

PRICE \$1.00

# HEATHKIT® ASSEMBLY MANUAL



AC POWER SUPPLY  
MODEL HP-24

HEATH COMPANY • BENTON HARBOR, MICHIGAN



## INTRODUCTION

The Heathkit Model HP-24 AC Power Supply is designed to furnish operating voltages for fixed station operation of the Heathkit Model HA-14 SSB Linear Amplifier. It cannot be used with continuous, steady current flow linear amplifier such as for AM or RTTY.

Fourteen silicon diodes are used as rectifiers in a full-wave voltage-doubler circuit. This circuit provides a well regulated source for high

voltage. Bias voltage is provided by a half-wave rectifier circuit. Filament voltage is provided by a separate power transformer winding.

The power transformer has two primary windings which may be parallel connected for 120 volt operation or series connected for 240 volt operation. Circuit breakers are used in the primary circuit of the power transformer to provide overload protection. The small size of the Power Supply requires a minimum of space for installation.

### CAUTION

USE EXTREME CARE DURING INITIAL TESTING AND ALL SUBSEQUENT OPERATION OF THIS POWER SUPPLY. WHILE THE HP-24 IS DESIGNED FOR MAXIMUM SAFETY, NEVER LOOSE RESPECT FOR THE HIGH VOLTAGE PRESENT IN THIS UNIT. PROTECT YOURSELF ALWAYS AGAINST LETHAL OR SEVERE ELECTRIC SHOCK.

## CONSTRUCTION NOTES

This manual is supplied to assist you in every way to complete your kit with the least possible chance for error. The arrangement shown is the result of extensive experimentation and trial. If followed carefully, the result will be highly stable and dependable performance. We suggest that you retain the manual in your files for future reference, both in the use of the equipment and for its maintenance.

UNPACK THE KIT CAREFULLY AND CHECK EACH PART AGAINST THE PARTS LIST. In so doing, you will become acquainted with the parts. Refer to the information on the inside covers of the manual to help you identify the components. If some shortage or parts damage is found in checking the Parts List, please read the Replacement section and supply the information called for therein.

Resistors generally have a tolerance rating of 10% unless otherwise stated in the Parts List. Tolerances on capacitors are generally even greater. Limits of +100% and -20% are common for electrolytic capacitors.

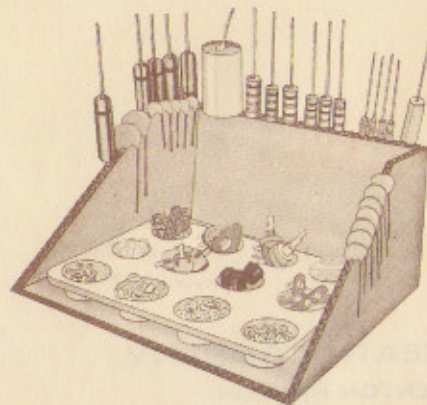
All color references throughout the Manual are abbreviated according to the following list:

Blk = black	Org = orange	Blu = blue	Wht = white
Brn = brown	Yel = yellow	Viol = violet	
Red = red	Grn = green	Gry = gray	

We suggest that you do the following before work is started:

1. Lay out all parts so that they are readily available.
2. Provide yourself with good quality tools. Basic tool requirements consist of a screwdriver with a 1/4" blade; a small screwdriver with a 1/8" blade; long-nose pliers; wire cutters, preferably separate diagonal cutters; a penknife or a tool for stripping insulation from wires; and a soldering iron (or gun). A set of nut drivers, while not necessary, will aid extensively in construction of the kit.

Most kit builders find it helpful to separate the various parts into convenient categories. Muffin tins or molded egg cartons make convenient trays for small parts. Resistors and capacitors may be placed with their lead ends inserted in the edge of a piece of corrugated cardboard until they are needed. Values can be written on the cardboard next to each component. The illustration shows one method that may be used.



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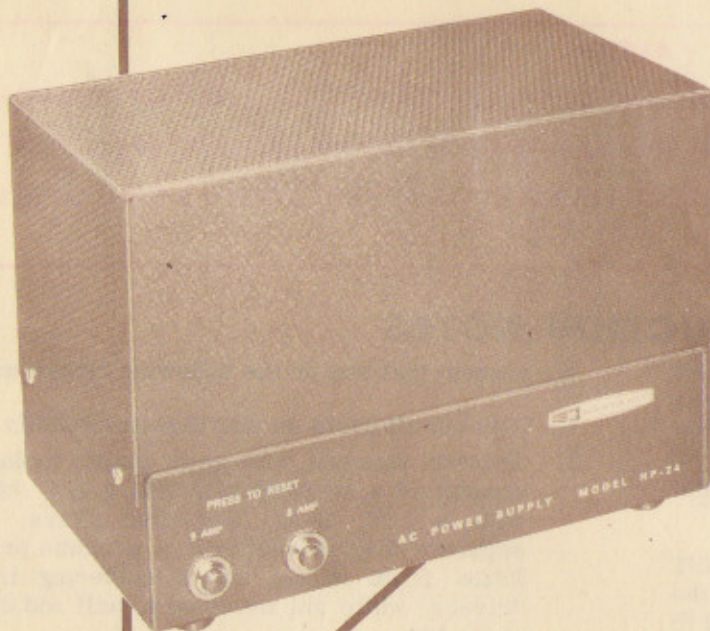


ASSEMBLY AND  
OPERATION  
OF THE



MODEL HP-24

# AC POWER SUPPLY



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## PARTS LIST

The number in red in the Parts List correspond to the numbers on the Parts Pictorial to aid in parts identification.

PART No.	PARTS Per Kit	DESCRIPTION
<b>RESISTORS</b>		
✓ 1A-22	1	1 1500 Ω 1 watt (brn-grn-red)
✓ 1B-20	1	2 100 Ω 2 watt (brn-blk-brn)
✓ 1B-24	7	100 KΩ 2 watt (brn-blk-yel)

PART No.	PARTS Per Kit	DESCRIPTION
<b>CAPACITORS</b>		
✓ 25-71	1	3 30 μfd electrolytic
✓ 25-34	6	4 125 μfd electrolytic

PART No.	PARTS Per Kit	DESCRIPTION
<b>INSULATORS-TERMINAL STRIPS</b>		
✓ 75-29	1	5 Strain relief insulator
✓ 75-53	8	6 Nylon insulator
✓ 481-3	12	7 Capacitor mounting insulator
✓ 431-14	1	8 2-lug terminal strip
✓ 431-11	1	5-lug terminal strip

PART No.	PARTS Per Kit	DESCRIPTION
<b>ADAPTER-CONNECTOR-SOCKET-PLUG</b>		
✓ 432-27	1	9 3-prong AC adapter
✓ 432-52	1	10 High voltage connector assembly
✓ 434-4	1	11 8-pin socket
✓ 438-6	1	12 8-pin plug

PART No.	PARTS Per Kit	DESCRIPTION
<b>WIRE-CABLE-SLEEVING</b>		
✓ 89-22	1	Line cord
✓ 344-13	1	Hookup wire
✓ 344-43	1	High voltage wire
✓ 347-18	1	8-wire cable
✓ 346-1	1	Small sleeving
✓ 346-7	1	Large sleeving

PART No.	PARTS Per Kit	DESCRIPTION
<b>METAL PARTS</b>		
✓ 100-M538F	1	Cabinet shell
✓ 200-M427P133P134	1	Chassis
✓ 205-M168F	1	Bottom plate

PART No.	PARTS Per Kit	DESCRIPTION
<b>HARDWARE</b>		
<b>Screws</b>		
✓ 250-170	8	13 #6 x 1/4" sheet metal
✓ 250-9	18	14 6-32 x 3/8"
✓ 250-18	4	15 8-32 x 3/8"

PART No.	PARTS Per Kit	DESCRIPTION
<b>Nuts</b>		
✓ 252-3	6	16 6-32
✓ 252-4	8	17 8-32

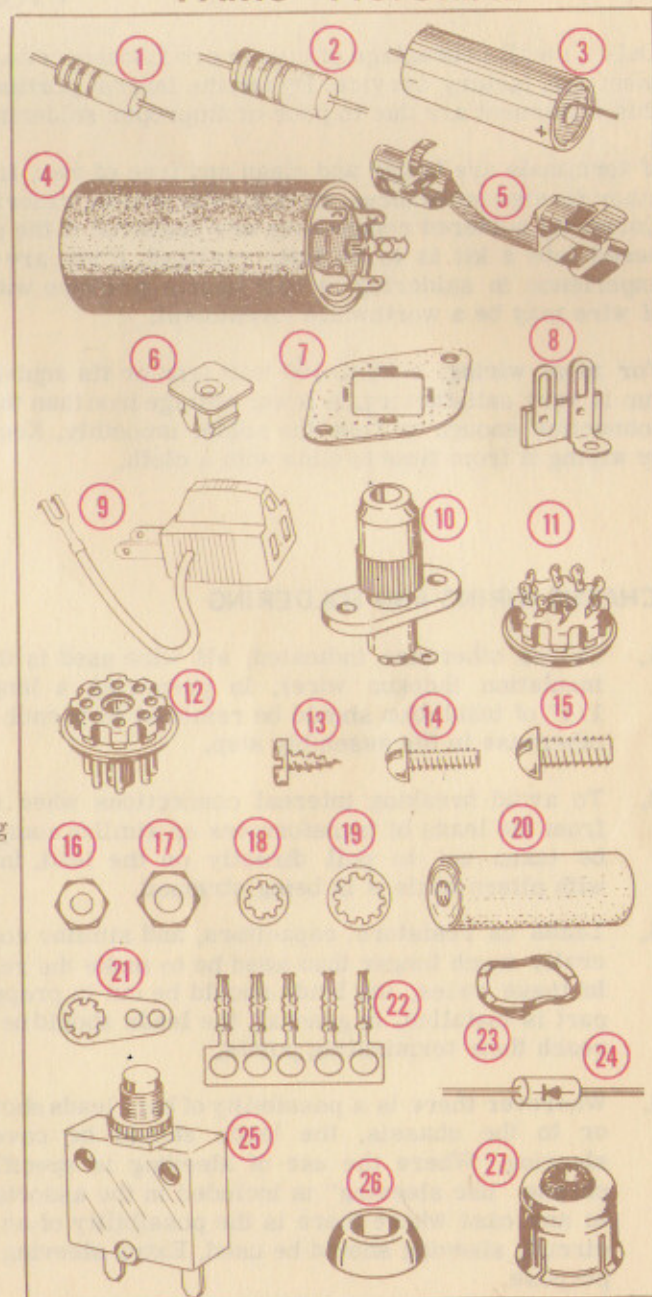
PART No.	PARTS Per Kit	DESCRIPTION
<b>Lockwashers</b>		
✓ 254-1	10	18 #6
✓ 254-2	5	19 #8

PART No.	PARTS Per Kit	DESCRIPTION
<b>Other Hardware</b>		
✓ 255-31	2	20 Spacer
✓ 259-2	3	21 #8 solder lug
✓ 259-20	5	22 Terminal pin
✓ 435-1	1	23 8-pin socket mounting ring

PART No.	PARTS Per Kit	DESCRIPTION
<b>MISCELLANEOUS</b>		
✓ 54-159	1	Power transformer
✓ 57-27	15	24 Silicon diode
✓ 65-15	2	25 Circuit breaker
✓ 261-6	4	26 Rubber feet
✓ 440-1	1	27 8-pin plug cap
✓ 85-103P132	1	Circuit board
✓ 490-5	1	Nut starter*
✓ 331-6	1	Solder
✓ 595-725	1	Manual

\*See inside of front cover.

## PARTS PICTORIAL





## PROPER SOLDERING TECHNIQUES

Only a small percentage of customers find it necessary to return equipment for factory service. By far the largest portion of malfunctions in this equipment are due to poor or improper soldering.

If terminals are bright and clean and free of wax, frayed insulation and other foreign substances, no difficulty will be experienced in soldering. Correctly soldered connections are essential if the performance engineered into a kit is to be fully realized. If you are a beginner, with no experience in soldering, a half hour's practice with some odd lengths of wire may be a worthwhile investment.

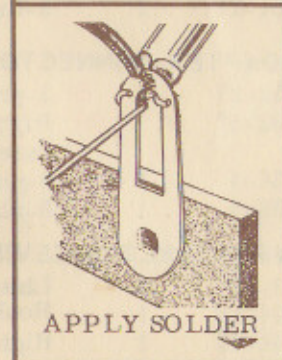
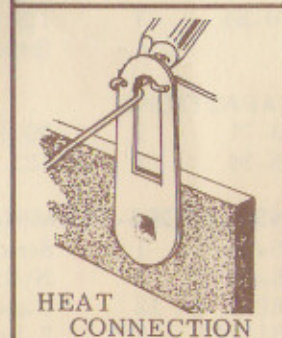
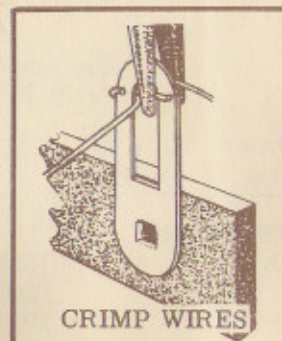
For most wiring, a 25 to 100 watt iron or its equivalent in a soldering gun is very satisfactory. A lower wattage iron than this may not heat the connection enough to flow the solder smoothly. Keep the iron tip clean by wiping it from time to time with a cloth.

### CHASSIS WIRING AND SOLDERING

1. Unless otherwise indicated, all wire used is the type with colored insulation (hookup wire). In preparing a length of hookup wire, 1/4" of insulation should be removed from each end unless directed otherwise in the assembly step.
2. To avoid breaking internal connections when stripping insulation from the leads of transformers or similar components, care should be taken not to pull directly on the lead. Instead, hold the lead with pliers while it is being stripped.
3. Leads on resistors, capacitors, and similar components, are generally much longer than need be to make the required connections. In these cases, the leads should be cut to proper length before the part is installed. In general, the leads should be just long enough to reach their terminating points.
4. Wherever there is a possibility of bare leads shorting to other parts or to the chassis, the leads should be covered with insulating sleeving. Where the use of sleeving is specifically intended, the phrase "use sleeving" is included in the associated assembly step. In any case where there is the possibility of an unintentional short circuit, sleeving should be used. Extra sleeving is provided for this purpose.

5. Crimp or bend the lead (or leads) around the terminal to form a good joint without relying on solder for physical strength. If the lead is too large to allow bending or if the step states that it is not to be crimped, position it so that a good solder connection can still be made.
6. Position the work, if possible, so that gravity will help to keep the solder where you want it.
7. Place a flat side of the soldering iron tip against the joint to be soldered until it is heated sufficiently to melt the solder.
8. Then place the solder against the connection and it will immediately flow over the joint; use only enough solder to thoroughly wet the junction. It is usually not necessary to fill the entire hole in the terminal with solder.
9. Remove the solder and then the iron from the completed joint. Use care not to move the leads until the solder is solidified.

A poor or cold solder joint will usually look crystalline and have a grainy texture, or the solder will stand up in a blob and will not have adhered to the joint. Such joints should be reheated until the solder flows smoothly. In some cases, it may be necessary to add a little more solder to achieve a smooth, bright appearance.



ROSIN CORE SOLDER HAS BEEN SUPPLIED WITH THIS KIT. THIS TYPE OF SOLDER MUST BE USED FOR ALL SOLDERING IN THIS KIT. ALL GUARANTEES ARE VOIDED AND WE WILL NOT REPAIR OR SERVICE EQUIPMENT IN WHICH ACID CORE SOLDER OR PASTE FLUXES HAVE BEEN USED. IF ADDITIONAL SOLDER IS NEEDED, BE SURE TO PURCHASE ROSIN CORE (60:40 or 50:50 TIN-LEAD CONTENT) RADIO TYPE SOLDER.



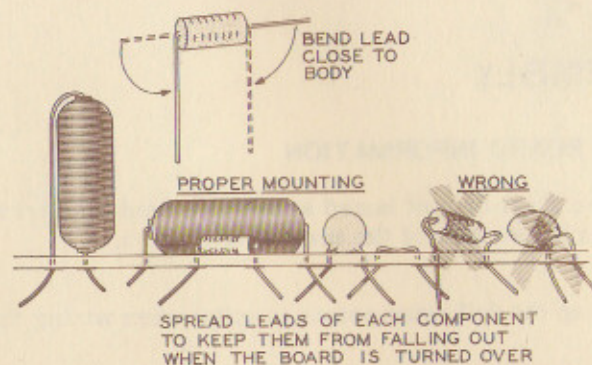
## CIRCUIT BOARD WIRING AND SOLDERING

Before attempting any work on the circuit board, read the following instructions carefully and study the Figures. It is only necessary to observe the following basic precautions to insure proper operation of the unit the first time it is turned on.

Proper mounting of components on the board is essential for good performance. A good general rule to follow is that all components on the board should be mounted tightly to the board, unless instructions state otherwise. Proper and improper methods of mounting are illustrated in the accompanying Figures.

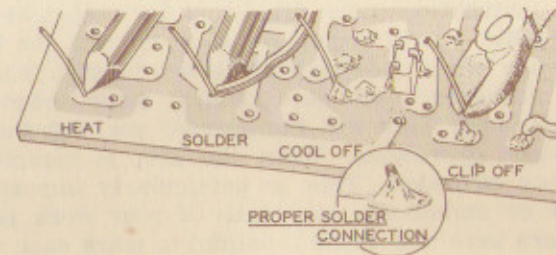
NOTE: Exercise care not to damage resistors or capacitors when bending the leads as shown.

Tubular capacitors and resistors will fit properly if the leads are bent as shown.



Parts should be inserted as instructed, and the leads bent outward, as illustrated, to lock them in place. When a group of parts have been installed on a circuit board, solder each lead to the foil pattern and clip off the excess wire.

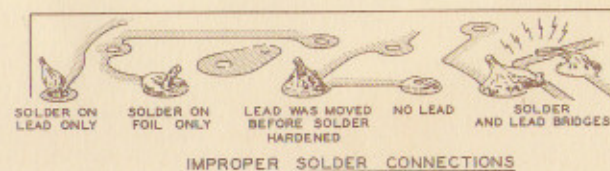
The actual technique of soldering leads to a circuit board is quite simple. Position the tip of the soldering iron so that it firmly contacts both the circuit board foil and the wire or lug to be soldered, as shown.



The iron should be held so that solder is not likely to flow to adjacent foil conductors or connections. The solder should immediately be placed between the iron and the joint to be soldered. Remove the length of solder as soon as its end begins to melt and flow onto the lead and foil. Hold the tip of the iron in place only until the solder begins to flow outward over the foil; then remove the iron quickly.

Avoid overheating the connection. A soldering pencil or small iron (approximately 25 watts) is ideal for use in circuit board work. If only a high wattage iron or soldering gun is available, precautions must be taken to avoid circuit board damage due to overheating and excess solder.

The use of excessive amounts of solder will increase the possibility of bridging between foil conductors or plugging holes which are to be left open for wires which may be added later on. If solder is accidentally bridged across insulating areas between conductors, it can be cleaned off by heating the connection carefully and quickly wiping or brushing the solder away with a soft cloth or clean brush. Holes which become plugged can be cleared by heating the area immediately over the hole while gently pushing the lead of a resistor through the hole from the opposite side, and withdrawing the lead before the solder rehardens. Do not force the lead through; too much pressure before the solder has time to soften may separate the foil from the board.





## STEP-BY-STEP PROCEDURE

The following instructions are presented in a logical step-by-step sequence to enable you to complete your kit with the least possible confusion. Be sure to read each step all the way through before beginning the specified operation. Also read several steps ahead of the actual step being performed. This will familiarize you with the relationship of the subsequent operations. When the step is completed, check it off in the space provided. This is particularly important as it may prevent errors or omissions, especially if your work is interrupted. Some kit builders have also found it helpful to mark each wire and part in colored pencil on the Pictorial as it is added.

### ILLUSTRATIONS

In general, the illustrations in this manual correspond to the actual configuration of the kit; however, in some instances the illustrations

may be slightly distorted to facilitate clearly showing all of the parts.

### SOLDERING

The abbreviation "NS" indicates that a connection should not be soldered yet as other wires will be added. When the last wire is installed, the terminal should be soldered and the abbreviation "S" is used to indicate this. Note that a number will appear after each solder instruction. This number indicates the number of leads that are supposed to be connected to the terminal in point before it is soldered. For example, if the instruction reads, "Connect a wire to lug 1 (S-2)," it will be understood that there will be two wires connected to the terminal at the time it is soldered.

## STEP-BY-STEP ASSEMBLY

### GENERAL STEP INFORMATION

When a resistor is to be installed, the step will give the resistor value, ohms sign ( $\Omega$ ), the resistor wattage rating, and abbreviated color code. For instance a 100 K ohm 2 watt resistor will be called out as follows:

( ) 100 K $\Omega$  2 watt (brn-blk-yel).

In a similar manner, a capacitor will be called out by its value in  $\mu$ fd, and its type (electrolytic). A step calling for a 40  $\mu$ fd electrolytic capacitor would read as follows: ( ) 40  $\mu$ fd electrolytic.

### CIRCUIT BOARD INFORMATION

Before you start circuit board assembly, read the Circuit Board Wiring And Soldering section of the manual on Page 5.

NOTE: Keep the following points in mind when wiring the circuit board.

1. Solder and clip off excess lead lengths after each group of six or eight parts is installed on the circuit board.
2. Do not cover unused holes when soldering.



### CIRCUIT BOARD WIRING

✓ Position the circuit board with the lettered side up as shown.

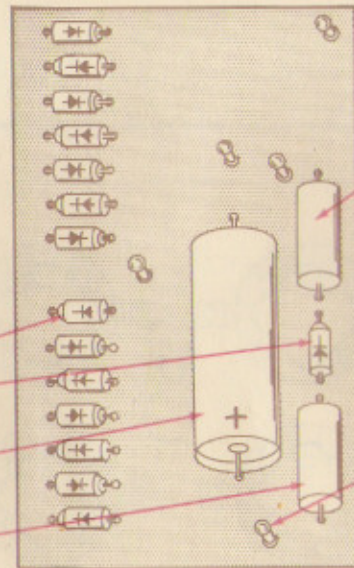
NOTE: When installing silicon diodes, position the cathode end as shown. The cathode end may be marked by a color dot, color end, or color band.



✓ Fifteen silicon diodes.

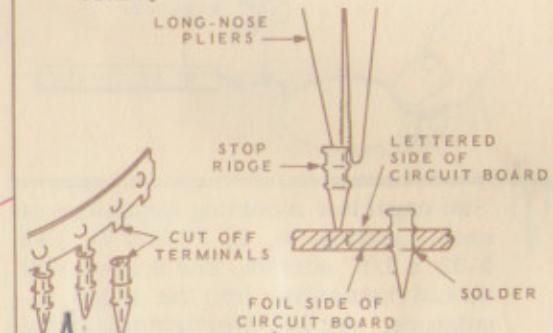
✓ 30  $\mu$ f electrolytic. Position the positive (+) end as shown.

✓ 100 K $\Omega$  2 watt (brn-blk-yel).



✓ 100  $\Omega$  2 watt (brn-blk-brn).

( ) Five terminal pins. Solder each terminal pin to the foil of the circuit board.



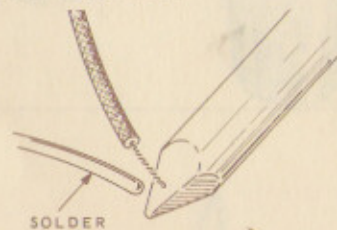
✓ Make sure all connections are soldered and cut off excess leads. Do not cut off the terminal pins.

PICTORIAL 1

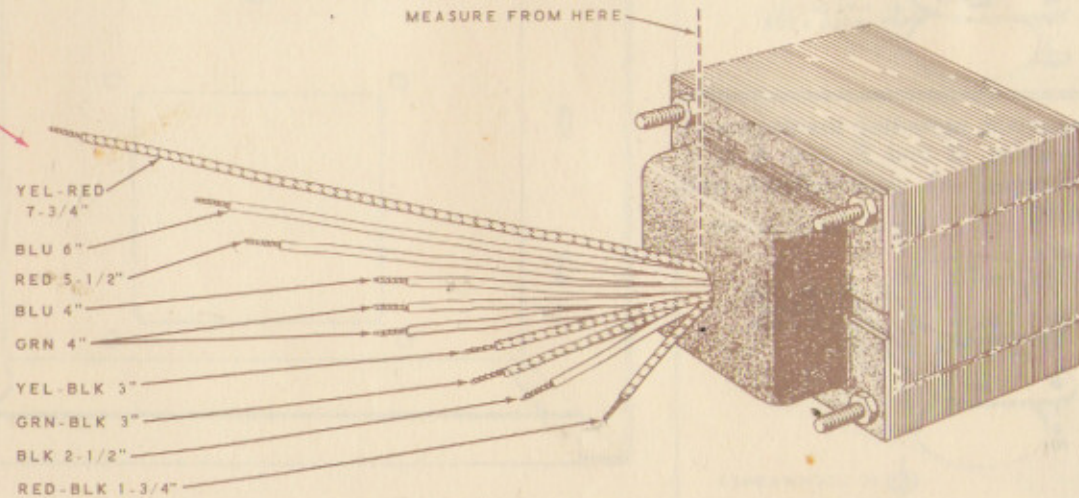
### TRANSFORMER PREPARATION

✓ Cut the power transformer (#54-159) leads to the specified lengths. Save the cut-off leads for use later.

✓ Strip 1/4" of insulation from the end of each transformer lead, and twist the small wire strands together. Melt a small amount of solder on each exposed lead end to hold the small strands together.



( ) Set the transformer aside temporarily.

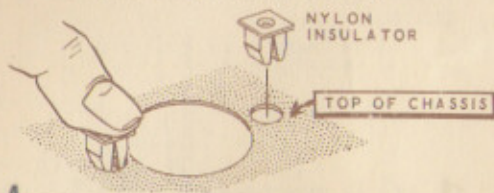


PICTORIAL 2

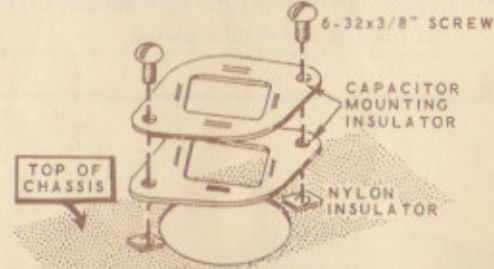


# PARTS MOUNTING

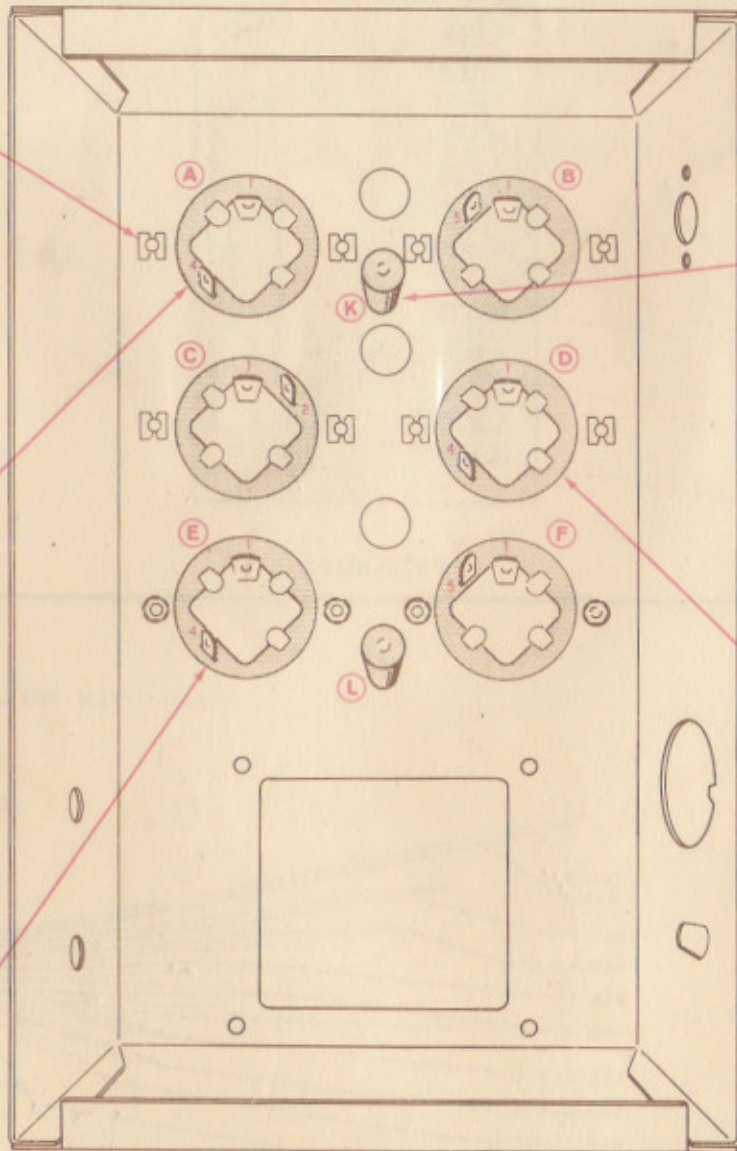
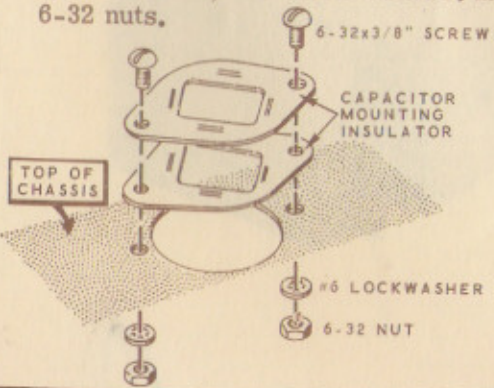
1) Insert eight nylon insulators from the top of the chassis. Push the insulators into place with your thumb.



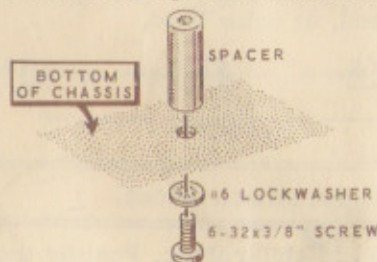
2) Two capacitor mounting insulators at each location, A, B, C, and D. Use 6-32 x 3/8" screws. The screws will thread themselves into the nylon insulators. Avoid overtightening the screws. Hold the nylon inserts with pliers to keep them from turning.



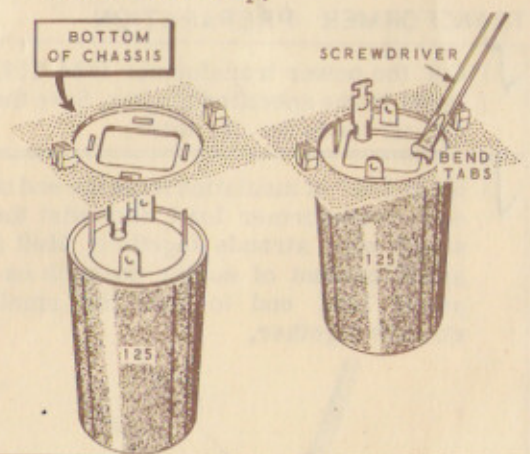
3) Two capacitor mounting insulators at each location, E and F. Use 6-32 x 3/8" screws, #6 lockwashers, and 6-32 nuts.



4) Spacers at K and L. Use #6 lockwasher and 6-32 x 3/8" screws. Do not overtighten the screws as the threads of the spacer could be stripped.



5) Six 125 μfd electrolytic capacitors at A, B, C, D, E, and F. Position each capacitor as shown. Bend all but the numbered tab inward on each capacitor. Take care not to let the screwdriver slip.

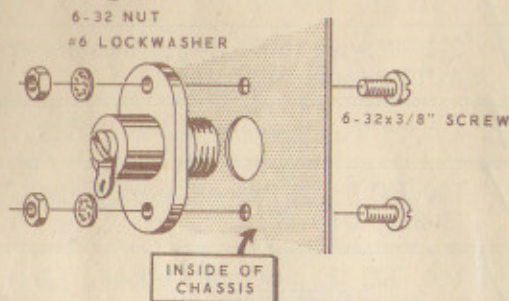


PICTORIAL 3

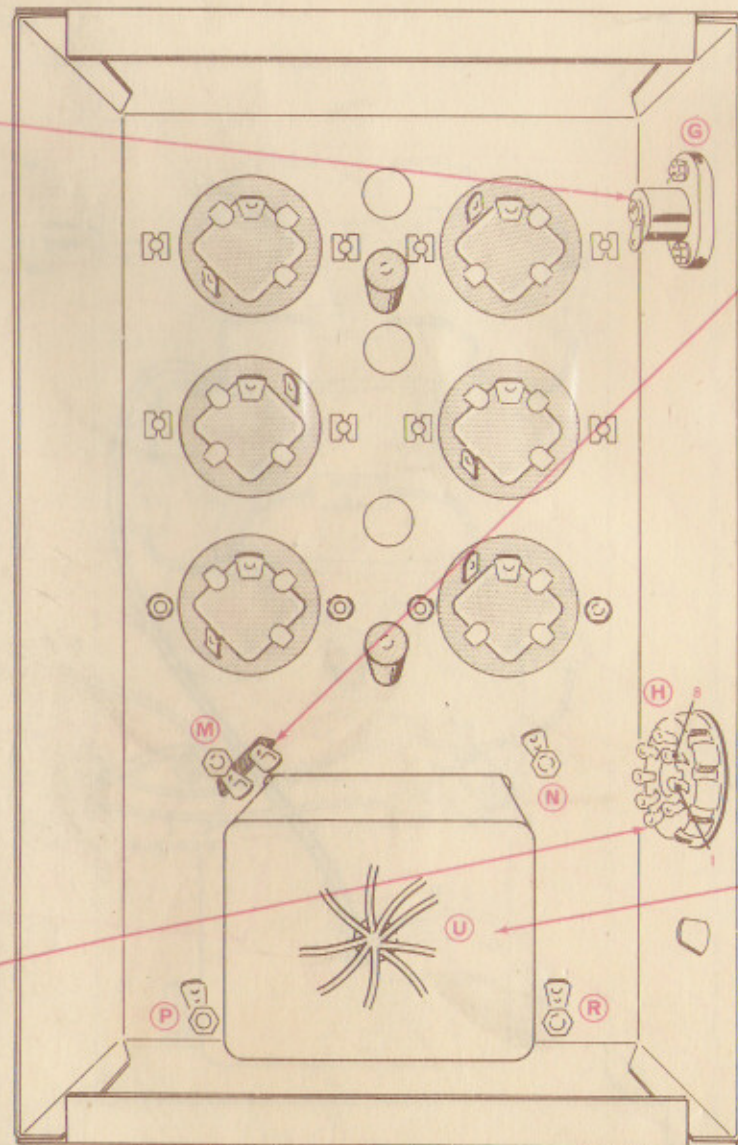


PARTS MOUNTING - CONTINUED

High voltage socket at G. Use 6-32 x 3/8" screws, #6 lockwashers, and 6-32 nuts. Be sure the socket screw is tight.

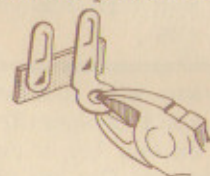


8-pin socket at H. Position lugs 1 and 8 as shown. Place one end of the 8-pin socket mounting ring in the socket groove. Using a screwdriver, press the ring into the groove around the socket.

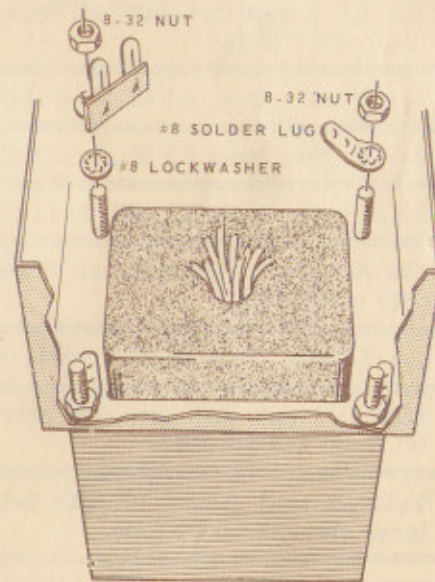


Scrape or sand off any paint overspray around holes R, M, N, and P on the bottom of the chassis.

Cut the mounting foot of the 2-lug terminal strip, and spread it open so it will fit the power transformer bolt.



Power transformer (#54-159) at U. Use #8 solder lugs and 8-32 nuts at R, N and P. Mount the prepared 2-lug terminal strip at M, using a #8 lockwasher and an 8-32 nut.



PICTORIAL 4



PRELIMINARY WIRING

Place a 1" length of small sleeving on each lead of six 100 K $\Omega$  2 watt (brn-blk-yel) resistors.

100 K $\Omega$  2 watt (brn-blk-yel) from A1 (NS) to B1 (NS).

NOTE: Use hookup wire in all wiring steps unless a wire color is specified. In these steps use the excess leads cut from the power transformer. Cut the wire to the specified length and strip 1/4" insulation from each end. Melt a small amount of solder on the exposed wire ends.

2-1/2" wire from A1 (NS) to B5 (S-1).

100 K $\Omega$  2 watt (brn-blk-yel) from A1 (S-3) to C1 (NS).

1-1/2" wire from A4 (S-1) to C1 (NS).

2-1/2" wire from C2 (S-1) to D1 (NS).

2-1/2" wire from E1 (NS) to F5 (S-1).

100 K $\Omega$  2 watt (brn-blk-yel) from E1 (NS) to M2 (NS).

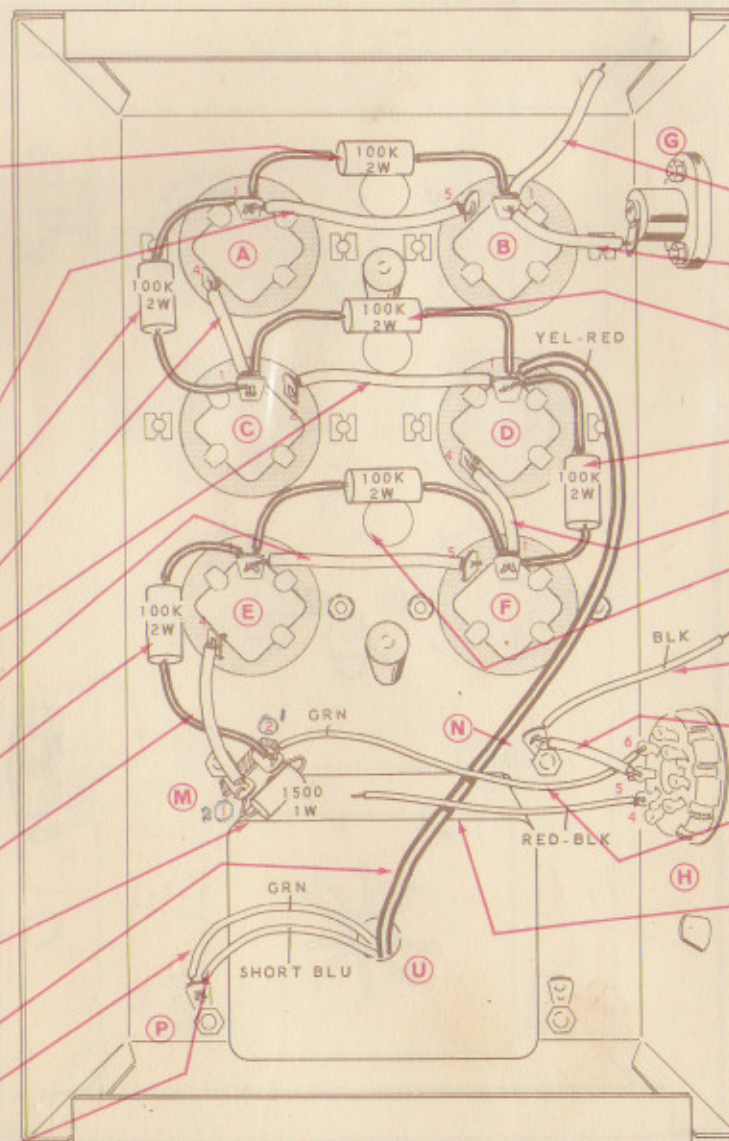
1-1/2" wire from E4 (S-1) to M1 (NS).

1500  $\Omega$  1 watt (brn-grn-red) between M1 (S-2) and M2 (NS).

Yel-red lead (from U) with 7-1/2" large sleeving to D1 (NS).

Either grn lead (from U) to P (NS).

Short blu lead (from U) to P (S-2).



2-1/4" wire to B1 (NS). The other end will be connected later.

1-1/2" wire from B1 (S-3) to G (S-1).

100 K $\Omega$  2 watt (brn-blk-yel) from C1 (S-3) to D1 (NS).

100 K $\Omega$  2 watt (brn-blk-yel) from D1 (S-4) to F1 (NS).

1-1/2" wire from D4 (S-1) to F1 (NS).

100 K $\Omega$  2 watt (brn-blk-yel) from E1 (S-3) to F1 (S-3).

3-1/4" blk wire to N (NS). The other end will be connected later.

1-1/4" wire from N (S-2) to H5 (S-1).

4-1/4" grn wire from M2 (S-3) to H6 (S-1).

5" red-blk wire to H4 (S-1). The other end will be connected later.

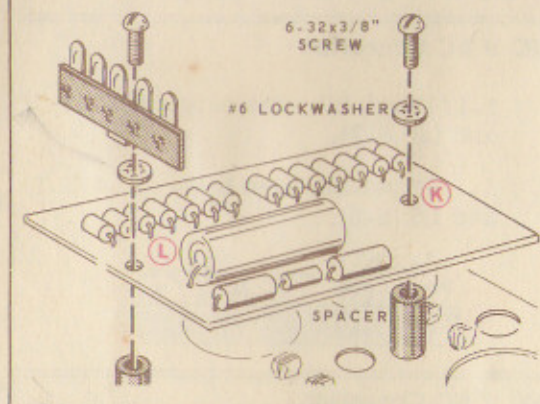
Check to see that all connections are soldered.

PICTORIAL 5

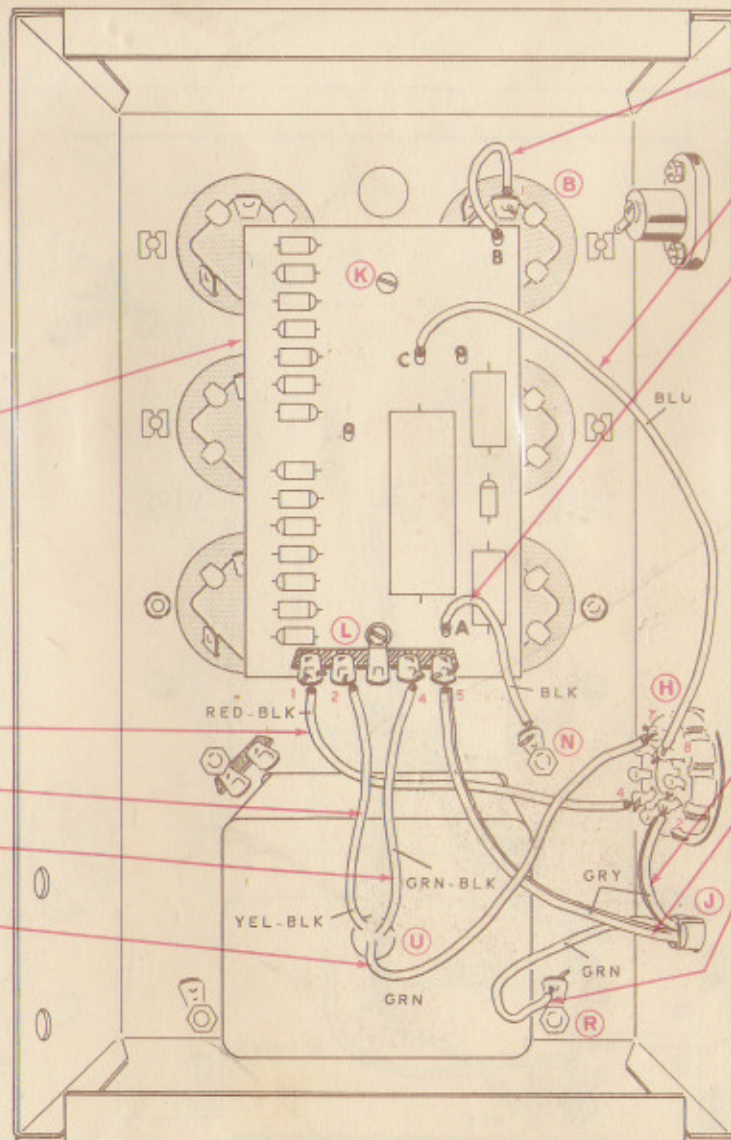


## WIRING - CONTINUED

- ✓) Circuit board with a 5-lug terminal strip at L. Use #6 lockwashers and 6-32 x 3/8" screws at K and L.



- ✓) Red-blk wire from H4, to L1 (NS).
- ✓) Yel-blk lead (from U) to L2 (NS).
- ✓) Grn-blk lead (from U) to L4 (NS).
- ✓) Remaining grn lead (from U) to H7 (S-1).

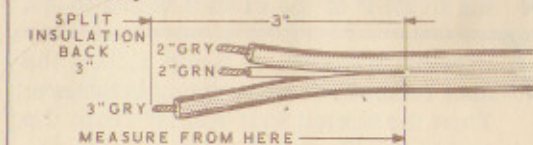


- ✓) Wire from B1, into terminal pin B of circuit board (S-1).

- ✓) 6" blu wire from H8 (S-1) to C of circuit board (S-1).

- ✓) Blk wire from N, to A of the circuit board (S-1).

- ✓) Prepare the wires at the end of the line cord as shown. Strip 1/4" of insulation from the wire ends. Melt a small amount of solder on the exposed wire ends.



- ✓) Install the line cord in hole J and connect the wires as follows:

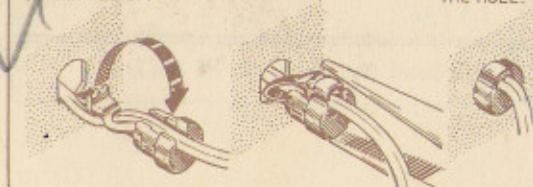
- ✓) 2" gry to H2 (S-1).
- ✓) 3" gry to L5 (NS).
- ✓) Grn to R (S-1).

Use the strain relief insulator.

PLACE THE LINE CORD IN THE SLOT OF THE STRAIN RELIEF.

SQUEEZE THE TWO SEGMENTS TOGETHER.

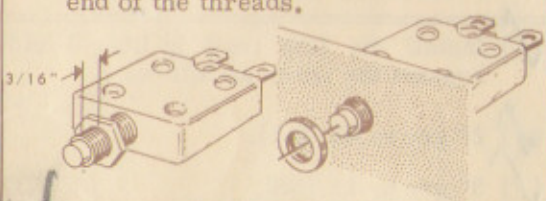
INSERT THE REAR HALF INTO THE HOLE.

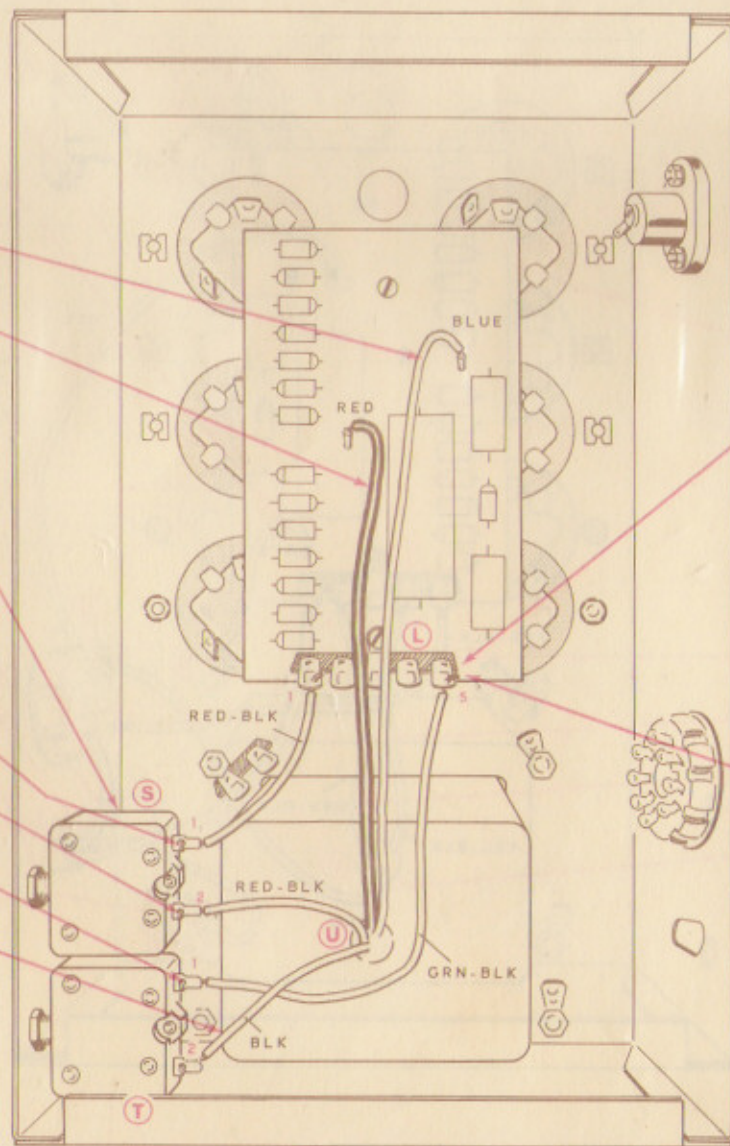


PICTORIAL 6



## FINAL WIRING

- (✓) Remaining blu lead (from U) to BLUE of the circuit board (S-1).
  - (✓) Red lead (from U) with 5" large sleeving to RED of the circuit board (S-1).
  - (✓) Circuit breakers at S and T. Use the nuts furnished on the circuit breakers. Turn the hex nut so it is 3/16" from the end of the threads.
- 
- (✓) 1-1/2" red-blk wire from L1 (NS) to S1 (S-1).
  - (✓) Red-blk lead (from U) to S2 (S-1).
  - (✓) 4" grn-blk wire from T1 (S-1) to L5 (NS).
  - (✓) Blk lead (from U) to T2 (S-1).



The Power Supply can be wired for 120 or 240 volt AC line operation. Choose the following group of steps that pertain to the line voltage you intend to use; then wire terminal strip L accordingly.

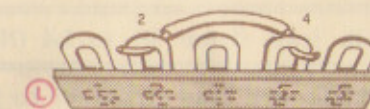
### 120 V AC Operation

- ( ) 1-1/4" yel-blk wire between L1 (S-3) and L2 (S-2).
- ( ) 1-1/4" yel-blk wire between L4 (S-2) and L5 (S-3).



### 240 V AC Operation

- (✓) 1-1/2" yel-blk wire between L2 (S-2) and L4 (S-2).



- (✓) Solder L1 (S-2).
- (✓) Solder L5 (S-2).

Check to see that all connections are soldered. Shake out any wire clippings or solder splashes.

PICTORIAL 7



## INITIAL TEST

- ( ) The following resistance measurements should be made on the Power Supply before placing it into operation. These measurements were made with an 11 megohm input VTVM. Use the RX100 range for the ALC measurement, and the RX10K range for the other two measurements. Check these resistance measurements between chassis and the locations shown below.

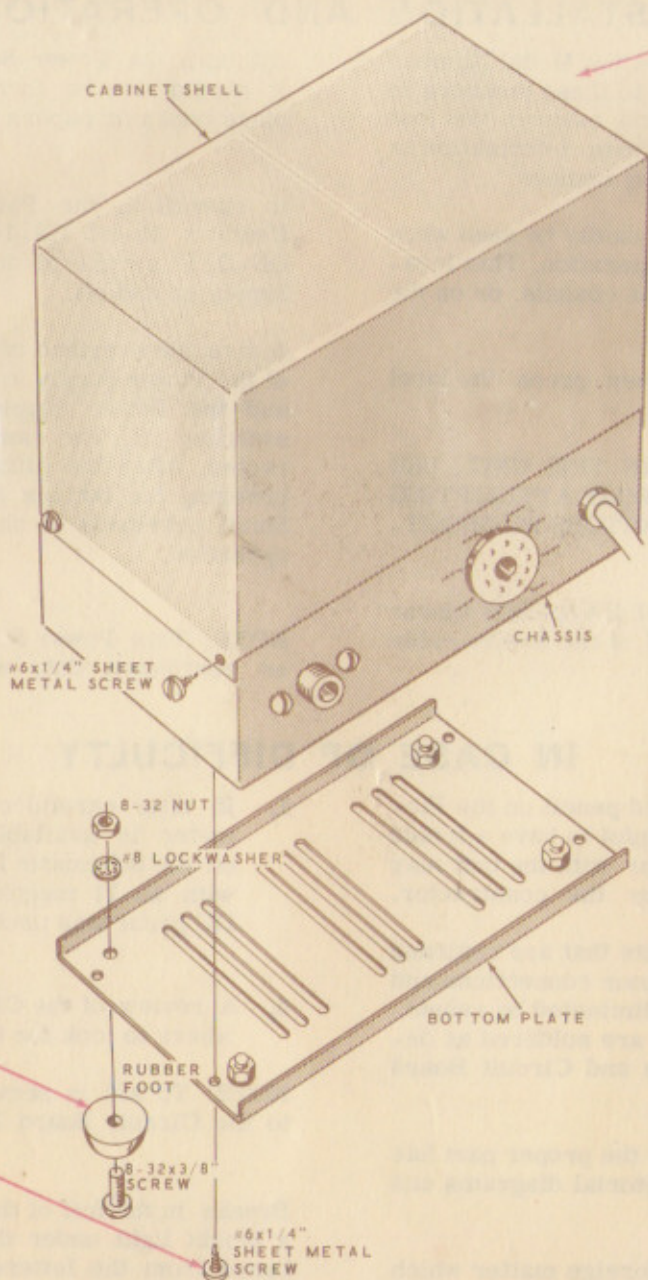


\*It may take a few seconds for the meter to reach this reading because of the charging time of the electrolytic capacitors.

If any difficulty is encountered in obtaining correct resistance reading, refer to the In Case Of Difficulty section of the Manual on Page 14.

## FINAL ASSEMBLY

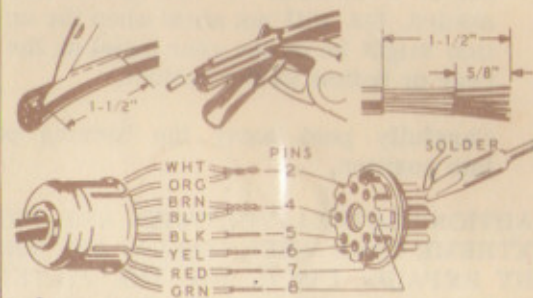
- ( ) Four rubber feet on the bottom plate. Use 8-32 x 3/8" screws, #8 lockwashers and 8-32 nuts.
- ( ) Bottom plate to chassis. Use four #6 x 1/4" sheet metal screws.



PICTORIAL 8

- ( ) Cabinet shell to chassis. Use four #6 x 1/4" sheet metal screws.

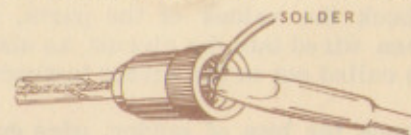
- ( ) Prepare one end of the 8-wire cable. Remove the outer insulation as shown. Strip the ends of the wires as indicated. Twist together the ends of the indicated wires as shown.



- ( ) Melt a small amount of solder on the exposed wire ends.
- ( ) Place the 8-pin plug cap over the prepared end of the 8-wire cable.
- ( ) Place the exposed wire ends into the pins of the 8-pin plug as shown, and solder them.
- ( ) Snap the 8-pin plug cap over the plug.

- ( ) Strip 5/8" from one end of the high voltage wire. Melt a small amount of solder on the exposed wire end.

- ( ) Place the exposed end of the high voltage wire into the center pin of the high voltage plug, and then solder.





## INSTALLATION AND OPERATION

NOTE: The blue and white identification label shows the Model Number and Production Series Number of your kit. Refer to these numbers in any communications with the Heath Company; this assures you that you will receive the most complete and up-to-date information in return. Install the identification label in the following manner:

1. Select a location for the label where it can easily be seen when needed, but will not show when the unit is in operation. This location might be on the rear panel or the top of the chassis, or on the rear or bottom of the cabinet.
2. Carefully peel away the backing paper. Then press the label into position.

CAUTION: LETHAL VOLTAGES ARE PRESENT IN THIS UNIT. USE EXTREME CARE WHEN MAKING ANY TESTS, BEFORE ATTEMPTING ANY REPAIRS, DISCHARGE THE FILTER CAPACITORS BY SHORTING THE B+ CONNECTOR TO THE CHASSIS.

Referring to the Assembly Manual for the Model HA-14 SSB Linear Amplifier, install the connectors to the free end of the 8-wire cable and high voltage wire of the Power Supply.

### IN CASE OF DIFFICULTY

1. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something consistently overlooked by the constructor.
2. It is interesting to note that about 90% of the kits that are returned for repair, do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by reheating all connections to make sure that they are soldered as described in the Proper Soldering Techniques and Circuit Board Wiring And Soldering sections of this manual.
3. Check the values of the parts. Be sure that the proper part has been wired into the circuit, as shown in the pictorial diagrams and as called out in the wiring instructions.
4. Check for bits of solder, wire ends or other foreign matter which may be lodged in the wiring.

Although the Power Supply does not generate a large amount of heat, it should not be located in a completely enclosed area. Also, do not place books or papers on top of the Power Supply.

In operation, the Power Supply should be connected as shown in the Heathkit Model HA-14 SSB Linear Amplifier Assembly Manual. The ON-OFF switch of the SSB Linear Amplifier also turns the Power Supply on and off.

A sizeable overload of sufficient duration will cause the circuit breakers of the Power Supply to open, thus turning both the SSB Linear Amplifier and the Power Supply off. If this happens, the equipment should be switched off. The cause of the overload should be determined and corrected. After the difficulty is corrected, reset the circuit breakers by pressing the buttons in; then place the equipment back into operation. Small overloads of short duration should not cause any interruption in operation.

NOTE: This Power Supply is not to be used for AM or RTTY operation as continuous duty will cause the power transformer to overheat.

5. If, after careful checks, the trouble is still not located and a voltmeter is available, check voltage readings against those shown on the Schematic Diagram. NOTE: All voltage readings were taken with an 11 megohm input vacuum tube voltmeter. A high voltage DC probe was used to obtain the B+ reading.
6. A review of the Circuit Description will prove helpful in indicating where to look for trouble.

NOTE: To aid in servicing or troubleshooting the Power Supply, refer to the Circuit Board X-Ray View and Chassis Photograph on Page 20.

Breaks in the foil of the circuit board can easily be detected by placing a bright light under the foil side of the board and looking through the board from the lettered side. A break will appear as a hair-line crack in the foil.



## SERVICE INFORMATION

### SERVICE

If, after applying the information in this manual and your best efforts, you are still unable to obtain proper performance, it is suggested that you take advantage of the technical facilities which the Heath Company makes available to its customers.

The Technical Consultation Department is maintained for your benefit. This service is available to you at no charge. Its primary purpose is to provide assistance for those who encounter difficulty in the construction, operation or maintenance of HEATHKIT equipment. It is not intended, and is not equipped to function as a general source of technical information involving kit modifications nor anything other than the normal and specified performance of HEATHKIT equipment.

Although the Technical Consultants are familiar with all details of this kit, the effectiveness of their advice will depend entirely upon the amount and the accuracy of the information furnished by you. In a sense, YOU MUST QUALIFY for GOOD technical advice by helping the consultants to help you. Please use this outline:

1. Before writing, fully investigate each of the hints and suggestions listed in this manual under In Case Of Difficulty. Possibly it will not be necessary to write.
2. When writing, clearly describe the nature of the trouble and mention all associated equipment. Specifically report operating procedures, switch positions, connections to other units, and anything else that might help to isolate the cause of trouble.
3. Report fully on the results obtained when testing the unit initially and when following the suggestions under In Case Of Difficulty. Be as specific as possible and include voltage readings if test equipment is available.
4. Identify the kit Model Number and Series Number, and date of purchase, if available. Also mention the date of the kit assembly manual. (Date at bottom of Page 1.)
5. Print or type your name and address, preferably in two places on the letter.

With the preceding information, the consultant will know exactly what kit you have, what you would like it to do for you and the difficulty you wish to correct. The date of purchase tells him whether or not engineering changes have been made since it was shipped to you. He will know what you have done in an effort to locate the cause of trouble and, thereby, avoid repetitious suggestions. In short, he will devote full time to the problem at hand, and through his familiarity with the kit, plus your accurate report, he will be able to give you a complete and helpful answer. If replacement parts are required, they will be shipped to you, subject to the terms of the Warranty.

The Factory Service facilities are also available to you, in case you are not familiar enough with electronics to provide our consultants with sufficient information on which to base a diagnosis of your difficulty, or in the event that you prefer to have the difficulty corrected in this manner. You may return the completed equipment to the Heath Company for inspection and necessary repairs and adjustments. You will be charged a minimal service fee, plus the price of any additional parts or material required. However, if the completed kit is returned within the Warranty period, parts charges will be governed by the terms of the Warranty. State the date of purchase, if possible.

Local Service by Authorized HEATHKIT Service Centers is also available in some areas and often will be your fastest, most efficient method of obtaining service for your HEATHKIT equipment. HEATHKIT Service Centers will honor the regular 90 day HEATHKIT Parts Warranty on all kits, whether purchased through a dealer or directly from Heath Company; however, it will be necessary that you verify the purchase date of your kit.

Under the conditions specified in the Warranty, replacement parts are supplied without charge; however, if the Service Center assists you in locating a defective part (or parts) in your kit, or installs a replacement part for you, you may be charged for this service.

HEATHKIT equipment purchased locally and returned to Heath Company for service must be accompanied by your copy of the dated sales receipt from your authorized HEATHKIT dealer in order to be eligible for parts replacement under the terms of the Warranty.



THIS SERVICE POLICY APPLIES ONLY TO COMPLETED EQUIPMENT CONSTRUCTED IN ACCORDANCE WITH THE INSTRUCTIONS AS STATED IN THE MANUAL. Equipment that has been modified in design will not be accepted for repair. If there is evidence of acid core solder or paste fluxes, the equipment will be returned NOT repaired.

For information regarding modification of HEATHKIT equipment for special applications, it is suggested that you refer to any one or more of the many publications that are available on all phases of electronics. They can be obtained at or through your local library, as well as at most electronic equipment stores. Although the Heath Company sincerely welcomes all comments and suggestions, it would be impossible to design, test, evaluate and assume responsibility for proposed circuit changes for special purposes. Therefore, such modifications must be made at the discretion of the kit builder, using information available from sources other than the Heath Company.

### REPLACEMENTS

Material supplied with HEATHKIT products has been carefully selected to meet design requirements and ordinarily will fulfill its function without difficulty. Occasionally, improper operation can be traced to a faulty component. Should inspection reveal the necessity for replacement, write to the Heath Company and supply all of the following information.

- A. Thoroughly identify the part in question by using the part number and description found in the manual Parts List.
- B. Identify the kit Model Number and Series Number.
- C. Mention date of purchase.
- D. Describe the nature of defect or reason for requesting replacement.

The Heath Company will promptly supply the necessary replacement, PLEASE DO NOT RETURN THE ORIGINAL COMPONENT UNTIL SPECIFICALLY REQUESTED TO DO SO. Do not dismantle the component in question as this will void the guarantee. This replacement policy does not cover the free replacement of parts that may have been broken or damaged through carelessness on the parts of the kit builder.

### SHIPPING INSTRUCTIONS

In the event that your instrument must be returned for service, these instructions should be carefully followed.

Wrap the equipment in heavy paper, exercising care to prevent damage. Place the wrapped equipment in a stout carton of such size that at least three inches of shredded paper, excelsior, or other resilient packing material can be placed between all sides of the wrapped equipment and the carton. Close and seal the carton with gummed paper tape, or alternately, tie securely with stout cord. Clearly print the address on the carton as follows:

To: HEATH COMPANY  
Benton Harbor, Michigan 49023

ATTACH A LETTER TO THE OUTSIDE OF THE CARTON BEARING YOUR NAME, COMPLETE ADDRESS, DATE OF PURCHASE, AND A BRIEF DESCRIPTION OF THE DIFFICULTY ENCOUNTERED. Also, include your name and return address on the outside of the carton. Preferably affix one or more "Fragile" or "Handle With Care" labels to the carton, or otherwise so mark with a crayon of bright color. Ship by insured parcel post or prepaid express; note that a carrier cannot be held responsible for damage in transit if, in HIS OPINION, the article is inadequately packed for shipment.

## WARRANTY

Heath Company warrants that all Heathkit parts shall be free of all defects in materials and workmanship under normal use and service, and in fulfillment of such warranty Heath Company will, for a period of three months from the date of shipment, replace any part upon verification that it is defective.

The foregoing warranty shall apply only to the original buyer, and is and shall be in lieu of all other warranties, whether express or implied and of all other obligations or liabilities on the part of Heath Company and in no event shall Heath Company be liable for any anticipated profits, consequential damages, loss of time or other losses incurred by the buyer in connection with the purchase, assembly or operation of Heathkits or components thereof. No replacement shall be made of parts damaged by the buyer in the course of handling or assembling Heathkit equipment.

The foregoing warranty is completely void if corrosive solder or fluxes have been used in wiring the equipment. Heath Company will not replace or repair any equipment in which corrosive solder or fluxes have been used.

This warranty applies only to Heath equipment sold and shipped within the continental United States including APO and FPO shipments. Warranty replacement for Heathkit equipment outside the United States is on an f.o.b. factory basis. Contact the Heathkit authorized distributor in your country or write: Heath Company, International Division, Benton Harbor, Michigan, U.S.A.

HEATH COMPANY



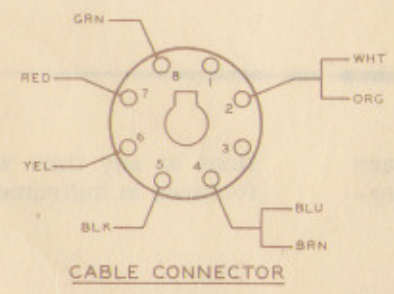
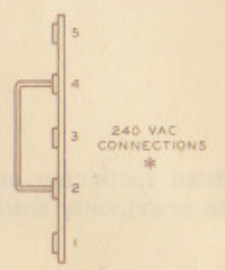
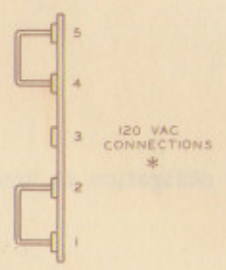
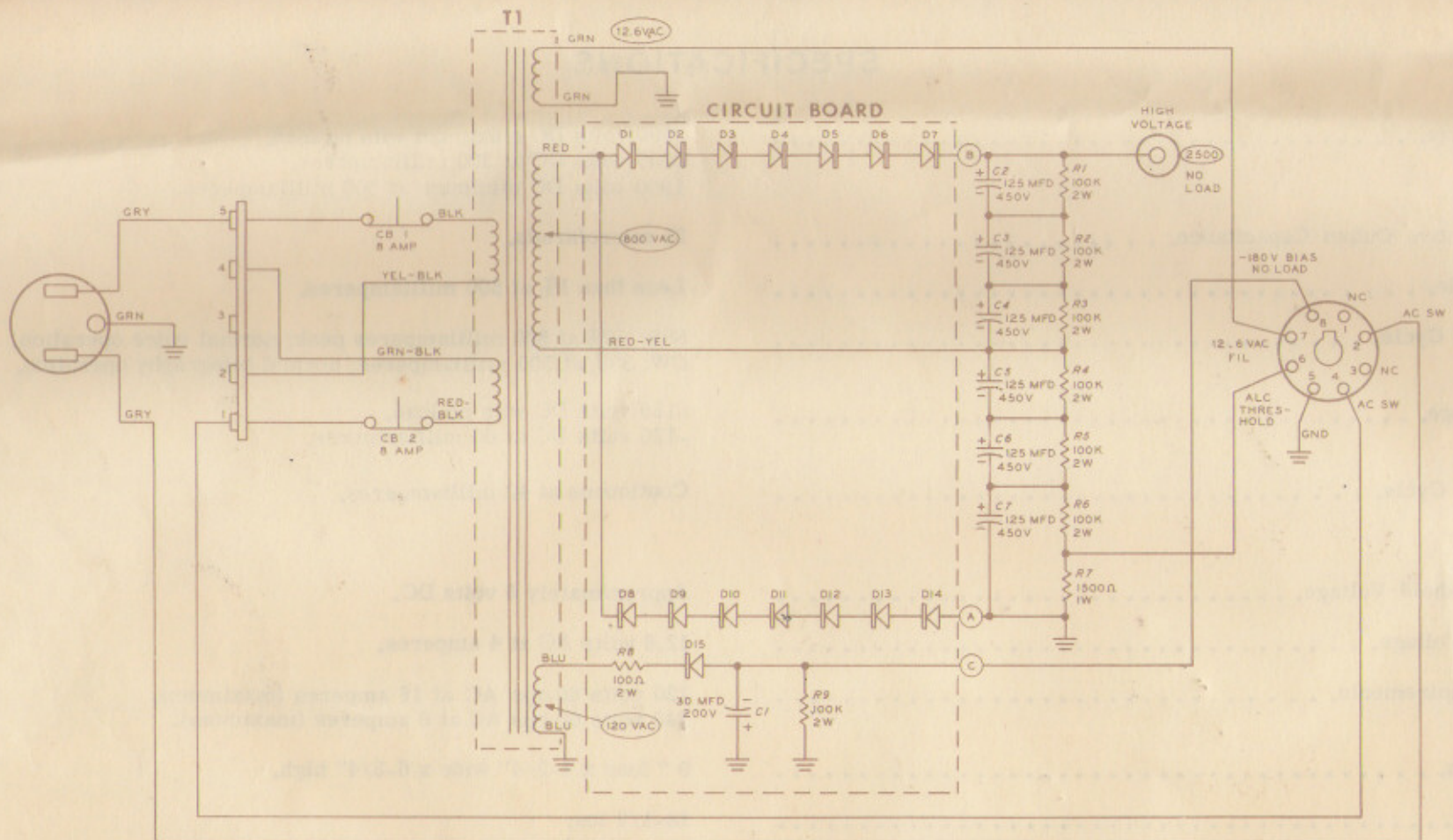
## SPECIFICATIONS

High Voltage. . . . .	2500 volts DC maximum with no load, 2000 volts DC at 300 milliamperes, 1900 volts DC minimum at 500 milliamperes.
Effective Output Capacitance. . . . .	21 microfarads.
Ripple. . . . .	Less than 1% at 500 milliamperes.
Duty Cycle. . . . .	SSB: 50% at 500 milliamperes peak; normal voice operation, CW: 33% at 500 milliamperes; normal telegraphy operation.
Bias Voltage. . . . .	-180 volts DC with no load, -120 volts DC at 60 milliamperes.
Duty Cycle. . . . .	Continuous at 40 milliamperes.
ALC Threshold Voltage. . . . .	Approximately 6 volts DC.
Filament Voltage. . . . .	12.6 volts AC at 4 amperes.
Power Requirements. . . . .	120 volts 60 cps AC at 16 amperes (maximum), 240 volts 60 cps AC at 8 amperes (maximum).
Dimensions. . . . .	9 " long x 4-3/4" wide x 6-3/4" high.
Net Weight. . . . .	18-1/2 lbs.

All prices are subject to change without notice. The Heath Company reserves the right to discontinue instruments and to change specifica-

tions at any time without incurring any obligation to incorporate new features in instruments previously sold.





ALL RESISTOR VALUES ARE IN OHMS (K = 1000).  
 ALL CAPACITOR VALUES ARE IN  $\mu$ F.  
 $\bigcirc$  INDICATES VOLTAGE READING.  
 ALL VOLTAGES ARE DC POSITIVE UNLESS MARKED OTHERWISE.  
 ALL VOLTAGES ARE MEASURED FROM POINT INDICATED TO CHASSIS GROUND,  
 EXCEPT AC VOLTAGES ON POWER TRANSFORMER WINDINGS.  
 VOLTAGE READINGS TAKEN WITH AN 11 MEGOHM INPUT VTVM. A HIGH VOLTAGE  
 DC PROBE SHOULD BE USED WITH THE VTVM TO MEASURE THE B+ VOLTAGE.  
 VOLTAGES MAY VARY  $\pm 10\%$ .  
 REFER TO THE X-RAY VIEW FOR THE PHYSICAL LOCATION OF PARTS ON THE  
 CIRCUIT BOARD.

\* OPTIONAL - SEE RIGHT-HAND COLUMN ON PAGE 12.

**SCHEMATIC OF THE  
 HEATHKIT®  
 AC POWER SUPPLY  
 MODEL HP-24**



## CIRCUIT DESCRIPTION

To better understand the circuit operation of the Power Supply, you may wish to refer to the Schematic Diagram while reading the following description.

The AC line voltage is applied to the primary winding of power transformer T1. One side of the line cord is connected in series with two lugs on the power output socket. This allows the Power Supply to be turned on and off by the ON-OFF switch of the HA-14 SSB Linear Amplifier.

The transformer is protected against overload by circuit breakers CB1 and CB2.

The power transformer has five separate windings. Each winding and its circuitry will be discussed.

### PRIMARY WINDINGS

The primary consists of two separate windings. These windings are connected in parallel for 120 volt operation, or in series for 240 volt operation.

### HIGH VOLTAGE SECONDARY WINDING

The high voltage winding (red and red-yellow leads) applies approximately 800 volts AC (rms) to a full-wave voltage-doubler circuit. The voltage doubler consists of silicon diodes D1 through D14 and capacitors C2 through C7. These diodes are connected in such a way that during one-half cycle, capacitors C2, C3, and C4 become charged,

During the next half-cycle, capacitors C5, C6, and C7 are charged. Resistors R1 through R6 are connected in the circuit to insure that the voltages across the electrolytic capacitors are equalized. The resistors also serve as a bleeder network, providing a discharge path for the capacitors.

The groups of capacitors are charged individually, but are discharged in series to produce a DC voltage equal to approximately twice the applied peak AC voltage. Because of the large value of capacitors C2 through C7, the output of the voltage-doubler circuit has a low ripple content and no further filtering is required. The large value of these capacitors also provides excellent dynamic regulation.

Resistor R7 of the bleeder network provides an ALC threshold voltage of approximately 6 volts for the SSB Linear Amplifier.

### BIAS VOLTAGE WINDING

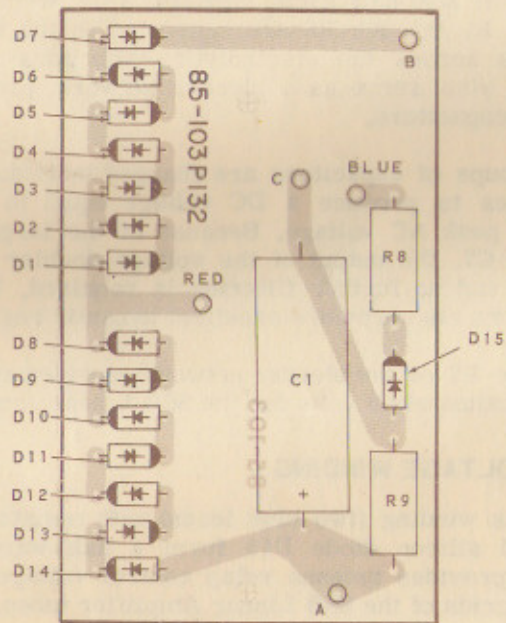
The bias winding (two blue leads) with resistors R8 and R9, capacitor C1, and silicon diode D15 form a half-wave rectifier circuit. This circuit provides antenna relay control voltage and cutoff bias voltage for the grids of the SSB Linear Amplifier tubes.

### FILAMENT WINDING

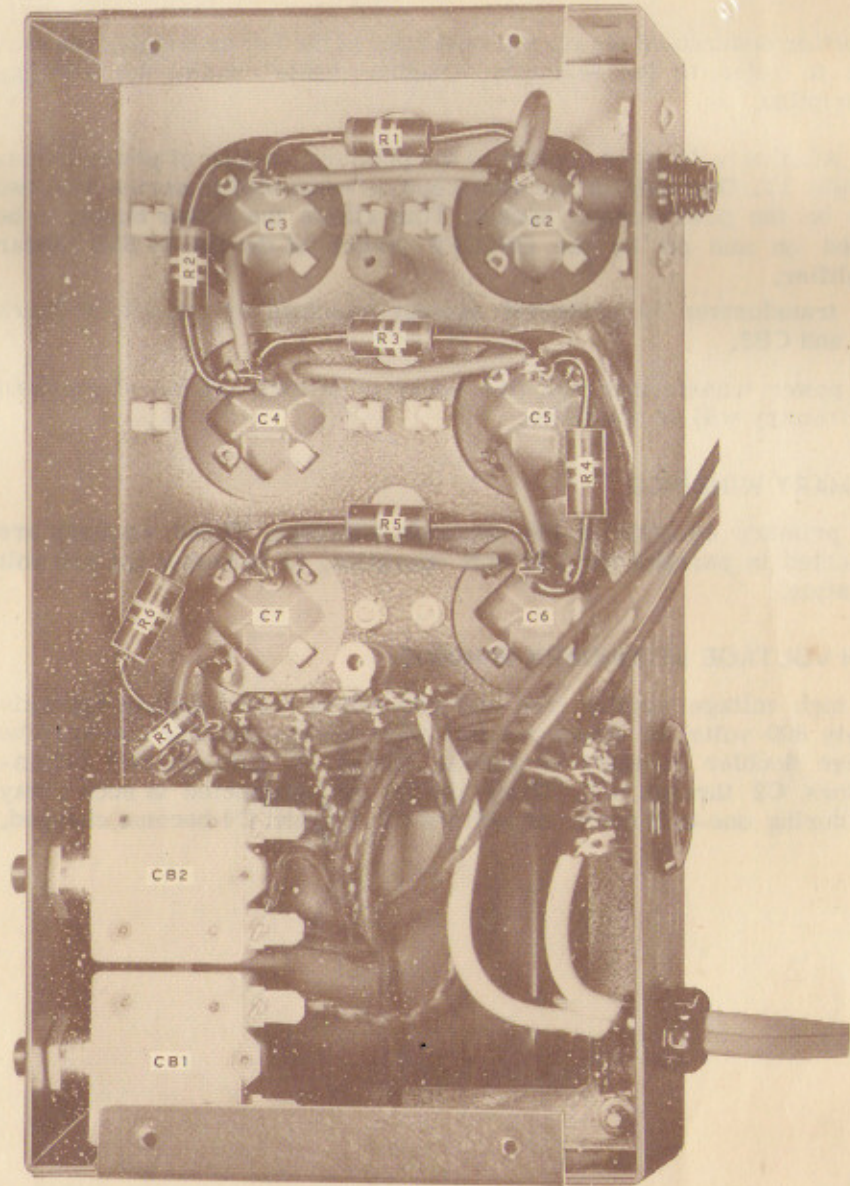
The filament winding (two green leads) provides 12.6 volts AC for the tube filaments and the pilot lamp in the meter of the SSB Linear Amplifier.



**CIRCUIT BOARD X-RAY VIEW**  
(VIEWED FROM LETTERED SIDE)



**CHASSIS PHOTOGRAPH**







# HEATH COMPANY

Phone 616-983-3961 • TWX-616-983-3897 • Benton Harbor, Michigan 49023

April 16, 1965

Dear Customer:

Please make the following observation in your HP-24 Manual before beginning assembly.

Page 7 - The capacitor value listed in the fourth step in the left-hand column is correct. The circuit board may be lettered "40  $\mu$ fd and 150 V" however, the 30  $\mu$ fd 200 V capacitor should be used.

Thank you,

HEATH COMPANY

HP-24  
4-16-65