

ASSEMBLY

and

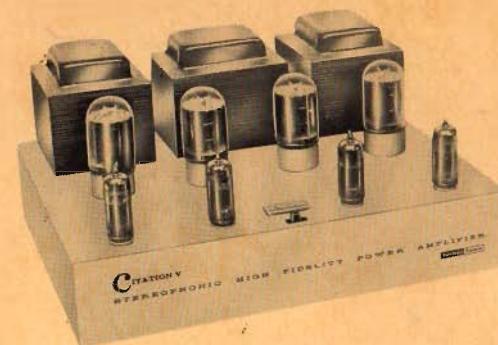
OPERATION

MANUAL

CITATION V



STEREOPHONIC AMPLIFIER



harman kardon

CITATION V

ASSEMBLY & OPERATION MANUAL

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 V will perform satisfactorily with any high quality preamplifier, it is strongly recommended it be used with the Citation I or IV preamplifier control center for optimum performance. The Citation preamplifiers match the superb frequency response and distortion specifications of the Citation V 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 each 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.

FEATURES

The Citation V is a smaller version of the powerful Citation II. This magnificent new basic power amplifier has every worthwhile feature required for superb stereophonic reproduction.

- * Conservatively rated at 40 watts RMS per channel with 95 watt peaks at less than 0.5% distortion.
- * Clips clean without breakup.
- * Can be operated as an 80 watt monophonic amplifier.
- * Output stage consists of two 7581's per channel operating conservatively in fixed bias, ultra-balance circuit.
- * Frequency response extends two octaves above and below the normal range of hearing to insure perfect square wave response at all frequencies.
- * Absolutely stable with any type of load.
- * Specially designed output transformers with resonant frequency above 200KC.
- * Power supply consists of four silicon diodes (hermetically sealed) and heavy duty electrolytics for superb B+ regulation and long life. This results in instantaneous recovery time and superb transient response.
- * Bias meter to statically and dynamically adjust each pair of 7581 output tubes.
- * Maximum power output at the extreme ends of the frequency range enables the amplifier to effortlessly drive any of today's inefficient speakers.
- * Military construction represented by rigid component terminal boards for ease of construction, strength and neat appearance.
- * Handsomely styled in charcoal brown and gold.

CITATION V SPECIFICATIONS

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. (IHF M 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: DC and AC balance potentiometers. Internal signal supplied for AC balance.

FUSE: AC 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: 13 7/8" W x 5 1/2" H x 11 1/4" D.

SHIPPING WEIGHT: 45 lbs.

FINISH: Gold and charcoal brown.

ACCESSORIES: Metal protective cage.

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.
ALWAYS STATE MODEL AND SERIAL NUMBER IN YOUR CORRESPONDENCE.

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.

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 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 all other obligations on the part of Harman-Kardon. Harman-Kardon neither assumes nor authorizes any one else to assume for it any other liability in connection with the sale of this instrument.

Harman-Kardon does not assume liability for damages or injuries incurred during the construction or operation 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., N. Y.**

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.

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 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, 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.

ASSEMBLY PROCEDURE

These instructions are presented in a simple, step by step sequence to make assembly and wiring of your Citation Kit as easy as possible. Please take time to read each step carefully before actually performing the work. A space is provided called "Assembly" to check off each operation as it is performed and will be helpful in preventing omissions or errors. A second space is provided called "Check". This should be used after every 10 or 15 steps to recheck 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. For example, TB-A-4, means Terminal Board A, Lug #4 or VI-2 means tube socket VI Pin #2, etc.

Abbreviations (NS), (S-1), (S-2), etc. after these coding designations indicate whether or not that particular point should be soldered at that time. (NS) indicates that more than one component is connected to that terminal and it should not be soldered in that operation. (S-1) indicates that there is only one connection to that terminal and it should be soldered in that operation. (S-2) indicates that there are two connections to that terminal and it should be soldered.

Two types of hook-up wire are used in the assembly of this kit. One type has light insulation and will be referred to as (LI). The other type has heavy insulation and will be referred to as (HI).

When wire lengths are specified, measure the length with a ruler so that the finished wiring will be accurate and neat. The solid wire supplied in this kit requires no pre-tinning. ("Tinning" is the process of applying a thin film of solder to the part to be soldered before the actual connection.)

When the instructions call for the use of a "white/black" wire it means a white wire with a black spiral tracer. When the instructions call for a "black/white" wire it means a black wire with a white spiral tracer.

This Citation amplifier is assembled and wired as three separate units.

1. Terminal Boards
2. Electrolytic Bracket
3. 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.

There are several resistor sizes used in this kit. Below are the exact full scale drawings of these values so they can be easily identified. Resistors with values above 2 watts have the wattage rating imprinted on the resistor body.


1/2 WATT RESISTOR


1 WATT RESISTOR


2 WATT RESISTOR

RESISTOR HOLDING CARD

The cards on which the resistors and small condensers 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.

PRELIMINARY TERMINAL BOARD WIRING

REFER TO PICTORIAL #1.

Channel A Terminal Board (TB-A) and Channel B Terminal Board (TB-B) are identical except for the fact that they are mirror images of each other. Therefore, they may be wired simultaneously to save time.

Connect jumpers to the lower section of the terminal lugs using bare wire. All wires should be wrapped one complete turn around the lug and then crimped to insure a mechanically secure connection. Note that each lug is numbered for easy identification. Put a check mark in the "Assembly" column as you perform each operation. REFER TO FIGURE A.

STEP #	ASSEMBLY	CHECK	FROM LUG #	TO LUG #
1	(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>)	17 (NS)	18 (S-1)
2	(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>)	22 (S-1)	23 (NS)
3	(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>)	20 (S-1)	24 (NS)
4	(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>)	3 (NS)	4 (NS)
5	(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>)	4 (S-2)	28 (S-1)

The following (HI) wires are connected to the lugs from the rear of the boards through the holes designated by a letter. Cut two each of the length specified. Strip 1/2" of insulation from each end. Connect to the bottom section of the lugs, wrapping tightly one complete turn. Crimp and clip any excess bare ends. REFER TO FIGURE A.

CHANNEL A	CHANNEL B	COLOR	LENGTH	FROM LUG #	TO LUG #
(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>)	Black	4 3/4"	B-8 (NS)	C-23 (NS)
(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>)	Yellow	3"	A-1 (S-1)	F-21 (NS)

The following capacitors are mounted to the rear (unprinted side) of the terminal board. The leads are connected to the lugs either by bending over the edge of the board or through holes designated by a letter, as indicated.

Slip sleeving over all the capacitor leads as shown in the pictorial. Connect to the bottom section of the lugs wrapping tightly one complete turn. Crimp and clip off any excess bare ends. Bands on condenser body indicates outside foil. Polarity is unimportant. REFER TO FIGURE B.

STEP #	ASSEMBLY	CHECK	VALUE - MARKING	FROM LUG #	TO LUG #	
	CHANNEL A	CHANNEL B				
8	(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>)	.47 MFD/600 V	10 (S-1)	12 (NS)
9	(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>)	.47 MFD/600 V	6 (S-1)	15 (NS)
10	(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>)	.47 MFD/400 V	8 (NS)	14 (NS)
11	(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>)	.47 MFD/400 V	D-21 (NS)	E-16 (NS)

This completes the preliminary wiring of the terminal boards. Inspect your work carefully against pictorials and text. Put this assembly aside for later use.

ELECTROLYTIC BRACKET ASSEMBLY

REFER TO PICTORIAL #2.

STEP # ASSEMBLY CHECK

- 1 () () Mount (4) capacitor insulating wafers at positions A through D. (Wafers are mounted on side of bracket indicated in the diagram.) Use #6-32 x 3/8" screws and #6 lockwashers under #6-32 hex nuts.
- 2 () () Mount selenium rectifier SR-1 using #6-32 x 1 1/4" screw through bracket as indicated in diagram. Slip rectifier on screw, negative lug first and engage the locating tab in the hole provided on the electrolytic bracket. Positive terminal may be identified by red band or plus symbol. Fasten with #6 lockwasher under #6-32 hex nut.
- 3 () () Mount lug strip T6 as shown. Use #6-32 x 3/8" screw and #6 lockwasher under #6-32 hex nut.
- 4 () () Mount silicon diode holder T5 as shown. Insert #6-32 x 3/8" screws through holder, then through bracket. Fasten with #6 lockwashers under #6-32 hex nuts on side of bracket indicated in diagram.

Mount the following electrolytics at their respective positions by inserting through the insulating wafer and twisting the mounting tabs 1/4 turn. (Use heavy duty broad nose pliers using care when twisting tabs.) Note that each electrolytic has 4 possible mounting positions. Since only one is correct, observe the orientation as shown in the pictorial. Observe that of the 4 mounting tabs on each electrolytic only one is blank, the other 3 have holes. This blank tab is the key referred to in the pictorial.

STEP # ASSEMBLY CHECK

- 5 () () C1, (90-30-30 MFD/500 Volt) at Position A
- 6 () () C2, (200 MFD/250 Volt) at Position B
- 7 () () C3, (200 MFD/250 Volt) at Position C
- 8 () () C4, (80-80 MFD/150 Volt) at Position D
- 9 () () Insert the 4 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. Note that the large discs on SD-1 and SD-2 are at the left, while the large discs on SD-3 and SD-4 are at the right.

STEP # ASSEMBLY CHECK

10 (✓) (✓) Hook the cathode lead from SD-1 with the anode lead from SD-2 as shown in the connecting detail (S-2). Cut off excess wire. FRAGILE!!! Use caution handling leads.

11 (✓) (✓) Hook anode lead from SD-3 with cathode lead from SD-4 (S-2). Cut off excess wire.

12 (✓) (✓) Connect free end (cathode) of SD-2 to T5 lug #2 (NS).

13 (✓) (✓) Connect free end (cathode) of SD-3 to T5 lug #1 (NS).

14 (✓) (✓) Connect free end (anode) of SD-1 to T5 lug #1 (NS).

15 (✓) (✓) Connect free end (anode) of SD-4 to T6 lug #1 (NS).

16 (✓) (✓) Slip 3/4" of sleeving over each end of a .01 mfd (10K) / 1400 volt Disc. capacitor (value marked on body). Connect between T5 lug #1 (NS) and T6 lug #2 (S-1).

This would be a good time to stop and inspect your previous steps before proceeding.

ELECTROLYTIC BRACKET WIRING

REFER TO PICTORIAL #3.

Cut the following (HI) wires to the lengths specified. Strip 1/4" of insulation from each end and connect between the points indicated.

STEP #	ASSEMBLY	CHECK	COLOR	LENGTH	FROM LUG #	TO LUG #
1	(✓)	(✓)	black	2 1/4"	A5 (S-1)	B3 (NS)
2	(✓)	(✓)	black	4 1/4"	B3 (S-2)	T6-1 (NS)
3	(✓)	(✓)	red	2 1/4"	C1 (NS)	T5-2 (S-2)
4	(✓)	(✓)	red	1 1/2"	B1 (S-1)	C2 (S-1)
5	(✓)	(✓)	black	10 1/2"	B2 (S-1)	D1 (NS)
6	(✓)	(✓)	orange	2 1/2"	D2 (NS)	SR1-1 (S-1)

Cut the following (HI) wires to the length specified. Strip 1/4" of insulation from one end and connect to the points indicated. Strip 1/2" of insulation from the other end and leave this end free.

7	(✓)	(✓)	black/white	11"	B4 (NS)
8	(✓)	(✓)	black/white	9 3/4"	B4 (S-2)
9	(✓)	(✓)	white/black	13 1/4"	A4 (NS)
10	(✓)	(✓)	white/black	13 1/4"	A4 (S-2)
11	(✓)	(✓)	red/white	14 1/2"	A2 (NS)
12	(✓)	(✓)	red/white	8 3/4"	A2 (NS)
13	(✓)	(✓)	white/red	7 1/2"	A1 (NS)
14	(✓)	(✓)	white/red	15 3/4"	A1 (NS)

Cut the following (HI) wires to the lengths specified. Strip 1/4" of insulation from each end. Connect one end to the points indicated and leave the other end free.

STEP #	ASSEMBLY	CHECK	COLOR	LENGTH
15	(✓)	(✓)	orange	11"
16	(✓)	(✓)	black	21 1/4"
17	(✓)	(✓)	black	10"
18	(✓)	(✓)	gray	4"
19	(✓)	(✓)	gray	11 1/2"

FROM LUG #
A3 (NS)
A6 (NS)
A6 (S-2)
D4 (NS)
D4 (S-2)

Connect the following resistors to the points indicated.

	VALUE	MARKING	FROM LUG #	TO LUG #
20	(✓) (✓) 1.5K 3 watt	value marked on body	D1 (S-2)	D2 (S-2)
21	(✓) (✓) 390 ohm 1 watt	orange, white, brown, silver	A1 (S-3)	A2 (NS)
22	(✓) (✓) 180 ohm 3 watt	value marked on body	A2 (S-4)	A3 (NS)
23	(✓) (✓) 270 ohm 10 watt	value marked on body	A3 (S-3)	C1 (NS)
24	(✓) (✓) Cut the lead on one end of a 33 ohm 1/2 watt 5% resistor (orange, orange, black, gold) to 1/2" and connect this end to T6-1 (NS). Leave the other end free.			
25	(✓) (✓) Cut the lead on one end of a 33 ohm 1/2 watt 5% resistor (orange, orange, black, gold) to 1/2" and connect this end to T6-1 (S-4). Leave the other end free.			
26	(✓) (✓) Group together the following 9 wires and carefully dress and tape at the points A and B indicated in the pictorial:			

1. 21 1/4" black from A6
2. 15 3/4" white/red from A1
3. 14 1/2" red/white from A2
4. 11" orange from A3
5. 13 1/4" white/black from A4
6. 13 1/4" white/black from A4
7. 11" black/white from B4
8. 9 3/4" black/white from B4
9. 11 1/2" gray from D4

27 (✓) (✓) Break out the orange, red/white, the two black/white and the two white/black wires just past tape Point B, as indicated in the diagram.

28 (✓) (✓) Dress the remaining black, white/red and gray wires, which are part of the harness, as shown and tape at Point C.

This completes the preliminary wiring of the electrolytic bracket. Inspect your work against pictorials and text. Put this assembly aside for later use.

CHASSIS ASSEMBLY

REFER TO PICTORIAL #4.

In order to prevent marring of the fine finish of the Citation V, it is suggested that the work bench be cleared and covered with one of the flat filler pieces originally used in the packaging of this kit.

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

Note that most components may be mounted facing in several directions. For example, each tube socket has two possible mounting positions, one rotated 180° from the other. Since only one position is correct, be sure to observe the orientation indicated on the pictorial.

STEP # ASSEMBLY CHECK

- 1 (✓) (✓) Install (4) nine pin tube sockets (V1, V2, V5 and V6), noting orientation. Use #4-40 x 3/8" screws and #4 lockwashers under #4-40 hex nuts. Note lug strip T7 on V1 and lug strip T8 on V5.
- 2 (✓) (✓) Install (4) octal tube sockets (V3, V4, V7 and V8), noting orientation. Use #6-32 x 3/8" screws and #6 lockwashers under #6-32 hex nuts.
- 3 (✓) (✓) Install (2) DC balance potentiometers, P6 and P7. Place fishpaper solder shield between potentiometer and chassis. Bend tabs down toward chassis to fasten. Exercise caution. Do not mar chassis when bending tab.
- 4 (✓) (✓) Install (2) AC balance potentiometers, P4 and P5. Place fishpaper solder shield between potentiometer and chassis. Bend tabs down toward chassis to fasten. Exercise caution. Do not mar chassis when bending tab.
- 5 (✓) (✓) Install slide switch S1. Use #6-32 x 3/8" screws and #6 lockwashers under #6-32 hex nuts. Switch may be mounted in either way.
- 6 () () Install meter M1 with meter clamps and #6-32 x 3/8" screws and #6 lockwashers under #6-32 hex nuts. Remove fine wire shunt across meter terminals.
- 7 (✓) (✓) NOTE: Do not tighten the two meter bracket nuts excessively as this may result in damage to the meter. Install Phono receptacle P3 and Lug Strip T3 using phenolic insulating shield between chassis and receptacle. Note orientation. Use #6-32 x 3/8" screws and #6 lockwashers under #6-32 hex nuts.
- 8 (✓) (✓) Install (2) Phono receptacles, P1 and P2 using phenolic insulating shield between chassis and receptacle. Note orientation. Use #6-32 x 3/8" screws and #6 lockwashers under #6-32 hex nuts. These two sockets mount the same as P3 except they do not have any lug strip.
- 9 (✓) (✓) Install speaker terminal strip T2 and Lug Strip T4. Use #6-32 x 3/8" screws and #6 lockwashers under #6-32 hex nuts.
- 10 (✓) (✓) Install speaker terminal Strip T1. Use #6-32 x 3/8" screws and #6 lockwashers under #6-32 hex nuts. This strip mounts the same as T2 except it does not have any lug strip.
- 11 () (✓) Install fuseholder F1. Slide rubber washer on holder before inserting in chassis. Use lockwasher and nut supplied.

NOTE: DO NOT MOUNT TRANSFORMERS AT THIS TIME. THEY WILL BE MOUNTED AT A LATER STEP.

PRELIMINARY CHASSIS WIRING

REFER TO PICTORIAL #5.

Note the solder lance located at the center of the rear panel of the chassis. This lance is covered with a piece of tape. Remove this tape before proceeding.

Using bare wire make the following connections.

STEP #	ASSEMBLY	CHECK	FROM PIN #	TO PIN #
1	(✓)	(✓)	V1-1 (NS)	V1-9 (S-1)
2	(✓)	(✓)	V2-8 (NS)	V2-3 (S-1)
3	(✓)	(✓)	V6-3 (S-1)	V6-8(NS)
4	(✓)	(✓)	V5-9 (S-1)	V5-1 (NS)

Using (HI) wire cut the following to the lengths specified. Strip 1/4" of insulation from each end. Dress all leads tight to chassis.

STEP #	ASSEMBLY	COLOR	LENGTH	FROM PIN OR LUG #	TO PIN OR LUG #	
5	(✓)	(✓)	Brown	4 1/2"	V2-4 (S-1)	T7-2 (NS)
6	(✓)	(✓)	Brown	8"	T7-2 (NS)	V3-7 (NS)
7	(✓)	(✓)	Brown	5 3/4"	V3-7 (S-2)	V4-7 (NS)
8	(✓)	(✓)	Brown	5 1/2"	V4-7 (NS)	V8-7 (NS)
9	(✓)	(✓)	Brown	5 1/2"	V8-7 (NS)	V7-7 (NS)
10	(✓)	(✓)	Brown	8 3/4"	V7-7 (S-2)	T8-2 (NS)
11	(✓)	(✓)	Brown	6 3/4"	T8-2 (NS)	V6-4 (S-1)
12	(✓)	(✓)	Brown/white	4"	V2-5 (S-1)	T7-1 (NS)
13	(✓)	(✓)	Brown/white	8"	T7-1 (NS)	V3-2 (NS)
14	(✓)	(✓)	Brown/white	5 1/2"	V3-2 (S-2)	V4-2 (NS)
15	(✓)	(✓)	Brown/white	5 1/2"	V4-2 (NS)	V8-2 (NS)
16	(✓)	(✓)	Brown/white	5 1/2"	V8-2 (NS)	V7-2 (NS)
17	(✓)	(✓)	Brown/white	7"	V7-2 (NS)	T8-1 (NS)
18	(✓)	(✓)	Brown/white	6"	T8-1 (NS)	V6-5 (S-1)
19	(✓)	(✓)	Connect a 1 ohm 1/2 watt 10% resistor (brown, black, gold, silver) from T8-2 (S-3) to V5-6 (S-1).			
20	(✓)	(✓)	Connect a 1 ohm 1/2 watt 10% resistor (brown, black, gold, silver) from T8-1 (S-3) to V5-4 (S-1) and V5-5 (S-1).			
21	(✓)	(✓)	Connect a 1 ohm 1/2 watt 10% resistor (brown, black, gold, silver) from T7-1 (S-3) to V1-4 (S-1) and V1-5 (S-1).			
22	(✓)	(✓)	Connect a 1 ohm 1/2 watt 10% resistor (brown, black, gold, silver) from T7-2 (S-3) to V1-6 (S-1).			
23	(✓)	(✓)	Orange	5"	V3-4 (S-1)	V4-4 (NS)
24	(✓)	(✓)	Orange	5"	V4-4 (NS)	V8-4 (NS)
25	(✓)	(✓)	Orange	5"	V8-4 (S-2)	V7-4 (S-1)
26	(✓)	(✓)	Blue/white	4 1/4"	V1-7 (NS)	V2-2 (NS)
27	(✓)	(✓)	Blue/white	4 1/4"	V5-7 (NS)	V6-2 (NS)
28	(✓)	(✓)	Black/white	5 1/4"	V3-6 (NS)	V4-6 (NS)
29	(✓)	(✓)	Black/white	5 1/4"	V8-6 (NS)	V7-6 (NS)
30	(✓)	(✓)	Violet	2 3/4"	S1-4 (S-1)	M1-2 (S-1)
31	(✓)	(✓)	Yellow	2 1/2"	S1-3 (S-1)	M1-1 (S-1)

STEP #	ASSEMBLY CHECK	COLOR	LENGTH	FROM PIN OR LUG #	TO PIN OR LUG #
32	(✓) (✓)	Yellow	12 1/2"	S1-2 (S-1)	V3-8 (NS)
33	(✓) (✓)	Yellow/white	8 1/4"	S1-1 (S-1)	V4-8 (NS)
34	(✓) (✓)	Violet	7 1/2"	S1-6 (S-1)	V8-8 (NS)
35	(✓) (✓)	Violet/white	10"	S1-5 (S-1)	V7-8 (NS)
36	(✓) (✓)	Black	7 1/4"	P1-2 (NS)	Solder Lance (NS)
37	(✓) (✓)	Black	7 1/2"	P2-2 (NS)	Solder Lance (S-2)
					Make this a good connection!

Again, this is a good place to stop and check the previous operations.

Connect the following resistors between the points indicated:

	VALUE	MARKING	FROM PIN OR LUG #	TO PIN OR LUG #
38	(✓) (✓) 1 meg 1/2 watt 10%	brown, black, green, silver	V2-2 (S-2)	V2-7 (NS)
39	(✓) (✓) 1 meg 1/2 watt 10%	brown, black, green, silver	V6-2 (S-2)	V6-7 (NS)
40	(✓) (✓) 3.3 ohm 1.2 watt 10%	orange, orange, gold, silver	V3-8 (NS)	V3-6 (S-2)
41	(✓) (✓) 3.3 ohm 1/2 watt 10%	orange, orange, gold, silver	V4-8 (NS)	V4-6 (NS)
42	(✓) (✓) 3.3 ohm 1/2 watt 10%	orange, orange, gold, silver	V8-8 (NS)	V8-6 (NS)
43	(✓) (✓) 3.3 ohm 1/2 watt 10%	orange, orange, gold, silver	V7-8 (NS)	V7-6 (S-2)

Slip 3/4" of sleeving over each end of the 4 (15K) resistors wired in steps 44, 45, 46 and 47.

	VALUE	MARKING	FROM PIN OR LUG #	TO PIN OR LUG #
44	(✓) (✓) 10K 15K ohm 1/2 watt 10%	brown, green, orange, silver	V3-8 (S-3)	P6-1 (NS)
45	(✓) (✓) 10K 15K ohm 1/2 watt 10%	brown, green, orange, silver	V4-8 (S-3)	P6-3 (NS)
46	(✓) (✓) 10K 15K ohm 1/2 watt 10%	brown, green, orange, silver	V8-8 (S-3)	P7-1 (NS)
47	(✓) (✓) 10K 15K ohm 1/2 watt 10%	brown, green, orange, silver	V7-8 (S-3)	P7-3 (NS)
48	(✓) (✓) 2.2K ohm 1/2 watt 20%	red, red, red	T3-1 (NS)	P3-1 (NS)
49	(✓) (✓) 330 ohm 1/2 watt 20%	orange, orange, brown	P3-1 (S-2)	P3-2 (S-1)

TRANSFORMER INSTALLATION AND WIRING

REFER TO PICTORIAL #4

- 1 (✓) (✓) Mount Output Transformer OT-1 into chassis. Use protective cover over transformer to prevent scratches during assembly. Observe orientation of leads. Use #8 lockwashers under #8-32 Hex nuts.
- 2 (✓) (✓) Mount Output Transformer OT-2 and Power Transformer PT-1 in the same manner. Use protective covers. Observe orientation of leads. Use #8 lockwashers under #8-32 Hex nuts.

REFER TO PICTORIAL #5.

STEP # ASSEMBLY CHECK

- 3 (✓) (✓) With a long nose pliers carefully bend fuse side tab F1-2 on fuse holder.
- 4 (✓) (✓) Connect the black wire from PT-1 to Lug #2 (S-1) on fuse holder F1.
- 5 (✓) (✓) Connect white/black wire from PT-1 to Lug #2 (NS) on Lug strip T4.
- 6 (✓) (✓) Insert line cord into hole in rear of chassis. Push until it snaps into place. Use screw driver if necessary, with extreme care.
- 7 (✓) (✓) Connect one black wire to T4 Lug #2 (S-2).
- 8 (✓) (✓) Connect the other black wire to T4 Lug #1 (NS).
- 9 (✓) (✓) Cut a (HI) black wire 5" long. Strip 1/4" of insulation from each end. Connect between T4 Lug #1 (S2) and F1 Lug #1 (S-1).
- 10 (✓) (✓) Slip rubber grommet over all remaining leads of the Power Transformer PT-1.

Connect the following wires from OT-1

	COLOR	TO
11 (✓) (✓)	Black	T1-G (NS)
12 (✓) (✓)	Orange	T1-4 (S-1)
13 (✓) (✓)	Yellow	T1-8 (S-1)
14 (✓) (✓)	Green	T1-16 (NS)

Tape all 4 leads together as shown.

Connect the following wires from OT-2

15 (✓) (✓)	Black	T2-G (NS)
16 (✓) (✓)	Orange	T2-4 (S-1)
17 (✓) (✓)	Yellow	T2-8 (S-1)
18 (✓) (✓)	Green	T2-16 (NS)

Tape all 4 leads together as shown.

Cut the following (HI) wires to the length specified. Strip 1/4" of insulation from one end and connect to the points indicated. Strip 1/2" of insulation from the other end. Dress through the rubber grommet and leave this end free.

	COLOR	LENGTH	FROM
19 (✓) (✓)	White	16"	T2-16 (S-2)
20 (✓) (✓)	White/Orange	16"	T1-16 (S-2)
21 (✓) (✓)	Brown/ White	13"	T3-1 (S-2)
22 () (✓)	Take one of the 13" black shielded cables and strip 3/4" of outer insulation, then unwrap the shield from the inner conductor. Twist the resulting strands of wire together. Strip 1/2" of insulation from the inner conductor, then tin the inner conductor and the shield. Strip 3/4" of insulation from the other end. Unwrap the shield and twist the resulting strands of wire together. Strip 1/2" of insulation from the inner conductor, then tin the inner conductor and the shield. Connect either end of the shield to P1 lug #2 (S-2) and the inner conductor to P1 lug #1 (S-1). Dress shielded lead as shown. Other end remains free.		
23 (✓) (✓)	In the same manner as above take the other 13" black shielded cable. Connect the shield to P2 lug #2 (S-2) and the inner conductor to P2 lug #1 (S-1).		

ELECTROLYTIC BRACKET INSTALLATION AND WIRING

REFER TO PICTORIAL #6.

STEP # ASSEMBLY CHECK

1 (✓) (✓) Place the electrolytic bracket in the chassis and align with the mounting holes. All the 9 leads which are in the grommet should pass through the large round cut-out. Move the grommet to align with the cut-out on the bracket. Insert the grommet in the cut-out and maneuver the bracket to re-align with the mounting holes. Be sure no wires are caught under the bracket. Fasten to chassis using #6-32 x 3/8" screws and #6 lockwashers under #6-32 Hex nuts.

Connect the following leads which are coming out from the grommet. Dress as shown.

	COLOR	TO PIN OR LUG #
2	(✓) (✓) White/Gray	SR1-2 (S-1)
3	(✓) (✓) Gray	D3 (S-1)
4	(✓) (✓) White/ Red	T5-1 (S-4)
5	(✓) (✓) Red	C3 (S-1)
6	(✓) (✓) Green	V8-2 (S-3)
7	(✓) (✓) White/Green	V8-7 (S-3)
8	(✓) (✓) Brown/ White	V7-2 (S-3)

The white and white/orange wires will be connected at a later time.

Connect the following output transformer leads to the points indicated. Dress as shown in the Pictorial and cut the leads to the necessary length.

	COLOR	FROM	TO PIN OR LUG #
9	(✓) (✓) Brown	OT-1	V3-3 (S-1)
10	(✓) (✓) Blue	OT-1	V4-3 (S-1)
11	(✓) (✓) Red	OT-1	C1 (on bracket) (NS)
12	(✓) (✓) Brown	OT-2	V7-3 (S-1)
13	(✓) (✓) Blue	OT-2	V8-3 (S-1)
14	(✓) (✓) Red	OT-2	C1 (on bracket) (S-4)

The following connections are for the wires which have previously been connected to the electrolytic bracket forming the taped harness. Dress as shown in Pictorial #6.

15	(✓) (✓)	Short Gray	D4	P7-2 (S-1) (Dress under 10K Resistor)
16	(✓) (✓)	Long Gray	D4	P6-2 (S-1) (Dress under 10K Resistor)
17	(✓) (✓)	Long Black/white	B4	V4-6 (S-3)
18	(✓) (✓)	Short Black/white	B4	V8-6 (S-3)
19	(✓) (✓)	Orange	A3	V4-4 (S-3)
20	(✓) (✓)	Long Red/white	A2	P5-2 (S-1)
21	(✓) (✓)	Short Red/white	A2	P4-2 (S-1)
22	(✓) (✓)	Short Black	A6	T1-G (S-2)
23	(✓) (✓)	Long Black	A6	T2-G (S-2)

The remaining 2 white/red and 2 white/black wires will be connected at a later time.

Cut the following (HI) wires to the lengths specified. Strip 1/4" of insulation from one end and connect to the points indicated. Strip 1/2" of insulation from the other end. Dress as shown and leave this end free. We are still on Pictorial #6.

STEP #	ASSEMBLY	CHECK	COLOR	LENGTH	FROM LUG #	
24	(✓)	(✓)	Orange	5 1/2"	P4-1 (S-1)	
25	(✓)	(✓)	Orange/white	6 1/4"	P4-3 (S-1)	
26	(✓)	(✓)	Blue	6 1/4"	P5-1 (S-1)	
27	(✓)	(✓)	Blue/white	5 1/2"	P5-3 (S-1)	
28	(✓)	(✓)	Gray	6 1/2"	P6-1 (S-2)	
29	(✓)	(✓)	Gray/white	8"	P6-3 (S-2)	
30	(✓)	(✓)	Yellow	8"	P7-1 (S-2)	
31	(✓)	(✓)	Yellow/white	6 1/2"	P7-3 (S-2)	
32	(✓)	(✓)	Connect the free end of one of the 33 ohm 1/2 watt 5% resistors (orange, orange, black, gold) to V4-7 (S-3).			
33	(✓)	(✓)	Connect the free end of the other 33 ohm 1/2 watt 5% resistor (orange, orange, black, gold) to V4-2 (S-3).			

Cut the following (LI) wires to the lengths specified. Strip 1/4" of insulation from one end and connect to the points indicated. Strip 1/2" of insulation from the other end and leave this end free. Extend the free ends of all the following connections straight up in the air.

34	(✓)	(✓)	Yellow (1+)	2 1/2"	V1-1 (S-2)
35	(✓)	(✓)	Green	2 1/2"	V1-2 (S-1)
36	(✓)	(✓)	Orange	3 1/2"	V1-8 (S-1)
37	(✓)	(✓)	Blue	3 1/2"	V1-7 (S-2)
38	(✓)	(✓)	Blue	2 1/2"	V2-6 (S-1)
39	(✓)	(✓)	Green	2 1/2"	V2-7 (S-2)
40	(✓)	(✓)	Yellow	2 1/2"	V2-8 (S-2)
41	(✓)	(✓)	Blue	3"	V2-1 (S-1)
42	(✓)	(✓)	Blue	3 1/4"	V6-6 (S-1)
43	(✓)	(✓)	Green	2 3/4"	V6-7 (S-2)
44	(✓)	(✓)	Yellow	2 1/2"	V6-8 (S-2)
45	(✓)	(✓)	Blue	3 1/2"	V6-1 (S-1)
46	(✓)	(✓)	Green	2 1/2"	V5-2 (S-1)
47	(✓)	(✓)	Yellow	2 3/4"	V5-1 (S-2)
48	(✓)	(✓)	Orange	3 1/4"	V5-8 (S-1)
49	(✓)	(✓)	Blue	3 1/4"	V5-7 (S-2)
50	(✓)	(✓)	Green	3 1/4"	V3-5 (S-1)
51	(✓)	(✓)	Green	2 1/2"	V4-5 (S-1)
52	(✓)	(✓)	Green	2 1/2"	V8-5 (S-1)
53	(✓)	(✓)	Green	3 1/4"	V7-5 (S-1)

Yellow/white (1+)

This would be a good time to stop and inspect your work before proceeding. At this time there should not be any unsoldered connections on either the chassis or the electrolytic bracket.

TERMINAL BOARD INSTALLATION AND WIRING

REFER TO PICTORIAL #7.

STEP # ASSEMBLY CHECK

- 1 Mount terminal board "B" to chassis. Slip #6-32 x 2" screw thru chassis, place tubular spacer over screw, mount board and fasten with #6 lockwasher under #6-32 hex nut. Observe orientation of board. CAUTION: Make sure that all bare wires above or below the board do not touch any of the mounting hardware.
- 2 In the same manner mount terminal board "A" to chassis.

REFER TO PICTORIAL #8.

Make the following connections to the terminal boards with the (HI) wires which are coming from the grommet on the electrolytic bracket. Connect to the bottom section of the terminal lug, wrap one full turn and then crimp to insure a mechanically secure connection.

	COLOR	TO
3	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	White/orange
4	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	White

Make the following connections to the terminal boards with the (HI) wires which are coming from the electrolytic bracket. Connect to the bottom section of the terminal lug, wrap one full turn and then crimp to insure a mechanically secure connection.

5	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Short White/red	TB-A-3 (S-2)
6	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Long White/red	TB-B-3 (S-2)
7	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Either White/black	TB-A-8 (S-3)
8	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Other White/black	TB-B-8 (S-3)

Make the following connections to the terminal boards with the (HI) wires which are coming from the (4) AC and DC balance potentiometers (P4, P5, P6, P7). Connect to the bottom section of the terminal lug, wrap one full turn and then crimp to insure a mechanically secure connection.

9	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Orange	TB-A-7 (S-1)
10	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Orange/white	TB-A-11 (S-1)
11	<input type="checkbox"/> <input type="checkbox"/>	Blue	TB-B-11 (S-1)
12	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Blue/white	TB-B-7 (S-1)
13	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Gray	TB-A-26 (S-1)
14	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Gray/white	TB-A-27 (S-1)
15	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Yellow	TB-B-27 (S-1)
16	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Yellow/white	TB-B-26 (S-1)

Make the following connections to the terminal boards with the (LI) wires which are coming from the tube sockets. Connect to the bottom section of the terminal lug. Wrap one full turn and then crimp to insure a mechanically secure connection.

STEP #	ASSEMBLY CHECK	COLOR	FROM PIN #	TO LUG #
17	(✓)	Yellow	V1-1	TB-A-21 (S-3)
18	(✓)	Green	V1-2	TB-A-19 (S-1)
19	(✓)	Orange	V1-8	TB-A-16 (S-2)
20	(✓)	Blue	V1-7	TB-A-17 (S-2)
21	(✓)	Blue	V2-6	TB-A-15 (S-2)
22	(✓)	Green	V2-7	TB-A-14 (S-2)
23	(✓)	Yellow	V2-8	TB-A-13 (S-1)
24	(✓)	Blue	V2-1	TB-A-12 (S-2)
25	(✓)	Yellow	V6-8	TB-B-13 (S-1)
26	(✓)	Green	V6-7	TB-B-14 (S-2)
27	(✓)	Blue	V6-6	TB-B-15 (S-2)
28	(✓)	Blue	V6-1	TB-B-12 (S-2)
29	(✓)	Green	V5-2	TB-B-19 (S-1)
30	(✓)	Yellow	V5-1	TB-B-21 (S-3)
31	(✓)	Orange	V5-8	TB-B-16 (S-2)
32	(✓)	Blue	V5-7	TB-B-17 (S-2)
33	(✓)	Green	V3-5	TB-A-5 (S-1)
34	(✓)	Green	V4-5	TB-A-9 (S-1)
35	(✓)	Green	V8-5	TB-B-9 (S-1)
36	(✓)	Green <i>yellow wire</i>	V7-5	TB-B-5 (S-1)
37	(✓)	Connect the inner conductor of the shielded cable coming from P1 to TB-A-24 (S-2) and connect to shield to TB-A-23 (S-3).		
38	(✓)	Connect the inner conductor of the shielded cable coming from P2 to TB-B-24 (S-2) and connect the shield to TB-B-23 (S-3).		

FINAL TERMINAL BOARD WIRING

REFER TO PICTORIAL #1.

At this time carefully check the lower section of all the lugs on terminal board A and B. Every connection should be soldered before proceeding.

Refer to Figure C and install the following components on TB-A and TB-B. Since the two boards are mirror images of each other each operation may be performed on both boards at one time.

Center the components between the lugs indicated and wrap one full turn around the top section of the lug, then crimp to insure a mechanically secure connection. After soldering cut off excess wire.

STEP #	ASSEMBLY CHECK		VALUE	MARKING	FROM LUG #	TO LUG #
	CHANNEL A	CHANNEL B				
1	(<input checked="" type="checkbox"/>	(<input checked="" type="checkbox"/>	20K ohm 2 watt 10%	red, black, orange, silver	11 (S-1)	12 (S-1)
2	(<input checked="" type="checkbox"/>	(<input checked="" type="checkbox"/>	100K ohm 1/2 watt 5%	brown, black, yellow, gold	10 (NS)	27 (S-1)
3	(<input checked="" type="checkbox"/>	(<input checked="" type="checkbox"/>	1K ohm 1/2 watt 10%	brown, black, red, silver	10 (S-2)	9 (S-1)
4	(<input checked="" type="checkbox"/>	(<input checked="" type="checkbox"/>	27K ohm 2 watt 5%	red, violet, orange, gold	8 (S-1)	13 (S-1)
5	(<input checked="" type="checkbox"/>	(<input checked="" type="checkbox"/>	20K ohm 2 watt 10%	red, black, orange, silver	7 (S-1)	15 (S-1)
6	(<input checked="" type="checkbox"/>	(<input checked="" type="checkbox"/>	100K ohm 1/2 watt 5%	brown, black, yellow, gold	6 (NS)	26 (S-1)
7	(<input checked="" type="checkbox"/>	(<input checked="" type="checkbox"/>	1K ohm 1/2 watt 10%	brown, black, red, silver	6 (S-2)	5 (S-1)
8	(<input checked="" type="checkbox"/>	(<input checked="" type="checkbox"/>	150K ohm 1 watt 5%	brown, green, yellow, gold	28 (S-1)	16 (S-1)
9	(<input checked="" type="checkbox"/>	(<input checked="" type="checkbox"/>	1K ohm 1/2 watt 10%	brown, black, red, silver	25 (NS)	17 (S-1)
10	(<input checked="" type="checkbox"/>	(<input checked="" type="checkbox"/>	430 MMFD 5% Capacitor	Value marked on body	25 (S-2)	4 (S-1)
11	(<input checked="" type="checkbox"/>	(<input checked="" type="checkbox"/>	10K ohm 1/2 watt 10%	brown, black, orange, silver	24 (S-1)	19 (S-1)
12	(<input checked="" type="checkbox"/>	(<input checked="" type="checkbox"/>	1 meg ohm 1/2 watt 10%	brown, black, green, silver	23 (S-1)	20 (S-1)
13	(<input checked="" type="checkbox"/>	(<input checked="" type="checkbox"/>	470 ohm 1/2 watt 5%	yellow, violet, brown, gold	22 (S-1)	21 (S-1)
14	(<input checked="" type="checkbox"/>	(<input checked="" type="checkbox"/>	10K ohm 1/2 watt 5%	Value marked on body	1 (NS)	2 (NS)
15	(<input checked="" type="checkbox"/>	(<input checked="" type="checkbox"/>	100 MMFD 5% Capacitor	Value marked on body	1 (S-2)	2 (S-2)
16	(<input checked="" type="checkbox"/>	(<input checked="" type="checkbox"/>	Cut the leads on each end of a 44K ohm 7 watt 10% resistor (value marked on body) to 1/2". Bend the leads at right angles to the body of the resistor and then insert the leads directly into the holes in the top of lug #3 (S-1) and lug #18 (S-1). Set the resistor down as close as possible to the terminal lugs.			

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.

FINAL INSPECTION

STEP # ASSEMBLY

- ()
- ()
- ()
- ()
- ()
- ()
- ()
- ()

Visually inspect all connections and wiring comparing against the master charts and manual.
 Rotate the 2 DC balance controls and the 2 AC balance controls, which are located on the top of the chassis, to their mechanical center position. (midpoint of rotation)
 Install 6 AMP fuse in the fuse holder.
 Install 12BY7A tubes (V1 and V5).
 Install 6CG7 tubes (V2 and V6).
 Install 7581 output tubes (V3, V4, V7, V8).
 If an ohmmeter is available check all points in the resistance chart.

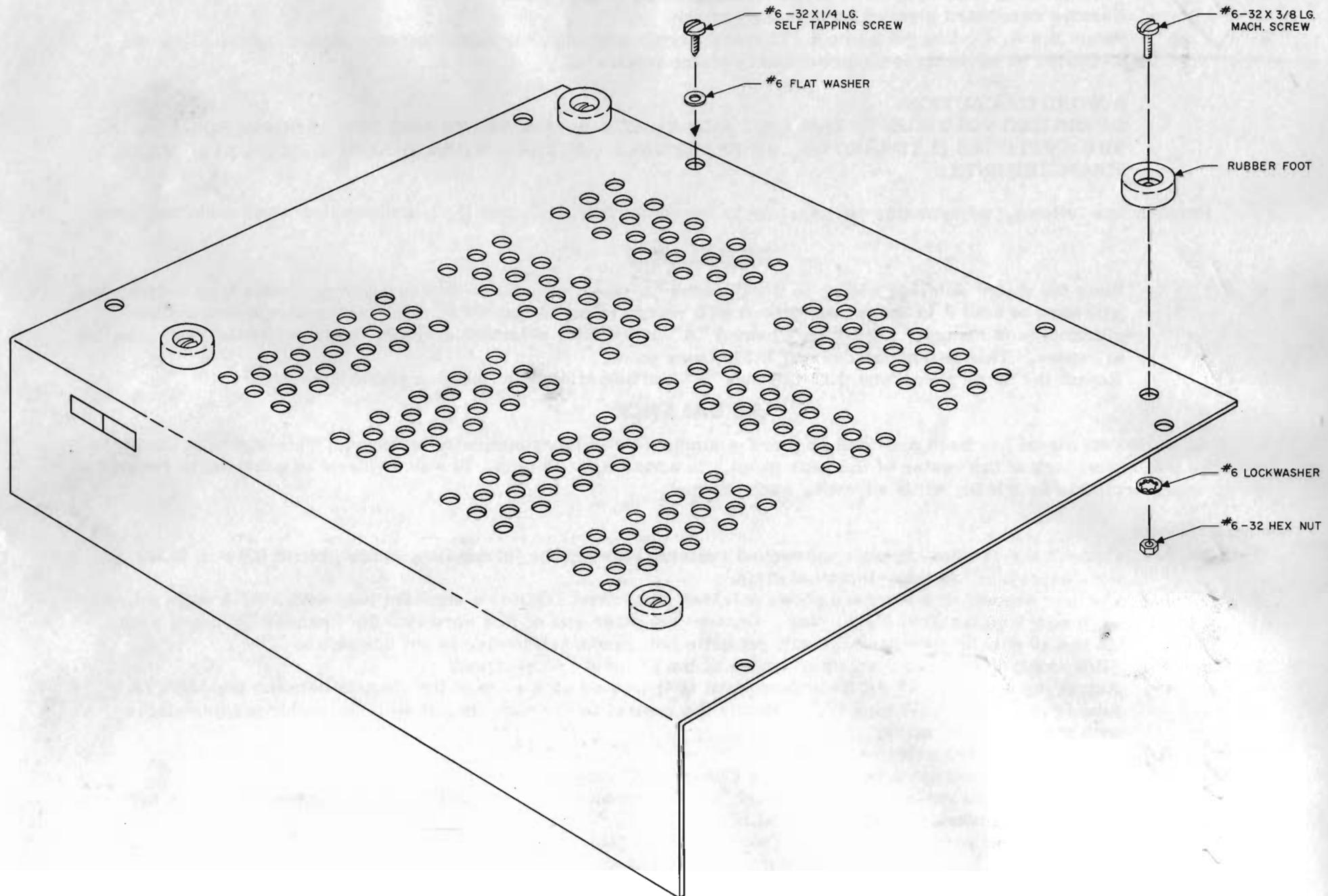
INSTALLING THE BOTTOM PLATE

REFER TO PICTORIAL #9.

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- ()
- ()
- ()

Install four rubber feet to bottom plate with #6-32 x 3/8" screws, #6 lockwasher and #6-32 hex nut as shown. Locate the .01 MFD/1400 V disc capacitor on the electrolytic bracket. Bend this capacitor toward the terminal boards so that it will lie flat. CAUTION: Be sure the capacitor leads do not touch any other parts. Place bottom plate on bottom lip of the chassis and align with the mounting holes. Insert #6 x 1/4" self tapping screws (using #6 washer under the screw head) in appropriate holes in bottom plate and tighten slightly. After all screws are installed, tighten securely.

PICTORIAL 9



INSTALLING THE BOTTOM PLATE

STEP # ASSEMBLY

- 1 (✓)
- 2 (✓)
- 3 (✓)

TEST AND ADJUSTMENTS

Turn the amplifier over so it is now resting on the bottom plate

Remove cardboard sleeves from transformers.

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 ten minutes.

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.

Perform the following adjustments periodically to insure perfect A.C. and D.C. balance, or when replacing tubes.

DC BALANCE

- 4 (✓)

Slide the meter selector switch to the Channel "A" position. Since this is a spring loaded type switch, you will have to hold it in that position or it will return to the center OFF. The meter should now deflect to either side of center. Adjust the Channel "A" DC balance potentiometer (P6) until the meter reads exactly at center. This is now the correct DC balance point.

- 5 (✓)

Repeat the same procedure with Channel "B" and adjust with DC balance potentiometer (P7).

AC BALANCE

A 60 cycle test signal has been provided so that the amplifier can be dynamically balanced. This signal is available from the test signal jack at the center of the rear panel. In addition, a 16 ohm, 20 watt resistor is provided to connect to the speaker terminals as a load, while adjusting each channel.

STEP # ASSEMBLY CHECK

- 1 (✓) (✓)

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

- 2 (✓) (✓)

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

- 3 (✓) (✓)

Slide and hold the meter selector switch to the Channel "A" position.

- 4 (✓) (✓)

Adjust the Channel "A" AC balance control (P4) located on the top of the chassis between the 12B77A tube (V1) and the 6CG7 tube (V2). Rotate the control to the right or left until the meter pointer aligns with the "Balance" mark.

- 5 (✓) (✓)

Release the meter selector switch.

- 6 (✓) (✓)

Remove the phono patch cord from the Channel "A" input jack.

- 7 (✓) (✓)

Remove the load resistor from Channel "A" and mount on the Channel "B" speaker terminal strip between the terminals marked Ground (G) and 16.

- 8 (✓) (✓)

Plug the phono patch cord into the Channel B input jack.

- 9 (✓) (✓)

Slide and hold the meter selector switch to the Channel "B" position.

STEP # ASSEMBLY CHECK

10 (✓) (✓) Adjust the Channel "B" AC balance control (P5) located on the top of the chassis between the 12BY7A tube (V5) and the 6CG7 tube (V6). Rotate the control to the right or left until the meter pointer aligns with the "Balance" mark.

11 (✓) (✓) Release the meter selector switch, remove the phono patch cord from both jacks and remove the load resistor.

This completes the AC balance adjustments.

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 re-check the step-by-step instructions and actual wiring.
2. Check the AC primary fuse. Improper wiring may cause overloading and will blow the fuse. Replace only with the same value supplied with the kit (6 Amp, MTH).
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.
6. If your voltage readings do not correspond to the voltage table, critically inspect that portion of the circuit where the readings fail to correspond.
7. Check all resistors and capacitors with an ohmmeter where the improper operating voltages are noted.
8. 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.
9. 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.

AC ELECTRICAL INSTALLATION

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

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 air circulation.

CONNECTING THE SPEAKERS

Your two speakers should be identical, if possible, to obtain optimum results. As this power amplifier is rated at 40 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 V 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 closet to the speaker rating. It may be noted that a mis-match 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 and Citation IV stereophonic preamplifiers incorporate circuitry 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 80 WATT MONOPHONIC OPERATION WITH SINGLE SPEAKER

In order to operate the Citation V as a 80 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 ends of these patch cords would be tied together in parallel and soldered to another type RCA 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 V 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.

FUSE

In the event of a potentially damaging failure of tubes or components, the Citation V is protected by a 6 amp MTH fuse, located on the rear panel. If this fuse blows, replace only with one of the same rating. Replacing with a fuse of a higher rating will not protect the amplifier, and may result in severe damage, which will not be covered by the factory warranty.

PARTS LIST

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

PART NUMBER	PARTS PER KIT	CODE DESIGNATION	DESCRIPTION
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SHEET METAL PARTS

P3714445	1		Chassis
P3714372	1		Bottom Plate
P3714386	1		Electrolytic Mounting Bracket

TRANSFORMERS

FT3714403	1	PT-1	Power Transformer
FT3714404	2	OT-1, OT-2	Output Transformer

COMPONENTS, SMALL PARTS, ETC.

P3714388	1	TB-A	Terminal Board, Channel A
P3714390	1	TB-B	Terminal Board, Channel B
STCOM4513	4	V3, V4, V7, V8	Octal Socket
STCOM4514	4	V1, V2, V5, V6	9 Pin Socket
STCOM3749	3	P1, P2, P3	Phono Jack
STCOM3897	3		Phono Jack Insulator
STCOM2707	2	T1, T2	Speaker, Terminal Strip
HCCOM3750	1	F1	Fuse Holder (with nut, lock and rubber washer)
ZCOM4425	1		Fuse 6 Amp, MTH
M3714400	1	M1	Meter
ER3714401	1	S1	Meter Switch
STCOM2702	4		Electrolytic Insulator
PCOM2547	4		Potentiometer Solder Shield
RV1121910	4	P4, P5, P6, P7	AC and DC Balance Controls
PCOM3597	4		Rubber Foot
WCOM4415	1		Line Cord
STCOM3822	1	T5	Diode Holder
ZCOM3716	1		Tape
STCOM3714	1		Rubber Grommet
HLCOM4377	1	T4	3 Lug Strip
HLCOM3132	1	T3	2 Lug Strip
HLCOM3091	1	T6	2 Lug Strip
HLCOM3930	2	T7, T8	3 Lug Strip

PART NUMBER	PARTS PER KIT	CODE DESIGNATION	DESCRIPTION
TUBES, DIODES, SELENIUM			
ZCOM3679	4	SD1, SD2, SD3, SD4	Silicon Diode (SD94A) (66-3284)
7581	4	V3, V4, V7, V8	Tube
12BY7A	2	V1, V5	Tube
6CG7	2	V2, V6	Tube
Z3714398	1	SR-1	Selenium Rectifier
HARDWARE			
KM4-40-6SB	8		#4-40 x 3/8" Lg. B.H.M.S. (binding head machine screw)
KL4-SC	8		#4 Internal Tooth Lockwasher
KN4-40SC	8		#4-40 Hex Nuts
KM6-32 6SB	47		#6-32 x 3/8" Lg. B.H.M.S. (binding head machine screw)
KM6-32-20SB	1		#6-32 x 1 1/4" Lg. B.H.M.S. (binding head machine screw)
KM6-32-32SB	6		#6-32 x 2" Lg. B.H.M.S. (binding head machine screw)
KL6 -SB	54		#6 Internal Tooth Lockwasher
KN6-32-SB	54		#6-32 Hex Nut
KN8-32-SC	12		#8-32 Hex Nut
KX8-SC	12		#8 Internal Tooth Lockwasher
KP6-4SB	6		#6 x 1/4" Lg. B.H.S.T.S. (binding head self tapping screw)
KW6-SB	6		#6 x 3/8" OD x 1/32" Thick Flatwasher
P3714405	6		Spacer, Standoff
STCOM3945	2		Metal Clamp, Meter Mounting
ELECTROLYTICS			
JE3714397	1	C4	80-80 mfd/150 volt (with insulating sleeve)
JE3714399	1	C1	90-30-30 mfd/500 volt (with insulating sleeve)
JE3273851	2	C2, C3	200 mfd/250 volt (with insulating sleeve)
MOLDED TUBULAR CAPACITORS			
JP4-.47	4	C7, C9, C14, C16	.47 mfd/400 volt
JP6-.47	4	C5, C10, C11, C17	.47 mfd/600 volt
DISC CERAMIC CAPACITORS			
JCST260	1	C13	.01 mfd/1400 volt
MICA CAPACITORS			
JQST115	2	C6, C12	100 mmfd/5%
JQST114	2	C8, C15	430 mmfd/5%

PART NUMBER	PARTS PER KIT	CODE DESIGNATION	DESCRIPTION
RESISTORS			
RA222-2	1	R1	2200 ohms 1/2 watt 20% (red, red, red)
RA331-2	1	R2	330 ohms 1/2 watt 20% (orange, orange, brown)
RA103-1	6 2	R4, R25, R18, R19, R40, R41	10K ohms 1/2 watt 10% (brown, black, orange, silver)
RA105-1	4	R3, R9, R24, R30	1 meg ohm 1/2 watt 10% (brown, black, green, silver)
RA471-.5	2	R5, R26	470 ohm 1/2 watt 5% (yellow, violet, brown, gold)
RA103-.5-CG	2	R23, R44	10K ohm 1/2 watt 5% (value marked on body)
RA104-.5	4	R14, R16, R35, R37	100 K ohm 1/2 watt 5% (brown, black, yellow, gold)
RA102-1	6	R17, R20, R38, R39, R8, R29	1K ohm 1/2 watt 10% (brown, black, red, silver)
RH443-1-CG	2	R7, R28	44K ohm 7 watt 10% (value marked on body)
RB154-.5	2	R6, R27	150K ohm 1 watt 5% (brown, green, yellow, gold)
RC273-.5-CG	2	R10, R31	27K ohm 2 watt 5% (red, violet, orange, gold)
RC203-1-CG	4	R11, R13, R32, R34	20K ohm 2 watt 10% (red, black, orange, silver)
RA33-1	4	R21, R22, R42, R43	3.3 ohm 1/2 watt 10% (orange, orange, gold, silver)
RSCOM3913	1	R50	1.5K ohm 3 watt 10% (value marked on body)
RW3714402	1	R45	270 ohm 10 watt 10% (value marked on body)
RD181-1CG	1	R46	180 ohm 3 watt 10% (value marked on body)
RB391-1	1	R47	390 ohm 1 watt 10% (orange, white, brown, silver)
RWCOM3959	1		16 ohm 20 watt 20% (value marked on body)
RA330-.5	2	R48, R49	33 ohm 1/2 watt 5% (orange, orange, black, gold)
RW3904924	4	R51, R52, R53, R54	1 ohm 1/2 watt 10% (brown, black, gold, silver)
RA153-1	4	R18, R19, R40, R41	15K ohm 1/2 watt 10% (brown, green, orange, silver)

HARMAN-KARDON, INC. CITATION KIT DIVISION
PLAINVIEW, L. I., N. Y.

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