Console 212G-1, Control Locations

located near the top, in the center of the right-hand portion of the front panel. Each has OFF, MON, CUE, and MIX positions. When both the audition/program switch and a REMOTE switch are set at OFF, the remote line is terminated in a resistive load. When a REMOTE switch is in the MON position, its remote line may be monitored by phones connected at the REMOTE monitor jack, J16. When one of the switches is in the CUE position, the cueing signal from the monitor amplifier may be fed back into the remote line for remote cue. In the MIX position, the signal from the associated remote line is sent to mixer 9 input when S14 is in the REMOTE position.

### 3.1.7 MONITOR INPUT SWITCH.

MONITOR INPUT switch S17 is located near the top and center of the left-hand portion of the front panel. It has AUD, PGM, and EXT positions. The AUD position permits the MONITOR level control and monitor amplifier to be connected to the monitor booster amplifier. When the MONITOR INPUT switch is in the PGM position, the program line is connected through a bridging pad to the MONITOR level control and monitor amplifier input. The EXT position permits a signal connected at terminals 37 and 38 of TB1 to be monitored through the MONITOR level control and monitor amplifier.

### 3.1.8 METER INPUT SWITCH.

The METER switch, S13, is located to the right of the meter near the top of the front panel. It has GR, VU, and EXT positions. If Limiter Amplifier 356E-1 is used, the GR position provides indication of the gain reduction in decibels above threshold. In the VU position, the vu meter is connected to the output of the Program/Monitor Amplifier 356B-1. In the EXT position, the vu meter is connected to terminals 39 and 40 of TB1.

### 3.1.9 PROGRAM SWITCH.

The PROGRAM switch, S10, permits switching either LINE 1 or LINE 2 to the program channel. In the middle position, the program channel is terminated in a resistive load.

### 3.1.10 SPARE SWITCHES.

Two spare level switches, S18 and S19, are provided to be used as desired in any custom wiring. One is located to the left of the PROGRAM switch in the upper right portion of the front panel. The other is located to the right of the MIXER 2 switch. Refer to paragraph 2.3.8 for suggested functions for these switches.

## 3.2 OPERATING PROCEDURES.

### 3.2.1 ROUTINE OPERATION.

3.2.1.1 LOCAL PROGRAM ON THE AIR. The procedure to put a local program on the air is as follows:

- a. Select desired microphone inputs with the mixer selector switches, if applicable.

- b. Move the PROGRAM switch, S10, to LINE 1 or LINE 2 as desired.
- c. Set MASTER control, AT10, to 24.
- d. Rotate MONITOR INPUT switch, S17, to the PGM position.
- e. Move mixer key switches as required to the P position.
- f. Turn up applicable MIXER as required to desired level as indicated on VU meter.
- g. Adjust the level of monitor speakers as desired by use of MONITOR gain control, AT11.

3.2.1.2 AUDITION PROGRAM. The procedure to audition program is as follows:

- a. Select desired microphone inputs with the mixer selector switches if applicable.
- b. Move mixer key switches to the A position.
- c. Turn up the corresponding mixer controls.
- d. Set the MONITOR INPUT Switch, S17, to AUD.
- e. The audition may be heard over the monitor speakers. The level may be adjusted by means of the MONITOR GAIN control, AT11.

### 3.2.2 REMOTE LINE OPERATION.

3.2.2.1 REMOTE PROGRAM ON THE AIR. The following procedures are necessary to put a remote line on the air:

- a. Move MIXER 9 NET/REMOTE switch, S14, to REMOTE.
- b. Set associated REMOTE switch, S15 or S16, to MIX.
- c. Set MIXER 9 program/audition switch, S9, to P.
- d. Move PROGRAM switch, S10, to place program on desired line.
- e. Adjust MIXER 9, AT9, 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 described for putting remote line on air, except set REMOTE function switch S15 or S16 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 S15 or S16 from CUE to MIX, and the remote line is on the air.

3.2.2.3 RECORD OPERATION. For normal record operation, an external recorder is connected to TB1, connectors 35 and 36. The record output is taken from the audition booster amplifier connected to J10 when MONITOR INPUT switch, S17, is in the AUD position.

### NOTE

Disconnect recorder from terminals 35 and 36 of TB1 when not in use.

For recording network program while a local program is on the air, the following operating procedures may be used.

- a. Move MIXER 9 A/P switch, S9, to A.
- b. Move MIXER 9 NET/REMOTE switch, S14, to NET.
- c. Adjust MIXER 9 for desired level at terminals 35 and 36 TB1.

**3.2.2.4 TALK-BACK OPERATION USING SPEAKERS.**  
The following operating procedures are necessary for the control room operator to listen to a remote line when a speaker is used.

- a. Move MIXER 9 A/P switch, S9, to A.
- b. Set MONITOR INPUT switch, S17, to AUD.
- c. Move MIXER 9 NET/REMOTE switch, S14, to REMOTE.
- d. Set applicable REMOTE line switch, S15 or S16, to MIX.
- e. Adjust MONITOR gain control, AT11, and MIXER 9, AT9, for desired listening level.

f. The following operating procedures are necessary for the control room operator to talk to the remote operator: Set MONITOR INPUT switch, S17, to AUD. Move MIXER 3 A/P switch, S3, to A. Set Applicable REMOTE line switch, S15 or S16 at CUE. Adjust MONITOR gain control, AT11, for suitable remote listening level.

**3.2.2.5 TALK-BACK OPERATION USING HEADPHONES.**  
The following operating procedures are necessary for the control room operator to communicate with a remote line operator when headphones are used.

- a. Plug headphones into REMOTE jack, J16.
- b. Set MIXER 3 A/P switch, S4, to A.
- c. Move MONITOR INPUT switch, S17, to AUD.
- d. Adjust MONITOR gain control, AT11, for desired listening level.
- e. For the control room operator to talk to the remote operator, move the applicable REMOTE line switch, S15 or S16, to CUE. For the control room operator to listen to the remote operator, move the applicable REMOTE line switch, S15 or S16, to MON.

## SECTION IV

### PRINCIPLES OF OPERATION

#### 4.1 GENERAL.

A functional block diagram of a typical Broadcast Console 212G-1 is shown in figure 4-1. Amplifiers of the plug-in module type may be added, as necessary, to handle up to nine of 13 possible inputs and serve one of two output lines. Lever switches permit the selection of two possible sources for two of six of the low-level input attenuators. The remote input attenuator may be switched to three possible inputs. The output of each step type attenuator is connected to a key switch which can feed either the program or the audition line. During normal program operation, the monitor line can be used for audition purposes. Output from the two-stage Preamplifier 356A-1 is passed through a constant impedance attenuator before being switched to the program or audition circuit. Connections for control room speakers and warning lights must be interlocked with the third mixer key switch (MIXER 3) and remote and cue functions to prevent program interruptions. Studio speakers can be interlocked with other mixer keys. The program line can be monitored with vu meter M1. Cueing signals from cue positions on MIXERS 4, 5, 6, 7, 8, and 9 are available when Cue Amplifier 356Q-1 is plugged into J9. A CUE speaker level control is provided on the front panel and a cue speaker is provided in the console.

#### 4.2 MIXER CIRCUITS.

Refer to figures 4-2 and 7-1. Nine independent input circuits are provided. Six are low-level microphone

or turntable inputs, each having an individual two-stage preamplifier. One remote net and two medium-level inputs are provided. 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 AT1 through AT9 control the input levels to the mixing circuits. Each is a constant-impedance attenuator with 600:1200 impedance ratio. Resistors R20 through R37 compensate for 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 loss. Contacts on the mixer and channel key switches complete 12-volt d-c circuits to operate the speaker and warning light control relays K701 through K704. 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.

Input signals connected into the program line are applied to the input of the booster amplifier. The booster amplifier is a type 356A-1 with input terminals connected for 250 ohms impedance. The booster amplifier plugs into J7. Output from the booster amplifier is attenuated by the MASTER gain control AT10. Output from the program amplifier is isolated from the program lines by a 6-db pad. The pad consists of resistors R42, R43, R45, and R46. Nominal

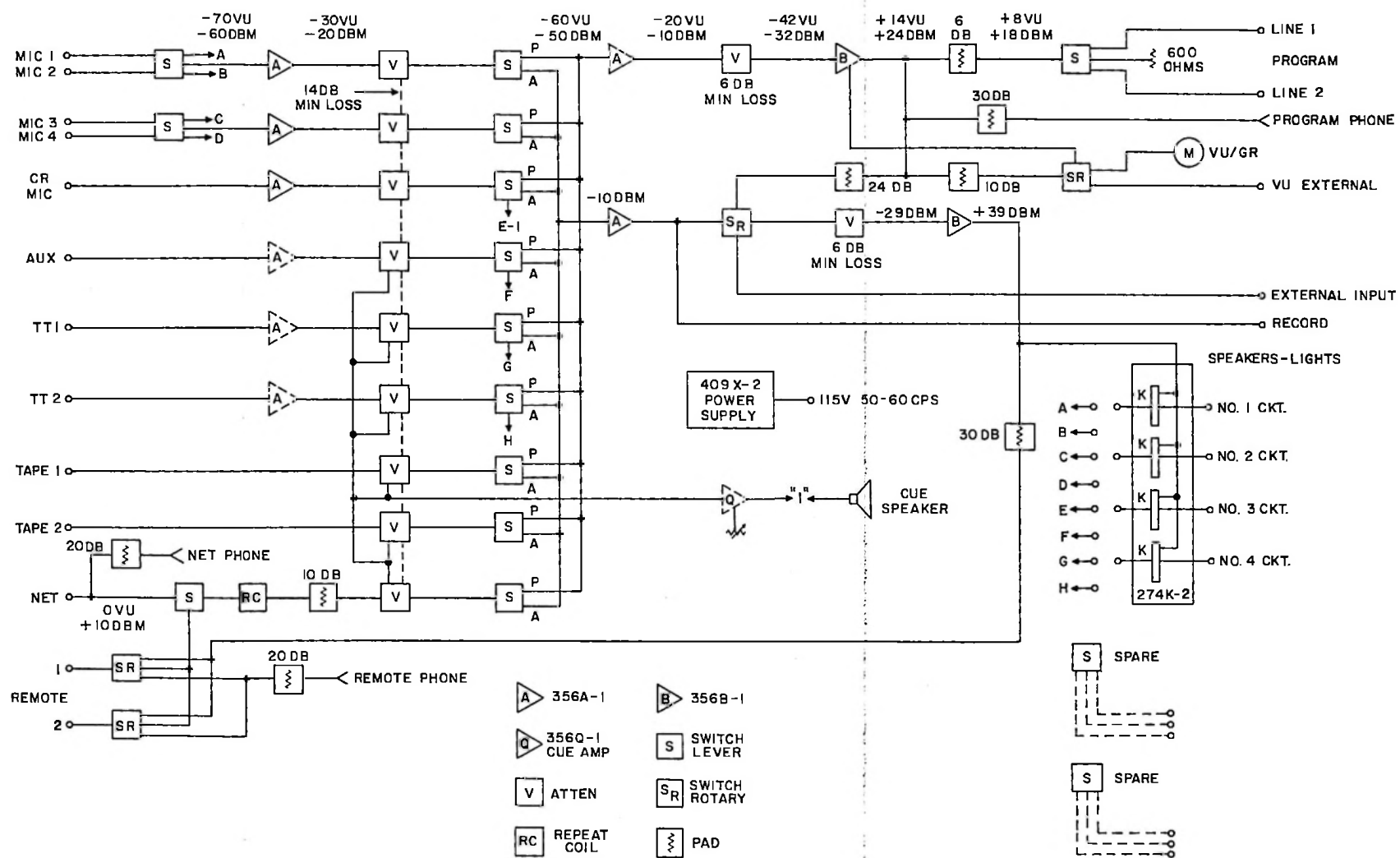


Figure 4-1. Broadcast Console 212G-1, Functional Block Diagram

NOTE:  
1. SWITCH S3 IS TYPICAL OF SWITCHES  
S4 THRU S8.

SEE NOTE 1

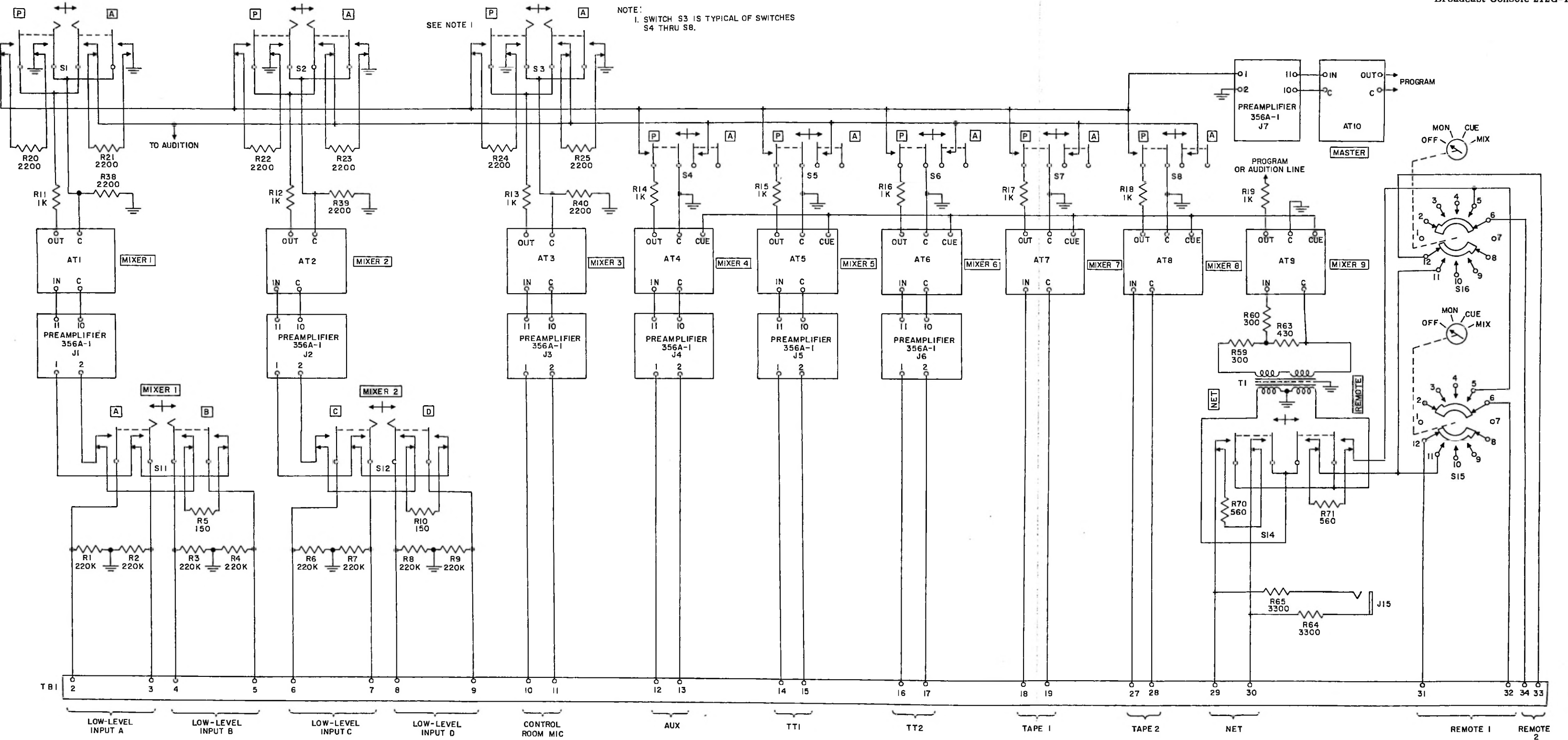


Figure 4-2. Mixer Circuits, Simplified Schematic Diagram

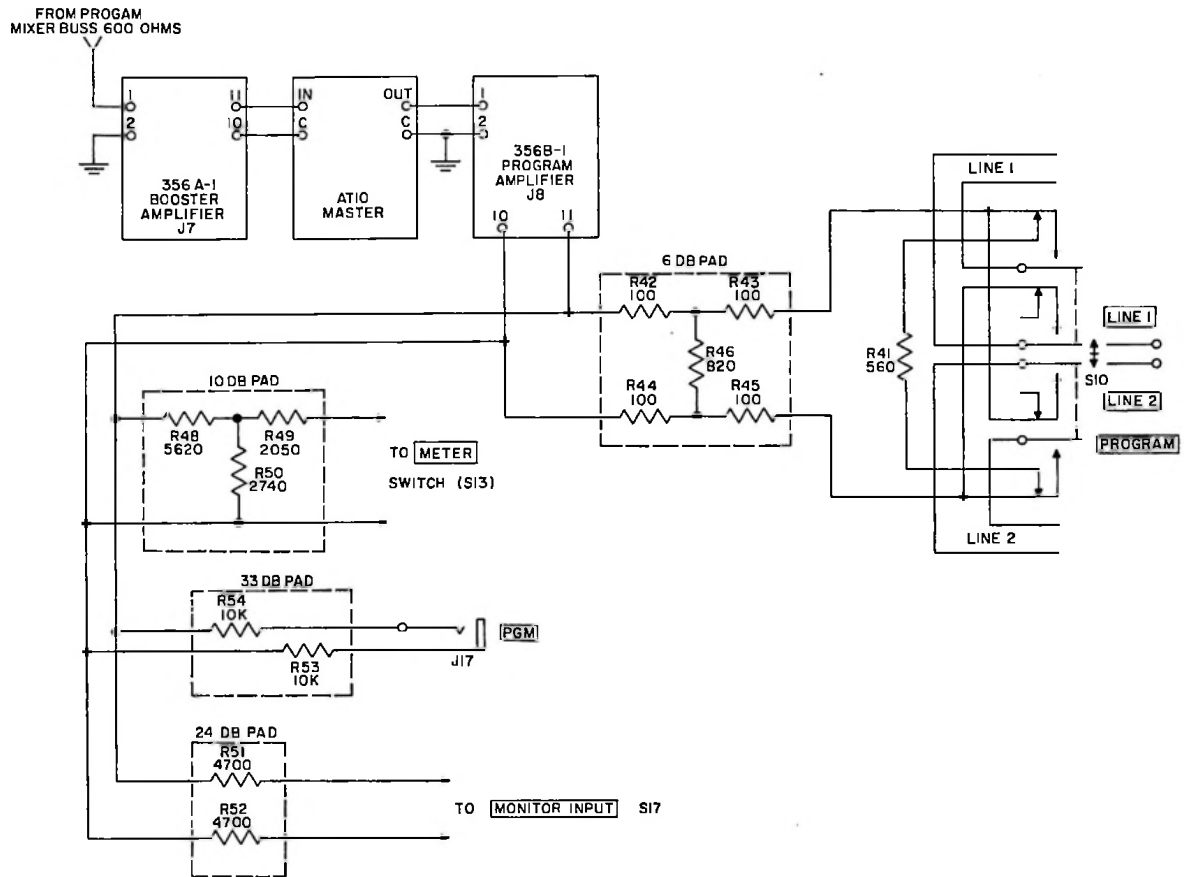


Figure 4-3. Program Circuits, Simplified Schematic Diagram

signal levels are -50 dbm at the input to the booster amplifier, -10 dbm at the output of the booster amplifier, -32 dbm at the input of the program amplifier, +24 dbm at the program amplifier output, and +18 dbm at the program line. The signal from the output of the program amplifier (+24 dbm) is connected through a 6-db pad and a LINE switch, S10, to the output line connections of the console. The program amplifier output also is applied through pads, to the MONITOR INPUT switch, S17, and the PGM phone jack, J17. The VU METER INPUT switch, S13, connects the VU meter, M1, through a pad to monitor the output of the program amplifier. Figure 4-3 is a simplified schematic diagram of the program circuits.

#### 4.4 MONITOR CIRCUITS.

Refer to figure 4-4. The MONITOR INPUT selector (S17) has three positions: AUD, PGM, and EXT. When the switch is in the EXT position, a signal connected at terminals 37 and 38 of TB1 may be monitored. With the switch in the PGM position, the program line

can be monitored. With the MONITOR INPUT switch in the AUD position and a mixer key in position A, the audition bus will be connected to the monitor circuit.

#### 4.5 STUDIO SPEAKER AND WARNING LIGHT CONTROL CIRCUITS.

Refer to figure 4-5. Mixer circuit key switches S11 and S12 and audition/program switches S1 through S6 control application of 12 volts d-c to relays K701 through K704.

The switches must be interlocked electrically to prevent program interruption. Speakers are operated from the 600-ohm output of Program/Monitor Amplifier 356B-1. Resistors R701, R702, R703, and R704 are connected as terminating resistors when speakers are removed from the circuit. Contacts on relays K701 through K704 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.



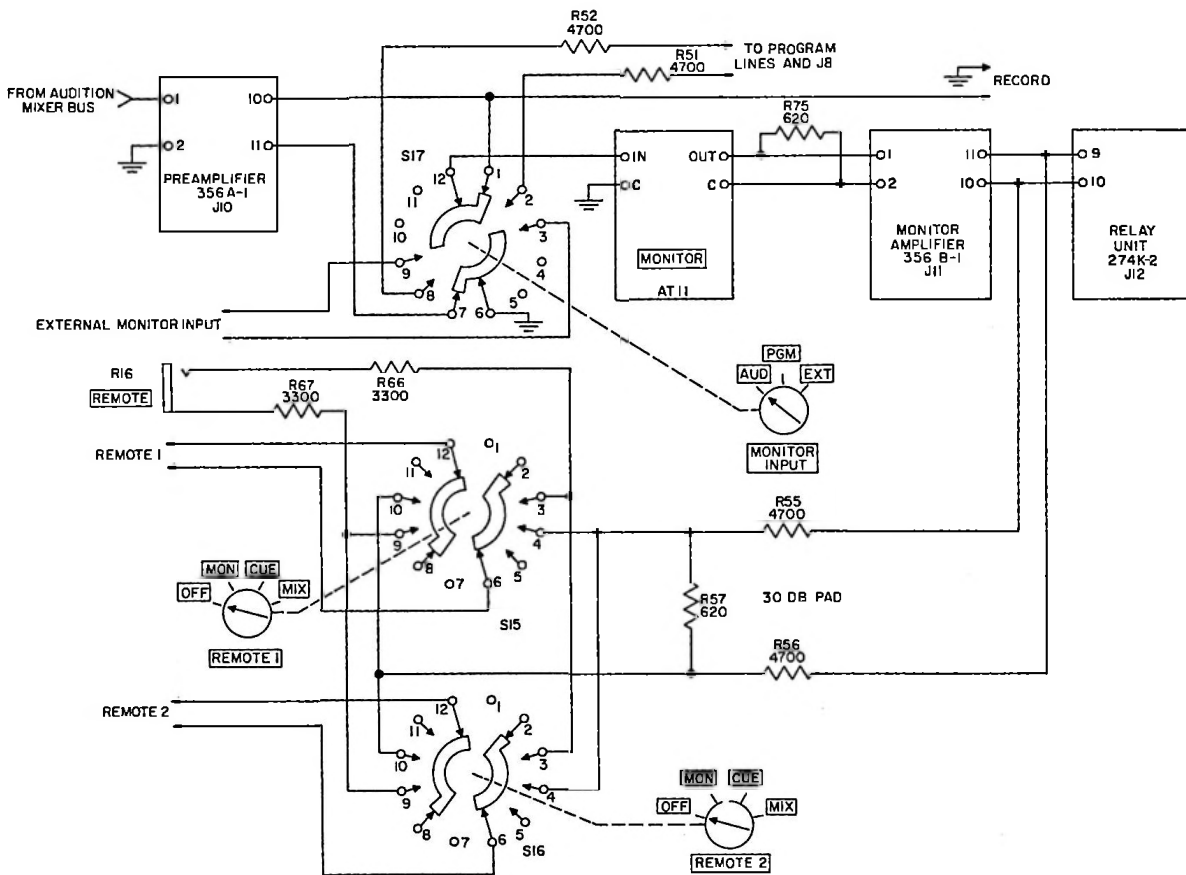
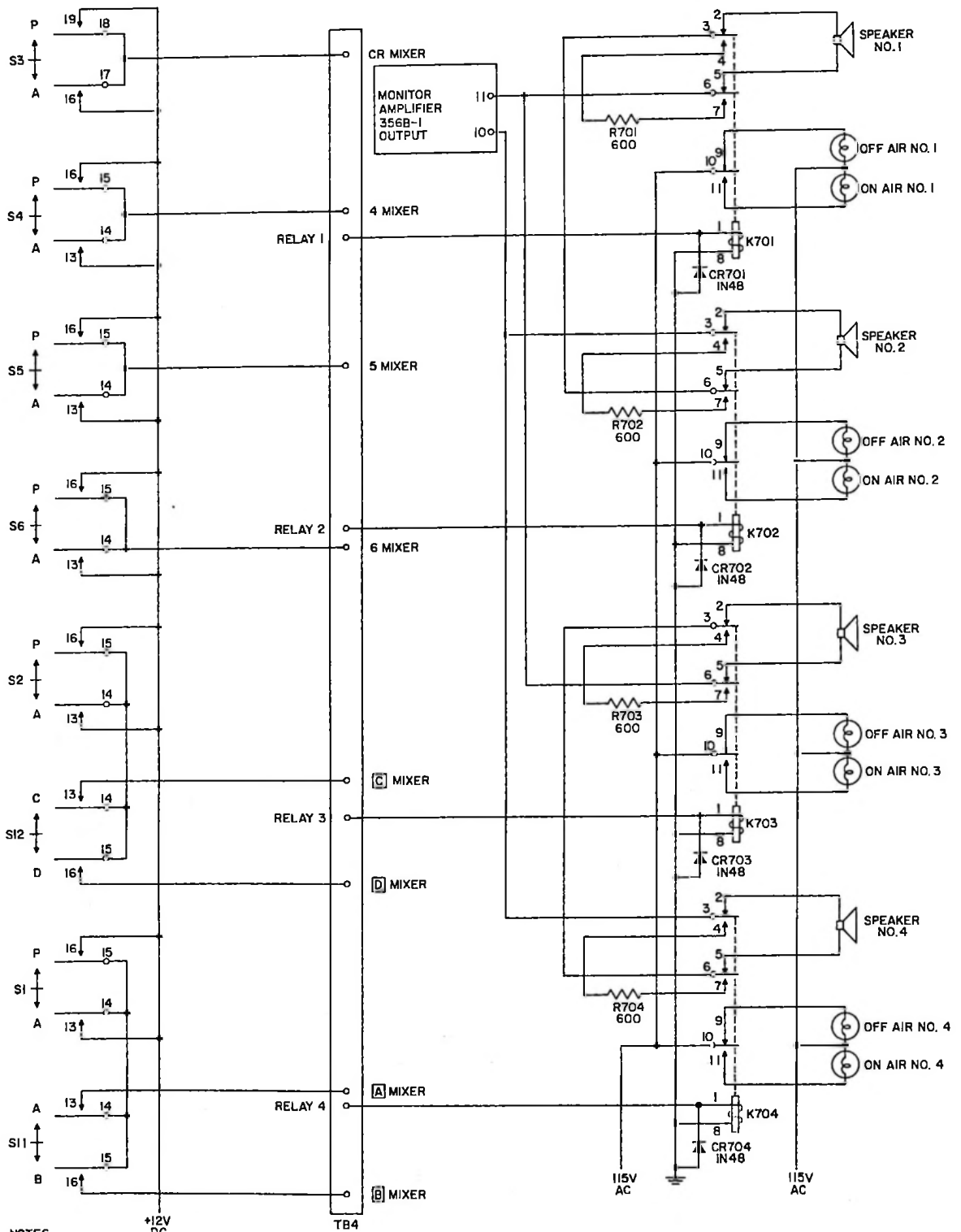


Figure 4-4. Monitor Circuits, Simplified Schematic Diagram



NOTES

1. A JUMPER MUST BE PLACED FROM CR MIXER TO RELAY 1 ON TB4 WHEN SPEAKER NO. 1 IS LOCATED IN THE CONTROL ROOM. ADDITIONAL JUMPERS MUST BE PLACED BETWEEN RELAYS 2, 3, 4 AND THE ASSOCIATED MIXER WHEN THERE IS A SPEAKER IN A STUDIO WITH A MICROPHONE.
2. IF MORE THAN ONE MICROPHONE IS USED IN A SPECIFIC LOCATION, THE SWITCH CONTACTS FOR EACH SHOULD BE PARALLELED & JUMPED ON TB4 SO THAT EITHER MICROPHONE WILL OPERATE THE ASSOCIATED RELAY.

Figure 4-5. Speaker and Warning Light Control Circuits, Simplified Schematic Diagram

## SECTION V

# MAINTENANCE

### 5.1 PERIODIC INSPECTION AND PREVENTIVE MAINTENANCE.

#### 5.1.1 ATTENUATORS.

Clean all attenuators occasionally to avoid noisy operation.

- a. Remove the dust cover.
- b. Wipe each contact and contact arm with a lint-free cloth that is saturated with carbon tetrachloride.
- 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.

#### 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.

#### NOTE

To remove an amplifier module, lift the rear edge of the module clear of the retaining rail, and push toward the rear to unplug.

Refer to the instruction book for the individual module for trouble-shooting and maintenance procedures. All subassembly instruction books are supplied following section VII of this instruction book.

#### 5.2.2 REPLACEMENT OF METER LAMPS.

The two lamps are located inside the 212G-1 front panel. Both are mounted on a bracket that is accessible when the front panel is tilted forward.

#### 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

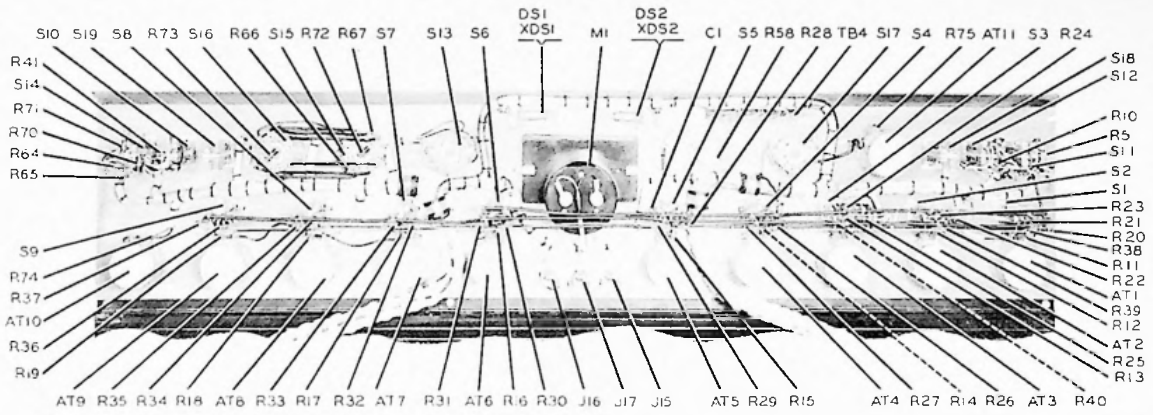


Figure 6-1. Broadcast Console 212G-1, Front Panel, Rear View

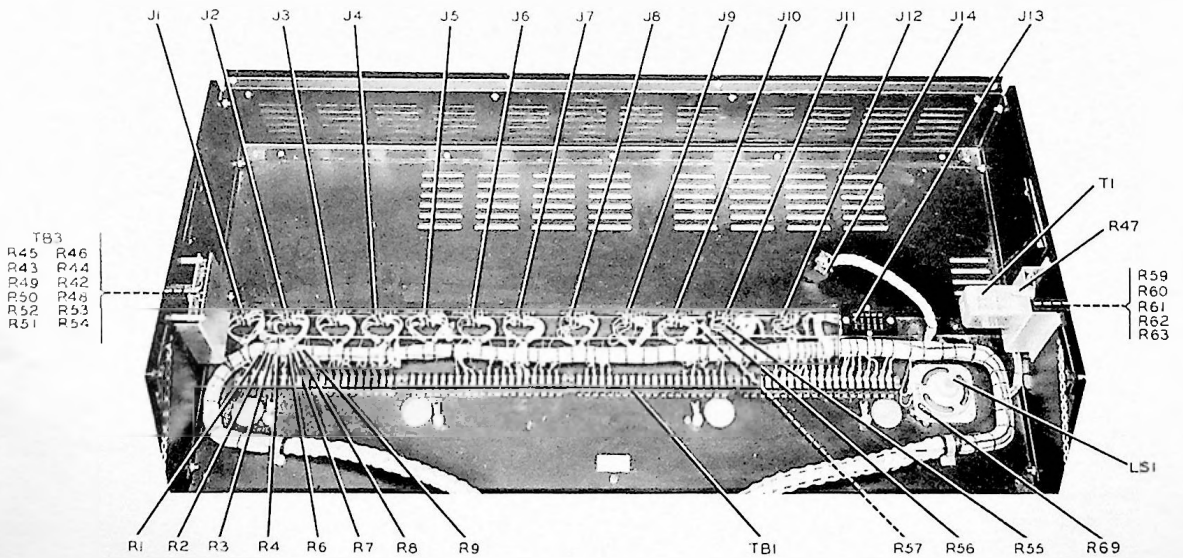


Figure 6-2. Broadcast Console 212G-1, Inside View

ITEM	DESCRIPTION	COLLINS PART NUMBER
BROADCAST CONSOLE 212G-1		522-1605-00
AT1	ATTENUATOR, VARIABLE: resistive type, 600/1200 ohms nom impedance, 20 steps, 2 db per step, 1-27/32 in. dia, 2-23/32 in. lg	378-0368-00
AT2	ATTENUATOR, VARIABLE: same as AT1	378-0368-00
AT3	ATTENUATOR, VARIABLE: same as AT1	378-0368-00
AT4	ATTENUATOR, VARIABLE: resistive type, 600/1200 ohms impedance, 20 steps attenuation in infinity, cueing position, 1-27/32 dia, 2-23/32 in. lg	378-0367-00
AT5 thru AT9	ATTENUATOR, VARIABLE: same as AT4	378-0367-00
AT10	ATTENUATOR, VARIABLE: resistive type, 600/600 ohms impedance 20 steps, 2 db each step, last step infinity	378-0530-00
AT11	ATTENUATOR, VARIABLE: same as AT10	378-0530-00
C1	CAPACITOR, FIXED, CERAMIC: 10.000 uuf, +100%, -20%, 500 v dc	913-1188-00
DS1	LAMP, INCANDESCENT: 6.3 v, 0.945 w, 0.15 amps; 1-1/8 in. lg max overall	262-3240-00
DS2	LAMP, INCANDESCENT: same as DS1	262-3240-00
J1	CONNECTOR, RECEPTACLE, ELECTRICAL: 12 flat female 10 amps, 730 v; straight shape	366-2120-00
J2 thru J12	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J1	366-2120-00
J13	CONNECTOR, RECEPTACLE, ELECTRICAL: 15 female contacts, chassis mtg, 3/4 in. by 1-21/32 in. overall	366-2150-00
J14	CONNECTOR, RECEPTACLE, ELECTRICAL: same as J13	366-2150-00
J15	JACK: telephone; for 2 conductor plug 1/4 in. dia. barrel	358-1080-00
J16	JACK: same as J15	358-1080-00
J17	JACK: same as J15	358-1080-00
LS1	LOUDSPEAKER, PERMANENT MAGNET: 3 to 4 ohms max. voice-coil impedance; 3 w nominal input; 3 in. sq.	371-0217-00
M1	METER, AUDIO LEVEL: db; top scale -20 thru 0, black, and +1 to +3 red markings CW; bottom scale 0 thru 100 and db gain reduction scale, black; phenolic case, 4 in. by 5 in. rectangular, flush panel mtg.	456-0053-00
P1	PLUG, JUMPER: 12 prong male connector	541-6459-002
P501	CONNECTOR, PLUG: 12 flat male contacts, 10 amps, 730 v ac; 1 mating end; plastic dielectric; straight shape	365-8120-00
P502	CONNECTOR, RECEPTACLE, ELECTRICAL: 12 flat female contacts; 1 mating end; straight shape polarized; nonlocking; 15/16 in. by 1-3/16 in. by 1-1/4 in.	366-8120-00
R1	RESISTOR, FIXED, COMPOSITION: 0.22 meg-ohms, ±10%, 1/2 w	745-1450-00
R2 thru R4	RESISTOR, FIXED, COMPOSITION: same as R1	745-1450-00
R5	RESISTOR, FIXED, COMPOSITION: 150 ohms, ±10%, 1/2 w	745-1317-00
R6 thru R9	RESISTOR, FIXED, COMPOSITION: same as R1	745-1450-00
R10	RESISTOR, FIXED, COMPOSITION: same as R5	745-1317-00
R11	RESISTOR, FIXED, COMPOSITION: 1000 ohms, ±10%, 1/2 w	745-1352-00
R12 thru R19	RESISTOR, FIXED, COMPOSITION: same as R11	745-1352-00
R20	RESISTOR, FIXED, COMPOSITION: 2200 ohms, ±10%, 1/2 w	745-1366-00
R21 thru R40	RESISTOR, FIXED, COMPOSITION: same as R20	745-1366-00
R41	RESISTOR, FIXED, COMPOSITION: 560 ohms, ±10%, 1 w	745-3342-00
R42	RESISTOR, FIXED, COMPOSITION: 100 ohms, ±5%, 1 w	745-3309-00
R43 thru R45	RESISTOR, FIXED, COMPOSITION: same as R42	745-3300-00
R46	RESISTOR, FIXED, COMPOSITION: 820 ohms, ±5%, 2w	745-5648-00
R47	RESISTOR, VARIABLE, COMPOSITION: 1000 ohms, ±20% 0.3 w	376-0203-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
R48	RESISTOR, FIXED, FILM: 5620 ohms, ±1%, 1/2 w	705-7632-00
R49	RESISTOR, FIXED, FILM: 2,050 ohms ±1%, 1/2 w	705-7611-00
R50	RESISTOR, FIXED, FILM: 2,740 ohms, ±1%, 1/2 w	705-7617-00
R51	RESISTOR, FIXED, COMPOSITION: 4700 ohms, ±10%, 1/2 w	745-1380-00
R52	RESISTOR, FIXED, COMPOSITION: same as R51	745-1380-00
R53	RESISTOR, FIXED, COMPOSITION: 10,000 ohms, ±10%, 1/2 w	745-1394-00
R54	RESISTOR, FIXED, COMPOSITION: same as R53	745-1394-00
R55	RESISTOR, FIXED, COMPOSITION: 4700 ohms, ±5%, 1/2 w	745-1379-00
R56	RESISTOR, FIXED, COMPOSITION: same as R55	745-1379-00
R57	RESISTOR, FIXED, COMPOSITION: 820 ohms, ±5%, 1/2 w	745-1343-00
R58	RESISTOR, VARIABLE, COMPOSITION: 50,000 ohms, ±30%, 1/4 w	376-7204-00
R59	RESISTOR, FIXED, COMPOSITION: 160 ohms, ±5%, 1/2 w	745-1319-00
R60 thru R62	RESISTOR, FIXED, COMPOSITION: same as R59	745-1319-00
R63	RESISTOR, FIXED, COMPOSITION: 430 ohms, ±5%, 1/2 w	745-1336-00
R64	RESISTOR, FIXED, COMPOSITION: 3300 ohms, ±10%, 1/2 w	745-1373-00
R65 thru R68	RESISTOR, FIXED, COMPOSITION: same as R64	745-1373-00
R69	NOT USED	
R69	RESISTOR, FIXED, COMPOSITION: 10 ohms, ±10%, 2 w	745-5568-00
R70 thru R73	RESISTOR, FIXED, COMPOSITION: same as R41	745-3342-00
R74	RESISTOR, FIXED, COMPOSITION: 560 ohms, ±10%, 1/2 w	745-1342-00
R75	RESISTOR, FIXED, COMPOSITION: same as R74	745-1342-00
S1	SWITCH, LEVER: 3 positions; upper, left 2D, Right 1A; Lower, left 2D, right 1A; 3 amps, 110 VAC noninductive	375-0175-00
S2	SWITCH, LEVER: same as S1	375-0175-00
S3	SWITCH, LEVER: 3 positions; upper, left 2D, Right 1C, 1A; lower, left 2D, right 1C, 1A, 3 amps 110 VAC noninductive	375-0177-00
S4 thru S6	SWITCH, LEVER: same as S1	375-0175-00
S7	SWITCH, LEVER: 3 position; upper, left 2D; lower left 2D, 3 amps, 110 VAC noninductive	375-0176-00
S8 thru S10	SWITCH, LEVER: same as S7	375-0176-00
S11	SWITCH, LEVER: same as S1	375-0175-00
S12	SWITCH, LEVER: same as S1	375-0175-00
S13	SWITCH, ROTARY: 2 pole, 3 positions, 1 section; 2 moving contacts, 8 fixed contacts	259-1138-00
S14	SWITCH, LEVER: 3 positions; upper, left 2D, right 2 dummy clips; lower, left 2D, right none; 3 amps, 110 VAC noninductive	375-0178-00
S15	SWITCH, ROTARY: 2 pole, 4 positions, 1 section; 2 moving contacts, 10 fixed contacts	259-1121-00
S16	SWITCH, ROTARY: same as S15	259-1121-00
S17	SWITCH, ROTARY: same as S13	259-1138-00
S18	SWITCH, LEVER: same as S7	375-0176-00
S19	SWITCH, LEVER: same as S3	375-0177-00
TB1	TERMINAL STRIP: molded bakelite barrier strip, 20 terminals, 7-7/8 in. lg by 7/8 in. w, 0.656 in. thk	367-0131-00
TB2	TERMINAL, BOARD: phenolic 1/16 in. thk, 3/8 in w by 1-1/8 in. lg overall excluding terminals	306-0168-00
TB3	TERMINAL BOARD: plastic 3/32 in. thk, 3-3/8 in. w by 4-5/16 in. lg incl 26 brass silver plated double end terminal lugs	545-6014-003
TB4	TERMINAL, BOARD: plastic 1/16 in. thk, 7/16 in. long, 12 brass solder lug type terminals	367-0905-00
TB5	TERMINAL, BOARD: phenolic 1/16 in. thk., 3/8 in. w by 1-1/8 in. lg. overall excluding terminals	300-0168-00
TB6	TERMINAL, BOARD: same as TB5	306-0168-00
TB7	TERMINAL, BOARD: same as TB5	306-0168-00
XDS1	LAMPHOLDER: steel, cadmium plated, single contact, bayonet type w/ bracket mtg; phenolic insulation; 1-1/16 in. w by 1-25/32 in. lg overall	262-0297-00
XDS2	LAMPHOLDER: same as XDS1	262-0297-00

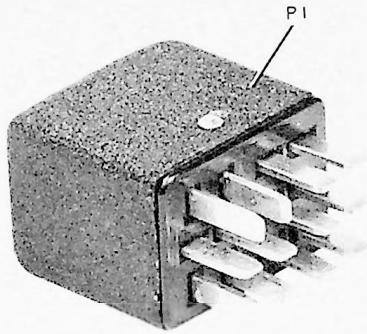


Figure 6-3. Jumper Plug



Figure 6-4. Test Cable



# SECTION VII ILLUSTRATIONS

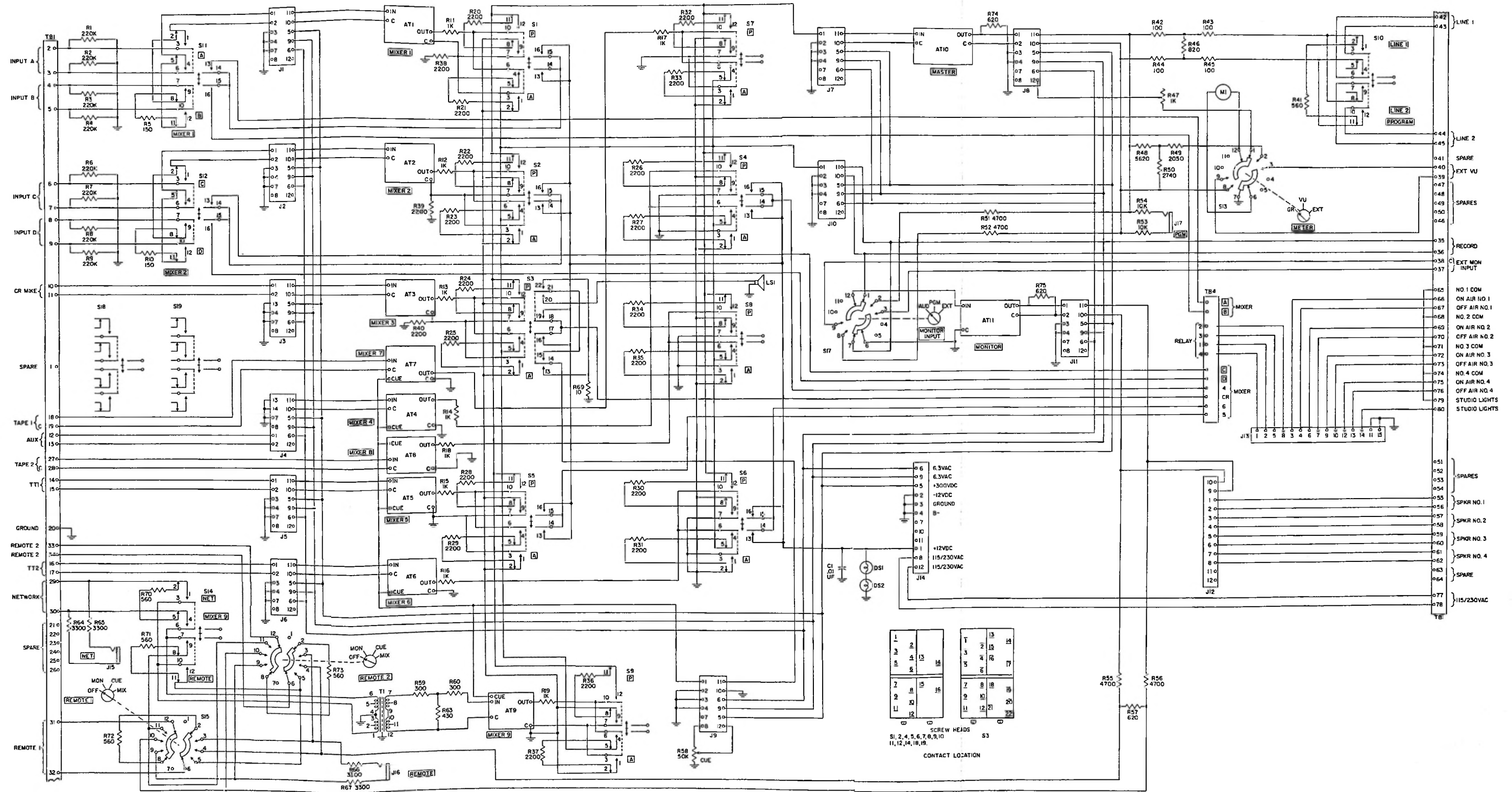


Figure 7-1. Broadcast Console 212G-1, Schematic Diagram

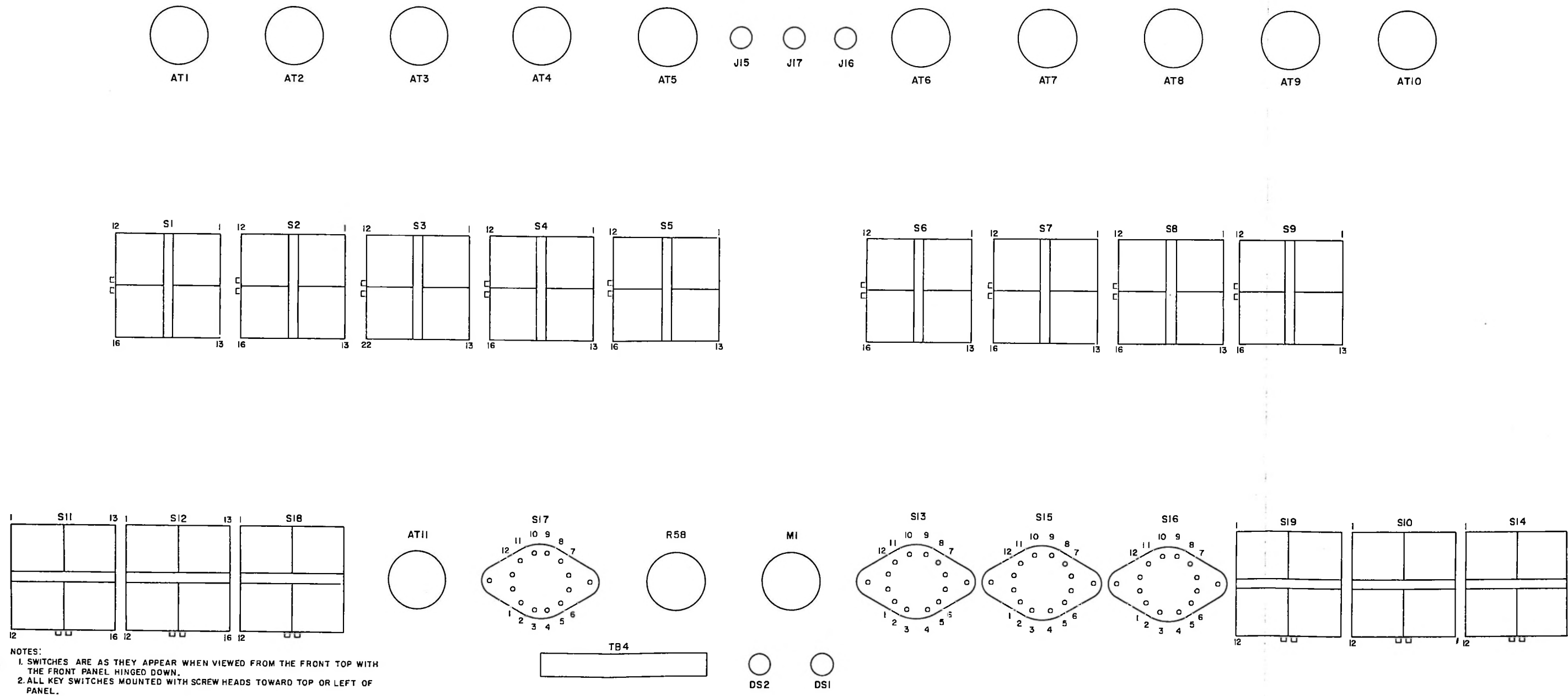


Figure 7-2. Broadcast Console 212G-1 Switch Pin Orientation

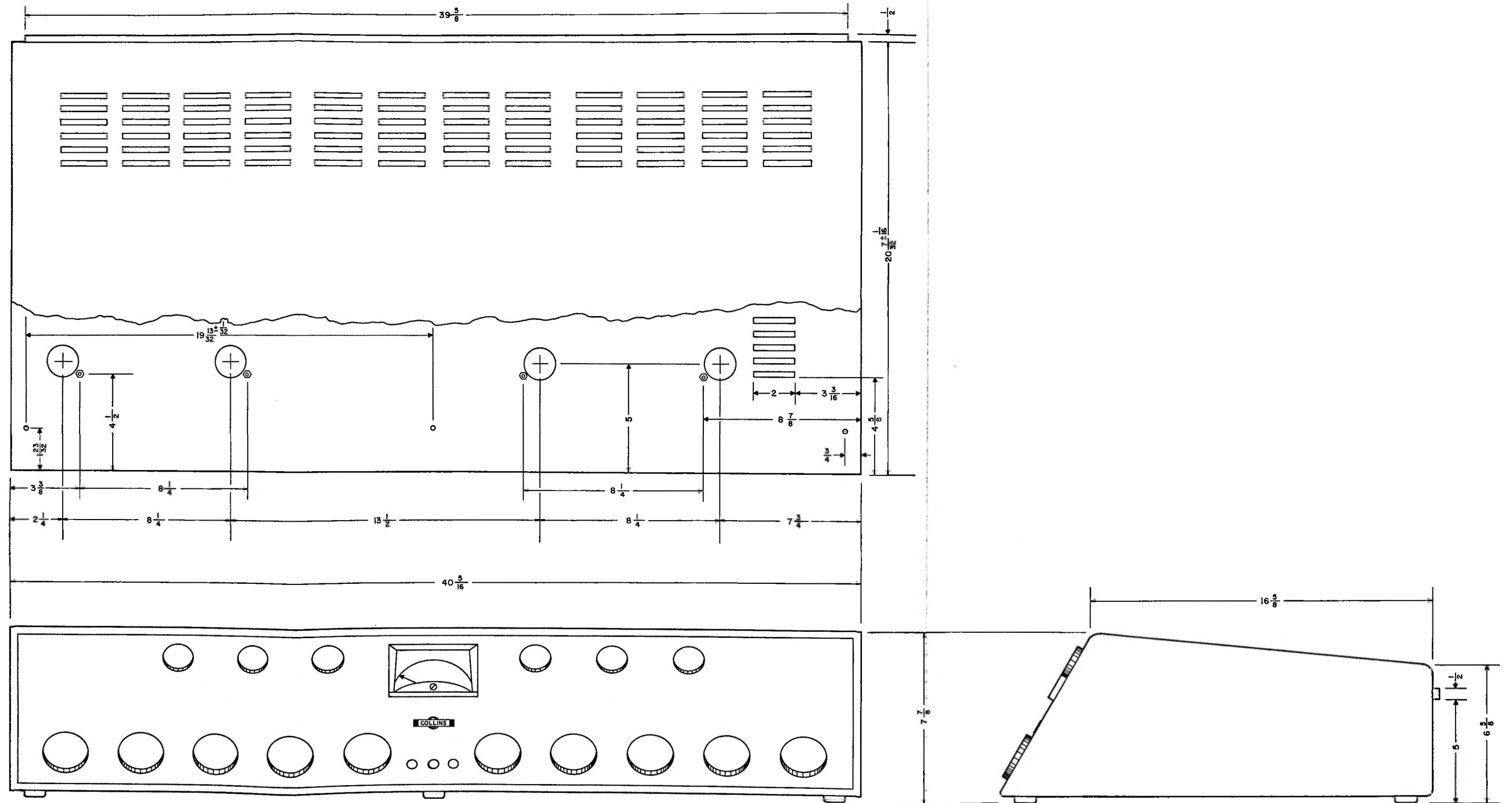


Figure 7-3. Broadcast Console 212G-1, Outline and Mounting Dimensions



# 356A-1 Preamplifier

unit instructions

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

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## 1. General Description.

### 1.1 PURPOSE OF EQUIPMENT.

The 356A-1 Preamplifier is intended for use as a pre-amplifier 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.

The 356A-1 Preamplifier (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.

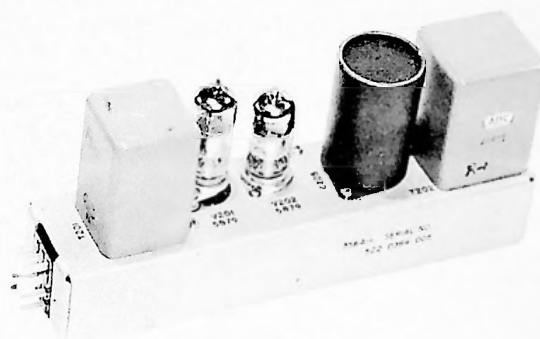
FUNCTION	SYMBOL	TUBE TYPE
Input amplifier	V201	5879
Output amplifier	V202	5879

### 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.



C99-40-P

Figure 1. 356A-1 Preamplifier, Equipment Supplied

**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. Circuit Description.

Figure 4 is a schematic diagram of the 356A-1 Preamplifier. 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. Maintenance.

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

4. Parts List.

The parts list 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 356A-1 PREAMPLIFIER

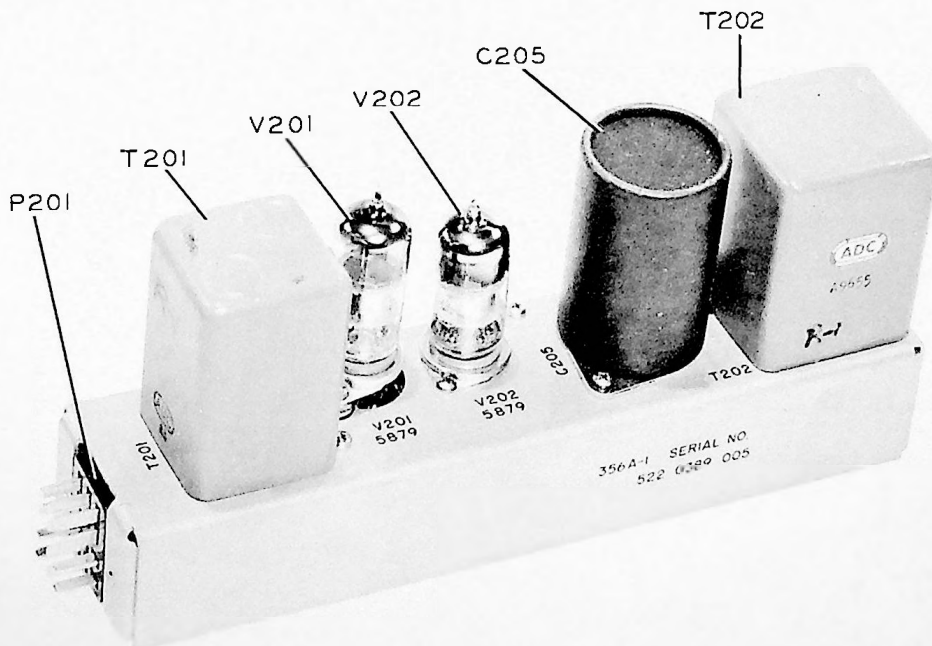
Conditions of Measurement:

- 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 D-C	0	0	1.9	20-50	20-50	0	46	82	1.9
	V A-C	0	0	0	3.0	3.0	0	0	0	0
	Ohms	6K	0	2300	2800	2800	0	37K	200K	2300
V202 (5879)	V D-C	0	0	5.7	40	40	0	210	210	210
	V A-C	0	0	0	3.0	3.0	0	0	0	0
	Ohms	2.2 meg	0	900	2800	2800	0	40K	40K	40K

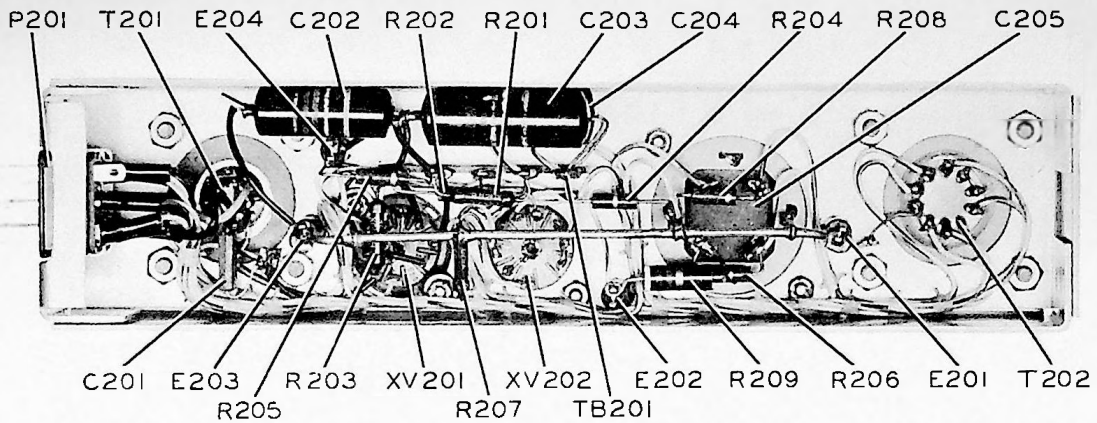
ITEM	DESCRIPTION	COLLINS PART NUMBER
C201	NOT USED	
C202	CAPACITOR: paper, 0.047 uf $\pm 10\%$ , 400 vdcw	931-0295-00
C203	CAPACITOR: paper, 0.1 uf $\pm 10\%$ , 400 vdcw	931-0299-00
C204	Same as C203	931-0299-00
C205	CAPACITOR: dry electrolytic, quadruple section; sections 1 and 2, 20 uf, 450 vdcw $+250\%$ $-10\%$ tolerance; section 3 and 4, 50 uf, 50 vdcw $+250\%$ $-10\%$ tolerance	183-1260-00
E201	TERMINAL, stud: melamine body, brass term. tinned, 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	365-0040-00
R201	RESISTOR: comp, 0.16 megohms $\pm 5\%$ , 1/2 w	745-1445-00
R202	RESISTOR: comp, 0.10 megohms $\pm 10\%$ , 1/2 w	745-1436-00
R203	RESISTOR: comp, 51,000 ohms $\pm 5\%$ , 1/2 w	745-1424-00
R204	RESISTOR: comp, 2.2 megohm $\pm 10\%$ , 1/2 w	745-1402-00
R205	RESISTOR: comp, 5.6 megohm $\pm 10\%$ , 1/2 w	745-1510-00
R206	RESISTOR: comp, 30,000 ohms $\pm 5\%$ , 1/2 w	745-1413-00
R207	RESISTOR: comp, 910 ohms $\pm 5\%$ , 1/2 w	745-1350-00
R208	RESISTOR: comp, 2,200 ohms $\pm 10\%$ , 1/2 w	745-1366-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
R209	RESISTOR: comp, 9100 ohms $\pm 5\%$ , 1 w	745-3392-00
R210	RESISTOR: comp, 270 ohms $\pm 10\%$ , 1/2 w (separate) in cloth bag	745-1328-00
R211	Same as R210	745-1328-00
R212	RESISTOR: comp, 2700 ohms $\pm 10\%$ , 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 16,500 ohms, 6 ma dc; secondary impedance 600 ohms when series connected; 150 ohms when parallel connected; transformer contains a feedback winding	667-0436-00
TB201	BOARD, TERMINAL: phenolic PBG; 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



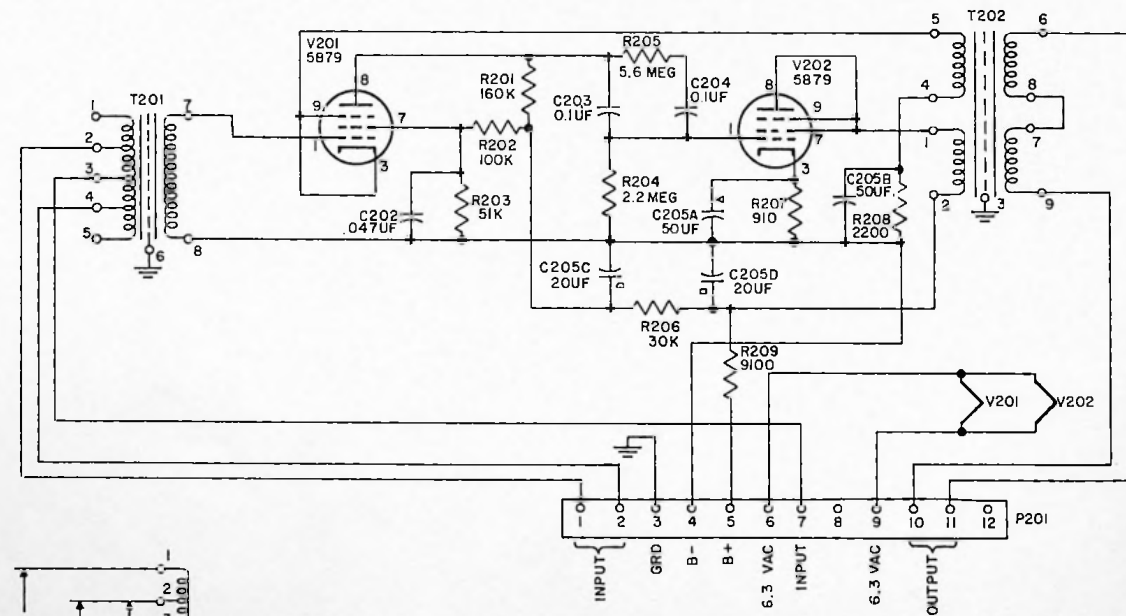
C99-30-P

Figure 2. 356A-1 Preamplifier, Top View



C99-31-P

Figure 3. 356A-1 Preamplifier, Bottom View



1. UNLESS OTHERWISE SPECIFIED:  
 RESISTOR VALUES IN OHMS; CAPACITOR VALUES IN MICROMICROFARADS.  
 2. T202 SHOWN CONNECTED FOR 600 OHM OUTPUT; FOR 150 OHM OUTPUT,  
 CONNECT TERMINAL 6 TO 7 & 8 TO 9.

C99-05-3

Figure 4. 356A-1 Preamplifier, Schematic Diagram





# 356B-1 Program/Monitor Amplifier

unit instructions

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

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Printed in U.S.A.

TD-324  
520-5447000-005418  
5th Edition, 15 August 1964

## I. General Description.

### 1.1 PURPOSE OF EQUIPMENT.

The 356B-1 Program/Monitor Amplifier is intended for use as a program or monitor amplifier with broadcast studio equipment, such as the 212F-1, 212F-2, or 212G-1 Broadcast Console. It may be used in high-fidelity AM, FM, and TV broadcast service or program control in audio systems.

### 1.2 PHYSICAL DESCRIPTION.

The 356B-1 Program/Monitor Amplifier (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 to 300 volts d-c at 63 to 88 ma and 6.3 volts a-c or d-c at 1.2 amperes.

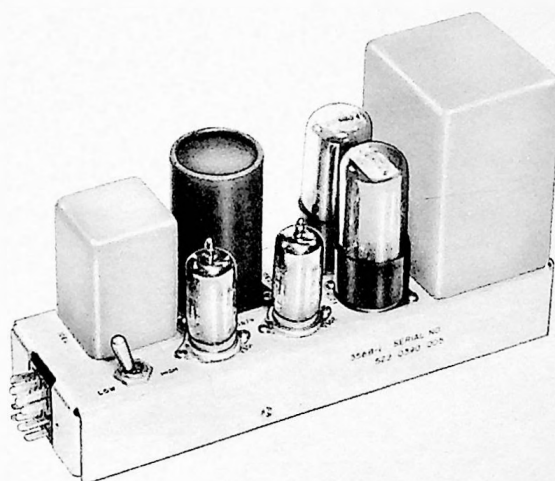


Figure 1. 356B-1 Program/Monitor Amplifier, Equipment Supplied

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 percent maximum at +30 dbm (one watt) output and 3 percent maximum at +39 dbm (8 watts) output.

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

2. Circuit Description.

Figure 4 is a schematic diagram of the 356B-1 Program/Monitor Amplifier. 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. Maintenance.

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

4. Parts List.

The parts list gives the description and Collins part number for all replaceable parts in the 356B-1 Program/Monitor Amplifier. 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:

- 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.
- c. Resistance readings taken with no power applied.
- d. 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	

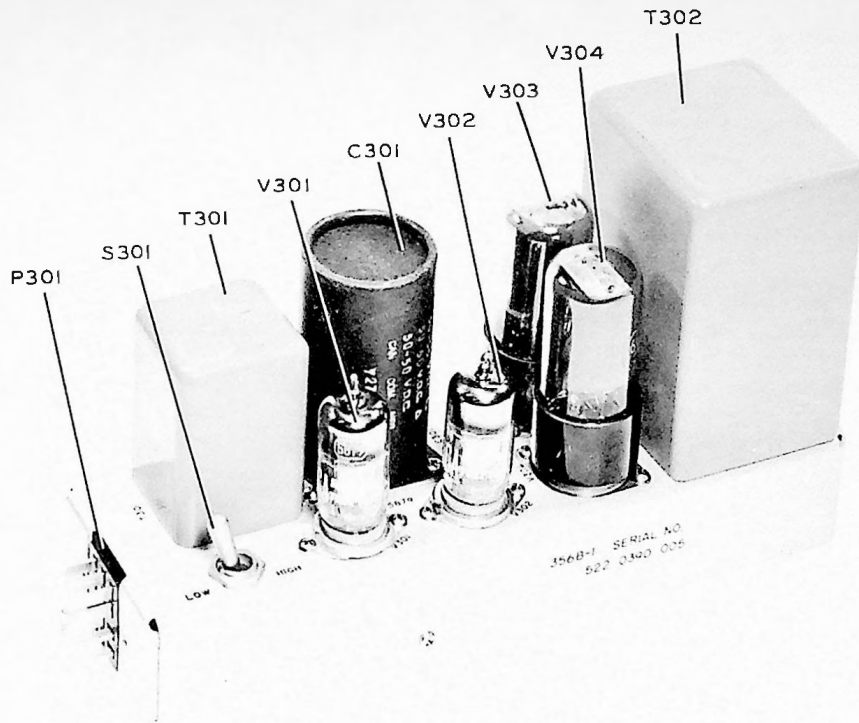


Figure 2. 356B-1 Program/Monitor Amplifier, Top View

C99-32-P

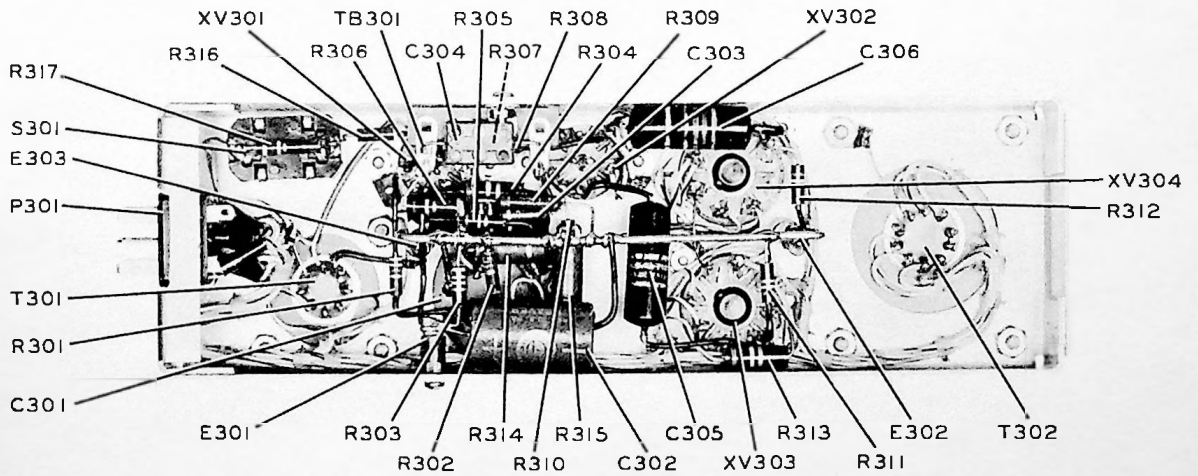


Figure 3. 356B-1 Program/Monitor Amplifier, Bottom View

C99-33-P

## 356B-1 Program/ Monitor Amplifier

ITEM	DESCRIPTION	COLLINS PART NUMBER
356B-1 PROGRAM/MONITOR AMPLIFIER		522-0390-005
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 $\pm 10\%$ , 400 vdcw	931-0295-00
C304	CAPACITOR: mica, 82 uuf $\pm 10\%$ , 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, RECEPTACLE, ELECTRICAL: 12 male contacts, 10 amp	365-0040-00
R301	RESISTOR: comp, 330 ohms $\pm 10\%$ , 1/2 w	745-1331-00
R302	RESISTOR: comp, 1100 ohms $\pm 5\%$ , 1/2 w	745-1354-00
R303	RESISTOR: comp, 33,000 ohms $\pm 10\%$ , 1/2 w	745-1415-00
R304	RESISTOR: comp, 0.10 megohm $\pm 10\%$ , 1/2 w	745-1436-00
R305	RESISTOR: comp, 0.10 megohm $\pm 10\%$ , 1 w	745-3436-00
R306	RESISTOR: comp, 0.20 megohm $\pm 5\%$ , 1/2 w	745-1448-00
R307	RESISTOR: comp, 1.0 megohm $\pm 10\%$ , 1/2 w	745-1478-00
R308	RESISTOR: comp, 2000 ohms $\pm 5\%$ , 1/2 w	745-1364-00
R309	RESISTOR: comp, 22,000 ohms $\pm 5\%$ , 1/2 w	745-1407-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
R310	RESISTOR: comp, 24,000 ohms $\pm 5\%$ , 1/2 w	745-1410-00
R311	RESISTOR: comp, 0.56 megohm $\pm 10\%$ , 1/2 w	745-1468-00
R312	SAME as R311	745-1468-00
R313	RESISTOR: comp, 15,000 ohms $\pm 10\%$ , 1 w	745-3401-00
R314	RESISTOR: comp, 510 ohms $\pm 5\%$ , 2 w	745-5640-00
R315	SAME as R314	745-5640-00
R316	RESISTOR: comp, 8,100 ohms $\pm 5\%$ , 1/2 w	745-1392-00
R317	RESISTOR: comp, 91,000 ohms $\pm 5\%$ , 1/2 w	745-1434-00
S301	SWITCH: toggle, spat, 30 V dc 20 amp/in locking position	266-3072-00
T301	TRANSFORMER AF: input type, 800 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, 6V6GT	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

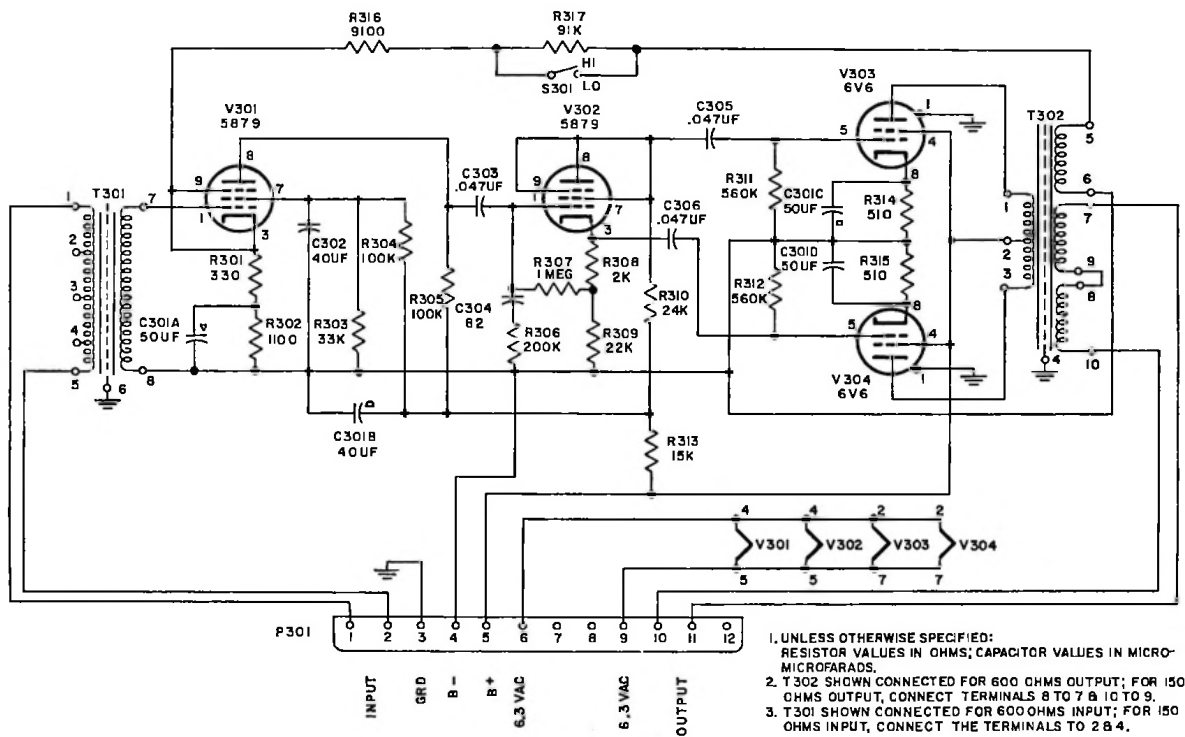


Figure 4. 356B-1 Program/Monitor Amplifier, Schematic Diagram

C99-09-3



# 356E-1 Limiter Amplifier

unit instructions

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

Collins Radio Company 1956, 1960, 1964  
Printed in U.S.A.

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3rd Edition, 1 September 1964

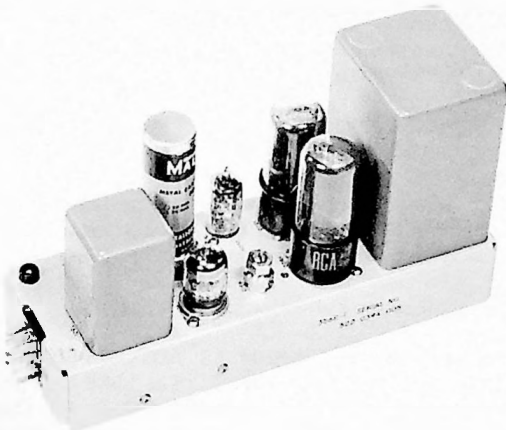


Figure 1. 356E-1 Limiter Amplifier,  
Equipment Supplied

C59-23-P

## 1. General Description. (See figure 1.)

### 1.1 PURPOSE OF EQUIPMENT.

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

### 1.2 PHYSICAL DESCRIPTION.

The 356E-1 Limiter Amplifier 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 on top of the chassis 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.

**1.4.4 INPUT IMPEDANCE.** The 356E-1 Limiter Amplifier 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 percent maximum distortion from 50 to 15,000 cps with no compression and 2 percent 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 the 356E-1 Limiter Amplifier is 0.9 second for 63-percent recovery with the switch set in the DUAL position, or 5.2 seconds for 63-percent recovery with the switch set in the AVERAGE position.

## 2. Circuit Description.

Figure 11 is a schematic diagram of the 356E-1 Limiter Amplifier. Transformer T601 couples the input signal to the grids of push-pull input stage V601. Output from B601 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. Threshold voltage control R612 adjusts the positive bias applied to the cathodes of 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, bias rectifier V604

conducts. The V604 plate current 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 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, 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 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 capacitance 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.

## 2.1 APPLICATION.

2.1.1 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.

2.1.2 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

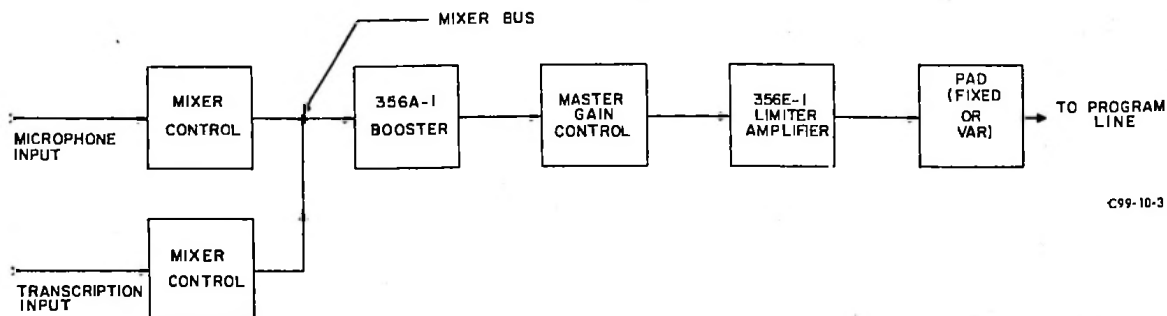


Figure 2. Collins Type 356E-1 Limiter Amplifier as Automatic Fader Control, Suggested Arrangement

C99-10-3



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.

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

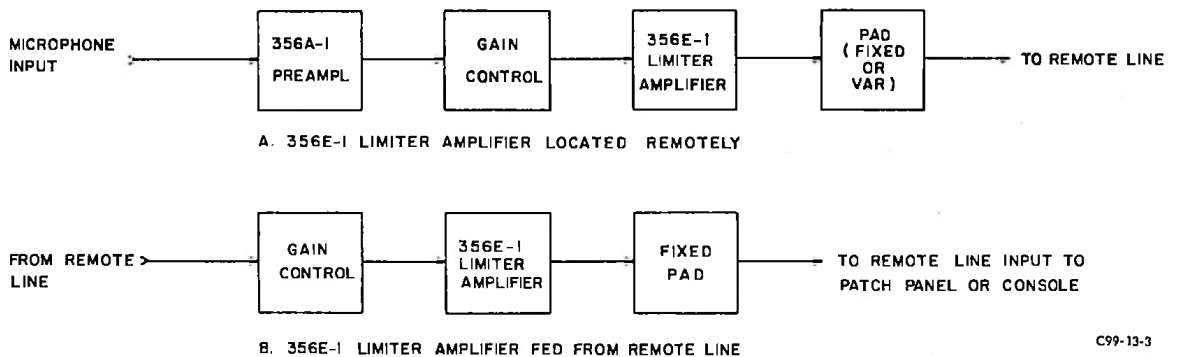
With an average input signal, adjust the input to the 356E-1 to produce approximately 15-db gain reduction.

2.1.4 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.

2.1.5 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.

3. Adjustments or Modifications.

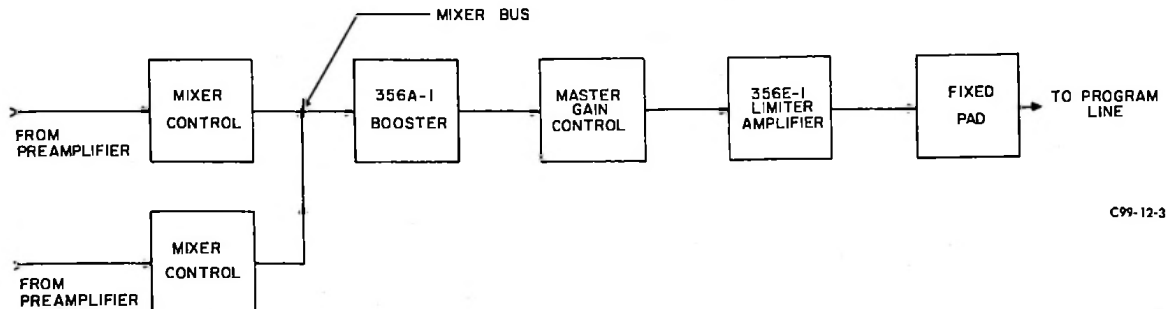
3.1 GENERAL. The following paragraphs describe adjustments of threshold voltage for various input and output levels, modification of resistor values for various release times, and modification of meter and switching circuits to provide for monitoring the amount of gain reduction.



C99-13-3

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

C99-13-3



C99-12-3

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

C99-12-3

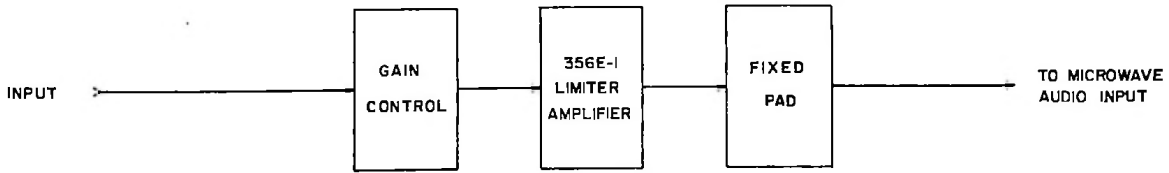


Figure 5. Collins Type 356E-1 Limiter Amplifier as Automatic Level Control in Microwave Relay Systems, Suggested Arrangement

C99-11-3

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.

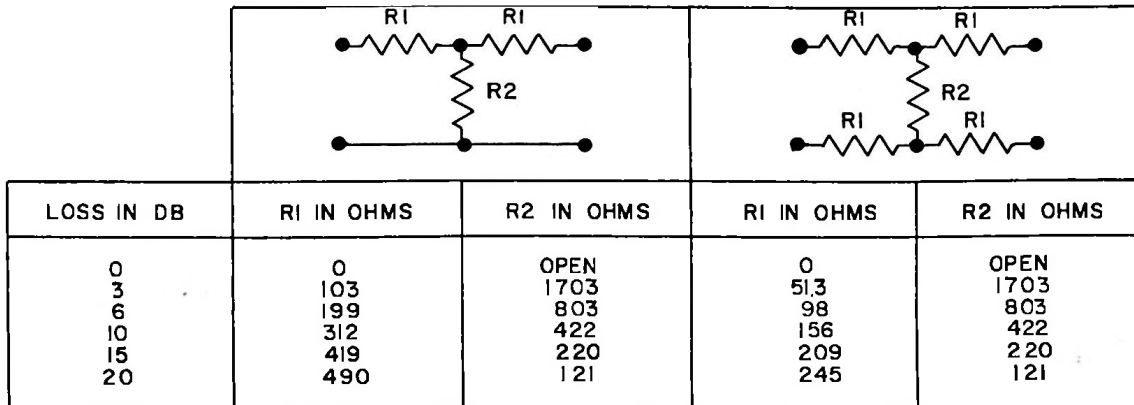
3.3 RELEASE TIME. The release time of the 356E-1 is satisfactory for most applications. If some other value of release time is desired, change the values of R616 and R617. Table 2 gives other values of resistance for R616 and R617 with corresponding release times.

TABLE 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		

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

MEGOHMS		DUAL POSITION (seconds)		AVERAGE POSITION (seconds)
R16	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



C99-18-3

Figure 6. Resistor Values for 600-Ohm Fixed Pads

C99-18-3

**3.4 MODIFICATION OF VU METER AND SWITCHING CIRCUITS TO READ GAIN REDUCTION.** 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:

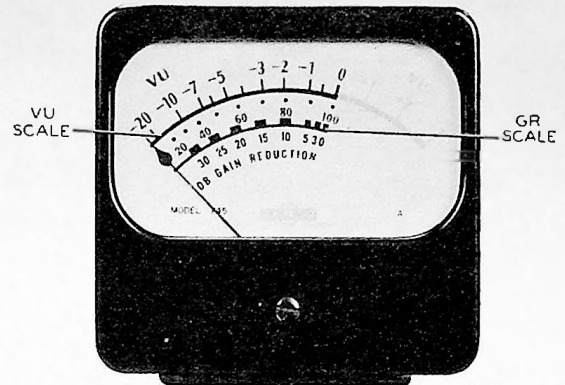
- a. Remove the front of the VU meter.
- b. Prepare the decal for application according to printed instructions on the decal.
- c. Apply the decal to the VU meter scale with the plain black line of the decal directly over the black line on the meter scale and with the zero of the decal aligned with the 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.

#### 4. 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 the 356E-1 Limiter Amplifier.

#### 5. Parts List.

The parts list gives the description and Collins part number for all replaceable parts in the 356E-1 Limiter



C99-26-P

Figure 7. VU Meter with GR Scale Decal Applied

Amplifier. 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.

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 volts 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		

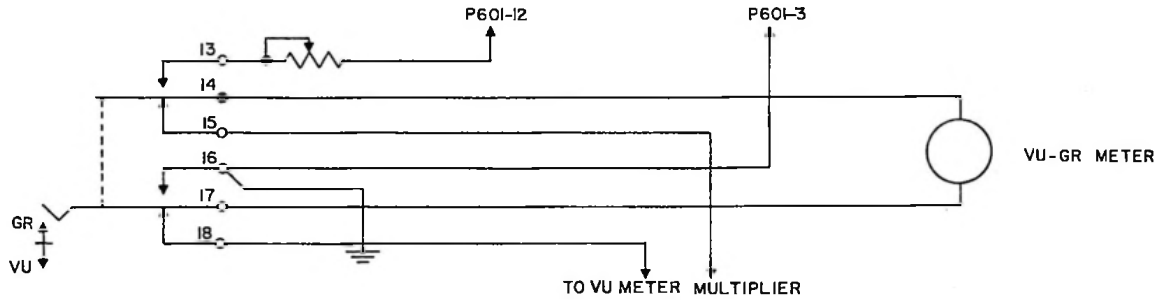


Figure 8. VU Meter and GR Switch Connections, Schematic Diagram

C99-14-2

ITEM	DESCRIPTION	COLLINS PART NUMBER
356E-1 Limiter Amplifier		522-0304-005
C601	CAPACITOR FIXED, PAPER: .001 mfd $\pm 10\%$ 1000 vdc; Sprague Electric Co. part no. 160P102910	931-0277-00
C602	CAPACITOR, FIXED, PAPER: .033 mfd $\pm 10\%$ 600 vdc; Sprague Electric part no. 160P33396	931-0293-00
C603	Same as C602	931-0293-00
C604	CAPACITOR, FIXED, ELECTROLYTIC: 40 mfd $-10\% +15\%$ , 450 v dc; Sprague part no. 71241	183-1262-00
C605	Same as C602	931-0293-00
C606	Same as C602	931-0293-00
C607	CAPACITOR, FIXED PAPER: 0.22 uf $\pm 10\%$ 400 v dc Sprague Electric Co. part no. 160P22494	931-0303-00
C608	CAPACITOR, FIXED, PAPER: 1.0 mfd $\pm 20\%$ 200 v dc	931-0908-00
J601	JACK, TIP: for use w/0.081 in. dia male contact; yellow nylon insulation; E. F. Johnson Co. part no. 105-607	360-0066-00
J602	JACK, TIP: receptacle connector w/ female contact for use w/0.081 in. dia male contact; black; E. F. Johnson Co. part no. 105-603	360-0063-00
P601	CONNECTOR, RECEPTACLE, ELECTRICAL: 12 male contacts, 10 amps	365-0040-00
R601	RESISTOR, FIXED, COMPOSITION: 0.33 megohms $\pm 5\%$ , 1/2 w; MIL RC20GF334J	745-1456-00
R602	RESISTOR, FIXED, COMPOSITION: 130 ohms $\pm 5\%$ , 1/2 w; Fed. code 81349, MIL type RC20GF131J	745-1315-00
R603	Same as R602	745-1315-00
R604	RESISTOR, FIXED, COMPOSITION: 68 ohms $\pm 5\%$ , 1/2 w; Fed. code 81349, MIL type RC20GF680J	745-1302-00
R605	RESISTOR, FIXED, COMPOSITION: 10,000 ohms $\pm 5\%$ , 1/2 w; MIL type RC20GF103J	745-1393-00
R606	Same as R605	745-1393-00
R607	RESISTOR, FIXED, WIREWOUND: 20,000 ohms $\pm 5\%$ , 5 w	747-9796-00
R608	RESISTOR, FIXED, COMPOSITION: 0.51 megohm $\pm 5\%$ , 1/2 w; Fed. code 81349, MIL type RC20GF514J	745-1406-00
R609	RESISTOR, FIXED, COMPOSITION: 180 ohms $\pm 10\%$ , 2 w; MIL type RC42GF181K	745-5621-00
R610	Same as R608	745-1466-00
R611	RESISTOR, FIXED, COMPOSITION: 0.20 megohms, $\pm 5\%$ , 1/2 w, MIL-R-11 RC20GF204J	745-1448-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
R612	RESISTOR, VARIABLE: composition; 100,000 ohms, $\pm 20\%$ , 2 w; MIL-R-94 type RV4LAXSA104B	380-5766-00
R613	Same as R608	745-1466-00
R614	Same as R608	745-1466-00
R615	RESISTOR, FIXED, COMPOSITION: 51,000 ohms $\pm 5\%$ , 1/2 w, MIL type RC20GF513J	745-1424-00
R616	RESISTOR, FIXED, COMPOSITION: 4.3 megohms $\pm 5\%$ , 1/2 w, MIL RC20GF435J	745-1504-00
R617	RESISTOR, FIXED, COMPOSITION: 10 megohms $\pm 5\%$ , 1/2 w; MIL RC20GF106J	745-1519-00
R618	RESISTOR, VARIABLE, WIREWOUND: 100 ohms $\pm 10\%$ , 2 w; Chicago Telephone Supply part no. KS22945	750-0516-00
S601	SWITCH, TOGGLE: SPST; 30 v dc, 25 amps, 250 v dc, 0.5 amps, resistive; 115 v ac, 10 amps, 220 v ac, 6 amps, resistive; JAN type ST42A	266-3072-00
T601	TRANSFORMER, AUDIO FREQUENCY: 600 ohms pri, 60,000 ohms sec; Audio Development A9956	667-0211-00
T602	TRANSFORMER, AUDIO FREQUENCY: 9000 ohms pri; 600 ohms sec.; Audio Development type A9656	667-0222-00
TB601	TERMINAL BOARD: phenolic w/3 solder-lug terminals; .062 in. by 0.375 in. by 1.125 in. lg; Cinch Mfg Corp. part no. 1520-A	306-9033-00
TB602	Same as TB601	306-9033-00
TB603	Same as TB601	306-9033-00
TB604	Same as TB601	306-9033-00
V601	ELECTRON TUBE: glass envelope; Aeronautical Radio, Inc. part no. 6386	253-0015-00
V602	ELECTRON TUBE: Radio Corp. of America part no. 6V6GT	255-0021-00
V603	Same as V602	255-0021-00
V604	ELECTRON TUBE: twin diode, Tung-Sol Electric, Inc. part no. 6AL5	257-0018-00
XV601	SOCKET, ELECTRON TUBE: 9 contact miniature; 0.745 in. dia body accommodation hole required JAN TS103P03	220-1282-00
XV602	SOCKET, ELECTRON TUBE: octal; stainless steel, phosphor bronze terminals, phenolic insulation; 0.812 in. by 1.187 in. by 1.625 in.; Amphenol-Borg Electronics Corp. part no. 88-8TM	220-1005-00
XV603	Same as XV602	220-1005-00
XV604	SOCKET, ELECTRON TUBE: 7 contacts miniature; copper base alloy contacts, plastic body; body accommodation hole required; TS102P03	220-1235-00

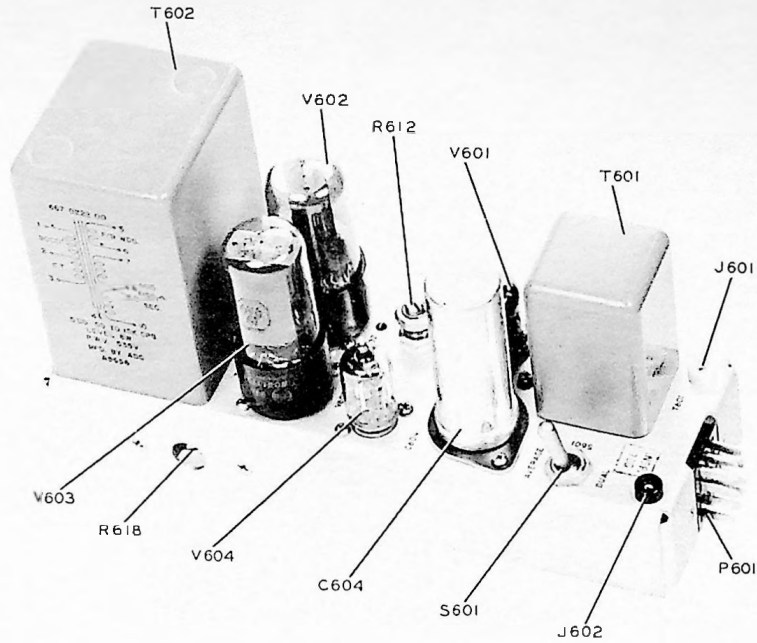


Figure 9. 356E-1 Limiter Amplifier, Top View

C99-42-P

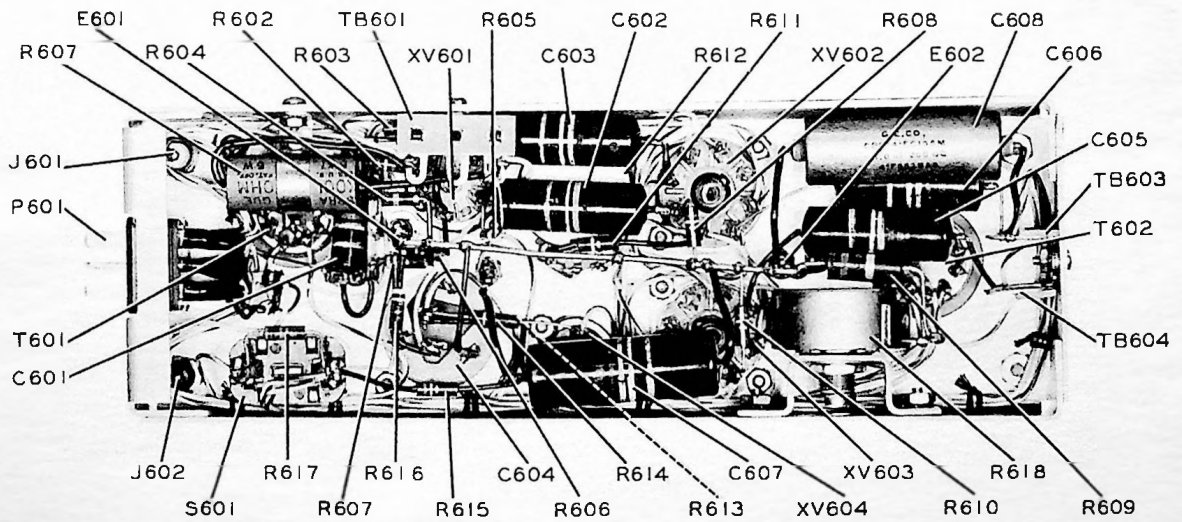
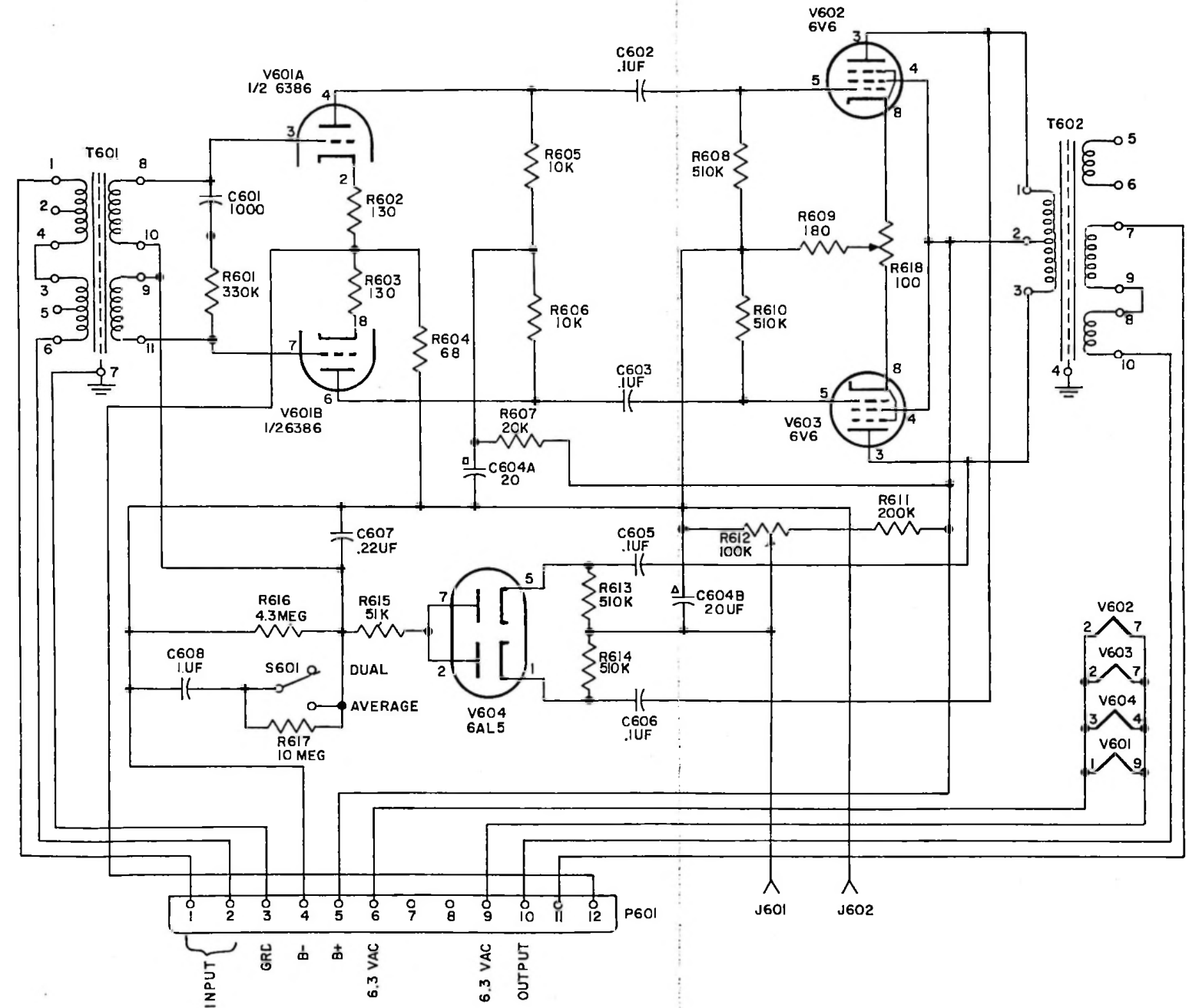


Figure 10. 356E-1 Limiter Amplifier, Bottom View

C99-43-P



NOTES  
 1. UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE IN OHMS,  
 CAPACITOR VALUES ARE IN MICROMICROFARADS.  
 2. S601 SHOWN IN DUAL POSITION.

Figure 11. 356E-1 Limiter Amplifier  
 Schematic Diagram

C99-07-3

# UNIT INSTRUCTIONS

TD-326  
3rd EDITION, 15 SEPTEMBER 1961  
523-0034-00

## CUE AMPLIFIER 356Q-1

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1960, 1961

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

PRINTED IN THE UNITED STATES OF AMERICA

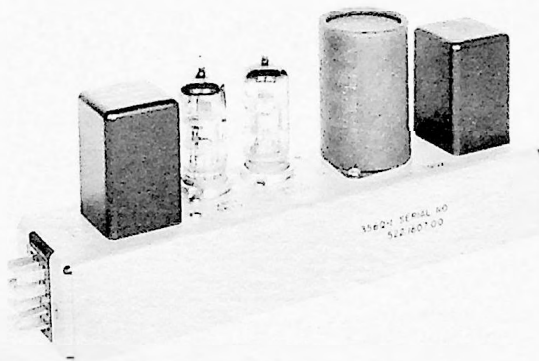


Figure 1. Cue Amplifier 356Q-1

C583-14-P

### 1.1 PURPOSE OF EQUIPMENT.

Cue Amplifier 356Q-1 is intended for use as an audio amplifier with broadcast equipment, such as Collins Broadcast Console 212G-1. It may be used in AM, FM, and TV broadcast service or program control in audio systems for cueing tapes and records.

### 1.2 PHYSICAL DESCRIPTION.

The 356Q-1 (figure 1) is a plug-in module containing the necessary circuitry for two stages of audio amplification. The 356Q-1 is 4-5/8 inches high, 2-1/8 inches wide, and 9-1/2 inches long and weighs approximately 2-1/4 pounds.

### 1.3 TUBE COMPLEMENT.

FUNCTION	SYMBOL	TUBE TYPE
Input amplifier	V801	5879
Output amplifier	V802	5879

### 1.4 ELECTRICAL CHARACTERISTICS.

a. CONNECTORS. One 12-pin connector, P801, is located at the front end of the chassis. All connections to the 356Q-1 are made at this connector.

b. POWER REQUIREMENTS. Power requirements for Cue Amplifier 356Q-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 ampere.

c. FREQUENCY RANGE. The frequency range of the 356Q-1 is 300 to 10,000 cycles per second.

d. INPUT IMPEDANCE. Cue Amplifier 356Q-1 is factory wired for 600 ohms unloaded transformer input impedance.

e. GAIN. A -30-dbm nominal input signal produces an output of +20 dbm nominal. Gain through the amplifier is 55 db.

f. OUTPUT IMPEDANCE. Cue Amplifier 356Q-1 is factory wired for 4 ohms output impedance.

g. FREQUENCY RESPONSE. The frequency response of the 356Q-1 is within 3 db from 300 to 10,000 cps.

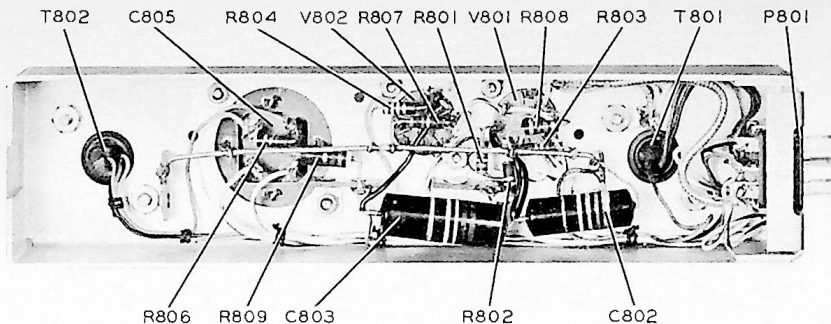


Figure 2. Cue Amplifier 356Q-1,  
Bottom View

C583-22-P

h. NOISE LEVEL. The equivalent input noise level of Cue Amplifier 356Q-1 is -100 dbm. When the 356Q-1 is used with Collins Power Supply 409X-2, the filaments are maintained at approximately +30 volts d-c above ground. This positive bias minimizes a-c noise in the amplifier.

### 2.1 CIRCUIT DESCRIPTION.

Figure 3 is a schematic diagram of Cue Amplifier 356Q-1. Input to the 356Q-1 is coupled by transformer T801 and the CUE gain control, R58, in the 212G-1, to the grid of V801.

#### NOTE

If Cue Amplifier 356Q-1 is used in equipment that does not provide a cue gain control, a 50,000-ohm potentiometer must be connected between terminals 8, 12, and 3 of P801. The potentiometer tap must be connected to terminal 8. Terminal 3 is ground.

The input amplifier, V801, is a pentode-connected type 5879. Its output is resistance-capacitance coupled to the grid of a triode connected type 5879, V802. Output from V802 is taken from the secondary winding of transformer T802. All connections to the 356Q-1 are made at P801.

### 3.1 MAINTENANCE.

Normal maintenance consists of tube replacement. Voltage and resistance measurements may be made by referring to figure 3.

### 4.1 REPLACEABLE PARTS.

The parts list gives the description and Collins part number for all replaceable parts in Cue Amplifier 356Q-1. When replacement of parts is necessary, only parts identical or equivalent to those listed should be used. All parts are identified in figure 2.



ITEM	DESCRIPTION	COLLINS PART NUMBER	ITEM	DESCRIPTION	COLLINS PART NUMBER
CUE AMPLIFIER 356Q-1			522-1607-00		
C801	NOT USED		R807	RESISTOR, FIXED, COMPOSITION: 820 ohms $\pm 5\%$ , 1/2 w	745-1348-00
C802	CAPACITOR, FIXED, PAPER: 400 v dc; 47,000 uuf, $\pm 10\%$	931-0295-00	R808	RESISTOR, FIXED, COMPOSITION: 8200 ohms, $\pm 10\%$ , 1/2 w	745-1391-00
C803	CAPACITOR, FIXED, PAPER: 0.1 uf $\pm 10\%$ , 400 v dc w	931-0299-00	R809	RESISTOR, FIXED, COMPOSITION: 9100 ohms, $\pm 5\%$ , 1 w	745-3392-00
C804	NOT USED		R801	TRANSFORMER, AUDIO, FREQUENCY: Input type, primary 600 ohms, secondary 50,000 ohms; primary current rating-zero; secondary current rating-zero; metal encased, 1-5/16 x 1-5/16 x 2-1/16 in. h two threaded stud type terminals	667-0442-00
C805	CAPACITOR, FIXED, ELECTROLYTIC: 4 sections; 1 & 2, 450 v dc working, 20 uuf; sections 3 & 4, 50 v dc working, 50 uf	183-1260-00	T802	TRANSFORMER, AUDIO, FREQUENCY: output type; primary 16,000 ohms; secondary 4 ohms; primary current rating-7 ma; secondary current rating-zero; metal encased 1-9/32 x 1-9/32 x 1-61/64 in. h; wire lead terminals	667-0441-00
P801	CONNECTOR, RECEPTACLE, ELECTRICAL: 12 male contacts, 10 amps, 730 v ac	365-2120-00	V801	ELECTRON TUBE: type 5879	257-0104-00
R801	RESISTOR, FIXED, COMPOSITION: 0.16 megohms $\pm 5\%$ , 1/2 w	745-1445-00	V802	ELECTRON TUBE: same as V801	257-0104-00
R802	RESISTOR, FIXED, COMPOSITION: 0.10 megohms $\pm 10\%$ , 1/2 w	745-1436-00	XV801	SOCKET, ELECTRON TUBE: 9 contact miniature top mtg tube socket w/o shield base; plastic	220-1274-00
R803	RESISTOR, FIXED, COMPOSITION: 51,000 ohms $\pm 5\%$ , 1/2 w	745-1424-00	XV802	SOCKET, ELECTRON TUBE: same as XV801	220-1274-00
R804	RESISTOR, FIXED, COMPOSITION: 0.47 megohms, $\pm 10\%$ , 1/2 w	745-1464-00			
R805	NOT USED				
R806	RESISTOR, FIXED, COMPOSITION: 30,000 ohms $\pm 5\%$ , 1/2 w	745-1413-00			

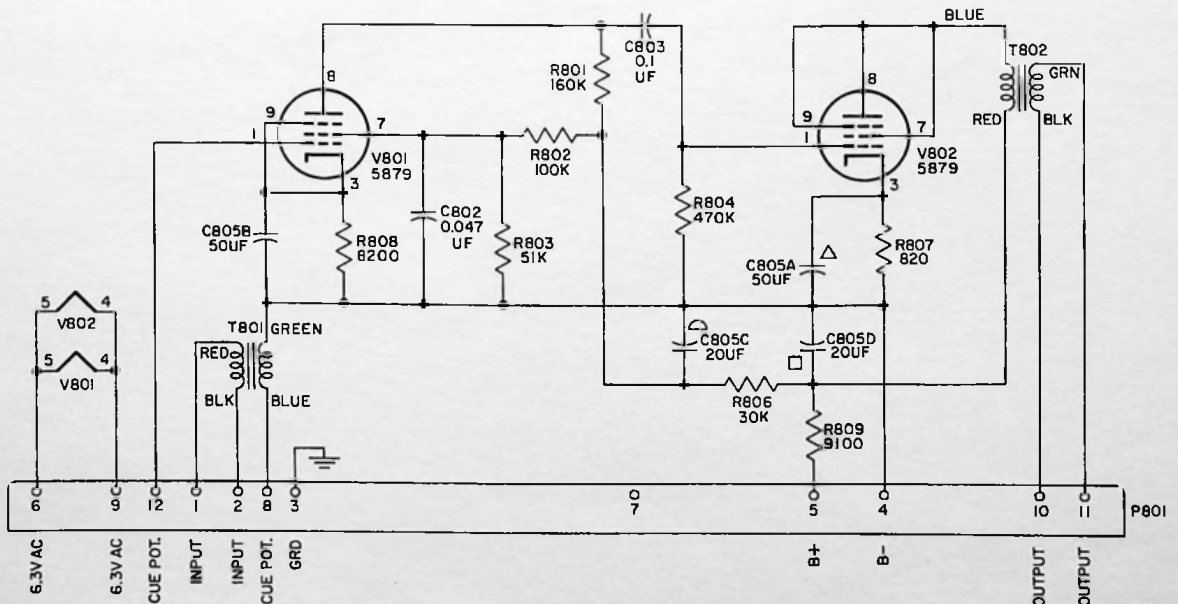


Figure 3. Cue Amplifier 356Q-1, Schematic Diagram

## RELAY UNIT 274K-2

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1960

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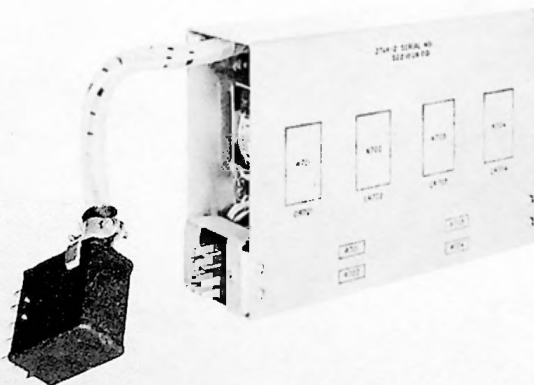


Figure 1. Relay Unit 274K-2

C583-13-P

### 1.1 PURPOSE OF EQUIPMENT.

Relay Unit 274K-2 controls application of audio power to station speakers and a-c power to studio warning lights when used with broadcast studio equipment, such as Collins Broadcast Console 212G-1. It may be used in AM, FM, and TV broadcast service or program control in audio systems.

### 1.2 PHYSICAL DESCRIPTION.

Relay Unit 274K-2 (figure 1) is a plug-in module containing four 12-volt d-c relays and their associated circuitry. The 274K-2 is provided with a cover to protect relay contacts from dust and damage while handling. The 274K-2 is 5-1/2 inches high, 2-1/2 inches wide, and 9-1/2 inches long and weighs approximately 2.5 pounds.

### 1.3 ELECTRICAL CHARACTERISTICS.

a. CONNECTORS. One 12-pin connector, P702, (Howard Jones Type P-312-AB) mounted on the front end of the chassis and one 15-pin connector, P701, (Howard Jones Type P-315-CCE) on a 5-1/2-inch pendant cable.

b. POWER REQUIREMENTS. Power requirements for Relay Unit 275K-2 are 12 volts d-c at 560 milliamperes.

c. NOISE. The four relays of the 274K-2 are mounted on rubber to minimize noise.

### 2.1 CIRCUIT DESCRIPTION.

Figure 3 is a schematic diagram of Relay Unit 274K-2. The relays are normally de-energized. When 12 volts d-c is applied, the relays are energized. All connections to the relay coils and contacts are made at P701 and P702. CR701 through CR704 are connected as transient suppressors 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 Collins Power Supply 409X-2.

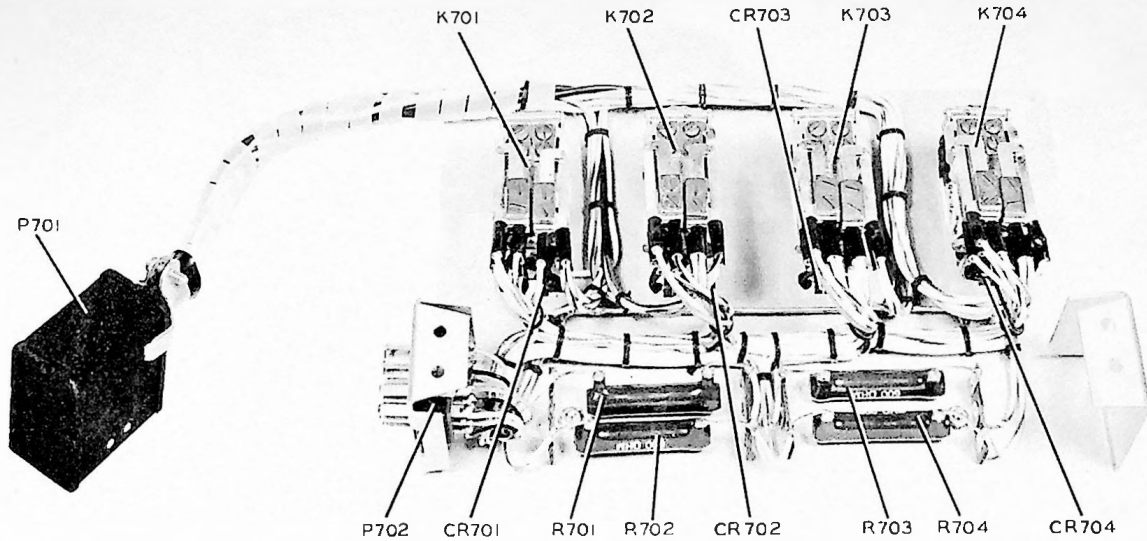


Figure 2. Relay Unit 274K-2, Cover Removed

C583-18-P

### 3.1 MAINTENANCE.

Relay Unit 274K-2 requires very little maintenance other than periodic inspections. Keep the relay contacts clean and bright. Refer to figure 3, if necessary, to perform continuity checks.

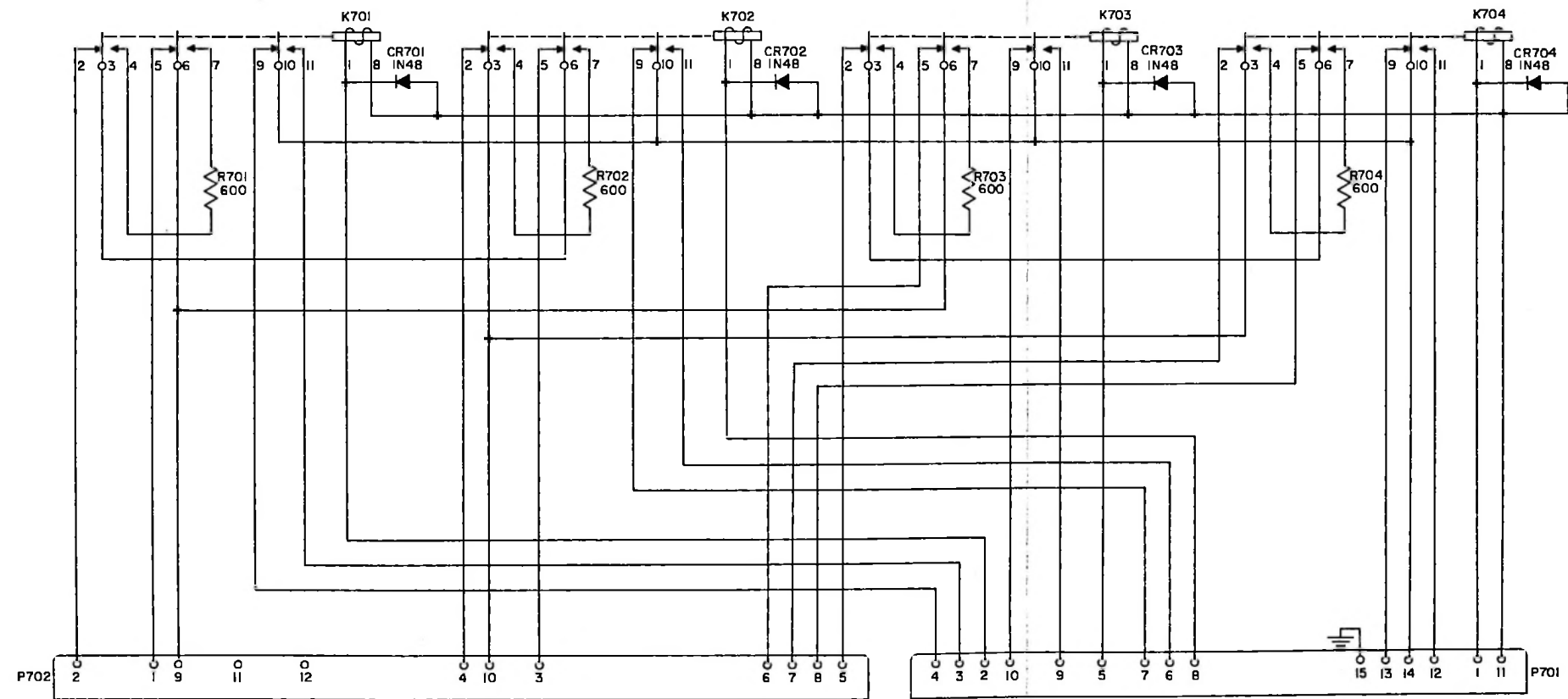
### 4.1 REPLACEABLE PARTS.

The parts list gives the description and Collins part number for all replaceable parts in Relay Unit 274K-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.

### PARTS LIST

ITEM	DESCRIPTION	COLLINS PART NUMBER
RELAY UNIT 274K-2		522 1606 00
CR701	SEMICONDUCTOR DEVICE, DIODE: germanium type 1N48; C.E.S. Hytron	353 0027 00
CR702 thru CR704	SEMICONDUCTOR DEVICE, DIODE: same as CR701	353 0027 00
K701	RELAY, ARMATURE: contact arrangement, right 1C, left 2C; 12 v, 3 amps, 150 w	970 1139 00
K702 thru K704	RELAY, ARMATURE: same as K701	970 1139 00

ITEM	DESCRIPTION	COLLINS PART NUMBER
P701	CONNECTOR, PLUG, ELECTRICAL: 15 male contacts; type 300	365 9150 00
P702	CONNECTOR, RECEPTACLE, ELECTRICAL: 12 male contacts, 10 amps, 730 v ac	365 2120 00
R701	RESISTOR, FIXED, WIRE WOUND: 600 ohms, $\pm 10\%$ , 7 w at 25°C derated linearly to 3.5 w at +105°C	710 9017 00
R702 thru R704	RESISTOR, FIXED, WIRE WOUND: same as R701	710 9017 00



C583-03-4

Figure 3. Relay Unit 274K-2, Schematic Diagram

# UNIT INSTRUCTIONS

TD-328  
15 JANUARY 1960  
523 0035 00

## POWER SUPPLY 409X-2

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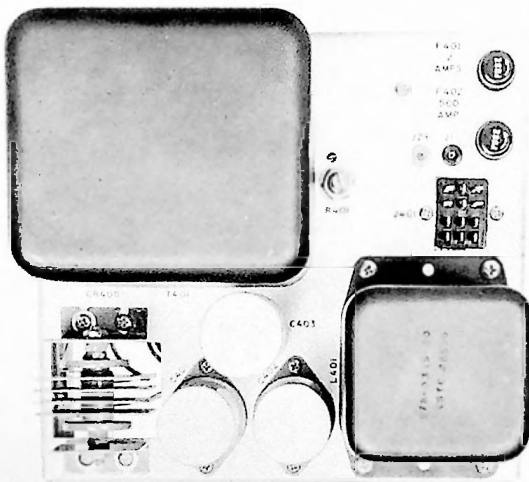


Figure 1. Power Supply 409X-2

CS83-17-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 a-c 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.

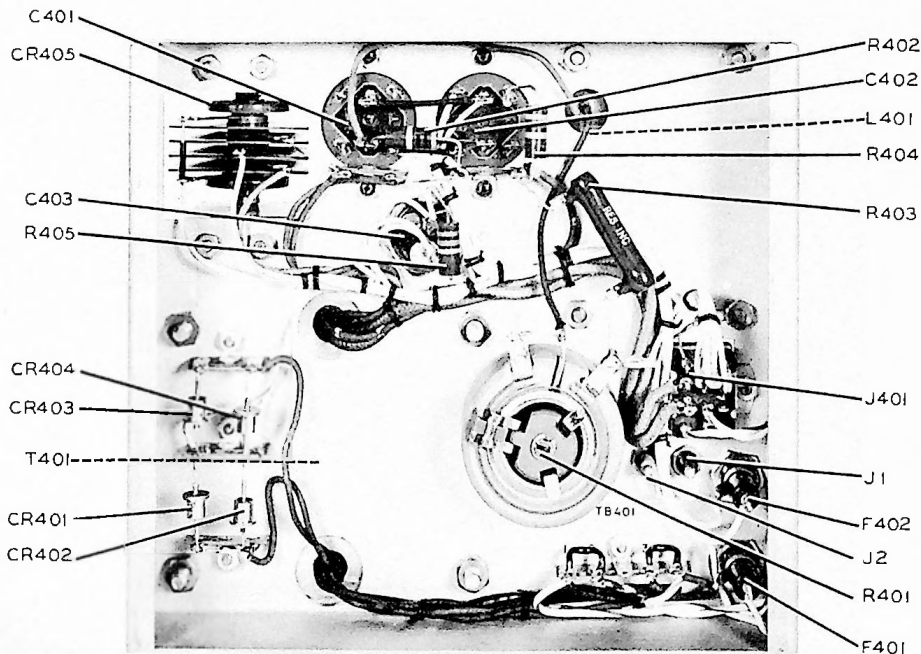


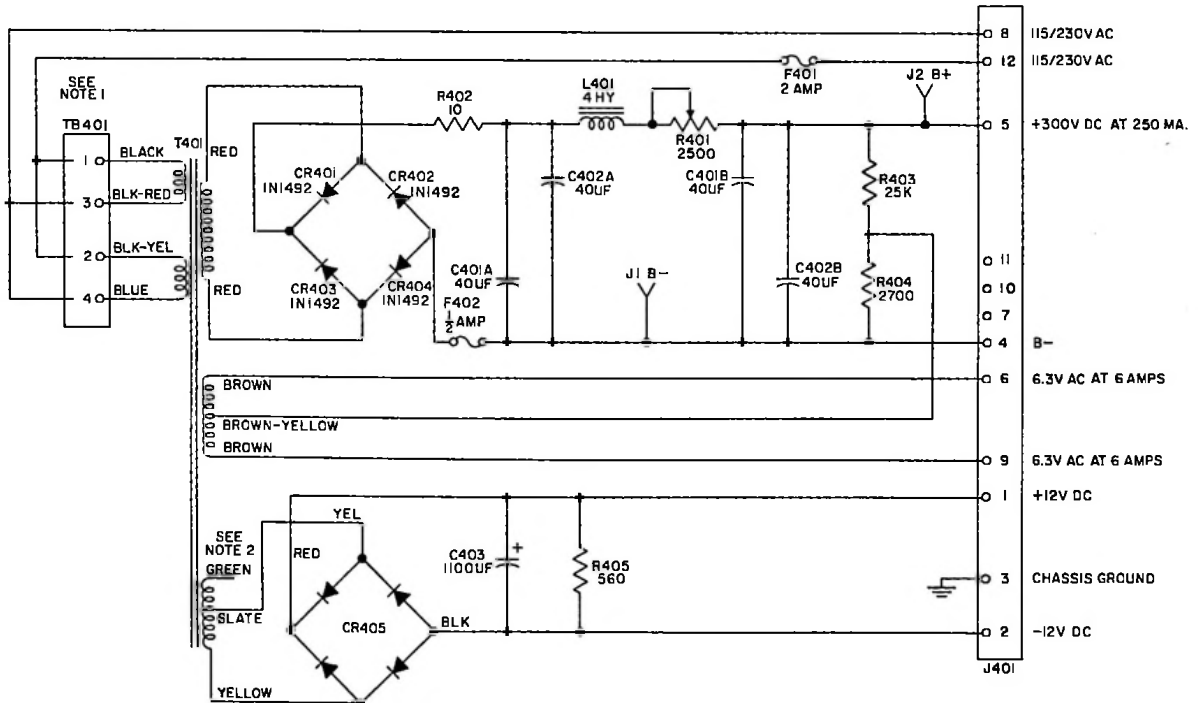
Figure 2. Power Supply 409X-2, Bottom View

CS83-19-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		
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 9068 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	662 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



