FILE: 2T5C2.207

INSTRUCTIONS

FOR

RCA SUPER MASTER-TENNA

TYPE HG

AMPLIFIER

September 3, 1956

Engineering Department - 623
RCA SERVICE COMPANY, INC.

TECHNICAL DATA

IMPEDANCE:
Input - 75 ohms, separate for each channel.
Output - 75 ohms, combined.

FREQUENCY RESPONSE:
Within 0.5 DB for 4.5 mc bandwidth

GAIN:
Low Channels - 50 DB minimum
High Channels - 54 DB minimum

OUTPUT VOLTAGE:
2.0 volts maximum RMS color signal per channel.

INPUT VOLTAGE:
.05 volts maximum

AGC:
Output within 3 DB for input signals between .003 volts and .05 volts. Recommended operating nominal .01 volts input.

POWER REQUIREMENTS:
115 volts, 60 cycles AC, 250 watts maximum.

OVER-ALL DIMENSIONS:
Height - 41"
Width - 20-1/4"
Depth - 11-1/8"
Weight - 100#

TUBE COMPLEMENT:
High Channel Strip:
2 - 6BQ7A
2 - 6BC8
Low Channel Strip:
2 - 6BQ7A
1 - 6BC8

DESCRIPTION

GENERAL

The Super Master-Tenna Amplifier equipments have been designed for use in large multiple outlet systems. The increased output voltage capabilities make it possible to operate a greater number of outlets from a single unit than heretofore possible. Higher gain and AGC make this equipment ideal for use in installations remote from signal sources. The maximum number of outlets that may be operated from a single unit, operating at full output, will be dependent upon the distribution system losses.

The Super Master-Tenna Amplifier equipments have been designed for continuous service. All components and circuits were selected so as to give long, trouble-free service. Adequate safety margins are provided so that the equipment will run cool and provide maximum life from tubes and components.

The Super Master-Tenna Amplifier consists of the components listed below:

939390 - Cabinet, Super Master-Tenna
939391 - Power Supply, Super Master-Tenna
939392 - Amplifier Mounting Chassis, Super Master-Tenna
939393 - Amplifier Strip, Super Master-Tenna, Low Channel
939394 - Amplifier Strip, Super Master-Tenna, High Channel
939395 - Mixer, Super Master-Tenna
939396 - Connecting Cable, Super Master-Tenna
939397 - Filter, Super Master-Tenna, High Channel
939398 - Filter, Super Master-Tenna, Low Channel
939399 - Accessory Mounting Chassis, Super Master-Tenna

939390 - CABINET

The cabinet is designed for surface type wall mounting. Provision has been made for mounting the Super Master-Tenna components in the cabinet. They may be mounted in a standard 19" rack also. Located in the top and bottom of the cabinet are combinations of 1/2", 3/4" and 1" knockouts for bringing in input, output and power cables. A full-length, removable door is provided for ease of servicing. The door and case are provided with a means of attaching a padlock to prevent unauthorized persons from tampering with the equipment. Outside finish is a deep umber grey. Inside finish is a heat absorbing black. Ventilation holes are provided in the top, bottom, and door. Twenty chassis mounting screws and one cable clamp are included.

Mounting:

The amplifier cabinet should be located centrally with respect to the distribution system. It should be indoors in a place accessible to service personnel. The cabinet will require a wall space approximately 3 x 4 feet. A minimum of 1 foot above and below the cabinet is required for adequate ventilation. Floor space of at least 4 x 4 feet in front of the cabinet should be allowed for service. If the cabinet is located in a closet, adequate ventilation must be provided in the closet door or walls. The use of

1/4" mounting bolts - together with lead anchors, toggle bolts, or expansion shields - are recommended. Mounting hardware is not included. Signal input and output cables should be separated as much as possible. Mounting dimensions are shown in Figure 1.

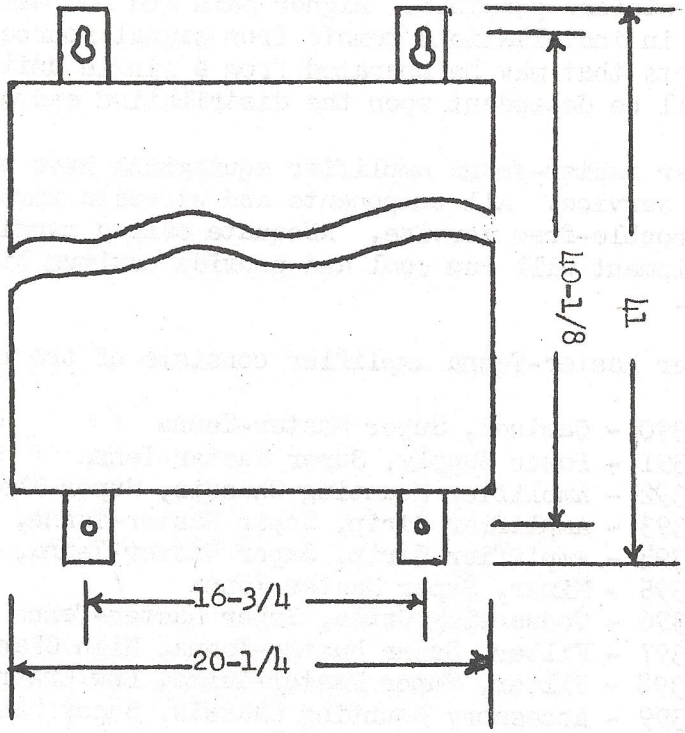


Figure 1.

Power Requirements:

The supply line should be from a source that is as free as possible from noise and voltage fluctuations. 115 volts, 60 cycles AC, 250 watts maximum, is required. In industrial areas, a power line filter is recommended. A duplex outlet and electric wiring box is required and may be mounted in the bottom of the cabinet directly over one of the knockout holes. Conduit should be used for power supply wiring. A switch and box with a 15 ampere fuse must be installed in the power circuit as prescribed by local Underwriters. Number 14 wire is recommended for this purpose. Follow all local Underwriters' specifications in making this installation.

939391 - POWER SUPPLY

The Power Supply is designed to supply B+ and filament voltages for a maximum of seven amplifier strips (3 - 939393 low channel strips, and 4 - 939394 high channel strips). It is designed to deliver 250 volts DC at 350 ma. and 6.3 volts AC at 12.0 amps. A constant voltage transformer is used to maintain B+ level for input voltages from 100 to 125 volts. A plug receptacle is provided for quick connection of 939396 Connecting Cable.

939392 - AMPLIFIER MOUNTING CHASSIS

The Amplifier Mounting Chassis is designed to provide a plug-in mounting and voltage feed for up to seven Amplifier Strips. It provides a plug receptacle for quick connection of the 939396 Connecting Cable. Supply voltages for the Amplifier Strips are divided and fed to the amplifier connection sockets. Screws for holding the Amplifier Strips in place are provided. The chassis should be mounted in the cabinet above the Power Supply with a 1" separation between the units so that antenna input cables can be dressed behind the units and brought out so as to form a small loop to the input connector. Mount with the amplifier sockets toward the top.

939393 - AMPLIFIER STRIP, LOW CHANNEL
939394 - AMPLIFIER STRIP, HIGH CHANNEL

The 939393 Amplifier Strip is a three-tube RF amplifier designed for use on Channels 2 through 6. The 939394 Amplifier Strip is a four-tube RF amplifier designed for use on Channels 7 through 13. To reduce stocking problems, the 939393 amplifier strip is supplied aligned for Channel 6, and the 939394 amplifier strip is supplied aligned for Channel 7. See Alignment Instructions for use on other channels. Solderless input and output connectors are provided for connecting the RG-59/U cable. A test point is provided for measuring the developed bias and for checking amplifier operation. Heat reducing tube shields are provided for longer tube life. See Technical Data for specifications. CASCADING OF UNITS IS NOT RECOMMENDED.

939395 - MIXER

The Mixer panel provides a means of mixing the outputs of the Amplifier Strips into a common line. Solderless input and output connectors are provided for connecting the RG-59/U cable. A test outlet connection 20 DB down on Channel 6, and 15 DB down on Channel 13, is provided for Amplifier adjustment. Loss through the unit is 0.5 DB. Provision is made for mounting a 939342 Two-Way Splitter or a 939343 Four-Way Splitter. The Mixer should be mounted directly above the Amplifier Mounting Chassis. Connections between Amplifier Strip outputs and Mixer input should be made with 13 inch lengths of RG-59/U cable. The Mixer is supplied aligned for Channels 2, 4, 5, 7, 9, 11, and 13. See Alignment Instructions for use on other channels. The Mixer may be used on the input where it may be desirable to separate the signals from a single antenna line to apply to the inputs of the Amplifier Strips.

939396 - CONNECTING CABLE

One Connecting Cable is required to inter-connect the Amplifier Mounting Chassis and the Power Supply. Dress the cable away from components and secure in place, using the cable clamp provided with the Cabinet.

939397 - FILTER, HIGH CHANNEL
939398 - FILTER, LOW CHANNEL

The Filter is an accessory item for use where signal conditions require its

AMPLIFIER ASSEMBLY

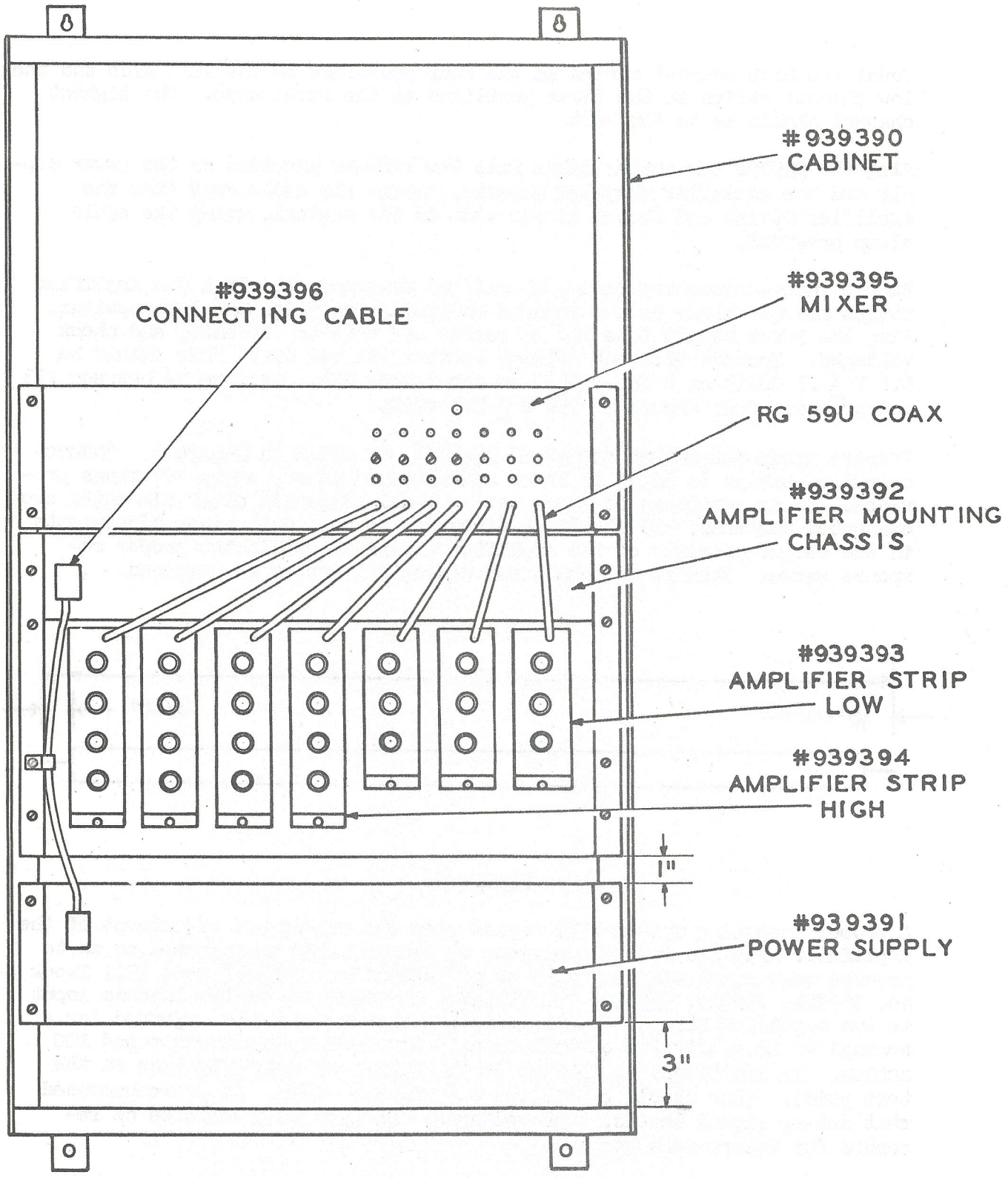


FIGURE 2

Mount the high channel strips in the four positions on the left side and the low channel strips in the three positions on the right side. The highest channel should be to the left.

Plug the 939396 Connecting Cable into the sockets provided in the Power Supply and the Amplifier Mounting Chassis. Dress the cable away from the Amplifier Strips and fasten to the side of the cabinet, using the cable clamp provided.

Before inter-connecting units, it will be necessary to align the Amplifier Strips and the Mixer to the desired channel. See Alignment Instructions. Plug the Power Supply into the AC source and turn on the unit, and check voltages. Measure filament voltage between TP1 and TP2. This should be 6.2 V $\pm$ .1 volts on a meter that measures true RMS. Measure B$+$ between TP3 and ground. This should be 250 V $\pm$ 5.0 volts.

Prepare inter-connecting cables of RG-59/U, as shown in Figure 3. Connect output of strips to input of Mixer and clamp in place, using "O" rings provided. It is advisable to check the over-all alignment after all units are connected together. It should be necessary to make only minor adjustments in the output circuits of the amplifier strips to obtain the proper response curve. Connect antenna feeds and output cables as required.

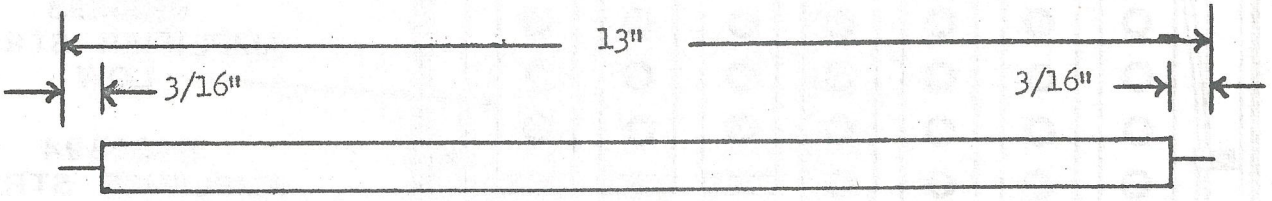


Figure 3.

A proper operating system will depend upon the set-up and adjustment of the amplifier. Signals from the various stations should be adjusted so as to provide near equal output levels on all channels. Install pads (RCA Stock No. 939344, 939345, 939346, and 939347), as required, in the antenna input to the amplifier strips. Amplifier strip inputs should be adjusted for a nominal of 10 millivolts on each channel for maximum performance and AGC action. An additional check will be the amount of developed bias on the test point. This should be between 0.7 and 1.0 volts. It is recommended that set-up signal levels, bias voltages, and operating voltages be recorded for future reference.

When 939397, or 939398 Filter is required, install as shown in Figure 4.

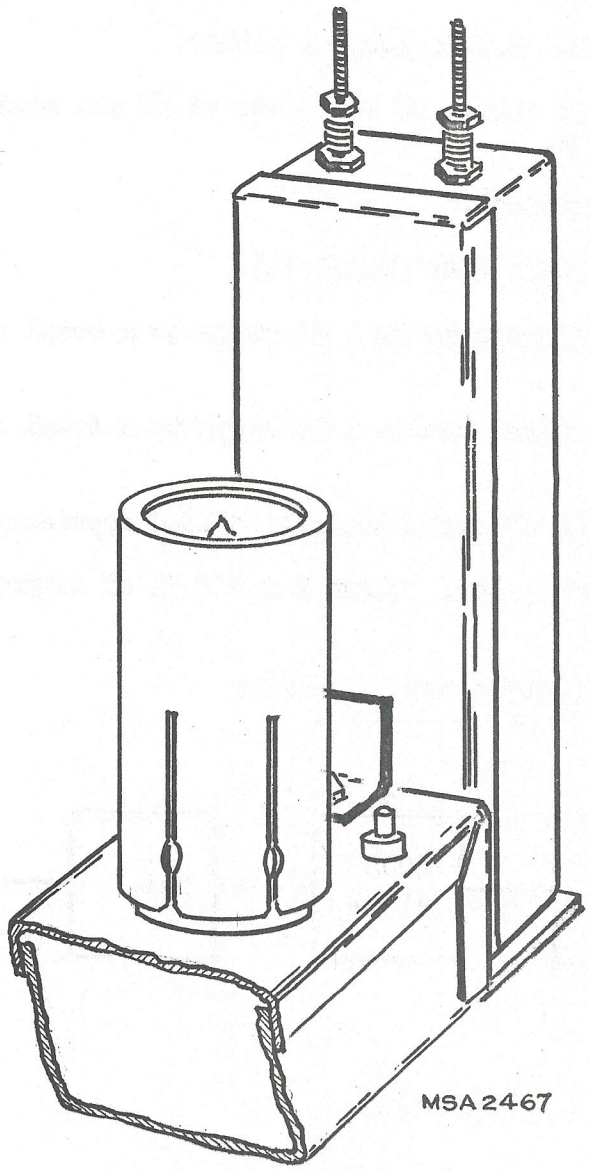


FIG. 4

ALIGNMENT OF HIGH GAIN AMPLIFIER

Equipment Required

1. Scope, RCA WO-56A, or equivalent.
2. Sweep, RCA WR-97B, or equivalent.
3. Detector, 75 ohm coaxial. S.W.R. 1.2, or better.
4. Power supply to power one unit. B+ 240 volts at 50 ma. maximum. Heater 6.2 V at 1.8 amp. maximum.
5. VTVM RCA WV-77A, or equivalent.
6. Damping capacitor with leads (See Figure 7.).
7. Attenuator pad 75 ohm, adjustable in 1 DB steps to a total of 70 DB (10% accuracy).
8. Attenuator pad 75 ohm, adjustable in 1 DB steps to a total of 40 DB (10% accuracy).
9. Source of 1.2 volts ± 5% 60 cycle to drive a load impedance of 75 ohms.
10. Ground plane sheet on table top. About 3 x 2 feet of copper, approximately 30 mils thick.

Connect equipment as follows for standardization:

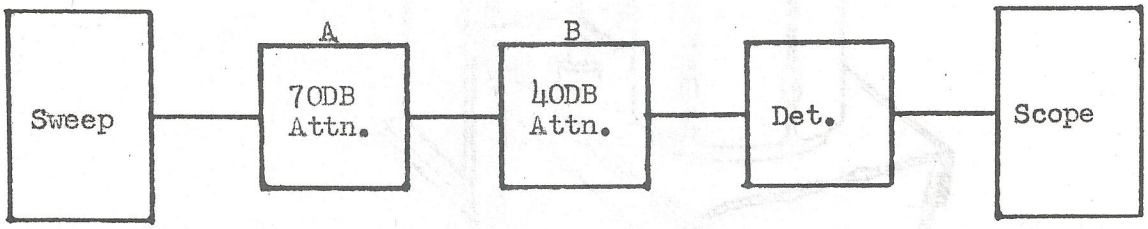


Figure 5.

Procedure

1. Set scope gain to vertical DC and maximum gain.
2. Switch both attenuator pads to minimum attenuation (0 DB reference).
3. Set sweep on desired channel.

4. Adjust sweep output and width to give a reference output indication on the scope, and width to sweep the entire television channel width, and 1 mc. more on either side.

5. Disconnect the detector input from Pad "A" and connect to source of 1.2 V 60 cycle. Adjust Pad "B" to give a scope amplitude equal to the previous indication. Make a note of the pad setting. See Figure 8 for typical curve.

The above set-up procedure should be repeated when necessary, to insure correctness of calibration. The scope gain and sweep output should not be readjusted at any time during the remainder of alignment.

To align the amplifier, connect the equipment as follows:

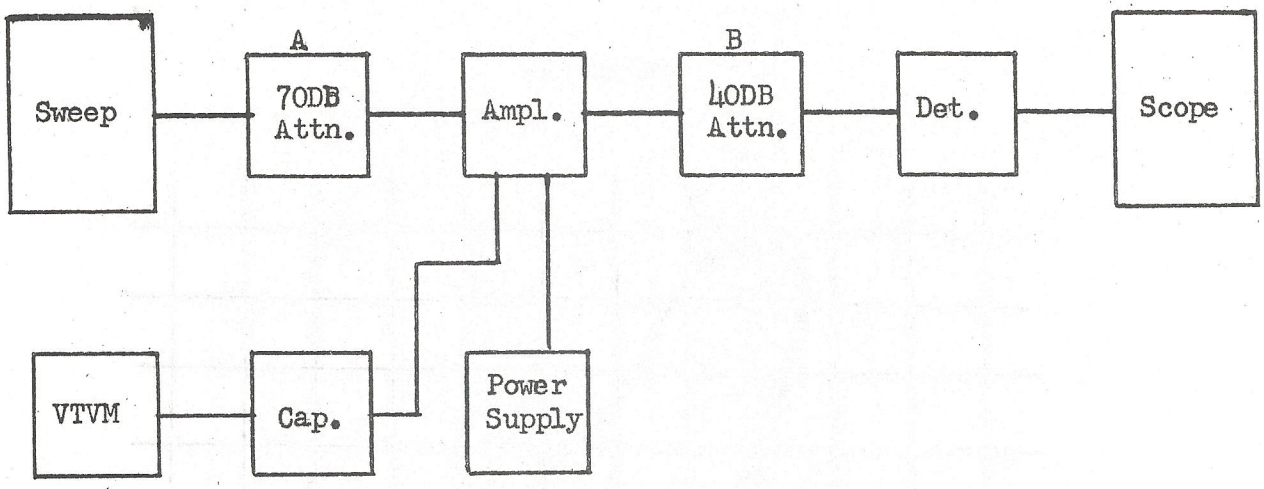
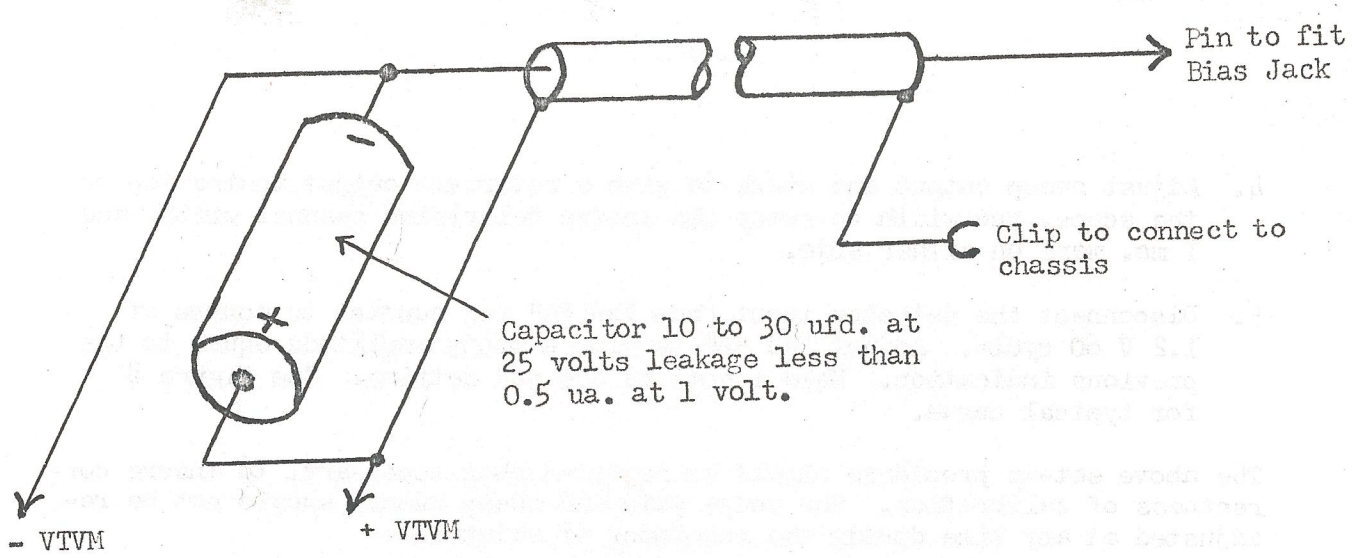


Figure 6.



DAMPING CAPACITOR

Figure 7.

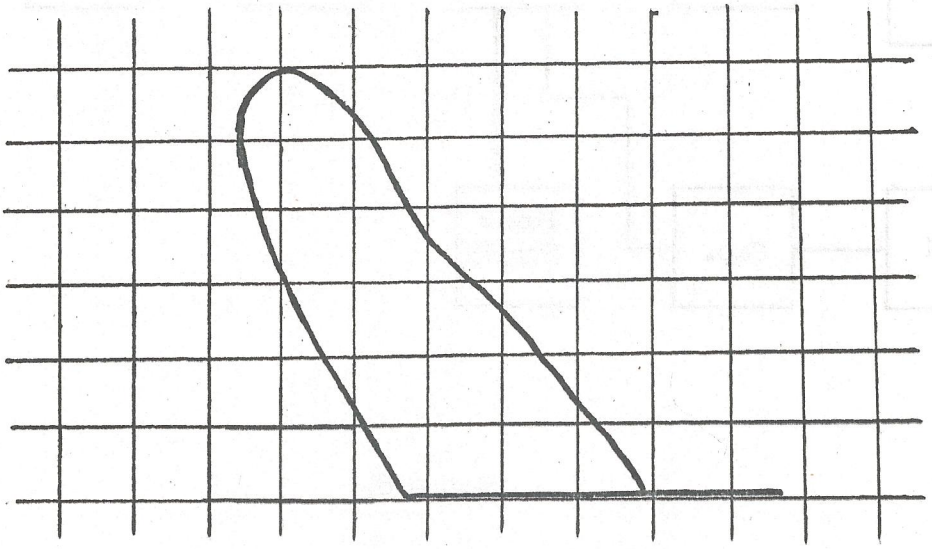


Figure 8.

Proceed as follows:

1. Switch VTVM to measure -1 V DC.
2. Adjust power supply to 240 volt DC.
3. Switch Pad A to minimum loss.
4. Switch Pad B to minimum loss.
5. Switch sweep to desired channel.
6. Withdraw all slug studs and tighten both trimmer capacitors.
7. Adjust slugs (in any order) to give either a maximum scope indication at channel center, or a maximum meter indication.
8. Limit VTVM reading to a maximum of -1 volt by switching Pad A.
9. Limit scope deflection to a visible indication by switching Pad B.
10. Adjust input trimmer capacitor (that one nearest the input jack) to give maximum meter indication and adjust the output trimmer capacitor to give a curve shape like Figure 9. Some re-adjustment of the output coil slug may be necessary following each output trimmer adjustment.

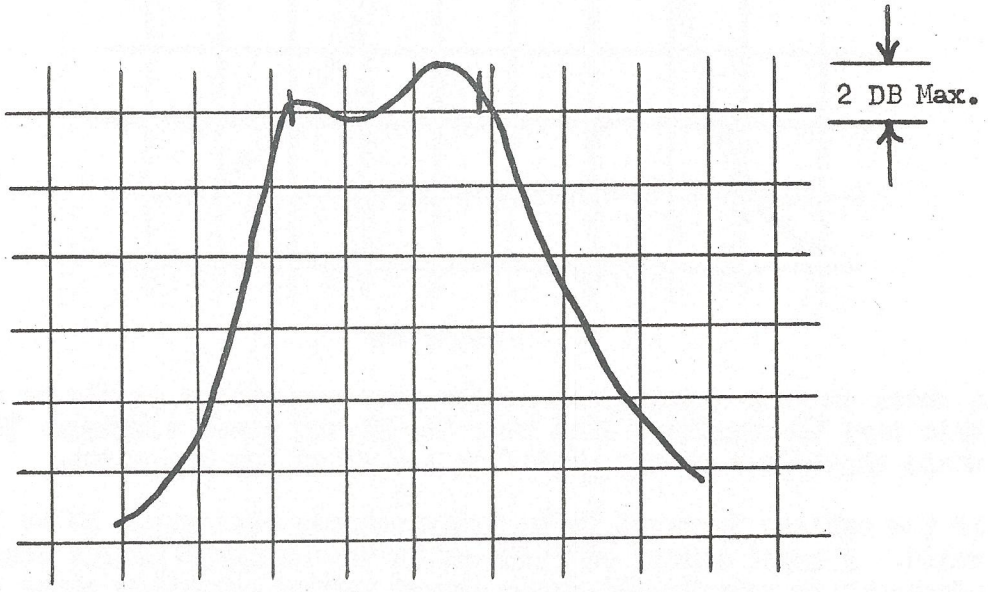


Figure 9.

11. Set Pad B at setting determined in standardization procedure, Step 6.

12. Adjust Pad A at setting to give a voltmeter indication of -1 volt bias.

13. Trim all adjustments for proper curve shape. Make sure that output indication on scope equals, or exceeds, the reference level as set by standardization.

14. Switch Pad B to minimum and increase Pad A setting to give a scope indication equal to standardization. Note the shape of the curve and the Pad A settings. The shape should conform to Figure 10, and the pad setting should be at least 54 DB for the high channels, and 50 DB for the low channels.

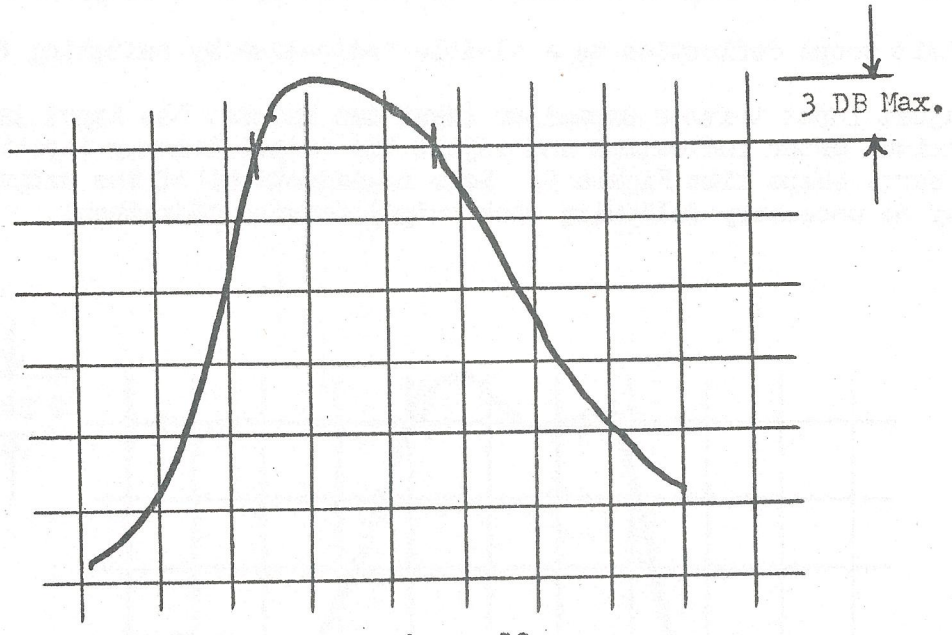


Figure 10.

15. A check of poor termination and/or poor connection should be made at this time by running a hand over the RF and power cabling. The curve shape should not change more than 1.5 DB at any one point.

16. If the cabling is found to be satisfactory, then Steps 10 to 14 are valid. A small amount of touch-up of the trimmers and/or slugs may be necessary to achieve the curve shapes and/or amplifier gains as specified.

17. Re-check Steps 10 to 13 if re-adjustment is necessary for Step 16.

NOTE: Curve tilts and valleys are determined by output attenuator settings. Since the detector linearity is rather poor at low input levels, a visual scope indication is far from accurate for amplitude measurements.

18. Tighten all adjustment lock nuts. Observe scope trace during this operation to be sure no adjustments have been changed.

Limit Specifications

1. Curve of Figure 9 shall not have more than 2 DB difference from maximum to minimum points within the pass band between picture and sound carriers.

2. Curve of Figure 10 shall not have more than 3 DB difference from maximum to minimum points within the pass band between picture and sound carriers.

ALIGNMENT OF MIXER

Equipment Required:

1. Scope, RCA WO-56A, or equivalent.

2. Sweep, RCA WR-97B, or equivalent.

3. Detector, 75 ohm coaxial. S.W.R. 1.2, or better.

4. Attenuator pad 75 ohm, adjustable in 1 DB steps to a total of 40 DB (10% accuracy).

Connect equipment as follows for standardization:

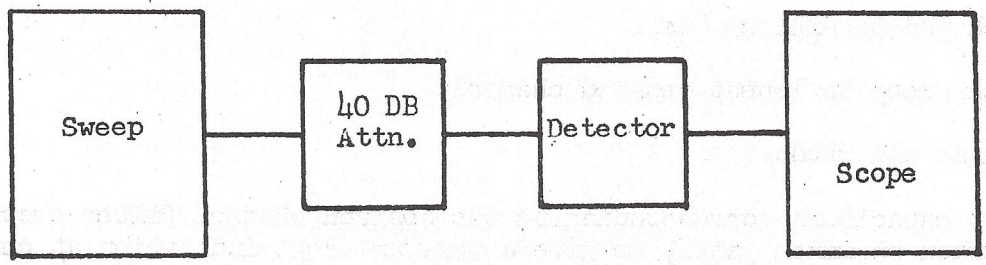


Figure 11.

Procedure

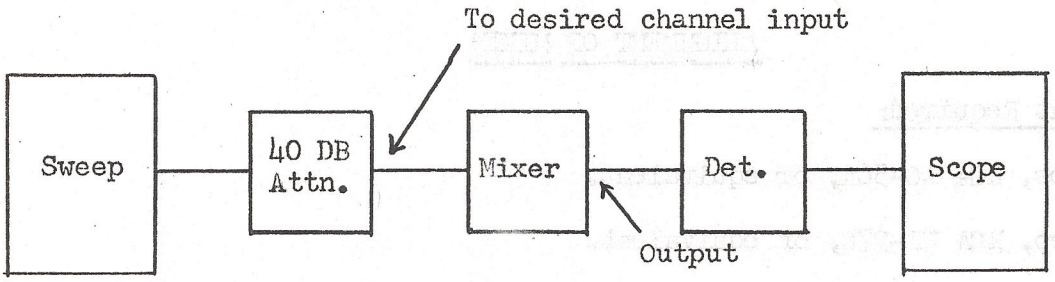
1. Set scope gain to vertical DC and maximum gain.

2. Switch attenuator pad to about 10 DB attenuation (reference).

3. Set sweep on desired channels. Adjust sweep output and width to give a reference output indication on the scope, and width to sweep the entire television channel width, and 1 mc. more on either side. Note pad reading on each desired channel to give a reference scope amplitude.

The above set-up procedure should be repeated when necessary, to insure correctness of calibration. The scope gain and sweep output should not be readjusted at any time during the remainder of alignment.

To align the mixer, connect the equipment as follows:



NOTE: REMOVE SCREWS HOLDING REAR COVER. ALIGN WITH COVER IN PLACE, BUT WITHOUT SCREWS.

Figure 12.

Proceed as follows:

1. Switch pad to minimum loss.
2. Switch sweep to lowest desired channel.
3. Withdraw all studs.
4. Adjust capacitors corresponding to the desired channel filter section as marked on mixer panel, to give a maximum scope indication at channel center.
5. Adjust coupling between input and output to obtain curve shape as shown in Figure 13. On the low channels, the coil coupling must be adjusted; on the high channels, the center capacitor trimmers must be adjusted.
6. Limit scope deflection to a visible indication by switching pad.

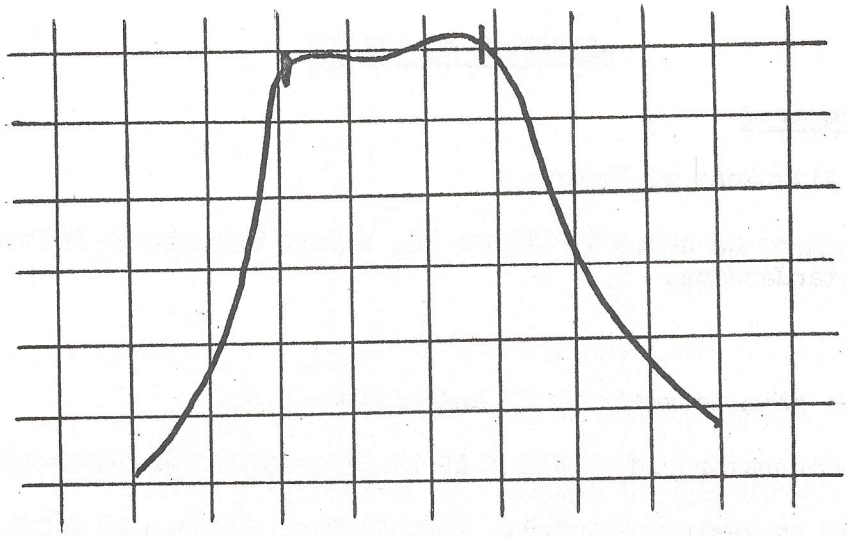


Figure 13.

7. Set pad at setting determined in standardization procedure, Step 3.

8. Adjust pad to give standard scope deflection.

9. Trim all adjustments for proper curve shape. Note pad setting. Loss in mixer will be the difference between pad settings of this step and Step 3.

10. Switch sweep to next highest channel and repeat Steps 4 through 9, inclusive.

11. Repeat for other channels. If an unused section causes a suckout on a desired channel, move the adjustments of the unused section to some other place.

12. Cement coils of low channel filter sections to prevent movement.

13. Tighten all adjustment lock nuts. Observe scope trace during this operation to be sure no adjustments have been changed.

14. Replace rear cover screws.

Limit Specifications

1. Curve of Figure 13 shall not have more than 1 DB difference from maximum to minimum points within the pass band between picture and sound carriers.

ALIGNMENT OF FILTER

Equipment Required

Same as for Alignment of Mixer.

Connect equipment as shown in Figure 11, except substitute Filter for Mixer, and standardize.

Procedure

1. Set scope gain to vertical DC and maximum gain.
2. Switch attenuator pad to about 10 DB attenuation (reference).
3. Set sweep on desired channel. Adjust sweep output and width to give a reference output indication on the scope, and width to sweep the entire television channel width, and 1 mc. more on either side.

The above set-up procedure should be repeated when necessary, to insure correctness of calibration. The scope gain and sweep output should not be re-adjusted at any time during the remainder of alignment.

To align the mixer, connect the equipment as shown in Figure 12, except substitute Filter for Mixer.

Proceed as follows:

1. Switch pad to minimum loss.
2. On the 939397 High Channel Filter, adjust the trimmer capacitors for maximum scope indication at channel center.
3. On the 939398 Low Channel Filter, adjust the trimmer capacitors for maximum scope indication at channel center and coil slugs for proper bandwidth.
4. Set pad at setting determined in Standardization Procedure, Step 3.
5. Adjust pad to give standard scope deflection.
6. Trim all adjustments for proper curve shape, as shown in Figure 14. Loss in Filter will be the difference between pad settings of this step and Step 3.
7. Tighten all adjustment lock nuts. Observe scope track during this operation to be sure no adjustments have been changed.

Limit Specifications

1. Curve of Figure 14 shall not have more than 1 DB difference from maximum to minimum points within the pass band between picture and sound carriers.

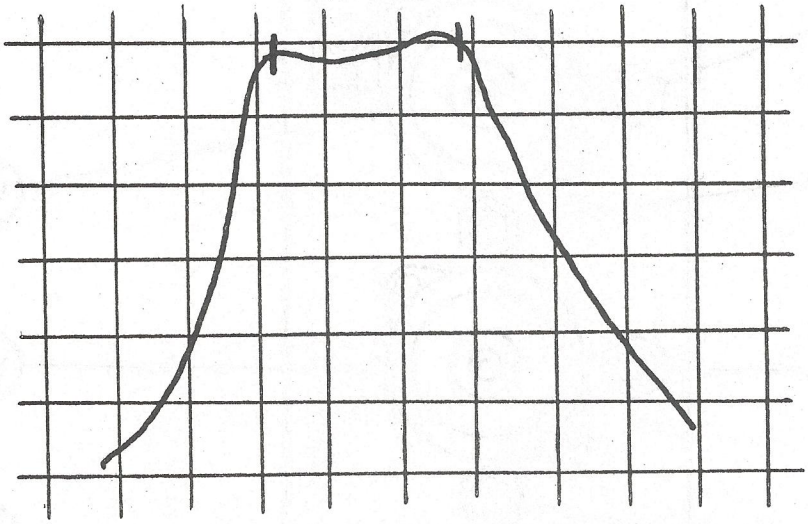


Figure 14.

#939393 AMPLIFIER STRIP

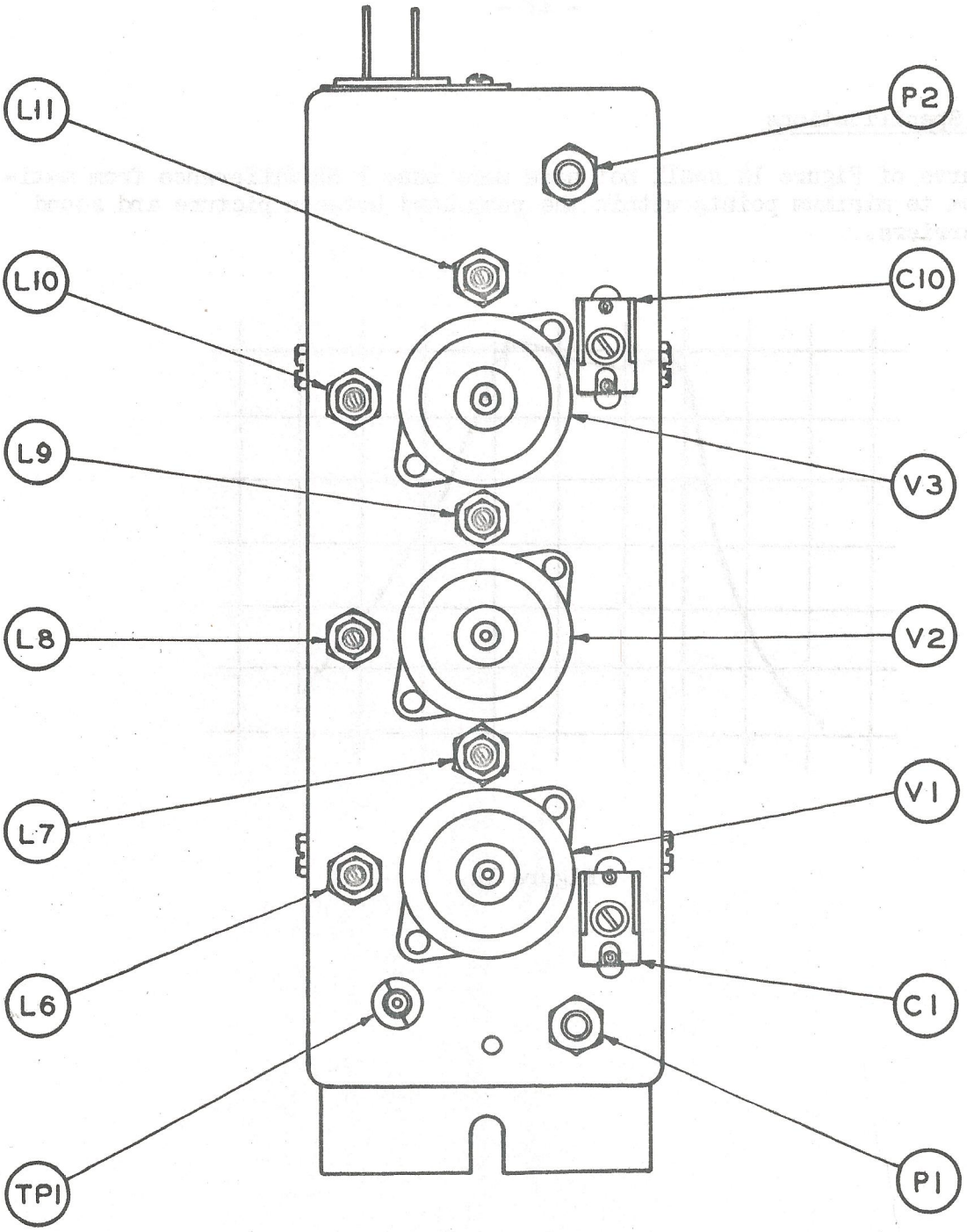
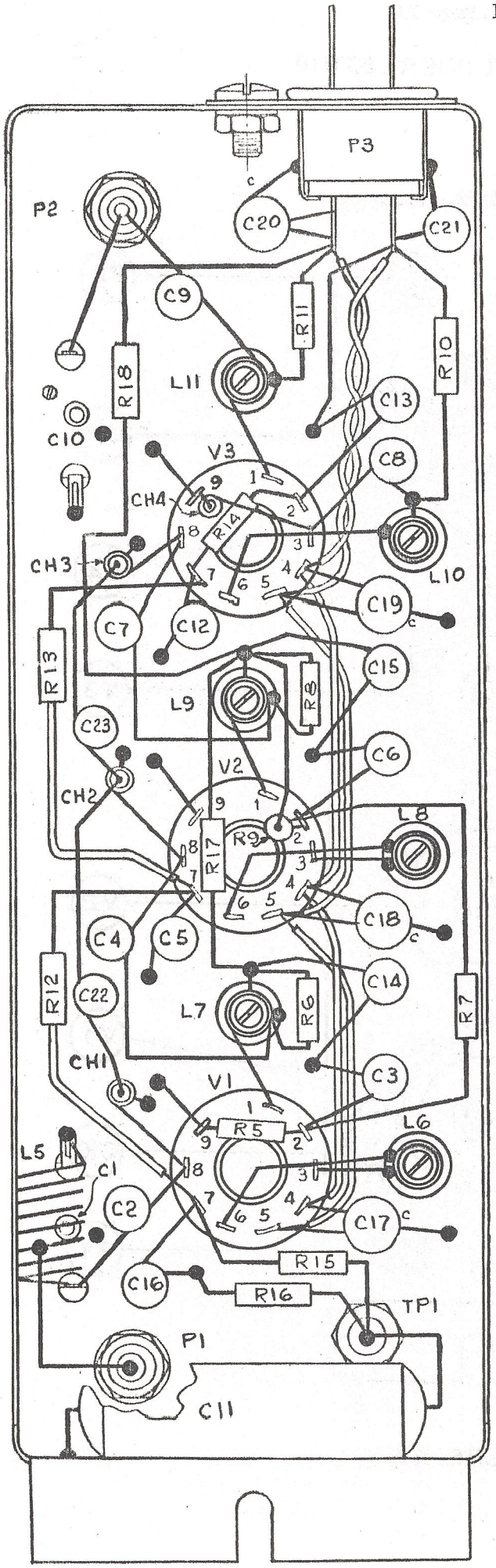


FIGURE 15



#939393 AMPLIFIER STRIP

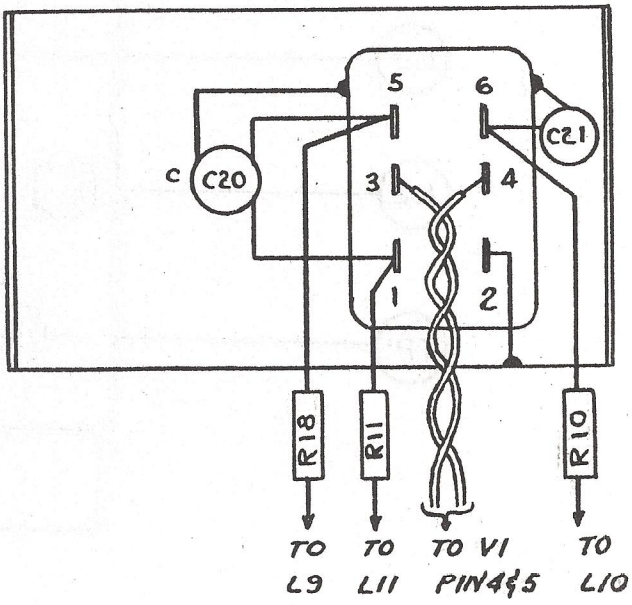


FIGURE 16

#939394 AMPLIFIER STRIP

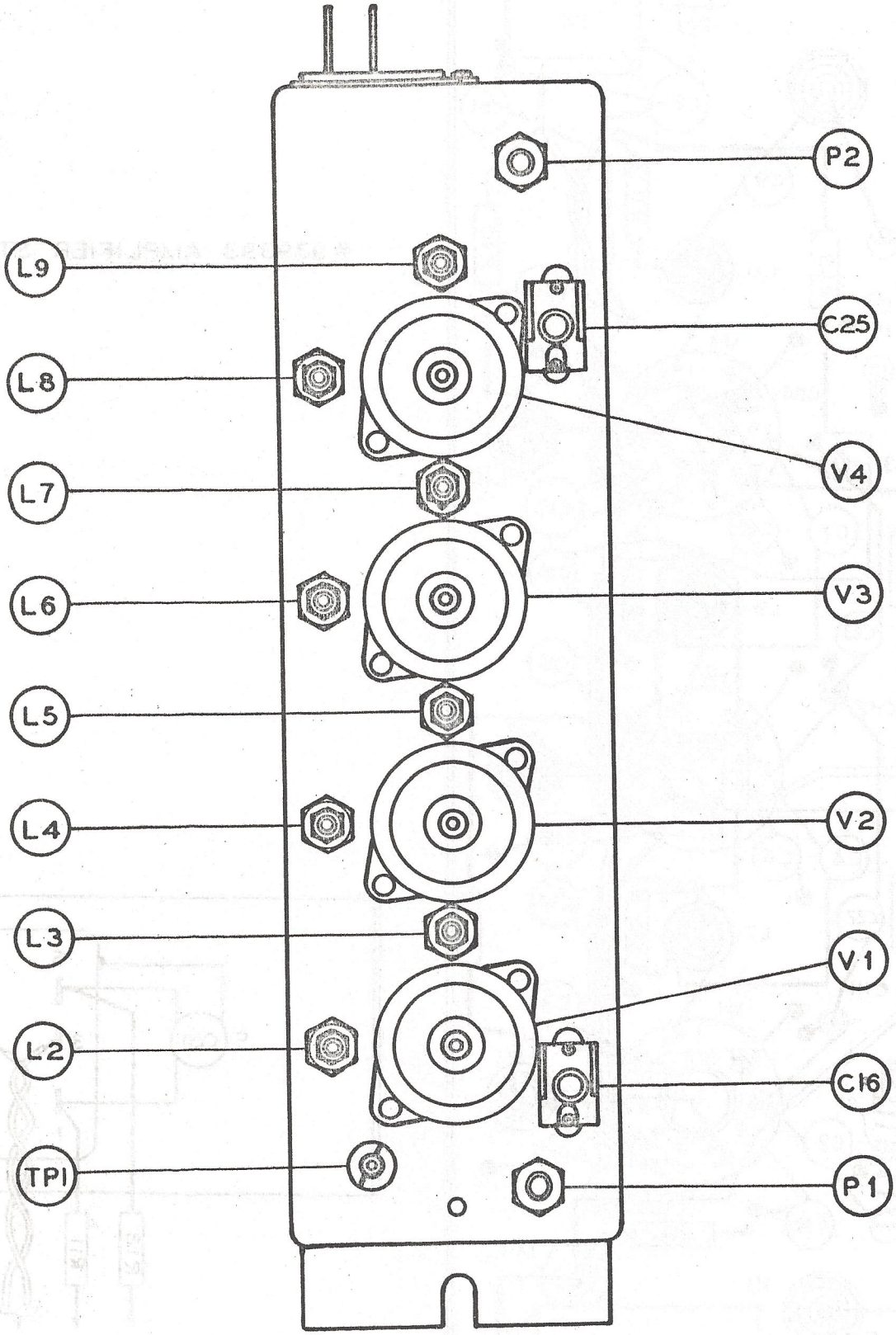
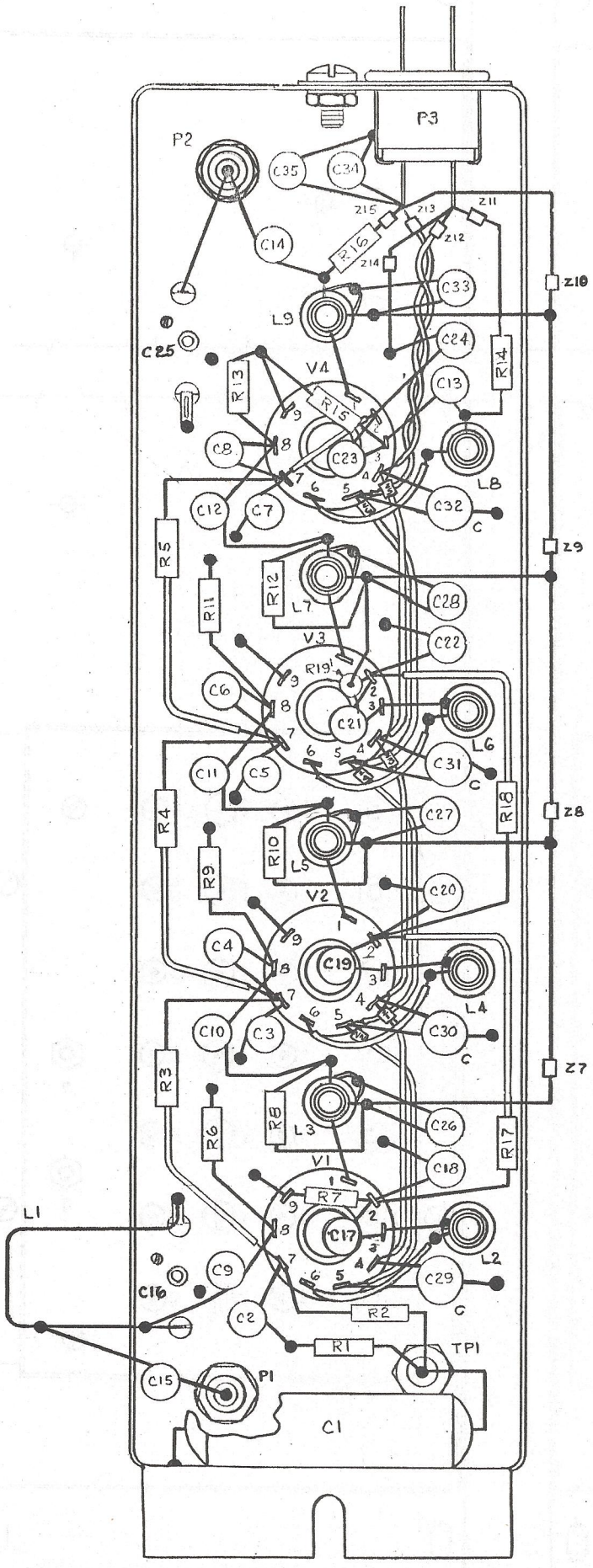


FIGURE 17



#939394 AMPLIFIER STRIP

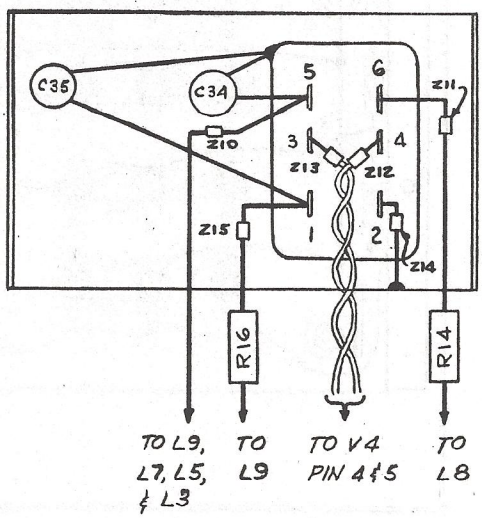
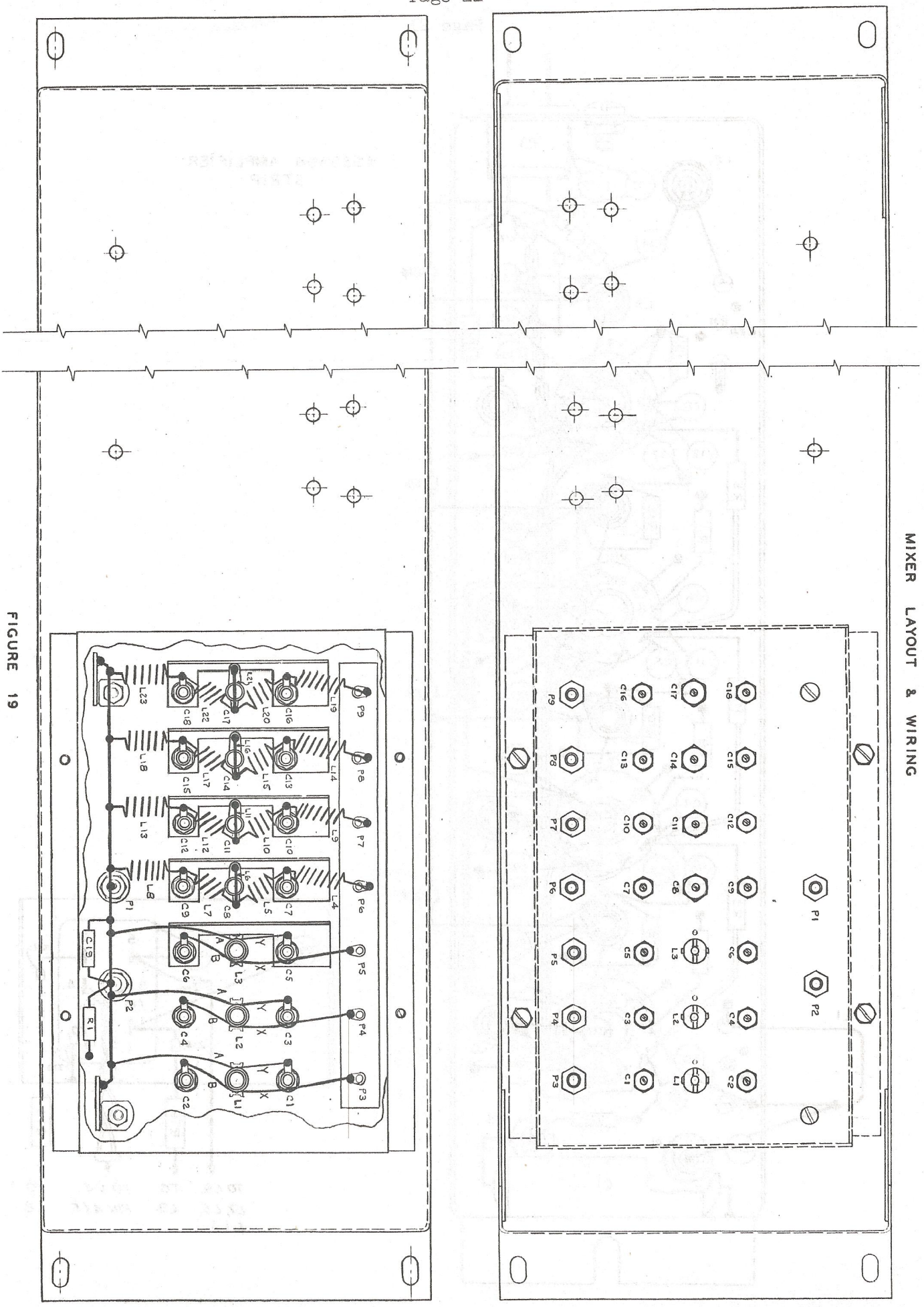
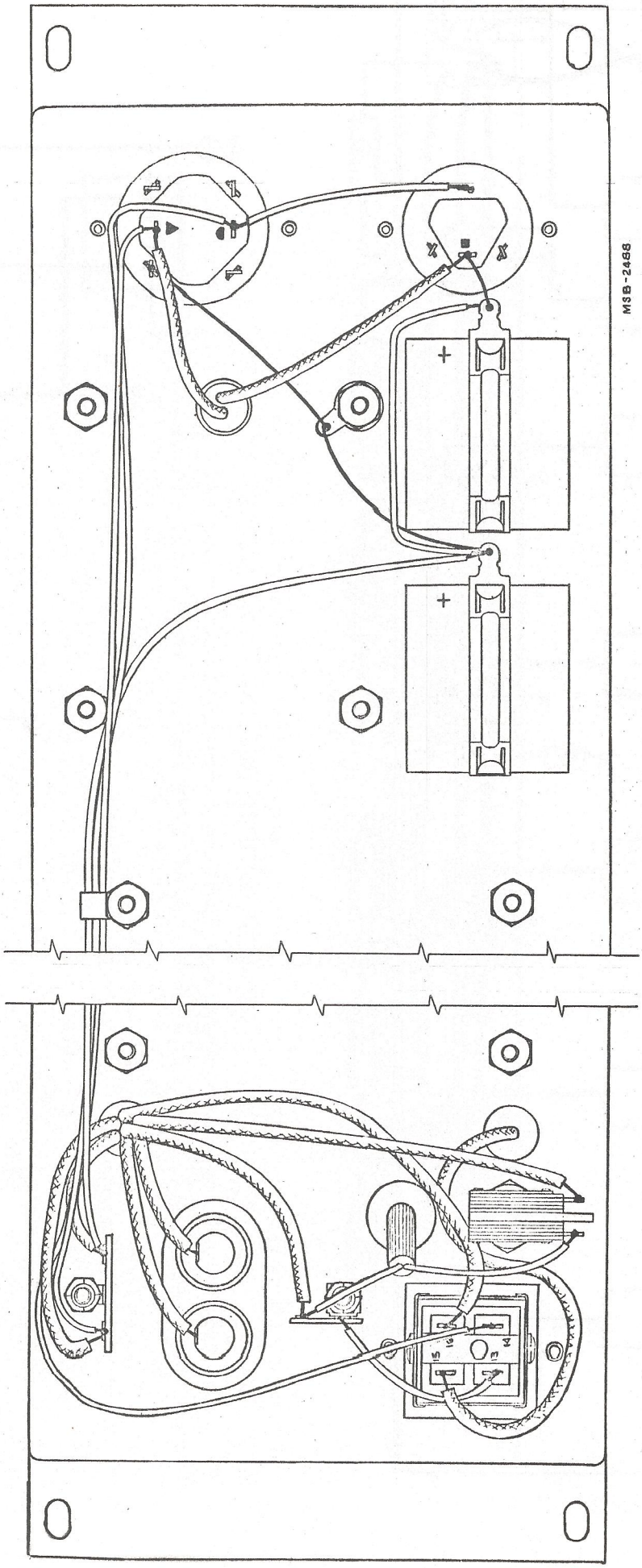


FIGURE 18



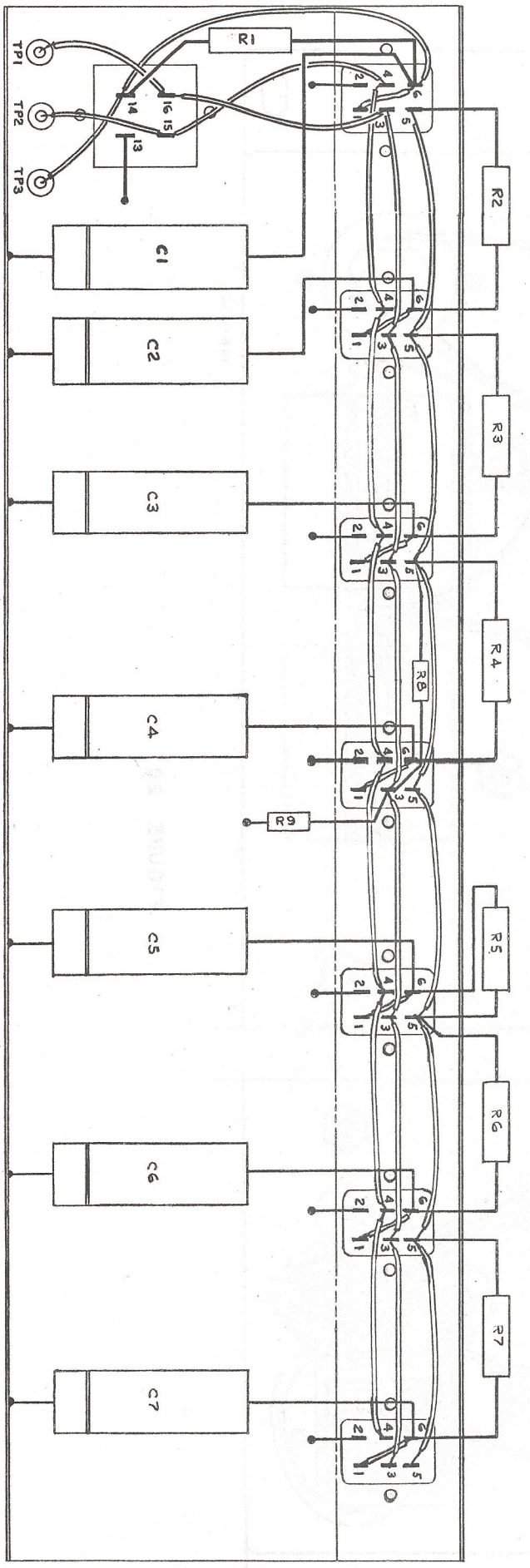
MIXER LAYOUT & WIRING

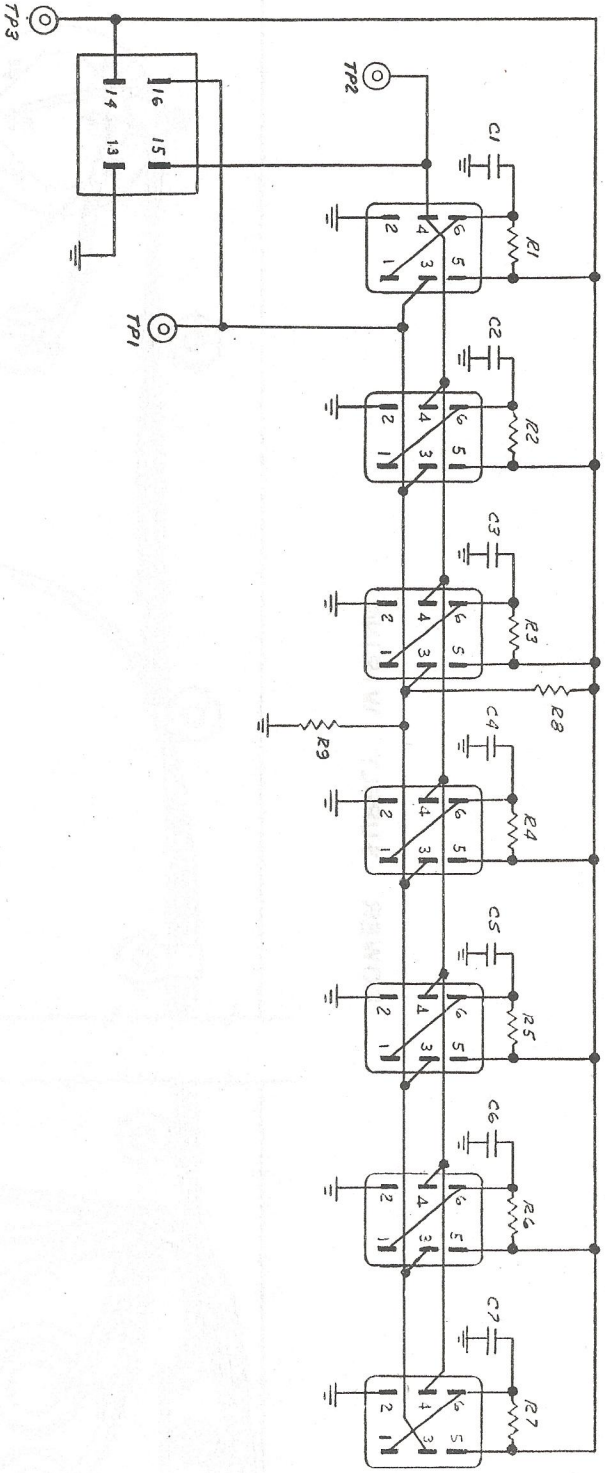
FIGURE 19



POWER SUPPLY WIRING

FIGURE 20

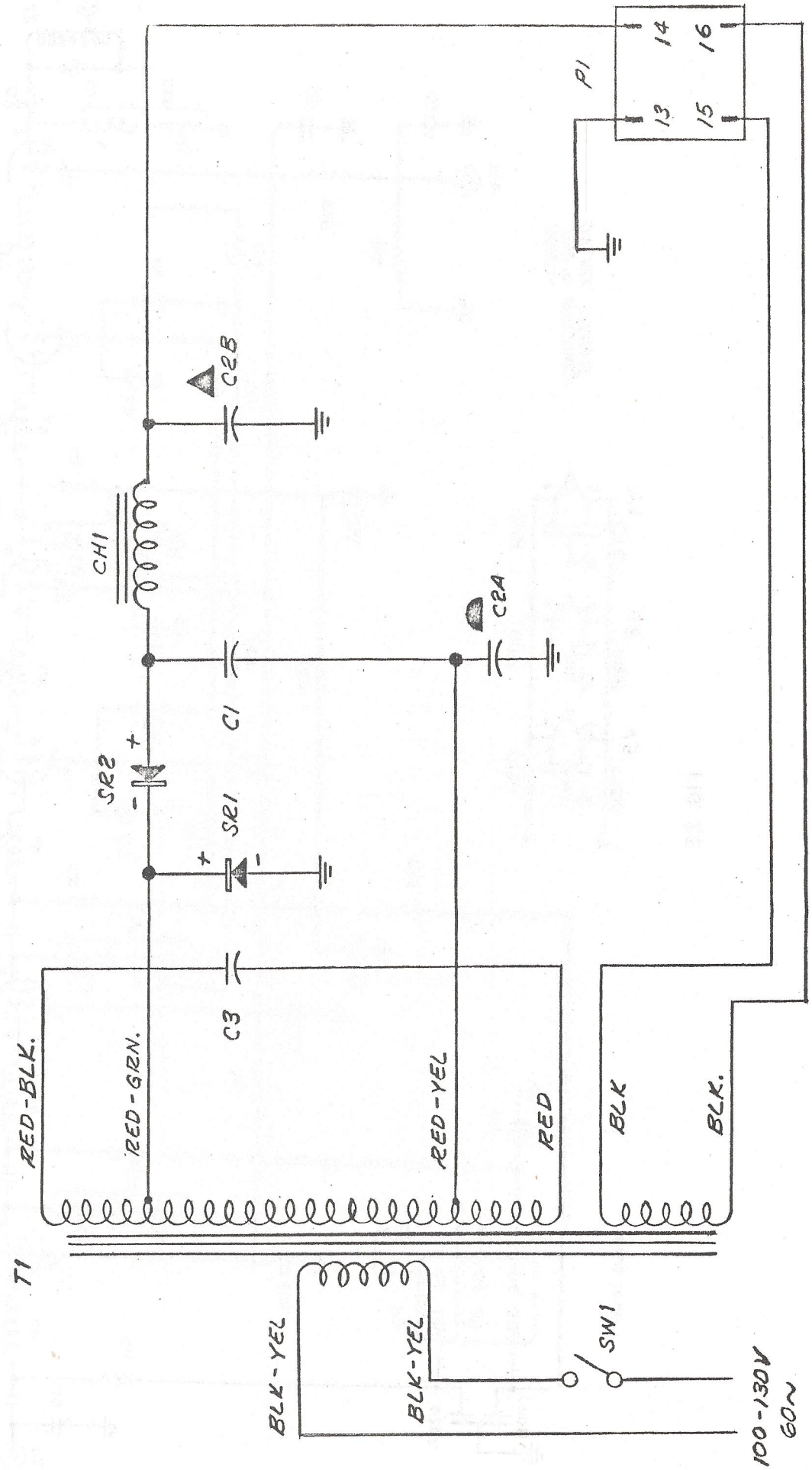




DISTRIBUTION PANEL SCHEMATIC & WIRING DIAGRAM

FIG. 21

POWER SUPPLY SCHEMATIC DIAGRAM



MSB 2465

FIG. 22

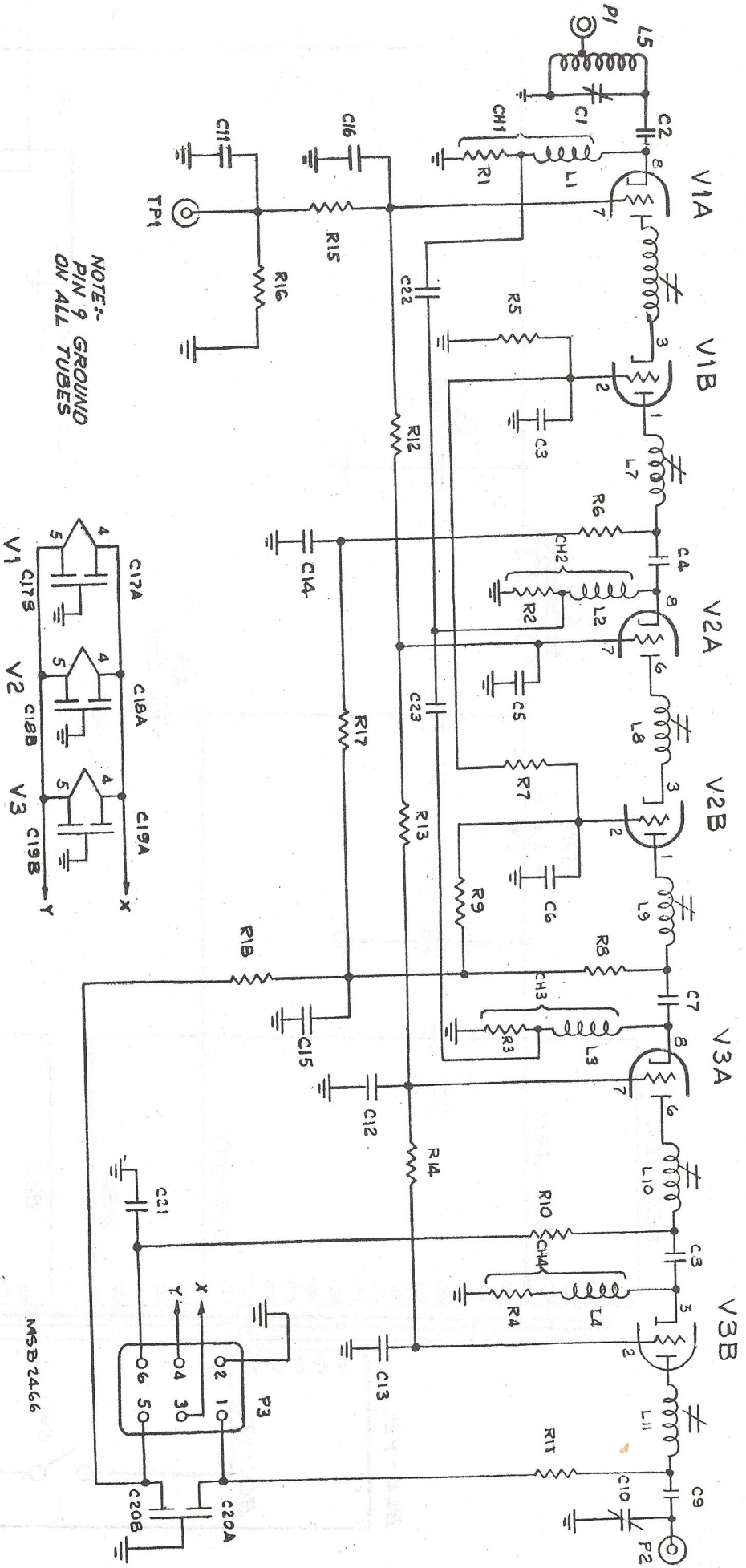

LOW STRIP SCHEMATIC DIAGRAM
P1
L5
C1
C2
CH1
R1
L1
V1A
C11
C16
TP1
R15
R16
C22
R5
V1B
C3
R12
L7
R6
CH2
C4
C14
R2
L2
V2A
C5
C23
L8
R7
V2B
R17
R13
C6
R9
L9
R18
R8
CH3
C7
C15
R3
L3
V3A
C12
R14
L10
C21
R10
CH4
C8
R4
L4
V3B
C13
L11
R11
C10
C9
P2
P3
X
Y
02
10
04
30
06
50
C20A
C20B
MSB 2466
V1
V2
V3
C17A
C17B
C18A
C18B
C19A
C19B
NOTE:- GROUND PIN 9 ON ALL TUBES

FIG. 23

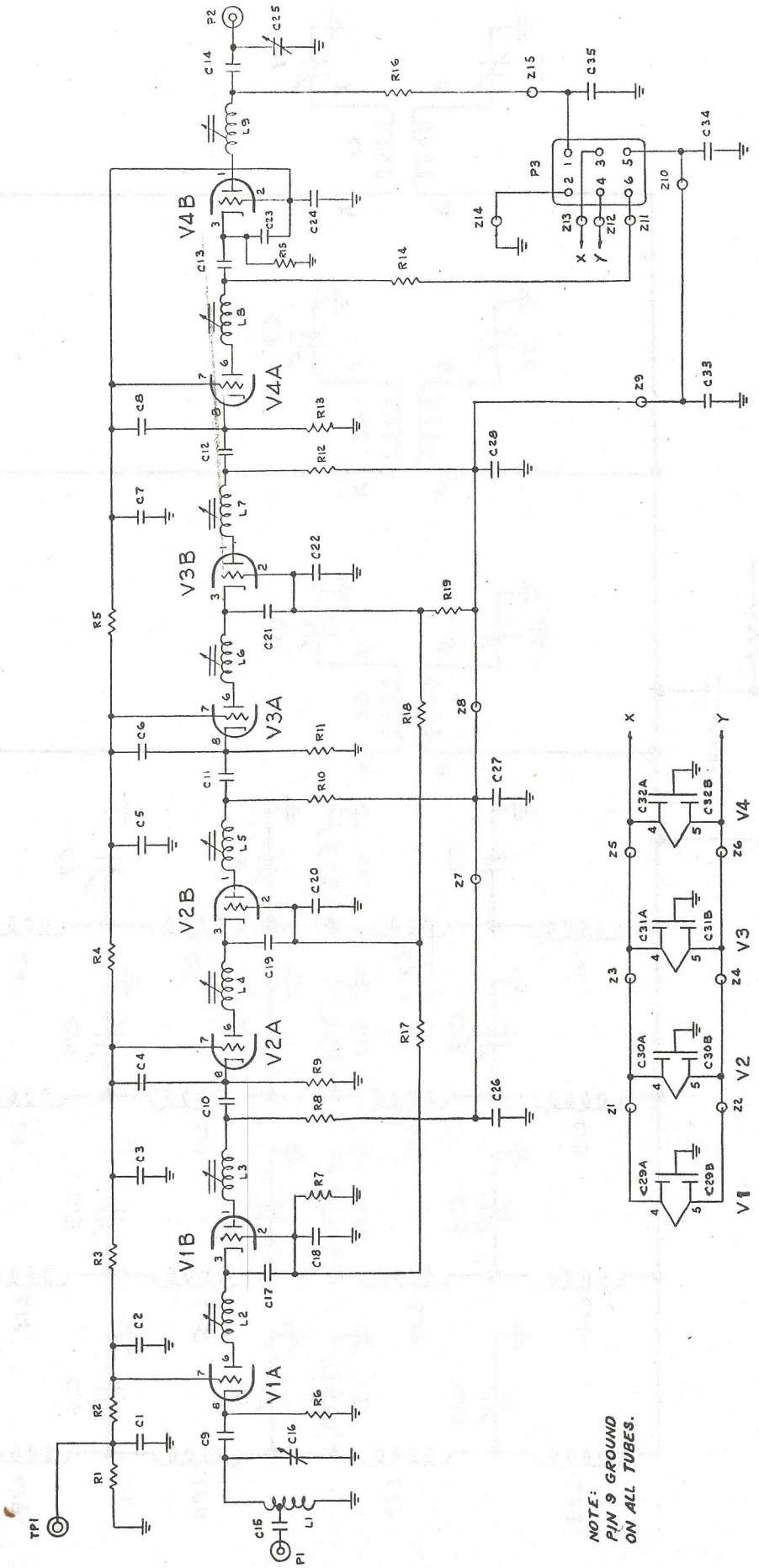

HIGH CHANNEL SCHEMATIC DIAGRAM
NOTE:
PIN 9 GROUND
ON ALL TUBES.
V1A
V1B
V2A
V2B
V3A
V3B
V4A
V4B
V1
V2
V3
V4
TP1
P1
P2
P3
X
Y

FIGURE 24

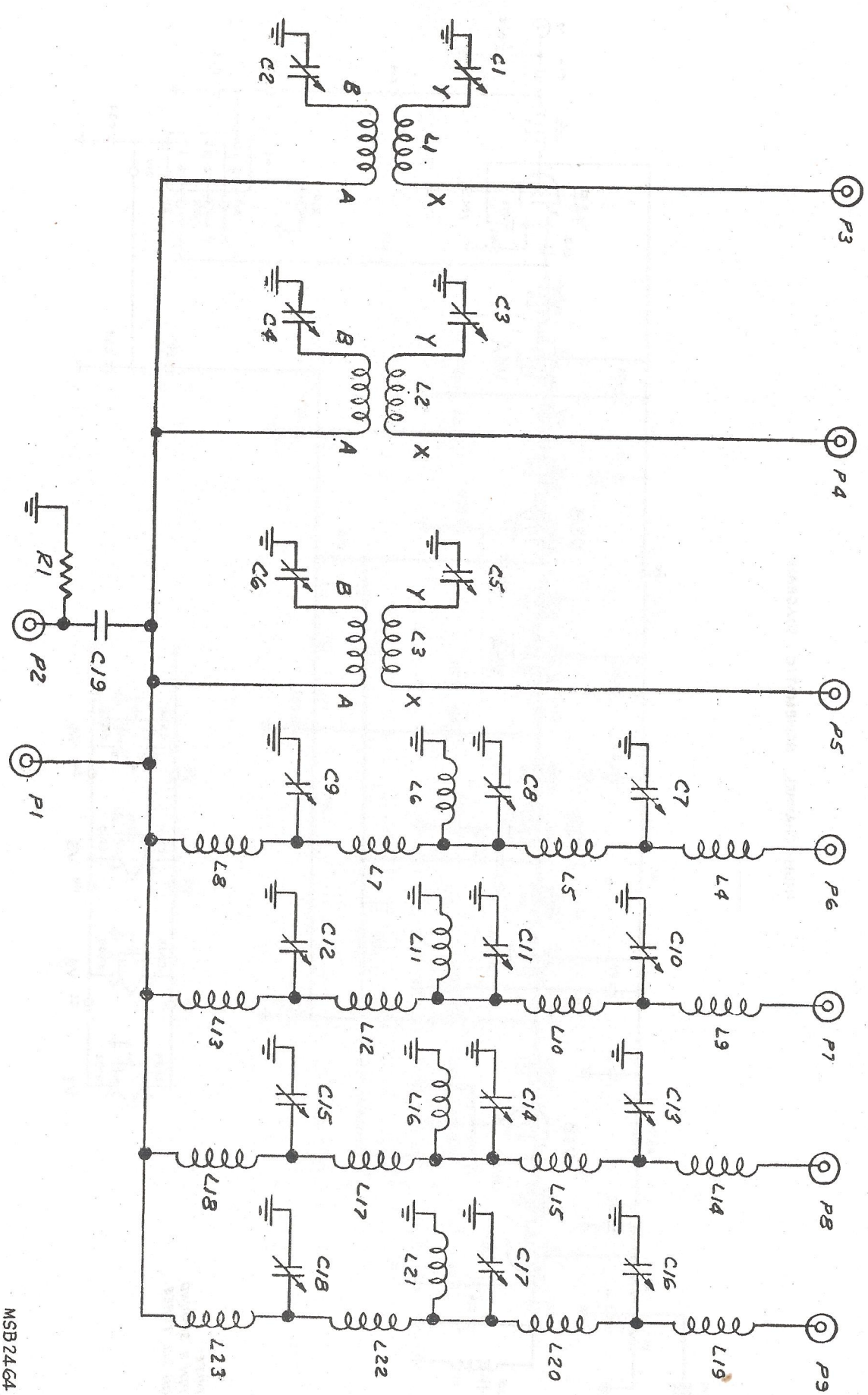

MIXER SCHEMATIC DIAGRAM
P1
P2
P3
P4
P5
P6
P7
P8
P9
R1
C19
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
C18
L1
L2
L3
L4
L5
L6
L7
L8
L9
L10
L11
L12
L13
L14
L15
L16
L17
L18
L19
L20
L21
L22
L23
A
B
X
Y
MSB2464

FIG. 25

PARTS LIST

939391 - POWER SUPPLY

Symbol	Description
C1	Capacitor, 80 mfd., 300 V, Sprague TVL 1573
C2	Capacitor, 80-80 mfd., 350 V, Sprague TVL 2635
C3	Capacitor, 2.5 mfd., 660 V AC, G.E. 690X53 (Supplied with T1)
CH1	Choke, 8 henreys, 300 M.A., Merit C3183
P1	Socket, Jones S2404 SB
SR1, SR2	Rectifier, RCT Type 203G1
SW1	Switch, SPST H&H 20994-EW
T1	Power Transformer, Sola 71342

939392 - AMPLIFIER MOUNTING CHASSIS

C1, C2, C3, C4, C5, C6, C7	Capacitor, 0.22 mfd., 600 V, Tubular
R1, R2, R3, R4, R5, R6, R7	Resistor, 5K, 5 watt, wire wound
R8	Resistor, 220 K, 2 W, 10%
R9	Resistor, 33 K, 1 W, 10%
---	Plug, Jones P2404-5B
---	Socket, Jones S306-AB

939393 - AMPLIFIER STRIP

C1, C10	Capacitor, 3-35 mmfd. trimmer, El-Menco #403
C2, C3, C4, C5, C6, C7, C8, C9, C12, C13, C14, C15, C16, C21	Capacitor, 470 mmfd., Hi-K Ceramic disc. 5/16" diameter, 500 V.
C17, C18, C19, C20	Capacitor, dual 1,000 mmfd., ceramic disc. 500 V.
C11	Capacitor, .47 mfd., 200 V. Tubular
C22	Capacitor, 2.0 mmfd., 500 V, Ceramic
C23	Capacitor, 15 mmfd., 500 V., Ceramic
CH1, CH2, CH3, CH4	Choke coil. 22 turns #32 enamel wire wound on 150 1/2 watt resistor.
P1, P2	Connector - RCA 939333
P3	Plug, Jones P-306-AB
R5, R9	Resistor, 150 K, 1/2 watt 10%
R6, R8, R10, R11	Resistor, 1K 1/2 watt 10%
R7, R12, R13, R14, R15, R17, R18	Resistor, 150 1/2 watt 10%
R16	Resistor, 220 K 1/2 watt 10%
TP1	Test Point, RCA 77460
V1, V2	Tube, RCA 6BQ7A
V3	Tube, RCA 6BC8
---	Tube Socket, Sylvania 7490-0075

939394 - AMPLIFIER STRIP

C1	Capacitor, .47 mfd. 200 V. Tubular
C2, C3, C5, C7, C9, C10, C11, C12, C13, C14, C15, C18, C20, C22, C24, C26, C27, C28, C33, C34, C35	Capacitor, 150 mmfd, 500 V. Disc ceramic, 5/16" diameter
C16, C25	Capacitor, 8-60 mmfd., Trimmer, El-Menco #404
C4, C6, C8, C17, C19, C21, C23	Capacitor, 6.8 mmfd., 500 V. Type NPO disc ceramic
C29, C30, C31, C32	Capacitor, dual 1,000 mmfd., 500 V Disc ceramic
P1, P2	Connector - RCA 939333
P3	Plug, Jones P306-AB
R1	Resistor, 680 K, 1/2 W. 10%
R2	Resistor, 100 1/2 W. 10%
R3, R4, R5, R17, R18	Resistor, 150 1/2 W. 10%
R6, R9, R11, R13, R15	Resistor, 150 1/2 W. Wire Wound
R8, R10, R12	Resistor, 820 1/2 W. Wire Wound
R7, R19	Resistor, 150K, 1/2 W. 10%
R14, R16	Resistor, 1,000 1/2 W. 10%
TP1	Test Point, RCA 77460
V1, V2	Tube, RCA 6BQ7A
V3, V4	Tube, RCA 6BC8
---	Tube Socket, Sylvania 7490-0075
Z1 thru Z15	Bead - Ferroxcube Type 265T118A205

939395 - MIXER

C1, C2, C3, C4, C5, C6, C7, C9, C10, C12, C13, C15, C16, C18	Capacitor, Trimmer, CTC, CST-6
C8, C11, C14, C17	Capacitor, Trimmer, CTC, CS6-50
C19	Capacitor, Ceramic, 1 mmfd.
P1 thru P9	Connector, RCA 939333
R1	Resistor, 220 ohm, 1/2 W., 10%