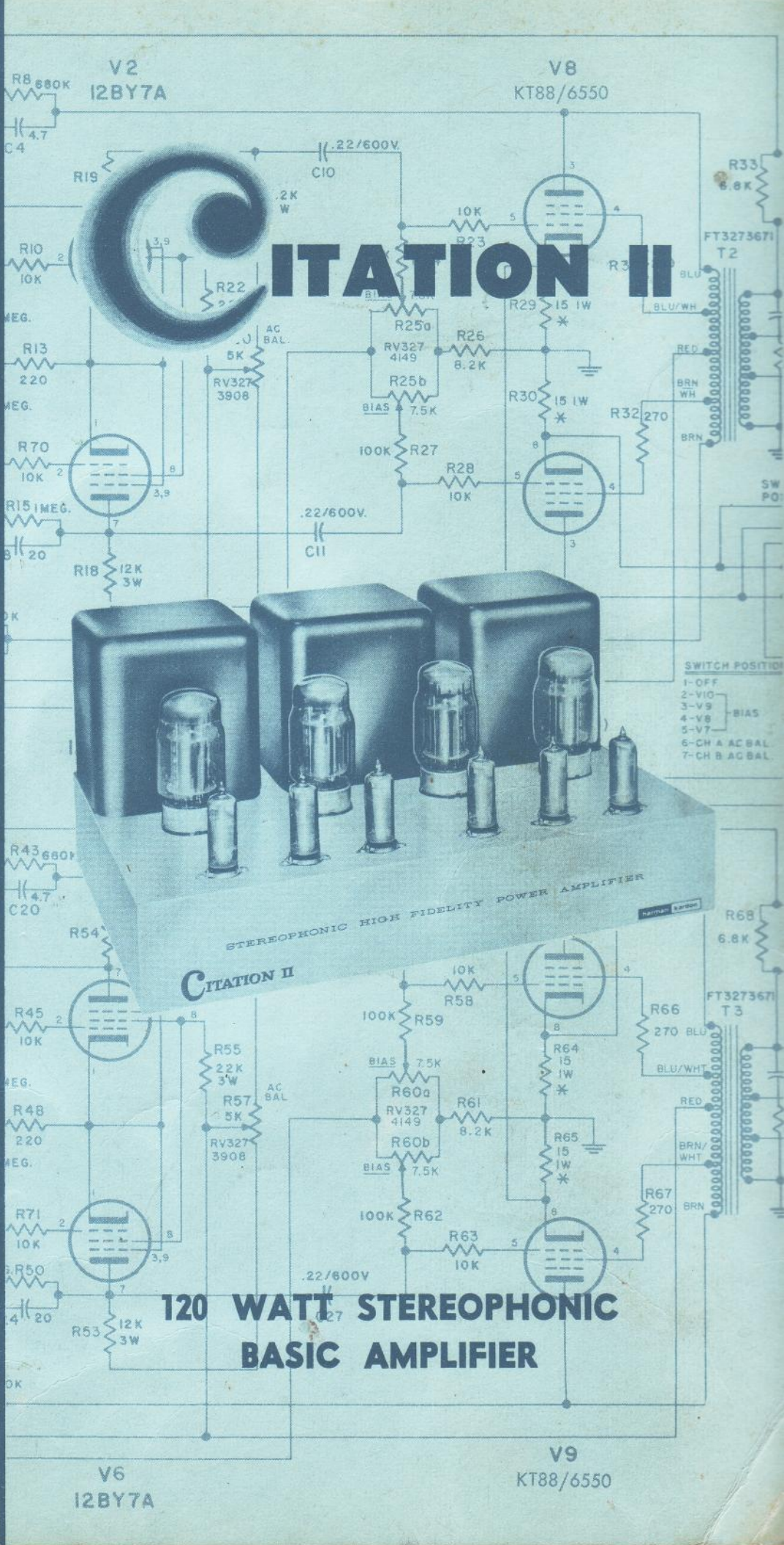
ASSEMBLY AND OPERATION MANUAL



CITATION II

120 WATT STEREOPHONIC BASIC AMPLIFIER

harman kardon

BASIC SPECIFICATIONS

SUSTAINED POWER OUTPUT:	60 watts per channel.
PEAK POWER OUTPUT:	130 watts per channel.
HARMONIC DISTORTION:	Less than 0.5%, 20- 20,000 cycles per second at 60 watts. Less than 0.1%, 20- 20,000 cycles per second at 20 watts. Unmeasurable at normal listening level.
INTERMODULATION DISTORTION:	Less than 0.5% at 60 watts. Less than 0.2% at 20 watts. Unmeasurable at normal listening level.
FREQUENCY RESPONSE:	60 watts. 18- 40,000 cycles per second +0, -1.0 db. 20 watts. 12- 60,000 cycles per second +0, -1.0 db. 1 watt. 2- 80,000 cycles per second +0, -1.0 db.
OUTPUT IMPEDANCE:	4, 8, and 16 ohms per channel.
DAMPING FACTOR:	Greater than 18.
FEEDBACK	Total 30 db. Achieved through multiple loops.
HUM AND NOISE:	Better than 90 db below 60 watts.
POWER SUPPLY:	Close B+ regulation through use of low Z silicon diode rectifier power supply.
SENSITIVITY:	1.5 volt RMS input for 60 watts.
STABILITY:	Unconditionally stable under any load.
INPUT RECEPTACLES:	One for each channel. One input for A.C. balance adjustment.
CONVENIENCE RECEPTACLE:	One A.C. convenience receptacle.
CONTROLS:	Four bias adjust controls. One for each output tube. Two A.C. balance controls.
FUSE	A.C. primary, externally accessible.
CONSTRUCTION:	Military terminal board construction with all components held to rigid tolerances.
TUBE COMPLEMENT:	Total 10 tubes, 5 semi-conductors. 6- 12BY7A pentodes; 4- KT88/6550 beam power pentodes, 4 silicon rectifier diodes, and 1 selenium rectifier.
POWER CONSUMPTION:	350 watts.
DIMENSIONS:	16⅜″ wide x 9″ high x 11½″ deep.
WEIGHT:	60 lbs.
FINISH:	Charcoal brown and gold.

FEATURES

- Use of video output pentodes in all low level stages for exceptionally wide frequency response and low distortion.

- Output stage consists of two KT88/6550's per channel, conservatively operated in fixed bias, distributed load circuit.

- Multiple feedback loops for increased degree of usable feedback to greatly lower distortion without sacrificing stability. 30 db overall.

- Low internal impedance power supply consists of 4 Silicon Rectifier Diodes, choke, and heavy duty electrolytics with potted power transformer for close regulation.

- Extended frequency response. Two octaves above and below the normal range of hearing for smooth, transparent sound.

- Absolute stability with any load!

- Output transformers designed specifically for this amplifier to exacting specifications.

- High power output at the extreme ends of the range enables the amplifier to effortlessly drive any of today's inefficient speakers at any power level. High power rating insures flawless, transparent reproduction at low listening levels.

- Military construction for neat and professional appearance.

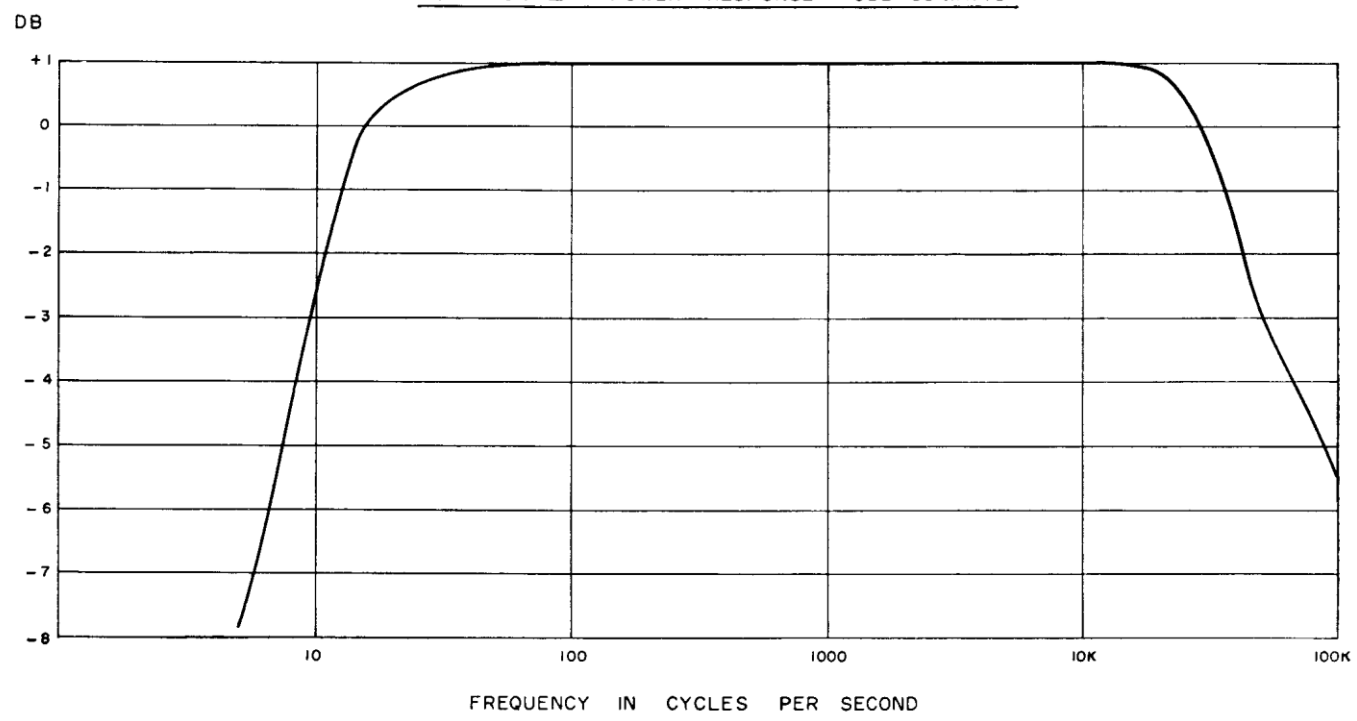
- Bias meter to adjust individually the plate current of each KT88/6550 for proper balance and lowest distortion. This insures optimum performance even after aging of the output tubes.

- Unique packaging of components to facilitate identification and to reduce assembly time.

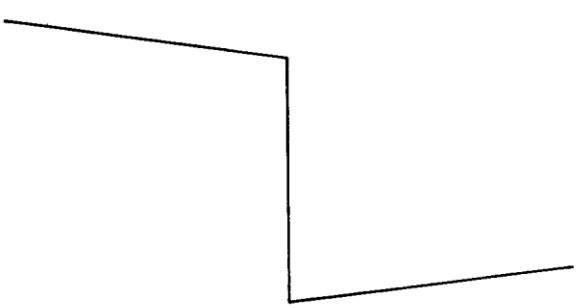
- Use of special glass resistors and heavy duty capacitors for long life and trouble free performance. All components are conservatively rated.

CITATION II CURVES

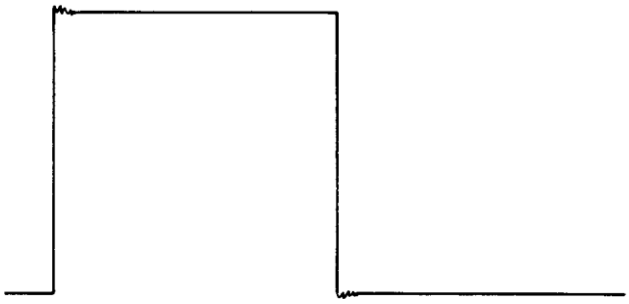
CITATION II POWER RESPONSE ODB=60 WATTS



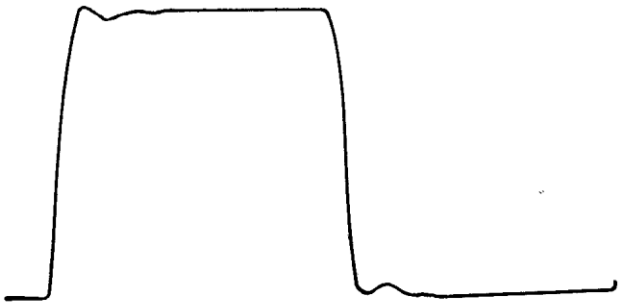
CITATION II SQUARE WAVE RESPONSE



10 CYCLES

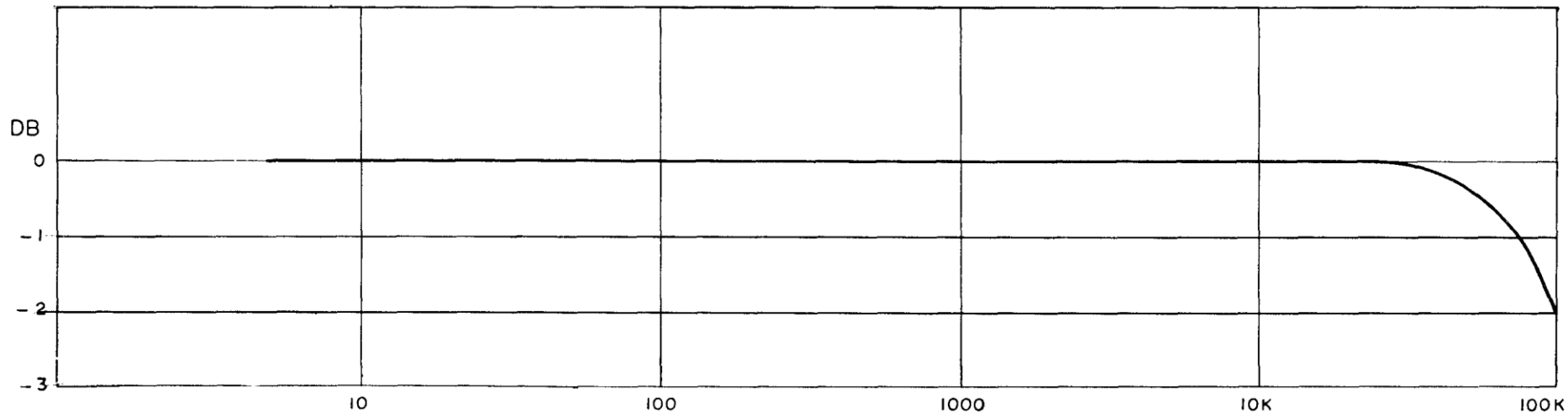


1000 CYCLES

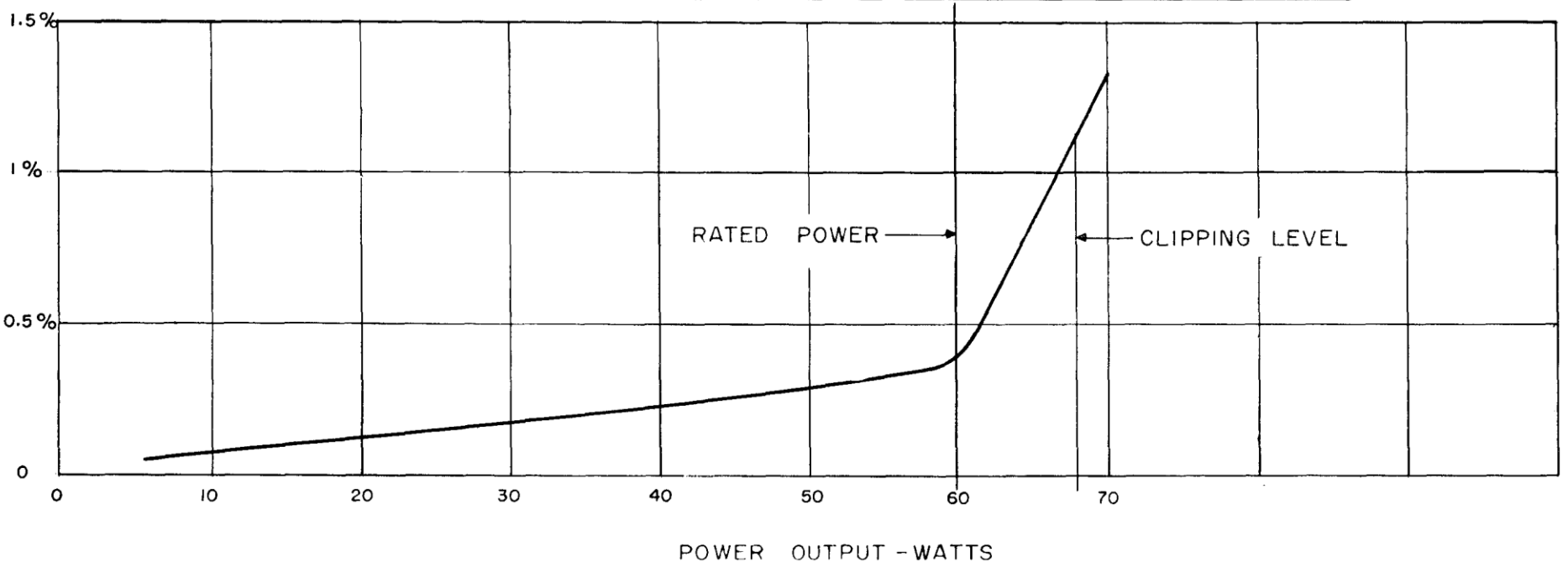


20,000 CYCLES

CITATION II FREQUENCY RESPONSE ODB = 1 WATT



CITATION II INTERMODULATION DISTORTION, 60 ∿ - 7KC 4:1, 16 Ω LOAD



INTRODUCTION

This new Citation basic amplifier kit represents the culmination of extensive research and experimentation in the technique of kit design. It is meant to satisfy the aspirations of those who insist on nothing short of perfection itself. The keynote is unparalleled performance and there has been no compromise made in the design of this magnificent instrument. Although the Citation II will perform satisfactorily with any high quality preamplifier, it is strongly recommended it be used with the Citation I or Citation IV stereo preamplifiers control center for optimum performance. The Citation I and IV match the superb frequency response and distortion specifications of the Citation II resulting in uncompromising performance.

This instruction manual is written in simple, nontechnical language and if you will take the time to read it thoroughly before starting the actual construction of this kit, your work will be easier and far more accurate. Additional information may be obtained by carefully studying the large fold-out diagrams supplied with this manual. These may be attached to the wall opposite your workbench for easy reference.

After studying the manual, work slowly and carefully. After every ten or fifteen steps, go back over your work to check for possible errors. This will insure proper construction and will afford you the feeling of satisfaction upon completing an amplifier that performs perfectly the first time it is connected.

KEEP THIS INSTRUCTION MANUAL AVAILABLE AT ALL TIMES FOR IT CONTAINS INDISPENSABLE TECHNICAL AND SERVICE INFORMATION.

TECHNICAL DESCRIPTION

Extensive listening studies reveal that the behavior of a high fidelity amplifier several octaves above and below the normal range of human hearing distinctly colors the reproduced sound. It has been determined that an amplifier having a wide frequency response at useable power levels below 5 cycles has a tight and clearly defined low end, particularly in the 40-100 cycles region.

A similar condition applies to the performance of an amplifier in the high frequency spectrum. If an amplifier limits its high frequency response to slightly above the limit of audibility, it may have a tendency toward strident reproduction and poor differentiation of instruments in the high overtones. Conversely, an amplifier which has a frequency response beyond 100,000 cycles without evidence of ringing or instability with reactive loads will offer clean, transparent tone qualities in the higher frequencies with excellent instrument separation.

It is for this reason as well as other considerations that conventional power amplifier design has been bypassed in the general design concept of this basic amplifier.

Current power amplifier design is based upon "single loop" feedback techniques, and linearization is obtained by overall feedback from the voice coil terminals to the cathode of the input tube. Stability problems limit this application to 20- 26 db of useable feedback, which represents a 101 to 201 reduction in distortion.

Careful listening evaluation of amplifier performance proves conclusively that extremely stable amplifiers with higher degrees of feedback provide a noticeable improvement in sound quality and a definite reduction in listening fatigue. This improvement can be attributed to lower harmonic and intermodulation distortion products, more linear phase characteristics, and improved transient response.

A "multiple loop" approach toward increasing the degree of useable feedback is the most logical approach to lower distortion without sacrificing stability. These "multiple loops" become additive if their ratio is adjusted to the relative degree of distortion produced. Thus, if one stage has twice the distortion of another, it should have twice as much feedback around it. Experiment has shown that the equivalent of 30 db overall feedback is safely reached by this approach.

It is essential to have a well regulated power supply in order to maintain clean transient response. The power supply of this amplifier incorporates four Silicon Rectifier Diodes, which together with extremely low copper loss in the power transformer provides regulation equivalent to that of a regulated supply. Leakage inductance in the output transformers has been kept to an absolute minimum, and the distributed capacitance of the primary halves have been carefully balanced against each other to maintain the natural resonances of the output

transformers well above 200,000 cycles. The combined use of these special output transformers in conjunction with video pulse amplifier techniques and multiple feedback loops have enabled us to achieve the exceptionally wide frequency response of two octaves above and below the normal range of human hearing.

This design employs 2-KT88/6550 beam power pentodes in each channel, driven by video power pentodes used conventionally in pulse amplifiers and wide band industrial equipment such as computers. All low frequency coupling networks have been inserted into internal feedback loops, thereby reducing phase distortion to an absolute minimum in the subsonic region. At the same time the high frequency response of the amplifier, exclusive of the output transformer, is flat to the megacycle region.

From the moment you turn this amplifier on and the stylus touches the record with an assured "thump", you will know you have constructed an exceptional instrument. Critical listening tests will reveal subtleties in your records and tapes you never knew existed, and each performance will prove to be a new experience for you.

UNPACKING

Set aside ample room on your workbench to unpack the contents of this kit. Open the carton carefully and place all of the components on your workbench, separating them into their respective categories. Handle all parts with care, for they may become damaged through carelessness. Check the contents of the carton and folds of the packing material before discarding it.

After all of the parts have been unpacked, check them against the master parts list in this manual to make certain all parts are present and are correct as to type and value. Whenever possible, the values are stamped on the outside of the parts to facilitate identification.

PLEASE NOTIFY YOUR DEALER IMMEDIATELY IF A SHORTAGE OR ERRONEOUS PART IS DISCOVERED.

In the event of visible shipping damage, notify your dealer at once. If the kit was shipped to you, notify the transportation company without delay. Harman-Kardon will cooperate with you in such instances, but please note that only you can recover from the carrier for damages incurred during shipping.

To help us expedite delivery to you, it may occasionally be necessary for us to make minor part substitutions. Before these substitutions are made, they are thoroughly checked to be certain that the replacement is equal to or superior to the original component in every respect. For example, a 50 volt capacitor may be substituted for a 25 volt unit. In some instances, a 5% tolerance component may be substituted for a 10% unit. This would provide a component with closer tolerances than required. In every case, these substitutions will not affect the performance of the unit.

CONSTRUCTION INFORMATION

Tools Required

Only standard tools are required for the proper assembly of this kit. The most important and frequently used tool will be the soldering iron. It should therefore be a good one. A pencil type iron between 50 and 80 watts or a solder gun up to 100 watts is recommended. You will also require a long-nose pliers, diagonal cutters, screwdriver, sharp knife, solder **(**rosin core only**)**, and an adjustable wrench. An ohmmeter could be of value but is not essential.

Soldering Technique

Good solder connections are essential for the proper operation of this instrument. An improperly soldered connection or a "cold" solder joint can cause considerable difficulty and is extremely hard to locate. If you have little or no experience with soldering, it is suggested you read the following section carefully before proceeding with the construction of the kit. Practice your soldering on an old terminal strip or tube socket until you are certain you can attain a workable degree of skill. Soldering is not difficult. Merely observe the following rules and precautions:

1. USE ONLY ROSIN CORE (NON-CORROSIVE) SOLDER! The solder you purchase should be clearly labeled for radio and television use. The usual composition is 60% tin and 40% lead indicated on the package label as 60/40. Do not use so-called non-corrosive paste. This compound is highly corrosive when heated and will destroy the insulation value of non-conductors and will quickly lead to erratic or degraded performance. It has been our experience that the following solder offer the best results.

   Alpha, Cen-tri-core energized rosin 60/40 alloy .062 dia.

   Bow, AE 16 rosin core 60/40 alloy .062 dia.

   Kester, "44" rosin core 60/40 alloy.

   Kester, "Rosin Five" core 60/40 alloy.

   Multi-core, Solder #13 SWG (5 core) Flux 364 (rosin) 60/40 alloy.

2. Use a high quality soldering iron in the 50-80 watt range. You may choose either the standard diamond or chisel tip. Always keep the tip clean and properly tinned in accordance with the manufacturer's instructions.

3. All terminals and leads must be free from dirt, wax, and corrosion, for solder will not adhere to dirty surfaces. Carefully scrape all terminals and leads which are not clean before applying solder.

4. Solder alone cannot be relied upon for strength. A good mechanical connection must always be made before applying solder. Tinning the leads on resistors and condensers is not always necessary, but is advisable for it helps the solder adhere more readily to the connection.

5. To solder properly, apply the soldering iron to the joint until the joint heats sufficiently to melt the solder. Apply the solder and hold the iron on the connection until the solder flows freely around and into the connection. Merely melting drops of solder onto the connection is not satisfactory and will result in faulty connections.

6. The general appearance of a connection can indicate if it is properly made. A "cold" solder joint presents a dull and pitted or grainy appearance. A good solder connection should have a bright and smooth appearance. When in doubt as to the condition of a connection, it may be tested by moving the leads slightly to determine if they are loose. Always apply fresh solder when correcting a loose or "cold" solder connection. As a rule, simply reheating the defective joint will not properly do the job.

7. When using your soldering iron, avoid applying excessive heat, as this can result in damage to certain components. When soldering a joint having a small component connected to it, the part may be protected from excessive heat produced by the iron by grasping the lead between the joint and the component with a long-nose pliers. The pliers will then conduct most of the heat away from the component, preventing overheating and damage.

8. Do not use excessive solder when making a connection. Use only enough solder to cover all leads and to insure a tight connection. Excessive solder may result in the formation of shorts between adjacent terminals, particularly on tube sockets and switch terminals.

9. The step-by-step instructions tell you when to solder and when not to solder a connection. When the letters "NS" appear after or during a step, simply wrap or crimp the lead to the terminal and proceed to the next step. When all connections have been completed to this terminal, the solder designation "S" will follow.

WARRANTY OF HARMAN-KARDON CITATION KITS

For a period of 90 days following the original date of purchase, all parts supplied with Harman-Kardon Citation Kits are guaranteed by the manufacturer to be free from defects in material and workmanship when put to normal use and service. This guaranty is specifically limited to the following conditions:

(1) To validate the warranty, the warranty card accompanying each kit must be filled out completely and returned to the factory immediately following the date of purchase.

(2) Harman-Kardon reserves the right to substitute replacement parts for any which may be found defective.

(3) The warranty is effective only as to parts which are defective at the time of sale or become defective as the result of the normal operation during the 90 day period following the date of sale.

(4) This warranty is limited to those parts which are returned to the factory transportation prepaid, and in the judgment of Harman-Kardon are found defective under the terms of this warranty.

(5) This warranty is specifically void as to any parts in which *acid core solder or paste fluxes* have been used.

This warranty is in lieu of all other warranties, express or implied, and of all other obligations on the part of Harman-Kardon. Harman-Kardon neither assumes nor authorizes anyone else to assume for it any other liability in connection with the sale of this kit.

Harman-Kardon does not assume liability for damages or injuries incurred during the construction of this kit.

SERVICE POLICY

If you should have difficulty with this kit and cannot resolve the problem through your own efforts, write directly to us for advice. Harman-Kardon has established a special Citation service division to answer all questions pertinent to the assembly, testing or installation of this instrument. Address all correspondence to:

HARMAN-KARDON, INC.
Citation Kit Division
PLAINVIEW, L. I., NEW YORK

If the factory feels your difficulty may not be easily resolved through your own efforts, you will be notified of the authorized warranty service station nearest your home. These stations are at your disposal in the event you require assistance. However, please note they will not accept a unit unless previous factory authorization has been given.

If it is necessary to ship your set, pack the unit carefully and return to the warranty station designated by the factory via Railway Express, PREPAID. Pack the kit in a large, rugged container using a substantial quantity of padding and bracing. Attach a tag to the set indicating your name, address and the specific problem. Mentioning the other components in your installation may be of value.

The Harman-Kardon warranty station will inspect and service your kit at a minimum service charge of $10 plus the cost of parts or tubes that are out of warranty, provided the unit has been constructed and completed in accordance with the instructions in this manual.

This special repair offer is available to you for the life of the instrument.

PLEASE NOTE THIS SERVICE APPLIES ONLY TO FULLY COMPLETED INSTRUMENTS. INCOMPLETE AMPLIFIERS OR THOSE THAT HAVE BEEN MODIFIED IN DESIGN WILL NOT BE ACCEPTED. AMPLIFIERS SHOWING EVIDENCE OF ACID CORE SOLDER OR PASTE FLUX WILL SIMILARLY BE REFUSED.

ASSEMBLY PROCEDURE

These instructions are presented in a simple, step by step sequence to make assembly and wiring of your amplifier as easy as possible. Please take the time to read each step carefully before actually performing the work. A space is provided to check off each operation and will be helpful in preventing omissions or errors. After every 10 or 15 steps, stop and check your work to insure accuracy.

Note that in the pictorials, each component is identified by a code designation and in addition, each terminal has also been assigned a number. When the instructions read, "Connect a 100K ½ watt 10% resistor (brown-black-yellow-silver from TB1-1 (S) to TBl-35 (NS)", it means that the resistor is connected between terminals 1 and 35 on terminal board 1. The abbreviation (S) indicates that the connection should be soldered. The abbreviation (NS) indicates that more than one component is connected to the same terminal and should not be soldered in this operation.

Two types of hook-up wire are used in the assembly of this kit. One type has standard insulation and will be used in all wiring unless otherwise specified. The other type wire has heavier insulation and is used in the B+ and filament lines. The heavy insulation wire will be referred to in all instances as "HI".

When wire lengths are specified, measure the length on the scale provided on the harness construction jig, In general, the ends of most leads can be stripped back ⅜" and any excess bare wire can be clipped off if necessary after installation. The solid wire provided requires no pre-tinning. The stranded wire (transformer leads, etc.) should be twisted and tinned after stripping.

The amplifier is assembled and wired as four separate units:

Electrolytic Bracket

Harness

Terminal Boards

Main Chassis

As each assembly is completed, it should be checked and put aside for later installation. In this way, any errors can be corrected before the construction of the kit has progressed to the final assembly.

The pictorials will facilitate the assembly, location, and wiring of the various component parts and should be referred to at all times. It is suggested that the manual be read and the pictorials studied before starting construction of your amplifier.

The mounting hardware supplied with this kit consists of the following:

1. #4-40 screws, nuts, and lockwashers. These are the smallest screws supplied and are used to mount the nine pin miniature sockets.
2. #6-32 x ⅜" screws, nuts, and lockwashers. These comprise most of the mounting hardware.
3. 1-#6-32 x ¾" screw to mount the selenium rectifier.
4. #10 nuts, lockwashers, and 3/32 thick flatwashers to mount the transformers.
5. #8-32 x ⅜" screws, nuts, and lockwashers to mount the choke. These are the thickest screws supplied.

RESISTOR HOLDING CARD

The cards on which the resistors and small capacitors are mounted may serve as a convenient holder during construction. Remove the tape by peeling it free from the resistor leads, holding the body of the resistors down to prevent them from being pulled out of the holder. Bend the card on the scored line until it forms a right angle and then use a small piece of tape from the lacing tape roll to hold it in shape.

The card now serves as a pyramid base with the resistor leads pointing upward. This will facilitate identification and selection of the components as the work progresses.

ELECTROLYTIC BRACKET ASSEMBLY

Refer to Pictorial Diagram #1.

Orient bracket so that the U-shaped notches are downward with the larger U-shaped notch to the right.

Check

( ) ( ) Mount selenium rectifier (SR1), using #6-32 x 3/4" screw through top of bracket. Slip rectifier on screw, negative lug first and engage locating tab in the hole provided on the electrolytic bracket. Positive terminal may be identified by red band or plus symbol. Use #6-32 hardware, lockwasher under nut.

( ) ( ) Mount small capacitor-insulating wafer as shown at (E). Use #6-32 x 3/8" screws, lockwasher under nut. (Wafer is mounted on top of bracket.) Note orientation.

( ) ( ) Mount large capacitor-insulating wafer and lug strip T6 in the same manner at (A).

( ) ( ) Mount silicon diode holder (T5). Insert screws through holder and bracket. Use #6-32 x 3/8" screws, lockwasher under nut.

( ) ( ) Mount 20-20 mfd 150 wv cardboard-insulated electrolytic capacitor at (E). Note orientation. Twist mounting tabs 1/4 turn after insertion, to lock in place.

( ) ( ) Mount 50-50 mfd 450 wv electrolytic capacitor at (D) in the same manner, noting orientation. Twist mounting tabs 1/4 turn.

( ) ( ) Mount single 40 mfd 525 wv electrolytic capacitor at (C) in the same manner, noting orientation. Twist mounting tabs 1/4 turn.

( ) ( ) Mount single 200 mfd 250 wv electrolytic capacitor at (B). Note orientation. Twist tabs 1/4 turn.

( ) ( ) Mount single 200 mfd 250 wv electrolytic capacitor with cardboard insulating sleeve at (A). Note orientation. Twist tabs 1/4 turn.

( ) ( ) Insert the four silicon diodes into the clips on the holder (T5) as shown in the pictorial. It is imperative that the silicon diodes are installed in the manner shown in Pictorial 1. Note that the large disks on SD1 and SD2 are at the right and the large disks on SD3 and SD4 are at the left.

( ) ( ) Hook cathode lead from SD1 with, anode lead from SD2 (S). Cut off excess wire. Fragile! Use caution handling leads.

( ) ( ) Hook anode lead from SD3 with cathode lead SD4 (S). Cut off excess wire.

( ) ( ) Connect free end (cathode) of SD2 to lug #2 of holder (T5) (NS).

( ) ( ) Connect free ends of SDI and SD3 to lug #1 of holder (T5) (NS).

( ) ( ) Connect free end (anode) of SD4 to terminal 2 of lug strip T6 (NS).

( ) ( ) Slip a piece of insulating sleeving over each end of a .01 MFD/1400 V disc capacitor and connect one end to T5 lug #1 (NS) and the other end to T6 lug #2 (NS).

( ) ( ) Connect a 2" HI red wire from T5-2 (S) to Al (NS).

( ) ( ) Connect a 2" HI red wire from A2 (S) to B1 (S).

( ) ( ) Connect a 3 3/4" HI black wire from B2 (S) to T6-2 (S).

( ) ( ) Connect a 2 1/2" gray wire from E3 (NS) to the negative lug of SRI (S).

( ) ( ) Connect a 2 1/2" black wire from E2 (NS) to D3 (S).

( ) ( ) Solder D3 to electrolytic bracket (this is to insure proper grounding of the electrolytic).

( ) ( ) Connect a 1.8K 1/2 watt 10% resistor (brown-gray-red-silver) between E1 (NS) and E2 (S).

( ) ( ) Solder solid twist tab of 40 mfd 525 wv electrolytic capacitor (C) to the electrolytic bracket.

( ) ( ) Similarly solder twist tab of 200 mfd 250 wv electrolytic capacitor at (B) to the electrolytic bracket.

ELECTROLYTIC BRACKET SUBASSEMBLY COMPLETED. Set aside for later use.

HARNESS CONSTRUCTION

The cardboard harness jig (Pictorial #2) will enable you to build your harness easily and quickly. Careful work at this time will pay dividends in terms of appearance and easy final wiring.

You will note that the jig has numerous scored rectangles with lines emerging from them. These are tabs to hold the wires in place as they are inserted in the harness. Bend these tabs upward toward you, and with a pencil point gently push the scored circle out of the tab. Similarly, remove the smaller scored rectangles.

To construct the harness, select the color of wire indicated, cut it to length (a scale is provided on the jig for this purpose), strip it at both ends as directed, and place it in the jig. The numbers in the parentheses indicate the length that each end is to be stripped. The numbers preceding the parentheses indicate the starting and finishing points of the wire route.

For example, the first step reads: "Connect a green wire 9″ long from 2 (1/4″) to 8 (1/4″)". The procedure is to first cut a piece of green wire 9″ long and strip both ends back 1/4″. Insert one stripped end in the hole marked "2" on the jig and bend it over behind the jig to hold it in place. Following the printed line, run the wire through the bent-up tabs, taking the designated route to the hole marked "8". Insert the end of the wire into this hole, and bend it over behind the jig to hold it in place.

If the wire has been accurately cut to size and properly inserted into the jig, it will stay in place while the rest of the wires are inserted. If they tend to fall out, however, they may be held in place temporarily by means of pieces of tape.

When all the wires are in place, tape them together tightly at the 22 points indicated. One or two turns of tape around each point is all that is required.

Check

( ) ( ) Connect a green wire 9″ long from 2 (1/4″) to 8 (1/4″).
( ) ( ) Connect a yellow wire 10″ long from 3 (1/4″) to 7 (1/4″).
( ) ( ) Connect a red wire 22 1/2″ long from 20 (1/4″) to 57 (1/4″).
( ) ( ) Connect a black wire 14 1/4″ long from 22 (3/8″) to 35 (1/4″).
( ) ( ) Connect a blue wire 13 3/4″ long from 27 (3/8″) to 53 (1/4″).
( ) ( ) Connect a brown wire 13 1/4″ long from 23 (3/8″) to 34 (1/4″).
( ) ( ) Connect a green wire 19 1/4″ long from 29 (1/4″) to 56 (1/4″).
( ) ( ) Connect a white wire 23 1/2″ long from 1 (3/8″) to 50 (1/4″).
( ) ( ) Connect an HI red wire 11 1/4″ long from 26 (1/4″) to 55 (1/4″).
( ) ( ) Connect a violet wire 16 1/2″ long from 6 (3/8″) to 52 (1/4″).
( ) ( ) Connect an HI red wire 9″ long from 19 (3/8″) to 25 (1/4″).
( ) ( ) Connect an HI red wire 11″ long from 18 (3/8″) to 4 (3/8″).
( ) ( ) Connect an HI red wire 13 3/4″ long from 5 (3/8″) to 12 (3/8″).
( ) ( ) Connect an HI orange wire 8 1/2″ long from 28 (1/4″) to 31 (3/8″).
( ) ( ) Connect an HI yellow wire 8 3/4″ long from 17 (3/8″) to 24 (1/4″).
( ) ( ) Connect a black wire 10 1/4″ long from 21 (3/8″) to 30 (3/8″).
( ) ( ) Connect a green wire 9″ long from 11 (1/4″) to 15 (1/4″).
( ) ( ) Connect a yellow wire 9 1/2″ long from 10 (1/4″) to 14 (1/4″).
( ) ( ) Connect a violet wire 25 3/4 long from 16 (3/8″) to 64 (1/4″).
( ) ( ) Connect a brown wire 12 1/4″ long from 42 (3/8″) to 32 (1/4″).
( ) ( ) Connect a yellow wire 24″ long from 45 (1/4″) to 61 (1/4″).
( ) ( ) Connect a blue wire 17 1/4″ long from 47 (3/8″) to 54 (1/4″).
( ) ( ) Connect a black wire 11 3/4″ long from 40 (3/8″) to 33 (1/4″).
( ) ( ) Connect a blue wire 19 1/2″ long from 36 (1/4″) to 62 (1/4″).

Check

( ) ( ) Connect a white wire 19¾″ long from 9 (⅜″) to 58 (¼″).
( ) ( ) Connect an HI red wire 10¾″ long from 38 (⅜″) to 13 (⅜″).
( ) ( ) Connect an HI red wire 8½″ long from 39 (⅜″) to 44 (¼″).
( ) ( ) Connect an HI yellow wire 8½″ long from 37 (⅜″) to 43 (¼″).
( ) ( ) Connect an HI orange wire 9″ long from 46 (¼″) to 49 (⅜″).
( ) ( ) Connect a black wire 10″ long from 41 (⅜″) to 48 (⅜″).
( ) ( ) Connect a gray wire 20½″ long from 60 (¼″) to 63 (¼″).
( ) ( ) Connect a gray wire 12¼″ long from 51 (¼″) to 59 (¼″).
( ) ( ) Tape the harness tightly at the place indicated.

THIS COMPLETES THE WIRING OF THE HARNESS. It will be installed at a later time. Keep harness on board till ready for use.

PRELIMINARY TERMINAL BOARD WIRING

Refer to Pictorial #3.

TB1 and TB2 are identical and may be wired simultaneously to save time. When each step has been performed on one, it should then be performed on the other.

Connect jumpers to lower section of lugs using bare wire. Note that each lug is numbered and for easy identification, the jumpers are screened on the board. Wrap wire one full turn. See Figure A.

Check TB1 TB2

( ) ( ) ( ) 10 (NS) to 11 (S) to 12 (S).
( ) ( ) ( ) 14 (NS) to 43 (NS).
( ) ( ) ( ) 45 (S) to 20 (NS).
( ) ( ) ( ) 42 (NS) to 23 (NS).
( ) ( ) ( ) 9 (NS) to 40 (S) to 28 (NS).
( ) ( ) ( ) 38 (S) to 29 (NS).
( ) ( ) ( ) 36 (NS) to 31 (S).
( ) ( ) ( ) 35 (S) to 34 (NS).
( ) ( ) ( ) 41 (S) to 25 (NS).
( ) ( ) ( ) 18 (NS) to 19 (NS).

The following wires are connected to the lugs from the rear of the board through the holes designated by a letter. Cut to size and strip ⅜″ at each end. Refer to Figure B.

( ) ( ) ( ) Yellow 5″ F-36 (S) to G-44 (S).
( ) ( ) ( ) Blue 4½″ M-37 (S) to B-43 (S).
( ) ( ) ( ) Blue 4¾″ C-24 (NS) to H-46 (S). Route as shown.
( ) ( ) ( ) Blue 3¾″ C-24 (NS) to N-7 (S).
( ) ( ) ( ) Yellow 4½″ A-5 (S). Leave other end free.
( ) ( ) ( ) Yellow 4½″ L-39 (NS). Leave other end free.
( ) ( ) ( ) Take one of the 14″ precut shielded wires and unwrap the shield from the inner conductor. Twist the resulting strands of wire together. Strip ⅜″ from the inner conductor insulation and tin the lead and the shield. Pass the shielded lead through hole D and connect the inner wire to Pin-27 (NS). Connect the shield to Pin-28 (S). Strip the other end of the shielded lead in the same manner and leave free. It will be connected later on.

Refer to Pictorial #3, Figure C.

The following capacitors are mounted to the rear (unprinted side) of the terminal board. The leads are bent over the edges of the board to connect the lugs which are on the front side of the board. Connect the leads snugly to the lower section of the lugs with one turn around the lug. Clip excess wire. Bands on capacitors indicate outside foil. Polarity, except for electrolytic, is unimportant. Slip sleeving over all the capacitor leads as shown in Pictorial #3, Figure C.

Check	TB1	TB2	
( )	( )	( )	Connect a .22 mfd 600V from 1 (NS) to 33 (NS).
( )	( )	( )	Connect a .47 mfd 600V from 14 (S) to 21 (NS).
( )	( )	( )	Connect a .22 mfd 600V from 15 (NS) to 19 (S).
( )	( )	( )	Connect a .47 mfd 600V from E-30 (NS) to C-24 (S).
( )	( )	( )	Connect a 4 mfd 450V, positive end (marked +) to J-42 (S). Connect the other end to L-39 (S). Dress the body of this capacitor 3/8" from the terminal board, see Figure N.

THIS COMPLETES ASSEMBLY OF THE TERMINAL BOARDS. Put them away for later use.

CHASSIS ASSEMBLY

Use of a good screwdriver, properly ground, (not chisel-pointed!), will reduce the possibility of scratching and gouging the chassis.

Refer to Pictorial #4 for location and orientation of parts.

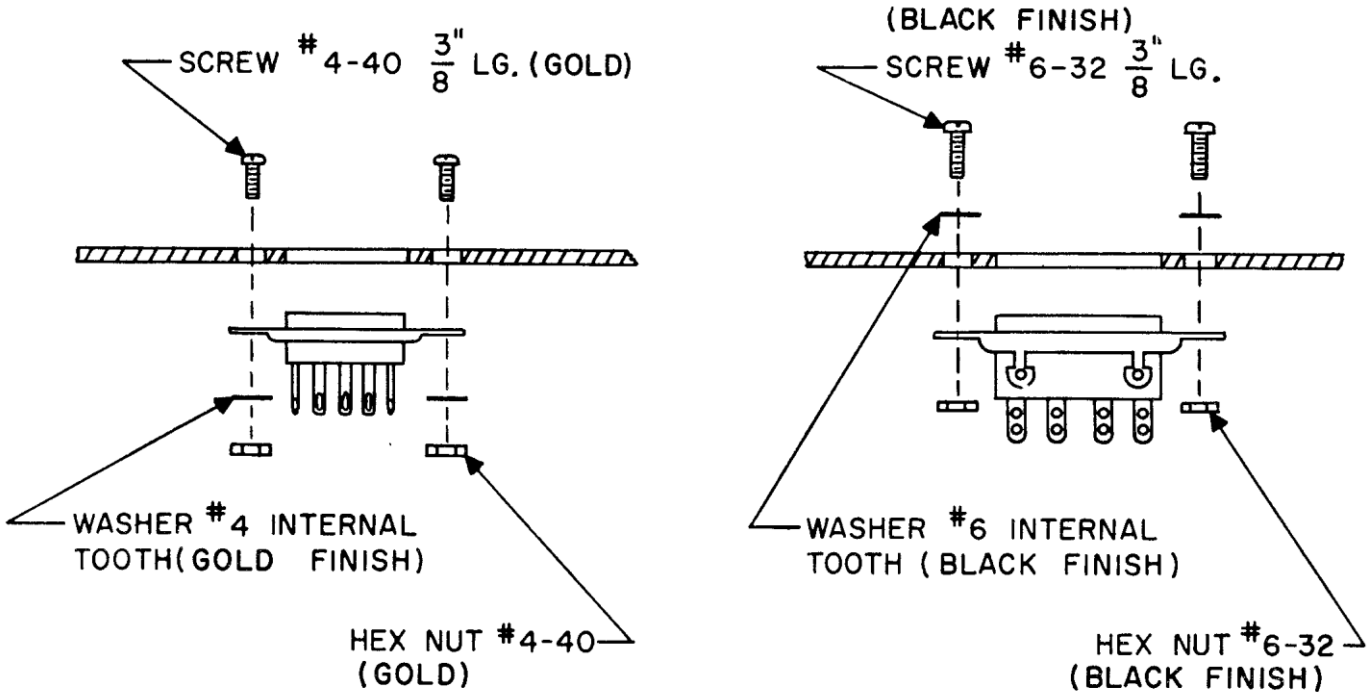


FIGURE E

Check

( ) ( ) Install (6) nine pin sockets, V1 through V6, noting orientation. Use 4-40 x 3/8″ screws, lockwasher under nut. (See Figure E.)

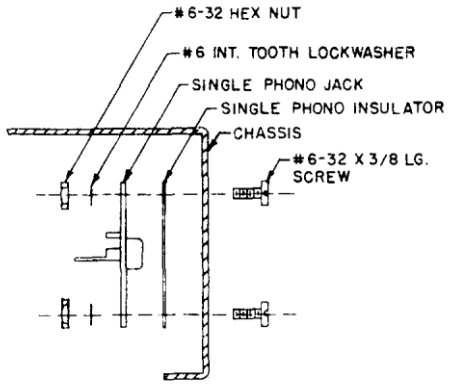
( ) ( ) Install (4) octal sockets, noting orientation. Use #6-32 x 3/8″ screws. Place lockwasher under screw head. (Lockwashers serve to ground tube socket to chassis.)

( ) ( ) Install (2) phono receptacles (P1 and P2) from inside of chassis. Use #6-32 x 3/8″ screws, lockwasher under nut. P2 is a dual input jack. Install using phenolic shield and grounding solder lug. Refer to Pictorial #4 & Figure M. P1 is a single input jack and is similarly installed, but without grounding lug.

( ) ( ) Install fuse holder (F). Slide rubber washer on holder before inserting. Use lockwasher and nut supplied.

( ) ( ) Install speaker terminal strip (T1) and lug strip (T3). Insert screw through T1 and install from outside of chassis. Placing lockwasher on screw, insert lug strip T3 as shown. Install T2 and T4 in same manner. Use #6-32 x 3/8″ screws.

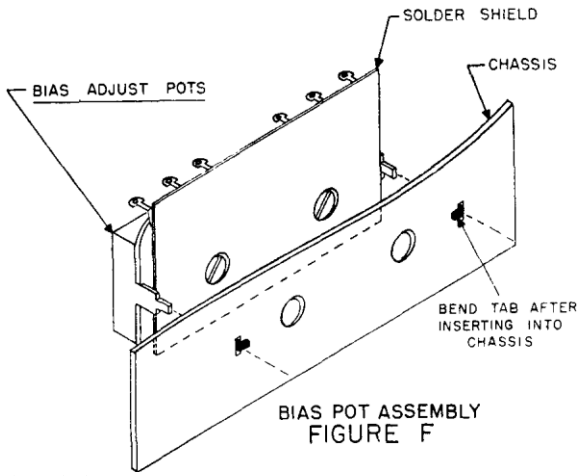
( ) ( ) Install AC receptacle (AC1) from inside of chassis. Use #6-32 x 3/8″ screws, Lockwashers under nut.



DOUBLE PHONO JACK ASSEMBLY SIMILAR EXCEPT FOR ADDITION OF GROUND LUG SHOWN ON PICTORIAL 4

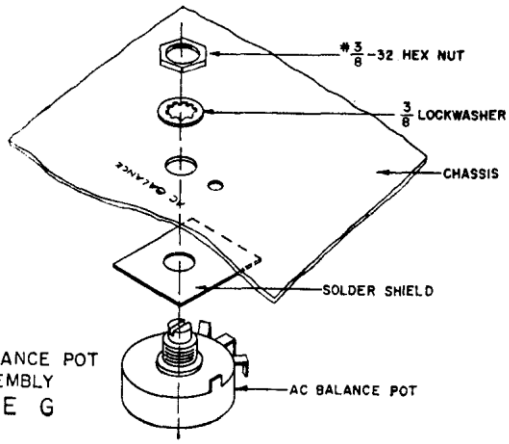
PHONO JACK ASSEMBLY

FIGURE M



BIAS POT ASSEMBLY

FIGURE F



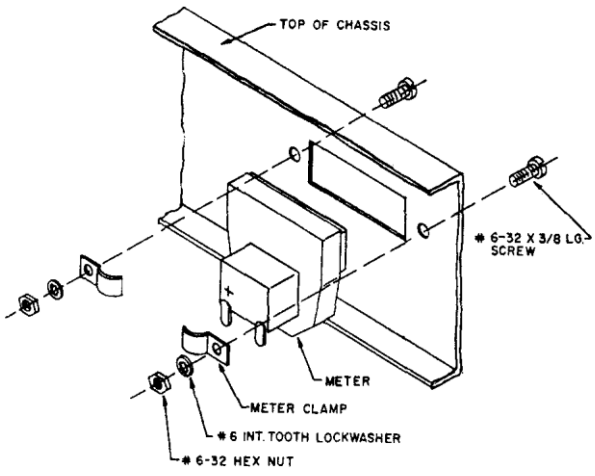
A C BALANCE POT ASSEMBLY

FIGURE G

( ) ( ) Install (2) dual pots (P3 and P4). Place fishpaper solder shields between pot and chassis. Bend tabs to fasten. (See Figure F).

( ) ( ) Install (2) AC balance controls (P5 and P6). Place fishpaper solder shields between control and chassis. Mount with 3/8″ lockwasher and 3/8-32 hex nut. (See Figure G.)

( ) ( ) Install meter with meter clamps and #6-32 x 3/8″ screws, lockwasher under nut. (See Figure H.) Remove fine wire shipping shunt before installing. (NOTE: Do not tighten the two meter bracket nuts excessively, as this may result in damage to the meter.)

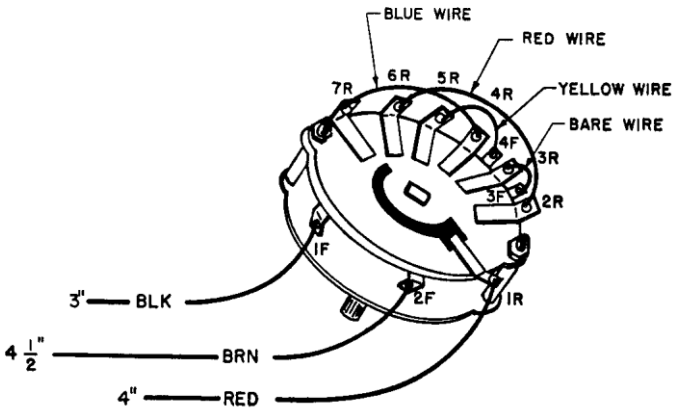


METER ASSEMBLY

FIGURE H

PRELIMINARY SWITCH WIRING

Refer to Figure J. Each contact is identified by number. The front contacts (closest to shaft) are identified by S-1F, S-2F, etc. Similarly, the rear contacts (farthest from shaft) by S-1R, S-2R, etc. Make the following connections:



PRELIMINARY SWITCH WIRING
FIGURE J

Check

( ) ( ) Connect a jumper using bare wire from S-3F (S) to S-3R (NS).
( ) ( ) Connect a yellow wire jumper S-4F (S) to S-5R (NS).
( ) ( ) Connect a red wire jumper from S-2R (NS) to S-6R (S).
( ) ( ) Connect a blue wire jumper from S-4R (NS) to S-7R (S).
( ) ( ) Connect a 4″ red wire to S-1R (S). Leave other end free.
( ) ( ) Connect a 4½″ brown wire to S-2F (S). Leave other end free.
( ) ( ) Connect a 3″ black wire to S-1F (S). Leave other end free.

PRELIMINARY SWITCH WIRING COMPLETE. Set aside for later final wiring.

PRELIMINARY CHASSIS WIRING

See Pictorial #5.

Check

( ) ( ) Connect jumpers using bare wire from Terminal 1 (S) to Terminal 3 (S) on each of the miniature sockets, V1 through V6.
( ) ( ) Connect a black 2″ wire from P4-1 (NS) to P4-4 (S).
( ) ( ) Connect a 5.6K ½ watt 10% resistor (green-blue-red-silver) from P4-1 (S) to T4-2 (NS).
( ) ( ) Connect a gray 2″ wire from P4-3 (NS) to P4-6 (NS).
( ) ( ) Connect a black 2″ wire from P3-1 (NS) to P3-4 (S).
( ) ( ) Connect a 5.6K ½ watt IV C resistor (green-blue-red-silver) from P3-1 (S) to T3-2 (NS).
( ) ( ) Connect a gray 2″ wire from P3-3 (S) to P3-6 (NS).
( ) ( ) Connect an HI black 1½″ wire from AC-1 (NS) to F-1 (S).

Use HI brown wire to make the following heater connections unless otherwise specified. Strip ¼″ unless designated. Dress wires tight to chassis.

( ) ( ) 6″ V2-6 (NS) to V3-6 (NS).
( ) ( ) 3¼″ V1-6 (S) to V3-6 (S).
( ) ( ) 6¼″ V2-4 & 5 (⅜″) (NS) to V3-4 & 5 (⅜″) (NS). Now solder pin 5 only on V2 and V3.
( ) ( ) 5″ V2-6 (S) to V8-7 (NS).
( ) ( ) 7″ V2-4 (S) to V8-2 (NS).
( ) ( ) 7½″ V8-7 (NS) to V7-7 (S).
( ) ( ) 6½″ V8-2 (NS) to V7-2 (NS).
( ) ( ) Connect a 2.2 ohm 1 watt resistor (red-red-gold-silver) from V3-4 (S) to V1-4 & 5 (S).
( ) ( ) 6″ V5-6 (NS) to V6-6 (NS).

Check

( ) ( ) 3¼″ V4-6 (S) to V6-6 (S).
( ) ( ) 6¼″ V5-4 & 5 (⅜″) (NS) to V6-4 & 5 (⅜″) (NS). Now solder pin 5 only on V5 and V6.
( ) ( ) 5″ V5-6 (S) to V10-7 (NS).
( ) ( ) 7″ V5-4 (S) to V10-2 (NS).
( ) ( ) 7½″ V10-7 (S) to V9-7 (NS). `
( ) ( ) 6⅜″ V10-2 (S) to V9-2 (NS).
( ) ( ) Connect a 2.2 ohm resistor (red-red-gold-silver) from V6-4 (S) to V4-4 & 5 (S).
( ) ( ) 4″ black V7-X5 (S) to V8-X6 (NS).
( ) ( ) 5″ black V8-X6 (NS) to V9-X7 (NS).
( ) ( ) 5″ black V9-X7 (S) to V10-X8 (S).
( ) ( ) 3⅜″ black V8-X6 (S). Other end should extend free.

At this time install bias selector switch "S" with ⅜″ nut and lockwasher. Orient switch so that tab lines up with hole in chassis. Mount knob.

( ) ( ) Connect free brown wire of switch to negative terminal of meter (S).
( ) ( ) Connect free red wire from switch to positive terminal of meter (S).
( ) ( ) Connect free black wire from switch to T4-3 (NS).
( ) ( ) Connect a 330 ohm ½ watt 5% resistor (orange-orange-brown-gold) from T4-3 (S) to T4-2 (NS).
( ) ( ) Connect 120 ohm ½ watt 10% resistor (brown-red-brown-silver) between V7-2 (S) and V7-1 (NS).
( ) ( ) Connect a brown wire 8″ long between V7-1 (S) and P2-2 (NS).
( ) ( ) Connect a 33 ohm ½ watt 20% resistor (orange-orange-black) between P2-2 (S) and the solder lug (S).

HARNESS INSTALLATION AND WIRING

Refer to Pictorial #6.

Remove the harness from the jig and place it to the right of V9 tube socket as shown. The leads emerging from the harness should fall approximately near the points to be wired. Keep the harness construction jig in sight. The numbers in parentheses identify the ends of the wires as designated on the jig.

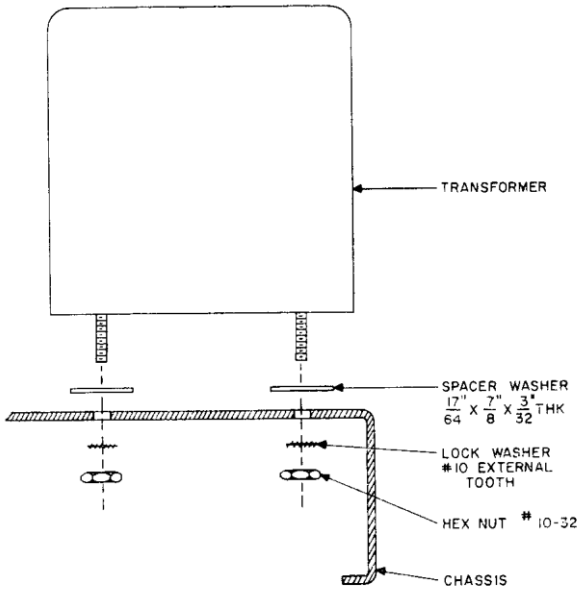
Connect the following wires:

Check

( ) ( ) Yellow to V3-9 (S). (14)
( ) ( ) Green to V3-8 (S). (15)
( ) ( ) Yellow to V7-8 (NS). (45)
( ) ( ) HI red to P6-2 (S). (44)
( ) ( ) HI orange to P6-3 (S). (46)
( ) ( ) HI yellow to P6-1 (S). (43)
( ) ( ) Blue to V8-8 (NS). (36)
( ) ( ) Yellow to V2-9 (NS). (10)
( ) ( ) Green to V2-8 (NS). (11)
( ) ( ) Yellow to V6-9 (S). (7)
( ) ( ) Green to V6-8 (S). (8)
( ) ( ) Green to V9-8 (NS). (29)
( ) ( ) HI red to P5-2 (NS). (25)
( ) ( ) HI red to P5-2 (S). (26)
( ) ( ) HI orange to P5-3 (S). (28)
( ) ( ) HI yellow to P5-1 (S). (24)
( ) ( ) Red to V10-8 (NS). (20)

Check

( ) ( ) Yellow to V5-9 (NS). (3)
( ) ( ) Green to V5-8 (NS). (2)
( ) ( ) Gray to P4-6 (S). (63)
( ) ( ) Violet to P4-5 (S). (64)
( ) ( ) Gray to P4-3 (S). (59)
( ) ( ) White to P4-2 (S). (58)
( ) ( ) Gray to P3-6 (S). (51)
( ) ( ) Violet to P3-5 (S). (52)
( ) ( ) White to P3-2 (S). (50)
( ) ( ) Connect blue wire from harness (62) to S-4R (S).
( ) ( ) Connect yellow wire (61) to S-5R (S).
( ) ( ) Connect red wire (57) to S-2R (S).
( ) ( ) Connect green wire (56) to S-3R (S).
( ) ( ) Mount power transformer (PT1) into center hole, inserting flat washers (Figure K) on studs between transformer and chassis. Use #10 nuts, lockwasher under nut. NOTE: Be careful not to pinch wires. Slip cardboard protective covers over transformers to prevent scratches during assembly.
( ) ( ) Mount output transformers OT1 and OT2 in same manner. Use flat washers and #10 nuts, lockwasher under nut. Use protective covers.
( ) ( ) Bend up fuse side tab F2 on fuse holder.
( ) ( ) Connect black wire from power transformer to fuse holder F2 (S).
( ) ( ) Connect black/white wire to AC-2 (NS). Slip large rubber grommet over all remaining leads coming from power transformer. See Pictorial #6.
( ) ( ) Connect green-white lead to V8-G2 (S).
( ) ( ) Connect green/red lead to V8-7 (S).
( ) ( ) Connect green lead to V8-2 (S).
( ) ( ) Connect brown-white lead to V9-G1 (S).
( ) ( ) Connect brown/blue lead to V9-2 (S).
( ) ( ) Connect brown lead to V9-7 (S).



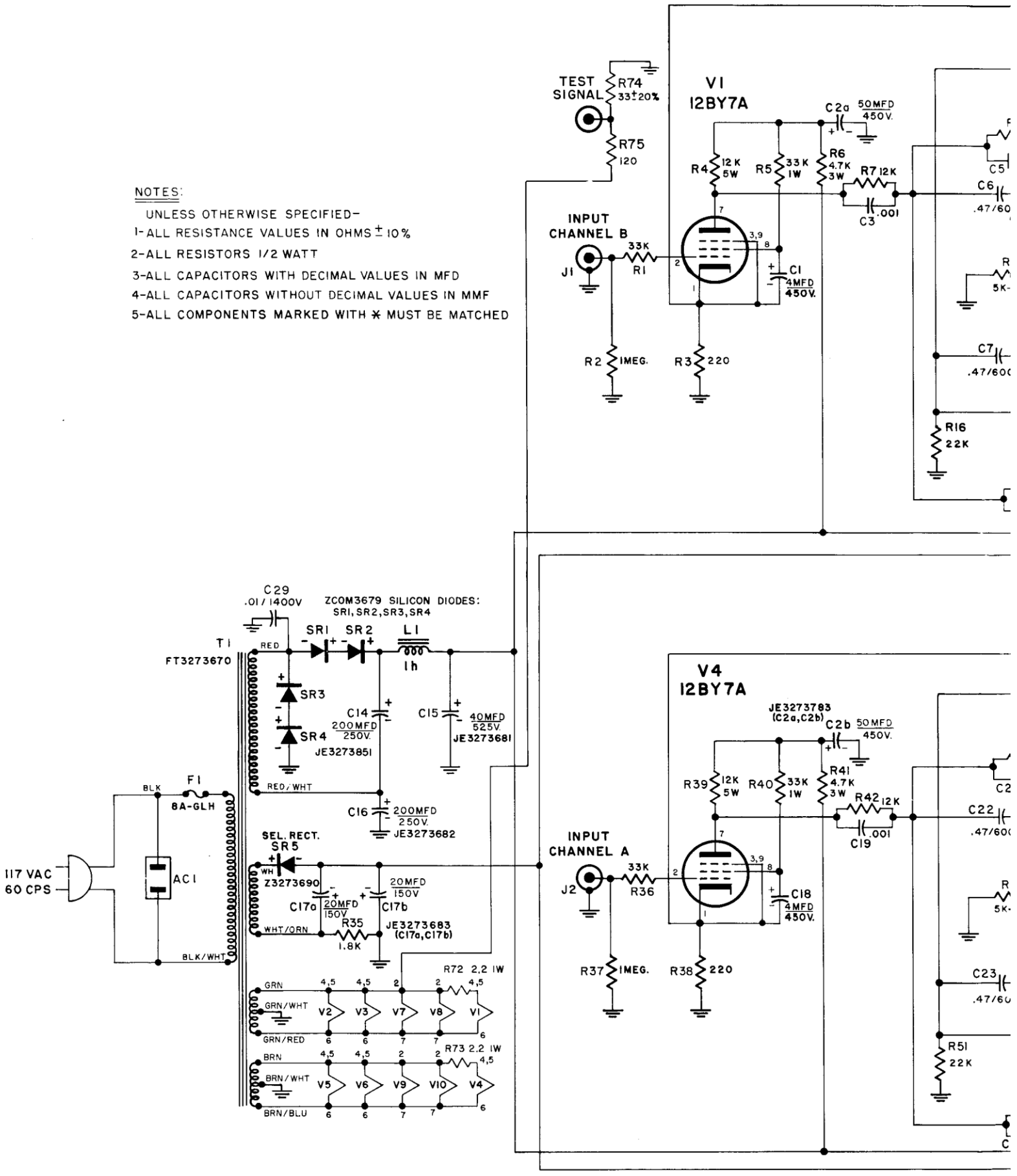
TRANSFORMER ASSEMBLY
FIGURE K

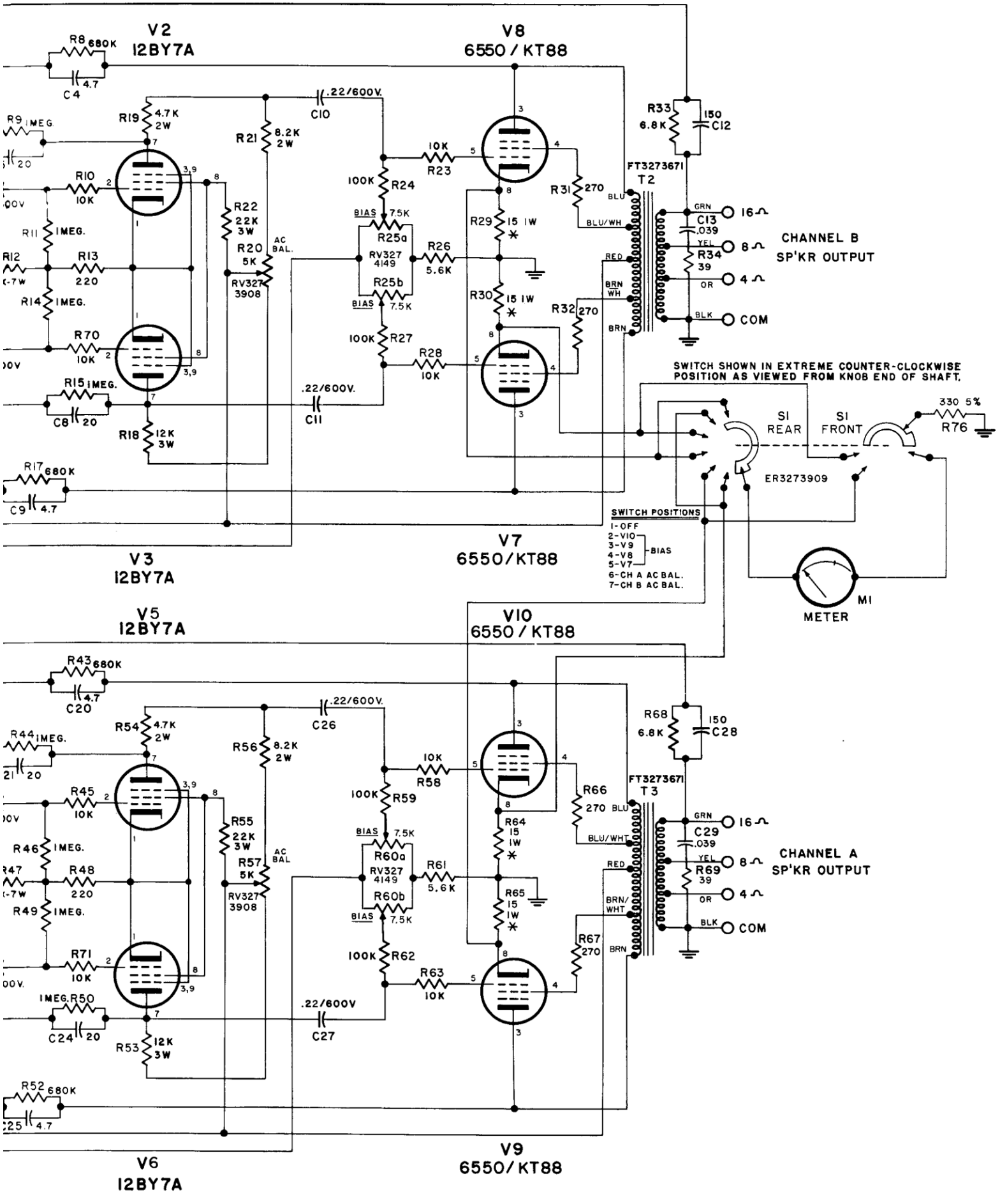
The red and white leads of the power transformer will be wired after the electrolytic bracket is installed.

( ) ( ) Cut one end of 15 ohm 1 watt 5% resistor (brown-green-black-gold) to ½" and connect to V8-8 (S).
( ) ( ) Cut the other end ½" and connect to V8-X3 (S). Dress resistor body so that it overhangs socket and clears pins 1 and 2.

In the same manner, connect the following:

( ) ( ) 15 ohm 1 watt 5% resistor (brown-green-black-gold) from V7-8 (S) to V7-X4 (S).
( ) ( ) 15 ohm 1 watt 5% resistor (brown-green-black-gold) from V9-8 (S) to V9-X2 (S).
( ) ( ) 15 ohm 1 watt 5% resistor (brown-green-black-gold) from V10-8 (S) to V10-X1 (S).


NOTES:
UNLESS OTHERWISE SPECIFIED-
1-ALL RESISTANCE VALUES IN OHMS ± 10%
2-ALL RESISTORS 1/2 WATT
3-ALL CAPACITORS WITH DECIMAL VALUES IN MFD
4-ALL CAPACITORS WITHOUT DECIMAL VALUES IN MMF
5-ALL COMPONENTS MARKED WITH * MUST BE MATCHED
TEST SIGNAL
R74 33±20%
R75 120
V1 12BY7A
C2a 50MFD 450V.
R4 12K 5W
R5 33K 1W
R6 4.7K 3W
R7 12K
C3 .001
C6 .47/600
INPUT CHANNEL B
J1
33K
R1
C1 4MFD 450V.
R2 1MEG.
R3 220
C7 .47/600
R16 22K
C29 .01/1400V
ZCOM3679 SILICON DIODES: SR1, SR2, SR3, SR4
SR1 SR2 L1 1h
T1 FT3273670
RED
SR3
SR4
C14 200MFD 250V.
JE3273851
C15 40MFD 525V.
JE3273681
RED/WHT
C16 200MFD 250V.
JE3273682
F1 8A-GLH
BLK
117 VAC 60 CPS
AC1
SEL. RECT. SR5
WH
Z3273690
C17a 20MFD 150V
C17b 20MFD 150V
JE3273683 (C17a, C17b)
WHT/ORN
R35 1.8K
BLK/WHT
R72 2.2 1W
GRN
GRN/WHT
GRN/RED
V2 V3 V7 V8 V1
R73 2.2 1W
BRN
BRN/WHT
BRN/BLU
V5 V6 V9 V10 V4
V4 12BY7A
JE3273783 (C2a, C2b)
C2b 50MFD 450V.
R39 12K 5W
R40 33K 1W
R41 4.7K 3W
R42 12K
C19 .001
C22 .47/600
INPUT CHANNEL A
J2
33K
R36
C18 4MFD 450V.
R37 1MEG.
R38 220
C23 .47/600
R51 22K



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Check

( ) ( ) Cut leads to ½″ on a 270 ohm ½ watt 10% resistor (red-violet-brown-silver) and connect between V7-6 (NS) and V7-4 (S).

In the same manner, connect the following:

( ) ( ) 270 ohm ½ watt 10% resistor (red-violet-brown-silver) from, V8-6 (NS) to V8-4 (S).
( ) ( ) 270 ohm ½ watt 10% resistor (red-violet-brown-silver) from V9-6 (NS) to V9-4 (S).
( ) ( ) 270 ohm ½ watt 10% resistor (red-violet-brown-silver) from V10-6 (NS) to V10-4 (S).

The output transformer secondaries will now be wired.

Route the following wires from the right output transformer and dress as shown in Pictorial #6.

( ) ( ) Cut the black lead to required length, strip ¼″ and tin. Connect to T2-G (NS).
( ) ( ) In the same manner, cut orange lead to required length. Connect to T2-4 (S).
( ) ( ) Cut yellow lead to required length. Connect to T2-8 (S).
( ) ( ) Cut green lead to required length. Connect to T2-16 (NS). Tape leads together.

Similarly, route the following leads from the left output OT1 transformer, and dress as shown.

( ) ( ) Cut black lead to required length. Connect to T1-G (NS).
( ) ( ) Cut orange lead to required length. Connect to T1-4 (S).
( ) ( ) Cut yellow lead to required length. Connect to T1-8 (S).
( ) ( ) Cut green lead to required length. Connect to T1-16 (NS). Tape leads together.
( ) ( ) Connect a bare wire from T1-G (S) to T3-2 (NS). (See Pictorial #7.)
( ) ( ) Connect a .039 mfd capacitor (marked on body) from T3-1 (NS) to T1-16 (NS).
( ) ( ) Connect a 39 ohm 1 watt 10% resistor (orange-white-black-silver) from T3-2 (S) to T3-1 (S).
( ) ( ) Connect a bare wire from T2-G (S) to T4-2 (NS).
( ) ( ) Connect a .039 mfd capacitor (marked on body) from T4-1 (NS) to T2-16 (NS).
( ) ( ) Connect a 39 ohm 1 watt 10% resistor (orange-white-black-silver) from T4-2 (S) to T4-1 (S).
( ) ( ) Insert line cord in hole on rear of chassis. Press in until it snaps in place.
( ) ( ) Connect the black wire to lug # 1 of the AC receptacle (S).
( ) ( ) Connect the white wire to lug #2 of the AC receptacle (S).

Place the electrolytic bracket in the chassis and align with the mounting holes. The harness should pass through the smaller round cut-out. The leads from the power transformer should pass through the larger round cut-out. Move the large grommet which holds the power transformer leads up to the large round cut-out of the bracket. See Pictorial #7.

( ) ( ) Split the small grommet and slip it over the harness.
( ) ( ) Now insert the grommets in the cut-outs of the electrolytic bracket and maneuver the bracket to realign with the mounting holes. Be sure no wires are caught under the bracket. Bolt to chassis using #6-32 hardware, lockwasher under head of screw.
( ) ( ) Connect the two brown and two black leads emerging from center of harness to C2 on the bracket (S). (Also solder C2 to bracket.)
( ) ( ) Connect white/orange lead from power transformer to El (S).
( ) ( ) Connect white lead from power transformer to the positive terminal of selenium rectifier SR1 (S).
( ) ( ) Connect red/white lead from power transformer to A3 (S).
( ) ( ) Connect red lead from power transformer to T5-1 (S).
( ) ( ) Connect free end of 3½″ black lead attached to V8-X6 to C-X9 (S).

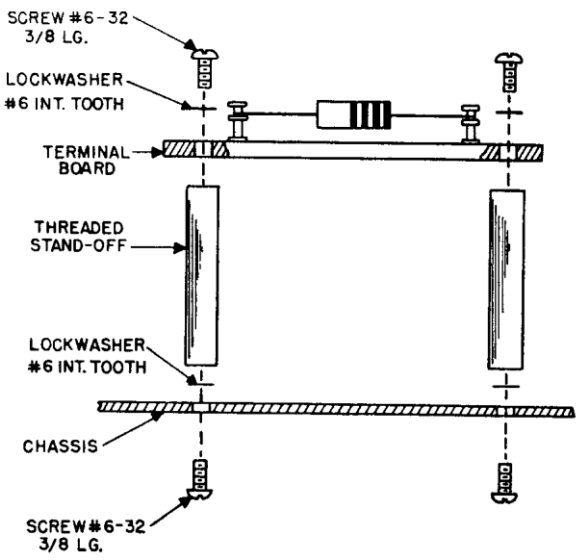
Route the remaining leads of the right output transformer OT2 as shown in Pictorial #7.

Check

( ) ( ) Cut brown lead to required length. Strip 1/4" and tin. Connect to V7-3 (NS).
( ) ( ) Similarly, cut brown-white. Connect to V7-6 (S).
( ) ( ) Cut blue to required length. Connect to V8-3 (NS).
( ) ( ) Cut blue-white to required length. Connect V8-6 (S).
( ) ( ) Cut red to required length. Connect to C1 (NS).
( ) ( ) Tape leads together.

Similarly on left output transformer OT1. Make the following connections:

( ) ( ) Cut brown to required length. Connect to V9-3 (NS).
( ) ( ) Cut brown-white to required length. Connect to V9-6 (S).
( ) ( ) Cut blue to required length. Connect to V10-3 (NS).
( ) ( ) Cut blue-white to required length. Connect to V 10-6 (S).
( ) ( ) Cut red to required length. Connect to C1 (NS).
( ) ( ) Tape leads together.
( ) ( ) Connect long gray lead (60) from wiring harness to E3 (S).
( ) ( ) Install terminal board mounting studs (8) in holes provided. (See Figure L.) Use #6-32 x 3/8" screws, lockwasher under stud. Insert screw through chassis and finger-tighten stud onto screw.
( ) ( ) Mount terminal boards to standoffs on chassis, using #6-32 hardware, lockwasher under screw head. (See Pictorial #8 for proper orientation.) Tighten standoffs to chassis. (Position harness and board leads as per Pictorial #6 prior to mounting boards.)



TERMINAL BOARD ASSEMBLY
FIGURE L

Starting with right terminal board (TB1) (Channel B) connect the following (see Pictorial #8):

( ) ( ) Connect free yellow lead from terminal 5 of board (TB1-5) to V2-9 (S).
( ) ( ) Connect free yellow lead from terminal 39 of board (TB1-39) to V1-9 (S).
( ) ( ) Dress the shielded wire from TB1-27 between the board studs, to the right side of chassis, run along chassis to input jack P2. Connect inner conductor to P2-3 (S). Connect shield to P2-4 (S).

Similarly on left terminal board (TB2) (Channel A) connect the following:

( ) ( ) Connect free yellow lead from terminal 5 of board (TB2-5) to V5-9 (S).
( ) ( ) Connect free yellow lead from TB2-39 to V4-9 (S).
( ) ( ) Connect shielded lead from TB2-27 as shown in pictorial. Dress under board (below lug #10). Dress across chassis between AC balance potentiometer and tube socket V9. Place thru hole in electrolytic bracket and then dress along rear of chassis. Connect inner conductor to P1-2 (S) and shield to P1-1 (S).

Mount choke on side of chassis near P1 using 2 #8-32 screws, lockwasher under nut. Leads should be nearest to bottom of chassis. See Pictorial #7.

( ) ( ) Connect longer yellow lead from choke to C1 (NS).

Check

( ) ( ) Connect shorter yellow lead from choke to Al (S).
( ) ( ) Connect red lead (55) from harness to C1 (S).
( ) ( ) Connect one of the blue leads (53 or 54) from harness to D1 (S).
( ) ( ) Connect the other of the blue leads (53 or 54) from harness to D2 (S).

Refer to Pictorial #8.
Make the following connections to lower part of lugs of terminal board TB1:

( ) ( ) Connect a 10K ½ watt 10% resistor (brown-black-orange-silver) from V8-5 (S) to TB1-1 (S).
( ) ( ) Similarly, connect a 10K ½ watt 10% resistor (brown-black-orange-silver) from V7-5 (S) to TB1-15 (S).

Connect the following wires:
( ) ( ) Blue 2½˝ long from V7-3 (S) to TB1-16 (S).
( ) ( ) Blue 2½˝ long from V8-3 (S) to TB1-6 (S).

Make the following connections to lower part of lugs of terminal board TB2:
( ) ( ) 10K ½ watt 10% (brown-black-orange-silver) from V10-5 (S) to TB2-1 (S).
( ) ( ) 10K ½ watt 10% (brown-black-orange-silver) from V9-5 (S) to TB2-15 (S).
( ) ( ) Blue 2˝ long from V9-3 (S) to TB2-16 (S).
( ) ( ) Blue 2½˝ long from V10-3 (S) to TB2-6 (S).

Connect the following leads from the harness to the lower section of TB1 lugs:
( ) ( ) Yellow to TB1-2 (S). (37)
( ) ( ) Red to TB1-3 (NS). (38)
( ) ( ) Red to TB 1-3 (S). (39)
( ) ( ) Black to TB1-4 (NS). (40)
( ) ( ) Black to TB1-4 (S). (41)
( ) ( ) Brown to TB1-9 (S). (42)
( ) ( ) Blue to TB1-10 (S). (47)
( ) ( ) Orange to TB 1-17 (S). (49)
( ) ( ) Violet to TB1-20 (S). (16)
( ) ( ) Red to TBl-26 (NS). (12)
( ) ( ) Red to TBl-26 (S). (13)
( ) ( ) White to TB1-34 (S). (9)
( ) ( ) Black to TBl-13 (S). (48)

Repeat as follows for terminal board TB2:
( ) ( ) Yellow to TB2-2 (S). (17)
( ) ( ) Red to TB2-3 (NS). (18)
( ) ( ) Red to TB2-3 (S). (19)
( ) ( ) Black to TB2-4 (NS). (21)
( ) ( ) Black to TB2-4 (S). (22)
( ) ( ) Brown to TB2-9 (S). (23)
( ) ( ) Blue to TB2-10 (S). (27)
( ) ( ) Orange to TB2-17 (S). (31)
( ) ( ) Violet to TB2-20 (S). (6)
( ) ( ) Red to TB2-26 (NS). (4)
( ) ( ) Red to TB2-26 (S). (5)
( ) ( ) White to TB2-34 (S). (1)
( ) ( ) Black to TB2-13 (S). (30)

Check

( ) ( ) Connect a 12″ white lead to TB1-8 (S), dress around bracket to rear of chassis and connect other end to T2-16 (S). Route as shown in Pictorial #8.

( ) ( ) Connect a 12″ white lead from TB2-8 (S) to T1-16 (S).

( ) ( ) Connect a 33K ohm ½ watt 10% resistor (orange-orange-orange-silver) from V1-2 (S) to TB1-27 (S).

Connect the following wires. Strip ⅜″.

( ) ( ) Blue 2½″ from V3-7 (NS) to TBl-22 (S).

( ) ( ) Blue 2½″ from V3-7 (S) to TB1-18 (S).

( ) ( ) Blue 2¾″ from V2-7 (NS) to TB1-29 (S).

( ) ( ) Blue 2¾″ from V1-7 (S) to TB 1-25 (S).

( ) ( ) Green 3″ from V1-8 (S) to TBl-23 (S).

( ) ( ) Green 2½″ from V2-8 (S) to TB1-32 (S).

( ) ( ) Connect a 10K ohm ½ watt 10% resistor (brown-black-orange-silver) from V3-2 (S) to TB1-21 (S).

( ) ( ) Connect a 10K ohm ½ watt 10% resistor (brown-black-orange-silver) from V2-2 (S) to TBl-30 (S).

( ) ( ) Connect a 4.7K ohm 2 watt 10% resistor (yellow-violet-red-silver) from V2-7 (S) to TBl-33 (S).

Connect the following wires. Strip ⅜″.

( ) ( ) Blue 2½″ from V6-7 (NS) to TB2-22 (S).

( ) ( ) Blue 2½″ from V6-7 (S) to TB2-18 (S).

( ) ( ) Blue 2¾″ from V5-7 (NS) to TB2-29 (S).

( ) ( ) Blue 2¾″ from V4-7 (S) to TB2-25 (S).

( ) ( ) Green 3″ from V4-8 (S) to TB2-23 (S).

( ) ( ) Green 2½″ from V5-8 (S) to TB2-32 (S).

( ) ( ) Connect a 10K ohm ½ watt 10% resistor (brown-black-orange-silver) from V6-2 (S) to TB2-21 (S).

( ) ( ) Connect a 10K ohm ½ watt 10% resistor (brown-black-orange-silver) from V5-2 (S) to TB2-30 (S).

( ) ( ) Connect a 4.7K ohm 2 watt 10% resistor (yellow-violet-red-silver) from V5-7 (S) to TB2-33 (S).

( ) ( ) Connect a 33K ½ watt 10 % resistor (orange-orange-orange-silver) from V4-2 (S) to TB2-27 (S).

FINAL WIRING OF THE TERMINAL BOARDS

Refer to Pictorial Diagram #3, Figure D, and install the following components on terminal board 1 (TB1). Since TB2 is identical, each operation may be performed on both boards at one time.

Center the components between the lugs indicated and bend the leads in a hook shape around the top section of the lugs. After soldering, cut off the excess wire.

Check TB1 TB2

( ) ( ) ( ) 12K ohm 3 watt (value marked on body of resistor) from TBl-17 (S) to TB1-18 (S). Mount ⅜″ off terminal board as shown in Figure N.

( ) ( ) ( ) 680K ohm 1 watt 10% resistor (blue-gray-yellow-silver) from TB1-16 (NS) to TB1-46 (NS).

( ) ( ) ( ) 4.7 mmf capacitor (value marked on body of capacitor) from TB1-16 (S) to TB1-46 (S).

( ) ( ) ( ) 100K ohm 12 watt 10% resistor (brown-black-yellow-silver) from TBl-15 (S) to TB1-45 (S).

( ) ( ) ( ) 1 meg ohm ½ watt 10% resistor (brown-black-green-silver) from TB1-44 (S) to TB1-21 (S).

( ) ( ) ( ) 22K ohm ½ watt 10% resistor (red-red-orange silver) from TB1-13 (S) to TB1-43 (NS).

( ) ( ) ( ) 1 meg ohm ½ watt 10% resistor (brown-black-green-silver) from TB1-43 (NS) to TB1-22 (NS).

( ) ( ) ( ) 33K ohm 1 watt 10% resistor (orange-orange-orange-silver) from TB1-12 (S) to TB1-42 (S).

( ) ( ) ( ) 12K ohm ½ watt 10% resistor (brown-red-orange-silver) from TB1-41 (NS) to TB1-24 (NS).

( ) ( ) ( ) 20 mmf capacitor (value marked on body of capacitor) from TB1-43 (S) to TB1-22 (S).

Check	TB1	TB2	
( )	( )	( )	1K mmf or .001 mfd capacitor (value marked on body of capacitor) from TB1-41 (S) to TB1-24 (S).
( )	( )	( )	12K ohm 5 watt resistor (value marked on body of resistor) from TB1-11 (S) to TBl-25 (S). Mount 3/8" off terminal board as shown in Figure N.
( )	( )	( )	4.7K ohm 3 watt resistor (value marked on body of resistor) from TB1-10 (S) to TBl-26 (S). Mount 3/8" off terminal board as shown in Figure N.
( )	( )	( )	1 meg ohm 1/2 watt 10% resistor (brown-black-green-silver) from TB1-40 (S) to TBl-27 (S).
( )	( )	( )	6.8K ohm 1/2 watt 10% resistor (blue-gray-red-silver) from TB1-8 (NS) to TB1-39 (NS).
( )	( )	( )	150 mmf capacitor (value marked on body of capacitor) from TB1-8 (S) to TB1-39 (NS).
( )	( )	( )	220 ohm 1/2 watt 10% resistor (red-red-brown-silver) from TB1-39 (S) to TB1-28 (S).
( )	( )	( )	1 meg ohm 1/2 watt 10% resistor (brown-black-green-silver) from TB1-7 (NS) to TBl-38 (NS).
( )	( )	( )	20 mmf capacitor (value marked on body of capacitor) from TBl-38 (S) to TB1-7 (S).
( )	( )	( )	680K ohm 1 watt 10% resistor (blue-gray-yellow-silver) from TB1-6 (NS) to TBl-37 (NS).
( )	( )	( )	4.7 mmf condenser (value marked on body of capacitor) from TB1-6 (S) to TB1-37 (S).
( )	( )	( )	220 ohm 12 watt 10% resistor (red-red-brown-silver) from TB1-5 (S) to TB1-36 (NS).
( )	( )	( )	1 meg ohm 1/2 watt 10% resistor (brown-black-green-silver) from TBl-36 (S) to TB1-30 (S).
( )	( )	( )	5K ohm 7 watt resistor (value marked on body of resistor) from TB1-4 (S) to TB1-31 (S). Mount 3/8" off terminal board as shown in Figure N. Position the body of this resistor in the space provided to the left of the lugs.
( )	( )	( )	22K ohm 3 watt resistor (value marked on body of resistor) from TB1-3 (S) to TBl-32 (S). Mount 3/8" off terminal board as shown in Figure N.
( )	( )	( )	8.2K ohm 2 watt 10 % resistor (gray-red-red-silver) from TB 1-2 (S) to TB 1-33 (S). Mount 3/8" off terminal board as shown in Figure N.
( )	( )	( )	100K ohm resistor 1/2 watt 10% (brown-black-yellow-silver) from TB1-1 (S) to TB1-35 (S).

THIS COMPLETES THE ELECTRICAL ASSEMBLY OF THE AMPLIFIER KIT. Do not install the tubes or connect the amplifier to an AC outlet until you have read the paragraph on final inspection.

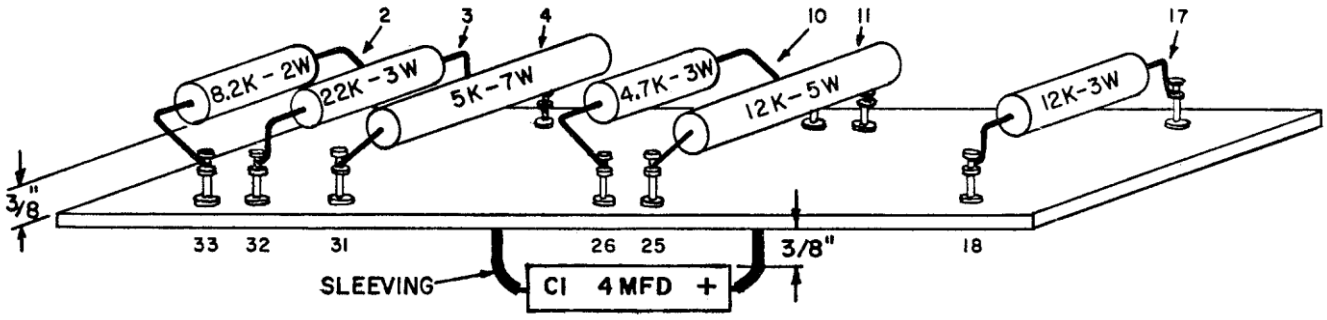


FIGURE N

FINAL INSPECTION

( ) Visually inspect all connections and wiring comparing against the master charts and manual.

( ) Rotate all four bias adjust controls located on the rear of the chassis (V7, V8, V9 and V10) fully clockwise for maximum bias. A.C. balance potentiometers between KT88/6550's should be set in the mid-position.

( ) Install 8 Amp fuse in fuse holder.

( ) Install 12BY7A tubes. (V1 thru V6).

( ) Install KT88/6550 output tubes (V7 thru V10).

( ) Set Meter selector switch to "OFF" position.

( ) If an ohmmeter is available check all points in the resistance chart.

NOTE: In order to insure accurate meter readings, the amplifier must be placed in its normal operating position.

A WORD OF CAUTION. OPERATING VOLTAGES IN THIS UNIT ARE AS HIGH AS 450 VOLTS AND ARE DANGEROUS. ONCE THE AMPLIFIER IS TURNED ON, BE EXTREMELY CAUTIOUS WHEN TAKING READINGS OR MAKING MEASUREMENTS.

( ) Insert the A.C. line cord into a 117 volt 60 cycle source. The tube filaments should light. Allow the amplifier to warm up for approximately one minute.

IF THE KT88/6550 OUTPUT TUBES BEGIN TO GLOW CHERRY RED DISCONNECT THE A.C. LINE CORD AND INSPECT THE AMPLIFIER FOR TROUBLE.

TESTS AND ADJUSTMENTS

( ) Rotate the meter bias selector switch located on the rear of the chassis to the V10 position. The meter should deflect upscale, but should be below the "BIAS" alignment mark. Switch through V9, V8 and V7 positions and the readings should be similar. At this point you may assume that the power supply has been correctly wired and that the KT88/6550 output tubes are being biased.

IF THE METER DEFLECTS BEYOND THE "BIAS" MARK OR IF THERE IS NO DEFLECTION AT ALL, DISCONNECT A.C. POWER PLUG AND RECHECK WIRING.

D.C. Bias Adjustment:

Allow the amplifier to warm up for an additional ten minutes before performing the following adjustments. These adjustments must be done without an input signal (phono or tape program source) feeding the amplifier. This operation establishes the D.C. quiescent point of the tubes.

( ) Set the meter selector switch located on the rear panel to the V10 position.

( ) Using a screwdriver adjust the V10 bias potentiometer until the pointer is exactly at the "BIAS" mark.

( ) Repeat this procedure for adjusting V9, V8 and V7, rotating meter selector switch to correspond with appropriate screwdriver adjustment positions.

( ) Repeat this procedure until no change in the meter setting is noticed as the meter selector switch is rotated through the various positions from V10 through V7.

( ) For approximately ½ hour after you have made the above adjustments keep a constant check on the meter reading. This should be done every few minutes by rotating the meter selector switch through positions V10, V9, V8 and V7. At each position check the meter to see that the reading has not gone above (to the right of) the original bias setting. If any of the original settings have changed, re-adjust the corresponding bias adjustment so that the meter again reads at the proper bias mark.

The output tubes have now been adjusted to their proper operating points.

A.C. Balance Adjustment:

A 60 cycle test signal has been provided so that the amplifier can be dynamically balanced. This signal is available next to the Channel B input jack. The upper jack is the input to the Channel B amplifier and the lower jack is the "test signal" source.

In addition a 16 ohm, 20 watt resistor is provided to connect to the speaker terminals as a load, while adjusting each channel.

Perform the following adjustments periodically to insure perfect A.C. balance.

( ) Connect the 16 ohm, 20 watt wirewound resistor between ground (G) and the 16 ohm terminal on the Channel A speaker terminal strip.

( ) Rotate the meter selector switch to the Channel A A.C. Balance position.

( ) Connect one end of a standard phono shielded patch cord (This is shielded lead with a RCA male plug on either end) into the "Test Signal" Jack. Connect the other end of this cord into the Channel A input jack. This should be done before plugging in the amplifier. As the 16 ohm, 20 watt resistor will get quite hot, prolonged testing is not advisable.

( ) Adjust the A.C. Balance control located on the top of the chassis between the two KT88 output tubes (V9 and V10) with a long screwdriver. Rotate the control to the right or to the left until the meter pointer aligns with the "BALANCE" mark.

( ) Remove the patch cord from the Channel A input jack.

( ) Rotate the meter selector switch to Channel B A.C. Balance position.

( ) Allow sufficient time for the 16 ohm, 20 watt load resistor to cool and disconnect from the channel A speaker terminal. Connect the load resistor to Channel B speaker terminals between ground (G) and 16 ohm.

( ) Connect the phono patch cord into Channel B input jack (the upper jack) and adjust the Channel B A.C. Balance control located on the top of the chassis between the two KT88/6550 output tubes (V7 and X8) with your screwdriver. Rotate the control as before either to the right or to the left until the meter pointer aligns with the "BALANCE" mark.

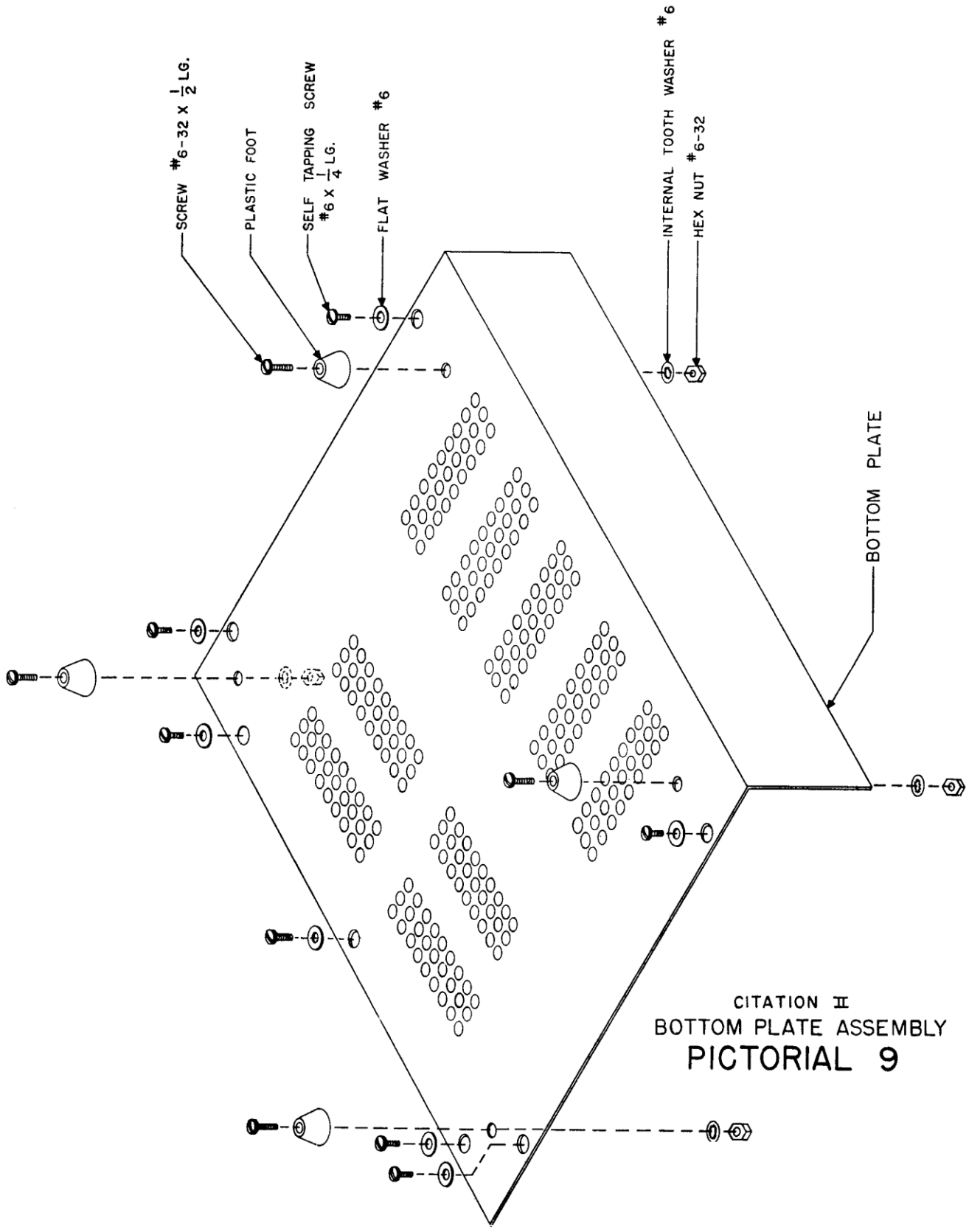
( ) Remove the phono patch cord and the 16 ohm, 20 watt resistor and set aside for use later on.

( ) This completes the A.C. balance adjustment. Throw the meter selector switch to "OFF". (The meter should not be allowed to operate for an extended period of time while playing the amplifier for this may result in damage to the meter movement.)

( ) After about ½ hour warm up time, repeat this adjustment to insure minimum distortion. No further adjustments are necessary unless any of the tubes are replaced.

It is possible that the resting point of the meter pointer (as seen in the "OFF" position of the meter selector switch) may not coincide with the A.C. Balance mark. For optimum results, in the A.C. Balance adjustment, note exactly where the meter pointer rests with the meter switch "OFF", and the amplifier in its normal upright operating position. Adjust to this point when balancing each amplifier with the test signal and the A.C. Balance control.

This completes the A.C. and D.C. balance adjustments.



CITATION II
BOTTOM PLATE ASSEMBLY
PICTORIAL 9

INSTALLING THE BOTTOM PLATE

The bottom plate is easily installed by turning the amplifier over to rest on the transformers.

( ) Install plastic feet to bottom plate with #6-32x½″ screw, lockwasher and nut as shown in Pictorial 9.

( ) Place bottom plate to align with mounting holes on the lip of the chassis. The gold plated name plate will cover the opening in the chassis below the 12BY7A tubes.

( ) Insert #6 by ¼″ self-tapping screw (using #6 washer under head) in appropriate holes in bottom plate and tighten slightly. After all screws are installed, tighten securely.

You have completed the amplifier and it is ready to be installed.

IN THE EVENT OF DIFFICULTY

1. Recheck all wiring beginning with the first step. Use a colored pencil to trace the leads on the pictorial as you recheck the step-by-step instructions and actual wiring.
2. Check the A.C. primary fuse. Improper wiring may cause overloading and will blow the fuse. Replace only with the same value supplied with the kit (8 Amp, GLH).
3. Check the tubes to see if they light.
4. Have someone with electronic experience review your wiring for he may find an error that is elusive to you.
5. Check all voltages and resistances. Variations in line voltages and components may cause as much as a 20% difference from the reading listed in the voltage and resistance charts. Using a 1000 ohm per-volt instrument may further lower the readings and it is advisable to use a VTVM if it is available If your voltage readings do not correspond to the voltage table, critically inspect that portion of the circuit where the readings fail to correspond.
6. Check all resistors and condensers with an ohmmeter where the improper operating voltages are noted.
7. If you cannot find the difficulty write to Harman-Kardon, Inc. Citation Kit Division, Plainview, L. I., New York and give all symptoms, voltage and resistance readings and describe your difficulty in detail. State model and serial number. You will receive our prompt reply to help solve your problem.
8. Our factory service department is at your disposal in the event you cannot resolve this problem by yourself. Please write us before shipping your amplifier for we may be able to advise you of a local warranty station equipped to assist you to obtain the specified performance from your amplifier.

A.C. ELECTRICAL INSTALLATION

Connect the A.C. line cord into any outlet furnishing 117 volts, 60 cycles A.C. current. The voltage may vary between 110 and 125 volts.

An A.C. convenience receptacle is located on the rear panel of the amplifier. Any auxiliary equipment may be connected to this power receptacle and will be turned off with the power amplifier.

Do not place books or objects on top of the amplifier for this will restrict ventilation and may reduce tube and component life. Allow at least 4 inches above the amplifier for unrestricted circulation.

CONNECTING THE SPEAKERS

Your two speakers should be identical, if possible, to obtain optimum results. As this power amplifier is rated at 60 watts per channel, it is advisable to use speakers with high power handling capabilities. The speakers should be placed along the same wall approximately 8 to 15 feet apart, depending upon room size and furniture placement. It may be necessary to experiment with speaker placement until best results are obtained.

Use any type wire to connect your speakers to the Citation II power amplifier. Lamp cord (″zip cord″) is excellent and may be easily dressed around the moulding for an inconspicuous and neat installation. Do not drive staples or tacks through the center of the wire, as this may result in a direct short between the two sections and will decrease the overall volume or short out the speakers entirely. It is permissible to use approximately 100 feet of lamp cord for each speaker without appreciable loss of volume.

Speakers are usually rated in terms of three impedance values, 4, 8, and 16 ohms. Several high quality speakers are rated at odd values which fall between the standard ratings. If your speakers correspond to the designations on the speaker output strips, attach one lead to the terminal marked "G" and the other lead to the appropriate impedance terminal corresponding with the rating of your speaker. If your speaker has an odd impedance value, choose the impedance connection closest to the speaker rating. It may be noted that a mismatch of as much as 50% may have very little effect on performance, and it is not critical to exactly match the speaker to the impedance terminal.

CONNECTING THE PREAMPLIFIER

Single conductor, shielded wire should be used to connect your monophonic or stereophonic preamplifier to the power amplifier. The Harman-Kardon Citation I stereophonic preamplifier incorporates two anode follower outputs which permit the use of up to 50 feet of cable in each channel without affecting the frequency response.

Connect one shielded lead from the preamplifier right output to the right input receptacle on the rear panel of the power amplifier. Connect an additional shielded lead between the left preamplifier output and the left input receptacle on the power amplifier.

WARNING: Do not remove or manipulate the input connections while the amplifier is powered. This may result in permanent damage to your speakers.

CONNECTING THE AMPLIFIER FOR 120 WATT MONOPHONIC OPERATION WITH SINGLE SPEAKER

In order to operate the Citation II as a 120 watt monophonic amplifier it is necessary to fulfill two requirements.

1. The speaker output terminals must be strapped together. Tie the two ground terminals in parallel and then tie either the two 8 or 16 ohm terminals in parallel depending on the nominal impedance of your speaker. For example, if you are using an 8 ohm speaker, tie the two 16 ohm terminals together and attach the speaker between either 16 ohm terminal and ground. If you are using a 16 ohm speaker it is permissible to connect it as described for an 8 ohm speaker, as a mismatch of as high as 50% will not affect the tone quality.

2. The amplifier input terminals must be tied together if no preamplifier is to be used and the signal is being fed directly by a tuner. If a monophonic preamplifier is used it is also necessary to tie the inputs together. This can be accomplished in any of several ways. One method would be to use two patch cords with RCA type phono plugs on one end. The other end of these patch cords would be tied together in parallel and soldered to another RCA type phono plug. Connect the two individual RCA plugs to the input receptacles of the amplifier and the other end (which is paralleled) to the output of your tuner.

   A more satisfactory method is to purchase a LAB-TRONICS patching plug, Part #A-754 to parallel the inputs of the amplifier. This device would eliminate the need of soldering and would insure perfect connections.

3. If a stereo preamplifier is used input strapping is not required. Merely connect the two outputs of your preamplifier to the corresponding inputs of the Citation II and connect the speakers as previously discussed.

PROTECTIVE COVER

A handsome protective snap-on cover is available for use with this amplifier. The cover is supplied with complete mounting instructions.

GENERAL INFORMATION

High quality amplifiers adjusted to operate at low inherent distortion levels must function in the Class A region. The efficiency of a Class A amplifier falls somewhere between 30 and 35%. This means that an amplifier which is capable of producing 120 watts of audio power must consume a minimum of 350 watts of AC power. With ordinary program material, only a small portion of this 350 watts of power is converted into audio energy. Everything else is converted into heat energy.

It is therefore evident that an amplifier designed to produce 120 watts of audio power must be constructed to dissipate a great amount of heat while operating on an extended basis without deterioration of its performance. The Citation II basic amplifier has been designed in just that way. The selection of components and their positioning in the chassis has been given careful consideration and will provide many years of trouble free operation.

The Citation II power transformer is potted with a chemical compound called "PERMAFIL" which is specifically selected because of its high heat conductivity. "PERMAFIL" carries the heat away from the core and the winding to the outer can where it is rapidly dissipated. As a result the transformer can, after extended use, will feel hot to the touch even though the inner core and windings are operating at a conservative temperature.

A slight red glow within the KT88/6550 output tube is normal and there should be no cause for concern. This will not affect the life or performance of the tube. A bright cherry red plate indicates the tube is running away and the bias and output circuit should be checked immediately.

VOLTAGE AND RESISTANCE CHECKS

Refer to the complete voltage and resistance chart for correct readings.

TUBE REPLACEMENT

The use of balanced output tubes is preferred although not mandatory. There is a statistical rate of probability that matched tubes will age at a more equal rate than unmatched tubes requiring less frequent adjustment. If it is necessary to replace a KT88/6550 output tube, it is advisable to replace both tubes of the channel. Matched KT88/6550's are available at most stores or through Harman-Kardon.

VOLTAGE AND RESISTANCE CHARTS
VOLTAGE READINGS

	12BY7A	12BY7A	12BY7A	12BY7A	12BY7A	12BY7A	KT88/6550	KT88/6550	KT88/6550	KT88/6550
PIN	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
1	5V	150V	150V	5V	150V	150V	0.6V AC	NC	NC	NC
2	0V	110V	110V	0V	110V	110V	3.1V AC	3.1V AC	3.1V AC	3.1V AC
3	5V	150V	150V	5V	150V	150V	450V	450V	450V	450V
4	1.5V AC	3.1V AC	3.1V AC	1.5V AC	3.1V AC	3.1V AC	450V	450V	450V	450V
5	1.5V AC	3.1V AC	3.1V AC	1.5V AC	3.1V AC	3.1V AC	-50V*	-50V*	-50V*	-50V*
6	3.1V AC	3.1V AC	3.1V AC	3.1V AC	3.1V AC	3.1V AC	450V	450V	450V	450V
7	160V	285V**	285V**	160V	285V**	285V**	3.1V AC	3.1V AC	3.1V AC	3.1V AC
8	210V	340V	340V	210V	340V	340V	1.5V	1.5V	1.5V	1.5V
9	5V	150V	150V	5V	150V	150V	—	—	—	—

Readings may vary ±20%.

NOTE: All measurements to gnd. with VTVM—117 Line—No signal input. All voltages DC unless otherwise noted.
* Differences in these voltages are normal but cathode currents should be equal.
** These voltages will be equal with balanced tubes, but may differ without affecting performance.

RESISTANCE READINGS

	12BY7A	12BY7A	12BY7A	12BY7A	12BY7A	12BY7A	KT88/6550	KT88/6550	KT88/6550	KT88/6550
PIN	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
1	220 ohms	5K	5K	220 ohms	5K	5K	—	—	—	—
2	1M	1M	1M	1M	1M	1M	0.1 ohm	0.1 ohm	0.1 ohm	0.1 ohm
3	220 ohms	5K	5K	220 ohms	5K	5K	62 ohms	62 ohms	62 ohms*	62 ohms
4	1 ohm	0.1 ohm	0.1 ohm	1 ohm	0.1 ohm	0.1 ohm	280 ohms	280 ohms	280 ohms	280 ohms
5	1 ohm	0.1 ohm	0.1 ohm	1 ohm	0.1 ohm	0.1 ohm	120K	120K	120K	120K
6	0.1 ohm	0.1 ohm	0.1 ohm	0.1 ohm	0.1 ohm	0.1 ohm	20 ohms	20 ohms*	20 ohms*	20 ohms
7	16K*	15K**	15K**	16K*	15K**	15K**	0.1 ohm	0.1 ohm	0.1 ohm	0.1 ohm
8	39K*	22K*	22K*	39K*	22K*	22K*	15 ohms	15 ohms	15 ohms	15 ohms
9	220 ohms	5K	5K	220 ohms	5K	5K	—	—	—	—

Readings may vary ±20%.

NOTE: * These readings are measured from B+ (the Junction of L1 & C15). All other readings to Ground.
** These readings are measured from B+ and depend on the position of the AC balance controls. They may vary ±25%.

REPLACEMENT PARTS LIST

When ordering replacement parts be sure to specify the part number listed below.

Part Number	Parts Per Kit	Description
		SHEET METAL PARTS
P3273664	1	Chassis
B3273668	1	Bottom Plate
P3273669	1	Electrolytic Mounting Bracket
		TRANSFORMERS, CHOKE
FT3273670	1	Power Transformer
FT3273671	2	Output Transformer
FC3273672	1	Choke
		COMPONENTS, SMALL PARTS, ETC.
B3273674	1	Terminal Board, Channel A
B3273923	1	Terminal Board, Channel B
STCOM3676	4	Octal Socket
STCOM3928	6	9 Pin Socket
STCOM3749	1	Phono Jack (Single)
STCOM4126	1	Phono Jack (Double)
STCOM3897	1	Phono Jack Insulator (Single)
STCOM4127	1	Phono Jack Insulator (Double)
Z1021705	1	Ground Lug
STCOM2707	2	Speaker Terminal Strip
HC24625	1	AC Outlet
HCCOM3750	1	Fuse Holder (with nut, lock and rubber washer)
ZCOM3715	1	Fuse, 8 Amps-GLH
P3273896	1	Knob
M3274124	1	Meter
ER3273909	1	Meter Switch
WCOM3678	1	Line Cord
Z1021702	1	Small Electrolytic Insulator
STCOM2702	1	Large Electrolytic Insulator
RV3274149	2	Twin Pot
PCOM2831	2	Twin Pot Solder Shield
RV3274125	2	AC Balance Pot (single pot)
RV3274123	2	Single Pot Solder Shield
STCOM3890	4	Plastic Feet
STCOM3714	1	Large Grommet
STCOM2559	1	Small Grommet
STCOM3822	1	Diode Holder
Z3273690	1	Selenium Rectifier
ZCOM3716	1	Tape
HLCOM3132	1	One Lug Strip
HLCOM3091	1	Two Lug Strip
HLCOM3354	1	Three Lug Strip
VN3273680	8	Standoff
STCOM3945	2	Meter Clamp

REPLACEMENT PARTS LIST (continued)

Part Number	Parts Per Kit	Description
		TUBES, DIODES
ZCOM3679	4	Silicon Diode (SD94A) (66-3284) (3679)
KT88/6550	4	Tube
12BY7A	6	Tube
		MOUNTING HARDWARE
KM4-40-6SG	12	#4-40 x 3/8 Lg. B.H.M.S. (binding head machine screw
KL4-SG	12	#4 Internal Tooth Lockwasher
KN4-40SG	12	#4-40 Hex Nuts
KM6-32-6SB	50	#6-32 x 3/8 Lg. B.H.M.S. (binding head machine screw)
KM6-32-8SC	4	#6-32 x 1/2 Lg. B.H.M.S. (binding head machine screw)
KM6-32-12SB	1	#6-32 x 3/4 Lg. B.H.M.S. (binding head machine screw)
KL6-SB	55	#6 Internal Tooth Lockwasher
KN6-32-SB	39	#6-32 Hex Nut
KP6-4SN	7	#6 x 1/4 Lg. B.H.S.T.S. (binding head self tapping screw)
KW6-SN	7	#6 x 3/8 O.D. x 1/32 THK. Flat Washer
KM8-32-6SB	2	#8-32 x 3/8 Lg. B.H.M.S. (binding head machine screw)
KS8-SC	2	#8 Split Lockwasher
KN8-32SC	2	#8-32 Hex Nut
KN10-32SC	12	#10-32 Hex Nut
KX10-SC	12	#10 External Tooth Lockwasher
KW3273916	12	17/64 I.D. x 7/8 O.D. x 3/32 THK Flat Washer
KN1832-SC	3	3/8-32 Hex Nut
KL18-SC	3	3/8 Internal Tooth Lockwasher
		WIRE
	85″	Black (thin insulation)
	36″	Brown (thin insulation)
	35″	Red (thin insulation)
	91″	Yellow (thin insulation)
	56″	Green (thin insulation)
	139″	Blue (thin insulation)
	57″	Violet (thin insulation)
	49″	Grey (thin insulation)
	80″	White (thin insulation)
	79″	Red (heavy insulation)
	21″	Orange (heavy insulation)
	23″	Yellow (heavy insulation)
	12″	Black (heavy insulation)
	98″	Brown (heavy insulation)
	14″	Green (shielded)
	14″	Green (shielded)
	72″	Bare wire
	36″	Sleeving

REPLACEMENT PARTS LIST (continued)

Part Number	Parts Per Kit	Description
		ELECTROLYTIC CAPACITORS
JE3273784	2	4 mfd/450 volts (Minimite)
JE3273681	1	40 mfd/525 volts
JE3273682	1	200 mfd/250 volts
JE3273851	1	200 mfd/250 volts (with insulating sleeve)
JE3273683	1	20-20 mfd/150 volts (with insulating sleeve)
JE3273783	1	50-50 mfd/450 volts
		MOLDED TUBULAR CAPACITORS
JP-6-.22	4	.22 mfd/600 volts
JP-6-.47	4	.47 mfd/600 volts
JP-2-.039	2	.039 mfd/200 volts
		DISC CAPACITORS
JCST221	2	.001 mfd
JCST271	4	20 mmfd
JCST274	2	150 mmfd
JCST302	4	4.7 mmfd
JCST260	1	.01 mfd/1400 V
		RESISTORS
RB150-5	4	15 ohms 1 watt 5% (brown-green-black-gold)
RA221-1	4	220 ohms ½ watt 10% (red-red-brown-silver)
RA271-1	4	270 ohms ½ watt 10% (red-violet-brown-silver)
RA151-.5	1	330 ohms ½ watt 5% (orange-orange-brown-gold)
RA 182-1	1	1.8K ohms ½ watt 10% (brown-gray-red-silver
RA682-1	2	6.8K ohms ½ watt 10% (blue-grey-red-silver)
RA822-1	2	5.6K ohms ½ watt 10% (green-blue-red-silver)
RA103-1	8	10K ohms ½ watt 10% (brown-black-orange-silver)
RA123-1	2	12K ohms ½ watt 10% (brown-red-orange-silver)
RA223-1	2	22K ohms ½ watt 10% (red-red-orange-silver)
RA333-1	2	33K ohms ½ watt 10% (orange-orange-orange-silver)
RA 104-1	4	100K ohms ½ watt 10% (brown-black-yellow-silver)
RA105-1	10	1 Meg ohm ½ watt 10% (brown-black-green-silver)
RB22-1	2	2.2 ohms 1 watt 10% (red-red-gold-silver)
RB39-1	2	39 ohms 1 watt 10% (orange-white-black-silver)
RC472-1	2	4.7K ohms 2 watt 10% (yellow-violet-red-silver)
RB333-1	2	33K ohms 1 watt 10% (orange-orange-orange-silver)
RB684-1	4	680K ohms 1 watt 10% (blue-grey-yellow-silver)
RS3274116	2	8.2K ohms 2 watt 10% (grey-red-red-silver)
RSCOM3926	2	4.7K ohms 3 watt 10% (value marked on body)
RSCOM3692	2	12K ohms 3 watt 10% (value marked on body)
RSCOM3693	2	22K ohms 3 watt 10% (value marked on body)
RSCOM3907	2	5K ohms 7 watt 10% (value marked on body)
RSCOM3974	2	12K ohms 5 watt 10% (value marked on body)
RA330-2	1	33 ohm ½ watt 20% (orange-orange-black)
RA121-2	1	120 ohm ½ watt 20% (brown-red-brown)
RWCOM3959	1	16 ohm, 20 watt, wirewound
		MISCELLANEOUS
L3273717	1	Harness Jig
L3273704	1	Instruction Book

"THE CITATION SOUND"

"...FOR THE SAKE OF MUSIC AND OUR DEMANDING LOVE OF IT."

"Over and above the details of design and performance, we felt that the Citation group bore eloquent witness to the one vital aspect of audio that for so many of us has elevated high fidelity from a casual hobby to a lifelong interest: the earnest attempt to reach an ideal—not for the sake of technical showmanship—but for the sake of music and our demanding love of it."

Herbert Reid, Hi Fi Stereo Review

A truly remarkable commentary about a truly remarkable group of products—the Citation Kits by Harman-Kardon.

Mr. Reid's eloquent tribute to Citation is one of many extraordinary reviews of these magnificent instruments. We are proud to present a brief collection of excerpts from Citation reviews written by outstanding audio critics.

"When we first heard the Citations our immediate reaction was that one listened through the amplifier system clear back to the original performance, and that the finer nuances of tone shading stood out clearly and distinctly for the first time . . . The kit is a joy to construct."

C. G. McProud, Editor, Audio Magazine

"The unit which we checked after having built the kit, is the best of all power amplifiers that we have tested over the past years."

William Stocklin, Editor, Electronics World

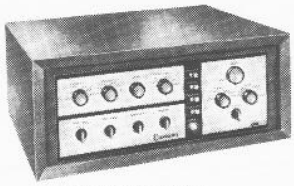
"Its listening quality is superb, and not easily described in terms of laboratory measurements. Listening is the ultimate test and a required one for full appreciation of Citation . . . Anyone who will settle for nothing less than the finest will be well advised to look into the Citation II."

Hirsch-Houck Labs, High Fidelity Magazine

"At this writing, the most impressive of amplifier kits is without doubt the new Citation line of Harman-Kardon . . . their design, circuitry, acoustic results and even the manner of their packaging set a new high in amplifier construction and performance, kit or no."

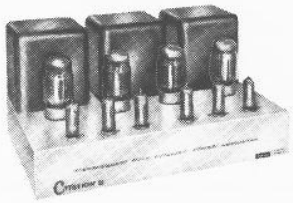
Norman Eisenberg, Saturday Review

PRESENTING THE NEW 1961 CITATION LINE



The CITATION I,
Stereophonic Preamplifier Control Center

The many professional features and philosophy of design expressed in Citation I permit the development of a preamplifier that provides absolute control over any program material without imparting any coloration of its own.



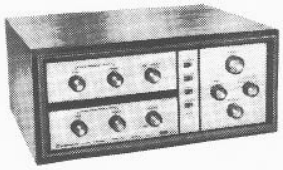
The CITATION II,
120 Watt Stereophonic Power Amplifier

Will reproduce frequencies as low as 5 cycles virtually without phase shift, and frequencies as high as 100,000 cycles without any evidence of instability or ringing. Because of its reliability and specifications the Citation II has been accepted by professionals as a laboratory standard.

The CITATION III,
Professional FM Tuner

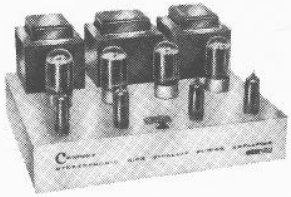
The world's most sensitive tuner. But more important—it offers sound quality never before achieved in an FM tuner. Now, for the first time Harman-Kardon has made it possible for the kit builder to construct a completely professional tuner without reliance upon external equipment.

The Citation III's front end employs the revolutionary Nuvistor tube which furnishes the lowest noise figure and highest sensitivity permitted by the state of the art. A two-stage audio section patterned after Citation II provides a frequency response three octaves above and below the range of normal hearing. The Citation III is styled in charcoal brown and gold to match all the other Citation instruments.



The CITATION IV,
Stereophonic Preamplifier Control Center

A compact stereophonic preamplifier designed in the best Citation tradition. It offers performance and features rivaled only by Citation I. The control over program material provided by the new Citation IV enables the user to perfectly recreate every characteristic of the original performance.



The CITATION V,
80 Watt Stereophonic Power Amplifier

A compact version of the powerful Citation II. Designed with the same lavish hand, it is conservatively rated at 40 watts RMS per channel with 95 watt peaks at less than 0.5% distortion. The availability of rated power at the extreme ends of the frequency range enables the unit to effortlessly drive the most inefficient speakers.

CITATION KITS *by*

harman kardon

Technical Notes and Specifications

The Citation I

Frequency Response:	+0 −0.5 db, 5-80,000 cycles per second.
Distortion:	Less than 0.05% at 2 volts.
Total Noise:	High-Level Input: 85 db below rated output. Low-Level Input: Less than 1.5 microvolts referred to input terminals.
Rated Output:	Main Outputs: 1.75 volts. Tape Outputs: 0.7 volts.
Input Sensitivities:	High Level: 0.5 volts. Low Level: 2.5 mv. in phono RIAA position; 2.0 mv. in tape head position. Ceramic Phono: 0.1 volt.
A.C. Convenience Outlets:	Total 4. Three switched; one unswitched.
Function Selector:	Six positions: Aux, Tape Amp, Tuner, Phono 1, Phono 2, Tape Head.
Mode Selector:	Five positions: Stereo, Blend, A+B, Channel A, Channel B.
Blend Control:	Acts as crossfeed control in blend position or third channel gain control in stereo position.
Equalization Controls:	Two separate controls for roll-off and turnover. Roll-off: 0/78, 4/FFRR, 10.5/Old Lon., 12/AES, 14/RIAA, 16/LP. Turnover: Tape, 800/RCA, RIAA, LP, AES, 78.
Tone Controls:	Professional step-type for each channel. Out of the circuit in the flat position.
Balance Control:	Zero to infinity type, frequency insensitive.
Phasing Switch:	To correct for improperly recorded program material or out of phase speakers.
Channel Reverse Switch:	Interchanges Channel A and B for proper orchestra orientation.
Contour Switch:	Compensates for Fletcher-Munson effect at low listening levels.
Low-Frequency Filter:	Three position switch: flat, 15 cycle subsonic filter, 75 cycle rumble filter.
High-Frequency Filter:	Five positions incorporated into treble tone controls.
Tape Monitor Switch:	Permits monitoring of tape while recording.
Power On/Off Switch:	Illuminated rotary A.C. switch—heavy duty type.
Output Receptacles:	Four main preamplifier outputs. One third channel output. Two tape outputs for recording.
Tube Complement:	(Total 9) 4-ECC83/12AX7, 5-ECC81/12AT7 plus 6 silicon diodes.
Dimensions:	14⅞" W x 12¼" D x 6" H.
Shipping Weight:	32 lbs.
Finish:	Gold and charcoal brown.
Accessories:	Optional wooden enclosure.

The Citation II

Continuous Power Output:	60 watts per channel.
Peak Power Output:	130 watts peaks per channel.
Harmonic Distortion:	Less than 0.5%, 20-20,000 cycles per second at 60 watts. Unmeasurable at normal listening level.
Intermodulation Distortion:	Less than 0.5% at 60 watts. Unmeasurable at normal listening level.
Frequency Range:	18-40,000 cycles per second, +0, −1.0 db at 60 watts. 2-80,000 cycles per second, +0, −1.0 db at 1 watt.
Sensitivity:	1.5 volt RMS input for 60 watts.
Damping Factor:	Greater than 18.
Feedback:	30 db achieved through multiple loops.
Hum and Noise:	Better than 90 db below 60 watts.
Power Supply:	Excellent B+ regulation attained through use of low Z silicon diode rectifier supply.
Inputs:	One input for each channel.
Output Impedance:	4, 8 and 16 ohms.
Controls:	4 D.C. bias adjust potentiometers, 1 for each output tube, plus 2 A.C. balance potentiometers.
Convenience Outlet:	One A.C. convenience outlet.
Fuse:	A.C. primary, externally accessible.
Special Feature:	Bias Meter.
Construction:	Military-type construction with all components held to tight tolerances.
Tube Complement:	(Total 10) 6-12BY7A, 4-6550 or KT88, plus 4 Silicon Diodes, 1 Selenium Rectifier.
Power Consumption:	350 watts.
Dimensions:	16⅜" W x 9" H x 11½" D.
Shipping Weight:	71 lbs.
Finish:	Charcoal brown and gold.
Accessories:	Metal protective cover.

The Citation III

Circuits:	Nuvistor front-end circuit tuned by two separate electrically and mechanically isolated tuning sections for maximum selectivity at lowest oscillator radiation. This is followed by a factory assembled and adjusted converter and IF sub-assembly consisting of a grounded grid triode RF stage, triode mixer and solid state AFC circuit, and three wide band IF stages. Two 6BN6 zero time constant gated beam limiters followed by a wide band Foster-Seeley discriminator. Special Citation wide band audio output circuitry for extended frequency response with unmeasurable phase shift.
Output Impedance:	1500 ohms, feedback couple.
Sensitivity:	0.65 microvolts for 20 db of quieting. 0.85 microvolts for 30 db of quieting.
Selectivity:	240 KC bandwidth: 6 db down.
Discriminator Peak to Peak Separation:	1 megacycle ultra linearity.
Image Rejection:	65 db. IF Rejection: 90 db.
Frequency Response:	±0.5 db, 1-52,000 cycles per second.
Distortion:	Unmeasurable at 30% modulation. Less than 0.1% at 100% modulation.
Limiter:	Dual cascaded gated-beam constant output.
Antenna Input:	300 ohms (Balanced).
Hum Level:	65 db below 100% modulation.
Radiation:	Within FCC requirements.
Output Level:	2 volts at 100% modulation. Adjustable by front panel volume control.
Dimensions:	14⅞" W x 12¼" D x 6" H.

The Citation IV

Frequency Response:	+0 −0.5 db, 5-80,000 c.p.s.
Distortion:	Less than .05% at 2 volts.
Noise:	Hi Level: 85 db below rated output. Lo Level: Less than 1.5 microvolts referred to input terminals.
Rated Output:	2 volts.
Sensitivity:	Hi Level: 0.4 volts. Lo Level: 4.0 mv in phono position.
Function Selector:	6 Positions: Aux, Tape Amp, Tuner, Phono-RIAA, Phono-LP, Tape Head.
Mode Selector:	Five Positions: Stereo, Reverse, A+B Channel A, Channel B.
Blend Control:	Continuously variable. Removed from circuit in zero position.
Tone Controls:	Variable type for each channel: May be removed completely from circuit by special switch.
Balance Control:	Zero to infinity type.
Contour Switch:	Compensates for Fletcher-Munson effect at low listening levels.
Rumble & Scratch Filters:	Non-ringing switched type.
Tape Monitor Switch:	Permits monitoring of tape while recording.
Power On/Off:	Illuminated push-button, heavy duty.
Output Receptacles:	Two main preamp. Output jacks. One center channel output. Two tape outputs for recordings.
Tube Complement:	Six ECC83/12AX7's, plus 4 semi-conductor rectifiers.
Dimensions:	14⅞" W x 11" D x 5⅝" H.
Shipping Weight:	25 lbs.
Finish:	Charcoal brown and gold.
Accessories:	Optional wooden enclosure.

The Citation V

Continuous Power Output:	40 watts per channel.
Peak Power Output:	95 watts per channel.
Harmonic Distortion:	Less than 0.5%, 20-20,000 cycles per second at 40 watts. Unmeasurable at normal listening level.
Intermodulation Distortion:	Less than 0.5% at 40 watts.
Frequency Response:	7-45,000 c.p.s. +0 −1.0 db at 40 watts. 2-80,000 c.p.s. +0 −1.0 db at 1 watt
Sensitivity:	1.2 volt RMS.
Damping Factor:	15 measured at 16 ohm tap. (IHFM method).
Feedback:	22 db.
Hum and Noise:	Better than 85 db below 40 watts.
Power Supply:	Excellent B+ regulation attained through use of low Z silicon diode rectifier supply.
Inputs:	One input for each channel.
Output Impedance:	4, 8 and 16 ohms.
Controls:	D.C. and A.C. balance potentiometers. Internal signal supplied for A.C. balance.
Fuse:	A.C. primary, externally accessible.
Special Feature:	Bias meter with special spring return switch to remove meter from circuit when not needed.
Construction:	Military-type terminal boards. Close tolerance components.
Tube Complement:	Total 8: 2—12BY7A, 2—6CG7, 4—7581 plus 4 silicon diodes and 1 selenium rectifier.
Power Consumption:	250 watts.
Dimensions:	13⅞" W x 5½" H x 11¼" D.
Shipping Weight:	45 lbs.
Finish:	Gold and charcoal brown.
Accessories:	Metal protective cage.