

ASSEMBLY **and** **OPERATION** **MANUAL**

CITATION IV



**STEREOPHONIC PREAMPLIFIER
CONTROL CENTER**



harman kardon

CITATION IV

ASSEMBLY & OPERATION MANUAL

INTRODUCTION

This new Citation IV Stereo Preamplifier 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 no compromise has been made in the design of this magnificent instrument.

This instruction manual has been 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. IT CONTAINS INDISPENSABLE TECHNICAL AND SERVICE INFORMATION.

When construction has been completed and preliminary tests performed as directed, refer to the Operation and Installation Manual for final test instructions.

FEATURES

The new Citation IV is a compact stereophonic preamplifier designed in the best Citation tradition. It offers performance and features rivaled only by the famous Citation I.

- * Separate bass and treble tone controls for each channel. Controls may be switched out of the circuit completely to eliminate phase shift and transient distortion inherent in all tone controls.
- * Each amplification stage is surrounded with a feedback loop and is flat over an extremely wide frequency range.
- * Special rumble and scratch filters to effectively remove turntable and record noise without introducing distortion or ringing.
- * D. C. on all heaters and the use of low noise resistors in critical places to reduce thermal agitation and hum.
- * Distortion and phase shift virtually non-existent at rated output.
- * Continuously variable blend control to obtain center "fill" as required. Completely out of the circuit in the zero position.
- * Illuminated push-button On/Off switch permits preamplifier to be turned on and off without upsetting careful setting of operating controls.
- * Third channel amplifier output.
- * Separate switches for Tape Monitor and Contour.
- * Zero infinity balance control allows complete cut-off for either speaker.
- * Feedback pair output stage for low output impedance with extended frequency response and minimum distortion.
- * Military-type terminal board construction for rigid, professional appearance. Phenolic terminal boards are 1/8" thick and are of the highest quality.
- * Beautifully styled in charcoal brown and gold.

SPECIFICATIONS

| | |
|---------------------------|---|
| FREQUENCY RESPONSE: | +0 -0.5db, 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: 0.2 volts Lo Level: 2.5 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: | 14 7/8" W x 11" D x 5 5/8" H. |
| SHIPPING WEIGHT: | 25 lbs. |
| FINISH: | Charcoal brown and gold. |
| ACCESSORIES: | Optional wooden enclosure. |

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 to be sure that all parts have been removed.

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.

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 kit.

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

SERVICE POLICY

Harman-Kardon has established a special consumer service division to answer all questions pertinent to the assembly, testing, or installation of this kit. Our superbly equipped factory service department is at your disposal in the event you require assistance to obtain the specified performance from your preamplifier. For information relating to your Harman-Kardon preamplifier, please address all correspondence to:

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

If your problem cannot be resolved through your own efforts and after you have received factory authorization (refer to warranty contract) pack the unit carefully and return via Railway Express, PREPAID, to the address listed above. Pack the preamplifier in a large, rugged container, preferably of wood, using a substantial quantity of padding such as excelsior, shredded paper, or crumpled newspaper. Attach a tag to the unit indicating your name and address and specific problem. Mentioning the other components in your installation may be of value.

Harman-Kardon will inspect and service your preamplifier at a minimum service charge of \$12 plus the cost of parts and tubes, provided the preamplifier has been constructed and completed in accordance with the instructions in this manual.

PLEASE NOTE THIS SERVICE APPLIES ONLY TO FULLY COMPLETED INSTRUMENTS. WE WILL NOT ACCEPT INCOMPLETE KITS OR THOSE THAT HAVE BEEN MODIFIED IN DESIGN. PREAMPLIFIERS 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:

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, V1-2 means tube socket V1 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 this time. (NS) indicates that more than one component is connected to this terminal and that 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 this operation. (S-2) indicates that there are two connections to the terminal and that it should be soldered.

When wire lengths are specified, measure the length with a ruler so that the finished wiring will be accurate and neat.

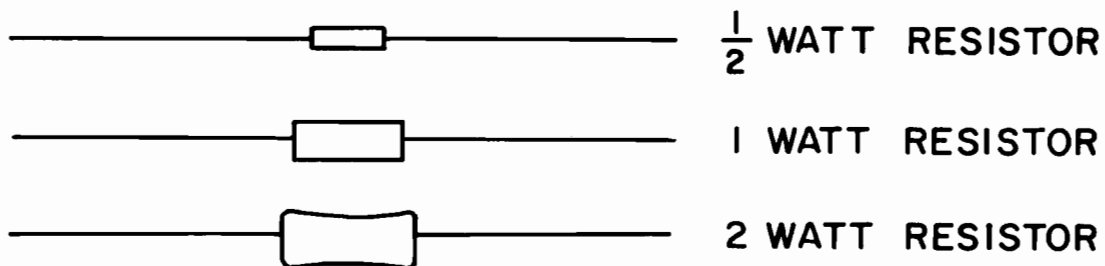
When the instructions call for the use of a "white/black" wire it means a white wire with a black spiral tracer. When the instructions call for a "black/white" wire it means a black wire with a white spiral tracer.

This Citation preamplifier is assembled and wired as five separate units.

1. Main Chassis
2. Switch
3. Terminal Boards
4. Power Supply
5. Control Panel

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.



CHASSIS ASSEMBLY

Refer to Pictorial #1

Mount the following components on the chassis.

Since there are two possible mounting positions of the tube sockets and the phono sockets be sure to observe the orientation indicated in the pictorial.

STEP # ASSEMBLY CHECK

- 1 () () Mount the fuseholder in position A. Use rubber washer, lockwasher and nut supplied.
- 2 (✓) () Mount the three AC outlets in position AC 1, AC 2 and AC 3. Use #6-32 x 3/8" screws, #6 lockwashers under #6-32 nuts.
Mount the following phono socket strips in the positions shown. Insert black insulating strip between socket and chassis, where called for. Use #6-32 x 3/8" screws, #6 lockwashers under #6-32 nuts.
- 3 (✓) () Two 4 jack sockets in positions D and E. (No insulating strip).
- 4 (✓) () Three 3 jack sockets in positions C, F, and G. (Use insulating strip on C only).
- 5 (✓) () Mount the six tube sockets in the positions shown. Use #4-40 x 3/8" screws, #4 lockwashers under #4-40 nuts. Note the #4 solder lug SL-1 under the nut at the V 1 tube socket. Position lug (SL-1) toward pin #4 on V 1.
- 6 (✓) () Install twelve large speed nuts over the holes on each flange of the chassis.
Inspect for proper orientation of all components.

CHASSIS WIRING

Refer to Pictorial #2

Cut the following wires to the length specified. Strip each end 1/4" of insulation and connect to the points indicated. Dress down to chassis.

| STEP # | ASSEMBLY CHECK | COLOR | LENGTH | FROM PIN # | TO PIN # |
|--------|----------------|---|---------|--------------|---|
| 1 | (✓) () | white/brown | 3 1/2" | 5- V 1 (S-1) | 5- V 2 (NS) |
| 2 | (✓) () | white/brown | 3 1/2" | 5- V 2 (S-2) | 5- V 3 (NS) |
| 3 | (✓) () | white/brown | 3" | 4- V 3 (S-1) | 4- V 6 (S-1) |
| 4 | (✓) () | white/brown | 3" | 4- V 2 (S-1) | 4- V 5 (S-1) |
| 5 | (✓) () | brown | 3 3/4" | 5- V 4 (S-1) | 5- V 5 (NS) |
| 6 | (✓) () | brown | 3 3/4" | 5- V 5 (S-2) | 5- V 6 (NS) |
| 7 | (✓) () | black | 3 1/4" | 4- V 4 (S-1) | 4- V 1 (NS) and thru solder lug SL-1 (NS) |
| 8 | (✓) () | Notice the metal tabs at each side of the phono sockets. Tin the tabs on the side shown in the pictorial. ("Tinning" is the process of applying a thin film of solder to the part to be soldered before the wire is actually connected.) Place a piece of bare wire so that it makes contact with each of the tabs as shown. Solder at all points of contact. Clip off excess wire. | | | |
| 9 | (✓) () | black | 17" | 4- V 1 (NS) | leave this end free |
| 10 | (✓) () | white/brown | 12 1/2" | 5- V 3 (S-2) | leave this end free |
| 11 | (✓) () | brown | 9 3/4" | 5- V 6 (S-2) | leave this end free |

Twist the above 3 wires together and dress as shown.

| STEP # | ASSEMBLY | CHECK |
|--------|----------|---|
| 12 | ✓ | () 100 mmf 10% disc capacitor (value marked on body of capacitor) from J 12 - L (NS) to J 11 - L (S-1). |
| 13 | ✓ | () 100 mmf 10% disc capacitor (value marked on body of capacitor) from J 9 - L (NS) to J 10 - L (S-1). |
| 14 | ✓ | () 56 K ohm 1/2 watt 10% resistor (green, blue, orange, silver) from J 12 - L (NS) to J 11 - G (S-1). |
| 15 | ✓ | () 56 K ohm 1/2 watt 10% resistor (green, blue, orange, silver) from J 9 - L (NS) to J 10 - G (S-1). |
| 16 | ✓ | () 100 mmf 10% disc capacitor (value marked on body of capacitor) between pin #2 (NS) and pin #3 (NS) on V 1 tube socket. Dress parallel to chassis. |
| 17 | ✓ | () 100 mmf 10% disc capacitor (value marked on body of capacitor) between pin #7 (NS) and pin #8 (NS) on V 4 tube socket. Dress parallel to chassis. |
| 18 | ✓ | () Cut a black wire 5 3/4" long. Strip one end 1/4" of insulation. Connect to J 13-G (S-1). Strip the other end 1/2" of insulation. Leave this end free. |
| 19 | ✓ | () Cut a black wire 3" long. Strip one end 1/4" of insulation. Connect to J 8-G (S-1). Strip the other end 1/2" of insulation. Leave this end free. |
| 20 | ✓ | () Cut a piece of heavy bare wire 1 7/8" long. Bend each end 1/4" as shown in the Bending Detail. Insert between AC-1 lug A (NS) and AC-3 lug A (NS). Bend AC-2 lug A over the wire and solder AC-2 only. |
| 21 | ✓ | () Cut a piece of heavy bare wire 1 1/4" long. Bend each end 1/4" as shown. Insert between AC-2 lug B (NS) and AC-3 lug B (S-1). |
| 22 | ✓ | () Cut a piece of heavy bare wire 2 1/2" long. Bend one end 1/4", slip a 1 3/4" piece of sleeving over the wire and bend the other end 1/4". Insert one end into AC-2 lug B (S-2). Insert the other end into fuseholder lug A (NS). Bend away from lug B of AC-1 as shown. |
| 23 | ✓ | () Cut a black wire (heavy insulation) 6" long. Strip each end 1/4" of insulation and tin the ends. Connect one end to fuseholder lug A (S-2). Leave the other end free. |
| 24 | ✓ | () Cut a black wire (heavy insulation) 6" long. Strip each end 1/4" of insulation and tin the ends. Connect one end to AC-1 lug B (NS). Leave the other end free. |
| 25 | ✓ | () Insert the A. C. line cord into hole B. Connect one wire to AC-1 lug B (S-2), connect the other wire to AC-1 lug A (S-2). |

Check the above steps before going further. This completes the preliminary wiring of the chassis.

FUNCTION. SWITCH WIRING

Refer to Pictorial #3, Figure A.

There are sections of the switch where two lugs are staked together. When wiring to these lugs make sure that the wire is inserted thru both lugs.

Use bare wire to make the following connections. Wrap around the lug, close to the wafer. Note the use of sleeving between several lugs.

| STEP # | ASSEMBLY | CHECK |
|--------|----------|--|
| 1 | ✓ | () On wafer #1 from Lug #11 (NS) thru Lug #10 (NS), add 1/2" of sleeving and continue thru Lug #8 (NS), then thru Lug #7 (NS), then add 3/8" of sleeving and continue to Lug #6 (NS). |
| 2 | ✓ | () On wafer #1 from Lug #4 (NS) to Lug #5 (NS). |
| 3 | ✓ | () On wafer #4 from Lug #11 (NS), then add 3/8" of sleeving and go thru Lug #1 (NS), then thru Lug #2 (NS), then add 1/2" of sleeving and go thru Lug #4 (NS), then to Lug #5 (NS). |
| 4 | ✓ | () On wafer #4 from Lug #9 (NS) to Lug #10 (NS). |

WIRING FUNCTION SWITCH COMPONENTS

Center the components between the lugs and make certain the leads from the components do not touch any of the adjacent lugs.

| STEP # | ASSEMBLY | CHECK | COMPONENT | VALUE | MARKING | FROM LUG # | TO LUG # |
|--------|----------|-------|--------------------|---------------------|-------------------------------|-------------------|-------------------|
| 5 | (X) | () | Capacitor, disc | 47 mmf $\pm 10\%$ | on body | 6 Wafer #1 (NS) | 5 Wafer #1 (S-2) |
| 6 | (X) | () | Capacitor, tubular | .0023 mfd $\pm 5\%$ | on body | 6 Wafer #1 (NS) | 7 Wafer #2 (S-1) |
| 7 | (X) | () | Capacitor, tubular | .003 mfd $\pm 5\%$ | on body | 7 Wafer #1 (S-2) | 9 Wafer #2 (S-1) |
| 8 | (X) | () | Capacitor, tubular | .05 mfd $\pm 5\%$ | on body | 8 Wafer #1 (S-2) | 10 Wafer #2 (S-1) |
| 9 | (X) | () | Resistor, 1/2 W | 82K $\pm 5\%$ | (grey, red, orange, gold) | 10 Wafer #1 (S-2) | 12 Wafer #2 (S-1) |
| 10 | (X) | () | Resistor, 1/2 W | 24K $\pm 5\%$ | (red, yellow, orange, gold) | 11 Wafer #1 (NS) | 13 Wafer #2 (S-1) |
| 11 | (X) | () | Capacitor, tubular | .03 mfd $\pm 5\%$ | on body | 11 Wafer #1 (S-3) | 1 Wafer #2 (NS) |
| 12 | (X) | () | Resistor, 1/2 W | 2.4K $\pm 5\%$ | (red, yellow, red, gold) | 1 Wafer #2 (S-2) | 4 Wafer #2 (NS) |
| 13 | (X) | () | Resistor, 1/2 W | 1.6K $\pm 5\%$ | (brown, blue, red, gold) | 4 Wafer #2 (S-2) | 5 Wafer #2 (NS) |
| 14 | (X) | () | Resistor, 1/2 W | 33K $\pm 5\%$ | (orange, orange, orange gold) | 5 Wafer #2 (NS) | 8 Wafer #2 (NS) |
| 15 | (X) | () | Capacitor, tubular | .003 mfd 5% | on body | 1 Wafer #3 (S-1) | 1 Wafer #4 (S-2) |
| 16 | (X) | () | Capacitor, tubular | .05 mfd $\pm 5\%$ | on body | 2 Wafer #3 (S-1) | 2 Wafer #4 (S-2) |
| 17 | (X) | () | Resistor, 1/2 W | 82K $\pm 5\%$ | (grey, red, orange, gold) | 4 Wafer #3 (S-1) | 4 Wafer #4 (NS) |
| 18 | (X) | () | Resistor, 1/2 W | 24K $\pm 5\%$ | (red, yellow, orange, gold) | 5 Wafer #3 (S-1) | 5 Wafer #4 (NS) |
| 19 | (X) | () | Capacitor, tubular | .03 mfd 5% | on body | 6 Wafer #3 (NS) | 5 Wafer #4 (S-3) |
| 20 | (X) | () | Capacitor, tubular | .0023 mfd $\pm 5\%$ | on body | 12 Wafer #3 (S-1) | 11 Wafer #4 (NS) |
| 21 | (X) | () | Capacitor, disc | 47 mmf $\pm 10\%$ | on body | 10 Wafer #4 (S-2) | 11 Wafer #4 (NS) |
| 22 | (X) | () | Resistor, 1/2 W | 2.4K $\pm 5\%$ | (red, yellow, red, gold) | 6 Wafer #3 (S-2) | 9 Wafer #3 (NS) |
| 23 | (X) | () | Resistor, 1/2 W | 1.6K $\pm 5\%$ | (brown, blue, red, gold) | 9 Wafer #3 (S-2) | 10 Wafer #3 (NS) |
| 24 | (X) | () | Resistor, 1/2 W | 33K $\pm 5\%$ | (orange, orange, orange gold) | 10 Wafer #3 (NS) | 13 Wafer #3 (NS) |

This completes the component wiring of the function switch. Inspect the previous steps for correct location of components before proceeding.

Refer to Pictorial #3, Figure B.

Cut the following wires to the length specified. Strip one end 1/4" of insulation. Connect this end to the lug indicated. Strip the other end 1/2" of insulation, leave this end free.

| STEP # | ASSEMBLY | CHECK | COLOR | LENGTH | CONNECT TO LUG # |
|--------|----------|-------|--------------|--------|------------------|
| 25 | (X) | () | Grey | 8 1/2" | 1 Wafer #1 (S-1) |
| 26 | (X) | () | White/violet | 8 3/4" | 2 Wafer #1 (NS) |
| 27 | (X) | () | White/violet | 2 1/2" | 2 Wafer #1 (S-2) |
| 28 | (X) | () | White | 9" | 3 Wafer #1 (S-1) |
| 29 | (X) | () | Green/white | 3 1/4" | 4 Wafer #1 (S-2) |
| 30 | (X) | () | Black | 9" | 6 Wafer #1 (NS) |

| STEP # | ASSEMBLY | CHECK | COLOR | LENGTH | CONNECT TO LUG # |
|--------|----------|-------|--------------|---------|-------------------|
| 31 | (✓) | () | Black/white | 5 1/2" | 6 Wafer #1 (S-5) |
| 32 | (✓) | () | Violet | 11 1/2" | 9 Wafer #1 (NS) |
| 33 | (✓) | () | Violet | 3 3/4" | 9 Wafer #1 (S-2) |
| 34 | (✓) | () | Green | 2 1/4" | 2 Wafer #2 (S-1) |
| 35 | (✓) | () | White/brown | 4 1/2" | 3 Wafer #2 (S-1) |
| 36 | (✓) | () | Yellow | 2 1/4" | 5 Wafer #2 (S-3) |
| 37 | (✓) | () | Brown | 5" | 6 Wafer #2 (S-1) |
| 38 | (✓) | () | White/yellow | 3 1/4" | 8 Wafer #2 (S-2) |
| 39 | (✓) | () | Black | 4 1/4" | 11 Wafer #2 (S-1) |
| 40 | (✓) | () | Black | 2 3/4" | 3 Wafer #3 (S-1) |
| 41 | (✓) | () | Green | 3 1/4" | 7 Wafer #3 (S-1) |
| 42 | (✓) | () | White/brown | 4 1/2" | 8 Wafer #3 (S-1) |
| 43 | (✓) | () | Yellow | 4 1/2" | 10 Wafer #3 (S-3) |
| 44 | (✓) | () | Brown | 3 3/4" | 11 Wafer #3 (S-1) |
| 45 | (✓) | () | White/Yellow | 5 1/2" | 13 Wafer #3 (S-2) |
| 46 | (✓) | () | Violet | 3" | 3 Wafer #4 (NS) |
| 47 | (✓) | () | Violet | 2 1/2" | 3 Wafer #4 (S-2) |
| 48 | (✓) | () | White/Black | 8 1/2" | 4 Wafer #4 (S-3) |
| 49 | (✓) | () | Grey | 1 3/4" | 6 Wafer #4 (S-1) |
| 50 | (✓) | () | White/violet | 2" | 7 Wafer #4 (NS) |
| 51 | (✓) | () | White/violet | 3 1/4" | 7 Wafer #4 (S-2) |
| 52 | (✓) | () | White | 2 1/2" | 8 Wafer #4 (S-1) |
| 53 | (✓) | () | Green/white | 3 3/4" | 9 Wafer #4 (S-2) |
| 54 | (✓) | () | Black | 4 1/2" | 11 Wafer #4 (S-4) |

This completes the wiring of the function switch. Inspect the previous steps and make certain that all lugs are soldered and there is no flow of solder into the contact section of the lugs.

Refer to Pictorial #4.

- 55 (✓) () Install two large speednuts onto the metal bracket of the switch, over the mounting holes.
- 56 (✓) () Dress all wires as shown.
- 57 (✓) () Refer to switch mounting detail. Mount the function switch to the side panel of the chassis. Use #6-32 x 3/8" screws. (The switch will be accurately positioned on a later step.) Connect the following wires from the switch to the phono sockets as indicated.

FUNCTION SWITCH WIRING TO CHASSIS

| | COLOR | FROM WAFER # | TO |
|--------|---------------------|-----------------------|----------------|
| 58 (✓) | () Gray | 4 | J 14 - L (S-1) |
| 59 (✓) | () 2" White/violet | 4 | J 15 - L (S-1) |
| 60 (✓) | () Black | 4 (dress along panel) | J 15 - G (S-1) |
| 61 (✓) | () White | 4 | J 16 - L (S-1) |
| 62 (✓) | () 3" Violet | 4 | J 17 - L (S-1) |

| STEP # | ASSEMBLY | CHECK | COLOR | FROM WAFER # | TO |
|--------|----------|-------|--|------------------------|----------------|
| 63 | (✓) | () | Brown | 3 (dress along panel) | J 13 - L (S-1) |
| 64 | (✓) | () | White/brown | 3 (dress along panel) | J 12 - L (S-3) |
| 65 | (✓) | () | Brown | 2 (dress over bracket) | J 8 - L (S-1) |
| 66 | (✓) | () | White/brown | 2 (dress over bracket) | J 9 - L (S-3) |
| 67 | () | () | Group together the black, white, 8 3/4" white/violet, gray and 11 1/2" violet wires from Wafer #1 and the white/black wire from Wafer #4. Dress leads as shown. Use pieces of cable wrap to hold the wires together at a point about a 1/2 inch away from Wafer #1. ("Cable Wrap" is the 1/4" strip of double yellow paper with thin wire sandwiched between the paper strips. This material is used to keep a number of wires grouped together to form a "cable". Cut a piece approximately 3/4" long and wrap around wires as indicated.) Bend at this point and dress toward the chassis. Bend again at the chassis. Use another piece of cable wrap just above the chassis bend. | | |

Connect these wires to the phono sockets as follows:

| | | | COLOR | TO |
|----|-----|-----|--------------|---------------|
| 68 | (✓) | () | gray | J 7 - L (S-1) |
| 69 | (✓) | () | white/violet | J 6 - L (S-1) |
| 70 | (✓) | () | black | J 6 - G (S-1) |
| 71 | (✓) | () | white | J 5 - L (S-1) |
| 72 | (✓) | () | violet | J 4 - L (S-1) |

This completes the preliminary function wiring. The remaining 16 wires from the switch are connected in a later step. Check the previous steps before proceeding.

CHANNEL "A" TERMINAL BOARD WIRING

Refer to Pictorial #5, Figure A.

Cut the following wires to the length specified. Strip each end 3/4" of insulation. Insert the stripped ends through the small holes from the rear side of the board. Wrap one complete turn around the bottom section of the lug. Dress the wire tight to the board and away from all other lugs as shown.

DO NOT SOLDER ANY CONNECTIONS AT THIS TIME.

| STEP # | ASSEMBLY | CHECK | COLOR | LENGTH | FROM LUG # | TO LUG # |
|--------|----------|-------|--------------|--------|------------|----------|
| 1 | (✓) | () | black | 3" | 68 | 57 |
| 2 | (✓) | () | black | 3 1/4" | 57 | 53 |
| 3 | (✓) | () | black | 3 1/2" | 51 | 49 |
| 4 | (✓) | () | black | 3 1/2" | 49 | 23 |
| 5 | (✓) | () | black | 2 3/8" | 23 | 17 |
| 6 | (✓) | () | black | 5" | 60 | 20 |
| 7 | (✓) | () | black | 2 3/4" | 20 | 21 |
| 8 | (✓) | () | yellow | 4" | 36 | 44 |
| 9 | (✓) | () | blue/white | 5 1/8" | 8 | 46 |
| 10 | (✓) | () | orange | 2 3/4" | 45 | 67 |
| 11 | (✓) | () | white/orange | 5" | 19 | 66 |
| 12 | (✓) | () | green/white | 2 3/4" | 42 | 64 |
| 13 | (✓) | () | white/red | 2 1/2" | 41 | 43 |
| 14 | (✓) | () | white/red | 2 3/4" | 43 | 65 |

| STEP # | ASSEMBLY | CHECK | COLOR | LENGTH | FROM LUG # | TO LUG # |
|--------|----------|-------|--------------|--------|------------|----------|
| 15 | (✓) | () | gray | 6" | 4 | 63 |
| 16 | (✓) | () | green | 4" | 27 | 62 |
| 17 | (✓) | () | green/white | 5" | 6 | 13 |
| 18 | (✓) | () | white/yellow | 5 3/4" | 29 | 37 |
| 19 | (✓) | () | red | 3" | 40 | 61 |
| 20 | (✓) | () | red | 2 3/4" | 40 | 25 |
| 21 | (✓) | () | white/violet | 5 1/2" | 16 | 70 |
| 22 | (✓) | () | violet | 6 1/4" | 12 | 69 |

Carefully check the previous wiring to make certain that the wires are connected to the proper lugs.

Cut the following wires to the length specified. Strip one end 3/4" of insulation. Insert through the small hole as previously described. Connect to the bottom section of the lug. Strip the other end 1/4" of insulation. Leave this end free. Dress toward the end of the board as shown. Do not solder any connections.

| STEP # | ASSEMBLY | CHECK | COLOR | LENGTH | CONNECT TO LUG # |
|--------|----------|-------|--------------|--------|------------------|
| 23 | (✓) | () | yellow/white | 7" | 48 |
| 24 | (✓) | () | yellow/white | 6 1/2" | 47 |
| 25 | (✓) | () | white/yellow | 7" | 56 |
| 26 | (✓) | () | yellow | 6 1/2" | 52 |
| 27 | (✓) | () | white/green | 3 3/4" | 18 |
| 28 | (✓) | () | green | 4 3/4" | 27 |
| 29 | (✓) | () | black | 3 1/2" | 21 |
| 30 | (✓) | () | black | 4 3/4" | 23 |

This completes the wiring of the rear of the board. Check to make certain that the wires are connected to the proper lugs.

Refer to Pictorial #5, Figure B.

The following instructions refer to the front section of the board. Use bare wire and make the following connections to the bottom section of the lugs. DO NOT SOLDER ANY CONNECTIONS.

| STEP # | ASSEMBLY | CHECK | FROM LUG # | TO LUG # |
|--------|----------|-------|------------|----------|
| 31 | (✓) | () | 2 | 14 |
| 32 | (✓) | () | 5 | 6 |
| 33 | (✓) | () | 7 | 8 |
| 34 | (✓) | () | 9 | 10 |
| 35 | (✓) | () | 11 | 15 |
| 36 | (✓) | () | 21 | 22 |
| 37 | (✓) | () | 33 | 34 |
| 38 | (✓) | () | 38 | 39 |
| 39 | (✓) | () | 48 | 54 |
| 40 | (✓) | () | 49 | 55 |

Connect the following components to the top section of the lugs. When soldering, take care not to burn the insulation off of the nearby jumpers. Make certain that the solder flows around all wires when soldering each lug.

| STEP # | ASSEMBLY | CHECK | COMPONENT | VALUE | MARKING | FROM LUG # | TO LUG # |
|--------|----------|-------|----------------------|--------------------|---|------------|----------|
| 61 | (✓) | () | Resistor, precision | 4.7K ohm | on body | 11 (S-3) | 21 (NS) |
| 62 | (✓) | () | Capacitor, disc | .002 mfd - 10% | on body | 21 (S-6) | 34 (NS) |
| 63 | (✓) | () | Capacitor, disc | 330 mmf - 10% | on body | 34 (S-5) | 47 (NS) |
| 64 | (✓) | () | Resistor, 1 watt | 560 ohm - 5% | (green, blue, brown, gold) | 47 (S-4) | 60 (S-2) |
| 65 | (✓) | () | Capacitor, tubular | 200 mfd 3 volt | on body (Observe polarity - positive end to lug #15) | 15 (S-2) | 33 (NS) |
| 66 | (✓) | () | Resistor, 1 watt | 150K - 10% | (brown, green, yellow, silver) | 33 (S-3) | 46 (S-2) |
| 67 | (✓) | () | Capacitor, tubular | .1 mfd - 400 Volt | on body | 10 (S-3) | 32 (NS) |
| 68 | (✓) | () | Resistor, precision | 270K ohm | on body | 32 (S-3) | 45 (S-2) |
| 69 | (✓) | () | Resistor, 1/2 watt | 1 meg ohm - 10% | (brown, black, green, silver) | 9 (S-2) | 20 (S-3) |
| 70 | (✓) | () | Capacitor, tubular | .47 mfd - 400 volt | on body | 8 (S-4) | 31 (NS) |
| 71 | (✓) | () | Resistor, 1/2 watt | 160K ohm - 5% | (brown, blue, yellow, gold) | 31 (S-2) | 44 (S-2) |
| 72 | (✓) | () | Resistor, 1 watt | 56K ohm - 10% | (green, blue, orange, silver) | 7 (S-2) | 19 (S-2) |
| 73 | (✓) | () | Capacitor, tubular | .47 mfd - 400 volt | on body | 6 (S-3) | 30 (NS) |
| 74 | (✓) | () | Resistor, precision | 68K ohm | on body | 30 (S-3) | 43 (S-3) |
| 75 | (✓) | () | Solder lug #42 (S-2) | | | | |
| 76 | (✓) | () | Resistor, 1/2 watt | 1.2 meg ohm - 10% | (brown, red, green, silver) | 5 (S-2) | 18 (NS) |
| 77 | (✓) | () | Capacitor, disc | 33 mmf - 10% | on body | 18 (S-4) | 29 (S-3) |
| 78 | (✓) | () | Capacitor, tubular | .1 mfd - 400 volt | on body | 4 (S-2) | 28 (NS) |
| 79 | (✓) | () | Resistor, 1 watt | 270K ohm - 10% | (red, violet, yellow, silver) | 28 (S-3) | 41 (S-2) |
| 80 | (✓) | () | Resistor, 1 watt | 3.9K ohm - 5% | (orange, white, red, gold) | 3 (S-2) | 17 (NS) |
| 81 | (✓) | () | Resistor, 1/2 watt | 4.7 meg ohm - 10% | (yellow, violet, green, silver) | 17 (S-3) | 27 (S-3) |
| 82 | (✓) | () | Capacitor, tubular | .1 mfd - 400 volt | on body | 2 (S-3) | 26 (NS) |
| 83 | (✓) | () | Resistor, 1 watt | 100K ohm - 10% | (brown, black, yellow, silver) | 26 (S-3) | 40 (S-3) |
| 84 | (✓) | () | Resistor, 1/2 watt | 1 meg ohm - 10% | (brown, black, green, silver) | 14 (S-2) | 23 (S-4) |
| 85 | (✓) | () | Resistor, 1 watt | 27K ohm - 10% | (red, violet, orange, silver) | 25 (S-2) | 39 (NS) |
| 86 | (✓) | () | Capacitor, tubular | .47 mfd - 400 volt | on body | 1 (NS) | 24 (NS) |
| 87 | (✓) | () | Resistor, 1 watt | 100K ohm - 10% | (brown, black, yellow, silver) | 24 (S-3) | 38 (S-2) |
| 88 | (✓) | () | Capacitor, tubular | 200 mfd - 3 volt | on body (Observe polarity, positive end to lug #48) | 48 (S-3) | 49 (S-4) |
| 89 | (✓) | () | Resistor, 1 watt | 470 ohm - 5% | (yellow, violet, brown, gold) | 54 (S-2) | 55 (S-2) |
| 90 | (✓) | () | Capacitor, tubular | 200 mfd - 3 volt | on body (Observe polarity, positive end to lug #50) | 50 (S-2) | 51 (S-3) |
| 91 | (✓) | () | Resistor, 1/2 watt | 2.7K ohm - 5% | (red, violet, red, gold) | 56 (S-3) | 57 (S-4) |
| 92 | (✓) | () | Capacitor, tubular | 200 mfd - 3 volt | on body (Observe polarity, positive end to lug #52) | 52 (S-3) | 53 (NS) |
| 93 | (✓) | () | Resistor, 1 watt | 820 ohm - 5% | (gray, red, brown, gold) | 58 (S-2) | 59 (NS) |

Recheck the previous steps for correct location of components, correct polarity of capacitors and all soldered connections. This completes this portion of the wiring of the channel A board. Put aside for later installation.

Refer to Pictorial #5, Figure D

Cut the following wires to the length specified. Strip each end $\frac{3}{4}$ " of insulation. Insert the stripped ends through the small holes from the rear side of the board.

Wrap one complete turn around the bottom section of the lug. Dress the wire tight to the board and away from all other lugs, as shown.

DO NOT SOLDER ANY CONNECTIONS AT THIS TIME.

| STEP # | ASSEMBLY | CHECK | COLOR | LENGTH | FROM LUG # | TO LUG # |
|--------|----------|-------|--------------|-------------------|------------|----------|
| 1 | (✓) | () | black | 3" | 63 | 57 |
| 2 | (✓) | () | black | 3 $\frac{1}{4}$ " | 57 | 48 |
| 3 | (✓) | () | black | 3 $\frac{1}{2}$ " | 50 | 52 |
| 4 | (✓) | () | black | 3 $\frac{1}{2}$ " | 52 | 29 |
| 5 | (✓) | () | black | 2 $\frac{3}{8}$ " | 29 | 18 |
| 6 | (✓) | () | black | 5" | 54 | 15 |
| 7 | (✓) | () | black | 2 $\frac{3}{4}$ " | 15 | 13 |
| 8 | (✓) | () | yellow | 4" | 43 | 30 |
| 9 | (✓) | () | blue/white | 5 $\frac{1}{8}$ " | 4 | 37 |
| 10 | (✓) | () | orange | 2 $\frac{3}{4}$ " | 38 | 64 |
| 11 | (✓) | () | white/orange | 5" | 16 | 65 |
| 12 | (✓) | () | green/white | 2 $\frac{3}{4}$ " | 39 | 67 |
| 13 | (✓) | () | white/red | 2 $\frac{1}{2}$ " | 40 | 44 |
| 14 | (✓) | () | white/red | 2 $\frac{3}{4}$ " | 44 | 66 |
| 15 | (✓) | () | gray | 6" | 8 | 68 |
| 16 | (✓) | () | green | 4" | 27 | 69 |
| 17 | (✓) | () | white/yellow | 5 $\frac{3}{4}$ " | 25 | 34 |
| 18 | (✓) | () | red | 3" | 41 | 70 |
| 19 | (✓) | () | blue | 2 $\frac{1}{2}$ " | 33 | 46 |
| 20 | (✓) | () | green/white | 6 $\frac{1}{4}$ " | 6 | 35 |
| 21 | (✓) | () | violet | 2 $\frac{1}{2}$ " | 42 | 62 |

Carefully check the previous wiring to make certain that the wires are connected to the proper lugs.

Cut the following wires to the length specified. Strip one end $\frac{3}{4}$ " of insulation. Insert through the small hole and wrap around the bottom section of the lug. Strip the other end $\frac{1}{4}$ " of insulation, dress toward the end of the board as shown. Leave this end free. DO NOT SOLDER ANY CONNECTION AT THIS TIME.

| STEP # | ASSEMBLY | CHECK | COLOR | LENGTH | CONNECT TO LUG # |
|--------|----------|-------|---------------|-------------------|------------------|
| 22 | (✓) | () | white | 4 $\frac{1}{4}$ " | 11 |
| 23 | (✓) | () | yellow/white | 7" | 53 |
| 24 | (✓) | () | yellow/white | 6" | 36 |
| 25 | (✓) | () | green | 5" | 27 |
| 26 | (✓) | () | yellow | 6 $\frac{1}{2}$ " | 49 |
| 27 | (✓) | () | white/green | 3 $\frac{3}{4}$ " | 17 |
| 28 | (✓) | () | white /yellow | 6 $\frac{1}{2}$ " | 58 |

| STEP # | ASSEMBLY | CHECK | COLOR | LENGTH | CONNECT TO LUG # |
|--------|----------|-------|--|--------|------------------|
| 29 | (✓) | () | black | 6 1/2" | 29 |
| | | | (Twist with the white wire from lug #11) | | |
| 30 | (✓) | () | black | 4 3/4" | 13 |

This completes the wiring of the rear of the board. Check to make certain that the wires are connected to the proper lugs.

Refer to Pictorial #5, Figure E

The following instructions refer to the front section of the board. Use bare wire and make the following connections to the bottom section of the lugs. Do not solder any connections.

| STEP # | ASSEMBLY | CHECK | FROM LUG # | TO LUG # |
|--------|----------|-------|------------|----------|
| 31 | (✓) | () | 1 | 14 |
| 32 | (✓) | () | 2 | 3 |
| 33 | (✓) | () | 4 | 5 |
| 34 | (✓) | () | 6 | 7 |
| 35 | (✓) | () | 10 | 19 |
| 36 | (✓) | () | 12 | 13 |
| 37 | (✓) | () | 22 | 23 |
| 38 | (✓) | () | 47 | 61 |
| 39 | (✓) | () | 48 | 55 |
| 40 | (✓) | () | 49 | 56 |
| 41 | (✓) | () | 50 | 57 |
| 42 | (✓) | () | 51 | 58 |
| 43 | (✓) | () | 52 | 59 |
| 44 | (✓) | () | 53 | 60 |

Cut the following wires to the length specified. Strip one end 1/2" of insulation and connect to the bottom section of the lug. Strip the other end 1/4" of insulation. Dress toward the end of the board between the lugs as shown. Leave this end free. DO NOT SOLDER ANY CONNECTIONS AT THIS TIME.

| STEP # | ASSEMBLY | CHECK | COLOR | LENGTH | CONNECT TO LUG # |
|--------|----------|-------|---|--------|------------------|
| 45 | (✓) | () | blue/white | 4 1/2" | 33 |
| 46 | (✓) | () | blue/white | 5 1/4" | 26 |
| 47 | (✓) | () | blue/white | 2 1/2" | 4 |
| 48 | (✓) | () | blue | 4" | 28 |
| 49 | (✓) | () | blue | 4 1/2" | 32 |
| 50 | (✓) | () | blue | 4 1/4" | 24 |
| 51 | (✓) | () | green/white | 2" | 10 |
| 52 | (✓) | () | green/white | 1 3/4" | 2 |
| 53 | (✓) | () | yellow | 2 1/2" | 9 |
| 54 | (✓) | () | yellow | 2" | 1 |
| 55 | (✓) | () | green | 4 1/2" | 21 |
| 56 | (✓) | () | Check the previous wiring for correct connections and proper dressing of wires. | | |

Refer to Pictorial #5, Figure F

Connect the following components to the bottom section of the lugs. Center the components between the lugs and wrap the leads one complete turn around the lugs. Cut off the excess wire close to the lugs. DO NOT SOLDER ANY CONNECTIONS AT THIS TIME.

| STEP # | ASSEMBLY | CHECK | COMPONENT | VALUE | MARKING | FROM LUG # | TO LUG # |
|--------|----------|-------|----------------|--------------|----------------------------------|------------|----------|
| 57 | (✓) | () | Resistor 1/2 W | 470K ohm 10% | (yellow, violet, yellow, silver) | 12 | 21 |
| 58 | (✓) | () | Resistor 1 W | 560 ohm 10% | (green, blue, brown, silver) | 13 | 22 |
| 59 | (✓) | () | Resistor 1/2 W | 4.7K ohm 10% | (yellow, violet, red, silver) | 22 | 36 |
| 60 | (✓) | () | Resistor 1/2 W | 120K ohm 10% | (brown, red, yellow, silver) | 17 | 25 |

Connect the following components to the top section of the lugs. Make certain that the solder flows around all wires when soldering each lug.

| | | | | | | | |
|---|-----|-----|----------------------|-----------------|---------------------------------|----------|----------|
| 61 | (✓) | () | Resistor, precision | 4.7K ohm | on body | 1 (S-3) | 13 (NS) |
| 62 | (✓) | () | Capacitor, disc | .002 mfd 10% | on body | 13 (S-6) | 22 (NS) |
| 63 | (✓) | () | Capacitor, disc | 330 mmf 10% | on body | 22 (S-5) | 36 (NS) |
| 64 | (✓) | () | Resistor, 1 W | 560 ohm 5% | (green, blue, brown, gold) | 36 (S-4) | 54 (S-2) |
| 65 | (✓) | () | Capacitor, tubular | 200 mmf 3 volt | on body | 14 (S-2) | 23 (NS) |
| (Observe polarity, positive end to Lug #14) | | | | | | | |
| 66 | (✓) | () | Resistor, 1 W | 150K ohm 10% | (brown, green, yellow, silver) | 23 (S-3) | 37 (S-2) |
| 67 | (✓) | () | Capacitor, tubular | .1 mfd 400 volt | on body | 2 (S-3) | 24 (NS) |
| 68 | (✓) | () | Resistor, precision | 270K ohm | on body | 24 (S-3) | 38 (S-2) |
| 69 | (✓) | () | Resistor, 1/2 W | 1 meg ohm 10% | (brown, black, green, silver) | 3 (S-2) | 15 (S-3) |
| 70 | (✓) | () | Capacitor, tubular | .47 mfd 400 V | on body | 4 (S-4) | 31 (NS) |
| 71 | (✓) | () | Resistor, 1/2 W | 160K ohm 5% | (brown, blue, yellow, gold) | 31 (S-2) | 43 (S-2) |
| 72 | (✓) | () | Resistor, 1 W | 56K ohm 10% | (green, blue, orange, silver) | 5 (S-2) | 16 (S-2) |
| 73 | (✓) | () | Capacitor, tubular | .47 mfd 400 V | on body | 6 (S-3) | 32 (NS) |
| 74 | (✓) | () | Resistor, precision | 68K ohm | on body | 32 (S-3) | 44 (S-3) |
| 75 | (✓) | () | Solder lug #39 (S-2) | | | | |
| 76 | (✓) | () | Resistor, 1/2 W | 1.2 meg ohm 10% | (brown, red, green, silver) | 7 (S-2) | 17 (NS) |
| 77 | (✓) | () | Capacitor, disc | 33 mmf 10% | on body | 17 (S-4) | 25 (S-3) |
| 78 | (✓) | () | Capacitor, tubular | .1 mfd 400 V | on body | 8 (S-2) | 26 (NS) |
| 79 | (✓) | () | Resistor, 1 W | 270K ohm 10% | (red, violet, yellow, silver) | 26 (S-3) | 40 (S-2) |
| 80 | (✓) | () | Resistor, 1 W | 3.9K ohm 5% | (orange, white, red, gold) | 9 (S-2) | 18 (NS) |
| 81 | (✓) | () | Resistor, 1/2 W | 4.7 meg ohm 10% | (yellow, violet, green, silver) | 18 (S-3) | 27 (S-3) |
| 82 | (✓) | () | Capacitor, tubular | .1 mfd 400 V | on body | 10 (S-3) | 28 (NS) |
| 83 | (✓) | () | Resistor, 1 W | 100K ohm 10% | (brown, black, yellow, silver) | 28 (S-3) | 41 (S-2) |
| 84 | (✓) | () | Resistor, 1/2 W | 1 meg ohm 10% | (brown, black, green, silver) | 19 (S-2) | 29 (S-4) |
| 85 | (✓) | () | Capacitor, tubular | 2 mfd 25 volt | on body | 11 (S-2) | 20 (NS) |
| (Observe polarity, positive end to lug #20) | | | | | | | |

| STEP # | ASSEMBLY | CHECK | COMPONENT | VALUE | MARKING | FROM LUG # | TO LUG # |
|--------|----------|-------|--------------------|---|-------------------------------|------------|----------|
| 86 | (✓) | () | Capacitor, tubular | .47 mfd 400 V | on body | 20 (NS) | 46 (S-2) |
| 87 | (✓) | () | Capacitor, tubular | 200 mfd 3 V | on body | 48 (S-3) | 49 (S-3) |
| | | | | (Observe polarity, positive end to lug #49) | | | |
| 88 | (✓) | () | Resistor, 1 W | 820 ohm 5% | (gray, red, brown, gold) | 55 (NS) | 56 (S-2) |
| 89 | (✓) | () | Capacitor, tubular | 200 mfd 3 V | on body | 50 (S-3) | 51 (S-2) |
| | | | | (Observe polarity, positive end to lug #51) | | | |
| 90 | (✓) | () | Resistor, 1/2 W | 2.7K ohm - 5% | (red, violet, red, gold) | 57 (S-4) | 58 (S-3) |
| 91 | (✓) | () | Capacitor, tubular | 200 mfd 3 V | on body | 52 (S-4) | 53 (S-3) |
| | | | | (Observe polarity, positive end to lug #53) | | | |
| 92 | (✓) | () | Resistor, 1 W | 470 ohm 5% | (yellow, violet, brown, gold) | 59 (S-2) | 60 (S-2) |

Recheck the previous steps for correct location of components, correct polarity of capacitors and all soldered connections. This completes the preliminary wiring of the terminal boards.

TERMINAL BOARD ASSEMBLY

Refer to Pictorial #6, Figure A

| STEP # | ASSEMBLY | CHECK | |
|--------|----------|-------|---|
| 1 | (✓) | () | Install five speed nuts (small) on each terminal board mounting bracket over the mounting holes. |
| 2 | (✓) | () | Mount the Channel A board to the brackets. Use #6-32 x 3/8" screws. Observe orientation of brackets. Bracket mounts to bottom of channel A board. Make sure there are no wires caught between the board and the bracket before tightening screws. |
| 3 | (✓) | () | Mount the channel B board to the above assembly. Use #6-32 x 3/8" screws. Observe same precaution as stated above. Bracket mounts to bottom of channel B board. At this point dress the loose wires from each board toward the component side of the board. |

Refer to Pictorial #6, Figure B

| | | | |
|---|-----|-----|---|
| 4 | (✓) | () | Slide 1" of sleeving over one lead of a .47 mfd 400 volt tubular capacitor (value marked on the body of the capacitor) and then insert that end through the small hole from the rear of the board to lug #45 (NS) on the channel B board. Wrap the lead one complete turn around the bottom section of the lug. Position the body of the capacitor between the two boards and against the mounting bracket. Leave the other end free. |
| 5 | (✓) | () | Connect a 100K ohm 1 watt 10% resistor (brown, black, yellow, silver) between lug #33 (S-3) and lug #45 (NS) on the channel B board. Connect to the top section of the lugs. |

Use bare wire and make the following connections between the boards. Feed the wire through the hole in the lugs and bend back over the lug to make a secure connection.

| STEP # | ASSEMBLY | CHECK | FROM CHANNEL "A" BOARD | TO CHANNEL "B" BOARD |
|--------|----------|-------|------------------------|----------------------|
| | | | LUG # | LUG # |
| 6 | (✓) | () | 67 (S-2) | 64 (NS) |
| 7 | (✓) | () | 66 (S-2) | 65 (NS) |
| 8 | (✓) | () | 65 (S-2) | 66 (NS) |
| 9 | (✓) | () | 39 (S-3) | 45 (S-3) |
| | | | use sleeving | |
| 10 | (✓) | () | 61 (S-2) | 70 (NS) |

| STEP # | ASSEMBLY | CHECK | COLOR | FROM LUG # | TO LUG # |
|--------|----------|-------|--|------------|--------------|
| 24 | (✓) | () | blue | 28 | 6-V6 - (S-1) |
| 25 | (✓) | () | green | 27 | 7-V6 - (S-1) |
| 26 | (✓) | () | yellow | 9 | 8-V6 - (NS) |
| 27 | (✓) | () | yellow/white | 53 | 3-V6 - (S-1) |
| 28 | (✓) | () | green/white | 10 | 2-V6 - (S-1) |
| 29 | (✓) | () | blue/white | 33 | 1-V6 - (S-1) |
| 30 | (✓) | () | Connect a 68K ohm 1/2 watt, 10% resistor (blue, gray, orange, silver) between lug #20 (S-3) and V6 Pin #8 (S-2). | | |

This completes wiring of V6 tube socket. All connections should be soldered.

| STEP # | ASSEMBLY | CHECK | |
|--------|----------|-------|--|
| 31 | (✓) | () | Connect the pair of black and white twisted wires from Lugs #29 and #11. white to J2 - L (S-1) black to J3 - G (S-1) |
| 32 | (✓) | () | Connect the free end of the .47 mfd 400 volt capacitor (between boards) to J3 - L (S-1). Make certain that all wires from the back of the board (to the tube sockets) are dressed tight to the board. |

Refer to Pictorial #8

Make the following connections from the function switch to the Channel A board.

| STEP # | ASSEMBLY | CHECK | COLOR | FROM WAFER # | TO LUG # |
|--------|----------|-------|--|--------------|----------|
| 33 | (✓) | () | white/black | 4 | 53 (S-4) |
| 34 | (✓) | () | violet | 4 | 12 (S-2) |
| 35 | (✓) | () | green/white | 4 | 13 (S-2) |
| 36 | (✓) | () | white/violet | 4 | 16 (S-2) |
| 37 | (✓) | () | black | 3 | 22 (NS) |
| 38 | (✓) | () | green | 3 | 35 (S-3) |
| 39 | (✓) | () | yellow | 3 | 36 (S-2) |
| 40 | (✓) | () | white/yellow | 3 | 37 (S-2) |
| 41 | (✓) | () | Connect the black wire from Lug #23 to J1 - G (S-1). | | |

The following instructions refer to the wiring of Channel A board to the tube sockets.

| STEP # | ASSEMBLY | CHECK | COLOR | FROM LUG # | TO PIN # |
|--------|----------|-------|--|------------|--------------|
| 42 | (✓) | () | yellow/white | 48 | 8-V3 - (S-1) |
| 43 | (✓) | () | blue/white | 24 | 6-V3 - (S-1) |
| 44 | (✓) | () | green/white | 2 | 7-V3 - (S-1) |
| 45 | (✓) | () | yellow | 3 | 3-V3 - (NS) |
| 46 | (✓) | () | green | 27 | 2-V3 - (S-1) |
| 47 | (✓) | () | blue | 26 | 1-V3 - (S-1) |
| 48 | (✓) | () | Connect a 68K 1/2 watt, 10% resistor (blue, gray, orange, silver) between Lug #1 (NS) and V3 Pin #3 (S-2). | | |
| 49 | (✓) | () | Connect a 2 mfd 25 volt tubular capacitor (value marked on body of capacitor) between Lug #1 (S-3) and J1 - L (S-1). Observe polarity, positive end to Lug #1 on terminal board. | | |

This completes the wiring of the V3 tube socket. All connections should be soldered.

| | | | | | |
|----|-----|-----|--|------------------------|--------------|
| 50 | (✓) | () | blue/white | 28 | 6-V2 - (S-1) |
| 51 | (✓) | () | white/yellow | 56 | 8-V2 - (S-1) |
| 52 | (✓) | () | yellow | 52 | 3-V2 - (NS) |
| 53 | (✓) | () | white/green | 18 Dress Across Socket | 2-V2 - (NS) |
| 54 | (✓) | () | blue | 30 | 1-V2 - (S-1) |
| 55 | (✓) | () | Connect a 7.5 mmfd disc capacitor between V2 Pin #3 (S-2) and V2 Pin #2 (S-2). | | |

This completes the wiring of V2 tube socket. All connections should be soldered.

| | | | | | |
|----|-----|-----|--|----|-------------------|
| 56 | (✓) | () | blue/white | 8 | 6-V1 - (S-1) |
| 57 | (✓) | () | green/white | 10 | 7-V1 - (S-1) |
| 58 | (✓) | () | yellow/white | 47 | 8-V1 - (S-1) |
| 59 | (✓) | () | yellow | 11 | 3-V1 - (S-2) |
| 60 | (✓) | () | green | 35 | 2-V1 - (S-2) |
| 61 | (✓) | () | blue | 32 | 1-V1 - (S-1) |
| 62 | (✓) | () | black | 21 | SL1 & V1 #4 (S-4) |
| 63 | (✓) | () | Connect the black wire from J13 -G to Lug #22 (S-4). | | |

This completes the wiring of V1 tube socket. All connections should be soldered.

- 64 (✓) () Insert the two black wires through hole "H". All other wires through hole "L". Mount the power transformer to the outside of the chassis as shown. Use #6 - 32 x 3/8" screws, #6 lockwashers under #6 - 32 nuts.
- 65 (✓) () Cut one black wire to the necessary length and connect to the B lug (S-1) on the fuseholder. Carefully bend fuseholder lug "B" as shown.
- 66 (✓) () Cut the other black wire to the necessary length and connect to AC3#A (S-2).
- 67 (✓) () Group together the wires from hole "L" with the brown and white/brown twisted wires and the black wire from the main chassis. Wrap two turns of a piece of cable wrap around the wires close to the chassis as shown.

POWER SUPPLY ASSEMBLY

Refer to Pictorial #9

STEP # ASSEMBLY CHECK

- 1 (✓) () Mount three electrolytic insulating wafers to power supply sub-chassis as shown. Note metal cable clamp mounted with "B" wafer. Use #6 - 32 x 3/8" screws, #6 lockwashers under #6 - 32 nuts.
- 2 (✓) () Mount TS8 lug strip. Use #6 - 32 x 3/8" screw, #6 lockwasher under #6 - 32 nut.
- 3 (✓) () Mount SR1 selenium rectifier. Use #6 - 32 x 1" screw, #6 lockwasher under #6 - 32 nut. Make certain locking tab falls into larger hole before tightening nut.
- 4 (✓) () Mount SR2 selenium rectifier. Use #6 lockwasher under #6 - 32 nut. Make certain locking tab falls into larger hole before tightening nut.
- 5 (✓) () Insert grommet in the hole near the TS8 lug strip.
Mount the following electrolytic capacitors by twisting the mounting tabs 1/4 turn. Refer to detail drawing. Notice the position of the solid tab. (keyway)
- 6 (✓) () 1000, 1000 mfd. 30 volt at A.
- 7 (✓) () 40, 40, 40 mfd. 450 volt at B.
- 8 (✓) () 80, 50, 40 mfd. 450 volt at C.
- 9 (✓) () Install three large speed nuts over the mounting holes along the flanges.

ASSEMBLY OF POWER SUPPLY TO CHASSIS AND WIRING

Refer to Pictorial #10

STEP # ASSEMBLY CHECK

- 1 (✓) () Mount the power supply chassis to the main chassis. Use #6 - 32 x 3/8" screws.
- 2 (✓) () Feed the wire from the fuseholder and the wire from the AC1 outlet through the grommet. Connect either wire to TS8-A (NS). Connect the other wire to TS8-B (NS).
- 3 (✓) () Mount a .01/1400 V disc capacitor directly across SR2-A (NS) and SR2-B (NS).
- 4 (✓) () Bend TS8 lug strip at an angle toward long selenium rectifier SR-2.

Dress the brown and the white/brown twisted wires and the black wire from the main chassis to the power supply as shown in the pictorial. Connect as follows:

| | | | | |
|---|---------|---------------|----|----------------|
| 5 | (✓) () | brown | to | C 67 - D (S-1) |
| 6 | (✓) () | white / brown | to | C 67 - A (NS) |
| 7 | (✓) () | black | to | C 66 - D (S-1) |

Cut the following wires to the length specified. Strip each end 1/4" of insulation. Connect to the points indicated.

| | COLOR | LENGTH | FROM | TO |
|----|---------------|--------|----------------|----------------|
| 8 | (✓) () red | 4 1/4" | SR 2 - B (S-2) | C 65 - A (NS) |
| 9 | (✓) () black | 1 3/4" | SR 1 - A (S-1) | C 67 - C (S-1) |
| 10 | (✓) () white | 3" | SR 1 - B (NS) | C 67 - B (NS) |

Cut the following wires to the length specified. Strip one end 1/4" of insulation. Connect this end to the power supply. Strip the other end 1/2" of insulation. Connect this end to the lugs on the Channel B board.

| STEP # | ASSEMBLY | CHECK | COLOR | LENGTH | FROM | TO |
|--------|----------|-------|---|--------|---------------|----------|
| 11 | (✓) | () | red | 4 1/4" | C 65 - C (NS) | 70 (S-3) |
| 12 | (✓) | () | white/red | 8 1/2" | C 66 - C (NS) | 66 (S-3) |
| 13 | (✓) | () | white/orange | 9 1/2" | C 66 - B (NS) | 65 (S-3) |
| 14 | (✓) | () | orange | 8" | C 66 - A (NS) | 64 (S-3) |
| 15 | (✓) | () | Wrap two turns of a piece of cable wrap around the above wires at a point between the terminal board and the power supply as shown. | | | |
| 16 | (✓) | () | Connect a bare wire (use sleeving) between C 65 - D (NS) and C 66 - E (S-1). | | | |

Dress the transformer wires as shown. Cut to the necessary length and strip each wire 3/8" of insulation and tin the end. When measuring wires, leave enough slack in them to be able to dress them neatly. Connect the transformer leads as follows:

| | | | | | |
|----|-----|-----|-------------|----|----------------|
| 17 | (✓) | () | red | to | SR 2 - A (S-2) |
| 18 | (✓) | () | green | to | SR 1 - C (S-1) |
| 19 | (✓) | () | green/white | to | SR 1 - D (S-1) |
| 20 | (✓) | () | red/white | to | C 65 - D (S-2) |

Inspect the previous wiring for proper lead dress, correct wiring and unsoldered connections.

Connect the following components to the points indicated.

| STEP # | ASSEMBLY | CHECK | COMPONENT | VALUE | MARKING | FROM | TO |
|--------|----------|-------|------------------|--------------|---------------------------------|----------------|----------------|
| 21 | (✓) | () | resistor 2 watt | 2.2K ohm 10% | on body | C 65 - A (S-2) | C 65 - B (NS) |
| 22 | (✓) | () | resistor 2 watt | 2.2K ohm 10% | on body | C 65 - B (S-2) | C 65 - C (NS) |
| 23 | (✓) | () | resistor 2 watt | 2.2K ohm 10% | on body | C 65 - C (S-3) | C 66 - C (NS) |
| 24 | (✓) | () | resistor 2 watt | 5.6K ohm 10% | (green, blue, red, silver) | C 66 - C (S-3) | C 66 - B (NS) |
| 25 | (✓) | () | resistor 2 watt | 47K ohm 10% | (yellow, violet, orange silver) | C 66 - B (S-3) | C 66 - A (S-2) |
| 26 | (✓) | () | resistor 10 watt | 15 ohm 10% | on body | SR 1 - B (S-2) | C 67 - A (NS) |

Slip sleeving over each lead of the 15 ohm resistor, dress flat to the side of the power supply sub-chassis with leads as short as possible.

CONTROL PANEL ASSEMBLY

Refer to Pictorial #11

Mount the following components to the control panel. Insert all screws from front side of panel.

| STEP # | ASSEMBLY | CHECK | |
|--------|----------|-------|--|
| 1 | (✓) | () | Three slide switches at S3, S4 and S6. Paper light shield under the screws at S6. Use 4-40 x 3/8" screws, #4 lockwashers, under #4-40 nuts. Mount slide switch S5 with slide switch shield bracket as shown in detail. |

STEP # ASSEMBLY CHECK

- 2 ☒ () Lug strips TS1, TS2, TS3, TS4, TS5, TS6, and TS7 in their respective position. Use #6-32 x 3/8" screws, #6 lockwashers under #6-32 nuts. (Note that TS3 and TS4 are mounted on a common screw. This also applies to TS5 and TS6.)
- 3 ☒ () Grommet in hole A.

Use 3/8" lockwashers under 3/8" nuts to mount the following rotary switches and controls.

- 4 ☒ () Install four tone controls R4, R5, R6 and R7 at positions R4, R5, R6 and R7.
- 5 ☒ () Install blend control R3 at position R3.
- 6 ☒ () Install balance control R2 at position R2.
- 7 ☒ () Install loudness control R1 at position R1.
- 8 ☒ () Install tone defeat switch S8 at position S8.
- 9 ☒ () Install mode switch S2 at position S2.
- 10 ☒ () AC push button switch at S7. Hand tighten one nut all the way down on switch bushing before installing. Insert tubular spacer between switch nut and panel as shown. Use lockwasher and nut supplied with switch.
- 11 ☒ () Metal switch shield over A. C. switch. Use #6 - 32 x 3/8" screws, #6 lockwashers under #6 - 32 nuts. Feed the two wires from the switch through the hole in the metal shield.
- 12 ☒ () Insert the #1847 bulb into the pilot light socket. Slip the cardboard tube over the bulb and socket. Use a twisting motion and force the tube over the white wire.
- 13 ☒ () Mount this assembly to the front panel as shown. Use #6 - 32 x 3/8" screw, #6 lockwasher under #6 - 32 nut. Twist the wires and pass through grommet A.
- X 14 ☐ () Install eight large speednuts over the holes around the edge of the front panel as shown.

CONTROL PANEL WIRING

Refer to Pictorial # 12

Cut the following wires to the length specified and connect to the points indicated. Strip each end 1/4" of insulation.

| STEP # | ASSEMBLY CHECK | COLOR | LENGTH | FROM | TO |
|--------|---|-------------|--------|-------------|-------------|
| 1 | <input checked="" type="checkbox"/> () | green/white | 3 1/2" | R5-2 (NS) | R4-2 (NS) |
| 2 | <input checked="" type="checkbox"/> () | green/white | 4 1/4" | R4-2 (S-2) | S8-1 (S-1) |
| 3 | <input checked="" type="checkbox"/> () | blue | 6 1/4" | TS6-A (NS) | S3-3 (NS) |
| 4 | <input checked="" type="checkbox"/> () | blue/white | 6" | TS6-C (NS) | S3-2 (S-1) |
| 5 | <input checked="" type="checkbox"/> () | green/white | 4 1/2" | TS6-D (NS) | TS3-H (NS) |
| 6 | <input checked="" type="checkbox"/> () | green | 6 1/4" | TS6-E (NS) | S5-3 (NS) |
| 7 | <input checked="" type="checkbox"/> () | black | 2 3/4" | R3A-1 (NS) | TS3-E (NS) |
| 8 | <input checked="" type="checkbox"/> () | black | 4 1/4" | TS3-E (NS) | S3-1 (NS) |
| 9 | <input checked="" type="checkbox"/> () | black | 1 3/4" | S3-1 (S-2) | TS2-B (NS) |
| 10 | <input checked="" type="checkbox"/> () | black | 4 1/2" | TS2-B (NS) | R1A-1 (NS) |
| 11 | <input checked="" type="checkbox"/> () | black | 3 1/4" | R1A-1 (S-2) | R2A-3 (S-1) |
| 12 | <input checked="" type="checkbox"/> () | white/green | 9 1/2" | S8-3 (S-1) | R1A-2 (S-1) |

| STEP # | ASSEMBLY | CHECK | COLOR | LENGTH | FROM | TO |
|--------|----------|-------|-------------|--------|-------------|--|
| 13 | (✓) | () | white/green | 5" | S4-3 (NS) | R1A-5 (S-1) |
| 14 | (✓) | () | green/white | 3 1/2" | S5-2 (S-1) | TS3-G (NS) |
| 15 | (✓) | () | green/white | 3 1/2" | R1A-3 (S-1) | R2A-2 (S-1) |
| 16 | (✓) | () | white/green | 2 1/2" | R2A-1 (S-1) | S 2-6 (S-1) connect to both lugs. |

Inspect the above steps for proper dressing of wires and correct wiring. Make certain that all points are soldered where indicated.

| | | | | | | |
|----|-----|-----|-------------|--------|-------------|-------------|
| 17 | (✓) | () | green/white | 3 1/2" | R7-2 (NS) | R6-2 (NS) |
| 18 | (✓) | () | green/white | 4 1/2" | TS5-D (NS) | TS3-A (NS) |
| 19 | (✓) | () | green | 7" | TS5-E (NS) | S5-6 (NS) |
| 20 | (✓) | () | blue/white | 7 1/2" | TS5-C (NS) | S3-5 (S-1) |
| 21 | (✓) | () | blue | 7 1/4" | TS5-A (NS) | S3-6 (S-1) |
| 22 | (✓) | () | green/white | 3" | TS3-B (NS) | S5-5 (S-1) |
| 23 | (✓) | () | black | 1 1/2" | R3B#1 (NS) | TS3-D (NS) |
| 24 | (✓) | () | black | 3 1/2" | TS3-D (NS) | S3-4 (NS) |
| 25 | (✓) | () | black | 1 3/4" | S3-4 (S-2) | TS2-A (NS) |
| 26 | (✓) | () | black | 3" | TS2-A (NS) | R1B-1 (NS) |
| 27 | (✓) | () | black | 2 1/2" | R1B-1 (S-2) | R2B-1 (S-1) |
| 28 | (✓) | () | white/green | 3 1/2" | R1B-3 (S-1) | R2B-2 (S-1) |
| 29 | (✓) | () | white/green | 4" | R1B-5 (S-1) | S4-6 (NS) |

Inspect the correct wiring and proper dressing of wires.

COMPONENTS

Refer to Pictorial #13

Connect the following components to the points indicated. Make all leads as short as possible. Mount the components on the side of the lug strip indicated in the pictorial.

All capacitors are disc type 10% unless otherwise indicated with the value marked on the body of the capacitors.

All resistors are one half watt, 10%.

| STEP # | ASSEMBLY | CHECK | COMPONENT | VALUE | MARKING | FROM | TO |
|--------|----------|-------|-----------|-----------|-------------------------------|--------------|--------------|
| 1 | (✓) | () | Capacitor | .015 mfd | | R5 - 2 (NS) | R5 - 3 (NS) |
| 2 | (✓) | () | Capacitor | .003 mfd | | R5 - 1 (NS) | R5 - 2 (S-3) |
| 3 | (✓) | () | Resistor | 120K ohm | (brown, red, yellow, silver) | R5 - 1 (S-2) | TS7-D (NS) |
| 4 | (✓) | () | Resistor | 27K ohm | (red, violet, orange, silver) | R5 - 3 (S-2) | TS7-C (NS) |
| 5 | (✓) | () | Capacitor | .0034 mfd | | R4 - 3 (S-1) | TS7-C (NS) |

| STEP # | ASSEMBLY | CHECK | COMPONENT | VALUE | MARKING | TO | FROM |
|--|----------|-------|-----------|------------------------------------|---------------------------------------|--------------|--------------|
| 6 | (S) | () | Capacitor | 750 mmf | (use sleeving) | R4 - 1 (S-1) | TS7-D (NS) |
| 7 | (S) | () | Resistor | 680K | (blue, gray, yellow, silver) | TS6-E (NS) | TS6-D (NS) |
| 8 | (S) | () | Resistor | 27K ohm | (red, violet, orange, silver) | TS6-D (NS) | TS6-B (NS) |
| 9 | (S) | () | Resistor | 3.3K ohm | (orange, orange, red, silver) | TS6-B (NS) | TS6-A (S-2) |
| 10 | (S) | () | Capacitor | .0015 mfd | | TS6-D (NS) | TS6-C (NS) |
| 11 | (S) | () | Capacitor | .0047 mfd | | TS6-C (S-3) | TS6-B (S-3) |
| 12 | (S) | () | Resistor | 47K ohm | (yellow, violet, orange, silver) | S8 - 4 (NS) | TS6-E (NS) |
| 13 | (S) | () | Capacitor | 47 mmf | | S8 - 4 (NS) | TS6-E (S-4) |
| 14 | (S) | () | Resistor | 6.8 meg ohm | (blue, gray, green, silver) | TS3-H (S-2) | TS3-G (NS) |
| 15 | (S) | () | Resistor | 2.2 meg ohm | (red, red, green, silver) | TS3-G (NS) | TS3-E (NS) |
| 16 | (S) | () | Resistor | 120K ohm | (brown, red, yellow, silver) | TS3-E (S-4) | TS3-F (NS) |
| 17 | (S) | () | Capacitor | .005 mfd | | TS3-F (NS) | TS3-G (NS) |
| 18 | (S) | () | Capacitor | .01 mfd 20% (smaller .01 mfd disc) | | S4 - 2 (NS) | S4 - 3 (S-2) |
| 19 | (S) | () | Resistor | 27K ohm | (red, violet, orange, silver) | S4 - 2 (S-2) | TS2-B (NS) |
| 20 | (S) | () | Resistor | 100K ohm | (brown, black, yellow, silver) | TS2-B (NS) | R1A-4 (S-1) |
| 21 | (S) | () | Resistor | 22K ohm | (red, red, orange, silver) | TS1-A (NS) | S2 - 5 (NS) |
| Check the above steps before proceeding. | | | | | | | |
| 22 | (S) | () | Capacitor | .003 mfd | | R7 - 2 (NS) | R7 - 3 (NS) |
| 23 | (S) | () | Capacitor | .015 mfd | | R7 - 2 (S-3) | R7 - 1 (NS) |
| 24 | (S) | () | Resistor | 27K ohm | (red, violet, orange, silver) | R7 - 1 (S-2) | TS7-A (NS) |
| 25 | (S) | () | Resistor | 120K ohm | (brown, red, yellow, silver) | R7 - 3 (S-2) | TS7-B (NS) |
| 26 | (S) | () | Capacitor | .0034 mfd | (use sleeving) | R6 - 1 (S-1) | TS7-A (NS) |
| 27 | (S) | () | Capacitor | 750 mmf | | R6 - 3 (S-1) | TS7-B (NS) |
| 28 | (S) | () | Resistor | 680K ohm | (blue, gray, yellow, silver) | TS5-E (NS) | TS5-D (NS) |
| 29 | (S) | () | Resistor | 27K ohm | (red, violet, orange, silver) | TS5-D (NS) | TS5-B (NS) |
| 30 | (S) | () | Resistor | 3.3K ohm | (orange, orange, red, silver) | TS5-A (NS) | TS5-B (NS) |
| 31 | (S) | () | Capacitor | .0015 mfd | | TS5-C (NS) | TS5-D (NS) |
| 32 | (S) | () | Capacitor | .0047 mfd | | TS5-B (S-3) | TS5-C (S-3) |
| 33 | (S) | () | Resistor | 2.2 meg ohm | (red, red, green, silver) | TS3-D (NS) | TS3-B (NS) |
| 34 | (S) | () | Resistor | 120K ohm | (brown, red, yellow, silver) | TS3-D (S-4) | TS3-C (NS) |
| 35 | (S) | () | Resistor | 6.8 meg ohm | (blue, gray, green, silver) | TS3-A (S-2) | TS3-B (NS) |
| 36 | (S) | () | Capacitor | .005 mfd | | TS3-B (NS) | TS3-C (NS) |
| 37 | (S) | () | Resistor | 47K ohm | (yellow, violet, orange, silver) | S8-8 (NS) | TS4-A (NS) |
| 38 | (S) | () | Capacitor | 47 mmf | | S8-8 (S-2) | TS4-A (NS) |
| 39 | (S) | () | Capacitor | .01 mfd 20% (smaller .01 mfd disc) | | S4-5 (NS) | S4-6 (S-2) |
| 40 | (S) | () | Resistor | 27K ohm | (red, violet, orange, silver) | S4-5 (S-2) | TS2-A (NS) |
| 41 | (S) | () | Resistor | 100K ohm | (brown, black, yellow, silver) | TS2-A (NS) | R1B-4 (S-1) |
| 42 | (S) | () | Resistor | 22K ohm | (red, red, orange, silver) | S2-2 (NS) | S6-5 (S-1) |
| 43 | (S) | () | Capacitor | .01 mfd | (use 3/4" piece of sleeving to TS3-F) | S5-3 (S-2) | TS3-F (S-3) |
| 44 | (S) | () | Capacitor | .01 mfd | (use 1/2" piece of sleeving to TS3-C) | S5-6 (S-2) | TS3-C (S-3) |

Recheck the previous steps.

STEP # ASSEMBLY CHECK

- 45 (✓) () Slip a 2" piece of sleeving over a piece of bare wire and connect between TS7-D (S-3) and TS6-D (S-5).
 46 (✓) () Slip a 2 1/4" piece of sleeving over a piece of bare wire and connect between TS7-B (S-3) and TS5-D (S-5).
 47 (✓) () Slip a 2" piece of sleeving over a piece of bare wire and connect between TS5-E (S-3) and TS4-A (S-3).
 48 (✓) () Connect a bare wire between R3A -2 (S-1) and R3B -2 (S-1).
 49 (✓) () Connect a bare wire between S2-3 (S-1) and S2-4 (NS).
 50 (✓) () Connect a bare wire between TS2-A (NS) and S2-1 (S-1).

Cut the following wires. Strip each end 1/4" of insulation and connect to the points indicated.

| STEP # | ASSEMBLY | CHECK | COLOR | LENGTH | FROM | TO |
|--------|----------|-------|-------------|--------|-------------|------------|
| 51 | (✓) | () | black | 5" | TS7-C (S-3) | R3A-1 (NS) |
| 52 | (✓) | () | black | 4 1/4" | TS7-A (S-3) | R3B-1 (NS) |
| 53 | (✓) | () | white/green | 4 1/4" | R6-2 (S-2) | S8-5 (S-1) |

Cut the following wires. Strip one end 1/4" of insulation, connect this end. Strip 1/2" of insulation from the other end, leave this end free.

| STEP # | ASSEMBLY | CHECK | COLOR | LENGTH | FROM |
|--------|----------|-------|--|--------|-------------|
| 54 | (✓) | () | white | 2" | S8-2 (S-1) |
| 55 | (✓) | () | white | 4 1/4" | S8-6 (S-1) |
| 56 | (✓) | () | blue | 3 1/2" | TS5-A (S-3) |
| 57 | (✓) | () | green/white | 8 3/4" | TS3-B (S-5) |
| 58 | (✓) | () | Take the precut white/black shielded wire. Connect the inner conductor from the end of the wire without the shield to S6 Lug #2 (S-1). Connect the inner conductor of the other end to TS1 Lug #A (S-2) and pass the shield wire thru the opening of the adjacent mounting lug of TS1 (S-1). | | |
| 59 | (✓) | () | Take the 5 1/2" white/blue precut shielded wire. Connect the inner conductor from the end of the wire without the shield to S6 Lug #6 (S-1). Dress as shown and leave the other end free. | | |
| 60 | (✓) | () | Take the 6" white/green precut shielded wire. Connect the inner conductor from the end of the wire without the shield to S6 Lug #4 (S-1). Dress as shown and leave the other end free. | | |
| 61 | (✓) | () | Take the 6" white/blue precut shielded wire. Connect the inner conductor from the end of the wire without the shield to S6 Lug #3 (S-1). Dress as shown and leave this end free. | | |
| 62 | (✓) | () | Take the 6 1/2" white/green precut shielded wire. Connect the inner conductor from the end of the wire without the shield to S6 Lug #1 (S-1). Dress as shown and leave this end free. | | |
| 63 | (✓) | () | green/white | 8 1/2" | TS3-G (S-5) |
| 64 | (✓) | () | blue | 3 1/4" | S3-3 (S-2) |
| 65 | (✓) | () | black | 2 3/4" | TS2-B (S-5) |
| 66 | (✓) | () | black | 3 1/2" | TS2-A (S-6) |

Cut the following wires. Strip each end 1/4" of insulation. Connect to the points indicated.

| | | | | | | |
|----|-----|-----|--------------------------|--------|------------|-------------|
| 67 | (✓) | () | white/green | 6 1/4" | S8-7 (S-1) | R1B-2 (S-1) |
| | | | (dress over TS2 and TS3) | | | |
| 68 | (✓) | () | white/green | 2" | S2-4 (S-2) | R2B-3 (S-1) |

- 69 (✓) () Take the 6 1/2" white/brown precut shielded wire. Connect the inner conductor of the end of the wire without the shield to S2 Lug #5 (S-2). Dress over S2 switch and over TS3 Lug strip and connect the inner conductor of the other end to R3A Lug #3 (S-1) and connect the shield wire to R3A Lug #1 (S-3).
- 70 (✓) () Take the 5 1/4" white/brown precut shielded wire. Connect the inner conductor of the end of the wire without the shield to S2 Lug #2 (S-2). Connect the inner conductor of the other end to R3B Lug #3 (S-1) and connect the shield wire to R3B Lug #1 (S-3).

This completes the wiring of the control panel. Recheck the previous wiring. All connections should be soldered. Check for proper lead dress.

FINAL WIRING TO CHASSIS

Refer to Pictorial #14

STEP # ASSEMBLY CHECK

- 1 (✓) () Loosen the two screws holding the function switch bracket to the chassis. Mount the control panel to the chassis. Use #6-32 x 3/8" screws. Make certain that the four metal tabs on the panel fall into the slots in the sides of the chassis and the shaft of the function switch is centered in the mounting hole before tightening the screws.
- 2 (✓) () Use a 3/8" lockwasher under a 3/8" nut to fasten the function switch to the control panel. Be sure the locking tab falls into the small hole in the panel before tightening nut.
Tighten the two screws which mount the function switch to the side of the chassis.
- 3 (✓) () Strip 1/2" of insulation from one end of the 6 1/4" black flexible tubing. (Use a sharp knife or razor blade, cut around the tubing and slit from this point to the edge of the tubing. Peel off the insulation.)
- 4 (✓) () Pass the two wires from the S7 A. C. switch through the unstripped end of the tubing. Insert the fibre insulating bushings into each end of the tubing around the wires. Slip the unstripped end into the hole of the A. C. switch shield. Slip the bared end under the metal cable clamp on the power supply bracket. Solder the clamp to the tubing.
- 5 (✓) () Dress the wires to TS8 lug strip under the 2.2K resistor and cut to the necessary length.
- 6 (✓) () Connect either wire to TS8-A (NS).
- 7 (✓) () Connect the other wire to TS8-B (NS).
- 8 (✓) () Connect a .01 mfd 1400 volt disc capacitor from TS8-A (S-3) to TS8-B (S-3). Lay over selenium rectifier as shown.
- 9 (✓) () Dress the twisted pair of wires from the pilot light along the wires from the A. C. switch.
- 10 (✓) () Connect the black wire to C67-A (S-3).
- 11 (✓) () Connect the white wire to C67-B (S-2).

Connect the following wires from the control panel to the Channel B board.

| STEP # | ASSEMBLY | CHECK | COLOR | FROM | TO LUG # | CONNECT SHIELD WIRE TO |
|--------|----------|-------|----------------------|-------|-----------------|-------------------------------|
| 12 | (✓) | () | black | TS2-A | 63 (S-2) | |
| 13 | (✓) | () | shielded white/green | S6-4 | 61 (S-2) | Lug #55 (NS) |
| 14 | (✓) | () | shielded white/blue | S6-6 | 62 (S-2) | Lug #55 (S-5) |
| 15 | (✓) | () | green/white | TS3-B | V5 Pin #2 (S-1) | IMPORTANT: DRESS AS INDICATED |
| 16 | (✓) | () | white | S8-6 | 69 (S-2) | IN PICTORIAL |
| 17 | (✓) | () | blue | TS5-A | 68 (S-2) | |

Refer to Pictorial #15

Connect the following wires from the control panel to the Channel A board.

| STEP # | ASSEMBLY | CHECK | COLOR | FROM | TO LUG # | CONNECT SHIELD WIRE TO |
|--------|-------------------------------------|--------------------------|----------------------|-------|-----------------|---|
| 18 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | white | S8-2 | 62 (S-2) | |
| 19 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | blue | S3-3 | 63 (S-2) | |
| 20 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | shielded white/green | S6-1 | 70 (S-2) | Lug #59 (NS) |
| 21 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | shielded white/blue | S6-3 | 69 (S-2) | Lug #59 (S-4) |
| 22 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | green/white | TS3-G | V2 Pin #7 (S-1) | IMPORTANT: DRESS AS INDICATED IN PICTORIAL |
| 23 | <input type="checkbox"/> | <input type="checkbox"/> | black | TS2-B | 68 (S-2) | |

This completes the wiring of the unit. Check the previous steps to make certain that the wires are going to the correct lugs and that all connections are soldered.

FINAL ASSEMBLY

Refer to Pictorial #16

| STEP # | ASSEMBLY | CHECK | |
|--------|--------------------------|--------------------------|--|
| 1 | <input type="checkbox"/> | <input type="checkbox"/> | Install close wound end of coil spring directly over the threaded portion of the bushing on the power switch. Thread the spring over the bushing as you would a nut. |
| 2 | <input type="checkbox"/> | <input type="checkbox"/> | Slip the four spacers over the mounting studs on the escutcheon. |
| 3 | <input type="checkbox"/> | <input type="checkbox"/> | Insert the white jewel into the hole as shown (from rear side of escutcheon). |
| 4 | <input type="checkbox"/> | <input type="checkbox"/> | Mount to control panel. Use #8 lockwashers under #8-32 nuts. |
| 5 | <input type="checkbox"/> | <input type="checkbox"/> | Install knobs as shown into the pictorial. If knobs are loose on controls, insert a screwdriver into slot of control shaft and spread apart slightly until knobs fit properly. |

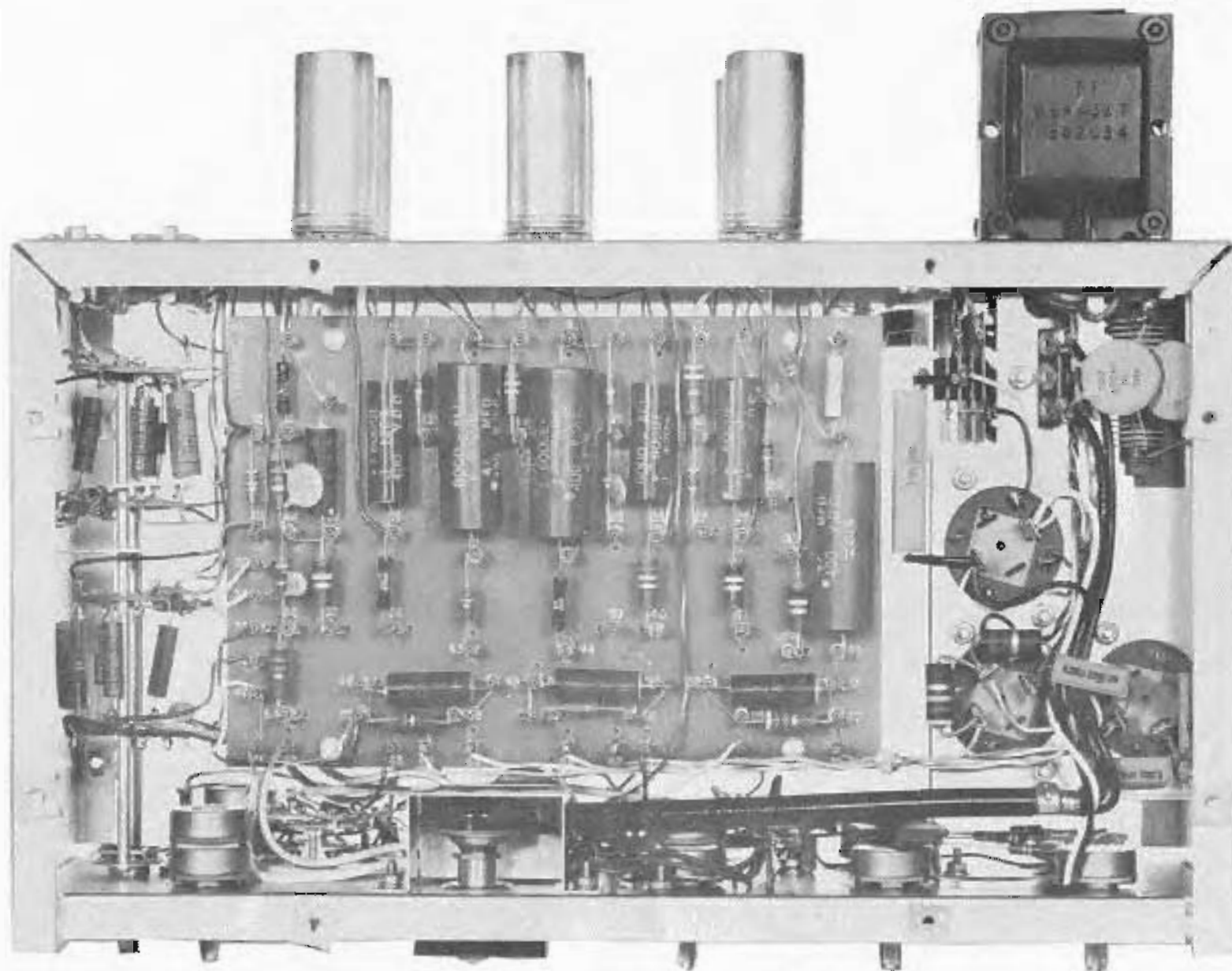
FINAL INSPECTION

| | | | |
|---|--------------------------|--------------------------|--|
| 1 | <input type="checkbox"/> | <input type="checkbox"/> | Visually inspect all connections and wiring, comparing against the Pictorials. |
| 2 | <input type="checkbox"/> | <input type="checkbox"/> | Install 1 amp fuse in fuseholder. |
| 3 | <input type="checkbox"/> | <input type="checkbox"/> | Install 12AX7 tubes. |
| 4 | <input type="checkbox"/> | <input type="checkbox"/> | Install tube shields over each tube. |
| 5 | <input type="checkbox"/> | <input type="checkbox"/> | If an ohmmeter is available, check all points in the resistance chart. |

INSTALLING BOTTOM PLATE AND TOP COVER

Refer again to Pictorial #16

| | | | |
|---|--------------------------|--------------------------|---|
| 1 | <input type="checkbox"/> | <input type="checkbox"/> | Install the four nut retainers to the bottom plate. (The positions of the holes are such that the retainers can be installed from either side of the plate.) Snap into the square holes as shown. |
| 2 | <input type="checkbox"/> | <input type="checkbox"/> | Mount the four rubber feet to the bottom plate. Use #6-32 x 5/8" screws and #6 flat washers. |
| 3 | <input type="checkbox"/> | <input type="checkbox"/> | Mount the bottom plate to the chassis. Use #6-32 x 3/8" screws. |
| 4 | <input type="checkbox"/> | <input type="checkbox"/> | Mount the top plate to the chassis. Use #6-32 x 3/8" screws. |
| 5 | <input type="checkbox"/> | <input type="checkbox"/> | Install "ground screw" in hole on rear of chassis marked "GND". |



BOTTOM VIEW OF COMPLETED UNIT

Insert the A. C. line cord into a 117 volt 60 cycle source. The tube filaments should light. Allow the preamplifier to warm up for approximately one minute. If the tubes do not light, refer to the instructions "IN THE EVENT OF DIFFICULTY".

OPERATION MANUAL

It is extremely important to read the operation manual thoroughly before attempting to operate this unit.

This manual contains complete information on installation and operation of the Citation IV. The schematic diagram is supplied as a separate insert in the operation manual. The voltage and resistance charts are also on this insert. Always refer to these charts when taking readings.

IN EVENT OF DIFFICULTY

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

1. Check the fuse. Improper wiring may cause overloading and will blow the fuse. Replace only with the same value supplied with the kit. (1 amp, 3AG)
2. Recheck all wiring beginning with the first step. A colored pencil would be helpful in tracing the leads on the pictorials as you recheck the step-by-step instructions and actual wiring.
3. Have someone with electronic experience review your wiring for he may find an error that is elusive to you.
4. Check all voltages and resistances. Variations in line voltages and components may cause as much as 20% difference from the readings listed in the table. Using a 1000 ohm per-volt instrument may further lower the readings. It is advisable to use a VTVM if one is available.
5. If your voltages do not correspond to the voltage table, critically inspect that portion of the circuit where the readings differ.
6. Check all resistors and condensers with an ohmmeter where improper operating voltages are noted.
7. If after completing the previous checks you are still unable to locate the difficulty, write to Harman-Kardon, Incorporated, Citation Kit Division, Plainview, Long Island, New York. 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 that you cannot resolve this problem by yourself.

Please write us before shipping your preamplifier for we may be able to advise you of a local warranty station equipped to assist you to obtain the specified performance from your preamplifier.

INSTALLATION PROCEDURE

The Citation IV may be easily installed in your cabinet by following the simple instructions on the mounting template supplied. Alternatively, a furniture-finished hardwood enclosure is available from your dealer as an optional extra.

VENTILATION

The Citation IV is well ventilated in itself, but sufficient space must be allowed around it to permit proper air flow. Install it in a manner to allow for unrestricted circulation. Do not cut off the air supply by putting books or other objects on or against it. Do not place the Citation IV directly above the power amplifier.

POWER AMPLIFIER CONNECTION

The Citation IV Preamplifier was specifically designed for operation with the Citation II or V Stereo Power Amplifiers. However, it is eminently suited to driving any other stereo power amplifier, or a pair of monophonic power amplifiers. If two monophonic amplifiers are used, it is strongly suggested that they be a matched pair.

One pair of preamplifier output receptacles is provided. Shielded leads with standard plugs are used for making the connection. Because the Citation IV uses low-impedance anode followers at the outputs, the power amplifiers may be placed in any location up to forty feet from the Citation IV.

When using the Citation II or V stereophonic power amplifier, connect from the Citation IV A OUTPUT receptacle to the Citation II or V CHANNEL A INPUT. Then connect a shielded lead from the Citation IV B OUTPUT receptacle to the Citation II or V CHANNEL B INPUT. If you are using a pair of monophonic amplifiers with the Citation IV, connect the A OUTPUT receptacle to one amplifier and the B OUTPUT receptacle to the other.

If center fill is required for your stereo system, a center channel monophonic amplifier (any high quality unit offering at least 30 watts) may be added. Simply connect a shielded lead from the Citation IV C OUTPUT receptacle to the input of the third channel amplifier. Be sure to connect all preamplifier and speaker leads on your power amplifiers before turning on your equipment.

TAPE HEAD PLAYBACK CONNECTION

Connect a pair of shielded leads from your stereo tape deck to the A and B TAPE HD input receptacles on the LO LEVEL INPUT strip at the rear of the Citation IV. A monophonic tape deck can be connected to either of these inputs. If your tape player has its own preamplifier, do not use the TAPE HD inputs. The next paragraph describes this type of connection.

TAPE RECORDER PLAYBACK CONNECTION

Connect the outputs of your stereo tape recorder to the A and B TAPE AMP input receptacles on the HI LEVEL INPUT strip at the rear of the Citation IV. The output of a monophonic tape recorder can be connected to either the A or B TAPE AMP input.

TAPE RECORDER RECORDING CONNECTION

Provision is made on the Citation IV to permit the recording of any program material. Connect the left input of your stereo tape recorder to the TAPE OUT receptacle A on the Citation IV, and connect the right recorder input to TAPE OUT receptacle B. A monophonic recorder can be connected to either of the TAPE OUT receptacles. These connections should be kept as short as possible to avoid loss of treble response.

TUNER CONNECTION

Connect a pair of shielded leads from the AM and FM output receptacles of your stereo tuner to the Citation IV TUNER Channel A and B receptacles. The FM lead is normally plugged into the Channel A tuner receptacle, the AM lead being connected to the Channel B receptacle. The same procedure applies if you are using separate AM and FM tuners.

If you are using a monophonic AM/FM tuner, connect it to the Channel A TUNER receptacle.

Multiplex is a form of FM stereo broadcasting where both channels are transmitted by one FM station. In addition to an FM tuner, a multiplex adaptor is necessary. For hookup information consult your adaptor instruction book.

RECORDER PLAYER CONNECTION

A stereo record player has two shielded output leads. If your record player uses a magnetic stereo cartridge, connect to the MAG PHONO receptacles, A and B, on the LO LEVEL INPUT strip at the rear of the Citation IV. If your record player uses a ceramic or crystal stereo cartridge, connect to the CER PHONO receptacles, A and B, directly below the magnetic phono input receptacles.

A monophonic cartridge of the magnetic type can be connected to either the A or B input of the MAG PHONO input. A monophonic ceramic or crystal should be plugged into the CER PHONO A or B input.

AUXILIARY INPUT CONNECTION

A pair of high-level input receptacles, marked AUX on the HI LEVEL INPUT strip, is provided for connecting an additional program source. This is for use in more complicated systems where a second tape player, telephone line, or other input source is desired.

POWER CONNECTIONS

Plug AC cord into any outlet furnishing 105-125 volts 50 or 60 cycle AC current. Three AC convenience outlets are provided on the rear deck of the Citation IV, one being live at all times and three live only when the power switch is on.

Plug the power cord on your Citation II or V (or other basic amplifier) into one of the switched outlets. Plug the power cord of your tuner into the other switched outlet. The heavy-duty Citation IV power switch will then control the preamplifier and the associated equipment.

Plug the power cord of a turntable or record changer into the unswitched receptacle; these devices are best controlled by their own switches, in order to avoid the possibility of flats on idler wheels.

OPERATION

DESCRIPTION OF THE CONTROLS:

Each control in a well designed and honestly considered high fidelity instrument has a specific useful function. A brief explanatory note on the relationship of the various front panel controls will doubtless prove useful in organizing and clarifying them for you.

The Citation IV Control Center front panel is clearly divided into four areas, each containing a group of functionally related controls.

The square gold colored area at the right contains the LOUDNESS, FUNCTION, MODE and BALANCE controls.

The upper rectangular gold area at the left contains the Channel A BASS, and TREBLE CONTROL and TONE CONTROL DEFEAT SWITCH.

The lower rectangular gold area contains the Channel B BASS and TREBLE CONTROL and the BLEND CONTROL.

The center vertical brown area contains the illuminated POWER switch, and the TAPE MON., RUMBLE, CONTOUR and SCRATCH FILTER SLIDE SWITCHES.

POWER SWITCH:

The heavy duty push-button POWER switch controls the Citation IV Preamplifier and all associated equipment with the exception of the record player, which should be controlled by its own switch. The translucent POWER switch push button lights up when power is turned on.

LOUDNESS CONTROL:

The LOUDNESS control adjusts the volume level of any program material fed into your stereo system. It is a dual control, simultaneously adjusting both channels. Its effect can be modified by the CONTOUR switch.

CONTOUR SWITCH:

One of the limitations of human hearing is its tendency to lose sensitivity to the very low pitched sounds, as the program sound level is reduced. It is this characteristic (known as the Fletcher-Munson effect) which causes one to play music programs at high listening level in order to experience the full rich tone available from fine modern recordings. The Citation CONTOUR switch compensates for the Fletcher-Munson effect, thus eliminating high listening levels as a requisite for full enjoyment of reproduced music.

For low-level listening throw the CONTOUR switch either IN or OUT depending on your listening preference. You will note how the low frequencies become more apparent while the volume level remains unchanged when the CONTOUR switch is IN.

BALANCE CONTROL:

The nature of stereo reproduction is such that it requires two identical channels to attain the highest degree of faithfulness and spatial distribution. Any variation in the efficiency of one channel as compared to the other will disturb this relationship. Since there may be slight differences between the two speakers, the tape heads, etc., the Citation IV includes a control to balance one channel against the other. Sufficient range is covered by this control to permit rebalancing of the overall system even in cases where major unbalance exists. This control may be set anywhere within its range to attain system balance. (It does not necessarily have to be set in the exact vertical position.)

When the BALANCE control is properly set, the apparent sound source will lie in a broad area between the two speakers. When BALANCE control is rotated to the right the sound will move to the right and when the control is rotated to the left, the sound will move to the left.

MODE SWITCH:

The MODE switch selects between stereo operation, where a stereo program source is available, and monophonic operation utilizing the full power of both channels and both speakers when the program source is monophonic only.

This switch has five positions. Reverse, Stereo, A & B, Mon-A and Mon. B. Stereo is the normal position for all stereo uses of the system. Reverse is to interchange Channel A and B for orchestra orientation, if needed. The A & B position is used when playing monophonic records or tape. MON A and MON B positions are used when the amplifiers and speakers are in full stereo connection, but the tuner or other input device is monophonic only and is connected to Channel A or Channel B inputs, respectively. Under these conditions, the combined power of both channels is utilized.

FUNCTION SWITCH:

The FUNCTION switch selects the desired type of program source and has six positions. It permits the choice of Auxiliary equipment, Tape, Amplifier, Tuner, Phono-RIAA, Phono-LP and Tape Hd. This switch controls all of the input receptacles located on the rear panel.

EQUALIZATION:

Phonograph playback equalization is controlled by the Phono-RIAA and Phono-LP positions on the FUNCTION switch. For all stereophonic records use PHONO-RIAA position. For all older monophonic LP's use PHONO-LP.

Tape recordings should be played with the FUNCTION switch set to TAPE HD. which automatically selects the NARTB equalization playback curve.

tone controls:

Individual BASS and TREBLE controls are provided for each channel to make it possible to balance the tone quality of one channel against the other. This, of course, is of major importance only if the two speakers, two program sources (AM & FM tuners for example) or room acoustics are unbalanced. For most stereo listening, however, the tone settings on both channels will be the same. A further application of the separate controls is in monophonic listening, to make it easy to switch from one monophonic source operating through Channel A to another operating through Channel B, having the tone settings previously adjusted.

tone control defeat switch:

When this switch is placed in the "OUT" position, all tone control circuitry is bypassed to give absolutely flat response. This eliminates transient distortion and phase shift inherent in all tone controls. To activate the tone controls, switch to the "IN" position.

RUMBLE AND SCRATCH FILTERS:

The RUMBLE switch when thrown "IN" rolls off the low frequencies effectively eliminating the possibility of speaker breathing or turntable and record rumble.

The SCRATCH switch when thrown "IN" rolls off the higher frequencies, without ringing, to eliminate unwanted record hiss.

BLEND CONTROL:

In a two-channel stereo system, where the room acoustics or too-wide spacing of the speakers cause the sound to come from two sources rather than from one very broad source, a "hole in the middle" effect exists. By rotating the BLEND control, the two apparent sound sources will be electrically "moved together", eliminating the hole in the middle. The BLEND control should be turned up just enough to satisfy the listener - further increase will degrade the stereo effect by eliminating all separation. When turned to the "OUT" position, the BLEND control is out of the circuit.

TAPE MONITOR SWITCH:

Two TAPE OUTPUT receptacles are provided on the Citation IV, to permit making tape recordings of any program being carried by the system. The signals appearing at these receptacles are unmodified by any of the control circuits, except for equalization, so that the tape recorder can provide its own proper equalization, while the main system is adjusted to the listener's taste. However, if the tape recorder is the professional type, with a third head for monitoring, it is possible to compare the recording with the original while it is being made. Simply slide the TAPE MONITOR switch to the "IN" position to listen to the recording and back to "OUT" position to listen to the original.

GENERAL OPERATING NOTES

The many operating controls of the Citation IV may at first seem elaborate and complicated. However, each is essential for some specific function, and a little practice and study of these instructions will soon familiarize you with their proper application. Don't be afraid to experiment - as long as the LOUDNESS control is at a reasonably low setting to avoid overloading the speakers or breaking your lease, no damage can be done. To maintain a low noise level on unused channels, we recommend you insert shorting plugs into all low level input receptacles.

FUSE

In the event of a potentially damaging failure of tubes or components, the Citation IV is protected by a 1.0 amp - 3 AG fuse, located on the rear deck. If this fuse blows, replace only with one of the same rating. Replacing with a fuse of a higher rating will not protect the preamplifier, and may result in severe damage, which will not be covered by the factory warranty.

TUBE REPLACEMENT

The tubes used in this instrument are available at your dealer or through the factory. Replace only with the same tube type.

ENCLOSURE

A beautiful walnut enclosure is available as optional equipment for this preamplifier. The enclosure is supplied with complete installation instructions.

You have purchased one of the finest stereo preamplifiers made. We hope you enjoy it.

PARTS LIST

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

| PART NUMBER | PARTS PER KIT | CODE DESIGNATION | DESCRIPTION |
|--------------------------|------------------|---------------------|-------------------------|
| SHEET METAL PARTS | | | |
| B3644382 | 1 | | Chassis |
| B3644265 | 1 | | Chassis, Front Panel |
| P3644523 | 1 | | Bracket, electrolytic |
| P3644269 | 2 | | Bracket, Board Mounting |
| P3644270 | 1 | | Shield, Power Switch |
| P3644267 | 1 | | Top Plate |
| P3644266 | 1 | | Bottom Plate |
| B3644368 | 1 | | Escutcheon |
| P3644825 | 1 | | Shield, slide switch |

TRANSFORMERS

| | | | |
|-----------|---|--|-------------------|
| FT3644317 | 1 | | Power Transformer |
|-----------|---|--|-------------------|

COMPONENTS, SMALL PARTS, ETC.

| | | | |
|-----------|---|------------------|---|
| B3644319 | 1 | | Terminal Board Channel A |
| B3644321 | 1 | | Terminal Board Channel B |
| STCOM3954 | 2 | | Phono Socket (4 position) |
| STCOM4253 | 3 | | Phono Socket (3 position) |
| STCOM4312 | 1 | | Phono Socket Insulator |
| HLCOM3750 | 1 | | Fuse Holder (with nut, lock, and rubber washer) |
| ZCOM3006 | 1 | | Fuse 1.0 Amp - 3 AC |
| WCOM4415 | 1 | | Line Cord |
| STCOM4517 | 6 | | 9 Pin Tube Socket |
| STCOM3453 | 6 | | Tube Shield |
| HC24625 | 3 | AC-1, AC-2, AC-3 | AC Receptacle |
| STCOM2702 | 3 | | Electrolytic Insulator |
| VM3644328 | 4 | | Spacer, Escutcheon Mounting |
| VM3644327 | 1 | | Spacer, Power Switch Mounting |
| P3644322 | 1 | | Spring, Power Switch |
| P3644736 | 1 | | Jewel, Push Button |
| P3644608 | 4 | | Rubber Foot |
| ZCOM3967 | 1 | | Black Metal Flexible Shield 6 1/4" L. |
| STCOM3656 | 2 | | Bushing, Flexible Shield |
| PCIT4610 | 8 | | Knob (medium) |

| PART NUMBER | PARTS PER KIT | CODE DESIGNATION | DESCRIPTION |
|--------------------|--------------------------|-----------------------------|---------------------|
| PCIT4611 | 1 | | Knob (large) |
| PCIT4612 | 1 | | Knob (small) |
| HC3644439 | 1 | | Pilot Light Socket |
| ZCOM2219 | 1 | | Shield, Pilot Light |
| KB1142117 | 1 | | Pilot Light #1847 |
| P3644519 | 1 | | Light Shield |
| HLCOM2864 | 1 | TS-7 | 5 Lug Strip |
| HLCOM3930 | 2 | TS-2, TS-8 | 3 Lug Strip |
| HLCOM3132 | 2 | TS-1, TS-4 | 2 Lug Strip |
| HLCOM4437 | 1 | TS-3 | 9 Lug Strip |
| HLCOM3845 | 2 | TS-5, TS-6 | 6 Lug Strip |
| Z901657 | 1 | SL-1 | Solder Lug |
| STCOM3945 | 1 | | Metal Clamp |
| STCOM3975 | 2 | | Rubber Grommet |

SWITCHES AND CONTROLS

| | | | |
|-----------|---|--------------------|----------------------------------|
| ER3644235 | 1 | S-1 | Function Switch |
| ER3644236 | 1 | S-2 | Mode Switch |
| ER3644237 | 1 | S-8 | Tone Defeat Switch |
| EP3644313 | 1 | S-7 | Power Switch (with 2 clamp nuts) |
| ESCOM3855 | 4 | S-3, S-4, S-5, S-6 | Slide Switches |
| RV3644314 | 1 | R-2 | Balance Control |
| RV3644315 | 1 | R-3 | Blend Control |
| RV3644316 | 1 | R-1 | Loudness Control |
| RV3644245 | 4 | R-4, R-5, R-6, R-7 | Bass and Treble Controls |

HARDWARE

| | | | |
|------------|----|--|--|
| KM440-6SN | 20 | | #4-40 x 3/8" Lg. B.H.M.S. (binding head machine screw) |
| KM632-6SC | 80 | | #6-32 x 3/8" Lg. B.H.M.S. (binding head machine screw) |
| KM632-10SC | 4 | | #6-32 x 5/8" Lg. B.H.M.S. (binding head machine screw) |
| KM632-16SC | 1 | | #6-32 x 1" Lg. B.H.M.S. (binding head machine screw) |
| KQ6-4SC | 1 | | #6 x 1/4" Lg. B.H.S.T.S. (binding head self tapping screw) |

| PART NUMBER | PARTS PER KIT | CODE DESIGNATION | DESCRIPTION |
|-------------|------------------|---------------------|--------------------------------|
| KL4-SN | 20 | | #4 Internal Tooth Lockwasher |
| KL6-SC | 46 | | #6 Internal Tooth Lockwasher |
| KL8-SB | 5 | | #8 Internal Tooth Lockwasher |
| PCOM4550 | 11 | | 3/8" Internal Tooth Lockwasher |
| KW6-SC | 4 | | #6 ID x 3/8 OD Flatwasher |
| KN440-SN | 20 | | #4-40 Hex Nut |
| KN632-SC | 46 | | #6-32 Hex Nut |
| KN832-SC | 5 | | #8-32 Hex Nut |
| KN1832-SC | 10 | | 3/8-32 Hex Nut |
| STCOM3762 | 25 | | Speed Nut (large) |
| STCOM4369 | 10 | | Speed Nut (small) |
| STCOM3763 | 4 | | Nut Retainer |

TUBES AND RECTIFIERS

| | | | |
|----------|---|------------|------------------|
| 12AX7 | 6 | V-1 thru 6 | 12AX7 Tube |
| Z3644384 | 1 | SR-1 | Square Rectifier |
| Z3644524 | 1 | SR-2 | Long Rectifier |

ELECTROLYTIC CAPACITORS

| | | | |
|-----------|---|---|-----------------------|
| JE3644375 | 1 | C-67 | 1000-1000 mfd/30 volt |
| JE3644444 | 1 | C-66 | 40-40-40 mfd/450 volt |
| JE3283790 | 2 | C-31, C-64 | 2 mfd/25 volt |
| JE3644421 | 8 | C-3, C-14, C-22, C-32, C-35, C-45, C-53, C-61 | 200 mfd/3 volt |
| JE3644438 | 1 | C-65 | 80-50-40 mfd/450 volt |

RESISTORS

| | | | |
|-----------|---|------------------|--|
| RWCOM4434 | 1 | R-96 | 15 ohm 10 W 10% W. W. (value marked on body) |
| RB471-.5 | 2 | R-47, R-89 | 470 ohm 1 W 5% (yellow, violet, brown, gold) |
| RB561-1 | 2 | R-12, R-54 | 560 ohm 1 W 10% (green, blue, brown, silver) |
| RB561-.5 | 2 | R-16, R-58 | 560 ohm 1 W 5% (green, blue, brown, gold) |
| RB821-.5 | 2 | R-25, R-67 | 820 ohm 1 W 5% (gray, red, brown, gold) |
| RA272-.5 | 2 | R-36, R-78 | 2.7K ohm 1 / 2 W 5% (red, violet, red, gold) |
| RWCOM4446 | 3 | R-91, R-92, R-93 | 2.2K 2 W 10% W.W. (value marked on body) |
| RA162-.5 | 2 | R-22, R-64 | 1.6K 1/2 W 5% (brown, blue, red, gold) |
| RA242-.5 | 2 | R-23, R-63 | 2.4K 1/2 W 5% (red, yellow, red, gold) |
| RA332-1 | 2 | R-38, R-80 | 3.3K 1/2 W 10% (orange, orange, red, silver) |

| PART NUMBER | PARTS PER KIT | CODE DESIGNATION | DESCRIPTION |
|-------------|------------------|------------------------------------|---|
| RB392-.5 | 2 | R-43, R-85 | 3.9K 1 W 5% (orange, white, red, gold) |
| RA472-1 | 2 | R-14, R-56 | 4.7K 1/2 W 10% (yellow, violet, red, silver) |
| RC562-1 | 1 | R-94 | 5.6K 2 W 10% (green, blue, red, silver) |
| RA472-.5-CG | 2 | R-11, R-53 | 4.7K 1/2 W 5% MF (value marked on body) |
| RA223-1 | 2 | R-28, R-70 | 22K 1/2 W 10% (red, red, orange, silver) |
| RA243-.5 | 2 | R-18, R-61 | 24K 1/2 W 5% (red, yellow, orange, gold) |
| RA273-1 | 6 | R-30, R-41, R-39, R-72, R-83, R-81 | 27K 1/2 W 10% (red, violet, orange, silver) |
| RB273-1 | 1 | R-49 | 27 K 1 W 10% (red, violet, orange, silver) |
| RA333-.5 | 2 | R-21, R-65 | 33K 1/2 W 5% (orange, orange, orange, gold) |
| RA473-1 | 2 | R-31, R-73 | 47K 1/2 W 10% (yellow, violet, orange, silver) |
| RC473-1 | 1 | R-95 | 47K 2 W 10% (yellow, violet, orange, silver) |
| RA563-1 | 2 | R-8, R-50 | 56K 1/2 W 10% (green, blue, orange, silver) |
| RB563-1 | 2 | R-15, R-59 | 56K 1 W 10% (green, blue, orange, silver) |
| RA683-1 | 2 | R-46, R-88 | 68K 1/2 W 10% (blue, gray, orange, silver) |
| RA683-.5-CG | 2 | R-27, R-69 | 68K 1/2 W 5% MF (value marked on body) |
| RA823-.5 | 2 | R-20, R-60 | 82K 1/2 W 5% (gray, red, orange, gold) |
| RA104-1 | 2 | R-29, R-71 | 100K 1/2 W 10% (brown, black, yellow, silver) |
| RB104-1 | 4 | R-44, R-48, R-86, R-90 | 100K 1 W 10% (brown, black, yellow, silver) |
| RA124-1 | 6 | R-24, R-33, R-40, R-66, R-75, R-82 | 120K 1/2 W 10% (brown, red, yellow, silver) |
| RB154-1 | 2 | R-17, R-57 | 150K 1 W 10% (brown, green, yellow, silver) |
| RA164-.5 | 2 | R-18, R-62 | 160K 1/2 W 5% (brown, blue, yellow, gold) |
| RB274-1 | 2 | R-37, R-77 | 270K 1 W 10% (red, violet, yellow, silver) |
| RA274-.5-CG | 2 | R-10, R-52 | 270K 1/2 W 5% MF (value marked on body) |
| RA474-1 | 2 | R-9, R-51 | 470K 1/2 W 10% (yellow, violet, yellow, silver) |
| RA684-1 | 2 | R-32, R-74 | 680K 1/2 W 10% (blue, gray, yellow, silver) |
| RA105-1 | 4 | R-13, R-45, R-55, R-87 | 1 Meg 1/2 W 10% (brown, black, green, silver) |
| RA125-1 | 2 | R-26, R-68 | 1.2 Meg 1/2 W 10% (brown, red, green, silver) |
| RA225-1 | 2 | R-34, R-76 | 2.2 Meg 1/2 W 10% (red, red, green, silver) |
| RA475-1 | 2 | R-42, R-84 | 4.7 Meg 1/2 W 10% (yellow, violet, green, silver) |
| RA685-1 | 2 | R-35, R-79 | 6.8 Meg 1/2 W 10% (blue, gray, green, silver) |

DISC CAPACITORS

| | | | |
|---------|---|------------------------|---------------|
| JCST322 | 2 | C-13, C-44 | 33 mmfd 10% |
| JCST323 | 4 | C-18, C-49, C-16, C-47 | 47 mmfd 10% |
| JCST268 | 4 | C-1, C-2, C-33, C-34 | 100 mmfd 10% |
| JCST290 | 2 | C-6, C-38 | 330 mmfd 10% |
| JCST267 | 2 | C-28, C-59 | 750 mmfd 10% |
| JCST300 | 2 | C-24, C-55 | .0015 mfd 10% |
| JCST279 | 2 | C-5, C-37 | .002 mfd 10% |

| PART NUMBER | PARTS PER KIT | CODE DESIGNATION | DESCRIPTION |
|-------------|------------------|---------------------|--------------------|
| JCST308 | 2 | C-25, C-56 | .003 mfd 10% |
| JCST326 | 2 | C-27, C-58 | .0034 mfd 10% |
| JCST260 | 2 | C-68, C-69 | .01 mfd/1400 V 20% |
| JCST324 | 2 | C-20, C-51 | .005 mfd 10% |
| JCST327 | 2 | C-23, C-54 | .0047 mfd 10% |
| JCST325 | 2 | C-19, C-50 | .01 mfd 10% |
| JCST265 | 2 | C-26, C-57 | .015 mfd 10% |
| JCST299 | 2 | C-17, C-48 | .01 mfd 20% |
| JCST304 | 2 | C-70, C-71 | 7.5 mmfd 10% |

TUBULAR MYLAR CAPACITORS

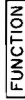
| | | | |
|-----------|---|---|-------------------|
| STCOM4729 | 2 | C-12, C-43 | .0023 mfd/100V 5% |
| STCOM4728 | 2 | C-11, C-42 | .003 mfd/100V 5% |
| STCOM4727 | 2 | C-8, C-40 | .03 mfd/100V 5% |
| STCOM4726 | 2 | C-10, C-41 | .05 mfd/100V 5% |
| STCOM4732 | 6 | C-4, C-21, C-29, C-36, C-52, C-60 | .1 mfd/400V 10% |
| STCOM4725 | 7 | C-7, C-15, C-30, C-39, C-46, C-62, C-63 | .47 mfd/400V 10% |

HARMAN-KARDON, INC.

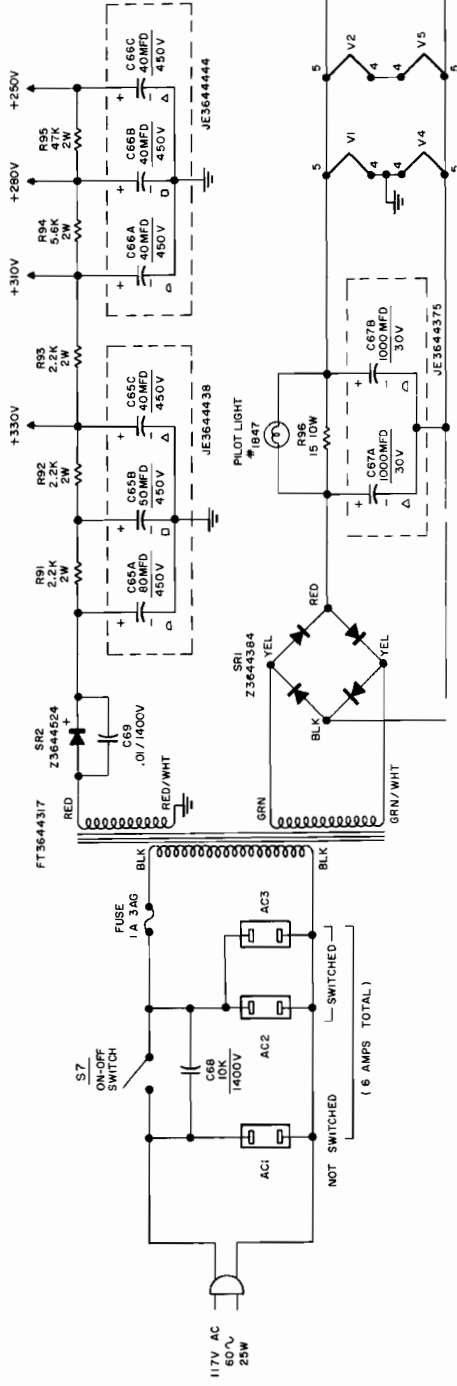
CITATION KIT DIVISION

PLAINVIEW, L. I., N. Y.

1/2 V2
I2AX7/ECC83



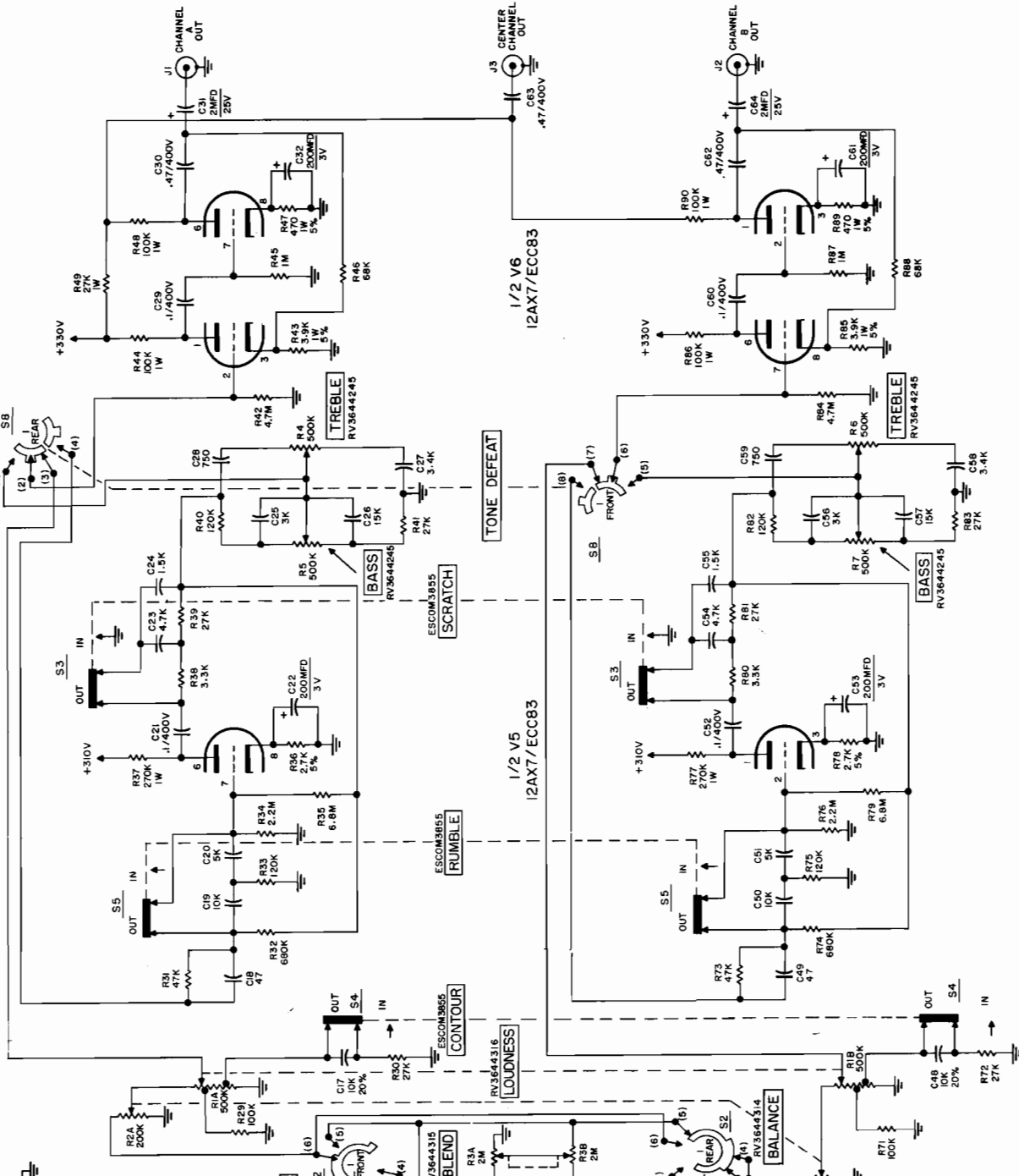
TAPE MONITOR



| ITEM | V1 | V2 | V3 | V4 | V5 | V6 |
|------|----|----|----|----|----|----|
| LINE | | | | | | |
| MET | | | | | | |
| MAX | | | | | | |
| IN P | | | | | | |
| REA | | | | | | |

1/2 V2
12AX7/ECC83

1/2 V3
12AX7/ECC83



VOLTAGE READINGS

TAGE -117V AC (READINGS TAKEN WITH 20,000 OHMS PER VOLT FUNCTION SWITCH IN TAPE POSITION, LOUDNESS CONTROL IN CLOCKWISE POSITION, ALL OTHER CONTROLS AND SWITCHES IN COUNTER-CLOCKWISE POSITION).

MAY VARY $\pm 20\%$

| ITEM | TUBE | PIN 1 | PIN 2 | PIN 3 | PIN 4 | PIN 5 | PIN 6 | PIN 7 | PIN 8 | PIN 9 |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| V1 | 12AX7 | *160V | 0V | 1.4V | 0V | 12V | 155V | CV | *7V | — |
| V2 | 12AX7 | 0V | 1.4V | 0V | 1.4V | 0V | 12V | 110V | 0V | 1.4V |
| V3 | 12AX7 | 0V | 2.4V | 0V | 2.4V | 0V | 12V | 130V | 0V | *55V |
| V4 | 12AX7 | 0V | 7V | 0V | 7V | 0V | 12V | 160V | 0V | 1.4V |
| V5 | 12AX7 | 0V | 1.4V | 0V | 1.4V | 0V | 12V | 200V | 0V | 1.4V |
| V6 | 12AX7 | 0V | 1.4V | 0V | 1.4V | 0V | 12V | 285V | 0V | 2.4V |

INGS MARKED WITH TRIANGLE DEPEND UPON THE FILAMENT RESISTANCE OF THE TUBES AND MAY VARY BETWEEN +.5V AND . VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

RESISTANCE READINGS

CAUTION - DISCONNECT AC LINE AND COMPLETELY DISCHARGE FILTER CAPACITORS BEFORE TAKING READINGS. FUNCTION SWITCH IN TAPE POSITION, LOUDNESS CONTROL IN MAXIMUM CLOCKWISE POSITION, ALL OTHER CONTROLS AND SWITCHES IN MAXIMUM COUNTER-CLOCKWISE POSITION. READINGS MAY VARY $\pm 20\%$.

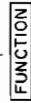
| ITEM | TUBE | PIN 1 | PIN 2 | PIN 3 | PIN 4 | PIN 5 | PIN 6 | PIN 7 | PIN 8 | PIN 9 |
|------|-------|-------|-------|--------------|---------------|---------------|-------|--------------|--------------|-------|
| V1 | 12AX7 | *330K | 470K | 4.7K | 0 | *100 Ω | *60K | 1M | 560 Ω | — |
| V2 | 12AX7 | *75K | 1.5M | 820 Ω | *130 Ω | *280K | 700K | 2.7K | — | — |
| V3 | 12AX7 | *100K | 100K | 3.9K | *130 Ω | *130K | 1M | 470 Ω | — | — |
| V4 | 12AX7 | *60K | 1M | 560 Ω | 0 | *100 Ω | *330K | 470K | 4.7K | — |
| V5 | 12AX7 | *280K | 700K | 2.7K | *130 Ω | *130K | 1.5M | 820 Ω | — | — |
| V6 | 12AX7 | *130K | 1M | 470 Ω | *130 Ω | *100K | 100K | 3.9K | — | — |

(*) READINGS MARKED WITH AN ASTERISK ARE MEASURED TO POSITIVE TERMINAL OF SELENIUM RECTIFIER (SR2).
(*) READINGS MARKED WITH DOUBLE ASTERISK DEPEND UPON THE FILAMENT RESISTANCE OF THE TUBE B MAY VARY $\pm 50\%$.

- NOTES:
- UNLESS OTHERWISE SPECIFIED -
 - 1- ALL RESISTANCE VALUES IN OHMS $\pm 10\%$.
 - 2- ALL RESISTORS 1/2 WATT.
 - 3- ALL CAPACITORS WITH DECIMAL VALUES IN MFD.
 - 4- ALL CAPACITORS WITHOUT DECIMAL VALUES IN MMF.

S391
S5644720-B

I2AX7/ECC83
V1
I2AX7/ECC83
I/2 V2

V4
I2AX7/ECC83