BROADCAST AUDIO EQUIPMENT

Type BA-25A
AGC Program Amplifier
MI-11434

IB-24790-2

EQUIPMENT LOST OR DAMAGED IN TRANSIT

When delivering the equipment to you, the truck driver or carrier's agent will present a receipt for your signature. Do not sign it until you have (a) inspected the containers for visible signs of damage and (b) counted the containers and compared with the amount shown on the shipping papers. If a shortage or if evidence of damage is noted, insist that notation to that effect be made on the shipping papers before you sign them.

Further, after receiving the equipment, unpack it and inspect thoroughly for concealed damage. If concealed damage is discovered, immediately notify the carrier, confirming the notification in writing, and secure an inspection report. This item should be unpacked and inspected for damage WITHIN 15 DAYS after receipt.

Report all shortages and damages to RCA, Broadcast and Television Department, Camden 2, N. J.

Radio Corporation of America will file all claims for loss and damage on this equipment so long as the inspection report is obtained. Disposition of the damaged item will be furnished by RCA.

REPLACEMENT PARTS AND ENGINEERING SERVICE

RCA field engineering service is available at current rates. Requests for field engineering service may be addressed to your RCA Broadcast Field Representative or the RCA Service Company, Inc., Broadcast Service Division, Camden, N. J. Telephone: WOodlawn 3-8000.

When ordering replacement parts, please give symbol, description, and stock number of each item ordered.

The part which will be supplied against an order for a replacement item may not be an exact duplicate of the original part. However, it will be a satisfactory replacement differing only in minor mechanical or electrical characteristics. Such differences will in no way impair the operation of the equipment. Parts with no stock numbers are standard components. They are not stocked by RCA and should be obtained from your local electronic parts distributor.

The following tabulations list service parts and electron tube ordering instructions according to your geographical location.

SERVICE PARTS

LOCATION	ORDER SERVICE PARTS FROM:
Continental United States, including Alaska and Hawaii	RCA Parts and Accessories Department, P.O. Box 654, Camden, New Jersey or through your nearest RCA Regional Office. Emergency orders may be telephoned, telegraphed, or teletyped to RCA Emergency Service, Bldg. 60, Camden, N. J. (Telephone: WO 3-8000).
Dominion of Canada	RCA Victor Company Limited, 1001 Lenoir Street, Montreal, Quebec or through your local Sales Representative or his office.
Outside of Continental United States, Alaska, Hawaii and the Dominion of Canada	RCA International Division, Clark, N. J., U.S.A., or through your local Sales Representative.

ELECTRON TUBES

LOCATION	ORDER ELECTRON TUBES FROM:
Continental United States, including Alaska and Hawaii	Local RCA Tube Distributor.
Dominion of Canada	RCA Victor Company Limited, 1001 Lenoir Street, Montreal, Quebec or through your local Sales Representative or his office.
Outside of Continental United States, Alaska, Hawaii and the Dominion of Canada	Local RCA Tube Distributor or from: Tube Department RCA International Division 30 Rockefeller Plaza New York 20, New York, U.S.A.

RETURN OF ELECTRON TUBES

If for any reason, it is desired to return tubes, please return them through your local RCA tube distributor, RCA Victor Co., Ltd., or RCA International Div., depending on your location.

PLEASE DO NOT RETURN TUBES DIRECTLY TO RCA WITHOUT AUTHORIZATION AND SHIPPING INSTRUCTIONS.

It is important that complete information regarding each tube (including type, serial number, hours of service and reason for its return) be given.

When tubes are returned, they should be shipped to the address specified on the Return Authorization form. A copy of the Return Authorization and also a Service Report for each tube should be packed with the tubes.

LIST OF RCA SALES OFFICES

Atlanta 3, Georgia
1121 Rhodes-Haverty Bldg.
134 Peachtree St. N.W.
JAckson 4-7703

Boston 16, Mass.
Room 2301, John Hancock Bldg.
200 Berkley St.
HUbbard 2-5765

Camden 2, N. J.
Building 15
WOodlawn 3-8000

Charlotte 4, N. C.
504 Charlottetown Mall
333-3996

Chicago 54, Ill.
1186 Merchandise Mart Plaza
DElaware 7-0700

Cleveland 15, Ohio
1600 Keith Bldg.
CHerry 1-3450

Dallas 35, Texas
7901 Empire Freeway
FLeetwood 2-3911

Detroit 39, Mich.
12605 Arnold St.
KEnwood 4-5100

Hollywood 28, Calif.
RCA Bldg., 1560 N. Vine St.
HOllywood 9-2154

Indianapolis, Ind.
501 N. LaSalle St.
MElrose 6-5321

Kansas City 15, Missouri
7711 State Line Road
EMerson 1-6770

New York 20, New York
36 W. 49th St.
JUdson 6-3800

Paterson, N. J.
495 E. 30th St.
MUlberry 4-0972

Portland 5, Oregon
1208 S.W. 14th St.
CApitol 6-6828

San Francisco 2, Calif.
420 Taylor St.
ORdway 3-8027

Seattle, Washington
2250 First Ave., S.
MAin 2-8350

Washington 6, D. C.
1725 K St., N.W.
FEderal 7-8500

INSTRUCTIONS

Type BA-25A
AGC Program Amplifier

MI-11434

RADIO CORPORATION OF AMERICA
INDUSTRIAL ELECTRONIC PRODUCTS, CAMDEN, N. J.

PRINTED IN U.S.A.
DU-5119-6100-691-6111

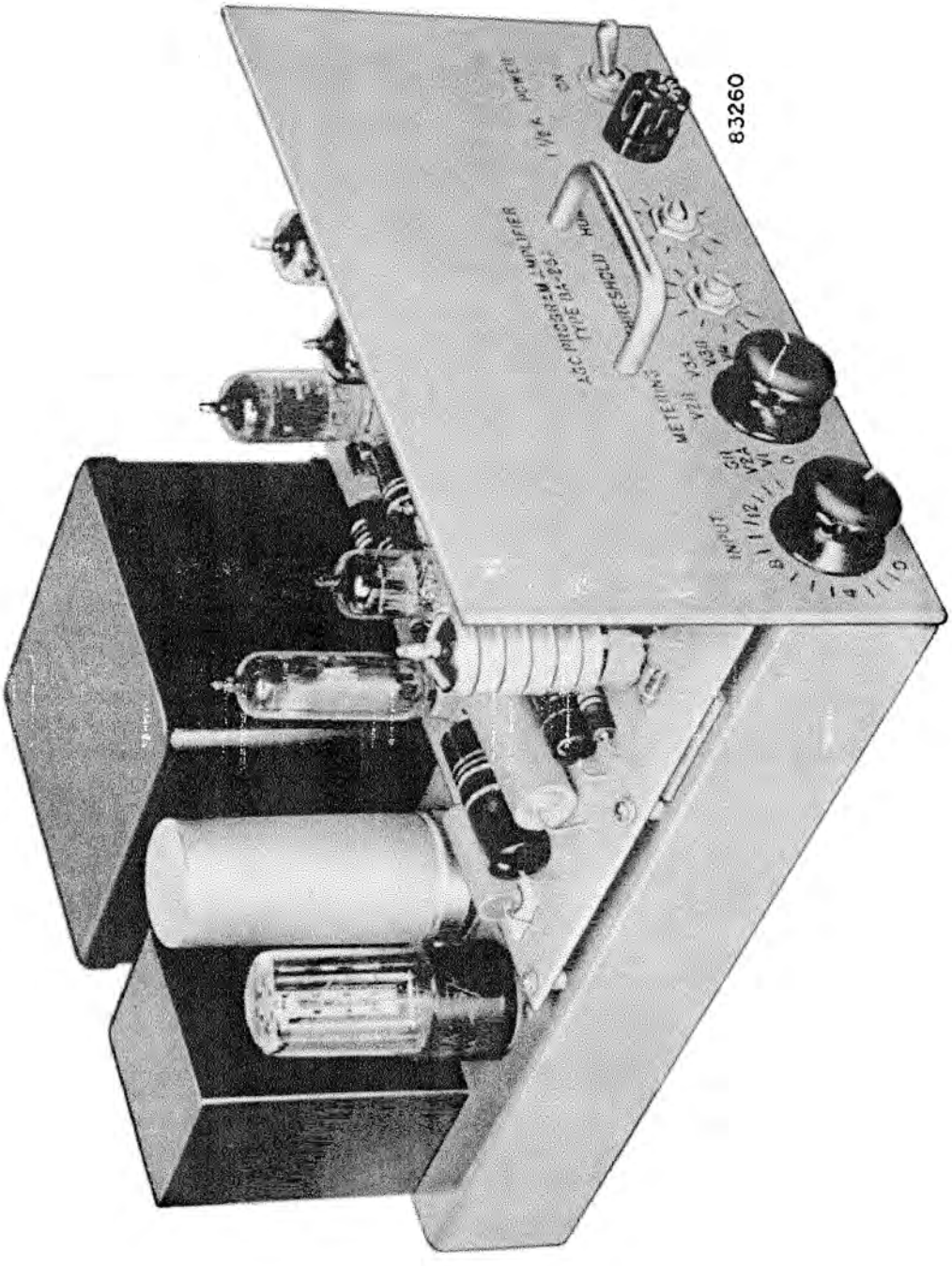


Figure 1 - Type BA-25A AGC Program Amplifier

TECHNICAL DATA

Power Required

100 - 130 v, 50/60 cps
55 watts

Source Impedance

150/600 ohms

Input Impedance

150-600 ohms

Maximum Input Level

-25 dbm

Maximum Output Level

+ 30 dbm

Output Impedance

30/120 ohms

Load Impedance

150/600 ohms

Harmonic Distortion

Less than 1% total RMS at 20 dbm output
30 to 15,000 cps

Threshold of Compression

Compression Ratio:	Output Level:
3:1	5 dbm
4:1	14 dbm
5:1	18 dbm
6:1	21 dbm

Gain, Maximum Below Verge of Compression

70 db ± 1 db

Frequency Response

± 1 db 30 to 15,000 cps

Maximum Noise Level (Output)

Less than -46 dbm at 70 db gain

Time Constants

Attack Time Constant	12.5 milliseconds
Recovery Time Constant	1.0 second

Tube Metering Voltage

1.0 ±0.15 v when measuring V1,V3A,V4-V5
1.2 ±0.20 v when measuring V2A and V2B

Mounting

Plug-in mounting on MI-11597 Type BR-22A Mounting Shelf

½ of shelf space required by one BA-25A

BR-22A shelf may be installed in standard 19-inch rack such as, Type BR-84 Series; 5-1/4 inch vertical space required.

Mechanical Dimensions

Length - 12-1/2 inches
Height - 4-21/32 inches
Width - 8-3/8 inches

weight: 15 pounds
Finish: Light umber gray

Tube Complement MI-11487 (Not Supplied)

1 MI-11299 selected 12AY7
1 6386
1 RCA 12AX7
2 RCA 12AU7
1 RCA 6AL5
1 RCA 0B2
1 RCA 5Y3GT

DESCRIPTION

The Type BA-25A AGC Program Amplifier, MI-11434, is designed for use in broadcast audio systems to control automatically the variations in the audio program level. The power supply is self contained. The guide assembly for installation on the BR-22A mounting shelf is supplied with the amplifier. The BR-22A Shelf will mount two BA-25A amplifiers and may be installed in a standard 19-inch rack such as the BR-84 Series.

The controls mounted on the front panel are:

Input Control
Metering Switch
Threshold Adjust (screwdriver)
HUM adjust (screwdriver)
POWER switch

The power fuse is also located on the front panel. The metering switch selects the tubes for measuring the cathode current. A U-shaped handle on the amplifier front panel makes the unit easily inserted or withdrawn.

The BA-25A amplifier is capable of maintaining automatically a nearly constant average output level over wide variations of average input level. Such variations are frequently encountered when switching between the output of projectors, turntable preamplifiers and other sound sources.

Equipment Supplied

The items shipped with the BA-25A program amplifier are as follows:

Qty.	*Unit*	*MI-number*
1	AGC Program Amplifier	MI-11434
1	Guide Assembly	
1	Connector (receptacle)	
1	Container: for necessary hardware to install guide assembly	
2	Tube Shields	
1	Instructions	IB-24790-2

Guide Assembly

A guide assembly is supplied with each amplifier for mounting the BA-25A on the MI-11597 shelf. The guide assembly holds the connector receptacle and is assembled to the mounting shelf by means of screws. Refer to the *Installation* section for the assembly procedure.

Circuits

The Type BA-25A amplifier is designed to control automatically variations in audio program level. The amplifier consists of a phase inverter, variable gain stage, driver and output stage, signal rectifier and a self-contained power supply with voltage regulator. Refer to block diagram, figure 2.

The input signal is applied through an input transformer and input level control to a phase inverter. The phase inverter drives a push-pull variable gain amplifier which utilizes a type 6386 remote-cutoff twin triode tube. The gain of this stage depends on the bias voltage, the more negative, the lower is the gain. The output of the variable gain stage is fed to the push-pull voltage amplifier and a push-pull parallel output stage. Negative feedback is applied over the output and driver stages. A portion of the output signal is supplied to a rectifier tube. An adjustable positive bias on this tube delays rectification of the signal until the output level exceeds the "threshold" value.

The rectified current is filtered through a resistance-capacitance network having a fast charge and slow discharge time constant. This voltage which is negative with respect to ground, is applied as a bias voltage to the grids of the remote cut-off tubes. As the output level increases, the bias voltage becomes more negative, reducing the gain of the amplifier and thus reducing the increase in output level. This constitutes a closed loop system which tends to maintain a nearly constant output level as long as the input signal is sufficient to reach the threshold of compression.

Below the threshold level, which is adjustable by varying the rectifier delay bias, the amplifier is linear and the output level is therefore proportional to the input level. Above the threshold level, the increase in

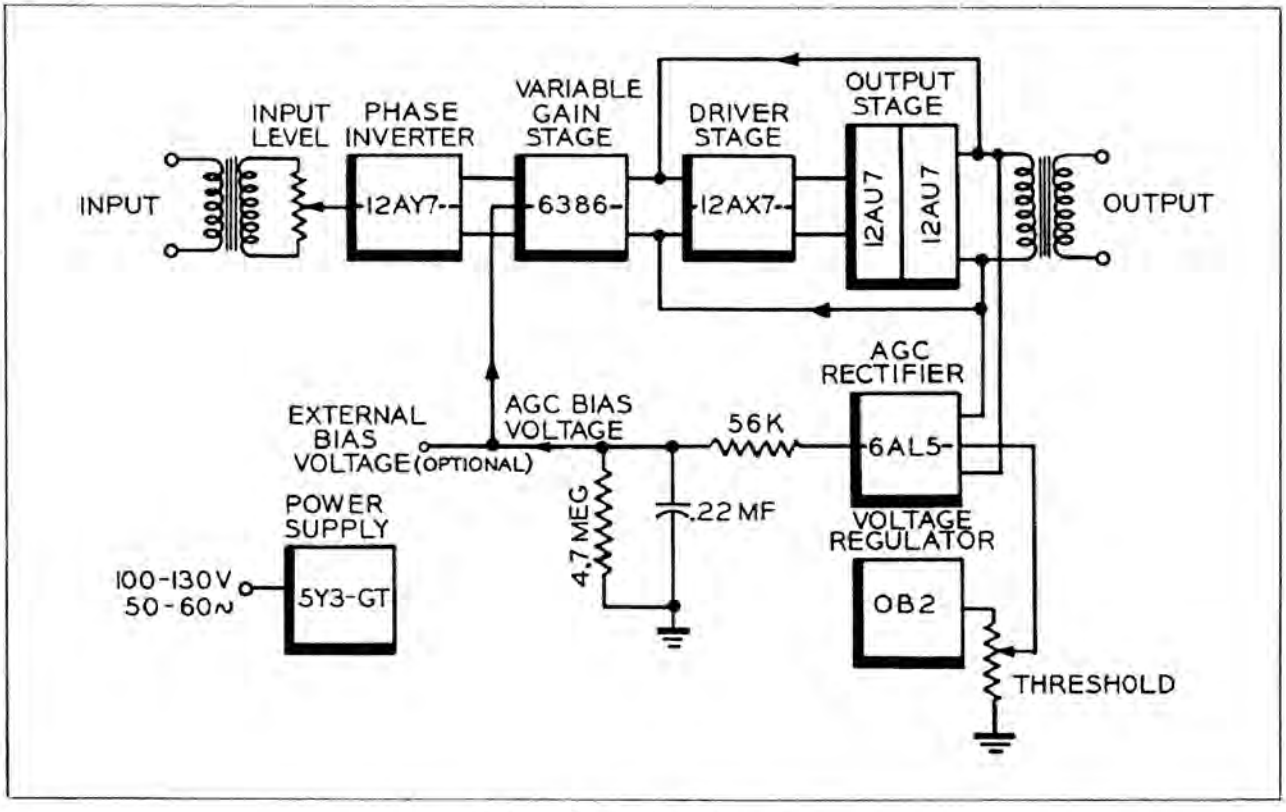


Figure 2 - Block Diagram

output level is less than the increase in input level. The ratio of the increase in input level to the increase in output level is the compression ratio. This compression ratio is a function of the threshold level. The higher the setting of the threshold level, the higher is the compression ratio.

A metering switch is provided on the front panel of the BA-25A amplifier. When connected to a meter panel such as the Type BI-1B, the cathode current of the amplifier tubes, which is an indication of the tube conditions, may be measured. An external attenuator may be used for adjusting the output level where necessary.

When used for automatic fading or remote gain control, an external source of control bias voltage may be applied.

INSTALLATION

Mounting Guide Assembly and Shelf

The guide assembly, receptacle and hardware are supplied with the MI-11434 AGC Program Amplifier as Items 2, 3, and 4 respectively. Mount the guide assembly and shelf as follows:

1. Place the guide assembly on the shelf so that the bracket is at the far or rear end and extends upwards.

2. Install the receptacle (Item 3) on the bracket with terminal #1 in the upper left hand corner. Fasten the receptacle to the bracket on the guide assembly by means of the two #6-32 x 1/2 round head machine screws (Item 4A), two #6 internal teeth lockwashers (Item 4D) and the two #6-32 hex nuts (Item 4C).

3. Secure the guide assembly to the mounting shelf with the six #6-32 x 1/4 binder head machine screws (Item 4B) and six #6 internal teeth lockwashers (Item 4D).

4. Mount the shelf on the rack by means of the hardware supplied with the rack.

Tubes MI-11487 (Not Supplied)

Plug the tubes into the sockets and push the tube shields supplied (Items 5 and 6) over the 12AY7 (V1) and 6386 (V2) respectively, making sure that the ground strap which extends upwards from the tube socket is wedged between the tube and the tube shield. Install the 5Y3GT (V8) *on the chassis* beside C18. All other tube sockets are mounted on the printed circuit board and are clearly marked.

CAUTION: Before mounting the amplifier on the shelf, check the transformer connections. If correct, as described under the Internal Connections, plug the unit into the receptacle mounted on the guide assembly.

Internal Connections

The Type BA-25A Amplifier is shipped from the factory with the input transformer T1 connected for operation from a balanced 600-ohm source, the output transformer T2 connected for matching a 600-ohm load and the power transformer T3 connected for operation from 115 v line. The amplifier may also be connected to operate from a 150-ohm source, for a 150-ohm load, and for other line voltages.

1. 150-ohm Input

To operate from 150-ohm input, remove the jumper between terminals 2 and 3 of transformer T1. Jumper terminals 1 to 2 and 3 to 4. Connect the wire previously connected to terminal 2 to terminal 5.

2. 150-ohm Output

To change the output transformer for matchine a 150-ohm load, remove the jumper between terminals 7 and 8. Jumper terminals 6 to 7 and 8 to 9.

3. Power Transformer Primary Connections

The amplifier may be set up with the power transformer T3 connected for operation from 100 to 130 v line voltage. If the line voltage is between 100 and 110 v, move the black/red wire from terminal 3 of T3 and connect it to terminal 2 of T3. If the line voltage is between 120 and 130 v, connect the black/red wire from terminal 3 to terminal 4.

External Connections

All external connections are made to the receptacle J1 on the mounting shelf which mates with the plug P1 on the amplifier. Input and output leads should be laced in separate cables and should be kept far apart from each other and a-c leads. The connections to the receptacle J1 should be made as follows:

FUNCTION	*TERMINALS*
Input	1 and 2
Metering (Gain Reduction)	3 (-) & 5 (+)
Metering (Tube Current)	3 (-) & 7 (+)
External Control Bias	3 (+) & 6 (-)
Center Tap, Input Transformer	4
Output	11 and 12
Ground	13
Power Line	14 and 15

Tube Metering

Using an RCA Type BI-1B Metering Panel, connect the meter to terminals 3 (-) and 7 (+) of the connector receptacle. Select the tube to be measured by turning the switch on the front panel of the amplifier. This meter gives an indication of the cathode current of the tubes. Normal indication is 1.2 ± .2 v in position V2A and V2B with no input signal, and 1.0 ± .15 v in the other positions.

Connection of Gain Reduction Meter to Amplifier

The gain reduction of the amplifier may be measured by connecting a microampere meter, 200 micro amperes maximum, or a VU meter in series with a 10,000-ohm variable resistor to terminals 3 (-) and 5 (+) of the connector receptacle. Adjust the resistor until the meter reads full scale with no input signal applied to the amplifier. Refer to the chart, figure 4, to find the gain reduction in db corresponding to the meter reading.

Used as Program Amplifier

To use the amplifier as a program amplifier without AGC, remove the signal rectifier tube V6, 6AL5, from the circuit. Alternately, the threshold control may be set for maximum delay bias (maximum clockwise position) and the control bias voltage shorted by connecting terminal 3 to 6 on the connector receptacle.

Shielding

Shielded twisted pairs of wire should be used for the input and output connections. The shields should be securely grounded at one end only. An insulating covering over the shield of the input leads is helpful in reducing noise and crosstalk.

Hum Adjustment

On the front panel of the amplifier is a screwdriver HUM adjustment. Adjust this control for minimum hum in the amplifier output.

OPERATION

The transfer characteristics of the BA-25A AGC Program Amplifier is shown in figure 3. The desired operating characteristic should be chosen from this chart. For most applications, compression ratios of from 4:1 to 5:1 are suggested.

Set the threshold control R47 to the maximum clockwise position. Apply a 1000 cps input signal of approximately -50 dbm to the input terminals of the amplifier. Adjust the input level control R1 for an output level corresponding to the knee of the curve having the desired compression ratio (14 dbm for a 4:1 ratio or 18 dbm for a 5:1 ratio for example).

Turn the threshold control counterclockwise until a slight reduction in output level is noted. If a gain reduction meter is connected to the amplifier, the meter will begin to indicate a reduction of gain at this point.

Apply normal program level to the amplifier input. Adjust the input level control until

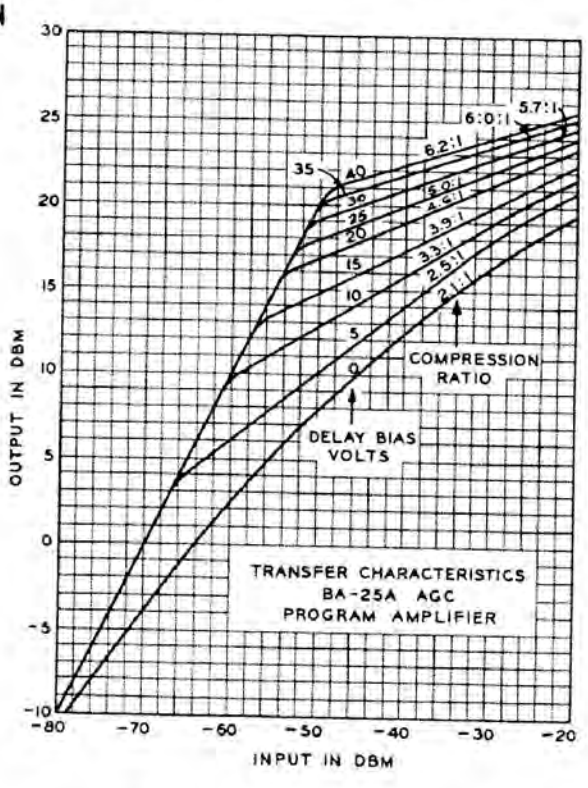


Figure 3 - Transfer Characteristics

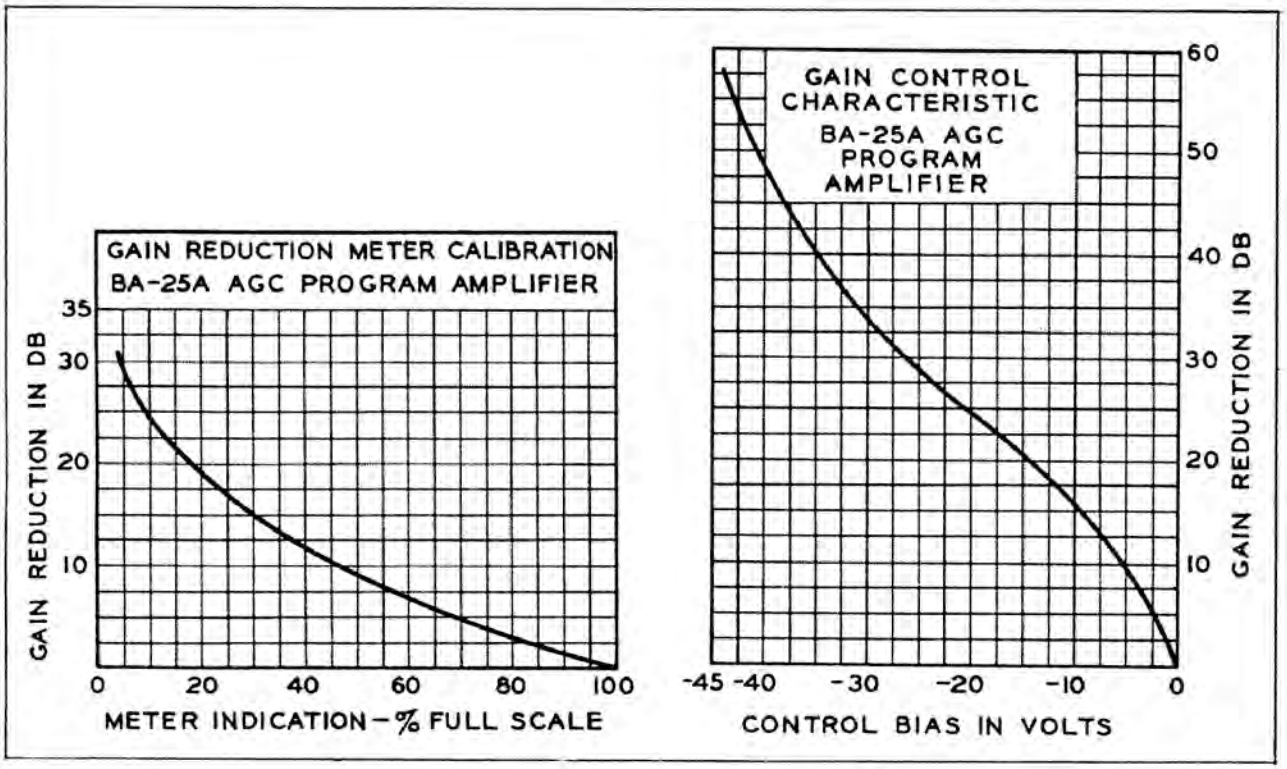


Figure 4 - Gain Reduction and Gain Control Characteristics

the gain reduction meter indicates the desired amount of gain reduction or until the desired output level is reached.

If there is too much variation in output level for a given range of input level, it may be necessary to increase the input level control (turn clockwise) and increase the threshold level (compression ratio). If the background noise level should come up too high during low level passages, the input gain control should be adjusted counterclockwise.

If the output level is too high after the above adjustments have been made, and if it is not possible to compensate for this high level by reducing the input control of the equipment following the AGC amplifier, then a fixed or variable attenuator should be installed between the output of the AGC amplifier and its load.

The time constants of the gain control circuit are selected for average conditions. If it is desired to change the attack time, this may be done by varying the value of R40. The recovery time may be changed by varying the value of R39.

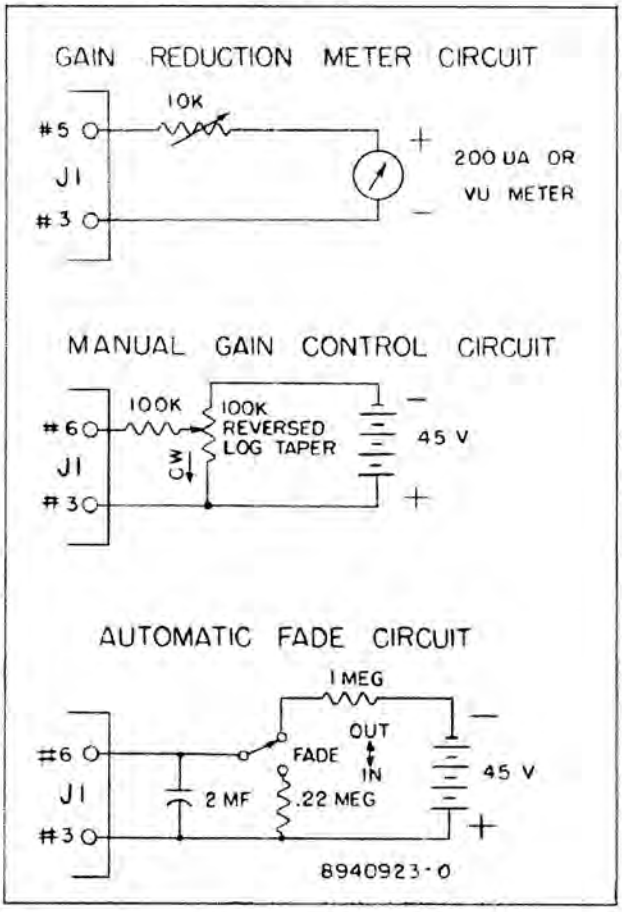


Figure 5 - Circuits

Remote Gain Control

It is possible to use the BA-25A AGC Program Amplifier for remote gain control applications using an external dc voltage. A suggested circuit is shown in figure 5. The 100 K potentiometer should have a reversed logarithmic taper. The negative voltage source may be a "C" battery or power supply having a ripple voltage of less than 1 mv. It is advisable to remove the 6AL5 AGC rectifier tube when using the amplifier in this application.

Automatic Fade

The BA-25A Amplifier can be used also for automatic fading. By means of a single-pole-double-throw switch or relay and other components, shown in figure 5, it is possible to automatically fade a program in or out. The time constants may be varied to meet individual customer requirements. Also, in this application, it is advisable to remove the 6AL5 tube.

MAINTENANCE

The MI-11434 amplifier should be given the care and checkup usually observed in the maintenance of high quality electronic equipment. A system of checking should be set up and followed. The condition of the tubes should be checked frequently by means of the metering circuits. An additional periodic check on a tube tester is also helpful in discovering an incipient failure.

Components and wiring should also be inspected at regular intervals and any dust which may have collected should be removed. The plug connectors should be cleaned by moving the amplifier in and out of the receptacle several times. The printed circuit board components should be serviced according to the special techniques described in the paragraphs *Servicing of the Etched Wiring Board Assemblies*.

Voltage Readings

The Voltage Chart below shows the typical voltage to ground readings at the tube socket terminals. These readings are obtained with a 20,000 ohm-per-volt meter.

Signal Levels

Signal levels at various tube socket terminals for an output level of 0 dbm (.78 v 600 ohms) are as follows:

Socket Terminal	*Signal Level*	*Socket Terminal*	*Signal Level*
XV1-2	.0025 V	XV4-2 & XV5-2	.21 V
XV2-3	.0065 V	XV4-7 & XV5-7	.21 V
XV2-7	.0065 V	XV4-1 & XV5-1	2.3 V
XV3-2	.047 V	XV4-6 & XV5-6	2.3 V
XV3-7	.047 V		

The values are approximate and may vary because of normal component tolerances.

VOLTAGE CHART

Pin / *Socket*	1	2	3	4	5	6	7	8	9
XV1	225-260	-	57-68	*	*	225-260	53-63	57-68	**
XV2	*	1.10-1.35	0	55-68	-	55-68	0	1.10-1.35	**
XV3	170-205	-	10-13.5	*	*	170-205	-	10-13.5	**
XV4	275-300	0	11-14	*	*	275-300	0	11-14	**
XV5	275-300	0	11-14	*	*	275-300	0	11-14	**
XV6	-	0	**	*	-	-	0	-	-
XV7	105-110	0	-	0	105-110	0	0	-	-
XV8	-	400***	-	390VAC	-	390VAC	-	400***	-

6.3 v AC between * and **
5.0 v AC between *** and ***

Servicing of the Etched Wiring Board Assemblies

The etched wiring boards are made of .062 inch thick paper base phenolic laminate to one side of which is bonded a thin sheet of copper. The conductor pattern is formed by an etching process. Component leads are threaded through holes which are punched into the board. The ends of the leads extending through the board are bent over against the copper conductors. The complete assembly is subsequently dip-soldered.

Components may be replaced easily by following these simple instructions. Care should be observed not to break or crack the board by undue stress or to damage the bonding adhesive by applying too much heat during soldering.

1. *Tools Required*

   a. A small (35 watt or less) soldering iron.

   b. A pair of small diagonal cutters.

   c. A pair of long nose pliers.

   d. A scribe or pick.

   e. A small knife.

2. *Emergency Repairs*

If it is known which component is defective, it may be replaced without removing the board from its mounting.

a. In the case of a small component, such as a 1/2 or 1 watt resistor, cut the component in half using diagonal pliers. Crush the body by means of the long nose pliers. This is done to obtain extra lead length. In the case of larger components, clip the leads as close as possible to the component body.

b. Using long nose pliers, form a loop of the lead ends as shown in figure 6.

c. Thread the leads of the new components through these loops. Cut off the excess lead, crimp and solder the connection.

3. *Permanent Repairs*

a. Since both sides of the printed circuit board are accessible, it is not necessary to remove the hardware fastening the board to the chassis.

b. Isolate the defective component. If it is necessary to disconnect a component from the circuit for test, heat the junction of the component lead and the etched wiring with the soldering iron. The heat should be concentrated on the component lead rather than the etched wiring pattern. Pry up and straighten the bent-over portion of the component lead with a knife blade, then pull lead through the hole with pliers.

c. To remove the defective component, snip the leads off at the component side of the board, see figure 6.

d. Using a small soldering iron (35 watts or less) heat the leads and remove them from the printed wiring side of the board. Be careful not to apply too much heat or force to avoid damage to the thin copper conductors.

e. Clean and preform the leads of the new component and insert through the holes

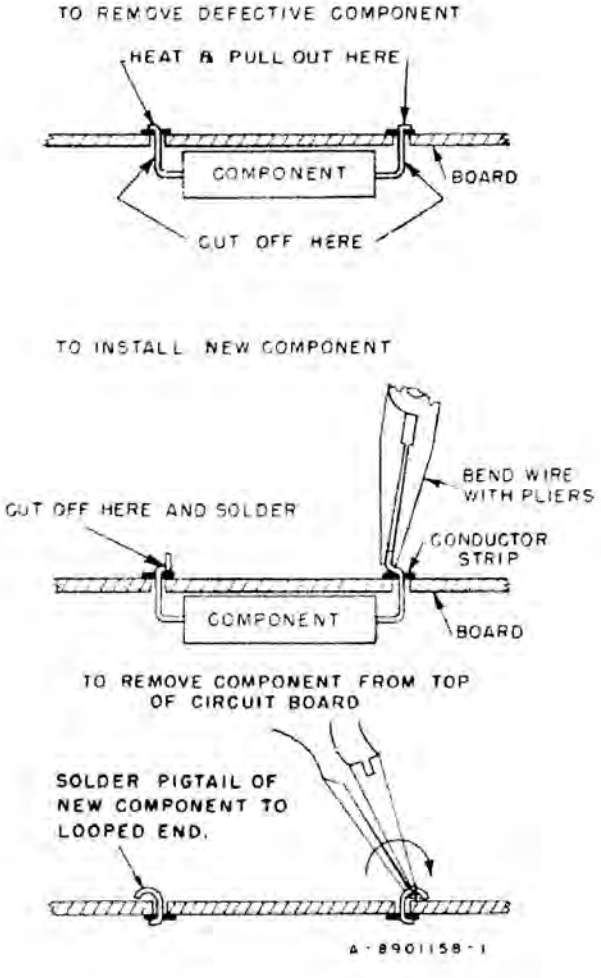


Figure 6 - Replacement of Components in Printed Circuits

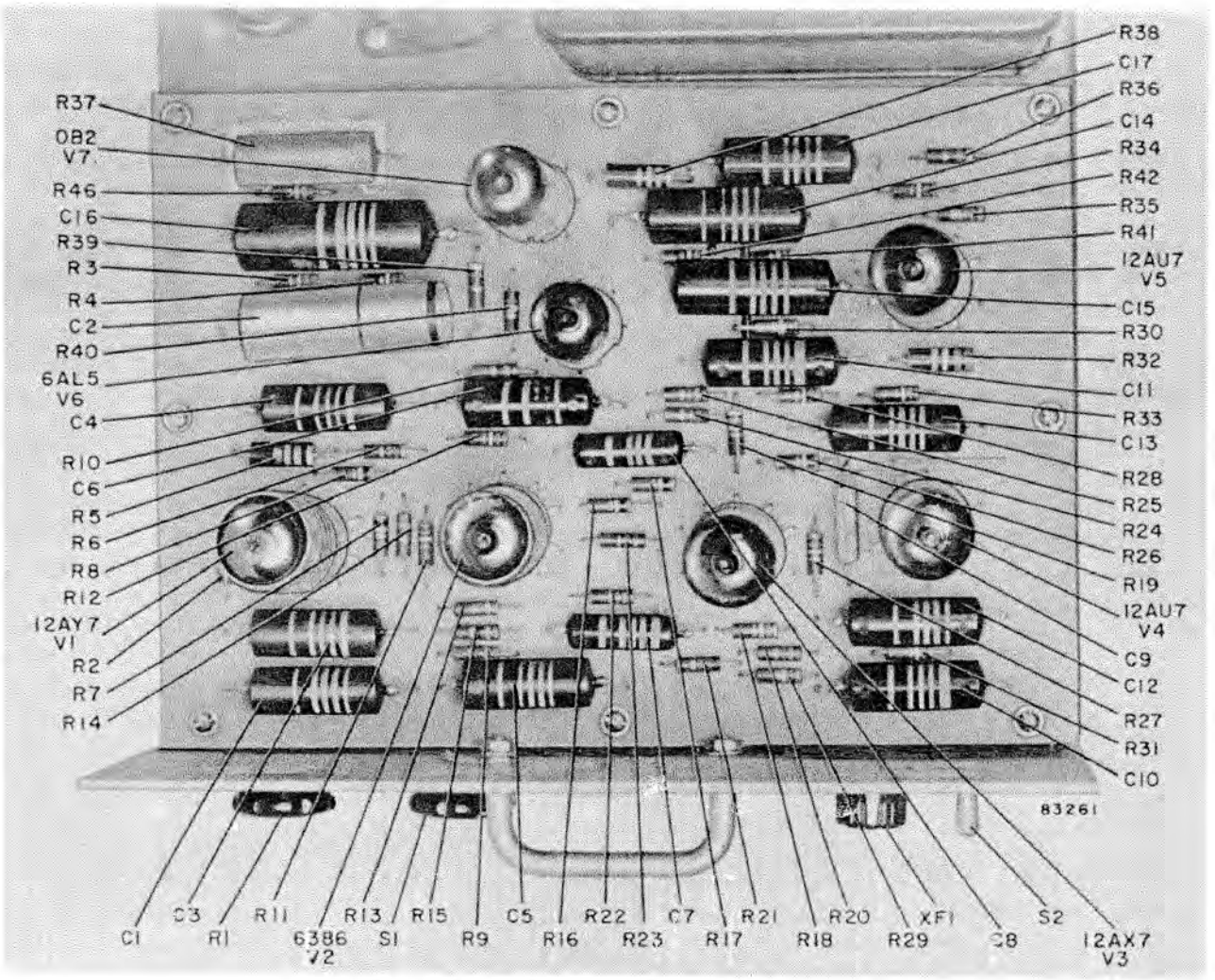


Figure 7 - Printed Circuit Board

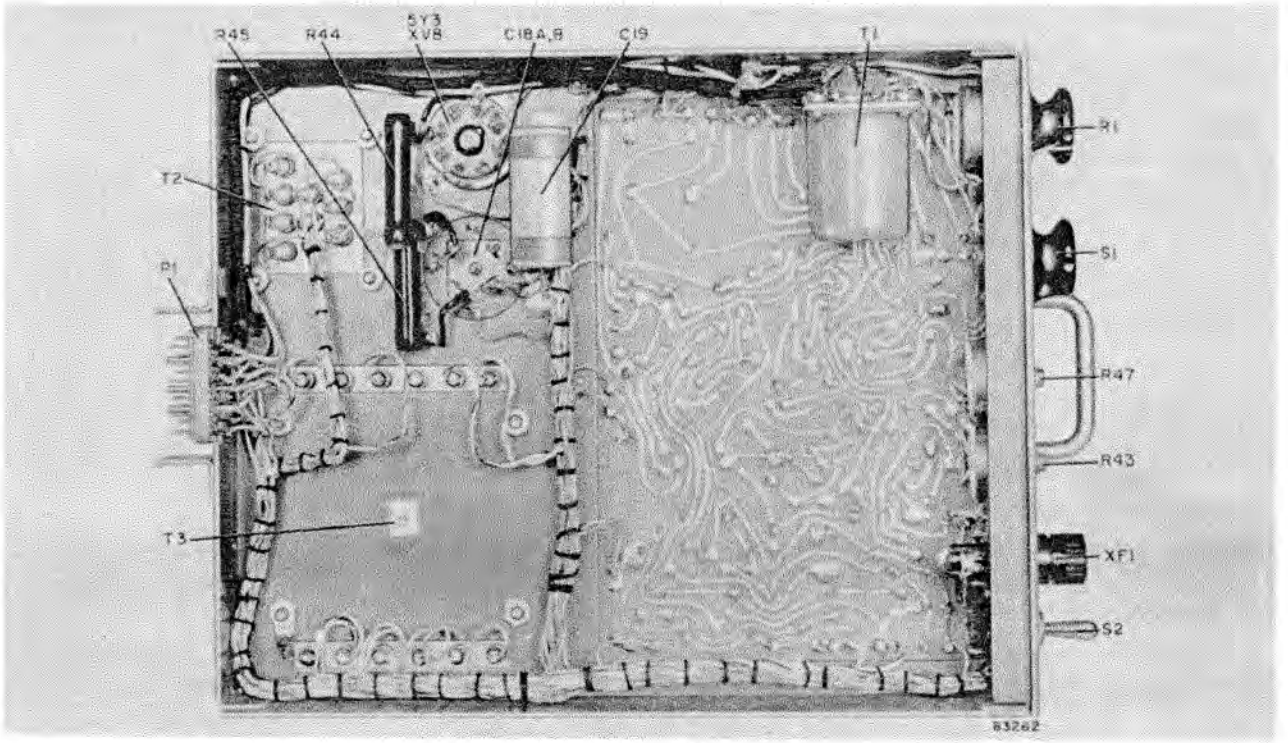


Figure 8 - Bottom View

until the component body is tight against the board.

f. On the circuit side, grasp the component lead and bend it over in the direction of the circuit pattern.

g. Crimp the wire tightly against the board (see figure 6) and cut off the excess component lead. Leave about 1/16 inch of wire protruding from the edge of the hole.

h. Heat the lead and apply rosin core solder. DO NOT USE PASTE OR ACID FLUX. Remove excess rosin from the joints with alcohol.

4. *Replacement of Tube Socket*

Heat each socket terminal and pry up and straighten with knife blade. Pull socket out applying heat to terminal leads, if necessary. Clean holes free of solder. Prepare new socket for installation as follows: If a tube shield ground strap (stock #210773) is required, insert strap from top of socket in slot provided until firmly seated. Small ridges on strap must point outward.

Using the old socket as a guide bend terminal leads at right angles to fit mounting holes provided in board. Insert socket terminals through holes making sure that socket terminal numbers correspond to the numbers etched on the board near the tube socket mounting holes. Bend socket terminals radially inward. If necessary, clip off excess length to prevent short circuit with adjacent conductors. Solder terminals to the etched wiring.

LIST OF PARTS

Symbol No.	*Description*	*Stock No.*
C1	Capacitor: fixed, paper, 0.047 mf ±10%, 400 v	
C2	Capacitor: electrolytic, 20 mf -10% +100%, 150 v	18368
C3 to C6	Capacitor: fixed, paper, 0.047 mf ±10%, 400 v. Same as C1	
C7,C8	Capacitor: fixed, paper, 0.01 mf ±10%, 400 v	
C9	Capacitor: fixed, mica, 330 mmf ±10%, 400 v	
C10, C11	Capacitor: fixed, paper, 0.068 mf ±10%, 200 v	
C12, C13	Capacitor: fixed, paper, 0.047 mf ±10%, 400 v. Same as C1	
C14, C15	Capacitor: fixed, paper, 0.1 mf ±10%, 400 v	
C16	Capacitor: fixed, paper, 0.22 mf ±20%, 200 v	
C17	Capacitor: fixed, paper, 0.047 mf ±10%, 400 v. Same as C1	
C18A,B	Capacitor: electrolytic, 40/40 mf -10% +50%, 450 v.	58567
C19	Capacitor: electrolytic, 10 mf -10% +50%, 450 v	91391
F1	Fuse: 1.5 amp, 125 v, slow blow type 3AG	98682
P1	Connector: male, 15 contact	205330
R1	Resistor: variable, composition, 100,000 ohm, ±10%, 2 w	209286
R2	Resistor: fixed, composition, 680,000 ohm ±10%, 1/2 w	
R3	Resistor: fixed, composition, 68,000 ohm ±5%, 1/2 w	
R4	Resistor: fixed, composition, 220,000 ohm ±5%, 1/2 w	
R5	Resistor: fixed, composition, 43,000 ohm ±5%, 1 w	
R6	Resistor: fixed, composition, 750 ohm ±5%, 1/2 w	
R7,R8	Resistor: fixed, composition, 10,000 ohm ±5%, 1/2 w	
R9,R10	Resistor: fixed, composition, 1.8 meg ±10%, 1/2 w	
R11, R12	Resistor: fixed, composition, 680,000 ±10%, 1/2 w Same as R2	
R13, R14	Resistor: fixed, composition, 130 ohm ±5%, 1/2 w	
R15	Resistor: fixed, composition, 68 ohm ±5%, 1/2 w	
R16, R17	Resistor: fixed, composition, 10,000 ohm ±5%, 1/2 w. Same as R7	
R18, R19	Resistor: fixed, composition, 470,000 ohm ±10%, 1/2 w	
R20	Resistor: fixed, composition, 1800 ohm ±5%, 1/2 w	
R21	Resistor: fixed, composition, 5100 ohm ±5%, 1/2 w	3413
R22, R23	Resistor: fixed, composition, 560 ohm ±5%, 1/2 w.	
R24	Resistor: fixed, composition, 5100 ohm ±5%, 1/2 w. Same as R21	3413

LIST OF PARTS (Continued)

Symbol No.	Description	Stock No.
R25	Resistor: fixed, composition, 1800 ohm ±5%, 1/2 w. Same as R20	
R26	Resistor: fixed, composition, 10,000 ohm ±10%, 1/2 w	
R27, R28	Resistor: fixed, composition, 120,000 ohm ±5%, 1/2 w	
R29, R30	Resistor: fixed, composition, 82,000 ohm ±5%, 1/2 w	
R31	Resistor: fixed, composition, 220,000 ohm ±5%, 1/2 w.	
R32	Resistor: fixed, composition, 220,000 ohm ±5%, 1 w.	
R33, R34	Resistor: fixed, composition, 680,000 ohm ±10%, 1/2 w. Same as R2	
R35	Resistor: fixed, composition, 360 ohm ±5%, 1/2 w	
R36	Resistor: fixed, composition, 36 ohm ±5%, 1/2 w	
R37	Resistor: fixed, wire wound, 10,000 ohm ±5%, 5 w.	45354
R38	Resistor: fixed, composition, 330,000 ohm ±10%, 1 w	
R39	Resistor: fixed, composition, 4.7 meg ±10%, 1/2 w	
R40	Resistor: fixed, composition, 56,000 ohm ±10%, 1/2 w	
R41, R42	Resistor: fixed, composition, 470,000 ohm ±10%, 1/2 w. Same as R18	
R43	Resistor: variable, composition, 500 ohm ±20%, 1/4 w	206037
R44	Resistor: fixed, wire wound, 750 ohm ±10%, 5 w	205210
R45	Resistor: fixed, wire wound, 1000 ohm ±10%, 5 w	206796
R46	Resistor: fixed, composition, 18,000 ohm ±10%, 1/2 w	
R47	Resistor: variable, composition, 50,000 ohm ±10%, 1/4 w	206038
S1	Switch: rotary, one circuit, one section, seven position	212915
S2	Switch: toggle, S.P.S.T.	48791
T1	Transformer: input	209280
T2	Transformer: output	209281
T3	Transformer: power	207435
V2	Tube: type 6386	212916
XF1	Holder: fuse	205914
XV1 to XV5	Socket: tube, 9 pin miniature	209284
XV6, XV7	Socket: tube, 7 pin miniature	209285
XV8	Socket: tube, octal	68590
	MISCELLANEOUS	
	Circuit Board: assembly including printed circuit board, 17 capacitors, 42 resistors, 7 tube sockets and 2 ground straps	212918
	Connector: female 15 contact	205331
	Knob: control for R1 & S1	30075
	Plate: capacitor mounting for C18	18469
	Screw: shouldered, #4-40, for mounting P1	209283
	Shield: tube, 53/64" I.D. x 1-3/8" high	211035
	Shield: tube, 53/64" I.D. x 1" high	212917
	Strap: ground, tube socket	210773

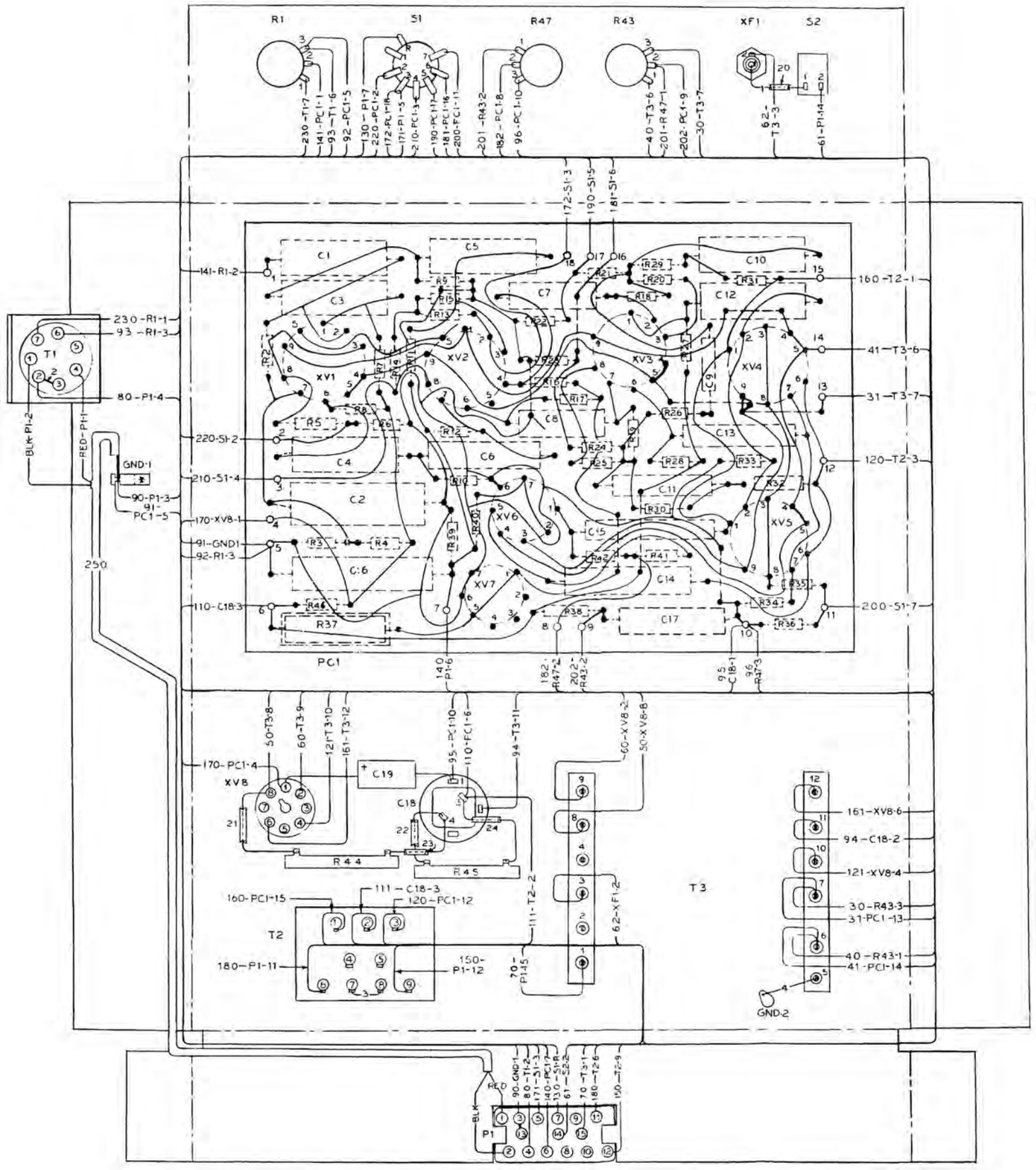
T1
INPUT LEVEL R1 100KΩ
C1 .047 MF
R2 680KΩ
C2 20MF
R3 68KΩ
R4 220KΩ
V1A ½ 12AY7
V1B ½ 12AY7
C3 .047 MF
C4 .047 MF
C5 .047 MF
C6 .047 MF
R5 43KΩ 1W
R6 750Ω
R7 10KΩ
R8 10KΩ
R9 1.8MEG.Ω
R10 1.8 MEG.
R11 680KΩ
R12 680KΩ
V2A ½ 6386
V2B ½ 6386
R13 130Ω
R14 130Ω
R15 68Ω
R16 10KΩ
R17 10KΩ
C7 .01 MF
C8 .01 MF
V3A ½ 12AX7
V3B ½ 12AX7
R18 470KΩ
R19 470KΩ
R20 1800Ω
R21 5100Ω
R22 560Ω
R23 560Ω
R24 5100Ω
R25 1800Ω
R26 10KΩ
C9 330 MMF
C10 .068MF
R29 82KΩ
R30 82KΩ
C11 .068MF
C12 .047 MFD
C13 .047MF
R27 120KΩ
R28 120KΩ
R31 220KΩ
R32 220KΩ 1W
R33 680KΩ
R34 680KΩ
V4 12AU7
V5 12AU7
R35 360Ω
R36 36Ω
T2
R46 18KΩ
R37 10KΩ-5W
R38 330KΩ W
R39 4.7 MEG.
R40 56KΩ
C14 0.1MF
C15 0.1MF
C16 0.22MF
V6 6AL5
R41 470KΩ
R42 470KΩ
V7 0B2
C17 .047 MF
R47 50KΩ
THRESHOLD
R44 750Ω 5W
R45 1000Ω 5W
C18 40-40MF 450V
C19 10MF 450V
V8 5Y3-GT
T3
HUM ADJ.
R43 500Ω
125V
115V
105V
F1 1½ AMP
POWER ON-OFF S2
METERING S1
OFF
V1 #2
V2A #18
V2B #3
V3A #17
V3B #15
V4-V5 #11
P1

V1 V2 V3 V4 V5 V6

639436-2

Figure 9 - Schematic Diagram

⊗ REFERS TO TERMINALS ON PRINTED CIRCUIT BOARD.



WIRE TABLE			8924079-501
WIRE NO INCL	DESCRIPTION	PS OR DWG NO	ITEM NO	OPEN NO'S
1 — 4	WIRE, TINNED COPPER .032 DIA	105	75	
20 - 24	TUBING, INSUL BLK .042 I D	8	76	
30 - 31	WIRE, WHITE - BROWN 7/0126	805-7	77	
40 - 41	BLK/BRN 7/0126	805-7	78	
50	RED 7/0126	805-7	79	
60 - 62	RED/BLK 7/0126	805-7	80	
70	RED/BLUE 7/0126	805-7	81	
80	WHITE 7/010	805-6	82	
90 - 96	BLACK		83	
110 - 111	RED		84	
120 - 121	BLUE		85	
130	ORANGE		86	
140 - 141	GREEN		87	
150	GRN/BLK		88	
160 - 161	RED/BLUE		89	
170 - 172	YEL/RED		90	
180 - 182	YEL/BLK		91	
190	YEL/BLUE		92	
200 - 202	YEL/BRN		93	
210	YEL/GRN		94	
220	YELLOW		95	
230	WIRE, WHT - GRN - RED 7/010	805-6	96	
250	SHIELDED CABLE	472930	58	

(11) FOR LIST OF PTS FOR ABOVE WIRE TABLE SEE DWG-8924079-501

NOTES

1-SOLDER ALL ELECTRICAL CONNECTIONS USING ITEM "59

2-CABLE & THEN LACE WIRES WHERE NECESSARY USING ITEM "60

3-THE FOLLOWING WIRES ARE TWISTED PAIRS.

30 31 50 61 120 121 150
40, 41, 60, 62, 160, 161, 180.

360176-0

Figure 10 - Connection Diagram