



instruction book

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

212G-1
Broadcast Console

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- (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
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INFORMATION NEEDED:

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- (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

212G-1 Broadcast Console

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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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 |



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"> 8 -- Preamplifiers 356A-1 1 -- Amplifier 356B-1 or 356E-1 1 -- Program/Monitor Amplifier 356B-1 1 -- Relay Unit 274K-2 1 -- Cue Amplifier 356Q-1 1 -- Power Supply 409X-2 |
| 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> |

*Shipped wired for 600 ohms output and net/remote line impedance, 150 ohms low-level impedance, and 115-volt power source.

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.

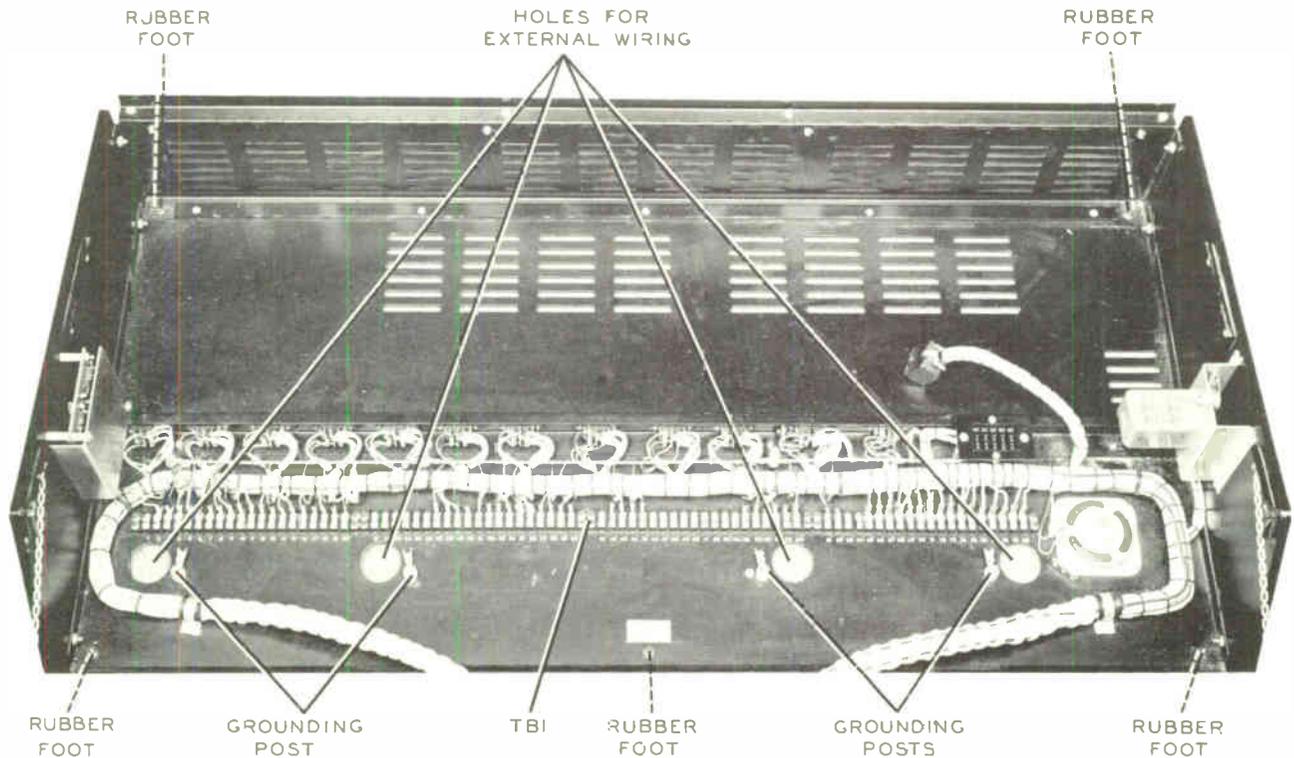


Figure 2-1. Broadcast Console 212G-1, Mounting and Wiring Detail

- 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 pendent cable from Relay Unit 274K-2 into J13.

- k. Mount Power Supply 409X-2.
 - 1. 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

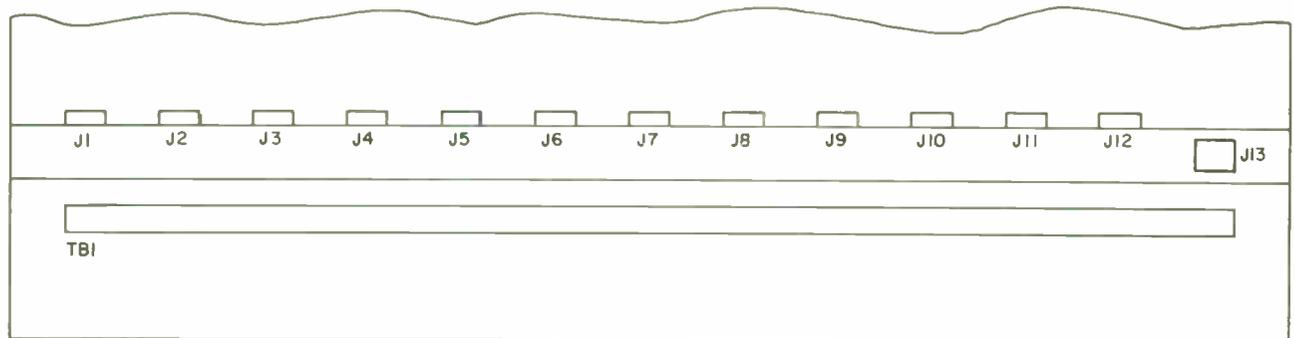


Figure 2-2. Broadcast Console 212G-1, Amplifier Connector Location

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 ON AIR-OFF AIR | 79 and 80 |
| External VU meter input | 39 and 40 | | |
| Spare | 41 | | |

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

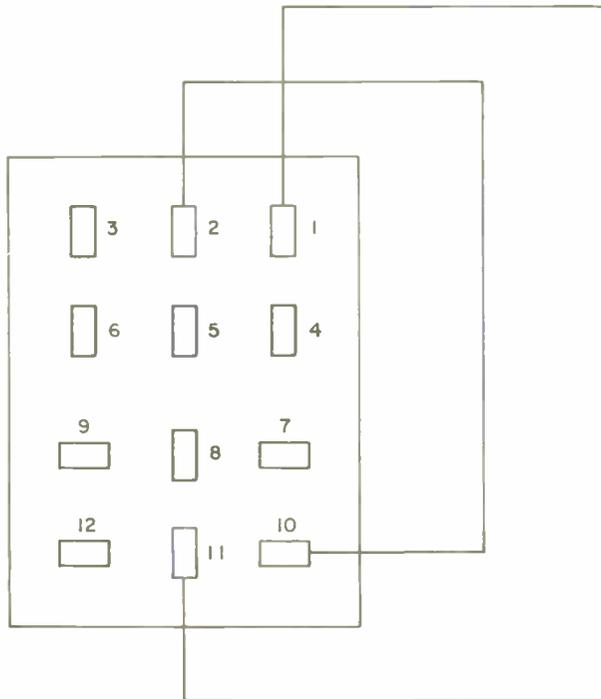


Figure 2-3. Jumper Plug Wiring Schematic Diagram

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.

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

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.

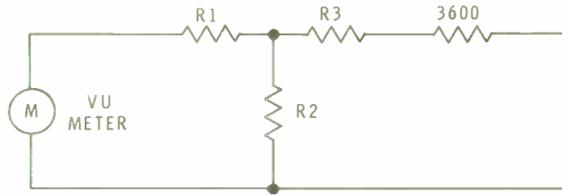
The vu meter, M1, and its pad are connected to the program line between the program amplifier and LINE switch S10. A 6-db pad in the line provides isolation between the program amplifier and the output line. The line pad consists of R42, R43, R44, R45, and R46. A 7500/3900-ohm pad made up of resistors 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 |
| +13DBM | 6DB | 1296 | 5221 | 1296 |
| +32DBM | 28DB | 3601 | 311 | 3601 |
| +39DBM | 35DB | 3764 | 139 | 3764 |

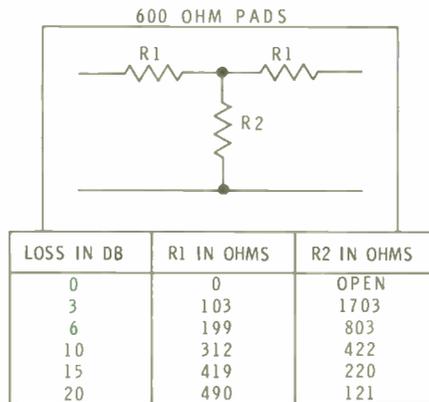


Figure 2-4. Resistor Values for Fixed Pads

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

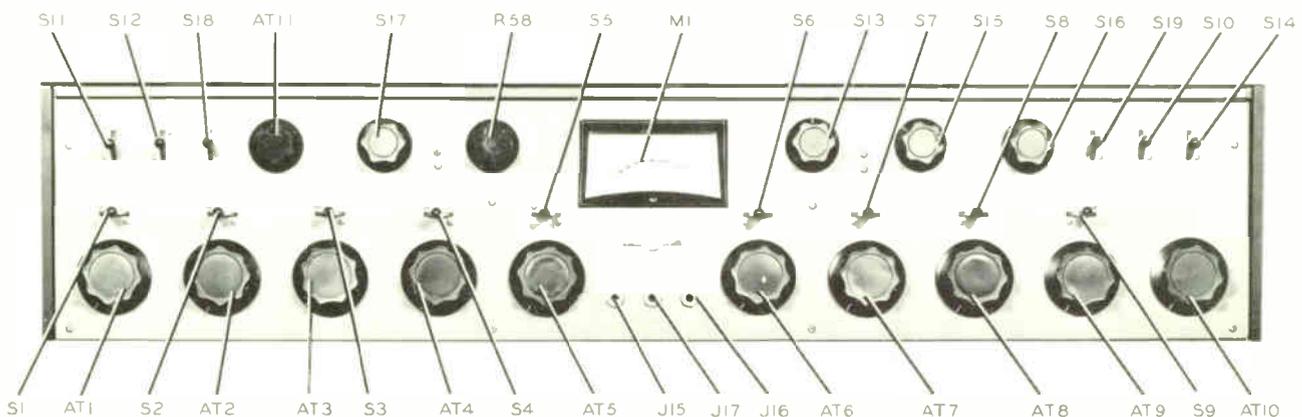


Figure 3-1. Broadcast Console 212G-1, Control Locations

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

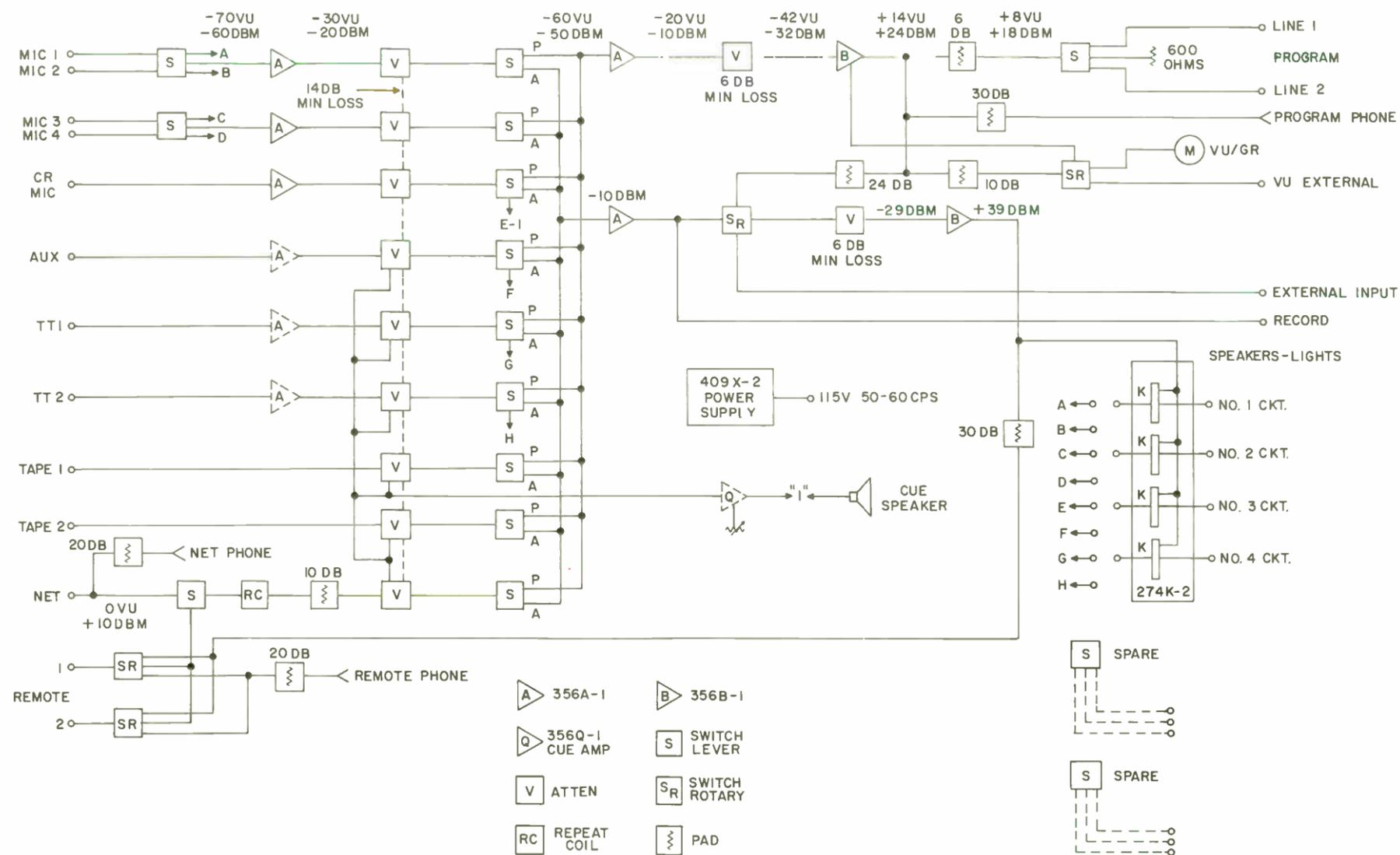


Figure 4-1. Broadcast Console 212G-1, Functional Block Diagram

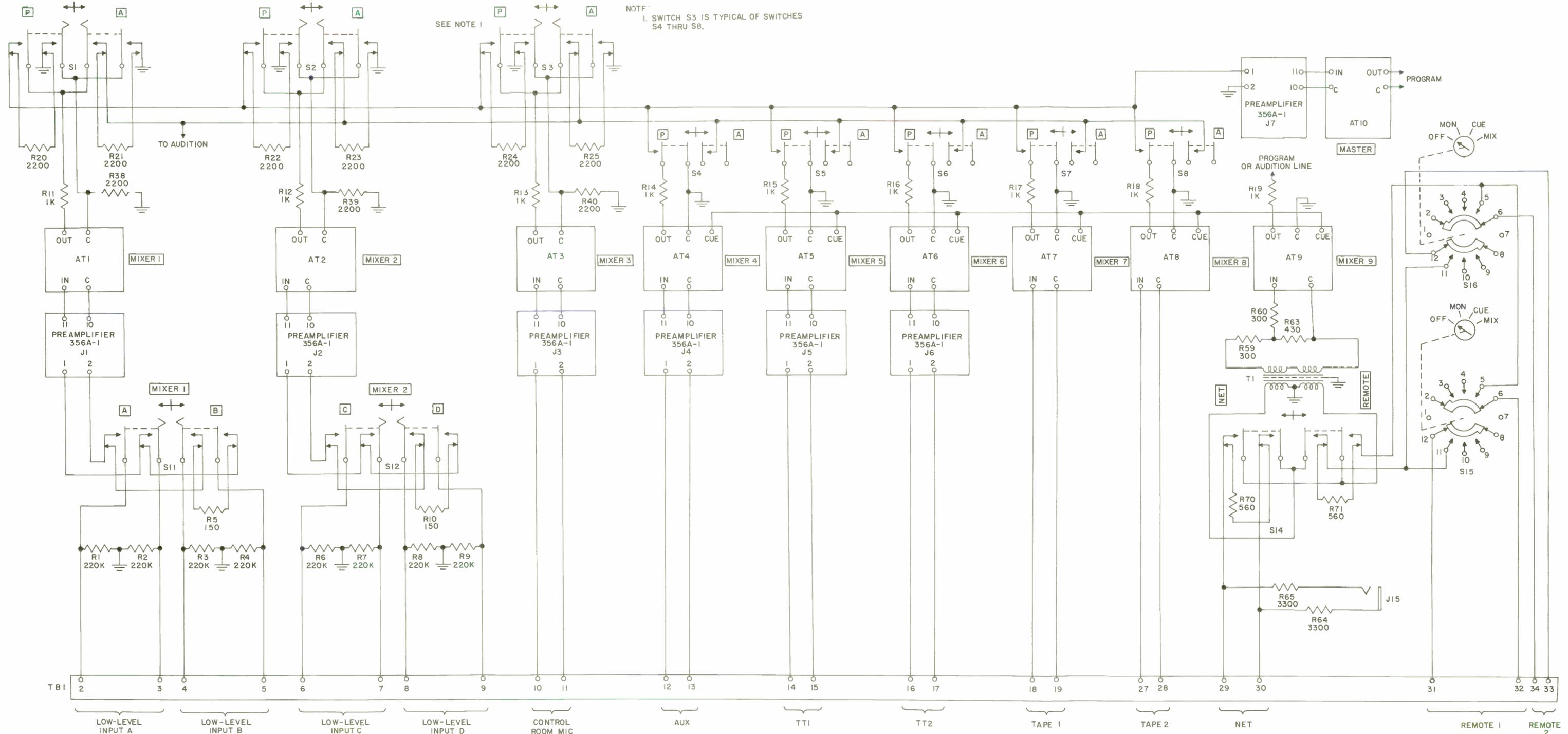


Figure 4-2. Mixer Circuits, Simplified Schematic Diagram

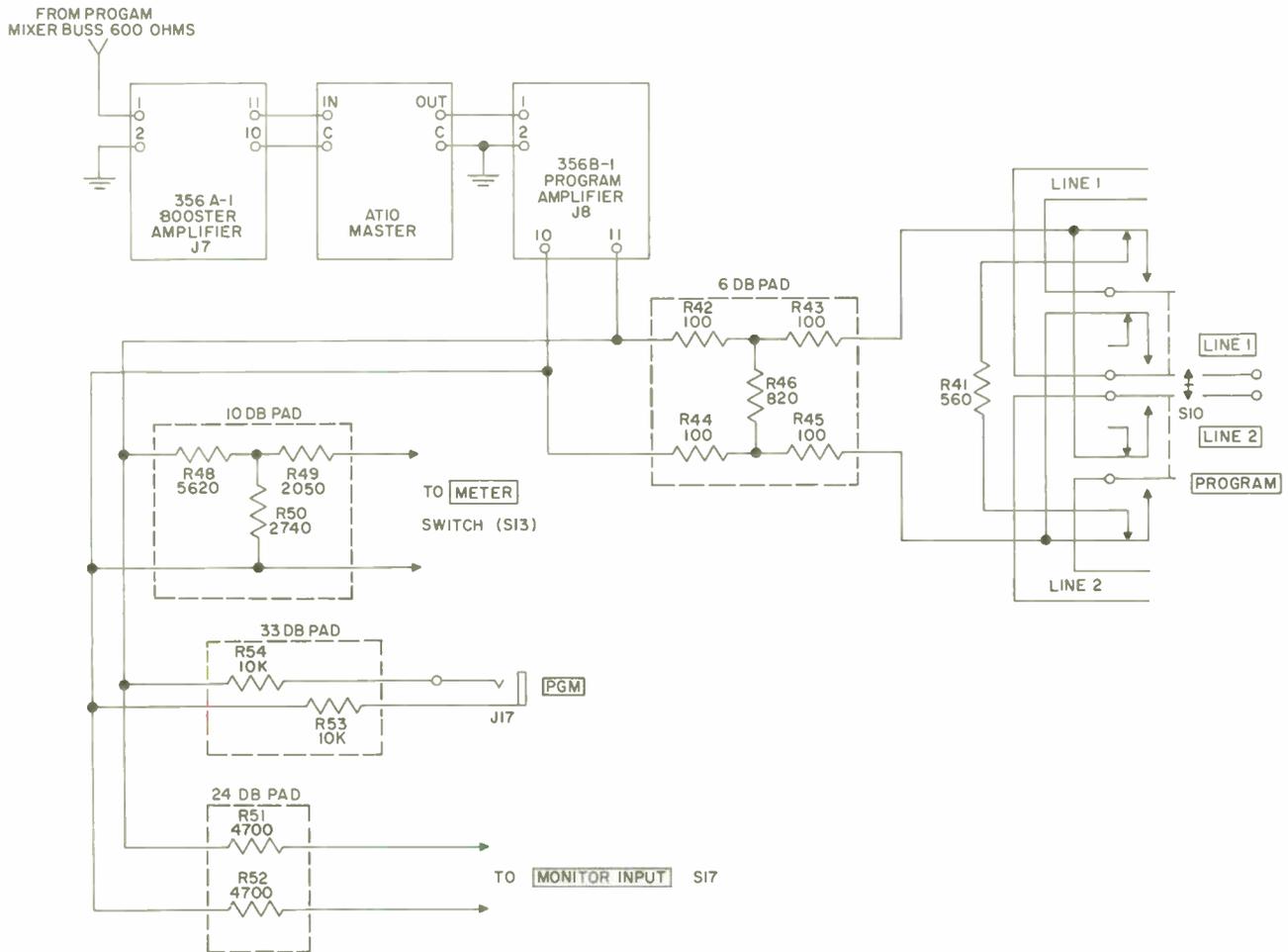


Figure 4-3. Program Circuits, Simplified Schematic Diagram

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.

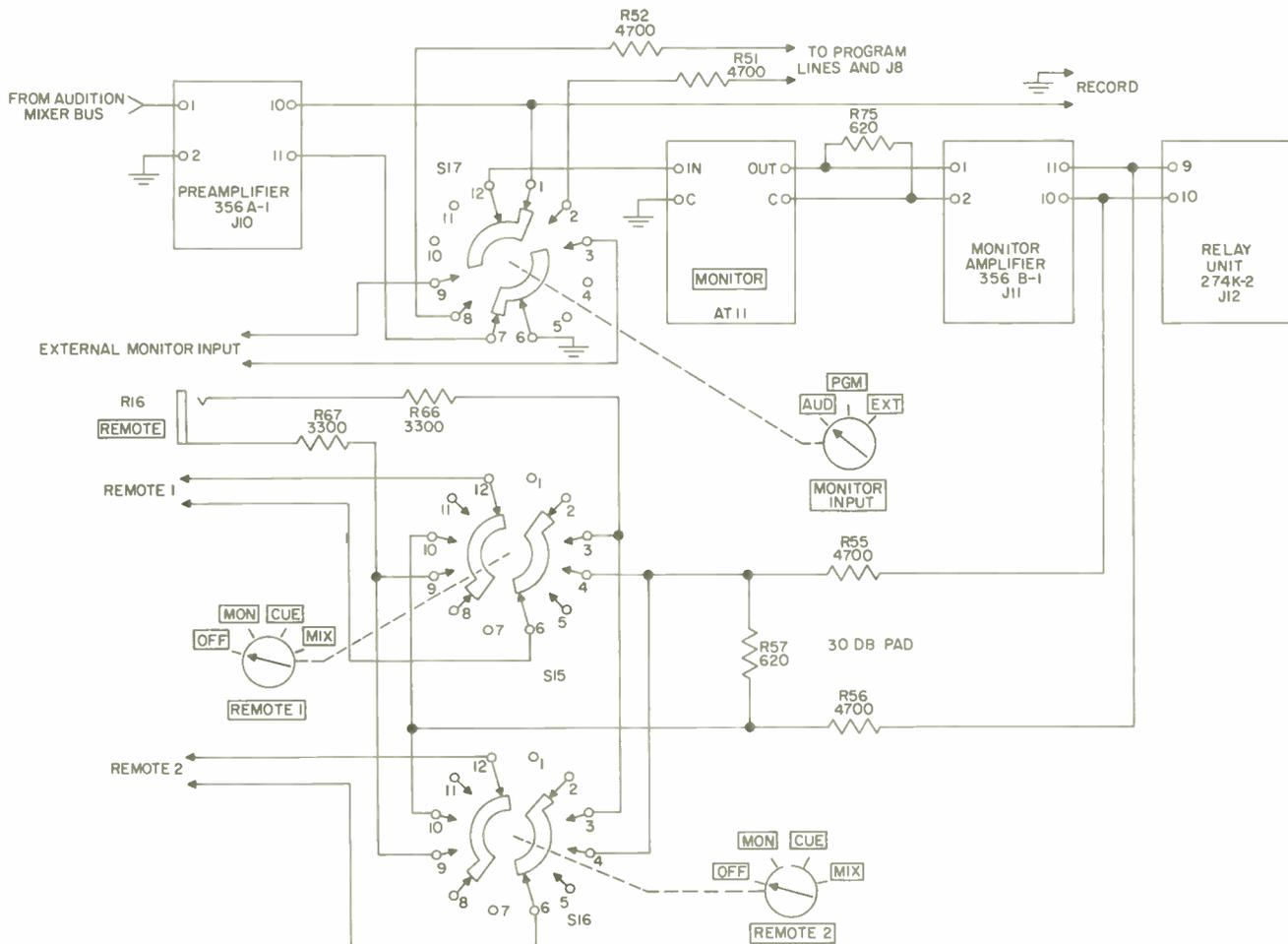
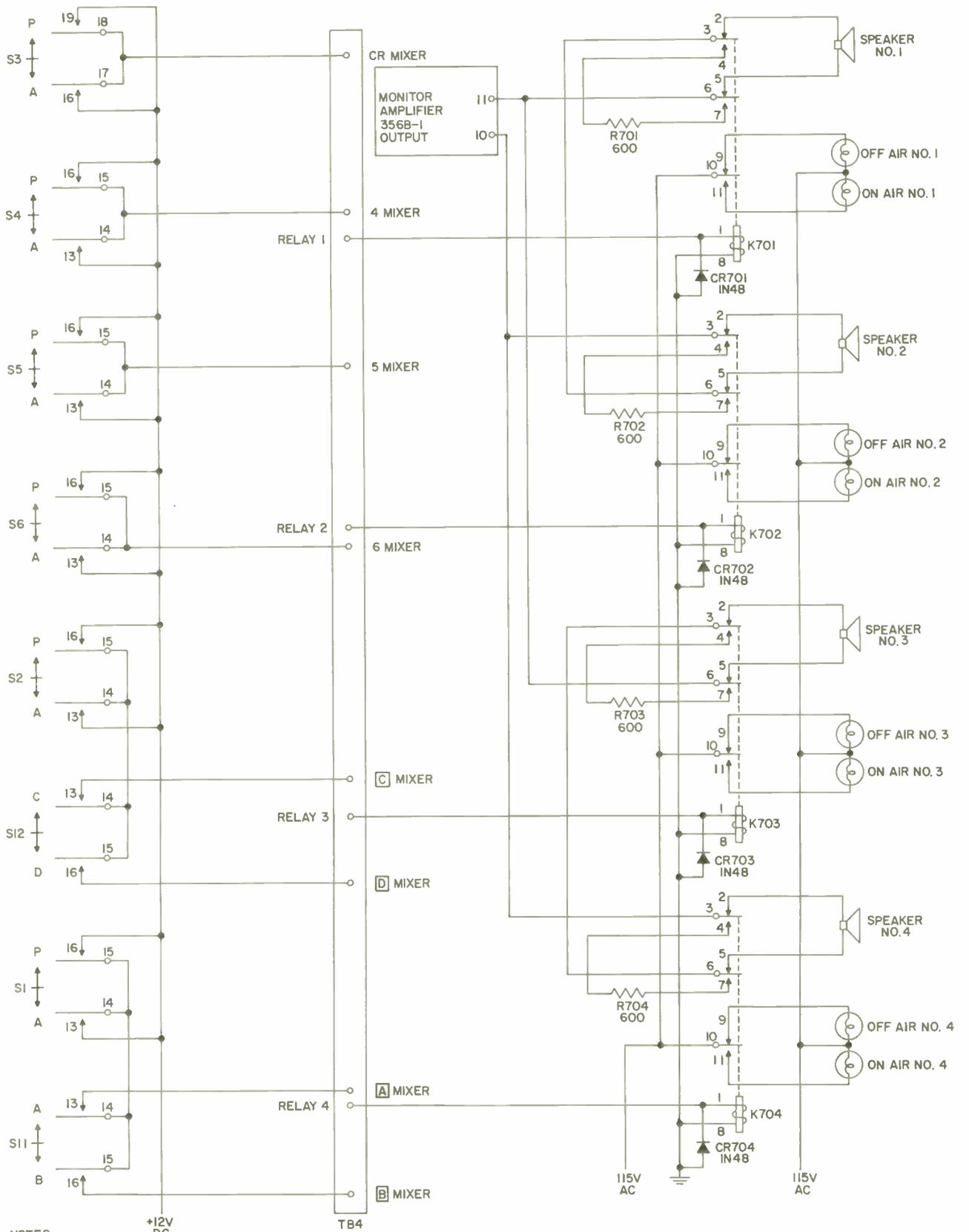


Figure 4-4. Monitor Circuits, Simplified Schematic Diagram



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

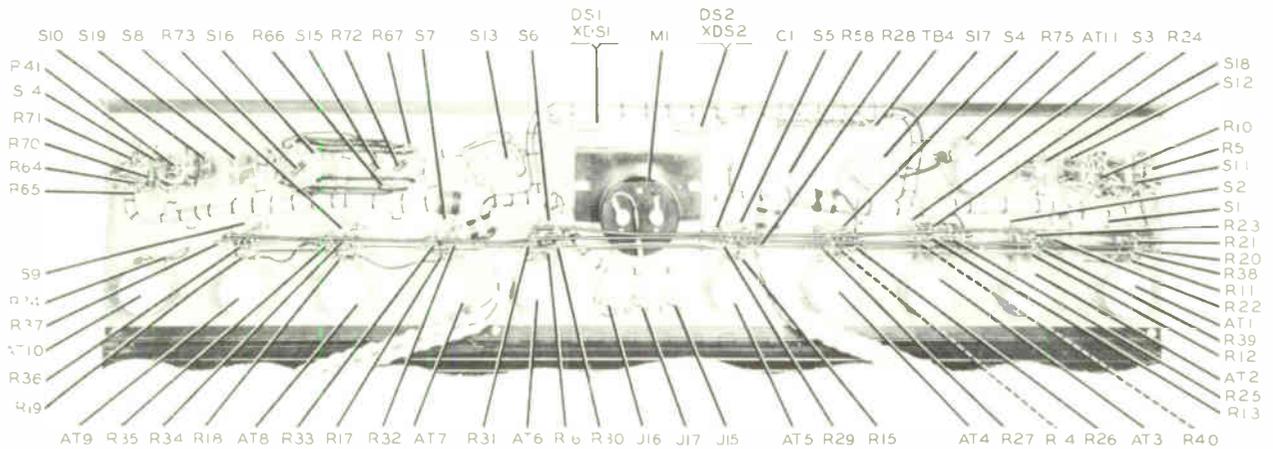


Figure 6-1. Broadcast Console 212G-1, Front Panel, Rear View

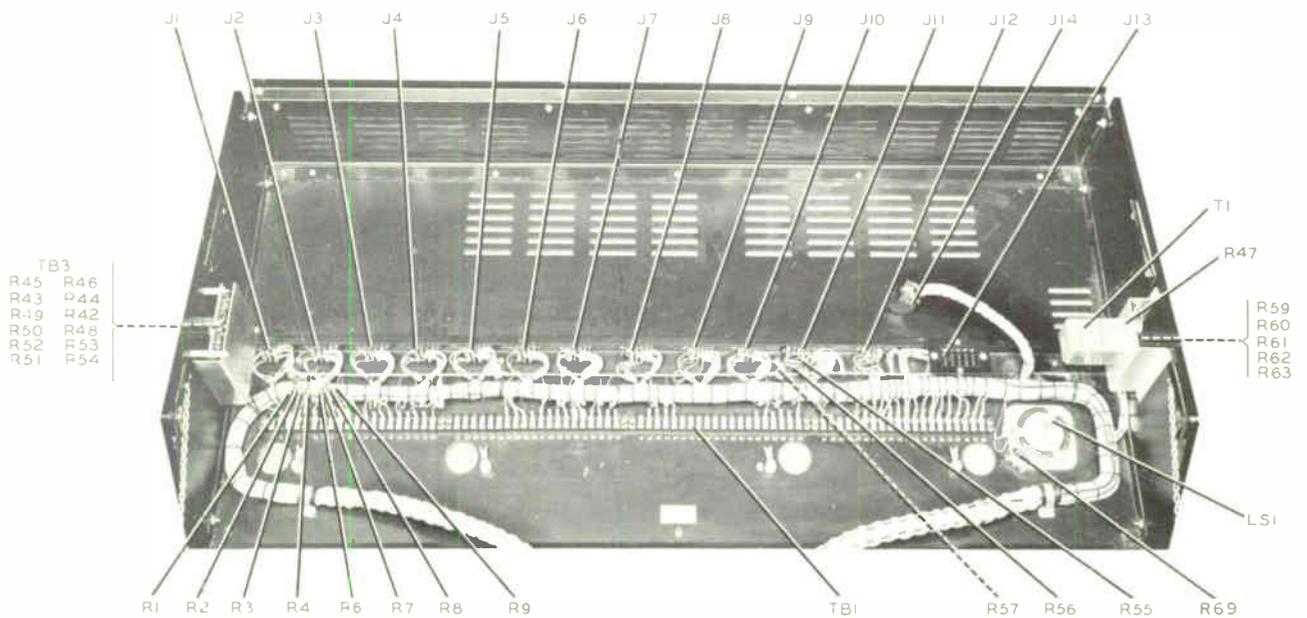


Figure 6-2. Broadcast Console 212G-1, Inside View

| 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 1-5 8 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 | 745-3309-00 |
| 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: 620 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 R67 | RESISTOR, FIXED, COMPOSITION: same as R64 | 745-1373-00 |
| R68 | 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 | 306-0168-00 |
| 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 |

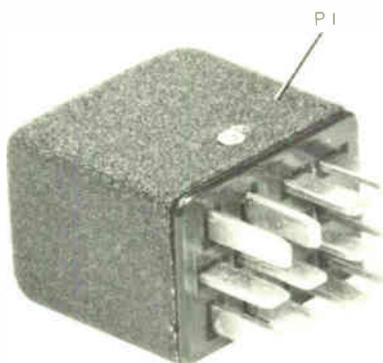


Figure 6-3. Jumper Plug

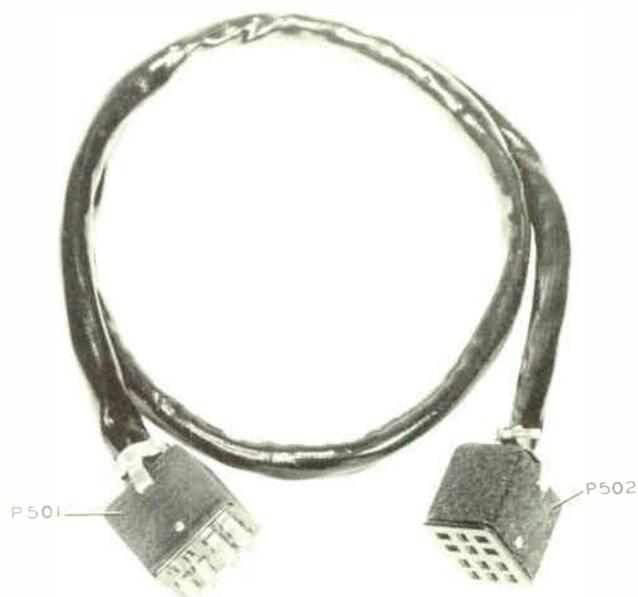


Figure 6-4. Test Cable

SECTION VII ILLUSTRATIONS

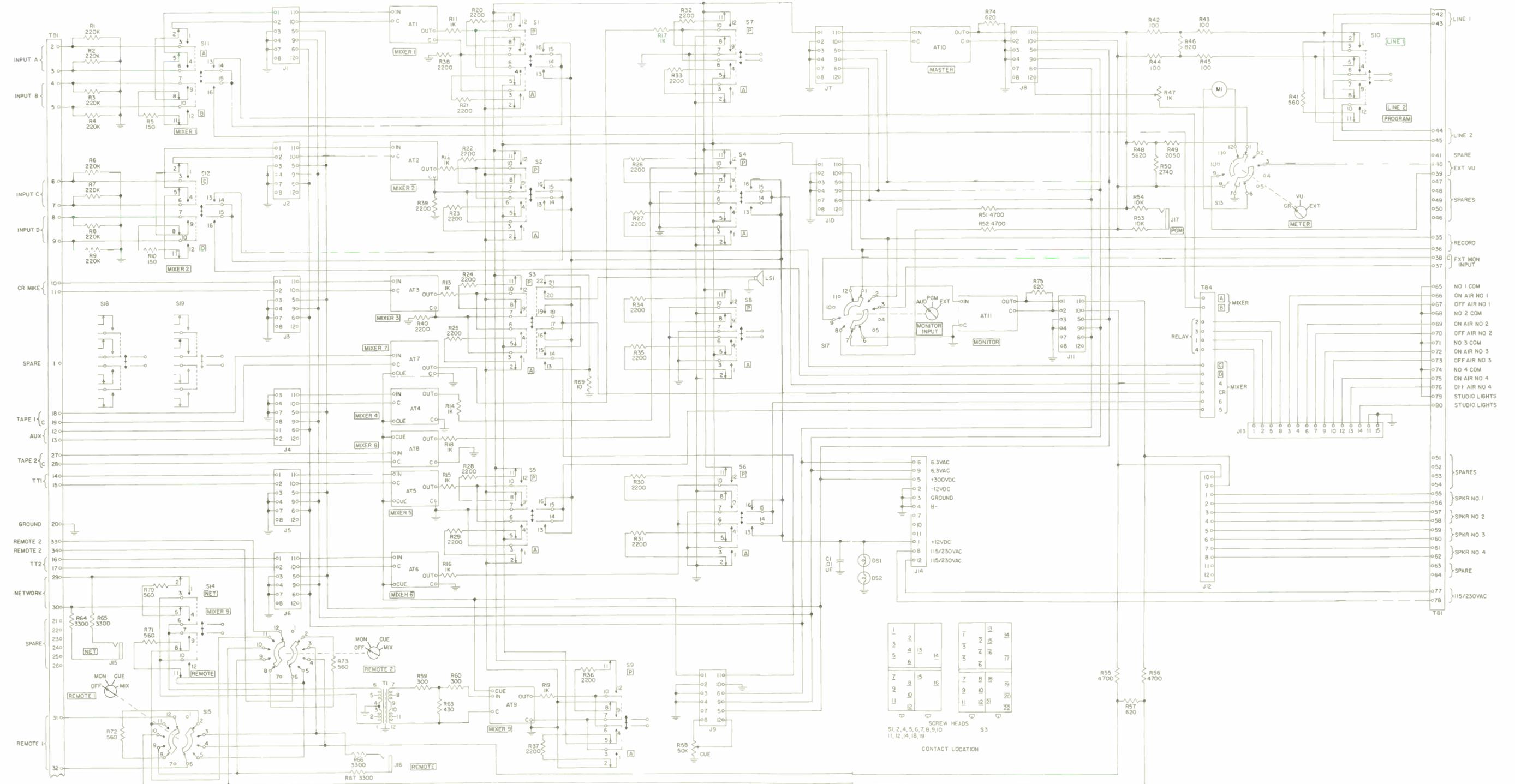


Figure 7-1. Broadcast Console 212G-1, Schematic Diagram

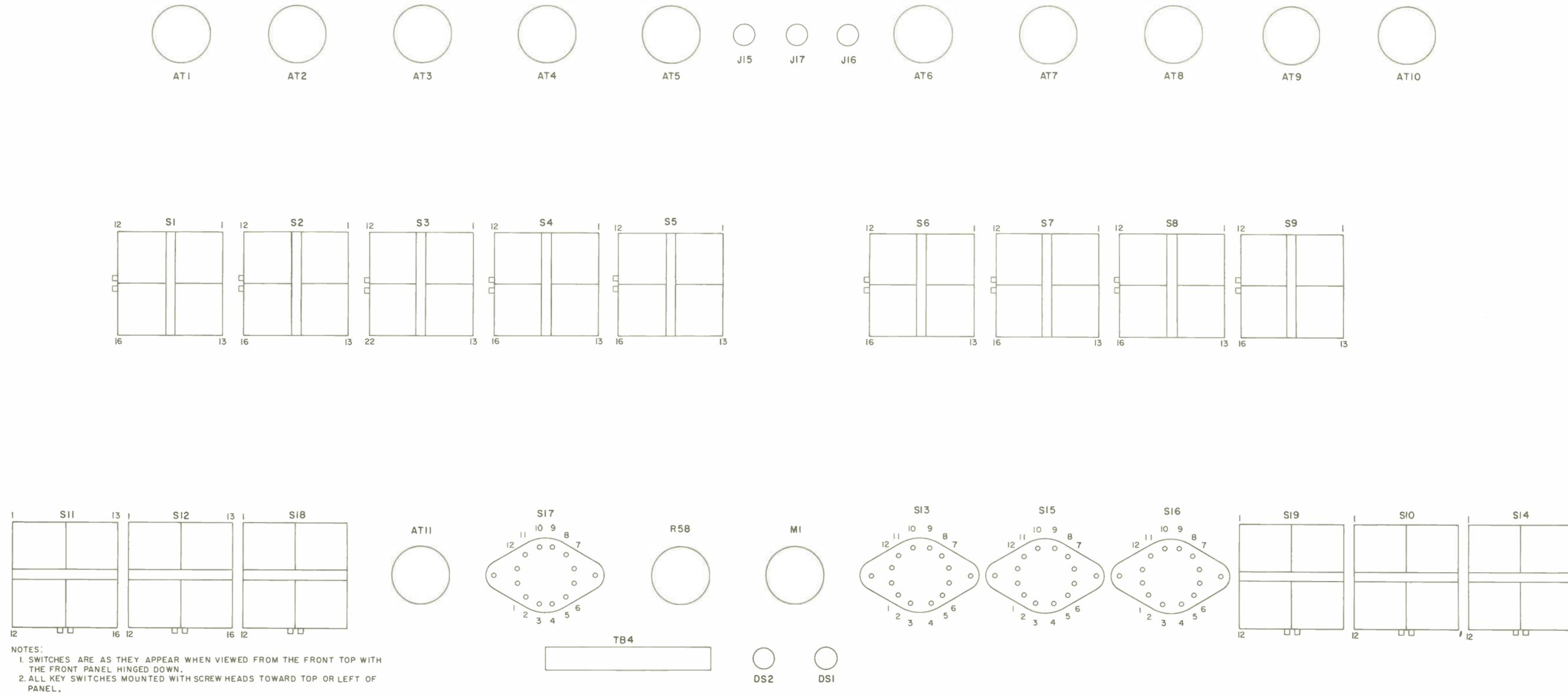


Figure 7-2. Broadcast Console 212G-1 Switch Pin Orientation



356A-1 Preamplifier

unit instructions

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

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TD-323
520-5446000-004418
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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.

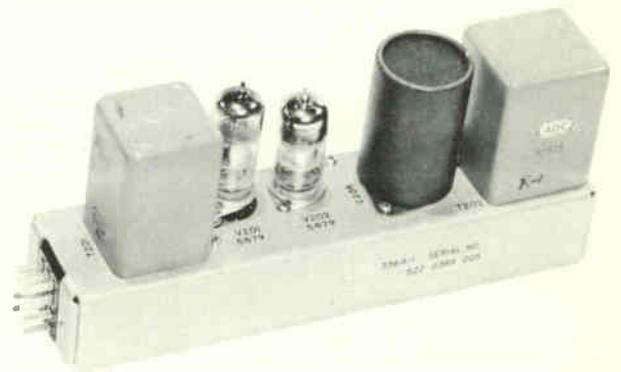
| FUNCTION | SYMBOL | TUBE TYPE |
|------------------|--------|-----------|
| Input amplifier | V201 | 5879 |
| Output amplifier | V202 | 5879 |

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 ± 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 ±10%, 400 vdcw | 931-0295-00 |
| C203 | CAPACITOR: paper, 0.1 uf ±10%, 400 vdcw | 931-0299-00 |
| C204 | Same as C203 | 931-0299-00 |
| C205 | CAPACITOR: dry electrolytic, quadruple section; sections 1 and 2, 20 uf, 450 vdcw +250% -10% tolerance; section 3 and 4, 50 uf, 50 vdcw +250% -10% tolerance | 183-1260-00 |
| E201 | TERMINAL, stud: melamine body, brass 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 | 385-0040-00 |
| R201 | RESISTOR: comp, 0.16 megohms ±5%, 1/2 w | 745-1445-00 |
| R202 | RESISTOR: comp, 0.10 megohms ±10%, 1/2 w | 745-1436-00 |
| R203 | RESISTOR: comp, 51,000 ohms ±5%, 1/2 w | 745-1424-00 |
| R204 | RESISTOR: comp, 2.2 megohm ±10%, 1/2 w | 745-1492-00 |
| R205 | RESISTOR: comp, 5.6 megohm ±10%, 1/2 w | 745-1510-00 |
| R206 | RESISTOR: comp, 30,000 ohms ±5%, 1/2 w | 745-1413-00 |
| R207 | RESISTOR: comp, 10 ohms ±5%, 1/2 w | 745-1350-00 |
| R208 | RESISTOR: comp, 2,200 ohms ±10%, 1/2 w | 745-1366-00 |

| ITEM | DESCRIPTION | COLLINS PART NUMBER |
|-------|---|---------------------|
| R209 | RESISTOR: comp, 9100 ohms ±5%, 1 w | 745-3392-00 |
| R210 | RESISTOR: comp, 270 ohms ±10%, 1/2 w (separate) in cloth bag | 745-1328-00 |
| R211 | Same as R210 | 745-1328-00 |
| R212 | RESISTOR: comp, 2700 ohms ±10%, 1/2 w (separate) in cloth bag | 745-1370-00 |
| R213 | Same as R212 | 745-1370-00 |
| T201 | TRANSFORMER, AF: input type; 600 ohms; primary impedance; secondary 50,000 ohms | 667-0435-00 |
| T202 | TRANSFORMER, AF: output type; primary 16,500 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 |

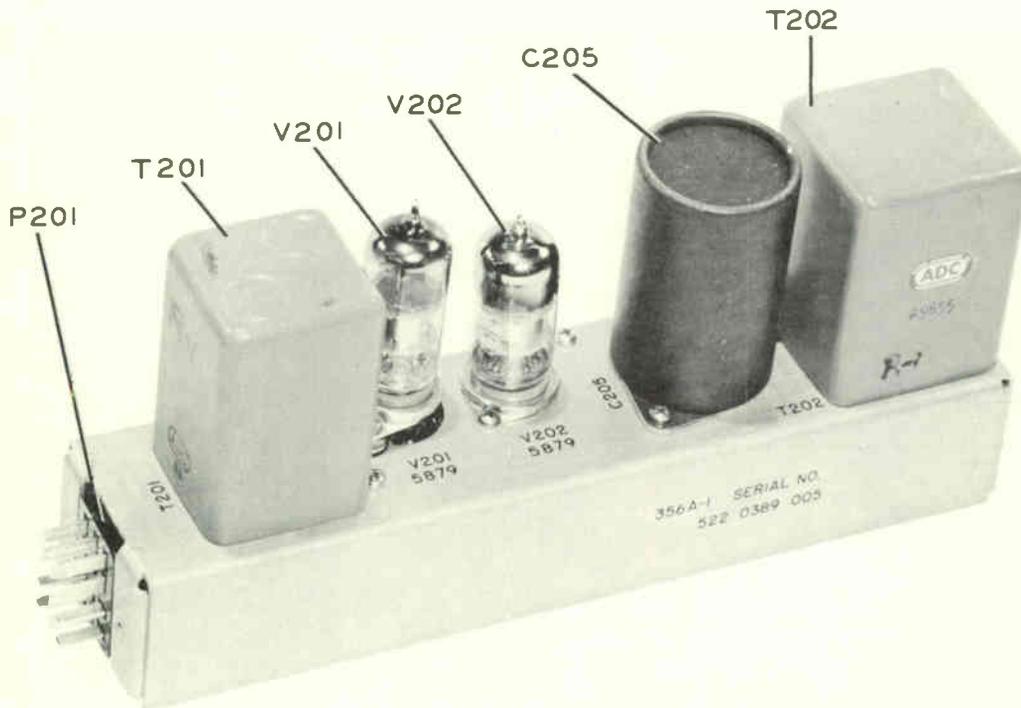
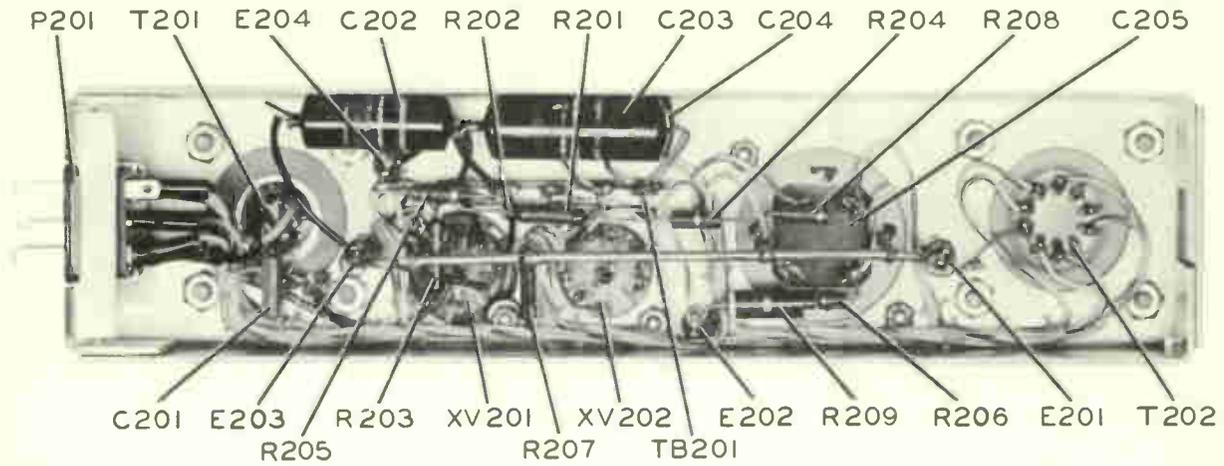


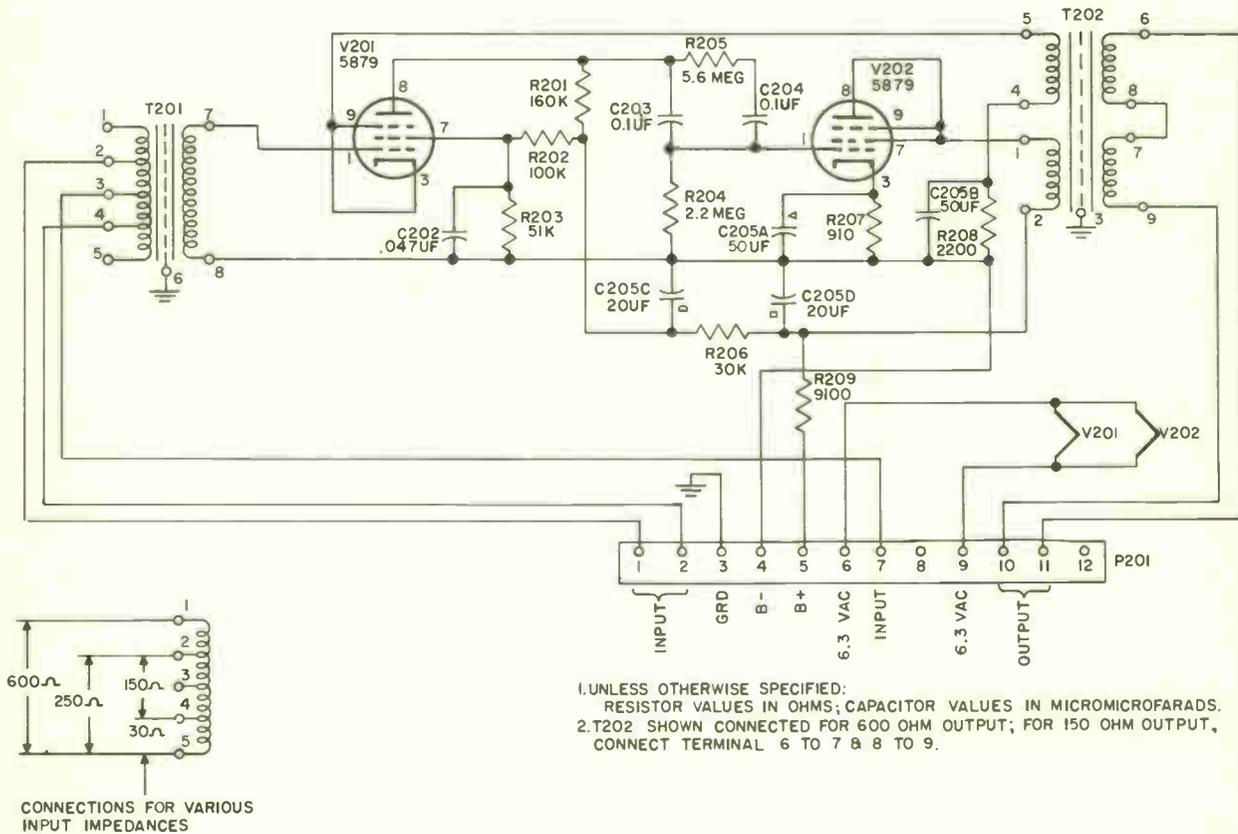
Figure 2. 356A-1 Preamplifier, Top View

C99-30-P



C99-31-P

Figure 3. 356A-1 Preamplifier, Bottom View



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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TD-324
520-5447000-005418
5th Edition 13 August 1964

1. 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.

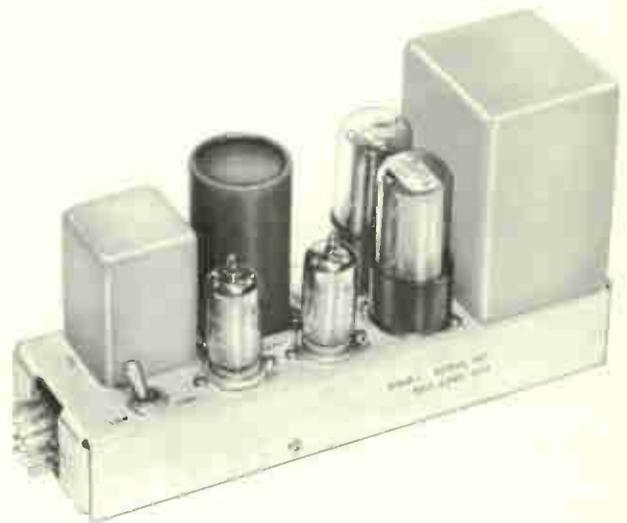


Figure 1. 356B-1 Program/Monitor Amplifier, Equipment Supplied

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 ± 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:

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

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

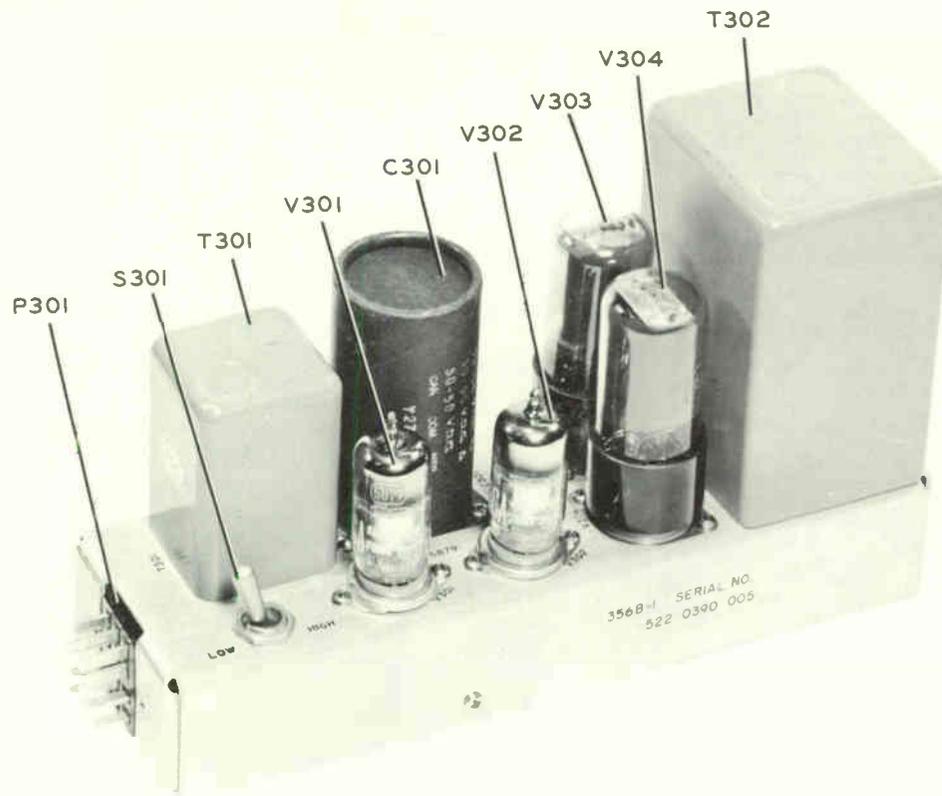


Figure 2. 356B-1 Program/Monitor Amplifier, Top View

C99-32-P

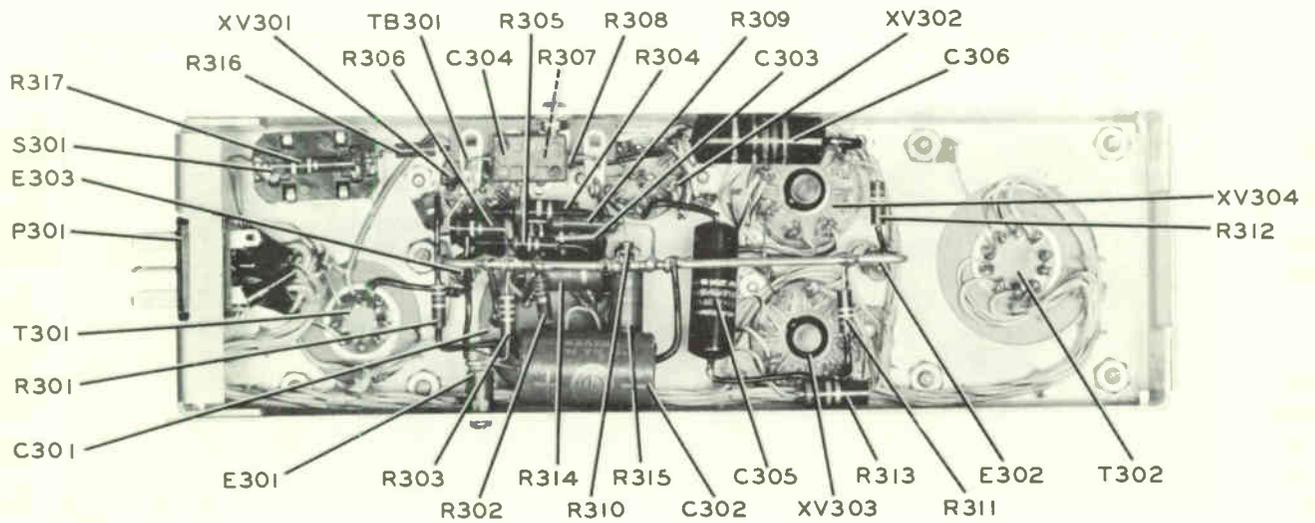


Figure 3. 356B-1 Program/Monitor Amplifier, Bottom View

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 |
| C303 | CAPACITOR: paper, 0.047 uf ±10%, 400 vdcw | 931-0295-00 |
| C304 | CAPACITOR: mica, 82 uuf ±10%, 500 vdcw | 935-0170-00 |
| C305 | SAME as C303 | 931-0295-00 |
| C306 | SAME as C303 | 931-0295-00 |
| E301 | TERMINAL: stud, melamine body, brass term tinned, brass base, cadmium plated, hex | 306-0233-00 |
| E302 | TERMINAL: stud, melamine body, terminal, brass hot tin dipped, base brass, cadmium plated, hex | 306-0234-00 |
| E303 | SAME AS E302 | 306-0234-00 |
| P301 | CONNECTOR, RECEPTACLE, ELECTRICAL: 12 male contacts, 10 amp | 365-0040-00 |
| R301 | RESISTOR: comp, 330 ohms ±10%, 1/2 w | 745-1331-00 |
| R302 | RESISTOR: comp, 1100 ohms ±5%, 1/2 w | 745-1354-00 |
| R303 | RESISTOR: comp, 33,000 ohms ±10%, 1/2 w | 745-1415-00 |
| R304 | RESISTOR: comp, 0.10 megohm ±10%, 1/2 w | 745-1436-00 |
| R305 | RESISTOR: comp, 0.10 megohm ±10%, 1 w | 745-3436-00 |
| R306 | RESISTOR: comp, 0.20 megohm ±5%, 1/2 w | 745-1448-00 |
| R307 | RESISTOR: comp, 1.0 megohm ±10%, 1/2 w | 745-1478-00 |
| R308 | RESISTOR: comp, 2000 ohms ±5%, 1/2 w | 745-1364-00 |
| R309 | RESISTOR: comp, 22,000 ohms ±5%, 1/2 w | 745-1407-00 |

| ITEM | DESCRIPTION | COLLINS PART NUMBER |
|-------|---|---------------------|
| R310 | RESISTOR: comp, 24,000 ohms ±5%, 1/2 w | 745-1410-00 |
| R311 | RESISTOR: comp, 0.56 megohm ±10%, 1/2 w | 745-1468-00 |
| R312 | SAME as R311 | 745-1468-00 |
| R313 | RESISTOR: comp, 15,000 ohms ±10%, 1 w | 745-3401-00 |
| R314 | RESISTOR: comp, 510 ohms ±5%, 2 w | 745-5640-00 |
| R315 | SAME as R314 | 745-5640-00 |
| R316 | RESISTOR: comp, 9,100 ohms ±5%, 1/2 w | 745-1392-00 |
| R317 | RESISTOR: comp, 91,000 ohms ±5%, 1/2 w | 745-1434-00 |
| S301 | SWITCH: toggle, spst, 30 V dc 20 amp in locking position | 266-3072-00 |
| T301 | TRANSFORMER AF: input type, 600 ohms primary impedance; secondary 50,000 ohms | 667-0435-00 |
| T302 | TRANSFORMER, AF: output type; primary 9,000 ohms, secondary impedance 600 ohms when series connected; 150 ohms when parallel connected; transformer contains a feedback winding | 667-0437-00 |
| TB301 | BOARD, TERMINAL: component mtg; four solder lug terminals; terminals 3/8 in. between centers; brown bakelite board | 306-2230-00 |
| V301 | TUBE: electron, pentode, 5879 | 257-0104-00 |
| V302 | SAME as V301 | 257-0104-00 |
| V303 | TUBE: electron, tetrode amplifier, 6Y6GT | 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 |

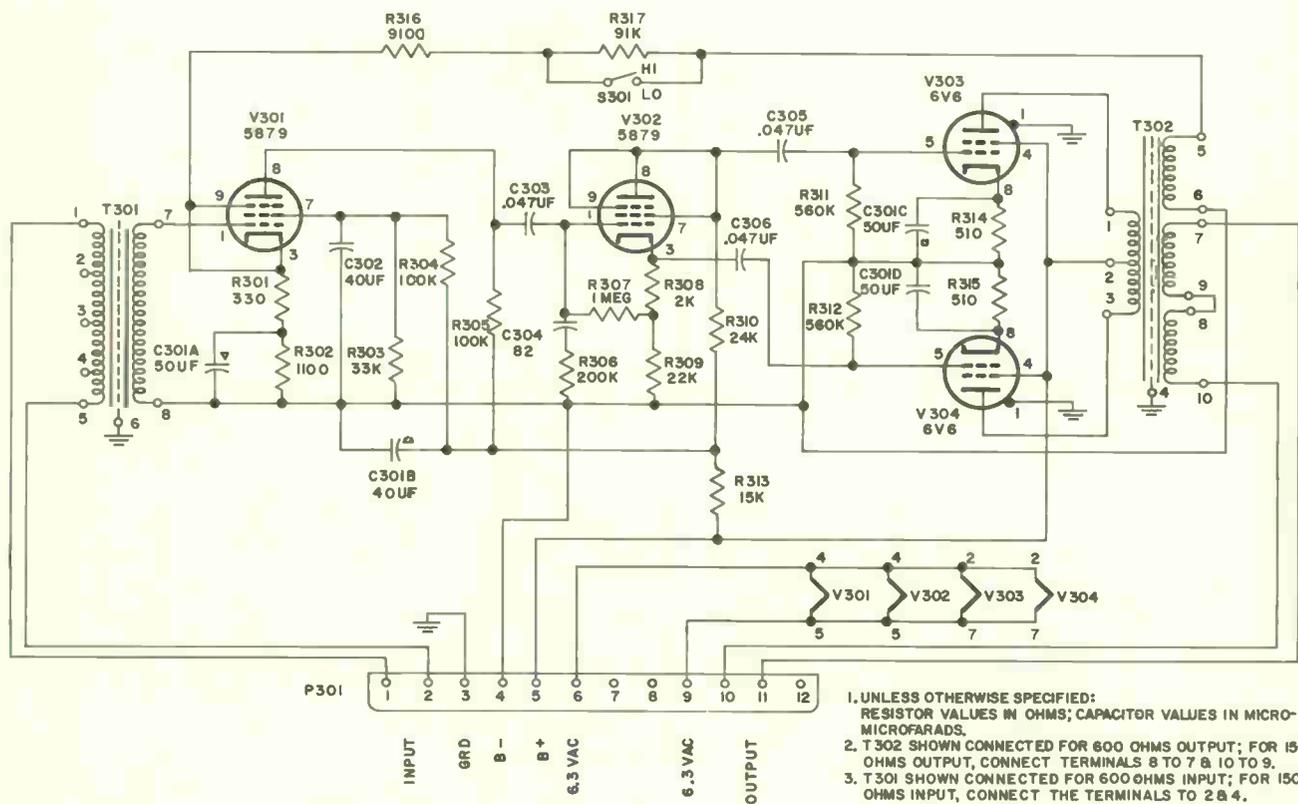


Figure 4. 356B-1 Program/Monitor Amplifier, Schematic Diagram

C99-09-3





WORLD RADIO HISTORY



WORLD RADIO HISTORY





356E-1 Limiter Amplifier

unit instructions

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

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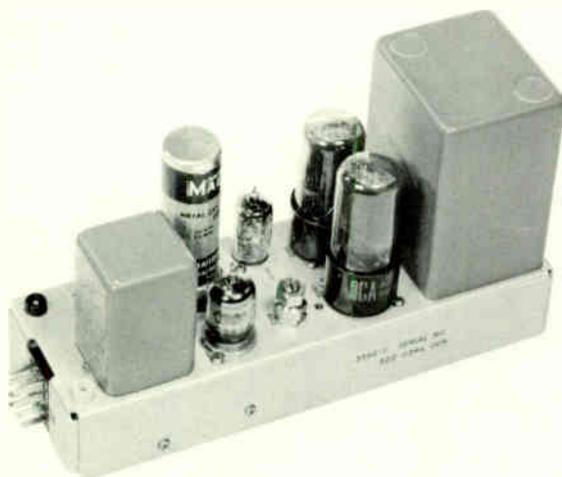


Figure 1. 356E-1 Limiter Amplifier,
Equipment Supplied

C99-23-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 | 6L6386 |
| 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 ± 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

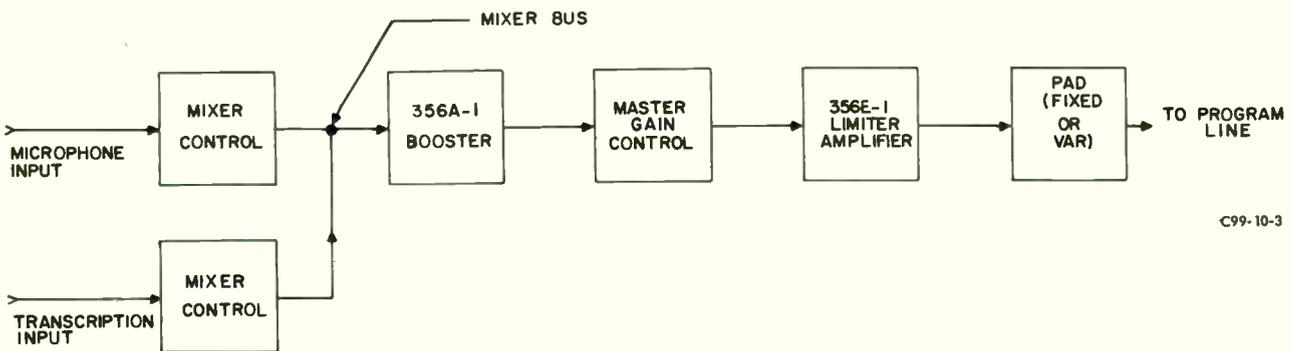


Figure 2. Collins Type 356E-1 Limiter Amplifier as Automatic Fader Control, Suggested Arrangement

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.

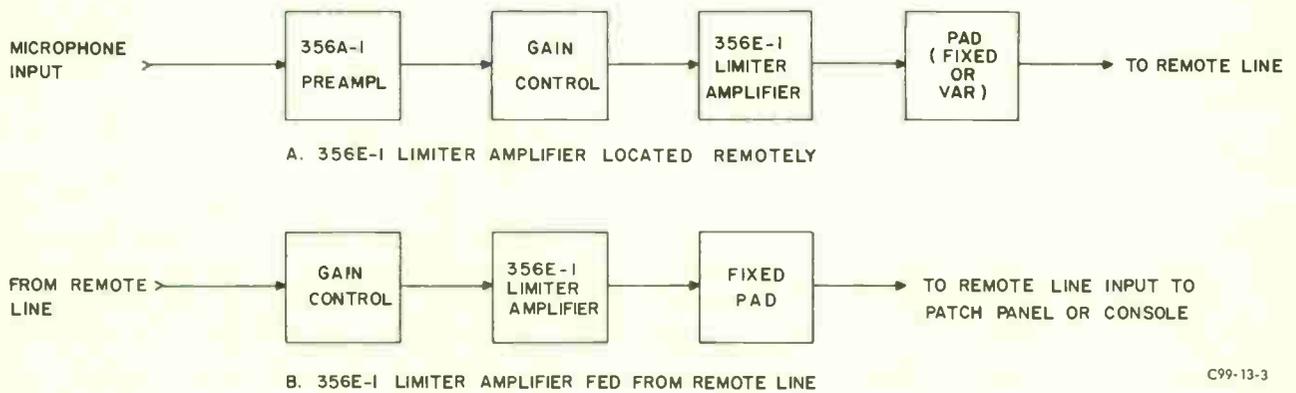
With an average input signal, adjust the input to the 356E-1 to produce approximately 15-db gain reduction.

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.

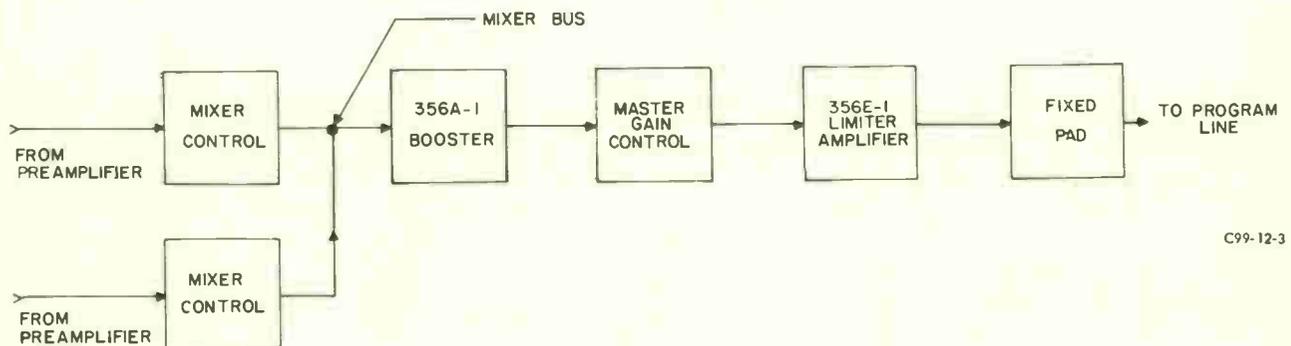
3.1 GENERAL. The following paragraphs describe adjustments of threshold voltage for various input and output levels, modification of resistor values for various release times, and modification of meter and switching circuits to provide for monitoring the amount of gain reduction.



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

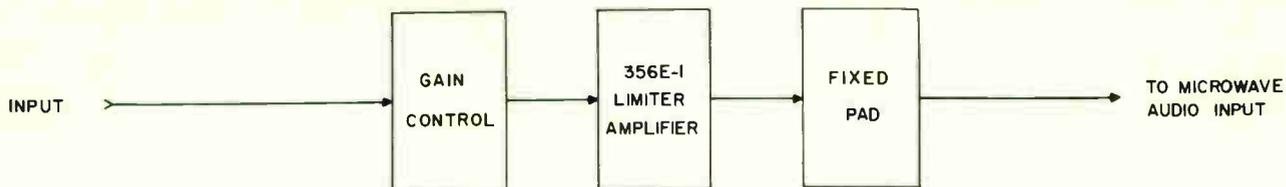


Figure 5. Collins Type 356E-1 Limiter Amplifier as Automatic Level Control in Microwave Relay Systems, Suggested Arrangement

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.

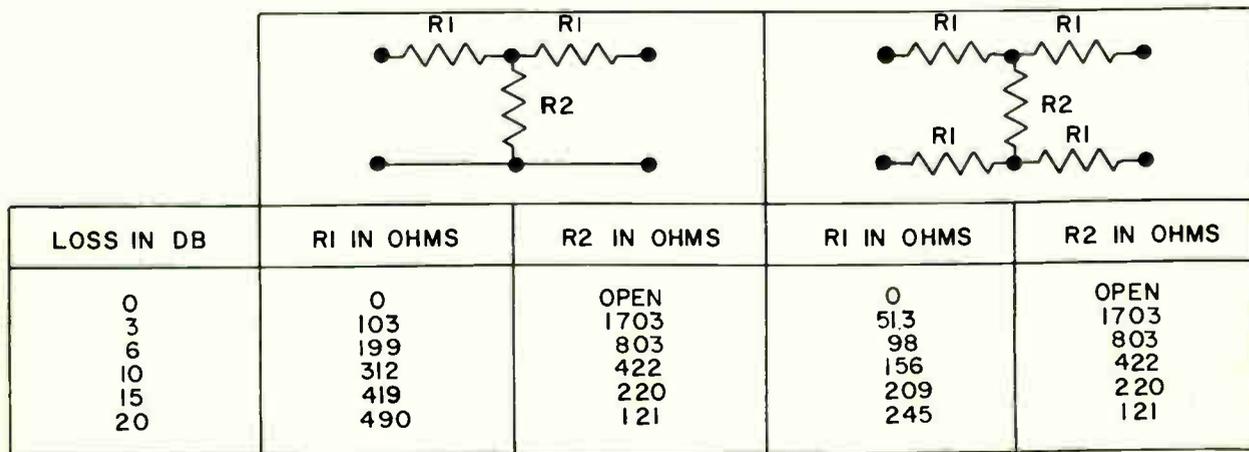
3.3 RELEASE TIME. The release time of the 356E-1 is satisfactory for most applications. If some other value of release time is desired, change the values of R616 and R617. Table 2 gives other values of resistance for R616 and R617 with corresponding release times.

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:

- Remove the front of the VU meter.
- Prepare the decal for application according to printed instructions on the decal.
- 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.
- Replace the front of the VU meter.
- 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

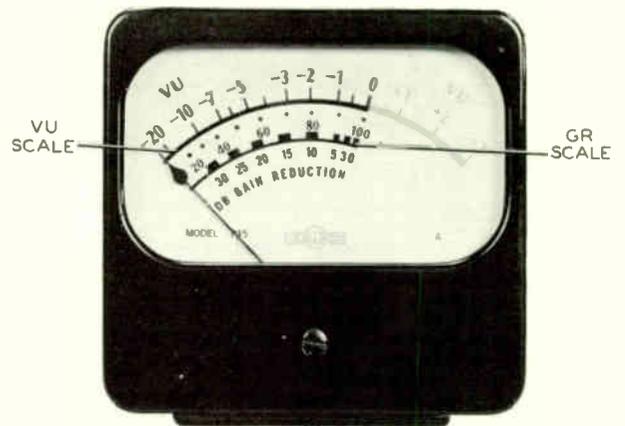


Figure 7. VU Meter with GR Scale Decal Applied

C99-26-P

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:

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

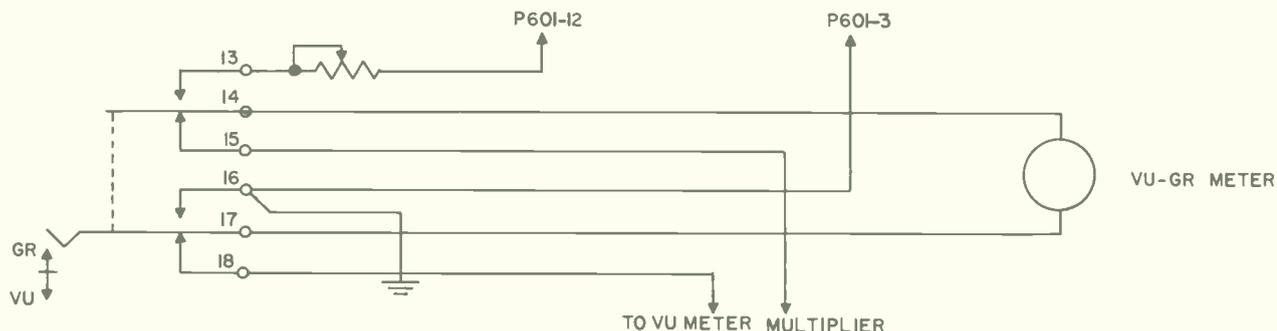


Figure 8. VU Meter and GR Switch Connections, Schematic Diagram

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 | 745-1466-00 |
| 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 | 220-1262-00 |
| 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 |

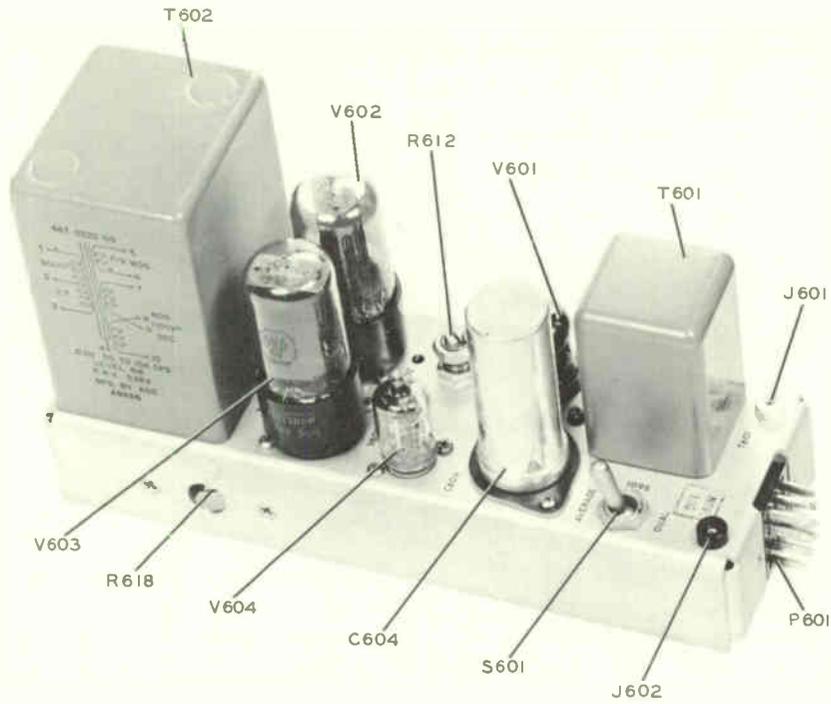


Figure 9. 356E-1 Limiter Amplifier, Top View

C99-42-P

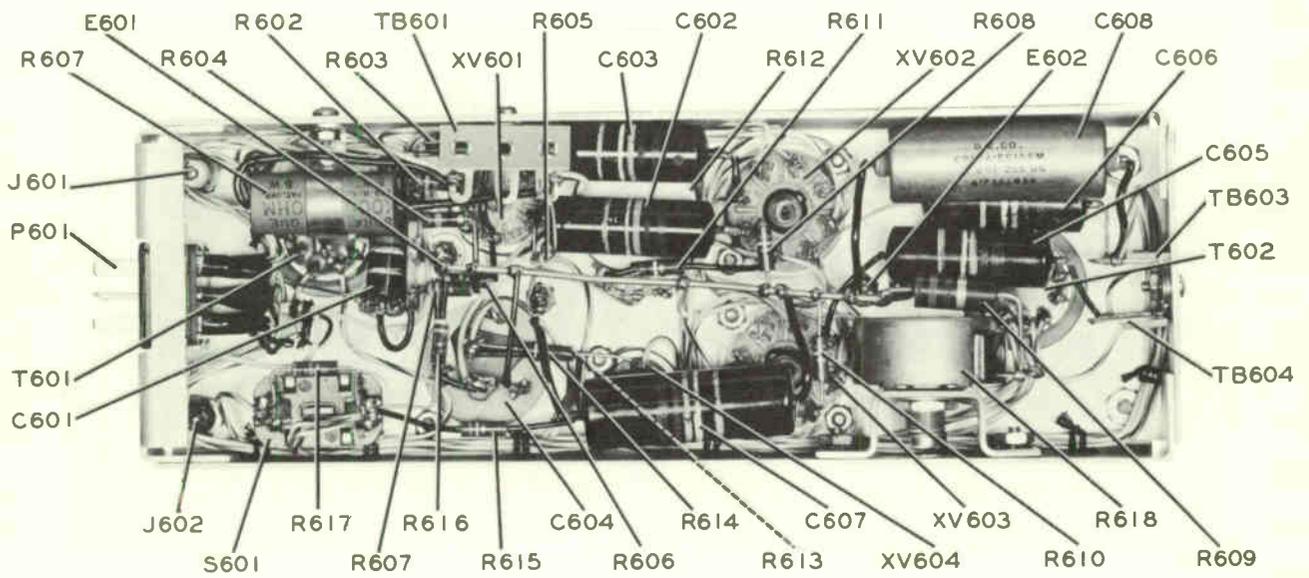
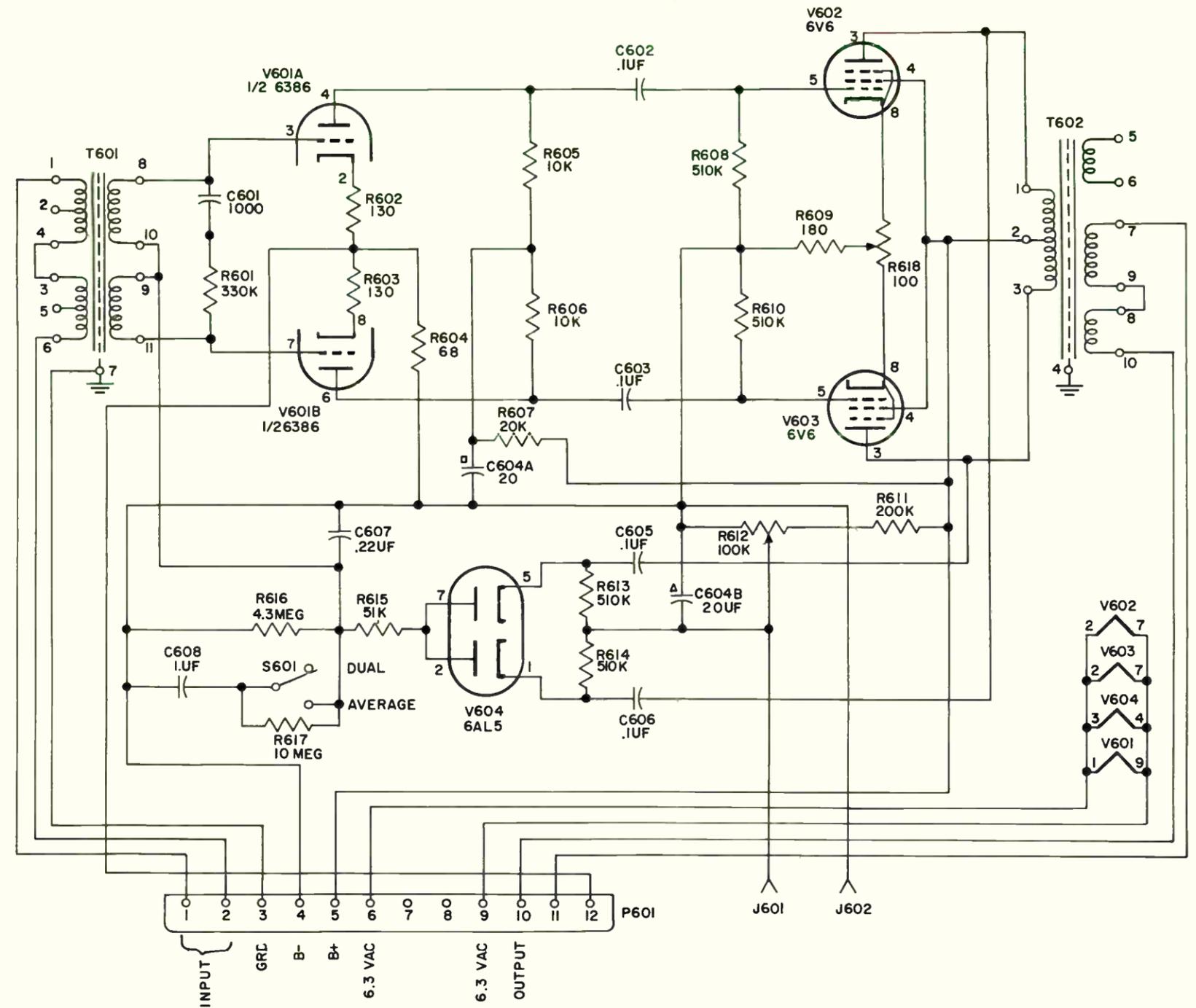


Figure 10. 356E-1 Limiter Amplifier, Bottom View

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.

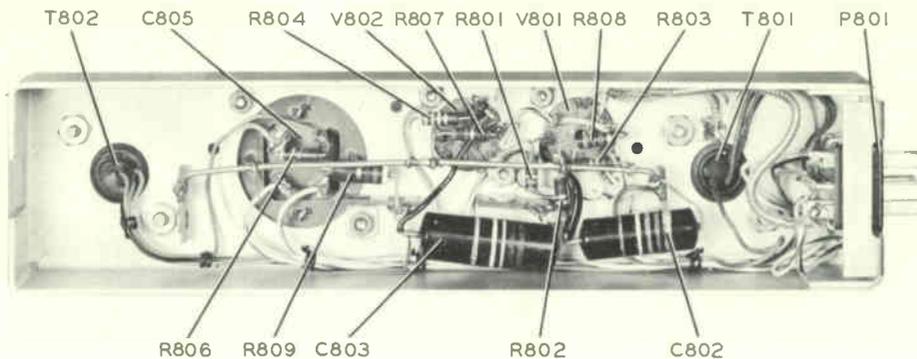


Figure 2. Cue Amplifier 356Q-1,
Bottom View

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 |
|----------------------|---|---------------------|
| CUE AMPLIFIER 356Q-1 | | 522-1607-00 |
| C801 | NOT USED | |
| C802 | CAPACITOR, FIXED, PAPER: 400 v dc; 47,000 uuf, ±10% | 931-0255-00 |
| C803 | CAPACITOR, FIXED, PAPER: 0.1 uf ±10%, 400 v dc w | 931-0299-00 |
| C804 | NOT USED | |
| 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 |
| P801 | CONNECTOR, RECEPTACLE, ELECTRICAL: 12 male contacts, 10 amps, 730 v ac | 365-2120-00 |
| R801 | RESISTOR, FIXED, COMPOSITION: 0.16 megohms ±5%, 1/2 w | 745-1445-00 |
| R802 | RESISTOR, FIXED, COMPOSITION: 0.10 megohms ±10% 1/2 w | 745-1436-00 |
| R803 | RESISTOR, FIXED, COMPOSITION: 51,000 ohms ±5%, 1/2 w | 745-1424-00 |
| R804 | RESISTOR, FIXED, COMPOSITION: 0.47 megohms, ±10% 1/2 w | 745-1464-00 |
| R805 | NOT USED | |
| R806 | RESISTOR, FIXED, COMPOSITION: 30,000 ohms ±5%, 1/2 w | 745-1413-00 |

| ITEM | DESCRIPTION | COLLINS PART NUMBER |
|-------|--|---------------------|
| R807 | RESISTOR, FIXED, COMPOSITION: 820 ohms ±5%, 1/2 w | 745-1348-00 |
| R808 | RESISTOR, FIXED, COMPOSITION: 8200 ohms, ±10%, 1/2 w | 745-1391-00 |
| R809 | RESISTOR, FIXED, COMPOSITION: 9100 ohms, ±5%, 1 w | 745-3392-00 |
| T801 | 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 |
| 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 |
| V801 | ELECTRON TUBE: type 5879 | 257-0104-00 |
| V802 | ELECTRON TUBE: same as V801 | 257-0104-00 |
| XV801 | SOCKET, ELECTRON TUBE: 9 contact miniature top mtg tube socket w/o shield base; plastic | 220-1274-00 |
| XV802 | SOCKET, ELECTRON TUBE: same as XV801 | 220-1274-00 |

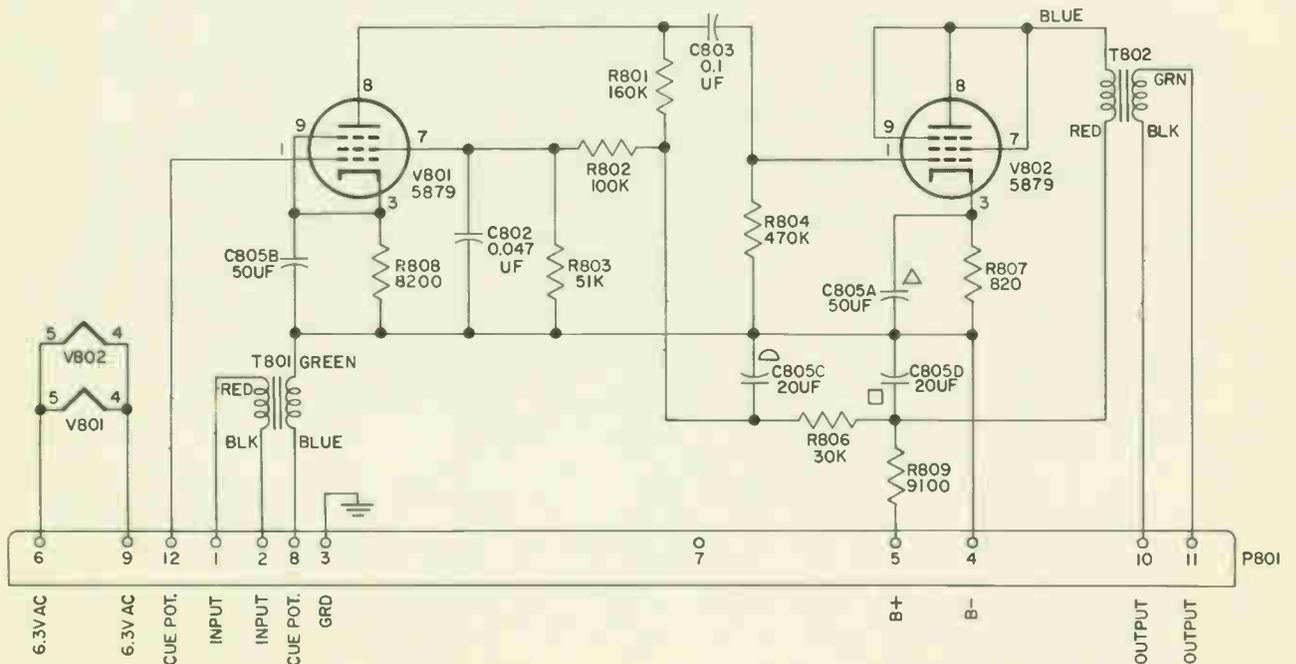


Figure 3. Cue Amplifier 356Q-1, Schematic Diagram

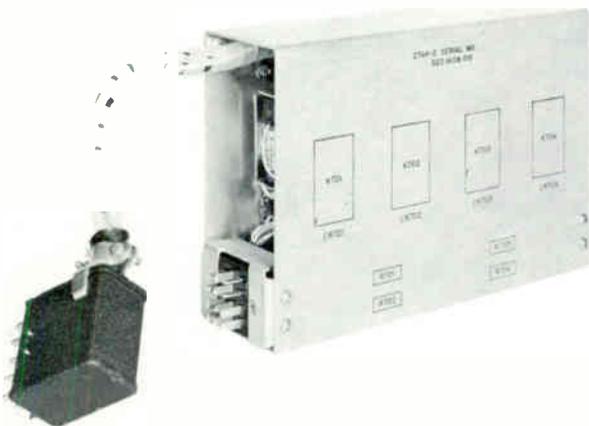
C583-06-3

RELAY UNIT 274K-2

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1960

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C583-13-P

Figure 1. Relay Unit 274K-2

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.

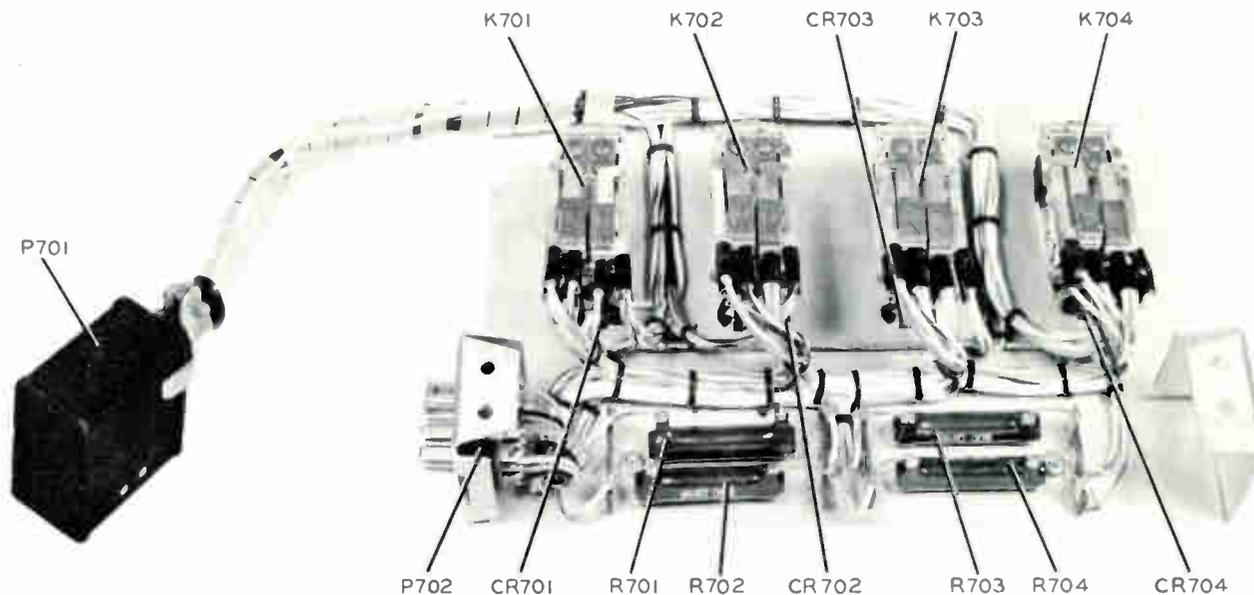


Figure 2. Relay Unit 274K-2, Cover Removed

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.

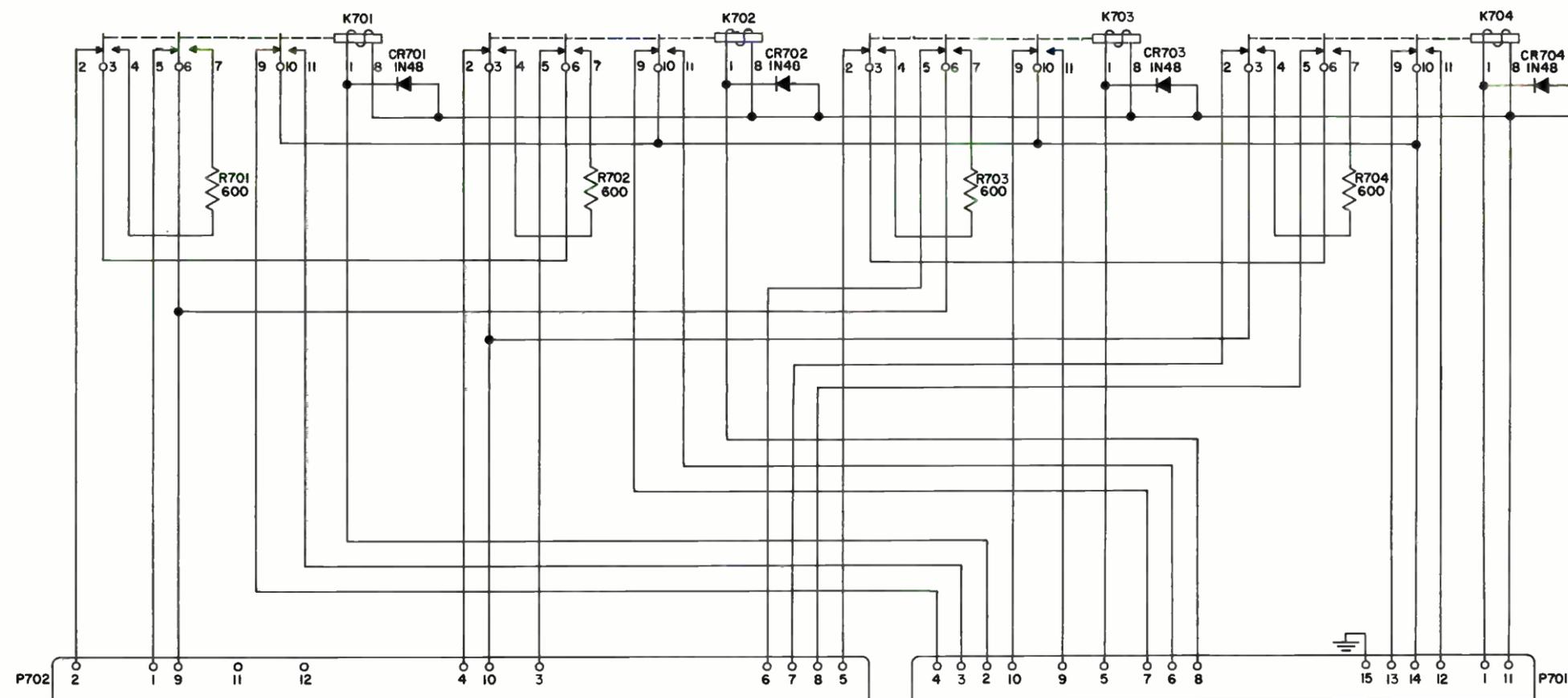
4.1 REPLACEABLE PARTS.

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.B.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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1960

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Figure 1. Power Supply 409X-2

C583-17-P

1.1 PURPOSE OF EQUIPMENT.

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

1.2 PHYSICAL DESCRIPTION.

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

1.3 ELECTRICAL CHARACTERISTICS.

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

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

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

2.1 CIRCUIT DESCRIPTION.

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

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

3.1 MAINTENANCE.

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

4.1 REPLACEMENT PARTS.

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

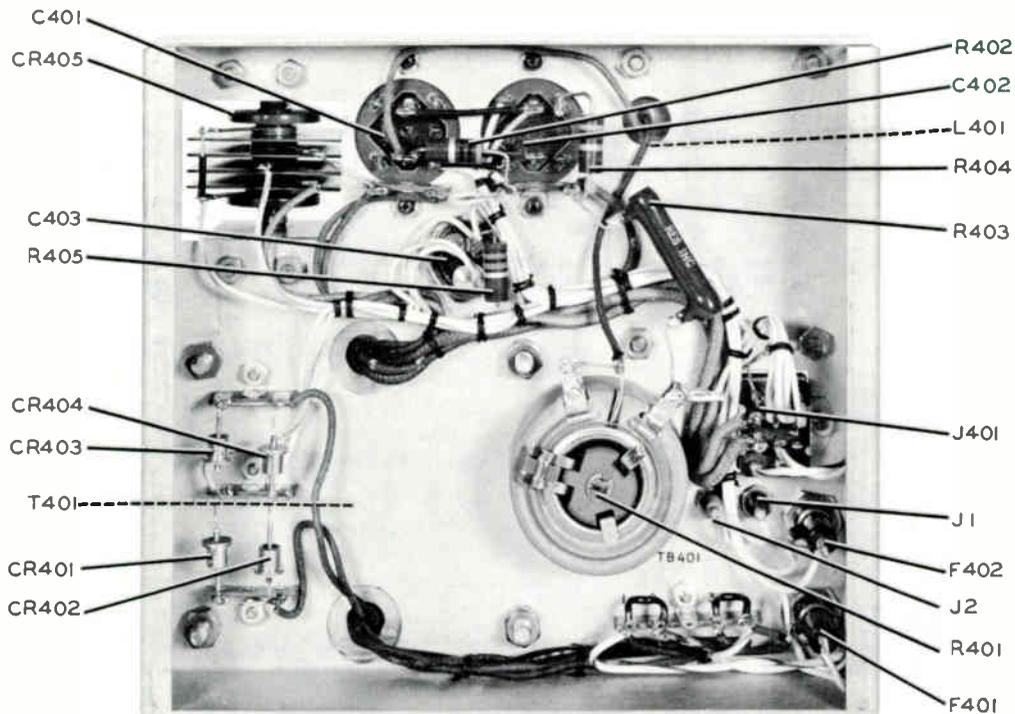


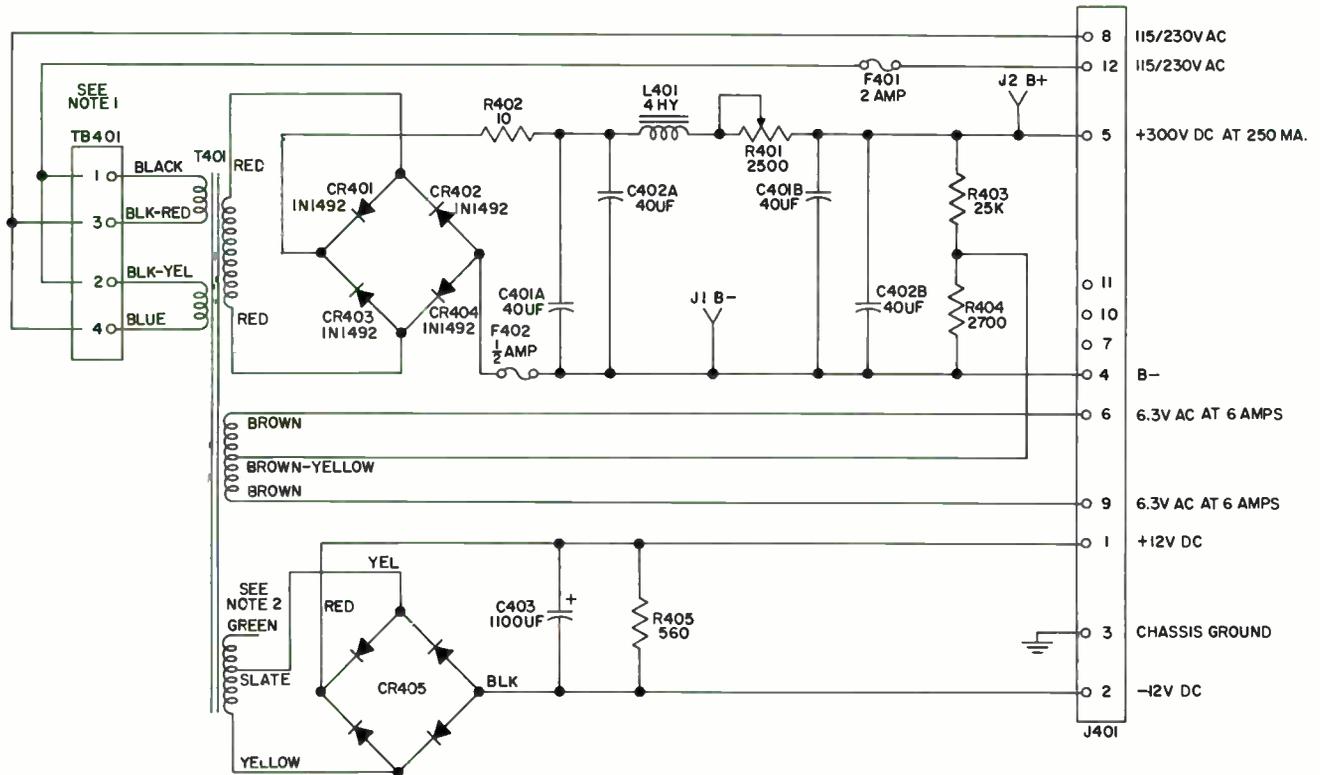
Figure 2. Power Supply 409X-2, Bottom View

C583-19-P

PARTS LIST

| ITEM | DESCRIPTION | COLLINS PART NUMBER |
|----------------------------|--|---------------------|
| POWER SUPPLY 409X-2 | | 522 1691 000 |
| C401 | CAPACITOR, FIXED, ELECTROLYTIC: dual section, 40 uf ea, +5% -10%, 450 v dc | 183 1259 00 |
| C402 | CAPACITOR, FIXED, ELECTROLYTIC: same as C401 | 183 1259 00 |
| C403 | CAPACITOR, FIXED, ELECTROLYTIC: 1100 uf, 25 v dc | 184 2000 00 |
| CR401 | RECTIFIER: silicon, General Electric IN1492 | 353 1661 00 |
| CR402 | RECTIFIER: same as CR401 | 353 1661 00 |
| CR404 | | |
| CR405 | RECTIFIER, METALLIC: selenium; Sarkes-Tarzian type 5N26-1B-1BBS | 353 0254 00 |
| F401 | FUSE, CARTRIDGE: 2 amp, 125 v dc; time delay, ferrule type terminal | 264 0008 00 |
| F402 | FUSE, CARTRIDGE: 1/2 amp, 250 v; time delay, ferrule terminals; 1/4 in. dia. by 1-1/4 in. lg c/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

