

622
AMPLIFIER LOUDSPEAKER
ASSEMBLY



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APRIL, 1963

AMPEX CORPORATION - AUDIO DIVISION

IMPORTANT NOTE

This manual, while it is a separate manual in itself, is also designed to fit into and become part of the manual for the AMPEX Model 602 Tape Recorder/Reproducer. To accomplish this: simply remove the staples holding this manual together; throw away the cover and this page; and insert the balance of this manual in the 602 manual behind section 10 "Basic Concepts of Magnetic Tape Recording." Except for the cover, the 622 manual is pre-punched and divider card is included for use with the 602 manual.

622 AMPLIFIER LOUDSPEAKER

DESCRIPTION

In the design of the Model 622 Amplifier Loudspeaker Assembly, AMPEX engineers have created an equipment which provides sound quality that would be remarkable from an amplifier loudspeaker of any size yet, it can be carried easily in one hand.

High quality components are used throughout the equipment, in keeping with professional standards. All normal operating controls for the amplifier are available on the front panel, clearly marked as to their function. Connection facilities for interconnecting the amplifier loudspeaker with other equipment are located on the side panel.

The 10-watt power amplifier is of push-pull design. It is a conventional high fidelity type of amplifier but is unusual for its fast transient overload recovery. In conjunction with the amplifier is a compensation network which forms an accurate inverted image of the speaker and enclosure characteristics. Since the speaker is designed to utilize the

boost from this network, the result is a uniform acoustical response that is virtually flat from 65 to better than 10,000 cycles per second.



622 Amplifier Loudspeaker

PERFORMANCE CHARACTERISTICS

<i>Overall Frequency Response:</i> (in air)	65 to better than 10,000 cps essentially flat acoustically. Response curve established by a test microphone in free field on axis with unit radiating into semi-infinite space of 2π steradians solid angle. Actual use will approximate this condition when the 622 is placed in a good acoustical environment. Tests were made with 7 component multitone of quarter octave width.
<i>Amplifier Frequency Response:</i>	± 0.5 db 20 to 20,000 cps.
<i>Power Output:</i>	10 watts amplifier power with no audible harmonic distortion. Speaker can use full power.
<i>Signal-To-Noise Ratio:</i>	Amplifier noise (including hum) is 70 db below rated output.
<i>Controls and Connections:</i>	Volume control, bass-treble control, power switch and on-off indicator light are provided. Cable for a-c power is furnished and also an a-c convenience outlet is built in. Audio input connector is of the concentric pin type. External speaker connection is a headphone type jack.
<i>Equalization:</i>	Single control on front panel gives a level tilt to speaker output, boosting the bass and attenuating the treble or vice versa. Maximum bass boost is 6 db relative to treble. Maximum treble boost is 6 db relative to bass.
<i>External Speaker Feed:</i>	Use of the external speaker jack automatically cuts out the 622's speaker and compensation network. Hence, flat amplifier output is fed to the external speaker.
<i>Input Impedance:</i>	20,000 ohms.
<i>Output Impedance:</i>	12 ohms to external speaker.
<i>Power Requirements:</i>	117 volts a-c, 50 or 60 cps, 0.5 amps, 55 watts.
<i>Weight:</i>	25 pounds.
<i>Dimensions:</i>	13 x 16 x 8 inches.

CONNECTIONS

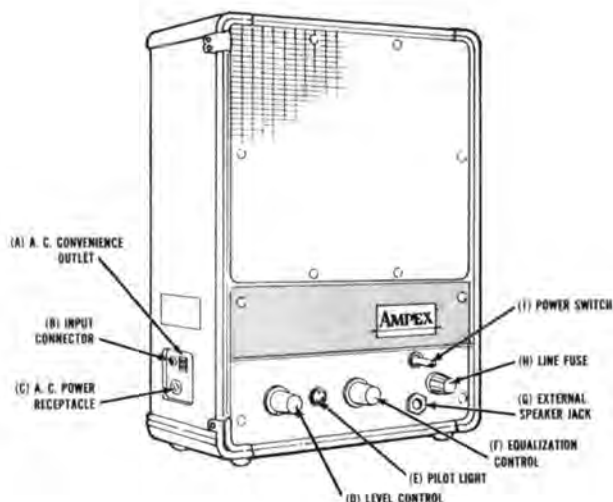
Connect the power cable from the a-c power input connector (C in the *Controls and Connections* illustration) to a convenient 117 volt a-c power source.

NOTE

The second a-c connector (A in the *Controls and Connections* illustration) is a convenience outlet which may be used to furnish power to auxiliary equipment. The convenience outlet is not controlled by the power switch, it is always on.

Connect the input cable to the INPUT receptacle (B in the *Controls and Connections* illustration). A shielded interconnecting cable is furnished primarily for use with the AMPEX Model 602 Portable Tape Recorder/Reproducer. Any other cable used to connect the 622 to other equipment should be of the shielded type and must have a standard phono pin plug on the end that plugs into the 622.

The internal speaker of the 622 is used in normal operation. An external speaker may, however, be plugged into the EXTERNAL SPEAKER jack (G in the *Controls and Con-*



Controls and Connections

nections illustration). Insertion of an external speaker plug automatically disconnects the internal speaker. The amplifier in the Model 622 has a low output impedance and will operate satisfactorily into external speaker load impedances of approximately 12 ohms.

OPERATION

Once the equipment is installed or interconnected, operation consists only of setting the controls to achieve the desired tonal value and output level.

To operate the equipment, place the POWER switch (I in the *Controls and Connections* illustration) in the ON position. After a short warm-up period, the input signal can be applied. Then, adjust the EQUALIZATION control (F) and the LEVEL control (D) for the most pleasing results.

SPECIAL APPLICATIONS

The Model 622 is a versatile unit, readily adaptable to a variety of practical applications. It can be used as a portable public address system, a guitar amplifier, or a remote auxiliary unit for a fixed sound system. See your distributor for advice on these special applications.

The use of the Model 622 (in conjunction with the AMPEX Model 602 Portable Tape Recorder) as a portable public address system is

covered in detail below as an example of what can be done with this unit.

Step 1:

Connect a microphone to the AMPEX portable recorder.

Step 2:

Connect the recorder output to the Model 622 input.

Step 3:

Turn the recorder MONITOR SELECTOR to the INPUT position.

Step 4:

Turn both machines on.

Step 5:

Set the recorder MIC REC LEVEL control exactly as for making a recording.

Step 6:

Adjust the loudspeaker volume with the LEVEL control on the Model 622.

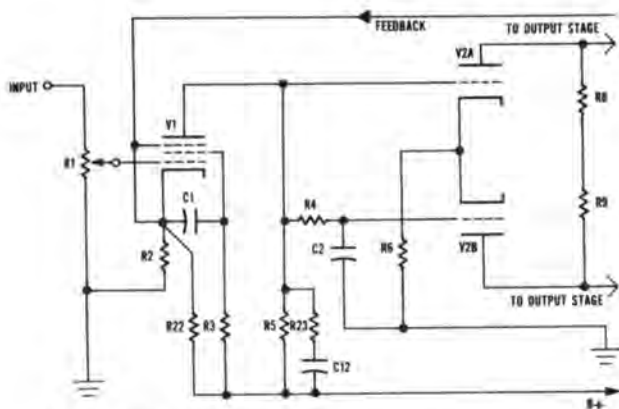
NOTE

The MIC REC LEVEL control on the recorder will also affect loudspeaker volume, but it should not be used for this purpose once it has been set as in Step 5.

A recording of the program may be made simultaneously by simply threading a tape on the recorder and placing the machine in the record mode. This will not affect the public address operation.

THEORY OF OPERATION

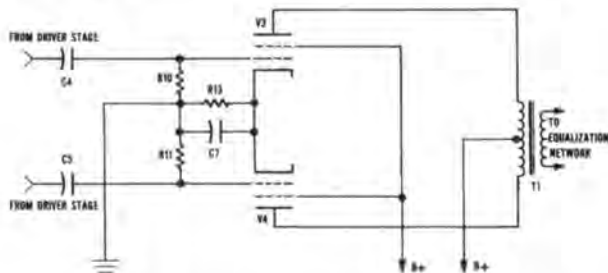
The signal from J1 appears at the grid of tube V1 through potentiometer R1. Potentiometer R1 provides a means of setting LEVEL. Bias and negative feedback is attained by unbypassed resistor R2. Negative feedback for tube V1 is also obtained from the compensating network. The signal is direct-coupled to the grid of tube V2a. Tube V2 is a standard self-balancing differential amplifier type phase inverter except that, because of the direct coupling to tube V1, the grid of tube V2b is approximately 100 volts positive with respect



Simplified Schematic, Input Stage and Phase Inverter

to d-c ground (the grid is at a-c ground because of the low impedance of capacitor C2).

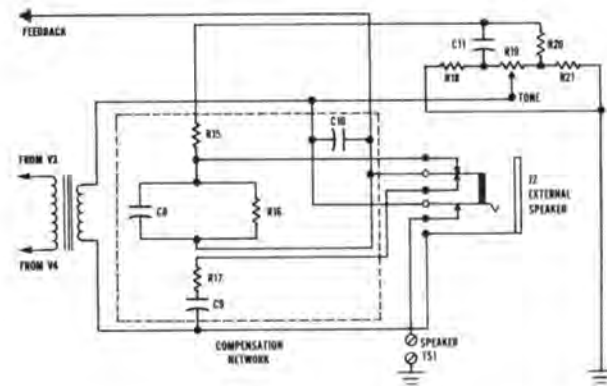
The two outputs of the phase inverter are coupled to the grids of output tubes V3 and V4 through capacitors C4 and C3. The output stage is a standard push-pull power amplifier.



Simplified Schematic, Power Amplifier

After power amplification, the signal is applied to the compensation network through output transformer T1. The compensation network, which consists of capacitors C8, C9, and C10 and resistors R15, R16, and R17, provides the necessary inverted image of the speaker and enclosure characteristics which results in virtually flat acoustical response. The compensation network acts as a passive filter and also provides feedback to tube V1. The equalization network, consisting of capacitor C11, resistors R18, R20, and R21 and potentiometer R19, provides the tonal compensation desired by the listener.

When an external speaker is plugged into EXTERNAL SPEAKER jack J2, the compensation network (but not the feedback or the



Simplified Schematic, Compensation Network

equalization network) is bypassed providing flat signal response at the speaker jack.

SERVICE NOTES

Certain circuit characteristics of the Model 622 should be understood before attempting measurements or servicing. (See Schematic Diagram.)

1. While response of the 622 (including speaker) is *acoustically flat*, the response of the amplifier, measured at the internal speaker terminals, is *not flat*. The amplifier response is flat *only* when measured across a 12-ohm load plugged into the EXTERNAL SPEAKER jack.
2. The phase inverter, V2, is of the differential type. Note, however, that the grid of the second section, V2b, is at ground potential with respect to a-c only (due to the low impedance of C2) and is approximately 100 volts positive with respect to d-c ground.

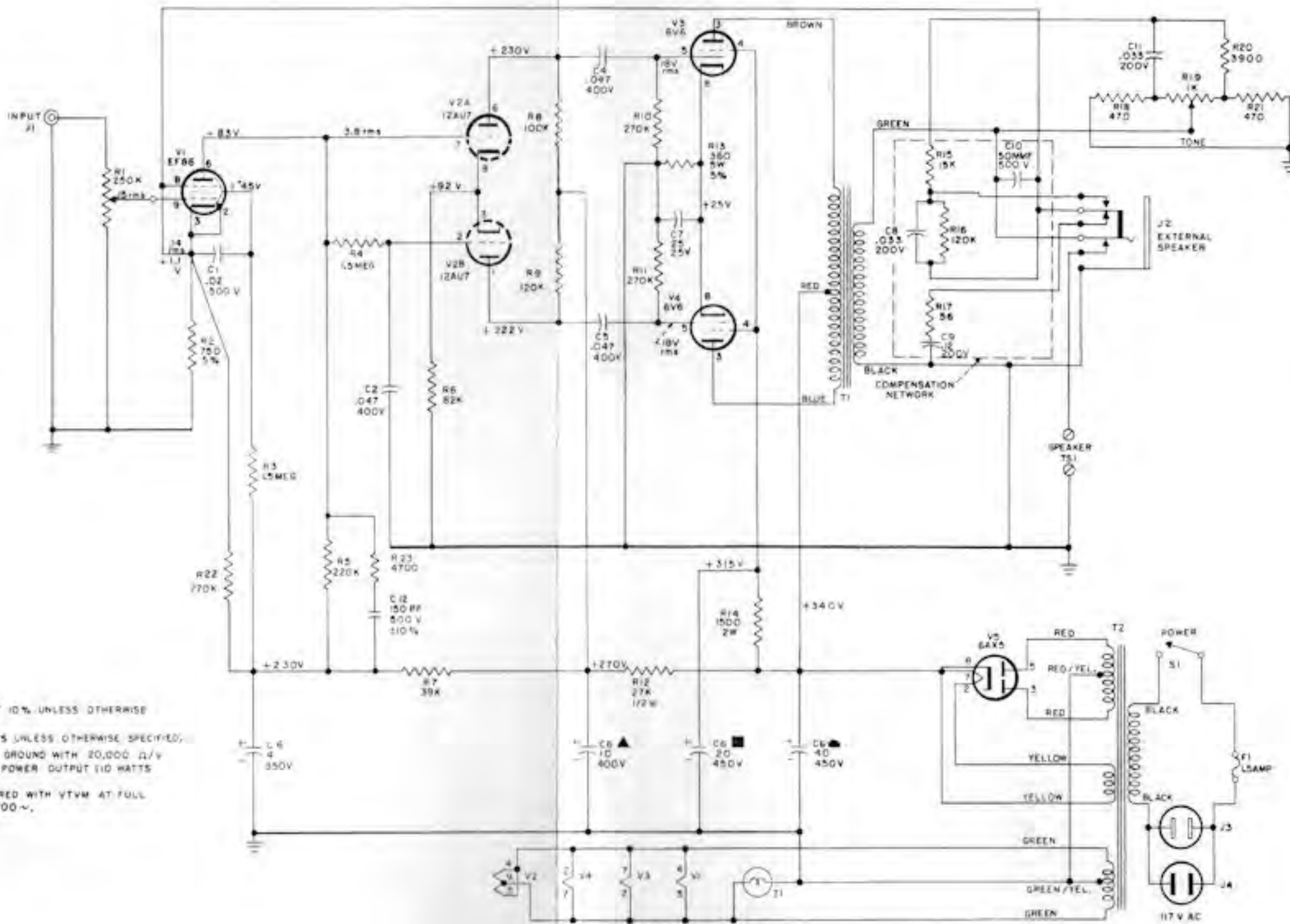
For service access to tubes, remove the four retaining screws from the front panel of the amplifier. For access to under-chassis parts, remove the screws at the forward edges of the amplifier chassis, and pull the front panel forward and down.

No attempt should be made to service the speaker, or to remove it from the case. If servicing is required during the warranty period, return the entire Model 622 to your nearest AMPEX dealer or authorized service center.

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
C1	CAPACITOR, Fixed: disc; .02 uf; 500 vdcw	54-0011
C2	CAPACITOR, Fixed: tubular paper; .047 uf; 400 vdcw	54-0003
C4	(Same as C2)	54-0003
C5	(Same as C2)	54-0003
C6	CAPACITOR, Fixed: electrolytic; 4, 10, 20, and 40 uf; 400, 450, 450 vdcw	55-0013
C7	CAPACITOR, Fixed: tubular electrolytic; 25 uf; 25 vdcw	55-0007
C8	CAPACITOR, Fixed: tubular paper; .033 uf; 200 vdcw	54-0014
C9	CAPACITOR, Fixed: tubular paper; .12 uf; 200 vdcw	
C10	CAPACITOR, Mica: 50 uuf	54-0012
C11	(Same as C8)	54-0014
C12	CAPACITOR, Fixed: disc; .00015 mfd; 500 vdcw	54-0029
F1	FUSE: 1.5 amp; 250 V; Type 3AG	61-0003
I-1	LAMP: G. E. Part No. 47	61-0002
J1	JACK: phono receptacle	63-0019
J2	JACK: phono Switch Craft No. SF-25	63-0018
J3	CONNECTOR, Receptacle: female; 2 contact	63-0005
J4	CONNECTOR, Receptacle: male; 2 contact	64-0001
R1	RESISTOR, Variable: 250K log taper volume control	52-0119
R2	RESISTOR, Fixed: composition; 750 ohms; 1/2 watt; 5%	51-0041
R3	RESISTOR, Fixed: composition; 1.5 meg; 1/2 watt; 10%	51-0042
R4	(Same as R3)	51-0042
R5	RESISTOR, Fixed: composition; 220K; 1/2 watt; 10%	51-0020
R6	RESISTOR, Fixed: composition; 82K; 1/2 watt; 10%	51-0036
R7	RESISTOR, Fixed: composition; 39K; 1/2 watt; 10%	51-0019
R8	RESISTOR, Fixed: composition; 100K; 1/2 watt; 10%	51-0037
R9	RESISTOR, Fixed: composition; 120K; 1/2 watt; 10%	51-0038
R10	RESISTOR, Fixed: composition; 270K; 1/2 watt; 10%	51-0040
R11	(Same as R10)	51-0040
R12	RESISTOR, Fixed: composition; 27K; 1/2 watt; 10%	51-0044
R13	RESISTOR, Fixed: wirewound; 360 ohms; 5 watts; 5%	51-0046
R14	RESISTOR, Fixed: composition; 1.5K; 2 watts; 10%	51-0045
R15	RESISTOR, Fixed: composition; 15K; 1/2 watt; 10%	51-0050
R16	(Same as R9)	51-0038
R17	RESISTOR, Fixed: composition; 56 ohms; 1/2 watt; 10%	51-0043
R18	RESISTOR, Fixed: composition; 470 ohms; 1/2 watt; 10%	51-0047
R19	RESISTOR, Fixed: composition; 1K; linear taper tone control	52-0008-01
R20	RESISTOR, Fixed: composition; 3.9K; 1/2 watt; 10%	51-0048
R21	(Same as R18)	51-0047
R22	(Same as R10)	51-0040
R23	RESISTOR, Fixed: composition; 4.7K ohm; 1/2 watt; 10%	51-0001

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
S1	SWITCH, Power	62-0007
T1	TRANSFORMER, Output	58-0005-01
T2	TRANSFORMER, Power	58-0004-01
V1	VACUUM TUBE: EF86	56-0010
V2	VACUUM TUBE: 12AU7	56-0002
V3	VACUUM TUBE: 6V6GT	56-0009
V4	(Same as V3)	56-0009
V5	VACUUM TUBE: 6AX5GT	56-0008
	POWER CORD	73-0004-03
	HEAT SHIELD	29-0006-01
	INPUT CABLE	473-0003-50
	*SPEAKER ASSEMBLY	68-0101-01
	FUSE POST	63-0015

*Available only as a replacement part for the Model 622. This speaker assembly will not function properly when associated with any other amplifier.



- NOTES:**
1. ALL RESISTORS ARE 1/2 WATT 10% UNLESS OTHERWISE SPECIFIED.
 2. ALL CAPACITORS ARE 400 VOLTS UNLESS OTHERWISE SPECIFIED.
 3. D.C. VOLTAGES MEASURED TO GROUND WITH 20,000 Ω/V VOLT METER AT FULL RATED POWER OUTPUT (10 WATTS AT 700 \sim).
 4. A.C. SIGNAL VOLTAGES MEASURED WITH VTVM AT FULL RATED POWER OUTPUT AT 700 \sim .

Schematic Diagram, 622 Amplifier

AMPEX PROFESSIONAL AUDIO EQUIPMENT ONE YEAR WARRANTY

Congratulations and thanks. You now own the finest instrument of its kind in the world today. This equipment meets standards of performance, durability and reliability that surpass anything in its market. The warranty covering this equipment is valuable to you.

This warranty is effective when the warranty-registration card is fully and properly filled and returned to the factory within ten (10) days of delivery.

Before your unit left the factory, all phases of its performance were carefully checked by sensitive test instruments. This individual Ampex unit equalled or exceeded all current specifications for its model. Hence, if properly used, it should meet your most exacting requirements.

Should you experience difficulty in the operation of this equipment or should servicing of any kind be necessary, please contact the distributor from whom it was purchased.

If the equipment has been damaged in transit, you should report the fact immediately to your distributor.

Ampex reserves the right to modify or change the equipment, in whole or in part, at any time prior to delivery thereof, in order to include therein electrical or mechanical refinements deemed appropriate by Ampex, but without incurring any liability to modify or change any equipment previously delivered, or to supply new equipment in accordance with earlier specifications.

WARRANTY

Ampex warrants to the original using purchaser that all new Professional Audio Equipment shall be free from defects in workmanship and material under normal and proper use and service for a period of one year from date of delivery to original using purchaser and agrees to repair or replace all parts (except tubes, transistors, diodes, fuses, lamps and tape) thereof showing such defects, subject to all of the following provisions.

Ampex Warranty Obligation

- (a) **Parts returned within 0-90 Days from Date Equipment Delivered to Original Using Purchaser**—All such defective parts will be repaired or replaced at no charge for labor or materials;
- (b) **Parts returned within 91-365 Days from Date Equipment Delivered to Original Using Purchaser**—All such defective parts will be repaired or replaced at no charge for material and a labor charge equal to actual labor costs incurred in such repair or replacement.
- (c) **In all warranty transactions the responsibility of Ampex shall be limited to making a new or factory-reconditioned replacement part available to the distributor; it is the responsibility of the distributor to repair or replace defective parts.**

Conditions of Ampex Warranty

- (a) Defective equipment shall be returned, transportation prepaid, to the Ampex distributor from whom the equipment was originally purchased unless such distributor agrees to inspect or repair at purchaser's premises; and
- (b) For warranty service, purchaser must provide Ampex Distributor from whom equipment was bought, with purchase date along with model and serial number of equipment; and

- (c) Purchaser shall not have used or allowed to have been used in the equipment any parts not supplied by Ampex through its distributors (tape, vacuum tubes, transistors, diodes, fuses, and lamps excepted); and
- (d) Inspection shall disclose to Ampex's satisfaction that the defects are as above specified and that the equipment has not been altered or repaired by other than factory approved procedures, subjected to negligence, misuse or accident, or damaged by excessive current or otherwise, or had its serial number or any part thereof altered, defaced or removed.

Exceptions to Ampex Warranty

- (a) Tubes, transistors, diodes, fuses, lamps, and tapes are hereby excluded from the provisions of this warranty (as to these items, no warranty, expressed or implied, is made by Ampex);
- (b) Replacement parts supplied under this warranty carry only the unexpired portion of the original warranty.

Sole Warranty

This warranty is expressly in lieu of all other warranties, expressed or implied, and all other obligations or liabilities on the part of Ampex. No person, including any distributor, agent or representative of Ampex, is authorized to assume for Ampex any liability on its behalf or in its name except to refer purchasers to this warranty. In no event shall Ampex be liable for claims, demands or damages of any nature, however denominated; Ampex's sole warranty liability shall be to repair defective items or to supply replacement parts in accordance with the terms of this warranty.

AMPEX

AMPEX CORPORATION, 401 BROADWAY, REDWOOD CITY, CALIFORNIA