

# Assembly and Operation

of the



## ACCESSORY POWER SUPPLY

MODEL HWA-7-1



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**HEATH COMPANY**  
BENTON HARBOR, MICHIGAN 49022



## INTRODUCTION

The Heathkit Model HWA-7-1 Accessory Power Supply is a low-voltage, well regulated DC power supply. It was designed to provide +13.0 VDC, primarily to power the Heathkit Model HW-7 Low Power CW Transceiver from an AC power source. The Power Supply can be wired for operation from a 120 or 240 VAC power line and still maintain its specified regulation. Applications for this Accessory Power Supply are almost limitless in this age of low-voltage solid-state

circuits. Its rugged construction and reliable performance will provide years of dependable service.

*NOTE: Refer to 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 numbers correspond to the numbers in the Parts Pictorial (fold-out from Page 3).

**NOTE:** Any part that is packaged in an individual envelope with its part number on it should be placed back in the envelope after it is identified until it is called for in a step.

KEY PART No.	PARTS No.	PARTS Per Kit	DESCRIPTION
<b>ELECTRICAL PARTS</b>			
A1	1-42	1	270 $\Omega$ , 1/2-watt (red-violet-brown) resistor
A2	1-2-1	1	1000 $\Omega$ , 1-watt (brown- black-red) resistor
A3	56-32	1	VR-13.5 zener diode
A3	57-27	2	1N2071 diode
A4	417-101	1	TA2577A transistor
A5	25-154	1	2500 $\mu$ F electrolytic capacitor

To order a replacement part, use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover of the Manual. For pricing information, refer to separate "Heath Parts Price List."

KEY PART No.	PARTS No.	PARTS Per Kit	DESCRIPTION
<b>Electrical Parts (Cont'd.)</b>			
A6	421-33	1	1/4-ampere slow-blow fuse
A7	60-70	1	Slide switch
	54-233	1	Power transformer
<b>MECHANICAL PARTS</b>			
B1	204-689	1	Transistor bracket

## PARTS PICTORIAL

HEATHKIT

KEY PART No.	PARTS No.	PER KIT	DESCRIPTION
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## Mechanical Parts (Cont'd.)

B2	434-117	1	Transistor socket
B3	75-44	1	Mica insulator
B4	75-52	1	Phenolic insulator
B5	431-11	2	Terminal strip
B6	422-1	1	Fuseholder
B7	432-95	1	Cable connector
B8	432-72	2	Male pin
B9	73-46	1	Plastic grommet
B10	75-30	1	Strain relief
B11	261-34	4	Foot
	90-575-1	1	Chassis
	90-576-1	1	Cover

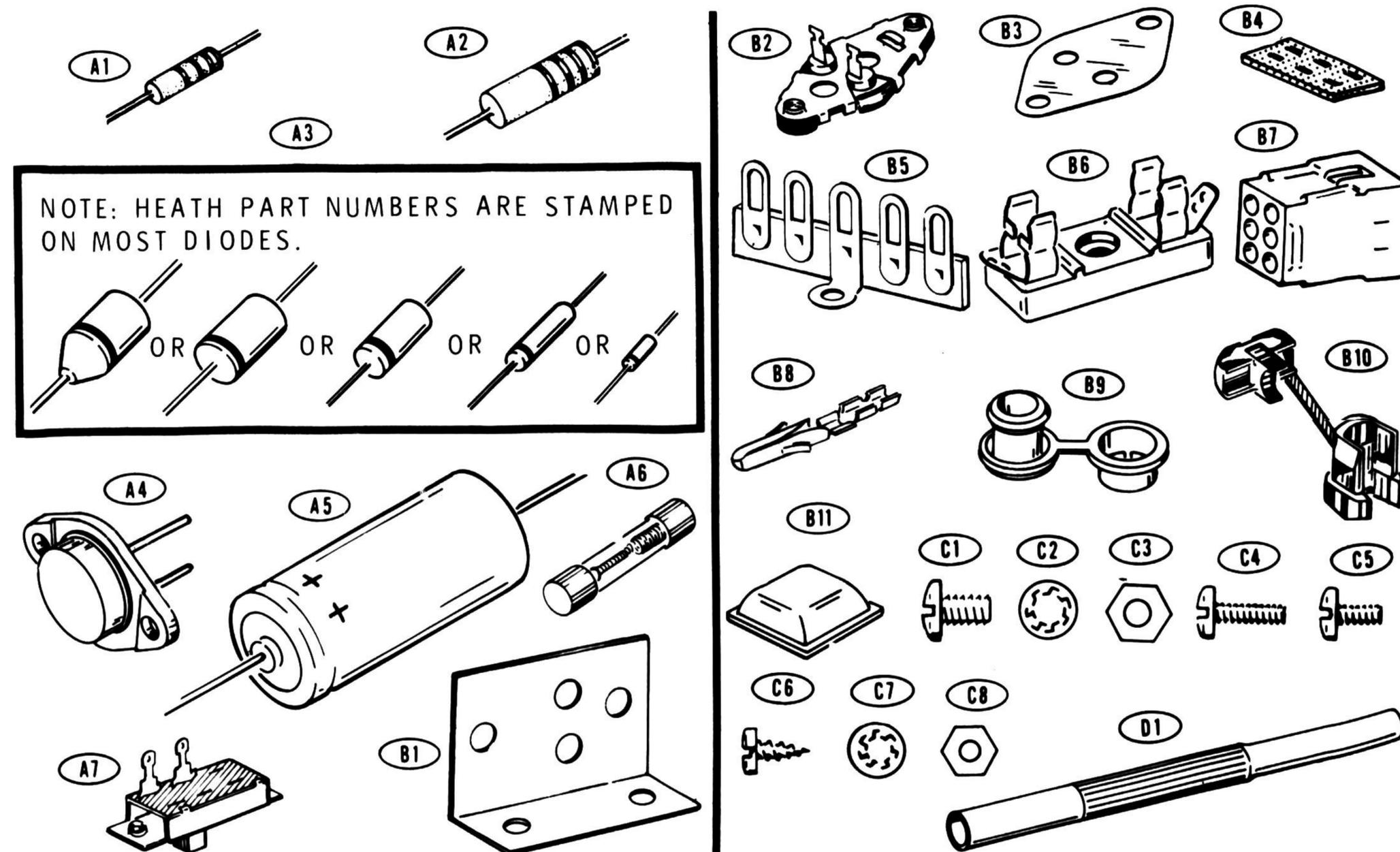
## HARDWARE

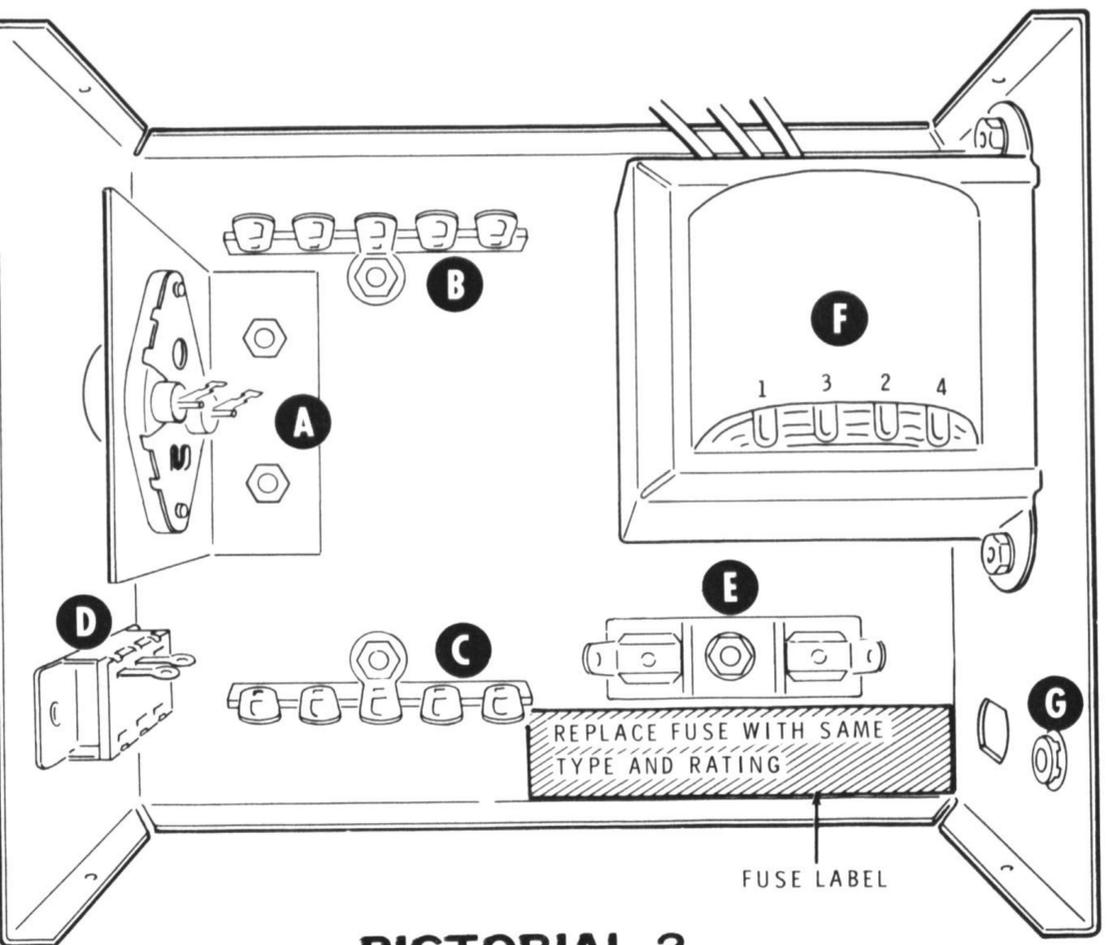
C1	250-174	2	8-32 x 1/4" screw
C2	254-2	2	#8 lockwasher
C3	252-4	2	8-32 nut
C4	250-89	3	6-32 x 3/8" screw
C5	250-56	6	6-32 x 1/4" screw
C6	250-170	6	#6 x 1/4" sheet metal screw
C7	254-1	8	#6 lockwasher
C8	252-3	5	6-32 nut

KEY PART No.	PARTS No.	PER KIT	DESCRIPTION
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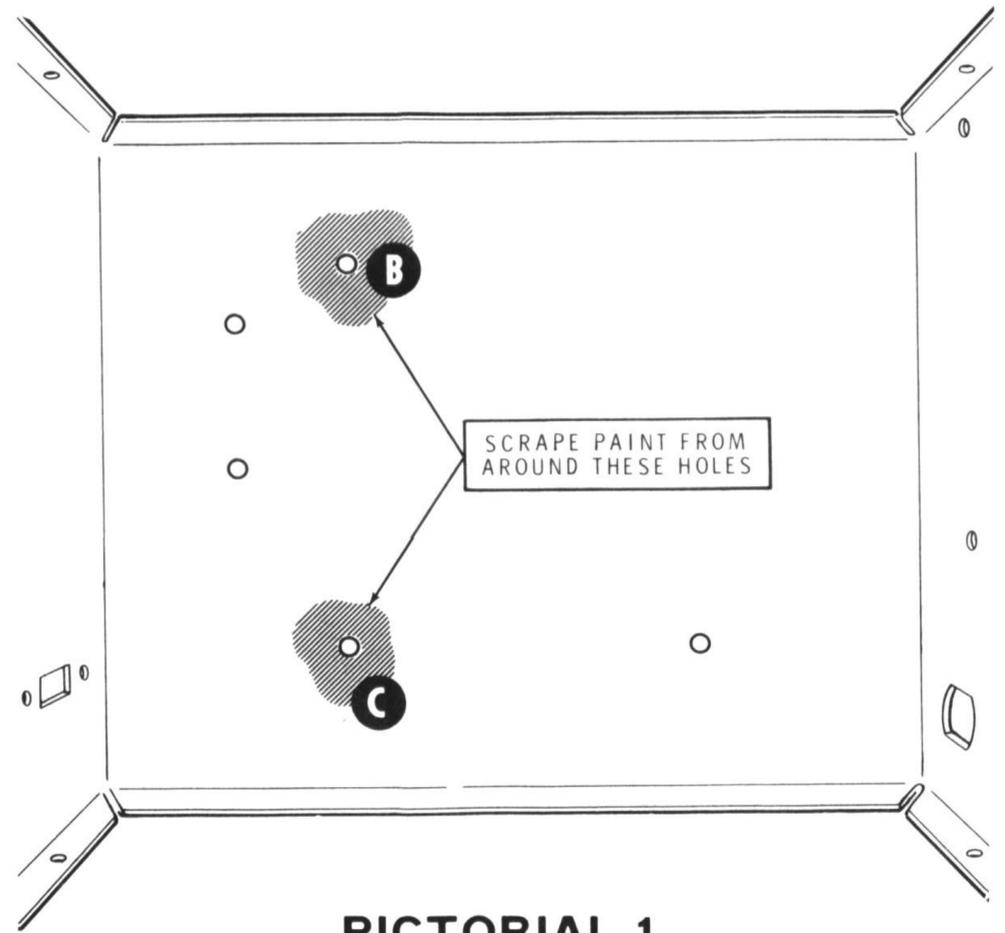
## GENERAL

	89-23	1	Line cord
	344-2	1	Black stranded wire
	344-3	1	Red stranded wire
	390-1255	1	Fuse label
	391-34	1	Identification label
D1	490-5	1	Nut starter
	597-260	1	Parts Order Form
	597-308	1	Kit Builders Guide
		1	Solder
		1	Manual (See front cover for part number.)





**PICTORIAL 2**



**PICTORIAL 1**

## STEP-BY-STEP ASSEMBLY

Before you start to assemble this kit, be sure to read the "Kit Builders Guide" for complete information on wiring, soldering, and step-by-step assembly procedures.

**Safety Warning:** Avoid eye injury when you clip off excess leads. We suggest that you wear glasses, or at least clip the leads so the ends will not fly toward your eyes.

### CHASSIS PARTS MOUNTING

Refer to Pictorial 1 for the following steps.

- ( ) Position the chassis on your work surface as shown.
- ( ) Scrape the paint from around the two indicated holes. This assures a better electrical ground for the terminal strips that will be mounted at these locations.

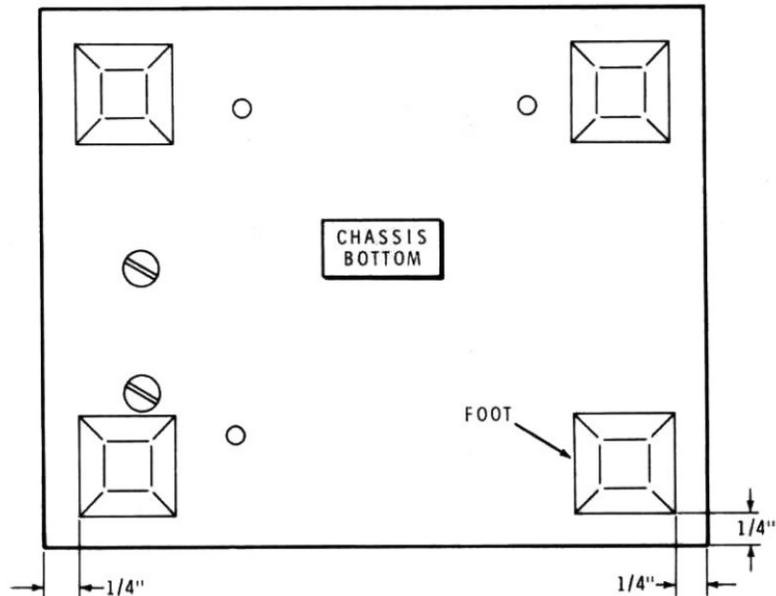
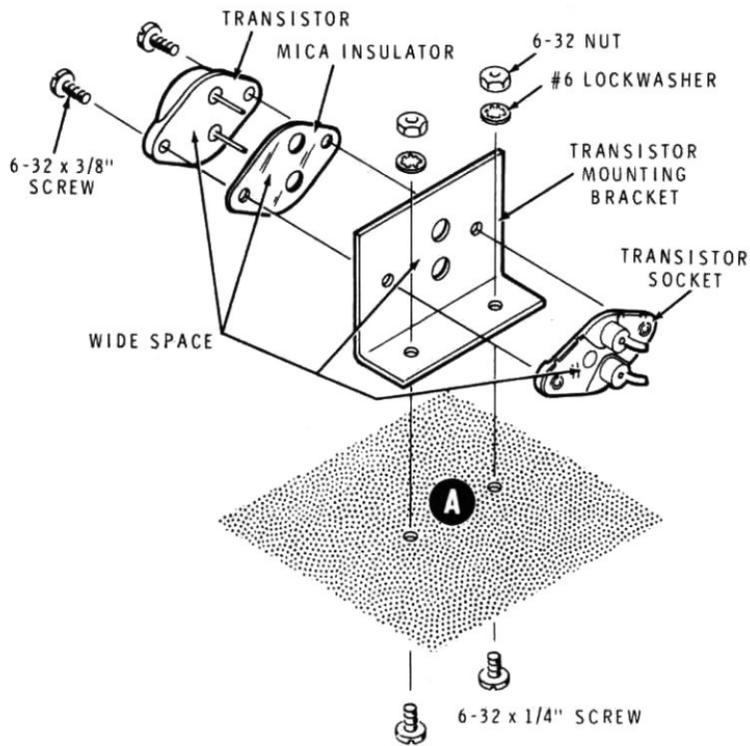
Refer to Pictorial 2 for the following steps.

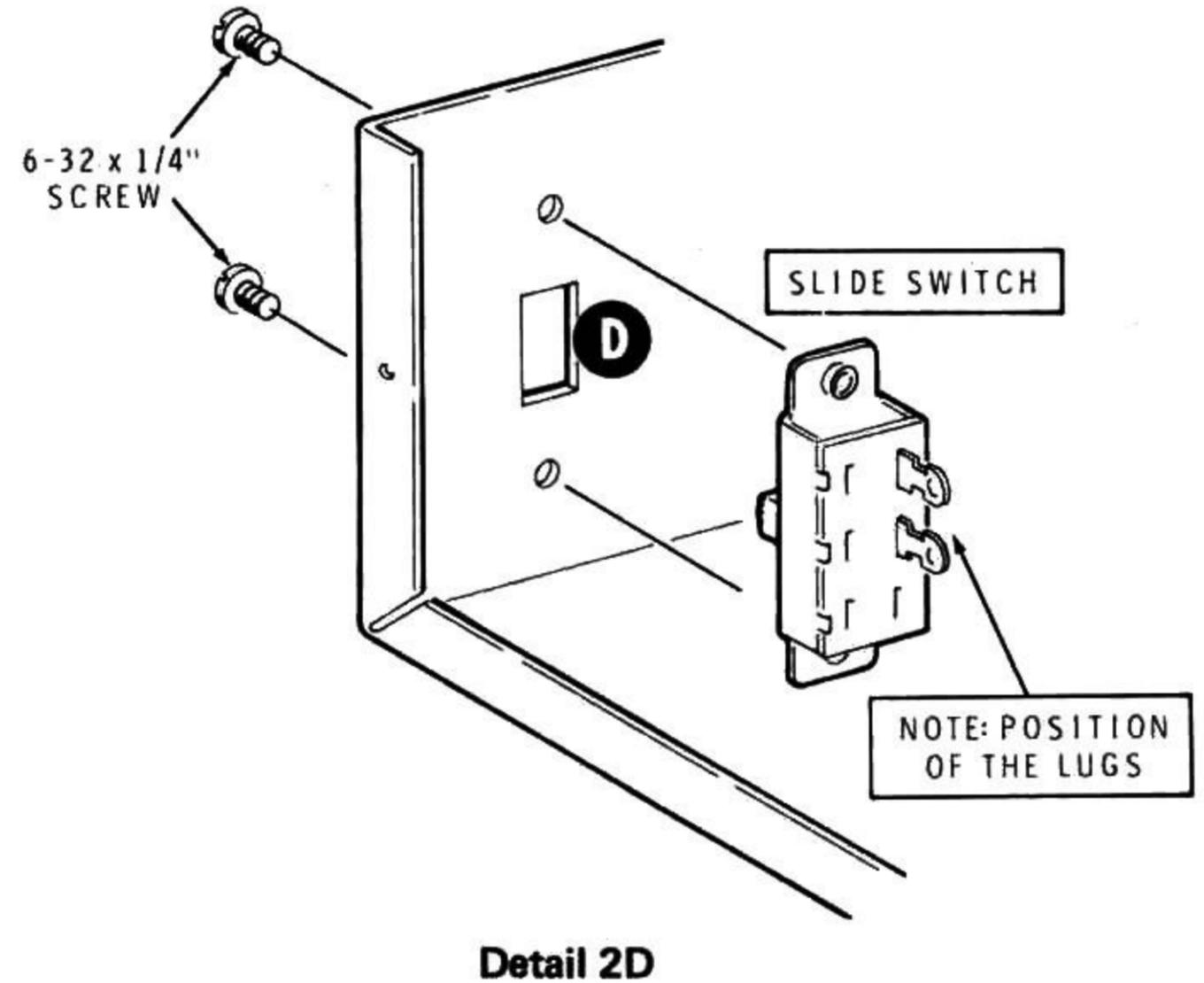
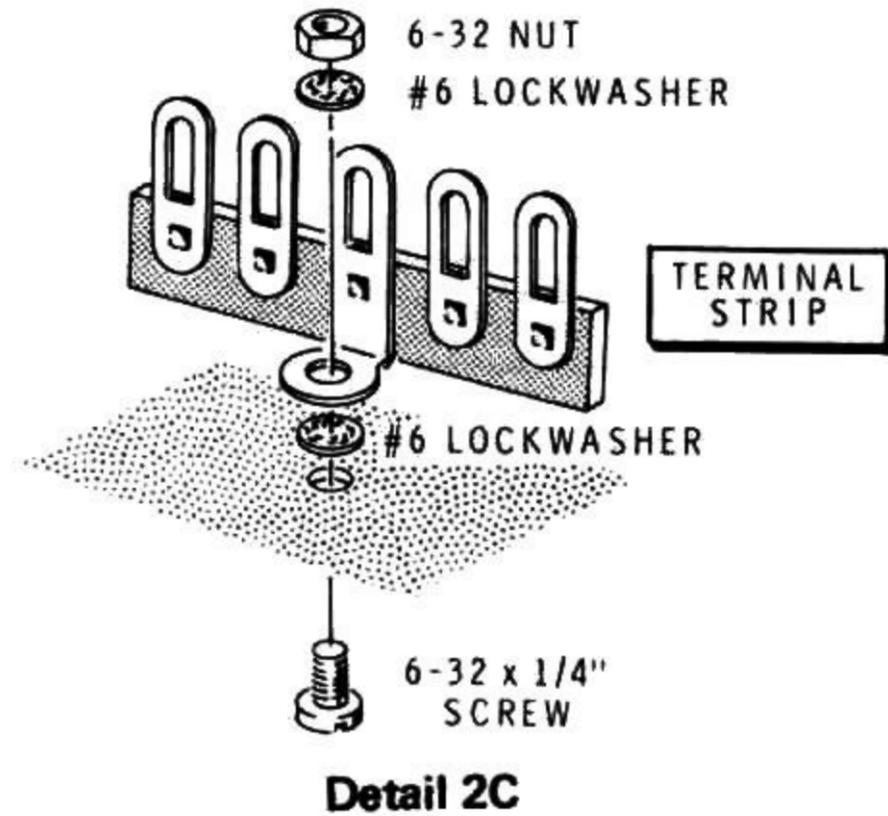
- ( ) Locate the TA2577A transistor, mica insulator, transistor bracket, transistor socket, and two 6-32 x 3/8" screws.
- ( ) Refer to Detail 2A and install the transistor, mica insulator, and transistor socket on the transistor bracket. Be sure to place the mica insulator between the transistor and the transistor bracket. Secure the transistor to the transistor bracket with 6-32 x 3/8" screws.

**NOTE:** When hardware is called for in a step, only the screw size will be given. For instance, if 6-32 x 1/4" hardware is called for, it means that a 6-32 x 1/4" screw, one or more #6 lockwashers, and a 6-32 nut should be used. The Detail referred to in the step will show the proper number of lockwashers to use.

The Heath Company has provided a plastic nut starter with this kit. Use this nut starter to start 6-32 and 3-48 nuts on screws. Refer to the "Kit Builders Guide" for further information.

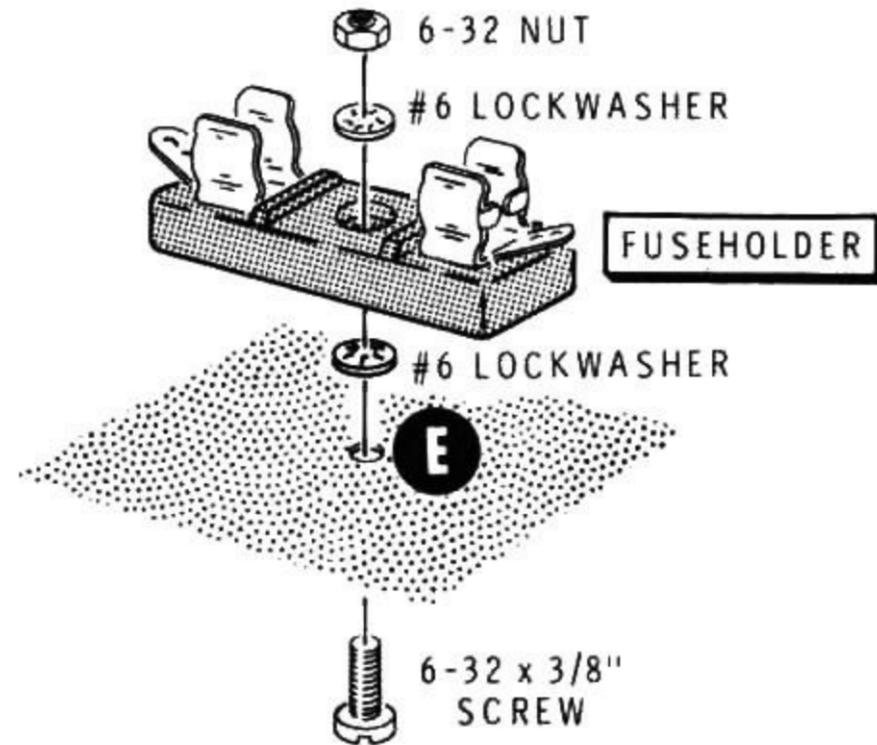
- ( ) Mount the prepared transistor bracket to the chassis at A with 6-32 x 1/4" hardware.
- ( ) Peel away the protective paper from each foot and mount one at each corner on the chassis bottom as shown in Detail 2B.



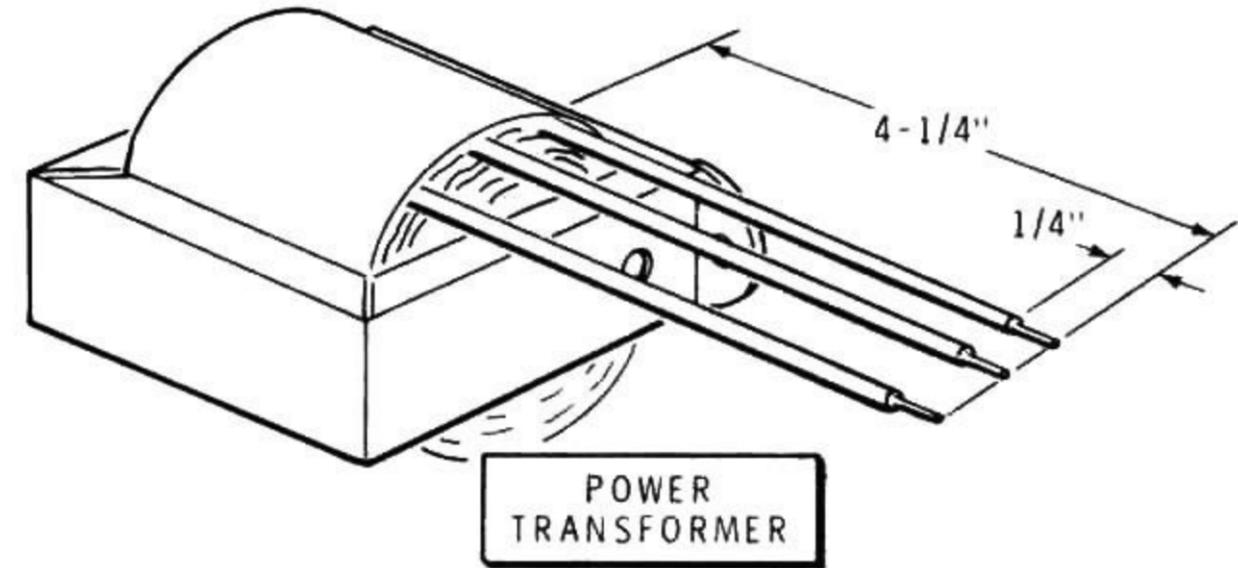


- ( ) Mount a terminal strip at B with 6-32 x 1/4" hardware as shown in Detail 2C. Be sure the terminal strip foot is positioned correctly.
- ( ) Mount the remaining terminal strip at C in a similar manner with 6-32 x 1/4" hardware. Be sure the terminal strip is positioned correctly.

- ( ) Refer to Detail 2D and mount the slide switch to the chassis at D with two 6-32 x 1/4" screws. Be sure the lugs of the switch are positioned correctly.



Detail 2E

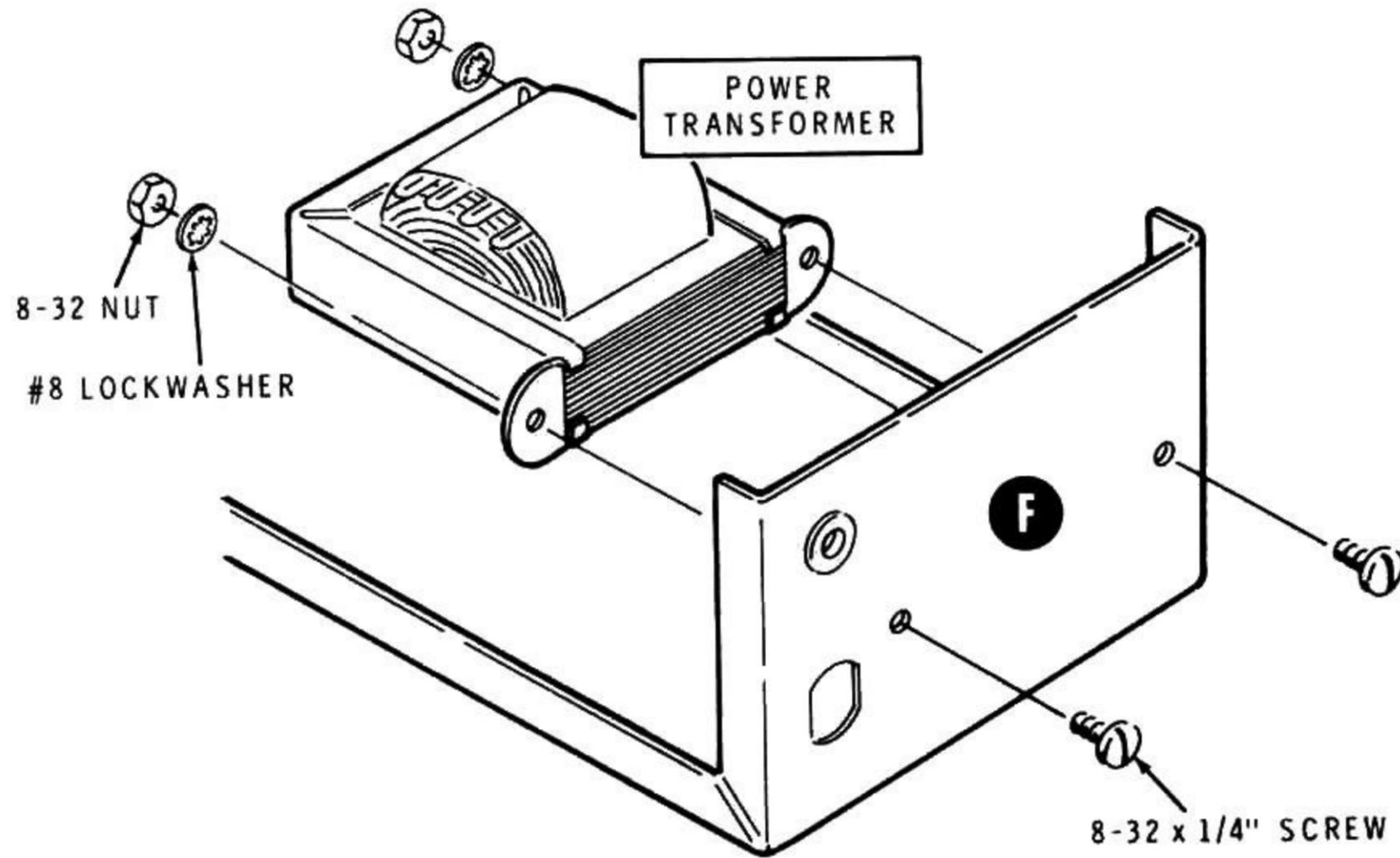


Detail 2F

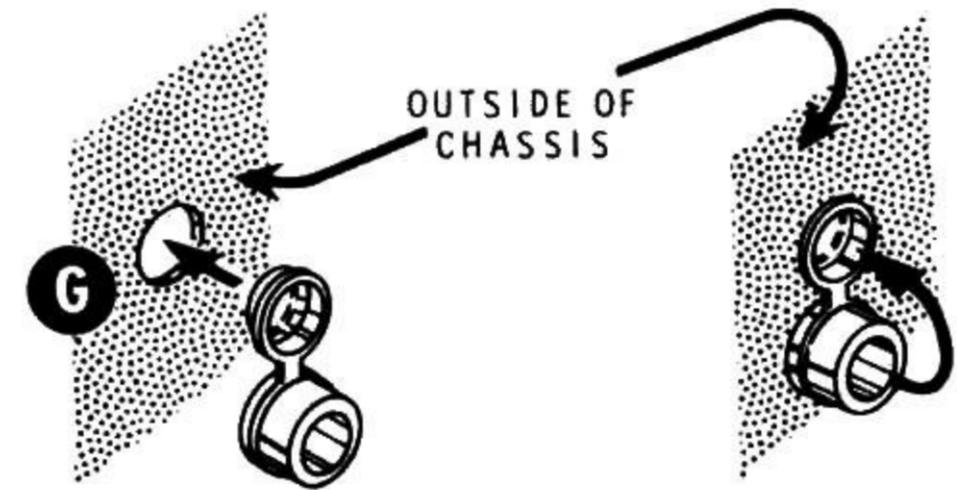
- ( ) Remove the protective backing paper from the fuse label and install the label exactly in the position shown.
- ( ) Use 6-32 x 3/8" hardware and mount the fuseholder to the chassis at E as shown in Detail 2E.

- ( ) Cut the three power transformer leads to the lengths specified in Detail 2F. Measure each lead from where it emerges from the transformer; then remove 1/4" of insulation from the end of each lead.





Detail 2G



POSITION THE SMALL PORTION OF THE GROMMET INTO THE CHASSIS HOLE.

BEND THE LARGE PORTION OF THE GROMMET OVER AND INTO THE SMALL PORTION. PRESS IT FIRMLY INTO PLACE.

Detail 2H

- ( ) Refer to Detail 2G and mount the power transformer to the chassis at F with 8-32 x 1/4" hardware. Be sure the lugs labeled 1 through 4 are positioned correctly.
- ( ) Install the plastic grommet in the chassis at G in the manner shown in Detail 2H.



## CHASSIS PARTS WIRING

Refer to Pictorial 3 (fold-out from Page 11) for the following steps.

**NOTE:** You will prepare the lengths of stranded wire ahead of time in the next step. To prepare stranded wire, cut it to the indicated length and remove 1/4" of insulation from each end. Then melt a small amount of solder on the bare wire ends to hold the small wire strands together.

( ) Prepare the following lengths of red stranded wire:

- 6"
- 3"
- 4"
- 4"

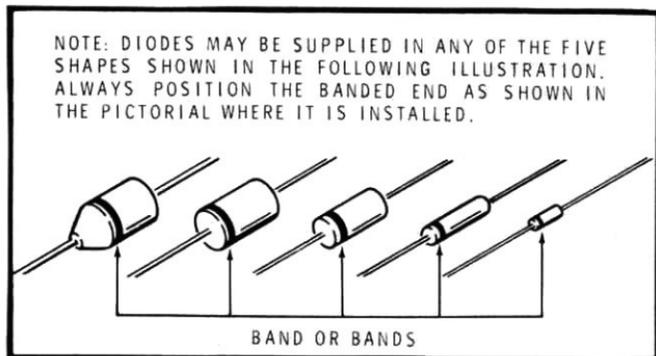
( ) Connect one of the red power transformer leads to lug 1 of terminal strip B (NS).

( ) Connect the other red power transformer lead to lug 2 of terminal strip B (NS).

( ) Connect the red-yellow power transformer lead to lug 3 of terminal strip B (S-1).

( ) Locate the two **1N2071 diodes** (#57-27) and identify the banded ends as shown in Detail 3A.

( ) Connect the banded end of a 1N2071 diode to lug 4 (NS) and the other end to lug 1 (S-2) of terminal strip B.



Detail 3A

( ) Connect the banded end of a 1N2071 diode to lug 4 (NS) and the other end to lug 2 (S-2) of terminal strip B.

( ) Connect a 6" red stranded wire from lug 4 of terminal strip B (NS) to lug 3 of transistor A (NS).

( ) Connect a 1000  $\Omega$ , 1-watt (brown-black-red) resistor from lug 1 of transistor A (NS) to lug 2 of terminal strip C (NS).

( ) Connect a 270  $\Omega$ , 1/2-watt (red-violet-brown) resistor between lugs 3 (S-2) and 2 (NS) of transistor A. Be sure the resistor is positioned close to the transistor socket as shown.



- ( ) Locate the VR-13.5 zener diode and identify the banded end. Then connect the banded end to lug 1 of terminal strip C (NS) and connect the other end to lug 2 of terminal strip C (NS).
- ( ) Connect a 3" red stranded wire between lug 1 of terminal strip C (S-2) and lug 2 of transistor A (S-2).
- ( ) Install the phenolic insulator on slide switch D as shown in inset drawing #1 on the Pictorial.

NOTE: In some of the following steps, you will be directed to "make a mechanically secure connection." Do this by inserting the wire through and/or wrapping it around the lug before soldering. See inset drawing #2 on Pictorial 3.

- ( ) Connect a 4" red stranded wire between lug 1 of fuseholder E (S-1) and lug 1 of slide switch D (S-1). Make mechanically secure connections.

NOTE: Save the remaining 4" red stranded wire. It will be used later.

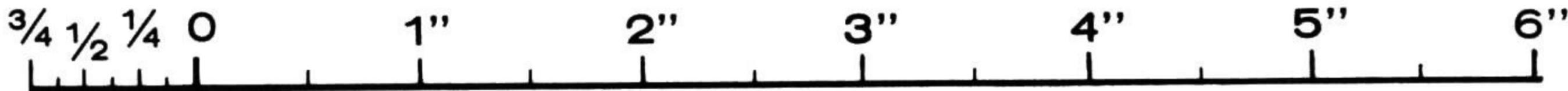
- ( ) Prepare one end of the remaining length of red stranded wire. The other end will be prepared later.
- ( ) Prepare one end of the length of black stranded wire. The other end will be prepared later.
- ( ) Insert the prepared ends of the red stranded and black stranded wires through plastic grommet G. Then gently pull 8" of the red stranded and 7" of the black stranded wire through the grommet.

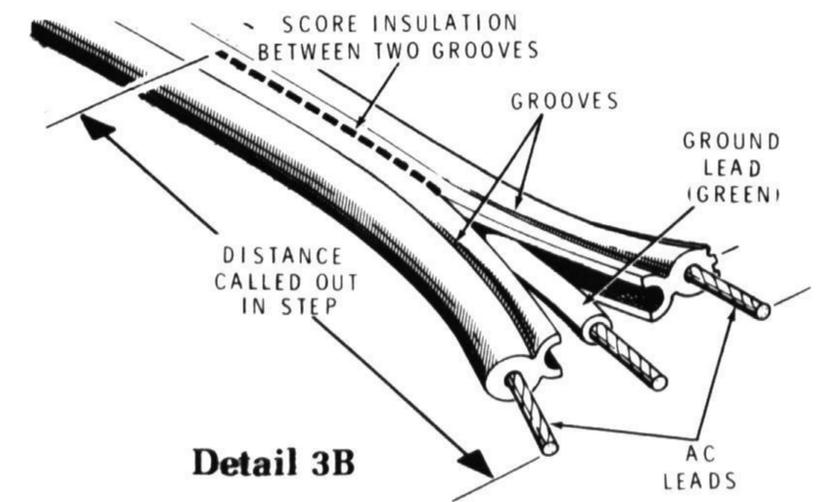
- ( ) Tie a knot in the red stranded and black stranded wires against the grommet. This will act as a strain relief so the wires cannot be pulled loose from their electrical connections.
- ( ) Connect the end of the red stranded wire coming from the grommet to lug 1 of transistor A (S-2).
- ( ) Connect the end of the black stranded wire coming from the grommet to lug 4 of terminal strip C (NS).

NOTE: Where a wire passes through a connection and then goes to another point, as in the next step, it will count as two wires in the solder instructions (S-2), one entering and one leaving the connection. Be especially careful, when soldering these connections, to apply enough solder and heat to solder these "through wires."

- ( ) Connect the positive (+) end of the 2500  $\mu$ F electrolytic capacitor to lug 4 of terminal strip B (S-4) and the other end through lug 4 (S-3), against lug 3 (NS), to lug 2 (S-3) of terminal strip C. NOTE: Save the bare lead cut off from the positive end of the electrolytic capacitor. It will be used during the "240 VAC Wiring" steps.

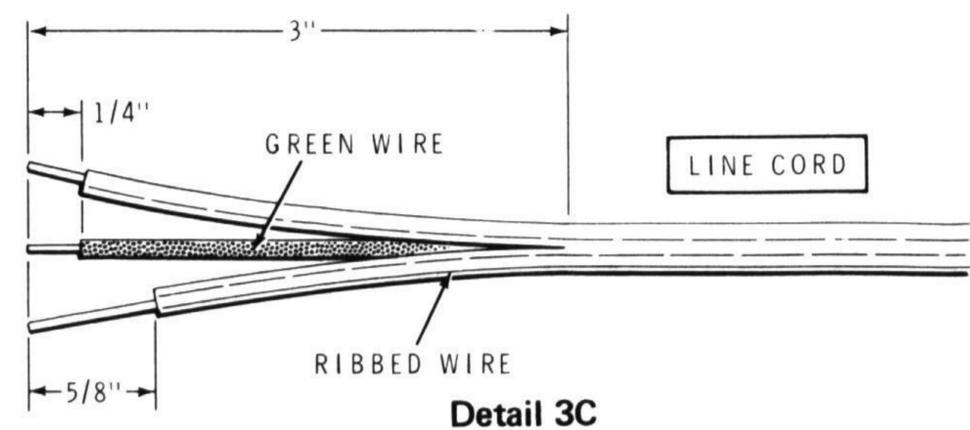
NOTE: The flat 3-wire line cord supplied with this kit has one of its outer wires marked with a rib in the insulation along its edge, another wire is smooth, and the third wire is color coded green. It is very important that you connect the ribbed wire as indicated.





Detail 3B

- ( ) Refer to Detail 3B and split the outer insulation of the line cord for 3 inches, as follows, so you do not cut into the protective insulation for the AC leads.
  1. Use a knife point to score a 3" line, BETWEEN the two grooves.
  2. Turn the cord over and repeat step 1.
  3. Grasp the lead ends by the insulation and pull the leads apart. The line cord will separate on the scored lines.
- ( ) Refer to Detail 3C and prepare the end of the 3-wire line cord.
- ( ) Insert the end of the prepared end of the line cord through hole H in the chassis.
- ( ) Connect the green line cord wire to lug 3 of terminal strip C (S-3). Make a mechanically secure connection. Be sure to press the electrolytic capacitor lead against the lug before soldering.

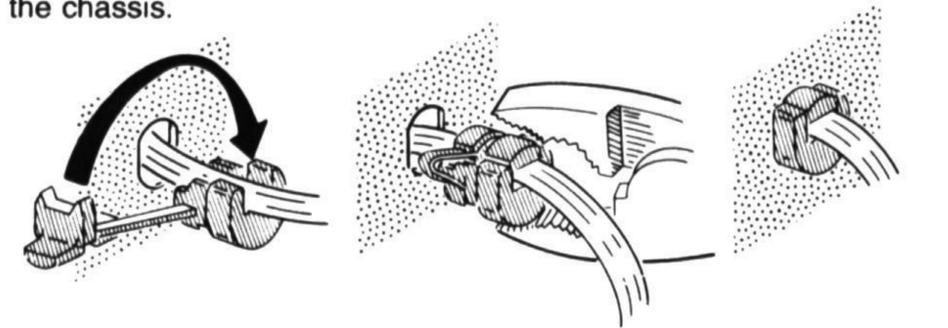


Detail 3C

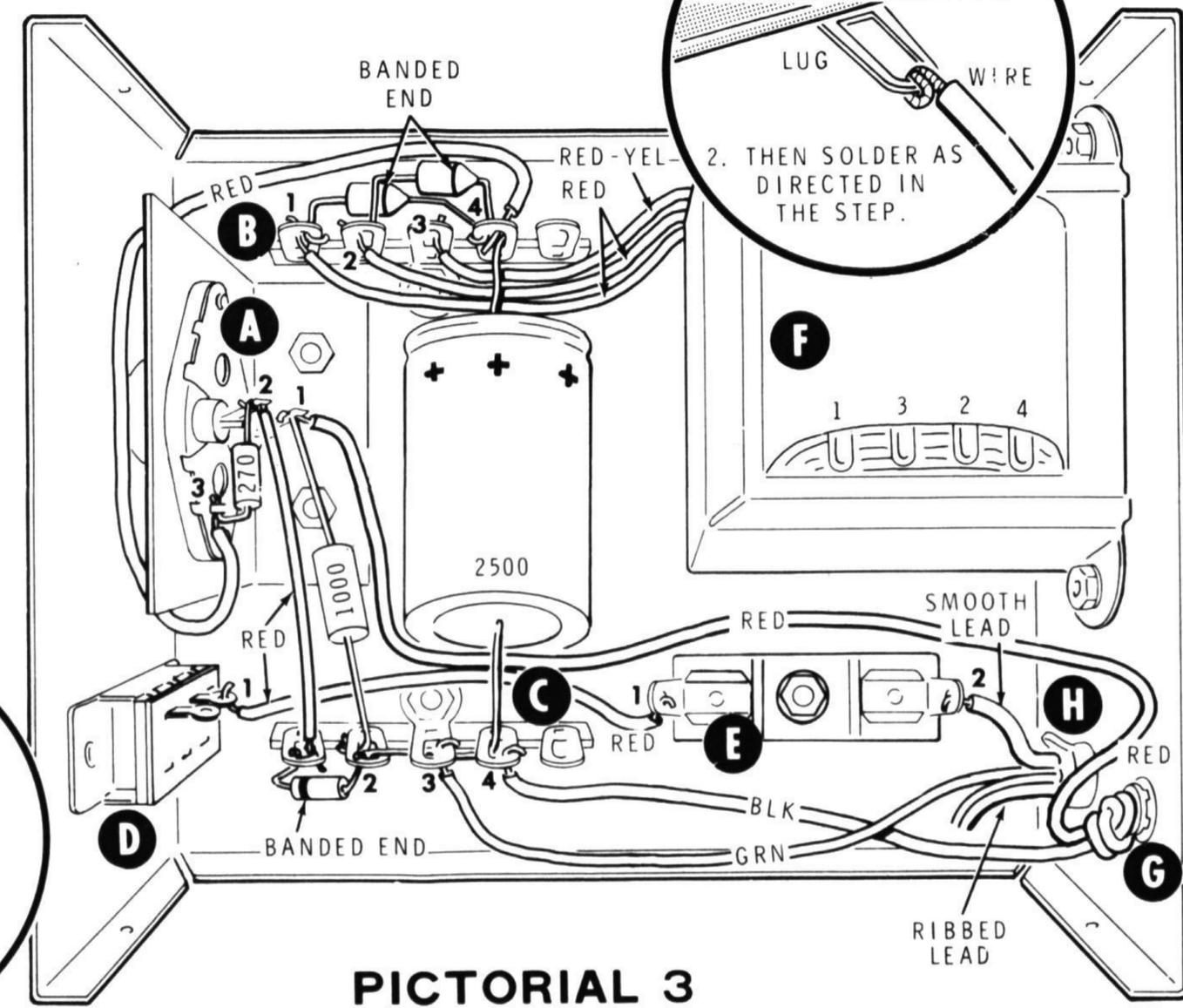
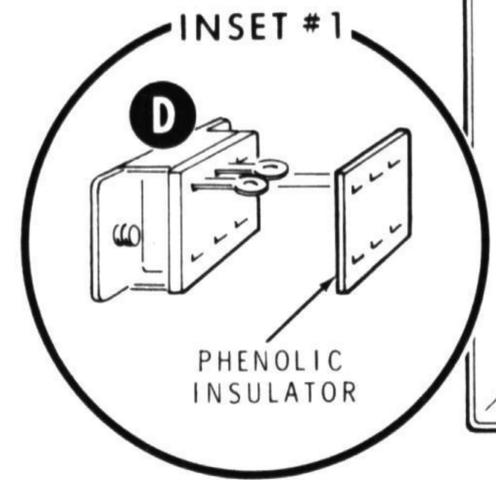
- ( ) Connect the smooth line cord wire to lug 2 (S-1) of fuseholder E. Make a mechanically secure connection.

NOTE: The remaining (ribbed) line cord wire will be connected later.

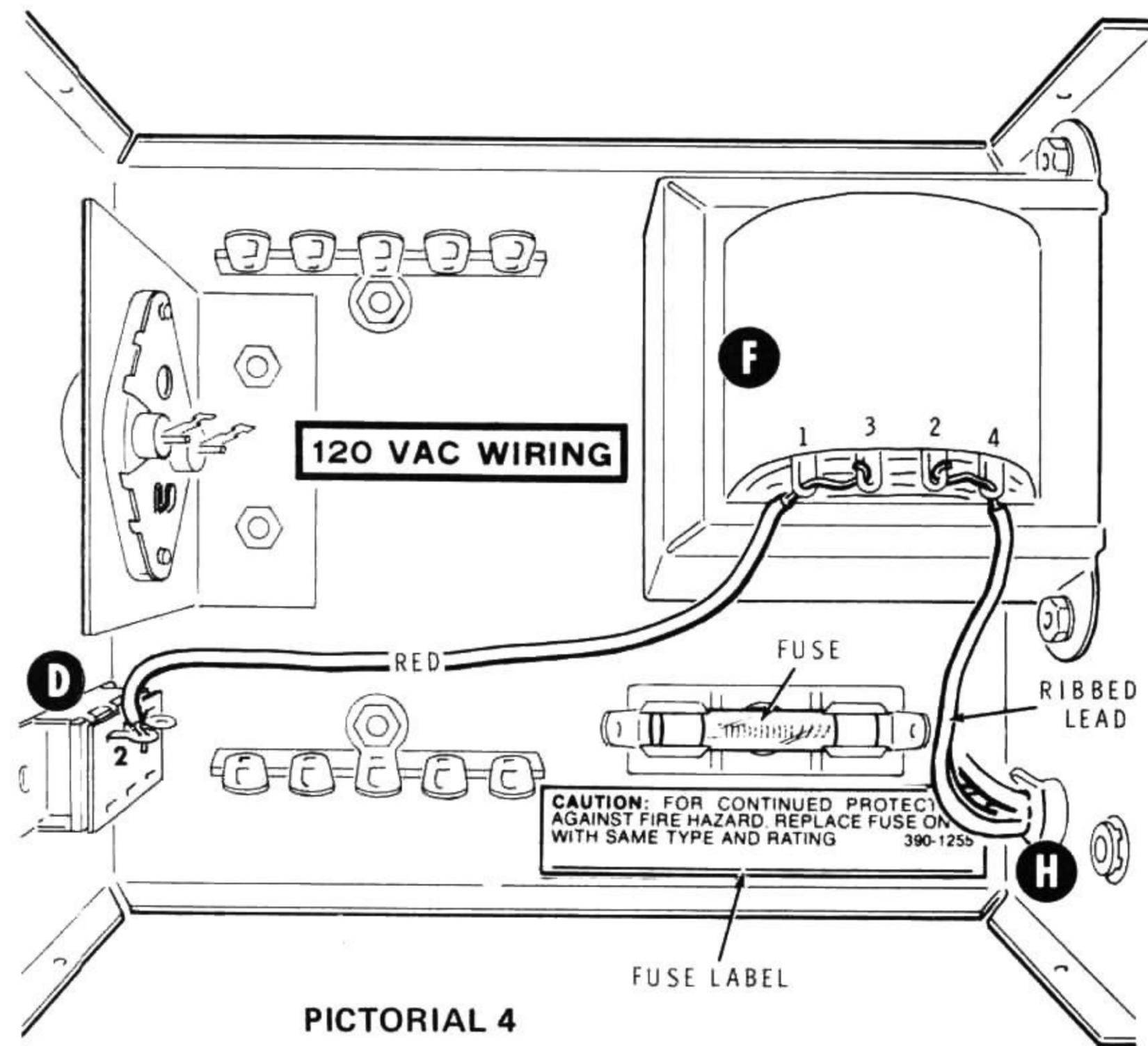
- ( ) Refer to Detail 3D and install the strain relief on the line cord in hole H in the chassis.



Detail 3D



PICTORIAL 3



## 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 ONLY THE INSTRUCTIONS THAT AGREE WITH THE LINE VOLTAGE IN YOUR AREA.

### 120 VAC Wiring

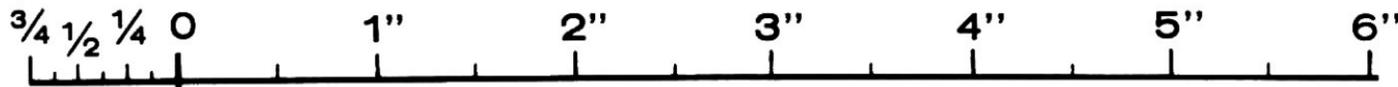
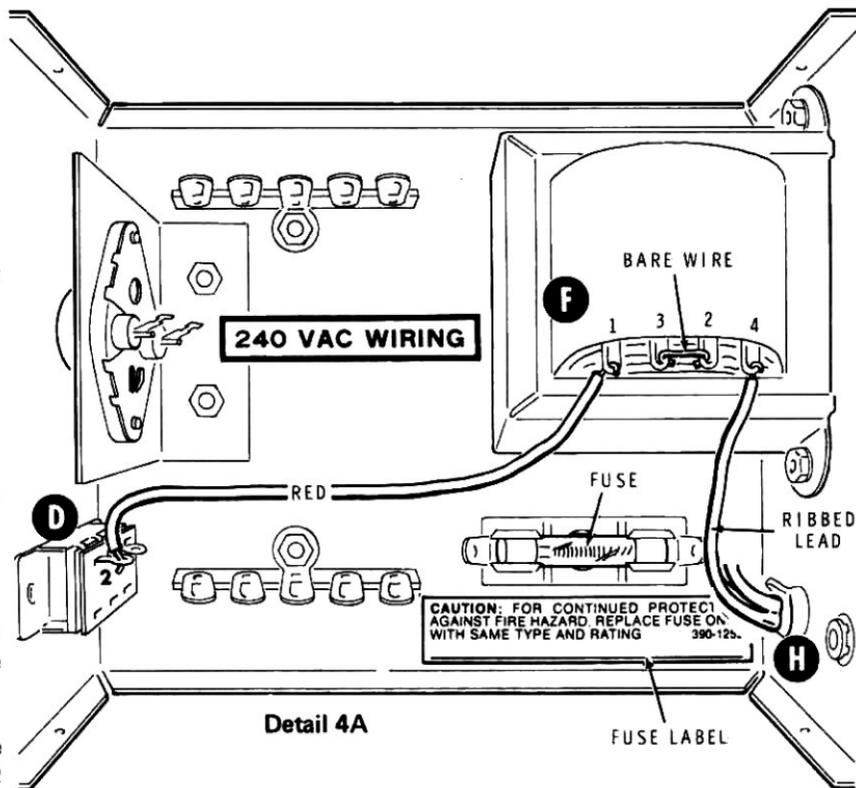
Refer to Pictorial 4 for the following steps.

- ( ) Locate the 1/4-ampere slow-blow fuse.
- ( ) Write the fuse type and ampere rating on the fuse label previously installed.
- ( ) Install the 1/4-ampere slow-blow fuse in the fuseholder.
- ( ) Connect the ribbed wire of the line cord through lug 4 (S-2) to lug 2 (S-1) of power transformer F. Make mechanically secure connections.
- ( ) Locate the previously prepared 4" red stranded wire and remove an additional 1/4" of insulation from one end.
- ( ) Connect the 1/2" bare end of the red stranded wire through lug 1 (S-2) to lug 3 (S-1) of power transformer F. Connect the other end of the wire to lug 2 of slide switch D (S-1). Make mechanically secure connections.

## 240 VAC Wiring

Refer to Detail 4A for the following steps.

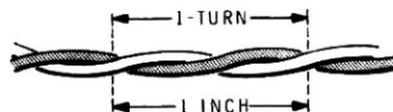
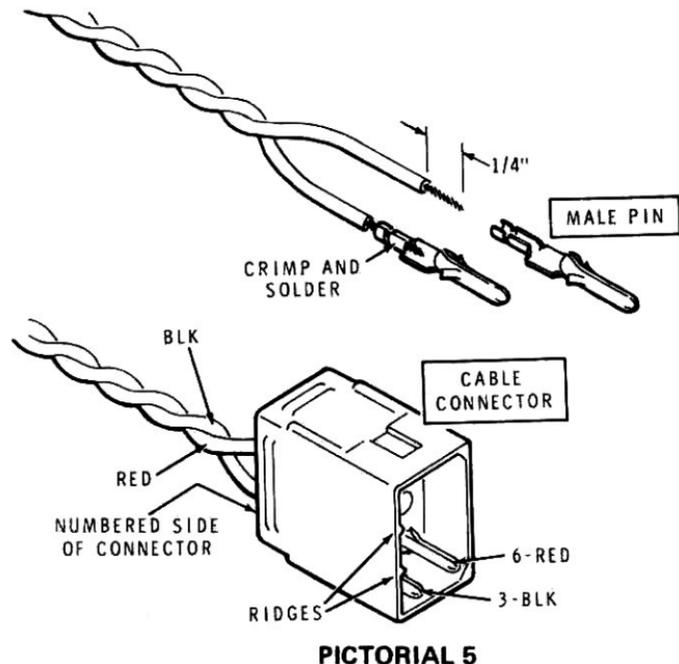
- ( ) Locate a 1/8-ampere slow-blow fuse (NOT SUPPLIED).
- ( ) Write the fuse type and ampere rating on the fuse label previously installed.
- ( ) Install the 1/8-ampere slow-blow fuse in the fuseholder.
- ( ) Cut the 5/8" bare wire end of the ribbed line cord wire to 1/4".
- ( ) Connect the ribbed line cord wire to lug 4 of power transformer F (S-1). Make a mechanically secure connection.
- ( ) Locate the previously prepared 4" red stranded wire.
- ( ) Connect the 4" red stranded wire from lug 1 (S-1) of power transformer F (S-1) to lug 2 of slide switch D (S-1). Make mechanically secure connections.
- ( ) Locate the bare wire previously cut off from the positive end of the electrolytic capacitor. Connect this cutoff lead between lugs 3 (S-1) and 2 (S-1) of power transformer F. Make mechanically secure connections.



**FINAL ASSEMBLY**

Refer to Pictorial 5 for the following steps.

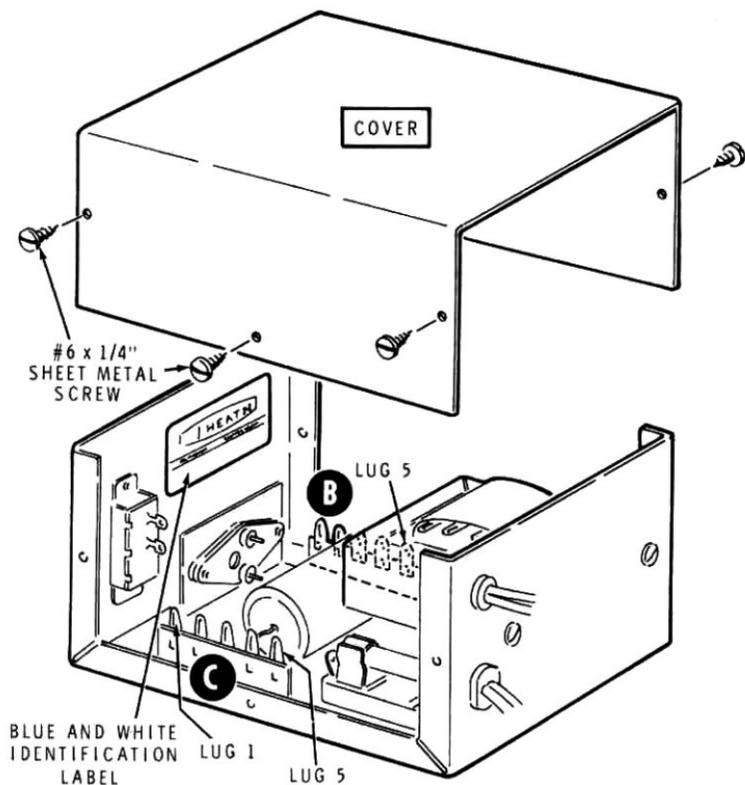
- ( ) Refer to Detail 5A and twist the red stranded and black stranded wires together to form a twisted pair.

**Detail 5A**

- ( ) Cut off the free ends of the twisted pair so they are exactly even. Then prepare the free ends.

NOTE: The following three steps can be disregarded if you intend to install a cable connector of your own choice on the free end of the twisted pair.

- ( ) Install a male pin on the prepared end of each wire.
- ( ) Push the pin on the black wire into hole #3 of the cable connector.
- ( ) Push the pin on the red wire into hole #6 of the cable connector.
- ( ) Gently pull on the wires installed in the connector to be sure they have clicked into place.



PICTORIAL 6

Refer to Pictorial 6 for the following steps.

- ( ) Carefully peel away the backing paper from the blue and white label. Then press the label into position as shown. Be sure to refer to the numbers on this label in any communications you have with the Heath Company about this kit.
- ( ) Lugs 1 and 5 of terminal strip C and lug 5 of terminal strip B should not be used. All remaining lugs should be soldered.

This completes the assembly of the Accessory Power Supply. Carefully inspect all connections for loose wires or unsoldered connections. Remove any wire clippings or solder splashes.

- ( ) Position the cover on the chassis and line up the holes in the cover with the holes in the chassis. The cover should extend about 3/16" over the switch end of the chassis. Reverse the cover if the overhang is toward the rear. Then mount the cover to the chassis with six #6 x 1/4" sheet metal screws.

**WARNING:** Hazardous voltages are exposed when the line cord is plugged in and the chassis cover is removed.



## SPECIFICATIONS

Output Voltage . . . . .	13.0 volts, regulated.
Maximum Output Current . . . . .	600 mA continuous.
Transistor and Diode Complement . . . . .	TA2577A transistor, series regulator. VR-13.5 zener diode, reference diode. 1N2071 diodes (2 in full-wave rectifier).
Power Requirements . . . . .	110 to 130 or 220 to 260 VAC, 50/60 Hz, at 15 watts.
Dimensions . . . . .	2-3/4" high x 4-1/4" wide x 6" deep (including switch and feet).
Net Weight . . . . .	3 lbs.

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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.

## IN CASE OF DIFFICULTY

**CAUTION:** *The full ac line voltage is present at several points in the Accessory Power Supply. Be careful to avoid personal shock when performing the checks described.*

This section of the Manual is divided into two parts: "Visual Checks," and the "Factory Repair Service." Begin your search by carefully following the checks listed below.

### VISUAL CHECKS

**NOTE:** The following checks will be most effective if you apply them to one part of the kit at a time.

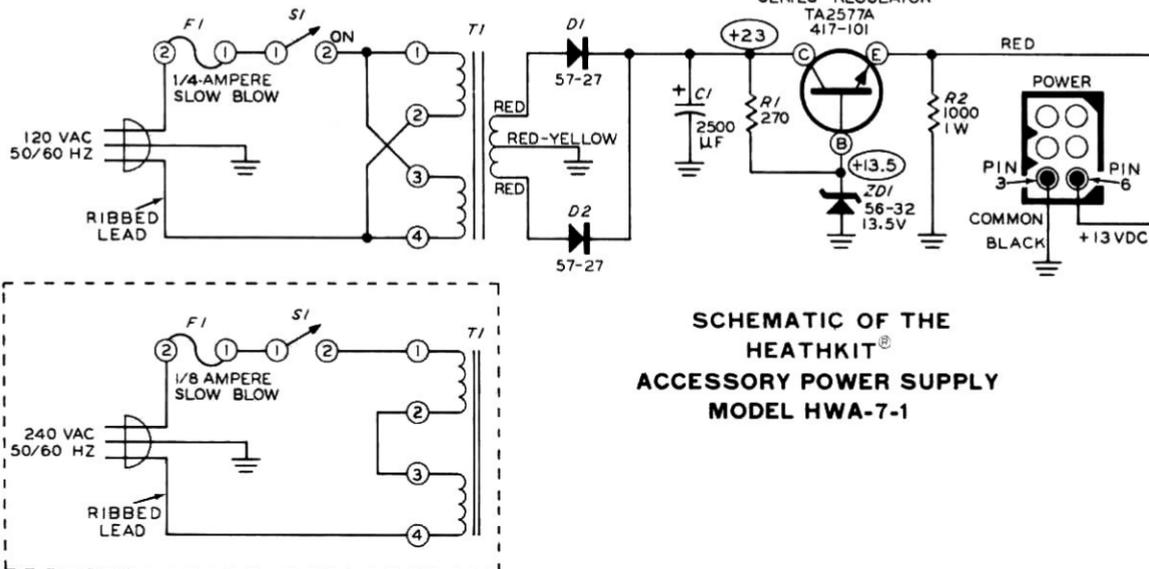
1. About 90% of the kits that are returned for repair do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by a careful inspection of connections to make sure they are soldered as described in the "Soldering" section of the "Kit Builders Guide." Resolder any doubtful connections and be sure all the wires are soldered at places where several wires are connected.
  2. Always check the polarity of electrolytic capacitors to be sure they are installed correctly.
  3. Check each resistor carefully. A resistor that is discolored, or cracked, or shows any sign of bulging would indicate that it is faulty and should be replaced.
  4. Be sure the correct diode is installed at each diode location, and that the banded end is positioned correctly.
  5. 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 you have consistently overlooked.
  6. If excessive current has been drawn from any section of the power supply, the fuse may be blown.
  7. Transistor Q1 may be shorted or diode ZD1 may be open if the output voltage is higher than required for normal operation.
  8. Diode ZD1 may be shorted if the output voltage is lower than required for normal operation, or if no output voltage is present at all.
  9. Transistor case shorted to bracket.
- If the trouble is not located after the "Visual Tests" are completed and a voltmeter is available, check voltage readings against those shown in the Schematic Diagram.

## CIRCUIT DESCRIPTION

Refer to the Schematic Diagram while you read the "Circuit Description."

The 120 VAC or 240 VAC line voltage is applied through fuse F1 and Power On-Off switch S1 to the primary winding of power transformer T1. From the secondary winding, the voltage is applied to silicon diodes D1 and D2. These diodes operate as a full-wave rectifier circuit. The DC voltage from D1 and D2 is then filtered by electrolytic capacitor C1 and is applied to series regulator transistor Q1. This transistor is connected in an emitter follower configuration, and filters any input voltage fluctuations to maintain the constant DC output voltage.

The power supply load resistance consists of resistor R2 which is in parallel with the external load. This resistance is connected between the emitter of transistor Q1 and ground. The operating point of the transistor is determined by zener diode ZD1, which has its bias determined by resistor R1. The DC output voltage is connected to the twisted-pair cable for convenience in placing the Accessory Power Supply away from its load.



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