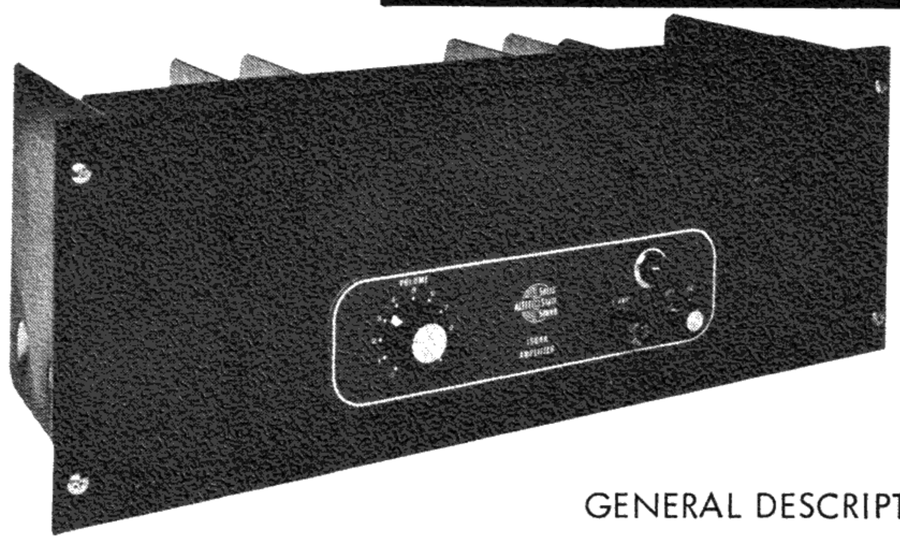
ALTEC®

1594A AMPLIFIER

OPERATING INSTRUCTIONS



SPECIFICATIONS

Type:	Power Amplifier
Gain:	64 dB
Input Sensitivity:	0.8 volt rms for rated output
Power Output:	100 watts at less than 1% THD, 50 - 20,000 Hz 100 watts at less than 2% THD, 45 - 20,000 Hz
Frequency Response:	±1 dB, 20 - 20,000 Hz
Input Impedance:	15,000 ohms (potentiometer)
Source Impedance:	150 or 600 ohms with 15095 plug-in transformer
Load Impedance:	4, 8, 16, 50 ohms (Transformer isolated output)
Noise Level:	-35 dBm, or 85 dB below rated output
Controls:	Potentiometer; continuously variable, composition
Power Supply:	120/240 volts 50/60 Hz 20 watts at zero signal 160 watts at 33 watts output 250 watts at 100 watts output
OR	
	28 volts dc (battery (+) is ground) 0.4 amp at zero signal 4.5 amp at 33 watts output 7.7 amp at 100 watts output
Operating Temperature:	Up to 55°C ambient
Dimensions:	7" H x 19" W x 8-1/2" D
Weight:	35-1/2 pounds
Color:	ALTEC Green
Accessories:	15095 Plug-in Line Transformer 15335 Plug-in Bridging and Matching Transformer

GENERAL DESCRIPTION

The 1594A Amplifier is a rack mounted, ac or dc operated power amplifier intended for use in public address, paging, music distribution, and sound reinforcement systems requiring low distortion, wide frequency range, complete stability with any type of load, reliability of operation, ease of servicing, and low cost.

At 100 watts, distortion is less than 2% at any frequency from 45 to 20,000 Hz and less than 1% total harmonic distortion between 50 and 20,000 Hz. The frequency response is within 1 dB from 20 to 20,000 Hz. (See Figures 1 and 2.) The feedback circuit is designed for stability under conditions of varying line voltage, varying transistor characteristics in which the current changes with drive, and all types of loads including long unloaded speaker lines having considerable capacitance.

The amplifier contains a Dissipation-Sensing circuit that provides protection of the output transistors. In the presence of high-level program material, should a malfunction occur in the load circuits, or should the load represent a severe downward mismatch, the protection circuit prevents the output transistors from operating in a mode that would cause damage or degradation. However, the operation of the protection circuit never completely cuts the program material off, it simply cuts off (through limiter action) that portion of the high-level signal that would tend to damage or unduly deteriorate the output transistors. The action is immediate and effective at all operating frequencies.

The 1594A occupies 4 units of rack space (7"), and has a hinged front-panel, allowing access to the components without removing the amplifier from the rack. (See Figure 3.) All active input and driver circuitry is contained on an etched circuit module, which plugs into a receptacle. The output transistors and associated drivers are mounted on a heat-sink on the rear of the chassis. (See Figure 4.) Mounted on the hinged front panel are the power ON-OFF switch, the ac fuse, a neon pilot light, and a continuously variable gain control. The amplifier is equipped with a 3-wire power cord terminating in a 3-pin plug for ac operation; for dc operation a barrier-type terminal block is mounted on the back of the chassis along with the audio input and output terminals.

The amplifier is capable of operation from 120/240-volt 50/60-Hz power or from a 28-volt dc source, either battery or power supply. When connected to an ac and dc source, if the ac

Specifications and components subject to change without notice. Overall performance will be maintained or improved.

ALTEC®

1515 S. Manchester Ave., Anaheim, Calif. 92803

42-02-041427-07
Litho in USA CP-672-2.5K

www.hifiengine.com

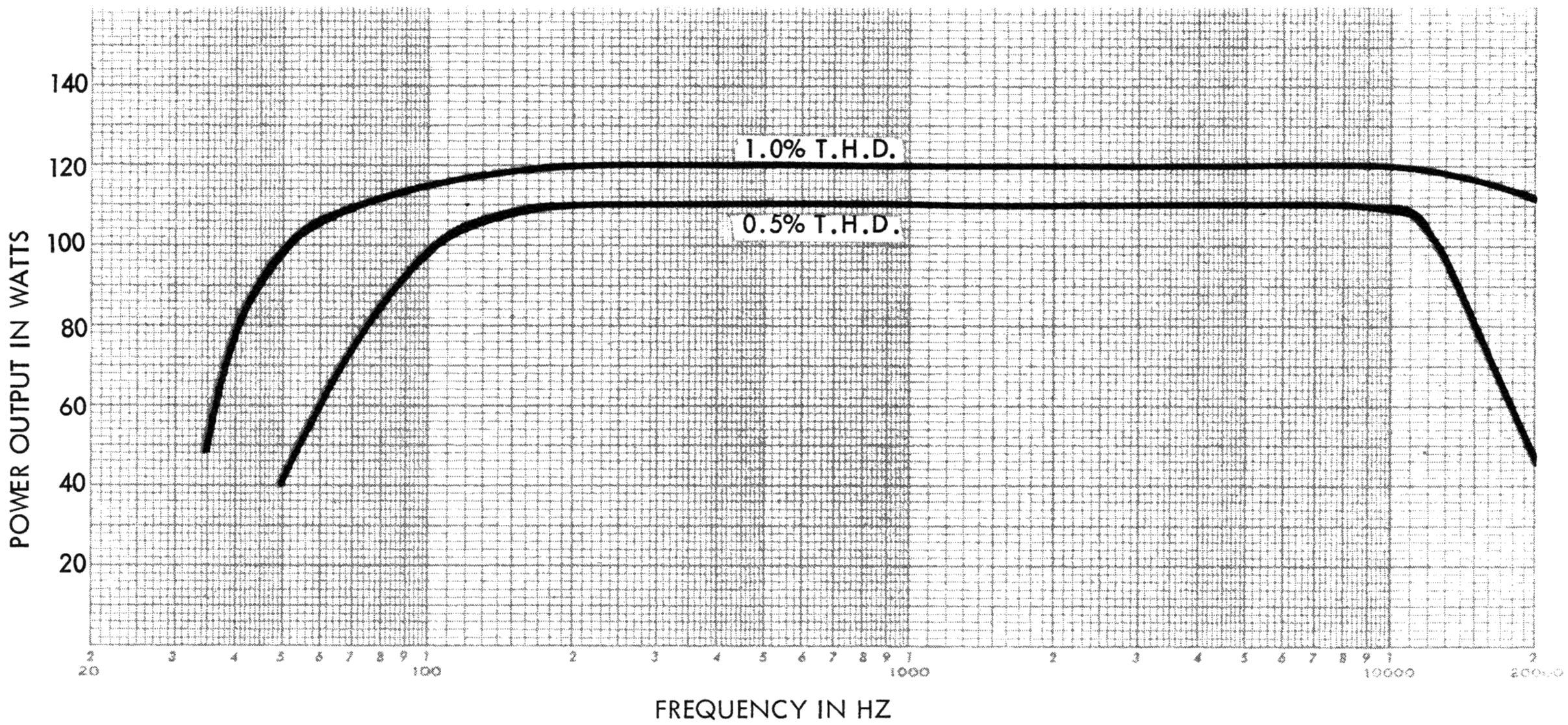


Figure 1. Frequency Response vs Power

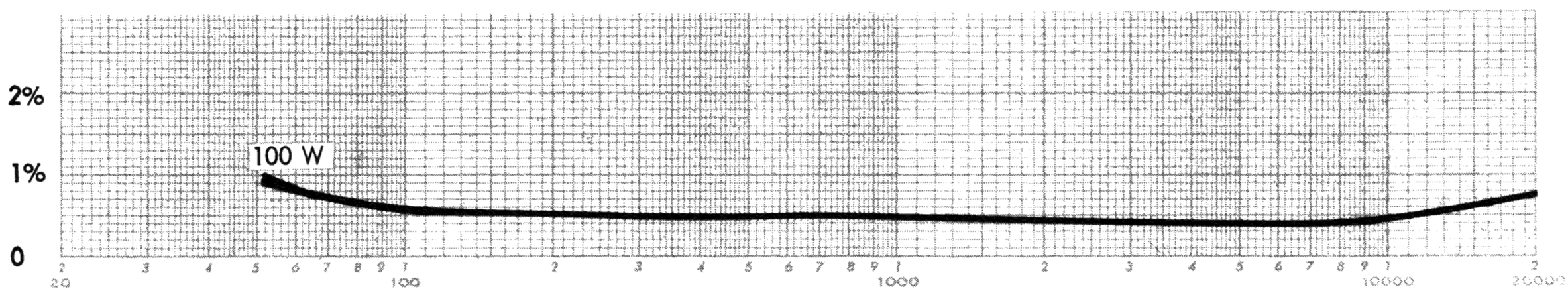


Figure 2. % THD vs Frequency - Typical

source should fail the dc source will automatically continue operation of the amplifier until the ac source is restored. When the dc source is a wet-cell storage battery, the amplifier will provide a trickle-charge to keep the battery charged while it is in the standby state.

POWER CONNECTIONS

120 Volt, 50/60 Hz: Equipment supplied for domestic use will have the power transformer primary strapped for 120 volts, (terminals 1 to 2 and 3 to 4 on TB3). The power input nameplate on the chassis adjacent to the power cord will be mounted to show the appropriate side specifying the connections.

240 Volt, 50/60 Hz: Export equipment, so specified, will have the power transformer primary strapped for 240 volt operation (terminals 2 to 3 on TB3). The power input nameplate on the chassis adjacent to the power cord will be mounted to show the appropriate side specifying the connections.

INPUT CONNECTIONS

The 1594A Power Amplifier is equipped with two pairs of input connections. Terminals 1 and 2, connecting directly to the input potentiometer, are provided for unbalanced high impedance sources, and to bridge unbalanced low impedance lines having a signal voltage of 0.8 volt or higher. Figure 4 illustrates the back of the amplifier showing the input terminal board, while Figure 6 illustrates the correct input connections. Terminals 3 and 4 connect to a standard octal socket that accommodates the accessory plug-in transformer. With the 15095 Transformer, balanced or unbalanced lines of 150 or 600 ohms up to a level of +15 dBm may be connected to inputs 3 and 4. The octal socket is normally connected for 500/600-ohm operation; 150 ohms impedance may be obtained by strapping the terminals in accordance with the diagram shown on the schematic.

Use the 15335 Plug-in Bridging and Matching Transformer if line bridging input is required or if it is necessary to match a 15K ohm line.

OUTPUT CONNECTIONS

Outputs accommodate nominal loads of 4, 8, 16, and 50 ohms; the corresponding full-drive output voltages being 20, 28, 40, and 70 volts, respectively. (See OUTPUT on Figure 4.)

Speaker Matching: Use the output tap that most nearly equals the total speaker impedance. If the load impedance falls between two output terminal values, favor the terminal of lower impedance.

70 Volt Line: The 70-volt distribution system permits connection to a large number of speakers, each to operate at its own power level as required, without the necessity for computing impedances. In this system each speaker is equipped with a

www.hifiengine.com

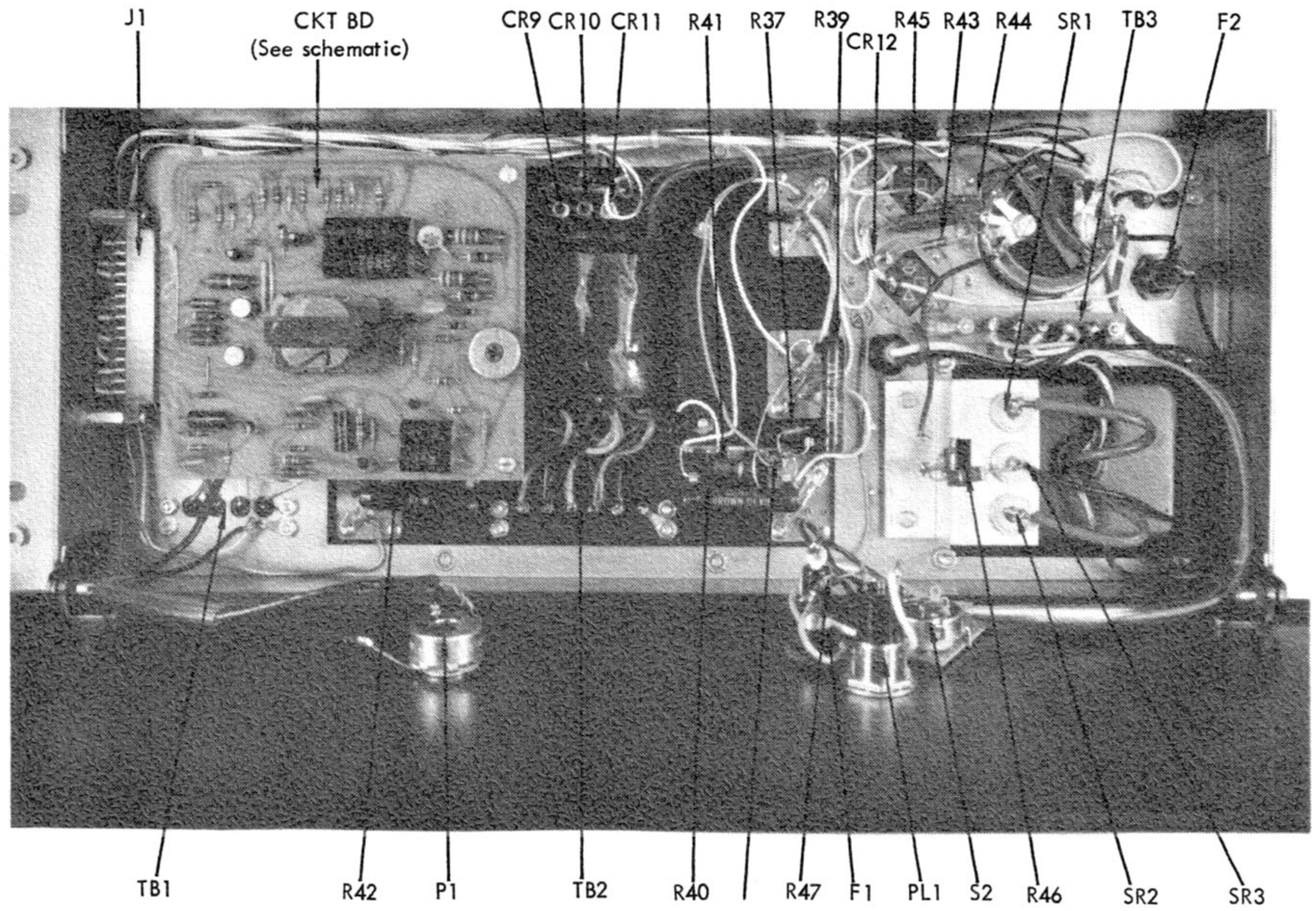


Figure 3. Front View with Hinged Panel Open

transformer containing a number of taps rated in terms of power, and the tap is selected that gives the power desired for that speaker. The total of the power settings for all speakers should be equal to or less than the amplifier system power rating. The 1594A Amplifier is equipped with outputs to drive both a 70-volt line and a 40-volt line.

Protection of Horn Loaded Drivers: Driver loudspeakers coupled to horns are used in paging or voice reinforcing systems where excellent intelligibility is required in the presence of high noise levels, effects of wind, and other disturbances. When a loudspeaker system dividing network is not available, the diaphragm of the driver loudspeaker may be protected from low-frequency power by the use of the low-frequency cut-off filter in the Q1 base circuit (see schematic). As shipped, the filter is switched OUT and locked in place. By removing the lock and setting the filter switch (S1) to IN, attenuation is introduced for frequencies below 500 Hz thereby assuring clarity voice range and portection of driver diaphragms.

CONTROLS

The only controls on this amplifier intended for normal operation are the power ON-OFF switch and the GAIN control. Potentiometer P2, which establishes the bias voltage for the push-pull amplifier transistors Q3 and Q4, is set at the factory and will probably not require readjustment over a long period of operation. If, due to aging or replacement of the output driver and power transistors, the output signal should be clipped and distorted, it may be desirable to adjust P2 to provide the proper undistorted output signal. Adjustment should be made using an oscilloscope connected across the 4-ohm output terminals with a 1000-Hz signal applied to the input terminals of the amplifier. Observe the scope while adjusting P2. This procedure is recommended only if one of the output drivers or a power transistor has been replaced.

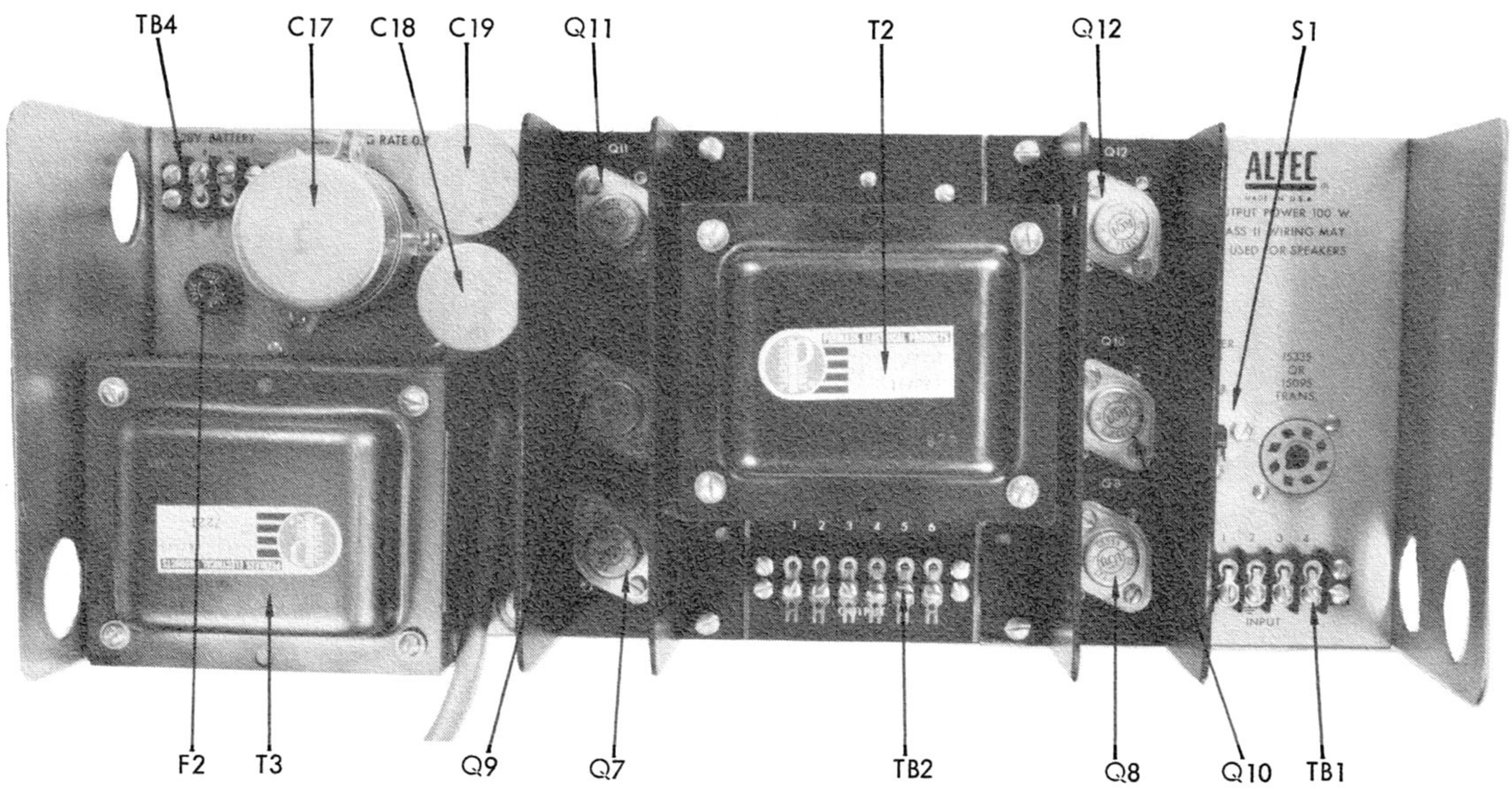
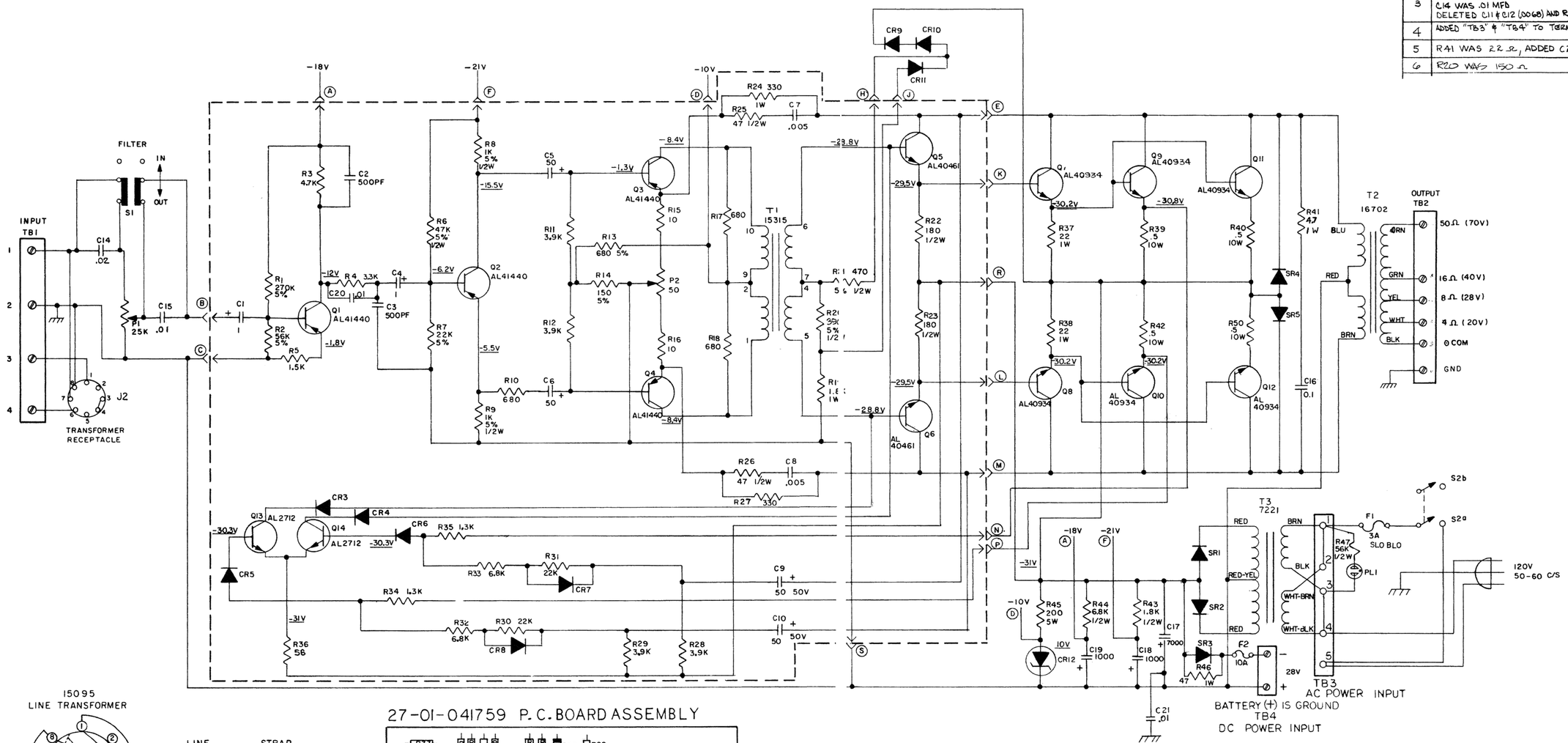
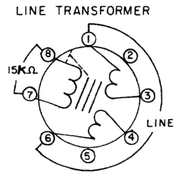


Figure 4. Rear View of 1594A Power Amplifier

REVISIONS				
SYM	DESCRIPTION	DATE	APPROVAL	ENGR
2	DELETED NO'S 8 ADDED COM. TO TB2 ADDED R48, 49 & 50	11-13-67		
3	R36 WAS 10Ω, ADDED F2, 10A. C14 WAS .01 MFD DELETED C11 & C12 (.0068) AND R48 & R49 (1KΩ)	2-29-68		
4	ADDED "TB3" & "TB4" TO TERMINAL BLOCK	5-24-68		
5	R41 WAS 22Ω, ADDED C21 TO GROUND	2-10-70		
6	R20 WAS 150Ω	3-12-71		

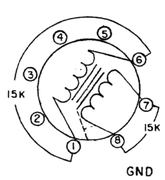


15095
LINE TRANSFORMER



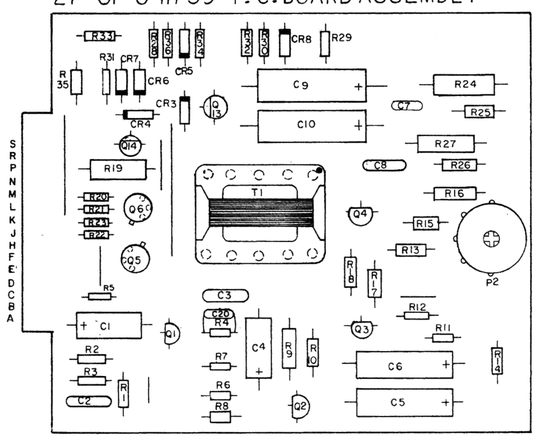
LINE	STRAP
150Ω	1-4, 3-6
600Ω	3-4

15335
BRIDGING & MATCHING TRANSFORMER



PRI	SEC
1-6	7-8

27-01-041759 P.C. BOARD ASSEMBLY



5. VOLTAGE SHOWN UNDERSCORED ARE DC VOLTAGES MEASURED TO CHASSIS (GROUND) WITH ZERO SIGNAL AND 120 VOLTS AC LINE VOLTAGE.
4. CAPACITANCE IN MFD
3. RESISTANCE IN OHMS. TOLERANCE ±10%.
NOTES: UNLESS OTHERWISE SPECIFIED.

UNLESS OTHERWISE SPECIFIED	ORIGINAL DATE OF DRAWING 7-28-67	SCHEMATIC 1594A AMPLIFIER	ALTEC LANSING® A Division of LTV Ling Altec, Inc. ANAHEIM, CALIFORNIA
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACT. 2 PLACE DEC. 3 PLACE DEC.	DR. BY D.S. ANDERSON		D 1D679-6
	CHKD. 8/18/67		
	ENGR.		
	ENGR.		
NEXT ASSY / USED ON	APPRD.	SCALE / CODE	SHEET 1 OF 1
APPLICATION			

FORM. ALC-54

TRANSISTOR MAINTENANCE

Transistors are inherently long-life devices and normally should not require replacement in the life of the equipment. If it becomes apparent through systematic troubleshooting that replacement is necessary, a few precautions must be observed.

PROTECTION

Transistors can be damaged by excessive heat. When removing or replacing a transistor soldered to tie points or to an etched circuit board, use a small soldering iron with a 1/8" diameter chisel tip. Use small diameter high tin content solder.

On etched circuit boards, use a toothpick inserted from the conductor side to clean out the holes before inserting the new transistor. High heat reduces conductor-to-board bonding. Pressure applied from the component side may cause the hold pad and conductor to be torn away from the board.

ORIENTATION

Transistors are packaged in various case sizes and types with various lead configurations. Before removing a transistor from an etched circuit board or tie points, make a sketch of the orientation of the transistor leads with respect to the circuit board or tie points. Forming the leads on the new transistor to conform with the leads on the one being replaced also will aid in making proper connections.

Before removing small 'plug-in' transistors, note the position of the index tab with respect to the socket. Cut the leads on the new transistor to the required length and insert into the socket properly indexed.

POWER TRANSISTORS

When replacing power transistors, be sure that —

1. The mica insulator is not damaged.
2. No grit or metal particles are lodged between the transistor and the heat sink.
3. Both sides of mica insulator are covered with silicone grease or fluid.
4. Mounting screws are tight, and
5. The protective cover is in place.

TRANSISTOR TESTING

Transistors should be checked with a transistor tester. If one is not available, an ohmmeter may be used inasmuch as most transistor failures result in a collector-to-emitter short or open circuit. Remove the suspected transistor from the circuit. Connect the ohmmeter leads to the collector and the emitter and read on the low-ohm range. If the low reading is virtually the same when the ohmmeter connections are reversed, the transistor is shorted. If the ohmmeter (on high megohm range) shows no reading for both connections of the ohmmeter, the transistor is open.

SERVICING ETCHED CIRCUIT BOARDS

Before removing or replacing components on etched circuit boards, read and observe the following precautions.

1. Use a small soldering iron with a 1/8" diameter chisel tip, and use small diameter, high tin content solder.
2. Components may be removed by placing the soldering iron on the component lead on the conductor side of the board and pulling out the lead. Avoid overheating the conductor.
3. If the component is obviously faulty or damaged, clip the leads close to the component and then unsolder the leads from the board. Withdraw them from the component side.
4. Large components such as potentiometers and sockets may be removed by rotating the soldering iron from lead to lead and applying steady pressure to lift the part free. If the part is to be replaced with a new one, follow the procedure outlined in 3 above.
5. Since the conductor part of the etched circuit board is a metal-plated surface covered with solder, use care to avoid overheating and lifting the conductor from the board. A method for repair is to solder a section of good conducting wire along the damaged area.
6. Clear the solder from the circuit board holes before inserting the leads of the new component. Heat the solder in the hole, remove the iron and quickly insert a pointed non-metallic object, such as a toothpick, from the conductor side.
7. Shape the new component leads and clip them to the proper length. Insert the leads in the holes, observing the same polarity or orientation as that of the removed component. Apply heat and solder on the conductor side.

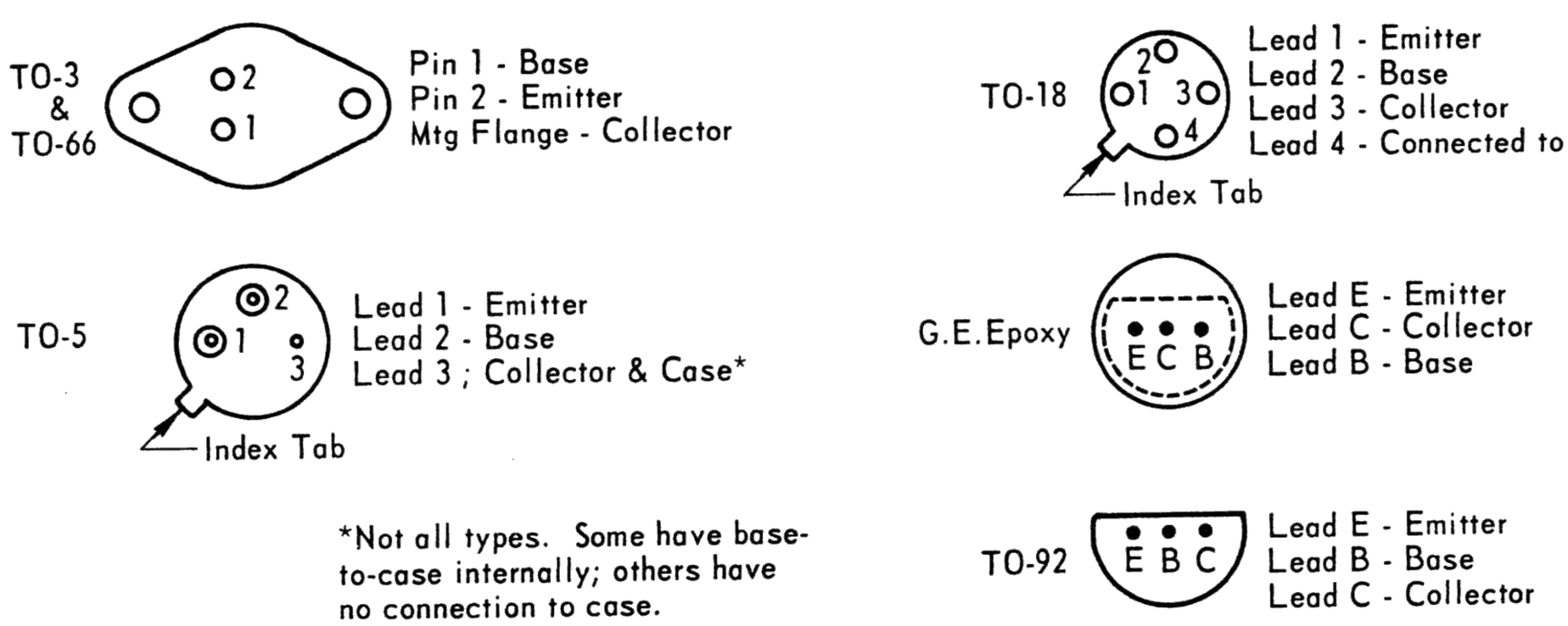


Figure 5. Typical Transistor Package Sizes

www.hifiengine.com

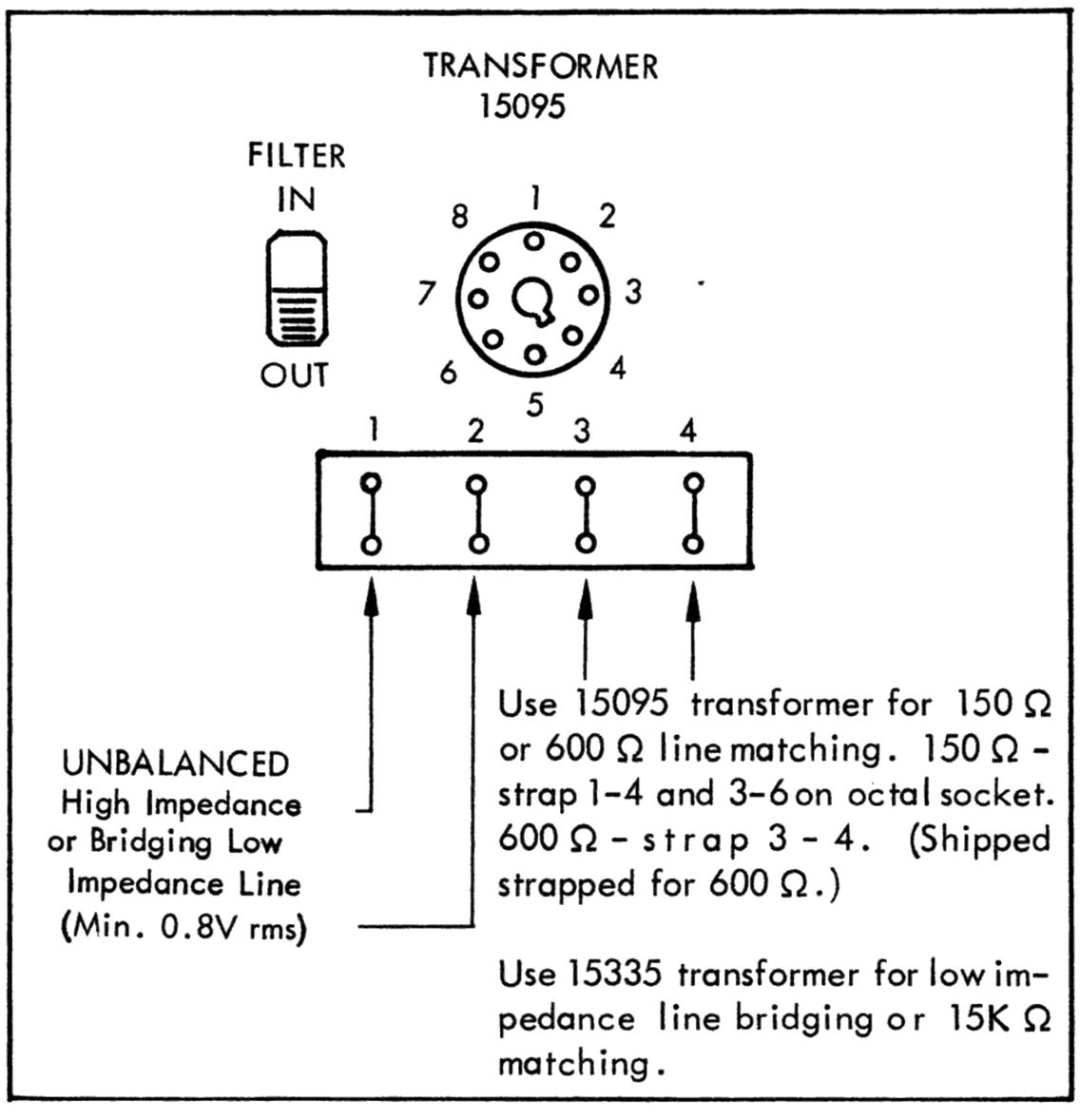


Figure 6. Audio Input Connections

VENTILATION

The 1594A, an all-transistor amplifier, generates a minimum of heat during normal usage. Although the amount of heat is relatively low, the amplifier must be ventilated to prevent a temperature rise. Because transistors are heat sensitive, the amplifier should not be placed adjacent to heat-generating equipment, or in areas where the ambient temperature exceeds 55° Centigrade (131° Fahrenheit).

IMPORTANT

The 1594A must be mounted so that both top and bottom of the heat sink are unobstructed for air passage.

If one is mounted above the other in a rack, space must be provided between units or the upper one will become too hot. The 1-3/4" perforated panel (10399) is recommended for this purpose.

If there is any doubt as to air temperature when several amplifiers are mounted in a single cabinet, operate the system until temperatures have stabilized and measure inlet air. This can be done with a bulb type thermometer held at the bottom of the heat sink of the top amplifier. Care should be taken to keep the thermometer bulb from touching metal which will probably be hotter than the air.

If the air temperature exceeds 55° (or if it will on a hot day), the amplifiers should be spaced further apart or a blower should be installed to pressurize the cabinet.

SERVICING

Should the amplifier become inoperative, a check of dc voltages will aid in localizing the trouble. The schematic diagram indicates pertinent voltages and conditions for their measurement.

REPLACEABLE ELECTRONIC PARTS LIST

PCB Assembly, Amplifier (27-01-041759-01)

Reference Designator	Ordering Number	Name and Description
C1,4	15-01-100156-01	Cap., 1 mfd, 25V
C2,3	15-02-102602-01	Cap., 500 pF ±10%, 100V
C5,6	15-01-100234-01	Cap., 50 mfd, 25V
C7,8	15-02-100050-01	Cap., 0.005 mfd ±20%, 100V
C9,10	15-01-100239-01	Cap., 50 mfd, 50V
C20	15-02-100307-01	Cap., 0.01 mfd ±20%, 100V
CR3 through 8	48-01-107017-01	Diode (1N456A)
P2	47-05-014697-01	Potentiometer, 50 Ω
Q1,2,3,4	48-03-041440-01	Transistor
Q5,6	48-03-040461-02	Transistor
Q13,14	48-03-101098-01	Transistor
R1	47-01-100472-01	Res., 270K Ω ±5%, 1/4W
R2	47-01-102121-01	Res., 56K Ω ±5%, 1/4W
R3	47-01-102171-01	Res., 4.7K Ω ±10%, 1/4W
R4	47-01-102169-01	Res., 3.3K Ω ±10%, 1/4W
R5	47-01-102165-01	Res., 1.5K Ω ±10%, 1/4W
R6	47-01-102304-01	Res., 47K Ω ±5%, 1/2W
R7	47-01-102110-01	Res., 22K Ω ±5%, 1/4W
R8,9	47-01-102264-01	Res., 1.0K Ω ±5%, 1/2W
R10,17,18	47-01-102161-01	Res., 680 Ω ±10%, 1/4W
R11,12,28,29	47-01-102170-01	Res., 3.9K Ω ±10%, 1/4W
R13	47-01-102074-01	Res., 680 Ω ±5%, 1/4W
R14	47-01-102058-01	Res., 150 Ω ±5%, 1/4W
R15,16	47-01-102140-01	Res., 10 Ω ±10%, 1/4W
R19	47-01-100652-01	Res., 1.8K Ω ±10%, 1W
R20	47-01-102254-01	Res., 390 Ω ±5%, 1/2W
R21	47-01-102256-01	Res., 470 Ω ±5%, 1/2W
R22,23	47-01-102345-01	Res., 180 Ω ±10%, 1/2W
R24,27	47-01-100642-01	Res., 330 Ω ±10%, 1W
R25,26	47-01-102338-01	Res., 47 Ω ±10%, 1/2W
R30,31	47-01-102179-01	Res., 22K Ω ±10%, 1/4W
R32,33	47-01-102173-01	Res., 6.8K Ω ±10%, 1/4W
R34,35	47-01-102181-01	Res., 1.3K Ω ±5%, 1/4W
R36	47-01-102148-01	Res., 56 Ω ±10%, 1/4W
T1	56-07-015315-01	Xfmr, driver

Panel Mounted Parts

F1	51-03-102601-01	Fuse, 3A, SLO-BLO
P1	47-06-041410-01	Potentiometer, 25K Ω
PL1	39-01-100539-01	Pilot lamp
S2	51-01-100988-01	Switch, power, 125V 3A, 20V 5A

www.hifiengine.com

REPLACEABLE ELECTRONIC PARTS LIST (Continued)

Reference Designator	Ordering Number	Name and Description
Chassis Mounted Parts		
C14	15-02-100087-01	Cap., 0.02 mfd ±20%, 100V
C15,20	15-02-100307-01	Cap., 0.01 mfd ±20%, 100V
C16	15-06-100111-01	Cap., 0.1 mfd ±10%, 100V
C17	15-01-102614-01	Cap., 7000 mfd, 35V
C18,19	15-01-102613-01	Cap., 1000 mfd, 50V
CR9,10,11	48-01-100895-01	Diode, rectifier (1N3754)
CR12	48-01-100856-01	Diode, Zener, 10V ±5% (Semcor
F2	51-04-105890-01	Fuse, 10A, 3AB
J1	21-02-100755-01	Receptacle, 15-pin
J2	21-02-100973-01	Socket, 8-pin
Q7 through 12	48-03-040934-02	Transistor
R37,38	47-01-100635-01	Res., 22 Ω ±10%, 1W
R39,40,42,50	47-02-100724-01	Res., 0.5 Ω ±10%, 10W, WW
R41	47-01-102925-01	Res., 4.7 Ω ±10%, 1W
R43	47-01-102358-01	Res., 1.8K Ω ±10%, 1/2W
R44	47-01-102365-01	Res., 6.8K Ω ±10%, 1/2W
R45	47-02-100715-01	Res., 200 Ω ±10%, 5W
R46	47-01-100638-01	Res., 47 Ω ±10%, 1W
R47	47-01-102376-01	Res., 56K Ω ±10%, 1/2W
S1	51-02-100922-01	Switch, slide, dpdt
SR1,2,3	48-02-100892-01	Diode, rectifier (1N3492R)
SR4,5	48-02-102594-01	Diode, rectifier (1N4002)
T2	56-07-016702-01	Xfmr, output
T3	56-08-007221-01	Xfmr, power
TB1	21-04-101038-01	Terminal board, 4-terminals
TB2	21-04-102598-01	Terminal board, 6-terminals
TB3	21-04-101013-01	Terminal board, 5-terminals
TB4	21-04-101034-01	Terminal board, 2-terminals

www.hifiengine.com