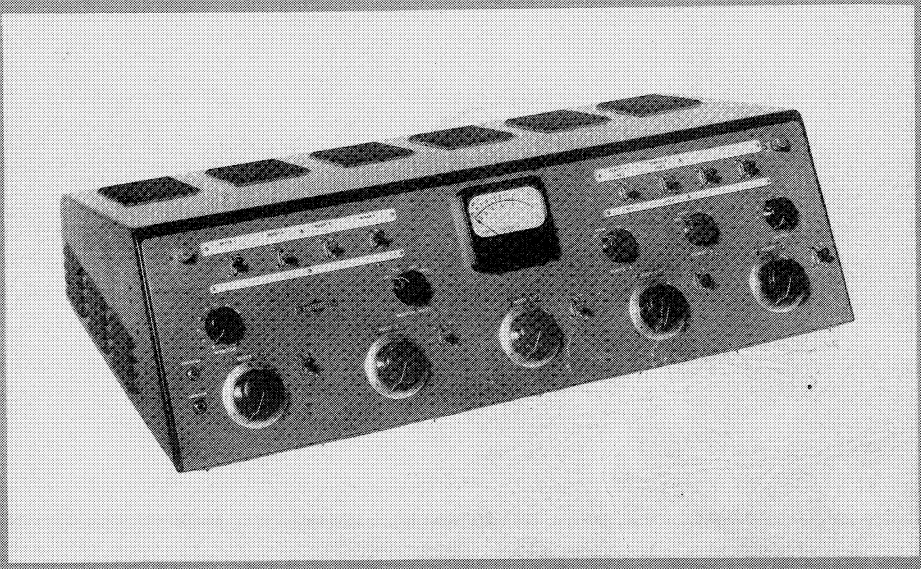
Collins



212F-1

BROADCAST CONSOLE

INSTRUCTION BOOK

Instruction Book
for

212F-1 BROADCAST CONSOLE

COLLINS RADIO COMPANY
Cedar Rapids, Iowa

520 5421 00
15 May 1956
Printed in the United States of America

GUARANTEE

The equipment described herein is sold under the following guarantee:

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

(a) Notice of the claimed defect is given Collins within one (1) year from date of delivery and goods are returned in accordance with Collins' instructions.

(b) Equipment, accessories, tubes, and batteries not manufactured by Collins or from Collins' designs are subject to only such adjustments as Collins may obtain from the supplier thereof.

(c) No equipment or accessory shall be deemed to be defective if, due to exposure or excessive moisture in the atmosphere or otherwise after delivery, it shall fail to operate in a normal or proper manner.

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

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

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

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

ADDRESS:

Collins Radio Company
Sales Service Department
Cedar Rapids, Iowa

INFORMATION NEEDED:

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

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

ADDRESS:

Collins Radio Company
Sales Service Department
Cedar Rapids, Iowa

INFORMATION NEEDED:

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

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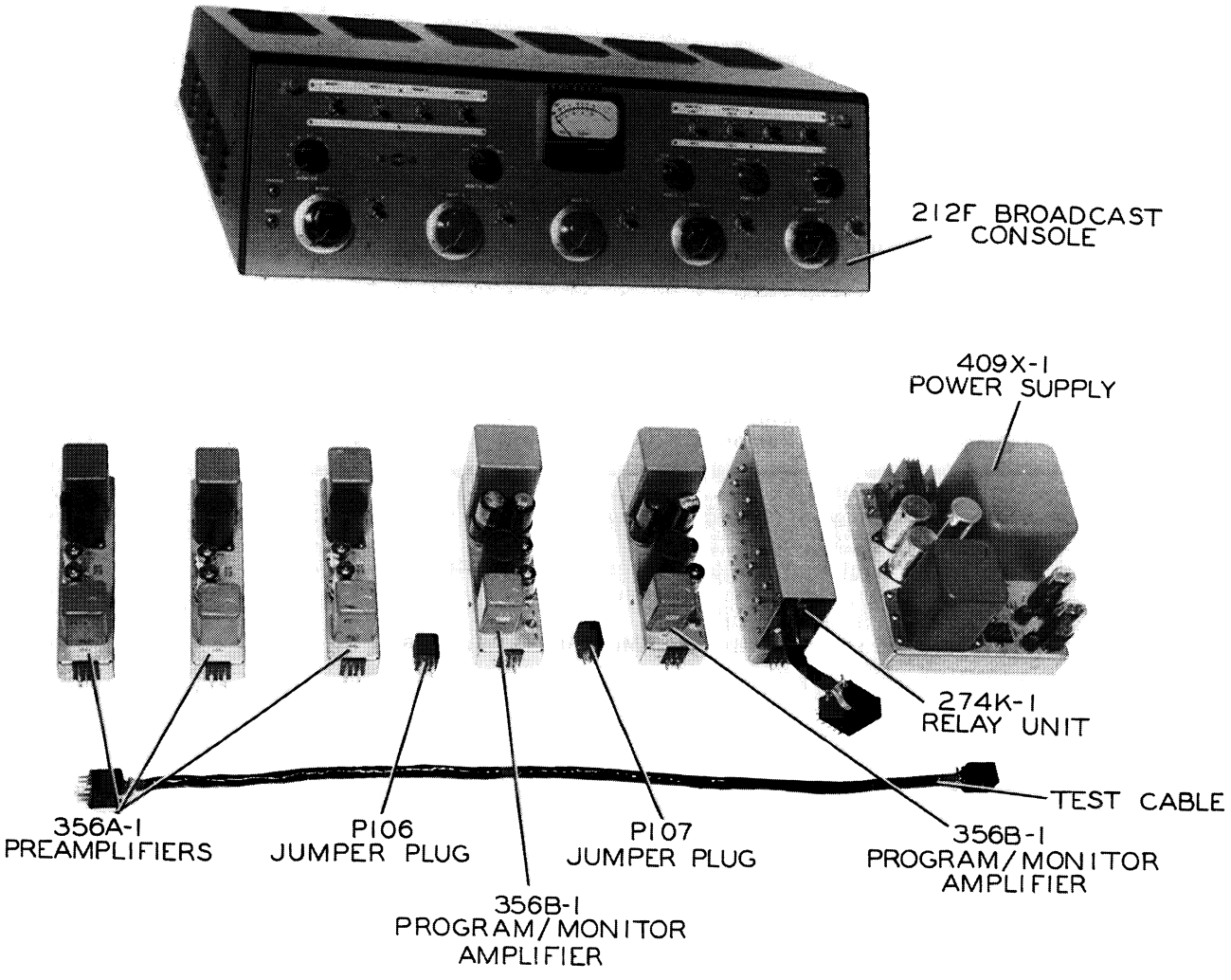

Figure 1-1. 212F-1 Broadcast Console, Equipment Supplied

SECTION I
GENERAL DESCRIPTION

1.1 PURPOSE OF INSTRUCTION BOOK.

This instruction book has been prepared to assist in the installation, adjustment, operation, and maintenance of the Collins Type 212F-1 Broadcast Console.

1.2 PURPOSE OF EQUIPMENT.

The 212F-1 Broadcast Console is intended for use in high-fidelity AM., FM, and TV broadcast service or program control in audio systems. It provides simultaneous mixing for auditioning or broadcasting of three out of eight possible inputs. It has provision for the addition of two more preamplifiers to allow simultaneous mixing of 5 out of 12 possible inputs. No rewiring is necessary.

1.3 EQUIPMENT SUPPLIED.

The equipment supplied is shown in figure 1-1 and listed in table 1-1.

TABLE 1-1. 212F-1 BROADCAST CONSOLE, EQUIPMENT SUPPLIED

ITEM	QUANTITY	PART NUMBER	OVER-ALL DIMENSIONS			WEIGHT IN POUNDS (TOTAL)
			HEIGHT (IN)	WIDTH (IN)	DEPTH (IN)	
Broadcast Console, Type 212F-1	1	522 0393 006	10-1/4	35	22	65
Preamplifiers, Type 356A-1	3	522 0389 005	4-5/8	2-1/8	9-1/2	7-1/2
Program/Monitor Amplifiers, Type 356B-1	2	522 0390 005	5-3/4	2-7/8	9-1/2	9
Power Supply, Type 409X-1	1	522 0392 006	6	7-1/2	9-1/2	20
Relay Unit Type 274K-1	1	522 0391 005	5-1/2	2-1/2	9-1/2	2-1/2
Test Cable	1	541 6473 003	35 (length)			1
Jumper plugs	2	541 6459 002				1/2
Total						105-1/2

1.4 DESCRIPTION OF MAJOR COMPONENT.

The 212F-1 Broadcast Console is a self-contained studio-type console with a hinged front panel which may be tilted forward to allow access to components. The amplifiers, the power supply, and the relay unit are plug-in modules. The 356A-1 Preamplifiers provide 40 db gain from low-level microphone or transcription lines to feed program, audition, or cue lines. The 356B-1 Program/Monitor amplifiers provide 56 or 68 db gain for feeding the line or for operating station speakers. Selection of 56 or 68 db gain is made by operation of a toggle switch on the amplifier chassis. The 274K-1 Relay Unit switches the ON AIR-OFF AIR station lights and the station speakers.

1.5 ACCESSORIES.

Wiring and connectors are provided in the 212F-1 Broadcast Console to accommodate four additional type 356A-1 Preamplifiers. Two of these serve as a third and fourth preamplifier and allow selection of two of four additional inputs. One may be used as a booster for the input to the Monitor Amplifier and one may be used as a cuing amplifier. When the 356A-1 is used as booster or cuing amplifier, the amplifier input should be rewired for 600 ohms impedance as shown in figure 2-4. The 356E-1 Limiter Amplifier (figure 1-2) may be used to provide compression in the program line.

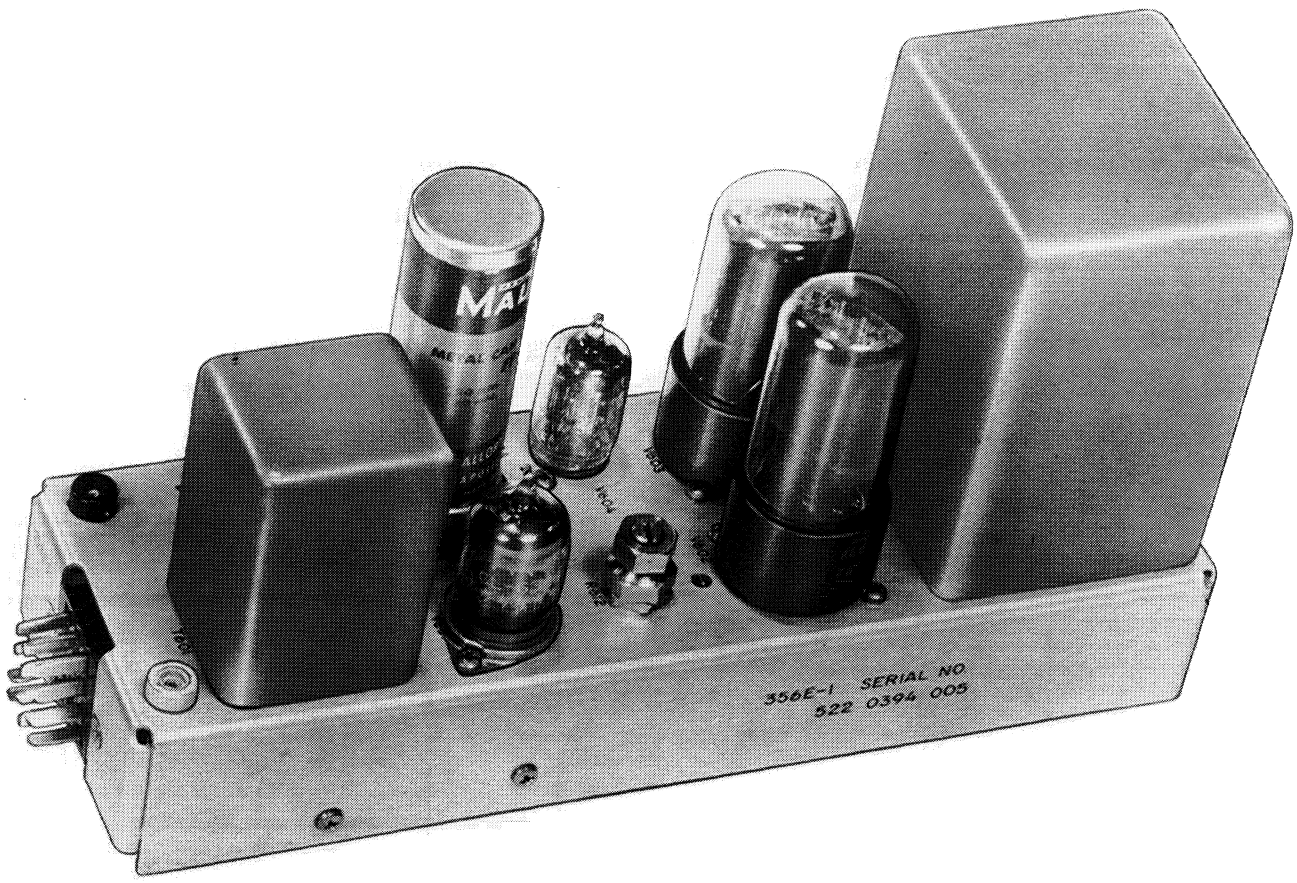

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Figure 1-2. Accessory, Type 356E-1 Limiter Amplifier

1.6 ELECTRICAL CHARACTERISTICS.

Electrical characteristics of the 212F-1 Broadcast Console are listed in table 1-2. These characteristics are measured with d-c voltage adjusted to 300 volts.

TABLE 1-2. ELECTRICAL CHARACTERISTICS OF THE TYPE 212F-1 BROADCAST CONSOLE

FUNCTION	DESCRIPTION
Power Source	115 or 230 vac, ±10%, 50/60 cps, single phase
Frequency Range	50 to 15,000 cps
Number of Channels	Two low-level inputs (provision for four low-level inputs with additional Type 356A-1 Pre-amplifiers). One remote input. One program output
Input Impedance	Low level: 30/150/250/600 ohms (balanced or unbalanced) factory wired for 150-ohm balanced input. Remote: 150/600 ohms
Output Impedance	150 or 600 ohms to program line 600 ohms to monitor speakers

TABLE 1-2. ELECTRICAL CHARACTERISTICS OF THE TYPE 212F-1 BROADCAST CONSOLE, (Cont)

FUNCTION	DESCRIPTION
Input Level	Low level: -60 dbm (nominal) Remote: +10 dbm
Gain	Low level to program line: 100 db Remote to program line: 48 db
Output Level	Program: +18 dbm (50 mw) Monitor: +39 dbm (8 watts)
Frequency Response at Program Line	±1-1/2 db, 50 to 15,000 cps
Distortion	Program line: less than 1% at +18 dbm (50 mw) Monitor Amplifier output: less than 3% at +39 dbm (8 watts)
Noise	-118 dbm at input

1.7 VACUUM TUBE COMPLEMENT.

A complete tube complement for the type 212F-1 Broadcast Console (as supplied) consists of the following: 10 type 5879, 4 type 6V6, and 2 type 5Y3.

TABLE 1-3. TUBE COMPLEMENT

SYMBOL DESIGNATION	FUNCTION	TUBE TYPE
356A-1 Preamplifier		
V201	Preamplifier Input	5879
V202	Preamplifier Output	5879
356B-1 Program/Monitor Amplifier		
V301	Program/Monitor Amplifier Input	5879
V302	Program/Monitor Amplifier Phase Inverter	5879
V303	Program/Monitor Amplifier Output	6V6
V304	Program/Monitor Amplifier Output	6V6
409X-1 Power Supply		
V401	Plate Voltage Supply Rectifier	5Y3
V402	Plate Voltage Supply Rectifier	5Y3

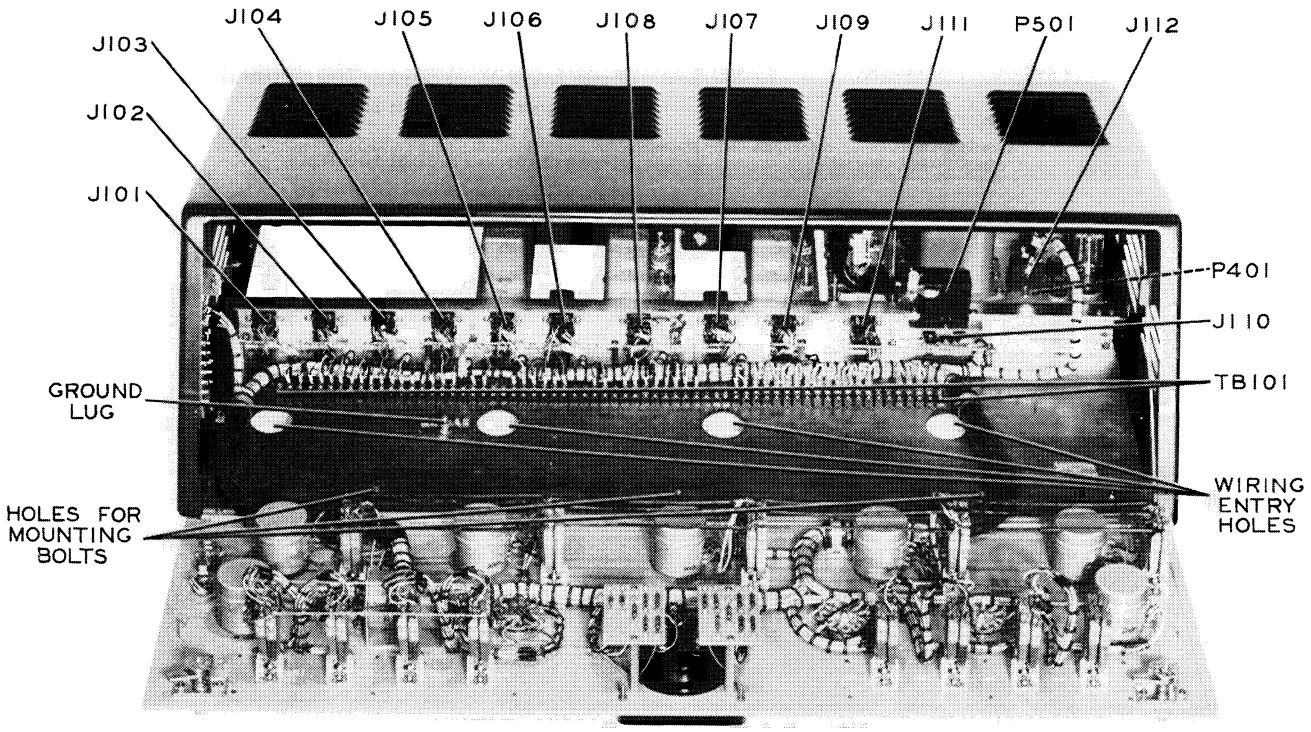

Figure 2-1. 212F-1 Broadcast Console, Mounting and Wiring Information

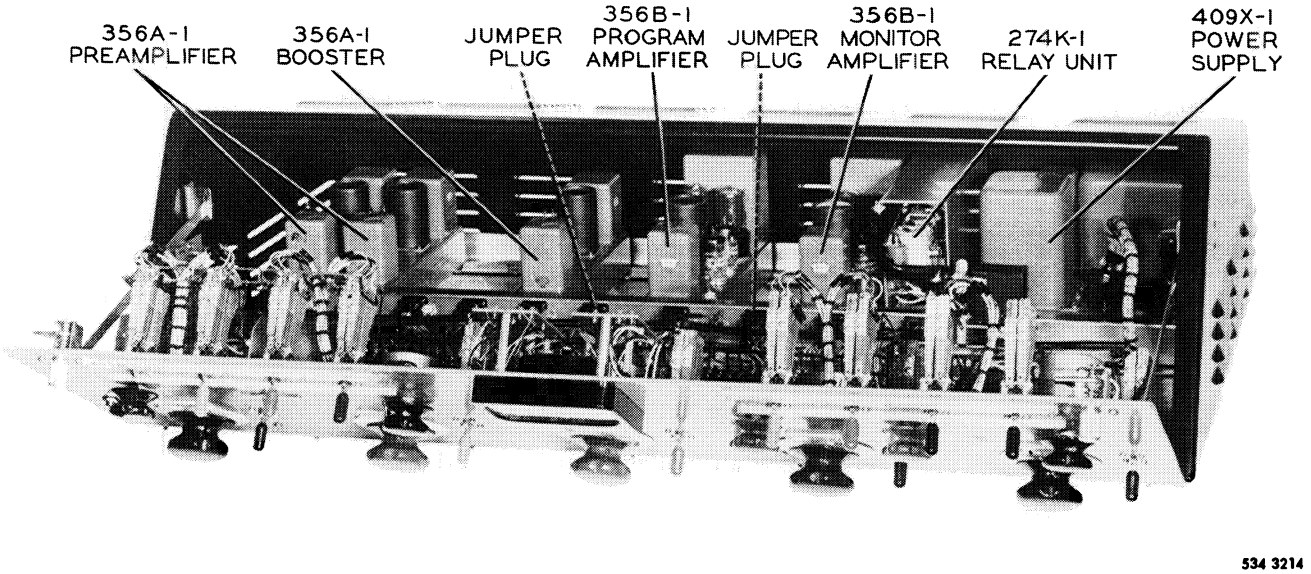

Figure 2-2. 212F-1 Broadcast Console, Modules in Place

SECTION II
INSTALLATION AND ADJUSTMENT

2.1 UNPACKING AND INSPECTING THE EQUIPMENT.

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

2.2 INSTALLATION PROCEDURE.

2.2.1 EQUIPMENT MOUNTING LOCATION. - The location of the equipment in a particular installation will be determined by the arrangement of studio and control room facilities. The placement of equipment and wiring should be carefully planned before any installation work is started. The 212F-1 Broadcast Console may be placed against a window, wall, or other obstructing surface without sacrificing maintenance accessibility. Outline and mounting dimensions of the console are shown in figure 7-6.

2.2.2 EQUIPMENT MOUNTING PROCEDURE. - Refer to figure 2-1. Four 1-11/32 inch diameter holes are provided in the console base plate for the entry of wiring into the console. They are equally spaced and located directly in front of the terminal strip. Three 1/4-inch diameter holes, located on a line in front of the entry holes, may be used for bolting the console to desk or table. Spacers are furnished to be used if the console is bolted down. Holes should be drilled in the desk or table top directly below the entry holes in the console base plate for passing the entry lines and control cables into the console.

After the console is securely mounted, the modules may be plugged into their receptacles in the following order (refer to figure 2-2):

(a) Set the 409X-1 Power Supply in the extreme right side of the console. If connection to 230 vac is desired, see figure 2-3.

(b) Plug J112 into P401.

(c) Set the 274K-1 Relay Unit beside the power supply and move it forward to insert P502 into J111. When P502 is completely engaged with J111, the rear edge of the unit should drop down in front of the retaining rail.

NOTE

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

(d) Plug P501 into J110.

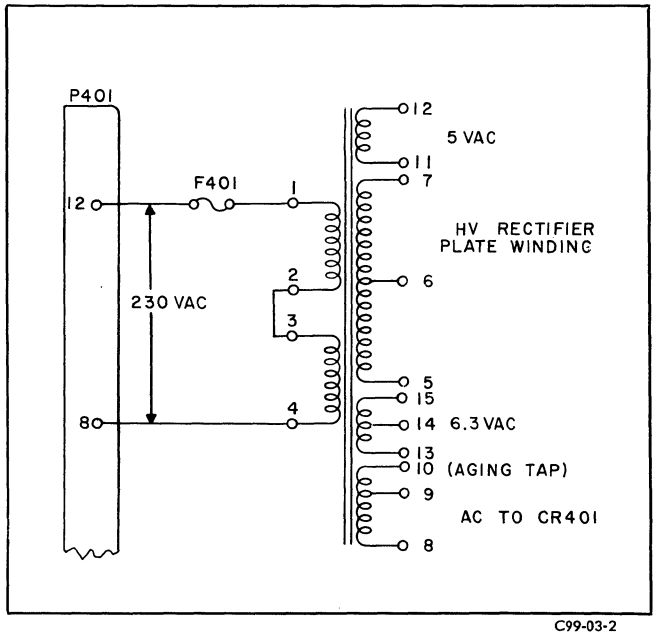

Figure 2-3. 409X-1 Power Supply, Connections for 230 Volts A-C Unit

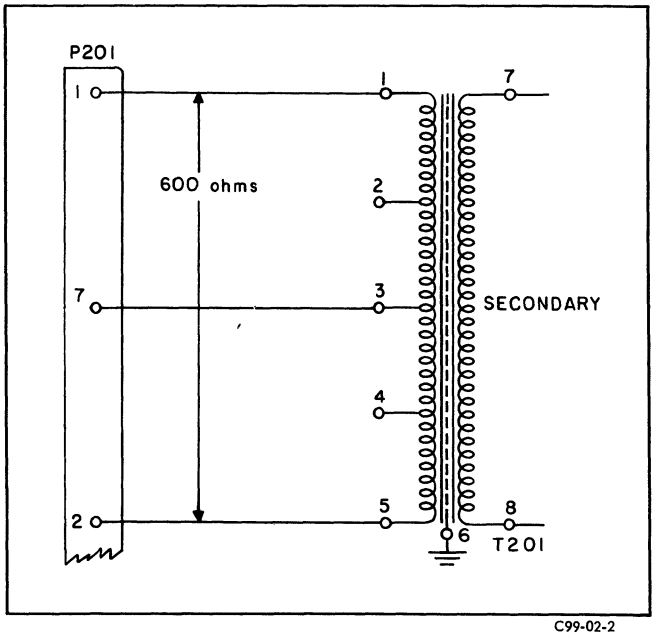

Figure 2-4. 356A-1 Preamplifier, Connections for 600-Ohm Input

(e) Plug one type 356A-1 Preamplifier into J101.

(f) Plug one type 356A-1 Preamplifier into J102.

NOTE

If input impedance is other than 150-ohm balanced, the 356A-1 Preamplifier must be re-wired to match. See figure 7-2.

(g) Rewire one type 356A-1 Preamplifier for 600-ohm input as shown in figure 2-4 and plug into J105.

(h) Plug jumper P106 into J106.

(i) Plug jumper P107 into J107.

(j) Plug one type 356B-1 Program/Monitor Amplifier into J108. Set S301 at LOW position.

(k) Plug one type 356B-1 Program/Monitor Amplifier into J109. Set S301 at HIGH position.

(l) Close the front panel and tighten the knurled knobs at the upper corners.

2.2.3 INSTALLATION WIRING. - All connections to the 212F-1 Broadcast Console are made with screw-type terminals. ALL LOW-LEVEL AUDIO LINES SHOULD BE KEPT SEPARATE FROM THE POWER AND CONTROL WIRES. All wiring should be made with twisted shielded pairs. Audio lines should be No. 20 AWG twisted shielded pair. Studio circuit connections for signal lights should be made with No. 16 AWG twisted shielded pair. The following connections should be made to the numbered terminal strip, TB101, located on the base plate of the console. Refer to figure 7-1. Table 2-1 lists line connections and their appropriate terminal numbers.

NOTE

If no speaker is to be connected to a pair of terminals, a 600-ohm, 10-watt resistor should be connected in its place.

TABLE 2-1. CONNECTIONS TO TERMINAL STRIP TB101

LINE	TB101 TERMINAL NUMBERS
Low-level input line 1	1 and 2
Low-level input line 2	3 and 4
Low-level input line 3	5 and 6
Low-level input line 4	7 and 8
Low-level input line 5	9 and 10
Low-level input line 6	11 and 12
Low-level input line 7	13 and 14
Low-level input line 8	15 and 16
Remote line 1	19 and 20
Remote line 2	21 and 22
Remote line 3	23 and 24
Remote line 4	25 and 26
Program line	29 and 30
Cue	32 and 33
Speaker No. 1 (or 600 ohm 10 w resistor)	34 and 35
Speaker No. 2 (or 600 ohm 10 w resistor)	36 and 37
Speaker No. 3 (or 600 ohm 10 w resistor)	38 and 39
Speaker No. 4 (or 600 ohm 10 w resistor)	41 and 42
ON AIR No. 1	43 and 44

TABLE 2-1. CONNECTIONS TO TERMINAL STRIP TB101, (Cont)

LINE	TB101 TERMINAL NUMBERS
OFF AIR No. 1	43 and 45
ON AIR No. 2	46 and 47
OFF AIR No. 2	46 and 48
ON AIR No. 3	49 and 50
OFF AIR No. 3	49 and 51
ON AIR No. 4	52 and 53
OFF AIR No. 4	52 and 54
115 vac for 409X-1 Power Supply	57 and 58
115 vac for Studio Lights ON AIR-OFF AIR	59 and 60
All wire shields	17 and adjacent ground lug

2.3 INITIAL ADJUSTMENTS AND MODIFICATIONS.

2.3.1 GENERAL. - Initial adjustments of the 212F-1 Broadcast Console equipment consist only of the selection of input or output impedances, the selection of the gain level of the 356B-1 Program/Monitor Amplifiers, and adjustment of d-c voltage from the 409X-1 Power Supply.

2.3.2 SELECTION OF IMPEDANCES. - The 356A-1 Preamplifiers are factory wired for input impedance of 150 ohms and output of 600 ohms. When the 356A-1 is used as a booster or cuing amplifier, its input should be rewired for 600 ohms impedance as shown in figure 2-4. For other desired input or output impedances, refer to terminal connections indicated in figure 7-2.

NOTE

If 250-ohm balanced input to the 356A-1 is desired, connect a 2700-ohm resistor from 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. If unbalanced input is desired, these resistors are not used.

The 356B-1 Program/Monitor Amplifier is factory wired for 600-ohm input and output impedances. For other desired input or output impedances, refer to figure 7-3.

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

2.3.4 ADJUSTMENT OF 300 VOLTS D-C OUTPUT FROM TYPE 409X-1 POWER SUPPLY. - A screwdriver adjustment (R401) on top of the 409X-1 Power Supply chassis varies the d-c output voltage. Adjust R401 until the output voltage is 300 volts d-c.

2.3.5. INITIAL ADJUSTMENTS FOR USE OF 356E-1 LIMITER AMPLIFIER. - Figure 2-5A is a schematic of the VU-GR meter circuit as supplied. When the 356E-1 Limiter Amplifier is used with the 212F-1 Broadcast Console, the necessary adjustments are as follows:

a. Plug the 356E-1 Limiter Amplifier into J108.

b. Adjust the level of the signal input to the 356E-1 Limiter Amplifier until it is below threshold level. At this input level, the 356E-1 has no limiting action and produces full gain of 54 db.

c. Operate the VU-GR switch S116 to the GR position.

d. Adjust the zeroing potentiometer R176 for a zero reading on the GR meter. The GR meter will now indicate the amount in db by which an input signal exceeds the threshold point.

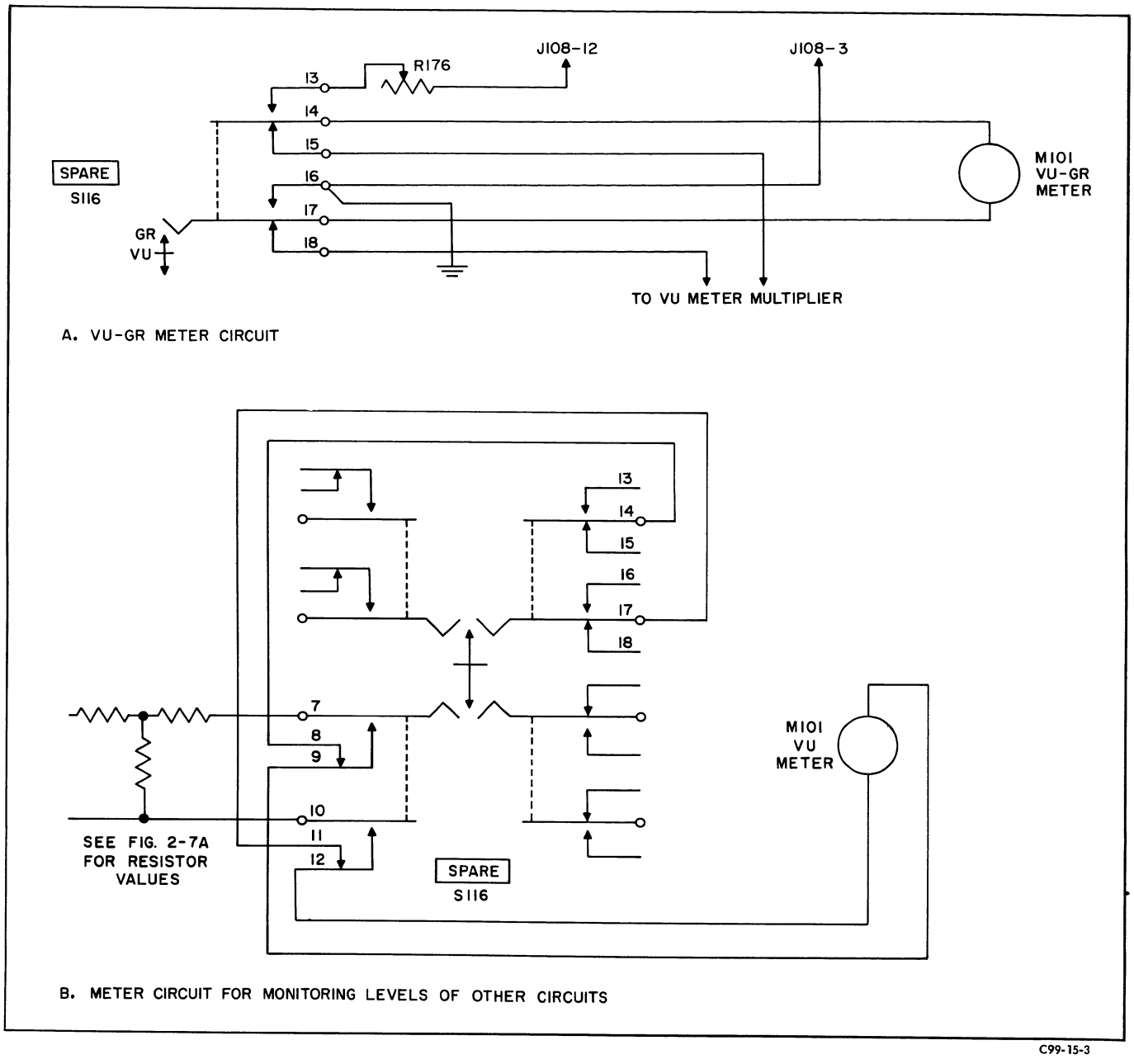

Figure 2-5. VU-GR Meter Switching Circuits

2.3.6 MODIFICATION OF VU METER SWITCHING CIRCUIT TO MONITOR LEVEL AT A SELECTED POINT. - If it is desirable to monitor the signal level at some point in the circuit other than the program line, the switching circuit for the VU meter may be connected as shown in figure 2-5B. If the level at the point selected is higher than +4 dbm, it will be necessary to insert a fixed pad between the meter and the circuit to be monitored. Figure 2-7A gives selected resistor values and circuit configuration for VU meter pads. Only calculated values of resistance are included, but the nearest standard value of resistance may be substituted without seriously affecting the attenuation through the pad.

2.3.7 RESISTOR VALUES FOR FIXED PADS. - Figure 2-7B lists values of calculated resistance for typical fixed pads. These pads may be inserted in the circuit as desired except in the VU meter circuit. Pads for the VU meter are discussed in the preceding paragraph. The nearest standard resistor values may be substituted for the calculated values in figure 2-7B.

2.3.8 SUGGESTED SWITCHING FUNCTIONS FOR S116 AND S117 SPARE SWITCHES. - Unused contacts of the SPARE switches S116 and S117 may be wired for switching the following functions:

(a) Override.

(b) Tape recorder.

(c) Headphones.

(d) VU meter.

(e) Auxiliary input or output circuits.

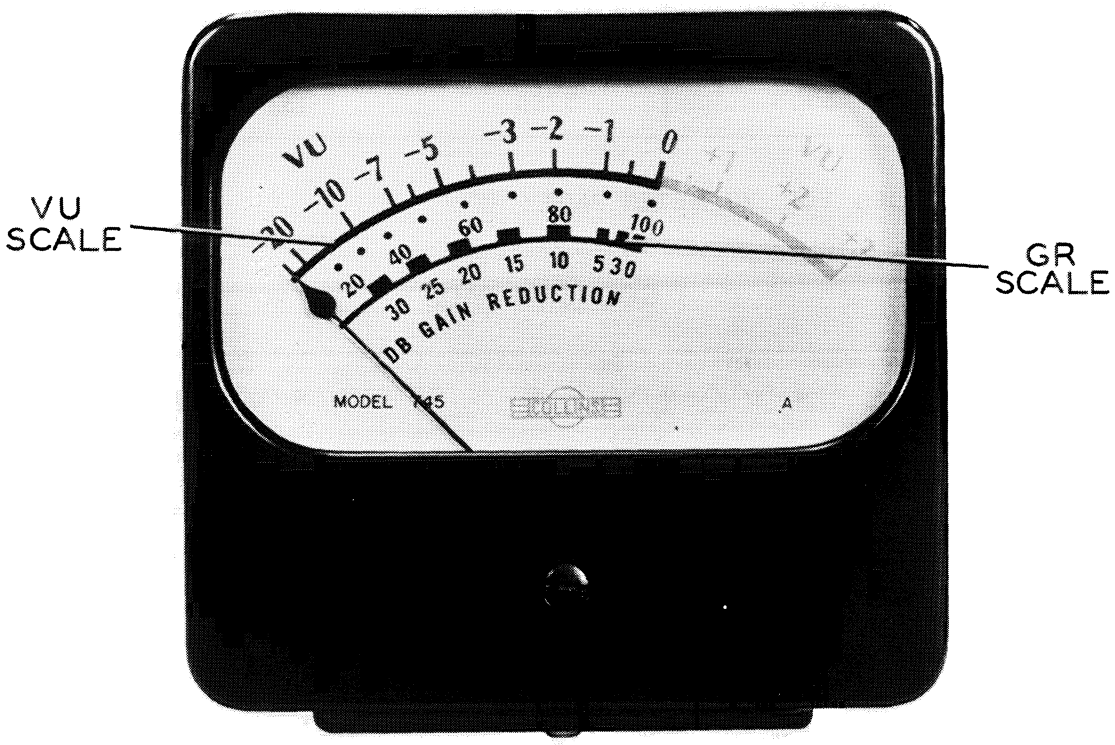

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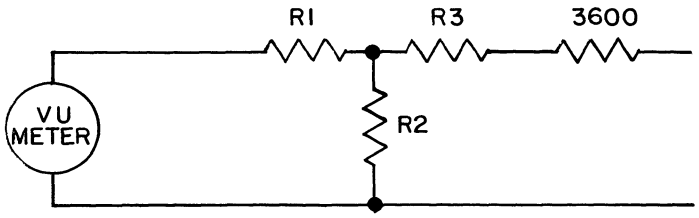
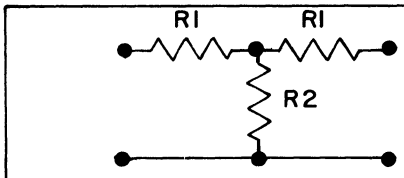
Figure 2-6. VU-GR Meter

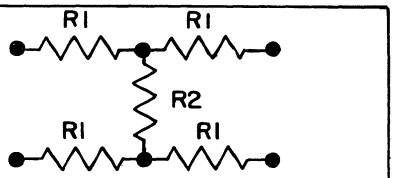


RESISTANCE VALUES IN OHMS				
LEVEL TO BE METERED	PAD LOSS FOR 0 VU READING	R 1	R 2	R 3
+4 DBM	0	0	OPEN	0
+10DBM	6DB	1296	5221	1296
+32DBM	28DB	3601	311	3601
+39DBM	35DB	3764	139	3764

A. RESISTANCE VALUES FOR VU METER PADS

600 OHM PADS





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

B. RESISTOR VALUES FOR 600 OHM PADS

C99-21-3

Figure 2-7. Resistor Values for Fixed Pads

SECTION III
OPERATION

3.1 MIXER CONTROLS.

The five large controls arranged in a line across the bottom of the 212F-1 panel are the mixer controls. The silk screening near the controls identify them as MIXER 1, MIXER 2, MIXER 3, MIXER 4, and REMOTE. These controls adjust the signal level fed to the program or audition lines.

3.2 MIXER SELECTOR SWITCHES.

Lettering on the panel identifies these switches as MIXER 1, MIXER 2, MIXER 3, MIXER 4, REMOTE A, and REMOTE B. These key switches are arranged in a line across the top of the panel and are color coded to match their companion mixer controls. Two spare key switches are provided at the right side of the panel to be used as desired in any custom wiring addition. The MIXER 1, 2, 3, and 4 switches each select one of two low-level input lines to be fed to the preamplifiers. Either REMOTE A or REMOTE B switches select one of two remote lines to be programed or auditioned. The panel lettering for these controls is on paper strips covered by plexiglass. These strips may be removed and any desired lettering inserted in their place.

3.3 PROGRAM/AUDITION SELECTOR SWITCHES.

To the right of each mixer control is located a program/audition selector switch. These switches are color coded to match their companion mixer controls. They are identified on the panel by a silk-screened "P" above and "A" below. These silk-screened letters indicate whether the input is being switched to program (P) or audition (A). The center position is "off."

3.4 GAIN CONTROLS.

The MONITOR gain control is located at the center of the left end of the panel directly above MIXER 1 control. The MASTER gain control is located at the center of the right end of the panel directly above the REMOTE mixer control. The MONITOR gain control adjusts the signal level introduced to the monitor amplifier and the MASTER gain control adjusts the signal level introduced to the program amplifier.

3.5 REMOTE FUNCTION SELECTOR SWITCHES.

The remote function selector switches are labeled REMOTE A and REMOTE B and are located above MIXER 4 control. Each has OFF, PHONE, CUE, and MIX positions. When either switch is in OFF position its mixer key switch is completely out of the circuit. When either switch is in PHONE position its remote line may be monitored in headphones. When either switch is in CUE position the cuing signal may be fed back into the remote line. When either switch is in MIX position the signal from its remote line may be mixed into the program line or the audition line.

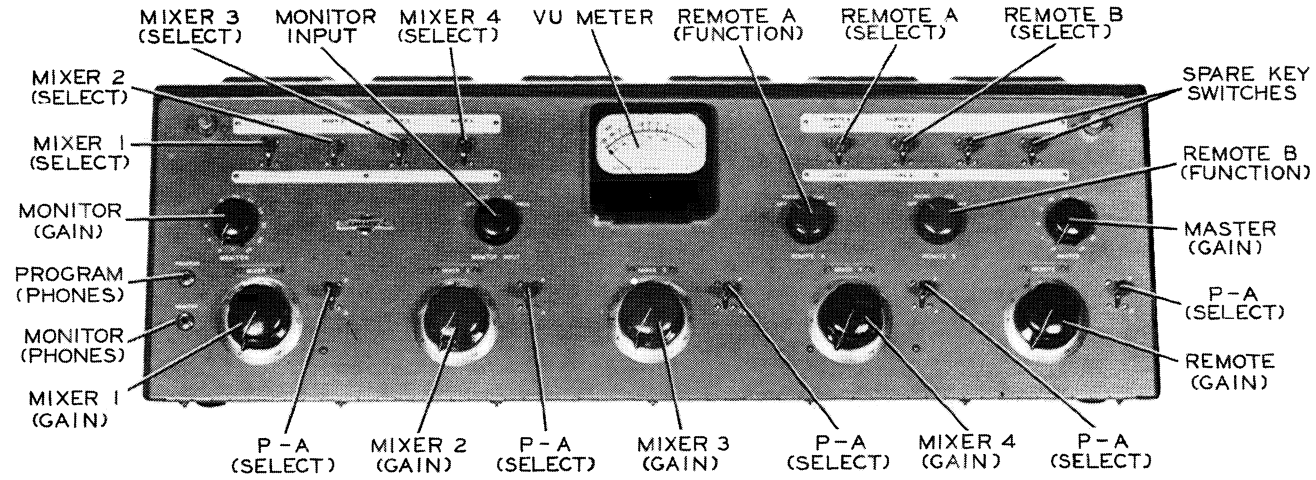


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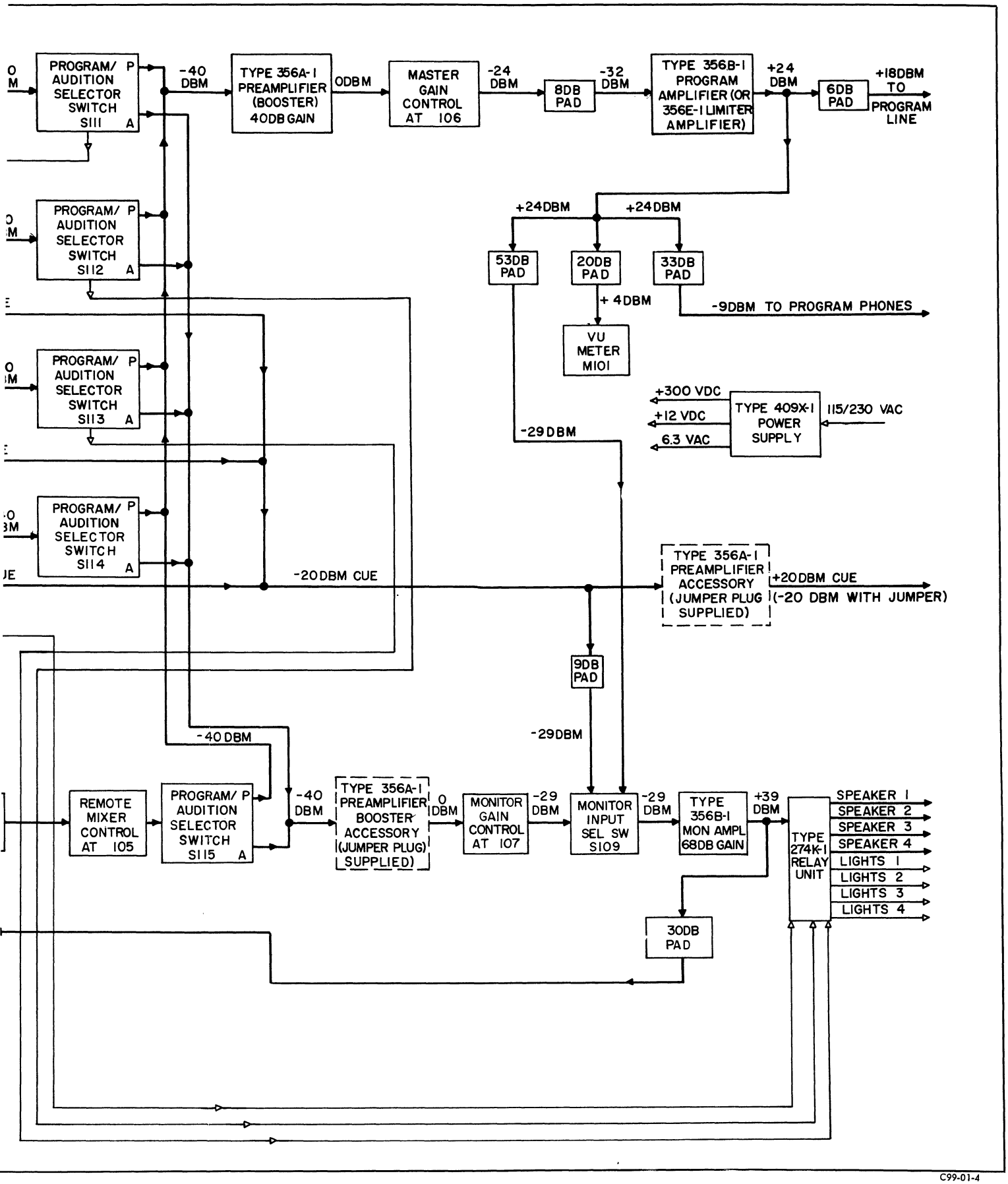
Figure 3-1. 212F-1 Broadcast Console, Panel Controls

3.6 MONITOR INPUT SWITCH.

The MONITOR INPUT switch is located above MIXER 2 control. It has four positions which are OFF, CUE, AUD, and PROG. When the MONITOR INPUT switch is in the OFF position, no signal is connected to the monitor amplifier input. When the switch is in CUE position and MIXER 2, 3, or 4 is set at 0, the cue signal from MIXER 2, MIXER 3, or MIXER 4 is connected to the input of the monitor amplifier. When the switch is in AUD position, signal from the audition mixer bus is connected to the monitor amplifier input. When the switch is in PROG position, signal from the program line is connected to the monitor amplifier input.

3.7 VU-GR SWITCH.

The VU-GR meter switch is located to the right of the REMOTE B switch. When the 356E-1 Limiter Amplifier is used, operation of the VU-GR switch to GR position provides a meter indication of the gain reduction accomplished in the 356E-1 Limiter Amplifier. When the switch is in center, or VU position the meter indicates the volume unit level at the program line.


PROGRAM/ AUDITION SELECTOR SWITCH S111 A
PROGRAM/ AUDITION SELECTOR SWITCH S112 A
PROGRAM/ AUDITION SELECTOR SWITCH S113 A
PROGRAM/ AUDITION SELECTOR SWITCH S114 A
-40 DBM
TYPE 356A-1 PREAMPLIFIER (BOOSTER) 40DB GAIN
0DBM
MASTER GAIN CONTROL AT 106
-24 DBM
8DB PAD
-32 DBM
TYPE 356B-1 PROGRAM AMPLIFIER (OR 356E-1 LIMITER AMPLIFIER)
+24 DBM
6DB PAD
+18DBM TO PROGRAM LINE
+24DBM
+24DBM
53DB PAD
20DB PAD
33DB PAD
+ 4DBM
-9DBM TO PROGRAM PHONES
VU METER M101
+300 VDC
+12 VDC
6.3 VAC
TYPE 409X-1 POWER SUPPLY
115/230 VAC
-29DBM
-20DBM CUE
TYPE 356A-1 PREAMPLIFIER ACCESSORY (JUMPER PLUG SUPPLIED)
+20DBM CUE (-20 DBM WITH JUMPER)
9DB PAD
-40DBM
-29DBM
REMOTE MIXER CONTROL AT 105
PROGRAM/ AUDITION SELECTOR SWITCH S115 A
-40 DBM
TYPE 356A-1 PREAMPLIFIER BOOSTER ACCESSORY (JUMPER PLUG) SUPPLIED)
0 DBM
MONITOR GAIN CONTROL AT 107
-29 DBM
MONITOR INPUT SEL SW S109
-29 DBM
TYPE 356B-1 MON AMPL 68DB GAIN
+39 DBM
TYPE 274K-1 RELAY UNIT
SPEAKER 1
SPEAKER 2
SPEAKER 3
SPEAKER 4
LIGHTS 1
LIGHTS 2
LIGHTS 3
LIGHTS 4
30DB PAD
C99-01-4

Diagram

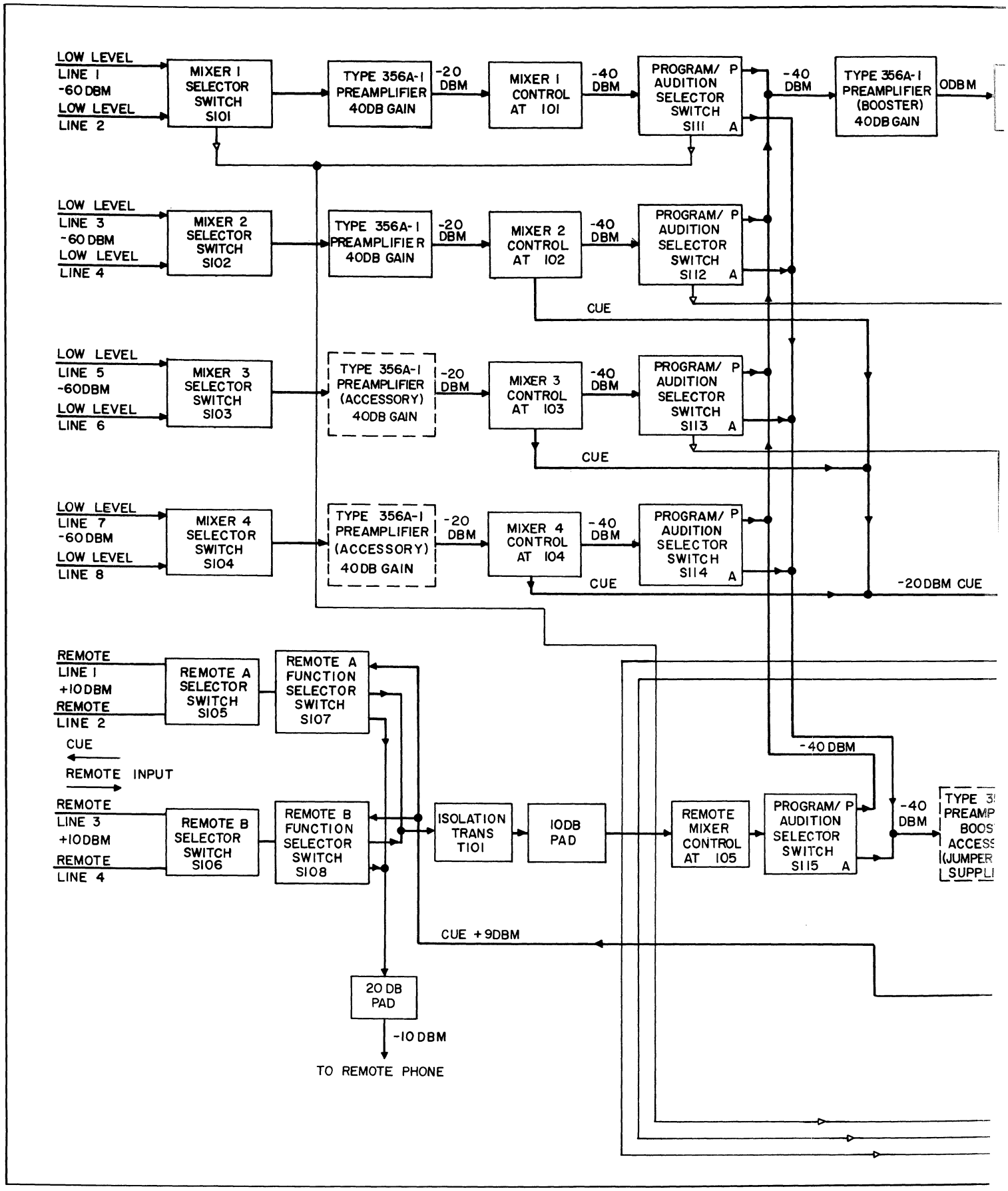


Figure 4-1. 212F-1 Broadcast Console, Block Diagram

SECTION IV
PRINCIPLES OF OPERATION

4.1 GENERAL.

4.1.1 PURPOSE OF EQUIPMENT. - The type 212F-1 Broadcast Console as supplied provides all facilities for centralized control for auditioning, rehearsing, cuing, and broadcasting simultaneously from any combination of two low-level inputs and one remote input.

4.1.2 BLOCK DIAGRAM. - Figure 4-1 is a block diagram of the 212F-1 console showing connections to low-level inputs, remote inputs, cue lines, program line, and station speakers and lights. Three independent input channels are provided, including two low-level microphone or transcription inputs selected from four low-level lines and one remote input selected from four remote lines. The type 356A-1 Preamplifiers indicated in the block diagram by dashed lines may be added to the equipment to provide two additional low-level inputs selected from four additional low-level lines. Output from the two-stage preamplifiers is passed through constant-impedance ladder-type attenuators before being switched to the program or audition lines. Connections for station speakers and warning lights are interlocked with the first mixer key switch (MIXER 1), and three P/A key switches (S111, S112, and S113). The power level of the program line is monitored continually by a VU meter. Transcription cuing signal from cue position on Mixers 2, 3 and 4 is available for headphone operation with the jumper plug P107 inserted in J107. If a 356A-1 preamplifier (wired for 600 ohm input) is plugged into J107, the power level is sufficient for cue speaker operation. If desired, these transcription cuing signals may be amplified by the 356B-1 Monitor Amplifier. Program cuing signal may be taken from the audition circuits and amplified by the monitor amplifier.

4.2 TYPE 409X-1 POWER SUPPLY CIRCUITS.

Refer to figure 7-4. The 409X-1 Power Supply operates from 115 or 230 vac, 60 cps, single-phase power source. It is factory wired for 115-volt operation but may be operated from a 230-volt source if transformer T401 primary terminals are connected as indicated in figure 2-3. The power supply is protected by fuse F401 in the transformer primary circuit and by F402 in the center-tap connection of the transformer high-voltage secondary winding. High-voltage d-c output is filtered by C401, C402, and L401. Output voltage may be adjusted from 250 volts d-c to 300 volts d-c by R401. A selenium rectifier CR401 provides 12 volts d-c for operation of relays. A-c power is supplied to CR401 from a winding on T401. This winding has a high-voltage tap to be used when necessary to compensate for aging of CR401. Approximately 30 volts positive bias is applied from a tap on the bleeder resistor to the 6.3 vac filament circuit. This minimizes a-c noise in the preamplifiers.

4.3 TYPE 356A-1 PREAMPLIFIER CIRCUITS.

Refer to figure 7-2. The 356A-1 Preamplifier is a two-stage amplifier factory-wired for 150-ohm balanced input and 600-ohm output. When the 356A-1 is used as a booster amplifier the input should be connected for 600 ohms (see figure 2-4). Negative feedback from a winding of T202 is applied to the cathode of V201. The output stage (V202) is triode connected. If other than 150-ohm input impedance is desired, see figure 7-2.

4.4 MIXER CIRCUITS.

Refer to figures 4-1 and 4-2. Three independent input circuits are provided. Two are low-level microphone or transcription inputs each having an individual two-stage preamplifier. Two additional low-level inputs may be added by plugging 356A-1 Preamplifiers into jacks J103 and J104. One remote input may be selected from four remote lines. The mixing circuits maintain correct impedance relationships at all times and the volume level in any specific circuit is independent of mixing and switching operations in other circuits. Attenuators AT101 through AT105 control the input levels to the mixing circuits. Each is a constant-impedance attenuator with 600/1200 impedance ratio. Resistors R126 through R135 compensate changes of impedance at the mixer bus when one or more of the attenuators is out of the circuit. Mixer controls and terminating resistors introduce approximately 12 db minimum loss. Contacts on the mixer and P/A key switches complete 12 volt d-c circuits to operate the speaker-and-signal-lights control relays K501, K502, K503 and K504. These circuits are interlocked to prevent program interruption.

If a transcription unit in use at the station is equipped with a preamplifier, the 356A-1 Preamplifier may be replaced by a jumper plug. The output of the transcription unit preamplifier combination then is connected directly to the attenuator (MIXER 1, 2, 3, or 4) in its channel for mixing into either program or audition lines.

4.5 PROGRAM CIRCUITS.

Refer to figures 3-1 and 4-3. Any signals keyed into the program line by the P/A key switches are applied to the input of the booster amplifier. This booster amplifier is a 356A-1 Preamplifier with its input terminals connected for 600 ohms as shown in figure 2-4. It is plugged into J105. Output from the booster amplifier is attenuated by the MASTER gain control (AT106). An 8-db pad consisting of R163, R164, and R165 is inserted between the MASTER gain control and the input to the 356B-1 Program Amplifier. Output from the program amplifier is isolated from this

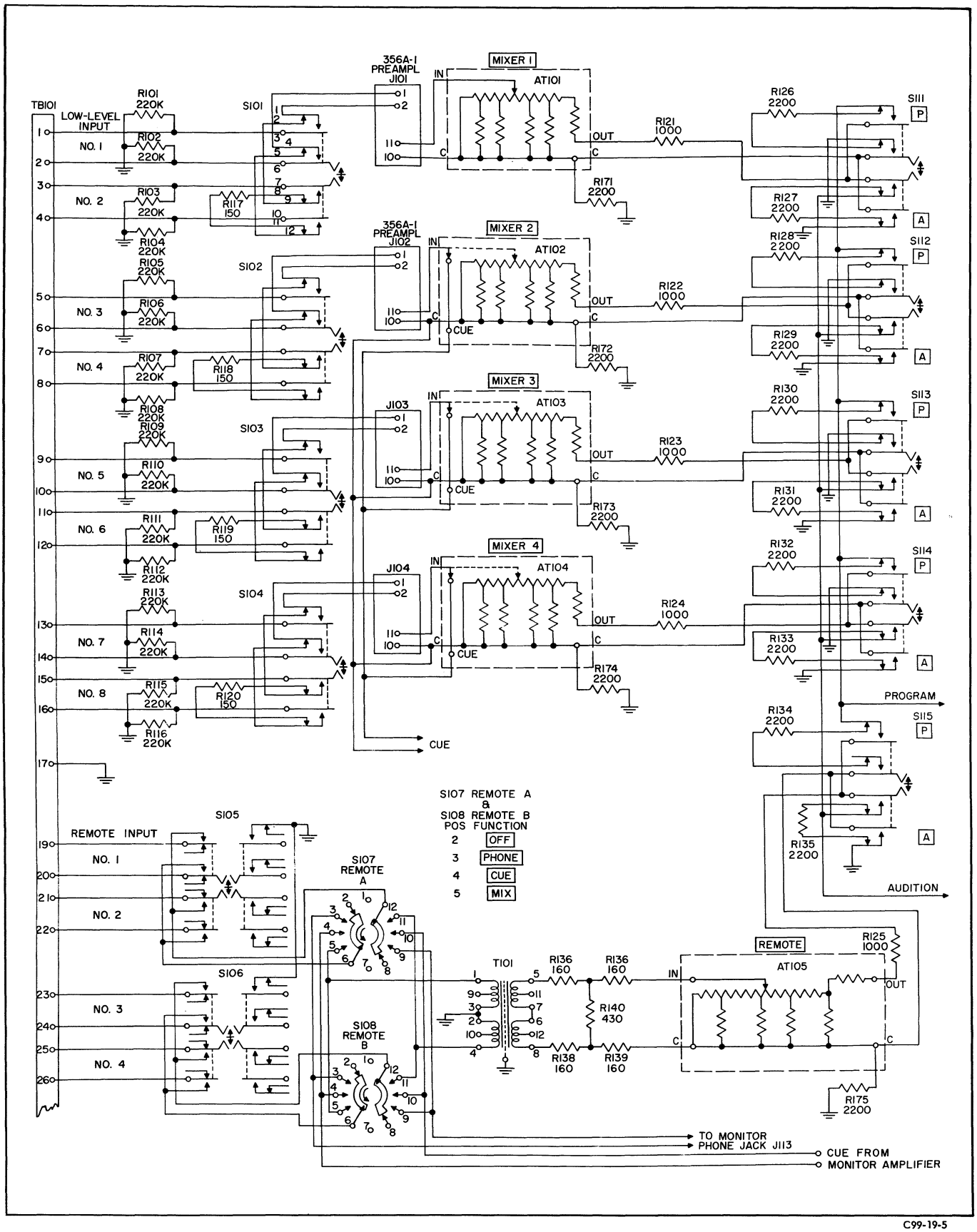


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Figure 4-2. Mixer Circuits, Simplified Schematic Diagram

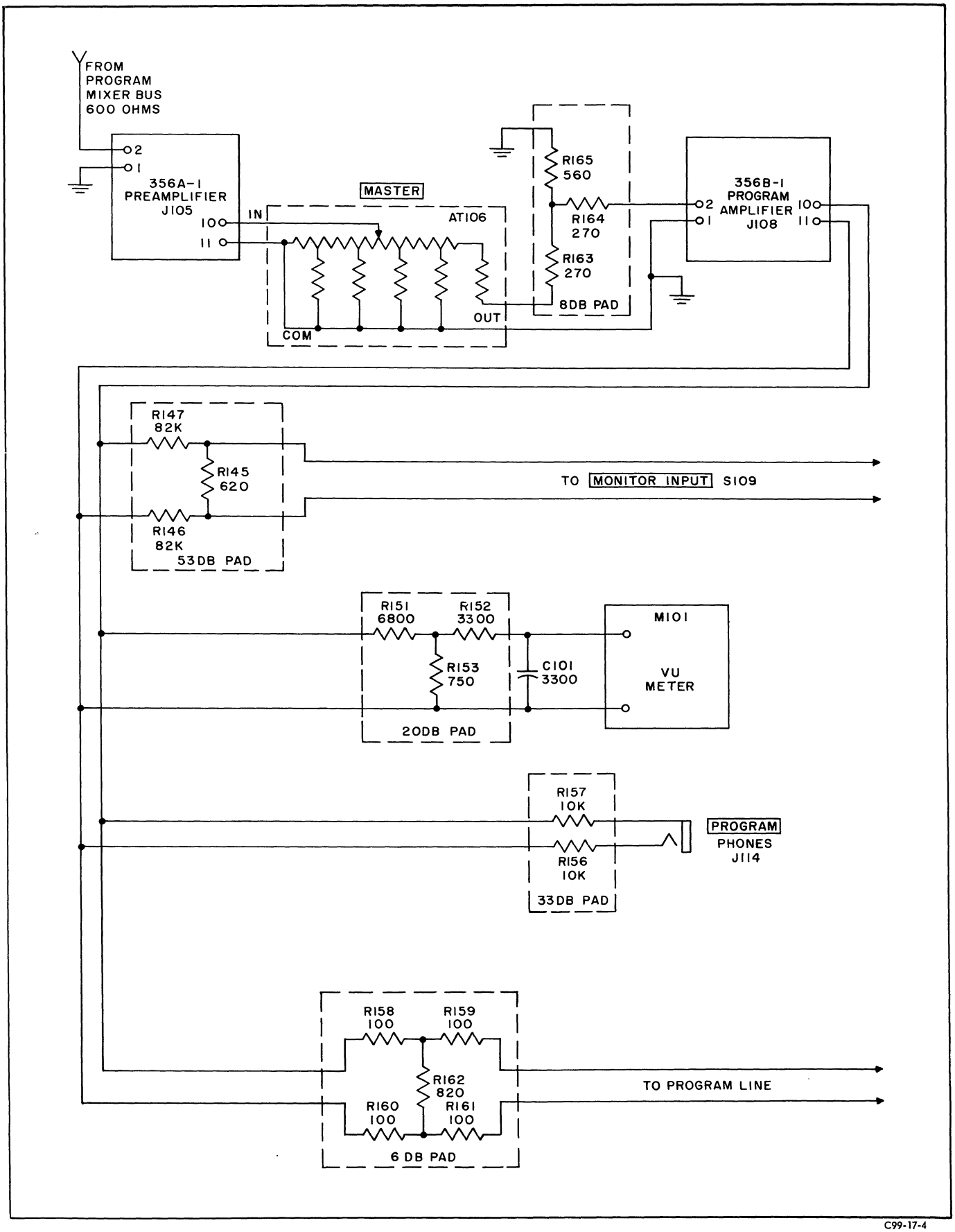


Figure 4-3. Program Circuits, Simplified Schematic Diagram

program line by a 6-db pad (R158 through R161). Nominal signal levels are: -40 dbm at the input to the booster amplifier, 0 dbm at the output of the booster amplifier, -32 dbm at the input to the program amplifier, +24 dbm at the output of the program amplifier and +18 dbm at the line. The circuits of the 356A-1 are described in paragraph 4.3. The 356B-1 Program Amplifier is a plug-in type three-stage amplifier. Switch S301 selects 68 db or 56 db gain. Negative feedback from a winding on output transformer T302 is applied to the cathode of V301. When S301 is in LOW position, R317 is shorted out. This increases the total negative feedback and reduces the gain. When the 356B-1 Program/Monitor Amplifier is used in the program line, S301 should be in the LOW position. The input amplifier is a pentode-connected type 5879 tube. The phase inverter is a triode-connected type 5879 tube and the output power amplifiers are two type 6V6 tubes in push-pull. Signal from the output of the program amplifier (+24 dbm) is applied through a 33-db pad to PROGRAM phone jack J114 where it may be monitored with headphones. Signal from the same point is applied through a 20-db pad to the VU meter (M101) for constant visual monitoring of program level. A +4 dbm level at the VU meter produces a meter reading of zero VU. Signal from the output of the program amplifier (+24 dbm) is applied through a 53-db pad to the MONITOR INPUT selector switch (S109) at a level of -29 dbm. The signal may be selected at this point as input to the 356B-1 Monitor Amplifier.

4.6 MONITOR CIRCUITS.

Refer to figures 4-4. The MONITOR INPUT selector (S109) has four positions: OFF, CUE, AUD, and PROG. When the switch is in OFF position the monitor amplifier input is disconnected from all other circuits. When the switch is in CUE position, cue signals from MIXER 2, MIXER 3, or MIXER 4 may be applied to the input of the monitor amplifier through a 9-db pad and the MONITOR INPUT switch.

Cue signal from the second, third, and fourth mixers is connected to terminals 32 and 33 of TB101 through J107 and jumper plug P107 for headphone monitoring. If desired, the signal level at this point may be raised to +20 dbm (100 mw) by plugging in a 356A-1 Preamplifier (input wired for 600 ohms) at J107. This produces sufficient output to drive a small speaker to be used for transcription cue. When the switch is in AUD position, signal from the audition line is connected through J106 and a jumper plug (P106) and applied through the MONITOR gain control to the input of the monitor amplifier. If more gain is desired for auditioning or rehearsal, a type 356A-1 Preamplifier may be wired for 600-ohm input and plugged into J106 instead of the jumper plug P106. Contacts in the 274K-1 Relay Unit control application of the monitor amplifier output to terminating resistors or station speakers. Cue signal may be introduced to remote lines from the output of the monitor amplifier through a 30-db fixed pad, the REMOTE A or REMOTE B selector switches and the REMOTE A or REMOTE B key switches. The level of the cue signal at the remote line is +9 dbm.

4.7 STUDIO SPEAKER AND LIGHTS CONTROL CIRCUITS.

Refer to figure 4-5. Mixer circuit key switch S101 and P/A key switches S111, S112, and S113 control application of 12 volts d-c to relays K501, K502, K503 and K504. These switches are interlocked electrically to prevent program interruption. The four speakers are operated from the 600-ohm output of the 356B-1 Monitor Amplifier. Resistors R501, R502, R503, and R504 are connected as terminating resistors when speakers are removed from the circuit. Contacts on relays K501, K502, K503, and K504 control the application of 115 vac to the ON AIR and OFF AIR warning lights.

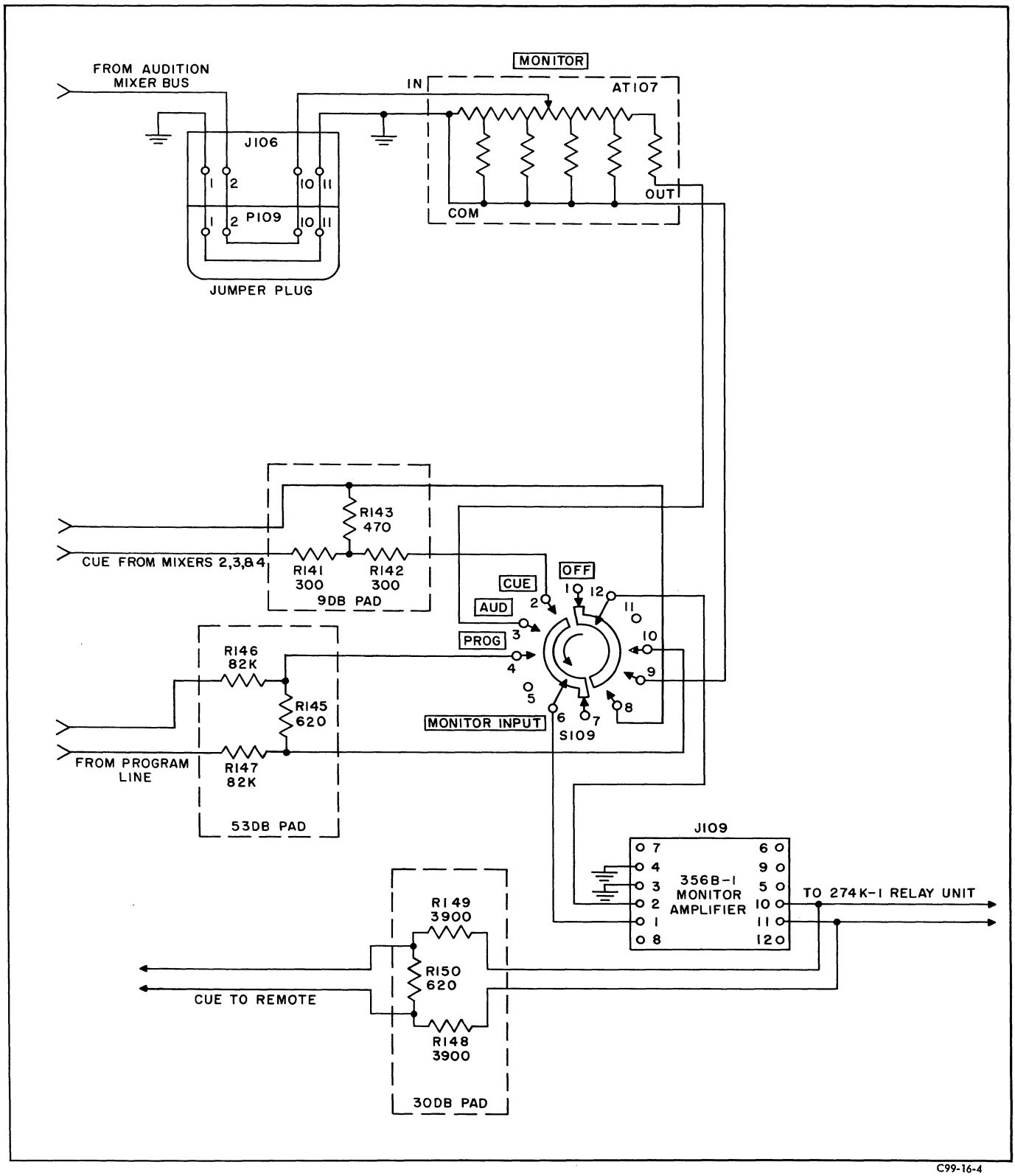


Figure 4-4. Monitor Circuits, Simplified Schematic Diagram

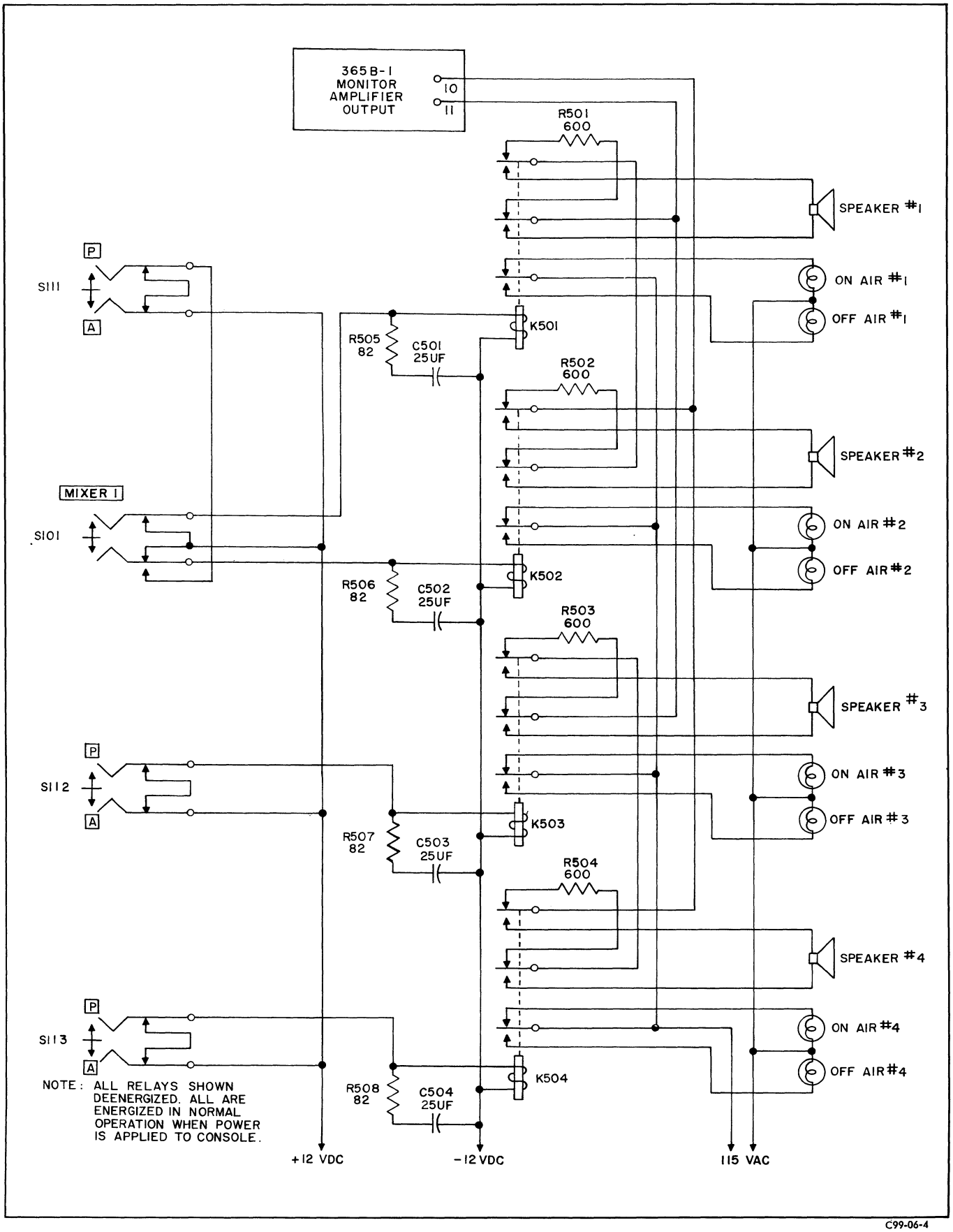


Figure 4-5. Speaker and Lights Control Circuits, Simplified Schematic Diagram

SECTION V
MAINTENANCE

5.1 PERIODIC INSPECTIONS AND PREVENTIVE MAINTENANCE.

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

(a) Remove the dust cover.

(b) Saturate a piece of lint-free cloth with carbon tetrachloride and wipe each contact and contact arm.

(c) Apply a thin film of contact lubricant such as Davenoil 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.

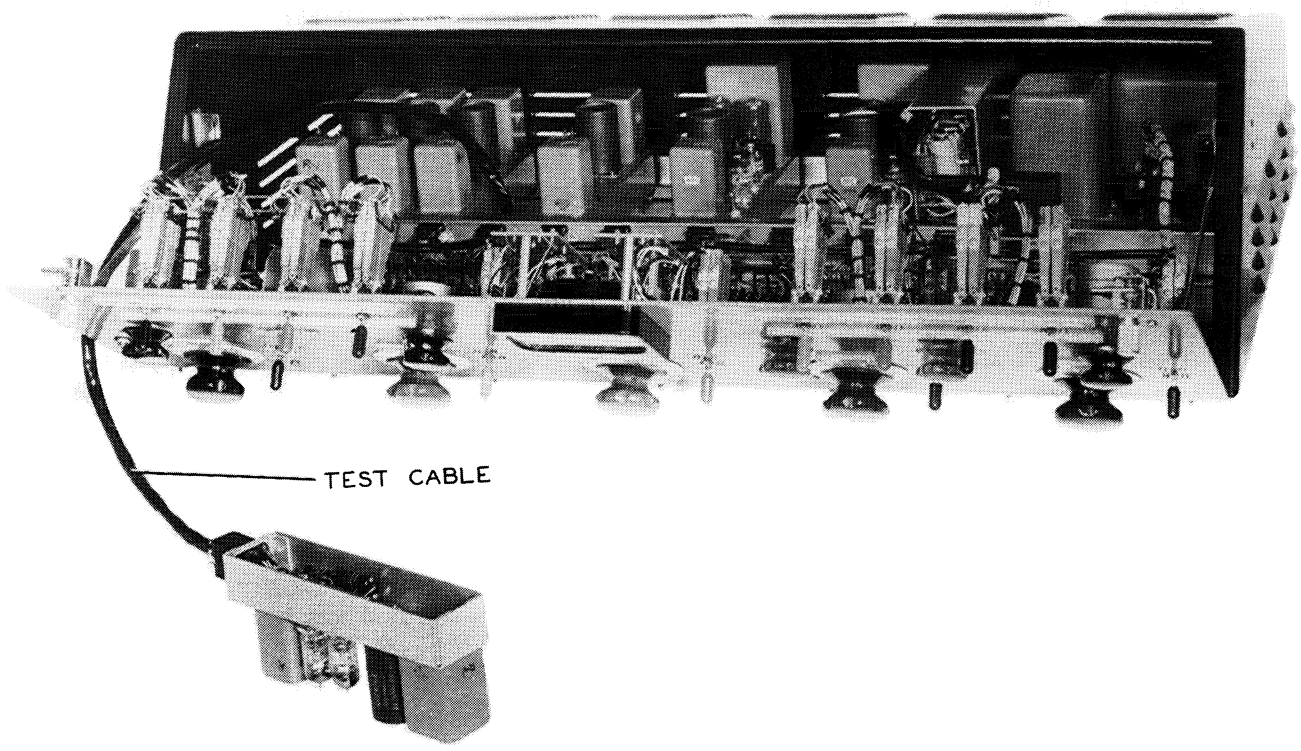
5.2 TROUBLE SHOOTING.

5.2.1 GENERAL. - A test cable is furnished with this equipment. When one of the modules is plugged into the test cable and the cable is plugged into the console, the module may be turned upside down for testing and maintenance. This arrangement is shown in figure 5-1.

NOTE

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

5.2.2 VOLTAGE AND RESISTANCE MEASUREMENTS. - The following tables give the voltages and resistances



534 2304

Figure 5-1. 212F-1 Broadcast Console, 356A-1 Preamplifier Connected to Test Cable

measured at all important points in the circuit. Voltages are measured with power applied as in normal operation using a 20,000 ohm-per-volt meter. All voltage readings are made at a line voltage of 115 vac and with the d-c supply voltage adjusted to 300 volts. Resistance measurements are made with no power applied. All measurements are taken between terminal and ground.

TABLE 5-1. 356A-1 PREAMPLIFIER VOLTAGE AND RESISTANCE MEASUREMENTS

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

TABLE 5-2. 356B-1 PROGRAM/MONITOR AMPLIFIER VOLTAGE AND RESISTANCE MEASUREMENTS

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

TABLE 5-3. 409X-1 POWER SUPPLY VOLTAGE AND RESISTANCE MEASUREMENTS

		Pin Number			
TUBE		2	4	6	8
V401 (5Y3)	DC V	380	0	0	380
	AC V	7	360	360	3
	Ohms	28K	36	36	28K
V402 (5Y3)	DC V	380	0	0	380
	AC V	7	360	360	3
	Ohms	28K	34	34	28K

5.2.3 REPLACEMENT OF METER LAMPS. - The two lamps in the VU meter (M101) are accessible from the front. Both are mounted on a bracket in the lower edge of the meter case. Remove the screw in the bottom edge of the meter face, remove the bracket, replace the lamps and replace the bracket.

5.2.4 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 V303 and V304.

SECTION VI
TABLE OF REPLACEABLE PARTS

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
AT101	Mixer No. 1	ATTENUATOR, variable: 600/1200 ohms impedance; 20 steps; 2 db each step, except last step, last step infinity	378 0368 00
AT102	Mixer No. 2	ATTENUATOR, variable: 600/1200 ohms impedance; 20 steps; 2 db each step, except last step, last step infinity	378 0367 00
AT103	Mixer No. 3	SAME as AT102	378 0367 00
AT104	Mixer No. 4	SAME as AT102	378 0367 00
AT105	Remote mixer	SAME as AT101	378 0368 00
AT106	Master gain control	ATTENUATOR, variable: 600/1200 ohms impedance; 20 steps; 2 db each step, except last step, last step infinity	378 0369 00
AT107	Monitor gain control	SAME as AT106	378 0369 00
C101	Meter filter	CAPACITOR: mica, 3330 uuf ±10%, 500 vdcw	935 4074 00
J101	Connector for pre-amplifier	CONNECTOR, receptacle: 12 flat polarized female contacts	366 2120 00
J102	Connector for pre-amplifier	SAME as J101	366 2120 00
J103	Connector for pre-amplifier	SAME as J101	366 2120 00
J104	Connector for pre-amplifier	SAME as J101	366 2120 00
J105	Booster connector	SAME as J101	366 2120 00
J106	Booster connector	SAME as J101	366 2120 00
J107	Cuing amplifier connector	SAME as J101	366 2120 00
J108	Program amplifier connector	SAME as J101	366 2120 00
J109	Monitor amplifier connector	SAME as J101	366 2120 00
J110	Relay unit connector	CONNECTOR, receptacle: 15 female contacts	366 2150 00
J111	Relay unit connector	SAME as J101	366 2120 00
J112	Power supply connector	CONNECTOR, receptacle: 12 female contacts	366 8120 00
J113	Monitor headphone jack	JACK TELEPHONE: midget, for a two conductor plug	358 1080 00
J114	Program headphone jack	SAME as J113	358 1080 00

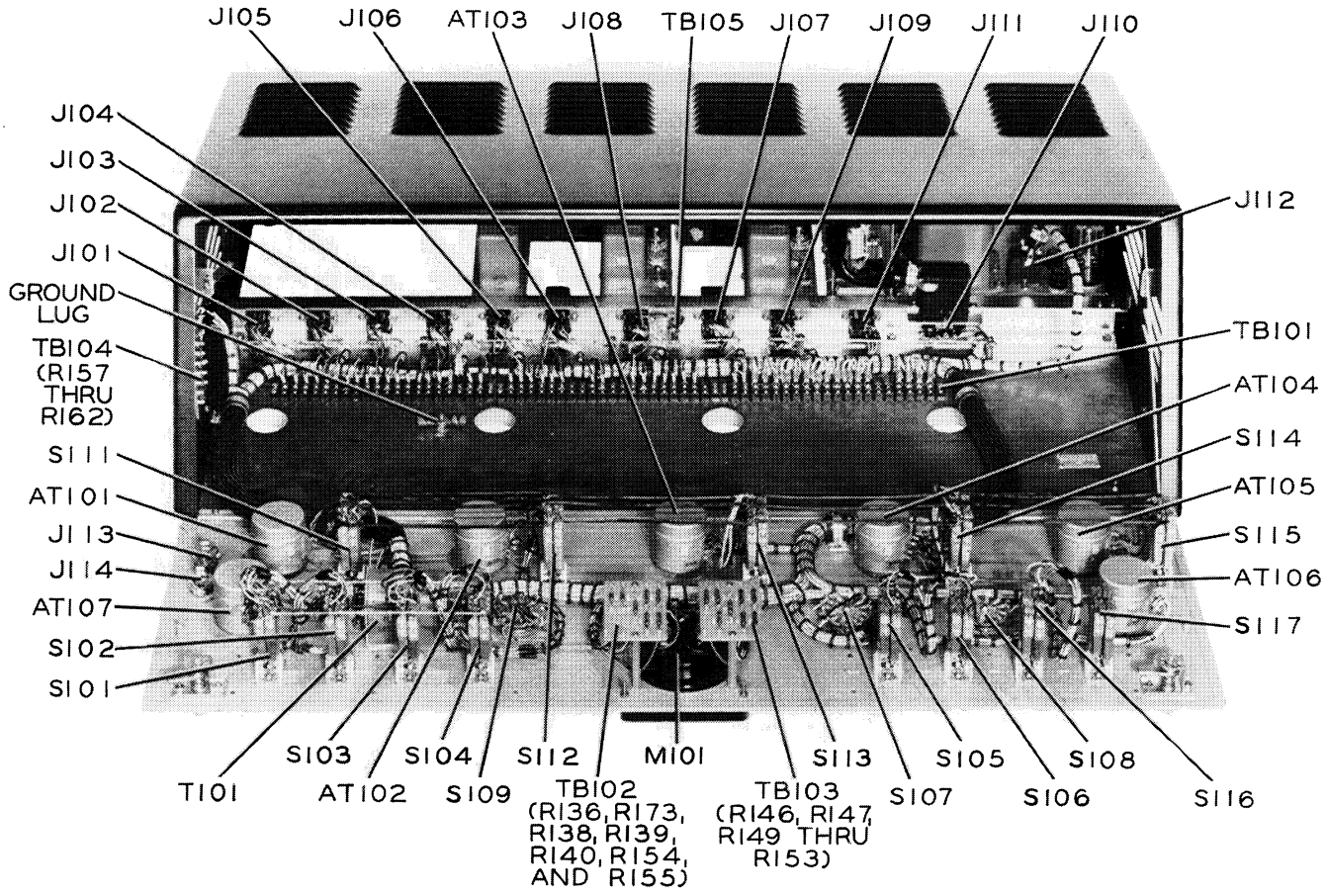


Figure 6-1. 212F-1 Broadcast Console, Panel Down

212F-1 STUDIO CONSOLE

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
M101	VU Meter	METER, voltmeter: scale to 0 thru -20 +3; total resistance of meter, and its external series resistor 7500 ohms; external series resistor 3600 ohms	456 0032 00
P106	Jumper plug	PLUG, jumper: 12 prong male connector	541 6459 002
P107	Jumper plug	SAME as P106	541 6459 002
		CABLE, ASSEMBLY: test cable for studio console; includes; P1501, P1502; one on each end	541 6473 003
P1501	Test cable connector	CONNECTOR, plug: 12 male contacts; cable connector with cover having a cable clamp on top; 1/2" dia hole in top	365 8120 00
P1502	Test cable connector	CONNECTOR, socket: 12 prong contacts; 1/2" hole in top of cap; cable clamp on top	366 8120 00
R101	Input terminating resistor	RESISTOR: comp, 0.22 megohm ±10%, 1/2 w	745 1450 00
R102	Same as R101	SAME as R101	745 1450 00
R103	Same as R101	SAME as R101	745 1450 00
R104	Same as R101	SAME as R101	745 1450 00
R105	Same as R101	SAME as R101	745 1450 00
R106	Same as R101	SAME as R101	745 1450 00
R107	Same as R101	SAME as R101	745 1450 00
R108	Same as R101	SAME as R101	745 1450 00
R109	Same as R101	SAME as R101	745 1450 00
R110	Same as R101	SAME as R101	745 1450 00
R111	Same as R101	SAME as R101	745 1450 00
R112	Same as R101	SAME as R101	745 1450 00
R113	Same as R101	SAME as R101	745 1450 00
R114	Same as R101	SAME as R101	745 1450 00
R115	Same as R101	SAME as R101	745 1450 00
R116	Same as R101	SAME as R101	745 1450 00
R117	Compensation for impedance	RESISTOR: comp, 150 ohms ±10%, 1/2 w	745 1317 00
R118	Same as R117	SAME as R117	745 1317 00
R119	Same as R117	SAME as R117	745 1317 00
R120	Same as R117	SAME as R117	745 1317 00

212F-1 STUDIO CONSOLE

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R121	Attenuator build-out	RESISTOR: comp, 1000 ohms ±10%, 1/2 w	745 1352 00
R122	Same as R121	SAME as R121	745 1352 00
R123	Same as R121	SAME as R121	745 1352 00
R124	Same as R121	SAME as R121	745 1352 00
R125	Same as R121	SAME as R121	745 1352 00
R126	Impedance compensating resistor	RESISTOR: comp; 2200 ohms ±10%, 1/2 w	745 1366 00
R127	Same as R126	SAME as R126	745 1366 00
R128	Same as R126	SAME as R126	745 1366 00
R129	Same as R126	SAME as R126	745 1366 00
R130	Same as R126	SAME as R126	745 1366 00
R131	Same as R126	SAME as R126	745 1366 00
R132	Same as R126	SAME as R126	745 1366 00
R133	Same as R126	SAME as R126	745 1366 00
R134	Same as R126	SAME as R126	745 1366 00
R135	Same as R126	SAME as R126	745 1366 00
R136	P/o 10 db pad	RESISTOR: comp, 160 ohms ±5%, 1/2 w	745 1319 00
R137	P/o 10 db pad	SAME as R136	745 1319 00
R138	P/o 10 db pad	SAME as R136	745 1319 00
R139	P/o 10 db pad	SAME as R136	745 1319 00
R140	P/o 10 db pad	RESISTOR: comp, 430 ohms ±5%, 1/2 w	745 1336 00
R141	P/o 9 db pad	RESISTOR: comp, 300 ohms ±5%, 1/2 w	745 1329 00
R142	P/o 9 db pad	SAME as R141	745 1329 00
R143	P/o 9 db pad	RESISTOR: comp, 470 ohms ±5%, 1/2 w	745 1337 00
R144		Not used	
R145	P/o 53 db pad	RESISTOR: comp, 620 ohms ±5%, 1/2 w	745 1343 00
R146	P/o 53 db pad	RESISTOR: comp, 82,000 ohms ±5%, 1/2 w	745 1432 00
R147	Same as R146	SAME as R146	745 1432 00
R148	P/o 30 db pad	RESISTOR: comp, 4700 ohms ±5%, 1/2 w	745 1379 00
R149	P/o 30 db pad	SAME as R148	745 1379 00
R150	P/o 30 db pad	SAME as R145	745 1343 00

212F-1 STUDIO CONSOLE

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R151	P/o 20 db pad	RESISTOR: comp, 6800 ohms ±5%, 1/2 w	745 1386 00
R152	P/o 20 db pad	RESISTOR: comp, 3300 ohms ±5, 1/2 w	745 1372 00
R153	P/o 20 db pad	RESISTOR: comp, 750 ohms ±5%, 1/2 w	745 1347 00
R154	P/o 20 db pad	RESISTOR: comp, 3300 ohm ±10%, 1/2 w	745 1373 00
R155	P/o 20 db pad	SAME as R154	745 1373 00
R156	P/o 33 db pad	RESISTOR: comp, 10,000 ohms ±10%, 1/2 w	745 1394 00
R157	P/o 33 db pad	SAME as R156	745 1394 00
R158	P/o 6 db pad	RESISTOR: comp, 100 ohms ±5%, 1/2 w	745 3309 00
R159	P/o 6 db pad	RESISTOR: comp, 100 ohms ±5%, 1/2 w	745 1309 00
R160	P/o 6 db pad	SAME as R159	745 1309 00
R161	P/o 6 db pad	SAME as R159	745 1309 00
R162	P/o 6 db pad	RESISTOR: comp, 820 ohms ±5%, 1/2 w	745 1348 00
R163	P/o 8 db pad	RESISTOR: comp, 270 ohms ±5%, 1/2 w	745 1327 00
R164	P/o 8 db pad	SAME as R163	745 1327 00
R165	P/o 8 db pad	RESISTOR: comp, 560 ohms ±5%, 1/2 w	745 1341 00
R166		Not used	
R167		Not used	
R168		Not used	
R169		Not used	
R170		Not used	
R171	Impedance compensating resistor	SAME as R126	745 1366 00
R172	Same as R171	SAME as R126	745 1366 00
R173	Same as R171	SAME as R126	745 1366 00
R174	Same as R171	SAME as R126	745 1366 00
R175	Same as R171	SAME as R126	745 1366 00
S101	Key switch for mixer No. 1	SWITCH, push-pull: one unit; 2 positions, locking both positions; 110 V 60 cps ac non-inductive; 3 amps 150 w	375 0017 00
S102	Key switch for mixer No. 2	SAME as S101	375 0017 00
S103	Key switch for mixer No. 3	SAME as S101	375 0017 00

212F-1 STUDIO CONSOLE

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
S104	Key switch for mixer No. 4	SAME as S101	375 0017 00
S105	Key switch for Remote A	SAME as S101	375 0017 00
S106	Key switch for Remote B	SAME as S101	375 0017 00
S107	Function selector for Remote A	SWITCH, rotary: 2 pole, 4 positions	259 0759 00
S108	Function selector for Remote B	SAME as S107	259 0759 00
S109	Function selector for monitor input	SWITCH, rotary: 2 pole, 4 positions	259 0758 00
S110		Not used	
S111	Key switch for Program or Audition	SAME as S101	375 0017 00
S112	Same as S111	SAME as S101	375 0017 00
S113	Same as S111	SAME as S101	375 0017 00
S114	Same as S111	SAME as S101	375 0017 00
S115	Same as S111	SAME as S101	375 0017 00
S116	Spare key-switch	SAME as S101	375 0017 00
S117	Same as S116	SAME as S101	375 0017 00
T101	Isolation transformer	TRANSFORMER AUDIO: primary 4 ma current; 10,000 ohms; secondary 40,000 ohms, 1600 v test	677 0180 00
TB101		BOARD, TERMINAL: phenolic bakelite, 9-1/2" lg; 1-1/8" w, over-all; 20 terminals; 9ty3	367 0118 00

365A-1 PREAMPLIFIER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C201		Not used	
C202	Screen bypass for V201	CAPACITOR: paper, 0.047 uf ±10%, 400 vdcw	931 0295 00
C203	Coupling, V201 output to V202 input	CAPACITOR: paper, 0.1 uf ±10%, 400 vdcw	931 0299 00
C204	Coupling, V201 output to V202 input	SAME as C203	931 0299 00
C205	C205A cathode bypass for V202, C205B cathode bypass for V201, C205C and C205D plate circuit decoupling	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; input, output and power	CONNECTOR, plug: 12 rectangular male contacts	365 2120 00
R201	Plate load for V201	RESISTOR: comp, 0.16 megohms ±5%, 1/2 w	745 1445 00
R202	p/o voltage divider for screen of V201	RESISTOR: comp, 0.10 megohms ±10%, 1/2 w	745 1436 00
R203	p/o voltage divider for screen of V201	RESISTOR: comp, 51,000 ohms ±5%, 1/2 w	745 1424 00
R204	Grid load for V201	RESISTOR: comp, 2.2 megohm ±10%, 1/2 w	745 1492 00
R205	Frequency compensating	RESISTOR: comp, 5.6 megohm ±10%, 1/2 w	745 1510 00
R206	Decoupling filter	RESISTOR: comp, 30,000 ohms ±5%, 1/2 w	745 1413 00
R207	Cathode bias for V202	RESISTOR: Comp, 910 ohms ±5%, 1/2 w	745 1350 00
R208	Cathode bias for V201	RESISTOR: comp, 2,200 ohms ±10%, 1/2 w	745 1366 00
R209	Voltage dropping	RESISTOR: comp, 9100 ohms ±5%, 1 w	745 3392 00
R210	Supplied for optional input impedance	RESISTOR: comp, 270 ohms ±10%, 1/2 w (separate) in a cloth bag	745 1328 00
R211	Supplied for optional input impedance	SAME as R210	745 1328 00
R212	Supplied for optional input impedance	RESISTOR: comp, 2700 ohms ±10%, 1/2 w (separate) in a cloth bag	745 1370 00
R213	Supplied for optional input impedance	SAME as R212	745 1370 00

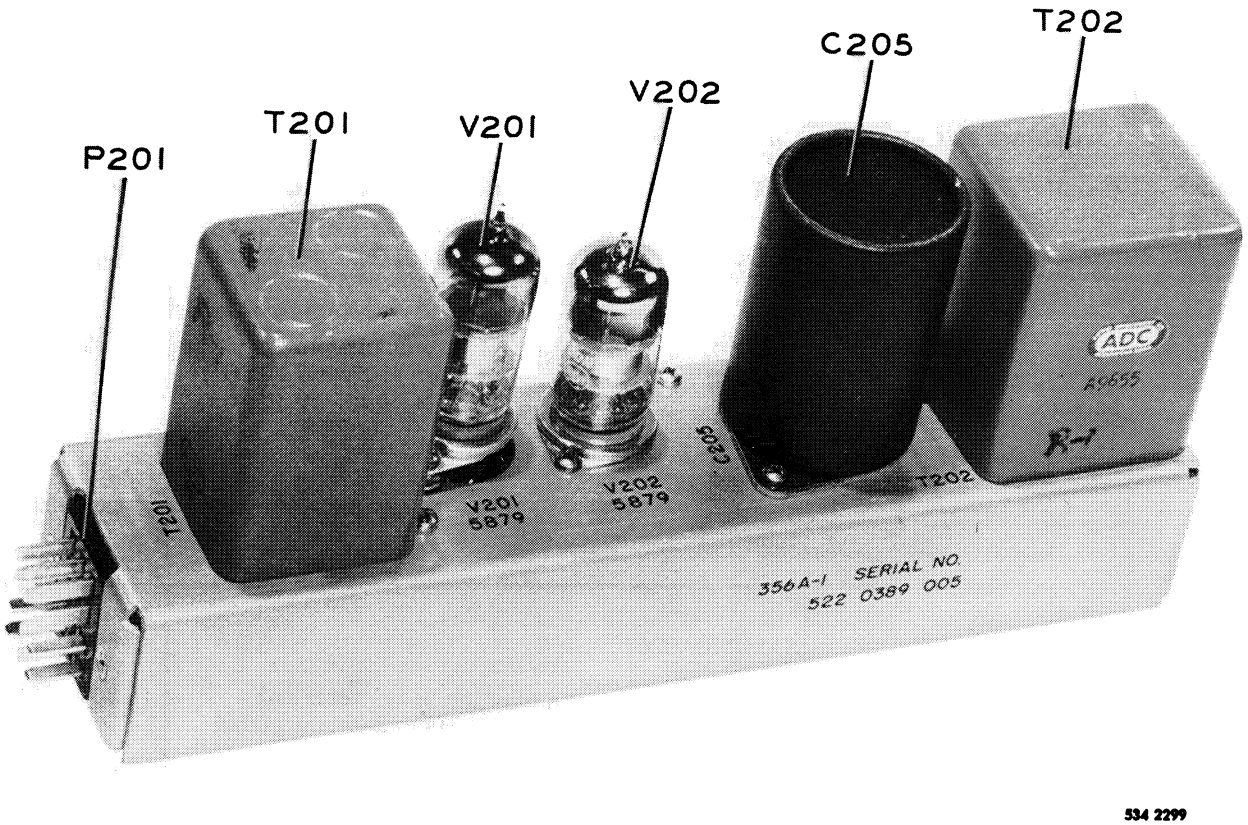


Figure 6-2. 356A-1 Preamplifier, Top View

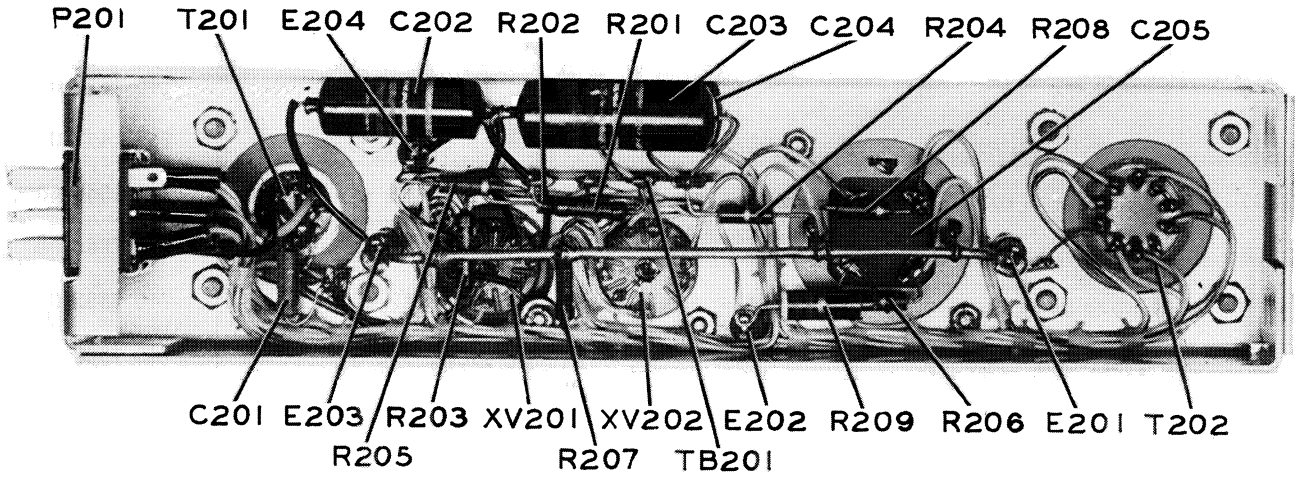


Figure 6-3. 356A-1 Preamplifier, Bottom View

365A-1 PREAMPLIFIER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
T201	Input transformer	TRANSFORMER, AF: input type; 600 ohms; primary impedance CT; 340 ohms primary impedance, 150 ohms CT; 37 ohms primary impedance; secondary 50,000 ohms	667 0220 00
T202	Output transformer	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, shielded between primary and secondary; grounded	667 0221 00
TB201		BOARD, TERMINAL: phenolic PBG, 5 solder lug terminals	306 0550 00
V201	Input amplifier	TUBE, electron: pentode 5879	257 0104 00
V202	Output amplifier	Same as V201	257 0104 00
XV201		SOCKET, tube: 9 contact miniature	220 1274 00
XV202		SOCKET, tube: 9 contact miniature	220 1274 00

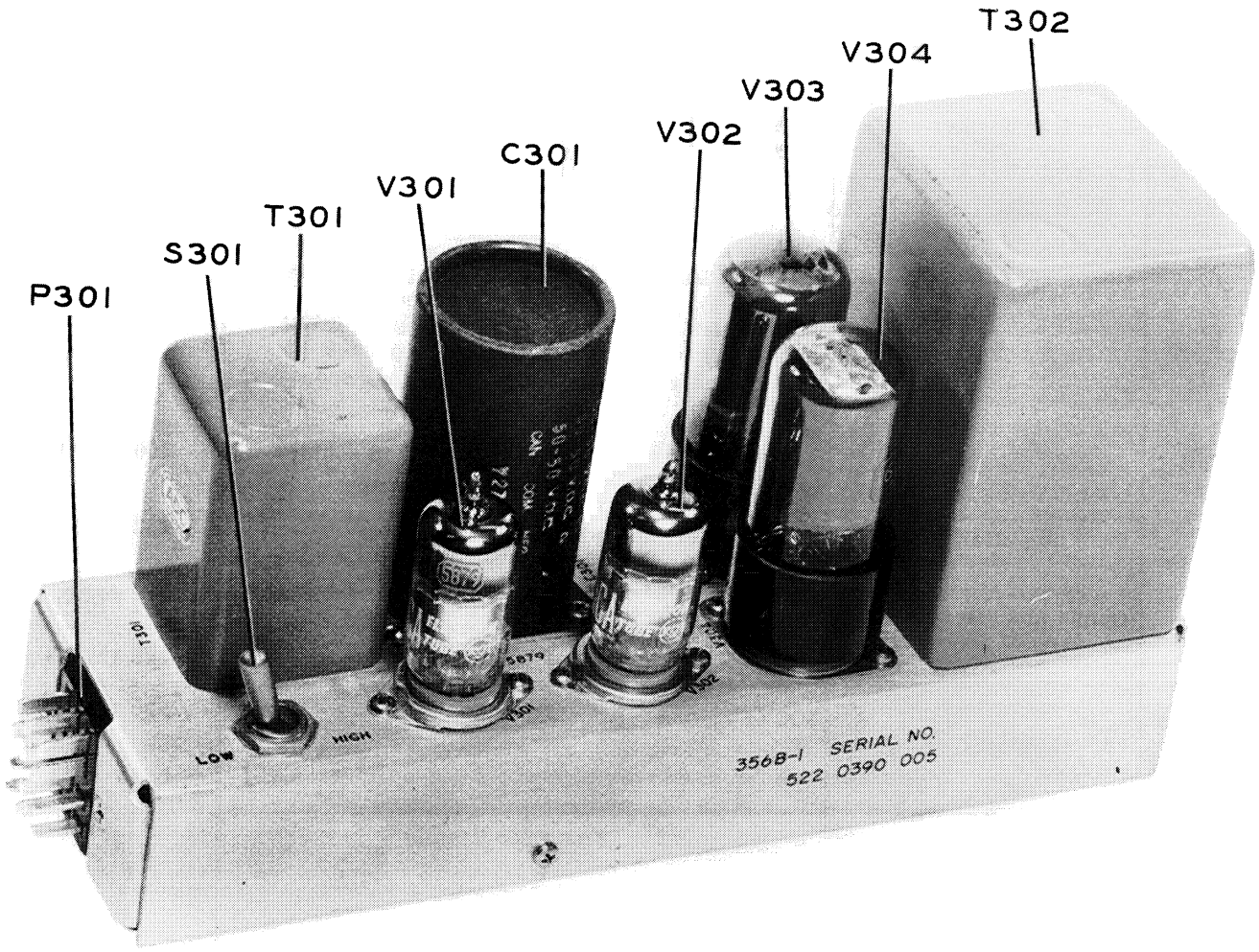


Figure 6-4. 356B-1 Program/Monitor Amplifier Top View

534 2301

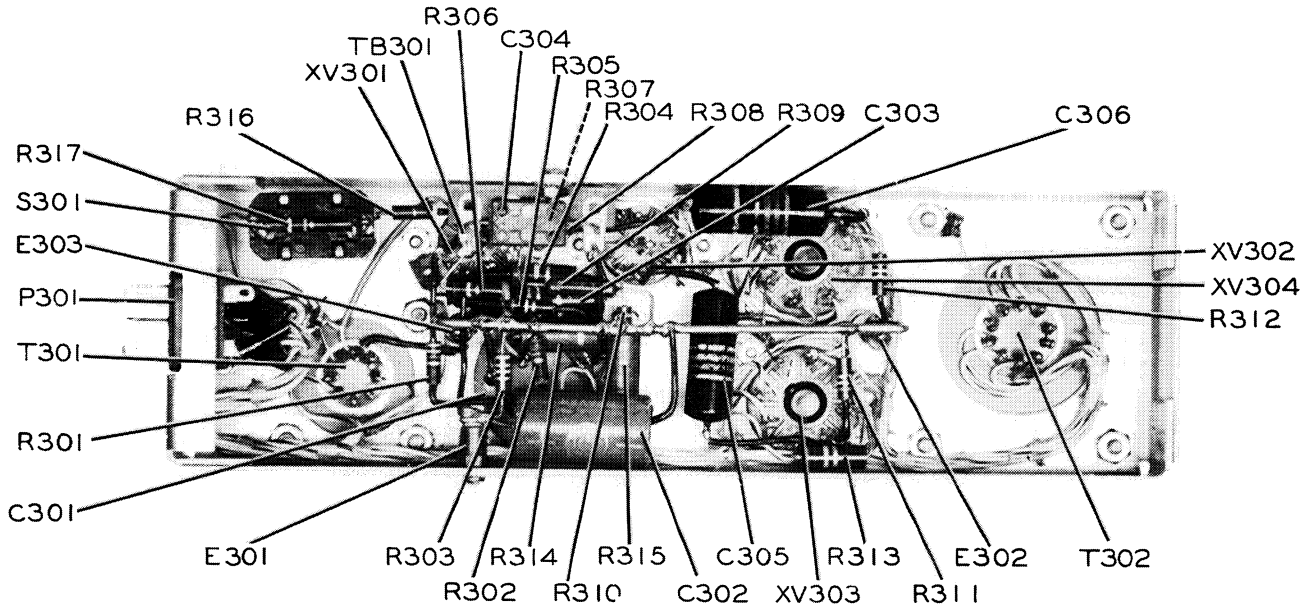


Figure 6-5. 356B-1 Program/Monitor Amplifier, Bottom View

534 2307

356B-1 PROGRAM/MONITOR AMPLIFIER

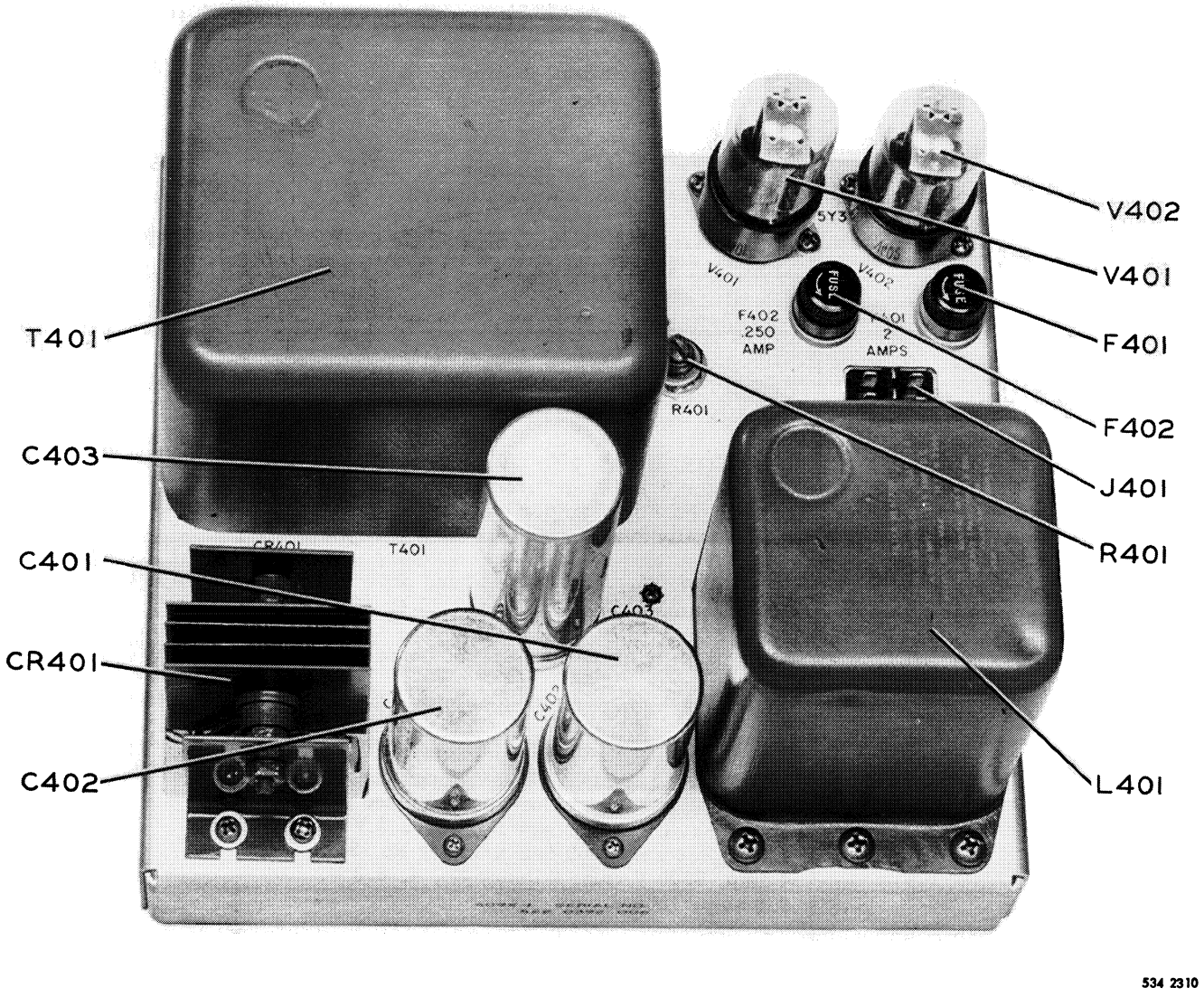
ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C301, C301A, C301B, C301C, C301D	Cathode bypass for V301 Decoupling filter Cathode bypass for V303 Cathode bypass for V304	CAPACITOR: dry electrolytic, quadruple sections, section No. 1, 40 uf, 450 V dc, section No. 2, 50 uf 50 Vdc, section No. 3, 50 uf, 50 V dc, section No. 4, 50 uf, 50 V dc capacity tolerance -10% +250% each section	183 1261 00
C302	Screen bypass for V301	CAPACITOR: electrolytic, 4 uf -15% +100%, 250 vdcw	183 1209 00
C303	Coupling from V301 to V302	CAPACITOR: paper, 0.047 uf ±10%, 400 vdcw	931 0295 00
C304	P/o frequency compensating networks	CAPACITOR: mica, 82 uuf ±10%, 500 vdcw	935 0170 00
C305	Coupling from V302 to V303	SAME as C303	931 0295 00
C306	Coupling from V302 to V304	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	CONNECTOR: plug, 12 rectangular male contacts	365 2120 00
R301	P/o cathode bias for V301	RESISTOR: comp, 330 ohms ±10%, 1/2 w	745 1331 00
R302	P/o cathode bias for V301	RESISTOR: comp, 1100 ohms ±5%, 1/2 w	745 1354 00
R303	P/o voltage divider for V301 screen	RESISTOR: comp, 33,000 ohms ±10%, 1/2 w	745 1415 00
R304	P/o voltage divider for V301 screen	RESISTOR: comp, 0.10 megohm ±10%, 1/2 w	745 1436 00
R305	Plate load for V301	RESISTOR: comp, 0.10 megohm ±10%, 1 w	745 3436 00
R306	P/o frequency compensating network	RESISTOR: comp, 0.20 megohm ±5%, 1/2 w	745 1448 00
R307	Grid load for V302	RESISTOR: comp, 1.0 megohm ±10%, 1/2 w	745 1478 00
R308	Cathode bias for V302	RESISTOR: comp, 2000 ohms ±5%, 1/2 w	745 1364 00
R309	Cathode load for V302	RESISTOR: comp, 22,000 ohms ±5%, 1/2 w	745 1407 00
R310	Plate load for V302	RESISTOR: comp, 24,000 ohms ±5%, 1/2 w	745 1410 00
R311	Grid load for V303	RESISTOR: comp, 0.56 megohm ±10%, 1/2 w	745 1468 00
R312	Grid load for V304	SAME as R-311	745 1468 00

356B-1 PROGRAM/MONITOR AMPLIFIER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
R313	Decoupling filter	RESISTOR: comp, 15,000 ohms ±10%, 1 w	745 3401 00
R314	Cathode bias for V303	RESISTOR: comp, 510 ohms ±5%, 2 w	745 5640 00
R315	Cathode bias for V304	SAME as R-314	745 5640 00
R316	P/o inverse feedback circuit	RESISTOR: comp, 9,100 ohms ±5%, 1/2 w	745 1392 00
R317	P/o inverse feedback circuit	RESISTOR: comp, 91,000 ohms ±5%, 1/2 w	745 1434 00
S301	Selects high or low gain	SWITCH, toggle: spst, 30 V dc 20 amps in locking position	266 3072 00
T301	Input transformer	TRANSFORMER AF: input type, 600 ohms primary impedance CT; 340 ohms primary impedance, 150 ohms CT; 37 ohms primary impedance; secondary 50,000 ohms	667 0220 00
T302	Output transformer	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 shielded between primary and secondary, grounded	667 0222 00
TB301		BOARD, TERMINAL: component mtg; four solder lug terminals; terminals 3/8 in. between centers; brown bakelite board	306 2230 00
V301	Input amplifier	TUBE, electron: pentode, 5879	257 0104 00
V302	Phase inverter	SAME as V301	257 0104 00
V303	Output amplifier	TUBE, electron: tetrode amplifier, 6V6GT	255 0021 00
V304	Output amplifier	SAME as V303	255 0021 00
XV301		SOCKET, tube: 9 pin miniature	220 1274 00
XV302		SAME as XV301	220 1274 00
XV303		SOCKET, tube: 8 pin octal	220 1005 00
XV304		SAME as XV303	220 1005 00

409X-1 POWER SUPPLY

ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
C401	+300 volt filter	CAPACITOR: electrolylic, dual section; section No. 1, 40 uf -10% +50%, 450 vdcw; section No. 2, 40 uf -10% +50%, 450 vdcw	183 1259 00
C402	+300 volt filter	SAME as C401	183 1259 00
C403	+12 volt filter	CAPACITOR: electrolytic, 1100 uf, 25 vdcw	184 2000 00
CR401	12 volt rectifier	RECTIFIER, metallic: selenium, single phase; nominal input voltage 13.5 V rms 60 cps; output load 1.0 amps dc	353 0254 00
E401		TERMINAL, stud: melamine body, brass term tinned, brass base, cadmium plated, hex	306 0233 00
F401		FUSE, cartridge: 2 amp, blowing time, life at 110%, 125 V, glass body	264 0008 00
F402		FUSE, cartridge: 1/4 amp, blowing time, life at 110%, 250 V nom; glass body	264 4020 00
P401	Connector	CONNECTOR, plug: 12 rectangular male contacts	365 2120 00
L401	Filter choke	REACTOR, filter: 100/120 cps frequency; 4 min inductance 0.275 amp current; 100 ohms max; ceramic bushings; solder lug terminals; hermetically sealed case	678 0315 00
R401	Output voltage adjustment	RESISTOR, rheostat: wire wound power type; 2500.0 ohms ±10%, 50 w min at 25°C	736 0231 00
R402	P/o bleeder	RESISTOR: wire wound, 25,000 ohms ±10%, 10 w	710 1254 20
R403	P/o bleeder	RESISTOR: comp, 2700 ohms ±10%, 2 w	745 5670 00
T401	Power transformer	TRANSFORMER, power: primary No. 1, 115 V; primary No. 2, 115 V, 230 V when connected, 1000 rms; secondary No. 1, 680 V, 250 ma dc, 2500 rms, CT; secondary No. 2, 13.5 V tap at 1.5 V, 1.0 amp 1000 rms primary No. 3, 5.0 V, 4 amp, 2500 V rms; primary No. 4, 6.3 V, 6.0 amp, 1000 V rms, CT	662 0219 00
V401	Rectifier	TUBE, electron: rectifier 5Y3GT	255 0157 00
V402	Rectifier	SAME as V401	255 0157 00
XF401		FUSEHOLDER: extractor post; for 3AG fuses; 15 amp nominal current rating	265 1003 00
XF402		Same as XF401	265 1003 00
XV401		SOCKET, tube: 8 pin octal	220 1121 00
XV402		SAME as XV407	220 1121 00



534 2310

Figure 6-6. 409X-1 Power Supply, Top View

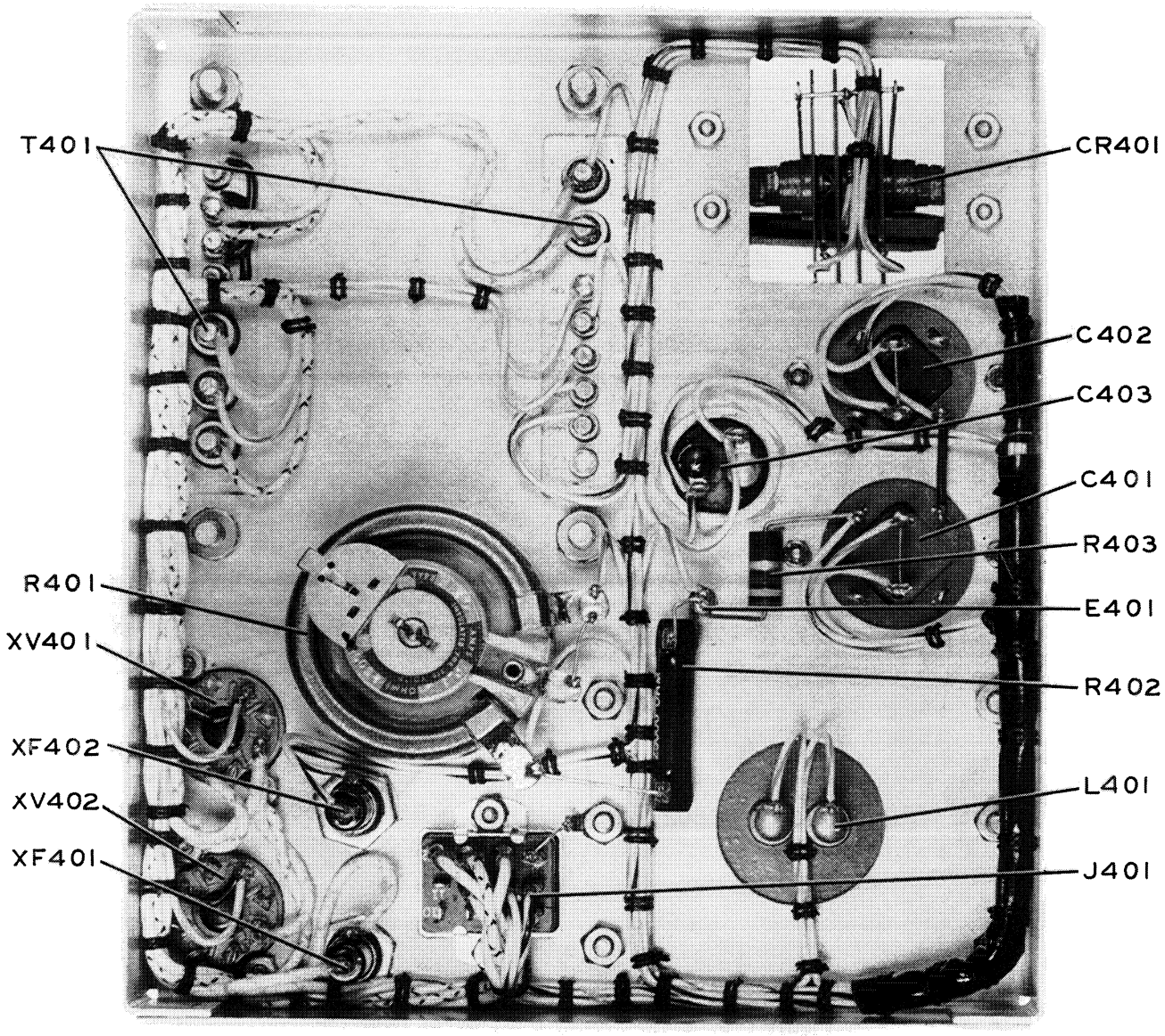


Figure 6-7. 409X-1 Power Supply, Bottom View

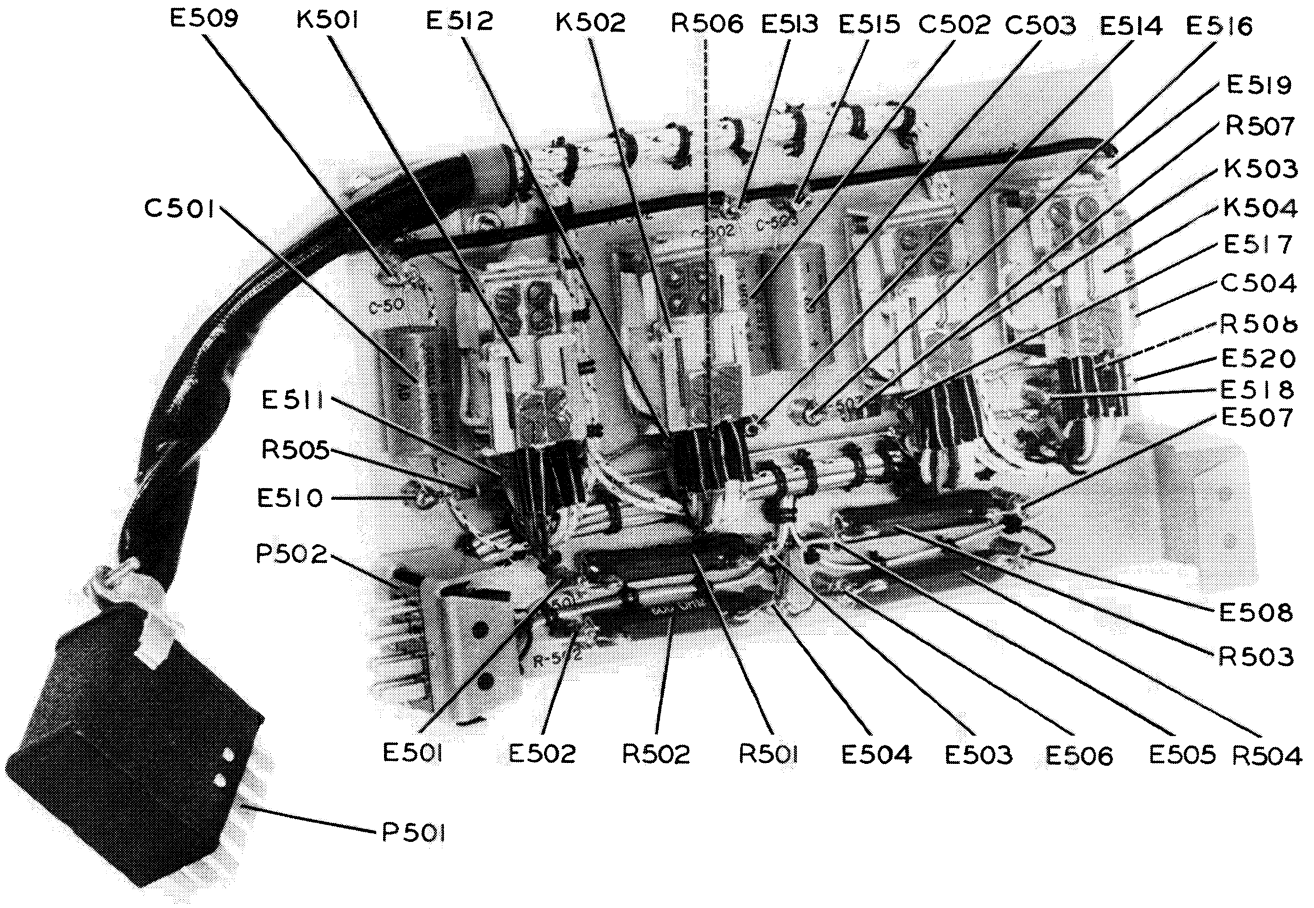


Figure 6-8. 274K-1 Relay Unit, Cover Removed

274K-1 RELAY UNIT

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

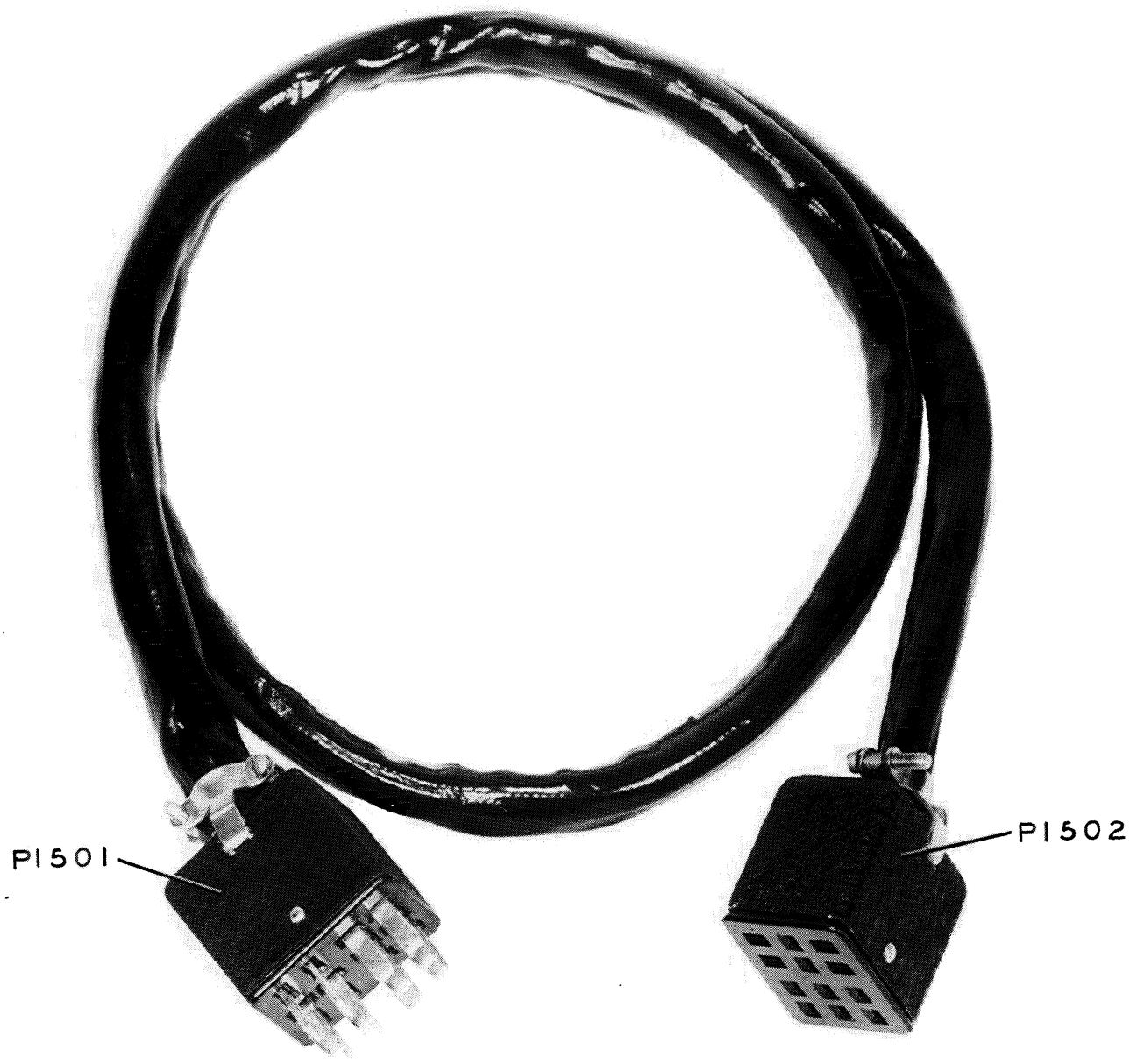
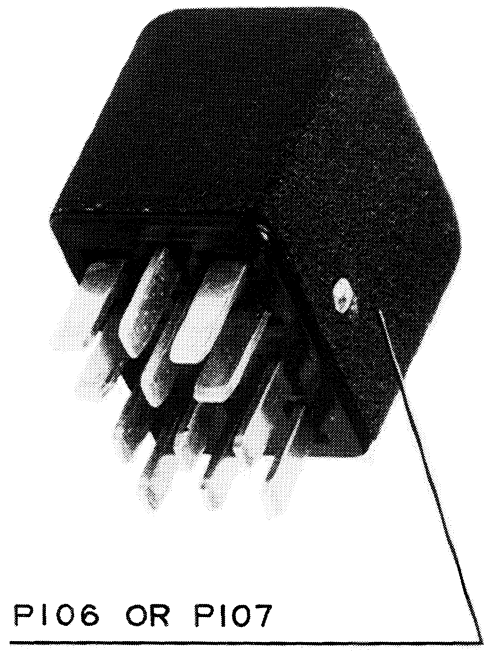


Figure 6-9. Test Cable

274K-1 RELAY UNIT

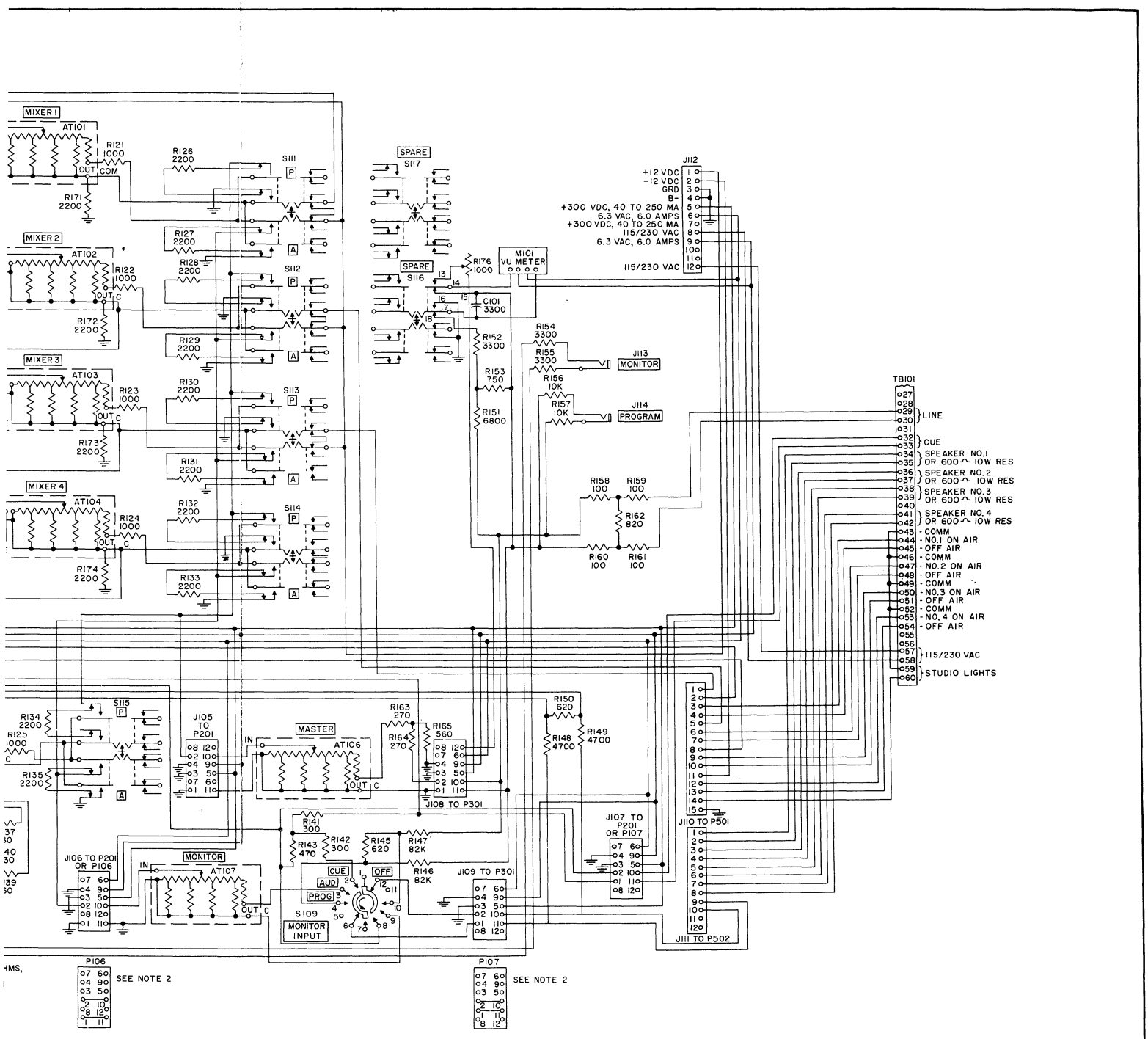
ITEM	CIRCUIT FUNCTION	DESCRIPTION	COLLINS PART NUMBER
K504	Speaker control relay	SAME as K501	970 1139 00
P501	Connector	CONNECTOR, plug: 15 prong contacts	365 9150 00
P502	Connector	CONNECTOR, plug: 12 prong contacts	365 2120 00
R501	Line terminating resistor	RESISTOR: ww, 129 ma max current ±10%, 10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



534 2306

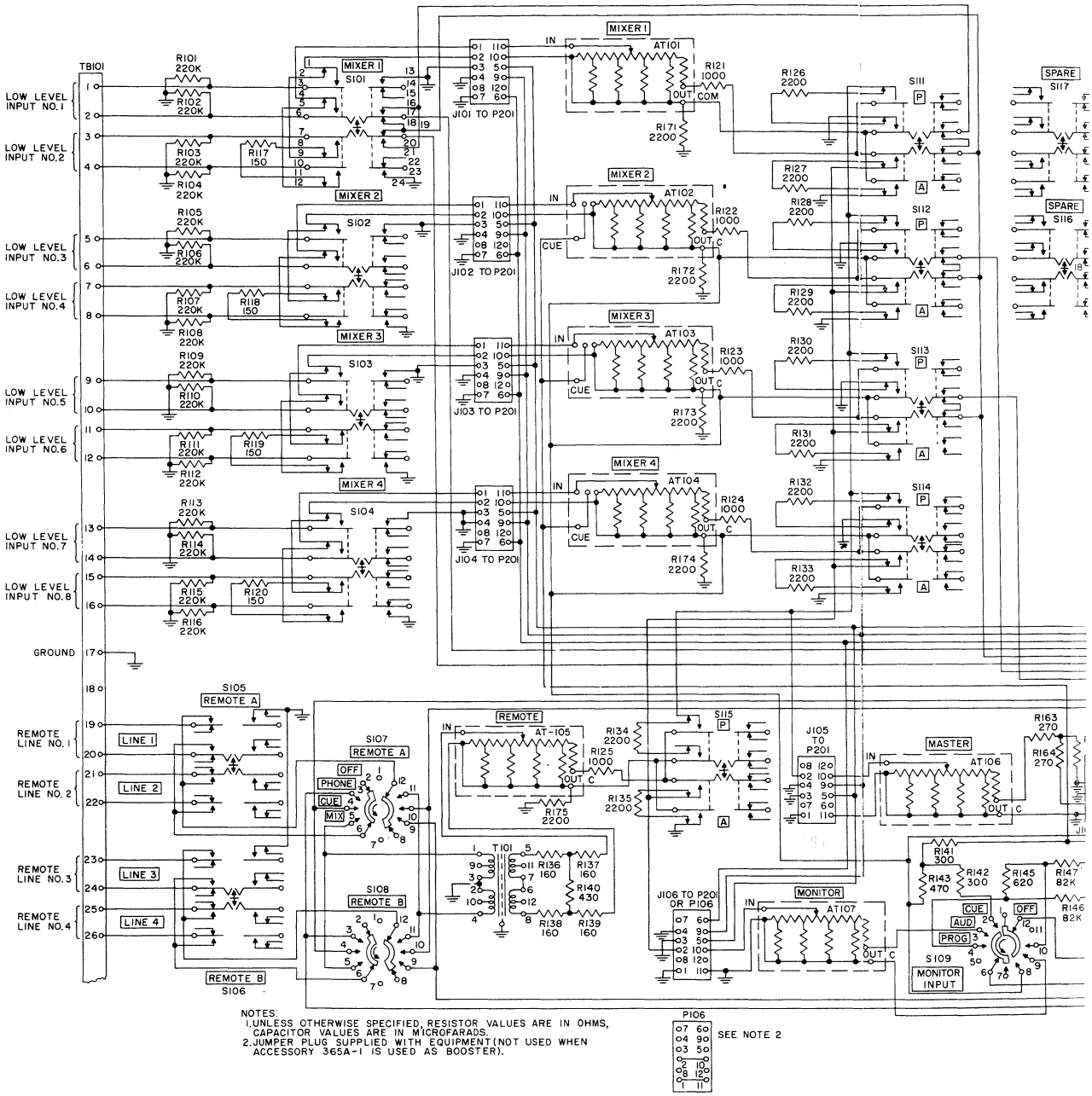
Figure 6-10. Jumper Plug P106 or P107

SECTION VII
DRAWING



C99-20-6

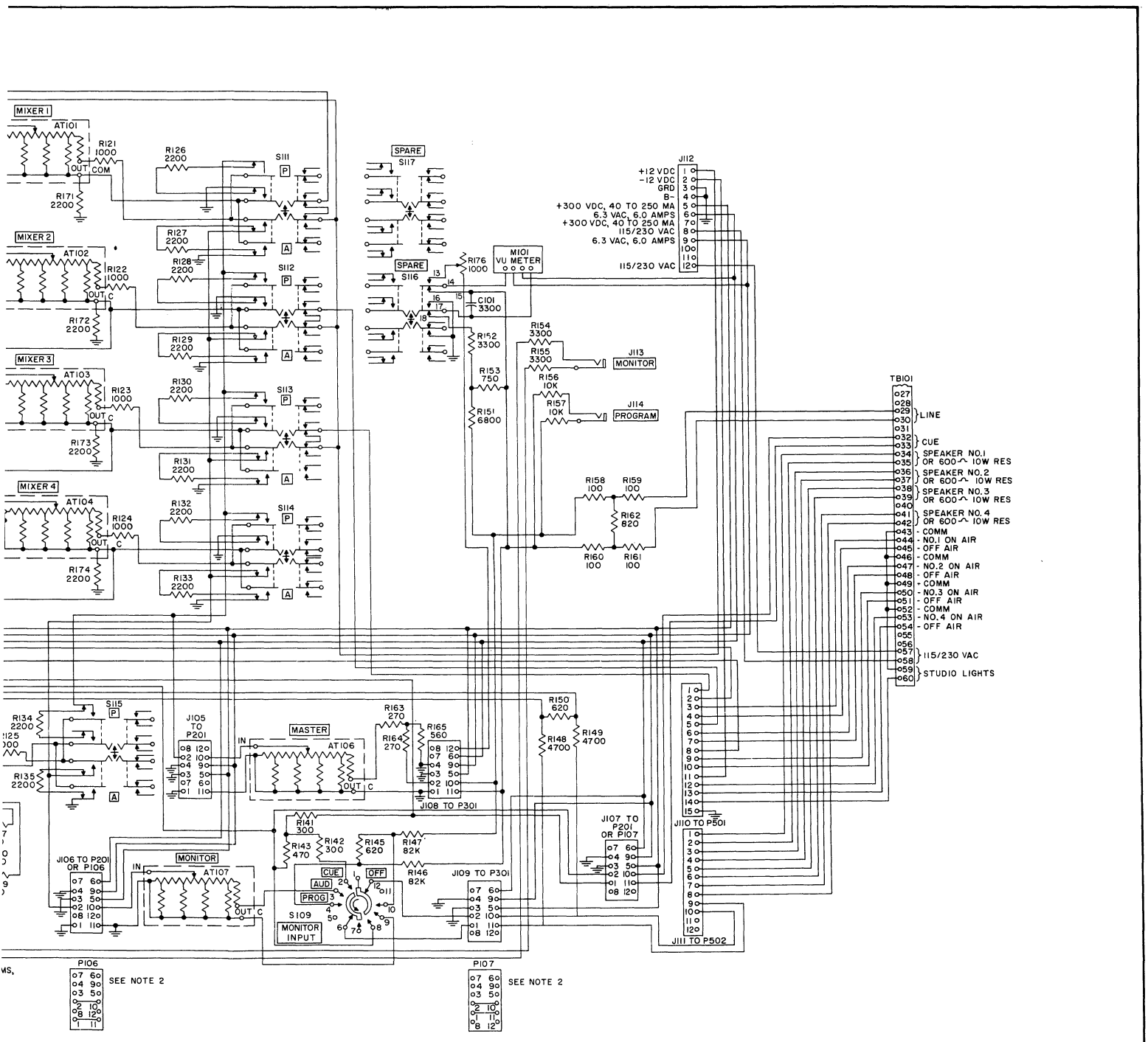
Figure 7-1. 212F-1 Broadcast Console, Schematic Diagram



NOTES:
1. UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS.
2. JUMPER PLUG SUPPLIED WITH EQUIPMENT (NOT USED WHEN ACCESSORY 365A-1 IS USED AS BOOSTER).

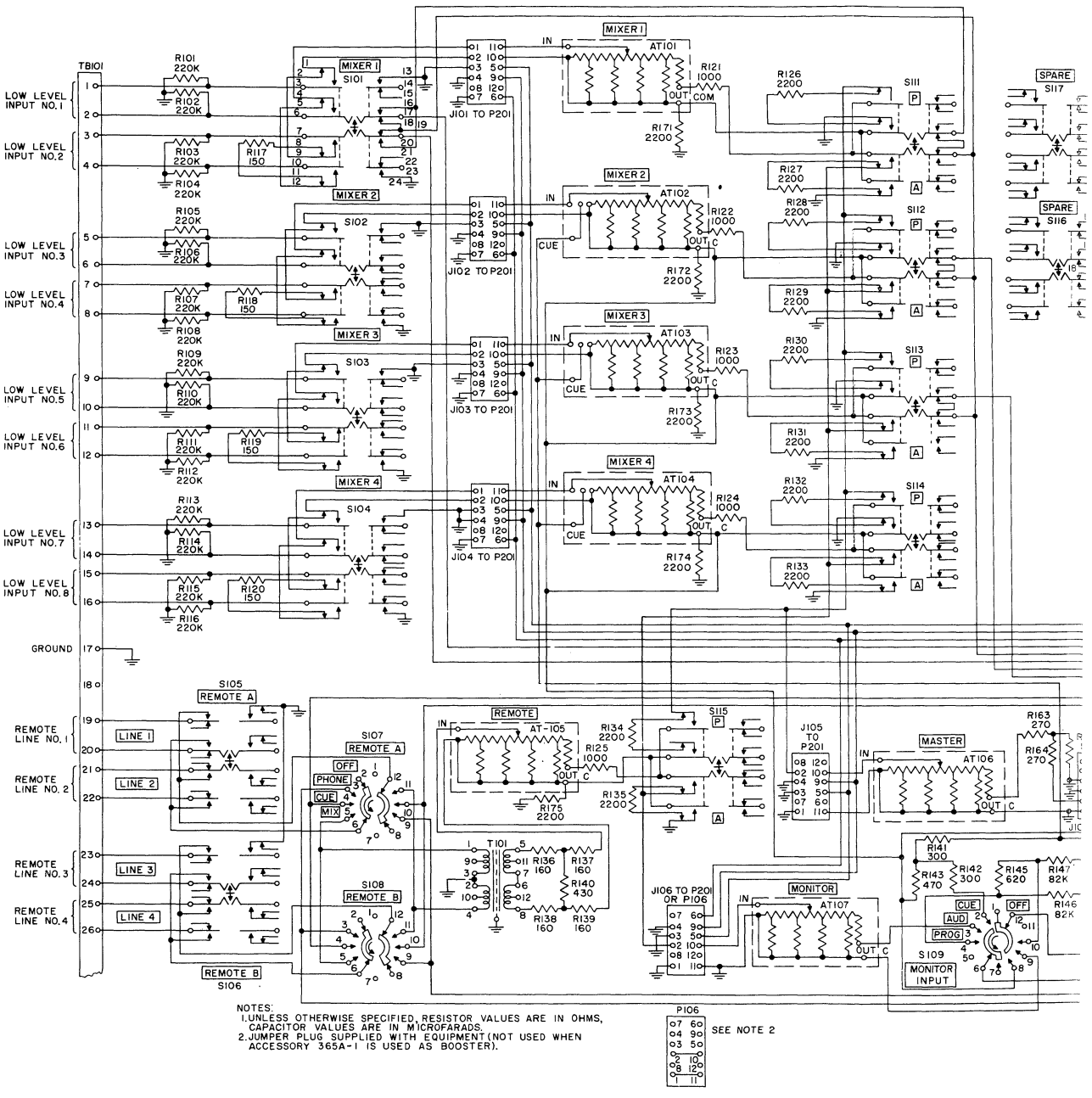
Figur

SECTION VII
DRAWING



C99-20-6

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


TB101
LOW LEVEL INPUT NO.1
LOW LEVEL INPUT NO.2
LOW LEVEL INPUT NO.3
LOW LEVEL INPUT NO.4
LOW LEVEL INPUT NO.5
LOW LEVEL INPUT NO.6
LOW LEVEL INPUT NO.7
LOW LEVEL INPUT NO.8
GROUND
R101 220K
R102 220K
R103 220K
R104 220K
R105 220K
R106 220K
R107 220K
R108 220K
R109 220K
R110 220K
R111 220K
R112 220K
R113 220K
R114 220K
R115 220K
R116 220K
R117 150
R118 150
R119 150
R120 150
MIXER 1
MIXER 2
MIXER 3
MIXER 4
S101
S102
S103
S104
J101 TO P201
J102 TO P201
J103 TO P201
J104 TO P201
AT101
AT102
AT103
AT104
R121 1000
R122 1000
R123 1000
R124 1000
R171 2200
R172 2200
R173 2200
R174 2200
R126 2200
R127 2200
R128 2200
R129 2200
R130 2200
R131 2200
R132 2200
R133 2200
S111
S112
S113
S114
SPARE
S117
SPARE
S116
REMOTE LINE NO.1
REMOTE LINE NO.2
REMOTE LINE NO.3
REMOTE LINE NO.4
LINE 1
LINE 2
LINE 3
LINE 4
S105 REMOTE A
S106 REMOTE B
S107 REMOTE A
S108 REMOTE B
OFF
PHONE
CUE
MIX
T101
R136 160
R137 160
R138 160
R139 160
R140 430
REMOTE
AT-105
R125 1000
R134 2200
R135 2200
R175 2200
S115
J105 TO P201
MASTER
AT106
R163 270
R164 270
J106 TO P201 OR P106
MONITOR
AT107
R141 300
R142 300
R143 470
R145 620
R147 82K
R146 82K
CUE
AUD
PROG
OFF
S109 MONITOR INPUT
P106
SEE NOTE 2
NOTES:
1. UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS.
2. JUMPER PLUG SUPPLIED WITH EQUIPMENT (NOT USED WHEN ACCESSORY 365A-1 IS USED AS BOOSTER).

Figur

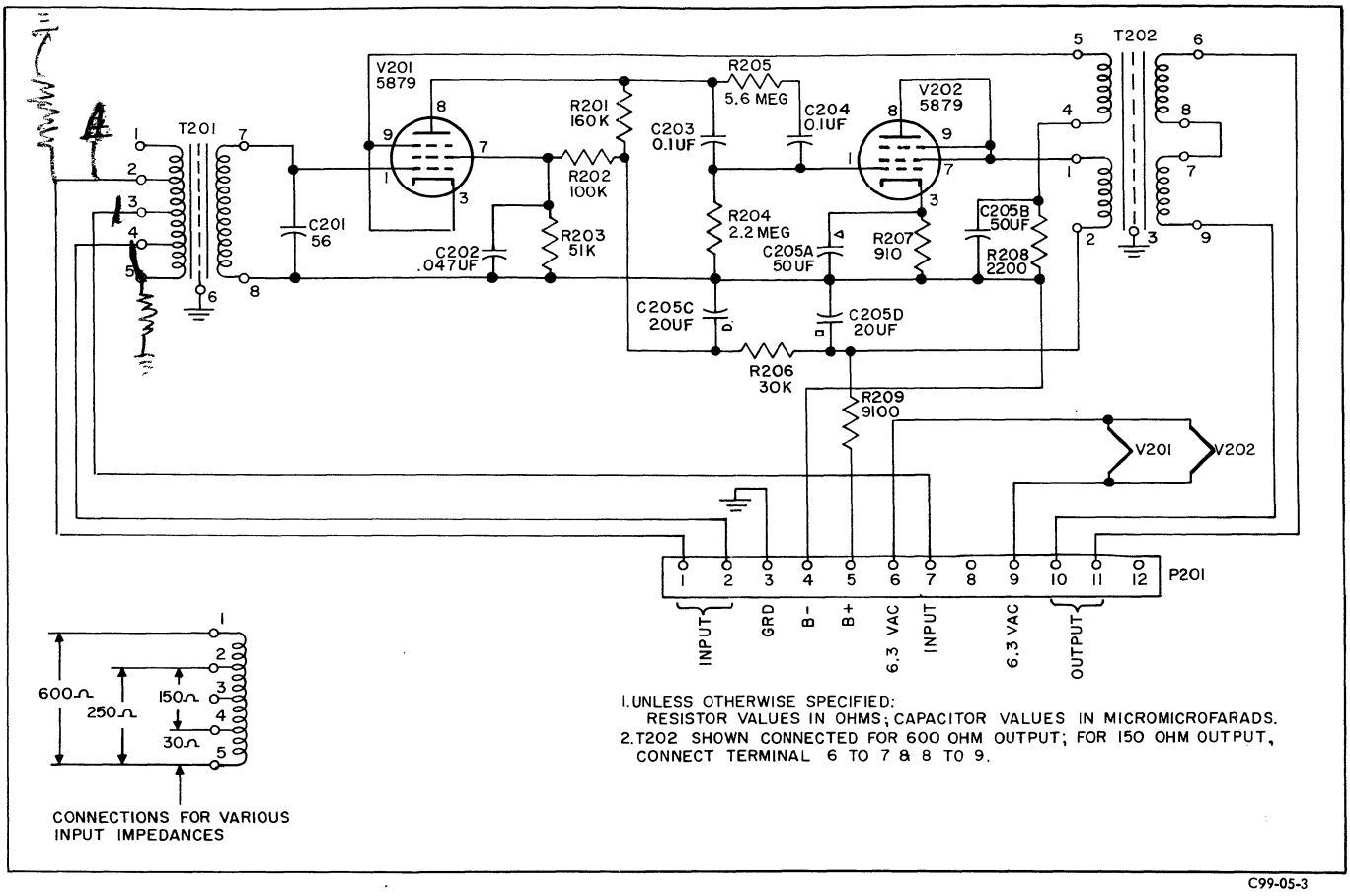
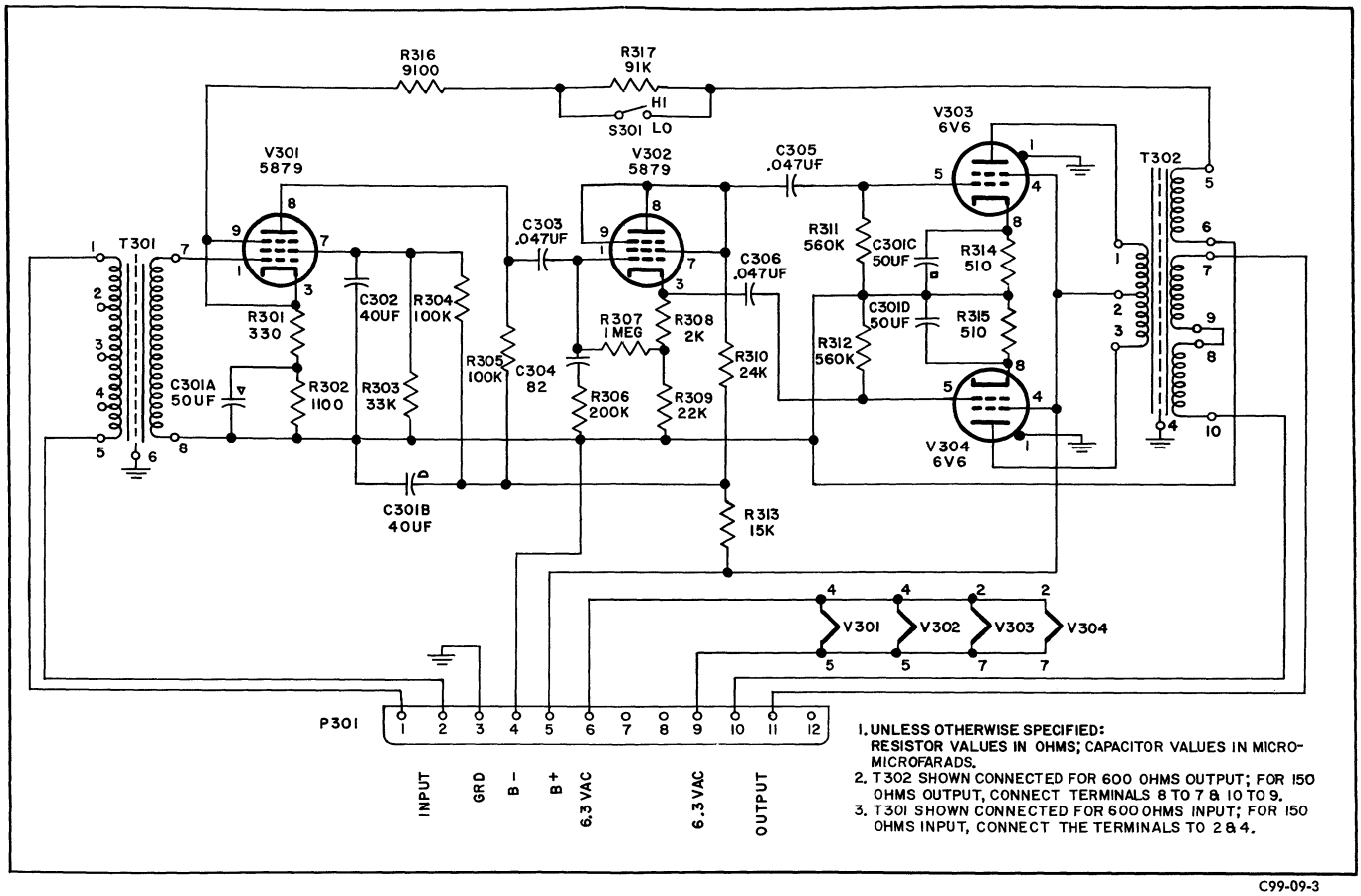


Figure 7-2. 356A-1 Preamplifier, Schematic Diagram



C99-09-3

Figure 7-3. 356B-1 Program/Monitor Amplifier, Schematic Diagram

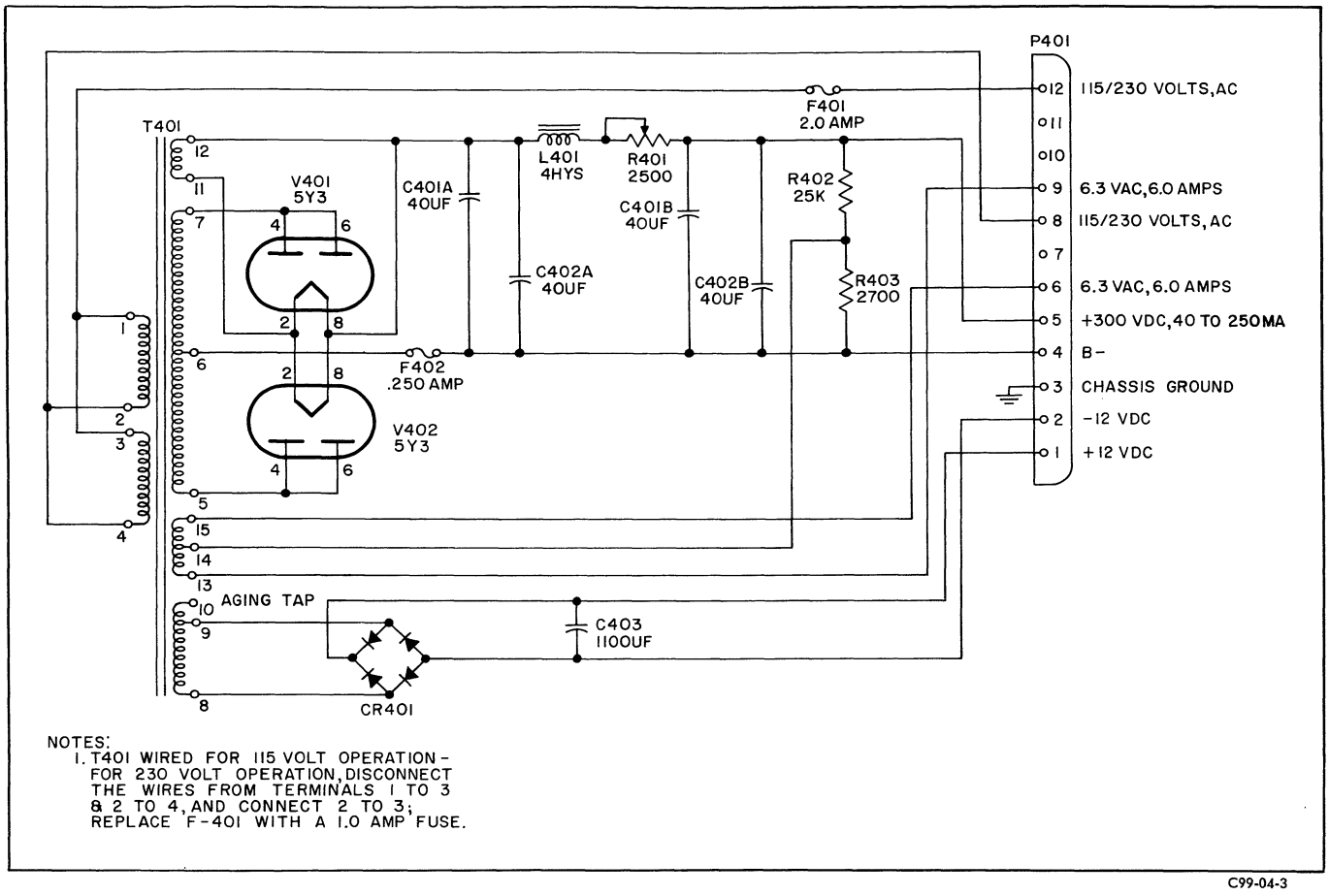


Figure 7-4. 409X-1 Power Supply, Schematic Diagram

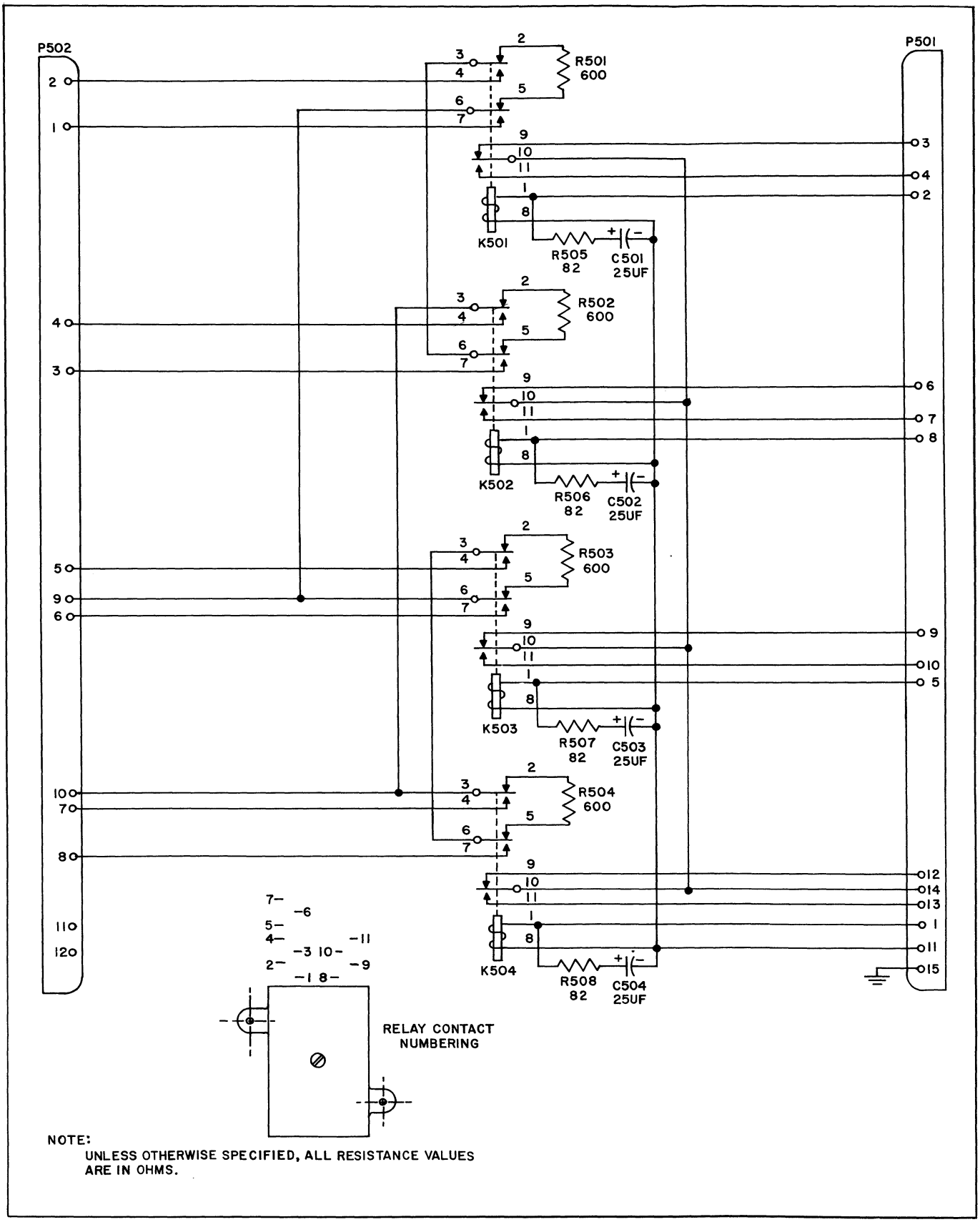


Figure 7-5. 274K-1 Relay Unit, Schematic Diagram

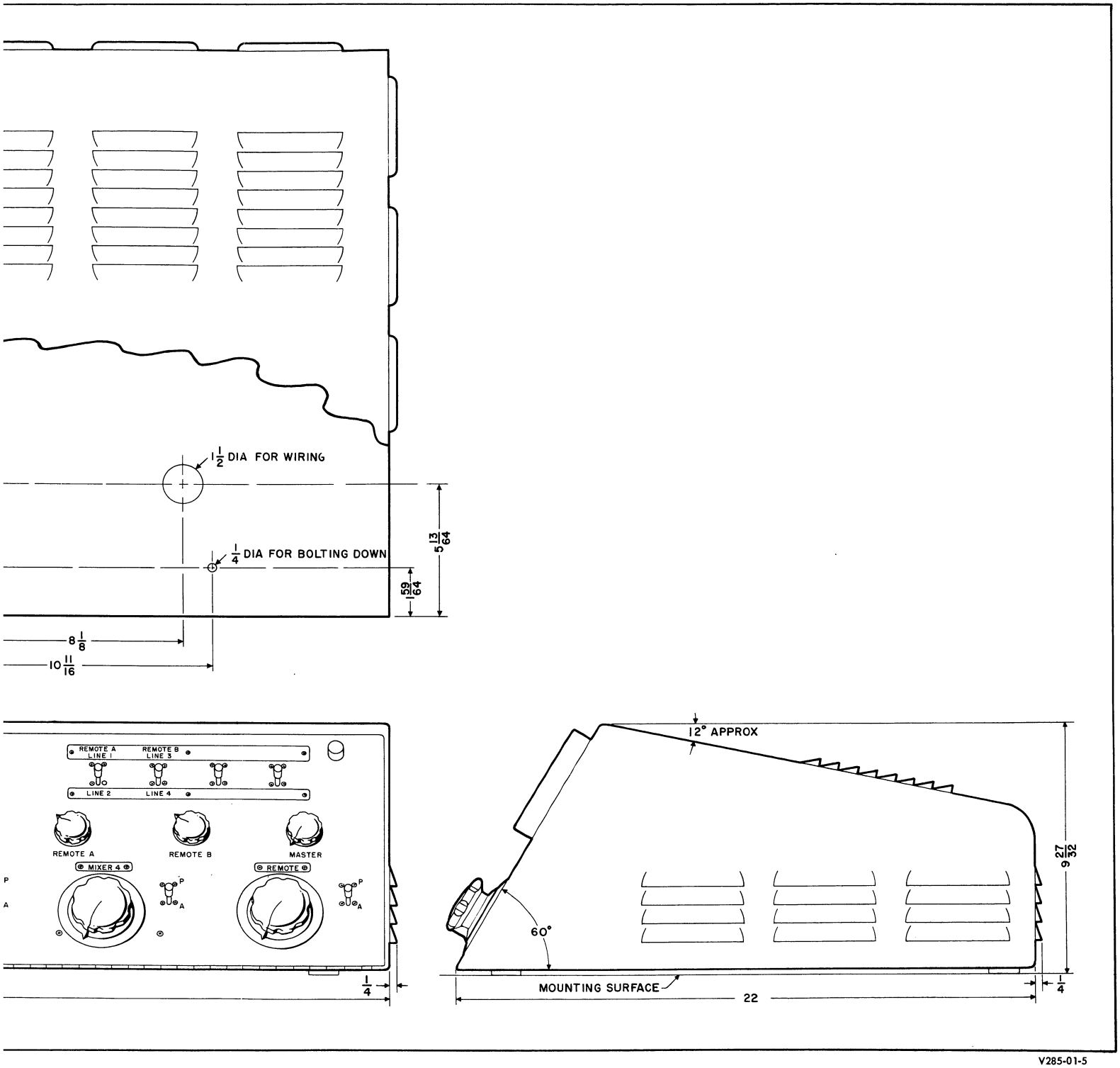


Figure 7-6. 212F-1 Broadcast Console, Outline and Mounting Dimensions

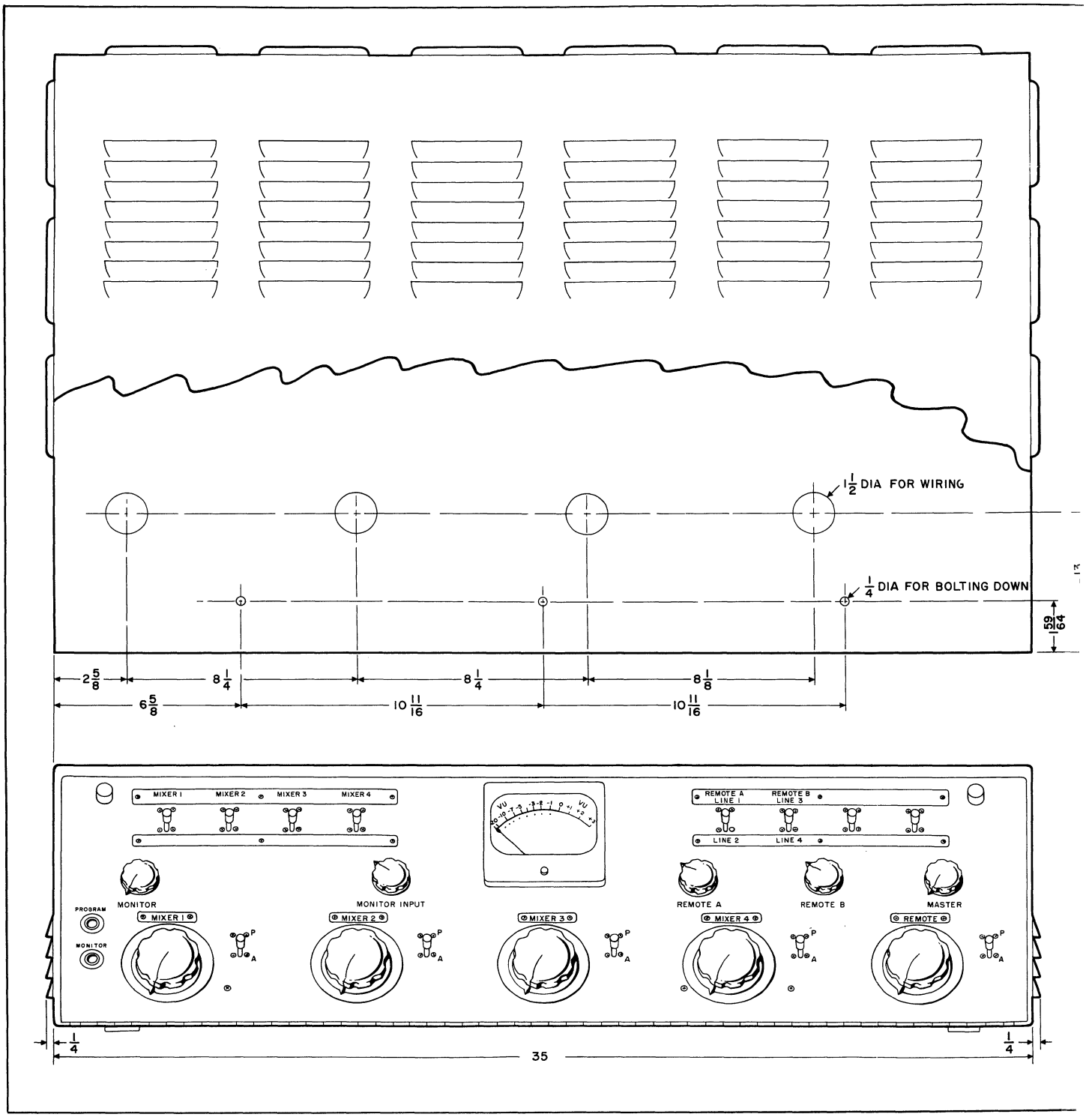
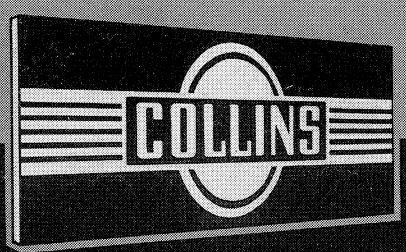

1 1/2 DIA FOR WIRING
1/4 DIA FOR BOLTING DOWN
59/64
2 5/8
8 1/4
8 1/4
8 1/8
6 5/8
10 11/16
10 11/16
MIXER 1
MIXER 2
MIXER 3
MIXER 4
VU
REMOTE A LINE 1
REMOTE B LINE 3
LINE 2
LINE 4
MONITOR
MONITOR INPUT
REMOTE A
REMOTE B
MASTER
PROGRAM
MONITOR
MIXER 1
MIXER 2
MIXER 3
MIXER 4
REMOTE
P
A
1/4
35
1/4

Figure 7-6.



COLLINS RADIO COMPANY
CEDAR RAPIDS, IOWA