

PRICE \$2.00

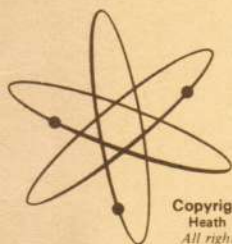
HEATH COMPANY • BENTON HARBOR, MICHIGAN

HEATHKIT[®] ASSEMBLY MANUAL



AC POWER SUPPLY
MODEL HP-23B

595-1416



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Assembly and Operation of the



AC POWER SUPPLY MODEL HP-23B



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HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

INTRODUCTION

The Heathkit Model HP-23B AC Power Supply is designed to provide all the necessary operating voltages for fixed station operation of Heathkit amateur radio transceivers. The versatility and many features of this Power Supply also make it ideal for use with many other types of amateur radio equipment.

The Power Supply features a high voltage source, a choice of two low voltage sources, a fixed bias source, and a 12.6 volt filament source. Extensive filtering and good regulation is provided for the dc sources. The power transformer has a dual primary winding which can be connected for operation from either 120 or 240 Vac power lines.

A series connection is provided at the power output socket to permit turning the Power Supply on or off remotely from

the equipment with which it is used. A toggle switch on the Power Supply is used to select the value of low B+ voltage available at the output socket. The switch also will turn off the Power Supply. A circuit breaker in the primary circuit provides overload and short circuit protection.

All output voltage connections from the Power Supply are made through the power output socket on the chassis. This provides an easy means of rapidly changing the equipment from mobile to fixed station operation.

Read the "Kit Builders Guide" for complete information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.

PARTS LIST

Check each part against the following list. The key numbers correspond to the numbers on the Parts Pictorial (fold-out from Page 3).

To order replacement parts, use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to the "Parts Replacement" section in the "Kit Builders Guide."

KEY PART No.	PART No.	PARTS Per Kit	DESCRIPTION	PRICE Each
RESISTORS				
A1	1-46-1	1	27 k Ω (red-violet-orange), 1-watt	.10
A2	1-15-2	1	1000 Ω (brown-black-red), 2-watt	.15
A2	1-24-2	5	100 k Ω (brown-black-yellow), 2-watt	.15

KEY PART No.	PART No.	PARTS Per Kit	DESCRIPTION	PRICE Each
CAPACITORS				
B1	25-20	2	40 μ F, 150 volt electrolytic	.60
B2	25-36	1	40 μ F, 450 volt electrolytic	1.05
B3	25-265	4	125 μ F, 500 volt electrolytic	2.50

KEY PART No.	PARTS No.	PARTS Per Kit	DESCRIPTION	PRICE Each
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HARDWARE

#6 Hardware

C1	250-8	8	#6 x 3/8" sheet metal screw	.05
C2	250-89	9	6-32 x 3/8" screw	.05
C3	252-3	9	6-32 nut	.05
C4	254-1	9	#6 lockwasher	.05
C5	259-1	1	#6 solder lug	.05

#8 Hardware

C6	250-137	6	8-32 x 3/8" screw	.05
C7	252-4	10	8-32 nut	.05
C8	254-2	10	#8 lockwasher	.05
C9	259-2	2	#8 solder lug	.05

MISCELLANEOUS

D1	57-27	7	Silicon diode, 600 V, 1A (1N2071)	.50
D2	431-40	1	4-lug terminal strip	.10
D3	431-55	1	6-lug terminal strip	.10
D4	481-1	2	Metal capacitor mounting wafer	.10
D4	481-3	2	Phenolic capacitor mounting wafer	.10
D5	438-29	1	11-pin plug	.45
D6	440-1	1	Plug cap	.20
D7	434-118	1	11-lug socket	.40
D8	435-1	1	Socket mounting ring	.10
D9	61-12	1	DPDT toggle switch	1.70
D10	65-17	1	Circuit breaker (2.92 ampere)	.65
D11	73-4	1	5/16" grommet	.10
D12	75-71	1	Strain relief	.10

KEY PART No.	PARTS No.	PARTS Per Kit	DESCRIPTION	PRICE Each
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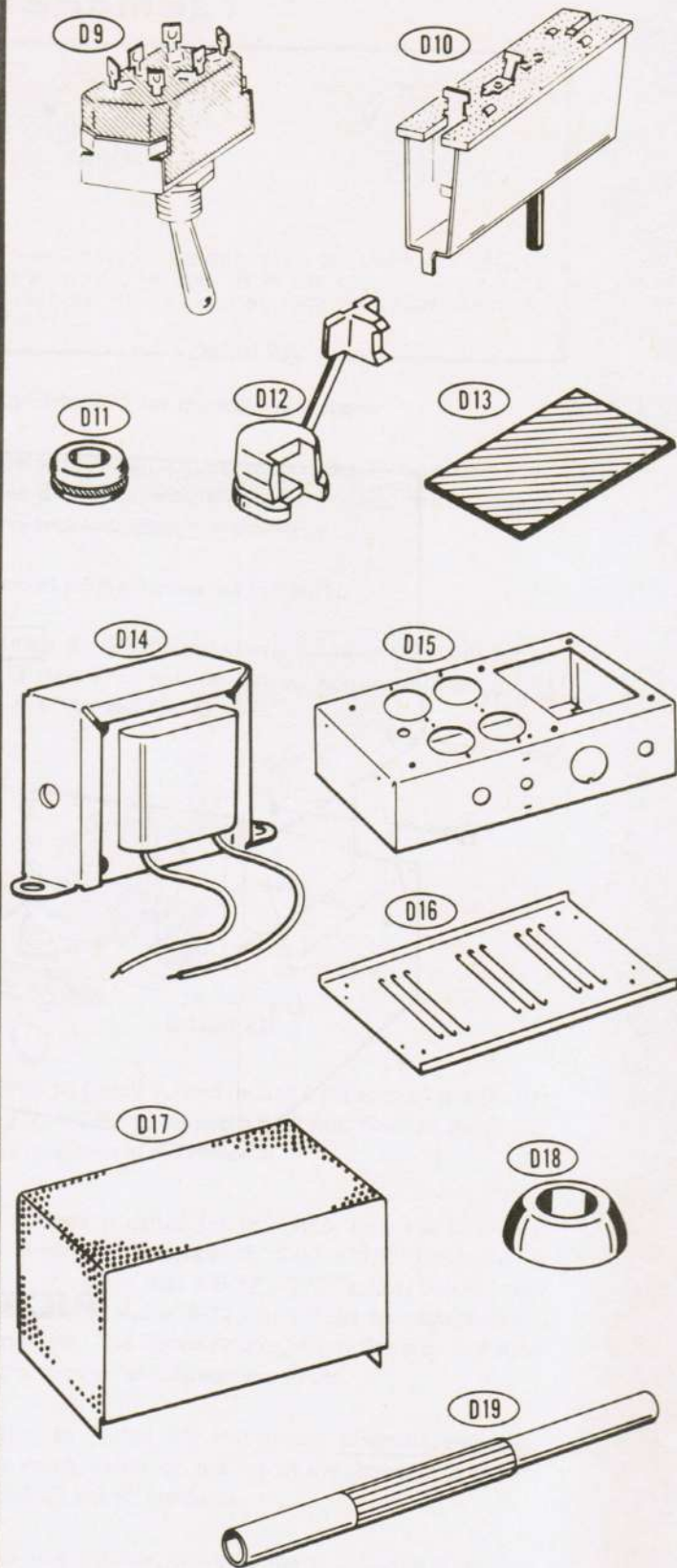
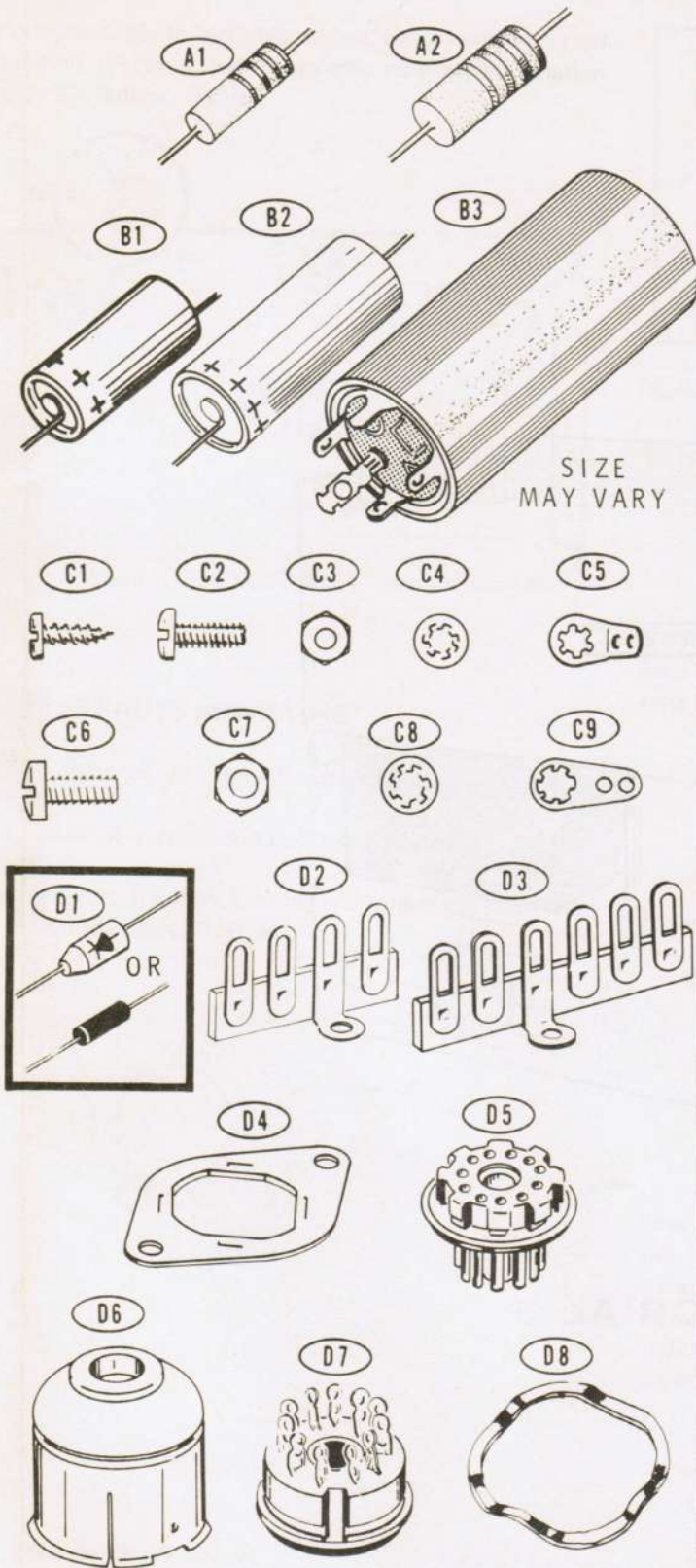
Miscellaneous (cont'd.)

D13	75-93	1	Insulating paper (adhesive backed)	.10
	54-807	1	Power transformer	17.30
D14	46-56	1	Filter choke	6.00
D15	200-634-1	1	Chassis	3.85
D16	205-168-1	1	Bottom plate	.65
D17	100-538-1	1	Cabinet shell	1.35
D18	261-6	4	Rubber foot	.10
	347-52	1	8-wire cable	.35/ft
	346-1	1	Small sleeving	.05/ft
	346-7	1	Large sleeving	.05/ft
	89-23	1	Line cord	.75
	390-926	1	Caution label	.15
	391-34	1	Blue and white label	
D19	490-5	1	Nut starter	.10
	597-260	1	Parts Order Form	
	597-308	1	Kit Builders Guide	
		1	Manual (See front cover for part number.)	2.00

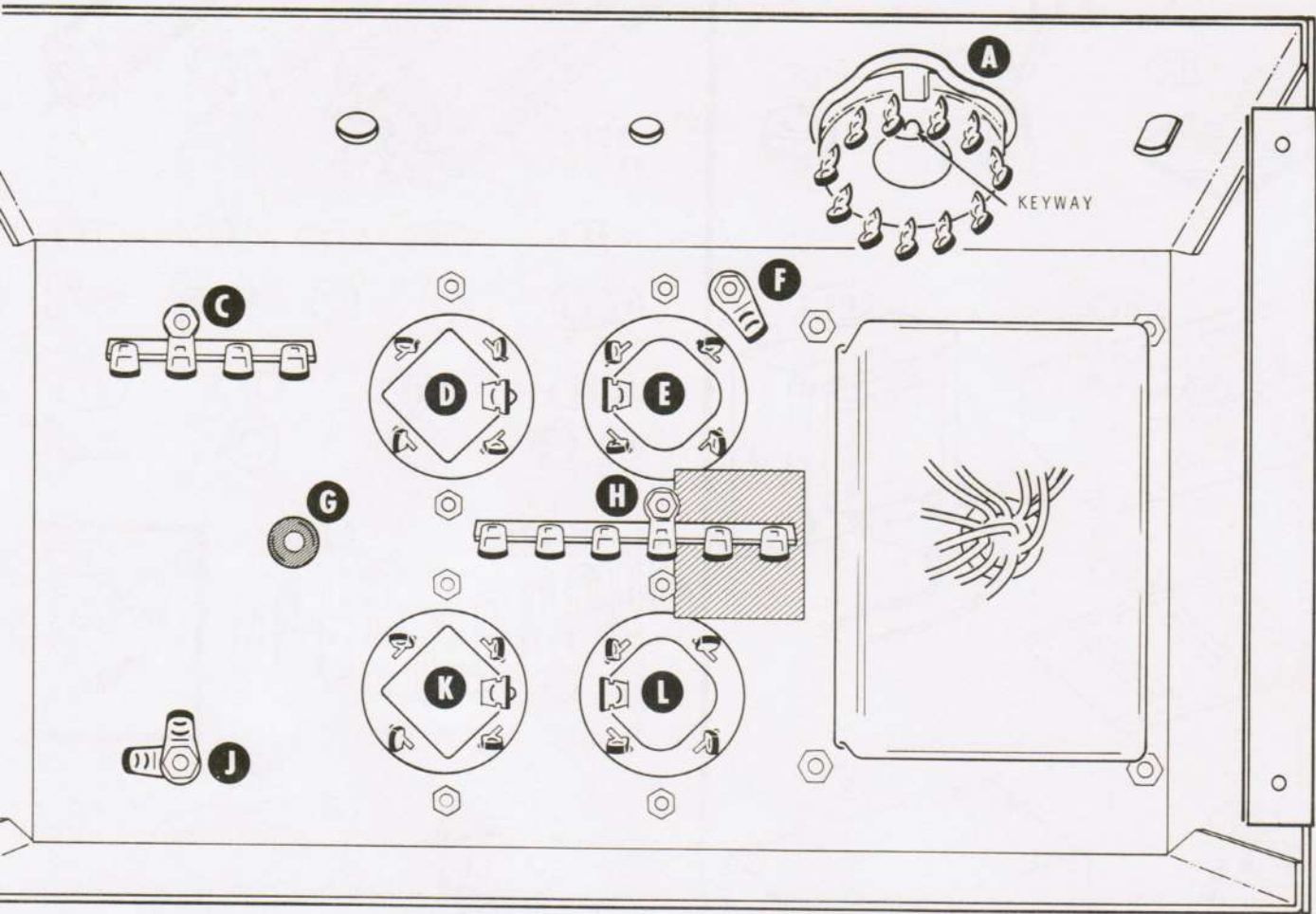
Solder (Additional 3' rolls of solder, #331-6, can be ordered for 15 cents each.)

The above prices apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering from a Heathkit Electronic Center to cover local sales tax, postage, and handling. Outside the U.S.A. parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties, and rates of exchange.

PARTS PICTORIAL



PARTS PICTORIAL



PICTORIAL 2

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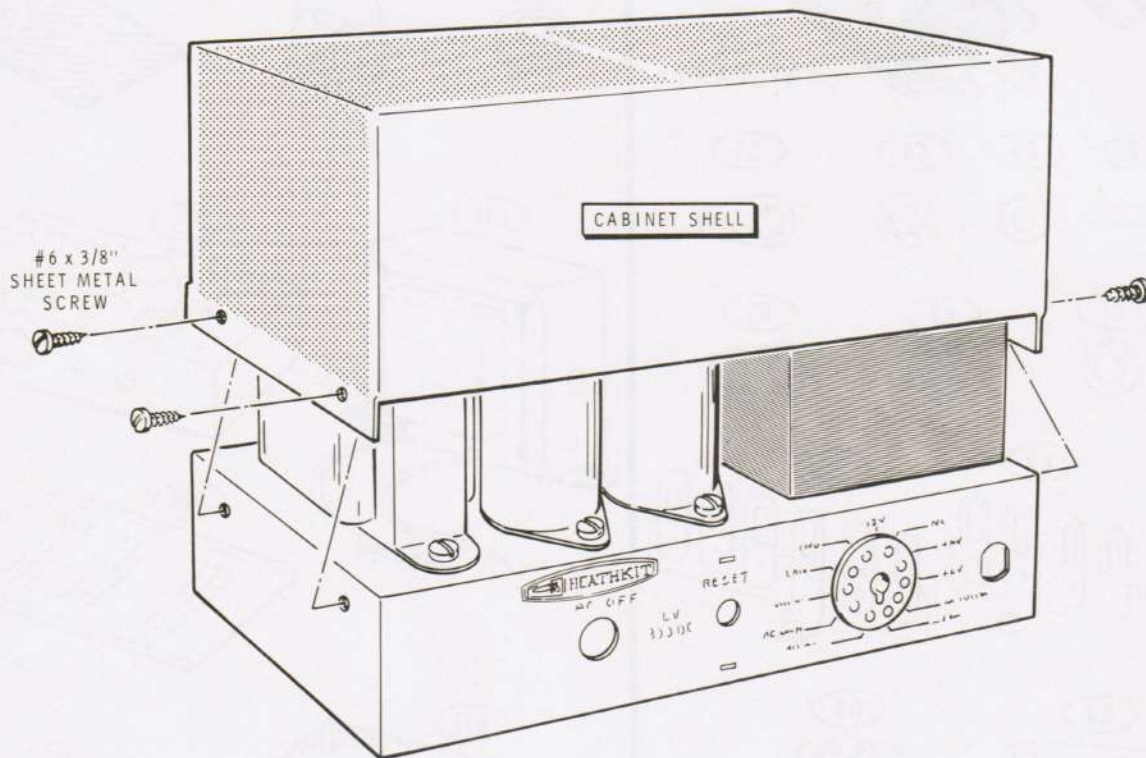
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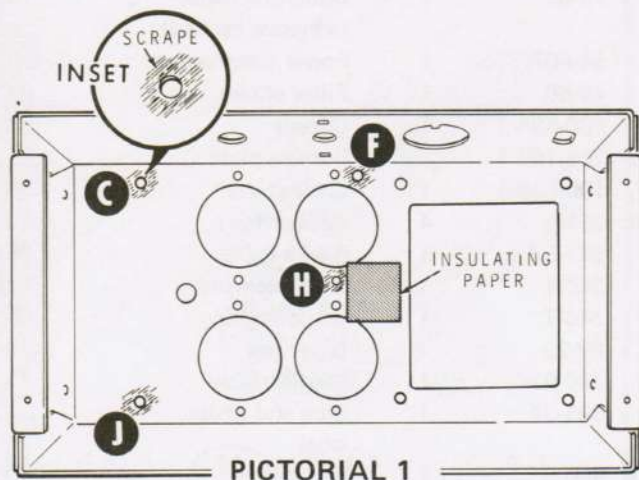
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PICTORIAL 3

STEP-BY-STEP ASSEMBLY

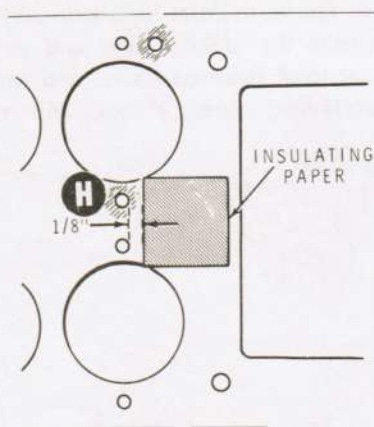
Before you begin to assemble this kit, be sure you have read the wiring, soldering, and step-by-step assembly information in the "Kit Builders Guide."



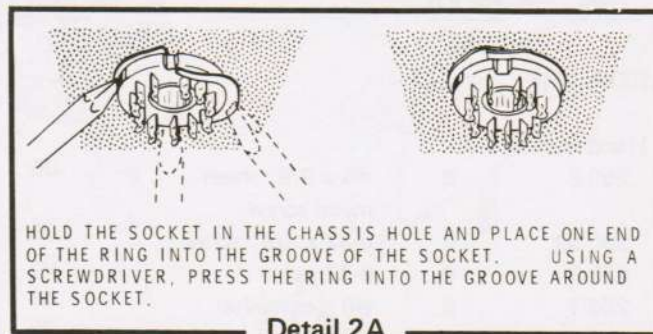
CHASSIS PARTS MOUNTING

Refer to Pictorial 1 for the following steps.

- () Locate the chassis and position it as shown.
- () Refer to the inset drawing and scrape the paint from around holes C, F, H, and J.



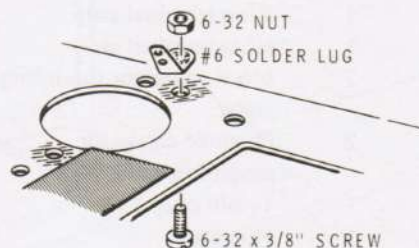
- () Refer to Detail 1A and peel the paper backing from the insulating paper. Position the insulating paper 1/8" from hole H as shown; then press the paper into place.



Refer to Pictorial 2 for the following steps.

- () Refer to Detail 2A and mount the 11-lug socket at A; use the socket mounting ring. Position the keyway in the socket as shown in the Pictorial.
- () Install a 5/16" grommet in hole G.

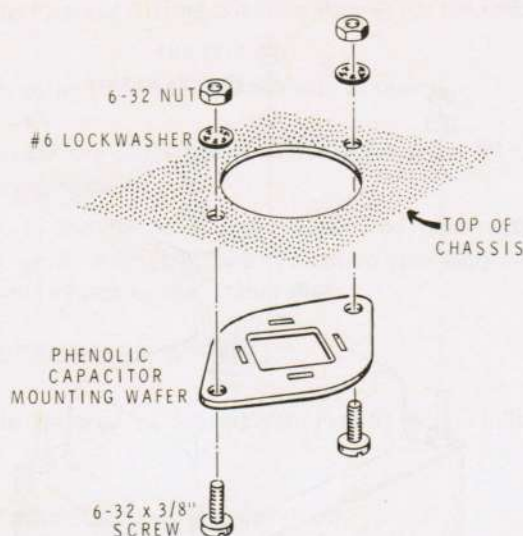
NOTE: Use the plastic nut starter supplied with this kit to hold and start 6-32 nuts on screws. For more information, refer to the "Kit Builders Guide."



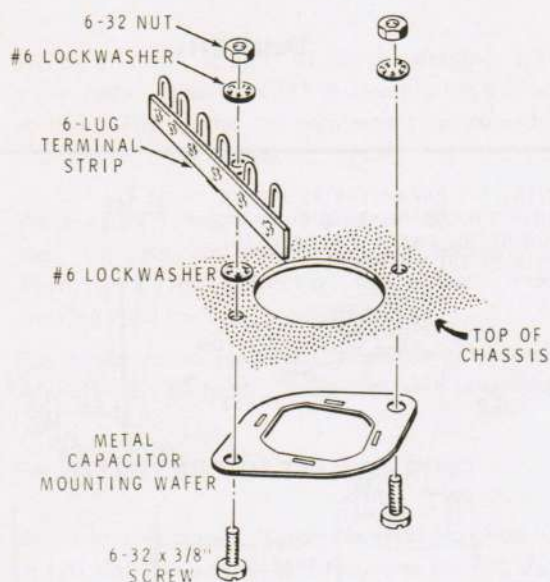
- () Refer to Detail 2B and mount a #6 solder lug at F; use a 6-32 x 3/8" screw and a 6-32 nut. Position the solder lug as shown in the Pictorial.

When hardware is called for in a step, only the screw size will be given. For instance, if "6-32 x 3/8" hardware" is called for, it means that a 6-32 x 3/8" screw, one or more #6 lockwashers, and a 6-32 nut should be used for each mounting hole. The Detail referred to in the step will show the proper number of lockwashers to use.

- () Refer to Detail 2C and install phenolic capacitor mounting wafers on the top of the chassis at D and K. Use 6-32 x 3/8" hardware.
- () In a like manner, mount a metal capacitor mounting wafer on the top of the chassis at L. Use 6-32 x 3/8" hardware.

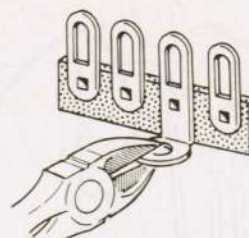


Detail 2C



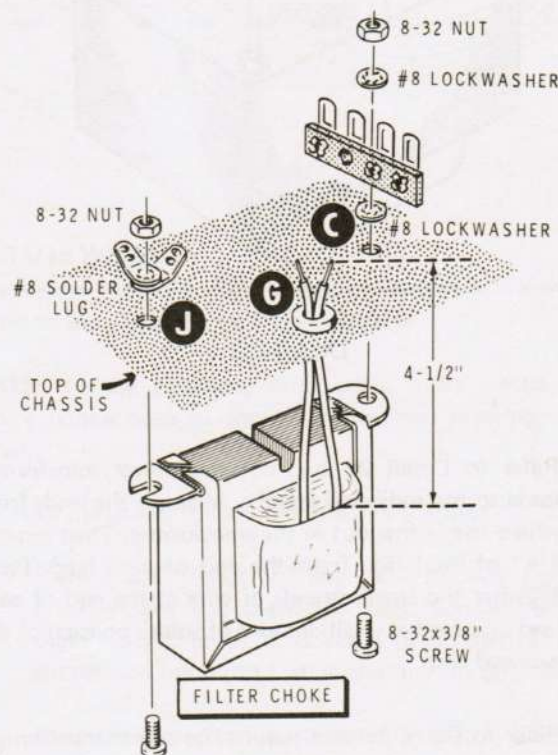
Detail 2D

- () Refer to Detail 2D and install a metal capacitor mounting wafer at E and a 6-lug terminal strip at hole H. Install the mounting wafer on the top of the chassis and the terminal strip on the bottom of the chassis. Use 6-32 x 3/8" hardware. Be sure to use two lockwashers with the terminal strip. Position the terminal strip as shown in the Pictorial.



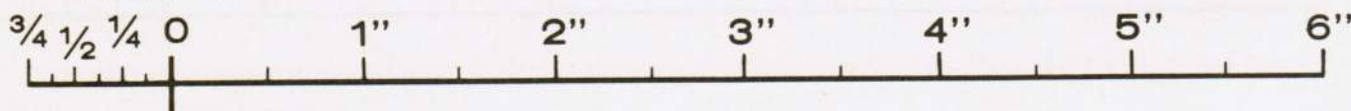
Detail 2E

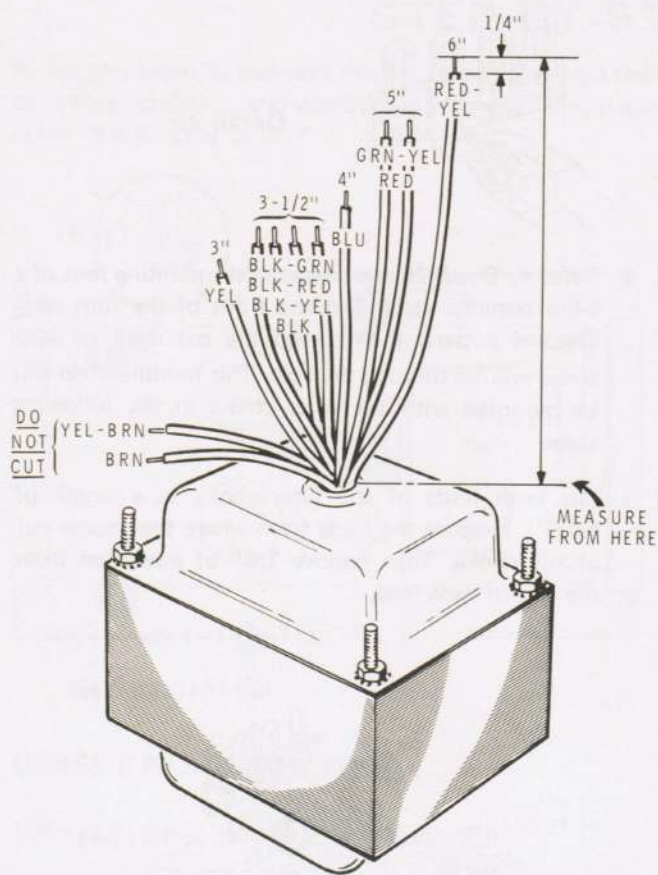
- () Refer to Detail 2E and prepare the mounting foot of a 4-lug terminal strip. Cut the front of the foot with diagonal cutters; then spread the cut until an 8-32 screw will fit through the hole. This terminal strip will be mounted with the filter choke in the following steps.
- () Cut both leads of the filter choke to a length of 4-1/2". Measure the leads from where they come out of the choke. Then remove 1/4" of insulation from the end of each lead.



Detail 2F

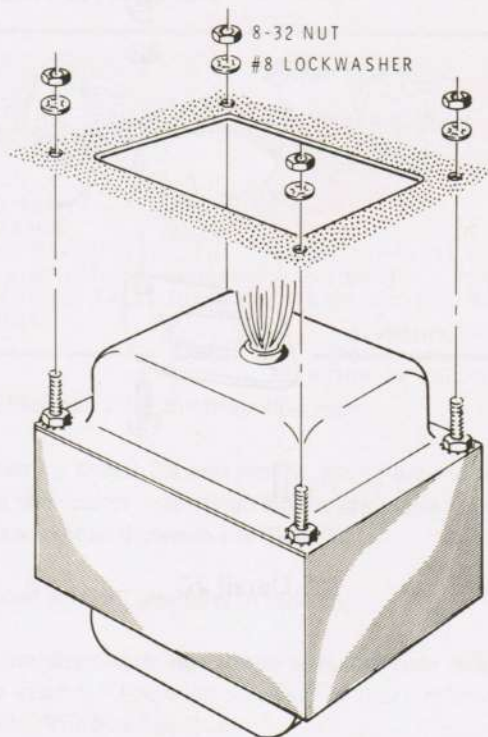
- () Refer to Detail 2F and position the filter choke on top of the chassis. Route the leads through grommet G. Mount the choke using 8-32 hardware and the prepared 4-lug terminal strip at C, and 8-32 hardware and two #8 solder lugs at J. Be sure to use two lockwashers with the terminal strip. Position the terminal strip and solder lugs as shown in the Pictorial. Bend the end of each solder lug up away from the chassis.





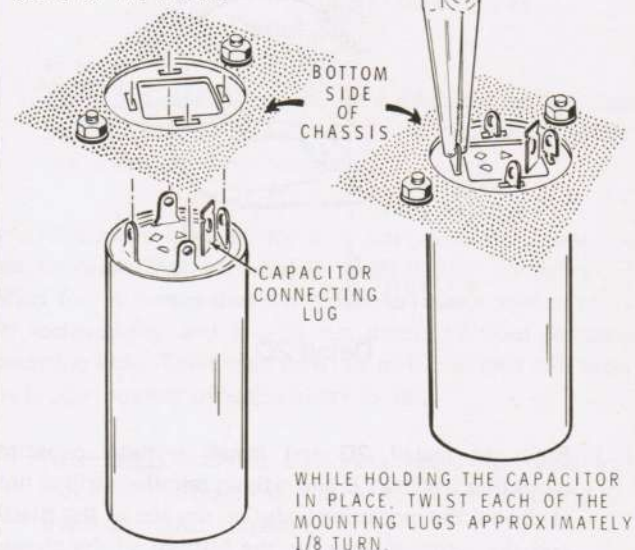
Detail 2G

- () Refer to Detail 2G and cut the power transformer leads to the indicated lengths. Measure the leads from where they come out of the transformer. Then remove 1/4" of insulation from the end of each lead. Twist together the small strands of wire at the end of each lead and melt a small amount of solder on each of the exposed ends.
- () Refer to Detail 2H and mount the power transformer in the large cutout in the chassis. Use 8-32 nuts and #8 lockwashers.
- () Refer to Detail 2J and install 125 μ F electrolytic capacitors in mounting wafers D, E, K, and L. Insert the capacitor mounting lugs into the wafers. Be sure the connecting lug of each capacitor is positioned as shown in the Pictorial. Then twist each mounting lug 1/8 turn.



Detail 2H

ORIENT THE CAPACITOR AS SHOWN IN THE PICTORIAL, THEN PUSH THE LUGS OF THE CAPACITOR INTO THE SLOTS OF THE WAFER.



Detail 2J

Refer to Pictorial 3 (fold-out from Page 4) for the following steps.

- () Position the chassis right-side-up as shown.
- () Install the cabinet shell on the chassis using #6 x 3/8" sheet metal screws.

NOTE: In the following steps, when you work with the chassis upside down, place a soft cloth on your work surface to prevent scratching the cabinet shell.

TRANSFORMER WIRING

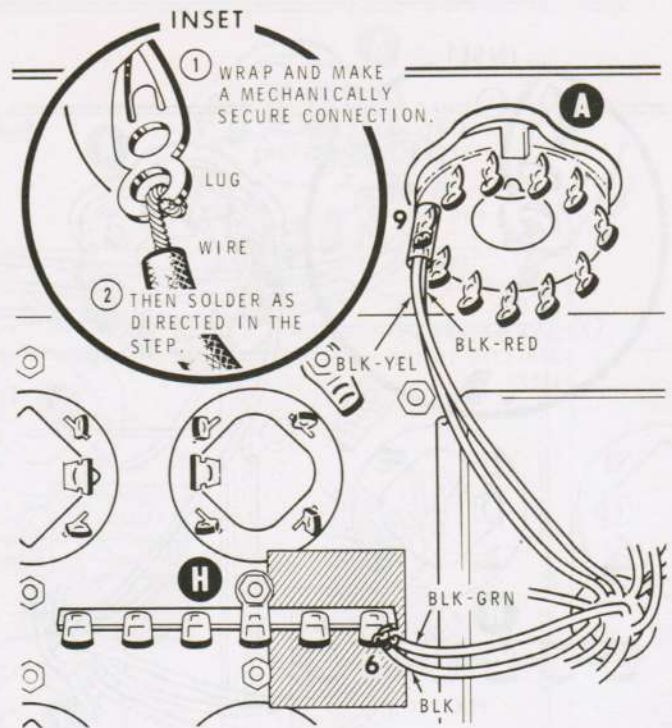
Refer to Pictorial 4 (fold-out from Page 9) for the following steps.

- () Position the chassis upside down.
- Connect the power transformer leads as follows:
 - () Red lead to lug 2 of terminal strip H (NS).
 - () Blue lead to lug 4 of terminal strip H (NS).
 - () Red-yellow lead to lug 1 of capacitor E (NS).

- () Place a 3/4" length of large sleeving on the green-yellow lead. Connect this lead to lug 6 of socket A (S-1). Then, after the connection has cooled, slide the sleeving onto the lug.
- () Place a 3/4" length of large sleeving on the yellow lead. Connect this lead to lug 2 of socket A (S-1). Then, after the connection has cooled, slide the sleeving onto the lug.
- () Route the brown lead and the yellow-brown lead as shown in the Pictorial. These leads will be connected later.

ALTERNATE LINE VOLTAGE WIRING

Two sets of line voltage wiring instructions are given below, one for 120 Vac line voltage and the other for 240 Vac line voltage. In the U.S.A. 120 Vac is more common. USE THE INSTRUCTIONS THAT AGREE WITH THE LINE VOLTAGE IN YOUR AREA.



Detail 4A

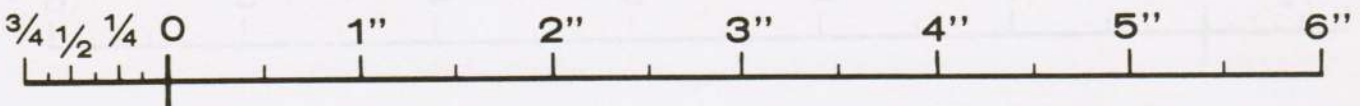
120 Vac Wiring

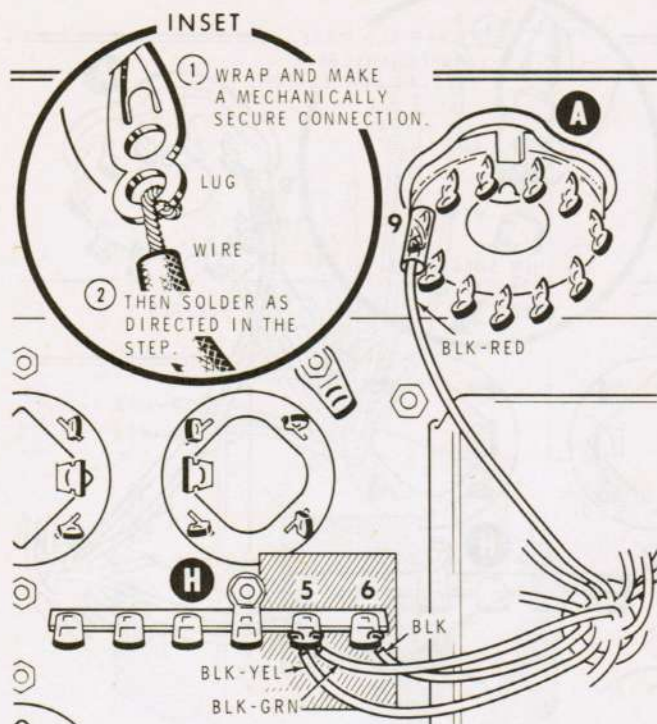
Refer to Detail 4A for the following steps.

NOTE: In the following three steps, make mechanically secure connections as shown in the inset drawing on the Detail.

Connect the power transformer leads as follows:

- () Place a 3/4" length of large sleeving over both the black yellow and black-red leads. Connect both of these leads to lug 9 of socket A (S-2). Then, after the connection has cooled, slide the sleeving onto the lug.
- () Black-green lead to lug 6 of terminal strip H (NS).
- () Black lead to lug 6 of terminal strip H (NS).





Detail 4B

240 Vac Wiring

Refer to Detail 4B for the following steps.

NOTE: In the following four steps, make mechanically secure connections as shown in the inset drawing on the Detail.

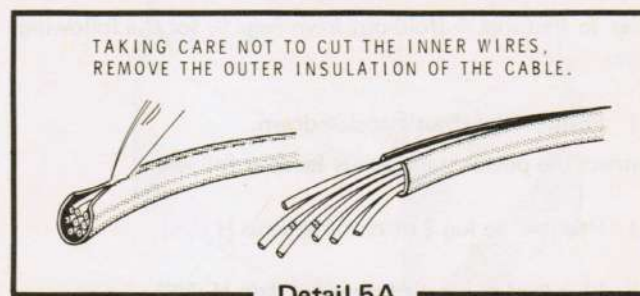
Connect the power transformer leads as follows:

- () Place a 3/4" length of large sleeving on the black-red lead. Connect this lead to lug 9 of socket A (S-1). Then, after the connection has cooled, slide the sleeving onto the lug.
- () Black lead to lug 6 of terminal strip H (NS).
- () Black-yellow lead to lug 5 of terminal strip H (NS).
- () Black-green lead to lug 5 of terminal strip H (S-2).

CHASSIS WIRING

Refer to Pictorial 5 for the following steps.

- () Connect the red lead coming from grommet G to lug 1 of terminal strip C (NS).
- () Connect the black lead coming from grommet G to lug 1 of capacitor L (NS).
- () Cut an 8" length of 8-wire cable.



Detail 5A

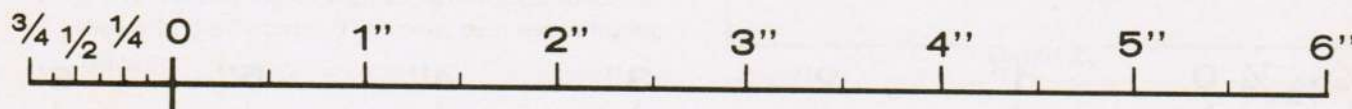
- () Refer to Detail 5A and remove the individual wires from the 8" cable. Some of these wires will be used as hookup wires in the following steps.

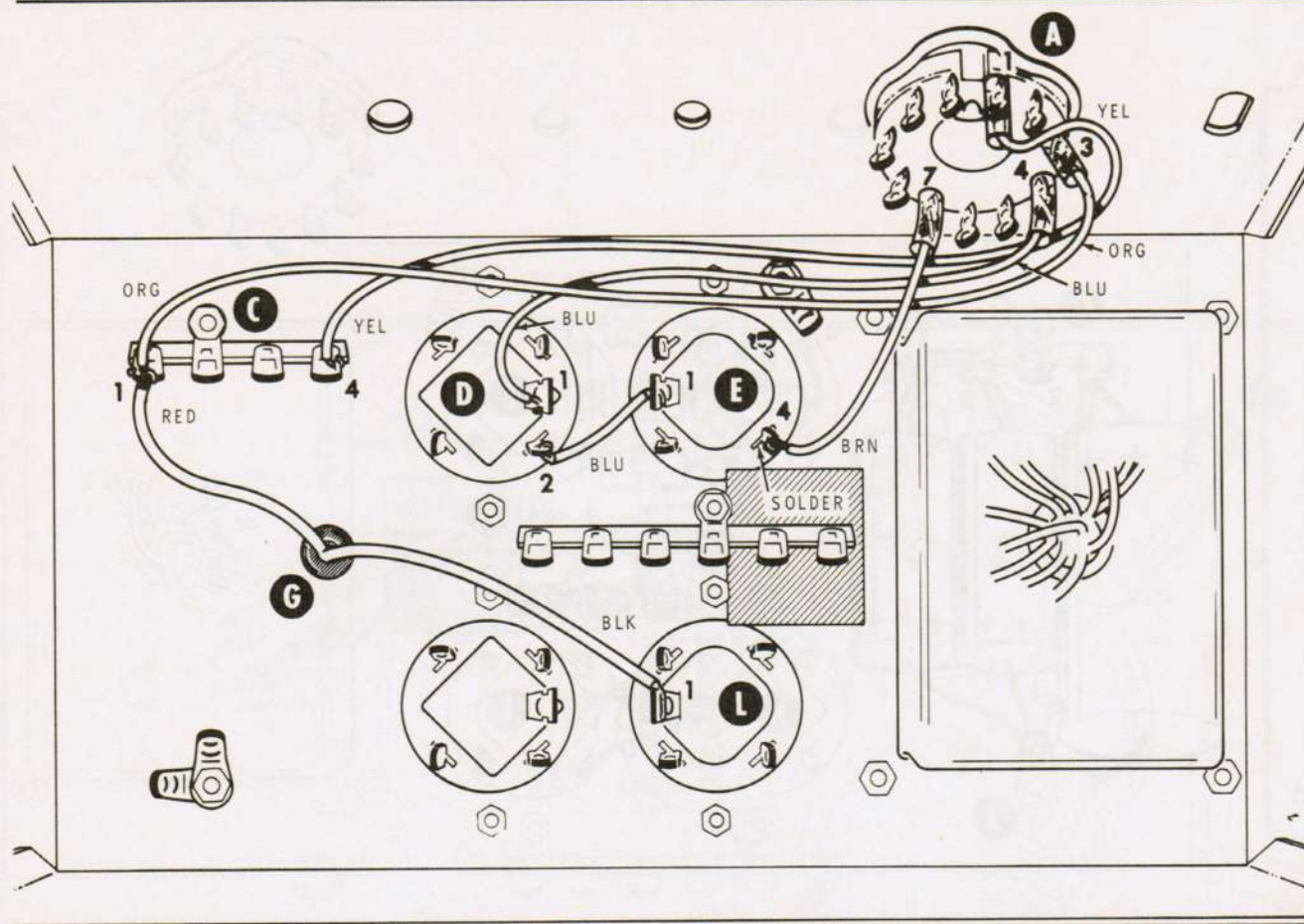
NOTE: When you wire this kit, you will be instructed to prepare lengths of hookup wire ahead of time, as in the following step. To prepare a wire, cut it to the indicated length and remove 1/4" of insulation from each end. Melt a small amount of solder on the bare wire ends to hold the small wires strands together. The wires are listed in the order in which they will be used.

- () Prepare the following lengths of hookup wire:

1-1/2"	blue
6"	blue
8"	orange
8"	yellow
2-1/2"	brown

- () Connect a 1-1/2" blue wire from lug 2 of capacitor D (NS) to lug 1 of capacitor E (NS).

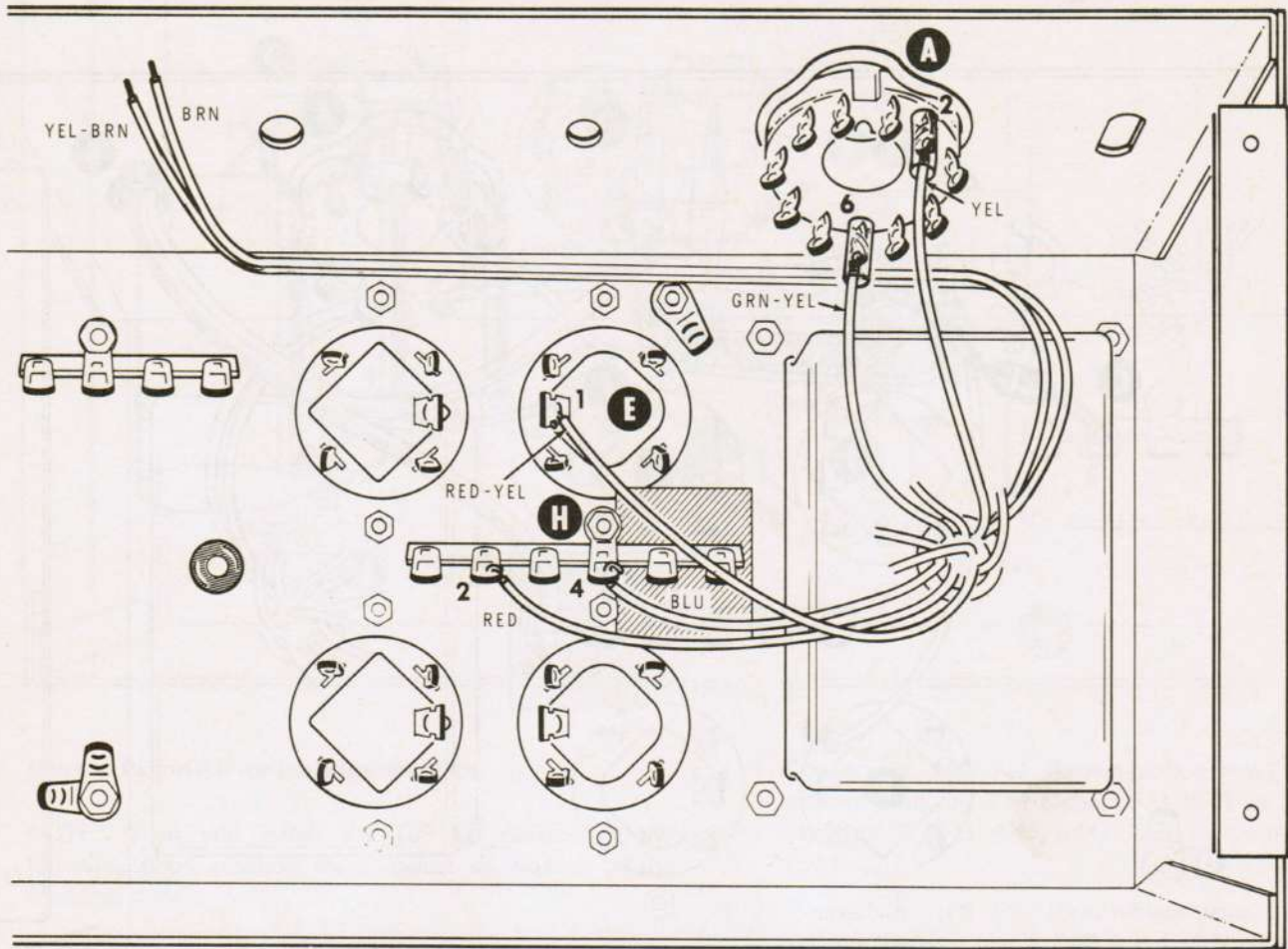




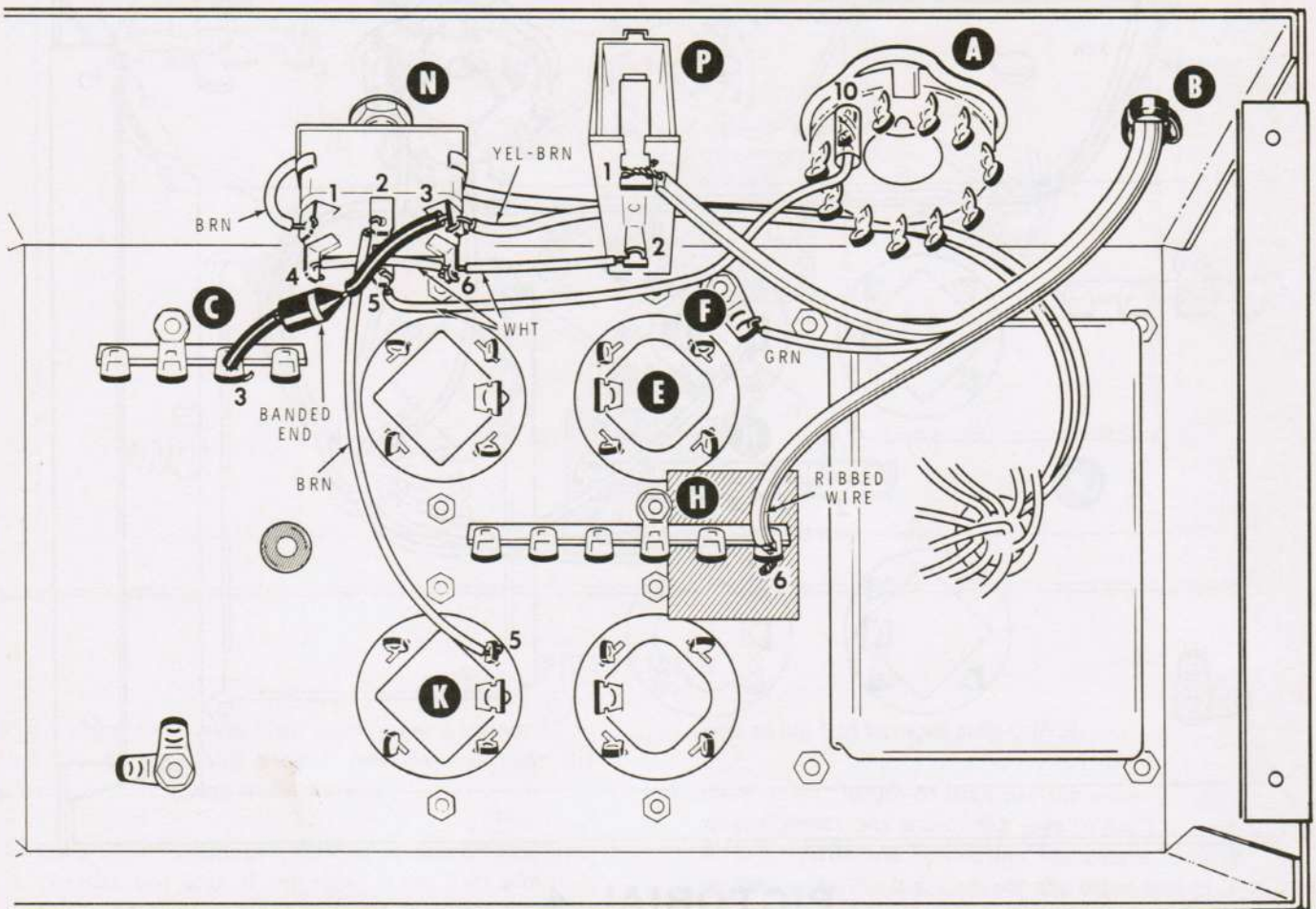
PICTORIAL 5

NOTE: Since some wires have already been connected to socket A, be especially careful you do not melt the insulation or the sleeving on these wires.

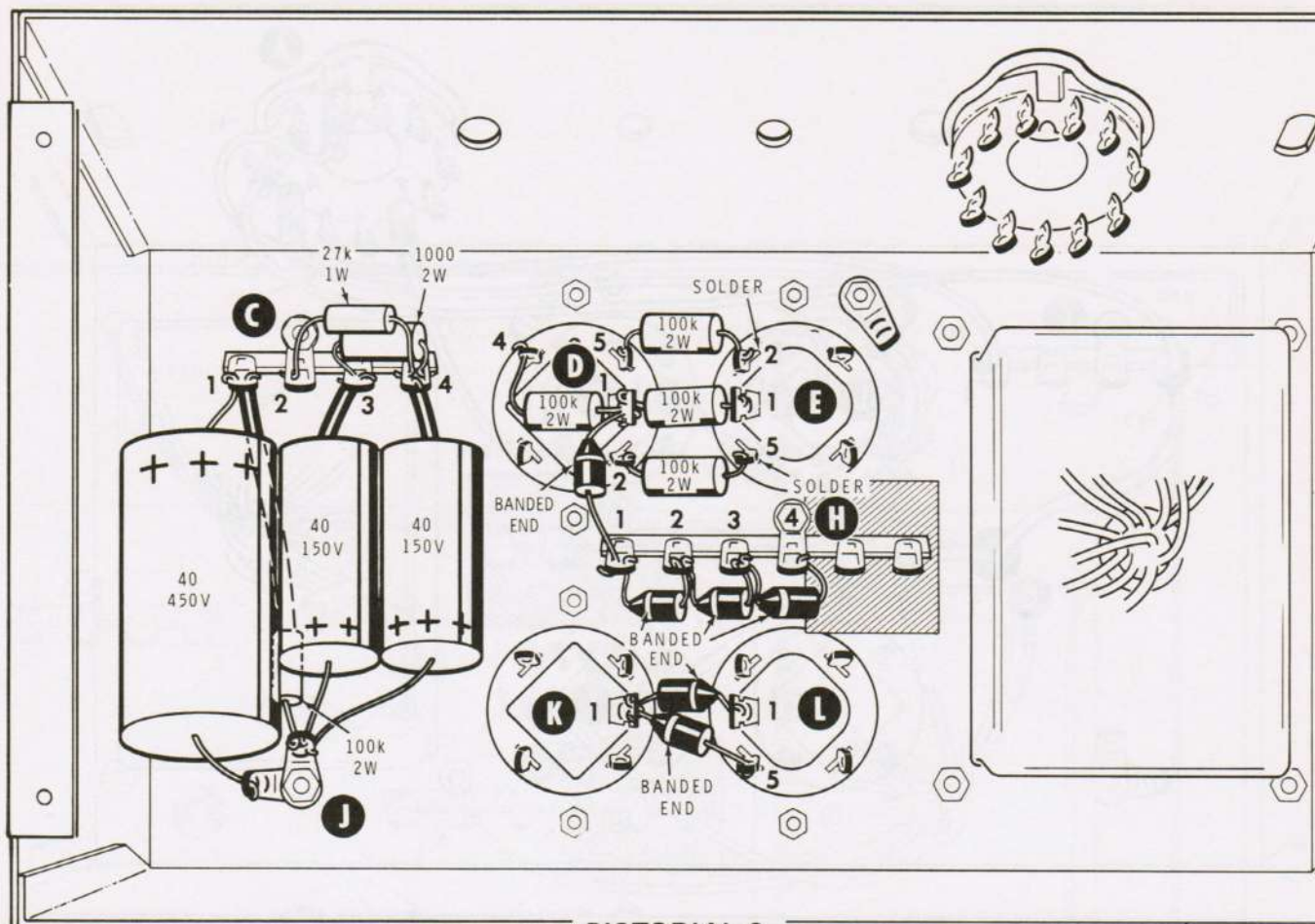
- () Place a 3/4" length of large sleeving on a 6" blue wire. Connect one end of this wire to lug 4 of socket A (S-1). After the connection has cooled, slide the sleeving onto the lug. Connect the other end of this wire to lug 1 of capacitor D (NS).
- () Place a 3/4" length of large sleeving on an 8" orange wire. Connect one end of this wire to lug 3 of socket A (S-1). After the connection has cooled, slide the sleeving onto the lug. Connect the other end of this wire to lug 1 of terminal strip C (NS).
- () Place a 3/4" length of large sleeving on an 8" yellow wire. Connect one end of this wire to lug 1 of socket A (S-1). After the connection has cooled, slide the sleeving onto the lug. Connect the other end of this wire to lug 4 of terminal strip C (NS).
- () Place a 3/4" length of large sleeving on a 2-1/2" brown wire. Connect one end of this wire from lug 7 of socket A (S-1). Then, after the connection has cooled, slide the sleeving onto the lug. Connect the other end of this wire to lug 4 of capacitor E (S-1). Also, solder lug 4 to the mounting wafer.



PICTORIAL 4



PICTORIAL 7



PICTORIAL 6

Refer to Pictorial 6 for the following steps.

NOTE: When you install the 100 k Ω resistors in the following steps, position them against the bottom of the chassis as shown.

- () Connect a 100 k Ω (brown-black-yellow), 2-watt resistor from lug 5 of capacitor D (S-1) to lug 2 of capacitor E (S-1). Also, solder lug 2 to the mounting wafer.

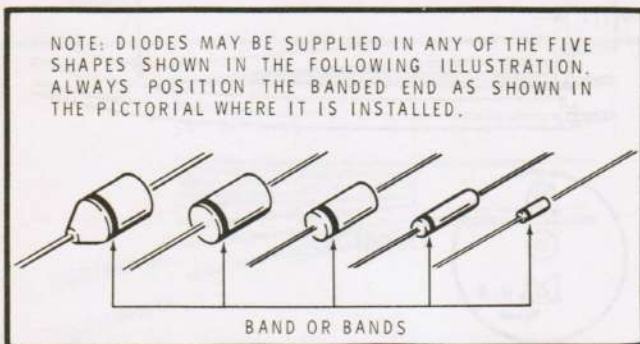
NOTE: In some of the following steps, one connection may have as many as four wires. After you solder one of these connections, re-examine it to be sure all wires are properly soldered.

- () Connect a 100 k Ω (brown-black-yellow), 2-watt resistor from lug 1 of capacitor D (NS) to lug 1 of capacitor E (S-3).

- () Connect a 100 k Ω (brown-black-yellow), 2-watt resistor from lug 2 of capacitor D (S-2) to lug 5 of capacitor E (S-1). Also, solder lug 5 to the mounting wafer.
- () Connect a 100 k Ω (brown-black-yellow), 2-watt resistor between lugs 1 (NS) and 4 (S-1) of capacitor D.
- () Place a 1-1/8" of small sleeving on one lead of a 100 k Ω (brown-black-yellow), 2-watt resistor. Connect this lead to lug 1 of terminal strip C (NS). Connect the other lead to the indicated solder lug at J (NS).
- () Connect a 1000 Ω (brown-black-red), 2-watt resistor between lugs 3 (NS) and 4 (NS) of terminal strip C.
- () Connect a 27 k Ω (red-violet-orange), 1-watt resistor between lugs 2 (S-1) and 4 (NS) of terminal strip C.
- () Connect the lead at the positive (+) end of a 40 μ F, 450 volt electrolytic capacitor to lug 1 of terminal strip C (S-4). Connect the other lead to the indicated

solder lug at J (S-1). Position the capacitor as shown in the Pictorial.

- () Cut the lead at the negative (—) end of both of the 40 μ F, 150 volt electrolytic capacitors to a length of 1-1/4".
- () Place a 1" length of small sleeving on the lead at the negative (—) end of a 40 μ F, 150 volt electrolytic capacitor. Connect this lead to lug 3 of terminal strip C (NS). Connect the lead at the positive (+) end to the indicated solder lug at J (NS).
- () Place a 1" length of small sleeving on the lead at the negative (—) end of a 40 μ F, 150 volt electrolytic capacitor. Connect this lead to lug 4 of terminal strip C (S-4). Connect the lead at the positive (+) end of the indicated solder lug at J (S-3).



Detail 6A

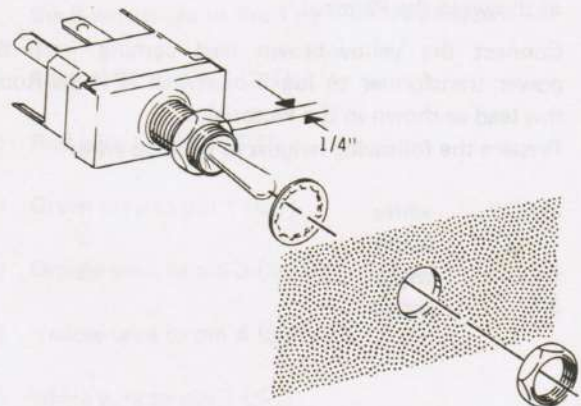
NOTE: When you install silicon diodes, be sure to place the end marked with a band as directed in the step. See Detail 6A.

- () Connect the lead at the banded end of a silicon diode to lug 1 of capacitor D (S-4). Connect the other lead to lug 1 of terminal strip H (NS).
- () Connect the lead at the banded end of a silicon diode to lug 1 of terminal strip H (S-2). Connect the other lead to lug 2 of terminal strip H (NS).

- () Connect the lead at the banded end of a silicon diode to lug 2 of terminal strip H (S-3). Connect the other lead to lug 3 of terminal strip H (NS).
- () Connect the lead at the banded end of a silicon diode to lug 3 of terminal strip H (S-2). Connect the other lead to lug 4 of terminal strip H (S-2).
- () Connect the lead at the banded end of a silicon diode to lug 1 of capacitor L (S-2). Connect the other lead to lug 1 of capacitor K (NS).
- () Connect the lead at the banded end of a silicon diode to lug 1 of capacitor K (S-2). Connect the other lead to lug 5 of capacitor L (S-1). Also, solder lug 5 to the mounting wafer.

FINAL WIRING

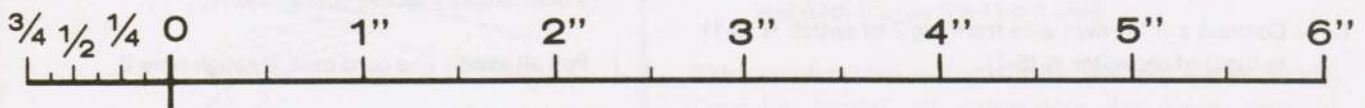
Refer to Pictorial 7 for the following steps.

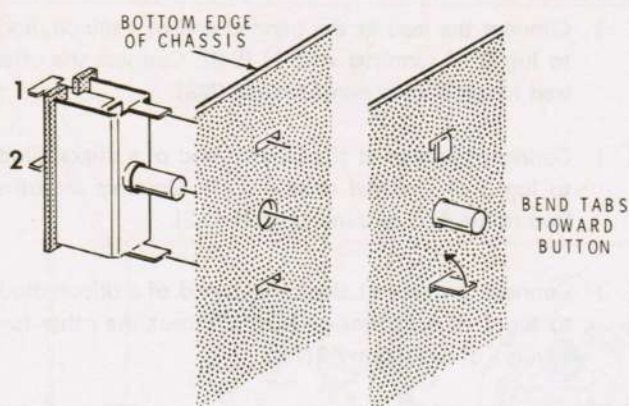


Detail 7A

- () Refer to Detail 7A and install the DPDT toggle switch at N. Use the hardware supplied with the switch, and position the nut on the bushing as shown.

CAUTION: Before you install the circuit breaker in the following step, make sure the circuit breaker body clears the adjacent wiring of capacitor E by at least 1/8".





Detail 7B

- () Refer to Detail 7B and install the circuit breaker at P with the lugs positioned as shown. Then bend the mounting tabs as shown.
- () Connect the brown lead coming from the power transformer to lug 1 of switch N (S-1). Route this lead as shown in the Pictorial.
- () Connect the yellow-brown lead coming from the power transformer to lug 3 of switch N (NS). Route this lead as shown in the Pictorial.
- () Prepare the following lengths of hookup wire:

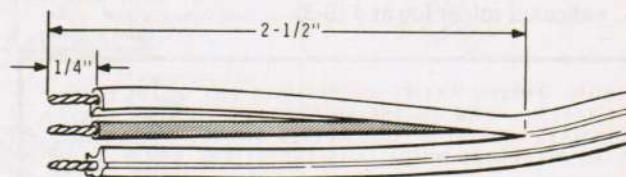
1-1/2"	white
1-1/2"	white
5"	white
3"	brown

- () Connect a 1-1/2" white wire between lugs 4 (S-1) and 6 (NS) of switch N. Make mechanically secure connections.
- () Connect a 1-1/2" white wire from lug 6 of switch N (S-2) to lug 2 of circuit breaker P (S-1). Make mechanically secure connections.
- () Place a 3/4" length of large sleeving on a 5" white wire. Connect one end of this wire to lug 10 of socket A (S-1). Now, slide the sleeving onto the lug. Connect the other end of this wire to lug 5 of switch N (S-1). Make mechanically secure connections.
- () Connect a 3" brown wire from lug 2 of switch N (S-1) to lug 5 of capacitor K (S-1).

- () Place a 1" length of small sleeving on each lead of a silicon diode. Connect the lead at the banded end to lug 3 of switch N (S-2). Connect the other lead to lug 3 of terminal strip C (S-3).

NOTE:

1. The flat 3-wire line cord supplied with this kit is approved for use in the U.S.A. and in some countries. If this cord is not approved for your locality, obtain locally an approved cord and proceed with the following steps, making changes as necessary.
2. The flat 3-wire line cord supplied with this kit has one of its outer wires marked with a rib in the insulation along its edge. The other wire is smooth, and the third wire is color coded green. It is very important that you connect the ribbed wire as indicated.

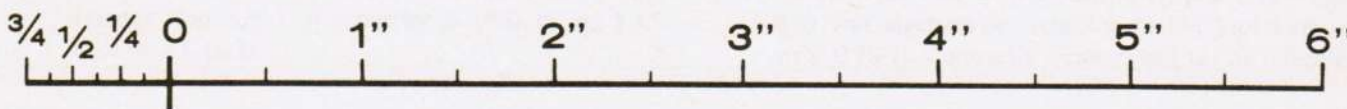


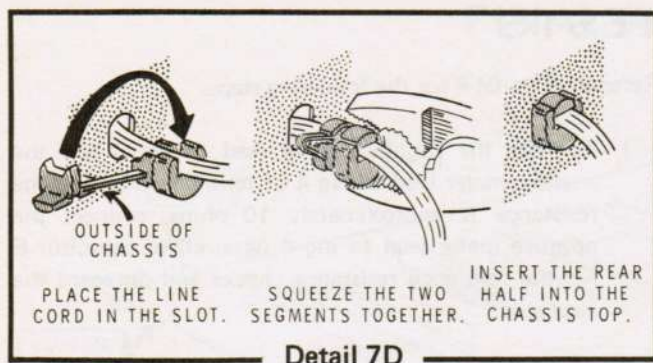
Detail 7C

- () Refer to Detail 7C and prepare the end of a 3-wire line cord. Twist together the small strands of wire at the end of each wire; then melt a small amount of solder on each of the exposed wires.
- () Pass the line cord through hole B in the chassis.

Connect the 3-wire line cord as follows:

- () Green wire to solder lug F (S-1). Make a mechanically secure connection.
- () Ribbed wire to lug 6 of terminal strip H (S-3) [S-2 if wired for 240 Vac]. Make a mechanically secure connection.
- () Smooth wire to lug 1 of circuit breaker P (S-1). Make a mechanically secure connection.
- () Pull all excess line cord back through hole B.

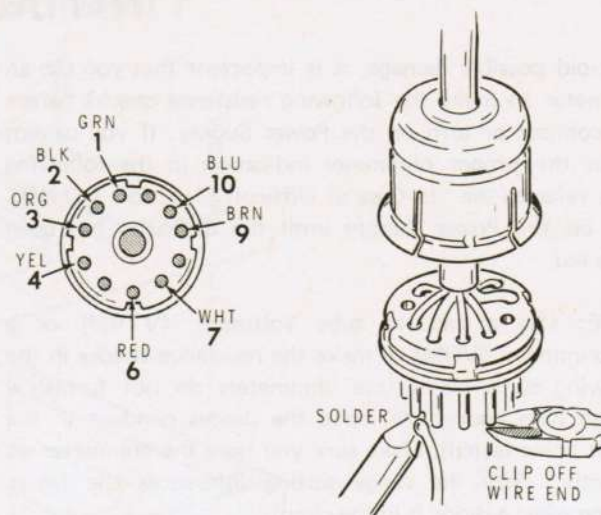
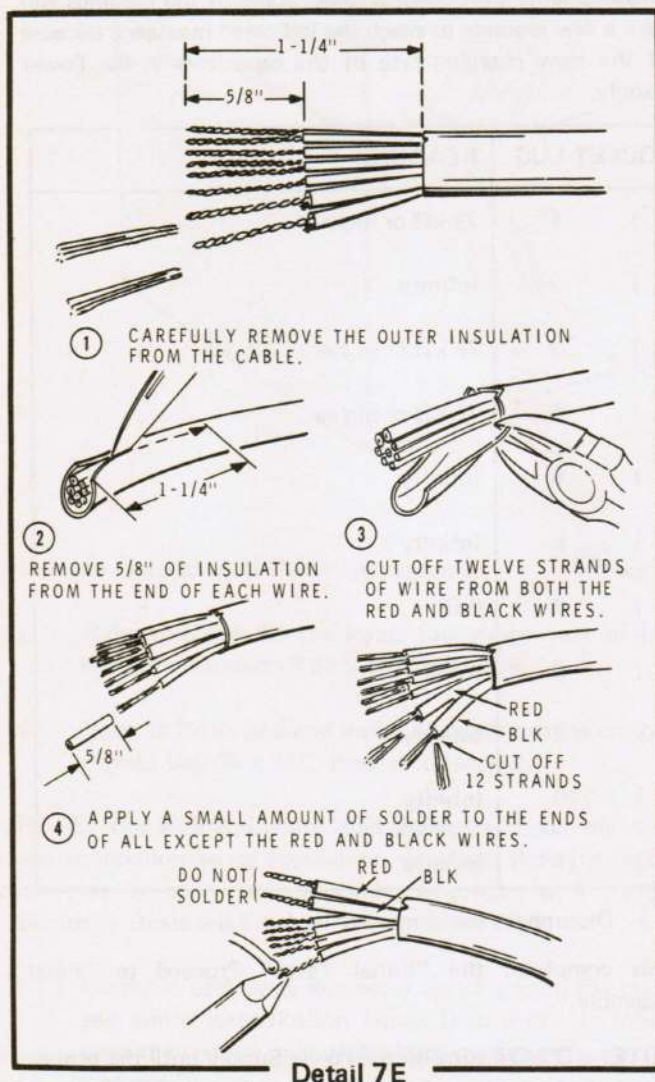




- () Refer to Detail 7D and install the strain relief on the line cord at B.

POWER CABLE PREPARATION

- () Refer to Detail 7E and prepare one end of the 8-wire cable.



Detail 7F

- () Refer to Detail 7F and connect the prepared end of the 8-wire cable to the 11-pin plug as follows:
- () Black wire to pin 2 (S-1).
 - () Red wire to pin 6 (S-1).
 - () Green wire to pin 1 (S-1).
 - () Orange wire to pin 3 (S-1).
 - () Yellow wire to pin 4 (S-1).
 - () White wire to pin 7 (S-1).

NOTE: If this Power Supply is to be used with equipment that does not have provisions for switching the ac power on and off, disregard the following two steps and install a jumper wire between pins 9 (S-1) and 10 (S-1) of the 11-pin plug. To make sure that the brown and blue cable wires are NOT connected to these pins, cut and tape the ends of each wire.

- () Brown wire to pin 9 (S-1).
- () Blue wire to pin 10 (S-1).
- () Slide the plug cap over the free end of the 8-wire cable and push it onto the 11-pin plug.

This completes the wiring of your Heathkit Power Supply. Carefully inspect all connections for loose wires or unsoldered connections. Remove any wire clippings or solder splashes. Then proceed to the "Initial Tests" section.

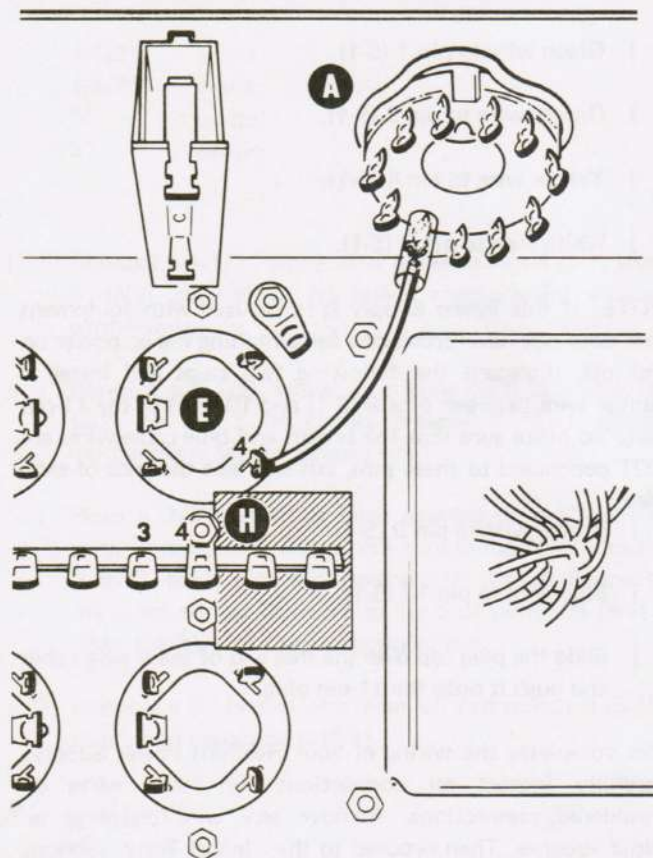
INITIAL TESTS

To avoid possible damage, it is important that you use an ohmmeter to make the following resistance checks before you connect or turn on the Power Supply. If you cannot obtain the proper ohmmeter indication in the following steps, refer to the "In Case of Difficulty" section. **DO NOT** turn on the Power Supply until the difficulty has been corrected.

NOTE: Use a vacuum tube voltmeter (VTVM) or a volt-ohmmeter (VOM) to make the resistance checks in the following steps (solid-state ohmmeters do not furnish a voltage high enough to make the diodes conduct in the circuit being tested). Make sure you have the ohmmeter set correctly, since the range setting influences the meter reading when a diode is in the circuit.

- () Set the ohmmeter to the RX1 range.

Because some of the circuits to be measured contain diodes, you will obtain different resistance readings if the polarity of the meter leads is reversed in the following measurements. Therefore, in the next two steps you will determine the polarity of the ohmmeter test leads and connect the proper lead to chassis ground.



PICTORIAL 8

Refer to Pictorial 8 for the following steps.

- () Connect the negative meter lead to lug 3 and the positive meter lead to lug 4 of terminal strip H. If the resistance is approximately 10 ohms, connect the negative meter lead to lug 4 (ground) of capacitor E for the following resistance checks and disregard the next step.
- () If the meter needle remains on or near the infinity mark (full scale), reverse the meter leads. If you now obtain a reading of approximately 10 ohms, connect the positive meter lead to lug 4 (ground) of capacitor E for the following resistance checks.

- () Set your ohmmeter to the RX10k range.

Now use the remaining meter lead to verify the resistance measurements in following steps. Some of the readings will take a few seconds to reach the indicated resistance because of the slow charging rate of the capacitors in the Power Supply.

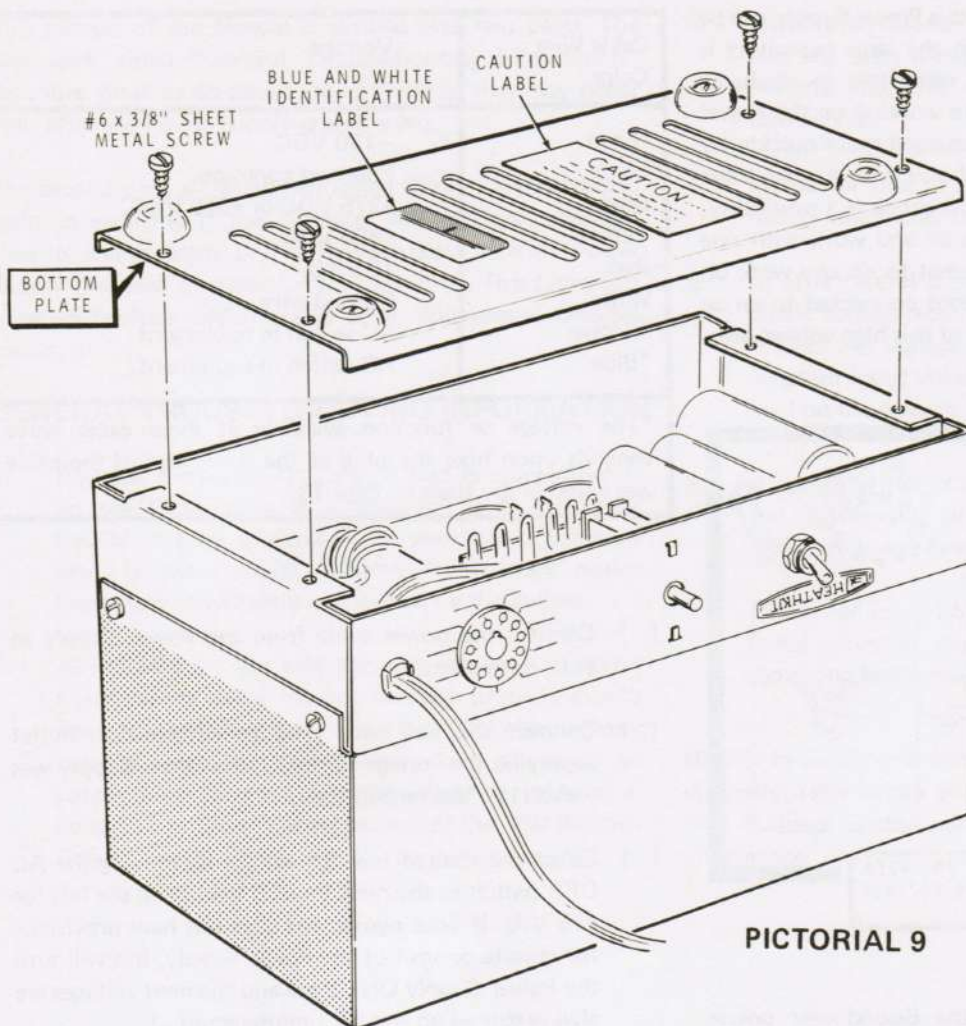
SOCKET LUG	READING
() 1	22 k Ω or higher
() 2	Infinity
() 3	75 k Ω or higher
() 4	75 k Ω or higher
() 5	Infinity
() 6	Infinity
() 7	0 Ω
() 8	Infinity
() 9	Infinity
() 10	Infinity
() 11	Infinity

- () Disconnect the ohmmeter leads.

This completes the "Initial Tests." Proceed to "Final Assembly."

NOTE: **DO NOT** turn on the Power Supply until the proper connector for your equipment has been installed, as outlined in the "Operation" sections of this Manual.

FINAL ASSEMBLY



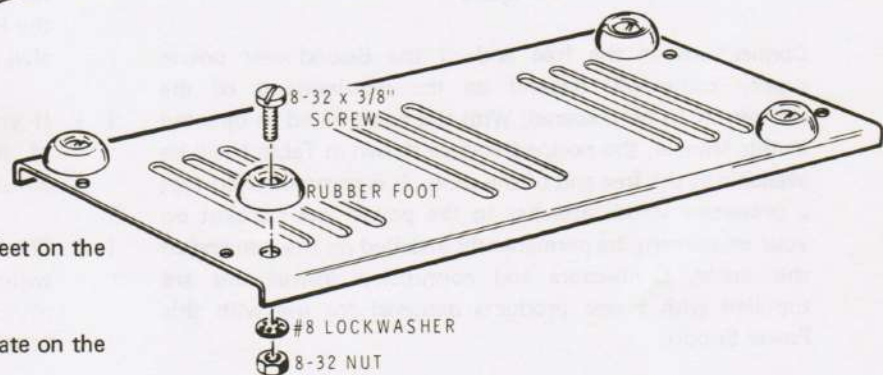
PICTORIAL 9

Refer to Pictorial 9 for the following steps.

- () Refer to Detail 9A and install four rubber feet on the bottom plate using 8-32 x 3/8" hardware.
- () Refer to Pictorial 9 and install the bottom plate on the chassis. Use #6 x 3/8" sheet metal screws.

NOTE: The blue and white label shows the model number and production series number on your kit. Refer to these numbers in any communications you have with Heath Company about this kit.

- () Carefully peel away the paper backing from the blue and white identification label. Then press the label onto the bottom side of the bottom plate as shown in Pictorial 9.



Detail 9A

- () Carefully peel away the paper backing from the caution label. Then press the label onto the bottom of the bottom plate as shown in Pictorial 9.

NOTE: Do NOT turn the Power Supply on until the proper connector for your equipment has been installed, as outlined in the "Operation" section of this Manual.

OPERATION

CAUTION: The output voltage of this Power Supply can be lethal. Also, the potential stored in the large capacitors is dangerous. Allow time for these capacitors to discharge through the bleeder resistors before working on the Power Supply. The capacitors can be discharged more quickly by shorting the capacitor lugs to the chassis with a screwdriver blade. In a situation where electrical shock is a possibility, stand on some dry insulating material and work with one hand behind your back. Never attempt to do any work on the Power Supply with the line cord connected to an ac outlet. Figure 1 shows the location of this high voltage area.

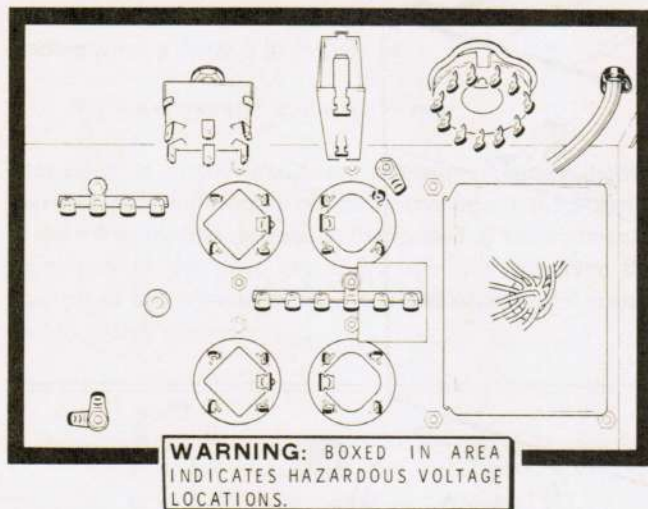


Figure 1

Connections at the free end of the 8-conductor power supply cable will depend on the requirements of the equipment to be powered. With the cable wired as directed in this Manual, the no load voltage shown in Table 1 will be available at the free end of the cable. It is recommended that a connector which attaches to the power input socket on your equipment, be permanently installed on the free end of this cable. Connectors and connection instructions are supplied with Heath products designed for use with this Power Supply.

Cable Wire Color	Voltage
Green	-130 VDC.
Black	Filament common.
Orange	+275 VDC or +350 VDC.
Yellow	+820 VDC.
Red	12 VAC.
White	Ground wire.
*Brown	AC switch in equipment.
*Blue	AC switch in equipment.

*The voltage or function available at these cable wires depends upon how the plug at the other end of the cable was wired in the steps on Page 13.

TABLE 1

- () Connect the power cable from the Power Supply to your equipment.
- () Connect the line cord plug to an electrical outlet supplying the voltage for which the Power Supply was wired (120 Vac or 240 Vac).
- () Select the desired low B+ voltage by moving the AC OFF switch to the right for 350 Vdc, or to the left for 275 Vdc. If your equipment does not have provisions for remote control of the Power Supply, this will turn the Power Supply ON. (Plate and filament voltages are always turned on and off simultaneously.)
- () If your equipment has provisions for remote control of the Power Supply, turn the equipment off-on switch to ON.
- () The Power Supply may be turned off by the AC OFF switch on the chassis, or by the off-on switch on your equipment, provided that it was wired for remote control.

IN CASE OF DIFFICULTY

This section of the Manual is divided into two parts. The first part, titled "General Troubleshooting Information" describes what to do about any difficulties that may occur right after the Power Supply is assembled.

The second part, a "Troubleshooting Chart," is provided to assist in servicing if the "General Information" does not clear up the problem, or if difficulties occur after the Power Supply has been in operation for some time. This Chart lists some difficulties which could arise, and several possible causes.

GENERAL TROUBLESHOOTING INFORMATION

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 builder.
2. About 90% of the kits that are returned to Heath Company 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 soldering section of the "Kit Builders Guide."

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.
5. If, after careful checks the trouble is still not located, check voltage readings against those on the Schematic. NOTE: All voltage readings were taken with an 11 megohm input voltmeter. Voltages shown are with no load on the output.
6. A review of the "Circuit Description," and a study of the Schematic Diagram will help you locate a difficulty in the Power Supply.
7. Check for loose hardware. Be especially careful that metal capacitor mounting wafers and terminal strip mounting feet are well grounded.

NOTE: In an extreme case where you are unable to resolve a difficulty, refer to the Service and Warranty sections of the "Kit Builders Guide," and to the "Factory Repair Service" information on Page 19 of this Manual.

Troubleshooting Chart

DIFFICULTY	POSSIBLE CAUSE
Completely inoperative.	<ol style="list-style-type: none"> 1. Circuit breaker open. 2. Switch S1. 3. Pin 9 or 10 on power output socket or cable plug open or incorrectly wired. 4. Remote switching circuit in associated equipment faulty. 5. Power transformer T1.
Circuit breaker opens when reset.	<ol style="list-style-type: none"> 1. Short in power transformer windings. 2. Short in rectifier or filter circuits. 3. Short in associated equipment. 4. Overload in associated equipment.
No high B+ voltage.	<ol style="list-style-type: none"> 1. Diodes D1, D2, D3 or D4 faulty. 2. Pin 4 on power output socket or power cable plug open or incorrectly wired. 3. Power transformer T1.
No low B+ voltage.	<ol style="list-style-type: none"> 1. Diode D5 and/or D6. 2. Filter choke L1. 3. Pin 3 of power output socket or cable plug open or incorrectly wired. 4. Switch incorrectly wired or faulty. 5. Polarity of diodes or filter capacitors is incorrect.
No bias voltage.	<ol style="list-style-type: none"> 1. Diode D7. 2. Resistor R7 or R8. 3. Pin 1 of power output socket or cable plug open or incorrectly wired.
High B+ voltage only half of indicated value with no load, less under load.	<ol style="list-style-type: none"> 1. Diode D1, D2, D3 or D4. 2. Capacitor C1 or C2.
Low B+ voltage only half of indicated value.	<ol style="list-style-type: none"> 1. Diode D5 or D6.
All voltages only half of indicated values.	<ol style="list-style-type: none"> 1. Power transformer primary wired for 240 Vac when Power Supply is used on 120 Vac.

FACTORY REPAIR SERVICE

You can return your completed kit to the Heath Company Service Department to have it repaired for a minimum service fee. (Kits that have been modified will not be accepted for repair.) Or, if you wish, you can deliver your kit to a nearby Heathkit Electronic Center. These centers are listed in your Heathkit catalog.

To be eligible for replacement parts under the terms of the warranty, equipment returned for factory repair service, or delivered to a Heathkit Electronic Center, must be accompanied by the invoice or the sales slip, or a copy of either. If you send the original invoice or sales slip, it will be returned to you.

If it is not convenient to deliver your kit to a Heathkit Electronic Center, please ship it to the factory at Benton Harbor, Michigan and observe the following shipping instructions:

Prepare a letter in duplicate, containing the following information:

- Your name and return address.
- Date of purchase.
- A brief description of the difficulty.
- The invoice or sales slip, or a copy of either.
- Your authorization to ship the repaired unit back to you C.O.D. for the service and shipping charges, plus the cost of parts not covered by the warranty.

Attach the envelope containing one copy of this letter directly to the unit before packaging, so that we do not overlook this important information. Send the second copy of the letter by separate mail to Heath Company, Attention: Service Department, Benton Harbor, Michigan 49022.

Check the equipment to see that all parts and screws are in place. Then, wrap the equipment in heavy paper. Place the equipment in a strong carton, and put at least **THREE INCHES** of resilient packing material (shredded paper, excelsior, etc.) on all sides, between the equipment and the carton. Seal the carton with gummed paper tape, and tie it with a strong cord. Ship it by prepaid express, United Parcel Service, or insured parcel post to:

Heath Company
Service Department
Benton Harbor, Michigan 49022

SPECIFICATIONS

HIGH VOLTAGE SUPPLY

Output Voltage	820 volts dc, no load. 700 volts dc at 250 mA.
Effective Output Capacitance	62.5 μ F.
Ripple	Less than 1% at 250 mA.
Duty Cycle	Continuous up to 150 mA. 50% at 300 mA.

LOW VOLTAGE SUPPLY (high tap)

Output Voltage	350 volts dc no load. 300 volts dc at 150 mA (with 100 mA load on High Voltage).
Ripple	Less than .05% at 150 mA.
Duty Cycle	Continuous up to 175 mA.

LOW VOLTAGE SUPPLY (low tap)

Output Voltage	275 volts dc, no load. 250 volts dc, at 100 mA (with 100 mA load on High Voltage).
Ripple	Less than .05% at 150 mA.
Duty Cycle	Continuous up to 175 mA.

OTHER OUTPUT VOLTAGES

Fixed Bias	-130 volts dc, no load. -100 volts dc, at 20 mA.
Filaments	12.6 volts ac at 5.5 amperes.

GENERAL

Power Requirements	120/240 volts ac, 50/60 Hz, 350 watts.
Dimensions	9" long x 4-3/4" wide x 6-3/4" high.
Net Weight	16 lbs.

The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

CIRCUIT DESCRIPTION

To better understand the circuit operation, refer to the Schematic Diagram while you read the following description. Each section of the Power Supply will be discussed individually.

PRIMARY CIRCUIT

The AC OFF switch, circuit breaker, transformer primary, and two terminals of the power output socket are wired in series across the ac line. The Power Supply may be controlled by its AC OFF switch, or by the off-on switch in the equipment being used with it. The dual primary winding may be connected in series for 240 Vac line operation, or in parallel for use on a 120 Vac line.

HIGH VOLTAGE SECONDARY CIRCUIT

The high voltage winding applies approximately 282 volts ac (rms) to a full-wave voltage doubler rectifying circuit consisting of silicon diodes D1, D2, D3, and D4, and capacitors C1 and C2. These diodes are connected so that during one-half cycle, capacitor C2 becomes charged; during the next half cycle capacitor C1 is charged. Resistors R1, R2, R3, and R4 are connected in the circuit to provide a discharge path for capacitors C1 and C2. The capacitors are charged individually, but discharge in series to produce a dc voltage equal to approximately twice the applied peak ac voltage. Excellent dynamic regulation is provided by the

large capacitance values of C1 and C2. The output of the voltage doubler circuit has a low ripple content and no further filtering is required.

LOW VOLTAGE CIRCUIT

The low voltage winding is tapped so that either 95 or 125 volts ac (rms) may be applied to a half-wave voltage-doubler rectifying circuit consisting of diodes D5 and D6, and capacitors C3 and C4. Capacitor C4 is also used with choke L1 and capacitor C5 in a pi filter; C4 is the input capacitor in the filter network. The use of a high-capacitance input pi filter network provides a well filtered dc output that has a very low percentage of ripple.

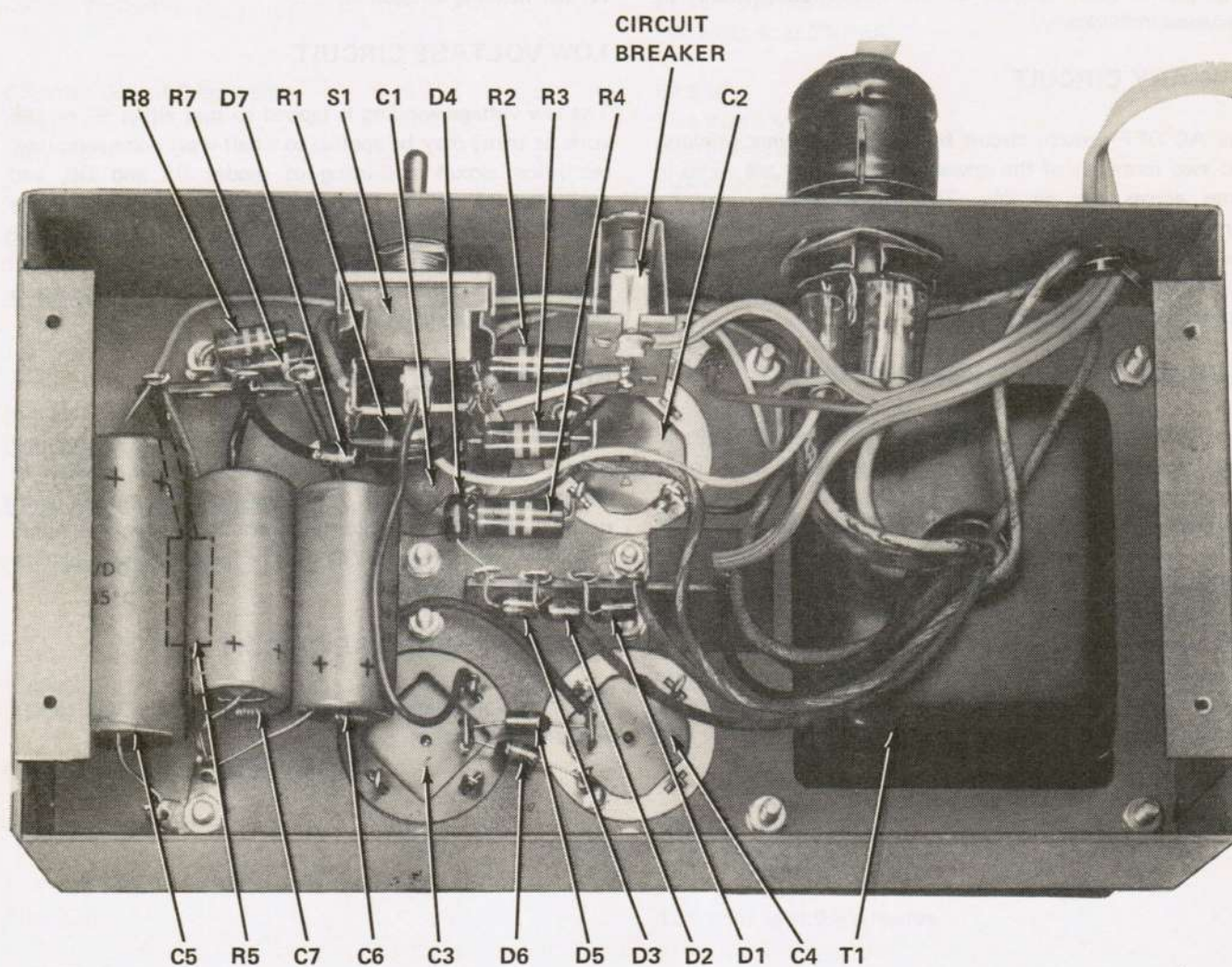
BIAS VOLTAGE CIRCUIT

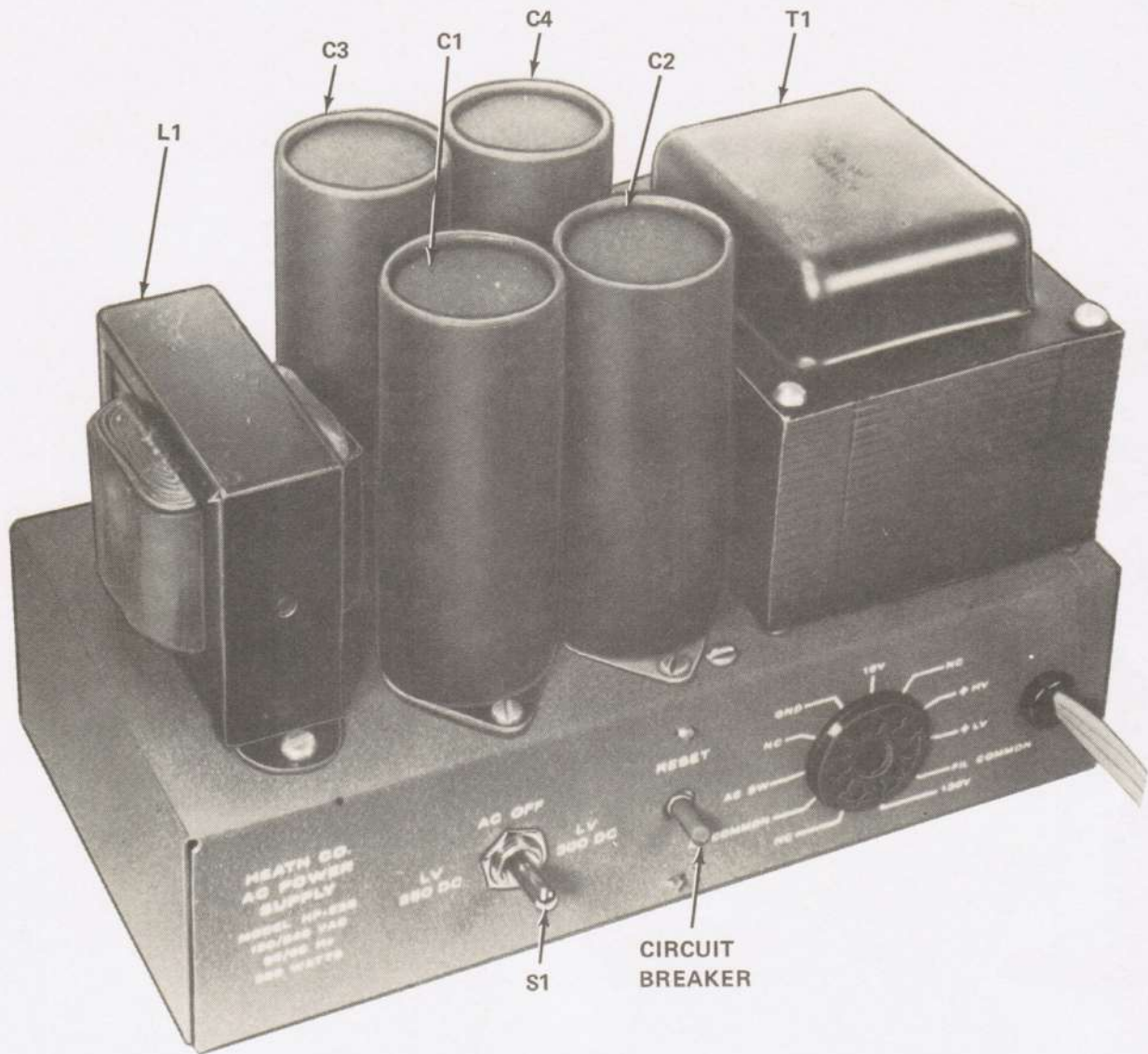
The bias voltage is obtained from the low tap on the low voltage winding. About 95 volts ac (rms) is applied to half-wave rectifier diode D7. Capacitors C6 and C7, with resistor R7, provide a filter network to remove the ripple from the bias voltage. -130 volts of fixed bias is coupled to the power output socket.

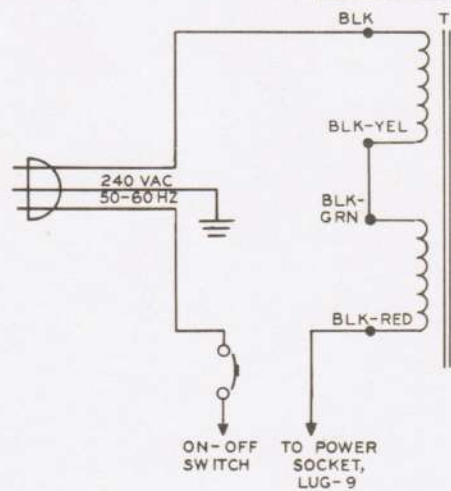
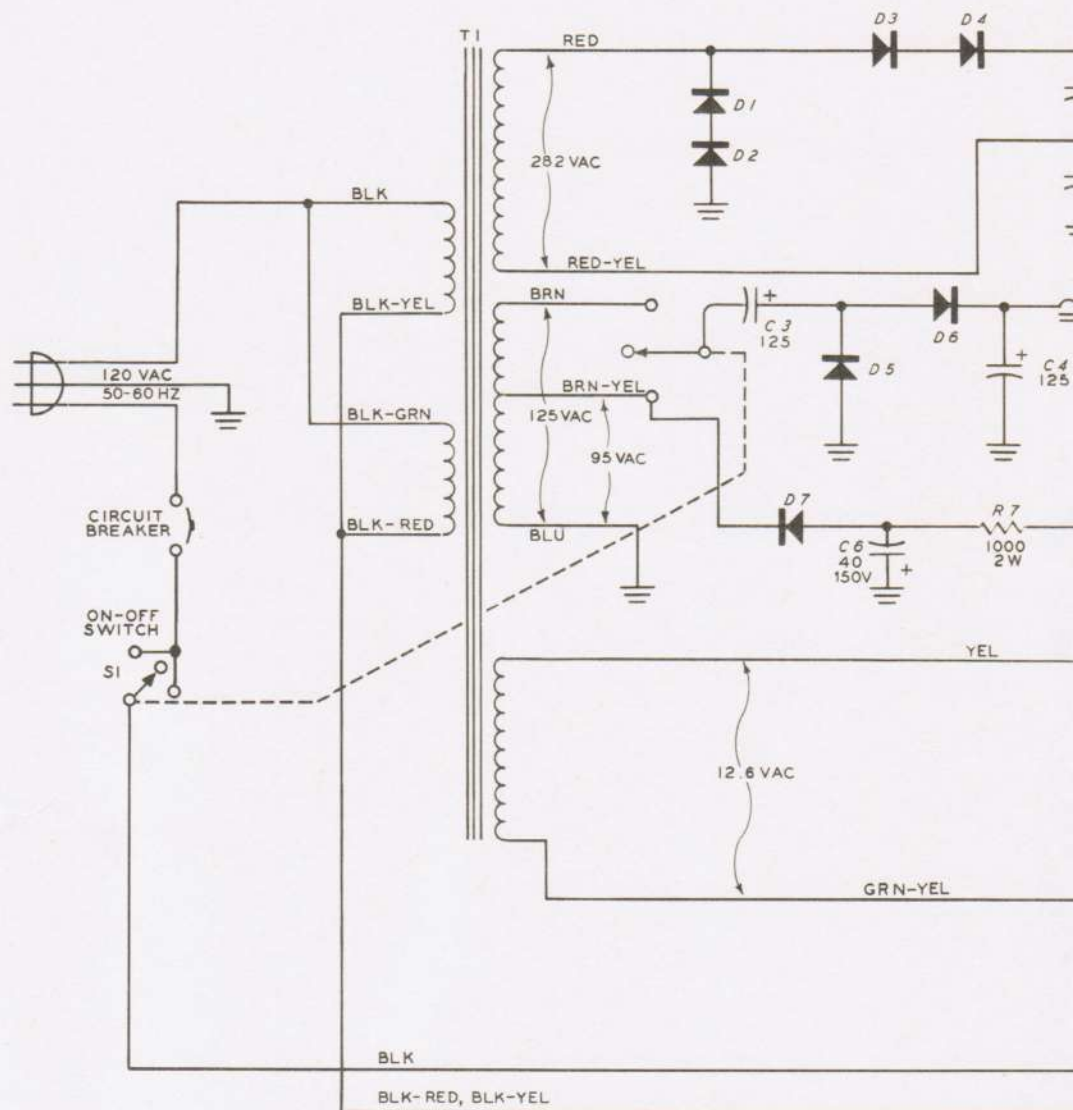
FILAMENT VOLTAGE CIRCUIT

The 12.6 volt filament winding provides 12.6 Vac to the power output socket.

CHASSIS PHOTOGRAPHS







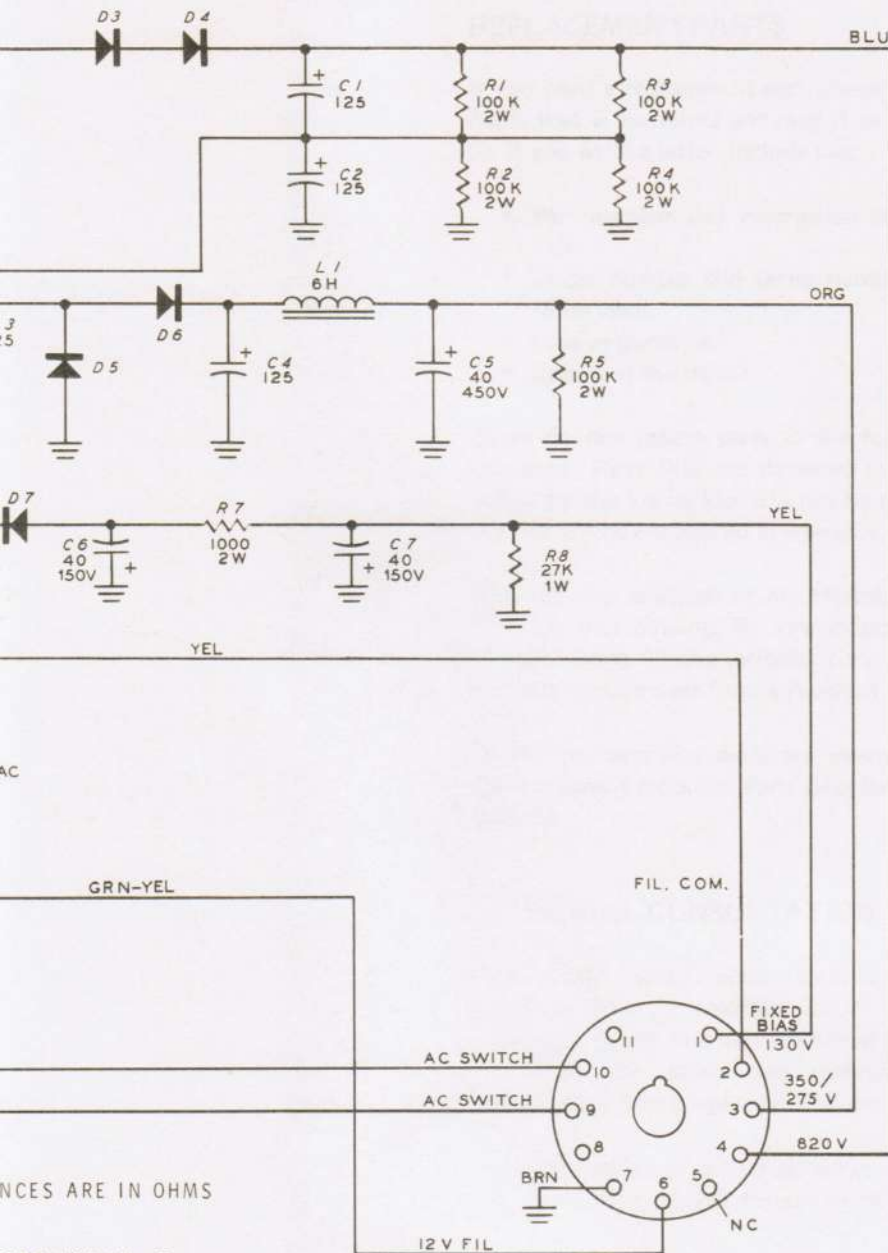
NOTE:
ALL RESISTANCES ARE IN OHMS
(K-1000).

ALL CAPACITORS ARE IN μ F.

ALL DC VOLTAGES MEASURED
FROM POINT INDICATED TO
GROUND, WITH NO LOAD ON
THE OUTPUT.

VOLTAGE MEASUREMENTS
MADE WITH AN 11 MEGOHM
INPUT ELECTRONIC
VOLTMETER.

CUSTOMER SERVICE



SCHEMATIC OF THE
HEATHKIT®
AC POWER SUPPLY
MODEL HP-23B

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