INSTRUCTIONS

for

TRI-AMPLIFIER

TYPE 58-A

(MI-4151)

RCA Victor Division

RCA Manufacturing Company, Inc.

Camden, N. J., U. S. A.

KVOR - COLO SPRINGS.

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Instructions IB-25846

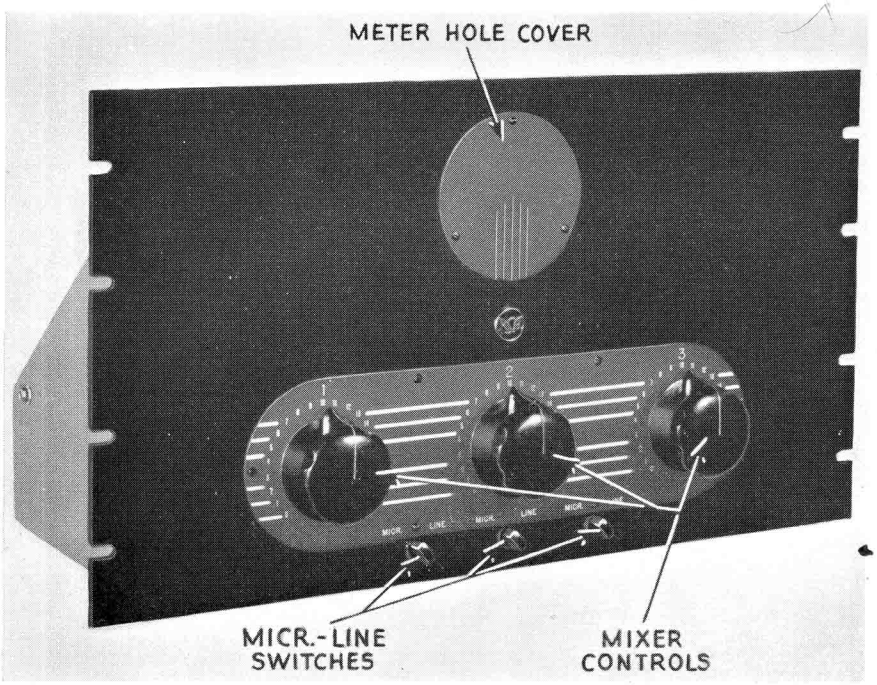

Figure 1—Front View of Type 58-A Tri-Amplifier

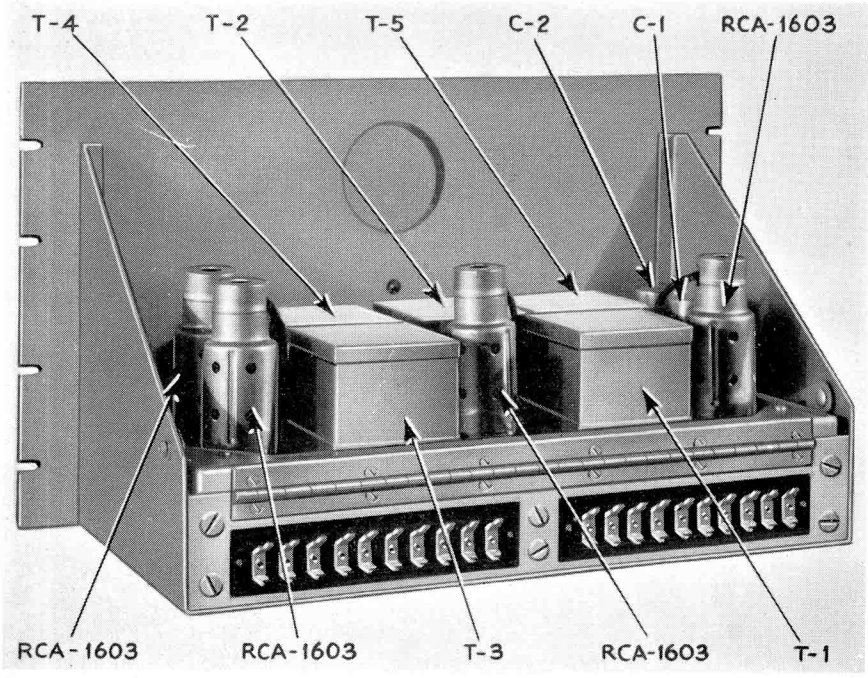

Figure 2—Rear View of Type 58-A Tri-Amplifier

OPERATING INSTRUCTIONS
FOR
TRI-AMPLIFIER
TYPE 58-A
(MI-4151)

PART I — INTRODUCTION

The RCA Type 58-A Tri-Amplifier consists of a pre-amplifier and mixer unit comprising a combination of three microphone pre-amplifiers, a three-position mixer, and a specially designed switching system by means of which the outputs of three low level microphones (via the aforementioned three microphone amplifiers), three transcription equipments, three transmission lines, or any triple combination of these three types of input may be mixed and combined in a common output circuit.

Each microphone pre-amplifier of the Tri-Amplifier consists of a single stage of amplification utilizing a Radiotron RCA-1603 connected as a triode. The input terminals of each microphone pre-amplifier are transformer-coupled to the RCA-1603 of their respective channel. The output of each RCA-1603 is brought to one side of a double-pole, double-throw switch. Each pair of the three sets of line input terminals is connected to the other side of its respective one of these three switches. The switching elements of each switch are connected to their respective attenuator in a three-position mixer, and the outputs of these attenuators are combined in the grid circuit of an RCA 1603 output stage. This output stage feeds into an output transformer, providing the proper impedance for either a 250-ohm or a 500-ohm line.

Figures 1, 2 and 6 show the general arrangement of the parts of the RCA Tri-Amplifier Type 58-A. The electrical connections are shown in Figures 3, 4 and 5.

PART II — EQUIPMENT

The equipment furnished by the manufacturer is:

1. Tri-Amplifier, Type 58-A.
2. Filament transformer, Type RT-386.

The following are required for the proper operation of the Tri-Amplifier unit:

1. Four Radiotrons RCA-1603.
2. Regulated power supply unit, Type TMV-118-B, its equivalent in "B" batteries or the tapped power supply of the Type 40-C General Purpose Amplifier.

PART III — SPECIFICATIONS

Input impedances:
- 3 Microphone inputs ..... To operate from a circuit of either 50 or 250 ohms
- 3 Line inputs ..... To operate from a circuit of 250 ohms

Output impedance ..... To operate into a circuit of either 250 or 500 ohms

Maximum gain:
- Microphone input to amplifier output ..... +31 db.
- Line input to amplifier output ..... −9 db.

Volume control range (each channel) ..... 38 db.

Frequency characteristics ..... Flat ± 1 db. from 30 to 10,000 cycles

Maximum undistorted output ..... Zero level (12.5 mw.)

Tubes used ..... See Part II

Plate supply required ..... 180 v. DC, 5.6 ma.

Filament supply ..... 6.3 v. (AC or DC), 1.2 amps.

Unit dimensions ..... 19 inches wide, 10¼ inches high, 9¼ inches deep

In the microphone pre-amplifier section of the unit three input transformers are provided, which are designed to operate from impedances of 50 or 250 ohms. The transformers are tapped for the 50-ohm input. The primary of each transformer is center tapped and grounded to the chassis, thus providing balanced inputs. Each transformer secondary is applied to the grid of its respective Radiotron RCA-1603, which is connected to operate as a triode.

The output of each of these three tubes is resistance-capacitance coupled to its respective double-pole, double-throw switch. These switches are mounted on the panel of the unit and are marked "MICR.—LINE".

When a "MICR.—LINE" switch is turned to the "MICR." position, the output of the pre-amplifier that it controls is connected through its respective attenuator to the mixer unit.

When a "MICR. — LINE" switch is turned to "LINE", the output of the corresponding pre-amplifier tube is grounded through a capacitor (thus preventing the signal getting through) and the line input assigned to that switch is connected to its respective attenuator in the mixer unit. Each line input is provided with a resistor to load properly the 250-ohm line (or transcription pickup). Each "MICR.—LINE" switch is furnished with an extra contact that may be used for operating a relay for talk-back purposes. When this is done the necessary filters should be provided to eliminate "clicking."

The output of the three attenuators of the mixer unit are combined through three isolating resistors into the grid circuit of the mixer output stage, which consists of a Radiotron RCA-1603 operating as a triode. The output of this tube is connected to an output transformer, which is designed to feed into an impedance of 500 ohms. A tap is provided for feeding into an impedance of 250 ohms.

A circular hole, concealed by a cover plate, is provided for mounting a volume indicator meter on the panel of the Tri-Amplifier. When the RCA Type 58-A Amplifier is used with the RCA Type 40-C General Purpose Amplifier, the volume indicator meter of the latter may, if desired, be removed and installed in the Tri-Amplifier. All that is necessary is to disconnect the meter at the meter terminals, remove it from the Type 40-C amplifier, mount it on the panel of the Type 58-A Tri-Amplifier and extend the meter connections in shielded wires to the meter in its new location. The cover plate may then be used to conceal the meter mounting hole in the panel of the Type 40-C amplifier.

A filament transformer Type RT-386 is provided with the equipment. If operating conditions require it, a 6-volt storage battery may be used to furnish the 6.3 volts at 1.2 amperes necessary for filament power supply.

The 180-volt, 5.6-milliampere plate supply may be obtained from an RCA Type TMV-118-B regulated power supply unit, from four 45-volt "B" batteries or, if an RCA Type 40-C General Purpose Amplifier is used in the same rack, the plate supply may be obtained from that unit. See Figure 3.

PART IV — INSTALLATION AND OPERATION

(a) Installation

The Tri-Amplifier should be mounted on the rack and secured in place by four screws in each side of the panel. In place of the usual upright rack a console rack may be used, or the unit may be placed conveniently on a table, if desired.

To gain access to the unit, remove the two retaining screws (one at either side of the unit) that lock the chassis to the shelf, thus permitting the chassis to be swung upward and outward, exposing the wiring and the component parts. For best operating conditions, the unit should be kept closed, except when servicing.

Access to the terminal board, which is located at the rear of the unit, is obtained by taking out the two screws in the terminal board cover at the rear of the amplifier and removing the cover.

Microphone input terminals are as follows: Microphone No. 1 (corresponding to channel No. 1) is to be connected to terminals 19 and 20, Microphone No. 2 (corresponding to channel No. 2) is to be connected to terminals 15 and 16, and Microphone No. 3 (corresponding to channel No. 3) is to be connected to terminals 11 and 12.

If microphones having an output impedance of 50 ohms each are to be used, it will be necessary to open the chassis of the Tri-Amplifier and make the following changes in the wiring:

Remove and tape the yellow lead and the blue and yellow lead from each set of microphone input terminals to be adapted for 50-ohm input. Where these leads enter the respective input transformer case will be found two taped leads, one brown and the other black and red in color. Remove the tape from these two leads and add sufficient flexible, insulated wire to make connections to the proper pair of microphone input terminals on the terminal board.

Line input terminals (to accommodate a 250-ohm line, a transcription equipment or other 250-ohm source) are as follows:

Line input No. 1 (corresponding to channel No. 1) is to be connected to terminals 17 and 18, Line input No. 2 (corresponding to channel No. 2) is to be connected to terminals 13 and 14, and Line input No. 3 (corresponding to channel No. 3) is to be connected to terminals 9 and 10.

Terminals 9, 13 and 17 are grounded to the chassis. Make sure that the grounded side of the line inputs are connected to these terminals. Terminals 9, 13 and

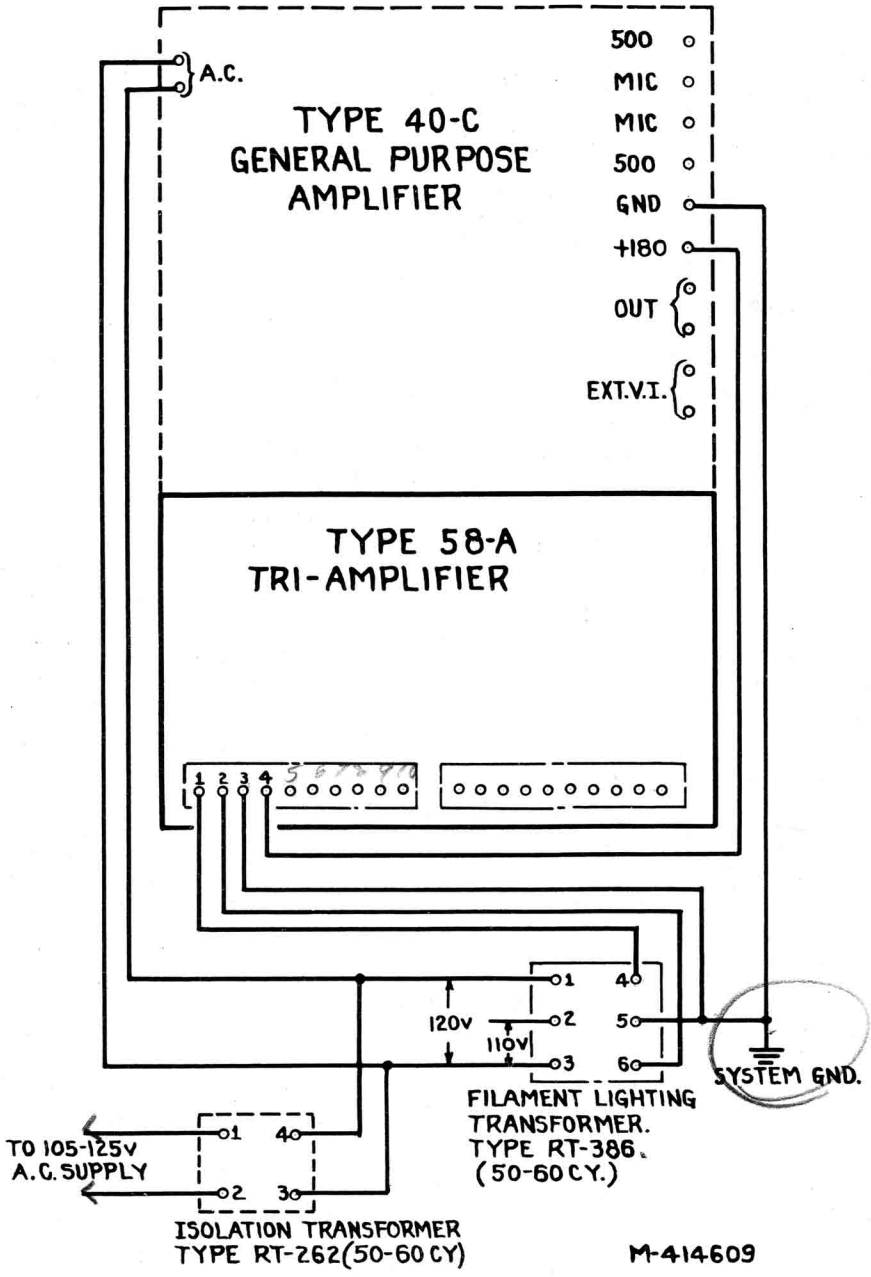

Figure 3—Power Supply Connections of Type 58-A Tri-Amplifier with Type 40-C General Purpose Amplifier

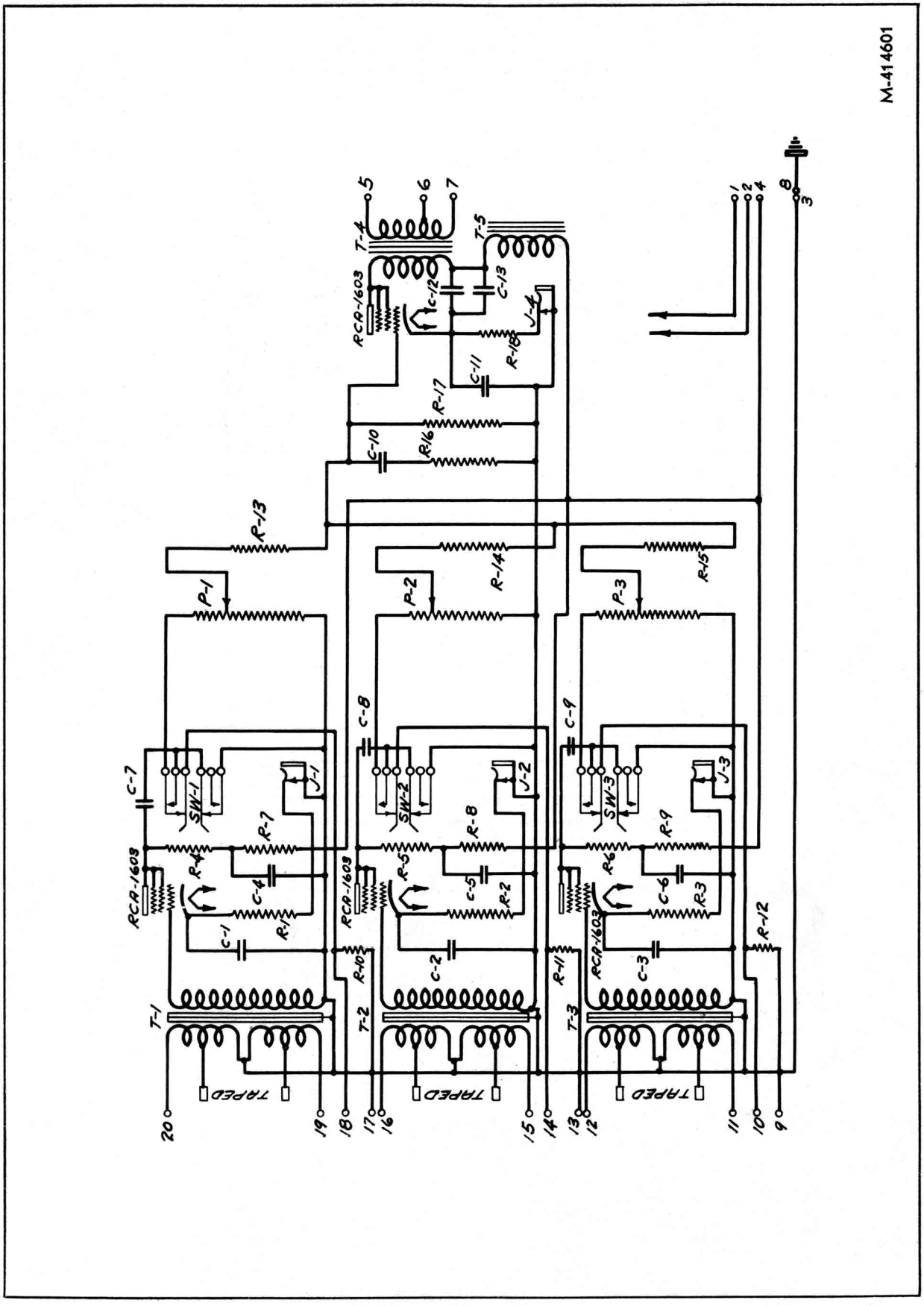

Figure 4—Schematic Wiring Diagram of Type 58-A Tri-Amplifier

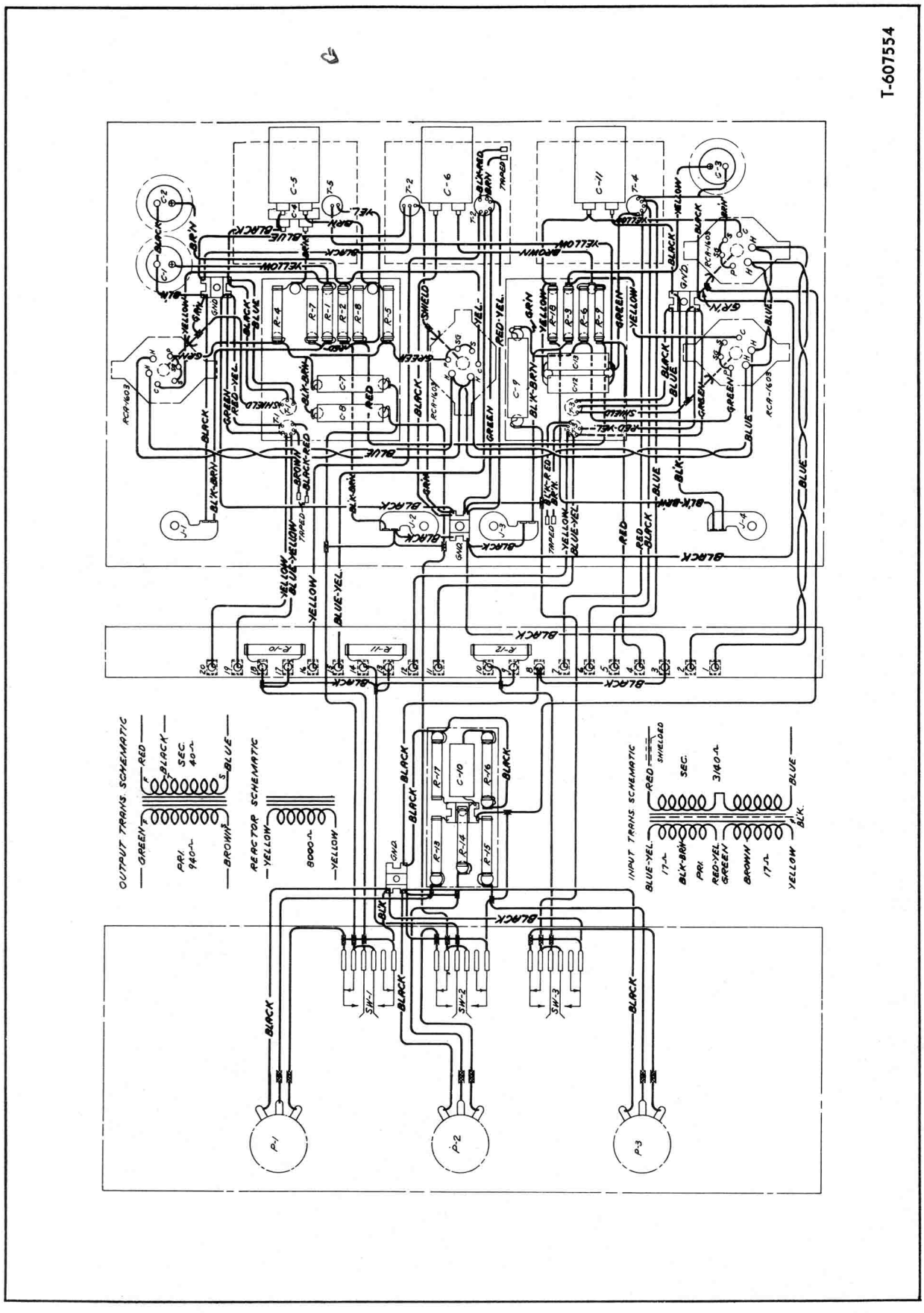

Figure 5—Wiring Diagram Type 58-A Tri-Amplifier

17 may also be used for grounding the shields of the microphone cables. Terminal 8 of the Tri-Amplifier unit must be connected to a suitable ground.

Terminals 5 and 6 on the Tri-Amplifier terminal board are provided for the 250-ohm output connections, and terminals 5 and 7 are the 500-ohm output terminals.

Terminals 1 and 2 on the Tri-Amplifier terminal board are filament supply terminals. Filament transformer Type RT-386 should be mounted in some convenient location on the rack, the only precaution necessary being to avoid any placement near the Tri-Amplifier input circuits, or any position that might introduce magnetic coupling with any other amplifier input circuit. If this precaution is not observed, excessive hum may result.

Terminals 4 and 6 of the filament transformer are to be wired to terminals 1 and 2 (filament supply terminals) on the terminal board of the Tri-Amplifier. Terminal 5 of the filament transformer must be connected to a suitable ground. Terminals 1 and 2 of the transformer are provided for connection of a 110-volt, 50–60-cycle AC supply line. Terminals 1 and 3 are provided for connection of a 120-volt, 50–60-cycle AC supply line. Refer to Figure 3.

Terminals 3 and 4 on the Tri-Amplifier terminal board are the 180-volt plate supply terminals. Terminal 3 is the negative terminal and terminal 4 is the positive terminal. As already stated under Part III—Specifications, the plate supply may be obtained from an RCA Type TMV-118-B regulated power supply, from four 45-volt "B" batteries, or from the power supply terminals ("+ 180" and "GND") of the RCA General Purpose Amplifier Type 40-C, provided that this unit is used in the same rack.

If it is desired to install a volume indicator meter, the cover plate concealing the meter mounting hole in the panel of the Tri-Amplifier may be removed and the meter mounted in the space provided. In the event that the Type 40-C General Purpose Amplifier is used in the same rack, directions for the use of its volume indicator meter for this purpose are contained in Part III—Specifications.

(b) Operation

Before placing the Tri-Amplifier in normal service, certain preliminary checks and adjustments should be made; *viz.*, a check of the plate currents of each of the three pre-amplifier channels and of the mixer output stage, and an adjustment of the hum potentiometer.

The plate currents of the three Radiotrons RCA-1603 in the three microphone pre-amplifier channels should be approximately 1.0 milliamperes. The plate current of the Radiotron RCA-1603 in the mixer output stage should be approximately 2.2 milliamperes. These currents may be measured at the plate current jacks by means of a Type 15-B meter panel, or similar unit using a current patch cord and plug. The jacks for measuring plate current are located at the rear of the Tri-Amplifier chassis. The jack located at the extreme right on the chassis applies to pre-amplifier channel No. 1, the next jack to the left applies to channel No. 2 and the third jack to the left is for channel No. 3. The jack farthest to the left applies to the mixer output tube.

To adjust the hum potentiometer, proceed as follows:

With the "MICR. — LINE" switches in the "MICR." position, a 250-ohm resistor connected across each of the three microphone inputs (the microphones being disconnected from the input circuits) and the three mixer controls turned to maximum ("20" on the dial), adjust the hum balancing potentiometer on the top of the filament transformer Type RT-386 for minimum hum output of the Type 58-A Tri-Amplifier. In order to hear the hum, it is recommended that a radio headset be connected across the output terminals of the amplifier unit (Type 40-C General Purpose Amplifier, or other) immediately following the Tri-Amplifier. The volume control of this latter amplifier should also be turned to full gain. The hum potentiometer of the filament transformer Type RT-386 may be turned over a certain arc at the center of its travel without introducing appreciable hum in the headset. Therefore, it should be turned in each direction to a position at which the hum is just noticeable and then reset at a point midway between the two positions.

The routine operating procedure is as follows:

1. Set the "MICR.—LINE" switches for each channel to either microphone input or line input as desired.
2. Control the gain of each channel by means of the attenuator (mixer) control knobs on the Tri-Amplifier panel. The number above each knob indicates the channel that it controls, and corresponds to the number of the microphone or the line inputs as wired and numbered under Part IV, Section (a) Installation.

(c) Maintenance

If the Tri-Amplifier should become noisy or have insufficient gain, the Radiotrons should be checked and replaced where necessary. The tube socket and Radiotron cap contacts should be cleaned with carbon tetrachloride or crocus cloth at least once every three months to insure noiseless operation. The switch contacts should be cleaned with carbon tetrachloride, but neither crocus cloth nor any similar abrasive may be used to clean the contacts of this switch.

PART V — LOCATION OF TROUBLES

The following table gives the normal voltages and currents existing at the tube sockets when the proper filament and plate voltages are applied to the Type 58-A Tri-Amplifier. Because of the high resistance

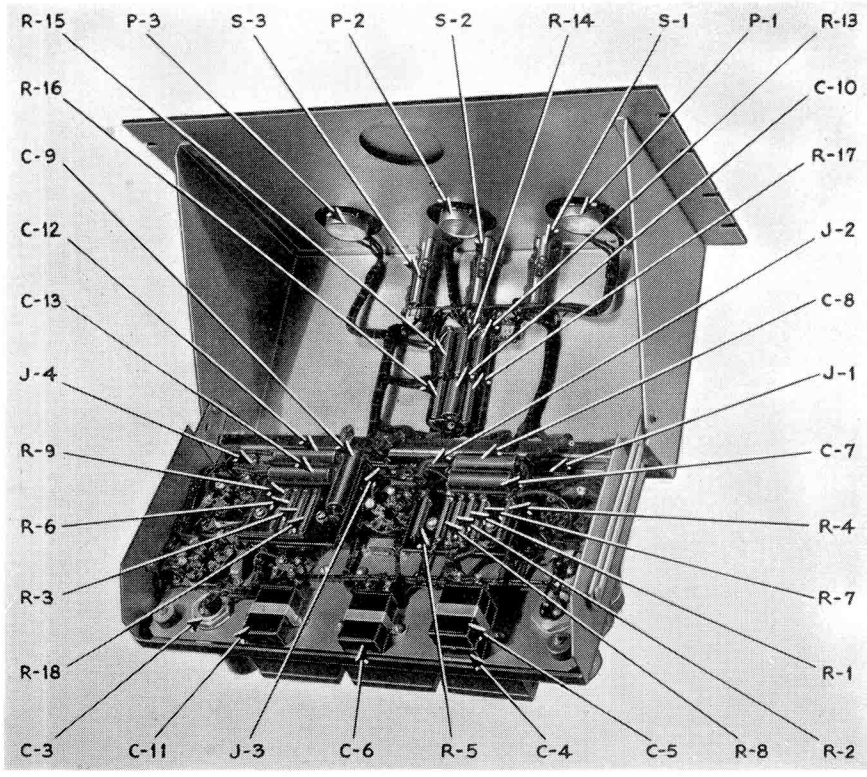

Figure 6—Sub-Chassis View of Type 58-A Tri-Amplifier

values of the plate and grid coupling resistors used, the bias and plate voltage readings will depend largely on the internal resistance of the measuring voltmeter. The voltmeter used in taking the data given below has an internal resistance of 1,000 ohms per volt. All plate voltages were measured from plate to cathode, using a 250-volt meter scale. All grid bias voltages were measured from cathode to ground, using a 50-volt meter scale.

Tube	Heater Voltage	Plate Voltage	Bias Voltage	Plate Current in ma.
Pre-Amplifier RCA-1603's (3)	6.3	55.0	2.1	1.0 (each tube)
Mixer RCA-1603	6.3	147.0	5.5	2.6
Total				5.6

If faulty operation develops at any time, the following information is given to simplify the locating of the trouble:

(a) Filaments Do Not Light

If all the tubes fail to light, it may generally be supposed that the AC power supply circuit is open or defective. Check the wiring from the AC supply source to the filament transformer, check the wiring from the filament transformer to terminals 1 and 2 on the terminal board of the Tri-Amplifier and check the leads from these terminals to the tube sockets.

If one tube fails to light, it is probably burnt out. If such a tube is replaced by a tube known to be in good condition and this tube also fails to light, check the wiring to that socket.

(b) No Plate Current in Any Stage

If no plate current can be obtained in any stage, check to make sure that the plate supply is connected to terminals 3 and 4, and that the polarity is correct (terminal 3 is the negative terminal and terminal 4 is the positive terminal). If the plate supply is properly applied, check the Tri-Amplifier wiring.

(c) No Plate Current in One Input Stage

If a plate current reading can be obtained in one input (microphone pre-amplifier) stage and not in another, replace the tube in the non-operating stage. If this procedure does not remedy the trouble, check the Tri-Amplifier wiring for a shorted by-pass condenser (C-1, C-5 or C-6), check for a short circuit between the tube socket contacts and ground, between ground and plate resistors R-4, R-5 and R-6, between ground and capacitors C-4, C-5 and C-6, and between ground and filter resistors R-7, R-8 and R-9, and check for an open in the plate circuit or the cathode circuit.

(d) No Plate Current in Output Stage

If no plate current reading can be obtained in the output (mixer) stage, but satisfactory plate current readings can be obtained in the input (microphone preamplifier) stages, replace the tube in this stage. If this does not remedy the trouble, check the capacitors (C-12 and C-13) for short circuit and for short circuit to ground, check for short circuit between the primary side of the output transformer T-4 and ground, check for short circuit between reactor T-5 and ground and between the tube socket contacts and the ground and check for open plate or cathode circuits.

(e) Low Plate Voltage in Any Stage

If all plate voltages are low, it is a general indication that there is a defect in the plate supply source. Check the plate voltage at the supply source. In case the plate voltage is low in any input stage, check capacitors C-7, C-8 or C-9 for short circuit and check for shorted or defective by-pass capacitors C-1, C-2, C-3, C-4, C-5 or C-6.

(f) Excessive Plate Current

Excessive plate current readings may be due to defective tubes or failure properly to attach the grid caps on the Radiotrons. Check also for short circuited cathode resistor (R-1, R-2, R-3 and R-18) and for short circuited by-pass capacitor (C-1, C-2, C-3 and C-11).

(g) No Signals at Output Terminals

If no signals can be obtained at the output terminals, check the setting of the "MICR.—LINE" switches, see that the tubes are lit and that their grid caps are in place, measure the Radiotron plate currents and, if necessary, replace the tubes with others known to be in good operating condition.

If the trouble is not disclosed as a result of the tests outlined above, use a pair of headphones, connected through a pair of 0.5-mfd. capacitors to a pair of test leads, to determine in what part of the circuit the signal is lost. With the signal on the input of channel No. 1, the "MICR.—LINE" switch in the "MICR." position, and the attenuator (mixer) control for that channel turned to maximum ("20") position, the phones may be connected across the following points in the order given and signals should be heard: Across the input terminals, from the grid of the input tube (the Radiotron RCA-1603 in the microphone preamplifier) to ground, from the plate circuit of the input tube to ground, across the terminals of the attenuator (mixer) P-1, across the resistor R-17, from the grid of the output tube (the Radiotron RCA-1603 in the mixer unit) to ground, and across the output terminals. If the trouble is in any of the other channels, the same procedure may be applied to that channel.

By following the routine test given above, it should be possible to localize the trouble. It is well to note that trouble arising from the fixed parts of the circuit, excepting transformers, is usually accompanied by changes in plate voltage, bias voltage and plate current, or all three.

(h) Noisy Operation

Noisy operation is generally due to defective tubes or to loose or dirty contacts. Tube socket contacts, grid clips and switches should be cleaned periodically to insure good contact. See Section IV (e).

After prolonged usage the attenuators (mixer potentiometers) may become noisy and require replacement. Removal of such a unit is accomplished by unsoldering the attenuator connections, withdrawing the push-on knob from the shaft of the unit and unscrewing and removing the hexagonal nut from the threaded bushing of the attenuator shaft. Leads should be tagged or otherwise marked upon removal to facilitate identification.

PART VI — REPLACEMENT PARTS

The following parts list is included to provide proper identification when ordering replacement parts. When ordering specify the item as called for in Figures 4 and 5, followed by description and Catalog No. Items are also identified in Figures 1, 2 and 6.

Item	*Description*	*Catalog No.*
C-1	Capacitor— 25 mfd.	16727
C-2	Capacitor— 25 mfd.	16727
C-3	Capacitor— 25 mfd.	16727
C-4	Capacitor— 1 mfd.	15786
C-5	Capacitor— 1 mfd.	15786
C-6	Capacitor— 1 mfd.	15786
C-7	Capacitor—0.25 mfd.	5170
C-8	Capacitor—0.25 mfd.	5170
C-9	Capacitor—0.25 mfd.	5170
C-10	Capacitor—.005 mfd.	4868
C-11	Capacitor—1.75 mfd.	16728
C-12	Capacitor—0.25 mfd.	5170
C-13	Capacitor—0.25 mfd.	5170
J-1	Plate Current Jack (special Yaxley No. 702)	16597
J-2	Plate Current Jack (special Yaxley No. 702)	16597
J-3	Plate Current Jack (special Yaxley No. 702)	16597
J-4	Plate Current Jack (special Yaxley No. 702)	16597
P-1	Potentiometer (mixer attenuator)— 50,000 ohms	16729
P-2	Potentiometer (mixer attenuator)— 50,000 ohms	16729

Item	*Description*	*Catalog No.*
P-3	Potentiometer (mixer attenuator)—50,000 ohms	16729
R-1	Resistor— 2,200 ohms	13129
R-2	Resistor— 2,200 ohms	13129
R-3	Resistor— 2,200 ohms	13129
R-4	Resistor— 56,000 ohms	13130
R-5	Resistor— 56,000 ohms	13130
R-6	Resistor— 56,000 ohms	13130
R-7	Resistor— 56,000 ohms	13130
R-8	Resistor— 56,000 ohms	13130
R-9	Resistor— 56,000 ohms	13130
R-10	Resistor— 270 ohms	4337
R-11	Resistor— 270 ohms	4337
R-12	Resistor— 270 ohms	4337
R-13	Resistor—100,000 ohms	13131
R-14	Resistor—100,000 ohms	13131
R-15	Resistor—100,000 ohms	13131
R-16	Resistor—220,000 ohms	13132
R-17	Resistor—470,000 ohms	13133
R-18	Resistor— 2,200 ohms	13129
S-1	Turn Key Switch	16948
S-2	Turn Key Switch	16948
S-3	Turn Key Switch	16948
T-1	Input Transformer (RT-369)	16724
T-2	Input Transformer (RT-369)	16724
T-3	Input Transformer (RT-369)	16724
T-4	Output Transformer (RT-421)	16725
T-5	Reactor (RT-422)	16726

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